200SX/S14 Silvia
Workshop manuals

A special thanks to all the people who made this manual possible (including Mr nissan!)
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<td>IDX</td>
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Observe the following precautions to ensure safe and proper servicing.

Precautions for Supplemental Restraint System “AIR BAG” and “SEAT BELT PRE-TENSIONER”

The Supplemental Restraint System “Air Bag” and “Seat belt pre-tensioner”, used along with a seat belt, help to reduce the risk or severity of injury to the driver and front passenger in a frontal collision. The Supplemental Restraint System consists of air bag modules (located in the center of the steering wheel and on the instrument panel on the passenger side), a seat belt pre-tensioner, a diagnosis sensor unit, warning lamp, wiring harness and spiral cable. Information necessary to service the system safely is included in the RS section of this Service Manual.

WARNING:
- To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN dealer.
- Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.
- All SRS electrical wiring harnesses and connectors are covered with yellow outer insulation. Do not use electrical test equipment on any circuit related to the SRS.

General Precautions
- 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 flammable materials. Special care should be taken when handling any flammable or poisonous materials, such as gasoline, refrigerant gas,等. 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.
- To prevent serious burns, avoid contact with hot metal parts such as the radiator, exhaust manifold, tail pipes and muffler. Do not remove the radiator cap when the engine is hot.
- 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.
- Before servicing the vehicle, protect tendons, upholstery and carpeting with appropriate covers. Take caution that keys, buckles or buttons on your person do not scratch the paint.
- Do not touch the terminals of electrical components which use microcomputers (such as ECMs). Static electricity may damage internal electronic components.
- Clean all disassembled parts in the designated liquid or solvent prior to inspection or assembly.
- Replace oil seals, gaskets, packings, O-rings, locking washers, cotter pins, self-locking nuts, etc. with new ones.
- Replace inner and outer races of tapered roller bearings and needle bearings as a set.
- Arrange the disassembled parts in accordance with their assembled locations and sequence.
- Do not mix the terminals of electrical components which use microcomputers (such as ECMs). Static electricity may damage internal electronic components.
PRECAUTIONS

General Precautions (Cont’d)
- After disconnecting vacuum or air hoses, attach a tag to indicate the proper connection.
- Use only the fluids and the lubricants specified in MA section and HA section or their equivalents.
- Use approved bonding agents, sealants or their equivalents when required.
- Use tools and recommended special tools where specified for safe and efficient service repairs.
- When repairing the fuel, oil, water, vacuum or exhaust systems, check all affected lines for leaks.
- Dispose of drained oil or the solvent used for cleaning parts in an appropriate manner.

Precautions for Multiport Fuel Injection System or ECCS Engine
- Before connecting or disconnecting multiport fuel injection system or ECCS (ECCS control module) harness connector, be sure to turn the ignition switch to the “OFF” position and disconnect the negative battery terminal.
- Otherwise, there may be damage to ECM.
- Before disconnecting pressurized fuel line from fuel pump to injectors, be sure to release fuel pressure to eliminate danger.
- Be careful not to jar components such as ECM and mass air flow sensor.

Precautions for Three Way 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 three way catalyst.
  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.
- Do not place the vehicle on flammable material. Keep flammable material off the exhaust pipe and the three way catalyst.

Precautions for Turbocharger
- The turbocharger turbine revolves at extremely high speeds and becomes very hot. Therefore, it is essential to maintain a clean supply of oil flowing through the turbocharger and to follow all required maintenance instructions and operating procedures.
- For proper operation of the system, follow the procedure below.
  1. Always use the recommended oil. Follow the instructions for proper time to change the oil and proper oil level.
  2. Avoid accelerating engine to a high rpm immediately after starting.
  3. If engine had been operating at high rpm for an extended period of time, let it idle for a few minutes prior to shutting it off.

PRECAUTIONS

Engine Oils
Prolonged and repeated contact with used engine oil may cause skin cancer. Try to avoid direct skin contact with used oil. If skin contact is made, wash thoroughly with soap or hand cleaner as soon as possible.

HEALTH PROTECTION PRECAUTIONS
- Avoid prolonged and repeated contact with oils, particularly used engine oils.
- Wear protective clothing, including impervious gloves where practicable.
- Do not put oily rags in pockets.
- Avoid contaminating clothes, particularly underpants, with oil.
- Heavily soiled clothing and oil-impregnated footwear should not be worn. Overalls must be cleaned regularly.
- First Aid treatment should be obtained immediately for open cuts and wounds.
- Use barrier creams, applying them before each work period, to help the removal of oil from the skin.
- Wash with soap and water to ensure all oil is removed (skin cleansers and nail brushes will help). Preparations containing lanolin replace the natural skin oils which have been removed.
- Do not use gasoline, kerosene, diesel fuel, gas oil, thinners or solvents for cleaning skin.
- If skin disorders develop, obtain medical advice without delay.
- Where practicable, degrease components prior to handling.
- Where there is a risk of eye contact, eye protection should be worn; for example, chemical goggles or face shields; in addition, an eye wash facility should be provided.

ENVIRONMENTAL PROTECTION PRECAUTIONS
Burning used engine oil in small space heaters or boilers can be recommended only for units of approved design. The heating system must meet the requirements of HM Inspectorate of Pollution for small burners of less than 0.4 MW. If in doubt check with the appropriate local authority and/or manufacturer of the approved appliance.
- Dispose of used oil and used oil filters through authorized waste disposal contractors to licensed waste disposal sites, or to the waste oil reclamation trade. If in doubt, contact the local authority for advice on disposal facilities.
- It is illegal to pour used oil on to the ground, down sewers or drains, or into water courses.
- The regulations concerning the pollution of the environment will vary from country to country.
**PRECAUTIONS**

Precautions for Fuel

Unleaded premium gasoline with an octane rating of at least 95 AKI (Anti-Knock Index) number (Research octane number 88).

**CAUTION:**

Using a fuel other than that specified could adversely affect the emission control devices and systems, and could also affect the warranty coverage validity. Under no circumstances should a leaded gasoline be used, since this will damage the three way catalyst.

**HOW TO USE THIS MANUAL**

- **ALPHABETICAL INDEX** is provided at the end of this manual so that you can rapidly find the item and page you are searching for.
- **A QUICK REFERENCE INDEX**, a black tab (e.g. [BL]) is provided on the first page. You can quickly find the first page of each section by noting it to the section's black tab.
- **THE CONTENTS** are listed on the first page of each section.
- **THE TITLE** is indicated on the upper portion of each page and shows the part or system.
- **THE PAGE NUMBER** of each section consists of two letters which designate the particular section and a number (e.g. "BR-5").
- **THE LARGE ILLUSTRATIONS** are exploded views (See below) and contain tightening torques, lubrication points, section number of the PARTS CATALOG (e.g. SEC.440) and other information necessary to perform repairs. The illustrations should be used in reference to service matters only. When ordering parts, refer to the appropriate PARTS CATALOG.

"Example"

SEC. 440

- **E**
- **C**
- **G1**
- **C1**
- **M1**
- **M2**
- **E1**
- **E2**
- **C2**

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

- The following SYMBOLS AND ABBREVIATIONS are used:
  - Tightening torque: M/T
  - A/T
  - A/C
  - P/S
  - Tool
  - SAE
  - ATF
  - Drive range 1st gear
  - Drive range 2nd gear
  - Drive range 3rd gear
  - Drive range 4th gear
  - Overdrive
  - 2nd range 2nd gear
  - 2nd range 1st gear
  - 1st range 2nd gear
  - 1st range 1st gear
  - Manual Transaxle/Transmission
  - Automatic Transaxle
  - Automatic Transmission Fluid
  - Society of Automotive Engineers, Inc.
  - E:
  - D:
  - Select with proper thickness.
  - Adjustment is required.
  - Service Data and Specifications
  - Left-Hand, Right-Hand
  - Front, Rear

- 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)

- TROUBLE DIAGNOSES are included in sections dealing with complicated components.

- SERVICE DATA AND SPECIFICATIONS are contained at the end of each section for quick reference of data.

- 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.

Sample/Wiring Diagram — EXAMPL —

Refer to optional parts

GI-8

GI-9
### HOW TO READ WIRING DIAGRAMS

Sample/Wiring Diagram — EXAMPLE — (Cont’d)

#### OPTIONAL SPlice

<table>
<thead>
<tr>
<th>Number</th>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Power condition</td>
<td>This shows the condition when the system receives battery positive voltage (can be operated)</td>
</tr>
<tr>
<td>2</td>
<td>Fusible link</td>
<td>The double line shows that this is a fusible link. The open circle shows current flow in and the shaded circle shows current flow out.</td>
</tr>
<tr>
<td>3</td>
<td>Fusible link fuse location</td>
<td>This shows the location of the fusible link or fuse in the fusible link or fuse box. See “POWER SUPPLY ROUTING” in EL section for location.</td>
</tr>
<tr>
<td>4</td>
<td>Fuse</td>
<td>The single line shows that this is a fuse. The open circle shows current flow in and the shaded circle shows current flow out.</td>
</tr>
<tr>
<td>5</td>
<td>Current rating</td>
<td>This shows the current rating of the fusible link or fuse.</td>
</tr>
<tr>
<td>6</td>
<td>Connectors</td>
<td>This shows that connector (1) is female and connector (2) is male. The GR wire is located in the A4 terminal of both connectors. Terminal No. with an alphabet (A1, B1, etc.) indicates that the connector is SMU connector. Refer to GI-16.</td>
</tr>
<tr>
<td>7</td>
<td>System branch</td>
<td>This shows that the system branches to another system identified by cell code (section and system).</td>
</tr>
<tr>
<td>8</td>
<td>Optional splice</td>
<td>The open circle shows that the splice is optional depending on vehicle application.</td>
</tr>
<tr>
<td>9</td>
<td>Splice</td>
<td>The shaded circle shows that the splice is always on the vehicle.</td>
</tr>
<tr>
<td>10</td>
<td>Page crossing</td>
<td>This arrow shows that the circuit continues to an adjacent page. The A will match with the A on the preceding or next page.</td>
</tr>
<tr>
<td>11</td>
<td>Option abbreviation</td>
<td>This shows that the circuit is optional depending on vehicle application.</td>
</tr>
<tr>
<td>12</td>
<td>Switch</td>
<td>This shows that continuity exists between terminals 1 and 2 when the switch is in the A position. Continuity exists between terminals 1 and 3 when the switch is in the B position.</td>
</tr>
<tr>
<td>13</td>
<td>Page Crossing</td>
<td>This arrow shows that the circuit continues to another page identified by cell code. The C will match with the C on another page within the system other than the next or preceding pages.</td>
</tr>
<tr>
<td>14</td>
<td>relay</td>
<td>This shows an internal representation of the relay. See “STANDARDIZED RELAY” in EL section for details.</td>
</tr>
<tr>
<td>15</td>
<td>Connectors</td>
<td>This shows that the connector is connected to the body or a terminal with a bulb or nut.</td>
</tr>
<tr>
<td>16</td>
<td>Component name</td>
<td>This shows the name of a component.</td>
</tr>
<tr>
<td>17</td>
<td>Component box in wire</td>
<td>This shows that another part of the component is also shown on another page (indicated by wave line) within the system.</td>
</tr>
<tr>
<td>18</td>
<td>Assembly parts</td>
<td>Connector terminal in component shows that it is a harness incorporated assembly.</td>
</tr>
<tr>
<td>19</td>
<td>Connector number</td>
<td>This shows the connector number. The letter shows which harness the connector is located. Example: M main harness. See “HARNESS LAYOUT” in EL section to locate the connector. A coordinate grid is included for complex harnesses to aid in locating connectors.</td>
</tr>
</tbody>
</table>
FOREWORD

This manual contains maintenance and repair procedures for the Nissan model 314 series.

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

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

IMPORTANT SAFETY NOTICE

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

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

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

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RE
HOW TO READ WIRING DIAGRAMS

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<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>Wire color</td>
<td>• This shows a code for the color of the wire.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• B = Black</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• BR = Brown</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• W = White</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• OR = Orange</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• R = Red</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• P = Pink</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• G = Green</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• PU = Purple</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• L = Blue</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• GY = Gray</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Y = Yellow</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• SB = Sky Blue</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• LG = Light Green</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• CF = Dark Brown</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• DG = Dark Green</td>
</tr>
<tr>
<td></td>
<td></td>
<td>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.</td>
</tr>
<tr>
<td>21</td>
<td>Common component</td>
<td>• Connectors enclosed in broken line show that those belong to the same component.</td>
</tr>
<tr>
<td>22</td>
<td>Common connector</td>
<td>• The dotted lines between terminals show that those terminals are part of the same connector.</td>
</tr>
<tr>
<td>23</td>
<td>Current flow arrow</td>
<td>• Arrow indicates electric current flow, especially where the direction of standard flow (vertically downward or horizontally from left to right) is difficult to follow.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• A double arrow &quot;→←&quot; shows that current can flow in either direction depending on circuit operation.</td>
</tr>
<tr>
<td>24</td>
<td>Option description</td>
<td>• This shows a description of the option abbreviation seen on the page.</td>
</tr>
<tr>
<td>25</td>
<td>Ground</td>
<td>• This shows the ground connection.</td>
</tr>
<tr>
<td>26</td>
<td>Connector views</td>
<td>• This shows the connector names of the components in the wiring diagram on the page.</td>
</tr>
<tr>
<td>27</td>
<td>Fusible link and fuse box</td>
<td>This shows the arrangement of fusible link(l) and fuse(s), used for connector views of POWER SUPPLY ROUTING in EL section. The open square shows current flow out, and the shaded square shows current flow in. Same meanings as the open and shaded circles in Number 2 and 4 above.</td>
</tr>
<tr>
<td>28</td>
<td>Reference</td>
<td>• This shows that more information on the Super Multiple Junction (SMJ) and joint connectors exists. See Foldout Page in EL section for details.</td>
</tr>
<tr>
<td>29</td>
<td>Shielded line</td>
<td>• The line enclosed by broken line circle shows shielded wire.</td>
</tr>
<tr>
<td>30</td>
<td>Connector color</td>
<td>• This shows the code for the color of the connector. For code meaning, refer to wire color codes above [30].</td>
</tr>
<tr>
<td>31</td>
<td>Cell code</td>
<td>• This identifies each page of the wiring diagram by section, system and wiring diagram page number.</td>
</tr>
<tr>
<td>32</td>
<td>Ground</td>
<td>• The line spliced and grounded under wire color shows that ground line is spliced at the grounded connector.</td>
</tr>
</tbody>
</table>

HOW TO READ WIRING DIAGRAMS

Description (Cont'd) CONNECTOR SYMBOLS

Most of connector symbols in wiring diagrams are shown from the terminal side.

• Connector symbols shown from the terminal side are enclosed by a single line.

• Connector symbols shown from the harness side are enclosed by a double line and followed by the direction mark.

• Male and female terminals

Connector guides for male terminals are shown in black and female terminals in white in wiring diagrams.
**HOW TO READ WIRING DIAGRAMS**

**Description (Cont'd)**

**SWITCH POSITIONS**

Switches are shown in wiring diagrams as if the vehicle is in the "normal" condition. A vehicle is in the "normal" condition when:
- Ignition switch is "OFF".
- Doors, hood and trunk lid are closed, and pedals are not depressed, and
- Parking brake is released.

**DETECTABLE LINES AND NON-DETECTABLE LINES**

In some wiring diagrams, two kinds of lines, representing wires, with different weight are used:
- A line with regular weight (wider line) represents a "detectable line for DTC (Diagnostic Trouble Code)". A "detectable line for DTC" is a circuit in which ECM (ECCS control module) can detect its malfunctions with the on-board diagnostic system.
- A line with less weight (thinner line) represents a "non-detectable line for DTC". A "non-detectable line for DTC" is a circuit in which ECM cannot detect its malfunctions with the on-board diagnostic system.

**Example**

**[SWITCH CHART]**

<table>
<thead>
<tr>
<th>APPER SWITCH</th>
<th>OFF</th>
<th>LG</th>
<th>WASH</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**[SWITCH DIAGRAM]**

[Diagram showing switches in combination]

**Continuity circuit of wiper switch**

<table>
<thead>
<tr>
<th>SWITCH POSITION</th>
<th>CONTINUITY CIRCUIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>3-4</td>
</tr>
<tr>
<td>INT</td>
<td>3-4, 5-6</td>
</tr>
<tr>
<td>LG</td>
<td>5-6</td>
</tr>
<tr>
<td>HI</td>
<td>2-3</td>
</tr>
<tr>
<td>WASH</td>
<td>1-5</td>
</tr>
</tbody>
</table>

---

GI-14

GI-15
HOW TO READ WIRING DIAGRAMS

Description (Cont'd)

FOLDOUT PAGE

The foldout should be spread to read the entire wiring diagram.

Super multiple junction (SMJ)

In wiring diagram, connectors consisting of terminals having terminal numbers with an alphabet (B1, D0, etc.) are SMJ connectors. If connector numbers are shown in Reference Area, these connector symbols are not shown in Connector Area. For terminal arrangement of these connectors, refer to the fold-out page at the end of this manual.

Joint connector

Joint connector symbols are shown in Connector Area in the wiring diagram concerned. Fold-out page also carries inside wiring layout together with such joint connector symbols.

Example

Super Multiple Junction (SMJ)

CONNECTOR AREA

Reference Area

Refer to the foldout page for the terminal arrangement of the connectors shown here in the "Reference Area."

HOW TO READ WIRING DIAGRAMS

Wiring Diagram Codes (Cell Codes)

Use the chart below to find out what each wiring diagram code stands for.

<table>
<thead>
<tr>
<th>Code</th>
<th>Section</th>
<th>Wiring Diagram Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAGV</td>
<td>EC</td>
<td>AICV AICV Valve</td>
</tr>
<tr>
<td>ABS</td>
<td>BR</td>
<td>Anti-lock Braking System</td>
</tr>
<tr>
<td>A/C, A</td>
<td>HA</td>
<td>Air Conditioning</td>
</tr>
<tr>
<td>A/C, M</td>
<td>HA</td>
<td>Manual Air Conditioner</td>
</tr>
<tr>
<td>A/T</td>
<td>AT</td>
<td>Automatic Transmission</td>
</tr>
<tr>
<td>ALM</td>
<td>AL</td>
<td>Headlamp System</td>
</tr>
<tr>
<td>AT/CD</td>
<td>EC</td>
<td>AIT Control</td>
</tr>
<tr>
<td>AUDIO</td>
<td>EL</td>
<td>Audio</td>
</tr>
<tr>
<td>BACK/L</td>
<td>EL</td>
<td>Back-up Lamp</td>
</tr>
<tr>
<td>BOOST</td>
<td>EC</td>
<td>Boost Pressure Sensor</td>
</tr>
<tr>
<td>CHARGE</td>
<td>EL</td>
<td>Charging System</td>
</tr>
<tr>
<td>CHIME</td>
<td>EL</td>
<td>Warning Chime</td>
</tr>
<tr>
<td>CMPS</td>
<td>EC</td>
<td>Camshaft Position Sensor</td>
</tr>
<tr>
<td>COWL</td>
<td>EC</td>
<td>Cooling Fan Control</td>
</tr>
<tr>
<td>DEF</td>
<td>EL</td>
<td>Rear Window Deicer</td>
</tr>
<tr>
<td>DEFF</td>
<td>EC</td>
<td>Rear Window Deicer</td>
</tr>
<tr>
<td>DIFF</td>
<td>PD</td>
<td>Differential Oil Cooler</td>
</tr>
<tr>
<td>DJLCK</td>
<td>EL</td>
<td>Power Door Lock</td>
</tr>
<tr>
<td>DTRL</td>
<td>EL</td>
<td>Dashboard - With Daytime Light System</td>
</tr>
<tr>
<td>ECTC</td>
<td>EC</td>
<td>Engine Coolant Temperature Sensor</td>
</tr>
<tr>
<td>EGRCV</td>
<td>EC</td>
<td>EGR and canister Control Solenoid Valve</td>
</tr>
<tr>
<td>F/F</td>
<td>EL</td>
<td>Fog Lamp</td>
</tr>
<tr>
<td>FICD</td>
<td>EC</td>
<td>IACV FICD Solenoid Valve</td>
</tr>
<tr>
<td>F/R</td>
<td>EC</td>
<td>Fuel Pump</td>
</tr>
<tr>
<td>H/LAMP</td>
<td>EL</td>
<td>Headlamp-Without Daytime Light System</td>
</tr>
<tr>
<td>H/RAT</td>
<td>EL</td>
<td>Headlight Switch</td>
</tr>
<tr>
<td>HTR</td>
<td>HA</td>
<td>Heater</td>
</tr>
<tr>
<td>HSC</td>
<td>EL</td>
<td>Headlamp Washer</td>
</tr>
<tr>
<td>HOS</td>
<td>EC</td>
<td>Headlight Sensor</td>
</tr>
<tr>
<td>HORN</td>
<td>EL</td>
<td>Horn, Cigarette Lighter, Clock</td>
</tr>
<tr>
<td>IGN/SG</td>
<td>EC</td>
<td>Ignition Signal</td>
</tr>
<tr>
<td>ILL</td>
<td>EL</td>
<td>Illumination</td>
</tr>
<tr>
<td>INSTALL</td>
<td>EC</td>
<td>Injector</td>
</tr>
<tr>
<td>INT /</td>
<td>EL</td>
<td>Interior, Spot and Trunk Room Lamps</td>
</tr>
<tr>
<td>KS</td>
<td>EC</td>
<td>Knock Sensor</td>
</tr>
</tbody>
</table>

CODE

GI-16

GI-17
**HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT**

**Work Flow**

```
START

LISTEN TO CUSTOMER COMPLAINTS

VERIFY THE SYMPTOM

NARROW THE POSSIBLE CAUSE

INSPECT THE CIRCUIT

REPAIR THE CIRCUIT

MAKE SURE THE CIRCUIT WORKS

END
```

**INCIDENT SIMULATION TESTS**

**INTRODUCTION**

Sometimes the symptom is not present when the vehicle is brought in for service. Therefore, it is necessary to simulate the conditions and environment when the incident occurred. Otherwise, only a No Trouble Found Diagnosis may be found. The following section illustrates ways to simulate the conditions/environment under which the owner experiences an electrical incident.

The section is broken into the six following topics:

1. Vehicle vibration
2. Heat sensitive
3. Freezing
4. Water intrusion
5. Electrical load
6. Cold or hot start up

Get a thorough description of the incident from the customer. It is important for simulating the conditions of the problem.

**VEHICLE VIBRATION**

The problem may occur or become worse while driving on a rough road or when engine is vibrating (Idle with A/C on). In such a case, you will want to check for a vibration related condition. Refer to the illustration below.

**Connectors & harness**

Determine which connectors and wiring harness would affect the electrical system you are inspecting. Gently shake each connector and harness while monitoring the system for the incident you are trying to duplicate. This test may indicate a loose or poor electrical connection.

**Hint**

Connectors can be exposed to moisture. It is possible to get a thin film of corrosion on the connector terminals. A visual inspection may not reveal this without disconnecting the connector. If the problem occurs intermittently, perhaps the problem is caused by corrosion. It is a good idea to disconnect, inspect and clean the terminals on related connectors in the system.

**Sensors & relays**

Gently apply a slight vibration to sensors and relays in the system you are inspecting. This test may indicate a loose or poorly mounted sensor or relay.

**Vibration test**

![Diagram of vibration test]
**HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT**

**Incident Simulation Tests (Cont'd)**

**Possible cause**

- Any probe entering the terminal may enlarge the contact spring opening creating an intermittent signal.

**DEFOMETEINS (ENLARGED) FEMALE TERMINALS**

- Male half
- Female half
- Seal
- Check for unlocked terminals by pulling each wire at the end of the connector.

**DEFECTIVE INSULATION STRIPPING**

- Intermediate strips
- Through-the-holes insulation
- Wire strands missing

**Tester probe**

When probing a connector it is possible to enlarge the contact spring opening. If this occurs it may create an intermittent signal in the circuit. When probing a connector, use care not to enlarge the opening. The probe of the Digital Multimeter (DMM) may not fit into the connector cavity. In such cases make an extension of a “T” pin and probe it from the harness side of the connector. Most DMMs have accessory alligator clips. Slide these over the probe to allow clipping the “T” pin for a better contact. If you have any difficulty probing a terminal, inspect the terminal. Ensure you have not accidentally opened the contact spring or pulled a wire loose.

**HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT**

**Incident Simulation Tests (Cont'd)**

**Engine compartment**

There are several reasons a vehicle or engine vibration could cause an electrical complaint. Some of the things to check for are:

- Connectors which are inaccessible for diagnosis probing
- Connectors which may not be fully seated
- Wiring harness which are not long enough and are being stressed during engine vibrations or rocking
- Wires laying across brackets or moving components
- Loose, dirty or corroded ground wires
- Wires routed too close to hot components

To inspect components under the hood, start by verifying the integrity of ground connections. (Refer to GROUND INSPECTION described later.) First check that the system is properly grounded. Then check for loose connection by gently shaking the wiring or components as previously explained. Using the wiring diagrams inspect the wiring for continuity.

**Behind the instrument panel**

Improperly routed or improperly clamped harness can become pinched during accessory installation. Vehicle vibration can aggravate a harness which is routed along a bracket or near a screw behind or below the dash.

**Under sealing areas**

An unclamped or loose harness can cause wiring to be pinched by seat components (such as slide guides) during vehicle vibration. If the wiring runs under sealing areas inspect wire routing for possible damage or pinching.

**HEAT SENSITIVE**

The owner’s problem may occur during hot weather or after the car has sat for a short time. In such cases you will want to check for a heat sensitive condition. To determine if an electrical component is heat sensitive, heat the component with a heat gun or equivalent.

Do not heat components above 60°C (140°F). If incident occurs while heating the unit, either replace or properly insulate the component.
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Changing A/T Fluid ....................................................... 20
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SUPPLEMENTAL RESTRAINT SYSTEM (SRS) "AIR BAG" AND "SEAT BELT PRE-TENSIONER"

The Supplemental Restraint System "Air Bag" and "Seat belt pre-tensioner", used along with a seat belt, help to reduce the risk or severity of injury to the driver and front passenger in a frontal collision. The Supplemental Restraint System consists of air bag modules (located in the center of the steering wheel and on the instrument panel on the passenger side), seat belt pre-tensioner, a diagnosis sensor unit, warning lamp, wiring harness and spiral cable. Information necessary to service the system safely is included in the RS section of this Service Manual.

WARNING:
- To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN dealer.
- Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.
- All SRS electrical wiring harnesses and connectors are covered with yellow outer insulation. Do not use electrical test equipment on any circuit related to the SRS.

Special Service Tools

<table>
<thead>
<tr>
<th>Tool number</th>
<th>Tool name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EG17505001</td>
<td>Radiator cap tester adapter</td>
<td></td>
</tr>
<tr>
<td>KV13159000</td>
<td>Oil filter wrench 85 mm (3-1/8 in) dia.</td>
<td></td>
</tr>
</tbody>
</table>

Commercial Service Tool

<table>
<thead>
<tr>
<th>Tool name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spark plug wrench</td>
<td>Wrench with a magnet to hold spark plug</td>
</tr>
</tbody>
</table>

PRE-DELIVERY INSPECTION ITEMS

Shown below are Pre-delivery inspection items required for the new vehicle. It is recommended that necessary items other than those listed here be added, paying due regard to the conditions in each country.

Perform applicable items on each model. Consult text of this section for specifications.

UNDER HOOD — ENGINE OFF
- Radiator coolant level and coolant hose connections for leaks
- Battery fluid level, specific gravity and conditions of battery terminals
- Drive belt tension
- Fuel filter for water or dusts, and fuel line and connections for leaks
- Engine oil level and oil leaks
- Clutch and brake reservoir fluid level and fluid lines for leaks
- Windshield and rear window washer and headlamp cleaner reservoir fluid level
- Power steering reservoir fluid level and hose connections for leaks

ON INSIDE AND OUTSIDE
- Remove front spring strut spacer (if applicable)
- Operation of all instruments, gauges, lights and accessories
- Operation of horn(s), wiper and washer
- Steering lock for operation
- Check air conditioner for gas leaks
- Front and rear seats, and seat belts for operation
- All moldings, trims and fittings for fit and alignment
- All windows for operation and alignment
- Hood, trunk lid, door panels for fit and alignment
- Latches, keys and locks for operation
- Weatherstrips for adhesion and fit
- Headlamp aiming
- Tighten wheel nuts (inc. inner nuts if applicable)
- Tire pressure (inc. spare tire)
- Check front wheels for toe-in
- Install cloc/voltmeter/room lamp fuse (if applicable)
- Install deodorizer filter to air purifier (if applicable)
- Remove wiper blade protectors (if applicable)

UNDER BODY
- Manual transmission/transaxle and differential gear oil level
- Brake and fuel lines and oil/fluid reservoirs for leaks
- Tighten bolts and nuts of steering linkage and gear box, suspension, propeller shafts and drive shafts
- Tighten rear body bolts and nuts (Models with wooden bed only)

ROAD TEST
- Clutch operation
- Parking brake operation
- Service brake operation
- Automatic transmission/transaxle shift timing and kickdown
- Steering control and returnability
- Engine performance
- Squeaks and rattles

ENGINE OPERATING AND HOT
- Adjust idle mixture and speed (and ignition timing*1)
- Automatic transmission/transaxle fluid level
- Engine idling and stop knob operation (Diesel only)

FINAL INSPECTION
- Install necessary parts (outside mirror, wheel covers, seat belts, mat, carpet or mud flaps)
- Inspect for interior and exterior metal and paint damage
- Check for spare tire, jack, tools (wheelchock), and literature
- Wash, clean interior and exterior

*1: Not required on models with a direct ignition system
** Not applicable on this model

MA-2 MA-3
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 pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>OUTSIDE THE VEHICLE</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>Tires Check the pressure with a gauge periodically when at a service station, including the spare, and adjust to the specified pressure if necessary. Check carefully for damage, cuts or excessive wear.</td>
<td></td>
</tr>
<tr>
<td>Windshield wiper blades Check for cracks or wear if they do not wipe properly.</td>
<td></td>
</tr>
<tr>
<td>Doors and engine hood Check that all doors, the engine hood, the trunk lid and back door operate properly. 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 for lubrication frequently.</td>
<td>MA-24</td>
</tr>
<tr>
<td>Tire rotation Tires should be rotated every 10,000 km (6,000 miles).</td>
<td>MA-21</td>
</tr>
<tr>
<td>INSIDE THE VEHICLE</td>
<td></td>
</tr>
<tr>
<td>The maintenance items listed here should be checked on a regular basis, such as when performing periodic maintenance, cleaning the vehicle etc.</td>
<td></td>
</tr>
<tr>
<td>Lights Make sure that the headlights, stop lights, tail lights, turn signal lights, and other lights are all operating properly and installed securely. Also check headlight aim.</td>
<td></td>
</tr>
<tr>
<td>Warning lights and chimes Make sure that all warning lights and chimes are operating properly.</td>
<td></td>
</tr>
<tr>
<td>Steering wheel Check for change in the steering conditions, such as excessive free play, hand steering or strange noises.</td>
<td></td>
</tr>
<tr>
<td>Free play Less than 35 mm (1.38 in)</td>
<td></td>
</tr>
<tr>
<td>Seat belts Check that all parts of the seat belt system (e.g. buckles, anchors, adjusters and retractors) operate properly and smoothly, and are installed securely. Check the belt webbing for cuts, fraying, wear or damage.</td>
<td>MA-24</td>
</tr>
<tr>
<td>UNDER THE HOOD AND VEHICLE</td>
<td></td>
</tr>
<tr>
<td>The maintenance items listed here should be checked periodically e.g. each time you check the engine oil or refill.</td>
<td></td>
</tr>
<tr>
<td>Windshield washer fluid Check that there is adequate fluid in the tank.</td>
<td></td>
</tr>
<tr>
<td>Engine coolant level Check the coolant level when the engine is cold.</td>
<td>MA-12</td>
</tr>
<tr>
<td>Engine oil level Check the level after parking the vehicle on a level spot and turning off the engine.</td>
<td>MA-15</td>
</tr>
<tr>
<td>Brake and clutch fluid level Make sure that the brake and clutch fluid level is between the &quot;MAX&quot; and &quot;MIN&quot; lines on the reservoir.</td>
<td>MA-16, 21</td>
</tr>
<tr>
<td>Battery Check the fluid level in each cell. It should be between the &quot;MAX&quot; and &quot;MIN&quot; lines.</td>
<td></td>
</tr>
</tbody>
</table>

PERIODIC MAINTENANCE (Except for Europe)

The following tables show the normal maintenance schedule. Depending upon weather and atmospheric conditions, varying road surfaces, individual driving habits and vehicle usage, additional or more frequent maintenance may be required.

Periodic maintenance beyond the last period shown on the tables requires similar maintenance.

<table>
<thead>
<tr>
<th>MAINTENANCE OPERATION</th>
<th>MAINTENANCE INTERVAL</th>
<th>Reference page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perform either at number of kilometers (Miles x 100) every 6 months, whichever comes first</td>
<td>10 30 50 70 90</td>
<td></td>
</tr>
<tr>
<td>ENGINE AND EMISSION CONTROL</td>
<td>Underhood and under vehicle</td>
<td></td>
</tr>
<tr>
<td>Check drive belts, cables, fraying, wear &amp; looseness</td>
<td>X</td>
<td>MA-12</td>
</tr>
<tr>
<td>Change engine antifreeze coolant (Ethylene glycol base) (LLC)</td>
<td>Every 5,000 km (3,000 miles) or 6 months</td>
<td></td>
</tr>
<tr>
<td>Check cooling system</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Check fuel lines</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Replace air cleaner filter (Viscous paper type)</td>
<td>Every 100,000 km (60,000 miles)</td>
<td></td>
</tr>
<tr>
<td>Change engine oil (EPA API SE, SF, SG or SH type)</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Change engine oil filter (use Part No. 15209-45901)</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Replace fuel filter</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Replace spark plugs (Use PLATINUM-TIPPED type)</td>
<td>Every 100,000 km (60,000 miles)</td>
<td></td>
</tr>
<tr>
<td>Check vacuum lines and treated oxygen sensor</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

CHASSIS AND BODY

<table>
<thead>
<tr>
<th>Chassis and Body</th>
<th>Underhood</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Check brake, clutch &amp; automatic transmission fluid level &amp; leaks</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Change brake fluid</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Check brake booster vacuum hoses, connections &amp; check valve</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Check power steering fluid &amp; lines</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Outside and Inside</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Check wheel alignment, if necessary, rotates &amp; balance wheels</td>
<td>X</td>
</tr>
<tr>
<td>Check brake pads, drums &amp; other brake components for wear, deterioration &amp; leaks</td>
<td>X</td>
</tr>
<tr>
<td>Check steering gear &amp; linkage, axle &amp; suspension parts &amp; propeller shaft &amp; drive shaft for damaged, loose &amp; missing parts &amp; lubrication</td>
<td>X</td>
</tr>
<tr>
<td>Lubricate locks, hinges &amp; hood latches</td>
<td>X</td>
</tr>
<tr>
<td>Check seat belts, buckles, retractors, anchors &amp; adjuster</td>
<td>X</td>
</tr>
<tr>
<td>Check foot brake, parking brake &amp; clutch for free play, stroke &amp; operation</td>
<td>X</td>
</tr>
<tr>
<td>Air bag system</td>
<td>See NOTE 1</td>
</tr>
</tbody>
</table>

NOTE: 1. Inspect at the first 10 years and then every 2 years.
2. Maintenance items with a "*" should be performed more frequently according to "Maintenance under severe driving conditions."

Check: Correct or replace if necessary.
PERIODIC MAINTENANCE (Except for Europe)

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 must be performed on the following items as shown in the table.

Severe driving conditions:
A — Driving under dusty conditions
B — Driving repeatedly short distances
C — Towing a trailer
D — Extended idling
E — Driving in extremely adverse weather conditions or in areas where ambient temperatures are either extremely low or extremely high
F — Driving in high humidity areas or in mountainous areas
G — Driving in areas using salt or other corrosive materials
H — Driving on rough and/or muddy roads or in the desert
I — Driving with frequent use of braking or in mountainous areas

<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</td>
<td>Air cleaner filter</td>
<td>Replace</td>
<td>More frequently</td>
<td>MA-15</td>
</tr>
<tr>
<td>B</td>
<td>Engine oil filter</td>
<td>Replace</td>
<td>Every 5,000 km (5,000 miles) or 3 months</td>
<td>MA-15</td>
</tr>
<tr>
<td>C</td>
<td>Engine oil filter</td>
<td>Replace</td>
<td>Every 20,000 km (24,000 miles) or 12 months</td>
<td>MA-15</td>
</tr>
<tr>
<td>D</td>
<td>Automatic &amp; manual transmission oil &amp; differential gear oil</td>
<td>Replace</td>
<td>Every 40,000 km (48,000 miles) or 24 months</td>
<td>MA-19, 20, 21</td>
</tr>
<tr>
<td>E</td>
<td>Steering gear &amp; steering, axle &amp; suspension parts &amp; propeller shaft &amp; drive shafts</td>
<td>Check</td>
<td>Every 10,000 km (6,000 miles) or 6 months</td>
<td>MA-20, 23, FA-6, RA-5, 7</td>
</tr>
<tr>
<td>F</td>
<td>Brake pads, discs &amp; other brake components</td>
<td>Check</td>
<td>Every 5,000 km (3,000 miles) or 3 months</td>
<td>MA-22</td>
</tr>
<tr>
<td>G</td>
<td>Lock, hinge &amp; hood latch</td>
<td>Lubricate</td>
<td></td>
<td>MA-24</td>
</tr>
</tbody>
</table>

Maintenance operation: Check = Check. Correct or replace if necessary.

The following tables show the normal maintenance schedule. Depending upon weather and atmospheric conditions, varying road surfaces, individual driving habits and vehicle usage, additional or more frequent maintenance may be required.

Periodic maintenance beyond the last period shown on the tables requires similar maintenance.

ENGINE OIL SERVICE
Abbreviations: R = Replace.

<table>
<thead>
<tr>
<th>MAINTENANCE OPERATION</th>
<th>MAINTENANCE INTERVAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perform an oil change or on month basis if not driven 10,000 km (6,000 miles) within a year.</td>
<td>Months</td>
</tr>
</tbody>
</table>

Engine compartment and under vehicle

<table>
<thead>
<tr>
<th>Engine oil</th>
<th>Engine oil filter (Use Part No. 151099-9900)</th>
<th>Reference page</th>
</tr>
</thead>
<tbody>
<tr>
<td>R</td>
<td>R</td>
<td>MA-15</td>
</tr>
<tr>
<td>R</td>
<td>R</td>
<td>MA-16</td>
</tr>
</tbody>
</table>

NOTE: (1) Maintenance items with "A" should be performed more frequently according to "Maintenance under severe driving conditions".

MAJOR SERVICE (Engine)
Abbreviations: R = Replace, I = Inspect. Correct or replace if necessary.

<table>
<thead>
<tr>
<th>MAINTENANCE OPERATION</th>
<th>MAINTENANCE INTERVAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perform an oil change or on month basis if driven 30,000 km (18,000 miles) within a year.</td>
<td>Months</td>
</tr>
</tbody>
</table>

Underhood and under vehicle

<table>
<thead>
<tr>
<th>Component</th>
<th>Reference page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drive belts</td>
<td>MA-12</td>
</tr>
<tr>
<td>Engine and transaxle cooler (Ethylene glycol base)</td>
<td>MA-12</td>
</tr>
<tr>
<td>Cooling system</td>
<td>MA-13</td>
</tr>
<tr>
<td>Fuel lines</td>
<td>MA-14</td>
</tr>
<tr>
<td>Air cleaner filter (Vacuum paper type)</td>
<td>MA-15</td>
</tr>
<tr>
<td>Spark plug (Use PLATINUM-TIPPCD type)</td>
<td>MA-16</td>
</tr>
<tr>
<td>Heated oxygen sensor (Except for Sweden)</td>
<td>MA-18</td>
</tr>
<tr>
<td>Vapor lines</td>
<td>MA-17</td>
</tr>
</tbody>
</table>

NOTE: (1) After 24 months or 50,000 km (31,000 miles), check every 12 months or 20,000 km (12,000 miles).
(2) Change at 50,000 km (31,000 miles), then every 24 months or 60,000 km (36,000 miles).
(3) For Sweden perform at the first 40,000 km (25,000 miles) and then every 80,000 km (50,000 miles) or 24 months, whichever comes first.
(4) Maintenance items with "A" should be performed more frequently according to "Maintenance under severe driving conditions".
## PERIODIC MAINTENANCE (For Europe)

### MAJOR SERVICE (Chassis and Body)
Abbreviations: R = Replace, I = Inspect. Correct or replace if necessary.

<table>
<thead>
<tr>
<th>Maintenance Operation</th>
<th>Maintenance Interval</th>
<th>Reference page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perform on month basis or on kilometer basis if driven 30,000 km (18,000 miles) within a year</td>
<td>Months: 12, 24, 36, 48</td>
<td>Reference page</td>
</tr>
<tr>
<td><strong>Underhood and Under Vehicle</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brake &amp; clutch oil level &amp; check</td>
<td>R I I I</td>
<td>MA-19, 21</td>
</tr>
<tr>
<td>Automatic transmission fluid level &amp; check</td>
<td>R I I I</td>
<td>MA-20</td>
</tr>
<tr>
<td>Brake fluid</td>
<td>R</td>
<td>MA-22</td>
</tr>
<tr>
<td>Brake booster vacuum hose, connections &amp; check valve</td>
<td>I</td>
<td>MA-22</td>
</tr>
<tr>
<td>Power steering fluid &amp; lines</td>
<td>I</td>
<td>MA-22</td>
</tr>
<tr>
<td>Brake &amp; clutch system</td>
<td>I</td>
<td>MA-22</td>
</tr>
<tr>
<td>Manual transmission &amp; standard differential gear oil (torque converter)</td>
<td>I</td>
<td>MA-22</td>
</tr>
<tr>
<td>Steering gear &amp; linkage, axle &amp; suspension parts, propeller shaft &amp; drive shaft, exhaust system</td>
<td>I</td>
<td>MA-23</td>
</tr>
<tr>
<td><strong>Outside and Inside</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wheel alignment (if necessary, rotate &amp; balance wheels)</td>
<td>I</td>
<td>MA-21</td>
</tr>
<tr>
<td>Brake pads, discs &amp; other brake components</td>
<td>I</td>
<td>MA-22</td>
</tr>
<tr>
<td>Headlamp aiming</td>
<td>I</td>
<td>CL-04</td>
</tr>
<tr>
<td>Seat belts, buckles, connectors &amp; adjuster</td>
<td>I</td>
<td>MA-24</td>
</tr>
<tr>
<td>Font brake, parking brake &amp; clutch (For free play, stroke &amp; operation)</td>
<td>I</td>
<td>CL-05</td>
</tr>
<tr>
<td>Body corrosion</td>
<td>Annually</td>
<td>MA-25</td>
</tr>
<tr>
<td>Air bag system</td>
<td>See NOTE 1</td>
<td>MA-26</td>
</tr>
</tbody>
</table>

**NOTE:** (1) Inspect at the first 10 years and then every 2 years.
(2) Maintenance Items with "a" should be performed more frequently according to "Maintenance under severe driving conditions".

### 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 must be performed on the following items as shown in the table.

#### Severe driving conditions

<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><strong>Engine oil service</strong></td>
<td></td>
<td></td>
<td>Every 5,000 km (3,000 miles) or 6 months</td>
<td>MA-15</td>
</tr>
<tr>
<td>A B C D</td>
<td>Engine oil</td>
<td>Replace</td>
<td>Every 5,000 km (3,000 miles) or 6 months</td>
<td>MA-15</td>
</tr>
<tr>
<td>A B C D</td>
<td>Engine oil filter</td>
<td>Replace</td>
<td>Every on change</td>
<td>MA-16</td>
</tr>
</tbody>
</table>

**Major Service**

<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</td>
<td>Air cleaner filter</td>
<td>Replace</td>
<td>Every 12 months or 30,000 km (18,000 miles)</td>
<td>MA-21</td>
</tr>
<tr>
<td>A</td>
<td>Fuel filter</td>
<td>Replace</td>
<td>Every 12 months or 30,000 km (18,000 miles)</td>
<td>MA-21</td>
</tr>
<tr>
<td>P</td>
<td>Brake fluid</td>
<td>Replace</td>
<td>Every 24 months or 60,000 km (30,000 miles)</td>
<td>MA-19, 20, 21</td>
</tr>
<tr>
<td>C</td>
<td>Automatic &amp; manual transmission &amp; differential gear oil</td>
<td>Check</td>
<td>Every 24 months or 60,000 km (30,000 miles)</td>
<td>MA-19, 20, 21</td>
</tr>
<tr>
<td>A</td>
<td>Brake pads, discs &amp; other brake components</td>
<td>Check</td>
<td>Every 6 months or 15,000 km (9,000 miles)</td>
<td>MA-22</td>
</tr>
</tbody>
</table>
### Fluids and Lubricants

<table>
<thead>
<tr>
<th>Capacity (Approximate)</th>
<th>Recommended fluids and lubricants</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Engine oil (Retail)</strong></td>
<td></td>
</tr>
<tr>
<td>With oil filter</td>
<td>3.7 <img src="#" alt="3-1/4 qt" /></td>
</tr>
<tr>
<td>Without oil filter</td>
<td>3.5 <img src="#" alt="3-1/8 qt" /></td>
</tr>
<tr>
<td><strong>Cooling system (with reservoir tank)</strong></td>
<td>6.2 <img src="#" alt="5-1/2 qt" /></td>
</tr>
<tr>
<td><strong>Manual transmission oil</strong></td>
<td>2.4 <img src="#" alt="2-1/4 qt" /></td>
</tr>
<tr>
<td><strong>Differential carrier gear oil</strong></td>
<td>1.6 <img src="#" alt="1-1/8 qt" /></td>
</tr>
<tr>
<td><strong>Automatic transmission fluid</strong></td>
<td>7.0 <img src="#" alt="7 qt" /></td>
</tr>
<tr>
<td><strong>Power steering fluid</strong></td>
<td>0.9 <img src="#" alt="3/4 qt" /></td>
</tr>
<tr>
<td><strong>Brake and clutch fluid</strong></td>
<td>- <img src="#" alt="-" /></td>
</tr>
<tr>
<td><strong>Multi-purpose greases</strong></td>
<td>- <img src="#" alt="-" /></td>
</tr>
</tbody>
</table>

1. For further details, see "SAE Viscosity Number".
2. For more information regarding suitable fluids, contact a Nissan dealership.
3. Never mix these fluids (DOT 3 and DOT 4).

#### SAE Viscosity Number

- **GASOLINE ENGINE OIL**
- **GEAR OIL**

**Outside Temperature Range**

- **Anticipated Before Next Oil Change**

- **Non-recommended for sustained high speed driving**

- **Not recommended for sustained high speed driving**

- **For warm and cold areas: 75W-90 for transmission and 80W-90 for differential carrier are preferable.**

- **For hot areas: 70 is suitable for ambient temperatures below 40°C (104°F).**
Checking Drive Belts

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

<table>
<thead>
<tr>
<th>Belt deflection</th>
<th>Used belt deflection</th>
<th>Deflection after adjustment</th>
<th>Deflection of new belt</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Limit (mm)</td>
<td>(mm)</td>
<td>(mm)</td>
</tr>
<tr>
<td>Alternator</td>
<td>11 (0.43)</td>
<td>7 - 8 (0.28 - 0.31)</td>
<td>4 - 6 (0.16 - 0.24)</td>
</tr>
<tr>
<td>Air conditioner</td>
<td>7 (0.28)</td>
<td>5 - 6 (0.20 - 0.24)</td>
<td>6 - 7 (0.24 - 0.28)</td>
</tr>
<tr>
<td>Power steering</td>
<td>15 (0.59)</td>
<td>11 - 12</td>
<td>0 - 10</td>
</tr>
<tr>
<td>oil pump</td>
<td>(0.43 - 0.47)</td>
<td>(0.35 - 0.39)</td>
<td></td>
</tr>
<tr>
<td>Applied pushing force</td>
<td>98 N (10 kg, 22 lb)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Inspect drive belt deflections when engine is cold.

Changing Engine Coolant

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

On this model it is unnecessary to move heater "TEMP" control lever or switch before changing the coolant. This is because air mix door is in "HOT" position when ignition switch is "OFF". (This applies to both automatic and manual air conditioners.)

1. Remove radiator drain plug and radiator cap.
2. Remove reservoir tank, drain coolant, then clean reservoir tank.
3. Install it temporarily.

Be careful not to allow coolant to contact drive belts.

3. Remove cylinder block drain plug, air relief plug and air bleeder cap.
4. Install radiator drain plug and tighten cylinder block drain plug securely.
5. Fill radiator and reservoir tank with water. Air relief plug is reinstalled once coolant spills from the air relief hole during refill.
6. Then fill radiator and reservoir tank with water.

**Air relief plug:** 10 N·m (1.0 kg-m, 7 ft-lb)

6. Reinstall radiator cap and air bleeder cap.

Changing Engine Coolant (Cont'd)

7. Warm up engine until cooling fan operates, then race engine 2 or 3 times under no-load.
8. Make sure that engine temperature is "OFF".
9. Stop engine and wait until it cools down.
10. Repeat step 1 through step 9 until clear water begins to drain from radiator.
11. Drain water.
12. Apply sealant to the threads of drain plug.
13. Fill radiator and reservoir tank with coolant up to specified level following step 5 through step 9. Follow instructions attached to anti-freeze container for mixing ratio of anti-freeze to water.

Coolant capacity (With reservoir tank):
6.2 l (5.1/2 imp qt)

[Reservoir tank capacity for "H" level is 1.6 l (1.9/6 imp qt).]
Pour coolant through coolant filler neck slowly to allow air in system to escape.

13. If necessary, add coolant.
14. Start and warm up engine, then increase engine speed to 4,000 rpm. Check that radiator coolant level is not lowered, and that no water noise is heard in heater core. If water noise is heard, bleed air by referring to "Refilling Engine Coolant" in section 1.C.

Checking Cooling System

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

CHECKING RADIATOR CAP
Apply pressure to radiator cap with cap tester to see if it is satisfactory.

Radiator cap relief pressure:
78 - 98 kPa
(0.78 - 0.98 bar, 0.8 - 1.0 kg/cm², 11 - 14 psi)
ENGINE MAINTENANCE

Checking Cooling System (Cont’d)
Pull the negative-pressure valve to open it. Check that it closes completely when released.

CHECKING COOLING SYSTEM FOR LEAKS
Apply pressure to the cooling system with cap tester to check for leaks. 
Testing pressure: 157 kPa (1.57 bar, 1.6 kg/cm², 23 psi)
CAUTION:
Higher pressure than the specified value may cause damage to radiator.

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

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

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

ENGINE MAINTENANCE

Changing Fuel Filter (Cont’d)
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
Viscous paper type
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.
- Prolonged and repeated contact with used engine oil may cause skin cancer; try to avoid direct skin contact with used oil. If skin contact is made, wash thoroughly with soap or hand cleaner as soon as possible.
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):
   WITH oil filter change 3.7 l (3-1/4 imp qtl)
   WITHOUT oil filter change 3.5 l (3-1/8 imp qtl)
CAUTION:
- Be sure to clean drain plug and install with new washer.
  Drain plug: 29 - 39 Nm (3.0 - 4.0 kg-m, 22 - 29 ft-lb)
- Use recommended engine oil.
ENGINE MAINTENANCE

Changing Engine Oil (Cont’d)
4. Check oil level.
5. Start engine and check area around drain plug and oil filter for oil leakage.
6. Run engine for a few minutes, then turn it off. After several minutes, check oil level.

Changing Oil Filter
1. Remove oil filter.

WARNING:
Be careful not to burn yourself, as the engine and the engine oil are hot.
The oil filter is a small full-flow cartridge type and is provided with a relief valve.
Refer to LC section ("OIL FILTER").

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

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

Changing Spark Plugs
1. Disconnect ignition wires from spark plugs at boot.
Do not pull on the wire.
2. Remove spark plugs with 16 mm (0.63 in) spark plug wrench.
Spark plug:
Standard type: PFR6B-9
Hot type: PFR5B-9
Cold type: PFR7B-9
[20 - 29 N-m (2.0 - 3.0 kg-m, 14 - 22 ft-lb)]

ENGINE MAINTENANCE

Changing Spark Plugs (Cont’d)
• Checking and adjusting plug gap are not required between renewals.
• Do not use a wire brush for cleaning.
• If plug tip is covered with carbon, spark plug cleaner may be used.
  Cleaner air pressure: Less than 588 kPa (5.9 bar, 6 kg/cm², 85 psi)
  Cleaning time: Less than 20 seconds

Checking Positive Crankcase Ventilation (PCV) System
Checking PCV valve
With engine running at idle, remove ventilation hose from PCV 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.

Checking Vacuum Hoses and Connections
Check vacuum hoses for improper attachment and for leaks, cracks, damage, loose connections, chafing and deterioration.

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 SYSTEM" in EC section.
ENGINE MAINTENANCE

Checking Heated Oxygen Sensor (HO2S)

Checking procedure

INSPECTION START

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

INSPECTION END

CHECK

Malfunction indicator lamp

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CHASSIS AND BODY MAINTENANCE

Checking Exhaust System

- Check exhaust pipes, muffler and mounting for improper attachment, 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 Clutch System

Check fluid lines and operating cylinder for improper attachment, cracks, damage, loose connections, chafing and deterioration.

Checking M/T Oil

- Check oil level and for oil leakage.
  - Never start engine while checking oil level.
  - Filter plug: [2] 25 - 34 N·m (2.5 - 3.5 kg·m, 18 - 25 ft·lb)

Changing M/T Oil

1. Drain oil from drain plug and refill with new gear oil.
2. Check oil level.
   - Oil grade: API GL-4
   - Viscosity:
     - See "RECOMMENDED FLUIDS AND LUBRICANTS".
   - Capacity: 2.5 L (4.5 US qt, 8.0 Imp qt)
   - Drain plug:
     - [2] 25 - 34 N·m (2.5 - 3.5 kg·m, 18 - 25 ft·lb)
   - After refilling oil, leave M/T unattended for about two minutes. Then check oil level again following the above procedure. Add oil if necessary.
Checking A/T Fluid
1. Warm up engine.
2. Check for fluid leakage.
3. Before driving, fluid level can be checked at fluid temperatures of 30 to 50°C (86 to 122°F) using "COLD" range on dipstick.
   a. Park vehicle on level surface and set parking brake.
   b. Start engine and move selector lever through each gear position. Leave selector lever in "P" position.
   c. Check fluid level with engine idling.
   d. Remove dipstick and note reading. If level is at low side of either range, add fluid to the charging pipe.
   e. Re-insert dipstick into charging pipe as far as it will go.
   f. Remove dipstick and note reading. If reading is at low side of range, add fluid to the charging pipe. Do not overfill.
   g. Drive vehicle for approximately 5 minutes in urban areas.
   h. Re-check fluid level at fluid temperatures of 50 to 80°C (122 to 177°F) using "HOT" range on dipstick.
   i. Check fluid condition. If fluid is very dark or smells burned, or contains friction material (clutches, bands, etc.), check operation of A/T. Refer to A/T section for checking operation of A/T.

Changing A/T Fluid
1. Warm up A/T fluid.
2. Stop engine.
3. Drain A/T fluid from drain plug and refill with new A/T fluid. Always refill same volume with drained fluid.
   Oil grade:
   - Genuine Nissan ATF or equivalent.
   Oil capacity (With torque converter):
   - 7.9 l (7 Imp qt)
   Drain plug:
   - 29 - 39 N·m (3.0 - 4.0 kg-m, 22 - 29 ft-lb)
4. Run engine at idle speed for five minutes.
5. Check fluid level and condition.
   Refer to "Checking A/T Fluid". If fluid is still dirty, repeat step 2 through 5.

Checking Propeller Shaft
Check propeller shaft and center bearing for damage, looseness or grease leakage. If greasing points are provided, supply grease as necessary. Refer to PD section.
CHASSIS AND BODY MAINTENANCE

Changing Brake Fluid
1. Drain brake fluid from each air bleeder valve.
2. Refill until new brake fluid comes out from each air bleeder valve. Use same procedure as in bleeding hydraulic system to refill brake fluid. Refer to BR section.
   - Refill with recommended brake fluid.
   - Never reuse drained brake fluid.
   - Never mix different type fluids (DOT3 and DOT4).
   - Be careful not to splash brake fluid on painted areas.

Checking Brake Booster, Vacuum Hoses, Connections and Check Valve
Check vacuum lines, connections and check valve for improper attachment, air tightness, chafing and deterioration.

Checking Disc Brake

<table>
<thead>
<tr>
<th>ROTOR</th>
<th>Unit: mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Front</td>
</tr>
<tr>
<td>Disc brake type</td>
<td>OPZ25V</td>
</tr>
<tr>
<td>Standard thickness</td>
<td>30.6 (1.191)</td>
</tr>
<tr>
<td>Minimum thickness</td>
<td>20.0 (0.787)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CALIPER</th>
<th>Unit: mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Front</td>
</tr>
<tr>
<td>Disc brake type</td>
<td>OPZ25V</td>
</tr>
<tr>
<td>Standard thickness</td>
<td>10.0 (0.394)</td>
</tr>
<tr>
<td>Minimum thickness</td>
<td>2.0 (0.079)</td>
</tr>
</tbody>
</table>
Lubricating Locks, Hinges and Hood Latches

Checking Seat Belts, Buckles, Retractors, Anchors and Adjusters

CAUTION:
- After any collision, inspect all seat belt assemblies, including retractors and other attached hardware (i.e. guide rail set). Nissan recommends to replace all seat belt assemblies in use during a collision, unless not damaged and properly operating after minor collision.
- Also inspect seat belt assemblies not in use during a collision, and replace if damaged or improperly operating.
- If any component of seat belt assembly is questionable, do not repair. Replace as seat belt assembly.
- If webbing is cut, frayed, or damaged, replace seat belt assembly.
- Never tie seat belts together.
- Use a genuine seat belt assembly.

For seat belt pre-tensioner, refer to section RE.

Anchor belt
- 14.4 - 24.5 N-m

Check function of buckles and tongues when buckled and released.

Engine Maintenance

Spark plug
- Platinum-tipped type
- Standard type: PFR1B-9
- Hot type: PFR1B-9
- Cold type: PFR1B-9

Cooling system
- Radiator cap initial pressure: 0.8 - 0.98 kg/cm²
- Cooling system leakage testing pressure: 157 (1.57) kPa, 111 (2.0)

TIGHTENING TORQUE

<table>
<thead>
<tr>
<th>Unit</th>
<th>m</th>
<th>kg-m</th>
<th>ft-lb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil pan drain plug</td>
<td>29 - 30</td>
<td>2.0 - 2.0</td>
<td>14 - 14</td>
</tr>
<tr>
<td>Sway bar plug</td>
<td>25 - 26</td>
<td>2.0 - 2.0</td>
<td>14 - 14</td>
</tr>
<tr>
<td>Camshaft position sensor</td>
<td>7 - 8</td>
<td>0.5 - 0.5</td>
<td>5 - 5</td>
</tr>
<tr>
<td>Crankshaft pulley</td>
<td>142 - 152</td>
<td>105 - 112</td>
<td></td>
</tr>
<tr>
<td>Timing belt tensioner pulley nut</td>
<td>29 - 30</td>
<td>2.0 - 2.0</td>
<td>14 - 14</td>
</tr>
</tbody>
</table>

Chassis and Body Maintenance

Brake

Disc brake

Pad
- Standard thickness: OPF25V
- Minimum thickness: OPI1H

Rotor
- Standard thickness: OPF25V
- Minimum thickness: OPI1H

INSPECTION AND ADJUSTMENT

Wheel balance

Maximum allowable unbalance (60 mm diameter)

<table>
<thead>
<tr>
<th>Dynamic</th>
<th>Static</th>
</tr>
</thead>
<tbody>
<tr>
<td>16 (0.35)</td>
<td>20 (0.35)</td>
</tr>
</tbody>
</table>

INSPECTION AND ADJUSTMENT (SDS)
HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT

Incident Simulation Tests (Cont'd)

FREEZING

The customer may indicate the incident goes away after the car warms up (winter time). In such cases the cause could be related to water freezing somewhere in the wiring/electrical system. There are two methods to check for this. The first is to arrange for the owner to leave his car overnight. Make sure it will get cold enough to demonstrate his complaint. Leave the car parked outside overnight. In the morning, do a quick and thorough diagnosis of those electrical components which could be affected.

The second method is to put the suspect component into a freezer long enough for any water to freeze. Reinstall the part into the car and check for the reoccurrence of the incident. If it occurs, repair or replace the component.

WATER INTRUSION

The incident may occur only during high humidity or in rainy/snowy weather. In such cases the incident could be caused by water intrusion on an electrical part. This can be simulated by soaking the car or running it through a car wash. Do not spray water directly on any electrical components.

ELECTRICAL LOAD

The incident may be electrical load sensitive. Perform diagnosis with all accessories (including A/C, rear window defogger, radio, fog lamp) turned on.

COLD OR HOT START UP

On some occasions an electrical incident may occur only when the car is started cold. Or it may occur when the car is restarted hot shortly after being turned off. In these cases you may have to keep the car overnight to make a proper diagnosis.

Circuit Inspection

INTRODUCTION

In general, testing electrical circuits is an easy task if it is approached in a logical and organized method. Before beginning it is important to have all available information on the system to be tested. Also, get a thorough understanding of system operation. Then you will be able to use the appropriate equipment and follow the correct test procedure. You may have to simulate vehicle vibrations while testing electrical components. Gently shake the wiring harness or electrical component to do this.

OPEN

A circuit is open when there is no continuity through the section of the circuit.

SHORT

There are two types of shorts.

1. SHORT CIRCUIT

When a circuit contacts another circuit and causes the normal resistance to change.

2. SHORT TO GROUND

When a circuit contacts a ground source and grounds the circuit.

TESTING FOR "OPENS" IN THE CIRCUIT

Before you begin to diagnose and test the system, you should rough sketch a schematic of the system. This will help you logically walk through the diagnosis process. Drawing the sketch will also reinforce your working knowledge of the system.

Continuity check method

The continuity check is used to find an open in the circuit. The Digital Multimeter (DMM) set on the resistance function will indicate an open circuit as over limit (OL, no beep tone or no ohms symbol). Make sure to always start with the DMM at the highest resistance level. To help in understanding the diagnosis of open circuits please refer to the schematic above.

1. Disconnect the battery negative cable.
2. Start at one end of the circuit and work your way to the other end. (At the fuse block in this example)
3. Connect one probe of the DMM to the fuse block terminal on the load side.
4. Connect the other probe to the fuse block (power) side of SW1. Little or no resistance will indicate that portion of the circuit has good continuity. If there were an open in the circuit, the DMM would indicate an over limit or infinite resistance condition. (point A)
5. Connect the probes between SW1 and the relay. Little or no resistance will indicate that portion of the circuit has good continuity. If there were an open in the circuit, the DMM would indicate an over limit or infinite resistance condition. (point B)
6. Connect the probes between the relay and the solenoid. Little or no resistance will indicate that portion of the circuit has good continuity. If there were an open in the circuit, the DMM would indicate an over limit or infinite resistance condition. (point C)

Any circuit can be diagnosed using the approach in the above example.
HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT

Circuit Inspection (Cont’d)

Voltage check method
To help in understanding the diagnosis of open circuits please refer to the previous schematic. In any powered circuit, an open can be found by methodically checking the system for the presence of voltage. This is done by switching the DMM to the voltage function.

1. Connect one probe of the DMM to a known good ground.
2. Begin probing at one end of the circuit and work your way to the other end.
3. With SW1 open, probe at SW1 to check for voltage. If no voltage, open is between fuse block and SW1 (point A).
4. Close SW1 and probe at relay. If voltage, open is further down the circuit than SW1. If no voltage, open is between relay and solenoid (point C).
5. Close the relay and probe at the solenoid. If voltage, open is further down the circuit than the solenoid. If no voltage, open is between relay and solenoid (point C).

Any powered circuit can be diagnosed using the approach in the above example.

TESTING FOR “SHORTS” IN THE CIRCUIT
To simplify the discussion of shorts in the system please refer to the schematic below.

Resistance check method
1. Disconnect the battery negative cable and remove the blown fuse.
2. Disconnect all loads (SW1 open, relay disconnected and solenoid disconnected) powered through the fuse.
3. Connect one probe of the ohmmeter to the load side of the fuse terminal. Connect the other probe to a known good ground.
4. With SW1 open, check for continuity. If continuous, short is between fuse terminal and SW1 (point A).
5. Close SW1 and disconnect the relay. Put probes at the load side of fuse terminal and a known good ground. Then, check for continuity. If continuous, short is between SW1 and the relay (point B).
6. Close SW1 and jump the relay contacts with jumper wire. Put probes at the load side of fuse terminal and a known good ground. Then, check for continuity. If continuous, short is between relay and solenoid (point C).

Voltage check method
1. Remove the blown fuse and disconnect all loads (i.e. SW1 open, relay disconnected and solenoid disconnected) powered through the fuse.
2. Turn the ignition key to the ON or START position. Verify battery voltage at the B+ side of the fuse terminal (one lead on the B+ terminal side of the fuse block and one lead on a known good ground).
3. With SW1 open and the DMM leads across both fuse terminals, check for voltage. If voltage, short is between fuse block and SW1 (point A).

GROUND INSPECTION
Ground connections are very important to the proper operation of electrical and electronic circuits. Ground connections are often exposed to moisture, dirt and other corrosive elements. The corrosion (rust) can become an unwanted resistance. This unwanted resistance can change the way a circuit works.

Electronically controlled circuits are very sensitive to proper grounding. A loose or corroded ground can drastically affect an electronically controlled circuit. A poor or corroded ground can easily affect the circuit. Even when the ground connection looks clean, there can be a thin film of rust on the surface.

When inspecting a ground connection follow these rules:
1. Remove the ground bolt screw or clip.
2. Inspect all mating surfaces for tarnish, dirt, rust, etc.
3. Clean as required to assure good contact.
4. Reinstall bolt or screw securely.
5. Inspect for “add-on” accessories which may be interfering with the ground circuit.
6. If several wires are crimped into one ground eyelet terminal, check for proper crimps. Make sure all of the wires are clean, securely fastened and providing a good ground path. If multiple wires are included in one eyelet make sure no ground wires have excess wire insulation.
HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT

Circuit Inspection (Cont’d)

VOLTAGE DROP TESTS
Voltage drop tests are often used to find components or circuits which have excessive resistance. A voltage drop in a circuit is caused by a resistance when the circuit is in operation.

Check the wire in the illustration. When measuring resistance with ohmmeter, contact by a single strand of wire will give reading of 0 ohms. This would indicate a good circuit. When the circuit operates, this single strand of wire is not able to carry the current. The single strand will have a high resistance to the current. This will be picked up as a slight voltage drop.

Unwanted resistance can be caused by many situations as follows:
- Undersized wiring (single strand example)
- Corrosion on switch contacts
- Loose wire connections or splices

If repairs are needed always use wire that is of the same or larger gauge.

Measuring voltage drop — Accumulated method
1. Connect the voltmeter across the connector or part of the circuit you want to check. The positive lead of the voltmeter should be closer to power and the negative lead closer to ground.
2. Operate the circuit.
3. The voltmeter will indicate how many volts are being used to "push" current through that part of the circuit.

Note in the illustration that there is an excessive 4.1 volt drop between the battery and the bulb.

Symptom: Dim bulb or no operation
0 (zero) ohm resistance between switch and bulb

Measuring voltage drop — Step by step
The step by step method is most useful for isolating excessive drops in low voltage systems (such as those in "Computer Controlled Systems").

Circuits in the "Computer Controlled System" operate on very low amperage. The (Computer Controlled) system operations can be adversely affected by any variation in resistance in the system. Such resistance variation may be caused by poor connection, improper installation, improper wire gauge or corrosion.

The step by step voltage drop test can identify a component or wire with too much resistance.

The chart that follows illustrates some maximum allowable voltage drops. These values are given as a guideline, the exact value for each component may vary.

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>VOLTAGE DROP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wire</td>
<td>Negligible &lt; 0.05 volts</td>
</tr>
<tr>
<td>Ground Connections</td>
<td>Approx. 0.1 volts</td>
</tr>
<tr>
<td>Switch Contacts</td>
<td>Approx. 0.5 volts</td>
</tr>
</tbody>
</table>

1. Connect the voltmeter as shown, starting at the battery and working your way around the circuit.
2. An unusually large voltage drop will indicate a component or wire that needs to be repaired. As you can see in the illustration above, the poor connection causes a 4 volt drop.
**HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT**

**Circuit Inspection (Cont'd)**

Relationship between open/short (high resistance) circuit and the ECU pin control

System Description: When the switch is ON, the ECU lights up the lamp.

**Case 1**

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Condition</th>
<th>Voltage value [V]</th>
<th>Terminal 1: Monitoring of the switch operation (ON/OFF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Battery</td>
<td>FUSE opens, inoperative lamp</td>
<td></td>
<td>Switch</td>
</tr>
<tr>
<td>Short</td>
<td></td>
<td></td>
<td>Terminal 2: Power supply to light up the lamp</td>
</tr>
<tr>
<td>Open</td>
<td></td>
<td></td>
<td>ECU</td>
</tr>
</tbody>
</table>

**Input-output voltage chart**

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Item</th>
<th>Condition</th>
<th>Voltage value [V]</th>
<th>In case of high resistance such as single strand [V] *</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Switch</td>
<td>ON Battery voltage</td>
<td>Lower than battery voltage Approx. 0 (Example)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OFF</td>
<td>Approx. 0</td>
<td>Approx. 0</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Lamp</td>
<td>ON Battery voltage</td>
<td>Approx. 0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OFF</td>
<td>Approx. 0</td>
<td>Approx. 0</td>
<td></td>
</tr>
</tbody>
</table>

The voltage value is based on the body ground.

* If high resistance exists in the switch side circuit (caused by a single strand), terminal 1 does not detect battery voltage. ECU does not detect the switch is ON even if the switch does turn ON. Therefore, the ECM does not supply power to light up the lamp.

**Case 2**

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Condition</th>
<th>Voltage value [V]</th>
<th>Terminal 1: Monitoring of the switch operation (ON/OFF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Battery</td>
<td>FUSE opens, inoperative lamp</td>
<td></td>
<td>Switch</td>
</tr>
<tr>
<td></td>
<td>Lamp</td>
<td>ON Ground control to light up the lamp</td>
<td>Terminal 2: Monitoring of the switch operation (ON/OFF)</td>
</tr>
<tr>
<td>Short</td>
<td></td>
<td></td>
<td>ECU</td>
</tr>
<tr>
<td>Open</td>
<td></td>
<td></td>
<td>Switch</td>
</tr>
</tbody>
</table>

**Input-output voltage chart**

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Item</th>
<th>Condition</th>
<th>Voltage value [V]</th>
<th>In case of high resistance such as single strand [V] *</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lamp</td>
<td>ON</td>
<td>Approx. 0</td>
<td>Battery voltage (inoperative lamp)</td>
</tr>
<tr>
<td></td>
<td>OFF</td>
<td>Battery voltage</td>
<td>Higher than 0 Approx. 4 (Example)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Switch</td>
<td>ON</td>
<td>Approx. 0</td>
<td>Battery voltage</td>
</tr>
<tr>
<td></td>
<td>OFF</td>
<td>Approx. 5</td>
<td>Approx. 5</td>
<td></td>
</tr>
</tbody>
</table>

The voltage value is based on the body ground.

* If high resistance exists in the switch side circuit (caused by a single strand), terminal 2 does not detect approx. 0V. ECU does not detect the switch is ON even if the switch does turn ON. Therefore, the ECM does not supply power to light up the lamp.

**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 and Harness Connector Location for the Systems described in each section for identification/location of components and harness connectors.
4. Refer to the Circuit Diagram for Quick Pinpoint Check. If you must check circuit continuity between harness connectors in more detail, such as when a sub-harness is used, refer to Wiring Diagram in each individual section and Harness Layout in EL section for identification of harness connectors.
5. When checking circuit continuity, ignition switch should be "OFF".
6. Before checking voltage at connectors, check battery voltage.
7. After accomplishing the Diagnostic Procedures and Electrical Components Inspection, make sure that all harness connectors are reconnected as they were.

**Example**

- **INSPECTION START**
  - CHECK POWER SUPPLY:
    1. Turn ignition switch "ON".
    2. Check voltage between terminal 8 and ground. Battery voltage should exist.

- **CHECK GROUND CIRCUIT**
  1. Turn ignition switch "OFF".
  2. Disconnect camshafts position sensor harness connector.
  3. Check resistance between terminal 8 and ground. Resistance: Approximately 0 (Example)
HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES

HOW TO FOLLOW THIS FLOW CHART

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

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

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

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

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

Direction mark
Refer to "CONNECTOR SYMBOLS" on GI-11.

---

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>![Symbol]</td>
<td>Check after disconnecting the connector to be measured.</td>
<td>![Symbol]</td>
<td>Procedure without CONSULT</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>Check after connecting the connector to be measured.</td>
<td>![Symbol]</td>
<td>A/C switch is &quot;OFF&quot;</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>Insert key into ignition switch.</td>
<td>![Symbol]</td>
<td>A/C switch is &quot;ON&quot;</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>Turn ignition switch to &quot;OFF&quot; position.</td>
<td>![Symbol]</td>
<td>REC switch is &quot;ON&quot;</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>Turn ignition switch to &quot;ON&quot; position.</td>
<td>![Symbol]</td>
<td>REC switch is &quot;OFF&quot;</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>Turn ignition switch to &quot;START&quot; position.</td>
<td>![Symbol]</td>
<td>DEF switch is &quot;ON&quot;</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>Turn ignition switch from &quot;OFF&quot; to &quot;ACC&quot; position.</td>
<td>![Symbol]</td>
<td>VENT switch is &quot;ON&quot;</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>Turn ignition switch from &quot;ACC&quot; to &quot;OFF&quot; position.</td>
<td>![Symbol]</td>
<td>Fan switch is &quot;ON&quot; (At any position except for &quot;OFF&quot; position)</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>Turn ignition switch from &quot;OFF&quot; to &quot;ON&quot; position.</td>
<td>![Symbol]</td>
<td>Fan switch is &quot;OFF&quot;</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>Turn ignition switch from &quot;ON&quot; to &quot;OFF&quot; position.</td>
<td>![Symbol]</td>
<td>Apply fused battery positive voltage directly to components</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>Do not start engine, or check with engine stopped.</td>
<td>![Symbol]</td>
<td>Drive vehicle</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>Start engine, or check with engine running.</td>
<td>![Symbol]</td>
<td>Disconnect battery negative cable</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>Apply parking brake.</td>
<td>![Symbol]</td>
<td>Depress brake pedal</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>Release parking brake.</td>
<td>![Symbol]</td>
<td>Release brake pedal</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>Check after engine is warmed up sufficiently.</td>
<td>![Symbol]</td>
<td>Depress accelerator pedal</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>Voltage should be measured with a voltmeter.</td>
<td>![Symbol]</td>
<td>Release accelerator pedal</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>Circuit resistance should be measured with an ohmmeter.</td>
<td>![Symbol]</td>
<td>Pin terminal check for SMJ ECM and AT control unit connectors. For details regarding the terminal arrangement, refer to the foldout page.</td>
</tr>
<tr>
<td>![Symbol]</td>
<td>Current should be measured with an ammeter.</td>
<td>![Symbol]</td>
<td>Procedure with CONSULT</td>
</tr>
</tbody>
</table>
CONSULT CHECKING SYSTEM

Function and System Application

<table>
<thead>
<tr>
<th>Diagnostic test mode</th>
<th>Function</th>
<th>ECCS</th>
<th>A/T</th>
<th>AIR BAG*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work support</td>
<td>This mode enables a technician to adjust some devices faster and more accurately by following the instructions on CONSULT.</td>
<td>X</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Self diagnostic results</td>
<td>Self-diagnostic results can be read and erased quickly.</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Data monitor</td>
<td>Input/Output data in the ECM can be read.</td>
<td>X</td>
<td>X</td>
<td>—</td>
</tr>
<tr>
<td>Active test</td>
<td>Diagnostic Test Mode in which CONSULT drives some actuators apart from the ECMs and also shifts some parameters in a specified range.</td>
<td>X</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>ECM part number</td>
<td>ECM part number can be read.</td>
<td>X</td>
<td>X</td>
<td>—</td>
</tr>
<tr>
<td>Function test</td>
<td>Conducted by CONSULT instead of a technician to determine whether each system is &quot;OK&quot; or &quot;NG&quot;.</td>
<td>X</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

X: Applicable
* The existing program card (EE929) is applicable only to driver's side air bag system on vehicles outside Europe.

Lithium Battery Replacement

CONSULT contains a lithium battery. When replacing the battery obey the following:

WARNING:
Replace the lithium battery with SANYO Electric Co., Ltd., CR2032 only. Use of another battery may present a risk of fire or explosion. The battery may present a fire or chemical burn hazard if mistreated. Do not recharge, disassemble or dispose of in fire.
Keep the battery out of reach of children and discard used battery conforming to the local regulations.

Checking Equipment

When ordering the below equipment, contact your NISSAN distributor.

<table>
<thead>
<tr>
<th>Tool name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NISSAN CONSULT</td>
<td>CONSULT unit and accessories</td>
</tr>
<tr>
<td>Program card (EE 929) (AE339)*</td>
<td></td>
</tr>
</tbody>
</table>

* For Australia
IDENTIFICATION INFORMATION

Identification Number

Vehicle identification number (Chassis number)

Vehicle identification plate

Built date plate (For Australia)

Identification Number (Cont’d)

For Australia and New Zealand

<table>
<thead>
<tr>
<th>J1</th>
<th>G</th>
<th>U</th>
<th>A</th>
<th>S14</th>
<th>A</th>
<th>0</th>
<th>XXXXX</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Stopgap</td>
<td></td>
<td></td>
<td>Vehicle serial number</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Destination</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>A: Australia and New Zealand</td>
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Except Europe, Australia and New Zealand

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Manufacturer |   |   |     |   |                       |
| J1: Nissan, Passenger vehicle |   |   |     |   |                       |

VEHICLE IDENTIFICATION NUMBER ARRANGEMENT

For Europe

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**Identification Information**

**Identification Number (Cont’d)**

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**Dimensions**

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<th>Unit (mm)</th>
<th>Unit (in)</th>
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<tr>
<td>Overall length</td>
<td></td>
<td>4,520 (178.0)</td>
</tr>
<tr>
<td>Overall width</td>
<td></td>
<td>1,730 (68.1)</td>
</tr>
<tr>
<td>Overall height</td>
<td></td>
<td>1,265 (50.0)</td>
</tr>
<tr>
<td>Front tread</td>
<td>mm (in)</td>
<td>1,480 (58.3)</td>
</tr>
<tr>
<td>Rear tread</td>
<td>mm (in)</td>
<td>1,470 (57.9)</td>
</tr>
<tr>
<td>Wheelbase</td>
<td>mm (in)</td>
<td>2,555 (99.4)</td>
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**Wheels and Tires**

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<th>Type</th>
<th>Description</th>
<th>Unit (mm)</th>
<th>Unit (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel°1</td>
<td>16 x 6-1/2JJ</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aluminum</td>
<td>16 x 6-1/2JJ</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offset</td>
<td>mm (in)</td>
<td>40 (1.57), 30 (1.18)°2</td>
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</tr>
<tr>
<td>Tire size</td>
<td>(Conventional)</td>
<td>205/50R16 66V</td>
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<td>Spare tire</td>
<td>(T-type)°2</td>
<td>T125/00316</td>
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</table>

°1 For Spare tire
°2 For Spare tire (T-type) for Australia
LIFTING POINTS AND TOW TRUCK TOWING

Garage Jack and Safety Stand

WARNING:
- Never get under the vehicle while it is supported only by the jack. Always use safety stands to support the frame when you have to get under the vehicle.
- Place wheel chocks at the front wheels when the rear wheels are raised and place wheel chocks at the rear wheels when the front wheels are raised.

CAUTION:
- Place a wooden or rubber block between safety stand and vehicle body when the supporting body is flat.
- Never place safety stand at the side member.

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.

Preparation

SPECIAL SERVICE TOOLS

<table>
<thead>
<tr>
<th>Tool number</th>
<th>Description</th>
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<tr>
<td>LM4986-0200</td>
<td>Board-on lift attachment</td>
</tr>
<tr>
<td>LM4510-0000</td>
<td>Safety stand attachment</td>
</tr>
</tbody>
</table>

Board-on Lift

CAUTION:
Make sure vehicle is empty when lifting.
- The board-on lift attachment (LM4986-0200) set at front end of vehicle should be set on the front of the sill under the front door opening.
- Position attachments at front and rear ends of board-on lift.
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.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Bolt size</th>
<th>Bolt diameter <strong>[mm]</strong></th>
<th>Pitch <strong>[mm]</strong></th>
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1. Special parts are excluded.
2. This standard is applicable to bolts having the following marks embossed on the bolt head.

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</tr>
<tr>
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Nominal diameter of bolt threads (Unit: mm)

Metric screw threads

GI-40

GI-41
### SAE J1930 Terminology List (Cont'd)

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<th>NEW ACRONYM / ABBREVIATION</th>
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<td>EGRC-BPT valve</td>
<td>BPT valve</td>
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<tr>
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<td>EGRC-solenoid valve</td>
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<td>Exhaust gas temperature sensor</td>
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<td>PAIRC solenoid valve</td>
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<td>noid valve</td>
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Precautions

Supplemental Restraint System (SRS) “AIR BAG” and “SEAT BELT PRE-TENSIONER”

The Supplemental Restraint System “Air Bag” and “Seat Belt Pre-tensioner”, used along with a seat belt, help to reduce the risk or severity of injury to the driver and front passenger in a frontal collision. The Supplemental Restraint System consists of air bag modules (located in the center of the steering wheel and on the instrument panel on the passenger side), seat belt pre-tensioners, a diagnosis sensor unit, warning lamp, wiring harness, and spiral cable. Information necessary to service the system safely is included in the RS section of this Service Manual.

WARNING:
- To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in an air bag inflation, all maintenance must be performed by an authorized NISSAN dealer.
- Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.
- All SRS air bag electrical wiring harnesses and connectors are covered with yellow outer insulation. Do not use electrical test equipment on any circuit related to the SRS.

Parts Requiring Angular Tightening

Use an angle wrench for the first tightening of the following engine parts:
- Cylinder head bolts
- Main bearing cap bolts
- Connecting rod bearing cap nuts

Do not use a torque value for final tightening. The torque values for these parts are for a preliminary step. Ensure threads and seat surfaces are clean and coated with engine oil.

Liquid Gasket Application Procedure

a. Use a scraper to remove all traces of old liquid gasket from mating surfaces and grooves. Also, completely clean any oil from these areas.

b. Apply a continuous bead of liquid gasket to mating surfaces. (Use Genuine Liquid Gasket or equivalent.)
   - Be sure liquid gasket is 4.0 to 5.0 mm (0.157 to 0.197 in) wide (for oil pan).
   - Be sure liquid gasket is 2.0 to 3.0 mm (0.079 to 0.118 in) wide (in areas except oil pan).

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

d. Wait at least 30 minutes before refilling engine oil and engine coolant.

Special Cautions to Ensure the Safe Disposal of Sodium-filled Exhaust Valves

The handling and disposal of sodium-filled exhaust valves requires special care and consideration. Under conditions such as breakage with subsequent exposure to water, the sodium metal will react violently. The sodium metal, which lines the inner portion of the exhaust valve, forms sodium hydroxide. Also, it releases hydrogen gas which may result in an explosion or fire.

A sodium-filled exhaust valve is identified on the top of its stem as shown in illustration.

Dealer Disposal Instructions

CAUTION:
- Use approved shatter-resistant eye protection when performing this procedure.
- Perform this and all subsequent disposal work procedures in an open room, away from flammable liquids. Keep a fire extinguisher, rated at least 10 ABC, in close proximity to the work area.
- Be sure to wear rubber gloves when performing the following operations.

1. Clamp valve stem in a vice.

2. The valve has a specially-hardened surface. To cut through it, first remove a half-round section, approximately 30 mm (1.18 in) long. Use an air-powered grinder until the black iron color is removed and the silver-colored metal appears.

3. Use a hacksaw to cut through approximately half the diameter of the valve stem. Make the serration at a point 40 mm (1.57 in) from the end of the stem.
**PRECAUTIONS**

Special Cautions to Ensure the Safe Disposal of Sodium-filled Exhaust Valves (Cont'd)

4. Cover the serrated end of the valve with a large shop towel. Strike the valve face and a hammer, separating it into two pieces.

5. Fill a bucket (such as a 20 1 oil can) with at least 10 l (2-1/4 Imp gal) of water. Using a pair of large tweezers, carefully place the already-cut (serrated) valves into the water one at a time. Quickly move away at least 2.7 m (9 ft). Place the valves in a standing position as shown in the figure. This allows complete reaction of the sodium with the water. The major portion of the resultant chemical reaction lasts 1 to 2 minutes. After the bubbling action has subsided, additional valves can be placed into the water. Wait until each subsequent chemical reaction subsides before placing additional valves into the water. However, no more than 8 valves should be placed in the same 10 l (2-1/4 Imp gal) amount of water. The complete chemical reaction may take as long as 4 to 5 hours. Remove the valves using a set of large tweezers after the chemical reaction has stopped. Afterwards, the valves can be mixed with ordinary scrap metal.

**CAUTION:**

- Make sure the resultant (high alkalinity) waste water does not contact your skin. If the waste water does contact you, wash the contacted area immediately with large quantities of water.
- Check country and local regulations concerning any chemical treatment or waste water discharge permits. These may be required to dispose of the resultant (high alkalinity) waste water.

---

### PREPARATION

**Special Service Tools**

<table>
<thead>
<tr>
<th>Tool number</th>
<th>Description</th>
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<tbody>
<tr>
<td>STC6015000</td>
<td>Disassembling and assembling</td>
</tr>
<tr>
<td>STC6010000</td>
<td>Engine stand assembly</td>
</tr>
<tr>
<td>STC6021000</td>
<td>Engine stand</td>
</tr>
<tr>
<td>STC6012000</td>
<td>Base</td>
</tr>
<tr>
<td>KV10105000</td>
<td>Engine stand shaft</td>
</tr>
<tr>
<td>KV10115000</td>
<td>Engine sub-attachment</td>
</tr>
<tr>
<td>STC6120000</td>
<td>Cylinder head bolt wrench</td>
</tr>
<tr>
<td>KV10116200</td>
<td>Valve spring compressor</td>
</tr>
<tr>
<td>KV10109210</td>
<td>Compressor</td>
</tr>
<tr>
<td>KV10109220</td>
<td>Adapter</td>
</tr>
<tr>
<td>KV10112000</td>
<td>Adapter (Useless)</td>
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Disassembling valve mechanism

Unit: mm (in.)
## PREPARATION
### Special Service Tools (Cont'd)

<table>
<thead>
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<td>Valve oil seal drill</td>
<td>Installing valve oil seal</td>
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<tr>
<td></td>
<td></td>
<td><img src="image" alt="Diagram" /></td>
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<tr>
<td></td>
<td></td>
<td><strong>Dimensions:</strong></td>
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<tr>
<td></td>
<td></td>
<td><strong>Side A</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>a) 20 (0.79) dia.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b) 13 (0.51) dia.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>c) 10.2 (0.405) dia.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>d) 8 (0.31) dia.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>e) 10.7 (0.421) dia.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>f) 5 (0.20)</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Side B</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>a) 20 (0.79) dia.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b) 14 (0.551) dia.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>c) 11 (0.433) dia.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>d) 8 (0.31) dia.</td>
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<tr>
<td></td>
<td></td>
<td>e) 10.7 (0.421) dia.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>f) 5 (0.20)</td>
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<tr>
<td>KV10115010</td>
<td>Dial gauge stand</td>
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<td>EM03470000</td>
<td>Piston ring compressor</td>
<td>Installing piston assembly into cylinder bore</td>
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<td>KV10107400</td>
<td>Piston pin press stand</td>
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<td>KV10107310</td>
<td>Center shaft</td>
<td></td>
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<td>ST13040000</td>
<td>Stand</td>
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<td>KV10107320</td>
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<td>ST13040050</td>
<td>Cap</td>
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<td>ST13040050</td>
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<td>EU19600000</td>
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<td>KV10111100</td>
<td>Seal cutter</td>
<td>Removing oil pan</td>
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### Additional Tools
- **Tube presser**
  - KM025
  - Pressing the tube of liquid gasket
- **Angle wrench**
  - KV10112100
  - Tightening bolts for bearing cap, cylinder head, etc.
- **Pilot bushing puller**
  - ST16610001
  - Removing pilot bushing
PREPARATION

Commercial Service Tools

<table>
<thead>
<tr>
<th>Tool Name</th>
<th>Description</th>
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<tr>
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<td>Valve seal cutter</td>
<td>Finishing valve seat dimensions</td>
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<tr>
<td>Piston ring expander</td>
<td>Removing and installing piston ring</td>
</tr>
<tr>
<td>Valve guide drill</td>
<td>Removing and installing valve guide</td>
</tr>
<tr>
<td>Valve guide reamer</td>
<td>Reaming valve guide or hole for oversize valve guide</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Unit</th>
<th>mm (in)</th>
<th>( d_1 )</th>
<th>( d_2 )</th>
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<tbody>
<tr>
<td>Intake</td>
<td>6.0 (0.236)</td>
<td>10.175</td>
<td>9.4000</td>
</tr>
<tr>
<td>Exhaust</td>
<td>7.0 (0.276)</td>
<td>11.175</td>
<td>9.4000</td>
</tr>
</tbody>
</table>

Front oil seal drill: Installing front oil seal

Rear oil seal drill: Installing rear oil seal

OUTER COMPONENT PARTS

- Spark plug
- Intake manifold collector
- Oil pressure switch
- Oil filter
- Oil filter bracket
- Alternator bracket
- Water outlet
- Thermostat
- Thermostat housing
- Knock sensor
- Blow-by control valve
- VTC solenoid valve
Measurement of Compression Pressure
1. Warm up engine.
2. Turn ignition switch off.
3. Release fuel pressure.
   Refer to "Releasing Fuel Pressure" in EC section.
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:

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<tr>
<th></th>
<th>Unit: kPa (bar, kg/cm², psi)/300 rpm</th>
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<tr>
<td>Standard</td>
<td>1,079 (10.79, 11.0, 156)</td>
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<tr>
<td>Minimum</td>
<td>883 (8.83, 9.0, 128)</td>
</tr>
<tr>
<td>Difference limit</td>
<td>98 (0.98, 1.0, 14)</td>
</tr>
</tbody>
</table>

10. If compression in one or more cylinders is low:
    a. Pour a small amount of engine oil into cylinders through spark plug holes.
    b. Re-test compression.
    - If adding oil helps compression, piston rings may be worn or damaged. If so, replace piston rings after checking piston for wear or damage.
    - If pressure stays low, a valve may be sticking or seating improperly. Inspect and repair valve and valve seal. (Refer to SDS.) If valve or valve seat is damaged excessively, replace them.
    - If compression stays low in two cylinder that are next to each other:
      a. The cylinder head gasket may be leaking, or
      b. Both cylinders may have valve component damage. Inspect and repair as necessary.
Removal
1. Remove engine under cover.
2. Drain engine oil.
3. Remove steel oil pan bolts.
4. Remove steel oil pan.
   (1) Insert Tool between aluminum oil pan and steel oil pan.
   - Be careful not to damage aluminum mating surface.
   - Do not insert screwdriver, or oil pan flange will be deformed.
OIL PAN

Removal (Cont’d)

(2) Slide Tool by tapping on the side of the Tool with a hammer.

(3) Remove steel oil pan.
(4) Remove baffle plate.

5. Install engine slingers to cylinder head. Refer to "ENGINE REMOVAL" (EM-55).
6. Set a suitable hoist on engine slinger and hold the engine.
7. Remove the following parts.
   • Tension rod bolts at transverse links
   • Front stabilizer bar securing bolts and nuts from side member.
   • Both left and right side engine mounting bolts. Refer to "ENGINE REMOVAL" (EM-55).
8. Disconnect steering shaft lower joint.

9. Remove power steering tube bracket securing bolts at left tension rod bracket.
10. Remove front suspension member securing bolts while supporting with a jack.
11. Lower front suspension member by around 60 mm (2.36 in).

12. Remove alternator support.

EM-14

15. Remove four oil pan-to-transmission bolts.

16. Remove two engine-to-transmission bolts and install them into open bolt holes shown. Tighten the two bolts to release aluminum oil pan from cylinder block.

17. Remove aluminum oil pan.

(1) Insert Tool between cylinder block and aluminum oil pan.
- Be careful not to damage aluminum mating surface.
- Do not insert screwdriver, or oil pan flange will be deformed.

(2) Slide Tool by tapping on the side of the Tool with a hammer.
OIL PAN

Removal (Cont'd)

18. Remove the two oil pan-to-transmission bolts previously installed in aluminum oil pan.

Installation

1. Install aluminum oil pan.
   (1) Before installing aluminum oil pan, remove all traces of liquid gasket from mating surfaces using a scraper.
   - Also remove traces of liquid gasket from mating surface of cylinder block and front cover.

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

   - For areas marked with "★", apply liquid gasket to the outer side of the bolt hole.

   - Be sure liquid gasket is 4.0 to 5.0 mm (0.157 to 0.197 in) wide.
   - Attaching should be done within 5 minutes after coating.
OIL PAN

Installation (Cont’d)

(3) Install aluminum oil pan.
   • Tighten bolts in numerical order shown.
     ① - ⑥ bolts:
       ⑤: 16 - 19 N·m (1.6 - 1.9 kg-m, 12 - 14 ft-lb)
     ⑦, ⑧ bolts:
       ⑤: 6.4 - 7.5 N·m (0.65 - 0.76 kg-m, 4.7 - 5.5 ft-lb)

2. Install the four oil pan-to-transmission bolts.
3. Install rear cover plate.
4. Install alternator support.
5. Tighten front suspension member securing bolts.
6. Install all removed parts after removing steel oil pan.

7. Install steel oil pan.
   (1) Before installing steel oil pan, remove all traces of liquid gasket from mating surfaces using a scraper.
      • Also remove traces of liquid gasket from mating surface of aluminum oil pan.

   (2) Apply a continuous bead of liquid gasket to mating surface of steel oil pan.
      • Use Genuine Liquid Gasket or equivalent.
OIL PAN

Installation (Cont'd)

- Be sure liquid gasket is 4.0 to 5.0 mm (0.157 to 0.197 in) wide.
- Attaching should be done within 5 minutes after coating.

(3) Install steel oil pan.
- Install bolts in numerical order shown.
- Wait at least 30 minutes before refilling engine oil.

EM-18
TIMING CHAIN

Removal (Cont’d)

14. Set No. 1 piston at TDC on the compression stroke by rotating crankshaft.

- Rotate crankshaft until mating mark on camshaft sprocket is set at position indicated in figure at left.

15. Remove chain tensioner.

16. Remove camshaft position sensor.

17. Remove timing chain guide.

EM-21
TIMING CHAIN

CAUTION:
- After removing timing chain, do not turn crankshaft and camshaft separately, or valves will strike piston heads.
- When installing rocker arms, camshafts, chain tensioner, oil seals, or other sliding parts, lubricate contacting surfaces with new engine oil.
- Apply new engine oil to bolt threads and seat surfaces when installing cylinder head, camshaft sprocket, crankshaft pulley, and camshaft brackets.

Removal
1. Release fuel pressure.
   Refer to "Releasing Fuel Pressure" in EC section.
2. Remove engine under covers.
3. Drain coolant.
4. Remove radiator.
5. Remove air duct to intake manifold and air recirculation duct.
6. Remove PCV hoses from rocker cover.
7. Remove drive belts and water pump pulley.
8. Remove alternator.
9. Remove power steering oil pump.
10. Remove the following parts from cylinder head and intake manifold: vacuum hoses, fuel hoses, water hoses, wires, harness, connectors and so on.
11. Remove ignition coils and all spark plugs.

12. Remove rocker cover.

13. Remove intake manifold supports.
TIMING CHAIN

Removal (Cont’d)

14. Set No. 1 piston at TDC on the compression stroke by rotating crankshaft.

- Rotate crankshaft until mating mark on camshaft sprocket is set at position indicated in figure at left.

15. Remove chain tensioner.

16. Remove camshaft position sensor.

17. Remove timing chain guide.

EM-21
TIMING CHAIN

Removal (Cont'd)

18. Remove camshaft sprockets.

19. Remove camshafts, camshaft brackets, oil tubes and baffle plate.


21. Remove cylinder head outside bolts and inside sub bolts.

22. Remove cylinder head bolts.
   - A warped or cracked cylinder head may result from removing in incorrect order.
   - Bolts should be loosened in two or three steps.

23. Remove cylinder head with intake manifold.
TIMING CHAIN

Removal (Cont’d)

24. Remove oil pans.
    Refer to "Removal" in "OIL PAN" (EM-13).
25. Remove oil strainer and baffle plate.

26. Remove crankshaft pulley.

27. Remove front cover.

28. Remove timing chain guides and timing chain.

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

1. Install crankshaft sprocket on crankshaft.

2. Position crankshaft so that No. 1 piston is set at TDC and key way is at 12 o'clock. Fit timing chain on crankshaft sprocket, aligning the mating marks.

- Mating mark color on timing chain.
  ①: Gold
  ②, ③: Silver

3. Install timing chain and timing chain guides.

4. Before installing front cover, remove all traces of liquid gasket from mating surface using a scraper.
- Also remove traces of liquid gasket from mating surface of cylinder block.

EM-24
TIMING CHAIN

Installation (Cont’d)

5. Apply a continuous bead of liquid gasket to mating surface of front cover.
   - Use Genuine Liquid Gasket or equivalent.

6. Install oil pump drive spacer and front cover.
   - Make sure that O-ring is installed on oil pump outlet passage of cylinder block.
   - Wipe off excessive liquid gasket.

7. Install crankshaft pulley.
8. Set No. 1 piston at TDC on its compression stroke.
TIMING CHAIN

Installation (Cont’d)

9. Install oil strainer and baffle plate.

10. Install oil pan.
    Refer to "Installation" in "OIL PAN" (EM-13).

11. Before installing cylinder head gasket, apply a continuous bead of liquid gasket to mating surface of cylinder block.

12. Install cylinder head with intake manifold.
    CAUTION:
The cylinder head bolts can be reused providing dimension "A" is not exceeded.
    Dimension "A":
    158.2 mm (6.23 in)

- Cylinder head bolts tightening procedure:
  a. Tighten all bolts to 39 N·m (4.0 kg-m, 29 ft-lb).
  b. Tighten all bolts to 78 N·m (8.0 kg-m, 58 ft-lb).
  c. Loosen all bolts completely.
  d. Tighten all bolts to 34 to 44 N·m (3.5 to 4.5 kg-m, 25 to 33 ft-lb).

EM-26
TIMING CHAIN

Installation (Cont’d)

e. Method A: Turn all bolts 90 to 95 degrees clockwise with Tool or suitable angle wrench.
Method B: If an angle wrench is not available, mark all cylinder head bolts on the side facing engine front. Then, turn each cylinder head bolt 90 to 95 degrees clockwise.

f. Turn all bolts 90 to 95 degrees clockwise.
g. Ensure that paint mark on each bolt faces the rear of the engine. (Method B only)
Do not turn any bolt 180 to 190 degrees clockwise all at once.

<table>
<thead>
<tr>
<th>Tightening torque N·m (kg-m, ft-lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>①</td>
</tr>
<tr>
<td>②</td>
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<td>③</td>
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<tr>
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<td>⑤</td>
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<tr>
<td>⑥</td>
</tr>
<tr>
<td>⑦</td>
</tr>
</tbody>
</table>

13. Install cylinder head outside bolts and inner sub-bolts.

15. Install camshafts, camshaft brackets, oil tubes and baffle plate.
   • Position camshaft.
     a. LH camshaft key at about 12 o’clock
     b. RH camshaft key at about 10 o’clock
TIMING CHAIN

Installation (Cont’d)

• Position camshaft bracket.

• Camshaft bracket bolts tightening procedure
  STEP 1:
  Tighten bolts 9 - 10 in that order then tighten bolts 1 - 8 in that order.
  \[ N\cdot m (0.2 \text{ kg-m, 1.4 ft-lb}) \]
  STEP 2:
  Tighten bolts in the specified order.
  \[ 6 N\cdot m (0.6 \text{ kg-m, 4.3 ft-lb}) \]
  STEP 3:
  Tighten bolts in the specified order.
  \[ 9.0 - 11.8 N\cdot m \\
  (0.92 - 1.2 \text{ kg-m, 6.7 - 8.7 ft-lb}) \]

16. Install camshaft sprockets.
Line up mating marks on timing chain with mating marks on camshaft sprockets.

• Lock camshafts as shown in figure and tighten to specified torque.
  \[ 127 - 137 N\cdot m \\
  (13 - 14 \text{ kg-m, 94 - 101 ft-lb}) \]
TIMING CHAIN

Installation (Cont'd)

17. Install timing chain guide.

18. Install camshaft position sensor.
   a. Make sure that No. 1 piston is at TDC on its compression stroke.
   b. Set mating marks on rotor shaft of camshaft position sensor as shown.

   c. Install camshaft position sensor aligning the center of fixing bolt hole.

   • After installing, confirm that mating marks on rotor shaft of camshaft position sensor are as shown.
   d. Tighten fixing bolts.

19. Install chain tensioner.
   Press cam stopper down and “press-in” sleeve until hook can be engaged on pin. When tensioner is bolted in position the hook will release automatically. Ensure arrow “A” faces the front of the engine.
TIMING CHAIN

Installation (Cont'd)

- If hook does not release automatically, turn crankshaft counterclockwise until it does release.

20. Install cylinder head front cover.
- Before installing, remove all traces of liquid gasket from mating surface of cylinder head and the cover using a scraper.
- Apply a continuous bead of liquid gasket to mating surface of cylinder head front cover.
- **Use Genuine Liquid Gasket or equivalent.**

21. Install intake manifold supports.

22. Remove all old liquid gasket from mating surfaces of rocker cover and cylinder head.
23. Apply a continuous bead of liquid gasket to mating surface of rocker cover gasket and cylinder head.
- **Use Genuine Liquid Gasket or equivalent.**

24. Install rocker cover.
**Rocker cover tightening procedure:**
(1) Tighten nuts ① - ⑩ - ⑪ - ⑬ - ⑮ in that order to 4 N·m (0.4 kg-m, 2.9 ft-lb).
(2) Tighten nuts ① to ⑬ as indicated in figure to 8 to 10 N·m (0.8 to 1.0 kg-m, 5.8 to 7.2 ft-lb).
TIMING CHAIN

Installation (Cont'd)

25. Reinstall any parts removed in reverse order of removal.
   • When refilling engine coolant, refer to "Engine Maintenance" in MA section.
VALVE OIL SEAL
1. Remove rocker cover.
2. Remove camshafts and sprockets.
   Refer to "Removal" in "TIMING CHAIN" (EM-20).
3. Remove ignition coils on spark plugs.

4. Install air hose adapter into spark plug hole and apply air pressure to hold valves in place. Apply a pressure of 490 kPa (4.9 bar, 5 kg/cm², 71 psi).
5. Remove rocker arm, rocker arm guide and shim.

6. Remove valve spring with Tool.
   **Piston concerned should be set at TDC to prevent valve from falling.**

7. Remove valve oil seal.

8. Apply engine oil to new valve oil seal and install it with Tool.
OIL SEAL REPLACEMENT

FRONT OIL SEAL
1. Remove the following parts:
   - Engine under cover
   - Drive belts
   - Crankshaft pulley

2. Remove front oil seal.
   Be careful not to scratch front cover.

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

EM-33
OIL SEAL REPLACEMENT

REAR OIL SEAL
1. Remove transmission. (Refer to MT or AT section.)
2. Remove flywheel or drive plate.
3. Remove rear oil seal.
Be careful not to scratch rear oil seal retainer.

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

Removal
1. Release fuel pressure. Refer to "Releasing Fuel Pressure" in EC section.
2. Drain coolant.
3. Remove air duct from intake manifold.
4. Remove PCV hoses from rocker cover.
5. Remove vacuum hoses, fuel hoses, water hoses, wires, harnesses, connectors, etc. from intake manifold.

6. Remove intake manifold collector supports.

7. Remove intake manifold collector.

8. Remove harness connectors of engine coolant temperature sensor and thermal transmitter.
9. Remove fuel tube assembly.

10. Remove EGR tube.
11. Remove hose and tube between EGR valve and EGRC-BPT valve.
INTAKE MANIFOLD

Removal (Cont’d)

12. Remove intake manifold supports.

13. Remove intake manifold.

Installation

1. Install intake manifold.
2. Install intake manifold supports.
3. Install EGR tube.
4. Install hose and tube between EGR valve and EGRC-BPT valve.

5. Install fuel tube assembly.
   - Tighten bolts in two steps.
     1st: 9.3 - 10.8 N·m (0.95 - 1.1 kg-m, 6.9 - 8.0 ft-lb)
     2nd: 21 - 26 N·m (2.1 - 2.7 kg-m, 15 - 20 ft-lb)

6. Connect harness connectors of engine coolant temperature sensor and thermal transmitter.

7. Install intake manifold collector.

EM-36
INTAKE MANIFOLD
Installation (Cont’d)

8. Reinstall any parts removed in reverse order of removal.
CAUTION:
- When installing rocker arms, camshaft and oil seal, lubricate contacting surfaces with new engine oil.
- When tightening cylinder head bolts, camshaft sprocket bolts and camshaft bracket bolts, lubricate thread portions and seal surfaces of bolts with new engine oil.

- If a hydraulic lash adjuster is kept on its side, there is a risk of air entering it. When hydraulic lash adjusters are removed, stand them straight up or soak them in new engine oil.
- Do not disassemble hydraulic lash adjusters.
- Attach tags to lash adjusters so as not to mix them up.

Removal and Installation
Removal and installation procedures are the same as those for timing chain. Refer to “Removal” and “Installation” in “TIMING CHAIN” (EM-20, EM-24).

Disassembly
1. Remove rocker arms, shims, rocker arm guides and hydraulic lash adjusters from cylinder head.

CAUTION:
Keep parts in order so that they can be installed in their original positions during assembly. (Install parts in their original positions.)

2. Remove intake manifold. Refer to “Removal” in “INTAKE MANIFOLD” (EM-35).
3. Remove water outlet.
4. Remove valve components with Tool.

5. Remove valve oil seal with a suitable tool.

Inspection

CYLINDER HEAD DISTORTION
Measure the distortion in the directions as shown.

Head surface distortion:
- Standard
- Less than 0.03 mm (0.0012 in)
- Limit
  0.1 mm (0.004 in)

If beyond the specified limit, replace or resurface.

Resurfacing limit:
The resurfacing limit of cylinder head is determined by the cylinder block resurfacing in an engine.
Amount of cylinder head resurfacing is "A".
Amount of cylinder block resurfacing is "B".
The maximum limit is as follows:
\[ A + B = 0.2 \text{ mm (0.008 in)} \]

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

Nominal cylinder head height:
136.9 - 137.1 mm (5.390 - 5.398 in)

CAMSHAFT VISUAL CHECK
Check camshaft for scratches, seizure and wear.
CYLINDER HEAD

Inspection (Cont’d)

CAMSHAFT RUNOUT
1. Measure camshaft runout at the center journal.
   Runout (Total indicator reading):
   Standard
   Less than 0.02 mm (0.0008 in)
   Limit
   0.1 mm (0.004 in)
2. If it exceeds the limit, replace camshaft.

CAMSHAFT CAM HEIGHT
1. Measure camshaft cam height.
   Standard cam height:
   Intake & Exhaust
   37.920 - 38.110 mm (1.4929 - 1.5004 in)
   Cam wear limit:
   Intake & Exhaust
   0.20 mm (0.0079 in)
2. If wear is beyond the limit, replace camshaft.

CAMSHAFT JOURNAL CLEARANCE
1. Install camshaft bracket and tighten bolts to the specified torque.
2. Measure inner diameter of camshaft bearing.
   Standard inner diameter:
   28.000 - 28.021 mm (1.1024 - 1.1032 in)
3. Measure outer diameter of camshaft journal.
   Standard outer diameter:
   27.935 - 27.955 mm (1.0998 - 1.1006 in)
4. If clearance exceeds the limit, replace camshaft and/or cylinder head.
   Camshaft journal clearance:
   Standard
   0.045 - 0.086 mm (0.0018 - 0.0034 in)
   Limit
   0.15 mm (0.0059 in)

CAMSHAFT END PLAY
1. Install camshaft in cylinder head.
2. Measure camshaft end play.
   Camshaft end play:
   Standard
   0.092 - 0.173 mm (0.0036 - 0.0068 in)
   Limit
   0.20 mm (0.0079 in)

EM-41
CYLINDER HEAD

Inspection (Cont'd)

CAMSHAFT SPROCKET RUNOUT
1. Install sprocket on camshaft.
2. Measure camshaft sprocket runout.
   Runout (Total indicator reading):
   Limit 0.25 mm (0.0098 in)
3. If it exceeds the limit, replace camshaft sprocket.

VALVE GUIDE CLEARANCE
1. Measure valve deflection in a parallel direction with rocker arm. (Valve and valve guide mostly wear in this direction.)
   Valve deflection limit (Dial gauge reading):
   Intake & Exhaust
   0.2 mm (0.008 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:

<table>
<thead>
<tr>
<th>Unit: mm (in)</th>
<th>Standard</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intake</td>
<td>0.020 - 0.053</td>
<td>0.08 (0.0031)</td>
</tr>
<tr>
<td></td>
<td>(0.008 - 0.021)</td>
<td></td>
</tr>
<tr>
<td>Exhaust</td>
<td>0.040 - 0.073</td>
<td>0.1 (0.004)</td>
</tr>
<tr>
<td></td>
<td>(0.0016 - 0.0029)</td>
<td></td>
</tr>
</tbody>
</table>

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

VALVE GUIDE REPLACEMENT
1. To remove valve guide, heat cylinder head to 110 to 130°C (230 to 266°F).
2. Press out valve guide or use a hammer and suitable tool.

3. Ream cylinder head valve guide hole.
   Valve guide hole diameter
   (for service parts):
   Intake: 10.175 - 10.196 mm (0.4006 - 0.4014 in)
   Exhaust: 11.175 - 11.196 mm (0.4400 - 0.4408 in)

4. Heat cylinder head to 110 to 130°C (230 to 266°F) and press
   service valve guide onto cylinder head.
   Projection “L”:
   14.0 - 14.2 mm (0.551 - 0.559 in)

5. Ream valve guide.
   Valve guide inner diameter:
   Intake: 6.000 - 6.018 mm (0.2362 - 0.2369 in)
   Exhaust: 7.000 - 7.018 mm (0.2756 - 0.2763 in)

VALVE SEATS
Check valve seats for pitting at contact surface. Resurface or
replace if excessively worn.
- 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.
CYLINDER HEAD

Inspection (Cont’d)

REPLACING VALVE SEAT FOR SERVICE PARTS

1. Bore out old seat until it collapses. Set machine depth stop so that boring cannot contact bottom face of seat recess in cylinder head.
2. Ream cylinder head recess.
   Reaming bore for service valve seat
   Oversize [0.5 mm (0.020 in)]:
   Intake
   35.500 - 35.516 mm (1.3976 - 1.3983 in)
   Exhaust
   31.500 - 31.516 mm (1.2402 - 1.2408 in)
   Use the valve guide center for reaming to ensure valve seat will have the correct fit.

3. Heat cylinder head to 110 to 130°C (230 to 266°F).
4. Press fit valve seat until it seats on the bottom.

5. Cut or grind valve seat using a suitable tool at the specified dimensions as shown in SDS.
6. After cutting, lap valve seat with abrasive compound.
7. Check valve seating condition.
   Seat face angle “α”:
   44°53’ - 45°07’ deg.
   Contacting width “W”:
   Intake
   1.4 - 1.7 mm (0.055 - 0.067 in)
   Exhaust
   1.7 - 2.0 mm (0.067 - 0.079 in)

VALVE DIMENSIONS

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

Inspection (Cont’d)

VALVE SPRING

Squareness
1. Measure “S” dimension.
   Out-of-square:
   Less than 2.2 mm (0.087 in)
2. If it exceeds the limit, replace spring.

Pressure
Check valve spring pressure.
   Standard:
   578.02 - 641.57 N
   (58.94 - 65.42 kg, 129.96 - 144.25 lb)
   at 30.0 mm (1.181 in)
   Limit:
   More than 549.2 N (56.0 kg, 123.5 lb)
   at 30.0 mm (1.181 in)

If it exceeds the limit, replace spring.

HYDRAULIC LASH ADJUSTER
1. Check contact and sliding surfaces for wear or scratches.
2. Check diameter of lash adjuster.
   Outer diameter:
   16.980 - 16.993 mm (0.6685 - 0.6690 in)
3. Check lash adjuster guide inner diameter.
   Inner diameter:
   17.000 - 17.020 mm (0.6693 - 0.6701 in)
   Standard clearance between lash adjuster and
   adjuster guide:
   0.007 - 0.040 mm (0.0003 - 0.0016 in)
CYLINDER HEAD

Inspection (Cont’d)

ROCKER ARM, SHIM AND ROCKER ARM GUIDE
Check contact and sliding surfaces of rocker arms, shims and rocker arm guides for wear or scratches.

Assembly
1. Install valve component parts.
   • Install valves, noting their identification marks as indicated in the table below.

<table>
<thead>
<tr>
<th>Valve</th>
<th>Identification mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intake valve</td>
<td>53J</td>
</tr>
<tr>
<td>Exhaust valve</td>
<td>5J</td>
</tr>
</tbody>
</table>

• Always use new valve oil seal. Refer to OIL SEAL REPLACEMENT.
• Before installing valve oil seal, install valve spring seat.
• Install valve spring (uneven pitch type) with its narrow pitched side toward cylinder head side (paint mark).
• After installing valve components, tap valve stem tip with a plastic hammer to assure a proper fit.

2. Check hydraulic lash adjusters.
   a. Push on the rocker arm above the hydraulic lash adjuster. If it moves 1 mm (0.04 in) or more, there is air in the high pressure chamber. Noise will be emitted from hydraulic lash adjuster if engine is started without bleeding air.

   b. Remove hydraulic lash adjuster and dip in a container filled with engine oil. While pushing plunger as shown in figure, lightly push check ball using a thin rod. Air is completely bled when plunger no longer moves. Air cannot be bled from this type of lash adjuster by running the engine.

EM-46
CYLINDER HEAD

Assembly (Cont’d)

3. Install rocker arms, shims, rocker arm guides and hydraulic lash adjusters.

CAUTION:
Install all parts in their original positions.

Valve shim clearance adjustment

4. Determine proper shim size when replacing valve, cylinder head, shim, rocker arm guide, or valve seat.
   a. Install valve component parts to cylinder head (Except shim).
      • Always replace rocker arm guide with a new one.

b. Remove hydraulic lash adjuster.

c. Install Tool* into hydraulic lash adjuster fixing hole.
   * Tool (KV10115700) is screwed into magnetic stand rod used with dial gauge.

d. Before measuring, make sure the following parts are installed in the cylinder head: valve, valve spring, collet, retainer, and rocker arm guide (except shim). On shim side, measure difference ($T_1$) between contact surfaces of rocker arm guide and valve stem end.
When measuring, lightly pull dial indicator rod toward you to eliminate play in Tool (KV10115700).
e. Select proper shim.
   Shim thickness (T): \( T \pm 0.025 \text{ mm (0.0010 in)} \)
   - Shims are available in thicknesses from 2.800 mm (0.1102 in) to 3.200 mm (0.1260 in) in steps of 0.025 mm (0.0010 in).

5. Install water outlet.
   (1) Before installing water outlet, remove all traces of liquid gasket from mating surface using a scraper.
   - Also remove traces of liquid gasket from mating surface of cylinder head.
   (2) Apply a continuous bead of liquid gasket to mating surface of water outlet.
   - Use Genuine Liquid Gasket or equivalent.

6. Install intake manifold.
   Refer to "Installation" in "INTAKE MANIFOLD" (EM-36).
Removal
1. Drain coolant from radiator and cylinder block.
2. Remove engine under cover.
3. Remove front exhaust tube.
4. Remove air ducts for turbocharger unit.
5. Remove air cleaner case.
6. Remove wastegate valve control solenoid and its hoses.
7. Remove exhaust manifold cover.
8. Remove heat insulator.
9. Remove heated oxygen sensor.
10. Remove EGR tube.
11. Remove connector bolts for water inlet and return tubes and oil inlet tube.
12. Remove oil return hose from cylinder block.
13. Remove exhaust manifold fixing nuts.
TURBOCHARGER

Removal (Cont'd)

14. Remove steering column shaft lower joint (LHD model only).
15. Remove exhaust manifold with turbocharger unit.

Disassembly

1. Remove oil tubes and water tubes. Before removing tubes, put mating marks on tube connectors and turbocharger.

2. Unbend locking plates for turbocharger unit fastening nuts.

3. Remove exhaust manifold.

4. Remove exhaust outlet, air outlet and heat insulator brackets.
**Inspection**
Perform the following checks. If NG, replace turbocharger unit.

**OIL AND WATER TUBES**
Check tubes for clogging.

**ROTOR SHAFT**
1. Check rotor shaft for smooth rotation.
TURBOCHARGER

Inspection (Cont’d)

2. Check rotor shaft for carbon deposits.

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

4. Measure rotor shaft end play.
   End play:
   Standard
   0.013 - 0.097 mm (0.0005 - 0.0038 in)
   • Do not allow wheels to turn when axial play is being measured.

TURBINE WHEEL
Check turbine wheel for the following.
• Oil
• Carbon deposits
• Deformed fins
• Contact with turbine housing

COMPRESSOR WHEEL
Check compressor wheel for the following.
• Oil
• Deformed fins
• Contact with compressor housing

EM-52
TURBOCHARGER

Inspection (Cont’d)

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

WASTEGATE VALVE ACTUATOR
Apply compressed air to wastegate valve actuator and check it for smooth movement.
- Do not applying compressed air to the actuator continuously.
- The air pressure should be in the range of 38.7 to 44.0 kPa (387 to 440 mbar, 290 to 330 mmHg, 11.42 to 12.99 inHg).

Assembly
Assembly is the reverse order of disassembly.
- Install gasket between exhaust manifold and turbocharger with lappet side facing exhaust manifold.
- Bend locking plates along the side of turbocharger fastening nuts.

Installation
1. Install exhaust manifold fixing nuts.
TURBOCHARGER

Installation (Cont’d)

2. Installation is the reverse order of removal.
   - Install oil tubes and water tubes in the following order, aligning the mating marks.
     a. Oil feed tube
     b. Water return tube
     c. Water feed tube
     d. Oil return tube
ENGINE REMOVAL

WARNING:
- Situate vehicle on a flat and solid surface.
- Place chocks at front and back of rear wheels.
- 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.
- For safety during subsequent steps, the tension of wires should be slackened against the engine.
- Before disconnecting fuel hose, release fuel pressure from fuel line.
  Refer to “Releasing Fuel Pressure” in EC section.
- Be sure to hoist engine and transmission in a safe manner.
- For engines not equipped with engine slingers, attach proper slingers and bolts described in PARTS CATALOG.

CAUTION:
- When lifting engine, be sure to clear surrounding parts. Take special care for accelerator wire casing, brake lines and brake master cylinder.
- In hoisting the engine, always use engine slingers in a safe manner.

Removal
1. Remove transmission.
Refer to AT or MT section.
2. Remove engine under cover and hood.
3. Drain coolant from both cylinder block drain plug, and radiator drain cock.
4. Drain engine oil from drain plug of oil pan.
5. Remove vacuum hoses, fuel tubes, wires, harness and connectors and so on.
6. Remove front exhaust tubes.
7. Remove radiator and shroud.
8. Remove drive belts.
9. Remove A/C compressor and power steering oil pump from engine.
10. Install engine slingers to cylinder head.
11. Set a suitable hoist on engine slinger.
12. Remove engine mounting bolts from both sides and then slowly raise engine.

13. Remove engine as shown.

Installation
Installation is in the reverse order of removal.

EM-56
1. Rear oil seal retainer
2. Cylinder block
3. Water pump
4. Front cover with oil pump
5. Oil strainer
6. Thrust bearing
7. Crankshaft
8. Connecting rod bushing
9. Piston rings
10. Piston
11. Piston pin
12. Connecting rod
13. Connecting rod bearing
14. Baffle plate
15. Main bearing beam
16. Main bearing cap
17. Pilot converter
18. Drive plate
19. Reinforcement plate
20. Flywheel
21. Pilot bushing
22. Rear plate
23. Main bearing
24. Oil jet
25. Baffle plate

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

Refer to “Assembly”.

6.4 - 7.5 (0.65 - 0.76, 4.7 - 5.5)

83 - 93
(8.5 - 9.5, 61 - 69)

A/T model

Refer to “Assembly”. 
CAUTION:
- When installing bearings, pistons, or other sliding parts, lubricate contacting surfaces with new engine oil.
- Place removed parts such as bearings and bearing caps in their proper order and direction.
- When installing connecting rod nuts, and main bearing cap bolts, apply new engine oil to threads and seating surfaces.

Disassembly

PISTON AND CRANKSHAFT

1. Remove engine.
   Refer to "ENGINE REMOVAL" (EM-55).
2. Remove compressor bracket and engine mounting bracket, then install engine on engine stand (ST0501S000).
3. Remove cylinder head.
   Refer to "Removal" in "TIMING CHAIN" (EM-20).
4. Remove oil pan.
   Refer to "Removal" in "OIL PAN" (EM-13).
5. Remove timing chain.
   Refer to "Removal" in "TIMING CHAIN" (EM-20).
6. Remove pistons with connecting rods.
   - When disassembling piston and connecting rod, remove snap ring first. Then heat piston to 60 to 70°C (140 to 158°F), or use piston pin press stand at room temperature.
7. Remove rear oil seal retainer.
8. Remove bearing beam, bearing cap and crankshaft.
   - Before removing bearing cap, measure crankshaft end play.
   - Bolts should be loosened in two or three steps.
**CYLINDER BLOCK**

**Disassembly (Cont’d)**

9. Remove baffle plate.
10. Remove oil jets.

---

**Inspection**

**PISTON AND PISTON PIN CLEARANCE**

1. Measure inner diameter of piston pin hole “dp”.
   
   Standard diameter “dp”:
   
   $21.987 \text{ - } 21.999 \text{ mm (0.8656 - 0.8661 in)}$

2. Measure outer diameter of piston pin “Dp”.
   
   Standard diameter “Dp”:
   
   $21.989 \text{ - } 22.001 \text{ mm (0.8657 - 0.8662 in)}$

3. Calculate piston pin clearance.
   
   $\text{dp} - \text{Dp} = -0.004 \text{ to } 0 \text{ mm (-0.0002 to 0 in)}$
   
   If it exceeds the above value, replace piston assembly with pin.

---

**PISTON RING SIDE CLEARANCE**

**Side clearance:**

- **Top ring**
  
  $0.045 \text{ - } 0.080 \text{ mm (0.0018 - 0.0031 in)}$

- **2nd ring**
  
  $0.030 \text{ - } 0.065 \text{ mm (0.0012 - 0.0026 in)}$

**Max. limit of side clearance:**

$0.1 \text{ mm (0.004 in)}$

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

---

EM-59
CYLINDER BLOCK

Inspection (Cont’d)

PISTON RING END GAP

Top ring:
  Standard
  0.20 - 0.30 mm (0.0079 - 0.0118 in)
  Limit
  0.39 mm (0.0154 in)

2nd ring:
  Standard
  0.35 - 0.50 mm (0.0138 - 0.0197 in)
  Limit
  0.59 mm (0.0232 in)

Oil ring:
  Standard
  0.20 - 0.60 mm (0.0079 - 0.0236 in)
  Limit
  0.60 mm (0.0272 in)

If out of specification, replace piston ring. If gap exceeds maximum limit with new ring, rebore cylinder and use oversize piston and piston rings.

Refer to SDS (EM-78).

CONNECTING ROD BEND AND TORSION

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

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

If it exceeds the limit, replace connecting rod assembly.
CYLINDER BLOCK

Inspection (Cont’d)

CYLINDER BLOCK DISTORTION AND WEAR
1. Clean upper face of cylinder block and measure the distortion in the directions as shown.
   - **Standard:**
     - Less than 0.03 mm (0.0012 in)
   - **Limit:**
     - 0.10 mm (0.0039 in)
2. If out of specification, resurface it.
   - The resurfacing limit is determined by cylinder head resurfacing in engine.
   - **Amount of cylinder head resurfacing is “A”**.
   - **Amount of cylinder block resurfacing is “B”**.
   - **The maximum limit is as follows:**
     \[ A + B = 0.2 \text{ mm (0.008 in)} \]
   - Nominal cylinder block height from crankshaft center:
     - 211.25 - 211.35 mm (8.3169 - 8.3208 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:**
     - 86.000 - 86.030 mm (3.3858 - 3.3870 in)
   - **Wear limit:**
     - 0.20 mm (0.0079 in)
   - If it exceeds the limit, rebore all cylinders. Replace cylinder block if necessary.
   - **Out-of-round (X – Y) standard:**
     - 0.015 mm (0.0006 in)
   - **Taper (A – B and A – C) standard:**
     - 0.010 mm (0.0004 in)

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

**Inspection (Cont’d)**

- If cylinder block or piston is replaced, match piston grade with grade number on cylinder block upper surface.

3. Measure piston skirt diameter.
   **Piston diameter “A”:**
   - Refer to SDS (EM-78).
   - Measuring point “a” (Distance from the bottom):
     10.5 mm (0.413 in)

4. Check that piston-to-bore clearance is within specification.
   **Piston-to-bore clearance “B”:**
   0.010 - 0.030 mm (0.0004 - 0.0012 in)

5. Determine piston oversize according to amount of cylinder wear.
   **Oversize pistons are available for service. Refer to SDS (EM-78).**

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 bolts to the specified torque. This will prevent distortion of cylinder bores.

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.

<table>
<thead>
<tr>
<th>Out-of-round (X – Y) and Taper (A – B)</th>
<th>Main journal</th>
<th>Pin journal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit: mm (in)</td>
<td>Less than 0.005 (0.0002)</td>
<td>Less than 0.0025 (0.0001)</td>
</tr>
</tbody>
</table>

EM-62
CYLINDER BLOCK

Inspection (Cont'd)

3. Measure crankshaft runout.
   Runout (Total indicator reading):
   Less than 0.05 mm (0.0020 in)

BEARING CLEARANCE

- Use Method A or Method B. Method A is preferred because it is more accurate.

Method A (Using bore gauge & micrometer)

Main bearing

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

2. Install main bearing cap and main bearing beam to cylinder block.
   Tighten all bolts in specified procedure. Refer to "CRANKSHAFT" in "Cylinder Block Assembly" (EM-68).

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: 0.004 - 0.022 mm (0.0002 - 0.0009 in)
   Limit: 0.050 mm (0.0020 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 SDS for grinding crankshaft and available service parts (EM-80).
8. If crankshaft is reused, measure main bearing clearances and select thickness of main bearings. If crankshaft is replaced, select thickness of main bearings as follows:

a. Grade number of each cylinder block main journal is punched on the respective cylinder block. These numbers are punched in either Arabic or Roman numerals.

b. Grade number of each crankshaft main journal is punched on the respective crankshaft. These numbers are punched in either Arabic or Roman numerals.

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

How to select main bearings (Identification mark and color)

<table>
<thead>
<tr>
<th>Crankshaft journal grade number</th>
<th>Main journal grade number</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0 (A, Black)</td>
</tr>
<tr>
<td></td>
<td>1 (B, Brown)</td>
</tr>
<tr>
<td></td>
<td>2 (C, Green)</td>
</tr>
<tr>
<td></td>
<td>3 (D, Yellow)</td>
</tr>
<tr>
<td>1</td>
<td>1 (B, Brown)</td>
</tr>
<tr>
<td></td>
<td>2 (C, Green)</td>
</tr>
<tr>
<td></td>
<td>3 (D, Yellow)</td>
</tr>
<tr>
<td></td>
<td>4 (E, Blue)</td>
</tr>
<tr>
<td>2</td>
<td>2 (C, Green)</td>
</tr>
<tr>
<td></td>
<td>3 (D, Yellow)</td>
</tr>
<tr>
<td></td>
<td>4 (E, Blue)</td>
</tr>
<tr>
<td></td>
<td>5 (F, Pink)</td>
</tr>
<tr>
<td>3</td>
<td>3 (D, Yellow)</td>
</tr>
<tr>
<td></td>
<td>4 (E, Blue)</td>
</tr>
<tr>
<td></td>
<td>5 (F, Pink)</td>
</tr>
<tr>
<td></td>
<td>6 (G, No color)</td>
</tr>
</tbody>
</table>

For example:
Main Journal grade number: 1
Crankshaft journal grade number: 2
Main bearing grade number = 1 + 2 = 3 (D, Yellow)
Inspection (Cont'd)

Connecting rod bearing (Big end)
1. Install connecting rod bearing to connecting rod and cap.
2. Install connecting rod cap to connecting rod.
3. Measure inner diameter "C" of each bearing.
4. Measure outer diameter "Dp" of each crankshaft pin journal.
5. Calculate connecting rod bearing clearance.
   Connecting rod bearing clearance (C – Dp):
   Standard
   0.020 - 0.045 mm (0.0008 - 0.0018 in)
   Limit
   0.65 mm (0.00256 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" (EM-63).
8. If crankshaft is replaced with a new one, select connecting rod bearing according to the following table.

   **Connecting rod bearing grade number:**
   These numbers are punched in either Arabic or Roman numerals.

<table>
<thead>
<tr>
<th>Crank pin journal 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>

   **Identification colors of connecting rod bearing:**
   Grade 0; No color
   Grade 1; Black
   Grade 2; Brown
CYLINDER BLOCK

Inspection (Cont’d)

Method B (Using plastigage)

CAUTION:
- Do not turn crankshaft or connecting rod while plastigage is being inserted.
- When bearing clearance exceeds the specified limit, ensure that the proper bearing has been installed. If clearance cannot be adjusted using any standard bearing grade, grind crankshaft journal and use undersized bearing.

CONNECTING ROD BUSHING CLEARANCE (Small end)

1. Measure inner diameter “C” of bushing.

2. Measure outer diameter “Dp” of piston pin.

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

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. Ream the bushing so that clearance with piston pin is within specification.
   Clearance between connecting rod bushing and piston pin:
   0.005 - 0.017 mm (0.0002 - 0.0007 in)

REPLACEMENT OF PILOT BUSHING (M/T) OR PILOT CONVERTER (A/T)

1. Remove pilot bushing or pilot converter using Tool or suitable tool.
CYLINDER BLOCK

Inspection (Cont'd)

2. Install pilot bushing or pilot converter as shown.

FLYWHEEL/DRIVE PLATE RUNOUT

Runout (Total indicator reading):
Flywheel (M/T model)
Less than 0.15 mm (0.0059 in)
Drive plate (A/T model)
Less than 0.20 mm (0.0079 in)

Assembly

1. Install timing chain oil jet.
   Drive oil jet into cylinder block with punchmark facing up.

2. Install piston oil jets.
3. Install baffle plate.

PISTON

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

Assembly (Cont’d)

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

3. Set piston rings as shown.
   **CAUTION:**
   - When piston rings are not replaced, make sure that piston rings are mounted in their original positions.
   - When replacing piston rings, if there is no punchmark, install with either side up.

4. Locate the ring gap as shown.

CRANKSHAFT

1. Set main bearings and thrust bearings in their proper positions on cylinder block and main bearing cap.
   - Confirm that correct main bearings are used. Refer to “Inspection” of this section.
   - Direct the oil grooved side of thrust bearing to crankshaft arm side.
CYLINDER BLOCK

Assembly (Cont'd)

2. Install crankshaft, main bearing caps and beam and tighten bolts to the specified torque.
   - Prior to tightening bearing cap bolts, shift crankshaft back and forth to properly seat the bearing cap.
   - Tightening procedure
     a. Tighten all bolts to 26 to 32 N-m (2.7 to 3.3 kg-m, 20 to 24 ft-lb).
     b. Turn all bolts 75 to 80 degrees clockwise with Tool or suitable angle wrench.
     c. Loosen all bolts completely.
     d. Tighten all bolts to 32 to 38 N-m (3.3 to 3.9 kg-m, 24 to 28 ft-lb).
     e. Turn all bolts 45 to 50 degrees clockwise with Tool or suitable angle wrench.
        - If an angle wrench is not available, mark all bearing cap bolts on the side facing engine rear. Then, turn each bolt specified degrees clockwise. Confirm angle of degrees with a graduator, not by eye-measurement.
        - After securing bearing cap bolts, make sure crankshaft turns smoothly by hand.

3. Measure crankshaft end play.
   Crankshaft end play:
   - Standard
     0.10 - 0.26 mm (0.0039 - 0.0102 in)
   - Limit
     0.30 mm (0.0118 in)
   If beyond the limit, replace thrust bearings with new ones.

4. Install connecting rod bearings in connecting rods and connecting rod bearing 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 engine front.
      - Be careful not to hit oil jet with connecting rod.
CYLINDER BLOCK

Assembly (Cont’d)

b. Install connecting rod bearing caps.
   Tighten connecting rod bearing cap nuts in the following two steps.

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

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

   • After securing connecting rod cap nuts, make sure crankshaft turns smoothly by hand.

6. Measure connecting rod side clearance.
   Connecting rod side clearance:
   Standard
   0.20 - 0.35 mm (0.0079 - 0.0138 in)
   Limit
   0.50 mm (0.0197 in)
   If beyond the limit, replace connecting rod and/or crankshaft.

7. Install baffle plate.

8. Install rear oil seal retainer.
   (1) Before installing rear oil seal retainer, 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) Install rear oil seal. Refer to "REAR OIL SEAL" in "Oil Seal
     Replacement" (EM-34).
CYLINDER BLOCK

Assembly (Cont'd)

(3) Apply a continuous bead of liquid gasket to mating surface of rear oil seal retainer.
- Use Genuine Liquid Gasket or equivalent.
## General Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cylinder arrangement</td>
<td>In-line 4</td>
</tr>
<tr>
<td>Displacement</td>
<td>1,968 (121.92) cm³ (cu in)</td>
</tr>
<tr>
<td>Bore and stroke</td>
<td>86 x 86 (3.39 x 3.39) mm (in)</td>
</tr>
<tr>
<td>Valve arrangement</td>
<td>DOHC</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>8.5</td>
</tr>
</tbody>
</table>

## COMPRESSION PRESSURE

<table>
<thead>
<tr>
<th>Category</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>1,079 (10.79, 11.0, 159) kPa (bar, kg/cm², psi)</td>
</tr>
<tr>
<td>Minimum</td>
<td>883 (8.83, 9.0, 126) kPa (bar, kg/cm², psi)</td>
</tr>
<tr>
<td>Differential limit</td>
<td>98 (0.98, 1.0, 14) kPa (bar, kg/cm², psi)</td>
</tr>
</tbody>
</table>

Unit: kPa (bar, kg/cm², psi) / 300 rpm
**SERVICE DATA AND SPECIFICATIONS (SDS)**

**Inspection and Adjustment**

**CYLINDER HEAD**

<table>
<thead>
<tr>
<th>Standard</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head surface distortion</td>
<td>Less than 0.03 (0.0012)</td>
</tr>
</tbody>
</table>

**VALVE**

**Unit: mm (in)**

<table>
<thead>
<tr>
<th>Valve head diameter &quot;D&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intake</td>
</tr>
<tr>
<td>Exhaust</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Valve length &quot;L&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intake</td>
</tr>
<tr>
<td>Exhaust</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Valve stem diameter &quot;d&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intake</td>
</tr>
<tr>
<td>Exhaust</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Valve seal angle &quot;α&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intake</td>
</tr>
<tr>
<td>Exhaust</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Valve margin &quot;T&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intake</td>
</tr>
<tr>
<td>Exhaust</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Valve margin &quot;T&quot; limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>More than 0.5 (0.020)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Valve stem end surface grinding limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 0.2 (0.008)</td>
</tr>
</tbody>
</table>

**Nominal cylinder head height "H"** | 136.9 - 137.1 (5.390 - 5.398) |

| Resurfacing limit | 0.2 (0.008)* |

* Sum of resurfacing cylinder head and cylinder block
## Valve spring

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Free height (mm in)</td>
<td>49.36 (1.9433)</td>
</tr>
<tr>
<td>Pressure N (kg, lb) at height (mm in)</td>
<td>578.02 - 641.57</td>
</tr>
<tr>
<td></td>
<td>(56.94 - 65.42, 129.96 - 144.25)</td>
</tr>
<tr>
<td></td>
<td>at 30.0 (1.181)</td>
</tr>
<tr>
<td>Limit</td>
<td>549.2 (56.0, 123.5)</td>
</tr>
<tr>
<td></td>
<td>at 30.0 (1.181)</td>
</tr>
<tr>
<td>Out-of-square (mm in)</td>
<td>Less than 2.2 (0.087)</td>
</tr>
</tbody>
</table>

## Hydraulic lash adjuster (HLA)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>HLA outer diameter</td>
<td>16.990 - 16.993 (0.6665 - 0.6690)</td>
</tr>
<tr>
<td>HLA guide inner diameter</td>
<td>17.000 - 17.020 (0.6693 - 0.6701)</td>
</tr>
<tr>
<td>Clearance between HLA and HLA guide</td>
<td>0.007 - 0.040 (0.0003 - 0.0016)</td>
</tr>
</tbody>
</table>

## Valve guide

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Standard</th>
<th>Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valve guide</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outer diameter</td>
<td>Intake</td>
<td>Exhaust</td>
</tr>
<tr>
<td></td>
<td>10.023 - 10.034 (0.3945 - 0.3950)</td>
<td>11.023 - 11.034 (0.4340 - 0.4344)</td>
</tr>
<tr>
<td></td>
<td>10.223 - 10.234 (0.4025 - 0.4029)</td>
<td>11.223 - 11.234 (0.4418 - 0.4423)</td>
</tr>
<tr>
<td>Valve guide</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inner diameter</td>
<td>Intake</td>
<td>Exhaust</td>
</tr>
<tr>
<td><em>(Finished size)</em></td>
<td>6.000 - 6.018 (0.2362 - 0.2369)</td>
<td>7.000 - 7.018 (0.2756 - 0.2763)</td>
</tr>
<tr>
<td>Cylinder head valve guide</td>
<td>Intake</td>
<td>Exhaust</td>
</tr>
<tr>
<td>Hole diameter</td>
<td>9.975 - 9.996 (0.3927 - 0.3935)</td>
<td>10.975 - 10.996 (0.4321 - 0.4329)</td>
</tr>
<tr>
<td></td>
<td>10.175 - 10.196 (0.4006 - 0.4014)</td>
<td>11.175 - 11.196 (0.4400 - 0.4408)</td>
</tr>
<tr>
<td>Interference fit of valve guide</td>
<td>0.027 - 0.059 (0.0011 - 0.0023)</td>
<td></td>
</tr>
<tr>
<td>Stem to guide clearance</td>
<td>Intake</td>
<td>Exhaust</td>
</tr>
<tr>
<td>Standard</td>
<td>0.020 - 0.053 (0.0008 - 0.0021)</td>
<td>0.040 - 0.073 (0.0016 - 0.0029)</td>
</tr>
<tr>
<td>Limit</td>
<td>0.08 (0.0031)</td>
<td>0.1 (0.004)</td>
</tr>
<tr>
<td>Valve deflection limit</td>
<td>0.2 (0.008)</td>
<td></td>
</tr>
<tr>
<td>Projection length <em>“L”</em></td>
<td>14.0 - 14.2 (0.551 - 0.559)</td>
<td></td>
</tr>
</tbody>
</table>
### Valve seat

**Cylinder head**

**INTAKE**

- **H**
- **D**

**EXHAUST**

- **H**
- **D**

**Standard**

- **h**: 29.35 - 29.65 (1.1555 - 1.1673)
- **44°53' - 45°07'**
- **d**: 33.6 - 33.8 (1.323 - 1.301)

- **Contacting width (W)**: 1.4 - 1.7 (0.055 - 0.067)

**Oversize**

- **h**: 31.4 - 31.6 (1.236 - 1.244)
- **44°53' - 45°07'**
- **d**: 33.6 - 33.8 (1.323 - 1.301)

- **Contacting width (W)**: 1.4 - 1.7 (0.055 - 0.067)

---

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Standard</th>
<th>Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cylinder head seat recess diameter (D) (In)</td>
<td>35.000 - 35.016 (1.3780 - 1.3786)</td>
<td>35.500 - 35.516 (1.3976 - 1.3983)</td>
</tr>
<tr>
<td></td>
<td>31.000 - 31.016 (1.2205 - 1.2211)</td>
<td>31.500 - 31.516 (1.2402 - 1.2408)</td>
</tr>
<tr>
<td>Valve seat interference fit (In)</td>
<td>0.064 - 0.096 (0.0255 - 0.0035)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.064 - 0.096 (0.0255 - 0.0038)</td>
<td></td>
</tr>
<tr>
<td>Valve seat outer diameter (d) (In)</td>
<td>35.080 - 35.096 (1.3811 - 1.3817)</td>
<td>35.580 - 35.596 (1.4006 - 1.4014)</td>
</tr>
<tr>
<td></td>
<td>31.080 - 31.096 (1.2226 - 1.2242)</td>
<td>31.580 - 31.596 (1.2433 - 1.2439)</td>
</tr>
<tr>
<td>Depth (H) (In)</td>
<td>6.25 (0.2461)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6.25 (0.2461)</td>
<td></td>
</tr>
<tr>
<td>Height (h)</td>
<td>6.2 - 6.3 (0.244 - 0.248)</td>
<td>5.4 - 5.5 (0.213 - 0.217)</td>
</tr>
</tbody>
</table>

---

**EM-75**
## Valve shim clearance adjustment

<table>
<thead>
<tr>
<th>Valve shim clearance (Cold)</th>
<th>Shim thickness 'T'</th>
<th>Unit: mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Less than 0.025 (0.001)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Shim thickness 'T'</th>
<th>0.025 (0.001)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Shim thickness 'T'</td>
<td>2.800 (0.1102)</td>
<td>28</td>
</tr>
<tr>
<td>Shim thickness 'T'</td>
<td>2.825 (0.1112)</td>
<td>28</td>
</tr>
<tr>
<td>Shim thickness 'T'</td>
<td>2.850 (0.1122)</td>
<td>28</td>
</tr>
<tr>
<td>Shim thickness 'T'</td>
<td>2.875 (0.1132)</td>
<td>28</td>
</tr>
<tr>
<td>Shim thickness 'T'</td>
<td>2.900 (0.1142)</td>
<td>29</td>
</tr>
<tr>
<td>Shim thickness 'T'</td>
<td>2.925 (0.1152)</td>
<td>29</td>
</tr>
<tr>
<td>Shim thickness 'T'</td>
<td>2.950 (0.1161)</td>
<td>29</td>
</tr>
<tr>
<td>Shim thickness 'T'</td>
<td>2.975 (0.1171)</td>
<td>29</td>
</tr>
<tr>
<td>Shim thickness 'T'</td>
<td>3.000 (0.1181)</td>
<td>30</td>
</tr>
<tr>
<td>Shim thickness 'T'</td>
<td>3.025 (0.1191)</td>
<td>30</td>
</tr>
<tr>
<td>Shim thickness 'T'</td>
<td>3.050 (0.1201)</td>
<td>30</td>
</tr>
<tr>
<td>Shim thickness 'T'</td>
<td>3.075 (0.1211)</td>
<td>30</td>
</tr>
<tr>
<td>Shim thickness 'T'</td>
<td>3.100 (0.1220)</td>
<td>31</td>
</tr>
<tr>
<td>Shim thickness 'T'</td>
<td>3.125 (0.1230)</td>
<td>31</td>
</tr>
<tr>
<td>Shim thickness 'T'</td>
<td>3.150 (0.1240)</td>
<td>31</td>
</tr>
<tr>
<td>Shim thickness 'T'</td>
<td>3.175 (0.1250)</td>
<td>31</td>
</tr>
<tr>
<td>Shim thickness 'T'</td>
<td>3.200 (0.1260)</td>
<td>32</td>
</tr>
</tbody>
</table>
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**Inspection and Adjustment (Cont'd)**

#### CAMSHAFT AND CAMSHAFT BEARING

<table>
<thead>
<tr>
<th>Description</th>
<th>Standard</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Camshaft journal to bearing clearance</td>
<td>0.045 - 0.066</td>
<td>0.15 (0.0059)</td>
</tr>
<tr>
<td></td>
<td>(0.0018 - 0.0034)</td>
<td></td>
</tr>
<tr>
<td>Inner diameter of camshaft bearing</td>
<td>28.000 - 28.021</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1.1024 - 1.1032)</td>
<td></td>
</tr>
<tr>
<td>Outer diameter of camshaft journal</td>
<td>27.935 - 27.955</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1.0938 - 1.1006)</td>
<td></td>
</tr>
<tr>
<td>Camshaft runout [TIR']</td>
<td>Less than 0.02 (0.0008)</td>
<td>0.1 (0.004)</td>
</tr>
<tr>
<td>Camshaft sprocket runout [TIR']</td>
<td>Less than 0.25 (0.0098)</td>
<td></td>
</tr>
<tr>
<td>Camshaft end play</td>
<td>0.092 - 0.173 (0.0036 - 0.0068)</td>
<td>0.20 (0.0079)</td>
</tr>
</tbody>
</table>

---

**Valve timing (VTC solenoid valve OFF)**

![Diagram showing valve timing](diagram.png)

<table>
<thead>
<tr>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>e</th>
<th>f</th>
</tr>
</thead>
<tbody>
<tr>
<td>240°</td>
<td>240°</td>
<td>-6°</td>
<td>66°</td>
<td>7°</td>
<td>53°</td>
</tr>
</tbody>
</table>

---

**Cam height “A”**

- Intake: 37.920 - 38.110 (1.4929 - 1.5004)
- Exhaust: 37.920 - 38.110 (1.4929 - 1.5004)

**Wear limit of cam height**

|                | 0.2 (0.008) |

**Valve lift**

- Intake: 9.2 (0.362)
- Exhaust: 9.2 (0.362)

---

*Total indicator reading*

---

EM-77
### CYLINDER BLOCK

#### Unit: mm (in)

![Diagram of cylinder block](image1).

### PISTON, PISTON RING AND PISTON PIN

#### Available piston

![Diagram of piston](image2).

<table>
<thead>
<tr>
<th>Piston skirt diameter “A”</th>
<th>85.980 - 85.990 (3.3850 - 3.3854)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade No. 1</td>
<td>85.990 - 85.000 (3.3854 - 3.3858)</td>
</tr>
<tr>
<td>Grade No. 2</td>
<td>86.000 - 86.010 (3.3858 - 3.3862)</td>
</tr>
<tr>
<td>Grade No. 3</td>
<td>86.010 - 86.020 (3.3862 - 3.3866)</td>
</tr>
<tr>
<td></td>
<td>86.020 - 86.030 (3.3866 - 3.3870)</td>
</tr>
<tr>
<td>0.20 (0.0079) over-size</td>
<td>86.180 - 86.210 (3.3929 - 3.3941)</td>
</tr>
</tbody>
</table>

### Surface flatness

<table>
<thead>
<tr>
<th>Standard</th>
<th>Less than 0.03 (0.0012)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limit</td>
<td>0.10 (0.0039)</td>
</tr>
</tbody>
</table>

### Cylinder bore

#### Inner diameter

<table>
<thead>
<tr>
<th>Standard</th>
<th>86.000 - 86.010 (3.3856 - 3.3862)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade No. 1</td>
<td>86.010 - 86.020 (3.3862 - 3.3866)</td>
</tr>
<tr>
<td>Grade No. 3</td>
<td>86.020 - 86.030 (3.3866 - 3.3870)</td>
</tr>
<tr>
<td>Wear limit</td>
<td>0.20 (0.0079)</td>
</tr>
<tr>
<td>Out-of-round (X - Y)</td>
<td>Less than 0.015 (0.0006)</td>
</tr>
<tr>
<td>Taper (A - B and A - C)</td>
<td>Less than 0.010 (0.0004)</td>
</tr>
</tbody>
</table>

### Difference in inner diameter between cylinders

| Limit             | Less than 0.05 (0.0020) |

### Main journal inner diameter

| Grade No. 0       | 58.944 - 58.950 (2.3206 - 2.3209) |
| Grade No. 1       | 58.950 - 58.956 (2.3209 - 2.3211) |
| Grade No. 2       | 58.956 - 58.962 (2.3211 - 2.3213) |
| Grade No. 3       | 58.962 - 58.968 (2.3213 - 2.3218) |

Piston pin hole diameter 21.987 - 21.999 (0.8656 - 0.8661)
### Piston Ring

<table>
<thead>
<tr>
<th>Side clearance</th>
<th>Top</th>
<th>Unit: mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>0.045 - 0.080 (0.0018 - 0.0031)</td>
<td></td>
</tr>
<tr>
<td>Limit</td>
<td>0.1 (0.004)</td>
<td></td>
</tr>
</tbody>
</table>

| 2nd            | Standard | 0.030 - 0.055 (0.0012 - 0.0026) |        |
|                | Limit    | 0.1 (0.004) |        |

<table>
<thead>
<tr>
<th>End gap</th>
<th>Top</th>
<th>Unit: mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>0.20 - 0.30 (0.0079 - 0.0118)</td>
<td></td>
</tr>
<tr>
<td>Limit</td>
<td>0.39 (0.0154)</td>
<td></td>
</tr>
</tbody>
</table>

| Standard       | 0.35 - 0.50 (0.0138 - 0.0197) |        |
| Limit          | 0.59 (0.0232) |        |

| Oil            | Standard | 0.20 - 0.60 (0.0079 - 0.0236) |
|                | Limit    | 0.69 (0.0272) |

*After installing in connecting rod

### Piston Pin

<table>
<thead>
<tr>
<th>Piston pin outer diameter</th>
<th>Unit: mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>21.989 - 22.001 (0.8657 - 0.8662)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Interference fit of piston pin to piston</th>
<th>Unit: mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 0.004 (0 - 0.0002)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Piston pin to connecting rod bushing clearance</th>
<th>Unit: mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>0.005 - 0.017 (0.0002 - 0.0007)</td>
</tr>
<tr>
<td>Limit</td>
<td>0.023 (0.0009)</td>
</tr>
</tbody>
</table>

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

**Main journal dia. "Dm"**

- Grade No. 0: 54.974 - 54.990 (2.1643 - 2.1646)
- Grade No. 1: 54.968 - 54.974 (2.1641 - 2.1643)
- Grade No. 2: 54.962 - 54.968 (2.1640 - 2.1641)
- Grade No. 3: 54.956 - 54.962 (2.1636 - 2.1639)

**Pin journal dia. "Dp"**

- Grade No. 0: 47.968 - 47.974 (1.8885 - 1.8887)
- Grade No. 1: 47.962 - 47.968 (1.8883 - 1.8885)
- Grade No. 2: 47.956 - 47.962 (1.8880 - 1.8883)

**Center distance "r"**

42.96 - 43.04 (1.6913 - 1.6945)

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

Standard
- Main journal: Less than 0.005 (0.0002)
- Pin journal: Less than 0.0025 (0.0001)

**Taper (A - B)**

Standard
- Main journal: Less than 0.005 (0.0002)
- Pin journal: Less than 0.0025 (0.0001)

**Runout [TIR]**

- Standard: Less than 0.025 (0.0010)
- Limit: Less than 0.05 (0.0020)

### Main bearing (Standard)

<table>
<thead>
<tr>
<th>Grade number</th>
<th>Thickness &quot;T&quot;</th>
<th>Width &quot;W&quot;</th>
<th>Identification color (mark)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1.977 - 1.980 (0.0778 - 0.0780)</td>
<td></td>
<td>Black (A)</td>
</tr>
<tr>
<td>1</td>
<td>1.981 - 1.983 (0.0780 - 0.0781)</td>
<td></td>
<td>Brown (B)</td>
</tr>
<tr>
<td>2</td>
<td>1.983 - 1.986 (0.0781 - 0.0782)</td>
<td>18.9 - 19.1 (0.744 - 0.752)</td>
<td>Green (C)</td>
</tr>
<tr>
<td>3</td>
<td>1.986 - 1.989 (0.0782 - 0.0783)</td>
<td></td>
<td>Yellow (D)</td>
</tr>
<tr>
<td>4</td>
<td>1.989 - 1.992 (0.0783 - 0.0784)</td>
<td></td>
<td>Blue (E)</td>
</tr>
<tr>
<td>5</td>
<td>1.992 - 1.995 (0.0784 - 0.0785)</td>
<td></td>
<td>Pink (F)</td>
</tr>
<tr>
<td>6</td>
<td>1.995 - 1.998 (0.0785 - 0.0787)</td>
<td></td>
<td>No color (G)</td>
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</tbody>
</table>

### Main bearing (Undersize)

<table>
<thead>
<tr>
<th>Undersize</th>
<th>Thickness &quot;T&quot;</th>
<th>Main journal diameter &quot;Dm&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.25 (0.0098)</td>
<td>2.109 - 2.117 (0.0830 - 0.0833)</td>
<td>Grind so that bearing clearance is the specified value.</td>
</tr>
</tbody>
</table>
## SERVICE DATA AND SPECIFICATIONS (SDS)

### Inspection and Adjustment (Cont’d)

## AVAILABLE CONNECTING ROD BEARING

### Connecting rod bearing

#### Standard size

<table>
<thead>
<tr>
<th>Grade number</th>
<th>Thickness &quot;T&quot;</th>
<th>Width &quot;W&quot;</th>
<th>Identification color (mark)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1.500 - 1.503 (0.0591 - 0.0592)</td>
<td></td>
<td>No color (A)</td>
</tr>
<tr>
<td>1</td>
<td>1.503 - 1.506 (0.0592 - 0.0593)</td>
<td>16.9 - 17.1 (0.665 - 0.673)</td>
<td>Black (B)</td>
</tr>
<tr>
<td>2</td>
<td>1.506 - 1.509 (0.0593 - 0.0594)</td>
<td></td>
<td>Brown (C)</td>
</tr>
</tbody>
</table>

#### Undersize

<table>
<thead>
<tr>
<th>Undersize</th>
<th>Thickness &quot;T&quot;</th>
<th>Crank pin journal diameter &quot;Dp&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.08 (0.0031)</td>
<td>1.541 - 1.549 (0.0607 - 0.0610)</td>
<td>Grind so that bearing clearance is the specified value.</td>
</tr>
<tr>
<td>0.12 (0.0047)</td>
<td>1.561 - 1.569 (0.0615 - 0.0618)</td>
<td></td>
</tr>
<tr>
<td>0.25 (0.0098)</td>
<td>1.626 - 1.634 (0.0640 - 0.0643)</td>
<td></td>
</tr>
</tbody>
</table>

### MISCELLANEOUS COMPONENTS

<table>
<thead>
<tr>
<th>Component</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Camshaft sprocket runout limit [TIR]</td>
<td>0.25 (0.0096)</td>
</tr>
<tr>
<td>Flywheel runout limit [TIR]</td>
<td>0.15 (0.0059)</td>
</tr>
</tbody>
</table>

## Bearing clearance

### Main bearing clearance

<table>
<thead>
<tr>
<th>Standard</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.004 - 0.022 (0.0002 - 0.0009)</td>
<td>0.05 (0.0020)</td>
</tr>
</tbody>
</table>

### Connecting rod bearing clearance

<table>
<thead>
<tr>
<th>Standard</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.020 - 0.045 (0.0008 - 0.0018)</td>
<td>0.65 (0.0256)</td>
</tr>
</tbody>
</table>

---

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Precaution

LIQUID GASKET APPLICATION PROCEDURE

a. Use a scraper to remove all traces of old liquid gasket from mating surfaces and grooves. Also, completely clean any oil from these areas.

b. Apply a continuous bead of liquid gasket to mating surfaces. (Use Genuine Liquid Gasket or equivalent.)
   - Be sure liquid gasket is 4.0 to 5.0 mm (0.157 to 0.197 in) wide (for oil pan).
   - Be sure liquid gasket is 2.0 to 3.0 mm (0.079 to 0.118 in) wide (in areas except oil pan).

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

d. Wait at least 30 minutes before refilling engine oil and engine coolant.

Special Service Tools

<table>
<thead>
<tr>
<th>Tool number</th>
<th>Tool name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST25051001</td>
<td>Oil pressure gauge</td>
<td></td>
</tr>
<tr>
<td>ST25052000</td>
<td>Hose</td>
<td>Adapting oil pressure gauge to cylinder block</td>
</tr>
<tr>
<td>KV10115801</td>
<td>Oil filter wrench</td>
<td>Removing oil filter</td>
</tr>
<tr>
<td>EG17650301</td>
<td>Radiator cap tester adapter</td>
<td>Adapting radiator cap tester to radiator filler neck</td>
</tr>
<tr>
<td>Tool number</td>
<td>Tool name</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>WS399300000</td>
<td>Tube presser</td>
<td>Pressing the tube of liquid gasket</td>
</tr>
<tr>
<td>KV99103510</td>
<td>Radiator plate pliers A</td>
<td>Installing radiator upper and lower tanks</td>
</tr>
<tr>
<td>KV99103520</td>
<td>Radiator plate pliers B</td>
<td>Removing radiator upper and lower tanks</td>
</tr>
</tbody>
</table>

LC-3
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 position”.
  1. Check oil level.
  2. Remove oil pressure switch.
ENGINE LUBRICATION SYSTEM

Oil Pressure Check (Cont’d)
3. Install pressure gauge.
4. Start engine and warm it up to normal operating temperature.
5. Check oil pressure with engine running under no-load.
   Approximate discharge pressure: kPa (bar, kg/cm², psi)
   Engine speed at idle
   More than 78 (0.78, 0.8, 11)
   Engine speed at 3,200 rpm
   314 - 392 (3.14 - 3.92, 3.2 - 4.0, 46 - 57)
If difference is extreme, check oil passage and oil pump for oil leaks.
6. Install oil pressure switch with sealant.

Oil Pump

REMOVAL
1. Remove front cover.
   Refer to “TIMING CHAIN” in EM section.
2. Remove oil pump cover.

DISASSEMBLY AND ASSEMBLY

SEC. 135-150

- Always replace oil seals and gaskets with new ones.
- When installing oil pump, apply engine oil to inner and outer gears.

LC-5
ENGINE LUBRICATION SYSTEM

Oil Pump (Cont’d)

INSTALLATION

- Before installing front cover assembly, remove all traces of liquid gasket from mating surface using a scraper.
- Also remove traces of liquid gasket from mating surface of cylinder block.

1. Apply a continuous bead of liquid gasket to mating surface of front cover assembly.
   - Use Genuine Liquid Gasket or equivalent.
2. Installation is in reverse order of removal.
ENGINE LUBRICATION SYSTEM

Oil Pump (Cont’d)

INSPECTION

Using a feeler gauge, check the following clearances:

<table>
<thead>
<tr>
<th>Clearance</th>
<th>Unit: mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body to outer gear clearance ①</td>
<td>0.114 - 0.200 (0.0045 - 0.0079)</td>
</tr>
<tr>
<td>Inner gear to outer gear tip clearance ②</td>
<td>Below 0.18 (0.0071)</td>
</tr>
<tr>
<td>Body to inner gear side clearance ③</td>
<td>0.05 - 0.09 (0.0020 - 0.0035)</td>
</tr>
<tr>
<td>Body to outer gear side clearance ④</td>
<td>0.05 - 0.11 (0.0020 - 0.0043)</td>
</tr>
<tr>
<td>Inner gear to brazed portion of housing clearance ⑤</td>
<td>0.045 - 0.091 (0.0018 - 0.0036)</td>
</tr>
</tbody>
</table>

- If the tip clearance (②) exceeds the limit, replace gear set.
- If body to gear side clearances (①, ③, ④, ⑤) exceed the limit, replace front cover assembly.

REGULATOR VALVE INSPECTION

1. Visually inspect components for wear and damage.
2. Check oil pressure regulator valve sliding surface and valve spring.
3. Coat regulator valve with engine oil. Check that it falls freely into the valve hole by its own weight.
   If damaged, replace regulator valve set or front cover assembly.
ENGINE LUBRICATION SYSTEM

Oil Pump (Cont’d)

4. Check regulator valve to oil pump cover clearance.
   **Clearance:**
   \[ \delta : 0.040 - 0.097 \text{ mm} \ (0.0016 - 0.0038 \text{ in}) \]
   If it exceeds the limit, replace oil pump cover.

Oil Filter

The oil filter is a small, full-flow cartridge type and is provided with a relief valve.
- The new and existing oil filter designs differ from each other and are not interchangeable.
- Use Tool KV10115801 for removing oil filter.

Oil Jet (For piston)

INSPECTION
1. Blow through outlet of oil jet and make sure that air comes out of inlet.
2. Push cut-off valve of oil jet bolt with a clean resin or brass rod and make sure that cut-off valve moves smoothly with proper repulsion.

When installing oil jet, align oil jet’s boss with hole on cylinder block.
Oil Cooler

REMOVAL AND INSTALLATION
1. Drain engine oil and coolant.
2. Remove oil cooler.
3. Installation is in reverse order of removal.

INSPECTION

Oil cooler
1. Check oil cooler for cracks.
2. Check oil cooler for clogging by blowing through coolant inlet.
   If necessary, replace oil cooler assembly.

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

Turbocharger Oil Tube

- For installation, first hand-tighten bolts connecting tubes. Then tighten bolts to the specified torques.
- Be careful not to deform tubes.
- After installation, run engine for a few minutes, and check for oil leakage.
ENGINE COOLING SYSTEM

Cooling Circuit

System Check

WARNING:
Never remove the radiator cap when the engine is hot; serious burns could be caused by high pressure fluid escaping from the radiator.
Wrap a thick cloth around cap and carefully remove the cap by turning it a quarter turn to allow built-up pressure to escape and then turn the cap all the way off.

CHECKING COOLING SYSTEM HOSES
Check hoses for improper attachment, leaks, cracks, damage, loose connections, chafing and deterioration.

CHECKING COOLING SYSTEM FOR LEAKS
To check for leakage, apply pressure to the cooling system with a tester.
Testing pressure: 157 kPa (1.57 bar, 1.6 kg/cm², 23 psi)
CAUTION:
Higher than the specified pressure may cause radiator damage.

LC-10
ENGINE COOLING SYSTEM

System Check (Cont’d)

CHECKING RADIATOR CAP

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

Radiator cap relief pressure:

78 - 98 kPa (0.78 - 0.98 bar, 0.8 - 1.0 kg/cm², 11 - 14 psi)

Pull the negative pressure valve to open it. Check that it closes completely when released.

Refilling Engine Coolant

Refer to “Changing Engine coolant” in MA section.

Water Pump

CAUTION:

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

REMOVAL

1. Drain coolant from cylinder block and radiator.
2. Remove fan coupling with fan.
3. Remove power steering pump drive belt, alternator drive belt and air compressor drive belt.
4. Remove water pump.
ENGINE COOLING SYSTEM

Water Pump (Cont’d)

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

INSTALLATION
1. Use a scraper to remove old liquid gasket from water pump.
   • Also remove traces of liquid gasket from mating surface of cylinder block.

2. Apply a continuous bead of liquid gasket to mating surface of water pump.
   • Use genuine liquid gasket or equivalent.

Thermostat

SEC. 210

Liquid gasket application places

A

- 2 - 3 mm
(0.08 - 0.12 in)
dia.

B

- 2 - 3 mm
(0.08 - 0.12 in)
dia.

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

Thermostat (Cont’d)

INSPECTION
1. Check valve seating condition at ordinary room temperatures. It should seat tightly.
2. Check valve opening temperature and maximum valve lift.

<table>
<thead>
<tr>
<th>Valve opening temperature</th>
<th>°C (°F)</th>
<th>76.5 (170)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum valve lift</td>
<td>mm/°C (in/°F)</td>
<td>More than 10/90 (0.39/194)</td>
</tr>
</tbody>
</table>

3. Then check if valve is closed at 5°C (9°F) below valve opening temperature.
   - Apply a continuous bead of liquid gasket to mating surface of water inlet. Refer to “Water Pump (LC-11)”.
   - After installation, run engine for a few minutes, and check for leaks.
   - Be careful not to spill coolant over engine compartment. Use a rag to absorb coolant.

Water Outlet

INSPECTION
Visually inspect for water leaks. If there is leakage, apply liquid gasket.

INSTALLATION
1. Use a scraper to remove old liquid gasket from water outlet.
   - Also remove traces of liquid gasket from mating surface of cylinder head.
2. Apply a continuous bead of liquid gasket to mating surface of water outlet.
   - Use Genuine Liquid Gasket or equivalent.
Cooling Fan Control System (Motor driven)
Fans are controlled by ECM. For details, refer to EC section.

Cooling Fan (Crankshaft driven)

DISASSEMBLY AND ASSEMBLY

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

LC-14
Aluminum radiator can be disassembled by using special procedures and special service tools.

**PREPARATION**

**Modification of radiator plate pliers A**

For proper maintenance of aluminum radiator, modify the radiator plate pliers A (KV99103510) as described below. The modified tool will be usable for radiators with either square or circular sealing rubber.

For radiators with circular sealing rubber, avoid excessive crimping. The standard crimping height for this type is larger.

**Step 1**
1. Draw out pin at ③ and disassemble ④ from ⑤. Then, grind ⑤. (Fig. 1)
2. Grind ⑤. Finish the surface as smoothly as possible. (Fig. 2)

**CAUTION:**

Be careful not to over-grind the standard size since it might damage washer when caulking.

3. Using a burner on the curved portion, straighten ⑤ until its end is 18 mm (0.71 in) lower as shown in the figure. (Fig. 3) Avoid applying too much force to ⑤.
4. Reassemble the tool in such a way that H' is approx. 9.1 mm (0.358 in) when ⑤ portion is joined. (Fig. 1)
5. If dimension H' can not be attained, adjust by grinding portion ⑤ or by straightening the curve (R) further. (Fig. 1, 3)
ENGINE COOLING SYSTEM

Radiator (Aluminum type) (Cont’d)

Fig. 1

Fig. 2

Fig. 3

Unit: mm (in)

Step 2

1. Make spacers (steel) with a specification of 1.5 mm (0.059 in) thick x 18 mm (0.71 in) wide x 8.5 mm (0.335 in) long.
2. Using double sided tape or adhesive, attach the spacer to the tip of the modified radiator plate pliers A.
3. Make sure that when radiator plate pliers A are closed dimension H'' is approx. 7.6 mm (0.299 in).
4. If dimension H'' is out of specification, adjust with the spacer.

DISASSEMBLY

1. Remove tank with Tool.

- Grip the crimped edge and bend it upwards so that Tool slips off.
  Do not bend excessively.
ENGINE COOLING SYSTEM

Radiator (Aluminum type) (Cont’d)

- In areas where Tool cannot be used, use a screwdriver to bend the edge up.
  Be careful not to damage tank.

  2. Make sure the edge stands straight up.
  3. Remove oil cooler from tank. (A/T models only)

ASSEMBLY

1. Install oil cooler. (A/T models only)
   Pay attention to direction of conical washer.

  2. Clean contact portion of tank.

  3. Install sealing rubber.
   Push it in with fingers.
   Be careful not to twist sealing rubber.

LC-17
ENGINE COOLING SYSTEM

Radiator (Aluminum type) (Cont'd)

4. Caulk tank in specified sequence with Tool. Be careful not to excessively caulk the radiator with circular shaped rubber. The Tool is not designed for the standard caulkng height (H).

5. Make sure that the rim is completely crimped down.
   Standard height "H":
   \[8.0 \text{ to } 8.4 \text{ mm (0.315 to 0.331 in)}\]

6. Confirm that there is no leakage. Refer to inspection.

INSPECTION

Apply pressure with Tool.

Specified pressure value:
\[157 \text{ kPa (1.57 bar, 1.6 kg/cm}^2, 23 \text{ psi)}\]

WARNING:

To prevent the risk of the hose coming undone while under pressure, securely fasten it down with a hose clamp. Attach a hose to the oil cooler as well. (A/T models only)
When installing water tubes, first hand-tighten bolts connecting tubes, then slightly tighten bracket securing bolts. Finally, tighten bolts securely.

- Be careful not to deform tubes.
- After installation, run engine for a few minutes, and check for water leakage.
### Service Data and Specifications (S.D.S.)

#### Engine Lubrication System

<table>
<thead>
<tr>
<th>Engine rpm</th>
<th>Approximate discharge pressure kPa (bar, kg/cm², psi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Idle speed</td>
<td>More than 78 (0.78, 0.8, 11)</td>
</tr>
<tr>
<td>3,200</td>
<td>314 - 392 (3.14 - 3.92, 3.2 - 4.0, 46 - 57)</td>
</tr>
</tbody>
</table>

#### Regulator Valve

<table>
<thead>
<tr>
<th>Regulator valve to oil pump cover clearance</th>
<th>Unit: mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.040 - 0.097 (0.0016 - 0.0038)</td>
<td></td>
</tr>
</tbody>
</table>

#### Oil Pump

<table>
<thead>
<tr>
<th>Body to outer gear clearance</th>
<th>Unit: mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.114 - 0.200 (0.0045 - 0.0079)</td>
<td></td>
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<td>Below 0.18 (0.0071)</td>
</tr>
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<td>Body to inner gear side clearance</td>
<td>0.05 - 0.09 (0.0020 - 0.0035)</td>
</tr>
<tr>
<td>Body to outer gear side clearance</td>
<td>0.05 - 0.11 (0.0020 - 0.0043)</td>
</tr>
<tr>
<td>Inner gear to brazed portion of housing clearance</td>
<td>0.045 - 0.061 (0.0018 - 0.0036)</td>
</tr>
</tbody>
</table>

#### Engine Cooling System

#### Cooling System Leakage Test

<table>
<thead>
<tr>
<th>Testing pressure</th>
<th>Unit: kPa (bar, kg/cm², psi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>157</td>
<td>1.57, 1.6, 23</td>
</tr>
</tbody>
</table>

#### Radiator Cap

<table>
<thead>
<tr>
<th>Relief pressure</th>
<th>Unit: kPa (bar, kg/cm², psi)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.5 - 98</td>
<td>0.75 - 0.98</td>
</tr>
<tr>
<td>0.8 - 1.0, 11 - 14</td>
<td></td>
</tr>
</tbody>
</table>

#### Thermostat

<table>
<thead>
<tr>
<th>Valve opening temperature</th>
<th>°C (°F)</th>
<th>Unit: mm/°C (in/°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>76.5 (170)</td>
<td>More than 10/90 (0.39/194)</td>
<td></td>
</tr>
</tbody>
</table>
ENGINE CONTROL SYSTEM

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  Engine Fuel & Emission Control System .................................. 4

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When you read wiring diagrams:
- Read GI section, "HOW TO READ WIRING DIAGRAMS".
- See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.
When you perform trouble diagnoses, read GI section, "HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES" and "HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT".
Supplemental Restraint System (SRS) “AIR BAG” and “SEAT BELT PRE-TENSIONER”

The Supplemental Restraint System "Air Bag" and "Seat Belt Pre-tensioner", used along with a seat belt, help to reduce the risk or severity of injury to the driver and front passenger in a frontal collision. The Supplemental Restraint System consists of air bag modules (located in the center of the steering wheel and on the instrument panel on the passenger side), seat belt pre-tensioners, a diagnosis sensor unit, warning lamp, wiring harness and spiral cable. Information necessary to service the system safely is included in the RS section of this Service Manual.

WARNING:
- To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN dealer.
- Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.
- All SRS air bag electrical wiring harnesses and connectors are covered with yellow outer insulation. Do not use electrical test equipment on any circuit related to the SRS.
PREPARATION AND PRECAUTIONS

Engine Fuel & Emission Control System

ECM
- Do not disassemble ECM (ECCS control module).
- Do not turn diagnosis mode selector forcibly.
- If a battery terminal is disconnected, the memory will return to the ECM value. The ECM 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 attempt to disconnect battery cables while engine is running.

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

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

ECM HARNESS HANDLING
- Securely connect ECM harness connectors. A poor connection can cause an extremely high (surge) voltage to develop in coil and condenser, thus resulting in damage to ICs.
- Keep ECM harness at least 10 cm (3.9 in) away from adjacent harnesses, to prevent an ECM system malfunction due to receiving extreme noise, degraded operation of ICs, etc.
- Keep ECM parts and harnesses dry.
- Before removing parts, turn off ignition switch and then disconnect battery ground cable.

EC-4
ENGINE AND EMISSION CONTROL OVERALL SYSTEM

System Chart

- Camshaft position sensor
- Mass air flow sensor
- Engine coolant temperature sensor
- Heated oxygen sensor
- Ignition switch
- Throttle position sensor
- Park/Neutral position switch
- Air conditioner switch
- Knock sensor
- Battery voltage
- Power steering oil pressure switch
- Vehicle speed sensor
- Boost pressure sensor
- Rear window defogger switch

<table>
<thead>
<tr>
<th>Fuel injection &amp; mixture ratio control</th>
<th>Injectors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric ignition system</td>
<td>Power transistor</td>
</tr>
<tr>
<td>Idle air control system</td>
<td>IACV-AAC valve IACV-FICD solenoid valve</td>
</tr>
<tr>
<td>EGR and canister control</td>
<td>EGR and canister control solenoid valve</td>
</tr>
<tr>
<td>Fuel pump control</td>
<td>Fuel pump relay</td>
</tr>
<tr>
<td>Diagnostic test mode II</td>
<td>Malfunction indicator lamp (On the instrument panel)</td>
</tr>
<tr>
<td>(Heated oxygen sensor monitor &amp; self-diagnosis)</td>
<td></td>
</tr>
<tr>
<td>Heated oxygen sensor heater control</td>
<td>Heated oxygen sensor heater</td>
</tr>
<tr>
<td>Cooling fan control</td>
<td>Cooling fan relay</td>
</tr>
<tr>
<td>Acceleration cut control</td>
<td>Air conditioner relay</td>
</tr>
<tr>
<td>Wastegate valve control</td>
<td>Wastegate valve control solenoid valve</td>
</tr>
<tr>
<td>Valve timing control (VTC)</td>
<td>VTC solenoid valve</td>
</tr>
</tbody>
</table>
Engine Control Module (ECM)-ECCS Control Module

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

Camshaft Position Sensor (CMPS)

The camshaft position sensor is a basic component of the ECCS. It monitors engine speed and piston position, and sends signals to the ECM to control fuel injection, ignition timing and other functions.

The camshaft position 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 (LED) and photo diodes are built in the wave-forming circuit.

When the rotor plate passes between the LED and the photo diode, the slits in the rotor plate continually cut the light being transmitted to the photo diode from the LED. This generates rough-shaped pulses which are converted into on-off pulses by the wave-forming circuit, which are sent to the ECM. For diagnosis, refer to EC-109, 201.

Mass Air Flow Sensor (MAFS)

The mass air flow sensor measures the intake air flow rate by measuring a part of the entire flow. Measurements are made in such a way that the ECM receives electrical output signals varied by the amount of heat emitting from the hot film placed in the stream of the intake air.

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

Therefore, it is necessary to supply the hot film with more electric current in order to maintain the temperature of the hot film. The ECM detects the air flow by means of this current change. For diagnosis, refer to EC-113, 201.
Engine Coolant Temperature Sensor (ECTS)
The engine coolant temperature sensor, located on the top of the thermostat housing, detects engine coolant temperature and transmits a signal to the ECM.
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.
For diagnosis, refer to EC-116, 201.

Throttle Position Sensor (TPS) & Soft Closed Throttle Position (CTP) Switch
The throttle position sensor responds to accelerator pedal movement. This sensor is a kind of potentiometer which transforms the throttle position into output voltage, and emits the voltage signal to the ECM. In addition, the sensor detects the opening and closing speed of the throttle valve and feeds the voltage signal to the ECM.
Closed throttle position of the throttle valve is determined by the ECM receiving the signal from the throttle position sensor. This system is called “soft closed throttle position switch”. It controls engine operation such as fuel cut. For diagnosis, refer to EC-135, 204.
**Fuel Injector**

The fuel injector is a small, elaborate solenoid valve. As the ECM 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 ECM in terms of injection pulse duration. For diagnosis, refer to EC-156, 205.

**Fuel Pressure Regulator**

The pressure regulator maintains the fuel pressure at 299.1 kPa (2.991 bar, 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. For diagnosis, refer to EC-208.

**Fuel Pump**

The fuel pump is a turbine type located in the fuel tank. For diagnosis, refer to EC-159, 202.

**Heated Oxygen Sensor (HO2S)**

The heated oxygen sensor, which is placed into the exhaust outlet, monitors the amount of oxygen in the exhaust gas. The sensor has a closed-end tube made of ceramic zirconia. The outer surface of the tube is exposed to exhaust gas, and the inner surface to atmosphere. The zirconia of the tube compares the oxygen density of exhaust gas with that of atmosphere, and generates electricity. In order to improve generating power of the zirconia, its tube is coated with platinum. The voltage is approximately 1V in a richer condition of the mixture ratio than the ideal air-fuel ratio, while approximately 0V in leaner conditions. The radical change from 1V to 0V occurs at around the ideal mixture ratio. In this way, the heated oxygen sensor detects the amount of oxygen in the exhaust gas and sends the signal of approximately 1V or 0V to the ECM. A heater is used to activate the sensor. For diagnosis, refer to EC-152, 203.
**Power Transistor Unit & Ignition Coil**

The ignition signal from the ECM 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 located on the spark plug. For diagnosis, refer to EC-120, 202.

---

**Fast Idle Cam (FIC)**

The FIC is installed on the throttle body to maintain adequate engine speed while the engine is cold. It is operated by a volumetric change in wax located inside the thermo-element. The thermo-element is controlled by engine coolant temperature. For diagnosis, refer to EC-207.

---

**Idle Air Control Valve (IACV)-Auxiliary Air Control (AAC) Valve**

The ECM actuates the IACV-AAC valve by an ON/OFF pulse. The longer that ON duty is left on, the larger the amount of air that will flow through the IACV-AAC valve. For diagnosis, refer to EC-169, 204.

---

**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 ECM. The ECM then sends the idle-up signal to the IACV-AAC valve. For diagnosis, refer to EC-184, 206.
Vehicle Speed Sensor (VSS)
The vehicle speed sensor provides a vehicle speed signal to the speedometer and the speedometer sends a signal to the ECM.
The speed sensor consists of a pulse generator which is installed in the transmission. For diagnosis, refer to EC-145, 202.

Knock Sensor (KS)
The knock sensor is attached to the cylinder block and senses engine knocking conditions.
A knocking vibration from the cylinder block is applied as pressure to the piezoelectric element. This vibrational pressure is then converted into a voltage signal which is sent to the ECM.
For diagnosis, refer to EC-132, 205.

Exhaust Gas Recirculation (EGR) Valve
The EGR valve controls the quantity of exhaust gas to be diverted to the intake manifold through vertical movement of a taper valve connected to the diaphragm. Vacuum is applied to the diaphragm in response to the opening of the throttle valve. For diagnosis, refer to EC-148, 203.

EGR Control (EGRC)-BPT Valve
The EGRC-BPT valve monitors exhaust pressure to activate the diaphragm, controlling throttle body vacuum applied to the EGR valve. In other words, recirculated exhaust gas is controlled in response to positioning of the EGR valve or to engine operation. For diagnosis, refer to EC-148, 203.

EGR and Canister Control Solenoid Valve
The EGR and canister control solenoid valve responds to signals from the ECM. When the ECM sends an ON (ground) signal, the coil in the solenoid valve is energized. A plunger will then move to cut the vacuum signal (from the throttle body to the EGR valve and canister purge valve).
When the ECM sends an OFF signal, the vacuum signal passes through the solenoid valve. The signal then reaches the EGR valve and carbon canister. For diagnosis, refer to EC-148, 203.

EC-16
Fuel Filter
The specially designed fuel filter has a metal case in order to withstand high fuel pressure.

Valve Timing Control (VTC) Solenoid Valve
The valve timing control solenoid is installed at the front right of the cylinder head, and controls oil pressure which regulates the position of the intake camshafts. For diagnosis, refer to EC-166, 205.

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. For diagnosis, refer to EC-148, 210.

Wastegate Valve Control Solenoid Valve
The solenoid valve is actuated by the ON/OFF pulse from the ECM. The longer that ON duty is left on the larger the amount of vacuum signals from the suction pipe or compressor outlet are fed into the wastegate valve actuator. The actuator is hard to open at this time. When the ECM sends an OFF signal, the coil pulls the plunger and cuts the route to the suction pipe. For diagnosis, refer to EC-163, 205.

Recirculation Valve
The recirculation valve reduces the noise occurring in the compressor of the turbocharger during deceleration. This valve recirculates air compressed downstream of the intercooler to upstream of the compressor using the intake manifold vacuum that occurs when the throttle chamber is suddenly closed. The recirculation valve also must not be disassembled or adjusted. For diagnosis, refer to EC-206.
Boost Pressure Sensor

The boost pressure sensor detects boost pressure at the upstream of the throttle body. The pressure signal is transmitted to the ECM to control the boost pressure precisely. For diagnosis, refer to EC-126, 206.
Multiport Fuel Injection (MFI) System

**INPUT/OUTPUT SIGNAL LINE**

- Camshaft position sensor
- Mass air flow sensor
- Engine coolant temperature sensor
- Heated oxygen sensor
- Throttle position sensor
- Park/Neutral position switch
- Vehicle speed sensor
- Ignition switch
- Air conditioner switch
- Battery

**Engine speed and piston position**

**Amount of intake air**

**Engine coolant temperature**

**Density of oxygen in exhaust gas**

**Throttle valve opening angle**

**Gear position**

**Vehicle speed**

**Start signal**

**Air conditioner operation**

**Battery voltage**

**ECM (ECCS control module)**

**Injector**

**VARIABLES FUEL INJECTION INCREASE/DECREASE COMPENSATION**

The amount of fuel injection is compensated for to improve engine performance. This will be made 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

---

**BASIC MULTIPOINT FUEL INJECTION SYSTEM**

The amount of fuel injected from the fuel injector, or the length of time the valve remains open, is determined by the ECM. The amount of fuel injected is a program value mapped in the ECM memory. In other words, the program value is preset by engine operating conditions determined by input signals (engine speed and air intake) from both the camshaft position sensor and the mass air flow sensor.
ENGINE AND EMISSION CONTROL SYSTEM DESCRIPTION

Multiport Fuel Injection (MFI) System (Cont’d)

**MIXTURE RATIO FEEDBACK CONTROL**

The mixture ratio feedback system is used for precise control of the mixture ratio to the stoichiometric point, so that the three way catalyst can reduce CO, HC and NOx emissions. This system uses a heated oxygen sensor in the exhaust manifold to check the air-fuel ratio. The ECM 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.

**OPEN LOOP CONTROL**

The open loop control condition refers to that under which the ECM detects any of the following conditions and feedback control stops in order to maintain stabilized fuel combustion:
1) Deceleration
2) High-load, high-speed operation
3) Engine idling
4) Malfunction of heated oxygen sensor or its circuit
5) Insufficient activation of heated oxygen sensor at low engine coolant temperature
6) Engine starting

**MIXTURE RATIO SELF-LEARNING CONTROL**

The mixture ratio feedback control system monitors the mixture ratio signal transmitted from the heated oxygen sensor. This feedback signal is then sent to the ECM 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. Both manufacturing differences (i.e. mass air flow sensor hot wire) and characteristic changes during operation (i.e. injector clogging) directly affect mixture ratio. Accordingly, the difference between the basic and theoretical mixture ratios is monitored in this system. This is then computed in terms of “fuel injection duration” to automatically compensate for the difference between the two ratios.

EC-20
Multiport Fuel Injection (MFI) System (Cont'd)

FUEL INJECTION TIMING

Two types of systems are used — sequential multiport fuel injection system and simultaneous multiport fuel injection system.

1) Sequential multiport fuel injection system
Fuel is injected into each cylinder during each engine cycle according to the firing order. This system is used when the engine is running.

2) Simultaneous multiport fuel injection system
Fuel is injected simultaneously into all four cylinders twice each engine cycle. In other words, pulse signals of the same width are simultaneously transmitted from the ECM. The four injectors will then receive the signals two times for each engine cycle.
This system is used when the engine is being started and/or if the fail-safe system (CPU) is operating.

FUEL SHUT-OFF
Fuel to each cylinder is cut off during deceleration or operation of the engine at excessively high speeds.
**Electronic Ignition (EI) System**

**INPUT/OUTPUT SIGNAL LINE**

- Camshaft position sensor → Engine speed and piston position
- Mass air flow sensor → Amount of intake air
- Engine coolant temperature sensor → Engine coolant temperature
- Throttle position sensor → Throttle position
- Vehicle speed sensor → Vehicle speed
- Ignition switch → Start signal
- Knock sensor → Engine knocking
- Park/Neutral position switch → Gear position
- Air conditioner switch → Air conditioner operation
- Power steering oil pressure switch → Power steering load signal
- Battery → Battery voltage

**ECM (ECCS control module)** → Power transistor
ENGINE AND EMISSION CONTROL SYSTEM DESCRIPTION

Electronic Ignition (EI) System (Cont’d)

SYSTEM DESCRIPTION
The ignition timing is controlled by the ECM in order to maintain the best air-fuel ratio for every running condition of the engine. The ignition timing data is stored in the ECM. This data forms the map shown below. The ECM detects information such as the injection pulse width and camshaft position sensor signal which varies every moment. Then responding to this information, Ignition signals are transmitted to the power transistor. e.g. N: 1,800 rpm, Tp: 1.50 msec A BTDC

In addition to this,
1) At starting
2) During warm-up
3) At idle
4) At low battery voltage
the ignition timing is revised by the ECM according to the other data stored in the ECM.

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

However, if engine knocking occurs, the knock sensor monitors the condition and the signal is transmitted to the ECM (ECCS control module). After receiving it, the ECM retards the ignition timing to eliminate the knocking condition.
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 the IACV-AAC valve. The IACV-AAC valve repeats ON/OFF operation according to the signal sent from the ECM. The camshaft position sensor detects the actual engine speed and sends a signal to the ECM.

The ECM then controls the ON/OFF time of the IACV-AAC valve so that engine speed coincides with the target value memorized in the ECM. The target engine speed is the lowest speed at which the engine can operate steadily. The optimum value stored in the ECM is determined by taking into consideration various engine conditions, such as noise and vibration transmitted to the vehicle interior, fuel consumption, and engine load.
ENGINE AND EMISSION CONTROL SYSTEM DESCRIPTION

Fuel Pump Control

**INPUT/OUTPUT SIGNAL LINE**

- Camshaft position sensor → Engine speed
- Mass air flow sensor → Amount of intake air
- Engine coolant temperature sensor → Engine coolant temperature
- Ignition switch → Start signal
- ECM (ECCS control module) → Fuel pump relay

**SYSTEM DESCRIPTION**

**Fuel pump ON-OFF control**

The ECM activates the fuel pump for several seconds after the ignition switch is turned on to improve engine start-up. If the ECM receives a 1st signal from the camshaft position sensor, it knows that the engine is rotating, and causes the pump to activate. If the 1st signal is not received when the ignition switch is on, the engine stalls. The ECM stops pump operation and prevents the battery from discharging, thereby improving safety. The ECM does not directly drive the fuel pump. It controls the ON/OFF fuel pump relay, which in turn controls the fuel pump.
ENGINE AND EMISSION CONTROL SYSTEM DESCRIPTION

Exhaust Gas Recirculation (EGR) and Canister Control System

**INPUT/OUTPUT SIGNAL LINE**

- Camshaft position sensor → Engine speed
- Mass air flow sensor → Amount of intake air
- Engine coolant temperature sensor → Engine coolant temperature
- Throttle position sensor → Throttle position
- Ignition switch → Start signal

**ECM (ECCS control module)**

**EGR and canister control solenoid valve**

**SYSTEM DESCRIPTION**

This system cuts and controls vacuum applied to EGR valve and canister to suit engine operating conditions. This cut-and-control operation is accomplished through the ECM and the EGR & canister control solenoid valve. When the ECM detects any of the following conditions, current flows through the solenoid valve. This causes the port vacuum to be discharged into the atmosphere. The EGR valve and canister remain closed.

1) Low engine coolant temperature
2) Engine starting
3) High-speed engine operation
4) Engine idling
5) Excessively high engine coolant temperature
6) Mass air flow sensor malfunction

---

**Air Conditioner Cut Control**

**INPUT/OUTPUT SIGNAL LINE**

- Air conditioner system → A/C ON signal
- Throttle position sensor → Throttle position
- Engine coolant temperature sensor → Engine coolant temperature

**ECM (ECCS control module)**

**Air conditioner relay**

**SYSTEM DESCRIPTION**

When the accelerator pedal is fully depressed, or engine coolant temperature is extremely high, the air conditioner is turned off for a few seconds.

This system improves acceleration when the air conditioner is used.
Valve Timing Control (VTC)

**INPUT/OUTPUT SIGNAL LINE**
- Mass airflow sensor
- Camshaft position sensor
- Engine coolant temperature sensor
- Throttle position sensor
- Park/Neutral position switch
- Amount of intake air
- Engine speed
- Engine coolant temperature
- Throttle valve opening angle
- Neutral position

**SYSTEM DESCRIPTION**
The valve timing control system is utilized to increase engine performance. Intake valve opening and closing time is controlled, according to the engine operating conditions, by the ECM.

Engine coolant temperature signals, engine speed, amount of intake air, throttle position, vehicle speed and gear position are used to determine intake valve timing.

The intake camshaft pulley position is regulated by oil pressure, which is controlled by the valve timing control solenoid valve.
### ENGINE AND EMISSION CONTROL SYSTEM DESCRIPTION

#### Valve Timing Control (VTC) (Cont’d)

![Diagram of engine components and valve timing control system.

---

#### OPERATION

<table>
<thead>
<tr>
<th>Engine operating condition</th>
<th>Valve timing control solenoid valve</th>
<th>Intake valve opening and closing time</th>
<th>Valve overlap</th>
<th>Engine torque curve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle is running.</td>
<td>ON</td>
<td>Advance</td>
<td>Increased</td>
<td></td>
</tr>
<tr>
<td>Engine coolant temperature is 50°C (122°F) or more.</td>
<td>ON</td>
<td>Advance</td>
<td>Increased</td>
<td></td>
</tr>
<tr>
<td>Engine speed is between 1,050 rpm and 5,700 rpm.</td>
<td>ON</td>
<td>Advance</td>
<td>Increased</td>
<td></td>
</tr>
<tr>
<td>Engine load is high.</td>
<td>ON</td>
<td>Advance</td>
<td>Increased</td>
<td></td>
</tr>
<tr>
<td>Engine speed is 1,050 rpm or less.</td>
<td>ON</td>
<td>Advance</td>
<td>Increased</td>
<td></td>
</tr>
<tr>
<td>Those other than above</td>
<td>OFF</td>
<td>Normal</td>
<td>Normal</td>
<td></td>
</tr>
</tbody>
</table>

---

EC-28
ENGINE AND EMISSION CONTROL SYSTEM DESCRIPTION

Heated Oxygen Sensor (HO2S) Heater Control

**INPUT/OUTPUT SIGNAL LINE**

- Camshaft position sensor → Engine speed
- Mass air flow sensor → Amount of intake air
- ECM (ECCS control module) → Heated oxygen sensor heater

The ECM performs ON/OFF control of the heated oxygen sensor heater corresponding to the engine speed and engine load.

**OPERATION**

<table>
<thead>
<tr>
<th>Engine operating condition</th>
<th>Heated oxygen sensor heater</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine speed is more than 4,000 rpm.</td>
<td>OFF</td>
</tr>
<tr>
<td>Heavy load</td>
<td>OFF</td>
</tr>
<tr>
<td>Except above</td>
<td>ON</td>
</tr>
</tbody>
</table>

**Cooling Fan Control**

**INPUT/OUTPUT SIGNAL LINE**

- Vehicle speed sensor → Vehicle speed
- Engine coolant temperature sensor → Engine coolant temperature
- Air conditioner switch → Air conditioner "ON" signal
- ECM (ECCS control module) → Cooling fan low speed
- Cooling fan relay-1
- Cooling fan high speed → Cooling fan relay-2

The ECM controls the cooling fan corresponding to vehicle speed, engine coolant temperature and air conditioner ON signal. The control system has a 2-step control [HIGH/LOW/OFF].

**OPERATION**

- Air conditioner switch is "OFF":
  - Engine coolant temperature:
    - 100 (212) °C
    - 95 (203) °C
  - Vehicle speed km/h (MPH)
    - Cooling fan does not operate

- Air conditioner switch is "ON":
  - Engine coolant temperature:
    - 100 (212) °C
  - Vehicle speed km/h (MPH)
    - Cooling fan operates at "HIGH" speed
    - Cooling fan operates at "LOW" speed

The cooling fan operates at HIGH speed if diagnostic test mode II (self-diagnostic results) for engine coolant temperature sensor is "NG".

EC-29
ENGINE AND EMISSION CONTROL SYSTEM DESCRIPTION

Boost Pressure Control

**INPUT/OUTPUT SIGNAL LINE**

- Camshaft position sensor → Engine speed and piston position
- Throttle position sensor → Throttle valve idle position
- Knock sensor → Engine knocking
- Vehicle speed sensor → Vehicle speed
- Boost pressure sensor → Boost pressure

ECM (ECCS control module) → Wastegate valve control solenoid valve (a duty type)

**SYSTEM DESCRIPTION**

The output signal maps of the ECM are selected according to fuel octane rating, gear position (M/T model) and vehicle speed (A/T model). The wastegate valve control solenoid valve changes the source vacuum which activates the actuator. This results in a proportional boost pressure to the acceleration. Knock signs are used to determine fuel octane rating.

**OPERATION**

<table>
<thead>
<tr>
<th>Fuel octane rating</th>
<th>Gear position or vehicle speed</th>
<th>Boost pressure control map</th>
</tr>
</thead>
</table>
| Premium            | • 1, 2 and 3 speed gears (M/T model)  
                      • Less than 46 km/h (29 MPH) (A/T model) | A slow response type |
|                    | • 4 and 5 speed gears (M/T model)  
                      • More than 46 km/h (29 MPH) (A/T model) | A quick response type |
| Lower than the above | Any                           | Fixed                     |

EC-30
ENGINE AND EMISSION CONTROL SYSTEM DESCRIPTION

Fail-safe System

**CPU MALFUNCTION**

**Input/output signal line**

<table>
<thead>
<tr>
<th>Signal Source</th>
<th>Signal Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mass air flow sensor</td>
<td>Amount of intake air</td>
</tr>
<tr>
<td>Ignition switch</td>
<td>Start signal</td>
</tr>
<tr>
<td>Engine coolant temperature sensor</td>
<td>Engine coolant temperature</td>
</tr>
<tr>
<td>Throttle position sensor</td>
<td>Throttle valve opening angle</td>
</tr>
<tr>
<td></td>
<td>ECM (ECCS control module)</td>
</tr>
<tr>
<td></td>
<td>Fuel injector</td>
</tr>
<tr>
<td></td>
<td>Power transistor</td>
</tr>
<tr>
<td></td>
<td>IACV-AAC valve</td>
</tr>
<tr>
<td></td>
<td>Fuel pump control unit</td>
</tr>
<tr>
<td></td>
<td>Malfunction indicator lamp</td>
</tr>
</tbody>
</table>

**Outline**

The fail-safe system makes engine starting possible if there is something malfunctioning in the ECM's CPU circuit. In former models, engine starting was difficult under the previously mentioned conditions. But with the provisions in this fail-safe system, it is possible to start the engine.

**Fail-safe system activating condition when ECM is malfunctioning**

The fail-safe mode operates when the computing function of the ECM is judged to be malfunctioning.

When the fail-safe system activates, i.e. if a malfunction condition is detected in the CPU of the ECM, the MALFUNCTION INDICATOR LAMP on the instrument panel lights to warn the driver.

**Engine control with fail-safe system, operates when ECM is malfunctioning**

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

**Operation (Mass air flow sensor malfunction)**

<table>
<thead>
<tr>
<th>Engine condition</th>
<th>Starter switch</th>
<th>Fail-safe system</th>
<th>Fail-safe functioning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stopped</td>
<td>ANY</td>
<td>Does not operate.</td>
<td>Engine will be started by a pre-determined injection pulse on ECM.</td>
</tr>
<tr>
<td>Cranking</td>
<td>ON</td>
<td>Operates.</td>
<td>Engine speed will not rise above 2,400 rpm.</td>
</tr>
<tr>
<td>Running</td>
<td>OFF</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Cancellation of fail-safe system when ECM is malfunctioning**

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

**MASS AIR FLOW SENSOR MALFUNCTION**

If the mass air flow sensor output voltage is below the specified value, the ECM senses an mass air flow sensor malfunction. In the case of a malfunction, the throttle position sensor substitutes for the mass air flow sensor.

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

Fall-safe System (Cont'd)

ENGINE COOLANT TEMPERATURE SENSOR MALFUNCTION
When engine coolant temperature sensor output voltage is below or above the specified value, engine coolant temperature is fixed at the preset value as follows:

<table>
<thead>
<tr>
<th>Engine condition</th>
<th>Engine coolant temperature preset value °C (°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start</td>
<td>20 (68)</td>
</tr>
<tr>
<td>Running</td>
<td>80 (176)</td>
</tr>
</tbody>
</table>

KNOCK SENSOR MALFUNCTION
When ECM judged to be malfunctioning, ignition timing is controlled numerical value for regular gasoline.

START SIGNAL FOR MALFUNCTION
If the ECM always receives a start signal, the ECM will judge the start signal “OFF” when engine speed is above 1,000 rpm to prevent extra enrichment.
After the engine speed is below 200 rpm, start-up enrichment will be allowed until the engine speed reaches 1,000 rpm.

BOOST PRESSURE SENSOR MALFUNCTION
When ECM judged to be malfunctioning, the duty of wastegate valve control solenoid valve is fixed at 20%.

THROTTLE POSITION SENSOR MALFUNCTION
Description
When the output signal of throttle position sensor is abnormal the ECM judges it as a malfunctioning of throttle position sensor.
The ECM do not use the throttle position sensor signal.

EC-32
Direct Ignition System

CHECKING IDLE SPEED AND IGNITION TIMING

Idle speed
1. Disconnect check connector for voltage type tachometer.

2. Connect tachometer using a suitable tool.

Ignition timing
- Method A (Without SST)
1. Remove No. 1 ignition coil.
2. Connect No. 1 ignition coil and No. 1 spark plug with a suitable high-tension wire as shown, and attach timing light. For the above procedures, enlarge the end of a suitable high-tension wire with insulating tape as shown.
3. Check ignition timing.
Direct Ignition System (Cont'd)

- Method B (Without SST)

Clamp wire as shown. This wire is provided at the rear end of the engine.
IDLE SPEED/IGNITION TIMING/IDLE MIXTURE RATIO INSPECTION

PREPARATION
1. Make sure that the following parts are in good order.
   • Battery
   • Ignition system
   • Engine oil and coolant levels
   • Fuses
   • ECM harness connector
   • Vacuum hoses
   • Air intake system
     (Oil filler cap, oil level gauge, etc.)
   • Fuel pressure
   • Engine compression
   • EGR valve operation
   • Throttle valve

Overall inspection sequence

INSTRUCTION START

Perform diagnostic test mode II (Self-diagnostic results).

OK

Check & adjust ignition timing.

OK

Check & adjust idle speed.

OK

NG

Check heated oxygen sensor function.

OK

Check heated oxygen sensor harness.

OK

Check CO%.

OK

NG

Check emission control parts and repair or replace if necessary.

NG

Replace heated oxygen sensor.

OK

Check heated oxygen sensor function.

OK

NG

Repair or replace harness.

NG

INSPECTION END

2. On air conditioner equipped models, checks should be carried out while the air conditioner is "OFF".
3. When checking idle speed, ignition timing and mixture ratio of A/T models, shift lever to "N" position.
4. When measuring “CO” percentage, insert probe more than 40 cm (15.7 in) into tail pipe.
5. Turn off headlamps, heater blower, rear defogger.
6. Keep front wheels pointed straight ahead.
7. Make the check after the cooling fan has stopped.
IDLE SPEED/IGNITION TIMING/IDLE MIXTURE RATIO INSPECTION

START

Visually check the following:
- Air cleaner clogging
- Hoses and ducts for leaks
- EGR valve operation
- Electrical connectors
- Gasket
- Throttle valve

A

Start engine and warm it up until engine coolant temperature indicator points to the middle of gauge. Ensure that engine speed is below 1,000 rpm.

B

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

C

Perform diagnostic test mode II (Self-diagnostic results).

OK

Repair or replace components as necessary.

NG

Run engine at about 2,000 rpm for about 2 minutes under no-load. Race engine two or three times under no-load, then run engine for about 1 minute at idle speed.

D

1) Select "IGNITION TIMING ADJ" in WORK SUPPORT mode.
2) Touch "START".

E

1) Stop engine and disconnect throttle position sensor harness connector.
2) Start engine.

Race engine two or three times to about 2,000 rpm under no-load. Then run engine at idle speed.

Check ignition timing with a timing light.

15° ± 2° BTDC

OK

NG

Adjust ignition timing by turning camshaft position sensor after loosening securing bolts.

EC-36
IDLE SPEED/IGNITION TIMING/IDLE MIXTURE RATIO INSPECTION

A
- IGN TIMING ADJ
- CONDITION SETTING
  IGN/T FEEDBACK: HOLD
  CAS-RPM (REF) 75rpm
  IGN TIMING 158TDC
  IDLE POSITION ON

Check idle speed.
- Read idle speed in "IGN TIMING ADJ" in "WORK SUPPORT" mode.
- Check idle speed.

800 ± 50 rpm (A/T in "N" position)

B
- IGN TIMING ADJ

IGNITION TIMING FEEDBACK CONTROL WILL BE HELD BY TOUCHING START. AFTER DOING SO, ADJUST IGNITION TIMING WITH A TIMING LIGHT BY TURNING THE CRANK ANGLE SENSOR.

START

C
- Fast
- Slow
- Idle adjusting screw

Adjust idle speed by turning idle speed adjusting screw.

750 ± 50 rpm (A/T in "N" position)

D
- Front
- M/T models
- A/T models
- Throttle position sensor

Touch "Back".

1) Stop engine and connect throttle position sensor harness connector.
2) Start engine.

Race engine two or three times to about 2,000 rpm under no-load. Then run engine at idle speed.

E

1) Select "IGN TIMING ADJ" in "WORK SUPPORT" mode.
2) Touch "START".

Turn off engine and disconnect throttle position sensor harness connector. Then start engine.

Race engine two or three times to about 2,000 rpm under no-load. Then run engine at idle speed.

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

800 ± 50 rpm (A/T in "N" position)

OK

Check AAC valve and replace if necessary.

Check AAC valve harness and repair if necessary.

Check ECM function* by substituting another known good ECM.

* ECM may be the cause of a problem, but this is rarely the case.

EC-37
IDLE SPEED/IGNITION TIMING/IDLE MIXTURE RATIO INSPECTION

A

Data link connector for CONSULT (Connect CHK and IGN terminals with a suitable harness.)

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

B

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

OR

Make sure that malfunction indicator lamp goes on and off more than 5 times during 10 seconds at 2,000 rpm.

C

Malfunction indicator lamp

D

Cylinder head cover

Heated oxygen sensor harness connector

EC-38
Check heated oxygen sensor harness:
1) Turn off engine and disconnect battery ground cable
2) Disconnect ECM connector from ECM.
3) Disconnect heated oxygen sensor harness connector. Then connect harness side terminal for heated oxygen sensor to ground with a jumper wire.
4) Check for continuity between terminal No. 29 of ECM connector and ground metal on vehicle body.

Continuity exists ............................................. OK
Continuity does not exist ..................................... NG

OK
NG

Repair or replace harness.

Connect ECM connector to ECM.
IDLE SPEED/IGNITION TIMING/IDLE MIXTURE RATIO INSPECTION

A

- ACTIVE TEST
- ENGINE TEMP 20°C
- MONITOR
- CAS-RPM (REF) 0rpm
- (NL) PULSE 6.2msec
- IGN TIMING 5BTDC

Qu UP DWN Qd

B

Engine coolant temperature sensor harness connector

DISCONNECT

1S

2.5 kΩ resistor

C

Start engine and warm it up until engine coolant temperature indicator points to the middle of gauge. (Be sure to start engine after installing a 2.5 kΩ resistor.)

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

Check "CO" %.

Idle CO: Less than 10% (and engine runs smoothly)

After checking CO%,
1) Disconnect the resistor from terminals of engine coolant temperature sensor.
2) Connect engine coolant temperature sensor harness connector to engine coolant temperature sensor.

D

Connect heated oxygen sensor harness connector to heated oxygen sensor.

Check fuel pressure regulator.

Check mass air flow sensor.

Check injector:
Clean or replace if necessary.

Check engine coolant temperature sensor.

Check ECM function* by substituting another known good ECM.

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

EC-40
TROUBLE DIAGNOSES

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EC-42
How to Perform Trouble Diagnoses for Quick and Accurate Repair

INTRODUCTION

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

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

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

Before checking, talk to customer about drivability complaint. The customer is a very good supplier of information on such problems, especially intermittent ones. Through interaction with the customer, find out what symptoms are present and under what conditions they occur.

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

1. Verify the complaint.
2. Isolate the cause.
3. Repair
4. Recheck and be sure no new symptoms have been caused.
TROUBLE DIAGNOSES
How to Perform Trouble Diagnoses for Quick and Accurate Repair (Cont'd)

WORK FLOW

- CHECK IN
- LISTEN TO CUSTOMER COMPLAINTS
- BASIC INSPECTION (EC-63)

Do self-diagnostic results exist?*1

Yes
ON-BOARD DIAGNOSTIC SYSTEM
Perform diagnostic test mode II (Self-diagnostic results). (Refer to EC-50.)

No
SYMPTOM BASIS
Select inspection on the basis of each symptom. (Diagnostic Procedure — Symptom 1 - 21)
EC-70 - 104

FUNCTION TEST BASIS
Perform sequence test in FUNCTION TEST with CONSULT.

Do self-diagnostic results exist?

Yes

Diagnostic Procedures 23 - 30
EC-109 - 139
(Self-diagnostic item)

No

Diagnostic Procedures 31 - 45
EC-142 - 195
(Not self-diagnostic item)

Diagnostic Procedures 23 - 45
EC-109 - 195
(Self-diagnostic item & Not self-diagnostic item)

REPAIR/REPLACE

INSPECTION OF EACH MALFUNCTION

FINAL CHECK
Confirm that the trouble is completely fixed by performing BASIC INSPECTION and TEST DRIVE.

OK
CHECK OUT

*1: If the on-board diagnostic system cannot be performed, check main power supply and ground circuit. (See Diagnostic Procedure 22)

*2: If the trouble is not duplicated, see INTERMITTENT PROBLEM SIMULATION (EC-47).
**TROUBLE DIAGNOSES**

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

<table>
<thead>
<tr>
<th>STEP</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>STEP I</td>
<td>Identify the trouble using the &quot;DIAGNOSTIC WORKSHEET&quot; as shown on the next page.</td>
</tr>
<tr>
<td>STEP II</td>
<td>Be sure to carry out the Basic Inspection, or the results of inspections thereafter may be misinterpreted.</td>
</tr>
<tr>
<td>STEP III</td>
<td>Check the self-diagnostic results stored in the ECM of the failed vehicle.</td>
</tr>
</tbody>
</table>

Perform inspection often selecting from the following three tests according to the trouble observed:

1. **ON-BOARD DIAGNOSTIC SYSTEM**
   - Follow the self-diagnostic procedure for each item described in "How to Execute On-board Diagnostic System in Diagnostic Test Mode II". Non-self-diagnostic procedures described for some items will also provide results which are equal to the self-diagnostic results.

2. **SYMPTOM BASIS**
   - This inspection is of a simplified method. When performing inspection of a part, the corresponding system must be checked thoroughly by selecting the appropriate check item from Diagnostic Procedures 23 - 45.

3. **FUNCTION TEST BASIS (Sequence test)**
   - In this inspection, the CONSULT judges "OK" or "NG" on each system in place of a technician. When performing inspection of a part, the corresponding system must be checked thoroughly by selecting the appropriate check item from Diagnostic Procedures 23 - 45.

4. **Diagnosis Procedure**
   - This inspection program is prepared using the data obtained when disconnection of harness or connectors has occurred in the respective circuit.
   - Inspection of the "Not self-diagnostic item" does not actually start with the execution of diagnostic test mode II (self-diagnostic results). However, inspection is started by assuming that the diagnostic test mode II (self-diagnostic results) has already been performed.
   - When a system having the diagnostic test mode II (self-diagnostic results) function contains any circuit placed outside the range of this diagnostic test mode II (self-diagnostic results) function, it is arranged that the "Not self-diagnostic item" of such a system will be performed when the self-diagnostic result is OK.

   Example: CAMSHAFT POSITION SENSOR

| STEP IV | 1. FINAL CHECK item is not described in the "Not self-diagnostic item". However, this FINAL CHECK must be performed without fail in order to ensure that the trouble has been repaired, and also that the unit disassembled in the course of the repair work has been reassembled correctly. |
|         | 2. If the same trouble phenomenon is observed again in the final check: Go back to STEP IV, and perform the inspection using a method which is different from the previous method. |
|         | 3. If the cause of the trouble is still unknown even after conducting step 2 above, check the circuit of each system for a short by using the voltage available at the "ECM INPUT/OUTPUT SIGNAL INSPECTION" terminal. |
# 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 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>Manuf. Date</td>
<td>Mileage</td>
</tr>
<tr>
<td>Incident Date</td>
<td></td>
<td>In Service Date</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>○ Impossibility to start  ○ No combustion  ○ Partial combustion  ○ Partial combustion affected by throttle position  ○ Partial combustion NOT affected by throttle position  ○ Possible but hard to start  ○ Others [ ]</th>
</tr>
</thead>
<tbody>
<tr>
<td>○ Idling</td>
<td>○ No fast idle  ○ Unstable  ○ High idle  ○ Low idle  ○ Others [ ]</td>
</tr>
<tr>
<td>○ Driveability</td>
<td>○ Stumble  ○ Surge  ○ Knock  ○ Lack of power  ○ Intake backfire  ○ Exhaust backfire  ○ Others [ ]</td>
</tr>
<tr>
<td>○ Engine stall</td>
<td>○ At the time of start  ○ While idling  ○ While accelerating  ○ While decelerating  ○ Just after stopping  ○ While loading</td>
</tr>
<tr>
<td>Incident occurrence</td>
<td>○ Just after delivery  ○ Recently  ○ In the morning  ○ At night  ○ In the daytime</td>
</tr>
<tr>
<td>Frequency</td>
<td>○ All the time  ○ Under certain conditions  ○ Sometimes</td>
</tr>
<tr>
<td>Weather conditions</td>
<td>○ Not affected</td>
</tr>
<tr>
<td>Weather</td>
<td>○ Fine  ○ Raining  ○ Snowing  ○ Others [ ]</td>
</tr>
<tr>
<td>Temperature</td>
<td>○ Hot  ○ Warm  ○ Cool  ○ Cold  ○ Humid °F</td>
</tr>
<tr>
<td>Engine conditions</td>
<td>○ Cold  ○ During warm-up  ○ After warm-up</td>
</tr>
<tr>
<td>Engine speed</td>
<td>Engine speed</td>
</tr>
<tr>
<td>Road conditions</td>
<td>○ In town  ○ In suburbs  ○ Highway  ○ Off road (up/down)</td>
</tr>
<tr>
<td>Driving conditions</td>
<td>○ Not affected  ○ At starting  ○ While idling  ○ At racing  ○ While accelerating  ○ While cruising  ○ While decelerating  ○ While turning (RH/LH)</td>
</tr>
<tr>
<td>Vehicle speed</td>
<td>Vehicle speed</td>
</tr>
<tr>
<td>Malfunction indicator lamp</td>
<td>○ Turned on  ○ Not turned on</td>
</tr>
</tbody>
</table>

EC-46
TROUBLE DIAGNOSES

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

INTERMITTENT PROBLEM SIMULATION

In order to duplicate an intermittent problem, it is effective to create similar conditions for component parts, under which the problem might occur. Perform the activity listed under Service procedure and note the result.

<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>Camshaft position sensor</td>
<td>Advanced</td>
<td>Rotate distributor counter clockwise.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Retarded</td>
<td>Rotate distributor clockwise.</td>
</tr>
<tr>
<td>3 Mixture ratio feedback control</td>
<td>Heated oxygen sensor</td>
<td>Suspended</td>
<td>Disconnect heated oxygen sensor harness connector.</td>
</tr>
<tr>
<td></td>
<td>ECM</td>
<td>Operation check</td>
<td>Perform diagnostic test mode II (Self-diagnostic results) at 2,000 rpm.</td>
</tr>
<tr>
<td>4 Idle speed</td>
<td>IACV-AAC valve</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 Electrical connection (Electric continuity)</td>
<td>Harness connectors and wires</td>
<td>Poor electrical connection or improper wiring</td>
<td>Race engine rapidly. See if the torque reaction of the engine unit causes electric breaks.</td>
</tr>
<tr>
<td>6 Temperature</td>
<td>ECM</td>
<td>Cooled</td>
<td>Cool with an icing spray or similar device.</td>
</tr>
</tbody>
</table>
|                 |                  | Warmed           | Heat with a hair drier.  
[WARNING: Do not overheat the unit.] |
| 7 Moisture      | Electric parts    | Damp             | Wet.  
[WARNING: Do not directly pour water on components. Use a mist sprayer.] |
| 8 Electric loads | Load switches     | Loaded           | Turn on headlights, air conditioner, rear defogger, etc. |
| 9 Throttle position sensor condition | ECM            | ON-OFF switching | Rotate throttle position sensor body. |
| 10 Ignition spark | Timing light     | Spark power check | Try to flash timing light for each cylinder. |

- Select the “Variable factor” when the symptom occurs. 
- Perform the “Service procedure” to try to simulate the intermittent.
# TROUBLE DIAGNOSES

## On-board Diagnostic System

**MALFUNCTION INDICATOR LAMP (MIL)**

A malfunction indicator lamp has been adopted on all models.

### ON-BOARD DIAGNOSTIC SYSTEM FUNCTION

<table>
<thead>
<tr>
<th>Condition</th>
<th>Diagnostic Test Mode I</th>
<th>Diagnostic Test Mode II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ignition switch in &quot;ON&quot; position stopped</td>
<td>BULB CHECK</td>
<td>SELF-DIAGNOSTIC RESULTS</td>
</tr>
<tr>
<td>Engine running</td>
<td>MALFUNCTION WARNING</td>
<td>HEATED OXYGEN SENSOR MONITOR</td>
</tr>
</tbody>
</table>
TROUBLE DIAGNOSES
On-board Diagnostic System (Cont'd)
HOW TO SWITCH MODES

1. Turn ignition switch "ON". (Do not start engine.)
2. Diagnostic Test Mode I (BULB CHECK)
   - Data link connector for CONSULT (Connect CHK and IGN terminals with a suitable harness.) SEF265L
   - Wait at least 2 seconds.
3. Diagnostic Test Mode II (SELF-DIAGNOSTIC RESULTS)
   - Data link connector for CONSULT (Connect CHK and IGN terminals with a suitable harness.) SEF265L
   - Wait at least 2 seconds.
4. Start engine.
   - Diagnostic Test Mode I — MALFUNCTION WARNING
5. Start engine.
   - Diagnostic Test Mode II (HEATED OXYGEN SENSOR MONITOR)

- Switching the modes is not possible when the engine is running.
- When ignition switch is turned off during diagnosis, power to ECM will drop after approx. 1 second. The diagnosis will automatically return to Diagnostic Test Mode I.
TROUBLE DIAGNOSES

On-board Diagnostic System — Diagnostic Test Mode I

DIAGNOSTIC TEST MODE I — BULB CHECK
In this mode, the MALFUNCTION INDICATOR LAMP in the instrument panel stays "ON". If it remains "OFF", check the bulb in the MALFUNCTION INDICATOR LAMP.

DIAGNOSTIC TEST MODE I — MALFUNCTION WARNING

<table>
<thead>
<tr>
<th>MALFUNCTION INDICATOR LAMP</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>When the ECM's CPU or camshaft position sensor is malfunctioning.</td>
</tr>
<tr>
<td>OFF</td>
<td>OK</td>
</tr>
</tbody>
</table>

On-board Diagnostic System — Diagnostic Test Mode II (Self-diagnostic results)

DESCRIPTION
In this mode, a diagnostic trouble code is indicated by the number of flashes from the MALFUNCTION INDICATOR LAMP (MIL) as shown below:

Example: Diagnostic trouble code No. 12 and Diagnostic trouble code No. 34

[Diagram showing ON and OFF states with timing indicators for code No. 12 and No. 34]

Long (0.6 second) blinking indicates the number of ten digits and short (0.3 second) blinking indicates the number of single digits.

For example, the MIL flashes for 0.6 seconds once and then it flashes for 0.3 seconds twice. This indicates the number "12" and refers to a malfunction in the mass air flow sensor. In this way, all the problems are classified by their diagnostic trouble code numbers.

The diagnostic results will remain in the ECM memory.

EC-50
## TROUBLE DIAGNOSES

On-board Diagnostic System — Diagnostic Test Mode II (Self-diagnostic results) (Cont'd)

### Display diagnostic trouble code table

<table>
<thead>
<tr>
<th>Diagnostic trouble code No.</th>
<th>Detected items</th>
<th>Malfunction is detected when ...</th>
<th>Check item (remedy)</th>
</tr>
</thead>
</table>
| 11*                         | Camshaft position 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. | Harness and connector  
(If harness and connector are normal, replace camshaft position sensor.) |
| 12                          | Mass air flow sensor circuit    | • The mass air flow sensor circuit is open or shorted.  
(An abnormally high or low voltage is entered.) | Harness and connector  
|                              |                              |                   | Engine coolant temperature sensor |
| 13                          | Engine coolant temperature sensor circuit | • The engine coolant temperature sensor circuit is open or shorted.  
(An abnormally high or low output voltage is entered.) | Harness and connector  
|                              |                              |                   | Engine coolant temperature sensor |
| 21*                         | Ignition signal circuit        | • The ignition signal in the primary circuit is not entered during engine cranking or running. | Harness and connector  
|                              |                              |                   | Power transistor unit |
| 26                          | Boost pressure sensor circuit  | • The boost pressure sensor circuit is open or shorted.  
(An abnormally high or low output voltage is entered.) | Harness and connector  
|                              |                              |                   | Boost pressure sensor |
| 34                          | Knock sensor circuit           | • The knock sensor circuit is open or shorted.  
(An abnormally high or low voltage is entered.) | Harness and connector  
|                              |                              |                   | Knock sensor |
| 43                          | Throttle position sensor circuit | • The throttle position sensor circuit is open or shorted.  
(An abnormally high or low voltage is entered.) | Harness and connector  
|                              |                              |                   | Throttle position sensor |
| 54                          | Signal circuit from A/T control unit to ECM (A/T only) | • The A/T communication line is open or shorted. | Harness and connector |

*: Check items causing a malfunction of camshaft position sensor circuit first, if both "CAMSHAFT POSITION SENSOR (No. 11)" and "IGN SIGNAL-PRIMARY (No. 21)" are displayed one after the other.

**: Check items causing a malfunction of camshaft position sensor circuit first, if both "CAMSHAFT POSITION SENSOR (No. 11)" and "IGN SIGNAL-PRIMARY (No. 21)" are displayed one after the other.
TROUBLE DIAGNOSES

On-board Diagnostic System — Diagnostic Test Mode II (Self-diagnostic results) (Cont’d)

HOW TO ERASE DIAGNOSTIC TEST MODE II (SELF-DIAGNOSTIC RESULTS)

The diagnostic trouble code is erased from the backup memory on the ECM when the diagnostic test mode is changed from Diagnostic Test Mode II to Diagnostic Test Mode I. (Refer to "HOW TO SWITCH DIAGNOSTIC TEST MODES".)

- When the battery terminal is disconnected, the diagnostic trouble code will be lost from the backup memory within 24 hours.
- Do not erase the stored memory before beginning diagnostic test mode II (Self-diagnostic results).

On-board Diagnostic System — Diagnostic Test Mode II (Heated oxygen sensor monitor)

DESCRIPTION

In this mode, the MALFUNCTION INDICATOR LAMP displays the condition of the fuel mixture (lean or rich) which is monitored by the heated oxygen sensor.

<table>
<thead>
<tr>
<th>MALFUNCTION INDICATOR LAMP</th>
<th>Fuel mixture condition in the exhaust gas</th>
<th>Air fuel ratio feedback control condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>Lean</td>
<td>Closed loop system</td>
</tr>
<tr>
<td>OFF</td>
<td>Rich</td>
<td>Open loop system</td>
</tr>
<tr>
<td>*Remains ON or OFF</td>
<td>Any condition</td>
<td></td>
</tr>
</tbody>
</table>

*: Maintain conditions just before switching to open loop.

HOW TO CHECK HEATED OXYGEN SENSOR

1. Set Diagnostic Test Mode II. (Refer to "HOW TO SWITCH DIAGNOSTIC TEST MODES''.)
2. Start engine and warm it up until engine coolant temperature indicator points to the middle of the gauge.
3. Run engine at about 2,000 rpm for about 2 minutes under no-load conditions.
4. Make sure MALFUNCTION INDICATOR LAMP goes ON and OFF more than 5 times every 10 seconds; measured at 2,000 rpm under no-load.

EC-52
Consult

CONSULT INSPECTION PROCEDURE
1. Turn off ignition switch.
2. Connect "CONSULT" to data link connector for CONSULT. (Data link connector for CONSULT is located behind the fuse box cover.)

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

5. Touch "ENGINE".

6. Perform each diagnostic test mode according to the inspection sheet as follows:
   For further information, read the CONSULT Operation Manual.
# TROUBLE DIAGNOSES
## Consult (Cont'd)

## ECCS COMPONENT PARTS APPLICATION

<table>
<thead>
<tr>
<th>ECCS COMPONENT PARTS</th>
<th>WORK SUPPORT</th>
<th>SELF-DIAGNOSTIC RESULTS</th>
<th>DATA MONITOR</th>
<th>ACTIVE TEST</th>
<th>FUNCTION TEST</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INPUT</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Camshaft position sensor</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mass air flow sensor</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Engine coolant temperature sensor</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Heated oxygen sensors</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vehicle speed sensors</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Throttle position sensor</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Knock sensor</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boost pressure sensor</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ignition switch (start signal)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Air conditioner switch</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Park/Neutral position switch</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Power steering oil pressure switch</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Battery</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A/T signal</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>OUTPUT</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Injectors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power transistor (ignition timing)</td>
<td>X</td>
<td>X (ignition signal)</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>IACV-AAC valve</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Valve timing control solenoid valve</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>EGRC-solenoid valve</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Air conditioner relay</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuel pump relay</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cooling fan relay</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wastegate valve control solenoid valve</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

X: Applicable

## FUNCTION

<table>
<thead>
<tr>
<th>Diagnostic test mode</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work support</td>
<td>This mode enables a technician to adjust some devices faster and more accurately by following the indications on the CONSULT unit.</td>
</tr>
<tr>
<td>Self-diagnostic results</td>
<td>Self-diagnostic results can be read and erased quickly.</td>
</tr>
<tr>
<td>Data monitor</td>
<td>Input/Output data in the ECM can be read.</td>
</tr>
<tr>
<td>Active test</td>
<td>Diagnostic Test Mode in which CONSULT drives some actuators apart from the ECMs and also shifts some parameters in a specified range.</td>
</tr>
<tr>
<td>ECM part number</td>
<td>ECM part number can be read.</td>
</tr>
<tr>
<td>Function test</td>
<td>Conducted by CONSULT instead of a technician to determine whether each system is &quot;OK&quot; or &quot;NG&quot;.</td>
</tr>
</tbody>
</table>

EC-54
## TROUBLE DIAGNOSES

### Consult (Cont’d)

### WORK SUPPORT MODE

<table>
<thead>
<tr>
<th>WORK ITEM</th>
<th>CONDITION</th>
<th>USAGE</th>
</tr>
</thead>
</table>
| THRTL POS SEN ADJ (THROTTLE SENSOR ADJUSTMENT) | CHECK THE THROTTLE POSITION SENSOR SIGNAL. ADJUST IT TO THE SPECIFIED VALUE BY ROTATING THE SENSOR BODY UNDER THE FOLLOWING CONDITIONS.  
- IGN SW “ON”  
- ENG NOT RUNNING  
- ACC PEDAL NOT PRESSED | When adjusting throttle position sensor initial position |
| IGNITION TIMING ADJUSTMENT | IGNITION TIMING FEEDBACK CONTROL WILL BE HELD BY TOUCHING “START”. AFTER DOING SO, ADJUST IGNITION TIMING WITH A TIMING LIGHT BY TURNING THE CAMSHAFT POSITION SENSOR. | When adjusting initial ignition timing |
| IACV-AAC VALVE ADJ (AAC VALVE ADJUSTMENT) | SET ENGINE RPM AT THE SPECIFIED VALUE UNDER THE FOLLOWING CONDITIONS.  
- ENGINE WARMED UP  
- NO-LOAD | When adjusting idle speed |
| FUEL PRESSURE RELEASE | FUEL PUMP WILL STOP BY TOUCHING “START” DURING IDLE. CRANK A FEW TIMES AFTER ENGINE STALLS. | When releasing fuel pressure from fuel line |

### SELF-DIAGNOSTIC RESULTS MODE

<table>
<thead>
<tr>
<th>DIAGNOSTIC ITEM</th>
<th>DIAGNOSTIC ITEM IS DETECTED WHEN ...</th>
<th>CHECK ITEM (REMEDY)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAMSHAFT POSI SEN* (CRANK ANGLE SENSOR*)</td>
<td>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.</td>
<td>Harness and connector (If harness and connector are normal, replace camshaft position sensor.)</td>
</tr>
<tr>
<td>MASS AIR FLOW SEN (AIR FLOW METER)</td>
<td>The mass air flow sensor circuit is open or shorted. (An abnormally high or low voltage is entered.)</td>
<td>Harness and connector (If harness and connector are normal, replace mass air flow sensor.)</td>
</tr>
</tbody>
</table>
| COOLANT TEMP SEN (ENGINE TEMP SENSOR) | The engine coolant temperature sensor circuit is open or shorted. (An abnormally high or low output voltage is entered.) | Harness and connector  
- Engine coolant temperature sensor  
- Power transistor unit |
| IGN SIGNAL — PRIMARY* | The ignition signal in primary circuit is not entered during engine cranking or running. | Harness and connector |
| KNOCK SENSOR (DETONATION SENSOR) | The knock sensor circuit is open or shorted. (An abnormally high or low voltage is entered.) | Harness and connector  
- Knock sensor  
- Throttle position sensor |
| THROTTLE POSI SEN (THROTTLE SENSOR) | The throttle position sensor circuit is open or shorted. (An abnormally high or low voltage is entered.) | Harness and connector |
| A/T COMM LINE | The A/T communication line is open or shorted. | Harness and connector |

* Check items causing a malfunction of camshaft position sensor circuit first, if both “CAMSHAFT POSI SEN (No. 11)” and “IGN SIGNAL-PRIMARY (No. 21)” are displayed one after the other.

- Sensor failures which set a self-diagnosis code are listed as due to an open or short circuit.
- A sensor sending a signal which is inaccurate but not open or short will NOT set a self-diagnosis code.
- If a driveability symptom is present but no self-diagnosis code is set, perform further inspections using DATA MONITOR.
### TROUBLE DIAGNOSES

#### DATA MONITOR MODE

**Consult (Cont’d)**

**Remarks:**
- Specification data are reference values.
- Specification data are output/input values which are detected or supplied by ECM at the connector.
- Specification data may not be directly related to their components' signals/values/operations.
- Adjust ignition timing with a timing light before monitoring IGN TIMING, because the monitor may show the specification data in spite of the ignition timing being not adjusted to the specification data. This IGN TIMING monitors the calculated data by ECM according to the input signals from camshaft position sensor and other ignition timing related sensors.
- If the real-time diagnosis results are NG and the self-diagnostic results are OK when diagnosing the mass air flow sensor, first check to see if the fuel pump control circuit is normal.

<table>
<thead>
<tr>
<th>MONITOR ITEM</th>
<th>CONDITION</th>
<th>SPECIFICATION</th>
<th>CHECK ITEM WHEN OUTSIDE SPEC.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMPS RPM (REF) (CAS-RPM (REF))</td>
<td>• Tachometer: Connect</td>
<td>Almost the same speed as the CONSULT value.</td>
<td>• Harness and connector</td>
</tr>
<tr>
<td></td>
<td>• Run engine and compare tachometer indication with the CONSULT value.</td>
<td></td>
<td>• Camshaft position sensor</td>
</tr>
<tr>
<td>MAS AIR/ FL SE (AIR FLOW MTR)</td>
<td>• Engine: After warming up, idle the engine</td>
<td>Idle 0.8 - 1.5V</td>
<td>• Harness and connector</td>
</tr>
<tr>
<td></td>
<td>• A/C switch &quot;OFF&quot;</td>
<td></td>
<td>• Mass air flow sensor</td>
</tr>
<tr>
<td></td>
<td>• Selector lever “N” position</td>
<td>1.4 - 2.0V</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• No-load</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3,000 rpm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>COOLANT TEMPS (ENG TEMP SEN)</td>
<td>• Engine: After warming up</td>
<td>More than 70°C (158°F)</td>
<td>• Harness and connector</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Engine coolant temperature sensor</td>
</tr>
<tr>
<td>O2 SEN (EXH GAS SEN)</td>
<td>• Engine: After warming up</td>
<td>Maintaining engine speed at 2,000 rpm LEAN → RICH Changes more than 5 times during 10 seconds</td>
<td>• Harness and connector</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Heated oxygen sensor</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Intake air leaks</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Injectors</td>
</tr>
<tr>
<td>M/R F/C MNT</td>
<td>• Turn drive wheels and compare speedometer indication with the CONSULT value</td>
<td>Almost the same speed as the CONSULT value</td>
<td>• Harness and connector</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Vehicle speed sensor</td>
</tr>
<tr>
<td>BATTERY VOLT</td>
<td>• Ignition switch: ON (Engine stopped)</td>
<td>11 - 14V</td>
<td>• Battery</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• ECM power supply circuit</td>
</tr>
<tr>
<td>THRTL POS SEN (THROTTLE SEN)</td>
<td>• Ignition switch: ON (Engine stopped)</td>
<td>Throttle valve fully closed (Engine: After warming up) 0.35 - 0.65V</td>
<td>• Harness and connector</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Throttle valve fully open Approx. 4.0V</td>
<td>• Throttle position sensor</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Throttle position sensor adjustment</td>
</tr>
<tr>
<td>START SIGNAL</td>
<td>• Ignition switch: ON → START</td>
<td>OFF → ON</td>
<td>• Harness and connector</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Starter switch</td>
</tr>
<tr>
<td>CLOSED TH/POS (IDLE POSITION)</td>
<td>• Ignition switch: ON (Engine stopped)</td>
<td>Throttle valve: Closed throttle position (Engine: After warming up) ON</td>
<td>• Harness and connector</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Throttle valve: Slightly open OFF</td>
<td>• Throttle position sensor</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Throttle position sensor adjustment</td>
</tr>
<tr>
<td>AIR COND SIG</td>
<td>• Engine: After warming up, idle the engine</td>
<td>A/C switch &quot;OFF&quot; OFF A/C switch &quot;ON&quot; ON</td>
<td>• Harness and connector</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Air conditioner switch</td>
</tr>
<tr>
<td>NEUT POSI SW (NEUTRAL SW)</td>
<td>• Ignition switch: ON</td>
<td>Shift lever “P” or “N” ON Except above OFF</td>
<td>• Harness and connector</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Neutral position switch</td>
</tr>
<tr>
<td>PW/ST SIGNAL</td>
<td>• Engine: After warming up, idle the engine</td>
<td>Steering wheel in neutral position (forward direction) OFF</td>
<td>• Harness and connector</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The steering wheel is turned ON</td>
<td>• Power steering oil pressure switch</td>
</tr>
<tr>
<td>MONITOR ITEM</td>
<td>CONDITION</td>
<td>SPECIFICATION</td>
<td>CHECK ITEM WHEN OUTSIDE SPEC.</td>
</tr>
<tr>
<td>----------------------</td>
<td>----------------------------------</td>
<td>------------------------</td>
<td>----------------------------------------------------------</td>
</tr>
<tr>
<td>INJ PULSE</td>
<td>• Engine: After warming up</td>
<td>1.7 - 2.5 msec.</td>
<td>• Harness and connector</td>
</tr>
<tr>
<td></td>
<td>• A/C switch &quot;OFF&quot;</td>
<td></td>
<td>• Injector</td>
</tr>
<tr>
<td></td>
<td>• Selector lever &quot;N&quot; position</td>
<td>1.5 - 2.3 msec.</td>
<td>• Mass air flow sensor</td>
</tr>
<tr>
<td></td>
<td>• No-load</td>
<td></td>
<td>• Intake air system</td>
</tr>
<tr>
<td></td>
<td>Idle</td>
<td>2,000 rpm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2,000 rpm</td>
<td>More than 25° BTDC</td>
<td></td>
</tr>
<tr>
<td>IGN TIMING</td>
<td>ditto</td>
<td>15° BTDC</td>
<td>• Harness and connector</td>
</tr>
<tr>
<td></td>
<td>Idle</td>
<td></td>
<td>• Camshaft position sensor</td>
</tr>
<tr>
<td></td>
<td>2,000 rpm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IACV-AAC/VC (AAC VALVE)</td>
<td>ditto</td>
<td>20 - 40%</td>
<td>• Harness and connector</td>
</tr>
<tr>
<td></td>
<td>Idle</td>
<td>2,000 rpm</td>
<td>• IACV-AAC valve</td>
</tr>
<tr>
<td></td>
<td>Maintaining engine</td>
<td>75 - 125%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>speed at 2,000 rpm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A/F ALPHA</td>
<td>• Engine: After warming up</td>
<td></td>
<td>• Harness and connector</td>
</tr>
<tr>
<td></td>
<td>Maintaining engine</td>
<td></td>
<td>• Air conditioner switch</td>
</tr>
<tr>
<td></td>
<td>speed at 2,000 rpm</td>
<td>75 - 125%</td>
<td>• Air conditioner relay</td>
</tr>
<tr>
<td></td>
<td>Maintaining engine speed at 2,000 rpm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AIR COND RLY</td>
<td>Engine: After warming up, idle</td>
<td>OFF -&gt; ON</td>
<td>• Harness and connector</td>
</tr>
<tr>
<td></td>
<td>the engine</td>
<td></td>
<td>• Air conditioner switch</td>
</tr>
<tr>
<td></td>
<td>Air conditioner switch OFF</td>
<td></td>
<td>• Air conditioner relay</td>
</tr>
<tr>
<td></td>
<td>ON</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>OFF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FUEL PUMP RLY</td>
<td>• Ignition switch is turned</td>
<td></td>
<td>• Harness and connector</td>
</tr>
<tr>
<td></td>
<td>to ON (Operates for 1</td>
<td></td>
<td>• Fuel pump relay</td>
</tr>
<tr>
<td></td>
<td>second)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Engine running and cranking</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• When engine is stopped (stops</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>in 1 second)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Except as shown above</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Idle</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>OFF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VALVE TIM SOL</td>
<td>• Jack up rear wheel</td>
<td></td>
<td>• Harness and connector</td>
</tr>
<tr>
<td></td>
<td>• Engine: After warming up</td>
<td></td>
<td>• Valve timing solenoid valve</td>
</tr>
<tr>
<td></td>
<td>• Shift selector lever to any</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>position except &quot;N&quot; or &quot;P&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>position</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Quickly depress accelerator</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>pedal, then quickly release it</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Idle</td>
<td>OFF -&gt; ON -&gt; OFF</td>
<td></td>
</tr>
<tr>
<td>COOLING FAN</td>
<td>• When cooling fan is stopped.</td>
<td>OFF</td>
<td>• Harness and connector</td>
</tr>
<tr>
<td>(RADIATOR FAN)</td>
<td></td>
<td></td>
<td>• Cooling fan relay</td>
</tr>
<tr>
<td></td>
<td>• When cooling fan operates at</td>
<td>LOW</td>
<td>• Cooling fan motor</td>
</tr>
<tr>
<td></td>
<td>low speed</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• When cooling fan operates at</td>
<td>HI</td>
<td></td>
</tr>
<tr>
<td></td>
<td>high speed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EGRC SOL/V (EGR CONTO S/V)</td>
<td>• Engine: After warming up</td>
<td>ON</td>
<td>• Harness and connector</td>
</tr>
<tr>
<td></td>
<td>• A/C switch &quot;OFF&quot;</td>
<td></td>
<td>• EGRC-solenoid valve</td>
</tr>
<tr>
<td></td>
<td>• Shift lever &quot;N&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• No-load</td>
<td>2,000 rpm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Idle</td>
<td>OFF</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Racing up to 4,000 rpm</td>
<td>0%</td>
<td>• Harness and connector</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20%</td>
<td>• Wastegate valve control solenoid valve</td>
</tr>
</tbody>
</table>

EC-57
# TROUBLE DIAGNOSES

## Consult (Cont'd)

### ACTIVE TEST MODE

<table>
<thead>
<tr>
<th>TEST ITEM</th>
<th>CONDITION</th>
<th>JUDGEMENT</th>
<th>CHECK ITEM (REMEDY)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FUEL INJECTION</td>
<td>• Engine: Return to the original trouble condition</td>
<td>If trouble symptom disappears, see CHECK ITEM.</td>
<td>• Harness and connector</td>
</tr>
<tr>
<td></td>
<td>• Change the amount of fuel injection with the CONSULT.</td>
<td></td>
<td>• Fuel injectors</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Heated oxygen sensors</td>
</tr>
<tr>
<td>IACV-AAC/V OPENING</td>
<td>• Engine: After warming up, idle the engine.</td>
<td>Engine speed changes according to the opening percent.</td>
<td>• Harness and connector</td>
</tr>
<tr>
<td>(AAC/V OPENING)</td>
<td>• Change the IACV-AAC valve opening percent with the CONSULT.</td>
<td></td>
<td>• IACV-AAC valve</td>
</tr>
<tr>
<td>ENG COOLANT TEMP</td>
<td>• Engine: Return to the original trouble condition</td>
<td>If trouble symptom disappears, see CHECK ITEM.</td>
<td>• Harness and connector</td>
</tr>
<tr>
<td>(ENGINE TEMPERATURE)</td>
<td>• Change the engine coolant temperature with the CONSULT.</td>
<td></td>
<td>• Engine coolant temperature sensor</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Fuel injectors</td>
</tr>
<tr>
<td>IGNITION TIMING</td>
<td>• Engine: Return to the original trouble condition</td>
<td>If trouble symptom disappears, see CHECK ITEM.</td>
<td>• Adjust initial ignition timing</td>
</tr>
<tr>
<td></td>
<td>• Timing light: Set</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Retard the ignition timing with the CONSULT.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>POWER BALANCE</td>
<td>• Engine: After warming up, idle the engine.</td>
<td>Engine runs rough or dies.</td>
<td>• Harness and connector</td>
</tr>
<tr>
<td></td>
<td>• A/C switch “OFF”</td>
<td></td>
<td>• Compression</td>
</tr>
<tr>
<td></td>
<td>• Selector lever “N” position</td>
<td></td>
<td>• Injectors</td>
</tr>
<tr>
<td></td>
<td>• Cut off each injector signal one at a time with the CONSULT.</td>
<td></td>
<td>• Power transistor</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Spark plugs</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Ignition coils</td>
</tr>
<tr>
<td>COOLING FAN</td>
<td>• Ignition switch: ON</td>
<td>Cooling fan moves at low and high speed, and stops.</td>
<td>• Harness and connector</td>
</tr>
<tr>
<td>(RADIATOR FAN)</td>
<td>• Turn cooling fan “LOW”, “HI” and “OFF” with CONSULT</td>
<td></td>
<td>• Cooling fan relay</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Cooling fan motor</td>
</tr>
<tr>
<td>FUEL PUMP RELAY</td>
<td>• Ignition switch: ON (Engine stopped)</td>
<td>Fuel pump relay makes the operating sound.</td>
<td>• Harness and connector</td>
</tr>
<tr>
<td></td>
<td>• Turn the fuel pump relay “ON” and “OFF” with the CONSULT and listen to operating sound.</td>
<td></td>
<td>• Fuel pump relay</td>
</tr>
<tr>
<td>EGRC SOLENOID VALVE</td>
<td>• Ignition switch: ON</td>
<td>Each solenoid valve makes an operating sound.</td>
<td>• Harness and connector</td>
</tr>
<tr>
<td>(EGR CONT SOL VALVE)</td>
<td>• Turn solenoid valve “ON” and “OFF” with the CONSULT and listen to operating sound.</td>
<td></td>
<td>• Solenoid valve</td>
</tr>
<tr>
<td>VALVE TIM SOL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SELF-LEARNING CONT.</td>
<td>• In this test, the coefficient of self-learning control mixture ratio returns to the original coefficient by touching “CLEAR” on the screen.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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## TROUBLE DIAGNOSES

### Consult (Cont'd)

### FUNCTION TEST MODE

<table>
<thead>
<tr>
<th>FUNCTION TEST ITEM</th>
<th>CONDITION</th>
<th>JUDGEMENT</th>
<th>CHECK ITEM (REMEDY)</th>
</tr>
</thead>
</table>
| **SELF-DIAG RESULTS** | • Ignition switch: ON (Engine stopped)  
  • Displays the self-diagnostic results. | - | Objective system |
| **CLOSED THROTTLE POSI**  
 **(CLOSED THROTTLE POSITION SWITCH CIRCUIT)**  
 **(IDLE POSITION (IDLE SWITCH CIRCUIT))** | • Ignition switch: ON (Engine stopped)  
  • Closed throttle position switch circuit is tested when throttle is opened and closed fully.  
  (**"CLOSED THROTTLE POSI" is the test item name for the vehicles in which idle is selected by throttle position sensor.**) | Throttle valve: opened | OFF  
  • Harness and connector  
  • Throttle position sensor (Closed throttle position switch)  
  • Throttle position sensor (Closed throttle position switch) adjustment  
  • Throttle linkage  
  • Verify operation in DATA MONITOR mode. |
| **THROTTLE POSI SEN CKT**  
 **(THROTTLE SENSOR CKT)** | • Ignition switch: ON (Engine stopped)  
  • Throttle position sensor circuit is tested when throttle is opened and closed fully. | Range (Throttle valve fully opened — Throttle valve fully closed) | More than 3.0V  
  • Harness and connector  
  • Throttle position sensor  
  • Throttle position sensor adjustment  
  • Throttle linkage  
  • Verify operation in DATA MONITOR mode. |
| **NEUTRAL POSI SW CKT**  
 **(NEUTRAL SW CIRCUIT)** | • Ignition switch: ON (Engine stopped)  
  • Neutral position switch circuit is tested when shift lever is manipulated. | OUT OF N/P-POSITION | OFF  
  • Harness and connector  
  • Neutral position switch/ inhibitor switch  
  • Linkage + inhibitor switch adjustment |
| **FUEL PUMP CIRCUIT** | • Ignition switch: ON (Engine stopped)  
  • Fuel pump circuit is tested by checking the pulsation in fuel pressure when fuel tube is pinched. | There is pressure pulsation on the fuel feed hose. | -  
  • Harness and connector  
  • Fuel pump  
  • Fuel pump relay  
  • Fuel filter clogging  
  • Fuel level |
| **EGRC SOL/V CIRCUIT**  
 **(EGR CONT S/V CIRCUIT)** | • Ignition switch: ON (Engine stopped)  
  • EGR control S/V circuit is tested by checking solenoid valve operating noise. | The solenoid valve makes an operating sound every 3 seconds. | -  
  • Harness and connector  
  • EGRG-solenoid valve |
| **VALVE TIMING S/V CKT** | • Ignition switch: ON (Engine stopped)  
  • Valve timing S/V circuit is tested by checking solenoid valve operating noise. | The solenoid valve makes an operating sound every 3 seconds. | -  
  • Harness and connector  
  • Valve timing solenoid valve |
| **COOLING FAN CIRCUIT**  
 **(RADIATOR FAN CIRCUIT)** | • Ignition switch: ON (Engine stopped)  
  • Cooling fan circuit is tested by checking cooling fan operation. | • The cooling fan rotates and stops every 3 seconds. | -  
  • Harness and connector  
  • Cooling fan relay  
  • Cooling fan motor |

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### TROUBLE DIAGNOSES

#### Consult (Cont’d)

<table>
<thead>
<tr>
<th>FUNCTION TEST ITEM</th>
<th>CONDITION</th>
<th>JUDGEMENT</th>
<th>CHECK ITEM (REMEDY)</th>
</tr>
</thead>
</table>
| **START SIGNAL CIRCUIT** | • Ignition switch: ON → START  
• Start signal circuit is tested when engine is started by operating the starter. Battery voltage and water temperature before cranking, and average battery voltage, mass air flow sensor output voltage and cranking speed during cranking are displayed. | Start signal: OFF → ON | • Harness and connector  
• Ignition switch |
| **PW/ST SIGNAL CIRCUIT** | • Ignition switch: ON  
(Engine running)  
• Power steering circuit is tested when steering wheel is rotated fully and then set to a straight line running position. | Locked position | ON | • Harness and connector  
• Power steering oil pressure switch  
• Power steering oil pump |
| **VEHICLE SPEED SEN CKT (CAR SPEED SEN CIRCUIT)** | • Vehicle speed sensor circuit is tested when vehicle is running at a speed of 10 km/h (6 mph) or higher. | Vehicle speed sensor input signal is greater than 4 km/h (2 MPH) | | • Harness and connector  
• Vehicle speed sensor  
• Electric speedometer |
| **IGN TIMING ADJ** | • After warming up, idle the engine.  
• Ignition timing adjustment is checked by reading ignition timing with a timing light and checking whether it agrees with specifications. | The timing light indicates the same value on the screen. | | • Adjust ignition timing (by moving camshaft position sensor or distributor)  
• Camshaft position sensor drive mechanism |
| **MIXTURE RATIO TEST** | • Air-fuel ratio feedback circuit (injection system, ignition system, vacuum system, etc.) is tested by examining the heated oxygen sensor output at 2,000 rpm under non-loaded state. | • O2 SEN COUNT: More than 5 times during 10 seconds | | • INJECTION SYS (Injector, fuel pressure regulator, harness or connector)  
• IGNITION SYS (Spark plug, power transistor, ignition coil, harness or connector)  
• VACUUM SYS (Intake air leaks)  
• Heated oxygen sensor circuit  
• Heated oxygen sensor operation  
• Fuel pressure high or low  
• Mass air flow sensor |
TROUBLE DIAGNOSES
Consult (Cont'd)

<table>
<thead>
<tr>
<th>FUNCTION TEST ITEM</th>
<th>CONDITION</th>
<th>JUDGEMENT</th>
<th>CHECK ITEM (REMEDY)</th>
</tr>
</thead>
</table>
| POWER BALANCE      | • After warming up, idle the engine.  
• Injector operation of each cylinder is stopped one after another, and resultant change in engine rotation is examined to evaluate combustion of each cylinder. (This is only displayed for models where sequential multiport fuel injection system is used.) | Difference in engine speed is greater than 25 rpm before and after cutting off the injector of each cylinder. | • Injector circuit (injector, harness or connector)  
• Ignition circuit (Spark plug, power transistor, ignition coil, harness or connector)  
• Compression  
• Valve timing |
| IACV-AAC/V SYSTEM (AAC VALVE SYSTEM) | • After warming up, idle the engine.  
• IACV-AAC valve system is tested by detecting change in engine speed when IACV-AAC valve opening is changed to 0%, 20% and 80%. | Difference in engine speed is greater than 150 rpm between when valve opening is at 80% (102 steps) and at 20% (25 steps). | • Harness and connector  
• IACV-AAC valve  
• Air passage restriction between air inlet and IACV-AAC valve  
• IAS (Idle adjusting screw) adjustment |

Diagnostic Procedure

CAUTION:
1. Before connecting or disconnecting the ECM harness connector, turn ignition switch OFF and disconnect negative battery terminal. Failure to do so may damage the ECM. Because battery voltage is applied to ECM even if ignition switch is turned off.

2. When connecting ECM harness connector, tighten securing bolt until red projection is in line with connector face.

3. When connecting or disconnecting pin connectors into or from ECM, take care not to damage pin terminals (bend or break).

4. Make sure that there are not any bends or breaks on ECM pin terminal, when connecting pin connectors.
TROUBLE DIAGNOSES

Diagnostic Procedure (Cont’d)

5. Before replacing ECM, perform ECM input/output signal inspection and make sure whether ECM functions properly or not. (See page EC-196.)

6. After performing this “Diagnostic Procedure”, perform diagnostic test mode II (Self-diagnostic results) and driving test.

7. When measuring ECM signals with a circuit tester, never bring the two tester probes into contact. Accidental contact of probes will cause a short circuit and damage the ECM power transistor.
**Basic Inspection**

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

**CONNECT CONSULT TO THE VEHICLE.**
Connect "CONSULT" to the data link connector for CONSULT and select "ENGINE" from the menu. (Refer to page EC-53.)

**DOES ENGINE START?**
- **Yes**
- **No** Go to **3**.

**CHECK IGNITION TIMING.**
Warm up engine sufficiently and check ignition timing at idle using timing light. (Refer to page EC-33.)

- **Ignition timing: 15°±2° BTDC**
- **OK**
- **NG** Adjust ignition timing by turning camshaft position sensor.

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

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TROUBLE DIAGNOSES

Basic Inspection (Cont’d)

5. CHECK IDLE ADJ. SCREW INITIAL SET RPM.
   1. Select “IGN TIMING ADJ.” in “WORK SUPPORT” mode.
   2. When touching “START”, does engine speed fall to 750 ± 50 rpm (A/T in “N” position)?
      OR
      When disconnecting throttle position sensor harness connector, does engine speed fall to
      750 ± 50 rpm (A/T in “N” position)?

6. CHECK THROTTLE POSITION SENSOR IDLE POSITION.
   1. Perform “THROTTLE SEN ADJ.” or “THRTL POS SEN ADJ.” in “WORK SUPPORT” mode.
   2. Check that output voltage of throttle position sensor is 0.35 to 0.65V. (Throttle valve fully
      closes.) and “IDLE POSITION” or “CLOSED TH/POS” stays “ON”.
   OR
      Measure output voltage of throttle position sensor using voltmeter, and check that it is
      0.35 to 0.65V. (Throttle valve fully closed.)

Adjust engine speed by turning idle adjusting screw.

1. Adjust output voltage by rotating throttle position sensor body.
2. Disconnect throttle position sensor harness connector for a few seconds and then reconnect it.
3. Confirm that “IDLE POSITION” or “CLOSED TH/POS” stays “ON”.

(Go to (b) on next page.)

EC-64
### TROUBLE DIAGNOSES

#### Basic Inspection (Cont'd)

#### CHECK SWITCH INPUT SIGNAL.
- Select the following switches in "[DATA MONITOR]" mode,
  - a) Start signal,
  - b) Idle position or closed throttle position,
  - c) Air conditioner signal,
  - d) Neutral (Parking) position switch, and check the switches' ON-OFF operation.
- OR
- Remove ECM from front dash side and check the above switches' ON-OFF operation using voltmeter at each ECM terminal.

<table>
<thead>
<tr>
<th>Switch</th>
<th>Condition</th>
<th>Voltage (V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start signal</td>
<td>IGN ON → IGN START</td>
<td>0 → Battery voltage</td>
</tr>
<tr>
<td>Closed throttle position</td>
<td>Accelerator pedal released</td>
<td>0.35 - 0.65 → Approx. 4.0</td>
</tr>
<tr>
<td></td>
<td>→ Accelerator pedal fully depressed</td>
<td></td>
</tr>
<tr>
<td>A/C signal</td>
<td>A/C OFF → A/C ON (Engine running)</td>
<td>Battery voltage → Approx. 0</td>
</tr>
<tr>
<td>Neutral (Parking) position</td>
<td>Selector lever is &quot;N&quot; or &quot;P&quot; position</td>
<td>0 → 4.0 - 5.0</td>
</tr>
<tr>
<td>switch</td>
<td>→ Except &quot;N&quot; and &quot;P&quot; position</td>
<td></td>
</tr>
</tbody>
</table>

#### READ SELF-DIAGNOSTIC RESULTS.
1. Perform "SELF-DIAG RESULTS" mode.
2. Read out self-diagnostic results
3. Is a failure detected?
   - OR
   1. Set Diagnostic Test Mode II. (Self-diagnostic results) (Refer to page EC-50.)
   2. Count the number of malfunction indicator lamp flashes and read out the diagnostic trouble codes.
   3. Are the diagnostic trouble codes being output?

---

**EC-65**
# TROUBLE DIAGNOSES

## How to Execute On-board Diagnostic System In Diagnostic Test Mode II

<table>
<thead>
<tr>
<th>Detected items</th>
<th>Display Diagnostic trouble code No.</th>
<th>How to perform diagnostic test mode II (Self-diagnostic results) judgement</th>
<th>Illustration</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Camshaft position sensor circuit</td>
<td>11</td>
<td><img src="image" alt="MONITOR" /> <img src="image" alt="NO FAIL" /></td>
<td><img src="image" alt="CHECK" /></td>
<td>PERFORM DIAGNOSTIC TEST MODE II (SELF-DIAGNOSTIC RESULTS).&lt;br&gt;1) Start engine.&lt;br&gt;2) Select “DATA MONITOR” mode with CONSULT.&lt;br&gt;☆ NO FAIL OR</td>
</tr>
<tr>
<td>Mass air flow sensor circuit</td>
<td>12</td>
<td><img src="image" alt="MONITOR" /> <img src="image" alt="NO FAIL" /></td>
<td><img src="image" alt="CHECK" /></td>
<td><img src="image" alt="MONITOR" /> <img src="image" alt="NO FAIL" /></td>
</tr>
</tbody>
</table>
## TROUBLE DIAGNOSES

### How to Execute On-board Diagnostic System in Diagnostic Test Mode II (Cont’d)

<table>
<thead>
<tr>
<th>Detected items</th>
<th>Display Diagnostic trouble code No.</th>
<th>How to perform diagnostic test mode II (Self-diagnostic results) judgement</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine coolant</td>
<td>13</td>
<td><img src="image1" alt="Diagram" /></td>
<td></td>
</tr>
<tr>
<td>temperature sensor</td>
<td></td>
<td>PERFORM DIAGNOSTIC TEST MODE II (SELF-DIAGNOSTIC RESULTS).</td>
<td></td>
</tr>
<tr>
<td>circuit</td>
<td></td>
<td>1) Turn ignition switch “ON” or start engine.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2) Select “DATA MONITOR” mode with CONSULT.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><img src="image2" alt="Diagram" /></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>OR</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2) Perform diagnostic test mode II (Self-diagnostic results) with ECM.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Malfunction indicator lamp displays diagnostic trouble code No. 55.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><img src="image3" alt="Diagram" /></td>
<td></td>
</tr>
<tr>
<td>Ignition signal</td>
<td>21</td>
<td><img src="image4" alt="Diagram" /></td>
<td></td>
</tr>
<tr>
<td>circuit</td>
<td></td>
<td>PERFORM DIAGNOSTIC TEST MODE II (SELF-DIAGNOSTIC RESULTS).</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1) Start engine.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2) Select “DATA MONITOR” mode with CONSULT.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><img src="image5" alt="Diagram" /></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>OR</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2) Turn ignition switch “OFF” and then “ON”.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3) Perform diagnostic test mode II (Self-diagnostic results) with ECM.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Malfunction indicator lamp displays diagnostic trouble code No. 55.</td>
<td></td>
</tr>
</tbody>
</table>

* Diagnostic test mode II (Self-diagnostic results) is not performed but this method provides results which are equal to the self-diagnostic results.

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# TROUBLE DIAGNOSES

## How to Execute On-board Diagnostic System in Diagnostic Test Mode II (Cont’d)

<table>
<thead>
<tr>
<th>Detected items</th>
<th>Display Diagnostic trouble code No.</th>
<th>How to perform diagnostic test mode II (Self-diagnostic results) judgement</th>
<th>Illustration</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boost pressure sensor circuit</td>
<td>26 RECORD</td>
<td>PERFORM DIAGNOSTIC TEST MODE II (SELF-DIAGNOSTIC RESULTS).</td>
<td><img src="SEF004Q" alt="CHECK" /></td>
<td>OR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1) Start engine.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2) Select “DATA MONITOR” mode with CONSULT.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3) NO FAIL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knock sensor circuit</td>
<td>34 RECORD</td>
<td>PERFORM DIAGNOSTIC TEST MODE II (SELF-DIAGNOSTIC RESULTS).</td>
<td><img src="SEF004Q" alt="CHECK" /></td>
<td>OR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1) Turn ignition switch “OFF” and then “ON”.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2) Perform diagnostic test mode II (Self-diagnostic results) with ECM.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Malfunction Indicator lamp displays diagnostic trouble code No. 55.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*: Diagnostic test mode II (Self-diagnostic results) is not performed but this method provides results which are equal to the self-diagnostic results.
Diagnostic Procedure 1 — Symptom — High Idling after Warm-up

1. CHECK FAST IDLE CAM.
   Does mark (short line) on fast idle cam align with the pin center of cam follower lever?

   - Yes
   - No
     - Check fast idle cam adjustment. (See page EC-207.)

2. CHECK INTAKE AIR LEAK.
   1. Select "SELF-LEARNING CONT" in "ACTIVE TEST" mode.
   2. Clear the self-learning control coefficient by touching "CLEAR".
   3. Does the engine speed drop?

   - Yes
     - Discover air leak location and repair.
   - No
     - OR
     1. Disconnect mass air flow sensor harness connectors.
     2. After starting and running engine for at least 30 seconds at 2,000 rpm, does the engine speed drop?

   - No
     - Repair throttle linkage or sticking of throttle valve.
   - Yes
     - INSPECTION END
Diagnostic Procedure 2 — Symptom — Hunting

1. **CHECK HEATED OXYGEN SENSORS.**
   When disconnecting heated oxygen sensor harness connectors, is the hunting fixed?
   - Yes: Check heated oxygen sensor(s). (See page EC-152.)
   - No

2. **PERFORM POWER BALANCE TEST.**
   1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
   2. Is there any cylinder which does not produce a momentary engine speed drop?
      - OR
      When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?
   - No: Go to 4.
   - Yes

3. **CHECK SPARK PLUGS.**
   Remove the spark plugs and check for fouling, etc.
   - NG: Repair or replace spark plug(s).
   - OK

4. **CHECK FOR INTAKE AIR LEAK.**
   When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?
   - Yes: Discover air leak location and repair.
   - No: (Go to 4 on next page.)
TROUBLE DIAGNOSES

Diagnostic Procedure 2 — Symptom — Hunting (Cont’d)

5.
CHECK EGR VALVE.
Check EGR valve for sticking.

NG Repair or replace.

OK

INSPECTION END

Diagnostic Procedure 3 — Symptom — Unstable Idle

1.
CHECK EGR VALVE.
Check EGR valve for sticking.

NG Repair or replace.

OK

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

OR

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

3.
CHECK INJECTOR.
Does each injector make an operating sound at idle?

Yes

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

(Go to A on next page.)

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TROUBLE DIAGNOSES

Diagnostic Procedure 3 — Symptom —
Unstable Idle (Cont’d)

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

NG Check ignition coil, power transistor unit and their circuits. (See page EC-120, 202.)

OK

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

NG Repair or replace spark plug(s).

OK

6 CHECK FUEL PRESSURE.
1. Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode in order to release fuel pressure to zero.
2. Install fuel pressure gauge and check fuel pressure.
   At Idle approx. 245 kPa (2.45 bar, 2.5 kg/cm², 36 psi)
   OR
   1. Release fuel pressure to zero.
      (Refer to page EC-206.)
   2. Install fuel pressure gauge and check fuel pressure.

NG Check fuel pump and circuit.

OK

(Go to 8 on next page.)
TROUBLE DIAGNOSES

Diagnostic Procedure 3 — Symptom — Unstable Idle (Cont’d)

7

CHECK HEATED OXYGEN SENSOR.
1. Start engine and warm it up sufficiently.
2. Perform "MIXTURE RATIO TEST" in "FUNCTION TEST" mode.
3. See "M/R F/C MNT" in "Data monitor" mode.
4. Maintaining engine at 2,000 rpm under no-load (engine is warmed up sufficiently), check that the monitor fluctuates between "LEAN" and "RICH" more than 5 times during 10 seconds.
1 cycle: RICH -> LEAN -> RICH
2 cycles: RICH -> LEAN -> RICH
   RICH
   OR

7

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

8

Yes
Discover air leak location and repair.

No
(Go to 6 on next page.)

NG
Replace heated oxygen sensor(s).

MIXTURE RATIO TEST
ACCELERATE TO 2000 RPM AND HOLD THEN TOUCH START

1800 2000 2200

NEXT START

MONITOR
CAS-RPM (REF) 2000rpm
M/R F/C MNT RICH

RECORD

CHECK

8

Blow-by hose
Rocker cover
Pinch
Front

SGF851F
SGF8072

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TROUBLE DIAGNOSES

Diagnostic Procedure 3 — Symptom —
Unstable Idle (Cont’d)

CHECK IDLE ADJ. SCREW CLOGGING.
1. Perform "IGN TIMING ADJ" in "WORK SUPPORT" mode.
2. Can you set engine speed at 750±50 rpm (A/T in "N" position) by turning idle adjusting screw?

OR

1. Disconnect throttle position sensor harness connector.
2. Can you set engine speed at 750±50 rpm (A/T in "N" position) by turning idle adjusting screw?

CHECK COMPRESSION PRESSURE.
- Check compression pressure.
  Standard: kPa (bar, kg/cm², psi)/300 rpm
  981 (9.81, 10.0, 142)
  Minimum: kPa (bar, kg/cm², psi)/300 rpm
  883 (8.83, 9.0, 128)
  Difference between each cylinder: kPa (bar, kg/cm², psi)/300 rpm
  98 (0.98, 1.0, 14)

OK

Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed.

Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

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

EC-75
Diagnostic Procedure 4 — Symptom — Hard to Start or Impossible to Start when the Engine is Cold

1. **CHECK BATTERY AND STARTER.**
   Check battery and starter condition. (Refer to EL section.)
   - NG: Repair or replace.
   - OK:

2. **CHECK FUEL PRESSURE.**
   1. Turn ignition switch “ON”.
   2. Perform “FUEL PUMP RELAY” in “ACTIVE TEST” mode.
   3. Pinch fuel feed hose with fingers.
      Is fuel pressure pulsation felt on the fuel feed hose?
   - OR
      1. Pinch fuel feed hose with fingers.
      2. When cranking the engine, is there any pressure on the fuel feed hose?
   - No: Check fuel pump and circuit. (See page EC-159.)
   - Yes:

3. **CHECK FAST IDLE CAM.**
   When the engine is cold, does mark (long line) on fast idle cam align with the pin center of cam follower lever?
   - No: Check fast idle cam adjustment. (See page EC-207.)
   - Yes:

4. **CHECK IACV-AAC VALVE.**
   When pressing accelerator pedal fully, can you start the engine.
   - Yes: Check IACV-AAC valve and circuit. (See page EC-169.)
   - No:

(Go to 4 on next page.)
TROUBLE DIAGNOSES

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

5 CHECK INJECTOR.
1. Remove camshaft position sensor from engine. (Harness connector should remain connected.)
2. Disconnect power transistor harness connector.
3. Turn ignition switch ON. (Do not start engine.)
4. When rotating camshaft position sensor shaft, does each injector make an operating sound?

   No -> Check injector(s) and circuit(s).

   Yes ->

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

   NG -> Check ignition coil, power transistor unit and their circuits. (See page EC-120, 202.)

   OK ->

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

   NG -> Repair or replace spark plug(s).

   OK ->

CHECK ECM POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EC-105.

   NG -> Repair or replace.

   OK ->

   Disconnect and reconnect harness connectors in the circuit. Then retest.

   Trouble is not fixed.

   Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.
Diagnostic Procedure 5 — Symptom — Hard to Start or Impossible to Start when the Engine is Hot

1. **CHECK FUEL PRESSURE.**
   1. Turn ignition switch "ON".
   2. Perform "FUEL PUMP RELAY" in "ACTIVE TEST" mode.
   3. Pinch fuel feed hose with fingers.
   Is fuel pressure pulsation felt on the fuel feed hose?
   
   OR
   1. Pinch fuel feed hose with fingers.
   2. When cranking the engine, is there any pressure on the fuel feed hose?

   ![Diagram of fuel system]

   
   
   Yes
   
   
   No
   Check fuel pump and circuit. (See page EC-159.)

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

   ![Diagram of fuel control system]

   Yes
   Check fuel properties.

   No

3. **CHECK INJECTOR.**
   Does each injector make an operating sound at idle?

   ![Diagram of injector system]

   Yes

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

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

   ![Diagram of ignition system]

   OK
   (Go to 4 on next page.)

   NG
   Check ignition coil, power transistor unit and circuits.
   (See page EC-120, 202.)
TROUBLE DIAGNOSES

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

A

CHECK ECM POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EC-105

NG Repair or replace.

OK

Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed.

Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.
Diagnostic Procedure 6 — Symptom — Hard to Start or Impossible to Start under Normal Conditions

1. **CHECK BATTERY AND STARTER.**
   Check battery and starter operation.
   (Refer to EL section.)
   - **OK**
   - **NG** Repair or replace.

2. **CHECK FUEL PRESSURE.**
   1. Turn ignition switch "ON".
   2. Perform "FUEL PUMP RELAY" in "ACTIVE TEST" mode.
   3. Pinch fuel feed hose with fingers.
   Is fuel pressure pulsation felt on the fuel feed hose?
   (OR)
   1. Pinch fuel feed hose with fingers.
   2. When cranking the engine, is there any pressure on the fuel feed hose?
   - **Yes**
   - **No** Check fuel pump and circuit (See page EC-159.)

3. **CHECK INJECTOR FOR LEAKAGE.**
   When pressing accelerator pedal fully, can you start the engine.
   - **Yes** Check injector(s) for leakage.
   - **No**

4. **CHECK INJECTOR.**
   1. Remove camshaft position sensor from engine. (Harness connector should remain connected.)
   2. Disconnect power transistor harness connector.
   3. Turn ignition switch ON. (Do not start engine.)
   4. When rotating camshaft position sensor shaft, does each injector make an operating sound?
   - **Yes** (Go to 6 on next page.)
   - **No** Check injectors and circuits.
TROUBLE DIAGNOSES

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

6

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

OK
NG
Check ignition coil, power transistor unit and circuits.
(See page EC-120, 202.)

6

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

OK
NG
Repair or replace spark plug(s).

7

CHECK EGR VALVE.
Check EGR valve for sticking.

OK
NG
Repair or replace.

CHECK ECM POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EC-105.

OK
NG
Repair or replace.

Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed.

Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.
Diagnostic Procedure 7 — Symptom —
Hesitation when the Engine is Hot

1
CHECK FUEL VAPOR.
1. Disconnect fuel pressure regulator
   vacuum hose and plug hose.
2. Perform cruise test.
3. Does the hesitation disappear?

   Yes → Check fuel properties.
   No →

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

   Yes → Check purge and vacuum
   lines.
   No →

3
CHECK FOR INTAKE AIR LEAK
When pinching blow-by hose (lowering
the blow-by air supply), does the engine
speed rise?

   Yes → Discover air leak location
   and repair.
   No →

INSPECTION END
TROUBLE DIAGNOSES

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

1. CHECK SPARK PLUGS.
   Remove spark plugs and check for
   fouling, etc.
   - OK
   - NG
     Repair or replace spark
     plug(s).

2. CHECK FOR INTAKE AIR LEAK.
   When pinching blow-by hose (lowering
   the blow-by air supply), does the engine
   speed rise?
   - Yes
     Discover air leak location and repair.
   - No
     Go to Diagnostic Procedure 24 (EC-113.)
     Or try a known good mass air flow sensor.
     Trouble is not fixed.
     CHECK FOR INTAKE VALVE DEPOSITS.
     If there are deposits on intake valves,
     remove them.

INSPECTION END

EC-83
Diagnostic Procedure 9 — Symptom —
Hesitation under Normal Conditions

1. CHECK SPARK PLUGS.
   Remove spark plugs and check for fouling, etc.
   NG: Repair or replace spark plug(s).
   OK:

2. CHECK HEATED OXYGEN SENSOR.
   1. Start engine and warm it up sufficiently.
   2. Perform "MIXTURE RATIO TEST" in "FUNCTION TEST" mode.
      OR
   4. Maintaining engine at 2,000 rpm under no-load (with engine warmed up sufficiently), check to make sure that the monitor fluctuates between "LEAN" and "RICH" more than 5 times during 10 seconds.
   1 cycle: RICH → LEAN → RICH
   2 cycles: RICH → LEAN → RICH → LEAN → RICH
   OR

2. Set "Heated oxygen sensor monitor" in Diagnostic Test Mode II. (See page EC-52)
   3. Maintaining engine at 2,000 rpm under no-load, check that malfunction indicator lamp goes ON and OFF more than 5 times during 10 seconds.

3. CHECK CANISTER PURGE.
   1. Disconnect canister purge line hose and plug hose.
   2. Perform cruise test.
   3. Does the hesitation disappear?
   No
   (Go to 3 on next page.)
   Yes: Check purge and vacuum lines.

EC-84
TROUBLE DIAGNOSES

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

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

Yes    Discover air leak location and repair.

No

INSPECTION END

Diagnostic Procedure 10 — Symptom — Engine Stalls when Turning

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

NG    Fill fuel tank with fuel.

OK

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

OR

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

Yes

CHECK INJECTOR.
Does each injector make an operating sound at idle?

Yes

(Go to 6 on next page.)

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

No    Go to 5.

Yes
### TROUBLE DIAGNOSES

**How to Execute On-board Diagnostic System in Diagnostic Test Mode II (Cont’d)**

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<td></td>
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</table>

**CAS-RPM(REF)** 800rpm<br>**AIR FLOW MTR** 1.55V<br>**ENG TEMP SEN** 81°C<br>**EXH GAS SEN** 0.06V<br>**M/R F/C MNT** LEAN<br>**CAR SPEED SEN** 0 V/km

**RECORD**

---

EC-69
TROUBLE DIAGNOSES

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

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

5 CHECK FUEL PRESSURE.
1. Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode in order to release fuel pressure to zero.
2. Install fuel pressure gauge and check fuel pressure.
   At idle approx. 245 kPa (2.45 bar, 2.5 kg/cm², 36 psi)
   The moment throttle valve is fully open:
   approx. 294 kPa (2.94 bar, 3.0 kg/cm², 43 psi)
   OR
   1. Release fuel pressure to zero.
      (Refer to page EC-208.)
   2. Install fuel pressure gauge and check fuel pressure.

CHECK ECM POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EC-105.

EC-86
TROUBLE DIAGNOSES

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

1. **CHECK FUEL VAPOR.**
   1. Disconnect fuel pressure regulator vacuum hose and plug hose.
   2. Perform cruise test.
   3. Does the engine stall disappear?

   Yes → Check fuel properties.

   No → Go to 2.

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

   OR

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

   Yes → Go to 3.

   No → Go to 2.

3. **CHECK INJECTOR.**
   Does each injector make an operating sound at idle?

   Yes → Check injector(s) and circuit(s).

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

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

   OK → (Go to 4 on next page.)
TROUBLE DIAGNOSES

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

5 | CHECK FUEL PRESSURE.

1. Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode in order to release fuel pressure to zero.
2. Install fuel pressure gauge and check fuel pressure.
   - At idle approx. 245 kPa (2.45 bar, 2.5 kg/cm², 36 psi)
   - The moment throttle valve is fully open:
     - approx. 294 kPa (2.94 bar, 3.0 kg/cm², 43 psi)
   OR
   1. Release fuel pressure to zero.
      (Refer to page EC-208.)
   2. Install fuel pressure gauge and check fuel pressure.

   OK → NG

6 | CHECK ECM POWER SUPPLY AND GROUND CIRCUIT.

Refer to page EC-105.

   OK → NG

   Repair or replace.

   Trouble is not fixed.

Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

EC-88
Diagnostic Procedure 12 — Symptom — Engine Stalls when the Engine is Cold

1. **CHECK FAST IDLE CAM.**
   When the engine is cold, does fast idle cam keep cam follower lever in position?
   - No: Check fast idle cam adjustment. (See page EC-207.)
   - Yes

2. **CHECK IACV-AAC VALVE.**
   When the engine is cold, can you start the engine when pressing accelerator pedal fully?
   - Yes: Check IACV-AAC valve and circuits. (See page EC-169.)
   - No

3. **PERFORM POWER BALANCE TEST.**
   1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
   2. Is there any cylinder which does not produce a momentary engine speed drop?
   - Yes: Go to 7.
   - No

4. **CHECK INJECTOR.**
   Does each injector make an operating sound at idle?
   - OK
   - NG: Check injector(s) and circuit(s).
   (Go to 4 on next page.)
TROUBLE DIAGNOSES
Diagnostic Procedure 12 — Symptom — Engine Stalls when the Engine is Cold (Cont'd)

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

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

CHECK FUEL PRESSURE.
1. Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode in order to release fuel pressure to zero.
2. Install fuel pressure gauge and check fuel pressure.
At idle approx. 245 kPa (2.45 bar, 2.5 kg/cm², 36 psi)
The moment the throttle valve is fully open:
approx. 294 kPa (2.94 bar, 3.0 kg/cm², 43 psi)

OR
1. Release fuel pressure to zero. (Refer to page EC-208)
2. Install fuel pressure gauge and check fuel pressure.

CHECK ECM POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EC-105.

EC-90
Diagnostic Procedure 13 — Symptom — Engine Stalls when Stepping on the Accelerator Momentarily

1. **CHECK IACV-AAC VALVE.**
   1. Start engine and warm it up sufficiently.
   2. Perform “AAC/V SYSTEM” or “IACV-AAC/V SYSTEM” in “FUNCTION TEST” mode.
   3. OR
   4. Select “AAC/V OPENING” or “IACV-AAC/V OPENING” in “ACTIVE TEST” mode.
   5. When touching “Qu” and “Qd”, does the engine speed change according to the percent of IACV-AAC valve opening?
   6. OR
   7. When disconnecting IACV-AAC valve harness connector, does the engine speed drop?

2. **PERFORM POWER BALANCE TEST.**
   1. Perform “POWER BALANCE” in “ACTIVE TEST” mode.
   2. Is there any cylinder which does not produce a momentary engine speed drop?
   3. OR
   4. When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

3. **CHECK INJECTOR.**
   Does each injector make an operating sound at idle?
   1. Yes
   2. No
      - Check injector(s) and their circuit(s).

(Go to 4 on next page)
TROUBLE DIAGNOSES

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

3 At idle

4 CHECK IGNITION SPARK.
1. Disconnect ignition coil assembly from rocker cover.
2. Connect a known good spark plug to the ignition coil assembly.
3. Place end of spark plug against an earth point with engine cranking.
4. Check for spark.

NG Check ignition coil, power transistor unit and their circuits. (See page EC-120, 202.)

OK

5 CHECK FUEL PRESSURE.
1. Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode in order to release fuel pressure to zero.
2. Install fuel pressure gauge and check fuel pressure.
   At idle approx. 245 kPa (2.45 bar, 2.5 kg/cm², 36 psi)
   The moment throttle valve is fully open:
   approx. 294 kPa (2.94 bar, 3.0 kg/cm², 43 psi)
   OR

NG Check fuel pressure regulator diaphragm.

OK

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

START

MEF3960

CHECK ECM POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EC-105.

OK

NG Repair or replace.

Trouble is not fixed.

Detach and reconnect harness connectors in the circuit. Then retest.

Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

EC-92
Diagnostic Procedure 14 — Symptom — Engine Stalls after Decelerating

1. **CHECK IACV-AAC VALVE.**
   - Start engine and warm it up sufficiently.
   - Perform “AAC/V SYSTEM” or “IACV-AAC/V SYSTEM” in “FUNCTION TEST” mode.

2. **CHECK IDLE ADJ. SCREW CLOGGING.**
   - Perform “IGN TIMING ADJ” in “WORK SUPPORT” mode.
   - Can you set engine speed at 750 ± 50 rpm (A/T in “N” position) by turning idle adjusting screw?

   **Or**
   - Disconnect throttle position sensor harness connector.
   - Can you set engine speed at 750 ± 50 rpm (A/T in “N” position) by turning idle adjusting screw?

   **(Go to A on next page)**
Diagnostic Procedure 14 — Symptom — Engine Stalls after Decelerating (Cont’d)

3

PERFORM POWER BALANCE TEST.
1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?
   OR
   When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

4

CHECK INJECTOR.
1. Does each injector make an operating sound at idle?

5

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

NG
Check ignition coil, power transistor unit and circuits.
(See page EC-120, 202.)

OK

(Go to 6 on next page.)
TROUBLE DIAGNOSES

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

6

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

START

CHECK FUEL PRESSURE:
1. Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode in order to release fuel pressure to zero.
2. Install fuel pressure gauge and check fuel pressure.
   At idle approx. 245 kPa (2.45 bar, 2.5 kg/cm², 36 psi)
   The moment throttle valve is fully open:
   approx. 294 kPa (2.94 bar, 3.0 kg/cm², 43 psi)
   OR
   1. Release fuel pressure to zero (Refer to page EC-208.)
   2. Install fuel pressure gauge and check fuel pressure.

7

MIXTURE RATIO TEST
ACCELERATE TO 2000 RPM AND HOLD THEN TOUCH
START

1800 2000 2200

NEXT  START

CHECK HEATED OXYGEN SENSOR:
1. Start engine and warm it up sufficiently.
2. Perform "MIXTURE RATIO TEST" in "FUNCTION TEST" mode
   OR
   2. See "M/R F/C MNT" in "DATA MONITOR" mode
   3. Maintaining engine at 2,000 rpm under no-load (with engine warmed up sufficiently.), check to make sure that the monitor fluctuates between "LEAN" and "RICH" more than 5 times during 10 seconds.
   1 cycle: RICH → LEAN → RICH
   2 cycles: RICH → LEAN → RICH → LEAN → RICH
   OR
   2. Set "Heated oxygen sensor monitor" in Diagnostic Test Mode II. (See page EC-52.)
   3. Maintaining engine at 2,000 rpm under no-load, check that malfunction indicator lamp goes ON and OFF more than 5 times during 10 seconds.

OK

NG

Check fuel pressure regulator diaphragm.

NG

Replace heated oxygen sensor(s).

OK

(Go to 6 on next page.)

EC-95
TROUBLE DIAGNOSES

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

☐

CHECK ECM POWER SUPPLY AND GROUND CIRCUIT. Refer to page EC-105.

OK

Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed.

Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

NG

Repair or replace.
Diagnostic Procedure 15 — Symptom — Engine Stalls when Accelerating or when Driving at Constant Speed

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

**OR**

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

2. CHECK INJECTOR.
   Does each injector make an operating sound at idle?

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

   **NG**
   Check ignition coil, power transistor unit and circuits.
   (See page EC-120, 202)

   **OK**
   (Go to ④ on next page.)
TROUBLE DIAGNOSES

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

4

CHECK FUEL PRESSURE.
1. Perform “FUEL PRESSURE RELEASE” in “WORK SUPPORT” mode in order to release fuel pressure to zero.
2. Install fuel pressure gauge and check fuel pressure.
   At idle approx. 245 kPa (2.45 bar, 2.5 kg/cm², 36 psi)
   The moment throttle valve is fully open:
   approx. 294 kPa (2.94 bar, 3.0 kg/cm², 43 psi)
   OR
   1. Release fuel pressure to zero. (Refer to page EC-208.)
   2. Install fuel pressure gauge and check fuel pressure.

NG
Check fuel pump, circuit and fuel pressure regulator.

5

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

Yes
Discover air leak location and repair.

No

CHECK ECM POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EC-105.

Yes
Repair or replace.

No
Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed.

Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

EC-98
TROUBLE DIAGNOSES

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

1. CHECK BATTERY AND ALTERNATOR.
   Check battery and alternator condition.
   (Refer to EL section)
   OK
   NG → Repair or replace

2. PERFORM POWER BALANCE TEST.
   1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
   2. Is there any cylinder which does not produce a momentary engine speed drop?
      OR
      When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?
      Yes
      No → Go to 5

3. CHECK INJECTOR.
   Does each injector make an operating sound at idle?
   Yes
   No → Check injector(s) and circuit(s).

4. CHECK IGNITION SPARK.
   1. Disconnect ignition coil assembly from rocker cover.
   2. Connect a known good spark plug to the ignition coil assembly.
   3. Place end of spark plug against a suitable ground and crank engine.
   4. Check for spark.
   OK
   NG → Check ignition coil, power transistor unit and circuits.
   (See page EC-120, 202.)

(Go to 4 on next page.)
Check fuel pressure regulator diaphragm.

CHECK FUEL PRESSURE.
1. Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode in order to release fuel pressure to zero.
2. Install fuel pressure gauge and check fuel pressure.
   At idle approx. 245 kPa (2.45 bar, 2.5 kg/cm², 35 psi)
   The moment throttle valve is fully open:
   approx. 294 kPa (2.94 bar, 3.0 kg/cm², 43 psi)  
   OR
1. Release fuel pressure to zero.
   (Refer to page EC-208.)
2. Install fuel pressure gauge and check fuel pressure.

CHECK ECM POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EC-105.

OK

OK

Trouble is not fixed.

EC-100
TROUBLE DIAGNOSES

Diagnostic Procedure 17 — Symptom — Lack of Power and Stumble

1. CHECK FUEL PRESSURE.
   1. Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode in order to release fuel pressure to zero.
   2. Install fuel pressure gauge and check fuel pressure.
      At idle approx. 245 kPa (2.45 bar, 2.5 kg/cm², 36 psi)
      The moment throttle valve is fully open:
      approx. 294 kPa (2.94 bar, 3.0 kg/cm², 43 psi)
   3. OR
      1. Release fuel pressure to zero.
         (Refer to page EC-208.)
      2. Install fuel pressure gauge and check fuel pressure.

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

   YES → Discover air leak location and repair
   NO → INSPECTION END

MEF702C

EC-101
TROUBLE DIAGNOSES

Diagnostic Procedure

1. CHECK FOR INTAKE AIR LEAK.
   When pinching blow-by hose (low speed rise), does the intake air leak?

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

3. CHECK EGRC-SOLENOID VALVE.
   1. Turn ignition switch "ON".
   2. Perform "EGR CONT S/V CIRCUIT" or "EGRC S/V CIRCUIT" in "FUNCTION TEST" mode.

4. CHECK VACUUM HOSES.
   Check the following vacuum hoses for clogging, cracks, and poor connections:
   a) Vacuum hose between EGR valve and EGRC solenoid valve.
   b) Vacuum hose between EGRC solenoid valve and throttle body port.
   c) Vacuum hose between EGRC solenoid valve and air duct.

(Go to A on next page.)
TROUBLE DIAGNOSES

Diagnostic Procedure 22

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

Refer to EL-POWER.

EC-MAIN-01

LHD models
RHD models
For Europe
Except EU

1...[L] R, [R] A/G
2... [L] B/R, [R] BR
3...[L] B/R, [R] BR

ECM (ECCS CONTROL MODULE)

Refer to last page (Foldout page).

EC-105
TROUBLE DIAGNOSES
Diagnostic Procedure 22 (Cont'd)

HarNESS layout

LHD models
Passenger's dash side
ECM harness connector
Door RH

RHD models
Passenger's dash side
ECM harness connector

LHD models
Behind ECM

RHD models
Behind ECM

CHECK POWER SUPPLY.
1) Turn ignition switch "ON".
2) Check voltage between ECM terminals 69 and ground.
Voltage: Battery voltage

INSPECTION START

A
CHECK POWER SUPPLY.
1) Turn ignition switch "ON".
2) Check voltage between ECM terminals 69 , 69 and ground.
Voltage: Battery voltage

B
CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect ECM harness connector.
3) Check harness continuity between ECM terminals 69 , 69
terminals 117 , 118 and engine ground.
Continuity should exist.
If NG, repair harness or connectors.

OK

NG

OK

Check ECM pin terminals for damage or the connection of ECM harness connector.
TROUBLE DIAGNOSES

Diagnostic Procedure 22 (Cont’d)

C

CHECK HARNESS CONTINUITY BETWEEN ECCS RELAY AND ECM.
1) Turn ignition switch "OFF".
2) Disconnect ECM harness connector.
3) Disconnect ECCS relay.
4) Check harness continuity between ECM terminals 86, 88 and terminal 3.
Continuity should exist.

NG
Repair harness or connectors.

D

CHECK VOLTAGE BETWEEN ECCS RELAY AND GROUND.
1) Check voltage between terminals 1, 5 and ground.
Voltage: Battery voltage

OK

NG
Check the following.
- 7.5A fuse
- Harness connectors 139, 140
- Harness connectors 145, 146
- Harness continuity between ECCS relay and battery
If NG, repair harness or connectors.

E

CHECK VOLTAGE BETWEEN ECM AND GROUND.
1) Check voltage between ECM terminals 86, 109 and ground.
Voltage: Battery voltage

OK

NG
Check the following.
- Harness continuity between ECM and harness connector 146
If NG, repair harness or connectors.

F

CHECK GROUND CIRCUIT.
1) Check harness continuity between ECM terminals 86, 88 and engine ground.
Continuity should exist.

OK

NG
Repair harness or connectors.

G

CHECK OUTPUT SIGNAL CIRCUIT.
1) Check harness continuity between ECM terminal 88 and terminal 3.
Continuity should exist.

OK

NG
Repair harness or connectors.
TROUBLE DIAGNOSES
Diagnostic Procedure 22 (Cont’d)

CHECK INPUT SIGNAL CIRCUIT.
1) Turn ignition switch “ON”.
2) Check voltage between ECM terminal 45 and ground.
Voltage: Battery voltage

OK → NG
Check the following:
- Harness connectors MD, FT
- Joint connector MH (Models for Europe)
- Harness continuity between ECM and ignition switch
If NG, repair harness or connectors.

CHECK COMPONENT
(ECCS relay)
Refer to “Electrical Components Inspection”. (See page EC-206.)

OK → NG
Replace ECCS relay.

NG

OK
Disconnector and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed.

Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.
TROUBLE DIAGNOSES

Diagnostic Procedure 23

CAMSHAFT POSITION SENSOR (Diagnostic trouble code No. 11)

LHD MODELS

EC-CMPS-01

Refer to EL-POWER.

A: A/T models
M: M/T models

x1: A 1, M 3
x2: A P7, M R
x3: A M52, M M55

Refer to last page
(Foldout page).

M10, E101
M50, F4

EC-109
TROUBLE DIAGNOSES
Diagnostic Procedure 23 (Cont’d)

Harness layout

LHD models
Passenger’s dash side
ECM harness connector

RHD models
Passenger’s dash side
ECM harness connector

Cylinder head cover
Camshaft position sensor harness connector
Intake manifold collector
Air duct
Engine ground

INSPECTION START

A

CHECK POWER SUPPLY.
1) Disconnect camshaft position sensor harness connector.
2) Turn ignition switch “ON”.
3) Check voltage between terminal ③ and ground.
Voltage: Battery voltage

Check the following.
- Harness connectors ⑦, ⑧ (LHD A/T models)
- Harness connectors ⑦, ⑧, ⑨ ⑩ (LHD M/T models)
- Harness connectors ⑦, ⑧, ⑨, ⑩ (RHD models)
- Joint connector M55 (Models for Europe)
- Harness continuity between camshaft position sensor and ECU relay
If NG, repair harness or connectors.

OK

NG

B

CHECK GROUND CIRCUIT.
1) Turn ignition switch “OFF”.
2) Loosen and retighten ground screws.
3) Check harness continuity between terminal ④ and engine ground.
Continuity should exist.

Repair harness or connectors.

OK

NG
TROUBLE DIAGNOSES

Diagnostic Procedure 23 (Cont'd)

CHECK INPUT SIGNAL CIRCUIT

1) Reconnect camshaft position sensor harness connector.
2) Start engine.
3) Read "CAS RPM" or "CMPS-RPM" signal in "DATA MONITOR" mode with CONSULT.
   800 ± 50 rpm (A/T: in "N" position)

NG
Repair harness or connectors.

OR

1) Disconnect ECM harness connector
2) Check harness continuity between terminal 6 and ECM terminals 45, 46 (1st signal), terminal 1 and ECM terminals 45, 51 (180° signal)
   Continuity should exist.

OK

CHECK COMPONENT
(Camshaft position sensor).
Refer to 'Electrical Components Inspection' (See page EC-201.)

Replace camshaft position sensor.

NG

OK

Disconnect and reconnect harness connectors in the circuit. Then restest.

Trouble is not fixed.

Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and restest.

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

1) Erase the diagnostic test mode II (Self-diagnostic results) memory.
   (Refer to EC-52.)
2) Perform test drive.
3) Perform diagnostic test mode II (Self-diagnostic results) again.
   (Refer to EC-50.)

Recheck ECM pin terminals for damage or the connection of ECM harness connector.

OK

INSPECTION END

EC-112
TROUBLE DIAGNOSES

Diagnostic Procedure 24

MASS AIR FLOW SENSOR (Diagnostic trouble code No. 12)

Refer to EL-POWER.

EC-MAFS-01

Refer to last page (Foldout page).

EC-113
TROUBLE DIAGNOSES
Diagnostic Procedure 24 (Cont’d)

Harness layout

LHD models
Passenger’s dash side
ECM harness connector

RHD models
Passenger’s dash side
ECM harness connector

INSPECTION START

A
CHECK POWER SUPPLY.
1) Disconnect mass air flow sensor harness connector.
2) Turn ignition switch “ON”.
3) Check voltage between terminal ⑧ and ground.

Voltage: Battery voltage

NG
Check the following.
- Harness continuity between mass air flow sensor and ECCS relay
If NG, repair harness or connectors.

OK

B
CHECK GROUND CIRCUIT.
1) Turn ignition switch “OFF”.
2) Disconnect ECM harness connector.
3) Loosen and retighten ground screws.
4) Check harness continuity between terminal ⑧ and ECM terminal ⑨.

Continuity should exist.

NG
Repair harness or connectors.

OK
TROUBLE DIAGNOSES

Diagnostic Procedure 24 (Cont’d)

CHECK INPUT SIGNAL CIRCUIT.
1) Reconnect mass air flow sensor harness connector and ECM harness connector.
2) Start engine and warm it up sufficiently.
3) Read "MAF/FL SE" signal in "DATA MONITOR" mode with CONSULT.
Voltage: 0.8 - 1.5 V (At Idle)

OK

NG
Repair harness or connectors.

1) Check harness continuity between terminal ⑤ and ECM terminal ⑥. Continuity should exist.

CHECK COMPONENT
(Mass air flow sensor). Refer to "Electrical Component Inspection". (See page EC-201.)

OK

NG
Replace mass air flow sensor.

Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed.

Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

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

FINAL CHECK

1) Erase the diagnostic test mode II (Self-diagnostic results) memory. (Refer to EC-52.)
2) Perform test drive
3) Perform diagnostic test mode II (Self-diagnostic results) again. (Refer to EC-50.)

NG
Recheck ECM pin terminals for damage or the connection of ECM harness connector.

OK

INSPECTION END
TROUBLE DIAGNOSES

Diagnostic Procedure 25

ENGINE COOLANT TEMPERATURE SENSOR (Diagnostic trouble code No. 13)

EC-ECTS-01

---

EC-116
TROUBLE DIAGNOSES

Diagnostic Procedure 25 (Cont’d)

A

INSPECTION START

CHECK POWER SUPPLY.
1) Start engine and warm it up sufficiently.
2) Select "ENG TEMP SEN" or "COOLANT TEMP/S" signal in "DATA MONITOR" mode with CONSULT.
3) Stop engine.
4) When restarting engine make sure that CONSULT indicates "ENG TEMP SEN" or "COOLANT TEMP/S" is 50°C (122°F) or more.

B

OK

OR

NG

Check the following:
- Harness continuity between ECM and harness control (PP)
If NG, repair harness or connectors.

1) Disconnect harness connectors (PP)
2) Turn ignition switch "ON".
3) Check voltage between terminal (Ω) and ground.
Voltage: Approximately 5V

NG

Check the following.
- Harness connectors (F1), (WE) (A/T models)
- Harness continuity between ECM and harness connector (PP)
- Harness continuity between A/T control unit and harness connector (PP)
If NG, repair harness or connectors.

C

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

NG

Replace engine coolant temperature sensor.

OK

CHECK COMPONENT
(Engine coolant temperature sensor).
Refer to "Electrical Components Inspection". (See page EC-201.)

OK

Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed.

Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

MEC145B

MEC145B
TROUBLE DIAGNOSES
Diagnostic Procedure 25 (Cont’d)

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

FINAL CHECK

1) Erase the diagnostic test mode II (Self-diagnostic results) memory. (Refer to EC-52.)
2) Perform test drive
3) Perform diagnostic test mode II (Self-diagnostic results) again. (Refer to EC-50.)

OK

INSPECTION END

NG

Recheck ECM pin terminals for damage or the connection of ECM harness connector.

EC-119
TROUBLE DIAGNOSES
Diagnostic Procedure 26 (Cont’d)

Harness layout

LHD models
Passenger’s dash side
ECM harness connector
Door RH
MEC108B

RHD models
Passenger’s dash side
ECM harness connector
MEC219B

Power steering fluid reservoir
Power transistor unit harness connectors
MEC116B

LHD models
Behind ECM
Ignition coil relay
MEC115B

RHD models
Behind ECM
Ignition coil relay
MEC214B

Ignition coil harness connector
MEC117B

EC-124
TROUBLE DIAGNOSIS

Diagnostic Procedure 26 (Cont'd)

A. INSPECTION START

CHECK POWER SUPPLY-I.
1) Disconnect ignition coil harness connectors.
2) Turn ignition switch “ON”.
3) Check voltage between terminal ③ and ground.
   Voltage: Battery voltage

B. CHECK POWER SUPPLY-II.
1) Turn ignition switch “OFF”.
2) Disconnect ignition coil relay.
3) Check harness continuity between terminal ① and terminal ③.
   Continuity should exist.

C. CHECK POWER SUPPLY-III.
1) Turn ignition switch “ON”.
2) Check voltage between terminals ①, ⑤ and ground.
   Voltage: Battery voltage

D. CHECK GROUND CIRCUIT-I.
1) Turn ignition switch “OFF”.
2) Check harness continuity between terminal ② and engine ground.
   Continuity should exist.

CHECK COMPONENT
(ignition coil relay).
Refer to “Electrical Components Inspection”. (See page EC-206.)

NG

Check the following.
- Harness connectors (F24, F98)
- Harness continuity between ignition coil and ignition coil relay
  If NG, repair harness or connectors.

OK

Repair harness or connectors.

NG

Replace ignition coil relay.

OK

Disconnect and reconnect harness connectors in the circuit. Then test.

Trouble is not fixed.

Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

EC-125
TROUBLE DIAGNOSES

Diagnostic Procedure 26 (Cont'd)

CHECK GROUND CIRCUIT-II
1) Turn ignition switch "OFF".
2) Check harness continuity between terminal 3 and engine ground. 
   Continuity should exist.
3) Disconnect power transistor unit harness connector.
4) Check harness continuity between terminal 4 and engine ground. 
   Continuity should exist.

CHECK OUTPUT SIGNAL CIRCUIT.
1) Check harness continuity between terminals 1, 4, 5, and 6. 
   Continuity should exist.
2) Disconnect ECM harness connector.
3) Check harness continuity between following terminals:
   1 - 5
   2 - 6
   Continuity should exist.

CHECK COMPONENTS
(Ignition coil and power transistor unit). Refer to "Electrical Components Inspection". (See pages EC-202)

NG
- Repair harness or connectors.

OK
- Check the following:
  - Harness connectors (F1A, F1B)
  - Harness connectors (M11, M12) (LHD models)
  - Harness connectors (M1B, M1E) (LHD models)
  - Harness continuity between ignition coil and power transistor unit
  - Harness continuity between ECM and power transistor unit
  - If NG, repair harness or connectors.

NG
- Replace malfunctioning component(s).

OK
- Disconnect and reconnect harness connectors in the circuit. Then retest.
- Check ECM pin terminals for damage of the connection of ECM harness connector. Reconnect ECM harness connector and retest.
TROUBLE DIAGNOSES

Diagnostic Procedure 26 (Cont'd)

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

FINAL CHECK

NG

1) Erase the diagnostic test mode II (Self-diagnostic results) memory. (Refer to EC-52.)
2) Perform test drive
3) Perform diagnostic test mode II (Self-diagnostic results) again. (Refer to EC-50.)

OK

Recheck ECM pin terminals for damage or the connection of ECM harness connector.

INSPECTION END

EC-127
TROUBLE DIAGNOSES
Diagnostic Procedure 27 (Cont’d)

Harness layout

LHD models
Passenger’s dash side
ECM harness connector

Door RH

RHD models
Passenger’s dash side
ECM harness connector

MEC108B

MEC218B

MEC118B

MEC111B

Boost pressure sensor harness connector
Relay box

LHD models
Driver’s dash lower

Fuse block

A/T control unit harness connector

MEC114B

MEC217B

Intake manifold collector
Engine ground

EC-129
TROUBLE DIAGNOSES

Diagnostic Procedure 27 (Cont'd)

**A**
CHECK POWER SUPPLY
1) Disconnect boost pressure sensor harness connector.
2) Turn ignition switch 'ON'.
3) Check voltage between terminal ② and ground.
   Voltage: Approximately 5V

**B**
CHECK GROUND CIRCUIT
1) Turn ignition switch "OFF".
2) Loosen and relighten ground screws.
3) Check harness continuity between terminal ④ and engine ground.
   Continuity should exist.

**C**
CHECK INPUT SIGNAL CIRCUIT
1) Disconnect ECM harness connector.
2) Check harness continuity between ECM terminal ⑤ and terminal ⑥.
   Continuity should exist.

**NG**
Check the following:
- Harness connectors (F4, M60)
- Harness connectors (M60, E61)
- Harness continuity between ECM and boost pressure sensor
If NG, repair harness or connectors.

**OK**
Check the following:
- Harness connectors (F4, M60)
- Harness connectors (M60, E61)
- Harness continuity between ECM and boost pressure sensor
- Harness continuity between A/T control unit and boost pressure sensor
If NG, repair harness or connectors.

**NG**
Replace boost pressure sensor.

EC-130
TROUBLE DIAGNOSES

Diagnostic Procedure 27 (Cont'd)

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

FINAL CHECK

1) Erase the diagnostic test mode II (Self-diagnostic results) memory. (Refer to EC-52)
2) Perform test drive.
3) Perform diagnostic test mode II (Self-diagnostic results) again. (Refer to EC-50)

NG

Recheck ECM pin terminals for damage or the connection of ECM harness connector.

OK

INSPECTION END
TROUBLE DIAGNOSES

Diagnostic Procedure 28

KNOCK SENSOR (Diagnostic trouble code No. 34)

EC-KS-01

EC-132
TROUBLE DIAGNOSES
Diagnostic Procedure 28 (Cont’d)

Harness layout

LHD models
Passenger’s dash side
ECM harness connector

RHD models
Passenger’s dash side
ECM harness connector

EC-133
TROUBLE DIAGNOSES

Diagnostic Procedure 28 (Cont'd)

A

INSPECTION START

CHECK INPUT SIGNAL CIRCUIT.
1) Disconnect ECM harness connector and harness connectors (174, 175).
2) Check harness continuity between terminal 6 and ECM terminal 3.
Continuity should exist.

NG
Repair harness or connectors.

OK
Loosen and retighten ground screws.

CHECK COMPONENT
(Knock sensor).
Refer to "Electrical Components Inspection" (See page EC-205)

NG
Replace knock sensor.

OK
Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is fixed.

Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

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

FINAL CHECK

1) Erase the diagnostic test mode II
   (Self-diagnostic results) memory.
   (Refer to EC-52.)
2) Perform test drive.
3) Perform diagnostic test mode II
   (Self-diagnostic results) again.
   (Refer to EC-50.)

NG
Recheck ECM pin terminals for damage or the connection of ECM harness connector.

OK

INSPECTION END

EC-134
TROUBLE DIAGNOSIS

Diagnostic Procedure 29

THROTTLE POSITION SENSOR (Diagnostic trouble code No. 43)

EC-TPS-01

EC-135
TROUBLE DIAGNOSES
Diagnostic Procedure 29 (Cont'd)

A

INSPECTION START

CHECK POWER SUPPLY.
1) Disconnect throttle position sensor harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal 3 and ground.
   Voltage: Approximately 5V

NG
   Repair harness or connectors.

OK

B

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Loosen and retighten ground screws.
3) Check harness continuity between terminal 6 and engine ground.
   Continuity should exist.

NG
   Check the following.
   • Harness connectors (P1, P3)
     (A/T models)
   • Harness continuity between ECM and throttle position sensor
   • Harness continuity between A/T control unit and throttle position sensor
     If NG, repair harness or connectors.

OK

C

CHECK INPUT SIGNAL CIRCUIT.
1) Reconnect throttle position sensor harness connector.
2) Turn ignition switch "ON".
3) Perform "THROTTLE SENSOR CKT" or "THROTTLE POS SEN CKT" in "FUNCTION TEST" mode with CONSULT.
   OR

NG
   Repair harness or connectors.

3) Read "THROTTLE SEN" or "THRTL POS SEN" signal in "WORK SUPPORT" mode with CONSULT.
   Throttle valve fully closed: 0.35 - 0.65V
   Throttle valve fully open: Approx. 4.0V

OK

C

1) Disconnect ECM harness connector.
2) Check harness continuity between ECM terminal 38 and terminal 85.
   Continuity should exist.
TROUBLE DIAGNOSES

Diagnostic Procedure 29 (Cont’d)

A

CHECK COMPONENT
(Throttle position sensor)
Refer to "Electrical Components Inspection". (See page EC-204.)

NG
Replace throttle position sensor.

OK

Disconnect and reconnect harness connectors in the circuit. Then retest.

NG
Trouble is not fixed.

OK
Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

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

FINAL CHECK

1) Erase the diagnostic test mode II (Self-diagnostic results) memory. (Refer to EC-52.)
2) Perform test drive.
3) Perform diagnostic test mode II (Self-diagnostic results) again. (Refer to EC-50.)

NG
Recheck ECM pin terminals for damage or the connection of ECM harness connector.

OK

INSPECTION END
TROUBLE DIAGNOSES

Diagnostic Procedure 30

A/T CONTROL (Diagnostic trouble code No. 54)

EC-AT/C-01

A: A/T models

ECM (ECMS CONTROL MODULE) (F1)

A/T CONTROL UNIT (M22: A)

F7

L/G L/W L/R
1 4 5

L/G L/W L/R
2 4 5

L/G L/W L/R
3 4 5

DT1 DT2 DT3

M22

H.S.

F1

H.S.
TROUBLE DIAGNOSES

Diagnostic Procedure 30 (Cont’d)

INSPECTION START

A

CHECK INPUT SIGNAL CIRCUIT.
1) Disconnect ECM harness connector and A/T control unit harness connector.
2) Check harness continuity between ECM terminal ⑩ and terminal ⑪.
   ECM terminal ⑩ and terminal ②.
   ECM terminal ⑨ and terminal ⑪.
   Continuity should exist.

OK

NG

Check the following:
- Harness connectors (P7) (M67)
- Harness continuity between ECM and A/T control unit
If NG, repair harness or connectors

OK

Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed.

Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

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

FINAL CHECK

1) Erase the diagnostic test mode Ⅱ (Self-diagnostic results) memory.
   (Refer to EC-52.)
2) Perform test drive.
3) Perform diagnostic test mode Ⅱ (Self-diagnostic results) again.
   (Refer to EC-50.)

OK

NG

Recheck ECM pin terminals for damage or the connection of ECM harness connector.

INSPECTION END
TROUBLE DIAGNOSES

Diagnostic Procedure 31

START SIGNAL (Not self-diagnostic item)

Refer to EL-POWER.

EC-S/SIG-01

Refer to last page (Foldout page).

M50, F4

EC-142
TROUBLE DIAGNOSES
Diagnostic Procedure 31 (Cont’d)

Harness layout

LHD models
- Passenger’s dash side
- ECM harness connector
- Door RH

RHD models
- Passenger’s dash side
- ECM harness connector

INSPECTION START

1) Turn ignition switch “ON”.
2) Perform “START SIGNAL CKT” in “FUNCTION TEST” mode with CONSULT.

CHECK OVERALL FUNCTION

1) Turn ignition switch to “ON”.
2) Check “START SIGNAL” in “DATA MONITOR” mode with CONSULT.

<table>
<thead>
<tr>
<th>IGN “ON”</th>
<th>OFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>IGN “START”</td>
<td>ON</td>
</tr>
</tbody>
</table>

Voltage:
- Ignition switch “START”
- Battery voltage
- Except above
- Approximately 0V

Check if 7.5A fuse is OK.

OK

NG

Replace 7.5A fuse.

EC-143
TROUBLE DIAGNOSES

Diagnostic Procedure 31 (Cont'd)

CHECK INPUT SIGNAL CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect ECM harness connector and 7.5A fuse.
3) Check harness continuity between ECM terminal ❶ and fuse block.
   Continuity should exist.

NG
Check the following
- Harness connectors ❷, ❸
- Harness continuity between ECM and fuse block
If NG, repair harness or connectors

OK
Disconnect and reconnect harness connectors in the circuit. Then retest
Trouble is not fixed.
Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.
Diagnostic Procedure 32

VEHICLE SPEED SENSOR (Not self-diagnostic item)

Refer to EL-POWER.

Refer to last page (Foldout page).

EC-VSS-01

EC-145
TROUBLE DIAGNOSES
Diagnostic Procedure 32 (Cont’d)

Harness layout

LHD models
Passenger's dash side
ECM harness connector

Door RH

RHD models
Passenger's dash side
ECM harness connector

Combination meter harness connector

EC-146
TROUBLE DIAGNOSES

Diagnostic Procedure 32 (Cont’d)

A

CHECK OVERALL FUNCTION.
1) Jack up drive wheels
2) Perform “CAR SPEED SEN CIRCUIT” or “VEHICLE SPEED SEN CKT” in “FUNCTION TEST” mode with CONSULT.

OK

INSPECTION END

OR

2) Read “CAR SPEED SEN” or “VHCL SPEED SE” signal in “DATA MONITOR” mode with CONSULT.
CONSULT value should be the same as the speedometer indication.

OR

2) Disconnect ECM harness connector.
3) Turn ignition switch “ON”.
4) Rotate drive wheel by hand.
5) Check voltage between ECM terminal ① and body ground.
Voltage should vary between approx. 0 to 5V.

NG

CHECK SPEEDOMETER FUNCTION.
Make sure that speedometer functions properly.

NG

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

OK

Check the following:
- Harness connectors (F5, ME)
- Harness continuity between ECM and combination meter
If NG, repair harness or connectors.

B

CHECK INPUT SIGNAL CIRCUIT.
1) Turn ignition switch “OFF”.
2) Disconnect ECM harness connector and combination meter harness connector.
3) Check harness continuity between ECM terminal ⑤ and terminal ⑦.
Continuity should exist.

NG

Disconnect and reconnect harness connectors in the circuit. Then retest.

OK

Trouble is not fixed.

Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.
TROUBLE DIAGNOSES

Diagnostic Procedure 33

EGR AND CANISTER CONTROL (Not self-diagnostic item)

Refer to EL-POWER.

EC-EGRC/V-01
TROUBLE DIAGNOSES
Diagnostic Procedure 33 (Cont'd)

Harness layout

LHD models
Passenger's dash side
ECM harness connector
Door RH
MEC108B

RHD models
Passenger's dash side
ECM harness connector
MEC218B

INSPECTION START

A
CHECK OVERALL FUNCTION.
1) Start engine and warm it up sufficiently.
2) Perform diagnostic test mode II (Self-diagnostic results).
   Make sure that diagnostic trouble code No. 12 is not displayed.
3) Make sure that EGR valve spring moves up and down (Use your finger) under the following conditions.
   At idle:
   Spring does not move.
   Racing engine from Idle to 3,000 rpm:
   Spring moves up and down.

NG

B
CHECK VACUUM SOURCE TO EGR VALVE.
1) Disconnect vacuum hoses to EGR valve and activated carbon canister.
2) Make sure that vacuum exists under the following conditions.
   At idle:
   Vacuum should not exist.
   Racing engine from Idle to 3,000 rpm:
   Vacuum should exist.

NG

CHECK COMPONENTS (EGR valve, EGRC-BPT valve and activated carbon canister).
Refer to "Electrical Components Inspection". (See pages EC-203, 210.)

OK

Replace malfunctioning component(s).

INSPECTION END
TROUBLE DIAGNOSES

Diagnostic Procedure 33 (Cont’d)

C

CHECK CONTROL FUNCTION.
1) Check voltage between ECM terminal ⑩ and ground under the following conditions.
   - Voltage:
     - At idle
     - Engine speed is 2,000 rpm
     - Battery voltage

E

CHECK POWER SUPPLY.
1) Stop engine.
2) Disconnect EGR & canister control solenoid valve harness connector.
3) Turn ignition switch “ON”.
4) Check voltage between terminal ⑧ and ground.
   - Voltage: Battery voltage

F

CHECK OUTPUT SIGNAL CIRCUIT.
1) Turn ignition switch “OFF”.
2) Disconnect ECM harness connector.
3) Check harness continuity between ECM terminal ⑩ and terminal ⑧.
   - Continuity should exist.

D

NG

Check the following:
- Harness connectors (ND, ND)
- Harness connectors (ECG, CEG)
- 10A fuse
- Harness continuity between EGR & canister control solenoid valve and fuse
- If NG, repair harness or connectors.

OK

NG

Check the following:
- Harness connectors (ECG, CEG)
- Harness connectors (ECG, CEG)
- Harness connectors (RD1, RD2)
- Harness connectors (ND1, ND2) (RHD models)
- Harness connectors (ECG, CEG) (LHD A/T models)
- Harness connectors (ECG, CEG) (LHD M/T models)
- Harness continuity between ECM and EGR & canister control solenoid valve
- If NG, repair harness or connectors.
TROUBLE DIAGNOSES

Diagnostic Procedure 33 (Cont'd)

CHECK COMPONENT (EGR & canister control solenoid valve).

1) Reconnect EGR & canister control solenoid valve harness connector and ECM harness connector.
2) Turn ignition switch “ON”.
3) Perform “EGR CONT SOLV CIRCUIT” or “EGRC SOLV CIRCUIT” in “FUNCTION TEST” mode with CONSULT.

NG
Replace EGR & canister control solenoid valve.

OK
Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed.

Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

EC-151
TROUBLE DIAGNOSES

Diagnostic Procedure 34
HEATED OXYGEN SENSOR (Not self-diagnostic item)

Refer to EL-POWER.

Refer to last page (Foldout page):

EC-H02S-01

EC-152
Harness layout

LHD models
Passenger's dash side
 ECM harness connector

RHD models
Passenger's dash side
 ECM harness connector

Cylinder head cover
 Heated oxygen sensor
 harness connector

Intake manifold collector
 Engine ground 195 (297)

EC-153
TROUBLE DIAGNOSES

Diagnostic Procedure 34 (Cont’d)

A

INSPECTION START

CHECK HEATED OXYGEN SENSOR CIRCUIT.
1) Start engine and warm it up sufficiently.
2) Perform “MIXTURE RATIO TEST” in “FUNCTION TEST” mode with CONSULT.

B

OK

INSPCTION END

- OR -

2) Make sure that “M/R F/C MNT” in “DATA MONITOR” mode indicates “RICH” and “LEAN” periodically more than 5 times during 10 seconds at 2,000 rpm.

- OR -

2) Run engine at about 2,000 rpm for about 2 minutes under no-load.
3) Set ECM Diagnostic Test Mode II.
4) Keep engine speed at 2,000 rpm and make sure that the malfunction indicator lamp on the instrument panel goes on and off more than 5 times during 10 seconds.

CHECK POWER SUPPLY.
1) Stop engine.
2) Disconnect heated oxygen sensor harness connector.
3) Turn ignition switch “ON”.
4) Check voltage between terminal ③ and ground.

Voltage: Battery voltage

NG

Check the following: 
- Harness connectors
- 10A fuse
- Harness continuity between heated oxygen sensor and fuse

If NG, repair harness or connectors.

OK

C

CHECK OUTPUT SIGNAL CIRCUIT.
1) Turn ignition switch “OFF”.
2) Disconnect ECM harness connector.
3) Check harness continuity between terminal ⑩ and ECM terminal 11E.

Continuity should exist.

NG

Repair harness or connectors.

OK

A

EC-154
TROUBLE DIAGNOSES

Diagnostic Procedure 34 (Cont'd)

A

D

CHECK INPUT SIGNAL CIRCUIT:
1) Loosen and retighten ground screws.
2) Check harness continuity between ECM terminal ⑨ and terminal ⑩. Continuity should exist.

NG

Repair harness or connectors.

OK

Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed.

Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

Trouble is not fixed.

Replace heated oxygen sensor.
TROUBLE DIAGNOSES
Diagnostic Procedure 35 (Cont’d)

Harness layout

LHD models
Passenger’s dash side
ECM harness connector

RHD models
Passenger’s dash side
ECM harness connector

---

**ACTIVE TEST**

---

**** POWER BALANCE ****
MONITOR
CAS-RPM (REF) 800rpm
AIR FLOW MTR 0.96V
AAC VALVE 41%

---

INSPECTION START

A

CHECK OVERALL FUNCTION.
1) Start engine.
2) Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT.
3) Make sure that each circuit produces a momentary engine speed drop.

---

A

NG

Clicking noise could be heard.

---

EC-157
TROUBLE DIAGNOSES

Diagnostic Procedure 35 (Cont'd)

A

CHECK POWER SUPPLY.
1) Stop engine.
2) Disconnect harness connectors F27, F111.
3) Turn ignition switch "ON".
4) Check voltage between terminal ⑨ and ground.
   Voltage: Battery voltage

NG

Check the following:
- Harness connectors F27, F111
- Harness connectors F4, M62
- Harness connectors M10, E16
- Harness continuity between ignition switch and harness connector F27
   If NG, repair harness or connectors.

OK

B

CHECK OUTPUT SIGNAL CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect ECM harness connector.
3) Check harness continuity between ECM terminal ⑩ and terminal ③, ECM terminal ⑪ and terminal ⑨, ECM terminal ⑫ and terminal ⑥, ECM terminal ⑬ and terminal ⑤. Continuity should exist.

NG

Check the following:
- Harness connectors F27, F111
- Harness continuity between ECM and harness connector F27
   If NG, repair harness or connectors.

OK

C

CHECK COMPONENT (Injector).
Refer to "Electrical Components Inspection". (See page EC-205.)

NG

Replace injector.

OK

Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed.

Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

EC-158
TROUBLE DIAGNOSES

Diagnostic Procedure 36

FUEL PUMP (Not self-diagnostic item)

Refer to EL-POWER.

EC-F/PUMP-01

EU: For Europe
EE: Except for Europe
L: LHD models
R: RHD models
#1...L 1, R 2
#2...L 2, R 1
#3...EU: P/B, EE: B/Y
#4...L > 1, R > 3
#5...L B/P, R B/Y

EC-159
TROUBLE DIAGNOSES

Diagnostic Procedure 36 (Cont'd)

A

CHECK OVERALL FUNCTION.
1) Turn ignition switch "ON".
2) Listen to fuel pump operating sound.
   Fuel pump should operate for 1 second after ignition switch is turned
   "ON".

INSPECTION START

OK

INSPECTION END

NG

B

CHECK POWER SUPPLY.
1) Turn ignition switch "OFF".
2) Disconnect fuel pump relay.
3) Turn ignition switch "ON".
4) Check voltage between terminals
   ①, ⑨ (LHD models), ②, ⑩ (RHD models) and ground.
   Voltage: Battery voltage

OK

NG

Check the following
- 15A fuse
- Harness continuity
  between fuel pump relay and fuse
If NG, repair harness or connectors.

C

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect fuel pump harness connector.
3) Check harness continuity between
   terminal ③ and body ground, terminal
   ⑤ and terminal ⑨.
   Continuity should exist.

OK

NG

Check the following
- Harness connectors ⑪, ⑫
- Harness connectors ⑬, ⑭
- Harness continuity
  between fuel pump and
  fuel pump relay
- Harness continuity
  between fuel pump and
  body ground
If NG, repair harness or
connectors.

D

CHECK OUTPUT SIGNAL CIRCUIT.
1) Disconnect ECM harness connector.
2) Check harness continuity between
   ECM terminal ② and terminal ③
   (LHD models), ① (RHD models).
   Continuity should exist.

OK

NG

Check the following
- Harness connectors ⑬, ⑭
- Joint connector (Models for Europe)
- Harness continuity
  between ECM and fuel
  pump relay
If NG, repair harness or
connectors.
TROUBLE DIAGNOSES

Diagnostic Procedure 36 (Cont’d)

A

CHECK COMPONENT
(Fuel pump relay)
1) Reconnect fuel pump relay,
fuel pump harness connector
and ECM harness connector.
2) Turn ignition switch “ON”.
3) Perform “FUEL PUMP
CIRCUIT” in “FUNCTION
TEST” mode with CONSULT.
OR
3) Turn fuel pump relay “ON”
and “OFF” in “ACTIVE TEST”
mode with CONSULT and
check operating sound.
OR
Refer to “Electrical Components
Inspection” (See page EC-206.)

NG
Replace fuel pump relay.

OK

CHECK COMPONENT
(Fuel pump).
Refer to “Electrical Components
Inspection” (See page EC-202.)

NG
Replace fuel pump.

OK

Disconnect and reconnect harness con-
nectors in the circuit. Then retest.

Trouble is not fixed.

Check ECM pin terminals for damage
or the connection of ECM harness con-
nector. Reconnect ECM harness con-
nector and retest.

EC-162
TROUBLE DIAGNOSES

Diagnostic Procedure 37 (Cont'd)

Harness layout

LHD models
Passenger's dash side
ECM harness connector
Door RH
MEC108B

RHD models
Passenger's dash side
ECM harness connector
MEC218B

INSPECTION START

CHECK OVERALL FUNCTION.
1) Start engine and warm it up sufficiently.
2) Perform diagnostic test mode II (Self-diagnostic results). Make sure that diagnostic trouble code No. 55 is displayed.
3) Stop engine.
4) Disconnect air passage hose to wastegate valve control solenoid valve and restart engine.
5) Make sure that boost pressure exists under the following conditions:
   At idle:
   - Boost pressure should not exist.
   - Engine is racing quickly (Up to about 5,000 rpm).
   - Boost pressure should exist.

INSPECTION END

CHECK COMPONENT
(Wastegate valve actuator)
Refer to "TURBOCHARGER" in EM section.
If NG, replace wastegate valve actuator.

MEC128B

EC-164
**TROUBLE DIAGNOSES**

**Diagnostic Procedure 37 (Cont’d)**

---

**A**

**CHECK CONTROL FUNCTION.**
1) Check voltage between ECM terminal 23 and ground under the following conditions:
   - Voltage: At idle
     - Battery voltage
   - Engine is racing quickly (Up to about 5,000 rpm).
   - Approximately 4 - 5V

**B**

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

**C**

**CHECK OUTPUT SIGNAL CIRCUIT.**
1) Turn ignition switch "OFF".
2) Disconnect ECM harness connector.
3) Check harness continuity between ECM terminal ⑥ and terminal ⑧.
   - Continuity should exist.

**D**

**CHECK COMPONENT**
(Wastegate valve control solenoid valve)
Refer to "Electrical Components Inspection". (See page EC-205.)

**E**

**Check air passage hose for clogging, cracks and proper connection.**

**NG**

Check the following:
- Harness connectors (HID, LED) (LHD models)
- Harness connectors (HGD, HF) (RHD models)
- I0A fuse
- Harness continuity between wastegate valve control solenoid valve and fuse
If NG, repair harness or connectors.

**EC-165**
TROUBLE DIAGNOSES

Diagnostic Procedure 38

VALVE TIMING CONTROL (Not self-diagnostic item)

IGNITION SWITCH
ON or START

10A

Refer to EL-POWER.

1

4

BR

BR

M50

BR

F4

BR

VTC

SOLENOID

VALVE

F31

Y

Y

113

VTC

ECM

(ECUS

CONTROL

MODULE)

F1

EC-VTC-01

Refer to last page
(Foldout page).

M50, F4

EC-166
TROUBLE DIAGNOSES
Diagnostic Procedure 38 (Cont’d)

Harness layout

LHD models
Passenger’s dash side
ECM harness connector

RHD models
Passenger’s dash side
ECM harness connector

VTC solenoid valve
harness connector

INSPECTION START

A
CHECK CONTROL FUNCTION.
1) Jack up drive wheels.
2) Start engine.
3) Shift gear to any position except the neutral position (M/T model).
Shift selector lever to any position except “N” or “P” position (A/T model).
4) Check voltage between ECM terminal (113) and ground under the following conditions.
Voltage: Quickly depress accelerator pedal, then quickly release it.
Approximately 0V
At idle
Battery voltage

OK

B
CHECK VTC SOLENOID VALVE OPERATION.
1) Stop engine.
2) Connect a suitable jumper wire between ECM terminal (113) and body ground.
3) Start engine and make sure that improper idle condition occurs.
If it does not occur, go to CHECK COMPONENT (VTC solenoid valve).

NG

INSPECTION END

EC-167
TROUBLE DIAGNOSES

Diagnostic Procedure 38 (Cont’d)

A

CHECK POWER SUPPLY.
1) Stop engine.
2) Disconnect VTC solenoid valve harness connector.
3) Turn ignition switch “ON”.
4) Check voltage between terminal (B) and ground.
Voltage: Battery voltage.

NG
Check the following.
- Harness connectors (MD, TD)
- 10A fuse
- Harness continuity between VTC solenoid valve and fuse
If NG, repair harness or connectors.

OK

D

CHECK INPUT SIGNAL CIRCUIT.
1) Turn ignition switch “OFF”.
2) Disconnect ECM harness connector.
3) Check harness continuity between terminal (B) and ECM terminal (113)
Continuity should exist.

NG
Repair harness or connectors.

OK

E

CHECK COMPONENT (VTC solenoid valve).
1) Reconnect ECM harness connector and VTC solenoid valve harness connector.
2) Turn ignition switch “ON”.
3) Perform “VALVE TIMING S/V CKT” in “FUNCTION TEST” mode with CONSULT
   OR
3) Perform “VALVE TIMING SOL” in “ACTIVE TEST” mode with CONSULT
   OR
4) Turn VTC solenoid valve “ON” and “OFF”, and check operating sound.

NG
Replace VTC solenoid valve.

OK

Disarm and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed

Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

EC-168
Diagnostic Procedure 39

IACV-AAC VALVE (Not self-diagnostic item)

EC-AAC/V-01

Refer to EL-POWER.

\[ \text{L}: \text{LHD models} \]
\[ \text{R}: \text{RHD models} \]

\[ \text{#1} \rightarrow \text{L} \rightarrow \text{B7, R} \rightarrow \text{A11} \]

\[ \text{F30} \]

Refer to last page (Foldout page).

\[ \text{M10, F10D} \]
\[ \text{M50, F4} \]

EC-169
TROUBLE DIAGNOSES
Diagnostic Procedure 39 (Cont'd)

Harness layout

LHD models
Passenger's dash side
ECM harness connector

RHD models
Passenger's dash side
ECM harness connector

CHECK OVERALL FUNCTION.
1) Start engine and warm it up sufficiently.
2) Check idle speed.
   800 ± 50 rpm (A/T: in "N" position)
   If NG, adjust idle speed.
3) Perform "IGN TIMING ADJ" in "WORK SUPPORT" mode with CONSULT.
4) Disconnect throttle position sensor harness connector.
   Make sure that idle speed drops.

INSPECTION START

INSPECTION END

A

EC-170
TROUBLE DIAGNOSES

Diagnostic Procedure 39 (Cont'd)

① CHECK POWER SUPPLY.
1) Stop engine.
2) Disconnect IACV-AAC valve harness connector.
3) Check voltage between terminal ⑨ and ground.
Voltage: Battery voltage

OK
NG

Check the following:
- Harness connectors ⑪ \( \rightarrow \) ⑫
- Harness connectors ⑬ \( \rightarrow \) ⑭
- 7.5A fuse
- Harness continuity between IACV-AAC valve and fuse
If NG, repair harness or connectors.

② CHECK OUTPUT SIGNAL CIRCUIT.
1) Reconnect IACV-AAC valve harness connector.
2) Perform "AAC VALVE SYSTEM" or "IACV-AAC/V SYSTEM" in "FUNCTION TEST" mode with CONSULT.

NG
Repair harness or connectors.

OR

② Perform "AAC VALVE OPENING TEST" or "IACV-AAC/V OPENING" in "ACTIVE TEST" mode with CONSULT.

③ Disconnect ECM harness connector.
2) Check harness continuity between ECM terminal ⑩ and terminal ⑪.
Continuity should exist.

OK
NG
Replace IACV-AAC valve.

③ CHECK COMPONENT
(IACV-AAC valve).
Refer to "Electrical Components Inspection" (See page EC-204.)

OK

Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed.

Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.
TROUBLE DIAGNOSES

Diagnostic Procedure 40

IACV-FICD SOLENOID VALVE (Not self-diagnostic item)

LHD MODELS

Refer to EL-POWER.

To compressor (Refer to HA-A/C, M and HA-A/C, A.)

To auto A/C unit or push control unit (Refer to HA-A/C, M and HA-A/C, A.)

EC-FICD-01

EC-172
RHD MODELS

IGNITION SWITCH
ON

7.5A
42

7.5A
6

L/OR

Refer to EL-POWER.

BATTERY

G/B

L/R

M10

L/R

M49

To auto A/C unit or push control unit
(Refer to HA-A/C, M and -A/C, A.)

THERMO
CONTROL
AMPLIFIER

THERMISTOR

G/W

TRIPLE-
PRESSURE
SWITCH

ON

OFF

M10

M49

M50

G/Y

F4

G/Y

F4

G/Y

B/W

AC
CON

RLY

ECM

(ECCS
CONTROL
MODULE)

EC-FICD-02

Refer to last page
(Foldout page).

F1

H.S.

M10

M50

F4

M49

EC-173
TROUBLE DIAGNOSES
Diagnostic Procedure 40 (Cont'd)

Harness layout

LHD models
Passenger's dash side
ECM harness connector

RHD models
Passenger's dash side
ECM harness connector

INSPECTION START

CHECK OVERALL FUNCTION.
1) Start engine and warm it up sufficiently
2) Check idle speed
   - Read idle speed in "DATA MONITOR" mode with CONSULT.
   - Check idle speed: 800 ± 50 rpm (A/T: in "N" position)
3) Turn air conditioner switch and blower fan switch "ON".
4) Recheck idle speed.
   800 rpm or more

- RECORD

OK
INSPECTION END

NG
Refer to HA section.

OK

Check if air conditioner compressor functions normally.

NG

EC-174
TROUBLE DIAGNOSES

Diagnostic Procedure 40 (Cont'd)

CHECK POWER SUPPLY.
1) Stop engine and turn air conditioner switch and blower fan switch "OFF".
2) Disconnect IACV-FICD solenoid valve harness connector.
3) Restart engine and turn air conditioner switch and blower fan switch "ON".
4) Check voltage between terminal ③ and ground.
   Voltage: Battery voltage

CHECK GROUND CIRCUIT.
1) Stop engine.
2) Check harness continuity between terminal ③ and engine ground.
   Continuity should exist.

CHECK COMPONENT
(IACV-FICD solenoid valve).
Refer to "Electrical Components Inspection". (See page EC-205.)

Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed.
Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

Check the following:
- Harness connectors E141, M16
- Harness connectors M60, TA
- Harness continuity between A/C relay and IACV-FICD solenoid valve
  If NG, repair harness or connectors.

NG
OK
OK
NG
NG
NC
EC-175
TROUBLE DIAGNOSES

Diagnostic Procedure 41 (Cont'd)

Harness layout

**LHD models**
Passenger's dash side
ECM harness connector

**RHD models**
Passenger's dash side
ECM harness connector

In the relay box
Cooling fan relay-1

Battery

Cooling fan relay-2

Harness connectors

Intake manifold collector (CH), (HD)

Cooling fan motor harness connector

Battery

---

**IN commemoration of**

**CHECK OVERALL FUNCTION-I**
1) Turn ignition switch "ON".
2) Make sure that engine coolant temperature is low.
3) Start engine.
4) Make sure that cooling fan is not operating.

**OK**
Go to "CHECK OVERALL FUNCTION-II"

**NG**

EC-178
TROUBLE DIAGNOSES

Diagnostic Procedure 41 (Cont’d)

B

CHECK HARNESS CONTINUITY BETWEEN COOLING FAN RELAY-1 AND GROUND.
1) Stop engine.
2) Disconnect cooling fan relay-1.
3) Disconnect triple-pressure switch harness connector.
4) Check harness continuity between terminal ② and terminal ⑥, terminal ⑧ and body ground. Continuity should exist.

OK

NG

Check the following:
- Harness connectors [EW] [EM] (LHD models)
- Harness connectors [MG] [TE] (LHD models)
- Harness continuity between cooling fan relay-1 and triple-pressure switch
- Harness continuity between triple-pressure switch and body ground.
If NG, repair harness or connectors.

NG

Replace triple-pressure switch.

OK

Go to “CHECK OUTPUT SIGNAL CIRCUIT” in [PROCEDURE A] C

C

CHECK COOLING FAN LOW SPEED OPERATION.
With air conditioner
1) Start engine.
2) Set temperature lever at full cold position.
3) Turn air conditioner switch “ON”.
4) Turn blower fan switch “ON”.
5) Run engine at idle for a few minutes with air conditioner operating.
6) Make sure that cooling fan operates at low speed.

Without air conditioner
1) Start engine.
2) Keep engine speed at about 2,000 rpm until engine is warmed up sufficiently.
3) Make sure that cooling fan begins to operate at low speed during warm-up.

OK

NG

Check cooling fan low speed control circuit (Go to [PROCEDURE A]).

C-179
TROUBLE DIAGNOSES

Diagnostic Procedure 41 (Cont'd)

[Diagram showing cooling fan and connections]

CHECK COOLING FAN HIGH SPEED OPERATION
1) Turn both air conditioner switch and blower fan switch "OFF".
2) Stop engine.
3) Connect 400 Ω resistor between terminals 8 and 7 on harness connector 123. (Refer to "Diagnostic Procedure 25").
4) Restart engine and make sure that cooling fan operates at high speed.

NG Check cooling fan high speed control circuit.
(Refer to [PROCEDURE B] )

OK

INSPECTION END

EC-180
TROUBLE DIAGNOSIS

Diagnostic Procedure 41 (Cont’d)

PROCEDURE A

INSPECTION START

CHECK POWER SUPPLY.
1. Stop engine.
2. Disconnect cooling fan relay-1.
3. Turn ignition switch ‘‘ON’’.
4. Check voltage between terminals ③, ⑤ and ground.
Voltage: Battery voltage

OK

NG

Check the following.
- Harness connectors (H3, H11)
- 7.5A fuse
- 30A fusible link
- Harness continuity between cooling fan relay-1 and fuse
- Harness continuity between cooling fan relay-1 and fusible link
If NG, repair harness or connectors.

CHECK GROUND CIRCUIT.
1. Turn ignition switch ‘‘OFF’’.
2. Disconnect cooling fan motor harness connector.
3. Check harness continuity between terminal ⑥ and terminal ⑧, terminal ⑩ and body ground.
Continuity should exist.

OK

NG

Repair harness or connectors.

CHECK OUTPUT SIGNAL CIRCUIT.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal ⑩ and terminal ⑨.
Continuity should exist.

OK

NG

Check the following.
- Harness connectors (E10, H10)
- Harness connectors (H10, F4)
- Harness continuity between ECM and cooling fan relay-1
If NG, repair harness or connectors.

CHECK COMPONENT
(Cooling fan relay-1).
Refer to ‘‘Electrical Components Inspection’’ (See page EC-206)

OK

NG

Replace cooling fan relay
TROUBLE DIAGNOSES

Diagnostic Procedure 41 (Cont'd)

CHECK COMPONENT (Cooling fan motor)
1) Reconnect cooling fan relay-1, cooling fan motor harness connector and ECM harness connector.
2) Turn ignition switch "ON".
3) Perform "RADIATOR FAN CIRCUIT" or "COOLING FAN CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

OK

Trouble is not fixed.

Disconnect and reconnect harness connectors in the circuit. Then retest.

Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

PROCEDURE B

INSTRUCTION START

CHECK POWER SUPPLY.
1) Stop engine.
2) Disconnect cooling fan relay-2.
3) Turn ignition switch "ON".
4) Check voltage between terminals ②, ⑤ and ground.
   Voltage: Battery voltage

OK

Check the following:
- Harness continuity between cooling fan relay-2 and harness connector (FD6)
- Harness continuity between cooling fan relay-2 and fusible link
If NG, repair harness or connectors.
TROUBLE DIAGNOSES
Diagnostic Procedure 41 (Cont’d)

CHECK GROUND CIRCUIT.
1) Turn ignition switch “OFF”.
2) Disconnect cooling fan motor harness connector.
3) Check harness continuity between terminal ③ and terminal ④, terminal ④ and body ground.
   Continuity should exist.

CHECK OUTPUT SIGNAL CIRCUIT.
1) Disconnect ECM harness connector.
2) Check harness continuity between ECM terminal ⑧ and terminal ①.
   Continuity should exist.

CHECK COMPONENT
(Cooling fan relay-2)
Refer to “Electrical Components Inspection”. (See page EC-206)

CHECK COMPONENT
(Cooling fan motor)
1) Reconnect cooling fan relay-2, cooling fan motor harness connector and ECM harness connector.
2) Disconnect 400 Ω resistor from harness connector ③7.
3) Turn ignition switch “ON”.
4) Perform “RADIATOR FAN CIRCUIT” or “COOLING FAN CIRCUIT” in “FUNCTION TEST” mode with CONSULT.
   OR
4) Perform “RADIATOR FAN CIRCUIT” or “COOLING FAN” in “ACTIVE TEST” mode with CONSULT.
   OR
Refer to “Electrical Components Inspection”. (See page EC-206).

Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed
Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

Replace cooling fan relay.

Check the following:
• Harness connectors ③9, ③10
• Harness connectors ③M, ③A
• Harness continuity between ECM and cooling fan relay-2
If NG, repair harness or connectors.

Replace cooling fan motor.

EC-183
TROUBLE DIAGNOSES

Diagnostic Procedure 42
POWER STEERING OIL PRESSURE SWITCH (Not self-diagnostic item)
EC-PST/SW-01

ECM (ECCS CONTROL MODULE)
F-1

PWST
[34]

PU/W

○
H

PU/W

PT1
F-4
M50

M10
M101

PU/W

○
H

PU/W

POWER STEERING OIL PRESSURE SWITCH
L : E18
R : F23

L : E57
R : F37
H : F26

L : LHD models
R : AHD models

Refer to last page
(Foldout page).

M10, F100
M50, F4

EC-184
TROUBLE DIAGNOSES
Diagnostic Procedure 42 (Cont'd)

Harness layout

LHD models
Passenger's dash side
ECM harness connector
Door RH

RHD models
Passenger's dash side
ECM harness connector

Under the vehicle
Power steering oil pressure switch
harness connector
Oil pan
TROUBLE DIAGNOSES
Diagnostic Procedure 42 (Cont’d)

A

**PW/ST SIGNAL CIRCUIT**

HOLD STEERING WHEEL IN A FULL

LOCKED POSITION THEN

TOUCH START

NEXT  START

SEF200L

B

**INSPECTION START**

OK

**INSPECTION END**

**CHECK CONTROL FUNCTION**

1) Start engine and warm it up sufficiently.

2) Perform "PW/ST SIGNAL CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

OR

2) Check "PW/ST SIGNAL" in "DATA MONITOR" mode with CONSULT.

Steering is neutral position: OFF

Steering is turned: ON

OR

2) Check voltage between ECM terminal 89 and ground.

Voltage: When steering wheel is turned quickly

- Approximately 0V
- Except above 4 - 5V

A

**RECORD**

SEF831K

B

**CHECK GROUND CIRCUIT**

1) Stop engine.

2) Disconnect power steering oil pressure switch harness connector.

3) Check harness continuity between terminal (89) and body ground.

Continuity should exist.

A

ECM CONNECTOR

24

V

C

LH

MEF4750

B

**NG**

Repair harness or connectors.

C

**OK**

CHECK INPUT SIGNAL CIRCUIT.

1) Disconnect ECM harness connector.

2) Check harness continuity between ECM terminal (89) and terminal (8). Continuity should exist.

A

DISCONNECT

Ω

SEF217K

B

DISCONNECT

CEFC

MEF4750

C

CHECK COMPONENT

(Power steering oil pressure switch).

Refer to "Electrical Components Inspection". (See page EC-206.)

A

DISCONNECT

ECM CONNECTOR

34

Ω

MEF4190

OK

Replace power steering oil pressure switch.

NG

Check the following.

- Harness connectors (14, 158) (LHD models)
- Harness connectors (13, 157) (LHD models)
- Harness continuity between ECM and power steering oil pressure switch.

If NG, repair harness or connectors.

OK

Disconnect and reconnect harness connectors in the circuit. Then retest.

NG

Trouble is not fixed.

Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

EC-186
TROUBLE DIAGNOSES

Diagnostic Procedure 43
NEUTRAL POSITION SWITCH & A/T CONTROL UNIT (PARK/NEUTRAL POSITION SIGNAL)
(Not self-diagnostic item)

EC-PNP/SW-01

EC-187
TROUBLE DIAGNOSES
Diagnostic Procedure 43 (Cont’d)

Harness layout

LHD models
Passenger’s dash side
ECM harness connector

RHD models
Passenger’s dash side
ECM harness connector

M/T models
Neutral position switch
harness connector

LHD models
Driver’s dash lower
Fuse block
A/T control unit harness connector

RHD models
Driver’s dash lower
A/T control unit harness connector

EC-188
TROUBLE DIAGNOSES

Diagnostic Procedure 43 (Cont’d)

Neutral position switch

INSPECTION START

A
CHECK OVERALL FUNCTION.
1) Turn ignition switch “ON”.
2) Perform “NEUTRAL SW CIRCUIT” or “NEUTRAL POSI SW CKT” in “FUNCTION TEST” mode with CONSULT.

OK
INSPECTION END

A

RECORD

B

MONITOR • NO FAIL
START SIGNAL OFF
IDLE POSITION ON
AIR COND SIG OFF
NEUTRAL SW ON

A

ECM CONNECTOR

1) Set shift lever to the neutral position.
2) Disconnect ECM harness connector.
3) Check harness continuity between ECM terminal ⑪ and body ground.
Continuity should exist.

NG

B

CHECK GROUND CIRCUIT.
1) Disconnect neutral position switch harness connector.
2) Check harness continuity between terminal ⑪ and body ground.
Continuity should exist.

OK

NG

Check the following:
- Harness connectors (EC1, EC2)
- Harness continuity between neutral position switch and body ground
If NG, repair harness or connectors.

B

Disconnect ECM harness connector.

A

EC-189
TROUBLE DIAGNOSES

Diagnostic Procedure 43 (Cont’d)

CHECK INPUT SIGNAL CIRCUIT
1) Check harness continuity between ECM terminal \( T_1 \) and terminal \( T_3 \). Continuity should exist.

CHECK COMPONENT
(Neutral position switch).
Refer to "ON-VEHICLE SERVICE" in MT section.

Check the following:
- Harness connectors \( T_8 \), \( M_8 \)
- Harness connectors \( M_5 \), \( E_9 \)
- Harness connectors \( F_8 \), \( F_9 \)
- Harness continuity between ECM and neutral position switch
If NG, repair harness or connectors.

Replace neutral position switch.

Disconnect and reconnect harness connectors in the circuit. Then retest.

OK

NG

Trouble is not fixed

Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

OK

EC-190
TROUBLE DIAGNOSES

Diagnostic Procedure 43 (Cont'd)

A/T CONTROL UNIT (PARK/NEUTRAL POSITION SIGNAL) CIRCUIT

INSPECTION START

CHECK OVERALL FUNCTION.
1) Turn ignition switch “ON”.
2) Perform “NEUTRAL SW CIRCUIT” or “NEUTRAL POSI SW CKT” in “FUNCTION TEST” mode with CONSULT.
   OR

   2) Check “NEUTRAL SW” or “NEUT POSI SW” signal in “DATA MONITOR” mode with CONSULT.
   “N” or “P”: ON
   Except above: OFF
   OR

2) Check voltage between ECM terminal @ and ground under the following conditions.
   Voltage:
   “N” or “P”
   Approximately 0V
   Except above
   Approximately 5V

CHECK INPUT SIGNAL CIRCUIT.
1) Turn ignition switch “OFF”.
2) Disconnect ECM harness connector.
3) Disconnect A/T control unit harness connector.
4) Check harness continuity between ECM terminal @ and terminal @. Continuity should exist.

CHECK INHIBITOR SWITCH FUNCTION.
Make sure that inhibitor switch functions properly. (Refer to AT section).

OK

NG

Check the following.
- Harness connectors (FT, MS)
- Harness continuity between ECM and A/T control unit
  If NG, repair harness or connectors.

OK

NG

Check inhibitor switch and circuit
(Refer to AT section.)

Trouble is not fixed.

Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.
TROUBLE DIAGNOSES

Diagnostic Procedure 44

REAR WINDOW DEFOGGER SWITCH (Not self-diagnostic item)

Refer to EL-POWER.

EC-DEF/S-01

A : A/T models
L : LHD models
R : RHD models

M1 → L P2, R M12

ECM (ECCS CONTROL MODULE)
F1

LOAD

Refer to last page
(Foldout page).

M11, B1
M69, F4

EC-192
TROUBLE DIAGNOSES
Diagnostic Procedure 44 (Cont'd)

Harness layout

LHD models
Passenger's dash side
ECM harness connector

RHD models
Passenger's dash side
ECM harness connector

LHD models
Driver's dash side
Fuse block
Rear window defogger relay

RHD models
Driver's dash side
Rear window defogger relay

EC-193
TROUBLE DIAGNOSES

Diagnostic Procedure 44 (Cont'd)

A

INSPECTION START

CHECK OVERALL FUNCTION.
1) Turn ignition switch "ON".
2) Check "LOAD SIGNAL" in "DATA MONITOR" mode with CONSULT
Rear window defogger switch "ON": ON
Rear window defogger switch "OFF": OFF

2) Check voltage between ECM terminal 8 and ground under the following conditions.
Voltage:
Rear window defogger switch "ON"
Battery voltage
Rear window defogger switch "OFF"
Approximately 0V

OK

NG

Check if rear window defogger functions normally.

NG

Check rear window defogger circuit. (Refer to EL section.)

B

NG

Check the following:
- Harness connectors [MID, FC]
- Harness continuity between ECM and rear window defogger relay
If NG, repair harness or connectors.

OK

Disconnect and reconnect harness connectors in the circuit. Then retest

Trouble is not fixed

Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

EC-194
TROUBLE DIAGNOSES

Diagnostic Procedure 45
MALFUNCTION INDICATOR LAMP & DATA LINK CONNECTOR FOR CONSULT (Not self-diagnostic item)

EC-MIL-01

 Refer to EL-POWER.

L : LHD models
R : RHD models

EC-195
TROUBLE DIAGNOSES

Electrical Components Inspection

ECM INPUT/OUTPUT SIGNAL INSPECTION

1. ECM is located at passenger’s dash side. For this inspection, remove the passenger’s dash side cover.

2. Remove ECM harness protector.

3. Perform all voltage measurements with the connectors connected. Extend tester probe as shown to perform tests easily.

ECM HARNESS CONNECTOR TERMINAL LAYOUT

EC-196
<table>
<thead>
<tr>
<th>TERMINAL NO.</th>
<th>ITEM</th>
<th>CONDITION</th>
<th>DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>19</td>
<td>Cooling fan (Low speed)</td>
<td>Engine is running</td>
<td>BATTERY VOLTAGE (11 - 14V)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cooling fan is not operating</td>
<td>approximately 0V</td>
</tr>
<tr>
<td>23</td>
<td>Knock sensor</td>
<td>Engine is running</td>
<td>2.0 - 3.0V</td>
</tr>
<tr>
<td>25</td>
<td>Wastegate valve control solenoid valve</td>
<td>Engine is running</td>
<td>BATTERY VOLTAGE (11 - 14V)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Idle speed</td>
<td>approximately 5V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Engine is running</td>
<td>(Warm-up condition)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Engine is racing up to 5,000 rpm.</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>Mass air flow sensor</td>
<td>Engine is running</td>
<td>0.8 - 1.5V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Idle speed</td>
<td>(Warm-up condition)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Engine speed is 3,000 rpm.</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Engine coolant temperature sensor</td>
<td>Engine is running</td>
<td>0 - 5.0V</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Output voltage varies with engine coolant temperature</td>
</tr>
<tr>
<td>29</td>
<td>Heated oxygen sensor</td>
<td>Engine is running</td>
<td>0 - 0.3V - 0.6 - 0.9V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>After warming up sufficiently and engine speed is 2,000 rpm.</td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>Cooling fan (High speed)</td>
<td>Engine is running</td>
<td>BATTERY VOLTAGE (11 - 14V)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cooling fan is not operating</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cooling fan is operating at low speed</td>
<td>Approximately 0V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Engine is running</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cooling fan is operating at high speed</td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>Power steering oil pressure switch</td>
<td>Engine is running</td>
<td>4.0 - 5.0V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Steering wheel stays straight.</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>Boost pressure sensor</td>
<td>Engine is running</td>
<td>Approximately 2V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Idle speed</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Engine is running</td>
<td>Approximately 2.2V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Engine is racing up to 4,000 rpm.</td>
<td></td>
</tr>
<tr>
<td>TERMINAL NO.</td>
<td>ITEM</td>
<td>CONDITION</td>
<td>DATA</td>
</tr>
<tr>
<td>-------------</td>
<td>------</td>
<td>-----------</td>
<td>------</td>
</tr>
<tr>
<td>38</td>
<td>Throttle position sensor</td>
<td>Ignition switch &quot;ON&quot;</td>
<td>0.35 - 4.0V Output voltage varies with throttle valve opening angle.</td>
</tr>
<tr>
<td>41</td>
<td>Camshaft position sensor (Reference signal)</td>
<td>Engine is running</td>
<td>0.3 - 0.6V Output voltage slightly varies with engine speed.</td>
</tr>
<tr>
<td>51</td>
<td>Camshaft position sensor (Position signal)</td>
<td>Do not run engine at high speed under no-load.</td>
<td>2.0 - 3.0V Output voltage slightly varies with engine speed.</td>
</tr>
<tr>
<td>43</td>
<td>Start signal</td>
<td>Ignition switch &quot;ON&quot;</td>
<td>0V</td>
</tr>
<tr>
<td>44</td>
<td>Neutral position switch (M/T models) A/T control unit (A/T models)</td>
<td>Ignition switch &quot;ON&quot;</td>
<td>BATTERY VOLTAGE (11 - 14V)</td>
</tr>
<tr>
<td>45</td>
<td>Ignition switch</td>
<td>Ignition switch &quot;OFF&quot;</td>
<td>BATTERY VOLTAGE (11 - 14V)</td>
</tr>
<tr>
<td>46</td>
<td>Air conditioner switch</td>
<td>Engine is running</td>
<td>BATTERY VOLTAGE (11 - 14V)</td>
</tr>
<tr>
<td>48</td>
<td>Power source for sensors</td>
<td>Ignition switch &quot;ON&quot;</td>
<td>Approximately 5.0V</td>
</tr>
<tr>
<td>49</td>
<td>Power source for ECM</td>
<td>Ignition switch &quot;ON&quot;</td>
<td>BATTERY VOLTAGE (11 - 14V)</td>
</tr>
<tr>
<td>54</td>
<td>Load signal</td>
<td>Rear window defogger switch is &quot;ON&quot;</td>
<td>BATTERY VOLTAGE (11 - 14V)</td>
</tr>
<tr>
<td>58</td>
<td>Power supply (Back-up)</td>
<td>Ignition switch &quot;OFF&quot;</td>
<td>BATTERY VOLTAGE (11 - 14V)</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>DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>101</td>
<td>Injectors</td>
<td>Engine is running</td>
<td>BATTERY VOLTAGE (11 - 14V)</td>
</tr>
<tr>
<td>103</td>
<td></td>
<td>(Warm-up condition)</td>
<td></td>
</tr>
<tr>
<td>110</td>
<td></td>
<td>Idle speed</td>
<td>Approximately 0V</td>
</tr>
<tr>
<td>112</td>
<td></td>
<td>Engine speed is 2,000 rpm.</td>
<td></td>
</tr>
<tr>
<td>102</td>
<td>EGR &amp; canister control solenoid</td>
<td>Engine is running</td>
<td>BATTERY VOLTAGE (11 - 14V)</td>
</tr>
<tr>
<td>valve</td>
<td></td>
<td>(Warm-up condition)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Engine is racing up to 2,000 rpm.</td>
<td>Approximately 0V</td>
</tr>
<tr>
<td>113</td>
<td>VTC solenoid valve</td>
<td>Engine is running</td>
<td>BATTERY VOLTAGE (11 - 14V)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Jack-up condition)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Engine is racing up to 2,000 rpm.</td>
<td></td>
</tr>
<tr>
<td>115</td>
<td>Heated oxygen sensor heater</td>
<td>Engine is running</td>
<td>Approximately 0V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Engine speed is between idle and 4,000 rpm.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Engine speed is above 4,000 rpm.</td>
<td>BATTERY VOLTAGE (11 - 14V)</td>
</tr>
</tbody>
</table>

*Data are reference values.*
TROUBLE DIAGNOSES

Electrical Components Inspection (Cont'd)

CAMSHAFT POSITION SENSOR
1. Remove camshaft position sensor from engine. (Camshaft position sensor harness connector should remain connected.)
2. Turn ignition switch “ON”.
3. Rotate camshaft position sensor shaft slowly by hand and check voltage between terminals ① and ground.

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>① (180° signal)</td>
<td>Voltage fluctuates between 5V and 0.1V</td>
</tr>
<tr>
<td>② (1° signal)</td>
<td></td>
</tr>
</tbody>
</table>

If NG, replace camshaft position sensor.

After this inspection, diagnostic trouble code No. 11 might be displayed though the camshaft position sensor is functioning properly. In this case erase the stored memory.

MASS AIR FLOW SENSOR
1. Fold back mass air flow sensor harness connector rubber as shown in the figure if the harness connector is connected.
2. Turn ignition switch “ON”.
3. Start engine and warm it up sufficiently.
4. Check voltage between terminal ① and ground.

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Voltage V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Idle speed</td>
<td>0.8 - 1.5</td>
</tr>
<tr>
<td>3,000 rpm</td>
<td>1.4 - 2.0</td>
</tr>
</tbody>
</table>

5. If NG, remove mass air flow sensor from air duct. Check hot film for damage or dust.

ENGINE COOLANT TEMPERATURE SENSOR
1. Disconnect engine coolant temperature sensor harness connector.
2. Check resistance as shown in the figure.

<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>50 (122)</td>
<td>0.68 - 1.00</td>
</tr>
<tr>
<td>80 (176)</td>
<td>0.33 - 0.38</td>
</tr>
</tbody>
</table>

If NG, replace engine coolant temperature sensor.

EC-201
TROUBLE DIAGNOSES

Electrical Components Inspection (Cont'd)

IGNITION COIL
1. Disconnect ignition coil harness connector.
2. Check resistance between terminals ① and ②.
   Resistance: Approximately 1Ω
   If NG, replace ignition coil.

POWER TRANSISTOR
1. Disconnect power transistor harness connector.
2. Check power transistor continuity between terminals with analog tester as shown in the figure.

<table>
<thead>
<tr>
<th>Terminal combination</th>
<th>Tester polarity</th>
<th>Continuity</th>
<th>Tester polarity</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2 3 4</td>
<td>①</td>
<td>No</td>
<td>①</td>
<td>Yes</td>
</tr>
<tr>
<td>a b c d</td>
<td>①</td>
<td>Yes</td>
<td>①</td>
<td>Yes</td>
</tr>
<tr>
<td>1 2 3 4</td>
<td>①</td>
<td>Yes</td>
<td>①</td>
<td>No</td>
</tr>
</tbody>
</table>

If NG, replace power transistor.

FUEL PUMP
1. Disconnect fuel pump harness connector.
2. Check resistance between terminals ④ and ⑤.
   Resistance: Approximately 0.2 - 5.0Ω
   If NG, replace fuel pump.

VEHICLE SPEED SENSOR
1. Jack up rear wheels. Use stands to support vehicle.
2. Disconnect vehicle speed sensor harness connector.
3. Check continuity between terminals ⑧ and ⑨ while rotating rear wheel by hand.
   Continuity should come and go.
   If NG replace vehicle speed sensor.

EC-202
TROUBLE DIAGNOSES

Electrical Components Inspection (Cont’d)

EGR AND CANISTER CONTROL SOLENOID VALVE

Check air passage continuity.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Air passage continuity between B and E</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>

EGR VALVE

Apply vacuum to EGR vacuum port with a hand vacuum pump. EGR valve spring should lift. If NG, replace EGR valve.

EGRC-BPT VALVE

Plug one of two ports of EGRC-BPT valve. Apply a pressure above 0.490 kPa (4.90 mbar, 50 mmH₂O, 1.97 inH₂O) to check for leakage. If a leak is noted, replace valve.

HEATED OXYGEN SENSOR HEATER

Check resistance between terminals ③ and ④. Resistance: 3 - 1,000Ω
If NG, replace heated oxygen sensor.

THROTTLE POSITION SWITCH (A/T model only)

Refer to “TROUBLE DIAGNOSES” in AT section.
TROUBLE DIAGNOSES

Electrical Components Inspection (Cont'd)

THROTTLE POSITION SENSOR

1. Disconnect throttle position sensor harness connector.
2. Make sure that resistance between terminals ⑨ and ⑩ changes when opening throttle valve manually.

<table>
<thead>
<tr>
<th>Accelerator pedal condition</th>
<th>Resistance kΩ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Completely released</td>
<td>Approximately 0.7</td>
</tr>
<tr>
<td>Partially released</td>
<td>0.7 - 5</td>
</tr>
<tr>
<td>Completely depressed</td>
<td>Approximately 5</td>
</tr>
</tbody>
</table>

If NG, replace throttle position sensor.

Adjustment of throttle position sensor (idle position)

If throttle position sensor is replaced or removed, it is necessary to install it in the proper position, by following the procedure as shown below:

1. Install throttle position sensor body in throttle body. Do not tighten bolts. Leave bolts loose.
2. Connect throttle position sensor harness connector.
3. Start engine and warm it up sufficiently.

4. Perform "THROTTLE SEN ADJ" or "THRTL POS SEN ADJ" in "WORK SUPPORT" mode.
   - Measure output voltage of throttle position sensor using voltmeter.

5. Adjust by rotating throttle position sensor body so that output voltage is 0.35 to 0.65V.
6. Tighten mounting bolts.
7. Disconnect throttle position sensor harness connector for a few seconds and then reconnect it.

IACV-AAC VALVE

- Check IACV-AAC valve resistance.
  - Resistance:
    - Approximately 10Ω
- Check plunger for seizing or sticking.
- Check for broken spring.
TROUBLE DIAGNOSES

Electrical Components Inspection (Cont'd)

IACV-FICD SOLENOID VALVE
Disconnect IACV-FICD solenoid valve harness connector.
- Check for clicking sound when applying 12V direct current to terminals.
- Check plunger for seizing or sticking.
- Check for broken spring.

KNOCK SENSOR
1. Disconnect knock sensor sub-harness connector.
2. Check continuity between terminal ④ and ground.
Continuity should exist.
- It is necessary to use an ohmmeter which can measure more than 10 MΩ.
CAUTION:
Discard any knock sensor which has been dropped or has undergone shocks; use a new one.

INJECTOR
1. Disconnect injector harness connector.
2. Check resistance between terminals as shown in the figure.
   Resistance: 10 - 14Ω
   If NG, replace injector.

VALVE TIMING CONTROL (VTC) SOLENOID VALVE
Check valve timing control solenoid valve for normal operation by supplying it with battery voltage between terminals ③ and ④.
If NG, replace solenoid valve.

WASTEGATE VALVE CONTROL SOLENOID VALVE
Check air passage continuity.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Air passage continuity between ③ and ④</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>

If NG, replace solenoid valve.
TROUBLE DIAGNOSES

Electrical Components Inspection (Cont’d)

BOOST PRESSURE SENSOR
Check resistance between terminals.

Resistance:
- ① and ② Approximately 1.1 kΩ
- ① and ④ Approximately 0.5 kΩ
- ③ and ④ Approximately 0.3 kΩ

POWER STEERING OIL PRESSURE SWITCH
1. Disconnect power steering oil pressure switch harness connector.
2. Check continuity between terminals.

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steering wheel is being turned</td>
<td>Yes</td>
</tr>
<tr>
<td>Steering wheel is not being turned</td>
<td>No</td>
</tr>
</tbody>
</table>

COOLING FAN MOTOR
1. Disconnect cooling fan motor harness connector.
2. Supply cooling fan motor terminals with battery voltage and check operation.

<table>
<thead>
<tr>
<th>Fan speed</th>
<th>Terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>①, ②</td>
</tr>
<tr>
<td>High</td>
<td>④, ⑤</td>
</tr>
</tbody>
</table>

Cooling fan motor should operate.
If NG, replace cooling fan motor.

ECCS RELAY, FUEL PUMP RELAY, IGNITION COIL RELAY AND COOLING FAN RELAY 1-2
Check continuity between terminals ③ and ④.

<table>
<thead>
<tr>
<th>Conditions</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 current supply</td>
<td>No</td>
</tr>
</tbody>
</table>

RECIRCULATION VALVE
Check air passage continuity between ① and ③.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>A vacuum of above -27.3 to -34.0 kPa (-273 to -340 mbar, -205 to -255 mmHg, -8.07 to -10.04 inHg) is applied to vacuum port</td>
<td>Yes</td>
</tr>
<tr>
<td>No vacuum applied</td>
<td>No</td>
</tr>
</tbody>
</table>

If NG, replace recirculation valve.
Do not disassemble and adjust recirculation valve.

EC-206
Fast Idle Cam (FIC) Inspection and Adjustment

REMOVAL AND INSTALLATION
- Do not extract thermo-element by pulling center rod.
- Always replace O-ring with a new one.
- Lubricate O-ring with a smear of engine oil.
- After installation, check for water leakage.

INSPECTION
1. Start engine. Warm the engine coolant up to 80°C (176°F) and keep it there for 10 minutes.
2. Check that mark A (short line) on FI cam aligns with roller center.
   a. If NG, measure thermo-element stroke (L) and engine coolant temperature.
      If stroke L is in the specification shown in the figure, adjust FI cam with adjusting screw.
   b. If stroke (L) is out of the specification, replace thermo-element with a new one.

ADJUSTMENT
1. Start engine. Warm the engine coolant up to 80°C (176°F) and keep it there for 10 minutes.
2. Loosen adjusting screw and align mark A (short line) on FI cam with roller center.
   Tighten lock nut to the specification.
3. Cool down the engine coolant to 25°C (77°F) and keep it there for 5 minutes.
4. Check that mark B (long line) on FI cam aligns with roller center.
MULTIPORT FUEL INJECTION SYSTEM INSPECTION

Releasing Fuel Pressure
Before disconnecting fuel line, release fuel pressure from fuel line to eliminate danger.
Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode with CONSULT.

1. Remove fuse for fuel pump.
2. Start engine.
3. After engine stalls, crank it two or three times to release all fuel pressure.
4. Turn ignition switch off and reconnect fuse for fuel pump.

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

5. Read the indication of fuel pressure gauge.
   At idling:
   When fuel pressure regulator valve vacuum hose is connected.
   Approximately 245 kPa (2.45 bar, 2.5 kg/cm², 36 psi)
   When fuel pressure regulator valve vacuum hose is disconnected.
   Approximately 294.1 kPa (2.94 bar, 3.0 kg/cm², 43 psi)

EC-208
MULTIPORT FUEL INJECTION SYSTEM INSPECTION

Fuel Pressure Check (Cont'd)

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

9. Start engine and read indication of fuel pressure gauge as vacuum is changed.  
Fuel pressure should decrease as vacuum increases. If results are unsatisfactory, replace fuel pressure regulator.

Injector Removal and Installation

1. Remove injectors with fuel tube assembly.
   Refer to "INTAKE MANIFOLD" in EM section.
2. Push out any malfunctioning injector from fuel tube assembly.
   • Do not extract injector by pinching connector.
   • Always replace O-rings and insulators with new ones.
   • Lubricate O-ring with a smear of silicone oil.
3. Installation is in the reverse order of removal.

CAUTION:
After properly connecting injectors to fuel tube assembly, check connections for fuel leakage.
The evaporative emission system is used to reduce hydrocarbons emitted into the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoal in the carbon canister.

The fuel vapor from sealed fuel tank is led into the canister when the engine is off. The fuel vapor is then stored in the canister. The canister retains the fuel vapor until the canister is purged by air.

When the engine is running, the air is drawn through the bottom of the canister. The fuel vapor will then be led to the intake manifold.

When the engine runs at idle, the purge control valve is closed. Only a small amount of vapor flows into the intake manifold through the constant purge orifice.

As the engine speed increases and the throttle vacuum rises, the purge control valve opens. The vapor is sucked through both main purge and constant purge orifices.

**Inspection**

**ACTIVATED CARBON CANISTER**

Check carbon canister as follows:
1. Blow air in port (A) and ensure that there is no leakage.
2. • Apply vacuum to port (A).
   • Cover port (B) with hand.
   • Blow air in port (C) and ensure free flow out of port (B).

EC-210
EVAPORATIVE EMISSION SYSTEM

Inspection (Cont'd)

FUEL TANK VACUUM RELIEF VALVE

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

FUEL CHECK VALVE

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

This system returns blow-by gas to the intake collector. The positive crankcase ventilation (PCV) 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 PCV 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 air inlet tubes into crankcase through a hose. The hose connects the air inlet tubes and the rocker cover. Under full-throttle condition, the manifold vacuum is insufficient to draw the blow-by flow through the valve. Flow then goes through the hose connection in the reverse direction. Under any condition, some of the flow goes through the hose connection to the air inlet tubes. This will occur on vehicles with an excessively high blow-by.

Inspection

**PCV (Positive Crankcase Ventilation) VALVE**

With engine running at idle, remove ventilation hose from PCV valve; if the valve is working properly, a hissing noise will be heard as air passes through it and a strong vacuum should be felt immediately when a finger is placed over valve inlet.

**VENTILATION HOSE**

1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air. If any hose cannot be freed of obstructions, replace.
# SERVICE DATA AND SPECIFICATIONS (SDS)

## General Specifications

<table>
<thead>
<tr>
<th>PRESSURE REGULATOR</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel pressure at idling kPa (bar, kg/cm², psi)</td>
<td>Approximately 245 (2.45, 2.5, 36)</td>
</tr>
<tr>
<td>Vacuum hose is connected</td>
<td></td>
</tr>
<tr>
<td>Vacuum hose is disconnected</td>
<td>Approximately 294 (2.94, 3.0, 43)</td>
</tr>
</tbody>
</table>

## Inspection and Adjustment

### FUEL PUMP

| Resistance | Ω | 0.2 - 5.0 |

### HEATED OXYGEN SENSOR HEATER

| Resistance | Ω | 3 - 1,000 |

### IACV-AAC VALVE

| Resistance | Ω | Approximately 10 |

### INJECTOR

| Resistance | Ω | 10 - 14 |

### THROTTLE POSITION SENSOR

<table>
<thead>
<tr>
<th>Accelerator pedal conditions</th>
<th>Resistance kΩ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fully released</td>
<td>Approximately 0.7</td>
</tr>
<tr>
<td>Partially released</td>
<td>0.7 - 5</td>
</tr>
<tr>
<td>Completely depressed</td>
<td>Approximately 5</td>
</tr>
</tbody>
</table>

### IGNITION COIL

| Primary voltage | V | 12 |
| Primary resistance [at 20°C (68°F)] | Ω | Approximately 1 |

### ENGINE COOLANT TEMPERATURE SENSOR

<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>50 (122)</td>
<td>0.66 - 1.00</td>
</tr>
<tr>
<td>80 (176)</td>
<td>0.30 - 0.33</td>
</tr>
</tbody>
</table>
ACCELERATOR CONTROL, FUEL & EXHAUST SYSTEMS

SECTION FE

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PREPARATION/ACCELERATOR CONTROL SYSTEM ................................................................. 2
  Special Service Tool ........................................................................................................... 2
  Accelerator Control System .............................................................................................. 2
  Adjusting Accelerator Wire ............................................................................................... 2

FUEL SYSTEM .................................................................................................................... 3
  Fuel Tank ............................................................................................................................ 3
  Fuel Pump and Gauge ........................................................................................................ 5

EXHAUST SYSTEM ............................................................................................................. 7
Special Service Tool

<table>
<thead>
<tr>
<th>Tool number</th>
<th>Tool name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>KV999G0010</td>
<td>Fuel tank lock ring</td>
<td>Removing and installing fuel tank lock ring.</td>
</tr>
<tr>
<td></td>
<td>socket</td>
<td></td>
</tr>
</tbody>
</table>

Accelerator Control System

CAUTION:
- When removing accelerator wire, make a mark to indicate lock nut’s initial position.
- Check that throttle valve opens fully when accelerator pedal is fully depressed. Also check that it returns to idle position when pedal is released.
- Check accelerator control parts for improper contact with any adjacent parts.
- When connecting accelerator wire, be careful not to twist or scratch wire.
- Refer to "AUTOMATIC SPEED CONTROL DEVICE" in EL section for ASCD wire adjustment.
- Refer to "ON-VEHICLE SERVICE" in AT section for Kickdown switch adjustment.

Adjusting Accelerator Wire
1. Loosen lock nut, and tighten adjusting nut until throttle drum starts to move.
2. From that position turn back adjusting nut 1.5 to 2 turns, and secure lock nut.
WARNING:
- Do not smoke while servicing fuel system. Keep open flames and sparks away from work area.
- Be sure to furnish workshop with a CO₂ fire extinguisher.

CAUTION:
- Before removing fuel line parts carry out the following procedures:
  a. Put drained fuel in an explosion-proof container and put the lid on securely.
  b. Release fuel pressure from fuel line. Refer to "Changing Fuel Filter" in MA section.
  c. Disconnect battery ground cable.
- When installing fuel check valve, be careful of its designated direction. (Refer to EC section.)
- Always replace O-ring and clamps with new ones.
- Do not kink or twist tubes when they are being installed.
- Do not tightened hose clamps excessively to avoid damaging hoses.
- After installing tubes, run engine and check for fuel leaks at connections.

SEC. 172

Fuel Tank
REMOVAL
CAUTION:
- Do not disconnect any fuel line unless absolutely necessary.
- Plug hose and pipe openings to prevent entry of dust or oil.

FE-3
FUEL SYSTEM

Fuel Tank (Cont’d)

2. Remove inspection hole cover located behind the rear seat.
3. Disconnect harness connectors under inspection hole cover.

4. Disconnect fuel tubes located on the lower right-hand side of fuel tank.
   • Put mating marks on tubes for correct installation.

5. Remove exhaust center tube, propeller shaft, differential carrier, rear suspension member and drive shafts (Refer to RA section).
6. Disconnect filler hose at fuel tank side and vent hose at filler tube side.

7. Remove fuel tank protector.
8. Remove fuel tank band mounting bolts while supporting fuel tank.
9. Remove fuel tank.

INSTALLATION

Installation procedure is the reverse order of removal.
• When installing filler collar, place the protrusion of the collar flange upward.
FUEL SYSTEM

Fuel Tank (Cont'd)

- When installing the grommet of the filler tube, align the protrusion on the grommet with the notch on the filler tube.

- When installing the inspection hole, put the arrow mark forward.

Fuel Pump and Gauge

REMOVAL

1. Release fuel pressure from fuel line.
   Refer to "Changing Fuel Filter" in MA section.
2. Remove inspection hole cover located behind the rear seat.
3. Disconnect harness connectors and fuel tubes on upper plate.
4. Put mating marks on tubes for correct installation.
5. Remove lock ring (Use Tool).
6. While lifting upper plate, disconnect fuel tube and harness connectors.
FUEL SYSTEM

Fuel Pump and Gauge (Cont’d)

6. Remove fuel pump pulling the top end of the fuel pump bracket upward.
7. Remove fuel gauge unit.
   a. Pull fuel gauge unit horizontally to the left.

   ![Diagram](SFE372A)

   ![Diagram](SFE373A)

   ![Diagram](SFE374A)

b. Remove harness connector.
   - Carefully place the removed connector in the fuel tank so that it can be pulled out for the installation.

INSTALLATION

Installation procedure is the reverse order of removal.

CAUTION:
- When installing upper plate, align the mark on it with the center of marks on fuel tank.
EXHAUST SYSTEM

CAUTION:
- Always replace exhaust gaskets with new ones when reassembling.
- With engine running, check all tube connections for exhaust gas leaks, and entire system for unusual noises.
- After installation, check to ensure that mounting brackets and mounting insulator are free from undue stress. If not installed properly, excessive noise or vibration may be transmitted to the vehicle body.
**PRECAUTIONS AND PREPARATION**

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

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

**Special Service Tools**

<table>
<thead>
<tr>
<th>Tool number</th>
<th>Tool name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GG94310000</td>
<td>Flare nut torque wrench</td>
<td>Removing and installing each clutch piping</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ST206000000</td>
<td>Clutch aligning bar</td>
<td>Installing clutch cover and clutch disc</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ST20050240</td>
<td>Diaphragm spring adjusting wrench</td>
<td>Adjusting unevenness of diaphragm spring of clutch cover</td>
</tr>
<tr>
<td></td>
<td></td>
<td></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>

CL-2
Adjusting Clutch Pedal

1. Adjust pedal height with pedal stopper.
   Pedal height "H":
   - LHD: 192 - 202 mm (7.56 - 7.95 in)
   - RHD: 188 - 198 mm (7.40 - 7.80 in)

2. Adjust pedal free play with master cylinder push rod. Then tighten lock nut.
   Pedal free play "A":
   - 9 - 16 mm (0.35 - 0.63 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.

3. Make sure that clevis pin can be rotated smoothly. If not, readjust pedal free play with master cylinder push rod.
Bleeding Procedure

1. Bleed air from clutch master cylinder (RHD model only) according to the following procedure.

   Carefully monitor fluid level at master cylinder during bleeding operation.
   
a. Top up reservoir with recommended brake fluid.
b. Connect a transparent vinyl tube to air bleeder valve.
c. Fully depress clutch pedal several times.
d. With clutch pedal depressed, open bleeder valve to release air.
e. Close bleeder valve.
f. Repeat steps c through e above until brake fluid flows from air bleeder valve without air bubbles.

2. Bleed air from clutch operating cylinder according to the above same procedure.

3. Bleed air from clutch piping connector according to the above same procedure.

4. Repeat the above bleeding procedures 1 through 3 several times.

Remarks

When replacing clutch tube, install new one parallel to body floor panel. If not, air bleeding might be difficult.
HYDRAULIC CLUTCH CONTROL

Clutch Master Cylinder

SEC. 305
LHD model

Reservoir cap

Piston cup

Return spring

Reservoir

Reservoir band

2.5 - 3.9
(0.25 - 0.40, 18 - 29)

Cylinder body

Rubbing surface to piston assembly

Piston assembly

Valve stopper

1.6 - 2.9 (0.15 - 0.30, 1.1 - 2.2)

- Apply brake fluid when assembling.

- Remove this stopper when removing piston and return spring.

Packing

- Apply rubber lubricant.
- Apply silicone grease.
- Apply rubber grease.
- N-m (kg-m, ft-lb)

- Apply rubber lubricant.
- Apply silicone grease.
- Apply rubber grease.
- N-m (kg-m, ft-lb)

- Apply rubber lubricant.
- Apply silicone grease.
- Apply rubber grease.
- N-m (kg-m, ft-lb)

Stopper

Dust cover

Rubbing surface to push rod

Push rod

Contact surface to piston assembly

Lock nut

8 - 12 (0.8 - 1.2, 5.8 - 8.7)

Stopper ring

Contact surface to piston assembly

SEC. 305
RHD model

Reservoir cap

Piston cup

Return spring

Reservoir

Cylinder body

Rubbing surface to piston assembly

Piston assembly

Push rod

Contact surface to piston assembly

Lock nut

8 - 12 (0.8 - 1.2, 5.8 - 8.7)

Dust cover

Rubbing surface to push rod

Bleeder screw

6 - 10 (0.6 - 1.0, 4.3 - 7.2)

DISASSEMBLY AND ASSEMBLY

- Push piston into cylinder body with screwdriver when removing and installing valve stopper.

CL-6
HYDRAULIC CLUTCH CONTROL

Clutch Master Cylinder (Cont’d)
- Align groove of piston assembly and valve stopper when installing valve stopper.
- Check direction of piston cups.

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

Operating Cylinder

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

SEC. 321

Dust cover
Withdrawal lever
Retainer spring
Holder spring
Release sleeve
Release bearing

| L | 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.

CL-8
CLUTCH RELEASE MECHANISM

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

LUBRICATION
- Apply recommended grease to contact surface and rubbing surface.
Too much lubricant might damage clutch disc facing.
CLUTCH DISC AND CLUTCH COVER

Clutch Cover and Flywheel

INSPECTION AND ADJUSTMENT
- Check clutch cover installed on vehicle for unevenness of diaphragm spring toe height.
  Uneven limit:
  0.5 mm (0.020 in)
- If out of limit, adjust the height with Tool.

FLYWHEEL INSPECTION
- Check contact surface of flywheel for slight burns or discoloration. Repair flywheel with emery paper.
- Check flywheel runout.
  Maximum allowable runout:
  Refer to EM section ("Inspection", "CYLINDER BLOCK").

INSTALLATION
- Insert Tool into clutch disc hub when installing clutch cover and disc.
- Tighten bolts in numerical order.
- Be careful not to allow grease to contaminate clutch facing.
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 for backlash of spline and runout of facing.
  Maximum backlash of spline (at outer edge of disc):
  1.0 mm (0.039 in)
  Runout limit:
  1.0 mm (0.039 in)
  Distance of runout check point (from hub center):
  115 mm (4.53 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.
## SERVICE DATA AND SPECIFICATIONS (SDS)

### CLUTCH CONTROL SYSTEM

| Type of clutch control | Hydraulic |

### CLUTCH MASTER CYLINDER

| Inner diameter (mm (in)) | 15.87 (5/8) |

### CLUTCH OPERATING CYLINDER

| Inner diameter (mm (in)) | 19.06 (3/4) |

### CLUTCH PEDAL

<table>
<thead>
<tr>
<th>Model</th>
<th>LHD</th>
<th>RHD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedal height &quot;H&quot; (7.56 - 7.95)</td>
<td>192 - 202</td>
<td>188 - 198</td>
</tr>
<tr>
<td>Pedal free play &quot;A&quot; (At pedal pad)</td>
<td>9 - 16 (0.35 - 0.63)</td>
<td></td>
</tr>
</tbody>
</table>

* Measured from surface of melt sheet to pedal pad

### CLUTCH DISC

<table>
<thead>
<tr>
<th>Model</th>
<th>240</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wear limit of facing surface to rivet hole</td>
<td>0.3 (0.012)</td>
</tr>
<tr>
<td>Runout limit of facing</td>
<td>1.0 (0.039)</td>
</tr>
<tr>
<td>Distance of runout check point (from the hub center)</td>
<td>11.5 (0.453)</td>
</tr>
<tr>
<td>Maximum backlash of spline (at outer edge of disc)</td>
<td>1.0 (0.039)</td>
</tr>
</tbody>
</table>

### CLUTCH COVER

<table>
<thead>
<tr>
<th>Model</th>
<th>240</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full load</td>
<td>240</td>
</tr>
<tr>
<td>Uneven limit of diaphragm spring toe height</td>
<td>0.5 (0.020)</td>
</tr>
</tbody>
</table>

---

**CL-12**
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## PREPARATION

### Special Service Tools

<table>
<thead>
<tr>
<th>Tool number</th>
<th>Tool name</th>
<th>Description</th>
<th>Diagram</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST23810001</td>
<td>Adapter setting plate</td>
<td>Fixing adapter plate with gear assembly</td>
<td><img src="a.png" alt="Diagram" /></td>
</tr>
<tr>
<td>KV31100401</td>
<td>Transmission press stand</td>
<td>Pressing counter gear and mainshaft</td>
<td><img src="b.png" alt="Diagram" /></td>
</tr>
<tr>
<td>ST22520000</td>
<td>Wrench</td>
<td>Tightening mainshaft lock nut</td>
<td><img src="c.png" alt="Diagram" /></td>
</tr>
<tr>
<td>ST23540000</td>
<td>Pin punch</td>
<td>Removing and installing fork rod retaining pin</td>
<td><img src="d.png" alt="Diagram" /></td>
</tr>
<tr>
<td>ST30031000</td>
<td>Puller</td>
<td>Removing and installing 1st gear bushing</td>
<td><img src="e.png" alt="Diagram" /></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Removing main drive gear bearing</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Measuring wear of baulk rings</td>
<td></td>
</tr>
<tr>
<td>ST23860000</td>
<td>Drift</td>
<td>Installing counter drive gear</td>
<td><img src="f.png" alt="Diagram" /></td>
</tr>
<tr>
<td>ST22380002</td>
<td>Drift</td>
<td>Installing counter gear front and rear end bearings</td>
<td><img src="g.png" alt="Diagram" /></td>
</tr>
</tbody>
</table>

- a: 166 mm (6.54 in)  
- b: 270 mm (10.63 in)
- a: 100 mm (3.94 in)  
- b: 41 mm (1.61 in)
- a: 2.3 mm (0.091 in) dia.
- b: 4 mm (0.16 in) dia.
- a: 90 mm (3.54 in) dia.
- b: 50 mm (1.97 in) dia.
- a: 38 mm (1.50 in) dia.
- b: 33 mm (1.30 in) dia.
- a: 28 mm (1.14 in) dia.
- b: 23 mm (0.91 in) dia.

**MT-2**
<table>
<thead>
<tr>
<th>Tool number/Tool name</th>
<th>Description</th>
<th>a:</th>
<th>b:</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST223500000 Drift</td>
<td>Installing OD gear bushing</td>
<td>34</td>
<td>28</td>
</tr>
<tr>
<td>ST238000000 Drift</td>
<td>Installing front cover oil seal</td>
<td>44</td>
<td>31</td>
</tr>
<tr>
<td>ST334000001 Drift</td>
<td>Installing rear oil seal</td>
<td>60</td>
<td>47</td>
</tr>
<tr>
<td>ST332900001 Puller</td>
<td>Removing rear oil seal</td>
<td>250</td>
<td>180</td>
</tr>
<tr>
<td>ST307200000 Drift</td>
<td>Installing mainshaft ball bearing</td>
<td>77</td>
<td>55.5</td>
</tr>
<tr>
<td>ST306130000 Drift</td>
<td>Installing main drive gear bearing</td>
<td>71.5</td>
<td>47.5</td>
</tr>
<tr>
<td>ST332000000 Drift</td>
<td>Installing counter rear bearing Installing 3rd &amp; 4th synchronizer assembly</td>
<td>60</td>
<td>44.5</td>
</tr>
</tbody>
</table>
### PREPARATION

#### Special Service Tools (Cont’d)

<table>
<thead>
<tr>
<th>Tool number</th>
<th>Tool name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>KV32101330</td>
<td>Puller</td>
<td>Removing overdrive mainshaft bearing</td>
</tr>
</tbody>
</table>

![Diagram](image)

- a: 447 mm (17.60 in)
- b: 100 mm (3.94 in)

#### 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 OD gears</td>
</tr>
</tbody>
</table>

![Diagram](image)

NT077

---

MT-4
Replacing Rear Oil Seal

REMOVAL

INSTALLATION

Check of Position Switches

<table>
<thead>
<tr>
<th>Switch</th>
<th>Gear position</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reverse lamp switch</td>
<td>Reverse</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Other than reverse</td>
<td>No</td>
</tr>
<tr>
<td>Neutral position switch</td>
<td>Neutral</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Other than neutral</td>
<td>No</td>
</tr>
</tbody>
</table>
1. Remove battery negative terminal.
2. Remove shift lever with control housing from transmission.
3. Remove clutch operating cylinder from transmission.
4. Disconnect speed sensor, reverse lamp switch and neutral position switch harness connectors.
5. Remove starter motor from transmission.
6. 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.
7. Remove exhaust tube mounting bracket from transmission.
8. Support manual transmission with a jack.
9. Remove rear mounting bracket.
10. Lower manual transmission as much as possible.

11. Remove transmission fixing bolts.
12. Remove transmission from engine.
   - Support manual transmission while removing it.
Installation

- Tighten transmission fixing bolts.

<table>
<thead>
<tr>
<th>Bolt No.</th>
<th>Tightening torque N·m (kg-m, ft-lb)</th>
<th>&quot;l&quot; mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>①</td>
<td>70 - 79 (7.1 - 8.1, 51 - 59)</td>
<td>68 (2.68)</td>
</tr>
<tr>
<td>②</td>
<td>70 - 79 (7.1 - 8.1, 51 - 59)</td>
<td>63 (2.48)</td>
</tr>
<tr>
<td>③</td>
<td>70 - 79 (7.1 - 8.1, 51 - 59)</td>
<td>78 (3.07)</td>
</tr>
<tr>
<td>④</td>
<td>29 - 39 (3.0 - 4.0, 22 - 29)</td>
<td>60 (2.36)</td>
</tr>
<tr>
<td>⑤</td>
<td>29 - 39 (3.0 - 4.0, 22 - 29)</td>
<td>30 (1.18)</td>
</tr>
</tbody>
</table>

- Install any part removed.
MAJOR OVERHAUL

Gear Components

SEC. 322

- Bauk ring
- Washer
- Snap ring ★
- Pilot bearing
- Snap ring
- Main drive gear ball bearing
- Snap ring ★
- Main drive gear
- Steel roller
- Steel ball
- 1st main gear
- 1st gear bushing
- 1st & 2nd coupling sleeve ★
- Mainshaft ball bearing
- Snap ring ★
- OD mainshaft bearing
- Speedometer drive gear
- Snap ring ★
- OD mainshaft lock nut
- (14.0 - 17.0, 101 - 123) Without Tool
- OD gear bushing
- OD (5th) & reverse synchronizer hub
- OD (5th) main gear
- Reverse counter gear
- Bauk ring
- Coupling sleeve
- Insert spring
- Needle bearing
- Insert spring
- Needle bearing
- Needle bearing
- OD counter gear
- Counter rear bearing
- Reverse counter gear spacer
- Counter shaft rear end bearing
- Countershaft lock nut
- (98 - 127) (10.0 - 13.0, 72 - 94)
- Countershaft rear end bearing
- Reverse idler gear
- Snap ring ★
- Counter gear
- Reverse idler gear
- Snap ring ★
- Reverse idler thrust washer
- Counter drive gear ★
- Sub-gear
- Counter drive gear ★
- Sub-gear
- Sub-gear spring ★
- Sub-gear bracket
- Shim ★
- Bush
- Countershaft front bearing
- Snap ring ★

Apply gear oil to gears, shafts, synchronizers, and bearings when assembling.
★ Select with proper thickness.
★ Pay attention to its direction.
N-m (kg-m, ft-lb)

MT-9
Case Components

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

   b. Drive out striking arm retaining pin.
   c. Remove striking arm from striking rod.

   d. 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.

MT-11
DISASSEMBLY

Case Components (Cont’d)
4. Remove front cover oil seal.

Shift Control Components
1. Set up Tool on adapter plate.
2. Remove striking rod from adapter plate.
3. Remove check ball plugs, check springs, and check balls.
4. Drive out retaining pins. Then drive out fork rods and remove interlock balls.
5. Draw out 3rd-4th and OD-reverse fork rods.

Gear Components
1. Before removing gears and shafts, measure each gear end play.
   Gear end play: Refer to SDS, MT-28.
   If not within specification, disassemble and check contact surface of gear to hub, washer, bushing, needle bearing and shaft.
DISASSEMBLY

Gear Components (Cont'd)

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

   b. Pull out OD 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 OD mainshaft bearing, then remove snap ring.
   g. Remove mainshaft nut.
   h. Remove steel roller and washer.
   i. Remove roller bearing and washer.
   j. Remove OD main gear, needle bearing and baulk ring (OD).
   k. Remove OD coupling sleeve and shifting inserts.
DISASSEMBLY

Gear Components (Cont’d)

1. Press out mainshaft and counter gear alternately.
   - Press down mainshaft and counter gear alternately and carefully. Do not allow gears attached to mainshaft and counter gear underneath adapter plate to hit each 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.

   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.

MT-14
INSPECTION

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 spread spring for deformation.
INSPECTION

Gear Components (Cont’d)

- Measure clearance between baulk ring and gear.

Clearance between baulk ring and gear (1st, main drive, OD and reverse baulk ring):

<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></td>
</tr>
<tr>
<td></td>
<td>(0.047 - 0.063)</td>
<td>0.8 (0.031)</td>
</tr>
<tr>
<td>Main drive</td>
<td>1.2 - 1.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.047 - 0.063)</td>
<td></td>
</tr>
<tr>
<td>OD</td>
<td>1.2 - 1.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.047 - 0.063)</td>
<td></td>
</tr>
<tr>
<td>Reverse</td>
<td>1.10 - 1.55</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0433 - 0.0610)</td>
<td>0.7 (0.028)</td>
</tr>
</tbody>
</table>

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

- Measure wear of 2nd and 3rd baulk rings.
  a. Place inner baulk ring in position on synchronizer cone.
  b. Hold baulk ring evenly against synchronizer cone and measure distance “A”.
  c. Place outer baulk ring in position on synchronizer cone.
  d. Hold baulk ring evenly against synchronizer cone and measure distance “B”.

  **Standard:**
  - Inner-A 0.6 - 1.1 mm (0.024 - 0.043 in)
  - Outer-B 0.7 - 0.9 mm (0.028 - 0.035 in)

  **Wear Limit:**
  - 0.2 mm (0.008 in)
  e. If distance “A” or “B” is smaller than the wear limit, replace baulk ring.

BEARINGS

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

Gear Components

1. Install bearings into case components.

2. Assemble adapter plate parts.
   - Install oil gutter on adapter plate and expand on rear side.
   - Install bearing retainer.
     a. Insert reverse shaft, then install bearing retainer.
     b. Tighten each screw, then stake each at two points.
ASSEMBLY

Gear Components (Cont’d)

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

   c. Select proper main drive gear snap ring to minimize clearance of groove and install it.
      Allowable clearance of groove:
      0 - 0.13 mm (0 - 0.0051 in)
      Main drive gear snap ring:
      Refer to SDS, MT-28.

4. Assemble synchronizers.
   • 1st & 2nd, 3rd & 4th synchronizers

   • Check coupling sleeve and synchronizer hub orientation.
ASSEMBLY
Gear Components (Cont'd)

- OD & reverse synchronizer

5. Install front side components on main shaft.
   b. Install 1st main gear.
   c. Install steel ball and 1st gear washer.

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

Gear Components (Cont’d)

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 SDS, MT-28.

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

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

Gear Components (Cont'd)

- Pay attention to direction of counter drive gear.

- Install sub-gear components.
  1. Install sub-gear and sub-gear bracket on counter drive gear. Then select proper snap ring to minimize clearance of groove in counter gear.
     
     **Allowable clearance of groove:**
     
     $0 - 0.13$ mm ($0 - 0.0051$ in)

     **Counter drive gear snap ring:** Refer to SDS, MT-28.

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

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

- Install selected counter drive gear snap ring.

- Press counter gear front bearing onto counter gear.

- 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.

MT-21
ASSEMBLY

Gear Components (Cont’d)

b. Install insert retainer and OD & reverse synchronizer to mainshaft.
   • Pay attention to direction of hub.

c. Install OD gear bushing with Tool.
d. Install OD main gear and needle bearing.
e. Install spacer, reverse counter gear and OD counter gear.
   • OD main gear and OD 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)
- 9. 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, MT-12.

Shift Control Components

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

   a. 1st-2nd shift fork

MT-23
ASSEMBLY

Shift Control Components (Cont’d)
b. 3rd-4th shift fork

c. OD-reverse shift fork or reverse shift fork

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.
ASSEMBLY

Case Components (Cont'd)

4. Install snap ring of main drive bearing.

5. Set 1st & 2nd, 3rd & 4th and 5th & reverse shift forks in neutral position.

6. Install striking rod onto adapter plate while aligning striking lever with shift brackets.

7. Apply sealant to mating surface of adapter plate.

8. Install rear extension while inserting striking arm into striking rod.

9. Install striking arm retaining pin.

10. Select counter front bearing shim.
    Counter front bearing shim: Refer to SDS, MT-29.

11. Install gasket and front cover.

MT-25
ASSEMBLY

Case Components (Cont'd)

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

13. Install control housing and gasket.
# SERVICE DATA AND SPECIFICATIONS (SDS)

## General Specifications

<table>
<thead>
<tr>
<th>Transmission model</th>
<th>FS5WTIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of speeds</td>
<td>5</td>
</tr>
<tr>
<td>Shift pattern</td>
<td><img src="image" alt="Shift Pattern" /></td>
</tr>
<tr>
<td>Synchronesh 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>OD</td>
<td>0.638</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>OD</td>
<td>22</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>OD</td>
<td>37</td>
</tr>
<tr>
<td>Reverse</td>
<td>15</td>
</tr>
<tr>
<td>Reverse idler gear</td>
<td></td>
</tr>
<tr>
<td>Oil capacity</td>
<td>2.5 (4-3/8)</td>
</tr>
<tr>
<td>Remarks</td>
<td>Sub-gear</td>
</tr>
<tr>
<td>Reverse synchronizer</td>
<td></td>
</tr>
<tr>
<td>Double baulk ring type synchronizer</td>
<td>2nd and 3rd synchronizer</td>
</tr>
</tbody>
</table>
# SERVICE DATA AND SPECIFICATIONS (SDS)

## Inspection and Adjustment

### GEAR END PLAY

<table>
<thead>
<tr>
<th>Gear</th>
<th>End play mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>0.31 - 0.41 (0.0122 - 0.0161)</td>
</tr>
<tr>
<td>2nd</td>
<td>0.11 - 0.21 (0.0043 - 0.0063)</td>
</tr>
<tr>
<td>3rd</td>
<td>0.11 - 0.21 (0.0043 - 0.0063)</td>
</tr>
<tr>
<td>OD</td>
<td>0.24 - 0.41 (0.0094 - 0.0161)</td>
</tr>
</tbody>
</table>

### CLEARANCE BETWEEN BAULK RING AND GEAR

#### 1st, main drive, OD and reverse baulk ring

<table>
<thead>
<tr>
<th></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>0.6 (0.031)</td>
</tr>
<tr>
<td>Main drive</td>
<td>1.2 - 1.6 (0.047 - 0.063)</td>
<td></td>
</tr>
<tr>
<td>OD</td>
<td>1.2 - 1.6 (0.047 - 0.063)</td>
<td></td>
</tr>
<tr>
<td>Reverse</td>
<td>1.10 - 1.53 (0.0430 - 0.0610)</td>
<td>0.7 (0.028)</td>
</tr>
</tbody>
</table>

#### 2nd and 3rd baulk ring

**Unit: mm (in)**

- Outer baulk ring
- Inner baulk ring
- Synchronizer cone

### 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 (0.0818)</td>
<td>32204-78004</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-VS200</td>
</tr>
<tr>
<td>2.5 (0.098)</td>
<td>32263-VS201</td>
</tr>
<tr>
<td>2.6 (0.102)</td>
<td>32263-VS202</td>
</tr>
</tbody>
</table>

#### OD mainshaft 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>

#### Counter drive gear

<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>1.4 (0.055)</td>
<td>32215-E9000</td>
</tr>
<tr>
<td>1.5 (0.059)</td>
<td>32215-E9001</td>
</tr>
<tr>
<td>1.6 (0.063)</td>
<td>32215-E9002</td>
</tr>
</tbody>
</table>

---

**MT-28**
### AVAILABLE SHIMS

#### Counter front bearing

**Unit:** mm (in)

![Diagram of transmission case and counter gear](image)

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

---

**MT-29**
PROPELLER SHAFT & DIFFERENTIAL CARRIER

SECTION PD

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When you read wiring diagrams:
• Read GI section, "HOW TO READ WIRING DIAGRAMS".
• See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.
When you perform trouble diagnoses, read GI section, “HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSIS” and “HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT”. 

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## PREPARATION

### Special Service Tools

<table>
<thead>
<tr>
<th>Tool number</th>
<th>Description</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>KV38100600</td>
<td>Mounting final drive (To use, make a new hole.)</td>
<td>a: 152 mm (5.98 in)</td>
</tr>
<tr>
<td>Diff. attacment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NT119</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ST3090S000</td>
<td>Removing and installing drive pinion rear cone</td>
<td>a: 79 mm (3.11 in) dia.</td>
</tr>
<tr>
<td>Driv. pinion rear</td>
<td></td>
<td>b: 45 mm (1.77 in) dia.</td>
</tr>
<tr>
<td>race puller set</td>
<td></td>
<td>c: 35 mm (1.38 in) dia.</td>
</tr>
<tr>
<td>① ST30031000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Puller</td>
<td></td>
<td></td>
</tr>
<tr>
<td>② ST30901000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Base</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NT527</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ST3306S001</td>
<td>Removing and installing differential side bearing inner cone</td>
<td>a: 28.5 mm (1.122 in) dia.</td>
</tr>
<tr>
<td>Different. side</td>
<td></td>
<td>b: 38 mm (1.50 in) dia.</td>
</tr>
<tr>
<td>bearing puller set</td>
<td></td>
<td></td>
</tr>
<tr>
<td>① ST3305S001</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Body</td>
<td></td>
<td></td>
</tr>
<tr>
<td>② ST33061000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adapter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NT072</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ST30611000</td>
<td>Installing pinion rear bearing outer race</td>
<td></td>
</tr>
<tr>
<td>Drift</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NT060</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ST30613000</td>
<td>Installing pinion front bearing outer race</td>
<td>a: 72 mm (2.83 in) dia.</td>
</tr>
<tr>
<td>Drift</td>
<td></td>
<td>b: 48 mm (1.89 in) dia.</td>
</tr>
<tr>
<td>NT073</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ST30621000</td>
<td>Installing pinion rear bearing outer race</td>
<td>a: 79 mm (3.11 in) dia.</td>
</tr>
<tr>
<td>Drift</td>
<td></td>
<td>b: 59 mm (2.32 in) dia.</td>
</tr>
</tbody>
</table>
### PREPARATION

#### Special Service Tools (Cont’d)

<table>
<thead>
<tr>
<th>Tool number</th>
<th>Description</th>
<th>Tool name</th>
</tr>
</thead>
<tbody>
<tr>
<td>KV38100200</td>
<td>Installing side oil seal</td>
<td>NT115</td>
</tr>
</tbody>
</table>
| Gear carrier side oil seal drift | a: 65 mm (2.56 in) dia.  
b: 49 mm (1.93 in) dia.     |           |
| KV38100500        | Installing front oil seal                        | NT115     |
| Gear carrier front oil seal drift | a: 85 mm (3.35 in) dia.  
b: 60 mm (2.36 in) dia.     |           |
| KV38100300        | Installing side bearing inner cone               | NT085     |
| Differential side bearing inner cone | a: 54 mm (2.13 in) dia.  
b: 46 mm (1.81 in) dia.  
c: 32 mm (1.26 in) dia.     |           |
| KV38100600        | Installing side bearing spacer                    | NT038     |
| Side bearing spacer drift | a: 8 mm (0.31 in)  
b: R42.5 mm (1.673 in)     |           |
| ST31275000        | Measuring pinion bearing preload and total preload | NT124     |
| Preload gauge     | a: 65 mm (2.56 in) dia.  
b: 49 mm (1.93 in) dia.     |           |
| ① GG91030000      | Torque wrench                                    |           |
| ② HT62940000      | Socket adapter                                    |           |
| ③ HT629900000     | Socket adapter                                    |           |
| HT724000000       | Removing differential case assembly              | NT125     |
| Slide hammer      |                                                  |           |
### PREPARATION

#### Special Service Tools (Cont’d)

<table>
<thead>
<tr>
<th>Tool number</th>
<th>Tool name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>KV38103950</td>
<td>Drive pinion height setting gauge</td>
<td>Selecting pinion height adjusting washer</td>
</tr>
<tr>
<td>KV38103910</td>
<td>Dummy shaft</td>
<td></td>
</tr>
<tr>
<td>KV38103120</td>
<td>Height gauge</td>
<td></td>
</tr>
<tr>
<td>KV38100140</td>
<td>Stopper</td>
<td></td>
</tr>
</tbody>
</table>

KV38107900 Side oil seal protector

---

#### Commercial Service Tool

<table>
<thead>
<tr>
<th>Tool name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drive pinion flange wrench</td>
<td>Removing and installing propeller shaft lock nut, and drive pinion lock nut.</td>
</tr>
</tbody>
</table>

a: 81.25 mm (3.1968 in)

NT355
M/T model

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.

A/T model

1. Final drive companion flange
2. Propeller shaft 2nd tube
3. Center bearing upper mounting bracket
4. Clip
5. Center bearing
6. Center bearing cushion
7. Center bearing lower mounting bracket
8. Washer
9. Companion flange
10. Lock nut
11. Propeller shaft 1st tube

SPD009A

N·m (kg-m, ft-lb)
PROPELLER SHAFT

On-vehicle Service

PROPELLER SHAFT VIBRATION
If vibration is present at high speed, inspect propeller shaft runout first.
1. Raise rear wheels.
2. Measure propeller shaft runout at indicated points by rotating final drive companion flange with hands.
   Runout limit: 0.6 mm (0.024 in)

Propeller shaft runout measuring points:

- Distance:
  - "A" 155 mm (6.10 in)
  - "B" 165 mm (6.50 in)
  - "C" 185 mm (7.28 in)

3. If runout exceeds specifications, disconnect propeller shaft at final drive companion flange. Then rotate companion flange 90, 180 or 270 degrees and reconnect propeller shaft.
   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 it.

Removal
- Draw out propeller shaft from transmission and plug up rear end of transmission rear extension housing.

Installation
If companion flange has been removed, put new alignment marks B and C on it. Then reassemble using the following procedure. Perform step 4 when final drive and propeller shaft are separated from each other. Also perform step 4 when either of these parts is replaced with a new one.
PROPELLER SHAFT

Installation (Cont’d)

1. Erase original marks B and C from companion flange with suitable solvent.
2. Mark (B)
   A. Measure companion flange vertical runout.
   B. Determine the position where maximum runout is read on dial gauge. Put mark (shown by B in figure at left) on flange perimeter corresponding to maximum runout position.

3. Mark (C)
   A. Measure companion flange surface runout.
   B. Determine the position where maximum runout is read on dial gauge. Put mark (shown by C in figure at left) on flange perimeter corresponding to maximum runout position.

4. Position companion flange and propeller shaft using alignment marks A and B. Set the marks A and B as close to each other as possible. Temporarily attach bolts and nuts.
5. Press down propeller shaft with alignment mark C facing upward. Then tighten the lower nut to specified torque.
6. Tighten remaining nuts to specified torque.

Inspection

- Inspect propeller shaft runout. If runout exceeds specifications, replace propeller shaft assembly.
  Runout limit: 0.8 mm (0.024 in)

- Inspect journal axial play.
  If the play exceeds specifications, replace propeller shaft assembly.
  Journal axial play:
  0 mm (0 in)
Front Oil Seal Replacement
1. Remove propeller shaft.
2. Loosen drive pinion nut with suitable tool.

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. Disconnect final drive side flange and drive shaft flange and suspend drive shaft flange with wire.
2. Remove final drive side flange.
Disassembly

CENTER BEARING
1. Put matchmarks on flanges, and separate 2nd tube from 1st tube.
2. Put matchmarks on the flange and shaft.
3. Remove locking nut with suitable tool.
4. Remove companion flange with puller.

5. Remove center bearing with Tool and press.
   Tool number: ST30031000

Assembly

CENTER BEARING
- When installing center bearing, position the "F" mark on center bearing toward rear of vehicle.
- Apply a coat of grease to the end face of center bearing and both sides of washer.
  Use multi-purpose lithium grease that contains molybdenum disulfide.
- Stake the nut. Always use new one.
- Align matchmarks when assembling tubes.
Side Oil Seal Replacement (Cont’d)

3. Remove oil seal.

4. Apply multi-purpose grease to sealing lips of oil seal. Press-fit oil seal into carrier with Tool.
   Tool number: KV38100200

5. Install final drive side flange.
   Use Tool to prevent side oil seal from being damaged by spline portion of side flange.
   Tool number: KV38107900

6. Install drive shaft.

Removal

CAUTION:
Before removing the final drive assembly, disconnect the ABS sensor from the assembly. Then move it away from the final drive assembly. Failure to do so may result in damage to the sensor wires and the sensor becoming inoperative.

- Remove propeller shaft.
- Plug up rear end of transmission rear extension housing.
  - Remove drive shafts.
  - Refer to “Drive Shaft” of “REAR AXLE” in RA section.
  - Remove nuts securing final drive rear cove to suspension member.
  - Support weight of final drive using jack.
  - Remove final drive mounting member from front of final drive.
  - Move final drive forward together with jack. Remove rear cover stud bolts from suspension member.
  - Lower final drive using jack. Remove jack from rear of vehicle.
ON-VEHICLE SERVICE/REMOVAL AND INSTALLATION

Removal (Cont’d)

CAUTION:
- Be careful not to damage spline, sleeve yoke and front oil seal, when removing propeller shaft.
- After removal, support suspension member on a stand to prevent its insulators from being twisted or damaged.

Installation

- Fill final drive with recommended gear oil.
- **Models equipped with oil cooler system —**
- Check oil level and for oil leakage from hoses after oil cooler has been operated.
DISASSEMBLY

**Pre-inspection**
Before disassembling final drive, perform the following inspection.
- **Total preload**
  1) Turn drive pinion in both directions several times to set bearing rollers.
  2) Check total preload with Tool.
    - Tool number: ST3127S000
    - Total preload:
      - \(1.4 - 3.1\) N·m (14 - 32 kg·cm, 12 - 28 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 (PD-23).

**Differential Carrier**
1. Using two 45 mm (1.77 in) spacers, mount carrier on Tool.
   - Tool number: KV38100800

2. For proper reinstallation, paint or punch matchmarks on one side of the side bearing cap.
   - Bearing caps are line-board during manufacture. Replace them in their proper positions.
DISASSEMBLY

Differential Carrier (Cont'd)

3. Remove side bearing caps.

4. Lift differential case assembly out with Tool.
   Tool number: HT72400000

Keep the side bearing outer races together with inner cone —
do not mix them up.
Also, keep side bearing spacer and adjusting shims together
with bearings.

5. Loosen drive pinion nut and pull off companion flange.

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.
DISASSEMBLY
Differential Carrier (Cont'd)

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) ST33055001
   B) ST33061000
   Be careful not to confuse left- and right-hand parts. Keep bearing and bearing race for each side together.

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. Loosen screws on differential cases A and B.
5. Separate differential cases A and B.

PD-15
INSPECTION

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).

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.

Differential Case Assembly
- Check mating surfaces of differential case, side gears, pinion mate gears, pinion mate shaft and thrust washers.
- Check viscous coupling for oil leakage. If necessary, replace it with a new one.

PD-16
ADJUSTMENT

To avoid confusion while calculating bearing shims, it is absolutely necessary to stay with the metric system. If you measure anything in inches, the results must be converted to the metric system.

Drive Pinion Height

1. First prepare Tools for pinion height adjustment:
   ① Dummy shaft (KV38103910)
   ② Height gauge (KV38100120)
   ③ Stopper (KV38100140)

2. To simplify the job, make a chart, like the one below, to organize your calculations.

<table>
<thead>
<tr>
<th>LETTERS</th>
<th>HUNDREDS OF A MILLIMETER</th>
</tr>
</thead>
<tbody>
<tr>
<td>H: Head number</td>
<td></td>
</tr>
<tr>
<td>N: Measuring clearance</td>
<td></td>
</tr>
</tbody>
</table>

3. Write the following numbers down the chart:
   H: Head number

4. Set Tool (Dummy shaft) as shown below and tighten drive pinion nut carefully to correct preload of 1.0 to 1.3 Nm (10 to 13 kg-cm, 8.7 to 11.3 in-lb).
   Tool number: KV38103910
ADJUSTMENT

Drive Pinion Height (Cont'd)

5. Attach Tool (Height gauge) to gear carrier, and measure the clearance between the height gauge and the dummy shaft face.

6. Substitute these values into the equation to calculate the thickness of the washer.

If value signifying H is not given, regard it as zero and calculate.

\[ T \text{ (Thickness of washer)} = N - (H \times 0.01) + 3.00 \]

Example:

\[
\begin{align*}
N &= 0.23 \\
H &= 1 \\
T &= N - (H \times 0.01) + 3.00 \\
&= 0.23 - (1 \times 0.01) + 3.00 \\
\end{align*}
\]

\[
\begin{array}{c|c}
(1) & H \hfill \\
(2) & +1 \\
(3) & +1 \times 0.01 \\
(4) & +0.01 \\
(5) & 0.23 \\
& -(+0.01) \\
& 0.22 \\
& +3.00 \\
& 3.22 \\
& T = 3.22 \\
\end{array}
\]

7. Select the proper pinion height washer.

Drive pinion height adjusting washer:

Refer to SDS (PD-36).

If you cannot find the desired thickness of washer, use washer with thickness closest to the calculated value.

Example:

Calculated value ... \( T = 3.22 \) mm

Used washer ... \( T = 3.21 \) mm

PD-18
ADJUSTMENT

Drive Pinion Height (Cont’d)

— Washer selection when replacing hypoid gear set —

Drive pinions may be different in height due to the manufacturing process. Use a washer of proper thickness to adjust the height of new drive pinion. Select the washer as follows:

\[
T = (t_1 - t_2) \times 0.01 + T_0
\]

where:
- \(T\) thickness of the washer to select
- \(T_0\) thickness of the washer used
- \(t_1\) old drive pinion head number
- \(t_2\) new drive pinion head number

Example:

\[
T_0 = 3.21, t_1 = +2, t_2 = -1
\]

\[
T = (2 - (-1)) \times 0.01 + 3.21
\]

\[
= 3 \times 0.01 + 3.21
\]

\[
= 0.03 + 3.21
\]

\[
= 3.24
\]

\[
T = 3.24 \text{ mm}
\]

Drive pinion height adjusting washer:
Refer to SDS (PD-36).

Side Bearing Preload

1. To simplify the job, make a chart like the one below to organize your calculations.

<table>
<thead>
<tr>
<th>LETTERS</th>
<th>VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>A: Left housing</td>
<td></td>
</tr>
<tr>
<td>B: Right housing</td>
<td></td>
</tr>
<tr>
<td>C: Differential case</td>
<td></td>
</tr>
<tr>
<td>D: Differential case</td>
<td></td>
</tr>
<tr>
<td>H: (+) or (-) ring gear</td>
<td></td>
</tr>
<tr>
<td>E: Left side bearing</td>
<td>= 21 - Measured height)</td>
</tr>
<tr>
<td>F: Right side bearing</td>
<td>= 21 - Measured height)</td>
</tr>
<tr>
<td>G: Side bearing spacer</td>
<td>= 8.1 - Measured thickness)</td>
</tr>
<tr>
<td>X:</td>
<td>1.97</td>
</tr>
<tr>
<td>Y:</td>
<td>2.07</td>
</tr>
</tbody>
</table>

2. Write the following numbers down in the chart.
If numbers for A, B, C, D and H are not given, regard them as zero.
A & B: Figures marked on gear carrier.
ADJUSTMENT

Side Bearing Preload (Cont'd)

C & D: Figures marked on differential case

H: Figure marked on ring gear
   Do not confuse negative and positive values.

3. Calculate "E" and "F" as follows:
   \[ E \& F = 21 \text{ mm (0.83 in)} \] - Measured bearing height
   Bearing height can be measured as follows:
   a. Measure height of bearing race which will be used as
      a base for the opposite side of a side bearing assembly.
   b. Set bearing assembly to be measured on the base race
      and measure the total height.
      \textbf{Lubricate bearing assembly and turn it several times to settle it on the base for accurate measurement.}
      c. Subtract base race height from total height.

4. Calculate "G":
   \textbf{G: This is the difference in thickness of side spacer from standard width [8.10 mm (0.3189 in)].}
   \[ G = 8.10 \text{ mm (0.3189 in)} \] - Measured thickness

PD-20
ADJUSTMENT
Side Bearing Preload (Cont'd)

<table>
<thead>
<tr>
<th>LETTERS</th>
<th>VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>A: Left housing</td>
<td></td>
</tr>
<tr>
<td>B: Right housing</td>
<td></td>
</tr>
<tr>
<td>C: Differential case</td>
<td></td>
</tr>
<tr>
<td>D: Differential case</td>
<td></td>
</tr>
<tr>
<td>H: (+) or (-): ring gear</td>
<td></td>
</tr>
<tr>
<td>E: Left side bearing</td>
<td></td>
</tr>
<tr>
<td>( = 21 - Measured height)</td>
<td></td>
</tr>
<tr>
<td>F: Right side bearing</td>
<td></td>
</tr>
<tr>
<td>( = 21 - Measured height)</td>
<td></td>
</tr>
<tr>
<td>G: Side bearing spacer</td>
<td></td>
</tr>
<tr>
<td>( = 8.1 - measured thickness)</td>
<td></td>
</tr>
<tr>
<td>X:</td>
<td>1.97</td>
</tr>
<tr>
<td>Y:</td>
<td>2.07</td>
</tr>
</tbody>
</table>

Calculations:
Side bearing spacer is used on the right
Left side washer thickness
\[ T_1 = (A - C + D - H) \times 0.01 + E + Y \]
Right side washer thickness
\[ T_2 = (B - D + H) \times 0.01 + F + G + X \]
Side bearing spacer is used on the left
Left side washer thickness
\[ T_1 = (A - C + D - H) \times 0.01 + E + G + X \]
Right side washer thickness
\[ T_2 = (B - D + H) \times 0.01 + F + Y \]
ADJUSTMENT
Side Bearing Preload (Cont’d)

Example for R200V which has a side bearing spacer on the right:

| A = 4 | E = 0.18 |
| B = 3 | F = 0.15 |
| C = 5 | G = 0.08 |
| D = 6 | X = 1.97 |
| H = -2 | Y = 2.07 |

Left side washer thickness (without spacer)

\[
T_1 = (A - C + D - H) \times 0.01 + E + Y
\]

| 4    | 3       |
| -5   | -6      |
| +1   | + (-2)  |
| = 5  | = -5    |
| - (-2) | x 0.01 |
| x 0.01 | x 0.01 |
| = 0.07 | = -0.05 |
| + 0.18 | + 0.15  |
| = 0.25 | = 0.10  |
| + 2.07 | + 0.08  |
| = 2.32 | = 2.15  |

\[
T_1 \approx 2.32 \text{ mm}
\]

Right side washer thickness (with spacer)

\[
T_2 = (B - D + H) \times 0.01 + F + G + X
\]

| 3    | B       |
| -6   | -D      |
| = -3 |            |
| + (-2) | + H |
| = -5 | x 0.01 |
| x 0.01 | x 0.01 |
| = -0.05 | + F |
| + 0.15 | + G  |
| = 0.18 | + X   |
| + 1.97 |      |
| = 2.15 |      |

\[
T_2 = 2.15 \text{ mm}
\]

5. Select the proper shims. Refer to SDS (PD-36).
If you cannot find the desired thickness of shims, use shims with the total thickness closest to the calculated value.
Tooth Contact
Checking gear tooth contact pattern is necessary to verify correct relationship between ring gear and drive pinion. Hypoid gears which are not positioned in proper arrangement may be noisy and/or have a short life. Check gear tooth contact pattern to obtain the best contact for low noise and long life.

1. Thoroughly clean ring gear and drive pinion teeth.
2. Lightly apply a mixture of powdered titanium oxide and oil or the equivalent. Apply it to 3 or 4 teeth of ring gear drive side.
3. Hold companion flange steady by hand and rotate the ring gear in both directions.

Usually the pattern will be correct if shims are correctly calculated and the backlash is correct. However, in rare cases, trial and error processes may be employed to obtain a correct 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 to bring drive pinion closer to ring gear.

To correct, reduce thickness of pinion height adjusting washer to position drive pinion away from ring gear.

Correct tooth contact

After adjustment, be sure to wipe off the ferric oxide and oil or their equivalent.
**ASSEMBLY**

**Differential Case**
Whenever side gears or pinion mate gears are replaced, selection of thrust washers should be carried out. Before selecting thrust washers, make sure all parts are clean and well lubricated with hypoid gear oil.

**THRUST WASHER SELECTION**
1. Install the previously removed thrust washer on right side gear. On left side gear, install a suitable thrust washer. Temporarily tighten differential cases using two screws.

2. Position differential assembly so that right side gear is on the upper side. Place two feeler gauges of 0.03 mm (0.0012 in) thickness between right side gear and thrust washer as shown.

**Do not insert feeler gauge in oil groove portion of differential case.**
3. Rotate right side gear with a suitable tool attached to splines.
   If hard to rotate, replace thrust washer on left side gear with a thinner one.
4. Replace both 0.03 mm (0.0012 in) feeler gauges with 0.10 mm (0.0039 in) gauges. At this point, make sure right side gear does not rotate. If it rotates, replace thrust washer on left side gear with a thicker one to prevent rotation.

**ASSEMBLY**
1. Install differential case A and B.

2. Place differential case on ring gear.
3. Apply locking sealant to ring gear bolts, and install them. Tighten bolts in a criss-cross fashion, lightly tapping bolt head with a hammer.
ASSEMBLY

Differential Case (Cont'd)

4. Press-fit side bearing inner cones on differential case with Tool.
   Tool number:
   A) KV38100300
   B) ST33061000

Differential Carrier

1. Press-fit front and rear bearing outer races with Tools.
   Tool number:
   A) ST30611000
   B) ST30621000
   C) ST30631000

2. Select pinion bearing adjusting washer and drive pinion bearing spacer. Refer to ADJUSTMENT (PD-17).

   Tool number: ST30901000

4. Place pinion front bearing inner cone in final drive housing.
ASSEMBLY

Differential Carrier (Cont'd)

5. Set drive pinion assembly (as shown in figure at left) in differential carrier and install drive pinion, with press and suitable tool.

Stop when drive pinion touches bearing.
Apply multi-purpose grease to pinion rear bearing inner race, pinion front bearing inner race.

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 suitable tool.
   Make sure that threaded portion of drive pinion and pinion nut are free from oil or grease.

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 specifications, replacement is required for pinion bearing adjusting washer and spacer. Replace with those of different thickness.
ASSEMBLY

Differential Carrier (Cont'd)

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
   Spacer location: Right side

13. Align mark on bearing cap with that on gear carrier and install bearing cap on gear carrier.

14. Check runout of ring gear with a dial indicator.
   Runout limit: 0.05 mm (0.0020 in)

PD-27
ASSEMBLY

Differential Carrier (Cont’d)

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, adjustment of shim thickness is required. 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:
1.4 - 3.1 N·m (14 - 32 kg-cm, 12 - 28 in-lb)

- If preload is too great, remove the same amount of shim from each side.
- If preload is too small, add the same amount of shim to each side.

Never add or remove a different number of shims for each side. Difference in number of shims will change ring gear to drive pinion backlash.

17. Recheck ring gear to drive pinion backlash. Increase or decrease in thickness of shims will cause change to ring gear to pinion backlash.

- Check whether the backlash varies excessively in different places. Foreign matter may be caught between the ring gear and the differential case causing the trouble.
- The backlash can vary greatly even when the ring gear runout is within a specified range. In that case, replace the hypoid gear set or differential case.

18. Check tooth contact.
Refer to ADJUSTMENT (PD-23).

19. Apply multi-purpose grease to cavity at sealing lips of oil seal. Install side oil seal.

Tool number: KV38100200

20. Install rear cover and gasket.

PD-28
DIFFERENTIAL OIL COOLER SYSTEM

Description

- The differential oil pumps automatically repeat ON-OFF operation according to the differential gear oil temperature.
  
  OFF → ON  130°C (266°F)
  ON → OFF  120°C (248°F)

However, the pumps will not operate when the vehicle speed is less than 120 km/h (75 MPH).

- When the oil temperature becomes excessively high, the warning lamp in the combination meter will illuminate.
  
  Differential gear oil:
  OFF → ON  180°C (356°F)
  ON → OFF  150°C (302°F)

Removal and Installation

![Diagram of differential oil cooler system with components labeled]

- Oil pump mounting bracket
- Oil pump assembly
- Oil pump bracket
- Oil cooler assembly
- Oil cooler protector
- Oil cooler tube assembly
- Inlet connector
- Warning lamp switch
- Oil temperature switch
- Connector bracket
- Final drive

PD-29
Differential Oil Cooler System

Inspection
Thoroughly clean all parts in cleaning solvent and blow dry with compressed air, if available.

Oil Pump Assembly
Replace oil pump assembly when motor does not rotate because of motor seizure or other damage.

Oil Cooler Assembly, Oil Tube Assembly, Oil Hose
If oil leakage is detected during removal, replace oil cooler assembly or oil tube.

Trouble Diagnoses
Symptom:
Oil pump does not rotate.

Check Oil Pump Operation
1. Disconnect speed control amplifier harness connector.
2. Disconnect oil pump temperature switch harness connector.
3. Turn ignition switch "ON".
4. Connect jump wire between oil temperature switch harness connector terminal ① and ground.
   - Oil pump rotates:
     Refer to Procedure A.
   - Oil pump does not rotate:
     Refer to Procedure B.
Differential Oil Cooler System

Trouble Diagnoses (Cont'd)

Procedure A

A

Check Oil Temperature Switch
1) Remove oil temperature switch.
2) Check proper operation.

Operating temperature:
OFF → ON 130°C (266°F)

NG → Replace oil temperature switch
OK

B

Check Speed Control Amplifier Power Supply
1) Disconnect speed control amplifier harness connector.
2) Turn ignition switch "ON".
3) Check voltage between ③, ④ and ground.

Battery voltage should exist.

NG → Check and repair the following parts:
- Harness continuity between speed control amplifier harness connector terminal ② and fuse.
- Harness continuity between speed control amplifier harness connector terminal ⑤ and oil cooler relay-2 harness connector terminal ①.
- Harness continuity between oil cooler relay-2 harness connector terminal ② and fuse.
- Oil cooler relay-2

OK

C

Check Speed Control Amplifier Ground Circuit
1) Turn ignition switch "OFF".
2) Disconnect speed control amplifier harness connector.
3) Check harness continuity between ①, ⑥ and ground.

Continuity should exist

NG → Repair or replace harness.
OK

D

Check Speed Signal Input Circuit
1) Disconnect speed control amplifier harness connector and combination meter harness connector.
2) Check harness continuity between speed control amplifier harness connector terminal ② and combination meter harness connector terminal ⑤.

Continuity should exist.

NG → Repair or replace harness.
OK

Check Vehicle Speed Sensor
Refer to "Meter and Gauges" in E1 section.

NG → Replace vehicle speed sensor
OK

Replace speed control amplifier
Differential Oil Cooler System

Trouble Diagnoses (Cont'd)

Procedure B

A

Check Power Supply
1) Disconnect oil temperature switch harness connector and speed control amplifier harness connector.
2) Turn ignition switch "ON".
3) Check voltage between oil temperature switch harness connector terminal ① and ground.

Battery voltage should exist.

B

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

Battery voltage should exist.

If NG, check and repair the following parts:
- Harness continuity between oil cooler relay-1 harness connector terminal ② and oil cooler relay-2 harness connector terminal ③
- Fuse
- Harness continuity between oil cooler relay-1 harness connector terminal ④ and oil pump relay harness connector terminal ①
- Oil cooler relay-1

C

Check Ground Circuit
1) Turn ignition switch "OFF".
2) Disconnect oil pump harness connector.
3) Check harness continuity between oil pump harness connector terminal ② and ground.

Continuity should exist.

If NG, repair or replace harness.

OK

Replace oil pump.

Check and repair the following parts:
- Harness continuity between oil cooler relay-1 harness connector terminal ① and fuse
- Fuse
- Harness continuity between oil cooler relay-1 harness connector terminal ② and oil cooler relay-2 harness connector terminal ③
- Oil cooler relay-1
- Oil cooler relay-2
- Harness continuity between oil cooler relay-2 harness connector terminal ③ and oil temperature switch harness connector terminal ①
# SERVICE DATA AND SPECIFICATIONS (SDS)

## Propeller Shaft

### GENERAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>Applied model</th>
<th>M/T</th>
<th>A/T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Propeller shaft model</td>
<td>3571A</td>
<td></td>
</tr>
<tr>
<td>Number of joints</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Coupling method with transmission</td>
<td>Sleeve type</td>
<td></td>
</tr>
<tr>
<td>Type of journal bearings</td>
<td>Shell type (Non-disassembly type)</td>
<td></td>
</tr>
<tr>
<td>Distance between yokes</td>
<td>63.0 (2.480)</td>
<td></td>
</tr>
<tr>
<td>Shaft length (Spider to spider)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st</td>
<td>421.0 (16.57)</td>
<td>441.0 (17.36)</td>
</tr>
<tr>
<td>2nd</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Without ABS</td>
<td>620.0 (24.59)</td>
<td></td>
</tr>
<tr>
<td>With ABS</td>
<td>636.0 (25.04)</td>
<td></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>50.8 (2.000)</td>
</tr>
</tbody>
</table>

### SPECIFICATIONS AND ADJUSTMENT

| Propeller shaft model | 3571A |
| Propeller shaft runout limit | 0.6 (0.024) |
| Journal axial play | 0 (0) |

## Final Drive

### GENERAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>Applied model</th>
<th>M/T</th>
<th>A/T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final drive model</td>
<td>R200V</td>
<td></td>
</tr>
<tr>
<td>Ring gear pitch diameter</td>
<td>205 (8.07)</td>
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<tr>
<td>Gear ratio</td>
<td>3.692</td>
<td>3.915</td>
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<tr>
<td>Number of teeth (Ring gear/drive pinion)</td>
<td>48/13</td>
<td>47/12</td>
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<tr>
<td>Oil capacity</td>
<td>1.2 - 1.4 (2-1/8 - 2-1/2)</td>
<td></td>
</tr>
<tr>
<td>Number of pinion gears</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Side gear bearing spacer location</td>
<td></td>
<td></td>
</tr>
<tr>
<td>INSPECTION AND ADJUSTMENT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ring gear runout</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ring gear runout limit</td>
<td>0.05 (0.0020)</td>
<td></td>
</tr>
<tr>
<td>Side gear adjustment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clearance between side gear and differential case</td>
<td>0.03 - 0.09</td>
<td></td>
</tr>
<tr>
<td>Available side gear thrust washers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thickness</td>
<td>mm (in)</td>
<td>Part number</td>
</tr>
<tr>
<td>0.80 (0.0315)</td>
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<td></td>
</tr>
<tr>
<td>0.83 (0.0327)</td>
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</tr>
<tr>
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</tr>
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<td>0.89 (0.0350)</td>
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</tr>
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<td>1.01 (0.0398)</td>
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<td>1.31 (0.0516)</td>
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<td>1.34 (0.0528)</td>
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<td>1.49 (0.0587)</td>
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</tbody>
</table>

PD-35
## Drive pinion height adjustment

**Available pinion height adjusting washers**

<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>3.15 (0.1240)</td>
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<td>3.18 (0.1252)</td>
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<td>3.27 (0.1287)</td>
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<td>3.30 (0.1299)</td>
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<td>3.63 (0.1429)</td>
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<td>3.66 (0.1441)</td>
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## Drive pinion preload adjustment

**Drive pinion bearing adjusting method**

<table>
<thead>
<tr>
<th>Drive pinion preload with front oil seal N·m (kg·cm, in·lb)</th>
<th>Pinion bearing adjusting washer and spacer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 - 1.4</td>
<td>(11 - 14, 9.5 - 12.2)</td>
</tr>
</tbody>
</table>

**Available drive pinion bearing preload adjusting washers**

<table>
<thead>
<tr>
<th>Thickness mm (in)</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.00 - 3.02 (0.1181 - 0.1197)</td>
<td>38125-61001</td>
</tr>
<tr>
<td>3.02 - 3.04 (0.1187 - 0.1197)</td>
<td>38126-61001</td>
</tr>
<tr>
<td>3.04 - 3.06 (0.1193 - 0.1202)</td>
<td>38127-61001</td>
</tr>
<tr>
<td>3.06 - 3.08 (0.1200 - 0.1207)</td>
<td>38128-61001</td>
</tr>
<tr>
<td>3.08 - 3.10 (0.1207 - 0.1220)</td>
<td>38129-61001</td>
</tr>
<tr>
<td>3.10 - 3.12 (0.1214 - 0.1228)</td>
<td>38130-61001</td>
</tr>
<tr>
<td>3.12 - 3.14 (0.1221 - 0.1235)</td>
<td>38131-61001</td>
</tr>
<tr>
<td>3.14 - 3.16 (0.1228 - 0.1242)</td>
<td>38132-61001</td>
</tr>
<tr>
<td>3.16 - 3.18 (0.1235 - 0.1247)</td>
<td>38133-61001</td>
</tr>
<tr>
<td>3.18 - 3.20 (0.1242 - 0.1254)</td>
<td>38134-61001</td>
</tr>
<tr>
<td>3.20 - 3.22 (0.1249 - 0.1262)</td>
<td>38135-61001</td>
</tr>
<tr>
<td>3.22 - 3.24 (0.1256 - 0.1268)</td>
<td>38136-61001</td>
</tr>
<tr>
<td>3.24 - 3.26 (0.1262 - 0.1274)</td>
<td>38137-61001</td>
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<td>3.26 - 3.28 (0.1269 - 0.1281)</td>
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</tr>
<tr>
<td>3.28 - 3.30 (0.1276 - 0.1288)</td>
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</table>

## Available drive pinion bearing preload adjusting spacers

<table>
<thead>
<tr>
<th>Length mm (in)</th>
<th>Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>54.50 (2.1457)</td>
<td>38155-B4000</td>
</tr>
<tr>
<td>54.80 (2.1575)</td>
<td>38155-B4001</td>
</tr>
<tr>
<td>55.10 (2.1693)</td>
<td>38155-B4002</td>
</tr>
<tr>
<td>55.40 (2.1811)</td>
<td>38155-B4003</td>
</tr>
<tr>
<td>55.70 (2.1929)</td>
<td>38155-B4004</td>
</tr>
<tr>
<td>56.00 (2.2047)</td>
<td>38155-61001</td>
</tr>
</tbody>
</table>

## Total preload adjustment

**Drive pinion to ring gear backlash mm (in)**

| 0.10 - 0.15 | 0.0039 - 0.0059 |

**Total preload N·m (kg·cm, in·lb)**

| 1.4 - 3.1 | 14 - 32.12 - 28 |

## Available side bearing adjusting washers

<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 (0.0846)</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>
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# PRECAUTIONS AND PREPARATION

## Commercial Service Tools

<table>
<thead>
<tr>
<th>Tool name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equivalent to GG94310000</td>
<td>Removing and installing each brake piping</td>
</tr>
<tr>
<td>① Flare nut crows tool</td>
<td></td>
</tr>
<tr>
<td>② Torque wrench</td>
<td></td>
</tr>
<tr>
<td>NT262</td>
<td>a: 10 mm (0.39 in)</td>
</tr>
<tr>
<td>Baffle plate drift</td>
<td>Installing baffle plate</td>
</tr>
<tr>
<td>NT205</td>
<td>a: 88 mm (3.46 in) dia.</td>
</tr>
<tr>
<td></td>
<td>b: 66 mm (2.44 in) dia.</td>
</tr>
<tr>
<td>Tension rod bushing drift</td>
<td>Removing and installing tension rod bushing</td>
</tr>
<tr>
<td>NT195</td>
<td>a: 75 mm (2.95 in) dia.</td>
</tr>
<tr>
<td></td>
<td>b: 66 mm (2.60 in) dia.</td>
</tr>
<tr>
<td></td>
<td>c: 62 mm (2.44 in) dia.</td>
</tr>
<tr>
<td></td>
<td>d: 25 - 55 mm (0.98 - 2.17 in) dia.</td>
</tr>
<tr>
<td>Attachment</td>
<td>Measure wheel alignment</td>
</tr>
<tr>
<td>Wheel alignment</td>
<td></td>
</tr>
<tr>
<td>NT148</td>
<td>a: Screw M22 x 1.5</td>
</tr>
<tr>
<td></td>
<td>b: 35 (1.38) dia.</td>
</tr>
<tr>
<td></td>
<td>c: 65 (2.56) dia.</td>
</tr>
<tr>
<td></td>
<td>d: 58 (2.28)</td>
</tr>
<tr>
<td></td>
<td>e: 12 (0.47)</td>
</tr>
<tr>
<td></td>
<td>Unit: mm (in)</td>
</tr>
</tbody>
</table>
### Precautions

- When installing rubber parts, final tightening must be carried out under unladen condition* with tires on ground.
  *: Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.
- After installing removed suspension parts, check wheel alignment and adjust if necessary.
- Use flare nut wrench when removing or installing brake tubes.
- Always torque brake lines when installing.

### Special Service Tools

<table>
<thead>
<tr>
<th>Tool number</th>
<th>Tool name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HT72520000</td>
<td>Ball joint remover</td>
<td>Removing tie-rod outer end and lower ball joint</td>
</tr>
<tr>
<td></td>
<td>HT71780000</td>
<td>Spring compressor</td>
</tr>
<tr>
<td></td>
<td>ST35652000</td>
<td>Strut attachment</td>
</tr>
<tr>
<td></td>
<td>GG94310000</td>
<td>Flare nut torque wrench</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

FA-2
When installing rubber parts, final tightening must be carried out under unladen condition* with tires on ground.

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

1. Strut mounting insulator
2. Spring upper seat
3. Coil spring
4. Strut assembly
5. Front suspension member
6. Front stabilizer
7. Tension rod bracket
8. Tension rod
9. Air guide
10. Transverse link with ball joint
11. Brake rotor

Front
Front Axle and Front Suspension Parts
Check front axle and front suspension parts for looseness, cracks, wear or other damage.
- Shake each front wheel to check for excessive play.
- Retighten all axle and suspensions nuts and bolts to the specified torque.
  **Tightening torque:**
  Refer to FRONT SUSPENSION (FA-11).
- Make sure that cotter pins are inserted.
- 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. If ball joint dust cover is cracked or damaged, replace transverse link.
- Check suspension ball joint end play.
  1. Jack up front of vehicle and set the stands.
  2. Clamp dial indicator onto transverse link and place indicator tip on lower edge of brake caliper.
  3. Make sure front wheels are straight and brake pedal is depressed.
  4. Place a pry bar between transverse link and inner rim of road wheel.
  5. While raising and releasing pry bar, observe maximum dial indicator value.
     **Vertical end play:**
     0 mm (0 in)
  6. If ball joint movement is beyond specifications, remove and recheck it.

Front Wheel Bearing
- Check that wheel bearings operate smoothly
- Check axial end play.
  **Axial end play:**
  0.05 mm (0.0020 in) or less
- If out of specification or wheel bearing does not turn smoothly, replace wheel bearing assembly.
  Refer to FRONT AXLE — Wheel Hub and Knuckle (FA-8)

Front Wheel Alignment
Before checking front wheel alignment, be sure to make a preliminary inspection (Unladen*).
*: Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.
ON-VEHICLE SERVICE

Front Wheel Alignment (Cont'd)

PRELIMINARY INSPECTION

1. Check tires for wear and improper inflation.
2. Check wheel runout.
   Wheel runout:
   Refer to SDS (FA-15).
3. Check front wheel bearings for looseness.
4. Check front suspension for looseness.
5. Check steering linkage for looseness.
6. Check that front shock absorbers work properly.
7. Check vehicle posture (Unladen).

CAMBER, CASTER AND KINGPIN INCLINATION

Camber, caster and kingpin inclination are preset at factory and cannot be adjusted.
1. Measure camber, caster and kingpin inclination of both right and left wheels with a suitable alignment gauge.
   Camber, Caster and Kingpin inclination:
   Refer to SDS (FA-15).
2. If camber, caster or kingpin inclination is not within specification, inspect front suspension parts. Replace damaged or worn out parts.

TOE-IN

Measure toe-in using following procedure. If out of specification, inspect and replace any damaged or worn front suspension parts.

WARNING:
• Perform following procedure always on a flat surface.
• Make sure that no person is in front of the vehicle before pushing it.
1. Move rear of vehicle up and down to stabilize the posture.
2. Push the vehicle straight ahead about 5 m (196.8 in).
3. Put a mark on base line of the tread (rear side) at the same height of hub center to be a measuring point.
5. Push the vehicle slowly ahead to turn the wheels around 180 degrees.
   If the wheels have passed 180 degrees, try the above procedure again from the beginning. Never push vehicle backward.
   Toe-in (A – B):
   Refer to SDS (FA-15).
7. Adjust toe-in by varying length of steering tie-rods.
   a. Loosen lock nuts.
   b. Adjust toe-in by turning forward and reverse tie-rod.

FA-6
ON-VEHICLE SERVICE

Front Wheel Alignment (Cont’d)

Make sure both tie-rods are the same length.
Standard length “L”:
Refer to SDS in ST section.

C. Tighten lock nuts to specified torque.
Lock nut tightening torque:
Refer to ST section.

FRONT WHEEL TURNING ANGLE

Turning angle is set by stroke length of steering gear rack and cannot be adjusted.

1. Set wheels in straight-ahead position. Then move vehicle forward until front wheels rest on turning radius gauge properly.
2. Rotate steering wheel all the way right and left; measure turning angle.
Do not hold the steering wheel on full lock for more than 15 seconds.
Wheel turning angle (Full turn):
Refer to SDS (FA-15).
REMOVAL

CAUTION:
Wheel hub bearing usually does not require maintenance. If any of the following symptoms are noted, replace wheel hub bearing assembly.
- Growling noise is emitted from wheel hub bearing during operation.
- Wheel hub bearing drags or turns roughly. This occurs when turning hub by hand after bearing lock nut is tightened to specified torque.
- If the wheel hub bearing assembly is removed, it must be renewed. The old assembly must not be re-used.

Remove brake caliper assembly and rotor.
Before removing the front axle assembly, disconnect the ABS wheel sensor from the assembly. Then move it away from the front axle assembly area.
Failure to do so may result in sensor wires being damaged and the sensor becoming inoperative.
Suspend caliper assembly with wire so as not to stretch brake hose.
Be careful not to depress brake pedal, or piston will pop out.
FRONT AXLE

Wheel Hub and Knuckle (Cont'd)

- Remove wheel bearing lock nut. Remove wheel hub from spindle.

- Remove tie-rod ball joint and lower ball joint.

- Disconnect knuckle from strut.

INSTALLATION

- Install wheel hub.
- Tighten wheel bearing lock nut.
  \[206 - 284 \text{ N-m} \quad (21 - 29 \text{ kg-m, } 152 - 210 \text{ ft-lb})\]

- Clinch two places of lock nut.

FA-9
**FRONT AXLE**

Wheel Hub and Knuckle (Cont’d)

- Check wheel bearing axial end play.
  Axial end play: 0.05 mm (0.0020 in) or less

ABS Sensor Rotor

**REMOVAL**

Remove ABS sensor rotor (models equipped with ABS) or labyrinth plate (models without ABS) with suitable tool.

**INSTALLATION**

Press-fit ABS sensor rotor or labyrinth plate.

**Baffle Plate**

**REMOVAL**

- Mark matchmarks on baffle plate before removing.
- If baffle plate replacement requires removal of knuckle spindle, separate it equally using a screwdriver.
  Be careful not to scratch knuckle spindle.

**INSTALLATION**

With matchmarks aligned, install baffle plate by tapping it with a copper hammer and a suitable tool.
When installing rubber parts, final tightening must be carried out under unladen condition with tires on ground.
* Fuel, radiator coolant and engine oil full.
Spare tire, jack, hand tools and mats in designated positions.

1. Cap
2. Gasket
3. Strut mounting insulator
4. Lock washer
5. Upper seat
6. (Polyurethane tube)
7. Coil spring
8. Bound bumper
9. Strut assembly
10. Plastic clip
11. Front suspension member
12. Stabilizer
13. Bushing
14. Clamp
15. Stabilizer connecting rod
16. Cotter pin
17. Knuckle spindle
18. Transverse link with ball joint
19. Tension rod
20. Air guide
21. Tension rod bushing
22. Tension rod bracket

N·m (kg·m, ft·lb)

Front
Coil Spring and Strut Assembly

REMOVAL
Remove strut assembly fixing bolts and nuts (to hood ledge). Do not remove piston rod lock nut on vehicle.

DISASSEMBLY
1. Set strut assembly on vise with Tool, then loosen piston rod lock nut. Do not remove piston rod lock nut.
2. Compress spring with 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 on welded or gland packing portion.
- Check piston rod for cracks, deformation or other damage. Replace if necessary.

Strut mounting insulator
- Check cemented rubber-to-metal portion for separation or cracks. Check rubber parts for deterioration.

Lock washer
Check for cracks, deformation or other damage. Replace if necessary.

Coil spring
Check for cracks, deformation or other damage. Replace if necessary.
FRONT SUSPENSION

Coil Spring and Strut Assembly (Cont’d)

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.

Tension Rod and Stabilizer Bar

REMOVAL AND INSTALLATION
- Remove tension rod and stabilizer bar.
- Place one drift on lower side of tension rod bushing and another on upper side, as shown. Remove tension rod bushing by pressing it 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.
FRONT SUSPENSION

Transverse Link and Lower Ball Joint

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 ON-VEHICLE SERVICE (FA-5).

INSPECTION

Transverse link
- Check transverse link for damage, cracks or deformation. Replace if necessary.
- Check rubber bushing for damage, cracks and deformation. Replace transverse link if necessary.

Lower ball joint
- Check ball joint for play. Replace transverse link assembly in any of the following cases: Ball stud is worn, play in axial direction is excessive or joint is hard to swing.
- Before checking, turn ball joint at least 10 revolutions so that ball joint is properly broken in.
  - Swinging force "A": Refer to SDS (FA-15), (measuring point: cotter pin hole of ball stud)
  - Turning torque "B": Refer to SDS (FA-15)
  - Vertical end play "C": Refer to SDS (FA-15)
- Check dust cover for damage. Replace it if necessary.

FA-14
## SERVICE DATA AND SPECIFICATIONS (SDS)

### General Specifications

#### COIL SPRING

<table>
<thead>
<tr>
<th>Applied model</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wire diameter</td>
<td>13.1 (0.516)</td>
</tr>
<tr>
<td>Outer diameter</td>
<td>183.2 (7.21)</td>
</tr>
<tr>
<td>Free length</td>
<td>310 (12.20)</td>
</tr>
<tr>
<td>Identification color</td>
<td>White x 1, White x 2</td>
</tr>
</tbody>
</table>

#### STRUT

<table>
<thead>
<tr>
<th>Applied model</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>Piston rod diameter</td>
<td>22 (0.87)</td>
</tr>
</tbody>
</table>

#### FRONT STABILIZER BAR

<table>
<thead>
<tr>
<th>Applied model</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stabilizer diameter</td>
<td>26.5 (1.043)</td>
</tr>
<tr>
<td>Identification color</td>
<td>Red</td>
</tr>
</tbody>
</table>

### Inspection and Adjustment

#### WHEEL ALIGNMENT (Unladen*1)

<table>
<thead>
<tr>
<th>Applied model</th>
<th>Europe</th>
<th>Australia</th>
<th>Except Europe and Australia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Camber degree</td>
<td>−1°35' to −0°05'</td>
<td>−1°30' to 0'</td>
<td></td>
</tr>
<tr>
<td>Caster degree</td>
<td>5°35' - 7°25'</td>
<td>6°00' - 7°30'</td>
<td></td>
</tr>
<tr>
<td>Toe-in</td>
<td>A</td>
<td>1 - 3 (0.04 - 0.12)</td>
<td>1.5 - 3.5 (0.059 - 0.138)</td>
</tr>
<tr>
<td>B</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total angle 20 degree</td>
<td>A</td>
<td>5° - 10°</td>
<td>8° - 19°</td>
</tr>
<tr>
<td>B</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kingpin inclination degree</td>
<td>12°55' - 14°25'</td>
<td>12°50' - 14°20'</td>
<td></td>
</tr>
</tbody>
</table>

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

2 On power steering models, wheel turning force (at circumference of steering wheel) of 98 to 147 N (10 to 15 kg, 22 to 33 lb) with engine at idle.

### LOWER BALL JOINT

Swinging force "A"
(Measuring point: cotter pin hole of ball stud)

| N (kg, lb) | 23.5 - 79.4 (2.4 - 8.1, 5.3 - 17.9) |

Turning torque "B"
(N m (kg-cm, in-lb))

| 1.5 - 4.9 (15 - 50.13 - 43) |

Vertical end play "C"

| mm (in) | 0 (0) |

### 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>0.7 (0.026) or less</td>
<td></td>
</tr>
</tbody>
</table>

### WHEEL BEARING

| Wheel bearing axial end play | 0.05 (0.0020) or less |
| Wheel bearing lock nut | 206 - 294 (21 - 29, 152 - 210) |

FA-15
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### PRECAUTIONS AND PREPARATION

**Precautions**
- When installing rubber parts, final tightening must be carried out under unladen condition* with tires on ground.
  *: Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.
- Use flare nut wrench when removing or installing brake tubes.
- After installing removed suspension parts, check wheel alignment and adjust if necessary.
- Always torque brake lines when installing.
- Do not jack up at the lower arm.

### Special Service Tools

<table>
<thead>
<tr>
<th>Tool number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HT71780000</td>
<td>Removing and installing coil spring</td>
</tr>
<tr>
<td>Spring compressor</td>
<td></td>
</tr>
<tr>
<td>ST35652000</td>
<td>Fixing strut assembly</td>
</tr>
<tr>
<td>Strut attachment</td>
<td></td>
</tr>
<tr>
<td>ST30031000</td>
<td>Removing inner race of wheel bearing</td>
</tr>
<tr>
<td>Bearing puller</td>
<td></td>
</tr>
<tr>
<td>ST38280000</td>
<td>Removing and installing bushing of rear axle housing</td>
</tr>
<tr>
<td>Arm bushing remover</td>
<td></td>
</tr>
<tr>
<td>GG94310000</td>
<td>Removing and installing brake piping</td>
</tr>
<tr>
<td>Flare nut torque wrench</td>
<td></td>
</tr>
</tbody>
</table>
# PRECAUTIONS AND PREPARATION

## Commercial Service Tools

<table>
<thead>
<tr>
<th>Tool name</th>
<th>Description</th>
<th>Diagram</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equivalent to GG94310000</td>
<td>Removing and installing brake piping</td>
<td><img src="" alt="Diagram" /></td>
</tr>
<tr>
<td>① Flare nut crow foot</td>
<td>a: 19 mm (0.79 in)</td>
<td></td>
</tr>
<tr>
<td>② Torque wrench</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attachment</td>
<td>Measure rear wheel alignment</td>
<td><img src="" alt="Diagram" /></td>
</tr>
<tr>
<td>Wheel alignment</td>
<td>a: Screw M24 x 1.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b: 35 mm (1.38 in) dia.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>c: 65 mm (2.56 in) dia.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>d: 56 mm (2.20 in)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>e: 12 mm (0.47 in)</td>
<td></td>
</tr>
<tr>
<td>Rear wheel hub drift</td>
<td>Installing wheel bearing</td>
<td><img src="" alt="Diagram" /></td>
</tr>
<tr>
<td></td>
<td>a: 49 mm (1.93 in) dia.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b: 41 mm (1.61 in) dia.</td>
<td></td>
</tr>
<tr>
<td>Wheel bearing drift</td>
<td>Removing rear wheel hub</td>
<td><img src="" alt="Diagram" /></td>
</tr>
<tr>
<td></td>
<td>a: 40 mm (1.57 in) dia.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b: 26 mm (1.02 in) dia.</td>
<td></td>
</tr>
<tr>
<td>Rear drive shaft plug seal drift</td>
<td>Installing rear drive shaft plug seal</td>
<td><img src="" alt="Diagram" /></td>
</tr>
<tr>
<td></td>
<td>a: 85 mm (3.35 in) dia.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b: 67 mm (2.64 in) dia.</td>
<td></td>
</tr>
</tbody>
</table>
ON-VEHICLE SERVICE

Rear Axle and Rear Suspension Parts
Check axle and suspension parts for looseness, wear or damage.
- Shake each rear wheel.
- Relighten all axle and suspension nuts and bolts to the specified torque.

**Tightening torque:**
Refer to REAR SUSPENSION (RA-17).
- Make sure that cotter pins are inserted.

- Check shock absorber for oil leakage or other damage.
- Check suspension lower ball joint for excessive play
- Check suspension ball joint for grease leakage and ball joint dust cover for cracks or other damage.

Rear Wheel Bearing
- Check wheel bearings smooth operation.
- Check axial end play.
  **Axial end play:**
  - 0.05 mm (0.0020 in) or less
- If out of specification or wheel bearing does not turn smoothly, replace wheel bearing assembly.
Refer to REAR AXLE — Wheel Hub and Axle Housing (RA-7).

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 SDS in FA section.
- 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:
  Refer to SDS (RA-23).

RA-5
When installing rubber parts, final tightening must be carried out under unladen condition with tires on ground.

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

1. Coil spring
2. Shock absorber
3. Lateral link
4. Drive shaft
5. Rear upper link
6. Stabilizer bar
7. Suspension member
8. Member stay
9. Lower arm
10. Front upper link
11. Dynamic damper assembly

N·m (kg·m, ft·lb)
ON-VEHICLE SERVICE

Rear Wheel Alignment (Cont’d)

- If camber is not within specification, adjust by turning the adjusting bolt.
  1. Turn the adjusting bolt to adjust.
     Camber changes about 4° with each graduation of the adjusting bolt.
  2. Tighten to the specified torque.
     \[ 69 - 88 \text{ Nm} \]
     \( (7.0 - 9.0 \text{ kg-m, 51 - 65 ft-lb}) \)

TOE-IN

Measure toe-in using following procedure. If out of specification, inspect and replace any damaged or worn rear suspension parts.

WARNING:
- Perform following procedure always on a flat surface.
- Make sure that no person is in front of the vehicle before pushing it.
1. Move rear of vehicle up and down to stabilize the posture.
2. Push the vehicle straight ahead about 5 m (196.9 in).
3. Put a mark on base line of the tread (rear side) at the same height of hub center to be a measuring point.
5. Push the vehicle slowly ahead to turn the wheels around 180 degrees.

If the wheels have passed 180 degrees, try the above procedure again from the beginning. Never push vehicle backward.
   Toe-in (A - B):
   Refer to SDS (RA-23).
   \[ \text{Total toe-in angle} = 2 \theta \]

7. Adjust toe-in by turning adjusting bolts.
   Toe changes about 1.3 mm (0.051 in) [One side] with each graduation of the adjusting bolt.
8. Tighten to the specified torque.
   \[ 69 - 88 \text{ Nm} \]
   \( (7.0 - 9.0 \text{ kg-m, 51 - 65 ft-lb}) \)

Drive Shaft

Check boot and drive shaft for cracks, wear, damage or grease leakage.

RA-6
REAR AXLE

Wheel Hub and Axle Housing

SEC. 396-430

1. Drive shaft
2. Axle housing
3. Bushing
4. Bushing
5. Shock absorber pin
6. Bushing
7. Battle plate
8. Wheel bearing with flange
9. Wheel hub
10. Plain washer
11. Insulator
12. Adjusting cap
13. Cotter pin
14. Hub bolt
15. Wheel nut
16. Wheel bearing lock nut

REMOVAL
1. Remove wheel bearing lock nut.
2. Separate drive shaft from axle housing by lightly tapping it. If it is hard to remove, use puller.
When removing drive shaft, cover boots with shop towel to prevent them from being damaged.

3. Remove brake caliper assembly and rotor.
Suspend caliper assembly with wire so as not to stretch brake hose.
Be careful not to depress brake pedal or piston will pop out.
REAR AXLE

Wheel Hub and Axle Housing (Cont'd)

4. Remove axle housing.

5. Remove wheel bearing with flange, and wheel hub from axle housing.

INSTALLATION

1. Install axle housing with wheel hub.
2. Tighten wheel bearing lock nut.
   Before tightening, apply oil to threaded portion of rear spindle and both sides of plain washer.
   \[ T: 206 - 275 \text{ N-m} \]
   \[ (21 - 28 \text{ kg-m, 152 - 203 ft-lb}) \]

3. Check wheel bearing axial end play.
   Axial end play: 0.05 mm (0.0020 in) or less
   Make sure that wheel bearings operate smoothly.
4. Check toe-in — Refer to ON-VEHICLE SERVICE (RA-6).
REAR AXLE

Wheel Hub and Axle Housing (Cont’d)

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 hub bearing drags or turns roughly. This occurs when turning hub by 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
1. Using a press and drift as shown in figure at left, press wheel bearing out.
2. Discard old wheel bearing assembly. Replace with a new one.

3. Remove inner race from hub using a bearing replacer/puller.

CAUTION:
- Do not reuse old inner race although it is of the same brand as the bearing assembly.
- Do not replace grease seals as single parts.

Axle housing
1. 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.
REAR AXLE

Wheel Hub and Axle Housing (Cont’d)

2. Ensure axle housing bore is free from scratches or deformities before pressing bushing into it.
3. Attach bushing to chamfered bore end of axle housing. Then 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. Be careful not to damage grease seal.
REAR AXLE

Drive Shaft

SEC. 396

1. Side flange
2. Drive shaft
3. Plain washer
4. Wheel bearing lock nut
5. Insulator
6. Adjusting cap
7. Cotter pin

\[\text{N-m (kg-m, ft-lb)}\]

REMOVAL
When removing drive shaft, cover boots with shop towel to prevent damage to them.
Final drive side
Remove side flange mounting bolt and separate shaft.

Wheel side
Remove drive shaft by lightly tapping it with a copper hammer.
If it is hard to remove, use puller.
To avoid damaging threads of drive shaft, install a nut while removing drive shaft.

INSTALLATION
1. Insert drive shaft from wheel hub and temporarily tighten wheel bearing lock nut.
2. Tighten side flange mounting bolts to specified torque.
3. Tighten wheel bearing lock nut to specified torque.
The image contains a disassembly guide for a rear axle drive shaft component. Here is the description:

**Components:**
1. Plug seal
2. Spring
3. Spring cap
4. Snap ring
5. Spider assembly
6. Slide joint housing
7. Boot band
8. Boot
9. Drive shaft
10. Boot
11. Spider assembly
12. Snap ring
13. Housing with shaft

**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.

---

**RA-12**
REAR AXLE

Drive Shaft (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, then remove spider assembly.

CAUTION:
Do not disassemble spider assembly.
5. 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.
REAR AXLE

Drive Shaft (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, ensure it moves smoothly over its entire range without binding.
- Use NISSAN GENUINE GREASE or equivalent after every overhaul.

Wheel side

1. Install new small boot band 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.
REAR AXLE

Drive Shaft (Cont’d)

4. Pack drive shaft with specified amount of grease.
   Specified amount of grease:
   135 - 145 g (4.76 - 5.11 oz)
5. Install slide joint housing, then install new snap ring.
6. Set boot so that it does not swell and deform when its length is “L2”.
   Length “L2”:
   95 - 97 mm (3.74 - 3.82 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.

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.

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 horizontally.
      This prevents spring inside it from tilting or falling down.

RA-15
REAR AXLE

Drive Shaft (Cont’d)

b. Move shaft in axial direction to ensure that spring is installed properly. If shaft drags or if spring is not properly installed, replace plug seal with a new one.

5. Pack drive shaft with specified amount of grease.
   **Specified amount of grease:**
   155 - 165 g (5.47 - 5.82 oz)

6. Set boot so that it does not swell and deform when its length is "L_1".
   **Length "L_1":**
   95 - 97 mm (3.74 - 3.82 in)
   Make sure that boot is properly installed on the drive shaft groove.

7. Lock new larger boot band securely with a suitable tool, then lock new smaller boot band.
REAR SUSPENSION

SEC. 380-396-431
CAUTION:
Do not jack up at lower link.
When installing rubber parts, final tightening
must be carried out under unladen condition,
with tires on ground.
* Fuel, radiator coolant and engine oil full.
Spare tire, jack, hand tools and mats
in designated positions.

Front

1. Cap
2. Gasket
3. Upper plate
4. Bushing
5. Upper spring seat
6. Upper rubber seal
7. Bushing
8. Plate
9. Bumper rubber with dust cover
10. Coil spring
11. Shock absorber
12. Suspension member
13. Rear upper link
14. Front upper link
15. Lateral link
16. Lower arm
17. Protector
18. Axle housing
19. Drive shaft
20. Connecting rod
21. Final drive
22. Stabilizer bar
23. Bushing
24. Member stay
25. Insulator
26. Adjusting cap
27. Dynamic damper assembly

RA-17
REAR SUSPENSION

Removal and Installation

CAUTION:
Before removing the rear suspension assembly, disconnect the ABS sensor from the assembly. Then move it away from the rear suspension assembly. Failure to do so may result in damages to the sensor wires, making the sensor inoperative.
1. Remove exhaust tube.
2. Disconnect propeller shaft rear end.
3. Disconnect hand brake wire front end.
4. Remove brake caliper assembly.
   Suspend caliper assembly with wire so as not to stretch brake hose.
   Be careful not to depress brake pedal, or piston will pop out.
5. Remove rear parcel shelf. Refer to BT section.
6. Remove upper end nuts of shock absorber.
Do not remove piston rod lock nut.
7. Remove suspension member fixing nuts. Then draw out rear axle and rear suspension assembly.

RA-18
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 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.

Coil spring
Check for cracks, deformation or other damage. Replace if necessary.
**REAR SUSPENSION**

**Coil Spring and Shock Absorber (Cont’d)**

**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 seal, make sure that it is positioned as shown.

**Multi-link and Lower Ball Joint**

**REMOVAL AND INSTALLATION**

- Refer to “Removal and Installation” of REAR SUSPENSION (RA-18).

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 ON-VEHICLE SERVICE (RA-5).

RA-20
REAR SUSPENSION

Multi-link and Lower Ball Joint (Cont’d)

INSPECTION

Rear suspension member
Replace suspension member assembly if cracked or deformed or if any part (insulator, for example) is damaged.

Upper and lower links
Replace upper or lower link as required if cracked or deformed or if bushing is damaged.

Lower ball joint
- Check ball joint for play. Replace transverse link assembly if any of the following cases occur. Ball stud is worn, play in axial direction is excessive or joint is hard to swing.

Swing force and turning torque
Before checking, turn ball joint at least 10 revolutions so that ball joint is properly broken in.

Swing force “A”:
(measuring point: cotter pin hole of ball stud)
7.8 - 54.9 N (0.8 - 5.6 kg, 1.8 - 12.3 lb)

Turning torque “B”:
0.5 - 3.4 N·m (5 - 35 kg·cm, 4.3 - 30.4 in-lb)

Vertical end play “C”:
0 mm (0 in)

Stabilizer Bar

REMOVAL
- Remove connecting rod and clamp.

INSPECTION
- Check stabilizer bar for deformation or cracks. Replace if necessary.
- Check rubber bushings for deterioration or cracks. Replace if necessary.

INSTALLATION
When installing connecting rod, make sure direction is correct (as shown at left).
### General Specifications

#### COIL SPRING

<table>
<thead>
<tr>
<th></th>
<th>Unit: mm (in)</th>
</tr>
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<tbody>
<tr>
<td>Applied model</td>
<td>All</td>
</tr>
<tr>
<td>Wire diameter</td>
<td>11.5 (0.453)</td>
</tr>
<tr>
<td>Coil outer diameter</td>
<td></td>
</tr>
<tr>
<td>Large diameter</td>
<td>123.5 - 126.5 (4.88 - 4.98)</td>
</tr>
<tr>
<td>Small diameter</td>
<td>112.3 - 115.3 (4.42 - 4.54)</td>
</tr>
<tr>
<td>Free length</td>
<td>350 (13.78)</td>
</tr>
<tr>
<td>Identification color</td>
<td>Red x 1</td>
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#### SHOCK ABSORBER

<table>
<thead>
<tr>
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<th>All</th>
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</thead>
<tbody>
<tr>
<td>Applied model</td>
<td>All</td>
</tr>
<tr>
<td>Piston rod diameter mm (in)</td>
<td>12.5 (0.492)</td>
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#### DRIVE SHAFT

<p>| | |</p>
<table>
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<tbody>
<tr>
<td>Joint type</td>
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</tr>
<tr>
<td>Final drive side</td>
<td>TS82F</td>
</tr>
<tr>
<td>Wheel side</td>
<td>TS82C</td>
</tr>
<tr>
<td>Grease name</td>
<td></td>
</tr>
<tr>
<td>Final drive side</td>
<td>Nissan genuine grease or equivalent</td>
</tr>
<tr>
<td>Wheel side</td>
<td>Nissan genuine grease or equivalent</td>
</tr>
<tr>
<td>Specified amount of grease g (oz)</td>
<td></td>
</tr>
<tr>
<td>Final drive side</td>
<td>155 - 165 (5.47 - 5.82)</td>
</tr>
<tr>
<td>Wheel side</td>
<td>135 - 145 (4.76 - 5.11)</td>
</tr>
<tr>
<td>Boot length mm (in)</td>
<td></td>
</tr>
<tr>
<td>Final drive side (Ld)</td>
<td>95 - 97 (3.74 - 3.82)</td>
</tr>
<tr>
<td>Wheel side (Lw)</td>
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</tbody>
</table>

#### REAR STABILIZER BAR

<table>
<thead>
<tr>
<th></th>
<th>LHD</th>
<th>RHD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stabilizer diameter mm (in)</td>
<td>17.3 (0.681)</td>
<td>18.0 (0.709)</td>
</tr>
<tr>
<td>Identification color</td>
<td>Light green</td>
<td>Orange</td>
</tr>
</tbody>
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RA-22
## SERVICE DATA AND SPECIFICATIONS (SDS)

### Inspection and Adjustment

#### WHEEL ALIGNMENT (Unladen*1)

<table>
<thead>
<tr>
<th>Applied model</th>
<th>Australia</th>
<th>Except Australia</th>
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</thead>
<tbody>
<tr>
<td>Camber</td>
<td>degree</td>
<td>degree</td>
</tr>
<tr>
<td></td>
<td>-1°0' to -3°0'</td>
<td>-1°35' to -3°35'</td>
</tr>
<tr>
<td>Toe-in</td>
<td>A - B</td>
<td>0.50 (0.197)</td>
</tr>
<tr>
<td></td>
<td>Total angle</td>
<td>0° - 28°</td>
</tr>
</tbody>
</table>

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

#### LOWER BALL JOINT

<table>
<thead>
<tr>
<th>Swing force (Measuring point: center pin hole of ball stud)</th>
<th>N (kg, lb)</th>
<th>7.6 - 54.9</th>
<th>(1.7 - 12.3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turning torque</td>
<td>N m (kg-cm, in-lb)</td>
<td>0.5 - 3.4</td>
<td>(6 - 35, 4.3 - 30.4)</td>
</tr>
<tr>
<td>Vertical end play</td>
<td>mm (in)</td>
<td>0 (0)</td>
<td></td>
</tr>
</tbody>
</table>

#### WHEEL BEARING

<table>
<thead>
<tr>
<th>Wheel bearing axial end play</th>
<th>mm (in)</th>
<th>0.05 (0.0020) or less</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheel bearing lock nut</td>
<td>Tightening torque</td>
<td>206 - 275</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>0.7 (0.028) or less</td>
</tr>
</tbody>
</table>
# BRAKE SYSTEM

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PRECAUTIONS AND PREPARATION

Precautions
- Recommended brake fluid.
  For Europe: DOT3 or DOT4
  Except for Europe: DOT3
  For Europe, never mix different type brake fluids (DOT3 and DOT4).
- Never reuse drained brake fluid.
- Be careful not to splash brake fluid on painted areas.
- To clean or wash all parts of master cylinder, disc brake caliper and wheel cylinder, use clean brake fluid.
- Never use mineral oils such as gasoline or kerosene. They will ruin rubber parts of the hydraulic system.
- Use flare nut wrench when removing and installing brake tube.
- Always torque brake lines when installing.

WARNING:
- Clean brake pads and shoes with a waste cloth, then wipe with a dust collector.

Commercial Service Tools

<table>
<thead>
<tr>
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**BRAKE HYDRAULIC LINE/CONTROL VALVE**

### Brake Hydraulic Line

![Diagram of brake hydraulic line]

- **Front brake**
- **ABS actuator**
- **Proportioning valve**
- **Master cylinder**
- **Rear brake**

**CAUTION:**
- Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.
- All hoses must be free from excessive bending, twisting and pulling.

1. Connect vinyl tube to air bleeder valve.
2. Drain brake fluid from each air bleeder valve by depressing brake pedal.
3. Remove flare nut connecting brake tube and hose, then withdraw lock spring.
4. Cover openings to prevent entrance of dirt whenever disconnecting brake line.

**INSPECTION**
Check brake lines (tubes and hoses) for cracks, deterioration or other damage. Replace any damaged parts.

---

**REMOVAL**

- : Secondary line
- : Primary line

| : Flare nut 15-18 (1.5 - 1.8, 11 - 13) |
| Connecting bolt 17 - 20 (1.7 - 2.0, 12 - 14) |

| N·m (kg·m, ft·lb) |

---

**BR-3**
BRAKE HYDRAULIC LINE/CONTROL VALVE

Brake Hydraulic Line (Cont’d)

INSTALLATION

CAUTION:
- Refill with new brake fluid.
  For Europe: DOT3 or DOT4
 Except for Europe: DOT3
  For Europe, never mix different type brake fluids (DOT3 and DOT4).
- Never reuse drained brake fluid.
  1. Tighten all flare nuts and connecting bolts.
    Specification:
    Flare nut
    15 - 18 N·m (1.5 - 1.8 kg-m, 11 - 13 ft-lb)
    Connecting bolt
    17 - 20 N·m (1.7 - 2.0 kg-m, 12 - 14 ft-lb)
  2. Refill until new brake fluid comes out of each air bleeder valve.

Proportioning Valve

INSPECTION

CAUTION:
- Carefully monitor brake fluid level at master cylinder.
- Use new brake fluid.
  For Europe: DOT3 or DT4
  Except for Europe: DOT3
  For Europe, never mix different type brake fluids (DOT3 and DOT4).
- Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on paint areas, wash it away with water immediately.
  1. Connect Tool to air bleeders of front and rear brakes on either LH and RH side.
  2. Bleed air from the Tool.
  3. Check fluid pressure by depressing brake pedal.

<table>
<thead>
<tr>
<th>Unit: kPa (bar, kg/cm², psi)</th>
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<td>Applied pressure (Front brake)</td>
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<tr>
<td>Output pressure (Rear brake)</td>
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  4. Bleed air after disconnecting the Tool. Refer to “Bleeding Brake System” (BR-5).
**CHECK AND ADJUSTMENT**

**Checking Brake Fluid Level**
- Check fluid level in reservoir tank. It should be between Max and Min lines on reservoir tank.
- If fluid level is extremely low, check brake system for leaks.
- If brake warning lamp comes on, check brake fluid level switch and parking brake switch.

**Checking Brake Line**
**CAUTION:**
If leakage occurs around joints, retighten or, if necessary, replace damaged parts.
1. Check brake lines (tubes and hoses) for cracks, deterioration or other damage. Replace any damaged parts.
2. Check for oil leakage by fully depressing brake pedal while engine is running.

**Changing Brake Fluid**
**CAUTION:**
- Refill with new brake fluid.
  - For Europe: DOT3 or DOT4/Except for Europe: DOT3
  - For Europe, never mix different type brake fluids (DOT3 and DOT4).
- Always keep fluid level higher than minimum line on reservoir tank.
- Never reuse drained brake fluid.
- Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.
1. Clean inside of reservoir tank, and refill with new brake fluid.
2. Connect a vinyl tube to each air bleeder valve.
3. Drain brake fluid from each air bleeder valve by depressing brake pedal.
4. Refill until brake fluid comes out of each air bleeder valve.
  - Use same procedure as in bleeding hydraulic system to refill brake fluid. Refer to "Bleeding Brake System" (BR5).

**Bleeding Brake System**
**CAUTION:**
- Carefully monitor brake fluid level at master cylinder during bleeding operation.
- Fill reservoir with new brake fluid.
  - For Europe: DOT3 or DOT4/Except for Europe: DOT3
  - For Europe, never mix different type brake fluids (DOT3 and DOT4).
Make sure it is full at all times while bleeding air out of system.
CHECK AND ADJUSTMENT

Bleeding Brake System (Cont'd)

- Place a container under master cylinder to avoid spillage of brake fluid.
- Turn ignition switch OFF and disconnect ABS actuator connectors or battery ground cable.

- Bleed air in the following order.
  Right rear brake → Left rear brake →
  Right front brake → Left front brake

1. Connect a transparent vinyl tube to air bleeder valve.
2. Fully depress brake pedal several times.
3. With brake pedal depressed, open air bleeder valve to release air.
5. Release brake pedal slowly.
6. Repeat steps 2. through 5. until clear brake fluid comes out of air bleeder valve.
**Removal and Installation**

**Inspection**
Check brake pedal for following items.
- Brake pedal bend
- Clevis pin deformation
- Crack of any welded portion

**Adjustment**
Check brake pedal free height from dash reinforcement panel.
Adjust if necessary.

- **H**: Free height
  - Refer to SDS (BR-66).
- **D**: Depressed height
  - Refer to SDS. (BR-66).
  - Under force of 490 N (50 kg, 110 lb) with engine running
- **C₁, C₂**: Clearance between pedal stopper and threaded end of stop lamp switch and ASCD switch
  - 0.3 - 1.0 mm (0.012 - 0.039 in)

1. Loosen lock nut and adjust pedal free height by turning brake booster input rod. Then tighten lock nut.
2. Check pedal free play.
3. Check brake pedal’s depressed height while engine is running. If lower than specification, check for leaks, air in system, or damage to components (master cylinder, wheel cylinder, etc.). Then make necessary repair.

---

**BR-7**
MASTER CYLINDER

Disassembly (Cont’d)

2. Remove valve stopper while piston is pushed into cylinder.
3. Remove piston assemblies.
If it is difficult to remove secondary piston assembly, gradually apply compressed air through fluid outlet.
4. Draw out reservoir tank.

Inspection

Check for the following items.
Replace any part if damaged.
Master cylinder:
- Pin holes or scratches on inner wall.
Piston:
- Deformation of or scratches on piston cups.

Assembly

1. Insert secondary piston assembly. Then insert primary piston assembly.
- Pay attention to alignment of secondary piston slit with valve stopper mounting hole of cylinder body.

2. Install stopper cap.
Before installing stopper cap, ensure that claws are bent inward.
3. Push reservoir tank seals.
4. Push reservoir tank into master cylinder.

5. Install valve stopper while piston is pushed into cylinder.

Installation

CAUTION:
- Refill with new brake fluid.
For Europe: DOT3 or DOT4/Except for Europe: DOT3
For Europe, never mix different type brake fluids (DOT3 and DOT4).
- Never reuse drained brake fluid.
1. Place master cylinder onto brake booster and secure mounting nuts lightly.
2. Torque mounting nuts.
   12 - 15 N·m (1.2 - 1.5 kg·m, 9 - 11 ft·lb)
3. Fill up reservoir tank with new brake fluid.
4. Plug all ports on master cylinder with fingers to prevent air suction while releasing brake pedal.
5. Have driver depress brake pedal slowly several times until no air comes out of master cylinder.
6. Fit brake lines to master cylinder.
7. Tighten flare nuts.
   Ø: 15 - 18 N·m (1.5 - 1.8 kg·m, 11 - 13 ft·lb)
8. Bleed air from brake system. Refer to “Bleeding Brake System” (BR-5)
MASTER CYLINDER

SEC. 460

1. Reservoir cap
2. Oil filter
3. Reservoir tank
4. Seal
5. Cylinder body
6. O-ring
7. Piston stopper
8. Secondary piston assembly
9. Primary piston assembly
10. Stopper cap

5. Proportioning valve
(Do not disassemble)

* Lubricate piston cup with brake fluid or rubber grease when assembling master cylinder.

7. 2.0 - 3.4
(0.20 - 0.35, 1.4 - 2.5)

12 - 15 (1.2 - 1.5, 9 - 11)

7. Brake fluid
N-m (kg-m, ft-lb)

Removal
CAUTION:
Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.
1. Connect a vinyl tube to air bleeder valve.
2. Drain brake fluid from each air bleeder valve, depressing brake pedal to empty fluid from master cylinder.
3. Remove brake pipe flare nuts.
4. Remove master cylinder mounting nuts.

Disassembly
1. Bend claws of stopper cap outward.
BRAKE BOOSTER/VACUUM HOSE

Brake Booster
ON-VEHICLE SERVICE

Operating check
- Stop engine and depress brake pedal several times. Check that pedal stroke does not change.
- 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. The pedal should go further down the first time, and then it should gradually rise thereafter.
- Depress brake pedal while engine is running, and stop engine with pedal depressed. The pedal stroke should not change after holding pedal down for 30 seconds.

REMOVAL
CAUTION:
- Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.
- Be careful not to deform or bend brake pipes, during removal of booster.

INSPECTION
Output rod length check
1. Apply vacuum of \(-66.7\) kPa (\(-667\) mbar, \(-500\) mmHg, \(-19.69\) inHg) to brake booster with a handy vacuum pump.
2. Check output rod length.
   Specified length: 10.4 mm (0.409 in)

INSTALLATION
CAUTION:
- Be careful not to deform or bend brake pipes, during installation of booster.
- Replace clevis pin if damaged.
- Refill with new brake fluid.
  For Europe: DOT3 or DOT4/Except for Europe: DOT3
  For Europe, never mix different type brake fluids (DOT3 and DOT4).
- Never reuse drained brake fluid.
- Take care not to damage brake booster mounting bolt

BR-10
BRAKE BOOSTER/VACUUM HOSE

Brake Booster (Cont’d)

thread when installing. Due to the angle of installation, threads can be damaged by the dash panel.

1. Before fitting booster, temporarily adjust clevis to dimension shown.
2. Fit booster, then secure mounting nuts (brake pedal bracket to booster) lightly.
3. Connect brake pedal and booster input rod with clevis pin.
4. Secure mounting nuts.
   Specification: 13 - 16 N-m (1.3 - 1.6 kg-m, 9 - 12 ft-lb)
5. Install master cylinder. Refer to “Installation” in “MASTER CYLINDER” (BR-9).

Vacuum Hose

REMOVAL AND INSTALLATION

CAUTION:
When installing vacuum hoses, pay attention to the following points.

- Do not apply any oil or lubricants to vacuum hose and check valve.
- Insert vacuum tube into vacuum hose as shown.

- Install check valve, paying attention to its direction.

INSPECTION

Hoses and connectors
Check vacuum lines, connections and check valve for airtightness, improper attachment chafing and deterioration.

Check valve
Check vacuum with a vacuum pump.
| Connect to booster side | Vacuum should exist. |
| Connect to engine side  | Vacuum should not exist. |

BR-11
Pad Replacement

CAUTION:
- When pads are removed, do not depress brake pedal because piston will pop out.
- Be careful not to damage dust seal or get oil on rotor. Always replace shims when replacing pads.
1. Remove clip from pad pin and then remove pad pin.
2. Remove cross spring.
3. Pull out outer pad and insert it temporarily between lower piston and rotor as shown.
4. Push back upper piston with a suitable tool and insert new pad so it contacts upper piston as shown.
5. Pull out old pad.
6. Push back lower piston with a suitable tool.
7. Pull out new pad and reinstall it in the proper position.
8. Repeat step 3 to 7 for inner pad.
9. Install cross spring, pad pin and clip.
FRONT DISC BRAKE (OPF25V)

Removal and Installation
1. Disconnect brake tube.
2. Remove brake pad.
3. Remove brake caliper mounting bolts.

Disassembly
1. Remove retaining ring.
2. Push out piston with dust seal using compressed air.
3. Remove piston seal.

CAUTION:
Be careful not to loosen or remove bolts joining both sides of caliper.
If there is any fluid leakage, replace caliper assembly.
Inspection

CALIPER
- Check dust seals for damage.
- Check calipers for damage, rust or foreign materials.
- Check inside surface of cylinder for scoring, rust, wear, damage or foreign materials. Replace if any such condition exists.
- Eliminate minor damage from rust or foreign materials by polishing surface with fine emery paper.

CAUTION:
Use brake fluid to clean.

PISTON
Check piston for scoring, rust, wear, damage or foreign materials. Replace if any condition exists.

CAUTION:
Piston sliding surface is plated. Do not polish with emery paper even if rust or foreign materials are stuck to sliding surface.

PAD PIN AND CLIPS
Check for wear, cracks, deformation, deterioration, rust or other damage. Replace if any such condition exists.

RUNOUT
1. Secure rotor to wheel hub with at least two nuts (M12 x 1.25).
2. Check runout using a dial indicator.

Make sure that wheel bearing axial end play is within the specifications before measuring. Refer to “Front Wheel Bearing” in FA section.

   Maximum runout:
   0.05 mm (0.0020 in)

3. If the runout is out of specification, find minimum runout position as follows:
   a. Remove nuts and rotor from wheel hub.
   b. Shift the rotor one hole and secure rotor to wheel hub with nuts.
   c. Measure runout.
   d. Repeat steps a. to c. so that minimum runout position can be found.
4. If the runout is still out of specification, turn rotor with on-car brake lathe ("MAD, DL-8700", "AMMCO 700 and 705" or equivalent).

THICKNESS

Thickness variation (At least 8 positions):
   Maximum 0.01 mm (0.0004 in)

If thickness variation exceeds the specification, turn rotor with on-car brake lathe.

   Rotor repair limit:
   28.0 mm (1.102 in)
Assembly
1. Insert piston seal into groove on cylinder body.
2. With dust seal fitted to piston, install piston into cylinder body.
3. Secure dust seal properly.
4. Install retaining ring.

Inspection (On-vehicle)
DISC PAD
- Check pad shims for deformation or damage.
- Check disc pad for wear or damage.
  Pad standard thickness (A):
  10.0 mm (0.394 in)
  Pad wear limit (A):
  2.0 mm (0.079 in)
REAR DISC BRAKE

Pad Replacement

WARNING:
Clean brake pads with a vacuum dust collector to minimize the hazard of airborne particles or other materials.

CAUTION:
- When cylinder body is open, do not depress brake pedal because piston will pop out.
- Be careful not to damage piston boot or get oil on rotor. Always replace shims in replacing pads.
- If shims are rusted or show peeling of rubber coat, replace them with new shims.
- It is not necessary to remove connecting bolt except for disassembly or replacement of caliper assembly. In this case, suspend cylinder body with wire so as not to stretch brake hose.

1. Remove master cylinder reservoir cap.
2. Release parking brake.
3. Remove brake cable mounting bolts from the rear suspension.
4. Remove pin bolts.
5. Remove cylinder body. Then remove pad retainers, and inner and outer shims.

Standard pad thickness:
- 9.5 mm (0.374 in)

Pad wear limit:
- 2.0 mm (0.079 in)

6. When installing new pads, push piston into cylinder body by gently turning piston clockwise, as shown. Carefully monitor brake fluid level because brake fluid will return to reservoir when pushing back piston.
REAR DISC BRAKE

Removal

WARNING:
Clean brake pads with a vacuum dust collector to minimize the hazard of airborne particles or other materials.
1. Remove brake cable mounting bracket bolt and lock spring.
2. Remove torque member fixing bolts and connecting bolt. It is not necessary to remove connecting bolt except for dis-assembly or replacement of caliper assembly. In this case, suspend caliper assembly with wire so as not to stretch brake hose.

Disassembly
1. Remove piston by turning it counterclockwise with suitable commercial service tool or long nose pliers.

2. Pry off ring A from piston with suitable pliers and remove adjusting nut.

3. Disassemble cylinder body.
   a. Pry off ring B with suitable pliers, then remove spring cover, spring and seat.
   b. Pry off ring C, then remove key plate, push rod and strut.
REAR DISC BRAKE

Disassembly (Cont'd)
c. Remove piston seal.
Be careful not to damage cylinder body.

4. Remove return spring, nut and parking brake lever.

Inspection — Caliper

CAUTION:
Use brake fluid to clean cylinder. Never use mineral oil.

CYLINDER BODY
- Check inside surface of cylinder for score, rust, wear, damage or presence of foreign materials. If any of the above conditions are observed, replace cylinder body.
- Minor damage from rust or foreign materials may be eliminated by polishing surface with a fine emery paper. Replace cylinder body if necessary.

TORQUE MEMBER
Check for wear, cracks or other damage. Replace if necessary.

PISTON

CAUTION:
Piston sliding surface is plated. Do not polish with emery paper even if rust or foreign matter is stuck to sliding surface. Check piston for score, rust, wear, damage or presence of foreign materials. Replace if any of the above conditions are observed.

PIN AND PIN BOOT
Check for wear, cracks or other damage. Replace if any of the above conditions are observed.
REAR DISC BRAKE

Inspection — Rotor

RUBBING SURFACE
Check rotor for roughness, cracks or chips.

RUNOUT
1. Secure rotor to wheel hub with two nuts (M12 x 1.25).
2. Check runout using a dial indicator.
   Make sure that axial end play is within the specifications before measuring. Refer to "Rear Wheel Bearing" in RA section.
3. Change relative positions of rotor and wheel hub so that runout is minimized.
   Maximum runout:
   0.07 mm (0.0028 in)

THICKNESS
   Rotor repair limit:
   Standard thickness
   9 mm (0.35 in)
   Minimum thickness
   8 mm (0.31 in)
   Thickness variation (At least 8 portions)
   Maximum 0.02 mm (0.0008 in)

Assembly
1. Install cup in the specified direction.

2. Fit push rod into square hole in key plate. Also match convex portion of key plate with concave portion of cylinder.

3. Install ring C with a suitable tool.

BR-20
REAR DISC BRAKE

Assembly (Cont’d)

4. Install seat, spring, spring cover and ring B while depressing with suitable commercial service tool or press and drift.

5. Install cup, adjuster, bearing, spacers, washers and ring A with a suitable tool.

6. Fit parking brake lever and tighten nut.
7. Fit return spring in the order shown.

Installation

CAUTION:

- Refill with new brake fluid “DOT 3” (Except for Europe) and “DOT3 or DOT4” (For Europe). For Europe, never mix different type brake fluids (DOT3 and DOT4).
- Never reuse drained brake fluid.
1. Install brake hose to caliper securely.
2. Install all parts and secure all bolts.
Removal and Installation

1. To remove parking brake cable, first remove center console.
2. Disconnect warning lamp connector.
3. Remove bolts, slacken off and remove adjusting nut.
4. Remove lock plate, then disconnect cable from caliper.
PARKING BRAKE CONTROL

Removal and Installation (Cont’d)
- When installing parking brake cable at rear caliper, make sure to align matchmark on cable guide.

Inspection
1. Check control lever for wear or other damage. Replace if necessary.
2. Check wires for discontinuity or deterioration. Replace if necessary.
3. Check warning lamp and switch. Replace if necessary.
4. Check parts at each connecting portion and, if found deformed or damaged, replace.

Adjustment
Pay attention to the following points after adjustment.
- There is no drag when control lever is being released.
- Parking brake lever returns to stopper bolt when control lever for rear disc brake is released.

1. Pull control lever up by 4 or 5 notches.
2. Insert a box wrench into opening in control lever and loosen self-lock adjusting nut to slacken cables.
3. Completely push control lever down.
4. Forcefully depress brake pedal about five times (so that caliper is automatically set in position).
5. Pull lever up by 4 or 5 notches.
6. Turn adjusting nut as shown in figure and adjust lever stroke to specified value.
7. Pull control lever with specified amount of force. Check lever stroke and ensure smooth operation.
   Number of notches: 7 - 9 [196 N (20 kg, 44 lb)]
8. Bend warning lamp switch plate to ensure the following. Warning lamp comes on when lever is lifted “A” notches, and goes out when fully released.
   Number of “A” notches: 1
ANTI-LOCK BRAKE SYSTEM

Purpose

The Anti-Lock Brake System (ABS) consists of electronic and hydraulic components. It allows for control of braking force so that locking of the wheels can be avoided.

The ABS:
1) Improves proper tracking performance through steering wheel operation.
2) Eases obstacle avoidance through steering wheel operation.
3) Improves vehicle stability.

Operation

- The ABS will not operate at speeds below 5 to 10 km/h (3 to 6 MPH) to completely stop the vehicle. (The speeds will vary according to road conditions.)
- The ABS has self-test capabilities. A mechanical noise may be heard as the ABS performs a self-test the first time the vehicle reaches 10 km/h (6 MPH). This is a normal part of the self-test feature. If a malfunction is found during this check, the anti-lock warning lamp will come on.
- During ABS operation, a mechanical noise may be heard. This is a normal condition.

ABS Hydraulic Circuit
ANTI-LOCK BRAKE SYSTEM

System Components

ABS consists of:
- Wheel sensors (3)
- Actuator
- Control unit

- Actuator
- Stop lamp switch
- Warning lamp
- Control unit
- Rear sensor
- Front wheel sensors
- Harness
- Piping

* For RHD models, actuator and actuator connectors are located at opposite sides.

System Description

SENSOR
The sensor unit consists of a gear-shaped sensor rotor and a sensor element. The element contains a bar magnet wound with a coil. The sensor is installed on the back side of the brake rotor or the final drive. As the wheel rotates, the sensor generates a sine-wave pattern. The frequency and voltage increase(s) as the rotating speed increases.

CONTROL UNIT
The control unit computes the wheel rotating speed by the signal current sent from the sensor. Then it supplies a DC current to the actuator solenoid valve. It also controls ON-OFF operation of the solenoid valve relay and motor relay. If any electrical malfunction should be detected in the system, the warning lamp is turned on. In this condition, the ABS will be deactivated, and the vehicle’s brake system reverts to normal operation.
ANTI-LOCK BRAKE SYSTEM

System Description (Cont’d)

ACTUATOR

The actuator contains:
- An electric motor and pump
- Two relays
- Six solenoid valves, each inlet and outlet for
  - LH front
  - RH front
  - LH and RH rear

These components control the hydraulic circuit. The ABS control unit directs the actuator to increase, hold or decrease hydraulic pressure to all or individual wheels.

ABS actuator operation

<table>
<thead>
<tr>
<th>Normal brake operation</th>
<th>Inlet solenoid valve</th>
<th>Outlet solenoid valve</th>
<th>Master cylinder brake fluid pressure is directly transmitted to caliper via the inlet solenoid valve</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure hold</td>
<td>ON (Closed)</td>
<td>OFF (Closed)</td>
<td>Hydraulic circuit is shut off to hold the caliper brake fluid pressure.</td>
</tr>
<tr>
<td>Pressure decrease</td>
<td>ON (Closed)</td>
<td>ON (Open)</td>
<td>Caliper brake fluid is sent to reservoir via the outlet solenoid valve. Then it is pushed up to the master cylinder by pump.</td>
</tr>
<tr>
<td>Pressure increase</td>
<td>OFF (Open)</td>
<td>OFF (Closed)</td>
<td>Master cylinder brake fluid pressure is transmitted to caliper.</td>
</tr>
</tbody>
</table>
ANTI-LOCK BRAKE SYSTEM

Removal and Installation

CAUTION:
Be careful not to damage sensor edge and sensor rotor teeth. When removing the front wheel hub or final drive assemblies, first remove the ABS wheel sensor from the assembly. Failure to do so may result in damage to the sensor wires making the sensor inoperative.

WHEEL SENSORS

SEC. 476
Front sensor

Rear sensor

\[ \theta : N \cdot m \ (kg \cdot m, ft \cdot lb) \]

SENSOR ROTOR

Removal
1. Remove the front wheel hub or final drive companion flange. Refer to FA and PD sections.
2. Remove the sensor rotor using suitable puller, drift and bearing replacer.

Installation
Install the sensor rotor using suitable drift and press.
- Always replace sensor rotor with new one.
- Pay attention to the direction of front sensor rotor as shown in figure.
ANTI-LOCK BRAKE SYSTEM

Removal and Installation (Cont’d)

CONTROL UNIT
Location: Under trunk side finisher LH.

ACTUATOR

Removal
1. Disconnect battery cable.
2. Drain brake fluid. Refer to "Changing Brake Fluid" (BR-5).
3. Apply different colored paint to each pipe connector and actuator to prevent incorrect connection.
4. Disconnect connector, brake pipes and remove fixing nuts and actuator ground cable.

Installation
CAUTION:
After installation, refill brake fluid. Then bleed air. Refer to “Bleeding Brake System” (BR-5).
1. Tighten actuator ground cable.
Place ground cable at a notch of mounting bracket.
2. Connect brake pipes temporarily.
3. Tighten fixing nuts.
4. Tighten brake pipes.
5. Fix actuator harness clip on the mounting bracket.
6. Connect connector and battery cable.

ACTUATOR RELAYS
1. Disconnect battery cable.
2. Remove actuator relay cover.
3. Pull out relays.

BR-28
ANTI-LOCK BRAKE SYSTEM

Wiring Diagram — ABS —

LHD MODELS

IGNITION SWITCH
ON or START

10A
1
G/Y

BATTERY

7.5A
19
OR/B

Refer to EL-POWER.

G/Y A> To BR-ABS-05

DATA LINK
CONNECTOR
FOR CONSULT
(M9)

CONSULT DATA IN
(RX)

CONSULT DATA OUT
(TX)

CONSULT DATA
CLK

ABS
CONTROL
UNIT

GND
B

GND
B

GND
B

GND
B

GND
B

119

1

2

3

22

27

28

W

W

121

13

2

19

1

29

19

1

125

W

W

W

W

W

W

SBR3910D

BR-29
ANTI-LOCK BRAKE SYSTEM

Wiring Diagram — ABS — (Cont'd)

Refer to EL-POWER.

Refer to EL-POWER.

To tachometer
(Refer to EL-METER.)

To stop lamp
(Refer to EL-TAIL/L.)

Refer to last page
(Foldout page).

 Mim 81
 F1
ANTI-LOCK BRAKE SYSTEM

Wiring Diagram — ABS — (Cont’d)

Refer to EL-POWER.

To BR-ABS-01

ABS ACTUATOR

Preceding page

Solenoid Valve Relay

Motor Relay

Refer to last page (Foldout page).

BR-ABS-05

BR-33
ANTI-LOCK BRAKE SYSTEM
Wiring Diagram — ABS — (Cont’d)

IGNITION SWITCH
ON or START

G/Y

10A

1

BATTERY

G/Y

OR/G

7.5A

19

Refer to EL-POWER.

G/Y "To BR-ABS-10

DATA LINK
CONNECTOR
FOR CONSULT

G/B

6

G/W

1

2

9

CONSULT
DATA IN
(RX)

6

2

9

CONSULT
DATA OUT
(TX)

G/B

6

G/W

1

2

9

CONSULT
DATA CLK

G/B

6

G/W

1

2

9

ABS
CONTROL
UNIT

GND

2

3

22

27

28

B

B

B

B

Refer to last page
(Foldout page).

M50, F.4

12

9

M53

GY

1

2

6

7

8

W

B

M53

W

GND

GND

GND

GND

Refer to BR-ABS-06

BR-34
How to Perform Trouble Diagnoses for Quick and Accurate Repair

INTRODUCTION

The ABS 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. It is also important to check for conventional problems: such as air leaks in the booster or lines, lack of brake fluid, or other problems with the 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 ABS 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 ABS controlled vehicle.
TROUBLE DIAGNOSES

Self-diagnosis

FUNCTION
- When a problem occurs in the ABS, the warning lamp on the instrument panel comes on.
- A maximum of three malfunctions are stored in the memory of the ABS control unit.

Erase the self-diagnosis results stored in the control unit after malfunctions are repaired (See next page).
- The self-diagnosis results are identified by Consult or LED on the control unit.

SELF-DIAGNOSIS PROCEDURE

A
Start engine.
Drive vehicle over 15 km/h (9 MPH) for at least one minute.

B
Stop vehicle with engine running.
Make sure that the ABS warning lamp activates.

The LED on the ABS control unit flashes to indicate the malfunction code No.

Verify the location of the malfunction with the malfunction code chart. Then make necessary repairs following the diagnostic procedures.

After the malfunctions are repaired, erase the self-diagnostic results stored in the control unit.
Disconnect connectors for ABS control unit or the battery negative terminal for at least one minute.

Check warning lamp for deactivation after driving vehicle over 15 km/h (9 MPH) for at least one minute.

Test the ABS in a safe area to verify that it functions properly.
TROUBLE DIAGNOSES
Self-diagnosis (Cont'd)

HOW TO READ SELF-DIAGNOSTIC RESULTS (Malfunction codes)
- Determine the code No. by counting the number of times the LED flashes on and off.
- The malfunction code chart is given on the next page.

Example

LED ON

Malfunction code No. 12 and 23

LED OFF

a : 3 seconds (Clearance between code No.)
b : 0.6 second (Ten digits)
c : 0.3 second (One digit)

HOW TO ERASE SELF-DIAGNOSTIC RESULTS (Malfunction codes)
- Disconnect ABS control unit connectors or battery negative terminal for at least one minute.
<table>
<thead>
<tr>
<th>Code No. (No. of LED flashes)</th>
<th>Malfunctioning part and circuit</th>
<th>Diagnostic procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Front right sensor (open-circuit)</td>
<td>4</td>
</tr>
<tr>
<td>02</td>
<td>Front left sensor (open-circuit)</td>
<td>4</td>
</tr>
<tr>
<td>03</td>
<td>Rear sensor (open-circuit)</td>
<td>4</td>
</tr>
<tr>
<td>05</td>
<td>Front right sensor (short-circuit)</td>
<td>4</td>
</tr>
<tr>
<td>06</td>
<td>Front left sensor (short-circuit)</td>
<td>4</td>
</tr>
<tr>
<td>07</td>
<td>Rear sensor (short-circuit)</td>
<td>4</td>
</tr>
<tr>
<td>11</td>
<td>Actuator front right inlet solenoid valve (open-circuit)</td>
<td>3</td>
</tr>
<tr>
<td>12</td>
<td>Actuator front left inlet solenoid valve (open-circuit)</td>
<td>3</td>
</tr>
<tr>
<td>13</td>
<td>Actuator rear inlet solenoid valve (open-circuit)</td>
<td>3</td>
</tr>
<tr>
<td>15</td>
<td>Actuator front right outlet solenoid valve (open-circuit)</td>
<td>3</td>
</tr>
<tr>
<td>16</td>
<td>Actuator front left outlet solenoid valve (open-circuit)</td>
<td>3</td>
</tr>
<tr>
<td>17</td>
<td>Actuator rear outlet solenoid valve (open-circuit)</td>
<td>3</td>
</tr>
<tr>
<td>21</td>
<td>Actuator front right inlet solenoid valve (short-circuit)</td>
<td>3</td>
</tr>
<tr>
<td>22</td>
<td>Actuator front left inlet solenoid valve (short-circuit)</td>
<td>3</td>
</tr>
<tr>
<td>23</td>
<td>Actuator rear inlet solenoid valve (short-circuit)</td>
<td>3</td>
</tr>
<tr>
<td>25</td>
<td>Actuator front right outlet solenoid valve (short-circuit)</td>
<td>3</td>
</tr>
<tr>
<td>26</td>
<td>Actuator front left outlet solenoid valve (short-circuit)</td>
<td>3</td>
</tr>
<tr>
<td>27</td>
<td>Actuator rear outlet solenoid valve (short-circuit)</td>
<td>3</td>
</tr>
<tr>
<td>41</td>
<td>Solenoid valve relay circuit (unable to turn off)</td>
<td>6</td>
</tr>
<tr>
<td>42</td>
<td>Solenoid valve relay circuit (unable to turn on)</td>
<td>6</td>
</tr>
<tr>
<td>43</td>
<td>Actuator motor or motor relay (unable to turn off)</td>
<td>5</td>
</tr>
<tr>
<td>44</td>
<td>Actuator motor or motor relay (unable to turn on)</td>
<td>5</td>
</tr>
<tr>
<td>47</td>
<td>Power supply (High voltage)</td>
<td>7</td>
</tr>
<tr>
<td>48</td>
<td>Power supply (Low voltage)</td>
<td>7</td>
</tr>
<tr>
<td>45, 46, 77</td>
<td>LED deactivation or continuous activation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Control unit</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Ground circuit</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Warning lamp does not come on when ignition switch is turned on</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Fuse, warning lamp bulb or warning lamp circuit</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Control unit power supply circuit</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pedal vibration and noise</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Control unit</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Ground circuit</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Long stopping distance</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Unexpected pedal action</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ABS does not work</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ABS works frequently</td>
<td></td>
</tr>
</tbody>
</table>
TROUBLE DIAGNOSES

Preliminary Check

A
Check brake fluid level in reservoir tank.
Low fluid level may indicate brake pad wear or leakage from brake line.

B
Check brake line for leakage.
OK
NG
Repair.

C
Check brake booster for operation and air tightness. Refer to (BR-10).
OK
NG
Replace.

D
Check brake pads and rotor. Refer to (BR-12, 16).
OK
NG
Replace.

A
Check brake fluid level in reservoir tank again.
OK
NG
Fill up brake fluid.

E
Check warning lamp activation. When ignition switch is turned on, warning lamp turns on.
OK
NG
Check fuse, warning lamp bulb and warning lamp circuit.

D
Check warning lamp for deactivation after engine is started.
OK
NG
Go to Self-diagnosis (BR-40).

Drive vehicle at speeds over 15 km/h (9 MPH) for at least one minute.

E
Ensure warning lamp remains off while driving.
OK
NG
Go to Self-diagnosis (BR-40).

END
Ground Circuit Check

ACTUATOR MOTOR GROUND
Actuator motor ground is secured with actuator mounting bracket bolt.
- Check resistance between actuator motor ground terminal and body ground.
  Resistance: approximately 0Ω

CONTROL UNIT GROUND
- Check resistance between control unit connector terminals and ground.
  Resistance: approximately 0Ω

ACTUATOR GROUND
- Check resistance between actuator harness 8-pin connector (body side) terminal & and ground.
  Resistance: approximately 0Ω
Diagnostic Procedure 1 (Not self-diagnostic item)

Warning lamp does not work when ignition switch is turned ON.

**WARNING LAMP CIRCUIT CHECK**

Check 7.5A fuse 25 for warning lamp. For fuse layout, refer to POWER SUPPLY ROUTING in EL section.

**OK**

- Install 7.5A fuse.
- Disconnect connectors from control unit and actuator.
- Check voltage between control unit connector terminal 15 and ground after turning ignition switch "ON". Battery voltage should exist after turning ignition switch "ON".

**NG**

- Check warning lamp bulb

**OK**

- Repair harness and connectors between battery and control unit connector terminal 15 (including combination meter)

**NG**

- Repair harness and connectors between warning lamp (combination meter) and actuator 6-pin connector (body side) terminal 13.

**OK**

- Repair harness and connectors.
TROUBLE DIAGNOSTIC

Diagnostic Procedure 1 (Not self-diagnostic item) (Cont'd)

- Disconnect solenoid valve relay.
- Check continuity between actuator connector (actuator side) terminals and solenoid valve relay box terminals.

<table>
<thead>
<tr>
<th>Actuator</th>
<th>Relay box</th>
</tr>
</thead>
<tbody>
<tr>
<td>11 (B)</td>
<td>30 (a)</td>
</tr>
<tr>
<td>21</td>
<td>87a</td>
</tr>
</tbody>
</table>

Continuity should exist. 
Note: Pay attention to tester polarity.

OK

CHECK SOLENOID VALVE RELAY.
Refer to SOLENOID VALVE RELAY in Electrical Components Inspection (BR-65).

NG
Replace solenoid valve relay.

OK
Go to D in Diagnostic Procedure 2.

*: Specifications may vary depending on the type of tester. 
Before performing this inspection, refer to the instruction manual of the tester.
Diagnostic Procedure 2

CONTROL UNIT OR GROUND CIRCUIT
(Malfunction code No. 45, 46, 77, LED deactivation or continuous activation)

- Disconnect connectors from control unit and actuator. Check terminals for damage or connection. Then reconnect connectors.
- Carry out self-diagnosis again. Does warning lamp activate again?

Solenoid Valve Relay Check
Refer to SOLENOID VALVE RELAY in Electrical Components Inspection (BR-65).

- Disconnect actuator 8-pin connector.
- Check continuity between actuator 8-pin connector (body side) terminal ⑤ and body ground. Continuity should exist.

A

- Disconnect control unit connectors and actuator 8-pin connector.
- Check continuity between control unit connector terminal ① and actuator 8-pin connector (body side) terminal ⑤. Continuity should exist.

B

- Check continuity between actuator 6-pin connector (actuator side) terminal ④ and solenoid valve relay box terminal ⑧.

<table>
<thead>
<tr>
<th>Actuator</th>
<th>Relay box</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>11 ④</td>
<td>30 ⑤</td>
<td>Yes</td>
</tr>
<tr>
<td>11 ④</td>
<td>30 ⑤</td>
<td>No</td>
</tr>
</tbody>
</table>

Note: Pay attention to tester polarity.*

NG

Replace actuator assembly.

OK

Repair harness and connectors.

NG

Repair harness and connectors.

OK

Replace solenoid valve relay.

NG

No

Inspection and

NG

Yes

OK

NG

OK

(A)

(Go to next page.)

*: Specifications may vary depending on the type of tester.
Before performing this inspection, refer to the instruction manual of the tester.
TROUBLE DIAGNOSES

Diagnostic Procedure 2 (Cont’d)

D: Control Unit Connector

A

Replace fuse

NG

Check 10A fuse [1] for control unit. For fuse layout, refer to POWER SUPPLY ROUTING in the EL section.

OK

Repair harness and connectors.

CONTROL UNIT POWER SUPPLY CIRCUIT

- Check voltage between control unit connector terminal ① and body ground after turning ignition switch “ON”.
  Battery voltage should exist after turning ignition switch “ON”.

OK

CONTROL UNIT GROUND CIRCUIT

Refer to CONTROL UNIT GROUND in Ground Circuit Check (BR-45).

OK

Go to Diagnostic Procedure 4 (BR-52).

OK

Replace ABS control unit.

NG

Repair harness and connectors.

BR-50
TROUBLE DIAGNOSES

Diagnostic Procedure 3
ACTUATOR SOLENOID VALVE
(Malfunction code No. 11 - 13, 15 - 17, 21 - 23, 25 - 27)

· Disconnect connectors from control unit and actuator. Check terminals for damage or loose connection. Then reconnect connectors.
· Carry out self-diagnosis again. Does warning lamp activate again?

No
Inspection and

Yes

ACTUATOR SOLENOID VALVE CHECK

· Disconnect control unit connectors.
· Check resistance between control unit connector terminals.

<table>
<thead>
<tr>
<th>Code No. (LED Flashes)</th>
<th>Terminals</th>
</tr>
</thead>
<tbody>
<tr>
<td>11, 21</td>
<td>7 - 8</td>
</tr>
<tr>
<td>12, 22</td>
<td>7 - 49</td>
</tr>
<tr>
<td>13, 23</td>
<td>7 - 2</td>
</tr>
<tr>
<td>15, 25</td>
<td>7 - 28</td>
</tr>
<tr>
<td>16, 26</td>
<td>7 - 26</td>
</tr>
<tr>
<td>17, 27</td>
<td>7 - 28</td>
</tr>
</tbody>
</table>

Resistance: 3.7 - 8.0Ω

NG
Replace actuator.

OK

- Disconnect actuator connectors.
- Check resistance between actuator connector (actuator side) terminals.

<table>
<thead>
<tr>
<th>Code No. (LED Flashes)</th>
<th>Terminals</th>
</tr>
</thead>
<tbody>
<tr>
<td>11, 21</td>
<td>6 - 2</td>
</tr>
<tr>
<td>12, 22</td>
<td>6 - 3</td>
</tr>
<tr>
<td>13, 23</td>
<td>5 - 3</td>
</tr>
<tr>
<td>15, 25</td>
<td>6 - 9</td>
</tr>
<tr>
<td>16, 26</td>
<td>6 - 7</td>
</tr>
<tr>
<td>17, 27</td>
<td>6 - 7</td>
</tr>
</tbody>
</table>

Resistance: 3.7 - 8.0Ω

NG
Repair harness and connector.

OK

- Check continuity between control unit connector terminals and actuator connector (body side) terminals

<table>
<thead>
<tr>
<th>Code No. (LED Flashes)</th>
<th>Control unit</th>
<th>Actuator</th>
</tr>
</thead>
<tbody>
<tr>
<td>11, 21</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>12, 22</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>13, 23</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>15, 25</td>
<td>8</td>
<td>26</td>
</tr>
<tr>
<td>16, 26</td>
<td>8</td>
<td>26</td>
</tr>
<tr>
<td>17, 27</td>
<td>7</td>
<td>26</td>
</tr>
<tr>
<td>42</td>
<td>7</td>
<td>8</td>
</tr>
</tbody>
</table>

Continuity should exist.

(OK)
(Go to next page)

BR-51
TROUBLE DIAGNOSES

Diagnostic Procedure 3 (Cont’d)

A

• Carry out self-diagnosis again. Does the malfunction code No. indicate actuator solenoid valve?

Yes → Go to D in Diagnostic Procedure 2

No → Go to applicable diagnostic procedure for malfunction code No.

Diagnostic Procedure 4

WHEEL SENSOR OR ROTOR
(Malfunction code No. 01 - 03, 05 - 07)

• Disconnect connectors from control unit and wheel sensor of malfunction code No. Check terminals for damage or loose connection. Then reconnect connectors.

• Carry out self-diagnosis again. Does warning lamp activate again?

Yes → WHEEL SENSOR ELECTRICAL CHECK

No → Inspection end

A

WHEEL SENSOR ELECTRICAL CHECK

• Disconnect control unit connector.

• Check resistance between control unit connector terminals.

Code No. 01 or 05 (Front RH wheel)
Terminals ③ and ⑥

Code No. 02 or 06 (Front LH wheel)
Terminals ⑦ and ⑨

Code No. 03 or 07 (Rear wheel)
Terminals ⑩ and ⑧

Resistance: 0.6 - 3.3 kΩ

Note: If the result is OK, check it again while moving sensor harness.

NG

⑧

(See next page.)

Note: Wheel position should be distinguished by code No. (LED flashes.)

BR-52
TROUBLE DIAGNOSES

Diagnostic Procedure 4 (Cont’d)

B
- Disconnect wheel sensor connector
- Check continuity between control unit connector terminals and wheel sensor connector (body side) terminals

<table>
<thead>
<tr>
<th>Code No. (LED flashes)</th>
<th>Control unit</th>
<th>Wheel sensor</th>
</tr>
</thead>
<tbody>
<tr>
<td>01, 05 (Front R-H)</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>02, 06 (Front L-H)</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>03, 07 (Rear)</td>
<td>6</td>
<td>3</td>
</tr>
</tbody>
</table>

Continuity should exist.

Note
- Repair harness and connectors between control unit connector and wheel sensor connector.

C
- WHEEL SENSOR MECHANICAL CHECK
- Check for any foreign materials and clearance between sensor and rotor.

Clearance:
- Front
  - Make sure the sensor is installed of minimum clearance.
  - Front: 0.31 - 0.82 mm (0.0122 - 0.0323 in)
- Rear

Note
- Clean sensor fixing portion, reinstall or replace sensor.

D
- Check sensor rotor for teeth damage.

OK
- Go to applicable diagnostic procedure for malfunction code No. (LED flashes).

Note: Wheel position should be distinguished by code No. (LED flashes).

Note: Wheel position should be distinguished by code No. (LED flashes).
DIAGNOSIS

Diagnostic Procedure 5

MOTOR RELAY OR MOTOR
(Malfunction code No. 43, 44)

A. Actuator connectors (body side)

B. Actuator connectors (actuator side)

C. Actuator connector (body side)

D. Control unit terminals (control unit side)

MOTOR POWER SUPPLY CIRCUIT
- Check 30A fusible link [L] and 10A fuse [T] for actuator. For fusible link and fuse layout, refer to POWER SUPPLY ROUTING in EL section.

OK

NG

No

Inspection end

Yes

Repair harness and connectors between battery and actuator connector (body side) terminals.

OK

Replace actuator assembly

NG

NG

Repair harness and connectors.

OK

Replace control unit.

Discontinue connectors from control unit and actuator. Check terminals for damage or loose connection. Then reconnect connectors.
Does warning light activate again?

Discontinue actuator connectors.
Check voltage between connector (body side) terminals and ground

Battery voltage should exist.

Discontinue actuator connectors.
Check continuity between actuator connector (actuator side) terminals and relay connector terminals or body ground.

Check continuity between actuator connector (body side) terminal 8 and ground.
Continuity should not exist.

Discontinue control unit connectors.
Check continuity between control unit terminals (control unit side) 5 and 2, 3, 26, 27, 28.
Continuity should not exist.

NG

NG

OK

OK

OK

OK

OK

OK

OK

{Go to next page}
TROUBLE DIAGNOSES

Diagnostic Procedure 5 (Cont’d)

---

**E**

MOTOR CHECK
- Connect actuator connectors.
- Connect suitable wire between relay connector terminals ⑨ and ⑪. Motor should operate. Do not connect wire for more than 5 seconds.

![Motor Check Diagram]

**F**

Control unit connector
Actuator connector (body side)

![Control Unit and Actuator Connector Diagram]

**G**

MOTOR RELAY CHECK
Refer to MOTOR RELAY in Electrical Components Inspection (BR-65).

**H**

CIRCUIT CHECK
- Disconnect control unit connector.
- Check continuity between control unit connector terminals and actuator connector (body side) terminals.

<table>
<thead>
<tr>
<th>Control unit</th>
<th>Actuator</th>
</tr>
</thead>
<tbody>
<tr>
<td>④</td>
<td>⑪</td>
</tr>
</tbody>
</table>

Continuity should exist.

Go to **E** in Diagnostic Procedure 2.

---

Replace actuator assembly.

Check actuator motor ground (Refer to BR-65).

Repair harness and terminals.

Replace motor relay.

Repair harness and connectors.
TROUBLE DIAGNOSES
Diagnostic Procedure 5 (Cont’d)

G. Actuator connectors (body side)
   - Replace fusible link or fuse.
   - Is it blown out when it is replaced or
     ignition switch is turned “ON”?

   No → Inspection end
   Yes → Motor power supply circuit

H. Actuator connectors (actuator side)
   - Disconnect connectors from actuator
     and control unit.
   - Check continuity between actuator
     connector (body side) terminals and
     ground.

<table>
<thead>
<tr>
<th>Fuse/Fusible link</th>
<th>Terminals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fusible link</td>
<td>④ - ground</td>
</tr>
<tr>
<td>Fuse</td>
<td>⑤ - ground</td>
</tr>
</tbody>
</table>

   Continuity should not exist.

I. Control unit terminals
   - Remove motor ground.
   - Check continuity between actuator
     connector (actuator side) terminals
     and ground.

<table>
<thead>
<tr>
<th>Fuse/Fusible link</th>
<th>Terminals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fusible link</td>
<td>④ - ground</td>
</tr>
<tr>
<td>Fuse</td>
<td>⑤ - ground</td>
</tr>
</tbody>
</table>

   Continuity should not exist.

   OK → Replace actuator assembly

   NG → Replace actuator assembly.

   OK → Replace control unit.

   NG → Replace actuator assembly.

BR-56
Diagnostic Procedure 6
SOLENOID VALVE RELAY
(Malfunction code No. 41, 42)

SOLENOID VALVE POWER SUPPLY CHECK
- Check 30A fuse link X and 10A fuse 1 for actuator. For fuse link and fuse layout, refer to POWER SUPPLY ROUTING in EL section.

DIAGNOSTIC PROCEDURE 6
SOLENOID VALVE RELAY
(Malfunction code No. 41, 42)

SOLENOID VALVE RELAY POWER SUPPLY CHECK
- Check 30A fuse link X and 10A fuse 1 for actuator. For fuse link and fuse layout, refer to POWER SUPPLY ROUTING in EL section.

SOLENOID VALVE RELAY POWER SUPPLY CHECK
- Disconnect connectors from control unit and actuator. Check terminals for damage or loose connection. Then reconnect connectors.
- Carry out self-diagnosis again. Does warning lamp activate again?

SOLENOID VALVE RELAY POWER SUPPLY CHECK
- Disconnect connectors from actuator.
- Check voltage between actuator 2-pin connector (body side) terminals and ground.

<table>
<thead>
<tr>
<th>Terminals</th>
<th>Ignition switch</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 &amp; 6</td>
<td>ON position</td>
</tr>
</tbody>
</table>

Battery voltage should exist.

SOLENOID VALVE RELAY CHECK
Refer to SOLENOID VALVE RELAY in Electrical Components Inspection (BR-65).

SOLENOID VALVE RELAY RELAY CHECK
Check continuity between relay terminals and actuator connector (actuator side) terminals.

<table>
<thead>
<tr>
<th>Relay terminals</th>
<th>Connector terminals</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>6</td>
<td>Yes</td>
</tr>
<tr>
<td>8</td>
<td>6</td>
<td>Yes</td>
</tr>
<tr>
<td>8 (21s)</td>
<td>5</td>
<td>Yes</td>
</tr>
<tr>
<td>8</td>
<td>7</td>
<td>Yes</td>
</tr>
<tr>
<td>6</td>
<td>5</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Ground | 7 | No

(See next page.)
TROUBLE DIAGNOSES

Diagnostic Procedure 6 (Cont'd)

C
Actuator connector (body side)

A

Check continuity between actuator connector (body side) terminal 2 and ground.
Continuity should not exist.

OK

C

D

Disconnect control unit connectors.

Check continuity between control unit terminals (control unit side) 6 and 7, 8, 9, 10.
Continuity should not exist.

Replace control unit.

NG

D

E

CIRCUIT CHECK

Disconnect control unit connector.
Check continuity between control unit connector terminals and actuator connector (body side) terminals.

Control unit

Actuator

Ground

Continuity should exist.

NG

D

F

Actuator connectors (body side)

Go to D in Diagnostic Procedure 2.

F

ACTUATOR POWER SUPPLY CIRCUIT

Disconnect connectors from actuator and control unit.
Check continuity between actuator connector (body side) terminals and ground.

Fuse/Fuse link

Terminals

Fuse link [K]

5 - ground

Fuse [T]

5 - ground

Continuity should not exist.

OK

NG

Repair harness and connectors.

Inspection end

Yes

NG

Repair harness and connectors.

(BR-58)
TROUBLE DIAGNOSES

Diagnostic Procedure 6 (Cont'd)

G
Actuator connectors (actuator side)

- Check continuity between actuator connector (actuator side) terminals and ground.

<table>
<thead>
<tr>
<th>Fuse/Fusible link</th>
<th>Terminals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fusible link K</td>
<td>6 - ground</td>
</tr>
<tr>
<td>Fuse 1</td>
<td>8 - ground</td>
</tr>
</tbody>
</table>

Continuity should not exist.

NG  Replace actuator assembly.

H
Control unit terminals (control unit side)

- Check continuity between control unit terminals (control unit side).

<table>
<thead>
<tr>
<th>Fuse/Fusible link</th>
<th>Terminals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fusible link K</td>
<td>7, 9, 11</td>
</tr>
<tr>
<td>Fuse 1</td>
<td>7, 9, 11</td>
</tr>
</tbody>
</table>

Continuity should not exist.

OK  Replace actuator assembly.

NG  Replace control unit.
Diagnostic Procedure 8
MEMORY VOLT STOP

- Disconnect control unit connectors.
- Check terminals for damage or loose connection. Then reconnect connectors.
- Turn ignition switch ON and OFF more than two times
- Carry out self-diagnosis again.
Does warning lamp activate again?

Yes

A

CONTROL UNIT POWER SUPPLY

- Disconnect control unit connectors.
- Check voltage between connector terminal ⑴ and ground.
Battery voltage should exist.

OK

NG

Check harness and connectors between battery and control unit connector terminal ⑴ or 7.5A fuse ⑴. For fuse layout, refer to POWER SUPPLY ROUTING in EL section.

CONTROL UNIT GROUND CIRCUIT

Refer to CONTROL UNIT GROUND in Ground Circuit Check (BR 45).

OK

Replace control unit

NG

Repair harness and connectors.

No

Inspection end

Note: MEMORY VOLT STOP is always indicated after disconnecting control unit connector.
TROUBLE DIAGNOSES

Diagnostic Procedure 7
POWER SUPPLY
(Malfunction code No. 47, 48)

- Disconnect control unit connectors.
  Check terminals for damage or connection. Then reconnect connectors.
- Carry out self-diagnosis again.
  Does warning lamp activate again?

Yes →

CONTROL UNIT POWER SUPPLY

- Disconnect control unit connectors.
- Check voltage between connector terminal (①) and ground when ignition switch is turned ON.
  Battery voltage should exist.

OK →

NG →

Check harness and connectors between battery and control unit connector terminal (①), 10A fuse (②), or battery. For fuse layout, refer to POWER SUPPLY ROUTING in EI section.

CONTROL UNIT GROUND CIRCUIT

Refer to CONTROL UNIT GROUND in Ground Circuit Check (BR-45).

OK →

Replace control unit.

NG →

Repair harness and connectors.

No → Inspection end
Diagnostic Procedure 9

SYMPTOM: Pedal vibration and noise

Check whether the symptom appears only when engine is started.

Yes → Carry out self-diagnosis. (See page BR-40.)

No

Check whether the symptom appears when brake is applied gradually under the conditions below:
- Shifting
- Operating clutch
- Passing over bumps/potholes

Yes → For such conditions, ABS will work due to difference of wheel speeds.

No

Check if there are any conditions, among those listed below, when symptom appears:
- Low friction road
- High speed cornering
- Passing over bumps/potholes

Yes → For such conditions, ABS will work due to difference of wheel speeds.

No

Check whether the symptom appears when engine speed is over 5,000 rpm with vehicle stopped.

Yes → Vibration related to sensor may cause ABS operation.

No

Check whether electrical equipment switches are operated.

Yes → Go to 2 in Diagnostic Procedure 11 (BR-63).

No

Check wheel sensor shield ground. For location of shield ground, refer to wiring diagram and "HARNESS LAYOUT" in EL section.

NG

Remedy.

OK

Replace control unit.
Diagnostic Procedure 10
SYMPTOM: Long stopping distance

Check if road condition is slippery with snow or gravel.

Yes → Stopping distance may be longer than vehicles without ABS

No → Go to B in Diagnostic Procedure 11 (See below)

Disconnect actuator connector and check whether stopping distance is still long.

Yes → Perform Preliminary Check and air bleeding.

No → Perform Preliminary Check and air bleeding.

Diagnostic Procedure 11
SYMPTOM: Unexpected pedal action

A
Check whether brake pedal stroke is excessively large.

Yes → Perform Preliminary Check (BR-44).

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 → Carry out self-diagnosis (See page BR-49).

NG → Remedy.

B
Ensure warning lamp remains off while driving.

OK → Replace control unit.

NG → Carry out self-diagnosis (See page BR-49).

CHECK WHEEL SENSOR
- Check wheel sensor connector for terminal damage or loose connection
- Perform wheel sensor mechanical check
Refer to C and D in Diagnostic Procedure 4 (BR-31)

OK → Replace control unit.
TROUBLE DIAGNOSES

Diagnostic Procedure 12
SYMPTOM: ABS does not work.

Check whether warning activates. Yes → Carry out self-diagnosis. (See page BR-40.)

No

Check symptom condition whether vehicle speed is under 10 km/h (6 MPH). Yes → ABS does not work in this condition.

No

Go to 6 in Diagnostic Procedure 11 (BR-53).

Diagnostic Procedure 13
SYMPTOM: ABS works frequently.

CHECK BRAKE FLUID PRESSURE.

Check whether brake fluid pressure distribution is normal. Refer to DP valve inspection in "CONTROL VALVE" (BR-4).

OK

NG → Perform Preliminary Check (BR-44)

CHECK WHEEL SENSOR.

- Check wheel sensor connector for terminal damage or loose connection.
- Perform wheel sensor mechanical check.
Refer to 6 and 7 in Diagnostic Procedure 4 (BR-53).

OK

NG → Remedy

Check front axle for excessive looseness. Refer to "Front Wheel Bearing" in FA section.

OK

NG → Remedy.

Replace control unit.

BR-64
**TROUBLE DIAGNOSES**

**Electrical Components Inspection**

**WHEEL SENSOR**
Check resistance for each sensor.
Resistances: 0.6 - 3.3 kΩ

---

**ACTUATOR MOTOR RELAY AND SOLENOID VALVE RELAY**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Solenoid valve relay</th>
<th>Actuator motor relay solenoid valve relay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Battery voltage not applied</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>between terminals 56 and 56</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Battery voltage applied</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>between terminals 55 and 55</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---
## General Specifications

<table>
<thead>
<tr>
<th>Component</th>
<th>Without ABS</th>
<th>With ABS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Front brake</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brake model</td>
<td>DPJ25V disc brake</td>
<td></td>
</tr>
<tr>
<td>Cylinder bore diameter</td>
<td>42.4 (1.68) x 2</td>
<td></td>
</tr>
<tr>
<td>Pad mm (in)</td>
<td>116.0 x 50.0 x 10.0</td>
<td></td>
</tr>
<tr>
<td>Length x width x thickness</td>
<td>4.57 x 1.969 x 0.394</td>
<td></td>
</tr>
<tr>
<td>Rotor outer diameter x thickness mm (in)</td>
<td>260 x 32 (11.02 x 1.26)</td>
<td></td>
</tr>
<tr>
<td><strong>Rear brake</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brake model</td>
<td>CL114 disc brake</td>
<td></td>
</tr>
<tr>
<td>Cylinder bore diameter</td>
<td>38.18 (1.5031)</td>
<td></td>
</tr>
<tr>
<td>Pad mm (in)</td>
<td>75.0 x 40.0 x 9.5</td>
<td></td>
</tr>
<tr>
<td>Length x width x thickness</td>
<td>2.953 x 1.575 x 0.374</td>
<td></td>
</tr>
<tr>
<td>Rotor outer diameter x thickness mm (in)</td>
<td>258.9 x 9 (10.16 x 0.35)</td>
<td></td>
</tr>
</tbody>
</table>

### DISC BRAKE

<table>
<thead>
<tr>
<th>Brake model</th>
<th>OPF25V</th>
<th>CL114</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pad wear limit mm (in)</td>
<td>20 (0.79)</td>
<td>28 (1.10)</td>
</tr>
<tr>
<td>Minimum thickness</td>
<td>20 (0.79)</td>
<td>28 (1.10)</td>
</tr>
<tr>
<td>Rotor repair limit mm (in)</td>
<td>8 (0.31)</td>
<td>8 (0.31)</td>
</tr>
</tbody>
</table>

## Inspection and Adjustment

### PARKING BRAKE

<table>
<thead>
<tr>
<th>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>7 - 9</td>
</tr>
<tr>
<td>Number of notches when warning lamp switch comes on</td>
<td>1</td>
</tr>
</tbody>
</table>

### BRAKE PEDAL

<table>
<thead>
<tr>
<th>Vehicle model</th>
<th>LHD</th>
<th>RHD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Free height &quot;H&quot; mm (in)</td>
<td>181 - 191</td>
<td>179 - 193</td>
</tr>
<tr>
<td>M/T (7.13 - 7.59)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A/T (7.52 - 7.91)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depressed height &quot;D&quot; mm (in) [under force of 490 N (50 kg, 110 lb) with engine running]</td>
<td>110 (4.33)</td>
<td></td>
</tr>
<tr>
<td>Clearance &quot;C&quot; between pedal stopper and threaded end of stop lamp switch or ASCD switch mm (in)</td>
<td>0.3 - 1.0 (0.012 - 0.039)</td>
<td></td>
</tr>
</tbody>
</table>
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<th>Topic</th>
<th>Page</th>
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</thead>
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<td>Checking Neutral Position on Steering Wheel</td>
<td>5</td>
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<td>5</td>
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<td>6</td>
</tr>
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<td>6</td>
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<td>7</td>
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<td>17</td>
</tr>
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<td>Inspection</td>
<td>17</td>
</tr>
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<td>Assembly</td>
<td>18</td>
</tr>
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<td>22</td>
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<td>24</td>
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<tr>
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<td>24</td>
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<tr>
<td>Disassembly</td>
<td>25</td>
</tr>
<tr>
<td>Inspection</td>
<td>25</td>
</tr>
<tr>
<td>Assembly</td>
<td>26</td>
</tr>
<tr>
<td>SERVICE DATA AND SPECIFICATIONS (SDS)</td>
<td>27</td>
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<td>27</td>
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<tr>
<td>Inspection and Adjustment</td>
<td>27</td>
</tr>
</tbody>
</table>
PRECAUTIONS AND PREPARATION

Precautions

SUPPLEMENTAL RESTRAINT SYSTEM (SRS) "AIR BAG" AND "SEAT BELT PRE-TENSIONER"

The Supplemental Restraint System "Air Bag" and "Seat belt pre-tensioner", used along with a seat belt, help to reduce the risk or severity of injury to the driver and front passenger in a frontal collision. The Supplemental Restraint System consists of air bag modules (located in the center of the steering wheel and on the instrument panel on the passenger side), seat belt pre-tensioner, a diagnosis sensor unit, warning lamp, wiring harness and spiral cable. Information necessary to service the system safely is included in the RS section of this Service Manual.

WARNING:
- To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN dealer.
- Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.
- All SRS electrical wiring harnesses and connectors are covered with yellow outer insulation. Do not use electrical test equipment on any circuit related to the SRS.

STEERING SYSTEM

- Before disassembly, thoroughly clean the outside of the unit.
- Disassembly should be done in a clean work area. It is important to prevent the internal parts from becoming contaminated by dirt or other foreign matter.
- Place disassembled parts in order, on a parts rack, for easier and proper assembly.
- 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 ATF* 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</th>
<th>Tool name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>KV48100700</td>
<td>Torque adapter</td>
<td>Measuring pinion rotating torque</td>
</tr>
<tr>
<td>ST27100001</td>
<td>Steering wheel puller</td>
<td>Removing and installing steering wheel</td>
</tr>
</tbody>
</table>

ST-2
## PRECAUTIONS AND PREPARATION

### Special Service Tools (Cont’d)

<table>
<thead>
<tr>
<th>Tool number</th>
<th>Description</th>
<th>Diagram</th>
</tr>
</thead>
<tbody>
<tr>
<td>HT72520000</td>
<td>Removing ball joint</td>
<td><img src="https://example.com" alt="Diagram" /></td>
</tr>
<tr>
<td>a: 33 mm (1.30 in)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b: 50 mm (1.97 in)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c: R11.5 mm (0.453 in)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ST27091000</td>
<td>Measuring oil pressure</td>
<td><img src="https://example.com" alt="Diagram" /></td>
</tr>
<tr>
<td>KV48102500</td>
<td>Measuring oil pressure</td>
<td><img src="https://example.com" alt="Diagram" /></td>
</tr>
<tr>
<td>KV48104400</td>
<td>Reforming teflon ring</td>
<td><img src="https://example.com" alt="Diagram" /></td>
</tr>
<tr>
<td>a: 50 mm (1.97 in) dia.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b: 35 mm (1.42 in) dia.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c: 100 mm (3.94 in)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Commercial Service Tools

<table>
<thead>
<tr>
<th>Tool name</th>
<th>Description</th>
<th>Diagram</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rear oil seal drift</td>
<td>Installing rear oil seal</td>
<td><img src="https://example.com" alt="Diagram" /></td>
</tr>
<tr>
<td>a: 26 mm (1.10 in) dia.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Precautions and Preparation

<table>
<thead>
<tr>
<th>Tool Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil seal drill</td>
<td>Installing oil seal</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Oil Pump Attachment</th>
<th>Disassembling and assembling oil pump</th>
</tr>
</thead>
<tbody>
<tr>
<td>R25 (0.99)</td>
<td>11 (0.44) dia.</td>
</tr>
<tr>
<td>42 (1.66)</td>
<td>12 (0.47)</td>
</tr>
<tr>
<td>95 (3.74)</td>
<td>62 (2.44)</td>
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<tr>
<td>15 (0.59)</td>
<td>80 (3.15)</td>
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### On-Vehicle Service

#### Checking Steering Wheel Play
1. With wheels in a straight-ahead position, check steering wheel play.
   - **Steering wheel play:**
     - 35 mm (1.38 in) or less
2. If it is not within specification, check the following for loose or worn components:
   - Steering gear assembly
   - Steering column
   - Front suspension and axle

#### Checking Neutral Position on Steering Wheel
**Pre-checking**
- Make sure that wheel alignment is correct.
- Wheel alignment:
  - Refer to SDS in FA section.
- 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 teeth, loosen tie-rod lock nuts. Turn the tie-rods by the same amount in opposite directions on both left and right sides.

#### Front Wheel Turning Angle
- Rotate steering wheel all the way right and left; measure turning angle.
  - **Turning angle of full turns**:
    - Refer to SDS in FA section.
- If it is not within specification, check rack stroke.
  - Measured length "S":
    - Refer to SDS (ST-27).
ON-VEHICLE SERVICE

Checking Gear Housing Movement
1. Check the movement of steering gear housing during stationary steering on a dry paved surface.
   • Apply a force of 49 N (5 kg, 11 lb) to steering wheel to check the gear housing movement.
   Turn off ignition key while checking.
   Movement of gear housing: 
   ≤ 2 mm (≤ 0.08 in) or less
2. If movement exceeds the limit remove 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 (For power steering)
Refer to Drive Belt Inspection in MA section.

Checking Fluid Level
Check fluid level with dipstick on reservoir cap.
Use "HOT" range for fluid temperatures of 50 to 80°C (122 to 176°F).
Use "COLD" range for fluid temperatures of 0 to 30°C (32 to 86°F).
CAUTION:
• Do not overfill.
• Recommended fluid is Automatic Transmission Fluid "DEXRON™-type or equivalent.

Checking Fluid Leaksage
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.
2. Make sure temperature of fluid in oil tank rises to 60 to 80°C (140 to 176°F).
3. Hold steering wheel at each "lock" position for five seconds and carefully check for fluid leakage.

ON-VEHICLE SERVICE

Checking Fluid Leakage (Cont’d)

CAUTION:
Do not hold the steering wheel in a locked position for more than 15 seconds.
4. If fluid leakage at connectors is noticed, loosen flare nut and then retighten.
Do not overtighten connector as this can damage O-ring, washer and connector.

Bleeding Hydraulic System
1. Raise front end of vehicle until wheels clear ground.
2. Add fluid into oil tank to specified level. Then, 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.
   a. Air bubbles in reservoir tank
   b. Clicking noise in oil pump
   c. Excessive buzzing in oil pump
   Fluid noise may occur in the valve or oil pump. This is common when the vehicle is stationary or while turning the steering wheel slowly. This does not affect the performance or durability of the system.

Checking Steering Wheel Turning Force
(For power steering)
1. Park vehicle on a level, dry surface and set parking brake.
2. Start engine.
3. Bring power steering fluid up to adequate operating temperature. [Make sure temperature of fluid is approximately 60 to 80°C (140 to 176°F).]
   Tires need to be inflated to normal pressure.
4. Check steering wheel turning force when steering wheel has been turned 360° from the neutral position.
   Steering wheel turning force:
   39 N (9 kg, 20 lb) or less
5. If steering wheel turning force is out of specification, check rack sliding force.
   a. Disconnect steering column lower joint and knuckle arms from the gear.
   b. Start and run engine at idle to make sure steering fluid has reached normal operating temperature.
   c. Pull tie-rod slowly to move it from neutral position to 11.5 mm (0.453 in) at speed of 3.5 m/s (0.138 m/s). Check that rack sliding force is within specification.
ON-VEHICLE SERVICE

Checking Steering Wheel Turning Force (For power steering) (Cont'd)

Average rack sliding force:
186 - 245 N (19 - 25 kg, 42 - 55 lb)
Maximum force deviation:
98 N (10 kg, 22 lb)
6. If rack sliding force is not within specification, overhaul steering gear assembly.

Checking Hydraulic System

Before starting, check belt tension, driving pulley and tire pressure.
1. Set Tool. Open shut-off valve. Then bleed air. (See "Bleeding Hydraulic System", ST-7.)
2. Run engine.
Make sure temperature of fluid in tank rises to 60 to 80°C (140 to 176°F). WARNING: Warm up engine with shut-off valve fully opened. If engine is started with shut-off valve closed, fluid pressure in oil pump increases to maximum. This will raise oil temperature abnormally.
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 pressure:
8,500 - 9,219 kPa (863 - 922 bar, 88 - 94 kg/cm², 1,251 - 1,337 psi)
4. If oil pressure is below the standard pressure, slowly close shut-off valve and check pressure.
   - When pressure reaches standard pressure, gear is damaged.
   - When pressure remains below standard pressure, pump is damaged.
CAUTION:
Do not close shut-off valve for more than 15 seconds.
5. If oil pressure is higher than standard pressure, check oil pump flow control valve.
6. After checking hydraulic system, remove Tool and add fluid as necessary. Then completely bleed air out of system.

ST-8

STEERING WHEEL AND STEERING COLUMN

Removal and Installation

SEC. 488-484

With air bag

6. Seat - 30
   10. G - 40, 20, 29
   16. T - 25
   12. 25, 11 - 18

Without air bag

1 - 29
24. 420, 4, 3, 17, 22
13. 19 (1.3, 1.8, 9, - 13)

LH model
14. 4 - 4, 0.35 - 0.45, 2.5 - 3.3
RHD model
4 - 12 (0.8 - 1.2, 6.4 - 8.7)

CAUTION:
- The rotation of the spiral cable (SRS "Air bag" component part) is limited. If the steering gear must be removed, set the front wheels in the straight-ahead direction. Do not rotate the steering column while the steering gear is removed.
- Remove the steering wheel before removing the steering lower joint to avoid damaging the SRS spiral cable.

ST-9

STEERING WHEEL

- With air bag type
  - Remove air bag module and spiral cable. Refer to "Removal — Air Bag Module and Spiral Cable", "Supplemental Restraint System" in RS section.
**ST-10**

**STEERING WHEEL AND STEERING COLUMN**

**Removal and Installation (Cont'd)**

- Align spiral cable correctly when installing steering wheel.
  a. Set the front wheels in the straight-ahead position.
  b. Make sure that the spiral cable is in the neutral position.
  
  The neutral position is detected by turning left 2.5 revolutions from the right end position. Align the two marks (Fig. 1).

CAUTION:

The spiral cable may snap due to steering operation if the cable is installed in an improper position. Also, with the steering linkage disconnected, the cable may snap by turning the steering wheel beyond the limited number of turns. (The spiral cable can be turned up to 2.5 turns from the neutral position to both the right and left.)

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**STEERING COLUMN**

**Removal and Installation (Cont'd)**

- When installing steering column, finger-tighten 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.

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**Without air bag type**

- Remove horn pad.
  Insert a crosshead screwdriver into hole on lower side of spoke and remove screw. Lift horn pad off by hand.

- Remove steering wheel with Tool.

- When installing steering wheel, lubricate with multi-purpose grease. Apply grease to entire surface of turn signal cancel pins and horn contact slip rings.

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**ST-11**
Disassembly and Assembly (Cont'd)

- Steering lock
  a. Break self-shear type screws with a drill or other appropriate tool.
  b. Install new self-shear type screws and then cut off self-shear type screw heads.

Inspection

- When steering wheel does not turn smoothly, check the steering column as follows 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 comes into a light collision, check length "L1" and "L2".
  - Steering column length "L1":
    - LHD model 639.7 mm (24.83 in)
    - RHD model 610.0 mm (24.02 in)
  - Steering column lower shaft length "L2":
    - LHD model 323.7 mm (12.74 in)
    - RHD model 341.0 mm (13.43 in)
  - If out of the specifications, replace steering column as an assembly.

- Tilt mechanism
  After installing steering column, check tilt mechanism operation.

When disassembling and assembling, unlock steering lock with key.

Install lock nut on steering column shaft and tighten the nut to specification:

- 25 - 34 N·m (2.5 - 3.5 kg·m, 18 - 25 ft·lb)
POWER STEERING GEAR AND LINKAGE (Model PR24AC)

Removal and Installation

- Install pipe connector.
- Observe specified tightening torque when tightening high-pressure and low-pressure pipe connectors. Excessive tightening can damage threads or damaged connector O-ring.

Connector tightening torque:
- Low-pressure side "1"
  27 - 39 N·m (2.8 - 4.0 kg·m, 20 - 29 ft·lb)
- High-pressure side "2"
  15 - 25 N·m (1.5 - 2.5 kg·m, 11 - 18 ft·lb)
- 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 (2 to 4 kg·m, 22 to 29 ft·lb). Then tighten further to align nut grooves 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.
- To install, set left and right dust boots to equal deflection. Attach lower joint by aligning matching marks of pinion shaft and pinion housing.

- Tighten gear housing mounting bracket bolts in the order shown.
  Temporary tightening torque:
  78 N·m (8.0 kg·m, 56 ft·lb)
  Secure tightening torque:
  88 - 108 N·m (9.0 - 11.0 kg·m, 65 - 80 ft·lb)
Power Steering Gear and Linkage (Model PR24AC)

Disassembly and Assembly

1. Prior to disassembling, measure pinion rotating torque. Record the pinion rotating torque as a reference.
2. Before measuring, disconnect cylinder tube and drain fluid.
3. 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.
4. Remove pinion gear.
5. Be careful not to damage pinion gear when removing pinion seal ring.
6. Remove tie-rod outer sockets and boots.
7. Loosen tie-rod inner socket by prying up staked portion, and remove socket.
8. Remove retainer.
9. Remove pinion assembly.
10. Use a 2 to 2.5 mm (0.079 to 0.098 in) diameter drill to completely remove staked portion of gear housing.

Disassembly

8. Remove gear housing and 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.

11. Remove center bushing and rack oil seal using tape wrapped socket and extension bar.

Do not scratch inner surfaces of pinion housing.

Inspection

Thoroughly clean all parts in cleaning solvent or automatic transmission fluid "DEXRON™" type or equivalent. 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.
Inspection (Cont'd)

PINION ASSEMBLY
- Thoroughly examine pinion gear. If pinion gear is damaged, cracked or worn, replace it.
- Check that all bearings roll freely. Ensure that balls, rollers and races are not cracked, pitted or worn. Replace if necessary.

GEAR HOUSING CYLINDER
Check gear housing cylinder bore for scratches or other damage. Replace if necessary.

TIE-ROD OUTER AND INNER SOCKETS
- Check ball joints for swinging force.
  Tie-rod outer and inner ball joints swinging force "A":
  Refer to SDS (ST-27).
- Check ball joint for rotating torque.
  Tie-rod outer ball joint rotating torque "B":
  Refer to SDS (ST-27).
- Check ball joints for axial end play.
  Tie-rod outer and inner ball joints axial end play "C":
  Refer to SDS (ST-27).
- Check condition of dust cover. If cracked excessively, replace outer tie-rod.

Assembly

1. Using a heat gun, heat new teflon rack seal ring to approximately 40°C (104°F). Then place it onto rack.

2. Using Tool, compress rack seal ring securely onto rack.
   Always insert the tool from the rack gear side.

3. Insert rack oil seal.
   - Place plastic film into rack oil seal to prevent damage by rack teeth.
   - Always remove plastic film after rack oil seal is positioned properly.
   - Make sure lips of rack oil seal face each other.

4. Install center bushing and rack oil seal with rack assembly.

5. Insert rack oil seal and end cover assembly to rack. Then tighten end cover assembly.

6. Fasten cylinder end cover assembly to gear housing by staking.

7. Set rack gear in the neutral position.
   Measured length "S":
   Refer to SDS (ST-27).
Assembly (Cont'd)

8. Coat seal lip of new pinion oil seal with multi-purpose grease. Install it into pinion housing of gear with a suitable tool.

Make sure lip of oil seal faces up when installed.

9. Install pinion bearing adjusting shim(s).
Whenever pinion assembly, gear housing and rear housing are disassembled, replace shim(s) with new ones. Always use the same number of shim(s) when replacing.

10. Install new pinion seal ring (made of Teflon) on pinion gear assembly.
- Using a heat gun, heat pinion seal ring to approximately 40°C (104°F) before installing it onto pinion gear assembly.
- Make sure pinion seal ring is properly settled in valve groove.

11. Apply a coat of multi-purpose grease to needle bearing roller and oil seal lip.

12. Install pinion assembly to rear housing.

Be careful not to damage pinion oil seal.

13. Apply a coat of multi-purpose grease to rear oil seal lip before installing rear housing.

14. Ensure that the rack is centered. Install rear cover cap so that protrusion of rear housing cover is positioned as shown in figure.

Be careful not to damage worm ring and oil seal.

15. Install diaphragm spring at Retainer.
- Always install Retainer, spring washer and diaphragm spring in that order.
- Make sure convex end (painted white) of diaphragm spring faces outward when installing.

16. Install Retainer spring and adjusting screw temporarily.

17. Install new lock plate.
- Attach lock plate ① to side rod inner socket ①.
- Apply locking sealant to inner socket threads ③.
- Screw inner socket into rack ④ and tighten to specified torque.
- Clinch two places of lock plate at rack's groove.

CAUTION:
To prevent scratching the boot, remove burrs from lock plate.

18. Tighten outer socket lock nut.

Tie-rod length "L":
Refer to SUS (ST-27).

19. Measure rack stroke.

Rack stroke "S":
Refer to SUS (ST-27).
POWER STEERING GEAR AND LINKAGE (Model PR24AC)

Assembly (Cont’d)

20. Before installing boot, coat the contact surfaces between boot and tie-rod with grease.

21. Install boot clamps.
   - To install, wrap boot clamp around boot groove twice. To tighten clamp, place a screwdriver through both rings. Twist rings 4 to 4 1/2 turns while pulling with a force of approx. 98 N (10 kg, 22 lb).
   - Twist boot clamp in the direction shown in figure at left.

   - Place twisted ends of boot clamp in the range shown. (This will prevent interference with other parts.)

   - 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 0.2 N m (2 kg-cm, 1.7 in-lb).
6. Move rack over its entire stroke several times.

Adjustment (Cont’d)

7. Measure pinion rotating torque within the range of 180° from neutral position. Stop the gear at the point of maximum torque.
8. Loosen adjusting screw, then retighten it to 4.9 N m (50 kg-cm, 43 in-lb).
9. Loosen adjusting screw by 70° to 110°.
10. Prevent adjusting screw from turning, and tighten lock nut to specified torque.

11. Check rack sliding force on vehicle as follows:
   - a. Install steering gear onto vehicle, but do not connect tie-rod to knuckle arm.
   - b. Connect all piping and fill with steering fluid.
   - c. Start engine and bleed air completely.
   - d. Disconnect steering column lower joint from the gear.
   - e. Keep engine at idle and make sure steering fluid has reached normal operating temperature.
   - f. Pull tie-rod slowly to move it from neutral position to ± 11.5 mm (± 0.453 in) at speed of 3.5 mm (0.138 in)/s. Check that rack sliding force is within specification.

Average rack sliding force:
   - 186 to 245 N (19 to 25 kg, 42 to 55 lb)
   - Maximum force deviation:
     - 98 N (10 kg, 22 lb)
   - g. Check sliding force outside above range at rack speed of 40 mm (1.57 in)/s.
     - Maximum rack sliding force:
       - 294 N (30 kg, 66 lb)
     - Maximum force deviation:
       - 147 N (15 kg, 33 lb)
   - If rack sliding force is not within specification, readjust by repeating adjustment procedure from the beginning.
   - If rack sliding force is still out of specification after readjustment, gear assembly needs to be replaced.

ST-22
POWER STEERING OIL PUMP

Disassembly and Assembly

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 flow control valve.

Pre-disassembly Inspection

Disassemble the power steering oil pump only if the following items are found:
- Oil leak from any point shown in the figure.
- Deformed or damaged pulley
- Poor performance.
Assembly

- Make sure O-rings and oil seal are properly installed.
- Always install new O-rings and oil seal.
- Be careful of oil seal direction.
- Cam ring, rotor, and vanes must be replaced as a set if necessary.
- Coat each part with ATF when assembling.

- Pay attention to the direction of rotor.

- When assembling vanes to rotor, rounded surfaces of vanes must face cam ring side.

- Insert pin ② into pin groove ① of front housing and front side plate. Then install cam ring ③ as shown at left.
POWER STEERING

Steering gear type: PREMAC

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<tr>
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<th>( N (\text{Kg}, \text{ft}) )</th>
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<tbody>
<tr>
<td>Lower limit</td>
<td>2 (0.32, 12.4)</td>
</tr>
<tr>
<td>Upper limit</td>
<td>4 (0.89, 0.53)</td>
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Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER"

The Supplemental Restraint System "Air Bag" and "Seat Belt Pre-tensioner", used along with a seat belt, help to reduce the risk or severity of injury to the driver and front passenger in a frontal collision. The Supplemental Restraint System consists of air bag modules (located in the center of the steering wheel and on the instrument panel on the passenger side), seat belt pre-tensioners, a diagnostic sensor unit, warning lamp, wiring harness and spiral cable.

WARNING:
- To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN dealer.
- Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.
- All SRS air bag electrical wiring harnesses and connectors are covered with yellow outer insulation. Do not use electrical test equipment on any circuit related to the SRS.

CAUTION:
- Before removing the seat belt assembly, turn the ignition switch off, disconnect battery ground cable and wait for at least 10 minutes. (For Europe model)
- Do not disassemble buckle or seat belt assembly.
- Replace anchor bolts if they are deformed or worn out.
- Never oil tongue and buckle.
- If any component of seat belt assembly is questionable, do not repair. Replace as seat belt assembly.
- If webbing is cut, frayed, or damaged, replace seat belt assembly.
- When replacing seat belt assembly, use a genuine seat belt assembly.
- After any collision, inspect all seat belt assemblies, including retractors and other attached hardware (i.e., guide rail set).

Front Seat Belt

1. Remove rear seat. Refer to "SEAT" in BT section for details.
2. Remove rear pillar lower garnish. Refer to "INTERIOR TRIM" in BT section for details.
3. Disconnect seat belt pre-tensioner connector. (For Europe model)
4. Remove floor anchor cover and the anchor bolt.
5. Remove pillar anchor cover and the anchor bolt.
6. Remove the screw and the anchor bolt securing front seat belt assembly.
SEAT BELTS

Rear Seat Belt

1. Remove rear seat. Refer to "SEAT" in BT section for details.
2. Remove rear pillar lower garnish. Refer to "INTERIOR TRIM" in BT section for details.
3. Remove each anchor bolt.
4. Remove the anchor bolt securing rear seat belt assembly.

SEC. 869

SUPPLEMENTAL RESTRAINT SYSTEM (SRS)

Precautions for SRS "Air Bag" and "Seat Belt Pre-tensioner" Service

- Do not use a circuit tester to check SRS circuits.
- Before servicing the SRS, turn ignition switch "OFF", disconnect battery ground cable and wait for at least 10 minutes.
- For approximately ten minutes after the cables are removed, it is still possible for the air bag and seat belt pre-tensioner to deploy. Therefore, do not work on any SRS connectors or wires until at least ten minutes have passed.
- Diagnosis sensor unit must always be installed with their arrow marks "<" pointing towards the front of the vehicle for proper operation. Also check diagnosis sensor unit for cracks, deformities or rust before installation and replace as required.
- The spiral cable must be aligned with the neutral position since its rotations are limited. Do not attempt to turn steering wheel or column after removal of steering gear.
- Handle air bag module carefully. Always place it with the pad side facing upward.
- After removing any SRS parts, discard old bolts and replace with new ones. Conduct self-diagnosis to check entire SRS for proper function.
- After air bag inflates, the front instrument panel assembly should be replaced.

Special Service Tools

<table>
<thead>
<tr>
<th>Tool number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>KV991065400</td>
<td>Deployment tool</td>
</tr>
<tr>
<td>KV99106550</td>
<td>Deployment tool adapter</td>
</tr>
<tr>
<td>KV991065390</td>
<td>Passenger air bag bracket</td>
</tr>
</tbody>
</table>

Commercial Service Tool

<table>
<thead>
<tr>
<th>Tool name</th>
<th>Description</th>
<th>Use for special bolts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Special Torx bit</td>
<td>TAMPER RESISTANT TORX (Size T50)</td>
<td></td>
</tr>
</tbody>
</table>

KV991065259

Anchor the passenger air bag module

RS-4

RS-5
Description
The air bag deploys if the diagnosis sensor unit activates while the ignition switch is in "ON" or "START" position.

SRS Component Parts Location

Maintenance Items

1. Check "AIR BAG" warning lamp (Models equipped with air bags)
After turning ignition key to "ON" or "START" position, "AIR BAG" warning lamp illuminates for about 7 seconds. The "AIR BAG" warning lamp will go out after about 7 seconds, if no malfunction is detected. When a warning lamp flashes, check and correct cause of the problem.

2. Visually check SRS components
(1) Diagnosis sensor unit — Airbag
• Check case and bracket for dents, cracks or deformities.
• Check connectors for damage, and terminals for deformities.

(2) Main harness and air bag harness
• Check connectors for poor connections.
• Check harnesses for binding, connectors for damage, and terminals for deformities.

(3) Spiral cable
• Visually check lock (engagement) pins and combination switch for damage.
• Check connectors, flat cable and protective tape for damage.
• Check steering wheel for noise, binding or difficult operation.

(4) Air bag module and steering wheel
• Remove air bag module from steering wheel or instrument panel. Check harness cover and connectors for damage, terminals for deformities, and harness for binding.
• Install driver side air bag module to steering wheel to check fit or alignment with the wheel.
• Check steering wheel for excessive free play.
• Install passenger side air bag module to instrument panel to check fit or alignment with the instrument panel.

CAUTION:
Replace previously used screws with new ones.

(5) Seat belt pre-tensioner
• Check harness cover and connectors for damage, terminals for deformities, and harness for binding.
• Check belt for damage and anchors for loose mounting.
• Check retractor for smooth operation.
• Perform self-diagnosis for seat belt pre-tensioner using circuit tester. Refer to "Self-diagnosis" for details. (RS-21)
Supplemental Restraint System (SRS)

Removal and Installation — Diagnosis Sensor Unit and Seat Belt Pre-tensioner

**CAUTION:**
- Before servicing SRS, turn the ignition switch off, disconnect battery ground cable and wait for at least 10 minutes.
- The special bolts are coated with bonding agent. Discard old ones after removal; replace with new ones.
- Check diagnosis sensor unit for proper installation.
- Check diagnosis sensor unit to ensure they are free of deformities, dents, cracks or rust. If they show any visible signs of damage, replace them with new ones.
- Do not attempt to disassemble seat belt pre-tensioner.
- Do not drop or impact seat belt pre-tensioner. If any portion is damaged, replace the seat belt pre-tensioner.
- Do not expose seat belt pre-tensioner to temperatures exceeding 80°C (176°F).
- Whenever seat belts (equipped with pre-tensioner) are moved, ensure that cylinder faces down. Do not hold cylinder.

**REMOVAL OF DIAGNOSIS SENSOR UNIT**
1. Disconnect driver and passenger air bag module connectors. Also, disconnect seat belt pre-tensioner connector.
2. Remove rear seat assembly. Refer to “Rear Seat” in GT section.
3. Remove cover.
4. Disconnect diagnosis sensor unit connector.
5. Remove bolt and also remove special bolts using the TAMPER RESISTANT TORX (Size T50), from diagnosis sensor unit. Then remove the diagnosis sensor unit.

**NOTE:**
- To install, reverse the removal procedure sequence.

**REMOVAL OF SEAT BELT PRE-TENSIONER**
For removal of seat belt pre-tensioner, refer to “Front Seat Belt” for details. (RS-3)

**NOTE:**
- To install, reverse the removal procedure sequence.
- After replacement, perform self-diagnosis for seat belt pre-tensioner using circuit tester. Refer to “Self-diagnosis” for details. (RS-21)

---

Supplemental Restraint System (SRS)

Removal — Air Bag Module and Spiral Cable

**CAUTION:**
Before servicing SRS, turn the ignition switch off, disconnect battery ground cable and wait for at least 10 minutes.
1. Remove side lid LH from steering wheel, and disconnect air bag module connector.

2. Remove side lid. Using the TAMPER RESISTANT TORX (Size T50), remove left and right special bolts. Air bag module can then be removed.

**CAUTION:**
- Always place air bag module with pad side facing upward.
- Do not attempt to disassemble air bag module.
- The special bolts are coated with bonding agent. Discard old ones after removal; replace with new ones.
SUPPLEMENTAL RESTRAINT SYSTEM (SRS)

Removal — Air Bag Module and Spiral Cable (Cont'd)
- Do not drop or impact air bag module. If any portion is deformed or cracked, replace the module.
- Do not expose the air bag module to temperatures exceeding 393°C (700°F).
- Do not allow oil, grease or water to come in contact with the air bag module.

3. Set steering wheel in the neutral position.
4. Disconnect horn connector and remove nuts.
5. Using steering wheel puller, remove steering wheel. Be careful not to over tighten puller bolt on steering wheel.
6. Remove steering column cover.
7. Disconnect connector and remove the four screws. The spiral cable can then be removed.

Removal — Front Passenger Air Bag Module

CAUTION:
Before servicing SRS, turn the ignition switch off, disconnect battery ground cable and wait for at least 10 minutes.
1. Remove connector bracket from air bag module and disconnect air bag module connector.

2. Remove instrument panel.
3. Remove the special bolts from left and right sides of front passenger air bag module. Then remove the air bag module from the steering member.
- Air bag module is heavy and should be supported using both hands during removal.

CAUTION:
- Always place air bag module with pad side facing upward.
- Do not attempt to disassemble air bag module.
- The special bolts are coated with bonding agent. Discard old ones after removal, replace with new ones.

Installation — Air Bag Module and Spiral Cable

1. Set the front wheels in the straight-ahead position.
2. Make sure that the spiral cable is in the neutral position. The neutral position is detected by turning left 2.5 revolutions from the right end position. Align the two marks (X).

CAUTION:
The spiral cable may snap due to steering operation if the cable is installed in an improper position.
Also, with the steering linkage disconnected, the cable may snap by turning the steering wheel beyond the limited number of turns. (The spiral cable can be turned up to 2.5 turns from the neutral position to both the right and left.)
3. Connect spiral cable connector and tighten with screws. Install steering column cover.

4. Install steering wheel setting spiral cable pin guides, and pull spiral cable through.
5. Connect horn connector and engage spiral cable with pawls in steering wheel.
6. Tighten nuts.

7. Position air bag module and tighten with new special bolts.
8. Connect air bag module connector.
9. Install all lids.
10. Conduct self-diagnosis to ensure entire SRS operates properly (Use CONSULT or warning lamp check).
Installation — Front Passenger Air Bag Module
1. Install front passenger air bag module on steering member.
   - Ensure harness is not caught between rear of air bag module and steering member.
2. Install instrument panel.
3. Connect air bag module connector to body harness connector.
4. Install air bag module connector on connector bracket.
5. Install connector bracket on air bag module.

Disposal of Air Bag Module and Seat Belt Pre-tensioner
- Make sure to deactivate air bag modules and seat belt pre-tensioners before disposing of them. Also, before disposing of a vehicle equipped with an SRS system, deactivate air bag modules and seat belt pre-tensioners. If such systems have already been deployed due to an accident, dispose of as indicated in "DISPOSING OF AIR BAG MODULE AND SEAT BELT PRE-TENSIONER".
- When deploying the air bag module and seat belt pre-tensioner, always use the Special Service Tool; Deployment tool KV99106400.
- When deploying the air bag module and seat belt pre-tensioner, stand at least 5 m (16 ft) away from the deployment component.
- Due to heat, do not touch air bag module for at least 30 minutes after deployment. Also do not touch seat belt pre-tensioner for at least 10 minutes after deployment.
- Be sure to wear gloves when handling a deployed air bag module and seat belt pre-tensioner.
- Never apply water to a deployed air bag module and seat belt pre-tensioner.
- Wash your hands clean after finishing work.

Disposal of Air Bag Module and Seat Belt Pre-tensioner (Cont'd)
CHECKING DEPLOYMENT TOOL
Connecting to battery
- Place vehicle outdoors with at least 6 m (20 ft) of open space on all sides.
- Use a voltmeter to make sure the vehicle battery is fully charged.
CAUTION:
The battery must show voltage of 9.6V or more.
Remove the battery from the vehicle and place it on dry wood blocks approximately 2 m (16 ft) away from the vehicle.
- Wait 10 to 12 minutes after the vehicle battery is disconnected before proceeding.
- Connect red clip of deployment tool to battery positive terminal and black clip to negative terminal.
CAUTION:
Make sure the polarity is correct. The right side lamp in the tool, marked "deployment tool power", should glow with a green light. If the right side lamp glows red, reverse the connections to the battery.

Deployment tool check
Press the deployment tool switch to the "ON" position. The left side lamp in the tool, marked "air bag connector voltage", should illuminate. If it does not illuminate, replace the tool.

Air bag deployment tool lamp illumination chart (Battery connected)

<table>
<thead>
<tr>
<th>Switch operation</th>
<th>Left side lamp, green* &quot;AIR BAG CONNECTOR VOLTAGE&quot;</th>
<th>Right side lamp, green* &quot;DEPLOYMENT TOOL POWER&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
</tr>
<tr>
<td>ON</td>
<td>ON</td>
<td>ON</td>
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</table>

* If this lamp glows red, the tool is connected to the battery incorrectly. Reverse the connections and make sure the lamp glows green.
SUPPLEMENTAL RESTRAINT SYSTEM (SRS)

Disposal of Air Bag Module and Seat Belt Pre-tensioner (Cont’d)

DEPLOYMENT PROCEDURES FOR AIR BAG MODULE AS A UNIT

Deploying air bag module while it is mounted in vehicle may damage vehicle. Deploy air bag module as a unit except when disposing of vehicle.

Anchor air bag module in a vise secured to a firm foundation during deployment.

Deployment of driver’s air bag module as a unit
1. Prepare two sets of nuts and bolts (see figure at left). These bolts are required to secure driver’s air bag module to the vise.
2. Install one set of nuts and bolts to each side of the air bag module.

CAUTION: Make sure to install two bolts and nuts on each side.

3. Firmly place two nuts (secured to air bag module) in the vise.

CAUTION: Ensure these two nuts are equally placed in the vise. Never finish the installation with just one nut.
4. Connect deployment tool (SST: KV99106400) to air bag module connector.

5. Connect red clip of deployment tool to battery positive terminal and black clip to negative terminal.
6. The lamp on the right side of the tool, marked “deployment tool power”, should glow green, not red.
7. Press the button on the deployment tool. The left side lamp on the tool, marked “air bag connector voltage”, will illuminate and the air bag module will deploy.

CAUTION: When deploying the air bag module, stand at least 5 m (16 ft) away from the air bag module.

Deployment of passenger air bag module as a unit

1. Using wire, secure air bag module to passenger air bag bracket (SST: KV99105300) at two places.

CAUTION: Use wire of at least 1 mm (0.04 in) in diameter.

2. Firmly anchor passenger air bag bracket in a vise.
3. Connect deployment tool adapter (SST: KV99106550) to deployment tool (SST: KV99106400) connector and connector on either side of air bag module.

4. Connect red clip of deployment tool to battery positive terminal and black clip to negative terminal.
5. The lamp on the right side of the tool, marked “deployment tool power”, should glow green, not red.
6. Press the button on the deployment tool. The left side lamp on the tool, marked “air bag connector voltage”, will illuminate and the air bag module will deploy.

CAUTION: When deploying the air bag module, stand at least 5 m (16 ft) away from the air bag module.

Deployment of seat belt pre-tensioner as a unit

1. Firmly anchor seat belt pre-tensioner in a vise.

CAUTION: Ensure bracket and webbing are placed in the vise.

2. Connect deployment tool adapter (SST: KV99106550) to deployment tool (SST: KV99106400) connector and seat belt pre-tensioner connector.

3. Connect red clip of deployment tool to battery positive terminal and black clip to negative terminal.
4. The lamp on the right side of the tool, marked “deployment tool power”, should glow green, not red.
5. Press the button on the deployment tool. The left side lamp on the tool, marked “air bag connector voltage”, will illuminate and the seat belt pre-tensioner will deploy.

CAUTION: When deploying the seat belt pre-tensioner, stand at least 5 m (16 ft) away from the seat belt pre-tensioner.
**Supplemental Restraint System (SRS)**

**Disposal of Air Bag Module and Seat Belt Pre-tensioner (Cont'd)**

**DEPLOYMENT OF AIR BAG MODULE AND SEAT BELT PRE-TENSIONER WHILE MOUNTED IN VEHICLE**

When disposing of a vehicle, deploy air bag modules and seat belt pre-tensioners while they are mounted in vehicle.

**CAUTION:**
- When deploying air bag module or seat belt pre-tensioner, ensure vehicle is empty.
  1. Disconnect battery ground cable and wait 10 minutes.
  2. Disconnect air bag modules and seat belt pre-tensioners connector.
  3. Connect deployment tool connector (SST: KV99108400) to air bag module or seat belt pre-tensioner.
  4. For front passenger air bag module and seat belt pre-tensioner, attach deployment tool adapters (SST: KV99108500) to the tool connector.
  5. Connect red clip of deployment tool to battery positive terminal and black clip to negative terminal.
  6. The lamp on the right side of the tool, marked "deployment tool power", should glow green, not red.
  7. Press the button on the deployment tool. The left side lamp on the tool, marked "air bag connector voltage", will illuminate and the air bag module or seat belt pre-tensioner will deploy.
  8. After deployment, remove them from vehicle and seal them up in plastic bags, then dispose of them.

**DISPOSING OF AIR BAG MODULE AND SEAT BELT PRE-TENSIONER**

Deployed air bag modules and seat belt pre-tensioners are very hot. Before disposing of air bag module, and seat belt pre-tensioner, wait at least 30 minutes, and 10 minutes, respectively. Seal them in a plastic bag before disposal.

**CAUTION:**
- Never apply water to a deployed air bag module and seat belt pre-tensioner.
- Be sure to wear gloves when handling a deployed air bag module and seat belt pre-tensioner.
- No poisonous gas is produced upon air bag module deployment. However, be careful not to inhale gas since it irritates throat and can cause choking.
- Do not attempt to disassemble air bag module and seat belt pre-tensioner.
- Air bag module and seat belt pre-tensioner can not be re-used.
- Wash your hands clean after finishing work.

---

**TROUBLE DIAGNOSES — Supplemental Restraint System (SRS)**

**Wiring Diagram — SRS —**

Refer to EL-POWER

Combination Meter (Air Bag Warning Lamp)

Refer to last page (Pullout page).
Schematic

**CAUTION:**
- Do not use a circuit tester to check SRS “Air Bag” harness connectors. The wiring harness and connectors have yellow outer insulation for easy identification.
- Do not attempt to repair, splice or modify the SRS “Air Bag” wiring harness. If the harness is damaged, replace it with a new one.
- Keep ground portion clean.

Self-diagnosis

The air bag and seat belt pre-tensioner can be put under self-diagnosis by the following methods:

<table>
<thead>
<tr>
<th>USING CIRCUIT TESTER</th>
<th>USING CONSULT</th>
<th>USING “AIR BAG” WARNING LAMP</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS-21</td>
<td>RS-22</td>
<td>RS-24</td>
</tr>
<tr>
<td>Seat belt pre-tensioner (Standard equipment)</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Equipped with driver air bag</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Equipped with driver air bag and passenger air bag</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Except for Europe</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>For Australia</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

**USING CIRCUIT TESTER**

Seat belt pre-tensioner self-diagnosis results can be read by using a circuit tester as follows:

1. Measure resistance between data link connector for CONSULT and body ground.
2. Visually check the oscillation of circuit tester needle.

   - **Normal**
     - No problem. The seat belt pre-tensioner is in good order.
   - **Malfunction (including when seat belt pre-tensioner is deployed)**
     - Seat belt pre-tensioner circuit is open or shorted to some power supply circuit, or shorted to ground.
       1. Visually check wiring harness connections.
       2. Replace seat belt assembly. (Before replacing, it must be deactivated.)
       3. Replace diagnosis sensor unit.
       4. Replace air bag sensor.
       5. Replace main harness.
       6. Recheck seat belt pre-tensioner using circuit tester at each replacement.
TROUBLE DIAGNOSES — Supplemental Restraint System (SRS)

Self-diagnosis (Cont’d)

USING CONSULT

The self-diagnosis results can be read by CONSULT, as follows:
1. Connect “CONSULT” to data link connector for CONSULT.
   (Data link connector for CONSULT is located in left or right
    dash side panel.)
2. Turn ignition switch to “ON”. (When CONSULT is connected, the "AIR BAG" warning lamp will be turned to present diagnosis mode.)
3. Touch “START” to operate “CONSULT”.
4. Touch “AIR BAG” to choose air bag system.
5. Touch "SELF DIAG RESULTS" to read self-diagnosis results.
6. Problem codes are displayed on "SELF DIAG RESULTS".
7. When "PRINT" is pressed, information displayed on "SELF DIAG RESULTS" is printed out.

WARNING:
- While CONSULT is displaying this "SELF-DIAG RESULTS" information, do not disconnect CONSULT from data line connector.
- When finishing diagnosis, make sure to change CONSULT display to SELECT SYSTEM mode by using BACK KEY.

8. After repairing malfunctioning parts, press "ERASE" to clear self-diagnosis results.
   "ERASE" function requires selecting "ERASE", and completing step 9.

9. Push BACK KEY of CONSULT until SELECT SYSTEM mode appears to make "SELF-DIAGNOSIS" user mode.
   If malfunctioning parts are not completely repaired, "AIR BAG" warning lamp will blink every 0.5 seconds.
10. Push the power off switch.
11. Turn off ignition switch, disconnect CONSULT.
12. Turn ignition switch to "ON". "AIR BAG" warning lamp should come on for about 7 seconds and then go off.
TROUBLE DIAGNOSIS — Supplemental Restraint System (SRS)

Self-diagnosis (Cont'd)

Using "AIR BAG" WARNING LAMP

Air bag self-diagnosis results can be read by using the "AIR BAG" warning lamp.

The "AIR BAG" warning lamp operates as shown below:

**WARNING:**

When the "AIR BAG" warning lamp is flashing, compare the flash time to the chart below.

---

**How to alternate self-diagnosis**

Within 7 seconds after ignition key is turned "ON", press driver's door switch at least 5 times.

Within 7 seconds after ignition key is turned "ON", press driver's door switch at least 5 times.

IGN OFF - ON

Problem codes are displayed in diagnosis mode (self-diagnosis results).

**Warning lamp indication**

- After repairing malfunctioning part, use driver's door switch to return the system to user mode. This will clear self-diagnosis results from memory.
- If a malfunctioning part is not completely repaired, self-diagnosis results will not be cleared.

**User mode**

<table>
<thead>
<tr>
<th>IGN ON</th>
<th>ON</th>
<th>Light check</th>
<th>No problem.</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td></td>
<td>7 sec.</td>
<td></td>
</tr>
</tbody>
</table>

- Malfunction (blinking)

<table>
<thead>
<tr>
<th>ON</th>
<th>0.5 sec</th>
<th>0.5 sec</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Air bag or diagnostic sensor unit is malfunctioning and continuously sends "ON" signal

<table>
<thead>
<tr>
<th>ON</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**Self-diagnosis results in diagnosis mode can be identified by number of flashes ⑨. Refer to Table on next page for trouble parts.**
### Warning Lamp Flashing Times and Repair

<table>
<thead>
<tr>
<th>Warning Lamp</th>
<th>Flash Code (Number of Flashes)</th>
<th>Explanation/Possible Causes</th>
<th>Repair Order</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>Normal SRS &quot;Air Bag&quot; is in good order.</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>Driver's air bag module circuit is out of order.</td>
<td>1. Visually check wiring harness connections. 2. Replace spiral cable 3. Replace driver’s air bag module. (Before disposal, it must be deployed.) 4. Replace diagnosis sensor unit 5. Replace air bag harness 6. Replace main harness</td>
</tr>
<tr>
<td>7</td>
<td>1</td>
<td>Diagnosis sensor unit is out of order.</td>
<td>1. Visually check wiring harness connections. 2. Replace diagnosis sensor unit 3. Replace air bag harness 4. Replace main harness</td>
</tr>
<tr>
<td>8</td>
<td>1</td>
<td>Front passenger air bag module circuit is out of order.</td>
<td>1. Visually check wiring harness connections. 2. Replace front passenger air bag module. (Before disposal, it must be deployed.) 3. Replace diagnosis sensor unit 4. Replace air bag harness 5. Replace main harness</td>
</tr>
<tr>
<td>9</td>
<td>1</td>
<td>More than two parts groups are out of order.</td>
<td>1. Visually check wiring harness connections. 2. Replace diagnosis sensor unit 3. Replace all sensors, spiral cable and air bag module 4. Replace air bag harness 5. Replace main harness</td>
</tr>
</tbody>
</table>

### Diagnostic Procedure 1
SYMPTOM: "AIR BAG" warning lamp flashes.

**WARNING:**
- Determine if the flash rate is every 0.5 seconds, or 3 seconds "ON" and 2 seconds "OFF".
- If every 0.5 seconds, perform self-diagnosis.
- If 3 seconds "ON" and 2 seconds "OFF", the system is in Present diagnosis mode, refer to page RS-24 for instructions.

#### Diagnostic Procedure 2
SYMPTOM: "AIR BAG" warning lamp does not come on.

1. Check 75A fuse (No. 15), located in fuse block.
   - **NG:** Replace the fuse.
   - **OK:**
   1. Connect the CONSULT and operate it. Read the "SELF-DIAGNOSIS RESULTS". (Refer to page RS-24.)
   2. Replace the diagnosis sensor unit.
   3. Read the SELF-DIAGNOSIS RESULTS.
   - **NG:** Refer to SELF-DIAGNOSIS RESULTS and repair.
   - **OK:**
   4. Check the warning lamp bulb.
      - **NG:** Replace the warning lamp bulb.
      - **OK:**
   5. Check the warning lamp harness connection.
      - **NG:** Replace the harness.
      - **OK:**
   6. Replace the diagnosis sensor unit.
Collision Diagnosis

To repair the SRS, perform the following steps:

When air bag deploys in a collision:
1. Replace the diagnostic sensor unit.
2. Replace the air bag modules and seat belt pre-tensioners.
3. Check the SRS components using the table shown below.
   - Replace any SRS components showing visible signs of damage (dents, cracks, deformation).
4. Conduct self-diagnosis. Refer to "Self-diagnosis" for details (RS-21). Ensure the remainder of the SRS is operating properly.
5. Install new air bag modules.

When air bag does not deploy in a collision:
1. Check the SRS components using the table shown below.
   - Replace any SRS components showing visible signs of damage (dents, cracks, deformation).

SRS Inspection

<table>
<thead>
<tr>
<th>Part</th>
<th>Air bag deployed</th>
<th>Air bag did NOT deploy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air bag module (driver and passenger side)</td>
<td>REPLACE</td>
<td>1. Remove air bag module. Check harness cover and connectors for damage, terminals for deformities, and harness for binding.</td>
</tr>
<tr>
<td>Instrument panel</td>
<td>REPLACE</td>
<td>2-1 Install driver air bag module into the steering wheel to check fit and alignment with the wheel.</td>
</tr>
<tr>
<td>Seat belt pre-tensioner assembly</td>
<td>REPLACE</td>
<td>2-2 Install passenger air bag module into the instrument panel to check fit with the instrument panel.</td>
</tr>
<tr>
<td>Diagnosis sensor unit</td>
<td>REPLACE</td>
<td>3. No damage found, reinstall with new bolts.</td>
</tr>
<tr>
<td>Steering wheel</td>
<td>1. Check harness (built into steering wheel) and connectors for damage, terminals for deformities and harness for binding.</td>
<td></td>
</tr>
<tr>
<td>Spiral cable</td>
<td>2. Check connectors, flat cable and protective tape for damage.</td>
<td></td>
</tr>
<tr>
<td>Harness and Connectors</td>
<td>3. Check steering wheel for excessive free play.</td>
<td></td>
</tr>
</tbody>
</table>

1. Check harness cover and connectors for damage, terminals for deformities, and harness for binding.
2. Check bolts for damage and anchors for loose mounting.
3. Check retractor for smooth operation.
4. If no damage is found, reinstall with new bolts.
5. If damaged—REPLACE.

1. Check harness cover and connectors for damage, terminals for deformities, and harness for binding.
2. Check bolts for damage and anchors for loose mounting.
3. Check retractor for smooth operation.
4. If no damage is found, reinstall with new bolts.
5. If damaged—REPLACE.
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<tr>
<td>Precautions</td>
<td>2</td>
</tr>
<tr>
<td>Supplemental Restraint System (SRS) &quot;AIR BAG&quot; and &quot;SEAT BELT PRE-TENSIONER&quot;</td>
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</tr>
</tbody>
</table>

* For seat belt, refer to MA and RS sections.
* For body electrical systems, refer to EL section.
Precautions

- When removing or installing various parts, place a cloth or padding onto the vehicle body to prevent scratches.
- Handle trim, molding, instruments, grille, etc. carefully during removing or installation. Be careful not to soil or damage them.
- Apply sealing compound where necessary when installing parts.
- When applying sealing compound, be careful that the sealing compound does not protrude from parts.
- When replacing any metal parts (for example body outer panel, members, etc.), be sure to take rust prevention measures.

Supplemental Restraint System (SRS) “AIR BAG” and “SEAT BELT PRE-TENSIONER”

The Supplemental Restraint System “Air Bag” and “Seat Belt Pre-tensioner”, used along with a seat belt, help to reduce the risk or severity of injury to the driver and front passenger in a frontal collision. The Supplemental Restraint System consists of air bag modules (located in the center of the steering wheel and on the instrument panel on the passenger side), seat belt pre-tensioners, a diagnosis sensor unit, warning lamp, wiring harness and spiral cable. Information necessary to service the system safely is included in the RS section of this Service Manual.

WARNING:
- To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN dealer.
- Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.
- All SRS air bag electrical wiring harnesses and connectors are covered with yellow outer insulation. Do not use electrical test equipment on any circuit related to the SRS.

Clip and Fastener

- Clips and fasteners in BT 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>Symbol No</th>
<th>Shapes</th>
<th>Removal &amp; Installation</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBF302H</td>
<td></td>
<td>Push center pin to seating position.</td>
</tr>
<tr>
<td>SBF302H</td>
<td></td>
<td>Push center pin by holding 1</td>
</tr>
<tr>
<td>SBF302H</td>
<td></td>
<td>Push</td>
</tr>
<tr>
<td>SBF302H</td>
<td></td>
<td>Installation:</td>
</tr>
<tr>
<td>SBF302H</td>
<td></td>
<td>Screwscrew</td>
</tr>
<tr>
<td>SBF302H</td>
<td></td>
<td>Screwdriver</td>
</tr>
<tr>
<td>SBF302H</td>
<td></td>
<td>Removal:</td>
</tr>
</tbody>
</table>

BT-2

BT-3
<table>
<thead>
<tr>
<th>Symbol No.</th>
<th>Shapes</th>
<th>Removal &amp; Installation</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCP</td>
<td>![Shape]</td>
<td>![Removal]</td>
</tr>
<tr>
<td>BCS</td>
<td>![Shape]</td>
<td>![Removal]</td>
</tr>
<tr>
<td>BCF</td>
<td>![Shape]</td>
<td>![Removal]</td>
</tr>
<tr>
<td>BCI</td>
<td>![Shape]</td>
<td>![Removal]</td>
</tr>
</tbody>
</table>

**Removal:**
1. Screw out with a Philips screwdriver.
2. Remove female portion with a flat-bladed screwdriver.

**Type 1:**
- BCP: Then bend up.
- BCS: Push.

**Type 2:**
- BCF: Molding by cutting off the clip.
- BCI:  
  - Remove:
  - BCP: Molding portion of clip must be spread out to remove rod.
Body Front End

- When removing or installing hood, place a cloth or other padding on hood. This prevents vehicle body from being scratched.
- Bumper fascia is made of plastic. Do not use excessive force and be sure to keep oil away from it.
- Hood adjustment: Adjust at hinge portion.
- Hood lock adjustment: After adjusting, check hood lock control operation. Apply a coat of grease to hood locks engaging mechanism.
- Hood opener: Do not attempt to bend cable forcibly. Doing so increases effort required to unlock hood.

REMOVAL — Front bumper assembly
1. Remove bolts securing bumper fascia to engine undercover.
2. Remove screws and clips securing left and right sides of front fender protector. Then remove the front fender protector.
3. Remove clips securing front grille, then remove the front grille.
4. Remove clip securing bumper fascia bracket to hood lock stay A.
5. Remove screws located at wheel opening.
6. Remove the screw securing each side of front clearance lamp assembly, then remove the front clearance lamp assembly.
7. Remove the screw securing each side of front turn signal lamp assembly. Then remove the front turn signal lamp assembly.
8. Remove bolts securing each side of front fender bracket.
9. Remove nuts securing left and right front fenders to bumper fascia bracket B.
10. Remove nuts and bolts securing bumper assembly to front side member.
11. Extract bumper assembly.
12. Remove bolts securing bumper fascia bracket to bumper fascia.
13. Disassemble bumper fascia and bumper fascia bracket.

SEC. 260-261-262-263-620-623-630-650-747
Hood lock adjustment
- Adjust hood so that hood primary lock moves to a position 1 to 1.5 mm (0.039 to 0.059 in) lower than latches.
- After hood lock adjustment, adjust bumper rubber.
- When securing hood lock, ensure 4 dots are not. Shaker 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 holding length

More Than 5.0 mm (0.197 in)

Hood adjustment

Bumper rubber adjustment
- Adjust so that hood is aligned with fenders. At that time, the gap is approx. 5 mm (0.16 in). Bumper rubber free length is approx. 35 mm (1.38 in).
BODY END

Body Rear End and Opener

- When removing or installing trunk lid, place a cloth or other padding on trunk lid. This prevents vehicle body from being scratched.
- Trunk lid adjustment: Adjust all hinge-trunk lid portion for proper trunk lid fit.
- Trunk lid lock system adjustment: Adjust striker so that it is in the center of the lock. After adjustment, check trunk lid lock operation.
- Opener cable: Do not attempt to bend cable using excessive force.
- After installation, make sure that trunk lid and fuel filler lid open smoothly.

REMOVAL — Rear bumper assembly
1. Remove trunk trim. Refer to "TRUNK ROOM TRIM" in "INTERIOR TRIM" for details. (BT-21)
2. Remove clips (2) securing rear panel upper to bumper fascia.
3. Remove clips (3) securing rear panel lower to bumper fascia.
4. Remove bolts from lower side of each side bumper.
5. Working inside trunk, remove nuts securing left and right rear fenders to bumper fascia.

**WARNING:** When removing and installing torsion bar, be careful as it is under tension.

**Bumper assembly mounting bolts, nuts and clips**
For removal of door trim, refer to "DOOR TRIM" in "INTERIOR TRIM" for details (BT-10).

After adjusting door or door lock, check door lock operation.

SEC. 800-809-805

Door Glass Fitting Adjustment

The door glass is properly adjusted using the following five methods:

A In-out adjustment (at the glass waist)
B Fore-aft tilt adjustment
C In-out tilt adjustment (at the glass upper stop)
D Up-stop adjustment
E Fore-aft adjustment

NOTICE:
When adjusting the door glass, it is not necessary to remove the outside door molding.

Adjustment locations

Adjustment standard clearance

SEC. 803
Door Glass Fitting Adjustment (Cont'd)

A IN-OUT ADJUSTMENT (at the glass upper stop)
1. Adjust door glass-to-holder clearance to 0 to 3.5 mm (0 to 0.138 in) (A) with the adjusting bolts.
2. Turn adjusting bolt clockwise to move door glass upper end inward.
3. Turn adjusting bolt counterclockwise to move door glass upper end outward.

CAUTION:
- Make sure door glass sub-channel is horizontal.
- The fore-aft tilt adjustment must be made at the same time the fore-aft adjustment B is made.

B UP-STOP ADJUSTMENT
1. Adjust panel stopper height so that clearance at upper edge of door meets the adjustment standard clearance A – A (Refer to BT-11). Make sure front and rear glass stoppers tightly contact front and rear panel stoppers, then tighten adjusting nuts.
2. If stoppers do not contact each other, adjust sub-channel nut. Refer to "B Fore-aft tilt adjustment".
3. Open and close doors to make sure upper end of door glass does not contact holder.

C FORE-AFT ADJUSTMENT
1. Adjust guide rail in the fore-aft direction so that when door is closed or opened the clearance between upper edge of door glass and holder conforms to the adjustment standard clearance A – A (Refer to BT-11).
2. If outer perimeter of door glass interferes with holder, when door is opened or closed, refer to "C Fore-aft tilt adjustment" for procedures.

CAUTION:
- Do not lower the glass excessively.

D OUT-IN TILT ADJUSTMENT
1. Raise door glass until glass stopper is in contact with inner stabilizer, just before the window stops.
2. Loosen adjusting bolts.
3. Lightly press door glass upper end outward so that glass outer surface contacts outer stabilizer. With glass held in that position, press inner stabilizer to glass inner surface and tighten adjusting bolt.

CAUTION:
- Make sure nap portions of stabilizers are clean and free from oil, grease, etc.

E FORE-AFT ADJUSTMENT
1. Adjust the door glass sub-channel so that the adjustment standard clearances A – A and B – B (Refer to BT-11) are obtained at the glass and retainer holder/body side weatherstrip locations.

F IN-OUT TILT ADJUSTMENT (at glass waist)
1. Adjust the inner stabilizer to the glass waist.
2. Loosen the adjusting bolts.
3. Lightly press the door glass upper end outward so that the glass outer surface contacts the outer stabilizer. With the glass held in that position, press the inner stabilizer to the glass inner surface and tighten the adjusting bolt.

CAUTION:
- Make sure nap portions of stabilizers are clean and free from oil, grease, etc.

G OUT-IN TILT ADJUSTMENT
1. Adjust the door glass-to-holder clearance to 0 to 3.5 mm (0 to 0.138 in) (A) with the adjusting bolts.
2. Turn the adjusting bolt clockwise to move the door glass upper end inward.
3. Turn the adjusting bolt counterclockwise to move the door glass upper end outward.

CAUTION:
- Make sure door glass sub-channel is horizontal.
- The fore-aft tilt adjustment must be made at the same time the fore-aft adjustment B is made.
CAUTION:
- Disconnect ground terminal from battery in advance.
- Disconnect air bag system line in advance.
- Never tamper with or force air bag lid open, as this may adversely affect air bag performance.
- Be careful not to scratch pad and other parts.

REMOVAL — Instrument panel assembly

1. Squeezing column cover and combination switch
   - Remove screws

2. A/T finisher or M/T shift lever boot

3. Instrument lower cover on driver side
   - Remove screws

4. Instrument lower reinforcement
   - Remove bolts

5. Cluster lid A
   - Remove screws then disconnect harness connectors.

6. Combination meter
   - Remove screws then disconnect harness connectors

7. Center ventilation assembly
   - Pull out with a flat-bladed screwdriver

8. Cluster lid C and audio
   - Remove screws

9. A/C or heater control
   - Remove screws

10. Glove box assembly
    - Remove screws

11. Console box
    - Remove screws then disconnect harness connectors

12. Instrument side trim panel

13. Dashboard grille

14. Front pillar garnish
    - Refer to "SIDE AND FLOOR TRIM" for details

15. Instrument panel and pads
    - Remove bolts

INSTRUMENT PANEL

SEC. 248-467-660-085-969

Instrument panel assembly mounting bolts and nuts

Metal clip

Hook

Metal clip

Metal clip

Metal clip

Metal clip

Metal clip

Metal clip

Metal clip

Metal clip

Metal clip

Metal clip

Metal clip

LHD model only

Glove box lid lock cylinder
INTERIOR TRIM

SIDE AND FLOOR TRIM

CAUTION:
Wrap the tip of flat-bladed screwdriver with a cloth when removing metal clips from garnishes.

REMOVAL — Body side trim
1. Remove front and rear seat. Refer to "SEAT" for details (BT-27)
2. Remove dash side finisher.
3. Remove kicking plate.
4. Remove front pillar garnish.
5. Remove rear side finisher.
6. Remove rear pillar finisher.
7. Remove rear parcel shelf.
8. Remove seat back finisher welt. Refer to "TRUNK ROOM TRIM" for details (BT-21)
9. Remove seat back finishers (Right, Center, Left)
DOOR TRIM

REMOVAL — Door trim

1. Remove screws securing inside handle escutcheon, then remove the inside handle escutcheon A.
2. Remove power window switch B.
3. Remove screws securing door finisher.
4. Remove clips C securing door finisher.
5. Pull door finisher to remove clips C and metal clips D from door panel and remove door finisher. Disconnect harness connectors.
6. Remove ventilator grille and ventilator duct assembly from door finisher D.

SEC. 809
ROOF TRIM

REMOVAL — Headlining
1. Remove rear seat. Refer to "Rear Seat" for details (BT-30).
2. Remove seat belt adjuster cover over anchor bolt.
3. Remove front and rear seat belts. Refer to "Seat Belt" in RS section for details.
4. Remove body side trim. Refer to "SIDE AND FLOOR TRIM" for details (BT-17).
5. Remove sunroof switch B.
6. Remove inside mirror assembly.
7. Remove sun visors E.
8. Remove interior lamp assembly.
9. Remove sunroof unit C.
10. Remove clips (D) securing each side of headlining.
11. Remove metal clips securing headlining B.
12. Remove headlining.

SEC. 738-903-964

TRUNK ROOM TRIM

SEC. 799-849

Metal clip A
1. Windshield upper and side molding

Method 1
Cut off top portion of molding and clean glass and panel surfaces.

Apply sealer to top portion of molding.

Cut off lower portion of new molding.

Finish well to get a good appearance.

Method 2
1. Cut off sealant at glass end.
2. Clean the side on which panel was mounted.
3. Set molding fastener and apply sealant to body panel, and apply primer to molding and body.

Apply primer.

Glass

Dem rubber joint

Sealant

Apply primer.

Double-faced adhesive tape

Fastener

Apply sealer.

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. Cowl top grille and hood rear sealing rubber

SEC. 660

3. Hood front sealing rubber

SEC. 650

6. Body side welt
**Body side weatherstrip and weatherstrip retainer**

**SEC. 766**

**Door weatherstrip**

Before removing door weatherstrip, remove door trim. Refer to "DOOR TRIM" for details (BT-19).

**SEC. 800**

**Back window upper and side molding (SEC. 797)**

Basically the same as windshield upper and side molding.

**Sun roof lid weatherstrip**

**Trunk lid weatherstrip**

**Door waist outside molding**

**Rear panel finisher**
EXTerior Trim

Rear combination lamp

SEC. 265

- Warm up lamp assembly area to a temperature a little below 60°C (140°F).
- Apply butyl seal evenly as it tends to become thin in the camera.
- Warm up lamp assembly area to a temperature a little below 60°C (140°F).

High-mounted stop lamp

SEC. 266

SEAT

- When removing or installing the seat trim, carefully handle it to keep dirt out and avoid damage.

Front Seat

SEC. 870

BT-26

BT-27
Front Seat (Cont'd)

Remove retainer from lower side of seatback with fingers.

Roll up seatback trim all the way to gain access to headrest holder pawls. Disengage and push headrest holder pawls to unlock holder. Lift off headrest holder.

HEATED SEAT

- When handling seat, be extremely careful not to scratch heating unit.
- To replace heating unit, seat trim and pad should be separated.
- Do not use any organic solvent, such as thinner, benzene, alcohol, gasoline, etc. to clean trims.

<table>
<thead>
<tr>
<th>Trim temperature</th>
<th>Increasing to 35 - 45°C (95 - 113°F)</th>
<th>Decreasing to 25 - 35°C (77 - 95°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermostat operation</td>
<td>Turns OFF</td>
<td>Turns ON</td>
</tr>
</tbody>
</table>

* For Wiring Diagram, refer to "HEATED SEAT" in EL section.
**SEAT**

**Rear Seat**

**SUN ROOF**

*For Wiring Diagram, refer to "ELECTRIC SUN ROOF" in EL section.*

**ADJUSTMENT**

Install motor & limit SW assembly and sunroof rail assembly in the following sequence:

1. Arrange equal lengths of link and wire assemblies on both sides of sunroof opening.
2. Connect sunroof connector to sunroof switch and positive (+) power supply.
3. Set lid assembly to fully closed position A by operating OPEN switch and TILT switch.
4. Fit outer side of lid assembly to the surface of root on body outer panel.
5. Remove motor, and keep OPEN switch pressed until motor pinion gear reaches the end of its rotating range.
6. Install motor.
7. Check that motor drive gear fits properly in wires.
8. Press TILT-UP switch to check lid assembly for normal tilting.
9. Check sunroof lid assembly for normal operations (tilt-up, tilt-down, open, and close).
- After any adjustment, check sun roof operation and lid alignment.
- Handle finisher plate and glass lid with care so not to cause damage.
- It is desirable for easy installation to mark each point before removal.

CAUTION:
Always work with a helper.

Link and wire assembly
Sun roof frame assembly
Shade assembly
Lid assembly
Motor assembly

Tell glass lid up

1. Side trim
   - Remove side trim clips.
2. Sun roof lid mount nuts
3. Lid assembly
4. Rear drain mount screws
5. Rear drain assembly
Operate sun roof switch to lift glass lid down
6. Shade assembly

Sun roof switch/tenor accessories/headlining
- Refer to "ROOF TRIM" (BT-30).

7. Motor switch bracket
8. Motor assembly

9. Window deflector holder
10. Window deflector mount screw
11. Window deflector assembly
12. Drain hoses
13. Sun roof unit bracket
14. Sun roof frame assembly
15. Guide stopper
16. Rear guide
17. Link and wire assembly

SEC. 264-736
SUN ROOF

A Using flat-bladed screwdriver, pry shade assembly holder off rail. Then pull shade assembly forward to remove it from rail.

B1 Disengage paws from rail, then remove window deflector holder.

B2 Using flat-bladed screwdriver, pry stopper spring off rail groove. Then slide rear guide backward to remove it from rail.

B3 Remove wire and link assembly from rail while pushing link back with flat-bladed screwdriver.

WINDSHIELD AND WINDOWS

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 until the sealant hardens.

WARNING:
Keep heat and open flames away as primers are flammable.

CAUTION:
Advise users not to drive the vehicle on rough roads until sealant has properly Vulcanized.
- Do not use sealant which is past its usable term.
- Do not leave cartridge unattended with its cap open.
- Keep primers and sealant in a cool, dry place. Ideally, they should be stored in a refrigerator.
- Molding must be installed securely so that it is in position and leaves no gap.

Windshield and Rear Window

Install spacer to panel.

Windshield

Glass

425 (16.72) mm

Dash upper panel

Spacer

Rear window

Glass

Spacer

Body panel

605 (15.94) mm

Unit: mm

Install molding fasteners.

When installing front body panel and fasteners, insert half of panel fastener (3/4 to 3/5) into panel.

Upper & side molding fasteners

Panel

Double-faced adhesive tape

Apply sealant evenly.

Windshield and rear window

7 - 8 (0.28 - 0.32)

12 T (A.D.O. 0.48)

REPAIRING WATER LEAKS FOR WINDSHIELD AND WINDOWS

Leaks can be repaired without removing and reinstalling glass.

If water is leaking between caulking material and body or glass, determine the extent of leaking. This can be determined by applying water while pushing glass outward.

To stop the leak, apply primer and then sealant to the leak point.
DOOR MIRROR

For Wiring Diagram, refer to "POWER DOOR MIRROR" in EL section.

CAUTION:
Be careful not to scratch door rearview mirror body.

REMOVAL — Door mirror

1. Remove door trim. Refer to "DOOR TRIM" in "INTERIOR TRIM" for details (BT-19).
2. Remove inner cover front corner of door A.
3. Disconnect door mirror harness connector.
4. Remove harness clips.
5. Remove three bolts securing door mirror, then remove door mirror.

SEC. 963

[Diagram of door mirror removal process]
FRONT AND REAR AIR SPOILER

- When installing, make sure that there are not gaps or waves at ends of air spoiler.
- Before installing spoiler, clean and remove oil from surface where spoiler will be mounted.

Front Air Spoiler

SEC. 960

- Retainer
- ø 40

Rear Air Spoiler

SEC. 960

- Sealing rubber

- Double-faced adhesive tape

BODY ALIGNMENT

- All dimensions indicated in figures are actual ones.
- When using a tracking gauge, adjust both pointers to equal length. Check the pointers and gauge itself to make sure there is no free play.
- When a measuring tape is used, check to be sure there is no elongation, twisting or bending.
- Measurements should be taken at the center of the mounting holes.
- An asterisk (*) following the value at the measuring point indicates that the measuring point on the other side is symmetrically the same value.
- The coordinates of the measurement points are the distances measured from the standard line of "X", "Y" and "Z".

ENGINE COMPARTMENT

MEASUREMENT
BODY ALIGNMENT

- All dimensions indicated in figures are actual ones.
- When using a tracking gauge, adjust both pointers to equal length. 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".

![Diagram of car body alignment](image)

**Engine Compartment**

**MEASUREMENT**

![Diagram of engine compartment measurement](image)

Unit: mm

BT-39
FRONT AND REAR AIR SPOILER

- When installing, make sure that there are not gaps or waves at ends of air spoiler.
- Before installing spoiler, clean and remove oil from surface where spoiler will be mounted.

Front Air Spoiler

Rear Air Spoiler
BODY ALIGNMENT
Underbody (Cont’d)

MEASUREMENT POINTS

Front coordinates:

A: X = 378  Y = -635.5  Z = 214.5
B: X = 185.3  Y = -630  Z = 179
C: X = 370  Y = -196.5  Z = 254.9
D: X = 344.2  Y = 32  Z = 254.9
E: X = 380  Y = 510  Z = 106.2
F: X = 420  Y = 1,150  Z = 106.2

Rear coordinates:

G: X = 422.5  Y = 1,650  Z = 103.9
H: X = 564  Y = 1,900  Z = 154
I: X = 540  Y = 2,100  Z = 115.2
J: X = 308  Y = 2,690  Z = 262.8
K: X = 540  Y = 2,955  Z = 350
L: X = 580  Y = 3,245  Z = 350
M: X = 530  Y = 3,250  Z = 350

Front and rear strut tower centers

Coordinates:

Front: P: X = 545.1  Y = 63.6  Z = 730.9
P: Front: X = 545.1  Y = 63.6  Z = 730.9
Rear: G: X = 422.5  Y = 1,650  Z = 103.9
G: Rear: X = 422.5  Y = 1,650  Z = 103.9

Unit: mm

BT-42
CONTENTS (Cont'd.)

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" and "HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT".

PRECAUTIONS AND PREPARATION

Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER"

The Supplemental Restraint System "Air Bag" and "Seat Belt Pre-tensioner", used along with a seat belt, help to reduce the risk or severity of injury to the driver and front passenger in a frontal collision. The Supplemental Restraint System consists of air bag modules (located in the center of the steering wheel and on the instrument panel on the passenger side), seat belt pre-tensioner, a diagnosis sensor unit, warning lamp, wiring harness and spiral cable. Information necessary to service the system safely is included in the RS section of this Service Manual.

WARNING:
- To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN dealer.
- Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.
- All SRS air bag electrical wiring harnesses and connectors are covered with yellow outer insulation. Do not use electrical test equipment on any circuit related to the SRS.

Precautions for Working with HFC-134a (R-134a)

- CFC-12 (R-12) refrigerant and HFC-134a (R-134a) refrigerant are not compatible. These refrigerants must never be mixed, even in the smallest amounts. If the refrigerants are mixed, compressor failure is likely to occur.
- Use only specified lubricant for the HFC-134a (R-134a) A/C system and HFC-134a (R-134a) components. If lubricant other than that specified is used, compressor failure is likely to occur.
- The specified HFC-134a (R-134a) lubricant rapidly absorbs moisture from the atmosphere. The following handing precautions must be observed:
  a. When removing refrigerant components from a vehicle, immediately cap (seal) the component to minimize the entry of moisture from the atmosphere.
  b. When installing refrigerant components to a vehicle, do not remove the caps (unseal) until just before connecting the components. Connect all refrigerant loop components as quickly as possible to minimize the entry of moisture into system.
  c. Only use the specified lubricant from a sealed container. Immediately reseal containers of lubricant. Without proper sealing, lubricant will become moisture saturated and should not be used.
  d. Avoid breathing A/C refrigerant and lubricant vapor or mist. Exposure may irritate eyes, nose and throat. Use only approved recovery/recycling equipment to discharge HFC-134a (R-134a) refrigerant. If accidental system discharge occurs, ventilate work area before resuming service. Additional health and safety information may be obtained from refrigerant and lubricant manufacturers.
  e. Do not allow lubricant (NISSAN A/C System Oil Type S) to come in contact with styrofoam parts. Damage may result.

General Refrigerant Precautions

WARNING:
- Do not release refrigerant into the air. Use approved recovery/recycling equipment to capture the refrigerant every time an air conditioning system is discharged.
- Always wear eye and hand protection (goggles and gloves) when working with any refrigerant or air conditioning system.
- Do not store or heat refrigerant containers above 52°C (125°F).
- Do not heat a refrigerant container with an open flame; if container warming is required, place the bottom of the container in a warm pool of water.
- Do not intentionally drop, puncture, or incinerate refrigerant containers.
- Keep refrigerant away from open flames; poisonous gas will be produced if refrigerant burns.
- Refrigerant will displace oxygen, therefore be certain to work in well ventilated areas to prevent suffocation.
- Do not introduce compressed air to any refrigerant container or refrigerant component.

HA-3
Precautions for Refrigerant Connection

WARNING:
Make sure all refrigerant is discharged into the recycling equipment and the pressure in the system is less than atmospheric pressure. Then gradually loosen the discharge side hose fitting and remove it.

CAUTION:
When replacing or cleaning refrigerant cycle components, observe the following.
- When the compressor is removed, store it in the same position as it is when mounted on the car.
- Failure to do so will cause lubricant to enter the low pressure chamber.
- When connecting tubes, always use a torque wrench and a back-up wrench.
- After disconnecting tubes, immediately plug all openings to prevent entry of dirt and moisture.
- When installing an air conditioner in the vehicle, connect the pipes as the final stage of the operation. Do not remove the seal caps of pipes and other components until just before required for connection.
- Allow components stored in cool areas to warm to working area temperature before removing seal caps. This prevents condensation from forming inside A/C components.
- Thoroughly remove moisture from the refrigeration system before charging the refrigerant.
- Always replace used O-rings.
- When connecting tube, apply lubricant to portions shown in illustration. Be careful not to apply lubricant to threaded portion.

Lubricant name: Nissan A/C System Oil Type R
Part number: KL00-P4AR00
- 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 seal to the specified torque.

<table>
<thead>
<tr>
<th>Tool number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>KV9323162</td>
<td>Clutch disc wrench</td>
</tr>
<tr>
<td>KV93232340</td>
<td>Removing clutch disc</td>
</tr>
<tr>
<td>KV93234330</td>
<td>Installing pulley</td>
</tr>
</tbody>
</table>

Special Service Tools
HFC-134a (R-134a) Service Tools and Equipment

Never mix HFC-134a refrigerant and/or its specified lubricant with CFC-12 (R-12) refrigerant and/or its lubrication oil. Separate and non-interchangeable service equipment must be used for each type of refrigerant/lubricant. Refrigerant container fittings, service hose fittings and service equipment fittings (equipment which handles refrigerant and/or lubricant) are different between CFC-12 (R-12) and HFC-134a (R-134a). This is to avoid mixed use of the refrigerants/lubricants. Adapters that convert one size fitting to another must never be used; refrigerant/lubricant contamination will occur and compressor failure will result.

<table>
<thead>
<tr>
<th>Tool name</th>
<th>Description</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>HFC-134a (R-134a) refrigerant</td>
<td><img src="image1.png" alt="Image" /></td>
<td>Container color: Light blue. Container marking: HFC-134a (R-134a). Fitting size: Thread size. Large container: 1/2&quot;-15 ACME.</td>
</tr>
<tr>
<td>Nissan A/C System Oil Type R</td>
<td><img src="image2.png" alt="Image" /></td>
<td>Type: Polyalkylene glycol oil (PAG). Type: R. Application: HFC-134a (R-134a) vane rotary compressors (Nissan only). Lubricity: 40 min. (1.4 imp. fl. oz.)</td>
</tr>
<tr>
<td>Recovery/Recycling/Recharging equipment</td>
<td><img src="image3.png" alt="Image" /></td>
<td>Function: Refrigerant Recovery and Recycling and Recharging</td>
</tr>
<tr>
<td>Electrical leak detector</td>
<td><img src="image4.png" alt="Image" /></td>
<td>Power supply: DC 12 V (Cigarette lighter)</td>
</tr>
<tr>
<td>Manifold gauge set (with hoses and couplers)</td>
<td><img src="image5.png" alt="Image" /></td>
<td>Identification: The gauge face indicates R-134a. Fitting size: Thread size. 1/2' -15 ACME</td>
</tr>
</tbody>
</table>

### Tool name | Description | Note
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Service hoses</td>
<td><img src="image6.png" alt="Image" /></td>
<td>Note color: High hose: Yellow with black stripe. High hose: Red with black stripe. Utility hose: Yellow with black stripe. Hose fitting to gauge: 1/2&quot;-16 ACME</td>
</tr>
<tr>
<td>Service couplers</td>
<td><img src="image7.png" alt="Image" /></td>
<td>Hose fitting to service hose: M14 x 1.5 lifting is optional or permanently attached</td>
</tr>
<tr>
<td>Refrigerant weight scale</td>
<td><img src="image8.png" alt="Image" /></td>
<td>For measuring of refrigerant. Fitting size: Thread size. 1/2&quot;-15 ACME</td>
</tr>
<tr>
<td>Vacuum pump (including the isolator valve)</td>
<td><img src="image9.png" alt="Image" /></td>
<td>Capacity: Air displacement: 8 CFM. Micron rating: 30 microns. Oil capacity: 480 g (17 oz). Fitting size: Thread size. 1/2&quot;-16 ACME</td>
</tr>
</tbody>
</table>
Precautions for Service Equipment

RECOVERY/RECYCLING EQUIPMENT
Be certain to follow the manufacturer's instructions for machine operation and machine maintenance. Never introduce any refrigerant other than that specified into the machine.

ELECTRONIC LEAK DETECTOR
Be certain to follow the manufacturer's instructions for testing operation and testing maintenance.

VACUUM PUMP
The lubricant contained inside the vacuum pump is not compatible with the specified lubricant for HFC-134a (R-134a) A/C systems. The vent side of the vacuum pump is exposed to atmospheric pressure. So the vacuum pump lubricant may migrate out of the pump into the service hose. This is possible when the pump is switched off after evacuation (vacuuming) and hose is connected to it.
To prevent this migration, use a manual valve placed near the hose-to-pump connection, as follows:
- Usually vacuum pumps have a manual isolator valve as part of the pump. Close this valve to isolate the service hose from the pump.
- For pumps without an isolator, use a hose equipped with a manual shut-off valve near the pump outlet. Close the valve to isolate the hose from the pump.
- If the hose has an automatic shut-off valve, disconnect the hose from the pump. As long as the hose is connected, the valve is open and lubricant may migrate. Some one-way valves open when vacuum is applied and close under a no vacuum condition. Such valves may restrict the pump's ability to pull a deep vacuum and are not recommended.

MANIFOLD GAUGE SET
Be certain that the gauge face indicates R-134a or 134a. Be sure the gauge set has 1/2"-16 ACME threaded connections for service hoses. Confirm the set has been used only with refrigerant HFC-134a (R-134a) and specified lubricants.

SERVICE HOSES
Be certain that the service hoses display the markings described (colored hose with black stripe). All hoses must include positive shut off devices (either manual or automatic) near the end of the hoses opposite the manifold gauge.
REFRIGERANT FLOW
The refrigerant flow is in the standard pattern. Refrigerant flows through the compressor, condenser, liquid tank, 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
Triple-pressure switch
The triple pressure switch is located on the liquid tank. If the system pressure rises or falls out of specifications, the switch opens to interrupt compressor clutch operation. Triple-pressure switch closes to turn on the cooling fan and reduce system pressure.

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 liquid tank.
DISCHARGE AIR FLOW

FAN CONTROL SWITCH
This switch turns the fan ON and OFF, and controls fan speed.

MODE SWITCHES
These switches control the outlet air flow.
In "DEF" or "F/D" mode, the intake door is set to "FRESH". The compressor turns on in the "DEF" mode.

TEMPERATURE CONTROL LEVER
This lever allows adjustment of the temperature of the outlet air.

RECIRC SWITCH
OFF position:
Outside air is drawn into the passenger compartment.
ON position:
Interior air is recirculated inside the vehicle.
RECIRC is canceled when DEF or F/D is selected, RECIRC resumes when another mode is chosen.

AIR CONDITIONER SWITCH
The air conditioner switch controls the A/C system. When the switch is depressed with the fan ON, the compressor will turn ON. The indicator lamp will also light.
The air conditioner cooling function operates only when the engine is running.
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Main Power Supply and Ground Circuit Check

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Diagnostic Procedure 2
(SYMPOTM: Air outlet does not change.) HA-56

Diagnostic Procedure 3
(SYMPOTM: Intake door does not change in VENT, B/L or FOOT mode.) HA-58

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How to Perform Trouble Diagnoses for Quick and Accurate Repair

WORK FLOW

CHECK IN  Reference Item

LISTEN TO CUSTOMER COMPLAINT AND CONFIRM BY PERFORMING OPERATIONAL CHECK

Can be confirmed

EDUCATE CUSTOMER ON CORRECT OPERATION OF SYSTEM

Cannot be confirmed

INVESTIGATE ITEMS YOU SHOULD CARRY OUT RELATED TO EACH SYMPTOM.

Preliminary Check
(Refer to HA-18)

CHECK MAIN POWER SUPPLY AND GROUND CIRCUITS

Main Power Supply and Ground Circuit Check
(Refer to HA-56)

DIAGNOSTIC PROCEDURE(S) ELECTRICALLY

Diagnostic Procedure(s) (Refer to HA-58)
Circuit Diagram
(Refer to HA-43)

ELIMINATE GOOD SYSTEM(S)/HARNESS(ES)/CONNECTOR(S) ELECTRICALLY

Malfunctioning harness(ies)/connector(s)

INSPECT EACH COMPONENT

Electrical Components Inspection
(Refer to HA-58)

REPAIR

REPAIR/REPLACE

FINAL CHECK

OK

CHECK OUT

O
Operational Check

The purpose of the operational check is to confirm that the system is as it should be. The systems which will be checked are the blower, mode (discharge air), intake air, temperature decrease, temperature increase and A/C switch.

**CONDITIONS:**
- Engine running and at normal operating temperature.

**PROCEDURE:**

1. **Check blower**
   1) Turn fan switch to 1-speed.
   2) Check blower operation.
   3) Leave blower on speed 1.

2. **Check discharge air**
   1) Press each mode switch.
   2) Confirm discharge air comes out according to the air distribution table at left.

   **NOTE:**
   Confirm the compressor clutch is engaged (visual inspection) and intake door position is at FRESH when the DEF button is pressed.
   Confirm that the intake door position is at FRESH when the F/D button is pressed.
   Intake door position is checked in the next step.

3. **Check recirc**
   1) Press REC switch.
   2) Listen for intake door position change (you should hear blower sound change slightly)

4. **Check temperature decrease**
   1) Slide temperature control lever to full cold.
   2) Check for cold air at discharge air outlets.

5. **Check temperature increase**
   1) Slide temperature control lever to full hot.
   2) Check for hot air at discharge air outlets.

6. **Check air conditioning switch**
   Move the fan control switch to the desired (1 to 4 speed) position and push the A/C switch to turn ON the air conditioner.
   The indicator lamp should come on when air conditioner is ON.
# TROUBLE DIAGNOSES

## Diagnostic Table

### Symptom Chart

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Preliminary Check</th>
<th>Diagnostic Procedure</th>
<th>Main Power Supply and Ground Circuit Check</th>
</tr>
</thead>
</table>

### Symptom

- **A/C does not blow cold air**
- **Insufficient heating**
- **Blower motor does not rotate**
- **Air outlet does not change**
- **Intake door does not change in VENT, BL, or FOOT mode**
- **Intake door is not set at “REH” in DEF or FID mode**
- **Air mix door does not change**
- **B-level door does not change**
- **Magnet clutch does not engage when A/C switch and fan switch are ON**
- **Magnet clutch does not engage in DEF mode**
- **Noise**

### Electrical Components Inspection

- **Blower motor**
- **Resistor**
- **A/C switch**
- **REC switch**
- **VENT switch**
- **BL switch**
- **FOOT switch**
- **FID switch**
- **DEF switch**
- **Mode door motor**
- **Arin A/C door motor**
- **B/L-EVEL DOOR motor**
- **A/C relay**
- **Trip pressure switch**
- **Compressor**
- **Thermal protector**
- **ECM (REC control module)**

### Notes

1. The number means checking order.
2. Checking order depends on malfunction in each flow chart.

---

HA-18

---

HA-19
PRELIMINARY CHECK 1
Intake door is not set at "FRESH" in DEF or F/D mode.

- Turn ignition switch ON and set fan speed at "4".
- Set mode door at VENT mode.
- Turn REC switch OFF.

Does intake door change from "FRESH" to "REC" position when REC switch is turned ON? (Make sure the intake door has moved by listening for air flow sound from the intake unit)

Yes

Go to Diagnostic Procedure 2 (HA-60)

No

Replace push control unit

Yes

INSPECTION END

PRELIMINARY CHECK 2
A/C does not blow cold air.

- 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.

No

- IS BLOWER MOTOR OPERATING NORMALLY?

Yes

- CHECK BLOWER MOTOR OPERATION. Perform Diagnostic Procedure 1, Refer to HA-56

No

- CHECK FOR EVAPORATOR COIL FREEZE UP. Remove intake unit. Check if evaporator freezes.

NG (Freeze up)

OK (Does not freeze up)

- CHECK VENTILATOR DUCT FOR AIR LEAKS

- CHECK REFRIGERATION CYCLE PRESSURE WITH MANIFOLD GAUGE CONNECTED. Refer to HA-28.

NG

OK

- CHECK REFRIGERANT. Connect manifold gauge, then check system pressure. Refer to HA-28.

OK

NG

- CHECK FOR REFRIGERANT LEAKS

- VISUALLY CHECK AIR MIX DOOR MOTOR AND LINKAGE OPERATION.

OK

NG

- VISUALLY INSPECT AIR MIX DOOR. Access by removing instrument panel.

- Perform Diagnostic Procedure 4, Refer to HA-61
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.

No

Perform Diagnostic Procedure 6. Refer to HA-64

With engine running, does magnet clutch engage normally when DEF switch and fan switch are ON?

Yes

INSTRUCTION END

No

Replace push control unit

INSTRUCTION END

PRELIMINARY CHECK 4
Air outlet does not change.

TURN IGNITION SWITCH ON. DOES AIR COME OUT NORMALLY FROM EACH DUCT WHEN EACH MODE SWITCH IS PUSHED?

<table>
<thead>
<tr>
<th>Switch model/Indicator</th>
<th>Face</th>
<th>Foot</th>
<th>Defroster</th>
</tr>
</thead>
<tbody>
<tr>
<td>j</td>
<td>100%</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>m</td>
<td>60%</td>
<td>40%</td>
<td>—</td>
</tr>
<tr>
<td>d</td>
<td>—</td>
<td>80%</td>
<td>20%</td>
</tr>
<tr>
<td>l</td>
<td>—</td>
<td>60%</td>
<td>40%</td>
</tr>
</tbody>
</table>

Perform Diagnostic Procedure 2. Refer to HA-66

INSTRUCTION END
PRELIMINARY CHECK 6
Insufficient heating

DOES AIR FLOW FROM FOOT AREA?
Condition:
- Ignition switch and fan switch are ON
- Mode switch is in FOOT mode and temperature lever is in FULL position.

OK
NG
- CHECK BLOWER MOTOR OPERATION
  Perform Diagnostic Procedure 1. Refer to HA-56

Check the following:
- Engine coolant level (Refer to MA section)
- Hoses for leaks or kinks
- Radiator cap (Refer to LC section)
- Air in cooling system

OK
NG
- Repair/replace as necessary

Check air mix door adjustment:
Refer to HA-71

OK

Check by feel the heater inlet and outlet hoses:
- Hot inlet
  Warm outlet

OK
NG
- Both hoses warm

Check thermostat:
Installation

OK
NG
- Back flush heater core, drain and refill coolant.
  Reinstall

Check heater hoses for proper installation:

OK
NG
- Both hoses warm

Check for noise in all modes and temperature settings:

Noise is constant

OK
NG
- Check blower motor for foreign particles

Check and adjust lubricant:
Refer to HA-146

OK
NG
- Replace compressor and liquid tank

Check and adjust lubricant:
Refer to HA-146

OK
NG
- Replace compressor and liquid tank

Noise is intermittent

Check air discharge ducts:
for obstructions, foreign materials or air leakage

OK
NG
- Replace compressor and liquid tank

The belt vibration is intense

Readjust belt tension:
Refer to MA section
("Checking Drive Belts", "ENGINE MAINTENANCE")

OK
NG
- The pulley center does not match
  Readjust the pulley center

The side of belt is worn out

Replace thermostat:
Refer to LC section
("Thermosat", "ENGINE COOLING SYSTEM")

OK
NG
- Back flush heater core, drain and refill coolant.
  Reinstall

OK
NG
- Both hoses warm

HA-25
Performance Test Diagnoses
INSUFFICIENT COOLING

INSUFFICIENT COOLING

CHECK AIR FLOW
NG

CHECK BLOWER MOTOR OPERATION
OK

CHECK COMPRESSOR OPERATION
OK

A

NG

Check high and low side pressure. Use performance chart.
(Refer to HA-28)

NG

Recover refrigerant using recovery recycling recharging equipment and charge specified amount of refrigerant

NG

Check high and low side pressure. Use performance chart.
(Refer to HA-28)

OK

Check discharge air temperature. Use performance chart.
(Refer to HA-28)

NG

End

Malfunctioning temperature control operation (air mix door position improperly adjusted)

Note: A-F correspond to those in TROUBLE DIAGNOSES FOR ABNORMAL PRESSURE
(Refer to HA-29)

END
Performance Chart

**TEST CONDITION**
Testing must be performed as follows:
- Vehicle location: Inside or in the shade (in a well-ventilated place).
- Doors: Closed
- Door window: Open (Front driver side only)
- Hood: Open
- TEMP setting: MAX. COLD
- Discharge Air: Face Vent
- RECIRC switch: (Recirculation) ON
- FAN speed: High speed
- A/C switch: ON
- Engine speed: Idle speed
- Operate the air conditioning system for 10 minutes before taking measurements.

**TEST READING**

Recirculating-to-discharge air temperature table

<table>
<thead>
<tr>
<th>Relative humidity (%)</th>
<th>Air temperature °C (°F)</th>
<th>Discharge air temperature at center ventliner °C (°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 - 60</td>
<td>20 (68)</td>
<td>6.2 - 8.6 (43 - 48)</td>
</tr>
<tr>
<td></td>
<td>25 (77)</td>
<td>9.4 - 13.5 (49 - 56)</td>
</tr>
<tr>
<td></td>
<td>30 (86)</td>
<td>14.6 - 18.2 (58 - 65)</td>
</tr>
<tr>
<td></td>
<td>35 (95)</td>
<td>19.7 - 23.0 (67 - 73)</td>
</tr>
<tr>
<td>60 - 70</td>
<td>20 (68)</td>
<td>8.8 - 11.6 (48 - 53)</td>
</tr>
<tr>
<td></td>
<td>25 (77)</td>
<td>13.5 - 16.8 (56 - 92)</td>
</tr>
<tr>
<td></td>
<td>30 (86)</td>
<td>18.2 - 22.0 (65 - 72)</td>
</tr>
<tr>
<td></td>
<td>35 (95)</td>
<td>23.0 - 27.2 (73 - 81)</td>
</tr>
</tbody>
</table>

*Thermometer should be placed at intake unit under left side of instrument panel.

Ambient air temperature-to-operating pressure table

<table>
<thead>
<tr>
<th>Ambient air</th>
<th>Relative humidity (%)</th>
<th>High-pressure (Discharge side) kPa (bar, kg/cm², psi)</th>
<th>Low-pressure (Section side) kPa (bar, kg/cm², psi)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>30 (86)</td>
<td>941 - 1,177 [9.41 - 11.77, 9.8 - 12.0, 137 - 171]</td>
<td>157 - 245 [1.57 - 2.45, 1.6 - 2.5, 22 - 36]</td>
</tr>
<tr>
<td></td>
<td>35 (95)</td>
<td>1,088 - 1,402 [10.88 - 1.402, 11.3 - 14.3, 161 - 201]</td>
<td>177 - 294 [1.77 - 2.94, 1.8 - 2.9, 26 - 36]</td>
</tr>
<tr>
<td></td>
<td>40 (104)</td>
<td>1,304 - 1,677 [13.04 - 16.77, 13.3 - 17.1, 189 - 245]</td>
<td>216 - 343 [2.16 - 3.43, 2.2 - 3.5, 31 - 50]</td>
</tr>
</tbody>
</table>

*If pressure is not within range, refer to HA-29, "Trouble Diagnoses for Abnormal Pressure".

---

**Trouble Diagnoses for Abnormal Pressure**

Whenever system's high and/or low side pressure is abnormal, diagnose using a manfoid gauge. The marker above the gauge scale in the following tables indicates the standard (normal) pressure range. Since the standard (normal) pressure, however, differs from vehicle to vehicle, refer to HA-28 ("Ambient air temperature-to-compressor pressure table").

<table>
<thead>
<tr>
<th>Gauge indication</th>
<th>Refrigerant cycle</th>
<th>Probable cause</th>
<th>Corrective action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Both high and low-pressure sides are too high</td>
<td>Pressure is reduced soon after water is sprayed on condenser</td>
<td>Excessive refrigerant charge in refrigeration cycle</td>
<td>Reduce refrigerant until specified pressure is obtained</td>
</tr>
<tr>
<td>Air suction by cooling fan is insufficient</td>
<td>Insufficient condenser cooling performance</td>
<td>Clean condenser</td>
<td></td>
</tr>
<tr>
<td>Low-pressure pipe is not cold</td>
<td>When compressor is stopped high-pressure value quickly drops by approximately 100 kPa (200 bar, 2 kg/cm², 28 psi). It then decreases gradually thereafter</td>
<td>Poor heat exchange in condenser (after compressor operation stops, high pressure decreases too slowly)</td>
<td>Check and repair cooling fan as necessary</td>
</tr>
<tr>
<td>Engine tends to overheat</td>
<td>Engine cooling systems malfunction</td>
<td>Poor heat exchange in condenser (after compressor operation stops, high pressure decreases too slowly)</td>
<td>Evacuate repeatedly and recharge system</td>
</tr>
<tr>
<td>An area of the low-pressure pipe is colder than areas near the evaporator outlet</td>
<td>Plates are sometimes covered with frost</td>
<td>Replace expansion valve</td>
<td></td>
</tr>
</tbody>
</table>

Check and repair each engine cooling system.
## TROUBLE DIAGNOSES

### Manual and Auto

#### Trouble Diagnoses for Abnormal Pressure

**(Cont’d)**

<table>
<thead>
<tr>
<th>Gauge indication</th>
<th>Refrigerant cycle</th>
<th>Probable cause</th>
<th>Corrective action</th>
</tr>
</thead>
<tbody>
<tr>
<td>High-pressure side is too high and low pressure side is too low.</td>
<td>Upper side of condenser and high pressure side are hot, however, liquid tank is not so hot.</td>
<td>High-pressure tube or parts located between compressor and condenser is plugged or crushed.</td>
<td>Check and repair or replace malfunctioning parts. Check lubricant for contamination.</td>
</tr>
<tr>
<td>High-pressure side is too low</td>
<td>High and low pressure sides become equal soon after compressor operation stops.</td>
<td>Compressor pressure operation is improper. Damaged inside compressor packings</td>
<td>Replace compressor.</td>
</tr>
<tr>
<td>No temperature difference between high and low pressure sides</td>
<td>Compressor discharge capacity does not change (Compressor stroke is set at maximum.)</td>
<td>Compressor discharge capacity does not change</td>
<td>Replace compressor.</td>
</tr>
<tr>
<td>Both high and low pressure sides are too low.</td>
<td>There is a big temperature difference between liquid tank outlet and inlet. Outlet temperature is extremely low. Liquid tank inlet and expansion valve are frozen.</td>
<td>Temperature of expansion valve inlet is extremely low as compared with area near liquid tank. Expansion valve inlet may be frosted. Temperature difference occurs somewhere in high pressure side.</td>
<td>Check and repair malfunctioning parts. Check lubricant for contamination.</td>
</tr>
<tr>
<td></td>
<td>Low pressure pipe is colder than areas near the evaporator outlet.</td>
<td>Air flow volume is not enough or is too low.</td>
<td>Replace compressor.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Low pressure pipe is clogged or crushed.</td>
<td>Check and repair malfunctioning parts. Check lubricant for contamination.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Evaporator is frozen.</td>
<td>Replace compressor.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Air conditioning system does not function and does not cyclically cool the compartment air. The system constantly functions for a certain period of time after compressor is stopped and restarted.</td>
<td>Check refrigerant for contamination.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Refrigerant does not discharge cyclically. Moisture is frozen at expansion valve outlet and inlet. Water is mixed with refrigerant.</td>
<td>Drain water from refrigerant or replace refrigerant. Replace liquid tank.</td>
</tr>
</tbody>
</table>
TROUBLE DIAGNOSES

Trouble Diagnoses for Abnormal Pressure (Cont'd)

<table>
<thead>
<tr>
<th>Gauge indication</th>
<th>Refrigerant cycle</th>
<th>Probable cause</th>
<th>Corrective action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low-pressure side becomes negative.</td>
<td>Liquid tank or fronteroor side of expansion valve's pipe is frosted or deformed.</td>
<td>High-pressure side is closed and refrigerant does not flow. Expansion valve or liquid tank is frosted.</td>
<td>Leave the system at rest until no frost is present. Start again to check whether or not the problem is caused by water or foreign particles. If water is the cause, initially cooling is okay. Then the water freezes, causing a blockage. If the problem is due to water, drain water from refrigerant or replace refrigerant. If due to foreign particles, remove expansion valve and remove the particles with dry and compressed air (not shock air). If neither of the above methods correct the problem, replace expansion valve. Replace liquid tank. Check lubricant for contamination.</td>
</tr>
</tbody>
</table>
Circuit Diagram — Heater

(W) - For details, refer to "Push Control System" (See page HA-41).
Main Power Supply and Ground Circuit Check

POWER SUPPLY CIRCUIT CHECK
Check power supply circuit for air conditioning system.
Refer to EL section ("Wiring Diagram", "POWER SUPPLY ROUTING").

PUSH CONTROL UNIT CHECK
Check power supply circuit for push control unit with ignition switch at ON.
1. Disconnect push control unit harness connector.
2. Connect voltmeter from harness side.
3. Measure voltage across terminal No. \( \Theta \) and body ground.

<table>
<thead>
<tr>
<th>Voltmeter terminal</th>
<th>Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \Theta )</td>
<td>Body ground</td>
</tr>
</tbody>
</table>

Check body ground circuit for push control unit.
1. Disconnect push control unit harness connector.
2. Connect ohmmeter from harness side.
3. Check for continuity between terminal No. \( \Theta \) and body ground.

<table>
<thead>
<tr>
<th>Ohmmeter terminal</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \Theta )</td>
<td>Body ground</td>
</tr>
</tbody>
</table>

Refer to last page (Fold out page).
**Diagnostic Procedure 1**

**SYMPTOM:** Blower motor does not rotate.
- Perform PRELIMINARY CHECK 2 before referring to the following flow chart.

1. Fan fails to rotate.
2. Fan does not rotate at 2-speed.
3. Fan does not rotate at 3-speed.
4. Fan does not rotate at 4-speed.
5. Fan does not rotate at 5-speed.

**Note:** If the result is NG after checking circuit continuity, repair harness or connector.

---

**CHECK POWER SUPPLY FOR BLOWER MOTOR**
- Disconnect blower motor harness connector.
- Do approx. 12 volts exist between blower motor harness terminal No. 2 and body ground?

- **OK:**
  - CHECK BLOWER MOTOR (Refer to HA-57).
  - Disconnect blower motor harness connector.
  - Replace blower motor.
- **NG:**
  - RECONNECT RESISTOR HARNESS CONNECTOR.

---

**CHECK BLOWER MOTOR CIRCUIT BETWEEN BLOWER MOTOR AND RESISTOR**
- Do approx. 12 volts exist between resistor harness terminal No. 2 and body ground?

- **Yes:**
  - Disconnect blower motor harness connectors.
  - Check circuit continuity between blower motor harness terminal No. 1 and resistor harness terminal No. 2.

- **NG:**
  - Replace fan switch.

---

**CHECK RESISTOR AFTER DISCONNECTING IT**
- (Refer to HA-56)
- OK
- NG
  - Replace resistor.

---

**CHECK FAN SWITCH CIRCUIT**
- Do approx. 12 volts exist between each fan switch harness terminal and body ground?

---

**CHECK FAN SWITCH AFTER disconnecting it**
- (Refer to HA-58)
- OK
- NG
  - Replace fan switch.
Diagnostic Procedure 2

SYMPTOM: Air outlet does not change.
- Perform PRELIMINARY CHECK 4, then Main Power Supply and Ground Circuit Check before referring to the flow chart below.

CHECK MODE DOOR MOTOR POSITION SWITCH
1. Turn VENT switch ON with ignition switch at ON position.
2. Turn ignition switch OFF.
   - Disconnect push control unit connector.
3. Check for continuity between terminal 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.

CHECK BODY GROUND CIRCUIT FOR MODE DOOR MOTOR
Does continuity exist between mode door motor harness terminal No. ⑧ and body ground?

Check circuit continuity between each terminal on push control unit and on mode door motor.

CHECK SIDE LINK
Refer to Control Linkage Adjustment (HA-79).

Note:
If the result is NG after checking circuit continuity, repair harness or connector.
Diagnostic Procedure 3
SYMPTOM: Intake door does not change in VENT, B/L or FOOT mode.
- Perform PRELIMINARY CHECK 1, then Main Power Supply and Ground Circuit Check before referring to the flow chart below.

A CHECK INTAKE DOOR MOTOR POSITION SWITCH
1. Turn REC switch ON with ignition switch at ON position.
2. Turn ignition switch OFF.
   Disconnect push control unit connector.
3. Check for continuity between terminal 9 of push control unit harness connector and body ground.
4. Using above procedures, check for REC switch OFF position as indicated in chart.

B Disconnect intake door motor harness connector

C CHECK BODY GROUND CIRCUIT FOR INTAKE DOOR MOTOR
Does continuity exist between intake door motor harness terminal No. 9 and body ground?

D Check continuity between push control unit harness terminal 9 and intake door motor harness terminal 9 (B).

E Reconnect push control unit and intake door motor harness connector.

F Replace intake door motor

Note:
If the result is NG after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 4
SYMPTOM: Air mix door does not change.
Perform PRELIMINARY CHECK 2, then Main Power Supply and Ground Circuit Check before referring to the flow chart below.
Diagnostic Procedure 4 (Cont’d)

**B**

CHECK FOR PUSH CONTROL UNIT OUTPUT.
- Slide the temperature control lever from HOT to COLD and COLD to HOT.
- Do approx. 12 volts exist between push control unit harness terminals ① and ② in both cases?

<table>
<thead>
<tr>
<th>Terminal No.</th>
<th>Temp control lever operation</th>
<th>Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>①</td>
<td>HOT</td>
<td>Approx 12V</td>
</tr>
<tr>
<td>②</td>
<td>COLD</td>
<td>Approx 12V</td>
</tr>
<tr>
<td>③</td>
<td>STOP</td>
<td>Approx 12V</td>
</tr>
</tbody>
</table>

---

**C**

CHECK FOR PIR RESISTANCE IN AIR MIX DOOR MOTOR.
- Refer to HA-70.

---

**D**

CHECK AIR MIX DOOR LINK.
(Refer to HA-71.)

---

**E**

CHECK FOR PIR RESISTANCE IN AIR MIX DOOR MOTOR.
- Refer to HA-70.

---

Diagnostic Procedure 5

**SYMPTOM:** Bi-level (B/L) door does not operate.

**A**

CHECK POWER SUPPLY FOR B/L DOOR MOTOR.
- Turn B/L switch ON and OFF.
- Do approx. 12 volts exist between B/L door motor harness terminals ① and ③ in both cases?

<table>
<thead>
<tr>
<th>Terminal No.</th>
<th>BIL switch</th>
<th>BIL door operation</th>
<th>Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>①</td>
<td>ON</td>
<td>Close</td>
<td>Approx 12V</td>
</tr>
<tr>
<td>②</td>
<td>OFF</td>
<td>Open</td>
<td>Approx 12V</td>
</tr>
</tbody>
</table>

---

**B**

Check circuit continuity between B/L door motor harness terminal No. ③ (⑤) and push control unit harness terminal No. ④ (⑥).

---

**C**

CHECK B/L DOOR LINK. Refer to HA-71.

---

**Note:**
- If the result is NG after checking circuit continuity, repair harness or connector.
TROUBLE DIAGNOSES

Diagnostic Procedure 6

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 COMPRESSION.
Disconnect compressor harness connector.
Do approx. 12 volts exist between compressor harness terminal No. 1 and body ground?

B
CHECK POWER SUPPLY FOR THERMAL PROTECTOR.
Disconnect thermal protector harness connector.
Do approx. 12 volts exist between thermal protector harness terminal No. 1 and body ground?

C
Check magnet clutch coil.

D
CHECK THERMAL PROTECTOR.
Check circuit continuity between thermal protector harness terminal No. 2 and compressor harness terminal No. 1.

E
Replace magnet clutch. Refer to COMPRESSOR (HA-146).

F
Replace thermal protector.

G
(Refer to next page.)
TROUBLE DIAGNOSES

Diagnostic Procedure 6 (Cont'd)

1. Disconnect thermo control amp. harness connector.

2. Check circuit continuity between thermo control amp. harness terminal No. 3 and ECM (ECCS control module) harness terminal No. 8.

   - OK
   - No

   CHECK POWER SUPPLY FOR THERMO CONTROL AMP.
   Disconnect thermo control amp. harness connector.
   Check for approx. 12 volts exist between thermo control amp. harness terminal No. 3 and body ground.
   - OK
   - NG

   CHECK BODY GROUND CIRCUIT FOR THERMO CONTROL AMP.
   Turn A/C switch or DEF switch ON.
   Check for continuity between thermo control amp. harness terminal 3 and body ground.

   - OK
   - NG

   (Go to next page.)

   CHECK THERMO CONTROL AMP.
   Refer to HA-66
   - OK
   - NG

   Replace thermo control amp.

Note:
If the result is NG after checking circuit continuity, repair harness or connector.

HA-66
**TROUBLE DIAGNOSES**

---

**Electrical Components Inspection**

**FAN SWITCH**
Check continuity between terminals at each position.

<table>
<thead>
<tr>
<th>POSITION</th>
<th>TERMINAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>OFF</td>
<td>1 - 2 - 3</td>
</tr>
<tr>
<td></td>
<td>2 - 1 - 4</td>
</tr>
<tr>
<td></td>
<td>3 - 2 - 6</td>
</tr>
<tr>
<td></td>
<td>4 - 3 - 5</td>
</tr>
</tbody>
</table>

---

**BLOWER MOTOR**
Check blower motor for smooth rotation.
- Ensure that there are no foreign particles inside the intake unit.

---

**BLOWER RESISTOR**
Check continuity between terminals.

---

**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)</th>
<th>Thermo amp operation</th>
<th>Tester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decreasing to 2.5 - 3.5 (37 - 38)</td>
<td>Turn OFF</td>
<td>Approx. 12V</td>
</tr>
<tr>
<td>Increasing to 1.2 (54 - 38)</td>
<td>Turn ON</td>
<td>Approx. 9V</td>
</tr>
</tbody>
</table>

---

**TRIPLE-PRESSURE SWITCH**

<table>
<thead>
<tr>
<th>LHD model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terminal</td>
</tr>
<tr>
<td>----------</td>
</tr>
<tr>
<td>Low-pressure side</td>
</tr>
<tr>
<td>Decreasing to 152 - 201 (1.50 - 2.01, 1.55 - 2.05, 22 - 29.5)</td>
</tr>
<tr>
<td>Medium-pressure side*</td>
</tr>
<tr>
<td>Decreasing to 1,128 - 1,422 (11.28 - 14.22, 11.5 - 14.5, 160 - 200)</td>
</tr>
<tr>
<td>High-pressure side</td>
</tr>
<tr>
<td>Decreasing to 2,452 - 2,844 (24.5 - 28.4, 25 - 25, 305 - 412)</td>
</tr>
</tbody>
</table>

*For cooling fan motor operation.

---

**RHD model**

<table>
<thead>
<tr>
<th>Terminal</th>
<th>High-pressure side line pressure kPa (bar, kgf/cm², psi)</th>
<th>Operation</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low-pressure side</td>
<td>Increasing to 157 - 216 (1.57 - 2.16, 1.5 - 2.16, 23 - 31)</td>
<td>ON</td>
<td>Exists</td>
</tr>
<tr>
<td>Decreasing to 152 - 201 (1.50 - 2.01, 1.55 - 2.05, 22 - 29.5)</td>
<td>OFF</td>
<td>Does not exist</td>
<td></td>
</tr>
<tr>
<td>Medium-pressure side*</td>
<td>Increasing to 1,440 - 1,697 (14.40 - 16.97, 14.7 - 17.3, 209 - 248)</td>
<td>ON</td>
<td>Exists</td>
</tr>
<tr>
<td>Decreasing to 1,128 - 1,422 (11.28 - 14.22, 11.5 - 14.5, 160 - 200)</td>
<td>OFF</td>
<td>Does not exist</td>
<td></td>
</tr>
<tr>
<td>High-pressure side</td>
<td>Increasing to 1,662 - 2,589 (16.67 - 25.89, 17 - 25, 242 - 290)</td>
<td>ON</td>
<td>Exists</td>
</tr>
<tr>
<td>Decreasing to 2,452 - 2,844 (24.5 - 28.4, 25 - 25, 305 - 412)</td>
<td>OFF</td>
<td>Does not exist</td>
<td></td>
</tr>
</tbody>
</table>

*For cooling fan motor operation.

---

**HA-68**

---

**HA-69**
TROUBLE DIAGNOSES

Electrical Components Inspection (Cont'd)

**THERMAL PROTECTOR**

<table>
<thead>
<tr>
<th>Temperature of compressor (°F)</th>
<th>Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increasing to approx. 145 - 155 (73 - 85)</td>
<td>Turn OFF</td>
</tr>
<tr>
<td>Decreasing to approx. 130 - 140 (56 - 64)</td>
<td>Turn ON</td>
</tr>
</tbody>
</table>

**A/C RELAY**

Check circuit continuity between terminals by supplying 12 volts to coil side terminals of the relay.

**AIR MIX DOOR MOTOR**

Check for PBR resistance.

1. Turn Ignition switch ON and temperature control lever to FULL HOT position.
2. Turn ignition switch OFF.
3. Disconnect air mix door motor connector.
4. Check for resistance between air mix door motor harness terminal
   ① and ②.
5. Using above procedures, check for each terminal as indicated in chart below.

<table>
<thead>
<tr>
<th>Terminal No.</th>
<th>Temp control lever position</th>
<th>Resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>① ②</td>
<td>FULL HOT</td>
<td>Approx. 0Ω</td>
</tr>
<tr>
<td>③ ④</td>
<td>FULL COLD</td>
<td>Approx. 3 kΩ</td>
</tr>
<tr>
<td>① ②</td>
<td>FULL HOT</td>
<td>Approx. 3 kΩ</td>
</tr>
<tr>
<td>⑤ ④</td>
<td>FULL COLD</td>
<td>Approx. 0Ω</td>
</tr>
</tbody>
</table>

**Control Linkage Adjustment**

**MODE DOOR**

1. Install mode door motor on heater unit and connect it to main harness.
2. Turn ignition switch to ON.
3. Turn VENT switch ON.
4. Turn OEF switch ON. Check that side link operates at the fully-open position. Also turn DEF switch ON to check that side link operates at the fully-open position.

**Intake Door**

1. Connect intake door motor harness connector before installing intake door motor.
2. Turn ignition switch to ON.
3. Turn REC switch ON.
4. Install intake door motor on intake unit.
5. Set intake door rod in REC position and fasten door rod to holder.
6. Check that intake door operates properly when REC switch is turned ON and OFF.

**Bi-Level (B/L) Door**

1. Connect B/L door motor harness connector before installing B/L door motor.
2. Turn ignition switch to ON.
3. Install B/L door motor on heater unit.
4. Check that B/L door operates properly when bi-level switch is turned ON and OFF.
Introduction

The Automatic Temperature Control (ATC) system provides automatic regulation of the vehicle's interior temperature. The operator selects "set temperature", on which the regulation is based, regardless of the outside temperature changes. This is done by utilizing a microcomputer, also referred to as the automatic amplifier (auto amp.), which receives input signals from several sensors. The automatic amplifier uses these input signals (including the set temperature) to automatically control the ATC system's outlet air volume, air temperature, and air direction.

Features

Air mix door control (Automatic temperature control)
The air mix door is automatically controlled so that in-vehicle temperature is maintained at a predetermined value by the temperature setting, ambient temperature, in-vehicle temperature and amount of sunlight.

Fan speed control
Blower speed is automatically controlled based on temperature setting, ambient temperature, in-vehicle temperature, amount of sunlight and air mix door position.

Intake door control
The intake doors are automatically controlled by the temperature setting, ambient temperature, in-vehicle temperature and amount of sunlight.

Mode door control
The mode doors (defrost door, ventilator door and foot door) are automatically controlled by the temperature setting, ambient temperature, in-vehicle temperature and amount of sunlight.

BI-level door control
The bi-level door is open to increase amount of air discharge when the air discharge outlet is set at bi-level position. The bi-level door is also opened when the fan speed is high and the set temperature is at 18°C.

Self-diagnostic system
The self-diagnostic system is built into the automatic amplifier to quickly locate the cause of problems.

Control Operation

AUTO SWITCH
The compressor, air intake doors, air mix door, mode doors, and blower speed are automatically controlled so that the in-vehicle temperature will reach, and be maintained at the set temperature. The air conditioning cooling function operates only when the engine is running.

A/C SWITCH
Manual control of the compressor operation. When the A/C mark appears on the display screen, compressor operation is being carried out.

TEMPERATURE SWITCH
Increases or decreases the set temperature.

OFF SWITCH
The compressor and blower are off, the air intake doors are set to the outside air position. Then, the mode doors are set to the foot (80% foot and 20% defrost) position. In the off position the ATC system uses the vehicle's flow through ventilation. It tries to maintain the interior temperature based on the last set temperature of the system.

FAN SWITCH
Manual control of the blower speed. Four speeds are available for manual control (as shown on the display screen):
- Low ( ), medium low ( ), medium high ( ), high ( )

MODE SWITCH
Manual control of the air discharge outlets. Four selections are available (as shown on the display screen):
- Face ( ), bi-level ( ), foot ( ), defrost/foot ( )
REC SWITCH
ON position: Interior air is recirculated inside the vehicle.
OFF position: Automatic control resumes.
RECIPE is canceled when DEF is selected. RECIRC resumes when another mode is chosen.

DEF SWITCH
Positions the mode doors to the defrost position. Also positions the air intake doors to the outside air position. With DEF switch ON, the compressor operates.
TROUBLE DIAGNOSES

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Diagnostic Procedure 1
SYMPTOM: Ambient sensor circuit is open or shorted.
(21 or -21 is indicated on display as a result of conducting Self-diagnosis STEP 2) ................. HA-111
Diagnostic Procedure 2
SYMPTOM: In-vehicle sensor circuit is open or shorted.
(22 or -22 is indicated on display as a result of conducting Self-diagnosis STEP 2) ................. HA-112
Diagnostic Procedure 3
SYMPTOM: Sunload sensor circuit is open or shorted.
(23 or -23 is indicated on display as a result of conducting Self-diagnosis STEP 2) ................. HA-113
Diagnostic Procedure 4
SYMPTOM: PBR circuit is open or shorted.
(24 or -24 is indicated on display as a result of conducting Self-diagnosis STEP 2) ................. HA-114
Diagnostic Procedure 5
SYMPTOM: Mode door motor does not operate normally ............................................................. HA-115
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**Trouble Diagnoses**

**How to Perform Trouble Diagnoses for Quick and Accurate Repair**

**Workflow**

1. **Check In**
   - Listen to customer complaint and confirm by performing operational check.
   - Operation check (Refer to HA-79)
   - Symptom chart (Refer to HA-80)
   - Can be confirmed

2. **Conduct Customer on Correct Operation of System**
   - Can not be confirmed

3. **Investigate Items You Should Carry Out Related to Each Symptom**
   - Symptom chart (Refer to HA-83)
   - Self-diagnosis (Refer to HA-84)

4. **Perform Self-diagnosis**
   - Can be confirmed
   - Check main power supply and ground circuit check (Refer to HA-112)

5. **Malfunction Code Can Be Found**
   - Yes
      - Preliminary check (Refer to HA-22)
   - No
      - Eliminate good parts/harness/connector(s) electrically
      - Malfunctioning harness/connector(s)

6. **Eliminate Good Parts/Harness/Connector(s) Electrically**
   - Malfunctioning harness/connector(s)
   - Inspect each component
   - Repair

7. **Repair/Replace**
   - Final check
   - Check out

---

**Operational Check**

The purpose of the operational check is to confirm that the system is as it should be. The systems which will be checked are the blower, mode (discharge air), intake air, temperature decrease, temperature increase, A/C switch and the memory function.

**Conditions:**
- Engine running and at normal operating temperature.

**Procedure:**

1. **Check Blower**
   - Press fan switch one time.
   - Blower should operate on low speed.
   - The fan symbol should have one blade lit.
   - Press fan switch one more time.
   - Continue checking blower speed and fan symbol until all speeds are checked.
   - Leave blower on MAX speed.

2. **Check Discharge Air**
   - Press mode switch four times and DEF switch one time.
   - When DEF switch is ON, DEF indicator should illuminate.
   - Confirm that discharge air comes out according to the air distribution table at left.

Refer to "Discharge Air Flow," "Description" (HA-12).

**Table:**

<table>
<thead>
<tr>
<th>Switch Mode/Indication</th>
<th>Air Outlet/Distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face</td>
<td>Foot</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Air Outlet</td>
<td>---</td>
</tr>
<tr>
<td>100%</td>
<td>100%</td>
</tr>
<tr>
<td>60%</td>
<td>40%</td>
</tr>
<tr>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>40%</td>
<td>40%</td>
</tr>
<tr>
<td>25%</td>
<td>25%</td>
</tr>
</tbody>
</table>

**Note:**
- Confirm that the compressor clutch is engaged (visual inspection) and intake door position is at FRESH when the DEF switch is pressed.
- Intake door position is checked in the next step.
TROUBLE DIAGNOSES

Operational Check (Cont'd)

3. Check recirc
1) Press REC switch. Recirc indicator should illuminate.
2) Listen for intake door position change (you should hear blower sound change slightly).

4. Check temperature decrease
1) Press the temperature switch (COLD) until 18°C is displayed.
2) Check for cold air at discharge air outlets.

5. Check temperature increase
1) Press the temperature switch (HOT) until 32°C is displayed.
2) Check for hot air at discharge air outlets.

6. Check AUTO mode
1) Press AUTO switch.
2) Display should indicate AUTO and A/C. Confirm that the compressor clutch engages (audio or visual inspection).
   (Discharge air will depend on ambient, in-vehicle, and set temperatures)

7. Check A/C mode
1) Press A/C switch
2) Display should indicate AUTO (A/C goes out). Confirm that the compressor clutch is not engaged (visual inspection).
   (Discharge air will depend on ambient, in-vehicle, and set temperatures)
3) Repress A/C switch. Display should indicate A/C and the compressor clutch is engaged.

8. Check memory function
1) Press OFF switch
2) Turn the ignition off.
3) Turn the ignition on.
4) Press the AUTO switch.
5) Confirm that the set temperature remains at previous temperature.
### Diagnostic Table

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Condition 1</td>
</tr>
<tr>
<td>2</td>
<td>Condition 2</td>
</tr>
<tr>
<td>3</td>
<td>Condition 3</td>
</tr>
<tr>
<td>4</td>
<td>Condition 4</td>
</tr>
</tbody>
</table>

### Troubleshooting Chart

1. **Symptom 1**: Check Actuator 1.
2. **Symptom 2**: Check Sensor 1.
3. **Symptom 3**: Check Motor 1.
4. **Symptom 4**: Check Relays 1.

### Auxiliary Mechanism

- Preliminary Check 1 (HA-22)
- Preliminary Check 2 (HA-92)
- Preliminary Check 3 (HA-52)
- Preliminary Check 4 (HA-98)
- Preliminary Check 5 (HA-62)
- Preliminary Check 6 (HA-28)
- Preliminary Check 7 (HA-92)
- Preliminary Check 8 (HA-128)

### Diagnostic Procedure

1. **Procedure 1**: (HA-111)
2. **Procedure 2**: (HA-112)
3. **Procedure 3**: (HA-119)
4. **Procedure 4**: (HA-117)
5. **Procedure 5**: (HA-118)
6. **Procedure 6**: (HA-118)
7. **Procedure 7**: (HA-120)
8. **Procedure 8**: (HA-122)
9. **Procedure 9**: (HA-122)

---

**HA-82**

**HA-83**
Self-diagnosis

The self-diagnostic system diagnoses sensors, door motors, blower motor, etc. by system line. Refer to applicable sections (items) for details. Shifting from normal control to the self-diagnostic system is done as follows. Start the engine (turn the ignition switch from "OFF" to "ON"). And press \[\text{AUTO}\] switch for at least 5 seconds. The "[AUTO]" switch must be pressed within 5 seconds after starting the engine (ignition switch is turned "ON"). This system will be canceled by either pressing \[\text{AUTO}\] switch or turning the ignition switch "OFF". Shifting from one step to another is accomplished by means of pushing \[\text{(HOT)}\] or \[\text{(COLD)}\] switch, as required.

Additionally shifting from STEP 5 to AUXILIARY MECHANISM is accomplished by means of pushing \[\text{FAN}\] switch.

STEP 1 — LEDs and segments are checked. (Refer to HA-82, 83.)

STEP 2 — Input signals from each sensor are checked. (Refer to HA-82, 83.)

STEP 3 — Mode and inflator door motor operation switch is checked. (Refer to HA-82, 83.)

STEP 4 — Actuators are checked. (Refer to HA-82, 83.)

STEP 5 — Temperature detected by each sensor is checked. (Refer to HA-82, 83.)

AUXILIARY MECHANISM — Temperature setting damper (Refer to HA-82, 83.)

CHECKING PROCEDURE

Self-diagnosis (Cont'd)

IGNITION SWITCH OFF 

[STEP 1]
All LEDs and segments illuminate.

- Yes
  - Malfunctioning \[\text{HOT}\] switch, LED or fluorescent display tube
  - Press \[\text{HOT}\] switch
  - Advance to self-diagnosis STEP 2?
    - No
      - Malfunctioning \[\text{HOT}\] switch
    - Yes
      - Malfunctioning \[\text{COLD}\] switch
  - Press \[\text{HOT}\] switch
  - Return to self-diagnosis STEP 1?
    - No
      - Malfunctioning \[\text{COLD}\] switch
    - Yes
      - Press \[\text{HOT}\] switch

[STEP 2]
Display 3

All sensors are in good order.

- Sensor(s) isolated malfunctioning

- Code No. of malfunctioning sensor is indicated on display

- Press \[\text{HOT}\] switch

Note:
For STEP 1 and 5, engine must be running for compressor to operate.

Note:
At any time, you can return to a previous step in the self-diagnosis by pressing the \[\text{COLD}\] switch.
TROUBLE DIAGNOSES
Self-diagnosis (Cont'd)

STEP 4

All mode and intake door motor position switches are in good order.

Display

Press \( \theta \) (HOT) switch

Code No. of malfunctioning mode door motor position switch is indicated on display.

Press \( \theta \) (DEF) switch

Code No. of actuators test pattern is indicated on display.

Press \( \theta \) (DEF) switch

Press \( \theta \) (HOT) switch

Self-diagnosis (Cont'd)

STEP 4

Display

Press \( \theta \) (HOT) switch

Temperature detected by each sensor is indicated on display.

Press \( \theta \) (DEF) switch

Display

Ambient sensor in-vehicle sensor

AUXILIARY MECHANISM — Temperature setting trimmer

Turn ignition switch OFF or \( \theta \) (AUTO) switch ON.

Note:
For STEP 4, engine must be running for compressor to operate.
TROUBLE DIAGNOSIS

Self-diagnosis (Cont'd)

HOW TO INTERPRET THE RESULTS

STEP 1: Checks LEDs and segments
When switch's LED and segments are functioning properly in STEP 1, LED and display will come on.

If LEDs or segments malfunction, LED will not come on or display will show incomplete segment.

STEP 2: Checks each sensor circuit for open or short circuit
Display shows "0" in STEP 2 mode. When all sensors are in good order, display shows "20". It takes approximately 5 seconds to check all sensors.

STEP 3: Checks mode and intake door positions
Display shows "3" in STEP 3 mode. When all doors are in good order, display will then show "30". It takes approximately 20 seconds to check all mode and intake doors.

Sensors and abnormalities
If a circuit is opened or shorted, display shows its code No. when input corresponds with any of the following conditions:

- Code No. Sensor: Open circuit: Short circuit: 21 Ambient sensor Less than -41.9°C (-45°F) Greater than 109°C (220°F) 22 In-vehicle sensor Less than -41.9°C (-45°F) Greater than 139°C (200°F) 25 Sunlight sensor 2 Less than 4.5 mA Greater than 192 mA 26 RH/PT Greater than 50% Less than 30%

1: "50%" and "30%" refer to percentage with respect to full stroke of air mix door. (Full code: 10%, Full hot: 90%)
2: Conduct self-diagnosis STEP 2 under sunshine. When conducting indoors, direct light (more than 60W) at sunlight sensor.

When abnormalities are detected, display shows a code No. corresponding with malfunctioning part.
**TROUBLE DIAGNOSES**

**Self-diagnosis (Cont'd)**

If two or more mode or intake doors are out of order, corresponding code numbers respectively blink two times.

If mode door motor harness connector is disconnected, the following display pattern will appear:

\[ 3 \rightarrow 32 \rightarrow 33 \rightarrow 24 \rightarrow 35 \]

If intake mode door harness connector is disconnected, the following display pattern will appear:

\[ 32 \rightarrow 30 \rightarrow 31 \]

If any mode door motor position switch is malfunctioning, mode door motor will also malfunction.

**STEP 4: Checks operation of each actuator**

Display shows "\( 44 \)" in STEP 4 mode. When DEF switch is pressed one time, display shows "\( 44 \)". Thereafter, each time the switch is pressed, display advances one number at a time, up to "\( 46 \)". Then returns to "\( 44 \)".

During inspection in STEP 4, the auto amp. will forcefully transmit an output to the affected actuators. The corresponding code Nos. are shown on display as indicated in the table below.

Checks must be made visually, by listening to any noise, or by touching air outlets with your hand, etc. for improper operation.

<table>
<thead>
<tr>
<th>Code No.</th>
<th>41</th>
<th>42</th>
<th>43</th>
<th>44</th>
<th>45</th>
<th>46</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mode door</td>
<td>VENT</td>
<td>B/L</td>
<td>B/L</td>
<td>FOOT</td>
<td>F/O</td>
<td>DEF</td>
</tr>
<tr>
<td>Intake door</td>
<td>REC</td>
<td>REC</td>
<td>20%</td>
<td>FRE</td>
<td>FRE</td>
<td>FRE</td>
</tr>
<tr>
<td>Air mix door</td>
<td>Full</td>
<td>Full</td>
<td>Full</td>
<td>Full</td>
<td>Full</td>
<td>Full</td>
</tr>
<tr>
<td>Blower motor</td>
<td>4.5</td>
<td>9.11</td>
<td>7.9</td>
<td>7.9</td>
<td>7.9</td>
<td>10-12</td>
</tr>
<tr>
<td>Compressor</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
</tr>
<tr>
<td>Bi-level door</td>
<td>Open</td>
<td>Open</td>
<td>Shut</td>
<td>Shut</td>
<td>Shut</td>
<td>Shut</td>
</tr>
</tbody>
</table>

Operating condition of each actuator cannot be checked by indicators.

**STEP 5: Checks temperature detected by sensors**

Checks temperature detected by sensors

Display shows "\( 5 \)" in STEP 5 mode.

- When DEF switch is pressed one time, display shows temperature detected by ambient sensor.
- When DEF switch is pressed second time, display shows temperature detected by in-vehicle sensor.
- When DEF switch is pressed third time, display returns to original presentation "\( 5 \)".

If temperature shown on display greatly differs from actual temperature, check sensor circuit at first. Then inspect sensor itself according to the procedures described in Control System Input Component. Refer to HA-128.
TROUBLE DIAGNOSES

Self-diagnosis (Cont’d)

AUXILIARY MECHANISM: Temperature setting trimmer

This trimmer compensates for differences between temperature setting (displayed digitally) and temperature felt by driver in a range of ±3°C.

Operating procedures for this trimmer are as follows:

Starting with STEP 5 under “Self-diagnostic mode”, press \( D \) (fan) switch to set air conditioning system in auxiliary mode. Then press either \( A \) (HOT) or \( B \) (COLD) switch as desired. Temperature will change at a rate of 1°C each time a switch is pressed.

---

PRELIMINARY CHECK 1

Air outlet does not change.

- Perform Self-diagnosis STEP 1 before referring to the flow chart.

CHECK SENSOR CIRCUIT

Set up Self-diagnosis STEP 2.

Is each sensor circuit normal?

Code No. 20 should be indicated on the display after approx. 5 seconds.

OK

CHECK MODE DOOR MOTOR

Set up Self-diagnosis STEP 3.

Is mode door motor operating normally?

Code No. 30 should be indicated on the display after approx. 20 seconds.

OK

CHECK MODE DOOR OPERATION

Set up Self-diagnosis STEP 4.

Does air outlet change according to each code No.?

- \( V1 \), \( V2 \), \( V3 \), \( V4 \), \( V5 \), \( V6 \)
- \( VENT \), \( V/L \), \( V/L \), \( FOOT \), \( F/D \), \( DEF \)

Refer to Discharge Air Flow. (HA-12)

OK

An outlet control system is normal. Refer to Mode door control specifications. (HA-133)

NG

Go to Diagnostic Procedure 5. (HA-115)

CHECK SIDE LINK MECHANISM

Refer to CONTROL LINKAGE ADJUSTMENT. (HA-133)

OK

Repair.

NG

Go to Diagnostic Procedure 5. (HA-115)

Are sensor circuits for ambient sensor and in-vehicle sensor operating normally? If malfunction is suspected, check temperature detected by each sensor using Self-diagnosis STEP 3. Confirm the temperature is within normal range before performing Diagnostic Procedures.
**PRELIMINARY CHECK 3**

**Insufficient cooling**

1. **CHECK SENSOR CIRCUIT**: Check sensor circuit in detail according to the diagnostic procedure below. Correspond to each code.

<table>
<thead>
<tr>
<th>Code No.</th>
<th>How to repair</th>
<th>Reference page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2A1</td>
<td>Go to Diagnostic Procedure 1.</td>
<td>HA-111</td>
</tr>
<tr>
<td>2A2</td>
<td>Go to Diagnostic Procedure 2.</td>
<td>HA-112</td>
</tr>
<tr>
<td>2B1</td>
<td>Go to Diagnostic Procedure 2.</td>
<td>HA-113</td>
</tr>
<tr>
<td>2B2</td>
<td>Go to Diagnostic Procedure 3.</td>
<td>HA-114</td>
</tr>
<tr>
<td>2C1</td>
<td>Go to Diagnostic Procedure 4.</td>
<td>HA-115</td>
</tr>
<tr>
<td>2C2</td>
<td>Go to Diagnostic Procedure 4.</td>
<td>HA-116</td>
</tr>
</tbody>
</table>

2. Are sensor circuits for ambient sensor and in-vehicle sensor operating normally? If malfunction is suspected, check temperature detected by each sensor using self-diagnosis STEP 3. Confirm that the temperature is within normal range before performing diagnostic procedures.

3. **CHECK INTAKE DOOR MOTOR**: Set up self-diagnosis STEP 3. Is intake door motor operating normally? Code No. 30 should be indicated on the display after approx. 20 seconds.

4. **CHECK INTAKE DOOR MOTOR OPERATION**: Set up self-diagnosis STEP 4. Does intake change or change according to each code No.?

<table>
<thead>
<tr>
<th>REC REC</th>
<th>REC FRE</th>
<th>FRE FRE FRE</th>
</tr>
</thead>
</table>

   - OK: Go to Diagnostic Procedure 6. (HA-117)
   - NG: Go to Performance Test Diagnosis. (HA-28)

5. Intake door control system is normal. Refer to intake door control specification. (HA-134)

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**HA-94**

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**HA-95**
PRELIMINARY CHECK 4
Insufficient heating

CHECK MODE DOOR OPERA-
TION
OK
Perform Preliminary
Check 1, Refer to HA-93.
NG
CHECK BLOWER MOTOR
OPERATION
OK
Perform Preliminary
Check 2, Refer to HA-97.
NG
CHECK THE FOLLOWING
- Engine coolant level (Refer to MA section)
- Hoses for leaks or kinks
- Radiator cap (Refer to LC section)
- Air in cooling system
OK
Perform Preliminary
Check 3, Refer to HA-99.
NG
CHECK AIR MIX DOOR OPER-
ATION
Refer to HA-125
OK
CHECK DUCTS FOR AIR
LEAKS
OK
Repair leaks
NG
CHECK BVF PMT THE
HEATER INLET AND OUTLET
HOSES
Hot inlet
Warm outlet
Check thermostat
installation
Check heater hoses for
proper installation
OK
Note
Replace thermostat
(Refer to LC section
"Thermostat", ENGINE
COOLING SYSTEM")
OK
Note
Replace heater core
Back flush heater core, clean and refill coolant
Rotate
Hot inlet
Warm outlet
Both hoses warm
SYSTEM OK
NG
Replace heater core

PRELIMINARY CHECK 5
Blower motor operation is malfunctioning.
- Perform Self-diagnosis STEP 1 before referring to the following flow chart.

CHECK SENSOR CIRCUIT
Set up Self-diagnosis STEP 2.
- Is each sensor circuit normal?
- Code No. 20 should be indicated on the display after approx. 5 seconds.
OK
NG
CHECK SENSOR CIRCUIT IN DETAIL ACCORDING TO THE DIAGNOSTIC PROCEDURE BELOW CORRESPONDING TO EACH CODE NO.

<table>
<thead>
<tr>
<th>Code No.</th>
<th>How to repair</th>
<th>Reference page</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>Go to Diagnostic Procedure 1</td>
<td>HA-111</td>
</tr>
<tr>
<td>22</td>
<td>Go to Diagnostic Procedure 2</td>
<td>HA-112</td>
</tr>
<tr>
<td>25</td>
<td>Go to Diagnostic Procedure 3</td>
<td>HA-113</td>
</tr>
<tr>
<td>26</td>
<td>Go to Diagnostic Procedure 4</td>
<td>HA-114</td>
</tr>
</tbody>
</table>

Are sensor circuits for ambient sensor and in-vehicle sensor operating normally? If malfunction is suspected, check temperature detected by each sensor using Self-diagnosis STEP 5. Confirm the temperature is within normal range before performing Diagnostic Procedures.

CHECK BLOWER MOTOR OPERATION
Set up Self-diagnosis STEP 4.
- Does Blower speed change according to each code No.?
OK
NG
<table>
<thead>
<tr>
<th>Code No.</th>
<th>How to repair</th>
<th>Reference page</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>Go to Diagnostic Procedure 5 (HA-120)</td>
<td></td>
</tr>
</tbody>
</table>

Is engine coolant temperature below 50°C (122°F)?
Yes
No
Blower motor operation is normal.
Refer to Fan speed control specification (HA-136)

IS BLOWER MOTOR CONTROLLED UNDER STARTING FAN SPEED CONTROL?
Refer to STARTING FAN SPEED CONTROL (HA-136)
Yes
No
Check engine coolant temperature sensor control circuit.
Refer to EC section

Blower motor operation is normal.

Note: To avoid unnecessary servicce of heating system,
final perform TEMPERATURE SETTING TRIMMING.
Refer to "AUXILIARY MECHANISM", "Self-diagnosis"
TROUBLE DIAGNOSES

PRELIMINARY CHECK 6

Magnet clutch does not engage.
Perform Self-diagnosis STEP 1 before referring to the following flow chart.

CHECK SENSOR CIRCUIT
Set up Self-diagnosis STEP 2.
Is each sensor circuit normal?
Code No. 29 should be indicated on the display after approx. 5 seconds.

CHECK SENSOR CIRCUIT IN DETAIL ACCORDING TO THE DIAGNOSTIC PROCEDURE BELOW CORRESPONDING TO EACH CODE NO.

<table>
<thead>
<tr>
<th>Code No.</th>
<th>How to repair</th>
<th>Reference page</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>Go to Diagnostic Procedure 1.</td>
<td>HA-111</td>
</tr>
<tr>
<td>24</td>
<td>Go to Diagnostic Procedure 2.</td>
<td>HA-112</td>
</tr>
<tr>
<td>25</td>
<td>Go to Diagnostic Procedure 3.</td>
<td>HA-113</td>
</tr>
<tr>
<td>26</td>
<td>Go to Diagnostic Procedure 4.</td>
<td>HA-114</td>
</tr>
<tr>
<td>27</td>
<td>Go to Diagnostic Procedure 5.</td>
<td>HA-115</td>
</tr>
<tr>
<td>28</td>
<td>Go to Diagnostic Procedure 6.</td>
<td>HA-116</td>
</tr>
</tbody>
</table>

Are sensor circuits for ambient sensor and in-vehicle sensor operating normally? If malfunction is suspected, check temperature detected by each sensor using Self-diagnosis STEP 5. Confirm the temperature is within normal range before performing Diagnostic Procedures.

CHECK MAGNET CLUTCH OPERATION
Set up Self-diagnosis STEP 4.
Does magnet clutch operate according to each code No.?

<table>
<thead>
<tr>
<th>Code No.</th>
<th>How to repair</th>
<th>Reference page</th>
</tr>
</thead>
<tbody>
<tr>
<td>41</td>
<td>Check magnet clutch control system</td>
<td>HA-137</td>
</tr>
</tbody>
</table>

Magnet clutch control system is normal. Refer to MAGNET CLUTCH CONTROL. (HA-137)

CHECK REFRIGERANT
Connect manometer gauge, then check system pressure.

OK

CHECK AIR MIX DOOR MECHANISM
Refer to CONTROL LINKAGE ADJUSTMENT (HA-125)

Go to Diagnostic Procedure 10. (HA-122)

HA-98

PRELIMINARY CHECK 7

Discharged air temperature does not change.
Perform Self-diagnosis STEP 1 before referring to the following flow chart.

CHECK SENSOR CIRCUIT
Set up Self-diagnosis STEP 2.
Is each sensor circuit normal?
Code No. 29 should be indicated on the display after approx. 5 seconds later.

CHECK SENSOR CIRCUIT IN DETAIL ACCORDING TO THE DIAGNOSTIC PROCEDURE BELOW CORRESPONDING TO EACH CODE NO.

<table>
<thead>
<tr>
<th>Code No.</th>
<th>How to repair</th>
<th>Reference page</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>Go to Diagnostic Procedure 1.</td>
<td>HA-111</td>
</tr>
<tr>
<td>22</td>
<td>Go to Diagnostic Procedure 2.</td>
<td>HA-112</td>
</tr>
<tr>
<td>25</td>
<td>Go to Diagnostic Procedure 3.</td>
<td>HA-113</td>
</tr>
<tr>
<td>26</td>
<td>Go to Diagnostic Procedure 4.</td>
<td>HA-114</td>
</tr>
<tr>
<td>27</td>
<td>Go to Diagnostic Procedure 5.</td>
<td>HA-115</td>
</tr>
<tr>
<td>28</td>
<td>Go to Diagnostic Procedure 6.</td>
<td>HA-116</td>
</tr>
</tbody>
</table>

CHECK AIR MIX DOOR OPERATION
Set up Self-diagnosis STEP 4.
Does discharged air temperature change according to each code No.?

<table>
<thead>
<tr>
<th>Code No.</th>
<th>How to repair</th>
<th>Reference page</th>
</tr>
</thead>
<tbody>
<tr>
<td>41</td>
<td>Check air mix door control system</td>
<td>HA-133</td>
</tr>
</tbody>
</table>

Air mix door control system is normal. Refer to Air mix door control specification. (HA-133)

Check refrigerant leaks.

OK

CHECK AIR MIX DOOR MECHANISM
Refer to CONTROL LINKAGE ADJUSTMENT (HA-125)

Go to Diagnostic Procedure 7. (HA-118)

HA-99
TROUBLE DIAGNOSES

PRELIMINARY CHECK 8

Preliminary Check (Cont'd)

Noise

Check where noise comes from:

- Blower motor
- Compressor
- Expansion valve
- Refrigerant line
- Belt

Check for noise in all modes and temperature settings:

- Noise is constant:
  - Check blower motor for foreign particles.
  - Replace compressor clutch and pulley.
  - Replace expansion valve.
  - Replace compressor and liquid tank.

- Noise is intermittent:
  - Check air discharge ducts for obstructions, foreign materials, or air leaks.

Check the compressor clutch and pulley:

- The line is fixed directly to the body:
  - Fix the line with rubber or some vibration-absorbing material.

- The line is not fixed:
  - Fix the line lightly.

Check the belt vibrations:

- The belt vibrations are intense:
  - Readjust belt tension.
  - The pulley center does not match.
  - Redo the pulley center.

- Side of belt is worn out:
  - Replace compressor clutch and pulley.

Engine compartment

Harness Layout

- Cooling fan motor
- Thermal protector
- Exhaust pipe
- A/C drive compressor
- Engine mount
- Rear pressure switch

HA-100

HA-101
Main Power Supply and Ground Circuit Check
POWER SUPPLY CIRCUIT CHECK FOR AUTO A/C SYSTEM
Check power supply circuit for auto air conditioning system. Refer to "POWER SUPPLY ROUTING" in EL section and Wiring Diagram.

AUTO AMP. CHECK
Check power supply circuit for auto amp. with ignition switch on.
1. Disconnect auto amp. harness connector.
2. Connect voltmeter from harness side.
3. Measure voltage across terminal ①, ③ and body ground.

<table>
<thead>
<tr>
<th>Voltmeter terminal</th>
<th>Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>①, ③</td>
<td>Body ground</td>
</tr>
</tbody>
</table>

Check body ground circuit for auto amp. with ignition switch off.
1. Disconnect push control unit harness connector.
2. Connect ohmmeter from harness side.
3. Check for continuity between terminal ② and body ground.

<table>
<thead>
<tr>
<th>Ohmmeter terminal</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>②, ③</td>
<td>Body ground</td>
</tr>
</tbody>
</table>

Diagnostic Procedure 1
SYMPTOM: Ambient sensor circuit is open or shorted. (Q1) or ~Q2~ is indicated on display as a result of conducting self-diagnosis STEP 2.)

A
CHECK AMBIENT SENSOR CIRCUIT BETWEEN AMBIENT SENSOR AND AUTO AMP.
Disconnect ambient sensor harness connector.
Do approx. 5 volts exist between ambient sensor harness terminal ① and body ground?

Yes
Discontinue auto amp. harness connector.

No
Discontinue auto amp. harness connector.

B
Check circuit continuity between ambient sensor harness terminal ⑥ and auto amp. harness terminal ③.

Replace auto amp.

C
Check circuit continuity between ambient sensor harness terminal ⑦ and auto amp. harness terminal ③.

Replace ambient sensor.

Note:
If the result is NG after checking circuit continuity, repair harness or connector.
**Diagnostic Procedure 2**

**SYMPTOM:** In-vehicle sensor circuit is open or shorted. (2) or -25 is indicated on display as a result of conducting Self-diagnosis STEP 2.)

- **CHECK IN-VEHICLE SENSOR CIRCUIT BETWEEN IN-VEHICLE SENSOR AND AUTO AMP.**
  - Disconnect in-vehicle sensor harness connector.
  - Do approx. 5 volts exist between in-vehicle sensor harness terminal (2) and body ground?
    - **Yes:** Disconnect auto amp. harness connector.
    - **No:** Continue to the next step.

- **Check circuit continuity between in-vehicle sensor harness terminal (2) and auto amp. harness terminal (6).**
  - **OK:** Replace auto amp.
  - **NG:** Replace in-vehicle sensor. (Refer to Control System Input Components.)

**Note:** If the result is NG after checking circuit continuity, repair harness or connector.

---

**Diagnostic Procedure 3**

**SYMPTOM:** Sunload sensor circuit is open or shorted. (25) or -25 is indicated on display as a result of conducting Self-diagnosis STEP 2.)

- **CHECK SUNLOAD SENSOR CIRCUIT BETWEEN SUNLOAD SENSOR AND AUTO AMP.**
  - Disconnect sunload sensor harness connector.
  - Do approx. 5 volts exist between sunload sensor harness terminal (1) and body ground?
    - **Yes:** Disconnect auto amp. harness connector.
    - **No:** Continue to the next step.

- **Check circuit continuity between sunload sensor harness terminal (1) and auto amp. harness terminal (6).**
  - **OK:** Replace auto amp.
  - **NG:** Replace sunload sensor. (Refer to Control System Input Components.)

**Note:** If the result is NG after checking circuit continuity, repair harness or connector.
TROUBLE DIAGNOSIS

Diagnostic Procedure 4
SYMPTOM: PBR circuit is open or shorted. (26 or 26% is indicated on display as a result of conducting Self-diagnosis STEP 2.)

A. CHECK PBR CIRCUIT BETWEEN PBR AND AUTO AMP
   Disconnect air mix door motor harness connector.
   3. Approx. 5 volts exist between air mix door motor harness terminal 1 and body ground?

   Yes
   Disconnect auto amp harness connector.
   Replace auto amp.

   No
   Replace air mix door motor (PBR).

Note: If the result is NG after checking circuit continuity, repair harness or connector.

Diagnostic Procedure 5
SYMPTOM: Mode door motor does not operate normally.
- Perform Self-diagnosis STEPS 1 to 4 before referring to the following flow chart.

A. CHECK MODE DOOR MOTOR POSITION SWITCH
   2. Disconnect auto amp harness connector after turning ignition switch OFF.
   3. Check if continuity exists between terminal 52 or 53 of auto amp harness connector and body ground.
   4. Using above procedure, check for continuity in any other mode, as indicated in chart.

   Yes
   Disconnect mode door motor harness connector.

   No
   Reconnect auto amp harness connector.

B. CHECK BODY GROUND CIRCUIT FOR MODE DOOR MOTOR
   Does continuity exist between mode door motor harness terminals 52 and body ground?

   OK
   Reconnect auto amp harness connector.

   NG
   (Go to next page)

Note:
If the result is NG after checking circuit continuity, repair harness or connector.

HA-114

HA-115
TROUBLE DIAGNOSES

Diagnostic Procedure 5 (Cont'd)

CHECK MODE DOOR MOTOR POSITION SWITCH
Set up Self-diagnosis STEP 4.
Measure voltage across auto amp harness terminals and body ground.

<table>
<thead>
<tr>
<th>Terminal No.</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1</td>
<td>12V</td>
</tr>
<tr>
<td>B2</td>
<td>0V</td>
</tr>
<tr>
<td>B3</td>
<td>12V</td>
</tr>
<tr>
<td>B4</td>
<td>0V</td>
</tr>
</tbody>
</table>

Check circuit continuity between each terminal on auto amp and on mode door motor:

<table>
<thead>
<tr>
<th>Terminal No.</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1</td>
<td>12V</td>
</tr>
<tr>
<td>B2</td>
<td>0V</td>
</tr>
<tr>
<td>B3</td>
<td>12V</td>
</tr>
<tr>
<td>B4</td>
<td>0V</td>
</tr>
</tbody>
</table>

OK
Replace mode door motor.

CHECK FOR OUTPUT OF AUTO AMP
Do approx. 10.5 volts exist between auto amp harness terminals B1 and B4 when code No. is switched from "41" to "40" or when code No. is switched from "48" to "49"?

No
Replace auto amp.

Yes
Replace mode door motor.

Diagnostic Procedure 6
SYMPTOM: Intake door motor does not operate normally.
- Perform Self-diagnosis STEPS 1, 2 and 4 before referring to the flow chart.

CHECK BODY GROUND CIRCUIT FOR INTAKE DOOR MOTOR:
Disconnect intake door motor harness connector.
Does continuity exist between intake door motor harness terminal and body ground?

Yes
Check circuit continuity between each terminal on auto amp and intake door motor:

<table>
<thead>
<tr>
<th>Terminal No.</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1</td>
<td>12V</td>
</tr>
<tr>
<td>B2</td>
<td>0V</td>
</tr>
<tr>
<td>B3</td>
<td>12V</td>
</tr>
<tr>
<td>B4</td>
<td>0V</td>
</tr>
</tbody>
</table>

Checks continuity.

OK
Replace intake door motor.

Note:
If the result is NG after checking circuit continuity, repair harness or connector.
**Diagnostic Procedure 7**

**SYMPTOM:** Air mix door motor does not operate normally.

- Perform Self-diagnosis STEPS 1, 2, and 4 before referring to the following flow chart.

**A**

*IS PIIR OPERATING NORMALLY?*

Refer to Self-diagnoses STEP 2.

**CHECK PIIR CIRCUIT**

Go to Diagnostic Procedure 4 (HA-114)

**CHECK FOR OUTPUT OF AUTO AMP**

Set up Self-diagnosis STEP 4.

Do approx. 19.5 volts exist between air mix door motor harness terminals ③ and ④ when code No. 1 is switched from "42" to "43" or when code No. 1 is switched from "45" to "41"?

If **YES**

- Replace air mix door motor.

If **NO**

**DISCONNECT AUTO AMP AND AIR MIX DOOR MOTOR HARNESS CONNECTOR.**

**CHECK CIRCUIT CONTINUITY BETWEEN AUTO AMP, HARNESS TERMINAL NO. 7 (③) AND AIR MIX DOOR MOTOR HARNESS TERMINAL NO. 8 (④).**

**OK**

Replace auto amp.

**Note:**

If the result is NG after checking circuit continuity, repair harness or connector.

---

**Diagnostic Procedure 8**

**SYMPTOM:** Bi-level (B/L) door motor does not operate normally.

- Perform Self-diagnosis STEP 4 before referring to the following flow chart.

**A**

**CHECK FOR AUTO AMP OUTPUT**

Set up Self-diagnosis STEP 4.

Do approx. 12 volts exist between B/L door motor harness terminals ② and ④ when code No. 1 is switched from "42" to "43" or when code No. 1 is switched from "45" to "41"?

If **YES**

Replace B/L door motor.

If **NO**

**DISCONNECT AUTO AMP, HARNESS CONNECTOR.**

**CHECK CIRCUIT CONTINUITY BETWEEN AUTO AMP, HARNESS TERMINAL NO. 1 (①) AND BI-LEVEL DOOR MOTOR HARNESS TERMINAL NO. 6 (④).**

Replace auto amp.

**Note:**

If the result is NG after checking circuit continuity, repair harness or connector.
Diagnostic Procedure 9

SYMPTOM: Blower motor operation is malfunctioning under out of Staring Fan Speed Control.
- Perform Preliminary Check 5 before referring to the following flow chart.

A. CHECK POWER SUPPLY FOR FAN CONTROL AMP.
   Disconnect fan control amp. harness connector.
   Do approx. 12 volts exist between fan control amp. harness terminal ① and body ground?  
   Yes  → No
   → Check continuity between auto amp harness terminal ⑤ and fan control harness terminal ⑨? 
   Yes  → Replace auto amp. 
   → Check 15A fuses at fuse block. (Refer to "POWER SUPPLY ROUTING" in EL section and Wiring Diagram.)

B. CHECK BODY GROUND CIRCUIT FOR FAN CONTROL AMP.
   Does continuity exist between fan control amp. harness terminal ⑧ and body ground?
   Yes  → No
   → Reconnect fan control amp. harness connector.

C. CHECK FOR OUTPUT OF AUTO AMP.
   Set up Set-diagnosis STEP 4, Measure voltage across fan control amp. harness terminal ① and body ground.
   Code No.  | Terminal No. | Voltage | Approx.
   ②  | ①  | Body ground | 2 - 3V

D. CHECK BLOWER MOTOR
   (Refer to Electrical Components Inspection) (HA-66)
   NG  → Replace blower motor
   → OK
   → Replace fan control amp.

Note:
- If the result is NG after checking circuit continuity, repair harness or connector.
TROUBLE DIAGNOSES

Diagnostic Procedure 10

SYMPTOM: Magnet clutch does not engage after performing Preliminary Check 6.

Perform Preliminary Check 6 before referring to the flow chart.

1. CHECK POWER SUPPLY FOR THERMAL PROTECTOR
   - Disconnect thermal protector harness connector
   - Set up code No. 41 in Self-diagnosis STEP 4
   - Do approx. 12 volts exist between thermal protector harness terminal (3) and body ground?
   - Disconnect compressor harness connector
   - Check circuit continuity between A/C relay harness terminal (2) and thermal protector harness terminal (3)
   - OK
   - NG

2. CHECK THERMAL PROTECTOR
   - Refer to Electrical Components Inspection [HA-70]
   - Check magnet clutch coil continuity.
   - NG
   - Replace magnet clutch assembly. Refer to HA-146.

3. Disconnect ignition switch OFF to cancel Self-diagnosis STEP 4.

4. CHECK POWER SUPPLY FOR A/C RELAY
   - Disconnect A/C relay
   - Do approx. 12 volts exist between A/C relay harness terminal (3) and body ground?
   - (Go to next page)

Note:
If the result is NG after checking circuit continuity, repair harness or connector.

HA-122
**MODE DOOR**

1. Install mode door motor on heater unit and connect it to main harness.
2. Set up code No. 45 in Self-diagnosis STEP 4.
3. Make sure mode door operates properly when changing from code No. 45 to 46 by pushing DEF switch.

<table>
<thead>
<tr>
<th>41</th>
<th>42</th>
<th>43</th>
<th>44</th>
<th>45</th>
<th>46</th>
</tr>
</thead>
<tbody>
<tr>
<td>VENT</td>
<td>B/L</td>
<td>B/L</td>
<td>FOOT</td>
<td>FID</td>
<td>DEF</td>
</tr>
</tbody>
</table>

**AIR MIX DOOR**

1. Install air mix door motor on heater unit and connect it to main harness.
2. Set up code No. 41 in Self-diagnosis STEP 4.
3. Move air mix door lever by hand and hold it in full cold position.
4. Attach air mix door lever to rod holder.
5. Make sure air mix door operates properly when changing from code No. 41 to 46 by pushing DEF switch.

<table>
<thead>
<tr>
<th>41</th>
<th>42</th>
<th>43</th>
<th>44</th>
<th>45</th>
<th>46</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full cold</td>
<td>Full hot</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Trouble Diagnoses**

**Control Linkage Adjustment (Cont’d)**

**Intake Door**

1. Install intake door motor on intake unit and connect it to main harness. Make sure lever of intake door motor is fitted in the slit of intake door link.
2. Set up code No. 41 in self-diagnosis STEP 4.
3. Make sure intake door operates properly when changing from code No. 41 to 46 by pushing DEF switch.

<table>
<thead>
<tr>
<th>41</th>
<th>42</th>
<th>43</th>
<th>44</th>
<th>45</th>
<th>46</th>
</tr>
</thead>
<tbody>
<tr>
<td>REC</td>
<td>20% PRE</td>
<td>PRE</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Bi-Level Door**

1. Install bi-level door motor on cooling unit and connect it to main harness. Make sure lever of bi-level door motor is fitted in the slit of bi-level door link.
2. Set up code No. 46 in self-diagnosis STEP 4.
3. Make sure bi-level door operates properly when changing from code No. 46 to 41 by pushing DEF switch.

<table>
<thead>
<tr>
<th>41</th>
<th>42</th>
<th>43</th>
<th>44</th>
<th>45</th>
<th>46</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPEN</td>
<td>PRE</td>
<td>CLOSE</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**System Description**

**Overview of Control System**

The control system consists of a) input sensors and switches, b) the auto amp. (microcomputer), and c) outputs. The relationship of these components is shown in the diagram below.
Control System Input Components

POTENTIO TEMPERATURE CONTROL (PTC)
The PTC is built into the auto amp. It can be set at an interval of 1°C (1°F) through both HOT (1) and COLD (2) control switches. Setting temperature is digitally displayed.

IN-VEHICLE SENSOR
The in-vehicle sensor is attached to cluster lid A. It converts variations in temperature of compartment air drawn from an aspirator into a resistance value. It is then input into the auto amp.

After disconnecting in-vehicle sensor harness connector, measure resistance between terminals ① and ② at sensor harness side, using the table below:

<table>
<thead>
<tr>
<th>Temperature °C (°F)</th>
<th>Resistance kΩ</th>
</tr>
</thead>
<tbody>
<tr>
<td>-15 (5)</td>
<td>12.7</td>
</tr>
<tr>
<td>-10 (14)</td>
<td>9.02</td>
</tr>
<tr>
<td>-5 (23)</td>
<td>7.80</td>
</tr>
<tr>
<td>0 (32)</td>
<td>6.19</td>
</tr>
<tr>
<td>5 (41)</td>
<td>4.96</td>
</tr>
<tr>
<td>10 (50)</td>
<td>3.96</td>
</tr>
<tr>
<td>15 (59)</td>
<td>3.24</td>
</tr>
<tr>
<td>20 (68)</td>
<td>2.55</td>
</tr>
<tr>
<td>25 (77)</td>
<td>2.19</td>
</tr>
<tr>
<td>30 (86)</td>
<td>1.81</td>
</tr>
<tr>
<td>35 (95)</td>
<td>1.51</td>
</tr>
<tr>
<td>40 (104)</td>
<td>1.27</td>
</tr>
<tr>
<td>45 (113)</td>
<td>1.07</td>
</tr>
</tbody>
</table>

ASPIRATOR
The aspirator is located on heater unit. It produces vacuum pressure due to air discharged from the heater unit, continuously taking compartment air in the aspirator.

SUNLOAD SENSOR
The sunload sensor is located on the LH defroster grille. It detects sunload entering through windshield by means of a photo diode and converts it into a current value which is then input to the auto amp.

Measure voltage between terminals (①) and (②) at vehicle harness side, using the table below:

<table>
<thead>
<tr>
<th>Input current mA</th>
<th>Output voltage V</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>0.05</td>
<td>4.2</td>
</tr>
<tr>
<td>0.1</td>
<td>3.4</td>
</tr>
<tr>
<td>0.15</td>
<td>2.8</td>
</tr>
<tr>
<td>0.2</td>
<td>1.8</td>
</tr>
<tr>
<td>0.25</td>
<td>1.0</td>
</tr>
</tbody>
</table>

- When checking sunload sensor, select a place where sun shines directly on it.
Control System Automatic Amplifier (Auto amp.)
The auto amplifier has a built-in microcomputer which processes information sent from various sensors needed for air conditioning operation. The air mix door motor, mode door motor, intake door motor, bi-level door motor, blower motor, and compressor are then controlled. The auto amp is utilized with control mechanisms. Signals from various switches are directly entered into auto amplifier. Self-diagnostic functions are also built into auto amp to provide quick check of malfunctions in the auto air conditioning system.

Ambient Temperature Input Process
The auto amp. includes a “processing circuit” for the ambient sensor input. When the ambient temperature increases quickly, the processing circuit controls the input from the ambient sensor. It allows the auto amp. to recognize the increase of temperature only 0.2°C (0.4°F) per 60 seconds. As an example, consider stopping for a cup of coffee after high speed driving. Even though the ambient temperature has not changed, the ambient sensor will detect the increase of temperature. The heat radiated from the engine compartment can radiate to the front grill area. The ambient sensor is located there.

Sunload Input Process
The auto amp. also includes a processing circuit which “average” the variations in detected sunload over a period of time. This prevents drastic swings in the ATC system operation due to small or quick variations in detected sunload. For example, consider driving along a road bordered by an occasional group of large trees. The sunload detected by the sunload sensor will vary whenever the trees obstruct the sunlight. The processing circuit averages the detected sunload over a period of time. As a result, the effect the above mentioned does not cause any change in the ATC system operation. On the other hand, shortly after entering a long tunnel, the system will recognize the change in sunload, and the system will react accordingly.

Control System Output Components
Air Mix Door Control (Automatic temperature control)
System operation
Temperature set by Potenti Temperature Control (PTC) is compensated through setting temperature correction circuit to determine target temperature. Auto amp. will operate air mix door motor to set air conditioning system in HOT or COLD position depending upon relationship between conditions (target temperature, sunload, in-vehicle temperature, and ambient temperature) and conditions (air mix door position and compressor operation).

Air Mix Door Control Specification
Example 1
- Temperature setting is set at 25°C (77°F) under no sunload condition when ambient in-vehicle temperature are 35°C (95°F).
- Sunload input 0.718 W/0.05 sq/m (25W/0.5 sq ft) (0.273 kW/6.5 sq ft) (253 BTU/sq ft)

AIR MIX DOOR MOTOR
The air mix door motor is attached to the bottom of the heater unit. It rotates so that the air mix door is opened to a position set by the auto amp. Motor rotation is then conveyed through a shaft and air mix door position is then fed back to the auto amp. by PBR built-in air mix door motor.
SYSTEM DESCRIPTION

Control System Output Components (Cont'd)

Air mix door operation

<table>
<thead>
<tr>
<th>3</th>
<th>5</th>
<th>Air mix door operation</th>
<th>Direction of lever movement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Θ</td>
<td>Θ</td>
<td>COLD + HOT</td>
<td>Clockwise (Towards passen</td>
</tr>
<tr>
<td></td>
<td></td>
<td>STOP</td>
<td>ger compartiment)</td>
</tr>
<tr>
<td>Θ</td>
<td>Θ</td>
<td>HOT + COLD</td>
<td>Counterclockwise (Towards</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>engine compartiment)</td>
</tr>
</tbody>
</table>

PBR characteristics

Measure voltage between terminals 4 and 5 at vehicle harness side.

MODE DOOR CONTROL

Component parts

Mode door control system components are:
1) Auto amp.
2) Mode door motor
3) PBR
4) In-vehicle sensor
5) Ambient sensor
6) Sunload sensor

System operation

The auto amp computes the air discharge conditions according to the ambient temperature and the in-vehicle temperature. The computed discharge conditions are then corrected for sunload. By this correction, it is determined through which outlets air will flow into the passenger compartment.

CONTROL SYSTEM OUTPUT COMPONENTS (Cont'd)

Mode door control specification

- Condition: PTC 25°C (77°F)
  - Without sunload
  - With sunload: 0.75PS (550Watt), 2.15ETU/min³

- Ambient temperature °C (°F)

- In-vehicle temperature °C (°F)

Example:
1) If temperature setting is set at 25°C (77°F) under no sunload condition when ambient and in-vehicle temperature are 30°C (86°F)
2) If temperature setting is set at 25°C (77°F) under no sunload condition when ambient temperature is 20°C (68°F) and in-vehicle temperature is 23°C (73°F), mode door is set automatically at H, position.

MODE DOOR MOTOR

The mode door motor is attached to the heater unit. It rotates so that air is discharged from the outlet set by the auto amp. Motor rotation is conveyed to a link which activates the mode door.

<table>
<thead>
<tr>
<th>7</th>
<th>8</th>
<th>Mode door operation</th>
<th>Direction of side link rotation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Θ</td>
<td>Θ</td>
<td>VENT → DEF</td>
<td>Clockwise</td>
</tr>
<tr>
<td></td>
<td></td>
<td>STOP</td>
<td></td>
</tr>
<tr>
<td>Θ</td>
<td>Θ</td>
<td>DEF → VENT</td>
<td></td>
</tr>
</tbody>
</table>
SYSTEM DESCRIPTION

INTAKE DOOR CONTROL

Components parts
Intake door control system components are:
1) Auto amp.
2) Intake door motor
3) PBR
4) In-vehicle sensor
5) Ambient sensor
6) Sunload sensor

System operation
The intake door control determines intake door position based on the ambient temperature and the in-vehicle temperature. When the DEF button is pushed, the auto amp. sets the intake door at the "Fresh" position.

FAN SPEED CONTROL

Component parts
Fan speed control system components are:
1) Auto amp.
2) Fan control amplifier
3) PBR

System operation
SYSTEM DESCRIPTION

AUTOMATIC MODE
In the automatic mode, the blower motor speed is calculated by the auto amp. based on inputs from the PBR, in-vehicle sensor, sunload sensor, and ambient sensor. The blower motor applied voltage ranges from approximately 4 volts (lowest speed) to 12 volts (highest speed). To control blower speed (in the range of 2V to 3V), the auto amp. supplies a signal to the fan control amplifier. Based on this signal, the fan control amplifier controls the current flow from the blower motor to ground.

STARTING FAN SPEED CONTROL
Start up from "COLD SOAK" condition (Automatic mode)
In a cold start up condition where the engine coolant temperature is below 50°C (122°F) and mode door position is BI-LEVEL, F/D or FOOT, the blower will not operate for a short period of time (up to 150 seconds). The exact start delay time varies depending on the ambient and in-vehicle temperature. In the most extreme case (very low ambient) the blower starting delay will be 150 seconds. After this delay, the blower will operate at low speed until the engine coolant temperature rises above 50°C (122°F). Then the blower speed will increase to the objective speed.

Start up from normal or "HOT SOAK" condition (Automatic mode)
The blower will begin operation momentarily after the AUTO switch is pushed. The blower speed will gradually rise to the objective speed over a time period of 6 seconds or less (actual time depends on the objective blower speed). If the in-vehicle temperature is 35°C (95°F) or more, the blower will operate for 3 seconds after AUTO switch is pushed.

BLOWER SPEED COMPENSATION
Sunload
When the in-vehicle temperature and the set temperature are very close, the blower will operate at low speed. With the mode door in the VENT position, the low speed varies depending on the sunload. During conditions of high sunload, the blower low speed will rise (approx. 6.0V). During lesser sunload conditions, the low speed will drop to "normal" low speed (approx. 6.0V).

Fan speed control specification

![Fan speed control diagram]

- **Condition:**
  - F/T: 25°C (77°F)
  - Without sunload
  - With sunload: 0.758 kW (1.06 hp), 2.799 BTU/min/W

- **Example:**
  - (55) 32

- **Example:**
  - (30) 20

- **Example:**
  - (15) 10

- **Example:**
  - (5) 0

- **In-vehicle temperature:**
  - 5°C (41°F)

- **Ambient temperature:**
  - 35°C (95°F)

- **Voltage (V):**
  - 15, 20, 25, 30, 35, 40, 45

- **In-vehicle temperature:**
  - 5°C (41°F)

- **Example notes:**
  1. If temperature setting is set at 25°C (77°F), under no sunload condition when ambient and in-vehicle temperature are 35°C (95°F), blower motor voltage is approx. 7 volts.
  2. When ambient temperature is 30°C (86°F) and in-vehicle temperature is reduced to 25°C (77°F), under the same condition, blower motor voltage is approx. 8 volts.

MAGNET CLUTCH CONTROL
The ECM (ECCS control module) controls compressor operation using inputs from the throttle position sensor and auto amplifier.

Acceleration cut control
The ECM (ECCS control module) will turn off the compressor "ON" or "OFF" based on the signal from the throttle position sensor.

HA-136

HFC-134a (R-134a) Service Procedure

**WARNING:**
Avoid breathing A/C refrigerant and lubricant vapor or mist. Exposure may irritate eyes, nose and throat. Remove HFC-134a (R-134a) from A/C system using certified service equipment meeting requirements of HFC-134a (R-134a) recycling equipment or HFC-134a (R-134a) recovery equipment. If accidental system discharge occurs, ventilate work area before resuming service. Additional health and safety information may be obtained from refrigerant and lubricant manufacturers.

**DISCHARGING REFRIGERANT**

**SETTING OF SERVICE TOOLS AND EQUIPMENT**

**EVACUATING SYSTEM AND CHARGING REFRIGERANT**

**Note:** *1* Before charging refrigerant, ensure engine is off.

* *2* Before checking for leaks, start engine to activate air conditioning system then turn it off. Service valve caps must be attached to valves (to prevent leakage).
Maintenance of Lubricant Quantity in Compressor

The lubricant used to lubricate the compressor circulates through the system with the refrigerant. Add lubricant to compressor when replacing any component or after a large gas leakage occurred. It is important to maintain the specified amount.

If lubricant quantity is not maintained properly, the following malfunctions may result:
- Lack of lubricant: May lead to a seized compressor
- Excessive lubricant: Inadequate cooling (thermal exchange interference)

LUBRICANT
Name: Nissan A/C System Oil Type R
Part number: KL800-PAGR0

CHECKING AND ADJUSTING
Adjust the lubricant quantity according to the flowchart shown below.

<table>
<thead>
<tr>
<th>Can oil return operation be performed?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
</tr>
</tbody>
</table>

No => Should the compressor be replaced?
No => Is there any part to be replaced?
(Ex: condenser, liquid tank or in case there is evidence of a large amount of lubricant leakage)
Yes => Carry out the A/C performance test.

Start

Perform oil return operation, proceeding as follows:

1. Start engine, and set the following conditions:
   - Cooling on
   - Temp. control: Manual
   - Fan speed: High
   - A/C or AUTO switch: ON

2. Next item is for V-5 or V-6 compressor. Connect the manifold gauges, and check that the high pressure side pressure is 500 kPa (72 psi) or higher.

3. Perform lubricant return operation for about 10 minutes.

4. Stop engine.

CAUTION:
If excessive oil leakage is noted, do not perform the oil return operation.

After replacing any of the following major components, add the correct amount of lubricant to the system.

<table>
<thead>
<tr>
<th>Component</th>
<th>Amount of lubricant to be added</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compressor</td>
<td>40 mL (1.5 fl oz)</td>
</tr>
<tr>
<td>Condenser</td>
<td>30 mL (1.0 fl oz)</td>
</tr>
<tr>
<td>Cylinders</td>
<td>10 mL (0.35 fl oz)</td>
</tr>
<tr>
<td>Rotor</td>
<td>30 mL (1.0 fl oz)</td>
</tr>
</tbody>
</table>

Add an additional 15 mL (0.52 fl oz) of new oil when replacing the liquid tank.
Compressor Mounting

Belt Tension
- Refer to MA section ("Checking Drive Belts", "ENGINE MAINTENANCE").

Fast Idle Control Device (FICD)
- Refer to EC section ("IACV-FICD SOLENOID VALVE", "TROUBLE DIAGNOSES").
COMPRESSOR CLUTCH

Removal
- When removing center bolt, hold clutch disc with clutch disc wrench.

- Using clutch disc puller clutch disc can be removed easily.

Inspection

Clutch disc
If the contact surface shows signs of damage due to excessive heat, the clutch disc 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 clutch disc should be replaced. The contact surfaces of the pulley assembly should be cleaned with a suitable solvent before reinstallation.

Coil
Check coil for loose connection or cracked insulation.

Installation
- Position coil assembly on compressor body. Be sure that the electrical terminals are reassembled in the original position. Install and tighten coil mounting screws evenly.

Adjustment
- Select adjusting shim(s) which give(s) the correct clearance between pulley and clutch disc.
- Using a plastic mallet, tape clutch disc in place on drive shaft.
- Do not use excessive force with a plastic mallet or in a press, or internal damages may result.
- Place spring washer and center bolt onto drive shaft. Tighten center bolt to drive clutch wheel onto drive shaft.

- Check clearance around the entire periphery of clutch disc.
  Disc-to-pulley clearance:
  0.3 - 0.6 mm (0.012 - 0.024 in)
  If the specified clearance is not obtained, replace adjusting spacer and readjust.

Break-in operation
When replacing compressor clutch assembly, always conduct the break-in operation. This is done by engaging and disengaging the clutch about thirty times. Break-in operation raises the level of transmitted torque.

THERMAL PROTECTOR

Inspection
- When servicing, do not allow foreign material to get into compressor.
- Check continuity between two terminals.
Overhaul — Push Control Unit Assembly

**Disassembly**

1. Remove switch knobs.
   Be careful not to scratch knobs during removal.

2. Remove fan switch knob.

### General Specifications

<table>
<thead>
<tr>
<th>Component</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>COMPRESSOR</strong></td>
<td></td>
</tr>
<tr>
<td>Model</td>
<td>DKY-14C</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 Type</td>
</tr>
<tr>
<td><strong>LUBRICATION OIL</strong></td>
<td></td>
</tr>
<tr>
<td>Model</td>
<td>ZEXEL make DKY-14C</td>
</tr>
<tr>
<td>Name</td>
<td>Nissan A/C System Oil Type R</td>
</tr>
<tr>
<td>Part No</td>
<td>KLI800-RA6190</td>
</tr>
<tr>
<td>Capacity</td>
<td>15 [lbf·ft, lbf·in]</td>
</tr>
<tr>
<td>Total in system</td>
<td>200 (7.0)</td>
</tr>
<tr>
<td>Compressor (Service part) charging amount</td>
<td>200 (7.0)</td>
</tr>
<tr>
<td><strong>REFRIGERANT</strong></td>
<td></td>
</tr>
<tr>
<td>Type</td>
<td>R134a (R-134a)</td>
</tr>
<tr>
<td>Capacity</td>
<td>0.10 - 0.49 (1.54 - 1.78)</td>
</tr>
<tr>
<td>R134a model</td>
<td>0.10 - 0.49 (1.54 - 1.78)</td>
</tr>
<tr>
<td>R134b model</td>
<td>0.69 - 0.70 (1.54 - 1.78)</td>
</tr>
</tbody>
</table>

### Inspection and Adjustment

**ENGINE IDLING SPEED**
When A/C is ON
- Refer to EC section ("Inspection and Adjustments", "SERVICE DATA AND SPECIFICATIONS").

**BELT TENSION**
- Refer to MA section ("Checking Drive Belts", "ENGINE MAINTENANCE").

---

RHA45BE

Small flat-headed screwdriver

Small flat-headed screwdriver

Switch knob

Clock

Flat-headed screwdriver

Control unit
When you read wiring diagrams:
- Read G1 section, "HOW TO READ WIRING DIAGRAMS".
- When you perform trouble diagnoses, read G1 section, "HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES" and "HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT".

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WIRING DIAGRAM REFERENCE CHART

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A/C CONTROL ............................................................ AT SECTION
AUTOLOCK BRAKING SYSTEM .................................. BR SECTION
DIFFERENTIAL OIL COOLER ........................................ PD SECTION
AIR BAG AND SEAT BELT PRE-TENSIONER .............. PS SECTION
HEATER AND AIR CONDITIONER .................................. HA SECTION
Supplemental Restraint System "AIR BAG" and "SEAT BELT PRE-TENSIONER"

The Supplemental Restraint System "Air Bag" and "Seat Belt Pre-tensioner", used along with a seat belt, help to reduce the risk or severity of injury to the driver and front passenger in a frontal collision. The Supplemental Restraint System consists of air bag modules (located in the center of the steering wheel and on the instrument panel on the passenger side), seat belt pre-tensioners, a diagnostic connector unit, warning lamp, wiring harness and spiral cable. Information necessary to service the system safely is included in the RS section of this Service Manual.

**WARNING:**
- To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN dealer.
- Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.
- All SRS electrical wiring harnesses and connectors are covered with yellow outer insulation. Do not use electrical test equipment on any circuit related to the SRS SYSTEM.

**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.

**Description**

**[Example]**

- [Diagram of harness connector and terminal retainer]
- [Diagram of terminal retainer]
- [Diagram of packing (waterproof type) and terminal retainer]
- [Diagram of terminal retainer (for combination meter)]
- [Diagram of terminal retainer (for relay)]
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>NORMAL OPEN RELAY</th>
<th>NORMAL CLOSED RELAY</th>
<th>MIXED TYPE RELAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>SW 1 OFF</td>
<td>SW 1 BATTERY</td>
<td>SW 1 BATTERY</td>
</tr>
<tr>
<td></td>
<td>SW 1 BATTERY</td>
<td></td>
</tr>
</tbody>
</table>

FLOW:
Does not flow.

FLOW:
Does not flow.

FLOW:
Does not flow.

Type of Standardized Relays

1M 1 Make
2M 2 Make
1T 1 Transfer
1M-1B 1 Make 1 Break

The arrangement of terminal numbers on the actual relays may differ from those shown above.
POWER SUPPLY ROUTING
Wiring Diagram — POWER — (Cont'd)

EL-POWER-09

Fuse
- If fuse is blown, be sure to eliminate cause of problem before installing new fuse.
- Use fuse of specified rating. Never use fuse of more than specified rating.
- Do not partially install fuse; always insert it into fuse holder properly.
- Remove fuse for clock if vehicle is not used for a long period of time.

Fusible Link
A melted fusible link can be detected either by visual inspection or by feeling with finger tip. If its condition is questionable, use circuit tester or test lamp.
CAUTION:
- If fusible link should melt, it is possible that critical circuit (power supply or large current carrying circuit) is shorted. In such a case, carefully check and eliminate cause of problem.
- Never wrap outside of fusible link with vinyl tape. Important: Never let fusible link touch any other wiring harness, vinyl or rubber parts.

Circuit Breaker
For example, when current is 30A, the circuit is broken within 8 to 20 seconds.
Circuit breakers are used in the following systems:
- Power window
- Power door lock
- Power sun roof
- Multi-remote control
- Theft warning
- Warning buzzer
- Rear window defogger and mirror defogger
BATTERY

CAUTION:
- If it becomes necessary to start the engine with a booster battery and jumper cables, use a 12-volt booster battery.
- After connecting battery cables, ensure that they are tightly clamped to battery terminals for good contact.
- Never add distilled water through the hole used to check specific gravity.

How to Handle Battery

METHODS OF PREVENTING OVER-DISCHARGE
The following precautions must be taken to prevent over-discharging a battery.
- The battery surface (particularly its top) should always be kept clean and dry.
- The terminal connections should be clean and tight.
- At every routine maintenance, check the electrolyte level.

- When the vehicle is 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.

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.

SULPHATION
A battery will be completely discharged if it is left unattended for a long time and the specific gravity becomes less than 1.100. This may result in sulphation on the cell plates.
To find if a discharged battery has been sulphated, pay attention to its voltage and current when charging it.
As shown in the figure at left, if the battery has been "sulphated", less current and higher voltage may be observed in the initial stage of charging.

SPECIFIC GRAVITY CHECK
1. Read hydrometer and thermometer indications at eye level.

- When electrolyte level is too low, tilt battery case to raise it for easy measurement.
**BATTERY**

How to Handle Battery (Cont'd)

2. Convert into specific gravity at 20°C (68°F).

Example:
- When electrolyte temperature is 35°C (95°F) and specific gravity of electrolyte is 1.240, 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 1.190.

**Battery Test and Charging Chart**

- **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 OK.
- **Checking Specific Gravity**
  - Refer to "Specific Gravity Check".
- **Below 1.100**
  - SLOW CHARGE
    - Refer to "A: Slow Charge"
  - STANDARD CHARGE
    - Refer to "B: Standard Charge"
  - QUICK CHARGE
    - Refer to "C: Quick Charge"
- **1.100 - 1.220**
- **Above 1.220**
  - CAPACITY TEST
    - Refer to "Chart II."

**Capacity Test**

- **Ready for use**
  - Mount battery again and check lead terminals. Also check other related circuits.
- **NG**
  - Replace battery.

**Quick Charge**

- **OK**
  - Time required 45 min.
- **NG**
  - Replace battery.

**Recharge**

- **OK**
  - Replace battery.
- **NG**
  - Replace battery.

*"STANDARD CHARGE" is recommended if the vehicle is in storage after charging.*
### BATTERY

**Battery Test and Charging Chart (Cont'd)**

- Check battery type and determine the specified current using the following table:

Fig 1 DISCHARGING CURRENT

<table>
<thead>
<tr>
<th>Type</th>
<th>Current (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25018NR(L)</td>
<td>90</td>
</tr>
<tr>
<td>34018NL(L)</td>
<td>88</td>
</tr>
<tr>
<td>46024NL(L)</td>
<td>125</td>
</tr>
<tr>
<td>55024NL(L)</td>
<td>155</td>
</tr>
<tr>
<td>50023NL(L)</td>
<td>150</td>
</tr>
<tr>
<td>55023NL(L)</td>
<td>150</td>
</tr>
<tr>
<td>65032NL(L)</td>
<td>195</td>
</tr>
<tr>
<td>80032NL(L)</td>
<td>195</td>
</tr>
<tr>
<td>75031NL(L)</td>
<td>210</td>
</tr>
<tr>
<td>90031NL(L)</td>
<td>240</td>
</tr>
<tr>
<td>115031NL(L)</td>
<td>240</td>
</tr>
<tr>
<td>90E41NL(L)</td>
<td>300</td>
</tr>
<tr>
<td>130E41NL(L)</td>
<td>330</td>
</tr>
</tbody>
</table>

### A. SLOW CHARGE

- Determine initial charging current from specific gravity referring to Fig. 2.

- Charge battery:
  - Check charging voltage 30 minutes after starting the battery charge.

- Continue to charge for 12 hours.

- Conduct additional charge as per Fig. 3, if necessary.

### CAUTION:
- Set charging current to value specified in Fig. 2. If charger is not capable of producing specified current value, set its charging current as close to that value as possible.
- Keep battery away from open flame while it is being charged.
- When connecting charger, connect leads first, then turn on charger. Do not turn on charger first, as this may cause a spark.
- If battery temperature rises above 60°C (140°F), stop charging. Always charge battery when its temperature is below 60°C (140°F).
**Battery Test and Charging Chart (Cont’d)**

**CONVERTED SPECIFIC GRAVITY**
- 1.100 - 1.130: 4.0 (A), 5.0 (A), 6.0 (A), 7.0 (A), 8.0 (A), 9.0 (A), 10.0 (A)
- 1.130 - 1.150: 3.0 (A), 4.0 (A), 5.0 (A), 6.0 (A), 7.0 (A), 8.0 (A), 9.0 (A)
- 1.150 - 1.200: 2.0 (A), 3.0 (A), 4.0 (A), 5.0 (A), 6.0 (A), 7.0 (A), 8.0 (A)
- 1.200 - 1.250: 1.0 (A), 2.0 (A), 3.0 (A), 4.0 (A), 5.0 (A), 6.0 (A)
- 1.250 - 1.300: 0.0 (A), 1.0 (A), 2.0 (A), 3.0 (A), 4.0 (A)

**BATTERY TYPE**
- 3S6/21P/L (3600 mAh) 4S6/21P/L (4800 mAh) 5S6/21P/L (6000 mAh) 6S6/21P/L (7200 mAh) 7S6/21P/L (8400 mAh) 8S6/21P/L (9600 mAh)
- 3S12/1P/L (1200 mAh) 4S12/1P/L (2400 mAh) 5S12/1P/L (3600 mAh) 6S12/1P/L (4800 mAh) 7S12/1P/L (6000 mAh) 8S12/1P/L (7200 mAh) 9S12/1P/L (8400 mAh)

**CAUTION:**
- Do not use quick charge method on a battery whose specific gravity is less than 1.190.
- Set initial charging current to value specified in Fig. 6. If charger is not capable of producing specified current value, set its charging current as close to that value as possible.
- Keep battery away from open flame while it is being charged.
- When connecting charger, connect leads first, then turn on charger. Do not turn on charger first, as this may cause a spark.
- Be careful of a rise in battery temperature because a large current flow is required during quick-charge operation.
- If battery temperature rises above 60°C (140°F), stop charging. Always charge battery when its temperature is below 60°C (140°F).

**Service Data and Specifications (SDS)**

<table>
<thead>
<tr>
<th>Applied model</th>
<th>For Europe</th>
<th>Exept for Europe</th>
<th>Optional on LHD models for Europe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>5S025P</td>
<td>6S026R</td>
<td>8S026R</td>
</tr>
<tr>
<td>Capacity</td>
<td>12 - 85</td>
<td>12 - 85</td>
<td>12 - 65</td>
</tr>
</tbody>
</table>
STARTING SYSTEM

System Description

M/T MODELS
Power is supplied at all times
- to ignition switch terminal ①
- through 30A fuse link (Refer ②, located in the fuse link and fuse box).
For models with theft warning system
Power is supplied at all times
- through 7.5A fuse (No ③, located in the fuse block)
- to theft warning relay terminal ④.
With the ignition switch in the START position, power is supplied
- from ignition switch terminal ⑤
- to theft warning relay terminal ⑥.
If the theft warning system is triggered, terminal ⑦ of the theft warning relay is grounded and power to the starter motor is interrupted.
When the theft warning system is not operating, power is supplied
- through theft warning relay terminal ⑧
- to terminal ⑨ of the starter motor windings.
For models without theft warning system
With the ignition switch in the START position, power is supplied
- from ignition switch terminal ⑩
- directly to terminal ⑪ of the starter motor windings.
The starter motor plunger closes and provides a closed circuit between the battery and the starter motor.
The starter motor is grounded to the engine block. With power and ground supplied, cranking occurs and the engine starts.

A/T MODELS
Power is supplied at all times
- to ignition switch terminal ⑪
- through 30A fuse link (Refer ⑫, located in the fuse link and fuse box).
For models with theft warning system
Power is supplied at all times
- through 7.5A fuse (No ⑬, located in the fuse block)
- to theft warning relay terminal ⑭.
With the ignition switch in the START position, power is supplied
- from ignition switch terminal ⑮
- to theft warning relay terminal ⑯.
If the theft warning system is triggered, terminal ⑰ of the theft warning relay is grounded and power to the inhibitor switch is interrupted.
When the theft warning system is not operating, power is supplied
- through theft warning relay terminal ⑱
- to inhibitor switch terminal ⑲
- through inhibitor switch terminal ⑳, with the selector lever in the P or N position
- to terminal ⑳ of the starter motor windings.
For models without theft warning system
With the ignition switch in the START position, power is supplied
- from ignition switch terminal ⑳
- to inhibitor switch terminal ⑳
- through inhibitor switch terminal ⑳, with the selector lever in the P or N position
- to terminal ⑳ of the starter motor windings.
The starter motor plunger closes and provides a closed circuit between the battery and starter motor.
The starter motor is grounded to the engine block. With power and ground supplied, cranking occurs and the engine starts.
STARTING SYSTEM

Trouble-shooting

If any abnormality is found, immediately disconnect battery negative terminal.

Starter does not stop  Replace magnetic switch

Engine does not start

Does engine turn by cranking? Yes Does engine turn normally?

Yes Check ignition/fuel system.

No (Turns slowly) Check battery as follows:

- Charging condition
- Terminal connections
- Terminal corrosion

NG OK Repair starter motor

Does starter motor turn? Yes Does gear shaft turn? Yes Check pinion clutch.

No Check reduction gear, armature and gear shaft.

Check fuse and fusible link. NG Replace

OK Check battery as follows:

- Charging condition
- Terminal connections
- Terminal corrosion

NG OK Charge battery.

Repair connections and corrosion of battery terminals.

Check starting system wiring NG Repair.

OK Does magnetic switch operation sound occur?

No Replace magnetic switch

Yes Does starter turn under no load by connecting wires as follows?

Yes Replace magnetic switch

No Repair starter motor

Check condition of pinion and ring gear mesh

NG Improve pinion movement

- Adjust pinion movement
- Check pinion moving mechanism
- Check ring gear

OK
STARTING SYSTEM

Construction

Removal and Installation

REMOVAL
1. Remove battery negative cable from battery.
2. Remove transmission harness bracket.
3. Remove battery cable from starter motor.
4. Disconnect harness connector from starter motor harness.
5. Remove starter motor from under vehicle.

INSTALLATION
Installation procedure is basically the reverse order of removal.

Magnetic Switch Check
- Before starting to check, disconnect battery ground cable.
- Disconnect "M" terminal of starter motor.
  1. Continuity test (between "S" terminal and switch body).
  2. Continuity test (between "S" terminal and switch body).
- No continuity ... Replace.
- Continuity test (between "M" terminal and switch body).
- 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. Inspect reduction gear teeth.
   - Replace reduction gear if teeth are worn or damaged.
     (Also check condition of armature shaft gear teeth.)
3. Check to see if pinion locks in one direction and rotates smoothly in the opposite direction.
   - If it locks or rotates in both directions, or unusual resistance is evident ... Replace.

Brush Check
BRUSH
Check wear of brush.
- Wear limit length:
  Refer to SDS. (EL-37)
- Excessive wear ... Replace.
STARTING SYSTEM

Brush Check (Cont'd)

BRUSH SPRING PRESSURE
Check brush spring pressure with brush spring detached from brush.

Spring pressure (with new brush):
Refer to SDS. (EL-37)
- Not within the specified values ... Replace.

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.

Yoke Check
Magnet is secured to yoke by bonding agent. Check magnet to see that it is secured to yoke and for any cracks. Replace malfunctioning parts as an assembly.
Holdcr may move slightly as it is only inserted and not bonded.
CAUTION:
Do not clamp yoke in a vice or strike it with a hammer.

Armature Check
1. Continuity test (between two segments side by side).
   - No continuity ... Replace.
2. Insulation test (between each commutator bar and shaft),
   - Continuity exists ... Replace.

3. Check commutator surface.
   - Rough ... Sand lightly with No. 500 - 600 emery paper.

4. Check diameter of commutator.
   Commutator minimum diameter:
   Refer to SDS. (EL-37)
   - 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)

EL-34
EL-35
Assembly
Apply high-temperature grease to lubricate the bearing, gears, and frictional surface when assembling the starter. Carefully observe the following instructions.

PINION PROTRUSION LENGTH ADJUSTMENT
With pinion driven out by magnetic switch, push pinion back to remove slack and measure clearance "l" between the front edge of the pinion and the pinion stopper.
Clearance "l": Refer to SDS. (EL-37)

- Not in the specified value. Adjust by adjusting plate.

<table>
<thead>
<tr>
<th>Type</th>
<th>HITACHI make</th>
<th>Rotation gear</th>
</tr>
</thead>
<tbody>
<tr>
<td>St14-700B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>St14-700C</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>System voltage</th>
<th>[V]</th>
<th>Terminal voltage</th>
<th>[V]</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td></td>
<td>11.0</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No-load</th>
<th>[A]</th>
<th>Revolution</th>
<th>[rpm]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>More than 2,950</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Maximum length of brush</th>
<th>[mm (in)]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>11.0 (0.433)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Brush spring tension (with new brush)</th>
<th>[N (kg. f)]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>17.6 - 21.6 (1.80 - 2.20, 3.96 - 4.86)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Minimum diameter of commutator</th>
<th>[mm (in)]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>32.0 (1.260)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Clearance between pinion front edge and pinion stopper</th>
<th>[mm (in)]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.3 - 1.6 (0.012 - 0.063)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Clearance between bearing metal and armature shaft</th>
<th>[mm (in)]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Less than 0.2 (0.008)</td>
</tr>
</tbody>
</table>
System Description

The alternator provides DC voltage to operate the vehicle’s electrical system and to keep the battery charged. The voltage output is controlled by the IC regulator. Power is supplied at all times to alternator terminal «» through:

- 100A fuse link (letter A, located in the fusible link and fuse box), and
- 7.5A fuse (No. 3, located in the fusible link and fuse box).

Terminal 6 supplies power to charge the battery and operates the vehicle’s electrical system. Output voltage is controlled by the IC regulator at terminal 5, detecting the input voltage. The charging circuit is protected by the 100A fuse link.

Terminal 4 of the alternator supplies ground through body ground (08).

With the ignition switch in the ON or START position, power is supplied through 7.5A fuse (No. 2, located in the fuse block)

- to combination meter terminal 21 for the charge warning lamp.

Ground is supplied to terminal 5 of the combination meter through terminal 4 of the alternator. With power and ground supplied, the charge warning lamp will illuminate. When the alternator is providing sufficient voltage with the engine running, the ground is opened and the charge warning lamp will go off.

If the charge warning lamp illuminates with the engine running, a fault is indicated.

Wiring Diagram — CHARGE —
CHARGING SYSTEM

Trouble-shooting

Before conducting an alternator test, make sure that the battery is fully charged. A 30-volt voltmeter and suitable test probes are necessary for the test. The alternator can be checked easily by referring to the inspection Table.

Before starting trouble-shooting, inspect the fusible link.

WITH IC REGULATOR

1) Use fully charged battery.
2) Light : Charge warning light
   ACG : Alternator parts except IC regulator
   IC-RC : IC regulator
   OK : IC-alternator is in good condition.
3) When reaching "Damaged ACG", remove alternator from vehicle and disassembly, 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.

Removal and Installation

REMOVAL
1. Remove engine undercover.
2. Remove stabilizer bracket.
3. Remove power steering pipe mounting bracket.
4. Remove drive belt from alternator.
5. Disconnect harness connector.
6. Remove cooling fan lower shroud.
7. Remove alternator.

INSTALLATION
To install, reverse the removal procedure.
CHARGING SYSTEM

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.

REAR BEARING
CAUTION:
- Do not reuse rear bearing after removal. Replace with a new one.
- Do not lubricate rear bearing outer race.

Rotor Check
1. Resistance test
   Resistance: Refer to SDS. (EL-45)
   - Not within the specified values ... Replace rotor.
2. Insulator test
   - Continuity exists ... Replace rotor.
3. Check slip ring for wear.
   Slip ring minimum outer diameter:
   - Refer to SDS. (EL-45)
   - Not within the specified values ... Replace rotor.

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.

Stator Check
1. Continuity test
   - No continuity ... Replace stator.
2. Ground test
   - Continuity exists ... Replace stator.
### CHARGING SYSTEM

#### 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>Judgement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive @ Diode plate</td>
<td>Diode conducts in only one direction.</td>
</tr>
<tr>
<td>Negative @ Diode terminals</td>
<td>Diode plate</td>
</tr>
<tr>
<td>Diodes check (Positive side)</td>
<td>Diode terminals</td>
</tr>
<tr>
<td>Diodes check (Negative side)</td>
<td>Diode terminals</td>
</tr>
<tr>
<td>Diode terminals</td>
<td>Diode conducts in only one direction.</td>
</tr>
</tbody>
</table>

#### Assembly

- **RING FITTING IN REAR BEARING**
  - Fix ring into groove in rear bearing so that it is as close to the adjacent area as possible.
  - **CAUTION:** Do not reuse rear bearing after removal.

#### REAR COVER INSTALLATION

1. Fit brush assembly, diode assembly, regulator assembly, and slator.
2. Push brushes up with fingers and install them to rotor.
   Take care not to damage slip ring sliding surface.

---

#### Service Data and Specifications (SDS)

**ALTERNATOR**

<table>
<thead>
<tr>
<th>Type</th>
<th>A07E01D1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Make</td>
<td>MITSUBISHI</td>
</tr>
<tr>
<td>Nominal rating V-A</td>
<td>120</td>
</tr>
<tr>
<td>Ground polarity</td>
<td>Negative</td>
</tr>
<tr>
<td>Minimum revolutions under no-load (when 13.5 volts is applied) rpm</td>
<td>Less than 1,300</td>
</tr>
<tr>
<td>Hot output current A/hmp</td>
<td>More than 291.300</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>More than 5 (0.200)</td>
</tr>
<tr>
<td>Slip ring minimum outer diameter mm (in)</td>
<td>More than 22.1 (0.870)</td>
</tr>
<tr>
<td>Rotor (field coil) resistance Ω</td>
<td>2.5</td>
</tr>
</tbody>
</table>

---

**Type:** EL-44

---

**Type:** EL-45
COMBINATION SWITCH

Replacement
- Each switch can be replaced without removing combination switch base.

- To remove combination switch base, remove base attaching screw.

HEADLAMP

Bulb Replacement

The headlamp is a semi-sealed beam type which uses a replaceable halogen bulb. The bulb can be replaced from the engine compartment side without removing the headlamp body.
- Grasp only the plastic base when handling the bulb. Never touch the glass envelope.
  1. Disconnect the battery cable.
  2. Disconnect harness connector from rear end of bulb (Outer).
  3. Turn bulb cover counterclockwise, then remove it.
  4. Pull off rubber cap.
  5. Push and turn retaining pin to loosen it.
  6. Remove headlamp bulb. Do not shake or rotate bulb when removing it.
  7. Disconnect harness connector (Inner).
  8. Install in the reverse order of removal.

CAUTION:
- Do not leave headlamp reflector without bulb for a long period of time. Dust, moisture, smoke, etc. entering headlamp body may affect the performance of the headlamp. Remove headlamp bulb from the headlamp reflector just before a replacement bulb is installed.

Bulb Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Wattage (W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outer (High/Low) (H4 type)</td>
<td>60/55</td>
</tr>
<tr>
<td>Inner (Low) (H3 type)</td>
<td>55</td>
</tr>
</tbody>
</table>
System Description

The headlamps are controlled by the lighting switch which is built into the combination switch.

MODELS FOR EUROPE

Power is supplied at all times
- to lighting switch terminal ⑥
- through 20A fuse (No. ③), located in the fusible link and fuse box, and
- to lighting switch terminal ⑥
- through 20A fuse (No. ③), located in the fusible link and fuse box.

Low beam operation

When the lighting switch is turned to the 2ND position and placed in LOW ("B") position, power is supplied
- from lighting switch terminal ⑥
- to terminal ② of the LH headlamp, and
- from lighting switch terminal ⑥
- to terminal ② of the RH headlamp.

Terminal ② of each headlamp supplies ground through body ground ⑧ or ⑨.

With power and ground supplied, the low beam headlamps will illuminate.

High beam operation/flash-to-pass operation

When the lighting switch is turned to the 2ND position and placed in HIGH ("A") position or PASS ("C") position, power is supplied
- from lighting switch terminal ⑥
- to terminals ⑤ (Outer) and ⑥ (Inner) of RH headlamp, and
- from lighting switch terminal ⑥
- to terminals ⑤ (Outer) and ⑥ (Inner) of LH headlamp, and
- to combination meter terminal ② for the high beam indicator.

Ground is supplied to terminal ⑥ of the combination meter through body ground ⑨.

Terminals ⑤ (Outer) and ⑥ (Inner) of headlamp supply ground through body ground ⑨ or ⑨.

With power and ground supplied, the high beams and the high beam indicator will illuminate.

MODELS EXCEPT FOR EUROPE

Power is supplied at all times
- to lighting switch terminal ⑥
- through 20A fuse (No. ③), located in the fusible link and fuse box, and
- to lighting switch terminal ⑥
- through 20A fuse (No. ③), located in the fusible link and fuse box.

Low beam operation

When the lighting switch is turned to the 2ND position and placed in LOW ("B") position, power is supplied
- from lighting switch terminal ⑥
- to terminal ② of the LH headlamp, and
- from lighting switch terminal ⑥
- to terminal ② of the RH headlamp.

Terminal ② of each headlamp supplies ground through body ground ⑨ or ⑨.

With power and ground supplied, the low beam headlamps will illuminate.

High beam operation/flash-to-pass operation

When the lighting switch is turned to the 2ND position and placed in HIGH ("A") position or PASS ("C") position, power is supplied
- from lighting switch terminal ⑥
- to terminals ⑤ (Outer) and ⑥ (Inner) of each RH headlamp, and
- from lighting switch terminal ⑥
- to terminals ⑤ (Outer) and ⑥ (Inner) of each LH headlamp, and
- to combination meter terminal ② for the high beam indicator.

Ground is supplied to terminal ⑥ of the combination meter through body ground ⑨.

Terminals ⑤ (Outer) and ⑥ (Inner) of each headlamp supply ground through body ground ⑨ or ⑨.

With power and ground supplied, the high beams and the high beam indicator will illuminate.
HEADLAMP — Daytime Light System —

System Description

The headlamp system on vehicles for Norway and Sweden contains a daytime light unit. The unit activates the following whenever the engine is running with the lighting switch in the OFF position:

- Low beam headlamps
- Clearance, license, tail and illumination lamps

Power is supplied at all times
- through 20A fuse (No. 3), located in the fuse box
- to daytime light unit terminal 4 and
- to lighting switch terminal 5.

Power is also supplied at all times
- through 20A fuse (No. 8), located in the fuse box
- to daytime light unit terminal 4 and
- to lighting switch terminal 5.

Operation (Daytime light system)

The headlamps’ low beam and clearance, license, tail and illumination lamps automatically turn on after starting the engine with lighting switch in "OFF" position.

Lighting switch operations other than the above are the same as conventional light systems.

<table>
<thead>
<tr>
<th>Lighting switch</th>
<th>OFF</th>
<th>1ST</th>
<th>2ND</th>
<th>With engine stopped</th>
<th>With engine running</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headlamp</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High beam</td>
<td>X</td>
<td>O</td>
<td>O</td>
<td>X O</td>
<td>X O</td>
</tr>
<tr>
<td>Low beam</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X X O</td>
<td>X X X O</td>
</tr>
<tr>
<td>Clearance and tail lamp</td>
<td>X</td>
<td>X</td>
<td>O</td>
<td>O O</td>
<td>O O</td>
</tr>
<tr>
<td>License and instrument illumination lamp</td>
<td>X</td>
<td>X</td>
<td>O</td>
<td>O O</td>
<td>O O</td>
</tr>
</tbody>
</table>

- Lamp "ON"
- Lamp "OFF"
- Added functions

HEADLAMP OPERATION

Low beam operation

When the lighting switch is turned to the 2ND position and placed in LOW ("B") position, power is supplied

- from lighting switch terminal 4, or
- from daytime light unit terminal 4,
- to RH headlamp terminal 5.

Ground is supplied to RH headlamp terminal 6 through body ground 16.

Also, when the lighting switch is turned to the 2ND position and placed in LOW ("B") position, power is supplied

- from lighting switch terminal 4, or
- from daytime light unit terminal 4,
- to LH headlamp terminal 3.

Ground is supplied to LH headlamp terminal 4 through body ground 16.

With power and ground supplied, the low beam headlamps illuminate.

High beam operation/flash-to-pass operation

When the lighting switch is turned to the 2ND position and placed in HIGH ("A") position or PASS ("C") position, power is supplied

- from lighting switch terminal 4,
- to terminals 1 (Outer) and 2 (Inner) of RH headlamp, and
- from lighting switch terminal 3,
- to terminals 1 (Outer) and 2 (Inner) of LH headlamp, and
- to combination meter terminal 5 for the high beam indicator.

Ground is supplied to terminal 6 of the combination meter through body ground 16.

Terminals 2 (Outer) and 5 (Inner) of headlamp supply ground through body ground 16 or 19.

With power and ground supplied, the high beams and the high beam indicator will illuminate.
### DAYTIME LIGHT 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>Power source (BAT)</td>
<td>When turning ignition switch to &quot;ON&quot;</td>
<td>Battery positive voltage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>When turning ignition switch to &quot;OFF&quot;</td>
<td>Battery positive voltage</td>
</tr>
<tr>
<td>2</td>
<td>Power source (BAT)</td>
<td>When turning ignition switch to &quot;ON&quot;</td>
<td>Battery positive voltage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>When turning ignition switch to &quot;OFF&quot;</td>
<td>Battery positive voltage</td>
</tr>
<tr>
<td>3</td>
<td>Power source (BAT)</td>
<td>When turning ignition switch to &quot;ON&quot;</td>
<td>Battery positive voltage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>When turning ignition switch to &quot;OFF&quot;</td>
<td>Battery positive voltage</td>
</tr>
<tr>
<td>4</td>
<td>RH to beam (Lighting switch)</td>
<td>When turning light switch to &quot;HEAD&quot; and 2ND positions</td>
<td>Battery positive voltage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>When turning light switch to &quot;OFF&quot; with engine running (daytime light operation)</td>
<td>Battery positive voltage</td>
</tr>
<tr>
<td>5</td>
<td>LH to beam (Lighting switch)</td>
<td>When turning light switch to &quot;HEAD&quot; and 2ND positions</td>
<td>Battery positive voltage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>When turning light switch to &quot;OFF&quot; with engine running (daytime light operation)</td>
<td>Battery positive voltage</td>
</tr>
<tr>
<td>6</td>
<td>Start signal</td>
<td>When turning ignition switch to &quot;ST&quot;</td>
<td>Battery positive voltage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>When turning ignition switch to &quot;ON&quot; from &quot;ST&quot;</td>
<td>1V or less</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>7</td>
<td>Power source (IGN)</td>
<td>When turning ignition switch to &quot;ON&quot;</td>
<td>Battery positive voltage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>When turning ignition switch to &quot;ST&quot;</td>
<td>Battery positive 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>8</td>
<td>Alternator</td>
<td>When turning ignition switch to &quot;ON&quot;</td>
<td>More than 5V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>When engine is running</td>
<td>Battery positive voltage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>When turning ignition switch to &quot;OFF&quot;</td>
<td>1V or less</td>
</tr>
</tbody>
</table>
HEADLAMP — Headlamp Aiming Control —

**Description**

- The vertical direction of the headlamp beam can be adjusted from inside the vehicle. This prevents the headlamp beam axis from facing upward due to changes in number of occupants and vehicle load conditions.

---

**CIRCUIT OPERATION**

**[Example]**

**Aiming switch “0”**
- When the aiming switch is set to “0”, the motor will not start. This is because the power terminals are positioned at the nonconductive section of the sensor’s rotary unit.

**Aiming switch “0” → “1”**
- When the aiming switch is moved from “0” to “1”, the sensor’s conductive section activates the relay. Power is supplied through the relay to the motor. The headlamps will then move in the “DOWN” direction.
- The motor continues to rotate while the rotary unit of the sensor moves from point A to point B.
- The power terminals will then be positioned at the nonconductive section, disconnecting the power to the motor. The motor will then stop.

**Aiming switch “1” → “0”**
- When the aiming switch is moved from “1” to “0”, the sensor’s conductive section activates the relay. Power is supplied through the relay to the motor. The motor will rotate to move the headlamps in the “UP” direction.
- When the rotary unit of the sensor moves from point B to point A, the motor will stop.
**Alimg Adjustment**

When performing headlamp aiming adjustment, use an aiming machine, aiming wall screen or headlamp tester. Aimers should be in good repair, calibrated and operated according to their operation manuals.

If any aimer is not available, aiming adjustment can be done as follows:

*For details, refer to the regulations in your own country.*

**CAUTION:**
- Keep all tires inflated to correct pressures.
- Place vehicle and tester on one and same flat surface.
- See that there is no-load in vehicle (coolant, engine oil filled up to correct level and fuel tank) other than the driver (or equivalent weight placed in driver's position).

**CAUTION:**
Be sure aiming switch is set to "0" when performing aiming adjustment on vehicles equipped with headlamp aiming control.

**LOW BEAM**

1. Turn headlamp low beam on.
2. Use adjusting screws to perform aiming adjustment.
   - First tighten the adjusting screw all the way and then make adjustment by loosening the screw.

3. Adjust headlamps so that main axis of light is parallel to center line of body and is aligned with point P shown in illustration.

4. Figure to the left shows headlamp aiming pattern for driving on right side of road; for driving on left side of road, aiming pattern is reversed.
5. Dotted lines in illustration show center of headlamp.
6. **H:** Horizontal center line of headlamps
7. **W:** Distance between each headlamp center
8. **L:** 5,000 mm (196.85 in)
9. **C:** 85 mm (3.35 in)

**Trouble Diagnoses**

**SYMPTOM:** Headlamp aiming does not operate.

**POWER SUPPLY CIRCUIT CHECK (for aiming switch)**

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Voltage (V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>12</td>
</tr>
<tr>
<td>2</td>
<td>12</td>
</tr>
</tbody>
</table>

**AMING SWITCH CHECK**

Check continuity between terminals at each switch position

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Switch position</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>OK</td>
</tr>
<tr>
<td>2</td>
<td>OK</td>
</tr>
</tbody>
</table>

**GROUND CIRCUIT CHECK FOR AIMING MOTOR**

Check continuity between terminals (B) and body ground. Continuity exists … OK

**POWER SUPPLY CIRCUIT CHECK (for aiming motor unit)**

Check if 12 volts exist between terminals (1), (2), (3), (4), (5) and (6)

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Voltage (V)</th>
<th>Aiming switch position</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Approx. 12</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Except &quot;1&quot;</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Approx. 12</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Approx. 12</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Approx. 12</td>
<td></td>
</tr>
</tbody>
</table>

OK

*Replace aiming motor unit*
**EXTERIOR LAMP**

Clearance, License and Tail Lamps/System Description

**LHD MODELS WITH DAYTIME LIGHT SYSTEM**

The clearance, license and tail lamps on vehicles for Norway and Sweden contain a daytime light unit. The unit activates the small lamps whenever the engine and lighting switch are under the following conditions:
- Engine running
- Lighting switch in the OFF position

(For daytime light system, refer to "HEADLAMP — Daytime Light System —").

**Operation (when daytime light system is triggered)**

Power is supplied at all times
- through 10A fuse (No. 13), located in the fuse block
- to daytime light unit terminal ④

With the engine running and the lighting switch in the OFF position, power is supplied
- through daytime light unit terminal ④
- to terminal ④ of each lamp.

Ground is supplied to terminal ② of clearance lamps through body ground (GG) or (GB).

Ground is also supplied to terminal ② of license lamp and to terminal ④ of tail lamps through body ground (GB).

With power and ground supplied, the clearance, license and tail lamps illuminate.

**Operation (when daytime light system is not triggered)**

Power is supplied at all times
- through 10A fuse (No. 13), located in the fuse block
- to lighting switch terminal ⑤

With the lighting switch in the 1ST or 2ND position, power is supplied
- through lighting switch terminal ⑤
- to daytime light unit terminal ④
- through daytime light unit terminal ④
- to terminal ④ of each lamp.

Ground is supplied to terminal ② of clearance lamps through body ground (GG) or (GB).

Ground is also supplied to terminal ② of license lamp and to terminal ④ of tail lamps through body ground (GB).

With power and ground supplied, the clearance, license and tail lamps illuminate.

**LHD MODELS WITHOUT DAYTIME LIGHT SYSTEM**

Power is supplied at all times
- through 45A fusible link (letter ①, located in the fusible link and fuse box)
- to lighting switch terminal ⑤

**Operation**

With the lighting switch in the 1ST or 2ND position, power is supplied
- from lighting switch terminal ⑤
- through 10A fuse (No. 13), located in the fuse block
- to terminal ④ of clearance, license and RH tail lamps.

With the lighting switch in the 1ST or 2ND position, power is also supplied
- from lighting switch terminal ⑤
- through 7.5A fuse (No. 8), located in the fuse box
- to LH tail lamp terminal ⑤.

Ground is supplied to terminal ② of clearance lamps through body ground (GB) or (GG).

Ground is also supplied to terminal ② of license lamp and to terminal ④ of tail lamps through body ground (GB).

With power and ground supplied, the clearance, license and tail lamps illuminate.

---

**RHD MODELS FOR EUROPE**

Power is supplied at all times
- through 10A fuse (No. 8), located in the fuse block
- to lighting switch terminal ⑤
- to front fog lamp relay terminal ④

**Operation**

With the lighting switch in the 1ST or 2ND position, power is supplied
- through the lighting switch terminal ⑤
- to terminal ④ of each lamp.

Ground is supplied to terminal ② of clearance lamps through body ground (GB) or (GG).

Ground is also supplied to terminal ② of license lamp and to terminal ④ of tail lamps through body ground (GB).

With power and ground supplied, the clearance, license and tail lamps illuminate.

---

**RHD MODELS EXCEPT FOR EUROPE**

Power is supplied at all times
- through 10A fuse (No. 8), located in the fuse block
- to lighting switch terminal ⑤

**Operation (when front fog lamp system is not triggered)**

With the lighting switch in the 1ST or 2ND position, power is supplied
- through lighting switch terminal ⑤
- to terminal ④ of each lamp.

Ground is supplied to terminal ② of clearance lamps through body ground (GB) or (GG).

Ground is also supplied to terminal ② of license lamp and to terminal ④ of tail lamps through body ground (GB).

**Operation (when front fog lamp system is triggered)**

With the front fog lamp switch in the ON position.
- ground is supplied to front fog lamp relay terminal ④ through the front fog lamp switch and body ground (GB).

The front fog lamp relay is energized and power is supplied
- through front fog lamp relay terminal ④
- to terminal ④ of each lamp.

Ground is supplied to terminal ② of clearance lamps through body ground (GB) or (GG).

Ground is also supplied to terminal ② of license lamp and to terminal ④ of tail lamps through body ground (GB).

With power and ground supplied, the clearance, license and tail lamps illuminate.
Front Fog Lamps/System Description

LHD MODELS WITH DAYTIME LIGHT SYSTEM

Power is supplied at all times
- through 15A fuse (No. 33), located in the fusible link and fuse box
- to front fog lamp relay terminal ③

When the daytime light system is triggered, power is supplied
- through daytime light unit terminal ①
- to front fog lamp relay terminal ③.

If the rear fog lamp switch is interrupted, the power to the daytime light system is grounded.

LHD MODELS WITHOUT DAYTIME LIGHT SYSTEM

Power is supplied at all times
- through 15A fuse (No. 5), located in the fusible link and fuse box
- to front fog lamp relay terminal ③

With the lighting switch in the 1ST or 2ND position, power is supplied
- through 45A fusible link (letter D, located in the fusible link and fuse box)
- to lighting switch terminal ⑧
- from lighting switch terminal ⑨
- through fuse (No. 32, located in the fuse box)
- to front fog lamp relay terminal ③.

Front fog lamp operation

The lighting switch must be in the 1ST or 2ND position for front fog lamp operation.

With the front fog lamp switch in the ON position:
- ground is supplied to front fog lamp relay terminal ② through the front fog lamp switch and body ground (⑥) or (⑦)
- The front fog lamp relay is energized and power is supplied
- from front fog lamp relay terminal ③
- to terminal ① of each front fog lamp

Ground is supplied to terminal ② of each front fog lamp through body ground (⑥) or (⑦).
With power and ground supplied, the front fog lamps illuminate.

RHD MODELS FOR EUROPE

Power is supplied at all times
- through 15A fuse (No. 33), located in the fusible link and fuse box
- to front fog lamp relay terminal ③.

With the lighting switch in the 1ST or 2ND position, power is supplied
- through 10A fuse (No. 32), located in the fuse box
- to lighting switch terminal ⑤
- through terminal ⑨ of lighting switch
- to front fog lamp relay terminal ③.

Front fog lamp operation

The lighting switch must be in the 1ST or 2ND position for front fog lamp operation.

With the front fog lamp switch in the ON position:
- ground is supplied to front fog lamp relay terminal ③ through the front fog lamp switch and body ground (⑥) or (⑦)

The front fog lamp relay is energized and power is supplied
- from front fog lamp relay terminal ③
- to terminal ① of each front fog lamp.

Ground is supplied to terminal ② of each front fog lamp through body ground (⑥) or (⑦).
With power and ground supplied, the front fog lamps illuminate.

RHD MODELS EXCEPT FOR EUROPE

Power is supplied at all times
- through 15A fuse (No. 33), located in the fusible link and fuse box
- to front fog lamp relay terminals ③.

Front fog lamp operation

The front fog lamp switch is built into the combination switch.

With the front fog lamp switch in the ON position:
- ground is supplied to front fog lamp relay terminal ③ through front fog lamp switch and body ground (⑥)

The front fog lamp relay is energized and power is supplied
- from front fog lamp relay terminal ③
- to terminal ① of each front fog lamp.

Ground is supplied to terminal ② of each front fog lamp through body ground (⑥) or (⑦).
With power and ground supplied, the front fog lamps illuminate.
Front Fog Lamp Aiming Adjustment

Before performing aiming adjustment, make sure of the following:

a. Keep all tires inflated to correct pressure.

b. Place vehicle on level ground.

c. See that vehicle is unloaded (except for full levels of coolant, engine oil and fuel, and spare tire, jack, and tools). Have the driver or equivalent weight placed in driver’s seat.

Adjust aiming in the vertical direction by turning the adjusting screw.

Check the distance between the vehicle and the ground point where the main axis of light of fog lamp reaches. Keep the distance within 40,000 mm (1,574.8 in).
Rear Fog Lamp/System Description

Power is supplied at all times
- through 7.5A fuse (No. 27 for LHD models, No. 3 for RHD models), located in the fuse block
- to rear fog lamp relay terminal ⑦ (with daytime light system) or ⑧ (without daytime light system)
- With the lighting switch in the 2ND position, power is supplied
- through 20A fuse (No. 31), located in the fusible link and fuse box
- to lighting switch terminal ⑤
- through lighting switch terminal ⑥
- to rear fog lamp relay terminal ⑨

Rear fog lamp operation

The lighting switch must be in the 2ND position for rear fog lamp operation.

Ground is supplied to rear fog lamp relay terminal ③ through body ground ⑭
- With the lighting switch in the 2ND position, the rear fog lamp relay is energized and power is supplied
- through rear fog lamp relay terminal ⑩ (with daytime light system) or ⑪ (without daytime light system)
- to rear fog lamp switch terminal ⑪
- With the rear fog lamp switch in the ON position, power is supplied
- through rear fog lamp switch terminal ⑫
- to terminal ⑮ of rear fog lamp

Ground is supplied to terminal ⑭ of rear fog lamp through body ground ⑭.
- With power and ground supplied, the rear fog lamp illuminates.

Refer to EL-POWER.

Refer to last page (Foldout page).

EL-R/FOG-01
EXTERIOR LAMP

Rear Fog Lamp/Wiring Diagram — R/FOG —
(Cont'd)

WITHOUT DAYTIME LIGHT SYSTEM

EL-R/FOG-02

BATTERY

Refer to EL-POWER.

LIGHTING SWITCH

Rear Fog Lamp Switch

To R/L-ILL L/R/L

LH turn

When the turn signal switch is moved to the LH position, power is supplied from turn signal switch terminal 3 to:
- front turn signal lamp LH terminal 1
- side turn signal lamp LH terminal 2
- rear combination lamp LH terminal 3
- combination meter terminal 4.

Ground is supplied to the front turn signal lamp LH terminal 2 through body ground 60H (LHD models) or 60H (RHD models).

Ground is supplied to the rear combination lamp LH terminal 4 through body ground 60H.

With power and ground supplied, the combination flasher unit controls the flashing of the LH turn signal lamps.

RH turn

When the turn signal switch is moved to the RH position, power is supplied from turn signal switch terminal 2 to:
- front turn signal lamp RH terminal 1
- side turn signal lamp RH terminal 2
- rear combination lamp RH terminal 3
- combination meter terminal 4.

Ground is supplied to the front turn signal lamp RH terminal 2 through body ground 60H (LHD models) or 60H (RHD models).

Ground is supplied to the rear combination lamp RH terminal 4 through body ground 60H.

With power and ground supplied, the combination flasher unit controls the flashing of the RH turn signal lamps.

HAZARD LAMP OPERATION

Power is supplied at all times to hazard switch terminal 3 through:
- 10A fuse (No. 24, located in the fuse block).

With the hazard switch in the ON position, power is supplied through:
- terminal 1 of the hazard switch
- to combination flasher unit terminal 2
- through terminal 3 of the combination flasher unit
- to hazard switch terminal 4.

Ground is supplied to combination flasher unit terminal 1 through body ground 60H or 60H.

Power is supplied through terminal 3 of the hazard switch to:
- front turn signal lamp LH terminal 1
- side turn signal lamp LH terminal 1
- rear combination lamp LH terminal 2
- combination meter terminal 1.

Power is supplied through terminal 6 of the hazard switch to:
EXTERIOR LAMP

Turn Signal and Hazard Warning Lamps/System Description (Cont'd)

- front turn signal lamp RH terminal (1)
- side turn signal lamp RH terminal (2)
- rear combination lamp RH terminal (3)
- combination meter terminal (6).

Ground is supplied to terminal (2) of each front turn signal lamp through body ground (65) or (66). Ground is supplied to terminal (2) of driver's side turn signal lamp through body ground (65) or (66). Ground is supplied to terminal (2) of passenger side turn signal lamp through body ground (65) or (66). Ground is supplied to terminal (3) of the rear combination lamps through body ground (66). Ground is supplied to combination meter terminal (6) through body ground (65).

With power and ground supplied, the combination flasher unit controls the flashing of the hazard warning lamps.

WITH MULTI-REMOTE CONTROL SYSTEM

Power is supplied at all times
- through 10A fuse (No. 22) located in the fuse block
- to multi-remote control relay-1 terminals (1), (6) and (8).

Ground is supplied to multi-remote control relay-1 terminal (2), when the multi-remote control system or theft warning system is triggered through the smart entrance control unit. Refer to "MULTI-REMOTE CONTROL SYSTEM" or "THEFT WARNING SYSTEM".

The multi-remote control relay-1 is energized.

Power is supplied through terminal (7) of the multi-remote control relay-1
- to front turn signal lamp LH terminal (1)
- to side turn signal lamp LH terminal (1)
- to rear combination lamp LH terminal (2)
- to combination meter terminal (6).

Power is supplied through terminal (3) of the multi-remote control relay-1
- to front turn signal lamp RH terminal (1)
- to side turn signal lamp RH terminal (3)
- to rear combination lamp RH terminal (3)
- to combination meter terminal (6).

Ground is supplied to terminal (2) of each front turn signal lamp through body ground (65) or (66).

Ground is supplied to terminal (2) of driver's side turn signal lamp through body ground (65) or (66). Ground is supplied to terminal (2) of passenger side turn signal lamp through body ground (65) or (66). Ground is supplied to terminal (4) of the rear combination lamps through body ground (66). Ground is supplied to combination meter terminal (6) through body ground (65).

With power and ground supplied, the smart entrance control unit controls the flashing of the hazard warning lamps.
### EXTERIOR LAMP

#### Turn Signal and Hazard Warning Lamps/Wiring Diagram — TURN — (Cont'd)

---

#### EXTERIOR LAMP

#### Turn Signal and Hazard Warning Lamps/Trouble Diagnoses

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Possible cause</th>
<th>Repair order</th>
</tr>
</thead>
</table>
| Turn signal and hazard warning lamps do not operate. | 1. Hazard switch  
2. Combination flasher unit  
2. Refer to combination flasher unit check (EL-101).  
3. Check wiring to combination flasher unit or open circuit. |
| Turn signal lamps do not operate but hazard warning lamps operate. | 1. 10A fuse  
2. Hazard switch  
3. Turn signal switch  
4. Open in turn signal switch circuit. | 1. Check 10A fuse (located in fuse block). Turn ignition switch ON and verify battery positive voltage is present at terminal 3 of hazard switch.  
2. Check hazard switch.  
3. Check turn signal switch.  
4. Check wire between combination flasher unit and turn signal switch for open circuit. |
| Hazard warning lamps do not operate but turn signal lamps operate. | 1. 10A fuse  
2. Hazard switch  
3. Open in hazard switch circuit. | 1. Check 10A fuse (located in fuse block). Verify battery positive voltage is present at terminal 3 of hazard switch.  
2. Check hazard switch.  
3. Check wire between combination flasher unit and hazard switch for open circuit. |
| Front turn signal lamp LH or RH does not operate. | 1. Bulb  
2. Ground (G) or (B). | 1. Check bulb.  
2. Check ground (G) or (B). |
| Side turn signal lamp on driver's side does not operate. | 1. Bulb  
2. Ground (H) or (B). | 1. Check bulb.  
2. Check ground (H) or (B). |
| Side turn signal lamp on passenger side does not operate. | 1. Bulb  
2. Ground (G) or (B). | 1. Check bulb.  
2. Check ground (G) or (B). |
| Rear turn signal lamp LH or RH does not operate. | 1. Bulb  
2. Check ground (T). |
| LH or RH turn indicators do not operate. | 1. Bulb  

---

#### 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>Front fog lamp</td>
<td>35</td>
</tr>
<tr>
<td>Front turn signal lamp</td>
<td>21</td>
</tr>
<tr>
<td>Clearance lamp</td>
<td>5</td>
</tr>
<tr>
<td>Side turn signal lamp</td>
<td>5</td>
</tr>
<tr>
<td>Rear combination lamp</td>
<td>21</td>
</tr>
<tr>
<td>Turn signal lamp</td>
<td>5</td>
</tr>
<tr>
<td>Stop/Tail lamp</td>
<td>21/5</td>
</tr>
<tr>
<td>Back-up lamp</td>
<td>21</td>
</tr>
<tr>
<td>License plate lamp</td>
<td>5</td>
</tr>
<tr>
<td>Rear fog lamp</td>
<td>21</td>
</tr>
<tr>
<td>High-mounted stop lamp</td>
<td>5</td>
</tr>
</tbody>
</table>

**Illumination/System Description**

Power supply routing for illumination lamps are the same as that of clearance, license and LH tail lamp. Refer to "Clearance, License and Tail Lamps".

On vehicles for Europe and Australia, illumination of combination meter and clock is controlled by illumination control switch. The illumination control switch that controls the amount of current to the illumination system. As the amount of current increases, the illumination becomes brighter.

The following chart shows the power and ground connector terminals for the components included in the illumination system:

<table>
<thead>
<tr>
<th>Component</th>
<th>Connector No</th>
<th>Power terminal</th>
<th>Ground terminal</th>
<th>Ground</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audio</td>
<td>M4A</td>
<td>8</td>
<td>[Unit ground]</td>
<td>—</td>
</tr>
<tr>
<td>Push control unit</td>
<td>M32</td>
<td>15</td>
<td>15</td>
<td>(W) or (H)</td>
</tr>
<tr>
<td>Auto A/C unit</td>
<td>M31</td>
<td>13</td>
<td>14</td>
<td>(W) or (H)</td>
</tr>
<tr>
<td>A/T indicator</td>
<td>B8</td>
<td>7</td>
<td>6</td>
<td>(W) or (H)</td>
</tr>
<tr>
<td>Power window main switch</td>
<td>D18</td>
<td>10</td>
<td>16</td>
<td>(W) or (H)</td>
</tr>
<tr>
<td>Cigarette lighter</td>
<td>M42</td>
<td>3</td>
<td>1</td>
<td>(W) or (H)</td>
</tr>
<tr>
<td>Combination meter</td>
<td>M20</td>
<td>6</td>
<td>33</td>
<td>(W) or (H)</td>
</tr>
<tr>
<td>Clock</td>
<td>M20</td>
<td>6</td>
<td>33</td>
<td>(W) or (H)</td>
</tr>
<tr>
<td>Hazard switch (For Europe)</td>
<td>M34</td>
<td>7</td>
<td>8</td>
<td>(W) or (H)</td>
</tr>
<tr>
<td>Hazard switch (Except for Europe)</td>
<td>M35</td>
<td>7</td>
<td>0</td>
<td>(W) or (H)</td>
</tr>
<tr>
<td>Glove box lamp (switch)</td>
<td>M403</td>
<td>2</td>
<td>1</td>
<td>(W) or (H)</td>
</tr>
<tr>
<td>Front fog lamp switch</td>
<td>B7</td>
<td>5</td>
<td>6</td>
<td>(W) or (H)</td>
</tr>
<tr>
<td>Rear fog lamp switch</td>
<td>M35</td>
<td>6</td>
<td>5</td>
<td>(W) or (H)</td>
</tr>
<tr>
<td>Headlamp washer switch</td>
<td>M35</td>
<td>4</td>
<td>3</td>
<td>(W) or (H)</td>
</tr>
<tr>
<td>Rear window defogger switch</td>
<td>M37</td>
<td>5</td>
<td>6</td>
<td>(W) or (H)</td>
</tr>
<tr>
<td>Illumination control switch</td>
<td>M21</td>
<td>1</td>
<td>0</td>
<td>(W) or (H)</td>
</tr>
</tbody>
</table>

1. For Europe and Australia models: Illumination control switch
2. Except for Europe and Australia models: (W) or (H)
INTERIOR LAMP

Interior, Spot and Trunk Room Lamps/System

Description

Power is supplied at all times
- through 10A fuse (No. 3) located in the fuse block
- to interior lamp terminal ①
- to spot lamp terminal ② and
- to trunk room lamp terminal ③.

INTERIOR LAMP

Switch operation

With interior lamp switch in the ON position, ground is supplied to turn interior lamp on.

When a door switch is set to OPEN with interior lamp switch in the DOOR position, ground is supplied
- to interior lamp terminal ①
- through diode [D] terminal ③ (Except for Europe models)
- to diode [E] terminal ② (Except for Europe models)
- through diode [F] terminal ① (Except for Europe models)
- to diode [G] terminal ② (Except for Europe models)
- through door switch passenger side terminal ③ or
- through door switch driver's side terminal ②,
- through door switch unit ground.

Interior lamp control by multi-remote control system

When the smart entrance control unit receives a signal from multi-remote controller to unlock the door with interior lamp switch set in DOOR position, ground is supplied
- to interior lamp terminal ①
- through smart entrance control unit terminal ③,
- through smart entrance control unit terminal ② and
- through body ground ①.

With power and ground supplied, the interior lamp illuminates.

For smart entrance control unit, refer to “MULTI-REMOTE CONTROL SYSTEM”.

TRUNK ROOM LAMP

When the truck room lamp switch is set to OPEN, ground is supplied
- to truck room lamp terminal ①
- through truck room switch terminal ③.
- through trunk room lamp switch terminal ③
- through body ground ①.

With power and ground supplied, the trunk room lamp illuminates.

SPOT LAMP

With the spot lamp switch in the ON position, ground is supplied
- to spot lamp terminal ②
- through body ground ③ or ④.

With power and ground supplied, the spot lamp illuminates.

Bulb Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Wattage (W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interior lamp</td>
<td>10</td>
</tr>
<tr>
<td>Spot lamp</td>
<td>10</td>
</tr>
<tr>
<td>Trunk room lamp</td>
<td>3.4</td>
</tr>
</tbody>
</table>

Refer to next page [Foldout page].
### Meter and Gauges

**System Description**

With the ignition switch in the ON or START position, power is supplied:
- through 7.5A fuse (No. 54), located in the fuse block.
- to combination meter terminal (3).

Ground is supplied:
- to combination meter terminal (4).
- through body ground (5).

**Water Temperature Gauge**

The water temperature gauge indicates the engine coolant temperature. The reading on the gauge is based on the resistance of the thermal transmitter. As the temperature of the coolant increases, the resistance of the thermal transmitter decreases. A variable ground is supplied to terminal (9) of the combination meter for the water temperature gauge. The needle on the gauge moves from "C" to "H".

**Tachometer**

The tachometer indicates engine speed in revolutions per minute (rpm).
- The tachometer is regulated by a signal from terminal (7) of the ECU (ECUs control module).
- to combination meter terminal (8) for the tachometer.

**Fuel Gauge**

The fuel gauge indicates the approximate fuel level in the fuel tank. The fuel gauge is regulated by a variable ground signal supplied:
- from terminal (1) of the fuel tank gauge unit.
- through terminal (2) of the fuel tank gauge unit.
- through body grounds (15), (16), and (17).

**Speedometer**

The vehicle speed sensor provides a voltage signal to the combination meter for the speedometer.
- The voltage is supplied to combination meter terminals (9) and (10) for the speedometer.
- from terminals (1) and (2) of the vehicle speed sensor.
- The speedometer converts the voltage into the vehicle speed displayed.
**METER AND GAUGES**

**Inspection/Fuel Gauge and Water Temperature Gauge**

**INSPECTION START**

**A** CHECK POWER SOURCE
1. Turn ignition switch "ON".
2. Check voltage between terminal 6 and ground.
   Battery voltage should exist.
   **OK**
   **NG** Check the following items:
1. Harness continuity between battery terminal and combination meter.
2. Ignition relay.
3. Fusible link and fuse.
4. Ignition switch.

**B** CHECK GAUGE OPERATION
1. Turn ignition switch "ON".
2. Connect terminals 8 (Fuel), 2 (Temp) and ground with wire for less than 10 seconds.
3. Check operation of gauge.
   Gauge should move smoothly to full scale.
   **OK**
   **NG** Repair or replace gauge.

**C** Check harness continuity between combination meter harness terminal 6 and thermal transmitter harness terminal 8.
**OK**
**NG** Repair or replace.

**D** Check harness continuity between combination meter harness terminal 6 and fuel tank gauge unit harness terminal 8.
Continuity should exist.
**OK**
**NG** Repair or replace.

**CHECK COMPONENT**
Check gauge units and harness.
Refer to "Fuel Tank Gauge Unit Check" (EL-120) or "Thermal Transmitter Check" (EL-120).
**OK**
**NG** Repair or replace. Refer to FE section. (Fuel gauge)

(Go to A on next page)

**Instruction**

**EL-116**

---

**METER AND GAUGES**

**Inspection/Fuel Gauge and Water Temperature Gauge (Cont’d)**

**A** Check harness continuity between fuel tank gauge unit harness terminal 8 and body ground.
Continuity should exist.
**OK**
**NG** Repair harness or connector.

Reinstall any part removed

**INSPECTION END**

**B** Check harness continuity between combination meter and combination meter.
**OK**
**NG** Repair harness or connector.

**C** CHECK ECM OUTPUT
1. Start engine.
2. Check voltage between terminals 12 and 19 at idle and 2,000 rpm.
   - Higher rpm = Higher voltage
   - Lower rpm = Lower voltage
   Voltage should change with rpm.
   **OK**
   **NG**

Replace tachometer

**INSPECTION END**

**EL-117**
**Inspection/Speedometer and Vehicle Speed Sensor**

**SYMPTOM:** Speedometer slays at 0 km/h (0 MPH).

**INSPECTION START**

A. **CHECK GROUND CIRCUIT OF SPEEDOMETER**
   - Check continuity between terminal (B) and body ground.
   - Continuity should exist.
   - **NG:** Repair harness or connector.
   - **OK:** Continue to next step.

B. **CHECK SPEEDOMETER CIRCUIT**
   - 1. Turn ignition switch to “ON”.
   - 2. Check voltage between terminal (B) and body ground.
   - Battery voltage should exist.
   - **NG:** Repair harness or connector.
   - **OK:** Continue to next step.

C. **CHECK VEHICLE SPEED SENSOR OUTPUT**
   - 1. Remove vehicle speed sensor from transaxle.
   - 2. Check voltage between terminal (B) and sensor pinion.
   - Voltage: Approx. 0.6V
   - **NG:** Replace speedometer.
   - **OK:** Continue to next step.

D. **CHECK VEHICLE SPEED SENSOR**
   - Check resistance between terminals (1) and (5).
   - Resistance: Approx. 250Ω.
   - **NG:** Repair harness or connector between speedometer and vehicle speed sensor.
   - **OK:** Replace speedometer.

**INSPECTION END**
**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 - 100Ω</td>
</tr>
<tr>
<td>100°C (212°F)</td>
<td>Approx. 21 - 24Ω</td>
</tr>
</tbody>
</table>

**Vehicle Speed Sensor Signal Check**

1. Remove vehicle speed sensor from transmission.
2. Turn vehicle speed sensor pinion quickly and measure voltage across ① and ②.

**Fuel Tank Gauge Unit Check**

**Sending unit**
- For removal, refer to FE section.

Check the resistance between terminals ① and ③.

<table>
<thead>
<tr>
<th>Ohmmeter (+)</th>
<th>Float position</th>
<th>Resistance value (Ω)</th>
</tr>
</thead>
<tbody>
<tr>
<td>① (Full)</td>
<td>508 (14.09)</td>
<td>4 - 6</td>
</tr>
<tr>
<td>② (1/2)</td>
<td>245 (8.56)</td>
<td>30 - 35</td>
</tr>
<tr>
<td>③ (Empty)</td>
<td>42 (1.66)</td>
<td>85 - 93</td>
</tr>
</tbody>
</table>

① and ③: When float is in contact with stopper.

---

**Lead Switch**

Lead switch is built into the fuel tank.
Check the continuity between terminals ④ and ⑤ or ④ and ⑥.

<table>
<thead>
<tr>
<th>Terminals</th>
<th>Lead switch condition</th>
<th>Fuel level line</th>
<th>Fuel capacity (Approximate values) (Imp gal)</th>
</tr>
</thead>
<tbody>
<tr>
<td>④⑤</td>
<td>SW1 SW2</td>
<td>Above ③</td>
<td>More than 5.6 (0)</td>
</tr>
<tr>
<td>⑥</td>
<td>OFF OFF</td>
<td>Below ④</td>
<td>Less than 2.5 (2-1/4)</td>
</tr>
</tbody>
</table>

---

**SLEEVE**
Fuel Warning Lamp Sensor Check
- It will take a short time for the bulb to light.

Oil Pressure Switch Check

<table>
<thead>
<tr>
<th>Oil pressure</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>kPa (bar, kgf/cm², psi)</td>
<td></td>
</tr>
<tr>
<td>More than 10 - 20 (kPa)</td>
<td>NO</td>
</tr>
<tr>
<td>Less than 10 - 20 (kPa)</td>
<td>YES</td>
</tr>
</tbody>
</table>

Check the continuity between the terminals of oil pressure switch and body ground.

Diode Check
- Check continuity using an ohmmeter.
- Diode is functioning properly if test results are as shown in the figure at left.

NOTE: Specification may vary depending on the type of tester. Before performing this inspection, be sure to refer to the instruction manual for the tester to be used.

- Diodes for warning lamps are built into the combination switch printed circuit.
**Warning Buzzer/System Description**

The warning buzzer is controlled by the smart entrance control unit.

- **Power is supplied at all times**
  - through 10A fuse (No. 2) located in the fuse block
  - to warning buzzer terminal ①
  - to key switch terminal ①
- **Power is supplied at all times**
  - (LHD models without daytime light system)
  - through 45A fusible link (letter L, located in the fusible link and fuse box)
  - to lighting switch terminal ①
  - (LHD models with daytime light system and RHD models)
  - through 10A fuse (No. 3) located in the fuse block
  - to lighting switch terminal ① (For Europe) or ② (Except for Europe)

**Power is supplied at all times**
- through 25A fusible link (letter L, located in the fusible link and fuse box)
- to circuit breaker terminal ①
- through circuit breaker terminal ①
- to smart entrance control unit terminal ①

With the ignition switch in the ON or START position, power is supplied
- through 7.5A fuse (No. 2) located in the fuse block
- to smart entrance control unit terminal ①

**Ground is supplied to smart entrance control unit terminal ② through body ground ③.**

When a signal, or combination of signals, is received by the smart entrance control unit, ground is supplied
- through smart entrance control unit terminal ②
- to warning buzzer terminal ①

With power and ground supplied, the warning buzzer will sound.

**Ignition key warning buzzer (Except for Europe models)**

With the key in the ignition switch in the OFF position, and the driver's door open, the warning buzzer will sound. A battery positive voltage is supplied
- from key switch terminal ②
- to smart entrance control unit terminal ①

**Ground is supplied**
- from driver side door switch terminal ①
- to smart entrance control unit terminal ①

**Driver side door switch terminal ① is grounded through body grounds ① and ②.**

**Light warning buzzer**

With ignition switch OFF, the driver's door open, and lighting switch in 1ST or 2ND position, warning buzzer will sound. A battery positive voltage is supplied
- (LHD models without daytime light system)
  - through lighting switch terminal ③
  - through 10A fuse (No. 2) located in the fuse block
  - to smart entrance control unit terminal ③
- (LHD models with daytime light system)
  - through lighting switch terminal ③
  - to daytime light unit terminal ③
  - through daytime light unit terminal ③
  - to smart entrance control unit terminal ③ (RHD models)
  - from lighting switch terminal ③ (For Europe) or ④ (Except for Europe)
  - to smart entrance control unit terminal ③

**Ground is supplied**
- from driver side door switch terminal ①
- to smart entrance control unit terminal ①

**Driver side door switch terminal ① is grounded through body grounds ① and ②.**
## SYMPTOM CHART

### Trouble Diagnoses — Warning Buzzer

<table>
<thead>
<tr>
<th>PROCEDURE</th>
<th>Preliminary Check</th>
<th>Main Power Supply and Ground Circuit Check</th>
<th>Diagnostic Procedure 1</th>
<th>Diagnostic Procedure 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>REFERENCE PAGE</td>
<td>EL-133</td>
<td>EL-133</td>
<td>EL-134</td>
<td>EL-135</td>
</tr>
</tbody>
</table>

### Preliminary Check

#### Preliminary check 1
- Light warning buzzer does not activate.

<table>
<thead>
<tr>
<th>Question</th>
<th>Option 1</th>
<th>Option 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does key warning buzzer activate?</td>
<td>Yes</td>
<td>Go to &quot;DIAGNOSTIC PROCEDURE 1 — Step 1&quot; (EL-133)</td>
</tr>
<tr>
<td>No</td>
<td>Yes</td>
<td>Go to &quot;DIAGNOSTIC PROCEDURE 1 — Step 2&quot; (EL-135)</td>
</tr>
</tbody>
</table>

#### Preliminary check 2
- Ignition key warning buzzer does not activate.

<table>
<thead>
<tr>
<th>Question</th>
<th>Option 1</th>
<th>Option 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does light warning buzzer activate?</td>
<td>Yes</td>
<td>Go to &quot;DIAGNOSTIC PROCEDURE 2 — Step 1&quot; (EL-136)</td>
</tr>
<tr>
<td>No</td>
<td>Yes</td>
<td>Go to &quot;DIAGNOSTIC PROCEDURE 2 — Step 2&quot; (EL-135)</td>
</tr>
<tr>
<td>Does interior lamp come on when door is open?</td>
<td>Yes</td>
<td>Go to &quot;DIAGNOSTIC PROCEDURE 2 — Step 3&quot; (EL-135)</td>
</tr>
</tbody>
</table>
WARNING LAMPS AND BUZZER

Trouble Diagnoses — Warning Buzzer (Cont'd)
MAIN POWER SUPPLY AND GROUND CIRCUIT CHECK

Main power supply

<table>
<thead>
<tr>
<th>Terminals</th>
<th>Battery voltage existence condition</th>
<th>Ignition switch position</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 - 5</td>
<td>No</td>
<td>OFF</td>
</tr>
<tr>
<td>1 - 2</td>
<td>Yes</td>
<td>ACC</td>
</tr>
</tbody>
</table>

Ground circuit

<table>
<thead>
<tr>
<th>Terminals</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - Ground</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Symptom: Light warning buzzer does not activate.

Diagnostic Procedure 1

1. Perform "Preliminary check" before referring to the following chart.

A. Door Switch Input Signal Check
   - Check door switch (Refer to EL-296)
   - Check harness continuity between control unit harness terminal 3 and 5.
   - Check harness continuity between control unit harness terminal 18 and driver side door switch harness terminal 5.
   - Continuity should exist.
   - Check harness continuity between door side door switch harness terminal 3 and body ground.
   - Continuity should exist.

   ![Door Switch Input Signal Check Diagram](EL-134)

B. Buzzer Power Supply Check
   - Measure voltage between buzzer harness terminal 3 and body ground.
   - Battery voltage should exist.

   ![Buzzer Power Supply Check Diagram](EL-135)

C. Buzzer Output Signal Check
   - Check continuity between warning buzzer harness terminal 3 and control unit harness terminal 28.
   - Continuity should exist.

   ![Buzzer Output Signal Check Diagram](EL-135)

D. Warning Buzzer Check
   - Refer to EL-137

   ![Warning Buzzer Check Diagram](EL-135)

   - Check lighting switch
   - Check harness continuity between control unit harness terminal 18 and lighting switch harness terminal 35.
   - Continuity should exist.
   - Measure voltage between lighting switch harness terminal 18 and body ground.
   - Battery voltage should exist.

   ![Lighting Switch Input Signal Check Diagram](EL-135)

Replace control unit.
Trouble Diagnoses — Warning Buzzer (Cont’d)

Diagnostic Procedure 2

Symptom: Ignition key warning buzzer does not activate.

(Except Europe models)

- Perform “Preliminary check 2” before referring to the following flow chart.

Step 1

Ignition Key Switch Input Signal Check

Measure voltage between control unit harness terminals ① and ②.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Voltage [V]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Key inserted</td>
<td>Approx. 12</td>
</tr>
<tr>
<td>Key removed</td>
<td>0</td>
</tr>
</tbody>
</table>

- Check ignition key switch.
- Check harness continuity between control unit harness terminal ① and key switch harness terminal ②.
- Continuity should exist.
- Measure voltage between key switch harness terminal ① and body ground.
- Battery voltage should exist.

Step 2

Door Switch Input Signal Check

Check continuity between control unit harness terminals ③ and ④.

Condition | Door State |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Driver side door is closed</td>
<td>No</td>
</tr>
<tr>
<td>Driver side door is open</td>
<td>Yes</td>
</tr>
</tbody>
</table>

- Check door switch.
- Check harness continuity between control unit harness terminal ③ and driver side door switch harness terminal ⑤.
- Continuity should exist.
- Check harness continuity between driver side door switch harness terminal ⑥ and body ground.
- Continuity should exist.

Step 3

Buzzer Power Supply Check

Measure voltage between warning buzzer harness terminal ⑦ and body ground.
- Battery voltage should exist.

- Check 10A fuse [B], harness and connector.

Step 4

Buzzer Output Signal Check

Check continuity between warning buzzer harness terminal ⑦ and control unit harness terminal ⑧.
- Continuity should exist.

- Repair harness or connectors.

Step 5

Warning Buzzer Check

Refer to EL-137.

- Replace warning buzzer.

Replace control unit.
WIPER AND WASHER

Front Wiper and Washer/System Description

WIPER OPERATION
The wiper switch is controlled by a lever built into the combination switch. There are three wiper switch positions:
- LO speed
- HI speed
- INT (Intermittent)

With the ignition switch in the ACC or ON position, power is supplied:
- through 20A fuse (No. 111, located in the fuse block)
- to front wiper motor terminal ②.

Low and high speed wiper operation
Ground is supplied to wiper switch terminal ① through body ground ③ or ④.
When the wiper switch is placed in the LO position, ground is supplied:
- through terminal ② of the wiper switch
- to wiper motor terminal ④.

With power and ground supplied, the wiper motor operates at low speed.
When the wiper switch is placed in the HI position, ground is supplied:
- through terminal ② of the wiper switch
- to wiper motor terminal ③.

With power and ground supplied, the wiper motor operates at high speed.

Auto stop operation
With wiper switch turned OFF, wiper motor will continue to operate until wiper arms reach windshield base.

When wiper arms are not located at base of windshield with wiper switch OFF, ground is provided:
- from terminal ④ of the wiper switch
- to wiper motor terminal ④, in order to continue wiper motor operation at low speed.

Ground is also supplied:
- through terminal ② of the wiper switch
- to wiper amplifier terminal ①
- through terminal ② of the wiper amplifier
- to wiper motor terminal ①
- through terminal ④ of the wiper motor, and
- through body ground ③.

When wiper arms reach base of windshield, wiper motor terminals ① and ② are connected instead of terminals ① and ④. Wiper motor will then stop wiper arms at the PARK position.

Intermittent operation
The wiper motor operates the wiper arms one time at low speed at a set interval of approximately 3 to 13 seconds. This feature is controlled by the wiper amplifier.

When the wiper switch is placed in the INT position, ground is supplied:
- to wiper amplifier terminal ①
- from wiper switch terminal ④
- through wiper switch terminal ② and body ground ③ or ④.
- to wiper motor terminal ④
- through the wiper switch terminal ④
- to wiper switch terminal ②
- through wiper amplifier terminal ①
- to wiper amplifier terminal ①
- through body ground ②.

The desired interval time is input:
- to wiper amplifier terminal ①
- from wiper switch terminal ④

The wiper motor operates at low speed at the desired time interval.

WASHER OPERATION
Front Wiper and Washer/System Description (Cont'd)

WASHER OPERATION
With the ignition switch in the ACC or ON position, power is supplied:
- through 20A fuse (No. 111, located in the fuse block)
- to washer motor terminal ①.

When the lever is pulled to the WASH position, ground is supplied:
- to washer motor terminal ②, and
- to wiper amplifier terminal ④.
- from terminal ⑧ of the wiper switch
- through terminal ⑩ of the wiper switch, and
- through body ground ⑪ or ⑫.

With power and ground supplied, the washer motor operates.
The wiper motor operates when the lever is pulled to the WASH position for one second or more and
for approximately 3 seconds after the lever is released. This feature is controlled by the wiper amplifier
in the same manner as the intermittent operation.
Trouble Diagnoses

DIAGNOSTIC PROCEDURE 1
SYMPTOM: Intermittent wiper does not operate.

A. WIPER AMP OUTPUT SIGNAL CHECK
   1) Turn ignition switch to "ACC".
   2) Turn wiper switch to "INT" or "OFF".
   3) Measure voltage between wiper amp.
      harness terminal ② and body ground.

   Condition of wiper switch  Voltage [V]
   OFF          Approx. 12
   INT          12 or 10 V at 12 sec.

   OK  Check wiper motor.
   NG  See next.

B. Measure voltage between wiper amp.
    harness terminal ② and body ground.
    Battery voltage should exist.

   OK  Check wiper switch.
   NG  Check wiper motor.

C. INTERMITTENT SWITCH INPUT SIGNAL
    CHECK
    Check harness continuity between
    wiper amp. harness terminal ②
    and body ground.

   Condition of wiper switch  Continuity
   OFF          No
   INT          Yes

   OK  Continuity should exist.
   NG  Check harness continuity
        between wiper amp.
        harness terminal ②
        and wiper switch harness
        terminal ③. Continuity should exist.

D. WIPER AMP GROUND CIRCUIT CHECK
   Check harness continuity between
   wiper amp. harness terminal ②
   and body ground.

   Continuity should exist.

   OK  Replace wiper amp.
   NG  Repair harness or connector.

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 2
SYMPTOM: Intermittent time of wiper cannot be adjusted.

A. INTERMITTENT WIPER VOLUME INPUT SIGNAL CHECK
   Measure resistance between wiper amp.
   harness terminals ③ and ⑤ while turning intermittent wiper volume.

   Position of wiper switch  Resistance [Ω]
   C  5
   L  Approx. 1 k

   OK  Replace wiper amp.
   NG  Check intermittent wiper volume.

B. Check harness continuity between
    wiper amp. harness terminal ④
    and wiper switch harness terminal ⑤.
    Check harness continuity between
    wiper amp. harness terminal ③
    and body ground.

DIAGNOSTIC PROCEDURE 3
SYMPTOM: Wiper and washer activate individually but not in combination.

A. WASHER SWITCH INPUT SIGNAL CHECK
   1) Turn ignition switch to "ACC".
   2) Measure voltage between wiper amp.
      harness terminals ③ and ⑤.

   Condition of wiper switch  Voltage [V]
   OFF          Approx. 12
   ON           6

   OK  Check harness continuity
        between wiper amp. harness
        terminal ③ and wiper switch
        harness terminal ⑤.
   NG  Check wiper switch.

B. WIPER AMP OUTPUT SIGNAL CHECK
   Measure voltage between wiper amp.
   harness terminals ③ and ⑤ after
   operating washer switch.

   OK  BV for approx. 3 seconds after washer
        has operated.
   NG  Replace wiper amp.
WIPER AND WASHER

Front Wiper Amplifier Check
1. Connect as shown in the figure at left.
2. If test lamp comes on when connected to terminal ① or ③ and battery ground, wiper amplifier is normal.

Front Wiper Installation and Adjustment
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 after 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” : 18 - 33 mm (0.71 - 1.30 in)
   Clearance “L2” : 17 - 32 mm (0.67 - 1.26 in)
   Tighten wiper arm nuts to specified torque.
   Front wiper:
   16.7 - 22.5 N·m (1.70 - 2.31 kgf-m, 12.32 - 16.67 ft-lb)

   • Before reinstalling wiper arm, clean up the pivot area as illustrated. This will reduce possibility of wiper arm looseness.

Front Washer Nozzle Adjustment
• Using a suitable tool, adjust windshield washer nozzle to correct its spray pattern.
  Adjustable range: ±10° (in any direction)
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.
This illustration is for LHD models. For RHD models, these units are installed on the opposite side.

REMOVAL
1. Remove 4 bolts that secure wiper motor.
2. Detach wiper motor from wiper linkage at ball joint.
3. Remove wiper linkage.

Be careful not to break ball joint rubber boot.

INSTALLATION
1. Grease ball joint portion before installation
2. Installation is the reverse order of removal.

Rear Wiper and Washer/System Description

WIPER OPERATION
The rear wiper switch is controlled by a ring built into the combination switch. There are two wiper switch positions:
- ON (LO speed)
- INT (intermittent)

With the ignition switch in the ACC or ON position, power is supplied:
- through 10A (LHD models) or 15A (RHD models) fuse (No. 5, LHD models) or 6, (RHD models) located in the fuse block
- to rear wiper motor terminal (4), and
- to rear wiper relay terminal (3).

Low speed wiper operation
Ground is supplied to rear wiper switch terminal (6) through body ground (16) or (17).

When the rear wiper is placed in the ON position, ground is supplied:
- through rear wiper switch terminal (6)
- to rear wiper relay terminal (3).

The rear wiper relay is energized and ground is supplied:
- to rear wiper motor terminal (3)
- through rear wiper relay terminal (3)
- to rear wiper relay terminal (4)
- through body ground (16) or (17).

Auto stop operation
With the rear wiper switch turned OFF, rear wiper motor will continue to operate until wiper arm reaches rear window base.

When wiper arm is not located at base of rear window with rear wiper switch OFF, rear wiper relay is not energized and ground is supplied:
- to rear wiper motor terminal (3)
- through rear wiper relay terminal (4)
- through rear wiper motor terminal (3), in order to continue rear wiper motor operation at low speed.

Ground is also supplied:
- to rear wiper motor terminal (4)
- through body ground (16) or (17).

When wiper arm reaches base of rear window, rear wiper motor terminals (4) and (5) are connected instead of terminals (4) and (3). Rear wiper motor will then stop wiper arm at the PARK position.

Intermittent operation
The rear wiper motor operates the wiper arm one time at low speed at an interval of approximately 7 seconds. This feature is controlled by rear wiper amplifier.

With the ignition switch in the ACC or ON position, power is supplied:
- through 10A (LHD models) or 15A (RHD models) fuse (No. 5, LHD models) or 6, (RHD models) located in the fuse block
- to rear wiper relay terminal (3).

When the rear wiper switch is placed in the INT position, ground is supplied:
- to rear wiper amplifier terminal (3)
- from rear wiper switch terminal (4)
- through body ground (16) or (17).

Ground is also supplied:
- to rear wiper relay terminal (3)
- through rear wiper amplifier terminal (6)
- to rear wiper amplifier terminal (3)
- through body ground (16) or (17).

Then the rear wiper relay is energized and ground is supplied:
- to rear wiper motor terminal (3)
- through rear wiper relay terminal (3)
- to rear wiper relay terminal (5)
- through body ground (17).
WIPER AND WASHER

Rear Wiper and Washer/System Description
(Cont'd)

With power and ground supplied, the rear wiper motor operates intermittently.

WASHER OPERATION

With the ignition switch in the ACC or ON position, power is supplied
- through 10A (LHD models) or 15A (RHD models) fuse (No. 2) (LHD models) or (3) (RHD models),
  located in the fuse block
- to rear washer motor terminal (1),
- when the ring is turned WASH position, ground is supplied
- to rear washer motor terminal (2), and
- to rear wiper amplifier terminal (3),
- from terminal (4) of rear wiper switch
- through terminal (5) of rear wiper switch, and
- through body ground (6) or (9).

With power and ground is supplied, the rear washer motor operates.
The rear wiper motor operates when the ring is turned to WASH position for one second or more and
for approximately 3 seconds after the ring is released. This feature is controlled by the rear wiper
amplifier in the same manner as the intermittent operation.
Rear Wiper Amplifier Check

1. Connect as shown in the figure at left.
2. If test lamp comes on when connected to terminal ① or ② and battery ground, wiper amplifier is normal.

Rear Wiper Installation and Adjustment

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 "L3" 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 "L3".
   - Clearance "L3": 25 - 42 mm (1.02 - 1.65 in)
   - Tighten wiper arm nuts to specified torque.
   - Rear wiper:
     12.7 - 17.7 N·m (1.30 - 1.81 kg·m, 9.37 - 13.06 ft·lb)

- Before reinstalling wiper arm, clean up the pivot area as illustrated. This will reduce possibility of wiper arm looseness.

Rear Washer Nozzle Adjustment

- Using a suitable tool, adjust rear window washer nozzle to correct its spray pattern.
- Adjustable range: ±15° (in any direction)
WIPER AND WASHER

Rear Washer Nozzle Adjustment (Cont'd)

<table>
<thead>
<tr>
<th>Unit: mm (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>'11</td>
</tr>
<tr>
<td>'12</td>
</tr>
</tbody>
</table>

* The diameters of these circles are less than 90 mm (3.54 in).

Rear Washer Tube Layout

Check Valve (For rear washer)
- A check valve is provided in the rear washer fluid line. Be careful not to connect check valve to washer tube in the wrong direction.

Headlamp Washer/System Description

Power is supplied at all times
- through 25A fusible link (fatter 1), located in the fusible link and fuse box
- to headlamp washer motor terminal ①.

Power is also supplied at all times
- through 20A fuse (No. 20), located in the fusible link and fuse box
- to lighting switch terminal ③.

Headlamp washer operation
The headlamp washer operates for approximately 1 second at one time. This feature is controlled by headlamp washer amplifier.
For headlamp washer operation, the lighting switch must be in the 2ND position and ignition switch in the ON or START position.
With the headlamp washer switch in the ON position, ground is supplied
- to headlamp washer amplifier terminal ②
- through headlamp washer switch terminal ③
- through headlamp washer switch terminal ④
- through body ground ⑤ or ⑥.
Ground is also supplied
- to headlamp washer motor terminal ②
- through headlamp washer amplifier terminal ④
- to headlamp washer amplifier terminal ⑥
- through body ground ③.
With power and ground supplied, headlamp washer will operate.
WIPER AND WASHER

Headlamp Washer/Wiring Diagram — HLC —

EL-HLC-01

ION ON or START

BATTERY

HEADLAMP WASHER MOTOR

L/R

HEADLAMP WASHER AMPLIFIER

Refer to EL-POWER.

Preceding page

Next page

R/L

To EL-ILL

Refer to EL-POWER.

Next page

R/L

To EL-POWER

Refer to EL-POWER

Followout page

EL-154

EL-155
**WIPER AND WASHER**

**Headlamp Washer Amplifier Check**
1. Connect as shown in the figure at left.
2. If test lamp comes on when connected to the terminal 3 and battery ground, headlamp washer amplifier is normal.

**Headlamp Washer Nozzle Adjustment**
- Using a suitable tool, adjust headlamp washer nozzle to correct its spray pattern.
- Adjustable range: ± 3° (Up and down)

**Headlamp Washer Tube Layout**

**Check Valve (For headlamp washer)**

---

**POWER WINDOW**

**System Description**

Power is supplied at all times:
- from 2SA fuse link (Letter 1 located in the fuse and fusible link box)
- to circuit breaker terminal 1
- through circuit breaker terminal 2
- to power window relay terminal 3

With ignition switch in ON or START position, power is supplied:
- through 7.5A fuse (No. 20, located in the fuse block)
- to power window relay terminal 1

Ground is supplied to power window relay terminal 3:
- through body ground 20

The power window relay is energized and power is supplied:
- through power window relay terminal 1
- to power window main switch terminal 4
- to power window sub-switch terminal 4
- to power window amplifier terminal 4

**MANUAL OPERATION**

**Driver side door**
- Ground is supplied
- to power window main switch terminal 4 and
- to power window amplifier terminal 7
- through body ground 20

**WINDOW UP**

When the driver side switch in the power window main switch is pressed in the up position, ground signal is supplied:
- to power window amplifier terminal 1
- from power window main switch terminal 2

Power is supplied:
- to driver side power window regulator terminal 1
- through power window amplifier terminal 8

Ground is supplied:
- to driver side power window regulator terminal 2
- through power window amplifier terminal 8

Then, the motor raises the window until the switch is released.

**WINDOW DOWN**

When the driver side switch in the power window main switch is pressed in the down position, ground signal is supplied:
- to power window amplifier terminal 2
- from power window main switch terminal 2

Power is supplied:
- to driver side power window regulator terminal 2
- through power window amplifier terminal 8

Ground is supplied:
- to driver side power window regulator terminal 3
- through power window amplifier terminal 8

Then, the motor lowers the window until the switch is released.

**Passenger side door**
- Ground is supplied
- to power window main switch terminal 4
- through body ground 20
POWER WINDOW
System Description (Cont'd)

NOTE:
Numbers in parentheses are terminal numbers, when power window switch is pressed in the UP and DOWN positions respectively.

MAIN SWITCH OPERATION
Power is supplied
- through power window main switch (⑥, ⑦)
- to power window sub-switch (①, ③)
The subsequent operation is the same as the sub-switch operation.

SUB-SWITCH OPERATION
Power is supplied
- through power window sub-switch (②, ⑧)
- to passenger side power window regulator (①, ③).
Ground is supplied
- to passenger side power window regulator (②, ③)
- through power window sub-switch (①, ③)
- to power window sub-switch (③, ③)
- through power window main switch (①, ③)
Then, the motor raises or lowers the window until the switch is released.

AUTO OPERATION
The power window AUTO feature enables the driver to raise or lower the driver's window without holding the window switch.
The AUTO feature only operates on the driver's window.
When a power window main switch is pressed and released the AUTO position, ground signal is supplied
- to power window amplifier terminal (⑥)
- from power window main switch terminal (①).
The subsequent operation is the same as the manual operation of driver side door.
Then, the driver side door window will fully close or fully open.

POWER WINDOW LOCK
The power window lock is designed to lock-out window operation to passenger side door window.
When the lock switch is pressed to lock position, ground of the passenger side switch in the power window main switch is disconnected. This prevents the power window motors from operating.
POWER WINDOW
Wiring Diagram — WINDOW — (Cont’d)

EL-WINDOW-03

POWER WINDOW

Trouble Diagnosis
DIAGNOSTIC PROCEDURE 1
SYMPTOM: Driver and passenger power window cannot be operated.

A
CHECK MAIN POWER SUPPLY AND GROUND CIRCUIT.
1) Disconnect power window amp. connector.
2) Check voltage while ignition switch is "ON".

<table>
<thead>
<tr>
<th>Terminals</th>
<th>Voltage (V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - GND</td>
<td>Approx. 12</td>
</tr>
</tbody>
</table>

B
Check continuity between power window amp. terminal (7) and (10).
Does continuity exist?

| OK | Yes | Go to DIAGNOSTIC PROCEDURE 2 and 3 |
|    |     |                                  |
|    | No  | Repair harness.                  |

To EL-WINDOW-01 <- M/B

Preceding Page
POWER WINDOW
Trouble Diagnosis (Cont'd)

DIAGNOSTIC PROCEDURE 2

SYMPTOM: Driver's power window cannot be operated but passenger power window can be operated.

CHECK POWER SUPPLY FOR POWER WINDOW AMP.
1) Disconnect connector from power window amp.
2) Check voltage across power window amp. terminal ① and GND, ③ and GND while ignition switch is "ON".

<table>
<thead>
<tr>
<th>Terminals</th>
<th>Battery voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>① - GND</td>
<td>Yes</td>
</tr>
<tr>
<td>③ - GND</td>
<td>Yes</td>
</tr>
</tbody>
</table>

NG  Repair harness between power window relay and power window amp.

CHECK POWER WINDOW MAIN SWITCH CIRCUIT.
1) Disconnect connector from power window main switch.
2) Check continuity.

<table>
<thead>
<tr>
<th>Power window main switch operation</th>
<th>Terminals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auto (Down)</td>
<td>① - ③</td>
</tr>
<tr>
<td>Up</td>
<td>② - ③</td>
</tr>
<tr>
<td>Down</td>
<td>② - ①</td>
</tr>
</tbody>
</table>

Does continuity exist?

No  Replace power window main switch.

Yes  OK

GO to next page

CHECK POWER WINDOW MOTOR CIRCUIT.
1) Connect power window amp. connector.
2) Check voltage for power window motor.

<table>
<thead>
<tr>
<th>Terminals</th>
<th>Power window main switch operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>① - ③</td>
<td>Up</td>
</tr>
<tr>
<td>② - ③</td>
<td>Down</td>
</tr>
<tr>
<td>② - ①</td>
<td>Down</td>
</tr>
</tbody>
</table>

Does battery voltage exist?

No  Repair harness.

Yes  OK

1) Disconnect driver side power window regulator connector.
2) Check continuity.

<table>
<thead>
<tr>
<th>Terminals</th>
</tr>
</thead>
<tbody>
<tr>
<td>① - ③</td>
</tr>
<tr>
<td>② - ③</td>
</tr>
<tr>
<td>② - ①</td>
</tr>
</tbody>
</table>

Does continuity exist?

Check driver side power window motor.
Refer to "ELECTRICAL COMPONENTS INSPECTION" (EL-168)
POWER WINDOW

Trouble Diagnosis (Cont’d)
DIAGNOSTIC PROCEDURE 3-1
SYMPTOM: Passenger power window (main switch and sub-switch) cannot be operated. But driver side power window can be operated.

A
CHECK GROUND CIRCUIT.
1) Disconnect power window main switch connector.
2) Check continuity between power window main switch terminal 8 and GND.

Does continuity exist?

No
Repair harness

Yes

B
CHECK POWER WINDOW MAIN SWITCH.
Check continuity when power window lock switch is in "UNLOCK" position.

Terminals 8 - 6.6
Does continuity exist?

No
Replace power window main switch

Yes

Check passenger side power window motor. Refer to "ELECTRICAL COMPONENTS INSPECTION" (EL-166).

POWER WINDOW

Trouble Diagnosis (Cont’d)
DIAGNOSTIC PROCEDURE 3-2
SYMPTOM: Passenger power window cannot be operated using main switch. But driver side and passenger side (using sub-switch) can be operated.

A
CHECK MAIN POWER SUPPLY.
1) Disconnect power window main switch connector.
2) Check voltage across power window main switch terminal 8 and GND.

Does battery voltage exist?

No
Repair harness

Yes

B
CHECK POWER WINDOW MAIN SWITCH.
Check continuity.

Power window main switch operation

Terminals
Up 1 - 8
Down 5 - GND
Does continuity exist?

No
Replace power window main switch

Yes

C
1) Connect power window main switch connector.
2) Check voltage.

Power window main switch operation

Terminals
Up 1 - 8
Down 5 - GND
Does battery voltage exist?

Yes
Replace power window sub-switch
**POWER WINDOW**

Trouble Diagnosis (Cont'd)

**DIAGNOSTIC PROCEDURE 3-3**

**SYMPTOM:** Passenger power window cannot be operated using sub-switch. But driver side and passenger side (using main switch) can be operated.

---

**CHECK MAIN POWER SUPPLY.**

1) Disconnect power window sub-switch connector.
2) Check voltage across power window sub-switch terminal ⑤ and GND. Does battery voltage exist?  

---

Yes

Repair harness.

No

Replace power window sub-switch.

---

**POWER WINDOW MOTOR**

**TERMINALS**

<table>
<thead>
<tr>
<th>Terminals</th>
<th>Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>①</td>
<td>Upward</td>
</tr>
<tr>
<td>②</td>
<td>Downward</td>
</tr>
</tbody>
</table>

---

**POWER DOOR LOCK**

**System Description**

Power is supplied at all times
- through 25A fusible link (No. ③ located in the fuse and fusible link box)
- to circuit breaker terminal ①
- through circuit breaker terminal ②
- to smart entrance control unit terminal ③
- Ground is supplied to smart entrance control unit terminal ④ through body ground ⑤

**POWER DOOR LOCK OPERATION**

When one of the following input signals is supplied:
- driver side door is locked/unlocked using key or lock knob
- passenger side door is locked/unlocked using key or lock knob (Only for models with multi-remote control system):
  - Smart entrance control unit locks/unlocks driver side door (Only for models with multi-remote control system) and passenger side door.

For operation by the remote controller, refer to "MULTI-REMOTE CONTROL SYSTEM".

**Input (Unlock signal)**

**Models with multi-remote control system**

When the driver side door is unlocked using key or lock knob, ground is supplied
- to smart entrance control unit terminal ③
- through driver side door lock actuator (door unlock sensor) terminal ④
- to driver side door lock actuator (door unlock sensor) terminal ⑤
- through body ground ⑥

When the passenger side door is unlocked using key or lock knob, ground is supplied
- to smart entrance control unit terminal ③
- through passenger side door lock actuator (door unlock sensor) terminal ④
- to passenger side door lock actuator (door unlock sensor) terminal ⑤
- through body ground ⑥

**Models without multi-remote control system**

When the driver side door is unlocked using key or lock knob, ground is supplied
- to smart entrance control unit terminal ③
- through lock knob switch terminal ④
- to lock knob switch terminal ⑤
- through body ground ⑥

**Input (Lock signal)**

The smart entrance control unit terminal ③ or ⑤ receives lock signal when the unlock signal is shut off.

**Output (Unlock)**

**Driver side door (Models with multi-remote control system)**

Power is supplied
- to driver side door lock actuator terminal ④
- through smart entrance control unit terminal ②

Then, the door is unlocked.

**Passenger side door**

Power is supplied
- to passenger side door lock actuator terminal ④
- through smart entrance control unit terminal ②

Then, the door is unlocked.
Output (Lock)

Driver side door (Models with multi-remote control system)
- Power is supplied
  - to driver side door lock actuator terminal 3
  - through smart entrance control unit terminal 5
Then, the door is locked.

Ground is supplied
- to driver side door lock actuator terminal 1
- through smart entrance control unit terminal 2

Passenger side door
- Power is supplied
  - to passenger side door lock actuator terminal 3
  - through smart entrance control unit terminal 4
Ground is supplied
- to passenger side door lock actuator terminal 1
- through smart entrance control unit terminal 2
Then, the door is locked.
POWER DOOR LOCK
Wiring Diagram — D/Lock — (Cont’d)

Trouble Diagnoses
DIAGNOSTIC PROCEDURE
SYMPTOM: Power door lock cannot be operated.

A. CHECK MAIN POWER SUPPLY AND GROUND CIRCUIT.
1) Disconnect connector from control unit.
2) Check voltage across control unit terminal 7 and GND.
   Does battery voltage exist?

B. Check continuity between terminal 7 and GND.
   Does continuity exist?

C. CHECK UNLOCK SENSOR CIRCUIT.
1) Connect control unit connector.
2) Check voltage across control unit terminal 1 and GND
   Driver side door lock knob condition
   Terminal Voltage [V]
   Locked → Unlocked 12 → 0 → 12

D. Check continuity between control unit connector and GND.
   Does continuity exist?

E. CHECK DOOR LOCK ACTUATOR CIRCUIT.
Check voltage for door lock motor.

F. Check the following.
   ■ Fuse
   ■ Circuit breaker
   ■ Power supply harness

Refer to last page (Foldout page)
POWER DOOR LOCK

Trouble Diagnoses (Cont’d)

1) Disconnect control unit connector and door lock actuator connector.

2) Check continuity

<table>
<thead>
<tr>
<th>Terminals</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>④ - ⑧</td>
<td>Yes</td>
</tr>
<tr>
<td>④ - ⑩</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Does continuity exist?

Yes

Check power door lock motor. Refer to "ELECTRICAL COMPONENTS INSPECTION".

ELECTRICAL COMPONENTS INSPECTION

Power door lock motor

<table>
<thead>
<tr>
<th>Door lock condition</th>
<th>Terminals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unlocked → Locked</td>
<td>⑥ - ⑧</td>
</tr>
<tr>
<td>Locked → Unlocked</td>
<td>⑥ - ⑩</td>
</tr>
</tbody>
</table>

POWER DOOR MIRROR

* For removal of door mirror, refer to "DOOR MIRROR" in BT section.

Wiring Diagram — MIRROR —

LHD MODELS

EL-MIRROR-01
REAR WINDOW DEFOGGER AND DOOR MIRROR DEFOGGER

System Description

The rear window and door mirror defogger system is controlled by the smart entrance control unit.

Power is supplied at all times
- to rear window defogger relay terminal (N)
- through 15A fuse (No. 6, located in the fuse block)
- to rear window defogger relay terminal (O)
- through 15A fuse (No. 7, located in the fuse block)
- to mirror defogger relay terminal (O)
- through 10A fuse (No. 13, located in the fuse block).

With the ignition switch in the ON or START position, power is supplied
- to each defogger relay terminal (N) and
- to smart entrance control unit terminal (N).

Ground is supplied
- to rear window defogger switch terminal (A) and
- to smart entrance control unit terminal (H).
- through body ground (E) or (F).

Operation

The ignition switch must be in the ON or START position for defogger operation.

With the rear window defogger switch in the ON position and for approximately 15 minutes after the rear window defogger switch has turned to OFF from ON, ground is supplied
- through terminal (O) of the rear window defogger switch
- to smart entrance control unit terminal (O).

Terminal (O) of the smart entrance control unit then supplies ground to each defogger relay terminal (N).

With power and ground supplied, each defogger relay is energized.

For rear window defogger system, power is supplied
- through terminals (N) and (O) of the rear window defogger relay
- to condenser terminal (A)
- through terminal (A) of the condenser
- to the rear window defogger terminal (O).

For mirror defogger system, power is supplied
- through mirror defogger relay terminal (A)
- to each mirror defogger terminal (O).

Ground is supplied
- to rear window defogger terminal (O)
- through body ground (E) and
- to each mirror defogger terminal (O)
- through body ground (F) or (F).

With power and ground supplied, each defogger filament heats and defogs the rear window and door mirrors.

When the system is activated, the rear window defogger indicator illuminates in the rear window defogger switch.

Power is supplied
- to terminal (O) of the rear window defogger switch
- from terminal (O) of the rear window defogger relay.

Terminal (O) of the rear window defogger switch is grounded through body ground (E) or (F).
Trouble Diagnoses

DIAGNOSTIC PROCEDURE 1
SYMPTOM: Rear defogger does not activate, or does not go off after activating.

A
REAR WINDOW DEFOGGER OUTPUT SIGNAL CHECK
Measure voltage between control unit harness terminals 10 and 11.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Voltage (V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rear defogger switch is OFF</td>
<td>Approx. 12</td>
</tr>
<tr>
<td>Rear defogger switch is ON</td>
<td>0</td>
</tr>
</tbody>
</table>

NG

B
REAR WINDOW DEFOGGER SWITCH INPUT SIGNAL CHECK
Check continuity between control unit harness terminal 10 and body ground.

<table>
<thead>
<tr>
<th>Condition of defogger switch</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rear defogger switch is pushed</td>
<td>Yes</td>
</tr>
<tr>
<td>Rear defogger switch is released</td>
<td>No</td>
</tr>
</tbody>
</table>

NG

C
IGNITION INPUT SIGNAL CHECK
Check voltage between control unit harness terminal 10 and body ground.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Voltage (V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ignition switch is ON</td>
<td>Approx. 12</td>
</tr>
<tr>
<td>Ignition switch is OFF</td>
<td>0</td>
</tr>
</tbody>
</table>

OK

D
CONTROL UNIT GROUND CIRCUIT CHECK
Check continuity between control unit harness terminal 10 and body ground.

OK

NG

Replace control unit

---

Rear window defogger relay
Check continuity between terminals 3 and 10, 11, and 12.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>12V direct current supply between terminals 3 and 10</td>
<td></td>
</tr>
<tr>
<td>No current supply</td>
<td>No</td>
</tr>
</tbody>
</table>

Rear window defogger switch
Check continuity between terminals when rear window defogger switch is pushed and released.

<table>
<thead>
<tr>
<th>Terminals</th>
<th>Condition</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 • 11</td>
<td>Rear window defogger switch is pushed</td>
<td>Yes</td>
</tr>
<tr>
<td>11 • 12</td>
<td>Rear window defogger switch is released</td>
<td>No</td>
</tr>
</tbody>
</table>

Filament Check
1. Attach probe circuit tester (in volt range) to middle portion of each filament.

- When measuring voltage, wrap tin foil around the top of the negative probe. Then press the foil against the wire with your finger.
Audio/System Description

Refer to Owner's Manual for audio system operating instructions.

Power is supplied at all times:
- through 7.5A fuse (No. 9), located in the fuse block.
- to radio terminal (B).

With the ignition switch in the ACC or ON position, power is supplied:
- through 10A fuse (No. 9), located in the fuse block.
- to radio terminal (B).

Ground is supplied through the case of the radio.

When the radio power knob is pushed to the ON position, audio signals are supplied:
- through radio terminals 1, 2, 3, 4, 13, 14, 15 and 16.
- to the door, pillar and rear speakers.
AUDIO AND POWER ANTENNA
Audio/Wiring Diagram — AUDIO — (Cont’d)

EL-AUDIO-04

RADIO AND
CASSETTE
PLAYER

FRSP
RH (+)

FRSP
RM (-)

FRSP
LH (+)

FRSP
LH (-)

LG/N

R/B

BAR

BR

BR/W

L/H

L/W

L/H:
models

RHD:
models

JOINT
CONNECTOR

BR

BR/W

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Location of Antenna

Antenna Rod Replacement

REMOVAL
1. Remove antenna nut and antenna base.
2. Withdraw antenna rod while raising it by operating antenna motor.

For Central and South America
Except (ό)
Antenna Rod Replacement (Cont'd)

INSTALLATION
1. Lower antenna rod by operating antenna motor.
2. Insert gear section of antenna rope into place with it facing toward antenna motor.
3. As soon as antenna rope is wound on antenna motor, stop antenna motor. Insert antenna rod lower end into antenna motor pipe.
4. Retract antenna rod completely by operating antenna motor.
5. Install antenna nut and base.

Window Antenna Repair

ELEMENT CHECK
1. Attach probe circuit tester (in ohm range) to antenna terminal on each side.
   - Continuity exists
   - Continuity does not exist
2. If an element is broken, no continuity will exist.
   - Continuity exists
   - Continuity does not exist

Window Antenna Repair (Cont'd)
3. To locate broken point, move probe to left and right along element. Tester needle will swing abruptly when probe passes the point.
   - Refer to REAR WINDOW DEFOGGER "Filament Repair" for Element Repair.
MULTI-REMOTE CONTROL SYSTEM

System Description

Power is supplied at all times
- through 25A fuse link (letter J, located in the fusible link and fuse box).
- to circuit breaker terminal (J)
- through circuit breaker terminal (2)
- to smart entrance control unit terminal (1)

Power is supplied at all times
- to interior lamp terminal (9) and
- to key switch terminal (1)
- through 10A fuse (No. 22, located in the fuse block).

Terminal (9) of the smart entrance control unit is grounded through body ground (9).

INPUTS

When the key switch is ON (ignition key is inserted in key cylinder), power is supplied
- through key switch terminal (2)
- to smart entrance control unit terminal (8)

When the driver side door switch is OPEN, ground is supplied
- to smart entrance control unit terminal (6)
- through driver side door switch terminal (1)
- to driver side door switch terminal (3)
- through body ground (1) or (2).

When the passenger side door switch is OPEN, ground is supplied
- to smart entrance control unit terminal (6)
- through passenger side door switch body ground.

When the driver side door lock actuator (door unlock sensor) is UNLOCKED, ground is supplied
- to smart entrance control unit terminal (6)
- through driver side door lock actuator (door unlock sensor) terminal (2)
- through body ground (1).

When the passenger side door lock actuator (door unlock sensor) is UNLOCKED, ground is supplied
- to smart entrance control unit terminal (6)
- through passenger side door lock actuator (door unlock sensor) terminal (2)
- through body ground (2).

Remote controller signal input
- through window antenna
- to smart entrance control unit terminal (6).

The multi-remote control system operates the
- power door lock
- interior lamp
- panic alarm
- hazard warning lamp
- ID code entry.

OPERATED PROCEDURE

Power door lock operation

When the following input signals are both supplied:
- key switch OFF (when ignition key is not inserted in key cylinder);
- door switch CLOSED (when all the doors are closed);
smart entrance control unit locks all the doors with input of LOCK signal from remote controller.

When key switch is OFF (when ignition key is not inserted in key cylinder), smart entrance control unit unlocks the doors with input of UNLOCK signal from remote controller.

For details of current flow, refer to "POWER DOOR LOCK".

MULTI-REMOTE CONTROL SYSTEM

System Description (Cont'd)

Interior lamp operation

When the following input signals are both supplied:
- key switch OFF (when ignition key is not inserted in key cylinder);
- door switch CLOSED (when all the doors are closed);

multi-remote control system turns on interior lamp (for 30 seconds) with input of UNLOCK signal from remote controller.

For detailed description, refer to "Interior, Spot and Trunk Room Lamps".

Panic alarm operation

When key switch is OFF (when ignition key is not inserted in key cylinder), multi-remote control system turns on and off horn and hazard warning lamp intermittently with input of PANIC ALARM signal from remote controller.

For detailed description, refer to "THEFT WARNING SYSTEM".

Hazard warning lamp operation

When the following input signals are all supplied:
- key switch OFF (when ignition key is not inserted in key cylinder);
- door switch CLOSED (when all the doors are closed);
- door lock actuator (door unlock sensor) LOCKED (when all the doors are locked);

multi-remote control system outputs two times the following ground signals with input of LOCK signal from remote controller:
- to multi-remote control relay-1 terminal (6); through smart entrance control unit terminal (7).

As a result, multi-remote control relay-1 is energized, and hazard warning lamps flash on and off.

For detailed description, refer to "Turn Signal and Hazard Warning Lamps" and "THEFT WARNING SYSTEM".
## SMART ENTRANCE CONTROL UNIT

### Input/Output Operation Signal

<table>
<thead>
<tr>
<th>Terminals No.</th>
<th>Connections</th>
<th>Operated condition</th>
<th>Voltage (V) (Approximate values)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Power source (GB)</td>
<td>-</td>
<td>12V</td>
</tr>
<tr>
<td>2</td>
<td>Passenger door lock motor</td>
<td>When door unlock signal is received from remote controller or unlock sensor</td>
<td>Unlocked</td>
</tr>
<tr>
<td>3</td>
<td>Driver door lock motor</td>
<td>Free</td>
<td>1V or less</td>
</tr>
<tr>
<td>4</td>
<td>Passenger door lock motor</td>
<td>When door lock signal is received from remote controller or unlock sensor</td>
<td>Locked</td>
</tr>
<tr>
<td>5</td>
<td>Driver’s door lock motor</td>
<td>Free</td>
<td>1V or less</td>
</tr>
<tr>
<td>7</td>
<td>Multi remote control relay</td>
<td>When doors are locked using remote controller or panic alarm is operated using remote controller</td>
<td>12V - 1V or less</td>
</tr>
<tr>
<td>8</td>
<td>Theft warning horn relay</td>
<td>When panic alarm is operated using remote controller</td>
<td>12V - 1V or less</td>
</tr>
<tr>
<td>9</td>
<td>Interior lamp</td>
<td>When doors are unlocked using remote controller (Lamp switch in &quot;DOOR&quot; position)</td>
<td>12V - 1V or less</td>
</tr>
<tr>
<td>10</td>
<td>Ground</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>11</td>
<td>Ignition switch (ON)</td>
<td>&quot;ON&quot; or &quot;START&quot; position</td>
<td>12V</td>
</tr>
<tr>
<td>12</td>
<td>Driver door unlock sensor</td>
<td>Driver door Locked → Unlocked</td>
<td>12V - 4.5V or less</td>
</tr>
<tr>
<td>13</td>
<td>Passenger door unlock sensor</td>
<td>Passenger door Locked - Unlocked</td>
<td>12V - 4.5V or less</td>
</tr>
<tr>
<td>15</td>
<td>Driver door switch</td>
<td>OFF (Closed) → ON (Open)</td>
<td>12V - 1.5V or less</td>
</tr>
<tr>
<td>16</td>
<td>Passenger door switch</td>
<td>OFF (Closed) → ON (Open)</td>
<td>12V - 1.5V or less</td>
</tr>
<tr>
<td>17</td>
<td>Ignition switch (ACC)</td>
<td>&quot;ACC&quot; or &quot;ON&quot; position</td>
<td>12V</td>
</tr>
<tr>
<td>24</td>
<td>Ignition key switch (Insert)</td>
<td>IGN key inserted → IGN key removed from IGN key cylinder</td>
<td>12V - 4.5V or less</td>
</tr>
<tr>
<td>37</td>
<td>Multi remote antenna</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

### Trouble Diagnoses

#### TROUBLE SYMPTOM

- **All functions of remote control system do not operate.**
  - **CHECK REMOTE CONTROLLER BATTERY**
    - Refer to DIAGNOSTIC PROCEDURE 1
  - **NG** Replace battery

- **Replace the multi-remote controller.**

- **Some functions of multi-remote controller do not operate.**
  1. **DOOR LOCK OR UNLOCK DOES NOT FUNCTION**
     - (Pressing lock or unlock button of remote controller normally locks or unlocks a door)
     - Go to DIAGNOSTIC PROCEDURE 2
     - **OK**

  - **HAZARD WARNING LAMPS DO NOT FLASH TWICE WHEN PRESSING LOCK BUTTON OF REMOTE CONTROLLER.**
    - Check if hazard warning lamps flash with hazard switch.
    - If check is OK, **GO TO DIAGNOSTIC PROCEDURE 3**

  - **INTERIOR LAMP DOES NOT TURN ON FOR 30 SECONDS WHEN PRESSING UNLOCK BUTTON OF REMOTE CONTROLLER.**
    - Check if the interior lamp switch is in the "door" position, the lamp illuminates when a door is open.
    - If check is OK, **GO TO DIAGNOSTIC PROCEDURE 5**

  - **PANIC ALARM (HORN AND HAZARD WARNING LAMP) DOES NOT ACTIVATE WHEN PANIC ALARM BUTTON IS CONTINUOUSLY PRESSED FOR MORE THAN 1.5 SECONDS.**
    - Check if horn and hazard warning lamp activate when test is conducted as follows:
      1. Open the driver’s window.
      2. Close all doors. Wait for about 30 seconds to make sure that the "SECURITY" warning lamp begins to blink.
      3. Lock doors with door key inserted into key cylinder.
      4. Manually unlock with driver’s door lock knob, then panic alarm should activate. (The alarm will stop when door is locked and unlocked with the key)
    - If check is NO, **CHECK "THEFT WARNING" system**

#### Note:
- The multi-remote control system does not activate with the ignition key inserted in the ignition key cylinder.
**MULTI-REMOTE CONTROL SYSTEM**

Trouble Diagnoses (Cont'd)

**DIAGNOSTIC PROCEDURE 1**
Check remote controller battery.

**CHECK REMOTE CONTROLLER BATTERY.**
Remove battery and measure voltage across battery positive and negative terminals (1) and (2).

<table>
<thead>
<tr>
<th>Measuring terminal</th>
<th>Standard value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>Battery positive terminal</td>
</tr>
<tr>
<td>(2)</td>
<td>Battery negative terminal</td>
</tr>
</tbody>
</table>

Battery voltage 3V or more

Note:
Remote controller does not function if battery is not set correctly.

**DIAGNOSTIC PROCEDURE 2**
SYMPTOM: All remote controls do not function even if remote controller is operated properly.

**A**
CHECK MAIN POWER SUPPLY AND GROUND CIRCUIT.
1) Remove key from ignition.
2) Disconnect connector from control unit. Check voltage across control unit terminal (1) and GND. Does battery voltage exist?

Yes → **B**
No → Check the following.
- Fuse
- Circuit breaker
- Power supply harness

**B**
Check continuity between terminal (1) and GND. Does continuity exist?

Yes → **C**
No → Check GND harness

**C**
CHECK ANTENNA CIRCUIT.
Disconnect 1-pin connector from control unit. Check continuity between a terminal and filament on the rear window. Does continuity exist?

Yes → [Go to next page]
No → Check antenna circuit (Refer to REAR WINDOW DEFROSTER "Filament Repair"")

**D**
CHECK DOOR SWITCH CIRCUIT.
1) Close all doors
2) Connect control unit connector
3) Check voltage across control unit terminal (2) and GND. Does battery voltage exist?

Yes
No → Replace smart entrance control unit

**E**
CHECK IGNITION SWITCH "ACC" CIRCUIT.
1) Open all doors
2) Check voltage across control unit terminal (1) and GND. Is voltage approx. 0V?

Yes → Check operation part in multi-remote control system for function
No → Check ignition switch "ACC" circuit.

**EL-212**

**EL-213**
MULTI-REMOTE CONTROL SYSTEM

Trouble Diagnoses (Cont’d)

F
Push lock button of remote controller and check voltage across control unit terminal and GND. Is voltage approx. 0V?

Yes
Replace smart entrance control unit

No

Disconnect connector from multi-remote control relay 1.
Check voltage across multi-remote control relay terminal and GND. Is battery voltage exist?

Yes
Replace multi-remote control relay 1.

No
Repair power supply harness.

G

DisConnection control unit connector

A

Check Interior Lamp Circuit.
When interior lamp switch is “DOOR” position, check voltage across control unit terminal and GND. Is battery voltage exist?

Yes
Repair harness between control unit connector and interior lamp connector.

No

Push lock button of remote controller and check voltage across control unit terminal and GND. Is voltage approx. 0V?

Yes
Check system again

No
Replace smart entrance control unit

DIAGNOSTIC PROCEDURE 5
SYMPTOM: Interior lamp does not turn on for 30 seconds when pressing unlock button of remote controller. Everything else functions.

CHECK INTERIOR LAMP CIRCUIT.
When interior lamp switch is “DOOR” position, check voltage across control unit terminal and GND. Is battery voltage exist?

Yes

No

Push lock button of remote controller and check voltage across control unit terminal and GND. Is voltage approx. 0V?

Yes
Check system again

Replacing Remote Controller or Control Unit

If the remote controller or the control unit needs to be replaced or if an additional remote controller needs to be set, enter the identity (ID) code manually.

ID Code Entry Procedure
To enter the ID code, follow this procedure.

“Setting mode”:
Three steps must be followed to establish the “setting mode”:
(1) Close and lock all doors.
(2) Insert and remove the key from the ignition more than six times within 10 seconds. (The hazard warning lamp will then flash twice.)

- At this time, the original ID codes are eliminated.

ID code entry:
(3) Turn ignition key to “ACC” position.
(4) Push lock button on the new remote controller once (for example, if door is locked using the remote controller during this ID code entry enable state, a new ID code can be entered).

- At this time, the new ID code is entered. (The hazard warning lamp will then flash twice.)
(5) If you need to enter additional remote controllers (including the original), release the driver’s door lock, then lock again with door lock knob.

- This ID code entry enable state and setting mode remain until the driver’s door is opened.

NOTE
- If the same ID code that existing in the memory is input, the entry is canceled, and no ID code will be entered.
- Entry of maximum four ID codes is allowed and any attempt to enter more will be ignored.
- Any ID codes entered after termination of the “setting” mode will not be accepted. Additionally, remote control signals will be inhibited when an ID code has not been entered during the “setting” mode.
THEFT WARNING SYSTEM

System Description

Refer to Owner's Manual for theft warning system operating instructions.

Power is supplied at all times:
- through 30A fusible link (number 1), located in the fuse block and fuse box
- to ignition switch terminal 1
- to theft warning relay terminal 3

With the ignition switch in the START position, power is supplied:
- to terminal 5 of the ignition switch
- to theft warning relay terminal 3.

Power is supplied at all times:
- through 7.5A fuse (number 19), located in the fuse block
- to security indicator lamp terminal 2.

Power is supplied at all times:
- through 20A fusible link (number 1), located in the fuse block and fuse box
- to circuit breaker terminal 1
- to circuit breaker terminal 2
- to smart entrance control unit terminal 3.

With the ignition switch in the ACC or ON position, power is supplied:
- through 10A fuse (number 8), located in the fuse block
- to smart entrance control unit terminal 9.

With the ignition switch in the ON or START position, power is supplied:
- through 7.5A fuse (number 28), located in the fuse block
- to smart entrance control unit terminal 3, and
- to theft warning relay terminal 1.

Ground is supplied:
- to smart entrance control unit terminal 22, and
- through body ground 23.

THEFT WARNING SYSTEM ACTIVATION (Without key or remote controller used to lock doors)

The operation of the theft warning system is controlled by the doors, hood and trunk lid.

To activate the theft warning system, the ignition switch must be in the OFF position and the smart entrance control unit must receive signals indicating the doors, hood and trunk are closed and the doors are locked.

When a door is open, smart entrance control unit terminal 22, or 23, receives a ground signal from driver side or passenger side door switch.

When a door is unlocked, smart entrance control unit terminal 22, or 23, receives a ground signal from:
- terminal 4 of the driver side door unlock sensor
- terminal 4 of the passenger side door unlock sensor
- through body ground 23, or 24, for the doors.

When the hood is open, smart entrance control unit terminal 22, or 23, receives a ground signal from:
- terminal 7 of the hood switch
- through body ground 23.

When the trunk lid is open, smart entrance control unit terminal 22, or 23, receives a ground signal from:
- terminal 10 of the trunk room lamp switch
- through body ground 23.

If none of the described conditions exist, the theft warning system will activate automatically.

THEFT WARNING SYSTEM ACTIVATION (With key or remote controller used to lock doors)

If the key or remote controller is used to lock doors, terminal 22, or 23, receives a ground signal from:
- terminal 2 of the driver side key cylinder switch
- terminal 1 of the passenger side door key cylinder switch
- through body ground 23, or 24.

If this signal is received by the smart entrance control unit, the theft warning system will activate automatically.

Once the theft warning system has been activated, smart entrance control unit terminal 22, or 23, supplies ground to terminal 1 of the security indicator lamp.

The security lamp will illuminate for approximately 30 seconds and then go on and off.

THEFT WARNING SYSTEM OPERATION

The theft warning system is triggered by:
- opening a door or the trunk lid without using the key
- opening the hood
- tampering with the key cylinder in the door
- when the theft warning system has been activated, if the smart entrance control unit receives a ground signal at terminal 22, or 23, and/or 24 (as described under THEFT WARNING SYSTEM ACTIVATION), the theft warning system will be triggered. Also, when a door key tamper signal is received at the smart entrance control unit, the system will be triggered. The hazard warning lamps flash and the horns sound intermittently, and the steering system is interrupted.

When a door key cylinder switch has been tampered with, smart entrance control unit terminal 22, or 23, receives a ground signal from:
- terminal 3 of each door's key cylinder switch
- through body ground 23, or 24.

If the theft warning system is triggered, ground is supplied:
- from terminal 5 of the smart entrance control unit
- to theft warning relay terminal 2.

With power and ground supplied, power to the inhibitor switch (A/T models) or starter motor (M/T models) is interrupted. The starter motor will not crank and the engine will not start.

Power is supplied at all times:
- through 7.5A fuse (number 19), located in the fuse block
- to theft warning horn relay terminals 5, and 6.

Power is supplied at all times:
- through 10A fuse (number 8), located in the fuse block
- to theft warning horn relay terminal 1.

When a door is unlocked, smart entrance control unit terminal 22, or 23, receives a ground signal from:
- terminal 1 of the driver side door key cylinder switch
- terminal 1 of the passenger side door key cylinder switch
- through body ground 23.

When the key is used to unlock the trunk lid, smart entrance control unit terminal 22, or 23, receives a ground signal from:
- terminal 1 of the smart entrance control unit
- to theft warning horn relay terminal 2, and
- to multi-remote control relay-1 terminal 1.

The hazard warning lamps flash and the horns sound intermittently.
The alarm automatically turns off after approximately 30 seconds but will reactivate if the vehicle is tampered with again.

THEFT WARNING SYSTEM DEACTIVATION

To deactivate the theft warning system, a door or the trunk lid must be unlocked with the key or remote controller.

When the key or remote controller is used to unlock a door, smart entrance control unit terminal 22, or 23, receives a ground signal from:
- terminal 1 of the driver side key cylinder switch
- from terminal 2 of the passenger side door key cylinder switch
- through body ground 23.

When the key is used to unlock the trunk lid, smart entrance control unit terminal 22, or 23, receives a ground signal from:
- terminal 1 of the trunk key cylinder switch
- through body ground 23.

If none of the described conditions exist, the theft warning system will activate automatically.

PANIC ALARM SYSTEM

Multi-remote control system may or may not operate theft warning system (horns and hazard warning lamps) as required.

When the multi-remote control system is triggered, ground is supplied intermittently:
- from smart entrance control unit terminal 22, or 23,
- to theft warning horn relay terminal 1, and
- from smart entrance control unit terminal 7,
- to multi-remote control relay-1 terminal 1.

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EL-219
THEFT WARNING SYSTEM

System Description (Cont’d)

A hazard warning lamps flash and the horns sound intermittently when alarm automatically turns off after 30 seconds or when smart entrance control unit receives any signal from multi-remote controller.
THEFT WARNING SYSTEM

Trouble Diagnoses

SYSTEM OPERATION CHECK
The system operation is canceled by turning ignition switch to "ACC" at any step in the following:
- A step between START and ARMED, or
- In the ARMED phase
in the following flow chart.

START

Close all doors, hood and trunk lid.
Turn ignition switch "OFF" and pull out key from key cylinder.

Does "SECURITY" indicator lamp remain "OFF"?
Yes

No

Does "SECURITY" indicator lamp remain "ON" or blinking?

Yes

No

- DOOR SWITCH INPUT SIGNAL CHECK
  Go to Diagnostic Procedure 1-1 (EL-234)
- HOOD SWITCH INPUT SIGNAL CHECK
  Go to Diagnostic Procedure 1-2 (EL-235)
- TRUNK ROOM LAMP SWITCH INPUT SIGNAL CHECK
  Go to Diagnostic Procedure 1-3 (EL-236)
- CYLINDER TAMPER SWITCH INPUT SIGNAL CHECK
  Go to Diagnostic Procedure 1-4 (EL-237)

Does "SECURITY" indicator lamp blink every second when each door is opened?
Yes

No

- DOOR SWITCH INPUT SIGNAL CHECK
  Go to Diagnostic Procedure 1-1 (EL-234)
- HOOD SWITCH INPUT SIGNAL CHECK
  Go to Diagnostic Procedure 1-2 (EL-235)
- TRUNK ROOM LAMP SWITCH INPUT SIGNAL CHECK
  Go to Diagnostic Procedure 1-3 (EL-236)
- CYLINDER TAMPER SWITCH INPUT SIGNAL CHECK
  Go to Diagnostic Procedure 1-4 (EL-237)

Does alarm horn and hazard warning lamp operate?
Yes

No

- POWER SUPPLY AND GROUND CIRCUIT CHECK (EL-233)
- INDICATOR LAMP CIRCUIT CHECK
  Go to Diagnostic Procedure 2 (EL-239)

(If "Yes" at "B" on next page.)

LOCK DOORS WITHOUT KEY OR MULTI-REMOTE CONTROLLER

Close all doors, hood and trunk lid. Install key cylinders properly.

Does "SECURITY" indicator lamp turn on?

No

Yes

- DOOR UNLOCK SENSOR INPUT SIGNAL CHECK
  Go to Diagnostic Procedure 3 (EL-239)

Unlock and open a door within 30 seconds while indicator lamp is on.

Does indicator lamp turn on?

No

Yes

- DOOR LOCK SWITCH INPUT SIGNAL CHECK
  Go to Diagnostic Procedure 4 (EL-240)

After about 30 seconds, does indicator lamp start to blink every 2 second?

No

Yes

- ARMED phase
  Unlock any door without key or multi-remote controller.

Does alarm horn and hazard warning lamp operate?

No

Yes

- ALARM OUTPUT SIGNAL CHECK
  Go to Diagnostic Procedure 5 (EL-241)

Turn ignition switch to "START" with key. Does the engine start?

No

Yes

- STARTER OUTPUT SIGNAL CHECK
  Go to Diagnostic Procedure 6 (EL-243)
THEFT WARNING SYSTEM

Trouble Diagnoses (Cont'd)

1. Look and unlock door(s) and/or trunk lid using key or multi-remote controller.

   - Does alarm stop?
     - Yes
     - No
       - DOOR/TRUNK LID UNLOCK SWITCH INPUT SIGNAL CHECK
         Go to Diagnostic Procedure 7 (EL-244) and 8 (EL-245)

   - Turn ignition switch to "START". Does the engine start?
     - Yes
     - No
       - STARTER OUTPUT SIGNAL CHECK
         Go to Diagnostic Procedure 6 (EL-243)

   - Close all doors, hood and trunk lid. Look doors with key or multi-remote controller.
     - After indicator lamp starts to blink every 2.4 seconds, unlock a door without key or multi-remote controller.

   - Does alarm stop automatically after approx. 2.5 minutes?
     - Yes
     - No
       - Replace control unit.

   - Turn ignition switch to "START". Does the engine start?
     - Yes
     - No
       - STARTER OUTPUT SIGNAL CHECK
         Go to Diagnostic Procedure 6 (EL-243)

   - Lock and unlock door(s) and/or trunk lid using key or multi-remote controller.

   - Turn ignition switch to "START". Does the engine start?
     - Yes
     - No
       - STARTER OUTPUT SIGNAL CHECK
         Go to Diagnostic Procedure 6 (EL-243)

System is OK.
THEFT WARNING SYSTEM

Trouble Diagnoses (Cont'd)
Diagnostic procedure 1-(3)

A Smart entrance control unit connector

OK

Go to Diagnostic Procedure 2 (EL-238).

TRUNK ROOM LAMP SWITCH INPUT SIGNAL CHECK
Check voltage between control unit harness terminals ⑧ and ⑨.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trunk lid open</td>
<td>Approx. 12V</td>
</tr>
<tr>
<td>Trunk lid closed</td>
<td>Approx. 12V</td>
</tr>
</tbody>
</table>

B Smart entrance control unit connector

NG

Replace trunk room lamp switch.

TRUNK ROOM LAMP SWITCH CHECK
Refer to “Electrical Components Inspection” (EL-249).

NG

Replace trunk room lamp switch.

TRUNK ROOM LAMP SWITCH CIRCUIT CHECK
- Check harness continuity between control unit harness terminal ⑧ and trunk room lamp switch harness terminal ⑨.
- Check harness continuity between trunk room lamp switch harness terminal ⑩ and body ground.
Continuity should exist.

C Smart entrance control unit connector

NG

Repair harness or connectors.

Check harness continuity between trunk room lamp switch harness terminal ⑩ and body ground.
(Before checking harness continuity, control unit harness connector should be disconnected.)
Continuity should not exist.

CHECK THE CONNECTIONS AT EACH CONNECTOR

OK

Trouble Diagnoses (Cont'd)
Diagnostic procedure 1-(4)

A Smart entrance control unit connector

OK

Go to Diagnostic Procedure 2 (EL-238).

KEY CYLINDER TAMPER SWITCH INPUT SIGNAL CHECK
Check continuity between control unit harness terminals ⑧ and ⑨.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tamper switch is</td>
<td>Normal</td>
</tr>
<tr>
<td>Normal</td>
<td>Yes</td>
</tr>
<tr>
<td>Normal</td>
<td>No</td>
</tr>
<tr>
<td>Normal</td>
<td>Yes</td>
</tr>
</tbody>
</table>

[Example]

Tamper switch

NG

Replace door key cylinder switch.

Tamper switch

No continuity ... OK

[Example]

Tamper switch

OK

KEY CYLINDER TAMPER SWITCH CHECK
Refer to “Electrical Components Inspection” (EL-247).

NG

Replace door key cylinder switch.

Tamper switch

No continuity ... OK

[Example]

Tamper switch

OK

Read switch turns on when key cylinder is removed.
Continuity exists ... OK

Repair harness and connectors.

(Next page)
THEFT WARNING SYSTEM

Trouble Diagnoses (Cont’d)

DIAGNOSTIC PROCEDURE 4

SYMPTOM: Indicator lamp does not come on.

A) Smart entrance control unit connector

DOOR LOCK SWITCH INPUT SIGNAL CHECK (LOCK SIGNAL)
- Check continuity between control unit harness terminals  and  

Key position Continuity
Neutral/Lock No
Between neutral and lock Yes

Replace control unit.

B) Smart entrance control unit connector

DOOR LOCK SWITCH CHECK
- Refer to "Electrical Components Inspection" (EL-241)

C) Door key cylinder switch connector

DOOR LOCK SWITCH CIRCUIT CHECK
- Check harness continuity between control unit harness terminal  and door key cylinder switch terminal.
- Check harness continuity between door key cylinder switch terminal and body ground.

Continuity should exist.

Check harness continuity between door key cylinder switch terminal and body ground.
(Before checking harness continuity, control unit harness connector should be disconnected.)

Continuity should not exist.

CHECK THE CONNECTIONS AT EACH CONNECTOR

OK

Go to Diagnostic Procedure 3 (EL-238)

NG

Replace key cylinder switch.

Replace harness or connectors.

OK

NG

Repair harness or connectors.

Trouble Diagnoses (Cont’d)

DIAGNOSTIC PROCEDURE 5

SYMPTOM: Alarm does not operate.

A) Smart entrance control unit connector

ALARM SIGNAL OUTPUT CHECK
- Check voltage between control unit harness terminal  and  

Condition Voltage
Exceed alarm phase Approx. 12V
Alarm phase Voltage fluctuates between 12V and 0V

NG

CHECK THE FOLLOWING
- Harness continuity between control unit harness terminal  and theft warning horn relay harness terminal  
- Harness continuity between fuse and theft warning horn relay harness terminal  
- Harness continuity between control unit harness terminal  and horn relay harness terminal  
- Harness continuity between fuse and horn relay harness terminal  
- Theft warning horn relay
- Refer to "Electrical Components Inspection" (EL-248).

OK

B) Theft warning horn relay connector

HORN CIRCUIT CHECK
- Check voltage between theft warning horn relay harness terminal  and body ground, terminal  and body ground.

Battery voltage should exist.

- Check harness continuity between theft warning horn relay harness terminal  and horn relay harness terminals.

Continuity should exist.

OK

NG

Repair harness or connectors.

OK

Replace horn.

Replace control unit.

NG

Replace relay.

(Next page)
THEFT WARNING SYSTEM

Trouble Diagnoses (Cont'd)

FLASHER OUTPUT CHECK
Check voltage between control unit harness terminals ① and ②

<table>
<thead>
<tr>
<th>Condition</th>
<th>Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Except alarm phase</td>
<td>Approx. 12V</td>
</tr>
<tr>
<td>Alarm phase</td>
<td>Voltage fluctuates between 12V and 0V.</td>
</tr>
</tbody>
</table>

CHECK THE FOLLOWING:
- Harness continuity between control unit harness terminal ① and multi-remote control relay-1 harness terminal ③
- Harness continuity between multi-remote control relay-1 harness terminal ④ and rear combination lamp LH harness terminal ⑤
- Check harness continuity between multi-remote control relay-1 harness terminal ④ and front/rear turn signal lamp LH harness terminal ⑥
- Check harness continuity between multi-remote control relay-1 harness terminal ④ and front/rear turn signal lamp RH harness terminal ⑦
- Continuity should exist.

HAZARD WARNING LAMP CIRCUIT CHECK
- Check voltage between multi-remote control relay-1 harness terminals ⑧ and ⑨ and body ground.
- Battery voltage should exist.
- Check harness continuity between multi-remote control relay-1 harness terminal ⑩ and rear combination lamp LH harness terminal ⑪.
- Check harness continuity between multi-remote control relay-1 harness terminal ⑩ and front/rear turn signal lamp LH harness terminal ⑬.
- Check harness continuity between multi-remote control relay-1 harness terminal ⑩ and rear combination lamp RH harness terminal ⑭.
- Check harness continuity between multi-remote control relay-1 harness terminal ⑩ and front/rear turn signal lamp RH harness terminal ⑮.
- Continuity should exist.

CHECK THE FOLLOWING:
- Harness continuity between control unit harness terminal ① and multi-remote control relay-1 harness terminal ③.
- Harness continuity between multi-remote control relay-1 harness terminal ④ and rear combination lamp LH harness terminal ⑤.
- Harness continuity between multi-remote control relay-1 harness terminal ④ and front/rear turn signal lamp LH harness terminal ⑥.
- Harness continuity between multi-remote control relay-1 harness terminal ④ and front/rear turn signal lamp RH harness terminal ⑦.
- Harness continuity between fuse and multi-remote control relay-1 harness terminal ⑧.
- Harness continuity between fuse and multi-remote control relay-1 harness terminal ⑨.

STARTER MOTOR KILL OUTPUT SIGNAL CHECK
Check voltage between control unit harness terminals ① and ②

<table>
<thead>
<tr>
<th>Condition</th>
<th>Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Except starter killed phase</td>
<td>Approx. 12V</td>
</tr>
<tr>
<td>Starter select phase</td>
<td>0V</td>
</tr>
</tbody>
</table>

CHECK THE FOLLOWING:
- Harness continuity between control unit harness terminal ① and multi-remote control relay-1 harness terminal ③.
- Harness continuity between control unit harness terminal ③ and multi-remote control relay-1 harness terminal ④.
- Harness continuity between multi-remote control relay-1 harness terminal ④ and fuse.
- Harness continuity between multi-remote control relay-1 harness terminal ④ and fuse.
- Multi-remote control relay-1 Refer to "Electrical Components Inspection" (EL-248), THREAT WARNING RELAY CHECK Refer to "Electrical Components Inspection" (EL-248).

OK

DELETE

Replace control unit.

CHECK THE CONNECTIONS AT EACH CONNECTOR.

OK

No

Does hazard warning lamp come on when pushing hazard warning lamp switch?

Yes

Check turn signal lamp system. Refer to "TURN SIGNAL LAMP" (EL-83).

CHECK THE CONNECTIONS AT EACH CONNECTOR.

NG

OK

Replace relay.
THEFT WARNING SYSTEM

Trouble Diagnoses (Cont’d)
DIAGNOSTIC PROCEDURE 7
SYMPTOM: Alarm does not stop even if stop signal is given.

A. Smart entrance control unit connector

B. Door unlock switch input signal check [Unlock signal]
Check continuity between control unit harness terminals ① and ②.

Neutral/Unlock Continuity exists
Key position Neutral/Unlock Yes

C. Door unlock switch check
Refer to “Electrical Components Inspection” (EL-247).

NG

OK

D. Door unlock switch circuit check
• Check harness continuity between control unit harness terminal ① and door key cylinder switch terminal ②.
• Check harness continuity between door key cylinder switch terminal and body ground.
Continuity should exist.

E. Check harness continuity between door key cylinder switch terminal and body ground.
(Short circuit exists between control unit harness terminal ① and door key cylinder switch terminal ②.)
Continuity should not exist.

F Check the connections at each connector.

OK

NG

G

H

OK

NG

I

Check harness continuity between trunk key cylinder switch harness terminal ① and body ground.
(Short circuit exists between control unit harness terminal ⑦ and trunk key cylinder switch terminal ⑫.)
Continuity should not exist.

OK

NG

J

Check the connections at each connector.
THEFT WARNING SYSTEM

Trouble Diagnoses (Cont'd)

**ELECTRICAL COMPONENTS INSPECTION**

**Door switches**
Check continuity between terminals when door switch is pushed and released.

<table>
<thead>
<tr>
<th>Terminal No.</th>
<th>Condition</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Driver side</td>
<td>Door switch is pushed</td>
<td>No</td>
</tr>
<tr>
<td>Passenger side</td>
<td>Door switch is released</td>
<td>Yes</td>
</tr>
<tr>
<td>1 - body ground</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Hood switch**
Check continuity between terminals when hood switch is pushed and released.

<table>
<thead>
<tr>
<th>Terminal No.</th>
<th>Condition</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>① - ②</td>
<td>Hood switch is pushed</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Hood switch is released</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Trunk room lamp switch**
Check continuity between terminals when trunk lid is closed and opened.

<table>
<thead>
<tr>
<th>Terminal No.</th>
<th>Condition</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>① - ②</td>
<td>Trunk lid is closed</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Trunk lid is opened</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Key cylinder tamper switch, door lock switch and door unlock switch**

- **Door key cylinder switch**

<table>
<thead>
<tr>
<th>Terminal No.</th>
<th>Condition</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tamper switch</td>
<td>Key cylinder is installed</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Key cylinder is removed</td>
<td>Yes</td>
</tr>
<tr>
<td>Door lock switch</td>
<td>Key position is neutral or lock</td>
<td>No</td>
</tr>
<tr>
<td>Door unlock switch</td>
<td>Key position is between neutral and lock</td>
<td>Yes</td>
</tr>
<tr>
<td>Key cylinder tamper switch terminal</td>
<td>Key position is neutral or unlock</td>
<td>No</td>
</tr>
<tr>
<td>Ground terminal</td>
<td>Key position is between neutral and unlock</td>
<td>Yes</td>
</tr>
</tbody>
</table>

- **Trunk key cylinder switch (unlock switch)**

<table>
<thead>
<tr>
<th>Terminal No.</th>
<th>Condition</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>① - ②</td>
<td>Key position is neutral</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Key position is unlock</td>
<td>Yes</td>
</tr>
</tbody>
</table>

- **Door lock actuator (Door unlock sensor)**

<table>
<thead>
<tr>
<th>Terminal No.</th>
<th>Condition</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>① - ②</td>
<td>Door is locked</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Door is unlocked</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Horns**
Supply horn terminal with battery voltage and check horn operation.
THEFT WARNING SYSTEM

Trouble Diagnoses (Cont'd)

Thief warning horn relay and multi-remote control relay-1

Check continuity between terminals ④ and ⑤, ⑥ and ⑦.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Continuity</th>
</tr>
</thead>
<tbody>
<tr>
<td>12V direct current supply</td>
<td>Yes</td>
</tr>
<tr>
<td>between terminals ④ and ⑤</td>
<td></td>
</tr>
<tr>
<td>No current supply</td>
<td>No</td>
</tr>
</tbody>
</table>

Thief warning relay

Check continuity between terminals ③ and ④.

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

LOCATION OF ELECTRICAL UNIT

Engine Compartment
Engine Harness

NOTE
ALPHABETICAL INDEX

Wheel sensors (ABS) .......................... BR-27
Wheelbase (Dimensions) ................. GI-38
Width (Dimensions) ....................... GI-38
Window, rear - See Rear window .......... BT-35
Window, side - See Rear side window .... BT-36
Windshield ........................................ BT-35
Wiper, front ................................. EL-138
Wiper, rear ..................................... EL-147
Withdrawal lever (clutch) .............. CL-8

SUPER MULTIPLE JUNCTION (SMJ)

Disconnecting and Connecting

- SMJ is located on left side of dash.
- To disconnect SMJ, loosen fixing bolt.

- To install SMJ, tighten bolts until orange “full-tight” mark appears and then retighten to specified torque as required.

CAUTION:
Do not overtighten bolts, otherwise, they may be damaged.

[Diagram showing SMJ location and tightening torque specifications]
Engine Control
System utilizing timers with enhanced real-time processing functions, high-precision A-D converter, and high-speed processing.

Memory with large internal ROM and RAM (M6M72561J) is used.