# QUICK REFERENCE INDEX

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# NISSAN MAXIMA

**MODEL A32 SERIES** 

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ELECTRICAL SYSTEM

ALPHABETICAL INDEX

# **FOREWORD**

This manual contains maintenance and repair procedures for the 1997 Nissan MAXIMA.

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 be completely satisfied that neither personal safety nor the vehicle's safety will be jeopardized by the service method selected.



Overseas Service Department Tokyo, Japan



# NISSANI PLEASE HELP MAKE THIS SERVICE MANUAL BETTER!

Your comments are important to NISSAN and will help us to improve our Service Manuals. Use this form to report any issues or comments you may have regarding our Service Manuals. Please photocopy this form and type or print your comments below. Mail or fax to:

Nissan North America, Inc. Technical Service Information 39001 Sunrise Drive, P.O. Box 9200 Farmington Hills, MI USA 48331 FAX: (810) 488-3910

SERVICE MANUAL: Model:\_\_\_\_\_ Year:\_\_\_\_ PUBLICATION NO. (Please photocopy back cover):\_\_\_\_\_ VEHICLE INFORMATION VIN:\_\_\_\_\_ Production Date:\_\_\_\_\_ Please describe any issues or problems in detail: Page number(s)\_\_\_\_\_\_ Note: Please include a copy of each page, marked with your comments. Are the trouble diagnosis procedures logical and easy to use? (circle your answer) YES NO If no, what page number(s)?\_\_\_\_\_Note: Please include a copy of each page, marked with your comments. Please describe the issue or problem in detail:\_\_\_\_\_ YES NO Is the organization of the manual clear and easy to follow? (circle your answer) Please comment: What information should be included in NISSAN Service Manuals to better support you in servicing or repairing customer vehicles? DATE:\_\_\_\_\_\_ POSITION:\_\_\_\_\_ DEALER:\_\_\_\_\_ DEALER NO.:\_\_\_\_ ADDRESS:\_\_\_\_ STATE/PROV./COUNTRY:\_\_\_\_\_ ZIP/POSTAL CODE:\_\_\_\_

# **QUICK REFERENCE CHART: MAXIMA**

# **ENGINE TUNE-UP DATA**

| Engine model  |                   | VQ30DE                       |                                   |  |                            |
|---|-------------------|------------------------------|-----------------------------------|--|----------------------------|
| Firing order  |                   | 1.2-3.4-5-6                  |                                   |  |                            |
| <u> </u>  | M/T               |                              | 625±50                            |  |                            |
| Idle speed rpm  | A/T<br>(in "N" po | osition}                     | 700±50                            |  |                            |
| Ignition timing (degree                                   | BTDC at id        | le speed)                    |                                   | M/T: 15°±2°                            |                            |
| CO% at idle   |                   |                              |                                   | dure screw is pro<br>sealed at factory |                            |
| Drive belt deflection (Cold                               | i)                | mm (in)                      | Ųse                               | d belt                                 |                            |
| Alternator  |                   | Limit                        | Deflection<br>after<br>adjustment | Deflection of<br>new belt              |                            |
| With air conditioner compressor                           |                   | 7 (0.28)                     | 4.2 - 4.6<br>(0.165 - 0.181)      | 3.8 - 4.1<br>(0.150 - 0.161)           |                            |
| Without air conditioner compressor                        |                   | 10 (0.39)                    | 6.3 - 6.9<br>(0.248 - 0.272)      | 5.8 - 6.2<br>(0.228 - 0.244)           |                            |
| Power steering oil pump                                   |                   |                              | 11 (0.43)                         | 7.3 - 8<br>(0.287 - 0.315)             | 6.5 - 7<br>(0.256 - 0.276) |
| Applied pressed force N (kg, lb)                          |                   | N (kg, lb)                   |                                   | 98 (10, 22)                            |                            |
| Radiator cap relief pressure<br>kPa (kg/cm², psi)         |                   | 78 - 98 (0.8 - 1.0, 11 - 14) |                                   | - 14)                                  |                            |
| Cooling system leakage testing pressure kPa (kg/cm², psi) |                   | 157 (1.6, 23)                |                                   |  |                            |
| Compression pressure                                      | Standard          |                              | 1,275 (13.0, 185)/300             |  |                            |
| kPa (kg/cm², psi)/rpm Minimum                             |                   |                              | 981 (10.0, 142)/30                | 0                                      |                            |
| Carella alua  | Туре              |                              |                                   | PFR5G-11                               |                            |
| Spark plug  | Gap               | mm (in)                      | 1.0                               | - 1.1 (0.039 - 0.0                     | 43)                        |

# **CLUTCH PEDAL**

| Unit: | mm | fin) |
|-------|----|------|

| Pedal height    | 168 - 175 (6.61 - 6.89) |
|-----------------|-------------------------|
| Pedal free play | 9 - 16 (0.35 - 0.63)    |

# FRONT WHEEL ALIGNMENT (Unladen\*)

| Camber  Degree minute         |                                   | Minimum                   | -1°00′ (-1.00°)     |
|-------------------------------|-----------------------------------|---------------------------|---------------------|
|                               |                                   | Nominal                   | -0°15′ (-0.25°)     |
|                               |                                   | Maximum                   | 0°30′ (0.50°)       |
| (D                            | ecimal degree)                    | Left and right difference | 45' (0.75°) or less |
| Caster                        |                                   | Minimum                   | 2°00′ (2.00°)       |
|                               | Ī                                 | Nominal                   | 2°45′ (2.75°)       |
|                               | Degree minute                     | Maximum                   | 3°30′ (3.50°)       |
|                               | ecimal degree)                    | Left and right difference | 45' (0.75°) or less |
| Total toe-in Distance (A – B) |                                   | Minimum                   | 1 (0.04)            |
|                               |                                   | Nominal                   | 2 (0.08)            |
| mm (ln)                       |                                   | Maximum                   | 3 (0.12)            |
| Angle (left plu               | ie right\                         | Minimum                   | 5.5′ (0.09°)        |
|                               | Degree minute                     | Nominal                   | 11' (0.18°)         |
| ۵)                            | ecimal degree)                    | Maximum                   | 16′ (0.27°)         |
| Wheel turning angl            | e (Full turn)                     | Minimum                   | 36°00′ (36.00°)     |
| Inside                        | [                                 | Nominal                   | 39°30′ (39.50°)     |
|                               | Degree minute -<br>ecimal degree) | Maximum                   | 40°30′ (40.50°)     |
|                               | Degree minute<br>ecimal degree)   | Nominal                   | 32°00′ (32.00°)     |

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

# REAR WHEEL ALIGNMENT (Unladen\*)

| Camber                         | Minimum | -1°45′ (-1.75°) |
|--------------------------------|---------|-----------------|
| Degree minute                  | Nominal | -1°00′ (-1.00°) |
| (Decimal degree)               | Maximum | -0°15′ (-0.25°) |
| Total toe-in                   | Minimum | -3 (-0.12)      |
| Distance (A - B)               | Nominal | 1 (0.04)        |
| mm (in)                        | Maximum | 5 (0.20)        |
| Angle (left plus right)        | Minimum | -16′ (-0.26°)   |
| Degree minute (Decimal degree) | Nominal | 5.5' (0.09°)    |
|                                | Maximum | 26' (0.43°)     |

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

# **BRAKE**

Parking brake

|                          | Unit: mm (in)  |
|--------------------------|--|
| Front brake              |  |
| Pad wear limit           | 2.0 (0.079)  |
| Rotor repair limit       | 20.0 (0.787)   |
| Rear brake               |  |
| Pad wear limit           | 1.5 (0.059)  |
| Rotor repair limit       | 8.0 (0.315)  |
| Pedal free height        | M/T: 158 - 165 (6.22 - 6.50)<br>A/T: 167 - 174 (6.57 - 6.85) |
| Pedat depressed height*1 | M/T: 70 (2.76)<br>A/T: 75 (2.95)                             |

10 - 11

Number of notches\*2

# **REFILL CAPACITIES**

| Unit<br>Fuel tank                                  |                 | Liter          | US measure     |                   |
|--|-----------------|----------------|----------------|-------------------|
|  |                 | 70             | 18-1/2 gal     |                   |
| Coolant wit  | th reservoir    |                | 8.5            | 9 qt              |
| Farias   | With oil filter |                | 4.0            | 4-1/4 qt          |
| Engine   | Without oil fi  | Iter           | 3.7            | 3-7/8 qt          |
| Transaxie  | M/T             | RS5F50V        | 4.3 - 4.5      | 9-1/8 - 9-1/2 pt  |
|  | M/I             | RS5F50A        | 4.5 - 4.8      | 9-1/2 - 10-1/8 pt |
|  | A/T             | RE4F04A/V      | 9.4            | 10 qt             |
| Power steering system                              |                 |                | 1.1            | 1-1/8 qt          |
| Air conditioning system Refrigerant Compressor oil |                 | 0.80 - 0.70 kg | 1.32 - 1.54 lb |                   |
|  |                 | 0.2            | 6.8 fl oz      |                   |

<sup>\*1</sup> Under force of 490 N (50 kg, 110 lb) with engine running

<sup>\*2</sup> At pulling force: 196 N (20 kg, 44 lb)

# TEST VALUE AND TEST LIMIT (GST ONLY — NOT APPLICABLE TO CONSULT-II)

The following is the information specified in Mode 6 of SAE J1979.

The test value is a parameter used to determine whether a system/circuit diagnostic test is "OK" or "NG" while being monitored by the ECM during self-diagnosis. The test limit is a reference value which is specified as the maximum or minimum value and is compared with the test value being monitored.

Items for which these data (test value and test limit) are displayed are the same as SRT code items.

These data (test value and test limit) are specified by Test ID (TID) and Component ID (CID) and can be displayed on the GST screen.

: Applicable ·: Not applicable

|             |   |       |      |          |              | Applicable • | : Not applicable |
|-------------|---|-------|------|----------|--------------|--------------|------------------|
|             |   |       | Test | value    |              |              |                  |
| SRT item    | Self-diagnostic test item                 | DTC   | (GST | display) | Te s t limit | Application  | Unit             |
|             | _   |       | TID  | CID      |              |              |                  |
| CATALYST    | The second of Continu                     | P0420 | 01H  | 01H      | Max.         | Х            | -                |
| CATALTST    | Three way catalyst function               | P0420 | 02H  | 81H      | Min.         | Χ            | -                |
| EVAP SYSTEM | EVAP control system (Small leak)          | P0440 | 05H  | 03H      | Max.         | Χ            | -                |
| EVAP SISIEM | EVAP control system purge flow monitoring | P1447 | 06H  | 83H      | Min.         | Χ            | mV               |
|             |   | P0130 | 09H  | 04H      | Max.         | Χ            | ms               |
|             |   | P0130 | OAH  | 84H      | Min.         | Χ            | mV               |
|             | Heated oxygen sensor 1(Bank 1)            | P0130 | 0BH  | 04H      | Max.         | Χ            | mV               |
|             |   | P0130 | 0CH  | 04H      | Max.         | Χ            | mV               |
|             |   | P0130 | ODH  | 04H      | Max.         | Χ            | S                |
|             |   | P0150 | 11H  | 05H      | Max.         | Χ            | ms               |
| H02S        | Heated oxygen sensor 1 (Bank 2)           | P0150 | 12H  | 85H      | Min.         | Χ            | mV               |
| 11023       |   | P0150 | 13H  | 05H      | Max.         | Χ            | mV               |
|             |   | P0150 | 14H  | 05H      | Max.         | Χ            | mV               |
|             |   | P0150 | 15H  | 05H      | Max.         | Χ            | S                |
|             |   | P0136 | 19H  | 86H      | Min.         | Χ            | mV/500ms         |
|             | Heated oxygen sensor 2                    | P0136 | 1AH  | 86H      | Min.         | Χ            | mV               |
|             |   | P0136 | 1BH  | 06H      | Max.         | Χ            | mV               |
|             |   | P0136 | 1CH  | 06H      | Max.         | Χ            | mV               |
|             | Heated oxygen sensor 1 heater(Bank 1)     | P0135 | 29H  | 08H      | Max.         | Χ            | mV               |
|             | neated oxygen sensor I heater (bank 1)    | P0135 | 2AH  | 88H      | Min.         | Χ            | mV               |
| HO2S HTR    | Heated oxygen sensor 2 heater(Bank 2)     | P0155 | 2BH  | 09H      | Max.         | Χ            | mV               |
| 11020 1111  | neated oxygen sensor 2 heater (bank 2)    | P0155 | 2CH  | 89H      | Min.         | Χ            | mV               |
|             | Heated oxygen sensor 2 heater             | P0141 | 2DH  | OAH      | Max.         | Χ            | mV               |
|             | neated oxygen sensor 2 heater             | P0141 | 2EH  | 8AH      | Min.         | Χ            | mV               |
|             |   | P0400 | 31H  | 8CH      | Min.         | Χ            | °C               |
|             |   | P0400 | 32H  | 8CH      | Min.         | Χ            | °C               |
|             | EGR function                              | P0400 | 33H  | 8CH      | Min.         | Χ            | °C               |
| EGR SYSTEM  |   | P0400 | 34H  | 8CH      | Min.         | Χ            | °C               |
|             |   | P0400 | 35H  | 0CH      | Max.         | Χ            | °C               |
|             | EGRC-BPT valve function                   | P0402 | 36H  | 0CH      | Max.         | Χ            | -                |
|             | Edito bili valve idilotion                | P0402 | 37H  | 8CH      | Min.         | Χ            | -                |

# **GENERAL INFORMATION**

# SECTION G

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| SAE J1930 Terminology List          | 44 |

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

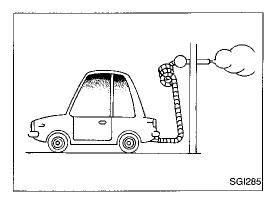


# Precautions for Supplemental Restraint System "AIR BAG"

This model has a Supplemental Restraint System "Air Bag". It helps to reduce the risk or severity of injury to the driver and front passenger in a frontal collision. The Supplemental Restraint System consists of an air bag modules (located in the center of the steering wheel and in the instrument panel on the passenger side), sensors, 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 lead to personal injury or death in the event of a severe frontal collision, all maintenance must be performed by an authorized NISSAN dealer.
- Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.
- All SRS electrical wiring harnesses and connectors are covered with yellow outer insulation. Do not use electrical test equipment on any circuit related to the SRS "Air Bag".



# **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 inflammable materials. Special care should be taken when handling any inflammable or poisonous materials, such as gasoline, refrigerant gas, etc. When working in a pit or other enclosed area, be sure to properly ventilate the area before working with hazardous materials.

Do not smoke while working on the vehicle.

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

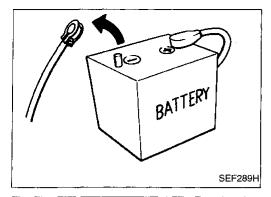
SGI231

# **PRECAUTIONS**

# General Precautions (Cont'd)

 Before starting repairs which do not require battery power: Turn off ignition switch.

Disconnect the negative battery terminal.



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SGI233

To prevent serious burns:

Avoid contact with hot metal parts.

Do not remove the radiator cap when the engine is hot.

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Before servicing the vehicle:

Protect fenders, upholstery and carpeting with appropriate covers.

AT

Take caution that keys, buckles or buttons do not scratch paint.

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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.

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

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

 Do not touch the terminals of electrical components which use microcomputers (such as ECMs).

Static electricity may damage internal electronic components.

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

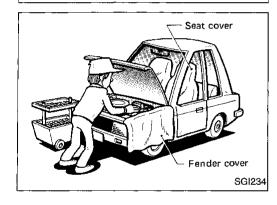
Use only the fluids and lubricants specified in this manual.

 Use approved bonding agent, 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**

# **General Precautions (Cont'd)**

# **WARNING:**

To prevent ECM from storing the diagnostic trouble codes, do not carelessly disconnect the harness connectors which are related to the ECCS system and A/T control system. The connectors should be disconnected only when working according to the WORK FLOW of TROUBLE DIAGNOSES in EC and AT sections.



# Precautions for Multiport Fuel Injection System or ECCS Engine

- Before connecting or disconnecting any harness connector for the multiport fuel injection system or ECM (ECCS control module):
  - Turn ignition switch to "OFF" position. Disconnect 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.
- 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 catalyst, the catalyst temperature will be excessively high. To prevent this, follow the instructions below:

- Use unleaded gasoline only. Leaded gasoline will seriously damage the three way catalyst.
- When checking for ignition spark or measuring engine compression, make tests quickly and only when necessary.
- Do not run engine when the fuel tank level is low, otherwise the engine may misfire, causing damage to the catalyst.

Do not place the vehicle on flammable material. Keep flammable material off the exhaust pipe and the three way catalyst.

# **Precautions for 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.

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#### **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 underclothing, 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 landlin replace the natural skin oils which have been removed.
- Do not use gasoline, kerosine, 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.

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#### **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 between regions.

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# **Precautions for Fuel**

Use premium unleaded gasoline with an octane rating of at least 91 AKI (Anti-Knock Index) number (research octane number 96). If premium unleaded gasoline is not available, regular unleaded gasoline with an octane rating of at least 87 AKI (research octane number 91) can be used.

However, for maximum vehicle performance, the use of premium unleaded gasoline is recommended.

# **CAUTION:**

Do not use leaded gasoline. Using leaded gasoline will damage the three way catalyst.

Using a fuel other than that specified could adversely affect the emission control devices and systems, and could also affect the warranty coverage validity.

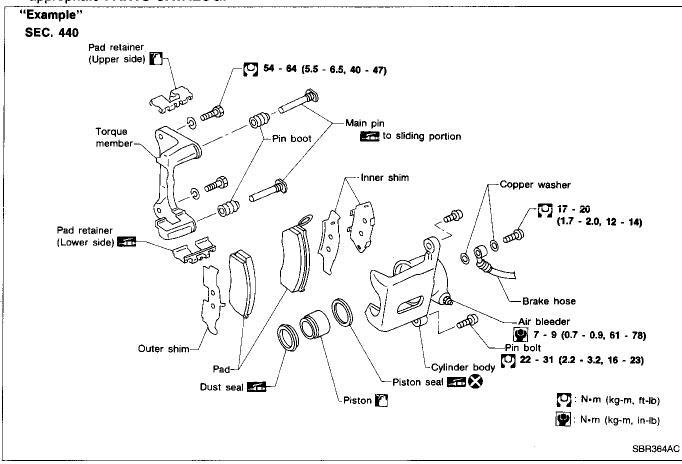
# **Precautions for Air Conditioning**

Use an approved refrigerant recovery unit any time the air conditioning system must be discharged. Refer to HA section ("HFC-134a (R-134a) Service Procedure", "SERVICE PROCEDURES") for specific instructions.

# **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. ER) is provided on the first page. You can quickly find the first page of each section by mating it to the section's black tab.
- 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**.



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.

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# **HOW TO USE THIS MANUAL**

• The following **SYMBOLS AND ABBREVIATIONS** are used:

| <b>(</b> ), [9] | : Tightening torque                    | A/T                                    | : Automatic Transaxle/Transmission      |
|-----------------|--|--|---|
|                 | :Should be lubricated with grease.     | A/C                                    | : Air Conditioner                       |
| <del></del>     | Unless otherwise indicated, use rec-   | P/S                                    | : Power Steering                        |
|                 | · · · · · · · · · · · · · · · · · · ·  | SST                                    | : Special Service Tools                 |
|                 | ommended multi-purpose grease.         | SDS                                    | : Service Data and Specifications       |
|                 | :Should be lubricated with oil.        | SAÈ                                    | : Society of Automotive Engineers, Inc. |
|                 | : Sealing point                        | LHD                                    | :Left-Hand Drive                        |
| <b>©</b>        | : Checking point                       | RHD                                    | :Right-Hand Drive                       |
| Š               | : Always replace after every disassem- | ATF                                    | : Automatic Transmission Fluid          |
|                 | bly.                                   | $D_1$                                  | :Drive range 1st gear                   |
| LH, RH          | : Left-Hand, Right-Hand                | $D_2$                                  | : Drive range 2nd gear                  |
| FR, RR          | : Front, Rear                          | $D_{3}^-$                              | : Drive range 3rd gear                  |
| zn, nn<br>2WD   | :2-Wheel Drive                         | $D_\mathtt{4}^{\scriptscriptstyle{-}}$ | : Drive range 4th gear                  |
| <b>≥</b> ₩D     | : Apply petroleum jelly.               | OD                                     | : Overdrive                             |
|                 | : Apply ATF.                           | 22                                     | :2nd range 2nd gear                     |
| ATF)            | : Select with proper thickness.        | $2_{1}^{-}$                            | :2nd range 1st gear                     |
| ☆               | : Adjustment is required.              | 12                                     | : 1st range 2nd gear                    |
| M/T             | : Manual Transaxle/Transmission        | 1 1                                    | :1st range 1st gear                     |
| 1VI/ I          | . Manual Transaxie/ Transmission       | - 1                                    |   |

• The **UNITS** given in this manual are primarily expressed as SI UNITS (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.

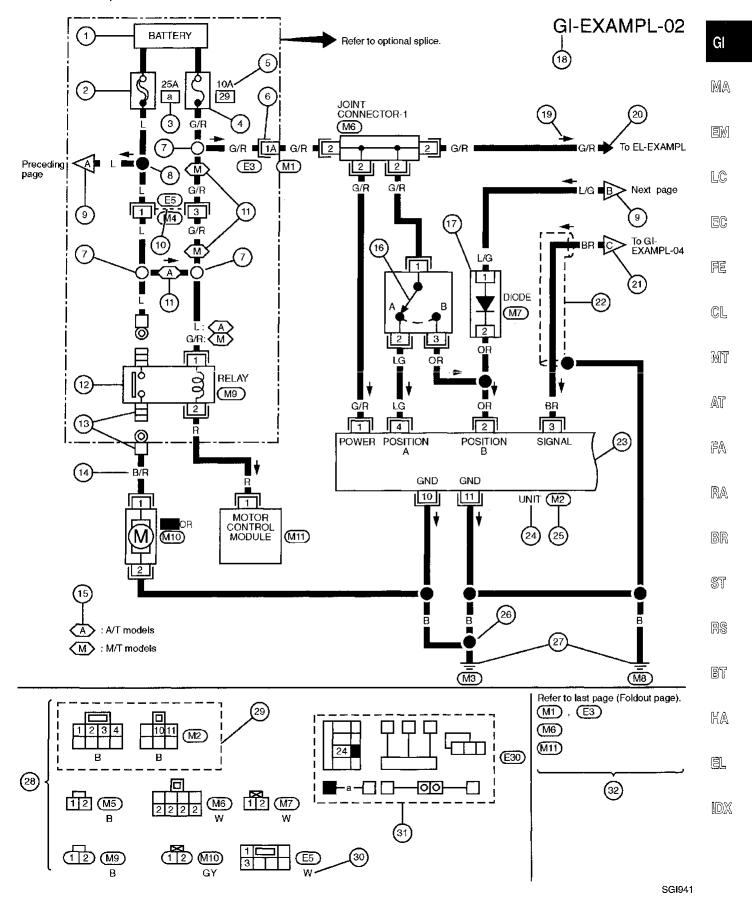
 The captions WARNING and CAUTION warn you of steps that must be followed to prevent personal injury and/or damage to some part of the vehicle.

**WARNING** indicates the possibility of personal injury if instructions are not followed. **CAUTION** indicates the possibility of component damage if instructions are not followed.

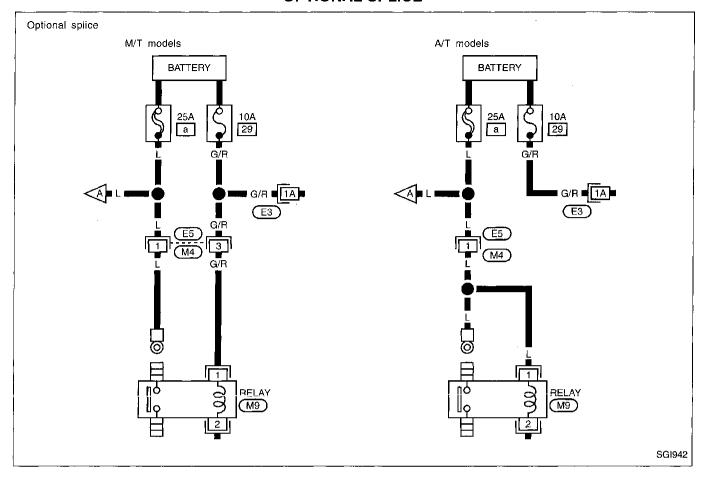
**BOLD TYPED STATEMENTS** except **WARNING** and **CAUTION** give you helpful information.

# Sample/Wiring Diagram — EXAMPL —

For Description, refer to GI-11.



# Sample/Wiring Diagram — EXAMPL — (Cont'd) OPTIONAL SPLICE



# Description

| Number     | ltem                       | Description  |  |  |
|------------|----------------------------|--|--|--|
| 1          | Power condition            | This shows the condition when the system receives battery positive voltage (can be operated).  |  |  |
| 2          | Fusible link               | <ul> <li>The double line shows that this is a fusible link.</li> <li>The open circle shows current flow in, and the shaded circle shows current flow out.</li> </ul>   |  |  |
| 3          | Fusible link/fuse location | This shows the location of the fusible link or fuse in the fusible link or fuse box.  For arrangement, refer to EL section ("POWER SUPPLY ROUTING").   |  |  |
| 4          | Fuse                       | The single line shows that this is a fuse. The open circle shows current flow in, and the shaded circle shows current flow out.  |  |  |
| <u>(5)</u> | Current rating             | This shows the current rating of the fusible link or fuse.   |  |  |
| 6          | Connectors                 | <ul> <li>This shows that connector (E3) is female and connector (M1) is male.</li> <li>The G/R wire is located in the 1A terminal of both connectors.</li> <li>Terminal number with an alphabet (1A, 5B, etc.) indicates that the connector is SMJ connector. Refer to GI-17.</li> </ul>   |  |  |
| 7          | Optional splice            | The open circle shows that the splice is optional depending on vehicle application.  |  |  |
| 8          | Splice                     | The shaded circle shows that the splice is always on the vehicle.  |  |  |
| 9          | Page crossing              | <ul> <li>This arrow shows that the circuit continues to an adjacent page.</li> <li>The A will match with the A on the preceding or next page.</li> </ul>   |  |  |
| 10         | Common connector           | The dotted lines between terminals show that these terminals are part of the same connector.   |  |  |
| 11)        | Option abbreviation        | This shows that the circuit is optional depending on vehicle application.  |  |  |
| 12         | Relay                      | <ul> <li>This shows an internal representation of the relay. For details, refer to EL section<br/>("STANDARDIZED RELAY").</li> </ul>   |  |  |
| 13         | Connectors                 | This shows that the connector is connected to the body or a terminal with bolt or nut.   |  |  |
| 14)        | Wire color                 | This shows a code for the color of the wire.  B = Black BR = Brown W = White OR = Orange R = Red P = Pink G = Green PU = Purple L = Blue GY = Gray Y = Yellow SB = Sky Blue LG = Light Green CH = Dark Brown DG = Dark Green When the wire color is striped, the base color is given first, followed by the stripe color as shown below: Example: L'W = Blue with White Stripe |  |  |
| 15         | Option description         | This shows a description of the option abbreviation used on the page.  |  |  |
| 16         | Switch                     | 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.  |  |  |
| 17         | Assembly parts             | Connector terminal in component shows that it is a harness incorporated assembly.  |  |  |
| 18         | Cell code                  | This identifies each page of the wiring diagram by section, system and wiring diagram page number.   |  |  |

**GI-11** 15

| Number     | Item                       | Description   |  |  |  |
|------------|----------------------------|---|--|--|--|
| 19         | Current flow arrow         | <ul> <li>Arrow indicates electric current flow, especially where the direction of standard flow (vertically downward or horizontally from left to right) is difficult to follow.</li> <li>A double arrow "◄►" shows that current can flow in either direction depending on circuit operation.</li> </ul>                              |  |  |  |
| <b>2</b> 0 | System branch              | This shows that the system branches to another system identified by cell code (section and system).   |  |  |  |
| <b>(1)</b> | Page crossing              | <ul> <li>This arrow shows that the circuit continues to another page identified by cell code</li> <li>The C will match with the C on another page within the system other than the next or preceding pages.</li> </ul>  |  |  |  |
| 22         | Shielded line              | The line enclosed by broken line circle shows shield wire.  |  |  |  |
| 23         | Component box in wave line | This shows that another part of the component is also shown on another page (indicated by wave line) within the system.   |  |  |  |
| 24)        | Component name             | This shows the name of a component.   |  |  |  |
| 25         | Connector number           | <ul> <li>This shows the connector number.</li> <li>The letter shows which harness the connector is located in. Example: M: main harness. For detail and to locate the connector, refer to EL setion ("Main Harness", "HARNESS LAYOUT"). A coordinate grid is included for complex harnesses to aid in locating connectors.</li> </ul> |  |  |  |
| 26         | Ground (GND)               | The line spliced and grounded under wire color shows that ground line is spliced at the grounded connector.   |  |  |  |
| 27         | Ground (GND)               | This shows the ground connection.   |  |  |  |
| 28         | Connector views            | This area shows the connector faces of the components in the wiring diagram on the page.  |  |  |  |
| 29         | Common component           | Connectors enclosed in broken line show that these connectors belong to the same component.   |  |  |  |
| 30         | Connector color            | This shows a code for the color of the connector. For code meaning, refer to wire color codes, Number    of this chart.   |  |  |  |
| 31)        | Fusible link and fuse box  | This shows the arrangement of fusible link(s) and fuse(s), used for connector views of "POWER SUPPLY ROUTING" in EL section. The open square shows current flow in, and the shaded square shows current flow out.   |  |  |  |
| <b>32</b>  | Reference area             | This shows that more information on the Super Multiple Junction (SMJ) and Joint Connectors (J/C) exists on the foldout page. Refer to GI-17 for details.  |  |  |  |

**GI-12** 16

# Connector Symbol Connector Symbol Single line Direction mark Connector Symbol Double line Direction mark Connector Direction mark Connector SGI364



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

GI T.S.

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

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

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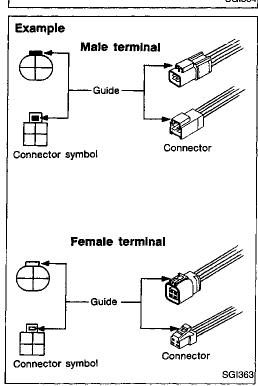
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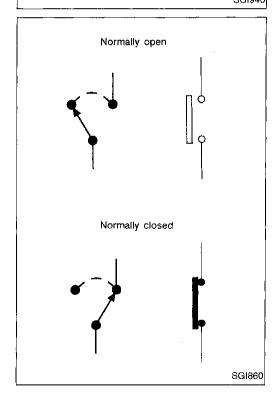
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# Example: Harness indication BCM connector (M33) Single C/UNIT O CONNECTOR 109 SB Component indication A/C mode switch connector (M39) Double line SGI940

# **Description (Cont'd)**

- Connector numbers that indicate harness are enclosed by a single line.
- Connector numbers that indicate components are enclosed by a double line.



# **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/back door are closed,
- · pedals are not depressed, and
- parking brake is released.

# IGNITION SWITCH ON or START 10A 21 VEHICLE SPEED SENSOR (E222) 17 15 SPEED OMETER Y/G (M27) Detectable line for DTC Non-detectable line for DTC Y/G 26 VSP ECM (ECCS CONTROL MODULE) (F29) SGI862

# **Description (Cont'd)**

# **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.

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# Description (Cont'd) MULTIPLE SWITCH

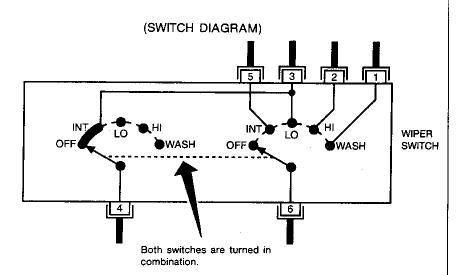
The continuity of multiple switch is described in two ways as shown below.

- The switch chart is used in schematic diagrams.
- The switch diagram is used in wiring diagrams.



(SWITCH CHART)

# 



# Continuity circuit of wiper switch

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

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# **Description (Cont'd)**

# **FOLDOUT PAGE**

The foldout page should be opened when reading wiring diagram.

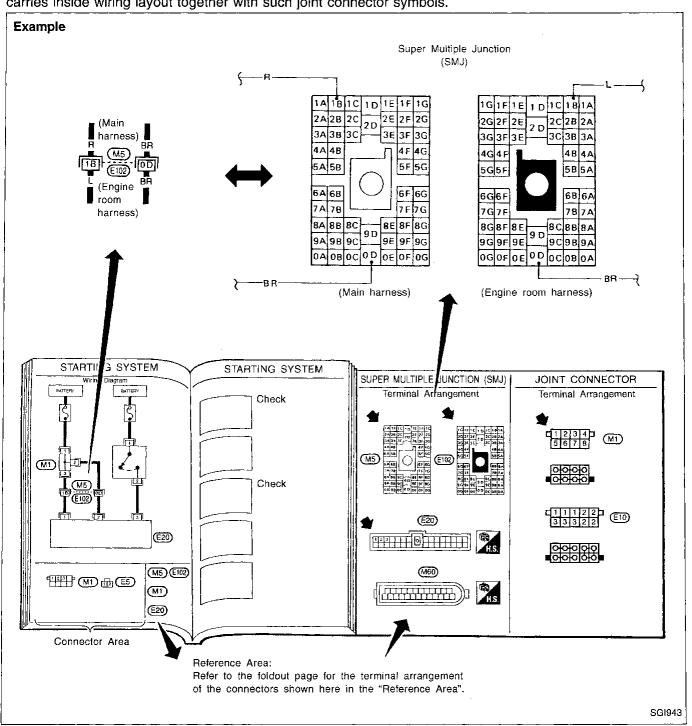
# Super multiple junction (SMJ)

In wiring diagram, connectors consisting of terminals having terminal numbers with an alphabet (1B, 0D, 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 foldout page at the end of this manual.

#### Joint connector

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



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# Wiring Diagram Codes (Cell Codes)

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

|        | 0 "     | Juliu Bi M  |  |
|--------|---------|---|--|
| Code   | Section | Wiring Diagram Name   |  |
| AAC/V  | EC      | IACV-AAC Valve  |  |
| ABS    | BR      | Anti-lock Brake System                                      |  |
| A/C, A | HA      | Auto Air Conditioner  |  |
| A/C, M | НА      | Manual Air Conditioner                                      |  |
| AP/SEN | EC      | Absolute Pressure Sensor                                    |  |
| ASCD   | EL      | Automatic Speed Control Device (ASCD)                       |  |
| A/T    | AT      | Automatic Transaxle   |  |
| AT/C   | EC      | A/T Control   |  |
| ATDIAG | EC      | A/T Diagnosis Communication Line                            |  |
| AUDIO  | EL      | Audio   |  |
| BACK/L | EL      | Back-up Lamp  |  |
| BUZZER | EL      | Warning Buzzer  |  |
| BYPS/V | EC      | Vacuum Cut Valve Bypass Valve                               |  |
| CANI/V | EC      | EVAP Canister Purge Control Valve/<br>Solenoid Valve        |  |
| CHARGE | EL      | Charging System   |  |
| СОММ   | EL      | Main Power Supply, Ground and Communication Circuits — IVMS |  |
| COOL/F | EC      | Cooling Fan   |  |
| DEF    | EL      | Rear Window Defogger  |  |
| D/LOCK | EL      | Power Door Lock — IVMS                                      |  |
| DTRL   | EL      | Headlamp - With Daytime Light System                        |  |
| ECTS   | EC      | Engine Coolant Temperature<br>Sensor                        |  |
| EGRC   | EC      | EGR Function  |  |
| EGRC/V | EC      | EGRC-Solenoid Valve   |  |
| EGR/TS | EC      | EGR Temperature Sensor                                      |  |
| EMNT   | EC      | Front Engine Mounting Control                               |  |
| F/FOG  | EL      | Front Fog Lamp  |  |
| FICD   | EC      | IACV-FICD Solenoid Valve                                    |  |
| FO2H-L | EC      | Front Heated Oxygen Sensor Heater (Left Bank)               |  |
| FO2H-R | EC      | Front Heated Oxygen Sensor Heater (Right Bank)              |  |
| FPCM   | EC      | Fuel Pump Control Module                                    |  |
| F/PUMP | EC      | Fuel Pump Control   |  |
| FRO2LH | EC      | Front Heated Oxygen Sensor (Left bank)                      |  |
| FRO2RH | EC      | Front Heated Oxygen Sensor (Right bank)                     |  |

| Code   | Section | Wiring Diagram Name                                    |  |
|--------|---------|--|--|
| FUELLH | EC      | Fuel Injection System Function (Left Bank)             |  |
| FUELRH | EC      | Fuel Injection System Function (Right Bank)            |  |
| H/LAMP | EL      | Headlamp   |  |
| HORN   | EL      | Horn, Cigarette Lighter, Clock                         |  |
| H/SEAT | EL      | Heated Seat  |  |
| IATS   | EC      | Intake Air Temperature Sensor                          |  |
| IGN/SG | EC      | Ignition Signal  |  |
| ILL    | EL      | Illumination   |  |
| INJECT | EC      | Injector   |  |
| INT/L  | EL      | Spot and Trunk Room Lamp                               |  |
| KS     | EC      | Knock Sensor   |  |
| LD/SIG | EC      | Electrical Load Signal                                 |  |
| MAFS   | EÇ      | Mass Air Flow Sensor                                   |  |
| MAIN   | EC      | Main Power Supply and Ground Circuit                   |  |
| METER  | EL      | Speedometer, Tachometer, Temp.,<br>Oil and Fuel Gauges |  |
| MIL/DL | EC      | MIL & Data Link Connector                              |  |
| MIRROR | EL      | Power Door Mirror                                      |  |
| MULTI  | EL      | Multi-remote Control System — IVMS                     |  |
| P/ANT  | EL      | Power Antenna  |  |
| PHONE  | EL      | Telephone Pre-wire                                     |  |
| PGC/V  | EC      | EVAP Canister Purge Volume Control Valve               |  |
| PHASE  | EC      | Camshaft Position Sensor (PHASE)                       |  |
| PNP/SW | EC      | Park/Neutral Position Switch                           |  |
| POS    | EC      | Crankshaft Position Sensor (POS)                       |  |
| POWER  | EL      | Power Supply Routing                                   |  |
| PRE/SE | EC      | EVAP Control System Pressure Sensor                    |  |
| PST/SW | EC      | Power Steering Oil Pressure Switch                     |  |
| REF    | EC      | Crankshaft Position Sensor (REF)                       |  |
| ROOM/L | EL      | Interior Lamp On-Off Control — IVMS                    |  |
| RRO2   | EC      | Rear Heated Oxygen Sensor                              |  |
| RRO2/H | EC      | Rear Heated Oxygen Sensor Heater                       |  |
| SEAT   | EL      | Power Seat   |  |
| SHIFT  | AT      | A/T Shift Lock System                                  |  |
| SROOF  | EL      | Electric Sunroof                                       |  |
|        |         |  |  |

# Wiring Diagram Codes (Cell Codes) (Cont'd)

| Code   | Section | Wiring Diagram Name             |  |
|--------|---------|---------------------------------|--|
| SRS    | RS      | Supplemental Restraint System   |  |
| S/SIG  | EC      | Start Signal                    |  |
| START  | EL      | Starting System                 |  |
| STEP/L | EL      | Step Lamp — IVMS                |  |
| STOP/L | EL      | Stop lamp                       |  |
| SW/ILL | EL      | Illumination — IVMS             |  |
| SW/V   | EC      | MAP/BARO Switch Solenoid Valve  |  |
| TAIL/L | EL      | Parking, License and Tail Lamps |  |
| TFTS   | EC      | Tank Fuel Temperature Sensor    |  |
| T/LID  | EL      | Trunk Lid Opener                |  |

| <b>-</b> |         |                                      |  |
|----------|---------|--------------------------------------|--|
| Code     | Section | Wiring Diagram Name                  |  |
| THEFT    | EL      | Theft Warning System — IVMS          |  |
| TPS      | EC      | Throttle Position Sensor             |  |
| TP/SW    | EC      | Closed Throttle Position Switch      |  |
| TURN     | EL      | Turn Signal and Hazard Warning Lamps |  |
| VENT/V   | EC      | EVAP Canister Vent Control Valve     |  |
| vss      | EC      | Vehicle Speed Sensor                 |  |
| WARN     | EL      | Warning Lamps                        |  |
| WINDOW   | EL      | Power Window — IVMS                  |  |
| WIPER    | ËL      | Front Wiper and Washer               |  |

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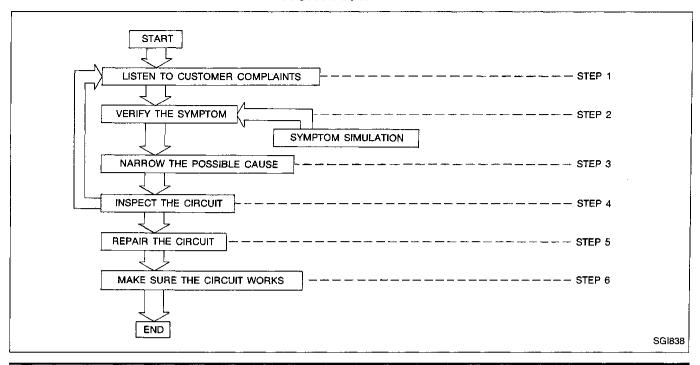
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# **Work Flow**



| STEP   |  | DESCRIPTION  |  |
|--------|--|--|--|
| STEP 1 | Get detailed information about the conditions and the environment when the incident occurred.  The following are key pieces of information required to make a good analysis:                         |  |  |
|        | WHAT   | Vehicle Model, Engine, Transmission and the System (i.e. Radio).   |  |
|        | WHEN   | Date, Time of Day, Weather Conditions, Frequency.  |  |
|        | WHERE  | Road Conditions, Altitude and Traffic Situation.   |  |
|        | HOW  | System Symptoms, Operating Conditions (Other Components Interaction). Service History and if any After Market Accessories have been installed.                             |  |
| STEP 2 | Operate the system, road test if necessary.  Verify the parameter of the incident.  If the problem can not be duplicated, refer to "Incident Simulation Tests" next page.                            |  |  |
| STEP 3 | Get the proper diagnosis materials together including:   |  |  |
|        |  | POWER SUPPLY ROUTING System Operation Descriptions Applicable Service Manual Sections Check For Any Service Bulletin*  |  |
|        | Identify wh  | ere to begin diagnosis based upon your knowledge of the system operation and the customer comments.  |  |
| STEP 4 | Inspect the system for mechanical binding, loose connectors or wiring damage.  Determine which circuits and components are involved and diagnose using the Power Supply Routing and Harness Layouts. |  |  |
| STEP 5 | Repair or i  | replace the incident circuit or component.   |  |
| STEP 6 |  | e system in all modes. Verify the system works properly under all conditions. Make sure you have not inad-<br>reated a new incident during your diagnosis or repair steps. |  |

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# **Incident Simulation Tests**

#### INTRODUCTION

Sometimes the symptom is not present when the vehicle is brought in for service. If possible, re-create the conditions present at the time of the incident. Doing so may help avoid a No Trouble Found Diagnosis. The following section illustrates ways to simulate the conditions/environment under which the owner experiences an electrical incident.

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The section is broken into the six following topics:

- Vehicle vibration
- Heat sensitive
- Freezing
- Water intrusion
- Electrical load
- 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.

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# **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.

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# 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.

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# 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.

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#### Sensors & relays

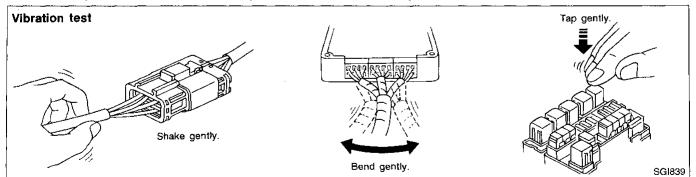
**Gently** apply a slight vibration to sensors and relays in the system you are inspecting. This test may indicate a loose or poorly mounted sensor or relay.

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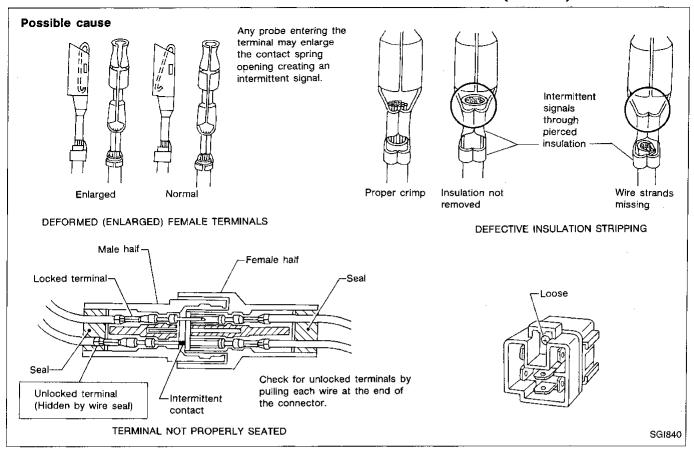
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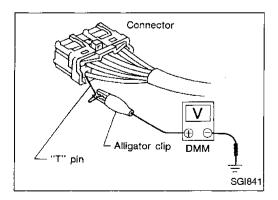


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# **Incident Simulation Tests (Cont'd)**





# 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.

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# **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 not fully seated.
- Wiring harness not long enough and is being stressed due to engine vibrations or rocking.
- Wires laying across brackets or moving components.
- Loose, dirty or corroded ground wires.
- Wires routed too close to hot components.

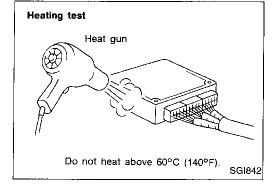
To inspect components under the hood, start by verifying the integrity of ground connections. (Refer to GROUND INSPECTION described later.) First check that the system is properly grounded. Then check for loose connection by **gently shaking** the wiring or components as previously explained. Using the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

# Behind the instrument panel

An 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.

# **Under seating 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 seating areas, inspect wire routing for possible damage or pinching.



#### **HEAT SENSITIVE**

The owner's problem may occur during hot weather or after 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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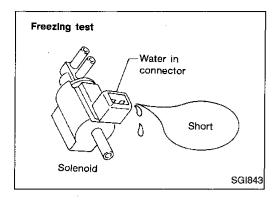
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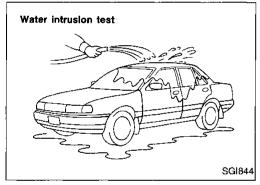
# Incident Simulation Tests (Cont'd)

#### **FREEZING**

The customer may indicate the incident goes away after the car warms up (winter time). 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.

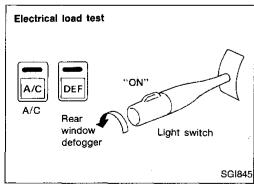
The second method is to put the suspect component into a freezer long enough for any water to freeze. Reinstall the part into the car and check for the reoccurrence of the incident. If it occurs, repair or replace the component.



# 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 lamps) 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.

GI-24

# **Circuit Inspection**

#### CONNECTOR AND TERMINAL PIN KIT

Use the connector and terminal pin kit listed below when replacing connectors or terminals.

The connector and terminal pin kit contains some of the most commonly used NISSAN connectors and terminals.

| Tool number<br>(Kent-Moore No.)<br>Tool name | Description   |   | MA |
|--|---|---|----|
|  |   |   | EM |
| Connector and terminal pin kit               |   | ÷ | LC |
|  |   |   | EC |
|  | ACIDS |   | FE |
|  | AGI063  |   | ⊘n |

#### INTRODUCTION

In general, testing electrical circuits is an easy task if it is approached in a logical and organized method. Before MT 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 a section of the circuit.

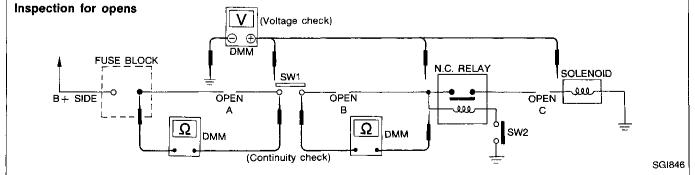
SHORT There are two types of shorts.

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

When a circuit contacts a ground source and grounds the SHORT TO GROUND 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 to logically walk through the diagnosis process. Drawing the sketch will also reinforce your working knowledge of the system.



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# Circuit Inspection (Cont'd)

# 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.

# Voltage check method

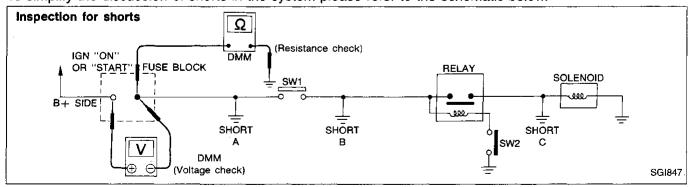
To help in understanding the diagnosis of open circuits please refer to the previous schematic. In any powered circuit, an open can be found by methodically checking the system for the presence of voltage. This is done by switching the DMM to the voltage function.

- 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.
  - voltage; open is further down the circuit than SW1.
  - no voltage; open is between fuse block and SW1 (point A).
- 4. Close SW1 and probe at relay.
  - voltage; open is further down the circuit than the relay.
  - no voltage; open is between SW1 and relay (point B).
- 5. Close the relay and probe at the solenoid.
  - voltage; open is further down the circuit than the solenoid.
  - 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.



# Circuit Inspection (Cont'd)

#### 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
- 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.
  - short is between fuse terminal and SW1 (point A). continuity;

no continuity: short is further down the circuit than SW1.

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.

short is between SW1 and the relay (point B). continuity: no continuity; short is further down the circuit than the relay.

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.

continuity: short is between relay and solenoid (point C).

no continuity; check solenoid, retrace steps.

# 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.
- 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).
- With SW1 open and the DMM leads across both fuse terminals, check for voltage.

short is between fuse block and SW1 (point A). voltage:

short is further down the circuit than SW1. no voltage:

4. With SW1 closed, relay and solenoid disconnected and the DMM leads across both fuse terminals, check for voltage.

voltage: short is between SW1 and the relay (point B).

no voltage: short is further down the circuit than the relay.

5. With SW1 closed, relay contacts jumped with fused jumper wire check for voltage.

voltage; short is down the circuit of the relay or between the relay and the disconnected solenoid

no voltage; retrace steps and check power to fuse block.

#### 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.
- 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 cased in one evelet make sure no ground wires have excess wire insulation.

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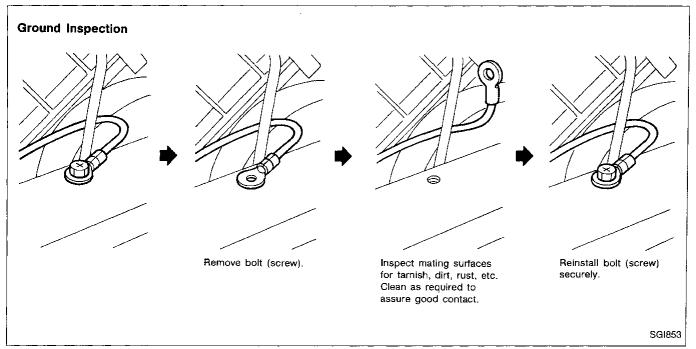
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# Circuit Inspection (Cont'd)



# **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.

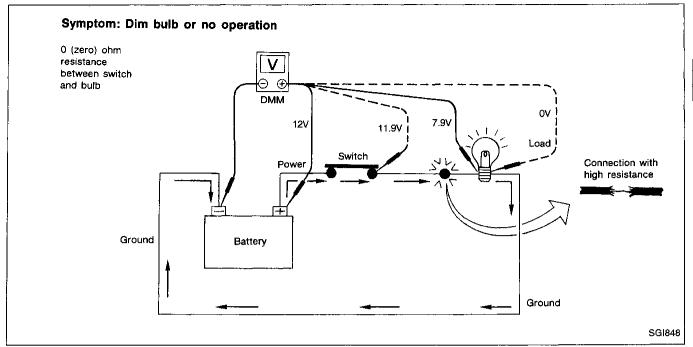
If repairs are needed always use wire that is of the same or larger gauge.

# 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.
- 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.

# Circuit Inspection (Cont'd)



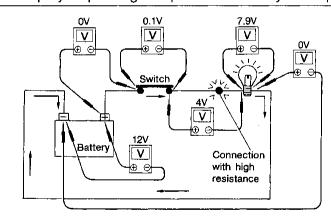
# Measuring voltage drop — Step by step

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.



- Connect the voltmeter as shown, starting at the battery and working your way around the circuit.
- An unusually large voltage drop will indicate a component or wire that needs to be repaired. As you can see the illustration above, the poor connection causes a 4 volt drop.

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.

COMPONENT

Wire Ground Connections Switch Contacts VOLTAGE DROP
negligible <.001 volts

Approx. 0.1 volts Approx. 0.3 volts

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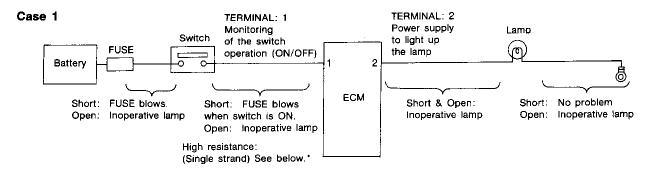
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# Circuit Inspection (Cont'd)

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

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

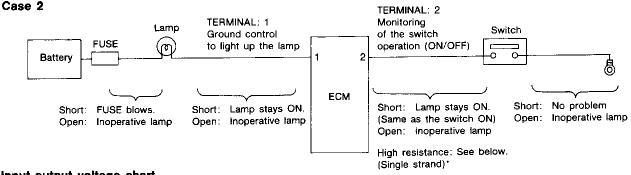


#### Input-output voltage chart

|            | -      | _              | *                    |  |
|------------|--------|----------------|----------------------|--|
| Pin<br>No. | Item   | Condition      | Voltage<br>value [V] | In case of high resistance such as single strand [V] * |
| 1          | Switch | Switch<br>ON   | Battery<br>voltage   | Lower than battery voltage<br>Approx. 8 (Example)      |
|            |        | OFF            | Approx. 0            | Approx. 0  |
| 2          | Lamp   | Lamp Switch ON | Battery<br>voltage   | Approx. 0<br>(Inoperative lamp)                        |
|            |        | OFF            | Арргох. 0            | Approx. 0  |

The voltage value is based on the body ground.

<sup>\* :</sup> If high resistance exists in the switch side circuit (caused by a single strand), terminal 1 does not detect battery voltage. ECM 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.



# Input-output voltage chart

| Pin<br>No. | Item   | Condition    | Voltage<br>value [V] | In case of high resistance such as single strand [V] * |
|------------|--------|--------------|----------------------|--|
| 1 Lamp     | Lamp   | Switch<br>ON | Approx. 0            | Battery voltage<br>(Inoperative lamp)                  |
|            |        | OFF          | Battery<br>voltage   | Battery voltage  |
| 2          | Switch | Switch<br>ON | Approx. 0            | Higher than 0<br>Approx. 4 (Example)                   |
|            |        | OFF          | Approx. 5            | Approx. 5  |

The voltage value is based on the body ground.

<sup>\* :</sup> If high resistance exists in the switch side circuit (caused by a single strand), terminal 2 does not detect approx. 0V. ECM does not detect the switch is ON even if the switch does turn ON. Therefore, the ECM does not control ground to light up the lamp.

#### NOTICE

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

- Use the flow chart after locating probable causes of a problem following the "Preliminary Check", the "Symptom Chart" or the "Work Flow".
- 2) After repairs, re-check that the problem has been completely eliminated.
- Refer to Component Parts and Harness Connector Location for the Systems described in each section for identification/location of components and harness con-
- 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.
- When checking circuit continuity, ignition switch should be "OFF".
- 6) Before checking voltage at connectors, check battery voltage.
- After accomplishing the Diagnostic Procedures and Electrical Components Inspection, make sure that all harness connectors are reconnected as they were.

Example AT 3 INSPECTION START 4 FA NG CHECK POWER SUPPLY. Check the following RA 1) Turn ignition switch "ON". items. 2) Check voltage between terminal (b) 1) Harness continuity and ground. between camshaft BR ▶Battery voltage should exist. position sensor and battery OΚ SGI561 2) ECCS relay-1 ST 3) "BR" fusible link ΙBΙ -2 4) Power source for **ECM** RS 5) Ignition switch BT В NG HA CHECK GROUND CIRCUIT. Check the following 1) Turn ignition switch "OFF". items 2) Disconnect camshaft position sensor 1) Harness continuity SGI562 EL, harness connector. between camshaft 3) Check resistance between terminal position sensor and d and ground. ground ЮX Resistance: 2) Ground circuit for **ECM** Approximately  $0\Omega$ ⊥ок SGI800-C

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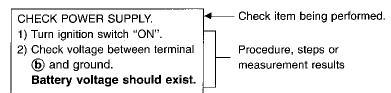
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#### HOW TO FOLLOW THIS FLOW CHART

#### | Work and diagnostic procedure

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

Α



#### 2 Measurement results

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

These have the following meanings:

Battery voltage  $\rightarrow$  11 - 14V or approximately 12V Voltage: Approximately 0V  $\rightarrow$  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 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-13.

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#### HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES

Key to symbols signifying measurements or procedures

| Symbol     | Symbol explanation                                      | Symbol            | Symbol explanation   |
|------------|---|-------------------|--|
| DISCONNECT | Check after disconnecting the connector to be measured. |                   | Procedure with Generic Scan Tool (GST, OBD-II scan tool)   |
| CONNECT    | Check after connecting the connector to be measured.    | TOOLS             | Procedure without CONSULT or GST   |
|            | Insert key into ignition switch.                        |                   | A/C switch is "OFF".   |
| (Per       | Remove key from ignition switch.                        | (AC)              | A/C switch is "ON".  |
| (COFF)     | Turn ignition switch to "OFF" position.                 |                   | REC switch is "ON".  |
| (Con)      | Turn ignition switch to "ON" position.                  |                   | REC switch is "OFF".   |
|            | Turn ignition switch to "START" position.               | •                 | DEF switch is "ON".  |
| (CFF-ACC   | Turn ignition switch from "OFF" to "ACC" position.      | OFF 1 2 3 4       | Fan switch is "ON". (At any position except for "OFF" position)  |
| (ACC+)DFF  | Turn ignition switch from "ACC" to "OFF" position.      |                   | Fan switch is "OFF".   |
| (OFF•ON    | Turn ignition switch from "OFF" to "ON" position.       | FUSE              | Apply positive voltage from battery with fuse directly to components.  |
| (GN+OFF    | Turn ignition switch from "ON" to "OFF" position.       |                   | Drive vehicle.   |
| X.         | Do not start engine, or check with engine stopped.      | BAT               | Disconnect battery negative cable.   |
|            | Start engine, or check with engine running.             |                   | Depress brake pedal.   |
| and the    | Apply parking brake.                                    |                   | Release brake pedal.   |
| suntilina. | Release parking brake.                                  |                   | Depress accelerator pedal.   |
| сФн        | Check after engine is warmed up sufficiently.           | ZZ.               | Release accelerator pedal.   |
| V          | Voltage should be measured with a volt-meter.           |                   | Pin terminal check for SMJ type ECM  |
|            | Circuit resistance should be measured with an ohmmeter. | CUNIT O CONNECTOR | and A/T control unit connectors.  For details regarding the terminal arrangement, refer to the foldout page. |
| A          | Current should be measured with an ammeter.             |                   | DISCONNECT   |
|            | Procedure with CONSULT                                  |                   |  |
|            | Procedure without CONSULT                               | -                 | ÷  |

**GI-33** 37

#### **Function and System Application**

| Diagnostic<br>test mode   | Function  | ECCS | A/T         | Air bag | ABS | ASCD | *IVMS |
|---------------------------|---|------|-------------|---------|-----|------|-------|
| Work support              | This mode enables a technician to adjust some devices faster and more accurately by following the indications on CONSULT.             | x    | _           | _       |     |      |       |
| Self-diagnostic results   | Self-diagnostic results can be read and erased quickly.   | х    | х           | х       | х   | х    | ×     |
| Trouble diagnostic record | Current self-diagnostic results and all trouble diagnostic records previously stored can be read.                                     |      | _           | ×       |     | _    | _     |
| ECU discriminated<br>No.  | Classification number of a replacement ECU can be read to prevent an incorrect ECU from being installed.                              | -    | <del></del> | х       | _   |      | _     |
| Data monitor              | Input/Output data in the ECM can be read.   | х    | х           |         | ×   | х    | х     |
| Active test               | Diagnostic Test Mode in which CONSULT drives some actuators apart from the ECMs and also shifts some parameters in a specified range. | x    | _           | _       | х   | _    | x     |
| ECM part number           | ECM part number can be read.  | x    | х           |         | х   |      | х     |
| Function test             | Conducted by CONSULT instead of a technician to determine whether each system is "OK" or "NG".  | х    | _           | _       | _   |      |       |
| SRT·OBD test value        | The results of SRT (System Readiness Test) and the OBD test values/test limits can be read.   | ×    | _           | _       | _   |      | _     |

x: Applicable

#### **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 of 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/INFINITI distributor.

| Tool name   | Description |
|---|-------------|
| NISSAN CONSULT  ① CONSULT unit and accessories ② Program card UE950 and UE951 | NT004       |

<sup>\*</sup>IVMS: In-vehicle multiplexing system

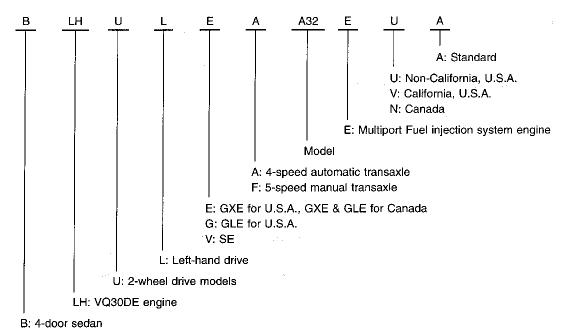
#### **IDENTIFICATION INFORMATION**

#### **Model Variation**

|             |              |                 |           | Destination               |                    |                   |  |
|-------------|--------------|-----------------|-----------|---------------------------|--------------------|-------------------|--|
| Body Engine |              | Grade Transaxle |           | Non-California,<br>U.S.A. | California, U.S.A. | Canada            |  |
|             |              | GXE             | RE4F04A*1 | BLHULEA-<br>EUA*3         | BLHULEA-EVA*3      | BLHULEA-<br>ENA*3 |  |
|             | Sedan VQ30DE |                 | RS5F50A*2 | BLHULEF-EUA               | BLHULEF-EVA        | BLHULEF-ENA       |  |
| Sedan       |              | GLE             | RE4F04A*1 | BLHULGA-EUA               | BLHULGA-EVA        | BLHULEA-ENA       |  |
| į           |              | 25 25 2 25 1    |           | BLHULVA-EUA               | BLHULVA-EVA        | BLHULVA-ENA       |  |
|             |              | SE, SE-S, SE-L  | RS5F50A*2 | BLHULVF-EUA               | BLHULVF-EVA        | BLHULVF-ENA       |  |

<sup>\*1:</sup> The automatic transaxle with viscous LSD is "RE4F04V".

#### Prefix and suffix designations:



ST

RS

BT

HA

EL

MA

EM

LC

EC

FE

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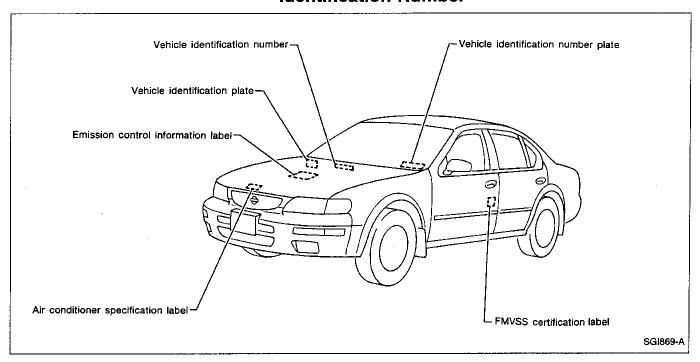
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BR

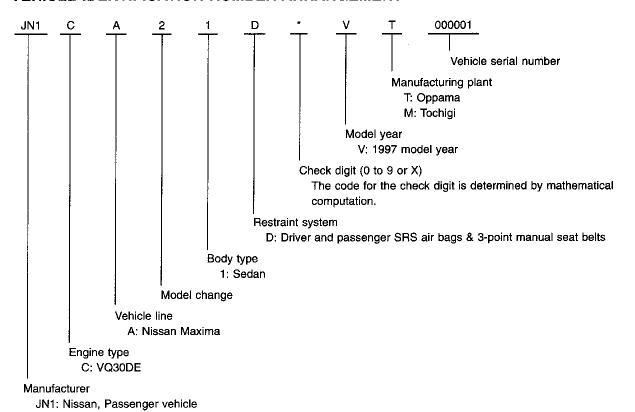
<sup>\*2:</sup> The manual transaxle with viscous LSD is "RS5F50V".

<sup>\*3:</sup> GXE or GXE-L grade

#### **Identification Number**



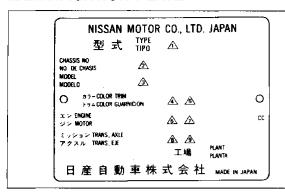
#### **VEHICLE IDENTIFICATION NUMBER ARRANGEMENT**



#### **IDENTIFICATION INFORMATION**

#### **Identification Number (Cont'd)**

#### **IDENTIFICATION PLATE**



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

SGI315

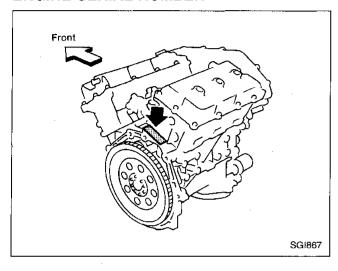
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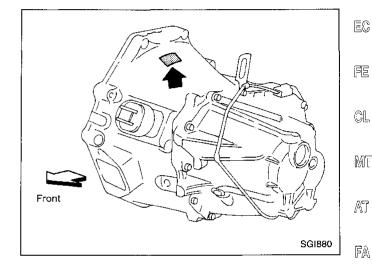
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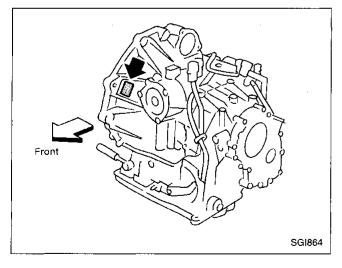
#### **ENGINE SERIAL NUMBER**



#### **MANUAL TRANSAXLE NUMBER**



#### **AUTOMATIC TRANSAXLE NUMBER**



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#### **IDENTIFICATION INFORMATION**

#### **Dimensions**

|                             |         | Sedan  |
|-----------------------------|---------|--|
| Overall length              | mm (in) | 4,810 (189.4)                                      |
| Overall width               | mm (in) | 1,770 (69.7)                                       |
| Overall height              | mm (in) | 1,415 (55.7)                                       |
| Front tread                 | mm (in) | 1,530 (60.2)*1<br>1,520 (59.8)*2                   |
| Rear tread                  | mm (in) | 1,510 (59.4)*1<br>1,500 (59.1)*2                   |
| Wheelbase                   | mm (in) | 2,700 (106.3)                                      |
| Gross vehicle weight rating | kg (lb) |  |
| Gross axle weight rating    |         | See the "FMVSS certifi-                            |
| Front                       | kg (lb) | cation label" on the<br>driver's side lock pillar. |
| Rear                        | kg (lb) | ·  |

<sup>\*1:</sup> For models with steel wheels

#### **Wheels and Tires**

|            | 1            |         |  |
|------------|--------------|---------|--|
|            | Steel        |         | 15 x 6JJ   |
|            | Offset       | mm (in) | 40 (1.57)  |
| Road wheel | Aluminum     |         | 15 x 6.5JJ<br>16 x 6.5JJ                           |
|            | Offset       | mm (in) | 45 (1.77)  |
| Tive eige  | Conventional |         | P205/65R15 92S<br>P205/65R15 92H<br>P215/55R16 91H |
| Tire size  | Spare        |         | Conventional*1<br>T125/70D16*2<br>T125/90D16*2, *3 |

<sup>\*2:</sup> For models with aluminum wheels

<sup>\*1:</sup> For Canada \*2: For U.S.A. \*3: For models with viscous LSD

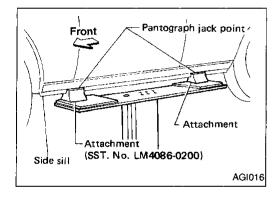
#### LIFTING POINTS AND TOW TRUCK TOWING

#### **Preparation**

#### **SPECIAL SERVICE TOOLS**

The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

| Tool number<br>(Kent-Moore number)<br>Tool name | Description | Gl |
|---|-------------|----|
| LM4086-0200                                     |             |    |
| Board on attachment                             |             |    |
|   | NT001       |    |
| LM4519-0000                                     |             |    |
| Safety stand attachment                         |             | EC |
|   | NT002       |    |
|   |             | FĒ |



#### **Board-on Lift**

#### **CAUTION:**

- 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.

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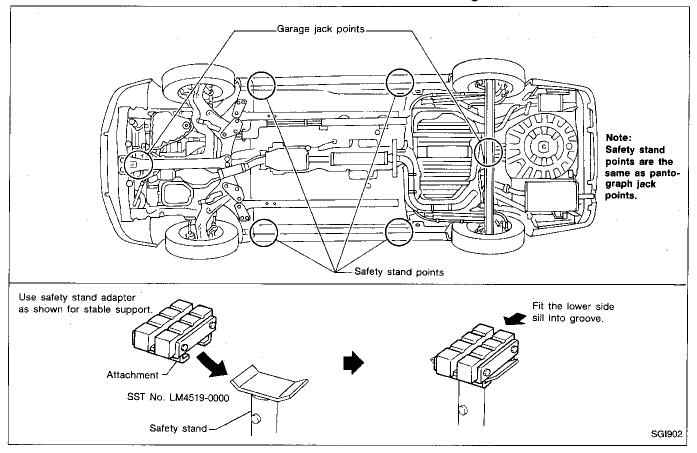
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#### LIFTING POINTS AND TOW TRUCK TOWING

#### Garage Jack and Safety Stand

#### **WARNING:**

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



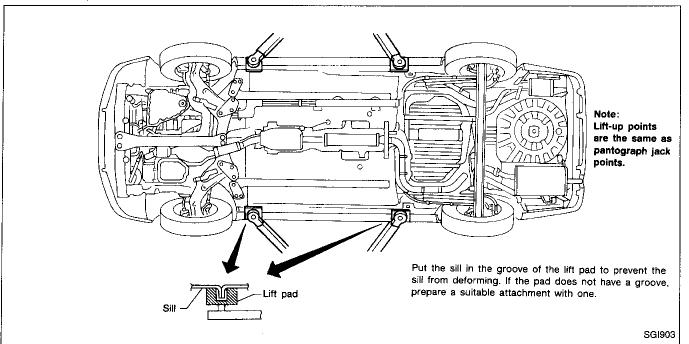
#### LIFTING POINTS AND TOW TRUCK TOWING

#### 2-pole Lift

#### **WARNING:**

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

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



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#### **Tow Truck Towing**

#### **CAUTION:**

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

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



Observe the following restricted towing speeds and distances.

Speed:

Below 50 km/h (30 MPH)

Distance:

Less than 65 km (40 miles)

#### **CAUTION:**

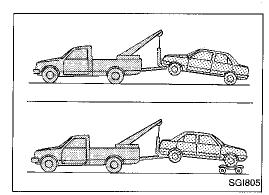
Never tow an automatic transaxle model from the rear (i.e., backward) with four wheels on the ground as this may cause serious and expensive damage to the transaxle.

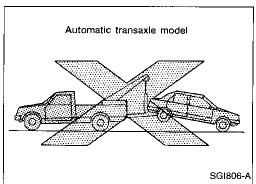
# TOWING AN AUTOMATIC TRANSAXLE MODEL WITH REAR WHEELS RAISED (With front wheels on ground)

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



- Tow chains or cables must be attached only to the main structural members of the vehicle.
- Pulling devices should be routed so they do not touch any part of the suspension, steering, brake or cooling systems.
- Always pull the cable straight out from the front or rear of the vehicle. Never pull on the vehicle at a sideways angle.
- Pulling devices such as ropes or canvas straps are not recommended for use in vehicle towing or recovery.





#### **TIGHTENING TORQUE OF STANDARD BOLTS**

|                 |           | Bolt diam-         |             |     |         | Tight     | ening torque | (Without lub | ricant) |             |       |
|-----------------|-----------|--------------------|-------------|-----|---------|-----------|--------------|--------------|---------|-------------|-------|
| Grade Bolt size | Bolt size | eter*              | Pitch<br>mm |     | Hexagon | head bolt |              |              | Hexagon | flange bolt |       |
|                 |           | mm                 |             | N∙m | kg-m    | ft-lb     | in-lb        | N∙m          | kg-m    | ft-lb       | in-lb |
|                 | M6        | 6.0                | 1.0         | 5.1 | 0.52    | 3.8       | 45.1         | 6.1          | 0.62    | 4.5         | 53.8  |
|                 | M8        | 8.0                | 1.25        | 13  | 1.3     | 9         | _            | 15           | 1.5     | 11          | _     |
|                 | IVIO      | 0.0                | 1.0         | 13  | 1.3     | 9         | _            | 16           | 1.6     | 12          | _     |
| 4T              | M10       | 10.0               | 1.5         | 25  | 2.5     | 18        | _            | 29           | 3.0     | 22          | _     |
| 41              | 10110     | 10.0               | 1.25        | 25  | 2.6     | 19        | _            | 30           | 3.1     | 22          | _     |
|                 | M12       | 12.0               | 1.75        | 42  | 4.3     | 31        | _            | 51           | 5.2     | 38          | _     |
|                 | IVITZ     | 12.0               | 1.25        | 46  | 4.7     | 34        | _            | 56           | 5.7     | 41          | _     |
|                 | M14       | 14.0               | 1.5         | 74  | 7.5     | 54        | _            | 88           | 9.0     | 65          | _     |
|                 | M6        | 6.0                | 1.0         | 8.4 | 0.86    | 6.2       | 74.6         | 10           | 1.0     | 7           | 87    |
|                 | MO        | M8 8.0<br>M10 10.0 | 1.25        | 21  | 2.1     | 15        | _            | 25           | 2.5     | 18          | _     |
|                 | INIO      |                    | 1.0         | 22  | 2.2     | 16        | _            | 26           | 2.7     | 20          | _     |
| 7 <b>T</b>      | N410      |                    | 1.5         | 41  | 4.2     | 30        | _            | 48           | 4.9     | 35          | _     |
| / 1             | IVITO     |                    | 1.25        | 43  | 4.4     | 32        | _            | 51           | 5.2     | 38          | _     |
|                 | 1416      | 12.0               | 1.75        | 71  | 7.2     | 52        | _            | 84           | 8.6     | 62          | _     |
| ļ               | M12       |                    | 1.25        | 77  | 7.9     | 57        | _            | 92           | 9.4     | 68          | _     |
|                 | M14       | 14.0               | 1.5         | 127 | 13.0    | 94        | _            | 147          | 15.0    | 108         | _     |
|                 | M6        | 6.0                | 1.0         | 12  | 1.2     | 9         | _            | 15           | 1.5     | 11          | _     |
|                 | 140       | 0.0                | 1.25        | 29  | 3.0     | 22        | _            | 35           | 3.6     | 26          | -     |
|                 | M8 8.0    | 8.0                | 1.0         | 31  | 3.2     | 23        | _            | 37           | 3.8     | 27          | -     |
| 9T              |           | 10.0               | 1.5         | 59  | 6.0     | 43        | _            | 70           | 7.1     | 51          | _     |
| 91              | M10       | 10.0               | 1.25        | 62  | 6.3     | 46        | _            | 74           | 7.5     | 54          | _     |
|                 | M12       | 12.0               | 1.75        | 98  | 10.0    | 72        | _            | 118          | 12.0    | 87          | _     |
|                 | IVI IZ    | 12.0               | 1.25        | 108 | 11.0    | 80        | _            | 137          | 14.0    | 101         | _     |
|                 | M14       | 14.0               | 1.5         | 177 | 18.0    | 130       |              | 206          | 21.0    | 152         | _     |

1. Special parts are excluded.

This standard is applicable to bolts having the following marks embossed on the bolt head.

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

\*: Nominal diameter

M 6
Nominal diameter of bolt threads (Unit: mm)

Metric screw threads

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#### **SAE J1930 Terminology List**

All emission related terms used in this publication in accordance with SAE J1930 are listed. Accordingly, new terms, new acronyms/abbreviations and old terms are listed in the following chart.

\*\*\*: Not applicable

| NEW TERM  | NEW ACRONYM /<br>ABBREVIATION | OLD TERM                         |
|---|-------------------------------|----------------------------------|
| Air cleaner   | ACL                           | Air cleaner                      |
| Barometric pressure                                 | BARO                          | ***                              |
| Barometric pressure sensor-BCDD                     | BAROS-BCDD                    | BCDD                             |
| Camshaft position                                   | CMP                           | ***                              |
| Camshaft position sensor                            | CMPS                          | Crank angle sensor               |
| Canister  | ***                           | Canister                         |
| Carburetor  | CARB                          | Carburetor                       |
| Charge air cooler                                   | CAC                           | Intercooler                      |
| Closed loop   | CL                            | Closed loop                      |
| Closed throttle position switch                     | CTP switch                    | Idle switch                      |
| Clutch pedal position switch                        | CPP switch                    | Clutch switch                    |
| Continuous fuel injection system                    | CFI system                    | ***                              |
| Continuous trap oxidizer system                     | CTOX system                   | ***                              |
| Crankshaft position                                 | СКР                           | ***                              |
| Crankshaft position sensor                          | CKPS                          | ***                              |
| Data link connector                                 | DLC                           | ***                              |
| Data link connector for CONSULT                     | DLC for CONSULT               | Diagnostic connector for CONSULT |
| Diagnostic test mode                                | DTM                           | Diagnostic mode                  |
| Diagnostic test mode selector                       | DTM selector                  | Diagnostic mode selector         |
| Diagnostic test mode I                              | DTM I                         | Mode I                           |
| Diagnostic test mode II                             | DTM II                        | Mode II                          |
| Diagnostic trouble code                             | DTC                           | Malfunction code                 |
| Direct fuel injection system                        | DFI system                    | ***                              |
| Distributor ignition system                         | DI system                     | Ignition timing control          |
| Early fuel evaporation-mixture heater               | EFE-mixture heater            | Mixture heater                   |
| Early fuel evaporation system                       | EFE system                    | Mixture heater control           |
| Electrically erasable programmable read only memory | EEPROM                        | ***                              |
| Electronic ignition system                          | El system                     | Ignition timing control          |
| Engine control                                      | EC                            | ***                              |
| Engine control module                               | ECM                           | ECCS control unit                |
| Engine coolant temperature                          | ECT                           | Engine temperature               |
| Engine coolant temperature sensor                   | ECTS                          | Engine temperature sensor        |
| Engine modification                                 | EM                            | ***                              |
| Engine speed  | RPM                           | Engine speed                     |
| Erasable programmable read only memory              | EPROM                         | ***                              |
| Evaporative emission canister                       | EVAP canister                 | Canister                         |

#### **SAE J1930 TERMINOLOGY LIST**

## SAE J1930 Terminology List (Cont'd)

\*\*\*: Not applicable

|   |                                     | . Not applicable                    |             |
|---|-------------------------------------|-------------------------------------|-------------|
| NEW TERM  | NEW ACRONYM /<br>ABBREVIATION       | OLD TERM                            |             |
| Evaporative emission system                               | EVAP system                         | Evaporative emission control system |             |
| Exhaust gas recirculation valve                           | EGR valve                           | EGR valve                           | Gl          |
| Exhaust gas recirculation control-BPT valve               | EGRC-BPT valve                      | BPT valve                           |             |
| Exhaust gas recirculation control-solenoid valve          | EGRC-solenoid valve                 | EGR control solenoid valve          |             |
| Exhaust gas recirculation temperature sensor              | ECDT concer                         | Exhaust and tomoroture concer       |             |
| EGR temperature sensor                                    | EGRT sensor                         | Exhaust gas temperature sensor      | _ EM        |
| Flash electrically erasable programmable read only memory | FEEPROM                             | ***                                 | -<br>- [_G  |
| Flash erasable programmable read only memory              | FEPROM                              | ***                                 | _           |
| Flexible fuel sensor                                      | FFS                                 | ***                                 | - EC        |
| Flexible fuel system                                      | FF system                           | ***                                 | _ IS\<br>_  |
| Fuel pressure regulator                                   | ***                                 | Pressure regulator                  |             |
| Fuel pressure regulator control solenoid valve            | ***                                 | PRVR control solenoid valve         |             |
| Fuel trim   | FT                                  | ***                                 |             |
| Heated Oxygen sensor                                      | HO2S                                | Exhaust gas sensor                  | CL          |
| dle air control system                                    | IAC system                          | Idle speed control                  | _           |
| dle air control valve-air regulator                       | IACV-air regulator                  | Air regulator                       | MT          |
| dle air control valve-auxiliary air control valve         | IACV-AAC valve                      | Auxiliary air control (AAC) valve   |             |
| dle air control valve-FICD solenoid valve                 | IACV-FICD solenoid valve            | FICD solenoid valve                 | _ Aī.       |
| dle air control valve-idle up control solenoid<br>valve   | IACV-idle up control solenoid valve | Idle up control solenoid valve      | -<br>PA     |
| dle speed control-FI pot                                  | ISC-FI pot                          | Fi pot                              | - FA        |
| dle speed control system                                  | ISC system                          | ***                                 | -           |
| gnition control   | IC                                  | ***                                 | – RA<br>–   |
| gnition control module                                    | ICM                                 | ***                                 |             |
| ndirect fuel injection system                             | IFI system                          | ***                                 | BR          |
| ntake air   | IA                                  | Air                                 |             |
| ntake air temperature sensor                              | IAT sensor                          | Air temperature sensor              | _<br>_      |
| Knock   | ***                                 | Detonation                          |             |
| Knock sensor  | KS                                  | Detonation sensor                   | _<br>RS     |
| Malfunction indicator lamp                                | MIL                                 | Check engine light                  | _           |
| Manifold absolute pressure                                | MAP                                 | ***                                 | –<br>_ Bĩ   |
| Manifold absolute pressure sensor                         | MAPS                                | ***                                 |             |
| Manifold differential pressure                            | MDP                                 | ***                                 | -<br>FlA    |
| Manifold differential pressure sensor                     | MDPS                                | ***                                 | יייים ויייי |

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## **SAE J1930 TERMINOLOGY LIST**

# SAE J1930 Terminology List (Cont'd)

\*\*\*: Not applicable

| NICAL TEDA  | NEW ACRONYM /        | ***: Not applicable                   |
|---|----------------------|---------------------------------------|
| NEW TERM  | ABBREVIATION         | OLD TERM                              |
| Manifold surface temperature                          | MST                  | *5%                                   |
| Manifold surface temperature sensor                   | MSTS                 | ***                                   |
| Manifold vacuum zone                                  | MVZ                  | ***                                   |
| Manifold vacuum zone sensor                           | MVZS                 | #11                                   |
| Mass air flow sensor                                  | MAFS                 | Air flow meter                        |
| Mixture control solenoid valve                        | MC solenoid valve    | Air-fuel ratio control solenoid valve |
| Multiport fuel injection System                       | MFI system           | Fuel injection control                |
| Neutral position switch                               | ***                  | Neutral switch                        |
| Nonvolatile random access memory                      | NVRAM                | ***                                   |
| On board diagnostic system                            | OBD system           | Self-diagnosis                        |
| Open loop   | OL                   | Open loop                             |
| Oxidation catalyst                                    | ос                   | Catalyst                              |
| Oxidation catalytic converter system                  | OC system            | ***                                   |
| Oxygen sensor   | O2S                  | Exhaust gas sensor                    |
| Park position switch                                  | ***                  | Park switch                           |
| Park/neutral position switch                          | PNP switch           | Park/neutral switch                   |
| Periodic trap oxidizer system                         | PTOX system          | ***                                   |
| Positive crankcase ventilation                        | PCV                  | Positive crankcase ventilation        |
| Positive crankcase ventilation valve                  | PCV valve            | PCV valve                             |
| Powertrain control module                             | РСМ                  | ***                                   |
| Programmable read only memory                         | PROM                 | ***                                   |
| Pulsed secondary air injection control solenoid valve | PAIRC solenoid valve | AIV control solenoid valve            |
| Pulsed secondary air injection system                 | PAIR system          | Air induction valve (AIV) control     |
| Pulsed secondary air injection valve                  | PAIR valve           | Air induction valve                   |
| Random access memory                                  | RAM                  | ***                                   |
| Read only memory                                      | ROM                  | ***                                   |
| Scan tool   | ST                   | ***                                   |
| Secondary air injection pump                          | AIR pump             | ***                                   |
| Secondary air injection system                        | AIR system           | ***                                   |
| Sequential multiport fuel injection system            | SFI system           | Sequential fuel injection             |
| Service reminder indicator                            | SRI                  | ***                                   |
| Simultaneous multiport fuel injection system          | ***                  | Simultaneous fuel injection           |
| Smoke puff limiter system                             | SPL system           | ***                                   |
| Supercharger  | SC                   | ***                                   |
| Supercharger bypass                                   | SCB                  | ***                                   |
| System readiness test                                 | SRT                  | ***                                   |
| Thermal vacuum valve                                  | TVV                  | Thermal vacuum valve                  |
| Three way catalyst                                    | TWC                  | Catalyst                              |
| Three way catalytic converter system                  | TWC system           | ***                                   |
| • •   | ·                    |                                       |

## **SAE J1930 TERMINOLOGY LIST**

# SAE J1930 Terminology List (Cont'd)

\*\*\*: Not applicable

| NEW TERM   | NEW ACRONYM /<br>ABBREVIATION | OLD TERM                |  |
|--|-------------------------------|-------------------------|--|
| Three way + oxidation catalytic converter system | TWC + OC system               | ***                     |  |
| Throttle body                                    | ТВ                            | Throttle chamber        |  |
|  |                               | SPI body                |  |
| Throttle body fuel injection system              | TBI system                    | Fuel injection control  |  |
| Throttle position                                | TP                            | Throttle position       |  |
| Throttle position sensor                         | TPS                           | Throttle sensor         |  |
| Throttle position switch                         | TP switch                     | Throttle switch         |  |
| Torque converter clutch solenoid valve           | TCC solenoid valve            | Lock-up cancel solenoid |  |
|  |                               | Lock-up solenoid        |  |
| Turbocharger                                     | тс                            | Turbocharger            |  |
| Vehicle speed sensor                             | vss                           | Vehicle speed sensor    |  |
| Volume air flow sensor                           | VAFS                          | Air flow meter          |  |
| Warm up oxidation catalyst                       | WU-OC                         | Catalyst                |  |
| Warm up oxidation catalytic converter system     | WU-OC system                  | 海水水                     |  |
| Warm up three way catalyst                       | WU-TWC                        | Catalyst                |  |
| Warm up three way catalytic converter system     | WU-TWC system                 | ***                     |  |
| Wide open throttle position switch               | WOTP switch                   | Full switch             |  |

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#### PRECAUTIONS AND PREPARATION

# Supplemental Restraint System (SRS) "AIR BAG"

The Supplemental Restraint System "Air Bag", used along with a seat belt, helps 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 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.
- Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses are covered with yellow insulation either just before the harness connectors or for the complete harness, for easy identification.

#### **Special Service Tool**

The actual shapes of Kent-Moore tools may differ from these of special service tools illustrated here.

| Tool number<br>(Kent-Moore No.)<br>Tool name | Description |                       |  |
|--|-------------|-----------------------|--|
| KV10115801<br>(J38956)<br>Oil filter wrench  |             |                       |  |
|  | NT375       | a: 64.3 mm (2.531 in) |  |

#### **GENERAL MAINTENANCE**

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

| ltem   | Reference page |             |
|--|----------------|-------------|
| OUTSIDE THE VEHICLE The maintenance items listed here should be performed from time to time, unless otherwise specified.   |                |             |
| Tires Check the pressure with a gauge periodically when at a service station, including the spare, and adjust to the specified pressure if necessary. Check carefully for damage, cuts or excessive wear.  |                |             |
| Wheel nuts When checking the tires, make sure no nuts are missing, and check for any loose nuts. Tighten if necessary.   | <del>-</del>   |             |
| Tire rotation Tires should be rotated every 12,000 km (7,500 miles).   | <b>MA</b> -19  |             |
| Wheel alignment and balance If the vehicle pulls to either side while driving on a straight and level road, or if you detect uneven or abnormal tire wear, there may be a need for wheel alignment. If the steering wheel or seat vibrates at normal highway speeds, wheel balancing may be needed.  | MA-19<br>FA-6  | <del></del> |
| Windshield wiper blades Check for cracks or wear if they do not wipe properly.   | <del>_</del>   |             |
| Doors and engine hood Check that all doors and the engine hood operate smoothly as well as the trunk lid or back hatch. Also make sure that all latches lock securely. Lubricate if necessary. Make sure that the secondary latch keeps the hood from opening when the primary latch is released.  When driving in areas using road salt or other corrosive materials, check lubrication frequently. | MA-21          |             |
| INSIDE THE VEHICLE The maintenance items listed here should be checked on a regular basis, such as when performing periodic maintenance, cleaning the vehicle, etc.  |                |             |
| Lights Make sure that the headlights, stop lights, tail lights, turn signal lights, and other lights are all operating properly and installed securely. Also check headlight aim.  | _              |             |
| Warning lights and buzzers/chimes Make sure that all warning lights and buzzers/chimes are operating properly.   | <u>—</u>       |             |
| Windshield wiper and washer Check that the wipers and washer operate properly and that the wipers do not streak.   |                |             |
| Windshield defroster Check that air comes out of the defroster outlets properly and in good quantity when operating the heater or air conditioner.   |                |             |
| Steering wheel Check that it has the specified play. Be sure to check for changes in the steer-<br>ng condition, such as excessive play, hard steering or strange noises.  Free play: Less than 35 mm (1.38 in)  | _              |             |
| Seats Check seat position controls such as seat adjusters, seatback recliner, etc. to make sure hey operate smoothly and that all latches lock securely in every position. Check that the head restrains move up and down smoothly and that the locks (if equipped) hold securely in all atched positions. Check that the latches lock securely for folding-down rear seatbacks.                     | _              |             |
| Seat belts Check that all parts of the seat belt system (e.g. buckles, anchors, adjusters and retractors) operate properly and smoothly, and are installed securely. Check the belt webbing for cuts, fraying, wear or damage.   | MA-21          |             |

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#### **GENERAL MAINTENANCE**

| ltem   | Reference page |
|--|----------------|
| Clutch pedal Make sure the pedal operates smoothly and check that it has the proper free play.   | CL-4           |
| Brakes Check that the brake does not pull the vehicle to one side when applied.  | _              |
| Brake pedal Check the pedal for smooth operation and make sure it has the proper distance under it when depressed fully. Check the brake booster function. Be sure to keep the floor mats away from the pedal.   | BR-6, 9        |
| Parking brake Check that the lever has the proper travel and make sure that the vehicle is held securely on a fairly steep hill when only the parking brake is applied.  | BR-21          |
| Automatic transaxle "Park position" mechanism Check that the lock release button on the selector lever operates properly and smoothly. On a fairly steep hill check that the vehicle is held securely with the selector lever in the "P" position without applying any brakes.   |                |
| UNDER THE HOOD AND VEHICLE The maintenance items listed here should be checked periodically (e.g. each time you check the engine oil or refuel).   |                |
| Windshield washer fluid Check that there is adequate fluid in the tank.  |                |
| Engine coolant level Check the coolant level when the engine is cold.  | MA-11          |
| Radiator and hoses Check the front of the radiator and clean off any dirt, insects, leaves, etc., that may have accumulated. Make sure the hoses have no cracks, deformation, deterioration or cose connections.   |                |
| Brake and clutch fluid levels Make sure that the brake and clutch fluid levels are between the 'MAX" and "MIN" lines on the reservoir.   | MA-17, 19      |
| Battery Check the fluid level in each cell. It should be between the "MAX" and "MIN" lines.  |                |
| Engine drive belts Make sure that no belt is frayed, worn, cracked or oily.  | MA-10          |
| Engine oil level Check the level on the dipstick after parking the vehicle on a level spot and urning off the engine.  | MA-14          |
| Power steering fluid level and lines Check the level in the reservoir tank with the engine off. Check the lines for proper attachment, leaks, cracks, etc.   | MA-20          |
| Automatic transaxle fluid level Check the level on the dipstick after putting the selector lever n "P" with the engine idling.   | MA-18          |
| Exhaust system Make sure there are no loose supports, cracks or holes. If the sound of the exhaust seems unusual or there is a smell of exhaust fumes, immediately locate the trouble and correct it.  | MA-17          |
| Underbody The underbody is frequently exposed to corrosive substances such as those used on icy roads or to control dust. It is very important to remove these substances, otherwise rust will form on the floor pan, frame, fuel lines and around the exhaust system. At the end of winter, the underbody should be thoroughly flushed with plain water, being careful to clean those areas where mud and dirt can easily accumulate. | _              |
| Fluid leaks Check under the vehicle for fuel, oil, water or other fluid leaks after the vehicle has been parked for a while. Water dripping from the air conditioner after use is normal. If you should notice any leaks or gasoline fumes are evident, check for the cause and correct it immediately.  | <u>.</u>       |

#### PERIODIC MAINTENANCE

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

#### **SCHEDULE 1**

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

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

#### **SCHEDULE 2**

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

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#### Schedule 1

]: At the mileage intervals only

Abbreviations: R = Replace. 1 = Inspect. Correct or replace if necessary.

| MAINTENANCE OPERATION                                       |                     |      |                     |       |      |          | Σ        | ANE     | NANCE    | MAINTENANCE INTERVAL | !\AL       |          |           |          |            |        |                      |
|---|---------------------|------|---------------------|-------|------|----------|----------|---------|----------|----------------------|------------|----------|-----------|----------|------------|--------|----------------------|
| Perform at number of miles,                                 | Miles × 1,000       | 3.75 | 7.5                 | 11.25 | 5    | 18.75    | 22.5 2   | 26.25   | 30       | 33.75 3              | 37.5 41.25 |          | 45 48.75  |          | 52.5 56.25 | 25 60  |                      |
| kilometers or months,                                       | (km × 1,000)        | (9)  | (12)                | (18)  | (24) | (30)     | (36)     | (42)    | (48)     | (54)                 | ) (09)     | 2) (99)  | (72) (78) | 3) (84)  | 4) (90)    | (96) ( | Heference page       |
| Wnichever comes inst.                                       | Months              | ო    | 9                   | 6     | 12   | 5        | 80       | 21      | 24       | 27                   | 99         | 33 3     | 36 39     | 9 42     | 2 45       | 5 48   |                      |
| Emission control system maintenance                         | aintenance          |      |                     |       |      |          |          |         |          |                      |            |          |           |          |            |        |                      |
| Drive belts   | See NOTE (1)        |      |                     |       |      |          |          |         |          |                      |            |          |           |          |            | *      | MA-10                |
| Air cleaner filter  | See NOTE (2)        |      |                     |       |      |          |          |         | 匠        |                      |            |          |           |          |            |        | MA-13                |
| Vapor lines   |                     |      |                     |       |      |          |          |         | *_       |                      |            |          |           |          |            | *      | MA-16                |
| Fuel lines  |                     |      |                     |       |      |          |          |         | *        |                      |            |          |           |          |            | *      | MA-12                |
| Fuel filter   | See NOTE (3)*       |      |                     |       |      |          |          |         |          |                      |            |          |           |          |            |        | MA-12                |
| Engine coolant  | See NOTE (4)        |      |                     |       |      |          |          |         |          |                      |            |          |           |          |            | Ě      | MA-11                |
| Engine oil  |                     | Œ    | Œ                   | Œ     | Œ    | <u>~</u> | <u>~</u> | <u></u> | <u>~</u> | æ                    | <br>  E    | l m      | ат<br>П   | <u> </u> |            | E      | MA-14                |
| Engine oil filter (Use part No. 15208-31U00 or equivalent.) | J00 or equivalent.) | Œ    | Œ                   | œ     | Œ    | <u>~</u> | Œ        | <br> œ  | æ        | ar.                  | Œ          | <u>د</u> | - E       | <u> </u> | - E        | 8      | MA-14                |
| Spark plugs (Use PLATINUM-TIPPED type)                      | PED type)           |      |                     |       |      |          |          |         |          |                      |            |          |           |          |            | H      | MA-15                |
| Intake & exhaust valve clearance                            | See NOTE (5)        |      |                     |       |      |          |          |         |          |                      |            |          |           |          |            |        |                      |
| Chassis and body maintenance                                | nce                 |      |                     |       |      |          |          |         |          |                      |            |          | ĺ         |          |            |        |                      |
| Brake lines & cables  |                     | İ    |                     |       | -    |          |          |         | _        |                      |            |          |           |          |            | -      | MA-19                |
| Brake pads & discs  |                     |      | -                   |       | _    |          | _        |         | _        |                      | _          |          |           |          | İ          | -      | MA-19, 20            |
| Manual & automatic transaxle oil                            | See NOTE (6)        |      |                     |       | -    |          |          |         | _        |                      |            |          |           |          |            | _      | MA-17, 18            |
| Steering gear & linkage, axle & suspension parts            | ion parts           |      | -                   |       | _    |          | -        |         |          |                      | _          |          | _         | _        |            | _      | MA-20, FA-5,<br>RA-4 |
| Steering linkage ball joints & front suspension ball joints | ension ball joints  |      | _                   |       | _    |          | _        |         | _        |                      | _          |          |           |          |            | -      | MA-20, FA-5          |
| Exhaust system  |                     |      | <br> - <sub> </sub> |       | _    |          | _        |         |          |                      | _          |          |           |          |            | -      | MA-17                |
| Drive shaft boots   |                     |      | -                   |       | _    |          | _        |         | _        |                      | _          |          |           | -        |            | -      | FA-7                 |
| Air bag system  | See NOTE (7)        |      |                     |       |      |          |          |         |          | !<br> <br>           |            |          |           |          |            |        | 7 00                 |

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After 60,000 miles (96,000 km) or 48 months, inspect every 15,000 miles (24,000 km) or 12 months. If operating mainly in dusty conditions, more frequent maintenance may be required. If vehicle is operated under extremely adverse weather conditions or in areas where ambient temperatures are either extremely low or extremely high, the filters might become clogged. In such an event, replace them immediately. After 60,000 miles (96,000 km) or 48 months, replace every 30,000 miles (48,000 km) or 24 months. If valve noise increases, inspect valve clearance. or 24 months.

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Inspect the air bag system 10 years after the date of manufacture noted on the FMVSS certification label.
Maintenance items and intervals with "\*" are recommended by NISSAN for reliable vehicle operation. The owner need not perform such maintenance in order to maintain the emission warranty or manufacturer recall liability. Other maintenance items and intervals are required.

#### Schedule 2

| MAINTENANCE OPERATION                                       |               | MAII         | MAINTENANCE INTERVAL | NTERVAL                       |      |                   |
|---|---------------|--------------|----------------------|-------------------------------|------|-------------------|
| Perform at number of miles,                                 | Miles x 1,000 | 7.5 15 22    | 22.5 30 37.5         | 5 45 52.5                     | 90   |                   |
| kilometers or months,                                       | (km × 1,000)  | (12) (24) (3 | 36) (48) (60         | (24) (36) (48) (60) (72) (84) | (96) | Reference page    |
|   | Months        | 6 12 1       | 18 24 30             | 36 42                         | 48   |                   |
| Emission control system maintenance                         |               |              |                      |                               |      |                   |
| Drive belts   | See NOTE (1)  |              |                      |                               | *    | MA-10             |
| Air cleaner filter  |               |              | <br> B               |                               | E E  | MA-13             |
| Vapor lines   |               |              | <u>*</u>             |                               | *    | MA-16             |
| Fuel lines  |               |              | <u>*</u>             |                               | *_   | MA-12             |
| Fuel filter   | See NOTE (2)* |              |                      |                               |      | MA-12             |
| Engine coolant  | See NOTE (3)  |              |                      |                               | ř    | MA-11             |
| Engine oil  |               | 8            | я<br>я               | R R                           | E    | MA-14             |
| Engine oil filter (Use part No. 15208-31U00 or equivalent.) |               | æ            | а<br>а               | R                             | E    | MA-14             |
| Spark plugs (Use PLATINUM-TIPPED type)                      |               |              |                      |                               | Œ    | MA-15             |
| Intake & exhaust valve clearance                            | See NOTE (4)  |              |                      |                               | ]    |                   |
| Chassis and body maintenance                                |               |              | !                    |                               |      |                   |
| Brake lines & cables  |               | _            | _                    | _                             | _    | MA-19             |
| Brake pads & discs  |               | _            | _                    | -                             | _    | MA-19, 20         |
| Manual & automatic transaxle oil                            |               |              |                      | _                             | _    | MA-17, 18         |
| Steering gear linkage, axle & suspension parts              |               |              | _                    |                               | _    | MA-20, FA-5, RA-4 |
| Exhaust system  |               |              | _                    |                               |      | MA-17             |
| Drive shaft boots   |               | —<br>  —     | _                    | _                             | _    | FA-7              |
| Air bag system  | See NOTE (5)  |              |                      |                               |      | RS-7              |

[ ]: At the mileage intervals only

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

NOTE: (1) After 60,000 miles (96,000 km) or 48 months, inspect every 15,000 miles (24,000 km) or 12 months.
(2) If vehicle is operated under extremely adverse weather conditions or in areas where ambient temperatures are either extremely low or extremely high, the

filters might become clogged. In such an event, replace them immediately.

(3) After 60,000 miles (96,000 km) or 48 months, replace every 30,000 miles (48,000 km) or 24 months.
(4) If valve noise increases, inspect valve clearance.
(5) Inspect the air bag system 10 years after the date of manufacture noted on the FMVSS certification label.
★ Maintenance items and intervals with "\*\*" are recommended by NISSAN for reliable vehicle operation. The owner need not perform such maintenance in order to maintain the emission warranty or manufacturer recall liability. Other maintenance items and intervals are required.

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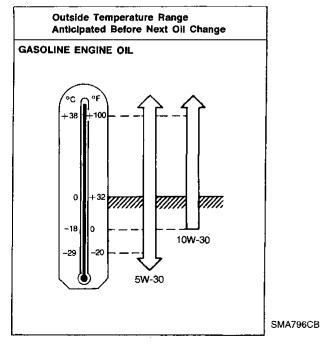
#### RECOMMENDED FLUIDS AND LUBRICANTS

#### Fluids and Lubricants

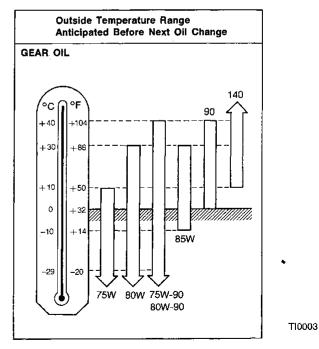
|                           | Ca                | apacity (Approximate | e)        | On a common de el fluido en el lubrica anto  |
|---------------------------|-------------------|----------------------|-----------|--|
|                           | US measure        | Imp measure          | Liter     | Recommended fluids and lubricants  |
| Engine oil (Refill)       |                   |                      |           |  |
| With oil filter           | 4-1/4 qt          | 3-1/2 qt             | 4.0       | <ul> <li>API SG or SH and Energy Conserving<br/>II*1</li> </ul>  |
| Without oil filter        | 3-7/8 qt          | 3-1/4 qt             | 3.7       | API Certification Mark*1   |
| Cooling system            |                   |                      |           |  |
| With reservoir            | 9 qt              | 7-1/2 qt             | 8.5       | Anti-freeze coolant  |
| Reservoir                 | 7/8 qt            | 3/4 qt               | 0.8       | (Ethylene glycol base)   |
| Manual transaxle gear oil |                   |                      |           |  |
| RS5F50V                   | 9-1/8 - 9-1/2 pt  | 7-5/8 - 7-7/8 pt     | 4.3 - 4.5 | API GL-4*1   |
| RS5F50A                   | 9-1/2 - 10-1/8 pt | 7-7/8 - 8-1/2 pt     | 4.5 - 4.8 | API GL-4*1   |
| Automatic transaxle fluid | 10 qt             | 8-1/4 qt             | 9.4       | Nissan Matic "D" (Continental U.S. and Alaska) or Genuine Nissan Automatic Transmission Fluid (Canada)*2 |
| Power steering fluid      | _                 |                      | _         | Type DEXRON <sup>™</sup> IIE, DEXRON <sup>™</sup> III or equivalent                                      |
| Brake & Clutch fluid      | _                 | _                    | _         | Genuine Nissan Brake Fluid*3<br>or equivalent<br>DOT 3 (US FMVSS No. 116)                                |
| Multi-purpose grease      |                   |                      |           | NLGI No. 2 (Lithium soap base)   |

<sup>\*1:</sup> For further details, see "SAE Viscosity Number".

#### **SAE Viscosity Number**



SAE 5W-30 viscosity oil is preferred for all temperatures. SAE 10W-30 viscosity oil may be used if the ambient temperature is above –18°C (0°F).



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

<sup>\*2:</sup> Dexron® III/Mercon® or equivalent may also be used. Outside the continental United States and Alaska contact a NISSAN dealership for more intormation regarding suitable fluids, including recommended brand(s) of Dexron® III/Mercon® or Dexron® IIE/Mercon® Automatic Transmission Fluid.

<sup>\*3:</sup> For more information regarding suitable fluids, contact a NISSAN dealership.

#### RECOMMENDED FLUIDS AND LUBRICANTS

#### **Anti-freeze Coolant Mixture Ratio**

The engine cooling system is filled at the factory with a high-quality, year-round, anti-freeze coolant solution. The anti-freeze solution contains rust and corrosion inhibitors. Therefore, additional cooling system additives are not necessary.

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#### **CAUTION:**

When adding or replacing coolant, be sure to use only an ethylene glycol anti-freeze with the proper mixture ratio of 50% anti-freeze and 50% soft water.

| i i | Λ   |
|-----|-----|
| ш   | 1.0 |

|     | emperature<br>vn to | Anti-<br>freeze | Soft  |
|-----|---------------------|-----------------|-------|
| °C  | °F                  | rreeze          | water |
| -35 | -30                 | 50%             | 50%   |



Other types of coolant solutions may damage the cooling system.



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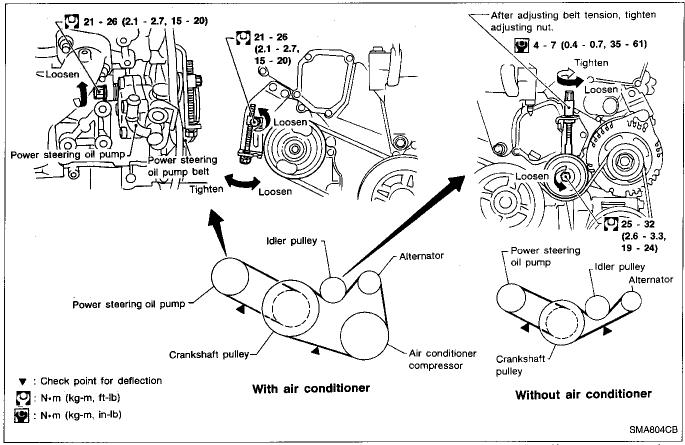
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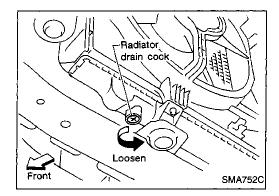
#### **Checking Drive Belts**



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

Inspect drive belt deflections when engine is cold. Adjust if belt deflections exceed the limit. Belt deflection:

|           |                              | Unit: mm (in)  |
|-----------|------------------------------|--|
| Used be   | It deflection                | Deflection of  |
| Limit     | Deflection after adjustment  | Deflection of new belt   |
|           |                              |  |
| 7 (0.28)  | 4.2 - 4.6<br>(0.165 - 0.181) | 3.8 - 4.1<br>(0.150 - 0.161)   |
| 10 (0.39) | 6.3 - 6.9<br>(0.248 - 0.272) | 5.8 - 6.2<br>(0.228 - 0.244)   |
| 11 (0.43) | 7.3 - 8<br>(0.287 - 0.315)   | 6.5 - 7<br>(0.256 - 0.276)   |
|           | 98 N (10 kg, 22 lb           | )  |
|           | Limit 7 (0.28) 10 (0.39)     | Timit adjustment  7 (0.28)  4.2 - 4.6 (0.165 - 0.181)  10 (0.39)  6.3 - 6.9 (0.248 - 0.272)  7.3 - 8 (0.287 - 0.315) |



#### **Changing Engine Coolant**

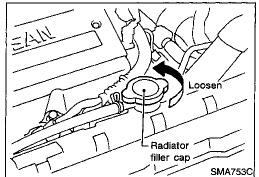
#### **WARNING:**

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

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

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Remove reservoir tank, drain coolant, then clean reservoir tank.

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Install it temporarily.

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Be careful not to allow coolant to contact drive belts.

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3. Open drain plugs on both sides of cylinder block.

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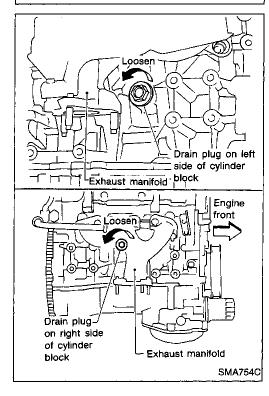
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4. Close and tighten drain plugs securely.

5. Flush cooling system by running fresh water through radiator.

Apply sealant to the drain plug thread.

[O]: 60 - 66 N·m (6.1 - 6.7 kg-m, 44 - 48 ft-lb) Left side 18 - 22 N·m (1.8 - 2.2 kg-m, 13 - 16 ft-lb) Right side



#### **ENGINE MAINTENANCE**

# Radiator SMA182B

#### **Changing Engine Coolant (Cont'd)**

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

Coolant capacity (With reservoir tank):

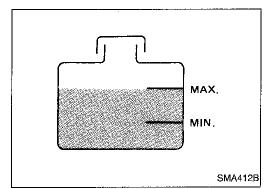
8.5% (9 US qt, 7-1/2 Imp qt)

Reservoir tank:

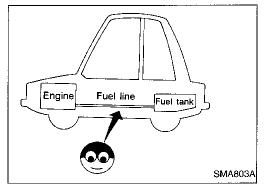
0.8ℓ (7/8 US qt, 3/4 Imp qt)

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

Regarding anti-freeze coolant mixture ratio, see MA-9.



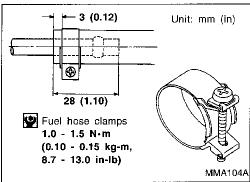
- Start engine and warm it up until it reaches normal operating temperature. Then race engine 2 or 3 times under no-load. Watch coolant temperature gauge for signs of overheating.
- Stop engine. After it completely cools down, refill radiator up to filler opening. Fill reservoir tank up to the "H" level.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



#### Checking Fuel Lines

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

If necessary, repair or replace.

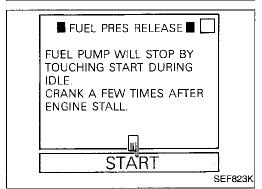


#### **CAUTION:**

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.



- Start engine. 1.
- Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode with CONSULT.
- After engine stalls, crank engine two or three times to make sure that fuel pressure is released.
- Turn ignition switch off.

#### **ENGINE MAINTENANCE**

# Changing Fuel Filter (Cont'd)



Fuel pump

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SMA757C

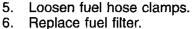
11/ / Master

cylinder

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







- 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".



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# Air cleaner filter

#### **Changing Air Cleaner Filter**

#### Viscous paper type

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

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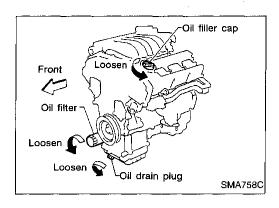
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#### **Changing Engine Oil**

#### **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. Stop engine and wait for more than 10 minutes.
- 3. Remove drain plug and oil filler cap.
- 4. Drain oil and refill with new engine oil.

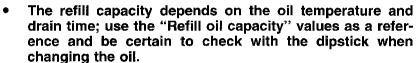
Oil grade: API SG or SH Viscosity: Refer to MA-8.

| Heriii oli capacity (Approximate | Unit: liter (US qt, Imp qt) |
|----------------------------------|-----------------------------|
| With oil filter change           | 4.0 (4-1/4, 3-1/2)          |
| Without oil filter change        | 3.7 (3-7/8, 3-1/4)          |

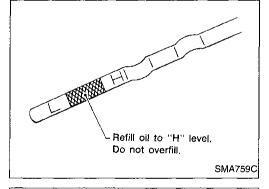
#### **CAUTION:**

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

[0]: 29 - 39 N·m (3.0 - 4.0 kg-m, 22 - 29 ft-lb)



- Never pull out level gauge while filling engine oil.
- 5. Warm up engine and check area around drain plug and oil filter for oil leakage.
- 6. Stop engine and wait for more than 10 minutes.
- Check oil level.



#### **Changing Oil Filter**

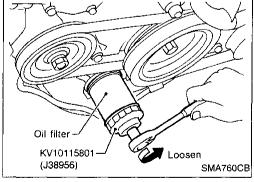
1. The oil filter is a small full-floating cartridge type and is provided with a relief valve.

Refer to LC section ("OIL FILTER").

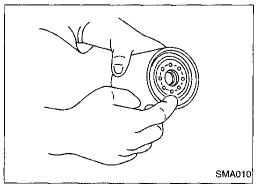
2. Remove oil filter with Tool or suitable tool.

#### WARNING:

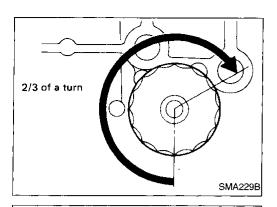
Be careful not to burn yourself, as the engine and the engine oil are hot.



Clean oil filter mounting surface on cylinder block. Coat rubber seal of new oil filter with engine oil.



#### **ENGINE MAINTENANCE**



#### Changing Oil Filter (Cont'd)

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

Refer to "Changing Engine Oil", MA-14.



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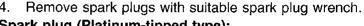
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- 1. Remove left side rocker cover ornament.
- Disconnect ignition coil harness connectors.
- Loosen ignition coil fixing bolts and pull out coil from intake manifold connector.



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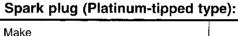
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AT

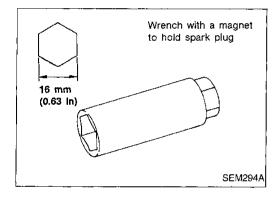
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| Make          | NGK      |  |
|---------------|----------|--|
| Standard type | PFR5G-11 |  |
| Hot type      | PFR4G-11 |  |
| Cold type     | PFR6G-11 |  |



#### Use standard type spark plug for normal condition.

The hot type spark plug is suitable when fouling may occur with the standard type spark plug such as:

- frequent engine starts
- low ambient temperatures

The cold type spark plug is suitable when spark knock may occur with the standard type spark plug such as:

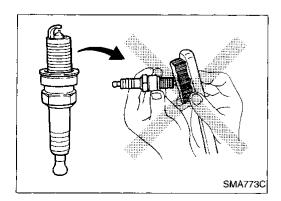
- extended highway driving
- frequent high engine revolution

[O]: 20 - 29 N·m

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

BT

RS



- Do not use a wire brush for cleaning.
- If plug tip is covered with carbon, spark plug cleaner may be used.

Cleaner air pressure:

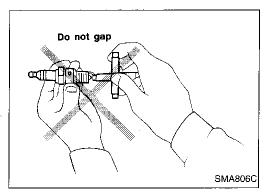
Less than 588 kPa (6 kg/cm<sup>2</sup>, 85 psi)

Cleaning time:

Less than 20 seconds

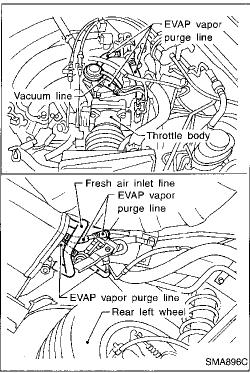
JDX

#### **ENGINE MAINTENANCE**



#### Changing Spark Plugs (Cont'd)

 Checking and adjusting plug gap is not required between change intervals.

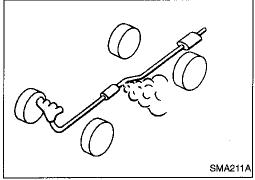


#### **Checking EVAP Vapor Purge Lines**

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

Refer to EVAPORATIVE EMISSION SYSTEM in EC section.

MA-16

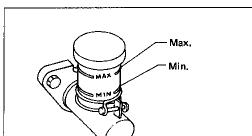


#### **Checking Exhaust System**

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

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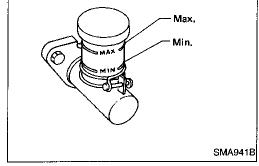
#### **Checking Clutch Fluid Level and Leaks**

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

EC

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#### Checking M/T Oil

Check for oil leakage and oil level.

Never start engine while checking oil level.

Filler pluq:

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

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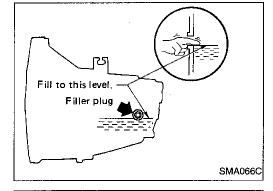
RS

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#### Changing M/T Oil

Drain oil from drain plug and refill with new gear oil.

Check oil level.

Oil grade:

API GL-4

Viscosity:

See "RECOMMENDED FLUIDS AND

LUBRICANTS", MA-8.

Capacity:

RS5F50A

4.5 - 4.8 ℓ

(9-1/2 - 10-1/8 US pt, 7-7/8 - 8-1/2 Imp pt)

RS5F50V

4.3 - 4.5 €

Drain pluq:

(C): 15 - 20 N·m (1.5 - 2.0 kg-m, 11 - 14 ft-lb)

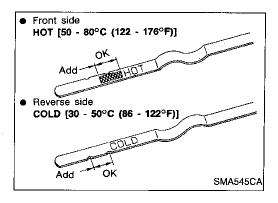
EL

Drain plug

SMA067C

(9-1/8 - 9-1/2 US pt, 7-5/8 - 7-7/8 lmp pt)

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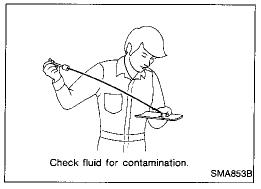


#### Checking A/T Fluid

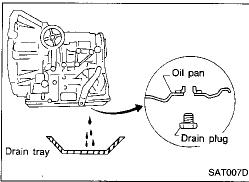
- 1. Warm up engine.
- 2. Check for fluid leakage.
- 3. Before driving, fluid level can be checked at fluid temperatures of 30 to 50°C (86 to 122°F) using "COLD" range on dipstick.
- Park vehicle on level surface and set parking brake.
- Start engine and move selector lever through each gear position. Leave selector lever in "P" position.
- c. Check fluid level with engine idling.
- d. Remove dipstick and wipe clean with lint-free paper.
- 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.

- 4. Drive vehicle for approximately 5 minutes in urban areas.
- 5. Re-check fluid level at fluid temperatures of 50 to 80°C (122 to 176°F) using "HOT" range on dipstick.



- 6. Check fluid condition.
- If fluid is very dark or smells burned, refer to AT section for checking operation of A/T. Flush cooling system after repair of A/T.
- If A/T fluid contains frictional material (clutches, bands, etc.), replace radiator and flush cooler line using cleaning solvent and compressed air after repair of A/T. Refer to LC section ("Radiator", "ENGINE COOLING SYSTEM").



#### Changing A/T Fluid

- 1. Warm up A/T fluid.
- 2. Stop engine.
- Drain A/T fluid from drain plug and refill with new A/T fluid.
   Always refill same volume with drained fluid.

#### Fluid grade:

Nissan Matic "D" (Continental U.S. and Alaska) or Genuine Nissan Automatic Transmission Fluid (Canada)

Refer to "RECOMMENDED FLUIDS AND LUBRICANTS", MA-8.

Fluid capacity (With torque converter): 9.4  $\ell$  (10 US qt, 8-1/4 Imp qt)

Drain plug:

[O]: 29 - 39 N·m (3.0 - 4.0 kg-m, 22 - 29 ft-lb)

- 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.

#### **Balancing Wheels**

Adjust wheel balance using road wheel center.

Wheel balance (Maximum allowable unbalance):

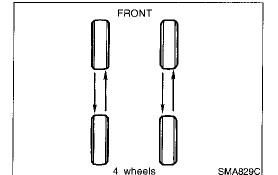
| Maximum allowable unbal- | Dynamic<br>(At rim flange) |        | 10 (0.35) (one side) |
|--------------------------|----------------------------|--------|----------------------|
| ance                     |                            | g (oz) |                      |
|                          | Static                     | g (oz) | 20 (0.71)            |

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#### Tire Rotation

Do not include the T-type spare tire when rotating the tires. Wheel nuts:

(): 98 - 118 N·m

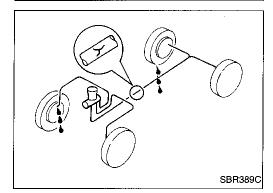
(10.0 - 12.0 kg-m, 72 - 87 ft-lb)

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#### **Checking Brake Fluid Level and Leaks**

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

#### **Checking Brake Lines and Cables**

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

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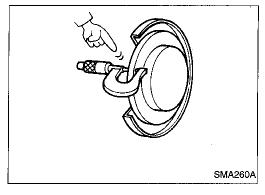
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# Checking Disc Brake ROTOR

Check condition and thickness.

Unit: mm (in)

| · · · · · · · · · · · · · · · · · · · |               |               |
|---------------------------------------|---------------|---------------|
|                                       | Front         | Rear          |
| Brake model                           | CL25VB        | CL9HA         |
| Standard thickness                    | 22 (0.87)     | 9 (0.35)      |
| Maximum runout                        | 0.08 (0.0031) | 0.15 (0.0059) |
| Minimum thickness<br>(Wear limit)     | 20.0 (0.787)  | 8.0 (0.315)   |

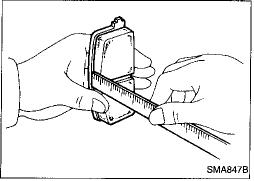
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# Checking Disc Brake (Cont'd) CALIPER

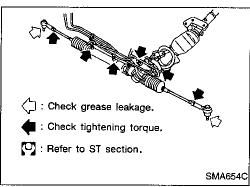
Check for leakage.



#### PAD

Check for wear or damage.

|                                   | Unit: mi    |             |
|-----------------------------------|-------------|-------------|
| Brake model                       | CL25VB      | CL9HA       |
| Standard thickness                | 11 (0.43)   | 10 (0.39)   |
| Minimum thickness<br>(Wear limit) | 2.0 (0.079) | 1.5 (0.059) |



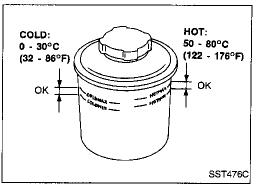
#### **Checking Steering Gear and Linkage**

#### STEERING GEAR

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

#### STEERING LINKAGE

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

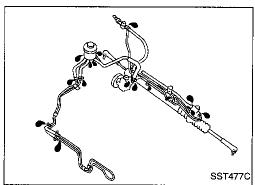


#### **Checking Power Steering Fluid and Lines**

Check fluid level in reservoir tank with engine off. Use "HOT" range at fluid temperatures of 50 to 80°C (122 to 176°F) or "COLD" range at fluid temperatures of 0 to 30°C (32 to 86°F).

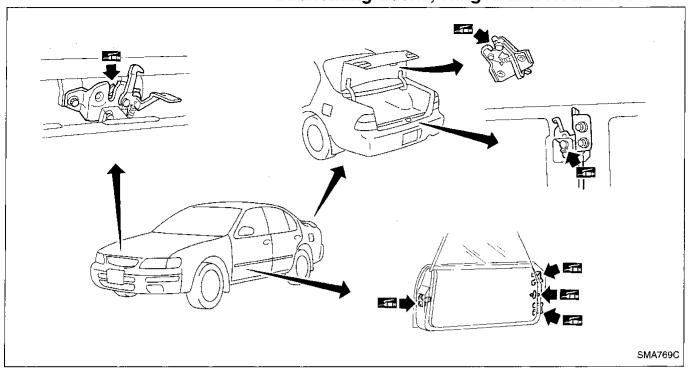
#### **CAUTION:**

- Do not overfill.
- Recommended fluid is Automatic Transmission Fluid type DEXRON<sup>TM</sup>IIE, DEXRON<sup>TM</sup>III or equivalent.



- Check lines for improper attachment, leaks, cracks, damage, loose connections, chafing or deterioration.
- Check rack boots for accumulation of power steering fluid.

## **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 hardwares (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.

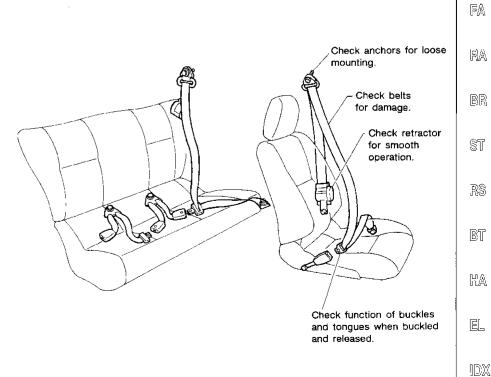
If webbing is cut, frayed, or damaged, replace belt assembly.

Never oil tongue and buckle.

Use a genuine seat belt assembly.

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

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



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# SERVICE DATA AND SPECIFICATIONS (SDS)

# **Engine Maintenance**

#### **INSPECTION AND ADJUSTMENT**

#### **Drive belt deflection**

#### Unit: mm (in)

|   |                      |                                   | Orac train (in)              |  |
|---|----------------------|-----------------------------------|------------------------------|--|
|   | Used belt deflection |                                   | Deflection                   |  |
| Drive belts                               | Limit                | Limit Deflection after adjustment |                              |  |
| Alternator                                |                      |                                   |                              |  |
| With air condi-<br>tioner com-<br>pressor | 7 (0.28)             | 4.2 - 4.6<br>(0.165 - 0.181)      | 3.8 - 4.1<br>(0.150 - 0.161) |  |
| Without air<br>conditioner<br>compressor  | 10 (0.39)            | 6.3 - 6.9<br>(0.248 - 0.272)      | 5.8 - 6.2<br>(0.228 - 0.244) |  |
| Power steering oil pump                   | 11 (0.43)            | 7.3 - 8<br>(0.287 - 0.315)        | 6.5 - 7<br>(0.256 - 0.276)   |  |
| Applied pushing force                     | 98 N (10 kg, 22 lb)  |                                   |                              |  |

# Spark plug

|          |         | Platinum tipped type         |  |
|----------|---------|------------------------------|--|
| Make     |         | NGK                          |  |
| Туре     |         |                              |  |
| Standard |         | PFR5G-11                     |  |
| Hot      |         | PFR4G-11                     |  |
| Cold     |         | PFR6G-11                     |  |
| Plug gap | mm (in) | n) 1.0 - 1.1 (0.039 - 0.043) |  |

# **Chassis and Body Maintenance**

#### **INSPECTION AND ADJUSTMENT**

#### Wheel balance

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

# **ENGINE MECHANICAL**

# SECTION EM

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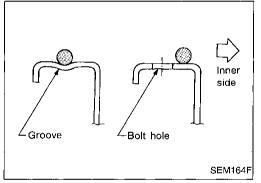
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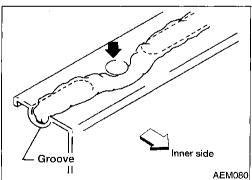
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# **Parts Requiring Angular Tightening**

- Use an angle wrench for the final tightening of the following engine parts:
  - (1) Cylinder head bolts
  - (2) Main bearing cap bolts
  - (3) Connecting rod cap nuts
  - (4) Crankshaft pulley bolt
- Do not use a torque value for final tightening.
- The torque value for these parts are for a preliminary step.
- Ensure thread 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 diameter is as specified.
- Apply liquid gasket around the inner side of bolt holes (unless otherwise specified).
- d. Assembly should be done within 5 minutes after coating.
- e. Wait at least 30 minutes before refilling engine oil and engine coolant.

# **PREPARATION**

# **Special Service Tools**

The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

| Tool number   | Moore tools may differ from those of special se | sivice tools mustrated fiere.   |          |
|---|---|---|----------|
| (Kent-Moore No.)<br>Tool name   | Description                                     |   | GI       |
| ST0501S000<br>( — )<br>Engine stand assembly<br>① ST05011000<br>( — ) | 2   | Disassembling and assembling  | M        |
| Engine stand  ST05012000  ( — )  Base                                 | NT042   |   | EN<br>LG |
| KV10106500<br>( — )<br>Engine stand shaft                             |   |   | EC       |
|   | NTO28   |   | FE       |
| KV10117000<br>(J41262)<br>Engine sub-attachment                       |   | KV10117000 has been replaced with KV10117001 (KV10117000 is no longer in production, but it is usable). | GL       |
|   |   |   | MT       |
|   | NT373   |   | AT       |
| KV10117001<br>( — )<br>Engine sub-attachment                          |   | Installing on the cylinder block  | FA       |
|   | NT372   |   | RA       |
| ST10120000  | N13/2 *   | Loosening and tightening cylinder head bolt   | BR       |
| (J24239-01)<br>Cylinder head bolt wrench                              |   |   | ST       |
| Mariana   | NTO19   |   | RS       |
| KV10116200<br>(J26336-A)<br>Valve spring compressor<br>① KV10115900   |   | Disassembling valve mechanism   | BT       |
| (J26336-20)<br>Attachment   | NT022   |   | HA       |
| (J39386)<br>Valve oil seal drift                                      |   | Installing valve oil seal   | EL       |
|   | NT024   |   | ΙDΣ      |

**EM-3** 

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# **PREPARATION**

| Special Service Tools (Cont'd)  |             |   |  |
|---|-------------|---|--|
| Tool number<br>(Kent-Moore No.)<br>Tool name  | Description |   |  |
| KV101151S0<br>(J38972)<br>Lifter stopper set<br>① KV10115110<br>(J38972-1)<br>Camshaft pliers<br>② KV10115120<br>(J38972-2)<br>Lifter stopper | NT041       | Changing shims  |  |
| EM03470000<br>(J8037)<br>Piston ring compressor   | NT044       | Installing piston assembly into cylinder bore         |  |
| ST16610001<br>(J23907)<br>Pilot bushing puller  | NT045       | Removing crankshaft pilot bushing                     |  |
| KV10111100<br>(J37228)<br>Seal cutter   |             | Removing steel oil pan and rear timing chain case     |  |
| WS39930000<br>( — )<br>Tube presser   | NT046       | Pressing the tube of liquid gasket                    |  |
| KV10112100<br>(BT8653-A)<br>Angle wrench  | NT052       | Tightening bolts for bearing cap, cylinder head, etc. |  |

# **PREPARATION**

# **Commercial Service Tools**

| Tool name             | Description        |  | _      |
|-----------------------|--------------------|--|--------|
| Spark plug wrench     | 16 mm<br>(0.63 in) | Removing and installing spark plug   | ©<br>R |
| Valve seat cutter set | NTO48              | Finishing valve seat dimensions  |        |
| Piston ring expander  | NT030              | Removing and installing piston ring  | [1]    |
| Valve guide drift     | NT015              | Removing and installing valve guide  Intake & Exhaust:  a = 9.5 mm (0.374 in) dia.  b = 5.5 mm (0.217 in) dia.   | ©      |
| Valve guide reamer    | NTO16              | Reaming valve guide ① or hole for oversize valve guide ②  Intake & Exhaust: $d_1 = 6.0 \text{ mm } (0.236 \text{ in) dia.}$ $d_2 = 10.2 \text{ mm } (0.402 \text{ in) dia.}$ | -<br>A |

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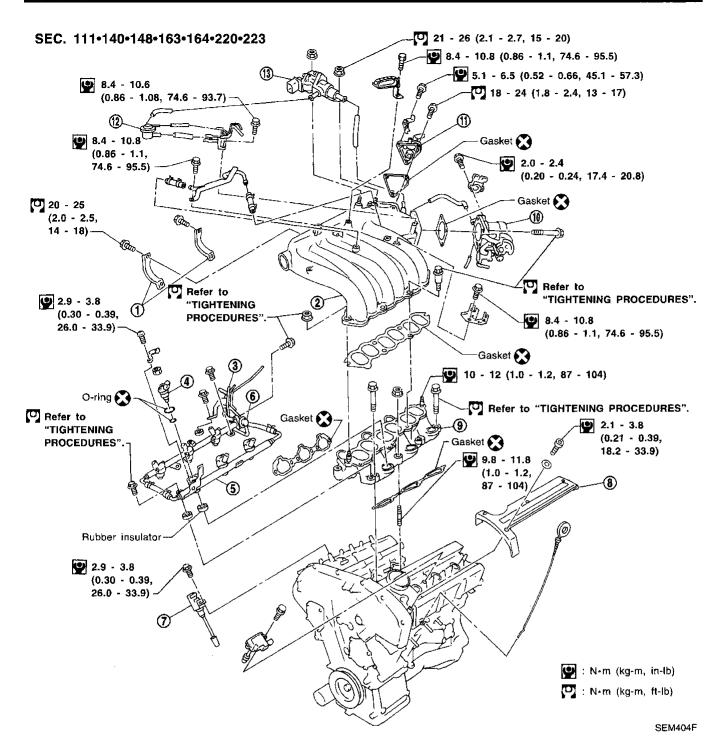
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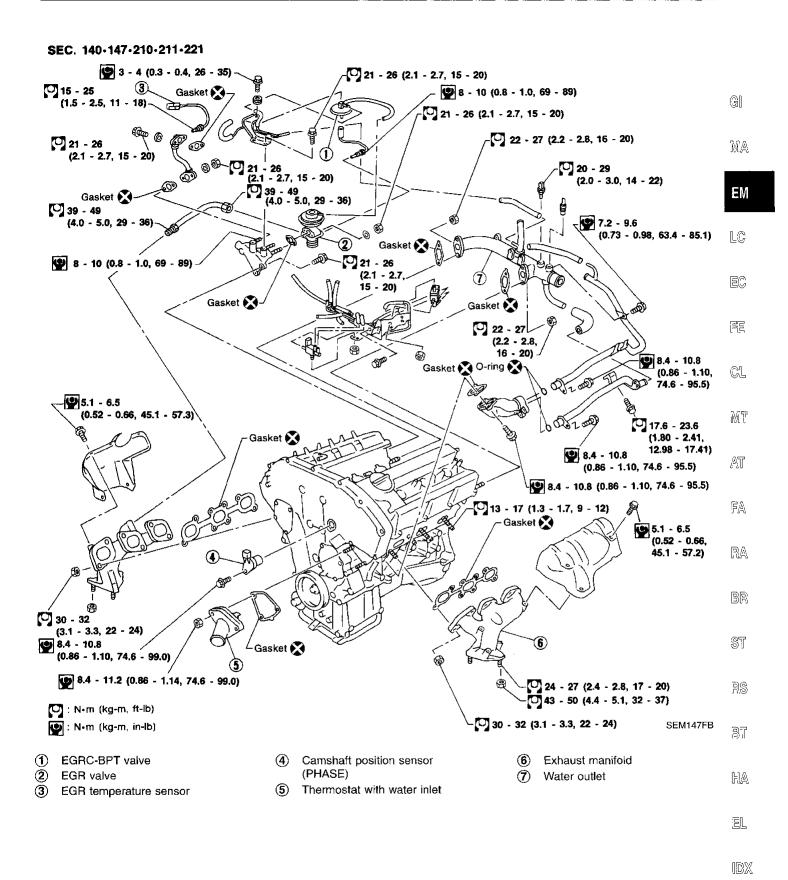
## **OUTER COMPONENT PARTS**



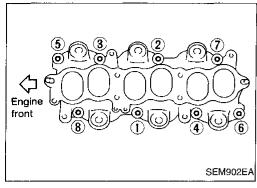
- (1) Intake manifold collector support
- 2 Intake manifold collector
- 3 Sub-fuel tube
- (4) Injector
- Fuel tube assembly

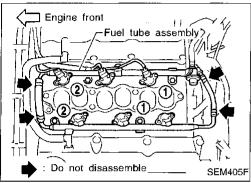
- 6 Fuel pressure regulator
- Ignition coil with power transistor
- (8) Ornament cover
- 9 Intake manifold

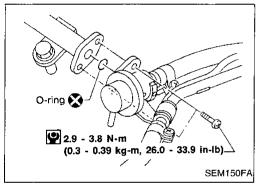
- (10) Throttle body
- 1 IACV-AAC valve
- EVAP canister purge control valve
- (3) EVAP canister purge volume control valve

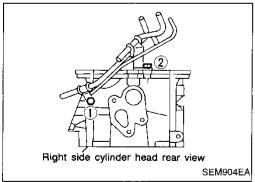


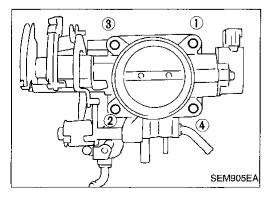
#### **OUTER COMPONENT PARTS**











#### **TIGHTENING PROCEDURES**

#### Intake manifold

- Tighten in numerical order shown in the figure.
- Tighten all bolts and nuts to 5 to 10 N·m (0.5 to 1.0 kg-m, 3.6 to 7.2 ft-lb).
- 2. Tighten all bolts and nuts to 26 to 31 N·m (2.7 to 3.2 kg-m, 20 to 23 ft-lb).
- 3. Repeat step 2 at least five times to have all bolts and nuts tightened at a torque of 26 to 31 N·m (2.7 to 3.2 kg-m, 20 to 23 ft-lb).

#### Fuel tube

- Tighten in numerical order shown in the figure.
- Tighten all bolts to 9.3 to 10.8 N·m (0.95 to 1.1 kg-m, 6.9 to 8.0 ft-lb).
- Tighten all bolts to 21 to 26 N·m (2.1 to 2.7 kg-m, 15 to 20 ftlb).
- Do not disassemble fuel tube assembly.

#### Fuel pressure regulator

Tighten fuel pressure regulator to 2.9 to 3.8 N·m (0.3 to 0.39 kg-m, 26.0 to 33.9 in-lb).

- Tighten screws evenly several times to have the fuel pressure regulator tightened at the specified torque.
- Always replace O-ring with new ones.
- Lubricate O-ring with new engine oil.

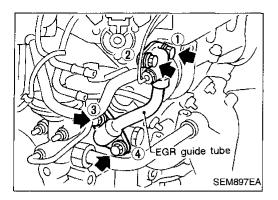
#### Sub-fuel tube

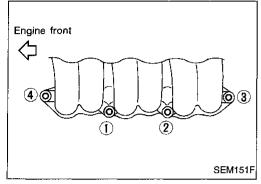
- 1. Temporarily tighten bolt (2).
- 2. Tighten bolt 1 to 20.6 to 26.5 N·m (2.10 to 2.70 kg-m, 15.19 to 19.55 ft-lb).
- 3. Tighten bolt ② to 8.5 to 10.8 N·m (0.87 to 1.10 kg-m, 75.5 to 95.5 in-lb).

#### Throttle body

- Tighten in numerical order shown in the figure.
- 1. Tighten all bolts to 9 to 11 N·m (0.9 to 1.1 kg-m, 6.5 to 8.0 ft-lb)
- 2. Tighten all bolts to 18 to 22 N·m (1.8 to 2.2 kg-m, 13 to 16 ft-lb).

#### **OUTER COMPONENT PARTS**





#### EGR guide tube

- 1. Tighten all bolts to 9 to 10 N·m (0.9 to 1.0 kg-m, 6.5 to 8.0 ft-lb).
- 2. Tighten all bolts to 21 to 26 N·m (2.1 to 2.7 kg-m, 15 to 20 ft-lb).
- Before installing EGR guide tube, tighten intake manifold collector and collector bracket.

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#### Intake manifold collector

Tighten bolts and nuts to 18 to 22 N·m (1.8 to 2.2 kg-m, 13 to 16  $\,$  LG ft-lb) in numerical order shown in the figure.

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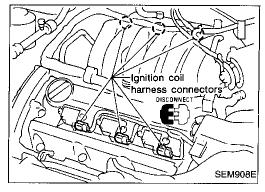
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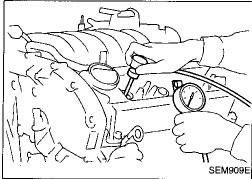
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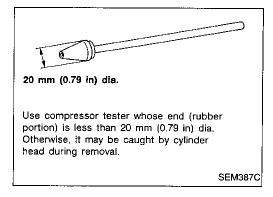
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#### **COMPRESSION PRESSURE**







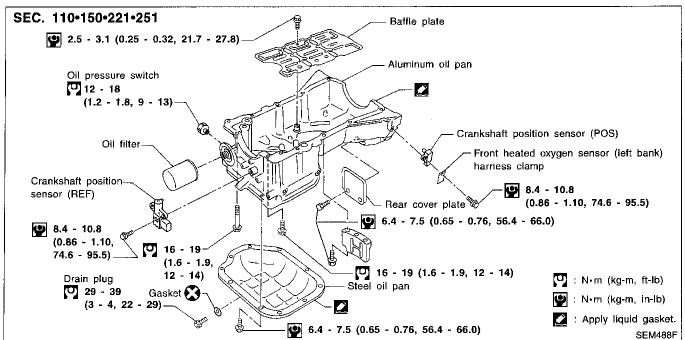
#### **Measurement of Compression Pressure**

- Warm up engine. 1.
- Turn ignition switch off. 2.
- Release fuel pressure.
  - Refer to "Releasing Fuel Pressure" in EC section.
- Disconnect ignition coil with power transistor harness connectors, then remove ignition coils.
- 5. Remove all spark plugs.
- Disconnect all injector harness connectors. 6.
- Attach a compression tester to No. 1 cylinder.
- 8. Depress accelerator pedal fully to keep throttle valve wide
- Crank engine and record highest gauge indication.
- 10. Repeat the measurement on each cylinder as shown above.
- Always use a fully-charged battery to obtain specified engine speed.

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

| Standard                 | Minimum                | Difference limit between cylinders |
|--------------------------|------------------------|------------------------------------|
| 1,275<br>(13.0, 185)/300 | 981<br>(10.0, 142)/300 | 98 (1.0, 14)/300                   |

- 11. If compression in one or more cylinders is low:
  - Pour a small amount of engine oil into cylinders through spark plug holes.
  - Retest compression.
- If adding oil helps compression, piston rings may be worn or damaged. If so, replace piston rings after checking pis-
- If pressure stays low, a valve may be sticking or seating improperly. Inspect and repair valve and valve seat. (Refer to SDS, EM-65 and EM-68.) If valve or valve seat is damaged excessively, replace them.
- If compression stays low in two cylinders that are next to each other:
  - The cylinder head gasket may be leaking, or
  - Both cylinders may have valve component damage. Inspect and repair as necessary.



#### Removal

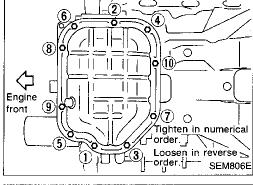
#### **CAUTION:**

When removing the aluminum oil pan from engine, first remove the crankshaft position sensors (POS and REF) from the assembly.

Be careful not to damage sensor edges and signal plate teeth.

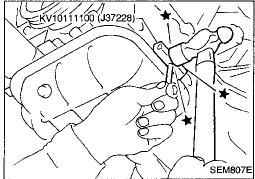
1. Remove engine undercover.

2. Drain engine oil.



3. Remove steel oil pan bolts.

- I. Remove steel oil pan.
- a. 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.



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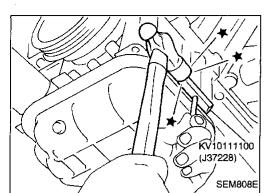
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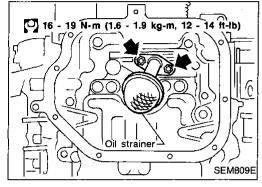
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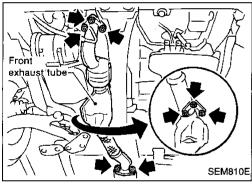
# Removal (Cont'd)



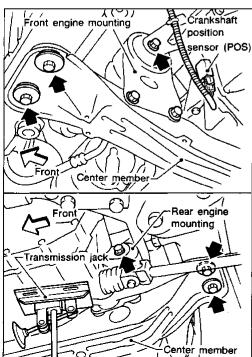
- b. Slide Tool by tapping on the side of the Tool with a hammer.
- c. Remove steel oil pan.



Remove oil strainer.



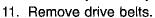
6. Remove front exhaust tube and its support.

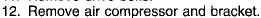


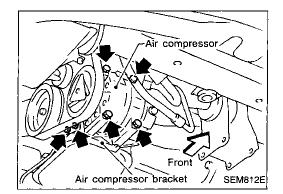
- Set a suitable transmission jack under transaxle and hoist engine with engine slinger.
- Remove crankshaft position sensors (POS and REF) from oil pan.
- 9. Remove front and rear engine mounting nuts and bolts.
- 10. Remove center member.

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# Removal (Cont'd)





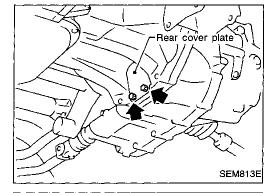


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13. Remove rear cover plate.



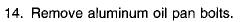


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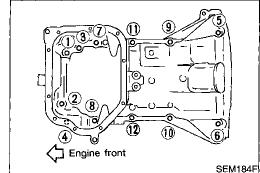
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15. Remove transaxle bolts.

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16. Remove aluminum oil pan. Insert an appropriate size tool into the notch of aluminum oil

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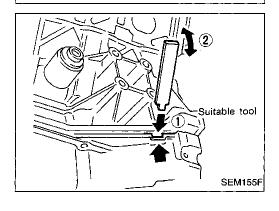
pan as shown in the figure. Be careful not to damage aluminum mating surface.

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Do not insert screwdriver, or oil pan flange will be deformed.

b. Pry off aluminum oil pan by moving the tool up and down.

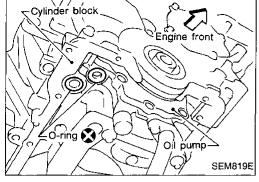
C. Remove aluminum oil pan.



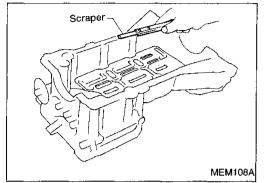
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# Removal (Cont'd)

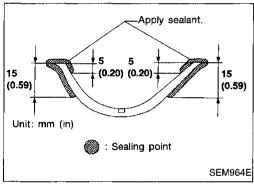
17. Remove O-rings from cylinder block and oil pump body.



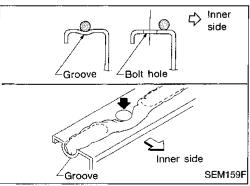
#### Installation



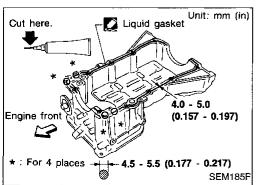
- Install aluminum oil pan.
- Use a scraper to remove all traces of liquid gasket from mating surfaces.
- Also remove traces of liquid gasket from mating surface of cylinder block, front cover and steel oil pan.
- Remove old liquid gasket from the bolt hole and thread.



Apply sealant to front cover gasket and rear oil seal retainer gasket.

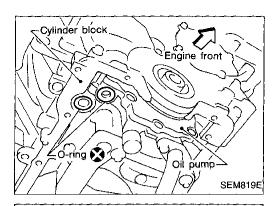


- Apply a continuous bead of liquid gasket to mating surface of aluminum oil pan.
- Use Genuine Liquid Gasket or equivalent.



- Apply liquid gasket to inner sealing surface as shown in figure. d.
- Be sure liquid gasket is 4.0 to 5.0 mm (0.157 to 0.197 in) or 4.5 to 5.5 mm (0.177 to 0.217 in) wide.
- Attaching should be done within 5 minutes after coating.

# Installation (Cont'd)



Engine front

Rear cover plate

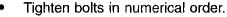
Install O-rings, cylinder block and oil pump body.



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Install aluminum oil pan.



Wait at least 30 minutes before refilling engine oil.



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2. Install the transaxle bolts.

Install rear cover plate.

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- Install air compressor and bracket.
- 5. Install drive belts.
- 6. Install center member.
- Install front and rear engine mounting insulator nuts and bolts.



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Install crankshaft position sensors (POS and REF) and front heated oxygen sensor (left bank) harness clamp. Make sure that crankshaft position sensor (POS) and front

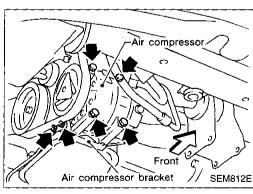
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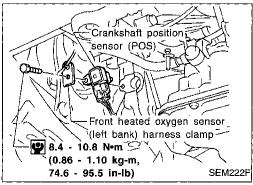
heated oxygen sensor (left bank) harness clamp are installed correctly as shown in figure.

Install front exhaust tube and its support.

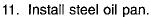
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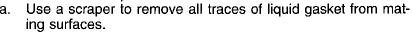
10. Install oil strainer.



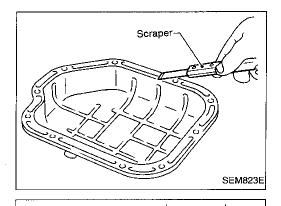


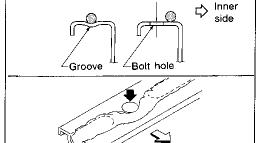
# Installation (Cont'd)





 Also remove traces of liquid gasket from mating surface of aluminum oil pan.

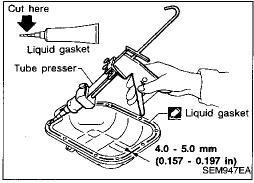




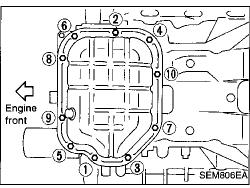
Inner side

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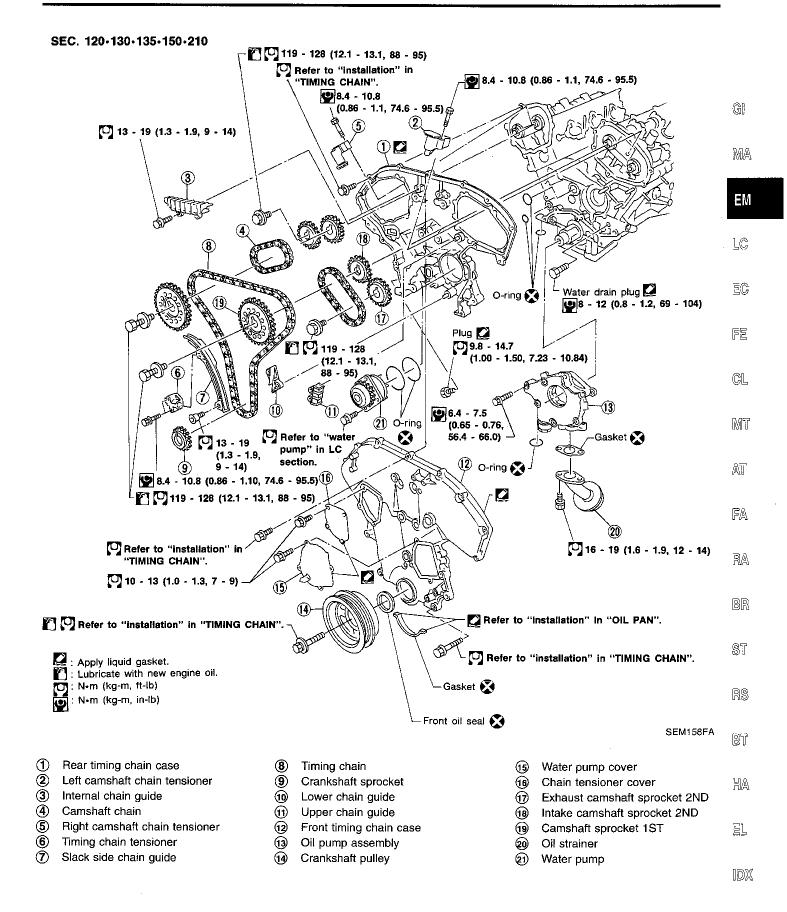
- Apply a continuous bead of liquid gasket to mating surface of steel oil pan.
- Use Genuine Liquid Gasket or equivalent.
- Be sure liquid gasket is 4.0 to 5.0 mm (0.157 to 0.197 in) wide.
- Attaching should be done within 5 minutes after coating.



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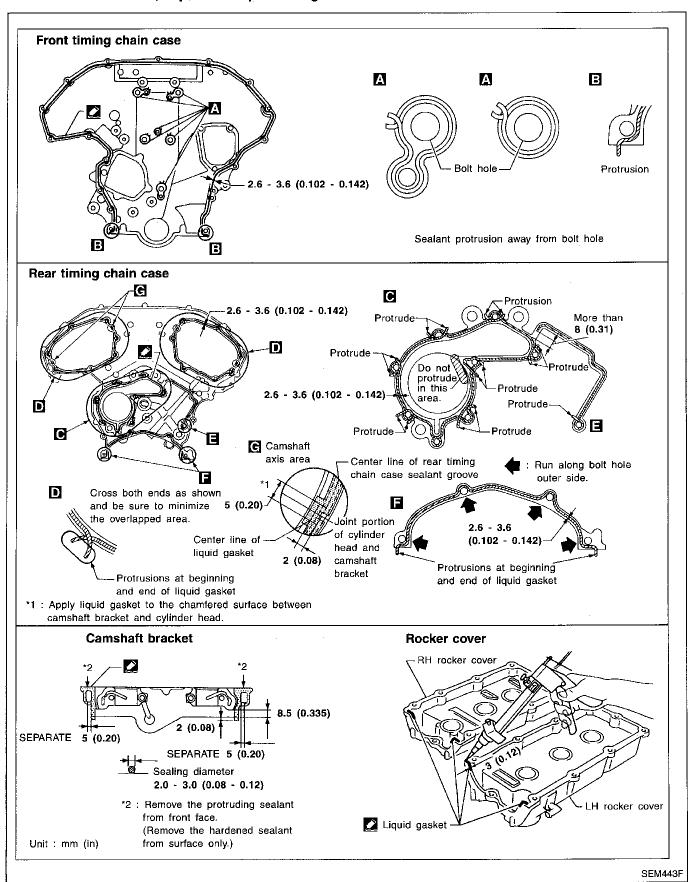
- c. Install steel oil pan.
- Tighten in numerical order shown in the figure.
- Wait at least 30 minutes before refilling engine oil.



#### POSITION FOR APPLYING LIQUID GASKET

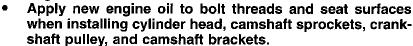
Refer to "Installation" in "OIL PAN" for installing oil pan (EM-14).

• Before installation, wipe off the protruding sealant.



#### **CAUTION:**

- After removing timing chain, do not turn crankshaft and camshaft separately, or valves will strike piston heads.
- When installing camshafts, chain tensioners, oil seals, or other sliding parts, lubricate contacting surfaces with new engine oil.



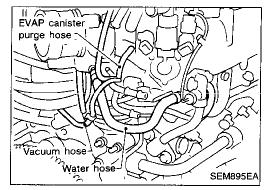
Before disconnecting fuel hose, release fuel pressure. Refer to EC section ("Fuel Pressure Release", "BASIC SERVICE PROCEDURE").

When removing the oil pans, oil pump assembly and timing chain from engine, first remove the camshaft position sensor (PHASE) and the crankshaft position sensors (REF)/(POS) from the assembly.
 Be careful not to damage sensor edges.

Do not spill engine coolant on drive belts.

Removal

- 1. Drain engine oil.
- 2. Release fuel pressure.
  Refer to "Fuel Pressure Release" in EC section.
- 3. Drain coolant by removing cylinder block drain plugs (refer to "Water pump" in LC section) and radiator drain cock.
- 4. Remove left side ornament cover.
- Remove air duct to intake manifold, collector, blow-by hose, vacuum hoses, fuel hoses, wires, harness, connectors and so on.



Engine front SEM896E

- Remove the following.
- Vacuum hoses
- Water hoses
- EVAP canister purge hose
- Blow-by hose

7. Remove RH and LH ignition coils.



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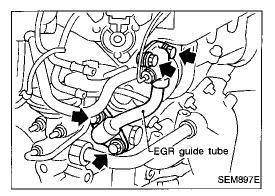




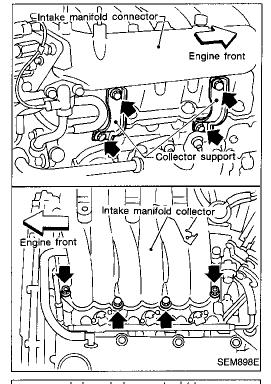


# Removal (Cont'd)

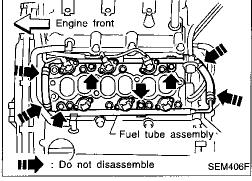
8. Remove EGR guide tube.



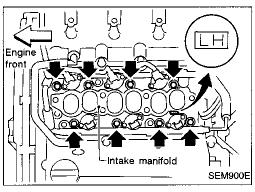
9. Remove intake manifold collector supports and intake manifold collector (RH cylinder head only).



- 10. Remove fuel tube assembly.
- Do not disassemble fuel tube assembly.



11. Remove intake manifold in reverse order of installation. Refer to "TIGHTENING PROCEDURES" in "OUTER COMPONENT PARTS", (EM-8).



# Removal (Cont'd)

12. Remove RH and LH rocker covers from cylinder head.

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- 13. Remove engine undercover.
- 14. Remove front RH wheel and engine side cover.
- 15. Remove drive belts and idler pulley bracket.

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16. Remove power steering oil pump belt and power steering oil pump assembly.

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17. Remove camshaft position sensor (PHASE) and crankshaft position sensors (REF)/(POS).

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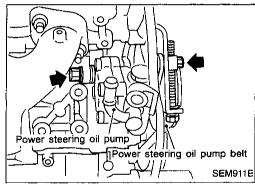
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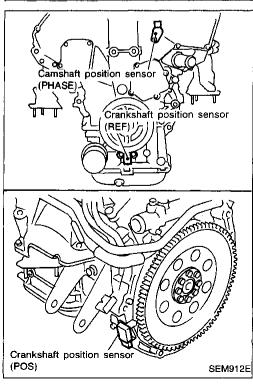


RH rocker cover

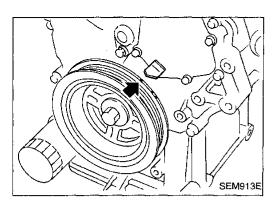
LH rocker cover

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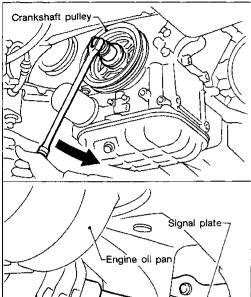
Engine front



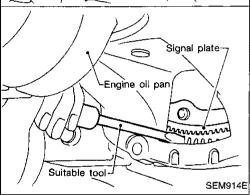
# Removal (Cont'd)



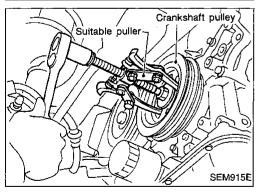
18. Set No. 1 piston at TDC on the compression stroke by rotating crankshaft.



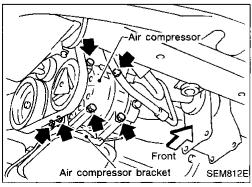
19. Loosen crankshaft pulley bolt. (At this time remove oil pan rear cover plate and set a suitable tool to ring gear so that crankshaft cannot rotate.)



Be careful not to damage the signal plate teeth.



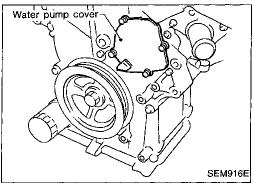
Remove crankshaft pulley with a suitable puller.

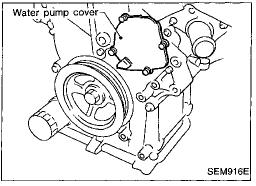


- 21. Remove air compressor and bracket.
- 22. Remove front exhaust tube and its support.
- 23. Hang engine at right and left side engine slingers with a suitable hoist.
- 24. Remove right side engine mounting, mounting bracket and
- 25. Remove center member assembly.
- 26. Remove upper and lower oil pans.
- For procedures described in steps 21 through 26, refer to "Removal" in "OIL PAN" (EM-11).

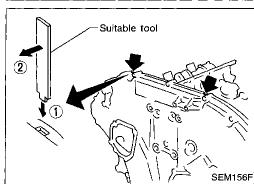
# Removal (Cont'd)

27. Remove water pump cover.





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- 28. Remove front timing chain case bolts.
- Loosen bolts in numerical order as shown in the figure.

- 29. Remove front timing chain case.
- Do not scratch sealing surfaces.

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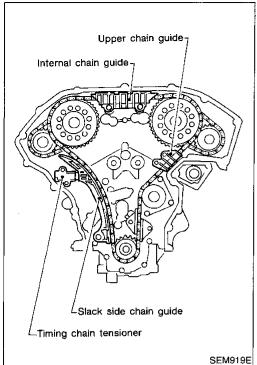
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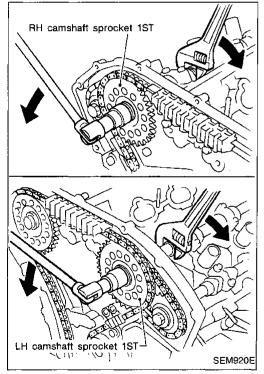
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# Removal (Cont'd)

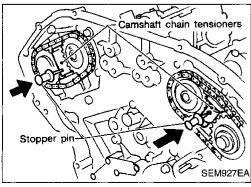
- 30. Remove internal timing chain guide.
- 31. Remove upper chain guide.
- 32. Remove timing chain tensioner and slack side chain guide.



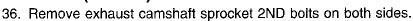
- 33. Remove RH & LH camshaft sprocket 1ST bolts.
- 34. Remove camshaft sprockets 1ST on both sides, crankshaft sprocket and timing chain.
- Apply paint to timing chain and camshaft sprockets 1ST for alignment during installation.



35. Attach a suitable stopper pin to RH and LH camshaft chain tensioners.



# Removal (Cont'd)



Apply paint to timing chain and camshaft sprockets 2ND for alignment during installation.



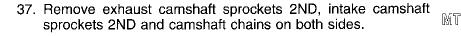
MA

LC

EC

FE

CL



AT

FA

RA

38. Remove lower chain guide. BR

ST

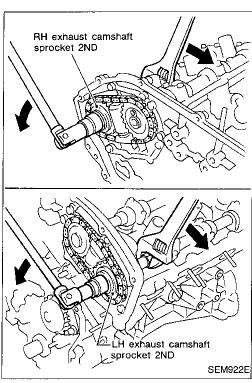
RS

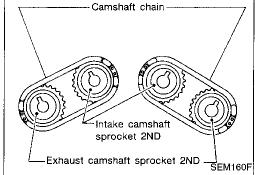
BT

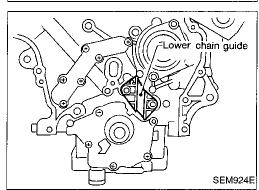
HA 39. Use a scraper to remove all traces of liquid gasket from front

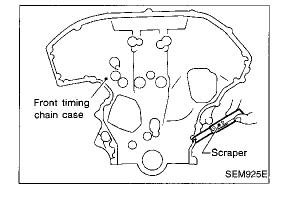
EL

IDX



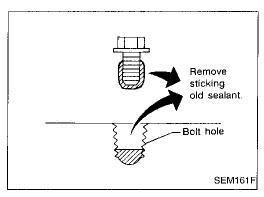




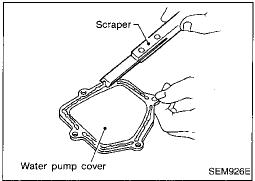


# Removal (Cont'd)

Remove old liquid gasket from the bolt hole and thread.

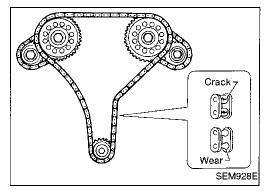


40. Use a scraper to remove all traces of liquid gasket from water pump cover.



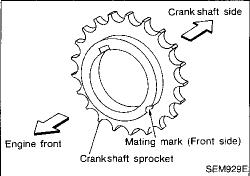
# Inspection

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

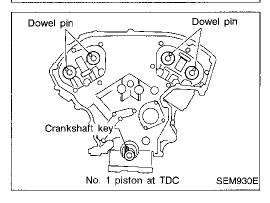


#### Installation

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



Position crankshaft so that No. 1 piston is set at TDC on compression stroke.



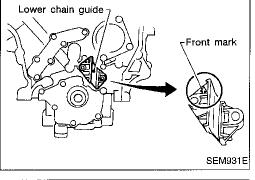
# Installation (Cont'd)

Lower chain guide -Front mark Install lower chain guide on dowel pin, with front mark on the guide facing upside.



MA

EM



Mating mark

mating mark

Stopper pin RH exhaust camshaft sprocket

LH exhaust camshaft sprocket

SEM162F

(different color) Camshaft sprocket

Mating mark

Align the marks on RH and LH intake camshaft sprockets 2ND, exhaust camshaft sprockets 2ND and camshaft chain, as shown.



Put LH camshaft dowel pin into camshaft sprocket dowel groove and install these on camshaft. Tighten LH exhaust camshaft sprocket 2ND bolt.



Put RH camshaft dowel pin in camshaft sprocket dowel groove and install sprocket on camshaft.

FE

Tighten RH exhaust camshaft sprocket 2ND bolt.

Make sure that the timing marks on RH and LH intake camshaft sprockets 2ND are aligned with the camshaft chain mark.

Lubricate threads and seat surfaces of camshaft sprocket bolts with new engine oil.

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Be careful not to confuse intake and exhaust camshaft BR sprockets 2ND (their thicknesses are different).

ST

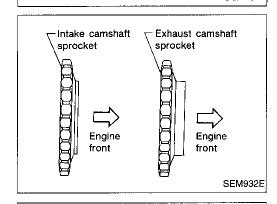
RS

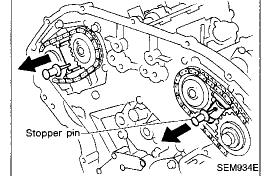
BT

HA

EL

[DX

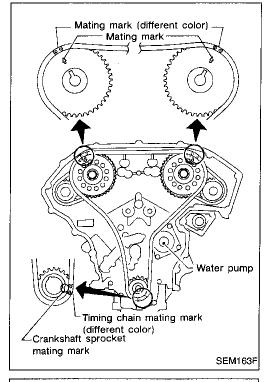




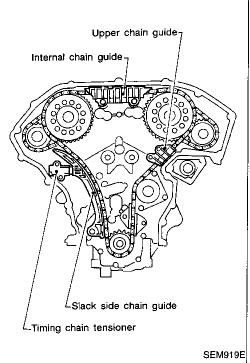
Remove RH and LH camshaft chain tensioner stopper pins.

# Installation (Cont'd)

- Align mating mark on crankshaft sprocket with matchmark on chain as shown.
- 10. Attach lower timing chain on the water pump sprocket.
- 11. Install RH and LH camshaft sprockets 1ST onto camshafts by matching sprocket dowel grooves with camshaft.
- 12. Tighten RH and LH camshaft sprocket 1ST bolts.
- Lubricate threads and seat surfaces of the bolts with new engine oil.
- 13. Install timing chain. Make sure that mating marks on crankshaft sprocket and RH and LH camshaft sprockets are aligned with matchmarks on timing chain.



- 14. Install internal chain guide.
- 15. Install upper chain guide.
- 16. Install timing chain tensioner and slack side chain guide.
- 17. Apply liquid gasket to front timing chain case.
- Refer to "POSITION FOR APPLYING LIQUID GASKET" (EM-18).
- Before installation, wipe off the protruding sealant.



# Installation (Cont'd)

- 18. Install rear case pin into dowel pin hole on front timing chain
- 19. Tighten bolts to the specified torque in order shown in the fig-
- Leave the bolts unattended for 30 minutes or more after tightening.



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20. Apply liquid gasket to water pump cover.

Apply a continuous bead of liquid gasket to mating surface of water pump cover. Refer to LC section ("Water Pump Installation").

AT

- 21. Install water pump cover.
- 22. Apply liquid gasket to RH and LH rocker covers.

Use genuine liquid gasket or equivalent.

Refer to "POSITION FOR APPLYING LIQUID GASKET" (EM-18).

FA

RA

BR

23. Install RH and LH rocker covers.

## Rocker cover tightening procedure:

- Tighten in numerical order as shown in the figure.
- Tighten bolts (1) to (10) in that order to 1 to 3 N·m (0.1 to 0.3 a. kg-m, 9 to 26 in-lb).
- Tighten bolts (1) to (10) as indicated in figure to 5.4 to 7.4 N·m



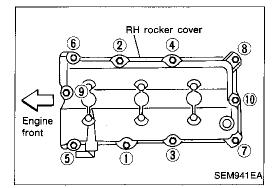
RS (0.55 to 0.75 kg-m, 47.7 to 65.1 in-lb).

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13(12)

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(2.6 - 3.2 kg-m, 18.8 - 23.1 ft-lb) 3 - 20 6 mm dia. bolts

(1.2 - 1.4 kg-m, 8.7 - 10.1 ft-lb)

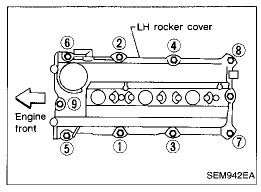
💟 🕦 - ② 8 mm dia. bolts 25.5 - 31.4 N·m

11.8 - 13.7 N·m

(17)

14

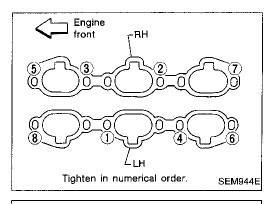
SEM938E

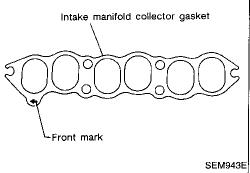


# Installation (Cont'd)

24. Install intake manifold. Tighten intake manifold nuts and bolts. Refer to "TIGHTENING PROCEDURES" in "OUTER COMPO-NENT PARTS", (EM-8).

25. Install fuel tube assembly.

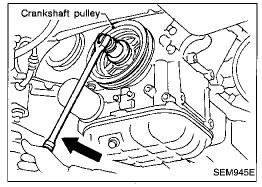




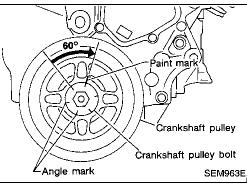
- 26. Install intake manifold collector gasket, with its front mark facing forwards.
- 27. Install intake manifold collector, supports and intake manifold collector bolt.
- 28. Install EGR guide tube.

Refer to "TIGHTENING PROCEDURES" in "OUTER COMPO-NENT PARTS", (EM-8).

- Install RH and LH ignition coils.
- 30. Install rocker cover ornament on left side.



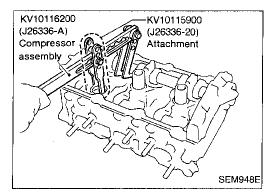
- 31. Install crankshaft pulley to crankshaft.
  - Lubricate thread and seat surface of the bolt with new engine oil.
- Tighten to 39 to 49 N·m (4.0 to 5.0 kg-m, 29 to 36 ft-lb).
- Put a paint mark on the crankshaft pulley.
- Again tighten by turning 60° to 66°, about the angle from one hexagon bolt head corner to another.



- 115 Crankshaft position sensor (POS) Front heated oxygen sensor <sup>(left bank)</sup> harness clamp 8.4 - 10.8 N·m 🕏 (0.86 - 1.10 kg-m, 74.6 - 95.5 in-lb) SEM222F

- 32. Install camshaft position sensor (PHASE), crankshaft position sensors (REF)/(POS) and front heated oxygen sensor (left bank) harness clamp.
- Make sure that crankshaft position sensor (POS) and front heated oxygen sensor (left bank) harness clamp are installed correctly as shown in figure.
- 33. Reinstall removed parts in reverse order of removal.
- When installing fuel tube assembly, refer to "Injector Removal and Installation" in EC section.
- After installing the tensioner, race the engine at about 3,000 rpm under no load to purge air from the high-pressure chamber. The engine may produce a rattling noise. This indicates that air still remains in the chamber and is not a matter of concern.

104 EM-30



#### **CAUTION:**

When removing the oil pans, oil pump assembly and timing chain from engine, first remove the camshaft position sensor (PHASE) and the crankshaft position sensors (REF)/(POS) from the assembly.

Be careful not to damage sensor edges.

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#### **VALVE OIL SEAL**

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- Remove LH ornament cover.
- 2. Remove RH and LH ignition coils.
- Remove EGR guide tube. 3.
- Remove intake manifold collector supports and intake manifold collector (RH cylinder head only).
- Remove RH and LH rocker covers from cylinder head.
- Remove camshaft position sensor (PHASE) and crankshaft position sensors (REF)/(POS).
- Remove oil pan. (Refer to "Removal" in "OIL PAN" EM-11.)
- 8. Remove timing chain. (Refer to "Removal" in "TIMING CHAIN" EM-19.)
- 9. Remove camshaft brackets and camshaft. (Refer to "Disassembly" in "CYLINDER HEAD" EM-35.)
- 10. Remove valve lifters and shims.
- 11. Remove valve spring with Tool.
- 12. Reinstall any parts removed in reverse order of removal.

Before removing valve spring, fix valve as follows. Method A:

AT

Piston concerned should be set at TDC to prevent valve from falling.

FA

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BR

Remove spark plug, then install air hose adapter into spark plug hole and apply air pressure to hold valves in place. Apply a pressure of 490 kPa (5

kg/cm<sup>2</sup>, 71 psi).

RS

137



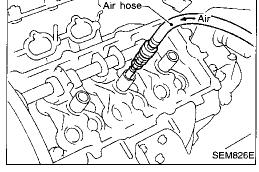
Method B:

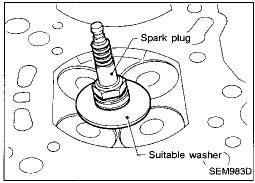
Install spark plug with suitable washer into spark plug hole from combustion chamber side.

EL

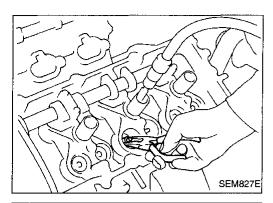
KA

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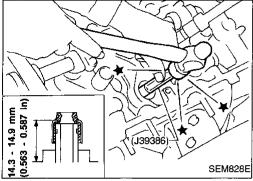




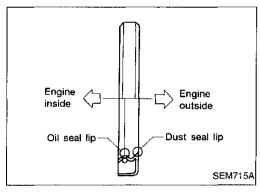
#### **OIL SEAL REPLACEMENT**



13. Remove valve oil seal.



14. Apply engine oil to new valve oil seal and install it with Tool.



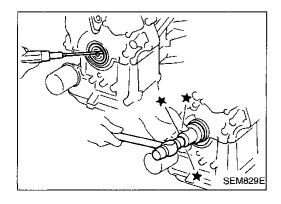
#### **OIL SEAL INSTALLATION DIRECTION**

Install new oil seal in the direction shown in the figure.

#### FRONT OIL SEAL

- 1. Remove the following parts:
- Engine undercover
- Front RH wheel and engine side cover
- Drive belts
- Crankshaft position sensor (REF)
- Crankshaft pulley

Be careful not to damage sensor edge.



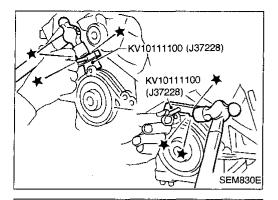
Remove front oil seal using a suitable tool.

#### Be careful not to scratch front cover.

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

**EM-32** 106

#### **OIL SEAL REPLACEMENT**



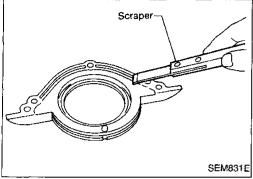
#### **REAR OIL SEAL**

- Remove transaxle. (Refer to MT or AT section.)
- Remove flywheel or drive plate.
- Remove oil pan. (Refer to OIL PAN.) 3.
- Remove rear oil seal retainer.

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- Remove traces of liquid gasket using scraper.
- Remove old liquid gasket from the bolt hole and thread.

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Apply liquid gasket to rear oil seal retainer.

MIT

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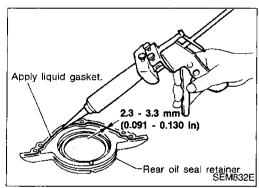
ST

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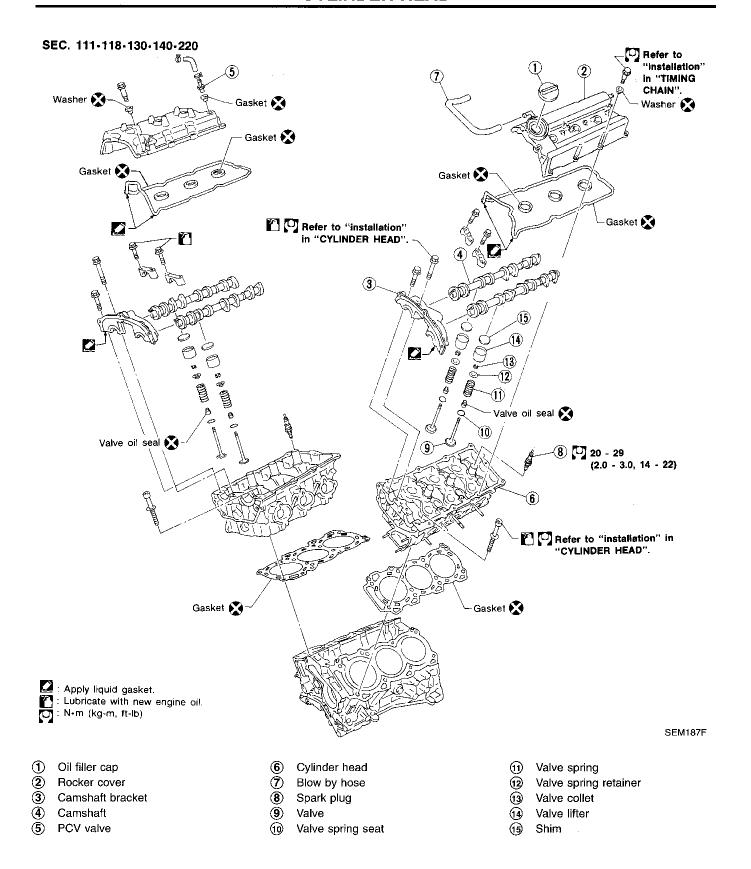
BT

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# **CYLINDER HEAD**



### CAUTION:

- When installing camshafts, chain tensioners, oil seals, or other sliding parts, lubricate contacting surfaces with new engine oil.
- Apply new engine oil to threads and seat surfaces when installing cylinder head, camshaft sprocket, crankshaft pulley, and camshaft bracket.
- Attach tags to valve lifters so as not to mix them up. Removal
- This removal is the same procedure as that for timing chain. Refer to "Removal" in "TIMING CHAIN" (EM-19).
- Apply paint to camshaft sprockets for alignment during installation.



GI

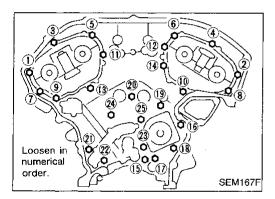
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# Disassembly

1. Remove rear timing chain case bolts.

Remove rear timing chain case.

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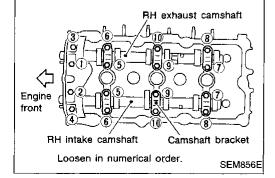
1DX

Remove intake and exhaust camshafts and camshaft brackets.

Equally loosen camshaft bracket bolts in several steps in the numerical order shown in the figure.

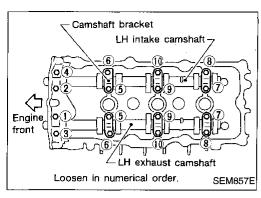
For reinstallation, be sure to put marks on camshaft bracket before removal.

Remove valve component parts. Refer to "VALVE OIL SEAL" in "OIL SEAL REPLACEMENT" (EM-31).

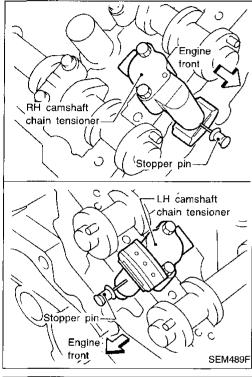


SEM168FA

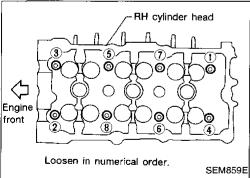
# Disassembly (Cont'd)



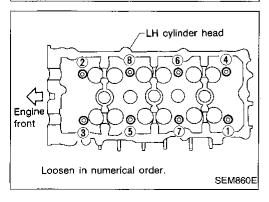




Remove RH and LH camshaft chain tensioners from cylinder head.

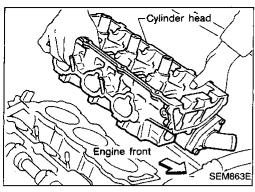


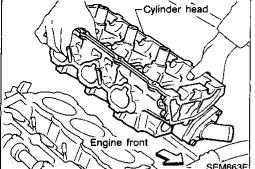
- 6. Remove cylinder head bolts.
- Cylinder head bolts should be loosened in two or three steps.
- A warped or cracked cylinder head could result from removing in incorrect order.



# Disassembly (Cont'd)

7. Remove cylinder head.





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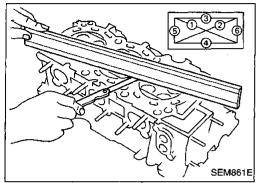
LC

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# Inspection

### CYLINDER HEAD DISTORTION

Clean surface of cylinder head.

Use a reliable straightedge and feeler gauge to check the flatness of cylinder head surface.

Check along six positions shown in the figure.

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

The limit for cylinder head resurfacing is determined by the

cylinder block resurfacing.

CL.

Resurfacing limit:

Amount of cylinder head resurfacing is "A". Amount of cylinder block resurfacing is "B".

The maximum limit: A + B = 0.2 mm (0.008 in)

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

> Nominal cylinder head height: 126.3 - 126.5 mm (4.972 - 4.980 in)

FA



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ST

### CAMSHAFT VISUAL CHECK

Check camshaft for scratches, seizure and wear.

CAMSHAFT RUNOUT

Measure camshaft runout at A and B as shown in the figure.

Runout (Total indicator reading): Limit 0.05 mm (0.0020 in)

RS

If it exceeds the limit, replace camshaft.

BT



HA

1. Measure camshaft cam height.

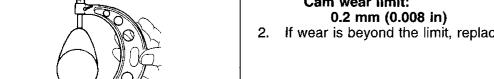
Standard cam height: 43.940 - 44.130 mm (1.7299 - 1.7374 in)

Cam wear limit:

If wear is beyond the limit, replace camshaft.

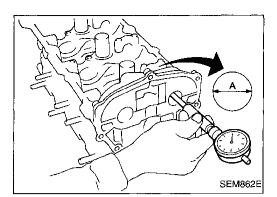
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SEM549A



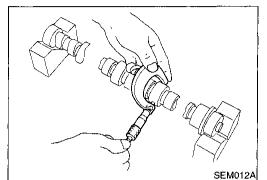
# Inspection (Cont'd)

### **CAMSHAFT JOURNAL CLEARANCE**

- 1. Install camshaft bracket and tighten bolts to the specified torque.
- 2. Measure inner diameter "A" of camshaft bearing.

Standard inner diameter:

No.1: 26.000 - 26.021 mm (1.0236 - 1.0244 in) No. 2, 3, 4: 23.500 - 23.521 mm (0.9252 - 0.9260 in)



3. Measure outer diameter of camshaft journal.

Standard outer diameter:

No. 1: 25.935 - 25.955 mm (1.0211 - 1.0218 in) No. 2, 3, 4: 23.435 - 23.455 mm (0.9226 - 0.9234 in)

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

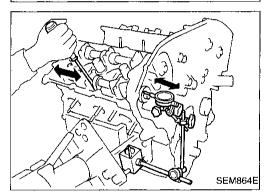
Camshaft journal clearance:

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.

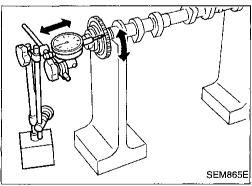
Camshaft end play:

Standard

0.115 - 0.188 mm (0.0045 - 0.0074 in)

Limit

0.24 mm (0.0094 in)



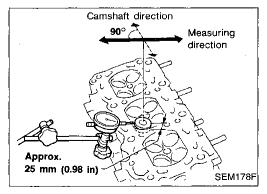
### CAMSHAFT SPROCKET RUNOUT

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

Runout (Total indicator reading):

Less than 0.15 mm (0.0059 in)

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



### **VALVE GUIDE CLEARANCE**

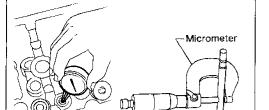
1. Measure valve deflection as shown in the figure. (Valve and valve guide mostly wear in this direction.)

Valve deflection limit (Dial gauge reading):

Intake 0.24 mm (0.0094 in)

Exhaust 0.28 mm (0.0110 in)

# Inspection (Cont'd)



SEM938C

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

Valve to valve guide clearance limit: Intake 0.08 mm (0.0031 in) Exhaust 0.1 mm (0.004 in)

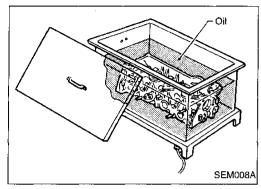
**G**]

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

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# VALVE GUIDE REPLACEMENT

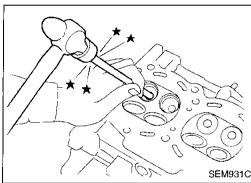


1. To remove valve guide, heat cylinder head to 110 to 130°C 🚨 (230 to 266°F) by soaking in heated oil.

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

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Ream cylinder head valve guide hole.

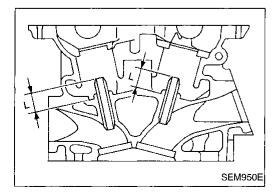
Valve guide hole diameter (for service parts):

10.175 - 10.196 mm (0.4006 - 0.4014 in)

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Heat cylinder head to 110 to 130°C (230 to 266°F) and press service valve guide onto cylinder head.

Projection "L":

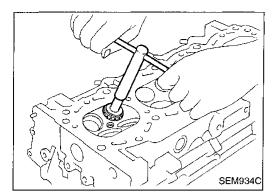
12.6 - 12.8 mm (0.496 - 0.504 in)

EL

Ream valve guide.

Finished size:

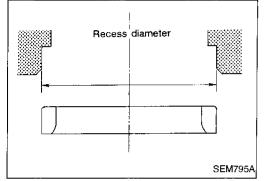
6.000 - 6.018 mm (0.2362 - 0.2369 in)



# Inspection (Cont'd) VALVE SEATS

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

- Before repairing valve seats, check valve and valve guide for wear. If they have worn, replace them. Then correct valve seat.
- Use both hands to cut uniformly.



### REPLACING VALVE SEAT FOR SERVICE PARTS

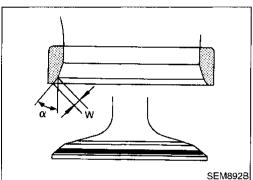
- Bore out old seat until it collapses. Boring should not continue beyond the bottom face of the seat recess in cylinder head. Set the machine depth stop to ensure this.
- Ream cylinder head recess for service valve seat.

Oversize [0.5 mm (0.020 in)]:

Intake 37.500 - 37.516 mm (1.4764 - 1.4770 in) Exhaust 32.700 - 32.716 mm (1.2874 - 1.2880 in)

Be sure to ream in circles concentric to the valve guide center.

This will enable valve seat to fit correctly.

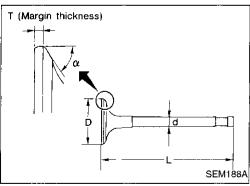


- 3. Heat cylinder head to 110 to 130°C (230 to 266°F) by soaking in heated oil.
- 4. Press fit valve seat until it seats on the bottom.
- Cut or grind valve seat using suitable tool to the specified dimensions as shown in SDS (EM-68).
- 6. After cutting, lap valve seat with abrasive compound.
- 7. Check valve seating condition.

Seat face angle " $\alpha$ ": 44°53′ - 45°07′ deg.

Contacting width "W":

Intake: 1.09 - 1.31 mm (0.0429 - 0.0516 in) Exhaust: 1.29 - 1.51 mm (0.0508 - 0.0594 in)

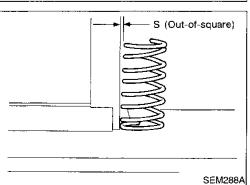


### **VALVE DIMENSIONS**

Check dimensions of each valve. For dimensions, refer to SDS (EM-65).

When valve head has been worn down to 0.5 mm (0.020 in) in margin thickness, replace valve.

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



### **VALVE SPRING**

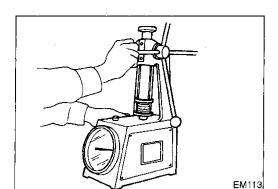
### **Squareness**

1. Measure dimension "S".

Out-of-square "S":

Less than 2.0 mm (0.079 in)

2. If it exceeds the limit, replace spring.



# Inspection (Cont'd)

### Pressure

Check valve spring pressure at specified spring height.

### Pressure:

Standard

454 N (46.3 kg, 102.1 lb)

at height 27.55 mm (1.0846 in)

Limit

More than 428 N (43.7 kg, 96.2 lb)

at height 27.55 mm (1.0846 in)

If it exceeds the limit, replace spring.

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### **VALVE LIFTER**

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

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2. Check diameter of valve lifter and valve lifter guide bore.

Valve lifter outer diameter:

34.960 - 34.975 mm (1.3764 - 1.3770 in)

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Lifter guide bore diameter: 35.000 - 35.021 mm (1.3780 - 1.3788 in)

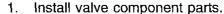
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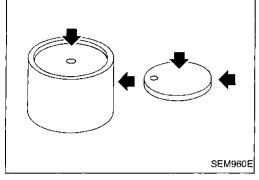
BT

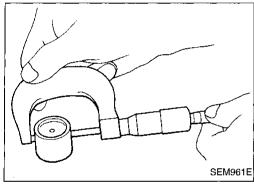
KA

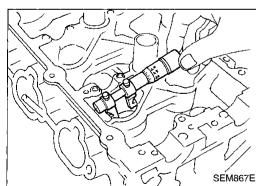
# **Assembly**

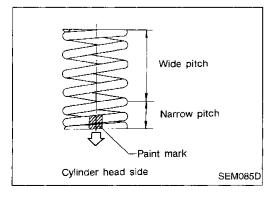


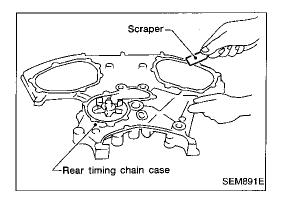
- Always use new valve oil seal. Refer to OIL SEAL EL REPLACEMENT (EM-31).
- Before installing valve oil seal, install valve spring seat.
- Install valve spring (uneven pitch type) with its narrow pitch side toward cylinder head side (paint mark).
- After installing valve component parts, tap valve stem tip with plastic hammer to assure a proper fit.





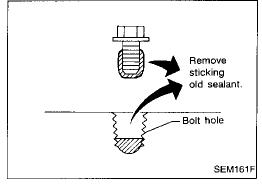




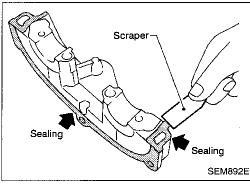


### Installation

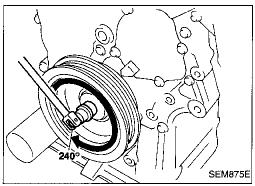
- 1. Before installing rear timing chain case, remove all traces of liquid gasket from mating surface using a scraper.
- Also remove traces of liquid gasket from mating surface of cylinder block.



Remove old liquid gasket from the bolt hole and thread.



- 2. Before installing cam bracket, remove all traces of liquid gasket from mating surface using a scraper.
- 3. Remove O-rings from cylinder block.



 Turn crankshaft until No. 1 piston is set at approximately 240° before TDC on compression stroke to prevent interference of valves and pistons.

# Installation (Cont'd)

- 5. Install cylinder heads with new gaskets.
- Do not rotate crankshaft and camshaft separately, or valves will strike piston heads.



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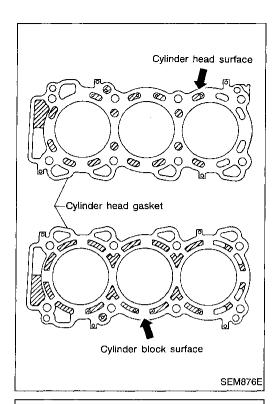
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### **CAUTION:**

Cylinder head bolts are tightened by plastic zone tightening method. Whenever the size difference between d1 and d2 exceeds the limit, replace them with new ones.

AT

Limit (d1 - d2):

0.11 mm (0.0043 in)

 Lubricate threads and seat surfaces of the bolts with new engine oil.

RA

FA



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a. Tighten all bolts to 98 N·m (10 kg-m, 72 ft-lb).b. Completely loosen all bolts.

Tighten all bolts to 34 to 44 N·m (3.5 to 4.5 kg-m, 25 to 33

ft-lb).

c.

d. Turn all bolts 90 to 95 degrees clockwise.

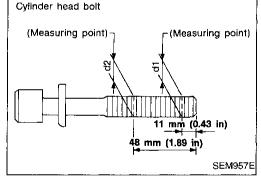
RS

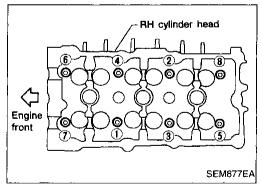
e. Turn all bolts 90 to 95 degrees clockwise.

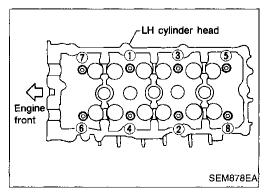
Tighten in numerical order shown in the figure.

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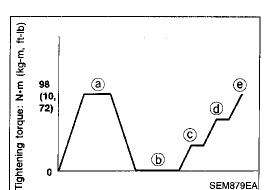
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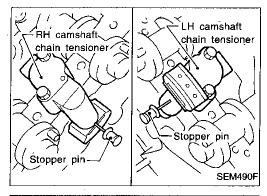




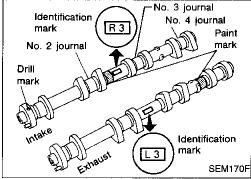
# Installation (Cont'd)



6. Install cylinder head outside bolts.

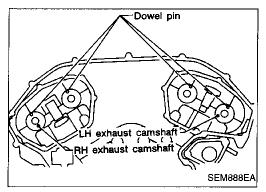


Install camshaft chain tensioners on both sides of cylinder head.



- 8. Install exhaust and intake camshafts and camshaft brackets.
- Identification marks are present on camshafts.

| Camsh | Camshaft |    | Paint mark location               |
|-------|----------|----|-----------------------------------|
| IN    | LH       | L3 | Patroon No. Cond No. Ciarmala     |
| IIN   | RH       | R3 | Between No. 2 and No. 3 journals  |
| EX    | LH       | L3 | Patrusen No. 2 and No. 4 journals |
|       | RH       | R3 | Between No. 3 and No. 4 journals  |



Position camshaft
 RH exhaust camshaft dowel pin at about 10 o'clock
 LH exhaust camshaft dowel pin at about 2 o'clock

# Installation (Cont'd)

- 9. Before installing camshaft brackets, apply sealant to mating surface of No. 1 journal head.
- Use Genuine Liquid Gasket or equivalent.
- Refer to "POSITION FOR APPLYING LIQUID GASKET", (EM-18).
- Install camshaft brackets in their original positions.
- Tighten camshaft bracket bolts gradually in two or three stages.

 If any part of valve assembly or camshaft is replaced, check valve clearance according to reference data.
 After completing assembly check valve clearance. Refer to "Checking" and "Adjusting" in "VALVE CLEARANCE" (EM-47 and 48).

Reference data valve clearance (Cold): Intake

0.26 - 0.34 mm (0.010 - 0.013 in) Exhaust

0.29 - 0.37 mm (0.011 - 0.015 in)

 Lubricate threads and seat surfaces of camshaft bracket bolts with new engine oil before installing them.

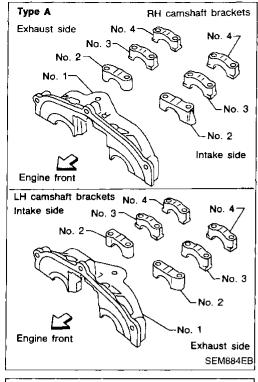
Align stamp mark as shown in the figure.

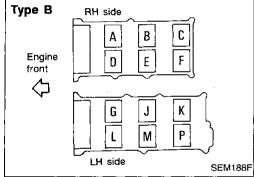
# Tightening procedure

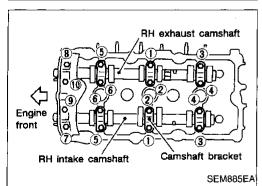
Tighten the camshaft brackets in the following steps.

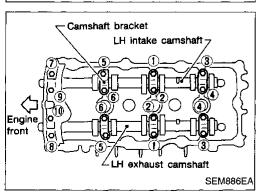
| Step | Tightening torque   | Tightening order                                     |
|------|---|--|
| 1    | 1.96 N·m (0.2 kg-m, 17 in-lb)                             | Tighten in the order of ⑦ to ⑩, then tighten ① to ⑥. |
| 2    | 6 N·m (0.6 kg-m, 52 in-lb)                                | Tighten in the numerical order.                      |
| 3    | 9.02 - 11.8 N·m (0.92 - 1.20 kg·m,<br>79.9 - 104.2 in-lb) | Tighten in the numerical order.                      |

Tighten in numerical order shown in the figure.









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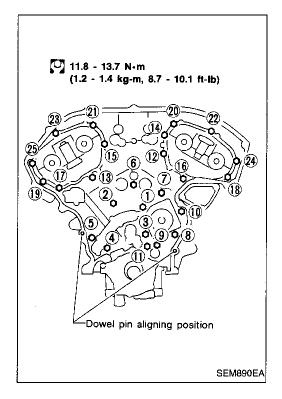
# Installation (Cont'd)

Engine front

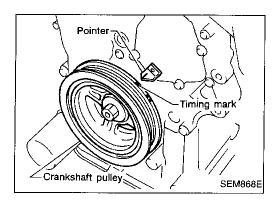
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10. Install O-rings to cylinder block.

- 11. Apply sealant to the hatched portion of rear timing chain case.
- Apply continuous bead of liquid gasket to mating surface of rear timing chain case.
   Refer to "POSITION FOR APPLYING LIQUID GASKET", (EM-18).
- Before installation, wipe off the protruding sealant.



- 12. Align rear timing chain case with dowel pins, then install on cylinder head and block.
- 13. Tighten rear chain case bolts.
  - (1) Tighten bolts in numerical order shown in the figure.
  - (2) Repeat above step (1).
- This installation is the same procedure as that for timing chain.
   Refer to "Installation" in "TIMING CHAIN" (EM-26).



### Checking

Valve

Crank

position
No. 1 TDC

No. 1

INT EXH

 $\bigcirc$ 

Check valve clearance while engine is cold and not running.

- 1. Remove intake manifold collector.
- 2. Remove rocker ornament covers.
- Remove RH and LH rocker covers.

4. Remove all spark plugs.

5. Set No. 1 cylinder at TDC on its compression stroke.

Align pointer with TDC mark on crankshaft pulley.

Check only those valves shown in the figure.

 $\bigcirc$ 

No. 3

INT EXH

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No. 4

No. 5

INT EXH INT EXH

No. 2

INT EXH

 Check that valve lifters on No. 1 cylinder are loose and valve lifters on No. 4 are tight.

If not, turn crankshaft one revolution (360°) and align as above.



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No. 6

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Using a feeler gauge, measure clearance between valve lifter and camshaft.

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Record any valve clearance measurements which are out of specification. They will be used later to determine the required replacement adjusting shim.

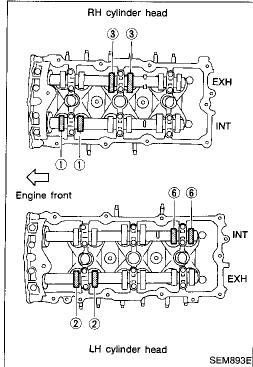
Valve clearance for checking (Cold):

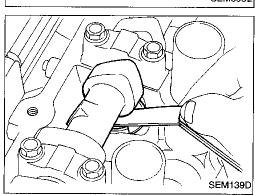
Intake

0.26 - 0.34 mm (0.010 - 0.013 in)

Exhaust

0.29 - 0.37 mm (0.011 - 0.015 in)



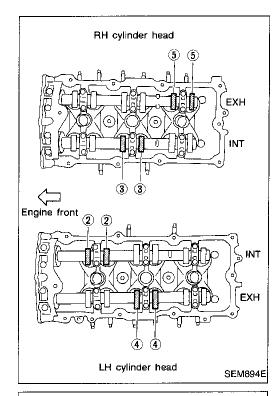


### **VALVE CLEARANCE**

# Checking (Cont'd)

- 7. Turn crankshaft 240° and align as above.
- 8. Set No. 3 cylinder at TDC on its compression stroke.
- 9. Check only those valves shown in the figure.

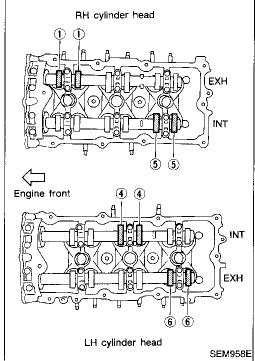
| Valve             |       | No  | o. 1 | No  | o. 2 | No  | э. З | No  | , 4 | No  | ). 5 | No  | . 6 |
|-------------------|-------|-----|------|-----|------|-----|------|-----|-----|-----|------|-----|-----|
| Crank<br>position |       | INT | EXH  | INT | EXH  | INT | EXH  | INT | EXH | INT | EXH  | INT | EXH |
| No.               | 3 TDC |     |      | 0   |      | 0   |      |     | 0   |     | 0    |     |     |

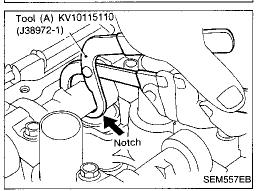


- 10. Turn crankshaft 240° and align as above.
- 11. Set No. 5 cylinder at TDC on its compression stroke.
- 12. Check only those valves shown in the figure.

| Valve<br>Crank | No  | o. 1 | No  | ). 2 | No  | o. 3 | No  | ). 4 | No  | . 5 | No  | . 6 |
|----------------|-----|------|-----|------|-----|------|-----|------|-----|-----|-----|-----|
| position       | INT | EXH   INT | EXH |
| No. 5 TDC      |     | 0    |     |      |     |      | 0   |      | 0   |     |     | 0   |

- 13. If all valve clearances are within specification, install the following parts.
- Intake manifold collector
- RH and LH rocker covers
- All spark plugs
- Rocker cover ornament





# **Adjusting**

Adjust valve clearance while engine is cold.

- 1. Turn crankshaft, to position cam lobe on camshaft of valve that must be adjusted upward.
- Place Tool (A) around camshaft as shown in figure.

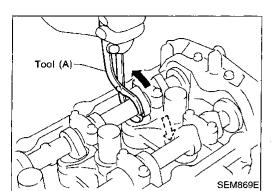
Before placing Tool (A), rotate notch toward center of cylinder head (See figure.), to simplify shim removal later.

### **CAUTION:**

Be careful not to damage cam surface with Tool (A).

### VALVE CLEARANCE

# Adjusting (Cont'd)

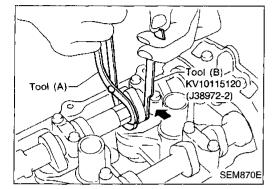


3. Rotate Tool (A) (See figure.) so that valve lifter is pushed down.



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Place Tool (B) between camshaft and the edge of the valve lifter to retain valve lifter.

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### **CAUTION:**

Tool (B) must be placed as close to camshaft bracket as possible.

EC

Be careful not to damage cam surface with Tool (B).

FE

Remove Tool (A).

CL

Blow air into the hole to separate adjusting shim from valve lifter.

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- Remove adjusting shim using a small screwdriver and a mag-BR
- Determine replacement adjusting shim size following formula. Using a micrometer determine thickness of removed shim.

ST

Calculate thickness of new adjusting shim so valve clearance comes within specified values.

RS

R = Thickness of removed shim

N = Thickness of new shim

M = Measured valve clearance Intake:

BT

N = R + [M - 0.30 mm (0.0118 in)]

HA

Exhaust:

lated value.

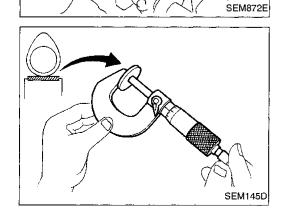
netic finger.

N = R + [M - 0.33 mm (0.0130 in)]

EL,

Shims are available in 64 sizes from 2.32 mm (0.0913 in) to 2.95 mm (0.1161 in), in steps of 0.01 mm (0.0004 in). Select new shim with thickness as close as possible to calcu-

IDX

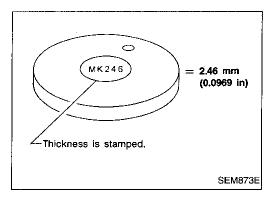


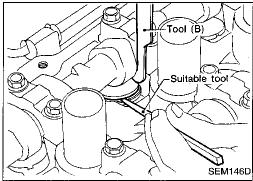
Magnetic finger

123 EM-49

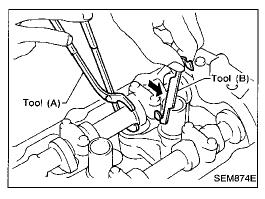
# **VALVE CLEARANCE**

# Adjusting (Cont'd)





- Install new shim using a suitable tool.
- Install with the surface on which the thickness is stamped facing down.



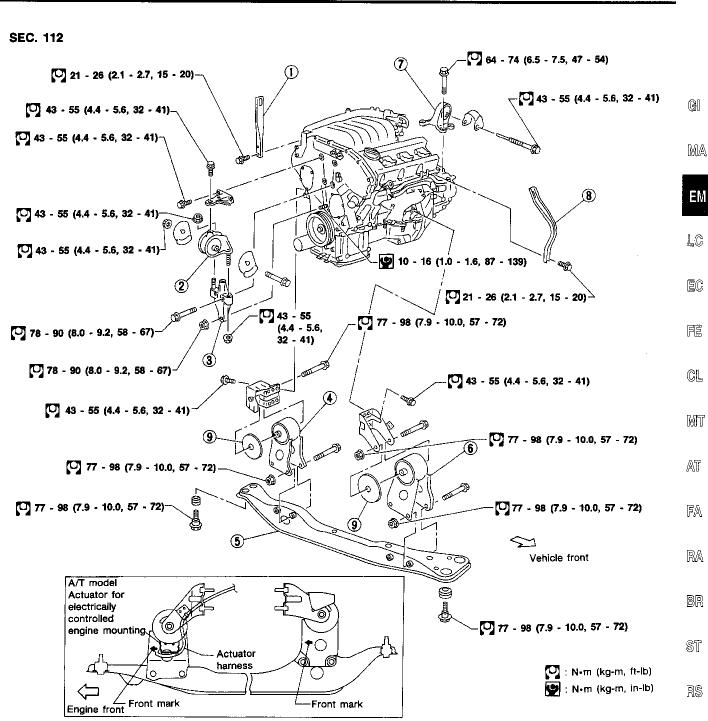
- 10. Place Tool (A) as mentioned in steps 2 and 3.
- 11. Remove Tool (B).12. Remove Tool (A).
- 13. Recheck valve clearance.

### Valve clearance:

Unit: mm (in)

|         | Çold                        | Hot* (reference data)         |
|---------|-----------------------------|-------------------------------|
| Intake  | 0.26 - 0.34 (0.010 - 0.013) | 0.304 - 0.416 (0.012 - 0.016) |
| Exhaust | 0.29 - 0.37 (0.011 - 0.015) | 0.308 - 0.432 (0.012 - 0.017) |

<sup>\*:</sup> Approximately 80°C (176°F)



- Front upper engine slinger
- <u>Ž</u> RH engine mounting
- 3 Mounting bracket
- Rear engine mounting (Fluid type)
- Center member
- Front engine mounting (Fluid type)
- LH engine mounting
- Rear engine slinger
- Insulator

EC

**CL** 

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MEM110AA BT

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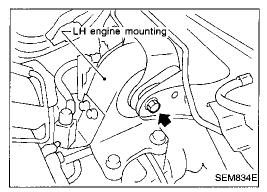
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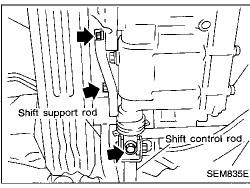
### WARNING:

- 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 "Fuel Pressure Release", "BASIC SERVICE PROCEDURE" in EC section.
- Before removing front axle from transaxle, place safety stands under designated front supporting points. Refer to GI section for lifting points and towing.
- Be sure to hoist engine and transaxle 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 careful not to strike adjacent parts, especially the following: Accelerator wire casing, brake lines, and brake master cylinder.
- In hoisting the engine, always use engine slingers in a safe manner.
- In removing drive shaft, be careful not to damage grease seal of transaxle.



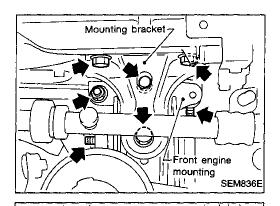


### Removal

- 1. Remove engine undercover and hood.
- 2. Drain coolant from both cylinder block and radiator.
- 3. Remove vacuum hoses, fuel hoses, wires, harnesses, connectors and so on.
- 4. Remove front exhaust tubes, ball joints and drive shafts.
- 5. Remove radiator and fans.
- 6. Remove drive belts.
- 7. Remove alternator, compressor and power steering oil pump from engine.
- 8. Set a suitable transmission jack under transaxle. Hoist engine with engine slinger.
- 9. Remove rear engine mounting.
- Disconnect control rod and support rod from transaxle (M/T model).
- 11. Disconnect control cable from transaxle (A/T model).

# **ENGINE REMOVAL**

# Removal (Cont'd)



SEM837E

12. Remove front engine mounting.

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13. Remove center member and then slowly lower transmission jack.

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14. Remove engine with transaxle as shown.

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# Installation

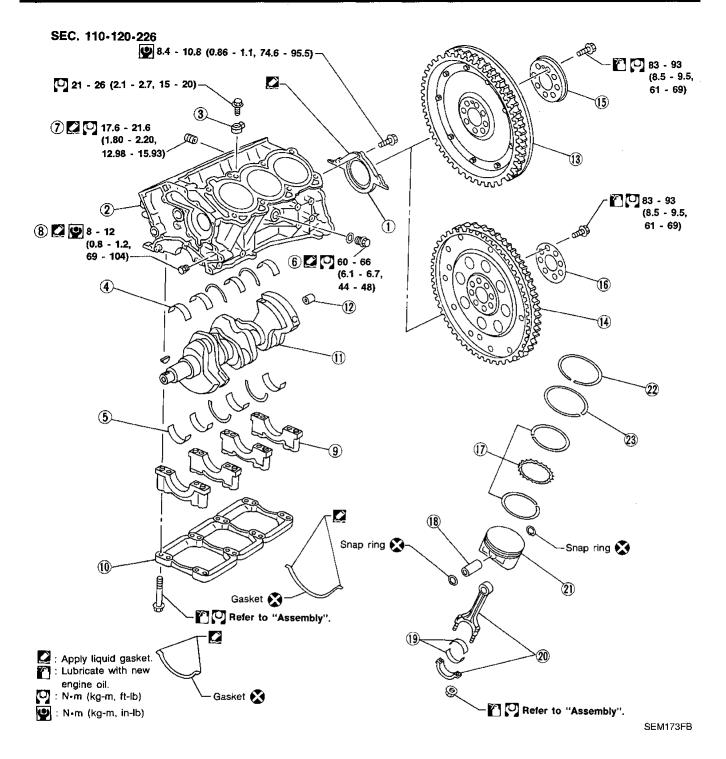
Installation is in the reverse order of removal.

Transmission jack

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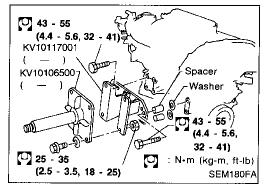
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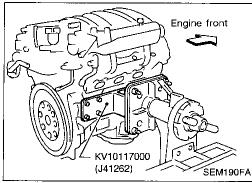


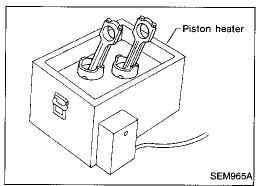
- Rear oil seal retainer
- 2 Cylinder block
- Knock sensor
- 4 Upper main bearing
- Lower main bearing
- Water drain plug (LH side)
- Water drain plug (RH side)
- Water drain plug (Water pump side)

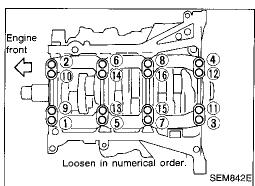
- Main bearing cap
- 10 Main bearing beam
- 1 Crankshaft
- Pilot bushing or pilot converter
- Flywheel with signal plate (M/T models)
- Drive plate with signal plate (A/T model)
- Flywheel reinforcement

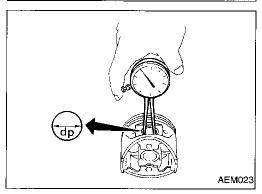
- Drive plate reinforcement
- 17 Oil ring
- 18) Piston pin
- Connecting rod bearing
- Connecting rod
- 21) Piston
- 2 Top ring
- 2nd ring











### **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.
- Do not allow any magnetic materials to contact the signal plate teeth of flywheel or drive plate.

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# Disassembly

### **PISTON AND CRANKSHAFT**

- Remove engine. Refer to "ENGINE REMOVAL" (EM-51).
- 2. Place engine on a work stand.
- 3. Drain coolant and oil.
- 4. Remove oil pan. Refer to "Removal" in "OIL PAN" (EM-11).
- Remove timing chain. Refer to "Removal" in "TIMING CHAIN" (EM-19).
- 6. Remove cylinder head. Refer to "Removal" in "TIMING CHAIN" (EM-19).



- 7. 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).
- Remove rear oil seal retainer.

### **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.



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- Remove main bearing beam, cap and crankshaft.
- Before removing bearing beam and bearing cap, measure crankshaft end play. Refer to EM-62.
- Bolts should be loosened in two or three steps.

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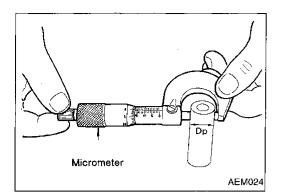
# Inspection

### **PISTON AND PISTON PIN CLEARANCE**

- Measure inner diameter of piston pin hole "dp". Standard diameter "dp":
  - 21.993 22.005 mm (0.8659 0.8663 in)

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# Inspection (Cont'd)

Measure outer diameter of piston pin "Dp".

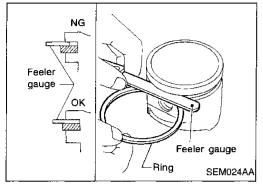
Standard diameter "Dp":

21.989 - 22.001 mm (0.8657 - 0.8662 in)

3. Calculate piston pin clearance.

 $Dp - dp = 0.002 - 0.006 \, mm \, (0.0001 - 0.0002 \, in)$ 

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



### PISTON RING SIDE CLEARANCE

Side clearance:

Top ring

0.040 - 0.080 mm (0.0016 - 0.0031 in)

2nd ring

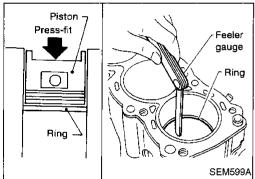
0.030 - 0.070 mm (0.0012 - 0.0028 in)

Max. limit of side clearance:

Top ring 0.11 mm (0.0043 in)

2nd ring 0.1 mm (0.004 in)

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



### PISTON RING END GAP

End gap:

Top ring 0.22 - 0.32 mm (0.0087 - 0.0126 in)

2nd ring 0.32 - 0.47 mm (0.0126 - 0.0185 in)

Oil ring 0.20 - 0.60 mm (0.0079 - 0.0236 in)

Max. limit of ring gap:

Top ring 0.55 mm (0.0217 in)

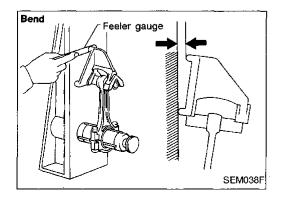
2nd ring 0.85 mm (0.0335 in)

Oil ring 0.95 mm (0.0374 in)

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

### Refer to SDS (EM-70).

When replacing the piston, check the cylinder block surface for scratches or seizure. If scratches or seizure is found, hone or replace the cylinder block.



### CONNECTING ROD BEND AND TORSION

Bend:

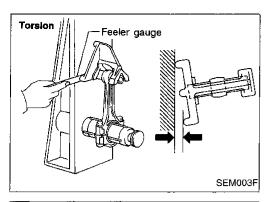
Limit 0.15 mm (0.0059 in) per 100 mm (3.94 in) length

Torsion:

Limit 0.30 mm (0.0118 in)

per 100 mm (3.94 in) length

If it exceeds the limit, replace connecting rod assembly.





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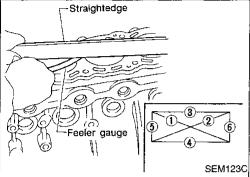
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### CYLINDER BLOCK DISTORTION AND WEAR

Clean upper surface of cylinder block.

Use a reliable straightedge and feeler gauge to check the flatness of cylinder block surface.

Check along six positions shown in the figure.

Distortion limit: 0.10 mm (0.0039 in) If out of specification, resurface it. The limit for cylinder block resurfacing is determined by cylinder head resurfacing in engine.

Resurfacing limit:

Amount of cylinder head resurfacing is "A". Amount of cylinder block resurfacing is "B".

The maximum limit is as follows:

A + B = 0.2 mm (0.008 in)

Nominal cylinder block height from crankshaft center: 214.95 - 215.05 mm (8.4626 - 8.4665 in) Refer to SDS, (EM-69).

If necessary, replace cylinder block.



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Using a bore gauge, measure cylinder bore for wear, out- ofround and taper.

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|---|----------|---------|
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|   |          |         |
|   |          |         |
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# Cylinder bore inner diameter

| Grade No. | Standard inner diameter                 | Wear limit          |
|-----------|---|---------------------|
| No. 1     | 93.000 - 93.010 mm (3.6614 - 3.6618 in) |                     |
| No. 2     | 93.011 - 93.020 mm (3.6618 - 3.6622 in) | 0.20 mm (0.0079 in) |
| No. 3     | 93.021 - 93.030 mm (3.6622 - 3.6626 in) |                     |

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

> Out-of-round (X - Y): Limit 0.015 mm (0.0006 in) Taper (A - B - C):

> > Limit 0.015 mm (0.0006 in)

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





Unit: mm (in)

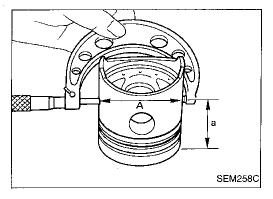
SEM321AA

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# Engine front Cylinder bore grade number No. 6 cylinder bore grade number No. 1 cylinder bore grade number SEM174F

# Inspection (Cont'd)

 If both cylinder block and piston are replaced with new ones, select piston of the same grade number punched on cylinder block rear position. These numbers are punched in either Arabic or Roman numerals.



Measure piston skirt diameter.

Piston diameter "A": Refer to SDS (EM-70). Measuring point "a" (Distance from the top): 45.4 mm (1.787 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)

Determine piston oversize according to amount of cylinder wear.

Oversize pistons are available for service. Refer to SDS (EM-70).

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

Rebored size calculation: D = A + B - C where.

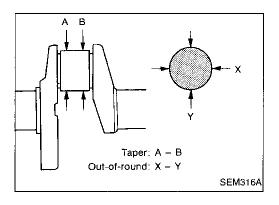
D: Bored diameter

A: Piston diameter as measured

B: Piston-to-bore clearance

C: Honing allowance 0.02 mm (0.0008 in)

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



### **CRANKSHAFT**

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

Out-of-round (X – Y):
 Standard
 0.002 mm (0.0001 in)
Taper (A – B):
 Standard
 0.002 mm (0.0001 in)

# Inspection (Cont'd)

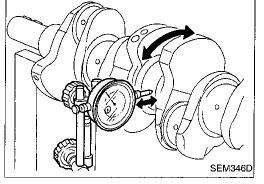
3. Measure crankshaft runout.

Runout (Total indicator reading): Limit: 0.10 mm (0.0039 in)

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### Upper main bearing \*: With oil (With oil groove) No. 3\* aroove No. 2\* No 1 No. 3 Lower main bearing No. 2 (Without oil groove) No. 1 SEM175F

### **BEARING CLEARANCE**

Use either of the following two methods, however, method "A" gives more reliable results and is preferable.

# Method A (Using bore gauge & micrometer)

Main bearing

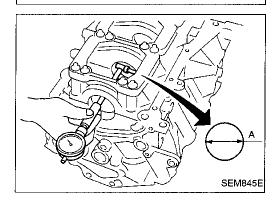
Set main bearings in their proper positions on cylinder block

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and main bearing cap.

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Install main bearing cap and bearing beam to cylinder block. Tighten all bolts in correct order.

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

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- Measure outer diameters "Dm" of each crankshaft main jour-BR
- Calculate main bearing clearance.

Main bearing clearance = A - Dm

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Standard: 0.012 - 0.030 mm (0.0005 - 0.0012 in) Limit: 0.065 mm (0.0026 in)

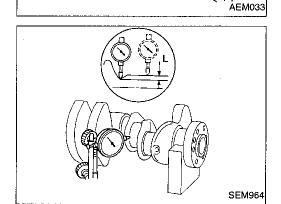
If it exceeds the limit, replace bearing.

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If clearance cannot be adjusted using any standard bearing grade, grind crankshaft journal and use undersized bearing.

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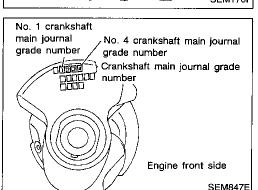
When grinding crankshaft journal, confirm that "L" dimension in fillet roll is more than the specified limit.

"L": 0.1 mm (0.004 in)

Refer to SDS for grinding crankshaft and available service parts.

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# Main journal grade //// No. 4 main journal grade number No. 1 main journal grade number Engine front SEM176F



# Inspection (Cont'd)

6. If crankshaft is reused, measure main bearing clearances and select thickness of main bearings.

If crankshaft is replaced with a new one, select thickness of main bearings as follows:

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.

- Grade number of each crankshaft main journal is punched on the respective crankshaft. These numbers are punched in either Arabic or Roman numerals.
- Select main bearing with suitable thickness according to the following calculation or table.

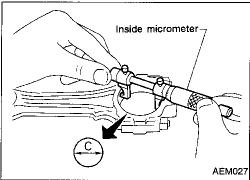
Example of calculation:

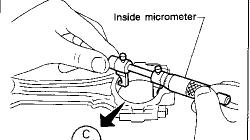
Cylinder block main journal grade number: 1 Crankshaft main journal grade number: 2 Main bearing grade number = 1 + 2 = 3 (Yellow)

### Main bearing grade number (Identification color):

These numbers are punched in either Arabic or Roman numerals.

|            |     | Cylind     | er block main | journal grade | number     |
|------------|-----|------------|---------------|---------------|------------|
|            |     | "0"        | 14-4-77       | "2"           | "3"        |
| Crankshaft | "0" | 0 (Black)  | 1 (Brown)     | 2 (Green)     | 3 (Yellow) |
| main jour- | "1" | 1 (Brown)  | 2 (Green)     | 3 (Yellow)    | 4 (Blue)   |
| nal grade  | "2" | 2 (Green)  | 3 (Yellow)    | 4 (Blue)      | 5 (pink)   |
| number     | "3" | 3 (Yellow) | 4 (Blue)      | 5 (Pink)      | 6 (Purple) |





# **AEM034**

# Connecting rod bearing (Big end)

- Install connecting rod bearing to connecting rod and cap.
- Install connecting rod cap to connecting rod.

### Tighten bolts to the specified torque.

Measure inner diameter "C" of connecting rod.

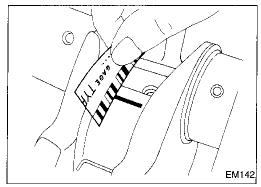
- Measure outer diameter "Dp" of each crankshaft pin journal.
- Calculate connecting rod bearing clearance.

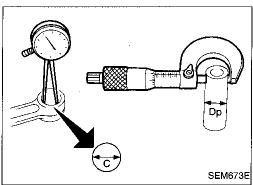
Connecting rod bearing clearance = C - Dp

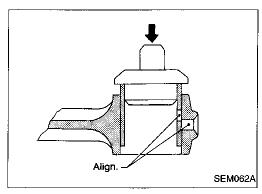
Standard: 0.020 - 0.045 mm (0.0008 - 0.0018 in) Limit: 0.070 mm (0.0028 in)

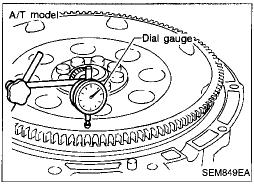
- If it exceeds the limit, replace bearing.
- If clearance cannot be adjusted within the standard of any bearing, grind crankshaft journal and use undersized bearing. Refer to "BEARING CLEARANCE — Main bearing" (EM-59).

# No. 6 cylinder crankshaft pin journal grade number Control grade number No. 1 cylinder crankshaft pin journal grade number Engine front side SEM848E









# Inspection (Cont'd)

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

### Connecting rod bearing grade number (Identification color):

These numbers are punched in either Arabic or Roman numerals.

| Crankshaft pin journal grade number | Connecting rod bearing grade number |
|-------------------------------------|-------------------------------------|
| 0                                   | 0 (Black)                           |
| 1                                   | 1 (Brown)                           |
| 2                                   | 2 (Green)                           |

# 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 incorrect bearing clearance exists, use a thicker or undersized main bearing to ensure specified clearance.

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

- Measure inner diameter "C" of bushing.
- 2. Measure outer diameter "Dp" of piston pin.
- Calculate connecting rod bushing clearance.
   Connecting rod bushing clearance = C Dp

Standard: 0.005 - 0.017 mm (0.0002 - 0.0007 in) Limit: 0.030 mm (0.0012 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. After driving in small end bushing, ream the bushing. This is to ensure the clearance between connecting rod bushing and piston pin is the specified value.
  - Clearance between connecting rod bushing and piston pin: 0.005 0.017 mm (0.0002 0.0007 in)

### FLYWHEEL/DRIVE PLATE RUNOUT

Runout (Total indicator reading): Flywheel (M/T model)★

Less than 0.15 mm (0.0059 in)

Drive plate (A/T model)
Less than 0.15 mm (0.0059 in)

★ Measurement position:

Approximately 145 mm (5.71 in) from the crankshaft center CAUTION:

The signal plate is built into the flywheel assembly. Be

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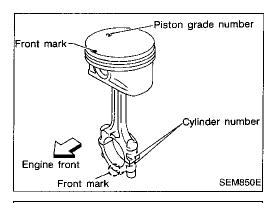
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# Inspection (Cont'd)

careful not to damage the signal plate, especially the teeth.

- Check the drive plate for deformation or cracks.
- Never place the flywheel assembly with the signal plate facing down.
- Keep any magnetized objects away from the signal plate.
- Do not allow any magnetic materials to contact the signal plate teeth.
- Do not surface flywheel. Replace as necessary.



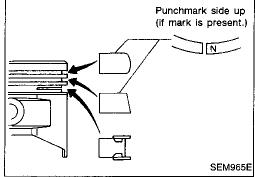
# **Assembly**

### **PISTON**

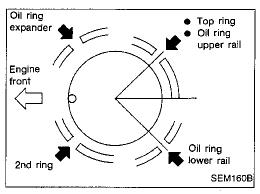
- 1. Install new snap ring on one side of piston pin hole.
- 2. Heat piston to 60 to 70°C (140 to 158°F) and assemble piston, piston pin, connecting rod and new snap ring.
- Align the direction of piston and connecting rod.
- Numbers stamped on connecting rod and cap correspond to each cylinder.
- After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



- When piston rings are not replaced, make sure that piston rings are mounted in their original positions.
- When replacing piston rings, these without punchmarks, present, piston rings can be mounted with either side up.

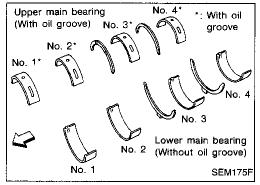


 Align piston rings so that end gaps are positioned as shown in the figure.



# CRANKSHAFT

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



# Assembly (Cont'd)

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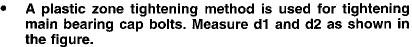
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SEM852E

Measuring

point

Instructions for re-use of main bearing cap bolts.

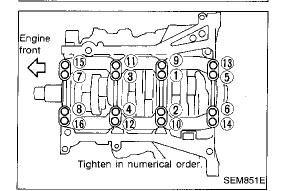


d2: Select minimum diameter in the measuring area. If the difference between d1 and d2 exceeds the limit, replace the bolts with new ones.

Limit (d1 - d2): 0.11 mm (0.0043 in)

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area

Unit: mm (in)

(0.79)

Measuring

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(1.18)

After installing crankshaft, main bearing cap, main bearing beam and bearing cap bolts, tighten bearing cap bolts in numerical order.

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Tightening procedure

(1) Tighten all bolts to 32 to 38 N·m (3.3 to 3.9 kg-m, 24 to 28 ft-lb).

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(2) Turn all bolts 90 to 95 degrees clockwise with angle wrench.

FE

Prior to tightening bearing cap bolts, place bearing beam in its proper position by shifting crankshaft in the axial direction.

GL.

After securing bearing cap bolts, make sure crankshaft turns smoothly by hand.

Wh

Lubricate threads and seat surfaces of the bolts with new engine oil.

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Measure crankshaft end play.

Crankshaft end play:

Standard: 0.10 - 0.25 mm (0.0039 - 0.0098 in)

Limit: 0.30 mm (0.0118 in)

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

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

Confirm that correct bearings are used.

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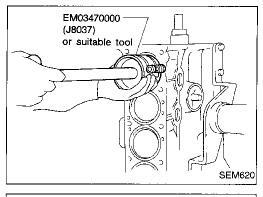
Install pistons with connecting rods. Install them into corresponding cylinders with Tool.

ST

Be careful not to scratch cylinder wall with the connecting

Arrange so that front mark on piston head faces toward engine front.

RS 87



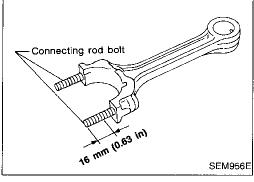
A plastic zone tightening method is used for tightening connecting rod bolts and nuts. Check the old bolts for deformation before re-using them.

Ensure that the connecting rod nut can be screwed smoothly as far as the bolt thread end.

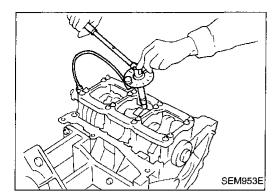
If this is not possible, use slide calipers to measure the outside diameter of the narrowest thread part of the bolt at 16 mm (0.63 in) from the thread end. Replace the connecting rod bolt and nut, if under the limit.

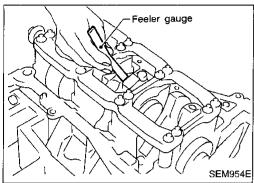
Standard: 7.90 - 8.00 mm (0.3110 - 0.3150 in)

Limit: 7.75 mm (0.3051 in)



# Assembly (Cont'd)





c. Install connecting rod caps.

Lubricate threads and seat surfaces with new engine oil.

Tighten connecting rod bearing cap nuts to the specified torque.

Connecting rod bearing nut:

(1) Tighten nuts to 19 to 21 N·m (1.9 to 2.1 kg-m, 14 to 15 ft-lb).

(2) Turn nuts 90 to 95 degrees clockwise with angle wrench

7. Measure connecting rod side clearance.

Connecting rod side clearance:

Standard

0.20 - 0.35 mm (0.0079 - 0.0138 in)

Limit

0.40 mm (0.0157 in)

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

8. Install rear oil seal retainer.

EM-64 138

# **General Specifications**

| Cylinder arrangement   |             | V-6                      |
|------------------------|-------------|--------------------------|
| Displacement           | cm³ (cu in) | 2,988 (182.33)           |
| Bore and stroke        | mm (in)     | 93 x 73.3 (3.66 x 2.886) |
| Valve arrangement      |             | DOHC                     |
| Firing order           |             | 1-2-3-4-5-6              |
| Number of piston rings |             |                          |
| Compression            |             | 2                        |
| Oil                    |             | 1                        |
| Number of main bearin  | gs          | 4                        |
| Compression ratio      |             | 10.0                     |

# **COMPRESSION PRESSURE**

|   | Unit: kPa (kg/cm², psi)/300 rpm |
|---|---------------------------------|
| Compression pressure                    |                                 |
| Standard                                | 1,275 (13.0, 185)               |
| Minimum                                 | 981 (10.0, 142)                 |
| Differential limit between<br>cylinders | 98 (1.0, 14)                    |

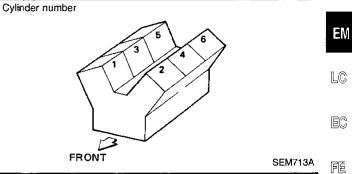
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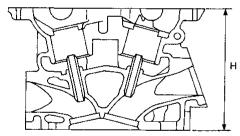
Unit: mm (in)



# **Inspection and Adjustment**

### **CYLINDER HEAD**

|                         |                            | Offic friff (in |
|-------------------------|----------------------------|-----------------|
|                         | Standard                   | Limit           |
| Head surface distortion | Less than<br>0.03 (0.0012) | 0.1 (0.004)     |



Nominal cylinder head height: H = 126.3 - 126.5 mm (4.972 - 4.980 in)

SEM949E

# **VALVE**

| T (Margin thickness)                     |                                 | MT     |
|--|---------------------------------|--------|
| α  |                                 | AT     |
|  | <u> </u>                        | FA     |
|  |                                 | RA     |
|  | SEM188                          | BR     |
| Valve head diameter "D"                  |                                 |        |
| Intake                                   | 36.0 - 36.3 (1.417 - 1.429)     | ST     |
| Exhaust                                  | 31.2 - 31.5 (1.228 - 1.240)     | Ø.(    |
| Valve length "L"                         |                                 |        |
| Intake                                   | 97.32 - 97.82 (3.8315 - 3.8512) | R\$    |
| Exhaust                                  | 94.85 - 95.35 (3.7342 - 3.7539) |        |
| Valve stem diameter "d"                  |                                 |        |
| Intake                                   | 5.965 - 5.980 (0.2348 - 0.2354) |        |
| Exhaust                                  | 5.945 - 5.960 (0.2341 - 0.2346) |        |
| Valve seat angle "α"                     |                                 | 0.0.6  |
| Intake                                   | 45°15′ - 45°45′                 | HA     |
| Exhaust                                  |                                 |        |
| Valve margin "T"                         |                                 |        |
| Intake                                   | 0.95 - 1.25 (0.0374 - 0.0492)   | الا    |
| Exhaust                                  | 1.15 - 1.45 (0.0453 - 0.0571)   |        |
| Valve margin "T" limit                   | More than 0.5 (0.020)           |        |
| Valve stem end surface grinding<br>limit | Less than 0.2 (0.008)           | ישפונו |
| Valve clearance (Cold)                   |                                 |        |
| Intake                                   | 0.26 - 0.34 (0.010 - 0.013)     |        |
| Exhaust                                  | 0.29 - 0.37 (0.011 - 0.015)     |        |
|  |                                 |        |

**EM-65** 139

# Inspection and Adjustment (Cont'd)

### Valve clearance

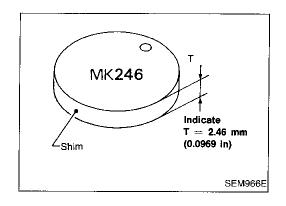
| _       | Unit: mm (                     |                                  |  |
|---------|--------------------------------|----------------------------------|--|
|         | Cold                           | Hot* (reference data)            |  |
| Intake  | 0.26 - 0.34<br>(0.010 - 0.013) | 0.304 - 0.416<br>(0.012 - 0.016) |  |
| Exhaust | 0.29 - 0.37<br>(0.011 - 0.015) | 0.308 - 0.432<br>(0.012 - 0.017) |  |

<sup>\*:</sup> Approximately 80°C (176°F)

### Available shims

| Thickness mm (in) | Identification mark |
|-------------------|---------------------|
| 2.32 (0.0913)     | 232                 |
| 2.33 (0.0917)     | 233                 |
| 2.34 (0.0921)     | 234                 |
| 2.35 (0.0925)     | 235                 |
| 2.36 (0.0929)     | 236                 |
| 2.37 (0.0933)     | 237                 |
| 2.38 (0.0937)     | 238                 |
| 2.39 (0.0941)     | 239                 |
| 2.40 (0.0945)     | 240                 |
| 2.41 (0.0949)     | 241                 |
| 2.42 (0.0953)     | 242                 |
| 2.43 (0.0957)     | 243                 |
| 2.44 (0.0961)     | 244                 |
| 2.45 (0.0965)     | 245                 |
| 2.46 (0.0969)     | 246                 |
| 2.47 (0.0972)     | 247                 |
| 2.48 (0.0976)     | 248                 |
| 2.49 (0.0980)     | 249                 |
| 2.50 (0.0984)     | 250                 |
| 2.51 (0.0988)     | 251                 |
| 2.52 (0.0992)     | 252                 |
| 2.53 (0.0996)     | 253                 |
| 2.54 (0.1000)     | 254                 |
| 2.55 (0.1004)     | 255                 |
| 2.56 (0.1008)     | 256                 |
| 2.57 (0.1012)     | 257                 |
| 2.58 (0.1016)     | 258                 |
| 2.59 (0.1020)     | 259                 |
| 2.60 (0.1024)     | 260                 |
| 2.61 (0.1028)     | 261                 |
| 2.62 (0.1031)     | 262                 |
| 2.63 (0.1035)     | 263                 |
| 2.64 (0.1039)     | 264                 |

| Thickness mm (in) | Identification mark |
|-------------------|---------------------|
| 2.65 (0.1043)     | 265                 |
| 2.66 (0.1047)     | 266                 |
| 2.67 (0.1051)     | 267                 |
| 2.68 (0.1055)     | 268                 |
| 2.69 (0.1059)     | 269                 |
| 2.70 (0.1063)     | 270                 |
| 2.71 (0.1067)     | 271                 |
| 2.72 (0.1071)     | 272                 |
| 2.73 (0.1075)     | 273                 |
| 2.74 (0.1079)     | 274                 |
| 2.75 (0.1083)     | 275                 |
| 2.76 (0.1087)     | 276                 |
| 2.77 (0.1091)     | 277                 |
| 2.78 (0.1094)     | 278                 |
| 2.79 (0.1098)     | 279                 |
| 2.80 (0.1102)     | 280                 |
| 2.81 (0.1106)     | 281                 |
| 2.82 (0.1110)     | 282                 |
| 2.83 (0.1114)     | 283                 |
| 2.84 (0.1118)     | 284                 |
| 2.85 (0.1122)     | 285                 |
| 2.86 (0.1126)     | 286                 |
| 2.87 (0.1130)     | 287                 |
| 2.88 (0.1134)     | 288                 |
| 2.89 (0.1138)     | 289                 |
| 2.90 (0.1142)     | 290                 |
| 2.91 (0.1146)     | 291                 |
| 2.92 (0.1150)     | 292                 |
| 2.93 (0.1154)     | 293                 |
| 2.94 (0.1157)     | 294                 |
| 2.95 (0.1161)     | 295                 |



# **Inspection and Adjustment (Cont'd)**

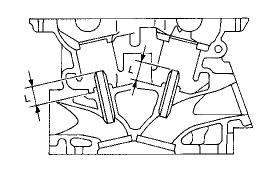
# Valve spring

| Free                                  | height    | mm (in)          | 46.93 (1.8476)                         |
|---------------------------------------|-----------|------------------|--|
| Pressure N (kg, lb) at height mm (in) |           | t height mm (in) |  |
| ţ                                     | Standard  |                  | 454 (46.3, 102.1)<br>at 27.55 (1.0846) |
| l                                     | Limit     |                  | 428 (43.7, 96.2) at<br>27.55 (1.0846)  |
| Out-                                  | of-square | mm (in)          | Less than 2.0 (0.079)                  |

# Valve lifter

|   | Unit: mm (in)                        |
|---|--------------------------------------|
| Valve lifter outer diameter               | 34.960 - 34.975<br>(1.3764 - 1.3770) |
| Lifter guide inner diameter               | 35.000 - 35.021<br>(1.3780 - 1.3788) |
| Clearance between lifter and lifter guide | 0.025 - 0.061<br>(0.0010 - 0.0024)   |

# Valve guide





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ST

RS

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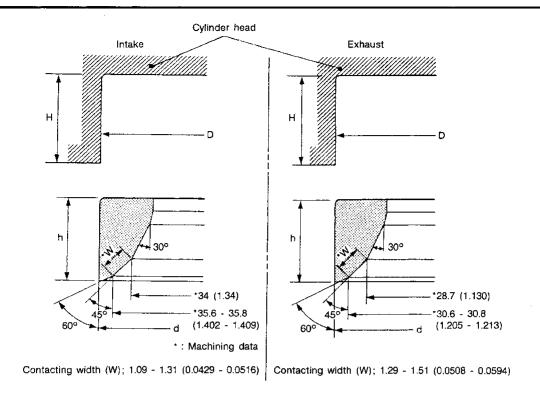
Unit: mm (in)

|   |         | Standard                             | Service                              |  |
|---|---------|--------------------------------------|--------------------------------------|--|
| Valve guide                             |         |                                      |                                      |  |
| Outer diame                             | ter     | 10.023 - 10.034<br>(0.3946 - 0.3950) | 10.223 - 10.234<br>(0.4025 - 0.4029) |  |
| Valve guide                             |         |                                      |                                      |  |
| Inner diameter<br>(Finished size)       |         | 6.000 -<br>(0.2362 -                 |                                      |  |
| Cylinder head valve guide hole diameter |         | 9.975 - 9.996<br>(0.3927 - 0.3935)   | 10.175 - 10.196<br>(0.4006 - 0.4014) |  |
| Interference fit of valve guide         |         | 0.027 - 0.059<br>(0.0011 - 0.0023)   |                                      |  |
|   |         | Standard                             | Max. tolerance                       |  |
| Stem to guide                           | Intake  | 0.020 - 0.053<br>(0.008 - 0.0021)    | 0.08 (0.0031)                        |  |
| clearance                               | Exhaust | 0.040 - 0.073<br>(0.0016 - 0.0029)   | 0.1 (0.004)                          |  |
| Valve deflection                        | Intake  | _                                    | 0.24 (0.0094)                        |  |
| limit                                   | Exhaust | _                                    | 0.28 (0.0110)                        |  |
| Projection length "L"                   |         | 12.6 - 12.8 (0.496 - 0.504)          |                                      |  |

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# Inspection and Adjustment (Cont'd)

# **VALVE SEAT**



SEM021EA

Unit: mm (in)

|  |     |                                   | Onk. mm (i                        |
|--|-----|-----------------------------------|-----------------------------------|
|  |     | Standard                          | Service                           |
| Culinder hand cost rance diameter (D)  | ln. | 37.000 - 37.016 (1.4567 - 1.4573) | 37.500 - 37.516 (1.4764 - 1.4770) |
| Cylinder head seat recess diameter (D) | Ex. | 32.200 - 32.216 (1.2677 - 1.2683) | 32.700 - 32.716 (1.2874 - 1.2880) |
| Verbon and interference fit            | ln. | 0.081 - 0.113 (0.0032 - 0.0044)   |                                   |
| Valve seat interference fit            | Ex. | 0.064 - 0.096 (0.0025 - 0.0038)   |                                   |
| 24.                                    | ln. | 37.097 - 37.113 (1.4605 - 1.4611) | 37.597 - 37.613 (1.4802 - 1.4808) |
| Valve seat outer diameter (d)          | Ex. | 32.280 - 32.296 (1.2709 - 1.2715) | 32.780 - 32.796 (1.2905 - 1.2912) |
| Initiat (b)                            | ln. | 5.9 - 6.0 (0.232 - 0.236)         | 5.05 - 5.15 (0.1988 - 0.2028)     |
| Height (h)                             | Ex. | 5.9 - 6.0 (0.232 - 0.236)         | 4.95 - 5.05 (0.1949 - 0.1988)     |
| Depth (H)                              |     | 5.9 - 6.1 (0.232 - 0.240)         |                                   |

# Inspection and Adjustment (Cont'd) CYLINDER BLOCK

# **CAMSHAFT AND CAMSHAFT BEARING**

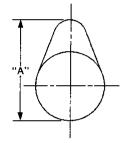
|   |  | Unit: mm (in) |
|---|--|---------------|
|   | Standard   | Limit         |
| Camshaft journal to bearing clearance   | 0.045 - 0.086<br>(0.0018 - 0.0034)   | 0.15 (0.0059) |
| Inner diameter of cam-<br>shaft bearing | No. 1<br>26.000 - 26.021<br>(1.0236 - 1.0244)<br>No. 2,3,4<br>23.500 - 23.521<br>(0.9252 - 0.9260) | _             |
| Outer diameter of cam-<br>shaft journal | No. 1<br>25.935 - 25.955<br>(1.0211 - 1.0218)<br>No. 2,3,4<br>23.435 - 23.455<br>(0.9226 - 0.9234) | _             |
| Camshaft runout [TIR*]                  | Less than 0.02 (0.0008)  | 0.05 (0.0020) |
| Camshaft sprocket runout [TIR*]         | Less than<br>0.15 (0.0059)   | _             |
| <del></del>                             |  |               |

0.115 - 0.188

(0.0045 - 0.0074)

0.24 (0.0094)

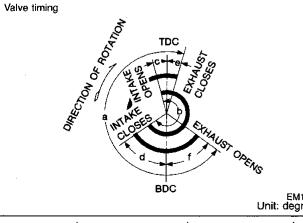
EM671



| Cam height "A"           |                                   |
|--------------------------|-----------------------------------|
| Intake & Exhaust         | 43.940 - 44.130 (1.7299 - 1.7374) |
| Wear limit of cam height | 0.2 (0.008)                       |

<sup>\*</sup>Total indicator reading

Camshaft end play



| _ | а   | b   | С | d  | е | f  |  |
|---|-----|-----|---|----|---|----|--|
| _ | 232 | 232 | 3 | 49 | 3 | 49 |  |

# Unit: mm (in)

|  |                                   | EM            |
|--|-----------------------------------|---------------|
|  | SEM022EA                          | LÇ            |
| Surface flatness                                       |                                   |               |
| Standard   | Less than 0.03 (0.0012)           |               |
| Limit  | 0.10 (0.0039)                     |               |
| Cylinder bore  |                                   |               |
| Inner diameter   |                                   | FE            |
| Standard   |                                   |               |
| Grade No. 1  | 93.000 - 93.010 (3.6614 - 3.6618) | CL            |
| Grade No. 2  | 93.011 - 93.020 (3.6618 - 3.6622) |               |
| Grade No. 3  | 93.021 - 93.030 (3.6622 - 3.6626) | MT            |
| Wear limit   | 0.20 (0.0079)                     | ,             |
| Out-of-round (X – Y)                                   | Less than 0.015 (0.0006)          | AT            |
| Taper (A - B - C)                                      | Less than 0.015 (0.0006)          | <i>t</i> =7.0 |
| Main journal inner diam-<br>eter                       |                                   |               |
| Grade No. 0  | 63.993 - 63.999 (2.5194 - 2.5196) |               |
| Grade No. 1  | 64.000 - 64.005 (2.5197 - 2.5199) | RA            |
| Grade No. 2  | 64.006 - 64.011 (2.5199 - 2.5201) | u ce u        |
| Grade No. 3  | 64.012 - 64.017 (2.5202 - 2.5203) | ത്ത           |
| Difference in inner<br>diameter between cylin-<br>ders |                                   | BR            |
| Standard   | Less than 0.03 (0.0012)           | ST            |

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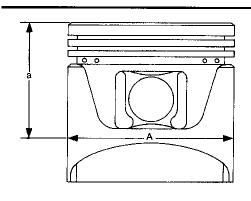
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# Inspection and Adjustment (Cont'd)

# PISTON, PISTON RING AND PISTON PIN

# Available piston

Unit: mm (in)



SEM882E

| Piston skirt diameter "A"           |                                   |
|-------------------------------------|-----------------------------------|
| Standard                            |                                   |
| Grade No. 1                         | 92.979 - 92.988 (3.6606 - 3.6609) |
| Grade No. 2                         | 92.988 - 93.000 (3.6609 - 3.6614) |
| Grade No. 3                         | 93.000 - 93.009 (3.6614 - 3.6618) |
| 0.20 (0.0079)<br>oversize (Service) | 93.180 - 93.210 (3.6685 - 3.6697) |
| "a" dimension                       | 45.4 (1.787)                      |
| Piston pin hole diameter            | 21.993 - 22.005 (0.8659 - 0.8663) |
| Piston clearance to cylinder block  | 0.010 - 0.030 (0.0004 - 0.0012)   |

# Piston ring

|                 |                                    | Unit: mm (in) |
|-----------------|------------------------------------|---------------|
|                 | Standard                           | Limit         |
| Side clearance  |                                    |               |
| Тор             | 0.040 - 0.080<br>(0.0016 - 0.0031) | 0.11 (0.0043) |
| 2nd             | 0.030 - 0.070<br>(0.0012 - 0.0028) | 0.1 (0.004)   |
| End gap         |                                    |               |
| Тор             | 0.22 - 0.32<br>(0.0087 - 0.0126)   | 0.55 (0.0217) |
| 2nd             | 0.32 - 0.47<br>(0.0126 - 0.0185)   | 0.85 (0.0335) |
| Oil (rail ring) | 0.20 - 0.60<br>(0.0079 - 0.0236)   | 0.95 (0.0374) |

# Piston pin

|  | Unit: mm (in)                     |
|--|-----------------------------------|
| Piston pin outer diameter                | 21.989 - 22.001 (0.8657 - 0.8662) |
| Interference fit of piston pin to piston | 0.002 - 0.006 (0.0001 - 0.0002)   |
| Piston pin to connecting rod             | 0.005 - 0.017 (0.0002 - 0.0007)   |

<sup>\*</sup>Values measured at ambient temperature of 20°C (68°F)

### **CONNECTING ROD**

Unit: mm (in)

| Center distance                         | 147.60 - 147.70 (5.8110 - 5.8149) |  |
|---|-----------------------------------|--|
| Bend [per 100 (3.94)]                   |                                   |  |
| Limit                                   | 0.15 (0.0059)                     |  |
| Torsion [per 100 (3.94)]                |                                   |  |
| Limît                                   | 0.30 (0.0118)                     |  |
| Connecting rod small end inner diameter | 23.980 - 24.000 (0.9441 - 0.9449) |  |
| Piston pin bushing inner diameter*      | 22.000 - 22.012 (0.8661 - 0.8666) |  |
| Connecting rod big end inner diameter   | 48.000 - 48.013 (1.8898 - 1.8903) |  |
| Side clearance                          |                                   |  |
| Standard                                | 0.20 - 0.35 (0.0079 - 0.0138)     |  |
| Limit                                   | 0.40 (0.0157)                     |  |

<sup>\*</sup>After installing in connecting rod

EM-70 144

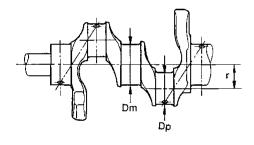
## **SERVICE DATA AND SPECIFICATIONS (SDS)**

# Inspection and Adjustment (Cont'd)

#### **CRANKSHAFT**

# AVAILABLE MAIN BEARING

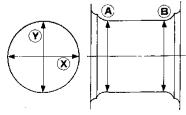
|                        | Unit: mm (in)                     |
|------------------------|-----------------------------------|
| Main journal dia. "Dm" |                                   |
| Grade No. 0            | 59.969 - 59.975 (2.3610 - 2.3612) |
| Grade No. 1            | 59.963 - 59.969 (2.3607 - 2.3610) |
| Grade No. 2            | 59.957 - 59.963 (2.3605 - 2.3607) |
| Grade No. 3            | 59.951 - 59.957 (2.3603 - 2.3605) |
| Pin journal dia. "Dp"  |                                   |
| Grade No. 0            | 44.968 - 44.974 (1.7704 - 1.7706) |
| Grade No. 1            | 44.962 - 44.968 (1.7702 - 1.7704) |
| Grade No. 2            | 44.956 - 44.962 (1.7699 - 1.7702) |
| Center distance "r"    | 36.61 - 36.69 (1.4413 - 1.4445)   |
| Out-of-round (X – Y)   |                                   |
| Standard               | Less than 0.002 (0.0001)          |
| Taper (A - B)          |                                   |
| Standard               | Less than 0.002 (0.0001)          |
| Runout [TIR]           |                                   |
| Limit                  | Less than 0.10 (0.0039)           |
| Free end play          |                                   |
| Standard               | 0.10 - 0.25 (0.0039 - 0.0098)     |
| Limit                  | 0.30 (0.0118)                     |



SEM645

EM715





| Upper main bearing No. 4* *: With oil groove  No. 2* No. 1* No. 4* No. 4* No. 4* No. 4* No. 4* No. 4* |         |
|---|---------|
| No. 3  Lower main bearing (Without oil groove)  No. 1   | SEM175F |

| Identification<br>color | Width "W"<br>mm (in)           | Thickness "T"<br>mm (in)           | Grade<br>number |
|-------------------------|--------------------------------|------------------------------------|-----------------|
| Black                   |                                | 2.000 - 2.003<br>(0.0787 - 0.0789) | 0               |
| Brown                   |                                | 2.003 - 2.006<br>(0.0789 - 0.0790) | 1               |
| Green                   |                                | 2.006 - 2.009<br>(0.0790 - 0.0791) | 2               |
| Yellow                  | 19.9 - 20.1<br>(0.783 - 0.791) | 2.009 - 2.012<br>(0.0791 - 0.0792) | 3               |
| Blue                    |                                | 2.012 - 2.015<br>(0.0792 - 0.0793) | 4               |
| Pink                    |                                | 2.015 - 2.018<br>(0.0793 - 0.0794) | 5               |
| Purple                  |                                | 2.018 - 2.021<br>(0.0794 - 0.0796) | 6               |
|                         |                                |                                    |                 |

#### **Undersize**

|                  |                                    | Unit: mm (in)   |
|------------------|------------------------------------|---|
|                  | Thickness                          | Main journal<br>diameter "Dm"                           |
| 0.25<br>(0.0098) | 2.132 - 2.140<br>(0.0839 - 0.0843) | Grind so that bearing clearance is the specified value. |

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# **SERVICE DATA AND SPECIFICATIONS (SDS)**

# Inspection and Adjustment (Cont'd)

#### **AVAILABLE CONNECTING ROD BEARING**

#### Connecting rod bearing

| Grade<br>number | Thickness "T"<br>mm (in)           | Identification color (mark) |
|-----------------|------------------------------------|-----------------------------|
| 0               | 1.500 - 1.503<br>(0.0591 - 0.0592) | Black                       |
| 1               | 1.503 - 1.506<br>(0.0592 - 0.0593) | Brown                       |
| 2               | 1.506 - 1.509<br>(0.0593 - 0.0594) | Green                       |

#### **Undersize**

Unit: mm (in)

|               | Thickness                          | Crank pin journal<br>diameter "Dp"                      |
|---------------|------------------------------------|---|
| 0.25 (0.0098) | 1.626 - 1.634<br>(0.0640 - 0.0643) | Grind so that bearing clearance is the specified value. |

# MISCELLANEOUS COMPONENTS

|                           | Unit: mm (in)           |
|---------------------------|-------------------------|
| Flywheel runout [TIR]*    | Less than 0.15 (0.0059) |
| Drive plate runout [TIR]* | Less than 0.15 (0.0059) |
| *Total indicator reading  |                         |

#### Bearing clearance

| Unit: mm (in)                   |
|---------------------------------|
|                                 |
| 0.012 - 0.030 (0.0005 - 0.0012) |
| 0.065 (0.0026)                  |
|                                 |
| 0.020 - 0.045 (0.0008 - 0.0018) |
| 0.070 (0.0028)                  |
|                                 |

# ENGINE LUBRICATION & COOLING SYSTEMS

# SECTION LC

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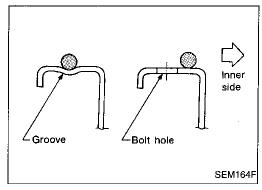
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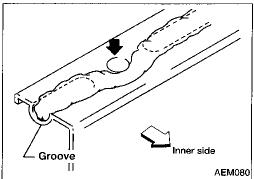
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#### PRECAUTIONS AND PREPARATION





#### **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.
- Apply a continuous bead of liquid gasket to mating surfaces.
   (Use Genuine Liquid Gasket or equivalent.)
- c. Apply liquid gasket around the inner side of bolt holes (unless otherwise specified).
- d. Assembly should be done within 5 minutes after coating.
- e. Wait at least 30 minutes before refilling engine oil and engine coolant.

# PRECAUTIONS AND PREPARATION

## **Special Service Tools**

The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

| Tool number<br>(Kent-Moore No.)<br>Tool name            | Description | Gi  |
|---|-------------|---|
| ST25051001<br>(J25695-1)<br>Oil pressure gauge          |             |   |
|   |             |   |
| OTOPOSOOO   | NT050       |   |
| ST25052000<br>(J25695-2)                                |             | pting oil pressure gauge to er oil pan        |
| Hose  |             |   |
|   | NT051       |   |
| WS39930000<br>( — )<br>Tube pressure                    |             | sing the tube of liquid gasket                |
| Tube pressure   |             |   |
|   | NT052       | M   |
| EG17650301<br>(J33984-A)<br>Radiator cap tester adapter |             | oting radiator cap tester to ator filler neck |
|   |             | F.  |
|   | NT053       |   |
| KV99103510<br>( — )                                     | Insta       | ulling radiator upper and lower tanks         |
| Radiator plate pliers A                                 | 90          | B   |
|   | NT224       | <del>©-</del>                                 |
| KV99103520  | Rem         | oving radiator upper and lower tanks          |
| Radiator plate pliers B                                 |             |   |
|   | NT225       | B1  |

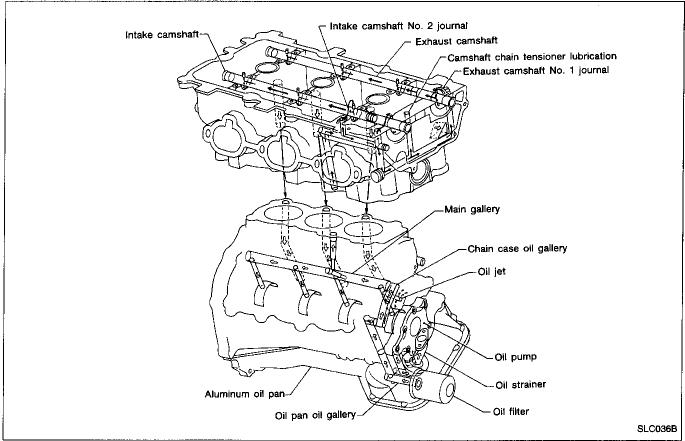
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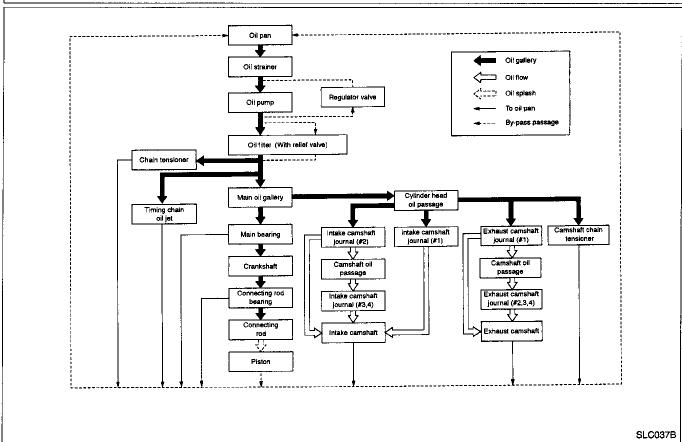
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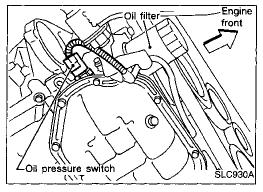
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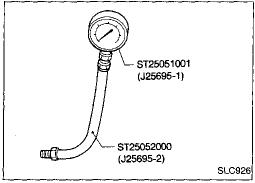
#### **Lubrication Circuit**





#### **ENGINE LUBRICATION SYSTEM**





#### **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" (M/T) or "Parking position" (A/T).
- 1. Check oil level.
- 2. Remove oil pressure switch.
- 3. Install pressure gauge.
- 4. Start engine and warm it up to normal operating temperature.
- 5. Check oil pressure with engine running under no-load.

| Engine speed rpm | Approximate discharge pressure kPa (kg/cm², psi) |  |
|------------------|--|--|
| Idle speed       | More than 69 (0.70, 10.0)                        |  |
| 3,000            | 435 - 551 (4.44 - 5.62, 63.1 - 79.9)             |  |

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

Install oil pressure switch with sealant.

#### Oil Pump

#### REMOVAL AND INSTALLATION

#### **CAUTION:**

When removing the oil pans, oil pump assembly and timing chain from engine, first remove the camshaft position sensor (PHASE) and the crankshaft position sensor (REF)/(POS) from the assembly.

#### Be careful not to damage sensor edge.

- 1. Drain engine oil.
- 2. Remove drive belts.
- 3. Remove camshaft position sensor (PHASE), and crankshaft position sensor (REF)/(POS).
- 4. Remove crank pulley.
- 5. Remove engine lower covers.
- 6. Remove front exhaust tube and its support.
- 7. Support engine at right and left side engine slingers with a suitable hoist.
- Remove engine right side mounting insulator and bracket bolts and nuts.
- Remove center member assembly.
- 10. Remove air compressor assembly and bracket.
- 11. Remove oil pans. (Refer to "Removal" of "OIL PAN" in EM section.)
- 12. Remove water pump cover.
- 13. Remove front cover assembly.
- 14. Remove timing chain. (Refer to "Removal" of "TIMING CHAIN" in EM section.)
- 15. Remove oil pump assembly.
- 16. Reinstall any parts removed in reverse order of removal.

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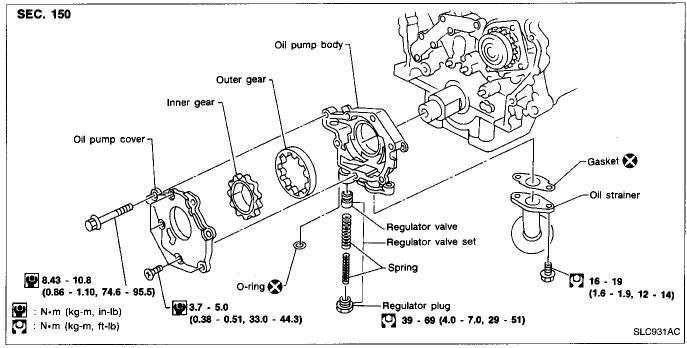
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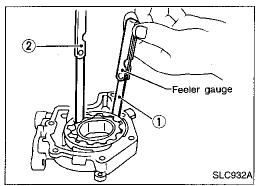
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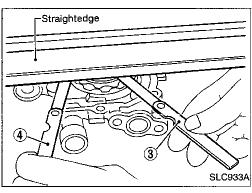
#### **ENGINE LUBRICATION SYSTEM**

# Oil Pump (Cont'd) DISASSEMBLY AND ASSEMBLY



When installing oil pump, apply engine oil to gears.





#### OIL PUMP INSPECTION

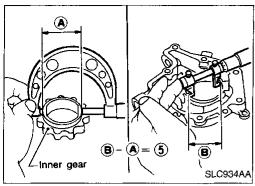
Using a feeler gauge, straightedge and micrometers, check the following clearances:

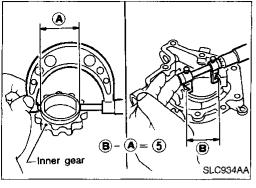
| <u>.</u>   | Unit: mm (in                    |
|--|---------------------------------|
| Body to outer gear radial clearance ①                                  | 0.114 - 0.260 (0.0045 - 0.0102) |
| Inner gear to outer gear tip clearance ②                               | Below 0.18 (0.0071)             |
| Body to inner gear axial clearance ③                                   | 0.05 - 0.09 (0.0020 - 0.0035)   |
| Body to outer gear axial clearance 4                                   | 0.030 - 0.190 (0.0012 - 0.0075) |
| Inner gear to brazed portion of housing clearance $(\hat{\mathbf{S}})$ | 0.045 - 0.091 (0.0018 - 0.0036) |

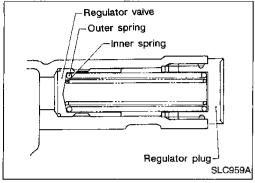
If the tip clearance (2) exceeds the limit, replace gear set.
If body to gear clearances (1, 3, 4, 5) exceed the limit, replace oil pump body assembly.

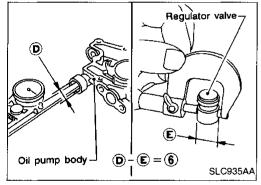
#### **ENGINE LUBRICATION SYSTEM**

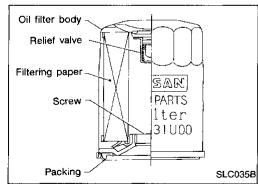
#### Oil Pump (Cont'd)











#### **REGULATOR VALVE INSPECTION**

Visually inspect components for wear and damage.

Check oil pressure regulator valve sliding surface and valve spring.

Coat regulator valve with engine oil. Check that it falls smoothly into the valve hole by its own weight.

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

Check regulator valve to oil pump body clearance. Clearance:

(6): 0.040 - 0.097 mm (0.0016 - 0.0038 in) If it exceeds the limit, replace oil pump body.

OIL FILTER

The oil filter is a small, full-flow cartridge type and is provided with a relief valve.

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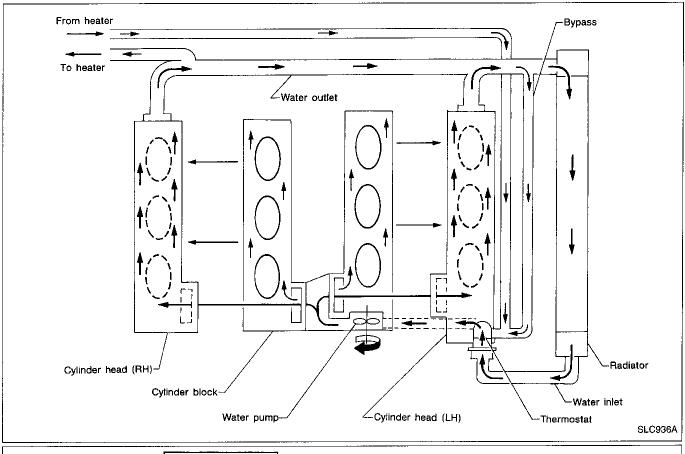
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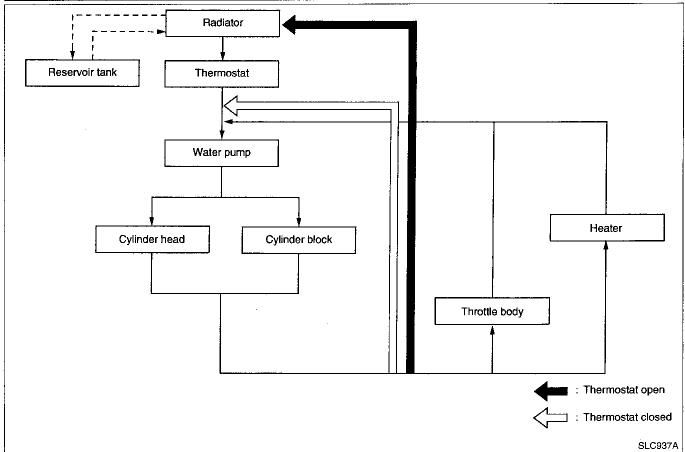
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## **Cooling Circuit**





#### System Check

#### **WARNING:**

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

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

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#### **CHECKING COOLING SYSTEM HOSES**

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



#### CHECKING RADIATOR CAP

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



Standard

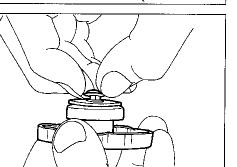
78 - 98 kPa (0.8 - 1.0 kg/cm<sup>2</sup>, 11 - 14 psi) Limit



59 - 98 kPa

(0.6 - 1.0 kg/cm<sup>2</sup>, 9 - 14 psi)





SLC755A

SMA967B

EG17650301

(J33984-A)

Pull the negative pressure valve to open it.



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Check that it closes completely when released.

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图图

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

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Testing pressure:

157 kPa (1.6 kg/cm<sup>2</sup>, 23 psi)

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Higher than the specified pressure may cause radiator damage.

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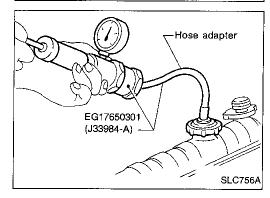


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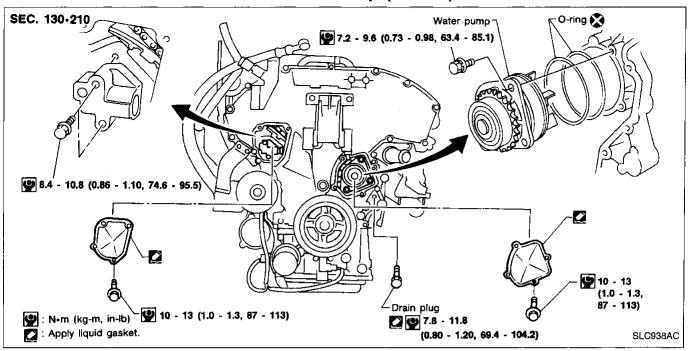
## **Water Pump**

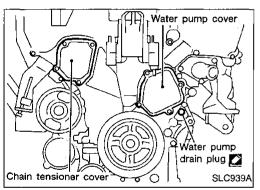
#### **CAUTION:**

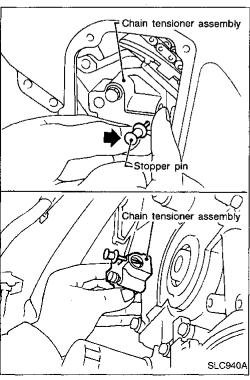
- When removing water pump assembly, be careful not to get coolant on drive belt.
- Water pump cannot be disassembled and should be replaced as a unit.
- After installing water pump, connect hose and clamp securely, then check for leaks using radiator cap tester.



#### Water Pump (Cont'd)



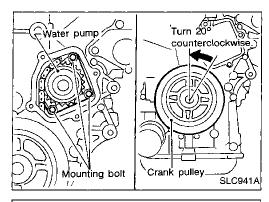




#### **REMOVAL**

- Drain coolant from drain plugs on radiator and both sides of cylinder block.
  - Refer to "Changing Engine Coolant" in MA section.
- 2. Remove water pump drain plug.
- Remove right side engine mounting, mounting bracket and nuts.
- 4. Remove drive belts and idler pulley bracket.
- 5. Remove chain tensioner cover and water pump cover.
- Pushing timing chain tensioner sleeve, apply a stopper pin so it does not return. Then remove the chain tensioner assembly.

#### Water Pump (Cont'd)

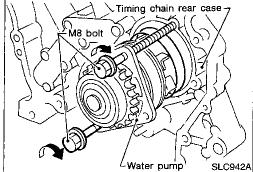


7. Remove the 3 water pump fixing bolts. Secure a gap between water pump gear and timing chain, by turning crankshaft pulley 20° backwards.



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Put M8 bolts to two M8-threaded holes out of 3 water pump fixing bolt holes.

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. Tighten M8 bolts by turning half turn alternately until they reach timing chain rear case.

 In order to prevent damages to water pump or timing chain rear case, do not tighten one bolt continuously. Always turn each bolt half turn each time.

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10. Lift up water pump and remove it.

 When lifting up water pump, do not allow water pump gear to hit timing chain.

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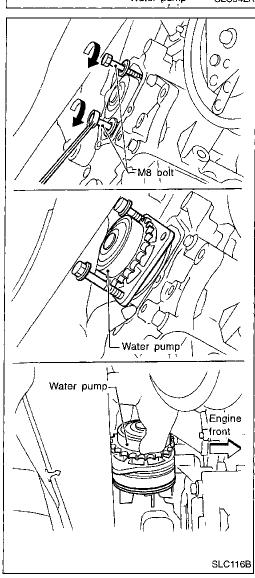
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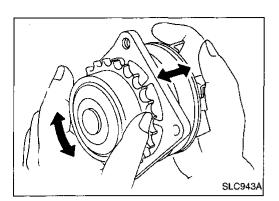
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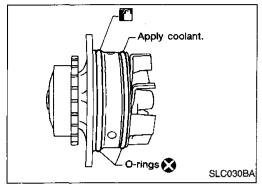
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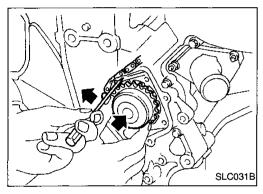
# Water Pump (Cont'd) INSPECTION

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

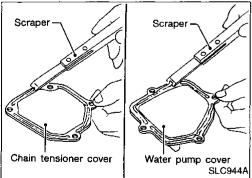


#### INSTALLATION

1. Apply engine oil and coolant to O-rings as shown in the figure.

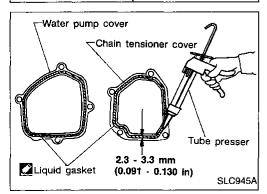


- 2. Install water pump.
- Do not allow cylinder block to nip O-rings when installing water pump.



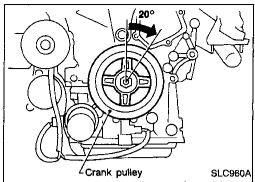
3. Before installing, remove all traces of liquid gasket from mating surface of water pump cover and chain tensioner cover using a scraper.

Also remove traces of liquid gasket from mating surface of front cover.



 Apply a continuous bead of liquid gasket to mating surface of chain tensioner cover and water pump cover.

#### Water Pump (Cont'd)

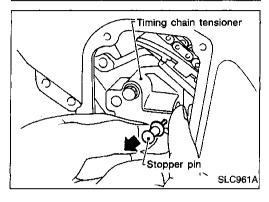




Return the crankshaft pulley to its original position by turning it 20° forward.



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- Install timing chain tensioner, then remove the stopper pin.
- After installing the tensioner, race the engine at about 3,000 rpm under no load to purge air from the high-pressure chamber. The engine may produce a rattling noise. This indicates that air still remains in the chamber and is not a matter of concern.



Reinstall any parts removed in reverse order of removal.

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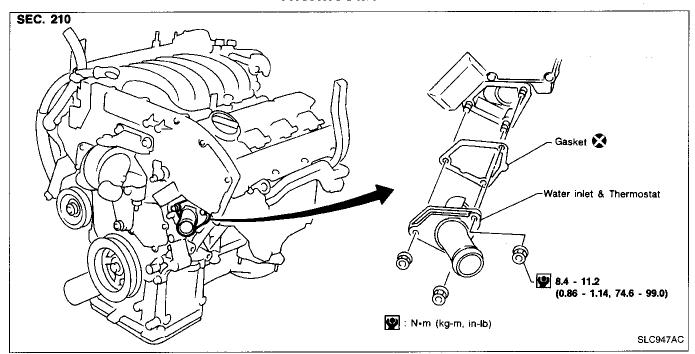
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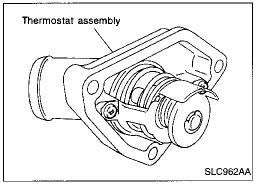
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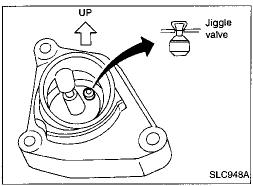
#### **Thermostat**



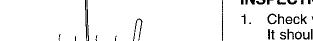


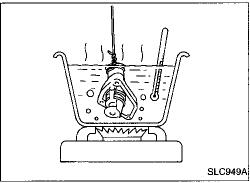


- Drain coolant from drain plugs on both sides of cylinder block and radiator.
- 2. Remove water pump drain plug on pump side of cylinder block.
- 3. Remove lower radiator hose.
- Remove water inlet and thermostat assembly.
- Do not disassemble water inlet and thermostat. Replace them as a unit, if necessary.



- Install thermostat with jiggle valve facing upward.
- 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.





#### INSPECTION

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

|                           |               | Standard                     |
|---------------------------|---------------|------------------------------|
| Valve opening temperature | °C (°F)       | 82 (180)                     |
| Valve lift n              | nm/°C (in/°F) | More than 8.6/95 (0.339/203) |

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

#### Radiator

#### **REMOVAL AND INSTALLATION**

- Remove under cover.
- 2. Drain coolant from radiator.
- Disconnect radiator upper and lower hoses.
- 4. Remove radiator shroud.
- Remove A/T oil cooler hoses. (A/T models only)
- Disconnect reservoir tank hose.
- 7. Remove radiator mounting bracket.
- 8. Remove radiator.
- After repairing or replacing radiator, install any part removed in reverse order of removal.

When filling radiator with coolant, refer to "Changing Engine Coolant" in MA section.

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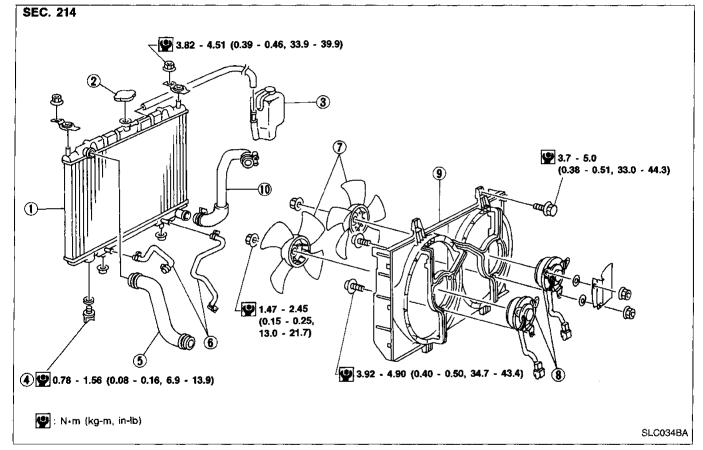
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- 1 Radiator
- Radiator filler cap
- Reservoir tank
- 4 Radiator drain cock

- (5) Lower radiator hose
- 6 Oil cooler hoses (A/T models)
- (7) Cooling fans

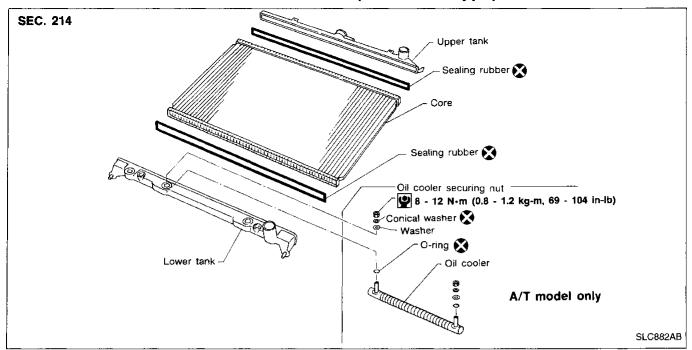
- 8 Cooling fan motors
- 9) Radiator shroud
- Upper radiator hose

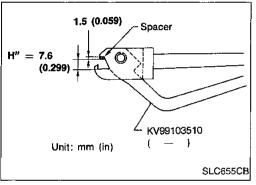
#### **Cooling Fan Control System**

Cooling fans are controlled by ECM (ECCS control module). For details, refer to EC section ("Cooling Fan", "TROUBLE DIAGNOSIS FOR DTC P1900".)

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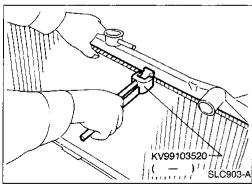
#### Radiator (Aluminum type)





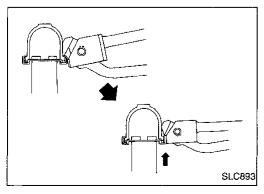
#### **PREPARATION**

- 1. Attach the spacer to the tip of the radiator plate pliers A. Spacer specification: 1.5 mm (0.059 in) thick x 18 mm (0.71 in) wide x 8.5 mm (0.335 in) long.
- 2. Make sure that when radiator plate pliers A are closed dimension H'' is approx. 7.6 mm (0.299 in).
- 3. Adjust dimension H'' with the spacer, if necessary.



#### DISASSEMBLY

1. Remove tank with Tool.



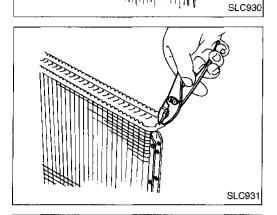
 Grip the crimped edge and bend it upwards so that Tool slips off.

Do not bend excessively.

#### 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.



Washer

Conical washer

Oil cooler

O-ring 🐼

 $\leq$ Lower tank

2. Make sure the edge stands straight up.

3. Remove oil cooler from tank. (A/T models only)

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1. Install oil cooler. (A/T models only)

Pay attention to direction of conical washer.

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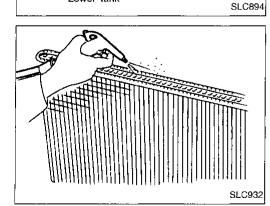
RS

BT

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SLC917A

2. Clean contact portion of tank.

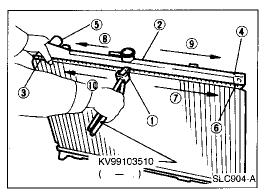
3. Install sealing rubber.

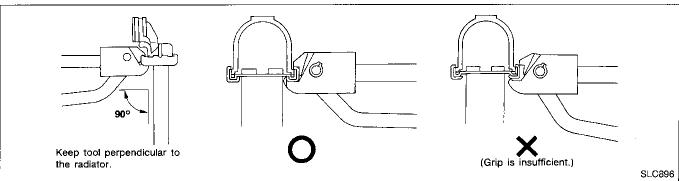
Push it in with fingers.

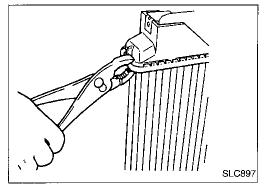
Be careful not to twist sealing rubber.

#### Radiator (Aluminum type) (Cont'd)

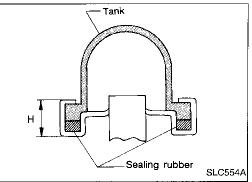
4. Caulk tank in specified sequence with Tool.







• Use pliers in the locations where Tool cannot be used.

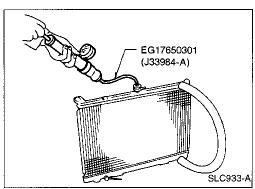


- 5. Make sure that the rim is completely crimped down.
  - Standard height "H":

8.0 - 8.4 mm (0.315 - 0.331 in)

6. Confirm that there is no leakage.

Refer to Inspection.



#### INSPECTION

Apply pressure with Tool.

LC-18

Specified pressure value: 157 kPa (1.6 kg/cm<sup>2</sup>, 23 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)

# **Overheating Cause Analysis**

|                           | Sy                             | mptom                           | Chec   | k items  |
|---------------------------|--------------------------------|---------------------------------|--|--|
|                           |                                | Water pump malfunction          | Worn or loose drive belt                         |  |
|                           |                                | Thermostat stuck closed         | _  | 1  |
|                           | Poor heat transfer             | Damaged fins                    | Dust contamination or paper clogging             | ]  |
|                           |                                |                                 | Mechanical damage                                |  |
|                           |                                | Clogged radiator cooling tube   | Excess foreign material (rust, dirt, sand, etc.) |  |
|                           |                                | Cooling fan does not operate.   |  |  |
|                           | Reduced air flow               | High resistance to fan rotation | ,  |  |
|                           |                                | Damaged fan blades              |  |  |
|                           | Damaged radiator shroud        |                                 |  |  |
|                           | Improper coolant mixture ratio | -                               |  | _  |
| Cooling sys-              | Poor coolant quality           |                                 |  | _  |
| tem parts<br>malfunction  |                                |                                 | Cooling hose                                     | Loose clamp  |
|                           |                                |                                 | Cooling Hose                                     | Cracked hose   |
|                           |                                |                                 | Water pump                                       | Poor sealing   |
|                           |                                |                                 | Radiator cap                                     | Loose  |
|                           |                                | Coolant leaks                   | Tradiator cap                                    | Poor sealing   |
|                           | Insufficient coolant           |                                 | Radiator   | O-ring for damage, deterioration or improper fitting |
|                           |                                |                                 |  | Cracked radiator tank                                |
|                           |                                |                                 |  | Cracked radiator core                                |
|                           |                                |                                 | Reservoir tank                                   | Cracked reservoir tank                               |
|                           |                                | Overflowing reservoir tank      | Exhaust das leaks into cooling                   | Cylinder head deterioration                          |
|                           |                                |                                 |  | Cylinder head gasket deterioration                   |
|                           |                                |                                 | Abusive driving                                  | High engine rpm under no load                        |
|                           |                                |                                 |  | Driving in low gear for extended time                |
| ٠                         |                                |                                 |  | Driving at extremely high speed                      |
|                           | _                              | Overload on engine              | Powertrain system malfunction                    |  |
|                           |                                |                                 | Installed improper size wheels and tires         | _  |
| Except cool-<br>ng system |                                |                                 | Dragging brakes                                  |  |
| parts malfunc-<br>tion    |                                |                                 | Improper ignition timing.                        |  |
|                           |                                | Blocked bumper                  | _  |  |
|                           |                                |                                 | Installed car brassiere                          |  |
|                           | Blocked or restricted air flow | Blocked radiator grille         | Mud contamination or paper clogging              | _  |
|                           |                                | Blocked radiator                |  |  |
|                           |                                | Blocked condenser               |  |  |
|                           |                                | Installed large fog lamp        | _  |  |

# **SERVICE DATA AND SPECIFICATIONS (SDS)**

# Engine Lubrication System Oil pump

#### Oil pressure

| Engine speed rpm | Approximate discharge<br>pressure kPa (kg/cm², psi) |
|------------------|---|
| ldle speed       | More than 69 (0.70, 10.0)                           |
| 3,000            | 435 - 551 (4.44 - 5.62, 63.1 - 79.9)                |

Unit: mm (in)

| Body to outer gear radial clearance               | 0.114 - 0.260 (0.0045 - 0.0102) |
|---|---------------------------------|
| Inner gear to outer gear tip clearance            | Below 0.18 (0.0071)             |
| Body to inner gear axia! clearance                | 0.05 - 0.09 (0.0020 - 0.0035)   |
| Body to outer gear axial clearance                | 0.030 - 0.190 (0.0012 - 0.0075) |
| Inner gear to brazed portion of housing clearance | 0.045 - 0.091 (0.0018 - 0.0036) |

## Regulator valve

Unit: mm (in)

| Regulator valve to oil pump cover clearance | 0.040 - 0.097 (0.0016 - 0.0038) |
|---|---------------------------------|
|---|---------------------------------|

# **Engine Cooling System**

#### **Thermostat**

| Valve opening temperature | °C (°F)       | 82 (180)                        |
|---------------------------|---------------|---------------------------------|
| Valve lift                | mm/°C (in/°F) | More than 8.6/95<br>(0.339/203) |

#### Radiator

Unit: kPa (kg/cm², psi)

| Cap relief pressure   | Standard | 78 - 98 (0.8 - 1.0, 11 - 14) |
|-----------------------|----------|------------------------------|
|                       | Limit    | 59 - 98 (0.6 - 1.0, 9 - 14)  |
| Leakage test pressure |          | 157 (1.6, 23)                |

# **ENGINE CONTROL SYSTEM**

# SECTION EC

G]

MA

EM

LC

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• 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".

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#### DIAGNOSTIC TROUBLE CODE INDEX

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<sup>\*1:</sup> In Diagnostic Test Mode II (Self-diagnostic results), these numbers are controlled by NISSAN.

<sup>\*2:</sup> These numbers are prescribed by SAE J2012.

<sup>\*3:</sup> When the fail-safe operation occurs, the MIL illuminates.

<sup>\*4:</sup> The MIL illuminates after A/T control unit enters the failsafe mode in two consecutive trips, if both the "Revolution sensor" and the "Engine speed signal" meet the fail-safe condition at the same time.

<sup>\*5:</sup> Since this diagnosis does not meet P1900 of SAE J2012, it is indicated only by CONSULT.

<sup>\*6:</sup> When engine is running.

#### **DIAGNOSTIC TROUBLE CODE INDEX**

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| P0155            | 1001       | FR O2 SE HEATER-B2                      | EC-165            |
| P0171            | 0115       | FUEL SYS LEAN/BK1                       | EC-169            |
| P0172            | 0114       | FUEL SYS RICH/BK1                       | EC-174            |
| P0174            | 0210       | FUEL SYS LEAN/BK2                       | EC-179            |
| P0175            | 0209       | FUEL SYS RICH/BK2                       | EC-184            |
| P0180            | 0402       | TANK FUEL TEMP SEN                      | EC-189            |
| P0300            | 0701       | RANDOM MISFIRE                          | EC-192            |
| P0301            | 0608       | CYL 1 MISFIRE                           | EC-192            |
| P0302            | 0607       | CYL 2 MISFIRE                           | EC-192            |
| P0303            | 0606       | CYL 3 MISFIRE                           | EC-192            |
| P0304            | 0605       | CYL 4 MISFIRE                           | EC-192            |
| P0305            | 0604       | CYL 5 MISFIRE                           | EC-192            |
| P0306            | 0603       | CYL 6 MISFIRE                           | EC-192            |
| P0325            | 0304       | KNOCK SENSOR                            | EC-196            |
| P0335            | 0802       | CRANK POS SEN (POS)                     | EC-199            |
| P0340            | 0101       | CAM POS SEN (PHASE)                     | EC-205            |
| P0400            | 0302       | EGR SYSTEM                              | EC-210            |
| P0402            | 0306       | EGRC-BPT VALVE                          | EC-220            |
| P0420            | 0702       | TW CATALYST SYS                         | EC-222            |
| P0440            | 0705       | EVAP (SMALL LEAK)                       | EC-225            |
| P0443            | 0807       | PURG CONT/V & S/V                       | EC-233            |
| P0446            | 0903       | VENT CONTROL VALVE                      | EC-241            |
| P0450            | 0704       | EVAP SYS PRES SEN                       | EC-246            |

| D                | TC    |                                   | B (               |            |
|------------------|-------|-----------------------------------|-------------------|------------|
| CONSULT<br>GST*2 | ECM*1 | Items<br>  (CONSULT screen terms) | Reference<br>page | <b>G</b> ] |
| P0500            | 0104  | VEHICLE SPEED SEN                 | EC-251            | 0.00       |
| P0505            | 0205  | IACV-AAC VALVE                    | EC-255            |            |
| P0510            | 0203  | CLOSED THRL POS SW                | EC-261            |            |
| P0600            | 0504  | A/T COMM LINE                     | EC-265            | EM         |
| P0605            | 0301  | ЕСМ                               | EC-269            |            |
| P0705            | 1003  | PARK/NEUT POSI SW                 | EC-272            | [_C        |
| P0705            | 1101  | INHIBITOR SWITCH                  | AT-59             |            |
| P0710            | 1208  | FLUID TEMP SENSOR                 | AT-65             | F.0        |
| P0720            | 1102  | VHCL SPEED SEN A/T*4              | AT-68             | EC         |
| P0725            | 1207  | ENGINE SPEED SIG*4                | AT-70             |            |
| P0731            | 1103  | A/T 1ST SIGNAL                    | AT-72             | [5[2       |
| P0732            | 1104  | A/T 2ND SIGNAL                    | AT-75             |            |
| P0733            | 1105  | A/T 3RD SIGNAL                    | AT-78             | CL.        |
| P0734            | 1106  | A/T 4TH SIG OR TCC                | AT-81             |            |
| P0740            | 1204  | TOR CONV CLUTCH SV                | AT-86             | 0.252      |
| P0744            | 1107  | A/T TCC SIGNAL                    | AT-89             | TM         |
| P0745            | 1205  | LINE PRESSURE S/V                 | AT-94             |            |
| P0750            | 1108  | SHIFT SOLENOID/V A*3              | AT-97             | AT         |
| P0755            | 1201  | SHIFT SOLENOID/V B*3              | AT-100            |            |
| P1105            | 1302  | MAP/BARO SW SOL/V                 | EC-277            | FA         |
| P1220            | 1305  | FPCM                              | EC-283            |            |
| P1320            | 0201  | IGN SIGNAL-PRIMARY                | EC-290            | ÐΛ         |
| P1335            | 0407  | CRANK POS SEN<br>(REF)*3          | EC-298            | RA         |
| P1336            | 0905  | CRANK P/S (POS) COG               | EC-303            | BR         |
| P1400            | 1005  | EGRC SOLENOID/V                   | EC-309            |            |
| P1401            | 0305  | EGR TEMP SENSOR                   | EC-314            | ST         |
| P1441            | 0801  | VC/V BYPASS/V                     | EC-225            | ⊚1         |
| P1445            | 1008  | PURG VOLUME<br>CONT/V             | EC-323            | RS         |
| P1447            | 0111  | EVAP PURG FLOW/<br>MON            | EC-330            |            |
| P1605            | 0804  | A/T DIAG COMM LINE                | EC-337            | ®T         |
| P1705            | 1206  | THRTL POSI SEN A/T*3              | AT-103            |            |
| P1760            | 1203  | OVERRUN CLUTCH S/V                | AT-105            | HA         |
| P1900*5          | 0208  | OVERHEAT                          | EC-340            |            |

<sup>\*1:</sup> In Diagnostic Test Mode II (Self-diagnostic results), these numbers are controlled by NISSAN.

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<sup>\*2:</sup> These numbers are prescribed by SAE J2012.
\*3: When the fail-safe operation occurs, the MIL illuminates.

<sup>\*4:</sup> The MIL illuminates after A/T control unit enters the failsafe mode in two consecutive trips, if both the "Revolution sensor" and the "Engine speed signal" meet the fail-safe

condition at the same time.
\*5: Since this diagnosis does not meet P1900 of SAE J2012, it is indicated only by CONSULT.

<sup>\*6:</sup> When engine is running.

## PRECAUTIONS AND PREPARATION

#### **Special Service Tool**

The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

| Tool number<br>(Kent-Moore No.)<br>Tool name                                  | Description |  |
|---|-------------|--|
| (J36471-A) Front heated oxygen sensor wrench Rear heated oxygen sensor wrench | NT379       | Loosening or tightening front and rear heated oxygen sensors |

#### **Commercial Service Tool**

| Tool name               | Description |   |
|-------------------------|-------------|---|
| Fuel filler cap adopter | NT653       | Checking fuel tank vacuum relief valve open- ing pressure |

#### PRECAUTIONS AND PREPARATION

# Supplemental Restraint System (SRS) "AIR BAG"

The Supplemental Restraint System "Air Bag", used along with a seat belt, helps 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 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.
- Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses are covered with yellow insulation either just before the harness connectors or for the complete harness, for easy identification.

# Precautions for On Board Diagnostic (OBD) System of Engine and A/T

The ECM (ECCS control module) has an on board diagnostic system. It will light up the malfunction indicator lamp (MIL) to warn the driver of a malfunction causing emission deterioration.

#### **CAUTION:**

- Be sure to turn the ignition switch "OFF" and disconnect the negative battery terminal before the repair or inspection work. The open/short circuit of the related switches, sensors, solenoid valves, etc. will cause the MIL to light up.
- Be sure to connect and lock the connectors securely after the work. The loose (unlocked) connector will cause the MIL to light up due to the open circuit. (Be sure to connect the connector without water, grease, dirt, bent terminals, etc. in it.)
- Be sure to route and clamp the harnesses properly after work. The interference of the harness with a bracket, etc. may cause the MIL to light up due to the short circuit.
- Be sure to connect rubber tubes properly after the work. The misconnected or disconnected rubber tube may cause the MIL to light up due to the malfunction of the EGR system or the fuel injection system, etc.
- Be sure to erase the unnecessary (already fixed) malfunction information in the ECM or A/T control unit before returning the vehicle to the customer.

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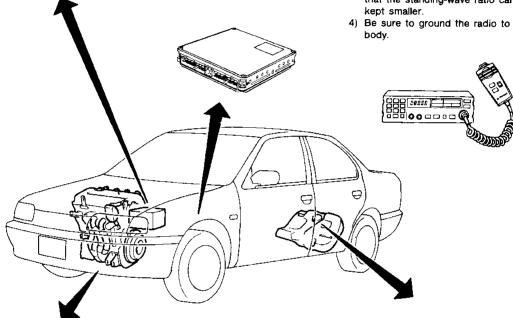
#### Engine Fuel & Emission Control System

#### **ECM**

- Do not disassemble ECM (ECCS) control module).
- Do not turn diagnosis mode selector
- 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.

#### 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 away as possible 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
- 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



#### **ECCS PARTS HANDLING**

BATTERY

source.

Always use a 12 volt battery as power

Do not attempt to disconnect battery

cables while engine is running.

- Handle mass air flow sensor carefully to avoid damage.
- Do not disassemble mass air flow
- Do not clean mass air flow sensor with any type of detergent.
- Do not disassemble IACV-AAC valve.
- Even a slight leak in the air intake system can cause serious problems.
- Do not shock or jar the camshaft position sensor or crankshaft position sensor.



#### WHEN STARTING

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

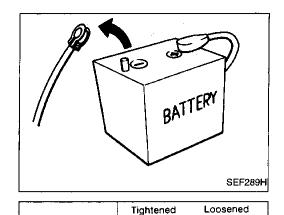
#### FUEL PUMP

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

#### **ECCS HARNESS HANDLING**

- Securely connect ECCS 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 ECCS harness at least 10 cm (3.9 in) away from adjacent harnesses, to prevent an ECCS system malfunction due to receiving external noise, degraded operation of ICs. etc.
- Keep ECCS parts and harnesses dry.
- Before removing parts, turn off ignition switch and then disconnect battery ground cable.

#### PRECAUTIONS AND PREPARATION



Indicator

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SEF291H

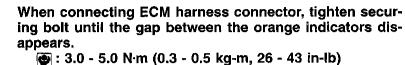
#### **Precautions**

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.



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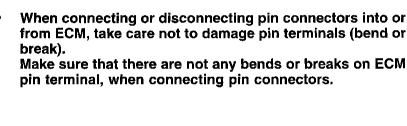
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Make sure that there are not any bends or breaks on ECM

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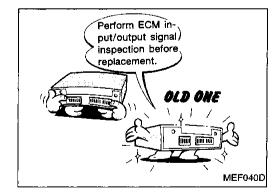
Before replacing ECM, perform ECM input/output signal inspection and make sure whether ECM functions properly or not. (See page EC-91.)

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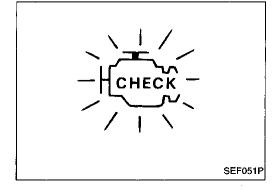


Bend

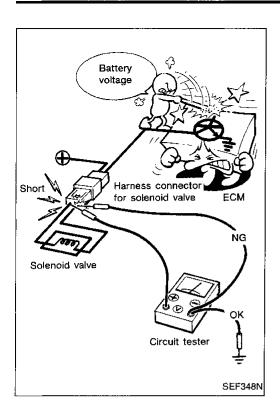
After performing each TROUBLE DIAGNOSIS, perform "OVERALL FUNCTION CHECK" or "DTC (Diagnostic **Trouble Code) CONFIRMATION PROCEDURE"** The DTC should not be displayed in the "DTC CONFIRMA-

TION PROCEDURE" if the repair is completed. The "OVERALL FUNCTION CHECK" should be a good result if the repair is completed.

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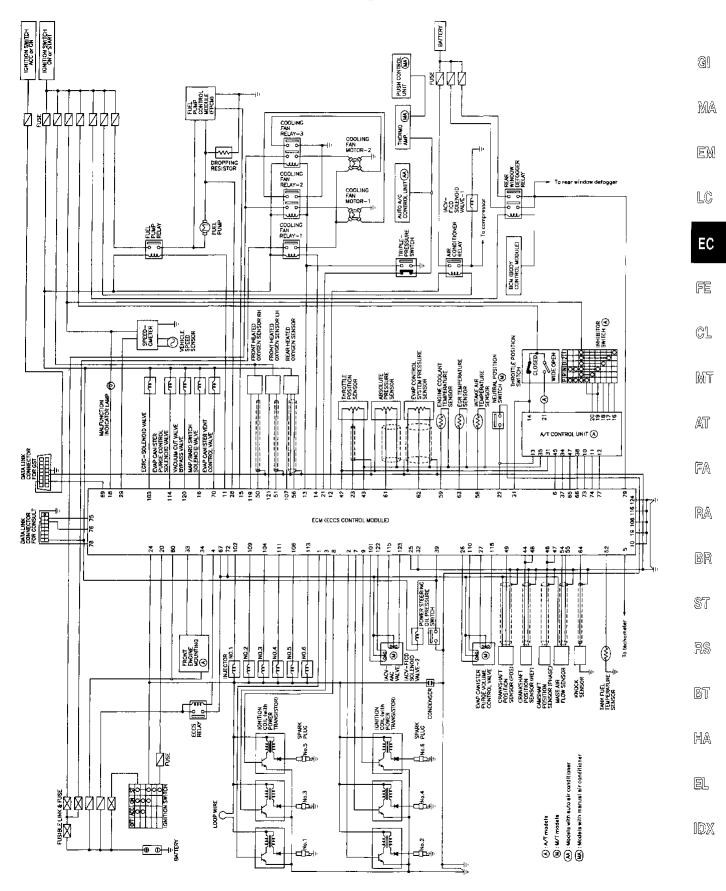
#### PRECAUTIONS AND PREPARATION



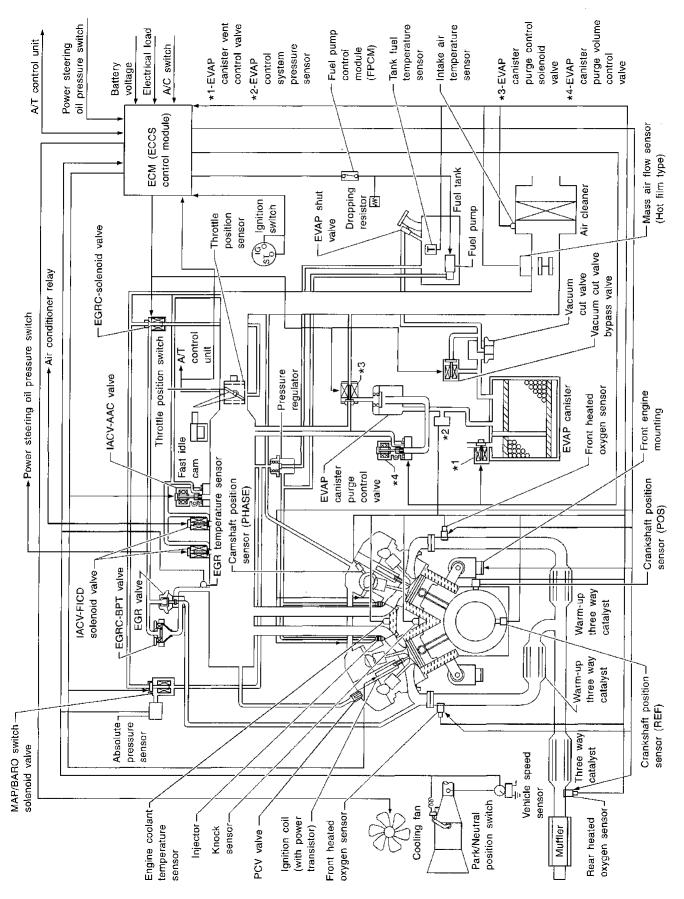
## Precautions (Cont'd)

 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.

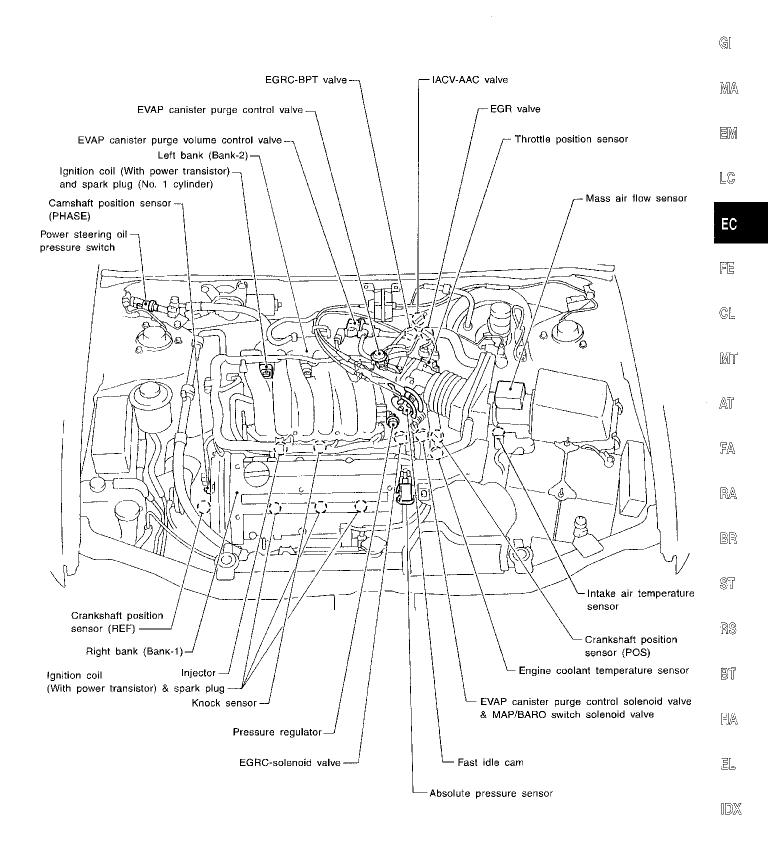
## **Circuit Diagram**



## System Diagram

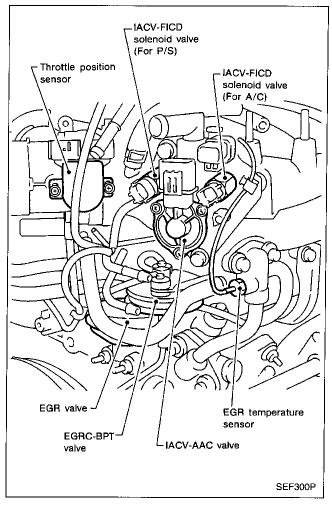


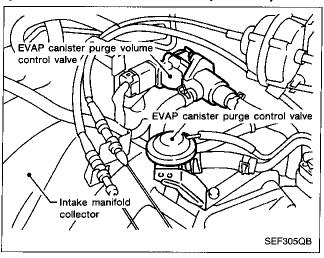
#### **ECCS Component Parts Location**

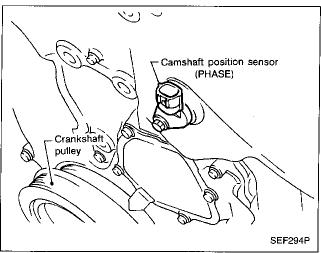


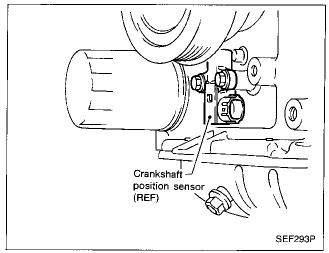
# **ENGINE AND EMISSION CONTROL OVERALL SYSTEM**

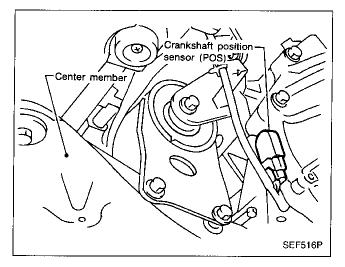
## **ECCS Component Parts Location (Cont'd)**







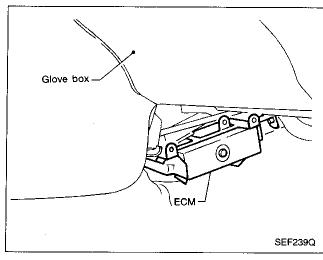


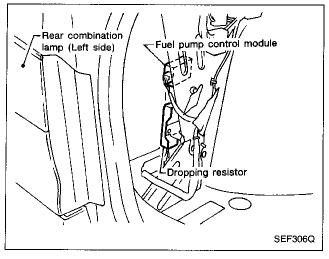


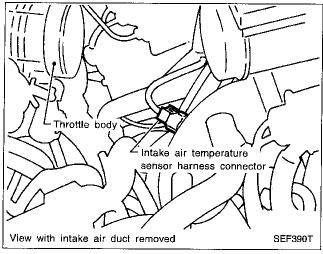
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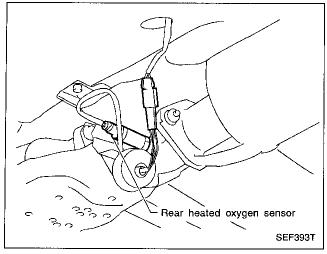
# **ENGINE AND EMISSION CONTROL OVERALL SYSTEM**

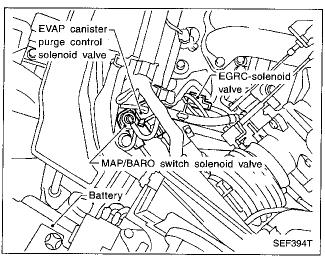
# **ECCS Component Parts Location (Cont'd)**

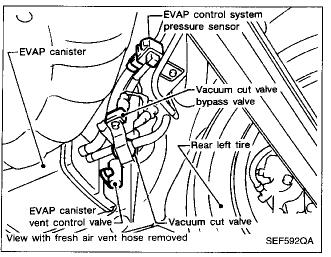












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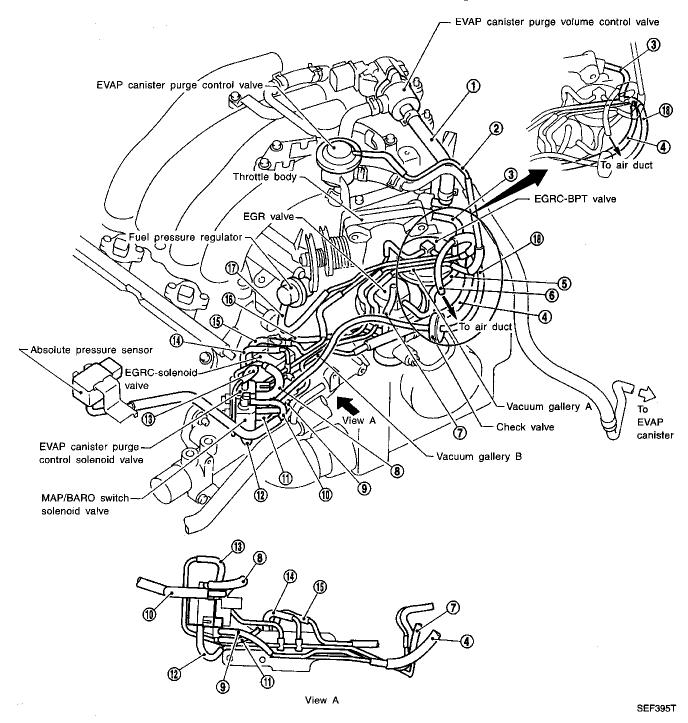
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### Vacuum Hose Drawing



- EVAP canister purge volume control valve to Throttle body
- EVAP canister purge control valve to Vacuum gallery A
- (3) Throttle body to Vacuum gallery A
- Vacuum gallery A to Vacuum gallery B
- 5 EGR valve to EGRC-BPT valve
- 6 Air duct to Vacuum gallery A
- Throttle body to Vacuum gallery B

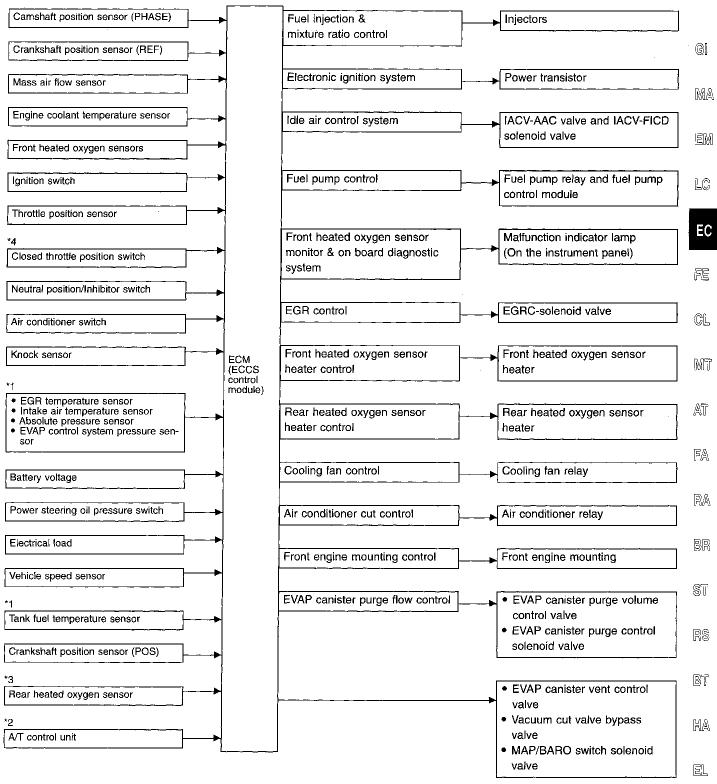
- (8) MAP/BARO switch solenoid valve to Vacuum gallery B
- EVAP canister purge control solenoid valve to Vacuum gallery B
- MAP/BARO switch solenoid valve to Absolute pressure sensor
- (1) EVAP canister purge control solenoid valve to Check valve
- (12) MAP/BARO switch solenoid valve to Vacuum gallery B
- (13) EVAP canister purge control solenoid valve to Vacuum gallery B

- (4) EGRC-solenoid valve to Vacuum gallery B
- (15) EGRC-solenoid valve to Vacuum gallery B
- EGRC-solenoid valve to Vacuum gallery B
- (1) Fuel pressure regulator to Vacuum gallery A
- 18 Check valve to Vacuum gallery A

Refer to "System Diagram", EC-10, for vacuum control system.

#### **ENGINE AND EMISSION CONTROL OVERALL SYSTEM**

### System Chart



<sup>\*1:</sup> These sensors are not directly used to control the engine system. They are used only for the on board diagnosis.

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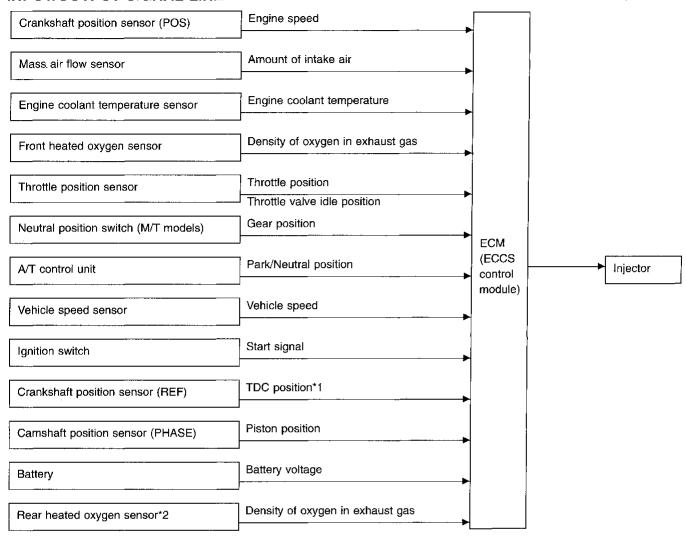
<sup>\*2:</sup> The DTC related to A/T will be sent to ECM.

<sup>\*3:</sup> This sensor is not used to control the engine system under normal conditions.

<sup>\*4:</sup> This switch will operate in place of the throttle position sensor to control EVAP parts if the sensor malfunctions.

#### Multiport Fuel Injection (MFI) System

#### INPUT/OUTPUT SIGNAL LINE



\*1: Top Dead Center

\*2: This sensor is not used to control the engine system under normal conditions.

# BASIC MULTIPORT FUEL INJECTION SYSTEM

The amount of fuel injected from the fuel injector is determined by the ECM. The ECM controls the length of time the valve remains open (injection pulse duration). The amount of fuel injected is a program value in the ECM memory. The program value is preset by engine operating conditions. These conditions are determined by input signals (for engine speed and intake air) from both the camshaft position sensor and the mass air flow sensor.

# VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

The amount of fuel injected is compensated for to improve engine performance. This will be made under various operating conditions as listed below. (Fuel increase)

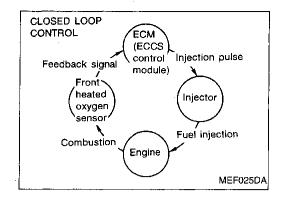
- During warm-up
- When starting the engine
- During acceleration
- Hot-engine operation
- High-load, high-speed operation

#### (Fuel decrease)

- During deceleration
- During high speed operation

EC-16 184

### ENGINE AND EMISSION BASIC CONTROL SYSTEM DESCRIPTION



### Multiport Fuel Injection (MFI) System (Cont'd) MIXTURE RATIO FEEDBACK CONTROL

The mixture ratio feedback system provides the best air-fuel mixture ratio for driveability and emission control. The three way catalyst can then better reduce CO, HC and NOx emissions. This system uses a front heated oxygen sensor in the exhaust manifold to monitor if the engine is rich or lean. The ECM adjusts the injection pulse width according to the sensor voltage signal. For more information about front heated oxygen sensor, refer to pages EC-159, 141. This maintains the mixture ratio within the range of stoichiometric (ideal air-fuel mixture).

Rear heated oxygen sensor is located downstream of the three way catalyst. Even if the switching characteristics of the front heated oxygen sensor shift, the air-fuel ratio is controlled to stoichiometric by the signal from the rear heated oxygen sensor. This stage is referred to as the closed loop control condition.

**OPEN LOOP CONTROL** 

The open loop system condition refers to when the ECM detects any of the following conditions. Feedback control stops in order to maintain stabilized fuel combustion.

- Deceleration and acceleration
- High-load, high-speed operation
- Engine idling
- Malfunction of front heated oxygen sensor or its circuit
- Insufficient activation of front heated oxygen sensor at low engine coolant temperature
- High-engine coolant temperature
- During warm-up
- After shifting from "N" to "D"
- When starting the engine

#### MIXTURE RATIO SELF-LEARNING CONTROL

The mixture ratio feedback control system monitors the mixture ratio signal transmitted from the front heated oxygen sensor. This feedback signal is then sent to the ECM. The ECM controls the 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 film) 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 "injection pulse duration" to automatically compensate for the difference between the two ratios.

"Fuel trim" refers to the feedback compensation value compared against the basic injection duration. Fuel trim includes short-term fuel trim and long-term fuel trim.

"Short-term fuel trim" is the short-term fuel compensation used to maintain the mixture ratio at its theoretical value. The signal from the front heated oxygen sensor indicates whether the mixture ratio is RICH or LEAN compared to the theoretical value. The signal then triggers a reduction in fuel volume if the mixture ratio is rich, and an increase in fuel volume if it is lean.

"Long-term fuel trim" is overall fuel compensation carried out longterm to compensate for continual deviation of the short-term fuel trim from the central value. Such deviation will occur due to individual engine differences, wear over time and changes in the usage environment.

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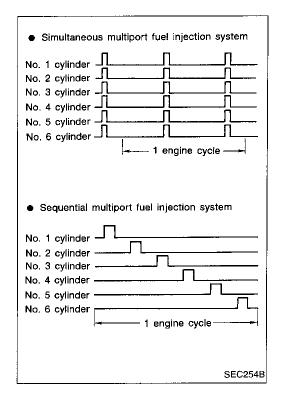
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#### ENGINE AND EMISSION BASIC CONTROL SYSTEM DESCRIPTION



# Multiport Fuel Injection (MFI) System (Cont'd) FUEL INJECTION SYSTEM

Two types of systems are used.

#### 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.

#### Simultaneous multiport fuel injection system

Fuel is injected simultaneously into all six cylinders twice each engine cycle. In other words, pulse signals of the same width are simultaneously transmitted from the ECM.

The six injectors will then receive the signals two times for each engine cycle.

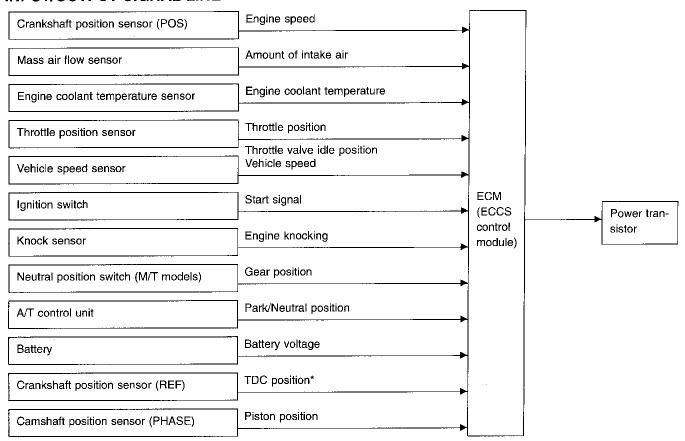
This system is used when the engine is being started and/or if the fail-safe mode (CPU) or crankshaft position sensor (REF) is operating.

#### **FUEL SHUT-OFF**

Fuel to each cylinder is cut off during deceleration or operation of the engine at excessively high speeds.

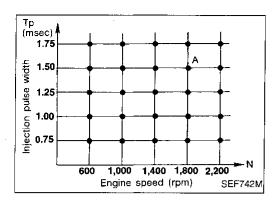
### **Electronic Ignition (EI) System**

#### INPUT/OUTPUT SIGNAL LINE



<sup>\*:</sup> Top Dead Center

### ENGINE AND EMISSION BASIC CONTROL SYSTEM DESCRIPTION



### Electronic Ignition (EI) System (Cont'd) SYSTEM DESCRIPTION

The ignition timing is controlled by the ECM 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. Responding to this information, ignition signals are transmitted to the power transistor.

N: 1,800 rpm, Tp: 1.50 msec e.a.

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During the following conditions, the ignition timing is revised by the ECM according to the other data stored in the ECM.

- At starting
- During warm-up 2
- 3 At idle
- Hot engine operation
- At acceleration

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

If engine knocking occurs, the knock sensor monitors the condition. The signal is transmitted to the ECM (ECCS control module). The ECM retards the ignition timing to eliminate the knocking condition.

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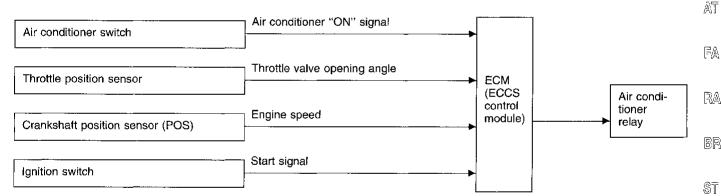
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# Air Conditioning Cut Control

#### INPUT/OUTPUT SIGNAL LINE



#### SYSTEM DESCRIPTION

This system improves engine operation when the air conditioner is used.

Under the following conditions, the air conditioner is turned off.

- When the accelerator pedal is fully depressed.
- When cranking the engine.
- At high engine speeds.

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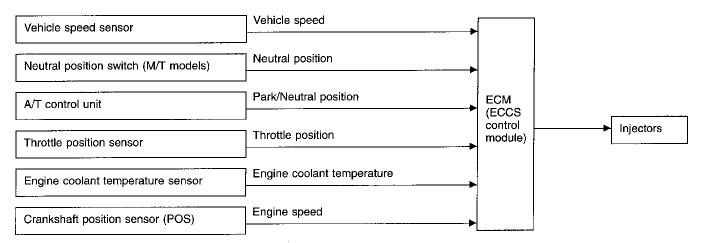
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# Fuel Cut Control (at no load & high engine speed)

#### INPUT/OUTPUT SIGNAL LINE



If the engine speed is above 2,700 rpm with no load (for example, in neutral and engine speed over 2,700 rpm) fuel will be cut off after some time. The exact time when the fuel is cut off varies based on engine speed.

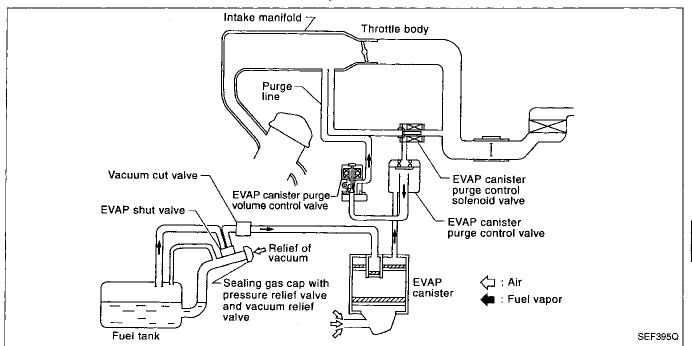
Fuel cut will operate until the engine speed reaches 2,200 rpm, then fuel cut is cancelled.

#### NOTE:

This function is different than deceleration control listed under multiport fuel injection on EC-16.

EC-20 188

#### **Description**



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 charcoals in the EVAP canister.

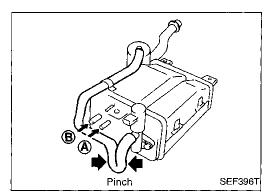
The fuel vapor in the sealed fuel tank is led into the EVAP canister which contains activated carbon and the vapor is stored there when the engine is not operating.

The vapor in the EVAP canister is purged by the air through the purge line to the intake manifold when the engine is operating.

EVAP canister purge volume control valve is controlled by engine control module. When the engine operates, the flow rate of vapor controlled by EVAP canister purge volume control valve is proportionally regulated as the air flow increases.

EVAP canister purge control valve shuts off the vapor purge line during decelerating and idling, and under normal operating conditions the valve is usually open.

EVAP shut valve shuts off the vapor charge line when fuel is being supplied to the fuel tank.



#### Inspection

#### **EVAP CANISTER**

Check EVAP canister as follows:

- 1. Pinch the fresh air vent hose.
- 2. Blow air in port (A) and ensure free flow out of port (B).

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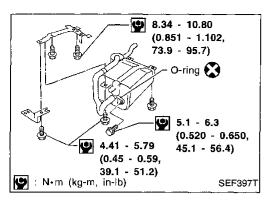
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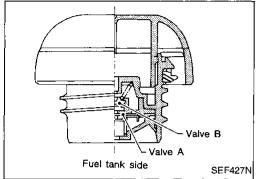
#### **EVAPORATIVE EMISSION SYSTEM**



# Inspection (Cont'd) TIGHTENING TORQUE

Tighten EVAP canister as shown in the figure.

Make sure new O-ring is installed properly between EVAP canister and EVAP canister vent control valve.



# FUEL TANK VACUUM RELIEF VALVE (Built into fuel filler cap)

- 1. Wipe clean valve housing.
- 2. Check valve opening pressure and vacuum.

#### Pressure:

15.3 - 20.0 kPa (0.156 - 0.204 kg/cm<sup>2</sup>, 2.22 - 2.90 psi)

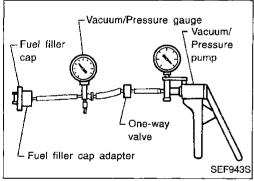
Vacuum:

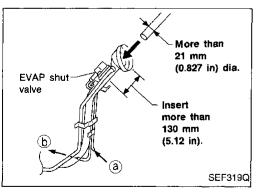
-6.0 to -3.3 kPa (-0.061 to -0.034 kg/cm<sup>2</sup>, -0.87 to -0.48 psi)

3. If out of specification, replace fuel filler cap as an assembly.



Use only a genuine fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may come on.





#### **EVAPORATIVE EMISSION (EVAP) SHUT VALVE**

- When pushing down the shutter inside the fuel filler opening, the EVAP shut valve is closed.
- When releasing the shutter, the valve is open.
- 1. Insert steel tube as shown in the figure.
- 2. Blow air from one side of the EVAP shut valve tube (a) or (b) and ensure that there is no air flow.

#### **EVAP CANISTER PURGE CONTROL VALVE**

Refer to EC-233.

#### **VACUUM CUT VALVE**

Refer to EC-322.

# EVAPORATIVE EMISSION (EVAP) CANISTER PURGE VOLUME CONTROL VALVE

Refer to EC-323.

# **EVAPORATIVE EMISSION (EVAP) CANISTER PURGE CONTROL SOLENOID VALVE**

Refer to EC-233.

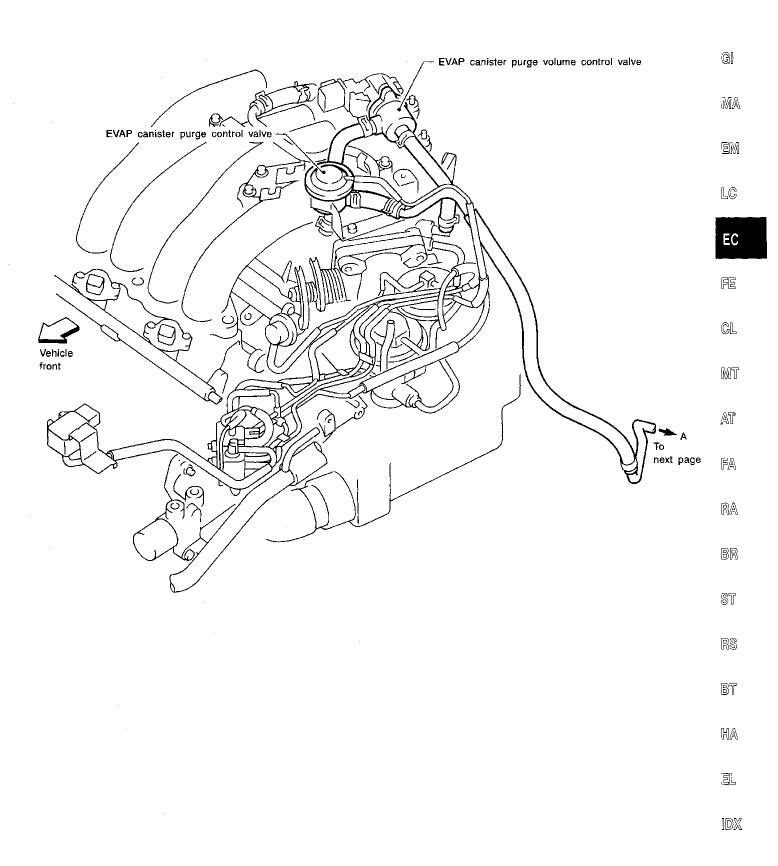
#### TANK FUEL TEMPERATURE SENSOR

Refer to EC-189.

EC-22

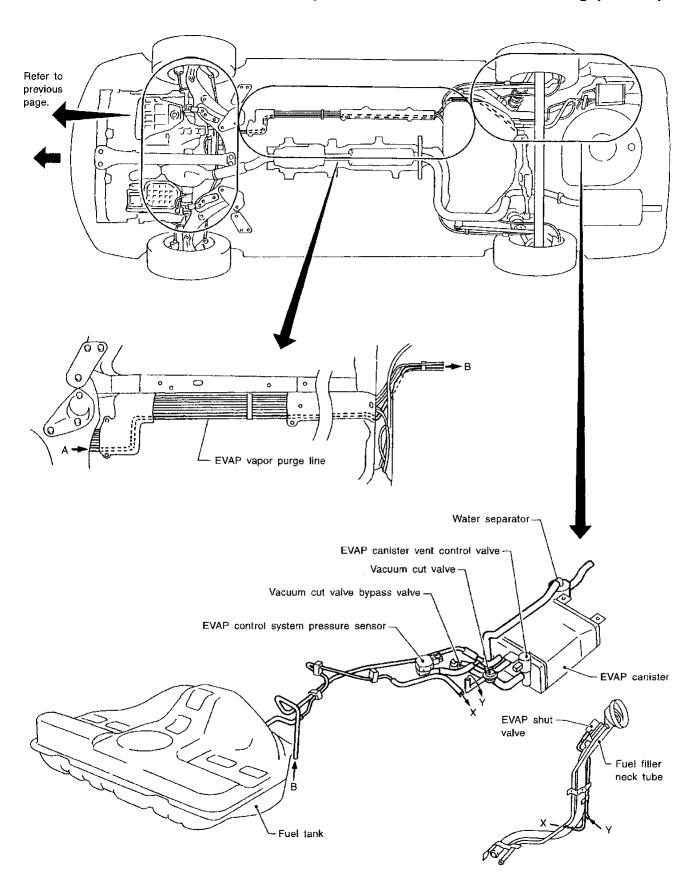
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# **Evaporative Emission Line Drawing**

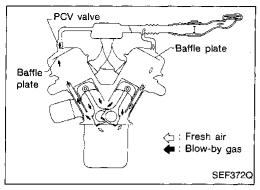


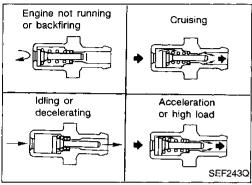
### **EVAPORATIVE EMISSION SYSTEM**

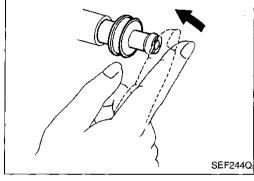
# **Evaporative Emission Line Drawing (Cont'd)**

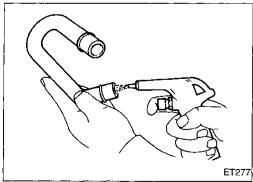


### POSITIVE CRANKCASE VENTILATION









#### Description

This system returns blow-by gas to both the intake manifold and air cleaner.

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 the air cleaner, through the hose connecting air cleaner to rocker cover, into the crankcase. Under full-throttle condition, the manifold vacuum is insufficient to draw the blow-by flow through the valve, and its flow goes through the hose connection in the reverse direction.

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

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#### Inspection

#### PCV (Positive Crankcase Ventilation) 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.

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#### PCV HOSE

- 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.



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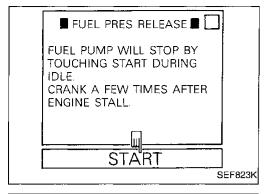
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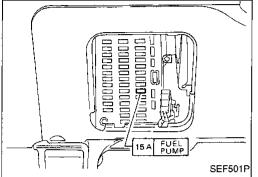
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#### **Fuel Pressure Release**

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



- 1. Start engine.
- Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode with CONSULT. (Touch "START" and after engine stalls, crank it two or three times to release all fuel pressure.)
- 3. Turn ignition switch off.



- 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 fuel pump fuse.

#### **Fuel Pressure Check**

- When reconnecting fuel line, always use new clamps.
- Make sure that clamp screw does not contact adjacent parts.
- Use a torque driver to tighten clamps.
- Use Pressure Gauge to check fuel pressure.
- Release fuel pressure to zero.
- Disconnect fuel hose between fuel filter and fuel tube (engine side).
- 3. Install pressure gauge between fuel filter and fuel tube.
- Start engine and check for fuel leakage.
- 5. Read the indication of fuel pressure gauge.

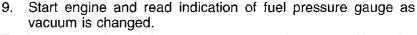
At idling:

Approximately 235 kPa (2.4 kg/cm<sup>2</sup>, 34 psi)

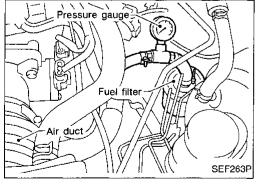
A few seconds after ignition switch is turned OFF to ON:

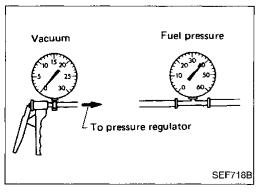
Approximately 294 kPa (3.0 kg/cm<sup>2</sup>, 43 psi)

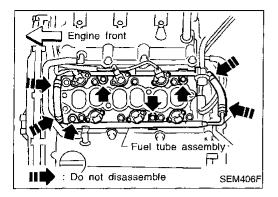
- 6. Stop engine and disconnect fuel pressure regulator vacuum hose from intake manifold.
- 7. Plug intake manifold with a rubber cap.
- 8. Connect variable vacuum source to fuel pressure regulator.

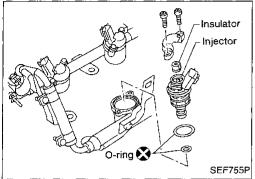


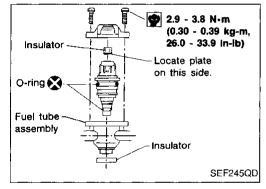
Fuel pressure should decrease as vacuum increases. If results are unsatisfactory, replace fuel pressure regulator.

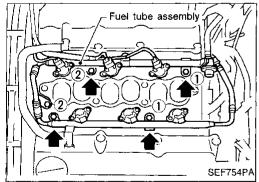












#### Injector Removal and Installation

- Release fuel pressure to zero.
- Remove intake manifold collector (Refer to TIMING CHAIN in EM section).
- Disconnect vacuum hose from pressure regulator.
- Disconnect injector harness connectors.
- Remove injectors with fuel tube assembly.

Do not disassemble fuel tube assembly.

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Push out any malfunctioning injector from fuel tube assembly. Do not extract injector by pinching connector.

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Replace or clean injector as necessary.

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Install injector to fuel tube assembly.

Always replace O-rings and insulators with new ones. Lubricate O-rings with a smear of engine oil.

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Install injectors with fuel tube assembly to intake manifold.

Tighten in numerical order shown in the figure.

First, tighten all bolts to 9.3 to 10.8 N·m (0.95 to 1.1 kg-m, 6.9 to 8.0 ft-lb).

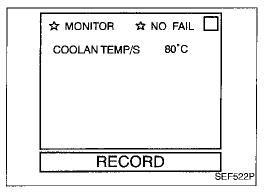
Then, tighten all bolts to 21 to 26 N·m (2.1 to 2.7 kg-m, 15 to 20 ft-lb).

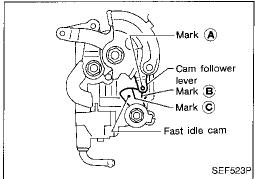
Lubricate fuel hoses with a smear of engine oil.

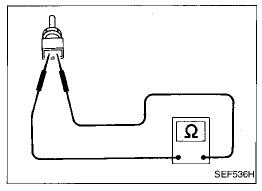
10. Reinstall any parts removed in reverse order of removal.

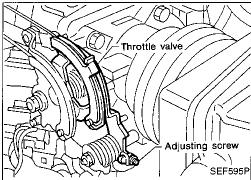
After properly connecting fuel hose to injector and fuel tube assembly, check connection for fuel leakage.

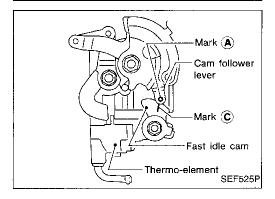
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## Fast Idle Cam (FIC) Inspection and Adjustment



1. Turn ignition switch "ON".

2. See "COOLAN TEMP/S" in "DATA MONITOR" mode with CONSULT.

3. Start engine and warm it up.
When engine temperature is 80±5°C (176±9°F), make sure that the center of mark (A) is aligned with mark (B) as shown in the figure.



1. Turn ignition switch "OFF".

2. Disconnect engine temperature sensor harness connector and check resistance as shown in the figure.

3. Start engine and warm it up. When the resistance of engine temperature sensor is 0.26 to 0.39 k $\Omega$ , make sure that the center of mark (A) is aligned with mark (B) as shown in the figure.

If NG, adjust by turning adjusting screw.

Adjusting screw tightening torque: 0.98 - 1.96 N·m (10 - 20 kg-cm, 8.7 - 17.4 in-lb)

I. Stop engine.

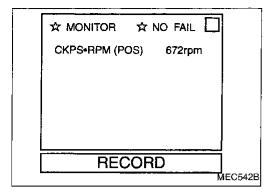


Turn ignition switch "ON" and see "COOLAN TEMP/S" in "DATA MONITOR" mode with CONSULT.
 When engine temperature is 25±5°C (77±9°F), make

6. When engine temperature is 25±5°C (77±9°F), make sure that the center of mark (A) is aligned with mark (C) as shown in the figure.

5. When the resistance of engine temperature sensor is 1.65 to 2.40 k $\Omega$ , make sure that the center of mark (a) is aligned with mark (b) as shown in the figure.

If NG, replace thermo-element and perform the above inspection and adjustment again.



# Direct Ignition System — How to Check Idle Speed and Ignition Timing

#### **IDLE SPEED**

#### Using CONSULT

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



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**IGNITION TIMING** 

Any of following two methods may be used.

#### Method A

Oil filler

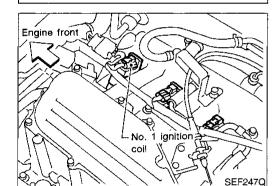
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- Attach timing light to loop wire as shown.
- 2. Check ignition timing.



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Method B

1. Remove No. 1 ignition coil.



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

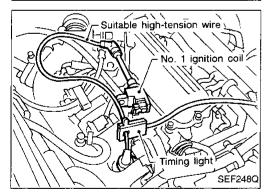
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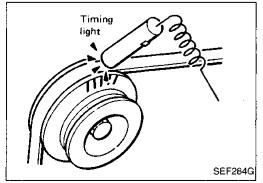
3. Check ignition timing.

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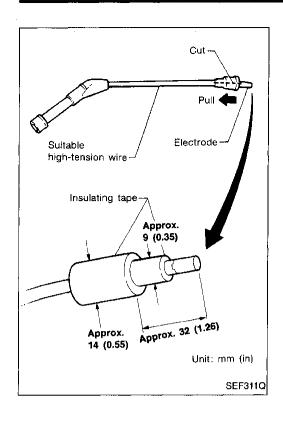
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Direct Ignition System — How to Check Idle Speed and Ignition Timing (Cont'd)



### Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment

#### **PREPARATION**

- Make sure that the following parts are in good order.
- **Battery** (1)
- **lanition** system (2)
- Engine oil and coolant levels
- Fuses
- **ECM** harness connector
- Vacuum hoses
- Air intake system (Oil filler cap, oil level gauge, etc.)
- (8) Fuel pressure
- (9) Engine compression
- (10) EGR valve operation
- (11) Throttle valve
- (12) Evaporative emission (EVAP) canister purge control valve

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

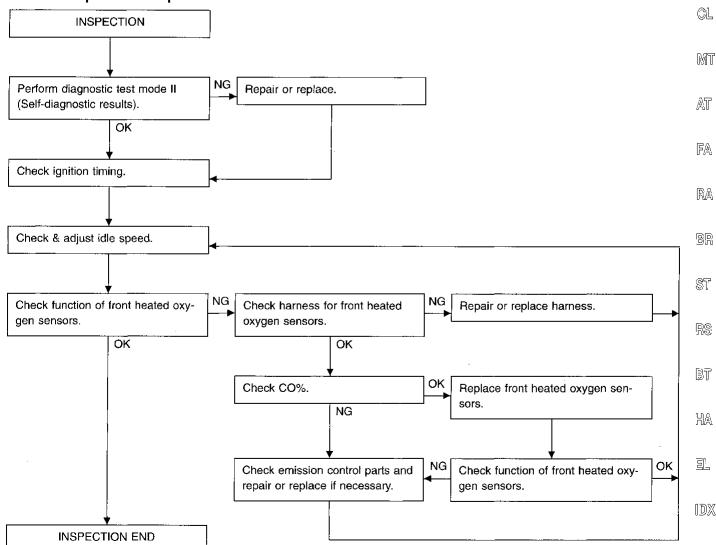
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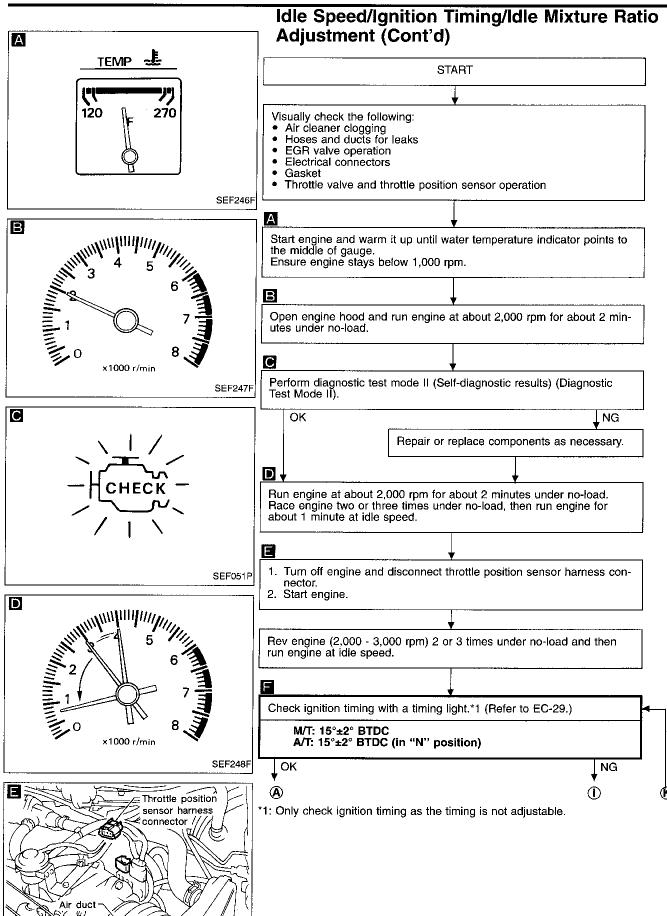
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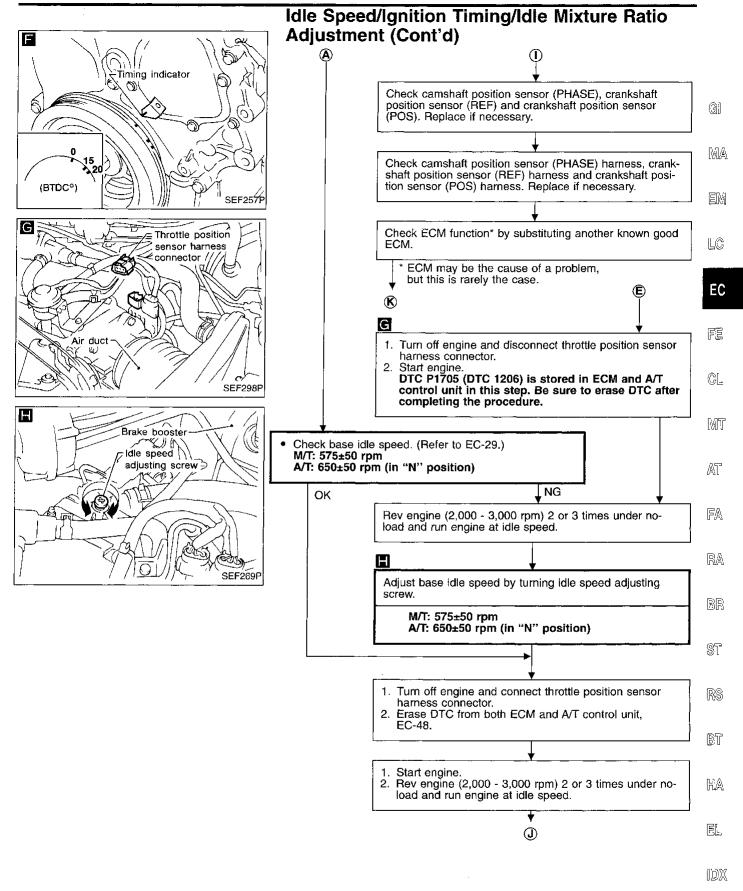
#### Overall inspection sequence



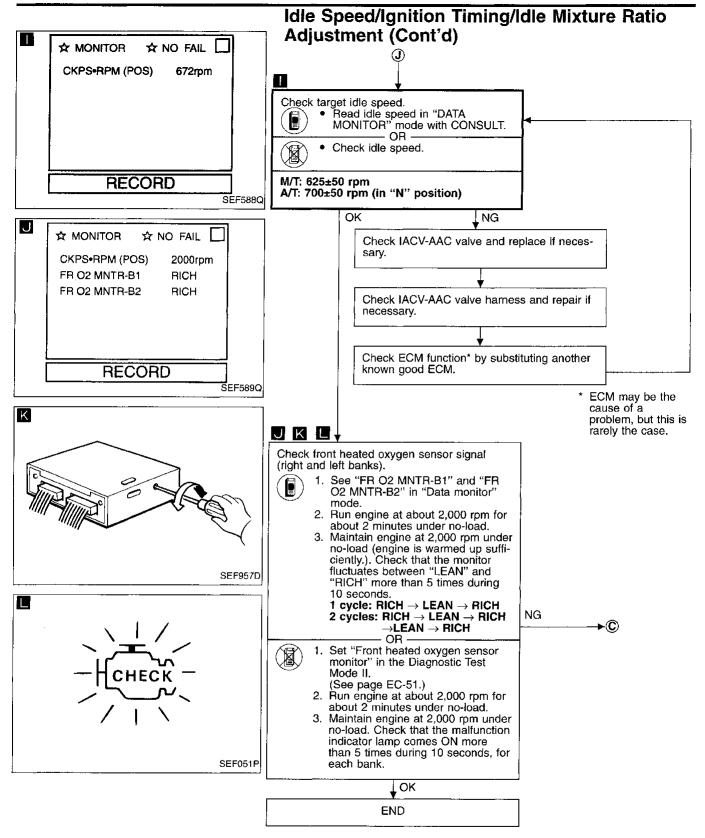


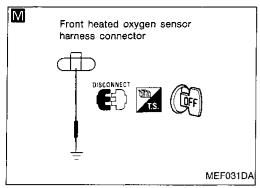
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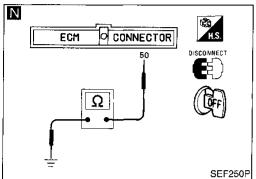
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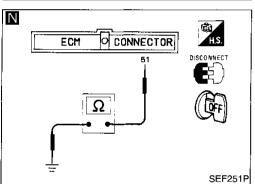


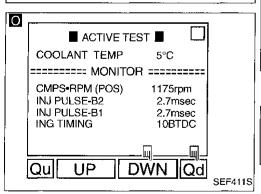
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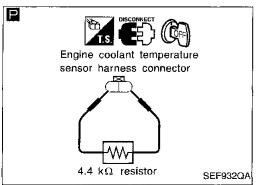


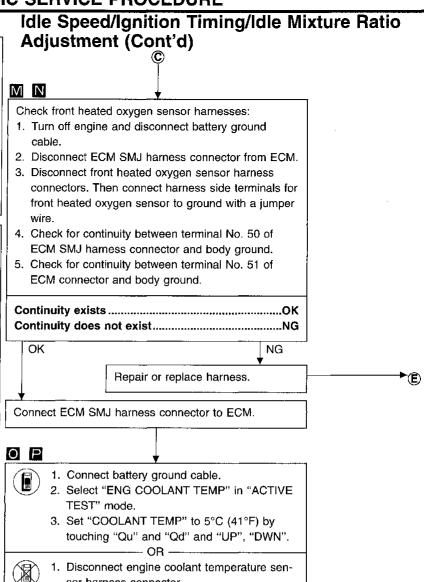












sor harness connector.

2. Connect a resistor (4.4 k $\Omega$ ) between terminals of engine coolant temperature sensor harness connector.

3. Connect battery ground cable.

Q Start engine and warm it up until water temperature indicator points to middle of gauge. (Be sure to start engine after installing 4.4 k $\Omega$  resistor.)

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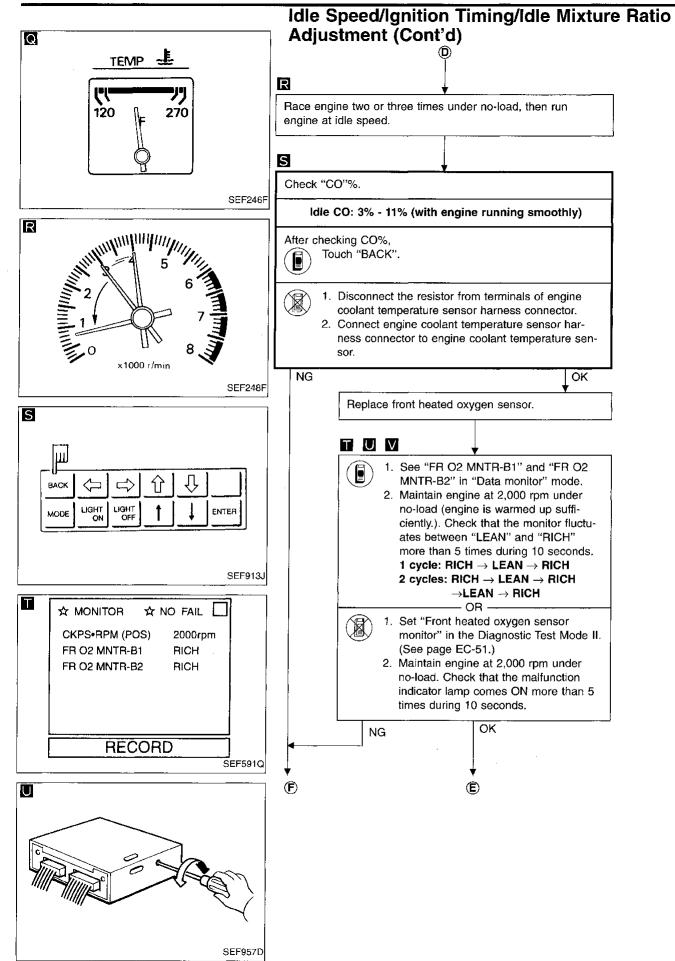
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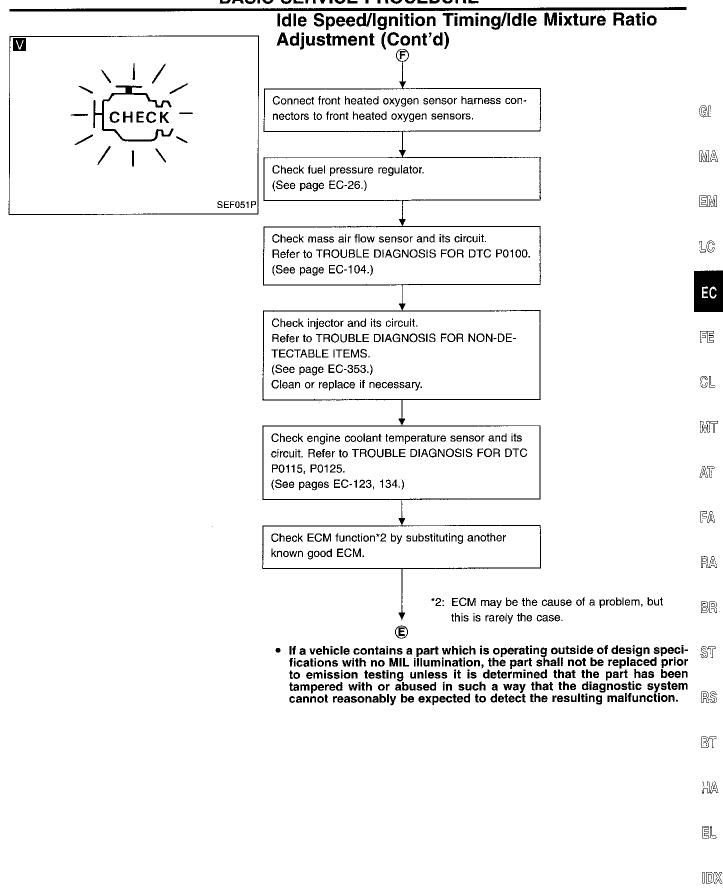
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#### Introduction

The ECM (ECCS control module) has an on board diagnostic system, which detects malfunctions related to sensors or actuators. The ECM also records various emission-related diagnostic information including:

- Diagnostic Trouble Code (DTC)
   Freeze Frame data
   Mode 2 of SAE J1979
- 1st Trip Diagnostic Trouble Code (1st Trip DTC)......Mode 7 of SAE J1979
- 1st Trip Freeze Frame data

The above information can be checked using procedures listed in the table below.

|   | DTC | 1st trip DTC | Freeze Frame<br>data | 1st trip Freeze<br>Frame data | SRT code | Test value |
|---|-----|--------------|----------------------|-------------------------------|----------|------------|
| Diagnostic test<br>mode II (Self-<br>diagnostic<br>results) | 0   | <b>○*1</b>   |                      |                               |          |            |
| CONSULT   | 0   | 0            | 0                    | 0                             | 0        | 0          |
| GST   | 0   | ○*2          | 0                    |                               | 0        | 0          |

<sup>\*1:</sup> When DTC and 1st trip DTC simultaneously appear on the display, they cannot be clearly distinguished from each other.

The malfunction indicator lamp (MIL) on the instrument panel lights up when the same malfunction is detected in two consecutive trips (Two trip detection logic), or when the ECM enters fail-safe mode (Refer to EC-82.).

#### Two Trip Detection Logic

When a malfunction is detected for the first time, 1st trip DTC and 1st trip Freeze Frame data are stored in the ECM memory. The MIL will not light up at this stage. (1st trip)

If the same malfunction is detected again during the next drive, the DTC and Freeze Frame data are stored in the ECM memory, and the MIL lights up. The MIL lights up simultaneously when the DTC is stored. (2nd trip) The "trip" in the "Two Trip Detection Logic" means a driving mode in which self-diagnosis is performed during vehicle operation. Specific on board diagnostic items will cause the ECM to light up or blink the MIL and store DTC and Freeze Frame data, even in the 1st trip, as shown below.

|   |          | MIL         |             | DTC 1st      |            |                        | trip DTC               |  |
|---|----------|-------------|-------------|--------------|------------|------------------------|------------------------|--|
| Items   | 1s       | t trip      | 2nd trip    | 1st trip     | 2nd trip   | 1st trip<br>displaying | 2nd trip<br>displaying |  |
|   | Blinking | Lighting up | lighting up | displaying   | displaying |                        |                        |  |
| Misfire (Possible three way catalyst damage) — DTC: P0300 - P0306 (0701, 0603 - 0608) is being detected | Х        |             |             | ×            |            | ×                      |                        |  |
| Misfire (Possible three way catalyst damage) — DTC: P0300 - P0306 (0701, 0603 - 0608) has been detected |          | x           |             | x            |            | ×                      |                        |  |
| Closed loop control — DTC: P0130 (0307), P0150 (0308)   |          | х           |             | Х            |            | х                      |                        |  |
| Fail-safe items (Refer to EC-82.)   |          | Х           |             | X*1          |            | X*1                    |                        |  |
| Except above  |          |             | Х           | <del>-</del> | Х          | Х                      | Х                      |  |

<sup>\*1:</sup> Except "ECM".

<sup>\*2: 1</sup>st trip DTCs for self-diagnoses concerning SRT items cannot be shown on the GST display.

#### **Emission-related Diagnostic Information**

#### DTC AND 1ST TRIP DTC

The 1st trip DTC (whose number is the same as the DTC number) is displayed for the latest self-diagnostic result obtained. If the ECM memory was cleared previously, and the 1st trip DTC did not reoccur, the 1st trip DTC will not be displayed. If a malfunction is detected during the 1st trip, the 1st trip DTC is stored in the ECM memory. The MIL will not light up (two trip detection logic). If the same malfunction is not detected in the 2nd trip (meeting the required driving pattern), the 1st trip DTC is cleared from the ECM memory. If the same malfunction is detected in the 2nd trip, both the 1st trip DTC and DTC are stored in the ECM memory and the MIL lights up. In other words, the DTC is stored in the ECM memory and the MIL lights up when the same malfunction occurs in two consecutive trips. If a 1st trip DTC is stored and a non-diagnostic operation is performed between the 1st and 2nd trips, only the 1st trip DTC will continue to be stored. For malfunctions that blink or light up the MIL during the 1st trip, the DTC and 1st trip DTC are stored in the ECM memory. Procedures for clearing the DTC and the 1st trip DTC from the ECM memory are described in "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION". Refer to EC-48.

For malfunctions in which 1st trip DTCs are displayed, refer to EC-46. These items are required by legal regulations to continuously monitor the system/component. In addition, the items monitored non-continuously are also displayed on CONSULT.

1st trip DTC is specified in Mode 7 of SAE J1979. 1st trip DTC detection occurs without lighting up the MIL and therefore does not warn the driver of a problem. However, 1st trip DTC detection will not prevent the vehicle from being tested, for example during Inspection/Maintenance (I/M) tests.

When a 1st trip DTC is detected, check, print out or write down and erase (1st trip) DTC and Freeze Frame data as specified in "Work Flow" procedure Step II, refer to page EC-76. Then perform "DTC confirmation procedure" or "Overall function check" to try to duplicate the problem. If the malfunction is duplicated, the item requires repair.

#### How to read DTC and 1st trip DTC

DTC and 1st trip DTC can be read by the following methods.

1. The number of blinks of the malfunction indicator lamp in the Diagnostic Test Mode II (Self-Diagnostic Results) Examples: 0101, 0201, 1003, 1104, etc. These DTCs are controlled by NISSAN.

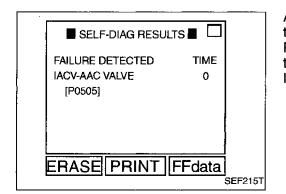
2. CONSULT or GST (Generic Scan Tool) Examples: P0340, P1320, P0705, P0750, etc. These DTCs are prescribed by SAE J2012.

(CONSULT also displays the malfunctioning component or system.)

1st trip DTC No. is the same as DTC No.

Output of the diagnostic trouble code indicates that the indicated circuit has a malfunction. However, in case of the Mode II and GST they do not indicate whether the malfunction is still occurring or occurred in the past and returned to normal. CONSULT can identify them as shown below. Therefore, using CONSULT (if available) is recom-

mended.



A sample of CONSULT display for DTC is shown at left. DTC or 1st trip DTC of a malfunction is displayed in SELF-DIAGNOSTIC RESULTS mode of CONSULT. Time data indicates how many times the vehicle was driven after the last detection of a DTC. If the DTC is being detected currently, the time data will be "0".

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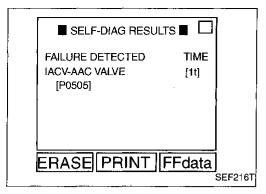
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# Emission-related Diagnostic Information (Cont'd)

If a 1st trip DTC is stored in the ECM, the time data will be "[1t]".

#### FREEZE FRAME DATA AND 1ST TRIP FREEZE FRAME DATA

The ECM has a memory function, which stores the driving condition such as fuel system status, calculated load value, engine coolant temperature, short term fuel trim, long term fuel trim, engine speed and vehicle speed at the moment the ECM detects a malfunction.

Data which are stored in the ECM memory, along with the 1st trip DTC, are called 1st trip freeze frame data, and the data, stored together with the DTC data, are called freeze frame data and displayed on CONSULT or GST. The 1st trip freeze frame data can only be displayed on the CONSULT screen, not on the GST. For detail, refer to EC-62.

Only one set of freeze frame data (either 1st trip freeze frame data of freeze frame data) can be stored in the ECM. 1st trip freeze frame data is stored in the ECM memory along with the 1st trip DTC. There is no priority for 1st trip freeze frame data and it is updated each time a different 1st trip DTC is detected. However, once freeze frame data (2nd trip detection/MIL on) is stored in the ECM memory, 1st trip freeze frame data is no longer stored. Remember, only one set of freeze frame data can be stored in the ECM. The ECM has the following priorities to update the data.

| Priority | Items                 |  |  |  |  |  |  |
|----------|-----------------------|--|--|--|--|--|--|
| 1        | Freeze frame data     | Misfire — DTC: P0300 - P0306 (0701, 0603 - 0608)  Fuel Injection System Function — DTC: P0171 (0115), P0172 (0114), P0174 (0209), P0175 (0210) |  |  |  |  |  |
| 2        |                       | Except the above items (Includes A/T related items)  |  |  |  |  |  |
| 3        | 1st trip freeze frame | data   |  |  |  |  |  |

For example, the EGR malfunction (Priority: 2) was detected and the freeze frame data was stored in the 2nd trip. After that when the misfire (Priority: 1) is detected in another trip, the freeze frame data will be updated from the EGR malfunction to the misfire. The 1st trip freeze frame data is updated each time a different malfunction is detected. There is no priority for 1st trip freeze frame data. However, once freeze frame data is stored in the ECM memory, 1st trip freeze data is no longer stored (because only one freeze frame data or first trip freeze frame data can be stored in the ECM). If freeze frame data is stored in the ECM memory and freeze frame data with the same priority occurs later, the first (original) freeze frame data remains unchanged in the ECM memory.

Both 1st trip freeze frame data and freeze frame data (along with the DTCs) are cleared when the ECM memory is erased. Procedures for clearing the ECM memory are described in "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION". Refer to EC-48.

#### SYSTEM READINESS TEST (SRT) CODE

System Readiness Test (SRT) code is specified in Mode 1 of SAE J1979. It indicates whether the self-diagnostic tests for non-continuously monitored items have been completed or not.

Inspection/Maintenance (I/M) tests of the on board diagnostic (OBD) II system may become the legal requirements in some states/areas. All SRT codes must be set in this case. Unless all SRT codes are set, conducting the I/M test may not be allowed.

SRT codes are set after diagnosis has been performed two or more times. This occurs regardless of whether the diagnosis results in "OK" or "NG", and whether or not the diagnosis is performed in consecutive trips. The following table lists the five SRT items (9 diagnoses) for the ECCS used in A32 models.

# Emission-related Diagnostic Information (Cont'd)

| SRT items                       | Self-diagnostic test items  |          |
|---------------------------------|---|----------|
| Catalyst monitoring             | Three way catalyst function P0420 (0702)  |          |
| EVAP system monitoring          | EVAP control system (Small Leak) P0440 (0705)     EVAP control system purge flow monitoring P1447 (0111)  | <u> </u> |
| Oxygen sensor monitoring        | <ul> <li>Front heated oxygen sensor P0130 (0503), P0150 (0303)</li> <li>Rear heated oxygen sensor P0136 (0707), P0156 (0708)</li> </ul>               | Γ. Π. Δ  |
| Oxygen sensor heater monitoring | <ul> <li>Front heated oxygen sensor heater P0135 (0901), P0155 (1001)</li> <li>Rear heated oxygen sensor heater P0141 (0902), P0161 (1002)</li> </ul> | MA       |
| EGR system monitoring           | <ul><li>EGR function P0400 (0302)</li><li>EGRC-BPT valve function P0402 (0306)</li></ul>  | EM       |

Together with the DTC, the SRT code is cleared from the ECM memory using the method described later (Refer to EC-48). This means that after ECCS components/system are repaired or if the battery terminals remain disconnected for more than 24 hours, all SRT codes may be cleared from the ECM memory.

#### How to display SRT code



1. Selecting "SRT" in "SRT-OBD TEST VALUE" mode with CONSULT For items whose SRT codes are set, a "CMPLT" is displayed on the CONSULT screen; for items whose SRT codes are not set, "INCMP" is displayed.



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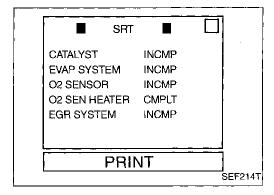
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2. Selecting Mode 1 with GST (Generic Scan Tool)

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A sample of CONSULT display for SRT code is shown at left. "INCMP" means the self-diagnosis is incomplete and SRT is not set. "CMPLT" means the self-diagnosis is complete and SRT is set.

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#### How to set SRT code



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To set all SRT codes, all diagnoses indicated above must be performed two or more times. Each diagnosis may require a long period of actual driving under various conditions. The most efficient driving pattern in which SRT codes can be properly set is explained on the next page. This type of driving pattern should be performed two times or more to set all SRT codes.

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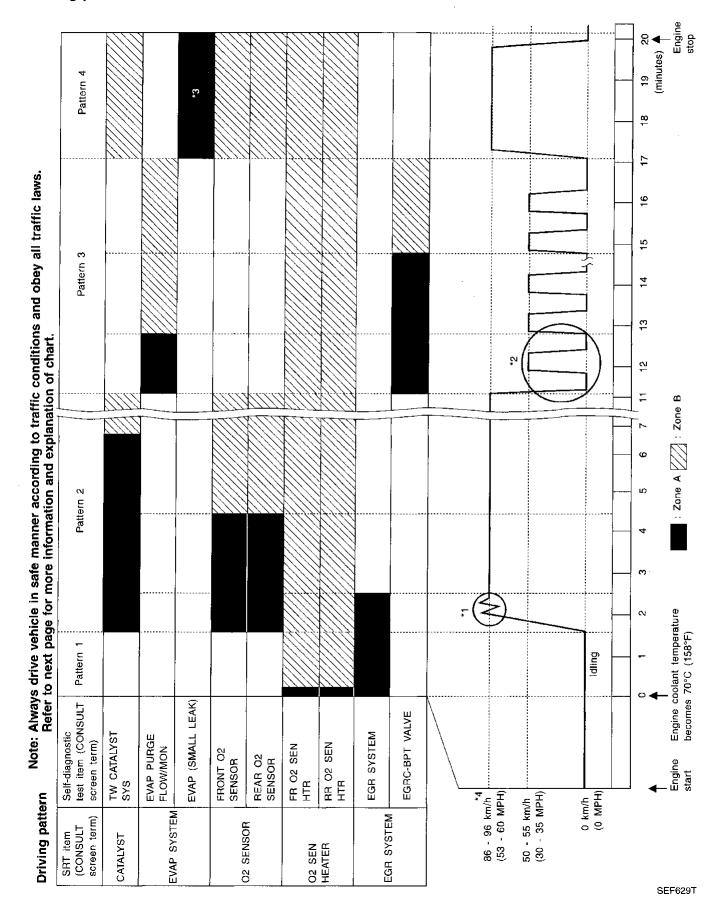
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# Emission-related Diagnostic Information (Cont'd)

#### **Driving pattern**



# Emission-related Diagnostic Information (Cont'd)

The time required for each diagnosis varies with road surface conditions, weather, altitude, individual driving habits, etc.

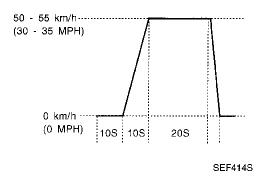
Zone A refers to the range where the time required, for the diagnosis under normal conditions\*, is the shortest. Zone B refers to the range where the diagnosis can still be performed if the diagnosis is not completed within zone A.

- \*: Normal conditions refer to the following:
- Sea level
- Flat road
- Ambient air temperature: 20 30°C (68 86°F)
- Diagnosis is performed as quickly as possible under normal conditions.

Under different conditions [For example: ambient air temperature is other than 20 - 30°C (68 - 86°F)], diagnosis may also be performed.

- Pattern 1: The engine is started at the engine coolant temperature of -10 to 20°C (14 to 68°F) (where the voltage between the ECM terminals (9) and (43) is 3.5 4.4V).
  - The engine must be operated at idle speed until the engine coolant temperature is greater than 70°C (158°F) (where the voltage between the ECM terminals (9) and (3) is lower than 1.4V).
- Pattern 2: When steady-state driving is performed again even after it is interrupted, each diagnosis can be conducted. In this case, the time required for diagnosis may be extended.
- Pattern 3: The driving pattern outlined in \*2 must be repeated at least 3 times.

  On M/T models, shift gears following "suggested upshift speeds" schedule at right.
- Pattern 4: Tests are performed after the engine has been operated for at least 12 minutes.
  - The accelerator pedal must be held very steady during steady-state driving.
  - If the accelerator pedal is moved, the test must be conducted all over again.
- \*1: Depress the accelerator pedal until vehicle speed is 90 km/h (56 MPH), then release the accelerator pedal and keep it released for more than 10 seconds. Depress the accelerator pedal until vehicle speed is 90 km/h (56 MPH) again.
- \*2: Operate the vehicle in the following driving pattern.



- \*3: The driving pattern may be omitted when EVAP (SMALL LEAK) checks are performed using the FUNCTION TEST mode of CONSULT.
- \*4: Checking the vehicle speed with CONSULT or GST is advised.

# Suggested transmission gear position for A/T models

Set the selector lever in the "D" position with the overdrive on-off switch turned on.

#### Suggested upshift speeds for M/T models

Shown below are suggested vehicle speeds for shifting into a higher gear. These suggestions relate to fuel economy and vehicle performance. Actual upshift speeds will vary according to road conditions, the weather and individual driving habits.

For normal acceleration in low altitude areas [less than 1,219 m (4,000 ft)]:

| Gear change | ACCEL<br>shift point<br>km/h (MPH) | CRUISE<br>shift point<br>km/h (MPH) |
|-------------|------------------------------------|-------------------------------------|
| 1st to 2nd  | 21 (13)                            | 21 (13)                             |
| 2nd to 3rd  | 37 (23)                            | 25 (16)                             |
| 3rd to 4th  | 53 (33)                            | 44 (27)                             |
| 4th to 5th  | 63 (39)                            | 58 (36)                             |

For quick acceleration in low altitude areas and high altitude areas [over 1,219 m (4,000 ft)]:

| km/h (MPH) |
|------------|
| 24 (15)    |
| 40 (25)    |
| 64 (40)    |
| 72 (45)    |
|            |

## Suggested maximum speed in each gear

Downshift to a lower gear if the engine is not running smoothly, or if you need to accelerate.

Do not exceed the maximum suggested speed (shown below) in any gear. For level road driving, use the highest gear suggested for that speed. Always observe posted speed limits, and drive according to the road conditions, which will ensure safe operation. Do not over-rev the engine when shifting to a lower gear as it may cause engine damage or loss of vehicle control.

| Gear | km/h (MPH)  |
|------|-------------|
| 1st  | 50 (30)     |
| 2nd  | 95 (60)     |
| 3rd  | 145 (90)    |
| 4th  | <del></del> |
| 5th  |             |

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# Emission-related Diagnostic Information (Cont'd)

#### **TEST VALUE AND TEST LIMIT**

The test value is a parameter used to determine whether diagnostic test is "OK" or "NG" while the ECM is monitored during self-diagnosis. The test limit is a reference value which is specified as the maximum or minimum value and is compared with the test value being monitored.

Items for which these data (test value and test limit) are displayed are the same as SRT code items (11 diagnoses).

These data (test value and test limit) are specified by Test ID (TID) and Component ID (CID). These data can be displayed on the CONSULT screen or GST.

X: Applicable —: Not applicable

|                                  |   |             |             |             |            | appnoo  |
|----------------------------------|---|-------------|-------------|-------------|------------|---------|
| SRT item<br>(CONSULT<br>display) | Self-diagnostic<br>test item                    | TID*1       | CłD*1       | Test value  | Test limit | Display |
| CATALYST                         | Three way cata-                                 | 01 <b>H</b> | 01H         | Parameter 1 | Max.       | Х       |
| CATALYST                         | lyst function                                   | 03H         | 81H         | Parameter 2 | Min.       | Х       |
| EVAD CVCTEM                      | EVAP control<br>system<br>(Small leak)          | 05H         | 03Н         | Parameter 1 | Max.       | Х       |
| EVAP SYSTEM                      | EVAP control<br>system purge<br>flow monitoring | 06H         | 83H         | Parameter 2 | Min.       | х       |
|                                  | Front heated<br>oxygen sensor<br>(Right bank)   | 09H         | 04 <b>H</b> | Parameter 1 | Max.       | Х       |
|                                  |   | 0AH         | 84H         | Parameter 2 | Min.       | Х       |
|                                  |   | 0BH         | 04H         | Parameter 3 | Min.       | Х       |
|                                  |   | 0CH         | 04H         | Parameter 4 | Max.       | Х       |
|                                  |   | 0DH         | 04 <b>H</b> | Parameter 5 | Max.       | Х       |
|                                  | Front heated                                    | 11 <b>H</b> | 05 <b>H</b> | Parameter 1 | Max.       | Х       |
| O2 SENSOR                        |   | 12H         | 85H         | Parameter 2 | Min.       | Х       |
| OZ SENSOR                        | oxygen sensor                                   | 13H         | 05 <b>H</b> | Parameter 3 | Min.       | X       |
|                                  | (Left bank)                                     | 14H         | 05H         | Parameter 4 | Max.       | X       |
|                                  |   | 15H         | 05H         | Parameter 5 | Max.       | Х       |
|                                  |   | 19H         | 86H         | Parameter 6 | Min.       | Х       |
|                                  | Rear heated oxy-                                | 1AH         | 86H         | Parameter 7 | Min.       | Х       |
|                                  | gen sensor                                      | 1BH         | 06H         | Parameter 8 | Мах.       | Х       |
|                                  |   | 1CH         | 06H         | Parameter 9 | Max.       | Х       |

<sup>\*1:</sup> TID and CID are hexadecimals and are shown only on GST.

# Emission-related Diagnostic Information (Cont'd)

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|----------------------------------|--|-------|-------|-------------|------------|----------------|
| SRT item<br>(CONSULT<br>display) | Self-diagnostic<br>test item             | TID*1 | CID*1 | Test value  | Test limit | Display        |
|                                  | Front heated oxygen sensor               | 29H   | 08H   | Parameter 1 | Max.       | x              |
|                                  | heater<br>(Right bank)                   | 2AH   | 88H   | Parameter 1 | Min.       | ×              |
| O2 SENSOR                        | Front heated oxygen sensor               | 2BH   | 09H   | Parameter 1 | Max.       | х              |
| HEATER                           | heater<br>(Left bank)                    | 2CH   | 89H   | Parameter 1 | Min.       | х              |
|                                  | Rear heated oxy-<br>gen sensor<br>heater | 2DH   | 0AH   | Parameter 1 | Max.       | х              |
|                                  |  | 2EH   | 8AH   | Parameter 1 | Min.       | Х              |
|                                  | EGR function                             | 31H   | 8CH   | Parameter 1 | Min.       | X              |
|                                  |  | 32H   | 8CH   | Parameter 2 | Min.       | ×              |
|                                  |  | 33H   | 8CH   | Parameter 3 | Min.       | ×              |
| EGR SYSTEM                       |  | 34H   | 8CH   | Parameter 4 | Min.       | х              |
|                                  |  | 35H   | 0CH   | Parameter 5 | Max.       | ×              |
|                                  | EGRC-BPT valve                           | 36H   | 0CH   | Parameter 6 | Max.       | Х              |
|                                  | function                                 | 37H   | 8CH   | Parameter 7 | Min.       | ×              |

<sup>\*1:</sup> TID and CID are hexadecimals and are shown only on GST.

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# **Emission-related Diagnostic Information** (Cont'd)

### **EMISSION-RELATED DIAGNOSTIC INFORMATION ITEMS**

X: Applicable
—: Not applicable

| Items                                     | DT               | C*4   |          | 1          |              |                |
|---|------------------|-------|----------|------------|--------------|----------------|
| (CONSULT screen terms)                    | CONSULT<br>GST*2 | ECM*1 | SRT code | Test value | 1st trip DTC | Reference page |
| NO SELF-DIAGNOSTIC FAIL-<br>URE INDICATED | P0000            | 0505  | _        |            | _            |                |
| MASS AIR FLOW SEN                         | P0100            | 0102  | _        | <u> </u>   | Х            | EC-104         |
| ABSOL PRESS SENSOR                        | P0105            | 0803  | -        | _          | ×            | EC-110         |
| INT AIR TEMP SEN                          | P0110            | 0401  | T -      | _          | ×            | EC-117         |
| COOLANT TEMP SEN                          | P0115            | 0103  | _        | _          | x            | EC-123         |
| THROTTLE POSI SEN                         | P0120            | 0403  | _        | _          | x            | EC-128         |
| *COOLANT TEMP SEN                         | P0125            | 0908  |          | _          | х            | EC-134         |
| CLOSED LOOP-B1                            | P0130            | 0307  |          | _          | х            | EC-139         |
| FRONT O2 SENSOR-B1                        | P0130            | 0503  | х        | х          | X*3          | EC-141         |
| FR O2 SEN HTR-B1                          | P0135            | 0901  | Х        | ×          | X*3          | EC-146         |
| REAR O2 SENSOR                            | P0136            | 0707  | х        | х          | X*3          | EC-150         |
| RR O2 SEN HTR                             | P0141            | 0902  | х        | х          | X*3          | EC-154         |
| CLOSED LOOP-B2                            | P0150            | 0308  |          | _          | X            | EC-139         |
| FRONT O2 SENSOR-B2                        | P0150            | 0303  | х        | х          | X*3          | EC-159         |
| FR O2 SEN HTR-B2                          | P0155            | 1001  | х        | х          | X*3          | EC-165         |
| FUEL SYS LEAN/BK1                         | P0171            | 0115  |          | _          | х            | EC-169         |
| FUEL SYS RICH/BK1                         | P0172            | 0114  | _        | _          | х            | EC-174         |
| FUEL SYS LEAN/BK2                         | P0174            | 0210  |          | _          | х            | EC-179         |
| FUEL SYS RICH/BK2                         | P0175            | 0209  | _        | _          | x            | EC-184         |
| TANK FUEL TEMP SENSOR                     | P0180            | 0402  |          | _          | х            | EC-189         |
| MULTI CYL MISFIRE                         | P0300            | 0701  | _        | _          | X            | EC-192         |
| CYL 1 MISFIRE                             | P0301            | 0608  | _        | _          | x            | EC-192         |
| CYL 2 MISFIRE                             | P0302            | 0607  |          | _          | ×            | EC-192         |
| CYL 3 MISFIRE                             | P0303            | 0606  | _        | _          | ×            | EC-192         |
| CYL 4 MISFIRE                             | P0304            | 0605  |          | _          | ×            | EC-192         |
| CYL 5 MISFIRE                             | P0305            | 0604  |          | _          | Х            | EC-192         |
| CYL 6 MISFIRE                             | P0306            | 0603  |          | <b>—</b> . | ×            | EC-192         |
| KNOCK SENSOR                              | P0325            | 0304  |          | _          | X            | EC-196         |
| CRANK POS SEN (POS)                       | P0335            | 0802  | _        | _          | ×            | EC-199         |
| CAM POS SEN (PHASE)                       | P0340            | 0101  |          | _          | ×            | EC-205         |
| EGR SYSTEM                                | P0400            | 0302  | х        | х          | X*3          | EC-210         |
| EGRC-BPT VALVE                            | P0402            | 0306  | х        | х          | X*3          | EC-220         |
| TW CATALYST SYS                           | P0420            | 0702  | Х        | Х          | X*3          | EC-222         |

<sup>\*1:</sup> In Diagnostic Test Mode II (Self-diagnostic results), these numbers are controlled by NISSAN.
\*2: These numbers are prescribed by SAE J2012.
\*3: These are not displayed with GST.
\*4: 1st trip DTC No. is the same as DTC No.

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# **Emission-related Diagnostic Information** (Cont'd)

X: Applicable

—: Not applicable

|                                 |                  |       |                |            |              | —: Not applicable |      |  |  |
|---------------------------------|------------------|-------|----------------|------------|--------------|-------------------|------|--|--|
|                                 | ΓD               | TC*4  |                |            |              |                   |      |  |  |
| items<br>(CONSULT screen terms) | CONSULT<br>GST*2 | ECM*1 | SRT code       | Test value | 1st trip DTC | Reference page    | GI   |  |  |
| EVAP (SMALL LEAK)               | P0440            | 0705  | X              | x          | X*3          | EC-225            |      |  |  |
| PURG CONT/V & S/V               | P0443            | 0807  |                |            | ×            | EC-233            | MA   |  |  |
| VENT CONTROL VALVE              | P0446            | 0903  |                |            | ×            | EC-241            |      |  |  |
| EVAP SYS PRES SEN               | P0450            | 0704  |                | _          | ×            | EC-246            | EM   |  |  |
| VEHICLE SPEED SEN               | P0500            | 0104  |                | _          | ×            | EC-251            |      |  |  |
| IACV-AAC VALVE                  | P0505            | 0205  | T -            | _          | ×            | EC-255            | LC   |  |  |
| CLOSED THRL POS SW              | P0510            | 0203  |                | _          | ×            | EC-261            |      |  |  |
| A/T COMM LINE                   | P0600            | · -   | _              | _          |              | EC-265            | EC   |  |  |
| ECM                             | P0605            | 0301  | _              | _          | ×            | EC-269            | EC   |  |  |
| PARK/NEUT POSI SW               | P0705            | 1003  | _              | _          | X            | EC-272            |      |  |  |
| INHIBITOR SWITCH                | P0705            | 1101  |                |            | ×            | AT-59             | FE   |  |  |
| FLUID TEMP SENSOR               | P0710            | 1208  |                | _          | х            | AT-65             |      |  |  |
| VHCL SPEED SEN A/T              | P0720            | 1102  | _              |            | ×            | AT-68             | CL   |  |  |
| ENGINE SPEED SIG                | P0725            | 1207  | T -            |            | ×            | AT-70             |      |  |  |
| A/T 1ST SIGNAL                  | P0731            | 1103  |                |            | ×            | AT-72             | MT   |  |  |
| A/T 2ND SIGNAL                  | P0732            | 1104  | _              |            | х            | AT-75             |      |  |  |
| A/T 3RD SIGNAL                  | P0733            | 1105  |                |            | ×            | AT-78             | AT   |  |  |
| A/T 4TH SIG OR TCC              | P0734            | 1106  | T -            | -          | ×            | AT-81             | ZALU |  |  |
| TOR CONV CLUTCH SV              | P0740            | 1204  | -              | _          | Х            | AT-86             |      |  |  |
| A/T TCC SIGNAL                  | P0744            | 1107  | -              | _          | ×            | AT-89             | FA   |  |  |
| LINE PRESSURE S/V               | P0745            | 1205  | _              |            | X            | AT-94             |      |  |  |
| SHIFT SOLENOID/V A              | P0750            | 1108  | _              | _          | ×            | AT-97             | RA   |  |  |
| SHIFT SOLENOID/V B              | P0755            | 1201  | _              | _          | х            | AT-100            |      |  |  |
| MAP/BARO SW SOL/V               | P1105            | 1302  | _              | _          | Х            | EC-277            | BR   |  |  |
| FPCM                            | P1220            | 1305  | <u> </u>       | _          | х            | EC-283            |      |  |  |
| IGN SIGNAL-PRIMARY              | P1320            | 0201  | _              | _          | х            | EC-290            | ST   |  |  |
| CRANK POS SEN (REF)             | P1335            | 0407  | _              | _          | x            | EC-298            | ூர   |  |  |
| CRANK P/S (POS) COG             | P1336            | 0905  | <del> </del> - | _          | х            | EC-303            |      |  |  |
| EGRC SOLENOID/V                 | P1400            | 1005  | <del> </del>   | _          | X            | EC-309            | RS   |  |  |
| EGR TEMP SENSOR                 | P1401            | 0305  | _              | <u> </u>   | X            | EC-314            |      |  |  |
| VC/V BYPASS/V                   | P1441            | 0801  | ·—             | -          | ×            | EC-318            | BT   |  |  |
| PURG VOLUME CONT/V              | P1445            | 1008  | _              | _          | x            | EC-323            |      |  |  |
| EVAP PURG FLOW/MON              | P1447            | 0111  | X              | х          | X*3          | EC-330            | HA   |  |  |
| A/T DIAG COMM LINE              | P1605            | 0804  | -              |            | х            | EC-337            |      |  |  |
| THRTL POSI SEN A/T              | P1705            | 1206  | _              | ·          | Х            | AT-103            |      |  |  |
| OVERRUN CLUTCH S/V              | P1760            | 1203  | _              |            | X            | AT-105            | .5L  |  |  |
|                                 |                  |       |                |            | <u> </u>     |                   |      |  |  |

**EC-47** 

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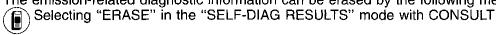
¹DX

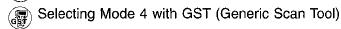
<sup>\*1:</sup> In Diagnostic Test Mode II (Self-diagnostic results), these numbers are controlled by NISSAN.
\*2: These numbers are prescribed by SAE J2012.
\*3: These are not displayed with GST.
\*4: 1st trip DTC No. is the same as DTC No.

# **Emission-related Diagnostic Information** (Cont'd)

#### HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION

The emission-related diagnostic information can be erased by the following methods.





Changing the diagnostic test mode from Diagnostic Test Mode II to Mode I by turning the mode selector on the ECM (Refer to EC-51.)

- If the battery terminal is disconnected, the emission-related diagnostic information will be lost within 24 hours.
- When you erase the emission-related diagnostic information, using CONSULT or GST is easier and quicker than switching the mode selector on the ECM.

The following data are cleared from the ECM memory in the mode obtained.

- 1. Diagnostic trouble codes
- 2. 1st trip diagnostic trouble codes
- 3. Freeze frame data
- 4. 1st trip freeze frame data
- 5. System readiness test (SRT) codes
- 6. Test values
- 7. Others

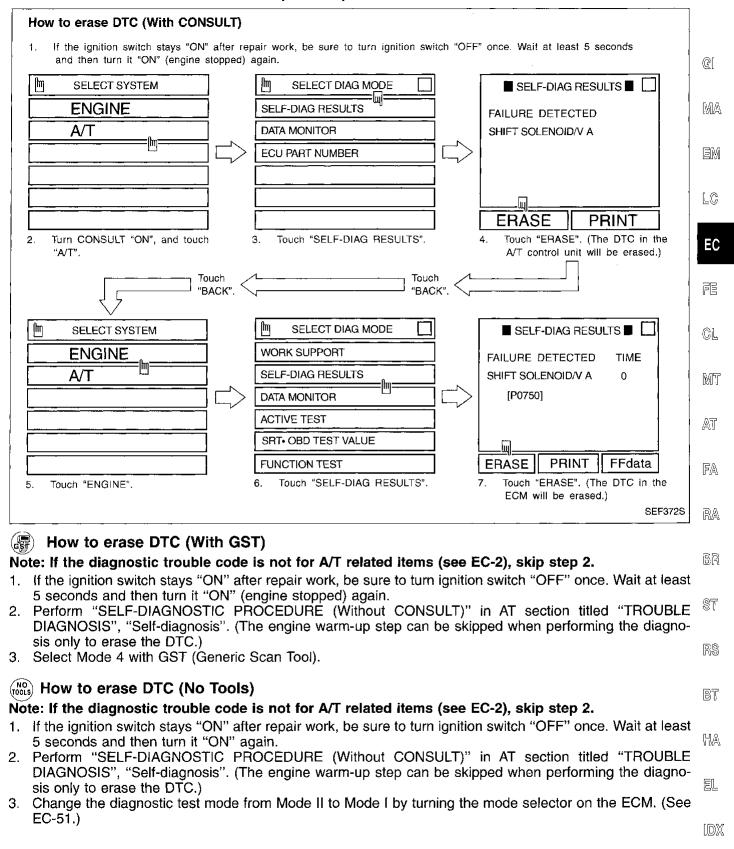
Actual work procedures are explained using a DTC as an example. Be careful so that not only the DTC, but all of the data listed above, are cleared from the ECM memory during work procedures.

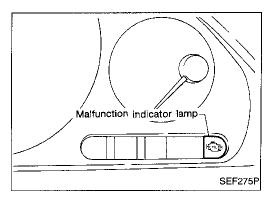
# How to erase DTC (With CONSULT)

#### Note: If the diagnostic trouble code is not for A/T related items (see EC-2), skip steps 2 through 4.

- 1. If the ignition switch stays "ON" after repair work, be sure to turn ignition switch "OFF" once. Wait at least 5 seconds and then turn it "ON" (engine stopped) again.
- 2. Turn CONSULT "ON" and touch "A/T".
- Touch "SELF-DIAG RESULTS".
- 4. Touch "ERASE". (The DTC in the A/T control unit will be erased.) And touch "BACK" twice.
- 5. Touch "ENGINE".
- 6. Touch "SELF-DIAG RESULTS".
- 7. Touch "ERASE". (The DTC in the ECM will be erased.)
- If DTCs are displayed for both ECM and A/T control unit, they need to be erased individually for both ECM and A/T control unit.

# Emission-related Diagnostic Information (Cont'd)





## Malfunction Indicator Lamp (MIL)

- 1. The malfunction indicator lamp will light up when the ignition switch is turned ON without the engine running. This is for checking the blown lamp.
- If the malfunction indicator lamp does not light up, see the WARNING LAMPS AND CHIME (BUZZER) in the EL section. (Or see EC-379.)
- 2. When the engine is started, the malfunction indicator lamp should go off.
  - If the lamp remains on, the on board diagnostic system has detected an engine system malfunction.

### ON BOARD DIAGNOSTIC SYSTEM FUNCTION

The on board diagnostic system has the following four functions.

### **Diagnostic Test Mode I**

- 1. BULB CHECK
- : This function checks the bulb for damage (blown, open circuit, etc.) of the malfunction indicator lamp.
  - If the MIL does not come on, check MIL circuit and ECM test mode selector. (See next page.)
- 2. MALFUNCTION WARNING
- : This is a usual driving condition. When a malfunction is detected twice (2 trip detection logic), the malfunction indicator lamp will light up to inform the driver that a malfunction has been detected.

  Only the following malfunctions will light up or blink the MIL even in the 1st trip
  - "Misfire (possible three way catalyst damage)"
  - "Closed loop control"
  - "Fail-safe mode" [except for crankshaft position sensor (REF) circuit]

## Diagnostic Test Mode II

- 1. SELF-DIAGNOSTIC RESULTS
- : By using this function, the diagnostic trouble codes can be read.
- 2. FRONT HEATED OXY-GEN SENSOR MONI-TOR
- : In this mode, the fuel mixture condition (lean or rich) monitored by front heated oxygen sensor can be read.

### MIL flashing without DTC

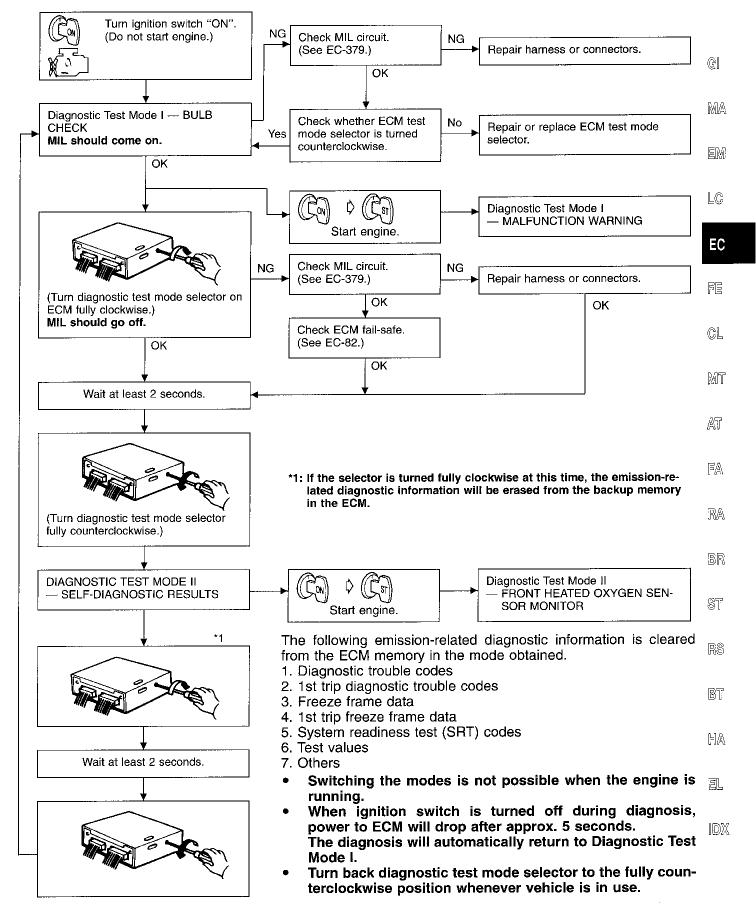
If the ECM is in Diagnostic Test Mode II, the MIL may flash when the engine is running. In this case, check ECM test mode selector following "HOW TO SWITCH DIAGNOSTIC TEST MODES" on next page.

How to switch the diagnostic test (function) modes and details of the above functions are described later. (See next page.)

| Co              | ndition           | Diagnostic<br>Test Mode I | Diagnostic<br>Test Mode II               |  |
|-----------------|-------------------|---------------------------|--|--|
| Ignition switch | Engine<br>stopped | BULB CHECK                | SELF-DIAGNOSTIC<br>RESULTS               |  |
| tion            | Engine<br>running | MALFUNCTION<br>WARNING    | FRONT HEATED<br>OXYGEN SENSOR<br>MONITOR |  |

## Malfunction Indicator Lamp (MIL) (Cont'd)

### **HOW TO SWITCH DIAGNOSTIC TEST MODES**



## Malfunction Indicator Lamp (MIL) (Cont'd)

### DIAGNOSTIC TEST MODE I—BULB CHECK

In this mode, the MALFUNCTION INDICATOR LAMP on the instrument panel should stay ON. If it remains OFF, check the bulb. (Refer to WARNING LAMPS AND CHIME in EL section or see EC-379.)

### DIAGNOSTIC TEST MODE I—MALFUNCTION WARNING

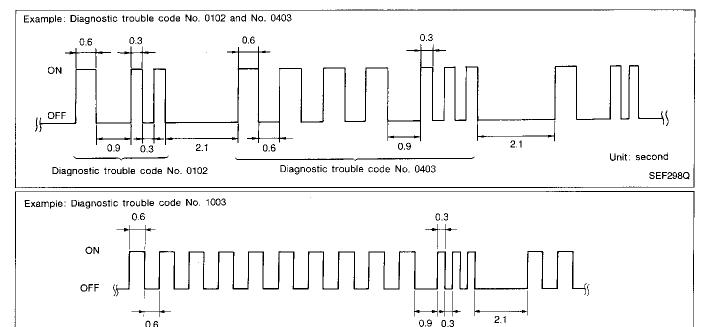
| MALFUNCTION<br>INDICATOR LAMP | Condition  |
|-------------------------------|--|
| ON                            | When the malfunction is detected or the ECM's CPU is malfunctioning. |
| OFF                           | No malfunction   |

These Diagnostic Trouble Code Numbers are clarified in Diagnostic Test Mode II (SELF-DIAGNOSTIC RESULTS).

### DIAGNOSTIC TEST MODE II—SELF-DIAGNOSTIC RESULTS

In this mode, the DTC and 1st trip DTC are indicated by the number of blinks of the MALFUNCTION INDI-CATOR LAMP.

The DTC and 1st trip DTC are displayed at the same time. If the MIL does not illuminate in diagnostic test mode 1 (Malfunction warning), all displayed items are 1st trip DTC's. If only one code is displayed when the MIL illuminates in diagnostic test mode II (SELF-DIAGNOSTIC RESULTS), it is a DTC; if two or more codes are displayed, they may be either DTC's or 1st trip DTC's. DTC No. is same as that of 1st trip DTC. These unidentified codes can be identified by using the consult or GST. A DTC will be used as an example for how to read a code.



Long (0.6 second) blinking indicates the two LH digits of number and short (0.3 second) blinking indicates the two RH digits of number. For example, the malfunction indicator lamp blinks 10 times for 6 seconds (0.6 sec  $\times$  10 times) and then it blinks three times for about 1 second (0.3 sec  $\times$  3 times). This indicates the DTC "1003" and refers to the malfunction of the park/neutral position switch.

Diagnostic trouble code No. 1003

In this way, all the detected malfunctions are classified by their diagnostic trouble code numbers. The DTC "0505" refers to no malfunction. (See DIAGNOSTIC TROUBLE CODE INDEX, refer to EC-2.)

Unit: second

SEF162PA

## Malfunction Indicator Lamp (MIL) (Cont'd)

### HOW TO ERASE DIAGNOSTIC TEST MODE II (Self-diagnostic results)

The diagnostic trouble code can be erased from the backup memory in the ECM when the diagnostic test mode is changed from Diagnostic Test Mode II to Diagnostic Test Mode I. (Refer to "HOW TO SWITCH DIAGNOS-TIC TEST MODES".)

- If the battery terminal is disconnected, the diagnostic trouble code will be lost from the backup memory within 24 hours.
- Be careful not to erase the stored memory before starting trouble diagnoses.

### DIAGNOSTIC TEST MODE II—FRONT HEATED OXYGEN SENSOR MONITOR

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

| MALFUNCTION INDICATOR LAMP | Fuel mixture condition in the exhaust gas | Air fuel ratio feedback control condition |
|----------------------------|---|---|
| ON                         | Lean                                      | Closed lose system                        |
| OFF                        | Rich                                      | Closed loop system                        |
| *Remains ON or OFF         | Any condition                             | Open loop system                          |

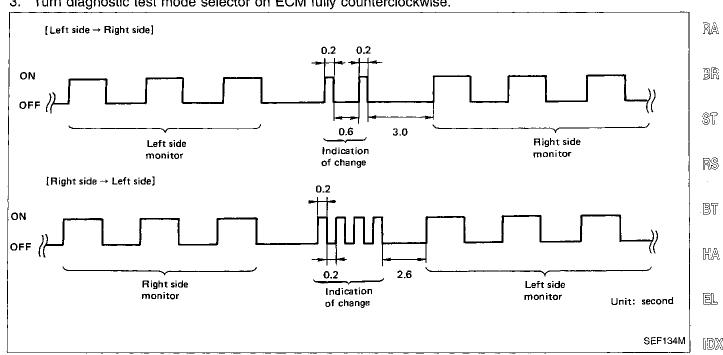
<sup>\*:</sup> Maintains conditions just before switching to open loop.

To check the front heated oxygen sensor function, start engine in the Diagnostic Test Mode II and warm it up until engine coolant temperature indicator points to the middle of the gauge.

Next run engine at about 2,000 rpm for about 2 minutes under no-load conditions. Then make sure that the MALFUNCTION INDICATOR LAMP comes ON more than 5 times within 10 seconds with engine running at 2,000 rpm under no-load.

## How to switch monitored sensor from left bank to right bank or vice versa

- The following procedure should be performed while the engine is running.
- Turn diagnostic test mode selector on ECM fully clockwise. 1.
- Wait at least 2 seconds.
- 3. Turn diagnostic test mode selector on ECM fully counterclockwise.



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## **OBD System Operation Chart**

### RELATIONSHIP BETWEEN MIL, 1ST TRIP DTC, DTC, AND DETECTABLE ITEMS

- When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data are stored in the ECM memory.
- When the same malfunction is detected in two consecutive trips, the DTC and the freeze frame data are stored in the ECM memory, and the MIL will come on. For details, refer to "Two Trip Detection Logic" on EC-38.
- The MIL will go off after the vehicle is driven 3 times with no malfunction. The drive is counted only when
  the recorded driving pattern is met (as stored in the ECM). If another malfunction occurs while counting,
  the counter will reset.
- The DTC and the freeze frame data can be displayed until the vehicle is driven 40 times (driving pattern A) without the same malfunction recurring (except for Misfire and Fuel Injection System). For Misfire and Fuel Injection System, the DTC and freeze frame data can be displayed until the vehicle is driven 80 times (driving pattern C) without the same malfunction recurring. The "TIME" IN "SELF-DIAGNOSTIC RESULTS" mode of CONSULT will count in response to the number of times the vehicle is driven.
- The 1st trip DTC is not displayed when the self-diagnosis results in "OK" for the 2nd trip.

### **SUMMARY CHART**

| Items                                 | Fuel Injection System | Misfire           | Except the lefts |
|---------------------------------------|-----------------------|-------------------|------------------|
| MIL (goes off)                        | 3 (pattern B)         | 3 (pattern B)     | 3 (pattern B)    |
| DTC, Freeze Frame Data (no display)   | 80 (pattern C)        | 80 (pattern C)    | 40 (pattern A)   |
| 1st Trip DTC (clear)                  | 1 (pattern C), *1     | 1 (pattern C), *1 | 1 (pattern B)    |
| 1st Trip Freeze Frame Data<br>(clear) | *1, *2                | *1, *2            | 1 (pattern B)    |

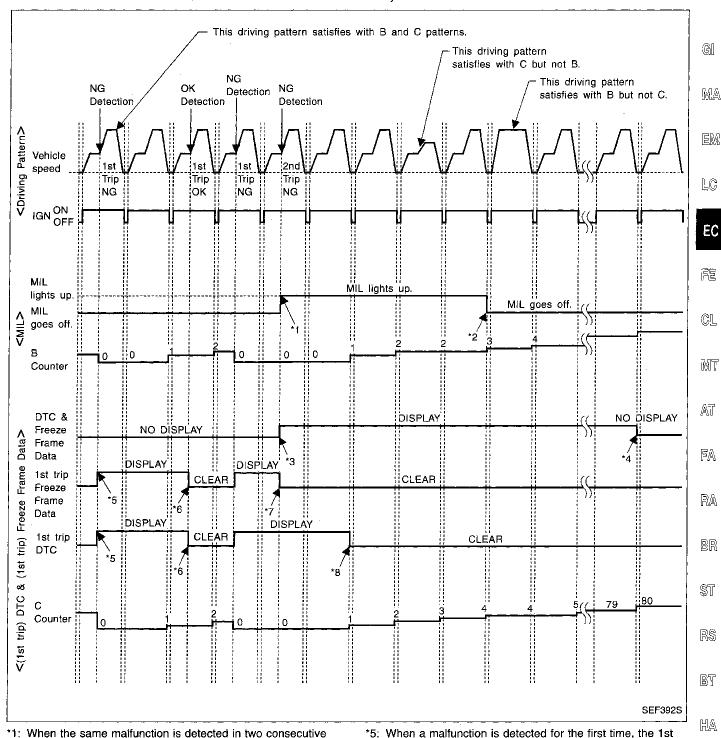
Details about patterns "A", "B", and "C" are on EC-56.

<sup>\*1:</sup> Clear timing is at the moment OK is detected.

<sup>\*2:</sup> Clear timing is when the same malfunction is detected in the 2nd trip.

# **OBD System Operation Chart (Cont'd)**

RELATIONSHIP BETWEEN MIL, DTC, 1ST TRIP DTC AND DRIVING PATTERNS FOR "MISFIRE" <EXHAUST QUALITY DETERIORATION>. "FUEL INJECTION SYSTEM"



- \*1: When the same malfunction is detected in two consecutive trips, MIL will light up.
- \*2: MIL will go off after vehicle is driven 3 times (pattern B) without any malfunctions.
- \*3: When the same malfunction is detected in two consecutive trips, the DTC and the freeze frame data will be stored in ECM.
- \*4: The DTC and the freeze frame data will not be displayed any longer after vehicle is driven 80 times (pattern C) without the same malfunction. (The DTC and the freeze frame data still remain in ECM.)
- trip DTC and the 1st trip freeze frame data will be stored in ECM.

  \*6: The 1st trip DTC and the 1st trip freeze frame data will be
- cleared at the moment OK is detected.
  \*7: When the same malfunction is detected in the 2nd trip, the
- \*7: When the same malfunction is detected in the 2nd trip, the 1st trip freeze frame data will be cleared.
- \*8: 1st trip DTC will be cleared when vehicle is driven a time (pattern C) without the same malfunction after DTC is stored in ECM.

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## **OBD System Operation Chart (Cont'd)**

# EXPLANATION FOR DRIVING PATTERNS FOR "MISFIRE <EXHAUST QUALITY DETERIORATION>", "FUEL INJECTION SYSTEM"

### (Driving pattern B)

Driving pattern B means the vehicle operation as follows:

All components and systems should be monitored at least once by the OBD system.

- The B counter will cleared when the malfunction is detected once regardless of the driving pattern.
- The B counter will be counted up when driving pattern B is satisfied without any malfunction.
- The MIL will go off when the B counter reaches 3. (\*2 in "OBD SYSTEM OPERATION CHART")

### (Driving pattern C)

Driving pattern C means the vehicle operation as follows:

- (1) The following conditions should be satisfied at the same time: Engine speed: (Engine speed in the freeze frame data) ±375 rpm Calculated load value: (Calculated load value in the freeze frame data) x (1±0.1) [%] Engine coolant temperature (T) condition:
- When the freeze frame data shows lower than 70°C (158°F), "T" should be lower than 70°C (158°F).
- When the freeze frame data shows higher than or equal to 70°C (158°F), "T" should be higher than or equal to 70°C (158°F).

### Example:

If the stored freeze frame data is as follows:

Engine speed: 850 rpm, Calculated load value: 30%, Engine coolant temperature: 80°C (176°F)

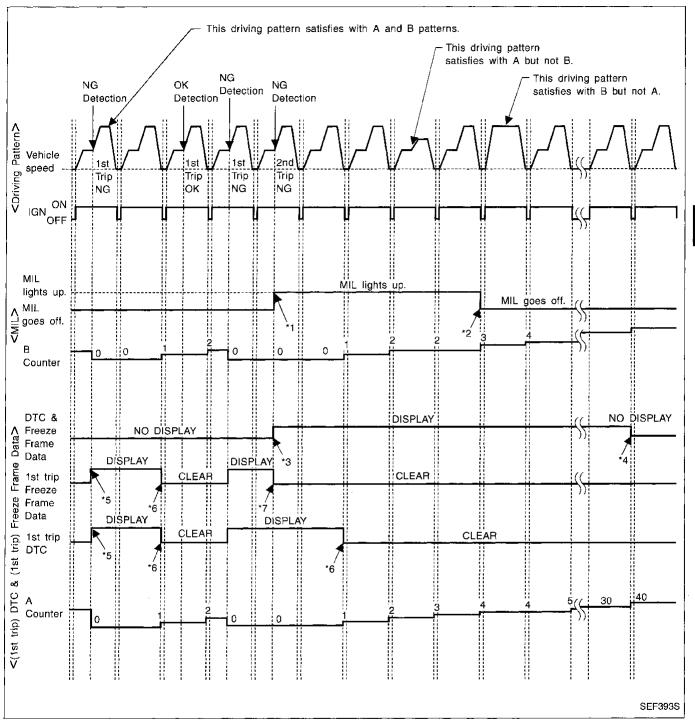
To be satisfied with driving pattern C, the vehicle should run under the following conditions:

Engine speed: 475 - 1,225 rpm, Calculated load value: 27 - 33%, Engine coolant temperature: more than ≥ 70°C (158°F)

- The C counter will be cleared when the malfunction is detected regardless of (1).
- The C counter will be counted up when (1) is satisfied without the same malfunction.
- The DTC will not be displayed after C counter reaches 80.
- The 1st trip DTC will be cleared when C counter is counted a time without the same malfunction after DTC is stored in ECM.

# **OBD System Operation Chart (Cont'd)**

RELATIONSHIP BETWEEN MIL, DTC, 1ST TRIP DTC AND DRIVING PATTERNS EXCEPT FOR "MISFIRE <EXHAUST QUALITY DETERIORATION>", "FUEL INJECTION SYSTEM"



- \*1: When the same malfunction is detected in two consecutive trips, MIL will light up.
- \*2: MIL will go off after vehicle is driven 3 times (pattern B) without any malfunctions.
- \*3: When the same malfunction is detected in two consecutive trips, the DTC and the freeze frame data will be stored in ECM.
- \*4: The DTC and the freeze frame data will not be displayed any longer after vehicle is driven 40 times (pattern A) without the same malfunction. (The DTC and the freeze frame data still remain in ECM.)
- \*5: When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data will be stored in ECM.
- \*6: 1st trip DTC will be cleared after vehicle is driven a time (pattern B) without the same malfunction.
- \*7: When the same malfunction is detected in the 2nd trip, the 1st trip freeze frame data will be cleared.

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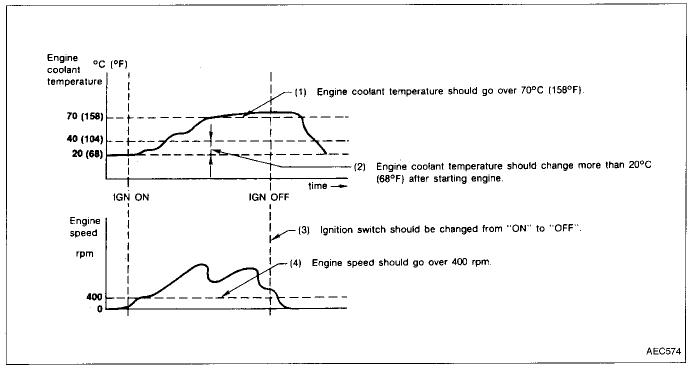
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## **OBD System Operation Chart (Cont'd)**

# EXPLANATION FOR DRIVING PATTERNS <u>EXCEPT</u> FOR "MISFIRE <EXHAUST QUALITY DETERIORATION>", "FUEL INJECTION SYSTEM"

(Driving pattern A)



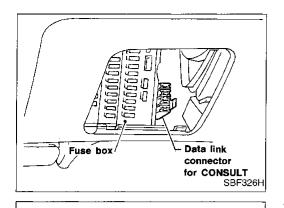
- The A counter will be cleared when the malfunction is detected regardless of (1) (4).
- The A counter will be counted up when (1) (4) are satisfied without the same malfunction.
- The DTC will not be displayed after the A counter reaches 40.

### (Driving pattern B)

Driving pattern B means the vehicle operation as follows:

All components and systems should be monitored at least once by the OBD system.

- The B counter will be cleared when the malfunction is detected once regardless of the driving pattern.
- The B counter will be counted up when driving pattern B is satisfied without any malfunctions.
- The MIL will go off when the B counter reaches 3 (\*2 in "OBD SYSTEM OPERATION CHART").



### CONSULT

### **CONSULT INSPECTION PROCEDURE**

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

GI

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EM

Turn on ignition switch.

Touch "ENGINE".

Touch "START".

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For further information, see the CONSULT Operation Manual. This example shows the display when using the UE951 program card. The screen differs according to the program card

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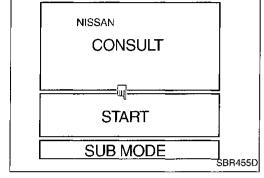
RS

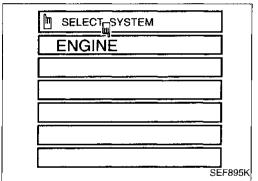
BT

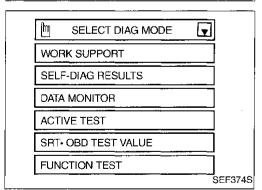
KA

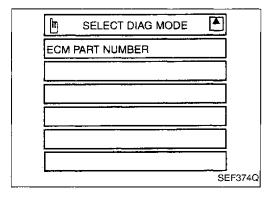
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used.

# CONSULT (Cont'd)

### **ECCS COMPONENT PARTS/CONTROL SYSTEMS APPLICATION**

|                      |  |  | DIAGNOSTIC TEST MODE           |                               |                           |         |       |              |              |  |
|----------------------|--|--|--------------------------------|-------------------------------|---------------------------|---------|-------|--------------|--------------|--|
|                      |  | ltem   | WORK SELF-DIAGNOSTIC RESULTS*1 |                               | DATA                      | ACTIVE  | FUNC- | SRT-OBD      |              |  |
|                      |  |  | SUP-<br>PORT                   |                               | FREEZE<br>FRAME<br>DATA*2 | MONITOR | TEST  | TION<br>TEST | VALUE        |  |
|                      |  | Camshaft position sensor (PHASE)                           |                                | Х                             | <u> </u>                  |         |       |              |              |  |
|                      |  | Crankshaft position sensor (REF)                           |                                | Х                             |                           | Х       |       |              |              |  |
|                      |  | Crankshaft position sensor (POS)                           |                                | Х                             | Х                         | Х       |       |              |              |  |
|                      |  | Mass air flow sensor                                       |                                | Х                             |                           | Х       |       |              |              |  |
| İ                    |  | Engine coolant temperature sensor                          |                                | Х                             | Х                         | Х       | Х     |              |              |  |
|                      |  | Front heated oxygen sensors                                |                                | Х                             |                           | Х       |       | Х            | X            |  |
|                      |  | Rear heated oxygen sensor                                  |                                | Х                             |                           | Х       |       |              | X            |  |
|                      |  | Vehicle speed sensor                                       |                                | Х                             | Х                         | Х       |       | Х            |              |  |
|                      |  | Throttle position sensor                                   | Х                              | Х                             |                           | Х       |       | Х            |              |  |
|                      |  | Tank fuel temperature sensor                               |                                | Х                             |                           | Х       | Х     |              |              |  |
|                      |  | EVAP control system pressure sensor                        |                                | Х                             | 1                         | Х       |       |              |              |  |
| İ                    |  | Absolute pressure sensor                                   |                                | Х                             |                           | х       |       |              |              |  |
| INF                  | PUT  | EGR temperature sensor                                     |                                | X                             |                           | X       |       |              |              |  |
|                      |  | Intake air temperature sensor                              |                                | X                             |                           | X       |       |              |              |  |
|                      |  | Knock sensor   |                                | X                             |                           | :       |       |              |              |  |
|                      |  | Ignition switch (start signal)                             |                                |                               |                           | Х       |       | Х            |              |  |
|                      | ľ  | Closed throttle position switch                            |                                | Х                             |                           |         |       |              |              |  |
| 2                    |  | Closed throttle position (throttle position sensor signal) |                                |                               |                           | Х       |       | х            |              |  |
| ECCS COMPONENT PARIS |  | Air conditioner switch                                     |                                |                               | i,                        | Х       |       |              |              |  |
| -                    |  | Park/Neutral position switch                               |                                | Х                             |                           | Х       |       | Х            |              |  |
| ב<br>ב               | ļ  | Power steering oil pump switch                             |                                |                               |                           | Х       |       | Х            |              |  |
| 5 ∣                  |  | Electrical load  |                                |                               |                           | Х       |       |              |              |  |
| ₹                    | •  | Air conditioner pressure switch                            |                                |                               |                           | х       |       |              |              |  |
| ว์                   | ŀ  | Battery voltage  |                                |                               |                           | Х       |       |              |              |  |
| 3                    |  | Injectors  |                                |                               |                           | х       | х     | X            |              |  |
| 고<br>                |  | Power transistor (Ignition timing)                         |                                | X (Igni-<br>tion sig-<br>nal) |                           | х       | Х     | Х            |              |  |
|                      |  | IACV-AAC valve   | Х                              | Χ                             |                           | Χ       | X     | Х            |              |  |
|                      |  | Front engine mounting                                      |                                |                               |                           | Х       | Х     |              |              |  |
|                      |  | EVAP canister purge volume control valve                   |                                | Х                             |                           | х       | Х     |              |              |  |
|                      |  | Air conditioner relay                                      |                                |                               |                           | X       |       |              |              |  |
|                      | -  | Fuel pump relay  | X                              |                               |                           | Х       | Х     | Х            |              |  |
| ΟU                   | <i>,</i> , , , , , , , , , , , , , , , , , , | Cooling fan  |                                | Х                             |                           | Х       | X     | X            |              |  |
|                      |  | EGRC-solenoid valve  |                                | Х                             |                           | Х       | X     | X            |              |  |
|                      | ļ  | Front heated oxygen sensor heaters                         |                                | X                             |                           | X       |       |              | Х            |  |
|                      | ļ  | Rear heated oxygen sensor heater                           |                                | X                             |                           | X       |       |              | X            |  |
|                      | _  | EVAP canister purge control solenoid valve                 |                                | Х                             |                           | Х       | Х     |              |              |  |
|                      | -  | EVAP canister vent control valve                           |                                | Х                             |                           | Х       |       |              |              |  |
|                      | H  | Vacuum cut valve bypass valve                              |                                | X                             |                           | Х       |       |              |              |  |
|                      |  | MAP/BARO switch solenoid valve                             |                                | Χ                             |                           | Х       | Х     |              | <del> </del> |  |
|                      |  | FPCM   |                                | Х                             |                           | Х       | Х     |              |              |  |
|                      |  | Calculated load value                                      | Ţ                              |                               | X                         | X       |       |              |              |  |

X: Applicable

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<sup>\*1:</sup> This item includes 1st trip DTCs.

<sup>\*2:</sup> This mode includes 1st trip freeze frame data or freeze frame data. The items appear on CONSULT screen in freeze frame data mode only if a 1st trip DTC or DTC is detected. For details, refer to EC-62.

# CONSULT (Cont'd)

### **FUNCTION**

| Diagnostic test mode    | Function   |
|-------------------------|--|
| Work support            | This mode enables a technician to adjust some devices faster and more accurately by following the indications on the CONSULT unit.             |
| Self-diagnostic results | Self-diagnostic results such as 1st trip DTC,<br>DTCs and 1st trip freeze frame data or freeze<br>frame data can be read and erased quickly.*1 |
| Data monitor            | Input/Output data in the ECM can be read.  |
| Active test             | Diagnostic Test Mode in which CONSULT drives some actuators apart from the ECMs and also shifts some parameters in a specified range.          |
| SRT·OBD test value      | The status of system monitoring tests and the test values/test limits can be read.   |
| Function test           | Conducted by CONSULT instead of a technician to determine whether each system is "OK" or "NG".   |
| ECM part numbers        | ECM part numbers can be read.  |

- \*1 The following emission-related diagnostic information is cleared from the ECM memory in the mode obtained.
  - 1. Diagnostic trouble codes
  - 2. 1st trip diagnostic trouble codes
  - 3. Freeze frame data
  - 4. 1st trip freeze frame data
  - 5. System readiness test (SRT) codes
  - 6. Test values
  - 7. Others

### **WORK SUPPORT MODE**

| WORK ITEM             | CONDITION  | USAGE  |
|-----------------------|--|--|
| THRTL POS SEN ADJ     | CHECK THE THROTTLE POSITION SENSOR SIGNAL. ADJUST IT TO THE SPECIFIED VALUE BY ROTATING THE SENSOR BODY UNDER THE FOLLOWING CONDI- | When adjusting throttle position sensor initial position |
|                       | TIONS.  • IGN SW "ON"  • ENG NOT RUNNING   |  |
|                       | ACC PEDAL NOT PRESSED  |  |
| IACV-AAC/V ADJ        | SET ENGINE SPEED 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"<br>DURING IDLING.<br>CRANK A FEW TIMES AFTER ENGINE STALLS.                                | When releasing fuel pressure from fuel line              |

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# CONSULT (Cont'd)

### **SELF-DIAGNOSTIC MODE**

## DTC and 1st trip DTC

Regarding items of "DTC and 1st trip DTC", refer to "DIAGNOSTIC TROUBLE CODE INDEX" (See EC-2).

### Freeze frame data and 1st trip freeze frame data

| Freeze frame data<br>item*3               | Description   |
|---|---|
| DIAG TROUBLE<br>CODE<br>[PXXXX]           | ECCS component part/control system has a trouble code, it is displayed as "PXXXX". [Refer to "Alphabetical & P No. Index for DTC (EC-2).]   |
| FUEL SYS-B1*1                             | <ul> <li>"Fuel injection system status" at the moment a malfunction is detected is displayed.</li> <li>One mode in the following is displayed.</li> <li>"MODE 2": Open loop due to detected system malfunction</li> </ul>                               |
| FUEL SYS-B2*1                             | "MODE 3": Open loop due to driving conditions (power enrichment, deceleration enrichment) "MODE 4": Closed loop - using heated oxygen sensor(s) as feedback for fuel control "MODE 5": Open loop - has not yet satisfied condition to go to closed loop |
| CAL/LD VALUE [%]                          | The calculated load value at the moment a malfunction is detected is displayed.   |
| COOLANT TEMP [°C] or [°F]                 | The engine coolant temperature at the moment a malfunction is detected is displayed.  |
| S-FUEL TRIM-B1 [%]                        | "Short-term fuel trim" at the moment a malfunction is detected is displayed.  |
| S-FUEL TRIM-B2 [%]                        | <ul> <li>The short-term fuel trim indicates dynamic or instantaneous feedback compensation to the base fuel<br/>schedule.</li> </ul>  |
| L-FUEL TRIM-B1 [%]                        | "Long-term fuel trim" at the moment a malfunction is detected is displayed.   |
| L-FUEL TRIM-B2 [%]                        | <ul> <li>The long-term fuel trim indicates much more gradual feedback compensation to the base fuel schedule<br/>than short-term fuel trim.</li> </ul>  |
| ENGINE SPEED [rpm]                        | The engine speed at the moment a malfunction is detected is displayed.  |
| VHCL SPEED [km/h]<br>or [mph]             | The vehicle speed at the moment a malfunction is detected is displayed.   |
| ABSOL PRESS [kPa]<br>or [kg/cm²] or [psi] | The absolute pressure at the moment a malfunction is detected is displayed.   |
| MAP*2 [kPa]                               | The intake manifold absolute pressure at the moment a malfunction is detected is displayed.   |

<sup>\*1:</sup> Regarding A32 model, "B1" indicates right bank and "B2" indicates left bank.

<sup>\*2:</sup> This item is not displayed on CONSULT. Only for Generic Scan Tool (GST).

<sup>\*3:</sup> The items are the same as those of 1st trip freeze frame data.

# CONSULT (Cont'd)

## **DATA MONITOR MODE**

| Monitored item<br>[Unit]         | ECM<br>input<br>signals | Main<br>signals | Description  | Remarks   |                |
|----------------------------------|-------------------------|-----------------|--|---|----------------|
| CKPS·RPM<br>(POS) [rpm]          | 0                       | 0               | Indicates the engine speed computed<br>from the POS signal (1° signal) of the<br>crankshaft position sensor (POS).   |   | GI             |
| CKPS·RPM<br>(REF) [rpm]          | 0                       |                 | Indicates the engine speed computed<br>from the REF signal (120° signal) of the<br>crankshaft position sensor (REF).   | <ul> <li>The accuracy of detection becomes poor if engine speed drops below the idle rpm.</li> <li>If the signal is interrupted while the engine is running, an abnormal value may be indicated.</li> </ul> | M/<br>En       |
| POS COUNT                        | 0                       | 0               | Indicates the number of signal plate (fly-<br>wheel) cogs (tooth) during engine 1 revo-<br>lution.   |   | LC             |
| MAS AIR/FL SE [V]                | 0                       | 0               | The signal voltage of the mass air flow<br>sensor is displayed.  | When the engine is stopped, a certain value is indicated.   | EC             |
| COOLAN TEMP/S<br>[°C] or [°F]    | 0                       | 0               | The engine coolant temperature (determined by the signal voltage of the engine coolant temperature sensor) is displayed.   | When the engine coolant temperature<br>sensor is open or short-circuited, ECM<br>enters fail-safe mode. The engine cool-<br>ant temperature determined by the ECM<br>is displayed.                          | FE             |
| FR O2 SEN-B2 [V]                 | 0                       | 0               | The signal voltage of the front heated oxygen sensor is displayed.   |   | CL             |
| FR O2 SEN-B1 [V]                 | 0                       |                 |  |   | MI             |
| RR O2 SENSOR [V]                 | 0                       |                 | <ul> <li>The signal voltage of the rear heated<br/>oxygen sensor is displayed.</li> </ul>  |   | AT             |
| FR O2 MNTR-B2<br>[RICH/LEAN]     | 0                       | 0               | <ul> <li>Display of front heated oxygen sensor<br/>signal during air-fuel ratio feedback con-<br/>trol:</li> <li>RICH means the mixture became<br/>"rich", and control is being affected</li> </ul>              | After turning ON the ignition switch,     "RICH" is displayed until air-fuel mixture     ratio feedback control begins.      When the air-fuel ratio feedback is     clamped, the value just before the     | FA             |
| FR O2 MNTR-B1<br>[RICH/LEAN]     | 0                       | 0               | toward a leaner mixture.  LEAN means the mixture became "lean", and control is being affected toward a rich mixture.   | clamping is displayed continuously.   | RA             |
| RR O2 MNTR<br>[RICH/LEAN]        | 0                       |                 | Display of rear heated oxygen sensor signal:     RICH means the amount of oxygen after three way catalyst is relatively small.     LEAN means the amount of oxygen after three way catalyst is relatively large. | When the engine is stopped, a certain<br>value is indicated.  | BR<br>ST<br>RS |
| VHCL SPEED SE<br>[km/h] or [mph] | 0                       | 0               | The vehicle speed computed from the vehicle speed sensor signal is displayed.  |   |                |
| NOTE:<br>Any monitored item tha  | at does n               | ot match        | the vehicle being diagnosed is deleted from  | m the display automatically.  | اانعا          |
| Regarding A32 model,             | "B1" ind                | icates riç      | iht bank and "B2" indicates left bank.   |   | HA             |

EL

# CONSULT (Cont'd)

| Monitored item<br>[Unit]      | ECM<br>input<br>signals | Main<br>signals | Description  | Remarks   |
|-------------------------------|-------------------------|-----------------|--|---|
| BATTERY VOLT [V]              | 0                       | 0               | The power supply voltage of ECM is displayed.  |   |
| THRTL POS SEN [V]             | $\bigcirc$              | 0               | The throttle position sensor signal voltage is displayed.  |   |
| TANK F/TMP SE [°C]<br>or [°F] | 0                       |                 | The fuel temperature judged from the tank fuel temperature sensor signal voltage is displayed.   |   |
| EGR TEMP SEN [V]              | 0                       |                 | The signal voltage of the EGR temperature sensor is displayed.   |   |
| INT/A TEMP SE [°C]<br>or [°F] | 0                       |                 | The intake air temperature determined<br>by the signal voltage of the intake air<br>temperature sensor is indicated.   |   |
| START SIGNAL<br>[ON/OFF]      | 0                       | 0               | Indicates [ON/OFF] condition from the starter signal.  | After starting the engine, [OFF] is displayed regardless of the starter signal.   |
| CLSD THL/P SW<br>[ON/OFF]     | $\bigcirc$              |                 | Indicates [ON/OFF] condition from the throttle position sensor signal.   |   |
| AIR COND SIG<br>[ON/OFF]      | 0                       | 0               | <ul> <li>Indicates [ON/OFF] condition of the air<br/>conditioner switch as determined by the<br/>air conditioner signal.</li> </ul>  |   |
| P/N POSI SW<br>[ON/OFF]       | $\bigcirc$              | 0               | Indicates [ON/OFF] condition from the park/neutral position switch signal.   |   |
| PW/ST SIGNAL<br>[ON/OFF]      | 0                       | 0               | <ul> <li>[ON/OFF] condition of the power steering<br/>oil pressure switch determined by the<br/>power steering oil pressure signal is indi-<br/>cated.</li> </ul>  |   |
| LOAD SIGNAL<br>[ON/OFF]       | 0                       | 0               | <ul> <li>Indicates [ON/OFF] condition from the<br/>electrical load signal and/or lighting<br/>switch.</li> <li>ON rear defogger is operating and/or<br/>lighting switch is on.</li> <li>OFF rear defogger is not operating<br/>and lighting switch is not on.</li> </ul> |   |
| IGNITION SW<br>[ON/OFF]       | $\bigcirc$              |                 | <ul> <li>Indicates [ON/OFF] condition from ignition switch.</li> </ul>   |   |
| INJ PULSE-B2 [msec]           |                         | 0               | Indicates the actual fuel injection pulse width compensated by ECM according to the input signals.   | When the engine is stopped, a certain computed value is indicated.  |
| B/FUEL SCHDL<br>[msec]        |                         | 0               | "Base fuel schedule" indicates the fuel injection pulse width programmed into ECM, prior to any learned on board correction.   |   |
| IGN TIMING [BTDC]             |                         | 0               | Indicates the ignition timing computed by<br>ECM according to the input signals.   | When the engine is stopped, a certain value is indicated.   |
| IACV-AAC/V [step]             |                         | 0               | <ul> <li>Indicates the idle air control valve (AAC<br/>valve) control value computed by ECM<br/>according to the input signals.</li> </ul>   |   |
| PURG VOL C/V [step]           |                         |                 | <ul> <li>Indicates the EVAP canister purge volume control valve computed by the engine control module according to the input signals.</li> <li>The opening becomes larger as the value increases.</li> </ul>   |   |
| ENGINE MOUNT<br>[IDLE/TRVL]   |                         | 0               | <ul> <li>The control condition of the front engine mounting (computed by the engine control module according to the input signals) is indicated.</li> <li>IDLE Idle condition</li> <li>TRVL Driving condition</li> </ul>   |   |
| A/F ALPHA-B2 [%]              |                         |                 | <ul> <li>The mean value of the air-fuel ratio feed-<br/>back correction factor per cycle is indi-<br/>cated.</li> </ul>  | <ul> <li>When the engine is stopped, a certain value is indicated.</li> <li>This data also includes the data for the</li> </ul> |
| A/F ALPHA-B1 [%]              |                         |                 | calcu.   | air-fuel ratio learning control.  |

# CONSULT (Cont'd)

|                              | E014                    | <u> </u>        | Concorn (Conca)  |         |            |
|------------------------------|-------------------------|-----------------|--|---------|------------|
| Monitored item [Unit]        | ECM<br>input<br>signals | Main<br>signals | Description  | Remarks |            |
| EVAP SYS PRES [V]            |                         |                 | The signal voltage of EVAP control system pressure sensor is displayed.  |         | GI         |
| AIR COND RLY<br>[ON/OFF]     |                         |                 | <ul> <li>The air conditioner relay control condition<br/>(determined by ECM according to the<br/>input signal) is indicated.</li> </ul>  |         |            |
| FUEL PUMP RLY<br>[ON/OFF]    |                         |                 | <ul> <li>Indicates the fuel pump relay control<br/>condition determined by ECM according<br/>to the input signals.</li> </ul>  |         | MA<br>     |
| COOLING FAN<br>[HI/LOW/OFF]  |                         |                 | <ul> <li>The control condition of the cooling fan<br/>(determined by ECM according to the<br/>input signal) is indicated.</li> <li>HI High speed operation<br/>LOW Low speed operation<br/>OFF Stop</li> </ul>   |         | EM<br>LC   |
| EGRC SOL/V<br>[ON/OFF]       |                         |                 | <ul> <li>The control condition of the EGRC-sole-<br/>noid valve (determined by ECM accord-<br/>ing to the input signal) is indicated.</li> <li>ON EGR (and canister purge) opera-<br/>tion is cut-off<br/>OFF EGR (and canister purge) is<br/>operational</li> </ul> |         | EC         |
| VENT CONT/V<br>[ON/OFF]      |                         |                 | <ul> <li>The control condition of the EVAP canister vent control valve (determined by ECM according to the input signal) is indicated.</li> <li>ON Closed OFF Open</li> </ul>  |         | CL<br>MT   |
| FR O2 SEN HTR-B1<br>[ON/OFF] |                         |                 | Indicates [ON/OFF] condition of heated<br>oxygen sensor's heater determined by   |         | /A57       |
| FR O2 SEN HTR-B2<br>[ON/OFF] |                         |                 | ECM according to the input signals.  |         | AT         |
| RR O2 SEN HEATER<br>[ON/OFF] |                         |                 |  |         | FA         |
| VC/V BYPASS/V<br>[ON/OFF]    |                         |                 | <ul> <li>The control condition of the vacuum cut valve bypass valve (determined by ECM according to the input signal) is indicated.</li> <li>ON Open OFF Closed</li> </ul>   |         | RA<br>BR   |
| PURG CONT S/V<br>[ON/OFF]    |                         |                 | <ul> <li>The control condition of the EVAP canister purge control solenoid valve (computed by the engine control module according to the input signals) is indicated.</li> <li>ON Canister purge is operational OFF Canister purge operation is cut-</li> </ul>      |         | st<br>St   |
| CAL/LD VALUE [%]             |                         |                 | "Calculated load value" indicates the value of the current airflow divided by peak airflow.  |         | <b>3</b> 7 |
| ABSOL TH-P/S [%]             |                         |                 | <ul> <li>"Absolute throttle position sensor" indi-<br/>cates the throttle opening computed by<br/>ECM according to the signal voltage of<br/>the throttle position sensor.</li> </ul>  |         | HA         |
| MASS AIRFLOW<br>[g·m/s]      |                         |                 | <ul> <li>Indicates the mass airflow computed by<br/>ECM according to the signal voltage of<br/>the mass airflow sensor.</li> </ul>   |         |            |
| FPCM DR VOLT [V]             |                         |                 | <ul> <li>The voltage between fuel pump and<br/>dropping resistor is displayed.</li> </ul>  |         | ]DX        |

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# ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION CONSULT (Cont'd)

| Monitored item<br>[Unit]       | ECM<br>input<br>signals | Main<br>signals | Description  | Remarks   |
|--------------------------------|-------------------------|-----------------|--|---|
| FPCM [HI/LOW]                  |                         |                 | The control condition of the fuel pump control module (FPCM) (determined by ECM according to the input signal) is indicated. HI High amount of fuel flow LOW Low amount of fuel flow         |   |
| MAP/BARO SW/V<br>[MAP/BARO]    |                         | T.              | The control condition of the MAP/BARO switch solenoid valve (determined by ECM according to the input signal) is indicated.  MAP Intake manifold absolute pressure  BARO Barometric pressure |   |
| ABSOL PRES/SE [V]              |                         |                 | The signal voltage of the absolute pressure sensor is displayed.   |   |
| VOLTAGE<br>[V]                 |                         |                 | Voltage measured by the voltage probe.   |   |
| PULSE<br>[msec] or [Hz] or [%] |                         |                 | <ul> <li>Pulse width, frequency or duty cycle<br/>measured by the pulse probe.</li> </ul>  | <ul> <li>Only "#" is displayed if item is unable to be measured.</li> <li>Figures with "#"s are temporary ones. They are the same figures as an actual piece of data which was just previously measured.</li> </ul> |

# CONSULT (Cont'd)

## **ACTIVE TEST MODE**

| TEST ITEM              | CONDITION   | JUDGEMENT  | CHECK ITEM (REMEDY)   |
|------------------------|---|--|---|
| FUEL INJECTION         | Engine: Return to the original trouble condition     Change the amount of fuel injection using CONSULT.   | If trouble symptom disappears, see CHECK ITEM.   | Harness and connector     Fuel injectors     Front heated oxygen sensor                                     |
| IACV-AAC/V<br>OPENING  | Engine: After warming up, idle the engine.     Change the IACV-AAC valve opening step using CONSULT.  | Engine speed changes according to the opening step.  | Harness and connector     IACV-AAC valve  |
| ENG COOLANT<br>TEMP    | Engine: Return to the original trouble condition     Change the engine coolant temperature using CONSULT.   | If trouble symptom disappears, see<br>CHECK ITEM,  | Harness and connector     Engine coolant temperature sensor     Fuel injectors                              |
| IGNITION TIMING        | Engine: Return to the original trouble condition     Timing light: Set     Retard the ignition timing using CONSULT.  | If trouble symptom disappears, see<br>CHECK ITEM.  | Camshaft position sensor (PHASE)     Crankshaft position sensor (REF)     Crankshaft position sensor (POS)  |
| POWER BALANCE          | <ul> <li>Engine: After warming up, idle the engine.</li> <li>A/C switch "OFF"</li> <li>Shift lever "N"</li> <li>Cut off each injector signal one at a time using CONSULT.</li> </ul>                  | Engine runs rough or dies.   | Harness and connector     Compression     Injectors     Power transistor     Spark plugs     Ignition coils |
| COOLING FAN            | Ignition switch: ON     Turn the cooling fan "ON" and "OFF" using CONSULT.  | Cooling fan moves and stops.   | Harness and connector     Cooling fan motor   |
| FUEL PUMP RELAY        | Ignition switch: ON (Engine stopped)     Turn the fuel pump relay "ON" and "OFF" using CONSULT and listen to operating sound.   | Fuel pump relay makes the operating sound.   | Harness and connector     Fuel pump relay   |
| EGRC SOLENOID<br>VALVE | Ignition switch: ON     Turn solenoid valve "ON" and "OFF" with the CONSULT and listen to operating sound.  | Solenoid valve makes an operating sound.   | Harness and connector     Solenoid valve  |
| SELF-LEARNING<br>CONT  | In this test, the coefficient of self-learning screen.  | ng control mixture ratio returns to the origin   | nal coefficient by touching "CLEAR" on the  |
| ENGINE<br>MOUNTING     | <ul> <li>Engine: After warming up, run engine at idle speed.</li> <li>Gear position: "D" range (Vehicle stopped)</li> <li>Turn front engine mounting "IDLE" and "TRAVEL" with the CONSULT.</li> </ul> | Body vibration changes according to the front engine mounting condition.   | Harness and connector     Front engine mounting   |
| PURG VOL CONT/V        | <ul> <li>Engine: After warming up, run engine<br/>at 1,500 rpm.</li> <li>Change the EVAP canister purge<br/>volume control valve opening step<br/>using CONSULT.</li> </ul>                           | Engine speed changes according to the opening step.  | Harness and connector     EVAP canister purge volume control valve  |
| PURG CONT S/V          | Start engine.     Turn the EVAP canister purge control solenoid valve "ON" and "OFF" using CONSULT and listen for operating sound.  | EVAP canister purge control solenoid valve makes an operating sound. Check vacuum signal for EVAP canister purge control valve. VC ON Vacuum exists. VC OFF Vacuum does not exist. | Harness and connector     EVAP canister purge control solenoid valve     Vacuum hose                        |
| MAP/BARO SW/V          | Ignition switch: ON     (Engine stopped)     Turn the MAP/BARO switch solenoid valve between "MAP" and "BARO" using CONSULT and listen for operating sound.   | MAP/BARO switch solenoid valve makes an operating sound.   | Harness and connector     MAP/BARO switch solenoid valve  |
| PCM                    | Start engine.     Turn the FPCM between "LOW" and "HI" using CONSULT and check that "FPCM DR VOLT" of CONSULT changes.  | "FPCM DR VOLT" of CONSULT changes as follows; HI Approx. 0V LOW Approx. 3.7V   | Harness and connector     FPCM     Dropping resistor  |
| TANK F/TEMP SEN        | Change the tank fuel temperature using  | * CONDITIT   | ·   |

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# CONSULT (Cont'd)

## **FUNCTION TEST MODE**

| FUNCTION TEST<br>ITEM    | CONDITION   | JUDGEM  | ENT               | CHECK ITEM (REMEDY)  |
|--------------------------|---|---|-------------------|--|
| SELF-DIAG<br>RESULTS     | Ignition switch: ON     (Engine stopped)     Displays the results of on board diagnostic system.  | (Engine stopped) Displays the results of on board                 |                   |  |
| CLOSED THROTTLE          | Ignition switch: ON     (Engine stopped)     Throttle position sensor circuit is tested when throttle is opened and closed fully. ("IDLE"                                   | Throttle valve: opened  | OFF               | Harness and connector     Throttle position sensor (Closed throttle position)     Throttle position sensor (Closed   |
| POSI                     | POSITION" is the test item name for the vehicles in which idle is selected by throttle position sensor.)  | Throttle valve: closed  | ON                | throttle position) adjustment Throttle linkage Verify operation in DATA MONITOR mode.  |
| THROTTLE POSI<br>SEN CKT | <ul> <li>Ignition switch: ON         (Engine stopped)</li> <li>Throttle position sensor circuit is tested when throttle is opened and closed fully.</li> </ul>              | Range (Throttle valve fully opened — Throttle valve fully closed) | More than<br>3.0V | Harness and connector     Throttle position sensor     Throttle position sensor     adjustment     Throttle linkage     Verify operation in DATA     MONITOR mode. |
| PARK/NEUT POSI           | Ignition switch: ON     (Engine stopped)     Inhibitor/Neutral position switch  | Out of N/P positions  | OFF               | Harness and connector     Neutral position switch or Inhibitor switch  |
|                          | circuit is tested when shift lever is manipulated.  | In N/P positions  | ON                | Linkage or Inhibitor switch     adjustment   |
| FUEL PUMP<br>CIRCUIT     | <ul> <li>Ignition switch: ON         (Engine stopped)</li> <li>Fuel pump circuit is tested by checking the pulsation in fuel pressure when fuel tube is pinched.</li> </ul> | There is pressure the fuel feed hose.                             |                   | Harness and connector     Fuel pump     Fuel pump relay     Fuel filter clogging     Fuel level  |
| EGRC SOL/V<br>CIRCUIT    | Ignition switch: ON     (Engine stopped)     EGRC-solenoid valve circuit is tested by checking solenoid valve operating noise.  | The solenoid valve operating sound ev seconds.                    |                   | Harness and connector     EGRC-solenoid valve  |
| COOLING FAN<br>CIRCUIT   | Ignition switch: ON     (Engine stopped)     Cooling fan circuit is tested when cooling fan is rotated.   | The cooling fan rot stops every 3 seco                            |                   | Harness and connector     Cooling fan motor     Cooling fan relay  |

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# CONSULT (Cont'd)

| FUNCTION TEST<br>ITEM    | CONDITION  | <ul> <li>Ignition switch: ON → START</li> <li>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</li> </ul> |                          |   |  |  |  |  |  |  |  |
|--------------------------|--|---|--------------------------|---|--|--|--|--|--|--|--|
| START SIGNAL<br>CIRCUIT  | starter. Battery voltage and water<br>temperature before cranking, and<br>average battery voltage, mass air<br>flow sensor output voltage and  |   |                          |   |  |  | 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 |  |  |  |  |
| PW/ST SIGNAL<br>CIRCUIT  | Ignition switch: ON     (Engine running)     Power steering circuit is tested when steering wheel is rotated   | Locked position   | ON                       | Harness and connector     Power steering oil pressure switch     Power steering oil pump  |  |  |  |  |  |  |  |
|                          | fully and then set to a straight line running position.  | Neutral position  | OFF                      |   |  |  |  |  |  |  |  |
| VEHICLE SPEED<br>SEN CKT | <ul> <li>Vehicle speed sensor circuit is<br/>tested when vehicle is running at<br/>a speed of 10 km/h (6 MPH) or<br/>higher.</li> </ul>  | Vehicle speed sens<br>signal is greater tha<br>(2 MPH)  | •                        | Harness and connector     Vehicle speed sensor     Electric speedometer   |  |  |  |  |  |  |  |
| GN TIMING ADJ            | <ul> <li>After warming up, idle the engine.</li> <li>Ignition timing is checked by reading ignition timing with a timing light and checking whether it agrees with specifications.</li> </ul>  | The timing light indi   |                          | Camshaft position sensor     (PHASE)     Crankshaft position sensor (REF)     Crankshaft position sensor (POS)  |  |  |  |  |  |  |  |
| MIXTURE RATIO<br>TEST    | Air-fuel ratio feedback circuit     (injection system, ignition system, vacuum system, etc.) is tested by examining the front heated oxygen sensor output at 2,000 rpm under non-loaded state.   | Front heated oxyge<br>COUNT: More than<br>during 10 seconds   |                          | <ul> <li>INJECTION SYS (Injector, fuel pressure regulator, harness or connector)</li> <li>IGNITION SYS (Spark plug, power transistor, ignition coil, harness or connector)</li> <li>VACUUM SYS (Intake air leaks)</li> <li>Front heated oxygen sensor circuit</li> <li>Front heated oxygen sensor operation</li> <li>Fuel pressure high or low</li> <li>Mass air flow sensor</li> </ul> |  |  |  |  |  |  |  |
| POWER BALANCE            | <ul> <li>After warming up, idle the engine.</li> <li>Injector operation of each cylinder is stopped one after another, and resultant change in engine rotation is examined to evaluate combustion of each cylinder. (This is only displayed for models where a sequential multiport fuel injection system is used.)</li> </ul> | Difference in engine greater than 25 rpm and after cutting off tor of each cylinder.  | before<br>the injec-     | <ul> <li>Injector circuit (Injector, harness or connector)</li> <li>Ignition circuit (Spark plug, power transistor, ignition coil, harness or connector)</li> <li>Compression</li> <li>Valve timing</li> </ul>  |  |  |  |  |  |  |  |
| ACV-AAC/V<br>SYSTEM      | <ul> <li>After warming up, idle the engine.</li> <li>IACV-AAC valve system is tested<br/>by detecting change in engine<br/>speed when IACV-AAC valve<br/>opening is changed to 1 step, 25<br/>steps and 102 steps.</li> </ul>  | Difference in engine<br>greater than 150 rpi<br>when valve opening<br>steps and at 25 step  | m between<br>j is at 102 | <ul> <li>Harness and connector</li> <li>IACV-AAC valve</li> <li>Air passage restriction between<br/>air inlet and IACV-AAC valve</li> <li>IAS (Idle adjusting screw) adjustment</li> </ul>  |  |  |  |  |  |  |  |

# CONSULT (Cont'd)

| FUNCTION TEST<br>ITEM | CONDITION  | JUDGEMENT   | CHECK ITEM (REMEDY)   |
|-----------------------|--|---|---|
| EVAP (SMALL<br>LEAK)★ | <ul> <li>After warming up, idle the engine etc.</li> <li>EVAP system is tested by using the evaporative gas pressure in the fuel tank or engine intake manifold pressure.</li> </ul> | EVAP control system has no leak.     EVAP control system operates properly. | <ul> <li>Incorrect fuel tank vacuum relief valve</li> <li>Incorrect fuel filler cap used</li> <li>Fuel filler cap remains open or fails to close.</li> <li>Foreign matter caught in fuel filler cap.</li> <li>Leak is in line between intake manifold and EVAP canister purge control valve.</li> <li>Foreign matter caught in EVAP canister vent control valve.</li> <li>EVAP canister or fuel tank leaks</li> <li>EVAP purge line tube leaks</li> <li>EVAP purge line rubber tube bent.</li> <li>Obstructed or bent rubber tube to EVAP canister purge control valve</li> <li>EVAP canister purge control valve</li> <li>EVAP canister purge control valve</li> <li>EVAP canister purge volume control valve</li> <li>EVAP canister purge control solenoid valve</li> <li>Absolute pressure sensor</li> <li>Tank fuel temperature sensor</li> <li>MAP/BARO switch solenoid valve</li> <li>Obstructed or bent rubber tube to MAP/BARO switch solenoid valve</li> </ul> |

<sup>★:</sup> Always select "SINGLE TEST" with CONSULT when performing the "FUNCTION TEST".

# CONSULT (Cont'd)

### **REAL TIME DIAGNOSIS IN DATA MONITOR MODE**

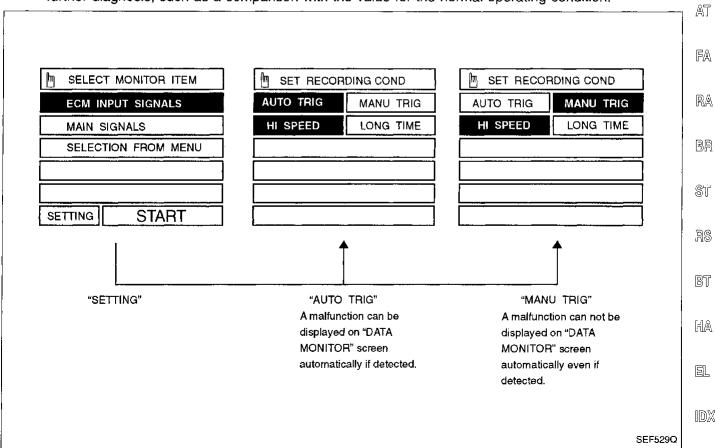
CONSULT has two kinds of triggers and they can be selected by touching "SETTING" in "DATA MONITOR" mode.

- 1. "AUTO TRIG" (Automatic trigger):
  - The malfunction will be identified on the CONSULT screen in real time.
     In other words, DTC/1st trip DTC and malfunction item will be displayed at the moment the malfunction is detected by ECM.
    - DATA MONITOR can be performed continuously until a malfunction is detected. However, DATA MONITOR cannot continue any longer after the malfunction detection.
- "MANU TRIG" (Manual trigger):
  - DTC/1st trip DTC and malfunction item will not be displayed automatically on CONSULT screen even though a malfunction is detected by ECM.

DATA MONITOR can be performed continuously even though a malfunction is detected.

Use these triggers as follows:

- "AUTO TRIG"
  - While trying to detect the DTC/1st trip DTC by performing the "DTC CONFIRMATION PROCEDURE", be sure to select to "DATA MONITOR (AUTO TRIG)" mode. You can confirm the malfunction at the moment it is detected.
  - While narrowing down the possible causes, CONSULT should be set in "DATA MONITOR (AUTO TRIG)" mode, especially in case the incident is intermittent.
     When you are inspecting the circuit by gently shaking (or twisting) the suspicious connectors, components and harness in the "DTC CONFIRMATION PROCEDURE", the moment a malfunction is found the DTC/1st trip DTC will be displayed. (Refer to GI section, "Incident Simulation Tests" in "HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT".)
- "MANU TRIG"
  - If the malfunction is displayed as soon as "DATA MONITOR" is selected, reset CONSULT to "MANU TRIG". By selecting "MANU TRIG" you can monitor and store the data. The data can be utilized for further diagnosis, such as a comparison with the value for the normal operating condition.



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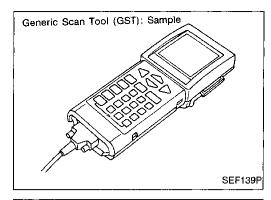
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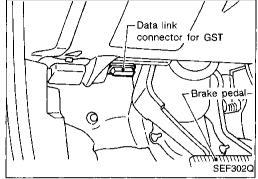


## **Generic Scan Tool (GST)**

### **DESCRIPTION**

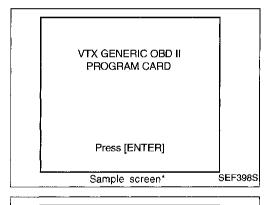
Generic Scan Tool (OBDII scan tool) complying with SAE J1978 has five different functions explained on the next page. ISO9141 is used as the protocol.

The name "GST" or "Generic Scan Tool" is used in this service manual.



### **GST INSPECTION PROCEDURE**

- 1. Turn off ignition switch.
- 2. Connect "GST" to data link connector for GST. (Data link connector for GST is located under LH dash panel near the fuse box cover.)



3. Turn ON ignition switch.

4. Enter the program according to instruction on the screen or in the operation manual.

(\*: Regarding GST screens in this section, sample screens are shown.)

OBD II FUNCTIONS

F0: DATA LIST F1: FREEZE DATA

F2: DTCs

F3: SNAPSHOT

F4: CLEAR DIAG INFO F5: O2 TEST RESULTS

### F6: READINESS TESTS

F7: ON BOARD TESTS

F8: EXPAND DIAG PROT

F9: UNIT CONVERSION

Sample screen\* SEF416S

Perform each diagnostic mode according to each service procedure.

For further information, see the GST Operation Manual of the tool maker.

# Generic Scan Tool (GST) (Cont'd)

# **FUNCTION**

|        | Diagnostic test mode | Function   |            |
|--------|----------------------|--|------------|
| MODE 1 | READINESS TESTS      | This mode gains access to current emission-related data values, including analog inputs and outputs, digital inputs and outputs, and system status information.                        | -<br>@     |
| MODE 2 | (FREEZE DATA)        | This mode gains access to emission-related data value which were stored by ECM during the freeze frame. [For details, refer to "Freeze Frame Data" (EC-62).]                           | - G        |
| MODE 3 | DTCs                 | This mode gains access to emission-related power train trouble codes which were stored by ECM.   | MI         |
|        |                      | This mode can clear all emission-related diagnostic information. This includes:  Clear number of diagnostic trouble codes (MODE 1)  Clear diagnostic trouble codes (MODE 3)            |            |
| MODE 4 | CLEAR DIAG INFO      | Clear trouble code for freeze frame data (MODE 1)  Clear freeze frame data (MODE 2)  Clear heated oxygen sensor test data (MODE 5)   | <u>[</u> . |
|        |                      | <ul> <li>Reset status of system monitoring test (MODE 1)</li> <li>Clear on board monitoring test results (MODE 6 and 7)</li> </ul>   |            |
| MODE 5 | (O2 TEST RESULTS)    | This mode gains access to the on board heated oxygen sensor monitoring test results.   | -<br>F1    |
| MODE 6 | (ON BOARD TESTS)     | This mode accesses the results of on board diagnostic monitoring tests of specific components/systems that are not continuously monitored.   | -<br>_ (C) |
| MODE 7 | (ON BOARD TESTS)     | This mode enables the off board test drive to obtain test results for emission-related powertrain components/systems that are continuously monitored during normal driving conditions. | -          |

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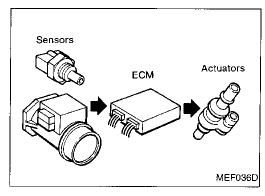
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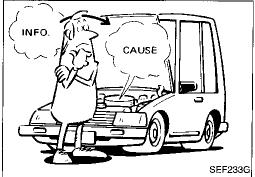
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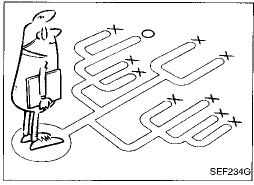
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**KEY POINTS** 

WHAT ..... Vehicle & engine model WHEN ..... Date, Frequencies

WHERE ..... Road conditions HOW ..... Operating conditions,

> Weather conditions, Symptoms

> > SEF907L

### 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 input and output signals are proper and stable. At the same time, it is important that there are no 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. A road test with CONSULT (or GST) or a circuit tester connected should be performed. Follow the "Work Flow", EC-76.

Before undertaking actual checks, take just a few minutes to talk with a customer who approaches with a driveability complaint. The customer can supply good information about such problems, especially intermittent ones. Find out what symptoms are present and under what conditions they occur. A "Diagnostic Worksheet" like the example on EC-74 should be used.

Start your diagnosis by looking for "conventional" problems first. This will help troubleshoot driveability problems on an electronically controlled engine vehicle.

# **Diagnostic Worksheet**

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

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

In general, each customer may feel differently about a given problem. It is important to fully understand the symptoms or conditions for a customer complaint.

Utilize a diagnostic worksheet like the one shown on next page in order to organize all the information for troubleshooting.

Some conditions may cause the malfunction indicator lamp to come on steady or blink and DTC to be detected. Examples:

- Vehicle ran out of fuel, which caused the engine to misfire.
- Fuel filler cap was left off or incorrectly screwed on, allowing fuel to evaporate into the atmosphere [for models with EVAP (SMALL LEAK) diagnosis].

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# Diagnostic Worksheet (Cont'd)

## **WORKSHEET SAMPLE**

| Customer nai    | me MR/MS       | Model & Year VIN   |  |  |  |  |  |  |  |  |  |
|-----------------|----------------|--|--|--|--|--|--|--|--|--|--|
| Engine #        |                | Trans. Mileage   |  |  |  |  |  |  |  |  |  |
| Incident Date   |                | Manuf. Date In Service Date  |  |  |  |  |  |  |  |  |  |
|                 | ☐ Startability | ☐ Impossible 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 [ ] |  |  |  |  |  |  |  |  |  |
| Symptoms        | □ Idling       | ☐ No fast idle ☐ Unstable ☐ High idle ☐ Low idle ☐ Others [  |  |  |  |  |  |  |  |  |  |
| Symptoms        | ☐ Driveability | ☐ Stumble ☐ Surge ☐ Knock ☐ Lack of power ☐ Intake backfire ☐ Exhaust backfire ☐ Others [ ]  |  |  |  |  |  |  |  |  |  |
|                 | ☐ Engine stall | □ At the time of start     □ While idling     □ While accelerating     □ Just after stopping     □ While loading   |  |  |  |  |  |  |  |  |  |
| Incident occui  | rrence         | ☐ Just after delivery ☐ Recently ☐ In the daytime  |  |  |  |  |  |  |  |  |  |
| Frequency       |                | ☐ All the time ☐ Under certain conditions ☐ Sometimes  |  |  |  |  |  |  |  |  |  |
| Weather cond    | litions        | ☐ Not affected   |  |  |  |  |  |  |  |  |  |
|                 | Weather        | ☐ Fine ☐ Raining ☐ Snowing ☐ Others [ ]  |  |  |  |  |  |  |  |  |  |
|                 | Temperature    | ☐ Hot ☐ Warm ☐ Cool ☐ Cold ☐ Humid °F  |  |  |  |  |  |  |  |  |  |
| Engine conditi  | ions           | ☐ Cold ☐ During warm-up ☐ After warm-up  Engine speed 1  |  |  |  |  |  |  |  |  |  |
| Road conditio   | ns             | ☐ In town ☐ In suburbs ☐ Highway ☐ Off road (up/down)  |  |  |  |  |  |  |  |  |  |
| Driving conditi | ions           | □ Not affected □ At starting □ While idling □ At racing □ While accelerating □ While cruising □ While decelerating □ While turning (RH/LH)  Vehicle speed □ 10 20 30 40 50 60 MPH                              |  |  |  |  |  |  |  |  |  |
| Malfunction in  | dicator lamp   | ☐ Turned on ☐ Not turned on  |  |  |  |  |  |  |  |  |  |
|                 | 4              |  |  |  |  |  |  |  |  |  |  |

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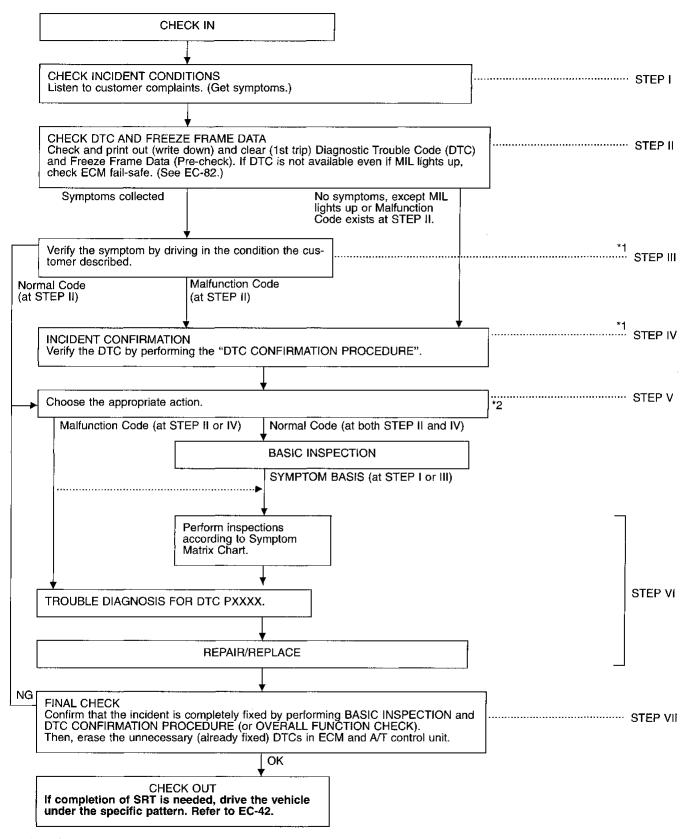
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### **Work Flow**



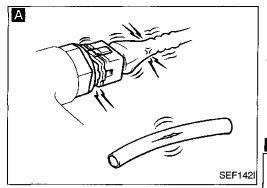
<sup>\*1:</sup> If the incident cannot be duplicated, see "Incident Simulation Tests" of "HOW TO PERFORM EFFICIENT DIAGNO-SIS FOR AN ELECTRICAL INCIDENT" in GI section.

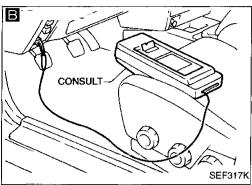
<sup>\*2:</sup> If the on board diagnostic system cannot be performed, check main power supply and ground circuit (See TROUBLE DIAGNOSIS FOR POWER SUPPLY, EC-99).

# **Description for Work Flow**

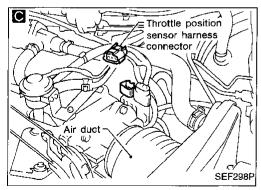
| STEP     | DESCRIPTION   |
|----------|---|
| STEP I   | Get detailed information about the conditions and the environment when the incident/symptom occurred using the "DIAGNOSTIC WORK SHEET" as shown on the next page.   |
| STEP II  | Before confirming the concern, check and write down (print out using CONSULT or Generic Scan Tool) the Diagnostic Trouble Code (DTC) and the (1st trip) freeze frame data, then erase the code and the data. (Refer to EC-48.) The (1st trip) DTC and the (1st trip) freeze frame data can be used when duplicating the incident at STEP III & IV.  Study the relationship between the cause, specified by (1st trip) DTC, and the symptom described by the customer. (The "Symptom Matrix Chart" will be useful. See page EC-83.)  |
| STEP III | Try to confirm the symptom and under what conditions the incident occurs.  The "DIAGNOSTIC WORK SHEET" and the freeze frame data are useful to verify the incident. Connect CONSULT to the vehicle in DATA MONITOR (AUTO TRIG) mode and check real time diagnosis results.  If the incident cannot be verified, perform INCIDENT SIMULATION TESTS. (Refer to GI section.)  If the malfunction code is detected, skip STEP IV and perform STEP V.  |
| STEP IV  | Try to detect the Diagnostic Trouble Code (DTC) by driving in (or performing) the "DTC CONFIRMATION PROCEDURE". Check and read the (1st trip) DTC and (1st trip) freeze frame data by using CONSULT or Generic Scan Tool.  During the (1st trip) DTC verification, be sure to connect CONSULT to the vehicle in DATA MONITOR (AUTO TRIG) mode and check real time diagnosis results.  If the incident cannot be verified, perform INCIDENT SIMULATION TESTS. (Refer to GI section.)  In case the "DTC CONFIRMATION PROCEDURE" is not available, perform the "OVERALL FUNCTION CHECK" instead. The (1st trip) DTC cannot be displayed by this check, however, this simplified "check" is an effective alternative.  The "NG" result of the "OVERALL FUNCTION CHECK" is the same as the (1st trip) DTC detection.                                       |
| STEP V   | Take the appropriate action based on the results of STEP I through IV.  If the malfunction code is indicated, proceed to TROUBLE DIAGNOSIS FOR DTC PXXXX.  If the normal code is indicated, proceed to the BASIC INSPECTION. (Refer to EC-78.) Then perform inspections according to the Symptom Matrix Chart. (Refer to EC-83.)  |
| STEP VI  | Identify where to begin diagnosis based on the relationship study between symptom and possible causes. Inspect the system for mechanical binding, loose connectors or wiring damage using (tracing) "Harness Layouts".  Gently shake the related connectors, components or wiring harness with CONSULT set in "DATA MONITOR (AUTO TRIG)" mode.  Check the voltage of the related ECM terminals or monitor the output data from the related sensors with CONSULT. Refer to EC-86.  The "DIAGNOSTIC PROCEDURE" in EC section contains a description based on open circuit inspection. A short circuit inspection is also required for the circuit check in the DIAGNOSTIC PROCEDURE. For details, refer to GI section ("HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT", "Circuit Inspection"). Repair or replace the malfunction parts. |
| STEP VII | Once you have repaired the circuit or replaced a component, you need to run the engine in the same conditions and circumstances which resulted in the customer's initial complaint.  Perform the "DTC CONFIRMATION PROCEDURE" and confirm the normal code (Diagnostic trouble code No. P0000 or 0505) is detected. If the incident is still detected in the final check, perform STEP VI by using a different method from the previous one.  Before returning the vehicle to the customer, be sure to erase the unnecessary (already fixed) (1st trip) DTC in ECM and A/T control unit. (Refer to EC-46.)   |

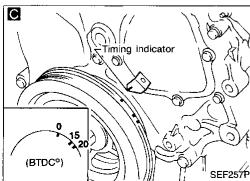
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### С 📕 IGN TIMING ADJ 🖺 IGNITION TIMING FEEDBACK CONTROL WILL BE HELD BY TOUCHING START. AFTER DOING SO, ADJUST IGNITION TIMING WITH A TIMING LIGHT BY TURNING THE CAMSHAFT POSITION SENSOR. START





## **Basic Inspection**

### Precaution:

Perform Basic Inspection without electrical or mechanical loads applied:

- Headlamp switch is OFF,
- Air conditioner switch is OFF,
- Rear window defogger switch is OFF,
- Steering wheel is in the straight-ahead position, etc.

# Α

### **BEFORE STARTING**

- 1. Check service records for recent repairs of related problems, or the current need for scheduled maintenance.
- 2. Open engine hood and check the fol-
- Harness connectors for proper connec-
- Vacuum hoses for splits, kinks, and proper connections
- Wiring for proper connections, pinches, or 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-59.)

Warm up engine sufficiently.



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### CHECK IGNITION TIMING.



- 1. Warm up engine sufficiently.
- 2. Select "IGN TIMING ADJ" in "WORK SUPPORT" mode.
- 3. Touch "START".
- 4. Check ignition timing at idle using timing light. (Refer to EC-29.)

Ignition timing\*2: 15°±2° BTDC



- 1. Warm up engine sufficiently.
- 2. Stop engine and disconnect throttle position sensor harness connector.\*1
- 3. Start engine.
- 4. Check ignition timing at idle using timing light. (Refer to EC-29.)

Ignition timing\*2: 15°±2° BTDC

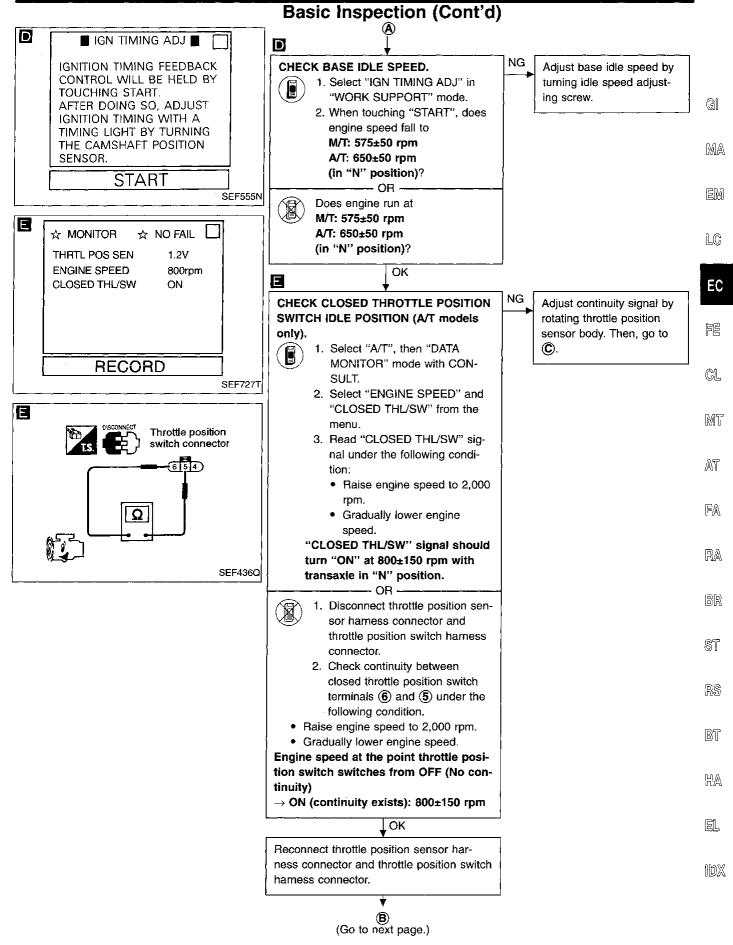
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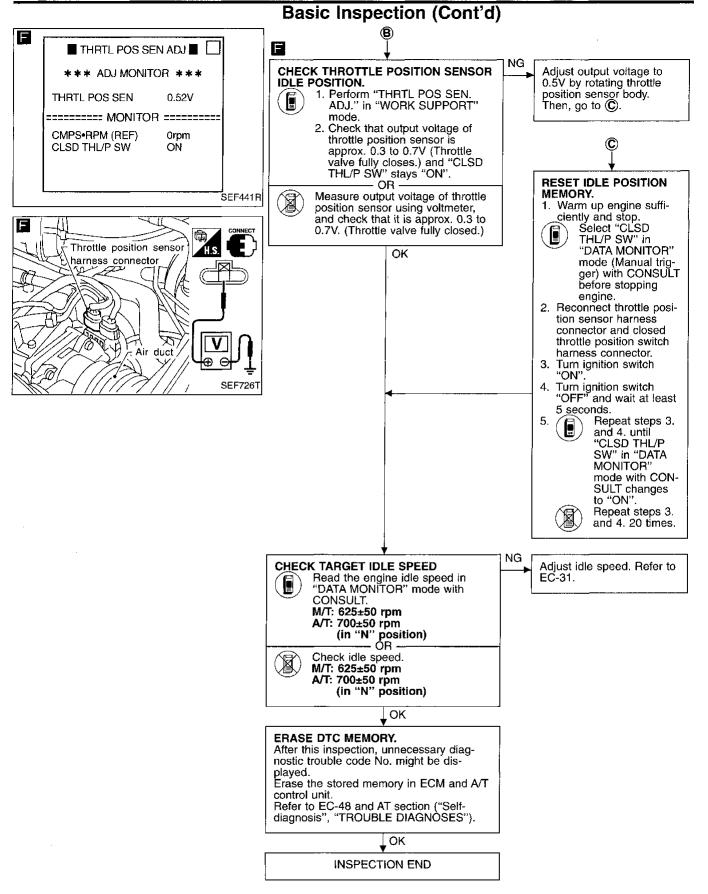
Check camshaft position sensor (PHASE) (EC-205), crankshaft position sensor (REF) (EC-298), and crankshaft position sensor (POS) (EC-199).

NG

- \*1 DTC P1705 (DTC 1206) is stored in ECM and A/T control unit in this step. Be sure to erase DTC after completing the procedure.
- \*2 Only check ignition timing as the timing is not adjustable.

(Go to (A) on next page.)





# Diagnostic Trouble Code (DTC) Inspection Priority Chart

If some DTCs are displayed at the same time, perform inspections one by one based on the following priority chart.

| Priority |   | Detected items (DTC)  |   |
|----------|---|---|---|
| 1        | • ECM (P0605, 0301)   | Camshaft position sensor<br>(PHASE) circuit (P0340, 0101)   | <ul> <li>Engine coolant temperature sensor<br/>circuit (P0115, 0103) (P0125,<br/>0908)</li> </ul> |
|          | Mass air flow sensor circuit<br>(P0100, 0102)   | <ul> <li>Vehicle speed sensor circuit<br/>(P0500, 0104)</li> </ul>                                | <ul> <li>Ignition signal circuit (P1320,<br/>0201)</li> </ul>                                     |
|          | Throttle position sensor circuit<br>(P0120, 0403)   | <ul> <li>Intake air temperature sensor circuit (P0110, 0401)</li> </ul>                           | <ul> <li>Park/Neutral position switch circuit<br/>(P0705, 1003)</li> </ul>                        |
|          | EGRC-solenoid valve circuit     (P1400, 1005)   | <ul> <li>Knock sensor circuit (P0325,<br/>0304)</li> </ul>  |   |
|          | A/T diagnosis communication line<br>(P1605, 0804)   | <ul> <li>Crankshaft position sensor (REF)<br/>circuit (P1335, 0407)</li> </ul>                    |   |
|          | Tank fuel temperature sensor<br>(P0180, 0402)   | <ul> <li>Crankshaft position sensor (POS)<br/>circuit (P0335, 0802) (P1336,<br/>0905)</li> </ul>  |   |
| 2        | EGR temperature sensor circuit<br>(P1401, 0305)   | <ul> <li>Front heated oxygen sensor<br/>heater circuit (P0135, 0901)<br/>(P0155, 1001)</li> </ul> | • Front heated oxygen sensor circuit (P0130, 0503) (P0150, 0303)                                  |
|          | Absolute pressure sensor circuit<br>(P0105, 0803)   | <ul> <li>EVAP control system pressure<br/>sensor circuit (P0450, 0704)</li> </ul>                 | • Rear heated oxygen sensor circuit (P0136, 0707)   |
|          | MAP/BARO switch solenoid valve<br>circuit (P1105, 1302)   | <ul> <li>EVAP canister vent control valve<br/>circuit (P0446, 0903)</li> </ul>                    | <ul> <li>EVAP canister purge volume con-<br/>trol valve circuit (P1445, 1008)</li> </ul>          |
|          | <ul> <li>EVAP canister purge control valve/<br/>solenoid valve circuit (P0443,<br/>0807)</li> </ul>     | <ul> <li>Closed throttle position switch circuit (P0510, 0203)</li> </ul>                         | <ul> <li>EVAP control system purge flow<br/>monitoring (P1447, 0111)</li> </ul>                   |
|          | Vacuum cut valve bypass valve<br>(P1441, 0801)  | <ul> <li>Rear heated oxygen sensor heater<br/>circuit (P0141, 0902)</li> </ul>                    |   |
|          | <ul> <li>A/T related sensors, solenoid<br/>valves and switches (P0705-<br/>P0710, 1101-1208)</li> </ul> |   |   |
| 3        | • EGR function (P0400, 0302)  | • Misfire (P0306 - P0300, 0603 - 0701)  | • Fuel injection system function (P0172, 0114), (P0171, 0115), (P0175, 0209), (P0174, 0210)       |
|          | • EGRC-BPT valve function (P0402, 0306)   | <ul> <li>Closed loop control<br/>(P0130, 0307) (P0150, 0308)</li> </ul>                           | <ul> <li>Three way catalyst function<br/>(P0420, 0702)</li> </ul>                                 |
|          | 1ACV-AAC valve circuit<br>(P0505, 0205)   | • Improper shifting (P0731 - P0734, 1103 - 1106)  | • Signal circuit from A/T control unit to ECM (P0600, 0504)                                       |
|          | • EVAP control system (small leak)<br>(P0440, 0705)   | • Fuel pump control module (FPCM) circuit (P1220, 1305)   |   |

# Fail-Safe Chart

The ECM enters fail-safe mode, if any of the following malfunctions is detected due to the open or short circuit.

When the ECM enters the fail-safe mode, the MIL illuminates.

| D <sup>*</sup>              | TC No.  |  |   |   |   |  |  |  |  |  |  |  |
|-----------------------------|---|--|---|---|---|--|--|--|--|--|--|--|
| CONSULT<br>GST              | ECM*1   | Detected items                                 | Engine operating condition in fail-safe mode  |   |   |  |  |  |  |  |  |  |
| P0100                       | 0102  | Mass air flow sensor cir-<br>cuit              | Engine speed will not rise more than 2,400 rpm due to the fuel cut.   |   |   |  |  |  |  |  |  |  |
| P0115                       | 0103  | Engine coolant tempera-<br>ture sensor circuit | Engine coolant temperature will be determined by ECM based on the after turning ignition switch "ON" or "START".  CONSULT displays the engine coolant temperature decided by ECM. |   |   |  |  |  |  |  |  |  |
|                             |   | :  | Сог   | ndition   | Engine coolant temperature decided (CONSULT display)  |  |  |  |  |  |  |  |
|                             |   |  | Just as ignition sw<br>Start  | itch is turned ON or  | 40°C (104°F)  |  |  |  |  |  |  |  |
|                             |   |  | More than 4 minut<br>or Start   | es after ignition ON  | 80°C (176°F)  |  |  |  |  |  |  |  |
|                             |   |  | Except as shown a   | above   | 40 - 80°C (104 - 176°F)<br>(Depends on the time)  |  |  |  |  |  |  |  |
| P0120                       | 0403  | Throttle position sensor circuit               | Throttle position w<br>and the engine spe<br>Therefore, accelera  | eed.  | ased on the amount of mass air flow   |  |  |  |  |  |  |  |
|                             |   |  |   |   | Driving condition   |  |  |  |  |  |  |  |
|                             |   |  | When engine is idl  | ing   | Normal  |  |  |  |  |  |  |  |
|                             |   |  | When accelerating   | ·   | Poor acceleration   |  |  |  |  |  |  |  |
| P1335                       | 0407  | Crankshaft position sensor (REF) circuit       |   | ignal and crankshat   | ) is controlled by camshaft position<br>ft position sensor (POS) signal. Igni-  |  |  |  |  |  |  |  |
| Unable to<br>access<br>ECCS | Unable to<br>access Diag-<br>nostic Test<br>Mode II | ECM  | When the fail-safe<br>condition in the CF<br>the instrument pan<br>However, it is not p<br>Engine control wi<br>When ECM fail-saf   | ction of the ECM w<br>system activates, i.<br>PU of ECM, the MA<br>el lights to warn the<br>cossible to access I<br>th ECM fail-safe<br>te is operating, fuel<br>AC valve operation | vas judged to be malfunctioning. e. if the ECM detects a malfunction LFUNCTION INDICATOR LAMP on e driver. ECCS and DTC cannot be confirmed. injection, ignition timing, fuel pump and cooling fan operation are con- |  |  |  |  |  |  |  |
| }                           |   |  |   | E.  | CM fail-safe operation  |  |  |  |  |  |  |  |
|                             |   |  | Engine speed  |   | will not rise more than 3,000 rpm.  |  |  |  |  |  |  |  |
|                             |   |  | Fuel injection  | Simultaneou   | us multiport fuel injection system  |  |  |  |  |  |  |  |
|                             |   |  | Ignition timing   | Ignition tim  | ing is fixed at the preset valve.   |  |  |  |  |  |  |  |
|                             |   |  | Fuel pump relay is "ON" when engine is running and "Control when engine stalls.   |   |   |  |  |  |  |  |  |  |
|                             |   |  | IACV-AAC valve Full open  |   |   |  |  |  |  |  |  |  |
|                             |   |  | Cooling fans  | Cooling fan relay "C<br>is running,   | N" (High speed condition) when engine and "OFF" when engine stalls.   |  |  |  |  |  |  |  |
|                             |   |  | Replace ECM, if E   | CM fail-safe conditi  | on is confirmed.  |  |  |  |  |  |  |  |

<sup>\*1:</sup> In Diagnostic Test Mode II (Self-diagnostic results)

# **Symptom Matrix Chart**

| SYSTEM  — Basic engine control system |                                       |                                  |              |                              |                        |                                 |                    | SY                 | MPT              | ОМ                     |                                  |                            |                           |           |              |                             |                |
|---------------------------------------|---------------------------------------|----------------------------------|--------------|------------------------------|------------------------|---------------------------------|--------------------|--------------------|------------------|------------------------|----------------------------------|----------------------------|---------------------------|-----------|--------------|-----------------------------|----------------|
|                                       |                                       | HARD/NO START/RESTART (EXCP. HA) | ENGINE STALL | HESITATION/SURGING/FLAT SPOT | SPARK KNOCK/DETONATION | LACK OF POWER/POOR ACCELERATION | HIGH IDLE/LOW IDLE | ROUGH IDLE/HUNTING | IDLING VIBRATION | SLOW/NO RETURN TO IDLE | OVERHEATS/WATER TEMPERATURE HIGH | EXCESSIVE FUEL CONSUMPTION | EXCESSIVE OIL CONSUMPTION | OVERCOOLS | OVERCHARGING | BATTERY DEAD (UNDER CHARGE) | Reference page |
| CT/CS                                 |                                       | AA                               | АВ           | AC                           | AD                     | AE                              | AF                 | AG                 | АН               | AJ                     | AK                               | AL                         | AM                        | 1P        | 1X           | НА                          |                |
| Fuel                                  | Fuel pump circuit                     | •                                | •            | •                            | 0                      | •                               |                    | 0                  | 0                |                        | <u> </u>                         | 0                          |                           |           | <u> </u>     | <u> </u>                    | EC-360         |
|                                       | Fuel pressure regulator system        | •                                | •            | 0                            | 0                      | 0                               | 0                  | 0                  | 0                | 0                      |                                  | 0                          |                           |           |              | <u> </u>                    | EC-26          |
|                                       | Injector circuit                      | •                                | •            | •                            | 0                      | •                               |                    | •                  | •                |                        |                                  | •                          |                           |           |              |                             | EC-353         |
|                                       | Evaporative emission system           | 0                                | 0            | 0                            | 0                      | 0                               | 0                  | 0                  | 0                | 0                      |                                  | 0                          |                           |           |              |                             | EC-21          |
| Air                                   | Positive crankcase ventilation system | 0                                | 0            | 0                            | 0                      | 0                               | 0                  | 0                  | 0                | 0                      |                                  | 0                          | 0                         |           |              | L                           | EC-25          |
|                                       | Incorrect idle speed adjustment       | 0                                | 0            |                              |                        |                                 | •                  | 0                  | 0                | •                      |                                  | 0                          |                           |           |              | <u></u>                     | EC-31          |
|                                       | IACV-AAC valve circuit                | •                                | •            |                              |                        |                                 | •                  | •                  | •                | •                      |                                  |                            |                           |           |              |                             | EC-255         |
|                                       | IACV-FICD solenoid valve circuit      |                                  | 0            |                              |                        |                                 | •                  | 0                  | 0                | •                      |                                  |                            |                           |           |              |                             | EC-373         |
| Ignition                              | Incorrect ignition timing adjustment  | 0                                | 0            | •                            | •                      | •                               |                    | •                  | •                |                        |                                  | •                          |                           |           |              |                             | EC-31          |
|                                       | Ignition circuit                      | •                                | •            | •                            | •                      | •                               |                    | •                  | •                |                        |                                  | •                          |                           |           |              |                             | EC-290         |
| EGR                                   | EGR control solenoid valve circuit    |                                  | 0            | •                            | 0                      | 0                               |                    |                    |                  |                        |                                  | 0                          |                           |           |              |                             | EC-309         |
| EGR system                            |                                       | 0                                | 0            | •                            | •                      | 0                               | 0                  | •                  | •                | 0                      |                                  | 0                          |                           |           |              |                             | EC-210         |
| Main power supply and ground circuit  |                                       | •                                | 0            | 0                            | 0                      | 0                               |                    | •                  | •                |                        | 0                                | 0                          |                           |           |              | 0                           | EC-99          |
| Cooling Cooling fan circuit           |                                       | 0                                | 0            | 0                            | 0                      | 0                               | 0                  | 0                  | 0                | 0                      | •                                | 0                          |                           | •         |              | 0                           | EC-340         |
| Air condition                         | ner circuit                           | 0                                | 0            | 0                            | 0                      | 0                               | 0                  | 0                  | 0                | 0                      |                                  | 0                          |                           |           |              | 0                           | HA section     |

IDX

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LC

EC

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MT

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FA

 $\mathbb{R}\mathbb{A}$ 

BR

ST

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HA

EL

<sup>• ;</sup> High Possibility Item

; Low Possibility Item

# TROUBLE DIAGNOSIS — General Description Symptom Matrix Chart (Cont'd)

|                      |  |                                  |              |                              |                        |                                 |                    | SY                 | MPT              | ОМ                     |                                  |                            |                           | SYMPTOM   |              |                             |                |  |  |  |  |  |  |  |  |  |  |
|----------------------|--|----------------------------------|--------------|------------------------------|------------------------|---------------------------------|--------------------|--------------------|------------------|------------------------|----------------------------------|----------------------------|---------------------------|-----------|--------------|-----------------------------|----------------|--|--|--|--|--|--|--|--|--|--|
| SYSTEM — ECCS system |  | HARD/NO START/RESTART (EXCP. HA) | ENGINE STALL | HESITATION/SURGING/FLAT SPOT | SPARK KNOCK/DETONATION | LACK OF POWER/POOR ACCELERATION | HIGH IDLE/LOW IDLE | ROUGH IDLE/HUNTING | IDLING VIBRATION | SLOW/NO RETURN TO IDLE | OVERHEATS/WATER TEMPERATURE HIGH | EXCESSIVE FUEL CONSUMPTION | EXCESSIVE OIL CONSUMPTION | OVERCOOLS | OVERCHARGING | BATTERY DEAD (UNDER CHARGE) | Reference page |  |  |  |  |  |  |  |  |  |  |
| CT/CS                |  | AA                               | AB           | AC                           | AD                     | ΑE                              | AF                 | AG                 | АН               | AJ                     | AK                               | AL                         | AM                        | 1P        | 1X           | НА                          |                |  |  |  |  |  |  |  |  |  |  |
| ECCS                 | Crankshaft position sensor (REF) circuit           | 0                                | 0            |                              |                        |                                 |                    |                    |                  |                        |                                  |                            |                           |           |              |                             | EC-298         |  |  |  |  |  |  |  |  |  |  |
|                      | Crankshaft position sensor (POS) circuit           | 0                                | 0            |                              |                        |                                 |                    |                    |                  |                        |                                  |                            |                           |           |              |                             | EC-199, 303    |  |  |  |  |  |  |  |  |  |  |
|                      | Camshaft position sensor (PHASE) circuit           | •                                |              |                              |                        |                                 |                    |                    |                  |                        |                                  |                            |                           |           |              |                             | EC-205         |  |  |  |  |  |  |  |  |  |  |
|                      | Mass air flow sensor circuit                       | •                                | •            | •                            | 0                      | •                               |                    | •                  | •                |                        |                                  | •                          |                           |           |              |                             | EC-104         |  |  |  |  |  |  |  |  |  |  |
|                      | Front heated oxygen sensor circuit                 |                                  | 0            | •                            | 0                      | •                               |                    | •                  | •                |                        |                                  | •                          |                           |           |              |                             | EC-159, 141    |  |  |  |  |  |  |  |  |  |  |
|                      | Engine coolant temperature sensor circuit          | •                                | 0            | 0                            | 0                      | 0                               | 0                  | •                  | •                | 0                      |                                  | 0                          |                           |           |              |                             | EC-123, 134    |  |  |  |  |  |  |  |  |  |  |
|                      | Throttle position sensor circuit                   |                                  | •            | ٠                            |                        | •                               | 0                  | •                  | •                | 0                      |                                  | •                          |                           |           |              |                             | EC-128         |  |  |  |  |  |  |  |  |  |  |
|                      | Incorrect throttle position sensor adjust-<br>ment |                                  | •            | 0                            |                        | 0                               | •                  | 0                  | 0                | •                      |                                  | 0                          |                           |           |              |                             | EC-78          |  |  |  |  |  |  |  |  |  |  |
|                      | Vehicle speed sensor circuit                       |                                  | Ö            | 0                            |                        | 0                               |                    |                    |                  |                        |                                  | 0                          |                           |           |              |                             | EC-251         |  |  |  |  |  |  |  |  |  |  |
|                      | Knock sensor circuit                               |                                  |              | •                            | 0                      | 0                               |                    |                    |                  |                        |                                  | 0                          |                           |           |              |                             | EC-196         |  |  |  |  |  |  |  |  |  |  |
|                      | ECM  | 0                                | 0            | 0                            | 0                      | 0                               | 0                  | 0                  | 0                | 0                      | 0                                | 0                          |                           |           |              |                             | EC-269, 82     |  |  |  |  |  |  |  |  |  |  |
|                      | Start signal circuit                               | Ŏ                                |              |                              | -                      |                                 |                    |                    |                  |                        |                                  |                            |                           |           |              |                             | EC-358         |  |  |  |  |  |  |  |  |  |  |
|                      | Park/Neutral position switch circuit               |                                  |              | 0                            |                        | 0                               |                    | 0                  | 0                |                        |                                  | 0                          |                           |           |              |                             | EC-272         |  |  |  |  |  |  |  |  |  |  |
|                      | Power steering oil pressure switch circuit         |                                  | 0            |                              |                        |                                 |                    | 0                  | Ō                |                        |                                  |                            |                           |           |              |                             | EC-368         |  |  |  |  |  |  |  |  |  |  |
|                      | Front engine mounting control circuit              |                                  |              |                              |                        |                                 |                    | 0                  | 0                |                        |                                  |                            | ┪                         |           |              |                             | EC-365         |  |  |  |  |  |  |  |  |  |  |
|                      | Electrical load signal circuit                     |                                  |              |                              |                        |                                 |                    | 0                  | 0                |                        |                                  |                            |                           |           |              |                             | EC-376         |  |  |  |  |  |  |  |  |  |  |

<sup>• ;</sup> High Possibility Item

; Low Possibility Item

# Symptom Matrix Chart (Cont'd)

|             |   |               |              |                         |                        |                                 |   | SY                 | MPT              | ОМ   |  |                  |  | -            |  | •  |                |                  |
|-------------|---|---------------|--------------|-------------------------|------------------------|---------------------------------|---|--------------------|------------------|--|--|------------------|--|--------------|--|--|----------------|------------------|
|             |   | 2             |              |                         |                        | NO                              |   |                    |                  | <del></del>                                      | HIGH   | <u> </u>         | Ţ <u>.</u>                                       |              |  |  |                |                  |
|             |   | (EXCP. HA)    |              | SPOT                    |                        | LERAT                           |   |                    |                  |  | ATURE  | NO<br>NO         | z  |              |  | 3GE)   |                | G                |
| SYSTEM      |   |               |              | FLAT S                  | ATION                  | R ACCE                          |   |                    |                  | IDLE   | EMPER,   | FUEL CONSUMPTION | JMPTIC   |              |  | R CHARGE)  | :              | MA               |
| — Engine m  | nechanical & other                                    | START/RESTART |              | RGING/                  | DETON                  | R/POO                           | , IDLE  |                    | NO               | JRN TO   | ATER TI  | EL CON           | CONS   |              | ၂<br>၂   | (UNDER   | Reference page | EM               |
|             |   | O STAR        | STALL        | ns/Noi                  | KNOCK                  | POWE                            | LE/LOW  | IDLE/HI            | /IBRAT           | O RETL   | EATS/W/  | IVE FUI          | VE OIL   | SOUS         | HARGIN   | Y DEAD   |                |                  |
|             |   | HARD/NO       | ENGINE STALL | HESITATION/SURGING/FLAT | SPARK KNOCK/DETONATION | LACK OF POWER/POOR ACCELERATION | HIGH IDLE/LOW IDLE                                | ROUGH IDLE/HUNTING | IDLING VIBRATION | SLOW/NO RETURN TO IDLE                           | OVERHEATS/WATER TEMPERATURE HIGH                 | EXCESSIVE        | EXCESSIVE OIL CONSUMPTION                        | OVERCOOLS    | OVERCHARGING                                     | BATTERY DEAD                                     |                | LC               |
| CT/CS       | <u>.</u>  | AA            | AB           | AC                      | ΑD                     |                                 | AF  | AG                 |                  | AJ   | AK   | AL               | AM   | 1P           | 1X   | НА   | 1              | EC               |
| Fuel        | Fuel tank   | 10            | 0            |                         |                        |                                 | •   |                    | <u> </u>         | <u> </u>   |  |                  |  |              |  |  |                |                  |
|             | Fuel piping   | 1             | ŏ            | 10                      | 0                      | ō                               |   | 0                  | 0                |  |  | 0                |  |              |  |  | 1              |                  |
|             | Vapor lock  | Ì             | Ō            | Ť                       |                        | <u> </u>                        | <u> </u>  | <u> </u>           | ↾                |  |  | 1                |  |              |  |  | 1              | FE               |
|             | Valve deposit   | O             | Ŏ            | 0                       | 0                      | 0                               |   | 0                  | 0                |  |  | 0                | <u> </u>   | Γ            | <u> </u>   |  | 1              |                  |
|             | Poor fuel (Heavy weight gasoline, Low octane)         | 0             | 0            | 0                       | 0                      | 0                               |   | 0                  | 0                |  |  | 0                |  |              |  |  | _              | GL               |
| Air         | Air duct  |               | 0            | 0                       |                        | 0                               |   | 0                  | 0                |  |  | 0                |  |              |  |  |                | 90               |
|             | Air cleaner Air leakage from air duct                 | 0             | 0            | 0                       | 0                      | 0                               | 0   | 0                  | 0                | 0  |  | 0                | }  |              |  |  |                | MT               |
|             | (Mass air flow sensor — throttle body)                | <u> </u>      | <b></b> _    | <b>↓</b>                |                        | <u> </u>                        | <u> </u>  | <u> </u>           | <u> </u>         |  |  |                  |  |              |  | ļ  | <u> </u>       | ני נטע —         |
|             | Throttle body, Throttle wire                          | •             | •            | <b>↓•</b>               | ļ                      | •                               | •   | 0                  | 0                | •  | <b> </b>   | 0                | <u> </u>   |              |  |  | FE section     |                  |
|             | Air leakage from intake manifold/<br>Collector/Gasket | •             | •            | •                       | 0                      | •                               | 0   | •                  | •                | 0  |  | •                |  |              |  |  |                | AT               |
| Cranking    | Battery   | 0             | 0            | <u> </u>                | <u> </u>               |                                 | <u> </u>  | $\bigcirc$         |                  | ļ  | ļ  | Q                | ļ  |              | 0  | 0  |                |                  |
|             | Alternator circuit                                    | 0             | 0            | 0                       |                        | 0                               | <u> </u>  | $\circ$            | 0                |  |  |                  | ļ  | <u> </u>     | 0  | 0  | EL section     | EΑ               |
|             | Starter circuit                                       | •             | Ĺ            | <u> </u>                | ļ. <u>-</u>            | ļ<br>                           | <u> </u>  | ļ                  | <u> </u>         | ļ  |  |                  |  |              |  |  | <del> </del>   | FA.              |
|             | Flywheel/Drive plate                                  | •             | <u> </u>     | <b>↓</b>                | <b> </b> _             | ļ                               | <b>├</b>  | ļ                  | <del> </del>     | <b></b>  | <b>}</b> -                                       |                  |  | <b>!</b>     |  | -  |                |                  |
|             | Clutch interlock switch                               | •             | }            | -                       |                        | ļ                               | <u> </u>  |                    | ļ                | <u> </u>   |  |                  |  | <b>}</b>     | -  | }  | CL section     | RA               |
|             | Inhibitor switch                                      | •             | <del> </del> |                         | ļ —                    |                                 | <u> </u>  |                    | -                | -  | }  |                  |  | <u> </u>     | <del> </del> -                                   | }  | AT section     | . <u>INIZA</u> I |
| F           | Theft warning circuit                                 |               | <del> </del> | •                       | <del> </del>           | •                               | }   | •                  | •                | <del> </del>                                     | ├  |                  |  |              |  | <del>}</del> -                                   | EL section     | •                |
| Engine      | Cylinder head Cylinder head gasket                    |               | Ö            | •                       |                        |                                 | <u> </u>  | •                  | •                | <del> </del> -                                   |  | 0                | _  | -            | <u> </u>   | <del>                                     </del> |                | BR               |
|             | Cylinder flead gasket Cylinder block                  | <u> </u>      |              | 0                       |                        |                                 | <b>.</b>  | 1                  |                  |  | 0  |                  | 0  | -            | <del> </del>                                     | <del> </del>                                     | -              | מפ               |
|             | Piston  | •             | 0            | 8                       | 0                      | 0                               | ļ. <u> </u>                                       | 0                  | 00               | -  |  | 00               | 0  | <del> </del> |  | <del>                                     </del> |                |                  |
|             | Piston ring   | •             | 6            | 10                      | 0                      | 0                               |   | 0                  | 5                |  | <b>├</b>   | 10               | 10   | ļ            |  | <del>                                     </del> |                | ST               |
|             | Connecting rod  | 6             | 10           | 10                      | 8                      | 0                               | <del> </del>                                      | 8                  | 0                |  |  | 3                | $\vdash$   | <u> </u>     | <del> </del>                                     | 1  | †              | Ø.1              |
|             | Bearing   | <del>  </del> | •            | 5                       | 0                      | $\frac{\circ}{\circ}$           |   | 8                  | 5                | <del> </del>                                     | <del> </del>                                     | 0                |  | ]            | <del> </del>                                     | <del> </del>                                     | 1              |                  |
|             | Crankshaft  | •             | •            | 0                       | 0                      | •                               |   | •                  | -                | +  | <del>                                     </del> | 0                | <del>                                     </del> |              |  |  | †              | RS               |
| Valve       | Timing chain  | •             | •            | -                       | ŏ                      | •                               | <del>  -                                   </del> | •                  | •                |  |  | Ö                |  |              | <u> </u>   | †—   | 1              | 11,000           |
| mechanism   | Camshaft  | 0             | •            | •                       | <u> </u>               | •                               |   | •                  | •                | <del> </del>                                     | 1  | ŏ                |  |              | <del>                                     </del> | <del> </del>                                     |                |                  |
|             | Intake valve  | •             | 0            | 0                       | Ŏ                      | •                               |   | •                  | •                | <del>                                     </del> |  | ŏ                | 0  | <del></del>  | <b> </b> -                                       |  | =              | Te               |
|             | Exhaust valve   | 0             | Ö            | Ō                       | Ŏ                      | 0                               | <del>  "</del> "                                  | Ō                  | 0                |  |  | Ŏ                | Ŏ  |              |  | <del> </del>                                     | 1 —            |                  |
| Exhaust     | Exhaust manifold/Tube/Muffler/Gasket                  | •             | •            | •                       | •                      | Ō                               |   | •                  | •                |  |  | Ō                |  |              | l  | <u> </u>   |                |                  |
|             | Three way catalytic converter                         | 0             | 0            | 0                       | 0                      | Ō                               |   | 0                  | 0                |  |  | ō                |  |              |  | ļ  | 1              | HA               |
| Lubrication | Oil pan/Oil strainer/Oil pump/Oil filter/Oil gallery  | •             | •            | 0                       | 0                      | 0                               |   | •                  | •                |  |  | 0                | 0  |              |  |  | ]              | n 117±7          |
|             | Oil level (Low)/Filthy oil                            | 0             | Ģ            | 0                       | 0                      | 0                               |   | 0                  | 0                |  |  | 0                | 0  |              |  |  | ]              | E                |
| Cooling     | Radiator/Hose/Radiator filler cap                     | Ō             | Ō            | Ō                       | Ō                      | Ō                               |   | Ō                  | Ō                |  | 0  | Ō                |  |              |  |  | ]              |                  |
|             | Thermostat  | Ō             | Ö            | Ō                       | 0                      | 0                               | 0   | 0                  | 0                | 0  | 0  | 0                |  | 0            |  |  |                |                  |
|             | Water pump  | 0             | 0            | 0                       | 0                      | 0                               |   | 0                  | 0                | <u>.</u>   | 0  | 0                |  |              |  |  |                | [II]             |
|             | Water gallery   | 0             | 0            | Ó                       | 0                      | 0                               |   | 0                  | 0                |  | 0  | 0                |  |              |  |  |                |                  |
|             | Cooling fan   | 0             | 0            | Ō                       | Ō                      | Ö                               | 0   | O                  | 0                | 0  | 0  | $\circ$          |  | 0            |  |  |                |                  |
|             | Coolant level (low)/Contaminated coolant              | 0             | 0            | 0                       | 0                      | 0                               |   | 0                  | 0                |  | 0  | 0                |  |              | Γ  |  | 1              |                  |

<sup>• ;</sup> High Possibility Item

; Low Possibility Item

**EC-85** 253

# **CONSULT Reference Value in Data Monitor Mode**

#### Remarks:

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

| MONITOR ITEM                   | COI   | NDITION  | SPECIFICATION  |
|--------------------------------|---|--|--|
| CKPS·RPM (POS) CKPS·RPM (REF)  | Tachometer: Connect     Run engine and compare tachometer     | Almost the same speed as the CON-<br>SULT value.       |  |
| POS COUNT                      | Engine: Running   |  | 179 - 181  |
| MAS AIR/FL SE                  | Engine: After warming up     Air conditioner switch: "OFF"    | Idle   | 1.0 - 1.7V   |
| ·····                          | Shift lever: "N"     No-load                                  | 2,500 rpm  | 1.5 - 2.1V   |
| COOLAN TEMP/S                  | Engine: After warming up                                      | •  | More than 70°C (158°F)                                   |
| FR O2 SEN-B2<br>FR O2 SEN-B1   |   |  | 0 - 0.3V ↔ Approx. 0.6 - 1.0V                            |
| FR O2 MNTR-B2<br>FR O2 MNTR-B1 | Engine: After warming up                                      | Maintaining engine speed at 2,000 rpm                  | LEAN ↔ RICH Changes more than 5 times during 10 seconds. |
| RR O2 SENSOR                   |   | Maintaining engine speed at 2,000 rpm                  | 0 ↔ Approx. 1.0V   |
| RR O2 MNTR                     | Engine: After warming up                                      | LEAN ↔ RICH  |  |
| VHCL SPEED SE                  | Turn drive wheels and compare spee<br>value                   | Almost the same speed as the CONSULT value             |  |
| BATTERY VOLT                   | • Ignition switch: ON (Engine stopped)                        |  | 11 - 14V   |
| TUDTI DOG OTAL                 | Ignition switch: ON   | Throttle valve: fully closed                           | 0.35 - 0.65V   |
| THRTL POS SEN                  | (Engine stopped)  | Throttle valve: fully opened                           | Approx. 4.0V   |
| EGR TEMP SEN                   | Engine: After warming up                                      |  | Less than 4.5V   |
| START SIGNAL                   | • Ignition switch: $ON \rightarrow START \rightarrow ON$      |  | $OFF \rightarrow ON \rightarrow OFF$                     |
|                                | Ignition switch: ON   | Throttle valve: Idle position                          | ON   |
| CLSD THL/P SW                  | (Engine stopped)  | Throttle valve: Slightly open                          | OFF  |
|                                | a Coming After warming up idle the                            | Air conditioner switch: "OFF"                          | OFF  |
| AIR COND SIG                   | <ul> <li>Engine: After warming up, idle the engine</li> </ul> | Air conditioner switch: "ON" (Compressor operates.)    | ON   |
| B/N BOOL CM                    | A Janitian quitable CM  | Shift lever: "P" or "N"                                | ON   |
| P/N POSI SW                    | Ignition switch: ON   | Except above   | OFF  |
| PW/ST SIGNAL                   | Engine: After warming up, idle the engine                     | Steering wheel in neutral position (forward direction) | OFF  |
|                                | GUÁRIC  | The steering wheel is turned                           | ON   |
| OAD SIGNAL                     | • Engine: Running   | Rear window defogger "ON"                              | ON   |
| OND SIGNAL                     | Except the above  |  | OFF  |

# TROUBLE DIAGNOSIS — General Description CONSULT Reference Value in Data Monitor Mode (Cont'd)

| MONITOR ITEM                 | con  | NDITION  | SPECIFICATION      | <del></del> |
|------------------------------|--|--|--------------------|-------------|
| IGNITION SW                  | Ignition switch: ON → OFF  |  | ON → OFF           | <del></del> |
| INJ PULSE-B2                 | Engine: After warming up     Air conditioner switch: "OFF"                       | ldie   | 2.4 - 3.2 msec.    | G[          |
| INJ PULSE-B1                 | Shift lever: "N"     No-load   | 2,000 rpm  | 1.9 - 2.8 msec.    | MA          |
| B/EUEL SCHDI                 | ditto  | Idle   | 1.0 - 1.6 msec     |             |
| B/FUEL SCHDL                 | ditto  | 2,000 rpm  | 0.7 - 1.3 msec     |             |
| IGN TIMING                   | ditto  | Idle   | 15° BTDC           | —— EM       |
| IGIA FIMILIAG                | i ditto  | 2,000 rpm  | More than 25° BTDC |             |
| IACV-AAC/V                   | ditto  | Idle   | 2 - 10 step        | — LC        |
| IACV-AAC/V                   | ditto  | 2,000 rpm  | _                  |             |
| ENGINE MOUNT                 | - Fadro Burrian  | Idle   | "IDLE"             | EC          |
| ENGINE MOUNT                 | Engine: Running  | 2,000 rpm  | "TRVL"             |             |
| BURG VOL CAV                 | ditto  | Vehicle stopped  | 0 step             |             |
| PURG VOL C/V                 | ditto  | Vehicle running  | _                  |             |
| A/F ALPHA-B2<br>A/F ALPHA-B1 | Engine: After warming up   | Maintaining engine speed at 2,000 rpm                                | 54 - 155%          | ŒL          |
| EVAP SYS PRES                | Ignition switch: ON  |  | Approx. 3.4V       |             |
| AIR COND BLY                 | Air conditioner switch: OFF → ON   |  | OFF → ON           | MT          |
| FUEL PUMP RLY                | Ignition switch is turned to ON (Opera     Engine running and cranking           | ates for 1 second)   | ON .               | <br>AT      |
|                              | Except as shown above  | OFF  |                    |             |
| 71                           |  | Engine coolant temperature is 94°C (201°F) or less                   | OFF                | FA          |
| COOLING FAN                  | After warming up engine, idle the engine.     Air conditioner switch: "OFF"      | Engine coolant temperature is between 95°C (203°F) and 104°C (219°F) | LOW                | —<br>—— RA  |
|                              |  | Engine coolant temperature is 105°C (221°F) or more                  | HIGH               |             |
| EGRC SOL/V                   | Engine: After warming up     Air conditioner switch: "OFF"                       | Idle   | ON                 | 8R          |
| Edno 30DV                    | Shift lever: "N"     No-load   | Racing up to 1,500 - 2,000 rpm                                       | OFF                | ST          |
| VENT CONT/V                  | Ignition switch: ON  |  | OFF                |             |
| FR O2 SEN HTR-B1             | Engine speed: Idle   |  | ON                 | ₽@          |
| FR O2 SEN HTR-B2             | Engine speed: Above 3,600 rpm (A/T)  | models) or 4,000 rpm (M/T models)                                    | OFF                | RS          |
| RR O2 HEATER                 | Engine speed: Idle   |  | ON                 |             |
| AN OZ MEALEN                 | Engine speed: Above 3,600 rpm  |  | OFF                | —— BT       |
| VC/V BYPASS/V                | ● Ignition switch: ON  |  | OFF                |             |
| PURG CONT S/V                | Engine: After warming up   | Idle   | OFF                | HA          |
|                              |  | 2,000 rpm  | ON                 |             |
| CAL/LD VALUE                 | <ul><li>Engine: After warming up</li><li>Air conditioner switch: "OFF"</li></ul> | Idle   | 14.0 - 33.0%       |             |
|                              | <ul><li>Shift lever: "N"</li><li>No-load</li></ul>                               | 2,500 rpm  | 12.0 - 25.0%       | 1DX         |

# CONSULT Reference Value in Data Monitor Mode (Cont'd)

| MONITOR ITEM  |  | CONDITION                                  | SPECIFICATION    |
|---------------|--|--|------------------|
| ABOOL TUBIO   | Ignition switch: ON  | Throttle valve: fully closed               | 0.0%             |
| ABSOL TH-P/S  | (Engine stopped)   | Throttle valve: fully opened               | Approx. 88%      |
| MASS AIRFLOW  | Engine: After warming up     Air conditioner switch: "OFF" | Idle                                       | 2.0 - 6.0 g·m/s  |
| VIASS AINFLOW | Shift lever: "N"     No-load                               | 2,500 rpm                                  | 7.0 - 20.0 g·m/s |
|               |  | Within 30 seconds of starting engine       | Approx. 0V       |
| FPCM DR VOLT  | Engine: After warming up                                   | More than 30 seconds after starting engine | Approx. 3.5V     |
|               | which is   | Within 30 seconds of starting engine       | HI               |
| FPCM          | ditto  | More than 30 seconds after starting engine | LOW              |
| MAP/BARO SW/V | Ignition switch: ON  |  | MAP              |
| ABSOL PRES/SE | - Facing After warming up                                  | Engine is not running                      | Approx. 4.4V     |
|               | Engine: After warming up                                   | Idle                                       | Approx. 1.2V     |

## Major Sensor Reference Graph in Data Monitor Mode

GI

MA

EM

LC

EC

FE

CL.

MT

AT

FA

RA

BR

ST

RS

87

HA

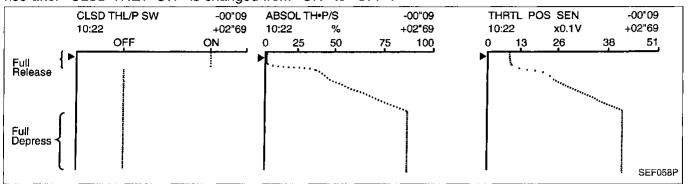
The following are the major sensor reference graphs in "DATA MONITOR" mode. (Select "HI SPEED" in "DATA MONITOR" with CONSULT.)

## THRTL POS SEN, ABSOL TH:P/S, CLSD THL/P SW

Below is the data for "THRTL POS SEN", "ABSOL TH:P/S" and "CLSD THL/P SW" when depressing the accelerator pedal with the ignition switch "ON".

The signal of "THRTL POS SEN" and "ABSOL TH-P/S" should rise gradually without any intermittent drop or

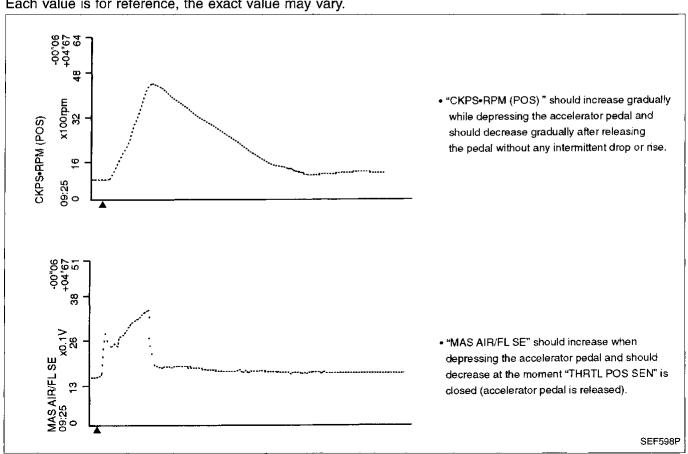
rise after "CLSD THL/P SW" is changed from "ON" to "OFF".



### CKPS·RPM (POS), MAS AIR/FL SE, THRTL POS SEN, RR O2 SENSOR, FR O2 SENSOR, INJ **PULSE**

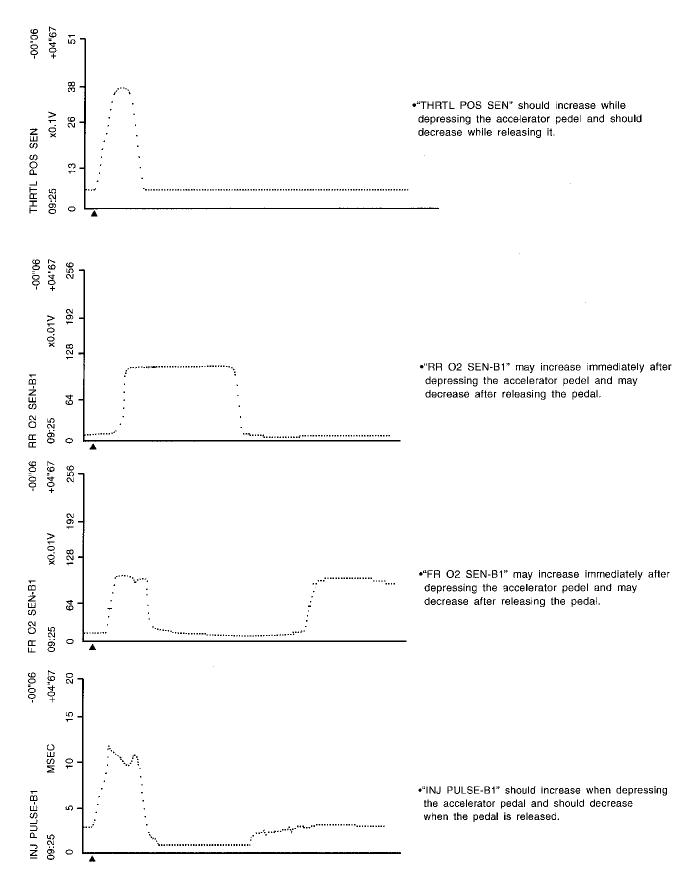
Below is the data for "CKPS·RPM (POS)", "MAS AIR/FL SE", "THRTL POS SEN", "RR O2 SENSOR", "FR O2 SENSOR" and "INJ PULSE" when revving engine quickly up to 4,800 rpm under no load after warming up engine sufficiently.

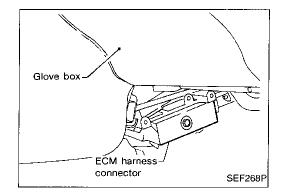
Each value is for reference, the exact value may vary.



**EC-89** 

# Major Sensor Reference Graph in Data Monitor Mode (Cont'd)





# **ECM Terminals and Reference Value PREPARATION**

ECM is located behind the center console panel. For this inspection, remove the center console under cover.

@[

MA

EM

Remove ECM harness protector.

LC

EC

FE

CL

Perform all voltage measurements with the connectors connected. Extend tester probe as shown to perform tests easily.

AT

MT

FA

 $\mathbb{R}\mathbb{A}$ 

BR

ST

RS

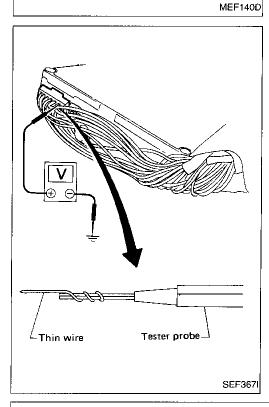
BT

KA

EL

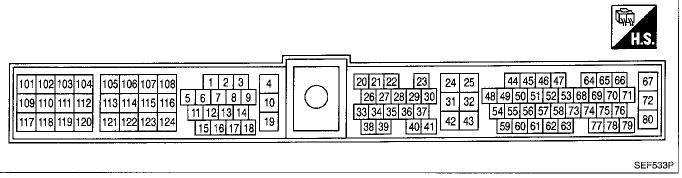
IDX

259



ECM harness protector

**ECM HARNESS CONNECTOR TERMINAL LAYOUT** 



# ECM Terminals and Reference Value (Cont'd)

### **ECM INSPECTION TABLE**

Remarks: Specification data are reference values, and are measured between each terminal and 25 (ECCS ground) with a voltmeter.

| TER-<br>MINAL<br>NO. | WIRE<br>COLOR | ITEM   | CONDITION   | DATA<br>(DC voltage)                            |
|----------------------|---------------|--|---|---|
| 1                    | Y/R           | Ignition signal (No. 1)                            | Engine is running.  L Idle speed  | Approximately 0.2V★  (V) 4 2 0 100 ms  SEF399T  |
| 2 3                  | G/R<br>L/R    | Ignition signal (No. 2) Ignition signal (No. 3)    | Engine is running.  Engine speed is 2,500 rpm.  | Approximately 0.3V★  (V) 4 2 0 100 ms  SEF645T  |
| 4                    | W/B           | ECCS relay (Self-shutoff)                          | Engine is running.  Ignition switch "OFF"  For a few seconds after turning ignition switch "OFF"  Ignition switch "OFF" | 0 - 1V  |
| 5                    | w/G           | Tachometer   | A few seconds passed after turning ignition switch "OFF"  Engine is running.  | BATTERY VOLTAGE (11 - 14V)  Approximately 7V★   |
| 6                    | R             | A/T diagnosis signal                               | Ignition switch "ON" Engine is running.   | 0.5 - 3.0V                                      |
| 7                    | GY            | Ignition signal (No. 4)                            | Engine is running.  Idle speed  | Approximately 0.2V*  (V) 4 2 0 100 ms SEF399T   |
| 9                    | PU/W<br>GY/R  | Ignition signal (No. 5)<br>Ignition signal (No. 6) | Engine is running.  Engine speed is 2,500 rpm   | Approximately 0.3V★  (V)  4 2 0 100 ms  SEF645T |

<sup>★:</sup> Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

# ECM Terminals and Reference Value (Cont'd)

|                      | <del> </del> |                                     | ·  | Taido (Ooint a)                                |
|----------------------|--------------|-------------------------------------|--|--|
| TER-<br>MINAL<br>NO. | WIRE         | ITEM                                | CONDITION  | DATA<br>(DC voltage)                           |
| 10                   | В            | ECCS ground                         | Engine is running.  Idle speed   | Engine ground                                  |
| 11                   | B/P          | Fuel pump relay                     | Ignition switch "ON"  For 1 second after turning ignition switch "ON"  Engine is running.            | 0 - 1V   |
|                      |              |                                     | Ignition switch "ON"  1 second after turning ignition switch "ON"                                    | BATTERY VOLTAGE<br>(11 - 14V)                  |
| 12                   | B/R          | Air conditioner relay               | Engine is running.  Both air conditioner switch and blower switch are "ON".                          | 0 - 1V   |
|                      | # :          |                                     | Engine is running.  Air conditioner switch is "OFF".   | BATTERY VOLTAGE<br>(11 - 14V)                  |
| 13                   | LG           | Cooling fan relay (High)            | Engine is running.  Cooling fan is not operating.  | BATTERY VOLTAGE<br>(11 - 14V)                  |
| 14                   | LG/R         | Cooling fan relay (Low)             | Engine is running.  Cooling fan is operating.  | 0 - 1V   |
|                      |              |                                     | Engine is running. (Warm-up condition)  Idle speed (within 30 seconds after starting engine)         | 0 - 0.4V                                       |
| 15                   | B/P          | Fuel pump control module            | Engine is running. (Warm-up condition)  Idle speed (30 seconds after starting engine and thereafter) | Approximately 10V                              |
| 16                   | OR/Y         | MAP/BARO switch sole-<br>noid valve | Ignition switch "ON"   | BATTERY VOLTAGE<br>(11 - 14V)                  |
| 18                   | LG/B         | Malfunction indicator lamp          | Ignition switch "ON"  Engine is running.   | Approximately 0.1V  BATTERY VOLTAGE (11 - 14V) |
| 19                   | В            | ECCS ground                         | Engine is running.  Lidle speed  | Engine ground                                  |
|                      |              |                                     | Ignition switch "ON"   | Approximately 0V                               |
| 20                   | BR/W         | Start signal                        | Ignition switch "START"  | BATTERY VOLTAGE<br>(11 - 14V)                  |
| 21                   | G/B          | Air conditioner switch              | Engine is running.  Both air conditioner switch and blower switch are "ON". (Compressor operates.)   | Approximately 0V                               |
|                      |              |                                     | Engine is running.  Air conditioner switch is "OFF".   | BATTERY VOLTAGE<br>(11 - 14V)                  |

# **ECM Terminals and Reference Value (Cont'd)**

| TER-<br>MINAL<br>NO. | WIRE<br>COLOR                  | ITEM  | CONDITION  | ĐATA<br>(DC voltage)                          |
|----------------------|--------------------------------|---|--|---|
| 22                   | G/W<br>(M/T<br>models)<br>G/OR | Neutral position switch<br>(M/T models)<br>Inhibitor switch (A/T mod- | Ignition switch "ON"  Gear position is "Neutral position" (M/T models).  Gear position is "N" or "P" (A/T models).           | Approximately 0V                              |
|                      | (A/T<br>models)                | els)  | Ignition switch "ON"  Except the above gear position   | Approximately 5V                              |
|                      |                                |   | Ignition switch "ON" (Warm-up condition)  Accelerator pedal released   | 0.35 - 0.65V                                  |
| 23                   | W                              | Throttle position sensor  | Ignition switch "ON"  Accelerator pedal fully depressed  | Approximately 4V                              |
|                      |                                |   | [gnition switch "OFF"]   | ov  |
| 24                   | R                              | Ignition switch   | [Ignition switch "ON"]   | BATTERY VOLTAGE<br>(11 - 14V)                 |
| 25                   | В                              | ECCS ground   | Engine is running.  Idle speed   | Engine ground                                 |
| 26                   | Υ                              | EVAP canister purge vol-  | Engine is running.   | 0.041   |
| 27                   | G                              | ume control valve   | L Idle speed   | 0 - 0.4V                                      |
| 28                   | G/R                            | Fuel pump control module  | Engine is running. (Warm-up condition)  Idle speed (within 30 seconds after starting engine)                                 | 0 - 0.4V                                      |
|                      | <b>G</b> /11                   | check   | Engine is running.  Idle speed (30 seconds after starting engine and thereafter)   | 3.3 - 3.8V                                    |
| 29                   | P/L                            | Vehicle speed sensor  | Engine is running.  Jack up front wheels and run engine at idle in "1st" position (M/T models) or "1" position (A/T models). | Approximately 5.2V*  (V) 6 4 2 0 1 ms SEF648T |
| 31                   | GY/L                           | Throttle position switch (Closed position)                            | Ignition switch "ON" (Warm-up condition)  Accelerator pedal released  Ignition switch "ON"  Accelerator pedal depressed      | BATTERY VOLTAGE (11 - 14V)  Approximately 0V  |
| 32                   | В                              | ECCS ground   | Engine is running.  Lidle speed  | Engine ground                                 |

<sup>★:</sup> Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

# ECM Terminals and Reference Value (Cont'd)

| TER-<br>MINAL<br>NO. | WIRE<br>COLOR | ITEM                                    | CONDITION   | DATA<br>(DC voltage)                |           |
|----------------------|---------------|---|---|-------------------------------------|-----------|
| 33                   | W/L           | Front engine mounting                   | Engine is running.  For 2 seconds after engine speed changes from 2,000 rpm to idle speed | 0 - 0.4V                            |           |
|                      |               |   | Engine is running.  Except the above  | BATTERY VOLTAGE<br>(11 - 14V)       | MA<br>EM  |
| 34                   | W/R           | Front engine mounting                   | Engine is running.  For 2 seconds after engine speed changes from idle speed to 2,000 rpm | 0 - 0.4V                            | LC        |
|                      |               |   | Engine is running.  Except the above  | BATTERY VOLTAGE<br>(11 - 14V)       | EC        |
|                      |               | Throttle position sensor                | Ignition switch "ON" (Warm-up condition)  Accelerator pedal released                      | Approximately 0.4V                  |           |
| 37                   | L/W           | signal                                  | Ignition switch "ON"  Accelerator pedal fully depressed                                   | Approximately 3V                    | CL        |
|                      | _             | Power steering oil pres-                | Engine is running.  Steering wheel is being turned.                                       | 0 - 1.5V                            | MT        |
| 39                   | G             | sure switch                             | Engine is running.  Steering wheel is not being turned.                                   | BATTERY VOLTAGE<br>(11 - 14V)       | TA        |
| 42                   | R             | Sensor's power supply                   | [Ignition switch "ON"]  | Approximately 5V                    | FA        |
| 43                   | В             | Sensor's ground                         | Engine is running. (Warm-up condition)  Idle speed  | ov                                  | RA        |
|                      |               |   |   | Approximately 2.3V★<br>(AC voltage) | BR        |
| 44<br>48             | w<br>w        | Crankshaft position sensor (REF)        | Engine is running.  L Idle speed  | (V)<br>20<br>10                     | ST        |
|                      | !             |   |   | 20 ms SEF400T                       | RS        |
|                      |               | *************************************** |   | Approximately 4.2V★ (AC voltage)    | BT        |
| 46                   | w             | Camshaft position sensor                | Engine is running.  | (V)<br>20<br>10                     | HA        |
| 47                   | W             | (PHASE)                                 | Idle speed  | 20 ms SEF644T                       | EL<br>IDX |

<sup>★:</sup> Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

# ECM Terminals and Reference Value (Cont'd)

| TER-         | WIRE   |   |   | DATA   |
|--------------|--------|---|---|--|
| MINAL<br>NO. | COLOR  | ITEM  | CONDITION   | (DC voltage)   |
| 49           | W      | Crankshaft position sensor (POS)  | Engine is running.  Lidle speed   | Approximately 2.5V★  (V) 4 2 (W) 1 ms  SEF646T   |
| 50<br>51     | w<br>w | Front heated oxygen sen-<br>sor (Right bank)<br>Front heated oxygen sen-<br>sor (Left bank) | Engine is running.  After warming up sufficiently and engine speed is 2,000 rpm.                          | 0 - Approximately 1.0V<br>(periodically change)  |
| 52           | P/L    | Tank fuel temperature sensor  | Engine is running.  | Approximately 0 - 4.8V Output voltage varies with fuel temperature.                      |
| 54           | w      | Mass air flow sensor  | Engine is running. (Warm-up condition)  Idle speed  | 1.0 - 1.7V   |
|              | ,,     | Wado all new Sensor   | Engine is running. (Warm-up condition)  Engine speed is 2,500 rpm.  | 1.5 - 2.1V   |
| <b>5</b> 5   | В      | Mass air flow sensor<br>ground  | Engine is running. (Warm-up condition)  Idle speed  | Approximately 0V   |
| 56           | w      | Rear heated oxygen sen-<br>sor  | Engine is running.  After warming up sufficiently and engine speed is 2,000 rpm.                          | 0 - Approximately 1.0V   |
| 58           | SB     | Intake air temperature sensor   | Engine is running.  | Approximately 0 - 4.8V<br>Output voltage varies with<br>intake air temperature.          |
| 59           | Υ      | Engine coolant tempera-<br>ture sensor  | Engine is running.  | Approximately 0 - 4.8V<br>Output voltage varies with<br>engine coolant tempera-<br>ture. |
|              |        |   | Ignition switch "ON"  Engine is not running.  | Approximately 4.4V   |
| 61           | W      | Absolute pressure sensor  | Engine is running. (Warm-up condition)  Idle speed (within approximately 5 minutes after starting engine) | Approximately 1.2V   |
| 62           | w      | EVAP control system pressure sensor   | Ignition switch "ON"  | Approximately 3.4V   |
| 60           | 1/05   | FOD 4   | Engine is running. (Warm-up condition)  Idle speed  | Less than 4.5V   |
| 63           | L/OR   | EGR temperature sensor  | Engine is running. (Warm-up condition)  EGR system is operating.  | 0 - 1.0V   |

<sup>★:</sup> Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

# ECM Terminals and Reference Value (Cont'd)

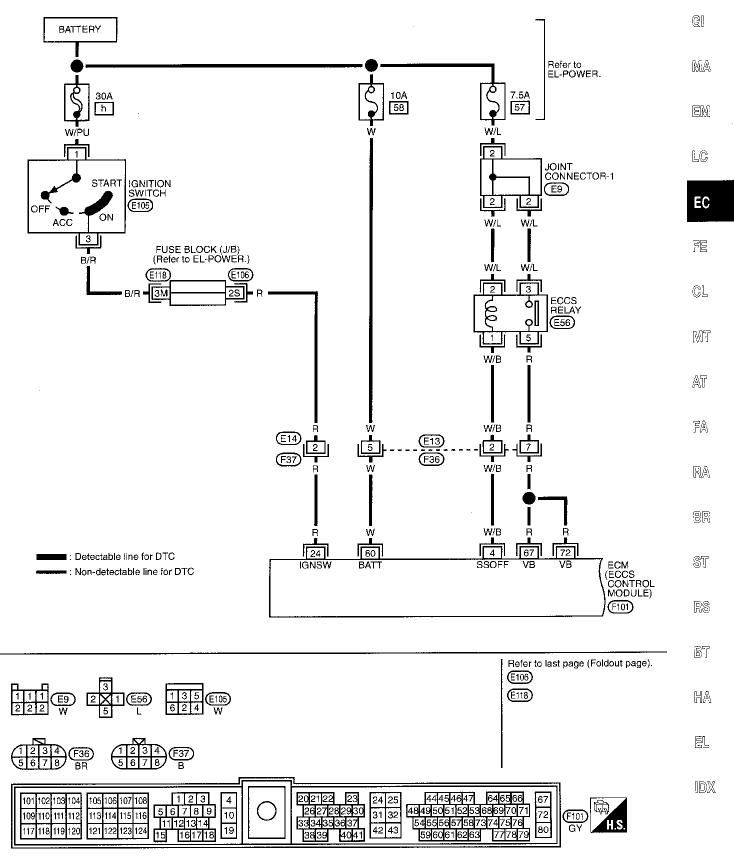
| TER-<br>MINAL<br>NO.     | WIRE<br>COLOR             | ITEM                                  | CONDITION   | DATA<br>(DC voltage)          | _                 |
|--------------------------|---------------------------|---------------------------------------|---|-------------------------------|-------------------|
| 64                       | w                         | Knock sensor                          | Engine is running.  Lidle speed                             | 2.0 - 3.0V                    | <del></del><br>Gi |
| 65                       | R/L                       | A/T signal No. 4                      | Ignition switch "ON"  Engine is running.  Idle speed        | 6 - 8V<br>0V                  | —<br>Ma<br>=M     |
| 66                       | Y/B                       | A/T signal No. 5                      | Ignition switch "ON"  Engine is running.  Idle speed        | 0V<br>6 - 8V                  | -<br>LC           |
| 67<br>72                 | R<br>R                    | Power supply for ECM                  | Ignition switch "ON"  | BATTERY VOLTAGE<br>(11 - 14V) | EC                |
| 69                       | G/B                       | Data link connector for GST           | Ignition switch "ON"  GST is disconnected.                  | 6 - 10V                       | FE                |
| 70                       | OR/L                      | EVAP canister vent con-<br>trol valve | Ignition switch "ON"  | BATTERY VOLTAGE<br>(11 - 14V) | CL                |
| 73                       | W/L                       | A/T signal No. 1                      | Ignition switch "ON"  Engine is running.  Idle speed        | 6 - 8V<br>OV                  | MT<br>—<br>AT     |
| 74                       | W/PU                      | A/T signal No. 2                      | Ignition switch "ON"  | 6 - 8V                        | <br>ra            |
| 75                       | BR/Y                      |                                       | Engine is running.  | Approximately 0V              | — FA<br>—         |
| 76                       | Р                         | Data link connector for<br>CONSULT    | ldle speed Connect CONSULT and select DATA MONI-            | Approximately 4 - 9V          | RA                |
| 78                       | LG                        |                                       | TOR mode.   | Approximately 3.5V            |                   |
| 77                       | R/W                       | A/T signal No. 3                      | [Ignition switch "ON"]  [Engine is running.]  L Idle speed  | 6 - 8V                        | _ BR<br>          |
| 70                       | R/W                       |                                       | Engine is running.  Idle speed (Electrical load: "OFF")     | ov                            | <br>R\$           |
| 79                       | PT/ VV                    | Electrical load signal                | Engine is running.  Idle speed (Rear window defogger: "ON") | BATTERY VOLTAGE<br>(11 - 14V) | Sī                |
| 80                       | W                         | Power supply (Back-up)                | [gnition switch "OFF"]                                      | BATTERY VOLTAGE<br>(11 - 14V) | — HA<br>_         |
| 101<br>115<br>122<br>123 | PU/G<br>GY/G<br>Y<br>GY/L | IACV-AAC valve                        | Engine is running.  Idle speed                              | 0.1 - 14V                     | EL<br>IDX         |

# TROUBLE DIAGNOSIS — General Description ECM Terminals and Reference Value (Cont'd)

| TER-<br>MINAL<br>NO. | WIRE | ITEM                                       | CONDITION   | DATA<br>(DC voltage)                        |  |
|----------------------|------|--|---|---|--|
| 102                  | R/B  | Injector No. 1                             |   | BATTERY VOLTAGE                             |  |
| 104                  | R/Y  | Injector No. 3                             | _   | (11 - 14V)                                  |  |
| 106                  | L/W  | Injector No. 5                             | Engine is running.  | (V)<br>4                                    |  |
| 109                  | R/G  | Injector No. 2                             | Idle speed  | 2 0   |  |
| 111                  | B/OR | Injector No. 4                             |   | 100 ms: 11111111111111111111111111111111111 |  |
| 113                  | PU/R | Injector No. 6                             |   | SEF728T                                     |  |
| 103                  | L/B  | EGRC-solenoid valve                        | Engine is running. (Warm-up condition)  L. Revving engine up to 2,000 rpm.                  | BATTERY VOLTAGE<br>(11 - 14V)               |  |
|                      |      |  | Engine is running. (Warm-up condition)  Idle speed  | 0 - 0.7V                                    |  |
| 107                  | R    | Rear heated oxygen sen-                    | Engine is running.  Engine speed is below 3,600 rpm.  | 0 - 0.5V                                    |  |
|                      |      | sor heater                                 | Engine is running.  Engine speed is above 3,600 rpm.  | BATTERY VOLTAGE<br>(11 - 14V)               |  |
| 108                  | В    | ECCS ground                                | Engine is running.  Idle speed  | Engine ground                               |  |
| 110                  | G/B  | EVAP canister purge vol-                   | Engine is running.  | BATTERY VOLTAGE                             |  |
| 118                  | L/R  | ume control valve                          | L Idle speed  | (11 - 14V)                                  |  |
| 114                  | LY   | EVAP canister purge control solenoid valve | Engine is running.  Idle speed  | BATTERY VOLTAGE<br>(11 - 14V)               |  |
| 116                  | В    | ECCS ground                                | Engine is running.  Idle speed  | Engine ground                               |  |
| 119                  | LY   | Front heated oxygen sen-                   | Engine is running.  Engine speed is below 3,600 rpm (A/T models) or 4,000 rpm (M/T models). | 0 - 0.5V                                    |  |
| 119                  |      | sor heater (right bank)                    | Engine is running.  Engine speed is above 3,600 rpm (A/T models) or 4,000 rpm (M/T models). | BATTERY VOLTAGE<br>(11 - 14V)               |  |
| 120                  | OR/G | Vacuum cut valve bypass valve              | [Ignition switch "ON"]  | BATTERY VOLTAGE<br>(11 - 14V)               |  |
| 101                  |      | Front heated oxygen sen-                   | Engine is running.  Engine speed is below 3,600 rpm (A/T models) or 4,000 rpm (M/T models). | 0 - 0.5V                                    |  |
| 121                  | L    | sor heater (left bank)                     | Engine is running.  Engine speed is above 3,600 rpm (A/T models) or 4,000 rpm (M/T models). | BATTERY VOLTAGE<br>(11 - 14V)               |  |
| 124                  | В    | ECCS ground                                | Engine is running.  Lidle speed   | Engine ground                               |  |

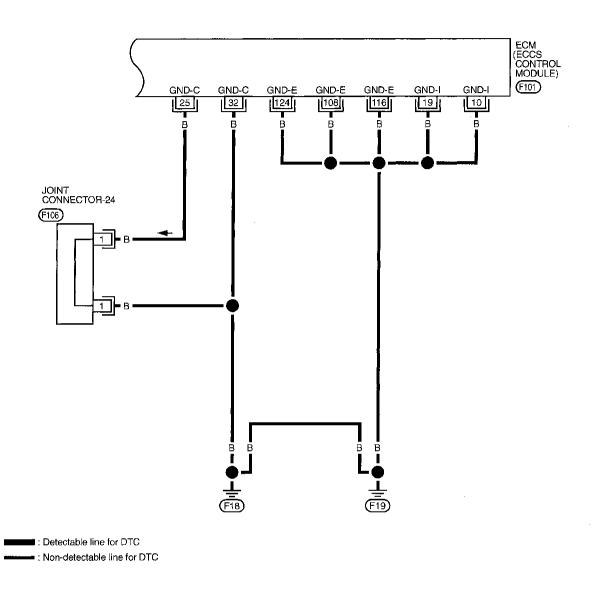
# Main Power Supply and Ground Circuit

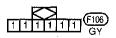
# EC-MAIN-01

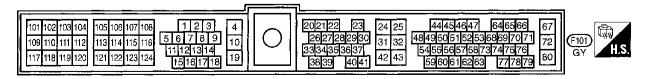


# Main Power Supply and Ground Circuit (Cont'd)

EC-MAIN-02







# TROUBLE DIAGNOSIS FOR POWER SUPPLY

# Main Power Supply and Ground Circuit (Cont'd)

# **CONSULT REFERENCE VALUE IN DATA MONITOR MODE**

Remarks: Specification data are reference values.

19

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116

124

В

В

В

В

В

В

ECCS ground

ECCS ground

ECCS ground

**ECCS** ground

ECCS ground

ECCS ground

| MONIT  | OR ITEM       |                           | SPECIFICATION  |                                   |
|--|---------------|---------------------------|--|-----------------------------------|
| ATTERY VOLT • Ignition switch: ON (Engine stopped) |               | stopped) 1                | 1 - 14V  |                                   |
|  |               | ALS AND REFEREN           | CE VALUE s, and are measured between each terminal and   | ② (ECCS ground) with a voltmeter. |
| TER-<br>VIINAL<br>NO.                              | WIRE<br>COLOR | ITEM                      | CONDITION  | DATA<br>(DC voltage)              |
| 4  | W/B           | ECCS relay (Self-shutoff) | Engine is running.  Ignition switch "OFF"  For a few seconds after turning ignition switch "OFF" | witch 0 - 1V                      |
|  |               |                           | Ignition switch "OFF"  A few seconds passed after turning ignition switch "OFF"                  | BATTERY VOLTAGE (11 - 14V)        |
|  |               |                           | [Ignition switch "OFF"]  | 0V                                |
| 24   | R             | Ignition switch           | Ignition switch "ON"   | BATTERY VOLTAGE<br>(11 - 14V)     |
| 67<br>72   | R<br>R        | Power supply for ECM      | Ignition switch "ON"   | BATTERY VOLTAGE<br>(11 - 14V)     |
| 80   | w             | Power supply (Back-up)    | Ignition switch "OFF"  | BATTERY VOLTAGE<br>(11 - 14V)     |
| 10   | В             | ECCS ground               | Engine is running.  Idle speed   | Engine ground                     |

Engine is running.

- Idle speed Engine is running.

 Idle speed Engine is running.

- Idle speed Engine is running.

 Idle speed Engine is running.

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Engine is running.

- Idle speed

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Engine ground

Engine ground

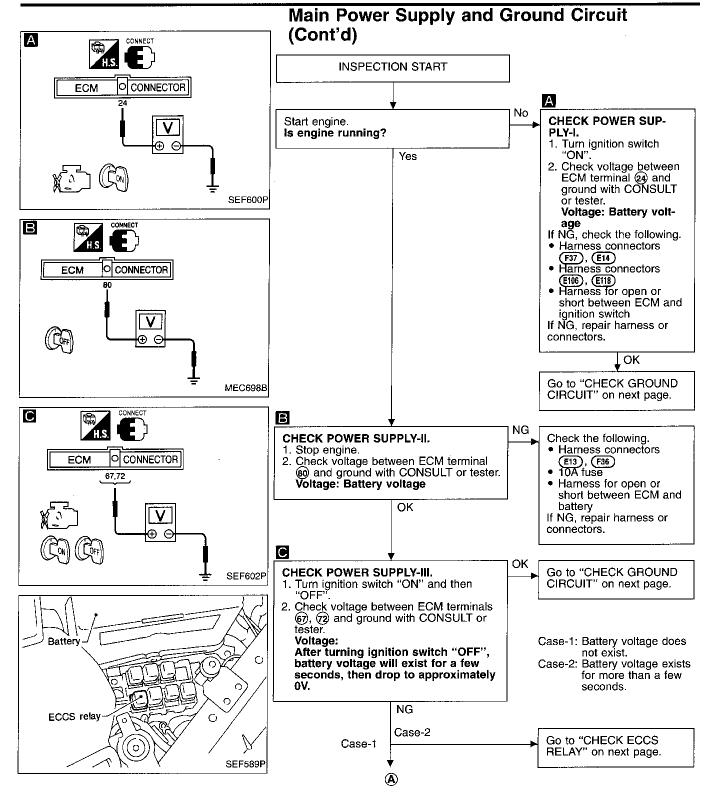
Engine ground

Engine ground

Engine ground

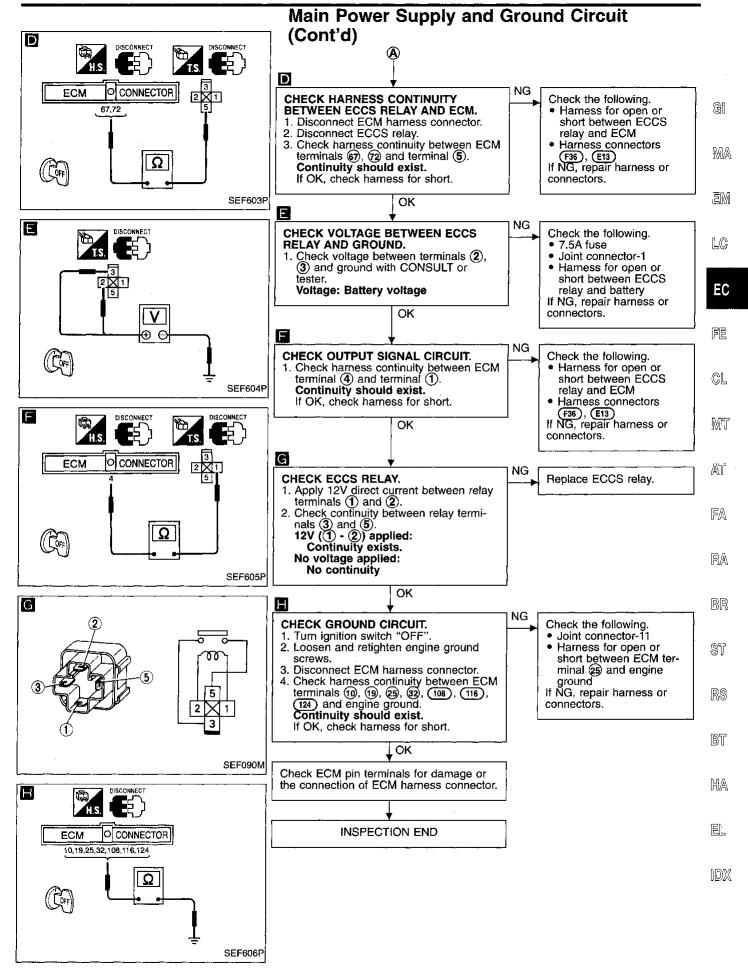
Engine ground

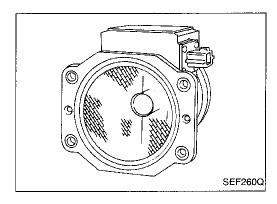
## TROUBLE DIAGNOSIS FOR POWER SUPPLY



EC-102 270

## TROUBLE DIAGNOSIS FOR POWER SUPPLY





# Mass Air Flow Sensor (MAFS)

#### COMPONENT DESCRIPTION

The mass air flow sensor is placed in the stream of intake air. It measures the intake flow rate by measuring a part of the entire intake flow. It consists of a hot film that is supplied with electric current from the ECM. The temperature of the hot film is controlled by the ECM a certain amount. The heat generated by the hot wire is reduced as the intake air flows around it. The more air, the greater the heat loss.

Therefore, the ECM must supply more electric current to the hot film as air flow increases. This maintains the temperature of the hot film. The ECM detects the air flow by means of this current change.

#### **CONSULT REFERENCE VALUE IN DATA MONITOR MODE**

Remarks: Specification data are reference values.

| MONITOR ITEM  | CONE   | NOITION   | SPECIFICATION |
|---------------|--|-----------|---------------|
| MAC AID/FL OF | Engine: After warming up     Air conditioner switch: "OFF" | Idle      | 1.0 - 1.7V    |
| MAS AIR/FL SE | Shift lever: "N"   | 2,500 rpm | 1.5 - 2.1V    |

#### **ECM TERMINALS AND REFERENCE VALUE**

Remarks: Specification data are reference values, and are measured between each terminal and @ (ECCS ground) with a voltmeter.

| TER-<br>MINAL<br>NO. | WIRE<br>COLOR | iTEM                        | CONDITION  | DATA<br>(DC voltage)          |
|----------------------|---------------|-----------------------------|--|-------------------------------|
| F.4                  | 101           | k.A. a. i. flavo            | Engine is running. (Warm-up condition)  Idle speed   | 1.0 - 1.7V                    |
| 54                   | W             | Mass air flow sensor        | Engine is running. (Warm-up condition)  Engine speed is 2,500 rpm.                               | 1.5 - 2.1V                    |
| 55                   | В             | Mass air flow sensor ground | Engine is running. (Warm-up condition)  Idle speed   | Approximately 0V              |
| 4                    | W/B           | ECCS relay (Self-shutoff)   | Engine is running.  Ignition switch "OFF"  For a few seconds after turning ignition switch "OFF" | 0 - 1V                        |
|                      |               |                             | Ignition switch "OFF"  A few seconds passed after turning ignition switch "OFF"                  | BATTERY VOLTAGE<br>(11 - 14V) |
| 67<br>72             | R<br>R        | Power supply for ECM        | Ignition switch "ON"   | BATTERY VOLTAGE<br>(11 - 14V) |

**EC-104** 272

# Mass Air Flow Sensor (MAFS) (Cont'd)

#### **FAIL-SAFE MODE**

When the ECM enters the fail-safe mode, the MIL illuminates.

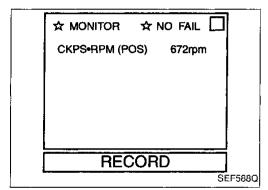
| DTC No.        |       |                                   |   | •  |
|----------------|-------|-----------------------------------|---|----|
| CONSULT<br>GST | ECM*1 | Detected items                    | Engine operating condition in fail-safe mode                        | Gl |
| P0100          | 0102  | Mass air flow sensor cir-<br>cuit | Engine speed will not rise more than 2,400 rpm due to the fuel cut. | MA |

<sup>\*1:</sup> In Diagnostic Test Mode II (Self-diagnostic results), these numbers are controlled by NISSAN.

#### ON BOARD DIAGNOSIS LOGIC

| Diagnostic<br>Trouble<br>Code No. | Malfunction is detected when  | Check Items<br>(Possible Cause)                                    | LC |
|-----------------------------------|---|--|----|
| P0100<br>0102                     | A) An excessively high or low voltage from the sensor is entered to ECM.*   | Harness or connectors     (The sensor circuit is open or shorted.) | EC |
|                                   | B)C) Voltage sent to ECM is not practical when compared with the crankshaft position sensor (POS) and throttle position sensor signals. | Mass air flow sensor   | FE |

<sup>\*:</sup> When this malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.



## DIAGNOSTIC TROUBLE CODE CONFIRMATION **PROCEDURE**

Perform "Procedure for malfunction A" first. If the DTC cannot be confirmed, perform "Procedure for malfunction B". If there is no problem on "Procedure for malfunction B", perform "Procedure for malfunction C", "OVERALL FUNCTION CHECK".

#### Procedure for malfunction A



- Turn ignition switch "ON", and wait at least 6 seconds. Select "DATA MONITOR" mode with CONSULT.
- 3) Start engine and wait at least 3 seconds. · OR -



NO TOOLS

- Turn ignition switch "ON", and wait at least 6 seconds. 1)
- Start engine and wait at least 3 seconds. 2)
- Select "MODE 7" with GST.





- 1) Turn ignition switch "ON", and wait at least 6 seconds.
- Start engine and wait at least 3 seconds.
- Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 4) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.



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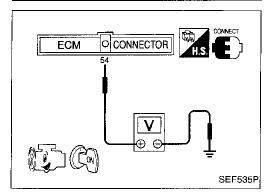
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# Mass air flow Engine speed sensor voltage 얼 38 26 X0.1V 48 32 16 X100rpm CMPS•RPM(REF) MAS\_AIR/FL SE 충 48 32 16 X100rpm 38 26 X0.1V 13 0 CMPS•RPM(REF) MAS AIR/FL

#### CALC LOAD 20% COOLANT TEMP 95°C SHORT FT #1 2% 0% LONG FT #1 SHORT FT #2 4% LONG FT #2 0% 2637RPM **ENGINE SPD** 0MPH VEHICLE SPD **IGN ADVANCE** 41.0° **INTAKE AIR** 41°C 14.1gm/sec THROTTLE POS SEF534P



# Mass Air Flow Sensor (MAFS) (Cont'd)

### Procedure for malfunction B



- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT.
- 3) Start engine and warm it up sufficiently.
- 4) Wait at least 10 seconds at idle speed.

# OR



- Turn ignition switch "ON".
- 2) Start engine and warm it up sufficiently.
- 3) Wait at least 10 seconds at idle speed.
- 4) Select "MODE 7" with GST.

#### - OR -



- 1) Turn ignition switch "ON".
- Start engine and warm it up sufficiently.
- 3) Wait at least 10 seconds at idle speed.
- 4) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 5) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

#### **OVERALL FUNCTION CHECK**

This procedure can be used for checking the overall function of the mass air flow sensor circuit. During this check, a DTC might not be confirmed.

#### Procedure for malfunction C



SEF945S

- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT.
- Start engine and warm it up sufficiently.
- 4) Check the voltage of mass air flow sensor with "DATA MONITOR".
- 5) Check for linear voltage rise in response to increases to about 4,000 rpm in engine speed.

#### OR ·



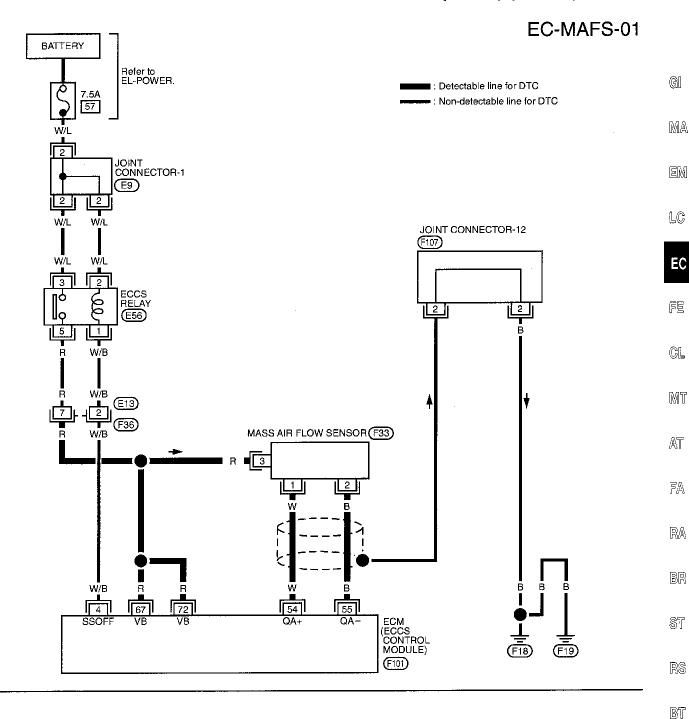
- 1) Turn ignition switch "ON".
- 2) Start engine and warm it up sufficiently.
- 3) Select "MODE 1" with GST.
- 4) Check the mass air flow with "MODE 1".
- 5) Check for linear mass air flow rise in response to increases to about 4,000 rpm in engine speed.

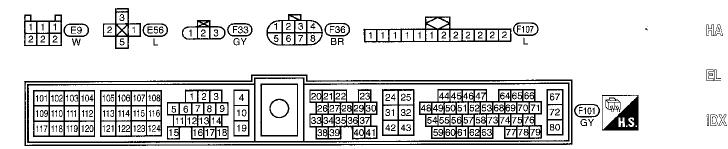


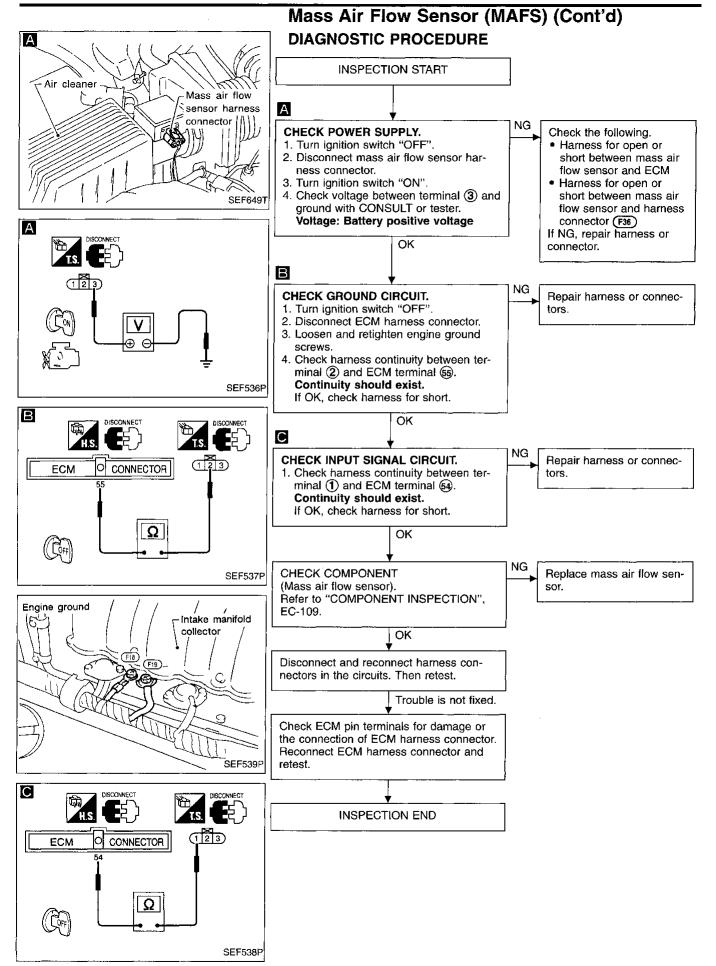


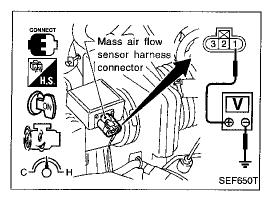
- 1) Turn ignition switch "ON".
- 2) Start engine and warm it up sufficiently.
- 3) Check the voltage between ECM terminal 64 and ground.
- 4) Check for linear voltage rise in response to increases to about 4,000 rpm in engine speed.

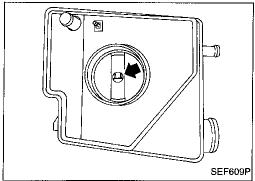
# Mass Air Flow Sensor (MAFS) (Cont'd)











# Mass Air Flow Sensor (MAFS) (Cont'd) COMPONENT INSPECTION

### Mass air flow sensor

- 1. Turn ignition switch "ON".
- 2. Start engine and warm it up sufficiently.
- 3. Check voltage between terminal 1 and ground.

| Conditions                               | Voltage V                |
|--|--------------------------|
| Ignition switch "ON" (Engine stopped.)   | Less than 1.0            |
| Idle (Engine is warmed-up sufficiently.) | 1.0 - 1.7                |
| 2,500 rpm                                | 1.5 - 2.1                |
| Idle to about 4,000 rpm*                 | 1.0 - 1.7 to Approx. 4.0 |

\*: Check for linear voltage rise in response to increase to about 4,000 rpm in engine speed.

\_

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4. If NG, remove mass air flow sensor from air duct. Check hot film for damage or dust.

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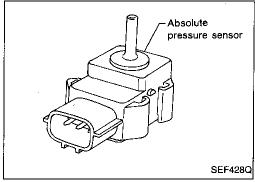
RS

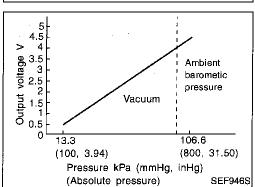
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# **Absolute Pressure Sensor**

#### **COMPONENT DESCRIPTION**

The absolute pressure sensor is connected to the MAP/BARO switch solenoid valve with a duct. The sensor detects ambient barometric pressure and intake manifold pressure respectively, and modifies the voltage signal received from the ECM. The modified signal will then be returned to the ECM. As the pressure increases, the voltage rises. The absolute pressure sensor is not directly used to control the engine system. It is used only for on board diagnosis.

### **CONSULT REFERENCE VALUE IN DATA MONITOR MODE**

Remarks: Specification data are reference values.

| MONITOR ITEM  | MONITOR ITEM CONDITION   |                       | SPECIFICATION |
|---------------|--------------------------|-----------------------|---------------|
| ABSOL PRES/SE | Engine: After warming up | Engine is not running | Approx. 4.4V  |
|               |                          | Idle                  | Approx. 1.2V  |

#### **ECM TERMINALS AND REFERENCE VALUE**

Remarks: Specification data are reference values, and are measured between each terminal and (a) (ECCS ground) with a voltmeter.

| TER-<br>MINAL<br>NO. | WIRE<br>COLOR | ITEM                     | CONDITION   | DATA<br>(DC voltage) |
|----------------------|---------------|--------------------------|---|----------------------|
|                      |               |                          | Ignition switch "ON"  Engine is not running.  | Approximately 4.4V   |
| 61                   | W             | Absolute pressure sensor | Engine is running. (Warm-up condition)  Idle speed (within approximately 5 minutes after starting engine) | Approximately 1.2V   |
| 42                   | R             | Sensor's power supply    | [Ignition switch "ON"]  | Approximately 5V     |
| 43                   | В             | Sensor's ground          | Engine is running. (Warm-up condition)  Idle speed  | ov                   |

# Absolute Pressure Sensor (Cont'd)

#### ON BOARD DIAGNOSIS LOGIC

| O803  Sor is entered into ECM.  (Absolute pressure sensor circuit is open or shorted.)  Absolute pressure sensor  Absolute pressure sensor  Absolute pressure sensor  Absolute pressure sensor  Absolute pressure sensor  Absolute pressure sensor  Absolute pressure sensor  (Hoses  (Hoses between the intake manifold and absolute pressure sensor are disconnected or clogged.)  Intake air leaks | Diagnostic Trouble<br>Code No. | Malfunction is detected when | Check Items<br>(Possible Cause)   |          |
|---|--------------------------------|------------------------------|---|----------|
| B) A low voltage from the sensor is entered into ECM under heavy load driving conditions.  C) A high voltage from the sensor is entered into ECM under light load driving conditions.  • Hoses (Hoses between the intake manifold and absolute pressure sensor are disconnected or clogged.)  • Intake air leaks  |                                | , ,                          | (Absolute pressure sensor circuit is open or shorted.)  | (0<br>Dr |
| C) A high voltage from the sensor is entered into     ECM under light load driving conditions.      (Hoses between the intake manifold and absolute pressure sensor are disconnected or clogged.)      Intake air leaks   |                                | 1 .                          | Absolute pressure sensor  | •        |
|   |                                | , ,                          | (Hoses between the intake manifold and absolute pressure sensor are disconnected or clogged.) |          |

## DIAGNOSTIC TROUBLE CODE CONFIRMATION **PROCEDURE**

Perform "Procedure for malfunction A" first. If the DTC cannot be confirmed, perform "OVERALL FUNCTION CHECK", "Procedure for malfunction B". If there is no problem on "Procedure for malfunction B", perform "Procedure for malfunction

## Procedure for malfunction A



- Turn ignition switch "ON".
- Select "DATA MONITOR" mode with CONSULT.

· OR

- OR

3) Wait at least 6 seconds.



- Turn ignition switch "ON" and wait at least 6 seconds.
- Select "MODE 7" with GST.



- 1) Turn ignition switch "ON" and wait at least 6 seconds.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

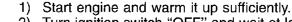
If the DTC cannot be confirmed, perform "Procedure for malfunction B", "OVERALL FUNCTION CHECK" on next page.

#### Procedure for malfunction C



- 1) Start engine and warm it up sufficiently.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
- Start engine and let it idle.
- 5) Wait at least 20 seconds.

#### -- OR -



- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Start engine.
- 4) Let engine idle and wait at least 20 seconds.
- 5) Select "MODE 7" with GST.

#### - OR -



- 1) Start engine and warm it up sufficiently.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- Start engine.
- 4) Let engine idle and wait at least 20 seconds.
- 5) Turn ignition switch "OFF".
- 6) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

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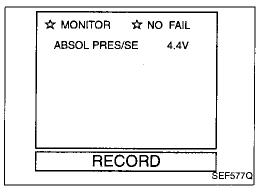
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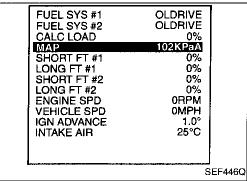
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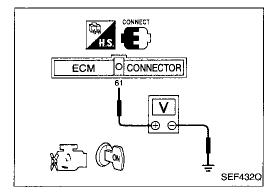
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# Absolute Pressure Sensor (Cont'd) OVERALL FUNCTION CHECK

Use this procedure to check the overall function of absolute pressure sensor circuit. During this check, a 1st trip DTC might not be confirmed.

#### Procedure for malfunction B



- Turn ignition switch "ON".
- 2) Select "ABSOL PRES/SE" in "DATA MONITOR" mode with CONSULT.
- 3) Make sure that the voltage of "ABSOL PRES/SE" is more than 1.74 [V].

- OR



- 1) Turn ignition switch "ON".
- 2) Select "MAP" in "MODE 1" with GST.
- 3) Make sure that the pressure of "MAP" is more than 46 kPa (0.47 kg/cm<sup>2</sup>, 6.7 psi).

OR

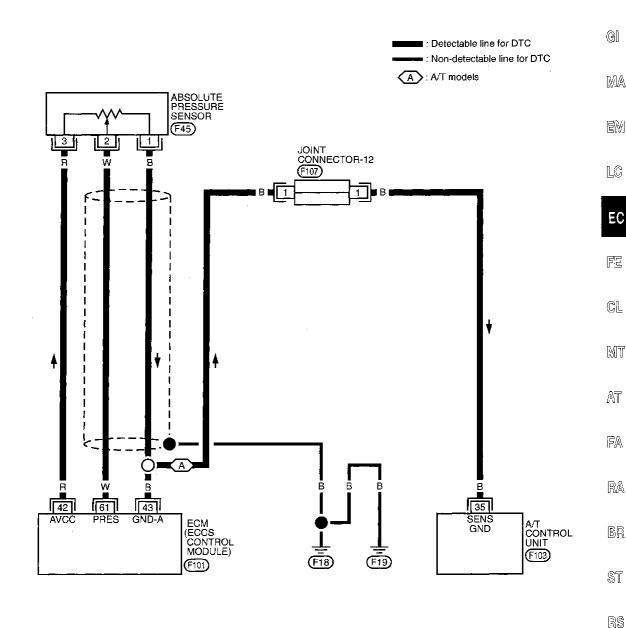


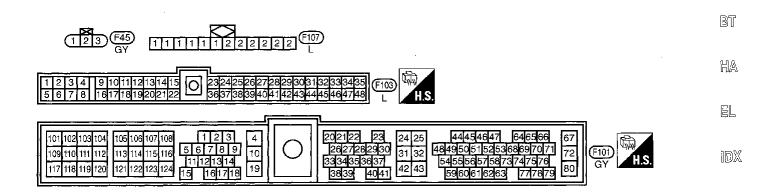
- Turn ignition switch "ON".
- 2) Make sure that the voltage between ECM terminal (5) and ground is more than 1.74 [V].

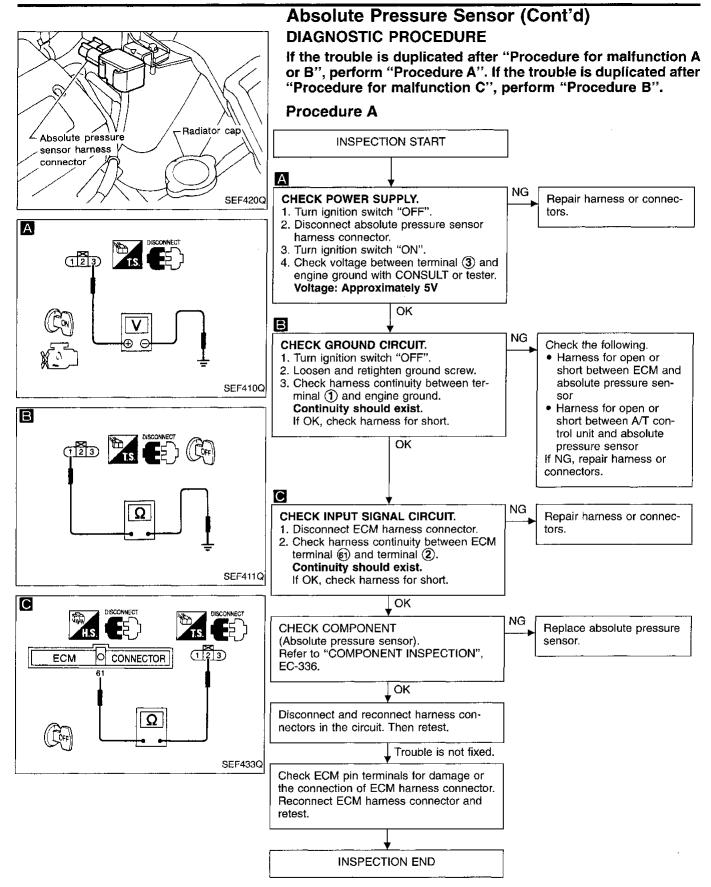
If the DTC cannot be confirmed, perform "Procedure for malfunction C" on the previous page.

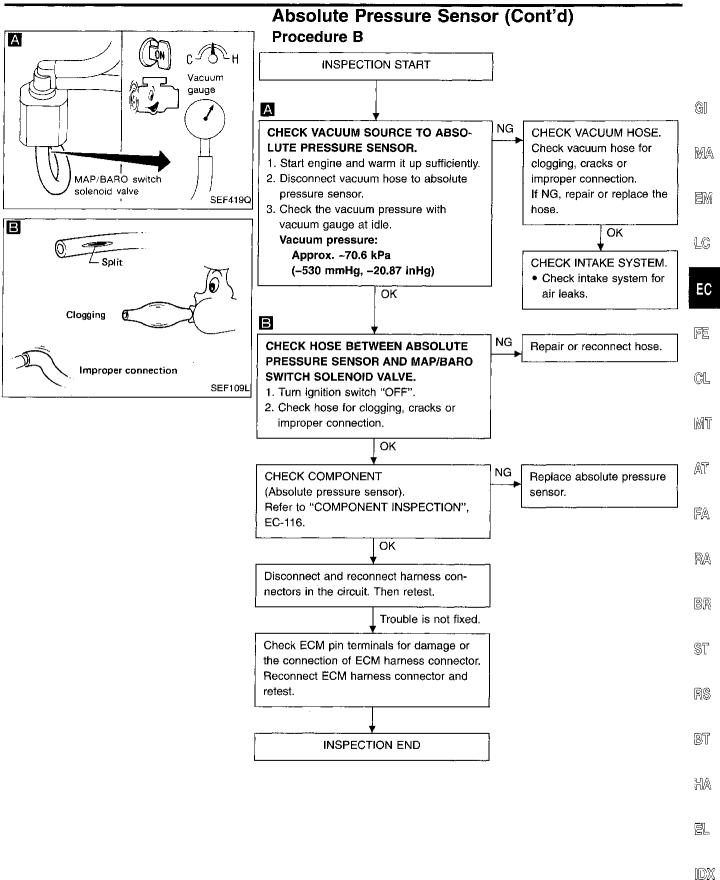
# Absolute Pressure Sensor (Cont'd)

# EC-AP/SEN-01

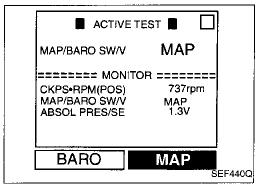


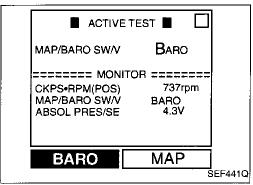


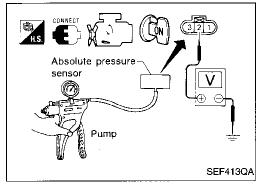


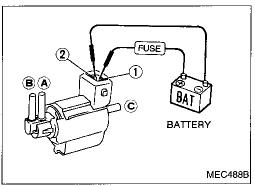


EC-115 283









# Absolute Pressure Sensor (Cont'd) COMPONENT INSPECTION

#### Absolute pressure sensor



- 1. Start engine and warm it up sufficiently.
- 2. Perform "MAP/BARO SW/V" in "ACTIVE TEST" mode with CONSULT.
- 3. Make sure of the following.
  - When selecting "MAP", "ABSOL PRES/SE" indicates approximately 1.3V.
  - When selecting "BARO", "ABSOL PRES/SE" indicates approximately 4.3V.
- 4. If NG, check "Absolute pressure sensor" below.

- OR -



- 1. Remove absolute pressure sensor from bracket with its harness connector connected.
- 2. Remove hose from absolute pressure sensor.
- 3. Apply vacuum and pressure to absolute pressure sensor as shown in figure.
- 4. Check output voltage between terminal (2) and engine ground.

| Pressure (Absolute pressure)     | Voltage (V)       |
|----------------------------------|-------------------|
| 106.6 kPa (800 mmHg, 31.50 inHg) | Approximately 4.6 |
| 13.3 kPa (100 mmHg, 3.94 inHg)   | Approximately 0.5 |

#### **CAUTION:**

#### Always calibrate the vacuum pump gauge when using it.

5. If NG, replace absolute pressure sensor. If OK, check MAP/BARO switch solenoid valve below.

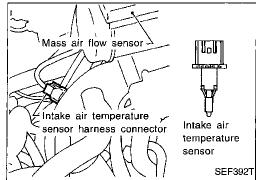
#### MAP/BARO switch solenoid valve

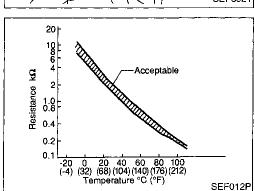
- 1. Remove MAP/BARO switch solenoid valve.
- 2. Check air passage continuity.

| Condition   | Air passage<br>continuity<br>between (A) and (B) | Air passage<br>continuity<br>between (A) and (C) |
|---|--|--|
| 12V direct current supply between terminals ① and ② | Yes  | No   |
| No supply   | No   | Yes  |

3. If NG, check "Absolute pressure sensor" above.

EC-116 284





# **Intake Air Temperature Sensor**

#### **COMPONENT DESCRIPTION**

The intake air temperature sensor is mounted to the air duct, detects intake air temperature and transmits a signal to the ECM. The temperature sensing unit uses a thermistor, which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.

This sensor is not directly used to control the engine system. It is used only for the on board diagnosis.

#### (Reference data)

| • | Intake air temperature<br>°C (°F) | Voltage*<br>(V) | Resistance (k $\Omega$ ) |
|---|-----------------------------------|-----------------|--------------------------|
|   | -10 (14)                          | 4.4             | 7.0 - 11.4               |
|   | 20 (68)                           | 3.5             | 2.1 - 2.9                |
|   | 80 (176)                          | 1.23            | 0.27 - 0.38              |

<sup>\*:</sup> These data are reference values and are measured between ECM terminal (38) (Intake air temperature sensor) and ECM terminal (49) (Sensor's ground).

## **ECM TERMINALS AND REFERENCE VALUE**

Remarks: Specification data are reference values, and are measured between each terminal and (25) (ECCS ground) with a voltmeter.

| TER-<br>MINAL<br>NO. | WIRE<br>COLOR | ITEM                             | CONDITION   | DATA<br>(DC voltage)  |
|----------------------|---------------|----------------------------------|---|---|
| 58                   | SB            | Intake air temperature<br>sensor | Engine is running.                                  | Approximately 0 - 4.8V<br>Output voltage varies with<br>intake air temperature. |
| 43                   | В             | Sensor's ground                  | Engine is running. (Warm-up condition) L Idle speed | ov  |

#### ON BOARD DIAGNOSIS LOGIC

| Diagnostic<br>Trouble Code<br>No. | Malfunction is detected when  | Check Items<br>(Possible Cause)                                    | Sī         |
|-----------------------------------|---|--|------------|
| P0110<br>0401                     | A) An excessively low or high voltage from the sensor is entered to ECM.                            | Harness or connectors     (The sensor circuit is open or shorted.) | RS         |
|                                   | B) Rationally incorrect voltage from the sensor is entered to ECM, compared with the voltage signal | Intake air temperature sensor                                      | BT         |
|                                   | from engine coolant temperature sensor.   |  | H <i>/</i> |

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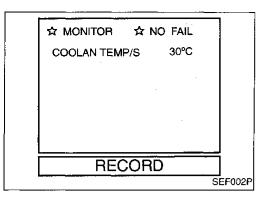
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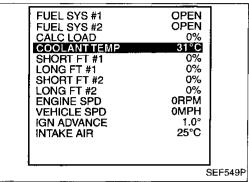
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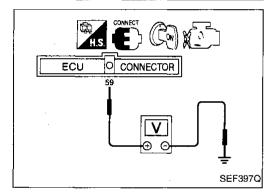
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# Intake Air Temperature Sensor (Cont'd) DIAGNOSTIC TROUBLE CODE CONFIRMATION **PROCEDURE**

#### Procedure for malfunction A



- 1) Turn ignition switch "ON".
- Select "DATA MONITOR" mode with CONSULT.
- 3) Wait at least 5 seconds. - OR -

- 1) Turn ignition switch "ON" and wait at least 5 seconds.
- Select MODE 7 with GST.

OR



- 1) Turn ignition switch "ON" and wait at least 5 seconds.
- 2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

#### Procedure for malfunction B



- 1) Lift up vehicle and open engine hood.
- 2) Wait until engine coolant temperature is less than 90°C (194°F).
  - (a) Turn ignition switch "ON".
  - (b) Select "DATA MONITOR" mode with CONSULT.
  - (c) Check the engine coolant temperature.
  - (d) If the engine coolant temperature is not less than 90°C (194°F), turn ignition switch "OFF" and cool down engine.
- Perform the following steps before engine coolant temperature is above 90°C (194°F).
- 3) Turn ignition switch "ON".
- Select "DATA MONITOR" mode with CONSULT.
- Start engine.
- 6) Shift selector lever to "D" position.
- 7) Hold vehicle speed at 70 to 80 km/h (43 to 50 MPH) for 2 minutes.

- OR -



- 1) Lift up vehicle and open engine hood.
- 2) Wait until engine coolant temperature is less than 90°C (194°F).
  - (a) Turn ignition switch "ON".
  - (b) Select MODE 1 with GST.
  - (c) Check the engine coolant temperature.
  - (d) If the engine coolant temperature is not less than 90°C (194°F), turn ignition switch "OFF" and cool down engine.
- · Perform the following steps before engine coolant temperature is above 90°C (194°F).
- 3) Start engine.
- 4) Shift selector lever to "D" position.
- 5) Hold vehicle speed at 70 to 80 km/h (43 to 50 MPH) for 2 minutes.
- 6) Select MODE 7 with GST.

- OR ·



- 1) Lift up vehicle and open engine hood.
- 2) Wait until engine coolant temperature is less than 90°C (194°F).
  - (a) Turn ignition switch "ON".
  - (b) Check voltage between ECM terminal 59 and ground. Voltage: More than 1.2 (V)
  - (c) If the voltage is not more than 1.2 (V), turn ignition switch "OFF" and cool down engine.

# Intake Air Temperature Sensor (Cont'd)

- · Perform the following steps before the voltage is below 1.2V.
- 3) Start engine.
- 4) Shift selector lever to "D" position.5) Hold vehicle speed at 70 to 80 km/h (43 to 50 MPH) for

- 6) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 7) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

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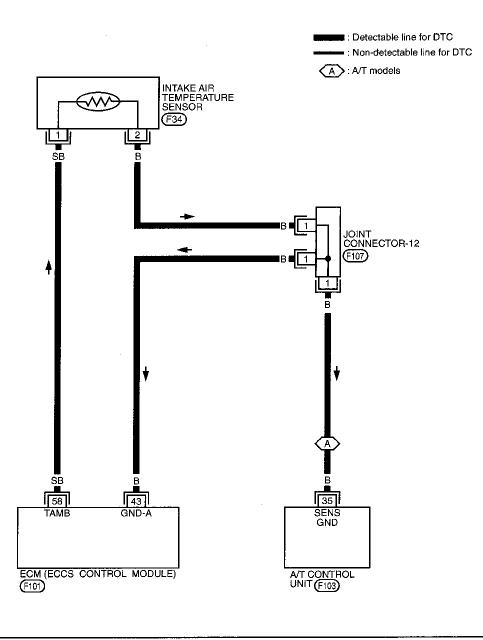
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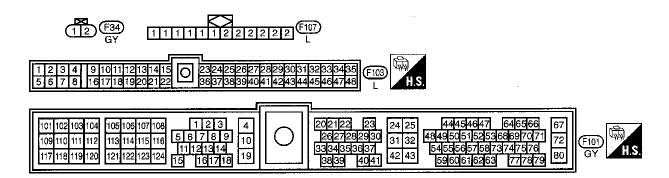
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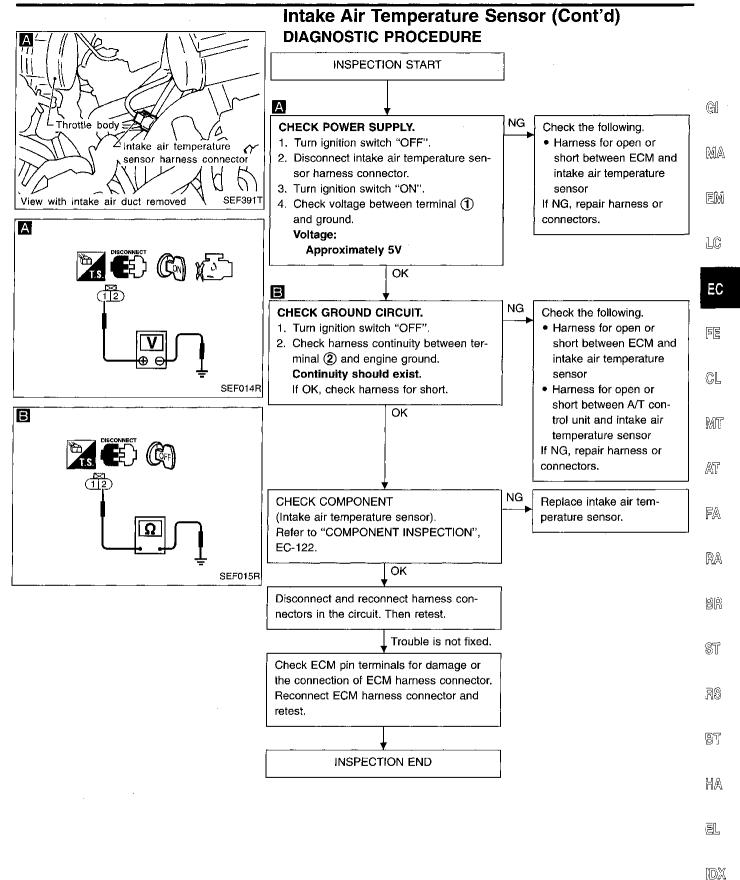
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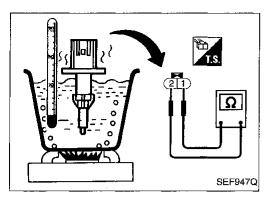
# **Intake Air Temperature Sensor (Cont'd)**

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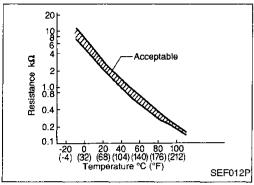




## Intake Air Temperature Sensor (Cont'd) COMPONENT INSPECTION

### Intake air temperature sensor

Check resistance as shown in the figure.

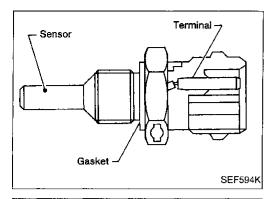


### (Reference data)

| Intake air temperature<br>°C (°F) | Resistance kΩ |
|-----------------------------------|---------------|
| 20 (68)                           | 2.1 - 2.9     |
| 80 (176)                          | 0.27 - 0.38   |

If NG, replace intake air temperature sensor.

**EC-122** 290

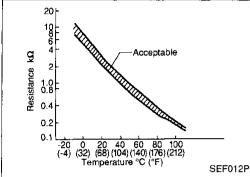


## Engine Coolant Temperature Sensor (ECTS) COMPONENT DESCRIPTION

The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.



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#### (Reference data)

| Engine coolant tempera-<br>ture<br>°C (°F) | Voltage*<br>(V) | Resistance<br>(kΩ) |
|--|-----------------|--------------------|
| -10 (14)                                   | 4.4             | 9.2                |
| 20 (68)                                    | 3.5             | 2.5                |
| 50 (122)                                   | 2.2             | 0.84               |
| 90 (194)                                   | 1.0             | 0.25               |

\*: These data are reference values and are measured between ECM terminal 
(59) (Engine coolant temperature sensor) and ECM terminal (43) (Sensor's ground).

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## CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Remarks: Specification data are reference values.

| MONITOR ITEM  | CONDITION                | SPECIFICATION          |
|---------------|--------------------------|------------------------|
| COOLAN TEMP/S | Engine: After warming up | More than 70°C (158°F) |

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#### ON BOARD DIAGNOSIS LOGIC

| Diagnostic<br>Trouble Code<br>No. | Malfunction is detected when  | Check Items<br>(Possible Cause)  |   |
|-----------------------------------|---|--|---|
| P0115<br>0103                     | An excessively high or low voltage from the sensor is entered to ECM. | Harness or connectors     (The sensor circuit is open or shorted.)     Engine coolant temperature sensor | _ |

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## Engine Coolant Temperature Sensor (ECTS) (Cont'd)

#### **FAIL-SAFE MODE**

When the ECM enters the fail-safe mode, the MIL illuminates.

| C No. |  |   |   |  |
|-------|--|---|---|--|
| ECM*1 | Detected items                                 | Engine operating condition in fail-safe mode  |   |  |
| 0103  | Engine coolant tempera-<br>ture sensor circuit | Engine coolant temperature will be determined by ECM base after turning ignition switch "ON" or "START".  CONSULT displays the engine coolant temperature decided |   |  |
|       |  | Condition   | Engine coolant temperature decided (CONSULT display)  |  |
|       |  | Just as ignition switch is turned ON or Start   | 40°C (104°F)  |  |
|       |  | More than 4 minutes after ignition ON or Start  | 80°C (176°F)  |  |
|       |  | Except as shown above   | 40 - 80°C (104 - 176°F)<br>(Depends on the time)  |  |
|       | ECM*1  | ECM*1 Detected items  0103 Engine coolant tempera-  | Detected items  Engine operating con  Engine coolant temperature will be deafter turning ignition switch "ON" or " CONSULT displays the engine coolar  Condition  Just as ignition switch is turned ON or Start  More than 4 minutes after ignition ON or Start |  |

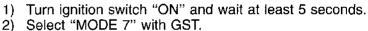
<sup>\*1:</sup> In Diagnostic Test Mode II (Self-diagnostic results), these numbers are controlled by NISSAN.

## DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE



- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT.
- 3) Wait at least 5 seconds.





– OR –

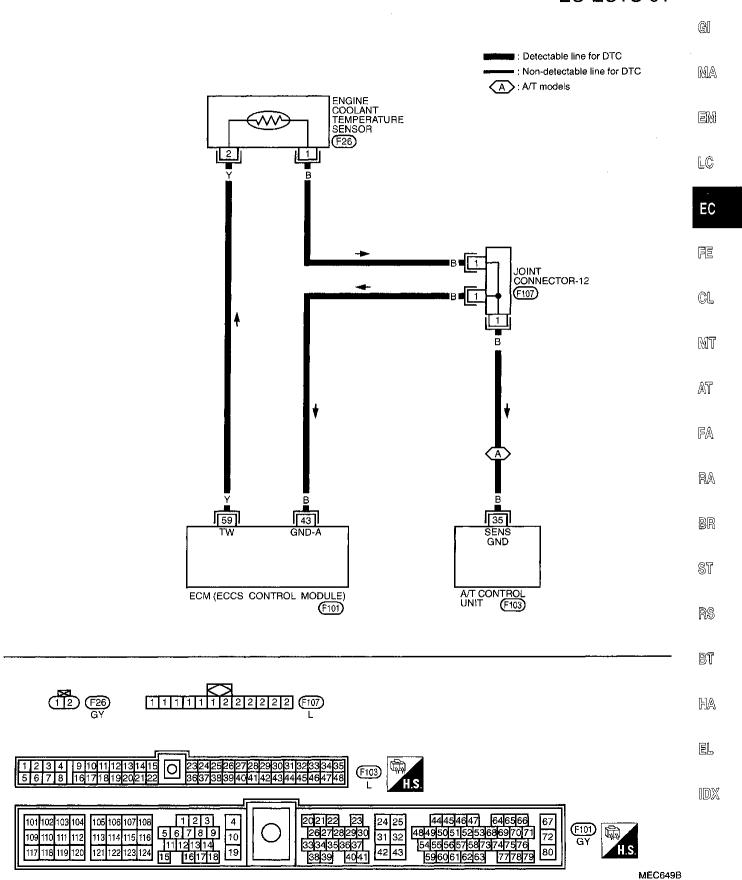


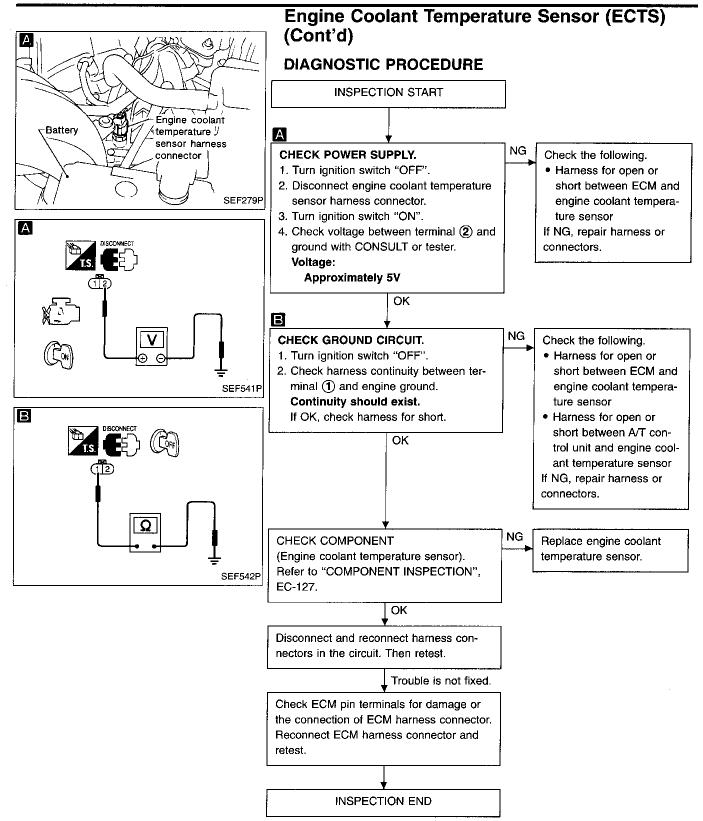
EC-124

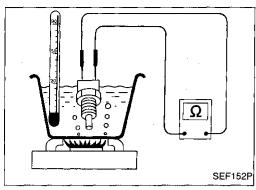
- 1) Turn ignition switch "ON" and wait at least 5 seconds.
- 2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

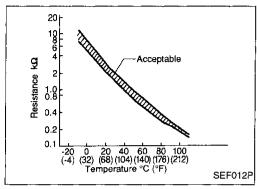
## Engine Coolant Temperature Sensor (ECTS) (Cont'd)

## EC-ECTS-01









## **Engine Coolant Temperature Sensor (ECTS)** (Cont'd)

### **COMPONENT INSPECTION**

### Engine coolant temperature sensor

Check resistance as shown in the figure.

| Temperature °C (°F) | Resistance k $\Omega$ |
|---------------------|-----------------------|
| 20 (68)             | 2.1 - 2.9             |
| 50 (122)            | 0.68 - 1.00           |
| 90 (194)            | 0.236 - 0.260         |

If NG, replace engine coolant temperature sensor.

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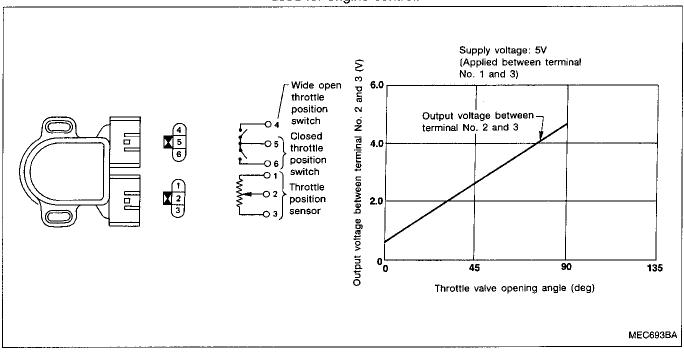
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## Throttle Position Sensor COMPONENT DESCRIPTION

The throttle position sensor responds to the 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.

Idle position of the throttle valve is determined by the ECM receiving the signal from the throttle position sensor. This one controls engine operation such as fuel cut.

On the other hand, the "Wide open and closed throttle position switch", which is built into the throttle position sensor unit, is not used for engine control.



#### CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Remarks: Specification data are reference values.

| MONITOR ITEM  | CONDITION           |                              | SPECIFICATION |
|---------------|---------------------|------------------------------|---------------|
| TUDTI DOG OFN | Ignition switch: ON | Throttle valve: fully closed | 0.35 - 0.65V  |
| THRTL POS SEN | (Engine stopped)    | Throttle valve: fully opened | Approx. 4.0V  |

## Throttle Position Sensor (Cont'd)

## **ECM TERMINALS AND REFERENCE VALUE**

Remarks: Specification data are reference values, and are measured between each terminal and (25) (ECCS ground) with a voltmeter.

| TER-<br>MINAL<br>NO. | WIRE<br>COLOR | ITEM                             | CONDITION  | DATA<br>(DC voltage) |   |
|----------------------|---------------|----------------------------------|--|----------------------|---|
| 00                   | 104           | Thurstille manifest conservation | Ignition switch "ON" (Warm-up condition)  Accelerator pedal released | 0.35 - 0.65V         |   |
| 23                   | W             | Throttle position sensor         | Ignition switch "ON"  Accelerator pedal fully depressed              | Approximately 4V     |   |
| 42                   | R             | Sensor's power supply            | Ignition switch "ON"   | Approximately 5V     | _ |
| 43                   | В             | Sensor's ground                  | Engine is running. (Warm-up condition)  Idle speed                   | ov                   |   |

### ON BOARD DIAGNOSIS LOGIC

| Diagnostic<br>Trouble<br>Code No. | Malfunction is detected when   | Check Items<br>(Possible Cause)   |          |
|-----------------------------------|--|---|----------|
| P0120<br>0403                     | <ul> <li>An excessively low or high voltage from the sensor is entered to ECM.</li> <li>Rationally incorrect voltage is entered to ECM compared with the signals from mass air flow sensor, crankshaft position sensor (POS) and IACV-AAC</li> </ul> | Harness or connectors     (The sensor circuit is open or shorted.)     Throttle position sensor | CL<br>Mi |
|                                   | valve.   |   | AT       |

### **FAIL-SAFE MODE**

When the ECM enters the fail-safe mode, the MIL illuminates.

| CONSULT | ECM*1 | Detected items                   | Engine operating condition in fail-safe mode   |  |
|---------|-------|----------------------------------|--|--|
| P0120   | 0403  | Throttle position sensor circuit | Throttle position will be determined based on the amount of mass air flow and the engine speed.  Therefore, acceleration will be poor. |  |
| 1       |       |                                  |  |  |
|         |       |                                  | Driving condition  |  |
|         |       |                                  | Driving condition  When engine is idling Normal  |  |

<sup>\*1:</sup> In Diagnostic Test Mode II (Self-diagnostic results), these numbers are controlled by NISSAN.

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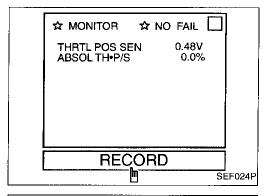
EM

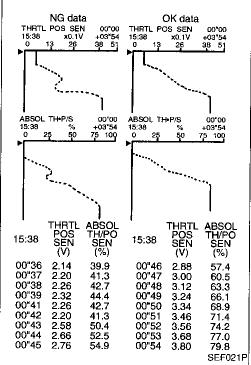
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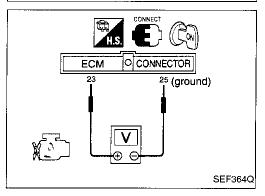
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## Throttle Position Sensor (Cont'd) OVERALL FUNCTION CHECK

This procedure can be used for checking the overall function of the throttle position sensor circuit. During this check, a DTC might not be confirmed.



- 1) Start engine and warm it up sufficiently.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Turn ignition switch "ON".
- 4) Select "MANU TRIG" and "HI SPEED" in "DATA MONITOR" mode with CONSULT.
- 5) Select "THRTL POS SEN" and "ABSOL TH-P/S" in "DATA MONITOR" mode with CONSULT.
- 6) Press RECORD on CONSULT SCREEN at the same time accelerator pedal is depressed.
- 7) Print out the recorded data and make sure the followings:
  - The voltage when accelerator pedal fully released is approximately 0.35 - 0.65V.
  - The voltage rise is linear in response to accelerator pedal depression.
  - The voltage when accelerator pedal fully depressed is approximately 4V.

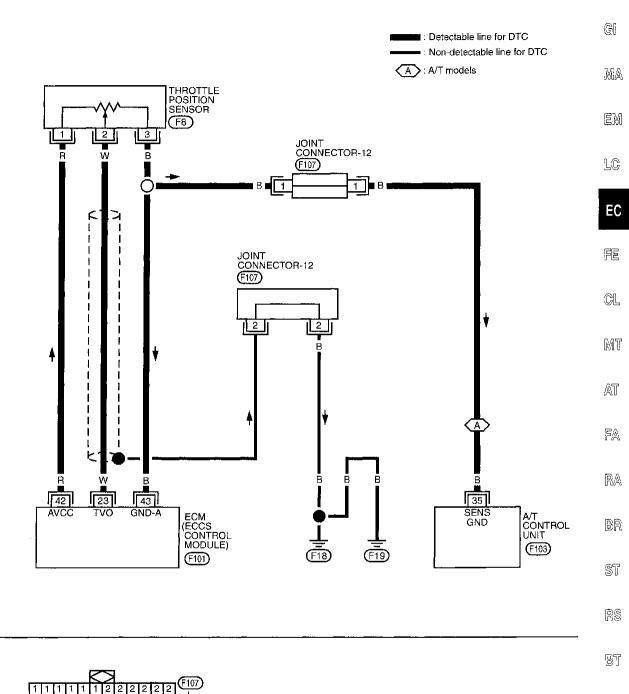


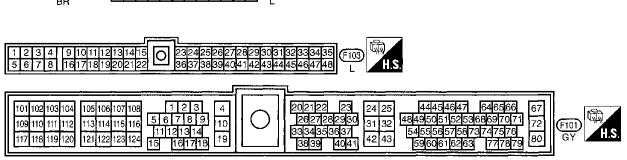
- 1) Start engine and warm it up sufficiently.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- Turn ignition switch "ON".
- 4) Check the voltage between ECM terminal (2) and (2) (ground) and make sure the followings:
  - The voltage when accelerator pedal fully released is approximately 0.35 - 0.65V.
  - The voltage rise is linear in response to accelerator pedal depression.
  - The voltage when accelerator pedal fully depressed is approximately 4V.

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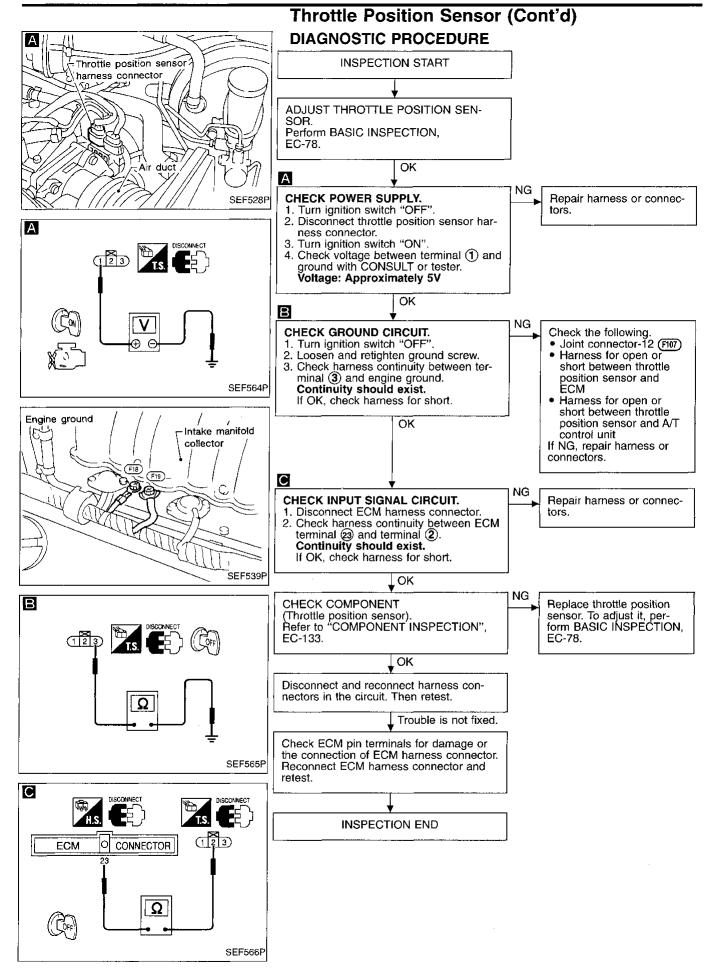
## Throttle Position Sensor (Cont'd)

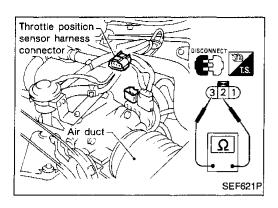
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## Throttle Position Sensor (Cont'd) COMPONENT INSPECTION

### Throttle position sensor

- 1. Start engine and warm it up sufficiently.
- 2. Turn ignition switch "OFF".
- 3. Disconnect throttle position sensor harness connector.
- 4. Make sure that resistance between terminals (2) and (3) changes when opening throttle valve manually.

| Throttle valve conditions | Resistance at 25°C (77°F) |
|---------------------------|---------------------------|
| Completely closed         | Approximately 0.5 kΩ      |
| Partially open            | 0.5 - 4.0 kΩ              |
| Completely open           | Approximately 4.0 kΩ      |

If NG, replace throttle position sensor.

To adjust throttle position sensor, perform "BASIC INSPECTION". (See page EC-78.)

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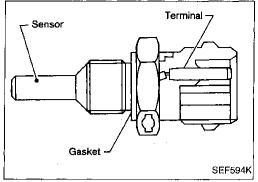
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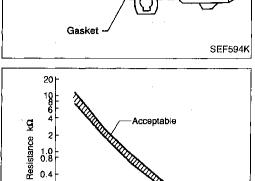
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## Engine Coolant Temperature Sensor (ECTS) COMPONENT DESCRIPTION

The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.

#### (Reference data)

| Engine coolant<br>temperature<br>°C (°F) | Voitage*<br>(V) | Resistance<br>(kΩ) |
|--|-----------------|--------------------|
| -10 (14)                                 | 4.4             | 9.2                |
| 20 (68)                                  | 3.5             | 2.5                |
| 50 (122)                                 | 2.2             | 0.84               |
| 90 (194)                                 | 1.0             | 0.25               |

<sup>\*:</sup> These data are reference values and are measured between ECM terminal (39) (Engine coolant temperature sensor) and ECM terminal (43) (Sensor's ground).

### **CONSULT REFERENCE VALUE IN DATA MONITOR MODE**

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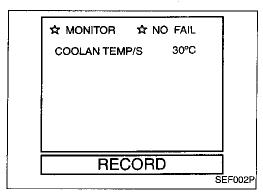
Remarks: Specification data are reference values.

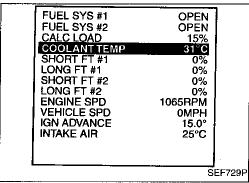
-20 0 20 40 60 80 100 (-4) (32) (68) (104) (140) (176) (212) Temperature °C (°F)

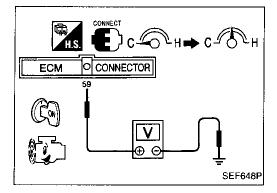
| MONITOR ITEM | CONDITION                | SPECIFICATION          |
|--------------|--------------------------|------------------------|
|              | Engine: After warming up | More than 70°C (158°F) |

#### ON BOARD DIAGNOSIS LOGIC

| Diagnostic<br>Trouble<br>Code No. | Malfunction is detected when  | Check Items<br>(Possible Cause)   |
|-----------------------------------|---|---|
| P0125<br>0908                     | <ul> <li>Voltage sent to ECM from the sensor is not practical, even when some time has passed after starting the engine.</li> <li>Engine coolant temperature is insufficient for closed loop fuel control.</li> </ul> | Harness or connectors     (High resistance in the circuit)     Engine coolant temperature sensor     Thermostat |







## **Engine Coolant Temperature Sensor (ECTS)** (Cont'd)

### **OVERALL FUNCTION CHECK**

This procedure can be used for checking the overall function of the engine coolant temperature sensor circuit. During this check, a 1st trip DTC might not be confirmed.

Note: If both DTC P0115 (0103) and P0125 (0908) are displayed, first perform TROUBLE DIAGNOSIS FOR DTC P0115 (0103). (See EC-123.)

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- 1) Turn ignition switch "ON".
- 2) Select "COOLANT TEMP/S" in "DATA MONITOR" mode with CONSULT.

Start engine and run it at idle speed.

LC Check that the engine coolant temperature rises to

to overheat engine.)

25°C (77°F) or more within 15 minutes. (Be careful not

OR ·

- Turn ignition switch "ON".
- 2) Select "MODE 1" with GST.

3) Start engine and run it at idle speed.

Check that the engine coolant temperature rises to 25°C (77°F) or more, within 15 minutes, (Be careful not to overheat engine.)

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- Turn ignition switch "ON". 1)
- 2) Probe voltage meter between ECM terminal 59 and ground.

- OR -

3) Start engine and run it at idle speed.

Check that voltage of engine coolant temperature changes to less than 3.3 (V) within 15 minutes. (Be careful not to overheat engine.)

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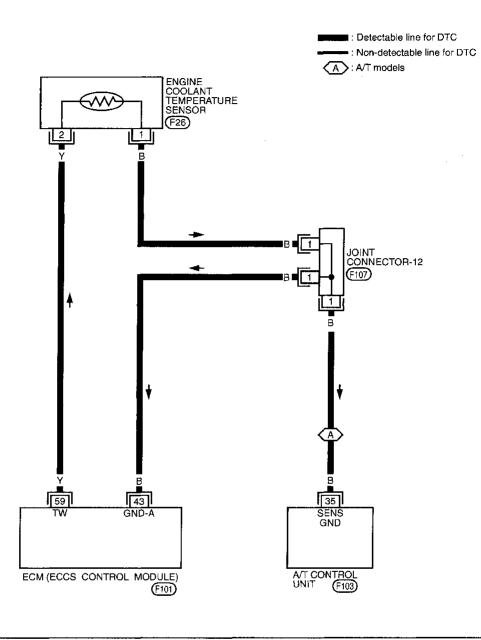
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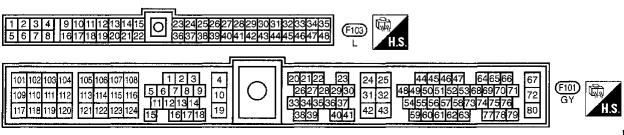
EL

## Engine Coolant Temperature Sensor (ECTS) (Cont'd)

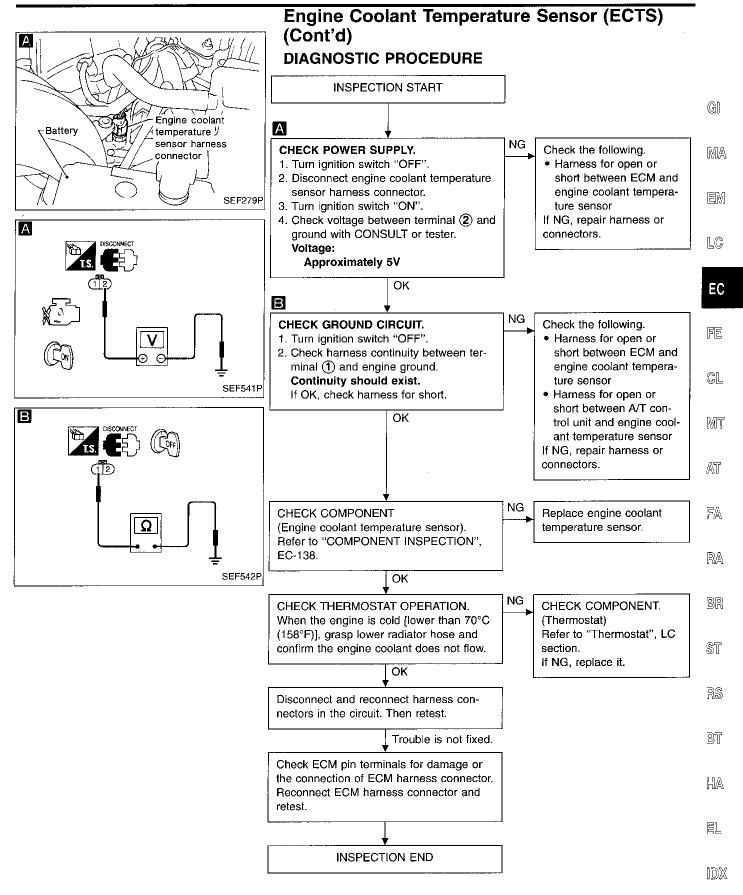
EC-ECTS-01



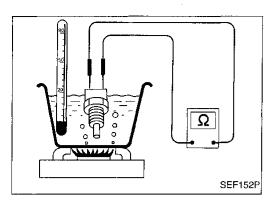




MEC649B



EC-137 305

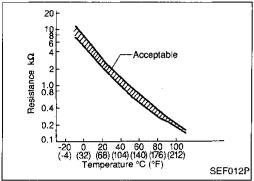


## Engine Coolant Temperature Sensor (ECTS) (Cont'd)

## **COMPONENT INSPECTION**

## Engine coolant temperature sensor

Check resistance as shown in the figure.



## (Reference data)

| Temperature °C (°F) | Resistance       |
|---------------------|------------------|
| 20 (68)             | 2.1 - 2.9 kΩ     |
| 50 (122)            | 0.68 - 1.0 kΩ    |
| 90 (194)            | 0.236 - 0.260 kΩ |

If NG, replace engine coolant temperature sensor.

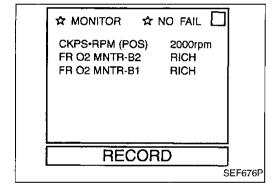
**EC-138** 306

## Closed Loop Control

#### ON BOARD DIAGNOSIS LOGIC

#### ★ The closed loop control has the one trip detection logic.

| P0130 O307  • The closed loop control function for right bank does not operate even when vehicle is driving in the specified condition.  • The closed loop control function for right bank does open or shorted. • Front heated oxygen sensor (right bank) • Front heated oxygen sensor heater (right bank)  • The closed loop control function for left bank does not operate even when vehicle is driving in the specified condition.  • The front heated oxygen sensor (left bank) circuit is open or shorted. • Front heated oxygen sensor (left bank) circuit is open or shorted. • Front heated oxygen sensor (left bank) | Diagnostic<br>Trouble<br>Code No. | Malfunction is detected when                           | Check Items<br>(Possible Cause)                            | Œ1   |
|---|-----------------------------------|--|--|------|
| operate even when vehicle is driving in the specified open or shorted.  |                                   | not operate even when vehicle is driving in the speci- | open or shorted. • Front heated oxygen sensor (right bank) | · MA |
| Front heated oxygen sensor heater (left bank)   |                                   | operate even when vehicle is driving in the specified  | open or shorted. • Front heated oxygen sensor (left bank)  | LC   |



### **OVERALL FUNCTION CHECK**

This procedure can be used for checking the overall function of the closed loop control. During this check, a DTC might not be confirmed.

Start engine and warm it up sufficiently.

2) Select "MANU TRIG" and "HI SPEED" in "DATA MONITOR" mode with CONSULT, and select "FRO2" MNTR-B1(B2)".

3) Hold engine speed at 2,000 rpm under no load during the following steps.

Touch "RECORD" on CONSULT screen.

Make sure of the following.

"FR O2 MNTR-B1(B2)" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" 5 times in 10 seconds.

5 times (cycles) are counted as shown below:

cycle | 1 | 2 | 3 | 4 | 5 | FR O2 MNTR-B1(B2) R-L-R-L-R-L-R-L-R

R = "FR O2 MNTR-B1(B2)", "RICH" L = "FR O2 MNTR-B1(B2)", "LEAN" - OR -

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Start engine and warm it up sufficiently.

Make sure that malfunction indicator lamp goes on more than 5 times within 10 seconds while keeping at 2,000 rpm in Diagnostic Test Mode II (Front heated oxygen sensor monitor).

## TROUBLE DIAGNOSIS FOR DTC P0130, P0150

## Closed Loop Control (Cont'd) DIAGNOSTIC PROCEDURE

### For right bank

Refer to TROUBLE DIAGNOSIS FOR DTC P0130 (0503). (See page EC-141.)

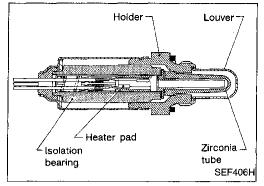
Refer to TROUBLE DIAGNOSIS FOR DTC P0135 (0901). (See page EC-146.)

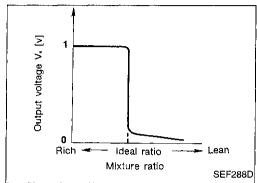
#### For left bank

Refer to TROUBLE DIAGNOSIS FOR DTC P0150 (0303). (See page EC-159.)

Refer to TROUBLE DIAGNOSIS FOR DTC P0155 (1001). (See page EC-165.)

EC-140 308





## Front Heated Oxygen Sensor (Front HO2S) (Right bank)

#### **COMPONENT DESCRIPTION**

The front heated oxygen sensor (right bank) is placed into the front tube (right bank). It detects the amount of oxygen in the exhaust gas compared to the outside air. The front heated oxygen sensor (right bank) has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The front heated oxygen sensor (right bank) signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.

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#### CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Remarks: Specification data are reference values.

| MONITOR ITEM     | CONE                     | DITION                                | SPECIFICATION                                |    |
|------------------|--------------------------|---------------------------------------|--|----|
| FR O2 SEN-B2     |                          |                                       |  | AT |
| FR O2 SEN-B1     |                          |                                       | 0 - 0.3V ↔ Approx. 0.6 - 1.0V                |    |
| FR O2 MNTR-B2    | Engine: After warming up | Maintaining engine speed at 2,000 rpm | LEAN ↔ RICH                                  | FA |
| FR O2 MNTR-B1    |                          |                                       | Changes more than 5 times during 10 seconds. |    |
| I A OZ WINI R-DI |                          |                                       |  | RA |

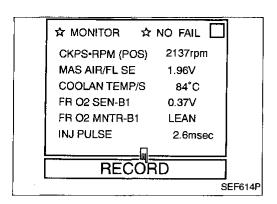
#### ECM TERMINALS AND REFERENCE VALUE

Remarks: Specification data are reference values, and are measured between each terminal and (a) (ECCS ground) with a voltmeter.

| TER-<br>MINAL<br>NO. | WIRE<br>COLOR | ITEM  | CONDITION  | DATA<br>(DC voltage)                            | <b>-</b> |
|----------------------|---------------|---|--|---|----------|
| 50<br>51             | w<br>w        | Front heated oxygen sen-<br>sor (Right bank)<br>Front heated oxygen sen-<br>sor (Left bank) | Engine is running.  After warming up sufficiently and engine speed is 2,000 rpm. | 0 - Approximately 1.0V<br>(periodically change) | _        |

#### ON BOARD DIAGNOSIS LOGIC

| Diagnostic Trouble<br>Code No. | Malfunction is detected when                                    | Check Items<br>(Possible Cause)           | ITUA |
|--------------------------------|---|---|------|
| P0130                          | An excessively high voltage from the sensor is entered to       | Harness or connectors                     | EL   |
| 0503                           | ECM.  | (The sensor circuit is open or shorted.)  |      |
|                                | The voltage from the sensor is constantly approx. 0.3V.         | • Front heated oxygen sensor (right bank) |      |
|                                | • The maximum and minimum voltages from the sensor are not      | Fuel pressure                             | IDX  |
|                                | reached to the specified voltages.                              | Injectors                                 |      |
|                                | • It takes more time for the sensor to respond between rich and | Intake air leaks                          |      |
|                                | lean than the specified time.                                   |   |      |



## Front Heated Oxygen Sensor (Front HO2S) (Right bank) (Cont'd)

#### **OVERALL FUNCTION CHECK**

This procedure can be used for checking the overall function of the front heated oxygen sensor circuit. During this check, a DTC might not be confirmed.

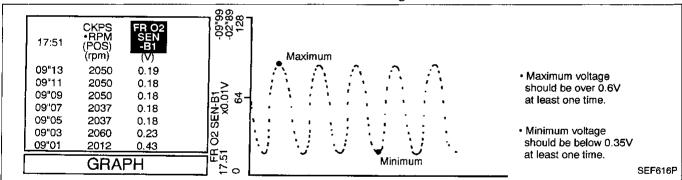


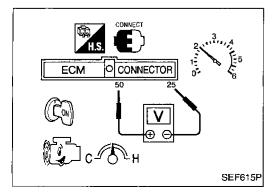
- 1) Start engine and warm it up sufficiently.
- Select "MANU TRIG" and "HI SPEED" in "DATA MONITOR" mode with CONSULT, and select "FR O2 SEN-B1" and "FR O2 MNTR-B1".
- Hold engine speed at 2,000 rpm under no load during the following steps.
- 4) Touch "RECORD" on CONSULT screen.
- 5) Make sure of the following.
- "FR O2 MNTR-B1" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" 5 times in 10 seconds.

5 times (cycles) are counted as shown below:

R = "FR O2 MNTR-B1", "RICH" L = "FR O2 MNTR-B1", "LEAN"

- "FR O2 SEN-B1" voltage goes above 0.6V at least once.
- "FR O2 SEN-B1" voltage goes below 0.35V at least once.
- The voltage never exceeds 1.0V.







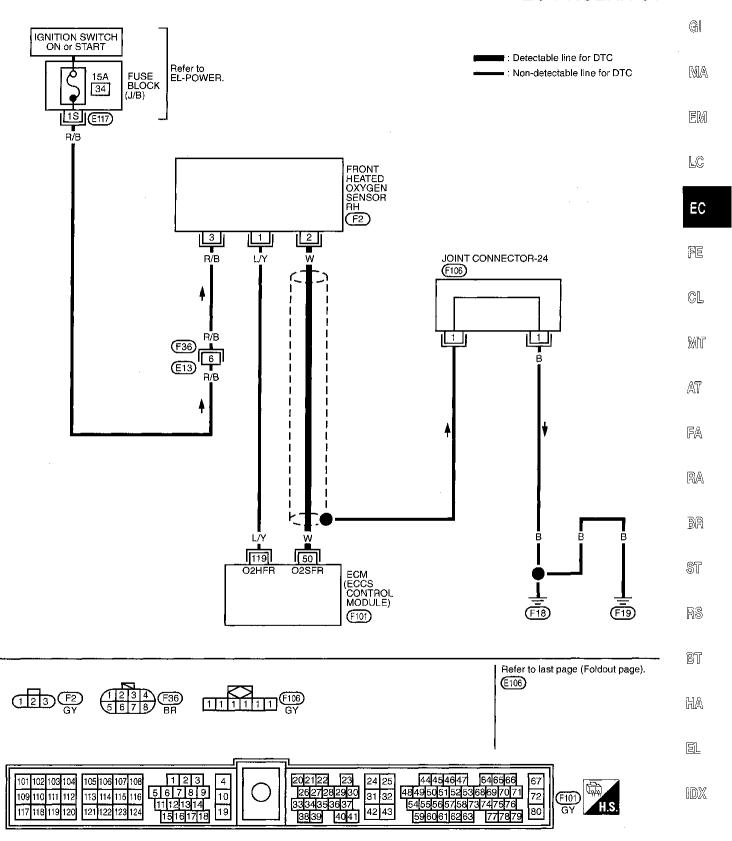
1) Start engine and warm it up sufficiently.

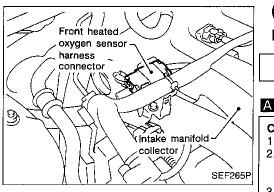
- OR -

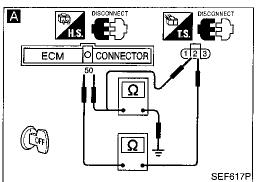
- 2) Set voltmeter probes between ECM terminal (6) (sensor signal) and (25) (engine ground).
- 3) Make sure of the following with engine speed held at 2,000 rpm constant under no load.
- Malfunction indicator lamp goes on more than 5 times within 10 seconds in Diagnostic Test Mode II (FRONT HEATED OXYGEN SENSOR MONITOR).
- The maximum voltage is over 0.6V at least one time.
- The minimum voltage is below 0.35V at least one time.
- The voltage never exceeds 1.0V.

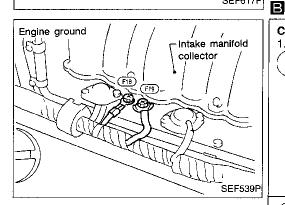
## Front Heated Oxygen Sensor (Front HO2S) (Right bank) (Cont'd)

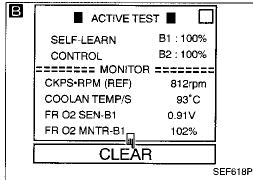
## EC-FRO2RH-01











## Front Heated Oxygen Sensor (Front HO2S) (Right bank) (Cont'd) **DIAGNOSTIC PROCEDURE**

**INSPECTION START** 

#### CHECK INPUT SIGNAL CIRCUIT. 1. Turn ignition switch "OFF"

2. Disconnect front heated oxygen sensor (right bank) harness connector and ECM harness connector.

3. Check harness continuity between ECM terminal 60 and terminal 2. Continuity should exist.

Check harness continuity between ECM terminal (50) (or terminal (2)) and ground. Continuity should not exist.

Loosen and retighten engine ground screws.

**CLEAR THE SELF-LEARNING DATA** 

1. Start engine and warm it up sufficiently.

2. Select "SELF-LEARNING CONT" in "ACTIVE TEST" mode with CONSULT.

3. Clear the self-learning control coefficient by touching "CLEAR".

4. Wait at least 10 minutes at idle speed.

Are the DTCs P0171, P0172 detected? Is it difficult to start engine?

2. Turn ignition switch "OFF".

- 3. Disconnect mass air flow sensor harness connector, and restart and run engine at least 3 seconds at idle speed.
- 4. Stop engine and reconnect mass air flow sensor harness connector.
- 5. Make sure diagnostic trouble code No. 0102 is displayed in Diagnostic Test Mode II.
- 6. Erase the diagnostic test mode II (Self-diagnostic results) memory. Make sure diagnostic trouble code No. 0505 is displayed in Diagnostic Test Mode
- 7. Wait at least 10 minutes at idle speed.

Are the DTCs 0114, 0115 detected? Is it difficult to start engine?

> **↓** No **(A)**

Repair harness or connectors

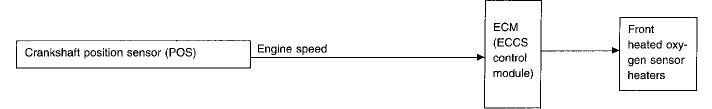
Yes Go to "TROUBLE DIAG-NOSIS FOR DTC P0171, P0172".

(See page EC-174, 169.)



## Front Heated Oxygen Sensor Heater (Right bank)

#### SYSTEM DESCRIPTION



The ECM performs ON/OFF control of the front heated oxygen sensor heaters corresponding to the engine speed.

### **OPERATION**

| Engine speed rpm                               | Front heated oxygen sensor heaters |
|--|------------------------------------|
| Above 3,600 (A/T models) or 4,000 (M/T models) | OFF                                |
| Below 3,600 (A/T models) or 4,000 (M/T models) | ON                                 |

#### CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Remarks: Specification data are reference values.

| MONITOR ITEM     | CONDITION  | SPECIFICATION |
|------------------|--|---------------|
| FR O2 SEN HTR-B1 | Engine speed: Idle   | ON            |
| FR O2 SEN HTR-B2 | • Engine speed: Above 3,600 rpm (A/T models) or 4,000 rpm (M/T models) | OFF           |

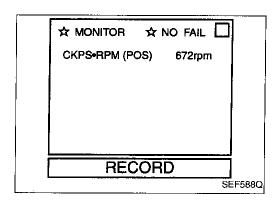
#### **ECM TERMINALS AND REFERENCE VALUE**

Remarks: Specification data are reference values, and are measured between each terminal and (a) (ECCS ground) with a voltmeter.

| TER-<br>MINAL<br>NO. | WIRE<br>COLOR | ITEM                     | CONDITION   | DATA<br>(DC voltage)          |
|----------------------|---------------|--------------------------|---|-------------------------------|
| 110                  |               | Front heated oxygen sen- | Engine is running.  Engine speed is below 3,600 rpm (A/T models) or 4,000 rpm (M/T models). | 0 - 0.5V                      |
| 119                  | LY            | sor heater (right bank)  | Engine is running.  Engine speed is above 3,600 rpm (A/T models) or 4,000 rpm (M/T models). | BATTERY VOLTAGE<br>(11 - 14V) |

### ON BOARD DIAGNOSIS LOGIC

| Diagnostic Trouble<br>Code No. | Malfunction is detected when  | Check Items<br>(Possible Cause)  |
|--------------------------------|---|--|
| P0135<br>0901                  | <ul> <li>The current amperage in the front heated oxygen<br/>sensor heater (Right bank) circuit is out of the nor-<br/>mal range.</li> <li>(The improper voltage drop signal is entered to ECM<br/>through the front heated oxygen sensor heater.)</li> </ul> | Harness or connectors     (The front heated oxygen sensor heater circuit is open or shorted.)     Front heated oxygen sensor heater (Right bank) |



## Front Heated Oxygen Sensor Heater (Right bank) (Cont'd)

## **DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE**



1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.

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2) Start engine and run it at least 5 seconds at idle speed.

- OR -

Start engine and run it at least 5 seconds at idle speed. 2) Turn ignition switch "OFF" and wait at least 5 seconds.

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Start engine and run it for at least 5 seconds at idle speed.

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Select "MODE 3" with GST.



Start engine and run it at least 5 seconds in idle condi-

Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON". 3) Perform "Diagnostic Test Mode II (Self-diagnostic

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results)" with ECM. When using GST, "DIAGNOSTIC TROUBLE CODE CON-

– OR -

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FIRMATION PROCEDURE" should be performed twice as much as when using CONSULT or ECM (Diagnostic Test Mode II) because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CON-SULT or ECM (Diagnostic Test Mode II) is recommended.

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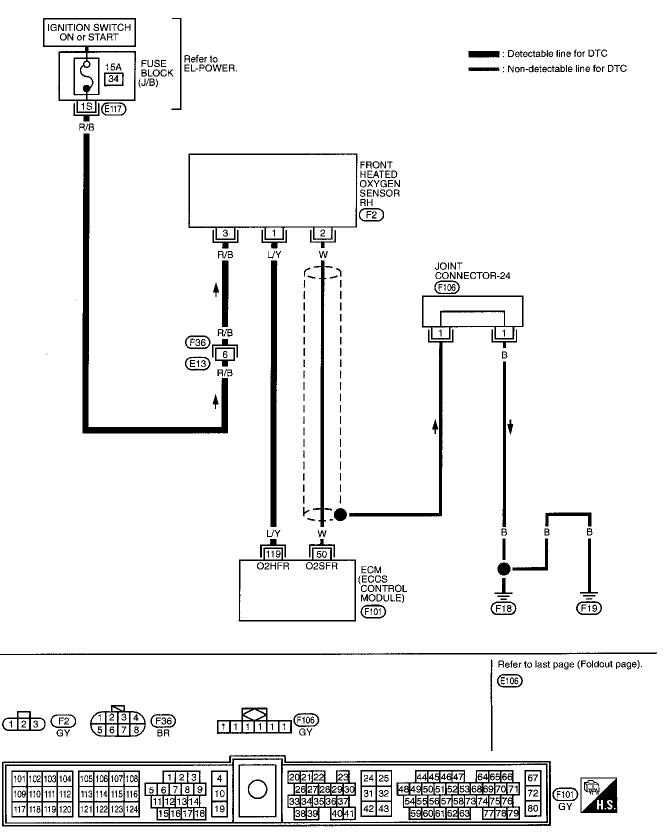
BT

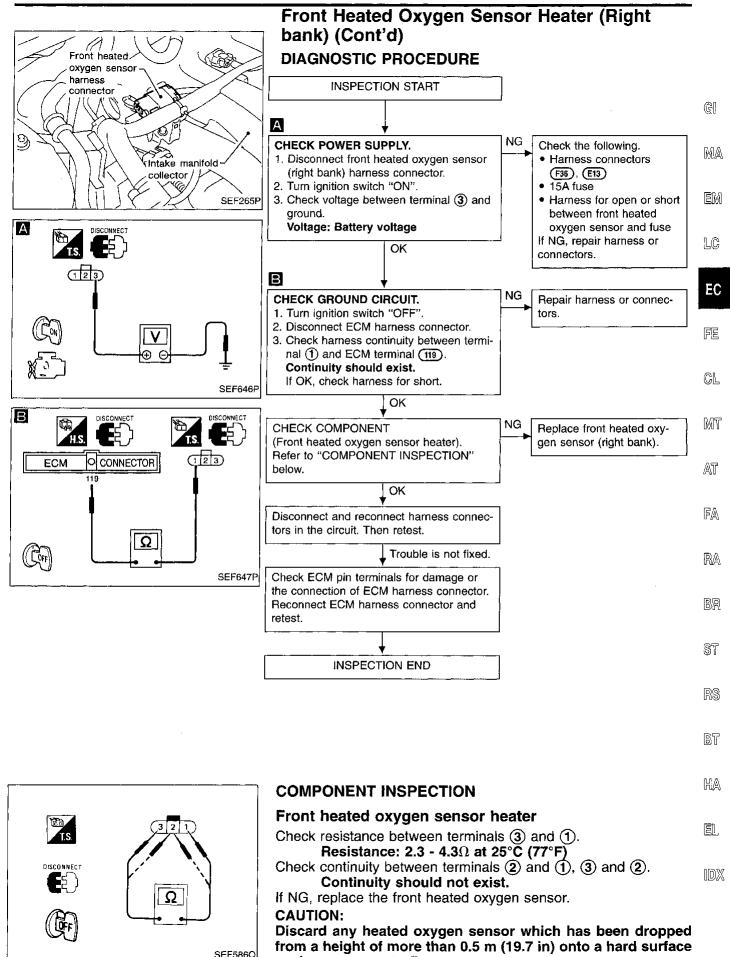
HA

EL

## Front Heated Oxygen Sensor Heater (Right bank) (Cont'd)

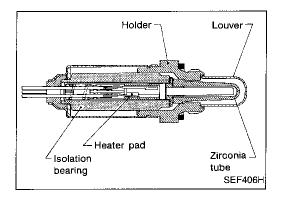
EC-FO2H-R-01





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such as a concrete floor; use a new one.



## Rear Heated Oxygen Sensor (Rear HO2S) COMPONENT DESCRIPTION

The rear heated oxygen sensor (Rear HO2S), after three way catalyst, monitors the oxygen level in the exhaust gas.

Even if switching characteristics of the front heated oxygen sensor are shifted, the air fuel ratio is controlled to stoichiometric, by the signal from the rear heated oxygen sensor.

This sensor is made of ceramic zirconia. The electrical resistance of ceramic zirconia drastically changes at the ideal air-fuel ratio. The output voltage of the sensor, depending on its resistance, is

approximately 0 to 1.0V.

Under normal conditions the rear heated oxygen sensor is not used for engine control operation.

#### **CONSULT REFERENCE VALUE IN DATA MONITOR MODE**

Remarks: Specification data are reference values.

| MONITOR ITEM | CONDITION                |                                       | SPECIFICATION    |
|--------------|--------------------------|---------------------------------------|------------------|
| RR O2 SENSOR | After comming com        |                                       | 0 ↔ Approx. 1.0V |
| RR O2 MNTR   | Engine: After warming up | Maintaining engine speed at 2,000 rpm | LEAN ↔ RICH      |

#### **ECM TERMINALS AND REFERENCE VALUE**

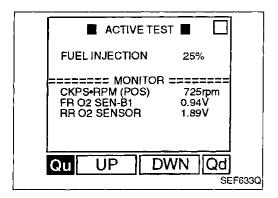
Remarks: Specification data are reference values, and are measured between each terminal and (a) (ECCS ground) with a voltmeter.

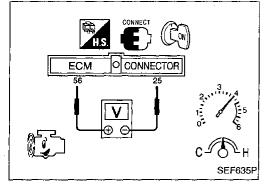
| TER-<br>MINAL<br>NO. | WIRE<br>COLOR | ITEM                      | CONDITION  | DATA<br>(DC voltage)   |
|----------------------|---------------|---------------------------|--|------------------------|
| 56                   | w             | Rear heated oxygen sensor | Engine is running.  After warming up sufficiently and engine speed is 2,000 rpm. | 0 - Approximately 1.0V |
| 25                   | В             | ECCS ground               | Engine is running.  Idle speed   | Engine ground          |

#### ON BOARD DIAGNOSIS LOGIC

The rear heated oxygen sensor has a much longer switching time between rich and lean than the front heated oxygen sensor. The oxygen storage capacity before the three way catalyst causes the longer switching time. To judge the malfunctions of rear heated oxygen sensor, ECM monitors the sensor's voltage value and the switching response during the various driving condition such as fuel-cut.

| Diagnostic Trouble<br>Code No. | Malfunction is detected when   | Check Items<br>(Possible Cause)   |
|--------------------------------|--|---|
| P0136<br>0707                  | An excessively high voltage from the sensor is entered to ECM.   | Harness or connectors     (The sensor circuit is open.)     Rear heated oxygen sensor   |
|                                | <ul> <li>The maximum and minimum voltages from the sensor are not reached to the specified voltages.</li> <li>It takes more time for the sensor to respond between rich and lean than the specified time.</li> </ul> | <ul> <li>Harness or connectors (The sensor circuit is shorted.)</li> <li>Rear heated oxygen sensor</li> <li>Fuel pressure</li> <li>Injectors</li> <li>Intake air leaks</li> </ul> |





## Rear Heated Oxygen Sensor (Rear HO2S) (Cont'd)

#### **OVERALL FUNCTION CHECK**

This procedure can be used for checking the overall function of the rear heated oxygen sensor circuit. During this check, a DTC might not be confirmed.

1) Start engine and warm it up sufficiently.

 Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "RR O2 MNTR" as the monitor item with CONSULT.

3) Check "RR O2 SENSOR" at idle speed when adjusting "FUEL INJECTION" to ±25%.

"RR O2 SENSOR" should be above 0.48V at least once when the "FUEL INJECTION" is +25%. "RR O2 SENSOR" should be below 0.43V at least

once when the "FUEL INJECTION" is -25%.

1) Start engine and warm it up sufficiently.

2) Set voltmeter probes between ECM terminals 66 (sensor signal) and 25 (engine ground).

 Check the voltage when racing up to 4,000 rpm under no load at least 10 times.

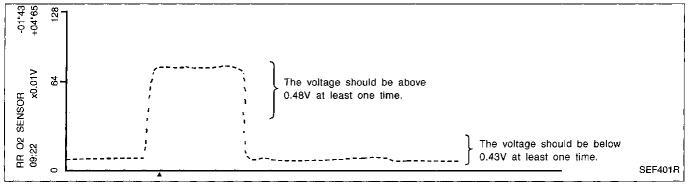
(depress and release accelerator pedal as soon as possible)

The voltage should be above 0.48V and below 0.43V at least once during this procedure.

If the voltage can be confirmed in step 3, step 4 is not necessary.

4) Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in 3rd gear position.

The voltage should be above 0.48V and below 0.43V at least once during this procedure.



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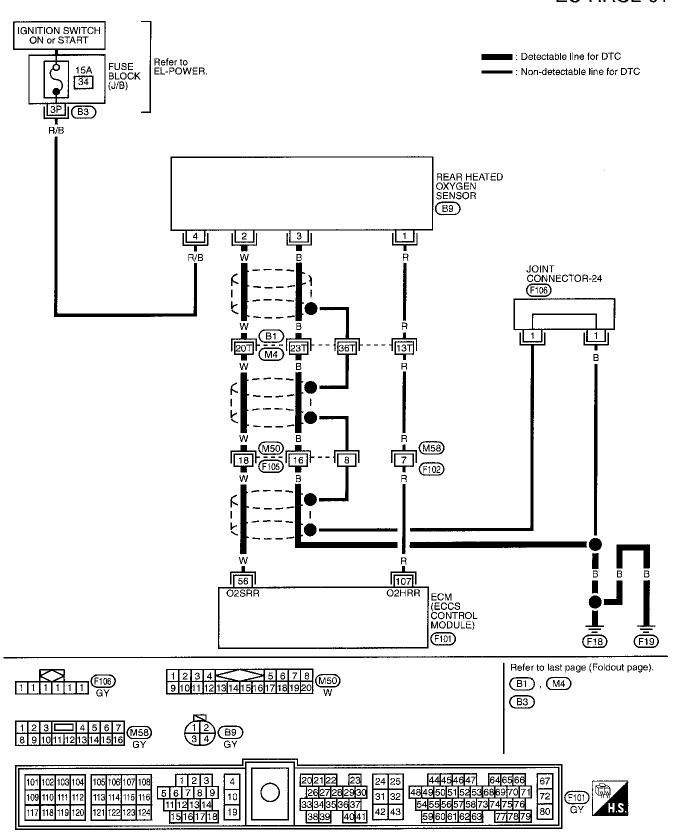
HA

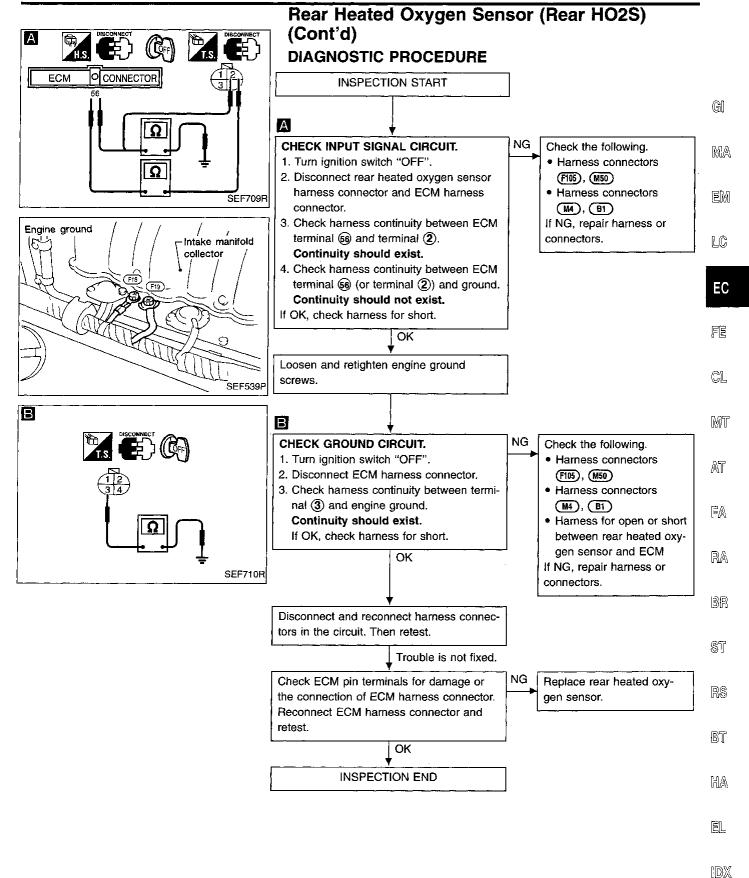
EL

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## Rear Heated Oxygen Sensor (Rear HO2S) (Cont'd)

**EC-RRO2-01** 

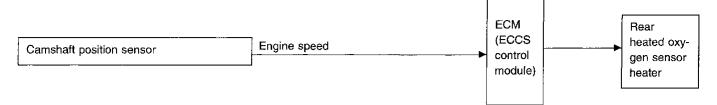




**EC-153** 321

## Rear Heated Oxygen Sensor Heater

#### SYSTEM DESCRIPTION



The ECM performs ON/OFF control of the rear heated oxygen sensor heaters corresponding to the engine speed.

### **OPERATION**

| Engine speed rpm | Rear heated oxygen sensor heaters |  |
|------------------|-----------------------------------|--|
| Above 3,600      | OFF                               |  |
| Below 3,600      | ON                                |  |

### **CONSULT REFERENCE VALUE IN DATA MONITOR MODE**

Remarks: Specification data are reference values.

| MONITOR ITEM | CONDITION                     | SPECIFICATION |
|--------------|-------------------------------|---------------|
| RR O2 HEATER | Engine speed: Idle            | ON            |
| nn Oz HEATEN | Engine speed: Above 3,600 rpm | OFF           |

#### **ECM TERMINALS AND REFERENCE VALUE**

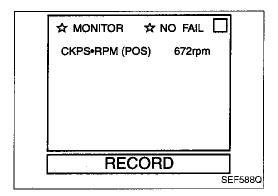
Remarks: Specification data are reference values, and are measured between each terminal and (a) (ECCS ground) with a voltmeter.

| TER-<br>MINAL<br>NO. | WIRE<br>COLOR | ITEM                                  | CONDITION  | DATA<br>(DC voltage)          |
|----------------------|---------------|---------------------------------------|--|-------------------------------|
| 107                  | R             | Rear heated oxygen sen-<br>sor heater | Engine is running.  Engine speed is below 3,600 rpm. | 0 - 0.5V                      |
|                      |               |                                       | Engine is running.  Engine speed is above 3,600 rpm. | BATTERY VOLTAGE<br>(11 - 14V) |

### ON BOARD DIAGNOSIS LOGIC

| Diagnostic Trouble<br>Code No. | Malfunction is detected when   | Check Items<br>(Possible Cause)   |
|--------------------------------|--|---|
| P0141<br>0902                  | <ul> <li>The current amperage in the rear heated oxygen<br/>sensor heater circuit is out of the normal range.</li> <li>(An improper voltage drop signal is sent to ECM<br/>through the rear heated oxygen sensor heater.)</li> </ul> | Harness or connectors     (The rear heated oxygen sensor heater circuit is open or shorted.)     Rear heated oxygen sensor heater |

**EC-154** 



# Rear Heated Oxygen Sensor Heater (Cont'd) DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE



- Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
- 2) Start engine and run it at least 5 seconds at idle speed.

  OR

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- 1) Start engine and run it at least 5 seconds at idle speed.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Start engine and run it at least 5 seconds at idle speed.

- OR

4) Select "Mode 3" with GST.

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- 1) Start engine and run it at least 5 seconds at idle speed.
- 2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- When using GST, "DIAGNOSTIC TROUBLE CODE CON-FIRMATION PROCEDURE" should be performed twice as much as when using CONSULT or ECM (Diagnostic Test Mode II) because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CON-SULT or ECM (Diagnostic Test Mode II) is recommended.

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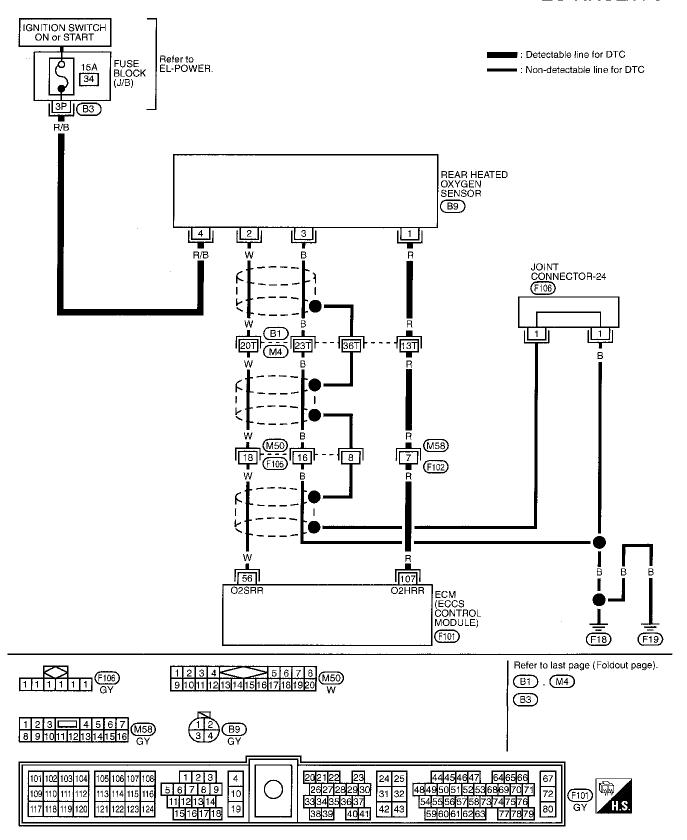
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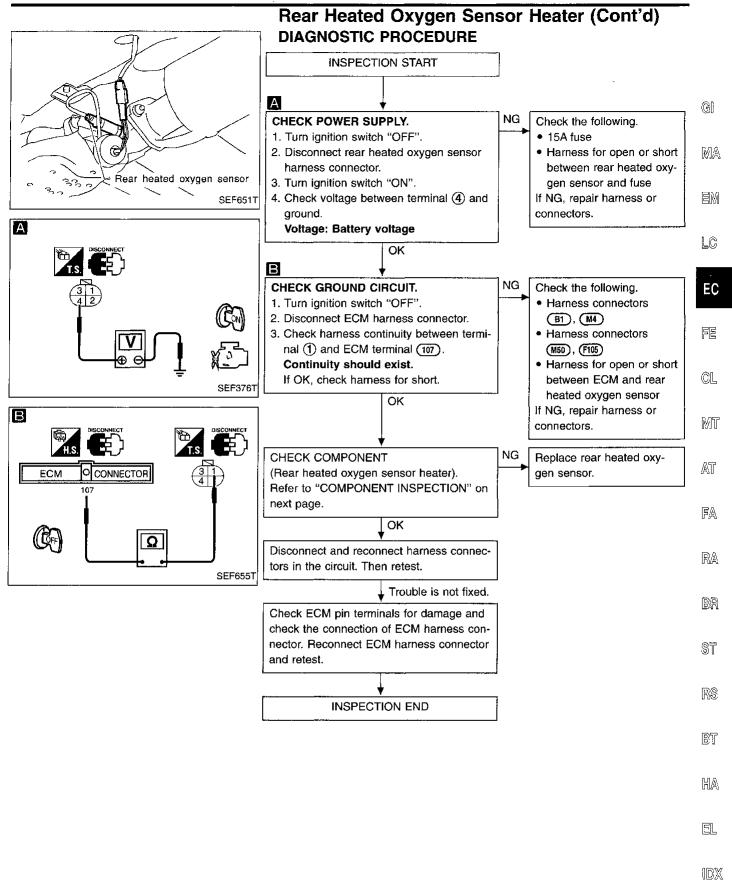
EL

IDX

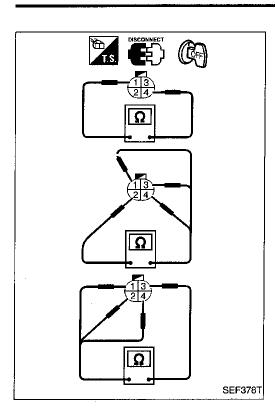
## Rear Heated Oxygen Sensor Heater (Cont'd)

## EC-RRO2/H-01





EC-157 325



# Rear Heated Oxygen Sensor Heater (Cont'd) COMPONENT INSPECTION

### Rear heated oxygen sensor heater

Check the following.

1. Check resistance between terminals **4** and **1**. **Resistance: 2.3 - 4.3**Ω at 25°C (77°F)

2. Check continuity.

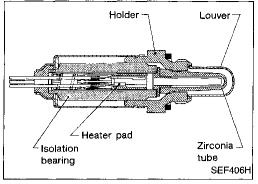
| Terminal No.  | Continuity |  |
|---------------|------------|--|
| ② and ①, ③, ④ | No         |  |
| 3 and 1, 2, 4 | No No      |  |

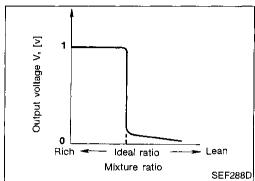
If NG, replace the rear heated oxygen sensor.

#### CAUTION:

Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

EC-158 326





### Front Heated Oxygen Sensor (Front HO2S) (Left bank)

### **COMPONENT DESCRIPTION**

The front heated oxygen sensor (left bank) is placed into the front tube (left bank). It detects the amount of oxygen in the exhaust gas compared to the outside air. The front heated oxygen sensor (left bank) has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The front heated oxygen sensor (left bank) signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.

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### CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Remarks: Specification data are reference values.

| MONITOR ITEM                    | CONE                     | DITION                                | SPECIFICATION                                |    |
|---------------------------------|--------------------------|---------------------------------------|--|----|
| FR O2 SEN-B2                    |                          |                                       | 0.004  | AT |
| FR O2 SEN-B1                    |                          |                                       | 0 - 0.3V ↔ Approx. 0.6 - 1.0V                |    |
| FR O2 MNTR-B2                   | Engine: After warming up | Maintaining engine speed at 2,000 rpm | LEAN ↔ RICH                                  | FA |
| ******************************* |                          |                                       | Changes more than 5 times during 10 seconds. |    |
| FR O2 MNTR-B1                   |                          |                                       |  | RA |

### **ECM TERMINALS AND REFERENCE VALUE**

Remarks: Specification data are reference values, and are measured between each terminal and (28) (ECCS ground) with a voltmeter.

| TER-<br>MINAL<br>NO. | WIRE<br>COLOR | ITEM  | CONDITION  | DATA<br>(DC voltage)                            |   |
|----------------------|---------------|---|--|---|---|
| 50<br>51             | w<br>w        | Front heated oxygen sen-<br>sor (Right bank)<br>Front heated oxygen sen-<br>sor (Left bank) | Engine is running.  After warming up sufficiently and engine speed is 2,000 rpm. | 0 - Approximately 1.0V<br>(periodically change) | • |
| 25                   | В             | ECCS ground   | Engine is running.  Idle speed   | Engine ground                                   | • |

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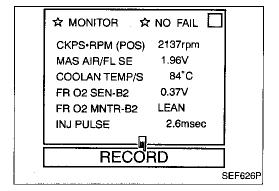
EL

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# Front Heated Oxygen Sensor (Front HO2S) (Left bank) (Cont'd)

### ON BOARD DIAGNOSIS LOGIC

| Diagnostic Trouble<br>Code No. | Malfunction is detected when  | Check Items<br>(Possible Cause) |
|--------------------------------|---|---------------------------------|
| P0150<br>0303                  | <ul> <li>An excessively high voltage from the sensor is entered to ECM.</li> <li>The voltage from the sensor is constantly approx. 0.3V.</li> <li>The maximum and minimum voltages from the sensor are not reached to the specified voltages.</li> <li>It takes more time for the sensor to respond between rich and lean than the specified time.</li> </ul> | • Injectors                     |



### **OVERALL FUNCTION CHECK**

This procedure can be used for checking the overall function of the front heated oxygen sensor circuit. During this check, a DTC might not be confirmed.



1) Start engine and warm it up sufficiently.

- 2) Select "MANU TRIG" and "HI SPEED" in "DATA MONITOR" mode with CONSULT, and select "FR O2 SEN-B2" and "FR O2 MNTR-B2".
- 3) Hold engine speed at 2,000 rpm under no load during the following steps.
- 4) Touch "RECORD" on CONSULT screen.
- 5) Make sure of the following.
- "FR O2 MNTR-B2" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" 5 times in 10 seconds.

5 times (cycles) are counted as shown below:

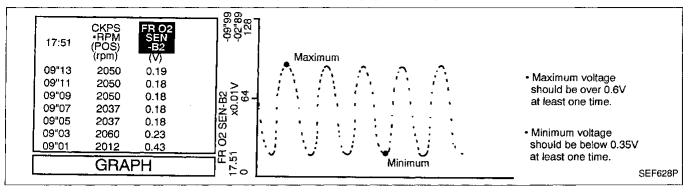
cycle | 1 | 2 | 3 | 4 | 5 | FR O2 MNTR-B2 R-L-R-L-R-L-R-L-R

R = "FR O2 MNTR-B2", "RICH" L = "FR O2 MNTR-B2", "LEAN"

- "FR O2 SEN-B2" voltage goes above 0.6V at least once.
- "FR O2 SEN-B2" voltage goes below 0.35V at least once.
- The voltage never exceeds 1.0V.

EC-160 328

# Front Heated Oxygen Sensor (Front HO2S) (Left bank) (Cont'd)



EC

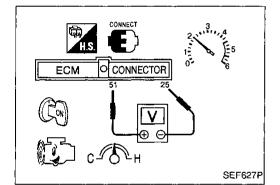
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1) Start engine and warm it up sufficiently.

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 Set voltmeter probes between ECM terminal (1) (sensor signal) and (2) (engine ground).

- OR -

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3) Make sure of the following with engine speed held at 2,000 rpm constant under no load.

FA

 Malfunction indicator lamp goes on more than 5 times within 10 seconds in Diagnostic Test Mode II (FRONT HEATED OXYGEN SENSOR MONITOR).

RA

The maximum voltage is over 0.6V at least one time.
The minimum voltage is below 0.35V at least one time.

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The voltage never exceeds 1.0V.

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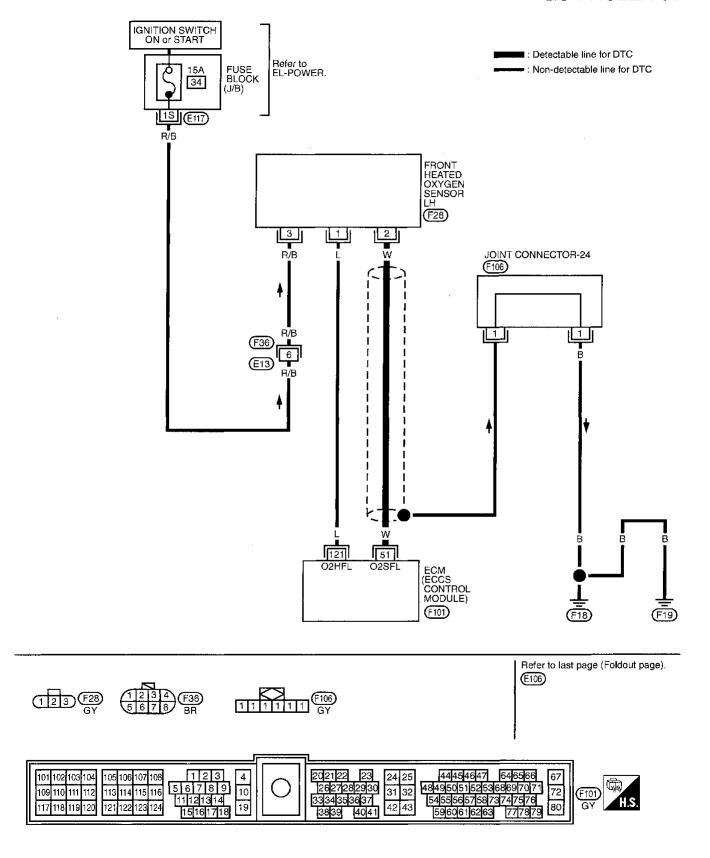
IDX

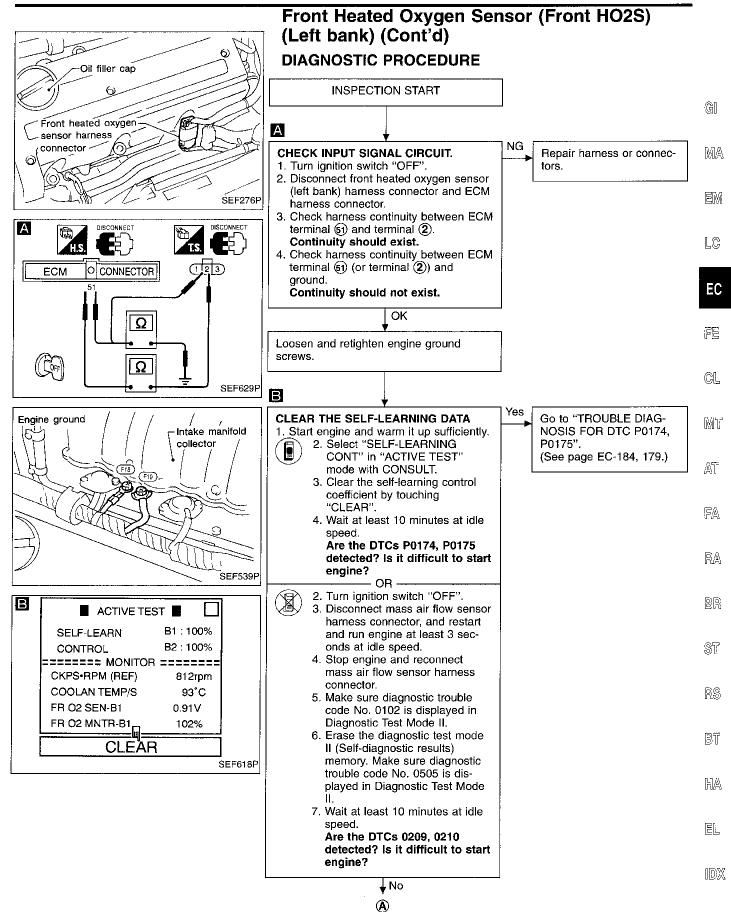
329

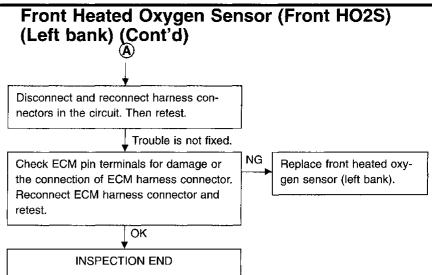
EC-161

# Front Heated Oxygen Sensor (Front HO2S) (Left bank) (Cont'd)

### EC-FRO2LH-01



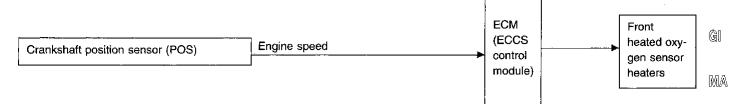




**EC-164** 332

### Front Heated Oxygen Sensor Heater (Left bank)

### SYSTEM DESCRIPTION



The ECM performs ON/OFF control of the front heated oxygen sensor heaters corresponding to the engine speed.

### **OPERATION**

| Engine speed rpm                               | Front heated oxygen sensor heaters |
|--|------------------------------------|
| Above 3,600 (A/T models) or 4,000 (M/T models) | OFF                                |
| Below 3,600 (A/T models) or 4,000 (M/T models) | ON                                 |

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### CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Remarks: Specification data are reference values.

| MONITOR ITEM     | CONDITION  | SPECIFICATION |
|------------------|--|---------------|
| FR O2 SEN HTR-B1 | Engine speed: Idle   | ON            |
| FR O2 SEN HTR-B2 | Engine speed: Above 3,600 rpm (A/T models) or 4,000 rpm (M/T models) | OFF           |

### **ECM TERMINALS AND REFERENCE VALUE**

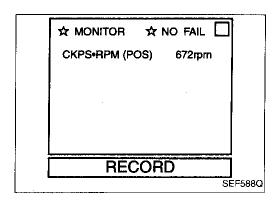
Remarks: Specification data are reference values, and are measured between each terminal and (a) (ECCS ground) with a voltmeter.

| TER-<br>MINAL<br>NO. | WIRE<br>COLOR | ITEM                     | CONDITION   | DATA<br>(DC voltage)          | FA<br>RA |
|----------------------|---------------|--------------------------|---|-------------------------------|----------|
| 101                  |               | Front heated oxygen sen- | Engine is running.  Engine speed is below 3,600 rpm (A/T models) or 4,000 rpm (M/T models). | 0 - 0.5V                      | BR       |
| 121                  | } <b>L</b>    | sor heater (left bank)   | Engine is running.  Engine speed is above 3,600 rpm (A/T models) or 4,000 rpm (M/T models). | BATTERY VOLTAGE<br>(11 - 14V) | ST       |
|                      |               | <u>l</u>                 | 1 , , , , , , , , , , , , , , , , , , ,   |                               | R\$      |

### ON BOARD DIAGNOSIS LOGIC

| Diagnostic Trouble<br>Code No. | Malfunction is detected when  | Check Items<br>(Possible Cause)   | Ta |
|--------------------------------|---|---|----|
| P0155<br>1001                  | <ul> <li>The current amperage in the front heated oxygen<br/>sensor heater (Left bank) circuit is out of the normal<br/>range.</li> </ul> | Harness or connectors     (The front heated oxygen sensor heater circuit is open or shorted.) |    |
|                                | (The improper voltage drop signal is entered to ECM through the front heated oxygen sensor heater.)                                       | · · · · · · · · · · · · · · · · · · ·   |    |

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# Front Heated Oxygen Sensor Heater (Left bank) (Cont'd)

### DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE



- 1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
- Start engine and run it at least 5 seconds at idle speed.

  OR



- 1) Start engine and run it at least 5 seconds at idle speed.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Start engine and run it at least 5 seconds at idle speed.
- 4) Select "MODE 3" with GST.

-- OR -

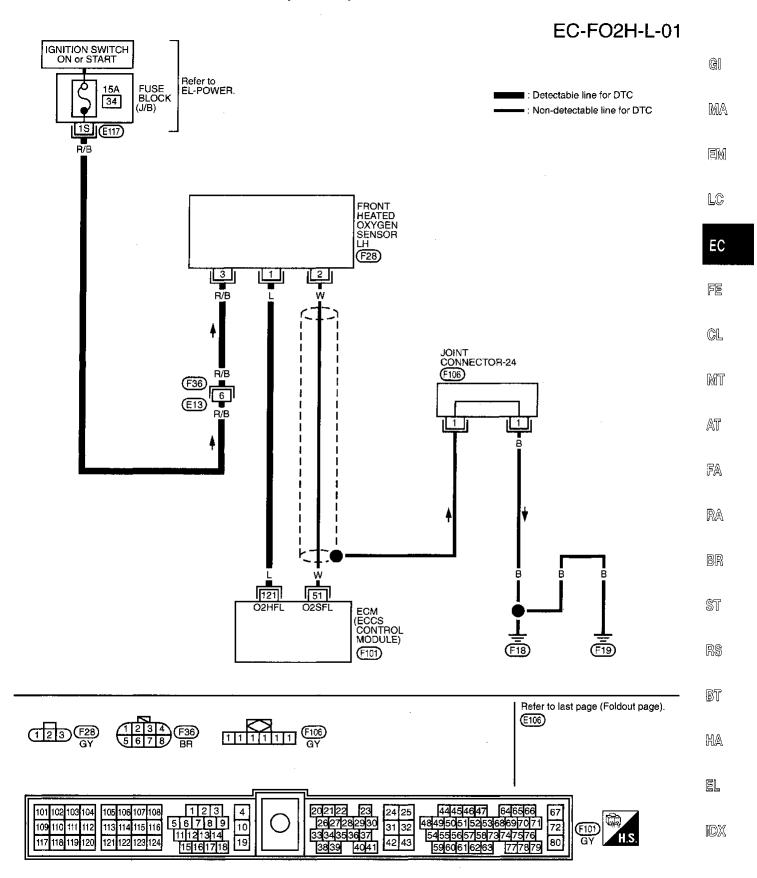


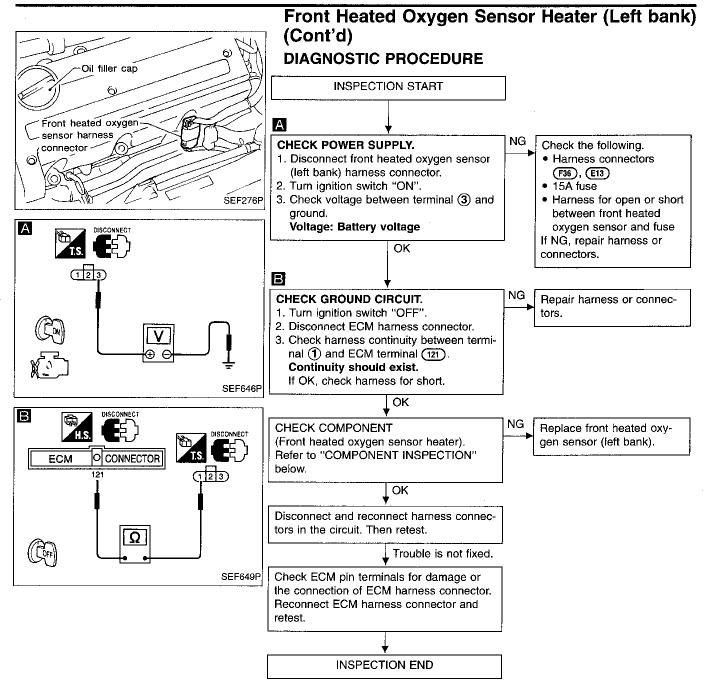
- 1) Start engine and run it at least 5 seconds in idle condition.
- Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- then turn "ON".

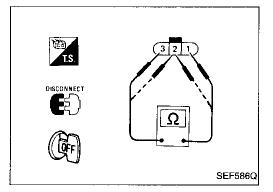
  3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- When using GST, "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" should be performed twice as much as when using CONSULT or ECM (Diagnostic Test Mode II) because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT or ECM (Diagnostic Test Mode II) is recommended.

334

# Front Heated Oxygen Sensor Heater (Left bank) (Cont'd)







### **COMPONENT INSPECTION**

### Front heated oxygen sensor heater

Check resistance between terminals (3) and (1).

Resistance: 2.3 - 4.3 $\Omega$  at 25°C (77°F)

Check continuity between terminals (2) and (1), (3) and (2).

Continuity should not exist.

If NG, replace the front heated oxygen sensor.

### **CAUTION:**

Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

**EC-168** 336

### Fuel Injection System Function (Right bank) (Lean side)

### ON BOARD DIAGNOSIS LOGIC

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from the front heated oxygen sensors. The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios. In case the amount of the compensation value is extremely large (The actual mixture ratio is too lean.), the ECM judges the condition as the fuel injection system malfunction and light up the MIL (2 trip detection logic).

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**ECM** Density of oxygen in exhaust gas (ECCS Front heated oxygen sensors Injectors control (Mixture ratio feedback signal) module)

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| Diagnostic Trouble<br>Code No. | Malfunction is detected when   | Check Items<br>(Possible Cause)  |      |
|--------------------------------|--|--|------|
| P0171<br>0115                  | Fuel injection system does not operate properly.     The amount of mixture ratio compensation is too large. (The mixture ratio is too lean.) | Intake air leaks     Front heated oxygen sensor (right bank)     Injectors (right bank)  | · -  |
|                                |  | <ul><li>Exhaust gas leaks</li><li>Incorrect fuel pressure</li><li>Lack of fuel</li></ul> | ©    |
|                                |  | Mass air flow sensor   | . [] |

### CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Remarks: Specification data are reference values

| Remarks: Specification data are reference values. |                          | AT                                    |                                       |                   |
|---|--------------------------|---------------------------------------|---------------------------------------|-------------------|
| MONITOR ITEM                                      | CONDITION                |                                       | SPECIFICATION                         |                   |
| FR O2 SEN-B2                                      |                          |                                       | 0 - 0.3V ↔ Approx. 0.6 - 1.0V         | <br>FA            |
| FR O2 SEN-B1                                      | - Fraiss Affar           |                                       |                                       |                   |
| FR O2 MNTR-B2                                     | Engine: After warming up | Maintaining engine speed at 2,000 rpm | LEAN ↔ RICH Changes more than 5 times | <br>RA            |
| FR O2 MNTR-B1                                     |                          |                                       | during 10 seconds.                    |                   |
| A/F ALPHA-B2                                      |                          |                                       | E4 1550                               | <del></del><br>BR |
| A/F ALPHA-B1                                      | Engine: After warming up | Maintaining engine speed at 2,000 rpm | <b>54</b> - 155%                      | . ت ت             |

#### ACTIVE TEST B1:100% SELF-LEARN CONTROL B2:100% ====== MONITOR ====== CKPS•RPM (POS) 0rpm **COOLAN TEMP/S** 93° C FR O2 SEN-B1 0.01V FR O2 MNTR-B1 100% SEE5830

### DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE (Overall)



- Start engine and warm it up sufficiently.
- Turn ignition switch "OFF" and wait at least 5 seconds.
- Turn ignition switch "ON" and select "SELF-LEARN CONTROL" in "ACTIVE TEST" mode with CONSULT.
- Clear the self-learning control coefficient by touching "CLEAR".
- 5) Select "DATA MONITOR" mode with CONSULT.

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# Fuel Injection System Function (Right bank) (Lean side) (Cont'd)

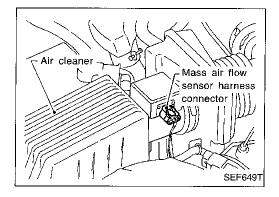
6) Start engine again and wait at least 10 minutes at idle speed.

The 1st trip DTC P0171 should be detected at this stage, if a malfunction exists.

7) If it is difficult to start engine at step 6, the fuel injection system has a malfunction, too.

Crank engine while depressing accelerator pedal. If engine starts, go to "DIAGNOSTIC PROCEDURE". If engine does not start, check exhaust and intake air leak visually again.







- 1) Start engine and warm it up sufficiently.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- Disconnect mass air flow sensor harness connector.
   Then restart and run it at least 3 seconds at idle speed.
- Stop engine and reconnect mass air flow sensor harness connector.
- 5) Turn ignition switch "ON".
- 6) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM. Make sure 1st trip DTC 0102 is detected.
- 7) Erase the 1st trip DTC 0102 by changing from Diagnostic Test Mode II to Diagnostic Test Mode I.
- 8) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM. Make sure DTC 0505 is detected.
- 9) Start engine again and wait at least 10 minutes at idle speed.

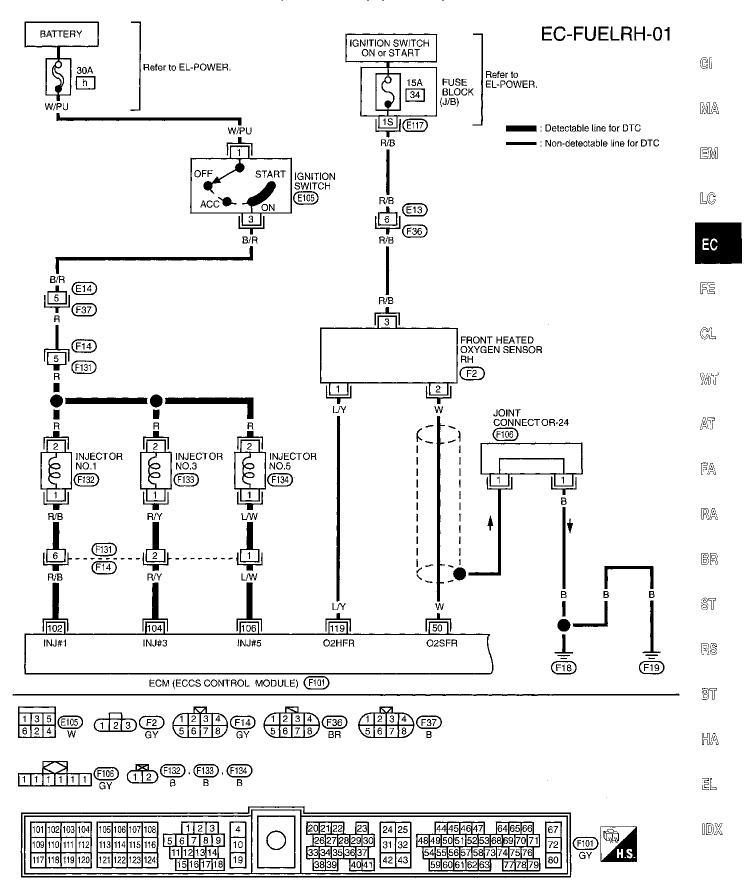
The 1st trip DTC 0115 should be detected at this stage, if a malfunction exists.

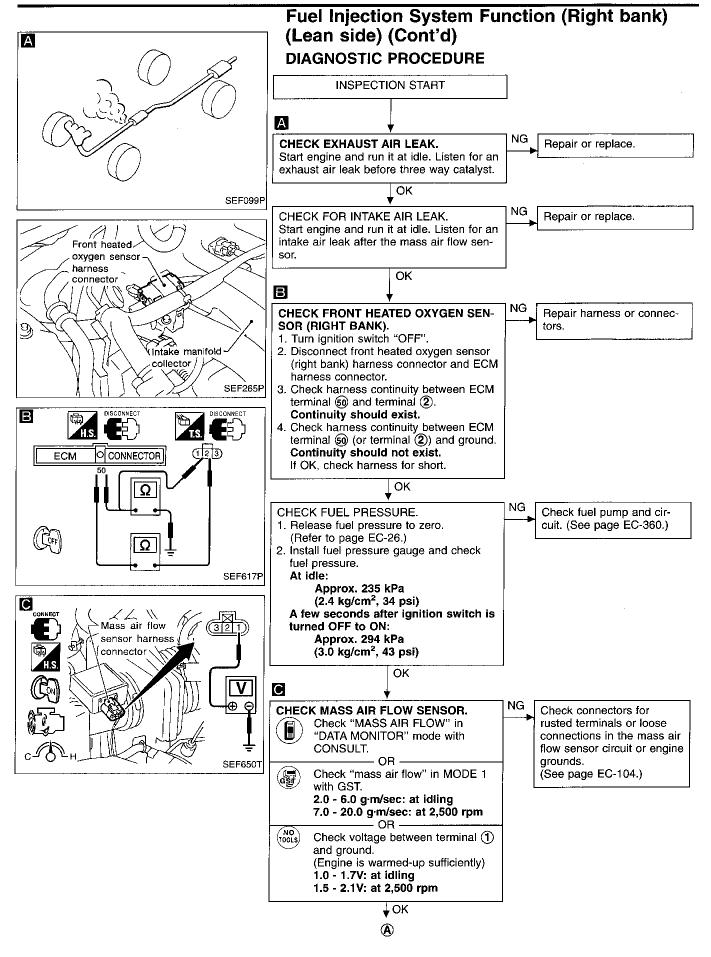
10) If it is difficult to start engine at step 8, the fuel injection system also has a malfunction.

Crank engine while depressing accelerator pedal. If engine starts, go to "DIAGNOSTIC PROCEDURE". If engine does not start, check exhaust and intake air leak visually again.

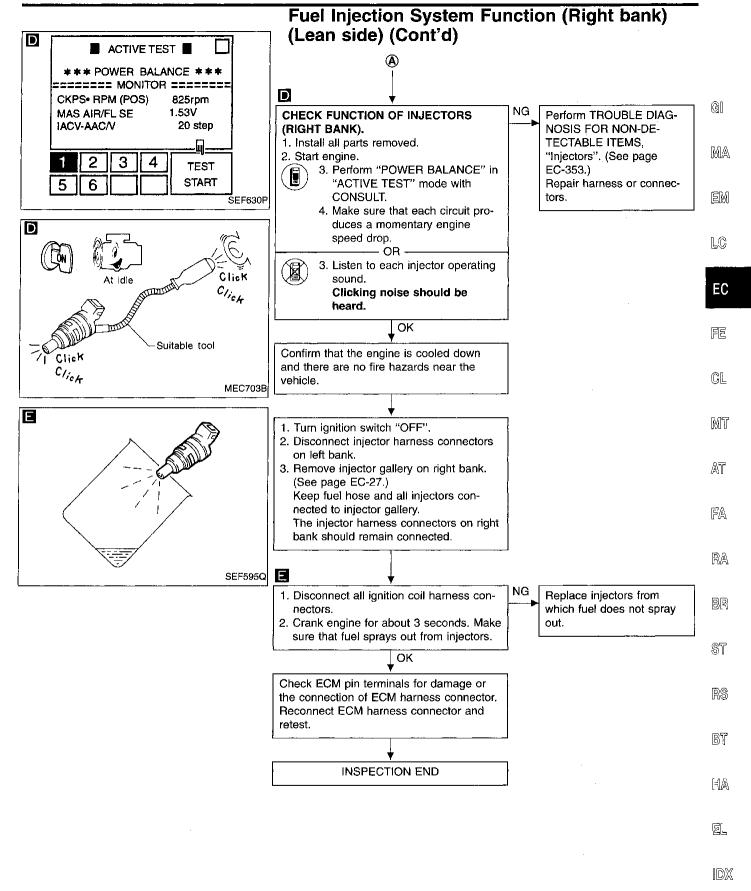
EC-170 338

# Fuel Injection System Function (Right bank) (Lean side) (Cont'd)





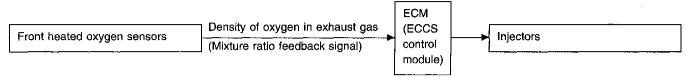
340



# Fuel Injection System Function (Right bank) (Rich side)

### ON BOARD DIAGNOSIS LOGIC

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from the front heated oxygen sensors. The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios. In case the amount of the compensation value is extremely large (The actual mixture ratio is too rich.), the ECM judges the condition as the fuel injection system malfunction and light up the MIL (2 trip detection logic).

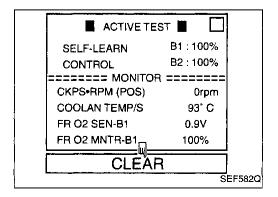


| Diagnostic Trouble<br>Code No. | Malfunction is detected when   | Check Items<br>(Possible Cause)   |
|--------------------------------|--|---|
| P0172<br>0114                  | Fuel injection system does not operate properly.     The amount of mixture ratio compensation is too large. (The mixture ratio is too rich.) | <ul> <li>Front heated oxygen sensor (right bank)</li> <li>Injectors (right bank)</li> <li>Exhaust gas leaks</li> <li>Incorrect fuel pressure</li> <li>Mass air flow sensor</li> </ul> |

#### CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Remarks: Specification data are reference values.

| MONITOR ITEM                   | CONDITION                 |   | SPECIFICATION  |
|--------------------------------|---------------------------|---|--|
| FR O2 SEN-B2<br>FR O2 SEN-B1   | a Engine After warming up | Maintaining applies around at 2 000 ram | 0 - 0.3V ↔ Approx. 0.6 - 1.0V                                  |
| FR O2 MNTR-B2<br>FR O2 MNTR-B1 | Engine: After warming up  | Maintaining engine speed at 2,000 rpm   | LEAN ↔ RICH<br>Changes more than 5 times<br>during 10 seconds. |
| A/F ALPHA-B2<br>A/F ALPHA-B1   | Engine: After warming up  | Maintaining engine speed at 2,000 rpm   | 54 - 155%  |



### DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE (Overall)



- 1) Start engine and warm it up sufficiently.
- Turn ignition switch "OFF" and wait at least 5 seconds.
- Turn ignition switch "ON" and select "SELF-LEARN CONTROL" in "ACTIVE TEST" mode with CONSULT.
- Clear the self-learning control coefficient by touching "CLEAR".
- Select "DATA MONITOR" mode with CONSULT.

### Fuel Injection System Function (Right bank) (Rich side) (Cont'd)

6) Start engine again and wait at least 10 minutes at idle speed.

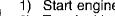
The 1st trip DTC P0172 should be detected at this stage, if a malfunction exists.

7) If it is difficult to start engine at step 6, the fuel injection system has a malfunction, too.

If engine does not start, remove ignition plugs and check for fouling, etc.

– OR –





Start engine and warm it up sufficiently.

Turn ignition switch "OFF" and wait at least 5 seconds. 2)

3) Disconnect mass air flow sensor harness connector. Then restart and run it at least 3 seconds at idle speed.

4) Stop engine and reconnect mass air flow sensor harness connector.

Turn ignition switch "ON".

6) Perform "Diagnostic Test Mode II (Self-diagnostic 📧 results)" with ECM. Make sure 1st trip DTC 0102 is detected.

Erase the 1st trip DTC 0102 by changing from Diagnostic Test Mode II to Diagnostic Test Mode I.

Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM. Make sure DTC 0505 is detected.

Start engine again and wait at least 10 minutes at idle speed.

The 1st trip DTC 0114 should be detected at this stage, if a malfunction exists.

10) If it is difficult to start engine at step 8, the fuel injection system also has a malfunction.

If engine does not start, remove ignition plugs and check for fouling, etc.

Mass air flow

connector

sensor harness

SEF649T

Air cleaner -

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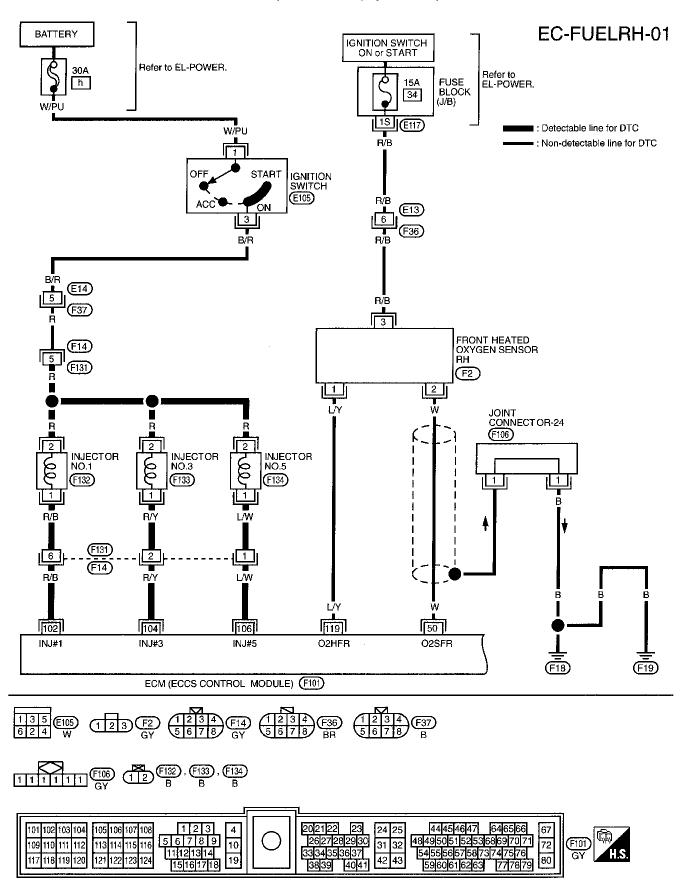
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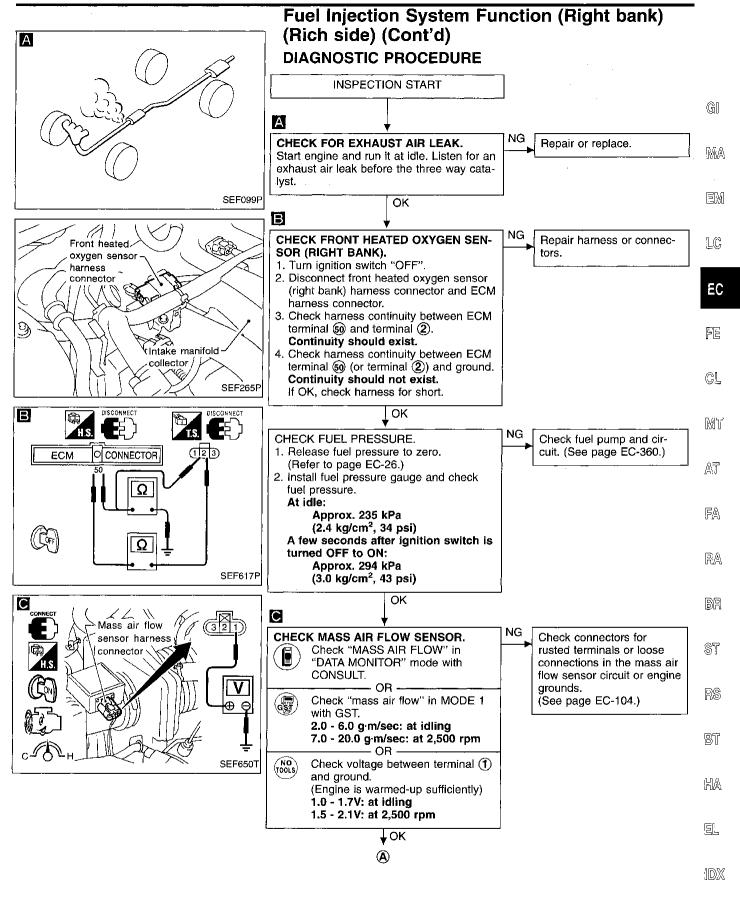
1DX

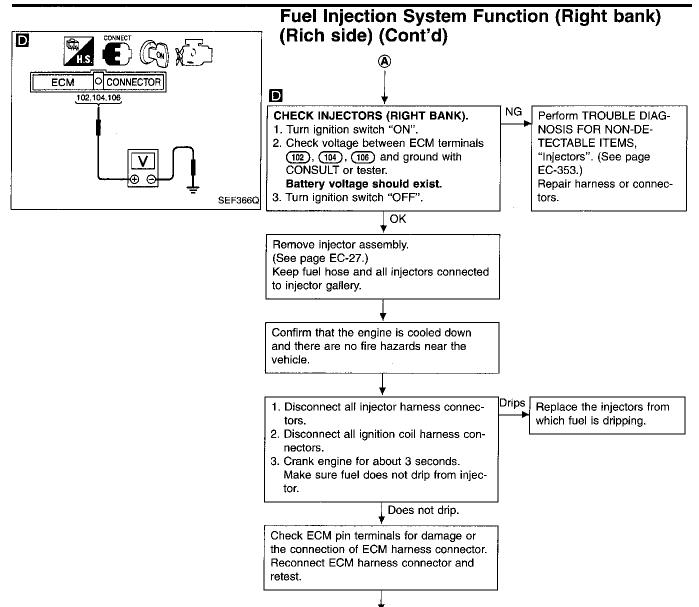


343

# Fuel Injection System Function (Right bank) (Rich side) (Cont'd)







INSPECTION END

EC-178 346

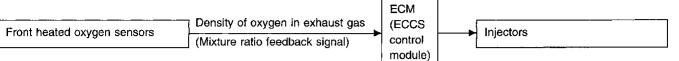
# Fuel Injection System Function (Left bank) (Lean side)

### ON BOARD DIAGNOSIS LOGIC

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from the front heated oxygen sensors. The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios. In case the amount of the compensation value is extremely large (The actual mixture ratio is too lean.), the ECM judges the condition as the fuel injection system malfunction and light up the MIL (2 trip detection logic).

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| Diagnostic Trouble<br>Code No. | Malfunction is detected when  | Check Items<br>(Possible Cause)  | EC       |
|--------------------------------|---|--|----------|
| P0174<br>0210                  | <ul> <li>Fuel injection system does not operate properly.</li> <li>The amount of mixture ratio compensation is too large. (The mixture ratio is too lean.)</li> </ul> | Intake air leaks Front heated oxygen sensor (left bank) Injectors (left bank) Exhaust gas leaks Incorrect fuel pressure Lack of fuel | FE<br>CL |
| <u> </u>                       |   | Mass air flow sensor   | MT       |

### 300 3

### CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Remarks: Specification data are reference values.

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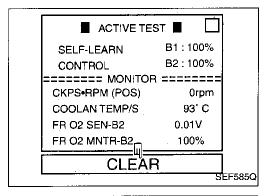
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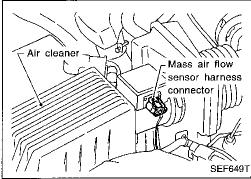
| MONITOR ITEM                   | CON                      | IDITION                               | SPECIFICATION  |  |
|--------------------------------|--------------------------|---------------------------------------|--|--|
| FR O2 SEN-B2<br>FR O2 SEN-B1   | Engine: After warming up | Maintaining engine speed at 2,000 rpm | 0 - 0.3V ↔ Approx. 0.6 - 1.0V                            |  |
| FR O2 MNTR-B2<br>FR O2 MNTR-B1 |                          |                                       | LEAN ↔ RICH Changes more than 5 times during 10 seconds. |  |
| A/F ALPHA-B2<br>A/F ALPHA-B1   | Engine: After warming up | Maintaining engine speed at 2,000 rpm | 54 - 155%  |  |

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### **Fuel Injection System Function (Left bank)** (Lean side) (Cont'd)

### DIAGNOSTIC TROUBLE CODE CONFIRMATION **PROCEDURE** (Overall)



- Start engine and warm it up sufficiently.
- Turn ignition switch "OFF" and wait at least 5 seconds. Turn ignition switch "ON" and select "SELF-LEARN CONTROL" in "ACTIVE TEST" mode with CONSULT.
- 4) Clear the self-learning control coefficient by touching "CLEAR".
- 5) Select "DATA MONITOR" mode with CONSULT.
- Start engine again and wait at least 10 minutes at idle speed.
  - The 1st trip DTC P0174 should be detected at this stage, if a malfunction exists.
- If it is difficult to start engine at step 6, the fuel injection system has a malfunction, too.

Crank engine while depressing accelerator pedal. If engine starts, go to "DIAGNOSTIC PROCEDURE". If engine does not start, check exhaust and intake air leak visually again.

OR -

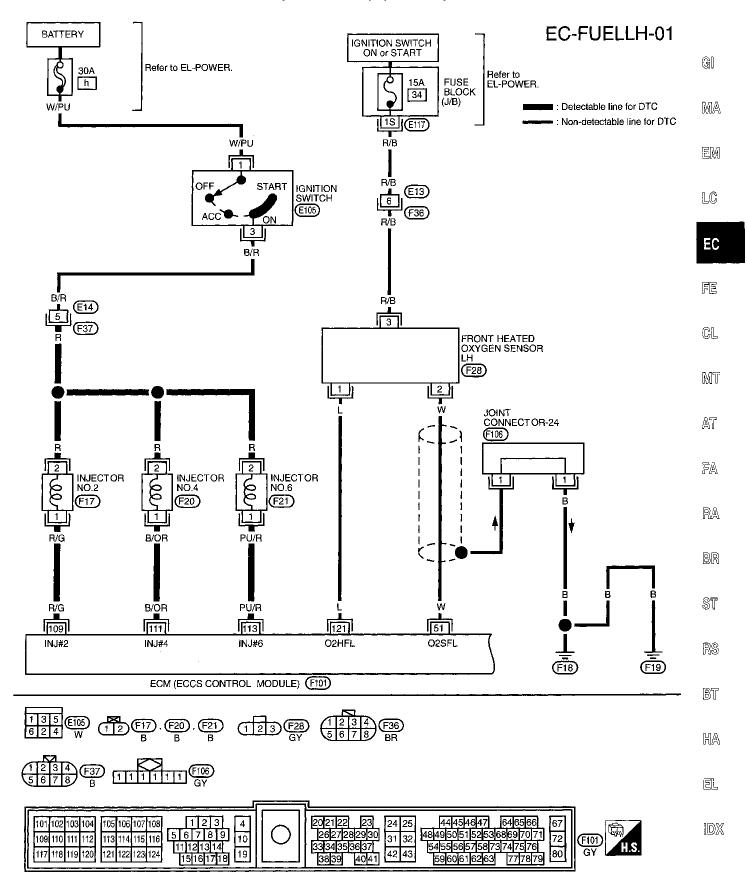


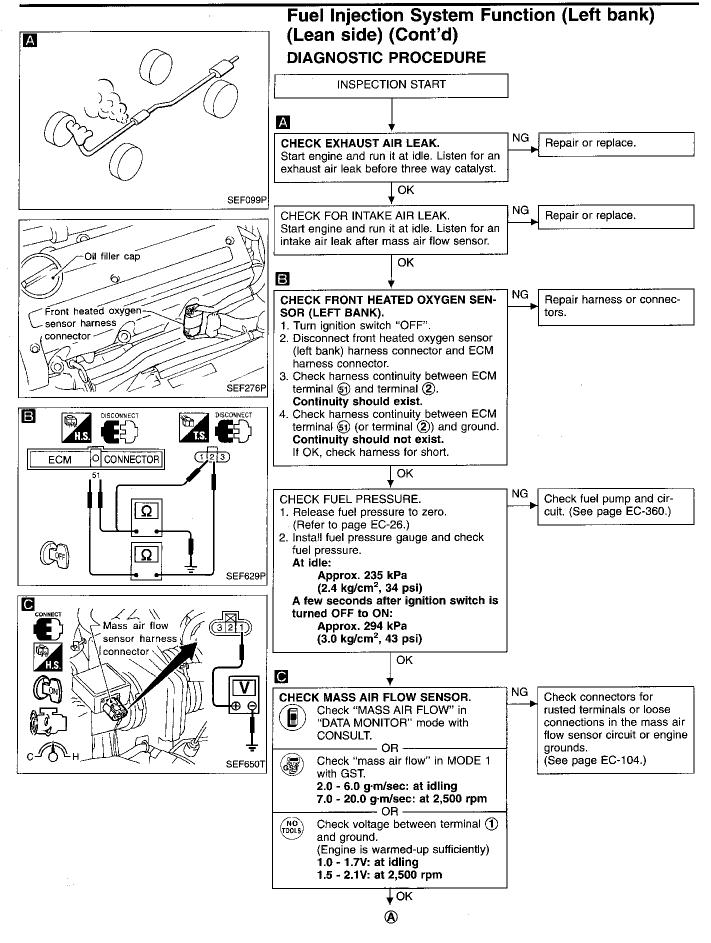
- Start engine and warm it up sufficiently. 1)
- Turn ignition switch "OFF" and wait at least 5 seconds. 2)
- Disconnect mass air flow sensor harness connector. Then restart and run it at least 3 seconds at idle speed.
- 4) Stop engine and reconnect mass air flow sensor harness connector.
- Turn ignition switch "ON".
- 6) Perform Diagnostic Test Mode II (Self-diagnostic results) with ECM. Make sure 1st trip DTC 0102 is detected.
- 7) Erase the 1st trip DTC 0102 by changing from Diagnostic Test Mode II to Diagnostic Test Mode I.
- 8) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM. Make sure DTC 0505 is detected.
- 9) Start engine again and wait at least 10 minutes at idle speed.
  - The 1st trip DTC 0210 should be detected at this stage, if a malfunction exists.
- 10) If it is difficult to start engine at step 8, the fuel injection system also has a malfunction.

Crank engine while depressing accelerator pedal. If engine starts, go to "DIAGNOSTIC PROCEDURE". If engine does not start, check exhaust and intake air leak visually again.

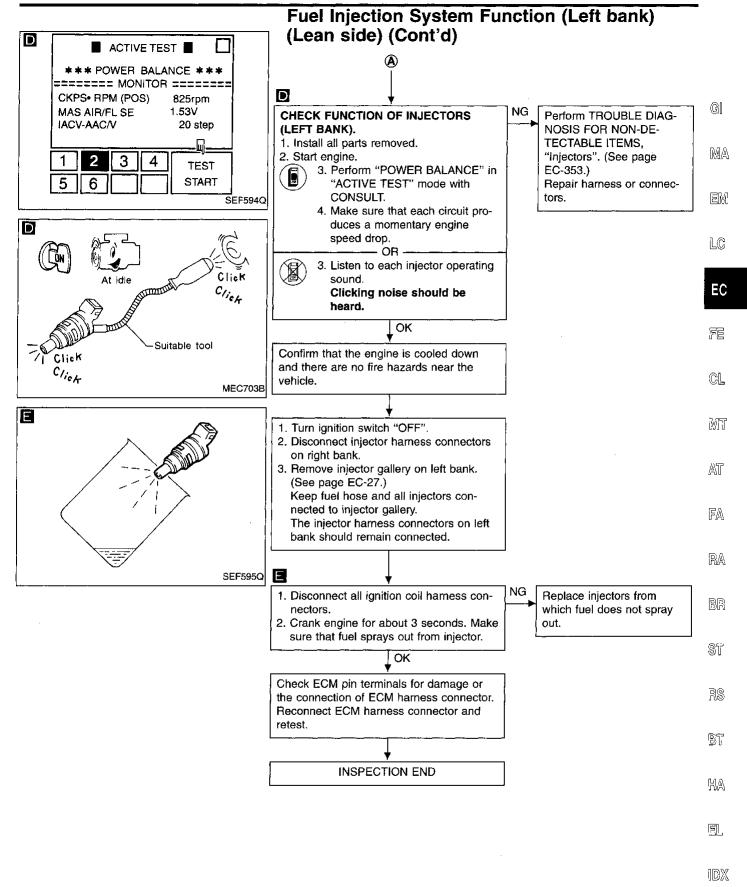
348 EC-180

# Fuel Injection System Function (Left bank) (Lean side) (Cont'd)





350

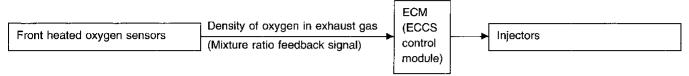


351

# Fuel Injection System Function (Left bank) (Rich side)

### ON BOARD DIAGNOSIS LOGIC

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from the front heated oxygen sensors. The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios. In case the amount of the compensation value is extremely large (The actual mixture ratio is too rich.), the ECM judges the condition as the fuel injection system malfunction and light up the MIL (2 trip detection logic).

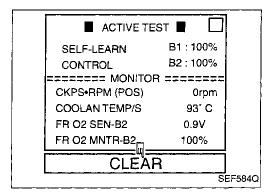


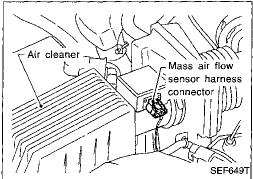
| Diagnostic Trouble<br>Code No. | Malfunction is detected when  | Check Items<br>(Possible Cause)   |
|--------------------------------|---|---|
| P0175<br>0209                  | <ul> <li>Fuel injection system does not operate properly.</li> <li>The amount of mixture ratio compensation is too large. (The mixture ratio is too rich.)</li> </ul> | <ul> <li>Front heated oxygen sensor (left bank)</li> <li>Injectors (left bank)</li> <li>Exhaust gas leaks</li> <li>Incorrect fuel pressure</li> <li>Mass air flow sensor</li> </ul> |

### CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Remarks: Specification data are reference values.

| MONITOR ITEM                     | CONDITION                  |                                       | SPECIFICATION  |
|----------------------------------|----------------------------|---------------------------------------|--|
| FR O2 SEN-B2<br>FR O2 SEN-B1     | ■ Engine: After warming up | Maintaining engine speed at 2,000 rpm | 0 - 0.3V ↔ Approx. 0.6 - 1.0V                            |
| FR O2 MNTR-B2<br>FR O2 MNTR-B1   |                            |                                       | LEAN ↔ RICH Changes more than 5 times during 10 seconds. |
| A/F ALPHA-B2<br><br>A/F ALPHA-B1 | Engine: After warming up   | Maintaining engine speed at 2,000 rpm | 54 - 155%  |





### Fuel Injection System Function (Left bank) (Rich side) (Cont'd)

### DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE (Overall)



- Start engine and warm it up sufficiently.
- Turn ignition switch "OFF" and wait at least 5 seconds.
- Turn ignition switch "ON" and select "SELF-LEARN CONTROL" in "ACTIVE TEST" mode with CONSULT.
- 4) Clear the self-learning control coefficient by touching "CLEAR".
- 5) Select "DATA MONITOR" mode with CONSULT.
- Start engine again and wait at least 10 minutes at idle speed.
  - The DTC P0175 should be detected at this stage, if a malfunction exists.
- 7) If it is difficult to start engine at step 6, the fuel injection system has a malfunction, too.

If engine does not start, remove ignition plugs and check for fouling, etc. - OR -



- 1) Disconnect mass air flow sensor harness connector.
- 2) Start engine and run it at least 3 seconds at idle speed.
- Stop engine and reconnect mass air flow sensor harness connector.
- Turn ignition switch "ON".
- Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM. Make sure DTC 0102 is detected.
- Erase the DTC 0102 by changing from Diagnostic Test Mode II to Diagnostic Test Mode I.
- Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM. Make sure DTC 0505 is detected.
- Start engine again and wait at least 10 minutes at idle speed.
  - The DTC 0209 should be detected at this stage, if a malfunction exists.
- 9) If it is difficult to start engine at step 8, the fuel injection system also has a malfunction.

If engine does not start, remove ignition plugs and check for fouling, etc.

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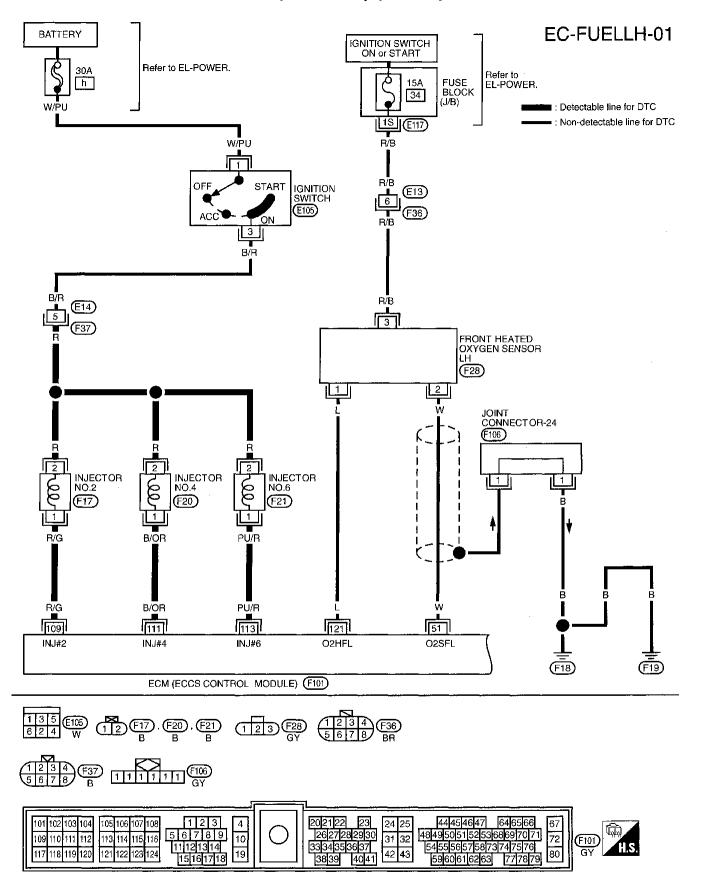
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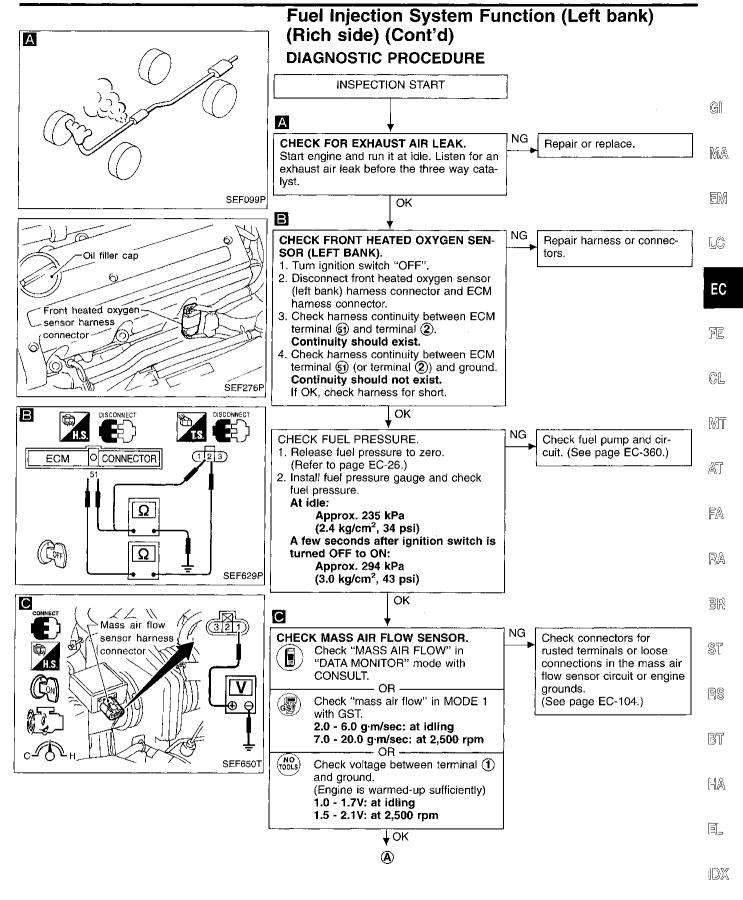
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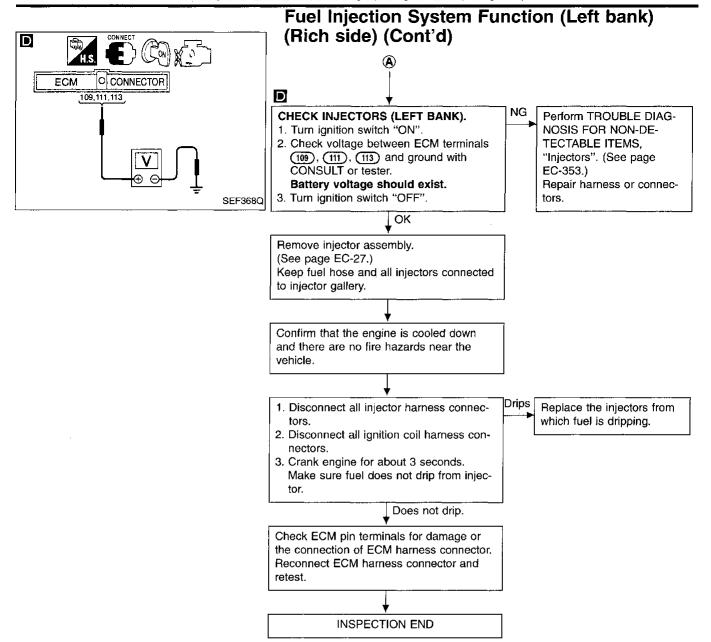
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353 EC-185

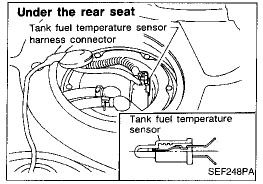
# Fuel Injection System Function (Left bank) (Rich side) (Cont'd)

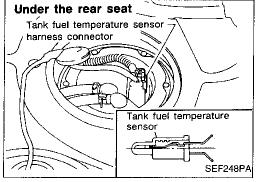






EC-188 356





### 20 Acceptable Resistance kn 0.4 0.2 0.1 -20 0 20 40 60 80 100 (-4) (32) (68) (104) (140) (176) (212) Temperature °C (°F) SEF012P

### Tank Fuel Temperature Sensor **COMPONENT DESCRIPTION**

The tank fuel temperature sensor is used to detect the fuel temperature inside the fuel tank. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the fuel temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.

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### (Reference data)

| Fluid temperature<br>°C (°F) | Voltage*<br>(V) | Resistance $(k\Omega)$ |
|------------------------------|-----------------|------------------------|
| 20 (68)                      | 3.5             | 2.5                    |
| 50 (122)                     | 2.2             | 0.84                   |

\*: These data are reference values and are measured between ECM terminal (52) (Tank fuel temperature sensor) and ECM terminal (43) (ECCS ground).

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### ON BOARD DIAGNOSIS LOGIC

| Diagnostic<br>Trouble Code<br>No. | Malfunction is detected when   | Check Items<br>(Possible Causes)  |
|-----------------------------------|--|---|
| P0180<br>0402                     | <ul> <li>An excessively high or low voltage is entered to ECM.</li> <li>Rationally incorrect voltage is entered to ECM, compared with the voltage signals from engine coolant temperature sensor and intake air temperature sensor.</li> </ul> | Harness or connectors     (The sensor circuit is open or shorted.)     Tank fuel temperature sensor |

### DIAGNOSTIC TROUBLE CODE CONFIRMATION **PROCEDURE**



- Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT.
- 3) Wait at least 12 seconds. - OR -



- Turn ignition switch "ON" and wait at least 12 seconds. 1)
- Select "MODE 7" with GST.

- OR



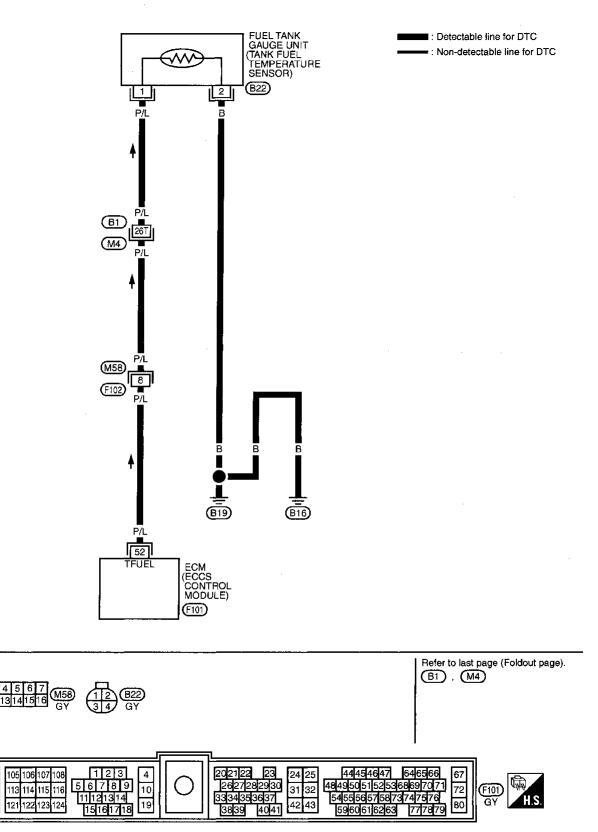
- Turn ignition switch "ON" and wait at least 12 seconds. 1)
- Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

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357 EC-189

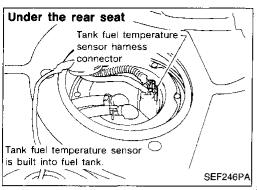
### Tank Fuel Temperature Sensor (Cont'd)

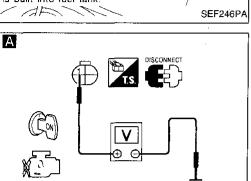
EC-TFTS-01

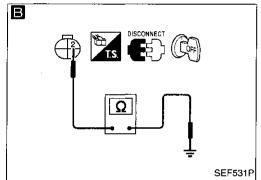


101 102 103 104 109 110 111 112

118 119 120







Hot water-

Tank fuel temperature

sensor connector

### Tank Fuel Temperature Sensor (Cont'd) **DIAGNOSTIC PROCEDURE**

### Α CHECK POWER SUPPLY.

1. Disconnect tank fuel temperature sensor harness connector.

INSPECTION START

- 2. Turn ignition switch "ON".
- 3. Check voltage between terminal (1) and ground with CONSULT or tester.

OK

Voltage: Approximately 5V

Check the following.

NG

- · Harness connectors (B1), (M4)
- · Harness connectors (M58), (F102)
- Harness for open or short between ECM and tank fuel temperature sensor

If NG, repair harness or connector.

Repair harness or connec-

tors.

В

SEF530P

### CHECK GROUND CIRCUIT.

- 1. Turn ignition switch "OFF".
- 2. Check harness continuity between terminal (2) and body ground. Continuity should exist.

OK

If OK, check harness for short.

Replace tank fuel tempera-

CHECK COMPONENT

(Tank fuel temperature sensor). Refer to "COMPONENT INSPECTION" below.

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.

INSPECTION END

COMPONENT INSPECTION

Tank fuel temperature sensor

Check resistance as shown in the figure.

ture sensor.

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Temperature °C (°F) Resistance  $k\Omega$ 20 (68) 2.3 - 2.750 (122) 0.79 - 0.90

SEF379T

(Reference data)

If NG, replace tank fuel temperature sensor.

### No. 6 - 1 Cylinder Misfire, Multiple Cylinder Misfire

### ON BOARD DIAGNOSIS LOGIC

If misfire occurs, the engine speed will fluctuate. If the fluctuation is detected by the crankshaft position sensor (POS), the misfire is diagnosed.

The misfire detection logic consists of the following two conditions.

Crankshaft position sensor (POS)

Engine speed

ECM

1. One Trip Detection Logic (Three Way Catalyst Damage)

When a misfire is detected which will overheat and damage the three way catalyst, the malfunction indicator lamp (MIL) will start blinking; even during the first trip. In this condition, ECM monitors the misfire every 200 engine revolutions.

If the misfire frequency decreases to a level that will not damage the three way catalyst, the MIL will change from blinking to lighting up.

(After the first trip detection, the MIL will light up from engine starting. If a misfire is detected that will cause three way catalyst damage, the MIL will start blinking.)

2. Two Trip Detection Logic (Exhaust quality deterioration)

When a misfire that will not damage the three way catalyst (but will affect exhaust emission) occurs, the malfunction indicator lamp will light up based on the second consecutive trip detection logic. In this condition, ECM monitors the misfire for each 1,000 revolutions of the engine.

| Diagnostic Trouble<br>Code No. | Malfunction is detected when | Check Items<br>(Possible Cause)                                |
|--------------------------------|------------------------------|--|
| P0306 (0603)                   | No. 6 cylinder misfires.     | Improper spark plug  |
| P0305 (0604)                   | No. 5 cylinder misfires.     | Insufficient compression     Incorrect fuel pressure           |
| P0304 (0605)                   | No. 4 cylinder misfires.     | EGR valve     The injector circuit is open or shorted.         |
| P0303 (0606)                   | No. 3 cylinder misfires.     | • Injectors  |
| P0302 (0607)                   | No. 2 cylinder misfires.     | Intake air leaks     The ignition secondary circuit is open or |
| P0301 (0608)                   | No. 1 cylinder misfires.     | shorted.  • Lack of fuel                                       |
| P0300 (0701)                   | Multiple cylinders misfire.  | Magnetized signal plate (flywheel)                             |

### **DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE (Overall)**



- 1) Turn ignition switch "ON", and select "DATA MONITOR" mode with CONSULT.
- 2) Start engine and warm it up sufficiently.
- 3) Turn ignition switch "OFF" and wait at least 5 seconds.
- 4) Start engine again and drive at 1,500 to 3,000 rpm at least 3 minutes. Hold the accelerator pedal as steady as possible during driving.

NOTE: Refer to the freeze frame data for the test driving condition.





- 1) Start engine and warm it up sufficiently.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Start engine again and drive at 1,500 to 3,000 rpm for at least 3 minutes. Hold the accelerator pedal as steady as possible during driving.

NOTE: Refer to the freeze frame data for the test driving condition.

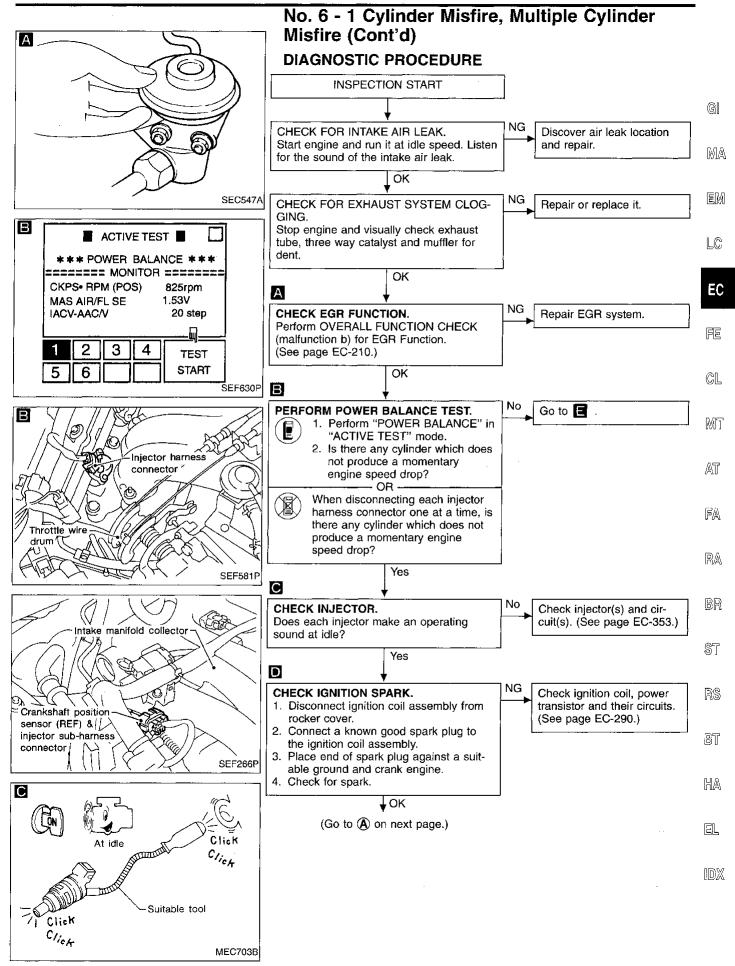
4) Select "MODE 7" with GST.

- OR -

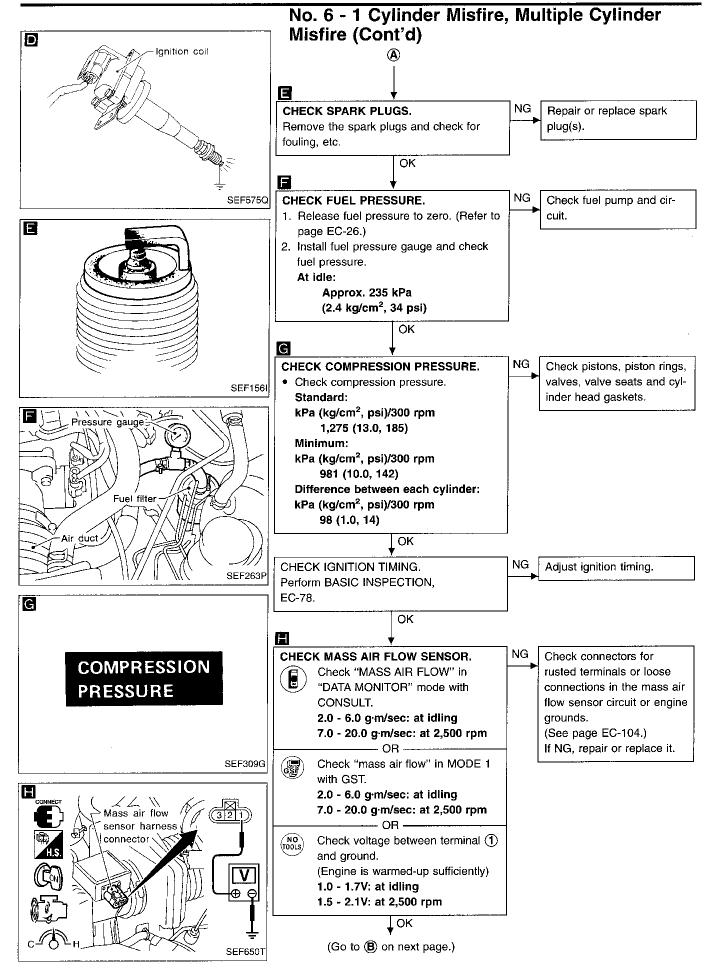


- 1) Start engine and warm it up sufficiently.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Start engine again and drive at 1,500 to 3,000 rpm at least 3 minutes. Hold the accelerator pedal as steady as possible during driving.
- 4) Turn ignition switch "OFF", wait at least 5 seconds, and then turn "ON".
- 5) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

#### TROUBLE DIAGNOSIS FOR DTC P0306 - P0300

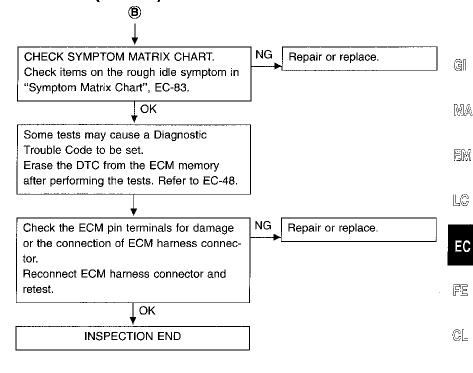


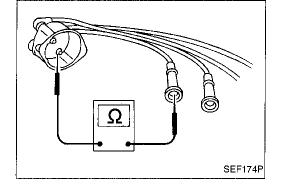
#### TROUBLE DIAGNOSIS FOR DTC P0306 - P0300



#### **TROUBLE DIAGNOSIS FOR DTC P0306 - P0300**

## No. 6 - 1 Cylinder Misfire, Multiple Cylinder Misfire (Cont'd)





#### COMPONENT INSPECTION

#### Ignition wires

- 1. Inspect wires for cracks, damage, burned terminals and for simproper fit.
- Measure the resistance of wires to their distributor cap terminal. Move each wire while testing to check for intermittent breaks.

#### Resistance:

13.6 - 18.4 kΩ/m (4.15 - 5.61 kΩ/ft) at 25°C (77°F)

If the resistance exceeds the above specification, inspect ignition wire to distributor cap connection. Clean connection or replace the ignition wire with a new one.

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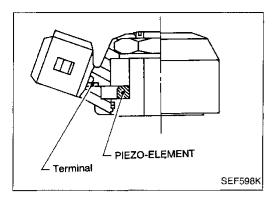
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EC-195 363



#### **Knock Sensor (KS)**

#### COMPONENT DESCRIPTION

The knock sensor is attached to the cylinder block. It senses engine knocking using a piezoelectric element. A knocking vibration from the cylinder block is sensed as vibrational pressure. This pressure is converted into a voltage signal and sent to the ECM.

#### **ECM TERMINALS AND REFERENCE VALUE**

Remarks: Specification data are reference values, and are measured between each terminal and (a) (ECCS ground) with a voltmeter.

| TER-<br>MINAL<br>NO. | WIRE<br>COLOR | ITEM         | CONDITION                        | DATA<br>(DC voltage) |
|----------------------|---------------|--------------|----------------------------------|----------------------|
| 64                   | w             | Knock sensor | Engine is running.  L Idle speed | 2.0 - 3.0V           |

#### ON BOARD DIAGNOSIS LOGIC

\* Freeze frame data is not stored in the ECM for the knock sensor.

The MIL will not light for knock sensor malfunction. The knock sensor has one trip detection logic.

| Diagnostic<br>Trouble Code<br>No. | Malfunction is detected when  | Check Items<br>(Possible Cause)   |
|-----------------------------------|---|---|
| P0325<br>0304                     | <ul> <li>An excessively low or high voltage from the knock<br/>sensor is entered to ECM.</li> </ul> | Harness or connectors     (The knock sensor circuit is open or shorted.)     Knock sensor |

## DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE



- Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
- Start engine and run it at least 5 seconds at idle speed.

  OR



- 1) Start engine and run it at least 5 seconds at idle speed.
- 2) Select "MODE 3" with GST.





- 1) Start engine and run it at least 5 seconds at idle speed.
- Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

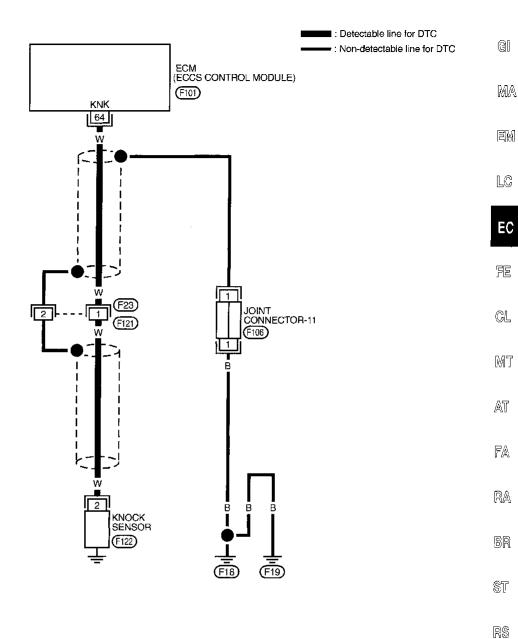
EC-196 364

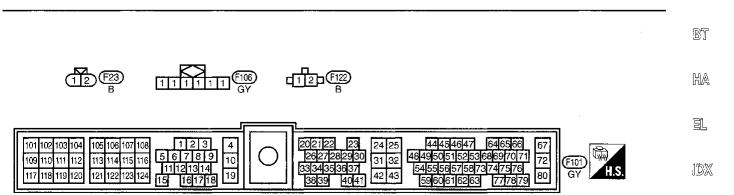
#### Knock Sensor (KS) (Cont'd)

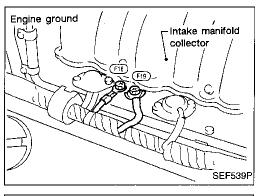
#### **EC-KS-01**

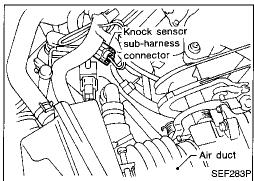
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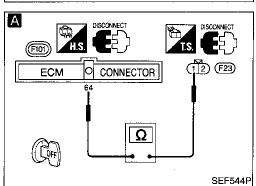
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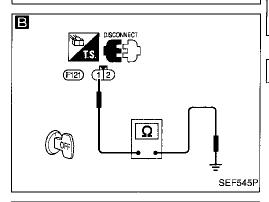


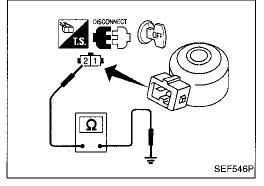




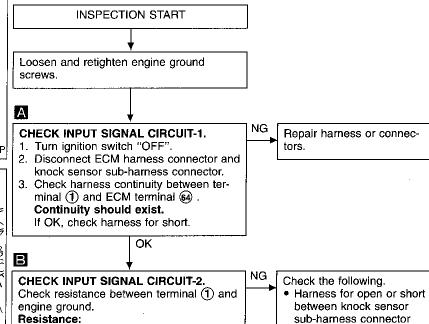


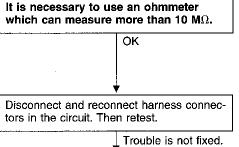






## Knock Sensor (KS) (Cont'd) DIAGNOSTIC PROCEDURE





Approximately 500 - 620 k $\Omega$ 

If OK, check harness for short.

Trouble is not fixed.

Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END

## Harness for open or short between knock sensor sub-harness connector and knock sensor If NG, repair harness or connectors. Knock sensor (Refer to

 Knock sensor (Refer to "COMPONENT INSPECTION" below.)
 If NG, replace knock sensor.

#### **COMPONENT INSPECTION**

#### **Knock sensor**

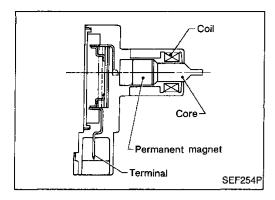
- 1. Disconnect knock sensor harness connector.
- 2. Check resistance between terminal ② and ground.

#### Approximately 500 - 620 k $\Omega$ [at 25°C (77°F)]

• It is necessary to use an ohmmeter which can measure more than 10  $M\Omega$ .

#### **CAUTION:**

Do not use any knock sensors that have been dropped or physically damaged. Use a new one.



## Crankshaft Position Sensor (CKPS) (POS) COMPONENT DESCRIPTION

The crankshaft position sensor (POS) is located on the oil pan facing the gear teeth (cogs) of the signal plate (flywheel). It detects the crankshaft position signal (1° signal).

The sensor consists of a permanent magnet, core and coil.

When engine is running, the gap between the sensor and the gear teeth (cogs) will periodically change. Permeability near the sensor also changes.

Due to the permeability change, the magnetic flux near the core is changed. Therefore, the voltage signal generated in the coil is changed.

The ECM receives the voltage signal and detects the crankshaft position signal (1° signal).

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#### CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Remarks: Specification data are reference values.

| MONITOR ITEM   | CONDITION  | SPECIFICATION                     |
|----------------|--|-----------------------------------|
| CKPS-RPM (POS) | Tachometer: Connect  | Almost the same speed as the CON- |
| CKPS-RPM (REF) | Run engine and compare tachometer indication with the CONSULT value. | SULT value.                       |

**ECM TERMINALS AND REFERENCE VALUE** 

Remarks: Specification data are reference values, and are measured between each terminal and (25) (ECCS ground) with a voltmeter.

| TER-<br>MINAL<br>NO. | WIRE<br>COLOR | ITEM                             | CONDITION  | DATA<br>(DC voltage)                         | AT             |
|----------------------|---------------|----------------------------------|--|--|----------------|
| 49                   | w             | Crankshaft position sensor (POS) | Engine is running.  Idle speed   | Approximately 2.5V★  (V) 4 2 0 1 ms  SEF646T | FA<br>RA<br>BR |
| 4                    | W/B           | ECCS relay (Self-shutoff)        | Engine is running.  Ignition switch "OFF"  For a few seconds after turning ignition switch "OFF" | 0 - 1V                                       | \$T            |
|                      |               |                                  | Ignition switch "OFF"  A few seconds passed after turning ignition switch "OFF"                  | BATTERY VOLTAGE<br>(11 - 14V)                | et             |
| 67<br>72             | R<br>R        | Power supply for ECM             | Ignition switch "ON"   | BATTERY VOLTAGE<br>(11 - 14V)                | KA             |
|                      |               |                                  |  | <u></u>                                      | EL             |

## Crankshaft Position Sensor (CKPS) (POS) (Cont'd)

#### ON BOARD DIAGNOSIS LOGIC

| Diagnostic<br>Trouble Code<br>No. | Malfunction is detected when  | Check Items<br>(Possible Cause)   |
|-----------------------------------|---|---|
| P0335<br>0802                     | 1° signal is not entered to ECM for the first few seconds during engine cranking.      1° signal is not entered to ECM during engine running. | <ul> <li>Harness or connectors (The crankshaft position sensor (POS) circuit is open or shorted.)</li> <li>Crankshaft position sensor (POS)</li> <li>Starter motor (Refer to EL section.)</li> <li>Starting system circuit (Refer to EL section.)</li> <li>Dead (Weak) battery</li> </ul> |

### DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

Before performing the following procedure, confirm that battery voltage is more than 10.5V.

– OR -



- Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
- 2) Crank engine at least 2 seconds.



- 1) Crank engine at least 2 seconds.
- 2) Select "MODE 7" with GST.

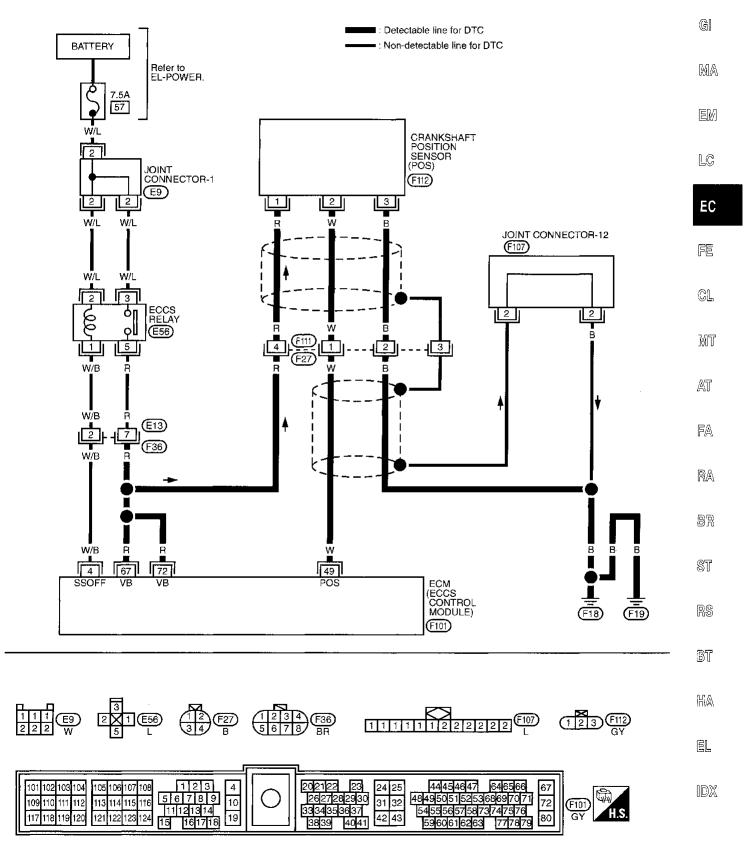


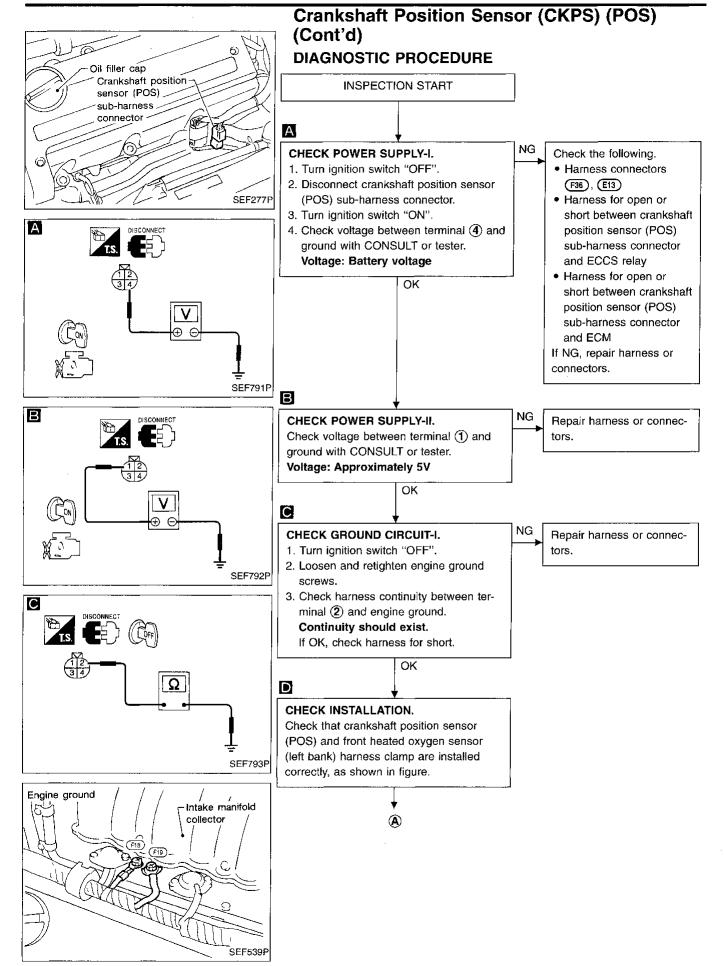


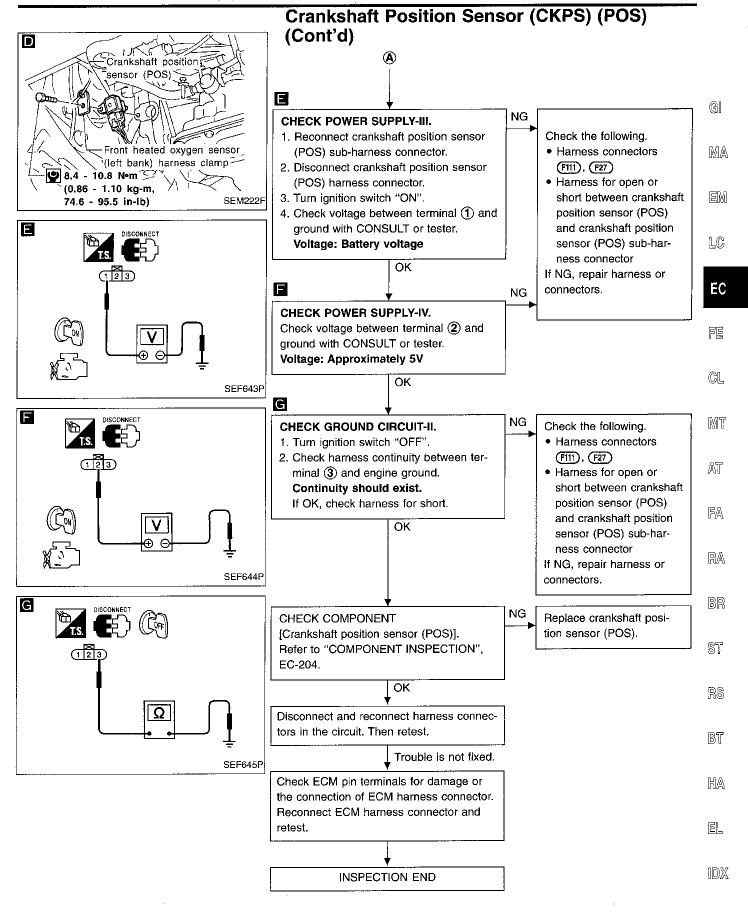
- 1) Crank engine at least 2 seconds.
- 2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

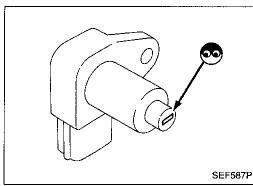
## Crankshaft Position Sensor (CKPS) (POS) (Cont'd)

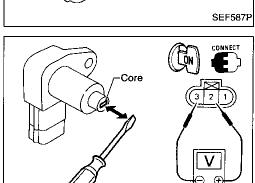
#### EC-POS-01











SEF801P

## Crankshaft Position Sensor (CKPS) (POS) (Cont'd)

#### **COMPONENT INSPECTION**

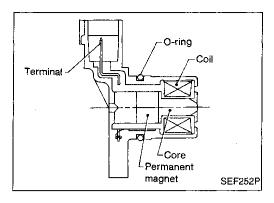
#### Crankshaft position sensor (POS)

- Disconnect crankshaft position sensor (POS) harness connector.
- 2. Loosen the fixing bolt of the sensor.
- 3. Remove the sensor.
- 4. Visually check the sensor for chipping.
- Reconnect crankshaft position sensor (POS) harness connector.
- 6. Turn ignition switch "ON".
- 7. Check voltage between terminals ② and ③ when bringing a screwdriver into contact with, and quickly pulling away from the sensor core.

| Terminal         | Condition   | Voltage          |
|------------------|-------------|------------------|
| <u> </u>         | Contacted   | Approximately 5V |
| <b>(2</b> ), (3) | Pulled away | Approximately 0V |

There should be a steady 5V as the screwdriver is drawn away slowly.

If NG, replace crankshaft position sensor (POS).



#### Camshaft Position Sensor (CMPS) (PHASE) COMPONENT DESCRIPTION

The camshaft position sensor (PHASE) is located on the engine front cover facing the camshaft sprocket. It detects the cylinder No. signal.

The sensor consists of a permanent magnet, core and coil.

When engine is running, the gap between the sensor and the camshaft sprocket will periodically change. Permeability near the sensor also changes.

Due to the permeability change, the magnetic flux near the core is changed. Therefore, the voltage signal generated in the coil is changed.

The ECM receives the voltage signal and detects the cylinder No.

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#### ECM TERMINALS AND REFERENCE VALUE

Remarks: Specification data are reference values, and are measured between each terminal and 😥 (ECCS ground) with a voltmeter.

| TER-<br>MINAL<br>NO. | WIRE<br>COLOR | ITEM                     | CONDITION          | DATA<br>(DC voltage)                    | FE |
|----------------------|---------------|--------------------------|--------------------|---|----|
|                      |               |                          |                    | Approximately 4.2V★ (AC voltage)        | CL |
| 46                   | w             | Camshaft position sensor | Engine is running. | (V)<br>20                               | MT |
| 47                   | W             | (PHASE)                  | L. Idle speed      | 0 W W W W W W W W W W W W W W W W W W W | AT |
|                      |               |                          |                    | SEF644T                                 | FA |

#### ON BOARD DIAGNOSIS LOGIC

| ON BOAILE                         |   |  | _ RA                   |
|-----------------------------------|---|--|------------------------|
| Diagnostic<br>Trouble Code<br>No. | Malfunction is detected when  | Check Items<br>(Possible Cause)  | BR                     |
| P0340<br>0101                     | The cylinder No. signal is not entered to ECM for the first few seconds during engine cranking. | Harness or connectors<br>(The camshaft position sensor (PHASE) circuit is<br>open or shorted.)                       | <br>ST                 |
|                                   | The cylinder No. signal is not entered to ECM during engine running.                            | Camshaft position sensor (PHASE) Starter motor (Refer to EL section.) Starting system circuit (Refer to EL section.) | S.<br>RS               |
|                                   | The cylinder No. signal is not in the normal pattern during engine running.                     |  | ori<br>Ta <del>–</del> |

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#### Camshaft Position Sensor (CMPS) (PHASE) (Cont'd)

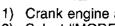
#### **DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE**

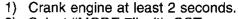
Note: If both DTC P0340 (0101) and P1335 (0407), P0335 (0802) or P1336 (0905) are displayed, perform TROUBLE DIAG-NOSIS FOR DTC P1335, P0335 or P1336 first. (See EC-298, 199 or EC-303.)

Before performing the following procedure, confirm that battery voltage is more than 10.5V.



- 1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
- Crank engine at least 2 seconds. – OR -





2) Select "MODE 7" with GST.





- 1) Crank engine at least 2 seconds.
- 2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

## Camshaft Position Sensor (CMPS) (PHASE) (Cont'd)

#### EC-PHASE-01

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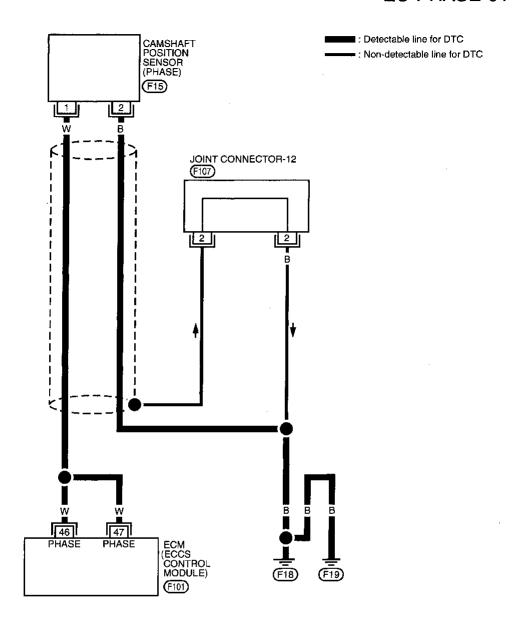
ST

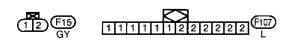
RS

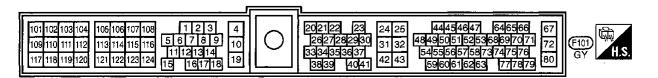
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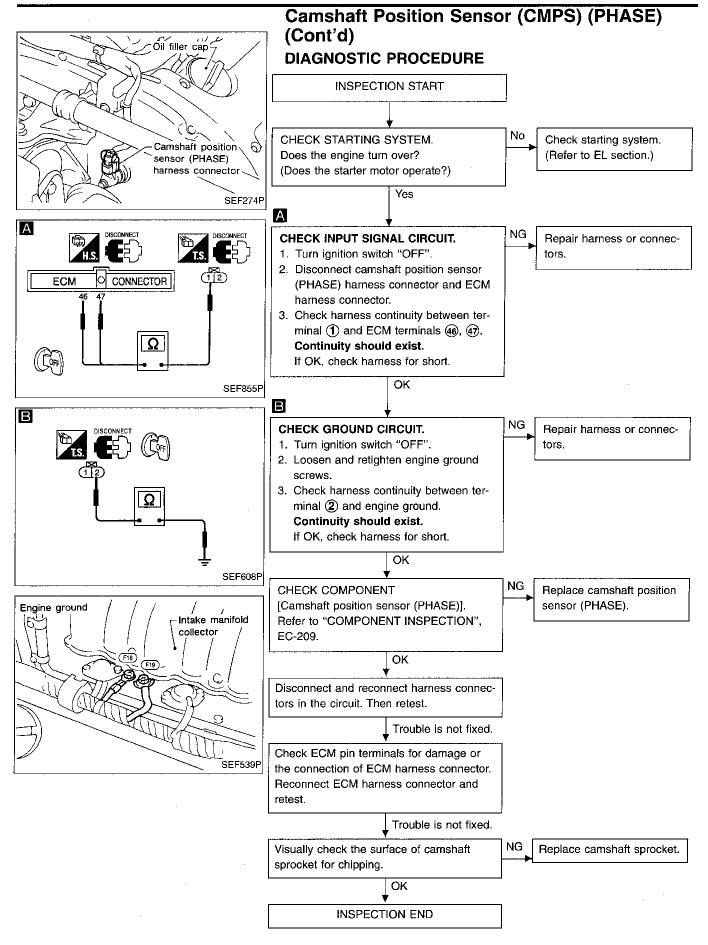
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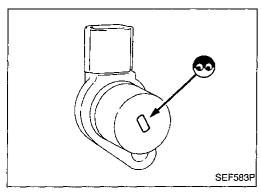
IDX

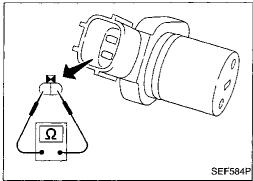












## Camshaft Position Sensor (CMPS) (PHASE) (Cont'd)

#### **COMPONENT INSPECTION**

#### Camshaft position sensor (PHASE)

- Disconnect camshaft position sensor (PHASE) harness connector.
- 2. Loosen the fixing bolt of the sensor.
- 3. Remove the sensor.
- 4. Visually check the sensor for chipping.

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5. Check resistance as shown in the figure.

Resistance:

Approximately 1,440 - 1,760 $\Omega$  at 20°C (68°F) (HITACHI make) Approximately 2,090 - 2,550 $\Omega$  at 20°C (68°F) (MITSUBISHI make) LC

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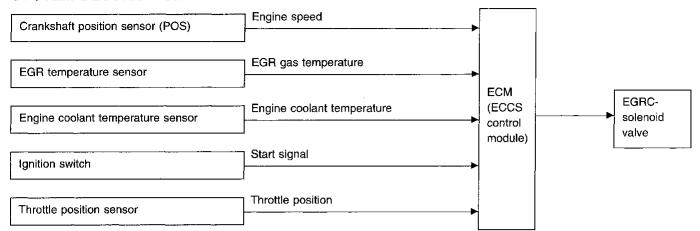
BT

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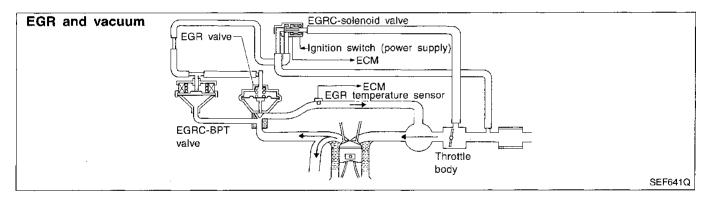
#### **EGR Function**

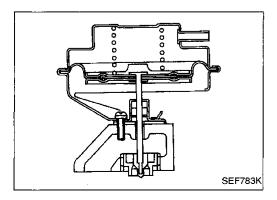
#### SYSTEM DESCRIPTION



This system cuts and controls vacuum applied to the EGR valve to suit engine operating conditions. This cut-and-control operation is accomplished through the ECM and the EGRC-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 remains closed.

- Low engine coolant temperature
- Engine starting
- · Engine stopped
- Engine idling
- Excessively high engine coolant temperature
- Mass air flow sensor malfunction



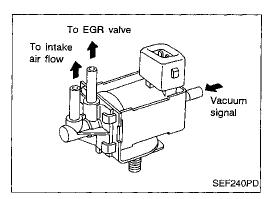


#### **COMPONENT DESCRIPTION**

#### Exhaust gas recirculation (EGR) valve

The EGR valve controls the amount of exhaust gas routed to the intake manifold. Vacuum is applied to the EGR valve in response to throttle valve opening. The vacuum controls the movement of a taper valve connected to the vacuum diaphragm in the EGR valve.

EC-210 378



#### **EGR Function (Cont'd)**

#### **EGRC-solenoid valve**

The EGRC-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 and EGR valve.

When the ECM sends an OFF signal, the vacuum signal passes through the solenoid valve. The signal then reaches the EGR valve.

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#### CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Remarks: Specification data are reference values.

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| MONITOR ITEM | CONDITION  |                                | SPECIFICATION  |
|--------------|--|--------------------------------|----------------|
| EGR TEMP SEN | Engine: After warming up   |                                | Less than 4.5V |
| EGRC SOLV    | <ul> <li>Engine: After warming up</li> <li>Air conditioner switch: "OFF"</li> <li>Shift lever: "N"</li> <li>No-load</li> </ul> | Idle                           | ON             |
| Edno 30L/V   |  | Racing up to 1,500 - 2,000 rpm | OFF            |

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#### **ECM TERMINALS AND REFERENCE VALUE**

Remarks: Specification data are reference values, and are measured between each terminal and (2s) (ECCS ground) with a voltmeter.

| TER-<br>MINAL<br>NO. | WIRE | ITEM                   | CONDITION   | DATA<br>(DC voltage)          | M<br>as           |
|----------------------|------|------------------------|---|-------------------------------|-------------------|
| 43                   | В    | Sensor's ground        | Engine is running. (Warm-up condition)  Idle speed                      | ov                            | — A<br>— F        |
| 63                   | L/OR | ECD temperature concer | Engine is running. (Warm-up condition)  Idle speed                      | Less than 4.5V                |                   |
| 63                   | LOR  | EGR temperature sensor | Engine is running. (Warm-up condition)  EGR system is operating.        | 0 - 1.0V                      | — ;;<br>B         |
| 100                  |      | EODO adamidualia       | Engine is running. (Warm-up condition)  Revving engine up to 2,000 rpm. | BATTERY VOLTAGE<br>(11 - 14V) | <del>-</del><br>§ |
| 103 j                | L/B  | EGRC-solenoid valve    | Engine is running. (Warm-up condition)  Idle speed                      | 0 - 0.7V                      | _<br>R            |

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### EGR temperature sensor **EGR** temperature **ECM** SEF073P

#### ON BOARD DIAGNOSIS LOGIC

If the absence of EGR flow is detected by EGR temperature sensor under the condition that calls for EGR, a low-flow malfunction is diagnosed.

If EGR temperature sensor detects EGR flow under the condition that does not call for EGR, a high-flow malfunction is diagnosed.

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#### **EGR Function (Cont'd)**

| Diagnostic Trouble Code No. | Malfunction is detected when  | Check Items (Possible Cause)  |
|-----------------------------|---|---|
| P0400<br>0302               | A) The exhaust gas recirculation (EGR) flow is excessively low during the specified driving condition.  | EGR valve stuck closed  EGRC-BPT valve leaks  Passage obstructed  EGRC-solenoid valve  Tube leaking for EGR valve  EGR temperature sensor |
|                             | B) The exhaust gas recirculation (EGR) flow is excessively high during the specified driving condition. | EGRC-solenoid valve     EGR valve leaking or stuck open     EGR temperature sensor  |

#### **OVERALL FUNCTION CHECK**

This procedure can be used for checking the overall function of the EGR function. During this check, a DTC might not be confirmed.

Before starting with the following procedure, check the engine coolant temperature of the freeze frame data with CONSULT or Generic Scan Tool.

If the engine coolant temperature is higher than or equal to 55°C (131°F), perform only "Procedure for malfunction A".

If the engine coolant temperature is lower than 55°C (131°F), perform both "Procedure for malfunction A" and "Procedure for malfunction B".

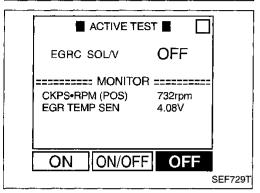
If the freeze frame data for another malfunction is stored in the ECM, perform both "Procedure for malfunction A" and "Procedure for malfunction B". In this case, check DTCs in the ECM and perform inspections one by one based on "Diagnostic Trouble Code (DTC) Inspection Priority Chart", EC-81.

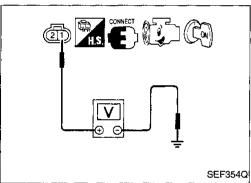
EC-212 380

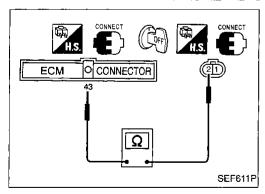
## Throttle body

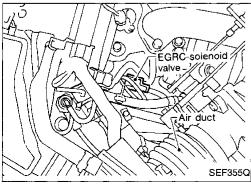
EGR valve

Air duct









#### **EGR Function (Cont'd)**

#### Procedure for malfunction A



SEF592P8

- 1) Start engine and warm it up sufficiently.
- Select "EGRC SOLENOID VALVE" in "ACTIVE TEST" mode with CONSULT and turn the solenoid valve "OFF".
- 3) Check the EGR valve lifting when revving engine from 2,000 rpm up to 4,000 rpm under no load.

EGR valve should lift up and down without sticking.

4) Check voltage between EGR temperature sensor harness connector terminal ① and ground at idle speed.

Less than 4.5V should exist.

5) Turn ignition switch "OFF".

6) Check harness continuity between EGR temperature sensor harness connector terminal ② and ECM terminal ④.

Continuity should exist.

7) Perform "COMPONENT INSPECTION", "EGR temperature sensor". (See page EC-219.)

— OR ——

- Disconnect EGRC-solenoid valve harness connector. (The DTC for EGRC-solenoid valve will be displayed, however, ignore it.)
- Start engine and warm it up sufficiently.
- 3) Check the EGR valve lifting when revving engine from 2,000 rpm up to 4,000 rpm under no load.

EGR valve should lift up and down without sticking.
4) Reconnect EGRC-solenoid valve harness connector.

5) Check voltage between EGR temperature sensor harness connector terminal ① and ground at idle speed.

Less than 4.5V should exist.

6) Turn ignition switch "OFF".

7) Check harness continuity between EGR temperature sensor harness connector terminal (2) and ECM terminal (43).

Continuity should exist.

8) Perform "COMPONENT INSPECTION", "EGR temperature sensor". (See page EC-219.)

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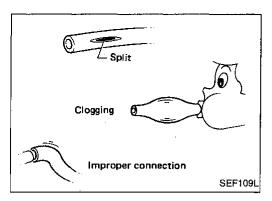
RS

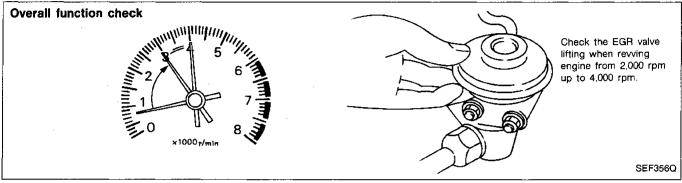
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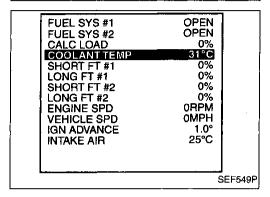
IDX

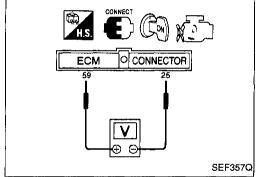
#### EGR Function (Cont'd)





## EGRC SOL/V ON ======= MONITOR ======= CKPS+RPM (POS) 725rpm ON ON/OFF OFF SEF612P





#### **EGR Function (Cont'd)**

#### Procedure for malfunction B



- 1) Start engine.
- 2) Select "EGRC SOLENOID VALVE" in "ACTIVE TEST" mode with CONSULT and turn the solenoid valve "ON".
- 3) Check for the EGR valve lifting when revving engine from 2,000 rpm up to 4,000 rpm under no load.

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- 1) Turn ignition switch "ON".
- Confirm the engine coolant temperature is lower than 52°C (126°F) in "Mode 1" with GST.
   Perform the following steps before its temperature becomes higher than 52°C (126°F).

3) Start engine.

4) Check for the EGR valve lifting when revving engine from 2,000 rpm up to 4,000 rpm under no load. EGR valve should be closed and should not lift up.

· OR —

1) Turn ignition switch "ON".

2) Confirm the voltage between ECM terminals (9) and (25) is higher than 2.24V.

Perform the following steps before the voltage becomes lower than 2.24V.

3) Start engine.

4) Check for the EGR valve lifting when revving engine from 2,000 rpm up to 4,000 rpm under no load. EGR valve should be closed and should not lift up.

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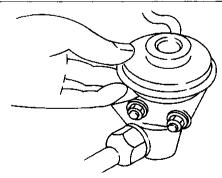
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Check the EGR valve lifting when revving engine from 2,000 rpm up to 4,000 rpm.

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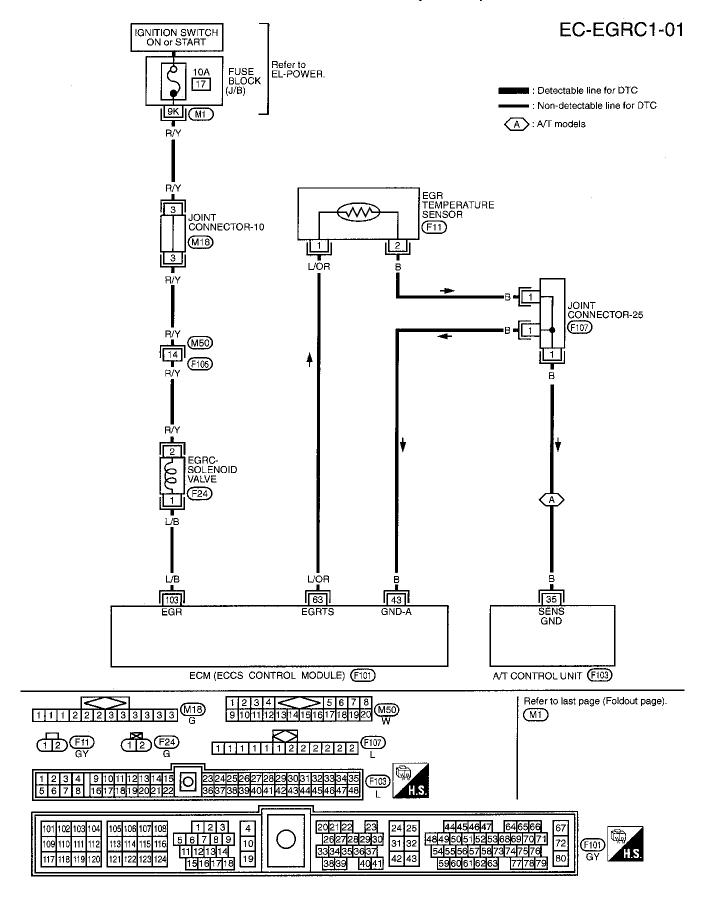
EL

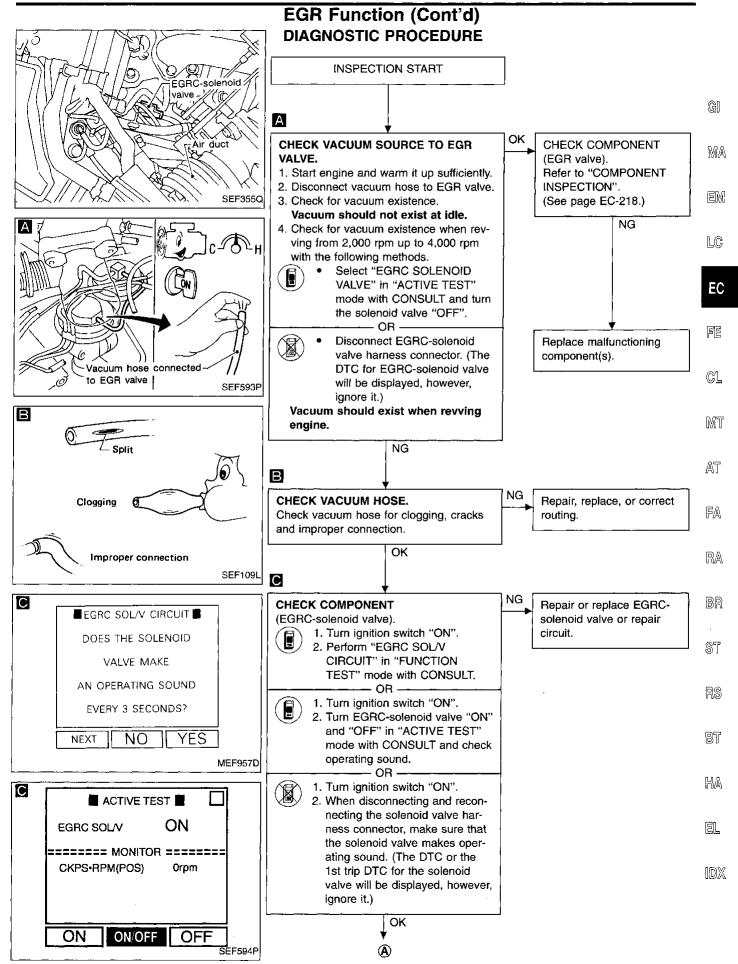
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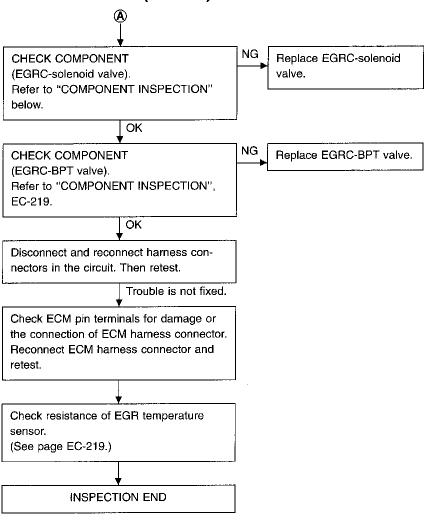
EC-215

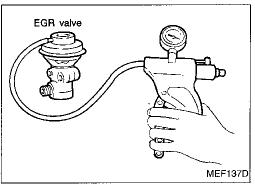
#### **EGR Function (Cont'd)**

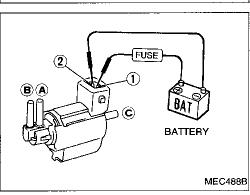




#### **EGR Function (Cont'd)**







#### **COMPONENT INSPECTION**

#### **EGR** valve

Apply vacuum to EGR valve vacuum port with a hand vacuum pump.

#### EGR valve spring should lift.

If NG, replace EGR valve.

#### **EGRC-solenoid valve**

Check solenoid valve, following the table as shown below:

| Conditions  | Air passage continuity between (A) and (B) | Air passage<br>continuity<br>between (A) and (C) |
|---|--|--|
| 12V direct current supply between terminals ① and ② | Yes  | No   |
| No supply   | No   | Yes  |

If NG, replace the solenoid valve.

# SEF643Q

Acceptable range

10,000

1,000

Resistance kΩ

100

10

#### EGR Function (Cont'd)

#### EGR temperature sensor

Check resistance change and resistance value.

#### (Reference data)

| EGR temperature | Voltage | Resistance  |
|-----------------|---------|-------------|
| °C (°F)         | (V)     | $(M\Omega)$ |
| 0 (32)          | 4.81    | 7.9 - 9.7   |
| 50 (122)        | 2.82    | 0.57 - 0.70 |
| 100 (212)       | 0.8     | 0.08 - 0.10 |

If NG, replace EGR temperature sensor.



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#### **EGRC-BPT** valve



 Vacuum from the other port and check for leakage while applying a pressure above 0.981 kPa (100 mmH<sub>2</sub>O, 3.94 inH<sub>2</sub>O) from under EGRC-BPT valve.

3. If a leakage is noted, replace the valve.

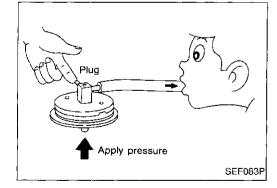


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Temperature °C (°F)

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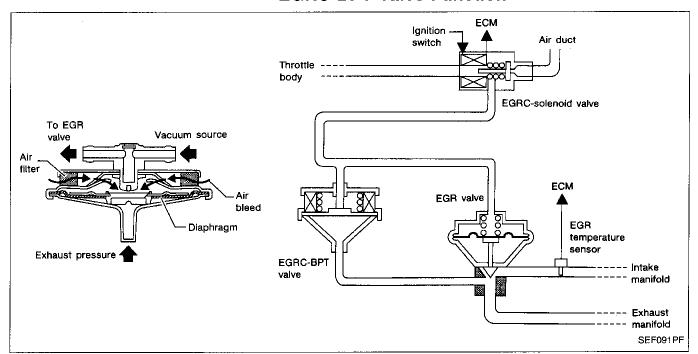
(302)

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#### **EGRC-BPT Valve Function**



#### SYSTEM DESCRIPTION

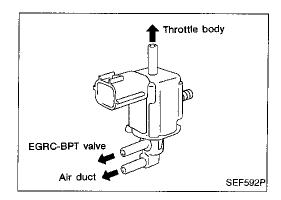
The EGRC-BPT valve monitors exhaust pressure to activate the diaphragm, controlling throttle body vacuum applied to the EGR valve. In other words, recirculated exhaust gas is controlled in response to positioning of the EGR valve or to engine operation.

#### ON BOARD DIAGNOSIS LOGIC

If too much EGR flow exists due to an EGRC-BPT valve malfunction, off idle engine roughness will increase. If the roughness is excessive, then the vacuum to the EGR valve is interrupted through the EGRC-solenoid valve. If the engine roughness is reduced at that time, the EGRC-BPT valve malfunction is indicated.

| Diagnostic Trouble<br>Code No. | Malfunction is detected when                  | Check Items<br>(Possible Cause)   |
|--------------------------------|---|---|
| P0402<br>0306                  | The EGRC-BPT valve does not operate properly. | <ul> <li>EGRC-BPT valve</li> <li>Loose or disconnected rubber tube</li> <li>Blocked rubber tube</li> <li>Intake manifold EGR passage</li> </ul> |

EC-220 388



## EGRC-BPT Valve Function (Cont'd) OVERALL FUNCTION CHECK

Use this procedure to check the overall function of the EGRC-BPT valve. During the check, a 1st trip DTC might not be confirmed.

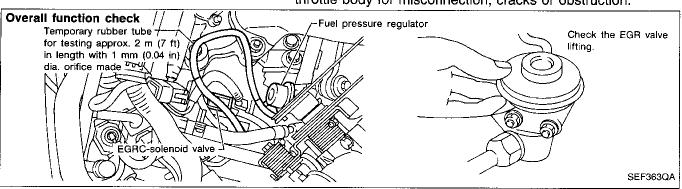
- 1) Disconnect the rubber tube to the fuel pressure regulator from the intake manifold at the fuel pressure regulator.
- Disconnect the rubber tube to the EGRC-solenoid valve from the EGRC-BPT valve at the EGRC-solenoid valve.
- 3) Connect these two rubber tubes using a rubber tube that is approx. 2 meter in length and has 1 mm (0.04 in) dia. orifice made in it. (The intake manifold vacuum will be directly applied to the EGRC-BPT valve.)
- 4) Start engine.
- 5) Check for the EGR valve lifting with engine at less than 1,500 rpm under no load.

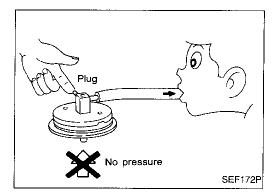
#### EGR valve should remain closed or slightly lift up.

6) Keep engine speed at about 2,000 rpm, then check the EGR valve lifting when revving engine up to 4,000 rpm under no load.

EGR valve should lift up to the full position, and go down without sticking when the engine is returned to idle.

 Check rubber tube between the EGRC-solenoid valve and throttle body for misconnection, cracks or obstruction.





#### COMPONENT INSPECTION

#### **EGRC-BPT** valve

- 1. Plug one of two ports of EGRC-BPT valve.
- Vacuum from the other port and check leakage without applying any pressure from under EGRC-BPT valve.

Leakage should exist.

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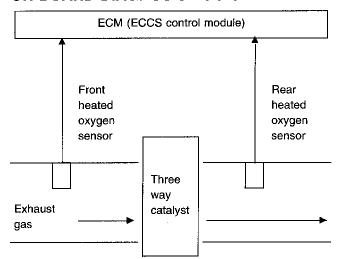
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#### **Three Way Catalyst Function**

#### ON BOARD DIAGNOSIS LOGIC



ECM monitors the switching frequency ratio of front and rear heated oxygen sensors.

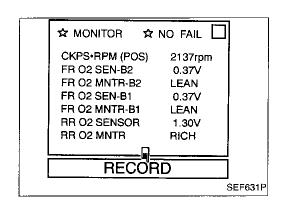
A three way catalyst with high oxygen storage capacity will indicate a low switching frequency of rear heated oxygen sensor. As oxygen storage capacity decreases, the rear heated oxygen sensor switching frequency will increase.

When the frequency ratio of front and rear heated oxygen sensors approaches a specified limit value, the three way catalyst malfunction is diagnosed.

| Diagnostic Trouble<br>Code No. | Malfunction is detected when   | Check Items<br>(Possible Cause)   |
|--------------------------------|--|---|
| P0420<br>0702                  | Three way catalyst does not operate properly. Three way catalyst does not have enough oxygen storage capacity. | Three way catalyst Exhaust tube Intake air leaks Injectors Injector leaks |

#### OVERALL FUNCTION CHECK

Use this procedure to check the overall function of the three way catalyst. During this check, a 1st trip DTC might not be confirmed.





- 1) Start engine and warm it up sufficiently.
- 2) Set "MANU TRIG" and "HI SPEED", then select "FR O2 SEN-B1", "FR O2 SEN-B2", "RR O2 SENSOR", "FR O2 MNTR-B2", "FR O2 MNTR-B1", "RR O2 MNTR" in "DATA MONITOR" mode with CONSULT.
- 3) Touch "RECORD" on CONSULT screen with engine speed held at 2,000 rpm constant under no load.
- 4) Make sure that the switching frequency between "RICH" and "LEAN" of "RR O2 SENSOR" is very less than that of "FR O2 SEN-B1" or "FR O2 SEN-B2". Switching frequency ratio =

Rear heated oxygen sensor switching frequency

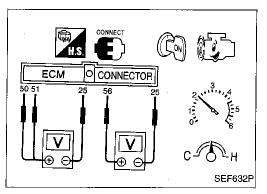
Front heated oxygen sensor switching frequency

#### This ratio should be less than 1/2.

If the ratio is greater than 0.5, the three way catalyst is not operating properly.

Note: If the "FR O2 MNTR-B1" or "FR O2 MNTR-B2" does not indicate "RICH" and "LEAN" periodically more than 5 times within 10 seconds at step 3, perform TROUBLE DIAGNOSIS FOR DTC P0130 or P0150 first. (See page EC-141 or EC-159.)

#### Three Way Catalyst Function (Cont'd)





1) Start engine and warm it up sufficiently.

2) Set voltmeters probes between ECM terminals 60 [front heated oxygen sensor (right bank) signal], 61 [front heated oxygen sensor (left bank) signal] and 25 (engine ground), and ECM terminals 66 (rear heated oxygen sensor signal) and 25 (engine ground).

**E** 

Keep engine speed at 2,000 rpm constant under no load.

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4) Make sure that the voltage switching frequency (high & low) between ECM terminals 66 and 25 is very less than that of ECM terminals 60 and 25, or 61 and 25.

Switching frequency ratio =

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Rear heated oxygen sensor voltage switching frequency

LC

Front heated oxygen sensor voltage switching frequency

EC

#### This ratio should be less than 1/2.

If the ratio is greater than 0.5, it means three way catalyst does not operate properly.

Note: If the voltage at terminal 50 or 51 does not switch periodically more than 5 times within 10 seconds at step 3, perform TROUBLE DIAGNOSIS FOR DTC 0503 or 0303 first. (See page EC-141 or EC-159.)

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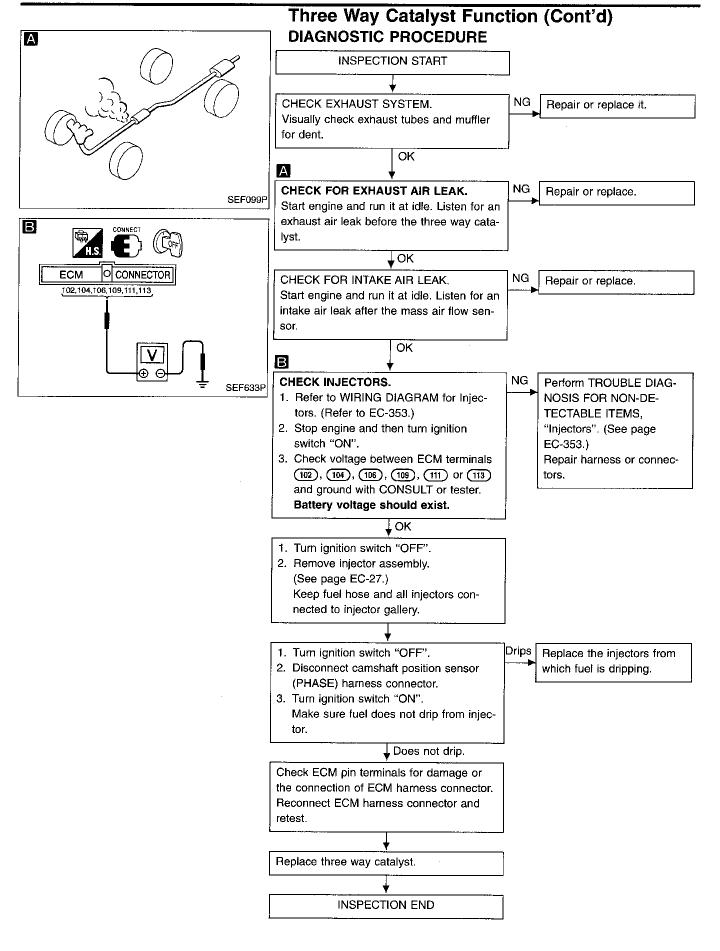
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## **Evaporative Emission (EVAP) Control System** (Small Leak)

Note: If both DTC P0440 and P0446 are displayed, perform TROUBLE DIAGNOSIS FOR DTC P0446 first. (See EC-241.)

#### ON BOARD DIAGNOSIS LOGIC

This diagnosis allows leak detection in the EVAP purge line to be accomplished using two methods. One is the pressure test which utilizes vapor pressure in the fuel tank. The other is the vacuum test utilizing MA the engine intake manifold vacuum.

#### Pressure test

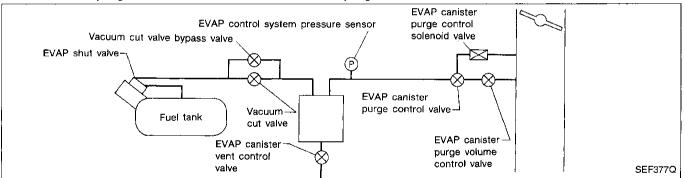
The EVAP canister vent control valve is closed to shut the EVAP purge line off. The vacuum cut valve bypass valve will then be opened to clear the line between the fuel tank and the EVAP canister purge control valve. The EVAP control system pressure sensor can now monitor the pressure inside the fuel tank.

When no pressure rise is observed, carry out the vacuum test. If pressure rise is observed, conduct leak detection check on the line between the vacuum cut valve and EVAP canister purge control valve, under the "Pressure test" condition.

#### Vacuum test

In the event of no pressure rise being observed in the "Pressure test", conduct the alternative leak detection check. This check, on the line between the fuel tank and EVAP canister purge control valve, is accomplished under the "Vacuum test" condition.

The vacuum cut valve bypass valve is opened to clear the line between the fuel tank and the EVAP canister purge control valve. The EVAP canister vent control valve will then be closed to shut the EVAP purge line off. The EVAP canister purge volume control valve and EVAP canister purge control valve are opened to depressurize the EVAP purge line using intake manifold vacuum. After this depressurization is implemented, the EVAP canister purge control valve and EVAP canister purge volume control valve will be closed.



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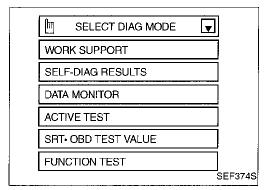
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## Evaporative Emission (EVAP) Control System (Small Leak) (Cont'd)

| Diagnostic<br>Trouble Code<br>No. | Malfunction is detected when   | Check Items<br>(Possible Cause)   |
|-----------------------------------|--|---|
| P0440<br>0705                     | EVAP control system has a leak.     EVAP control system does not operate properly. | <ul> <li>Incorrect fuel tank vacuum relief valve</li> <li>Incorrect fuel filler cap used</li> <li>Fuel filler cap remains open or fails to close.</li> <li>Foreign matter caught in fuel filler cap.</li> <li>Leak is in line between intake manifold and EVAP canister purge control valve.</li> <li>Foreign matter caught in EVAP canister vent control valve.</li> <li>EVAP canister or fuel tank leaks</li> <li>EVAP purge line (pipe and rubber tube) leaks</li> <li>EVAP purge line rubber tube bent.</li> <li>Blocked or bent rubber tube to EVAP control system pressure sensor</li> <li>Loose or disconnected rubber tube</li> <li>EVAP canister purge control valve</li> <li>EVAP canister purge control valve</li> <li>EVAP canister purge control solenoid valve</li> <li>Absolute pressure sensor</li> <li>Tank fuel temperature sensor</li> <li>MAP/BARO switch solenoid valve</li> <li>Blocked or bent rubber tube to MAP/BARO switch solenoid valve</li> <li>O-ring of EVAP canister vent control valve is missing or damaged.</li> </ul> |

#### **CAUTION:**

- Use only a genuine fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL
  may come on.
- If the fuel filler cap is not tightened properly, the MIL may come on.
- Use only a genuine rubber tube as a replacement.



### DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

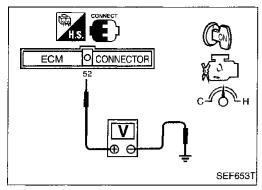


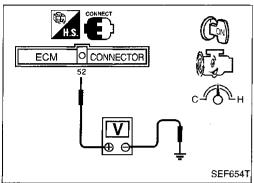
#### **CAUTION:**

- Always select "SINGLE TEST" with CONSULT when performing the "FUNCTION TEST".
- Perform "FUNCTION TEST" when the fuel level is less than 3/4 full. If not, inspect fuel filler cap and fuel tank separately. Refer to EC-228.
- Select "EVAP (SMALL LEAK)" in "FUNCTION TEST" mode with CONSULT. Follow the instruction displayed.
- 2) Make sure that "OK" is displayed with "EVAP (SMALL LEAK)". (If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE".)
  Refer to "DIAGNOSTIC PROCEDURE", EC-228.

— OR —

**EC-226** 394





#### **Evaporative Emission (EVAP) Control System** (Small Leak) (Cont'd)



- Start engine and warm it up sufficiently. 1)
- Turn ignition switch "OFF" and wait at least 5 seconds. Turn ignition switch "ON" and wait at least 12 seconds. 2)
- Check voltage between ECM terminal 52 and ground (Voltage 1).

Voltage: 1.9 - 4.2V

- Restart engine and let it idle for at least 70 seconds.
- Maintain the following conditions for at least 80 seconds.

Gear position: Suitable gear position Vehicle speed: 40 - 80 km/h (25 - 50 MPH) Engine speed: 1,500 - 2,500 rpm

Engine coolant temperature: Less than 100°C (212°F)

Stop the vehicle and let engine at idle.

- 8) Maintain the following conditions for at least 2 seconds. Gear position: Suitable gear position Vehicle speed: 40 - 60 km/h (25 - 37 MPH) Engine speed: 1,500 - 2,500 rpm Engine coolant temperature: Less than 100°C (212°F)
- 9) Perform steps 7,8 more than 10 times.
- 10) Decelerate the vehicle to idle and wait at least 10 sec-
- 11) Check voltage between ECM terminal (52) and ground (Voltage 2). Voltage: 1.9 - 4.2V
- 12) Check voltage decrease between voltage 1 and 2. Voltage 2 - Voltage 1 ≥ 0.01V
- 13) Maintain the following conditions for 9 minutes after 12 minutes have passed from restarting engine in step 5. Gear position: Suitable gear position Vehicle speed: 20 - 80 km/h (12 - 50 MPH) Engine speed: 800 - 3,500 rpm Engine coolant temperature: Less than 100°C
- (212°F) 14) Stop the vehicle, turn ignition switch "OFF", wait at least 5 seconds, and then turn "ON".
- 15) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

#### NOTE:

- Hold the accelerator pedal as steady as possible during driving in steps 6, 8 and 13.
- It is better that the fuel level is low.

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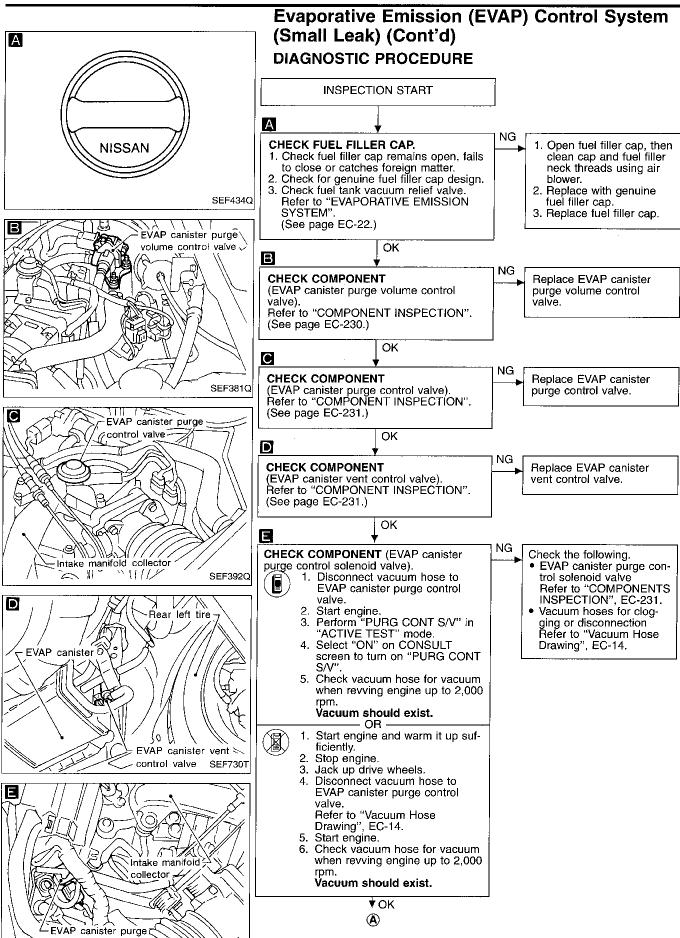
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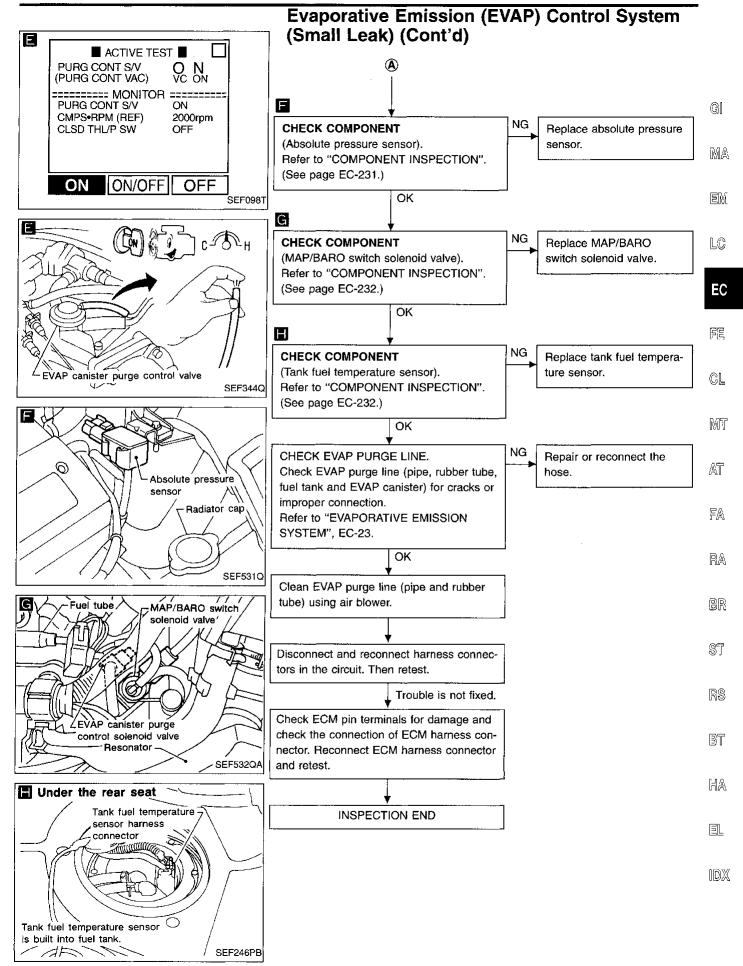
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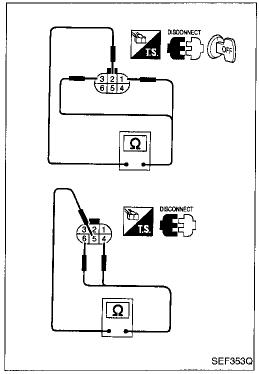


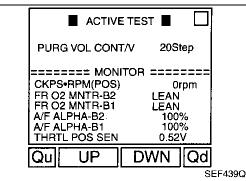
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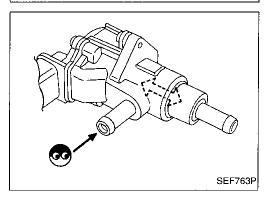
control solenoid valve

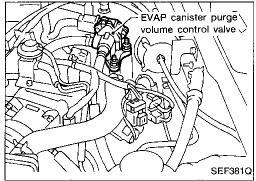


**EC-229** 397









# **Evaporative Emission (EVAP) Control System** (Small Leak) (Cont'd)

### **COMPONENT INSPECTION**

### **EVAP** canister purge volume control valve



- 1. Disconnect EVAP canister purge volume control valve harness connector.
- 2. Check resistance between the following terminals. terminal (2) and terminals (1), (3)

terminal (5) and terminals (4), (6)

#### Resistance:

### Approximately 30Ω [At 25°C (77°F)]

- 3. Reconnect EVAP canister purge volume control valve harness connector.
- 4. Remove EVAP canister purge volume control valve from intake manifold collector and disconnect hoses from the valve.

  (Plug the purge hoses. The EVAP canister purge vol-
  - (Plug the purge hoses. The EVAP canister purge volume control valve harness connector should remain connected.)
- 5. Turn ignition switch "ON".
- Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT and ensure the EVAP canister purge volume control valve shaft smoothly moves forward and backward according to the valve opening. If NG, replace the EVAP canister purge volume control valve.



- 1. Disconnect EVAP canister purge volume control valve harness connector.
- 2. Check resistance between the following terminals. terminal (2) and terminals (1), (3) terminal (5) and terminals (4), (6)

- OR -

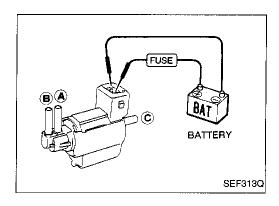
### Resistance:

### Approximately 30Ω [At 25°C (77°F)]

- 3. Reconnect EVAP canister purge volume control valve harness connector.
- 4. Remove EVAP canister purge volume control valve from intake manifold collector and disconnect hoses from the valve.
  - (Plug the purge hoses. The EVAP canister purge volume control valve harness connector should remain connected.)
- Turn ignition switch "ON" and "OFF" and ensure the EVAP canister purge volume control valve shaft smoothly moves forward and backward according to the ignition switch position.

If NG, replace the EVAP canister purge volume control valve.

**EC-230** 398



# **Evaporative Emission (EVAP) Control System** (Small Leak) (Cont'd)

### **EVAP** canister purge control solenoid valve

Check air passage continuity.

| Condition                                   | Air passage<br>continuity<br>between (A) and (B) | Air passage<br>continuity<br>between (A) and (C) |
|---|--|--|
| 12V direct current supply between terminals | Yes  | No   |
| No supply                                   | No   | Yes  |

If NG, replace solenoid valve.



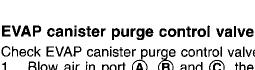
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Check EVAP canister purge control valve as follows:

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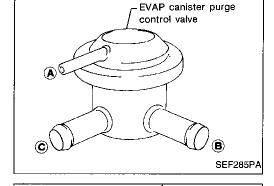
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- Blow air in port (A), (B) and (C), then ensure that there is no leakage.
- Apply vacuum to port (A). [Approximately -13.3 to -20.0 kPa 2. (-100 to -150 mmHg, -3.94 to -5.91 inHg)]Blow air in port (c) and ensure free flow out of port (B).

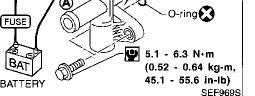


# EVAP canister vent control valve

Check air passage continuity.

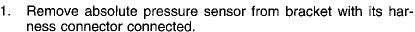
| Condition   | Air passage continuity between (A) and (B) |
|---|--|
| 12V direct current supply between terminals ① and ② | No   |
| No supply   | Yes  |

If NG, clean valve using air blower or replace as necessary. Make sure new O-ring is installed properly.



FUSE

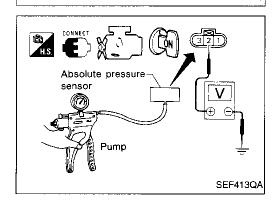
# Absolute pressure sensor



2. Remove hose from absolute pressure sensor.

3. Apply vacuum and pressure to absolute pressure sensor as shown in figure.

Check output voltage between terminal (2) and engine ground.



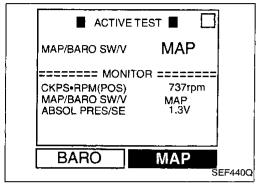
# Evaporative Emission (EVAP) Control System (Small Leak) (Cont'd)

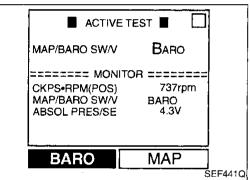
| Pressure (Absolute pressure)     | Voitage (V)       |
|----------------------------------|-------------------|
| 106.6 kPa (800 mmHg, 31.50 inHg) | Approximately 4.6 |
| 13.3 kPa (100 mmHg, 3.94 inHg)   | Approximately 0.5 |

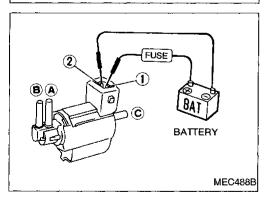
#### CAUTION:

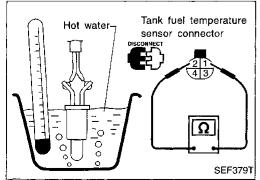
### Always calibrate the vacuum pump gauge when using it.

5. If NG, replace absolute pressure sensor.









#### MAP/BARO switch solenoid valve



- 1. Start engine and warm it up sufficiently.
- Perform "MAP/BARO SW/V" in "ACTIVE TEST" mode with CONSULT.
- 3. Make sure of the following.
  - When selecting "MAP", "ABSOL PRES/SE" indicates approximately 1.3V.
  - When selecting "BARO", "ABSOL PRES/SE" indicates approximately 4.3V.
- 4. If NG, check solenoid valve below.



1. Remove MAP/BARO switch solenoid valve.

OR

2. Check air passage continuity.

| Condition   | Air passage continuity between (A) and (B) | Air passage continuity between (A) and (C) |
|---|--|--|
| 12V direct current supply between terminals ① and ② | Yes  | No   |
| No supply   | No   | Yes  |

3. If NG, replace solenoid valve.

# Tank fuel temperature sensor

Check resistance as shown in the figure.

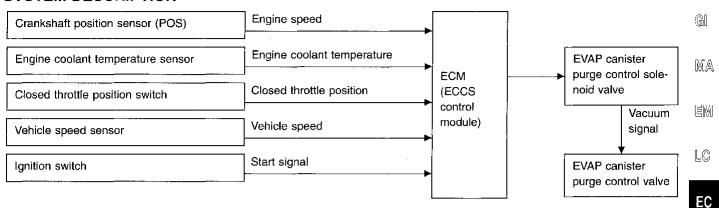
#### (Reference data)

| Temperature °C (°F) | Resistance kΩ |
|---------------------|---------------|
| 20 (68)             | 2.3 - 2.7     |
| 50 (122)            | 0.79 - 0.90   |

If NG, replace tank fuel temperature sensor.

# **Evaporative Emission (EVAP) Canister Purge** Control Valve/Solenoid Valve

### SYSTEM DESCRIPTION

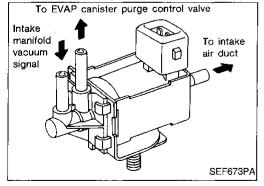


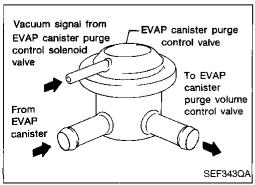
This system controls the vacuum signal applied to the EVAP canister purge control valve.

When the ECM detects any of the following conditions, current does not flow through the EVAP canister purge control solenoid valve.

The solenoid valve cuts the vacuum signal so that the EVAP canister purge control valve remains closed.

- Start switch "ON"
- Closed throttle position
- Low or high engine coolant temperature
- **During deceleration**
- Engine stopped
- Low vehicle speed (M/T models)





#### COMPONENT DESCRIPTION

# EVAP canister purge control solenoid valve

The EVAP canister purge control solenoid valve responds to signals from the ECM. When the ECM sends an OFF signal, the vacuum signal (from the intake manifold to the EVAP canister purge control valve) is cut.

When the ECM sends an ON (ground) signal, the vacuum signal passes through the EVAP canister purge control solenoid valve. The signal then reaches the EVAP canister purge control valve.

### EVAP canister purge control valve

When the vacuum signal is cut by EVAP canister purge control solenoid valve, EVAP canister purge control valve shuts off the EVAP purge line.

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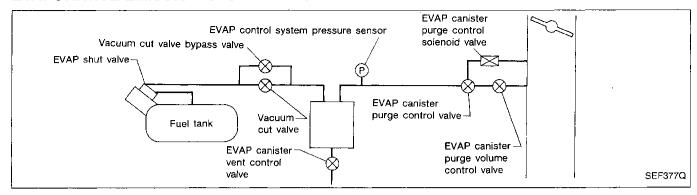
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# Evaporative Emission (EVAP) Canister Purge Control Valve/Solenoid Valve (Cont'd)

### **EVAPORATIVE EMISSION SYSTEM DIAGRAM**



### **CONSULT REFERENCE VALUE IN DATA MONITOR MODE**

Remarks: Specification data are reference values.

| MONITOR ITEM  | CONDITION                  |           | SPECIFICATION |  |
|---------------|----------------------------|-----------|---------------|--|
| PURG CONT S/V | a Engine, After Warming Up | Idle      | OFF           |  |
|               | Engine: After warming up   | 2,000 rpm | ON            |  |

### **ECM TERMINALS AND REFERENCE VALUE**

Remarks: Specification data are reference values, and are measured between each terminal and (a) (ECCS ground) with a voltmeter.

| TER-<br>MINAL<br>NO. | WIRE<br>COLOR | ITEM  | CONDITION                        | DATA<br>(DC voltage)          |
|----------------------|---------------|---|----------------------------------|-------------------------------|
| 114                  | LY            | EVAP canister purge con-<br>trol solenoid valve | Engine is running.  — Idle speed | BATTERY VOLTAGE<br>(11 - 14V) |

### ON BOARD DIAGNOSIS LOGIC

| Diagnostic<br>Trouble Code<br>No. | Malfunction is detected when   | Check Items<br>(Possible Cause)  |
|-----------------------------------|--|--|
| P0443<br>0807                     | A) The improper voltage signal is entered to ECM through EVAP canister purge control solenoid valve. | Harness or connectors     (The EVAP canister purge control solenoid valve circuit is open or shorted.)     EVAP canister purge control solenoid valve  |
| ,                                 | B) EVAP canister purge control valve does not operate properly (stuck open).                         | <ul> <li>EVAP canister purge control valve</li> <li>EVAP canister purge control solenoid valve</li> <li>Vacuum hoses for clogging or disconnection</li> <li>EVAP control system pressure sensor</li> </ul> |

# **Evaporative Emission (EVAP) Canister Purge** Control Valve/Solenoid Valve (Cont'd)

### DIAGNOSTIC TROUBLE CODE CONFIRMATION **PROCEDURE**

Perform "Procedure for malfunction A" first. If the (1st trip) DTC cannot be confirmed, perform "Procedure for maifunction B" on next page.

#### Procedure for malfunction A



- Turn ignition switch "ON".
- Select "DATA MONITOR" mode with CONSULT.

- OR

3) Wait at least 5 seconds. LC

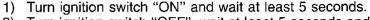
MA



NO TOOLS

- Turn ignition switch "ON" and wait at least 5 seconds.
- Select "MODE 7" with GST.

- OR ·



- Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

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### Procedure for malfunction B



- Jack up drive wheels.
- Turn ignition switch "ON" and select "DATA MONITOR" MIT mode with CONSULT.
- Start engine and warm it up sufficiently.
- 4) Check that tank fuel temperature is above 0°C (32°F).
- 5) Turn ignition switch "OFF" and wait at least 5 seconds.
- Start engine and let it idle at least 70 seconds.
- Maintain the following conditions at least 10 seconds. Gear position:

"2" or "D" range (A/T)

"3rd" or "4th" gear (M/T)

Vehicle speed:

40 - 80 km/h (25 - 50 MPH)

Engine speed:

1,500 - 2,500 rpm

Coolant temperature:

Less than 100°C (212°F) - OR -

ST

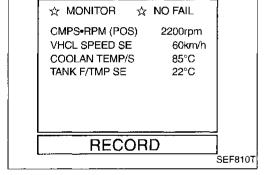


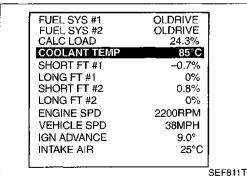
- Jack up drive wheels. 1)
- Turn ignition switch "ON" and select "MODE 1" with
- Start engine and warm it up sufficiently.
- Check that voltage between ECM terminal (52) and ground is less than 4.2V.
- Turn ignition switch "OFF" and wait at least 5 seconds.
- 6) Start engine and let it idle at least 70 seconds.

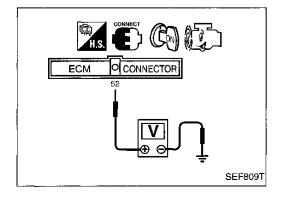
Engine speed:

1,500 - 2,500 rpm

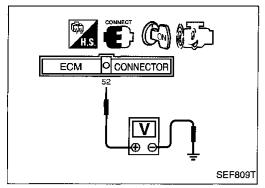
Coolant temperature: Less than 100°C (212°F)

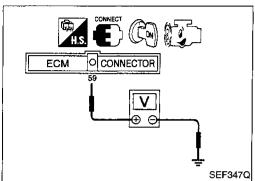






8) Select "MODE 7" with GST.





# **Evaporative Emission (EVAP) Canister Purge** Control Valve/Solenoid Valve (Cont'd)

Jack up drive wheels.

(NO TOOLS)

2) Turn ignition switch "ON".

3) Start engine and warm it up sufficiently.

4) Check that voltage between ECM terminal (52) and ground is less than 4.2V.

5) Turn ignition switch "OFF" and wait at least 5 seconds.6) Start engine and let it idle at least 70 seconds.

7) Maintain the following conditions at least 10 seconds. Gear position:

"2" or "D" range (A/T)

"3rd" or "4th" gear (M/T)

Vehicle speed:

40 - 80 km/h (25 - 50 MPH)

Engine speed:

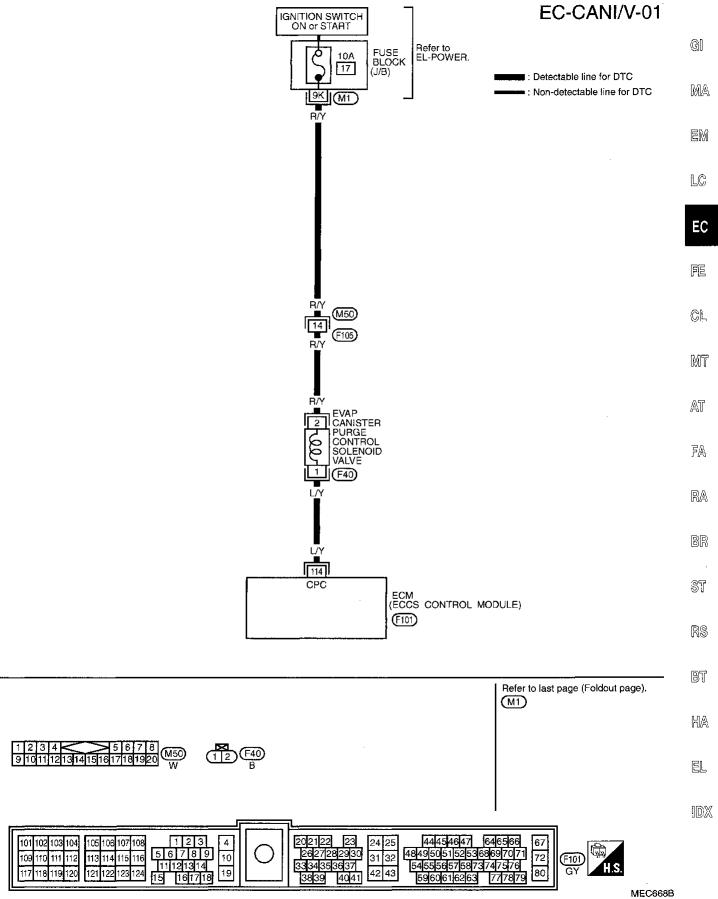
1,500 - 2,500 rpm

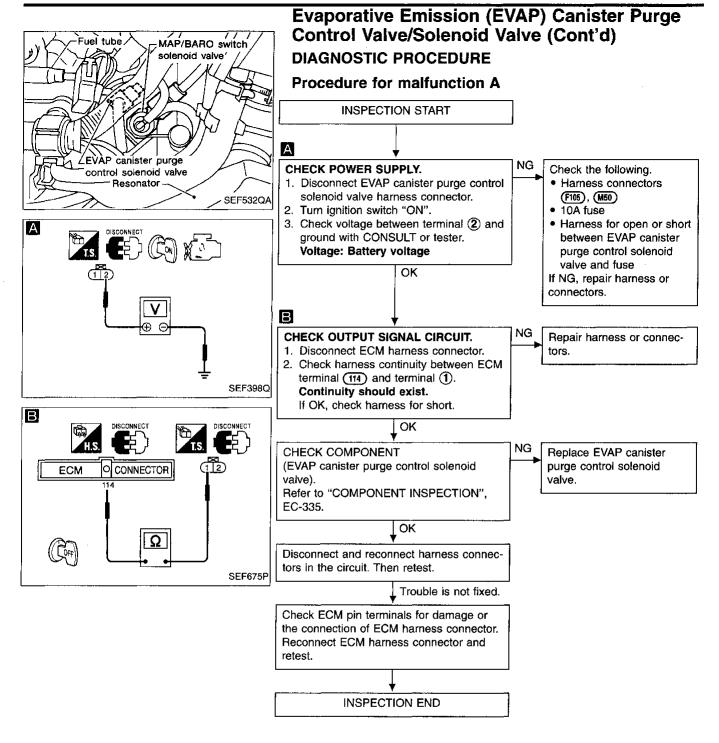
Voltage between ECM terminal 59 and ground: More than 0.8V

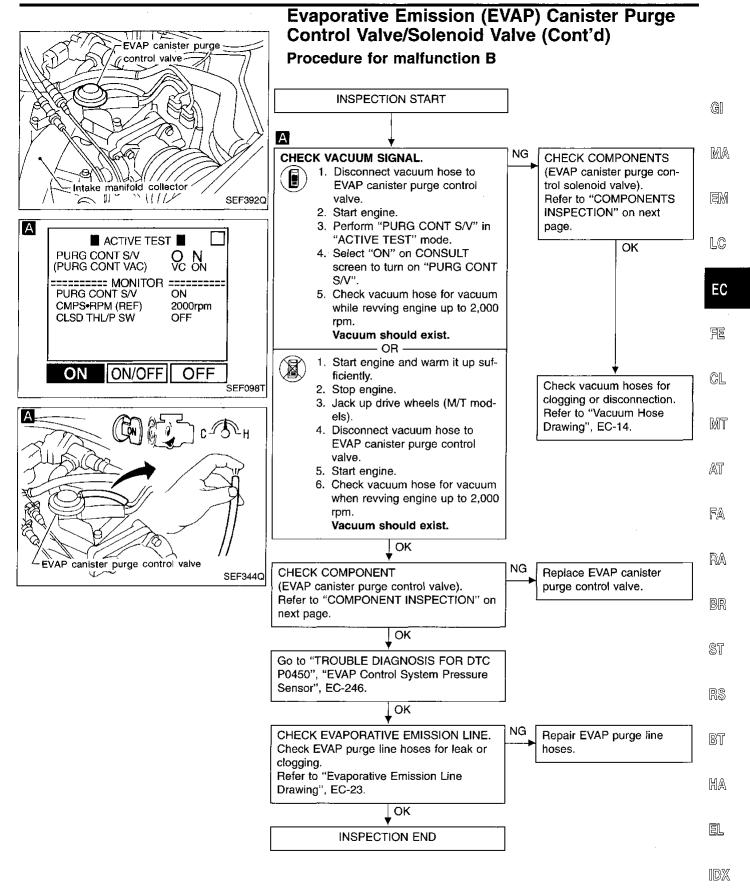
- 8) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 9) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

404 EC-236

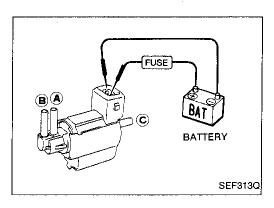
# **Evaporative Emission (EVAP) Canister Purge** Control Valve/Solenoid Valve (Cont'd)







**EC-239** 407



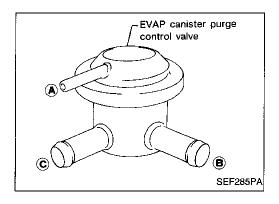
# Evaporative Emission (EVAP) Canister Purge Control Valve/Solenoid Valve (Cont'd) COMPONENT INSPECTION

### **EVAP** canister purge control solenoid valve

Check air passage continuity.

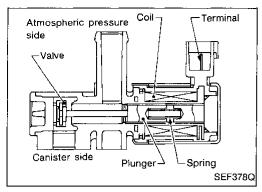
| Condition                                      | Air passage<br>continuity<br>between (A) and (B) | Air passage<br>continuity<br>between (A) and (C) |
|--|--|--|
| 12V direct current supply<br>between terminals | Yes  | No   |
| No supply                                      | No   | Yes  |

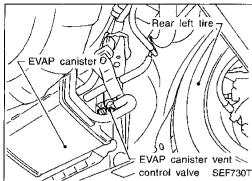
If NG, replace solenoid valve.



## **EVAP** canister purge control valve

- Blow air in ports (A), (B) and (C) and ensure that there is no leakage.
- 2. Apply vacuum to port (A). [Approximately -13.3 to -20.0 kPa (-100 to -150 mmHg, -3.94 to -5.91 inHg)]
  Then blow air in port (C) and ensure free flow out of port (B).





# **Evaporative Emission (EVAP) Canister Vent Control Valve**

### COMPONENT DESCRIPTION

Note: If both DTC P0440 and P0446 are displayed, perform TROUBLE DIAGNOSIS FOR P0446 first.

The EVAP canister vent control valve is located on the EVAP canister and is used to seal the canister vent.

This solenoid (the EVAP canister vent control valve) responds to signals from the ECM.

When the ECM sends an ON signal, the coil in the solenoid valve is energized.

A plunger will then move to seal the canister vent. The ability to seal the vent is a necessary part of the diagnosis algorithms for other evaporative loss system components.

This solenoid valve is used only for diagnosis, and usually remains opened.

When the vent is closed, under normal purge conditions, the evaporative loss system is depressurized allowing "EVAP Control System (Small Leak)" diagnosis.

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### CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Remarks: Specification data are reference values.

| MONITOR ITEM | CONDITION           | SPECIFICATION |
|--------------|---------------------|---------------|
| VENT CONT/V  | Ignition switch: ON | OFF           |

### **ECM TERMINALS AND REFERENCE VALUE**

Remarks: Specification data are reference values, and are measured between each terminal and (a) (ECCS ground) with a voltmeter.

| TER-<br>MINAL<br>NO. | WIRE<br>COLOR | ITEM                             | CONDITION              | DATA<br>(DC voltage)          |
|----------------------|---------------|----------------------------------|------------------------|-------------------------------|
| 70                   | OR/L          | EVAP canister vent control valve | [Ignition switch "ON"] | BATTERY VOLTAGE<br>(11 - 14V) |

#### ON BOARD DIAGNOSIS LOGIC

| Diagnostic<br>Trouble Code<br>No. | Malfunction is detected when  | Check Items<br>(Possible Cause)  | RS |
|-----------------------------------|---|--|----|
| P0446<br>0903                     | A) An improper voltage signal is entered into ECM through EVAP canister vent control valve. | Harness or connectors     (EVAP canister vent control valve circuit is open or shorted.)                                       | BŢ |
|                                   | B) EVAP canister vent control valve does not operate properly.                              | EVAP canister vent control valve     EVAP control system pressure sensor     Blocked rubber tube to EVAP canister vent control | HA |
|                                   |   | Valve     Water separator  | EL |

1DX

# Evaporative Emission (EVAP) Canister Vent Control Valve (Cont'd)

# DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

Perform "Procedure for malfunction A". If the DTC cannot be confirmed, then perform "Procedure for malfunction B".

#### Procedure for malfunction A



- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT.
- 3) Start engine and wait at least 5 seconds.

- OR

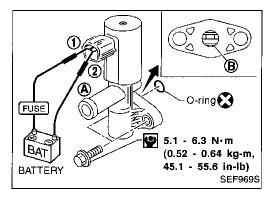


- 1) Start engine and wait at least 5 seconds.
- 2) Select "MODE 7" with GST.

- OR -



- 1) Start engine and wait at least 5 seconds.
- 2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.



### **OVERALL FUNCTION CHECK**

Use this procedure to check the overall function of the EVAP canister vent control valve circuit. During this check, a 1st trip DTC might not be confirmed.

#### Procedure for malfunction B

- Remove EVAP canister vent control valve from EVAP canister and disconnect hoses from the valve.
- 2. Check air passage continuity.

| Condition   | Air passage continuity between (A) and (B) |
|---|--|
| 12V direct current supply between terminals ① and ② | No   |
| No supply   | Yes  |

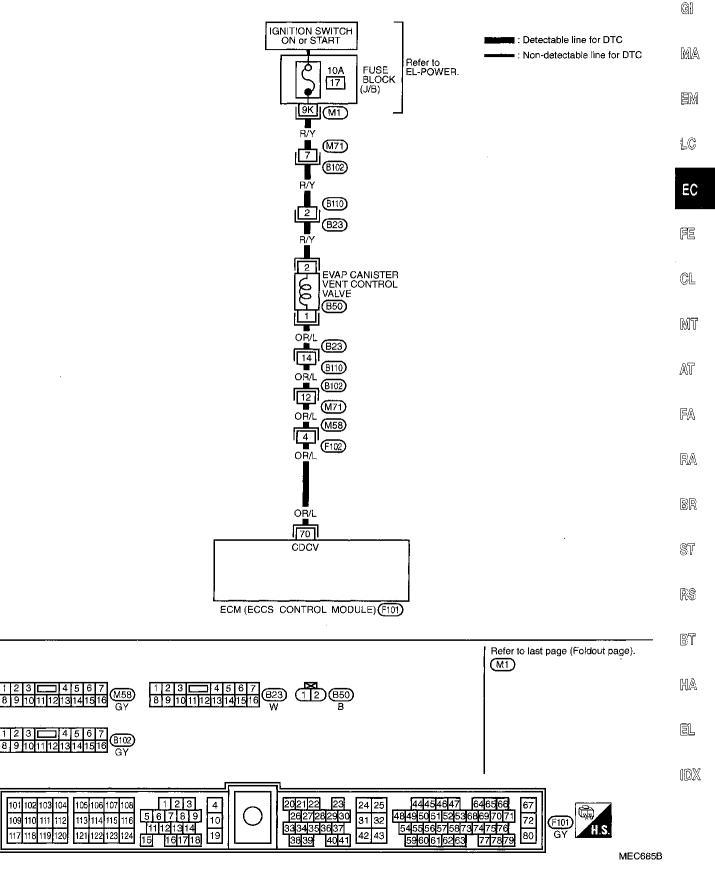
If removed, clean valve using air blower.

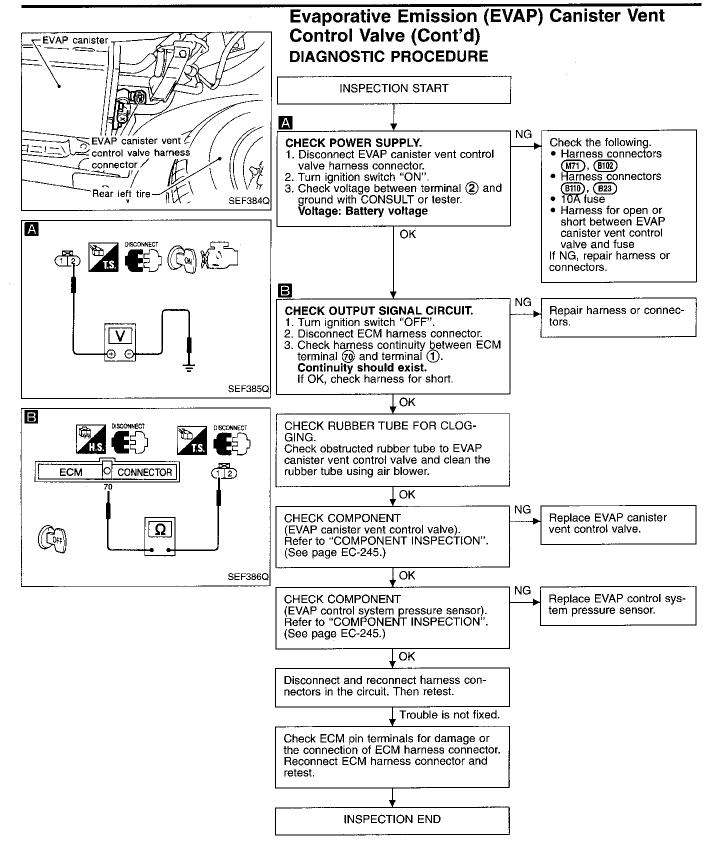
Make sure new O-ring is installed properly.

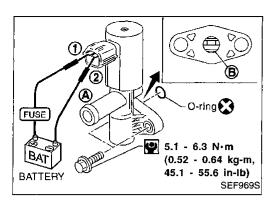
EC-242 410

# **Evaporative Emission (EVAP) Canister Vent Control Valve (Cont'd)**

### EC-VENT/V-01







# Evaporative Emission (EVAP) Canister Vent Control Valve (Cont'd) COMPONENT INSPECTION

### **EVAP** canister vent control valve

Check air passage continuity.

| Condition   | Air passage continuity between <b>(A)</b> and <b>(B)</b> |
|---|--|
| 12V direct current supply between terminals ① and ② | No   |
| No supply   | Yes  |

If NG, clean valve using air blower or replace as necessary.

Make sure new O-ring is installed properly.



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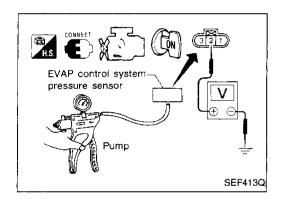
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# **EVAP** control system pressure sensor

- Remove EVAP control system pressure sensor from bracket with its harness connector connected.
- 2. Remove hose from EVAP control system pressure sensor.
- 3. Apply vacuum and pressure to EVAP control system pressure sensor with pump as shown in figure.
- Check output voltage between terminal (2) and engine ground.

| Pressure (Relative to atmospheric pressure) | Voltage (V)       |
|---|-------------------|
| +4.0 kPa (+30 mmHg, +1.18 inHg)             | Approximately 4.6 |
| -9.3 kPa (-70 mmHg, -2.76 inHg)             | Approximately 0.5 |



# Always calibrate the vacuum pump gauge when using it.

5. If NG, replace EVAP control system pressure sensor.



ST

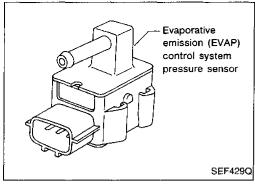
RS

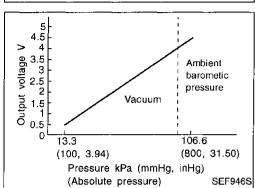
BT



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# **Evaporative Emission (EVAP) Control System Pressure Sensor**

### COMPONENT DESCRIPTION

The EVAP control system pressure sensor is installed in the purge line. The sensor detects the pressure inside the purge line and modifies the voltage signal sent from the ECM. The modified signal will then be returned to the ECM as an input voltage signal. As the pressure increases, the voltage rises. The EVAP control system pressure sensor is not directly used to control the engine system. It is used only for on board diagnosis.

### **CONSULT REFERENCE VALUE IN DATA MONITOR MODE**

Remarks: Specification data are reference values.

| MONITOR ITEM  | CONDITION           | SPECIFICATION |
|---------------|---------------------|---------------|
| EVAP SYS PRES | Ignition switch: ON | Approx. 3.4V  |

#### **ECM TERMINALS AND REFERENCE VALUE**

Remarks: Specification data are reference values, and are measured between each terminal and (a) (ECCS ground) with a voltmeter.

| TER-<br>MINAL<br>NO. | WIRE | ITEM                                | CONDITION  | DATA<br>(DC voltage) |
|----------------------|------|-------------------------------------|--|----------------------|
| 62                   | w    | EVAP control system pressure sensor | Ignition switch "ON"                               | Approximately 3.4V   |
| 42                   | R    | Sensor's power supply               | Ignition switch "ON"                               | Approximately 5V     |
| 43                   | В    | Sensor's ground                     | Engine is running. (Warm-up condition)  Idle speed | ov                   |

### ON BOARD DIAGNOSIS LOGIC

| Diagnostic<br>Trouble Code<br>No. | Malfunction is detected when   | Check Items<br>(Possible Cause)   |
|-----------------------------------|--|---|
| P0450<br>0704                     | An improper voltage signal from EVAP control system pressure sensor is entered into ECM. | Harness or connectors     (The EVAP control system pressure sensor circuit is open or shorted.)     EVAP control system pressure sensor     EVAP canister vent control valve (The valve is stuck open.) |

# **Evaporative Emission (EVAP) Control System Pressure Sensor (Cont'd)**

# DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE



- 1) Start engine and warm it up sufficiently.
- 2) Check that tank fuel temperature is above 0°C (32°F).
- 3) Turn ignition switch "OFF" and wait at least 5 seconds.
- 4) Turn ignition switch "ON".
- 5) Select "DATA MONITOR" mode with CONSULT.
- Wait at least 3 seconds.

- OR



- 1) Start engine and warm it up sufficiently.
- 2) Check that voltage between ECM terminal 52 and ground is less than 4.2V.
- 3) Turn ignition switch "OFF" and wait at least 5 seconds.
- 4) Turn ignition switch "ON" and wait at least 3 seconds.
- 5) Select "MODE 7" with GST.

- OR

(S) and



- 1) Start engine and warm it up sufficiently.
- 2) Check that voltage between ECM terminal 52 and ground is less than 4.2V.
- 3) Turn ignition switch "OFF" and wait at least 5 seconds.4) Turn ignition switch "ON" and wait at least 3 seconds.
- 5) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 6) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

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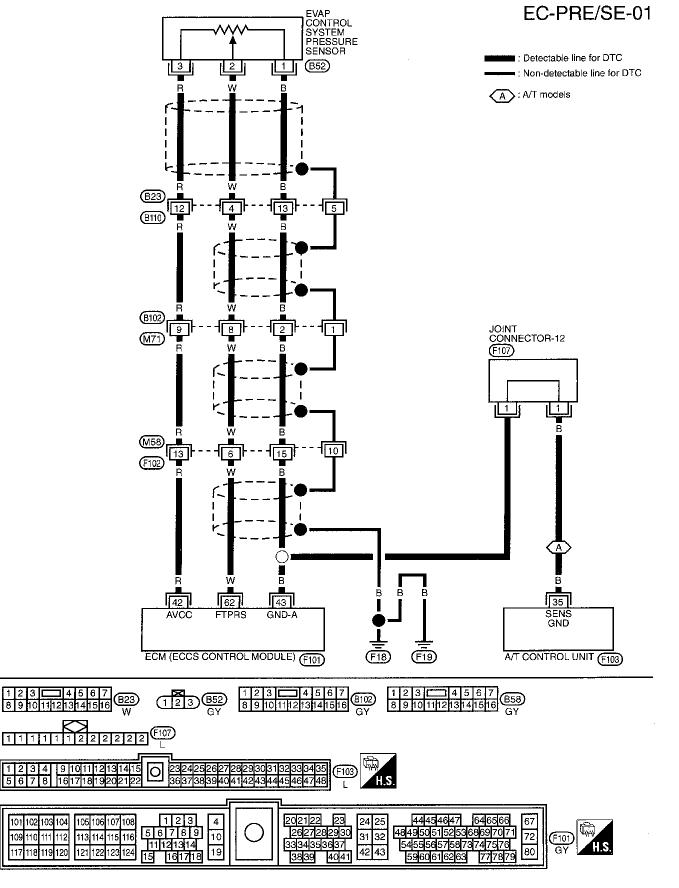
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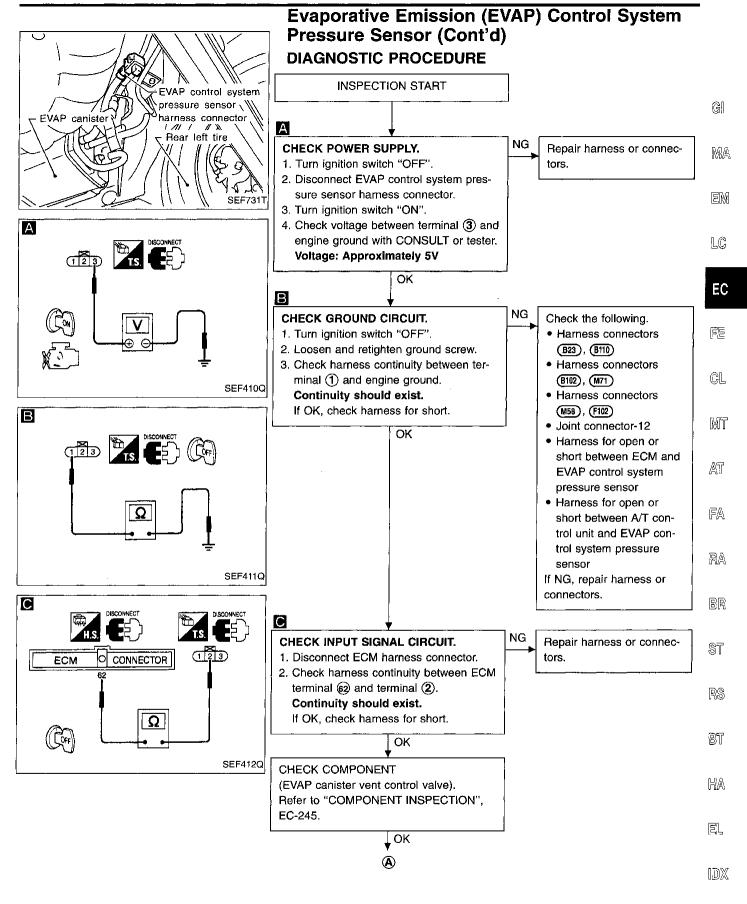
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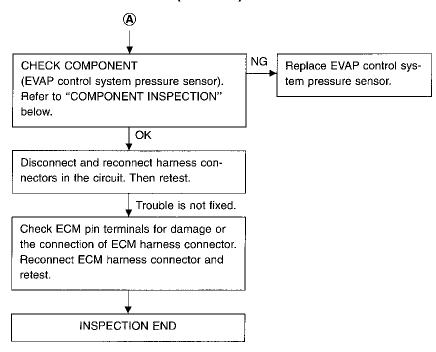
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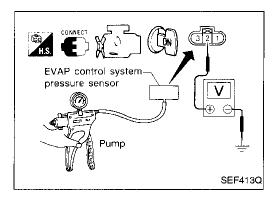
# **Evaporative Emission (EVAP) Control System Pressure Sensor (Cont'd)**





# Evaporative Emission (EVAP) Control System Pressure Sensor (Cont'd)





### **COMPONENT INSPECTION**

### **EVAP** control system pressure sensor

- Remove EVAP control system pressure sensor from bracket with its harness connector connected.
- Remove hose from EVAP control system pressure sensor.
- 3. Apply vacuum and pressure to EVAP control system pressure sensor with pump as shown in figure.
- 4. Check output voltage between terminal (2) and engine ground.

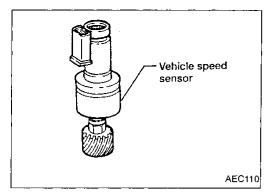
| Pressure (Relative to atmospheric pressure) | Voltage (V)       |
|---|-------------------|
| +4.0 kPa (+30 mmHg, +1.18 inHg)             | Approximately 4.6 |
| -9.3 kPa (-70 mmHg, -2.76 inHg)             | Approximately 0.5 |

#### **CAUTION:**

Always calibrate the vacuum pump gauge when using it.

5. If NG, replace EVAP control system pressure sensor.

**EC-250** 418



# Vehicle Speed Sensor (VSS)

### COMPONENT DESCRIPTION

The vehicle speed sensor is installed in the transaxle. It contains a pulse generator which provides a vehicle speed signal to the speedometer. The speedometer then sends a signal to the ECM.

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# **CONSULT REFERENCE VALUE IN DATA MONITOR MODE**

Remarks: Specification data are reference values.

LC

| MONITOR ITEM  | CONDITION   | SPECIFICATION                              |
|---------------|---|--|
| VHCL SPEED SE | Turn drive wheels and compare speedometer indication with the CONSULT value | Almost the same speed as the CONSULT value |

EC

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### **ECM TERMINALS AND REFERENCE VALUE**

Remarks: Specification data are reference values, and are measured between each terminal and (25) (ECCS ground) with a voltmeter.

| TER-<br>MINAL<br>NO. | WIRE<br>COLOR | ITEM                 | CONDITION  | DATA<br>(DC voltage) | MT |
|----------------------|---------------|----------------------|--|----------------------|----|
|                      | )             |                      |  | Approximately 5.2V★  |    |
|                      |               |                      | Engine is running.   | (V)<br>6             | AT |
| 29                   | P/L           | Vehicle speed sensor | Jack up front wheels and run engine in "1st" position (M/T models) or "1" position (A/T models). | 4 2 0                | FA |
|                      |               |                      | modela).   | 1 ms SEF648T         | RA |

<sup>★:</sup> Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

### ON BOARD DIAGNOSIS LOGIC

| Diagnostic<br>Trouble Code<br>No. | Malfunction is detected when   | Check Items<br>(Possible Cause)  |
|-----------------------------------|--|--|
| P0500<br>0104                     | The almost 0 km/h (0 MPH) signal from the vehicle speed sensor is entered to ECM even when the vehicle is driving. | Harness or connector     (The vehicle speed sensor circuit is open or shorted.)     Vehicle speed sensor |

BR

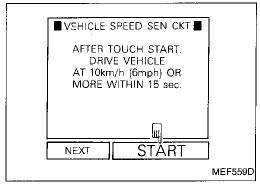
ST

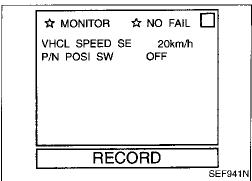
RS

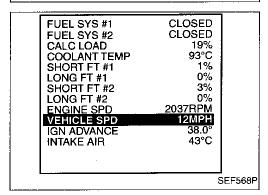
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# Vehicle Speed Sensor (VSS) (Cont'd) OVERALL FUNCTION CHECK

Use this procedure to check the overall function of the vehicle speed sensor circuit. During this check, a 1st trip DTC might not be confirmed.

1) Jack up drive wheels.



- 2) Start engine.
- Perform "VEHICLE SPEED SEN CKT" in "FUNCTION TEST" mode with CONSULT.

----- OR -



- 2) Start engine.
- Read vehicle speed sensor signal in "DATA MONITOR" mode with CONSULT.

The vehicle speed on CONSULT should be able to exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.

——— OR -



- 2) Start engine.
- Read vehicle speed sensor signal in "MODE 1" with GST.

The vehicle speed on GST should be able to exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.

# DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

---- OR -

(ND) TOOLS

- 1) Start engine and warm it up sufficiently.
- 2) Perform test drive at least 10 seconds continuously in the following recommended condition.

Engine speed

Intake

: 1,400 - 2,400 rpm (A/T models) 1,700 - 2,400 rpm (M/T models)

manifold vacuum: -53.3 to -40.0 kPa

(-400 to -300 mmHg, -15.75 to -11.81 inHg) (A/T models)

-53.3 to -26.7 kPa

(-400 to -200 mmHg, -15.75 to

-7.87 inHg) (M/T models)

Gear position

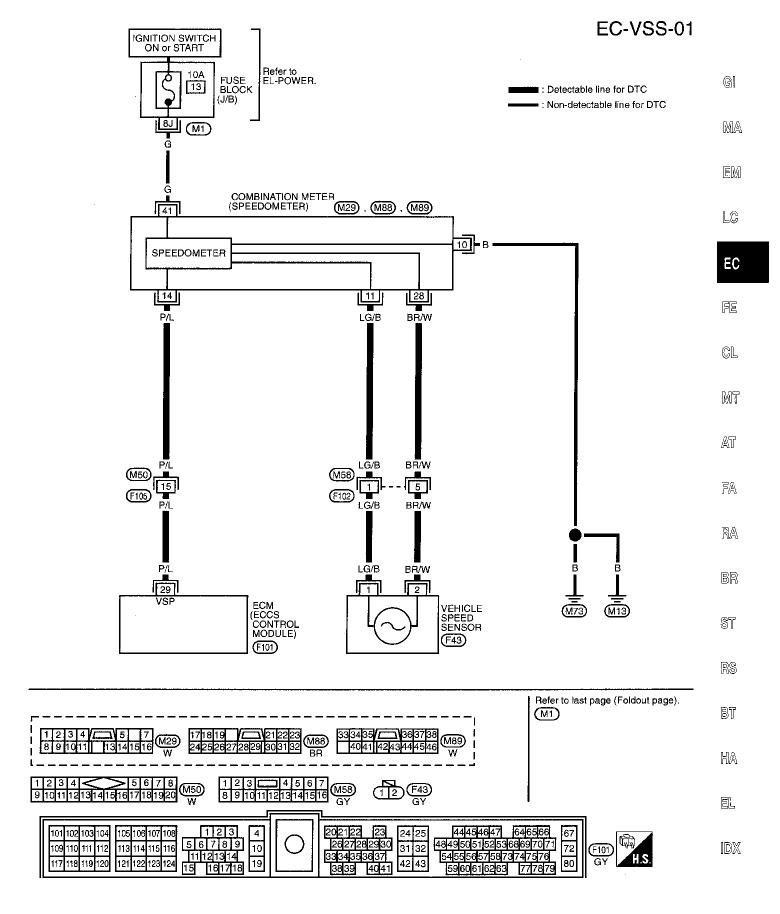
: Suitable position (except "N" or

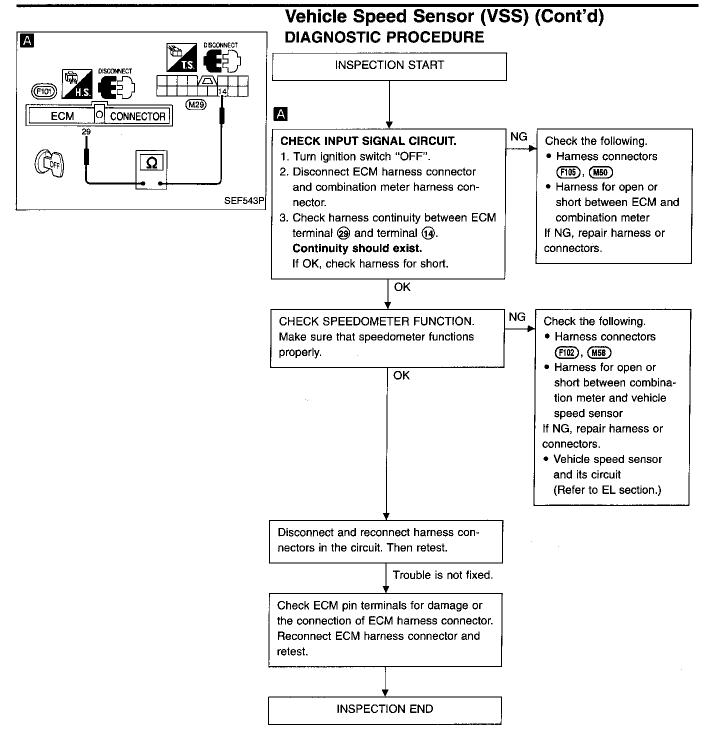
"P" position)

- 3) Stop the vehicle, turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 4) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

Even if 1st trip DTC is not detected, perform the above test drive at least one more time.

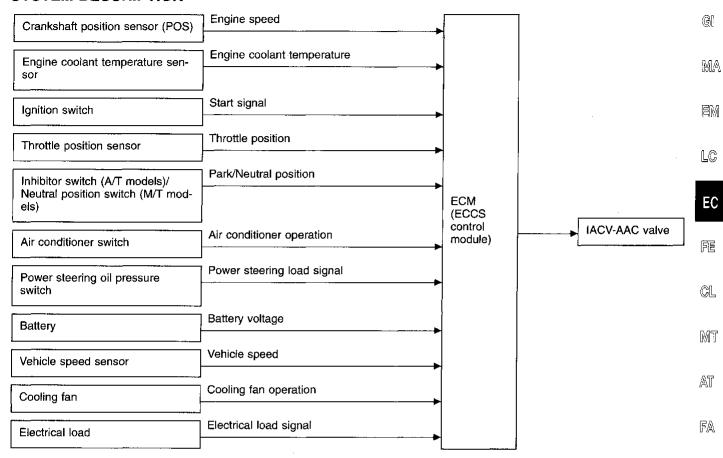
# Vehicle Speed Sensor (VSS) (Cont'd)



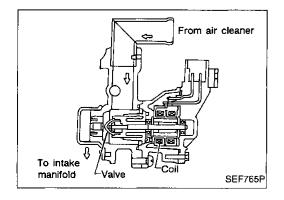


# Idle Air Control Valve (IACV) — Auxiliary Air Control (AAC) Valve

### 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 IACV-AAC valve. The IACV-AAC valve changes the opening of the air by-pass passage to control the amount of auxiliary air. This valve is actuated by a step motor built into the valve, which moves the valve in the axial direction in steps corresponding to the ECM output signals. One step of IACV-AAC valve movement causes the respective opening of the air by-pass passage. (i.e. when the step advances, the opening is enlarged.) The opening of the valve is varied to allow for optimum control of the engine idling speed. The crankshaft position sensor (POS) detects the actual engine speed and sends a signal to the ECM. The ECM then controls the step position of the IACV-AAC valve so that engine speed coincides with the target value memorized in 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 during warm up, deceleration, and engine load (air conditioner, power steering and cooling fan operation).



### COMPONENT DESCRIPTION

The IACV-AAC valve is operated by a step motor for centralized control of auxiliary air supply. This motor has four winding phases and is actuated by the output signals of ECM which turns ON and OFF two windings each in sequence. Each time the IACV-AAC valve opens or closes to change the auxiliary air quantity, the ECM sends a pulse signal to the step motor. When no change in the auxiliary air quantity is needed, the ECM does not issue the pulse signal. A certain voltage signal is issued so that the valve remains at that particular opening.

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# Idle Air Control Valve (IACV) — Auxiliary Air Control (AAC) Valve (Cont'd)

# **CONSULT REFERENCE VALUE IN DATA MONITOR MODE**

Remarks: Specification data are reference values.

| MONITOR ITEM | CONDITION  |           | SPECIFICATION |
|--------------|--|-----------|---------------|
| IACV-AAC/V   | Engine: After warming up     Air conditioner switch: "OFF" | Idle      | 2 - 10 step   |
|              | <ul><li>Shift lever: "N"</li><li>No-load</li></ul>         | 2,000 rpm |               |

### **ECM TERMINALS AND REFERENCE VALUE**

Remarks: Specification data are reference values, and are measured between each terminal and (a) (ECCS ground) with a voltmeter.

| TER-<br>MINAL<br>NO.     | WIRE<br>COLOR             | ITEM   | CONDITION   | DATA<br>(DC voltage)          |
|--------------------------|---------------------------|--|---|-------------------------------|
| 101<br>115<br>122<br>123 | PU/G<br>GY/G<br>Y<br>GY/L | IACV-AAC valve   | Engine is running.  Idle speed  | 0.1 - 14V                     |
| 4 W/B                    | ECCS relay (Self-shutoff) | Engine is running.  Ignition switch "OFF"  For a few seconds after turning ignition switch "OFF" | 0 - 1V  |                               |
|                          |                           |  | Ignition switch "OFF"  A few seconds passed after turning ignition switch "OFF" | BATTERY VOLTAGE<br>(11 - 14V) |
| 67<br>72                 | R<br>R                    | Power supply for ECM   | [Ignition switch "ON"]  | BATTERY VOLTAGE<br>(11 - 14V) |

### ON BOARD DIAGNOSIS LOGIC

| Diagnostic<br>Trouble Code<br>No. | Malfunction is detected when                     | Check Items<br>(Possible Cause)   |
|-----------------------------------|--|---|
| P0505<br>0205                     | A) The IACV-AAC valve does not operate properly. | Harness or connectors     (The IACV-AAC valve circuit is open.)     IACV-AAC valve    |
|                                   | B) The IACV-AAC valve does not operate properly. | Harness or connectors     (The IACV-AAC valve circuit is shorted.)     IACV-AAC valve |

# Idle Air Control Valve (IACV) — Auxiliary Air Control (AAC) Valve (Cont'd)

### DIAGNOSTIC TROUBLE CODE CONFIRMATION **PROCEDURE**

Perform "Procedure for malfunction A" first. If the DTC cannot be confirmed, perform "Procedure for malfunction B".

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#### Procedure for malfunction A



Turn ignition switch "ON".

Select "DATA MONITOR" mode with CONSULT.

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3) Start engine and let it idle.

Keep engine speed at 2,500 rpm for 3 seconds, then let it idle for 3 seconds.

Do not rev engine up to speeds more than 3,000 rpm.

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5) Perform step 4 once more.

- OR

- OR -

Start engine and let it idle.

Keep engine speed at 2,500 rpm for 3 seconds, then let it idle for 3 seconds.

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- Do not rev engine up to speeds more than 3,000 rpm.
- Perform step 2 once more. 4) Select "MODE 7" with GST.

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- 1) Start engine and let it idle.
- Keep engine speed at 2,500 rpm for 3 seconds, then let it idle for 3 seconds.

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- Do not rev engine up to speeds more than 3,000 Perform step 2 once more.
- Turn ignition switch "OFF". Wait at least 5 seconds and then turn "ON".

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5) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

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#### Procedure for malfunction B



- 1) Open engine hood.
- Start engine and warm it up sufficiently.

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- Turn ignition switch "OFF" and wait at least 5 seconds.
- Turn ignition switch "ON" again and select "DATA MONITOR" mode with CONSULT.

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Start engine and run it at least 1 minute at idle speed. (Headlamp switch, rear defogger switch: OFF)

- OR

OR

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- Open engine hood.
- 2) Start engine and warm it up sufficiently.
- 3) Turn ignition switch "OFF" and wait at least 5 seconds.

Start engine again and run it at least 1 minute at idle speed. (Headlamp switch, rear defogger switch: OFF)

Select "MODE 7" with GST.

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- 1) Open engine hood.
- 2) Start engine and warm it up sufficiently.

3) Turn ignition switch "OFF" and wait at least 5 seconds.

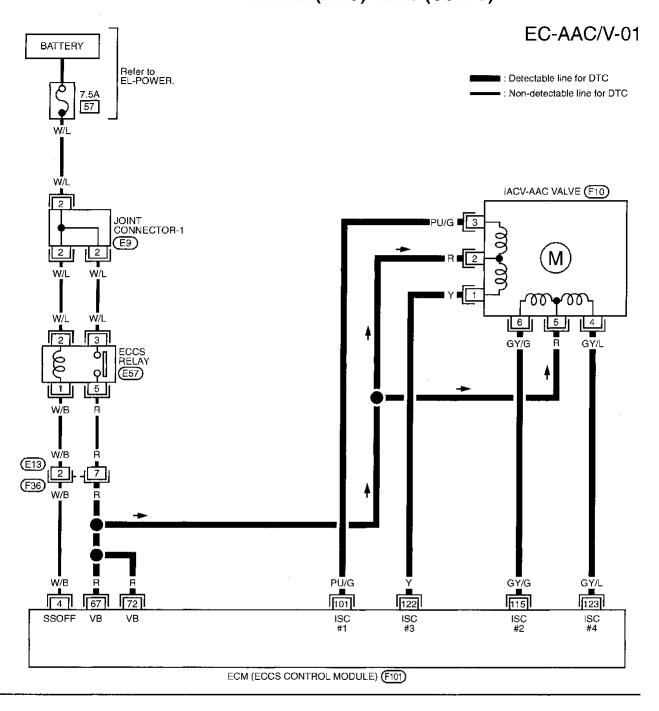
Start engine again and run it at least 1 minute at idle speed. (Headlamp switch, rear defogger switch: OFF)

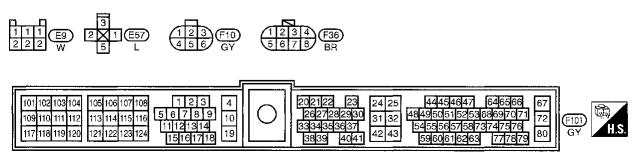
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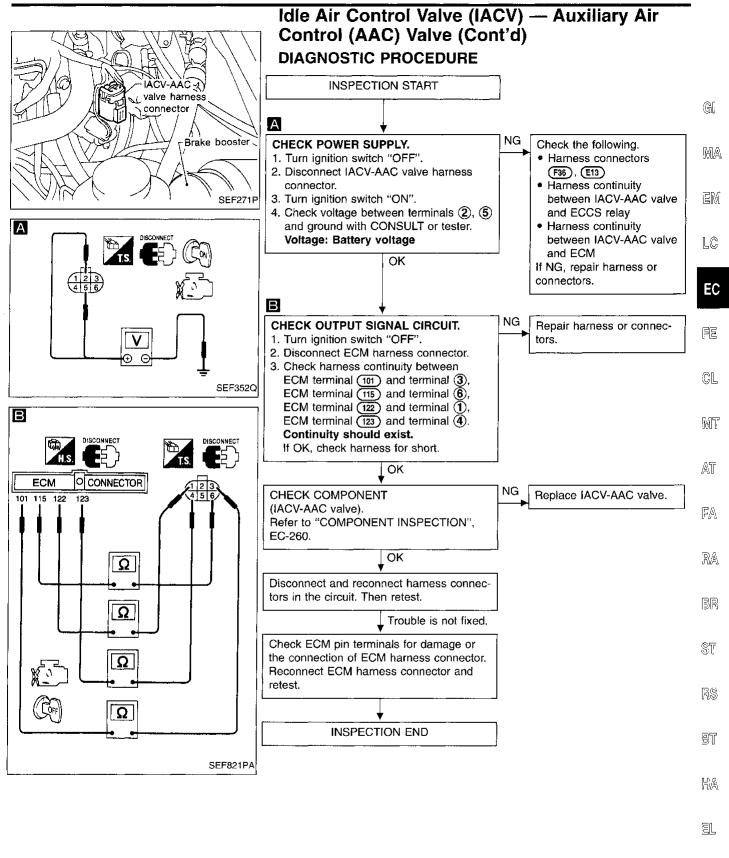
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- 5) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

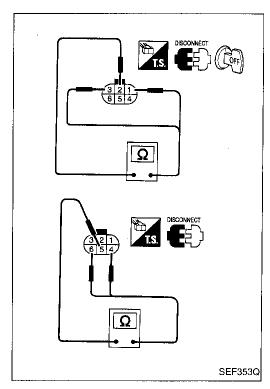
# Idle Air Control Valve (IACV) — Auxiliary Air Control (AAC) Valve (Cont'd)







EC-259 427



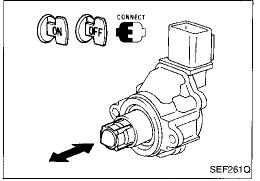
# Idle Air Control Valve (IACV) — Auxiliary Air Control (AAC) Valve (Cont'd) COMPONENT INSPECTION

#### **IACV-AAC** valve

- 1. Disconnect IACV-AAC valve harness connector.
- 2. Check resistance between the following terminals. terminal (2) and terminals (1), (3) terminal (5) and terminals (4), (6)

### Resistance:

Approximately 30 $\Omega$  [at 20°C (68°F)]

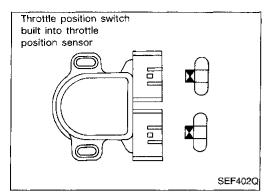


- 3. Reconnect IACV-AAC valve harness connector.
- Remove idle air adjusting unit assembly (IACV-AAC valve is built-in) from engine.
   (The IACV-AAC valve harness connector should remain con-

nected.)

5. Turn ignition switch "ON" and "OFF", and ensure the IACV-AAC valve shaft smoothly moves forward and backward, according to the ignition switch position.

If NG, replace the IACV-AAC valve.



# **Closed Throttle Position Switch**

#### COMPONENT DESCRIPTION

The throttle position switch, built into the throttle position sensor unit, consists of a closed throttle position switch and wide open throttle position switch. The closed throttle position switch detects the throttle valve position, i.e. whether it is in the idle position or not. The detected position will then be sent to the ECM as a voltage signal. The ECM uses this signal to open or close the EVAP canister purge control valve when the throttle position sensor is malfunctioning.

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### CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Remarks: Specification data are reference values.

| MONITOR ITEM  | CONDITION                                |                               | SPECIFICATION |
|---------------|--|-------------------------------|---------------|
| CLSD THL/P SW | Ignition switch: ON     (Engine stopped) | Throttle valve: Idle position | ON            |
| CLSD IMDP SW  |  | Throttle valve: Slightly open | OFF           |

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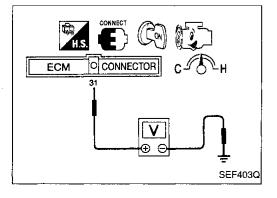
### **ECM TERMINALS AND REFERENCE VALUE**

Remarks: Specification data are reference values, and are measured between each terminal and 🔞 (ECCS ground) with a voltmeter.

| TER-<br>MINAL<br>NO. | WIRE | ITEM                                       | CONDITION  | DATA<br>(DC voltage)          | - Cl<br>Mt |
|----------------------|------|--|--|-------------------------------|------------|
| 31                   | GY/L | Throttle position switch (Closed position) | [Ignition switch "ON"] (Warm-up condition)  Accelerator pedal released | BATTERY VOLTAGE<br>(11 - 14V) | -<br>AT    |
|                      |      |  | Ignition switch "ON"  Accelerator pedal depressed                      | Approximately 0V              | -<br>Fa    |

#### ON BOARD DIAGNOSIS LOGIC

|                                |  |   | _ RA       |
|--------------------------------|--|---|------------|
| Diagnostic Trouble<br>Code No. | Malfunction is detected when   | Check Items<br>(Possible Cause)   | — BR       |
| P0510<br>0203                  | Battery voltage from the closed throttle position<br>switch is entered into ECM with the throttle valve<br>opened. | Harness or connectors     (The closed throttle position switch circuit is shorted.)     Closed throttle position switch | — er<br>ST |



### **OVERALL FUNCTION CHECK**

Use this procedure to check the overall function of the closed throttle position switch circuit. During this check, a 1st trip DTC might not be confirmed.

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1) Start engine and warm it up sufficiently.

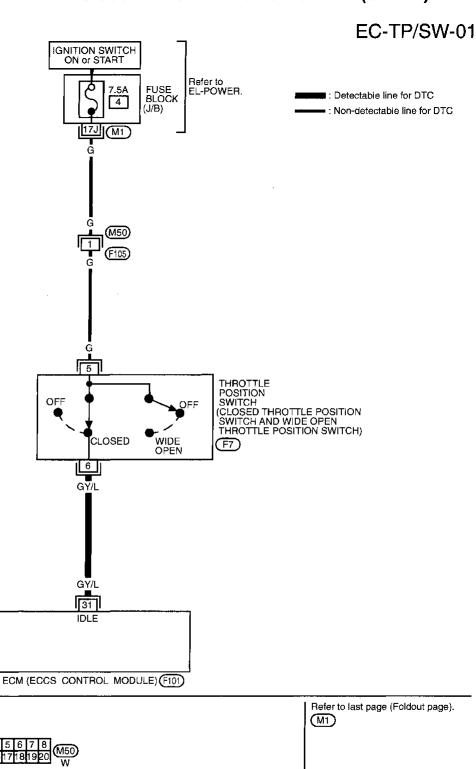
2) Check the voltage between ECM terminal 31 and ground under the following conditions.

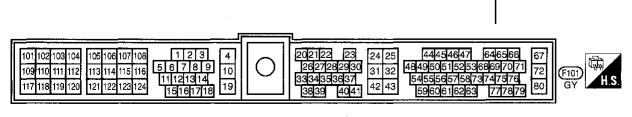
At idle: Battery voltage
At 2,000 rpm: Approximately 0V

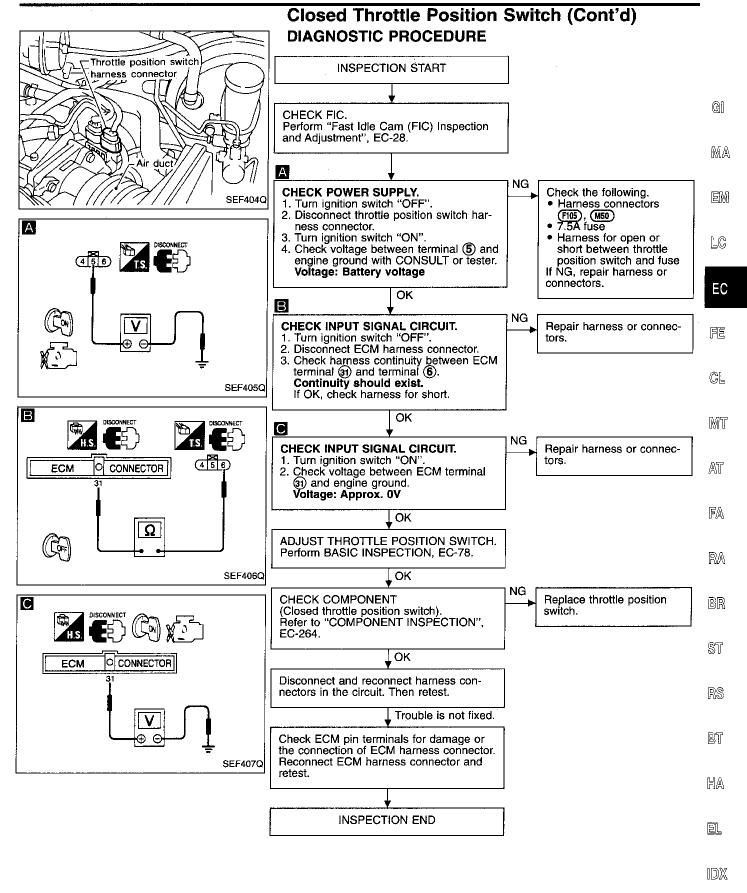
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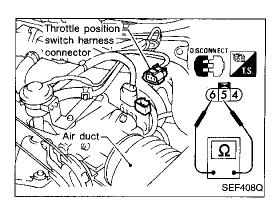
NO

# Closed Throttle Position Switch (Cont'd)









# **Closed Throttle Position Switch (Cont'd) COMPONENT INSPECTION**

# Closed throttle position switch

- Start engine and warm it up sufficiently. Turn ignition switch "OFF".
- 3. Disconnect throttle position switch harness connector.
- 4. Check continuity between terminals (5) and (6).

| Accelerator pedal conditions               | Continuity |
|--|------------|
| Completely released                        | Yes        |
| Partially released or completely depressed | No         |

If NG, replace throttle position switch.

432 EC-264

## A/T Control

## **COMPONENT DESCRIPTION**

These circuit lines are used to control the smooth shifting up and down of A/T during the hard acceleration/ deceleration. Voltage signals are exchanged between ECM and A/T control unit.

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## **ECM TERMINALS AND REFERENCE VALUE**

Remarks: Specification data are reference values, and are measured between each terminal and (25) (ECCS ground) with a voltmeter.

| TER-<br>MINAL<br>NO. | WIRE<br>COLOR | ITEM             | CONDITION                       | DATA<br>(DC voltage) | EM        |
|----------------------|---------------|------------------|---------------------------------|----------------------|-----------|
|                      |               |                  | Ignition switch "ON"            | 6 - 8V               | - na      |
| 65                   | R/L           | A/T signal No. 4 | Engine is running.  Idle speed  | ov                   |           |
|                      |               |                  | Ignition switch "ON"            | ov                   | EC        |
| 66                   | Y/B           | A/T signal No. 5 | Engine is running.  Idle speed  | 6 - 8V               | FE        |
|                      |               |                  | Ignition switch "ON"            | 6 - 8V               | -<br>- Cl |
| 73                   | W/L           | A/T signal No. 1 | Engine is running.  Lidle speed | ov                   |           |
| 74                   | W/PU          | A/T signal No. 2 | Ignition switch "ON"            | 6 - 8V               | _         |
|                      |               |                  | Ignition switch "ON"            | ov                   | _ AT      |
| 77                   | R/W           | A/T signal No. 3 | Engine is running.  Idle speed  | 6 - 8V               | FA<br>•   |

## ON BOARD DIAGNOSIS LOGIC

\* Freeze frame data is not stored in the ECM for the "A/T control". The MIL will not light for "A/T control" malfunction.

| Diagnostic<br>Trouble<br>Code No. | Malfunction is detected when | Check Items<br>(Possible Cause)  |  |
|-----------------------------------|------------------------------|--|--|
| P0600<br>0504                     | continuously.                | <ul> <li>Harness or connectors (The circuit between ECM and<br/>A/T control unit is open or shorted.)</li> <li>A/T control unit</li> </ul> |  |

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433 **EC-265** 

# A/T Control (Cont'd) DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

Note: If any diagnostic trouble code is displayed performing self-diagnosis for A/T (Refer to AT section.), perform the trouble diagnosis for the DTC first (Refer to AT section.).

- Jack up drive wheels.
- 2) Make sure that selector lever is set in "P" or "N" position.
- 3) Turn ignition switch "ON".



- 4) Select "DATA MONITOR" mode with CONSULT.
- 5) Start engine and rise engine speed to more than 1,000 rpm at once.
- 6) Run engine at least 10 seconds at idle speed.
- 7) Run engine at least 10 seconds at 2,000 rpm.
- 8) Set selector lever in "D" position and run engine at least 10 seconds at idle speed (with vehicle stopped).
- 9) Drive vehicle at 12 to 20 km/h (7 to 12 MPH) at least 10 seconds in "D" position.





- 4) Start engine and rise engine speed to more than 1,000 rpm at once.
- 5) Run engine at least 10 seconds at idle speed.
- 6) Run engine at least 10 seconds at 2,000 rpm.
- 7) Set selector lever in "D" position and run engine at least 10 seconds at idle speed (with vehicle stopped).
- 8) Drive vehicle at 12 to 20 km/h (7 to 12 MPH) for at least 10 seconds in "D" position.
- 9) Select "Mode 3" with GST.

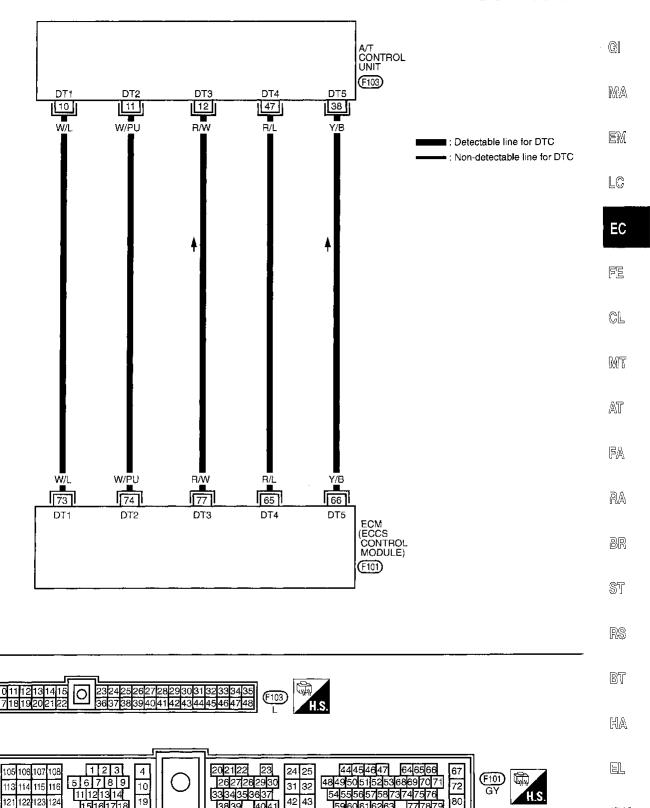




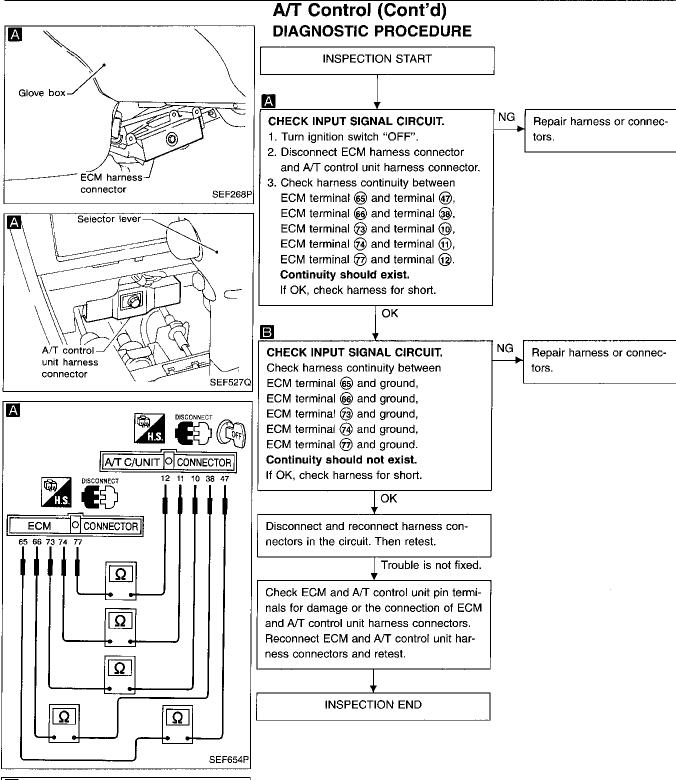
- 4) Start engine and rise engine speed to more than 1,000 rpm at once.
- 5) Run engine at least 10 seconds at idle speed.
- 6) Run engine at least 10 seconds at 2,000 rpm.
- 7) Set selector lever in "D" position and run engine at least 10 seconds at idle speed (with vehicle stopped).
- 8) Drive vehicle at 12 to 20 km/h (7 to 12 MPH) at least 10 seconds in "D" position.
- Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 10) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

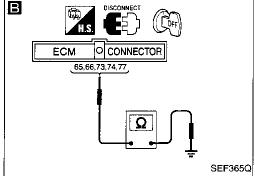
## A/T Control (Cont'd)

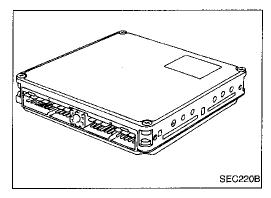
## EC-AT/C-01



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## **Engine Control Module (ECM)-ECCS Control** Module

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

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|---|---|
|   |   |
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| Diagnostic Trouble<br>Code No. | Malfunction is detected when                | Check Item<br>(Possible Cause) | LO |
|--------------------------------|---|--------------------------------|----|
| P0605<br>0301                  | ECM calculation function is malfunctioning. | ECM     (ECCS control module)  | E  |

## DIAGNOSTIC TROUBLE CODE CONFIRMATION **PROCEDURE**



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- 1) Turn ignition switch "ON".
- Select "DATA MONITOR" mode with CONSULT.

– OR -

- Start engine and wait at least 30 seconds.
- CL



- 1) Turn ignition switch "ON".
- 2) Start engine and wait at least 30 seconds.
- 3) Select "Mode 7" with GST.

- OR -AT



- Turn ignition switch "ON". 1)
- 2) Start engine and wait at least 30 seconds.
- Turn ignition switch "OFF" and wait at least 5 seconds.
- Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

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# Engine Control Module (ECM)-ECCS Control Module (Cont'd)

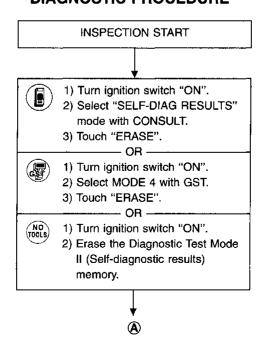
## **FAIL-SAFE MODE**

When the ECM enters the fail-safe mode, the MIL illuminates.

| DTC No.                     |   |                |   |   |  |
|-----------------------------|---|----------------|---|---|--|
| CONSULT<br>GST              | ECM*1   | Detected items | Engine operating condition in fail-safe mode  |   |  |
| Unable to<br>access<br>ECCS | Unable to<br>access Diag-<br>nostic Test<br>Mode II | ECM            | ECM fail-safe activating condition The computing function of the ECM was judged to be malfunctioning. When the fail-safe system activates, i.e. if the ECM detects a malfunction condition in the CPU of ECM, the MALFUNCTION INDICATOR LAMP on the instrument panel lights to warn the driver. However, it is not possible to access ECCS and DTC cannot be confirmed. Engine control with ECM fail-safe When ECM fail-safe is operating, fuel injection, ignition timing, fuel pump operation, IACV-AAC valve operation and cooling fan operation are controlled under certain limitations. |   |  |
|                             |   |                | ECM fail-safe operation   |   |  |
|                             |   |                | Engine speed Engine speed will not rise more than 3,000 rpm.  |   |  |
|                             |   |                | Fuel injection  | Simultaneous multiport fuel injection system  |  |
|                             |   |                | Ignition timing   | Ignition timing is fixed at the preset valve. |  |
| ;                           |   |                | Fuel pump  Fuel pump relay is "ON" when engine is running and "OFF when engine stalls.  IACV-AAC valve  Full open  Cooling fans  Cooling fan relay "ON" (High speed condition) when engine is running, and "OFF" when engine stalls.  Replace ECM, if ECM fail-safe condition is confirmed.   |   |  |
|                             | İ   |                |   |   |  |
|                             |   |                |   |   |  |
|                             |   |                |   |   |  |

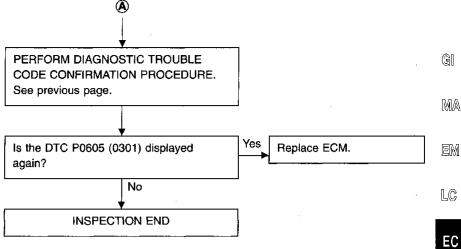
<sup>\*1:</sup> In Diagnostic Test Mode II (Self-diagnostic results), these numbers are controlled by NISSAN.

## **DIAGNOSTIC PROCEDURE**



**EC-270** 438

## **Engine Control Module (ECM)-ECCS Control** Module (Cont'd)



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## Park/Neutral Position Switch

## **COMPONENT DESCRIPTION**

When the gear position is in "P" (A/T models only) or "N", park/neutral position is "ON". ECM detects the position because the continuity of the line (the "ON" signal) exists.

## **CONSULT REFERENCE VALUE IN DATA MONITOR MODE**

Remarks: Specification data are reference values.

| MONITOR ITEM | CONDITION             |                            | SPECIFICATION |
|--------------|-----------------------|----------------------------|---------------|
| P/N POSI SW  | Ignition switch: ON   | Shift lever: "P" or "N" ON |               |
| F/N FOSI SW  | - Ignition switch. ON | Except above               | OFF           |

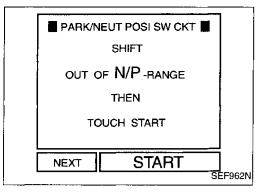
## **ECM TERMINALS AND REFERENCE VALUE**

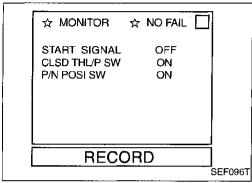
Remarks: Specification data are reference values, and are measured between each terminal and (a) (ECCS ground) with a voltmeter.

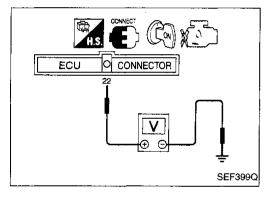
| TER-<br>MINAL<br>NO. | WIRE<br>COLOR                  | ITEM  | CONDITION  | DATA<br>(DC voltage) |
|----------------------|--------------------------------|---|--|----------------------|
| 22                   | G/W<br>(M/T<br>models)<br>G/OR | Neutral position switch<br>(M/T models)<br>Inhibitor switch (A/T mod- | Ignition switch "ON"                                 | Approximately 0V     |
|                      | (A/T<br>models)                | els)  | Ignition switch "ON"  Except the above gear position | Approximately 5V     |

## ON BOARD DIAGNOSIS LOGIC

| Diagnostic<br>Trouble Code<br>No. | Malfunction is detected when  | Check Items<br>(Possible Cause)  |
|-----------------------------------|---|--|
| P0705<br>1003                     | The signal of the park/neutral position switch is not<br>changed in the process of engine starting and driving. | <ul> <li>Harness or connectors <ul> <li>a. The neutral position switch or inhibitor switch circuit is open or shorted.</li> <li>b. The circuit between ECM and A/T control unit is open or shorted.</li> </ul> </li> <li>Neutral position switch (M/T models)</li> <li>Inhibitor switch (A/T models)</li> <li>A/T control unit (A/T models)</li> </ul> |







## Park/Neutral Position Switch (Cont'd) **OVERALL FUNCTION CHECK**

This procedure can be used for checking the overall function of the park/neutral position switch circuit. During this check, a DTC might not be confirmed.

OR -



1) Turn ignition switch "ON".

2) Perform "PARK/NEUT POSI SW CKT" in "FUNCTION TEST" mode with CONSULT.

Select "P/N POSI SW" in "DATA MONITOR" mode with CONSULT.

Check the "P/N POSI SW" signal in the following conditions.

| Condition (Gear position)       | Known good signal |
|---------------------------------|-------------------|
| "P" (A/T only) and "N" position | ON                |
| Except the above position       | OFF               |

OR ·

Turn ignition switch "ON". 1)

Check voltage between ECM terminal (2) and body ground in the following conditions.

Voltage (V) (Known good data) Condition (Gear position) "P" (A/T only) and "N" position Approx. 0 Except the above position Approx. 5

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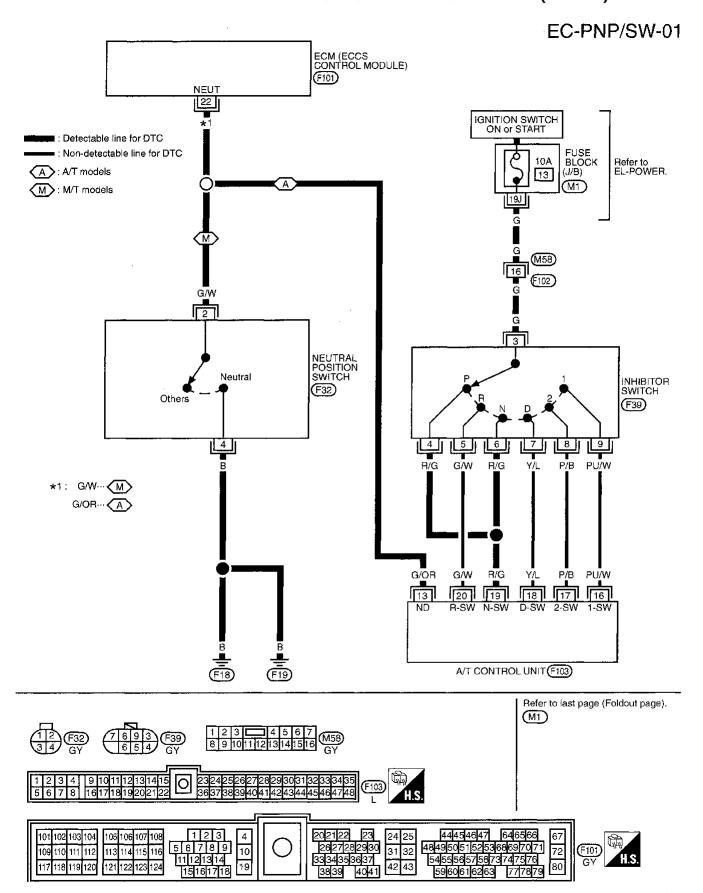
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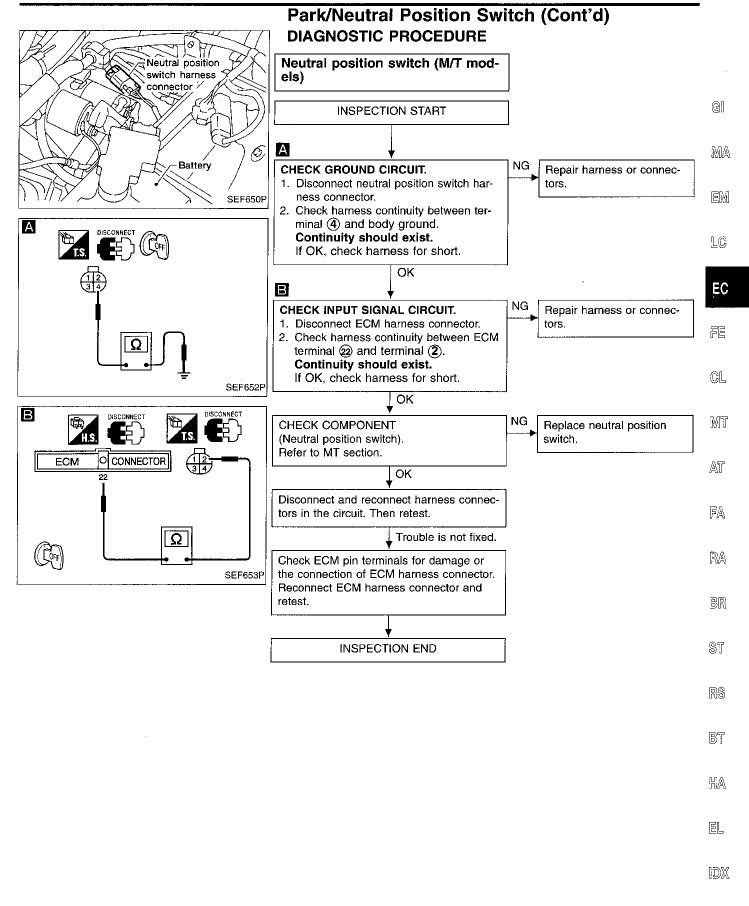
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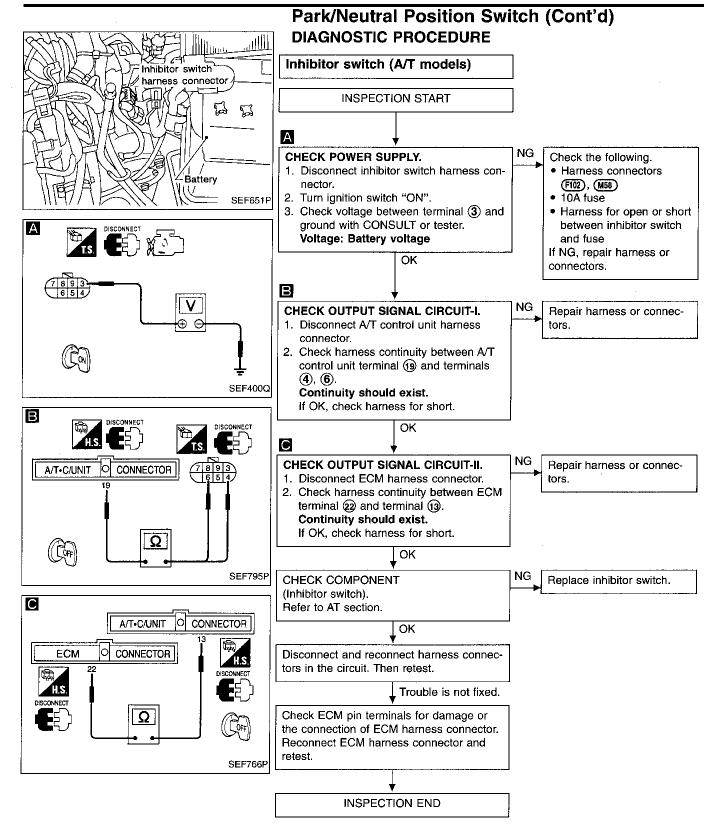
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## Park/Neutral Position Switch (Cont'd)



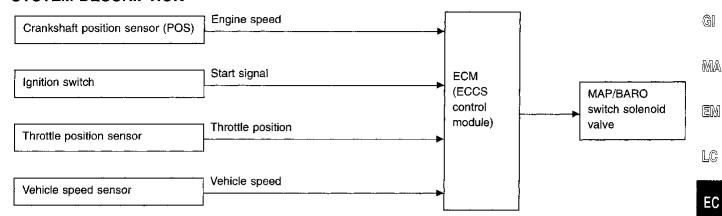




EC-276 444

## Manifold Absolute Pressure (MAP)/Barometric Pressure (BARO) Switch Solenoid Valve

### SYSTEM DESCRIPTION

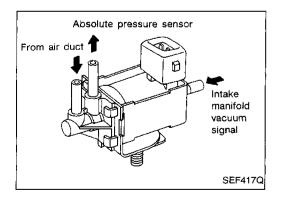


This system provides the absolute pressure sensor with either ambient barometric pressure or intake manifold pressure for monitoring.

The MAP/BARO switch solenoid valve switches between two passages (one is from the air duct, the other is from the intake manifold) by ON-OFF operation. When the MAP/BARO switch solenoid valve is activated ON or OFF by the ECM, either ambient barometric pressure or intake manifold pressure is applied to the absolute pressure sensor.

The solenoid valve is almost always OFF under normal conditions. When the following conditions are met, the solenoid valve is activated to switch ON for 1 second.

| Solenoid | Conditions  |
|----------|---|
|          | Immediately after starting engine                       |
|          | or  |
|          | More than 5 minutes after the solenoid valve shuts OFF. |
| ON       | and   |
| ON       | Throttle valve is shut or almost fully shut for         |
|          | more than 5 seconds                                     |
|          | and   |
|          | Vehicle speed is less than 100 km/h (62                 |
|          | MPH).   |



## **COMPONENT DESCRIPTION**

The MAP/BARO switch solenoid valve switches between ambient barometric pressure and intake manifold pressure according to the voltage signal sent from the ECM. When the MAP/BARO switch solenoid valve is supplied with a voltage by the ECM, it turns "ON" so that the MAP/BARO switch solenoid valve monitors the ambient barometric pressure. When the MAP/BARO switch solenoid valve is not supplied the voltage, it goes "OFF" and the sensor monitors the intake manifold pressure.

BR

RA

ST

RS

BT

HA

IDX

## Manifold Absolute Pressure (MAP)/Barometric Pressure (BARO) Switch Solenoid Valve (Cont'd)

## CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Remarks: Specification data are reference values.

| MONITOR ITEM  | CONDITION           | SPECIFICATION |
|---------------|---------------------|---------------|
| MAP/BARO SW/V | Ignition switch: ON | MAP           |

## **ECM TERMINALS AND REFERENCE VALUE**

Remarks: Specification data are reference values, and are measured between each terminal and (a) (ECCS ground) with a voltmeter.

| TER-<br>MINAL<br>NO. | WIRE | ITEM                                | CONDITION            | DATA<br>(DC voltage)          |
|----------------------|------|-------------------------------------|----------------------|-------------------------------|
| 16                   | OR/Y | MAP/BARO switch sole-<br>noid valve | Ignition switch "ON" | BATTERY VOLTAGE<br>(11 - 14V) |

#### ON BOARD DIAGNOSIS LOGIC

| Diagnostic Trouble<br>Code No. | Malfunction is detected when   | Check Items<br>(Possible Cause)   |
|--------------------------------|--|---|
| P1105<br>1302                  | MAP/BARO switch solenoid valve receives the voltage supplied though ECM does not supply the voltage to the valve.     There is little difference between MAP/BARO switch solenoid valve input voltage at ambient barometric pressure and that at intake manifold pressure. | Harness or connectors     (MAP/BARO switch solenoid valve circuit is open or shorted.)     Hoses     (Hoses are clogged or disconnected.)     Absolute pressure sensor     MAP/BARO switch solenoid valve |

## DIAGNOSTIC TROUBLE CODE CONFIRMATION **PROCEDURE**



- 1) Start engine and warm it up sufficiently.
- Turn ignition switch "OFF" and wait at least 5 seconds.
- Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
- Start engine and let it idle.
- Wait at least 6 minutes.





- Start engine and warm it up sufficiently.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Start engine and let it idle.
- 4) Wait at least 6 minutes.
- 5) Select "MODE 7" with GST.

– OR -

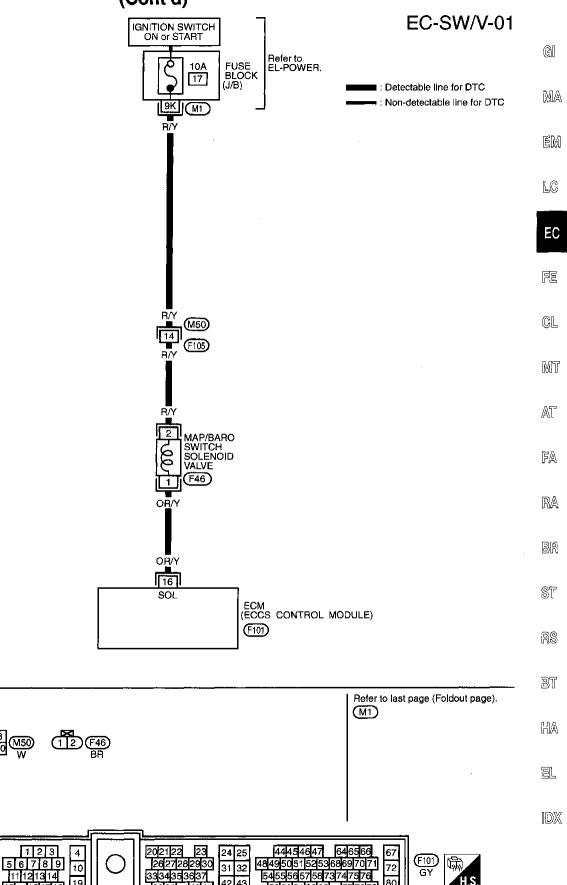


- 1) Start engine and warm it up sufficiently.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Start engine and let it idle.
- 4) Wait at least 6 minutes.
- 5) Turn ignition switch "OFF", wait at least 5 seconds and
- then turn "ON".

  6) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

446 EC-278

## Manifold Absolute Pressure (MAP)/Barometric Pressure (BARO) Switch Solenoid Valve (Cont'd)



MEC684B

31 32

42

72

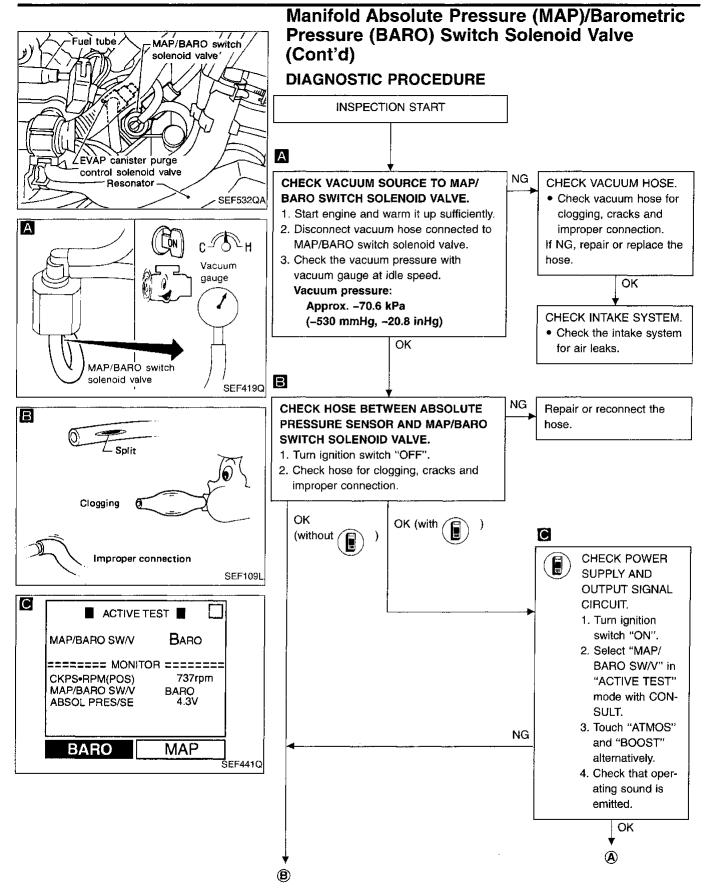
GY

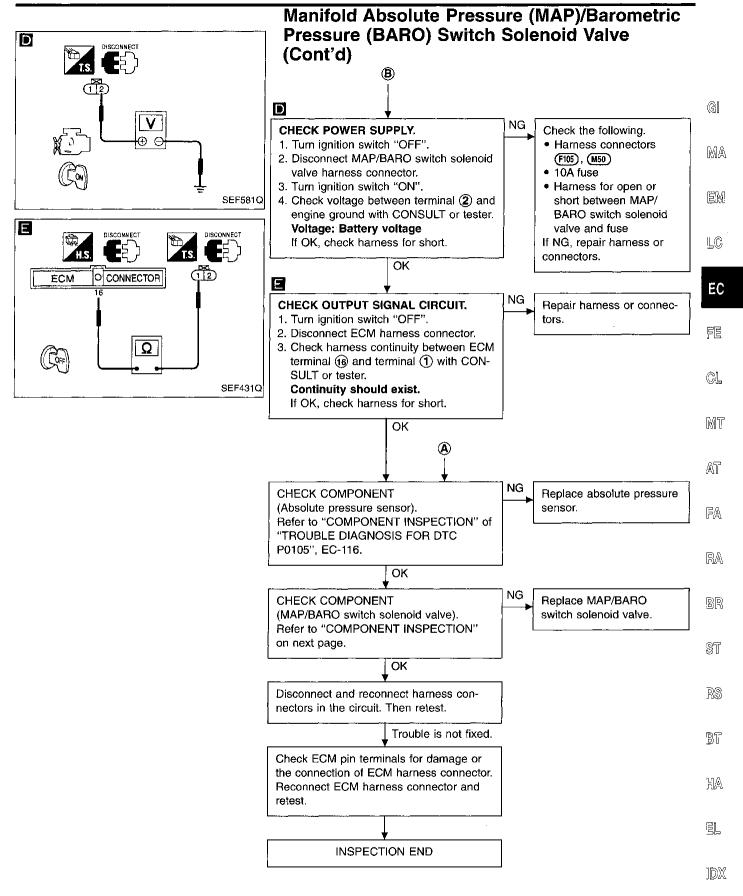
105 106 107 108

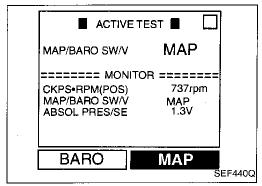
113 114 115 116

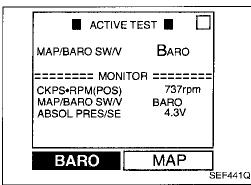
10

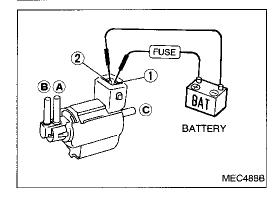
109 110 111 112











# Manifold Absolute Pressure (MAP)/Barometric Pressure (BARO) Switch Solenoid Valve (Cont'd)

## COMPONENT INSPECTION

## MAP/BARO switch solenoid valve



- 1. Start engine and warm it up sufficiently.
- 2. Perform "MAP/BARO SW/V" in "ACTIVE TEST" mode with CONSULT.
- 3. Make sure of the following.
  - When selecting "MAP", "ABSOL PRES/SE" indicates approximately 1.3V.
  - When selecting "BARO", "ABSOL PRES/SE" indicates approximately 4.3V.
- 4. If NG, check solenoid valve below.



1. Remove MAP/BARO switch solenoid valve.

- OR -

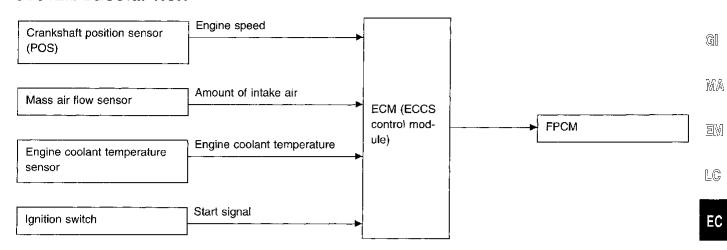
2. Check air passage continuity.

| Condition   | Air passage<br>continuity<br>between (A) and (B) | Air passage<br>continuity<br>between <b>(A</b> ) and <b>(C</b> ) |
|---|--|--|
| 12V direct current supply between terminals (1) and (2) | Yes  | No   |
| No supply   | No   | Yes  |

3. If NG, replace solenoid valve.

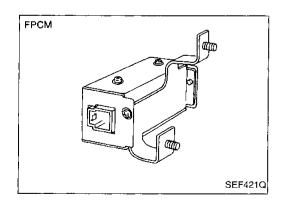
## **Fuel Pump Control Module (FPCM)**

### SYSTEM DESCRIPTION



This system controls the fuel pump operation. The amount of fuel flow delivered from the fuel pump is altered between two flow rates by the FPCM operation. The FPCM determines the voltage applied to the fuel pump (and therefore fuel flow) according to the following conditions.

|  |                           |                               | FE             |
|--|---------------------------|-------------------------------|----------------|
| Conditions   | Amount<br>of fuel<br>flow | Supplied voltage              | CL             |
| <ul> <li>Engine cranking</li> <li>Engine coolant temperature below 7°C (45°F)</li> <li>Within 30 seconds after starting engine [above 50°C (122°F)]</li> <li>Engine is running under heavy load and high speed conditions</li> </ul> | hìgh                      | Battery voltage<br>(11 - 14V) | MT<br>AT<br>FA |
| Except the above   | low                       | Approximately<br>9.5V         | RA             |



## COMPONENT DESCRIPTION

The FPCM adjusts the voltage supplied to the fuel pump to control the amount of fuel flow. When the FPCM increases the voltage supplied to the fuel pump, the fuel flow is raised. When the FPCM decreases the voltage, the fuel flow is lowered.

451

BR

ST

RS

BT

HA

10X

## Fuel Pump Control Module (FPCM) (Cont'd)

## **CONSULT REFERENCE VALUE IN DATA MONITOR MODE**

Remarks: Specification data are reference values.

| MONITOR ITEM  | CONDITION   |  | SPECIFICATION |
|---------------|---|--|---------------|
| FUEL PUMP RLY | Ignition switch is turned to ON (Operates for 1 second)     Engine running and cranking |  | ON            |
|               | Except as shown above   |  | OFF           |
| FPCM DR VOLT  | Engine: After warming up  | Within 30 seconds of starting engine       | Approx. 0V    |
|               |   | More than 30 seconds after starting engine | Approx. 3.5V  |
|               |   | Within 30 seconds of starting engine       | HI            |
| FPCM          | Engine: After warming up  | More than 30 seconds after starting engine | LOW           |

## **ECM TERMINALS AND REFERENCE VALUE**

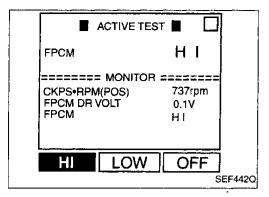
Remarks: Specification data are reference values, and are measured between each terminal and ② (ECCS ground) with a voltmeter.

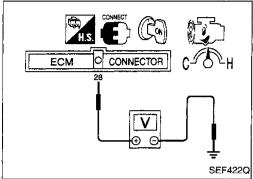
| TER-<br>MINAL<br>NO.            | WIRE<br>COLOR  | ITEM   | CONDITION   | DATA<br>(DC voltage)          |
|---------------------------------|--|--|---|-------------------------------|
| 11 B/P                          |  | P Fuel pump relay  | Ignition switch "ON"  For 1 second after turning ignition switch "ON"  Engine is running. | 0 - 1V                        |
|                                 |  |  | Ignition switch "ON"  1 second after turning ignition switch "ON"                         | BATTERY VOLTAGE<br>(11 - 14V) |
| 15 B/P Fuel pump control module |  | Engine is running. (Warm-up condition)  Idle speed (within 30 seconds after starting engine) | 0 - 0.4V  |                               |
|                                 | Engine is running. (Warm-up condition)  Idle speed (30 seconds after starting engine and thereafter) | Approximately 10V  |   |                               |
| 00 049                          | _ Fuel pump control module   | Engine is running. (Warm-up condition)  Idle speed (within 30 seconds after starting engine) | 0 - 0.4V  |                               |
| 28                              | G/R  | check  | Engine is running.  Idle speed (30 seconds after starting engine and thereafter)          | 3.3 - 3.8V                    |

## ON BOARD DIAGNOSIS LOGIC

| Diagnostic Trouble<br>Code No. | Malfunction is detected when  | Check Items<br>(Possible Cause)   |
|--------------------------------|---|---|
| P1220<br>1305                  | An improper voltage signal from the FPCM, which is supplied to a point between the fuel pump and the dropping resistor, is detected by ECM. | <ul> <li>Harness or connectors<br/>(FPCM circuit is open or shorted.)</li> <li>Dropping resistor</li> <li>FPCM</li> </ul> |

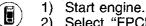
**EC-284** 452





## Fuel Pump Control Module (FPCM) (Cont'd) OVERALL FUNCTION CHECK

Use this procedure to check the overall function of the FPCM circuit. During this check, a DTC might not be confirmed.



2) Select "FPCM" in "ACTIVE TEST" mode with CON-SULT.

3) Touch "HI" then "LOW" respectively.

Check voltage between ECM terminal 28 and ground. HI: Approximately 0V LOW: Approximately 3.7V

EM

MA



1) Start engine and warm it up sufficiently.

2) Turn ignition switch "OFF" and wait at least 5 seconds.

Start engine and let it idle.

Check voltage between ECM terminal 28 and ground.

Within 30 seconds of starting engine: Approximately 0V

More than 30 seconds after starting engine: Approximately 3.7V

EC

LC

CL.

MT

AT

FA

RA

BR

ST

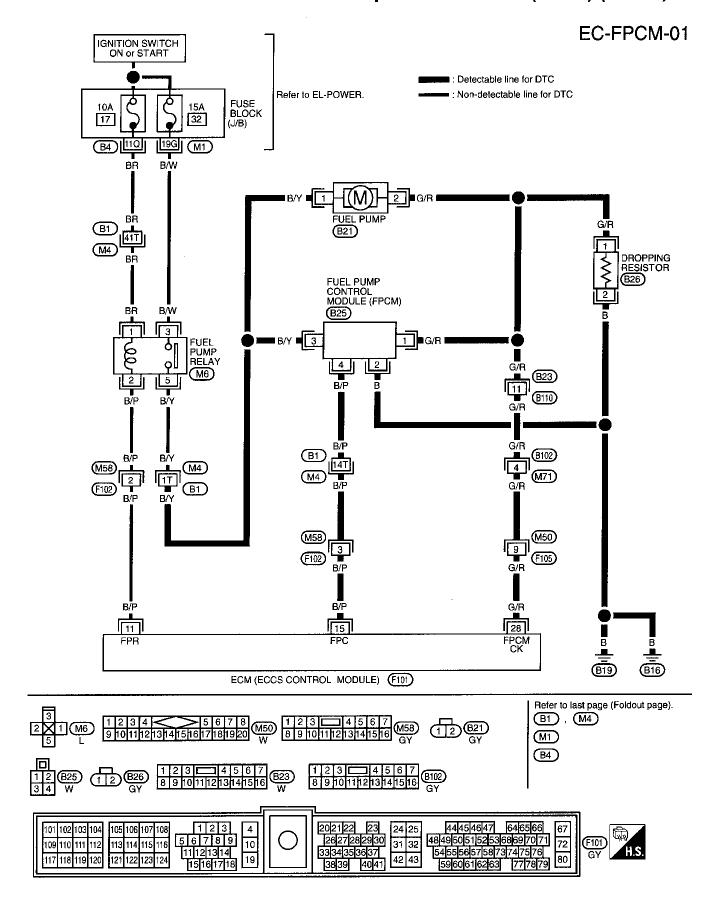
RS

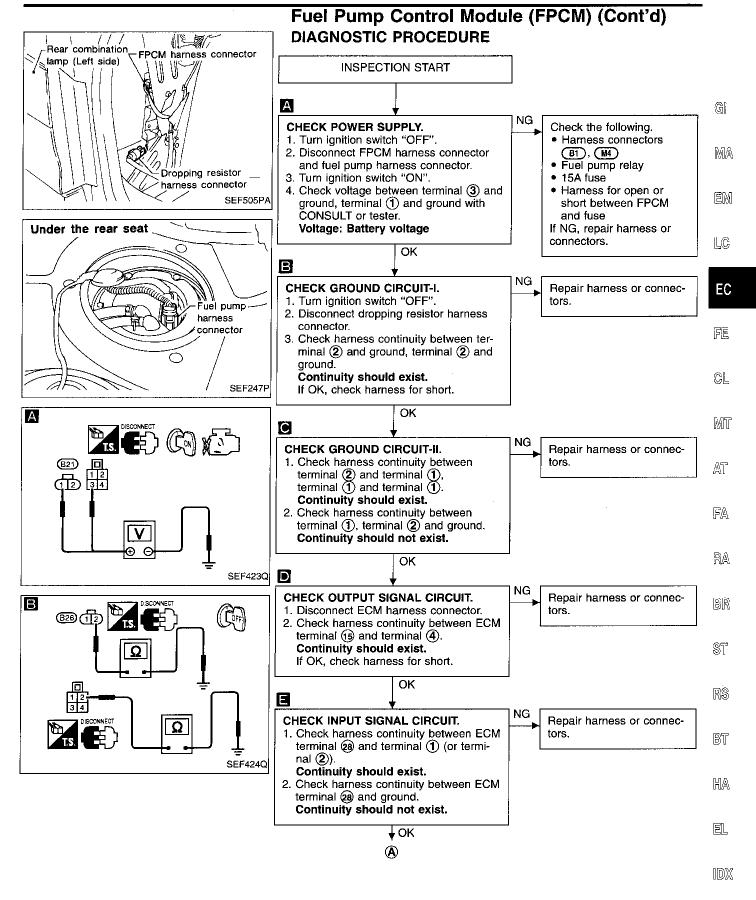
BT

HA

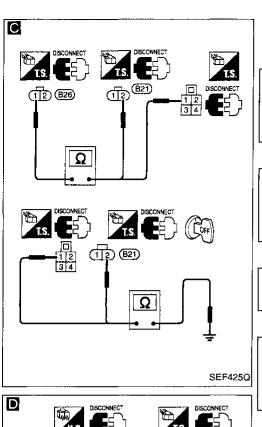
IDX

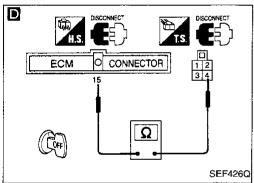
## Fuel Pump Control Module (FPCM) (Cont'd)

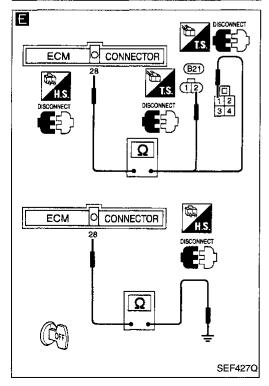


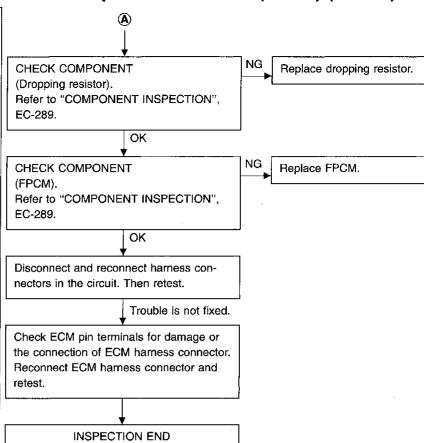


EC-287 455



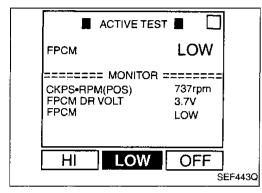


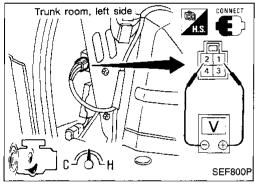


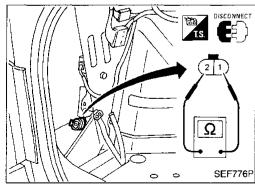


Fuel Pump Control Module (FPCM) (Cont'd)

# FPCM H I ====== MONITOR ======= CKPS•RPM(POS) 737rpm FPCM DR VOLT 0.1V FPCM H I HI LOW OFF SEF442Q







# Fuel Pump Control Module (FPCM) (Cont'd) COMPONENT INSPECTION

### **FPCM**



- Start engine and let it idle.
- Perform "FPCM" in "ACTIVE TEST" mode with CON-SULT.
- Make sure of the following.
  - When selecting "HI", "FPCM DR VOLT" indicates approximately 0V.
  - When selecting "LOW", "FPCM DR VOLT" indicates approximately 3.7V.
- 4. If NG, replace FPCM.

Start anging and warm i

- Start engine and warm it up sufficiently.
   Turn ignition switch "OFF" and wait at least 5 seconds.
- 2. Start anging and let it idle
- 3. Start engine and let it idle.
- Check voltage between terminals 1 and 2.
   Within 30 seconds of starting engine:
   Approximately 0V

More than 30 seconds after starting engine: Approximately 3.7V

5. If NG, replace FPCM.

**Dropping resistor** 

Check resistance between terminals ① and ②.

Resistance: Approximately 0.9Ω at 25°C (77°F)

RA

MA

LC

EC

FE

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FA

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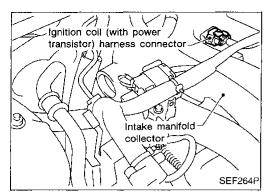
RS

87

AH

EL

IDX



# Ignition Signal COMPONENT DESCRIPTION

## Ignition coil & power transistor

The ignition signal from the ECM is sent to and amplified by the power transistor. The power transistor turns on and off the ignition coil primary circuit. This on-off operation induces the proper high voltage in the coil secondary circuit.

## **ECM TERMINALS AND REFERENCE VALUE**

Remarks: Specification data are reference values, and are measured between each terminal and (a) (ECCS ground) with a voltmeter.

| nemarks              | . Specifica  | mon data are reference value                    | es, and are measured between each terminal and (25) (EG | 503 ground) with a volumeter.                  |
|----------------------|--|---|---|--|
| TER-<br>MINAL<br>NO. | WIRE<br>COLOR  | ITEM  | CONDITION   | DATA<br>(DC voltage)                           |
| 1 2                  | 1 Y/R<br>2 G/R<br>3 L/R                              | Ignition signal (No. 1)                         | Engine is running.  Idle speed                          | Approximately 0.2V★  (V) 4 2 0 100 ms  SEF399T |
|                      |  | Ignition signal (No. 2) Ignition signal (No. 3) | Engine is running.  Engine speed is 2,500 rpm.          | Approximately 0.3V★  (V)  4 2 100 ms  SEF645T  |
| 7<br>8               | GY<br>PHAW   | Ignition signal (No. 4)                         | Engine is running.  Idle speed                          | Approximately 0.2V★  (V) 4 2 0 100 ms  SEF399T |
| 9                    | PU/W Ignition signal (No. 5) Ignition signal (No. 6) | Engine is running.  Engine speed is 2,500 rpm   | Approximately 0.3V ★  (V) 4 2 100 ms  SEF645T           |  |

<sup>★:</sup> Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

## Ignition Signal (Cont'd)

### ON BOARD DIAGNOSIS LOGIC

| Diagnostic<br>Trouble<br>Code No. | Malfunction is detected when   | Check Items<br>(Possible Cause)  |       |
|-----------------------------------|--|--|-------|
| P1320<br>0201                     | The ignition signal in the primary circuit is not entered during engine cranking or running. | Harness or connectors     (The ignition primary circuit is open or shorted.) | — GI  |
| 0201                              | during engine cranking or running.   | Power transistor unit built into ignition coil                               | D A A |
|                                   |  | Condenser  | MA    |
|                                   |  | Crankshaft position sensor (REF)   |       |
|                                   |  | Crankshaft position sensor (REF) circuit                                     |       |

## DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

Note: If both DTC P1320 (0201) and DTC P0340 (0101), P1335 (0407), P0335 (0802) or P1336 (0905) are displayed, perform TROUBLE DIAGNOSIS FOR DTC P0340, P1335, P0335 or P1336 first. (See EC-205, 298, 199, or 303.)



- 1) Turn ignition switch "ON".
- Select "DATA MONITOR" mode with CONSULT.
- Start engine. (If engine does not run, turn ignition switch to "START" at least 5 seconds.)





- 1) Turn ignition switch "ON".
- 2) Start engine. (If engine does not run, turn ignition switch to "START" at least 5 seconds.)
- 3) Select MODE 7 with GST.



- 1) Turn ignition switch "ON".
- 2) Start engine. (If engine does not run, turn ignition switch to "START" at least 5 seconds.)
- 3) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 4) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

EC

FE

CL

MIT

AT

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BR

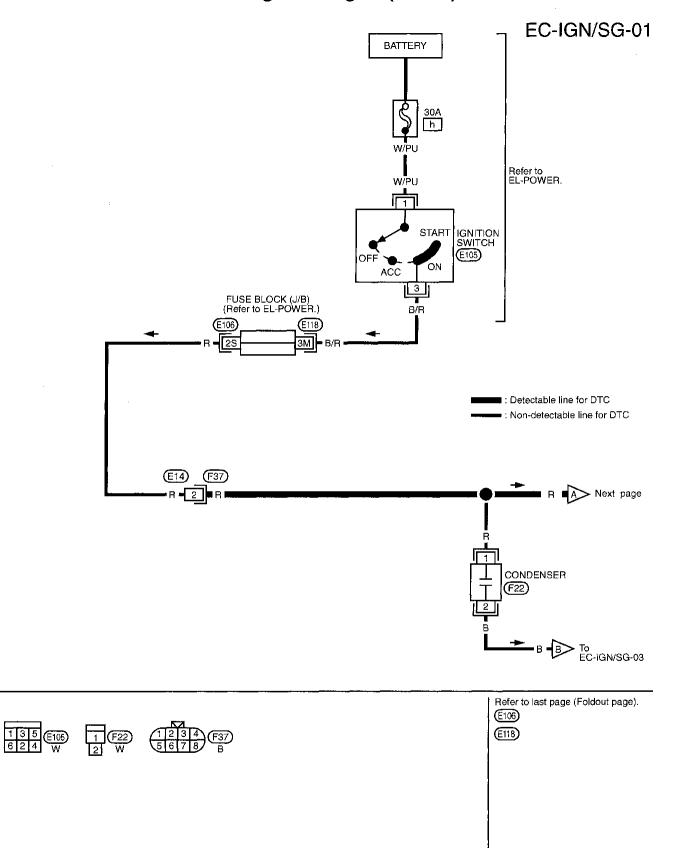
ST.

RS

87

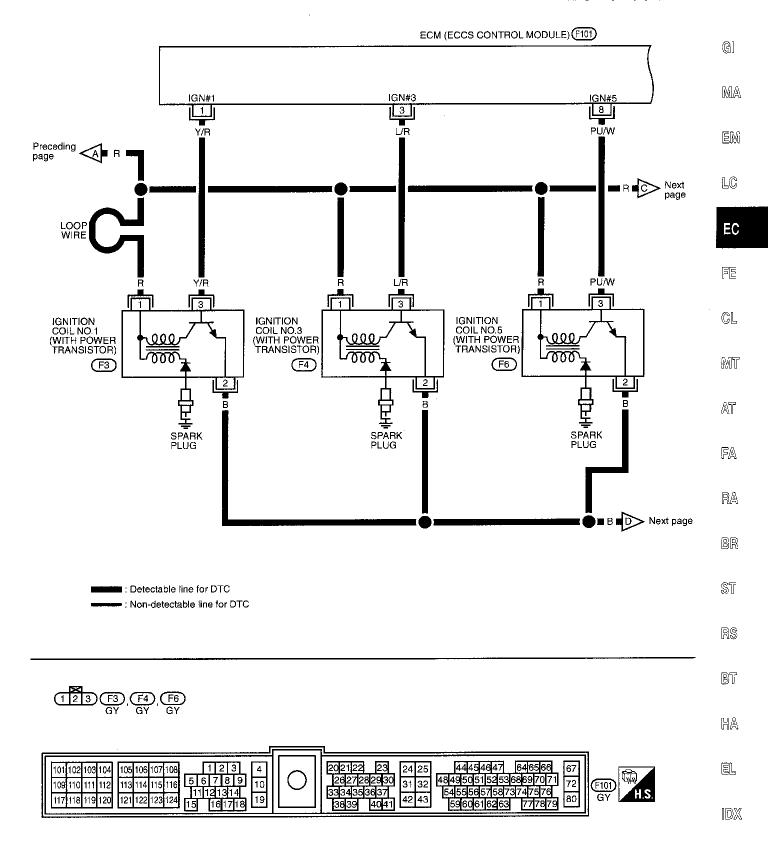
EC-291 459

## Ignition Signal (Cont'd)



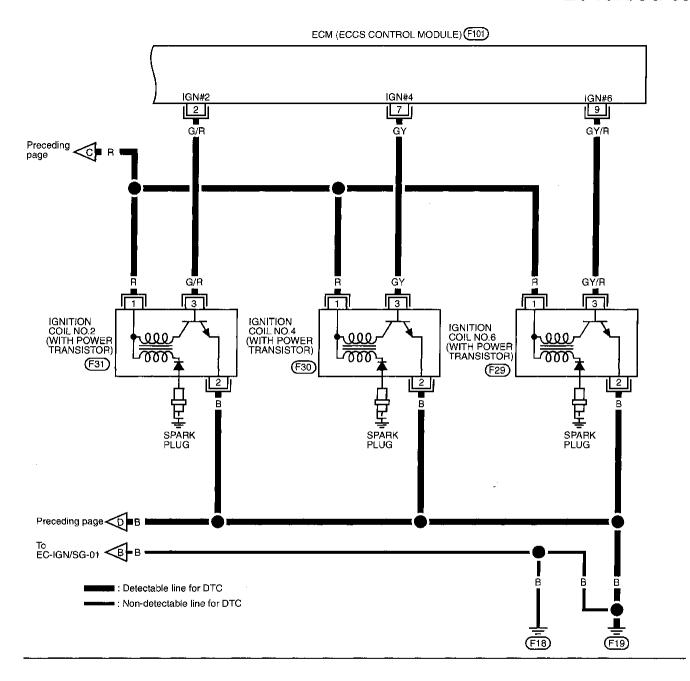
## Ignition Signal (Cont'd)

## EC-IGN/SG-02

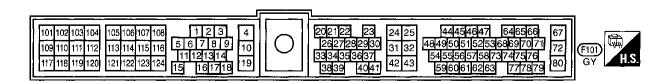


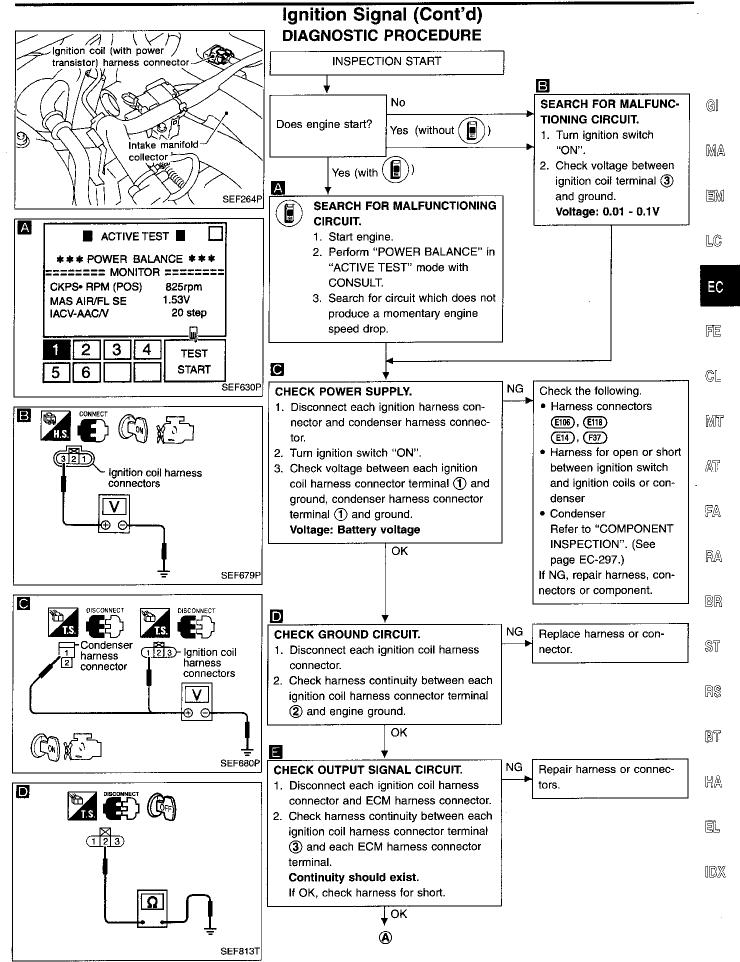
## Ignition Signal (Cont'd)

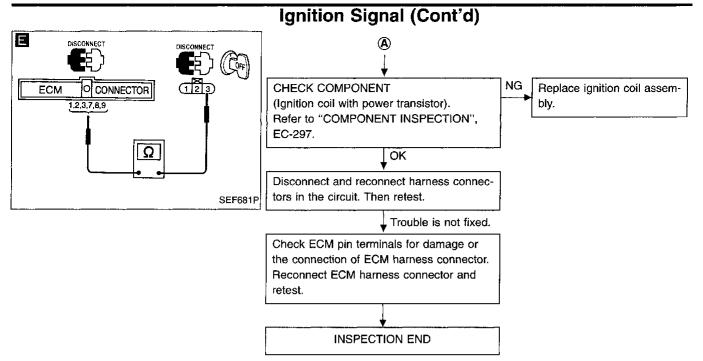
EC-IGN/SG-03

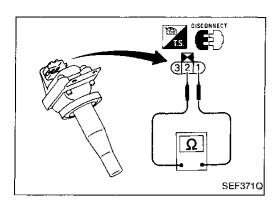












# Ignition Signal (Cont'd) COMPONENT INSPECTION

## Ignition coil with power transistor

- Disconnect ignition coil with power transistor harness connector.
- 2. Check ignition coil with power transistor for resistance between terminals (1) and (2).

| Terminals   | Resistance | Result |
|-------------|------------|--------|
| ① and ②     | Not 0Ω     | ОК     |
| (f) and (g) | Ω          | NG     |

If NG, replace ignition coil with power transistor assembly.



EC

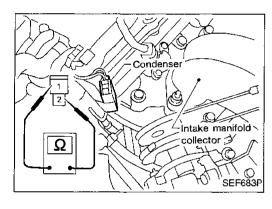
FE

CL

MT

G]

MA



## Condenser

- 1. Disconnect condenser harness connector.
- 2. Check condenser continuity between terminals ① and ②. Resistance: Above 1 MΩ at 25°C (77°F)

AT

FA RA

BR

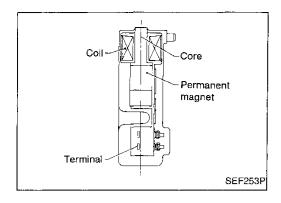
ST

RS

BŢ

HA

EL



# Crankshaft Position Sensor (CKPS) (REF) COMPONENT DESCRIPTION

The crankshaft position sensor (REF) is located on the oil pan (upper) facing the crankshaft pulley. It detects the TDC (Top Dead Center) signal (120° signal).

The sensor consists of a permanent magnet, core and coil.

When engine is running, the gap between the sensor and the crankshaft pulley will periodically change. Permeability near the sensor also changes.

Due to the permeability change, the magnetic flux near the core is changed. Therefore, the voltage signal generated in the coil is changed.

The ECM receives the voltage signal and detects the TDC signal (120° signal).

## **CONSULT REFERENCE VALUE IN DATA MONITOR MODE**

Remarks: Specification data are reference values.

| MONITOR ITEM   | CONDITION  | SPECIFICATION                     |
|----------------|--|-----------------------------------|
| CKPS-RPM (POS) | Tachometer: Connect  | Almost the same speed as the CON- |
| CKPS-RPM (REF) | Run engine and compare tachometer indication with the CONSULT value. | SULT value.                       |

#### **ECM TERMINALS AND REFERENCE VALUE**

Remarks: Specification data are reference values, and are measured between each terminal and (a) (ECCS ground) with a voltmeter.

| TER-<br>MINAL<br>NO. | WIRE<br>COLOR | ITEM                             | CONDITION                      | DATA<br>(DC voltage)  |
|----------------------|---------------|----------------------------------|--------------------------------|---|
| 44<br>48             | w<br>w        | Crankshaft position sensor (REF) | Engine is running.  Idle speed | Approximately 2.3V★ (AC voltage)  (V) 20 10 0 20 ms SEF400T |

<sup>★:</sup> Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

## ON BOARD DIAGNOSIS LOGIC

| Diagnostic<br>Trouble Code<br>No. | Malfunction is detected when  | Check Items<br>(Possible Cause)  |
|-----------------------------------|---|--|
| P1335<br>0407                     | 120° signal is not entered to ECM for the first few seconds during engine cranking. | Harness or connectors     (The crankshaft position sensor (REF) circuit is open or shorted.)   |
|                                   | 120° signal is not entered to ECM during engine run-<br>ning.                       | <ul> <li>Crankshaft position sensor (REF)</li> <li>Starter motor (Refer to EL section.)</li> <li>Starting system circuit (Refer to EL section.)</li> </ul> |
|                                   | 120° signal cycle excessively changes during engine running.                        |  |

EC-298

## Crankshaft Position Sensor (CKPS) (REF) (Cont'd)

## **FAIL-SAFE MODE**

When the ECM enters the fail-safe mode, the MIL illuminates.

| DTC No.        |                |  |  | G]          |
|----------------|----------------|--|--|-------------|
| CONSULT<br>GST | ECM*1          | Detected items                           | Engine operating condition in fail-safe mode   | <b>3</b> 13 |
| P1335          | 0407           | Crankshaft position sensor (REF) circuit | Compression TDC signal (120° signal) is controlled by camshaft position sensor (PHASE) signal and crankshaft position sensor (POS) signal. Ignition timing will be delayed 0° to 2°. | MA          |
| *1. In Diggn   | notic Tost Mod | o II (Salf diagnostic results            | ) these numbers are controlled by MISSAN   | EM          |

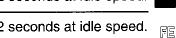
<sup>\*1:</sup> In Diagnostic Test Mode II (Self-diagnostic results), these numbers are controlled by NISSAN.

## DIAGNOSTIC TROUBLE CODE CONFIRMATION **PROCEDURE**



Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.

Start engine and run it at least 2 seconds at idle speed. – OR -





Start engine and run it at least 2 seconds at idle speed. 1)

2) Select "MODE 7" with GST.



Start engine and run it at least 2 seconds at idle speed.

2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".

Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

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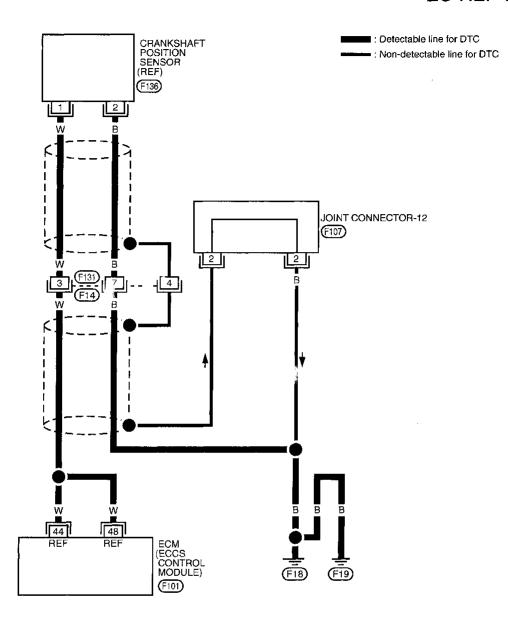
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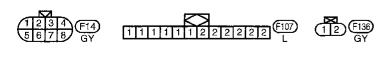
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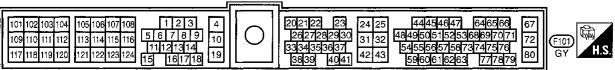
**EC-299** 

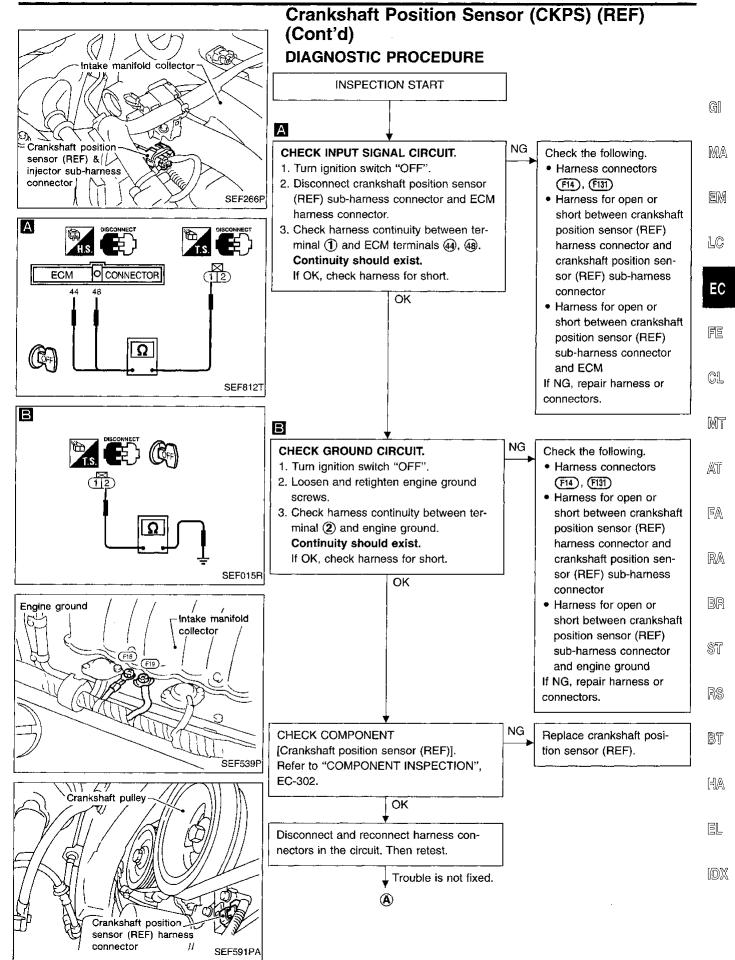
## Crankshaft Position Sensor (CKPS) (REF) (Cont'd)

## EC-REF-01

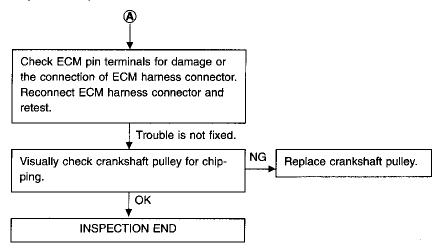


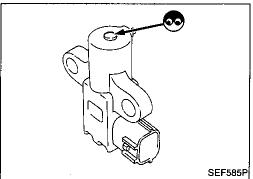


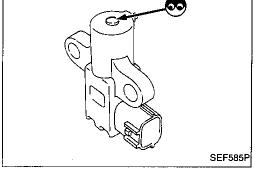


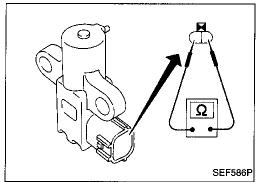


#### Crankshaft Position Sensor (CKPS) (REF) (Cont'd)









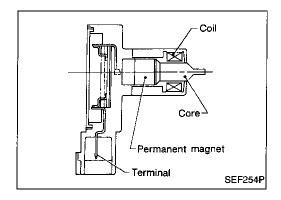
#### **COMPONENT INSPECTION**

#### Crankshaft position sensor (REF)

- Disconnect crankshaft position sensor (REF) harness connec-
- Loosen the fixing bolt of the sensor.
- 3. Remove the sensor.
- Visually check the sensor for chipping.

Check resistance as shown in the figure. Resistance: Approximately 470 - 570 $\Omega$  [At 20°C (68°F)]

470 **EC-302** 



# Crankshaft Position Sensor (CKPS) (POS) (COG)

#### **COMPONENT DESCRIPTION**

The crankshaft position sensor (POS) is located on the oil pan facing the gear teeth (cogs) of the signal plate (flywheel). It detects the crankshaft position signal (1° signal).

The sensor consists of a permanent magnet, core and coil. When engine is running, the gap between the sensor and the gear teeth (cogs) will periodically change. Permeability near the sensor

also changes.

Due to the permeability change, the magnetic flux near the core is changed. Therefore, the voltage signal generated in the coil is changed.

The ECM receives the voltage signal and detects the crankshaft position signal (1° signal).

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#### **CONSULT REFERENCE VALUE IN DATA MONITOR MODE**

Remarks: Specification data are reference values.

| MONITOR ITEM   | CONDITION  | SPECIFICATION                     |  |
|----------------|--|-----------------------------------|--|
| CKPS·RPM (POS) | Tachometer: Connect  | Almost the same speed as the CON- |  |
| CKPS·RPM (REF) | Run engine and compare tachometer indication with the CONSULT value. | SULT value.                       |  |

#### **ECM TERMINALS AND REFERENCE VALUE**

Remarks: Specification data are reference values, and are measured between each terminal and ② (ECCS ground) with a voltmeter.

| TER-<br>MINAL<br>NO. | WIRE<br>COLOR | ITEM                       | CONDITION  | DATA<br>(DC voltage)                    | AT       |
|----------------------|---------------|----------------------------|--|---|----------|
|                      |               |                            |  | Approximately 2.5V★                     | FA       |
| 49                   | w             | Crankshaft position sensor | Engine is running.   | 4 2 WWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWW | RA       |
|                      |               | (POS)                      | L Idle speed   | 1 ms                                    |          |
|                      |               |                            |  | SEF646T                                 | ST       |
| 4                    | W/B           | ECCS relay (Self-shutoff)  | Engine is running.  Ignition switch "OFF"  For a few seconds after turning ignition switch "OFF" | 0 - 1V                                  | RS       |
|                      |               |                            | Ignition switch "OFF"  A few seconds passed after turning ignition switch "OFF"                  | BATTERY VOLTAGE<br>(11 - 14V)           | BT<br>HA |
| 67<br>72             | R<br>R        | Power supply for ECM       | Ignition switch "ON"   | BATTERY VOLTAGE<br>(11 - 14V)           |          |

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

IDX

# Crankshaft Position Sensor (CKPS) (POS) (COG) (Cont'd)

#### ON BOARD DIAGNOSIS LOGIC

| Diagnostic<br>Trouble Code<br>No. | Malfunction is detected when   | Check Items<br>(Possible Cause)  |
|-----------------------------------|--|--|
| P1336<br>0905                     | Chipping of the signal plate (on flywheel) gear teeth (cogs) is detected by the ECM. | <ul> <li>Harness or connectors</li> <li>Crankshaft position sensor (POS)</li> <li>Signal plate (flywheel)</li> </ul> |

### DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

Before performing the following procedure, confirm that battery voltage is more than 10.5V.

- OR -

– OR -



- 1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
- 2) Start engine and run it at least 1 minute and 10 seconds at idle speed.



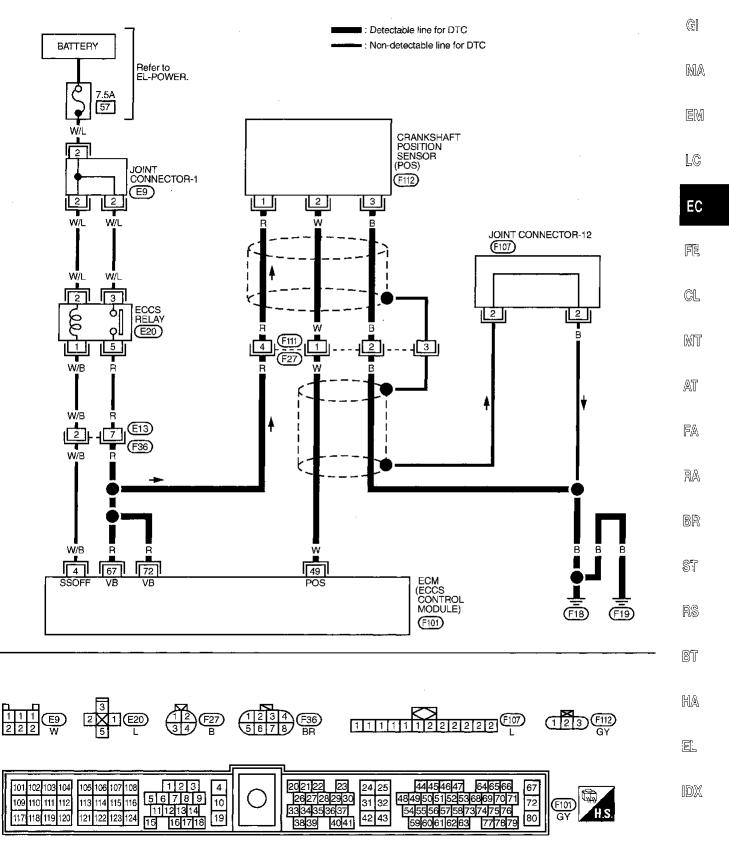
- 1) Start engine and run it at least 1 minute and 10 seconds at idle speed.
- 2) Select "MODE 7" with GST.

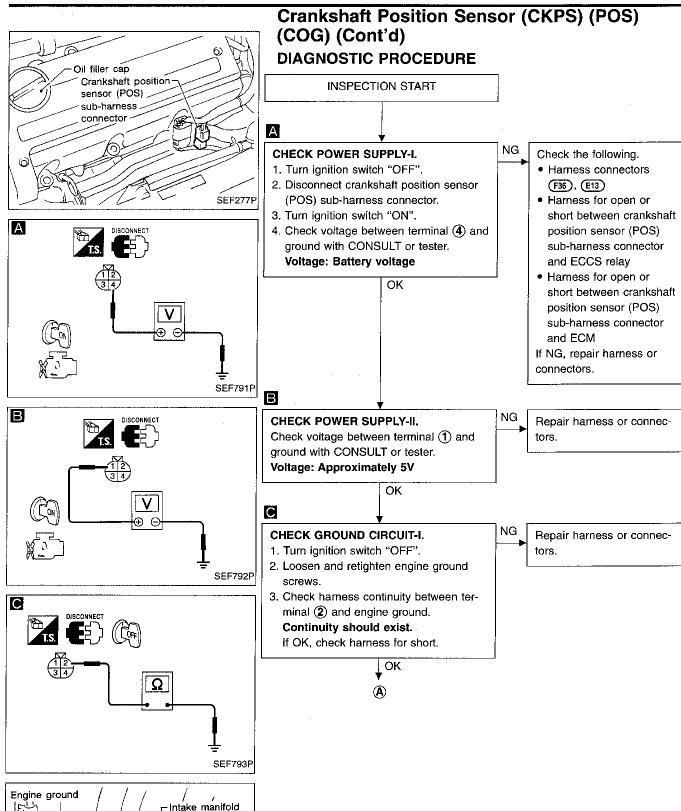


- 1) Start engine and run it at least 1 minute and 10 seconds at idle speed.
- 2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

# Crankshaft Position Sensor (CKPS) (POS) (COG) (Cont'd)

#### EC-POS-01

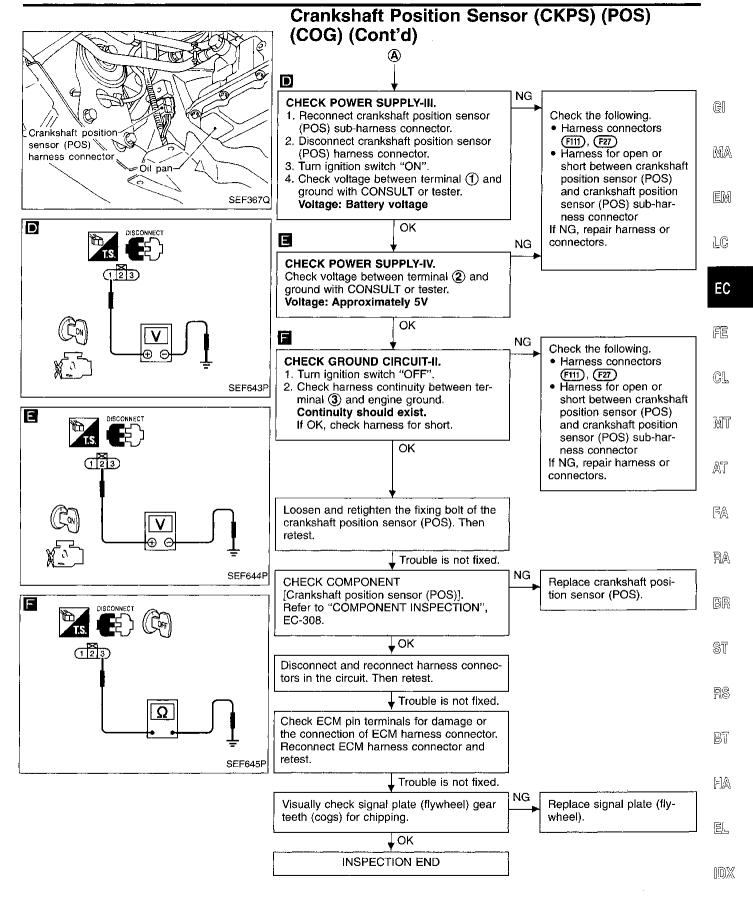


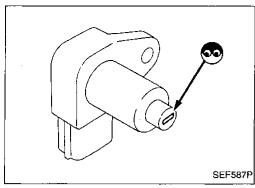


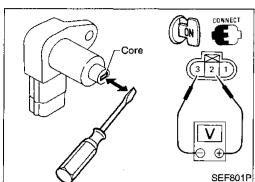
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# Crankshaft Position Sensor (CKPS) (POS) (COG) (Cont'd)

#### **COMPONENT INSPECTION**

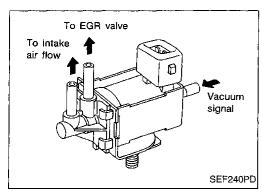
#### Crankshaft position sensor (POS)

- Disconnect crankshaft position sensor (POS) harness connector.
- 2. Loosen the fixing bolt of the sensor.
- 3. Remove the sensor.
- 4. Visually check the sensor for chipping.
- Reconnect crankshaft position sensor (POS) harness connector.
- 6. Turn ignition switch "ON".
- 7. Check voltage between terminals ② and ③ when bringing a screwdriver into contact with, and quickly pulling away from the sensor core.

| Terminal | Condition   | Voltage          |
|----------|-------------|------------------|
| (a) (a)  | Contacted   | Approximately 5V |
| 2, 3     | Pulled away | Approximately 0V |

There should be a steady 5V as the screwdriver is drawn away slowly.

If NG, replace crankshaft position sensor (POS).



#### **EGRC-Solenoid Valve**

#### COMPONENT DESCRIPTION

The EGRC-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.]

When the ECM sends an OFF signal, the vacuum signal passes through the solenoid valve. The signal then reaches the EGR valve.

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#### CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Remarks: Specification data are reference values.

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| MONITOR ITEM  | CONDITION                      |      | SPECIFICATION |
|---|--------------------------------|------|---------------|
| Engine: After warming up     Air conditioner switch: "OFF"     Shift lever: "N"     No-load |                                | Idle | ON            |
|   | Racing up to 1,500 - 2,000 rpm | OFF  |               |

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#### **ECM TERMINALS AND REFERENCE VALUE**

Remarks: Specification data are reference values, and are measured between each terminal and ② (ECCS ground) with a voltmeter.

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| TER-<br>MINAL<br>NO. | WIRE | ITEM                | CONDITION   | DATA<br>(DC voltage)          |  |
|----------------------|------|---------------------|---|-------------------------------|--|
| 100                  | L/B  | FORC palancid uptur | Engine is running. (Warm-up condition)  Revving engine up to 2,000 rpm. | BATTERY VOLTAGE<br>(11 - 14V) |  |
| 103                  | L/B  | EGRC-solenoid valve | Engine is running. (Warm-up condition)  Idle speed                      | 0 - 0.7V                      |  |

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#### ON BOARD DIAGNOSIS LOGIC

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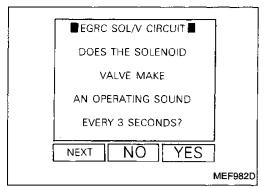
| Diagnostic<br>Trouble Code<br>No. | Malfunction is detected when   | Check Items<br>(Possible Cause)   | BR |
|-----------------------------------|--|---|----|
| P1400<br>1005                     | The improper voltage signal is entered to ECM through EGRC-solenoid valve. | Harness or connectors     (The EGRC-solenoid valve circuit is open or shorted.)     EGRC-solenoid valve | ST |

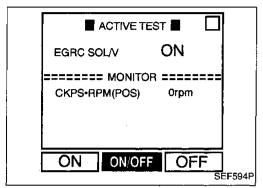
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# EGRC-Solenoid Valve (Cont'd) OVERALL FUNCTION CHECK

Use this procedure to check the overall function of the EGRC-solenoid valve circuit.

During this check, a 1st trip DTC might not be confirmed.



 Turn ignition switch "ON".
 Perform "EGRC SOL/V CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

- OR -



1) Turn ignition switch "ON".

2) Perform "EGRC SOLENOID VALVE" in "ACTIVE TEST" mode with CONSULT and check the operating sound, according to ON/OFF switching.

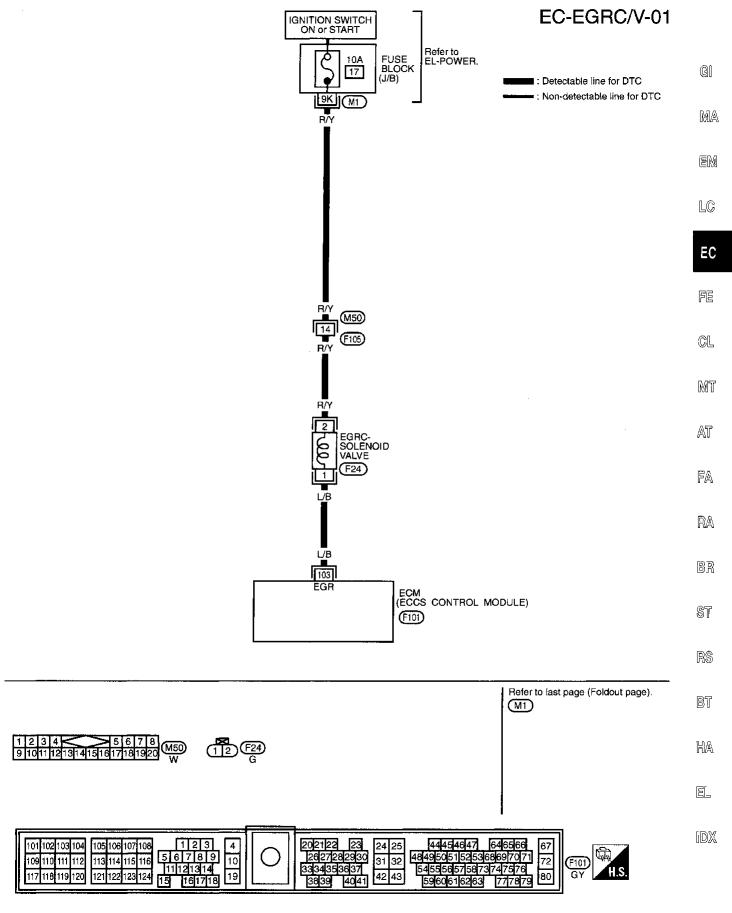
- OR -

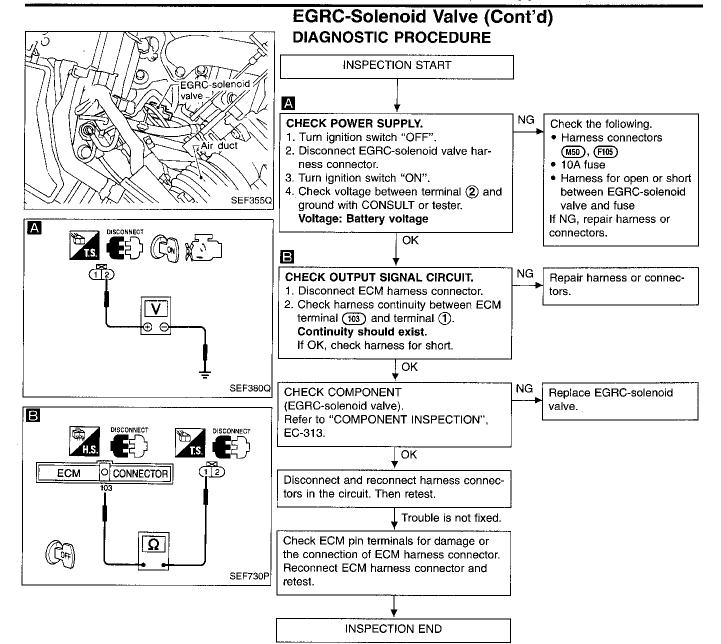


1) Turn ignition switch "ON".

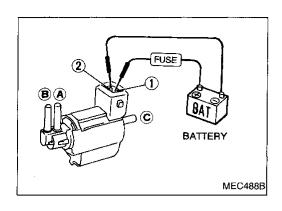
 When disconnecting and reconnecting the EGRC-solenoid valve harness connector, make sure that the solenoid valve makes operating sound.

#### EGRC-Solenoid Valve (Cont'd)





EC-312 480



#### EGRC-Solenoid Valve (Cont'd) **COMPONENT INSPECTION**

#### **EGRC-solenoid valve**

Check air passage continuity.

| Condition   | Air passage continuity between (A) and (B) | Air passage continuity between (A) and (C) |
|---|--|--|
| 12V direct current supply between terminals ① and ② | Yes  | No   |
| No supply   | No   | Yes  |

If NG, replace solenoid valve.

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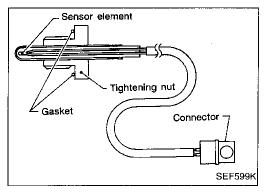
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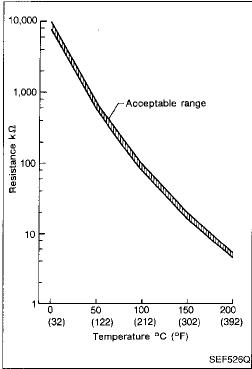
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#### **EGR Temperature Sensor**

#### **COMPONENT DESCRIPTION**

The EGR temperature sensor detects temperature changes in the EGR passage way. When the EGR valve opens, hot exhaust gases flow, and the temperature in the passage way changes. The EGR temperature sensor is a thermistor that modifies a voltage signal sent from the ECM. This modified signal then returns to the ECM as an input signal. As the temperature increases, EGR temperature sensor resistance decreases.

This sensor is not directly used to control the engine system. It is used only for the on board diagnosis.

#### (Reference data)

| EGR temperature<br>°C (°F) | Voltage*<br>(V) | Resistance (M $\Omega$ ) |
|----------------------------|-----------------|--------------------------|
| 0 (32)                     | 4.81            | 7.9 - 9.7                |
| 50 (122)                   | 2.82            | 0.57 - 0.70              |
| 100 (212)                  | 0.8             | 0.08 - 0.10              |

<sup>\*:</sup> These data are reference values and are measured between ECM terminal 
(3) (EGR temperature sensor) and ECM terminal (3) (ECCS ground).

#### CONSULT REFERENCE VALUE IN DATA MONITOR MODE

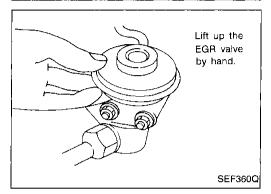
Remarks: Specification data are reference values.

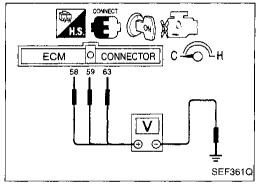
| MONITOR ITEM | CONDITION                | SPECIFICATION  |
|--------------|--------------------------|----------------|
| EGR TEMP SEN | Engine: After warming up | Less than 4.5V |

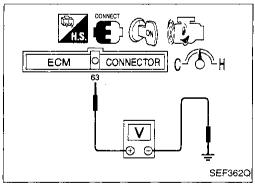
#### ON BOARD DIAGNOSIS LOGIC

| Diagnostic Trouble<br>Code No. | Malfunction is detected when  | Check Items<br>(Possible Cause)  |
|--------------------------------|---|--|
| P1401<br>0305                  | A) An excessively low voltage from the EGR temperature sensor is entered to ECM, even when engine coolant temperature is low.   | <ul> <li>Harness or connectors         (The EGR temperature sensor circuit is shorted.)</li> <li>EGR temperature sensor</li> <li>Malfunction of EGR function, EGRC-BPT valve or EGRC-solenoid valve</li> </ul> |
|                                | B) An excessively high voltage from the EGR temperature sensor is entered to ECM, even when engine coolant temperature is high. | Harness or connectors     (The EGR temperature sensor circuit is open.)     EGR temperature sensor     Malfunction of EGR function, EGRC-BPT valve or EGRC-solenoid valve                                      |

# ★ MONITOR ★ NO FILE CKPS•RPM (POS) 0rpm COOLAN TEMP/S 20°C EGR TEMP SEN 4.3V INT/A TEMP SE 22°C







# EGR Temperature Sensor (Cont'd) OVERALL FUNCTION CHECK

Use this procedure to check the overall function of the EGR temperature sensor. During this check, a 1st trip DTC might not be confirmed.

#### Procedure for malfunctions A and B



- Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
- Confirm that engine coolant temperature and intake air temperature are lower than 40°C (104°F). (If necessary, wait until the temperatures equal atmospheric temperature.)
- 3) Confirm that "EGR TEMP SEN" reading is between 3.45V and 5.0V.
- 4) Start engine and warm it up sufficiently.
- 5) Run engine at idle for at least 2 minutes.
- 6) Confirm that EGR valve is not lifting. If NG, go to TROUBLE DIAGNOSES FOR DTC P0400 and P0402. (See pages EC-210 and 220.)
- Read "EGR TEMP SEN" at about 1,500 rpm with EGR valve lifted up to the full position by hand.
   Voltage should decrease to less than 1.0V.
- 8) If step 7 is OK, perform TROUBLE DIAGNOSES FOR DTC P0400, P0402 and P1400. (See pages EC-210, 220 and 309.)

OR



- Turn ignition switch "ON".
- 2) Confirm that voltage between ECM terminals (8), (9) and ground are more than 2.72V. (If necessary, wait until engine coolant temperature and intake air temperature equal atmospheric temperature.)
- 3) Confirm that voltage between ECM terminal 63 and ground is between 3.45V and 5.0V.
- 4) Start engine and warm it up sufficiently.
- 5) Run engine at idle for at least 2 minutes.
- 6) Confirm that EGR valve is not lifting. If NG, go to TROUBLE DIAGNOSES FOR DTC 0302 and 0306. (See pages EC-210 and 220.)
- 7) Check voltage between ECM terminal (3) and ground at about 1,500 rpm with EGR valve lifted up to the full position by hand.
  - Voltage should decrease to less than 1.0V.
- 8) If step 7 is OK, perform TROUBLE DIAGNOSES FOR DTC 0302, 0306 and 1005. (See pages EC-210, 220 and 309.)

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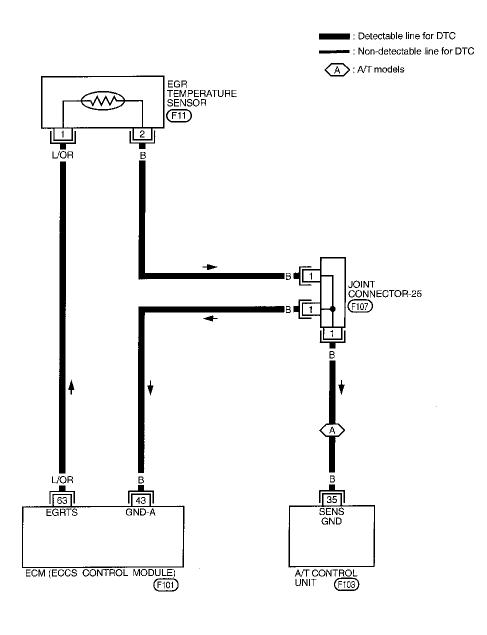
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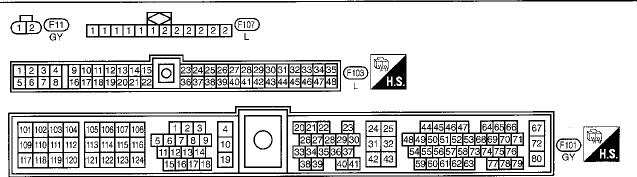
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#### **EGR Temperature Sensor (Cont'd)**

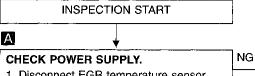
#### EC-EGR/TS-01





# sensor harness connector Brake booster SÈF270P

#### EGR Temperature Sensor (Cont'd) **DIAGNOSTIC PROCEDURE**



1. Disconnect EGR temperature sensor harness connector.

2. Turn ignition switch "ON".

CHECK GROUND CIRCUIT.

1. Turn ignition switch "OFF".

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3. Check voltage between terminal (1) and ground with CONSULT or tester. Voltage: Approximately 5V

2. Check harness continuity between termi-

Repair harness or connectors.

Check the following.

Joint connector-12 (F107)

Harness for open or short

between ECM and EGR

• Harness for open or short

between A/T control unit

and EGR temperature

Replace EGR temperature

If NG, repair harness or

sensor

connector.

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temperature sensor

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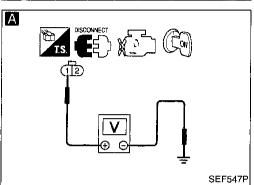
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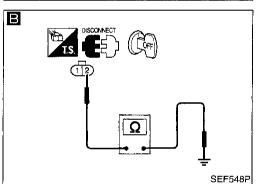
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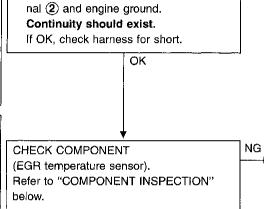
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If NG, replace EGR temperature sensor.





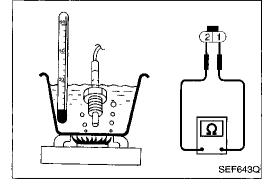


Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed.

Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END

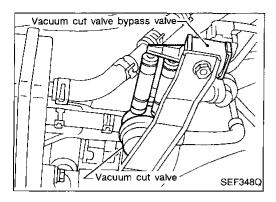


#### **COMPONENT INSPECTION**

#### EGR temperature sensor

Check resistance change and resistance value. (Reference data)

| EGR temperature<br>°C (°F) | Voltage<br>(V) | Resistance $(M\Omega)$ |
|----------------------------|----------------|------------------------|
| 0 (32)                     | 4.81           | 7.9 - 9.7              |
| 50 (122)                   | 2.82           | 0.57 - 0.70            |
| 100 (212)                  | 0.8            | 0.08 - 0.10            |



#### Vacuum Cut Valve Bypass Valve

#### **COMPONENT DESCRIPTION**

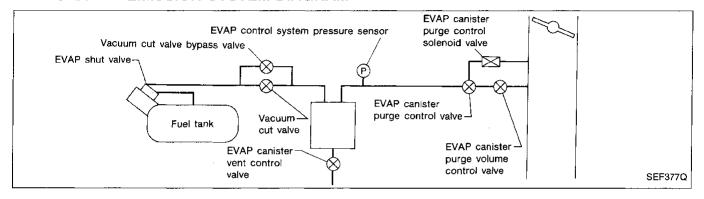
The vacuum cut valve and vacuum cut valve bypass valve are installed in parallel on the EVAP purge line between the fuel tank and the EVAP canister.

The vacuum cut valve prevents the intake manifold vacuum from being applied to the fuel tank.

The vacuum cut valve bypass valve is a solenoid type valve and generally remains closed. It opens only for OBD.

The vacuum cut valve bypass valve responds to signals from the ECM. When the ECM sends an ON (ground) signal, the valve is opened. The vacuum cut valve is then bypassed to apply intake manifold vacuum to the fuel tank.

#### **EVAPORATIVE EMISSION SYSTEM DIAGRAM**



#### **ECM TERMINALS AND REFERENCE VALUE**

Remarks: Specification data are reference values, and are measured between each terminal and (28) (ECCS ground) with a voltmeter.

| TER-<br>MINAL<br>NO. | WIRE<br>COLOR | ITEM                          | CONDITION            | DATA<br>(DC voltage)          |
|----------------------|---------------|-------------------------------|----------------------|-------------------------------|
| 120                  | OR/G          | Vacuum cut valve bypass valve | Ignition switch "ON" | BATTERY VOLTAGE<br>(11 - 14V) |

#### ON BOARD DIAGNOSIS LOGIC

| Diagnostic Trouble<br>Code No. | Malfunction is detected when   | Check Items<br>(Possible Cause)  |
|--------------------------------|--|--|
| P1441<br>0801                  | A) An improper voltage signal is entered to ECM through vacuum cut valve bypass valve. | Harness or connectors     (The vacuum cut valve bypass valve circuit is open or shorted.)     Vacuum cut valve bypass valve  |
|                                | B) Vacuum cut valve bypass valve does not operate properly.                            | <ul> <li>Vacuum cut valve bypass valve</li> <li>Vacuum cut valve</li> <li>Bypass hoses for clogging</li> <li>EVAP shut valve</li> <li>EVAP control system pressure sensor</li> </ul> |

#### Vacuum Cut Valve Bypass Valve (Cont'd) DIAGNOSTIC TROUBLE CODE CONFIRMATION **PROCEDURE**

Perform "Procedure for malfunction A" first. If DTC cannot be confirmed, perform "OVERALL FUNCTION CHECK", "Procedure for malfunction B".



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#### Procedure for malfunction A



- 1) Turn ignition switch "ON".
- Select "DATA MONITOR" mode with CONSULT.
- 3) Wait at least 5 seconds.

- OR

- OR ·

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- (GF)
- Turn ignition switch "ON" and wait at least 5 seconds.
- Select "MODE 7" with GST.

LC Turn ignition switch "ON" and wait at least 5 seconds.

Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

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#### **OVERALL FUNCTION CHECK**

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#### Procedure for malfunction B

- Remove vacuum cut valve and vacuum cut valve bypass valve as an assembly.
- Apply vacuum to port (A) and ensure that there is no suction from port (B).
- Apply vacuum to port (B) and ensure that there is suction from port (A).
- Blow air in port (B) and ensure that there is a resistance to flow 4) out of port (A).
- Supply battery voltage to the terminal. 5)
- Blow air in port (A) and ensure free flow out of port (B). 6)
- Blow air in port (B) and ensure free flow out of port (A).





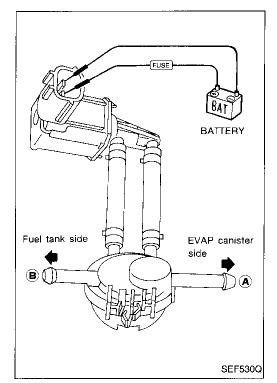




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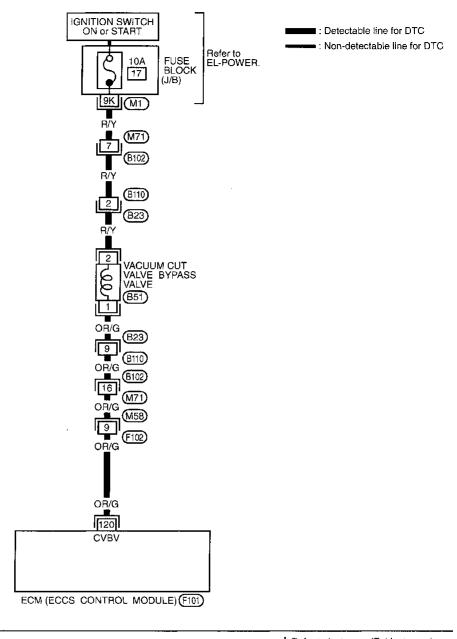
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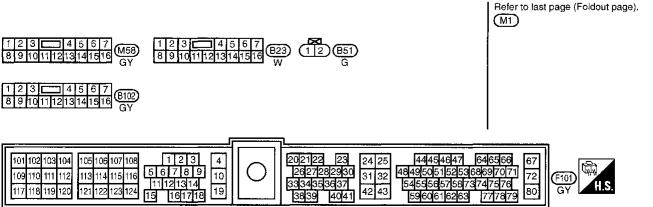
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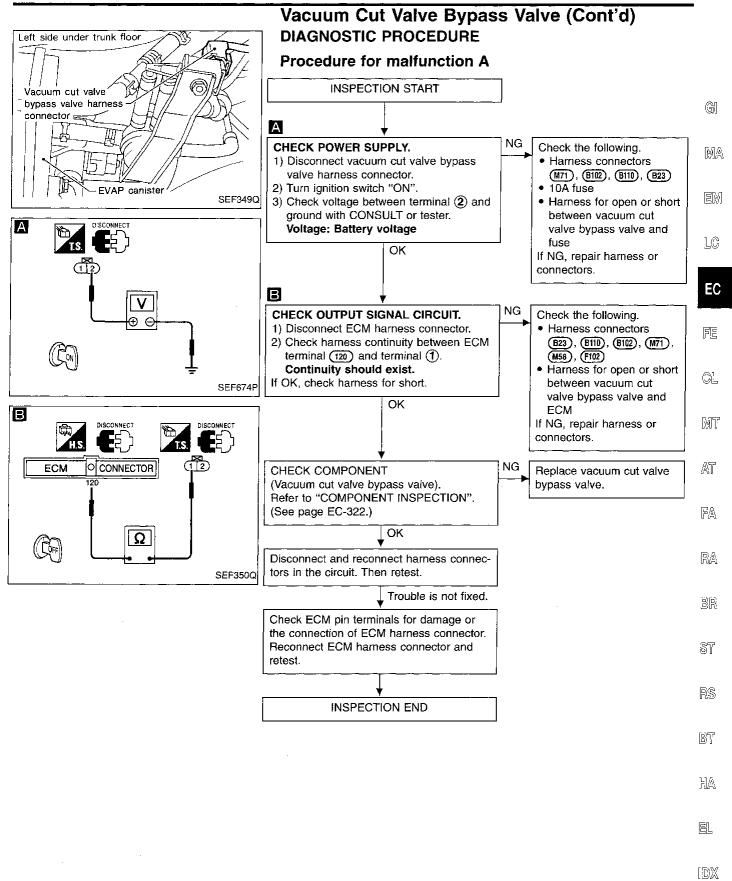


#### Vacuum Cut Valve Bypass Valve (Cont'd)

EC-BYPS/V-01



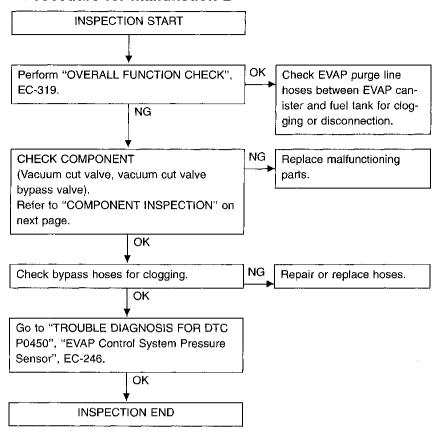


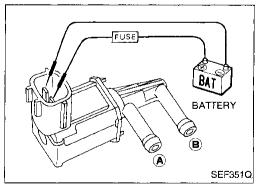


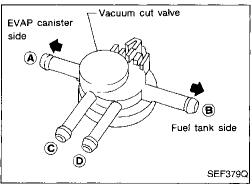
#### Vacuum Cut Valve Bypass Valve (Cont'd)

#### DIAGNOSTIC PROCEDURE

#### Procedure for malfunction B







#### COMPONENT INSPECTION

#### Vacuum cut valve bypass valve

Check air passage continuity.

| Condition                                   | Air passage continuity between (A) and (B) |
|---|--|
| 12V direct current supply between terminals | Yes  |
| No supply                                   | No   |

If NG, replace vacuum cut valve bypass valve.

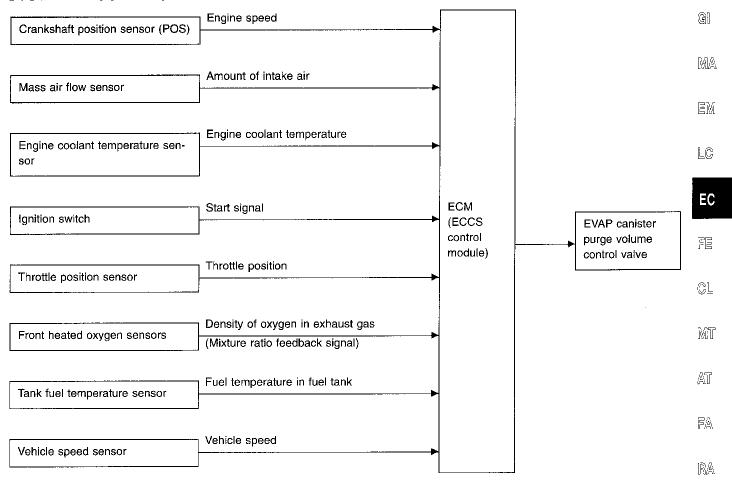
#### Vacuum cut valve

Check vacuum cut valve as follows:

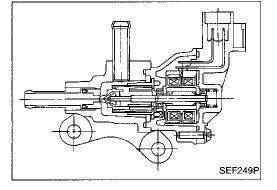
- 1. Plug port (C) and (D) with fingers.
- 2. Apply vacuum to port (A) and ensure that there is no suction from port (B).
- 3. Apply vacuum to port (B) and ensure that there is suction from port (A).
- 4. Blow air in port (B) and ensure that there is a resistance to flow out of port (A).
- 5. Open port (C) and (D).
- 6. Blow air in port (A) and ensure free flow out of port (C).
- 7. Blow air in port **B** and ensure free flow out of port **D**.

# Evaporative Emission (EVAP) Canister Purge Volume Control Valve

#### SYSTEM DESCRIPTION



This system automatically controls flow rate of fuel vapor from EVAP canister. The EVAP canister purge volume control valve changes the opening of the vapor by-pass passage to control the flow rate. This valve is actuated by a step motor built into the valve, which moves the valve in the axial direction in steps corresponding to the ECM output pulses, the opening of the valve is varied to allow for optimum engine control. The optimum value stored in the ECM is determined by taking into consideration various engine conditions. When the engine operates, the flow rate is proportionally regulated as the air flow increases.



#### COMPONENT DESCRIPTION

The EVAP canister purge volume control valve is operated by a step motor for control of flow rate of fuel vapor from EVAP canister. This motor has four winding phases and is actuated by the output pulse signal of ECM which turns ON and OFF two windings each in sequence. Each time the valve opens or closes to change the flow rate, an ON pulse is issued. When no change in the flow rate is needed, the valve remains at a certain opening, hence no pulse signal output is issued.

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# Evaporative Emission (EVAP) Canister Purge Volume Control Valve (Cont'd)

#### **CONSULT REFERENCE VALUE IN DATA MONITOR MODE**

Remarks: Specification data are reference values.

| MONITOR ITEM | CONDITION        |                 | SPECIFICATION |
|--------------|------------------|-----------------|---------------|
| PURG VOL C/V | • Engine Rupping | Vehicle stopped | 0 step        |
| FUNG VOL 0/V | Engine: Running  | Vehicle running | _             |

#### **ECM TERMINALS AND REFERENCE VALUE**

Remarks: Specification data are reference values, and are measured between each terminal and (a) (ECCS ground) with a voltmeter.

| TER-<br>MINAL<br>NO. | WIRE                  | ITEM                          | CONDITION  | DATA<br>(DC voltage)          |
|----------------------|-----------------------|-------------------------------|--|-------------------------------|
| 26                   | Y                     | EVAP canister purge vol-      | Engine is running.   | 0.041/                        |
| 27                   | G                     | ume control valve             | L Idle speed   | 0 - 0.4V                      |
| 110                  | G/B                   | EVAP canister purge vol-      | Engine is running.   | BATTERY VOLTAGE               |
| 118                  | L/R ume control valve |                               | ldle speed   | (11 - 14V)                    |
| 4 W/B                | W/B                   | N/B ECCS relay (Self-shutoff) | Engine is running.  Ignition switch "OFF"  For a few seconds after turning ignition switch "OFF" | 0 - 1V                        |
|                      | ,                     |                               | Ignition switch "OFF"  A few seconds passed after turning ignition switch "OFF"                  | BATTERY VOLTAGE<br>(11 - 14V) |
| 67<br>72             | R<br>R                | Power supply for ECM          | Ignition switch "ON"   | BATTERY VOLTAGE<br>(11 - 14V) |

#### ON BOARD DIAGNOSIS LOGIC

| Diagnostic Trouble<br>Code No. | Malfunction is detected when   | Check Items<br>(Possible Cause)  |
|--------------------------------|--|--|
| P1445<br>1008                  | A) An improper voltage signal is entered to ECM through the valve.   | Harness or connectors     (The valve circuit is open or shorted.)     EVAP canister purge volume control valve   |
|                                | B) The canister purge flow is detected during the specified driving conditions, even when EVAP canister purge volume control valve is completely shut off. | EVAP control system pressure sensor     EVAP canister purge volume control valve (The valve is stuck open.)     EVAP canister purge control valve     Hoses     (Hoses are connected incorrectly.) |

#### **Evaporative Emission (EVAP) Canister Purge** Volume Control Valve (Cont'd)

#### DIAGNOSTIC TROUBLE CODE CONFIRMATION **PROCEDURE**

Perform "Procedure for malfunction A" first. If the DTC cannot be confirmed, perform "Procedure for malfunction B".

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#### Procedure for malfunction A



Jack up drive wheels.

Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.

Start engine and let it idle for at least 90 seconds.

4) Move selector/gearshift lever to "1" range (A/T) or "1st"

5) Race engine from idle to 2,000 to 3,000 rpm more than 10 times.

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- Jack up drive wheels.
- Start engine and let it idle for at least 90 seconds.

OR -

Move selector/gearshift lever to "1" range (A/T) or "1st" gear (M/T).

4) Race engine from idle to 2,000 to 3,000 rpm more than 10 times.

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5) Select "MODE 7" with GST. - OR -

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- Jack up drive wheels.
- 2) Start engine and let it idle for at least 90 seconds.

3) Move selector/gearshift lever to "1" range (A/T) or "1st" gear (M/T).

4) Race engine from idle to 2,000 to 3,000 rpm more than 10 times.

5) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".

6) Perform Diagnostic Test Mode II (Self-diagnostic results) with ECM.

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Procedure for malfunction B



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- Jack up drive wheels.
- Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.

Start engine and warm it up sufficiently.

- 4) Check that tank fuel temperature is above 0°C (32°F).
- 5) Turn ignition switch "OFF" and wait at least 5 seconds.
- 6) Start engine and let it idle at least 70 seconds.
- Maintain the following conditions at least 10 seconds.

Gear position:

"2" or "D" range (A/T) "3rd" or "4th" gear (M/T)

Vehicle speed:

40 - 80 km/h (25 - 50 MPH)

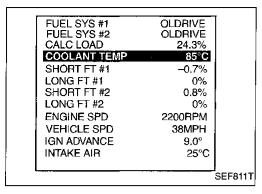
**Engine speed:** 

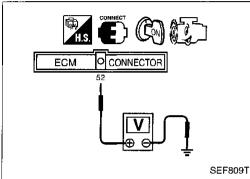
1,500 - 2,500 rpm

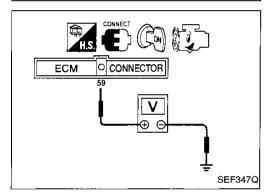
Coolant temperature:

**Less than 100°C (212°F)** ---- OR -

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#### **Evaporative Emission (EVAP) Canister Purge Volume Control Valve (Cont'd)**



- 1) Jack up drive wheels.
- Turn ignition switch "ON" and select "MODE 1" with GST.
- Start engine and warm it up sufficiently.
- 4) Check that voltage between ECM terminal 52 and ground is less than 4.2V.
- 5) Turn ignition switch "OFF" and wait at least 5 seconds.
- 6) Start engine and let it idle at least 70 seconds.
- Maintain the following conditions at least 10 seconds.

Gear position:

"2" or "D" range (A/T) "3rd" or "4th" gear (M/T)

Vehicle speed:

40 - 80 km/h (25 - 50 MPH)

Engine speed:

1,500 - 2,500 rpm

Coolant temperature:

Less than 100°C (212°F)

8) Select "MODE 3" with GST.

- OR



- Jack up drive wheels. 1)
- 2) Turn ignition switch "ON".
- 3) Start engine and warm it up sufficiently.
- 4) Check that voltage between ECM terminal (52) and ground is less than 4.2V.
- 5) Turn ignition switch "OFF" and wait at least 5 seconds.
- 6) Start engine and let it idle at least 70 seconds.
- 7) Maintain the following conditions at least 10 seconds.

Gear position:

"2" or "D" range (A/T) "3rd" or "4th" gear (M/T)

Vehicle speed:

40 - 80 km/h (25 - 50 MPH)

Engine speed:

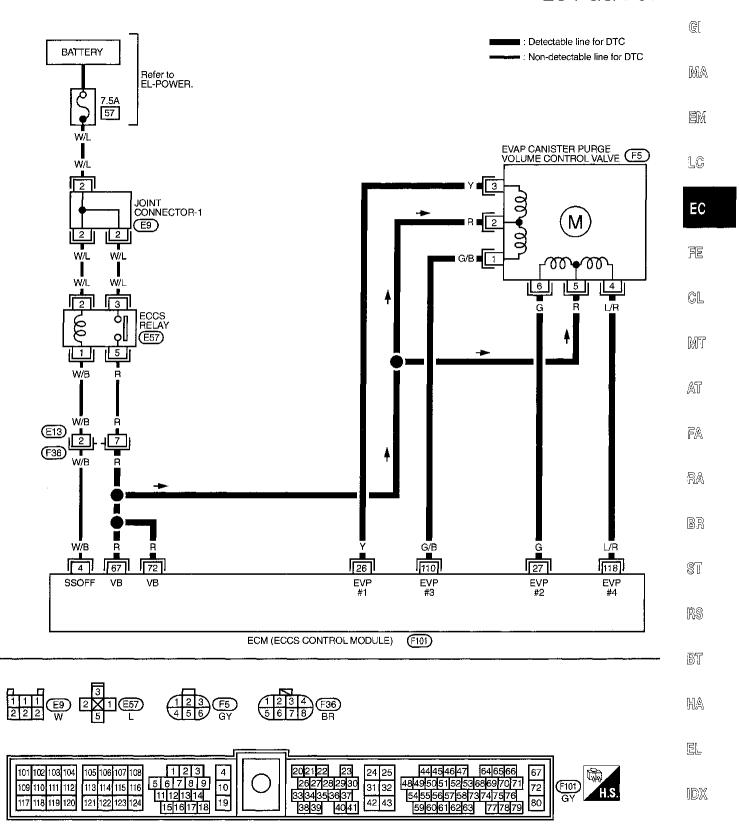
1,500 - 2,500 rpm

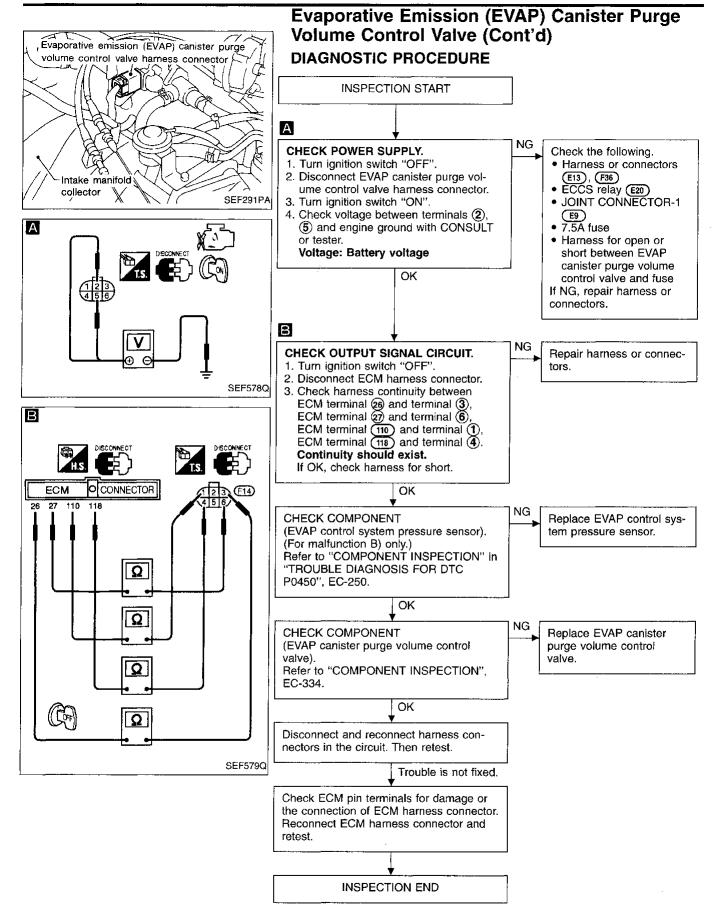
Voltage between ECM terminal 59 and ground: More than 0.8V

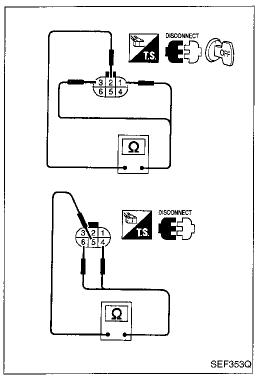
- 8) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 9) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

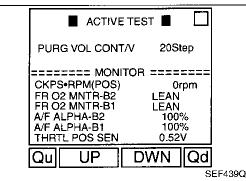
# **Evaporative Emission (EVAP) Canister Purge Volume Control Valve (Cont'd)**

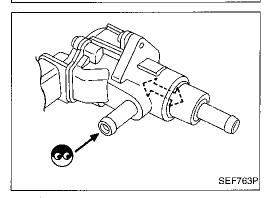
#### EC-PGC/V-01

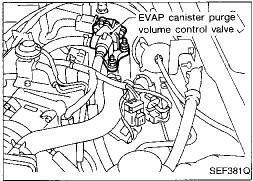












# Evaporative Emission (EVAP) Canister Purge Volume Control Valve (Cont'd)

#### **COMPONENT INSPECTION**

#### **EVAP** canister purge volume control valve



- 1. Disconnect EVAP canister purge volume control valve harness connector.
- 2. Check resistance between the following terminals. terminal (2) and terminals (1), (3) terminal (5) and terminals (4), (6)

#### Resistance:

connected.)

Approximately 30 $\Omega$  [At 25°C (77°F)]

- 3. Reconnect EVAP canister purge volume control valve harness connector.
- Remove EVAP canister purge volume control valve from intake manifold collector and disconnect hoses from the valve.
   (Plug the purge hoses. The EVAP canister purge volume control valve harness connector should remain
- 5. Turn ignition switch "ON".
- 6. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT and ensure the EVAP canister purge volume control valve shaft smoothly moves forward and backward according to the valve opening. If NG, replace the EVAP canister purge volume control valve.



- 1. Disconnect EVAP canister purge volume control valve harness connector.
- 2. Check resistance between the following terminals. terminal (2) and terminals (1), (3) terminal (5) and terminals (4), (6)

- OR -

#### Resistance:

#### Approximately 30 $\Omega$ [At 25°C (77°F)]

- 3. Reconnect EVAP canister purge volume control valve harness connector.
- 4. Remove EVAP canister purge volume control valve from intake manifold collector and disconnect hoses from the valve.
- (Plug the purge hoses. The EVAP canister purge volume control valve harness connector should remain connected.)
- Turn ignition switch "ON" and "OFF" and ensure the EVAP canister purge volume control valve shaft smoothly moves forward and backward according to the ignition switch position.
   If NG replace the EVAP canister purge volume control
  - If NG, replace the EVAP canister purge volume control valve.

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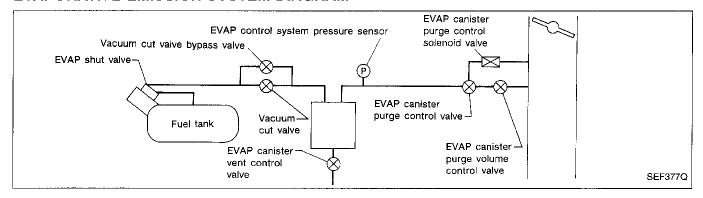
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# **Evaporative Emission (EVAP) Control System Purge Flow Monitoring**

#### **EVAPORATIVE EMISSION SYSTEM DIAGRAM**



#### SYSTEM DESCRIPTION

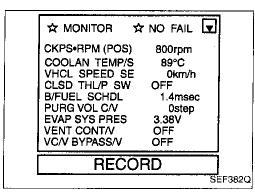
In this evaporative emission (EVAP) control system, purge volume is related to air intake volume and occurs during non-closed throttle conditions. In normal purge conditions (non-closed throttle), the EVAP canister purge volume control valve and EVAP canister purge control valve are open to admit purge flow. Purge flow exposes the EVAP control system pressure sensor to intake manifold vacuum.

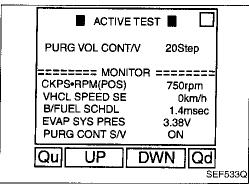
#### ON BOARD DIAGNOSIS LOGIC

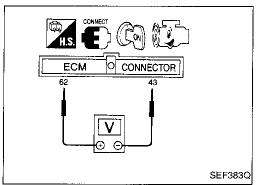
In normal conditions (non-closed throttle), if the sensor output does not show the appropriate pressure drop in the EVAP purge line, lack of purge flow is indicated, and a fault is determined.

| Diagnostic<br>Trouble Code<br>No. | Malfunction is detected when  | Check Items<br>(Possible Cause)   |
|-----------------------------------|---|---|
| P1447<br>0111                     | <ul> <li>EVAP control system does not operate properly.</li> <li>EVAP control system has a leak in line between intake manifold and EVAP control system pressure sensor.</li> </ul> | EVAP canister purge volume control valve stuck closed EVAP canister purge control valve stuck closed EVAP control system pressure sensor Loose or disconnected rubber tube Blocked rubber tube EVAP canister purge control solenoid valve Blocked or bent rubber tube to MAP/BARO switch solenoid valve Cracked EVAP canister Absolute pressure sensor MAP/BARO switch solenoid valve |

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#### **Evaporative Emission (EVAP) Control System Purge Flow Monitoring (Cont'd)**

#### **OVERALL FUNCTION CHECK**

Use this procedure to check the overall function of the EVAP control system purge flow monitoring. During this check, a 1st trip DTC might not be confirmed.

Jack up drive wheels (M/T models).

Start engine.

Select "EVAP SYS PRES" in "DATA MONITOR" mode with CONSULT.

Check EVAP control system pressure sensor value at idle speed.

Select "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT and set "PURG VOL CONT/V" to 20 ILC steps by touching "DWN" and "Qd".

6) Maintain the following conditions at least 30 seconds. Verify that EVAP control system pressure sensor value ("EVAP SYS PRES") stays 0.1V less than that at idle speed at least 2 seconds.

Engine speed:

Approx. 2,000 rpm

Gear position (for M/T models):

Any position other than "Neutral" or "Reverse"

4)

Do not run vehicle up to speeds greater than 80 km/h (50 MPH).

- OR Jack up drive wheels (M/T models). 1)

Start engine and warm it up sufficiently.

3) Turn ignition switch "OFF", wait at least 5 seconds.

Start engine and wait at least 70 seconds. Set voltmeter probes to ECM terminals (2) (EVAP control system pressure sensor signal) and 43 (ground).

Check EVAP control system pressure sensor value at idle speed.

Establish the following conditions and maintain at least 30 seconds, then completely return to normal conditions. Repeat this procedure 5 or more times.

Air conditioner switch: ON Steering wheel: Fully turned Headlamp switch: ON

Rear window defogger switch: ON

Engine speed: Approx. 3,500 rpm Intake manifold vacuum:

-73.3 to -60.0 kPa (-550 to -450 mmHg,

-21.65 to -17.72 inHq)

Gear position (for M/T models):

Any position other than "Neutral" or "Reverse" Verify that EVAP control system pressure sensor value stays 0.1V less than that at idle speed at least 2 seconds.

**CAUTION:** 

Do not run vehicle up to speeds greater than 80 km/h (50 MPH).

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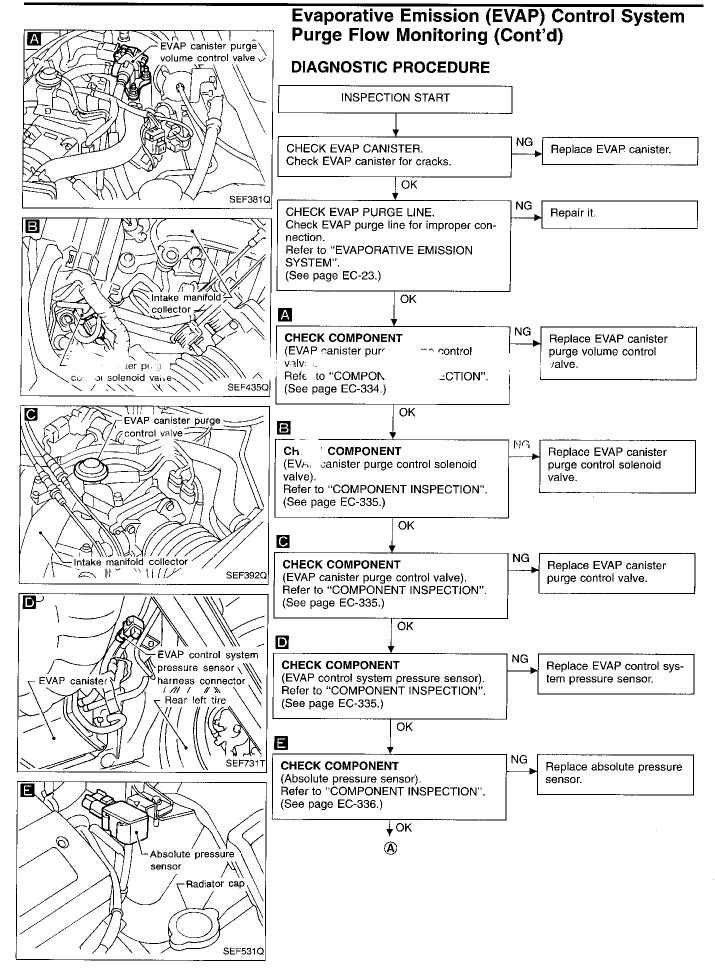
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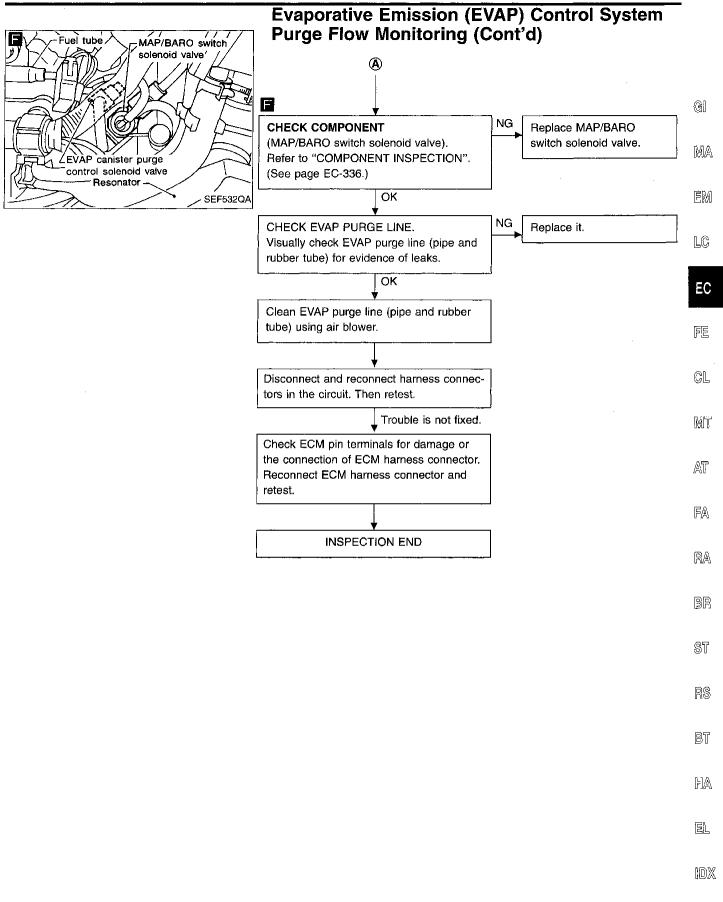
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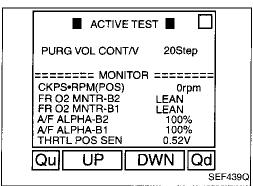
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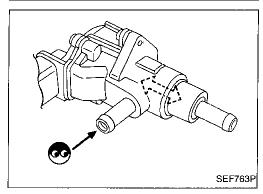
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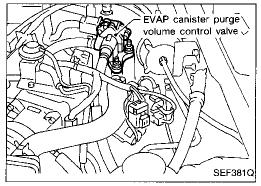




# DISCONNECT SEF353Q







# **Evaporative Emission (EVAP) Control System Purge Flow Monitoring (Cont'd)**

#### **COMPONENT INSPECTION**

#### **EVAP** canister purge volume control valve



- Disconnect EVAP canister purge volume control valve harness connector.
- 2. Check resistance between the following terminals. terminal ② and terminals ①, ③

terminal (5) and terminals (4), (6)

#### Resistance:

#### Approximately 30Ω [At 25°C (77°F)]

- 3. Reconnect EVAP canister purge volume control valve harness connector.
- 4. Remove EVAP canister purge volume control valve from intake manifold collector and disconnect hoses from the valve.

(Plug the purge hoses. The EVAP canister purge volume control valve harness connector should remain connected.)

- 5. Turn ignition switch "ON".
- Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT and ensure the EVAP canister purge volume control valve shaft smoothly moves forward and backward according to the valve opening. If NG, replace the EVAP canister purge volume control valve.



- 1. Disconnect EVAP canister purge volume control valve harness connector.
- 2. Check resistance between the following terminals. terminal (2) and terminals (1), (3) terminal (5) and terminals (4), (6)

- OR

#### Resistance:

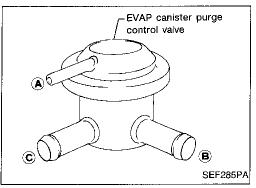
#### Approximately 30Ω [At 25°C (77°F)]

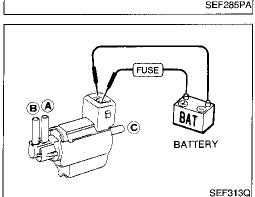
- 3. Reconnect EVAP canister purge volume control valve harness connector.
- 4. Remove EVAP canister purge volume control valve from intake manifold collector and disconnect hoses from the valve.

(Plug the purge hoses. The EVAP canister purge volume control valve harness connector should remain connected.)

5. Turn ignition switch "ON" and "OFF" and ensure the EVAP canister purge volume control valve shaft smoothly moves forward and backward according to the ignition switch position.

If NG, replace the EVAP canister purge volume control valve.





# Evaporative Emission (EVAP) Control System Purge Flow Monitoring (Cont'd)

#### **EVAP** canister purge control valve

Check EVAP canister purge control valve as follows:

- 1. Blow air in port (A), (B) and (C), then ensure that there is no leakage.
- 2. Apply vacuum to port (A). [Approximately -13.3 to -20.0 kPa (-100 to -150 mmHg, -3.94 to -5.91 inHg)]
  Blow air in port (C) and ensure free flow out of port (B).

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#### EVAP canister purge control solenoid valve

Check air passage continuity.

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| Condition                                   | Air passage<br>continuity<br>between (A) and (B) | Air passage<br>continuity<br>between (A) and (C) |
|---|--|--|
| 12V direct current supply between terminals | Yes  | No   |
| No supply                                   | No   | Yes  |

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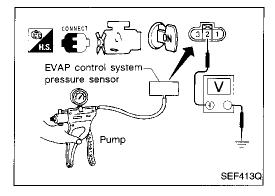
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If NG, replace solenoid valve.



#### **EVAP control system pressure sensor**

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- Remove EVAP control system pressure sensor from bracket with its harness connector connected.
- 2. Remove hose from EVAP control system pressure sensor.
- 3. Apply vacuum and pressure to EVAP control system pressure sensor with pump as shown in figure.
- 4. Check output voltage between terminal (2) and engine ground.

| Pressure (Relative to atmospheric pressure) | Voltage (V)       |
|---|-------------------|
| +4.0 kPa (+30 mmHg, +1.18 inHg)             | Approximately 4.6 |
| -9.3 kPa (-70 mmHg, -2.76 inHg)             | Approximately 0.5 |

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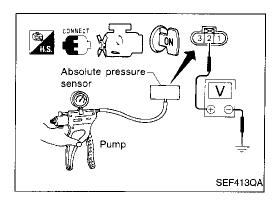
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#### **CAUTION:**

Always calibrate the vacuum pump gauge when using it.

5. If NG, replace EVAP control system pressure sensor.

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# **Evaporative Emission (EVAP) Control System Purge Flow Monitoring (Cont'd)**

#### Absolute pressure sensor

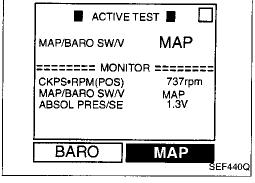
- Remove absolute pressure sensor from bracket with its harness connector connected.
- 2. Remove hose from absolute pressure sensor.
- 3. Apply vacuum and pressure to absolute pressure sensor as shown in figure.
- 4. Check output voltage between terminal (2) and engine ground.

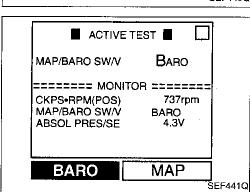
| Pressure (Absolute pressure)     | Voltage (V)       |
|----------------------------------|-------------------|
| 106.6 kPa (800 mmHg, 31.50 inHg) | Approximately 4.6 |
| 13.3 kPa (100 mmHg, 3.94 inHg)   | Approximately 0.5 |

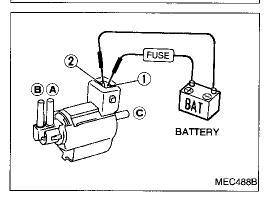
#### **CAUTION:**

#### Always calibrate the vacuum pump gauge when using it.

5. If NG, replace absolute pressure sensor.







#### MAP/BARO switch solenoid valve



- 1. Start engine and warm it up sufficiently.
- Perform "MAP/BARO SW/V" in "ACTIVE TEST" mode with CONSULT.
- 3. Make sure of the following.
  - When selecting "MAP", "ABSOL PRES/SE" indicates approximately 1.3V.
  - When selecting "BARO", "ABSOL PRES/SE" indicates approximately 4.3V.
- 4. If NG, check solenoid valve below.



1. Remove MAP/BARO switch solenoid valve.

OR

2. Check air passage continuity.

| Condition   | Air passage<br>continuity<br>between (A) and (B) | Air passage continuity between (A) and (C) |
|---|--|--|
| 12V direct current supply between terminals ① and ② | Yes  | No   |
| No supply   | No   | Yes  |

3. If NG, replace solenoid valve.

**EC-336** 

#### A/T Diagnosis Communication Line

#### **COMPONENT DESCRIPTION**

The malfunction information related to A/T (Automatic Transaxle) is transferred through the line (circuit) from A/T control unit to ECM. Therefore, be sure to erase the malfunction information such as DTC not only in A/T control unit but also ECM after the A/T related repair.

GI

MA

#### ECM TERMINALS AND REFERENCE VALUE

Remarks: Specification data are reference values, and are measured between each terminal and 25 (ECCS ground) with a voltmeter.

|   | TER-<br>MINAL<br>NO. | WIRE<br>COLOR | ITEM                 | CONDITION                               | DATA<br>(DC voltage) | [ |
|---|----------------------|---------------|----------------------|---|----------------------|---|
| - | 6                    | R             | A/T diagnosis signal | Ignition switch "ON" Engine is running. | 0.5 - 3.0V           |   |

EM .

LC.

#### ON BOARD DIAGNOSIS LOGIC

| Diagnostic<br>Trouble<br>Code No. | Malfunction is detected when                         | Check Items<br>(Possible Cause)   |    |
|-----------------------------------|--|---|----|
| P1605<br>0804                     | Signal from A/T control units is not entered to ECM. | Harness or connectors     (The communication line circuit between ECM and A/T control unit is open or shorted.) | CL |
|                                   |  | Dead (Weak) battery     A/T control unit  | MT |

EC

## DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

Note: Before performing following procedure, confirm that battery voltage is more than 10.5V.



- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT.
- 3) Wait at least 40 seconds or start engine and wait at least 40 seconds.

  OR

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- 1) Turn ignition switch "ON".
- 2) Wait at least 40 seconds or start engine and wait at least 40 seconds.
- 3) Select "MODE 7" with GST.

- OR -



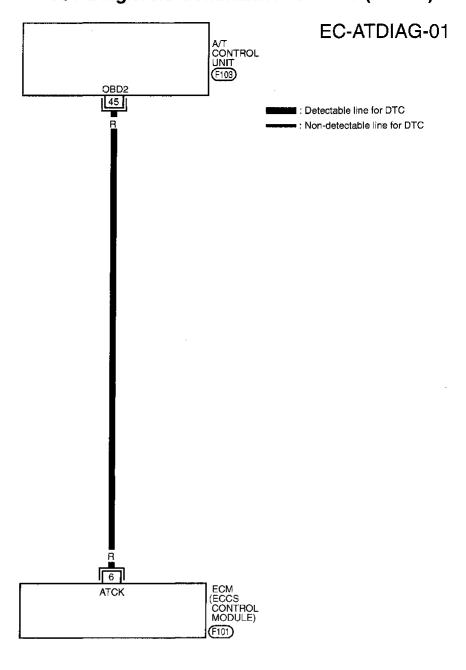
- 1) Turn ignition switch "ON".
- 2) Wait at least 40 seconds or start engine and wait at least 40 seconds.
- 3) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 4) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

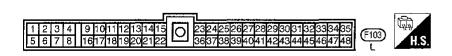
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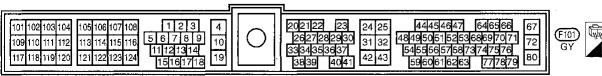
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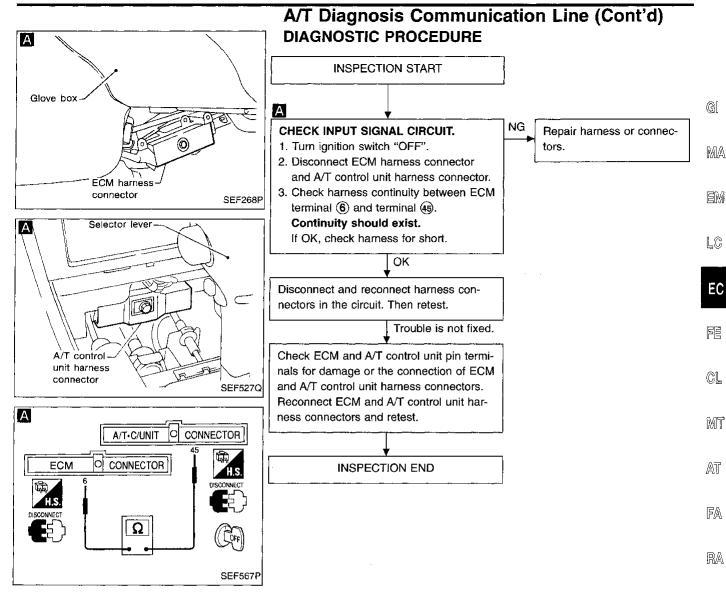
## A/T Diagnosis Communication Line (Cont'd)











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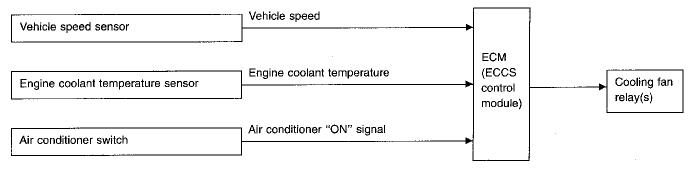
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AH

#### **Overheat**

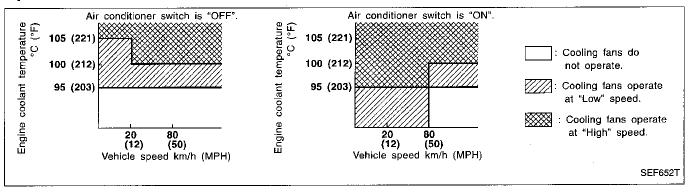
NOTE: Since this diagnosis does not meet P1900 of SAE J2012, it is indicated only by CONSULT.

#### SYSTEM DESCRIPTION



The ECM controls the cooling fan corresponding to the vehicle speed, engine coolant temperature and air conditioner ON signal. The control system has 3-step control [HIGH/LOW/OFF].

#### **Operation**



#### **ECM TERMINALS AND REFERENCE VALUE**

Remarks: Specification data are reference values, and are measured between each terminal and (ECCS ground) with a voltmeter.

| TER-<br>MINAL<br>NO. | WIRE   | ITEM  | CONDITION   | DATA<br>(DC voltage)          |
|----------------------|--|---|---|-------------------------------|
| 13                   | 13 LG Cooling fan relay (High) 14 LG/R Cooling fan relay (Low) | Cooling fan relay (High)                      | Engine is running.  Cooling fan is not operating. | BATTERY VOLTAGE<br>(11 - 14V) |
| 14                   |  | Engine is running.  Cooling fan is operating. | 0 - 1V  |                               |

#### Overheat (Cont'd)

#### ON BOARD DIAGNOSIS LOGIC

If the cooling fan or another component in the cooling system malfunctions, the engine coolant temperature will rise.

When the engine coolant temperature reaches an abnormally high temperature condition, a malfunction is indicated.

|                             | <u> </u>  | <u> </u>   | _ GI    |  |
|-----------------------------|---|--|---------|--|
| Diagnostic trouble code No. | Malfunction is detected when                                | Check Items (Possible Cause)   | - MA    |  |
| OVERHEAT (P1900)<br>0208    | Engine coolant reaches an abnormally high tempera-<br>ture. | Harness or connectors     (The cooling fan circuit is open or shorted.)                      | - DWJ/A |  |
|                             |   | Cooling fan     Radiator hose  | EM      |  |
|                             |   | Radiator     Radiator cap     Water pump   | LC      |  |
|                             |   | Thermostat     For more information, refer to "MAIN 12     CAUSES OF OVERHEATING", (EC-351). | EC      |  |

#### **CAUTION:**

When a malfunction is indicated, be sure to replace the coolant following the procedure in the MA section ("Changing Engine Coolant", "ENGINE MAINTENANCE"). Also, replace the engine oil.

a. Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute like pouring coolant by kettle. Be sure to use coolant with the proper mixture ratio. Refer to MA section ("Anti-freeze Coolant Mixture Ratio", "RECOMMENDED FLUIDS AND LUBRICANTS").

b. After refilling coolant, run engine to ensure that no water-flow noise is emitted.

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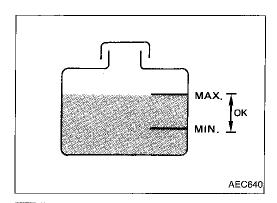
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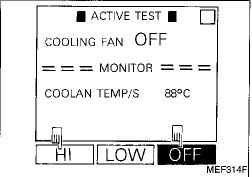
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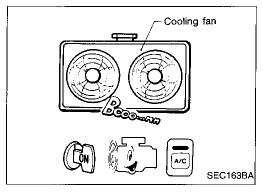
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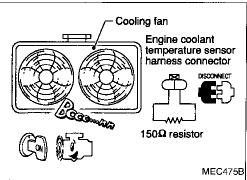
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#### Overheat (Cont'd)

#### **OVERALL FUNCTION 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. Carefully remove the cap by turning it a quarter turn to allow built-up pressure to escape. Then turn the cap all the way off.

- Check the coolant level in the reservoir tank and radiator.
   Allow engine to cool before checking coolant level.
   If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to "DIAGNOSTIC PROCEDURE", EC-345.
- Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to "DIAG-NOSTIC PROCEDURE", EC-345.
- 3) Turn ignition switch "ON".

3) Start engine.

#### Be careful not to overheat engine.

- 4) Set temperature control lever to full cold position.
- 5) Turn air conditioner switch "ON".
- 6) Turn blower fan switch "ON".
- 7) Run engine at idle for a few minutes with air conditioner operating.

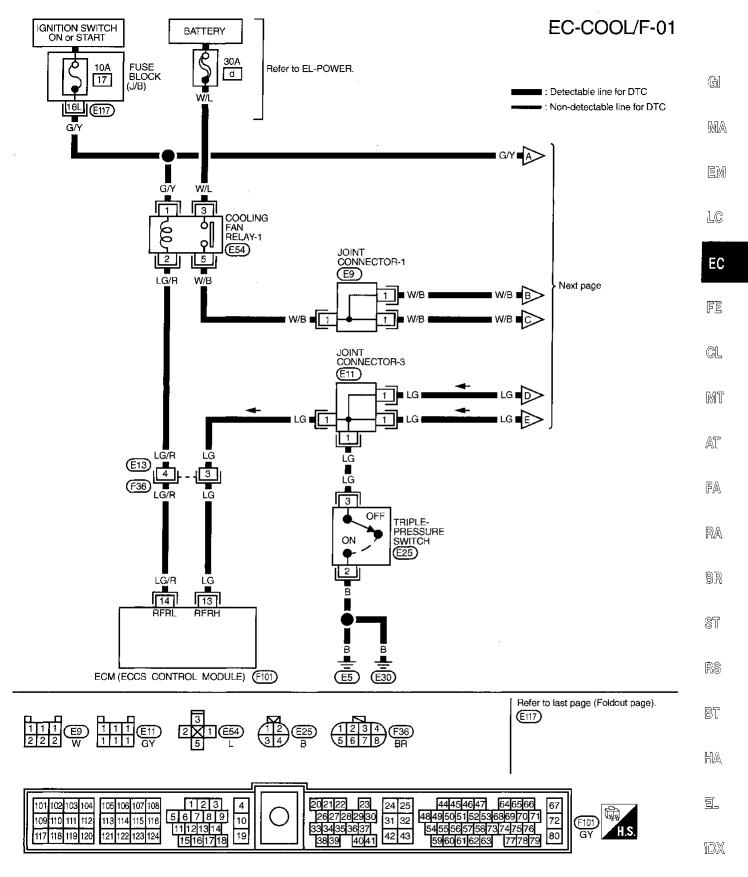
#### Be careful not to overheat engine.

- 8) Make sure that cooling fan operates at low speed.
- 9) Turn ignition switch "OFF".
- 10) Turn air conditioner switch and blower fan switch "OFF".
- 11) Disconnect engine coolant temperature sensor harness connector.
- 12) Connect 150 $\Omega$  resistor to engine coolant temperature sensor harness connector.
- 13) Restart engine and make sure that cooling fan operates at higher speed than low speed.

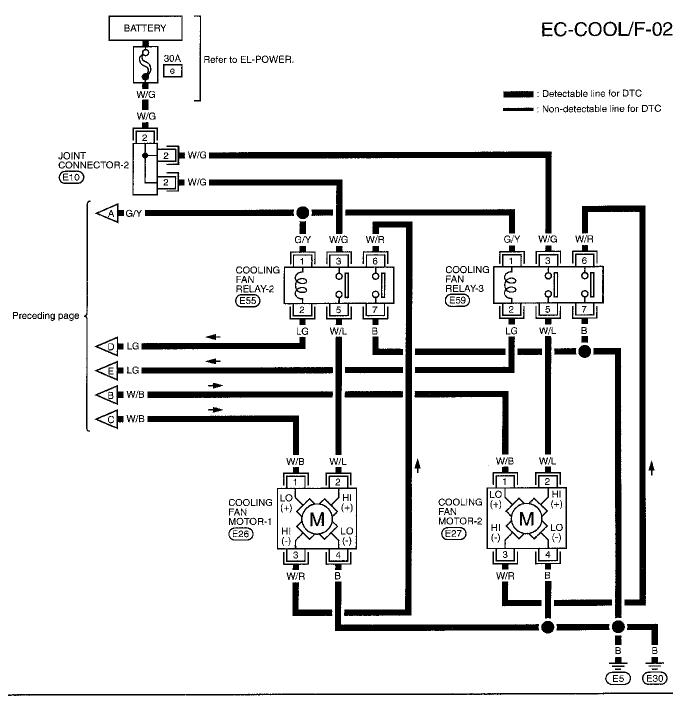
Be careful not to overheat engine.

510

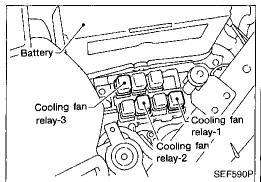
#### Overheat (Cont'd)

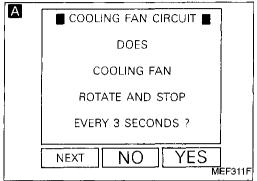


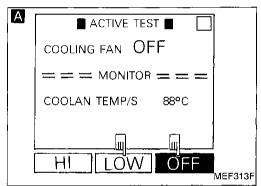
#### Overheat (Cont'd)

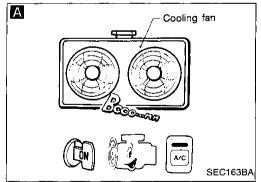




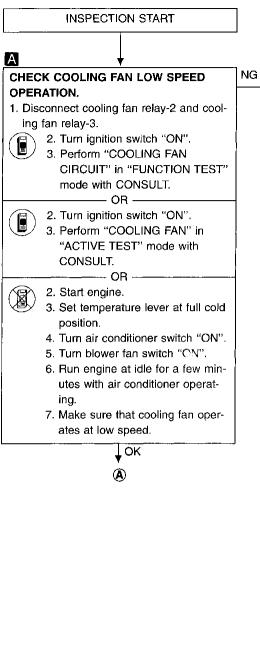








# Overheat (Cont'd) DIAGNOSTIC PROCEDURE



Check cooling fan low speed control circuit.

(Go to PROCEDURE A.)

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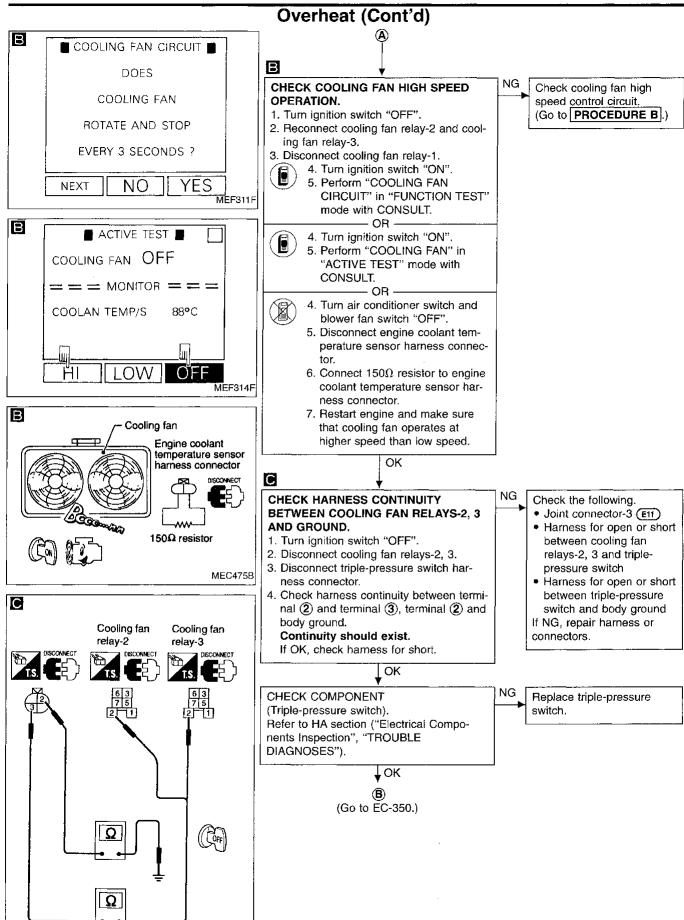
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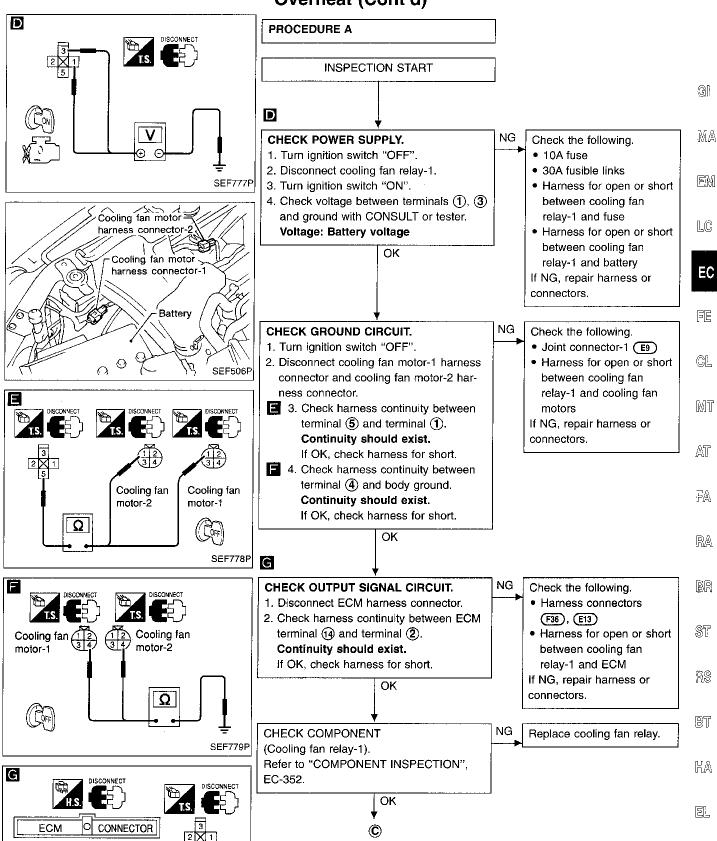
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#### Overheat (Cont'd)

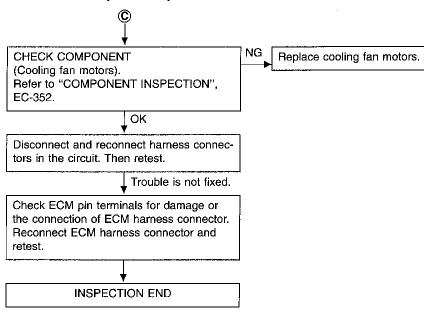


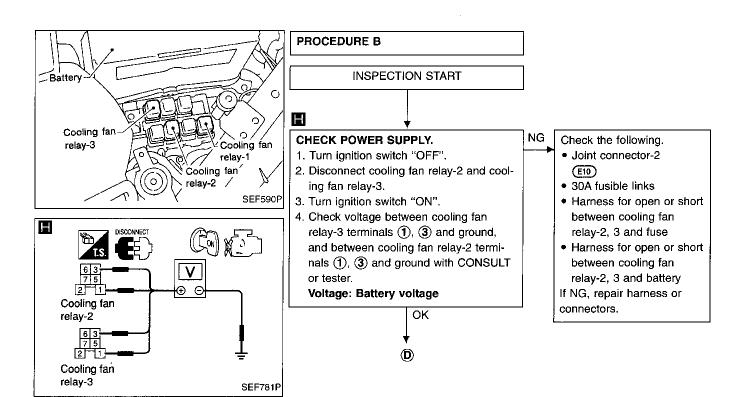
SEF780P

**EC-347** 515

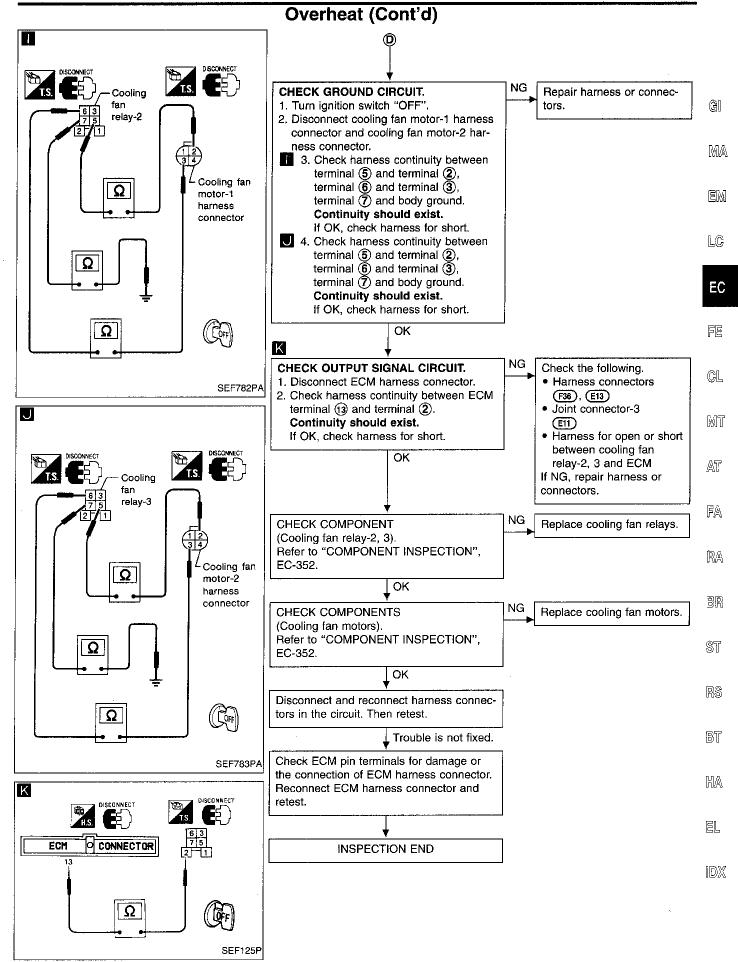
IDX

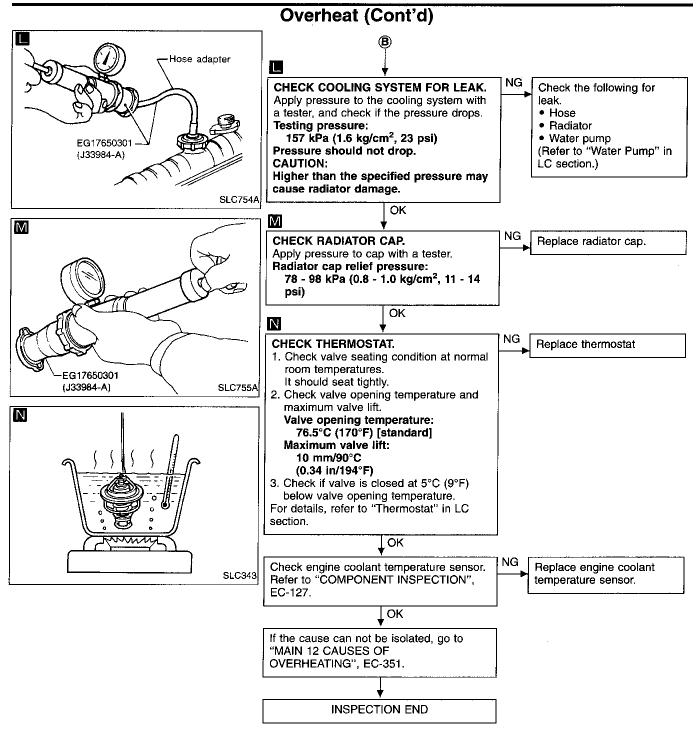
#### Overheat (Cont'd)





516





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

- Warm up engine. Run the vehicle at least 20 minutes. Pay attention to engine coolant temperature gauge on the instrument panel. If the reading shows an abnormally high temperature, another part may be malfunctioning.
- 2. Stop vehicle and let engine idle. Check the intake and exhaust systems for leaks by listening for noise or visually inspecting the components.
- 3. Allow engine to cool and visually check for oil and coolant leaks. Then, perform "OVERALL FUNCTION CHECK".

**EC-350** 518

#### Overheat (Cont'd)

#### **MAIN 12 CAUSES OF OVERHEATING**

| Engine           | Step       | Inspection item  | Equipment                                       | Standard   | Reference page   | -               |
|------------------|------------|--|---|--|--|-----------------|
| OFF              | 1          | Blocked radiator     Blocked condenser     Blocked radiator grille | • Visual  | No blocking  | <del>_</del>   | -<br>Gi         |
| ,                | 2          | Blocked bumper     Coolant mixture                                 | Coolant tester                                  | 50 - 50% coolant mixture   | See "RECOMMENDED<br>FLUIDS AND<br>LUBRICANTS" in MA<br>section             | -<br>M<br>Ei    |
|                  | 3          | Coolant level  | Visual  | Coolant up to MAX level in reservoir tank and radiator filler neck   | See "Changing Engine<br>Coolant", "ENGINE<br>MAINTENANCE" in MA<br>section |                 |
|                  | 4          | Radiator cap   | Pressure tester                                 | 78 - 98 kPa<br>(0.8 - 1.0 kg/cm <sup>2</sup> , 11 - 14<br>psi) 59 - 98 kPa<br>(0.6 - 1.0 kg/cm <sup>2</sup> , 9 - 14<br>psi) (Limit) | See "System Check" "ENGINE COOLING SYSTEM" in LC section                   | E               |
| ON* <sup>2</sup> | 5          | Coolant leaks  | Visual  | No leaks   | See "System Check" "ENGINE COOLING SYSTEM" in LC section                   | -<br>Cl         |
| ON*2             | 6          | Thermostat   | Touch the upper and<br>lower radiator hoses     | Both hoses should be hot   | See "Thermostat" and "Radiator", "ENGINE COOLING SYSTEM" in LC section     | -<br>M'<br>- Aī |
| ON*1             | 7          | Cooling fan  | • CONSULT                                       | Operating  | See "TROUBLE DIAG-<br>NOSIS FOR DTC P1900"<br>(EC-340)                     |                 |
| OFF              | 8          | Combustion gas leak  | Color checker chemical<br>tester 4 Gas analyzer | Negative   | _  | . R/            |
| ON* <sup>3</sup> | 9          | Coolant temperature gauge  | Visual  | Gauge less than 3/4 when driving   | _  | lñù/ñ           |
|                  |            | Coolant overflow to reservoir tank                                 | • Visual  | No overflow during driving and idling  | See "Changing Engine<br>Coolant", "ENGINE<br>MAINTENANCE" in MA<br>section | BF<br>St        |
| OFF*4            | 10         | Coolant return from reservoir tank to radiator                     | Visual  | Should be initial level in reservoir tank  | See "ENGINE<br>MAINTENANCE" in MA<br>section                               | Re              |
| OFF              | 11         | Cylinder head  | Straight gauge feeler<br>gauge                  | 0.1 mm (0.004 in) Maximum distortion (warping)   | See "Inspection", "CYL-<br>INDER HEAD" in EM<br>section                    | Bī              |
|                  | 12         | Cylinder block and pistons   | Visual  | No scuffing on cylinder walls or piston  | See "Inspection", "CYL-<br>INDER BLOCK" in EM<br>section                   | HA              |
| 1: Turn the      | ignition s | witch ON.  |   |  | <u> </u>   |                 |

519

<sup>\*1:</sup> Turn the ignition switch ON.
\*2: Engine running at 3,000 rpm for 10 minutes.
\*3: Drive at 90 km/h (55 MPH) for 30 minutes and then let idle for 10 minutes.

<sup>\*4:</sup> After 60 minutes of cool down time.
For more information, refer to "OVERHEATING CAUSE ANALYSIS" in LC section.

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# Overheat (Cont'd) COMPONENT INSPECTION

#### Cooling fan relay-1

Check continuity between terminals 3 and 5.

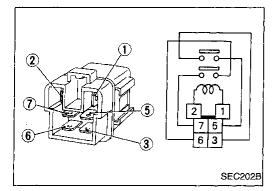
| Conditions  | Continuity |
|---|------------|
| 12V direct current supply between terminals ① and ② | Yes        |
| No current supply                                   | No         |

#### Cooling fan relays-2 and -3

Check continuity between terminals 3 and 5, 6 and 7.

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

If NG, replace relay.



#### Cooling fan motors-1 and -2

1. Disconnect cooling fan motor harness connectors.

2. Supply cooling fan motor terminals with battery voltage and check operation.

|             | Creed | Terminals |     |  |
|-------------|-------|-----------|-----|--|
|             | Speed | (⊕)       | (⊜) |  |
| Cooling fan | Low   | 1         | 4   |  |
| motor-1     | High  | 1,2       | 3,4 |  |
| Cooling fan | Low   | 1         | 4   |  |
| motor-2     | High  | 1,2       | 3,4 |  |

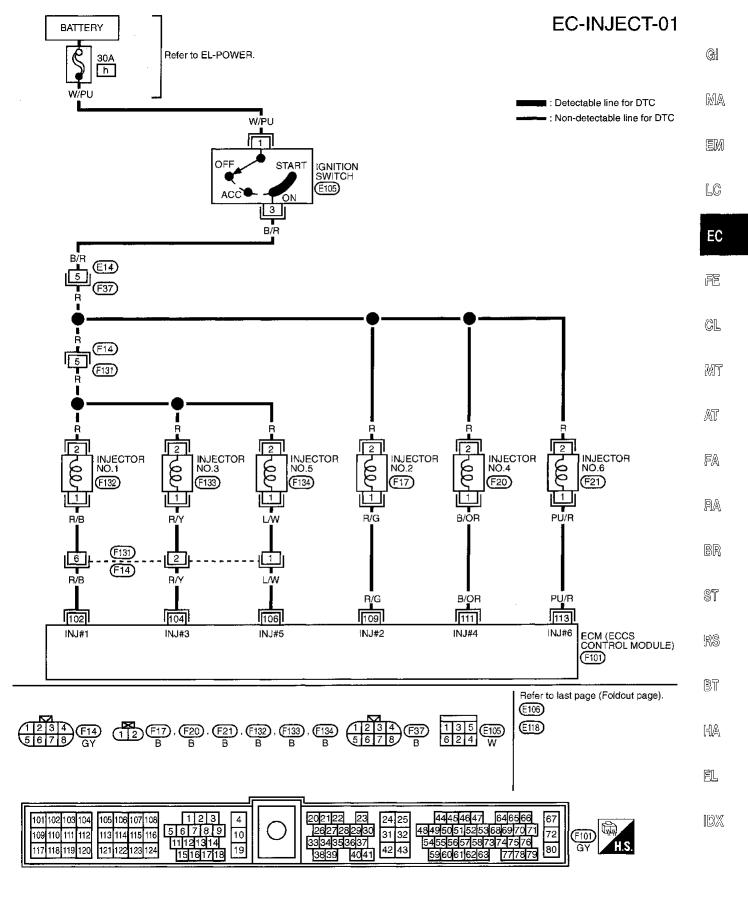
# Cooling fan motor-1 harness connector Cooling fan motor-2 harness connector

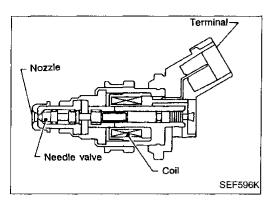
SEF573Q

#### Cooling fan motor should operate.

If NG, replace cooling fan motor.

#### Injector





# Injector (Cont'd) COMPONENT DESCRIPTION

The fuel injector is a small, precise solenoid valve. When the ECM supplies a ground to the injector circuit, the coil in the injector is energized. The energized coil pulls the needle valve back and allows fuel to flow through the injector into the intake manifold. The amount of fuel injected depends upon the injection pulse duration. Pulse duration is the length of time the injector remains open. The ECM controls the injection pulse duration based on engine fuel needs.

#### **CONSULT REFERENCE VALUE IN DATA MONITOR MODE**

Remarks: Specification data are reference values.

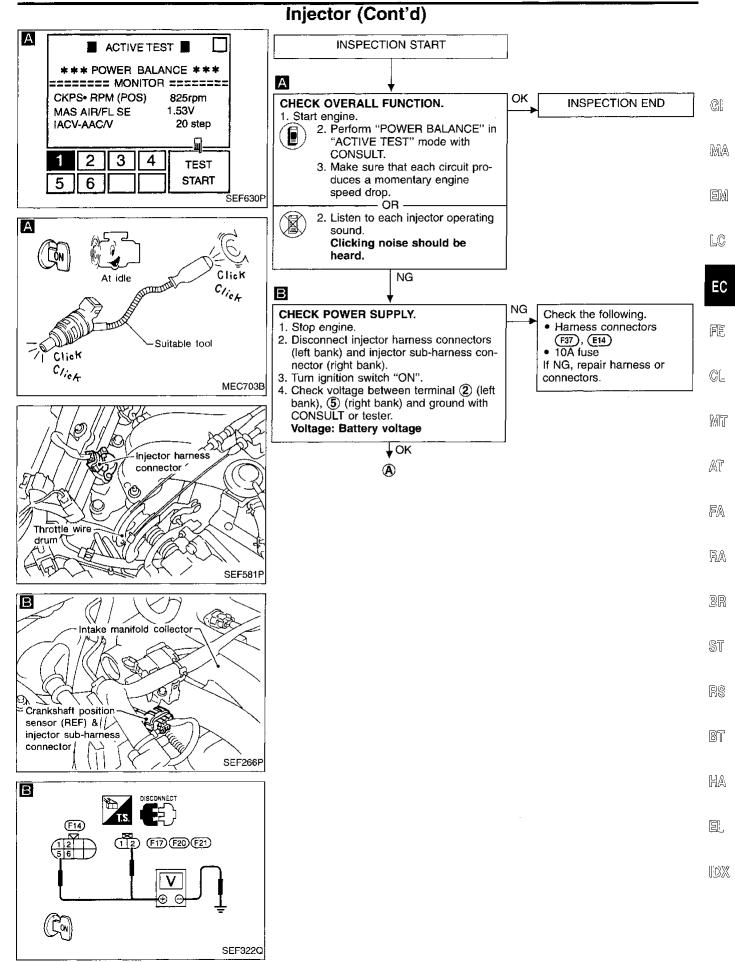
| MONITOR ITEM | CONDITION  |           | SPECIFICATION   |
|--------------|--|-----------|-----------------|
| INJ PULSE-B2 | Engine: After warming up     Air conditioner switch: "OFF" | Idle      | 2.4 - 3.2 msec. |
| INJ PULSE-B1 | <ul><li>Shift lever: "N"</li><li>No-load</li></ul>         | 2,000 rpm | 1.9 - 2.8 msec. |

#### **ECM TERMINALS AND REFERENCE VALUE**

Remarks: Specification data are reference values, and are measured between each terminal and (a) (ECCS ground) with a voltmeter.

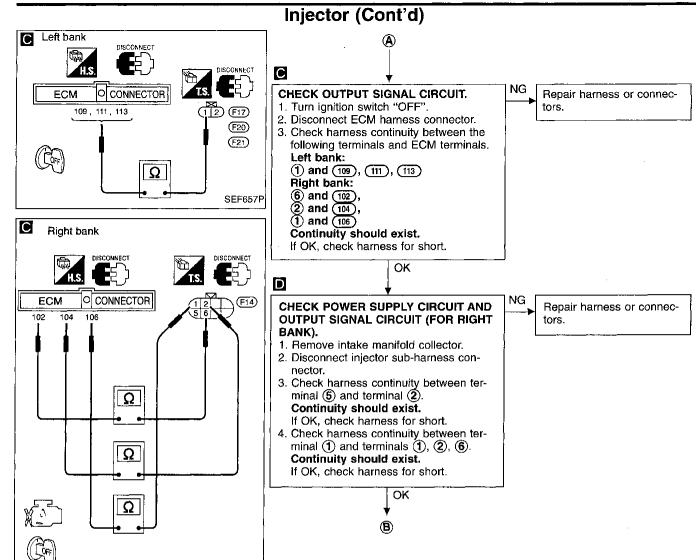
| TER-<br>MINAL<br>NO. | WIRE<br>COLOR | ITEM           | CONDITION          | DATA<br>(DC voltage)          |
|----------------------|---------------|----------------|--------------------|-------------------------------|
| 102                  | R/B           | Injector No. 1 |                    | BATTERY VOLTAGE<br>(11 - 14V) |
| 104                  | R/Y           | Injector No. 3 |                    |                               |
| 106                  | L/W           | Injector No. 5 | Engine is running. |                               |
| 109                  | R/G           | Injector No. 2 | Idle speed         |                               |
| 111                  | B/OR          | Injector No. 4 |                    |                               |
| 113                  | PU/R          | Injector No. 6 |                    |                               |

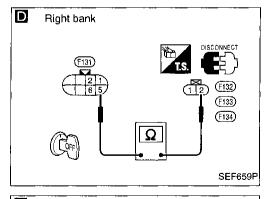
**EC-354** 522



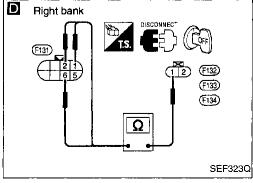
**EC-355** 

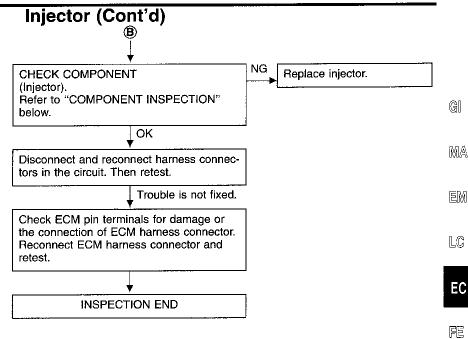
523

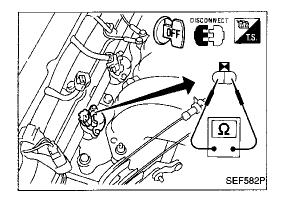




SEF658P







#### **COMPONENT INSPECTION**

#### Injector

- 1. Disconnect injector harness connector.
- 2. Check resistance between terminals as shown in the figure. Resistance: 10 14 $\Omega$  at 25°C (77°F) If NG, replace injector.

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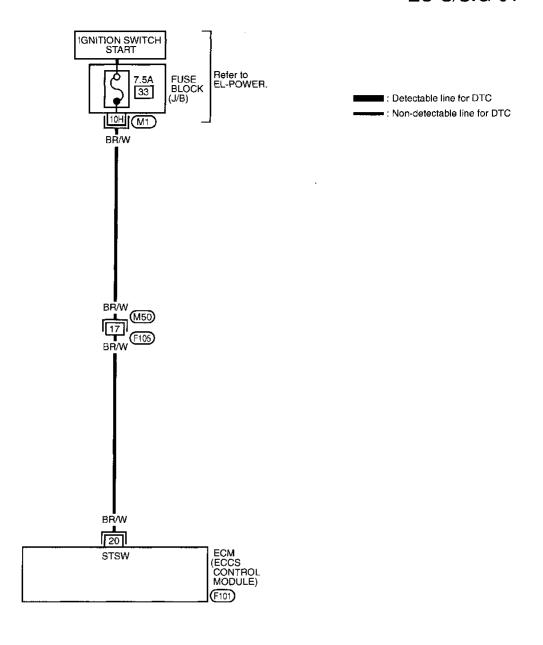
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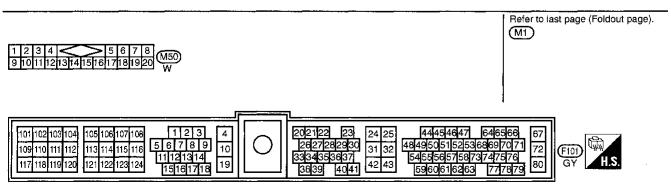
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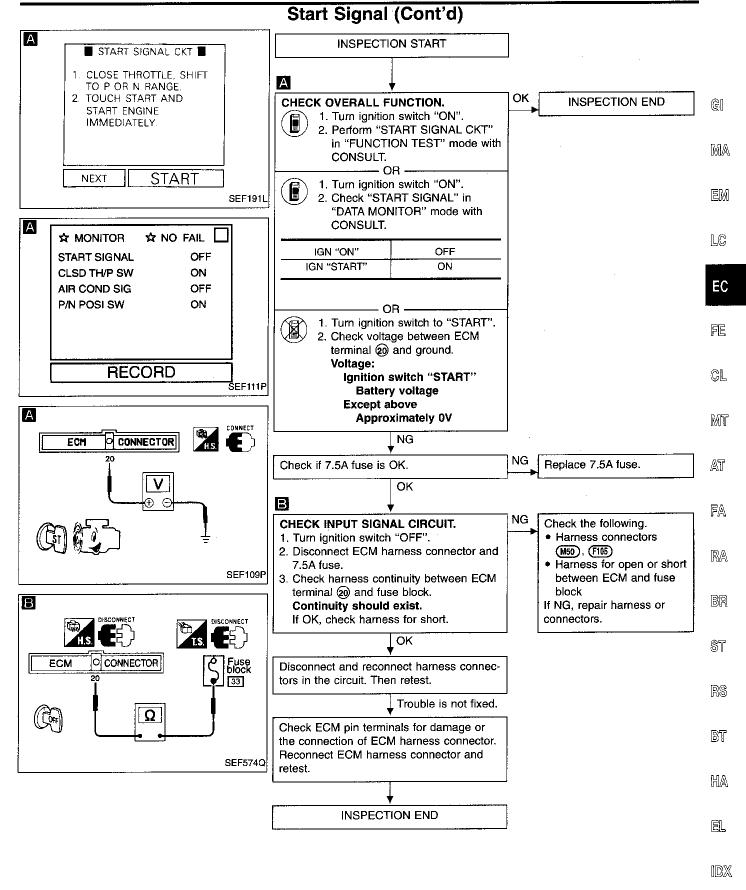
[DX

#### **Start Signal**

EC-S/SIG-01



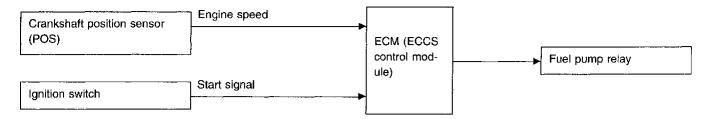




**EC-359** 527

#### **Fuel Pump Control**

#### 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 1° signal from the crankshaft position sensor (POS), it knows that the engine is rotating, and causes the pump to activate. If the 1° signal is not received when the ignition switch is ON, the engine stalls. The 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.

| Condition                        | Fuel pump operation   |  |
|----------------------------------|-----------------------|--|
| Ignition switch is turned to ON. | Operates for 1 second |  |
| Engine running and cranking      | Operates              |  |
| Except as shown above            | Stops                 |  |

#### **CONSULT REFERENCE VALUE IN DATA MONITOR MODE**

Remarks: Specification data are reference values.

| MONITOR ITEM  | CONDITION  |  | SPECIFICATION |
|---------------|--|--|---------------|
| FUEL PUMP RLY | Ignition switch is turned to ON (C     Engine running and cranking | ON   |               |
|               | Except as shown above  |  | OFF           |
|               | Engine: After warming up   | Within 30 seconds of starting engine       | Approx. 0V    |
| FPCM DR VOLT  |  | More than 30 seconds after starting engine | Approx. 3.5V  |
|               |  | Within 30 seconds of starting engine       | HI            |
| FPCM          | Engine: After warming up   | More than 30 seconds after starting engine | LOW           |

## Fuel Pump Control (Cont'd)

#### **ECM TERMINALS AND REFERENCE VALUE**

Remarks: Specification data are reference values, and are measured between each terminal and (a) (ECCS ground) with a voltmeter.

| TER-<br>MINAL<br>NO. | WIRE<br>COLOR       | ITEM   | CONDITION  | DATA<br>(DC voltage)            | (  |                   |
|----------------------|---------------------|--|--|---------------------------------|--|-------------------|
| 11                   | B/P Fuel pump relay | Ignition switch "ON"  For 1 second after turning ignition switch "ON"  Engine is running.    | 0 - 1V   | [                               |  |                   |
|                      |                     |  | Ignition switch "ON"  1 second after turning ignition switch "ON"                            | BATTERY VOLTAGE<br>(11 - 14V)   | (  |                   |
| 15 B/P               |                     | Engine is running. (Warm-up condition)  Idle speed (within 30 seconds after starting engine) | 0 - 0.4V   |                                 |  |                   |
|                      | B/P                 | D/P   F  | Fuel pump control module   | Engine is running. (Warm-up cor | Engine is running. (Warm-up condition)  Idle speed (30 seconds after starting engine and thereafter) | Approximately 10V |
| 28                   | G/B                 | Fuel pump control module   | Engine is running. (Warm-up condition)  Idle speed (within 30 seconds after starting engine) | 0 - 0.4V                        | <u> </u>   |                   |
| <b>28</b>            | u/n                 | check  | Engine is running.  Idle speed (30 seconds after starting engine and thereafter)             | 3.3 - 3.8V                      | <del></del>  |                   |

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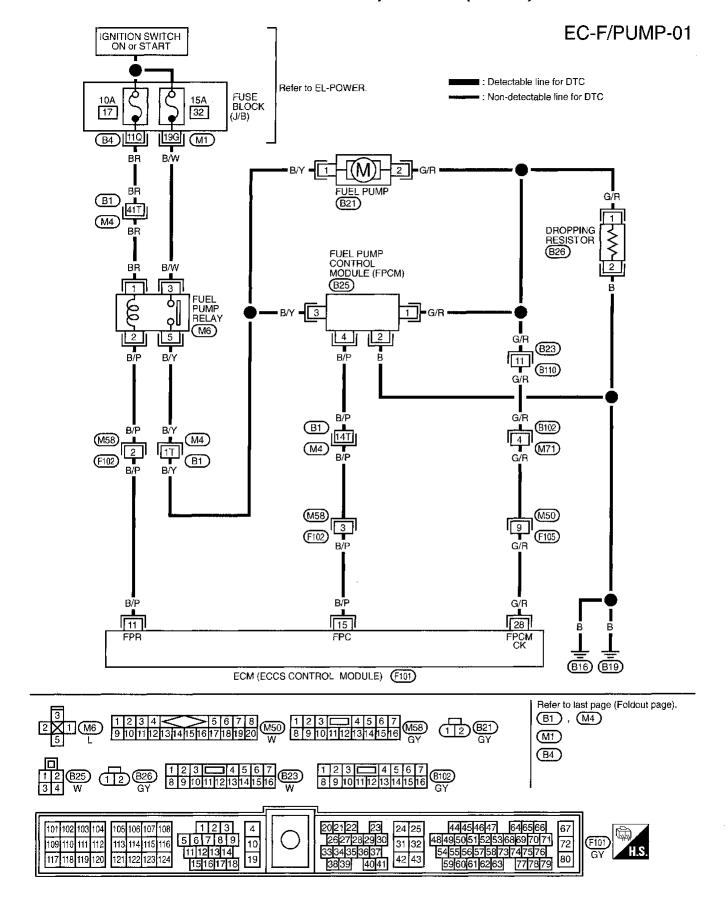
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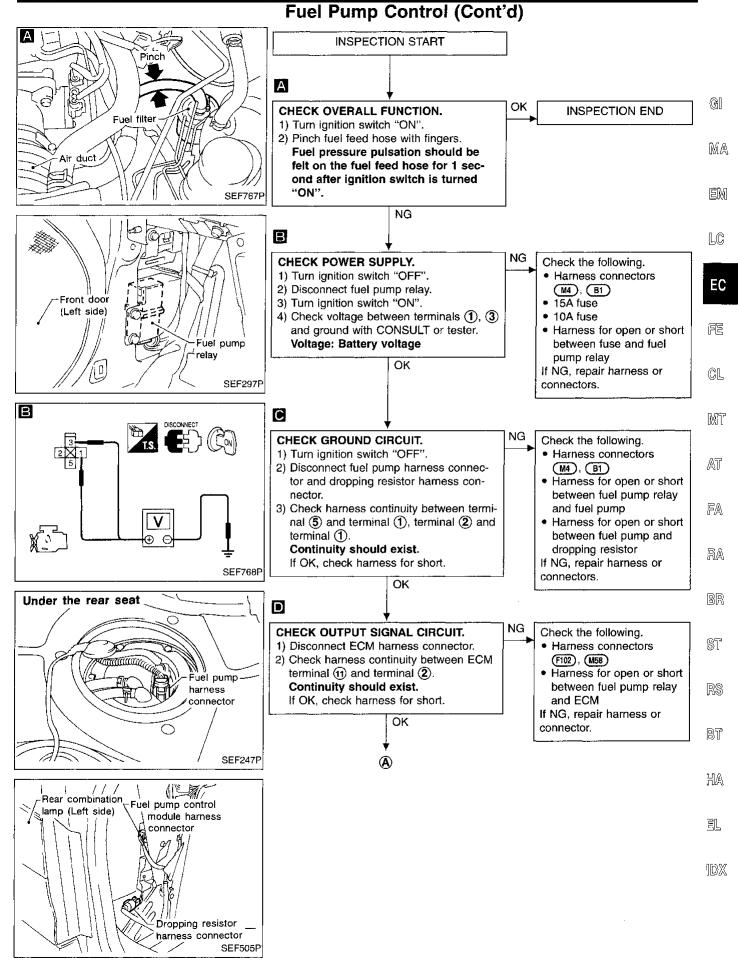
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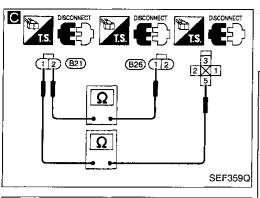
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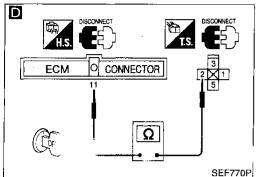
#### Fuel Pump Control (Cont'd)

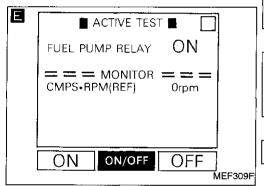


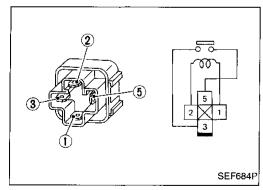


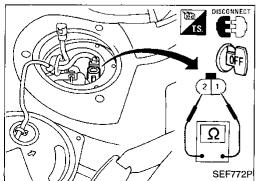
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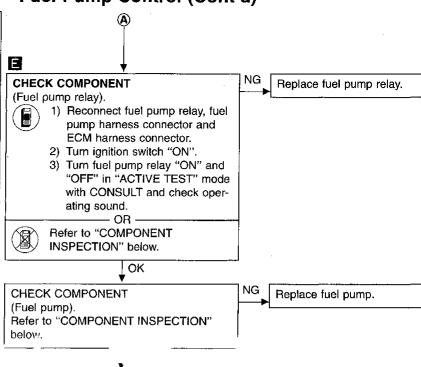








#### Fuel Pump Control (Cont'd)



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.

INSPECTION END

#### COMPONENT INSPECTION

#### Fuel pump relay

Check continuity between terminals 3 and 5.

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

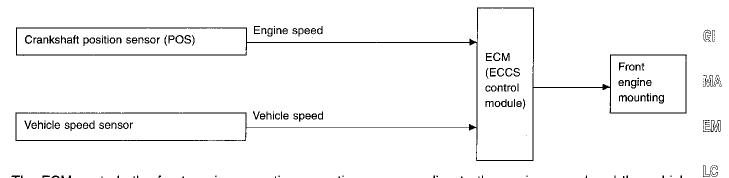
If NG, replace relay.

#### Fuel pump

- 1. Disconnect fuel pump harness connector.
- Check resistance between terminals ① and ②.
   Resistance: 0.2 5.0Ω at 20°C (68°F)
   If NG, replace fuel pump.

#### **Front Engine Mounting Control**

#### SYSTEM DESCRIPTION



The ECM controls the front engine mounting operation corresponding to the engine speed and the vehicle speed. The control system has 2-step control [soft/hard].

#### Front engine mounting control

| Vehicle condition           | Front engine mounting control |  |
|-----------------------------|-------------------------------|--|
| Idle (with vehicle stopped) | Soft                          |  |
| Driving                     | Hard                          |  |

#### **CONSULT REFERENCE VALUE IN DATA MONITOR MODE**

Remarks: Specification data are reference values.

| MONITOR ITEM | CONDITION       |           | SPECIFICATION | AT |
|--------------|-----------------|-----------|---------------|----|
| ENGINE MOUNT | Engine: Running | Idle      | "IDLE"        |    |
| ENGINE WOON  |                 | 2,000 rpm | "TRVL"        | FA |

#### **ECM TERMINALS AND REFERENCE VALUE**

Remarks: Specification data are reference values, and are measured between each terminal and (29) (ECCS ground) with a voltmeter.

| TER-<br>MINAL<br>NO. | WIRE<br>COLOR | ITEM                  | CONDITION   | DATA<br>(DC voltage)          |
|----------------------|---------------|-----------------------|---|-------------------------------|
| 33                   | W/L           | Front engine mounting | Engine is running.  For 2 seconds after engine speed changes from 2,000 rpm to idle speed | 0 - 0.4V                      |
|                      |               |                       | Engine is running.  Except the above  | BATTERY VOLTAGE<br>(11 - 14V) |
| 34                   | W/R           | Front engine mounting | Engine is running.  For 2 seconds after engine speed changes from idle speed to 2,000 rpm | 0 - 0.4V                      |
|                      |               |                       | Engine is running.  Except the above  | BATTERY VOLTAGE<br>(11 - 14V) |

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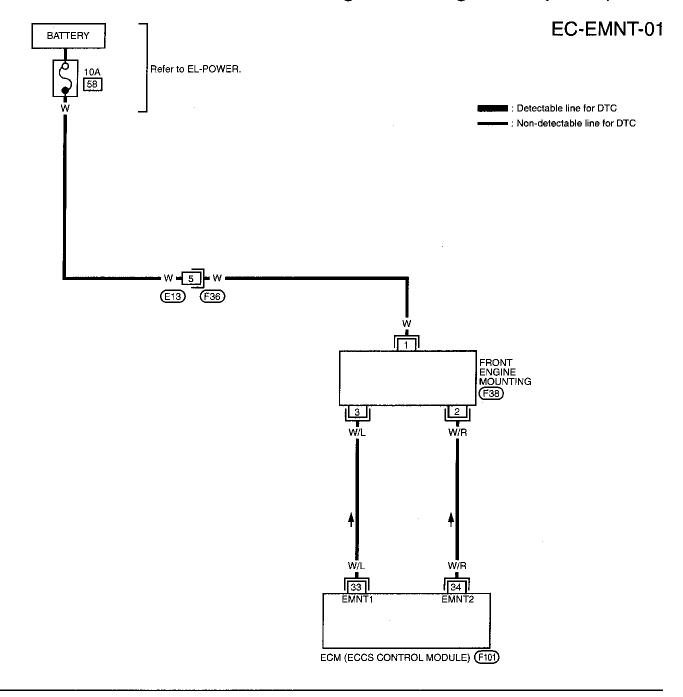
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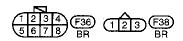
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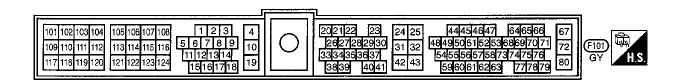
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#### Front Engine Mounting Control (Cont'd)







#### Front Engine Mounting Control (Cont'd) Α ■ ACTIVE TEST INSPECTION START IDLE **ENG MOUNTING** A. OK CHECK THE OVERALL FUNCTION. INSPECTION END G CKPS•RPM(POS) 675rpm 1. After warming up engine, run it at idle **COOLAN TEMP/S** 92°C speed. 2. Shift selector lever to "D" range while MA depressing the brake pedal and pulling the parking brake control lever. 3. Perform "ENGINE MOUNTING" TRV/IDL TRAVEL IDOL in "ACTIVE TEST" mode with EM SEF784P CONSULT and check that the body vibration changes accord-Front engine mounting ing to switching the condition harness connector LC (With vehicle stopped). OR 3. Disconnect front engine mounting harness connector when EC engine speed is more than 1,000 rpm. 4. When returning engine speed to Dil pan FE idle speed, check that the body vibration increases, compared with the condition of the above step 2 (With vehicle stopped). GL SEF369Q NG В В MT CHECK POWER SUPPLY. Check the following. 1. Tum ignition switch "OFF". Harness connectors 2. Disconnect front engine mounting har-(F36), (E13) AT 10A fuse ness connector. 3. Check voltage between terminal (1) and · Harness for open or short ground with CONSULT or tester. between front engine Voltage: Battery voltage mounting and battery FA If NG, repair harness or **OK** connectors. C RA SEF785P NG CHECK OUTPUT SIGNAL CIRCUIT. Repair harness or connec-1. Disconnect ECM harness connector. tors. BR 2. Check harness continuity between ECM terminal (3) and terminal (3), ECM terminal (34) and terminal (2) Continuity should exist. ST CONNECTOR (T2]3) **ECM** If OK, check harness for short. OK Ω RS Disconnect and reconnect harness connectors in the circuit, and retest. Ω Trouble is not fixed. BT

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Replace front engine mounting assembly.

Check ECM pin terminals for damage or

Reconnect ECM harness connector and

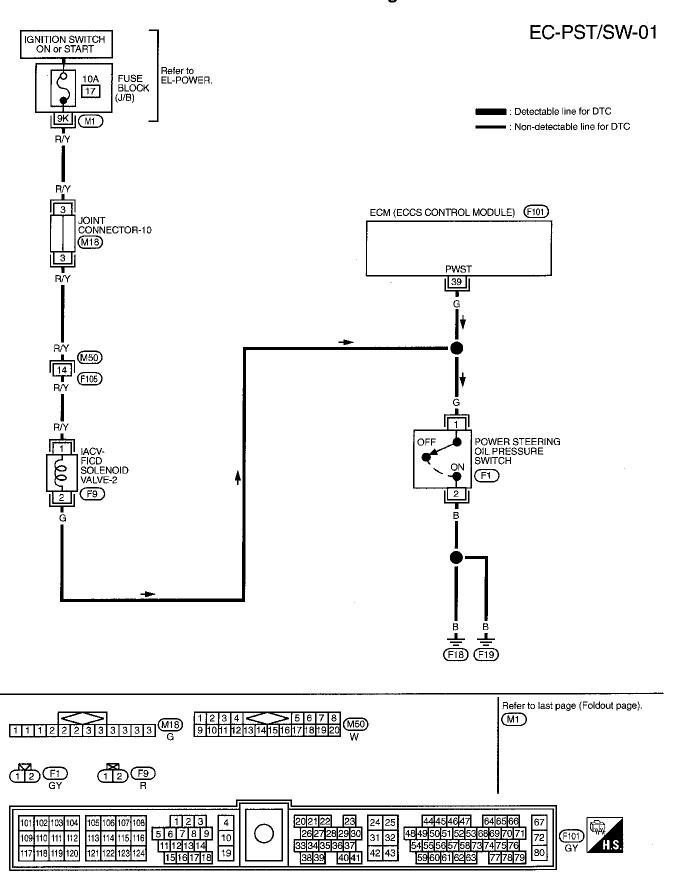
Visually check front engine mounting.

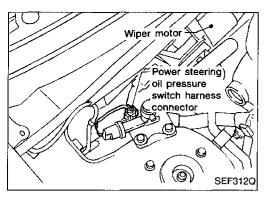
the connection of ECM harness connector.

SEF786P

retest.

#### **Power Steering Oil Pressure Switch**





#### Power Steering Oil Pressure Switch (Cont'd) **COMPONENT DESCRIPTION**

The power steering oil pressure switch is attached to the power steering high-pressure tube and detects a power steering load. When a power steering load is detected, it signals the ECM. The ECM adjusts the IACV-AAC valve to increase the idle speed and adjust for the increased load.

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#### CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Remarks: Specification data are reference values.

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| MONITOR ITEM | CONDITION                                 |  | SPECIFICATION |
|--------------|---|--|---------------|
| PW/ST SIGNAL | Engine: After warming up, idle the engine | Steering wheel in neutral position (forward direction) | OFF           |
|              |   | The steering wheel is turned                           | ON            |
|              | •   |  | ·             |

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#### **ECM TERMINALS AND REFERENCE VALUE**

Remarks: Specification data are reference values, and are measured between each terminal and (25) (ECCS ground) with a voltmeter.

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| MINAL<br>NO. | WIRE | ITEM                               | CONDITION   | DATA<br>(DC voltage)          |
|--------------|------|------------------------------------|---|-------------------------------|
| 39           | G    | Power steering oil pressure switch | Engine is running.  Steering wheel is being turned.     | 0 - 1.5V                      |
|              |      |                                    | Engine is running.  Steering wheel is not being turned. | BATTERY VOLTAGE<br>(11 - 14V) |

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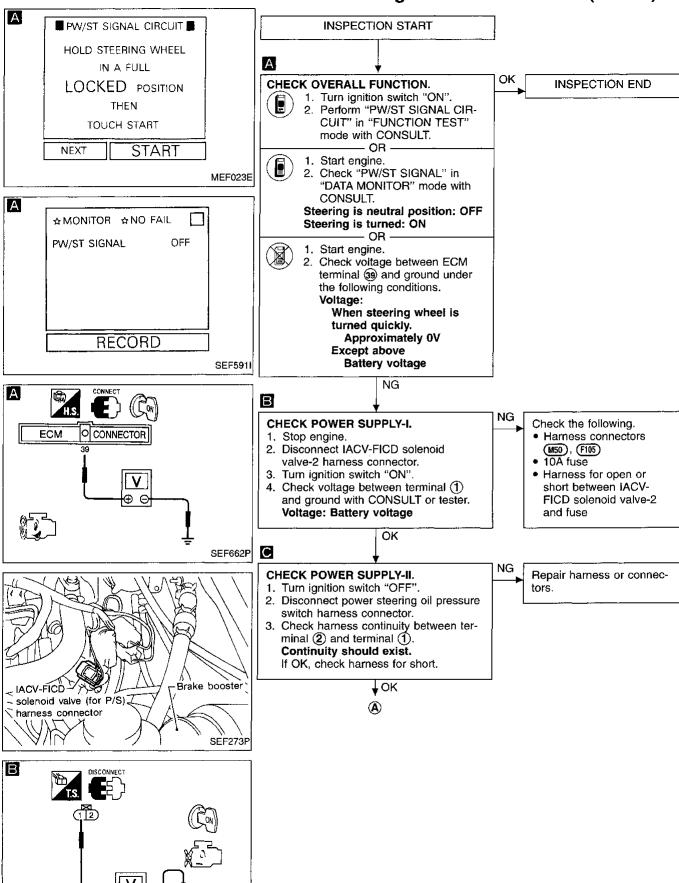
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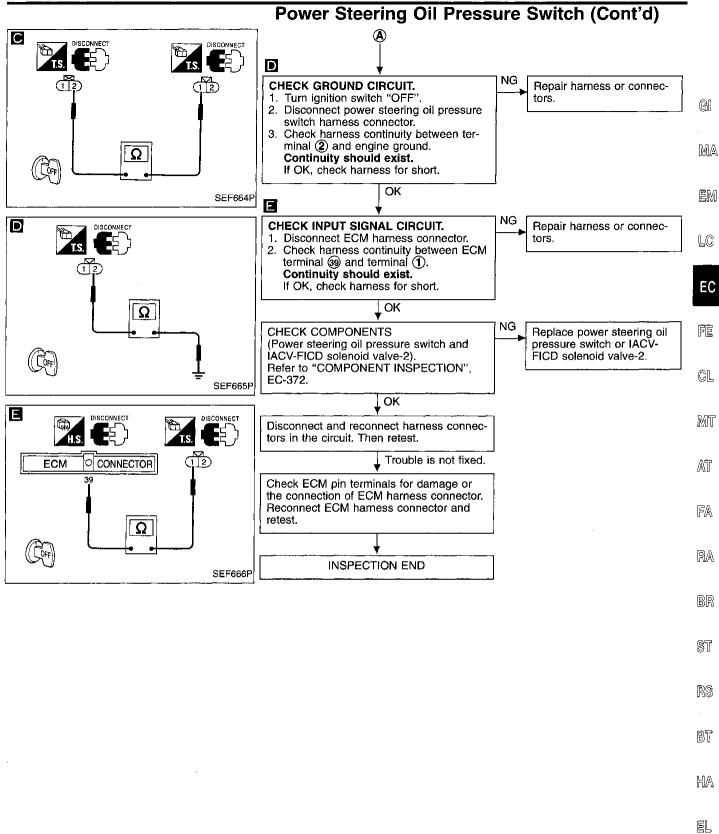
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537 **EC-369** 

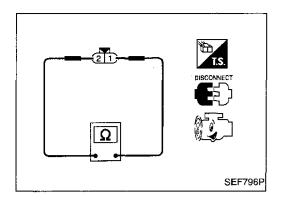
#### Power Steering Oil Pressure Switch (Cont'd)



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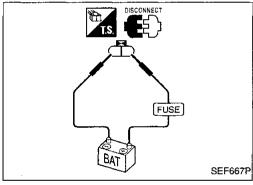
#### Power Steering Oil Pressure Switch (Cont'd) **COMPONENT INSPECTION**

#### Power steering oil pressure switch

- Disconnect power steering oil pressure switch harness connector then start engine.
- 2. Check continuity between terminals (1) and (2).

| Conditions                         | Continuity |
|------------------------------------|------------|
| Steering wheel is being turned     | Yes        |
| Steering wheel is not being turned | No         |

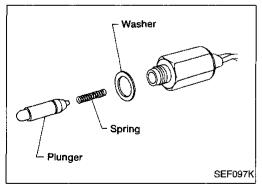
If NG, replace power steering oil pressure switch.



#### IACV-FICD solenoid valve-2

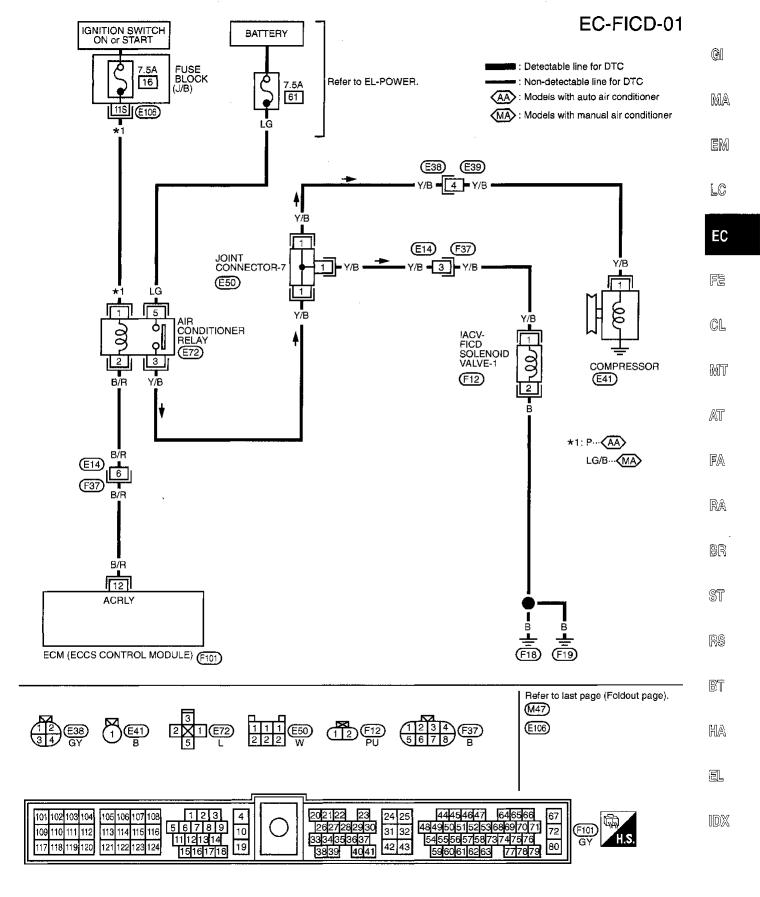
Disconnect IACV-FICD solenoid valve-2 harness connector.

Check for clicking sound when applying 12V direct current to terminals.

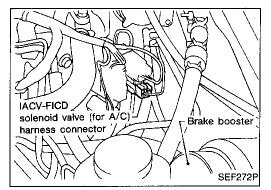


- Check plunger for seizing or sticking.
- Check for broken spring.

#### **IACV-FICD Solenoid Valve**



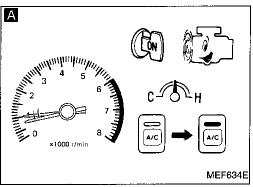
#### TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

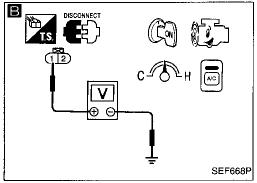


#### IACV-FICD Solenoid Valve (Cont'd)

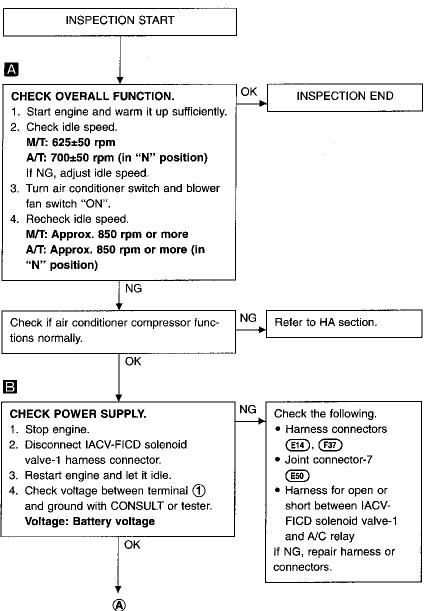
#### **DESCRIPTION**

The idle air adjusting (IAA) unit is made up of the IACV-AAC valve, IACV-FICD solenoid valves and idle adjusting screw. It receives the signal from the ECM and controls the idle speed at the preset value.





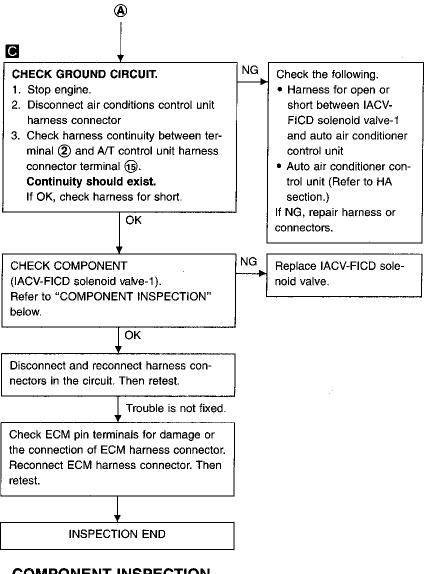
#### **DIAGNOSTIC PROCEDURE**

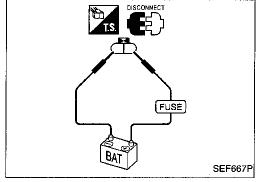


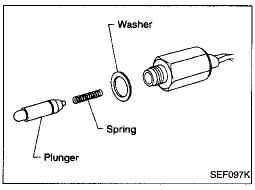
#### TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

## A/C C/UNIT O CONNECTOR SEF320Q

#### **IACV-FICD Solenoid Valve (Cont'd)**







#### **COMPONENT INSPECTION**

#### IACV-FICD solenoid valve-1

Disconnect IACV-FICD solenoid valve-1 harness connector.

Check for clicking sound when applying 12V direct current to terminals.

Check plunger for seizing or sticking.

Check for broken spring.

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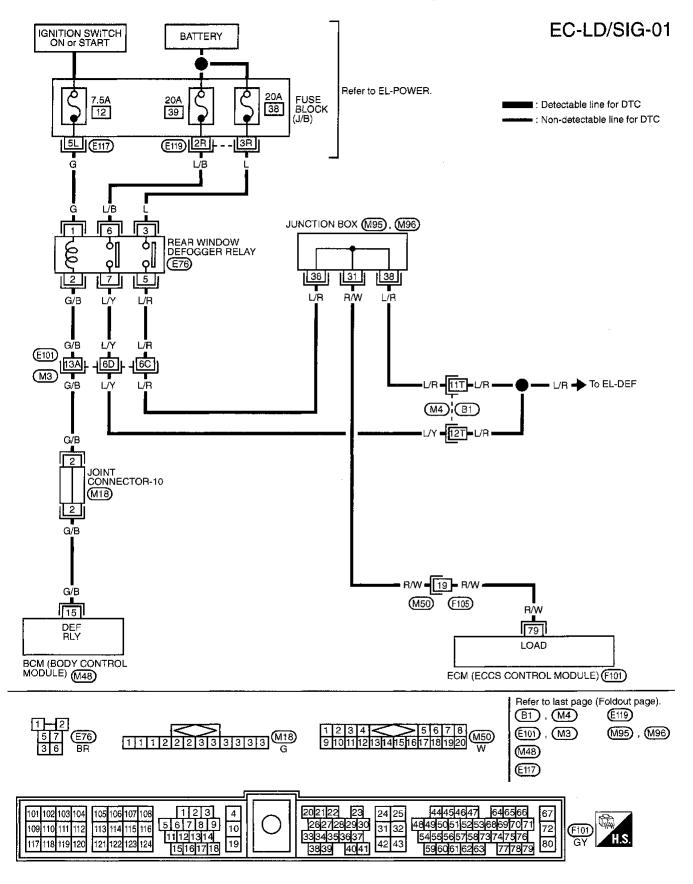
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#### **Electrical Load Signal**



#### TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

#### Electrical Load Signal (Cont'd)

#### **CONSULT REFERENCE VALUE IN DATA MONITOR MODE**

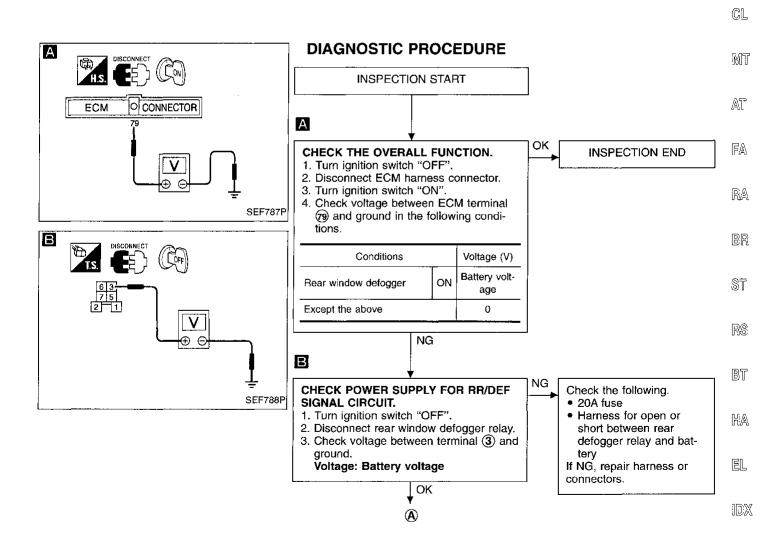
Remarks: Specification data are reference values.

| MONITOR ITEM | CONDITION         |                           | SPECIFICATION |             |
|--------------|-------------------|---------------------------|---------------|-------------|
| LOAD SIGNAL  | • Enginer Rupping | Rear window defogger "ON" | ON            | <i>(</i> ≥1 |
| EUAD SIGNAL  | Engine: Running   | Except the above          | OFF           | G1          |

#### **ECM TERMINALS AND REFERENCE VALUE**

Remarks: Specification data are reference values, and are measured between each terminal and (a) (ECCS ground) with a voltmeter.

| TER-<br>MINAL<br>NO. | WIRE<br>COLOR | ITEM                   | CONDITION   | DATA<br>(DC voltage)          |
|----------------------|---------------|------------------------|---|-------------------------------|
|                      |               |                        | Engine is running.  Idle speed (Electrical load: "OFF")     | ov                            |
| 79                   | R/W           | Electrical load signal | Engine is running.  Idle speed (Rear window defogger: "ON") | BATTERY VOLTAGE<br>(11 - 14V) |



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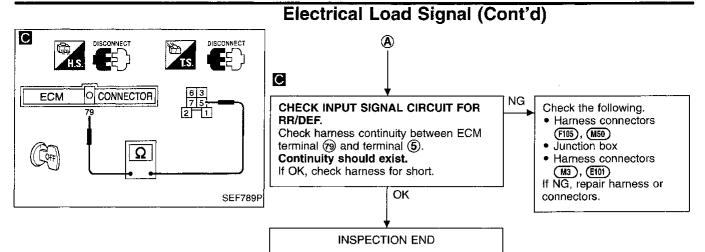
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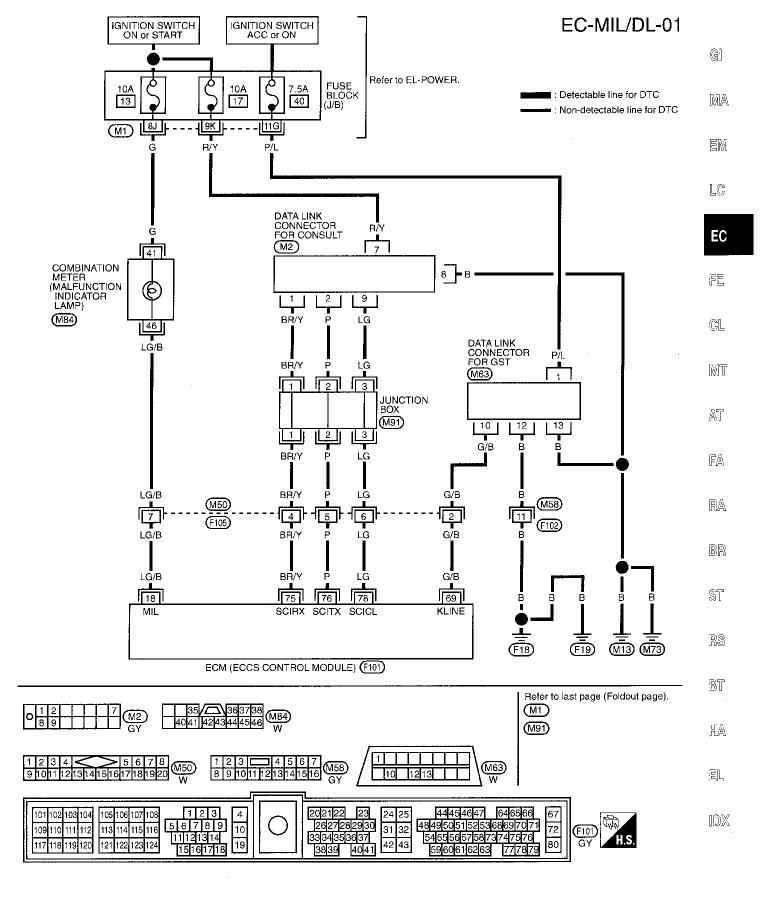
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#### TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS



**EC-378** 546

#### **MIL & Data Link Connectors**



#### **SERVICE DATA AND SPECIFICATIONS (SDS)**

#### **General Specifications**

| PRESSURE REGULATOR Fuel pressure at idling kPa (kg/cm², psi) |                                |
|--|--------------------------------|
| Vacuum hose is connected                                     | Approximately<br>235 (2.4, 34) |
| Vacuum hose is disconnected                                  | Approximately<br>294 (3.0, 43) |

#### **Inspection and Adjustment**

| Idle speed*1    | rpm                     |                            |
|-----------------|-------------------------|----------------------------|
| No-load*2       | (in "N" position)       | M/T: 625±50<br>A/T: 700±50 |
| Air conditioner | ON<br>(in "N" position) | 850 or more                |
| Ignition timing |                         | 15°±2° BTDC                |

<sup>\*1:</sup> Feedback controlled and needs no adjustments

- Air conditioner switch: OFF
- Electric load: OFF (Heater, fan & rear window defogger)

#### MASS AIR FLOW SENSOR

|  |    | *  |
|--|----|--|
| Supply voltage                                   | ٧  | Battery voltage (11 - 14)                      |
| Output voltage                                   | ٧  | 1.0 - 1.7 at idle*<br>1.5 - 2.1 at 2,500 rpm*  |
| Mass air flow<br>(Using CONSULT or GST)<br>g·m/s | ec | 2.0 - 6.0 at idle*<br>7.0 - 20.0 at 2,500 rpm* |

<sup>\*:</sup> Engine is warmed up sufficiently and under no-load.

## ENGINE COOLANT TEMPERATURE SENSOR

| Temperature °C (°F) | Resistance       |
|---------------------|------------------|
| 20 (68)             | 2.1 - 2.9 kΩ     |
| 50 (122)            | 0.68 - 1.00 kΩ   |
| 90 (194)            | 0.236 - 0.260 kΩ |

#### **EGR TEMPERATURE SENSOR**

| EGR temperature<br>°C (°F) | Resistance $(M\Omega)$ |
|----------------------------|------------------------|
| 0 (32)                     | 7.9 - 9.7              |
| 50 (122)                   | 0.57 - 0.70            |
| 100 (212)                  | 0.08 - 0.10            |

## FRONT HEATED OXYGEN SENSOR HEATER

| Resistance [at 25°C ( | $(77^{\circ}F)$ ] $\Omega$ | 2.3 - 4.3 |  |
|-----------------------|----------------------------|-----------|--|
|                       |                            | <u> </u>  |  |
|                       |                            |           |  |

#### **FUEL PUMP**

| Resistance [at 25°C (77°F)] | Ω | 0.2 - 5.0 |
|-----------------------------|---|-----------|

#### **IACV-AAC VALVE (Step motor type)**

| Resistance [at 25°C (77°F)] | Ω | Approximately 30 |
|-----------------------------|---|------------------|
|                             |   | ***              |

#### **INJECTOR**

| 10 - 14 | Resistance [at 25°C (77°F)] | Ω | 10 - 14 |
|---------|-----------------------------|---|---------|
|---------|-----------------------------|---|---------|

#### THROTTLE POSITION SENSOR

| Accelerator pedal conditions | Resistance [at 25°C (77°F)] |
|------------------------------|-----------------------------|
| Completely released          | Approximately 0.5 kΩ        |
| Partially released           | 0.5 - 4.0 kΩ                |
| Completely depressed         | Approximately 4.0 kΩ        |

<sup>\*2:</sup> Under the following conditions:

#### **SERVICE DATA AND SPECIFICATIONS (SDS)**

#### Inspection and Adjustment (Cont'd)

#### **CALCULATED LOAD VALUE**

|              | Calculated load value %<br>(Using CONSULT or GST) |
|--------------|---|
| At idle      | 14.0 - 33.0                                       |
| At 2,500 rpm | 12.0 - 25.0                                       |

#### **INTAKE AIR TEMPERATURE SENSOR**

| Temperature °C (°F) | Resistance kΩ |
|---------------------|---------------|
| 20 (68)             | 2.1 - 2.9     |
| 80 (176)            | 0.27 - 0.38   |

## EVAP CANISTER PURGE VOLUME CONTROL VALVE

| Resistance [at 25°C (77°F)] | Ω | Approximately 30 |
|-----------------------------|---|------------------|
|                             |   |                  |

#### REAR HEATED OXYGEN SENSOR HEATER

| Resistance [at 25°C (77°F)] | Ω | 2.3 - 4.3 |
|-----------------------------|---|-----------|
|                             | F |           |

#### **CAMSHAFT POSITION SENSOR (PHASE)**

| Resistance $\Omega$ | HITACHI make    | 1,440 - 1,760<br>[at 20°C (68°F)] |
|---------------------|-----------------|-----------------------------------|
| nesistance 12       | MITSUBISHI make | 2,090 - 2,550<br>[at 20°C (68°F)] |

#### **CRANKSHAFT POSITION SENSOR (REF)**

| Resistance [at 25°C (77°F)] | Ω | 470 - 570 |
|-----------------------------|---|-----------|
|                             |   |           |

#### **DROPPING RESISTOR**

| Resistance [at 25°C (77°F)] | Ω | Approximately 0.9 |
|-----------------------------|---|-------------------|

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## ACCELERATOR CONTROL, FUEL & EXHAUST SYSTEMS



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## **CONTENTS**

| PREPARATION/ACCELERATOR CONTROL | Adjusting Accelerator Wire | 2 |
|---------------------------------|----------------------------|---|
| SYSTEM2                         | FUEL SYSTEM                | 3 |
| Special Service Tool2           | EXHAUST SYSTEM             | 4 |
| **                              |                            |   |
|                                 |                            |   |
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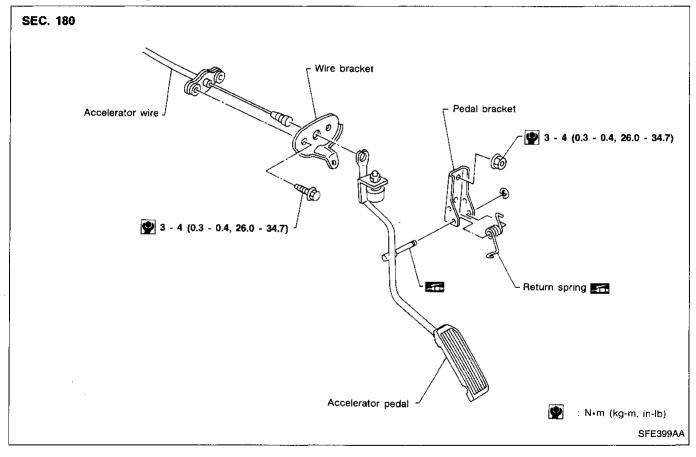
#### **Special Service Tool**

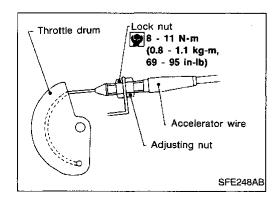
The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

| Tool number<br>(Kent-Moore No.)<br>Tool name              | Description |     |  |
|---|-------------|-----|--|
| KV10114400<br>(J-38365)<br>Heated oxygen sensor<br>wrench |             | a a | Loosening or tightening front and rear heated oxygen sensors |
| wrench  | NT636       |     | a = 22 mm (0.87 in)  |

#### **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.





### Adjusting Accelerator Wire

#### **CAUTION:**

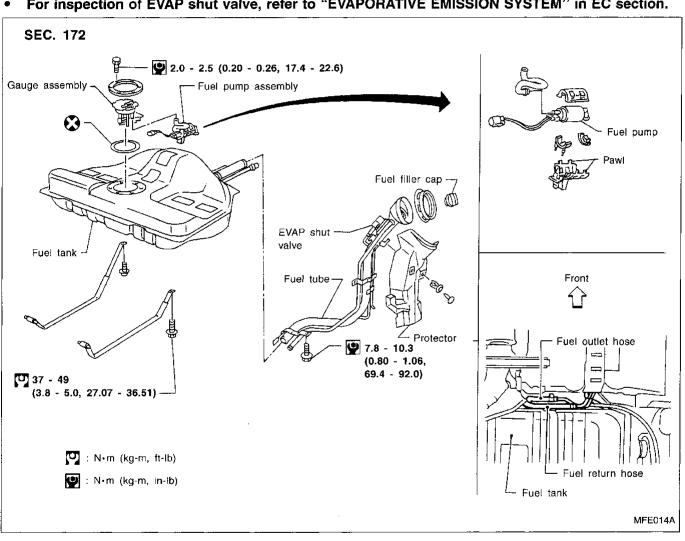
- Make sure the ASCD wire is not pulling the throttle drum.
- Refer to "AUTOMATIC SPEED CONTROL DEVICE" in EL section for ASCD wire adjustment.
- Loosen lock nut, and tighten adjusting nut until throttle drum starts to move.
- 2. From that position turn back adjusting nut 1.5 to 2 turns, and fasten it with lock nut.

#### **WARNING:**

- Be sure to furnish workshop with a CO<sub>2</sub> fire extinguisher.
- Do not smoke while servicing fuel system. Keep open flames and sparks away from work area.

#### **CAUTION:**

- Before removing fuel line parts carry out the following procedures:
- Put drained fuel in an explosion-proof container and put the lid on securely.
- Release fuel pressure from fuel line. Refer to "Changing Fuel Filter" in MA section.
- Disconnect battery ground cable.
- Always replace O-ring and clamps with new ones.
- Do not kink or twist tubes when they are being installed.
- Do not tighten hose clamps excessively to avoid damaging hoses.
- After installing tubes, run engine and check for fuel leaks at connections.
- Use only a genuine fuel filler cap as a replacement.
- For inspection of EVAP shut valve, refer to "EVAPORATIVE EMISSION SYSTEM" in EC section.



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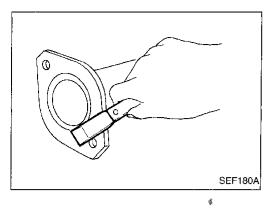
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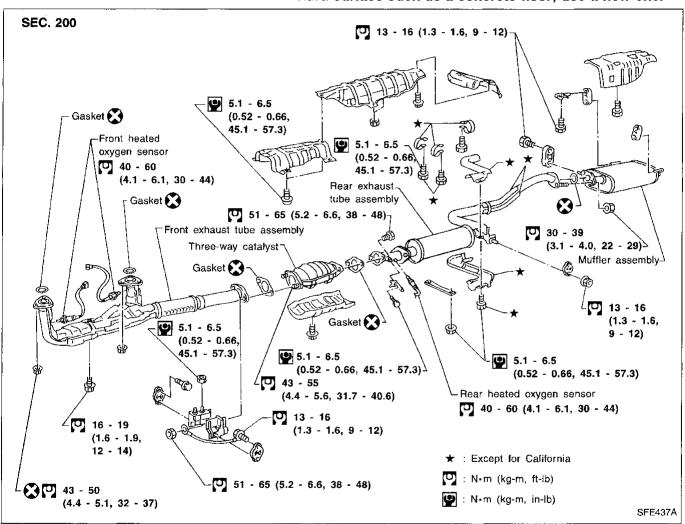
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#### **CAUTION:**

- Always replace exhaust gaskets with new ones when reassembling. If gasket remains on flange surface, scrape off completely as shown at left.
- With engine running, check all tube connections for exhaust gas leaks, and entire system for unusual noises.
- Check to ensure that mounting brackets and mounting insulators are installed properly and free from undue stress. Improper installation could result in excessive noise or vibration.
- Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.



## **CLUTCH**

# SECTION CL

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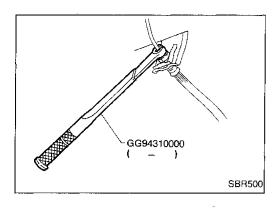
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#### PRECAUTIONS AND PREPARATION



#### **Precautions**

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

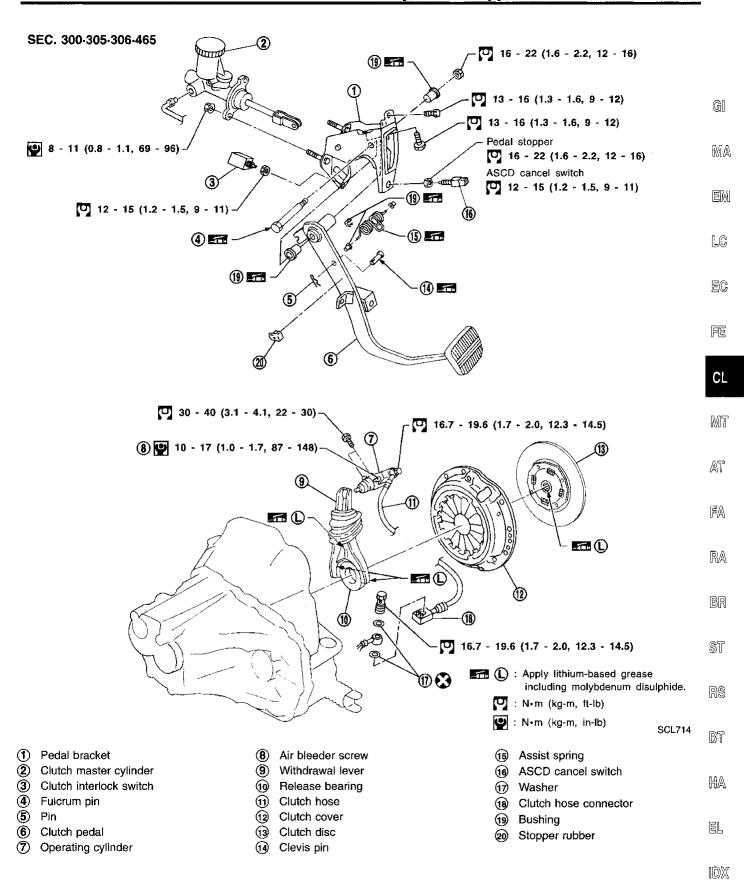
#### WARNING:

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

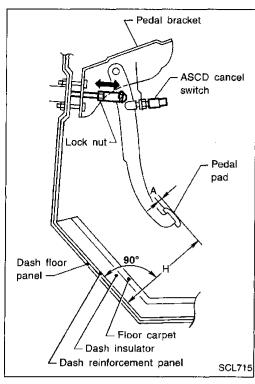
#### **Special Service Tools**

The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

| Tool number<br>(Kent-Moore No.)<br>Tool name   | Description |  |
|--|-------------|--|
| GG94310000<br>( — )<br>Flare nut torque wrench |             | Removing and installing clutch piping                    |
|  | NT406       | a: 10 mm (0.39 in)                                       |
| KV30101000<br>(J33213)<br>Clutch aligning bar  | New d e     | Installing clutch cover and clutch disc                  |
|  |             | a: 12 mm (0.47 in) dia.                                  |
|  | a b         | b: 15.7 mm (0.618 in) dia.                               |
|  | Former      | c: 22.8 mm (0.898 in) dia.<br>d: 21 mm (0.83 in)         |
|  | NT440       | e: 22 mm (0.87 in)                                       |
| ST20050240<br>( — )<br>Diaphragm spring        | a           | Adjusting unevenness of diaphragm spring of clutch cover |
| adjusting wrench                               |             | 450 mm /5 04 in)   |
|  | NT404       | a: 150 mm (5.91 in)<br>b: 25 mm (0.98 in)                |



#### **INSPECTION AND ADJUSTMENT**

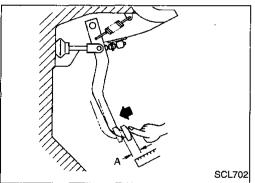


#### **Adjusting Clutch Pedal**

1. Adjust pedal height with ASCD cancel switch.

Pedal height "H":

168 - 175 mm (6.61 - 6.89 in)

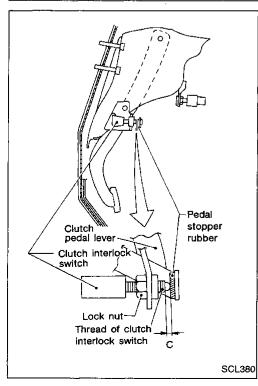


Adjust pedal free play with master cylinder push rod. Then tighten lock nut.

Pedal free play "A":

9 - 16 mm (0.35 - 0.63 in)

 Push or step on clutch pedal until resistance is felt, and check the distance the pedal moves.



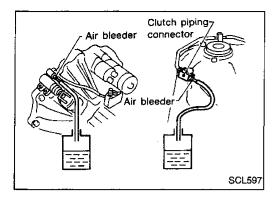
#### For U.S.A. model only

Adjust clearance "C" shown in the figure while fully depressing clutch pedal.

Clearance C:

0.3 - 1.0 mm (0.012 - 0.039 in)

#### **INSPECTION AND ADJUSTMENT**



#### **Bleeding Procedure**

1. Bleed air from clutch operating cylinder according to the following procedure.

Carefully monitor fluid level at master cylinder during bleeding operation.

- Top up reservoir with recommended brake fluid.
- b. Connect a transparent vinyl tube to air bleeder valve.
- c. Slowly depress clutch pedal all the way several times.
- With clutch pedal depressed, open bleeder valve to release air.
   Then close bleeder valve.
- e. Release clutch pedal and wait for a few seconds.
- f. Repeat steps c through e above until brake fluid flows from air bleeder valve without air bubbles.
- 2. Bleed air from clutch piping connector according to the above same procedure.
- 3. Repeat the above bleeding procedures 1 and 2 several times.

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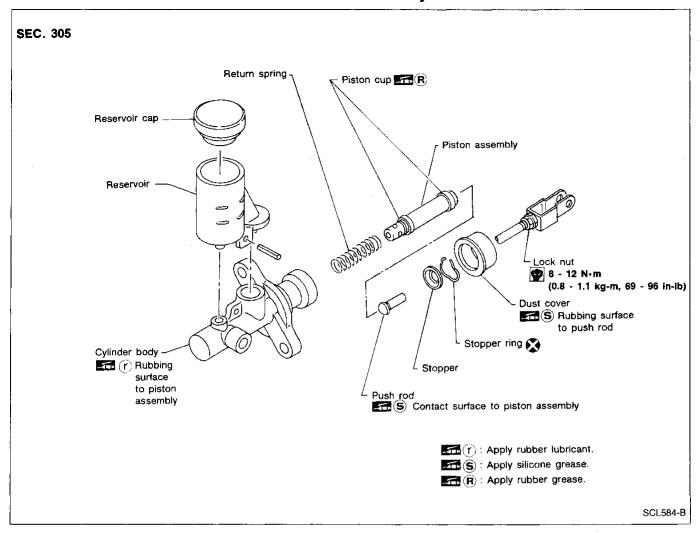
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#### **Clutch Master Cylinder**



#### **DISASSEMBLY AND ASSEMBLY**

Push piston into cylinder body with screwdriver when removing and installing valve stopper.

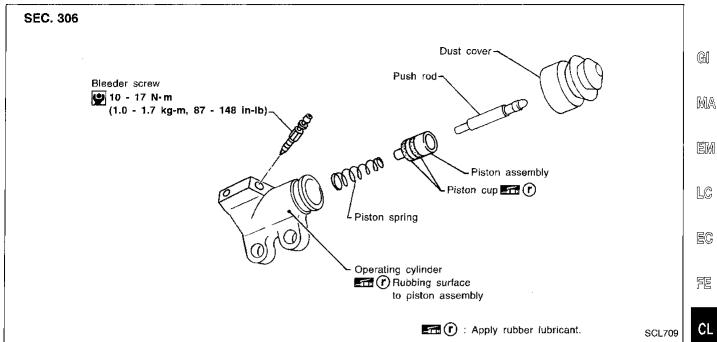
#### **INSPECTION**

Check the following items, and replace if necessary.

- Rubbing surface of cylinder and piston, for uneven wear, rust or damage
- Piston with piston cup, for wear or damage
- · Return spring, for wear or damage
- Dust cover, for cracks, deformation or damage
- Reservoir, for deformation or damage

#### **HYDRAULIC CLUTCH CONTROL**

#### **Operating Cylinder**



#### **INSPECTION**

Check the following items, and replace if necessary.

- Rubbing surface of cylinder and piston, for uneven wear, rust or damage
- Piston with piston cup, for wear or damage
- Piston spring, for wear or damage
- Dust cover, for cracks, deformation or damage

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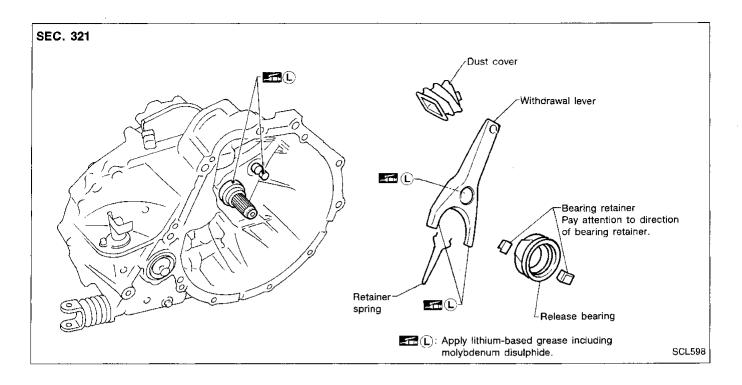
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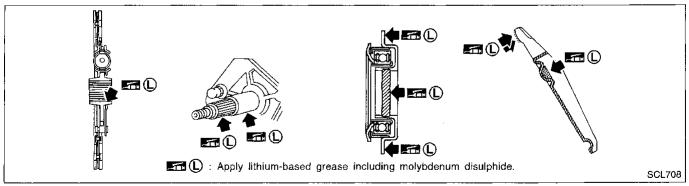
#### **CLUTCH RELEASE MECHANISM**



#### INSPECTION

Check the following items, and replace if necessary.

- Release bearing, to see that it rolls freely and is free from noise, cracks, pitting or wear
- Release sleeve and withdrawal lever rubbing surface, for wear, rust or damage

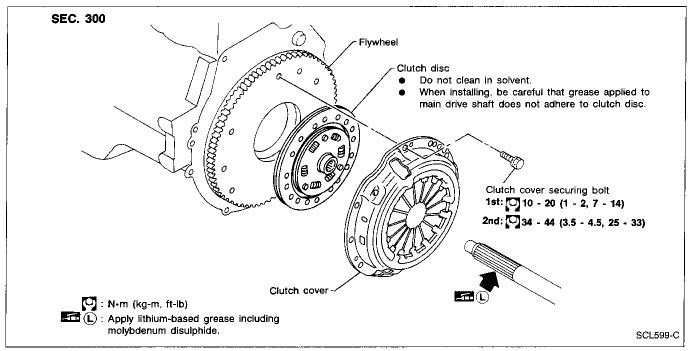


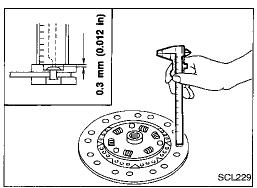
#### **LUBRICATION**

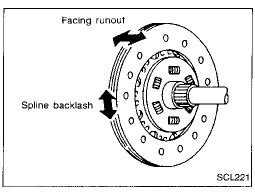
- Apply recommended grease to contact surface and rubbing surface.
- Too much lubricant might damage clutch disc facing.

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#### **CLUTCH DISC AND CLUTCH COVER**







## Clutch Disc

INSPECTION

Check the following items, and replace if necessary.

- Clutch disc, for burns, discoloration, oil or grease leakage
- Clutch disc, for wear of facing

Wear limit of facing surface to rivet head: 0.3 mm (0.012 in)

Clutch disc, for spline backlash

Maximum spline backlash (at outer edge of disc):

1.0 mm (0.039 in)

Clutch disc, for facing runout

Runout limit:

1.0 mm (0.039 in)

Distance of runout check point (from hub cen-

115 mm (4.53 in)

#### INSTALLATION

Apply recommended grease to contact surface of spline portion.

Too much lubricant might damage clutch facing.

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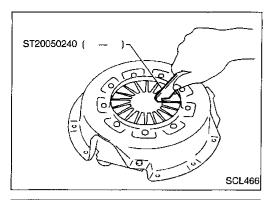
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#### CLUTCH DISC AND CLUTCH COVER



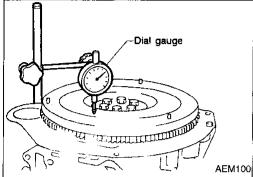
#### Clutch Cover and Flywheel INSPECTION AND ADJUSTMENT

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.

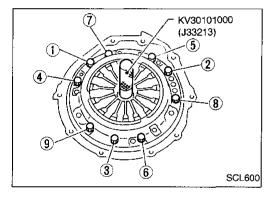


#### **FLYWHEEL INSPECTION**

- 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
- fighten bolts in numerical order.
- Be careful not to allow grease to contaminate clutch facing.

First step:

(i): 10 - 20 N·m (1 - 2 kg-m, 7 - 14 ft-lb) Final step:

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

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#### **SERVICE DATA AND SPECIFICATIONS (SDS)**

#### **General Specifications CLUTCH DISC**

#### **CLUTCH CONTROL SYSTEM**

| Type of clutch control | Hydraulic |
|------------------------|-----------|
|                        |           |

#### **CLUTCH MASTER CYLINDER**

| Inner diameter | mm (in) | 15.87 (5/8) |
|----------------|---------|-------------|

#### Unit: mm (in) 240 Model $240 \times 160 \times 3.5$ Facing size (Outer dia. $\times$ inner dia. × thickness) $(9.45 \times 6.30 \times 0.138)$ Thickness of disc assembly 7.6 - 8.0 (0.299 - 0.315) with With load 5,688 N (580 kg, 1,279 lb)

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#### **CLUTCH OPERATING CYLINDER**

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

#### **CLUTCH COVER**

| Model    |            | 240                |
|----------|------------|--------------------|
| Set load | N (kg, lb) | 5,688 (580, 1,279) |

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## **Inspection and Adjustment**

#### **CLUTCH PEDAL**

|   | Unit: mm (in)             |
|---|---------------------------|
| Pedal height*   | 168 - 175 (6.61 - 6.89)   |
| Pedal free play   | 9 - 16 (0.35 - 0.63)      |
| Clearance between pedal stopper<br>rubber and clutch interlock switch<br>threaded end while clutch pedal<br>is fully depressed. | 0.3 - 1.0 (0.012 - 0.039) |

<sup>\*:</sup> Measured from surface of dash reinforcement panel to surface of pedal pad

## CLUTCH DISC

|  | Onic min (in) |
|--|---------------|
| Model  | 240           |
| Wear limit of facing surface to rivet head           | 0.3 (0.012)   |
| Facing runout limit                                  | 1.0 (0.039)   |
| Distance of runout check point (from the hub center) | 115 (4.53)    |
| Maximum spline backlash (at outer edge of disc)      | 1.0 (0.039)   |



#### **CLUTCH COVER**

|   | Unit: mm (in) | RR   |
|---|---------------|------|
| Model                                       | 240           | וווש |
| Uneven limit of diaphragm spring toe height | 0.5 (0.020)   | ST   |

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## **MANUAL TRANSAXLE**

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#### **PREPARATION**

#### **Special Service Tools**

The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

| Tool number<br>(Kent-Moore No.)<br>Tool name  | Description |  |
|---|-------------|--|
| KV38105210<br>( — )<br>Preload adapter  | NT075       | Measuring turning torque of final drive assembly  Measuring total turning torque   |
| KV32101000<br>(J25689-A)<br>Pin punch   | a           | Removing and installing retaining pin  |
| ST22730000<br>(J25681)<br>Puller  | NT410       | a: 4 mm (0.16 in) dia.  Removing mainshaft front and rear bearing inner race   |
|   | NT411       | a: 82 mm (3.23 in) dia.<br>b: 30 mm (1.18 in) dia.   |
| ST30031000<br>(J22912-01)<br>Puller   | a b         | Removing input shaft front and rear bearing<br>Removing 4th & 5th main gear  |
|   | NT411       | a: 90 mm (3.54 in) dia.<br>b: 50 mm (1.97 in) dia.   |
| ST30021000<br>(J22912-01)<br>Puller   | a b         | Removing 5th synchronizer<br>Removing 3rd & 4th synchronizer<br>Removing 2nd & 3rd main gear                               |
|   | NT411       | a: 110 mm (4.33 in) dia.<br>b: 68 mm (2.68 in) dia.  |
| ST3306S001<br>(J22888-D)<br>Differential side bearing<br>puller set<br>① ST33051001 | 2 b         | Removing differential side bearing inner race  |
| (J22888-D) Puller ② ST33061000 (J8107-2) Adapter                                    | NT413       | a: 38 mm (1.50 in) dia.<br>b: 28.5 mm (1.122 in) dia.<br>c: 130 mm (5.12 in)<br>d: 135 mm (5.31 in)<br>e: 100 mm (3.94 in) |
| ST33290001<br>(J34286)<br>Puller  | a           | Removing differential oil seal Removing mainshaft rear bearing outer race Removing differential side bearing outer race    |
|   | NT414       | a: 250 mm (9.84 in)<br>b: 160 mm (6.30 in)   |
| ST33400001<br>(J26082)<br>Drift   |             | Installing differential oil seal (50A and 50V right side)  |
| Dill  | NT086       | a: 60 mm (2.36 in) dia.<br>b: 47 mm (1.85 in) dia.   |

#### **PREPARATION**

| Special Service Tools (Cont'd)  |  |  |
|---|--|--|
| Tool number<br>(Kent-Moore No.)<br>Tool name  | Description                              | ·  |
| ST30600000<br>(J25863-01)<br>Drift  |  | Installing input shaft front bearing   |
|   | NT065                                    | a: 36 mm (1.42 in) dia.<br>b: 31 mm (1.22 in) dia.                                     |
| ST22452000<br>(J34335)<br>Orift   |  | Installing 3rd, 4th and 5th main gear  |
|   | NT065                                    | a: 45 mm (1.77 in) dia.<br>b: 36 mm (1.42 in) dia.                                     |
| ST30621000<br>J25742-5)<br>Drift  | b to to to to to to to to to to to to to | Installing mainshaft rear bearing outer race (Use with ST30611000.)                    |
|   | NT073                                    | a: 79 mm (3.11 in) dia.<br>b: 59 mm (2.32 in) dia.                                     |
| ST30611000<br>(J25742-1)  | b  | (Use with ST30621000.)   |
| ,   | NT419                                    | a: 15 mm (0.59 in)<br>b: 335 mm (13.19 ln)<br>c: 25 mm (0.98 in) dia.<br>d: M12 x 1.5P |
| <v38100300< td=""><td>N. 413</td><td>Installing differential side bearing</td></v38100300<> | N. 413                                   | Installing differential side bearing   |
| Drift   | NT085                                    | a: 54 mm (2.13 in) dia.<br>b: 46 mm (1.81 in) dia.<br>c: 32 mm (1.26 in) dia.          |
| ST30613000<br>— )<br>Drift  | <u> </u>                                 | Installing differential side bearing   |
|   | NT073                                    | a: 72 mm (2.83 in) dia.<br>b: 48 mm (1.89 in) dia.                                     |
| J34290)<br>Shim selecting tool set  | 6.6                                      | Selecting differential side bearing adjusting shim                                     |
|   |  |  |
|   | NT080                                    | ·  |
| J34305)<br>Snap ring remover and<br>Installer   | 5  | Removing and installing stopper ring of shift fork                                     |
|   | NT081                                    |  |
| J25407-2)   |  | Measuring reverse baulk ring wear  |
|   | NT082                                    |  |

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#### **PREPARATION**

| Special Servic                               |                  | ce Tools (Cont'd)                                |
|--|------------------|--|
| Tool number<br>(Kent-Moore No.)<br>Tool name | Description      |  |
| KV38106500<br>(J34284)<br>Preload adapter    | NT087            | Measuring turning torque of final drive assembly |
| (J34291)<br>Shim setting gauge set           | NT101 PAPAP WWW. | Selecting side gear thrust washer                |

#### **Commercial Service Tools**

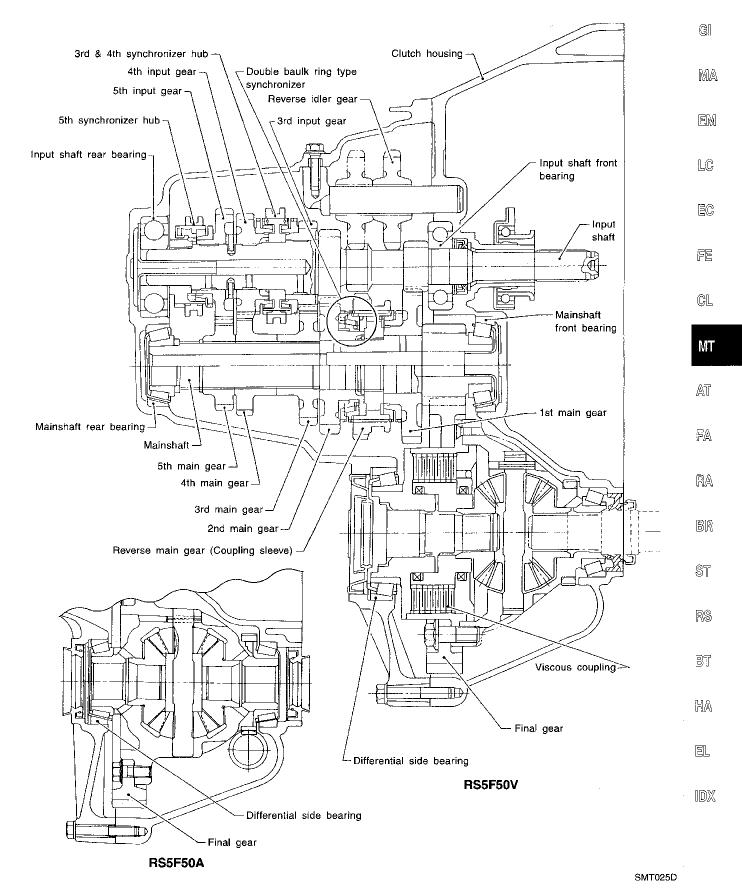
| Tool name | Description |   |
|-----------|-------------|---|
| Drift     |             | Installing differential side bearing inner race       |
|           | NTO65       | a: 45 mm (1.77 in) dia.<br>b: 41 mm (1.61 in) dia.    |
| Drift     |             | Installing differential side bearing outer race       |
|           | NT065       | a: 69 mm (2.72 in) dia.<br>b: 64 mm (2.52 in) dia.    |
| Drift     | albIO       | Installing striking rod oil seal                      |
|           | NT065       | a: 38 mm (1.50 in) dia.<br>b: 20 mm (0.79 in) dia.    |
| Orift     | 1010        | Installing differential oil seal (50V left side)      |
|           | NT065       | a: 92 mm (3.62 in) dia.<br>b: 72 mm (2.83 in) dia.    |
| Orift     |             | Installing differential side bearing outer race (50V) |
|           | a 163       | a: 99 mm (3.90 in) dia.                               |
|           | NT065       | b: 94 mm (3.70 in) dia.                               |

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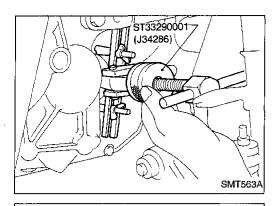
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#### **Cross-sectional View**

#### **RS5F50A AND 50V**



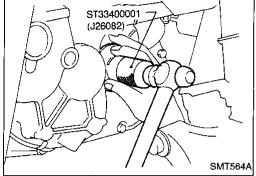
#### ON-VEHICLE SERVICE/REMOVAL AND INSTALLATION



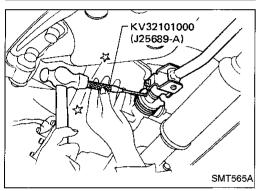
#### Replacing Oil Seal

#### **DIFFERENTIAL OIL SEAL**

- 1. Drain gear oil from transaxle.
- Remove drive shafts. Refer to FA section ("Removal", "FRONT AXLE — Drive Shaft").
- 3. Remove differential oil seal.

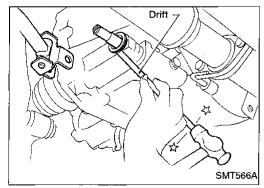


- Install differential oil seal.
- Apply multi-purpose grease to seal lip of oil seal before installing.
- 5. Install drive shafts. Refer to FA section ("Installation", "FRONT AXLE Drive Shaft").

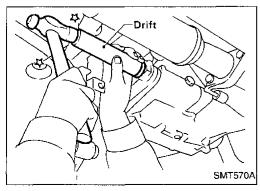


#### STRIKING ROD OIL SEAL

- 1. Remove transaxle control rod from yoke.
- 2. Remove retaining pin.
- Be careful not to damage boot.

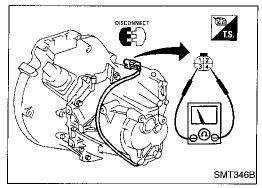


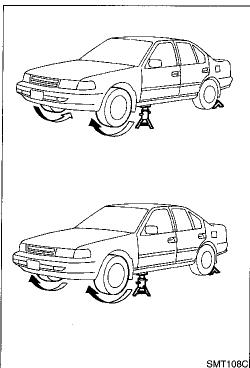
3. Remove striking rod oil seal.

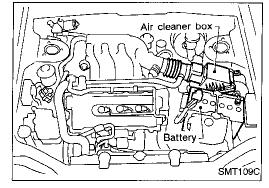


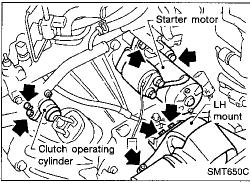
- 4. Install striking rod oil seal.
- Apply multi-purpose grease to seal lip of oil seal before installing.

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#### **Position Switch Check**

## BACK-UP LAMP SWITCH AND NEUTRAL POSITION SWITCH

Check continuity.

| Gear position              | Continuity |  |
|----------------------------|------------|--|
| Reverse                    | 2 - 4      |  |
| Neutral                    | ① - ③      |  |
| Except reverse and neutral | No         |  |

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#### **Viscous Coupling Check**

- 1. Apply parking brake firmly and place shift lever in the neutral position.
- 2. Jack up front wheels.
- Rotate one front wheel and check turning direction of the other front wheel.

#### Turning direction of the two wheels is opposite:

The viscous coupling is not functioning normally.

#### Turning direction of the two wheels is the same:

If differential side gear and pinion mate gear thrust washers are OK, viscous coupling is functioning normally.

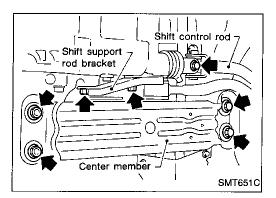
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CAUTION:

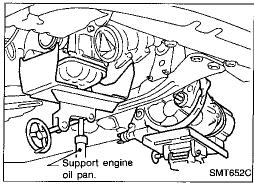
Remove the crankshaft position sensor (POS) from transaxle assembly before separating transaxle from engine. Be careful not to damage sensor edge.

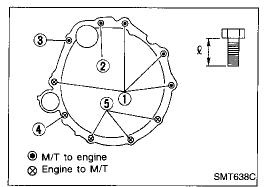
- 1. Remove battery and its bracket.
- 2. Remove air cleaner box with mass air flow sensor.
- Remove clutch operating cylinder from transaxle. Tighten clutch operating cylinder to the specified torque. Refer to CL section ("CLUTCH SYSTEM — Hydraulic Type").
- 4. Remove clutch hose clamp.
- Disconnect speedometer pinion, position switch and ground harness connectors.
- 6. Remove starter motor from transaxle.
- Remove crankshaft position sensor (POS) from transaxle front side.

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#### ON-VEHICLE SERVICE/REMOVAL AND INSTALLATION







#### Removal (Cont'd)

- 8. Remove shift control rod and support rod bracket from transaxle.
- 9. Drain gear oil from transaxle.
- 10. Draw out drive shafts from transaxle. Refer to FA section ("Removal", "FRONT AXLE Drive Shaft").
- 11. Support engine of transaxle by placing a jack under oil pan.

#### **CAUTION:**

#### Do not place jack under oil pan drain plug.

- Remove bolts securing center member. Tighten center member to the specified torque. Refer to EM section ("ENGINE REMOVAL").
- 13. Remove LH mounts. Tighten center member to the specified torque. Refer to EM section ("ENGINE REMOVAL").
- 14. Remove bolts securing transaxle.
- 15. Lower transaxle while supporting it with a jack.

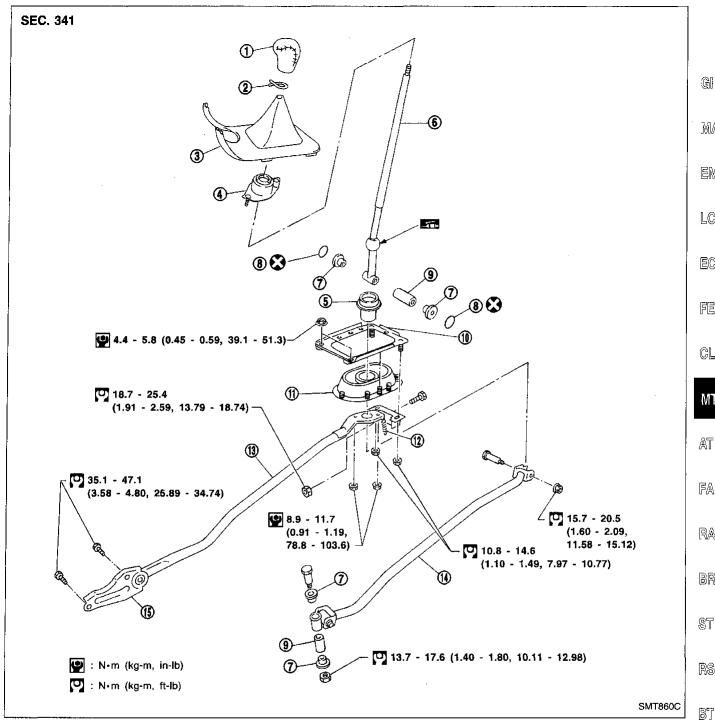
#### Installation

Tighten all transaxle bolts.

| Bolt<br>No. | Tightening torque<br>N⋅m (kg-m, ft-lb)   | "ℓ" mm (in) |
|-------------|--|-------------|
| 1           | 70 - 79 (7.1 - 8.1, 51 - 59)             | 52 (2.05)   |
| 2           | 70 - 79 (7.1 - 8.1, 51 - 59)             | 65 (2.56)   |
| 3           | 70 - 79 (7.1 - 8.1, 51 - 59)             | 124 (4.88)  |
| 4           | 35.1 - 47.1 (3.58 - 4.80, 25.89 - 34.74) | 40 (1.57)   |
| <b>⑤</b>    | 35.1 - 47.1 (3.58 - 4.80, 25.89 - 34.74) | 40 (1.57)   |

- 3 with starter
- with support rod bracket

#### TRANSAXLE GEAR CONTROL



- Control lever knob
- Boot retainer
- ② ③ **Boot**
- Control lever socket
- Seat-bearing set

- Control lever
- Bushing
- O-ring
- Collar
- Plate bolt

- Transaxle hole cover
- 12 Return spring
- 13 Support rod
- Shift control rod
- Shift support rod bracket

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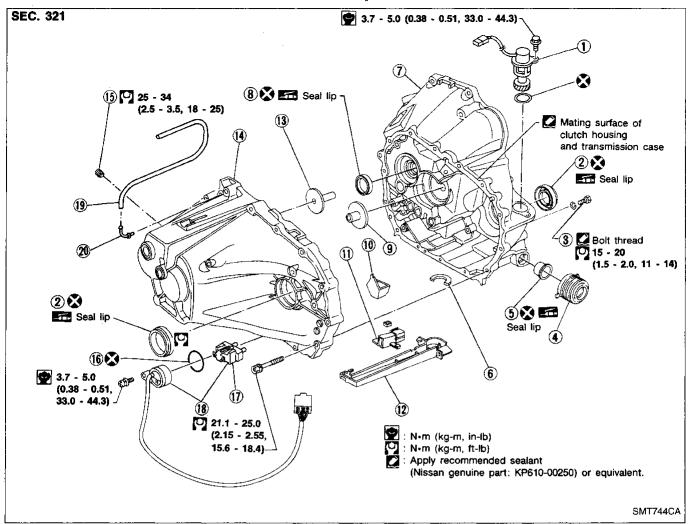
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#### **Case Components**

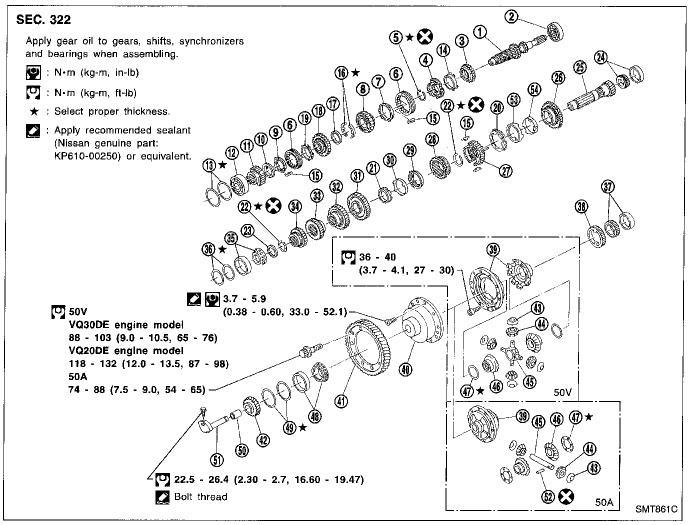


- Speedometer pinion
- ② ③ Differential oil seal
- Drain plug
- Boot
- **⑤** Striking rod oil seal
- 6 Magnet
- Clutch housing

- Input shaft oil seal
- 9 Oil channel (Mainshaft)
- Oil pocket
- 11 Box breather
- Oil gutter
- Oil channel (Input shaft) 13
- Transmission case

- Filler plug 15
- 16 O-ring
- 17 Movable plate assembly
- 18) Position switch
- 19 Breather hose
- Breather pipe

#### **Gear Components**



- 1 Input shaft
- ② Input shaft front bearing
- 3 3rd input gear
- 4 3rd & 4th synchronizer hub
- Snap ring
- 6 Coupling sleeve
- (7) 4th baulk ring
- 8 4th input gear
- 9 Reverse baulk ring
- 10 Reverse synchronizer cone
- 1 5th synchronizer hub
- 1 Input shaft rear bearing
- 13 Input shaft bearing adjusting shim
- 3rd baulk ring
- 15) Insert spring
- 16 4th input gear thrust washer
- (17) Thrust washer ring
- 18 5th input gear
- 19 5th baulk ring

- 1st outer baulk ring
- 21 2nd inner baulk ring
- 22 Snap ring
- 23 Mainshaft bearing spacer
- (24) Mainshaft front bearing
- (25) Mainshaft
- (26) 1st main gear
- 27 1st & 2nd synchronizer hub
- 28 Reverse main gear (Coupling sleeve)
- 29 2nd outer baulk ring
- 30 2nd gear synchronizer cone
- 31 2nd main gear
- 32) 3rd main gear
- 33 4th main gear
- (34) 5th main gear
- 35 Mainshaft rear bearing
- (36) Mainshaft bearing adjusting shim

- 37 Differential side bearing
- 38 Speedometer drive gear
- 39 Differential case
- (40) Viscous coupling
- (1) Final gear
- 42 Reverse idler gear
- (43) Pinion mate gear thrust washer
- (4) Pinion mate gear
- 45 Pinion mate shaft
- (46) Side gear
- 47 Side gear thrust washer
- Differential side bearing
- Ø Differential side bearing adjusting shim
- 60 Bushing
- (51) Reverse idler shaft
- 62 Retaining pin
- (3) 1st gear synchronizer cone
- (54) 1st inner baulk ring

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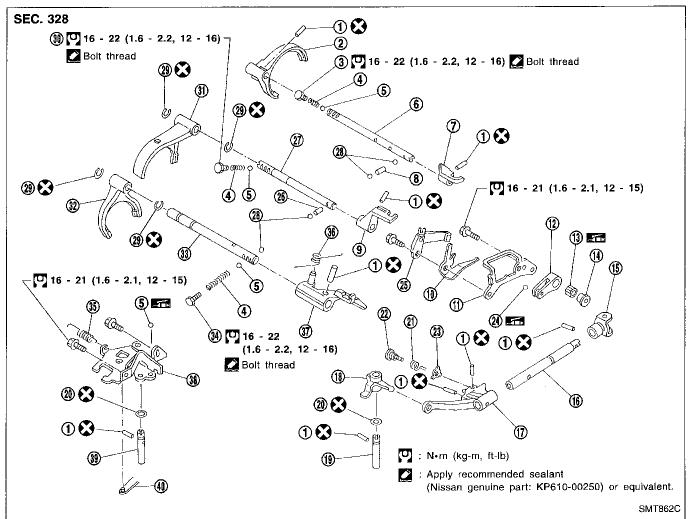
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#### **Shift Control Components**

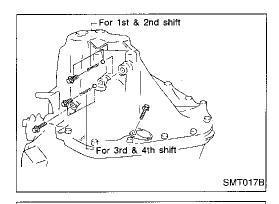


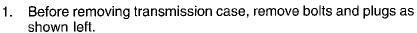
- 1 Retaining pin
- 2 1st & 2nd shift fork
- 3 1st & 2nd check plug
- (4) Return spring
- 5 Check ball
- 6 1st & 2nd fork rod
- (7) 1st & 2nd bracket
- (8) Interlock plunger
- 3rd & 4th bracket
- (9) 310 & 4111 blacke
- 10 Return spring
- (1) Reverse gate
- 12) Select arm
- (13) Return bearing
- (14) Bush

- (15) Yoke
- Striking rod
- (17) Striking lever
- (18) Selector
- (19) Selector shaft
- 20 O-ring
- (21) Return spring
- 22 Cam pin
- (23) Reverse check cam
- (24) Check ball
- 25) Select check spring
- (26) Interlock plunger
- (27) 3rd & 4th fork rod

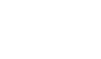
- nterlock ball
- 29 Stopper ring
- 30 3rd & 4th check plug
- (3) 3rd & 4th shift fork
- 32) 5th shift fork
- 33) 5th fork rod
- 34 5th & reverse check plug
- 35 Reverse lever spring
- (36) Reverse lock spring
- 37 5th & reverse bracket
- (38) Reverse lever assembly
- (39) Reverse arm shaft
- 40 Control lever spring

#### **DISASSEMBLY**





2. Remove transmission case.



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3. Remove position switch.

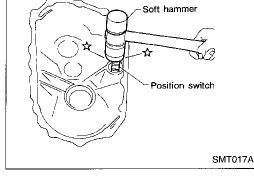


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 Mesh 4th gear, and then remove reverse idler shaft and reverse idler gear.

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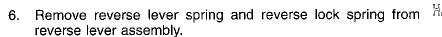
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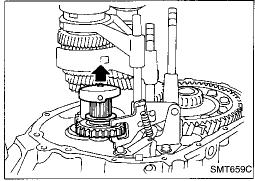
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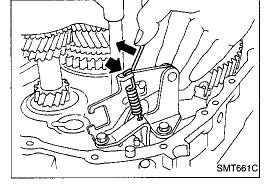
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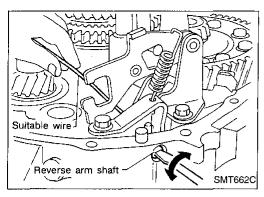
5. Pull out retaining pin.



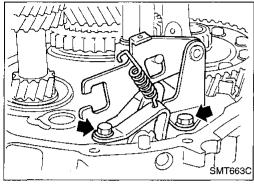
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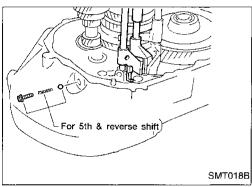
#### **DISASSEMBLY**



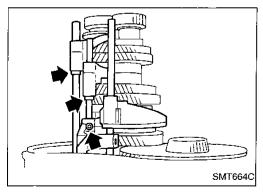
7. Remove reverse arm shaft while rotating it.



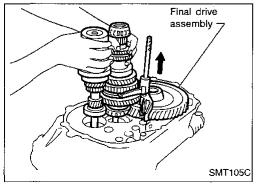
8. Remove reverse lever assembly.



9. Remove 5th & reverse check plug, spring and ball.

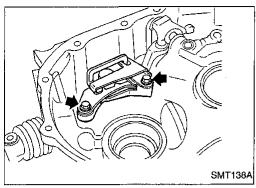


- 10. Remove stopper rings and retaining pins from 5th and 3rd & 4th fork rods.
- 11. Remove 5th and 3rd & 4th fork rods. Then remove forks and brackets.

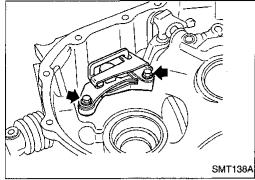


- Remove both input and mainshafts with 1st & 2nd fork and fork rod as a set.
- 13. Remove final drive assembly.
- Always withdraw mainshaft straight out. Failure to do so can damage resin oil channel on clutch housing side.

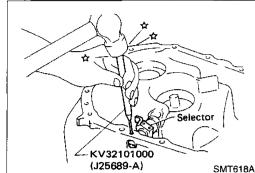
#### **DISASSEMBLY**

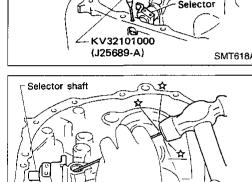


- 14. Remove reverse gate assembly.
- Be careful not to lose check ball.

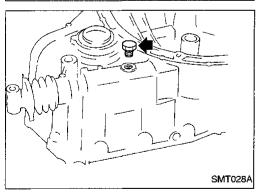


15. Remove retaining pin and detach the selector.



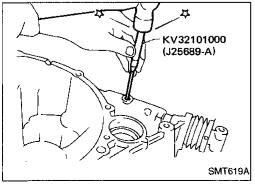


16. Remove drain plug for convenience in removing retaining pin which holds striking lever to striking rod.



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HA 17. Remove retaining pin and then withdraw striking lever and striking rod.



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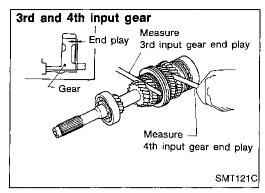
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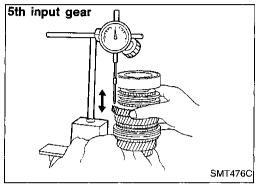


## **Input Shaft and Gears**

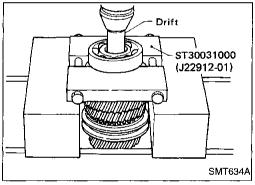
#### **DISASSEMBLY**

1. Before disassembly, check 3rd, 4th and 5th input gear end plays.

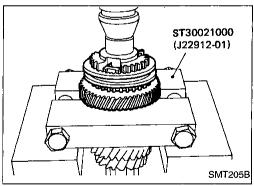
Gear end play: Refer to SDS, AT-40.



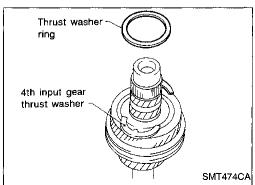
If not within specification, disassemble and check contact surface of gear, shaft and hub. Check clearance of snap ring groove. Refer to "ASSEMBLY", MT-18.



2. Remove input shaft rear bearing.

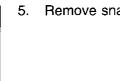


3. Remove 5th & reverse synchronizer and 5th input gear.



4. Remove thrust washer ring, 4th input gear thrust washers and 4th input gear.

## Input Shaft and Gears (Cont'd)



5. Remove snap ring.



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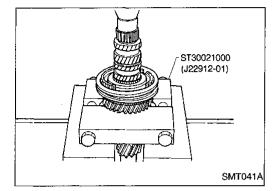
Remove 3rd & 4th synchronizer and 3rd input gear.



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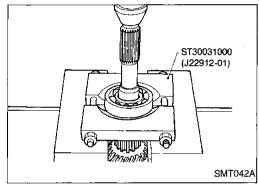




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7. Remove input shaft front bearing.



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Check shaft for cracks, wear or bending.

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Check gears for excessive wear, chips or cracks.

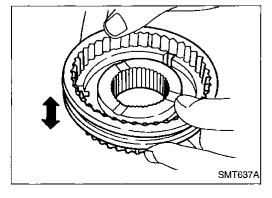
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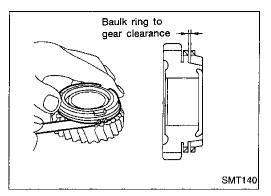
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- Check spline portion of coupling sleeves, hubs and gears for wear or cracks.
- Check baulk rings for cracks or deformation.
- Check insert springs for wear or deformation.



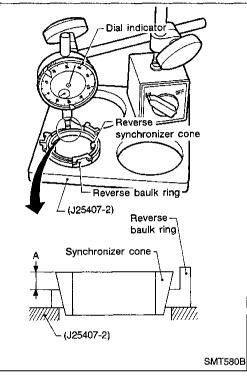


#### Input Shaft and Gears (Cont'd)

Measure clearance between baulk ring and gear (4th and 5th). Clearance between baulk ring and gear:

> **Standard** 1.0 - 1.35 mm (0.0394 - 0.0531 in)

Wear limit 0.7 mm (0.028 in)

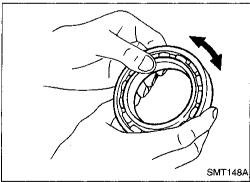


- Measure wear of reverse baulk ring.
- Place reverse baulk ring on Tool and then place reverse synchronizer cone on reverse baulk ring.
- Make sure projection of synchronizer cone is positioned over the recess on Tool.
- While holding reverse synchronizer cone against reverse baulk ring as firmly as possible, measure dimension "A" with dial indicator.

#### Wear limit:

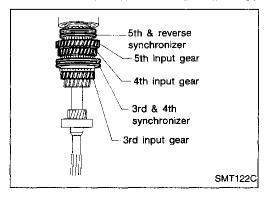
Dimension "A" 1.2 mm (0.047 in)

If dimension "A" is smaller than the wear limit, replace baulk



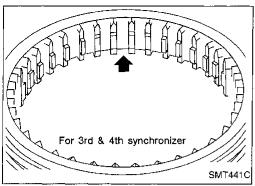
#### Bearing

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

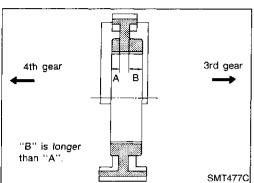


#### **ASSEMBLY**

## Input Shaft and Gears (Cont'd)



1. Place inserts in three grooves on coupling sleeve (3rd & 4th synchronizer).



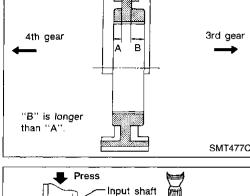
Install 3rd input gear and 3rd baulk ring.

Press on 3rd & 4th synchronizer hub. Pay attention to its direction.

Select proper snap ring of 3rd & 4th synchronizer hub to minimize clearance of groove, and then install it.

Allowable clearance of groove: 0 - 0.1 mm (0 - 0.004 in) Snap ring of 3rd & 4th synchronizer hub:

Refer to SDS, MT-41.



3rd & 4th synchronizer

hub

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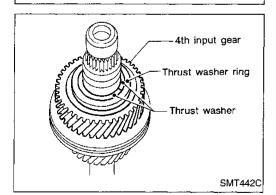
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Install 4th input gear. Select proper thrust washers to minimize clearance of groove.

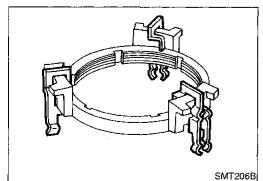
Then install them and thrust washer ring.

Allowable clearance of groove: 0 - 0.06 mm (0 - 0.0024 in) 4th input gear thrust washer: Refer to SDS, MT-41.

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Install 5th & reverse synchronizer assembly.

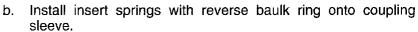
Hook insert springs on reverse baulk ring.

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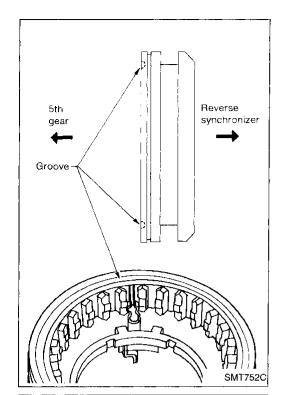
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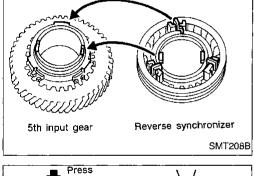
## Input Shaft and Gears (Cont'd)



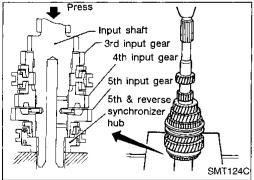
- Pay attention to position of insert springs.
- Place 5th baulk ring on 5th input gear.
- d. Install reverse synchronizer cone on reverse baulk ring.



- e. Place reverse synchronizer assembly on 5th input gear.
- Mesh recesses of 5th input gear with projections of reverse synchronizer cone.
- Put insert spring mounts on reverse baulk ring upon those on 5th baulk ring.



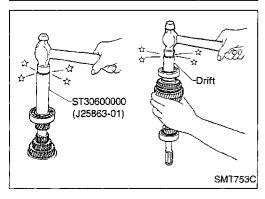
f. Press on 5th & reverse synchronizer assembly with 5th input gear.

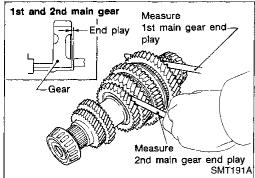


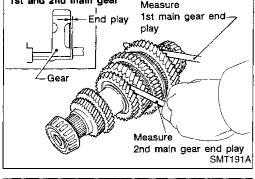
. Install input shaft front and rear bearings.

MT-20

9. Measure gear end play as a final check. Refer to "DISASSEMBLY", MT-16.







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#### **Mainshaft and Gears**

#### DISASSEMBLY

1. Before disassembly, check 1st and 2nd main gear end plays. Gear end play:

Refer to SDS, AT-40.

If not within specification, disassemble and check contact surface of gear, shaft and hub. Check clearance of snap ring groove. Refer to "ASSEMBLY", MT-23.

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2. Press out mainshaft rear bearing.

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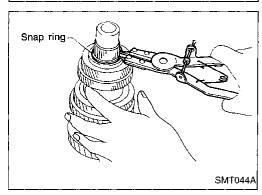
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3. Remove thrust washer and snap ring.

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Press out 5th main gear and 4th main gear. BR

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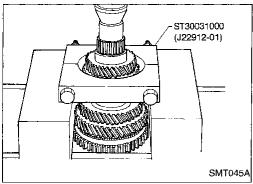
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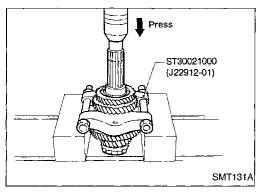
HA

5. Press out 3rd main gear and 2nd main gear.

EL

DX

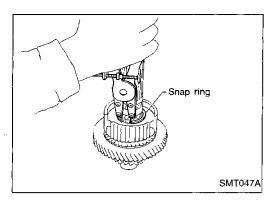




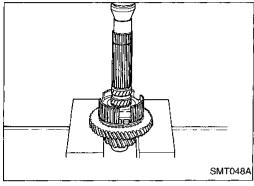
587 MT-21

#### Mainshaft and Gears (Cont'd)

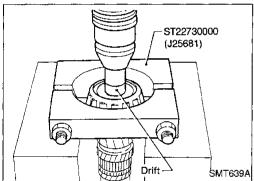
6. Remove snap ring.



7. Remove 1st & 2nd synchronizer hub and 1st main gear.



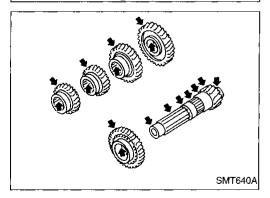
8. Remove mainshaft front bearing.



#### INSPECTION

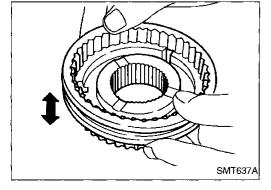
#### Gear and shaft

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

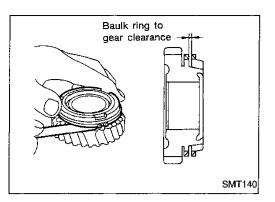


#### Synchronizer

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



MT-22 588



#### Mainshaft and Gears (Cont'd)

Measure clearance between baulk ring and gear (1st). Clearance between baulk ring and gear: Standard 1.0 - 1.35 mm (0.0394 - 0.0531 in)

Wear limit 0.7 mm (0.028 in)

GI

MA

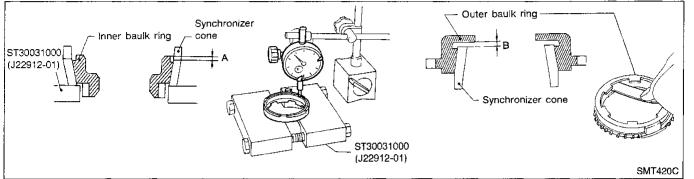
LC

EC

FE

CL

MΤ



Measure wear of 2nd baulk rings.

Place baulk rings in position on synchronizer cone. a.

While holding baulk ring against synchronizer cone as far as it will go, measure dimensions "A" and "B".

AT

Standard: A 0.6 - 0.8 mm (0.024 - 0.031 in)

B 0.6 - 1.1 mm (0.024 - 0.043 in)

Wear limit:

0.2 mm (0.008 in)

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

RA

FA





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

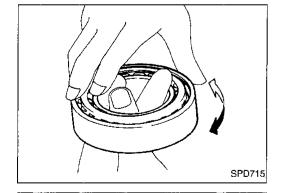
When replacing tapered roller bearing, replace outer and inner race as a set.

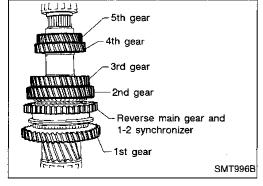
RS

BT

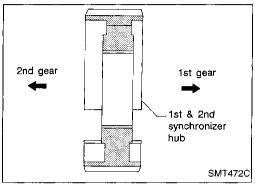








# 1st main gear 1st & 2nd 1st baulk ring synchronizer hub SMT804B



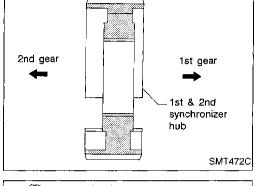


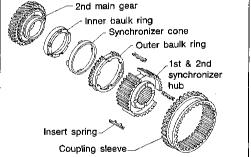
- 1. Press on 1st main gear, 1st baulk ring and 1st & 2nd synchronizer hub.
- Pay attention to direction of 1st & 2nd synchronizer hub.
- Select proper snap ring of 1st & 2nd synchronizer hub to minimize clearance of groove and then install it.

Allowable clearance of groove: 0 - 0.1 mm (0 - 0.004 in)

Snap ring of 1st & 2nd synchronizer hub:

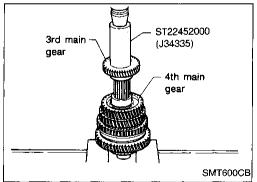
Refer to SDS, MT-41.



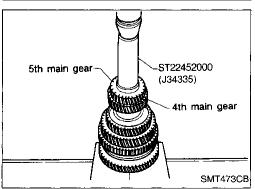


**SMT805B** 

- Install 2nd synchronizer cone, inner & outer baulk rings. Insert springs and 1st & 2nd coupling sleeve.
- Install 2nd main gear.
- Ensure four protrusions of 2nd synchronizer cone are set in holes of 2nd main gear.



- Press on 3rd main gear.
- Press on 4th main gear.



- 7. Press on 5th main gear.
- Select proper snap ring of 5th main gear to minimize clearance of groove and then install it.

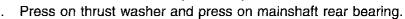
Allowable clearance of groove:

0 - 0.15 mm (0 - 0.0059 in)

Snap ring of 5th main gear:

Refer to SDS, MT-41.

## Mainshaft and Gears (Cont'd)



10. Press on mainshaft front bearing.

11. Measure gear end play as a final check. Refer to "DISASSEMBLY", MT-21.

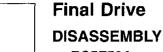


MA

LC

EC

FE



SMT059A

ST33061000

SMT744AB

SMT891-A

SMT696B

(J8107-2)

Drift

∜₹

KV32101000 (J25689-A)

ST33051001-

(J22888-D)

— RS5F50A —

Remove final gear.

Remove speedometer drive gear by cutting it.

Press out differential side bearings. 3.

Be careful not to mix up the right and left bearings.



Drive out retaining pin and draw out pinion mate shaft.



Remove pinion mate gears and side gears.



FA

RA

BR



Remove final gear.

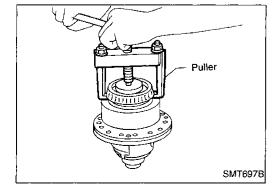


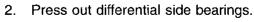
RS

BT

HA

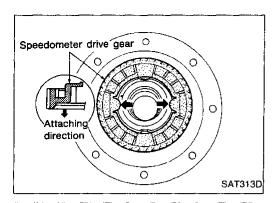
DX



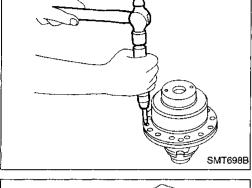


## Final Drive (Cont'd)

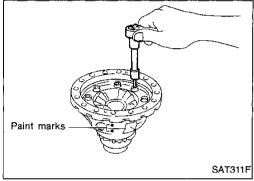
3. Remove speedometer drive gear.



4. Remove viscous coupling.



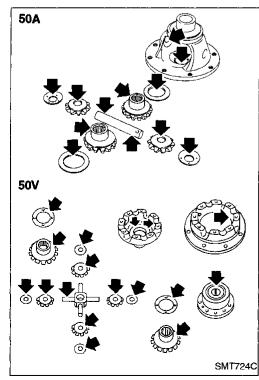
- Separate differential cases. Make paint marks to identify their original positions.
- 6. Remove pinion mate shaft with gears.

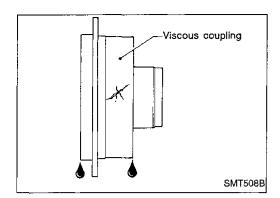


#### INSPECTION

#### Gear, washer, shaft and case

- Check mating surfaces of differential case, viscous coupling, side gears and pinion mate gears.
- · Check washers for wear.





#### Final Drive (Cont'd)

#### Viscous coupling

- Check case for cracks.
- Check silicone oil for leakage.



MA

EM

#### **Bearings**

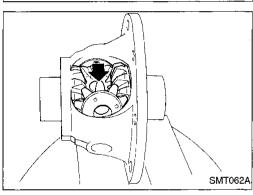
- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.
- When replacing taper roller bearing, replace outer and inner race as a set.



LC

FE

CL



**ASSEMBLY** 

SPD715

 Attach side gear thrust washers to side gears, then install pinion mate washers and pinion mate gears in place.

AŢ

MΤ

EA

D) /A

 $\mathbb{R}\mathbb{A}$ 

BR

- Insert pinion mate shaft.
- When inserting, be careful not to damage pinion mate thrust washers.

ST

RS

BT

--- RS5F50A ---

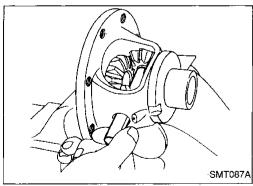


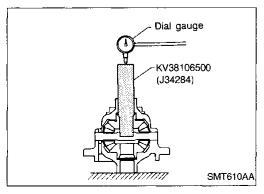
IDX

- 3. Measure clearance between side gear and differential case with washers following the procedure below:
- a. Set Tool and dial indicator on side gear.
- Move side gear up and down to measure dial indicator deflection. Always measure indicator deflection on both side gears.

Clearance between side gear and differential case with washers:

0.1 - 0.2 mm (0.004 - 0.008 in)



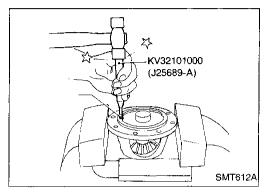


SMT611A

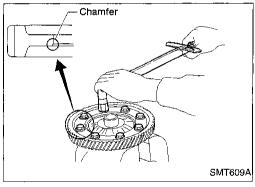
#### Final Drive (Cont'd)

 If not within specification, adjust clearance by changing thickness of side gear thrust washers.

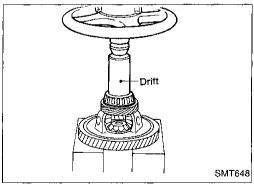
Side gear thrust washer: Refer to SDS, AT-41.



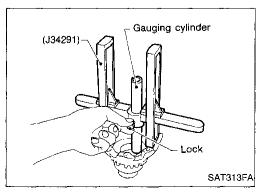
- 4. Install retaining pin.
- Make sure that retaining pin is flush with case.



- 5. Install final gear.
- 6. Install speedometer drive gear.



7. Press on differential side bearings.



#### -- RS5F50V --

3. Measure clearance between side gear and differential case & viscous coupling with washers using the following procedure:

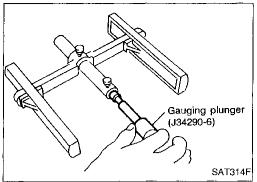
#### Differential case side

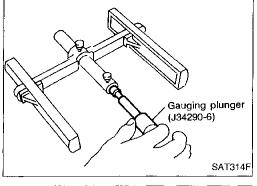
a. Set tool on the differential case and lock gauging cylinder in place with set screw.

MT-28 594

#### Final Drive (Cont'd)

Install gauging plunger into cylinder.





(J34291)

hrust washer

SAT315FA

Install pinion mate gears and side gear with thrust washer on differential case.

LC

Set tool and allow gauging plunger to rest on side gear thrust d. washer.

EC

GF.

MA

EM

Measure gap between plunger and cylinder. This measurement should give exact clearance between side gear and differential case with washers.

Æ

Standard clearance: 0.1 - 0.2 mm (0.004 - 0.008 in) f. If not within specification adjust clearance by changing thickness of side gear thrust washer. Side gear thrust washers for differential case side: Refer to SDS, MT-42.

CL

#### Viscous coupling side

МΤ

Place side gear and thrust washer on pinion mate gears installed on differential case.

AT

Measure dimension X.

Set tool on viscous coupling and lock gauging cylinder in place with set screw.

FA

Measure dimension X in at least four places.

RA

install gauging plunger into cylinder.

ST

RS

BT

Install pinion mate gears and side gears with original washers on differential cases.

HA



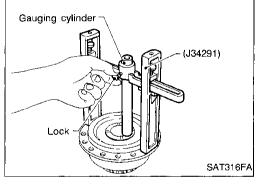
Tighten differential case bolts.

Set tool and allow plunger to rest on side gear thrust washer.

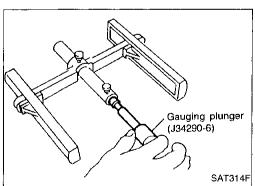
Measure gap between plunger and cylinder. This measurement should give exact clearance between side gear and differential case with washers.

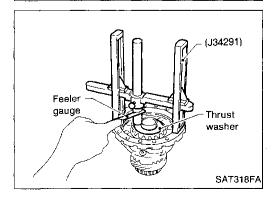
Standard clearance:

0.1 - 0.2 mm (0.004 - 0.008 in)



Feeler

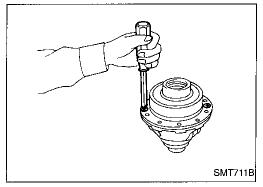




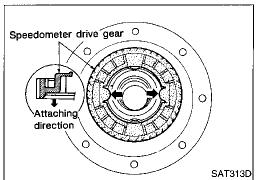
#### Final Drive (Cont'd)

g. If not within specification, adjust clearance by changing thickness of side gear thrust washer.

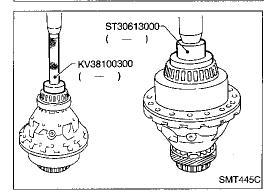
Side gear thrust washers for viscous coupling side: Refer to SDS, MT-42.



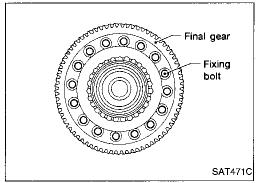
4. Install viscous coupling.



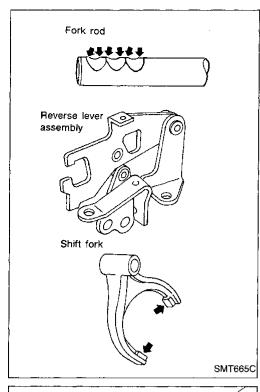
- 5. Install speedometer drive gear on differential case.
- Align the projection of speedometer drive gear with the groove of differential case.



6. Press differential side bearings on differential case.



7. Install final gear and tighten fixing bolts in a crisscross pattern.



## **Shift Control Components**

#### INSPECTION

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



MA

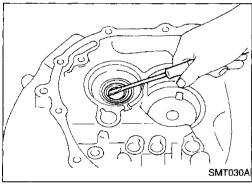
EM

[\_C

EC

FE

CL



**Case Components REMOVAL AND INSTALLATION** 

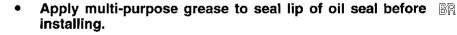
Input shaft oil seal



AT.

EA

RA



ST

RS

BT

Mainshaft front bearing outer race

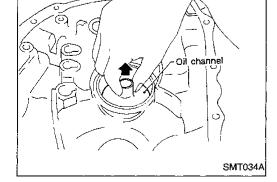
IDX

Differential side bearing outer race Refer to "ADJUSTMENT", MT-32.

Mainshaft rear bearing outer race

Refer to "ADJUSTMENT", MT-33.

HA



SMT031A

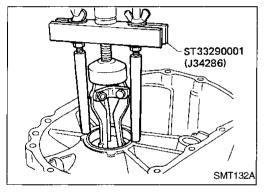
# Input Shaft End Play and Differential Side Bearing Preload

If any of the following parts are replaced, adjust input shaft end play.

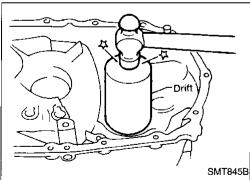
- Input shaft
- · Input shaft bearing
- Clutch housing
- Transmission case

If any of the following parts are replaced, adjust differential side bearing preload.

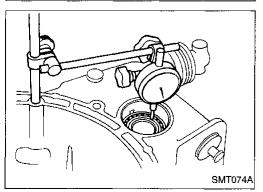
- Differential case
- Differential side bearing
- Clutch housing
- Transmission case



 Remove differential side bearing outer race (transmission case side) and shim(s).

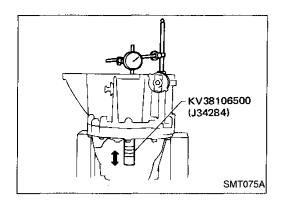


- 2. Reinstall differential side bearing outer race without shim(s).
- 3. Install input shaft and final drive assembly on clutch housing.
- Install transmission case without input shaft bearing shim(s). Then tighten it to the specified torque. Refer to MT-10.



- 5. Using the following procedures, measure clearance between bearings and transmission case.
- Differential side
- Attach dial indicator. If clamp diameter of dial indicator is too small or too large, attach dial indicator using a magnetic stand.

#### **ADJUSTMENT**

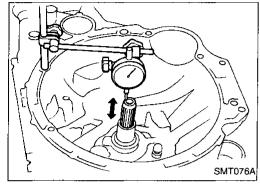


#### Input Shaft End Play and Differential Side Bearing Preload (Cont'd)

b. Insert Tool all the way into differential side gear. Move Tool up and down and measure dial indicator deflection.



MA



Input shaft side

Set dial indicator on end of input shaft.

LC

Move input shaft up and down and measure dial indicator deflection.

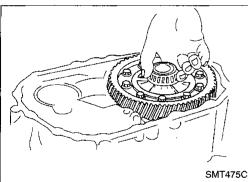
EC

Select shims with proper thickness with SDS table as a guide. Refer to MT-44.

Æ

Install selected differential side bearing adjusting shim and differential side bearing outer race.

CL



KV38105210

Check differential side bearing turning torque.

Install final drive assembly on clutch housing.

Install transmission case on clutch housing.

AT

MΤ

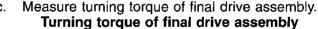
Tighten transmission case fixing bolts to the specified

torque.

FA

RA

BR



(New bearing):

4.9 - 7.8 N·m (50 - 80 kg-cm, 43 - 69 in-lb)

ST

When old bearing is used again, turning torque will be slightly less than the above.

RS

Make sure torque is close to the specified range.

BT

## Mainshaft Bearing Preload

If any of the following parts are replaced, adjust mainshaft bearing preload.

EL

IDX

Mainshaft

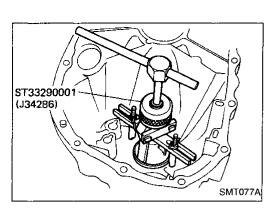
SAT478E

- Mainshaft bearings
- Clutch housing
- Transmission case

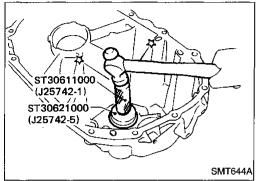
HA

#### **ADJUSTMENT**

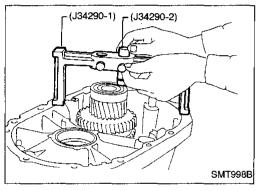
## Mainshaft Bearing Preload (Cont'd)



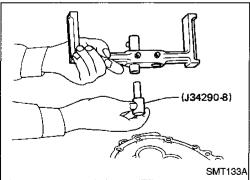
1. Remove mainshaft rear bearing outer race and shim(s).



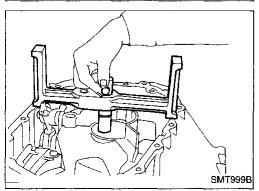
- 2. Reinstall mainshaft rear bearing outer race without shims.
- Clean mating surfaces of clutch housing and transmission case with solvent.
- 4. Install mainshaft and mainshaft front bearing outer race into transmission case. Turn mainshaft while holding bearing outer race so that bearings are properly seated.



Place Tools (bridge and gauging cylinder) onto machined surface of transmission case. Allow gauging cylinder to rest on surface of mainshaft front bearing outer race. Use proper screw in bridge to lock gauging cylinder in place.

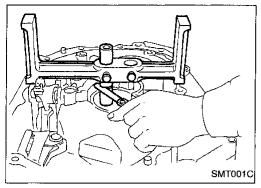


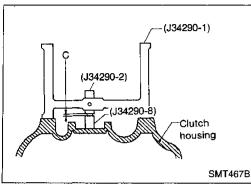
Turn bridge over and place Tool (gauging plunger) into gauging cylinder.



 Place bridge, legs up, onto machined surface of clutch housing. Allow gauging plunger to rest upon mating surface where mainshaft front bearing outer race fits.

#### **ADJUSTMENT**





#### Mainshaft Bearing Preload (Cont'd)

- 8. Measure with feeler gauge distance between gauging cylinder and shoulder of gauging plunger.
- Use feeler gauge reading to select correct mainshaft preload shim(s).

# Mainshaft bearing adjusting shim: Refer to SDS, MT-42.

- 10. Install selected mainshaft bearing adjusting shim and mainshaft bearing outer race.
- 11. Check total turning torque after assembly. Refer to "ASSEMBLY", MT-39.

GI

MA

LĈ

EC

FE

GL.

MT

AT

FA

RA

BR

ST

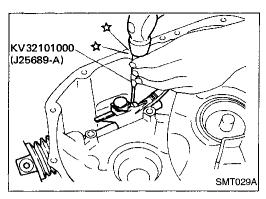
RS

BT

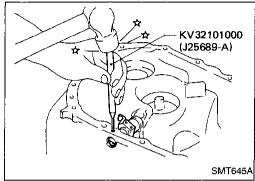
HA

EL

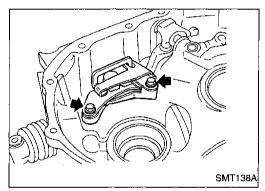
IDX



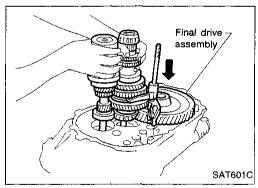
1. Install striking lever and striking rod.



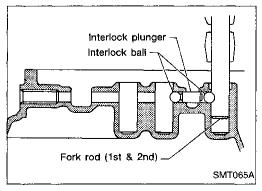
2. Install selector and retaining pin.



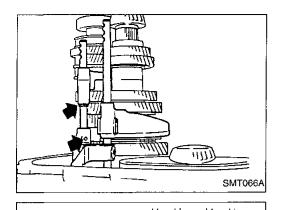
- 3. Install reverse gate assembly.
- Be careful not to lose check ball.



- 4. Install final drive assembly.
- 5. Install input shaft and mainshaft with 1st & 2nd shift fork assembly.
- Be careful not to damage input shaft oil seal.



6. Install interlock balls and plunger.



Fork rod (3rd & 4th)

Interlock plunger

Interlock ball

Install 3rd & 4th shift fork and bracket, then install 3rd & 4th fork rod, stopper ring and retaining pin.



MA

EM

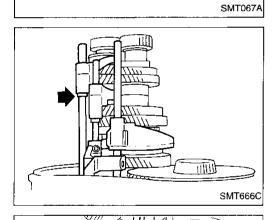
Install interlock balls.



EC

FE

CL



Install 5th shift fork, then install fork rod, stopper ring and retaining pin.



AT

MT

FA

RA

10. Install 5th & reverse check plug, spring and ball.

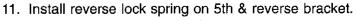


BR

ST

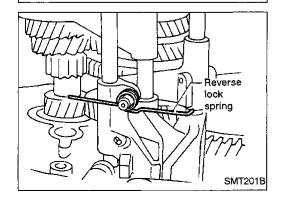
RS

BT



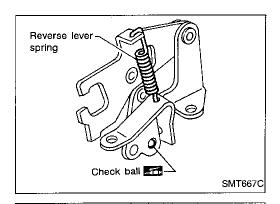
HA

Pay attention to its direction.

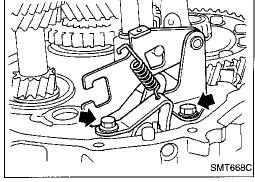


SMT018B

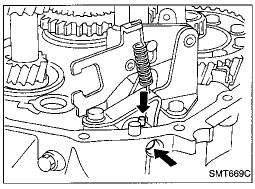
For 5th & reverse shift



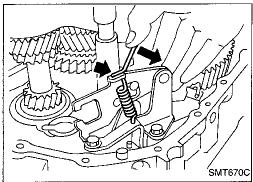
- 12. Install check ball and reverse lever spring on reverse lever assembly.
- Apply multi-purpose grease to check ball.
- Pay attention to direction of reverse lever spring.



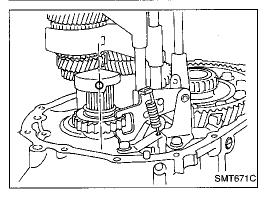
13. Install reverse lever assembly on clutch housing.



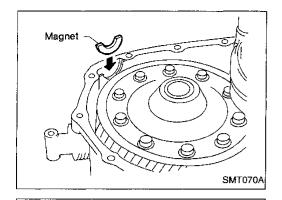
14. Install reverse arm shaft and retaining pin.



15. Hook reverse lock spring and reverse lever spring on reverse lever assembly.



- 16. Mesh 4th gear, then install reverse idler gear and shaft.
- Pay attention to direction of tapped hole.

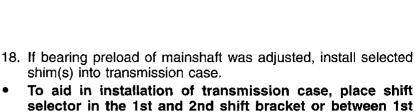


-1st & 2nd shift bracket

Shift selector

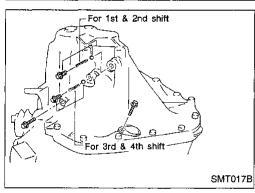
3rd & 4th shift bracket

17. Place magnet on clutch housing.



and 2nd bracket and 3rd and 4th bracket.19. Apply sealant to mating surface of transmission case and install it.

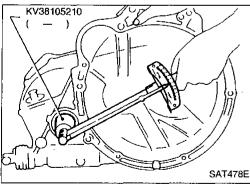
20. Install position switch.



SMT446C

21. Apply sealant to threads of check plugs. Install balls, springs and plugs.

22. After assembly, check that you can shift into each gear smoothly.



Measure total turning torque.

Total turning torque (New bearing):

8.8 - 21.6 N·m (90 - 220 kg-cm, 78 - 191 in-lb)

When old bearing is used again, preload will be slightly less than the above. Make sure torque is close to the specified range.

main at Assault

ST

GI

MA

LC

EC

FE

CL

ΜT

AT

FA

RA

BR

RS

BT HA

EL

605

MT-39

#### **General Specifications**

#### **TRANSAXLE**

| Engine                                |  | VQ30DE   |      |         |            |
|---------------------------------------|--|--|------|---------|------------|
| Transaxle model                       |  | RS5F50A RS5F50V  |      | RS5F50V |            |
| Number o                              | f speeds                                       | 5  |      |         |            |
| Synchrom                              | esh type                                       |  | Wa   | rner    |            |
| Shift pattern                         |  | 1 3 5<br>N 2 4 R   |      |         |            |
|                                       |  | Gear ratio   |      | Number  | of teeth   |
|                                       |  | Gearland   | Inpu | l gear  | Main gear  |
|                                       | 1st  | 3.285  | 1    | 4       | 46         |
|                                       | 2nd  | 1.850  | 2    | 20      | 37         |
|                                       | 3rd  | 1.272  | 3    | 33      | 42         |
|                                       | 4th  | 0.954  | _    | 14      | <b>4</b> 2 |
| 5th                                   |  | 0.795  | 4    | 9       | 39         |
| Rev.                                  |  | 3.428  | 1    | 4       | 48         |
| Reverse idler gear                    |  | 29   |      |         |            |
| Oil capacity<br>liter (US pt, Imp pt) |  | 4.5 - 4.8 (9-1/2 -<br>10-1/8, 7-7/8 -<br>8-1/2)  4.3 - 4.5 (9-1/8 -<br>9-1/2, 7-5/8 - 7-7/ |      | •       |            |
| Remarks                               | Double<br>baulk ring<br>type syn-<br>chronizer | 1st & 2nd synchronizer   |      | izer    |            |

#### **FINAL GEAR**

| Engine            | VQ30DE          |       |
|-------------------|-----------------|-------|
| Transaxle model   | RS5F50A RS5F50V |       |
| Final gear ratio  | 3.823           |       |
| Number of teeth   |                 |       |
| Final gear/Pinion | 65/17           |       |
| Side gear/Pinion  | 14/10           | 16/10 |

## Inspection and Adjustment

#### **GEAR END PLAY**

|                | Unit: mm (in)                 |
|----------------|-------------------------------|
| Gear           | End play                      |
| 1st main gear  | 0.23 - 0.43 (0.0091 - 0.0169) |
| 2nd main gear  | 0.23 - 0.58 (0.0091 - 0.0228) |
| 3rd input gear | 0.23 - 0.43 (0.0091 - 0.0169) |
| 4th input gear | 0.25 - 0.55 (0.0098 - 0.0217) |
| 5th input gear | 0.23 - 0.48 (0.0091 - 0.0189) |

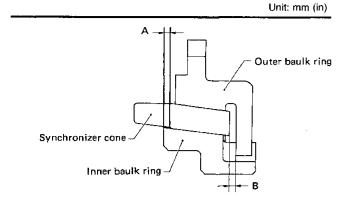
# CLEARANCE BETWEEN BAULK RING AND GEAR

#### 3rd, 4th & 5th

|           |                                 | Unit: mm (in) |
|-----------|---------------------------------|---------------|
|           | Standard                        | Wear limit    |
| 3rd & 4th | 1.0 - 1.35<br>(0.0394 - 0.0531) | 0.7 (0.028)   |
| 5th       | 1.0 - 1.35<br>(0.0394 - 0.0531) | 0.7 (0.028)   |

#### Inspection and Adjustment (Cont'd)

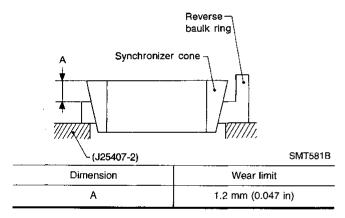
#### 1st and 2nd double baulk ring



| SM | T80 | 68 |
|----|-----|----|
|----|-----|----|

| Dimension | Standard                     | Wear limit  |  |
|-----------|------------------------------|-------------|--|
| Α         | 0.6 - 0.8<br>(0.024 - 0.031) | 0.0 (0.000) |  |
| В         | 0.6 - 1.1<br>(0.024 - 0.043) | 0.2 (0.008) |  |

#### Reverse baulk ring



#### **AVAILABLE SNAP RING**

#### 1st & 2nd synchronizer hub (At mainshaft)

| Allowable clearance | 0 - 0.1 mm (0 - 0.004 in) |  |
|---------------------|---------------------------|--|
| Thickness mm (in)   | Part number               |  |
| 1.95 (0.0768)       | 32269-03E03               |  |
| 2.00 (0.0787)       | 32269-03E00               |  |
| 2.05 (0.0807)       | 32269-03E01               |  |
| 2.10 (0.0827)       | 32269-03E02               |  |

## 3rd & 4th synchronizer hub (At input shaft)

| in) | 0 - 0.1 mm (0 - 0.004 in) | Allowable clearance |
|-----|---------------------------|---------------------|
|     | Part number               | Thickness mm (in)   |
|     | 32269-03E03               | 1.95 (0.0768)       |
|     | 32269-03E00               | 2.00 (0.0787)       |
|     | 32269-03E01               | 2.05 (0.0807)       |
|     | 32269-03E02               | 2.10 (0.0827)       |
|     |                           |                     |

#### 5th main gear (At mainshaft)

| th main gear (At mainshaft) |                             | _ EM      |
|-----------------------------|-----------------------------|-----------|
| Allowable clearance         | 0 - 0.15 mm (0 - 0.0059 in) | _         |
| Thickness mm (in)           | Part number                 | -<br>L LG |
| 1.95 (0.0768)               | 32348-05E00                 | - 50      |
| 2.05 (0.0807)               | 32348-05E01                 | E 6       |
| 2.15 (0.0846)               | 32348-05E02                 | ĒĞ        |
| 2.25 (0.0886)               | 32348-05E03                 |           |
|                             |                             | - 66      |

## **AVAILABLE THRUST WASHER**

#### 4th input gear (At input shaft)

| Allowable clearance | 0 - 0.06 mm (0 - 0.0024 in) |  |
|---------------------|-----------------------------|--|
| Thickness mm (in)   | Part number                 |  |
| 4.500 (0.1772)      | 32278-03E01                 |  |
| 4.525 (0.1781)      | 32278-03E02                 |  |
| 4.550 (0.1791)      | 32278-03E03                 |  |
| 4.575 (0.1801)      | 32278-03E04                 |  |

#### Differential side gear thrust washer --RS5F50A

| Allowable clearance between side gear and differential case with washer | 0.1 - 0.2 mm (0.004 - 0.008 in |  |
|---|--------------------------------|--|
| Thickness mm (in)   | Part number                    |  |
| 0.75 - 0.80 (0.0295 - 0.0315)   | 38424-E3020                    |  |
| 0.80 - 0.85 (0.0315 - 0.0335)   | 38424-E3021                    |  |
| 0.85 - 0.90 (0.0335 - 0.0354)   | 38424-E3022                    |  |
| 0.90 - 0.95 (0.0354 - 0.0374)   | 38424-E3023                    |  |

FE

CL

ΜT



















IDX

## Inspection and Adjustment (Cont'd)

## Differential side gear thrust washer — RS5F50V

#### Allowable clearance between side gear and (differential case or viscous coupling) with washer

0.1 - 0.2 mm (0.004 - 0.008 in)

|                       | Thickness mm (in)             | Part number |
|-----------------------|-------------------------------|-------------|
|                       | 0.75 - 0.80 (0.0295 - 0.0315) | 38424-E3000 |
| Differential          | 0.80 - 0.85 (0.0315 - 0.0335) | 38424-E3001 |
| case side             | 0.85 - 0.90 (0.0335 - 0.0354) | 38424-E3002 |
|                       | 0.90 - 0.95 (0.0354 - 0.0374) | 38424-E3003 |
|                       | 0.43 - 0.45 (0.0169 - 0.0177) | 38424-51E10 |
|                       | 0.52 - 0.54 (0.0205 - 0.0213) | 38424-51E11 |
| Viscous coupling side | 0.61 - 0.63 (0.0240 - 0.0248) | 38424-51E12 |
| 3                     | 0.70 - 0.72 (0.0276 - 0.0283) | 38424-51E13 |
|                       | 0.79 - 0.81 (0.0311 - 0.0319) | 38424-51E14 |

#### **AVAILABLE SHIM**

#### — INPUT SHAFT END PLAY AND MAINSHAFT AND DIFFERENTIAL SIDE BEARING PRELOAD AND ADJUSTING SHIM

#### Bearing preload and end play

Unit: mm (in)

| Mainshaft bearing preload         | 0.06 - 0.11 (0.0024 - 0.0043) |
|-----------------------------------|-------------------------------|
| Input shaft end play              | 0 - 0.05 (0 - 0.0020)         |
| Differential side bearing preload | 0.40 - 0.45 (0.0157 - 0.0177) |

#### Turning torque (New bearing)

Unit: N·m (kg-cm, in-lb)

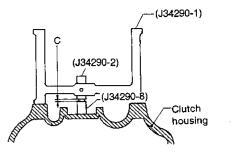
| Final drive only | 4.9 - 7.8 (50 - 80, 43 - 69)    |
|------------------|---------------------------------|
| Total            | 8.8 - 21.6 (90 - 220, 78 - 191) |

#### Mainshaft bearing adjusting shim

| Thickness mm (in) | Part number |
|-------------------|-------------|
| 0.40 (0.0157)     | 32139-03E11 |
| 0.44 (0.0173)     | 32139-03E00 |
| 0.48 (0.0189)     | 32139-03E01 |
| 0.52 (0.0205)     | 32139-03E12 |
| 0.56 (0.0220)     | 32139-03E02 |
| 0.60 (0.0236)     | 32139-03E03 |
| 0.64 (0.0252)     | 32139-03E04 |
| 0.68 (0.0268)     | 32139-03E05 |
| 0.72 (0.0283)     | 32139-03E06 |
| 0.76 (0.0299)     | 32139-03E07 |
| 0.80 (0.0315)     | 32139-03E08 |
| 1.20 (0.0472)     | 32139-03E13 |

# Table for selecting mainshaft bearing adjusting shim

Unit: mm (in)



| CM | IT/ | 67 | R |
|----|-----|----|---|

|                               | SMT467B                       |
|-------------------------------|-------------------------------|
| Dimension "C"                 | Suitable shim(s)              |
| 0.30 - 0.34 (0.0118 - 0.0134) | 0.40 (0.0157)                 |
| 0.34 - 0.38 (0.0134 - 0.0150) | 0.44 (0.0173)                 |
| 0.38 - 0.42 (0.0150 - 0.0165) | 0.48 (0.0189)                 |
| 0.42 - 0.46 (0.0165 - 0.0181) | 0.52 (0.0205)                 |
| 0.46 - 0.50 (0.0181 - 0.0197) | 0.56 (0.0220)                 |
| 0.50 - 0.54 (0.0197 - 0.0213) | 0.60 (0.0236)                 |
| 0.54 - 0.58 (0.0213 - 0.0228) | 0.64 (0.0252)                 |
| 0.58 - 0.62 (0.0228 - 0.0244) | 0.68 (0.0268)                 |
| 0.62 - 0.66 (0.0244 - 0.0260) | 0.72 (0.0283)                 |
| 0.66 - 0.70 (0.0260 - 0.0276) | 0,76 (0.0299)                 |
| 0.70 - 0.74 (0.0276 - 0.0291) | 0.80 (0.0315)                 |
| 0.74 - 0.78 (0.0291 - 0.0307) | 0.40 + 0.44 (0.0157 + 0.0173) |
| 0.78 - 0.82 (0.0307 - 0.0323) | 0.44 + 0.44 (0.0173 + 0.0173) |
| 0.82 - 0.86 (0.0323 - 0.0339) | 0.44 + 0.48 (0.0173 + 0.0189) |
| 0.86 - 0.90 (0.0339 - 0.0354) | 0.48 + 0.48 (0.0189 + 0.0189) |
| 0.90 - 0.94 (0.0354 - 0.0370) | 0.48 + 0.52 (0.0189 + 0.0205) |
| 0.94 - 0.98 (0.0370 - 0.0386) | 0.52 + 0.52 (0.0205 + 0.0205) |
| 0.98 - 1.02 (0.0386 - 0.0402) | 0.52 + 0.56 (0.0205 + 0.0220) |
| 1.02 - 1.06 (0.0402 - 0.0417) | 0.56 + 0.56 (0.0220 + 0.0220) |
| 1.06 - 1.10 (0.0417 - 0.0433) | 0.56 + 0.60 (0.0220 + 0.0236) |
| 1.10 - 1.14 (0.0433 - 0.0449) | 0.60 + 0.60 (0.0236 + 0.0236) |
| 1.14 - 1.18 (0.0449 - 0.0465) | 0.60 + 0.64 (0.0236 + 0.0252) |
| 1.18 - 1.22 (0.0465 - 0.0480) | 0.64 + 0.64 (0.0252 + 0.0252) |
| 1.22 - 1.26 (0.0480 - 0.0496) | 0.64 + 0.68 (0.0252 + 0.0268) |
| 1.26 - 1.30 (0.0496 - 0.0512) | 0.68 + 0.68 (0.0268 + 0.0268) |
| 1.30 - 1.34 (0.0512 - 0.0528) | 0.68 + 0.72 (0.0268 + 0.0283) |
| 1.34 - 1.38 (0.0528 - 0.0543) | 0.72 + 0.72 (0.0283 + 0.0283) |
| 1.38 - 1.42 (0.0543 - 0.0559) | 0.72 + 0.76 (0.0283 + 0.0299) |
| 1.42 - 1.46 (0.0559 - 0.0575) | 0.76 + 0.76 (0.0299 + 0.0299) |
| 1.46 - 1.50 (0.0575 - 0.0591) | 0.76 + 0.80 (0.0299 + 0.0315) |

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#### Inspection and Adjustment (Cont'd)

#### Input shaft bearing adjusting shim

| Thickness mm (in) | Part number |
|-------------------|-------------|
| 0.40 (0.0157)     | 32225-08E00 |
| 0.44 (0.0173)     | 32225-08E01 |
| 0.48 (0.0189)     | 32225-08E02 |
| 0.52 (0.0205)     | 32225-08E03 |
| 0.56 (0.0220)     | 32225-08E04 |
| 0.60 (0.0236)     | 32225-08E05 |
| 0.64 (0.0252)     | 32225-08E06 |
| 0.68 (0.0268)     | 32225-08E07 |
| 0.72 (0.0283)     | 32225-08E08 |
| 0.76 (0.0299)     | 32225-08E09 |
| 0.80 (0.0315)     | 32225-08E10 |
| 1.20 (0.0472)     | 32225-08E11 |
|                   | i           |

# Table for selecting input shaft bearing adjusting shim

Unit: mm (in)

|                               | Oshi: Hall (III)              |
|-------------------------------|-------------------------------|
| Dial indicator indication     | Suitable shim(s)              |
| 0.65 - 0.69 (0.0256 - 0.0272) | 0.64 (0.0252)                 |
| 0.69 - 0.73 (0.0272 - 0.0287) | 0.68 (0.0268)                 |
| 0.73 - 0.77 (0.0287 - 0.0303) | 0.72 (0.0283)                 |
| 0.77 - 0.81 (0.0303 - 0.0319) | 0.76 (0.0299)                 |
| 0.81 - 0.85 (0.0319 - 0.0335) | 0.80 (0.0315)                 |
| 0.85 - 0.89 (0.0335 - 0.0350) | 0.40 + 0.44 (0.0157 + 0.0173) |
| 0.89 - 0.93 (0.0350 - 0.0366) | 0.44 + 0.44 (0.0173 + 0.0173) |
| 0.93 - 0.97 (0.0366 - 0.0382) | 0.44 + 0.48 (0.0173 + 0.0189) |
| 0.97 - 1.01 (0.0382 - 0.0398) | 0.48 + 0.48 (0.0189 + 0.0189) |
| 1.01 - 1.05 (0.0398 - 0.0413) | 0.48 + 0.52 (0.0189 + 0.0205) |
| 1.05 - 1.09 (0.0413 - 0.0429) | 0.52 + 0.52 (0.0205 + 0.0205) |
| 1.09 - 1.13 (0.0429 - 0.0445) | 0.52 + 0.56 (0.0205 + 0.0220) |
| 1.13 - 1.17 (0.0445 - 0.0461) | 0.56 + 0.56 (0.0220 + 0.0220) |
| 1.17 - 1.21 (0.0461 - 0.0476) | 0.56 + 0.60 (0.0220 + 0.0236) |
| 1.21 - 1.25 (0.0476 - 0.0492) | 0.60 + 0.60 (0.0236 + 0.0236) |
| 1.25 - 1.29 (0.0492 - 0.0508) | 0.60 + 0.64 (0.0236 + 0.0252) |
| 1.29 - 1.33 (0.0508 - 0.0524) | 0.64 + 0.64 (0.0252 + 0.0252) |
| 1.33 - 1.37 (0.0524 - 0.0539) | 0.64 + 0.68 (0.0252 + 0.0268) |
| 1.37 - 1.41 (0.0539 - 0.0555) | 0.68 + 0.68 (0.0268 + 0.0268) |
| 1.41 - 1.45 (0.0555 - 0.0571) | 0.68 + 0.72 (0.0268 + 0.0283) |
| 1.45 - 1.49 (0.0571 - 0.0587) | 0.72 + 0.72 (0.0283 + 0.0283) |
| 1.49 - 1.53 (0.0587 - 0.0602) | 0.72 + 0.76 (0.0283 + 0.0299) |
| 1.53 - 1.57 (0.0602 - 0.0618) | 0.76 + 0.76 (0.0299 + 0.0299) |
| 1.57 - 1.61 (0.0618 - 0.0634) | 0.76 + 0.80 (0.0299 + 0.0315) |
| 1.61 - 1.65 (0.0634 - 0.0650) | 0.80 + 0.80 (0.0315 + 0.0315) |
| 1.65 - 1.69 (0.0650 - 0.0665) | 0.44 + 1.20 (0.0173 + 0.0472) |

# Differential side bearing adjusting shim — RS5F50A

| Thickness mm (in) | Part number |      |
|-------------------|-------------|------|
| 0.40 (0.0157)     | 38453-96E00 | Gl   |
| 0.44 (0.0173)     | 38453-96E01 | (III |
| 0.48 (0.0189)     | 38453-96E02 |      |
| 0.52 (0.0205)     | 38453-96E03 | MA   |
| 0.56 (0.0220)     | 38453-96E04 |      |
| 0.60 (0.0236)     | 38453-96E05 | EM   |
| 0.64 (0.0252)     | 38453-96E06 |      |
| 0.68 (0.0268)     | 38453-96E07 | LC   |
| 0.72 (0.0283)     | 38453-96E08 |      |
| 0.76 (0.0299)     | 38453-96E09 | EC   |
| 0.80 (0.0315)     | 38453-96E10 |      |
| 0.84 (0.0331)     | 38453-96E11 |      |
| 0.88 (0.0346)     | 38453-96E12 | FE   |
| 1.20 (0.0472)     | 38453-96E13 |      |

# Differential side bearing adjusting shim — RS5F50V

| Part number | Thickness mm (in) |
|-------------|-------------------|
| 38753-56E00 | 0.36 (0.0142)     |
| 38753-56E01 | 0.40 (0.0157)     |
| 38753-56E02 | 0.44 (0.0173)     |
| 38753-56⊞03 | 0.48 (0.0189)     |
| 38753-56E04 | 0.52 (0.0205)     |
| 38753-56E05 | 0.56 (0.0220)     |
| 38753-56E06 | 0.60 (0.0236)     |
| 38753-56E07 | 0.64 (0.0252)     |
| 38753-56E08 | 0.68 (0.0268)     |
| 38753-56E09 | 0.72 (0.0283)     |
| 38753-56E10 | 0.76 (0.0299)     |
| 38753-56E11 | 0.80 (0.0315)     |
| 38753-56E12 | 0.84 (0.0331)     |
| 38753-56E13 | 0.88 (0.0346)     |
| 38753-56E14 | 0.92 (0.0362)     |

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#### **Inspection and Adjustment (Cont'd)**

# Table for selecting differential side bearing adjusting shim(s) — RS5F50A

Unit: mm (in)

#### Dial indicator deflection Suitable shim(s) 0.47 - 0.51 (0.0185 - 0.0201) 0.44 + 0.48 (0.0173 + 0.0189)0.48 + 0.48 (0.0189 + 0.0189)0.51 - 0.55 (0.0201 - 0.0217) 0.55 - 0.59 (0.0217 - 0.0232) 0.48 + 0.52 (0.0189 + 0.0205)0.59 - 0.63 (0.0232 - 0.0248) 0.52 + 0.52 (0.0205 + 0.0205)0.63 - 0.67 (0.0248 - 0.0264) 0.52 + 0.56 (0.0205 + 0.0220)0.56 + 0.56 (0.0220 + 0.0220)0.67 - 0.71 (0.0264 - 0.0280) 0.71 - 0.75 (0.0280 - 0.0295) 0.56 + 0.60 (0.0220 + 0.0236)0.75 - 0.79 (0.0295 - 0.0311) 0.60 + 0.60 (0.0236 + 0.0236)0.79 - 0.83 (0.0311 - 0.0327) 0.60 + 0.64 (0.0236 + 0.0252)0.83 - 0.87 (0.0327 - 0.0343) 0.64 + 0.64 (0.0252 + 0.0252)0.64 + 0.68 (0.0252 + 0.0268)0.87 - 0.91 (0.0343 - 0.0358) 0.91 - 0.95 (0.0358 - 0.0374) 0.68 + 0.68 (0.0268 + 0.0268)0.68 + 0.72 (0.0268 + 0.0283)0.95 - 0.99 (0.0374 - 0.0390) 0.99 - 1.03 (0.0390 - 0.0406) 0.72 + 0.72 (0.0283 + 0.0283)1.03 - 1.07 (0.0406 - 0.0421) 0.72 + 0.76 (0.0283 + 0.0299)0.76 + 0.76 (0.0299 + 0.0299)1.07 - 1.11 (0.0421 - 0.0437) 1.11 - 1.15 (0.0437 - 0.0453) 0.76 + 0.80 (0.0299 + 0.0315)1.15 - 1.19 (0.0453 - 0.0469) 0.80 + 0.80 (0.0315 + 0.0315)1,19 - 1.23 (0.0469 - 0.0484) 0.44 + 1.20 (0.0173 + 0.0472)1.23 - 1.27 (0.0484 - 0.0500) 0.48 + 1.20 (0.0189 + 0.0472)1.27 - 1.31 (0.0500 - 0.0516) 0.52 + 1.20 (0.0205 + 0.0472)

# Table for selecting differential side bearing adjusting shim(s) — RS5F50V

Unit: mm (in)

| Dial indicator deflection     | Suitable shim(s)              |
|-------------------------------|-------------------------------|
| 0.47 - 0.51 (0.0185 - 0.0201) | 0.44 + 0.48 (0.0173 + 0.0189) |
| 0.51 - 0.55 (0.0201 - 0.0217) | 0.48 + 0.48 (0.0189 + 0.0189) |
| 0.55 - 0.59 (0.0217 - 0.0232) | 0.48 + 0.52 (0.0189 + 0.0205) |
| 0.59 - 0.63 (0.0232 - 0.0248) | 0.52 + 0.52 (0.0205 + 0.0205) |
| 0.63 - 0.67 (0.0248 - 0.0264) | 0.52 + 0.56 (0.0205 + 0.0220) |
| 0.67 - 0.71 (0.0264 - 0.0280) | 0.56 + 0.56 (0.0220 + 0.0220) |
| 0.71 - 0.75 (0.0280 - 0.0295) | 0.56 + 0.60 (0.0220 + 0.0236) |
| 0.75 - 0.79 (0.0295 - 0.0311) | 0.60 + 0.60 (0.0236 + 0.0236) |
| 0.79 - 0.83 (0.0311 - 0.0327) | 0.60 + 0.64 (0.0236 + 0.0252) |
| 0.83 - 0.87 (0.0327 - 0.0343) | 0.64 + 0.64 (0.0252 + 0.0252) |
| 0.87 - 0.91 (0.0343 - 0.0358) | 0.64 + 0.68 (0.0252 + 0.0268) |
| 0.91 - 0.95 (0.0358 - 0.0374) | 0.68 + 0.68 (0.0268 + 0.0268) |
| 0.95 - 0.99 (0.0374 - 0.0390) | 0.68 + 0.72 (0.0268 + 0.0283) |
| 0.99 - 1.03 (0.0390 - 0.0406) | 0.72 + 0.72 (0.0283 + 0.0283) |
| 1.03 - 1.07 (0.0406 - 0.0421) | 0.72 + 0.76 (0.0283 + 0.0299) |
| 1.07 - 1.11 (0.0421 - 0.0437) | 0.76 + 0.76 (0.0299 + 0.0299) |
| 1,11 - 1.15 (0.0437 - 0.0453) | 0.76 + 0.80 (0.0299 + 0.0315) |
| 1.15 - 1.19 (0.0453 - 0.0469) | 0.80 + 0.80 (0.0315 + 0.0315) |
| 1.19 - 1.23 (0.0469 - 0.0484) | 0.72 + 0.92 (0.0283 + 0.0362) |
| 1.23 - 1.27 (0.0484 - 0.0500) | 0.76 + 0.92 (0.0299 + 0.0362) |
| 1,27 - 1.31 (0.0500 - 0.0516) | 0.80 + 0.92 (0.0315 + 0.0362) |

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# **AUTOMATIC TRANSAXLE**

# SECTION AT

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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".

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## PREPARATION AND PRECAUTIONS

#### **Special Service Tools**

The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

| Tool number<br>(Kent-Moore No.)<br>Tool name  | Description |   |
|---|-------------|---|
| KV381054S0<br>(J34286)<br>Puller  | NT414       | <ul> <li>Removing differential side oil seals</li> <li>Removing differential side bearing outer race</li> <li>Removing idler gear bearing outer race</li> <li>a: 250 mm (9.84 in)</li> <li>b: 160 mm (6.30 in)</li> </ul> |
| ST33400001<br>(J26082)<br>Drift   | a b         | Installing differential side oil seal (RH side) Installing oil seal on oil pump housing  a: 60 mm (2.36 in) dia.  |
|   | NT086       | b: 47 mm (1.85 in) dia.   |
| ST2505S001 (J34301-C) Oil pressure gauge set  ① ST25051001 ( — ) Oil pressure gauge ② ST25052000 ( — ) Hose ③ ST25053000 ( — ) Joint pipe ④ ST25054000 ( — ) Adapter ⑤ ST25055000 ( — ) Adapter | NT097       |   |
| ST27180001<br>(J25726-A)<br>Puller  |             | Removing idler gear   |
|   | NT424 C     | a: 100 mm (3.94 in)<br>b: 110 mm (4.33 in)<br>c: M8 x 1.25P   |
| ST23540000<br>(J25689-A)<br>Pin punch   | a           | Removing and installing parking rod plate and manual plate pins.  |
|   | NT442       | a: 2.3 mm (0.091 in) dia.<br>b: 4 mm (0.16 in) dia.   |
| ST25710000<br>(J25689-A)<br>Pin punch   | a           | Aligning groove of manual shaft and hole of transmission case.  |
|   | NT410       | a: 2 mm (0.08 in) dia.  |

## PREPARATION AND PRECAUTIONS

| Special Service Tools (Cont'd)                                      |  |   |               |  |
|---|--|---|---------------|--|
| Tool number<br>(Kent-Moore No.)<br>Tool name                        | Description  |   |               |  |
| KV32101000<br>(J25689-A)<br>Pin punch                               |  | Installing manual shaft retaining pin   | ·<br>GI<br>MA |  |
| -   | NT410  | a: 4 mm (0.16 in) dia.  |               |  |
| KV31102400<br>(J34285 and<br>J34285-87)<br>Clutch spring compressor | a a second secon | <ul> <li>Removing and installing clutch return<br/>springs</li> <li>Installing low and reverse brake piston</li> </ul>              | EM            |  |
|   |  |   | lC<br>Fa      |  |
|   | NT423  | a: 320 mm (12.60 in)<br>b: 174 mm (6.85 in)   | EC            |  |
| KV40100630<br>(J26092)<br>Drift                                     | a b C C  | <ul> <li>Installing reduction gear bearing inner race</li> <li>Installing idler gear bearing inner race</li> </ul>                  | FE            |  |
|   |  | a: 67.5 mm (2.657 in) dia.<br>b: 44 mm (1.73 in) dia.   | GL<br>        |  |
|   | NT107  | c: 38.5 mm (1.516 in) dia.  | MT            |  |
| ST30720000<br>(J25405)<br>Bearing installer                         | a b to   | <ul> <li>Installing idler gear bearing outer race</li> </ul>  | АТ            |  |
|   | NT115  | a: 77 mm (3.03 in) dia.<br>b: 55.5 mm (2.185 in) dia.   | FA            |  |
| ST35321000<br>( — )   | b  | Installing output shaft bearing   | RA            |  |
| Drift .   | NT073  | a: 49 mm (1.93 in) dia.<br>b: 41 mm (1.61 in) dia.  | BR            |  |
| (J34291)<br>Shim setting gauge set                                  |  | <ul> <li>Selecting oil pump cover bearing race and<br/>oil pump thrust washer</li> <li>Selecting side gear thrust washer</li> </ul> | ST            |  |
|   | NT101  |   | RS            |  |
| KV38100300<br>(J25523)<br>Bearing installer                         |  | Installing differential side bearing inner race (RH side)   | 87            |  |
| Ü   | NT085  | a: 54 mm (2.13 in) dia.<br>b: 46 mm (1.81 in) dia.<br>c: 32 mm (1.26 in) dia.   | ÄK            |  |
| ST30613000<br>(J25742-3)  | <u>b</u>   | Installing differential side bearing inner race (LH side)   |               |  |
| Bearing installer   | NT073  | a: 72 mm (2.83 in) dia.<br>b: 48 mm (1.89 in) dia.  | IDX           |  |

#### **Special Service Tools (Cont'd)** Tool number (Kent-Moore No.) Description Tool name ST3306S001 Removing differential side bearing inner race (J22888-D) Differential side bearing puller set (1) ST33051001 (J22888-D) a: 38 mm (1.50 in) dia. Puller b: 28.5 mm (1.122 in) dia. (2) ST33061000 c: 130 mm (5.12 in) (J8107-2)d: 135 mm (5.31 in) Adapter e: 100 mm (3.94 in) NT413 ST3127S000 Checking differential side bearing preload (See J25765-A) Preload gauge ① GG91030000 (J25765-A) Torque wrench 2 HT62940000 Socket adapter (3) HT62900000 Socket adapter NT124 ST33220000 Selecting differential side bearing adjusting (J25805-01) shim (F04V) Drift a: 37 mm (1.46 in) dia. b: 31 mm (1.22 in) dia. NT085 c: 22 mm (0.87 in) dia. KV38105210 · Selecting differential side bearing adjusting (J39883) shim (F04V) Preload adapter · Checking differential side bearing preload (F04V) NT075 ST35271000 Installing idler gear (J26091) Drift a: 72 mm (2.83 in) dia. NT115 b: 63 mm (2.48 in) dia. KV38107700 · Selecting differential side bearing adjusting (J39027)shim (F04A) Preload adapter · Checking differential side bearing preload (F04A) NT087

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| Special Service Tools (Cont'd)               |                |   |   |  |  |  |  |
|--|----------------|---|---|--|--|--|--|
| Tool number<br>(Kent-Moore No.)<br>Tool name | Description    |   | _ |  |  |  |  |
| (J34290)<br>Shim selecting tool set          |                | Selecting differential side bearing adjusting shim  |   |  |  |  |  |
|  | NT080          |   | _ |  |  |  |  |
| ST33230000<br>(J25805-01)<br>Drift           |                | Installing differential side bearing  |   |  |  |  |  |
|  | NT084          | a: 51 mm (2.01 in) dia.<br>b: 28.5 mm (1.122 in) dia.   | _ |  |  |  |  |
|  | Commercial Ser | rvice Tools   |   |  |  |  |  |
| Tool name                                    | Description    |   | • |  |  |  |  |
| Puller                                       |                | <ul> <li>Removing idler gear bearing inner race</li> <li>Removing and installing band servo piston<br/>snap ring</li> </ul> |   |  |  |  |  |
| Puller                                       | NT077          | Removing reduction gear bearing inner race  |   |  |  |  |  |
|  |                | a: 60 mm (2.36 in) dia.   | • |  |  |  |  |
|  | NT411          | b: 35 mm (1.38 in) dia.   |   |  |  |  |  |
| Orift  | 3.50           | Installing differential side oil seal (Left side)   | į |  |  |  |  |
|  | NT083          | a: 90 mm (3.54 in) dia.   | • |  |  |  |  |
| Orift  |                | Installing needle bearing on bearing retainer   |   |  |  |  |  |
|  | a              |   |   |  |  |  |  |
| <b>Drift</b>                                 | NT083          | a: 36 mm (1.42 in) dia.  Removing needle bearing from bearing   |   |  |  |  |  |
| zint.  |                | retainer  |   |  |  |  |  |
|  | a              |   |   |  |  |  |  |
|  | NT083          | a: 33.5 mm (1.319 in) dia.  |   |  |  |  |  |

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# Supplemental Restraint System (SRS) "AIR BAG"

The Supplemental Restraint System "Air Bag", used along with a seat belt, helps 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 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.
- Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses are covered with yellow insulation either just before the harness connectors or for the complete harness, for easy identification.

# Precautions for On Board Diagnostic (OBD) System of A/T and Engine

The ECM (ECCS control module) has an on board diagnostic system. It will light up the malfunction indicator lamp (MIL) to warn the driver of a malfunction causing emission deterioration.

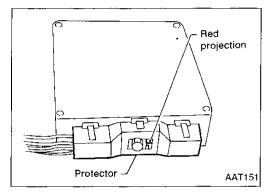
### **CAUTION:**

- Be sure to turn the ignition switch OFF and disconnect the negative battery terminal before any repair or inspection work. The open/short circuit of related switches, sensors, solenoid valves, etc. will cause the MIL to light up.
- Be sure to connect and lock the connectors securely after the work. Loose (unlocked) connectors will cause the MIL to light up due to an open circuit. (Be sure the connectors are free from water, grease, dirt, bent terminals, etc.)
- Be sure to route and clamp the harnesses properly after work. Interference of the harness with a bracket, etc. may cause the MIL to light up due to a short circuit.
- Be sure to erase the unnecessary malfunction information (repairs completed) from the A/T control unit or ECM before returning the vehicle to the customer.

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### **Precautions**

- Before proceeding with disassembly, thoroughly clean the outside of the transaxle. It is important to prevent the internal parts from becoming contaminated by dirt or other foreign matter.
- Disassembly should be done in a clean work area.
- Use lint-free cloth or towels for wiping parts clean. Common shop rags can leave fibers that could interfere with the operation of the transaxle.
- Place disassembled parts in order for easier and proper assembly.
- All parts should be carefully cleaned with a general purpose, non-flammable solvent before inspection or reassembly.
- Gaskets, seals and O-rings should be replaced any time the transaxle is disassembled.
- When connecting A/T control unit harness connector, tighten bolt until red projection is in line with connector.



 It is very important to perform functional tests whenever they are indicated.

- The valve body contains precision parts and requires extreme care when parts are removed and serviced. Place disassembled valve body parts in order for easier and proper assembly. Care will also prevent springs and small parts from becoming scattered or lost.
- Properly installed valves, sleeves, plugs, etc. will slide along bores in valve body under their own weight.
- Before assembly, apply a coat of recommended ATF to all parts. Apply petroleum jelly to protect O-rings and seals, or hold bearings and washers in place during assembly. Do not use grease.
- Extreme care should be taken to avoid damage to O-rings, seals and gaskets when assembling.
- Replace ATF cooler if excessive foreign material is found in oil pan or clogging strainer. Refer to "ATF COOLER SERVICE", on next page.
- After overhaul, refill the transmission with new ATF.
- When the A/T drain plug is removed, only some
  of the fluid is drained. Old A/T fluid will remain
  in torque converter and ATF cooling system.
  Always follow the procedures under "Changing
  A/T Fluid" in the MA section when changing A/T
  fluid.

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### **Service Notice or Precautions**

### **FAIL-SAFE**

The A/T control unit has an electronic Fail-Safe (limp home mode). This allows the vehicle to be driven even if a major electrical input/output device circuit is damaged.

Under Fail-Safe, the vehicle always runs in third gear, even with a shift lever position of "1", "2" or "D". The customer may complain of sluggish or poor acceleration.

When the ignition key is turned ON following Fail-Safe operation, O/D OFF indicator lamp blinks for about 8 seconds. (For diagnosis, refer to AT-40.)

Fail-Safe may occur without electrical circuit damage if the vehicle is driven under extreme conditions (such as excessive wheel spin followed by sudden braking). To recover normal shift pattern, turn the ignition key OFF for 5 seconds, then ON.

The blinking of the O/D OFF indicator lamp for about 8 seconds will appear only once and be cleared. The customer may resume normal driving conditions.

Always follow the "WORK FLOW" (Refer to AT-38).

The SELF-DIAGNOSIS results will be as follows:

The first SELF-DIAGNOSIS will indicate damage to the vehicle speed sensor or the revolution sensor. During the next SELF-DIAGNOSIS, performed after checking the sensor, no damages will be indicated.

### ATF COOLER SERVICE

Replace ATF cooler if excessive foreign material is found in oil pan or clogging strainer.

VQ30DE engine (with RE4F04A/V) ... fin type cooler

Replace radiator lower tank (which includes ATF cooler) with a new one and flush cooler line using cleaning solvent and compressed air.

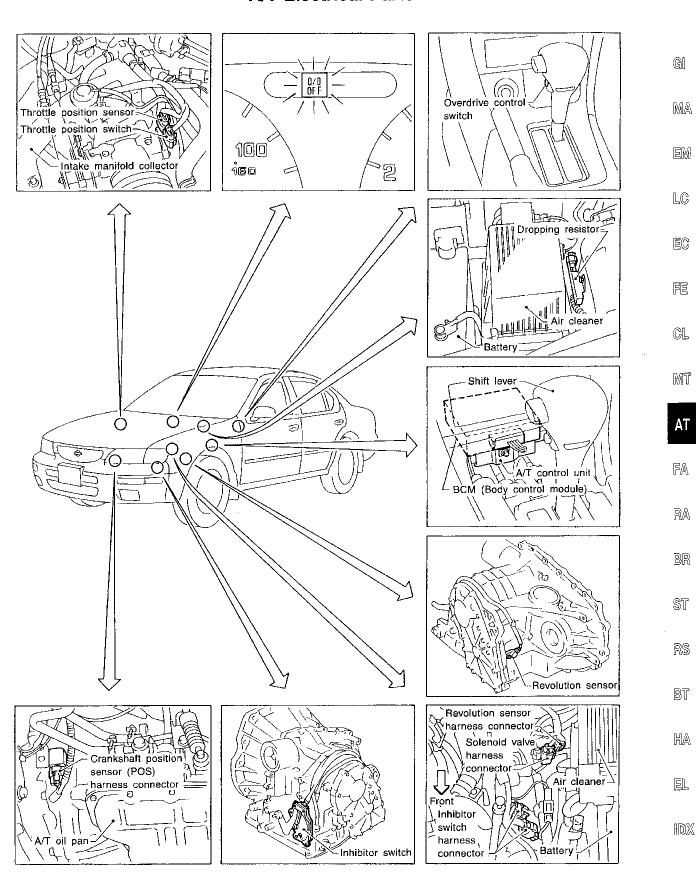
#### **OBD-II SELF-DIAGNOSIS**

- A/T self-diagnosis is performed by the A/T control unit in combination with the ECM. The results can be
  read through the blinking pattern of the O/D OFF indicator or the malfunction indicator lamp (MIL). Refer
  to the table on AT-26 for the indicator used to display each self-diagnostic result.
- The self-diagnostic results indicated by the MIL are automatically stored in both the ECM and A/T control
  unit memories.

Always perform the procedure "HOW TO ERASE DTC" on AT-24 to complete the repair and avoid unnecessary blinking of the MIL.

- The following self-diagnostic items can be detected using ECM self-diagnostic results mode\* only when the O/D OFF indicator lamp does not indicate any malfunctions.
  - -Improper shifting to 1st, 2nd, 3rd, or 4th gear position
  - -Improper torque converter clutch operation
  - -Improper lock-up operation.
  - \*: For details of OBD-II, refer to EC section ("ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION").

## A/T Electrical Parts Location



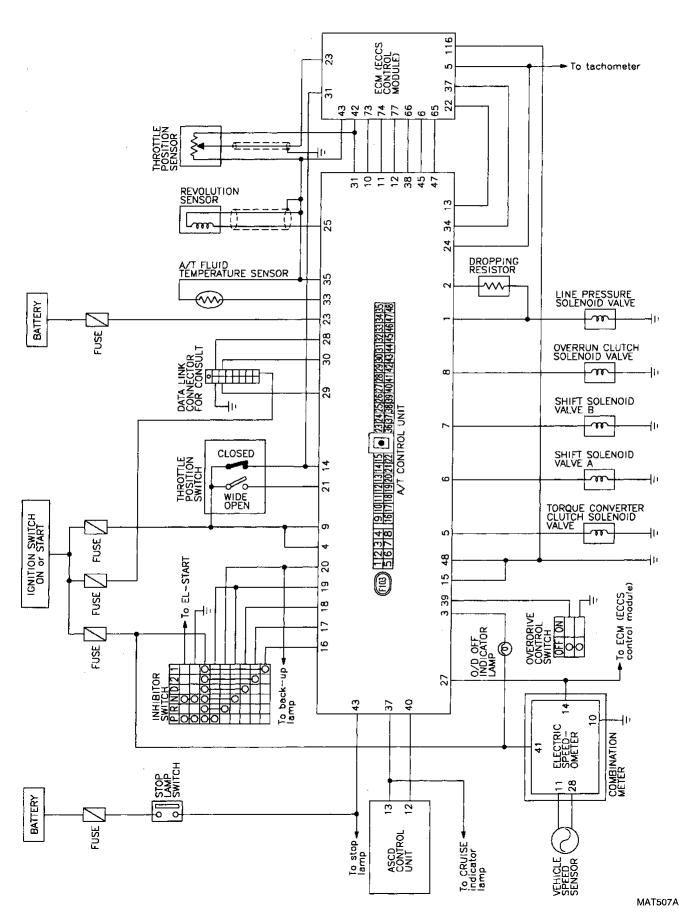
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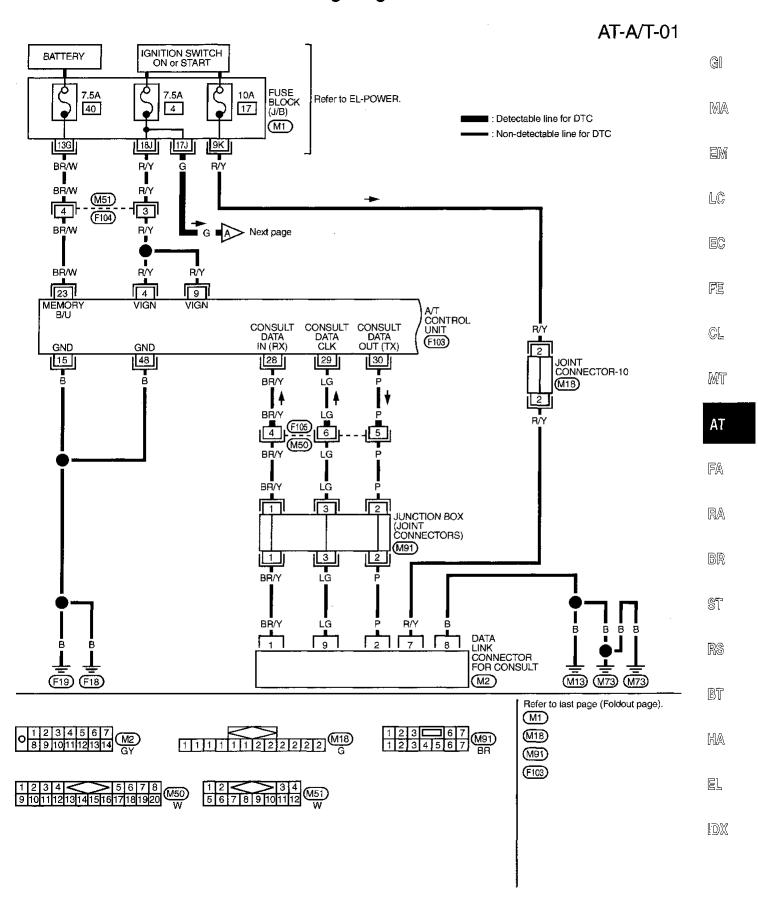
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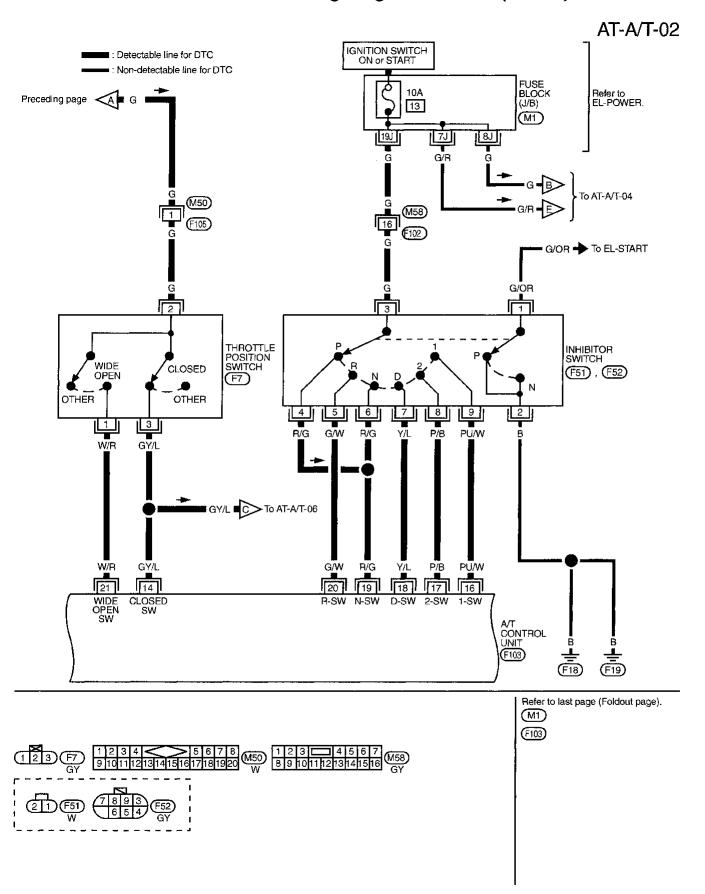
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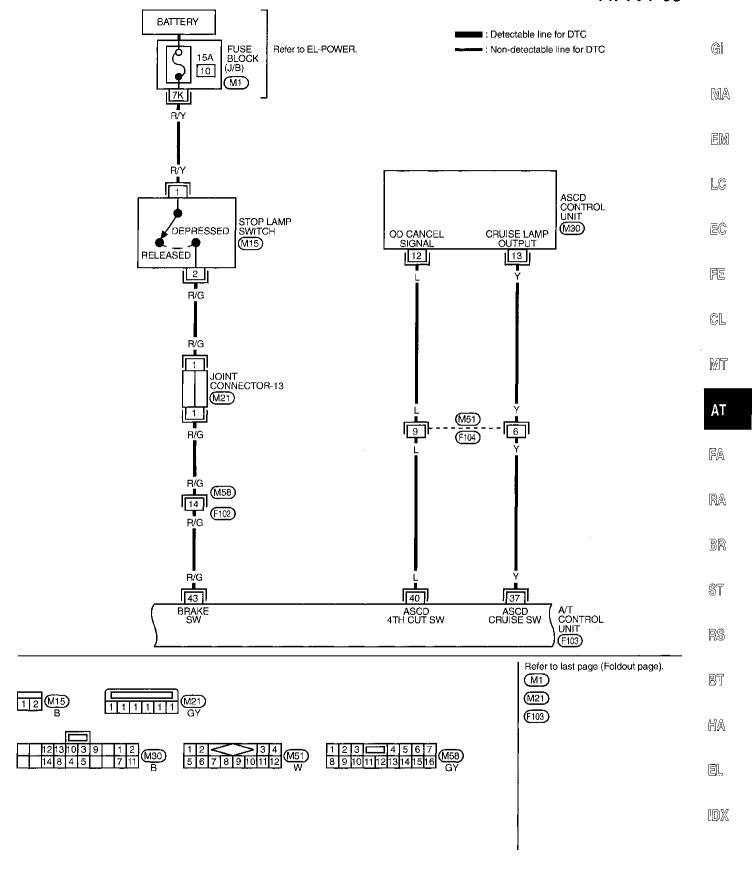
## **Circuit Diagram for Quick Pinpoint Check**

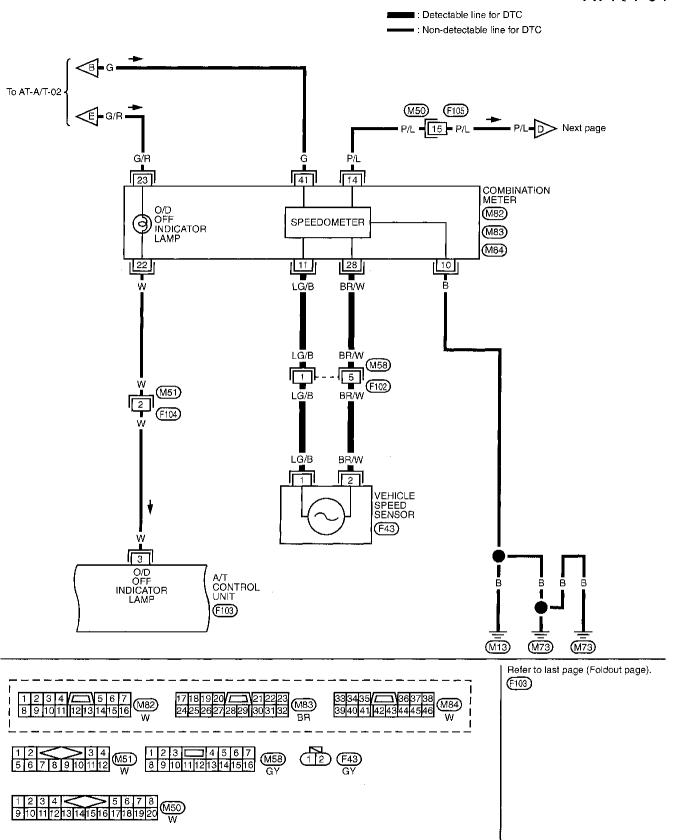


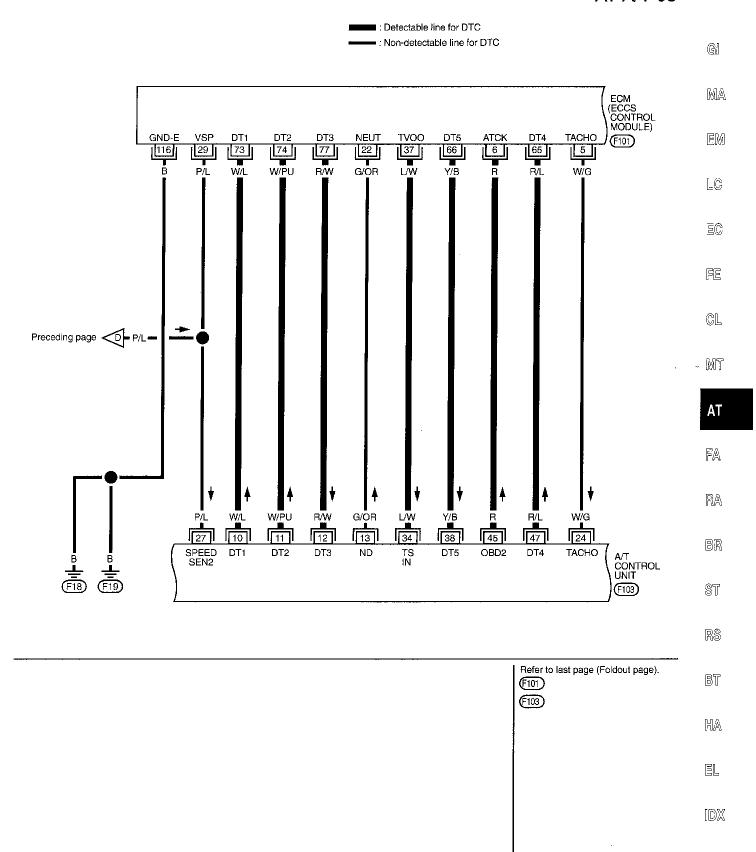
## Wiring Diagram — AT —

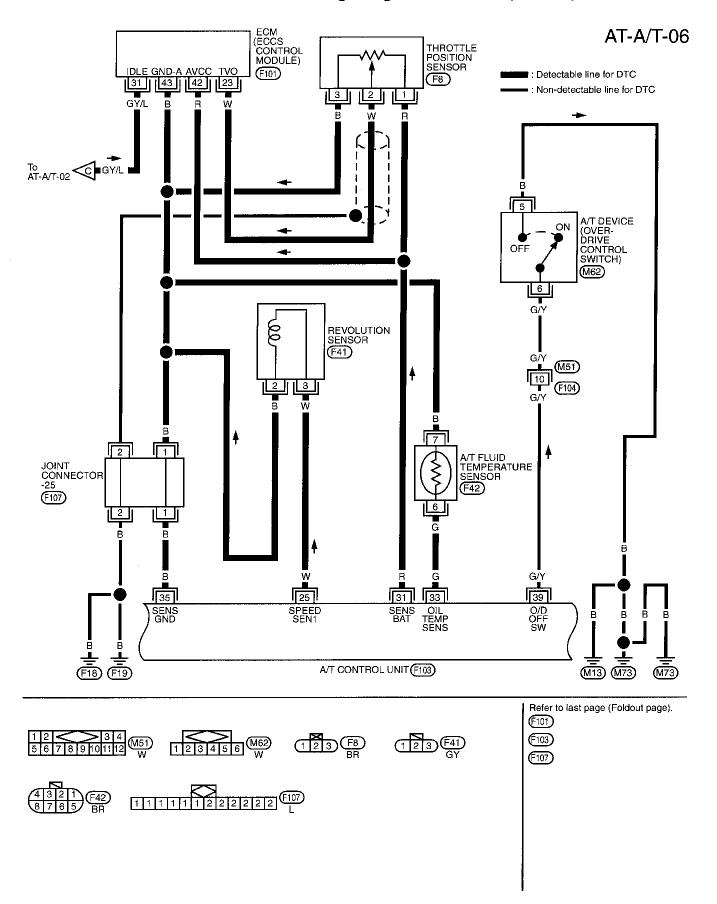


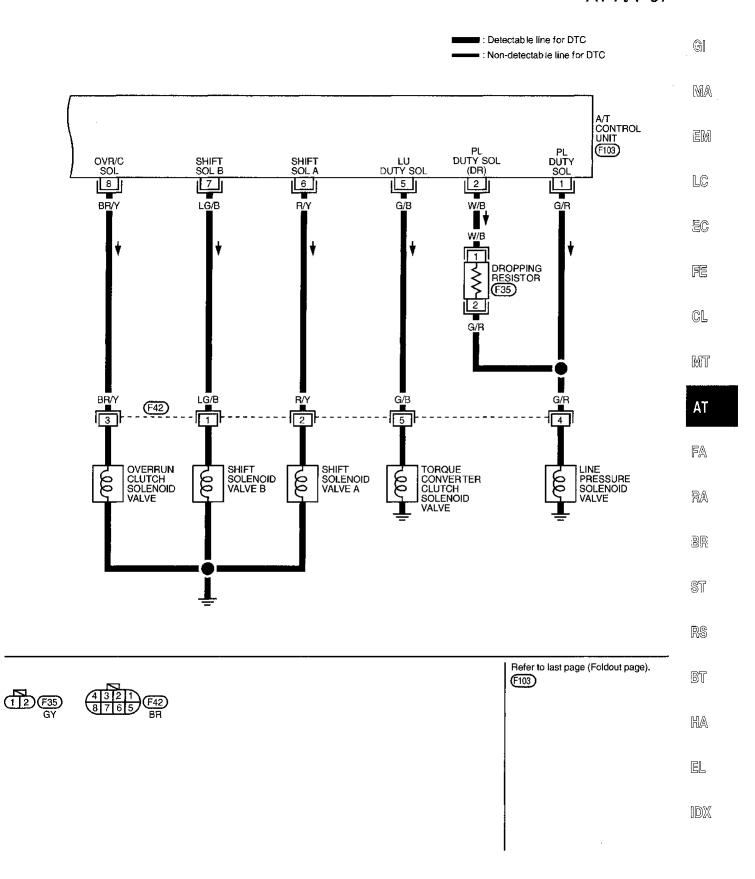




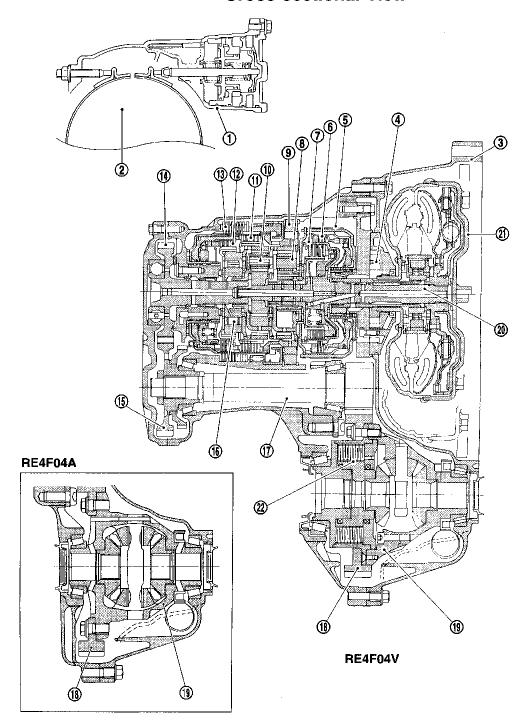








## **Cross-sectional View**



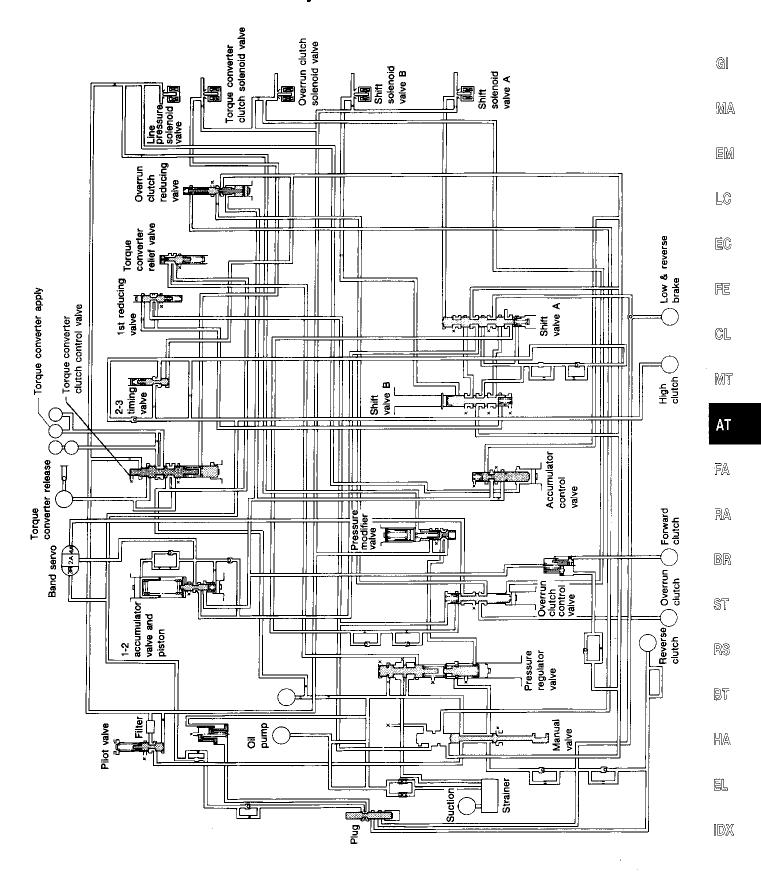
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- Band servo piston
- Reverse clutch drum
- Converter housing
- Oil pump
- Brake band
- Reverse clutch
- High clutch

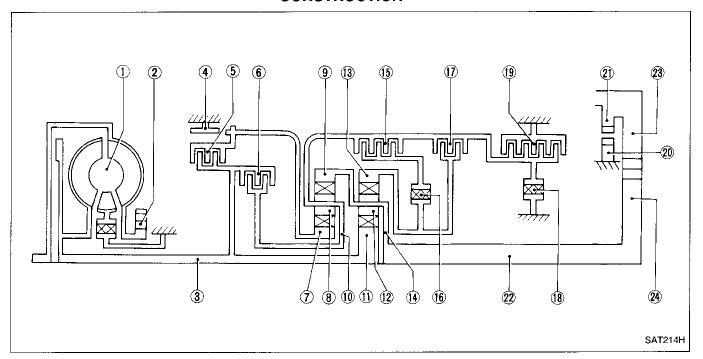
- Front planetary gear Low one-way clutch
- Rear planetary gear
- Forward clutch
- Overrun clutch
- Low & reverse brake
- Output gear

- ldler gear
- Forward one-way clutch
- Pinion reduction gear
- Final gear Differential case
- Input shaft
- Torque converter
- Viscous coupling

## **Hydraulic Control Circuit**



## **Shift Mechanism CONSTRUCTION**



- Torque converter
- Oil pump
- ② ③ Input shaft
- 4 Brake band
- Reverse clutch
- High clutch
- Front sun gear
- Front pinion gear

- Front internal gear
- **1** Front planetary carrier
- 11) Rear sun gear
- 12 Rear pinion gear
- 13 Rear internal gear
- 4 Rear planetary carrier
- (15) Forward clutch
- Forward one-way clutch

- Overrun clutch
- Low one-way clutch 18
- 19 Low & reverse brake
- Parking pawl 20
- **(1)** Parking gear
- 22 Output shaft
- 23 Idle gear
- Output gear

## **FUNCTION OF CLUTCH AND BRAKE**

| Clutch and brake components | Abbr. | Function  |
|-----------------------------|-------|---|
| ⑤ Reverse clutch            | R/C   | To transmit input power to front sun gear ⑦.  |
| High clutch                 | H/C   | To transmit input power to front planetary carrier (i).   |
| (5) Forward clutch          | F/C   | To connect front planetary carrier (1) with forward one-way clutch (16).  |
| ① Overrun clutch            | O/C   | To connect front planetary carrier (1) with rear internal gear (13).  |
| 4 Brake band                | B/B   | To lock front sun gear ⑦.   |
| (6) Forward one-way clutch  | F/O.C | When forward clutch (15) is engaged, to stop rear internal gear (13) from rotating in opposite direction against engine revolution. |
| (a) Low one-way clutch      | L/O.C | To stop front planetary carrier (1) from rotating in opposite direction against engine revolution.                                  |
| 19 Low & reverse brake      | L&R/B | To lock front planetary carrier @.  |

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## **OVERALL SYSTEM**

# Shift Mechanism (Cont'd)

### **OPERATION OF CLUTCH AND BRAKE**

|         |         |                   | 1 13 1-        | <b>_</b>       |                   |                | Band serve     | )            | Forward           | Low               | Low &            |         |   |   |   |  |
|---------|---------|-------------------|----------------|----------------|-------------------|----------------|----------------|--------------|-------------------|-------------------|------------------|---------|---|---|---|--|
| Shift p | osition | Reverse<br>clutch | High<br>clutch | Forward clutch | Overrun<br>clutch | 2nd<br>apply   | 3rd<br>release | 4th<br>apply | one-way<br>clutch | one-way<br>clutch | reverse<br>brake | Lock-up | Remarks   | _ |   |  |
| i       | 5       |                   |                |                |                   |                |                |              |                   |                   |                  |         | PARK<br>POSITION  |   |   |  |
| ļ       | 7       | 0                 |                |                |                   | •              |                |              |                   |                   | 0                |         | REVERSE<br>POSITION   |   |   |  |
| ſ       | V       |                   |                |                |                   |                |                |              |                   |                   |                  |         | NEUTRAL<br>POSITION   |   |   |  |
|         | 1st     |                   |                | 0              | *1⊗               |                |                |              | •                 | •                 |                  |         |   |   |   |  |
| D+4     | 2nd     |                   |                | 0              | *1(()             | 0              |                |              | •                 |                   |                  |         | Automatic shift $1 \leftrightarrow 2 \leftrightarrow 3 \leftrightarrow 4$ |   |   |  |
| D*4     | 3rd     |                   | 0              | 0              | *10               | *2( <b>X</b> ) | <b>X</b>       |              | •                 |                   |                  | *5      |   |   | $ \boxed{ 1 \leftrightarrow 2 \leftrightarrow 3 \leftrightarrow 4 } $ |  |
|         | 4th     |                   | 0              | <b>X</b>       |                   | *3 <b>(X)</b>  | <b>(X)</b>     | 0            |                   |                   |                  | 0       |   |   |   |  |
|         | 1st     |                   |                | 0              | 8                 |                |                |              | •                 | •                 |                  |         | Automatic shift $1 \leftrightarrow 2 \leftarrow 3$                        |   |   |  |
| 2       | 2nd     |                   |                | 0              | 0                 | 0              |                |              | •                 |                   |                  |         |   |   |   |  |
|         | 1st     |                   |                | 0              | 0                 |                |                |              | •                 |                   | 0                |         | Locks (held sta-<br>tionary)  |   |   |  |
| 1       | 2nd     |                   |                | 0              |                   | 0              |                |              | •                 |                   |                  |         | in 1st speed $1 \leftarrow 2 \leftarrow 3$                                |   |   |  |

<sup>\*2:</sup> Oil pressure is applied to both 2nd "apply" side and 3rd "release" side of band servo pisto pressure area on the "release" side is greater than that on the "apply" side.
\*3: Oil pressure is applied to 4th "apply" side in condition \*2 above, and brake band contracts.
\*4: A/T will not shift to 4th when overdrive control switch is set in "OFF" position.

( ): Operates ( ): Operates when throttle opening is less than 1/16, activating engine brake. : Operates during "progressive" acceleration. Operates but does not affect power transmission. (x): Operates when throttle opening is less than 1/16, but does not affect engine brake.

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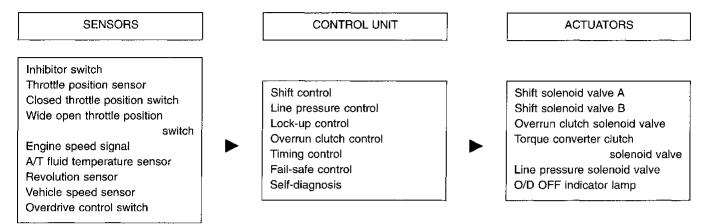
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<sup>\*5:</sup> Operates when overdrive control switch is "OFF".

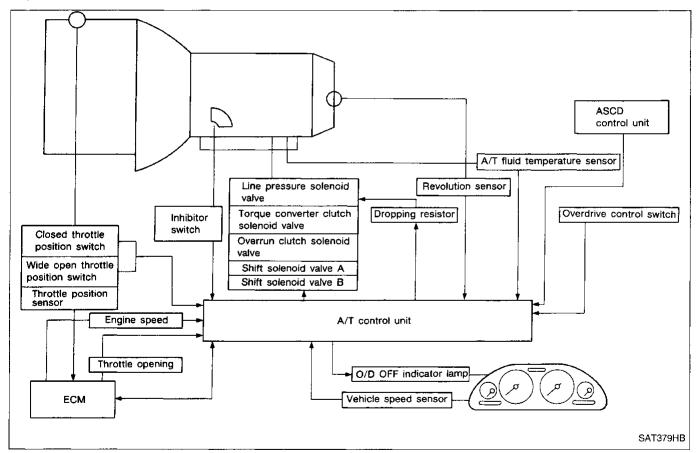
## **Control System**

### **OUTLINE**

The RE4F04A(V) automatic transmission senses vehicle operating conditions through various sensors. It always controls the optimum shaft position and reduces shifting and lock-up shocks.



### **CONTROL SYSTEM**



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## **OVERALL SYSTEM**

## Control System (Cont'd)

## A/T CONTROL UNIT FUNCTION

The function of the A/T control unit is to:

- Receive input signals sent from various switches and sensors.
- Determine required line pressure, shifting point, lock-up operation, and engine brake operation. Send required output signals to the respective solenoids.

## INPUT/OUTPUT SIGNAL OF A/T CONTROL UNIT

|        | Sensors and solenoid valves            | Function   |
|--------|--|--|
|        | Inhibitor switch                       | Detects select lever position and sends a signal to A/T control unit.  |
|        | Throttle position sensor               | Detects throttle valve position and sends a signal to A/T control unit.  |
|        | Closed throttle position switch        | Detects throttle valve's fully-closed position and sends a signal to A/T control unit.                                     |
|        | Wide open throttle position switch     | Detects a throttle valve position of greater than 1/2 of full throttle and sends a signal to A/T control unit.             |
| Input  | Engine speed signal                    | From ECM (ECCS control module).  |
|        | A/T fluid temperature sensor           | Detects transmission fluid temperature and sends a signal to A/T control unit.   |
|        | Revolution sensor                      | Detects output shaft rpm and sends a signal to A/T control unit.   |
|        | Vehicle speed sensor                   | Used as an auxiliary vehicle speed sensor. Sends a signal when revolution sensor (installed on transmission) malfunctions. |
|        | Overdrive control switch               | Sends a signal, which prohibits a shift to "D <sub>4</sub> " (overdrive) position, to the A/T control unit.                |
|        | Shift solenoid valve A/B               | Selects shifting point suited to driving conditions in relation to a signal sent from A/T control unit.                    |
|        | Line pressure solenoid valve           | Regulates (or decreases) line pressure suited to driving conditions in relation to a signal sent from A/T control unit.    |
| Output | Torque converter clutch solenoid valve | Regulates (or decreases) lock-up pressure suited to driving conditions in relation to a signal sent from A/T control unit. |
|        | Overrun clutch solenoid valve          | Controls an "engine brake" effect suited to driving conditions in relation to a signal sent from A/T control unit.         |
|        | O/D OFF indicator lamp                 | Shows A/T control unit faults, when A/T control components malfunction.  |

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### Introduction

The ECM (ECCS control module) provides two functions for the A/T system. One function is to receive a signal from the A/T control unit used with OBD-related parts of the A/T system. The signal is sent to the ECM when a malfunction occurs in the corresponding OBD-related part. The other function is to indicate a diagnostic result by means of the MIL (malfunction indicator lamp) on the instrument panel. Sensors, switches and solenoid valves are used as sensing elements.

The MIL automatically illuminates in One or Two Trip Detection Logic when a malfunction is sensed in relation to A/T system parts.

## One or Two Trip Detection Logic

### ONE TRIP DETECTION LOGIC

If a malfunction is sensed during the first test drive, the MIL will illuminate and the malfunction will be stored in the ECM memory as a DTC. The A/T control unit is not provided with such a memory function.

### TWO TRIP DETECTION LOGIC

When a malfunction is sensed during the first test drive, it is stored in the ECM memory as a 1st trip DTC (diagnostic trouble code) or 1st trip freeze frame data. At this point, the MIL will not illuminate. — First Trip If the same malfunction as that experienced during the first test drive is sensed during the second test drive, the MIL will illuminate. — Second Trip

A/T-related parts for which the MIL illuminates during the first or second test drive are listed below.

| Itama  | M .                | IIL                |
|--|--------------------|--------------------|
| Items  | One trip detection | Two trip detection |
| Shift solenoid valve A — DTC: P0750 (1108)             | X                  |                    |
| Shift solenoid valve B — DTC: P0755 (1201)             | X                  |                    |
| Throttle position sensor or switch — DTC: P1705 (1206) | X                  |                    |
| Except above   |                    | X                  |

The "trip" in the "One or Two Trip Detection Logic" means a driving mode in which self-diagnosis is performed during vehicle operation.

## **Diagnostic Trouble Code (DTC)**

### **HOW TO READ DTC**

The diagnostic trouble code can be read by the following methods.

(Either code for the 1st trip or the 2nd trip can be read.)

(NO TOOLS) 1. The number of blinks of the malfunction indicator lamp in the Diagnostic Test Mode II (Self-Diagnostic Results) Examples: 1101, 1102, 1103, 1104, etc.

These DTCs are controlled by NISSAN.

2. CONSULT or GST (Generic Scan Tool) Examples: P0705, P0710, P0720, P0725, etc.

These DTCs are prescribed by SAE J2012. (CONSULT also displays the malfunctioning component or system.)

Output of a DTC indicates a malfunction. However, Mode II and GST do not indicate whether the
malfunction is still occurring or has occurred in the past and has returned to normal.
CONSULT can identify them. Therefore, using CONSULT (if available) is recommended.

### **HOW TO ERASE DTC**

The diagnostic trouble code can be erased by CONSULT, GST or ECM DIAGNOSTIC TEST MODE as described following.

- If the battery terminal is disconnected, the diagnostic trouble code will be lost within 24 hours.
- When you erase the DTC, using CONSULT or GST is easier and quicker than switching the mode selector on the ECM.

The following emission-related diagnostic information is cleared from the ECM memory when erasing DTC related to OBD-II. For details, refer to EC section "Emission-related Diagnostic Information", "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION".

- Diagnostic trouble codes (DTC)
- 1st trip diagnostic trouble codés (1st trip DTC)
- Freezė frame data
- 1st trip freeze frame data
- System readiness test (SRT) codes
- Test values

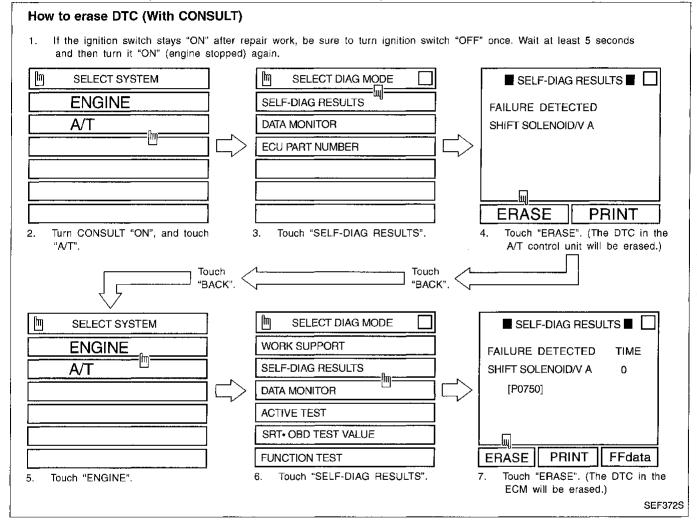
## Diagnostic Trouble Code (DTC) (Cont'd)

# ) HOW TO ERASE DTC (With CONSULT)

- If a DTC is displayed for both ECM and A/T control unit, it needs to be erased for both ECM and A/T control unit.
- If diagnostic trouble code is not for A/T related items (Refer to AT-50), skip steps 2 through 4.
- If the ignition switch stays "ON" after repair work, be sure to turn ignition switch "OFF" once. Wait at least 5 seconds and then turn it "ON" (engine stopped) again. Turn CONSULT "ON" and touch "A/T".
- 2.
- Touch "SELF-DIAG RESULTS".

  Touch "ERASE". (The DTC in the A/T control unit will be erased.) Then touch "BACK" twice.

  Touch "ENGINE". 4.
- Touch "SELF-DIAG RESULTS" 6.
- Touch "ERASE". (The DTC in the ECM will be erased.)



#### **HOW TO ERASE DTC (With GST)**

- If the ignition switch stays "ON" after repair work, be sure to turn ignition switch "OFF" once. Wait at least 5 seconds and then turn it "ON" (engine stopped) again.
- Perform "SELF-DIAGNOSTIC PROCEDURE (No Tools)". Refer to AT-27. (The engine warm-up step can
- be skipped when performing the diagnosis only to erase the DTC.) Select Mode 4 with Generic Scan Tool (GST). For details, refer to EC section ("Generic Scan Tool (GST)", "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION").

#### TOOLS **HOW TO ERASE DTC (No Tools)**

- If the ignition switch stays "ON" after repair work, be sure to turn ignition switch "OFF" once. Wait at least 5 seconds and then turn it "ON" (engine stopped) again.

  Perform "SELF-DIAGNOSTIC PROCEDURE (No Tools)". Refer to AT-27. (The engine warm-up step can
- be skipped when performing the diagnosis only to erase the DTC.)
- Change the diagnostic test mode from Mode II to Mode I by turning the mode selector on the ECM.

  Refer to EC section ["HOW TO SWITCH DIAGNOSTIC TEST MODES", "Malfunction Indicator Lamp (MIL)", "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION"].

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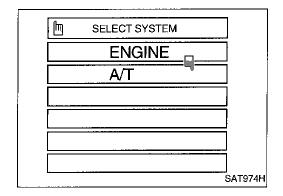
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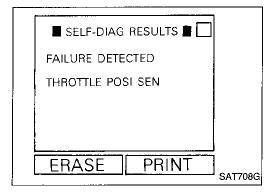
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## **Self-diagnosis**

After performing this procedure, place check marks for results on the "DIAGNOSTIC WORKSHEET", AT-36. Reference pages are provided following the items.

## SELF-DIAGNOSTIC PROCEDURE (With CONSULT)

- Turn on CONSULT and touch "A/T".

  If A/T is not displayed, check A/T control unit power supply and ground circuit. Refer to AT-55. If result is NG, refer to EL section ("POWER SUPPLY ROUTING").
- 2. Touch "SELF-DIAG RESULTS".

Display shows malfunction experienced since the last erasing operation.

CONSULT performs REAL-TIME SELF-DIAGNOSIS. Also, any malfunction detected while in this mode will be displayed at real time.

|  |  | Indicator for Dia  | ignostic Results  |
|--|--|--|---|
| Detected items (Screen terms for CONSULT, "SELF-DIAG RESULTS" test mode) | Malfunction is detected when   | O/D OFF indicator lamp (Available when "A/T" on CONSULT is touched.) | Malfunction indicator lamp*2 (Available when "ENGINE" on CON- SULT is touched.) |
| Inhibitor switch circuit (INHIBITOR SWITCH)                              | A/T control unit does not receive the correct voltage signal (based on the gear position) from the switch. | _  | Х   |
| Revolution sensor<br>(VHCL SPEED SEN-A/T)                                | A/T control unit does not receive the proper voltage signal from the sensor.                               | Х  | Х   |
| Vehicle speed sensor (Meter)<br>(VHCL SPEED SEN·MTR)                     | A/T control unit does not receive the proper voltage signal from the sensor.                               | х  | _   |
| Improper shifting to 1st gear position (A/T 1ST SIGNAL)                  | A/T cannot be shifted to the 1st gear position even if electrical circuit is good.                         | <u>—</u>   | X*1   |
| Improper shifting to 2nd gear position (A/T 2ND SIGNAL)                  | A/T cannot be shifted to the 2nd gear position even if electrical circuit is good.                         | <u>—</u>   | X*1   |
| Improper shifting to 3rd gear position (A/T 3RD SIGNAL)                  | A/T cannot be shifted to the 3rd gear position even if electrical circuit is good.                         |  | X*1   |
| Improper shifting to 4th gear position (A/T 4TH SIG OR TCC)              | A/T cannot be shifted to the 4th gear position even if electrical circuit is good.                         | _  | X*1   |
| Improper lock-up operation (A/T TCC SIGNAL)                              | A/T cannot perform lock-up even if electrical circuit is good.   | _  | X*1   |
| Shift solenoid valve A<br>(SHIFT SOLENOID/V A)                           | A/T control unit detects an improper voltage drop when it tries to operate the solenoid valve.             | Х  | Х   |
| Shift solenoid valve B<br>(SHIFT SOLENOID/V B)                           | A/T control unit detects an improper voltage drop when it tries to operate the solenoid valve.             | Х  | Х   |
| Overrun clutch solenoid valve (OVERRUN CLUTCH S/V)                       | A/T control unit detects an improper voltage drop when it tries to operate the solenoid valve.             | Х  | Х   |
| T/C clutch solenoid valve<br>(TOR CONV CLUTCH SV)                        | A/T control unit detects an improper voltage drop when it tries to operate the solenoid valve.             | Х  | Х   |
| Line pressure solenoid valve<br>(LINE PRESSURE S/V)                      | A/T control unit detects an improper voltage drop when it tries to operate the solenoid valve.             | Х  | Х   |
| Throttle position sensor Throttle position switch (THRTL POSI SEN-A/T)   | A/T control unit receives an excessively low or high voltage from the sensor.                              | ×  | х   |
| Engine speed signal<br>(ENGINE SPEED SIG)                                | A/T control unit does not receive the proper voltage signal from the ECM.                                  | Х  | Х   |

## Self-diagnosis (Cont'd)

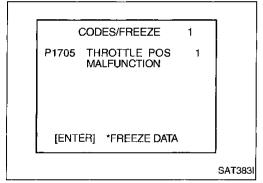
|   |   |  | agnostic Results  |
|---|---|--|---|
| Detected items (Screen terms for CONSULT, "SELF-DIAG RESULTS" test mode)                          | Malfunction is detected when  | O/D OFF indicator lamp (Available when "A/T" on CONSULT is touched.) | Malfunction indicator lamp*2 (Available when "ENGINE" on CON- SULT is touched.) |
| A/T fluid temperature sensor (A/T FLUID TEMP SENSOR)  | A/T control unit receives an excessively low or high voltage from the sensor.   | X  | Х   |
| Initial start<br>INITIAL START  | This is not a malfunction message (Whenever shutting off<br>a power supply to the control unit, this message appears<br>on the screen.) | х  |   |
| No failure<br>(NO SELF DIAGNOSTIC FAILURE INDI-<br>CATED<br>FURTHER TESTING MAY BE<br>REQUIRED**) | No failure has been detected.   | Х  | х   |

X : Applicable

- : Not applicable

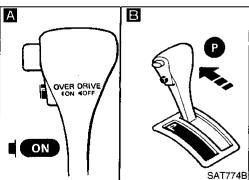
\*1 : These malfunctions can not be displayed by MIL HCHECK if another malfunction is assigned to the O/D OFF indicator lamp

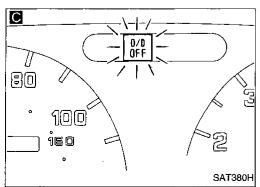
\*2:Refer'tò EC section ["Malfunction Indicator Lamp (MIL)", "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION"].



## SELF-DIAGNOSTIC PROCEDURE (With GST)

Refer to EC section ["Generic Scan Tool (GST)", "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION"].





SELF-DIAGNOSTIC PROCEDURE (No Tools)

A B C 1. Start engine and warm it up to normal engine operating temperature. 2. Turn ignition switch to "OFF" position. Wait for at least 5 seconds. 3. Turn ignition switch to "ACC" position.

DIAGNOSIS START

position. 5. Move selector lever to "P" position.

4. Set overdrive control switch in "ON"

6. Turn ignition switch to "ON" position. (Do not start engine.)

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

Ų Yes

(A)

No Go to "1. O/D OFF Indicator Lamp Does Not Come On", AT-110.

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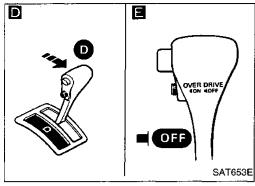
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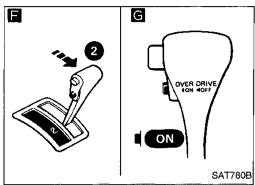
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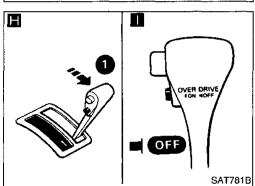
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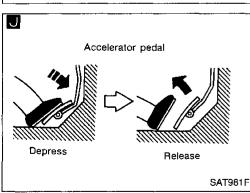
**AT-27** 

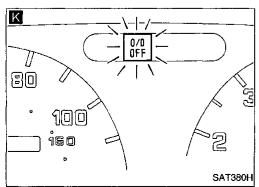
## Self-diagnosis (Cont'd)













- 1. Turn ignition switch to "OFF" position.
- 2. Turn ignition switch to "ON" position (Do not start engine.)
- 3. Move selector lever to "D" position.
- 4. Turn ignition switch to "OFF" position.
- Set overdrive control switch to "OFF" position.
- Turn ignition switch to "ON" position (Do not start engine.)
- Wait for more than 2 seconds after ignition switch "ON".

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- 1. Move selector lever to "2" position.
- Set overdrive control switch in "ON" position.

Move selector lever to "1" position. Set overdrive control switch in "OFF" position.

J

Depress accelerator pedal fully and release it.

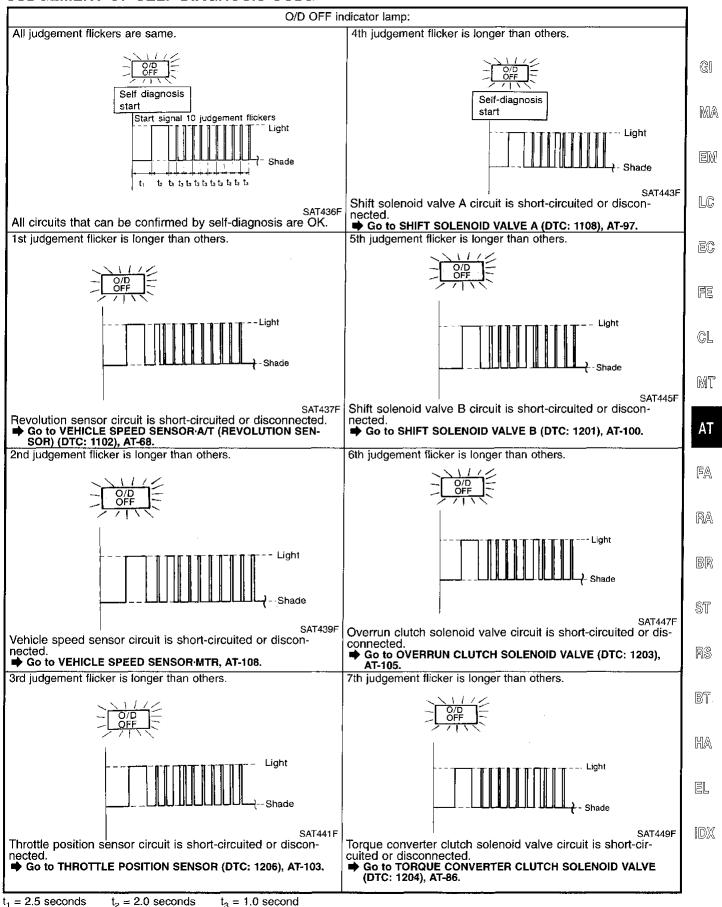
K

Check O/D OFF indicator lamp. Refer to JUDGEMENT OF SELF-DIAG-NOSIS CODE on next page.

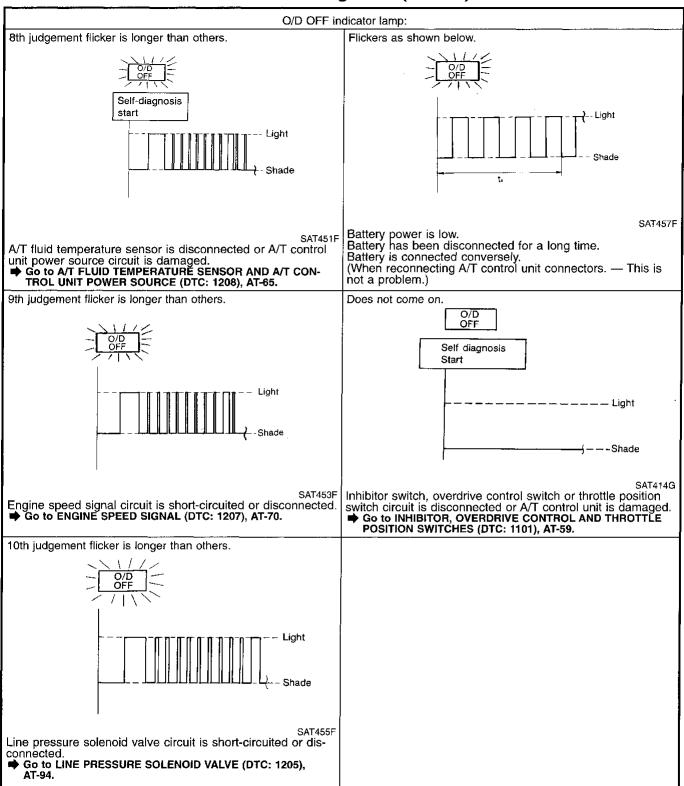
DIAGNOSIS END

## Self-diagnosis (Cont'd)

### JUDGEMENT OF SELF-DIAGNOSIS CODE



## Self-diagnosis (Cont'd)



 $t_4 = 1.0$  second

## Diagnosis by CONSULT

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### **NOTICE**

- 1. The CONSULT electrically displays shift timing and lock-up timing (that is, operation timing of each sole-noid).
  - Check for time difference between actual shift timing and the CONSULT display. If the difference is noticeable, mechanical parts (except solenoids, sensors, etc.) may be malfunctioning. Check mechanical parts using applicable diagnostic procedures.
- 2. Shift schedule (which implies gear position) displayed on CONSULT and that indicated in Service Manual may differ slightly. This occurs because of the following reasons:
  - Actual shift schedule has more or less tolerance or allowance,
  - · Shift schedule indicated in Service Manual refers to the point where shifts start, and
  - Gear position displayed on CONSULT indicates the point where shifts are completed.
- 3. Shift solenoid valve "A" or "B" is displayed on CONSULT at the start of shifting. Gear position is displayed upon completion of shifting (which is computed by A/T control unit).
- 4. Additional CONSULT information can be found in the Operation Manual supplied with the CONSULT unit.

# SELF-DIAGNOSTIC RESULT TEST MODE Refer to AT-26.

### DATA MONITOR DIAGNOSTIC TEST MODE

|   |                                  | Monit                   | or item         |   |   | · Gl     |
|---|----------------------------------|-------------------------|-----------------|---|---|----------|
| Item  | Display                          | ECU<br>input<br>signals | Main<br>signals | Description   | Remarks   | Wī       |
| Vehicle speed sensor 1 (A/T)<br>(Revolution sensor) | VHCL/S SE·A/T<br>[km/h] or [mph] | х                       |                 | Vehicle speed computed from<br>signal of revolution sensor is<br>displayed.                                     | When racing engine in "N" or "P" position with vehicle stationary, CONSULT data may not indicate 0 km/h (0 mph).                        | AT       |
| Vehicle speed sensor 2<br>(Meter)                   | VHCL/S SE-MTR<br>[km/h] or [mph] | x                       | _               | Vehicle speed computed from<br>signal of vehicle speed sensor<br>is displayed.                                  | Vehicle speed display may not be accurate under approx. 10 km/h (6 mph). It may not indicate 0 km/h (0 mph) when vehicle is stationary. | FA<br>RA |
| Throttle position sensor                            | THRTL POS SEN                    | х                       | _               | Throttle position sensor signal voltage is displayed.   |   | 1 12774  |
| A/T fluid temperature sensor                        | FLUID TEMP SEN<br>[V]            | X                       |                 | A/T fluid temperature sensor signal voltage is displayed.     Signal voltage lowers as fluid temperature rises. |   | BR<br>ST |
| Battery voltage                                     | BATTERY VOLT [V]                 | х                       | _               | Source voltage of control unit is displayed.  |   | 9"       |
| Engine speed  | ENGINE SPEED<br>[rpm]            | x                       | X               | Engine speed, computed from<br>engine speed signal, is dis-<br>played.  | Engine speed display may not be accurate under approx. 800 rpm. It may not indicate 0 rpm even when engine is not running.              | RS       |
| Overdrive control switch                            | OVERDRIVE SW<br>[ON/OFF]         | ×                       | _               | ON/OFF state computed from<br>signal of overdrive control SW<br>is displayed.                                   |   | BT       |
| P/N position switch                                 | P/N POSI SW<br>[ON/OFF]          | х                       | _               | ON/OFF state computed from<br>signal of P/N position SW is<br>displayed.  |   | HA       |
| R position switch                                   | R POSITION SW<br>[ON/OFF]        | х                       |                 | ON/OFF state computed from<br>signal of R position SW is dis-<br>played.  |   |          |
| D position switch                                   | D POSITION SW<br>[ON/OFF]        | ×                       | _               | ON/OFF state computed from<br>signal of D position SW is dis-<br>played.  |   | [DX      |
| 2 position switch                                   | 2 POSITION SW<br>[ON/OFF]        | х                       | <u> </u>        | ON/OFF status, computed from<br>signal of 2 position SW, is dis-<br>played.                                     |   |          |

AT-31 643

# Diagnosis by CONSULT (Cont'd)

| ION/OFF    X   |  |                           |        |              | •  |  |
|--|--|---------------------------|--------|--------------|--|--|
| 1 position switch   1 POSITION SW   1 position switch   1 POSITION SW   1 position switch   1 POSITION SW   1 position switch   2 position switc   |  |                           | Monite | or item      |  |  |
| ASCD-cruises signal  ASCD-cruises signal  ASCD-cruises signal  ASCD-cruises signal  ASCD-cruises signal  ASCD-cruises signal  ASCD-cruises signal  ASCD-cruises signal is Status of ASCD cruises signal is displayed.  ASCD-OD cut signed  ASCD-OD cut signed  ASCD-OD cut signed  ASCD-OD cut signed  ASCD-Cruises signal is displayed.  ASCD-OD cut signed  ASCD-Cruises signal is displayed.  ASCD-OD cut signed  Conv. OD released  OFF OD not released  OFF ON OFF status, computed from signal of closed throtte penaltic from schelling to released  OFF ON OFF status, comput   | ltem   | Display                   | input  |              | Description  | Remarks  |
| ION/OFF    X   | 1 position switch  | 1                         | x      | _            | signal of 1 position SW, is dis-                             |  |
| ION/OFF    X   | ASCD-cruise signal   |                           | Х      | <u> </u>     | displayed. ON Cruising state                                 | This is displayed even when no<br>ASCD is mounted.   |
| Closed throttle position switch   CLOSED THL/SW   DN/OFF   Status, computed from signal of closed throttle position switch   CLOSED THL/SW   DN/OFF   Status, computed from signal of closed throttle position   SW, is displayed.   CoN/OFF status, computed from signal of closed throttle position   SW, is displayed.   CoN/OFF status, computed from signal of wide open throttle position   SW, is displayed.   CoN/OFF status, computed from signal of wide open throttle position   SW, is displayed.   CoN/OFF status, computed from signal of wide open throttle position   SW, is displayed.   Control wall used for computation by control unit, is displayed.   Control wall used for computation by control unit, is displayed.   A specific value used for computation by control unit, is displayed.   A specific value used for computation by control unit, is displayed.   A specific value used for computation by control unit, is displayed.   A specific value used for computation by control unit, is displayed.   A specific value used for computation by control unit, is displayed.   A specific value used for computation by control unit, is displayed.   A specific value used for computation by control unit, is displayed.   A specific value used for computation by control unit, is displayed.   A specific value used for computation by control unit, is displayed.   A specific value used for computation by control unit, is displayed.   A specific value used for computation by control unit, is displayed.   A specific value used for computation by control unit, is displayed.   A specific value used for computation by control unit, is displayed.   A specific value used for computation by control unit, is displayed.   A specific value used for computation by control unit, is displayed.   A specific value used for computation by control unit, is displayed.   A specific value used for computation by control unit, is displayed.   A specific value used for computation by control unit, is displayed.   A specific value used for computation by contr   | ASCD-OD cut signal   | 1                         | х      | _            | signal is displayed.<br>ON OD released                       | This is displayed even when no<br>ASCD is mounted.   |
| Mide open throttle position switch   W/O THRUP-SW [ON/OFF]   X   | Kickdown switch  |                           | х      |              | signal of kickdown SW, is dis-                               | This is displayed even when no kickdown switch is equipped.                                    |
| Gear position  GEAR  GEAR  GEAR  Selector lever position  Selector lever position  Selector lever position  Selector lever position  Selector lever position  Selector lever position  Selector lever position  Selector lever position  Selector lever position  Selector lever position  Selector lever position  Selector lever position  Selector lever position  Selector lever position  Selector lever position  Selector lever position  Selector lever position  Selector lever position data used for computation by control unit, is displayed.  Selector lever position data, used for computation by control unit, is displayed.  Vehicle speed data, used for computation by control unit, is displayed.  Throttle position  THROTTLE POSI [/8]  THROTTLE POSI [/8]  Selector lever position data, used for computation by control unit, is displayed.  Throttle position data, used for computation by control unit, is displayed.  Throttle position data used for computation by control unit, is displayed.  Throttle position  THROTTLE POSI [/8]  Throttle position data used for computation by control unit, is displayed.  Throttle position data used for computation by control unit, is displayed.  **A specific value used for computation by control unit, is displayed.  **A specific value used for computation by control unit, is displayed.  **A specific value used for computation by control unit, is displayed.  **A specific value used for computation by control unit, is displayed.  **A specific value used for computation by control unit is displayed.  **A specific value used for computation by control unit is displayed.  **A specific value used for computation by control unit is displayed.  **A specific value used for computation by control unit is displayed.  **A specific value used for computation by control unit is displayed.  **A specific value used for computation by control unit is displayed.  **A specific value used for computation by control unit is displayed.  **A specific value used for computation by control unit from each input signal, | Closed throttle position switch  | Į.                        | х      | _            | signal of closed throttle position                           |  |
| Selector lever position  SLCT LVR POSI  Selector lever position by control unit, is displayed.  Selector lever position data, used for computation by control unit, is displayed.  VEHICLE SPEED [km/h] or [mph]  WEHICLE SPEED [km/h] or [mph]  Throttle position  THROTTLE POSI [/8]  THROTTLE POSI [/8]  Throttle position  THROTTLE POSI [/8]  Throttle position  TIROTTLE POSI [/8]  Throttle position data, used for computation by control unit, is displayed.  Throttle position  THROTTLE POSI [/8]  Throttle position data, used for computation by control unit, is displayed.  Throttle position data, used for computation by control unit, is displayed.  Throttle position data, used for computation by control unit, is displayed.  Throttle position data, used for computation by control unit, is displayed.  Throttle position data, used for computation by control unit, is displayed.  Throttle position data, used for computation by control unit, is displayed.  Throttle position data, used for computation by control unit, is displayed.  Throttle position data, used for computation by control unit, is displayed.  Throttle position data, used for computation by control unit, is displayed.  Throttle position data, used for computation by control unit, is displayed.  Throttle position data, used for computation by control unit, is displayed.  Throttle position data, used for computed by control unit, is displayed.  Throttle position data, used for computed by control unit from each input signal, is displayed.  Throttle position data, used for computed by control unit from each input signal, is displayed.  Throttle position data, used for computed by control unit from each input signal, is displayed.  Throttle position data, used for computed by control unit from each input signal, is displayed.  Throttle position data, used for computed by control unit from each input signal, is displayed.  Throttle position data, used for computed by control unit from each input signal, is displayed.  Throttle position data, used for control unit fro | Wide open throttle position switch   |                           | X      | <del>-</del> | signal of wide open throttle                                 |  |
| Vehicle speed  VEHICLE SPEED [km/h] or [mph]  Throttle position  THROTTLE POSI [/8]  Line pressure duty  LINE PRES DTY [%]  Torque converter clutch solencid valve duty  Shift solencid valve A [ON/OFF]  Shift solencid valve B  Shift solencid valve B  Shift solencid valve B  Shift solencid valve B  VEHICLE SPEED [km/h] or [mph]  VEHICLE SPEED [km/h] or [mph]  - X  Vehicle speed data, used for computation by control unit, is displayed.  Vehicle speed data, used for computation by control unit, is displayed.  Throttle position data, used for computation by control unit, is displayed.  * A specific value used to rompute dutor line pressure solencid valve, computed by control unit from each input signal, is displayed.  * Control value of torque converter clutch solencid valve, computed by control unit from each input signal, is displayed.  * Control value of shift solencid valve, computed by control unit from each input signal, is displayed.  * Control value of shift solencid valve A, computed by control unit from each input signal, is displayed.  * Control value of shift solencid valve A, computed by control unit from each input signal, is displayed.  * Control value of shift solencid valve B, computed by control unit from each input signal, is displayed.  * Control value of shift solencid valve B, computed by control unit from each input signal, is displayed.  * Control value of shift solencid valve B, computed by control unit from each input signal, is displayed.  * Control value of shift solencid valve B, computed by control unit from each input signal, is displayed.  | Gear position  | GEAR                      |        | Х            | computation by control unit, is                              |  |
| Throttle position  | Selector lever position  | SLCT LVR POSI             | _      | х            | used for computation by control                              | A specific value used for con-<br>trol is displayed if fail-safe is<br>activated due to error. |
| Eline pressure duty  | Vehicle speed  |                           |        | X            | computation by control unit, is                              |  |
| [%] X solenoid valve, computed by control unit from each input signal, is displayed.  Torque converter clutch solenoid valve duty  Torque converter clutch solenoid valve, computed by control unit from each input signal, is displayed.  Shift solenoid valve A  SHIFT S/V A  [ON/OFF] X  Shift solenoid valve B  SHIFT S/V B  [ON/OFF] X  Solenoid valve, computed by control unit from each input signal, is displayed.  Control value of shift solenoid valve A, computed by control unit from each input signal, is displayed.  Control value of solenoid valve A, computed by control unit from each input signal, is displayed.  Control value of shift solenoid valve B, computed by control unit from each input signal, is displayed.   | Throttle position  |                           | _      | X            | computation by control unit, is                              | A specific value used for con-<br>trol is displayed if fail-safe is<br>activated due to error. |
| Valve duty  [%] — X verter clutch solenoid valve, computed by control unit from each input signal, is displayed.  Shift solenoid valve A [ON/OFF] — X  Shift solenoid valve B [ON/OFF] — X  Shift solenoid valve B [ON/OFF] — X  Verter clutch solenoid valve, computed by control unit from each input signal, is displayed.  Control value of shift solenoid valve by control unit from each input signal, is displayed.  Control value of shift solenoid valve of shift solenoid valve by control unit from each input signal, is displayed.  | Line pressure duty   |                           | _      | Х            | solenoid valve, computed by control unit from each input     |  |
| Control value B   Control value B   Control value B   Control value B   Control value of shift solenoid valve B   Control value of shift solenoid valve B, computed by control value of shift solenoid valve B, computed by control unit from each input signal, is displayed.   | , ' ,  | FA. 7                     |        | Х            | verter clutch solenoid valve, computed by control unit from  |  |
| Shift solehold valve B  [ON/OFF]  X  Control value of shift solehold valve B, computed by control unit from each input signal, is displayed.   | Shift solenoid valve A   |                           | -      | х            | valve A, computed by control unit from each input signal, is | The "OFF" signal is displayed if   |
| Oversity states expensely solve. OVERDI IN/C SM  | Shift solenoid valve B   |                           |        | x            | valve B, computed by control unit from each input signal, is | solenoid circuit is shorted.   |
| Overrun clutch solenoid valve  OVERHON/C S/V  [ON/OFF]  X  Control value of overrun clutch solenoid valve computed by control unit from each input signal is displayed.  | Overrun clutch solenoid valve  | OVERRUN/C S/V<br>[ON/OFF] |        | х            | control unit from each input sig-                            |  |
| Self-diagnosis display lamp (O/D OFF indicator lamp)  SELF-D DP LMP  [ON/OFF]   X  Control status of O/D OFF indicator lamp is displayed.  | The state of the s |                           | _      | Х            |  |  |

644 **AT-32** 

X: Applicable
—: Not applicable

# Diagnosis by CONSULT (Cont'd)

### **DATA ANALYSIS**

| Item   | Disp    | lay form                        | Mea  | ining |  |
|--|---------|---------------------------------|--|-------|--|
| Torque converter clutch sole-<br>noid valve duty | . ,     | imately 4%<br>↓<br>mately 94%   | Lock-up "OFF"<br>↓<br>Lock-up "ON"   |       |  |
| Line pressure solenoid valve duty                | • .     | mately 24%<br>↓<br>mately 95%   | Low line-pressure (Small throttle opening) ↓ High line-pressure (Large throttle opening) |       |  |
| Throttle position sensor                         | Approxi | mately 0.5V                     | Fully-closed throttle  |       |  |
| Throttle position sensor                         | Approx  | imately 4V                      | Fully-open throttle  |       |  |
| A/T fluid temperature sensor                     |         | mately 1.5V<br>↓<br>mately 0.5V | Cold [20°C (68°F)]<br>↓<br>Hot [80°C (176°F)]  |       |  |
| Gear position                                    | †       | 2                               | 3  | 4     |  |
| Shift solenoid valve A                           | ON      | OFF                             | OFF  | ON    |  |
| Shift solenoid valve B                           | ON      | ON                              | OFF  | OFF   |  |

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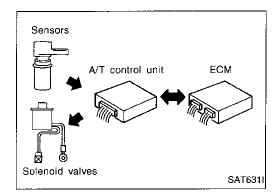
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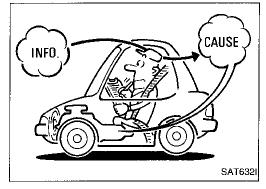
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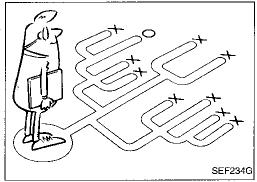
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### TROUBLE DIAGNOSIS — Introduction







### Introduction

The A/T control unit receives a signal from the vehicle-speed sensor, throttle position sensor or inhibitor switch and provides shift control or lock-up control via A/T unit solenoid valves.

The A/T control unit also communicates with the ECM by means of a signal sent from sensing elements used with the OBD-related parts of the A/T system for malfunction-diagnostic purposes. The A/T control unit is capable of diagnosing malfunctioning parts while the ECM can store malfunctions in its memory.

Input and output signals must always be correct and stable in the operation of the A/T system. The A/T system must be in good operating condition and be free of valve seizure, solenoid valve malfunction, etc.

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. A road test with CONSULT (or GST) or a circuit tester connected should be performed. Follow the "Work Flow". Refer to AT-38.

Before undertaking actual checks, take a few minutes to talk with a customer who approaches with a driveability complaint. The customer can supply good information about such problems, especially intermittent ones. Find out what symptoms are present and under what conditions they occur. A "Diagnostic Worksheet" like the example (AT-36) should be used.

Start your diagnosis by looking for "conventional" problems first. This will help troubleshoot driveability problems on an electronically controlled engine vehicle.

AT-34 646

## **Diagnostic Worksheet**

## **INFORMATION FROM CUSTOMER**

**KEY POINTS** 

WHAT ..... Vehicle & A/T model WHEN ..... Date, Frequencies WHERE ..... Road conditions

**HOW** ..... Operating conditions, Symptoms

| Customer name MR/MS              | Model & Year   | VIN  |  |  |  |
|----------------------------------|--|--|--|--|--|
| Trans. model<br>RE4F04A/V        | Engine<br>VQ30DE   | Mileage  |  |  |  |
| Incident Date                    | Manuf. Date  | In Service Date  |  |  |  |
| Frequency                        | ☐ Continuous ☐ Intermittent                                      | ( times a day)   |  |  |  |
| Symptoms                         | ☐ Vehicle does not move. (☐ Any position ☐ Particular position)  |  |  |  |  |
|                                  | $\square$ No up-shift ( $\square$ 1st $ ightarrow$ 2nd $\square$ | $\square$ 2nd $\rightarrow$ 3rd $\square$ 3rd $\rightarrow$ O/D) |  |  |  |
|                                  | $\square$ No down-shift ( $\square$ O/D $\rightarrow$ 3rd        | $\square$ 3rd $\rightarrow$ 2nd $\square$ 2nd $\rightarrow$ 1st) |  |  |  |
|                                  | ☐ Lockup malfunction   |  |  |  |  |
|                                  | ☐ Shift point too high or too low.                               |  |  |  |  |
|                                  | $\square$ Shift shock or slip ( $\square$ N $\rightarrow$ D      | □ Lockup □ Any drive position)                                   |  |  |  |
|                                  | ☐ Noise or vibration   |  |  |  |  |
|                                  | □ No kickdown  |  |  |  |  |
|                                  | □ No pattern select  |  |  |  |  |
|                                  | ☐ Others   |  |  |  |  |
|                                  | (  | )  |  |  |  |
| O/D OFF indicator lamp           | Blinks for about 8 seconds.                                      |  |  |  |  |
|                                  | ☐ Continuously lit   | □ Not lit  |  |  |  |
| Malfunction indicator lamp (MIL) | □ Continuously lit   | □ Not lit  |  |  |  |

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# TROUBLE DIAGNOSIS — Introduction

# Diagnostic Worksheet (Cont'd)

## **DIAGNOSTIC WORKSHEET**

| 1. | ☐ Read the Fail-safe and listen to customer complaints.   | AT-8   |
|----|---|--------|
| 2. | ☐ CHECK A/T FLUID   | AT-39  |
|    | <ul><li>☐ Leakage (Follow specified procedure)</li><li>☐ Fluid condition</li><li>☐ Fluid level</li></ul>  |        |
| 3. | ☐ Perform all ROAD TEST and mark required procedures.   | AT-39  |
|    | 3-1. Check before engine is started   | AT-40  |
|    | ☐ SELF-DIAGNOSTIC PROCEDURE — Mark detected items.  |        |
|    | <ul> <li>Inhibitor, overdrive control and throttle position switches, AT-59.</li> <li>A/T fluid temperature sensor and A/T control unit power source, AT-65.</li> <li>Vehicle speed sensor·A/T (Revolution sensor), AT-68.</li> <li>Engine speed signal, AT-70.</li> <li>Torque converter clutch solenoid valve, AT-86.</li> <li>Line pressure solenoid valve, AT-94.</li> <li>Shift solenoid valve A, AT-97.</li> <li>Shift solenoid valve B, AT-100.</li> <li>Throttle position sensor, AT-103.</li> <li>Overrun clutch solenoid valve, AT-105.</li> <li>Vehicle speed sensor·MTR, AT-108.</li> <li>Battery</li> <li>Others</li> </ul>  |        |
|    | 3-2. Check at idle  | AT-41  |
|    | <ul> <li>□ 1. O/D OFF Indicator Lamp Does Not Come On, AT-110.</li> <li>□ 2. Engine Cannot Be Started In "P" And "N" Position, AT-111.</li> <li>□ 3. In "P" Position, Vehicle Moves Forward Or Backward When Pushed, AT-111.</li> <li>□ 4. In "N" Position, Vehicle Moves, AT-112.</li> <li>□ 5. Large Shock. "N" → "R" Position, AT-113.</li> <li>□ 6. Vehicle Does Not Creep Backward In "R" Position, AT-114.</li> <li>□ 7. Vehicle Does Not Creep Forward In "D", "2" Or "1" Position, AT-115.</li> </ul>   |        |
|    | 3-3. Cruise test  | AT-42, |
|    | Part-1 $\square$ 8. Vehicle Cannot Be Started From D <sub>1</sub> , AT-116. $\square$ 9. A/T Does Not Shift: D <sub>1</sub> $\rightarrow$ D <sub>2</sub> Or Does Not Kickdown: D <sub>4</sub> $\rightarrow$ D <sub>2</sub> , AT-117. $\square$ 10. A/T Does Not Shift: D <sub>2</sub> $\rightarrow$ D <sub>3</sub> , AT-118. $\square$ 11. A/T Does Not Shift: D <sub>3</sub> $\rightarrow$ D <sub>4</sub> , AT-119. $\square$ 12. A/T Does Not Perform Lock-up, AT-120. $\square$ 13. A/T Does Not Hold Lock-up Condition, AT-121. $\square$ 14. Lock-up Is Not Released, AT-121. $\square$ 15. Engine Speed Does Not Return To Idle (Light Braking D <sub>4</sub> $\rightarrow$ D <sub>3</sub> ), AT-122. | AT-45  |

648

# TROUBLE DIAGNOSIS — Introduction

# Diagnostic Worksheet (Cont'd)

| 3. |  |                | •                      |
|----|--|----------------|------------------------|
|    | Part-2   | AT-47          |                        |
|    | □ 16. Vehicle Does Not Start From D <sub>1</sub> , AT-123. □ 9. A/T Does Not Shift: D <sub>1</sub> $\rightarrow$ D <sub>2</sub> Or Does Not Kickdown: D <sub>4</sub> $\rightarrow$ D <sub>2</sub> , AT-117.  |                | (E                     |
|    | $\square$ 10. A/T Does Not Shift: $D_2 \rightarrow D_3$ , AT-118.  |                | <u>U</u>               |
|    | ☐ 11. A/T Does Not Shift: $D_3 \rightarrow D_4$ , AT-119.  Part-3  | AT-48          | 0.07                   |
|    | $\square$ 17. A/T Does Not Shift: $D_4 \rightarrow D_3$ When Overdrive Control Switch "ON" $\rightarrow$   | A1-40          | M/                     |
|    | "OFF", AT-123  ☐ 15. Engine Speed Does Not Return To Idle (Engine Brake In D <sub>3</sub> ), AT-122.   |                | ren                    |
|    | □ 13. Engine Speed Does Not Return to ldie (Engine Brake in $D_3$ ), A1-122.<br>□ 18. A/T Does Not Shift: $D_3 \rightarrow 2_2$ , When Selector Lever "D" $\rightarrow$ "2" Position, AT-124.  |                |                        |
|    | <ul> <li>☐ 15. Engine Speed Does Not Return To Idle (Engine Brake In 2<sub>2</sub>), AT-122.</li> <li>☐ 19. A/T Does Not Shift: 2<sub>2</sub> → 1<sub>1</sub>, When Selector Lever "2" → "1" Position, AT-124.</li> </ul>  |                | 10                     |
|    | <ul> <li>20. Vehicle Does Not Decelerate By Engine Brake, AT-125.</li> <li>SELF-DIAGNOSTIC PROCEDURE — Mark detected items.</li> </ul>   |                | EC                     |
|    | ☐ Inhibitor, overdrive control and throttle position switches, AT-59.  |                |                        |
|    | <ul> <li>□ A/T fluid temperature sensor and A/T control unit power source, AT-65.</li> <li>□ Vehicle speed sensor·A/T (Revolution sensor), AT-68.</li> <li>□ Engine eneed signal, AT-70.</li> </ul>  |                | FE                     |
|    | <ul><li>Engine speed signal, AT-70.</li><li>Torque converter clutch solenoid valve, AT-86.</li></ul>   |                | ©L                     |
|    | <ul><li>□ Line pressure solenoid valve, AT-94.</li><li>□ Shift solenoid valve A, AT-97.</li></ul>  |                |                        |
|    | ☐ Shift solenoid valve B, AT-100.  |                | Mī                     |
|    | <ul><li>☐ Throttle position sensor, AT-103.</li><li>☐ Overrun clutch solenoid valve, AT-105.</li></ul>   |                |                        |
|    | ☐ Vehicle speed sensor·MTR, AT-108.  | J              | ΑT                     |
|    | □ Battery<br>□ Others  |                |                        |
| 4. | ☐ For self-diagnosis NG items, inspect each component. Repair or replace the damaged parts.  | AT-26          | FA                     |
| 5. | ☐ Perform all ROAD TEST and re-mark required procedures.   |                |                        |
| 6. | ☐ Perform SELF-DIAGNOSIS for following MIL indicating items and check out NG   | EÇ             | RA                     |
|    | items. Refer to EC section ["Emission-related Diagnostic Information", "ON BOARD   | section        |                        |
|    | DIAGNOSTIC SYSTEM DESCRIPTION].  |                | 86                     |
|    | <ul> <li>□ DTC (P0731, 1103) Improper shifting to 1st gear position, AT-72.</li> <li>□ DTC (P0732, 1104) Improper shifting to 2nd gear position, AT-75.</li> </ul>   |                |                        |
|    | ☐ DTC (P0733, 1105) Improper shifting to 3rd gear position, AT-78.   |                | ST                     |
| i  | <ul> <li>□ DTC (P0734, 1106) Improper shifting to 4th gear position, AT-81.</li> <li>□ DTC (P0744, 1107) Improper lock-up operation, AT-89.</li> </ul>   |                |                        |
|    | L DIO (LOTT, LIOT) IMPROPELION-UP OPERATION, ALTOS.  |                |                        |
| 7. | ☐ Perform the Diagnostic Procedures for all remaining items marked NG. Repair or   | AT-55          | RS                     |
| 7. | □ Perform the Diagnostic Procedures for all remaining items marked NG. Repair or replace the damaged parts.  | AT-55<br>AT-52 | RS                     |
| 7. | replace the damaged parts.  Refer to the Symptom Chart when you perform the procedures. (The chart also  |                | RS<br>BT               |
| 7. | replace the damaged parts.   |                |                        |
| 8. | replace the damaged parts. Refer to the Symptom Chart when you perform the procedures. (The chart also shows some other possible symptoms and the component inspection orders.)  | AT-52          |                        |
| 8. | replace the damaged parts. Refer to the Symptom Chart when you perform the procedures. (The chart also shows some other possible symptoms and the component inspection orders.)  □ Erase DTC from A/T control unit and ECM memories.   | AT-52<br>AT-24 | 87                     |
| 8. | replace the damaged parts. Refer to the Symptom Chart when you perform the procedures. (The chart also shows some other possible symptoms and the component inspection orders.)  Erase DTC from A/T control unit and ECM memories.  Perform FINAL CHECK.  Stall test — Mark possible damaged components/others.  Torque converter one-way clutch  Low & reverse brake  | AT-52<br>AT-24 | BT<br>HA               |
| 8. | replace the damaged parts. Refer to the Symptom Chart when you perform the procedures. (The chart also shows some other possible symptoms and the component inspection orders.)  Erase DTC from A/T control unit and ECM memories.  Perform FINAL CHECK.  Stall test — Mark possible damaged components/others.  Torque converter one-way clutch  Reverse clutch   | AT-52<br>AT-24 | B1                     |
| 8. | replace the damaged parts. Refer to the Symptom Chart when you perform the procedures. (The chart also shows some other possible symptoms and the component inspection orders.)  Erase DTC from A/T control unit and ECM memories.  Perform FINAL CHECK.  Stall test — Mark possible damaged components/others.  Torque converter one-way clutch Reverse clutch Reverse clutch Forward clutch Stall test — Mark possible damaged components/others.  Engine Overrun clutch Low & reverse brake Engine Coverrun clutch Line pressure is low | AT-52<br>AT-24 | 81<br>H <i>A</i><br>El |
| 8. | replace the damaged parts. Refer to the Symptom Chart when you perform the procedures. (The chart also shows some other possible symptoms and the component inspection orders.)  Erase DTC from A/T control unit and ECM memories.  Perform FINAL CHECK.  Stall test — Mark possible damaged components/others.  Torque converter one-way clutch  Reverse clutch  Reverse clutch  Engine   | AT-52<br>AT-24 | 87                     |

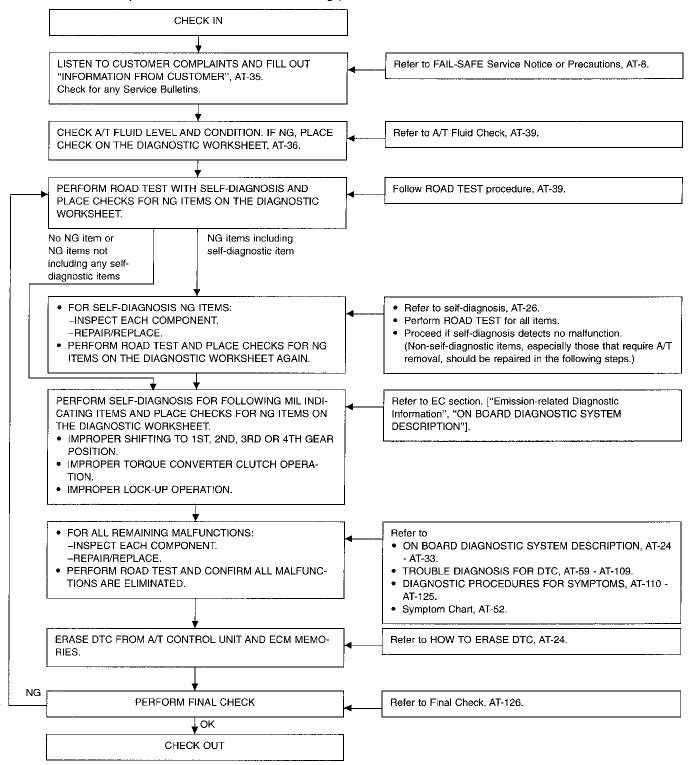
**AT-37** 649

### **Work Flow**

### HOW TO PERFORM TROUBLE DIAGNOSES FOR QUICK AND ACCURATE REPAIR

A good understanding of the malfunction conditions can make troubleshooting faster and more accurate. In general, each customer feels differently about a problem. It is important to fully understand the symptoms or conditions for a customer complaint.

Make good use of the two sheets provided, "INFORMATION FROM CUSTOMER" and "DIAGNOSTIC WORKSHEET", to perform the best troubleshooting possible.



AT-38 650

### A/T Fluid Check

### **FLUID LEAKAGE CHECK**

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





LC

EC

FE



### **FLUID CONDITION CHECK**

| Fluid color                                    | Suspected problem   |
|--|---|
| Dark or black with burned odor                 | Wear of frictional material   |
| Milky pink                                     | Water contamination — Road water entering through filler tube or breather |
| Varnished fluid, light to dark brown and tacky | Oxidation — Over or under filling, — Overheating                          |

### FLUID LEVEL CHECK

Refer to MA section ("Checking A/T Fluid", "CHASSIS AND BODY MAINTENANCE").

CL

MT

# Road Test

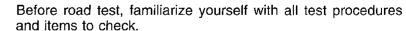
### DESCRIPTION

- The purpose of the test is to determine overall performance of A/T and analyze causes of problems.
- The road test consists of the following three parts:
- 1. Check before engine is started
- 2. Check at idle
- 3. Cruise test



ΑT

 $\mathbb{R}\mathbb{A}$ 



es BR

ST

Conduct tests on all items until specified symptom is found. Troubleshoot items which check out No Good after road test. Refer to "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION" and "DIAGNOSTIC PROCEDURES FOR SYMPTOMS", AT-24 - AT-33 and AT-110 - AT-125.

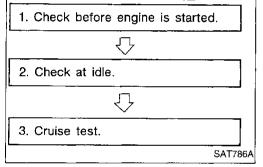
RS

BT

HA

EL

MOI



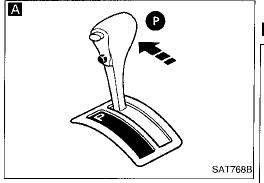
**ROAD TEST PROCEDURE** 

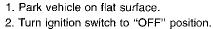


# Road Test (Cont'd)

#### 1. CHECK BEFORE ENGINE IS STARTED

#### A B





3. Move selector lever to "P" position.

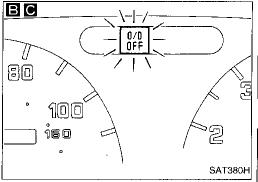
4. Set overdrive control switch to "ON" position.

Turn ignition switch to "ON" position. (Do not start engine.)

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

Yes

Go to "1. O/D OFF Indicator Lamp Does Not Come On", AT-110.



Does O/D OFF indicator lamp flicker for about 8 seconds?

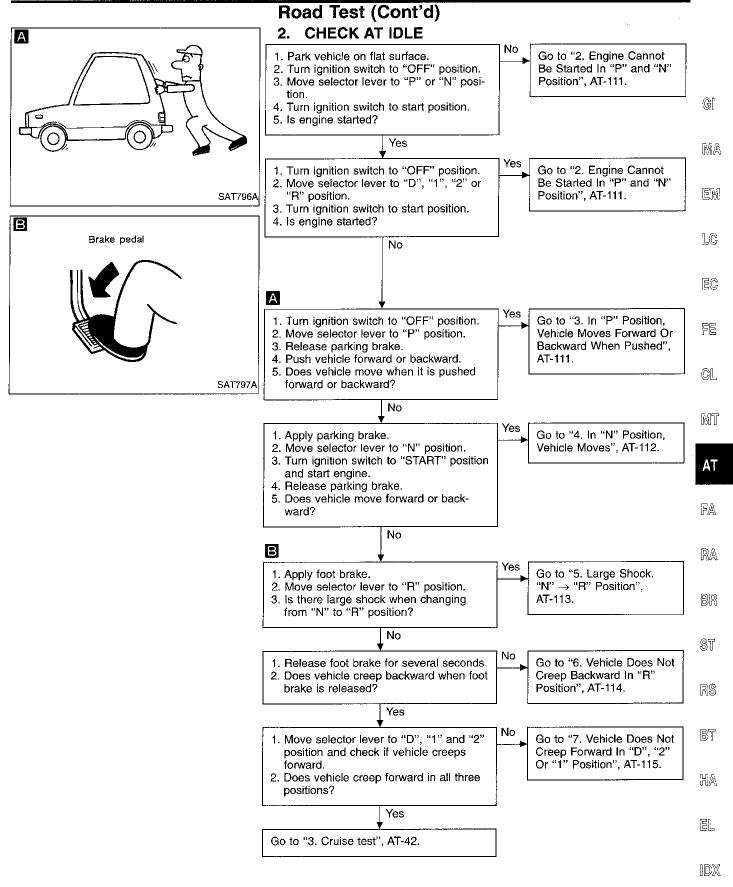
Perform self-diagnosis. Refer to SELF-DIAGNO-SIS PROCEDURE, AT-26.

Yes

- 1. Turn ignition switch to "OFF" position.
- 2. Perform self-diagnosis and note NG items.

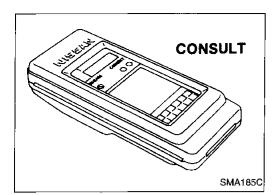
Refer to SELF-DIAGNOSIS PROCEDURE, AT-26.

3. Go to "2. Check at idle", AT-41.



AT-41

653



# Road Test (Cont'd)

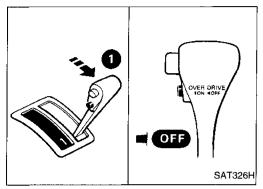
#### 3. CRUISE TEST

Check all items listed in Parts 1 through 3.



#### With CONSULT

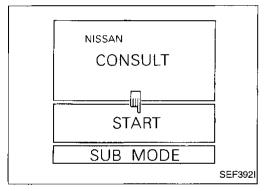
- Using CONSULT, conduct a cruise test and record the result.
- Print the result and ensure that shifts and lock-ups take place as per "Shift Schedule".



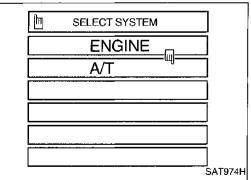
### **CONSULT** setting procedure

- 1. Turn off ignition switch.
- 2. Connect "CONSULT" to Data link connector for CONSULT.

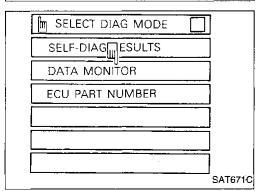
  Data link connector for CONSULT is located in instrument lower panel on driver side.



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

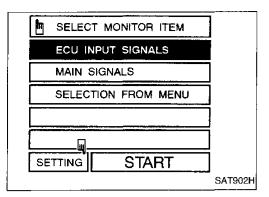


5. Touch "A/T".

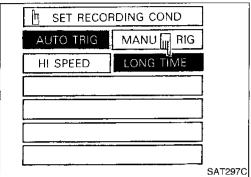


6. Touch "DATA MONITOR".

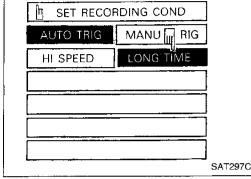
# Road Test (Cont'd)



7. Touch "SETTING" to set recording condition.



8. Touch "LONG TIME" and "ENTER" key.



Go back to SELECT MONITOR ITEM and touch "MAIN SIGNALS".

MT

EA

RA

**G** 

MA

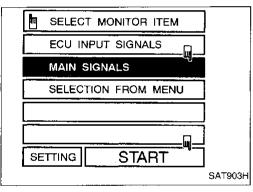
1LC

EC

FE

CL

10. Touch "START".



쇼MONITOR 쇼NO FAIL

ENGINE SPEED

SLCT LVR POSI

VEHICLE SPEED

THROTTLE POSI

LINE PRES DTY

**GEAR** 

11. When performing cruise test, touch "RECORD".

BR ST

RS

BT

4% TCC S/V DUTY SHIFT S/V A ON SHIFT S/V B ON RECORD

V

SAT071H

800rpm

0km/h

N•P

0.0/8

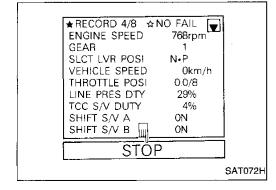
29%

12. After finishing cruise test part 1, touch "STOP".

HA

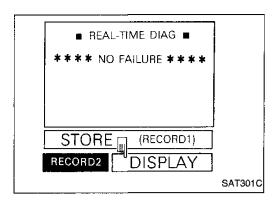
EL

DX

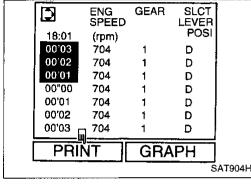


# Road Test (Cont'd)

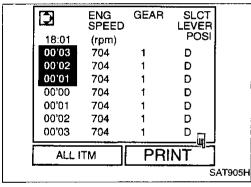
13. Touch "DISPLAY".



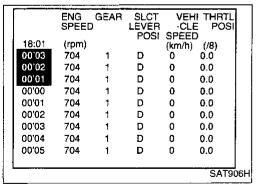
io. Todon Biol Ext



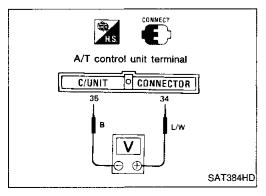
14. Touch "PRINT".



15. Touch "PRINT" again.

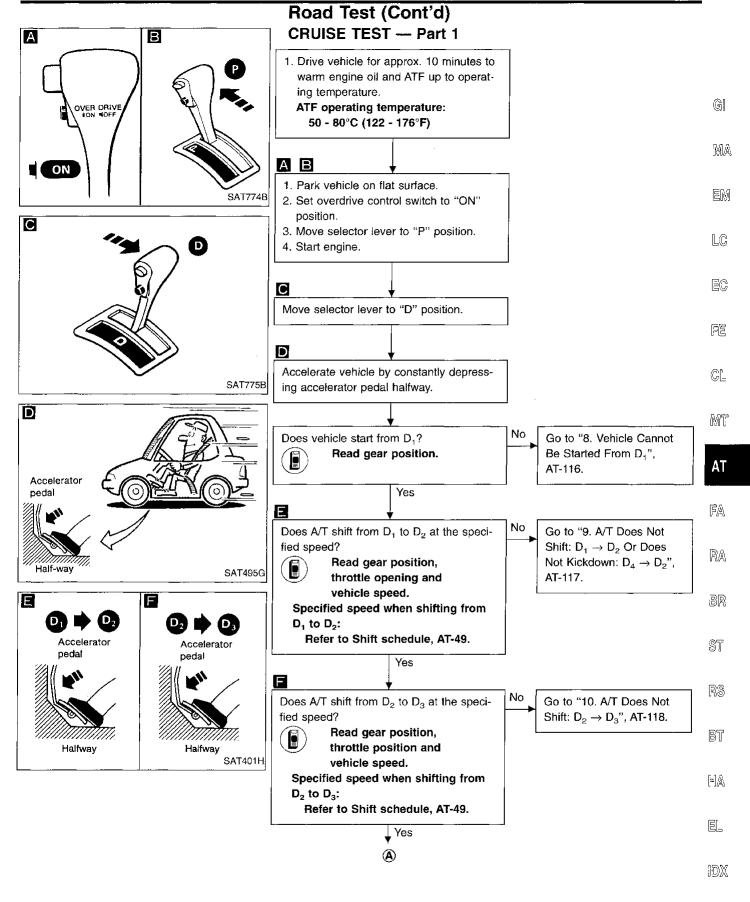


- 16. Check the monitor data printed out.
- 17. Continue cruise test part 2 and 3.

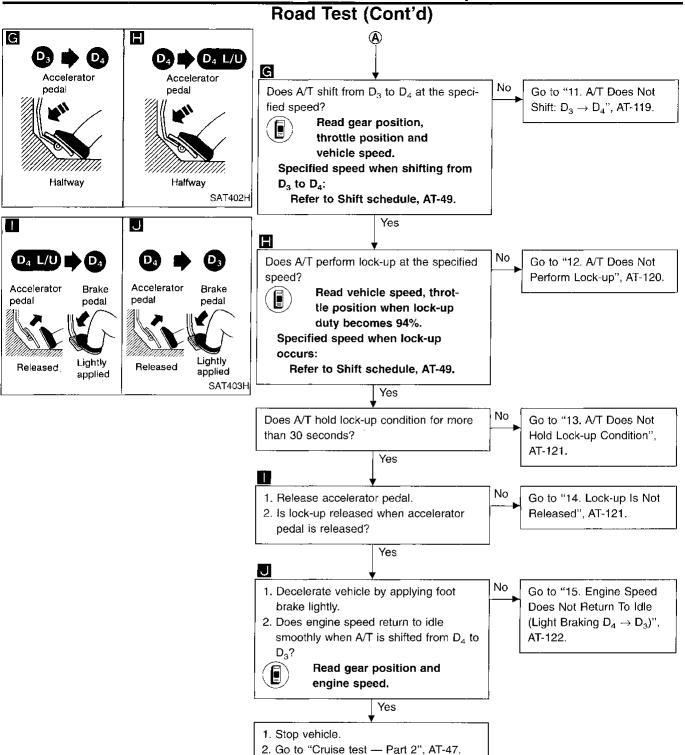


# Without CONSULT

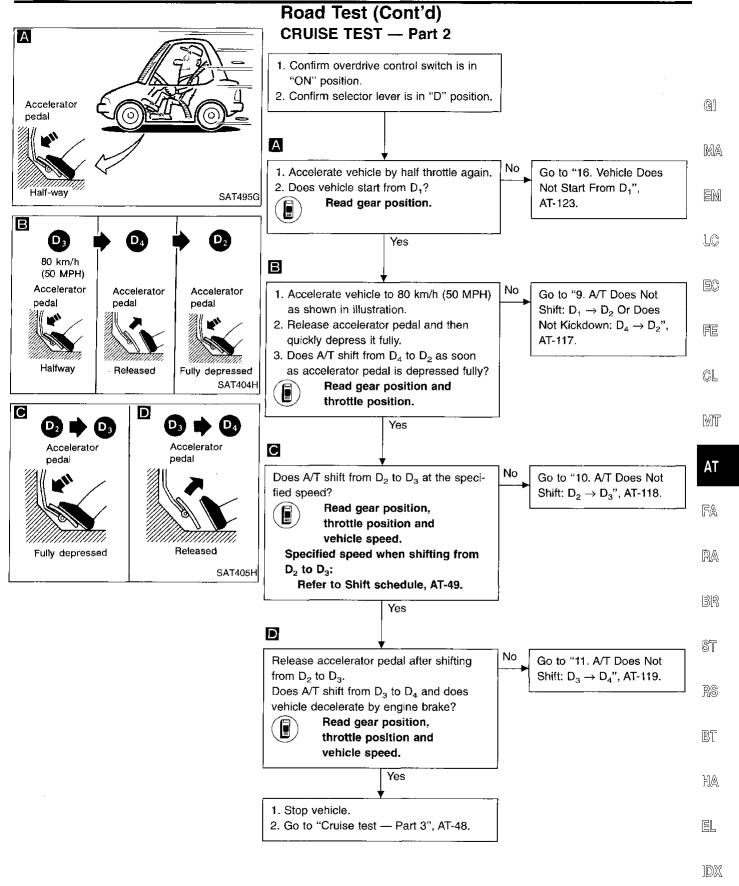
Throttle position can be checked by voltage across terminals
 and 5 of A/T control unit.

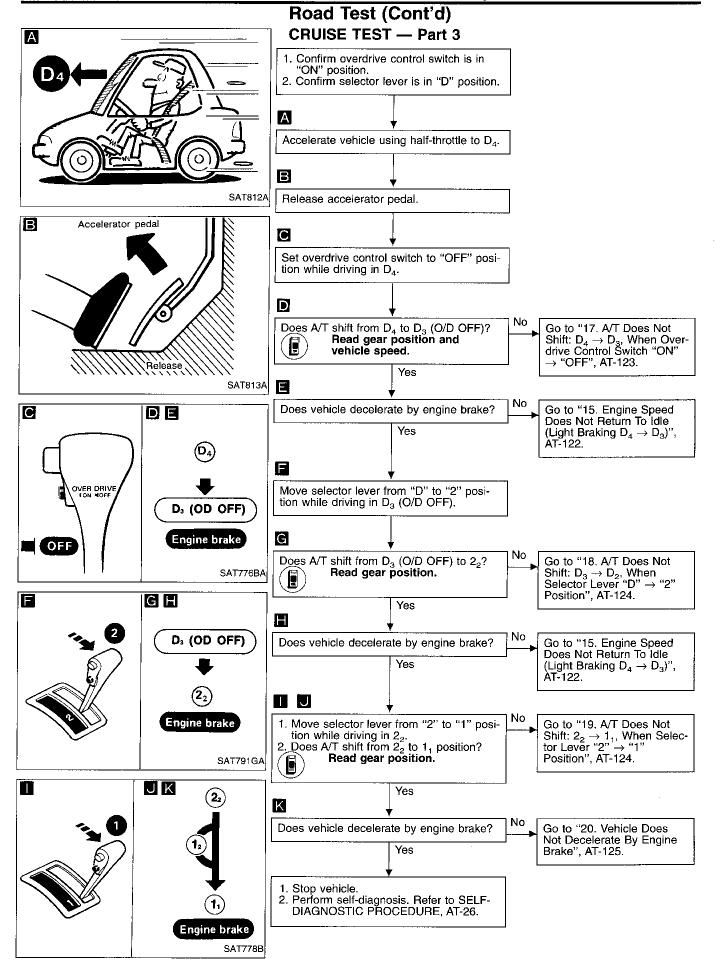


**AT-45** 657



AT-46 658





#### **Shift Schedule**

## **VEHICLE SPEED WHEN SHIFTING GEARS**

| Throttle posi-           | Shift pattern        | Vehicle speed km/h (MPH) |                                |                          |                          |                                 |                       |                                 |  |  |  |  |  |  |
|--------------------------|----------------------|--------------------------|--------------------------------|--------------------------|--------------------------|---------------------------------|-----------------------|---------------------------------|--|--|--|--|--|--|
| tion                     | Shiit pattern        | $D_1 \rightarrow D_2$    | $D_2 \rightarrow D_3$          | $D_3 \rightarrow D_4$    | $D_4 \rightarrow D_3$    | $\mathrm{D_3} \to \mathrm{D_2}$ | $D_2 \rightarrow D_1$ | 1 <sub>2</sub> → 1 <sub>1</sub> |  |  |  |  |  |  |
| C. II ale 441-           | Comfort              | 61 - 69<br>(38 - 43)     | 113 - 12 <b>1</b><br>(70 - 75) | 177 - 185<br>(110 - 115) | 173 - 181<br>(108 - 112) | 103 - 111<br>(64 - 69)          | 54 - 62<br>(34 - 39)  | 61 - 69<br>(38 - 43)            |  |  |  |  |  |  |
| Full throttle Auto power | 61 - 69<br>(38 - 43) | 113 - 121<br>(70 - 75)   | 177 - 185<br>(110 - 115)       | 173 - 181<br>(108 - 112) | 103 - 111<br>(64 - 69)   | 54 - 62<br>(34 - 39)            | 61 - 69<br>(38 - 43)  |                                 |  |  |  |  |  |  |
| I la 16 dana dala        | Comfort              | 39 - 47<br>(24 - 29)     | 73 - 81<br>(45 - 50)           | 113 - 121<br>(70 - 75)   | 79 - 87<br>(49 - 54)     | 36 - 44<br>(22 - 27)            | 5 - 13<br>(3 - 8)     | 61 - 69<br>(38 - 43)            |  |  |  |  |  |  |
| Half throttle Aut        | Auto power           | 46 - 54<br>(29 - 34)     | 85 <b>-</b> 93<br>(53 - 58)    | 134 - 142<br>(83 - 88)   | 85 - 93<br>(53 - 58)     | 51 - 59<br>(32 - 37)            | 5 - 13<br>(3 - 8)     | 61 - 69<br>(38 - 43)            |  |  |  |  |  |  |

## **VEHICLE SPEED WHEN PERFORMING LOCK-UP (Reference value)**

| Model code No. |            |                       | 80X17   | 80X18     |
|----------------|------------|-----------------------|---------|-----------|
| Vehicle speed  | km/h (MPH) | Throttle position 1/8 | 49 - 65 | (30 - 40) |

Note: • Lock-up vehicle speed indicates the speed in D<sub>4</sub> position.
• Make sure that lock-up is released under the following conditions:
 Throttle opening 0/8
 Vehicle speed is less than 120 km/h (75 MPH).
• Perform lock-up inspection after warming up engine.
• Lock-up vehicle speed may vary depending on the driving conditions and circumstances.

LC

GI

MA

EM

FE

EG

MT

GL

**AT** 

FA

RA

BR

ST

RS

BT

HA

1DX

# Diagnostic Trouble Code (DTC) Chart

#### A/T RELATED ITEMS

| Diagno<br>trouble<br>No.* | code  | Detected items   | Malfunction is detected when   |
|---------------------------|-------|--|--|
| CONSULT<br>GST            | ECM*3 | (Screen terms for CONSULT,<br>"SELF-DIAG RESULTS" mode)                      |  |
| P0705                     | 1101  | Inhibitor switch circuit<br>(INHIBITOR SWITCH)                               | AT control unit does not receive the correct voltage signal from the switch based on the gear position.    |
| P0710                     | 1208  | A/T fluid temperature sensor (FLUID TEMP SENSOR)                             | <ul> <li>A/T control unit receives an excessively low or high voltage from the<br/>sensor.</li> </ul>      |
| P0720                     | 1102  | Revolution sensor<br>(VHCL SPEED SEN-A/T)                                    | A/T control unit does not receive the proper voltage signal from the sensor.                               |
| P0725                     | 1207  | Engine speed signal<br>(ENGINE SPEED SIG)                                    | A/T control unit does not receive the proper voltage signal from the ECM.                                  |
| P0731                     | 1103  | Improper shifting to 1st gear position (A/T 1ST SIGNAL)                      | A/T cannot be shifted to the 1st gear position even if electrical circuit is good.                         |
| P0732                     | 1104  | Improper shifting to 2nd gear position (A/T 2ND SIGNAL)                      | <ul> <li>A/T cannot be shifted to the 2nd gear position even if electrical circuit<br/>is good.</li> </ul> |
| P0733                     | 1105  | Improper shifting to 3rd gear posi-<br>tion<br>(A/T 3RD SIGNAL)              | <ul> <li>A/T cannot be shifted to the 3rd gear position even if electrical circuit<br/>is good.</li> </ul> |
| P0734                     | 1106  | Improper shifting to 4th gear position (A/T 4TH SIGNAL OR TCC*5)             | <ul> <li>A/T cannot be shifted to the 4th gear position even if electrical circuit<br/>is good.</li> </ul> |
| P0740                     | 1204  | T/C clutch solenoid valve<br>(TOR CONV CLUTCH SV)                            | A/T control unit detects an improper voltage drop when it tries to operate the solenoid valve.             |
| P0744                     | 1107  | Improper lock-up operation (A/T TCC SIGNAL)                                  | A/T cannot perform lock-up even if electrical circuit is good.   |
| P0745                     | 1205  | Line pressure solenoid valve<br>(LINE PRESSURE S/V)                          | A/T control unit detects an improper voltage drop when it tries to operate the solenoid valve.             |
| P0750                     | 1108  | Shift solenoid valve A<br>(SHIFT SOLENOID/V A)                               | A/T control unit detects an improper voltage drop when it tries to operate the solenoid valve.             |
| P0755                     | 1201  | Shift solenoid valve B<br>(SHIFT SOLENOID/V B)                               | A/T control unit detects an improper voltage drop when it tries to operate the solenoid valve.             |
| P1705                     | 1206  | Throttle position sensor<br>Throttle position switch<br>(THRTL POSI SEN·A/T) | A/T control unit receives an excessively low or high voltage from the sensor.                              |
| P1760                     | 1203  | Overrun clutch solenoid valve<br>(OVERRUN CLUTCH S/V)                        | A/T control unit detects an improper voltage drop when it tries to operate the solenoid valve.             |

<sup>\*1:</sup> DRIVING pattern 1-6 means as follows:

Pattern 1 should meet b and c.

Pattern 2 should meet a and c.

Pattern 3 should meet a through e.

Pattern 4 should meet a and b.

Pattern 5 should meet a through c.

Pattern 6 should meet a through d.

- a: Selector lever is in "D" position.
- b: Vehicle speed is over 10 km/h (6 MPH).
- c: Throttle opening is over 1/8.
- d: Engine speed is over 450 rpm.
- e: A/T fluid temperature is 20 120°C (68 248°F).

<sup>\*3:</sup> In Diagnostic Test Mode II (Self-diagnostic results)

<sup>\*4: 1</sup>st trip DTC No. is the same as DTC No.

<sup>\*5:</sup> Although "A/T 4TH SIGNAL OR TCC" is shown as a self-diagnostic result for P0734 with CONSULT, malfunction is present at 4th speed only.

## TROUBLE DIAGNOSIS — General Description

# Diagnostic Trouble Code (DTC) Chart (Cont'd)

X: Applicable -: Not applicable

|   |  |  |                        |                           | . Hot applicabl                        |                |
|---|--|--|------------------------|---------------------------|--|----------------|
| Check Items<br>Possible Cause)  | "DTC *1<br>CONFIRMA-<br>TION<br>PROCEDURE"<br>Quick Ref. | *2<br>"OVERALL<br>FUNCTION<br>CHECK"<br>Quick Ref. | Fail<br>Safe<br>System | *8<br>MfL<br>Illumination | Reference<br>Page                      | <b>-</b><br>(6 |
| <ul> <li>Harness or connectors</li> <li>(The switch circuit is open or shorted.)</li> <li>Inhibitor switch</li> </ul>   | DRIVING<br>(pattern 1)                                   | -  |                        | 2 trip                    | AT-59                                  | - N            |
| <ul> <li>Harness or connectors         (The sensor circuit is open or shorted.)         A/T fluid temperature sensor     </li> </ul>  | DRIVING<br>(pattern 6)                                   |  | х                      | 2 trip                    | AT-65                                  | _<br>_<br>_    |
| <ul> <li>Harness or connectors         (The sensor circuit is open or shorted.)         Revolution sensor     </li> </ul>   | DRIVING<br>(pattern 2)                                   | _  | X*7                    | 2 trip*3                  | AT-68                                  | ļ              |
| <ul> <li>Harness or connectors</li> <li>(The signal circuit is open or shorted.)</li> </ul>   | DRIVING<br>(pattern 5)                                   | _  | X*7                    | 2 trip*3                  | AT-70                                  | -<br>[3        |
| <ul> <li>Shift solenoid valve A</li> <li>Shift solenoid valve B</li> <li>Overrun clutch solenoid valve</li> </ul>   |  |  |                        |                           | AT-72                                  | -<br>[5        |
| <ul> <li>Line pressure solenoid valve</li> <li>Each clutch</li> <li>Hydraulic control circuit</li> </ul>  | DRIVING (pattern 3)                                      | _  | _                      | 2 trip                    | AT-75                                  | -<br>©         |
|   | (pattern 3)  |  |                        |                           | AT-78                                  | _<br>D         |
|   |  |  |                        |                           | AT-81                                  |                |
|   |  |  |                        |                           | A1-01                                  | _ /            |
| Harness or connectors (The solenoid circuit is open or shorted.) T/C clutch solenoid valve  | IGN: ON  | _  | Х                      | 2 trip                    | AT-86                                  |                |
| (The solenoid circuit is open or shorted.) T/C clutch solenoid valve T/C clutch solenoid valve Each clutch Hydraulic control circuit  | IGN: ON  DRIVING (pattern 3)                             | _  | ×                      | 2 trip                    | ************************************** | _ [            |
| (The solenoid circuit is open or shorted.) T/C clutch solenoid valve T/C clutch solenoid valve Each clutch Hydraulic control circuit Harness or connectors (The solenoid circuit is open or shorted.) Line pressure solenoid valve  | DRIVING  |  | x<br>_<br>x            | -                         | AT-86                                  | - [            |
| (The solenoid circuit is open or shorted.) T/C clutch solenoid valve T/C clutch solenoid valve Each clutch Hydraulic control circuit Harness or connectors (The solenoid circuit is open or shorted.) Line pressure solenoid valve Harness or connectors (The solenoid circuit is open or shorted.) Shift solenoid valve A  | DRIVING (pattern 3)                                      |  |                        | 2 trip                    | AT-86<br>AT-89                         |                |
| (The solenoid circuit is open or shorted.) T/C clutch solenoid valve T/C clutch solenoid valve Each clutch Hydraulic control circuit Harness or connectors (The solenoid circuit is open or shorted.) Line pressure solenoid valve Harness or connectors (The solenoid circuit is open or shorted.)   | DRIVING<br>(pattern 3)                                   |  | x                      | 2 trip<br>2 trip          | AT-86<br>AT-89<br>AT-94                | - [            |
| (The solenoid circuit is open or shorted.) T/C clutch solenoid valve T/C clutch solenoid valve Each clutch Hydraulic control circuit Harness or connectors (The solenoid circuit is open or shorted.) Line pressure solenoid valve Harness or connectors (The solenoid circuit is open or shorted.) Shift solenoid circuit is open or shorted.) Shift solenoid valve A Harness or connectors (The solenoid circuit is open or shorted.) | DRIVING (pattern 3)  IGN: ON  IGN: ON                    |  | _ X<br>X*7             | 2 trip 2 trip 1 trip      | AT-86<br>AT-89<br>AT-94<br>AT-97       |                |

<sup>\*1: •</sup> This is Quick Reference of "DTC CONFIRMATION PROCEDURE".

Details are described in each TROUBLE DIAGNOSIS FOR DTC PXXXX.

\*2: • The "OVERALL FUNCTION CHECK" is a simplified and effective way to inspect a component or circuit.

In some cases, the "OVERALL FUNCTION CHECK" is used rather than a "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE".

When no DTC CONFIRMATION PROCEDURE is available, the "NG" result of the OVERALL FUNCTION CHECK can be considered to mean the same as a DTC detection.

. During an "NG" OVERALL FUNCTION CHECK, the DTC or 1st trip DTC might not be confirmed.

This is Quick Reference of "OVERALL FUNCTION CHECK".

 The control of the

Details are described in each TROUBLE DIAGNOSIS FOR DTC PXXXX. \*7: • When the fail-safe operation occurs, the MIL illuminates immediately.

IDX

<sup>\*8: •</sup> The MIL illuminates after A/T control unit enters the fail-safe mode in two consecutive trips, if both the "Revolution sensor" and the "Engine speed signal" meet the fail-safe condition at the same time.

# TROUBLE DIAGNOSIS — General Description

# **Symptom Chart**

| •                     |   | ON vehicle  |                    |                  |                                       |  |                     |                   |               |  |                        |                        | <b> </b>                     |  |                               |                              | OFI             | F ve                      | hicle                       | )                |           |                | <b>→</b>    |                |                        |               |                    |                     |              |  |
|-----------------------|---|-------------|--------------------|------------------|---------------------------------------|--|---------------------|-------------------|---------------|--|------------------------|------------------------|------------------------------|--|-------------------------------|------------------------------|-----------------|---------------------------|-----------------------------|------------------|-----------|----------------|-------------|----------------|------------------------|---------------|--------------------|---------------------|--------------|--|
|                       | Reference page (AT- )   | 3:<br>14    | 9,<br>40           | 1                | 39                                    | 6:<br>10                                   | 18,                 | 1:                | 29            |  | 38,<br>97              |                        | 00,<br>14                    | 1                                      | 6,<br>05                      |                              | 5,<br>38        | 10                        | 38                          |                  | 48,<br>64 |                | B2,<br>85   | 1              | <br>39,<br>99          | 11            | 89                 | 195<br>206          |              |  |
| Reference page (AT- ) | Numbers are arranged in order of probability. Perform inspections starting with number one and work up. Circled numbers indicate that the transaxle must be removed from the vehicle. | Fluid level | Control cable      | Inhibitor switch | Throttle position sensor (Adjustment) | Revolution sensor and vehicle speed sensor | Engine speed signal | Engine idling rpm | Line pressure | Control valve assembly                       | Shift solenoid valve A | Shift solenoid valve B | Line pressure solenoid valve | Torque converter clutch solenoid valve | Overrun clutch solenoid valve | A/T fluid temperature sensor | Accumulator N-D | Accumulator servo release | Ignition switch and starter | Torque converter | Oil pump  | Reverse clutch | High clutch | Forward clutch | Forward one-way clutch | Overnn clutch | Low one-way clutch | Low & reverse brake | Brake band   | Parking components                           |
| 111                   | Engine does not start in "N", "P" positions.  | Ŀ           | 2                  | 3                |                                       |  |                     |                   |               | Ŀ  |                        | ·                      |                              | ·                                      |                               | ·                            |                 |                           | t                           | ٠                |           |                |             |                |                        |               |                    |                     |              |  |
| 111                   | Engine starts in positions other than "N" and "P".  |             | 1                  | 2                |                                       |  |                     |                   |               |  |                        |                        |                              |  |                               |                              |                 |                           |                             |                  |           |                |             |                |                        |               |                    |                     | .            |  |
| _                     | Transaxle noise in "P" and "N" positions.   | 1           |                    |                  | 3                                     | 4  | 5                   |                   | 2             |  |                        |                        |                              |  |                               |                              |                 |                           |                             | 7                | <b>6</b>  |                | ,           |                |                        |               |                    |                     |              |  |
| 111                   | Vehicle moves when changing into<br>"P" position or parking gear does<br>not disengage when shifted out of<br>"P" position.   |             | 1                  |                  |                                       |  |                     |                   |               |  |                        |                        |                              |  |                               |                              |                 | ,                         |                             |                  |           |                | .           |                |                        |               |                    |                     | . (          | 2  |
| 112                   | Vehicle runs in "N" position.   |             | 1                  |                  |                                       | <u>.</u>                                   | ·                   |                   | · .           | <u>.                                    </u> | -:-                    | ļ.,                    | -                            |  |                               | - :                          |                 | <u> </u>                  | -                           | ·                | _ :_      | 3              |             | 2              |                        | 4             | ,                  |                     |              | <u>.                                    </u> |
| 114                   | Vehicle will not run in "R" position (but runs in "D", "2" and "1" positions). Clutch slips. Very poor acceleration.  |             | 1                  |                  |                                       |  | . ,                 |                   | 2             | 4  |                        |                        | 3                            |  |                               |                              |                 |                           |                             |                  |           | (5)            | 6           | <b>⑦</b>       |                        | 8             | ·                  | 9                   |              | -  |
| _                     | Vehicle braked when shifting into<br>"R" position.  | 1           | 2                  |                  | ٠                                     |  |                     |                   | 3             | 5  |                        |                        | 4                            |  |                               |                              |                 |                           |                             |                  | -         |                | •           | 8              | ٠                      | 9             |                    | . (                 | <u>7</u> )   |  |
| _                     | Sharp shock in shifting from "N" to "D" position.   |             |                    |                  | 2                                     |  | 5                   | 1                 | 3             | 7  |                        |                        | 6                            |  |                               | 4                            | 8               |                           |                             |                  | ٠,        |                |             | 9              |                        |               |                    |                     | . [          |  |
| _                     | Vehicle will not run in "D" and "2" positions (but runs in "1" and "R" positions).  |             | 1                  |                  |                                       | -  |                     |                   |               |  |                        |                        |                              |  | ,                             |                              |                 |                           |                             |                  |           |                |             |                |                        |               | 2                  |                     |              |  |
| 115                   | Vehicle will not run in "D", "1", "2" positions (but runs in "R" position). Clutch slips. Very poor acceleration.   | 1           |                    |                  |                                       | •  |                     |                   | 2             | 4  |                        | •                      | 3                            |  |                               |                              | 5               |                           |                             |                  |           | 6              | 7           | 8              | 9                      | •             | 10                 |                     | . }          |  |
| _                     | Clutches or brakes slip somewhat in starting.   | 1           | 2                  |                  | 3                                     |  | .                   |                   | 4             | 6  | .                      |                        | 5                            |  | .                             |                              | 7               |                           |                             | 12               | 11        | 9              |             | 8              |                        |               |                    | 10                  |              |  |
| _                     | Excessive creep.  |             | <u>.</u>           |                  |                                       |  | $\overline{\cdot}$  | 1                 |               |  | ·                      |                        | ·                            |  | $\Box$                        | _                            | ·               |                           | ·                           |                  |           |                | ·           |                | ·                      | -             |                    |                     |              |  |
| 114<br>115            | No creep at all.  | 1           | $\cdot$            |                  | . ]                                   |  |                     |                   | 2             | 3  |                        |                        | .                            |  | .                             |                              |                 |                           |                             | 6                | (5)       |                | .           | 4              |                        |               |                    |                     | .            |  |
| _                     | Failure to change gear from " $D_1$ " to " $D_2$ ".   |             | 2                  | 1                |                                       | 5  |                     | -                 |               | 4  | 3                      |                        |                              |  |                               |                              |                 |                           |                             |                  |           |                |             |                |                        |               |                    | . (                 | 6)           | $\cdot$                                      |
| _                     | Failure to change gear from " $D_2$ " to " $D_3$ ".   |             | 2                  | 1                |                                       | 5  |                     |                   |               | 4  |                        | 3                      | -                            |  |                               |                              |                 |                           |                             |                  |           |                | 6           |                |                        |               |                    | . (                 | 0            |  |
| _                     | Failure to change gear from "D <sub>3</sub> " to "D <sub>4</sub> ".   |             | 2                  | 1                |                                       | 4  | -                   |                   |               |  | 3                      |                        |                              |  | .                             | 5                            |                 |                           | -                           |                  |           |                | <br>·       |                |                        | ,             |                    | . (                 | <b>5</b>     |  |
| 118<br>119            | Too high a gear change point from " $D_1$ " to " $D_2$ ", from " $D_2$ " to " $D_3$ ", from " $D_3$ " to " $D_4$ ".   |             |                    |                  | 1                                     | 2  |                     |                   |               |  | 3                      | 4                      |                              |  |                               | •                            |                 | ,                         | ·                           | ,                |           |                |             |                | ·                      |               | •                  |                     |              |  |
| _                     | Gear change directly from "D <sub>1</sub> " to "D <sub>3</sub> " occurs.  | 1           | ·                  |                  | ·                                     |  | ·                   |                   | ·             |  |                        |                        | ·                            |  |                               |                              |                 | 2                         | ·                           |                  |           |                |             |                |                        |               |                    | . (                 | 3)           | ·  |
|                       | Engine stops when shifting lever into "R", "D", "2" and "1".  |             | $\cdot$            |                  | . ]                                   |  | ·                   | 1                 | ·             | 3  |                        |                        | ·                            | 2                                      | -                             |                              |                 |                           |                             | 4                | -         | ,              | ,           |                | ]                      |               |                    |                     | $\cdot \int$ | . ]  |
| _                     | Too sharp a shock in change from "D <sub>1</sub> " to "D <sub>2</sub> ".  |             | $\overline{\cdot}$ |                  | 1                                     |  |                     |                   | 2             | 4  |                        |                        |                              |  |                               | 5                            | .               | 3                         |                             |                  |           |                |             |                | -                      |               |                    | . (                 | <b>5</b> )   |  |
| _                     | Too sharp a shock in change from "D <sub>2</sub> " to "D <sub>3</sub> ".  |             |                    |                  | 1                                     |  |                     | ,                 | 2             | 3  |                        |                        |                              |  |                               | -                            |                 |                           |                             |                  |           |                | 4           |                |                        |               |                    | . (                 | 5)           |  |

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# TROUBLE DIAGNOSIS — General Description Symptom Chart (Cont'd)

|                       |  | <b>-</b>    | ON vehicle    |                  |                                       |  |  | nicle             |               |                        |                        |                        |                              | -                                      |                               |                              |                 | OF   | F ve                        | hicle            | €                     | _              |                     | <b>-</b>       |                        |                |                    |                     |            |                    |                |
|-----------------------|--|-------------|---------------|------------------|---------------------------------------|--|--|-------------------|---------------|------------------------|------------------------|------------------------|------------------------------|--|-------------------------------|------------------------------|-----------------|--|-----------------------------|------------------|-----------------------|----------------|---------------------|----------------|------------------------|----------------|--------------------|---------------------|------------|--------------------|----------------|
|                       | Reference page (AT- )  |             | 39,<br>40     | 1:               | 39                                    | 10   | 88,<br>08,<br>0,                             | 1                 | 29            |                        | 38,<br>97              |                        | 00,<br>94                    |  | 86,<br>05                     |                              | 5,<br>38        | 1:   | 38                          | 14<br>16         | 18,<br>54             |                | 12,<br>35           |                | 89,<br>99              | 1.             | 89                 | 1                   | 95,<br>:06 | _                  | 1              |
| Reference page (AT. ) | Numbers are arranged in order of probability. Perform inspections starting with number one and work up. Circled numbers indicate that the transaxle must be removed from the vehicle.  | Fluid level | Control cable | Inhibitor switch | Throttle position sensor (Adjustment) | Revolution sensor and vehicle speed sensor | Engine speed signal                          | Engine idling rpm | Line pressure | Control valve assembly | Shift solenoid valve A | Shift solenoid valve B | Line pressure solenoid valve | Torque converter clutch solenoid valve | Overrun clutch solenoid valve | A/T fluid temperature sensor | Accumulator N-D | Accumulator servo release                    | Ignition switch and starter | Torque converter | Oil pump              | Reverse clutch | High clutch         | Forward clutch | Forward one-way clutch | Overnun clutch | Low one-way clutch | Low & reverse brake | Brake band | Parking components | MA<br>EM<br>LC |
| _                     | Too sharp a shock in change from "D <sub>3</sub> " to "D <sub>4</sub> ".   | ŀ           |               |                  | 1                                     |  |  |                   | 2             | 3                      |                        |                        |                              |  |                               |                              | ·               |  |                             |                  | -                     |                |                     |                |                        | (5)            |                    | Ŀ                   | 4          |                    |                |
|                       | Almost no shock or clutches slip-<br>ping in change from "D <sub>1</sub> " to "D <sub>2</sub> ".<br>Almost no shock or slipping in   | 1           | ·             |                  | 2                                     |  |  |                   | 3             | 5                      |                        |                        | •                            |  |                               | ٠                            | -               | 4  | ·<br>                       | ļ.               | .                     | •              | ·                   |                |                        |                |                    |                     | 6          | -                  | FE             |
| _                     | change from "D <sub>2</sub> " to "D <sub>3</sub> ".  Almost no shock or slipping in  | 1           |               |                  | 2                                     |  | •  | -                 | 3             | 4                      | -                      |                        |                              | ·                                      |                               |                              | -               |  | -                           |                  | •                     |                | <b>⑤</b>            |                | •                      |                | •                  | ├                   | <u>6</u>   |                    | .⊜ı            |
| _                     | change from "D <sub>3</sub> " to "D <sub>4</sub> ".  Vehicle braked by gear change   | 1           | ·<br>         |                  | 2                                     | -  | •  |                   | 3             | 4                      |                        |                        |                              |  | •                             |                              | •               | -  | •                           |                  | •                     |                | <b>⑤</b>            | •              | •                      |                |                    |                     | 6          |                    | GL             |
| _                     | from "D <sub>1</sub> " to "D <sub>2</sub> ".  Vehicle braked by gear change  | 1           | ·             |                  |                                       | .<br>                                      | .  | —                 | -             |                        | •                      | -                      | ٠.                           | -                                      |                               | !<br>                        | .               | .<br><del></del>                             |                             | .<br><del></del> | ·  <br><del>-  </del> | 2              | 4                   | •              | •                      |                | <u>(5)</u>         | 3                   | •          |                    | Mi             |
| _                     | from "D <sub>2</sub> " to "D <sub>3</sub> ".  Vehicle braked by gear change  | 1           | -             | -                | ·<br>                                 | -  | •  | -                 | ٠             |                        | ٠                      | -                      |                              |  | •                             | •                            | •               | •  | $\dashv$                    | •                | •                     | •              | -                   | •              | •                      | ·              | $\dashv$           |                     | 2          | •                  |                |
| _                     | from "D <sub>3</sub> " to "D <sub>4</sub> ".  Maximum speed not attained.  | 1           |               | ·<br>            |                                       | •  | -  | -                 | •             |                        | _                      |                        | •                            | •                                      | ,                             |                              | ٠               | -  | -                           | •                | $\dashv$              | <b>4</b>       |                     | •              | 3                      | 2              | _                  |                     |            |                    | AT             |
|                       | Acceleration poor. Failure to change gear from "D <sub>4</sub> " to  | 1           | •             | 2                | 2                                     | -  | -  | •                 | -             | 5<br>6                 | 4                      | 4                      | 5                            | •                                      | 3                             | •                            | $\dashv$        | -  | -                           | 10               | (10)                  | <u>6</u>       | $ \Psi $            | -              | -                      | ·<br>(8)       |                    | (9)<br>(7)          | (8)        | • !                | Pa             |
|                       | "D <sub>3</sub> ". Failure to change gear from "D <sub>3</sub> " to  | 1           | -             | <u> </u>         | 2                                     | · ·  | -  |                   |               | 5                      | 3                      | 4                      | ٠,                           |  |                               | ·                            |                 | -  |                             | •                | -                     | ·              | ·<br>⑥              |                |                        | 8              |                    | _                   | <u>·</u>   | _                  | FA             |
| _                     | "D <sub>2</sub> " or from "D <sub>4</sub> " to "D <sub>2</sub> ".  Failure to change gear from "D <sub>2</sub> " to "D <sub>2</sub> " are from "D <sub>2</sub> " to "D <sub>2</sub> ". | 1           |               |                  | 2                                     |  |  | ·                 |               | 5                      | 3                      | 4                      |                              | <u> </u>                               | -                             | <u>.</u>                     | $\frac{1}{2}$   | <u>.                                    </u> |                             | <u>.</u>         | -                     |                | 7                   | ·              |                        | <u>.</u>       | 6                  | ļ                   | 8          | ·                  | RA             |
| -                     | "D <sub>1</sub> " or from "D <sub>3</sub> " to "D <sub>1</sub> ".  Gear change shock felt during deceleration by releasing accelerator pedal.  | L           |               |                  | 1                                     | <del>-</del> -                             |  |                   | 2             | 4                      |                        | ·                      |                              |  | 3                             | -                            | -               |  | -                           |                  |                       | ,              | <del>-</del>  <br>, |                |                        |                |                    | •                   |            | •                  | BR             |
|                       | Too high a change point from "D <sub>4</sub> " to "D <sub>3</sub> ", from "D <sub>3</sub> " to "D <sub>2</sub> ", from "D <sub>2</sub> " to "D <sub>4</sub> ".                         |             | •             |                  | 1                                     | 2  |  |                   |               |                        |                        |                        |                              |  |                               |                              | 1               |  |                             |                  | -                     |                |                     |                |                        | -              | -                  |                     | •          | -                  | ST<br>ST       |
|                       | Kickdown does not operate when depressing pedal in "D <sub>4</sub> " within kickdown vehicle speed.  |             | -             |                  | 1                                     | 2  |  |                   |               |                        | 3                      | 4                      |                              | ,                                      |                               |                              | ,               |  |                             |                  |                       |                |                     |                |                        |                |                    |                     |            |                    |                |
|                       | Kickdown operates or engine over-<br>runs when depressing pedal in "D <sub>4</sub> "<br>beyond kickdown vehicle speed<br>limit.  |             |               |                  | 2                                     | 1  |  |                   |               |                        | 3                      | 4                      |                              |  | -                             |                              |                 | -  |                             |                  |                       |                |                     |                |                        |                |                    |                     | -          |                    |                |
| _                     | Races extremely fast or slips in changing from "D <sub>4</sub> " to "D <sub>3</sub> " when depressing pedal.   | 1           |               |                  | 2                                     | ,  | ,  |                   | 3             | 5                      |                        |                        | 4                            |  | •                             |                              |                 |  |                             | ÷                |                       |                | 6                   | ⑦              | -                      |                |                    |                     |            |                    | ST             |
| _                     | Races extremely fast or slips in changing from "D <sub>4</sub> " to "D <sub>2</sub> " when depressing pedal.   | 1           | -             |                  | 2                                     |  | ·  |                   | 3             | 6                      | 5                      |                        | 4                            |  |                               |                              |                 |  |                             |                  |                       |                | .                   | 8              | ,                      | •              |                    |                     | 1          | ·                  | K.A            |
|                       | Races extremely fast or slips in changing from "D <sub>3</sub> " to "D <sub>2</sub> " when depressing pedal.   | 1           |               |                  | 2                                     |  |  |                   | 3             | 5                      |                        |                        | 4                            |  | ·                             | 6                            |                 | ,  |                             |                  |                       | . 1            | 9                   | 8              |                        | •              | ·                  |                     | 7          |                    |                |
| _                     | Races extremely fast or slips in changing from "D <sub>4</sub> " or "D <sub>3</sub> " to "D <sub>1</sub> " when depressing pedal.  | 1           | -             | •                | 2                                     |  |  |                   | 3             | 5                      | ·                      |                        | 4                            |  | •                             |                              |                 |  |                             |                  |                       |                | ŀ                   | <b>6</b>       | 7                      |                | 8                  | •                   |            | ·                  | ID)X           |
|                       | Vehicle will not run in any position.  Transaxle noise in "D", "2", "1" and  |             | 2             |                  |                                       | •  | <u>.                                    </u> | •                 | 3             | •                      | <u>. [</u>             |                        | 4                            | •                                      | -                             | •                            | -{              |  | П                           | <u>9</u>         | <u> </u>              |                | 6                   |                | -                      | <u>:</u>       | -                  | 8                   | <b>O</b>   | 10                 |                |
| -                     | 'R" positions.   | 1           | .             | •                |                                       | -  |  |                   |               | •                      | •                      | -                      |                              | -                                      |                               | -                            |                 |  |                             | 2                |                       | •              | •                   | ٠              | •                      |                | •                  |                     |            |                    |                |

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# TROUBLE DIAGNOSIS — General Description Symptom Chart (Cont'd)

|                       |   | <b> </b>    | ON vehicle    |                  |                                       |  |                     |                   |               |                        |                        |                        |                              | OFF v  |                               |                              |                 | hicle                     |                             |                  |           | →              |             |                |                        |                |                    |                     |            |                    |
|-----------------------|---|-------------|---------------|------------------|---------------------------------------|--|---------------------|-------------------|---------------|------------------------|------------------------|------------------------|------------------------------|--|-------------------------------|------------------------------|-----------------|---------------------------|-----------------------------|------------------|-----------|----------------|-------------|----------------|------------------------|----------------|--------------------|---------------------|------------|--------------------|
|                       | Reference page (AT- )   |             | 9,<br>40      | 13               | 39                                    | 10   | 8,<br>08,<br>0,     | 1:                | 29            |                        | 38,<br>97              | •                      | 00,<br>14                    |  | 6,<br>05                      |                              | 5,<br>38        | 1;                        | 38                          | ŧ                | 48,<br>64 |                | 82,<br>85   |                | 39,<br>99              | 18             | 39                 |                     | 95,<br>06  | —                  |
| Reference page (AT- ) | Numbers are arranged in order of probability. Perform inspections starting with number one and work up. Circled numbers indicate that the transaxle must be removed from the vehicle. | Fluid level | Control cable | Inhibitor switch | Throttle position sensor (Adjustment) | Revolution sensor and vehicle speed sensor | Engine speed signal | Engine idling rpm | Line pressure | Control valve assembly | Shift solenoid vafve A | Shift solenoid valve B | Line pressure solenoid valve | Torque converter clutch solenoid valve       | Overrun clutch solenoid valve | A/T fluid temperature sensor | Accumulator N-D | Accumulator servo release | Ignition switch and starter | Torque converter | Oil pump  | Reverse clutch | High clutch | Forward clutch | Forward one-way clutch | Overrun clutch | Low one-way clutch | Low & reverse brake | Brake band | Parking components |
| 122                   | Failure to change from "D <sub>3</sub> " to "2 <sub>2</sub> " when changing lever into "2" position.  |             | 7             | 1                | 2                                     | ,  |                     |                   |               | 6                      | 5                      | 4                      |                              |  | 3                             |                              |                 |                           |                             | ,                |           |                |             |                |                        | 9              |                    |                     | 8          | ·                  |
| _                     | Gear change from "22" to "23" in "2" position.  | •           |               | 1                | •                                     |  | ,                   | ,                 |               | ,                      |                        |                        |                              |  |                               |                              |                 |                           |                             |                  | ,         |                |             | •              |                        |                |                    |                     |            | ,                  |
| 123                   | "1" position.   |             | 2             | 1                | 3                                     | 4  |                     |                   |               | 60                     | 5                      |                        |                              | •  | 7                             |                              |                 |                           |                             |                  |           | ·              | •           | •              |                        | 8              |                    | 9                   |            |                    |
| _                     | Gear change from "1 <sub>1</sub> " to "1 <sub>2</sub> " in "1" position.  |             | 2             | 1                |                                       | •  |                     | •                 |               |                        |                        |                        | . ;                          |  |                               |                              |                 |                           |                             |                  |           |                |             | •              |                        |                |                    |                     |            |                    |
| _                     | Does not change from "1 <sub>2</sub> " to "1 <sub>1</sub> " in "1" position.  | •           |               | 1                | ,                                     | 2  |                     |                   |               | 4                      | 3                      |                        |                              |  | 5                             |                              |                 | ,                         | ٠                           |                  |           |                |             |                |                        | 6              |                    | 7                   | ٠          |                    |
| _                     | Large shock changing from "1 <sub>2</sub> " to "1 <sub>1</sub> " in "1" position.   |             |               |                  |                                       |  |                     |                   |               | 1                      |                        |                        |                              |  |                               |                              |                 |                           |                             |                  |           |                |             | ٠              |                        |                |                    | 2                   | ٠          |                    |
|                       | Transaxle overheats.  | 1           | •             | <u>.</u>         | 3                                     | ·  |                     | 2                 | 4             | 6                      | ·                      |                        | 5                            | <u>.                                    </u> |                               | ٠.                           |                 | <u>.</u>                  |                             | 14)              | 7         | 8              | 9           | 1              | ·                      | 12             | ·                  | <u> (13</u>         | 100        | ٠                  |
| _ :                   | ATF shoots out during operation. White smoke emitted from exhaust pipe during operation.  | 1           |               | ٠                |                                       |  | -                   |                   |               |                        |                        |                        |                              |  |                               |                              |                 |                           | ٠                           | ٠,               |           | @              | 3           | ⑤              | ·                      | <b>⑥</b>       |                    | Ø                   | 4          |                    |
| -                     | Offensive smell at fluid charging pipe.   | 1           |               |                  |                                       |  |                     |                   |               |                        |                        |                        |                              |  |                               |                              |                 |                           |                             | 2                | 3         | 4              | ⑤           | 7              |                        | 8              |                    | 9                   | <b>6</b>   |                    |
|                       | Torque converter is not locked up.  |             |               | 3                | 1                                     | 2  | 4                   |                   | 6             | 8                      |                        |                        | .                            | 7  |                               | 5                            |                 |                           |                             | 9                |           | <u>.</u>       | <u>.</u>    |                |                        |                | ٠                  |                     |            |                    |
|                       | Torque converter clutch piston slip.  | 1           | -             |                  | 2                                     |  |                     |                   | 3             | 6                      | ٠,                     |                        | 5                            | 4  |                               |                              |                 |                           |                             | 7                |           |                |             |                | .                      |                |                    |                     | <u>.</u>   | ╧                  |
| 120                   | IOW.  |             |               | ,                | 1                                     | 2  | . }                 |                   |               | 4                      |                        |                        |                              | 3  |                               | ٠                            |                 |                           | ·                           |                  |           |                | .           |                |                        |                |                    | •                   | ·          | ·                  |
| _                     | A/T does not shift to "D <sub>4</sub> " when driving with overdrive switch "ON".  |             | ·             | 2                | 1                                     | 3  | ·                   |                   | 8             | 6                      | 4                      |                        | ·                            |  | 5                             | 7                            |                 |                           | ·                           |                  |           |                | ·           |                |                        | 10             |                    |                     | 9          |                    |
| -                     | Engine is stopped at "R", "D", "2" and "1" positions.   | 1           |               |                  | $\cdot$                               |  |                     |                   |               | 5                      | 4                      | 3                      | $\cdot$                      | 2  | -                             |                              |                 |                           |                             |                  |           |                |             |                |                        |                |                    |                     |            |                    |

AT-54 666

# TROUBLE DIAGNOSIS — General Description

# A/T Control Unit Terminals and Reference Value (Cont'd)

| Terminal<br>No. | Item   |                     | Condition   | Judgement<br>standard   |  |  |
|-----------------|--|---------------------|---|---|--|--|
| 40              | Inhibitor "N" or "P" posi-                                       |                     | When setting selector lever to "N" or "P" position.                           | Battery voltage   |  |  |
| 19              | tion switch  |                     | When setting selector lever to other positions.                               | 1V or less  |  |  |
| 00              | Inhibitor "R" position   |                     | When setting selector lever to "R" position.                                  | Battery voltage   |  |  |
| 20              | switch   |                     | When setting selector lever to other positions.                               | 1V or less  |  |  |
| 21              | Wide open throttle posi-<br>tion switch<br>(in throttle position | <b>X</b>            | When depressing accelerator pedal more than half-way after warming up engine. | Battery voltage   |  |  |
|                 | switch)  |                     | When releasing accelerator pedal after warming up engine.                     | 1V or less  |  |  |
| 22              | <del>-</del>   |                     | and the second  | _   |  |  |
| 22              | Power source   |                     | When turning ignition switch to "OFF".  | Battery voltage   |  |  |
| 23              | (Back-up)  | (CON) OF (COFF)     | When turning ignition switch to "ON".   | Battery voltage   |  |  |
|                 |  | @n 65.2             | When engine runs at idle speed.   | Approximately 0.6V  |  |  |
| 24              | Engine speed signal  |                     | When engine runs at 4,000 rpm.  | Approximately 2.2V  |  |  |
| 25              | Revolution sensor<br>(Measure in AC range)                       |                     | When vehicle cruises at 30 km/h (19 MPH).                                     | 1V or more<br>Voltage rises gradually in<br>response to vehicle<br>speed. |  |  |
|                 |  |                     | When vehicle parks.   | ov  |  |  |
| 26              | _  |                     | _   | _   |  |  |
| 27              | Vehicle speed sensor   |                     | When moving vehicle at 2 to 3 km/h (1 to 2 MPH) for 1 m (3 ft) or more.       | Voltage varies between<br>less than 1V and more<br>than 4.5V              |  |  |
| 28*             | _  |                     | _   |   |  |  |
| 29*             | <del></del>  | (Can)               |   |   |  |  |
| 30*             | _  |                     | _   |   |  |  |
| 31              | Throttle position sensor (Power source)                          | % <sup>5</sup> .5-7 | _   | 4.5 - 5.5V  |  |  |
| 32              |  | W                   |   |   |  |  |

<sup>\*:</sup> These terminals are connected to the Data link connector for CONSULT.

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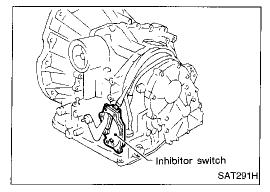
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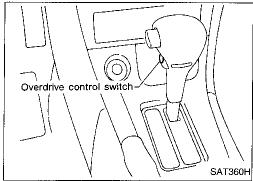
# TROUBLE DIAGNOSIS — General Description

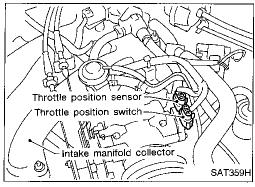
# A/T Control Unit Terminals and Reference Value (Cont'd)

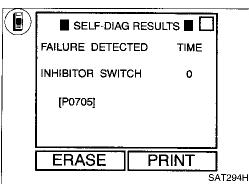
| Terminal<br>No. | ltem                              |              | Condition   | Judgement<br>standard  |  |  |  |  |
|-----------------|-----------------------------------|--------------|---|--|--|--|--|--|
| 33              | A/T fluid temperature             |              | When ATF temperature is 20°C (68°F).  | Approximately 1.5V   |  |  |  |  |
| <i>3</i> 3      | sensor                            | (Con)        | When ATF temperature is 80°C (176°F).   | Approximately 0.5V   |  |  |  |  |
| 34              | Throttle position sensor          | \$5-7-1      | When depressing accelerator pedal slowly after warming up engine. (Voltage rises gradually in response to throttle position.) | Fully-closed throttle:<br>Approximately 0.5V<br>Fully-open throttle:<br>Approximately 4V |  |  |  |  |
| 35              | Throttle position sensor (Ground) |              | _   | _  |  |  |  |  |
| 36              | _                                 |              | _   | _  |  |  |  |  |
|                 |                                   |              | When ASCD cruise is being performed. ("CRUISE" light comes on.)   | Battery voltage  |  |  |  |  |
| 37              | ASCD cruise signal                |              | When ASCD cruise is not being per-<br>formed. ("CRUISE" light does not<br>comes on.)  | 1V or less   |  |  |  |  |
| 38              | _                                 |              | _   |  |  |  |  |  |
| 00              | Outside a second subtale          | (Son)        | When setting overdrive control switch in "ON" position  | Battery voltage  |  |  |  |  |
| 39              | Overdrive control switch          |              | When setting overdrive control switch in "OFF" position   | 1V or less   |  |  |  |  |
| 40              | ACCD OD out signal                |              | When "ACCEL" set switch on ASCD cruise is released.   | 5 - 8V   |  |  |  |  |
| 40              | ASCD OD cut signal                |              | When "ACCEL" set switch on ASCD cruise is applied.  | 1V or less   |  |  |  |  |
| 41              |                                   |              | _   | _  |  |  |  |  |
| 42              |                                   |              | , upon sy.  | _  |  |  |  |  |
| 43              | _                                 | (Lon)        | _   | <u> </u>   |  |  |  |  |
| 44              | _                                 | ·            | _   |  |  |  |  |  |
| 45*             | OBD-II                            |              | _   | _  |  |  |  |  |
| 46              | _                                 | <b>%</b> [3] | _   | <u> </u>   |  |  |  |  |
| 47*             | DT4                               | <b>X</b>     |   | _  |  |  |  |  |
| 48              | Ground                            |              | _   | _  |  |  |  |  |

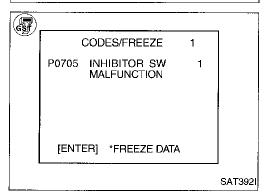
<sup>\*</sup> This terminal is connected to the ECM (ECCS control module).











## Inhibitor, Overdrive Control and Throttle **Position Switches**

#### **DESCRIPTION**

- Inhibitor switch Detects the selector lever position and sends a signal to the A/T control unit.
- Overdrive control switch Detects the overdrive control switch position (ON or OFF) and sends a signal to the A/T control unit.
  - Throttle position switch Consists of a wide-open throttle position switch and a closed throttle position switch. The wide-open position switch sends a signal to the A/T con-

trol unit when the throttle valve is open at least 1/2 of the full throttle position. The closed throttle position switch sends a signal to the A/T control unit when the throttle valve is fully closed.

| A/T control unit does not receive the correct voltage signal  • Harness or connectors (The inhibitor extitors circuit is | Diagnostic trouble code | Malfunction is detected when   | Check item<br>(Possible cause)              |
|--|-------------------------|--|---|
| from the switch based on the gear position.    Switch Circle Is open or shorted.   Inhibitor switch                      | P0705                   | not receive the cor-<br>rect voltage signal<br>from the switch based | tors<br>(The inhibitor<br>switch circuit is |

# Diagnostic trouble code (DTC) confirmation procedure

After the repair, perform the following procedure to confirm the malfunction is eliminated.

- 1) Start engine.
  - 2) Select "SELF-DIAG RESULTS" mode for ECM with CONSULT.
  - Drive vehicle under the following conditions: Selector lever in "D", overdrive control switch in "OFF" position, vehicle speed higher than 10 km/h (6 MPH), throttle opening greater than 1/2 of the full throttle position and driving for more than 5 seconds. – OR -
- 1) Start engine.
  - Drive vehicle under the following conditions: Selector lever in "D", overdrive control switch in "OFF" position, vehicle speed higher than 10 km/h (6 MPH), throttle opening greater than 1/2 of the full throttle position and driving for more than 5 seconds.
  - Select "MODE 7" with GST. 3)
  - 1) Start engine.
  - 2) Drive vehicle under the following conditions: Selector lever in "D", overdrive control switch in "OFF" position, vehicle speed higher than 10 km/h (6 MPH), throttle opening greater than 1/2 of the full throttle position and driving for more than 5 seconds.

– OR -

Perform self-diagnosis for ECM. Refer to EC section ["Malfunction Indicator Lamp (MIL)" "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION"]. MT

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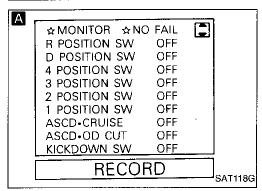
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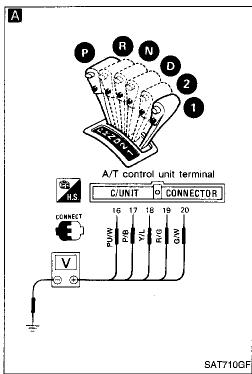
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# Inhibitor, Overdrive Control and Throttle Position Switches (Cont'd)

Α

# Ignition switch Fuse Fuse Position Switch Switch Aff convol unit ON OFF Control switch SAT315HB





#### CHECK INHIBITOR SWITCH CIRCUIT.



- Turn ignition switch to "ON" position.
- (Do not start engine.)
- 2. Select "ECU INPUT SIGNALS" in Data Monitor.
- Read out "R, N, D, 1 and 2
  position switches" moving selector lever to each position.
  Check the signal of the selector lever position is indicated properly.

1. Turn ignition switch to "ON" position. (Do not start engine.)

OR

Check voltage between A/T control unit terminals (6), (7), (8),
 (9), (2) and ground while moving selector lever through each position.

#### Voltage:

B: Battery voltage 0: 0V

| Lever position | Terminal No. |   |    |   |             |  |  |  |  |  |  |  |
|----------------|--------------|---|----|---|-------------|--|--|--|--|--|--|--|
| Lever position | 9            | @ | 18 | 7 | <b>(9</b> ) |  |  |  |  |  |  |  |
| P, N           | В            | 0 | 0  | 0 | 0           |  |  |  |  |  |  |  |
| R              | 0            | В | 0  | 0 | 0           |  |  |  |  |  |  |  |
| D              | 0            | 0 | В  | 0 | 0           |  |  |  |  |  |  |  |
| 2              | 0            | 0 | 0  | В | 0           |  |  |  |  |  |  |  |
| 1              | 0            | 0 | 0  | 0 | В           |  |  |  |  |  |  |  |

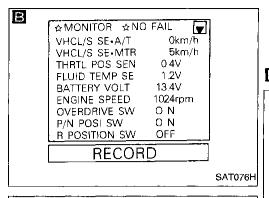
OK

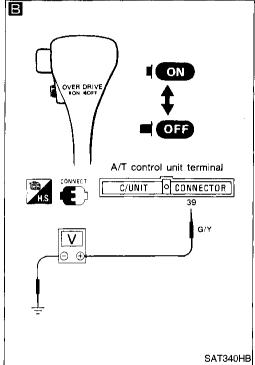
(Go to next page.)

NG Check the following items:

- Inhibitor switch Refer to "Component Inspection", AT-63.
- Harness for short or open between ignition switch and inhibitor switch (Main harness)
- Harness for short or open between inhibitor switch and A/T control unit (Main harness)

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# Inhibitor, Overdrive Control and Throttle Position Switches (Cont'd)

NG



# CHECK OVERDRIVE CONTROL SWITCH CIRCUIT.



- Turn ignition switch to "ON" position.
  - (Do not start engine.)
- Select "ECU INPUT SIGNALS" in Data Monitor.
- 3. Read out "OVERDRIVE SWITCH".

Check the signal of the overdrive control switch is indicated properly. (Overdrive control switch "ON"

displayed on CONSULT means overdrive "OFF".)

OR



- 1. Turn ignition switch to "ON" position.
  - (Do not start engine.)
- Check voltage between A/T control unit terminal (a) and ground when overdrive control switch is "ON" and "OFF".

| Switch position | Voltage         |  |  |  |  |  |  |  |  |
|-----------------|-----------------|--|--|--|--|--|--|--|--|
| ON              | Battery voltage |  |  |  |  |  |  |  |  |
| OFF             | 1V or less      |  |  |  |  |  |  |  |  |
|                 |                 |  |  |  |  |  |  |  |  |
| OK              |                 |  |  |  |  |  |  |  |  |
| <b>▼</b>        |                 |  |  |  |  |  |  |  |  |
| •               | <b>(B</b> )     |  |  |  |  |  |  |  |  |

(Go to next page.)

Check the following items.

• Overdrive control switch

- Refer to "Component Inspection", AT-63.
- Harness for short or open between A/T control unit and overdrive control switch (Main harness)
- Harness for short or open of ground circuit for overdrive control switch (Main harness)

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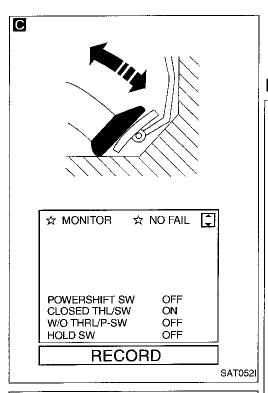
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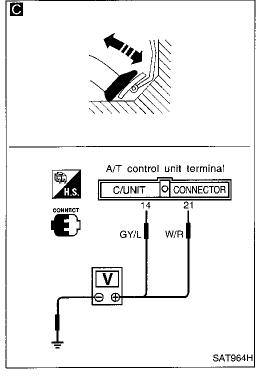
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# Inhibitor, Overdrive Control and Throttle Position Switches (Cont'd)

NG

**B** 

# CHECK THROTTLE POSITION SWITCH CIRCUIT.



- Turn ignition switch to "ON" position.
   (Do not start engine.)
- 2. Select "ECU INPUT SIGNALS" in Data Monitor.
- Read out "CLOSED THL/SW" and "W/O THRL/P-SW" depressing and releasing accelerator pedal.

Check the signal of throttle position switch is indicated properly.

| Accelerator<br>pedal condi-<br>tìon | Data monitor     |                   |
|-------------------------------------|------------------|-------------------|
|                                     | CLOSED<br>THL/SW | W/O THRL/<br>P-SW |
| Released                            | ON               | OFF               |
| Fully depressed                     | OFF              | ON                |

OR



- 1. Turn ignition switch to "ON" position.
  - (Do not start engine.)
- Check voltage between A/T control unit terminals (4), (2) and ground while depressing, and releasing accelerator pedal slowly. (after warming up engine)

| Accelerator          | Voltage              |                    |
|----------------------|----------------------|--------------------|
| pedal condi-<br>tion | Terminal<br>No. 👍    | Terminal No.       |
| Released             | Battery volt-<br>age | 1V or less         |
| Fully<br>depressed   | 1V or less           | Battery<br>voltage |

Perform Diagnostic Trouble Code (DTC) confirmation procedure, AT-59.

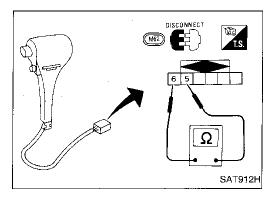
INSPECTION END

- Check the following items:
- Throttle position switch Refer to "Component Inspection", AT-64.
- Harness for short or open between ignition switch and throttle position switch (Main harness)
- Harness for short or open between throttle position switch and A/T control unit (Main harness)

 Perform A/T control unit input/output signal inspection.

If NG, recheck A/T control unit pin terminals for damage or loose connection with harness connector.

672



Inhibitor switch PAIU

Inhibitor switch

harness connector >

SAT884GD

SAT295F

# Inhibitor, Overdrive Control and Throttle Position Switches (Cont'd) COMPONENT INSPECTION

#### Overdrive control switch

Check continuity between two terminals.

| Switch position | Continuity |
|-----------------|------------|
| ON              | No         |
| OFF             | Yes        |

# (G)

| M. | A |  |
|----|---|--|
|    |   |  |

#### EM

#### Inhibitor switch

Check continuity between terminals (1) and (2) and between terminals 3 and 4, 5, 6, 7, 8, 9 while moving manual shaft through each position.

FE

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| Lever position | Termin | al No. |
|----------------|--------|--------|
| Р              | 1-2    | 3-4    |
| R              | 3-5    |        |
| N              | 1 - 2  | 3-6    |
| D              | 3-7    |        |
| 2              | 3-8    | _      |
| 1              | 3-9    |        |



| CL |  |
|----|--|
|    |  |



# ΑT







Front

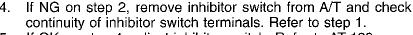
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- If NG, check again with manual control cable disconnected 38 from manual shaft of A/T assembly. Refer to step 1.
- If OK on step 2, adjust manual control cable. Refer to AT-140.









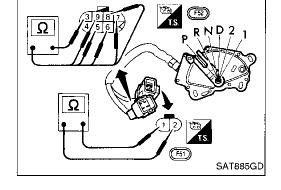
If OK on step 4, adjust inhibitor switch. Refer to AT-139.

If NG on step 4, replace inhibitor switch.

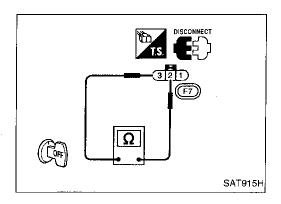


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# Inhibitor, Overdrive Control and Throttle Position Switches (Cont'd)

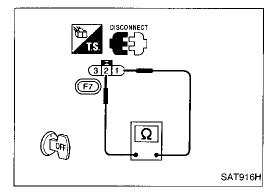
## Throttle position switch

Closed throttle position switch (idle position)

• Check continuity between terminals (2) and (3).

| Accelerator pedal condition |           | Continuity |  |
|-----------------------------|-----------|------------|--|
|                             | Released  | Yes        |  |
|                             | Depressed | No         |  |

To adjust closed throttle position switch, refer to EC section ("Basic Inspection", "TROUBLE DIAGNOSIS — Basic Inspection").

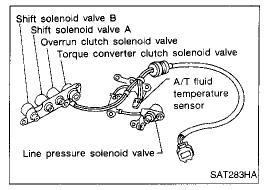


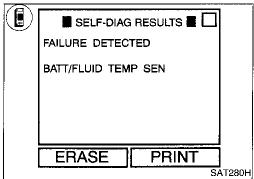
#### Wide open throttle position switch

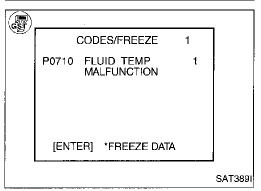
Check continuity between terminals 1 and 2.

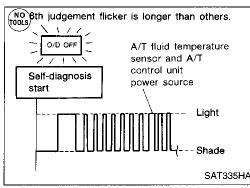
| Accelerator pedal condition | Continuity |
|-----------------------------|------------|
| Released                    | No         |
| Depressed                   | Yes        |

**AT-64** 674









## A/T Fluid Temperature Sensor Circuit and A/T **Control Unit Power Source**

#### **DESCRIPTION**

The A/T fluid temperature sensor detects the A/T fluid temperature and sends a signal to the A/T control unit.

|  | Diagnostic trouble code | Malfunction is detected when                   | Check item<br>(Possible cause)                                 |
|--|-------------------------|--|--|
| BATT/FLUID TEMP  A/T control unit receives an excessively low or high voltage from the sensor.  Bath judgement flicker  Harness or connectors (The sensor circuit is open or shorted.)  A/T fluid temperature sensor | P0710  8th judgement    | receives an exces-<br>sively low or high volt- | (The sensor circuit is open or shorted.)  • A/T fluid tempera- |

#### Diagnostic Trouble Code (DTC) confirmation procedure

After the repair, perform the following procedure to confirm the malfunction is eliminated.

Start engine. 1)

2) Select "SELF-DIAG RESULTS" mode with CONSULT.

3) Drive vehicle under the following conditions: Selector lever in "D", vehicle speed higher than 10 km/h (6 MPH), throttle opening greater than 1/8 of the full open position, engine speed higher than 450 rpm and MT driving for more than 10 minutes.

– OR -

GSF

Start engine. 1)

Drive vehicle under the following conditions: Selector lever in "D", vehicle speed higher than 10 km/h (6 MPH), throttle opening greater than 1/8 of the full open position, engine speed higher than 450 rpm and driving for more than 10 minutes.

Select "MODE 7" with GST.

OR ·

1) Start engine.

2) Drive vehicle under the following conditions: Selector lever in "D", vehicle speed higher than 10 km/h (6 MPH), throttle opening greater than 1/8 of the full open position, engine speed higher than 450 rpm and driving for more than 10 minutes.

Perform self-diagnosis. Refer to SELF-DIAGNOSTIC PROCEDURE (No Tools), AT-27.

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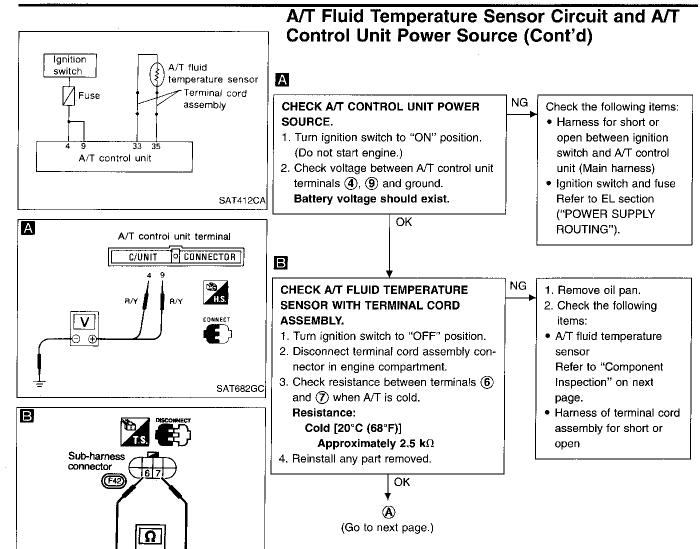
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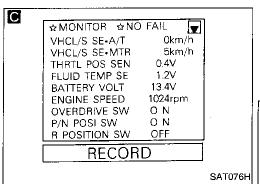
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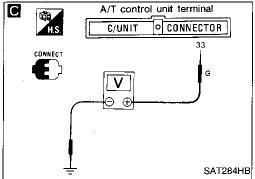
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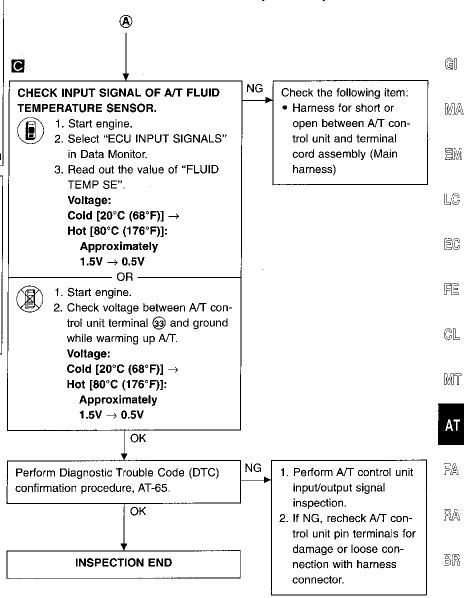


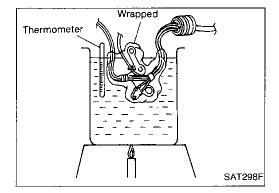
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# A/T Fluid Temperature Sensor Circuit and A/T Control Unit Power Source (Cont'd)





#### **COMPONENT INSPECTION**

## A/T fluid temperature sensor

• For removal, refer to AT-138.

 Check resistance between two terminals while changing temperature as shown at left.

| Temperature °C (°F) | Resistance                   |
|---------------------|------------------------------|
| 20 (68)             | Approximately 2.5 k $\Omega$ |
| 80 (176)            | Approximately 0.3 k $\Omega$ |

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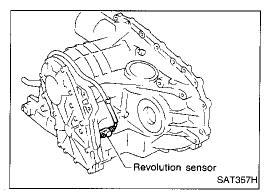
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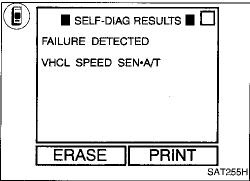
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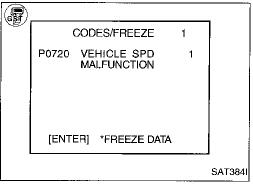
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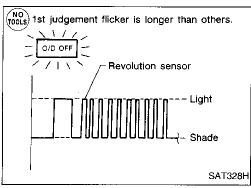
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IDX









# Vehicle Speed Sensor·A/T (Revolution sensor) DESCRIPTION

The revolution sensor detects the revolution of the idler gear parking pawl lock gear and emits a pulse signal. The pulse signal is sent to the A/T control unit which converts it into vehicle speed.

| Diagnostic trouble code                                  | Malfunction is detected when  | Check item<br>(Possible cause)   |
|--|---|--|
| : VHCL SPEED SEN-A/T : P0720  NO 1 1st judgement flicker | A/T control unit does<br>not receive the proper<br>voltage signal from<br>the sensor. | Harness or connectors     (The sensor circuit is open or shorted.)     Revolution sensor |

## Diagnostic Trouble Code (DTC) confirmation procedure

After the repair, perform the following procedure to confirm the malfunction is eliminated.

- OR



- 1) Start engine.
- 2) Select "SELF-DIAG RESULTS" mode with CONSULT.
- 3) Drive vehicle under the following conditions: Selector lever in "D", vehicle speed higher than 30 km/h (19 MPH), throttle opening greater than 1/8 of the full throttle position and driving for more than 5 seconds.

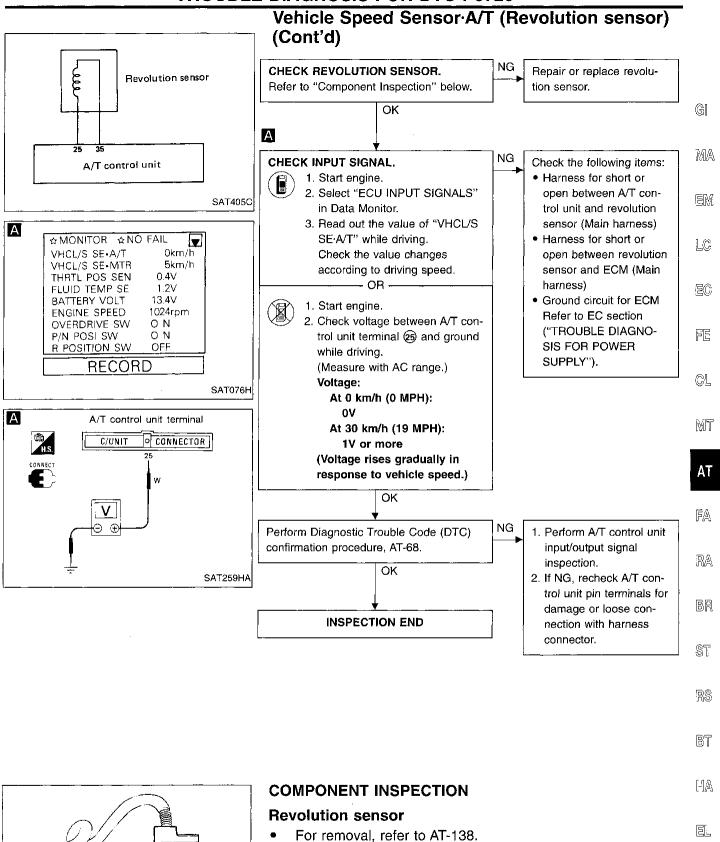


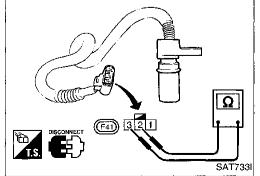
- 1) Start engine.
- Drive vehicle under the following conditions: Selector lever in "D", vehicle speed higher than 30 km/h (19 MPH), throttle opening greater than 1/8 of the full throttle position and driving for more than 5 seconds.
- 3) Select "MODE 7" with GST.



- 1) Start engine.
- 2) Drive vehicle under the following conditions: Selector lever in "D", vehicle speed higher than 30 km/h (19 MPH), throttle opening greater than 1/8 of the full throttle position and driving for more than 5 seconds.
- 3) Perform self-diagnosis.
  Refer to SELF-DIAGNOSTIC PROCEDURE (No Tools),
  AT-27.

678





Check resistance between terminals (2) and (3).

| Terminal No. |   | Resistance |  |
|--------------|---|------------|--|
| 2            | 3 | 500 - 650Ω |  |

## **Engine Speed Signal**

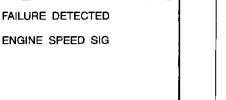
#### **DESCRIPTION**

The engine speed signal is sent from the ECM to the A/T control unit.

| Diagnostic trouble code | Malfunction is detected when   | Check item<br>(Possible cause)           |  |
|-------------------------|--|--|--|
| ENGINE SPEED SIG        | A/T control unit does<br>not receive the proper<br>voltage signal from<br>ECM. | Harness or connectors                    |  |
| 9th judgement flicker   |  | (The sensor circuit is open or shorted.) |  |

Diagnostic Trouble Code (DTC) confirmation procedure

After the repair, perform the following procedure to confirm the



PRINT

SELF-DIAG RESULTS

SAT285H

1) Start engine.

malfunction is eliminated.

2) Select "SELF-DIAG RESULTS" mode with CONSULT.

3) Drive vehicle under the following conditions:
Selector lever in "D", vehicle speed higher than 10 km/h
(6 MPH), throttle opening greater than 1/8 of the full throttle position and driving for more than 10 seconds.

CODES/FREEZE 1
P0725 ENGINE SPD 1
MALFUNCTION

[ENTER] \*FREEZE DATA

**ERASE** 



1) Start engine.

2) Drive vehicle under the following conditions: Selector lever in "D", vehicle speed higher than 10 km/h (6 MPH), throttle opening greater than 1/8 of the full throttle position and driving for more than 10 seconds.

- OR -

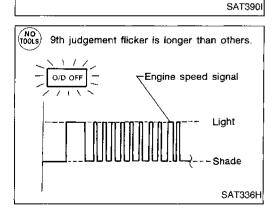
3) Select "MODE 7" with GST.

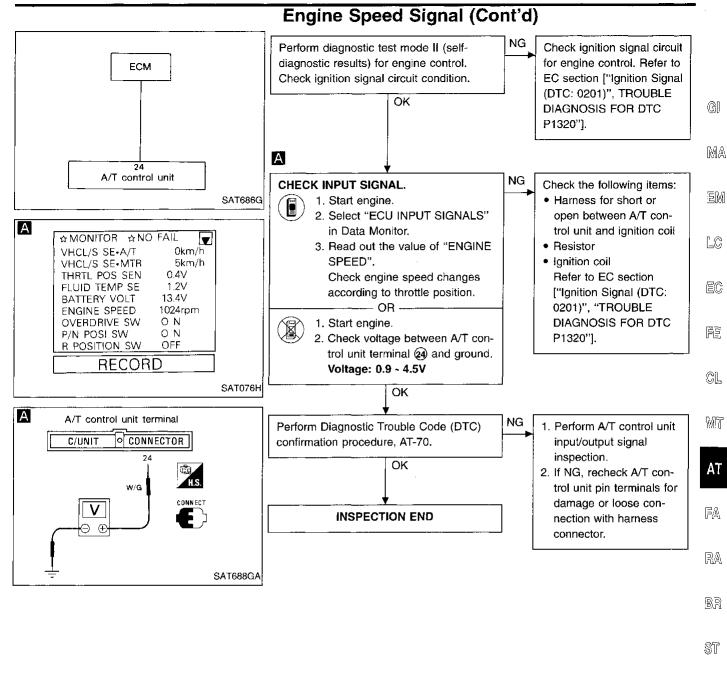
TOOLS

1) Start engine.

 Drive vehicle under the following conditions: Selector lever in "D", vehicle speed higher than 10 km/h (6 MPH), throttle opening greater than 1/8 of the full throttle position and driving for more than 10 seconds.

 Perform self-diagnosis.
 Refer to SELF-DIAGNOSTIC PROCEDURE (No Tools), AT-27.





AT-71 681

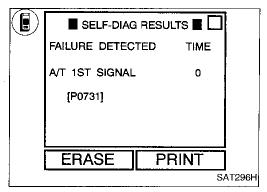
RS

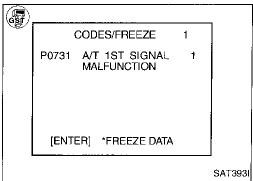
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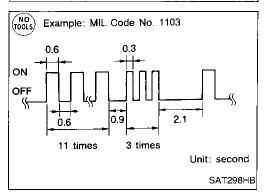
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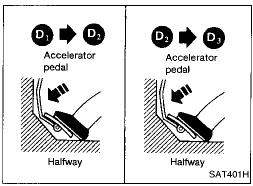
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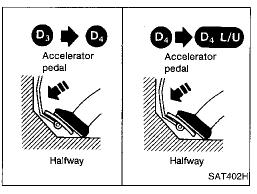
]DX











# Improper Shifting to 1st Gear Position DESCRIPTION

- This is one of the items indicated by the MIL.
- This malfunction will not be detected while the O/D OFF indicator lamp is indicating another self-diagnosis malfunction.
- This malfunction is detected when the A/T does not shift into first gear position as instructed by the A/T control unit. This is not caused by electrical malfunction (circuits open or shorted) but by mechanical malfunction such as control valve sticking, improper solenoid valve operation, etc.

| Diagnostic trouble code                      | Malfunction is detected when   | Check item (Possible cause)  |
|--|--|--|
| : A/T 1ST SIGNAL : P0731 : MIL Code No. 1103 | A/T cannot be shifted to the 1st gear position even if electrical circuit is good. | <ul> <li>Shift solenoid valve A</li> <li>Shift solenoid valve B</li> <li>Each clutch</li> <li>Hydraulic control circuit</li> </ul> |

#### Diagnostic Trouble Code (DTC) confirmation procedure

After the repair, perform the following procedure to confirm the malfunction is eliminated.



- 1) Start engine and warm up ATF.
- Select "SELF-DIAG RESULTS" mode for ECM with CONSULT.
- 3) Start vehicle with selector lever in "D" and throttle opening halfway. Check that vehicle runs through gear shift of  $D_1 \rightarrow D_2 \rightarrow D_3 \rightarrow D_4$ , in accordance with shift schedule. Refer to shift schedule, AT-49.



- 1) Start engine and warm up ATF.
- 2) Start vehicle with selector lever in "D" and throttle opening halfway. Check that vehicle runs through gear shift of  $D_1 \rightarrow D_2 \rightarrow D_3 \rightarrow D_4$ , in accordance with shift schedule. Refer to shift schedule, AT-49.
- 3) Select "MODE 7" with GST.

- OR -

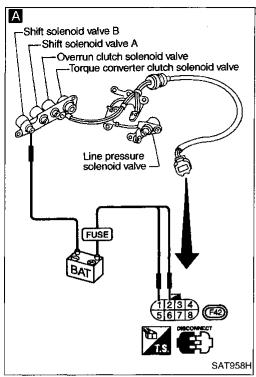
- OR

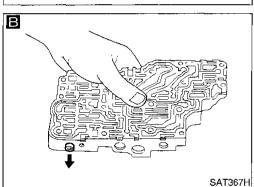


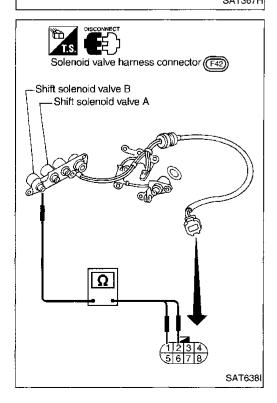
- Start engine and warm up ATF.
- 2) Start vehicle with selector lever in "D" and throttle opening halfway. Check that vehicle runs through gear shift of  $D_1 \rightarrow D_2 \rightarrow D_3 \rightarrow D_4$ , in accordance with shift schedule. Refer to shift schedule, AT-49.
- Perform self-diagnosis for ÉCM.
   Refer to EC section ["Malfunction Indicator Lamp (MIL)",
   "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION"].

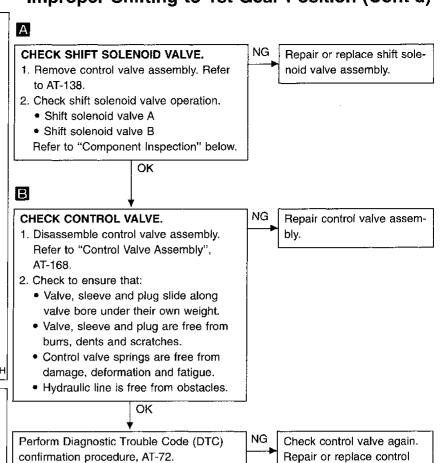
**AT-72** 682

# Improper Shifting to 1st Gear Position (Cont'd)









## COMPONENT INSPECTION

#### Shift solenoid valve A and B

**INSPECTION END** 

OK

For removal, refer to AT-138.

#### Resistance check

Check resistance between two terminals.

| Solenoid valve         | Terminal No. |        | Resistance<br>(Approx.) | KS<br>KS |
|------------------------|--------------|--------|-------------------------|----------|
| Shift solenoid valve A | 2            | 0      | 00 400                  | BŢ       |
| Shift solenoid valve B | ①            | Ground | 20 - 40Ω                | HA       |

valve assembly.

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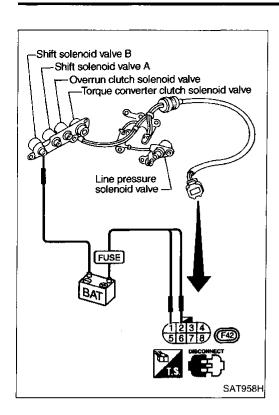
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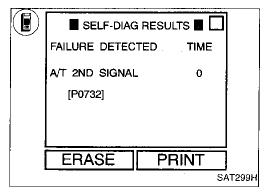
IDX

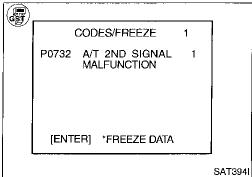


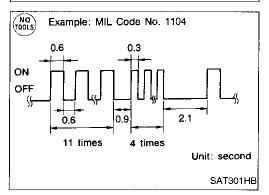
# Improper Shifting to 1st Gear Position (Cont'd) Operation check

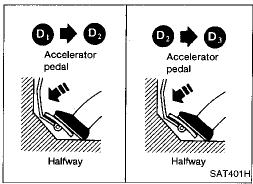
 Check solenoid valve by listening for its operating sound while applying battery voltage to the terminal and ground.

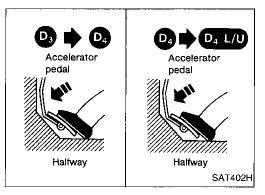
AT-74 684











# Improper Shifting to 2nd Gear Position DESCRIPTION

- This is one of the items indicated by the MIL.
- This malfunction will not be detected while the O/D OFF indicator lamp is indicating another self-diagnosis malfunction.
- This malfunction is detected when the A/T does not shift into second gear position as instructed by the A/T control unit. This is not caused by electrical malfunction (circuits open or shorted) but by mechanical malfunction such as control valve sticking, improper solenoid valve operation, etc.

| Diagnostic trouble code                         | Malfunction is detected when  | Check item (Possible cause)  | LĈ |
|---|---|--|----|
| A/T 2ND SIGNAL P0732  NO SOLS MIL Code No. 1104 | A/T cannot be shifted<br>to the 2nd gear posi-<br>tion even if electrical<br>circuit is good. | Shift solenoid valve     B     Each clutch     Hydraulic control     circuit | EG |
|   |   |  | FE |

## Diagnostic Trouble Code (DTC) confirmation procedure

After the repair, perform the following procedure to confirm the malfunction is eliminated.



- Start engine and warm up ATF.
- Select "SELF-DIAG RESULTS" mode for ECM with CONSULT.
- 3) Start vehicle with selector lever in "D" and throttle opening halfway. Check that vehicle runs through gear shift of  $D_1 \rightarrow D_2 \rightarrow D_3 \rightarrow D_4$ , in accordance with shift schedule. Refer to shift schedule, AT-49.

— OR



- 1) Start engine and warm up ATF.
- 2) Start vehicle with selector lever in "D" and throttle opening halfway. Check that vehicle runs through gear shift of  $D_1 \rightarrow D_2 \rightarrow D_3 \rightarrow D_4$ , in accordance with shift schedule. Refer to shift schedule, AT-49.
- Select "MODE 7" with GST.

– OR -



- 1) Start engine and warm up ATF.
- 2) Start vehicle with selector lever in "D" and throttle opening halfway. Check that vehicle runs through gear shift of  $D_1 \rightarrow D_2 \rightarrow D_3 \rightarrow D_4$ , in accordance with shift schedule. Refer to shift schedule, AT-49.
- Perform self-diagnosis for ECM.
   Refer to EC section ["Malfunction Indicator Lamp (MIL)",
   "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION"].

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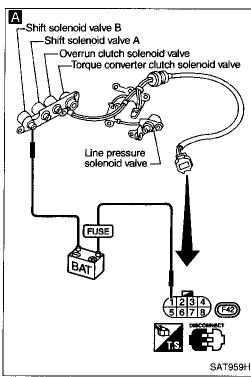
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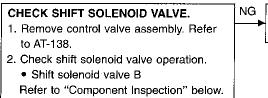
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# Improper Shifting to 2nd Gear Position (Cont'd)





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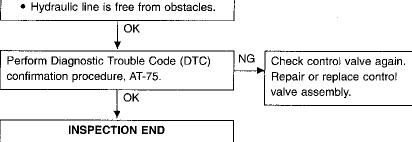
Repair or replace shift sole-

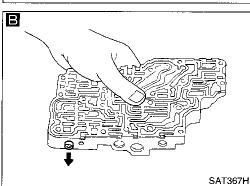
Repair control valve assem-

noid valve assembly.

#### CHECK CONTROL VALVE.

- 1. Disassemble control valve assembly. Refer to "Control Valve Assembly", AT-168.
- 2. Check to ensure that:
  - Valve, sleeve and plug slide along valve bore under their own weight.
  - Valve, sleeve and plug are free from burrs, dents and scratches.
  - Control valve springs are free from damage, deformation and fatigue.





#### COMPONENT INSPECTION

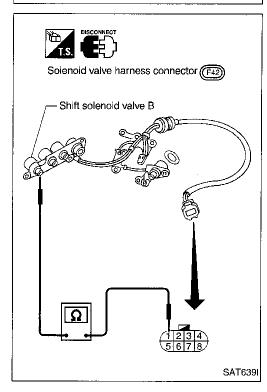
#### Shift solenoid valve B

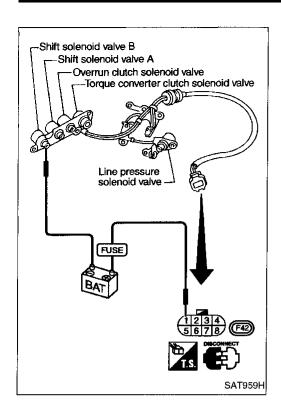
For removal, refer to AT-138.

#### Resistance check

Check resistance between two terminals.

| Solenoid valve         | Terminal No. |        | Resistance<br>(Approx.) |
|------------------------|--------------|--------|-------------------------|
| Shift solenoid valve B | 1            | Ground | 20 - 40Ω                |





# Improper Shifting to 2nd Gear Position (Cont'd) Operation check

 Check solenoid valve by listening for its operating sound while applying battery voltage to the terminal and ground.

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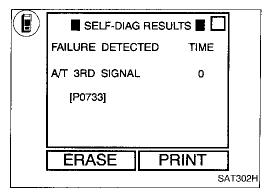
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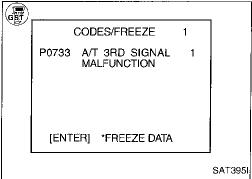
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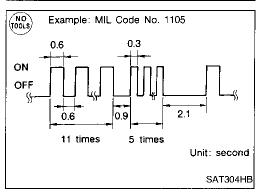
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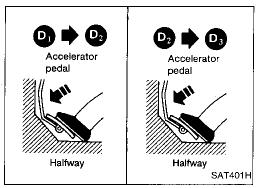
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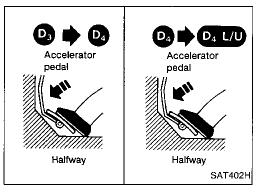
IDX











# Improper Shifting to 3rd Gear Position DESCRIPTION

- This is one of the items indicated by the MIL.
- This malfunction will not be detected while the O/D OFF indicator lamp is indicating another self-diagnosis malfunction.
- This malfunction is detected when the A/T does not shift into third gear position as instructed by the A/T control unit. This is not caused by electrical malfunction (circuits open or shorted) but by mechanical malfunction such as control valve sticking, improper solenoid valve operation, malfunctioning servo piston or brake band, etc.

| Diagnostic trouble code                      | Malfunction is detected when   | Check item (Possible cause)                                  |
|--|--|--|
| : A/T 3RD SIGNAL : P0733 : MIL Code No. 1105 | A/T cannot be shifted to the 3rd gear position even if electrical circuit is good. | Shift solenoid valve A Each clutch Hydraulic control circuit |

### Diagnostic Trouble Code (DTC) confirmation procedure

After the repair, perform the following procedure to confirm the malfunction is eliminated.



- 1) Start engine and warm up ATF.
- Select "SELF-DIAG RESULTS" mode for ECM with CONSULT.
- 3) Start vehicle with selector lever in "D" and throttle opening halfway. Check that vehicle runs through gear shift of  $D_1 \rightarrow D_2 \rightarrow D_3 \rightarrow D_4$ , in accordance with shift schedule. Refer to shift schedule, AT-49.



- 1) Start engine and warm up ATF.
- 2) Start vehicle with selector lever in "D" and throttle opening halfway. Check that vehicle runs through gear shift of  $D_1 \rightarrow D_2 \rightarrow D_3 \rightarrow D_4$ , in accordance with shift schedule. Refer to shift schedule, AT-49.
- 3) Select "MODE 7" with GST.

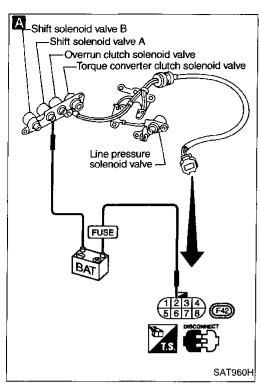
- OR

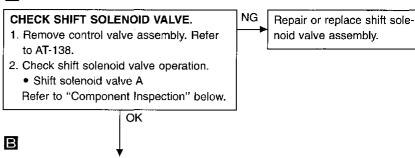
NO

- 1) Start engine and warm up ATF.
- 2) Start vehicle with selector lever in "D" and throttle opening halfway. Check that vehicle runs through gear shift of  $D_1 \rightarrow D_2 \rightarrow D_3 \rightarrow D_4$ , in accordance with shift schedule. Refer to shift schedule, AT-49.
- 3) Perform self-diagnosis for ECM.
  Refer to EC section ["Malfunction Indicator Lamp (MIL)",
  "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION"].

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# Improper Shifting to 3rd Gear Position (Cont'd)

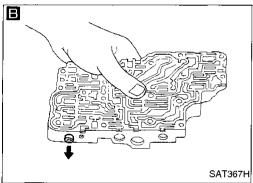


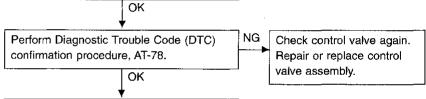


### CHECK CONTROL VALVE.

 Disassemble control valve assembly. Refer to "Control Valve Assembly", AT-168.

- 2. Check to ensure that:
  - Valve, sleeve and plug slide along valve bore under their own weight.
  - Valve, sleeve and plug are free from burrs, dents and scratches.
  - Control valve springs are free from damage, deformation and fatigue.
  - · Hydraulic line is free from obstacles.





# COMPONENT INSPECTION

INSPECTION END

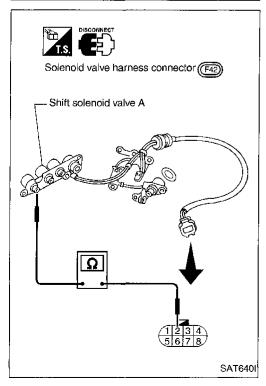
### Shift solenoid valve A

For removal, refer to AT-138.

### Resistance check

Check resistance between two terminals.

| Solenoid valve         | Terminal No. |        | Resistance<br>(Approx.) |
|------------------------|--------------|--------|-------------------------|
| Shift solenoid valve A | 2            | Ground | 20 - 40Ω                |



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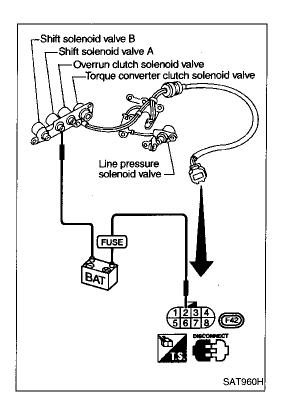
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Repair control valve assem-

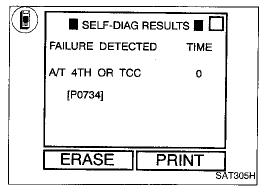
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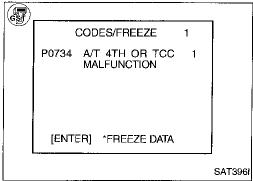


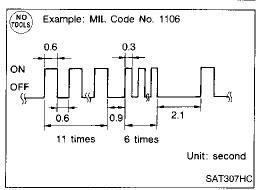
# Improper Shifting to 3rd Gear Position (Cont'd) Operation check

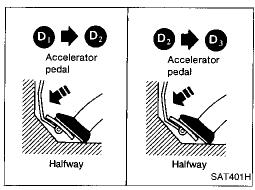
 Check solenoid valve by listening for its operating sound while applying battery voltage to the terminal and ground.

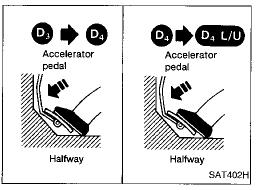
**AT-80** 690











# Improper Shifting to 4th Gear Position DESCRIPTION

- This is one of the items indicated by the MIL.
- This malfunction will not be detected while the O/D OFF indicator lamp is indicating another self-diagnosis malfunction.
- This malfunction is detected when the A/T does not shift into fourth gear position or the torque converter clutch does not lock up as instructed by the A/T control unit. This is not caused by electrical malfunction (circuits open or shorted) but by mechanical malfunction such as control valve sticking, improper solenoid valve operation, malfunctioning oil pump or torque converter clutch, etc.

| Diagnostic trouble code  | Malfunction is detected when   | Check item (Possible cause)  | L |
|--------------------------|--|--|---|
| : A/T 4TH SIGNAL         |  | Shift solenoid valve     A     Shift solenoid valve                |   |
| <b>(</b> F): P0734       | A/T cannot be shifted to the 4th gear position even if electrical circuit is good. | B • Overrun clutch solenoid valve • Line pressure sole- noid valve | F |
| (NO) : MIL Code No. 1106 |  | Each clutch     Hydraulic control circuit                          | N |

# Diagnostic Trouble Code (DTC) confirmation procedure

After the repair, perform the following procedure to confirm the malfunction is eliminated.

- Start engine and warm up ATF.
- 2) Select "SELF-DIAG RESULTS" mode for ECM with CONSULT.
- 3) Start vehicle with selector lever in "D" and throttle opening halfway. Check that vehicle runs through gear shift of  $D_1 \rightarrow D_2 \rightarrow D_3 \rightarrow D_4 \rightarrow D_4$  lock-up, in accordance with shift schedule. Refer to shift schedule, AT-49.

- OR

- 1) Start engine and warm up ATF.
- 2) Start vehicle with selector lever in "D" and throttle opening halfway. Check that vehicle runs through gear shift of  $D_1 \rightarrow D_2 \rightarrow D_3 \rightarrow D_4 \rightarrow D_4$  lock-up, in accordance with shift schedule. Refer to shift schedule, AT-49.
- 3) Select "MODE 7" with GST.

---- OR

No. 1) Start engine and warm up ATF.

- 2) Start vehicle with selector lever in "D" and throttle opening halfway. Check that vehicle runs through gear shift of  $D_1 \rightarrow D_2 \rightarrow D_3 \rightarrow D_4 \rightarrow D_4$  lock-up, in accordance with shift schedule. Refer to shift schedule, AT-49.
- Perform self-diagnosis for ECM.
   Refer to EC section ["Malfunction Indicator Lamp (MIL)",
   "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION"].

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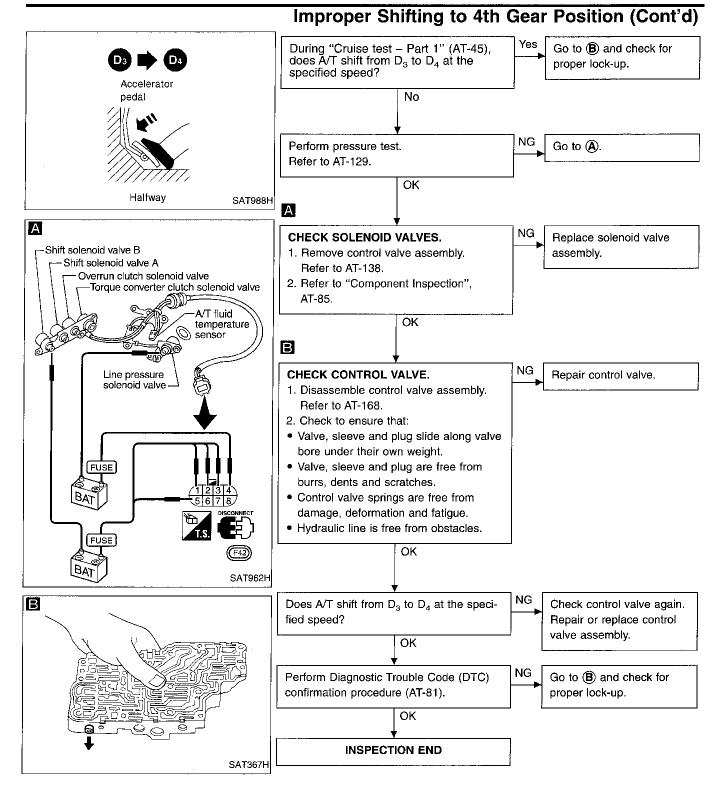
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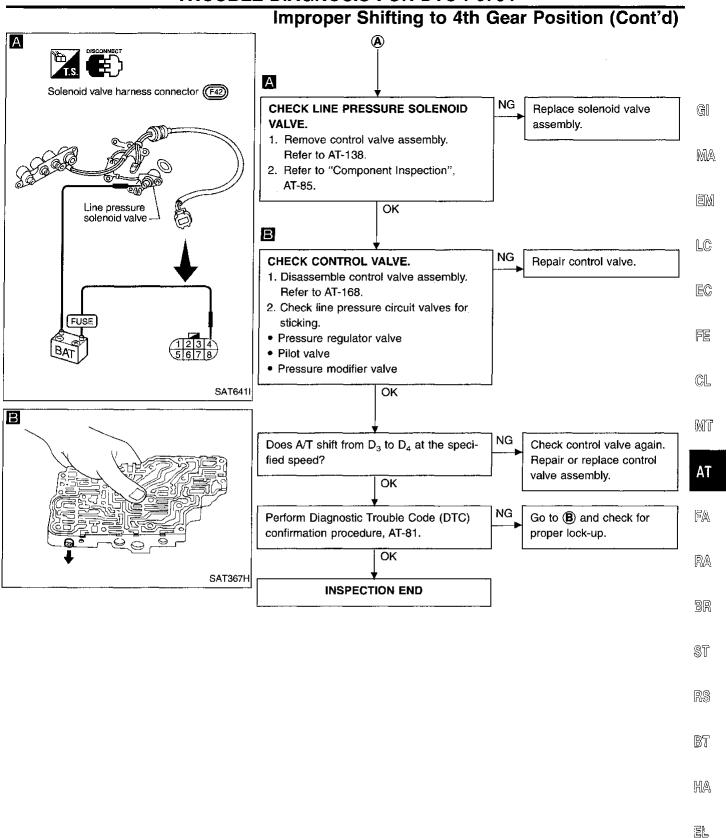
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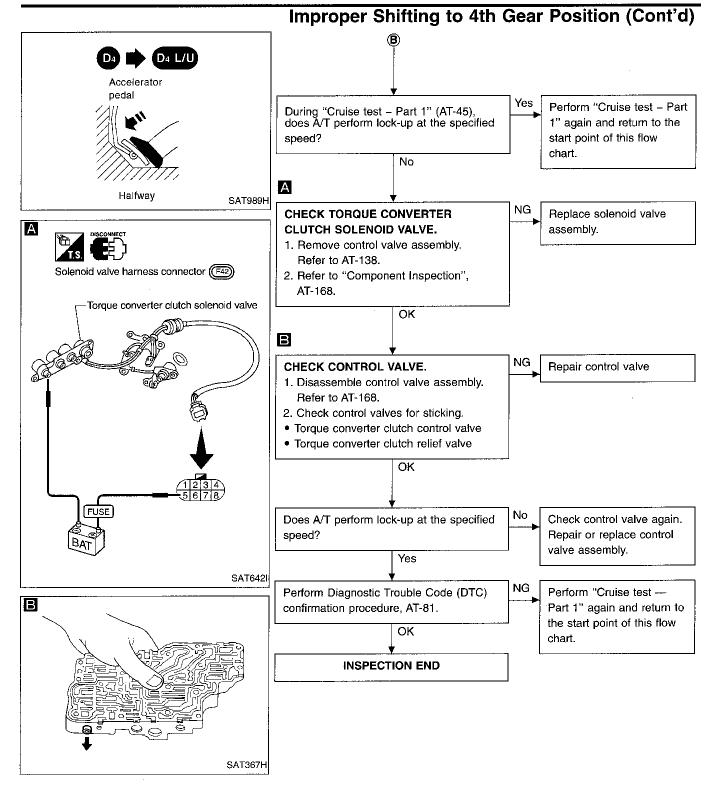
AT-81





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**AT-84** 694

# Shift solenoid valve A Overrun clutch solenoid valve Torque converter clutch solenoid valve A/T fluid temperature sensor Line pressure solenoid valve Solenoid valve SAT734

# Improper Shifting to 4th Gear Position (Cont'd) COMPONENT INSPECTION

### Solenoid valves

• For removal, refer to AT-138.

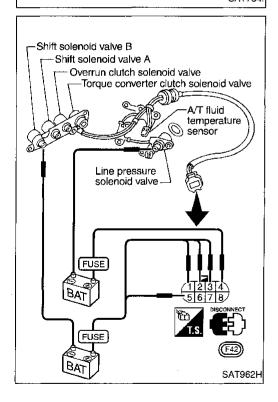
### Resistance check

Check resistance between two terminals.

| Solenoid valve                         | Terminal No. |        | Resistance<br>(Approx.) |
|--|--------------|--------|-------------------------|
| Shift solenoid valve A                 | 2            |        |                         |
| Shift solenoid valve B                 | 1            |        | 20 - 40Ω                |
| Overrun clutch solenoid valve          | 3            | Ground |                         |
| Line pressure solenoid valve           | 4            |        | 2.5 - 5Ω                |
| Torque converter clutch solenoid valve | <b>⑤</b>     |        | 10 - 16Ω                |

# Operation checkCheck solenoi

 Check solenoid valve by listening for its operating sound while applying battery voltage to the terminal and ground.



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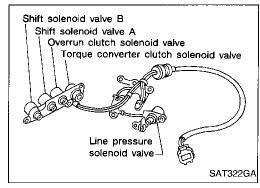
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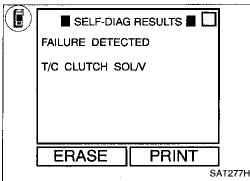
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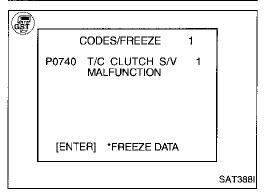
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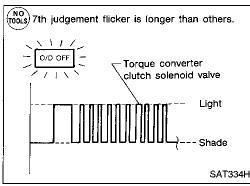
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# Torque Converter Clutch Solenoid Valve

### **DESCRIPTION**

The torque converter clutch solenoid valve is activated, with the gear in D<sub>4</sub>, by the A/T control unit in response to signals sent from the vehicle speed and throttle position sensors. Lock-up piston operation will then be controlled.

Lock-up operation, however, is prohibited when A/T fluid temperature is too low.

| Diagnostic trouble code | Malfunction is detected when             | Check item<br>(Possible cause)        |
|-------------------------|--|---------------------------------------|
| : T/C CLUTCH SOL/V      | A/T control unit                         | Harness or connectors                 |
| (S) : P0740             | detects an improper voltage drop when it | (The solenoid cir-<br>cuit is open or |
| 7th judgement flicker   | tires to operate the solenoid valve.     | shorted.) • T/C clutch solenoid valve |

### Diagnostic Trouble Code (DTC) confirmation procedure

After the repair, perform the following procedure to confirm the malfunction is eliminated.



- 1) Start engine.
- 2) Select "SELF-DIAG RESULTS" mode with CONSULT.

---- OR -----

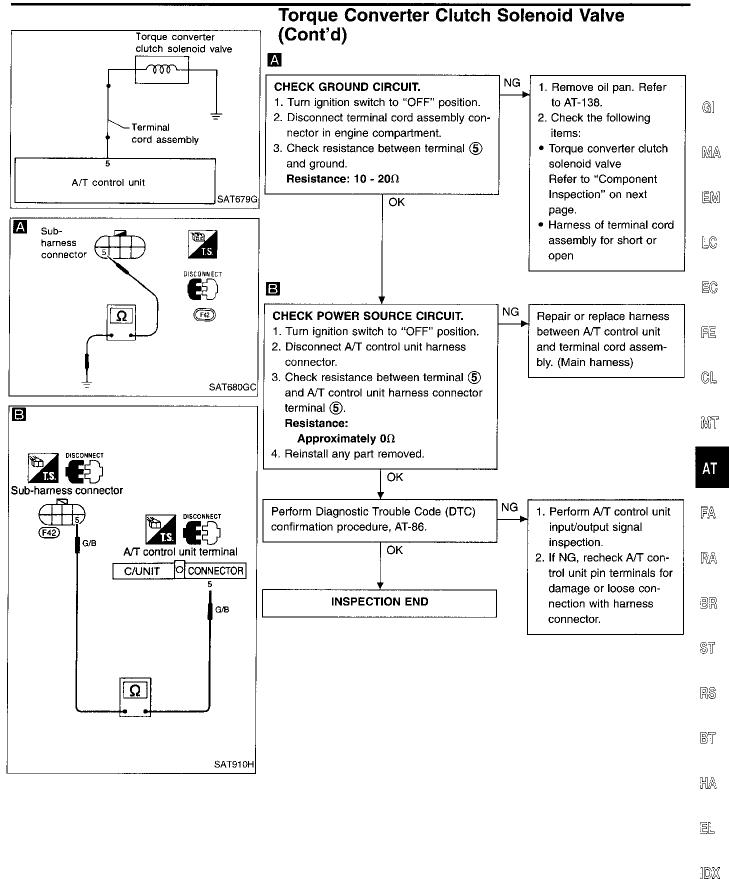
— OR -

Drive vehicle in  $D_1 \rightarrow D_2 \rightarrow D_3 \rightarrow D_4 \rightarrow D_4$  lock-up position.

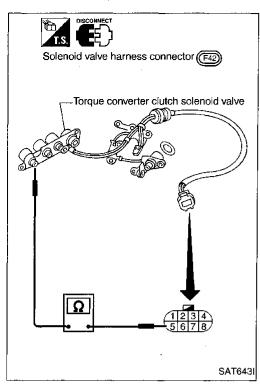


- Start engine. 1)
- Drive vehicle in  $D_1 \rightarrow D_2 \rightarrow D_3 \rightarrow D_4 \rightarrow D_4$  lock-up 2)
- Select "MODE 7" with GST. 3)

- Start engine. 1)
  - Drive vehicle in  $D_1 \to D_2 \to D_3 \to D_4 \to D_4$  lock-up 2) position.
  - Perform self-diagnosis. Refer to SELF-DIAGNOSTIC PROCEDURE (No Tools), AT-27.



**AT-87** 697



# Torque Converter Clutch Solenoid Valve (Cont'd)

### **COMPONENT INSPECTION**

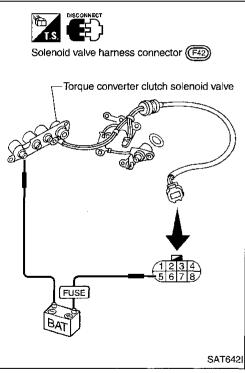
### Torque converter clutch solenoid valve

For removal, refer to AT-138.

## Resistance check

Check resistance between two terminals.

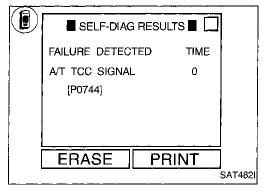
| Solenoid valve                         | Terminal No. |        | Resistance<br>(Approx.) |
|--|--------------|--------|-------------------------|
| Torque converter clutch solenoid valve | <b>(5)</b>   | Ground | 10 - 16Ω                |

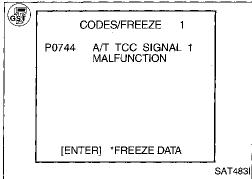


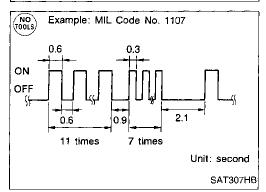
### Operation check

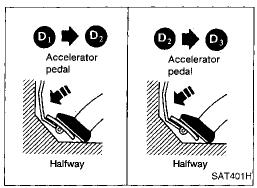
 Check solenoid valve by listening for its operating sound while applying battery voltage to the terminal and ground.

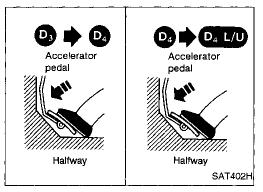
AT-88 698











# Improper Lock-up Operation

### **DESCRIPTION**

- This is one of the items indicated by the MiL.
- This malfunction will not be detected while the O/D OFF indicator lamp is indicating another self-diagnosis malfunction.
- This malfunction is detected when the A/T does not shift into fourth gear position or the torque converter clutch does not lock up as instructed by the A/T control unit. This is not caused by electrical malfunction (circuits open or shorted) but by mechanical malfunction such as control valve sticking, improper solenoid valve operation, malfunctioning oil pump or torque converter clutch, etc.

| Diagnostic trouble code                           | Malfunction is detected when                                   | Check item<br>(Possible cause)   |
|---|--|--|
| : A/T TCC SIGNAL  : P0744  NO : MIL Code No. 1107 | A/T cannot perform lock-up even if electrical circuit is good. | Torque converter clutch solenoid valve Each clutch Hydraulic control circuit |

# Diagnostic Trouble Code (DTC) confirmation procedure

After the repair, perform the following procedure to confirm the malfunction is eliminated.

- OR



- 1) Start engine and warm up ATF.
- 2) Select "SELF-DIAG RESULTS" mode for ECM with CONSULT.
- 3) Start vehicle with selector lever in "D" and throttle opening halfway. Check that vehicle runs through gear shift of  $D_1 \rightarrow D_2 \rightarrow D_3 \rightarrow D_4 \rightarrow D_4$  lock-up, in accordance with shift schedule. Refer to shift schedule, AT-49.



- 1) Start engine and warm up ATF.
- 2) Start vehicle with selector lever in "D" and throttle opening halfway. Check that vehicle runs through gear shift of  $D_1 \rightarrow D_2 \rightarrow D_3 \rightarrow D_4 \rightarrow D_4$  lock-up, in accordance with shift schedule. Refer to shift schedule, AT-49.
- 3) Select "MODE 7" with GST.



- 1) Start engine and warm up ATF.
- 2) Start vehicle with selector lever in "D" and throttle opening halfway. Check that vehicle runs through gear shift of  $D_1 \rightarrow D_2 \rightarrow D_3 \rightarrow D_4 \rightarrow D_4$  lock-up, in accordance with shift schedule. Refer to shift schedule, AT-49.
- Perform self-diagnosis for ECM.
   Refer to EC section ["Malfunction Indicator Lamp (MIL)",
   "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION"].

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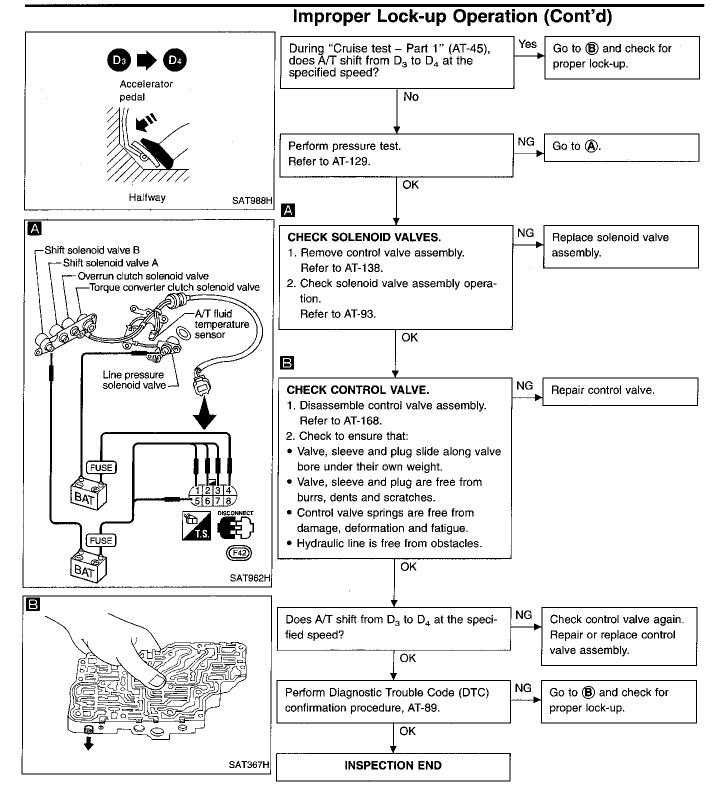
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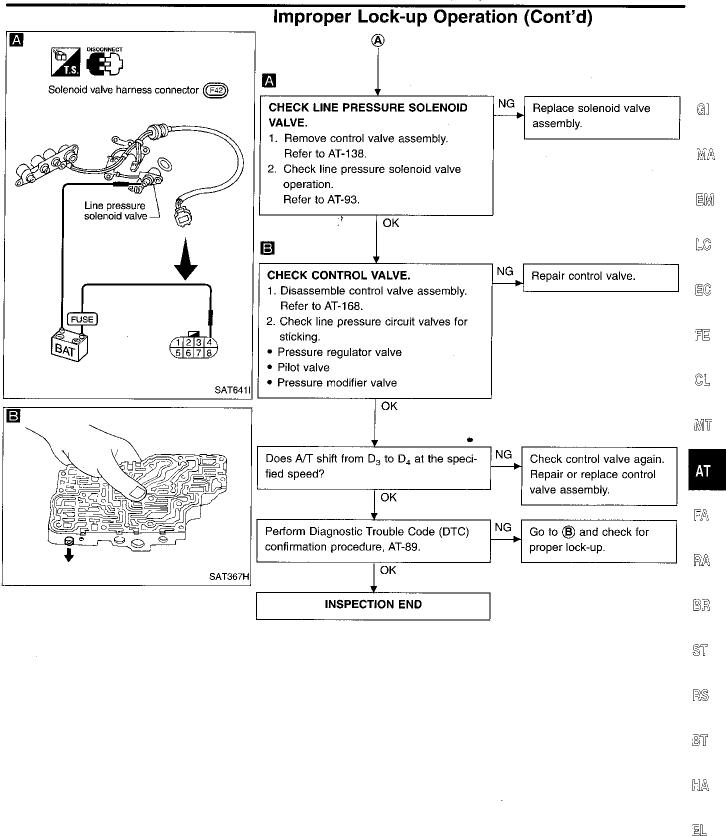
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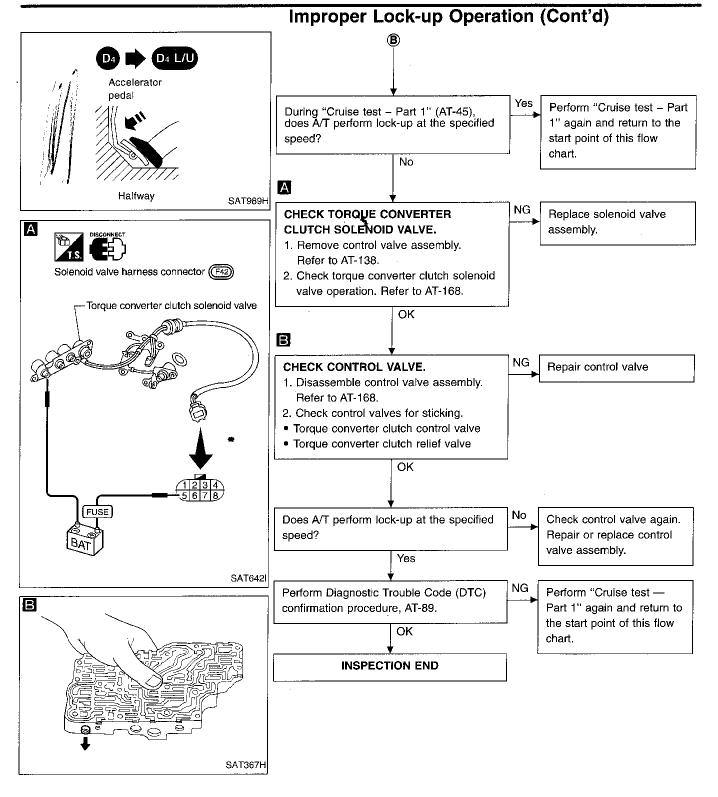
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# Shift solenoid valve B Shift solenoid valve A Overrun clutch solenoid valve Torque converter clutch solenoid valve A/T fluid temperature sensor Line pressure solenoid valve SAT734I

# Improper Lock-up Operation (Cont'd) **COMPONENT INSPECTION**

### Solenoid valves

For removal, refer to AT-138.

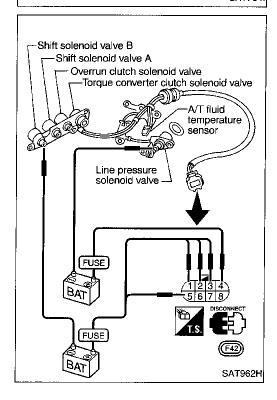
### Resistance check

Check resistance between two terminals.

| Solenoid valve                         | Terminal No. |        | Resistance<br>(Approx.) | m.      |
|--|--------------|--------|-------------------------|---------|
| Shift solenoid valve A                 | 2            |        |                         | -<br>20 |
| Shift solenoid valve B                 | 1            |        | 20 - 40Ω                |         |
| Overrun clutch solenoid valve          | 3            | Ground |                         | LC      |
| Line pressure solenoid valve           | 4            |        | 2.5 - 5Ω                | -<br>EC |
| Torque converter clutch solenoid valve | (5)          |        | 10 - 16Ω                | -<br>FE |

# Operation check

Check solenoid valve by listening for its operating sound while applying battery voltage to the terminal and ground.



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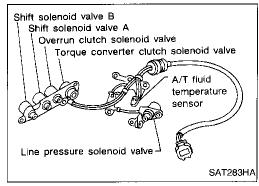
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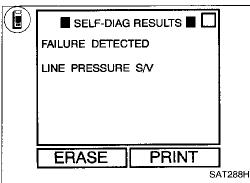
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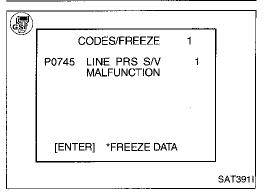
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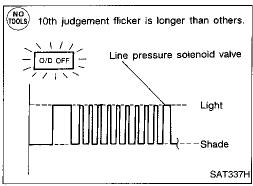
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# Line Pressure Solenoid Valve DESCRIPTION

The line pressure solenoid valve regulates the oil pump discharge pressure to suit the driving condition in response to a signal sent from the A/T control unit.

| Diagnostic trouble code | Malfunction is detected when             | Check item<br>(Possible cause)              |
|-------------------------|--|---|
| : LINE PRESSURE S/V     | A/T control unit                         | Harness or connectors                       |
| <b>P</b> 0745           | detects an improper voltage drop when it | (The solenoid cir-<br>cuit is open or       |
| 10th judgement flicker  | tries to operate the solenoid valve.     | shorted.)  • Line pressure sole- noid valve |

# Diagnostic Trouble Code (DTC) confirmation procedure

After the repair, perform the following procedure to confirm the malfunction is eliminated.

- OR

- OR -



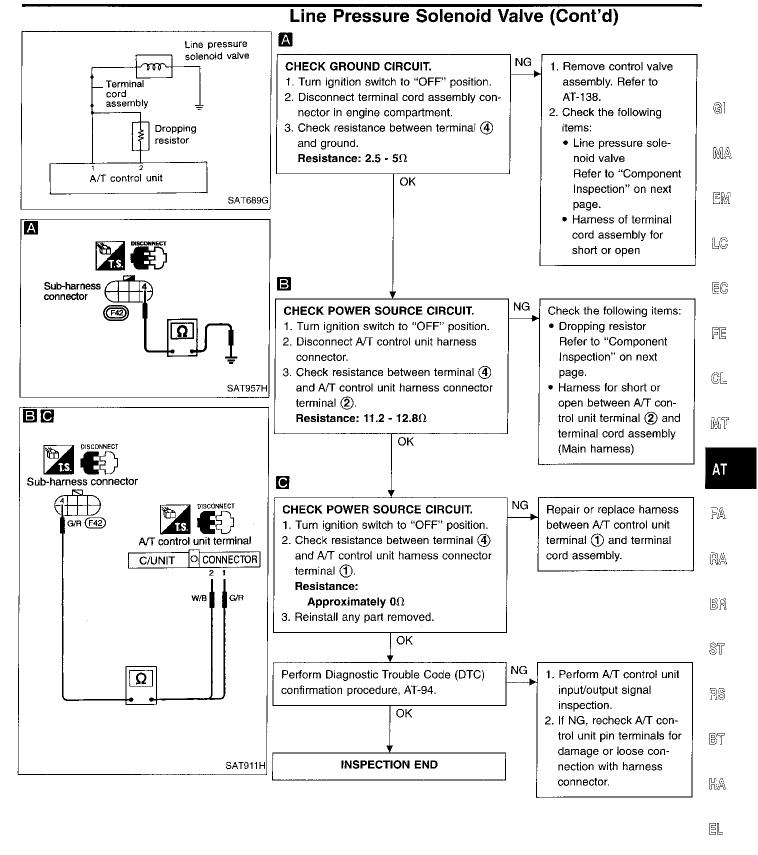
- 1) Start engine.
- 2) Select "SELF-DIAG RESULTS" mode with CONSULT.
- 3) With brake pedal depressed, shift the lever from "P"  $\rightarrow$  "N"  $\rightarrow$  "D"  $\rightarrow$  "N"  $\rightarrow$  "P".



- 1) Start engine.
- With brake pedal depressed, shift the lever from "P" → "N" → "D" → "N" → "P".
- 3) Select "MODE 7" with GST.

(NO TOOLS

- 1) Start engine.
- 2) With brake pedal depressed, shift the lever from "P"  $\rightarrow$  "N"  $\rightarrow$  "D"  $\rightarrow$  "N"  $\rightarrow$  "P".
- Perform self-diagnosis.
   Refer to SELF-DIAGNOSTIC PROCEDURE (No Tools), AT-27.



**AT-95** 705

[DX

# Solenoid valve harness connector F42 Line pressure solenoid valve 1 2 3 4 5 6 7 8 SAT6441

# Line Pressure Solenoid Valve (Cont'd) COMPONENT INSPECTION

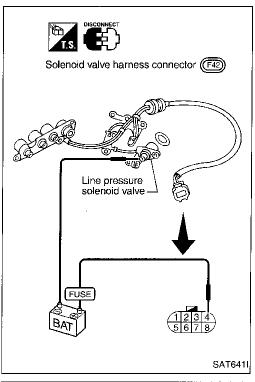
### Line pressure solenoid valve

• For removal, refer to AT-138.

## Resistance check

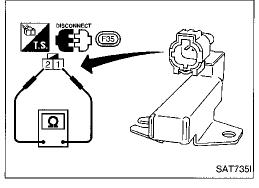
• Check resistance between two terminals.

| Solenoid valve               | Terminal No. |        | Resistance<br>(Approx.) |
|------------------------------|--------------|--------|-------------------------|
| Line pressure solenoid valve | 4            | Ground | 2.5 - 5Ω                |



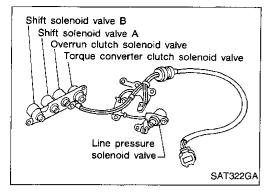
### Operation check

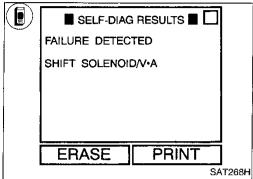
 Check solenoid valve by listening for its operating sound while applying battery voltage to the terminal and ground.

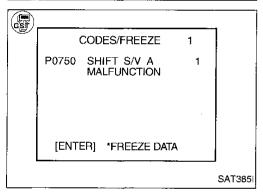


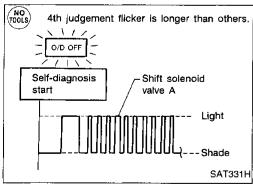
# **Dropping resistor**

Check resistance between two terminals.
 Resistance: 11.2 - 12.8Ω









### Shift Solenoid Valve A

### **DESCRIPTION**

Shift solenoid valves A and B are turned "ON" or "OFF" by the A/T control unit in response to signals sent from the inhibitor switch, vehicle speed and throttle position sensors. Gears will then be shifted to the optimum position.

| Gear position          | 1  | 2   | 3   | 4   |
|------------------------|----|-----|-----|-----|
| Shift solenoid valve A | ON | OFF | OFF | ON  |
| Shift solenoid valve B | ON | ON  | OFF | OFF |

| Diagnostic trouble code                           | Malfunction is detected when   | Check item<br>(Possible cause)  |
|---|--|---|
| SHIFT SOLENOID/ V·A  P0750  4th judgement flicker | A/T control unit<br>detects an improper<br>voltage drop when it<br>tires to operate the<br>solenoid valve. | <ul> <li>Harness or connectors         (The solenoid circuit is open or shorted.)     </li> <li>Shift solenoid valve A</li> </ul> |

# Diagnostic Trouble Code (DTC) confirmation procedure

After the repair, perform the following procedure to confirm the malfunction is eliminated.

— OR -

- OR -



- Start engine.
- 2) Select "SELF-DIAG RESULTS" mode with CONSULT.
- 3) Drive vehicle in  $D_1 \rightarrow D_2$  position.

(SF)

- 1) Start engine.
- 2) Drive vehicle in  $D_1 \rightarrow D_2$  position.
- 3) Select "MODE 7" with GST.

NO

- 1) Start engine.
- 2) Drive vehicle in  $D_1 \rightarrow D_2$  position.
- 3) Perform self-diagnosis.

  Refer to SELF-DIAGNOSTIC PROCEDURE (No Tools),
  AT-27.

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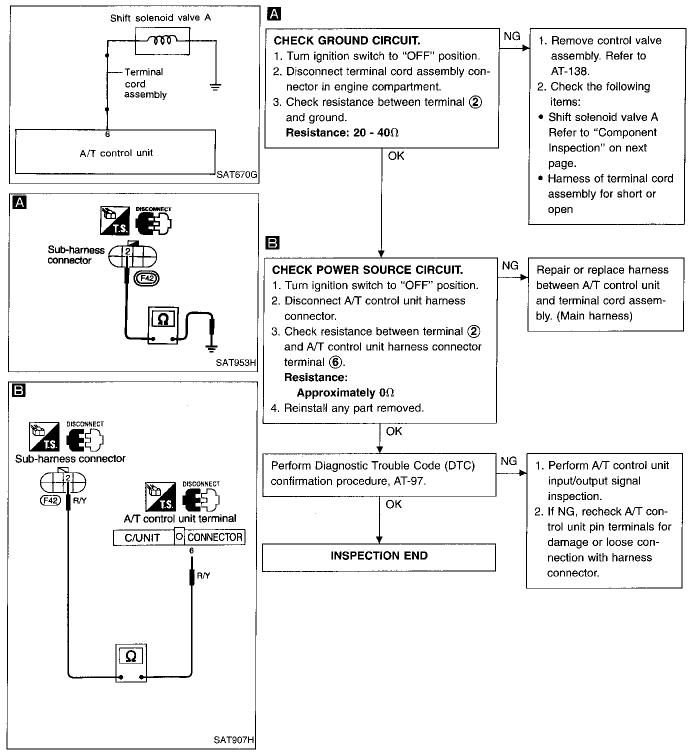
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# Shift Solenoid Valve A (Cont'd)



**AT-98** 708

# Solenoid valve harness connector A Shift solenoid valve A 1 2 3 4 5 6 7 8 SAT640I

# Shift Solenoid Valve A (Cont'd) COMPONENT INSPECTION

### Shift solenoid valve A

• For removal, refer to AT-138.

### Resistance check

• Check resistance between two terminals.

| Solenoid valve         | Terminal No. |        | Resistance<br>(Approx.) |
|------------------------|--------------|--------|-------------------------|
| Shift solenoid valve A | 2            | Ground | 20 - 40Ω                |

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### Operation check

 Check solenoid valve by listening for its operating sound while applying battery voltage to the terminal and ground.

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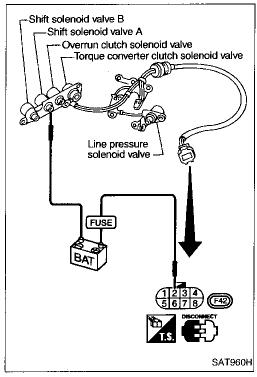
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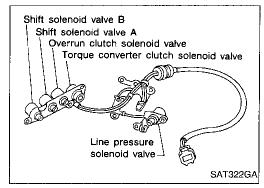
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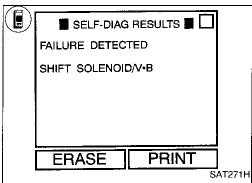
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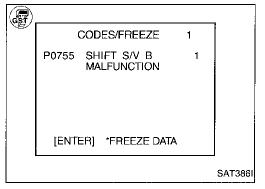
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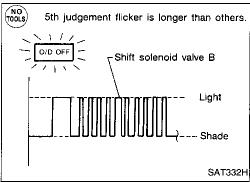
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### Shift Solenoid Valve B

### **DESCRIPTION**

Shift solenoid valves A and B are turned "ON" or "OFF" by the A/T control unit in response to signals sent from the inhibitor switch, vehicle speed and throttle position sensors. Gears will then be shifted to the optimum position.

| Gear position          | 1  | 2   | 3   | 4   |
|------------------------|----|-----|-----|-----|
| Shift solenoid valve A | ON | OFF | OFF | ON  |
| Shift solenoid valve B | ON | ON  | OFF | OFF |

| Diagnostic trouble code  | Malfunction is detected when   | Check item (Possible cause)   |
|--|--|---|
| : SHIFT SOLENOID/<br>V·B : P0755  NO TOOLS : 5th judgement flicker | A/T control unit detects an improper voltage drop when it tires to operate the solenoid valve. | <ul> <li>Harness or connectors         (The solenoid circuit is open or shorted.)     </li> <li>Shift solenoid valve B</li> </ul> |

### Diagnostic Trouble Code (DTC) confirmation procedure

After the repair, perform the following procedure to confirm the malfunction is eliminated.

- OR ·



- Start engine.
- 2) Select "SELF-DIAG RESULTS" mode with CONSULT.
- 3) Drive vehicle in  $D_1 \rightarrow D_2 \rightarrow D_3$  position. OR

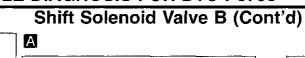


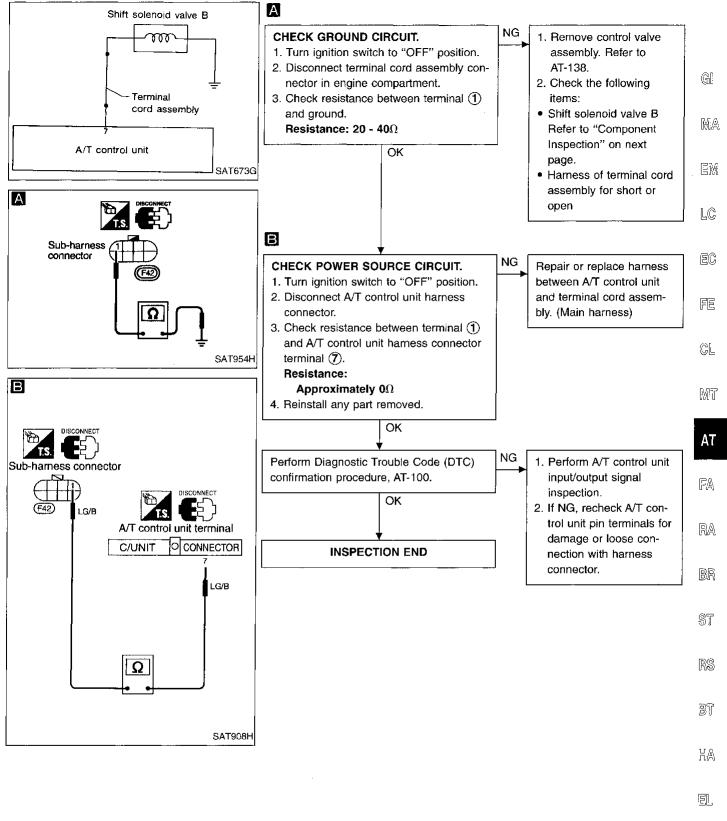
- 1) Start engine.
- 2) Drive vehicle in  $D_1 \rightarrow D_2 \rightarrow D_3$  position.
- 3) Select "MODE 7" with GST.

TOOLS

- 1) Start engine.
- 2) Drive vehicle in  $D_1 \rightarrow D_2 \rightarrow D_3$  position.
- Perform self-diagnosis.
   Refer to SELF-DIAGNOSTIC PROCEDURE (No Tools), AT-27.

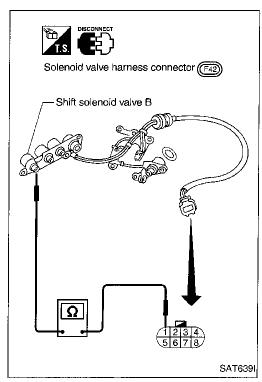
AT-100 710





AT-101 711

]DX



# Shift Solenoid Valve B (Cont'd) COMPONENT INSPECTION

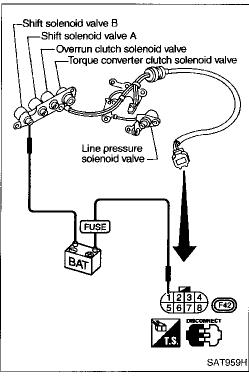
### Shift solenoid valve B

For removal, refer to AT-138.

### Resistance check

• Check resistance between two terminals.

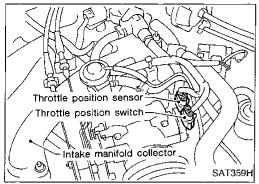
| Solenoid valve         | Terminal No. |        | Resistance<br>(Approx.) |
|------------------------|--------------|--------|-------------------------|
| Shift solenoid valve B | 1            | Ground | 20 - 40Ω                |

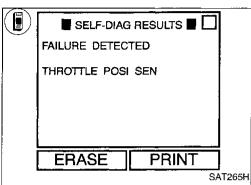


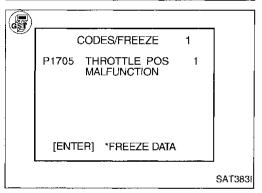
### **Operation check**

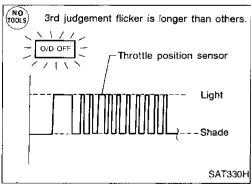
 Check solenoid valve by listening for its operating sound while applying battery voltage to the terminal and ground.

**AT-102** 712









# Throttle Position Sensor

### DESCRIPTION

The throttle position sensor detects the throttle valve position and sends a signal to the A/T control unit.

| Diagnostic trouble code                                  | Malfunction is detected when  | Check item (Possible cause)   | D. |
|--|---|---|----|
| : THROTTLE POSITION  : P1705  NO : 3rd judgement flicker | A/T control unit receives an excessively low or high voltage from the sensor. | Harness or connectors     (The sensor circuit is open or shorted.)     Throttle position sensor |    |

# Diagnostic Trouble Code (DTC) confirmation procedure

After the repair, perform the following procedure to confirm the malfunction is eliminated.

- OR -



- Start engine. 1)
- 2) Select "SELF-DIAG RESULTS" mode with CONSULT.
- Drive vehicle under the following conditions: Selector lever in "D", vehicle speed higher than 10 km/h (6 MPH), throttle opening greater than 1/2 of the full throttle position and driving for more than 3 seconds.



- Start engine. 1)
- 2) Drive vehicle under the following conditions: Selector lever in "D", vehicle speed higher than 10 km/h (6 MPH), throttle opening greater than 1/2 of the full throttle position and driving for more than 3 seconds.
- 3) Select "MODE 7" with GST. - OR -



- 1) Start engine.
- 2) Drive vehicle under the following conditions: Selector lever in "D", vehicle speed higher than 10 km/h (6 MPH), throttle opening greater than 1/2 of the full throttle position and driving for more than 3 seconds.
- Perform self-diagnosis. Refer to SELF-DIAGNOSTIC PROCEDURE (No Tools), AT-27.

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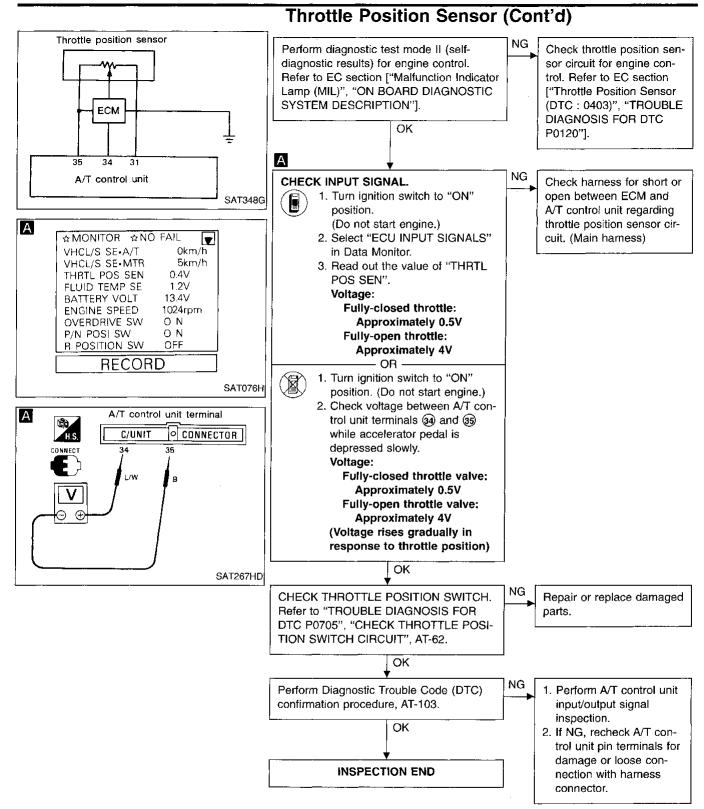
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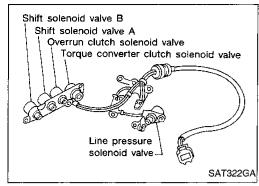
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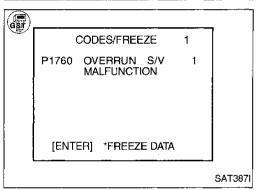


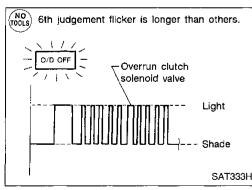


AT-104









# Overrun Clutch Solenoid Valve DESCRIPTION

The overrun clutch solenoid valve is activated by the A/T control unit in response to signals sent from the inhibitor switch, overdrive control switch, vehicle speed and throttle position sensors. The overrun clutch operation will then be controlled.

| Diagnostic trouble code | Malfunction is detected when  | Check item (Possible cause)                        |  |
|-------------------------|---|--|--|
| OVERRUN CLUTCH S/V      | A/T control unit  | Harness or connectors                              |  |
| ⑤ : P1760               | detects an improper<br>voltage drop when it<br>tires to operate the | (The solenoid cir-<br>cuit is open or<br>shorted.) |  |
| 6th judgement flicker   | solenoid valve.   | Overrun clutch solenoid valve                      |  |

# Diagnostic Trouble Code (DTC) confirmation procedure

After the repair, perform the following procedure to confirm the malfunction is eliminated.



Start engine. 1) 2) Select "SELF-DIAG RESULTS" mode with CONSULT.

OR -

– OR –

3) Drive vehicle under the following conditions: Selector lever in "D", overdrive control switch in "OFF" position and vehicle speed higher than 10 km/h (6 MPH).



- 1) Start engine.
- 2) Drive vehicle under the following conditions: Selector lever in "D", overdrive control switch in "OFF" position and vehicle speed higher than 10 km/h (6 MPH).
- 3) Select "MODE 7" with GST.



- Start engine. 1)
- Drive vehicle under the following conditions: 2) Selector lever in "D", overdrive control switch in "OFF" position and vehicle speed higher than 10 km/h (6 MPH).
- Perform self-diagnosis. Refer to SELF-DIAGNOSTIC PROCEDURE (No Tools), AT-27.

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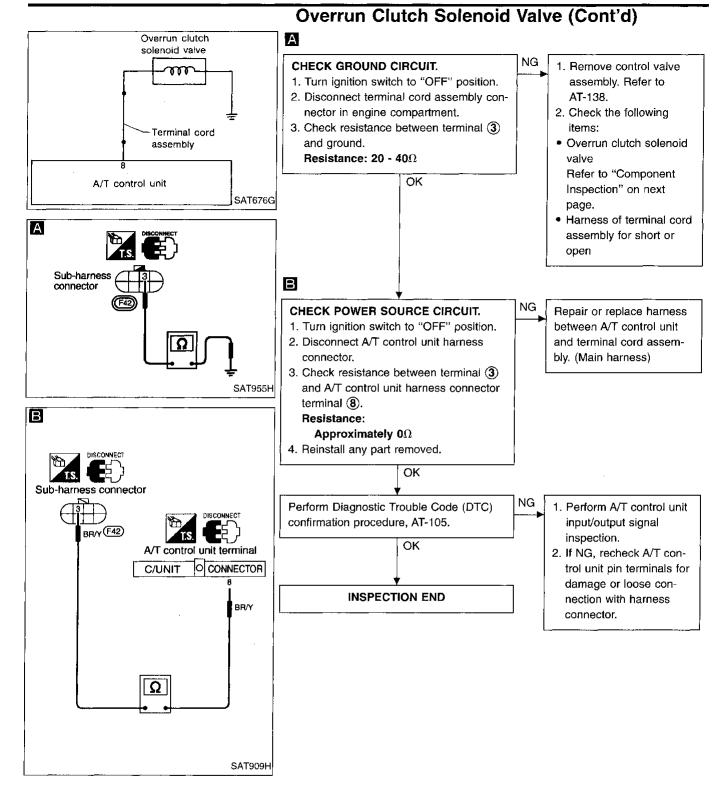
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# Solenoid valve harness connector (F42) Overrun clutch solenoid valve 11234 5678

# Overrun Clutch Solenoid Valve (Cont'd) COMPONENT INSPECTION

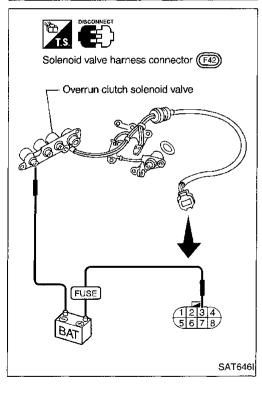
### Overrun clutch solenoid valve

• For removal, refer to AT-138.

### Resistance check

· Check resistance between two terminals.

| Solenoid valve                | Terminal No. |        | Resistance<br>(Approx.) |
|-------------------------------|--------------|--------|-------------------------|
| Overrun clutch solenoid valve | 3            | Ground | 20 - 40Ω                |



### Operation check

 Check solenoid valve by listening for its operating sound while applying battery voltage to the terminal and ground.

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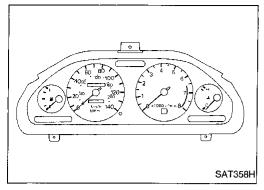
87

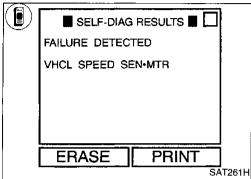
HA

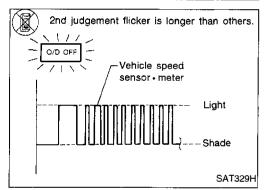
1DX

AT-107 717

### TROUBLE DIAGNOSIS FOR VHCL SPEED SEN-MTR







# Vehicle Speed Sensor·MTR DESCRIPTION

The vehicle speed sensor MTR is built into the speedometer assembly. The sensor functions as an auxiliary device to the revolution sensor when it is malfunctioning. The A/T control unit will then use a signal sent from the vehicle speed sensor MTR.

| Diagnostic trouble code | Malfunction is detected when                 | Check item<br>(Possible cause)                 |
|-------------------------|--|--|
| : VHCL SPEED SEN-MTR    | A/T control unit does not receive the proper | Harness or connectors     (The sensor circuit) |
| 2nd judgement flicker   | voltage signal from<br>the sensor.           | is open or shorted.)  • Vehicle speed sensor   |

# Diagnostic Trouble Code (DTC) confirmation procedure

After the repair, perform the following procedure to confirm the malfunction is eliminated.



- 1) Start engine.
- 2) Select "SELF-DIAG RESULTS" mode with CONSULT.
- 3) Drive vehicle under the following conditions: Selector lever in "D" and vehicle speed higher than 20 km/h (12 MPH).

- OR -

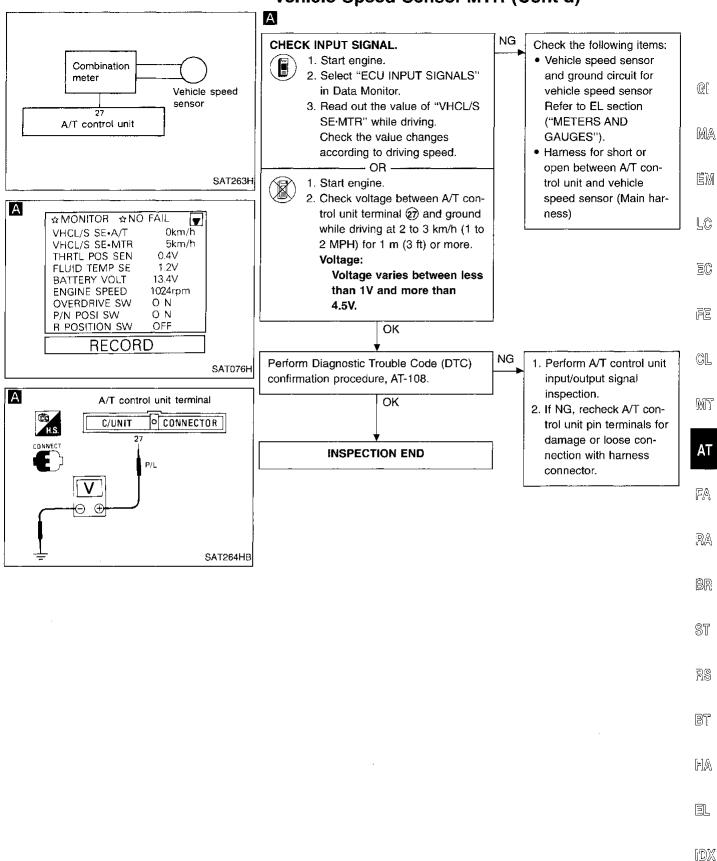


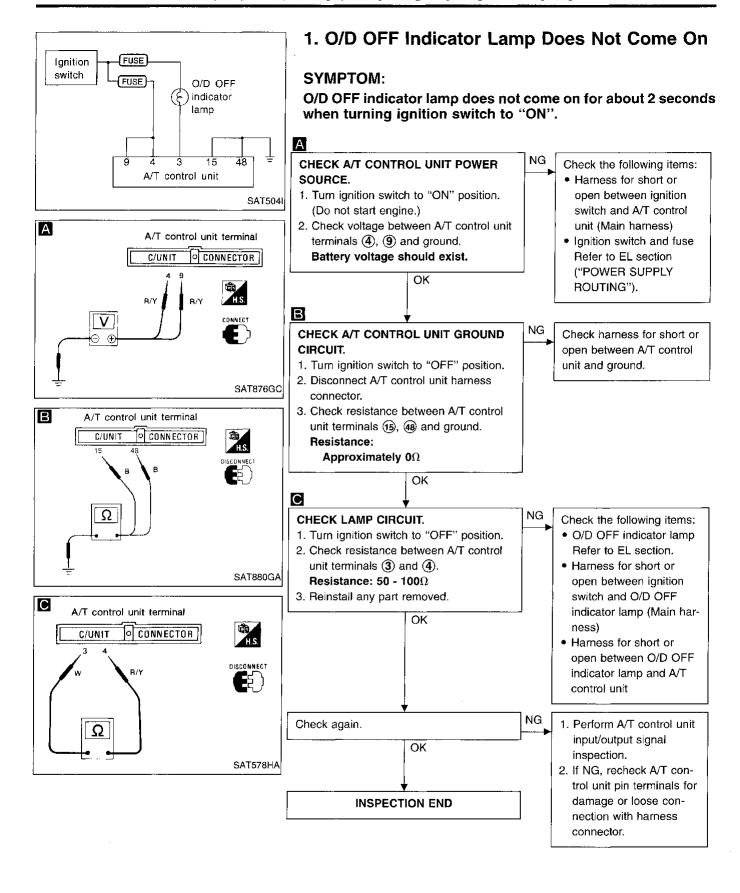
- 1) Start engine.
- Drive vehicle under the following conditions: Selector lever in "D" and vehicle speed higher than 20 km/h (12 MPH).
- Perform self-diagnosis.
   Refer to SELF-DIAGNOSTIC PROCEDURE (No Tools), AT-27.

**AT-108** 718

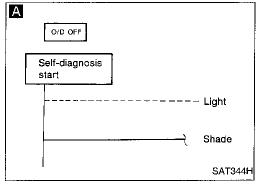
# TROUBLE DIAGNOSIS FOR VHCL SPEED SEN:MTR

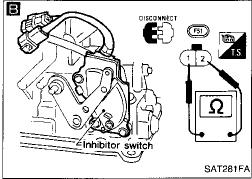
# Vehicle Speed Sensor·MTR (Cont'd)





### DIAGNOSTIC PROCEDURES FOR SYMPTOMS

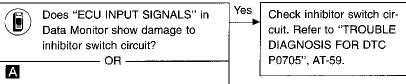




# 2. Engine Cannot Be Started In "P" and "N" Position

### SYMPTOM:

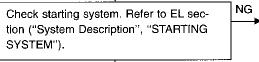
- Engine cannot be started with selector lever in "P" or "N" position.
- Engine can be started with selector lever in "D", "2", "1" or "R" position.



Does self-diagnosis show damage to inhibitor switch circuit?

No

Check for short or open of inhibitor switch 2-pin connector. Refer to "Component Inspection", AT-63.



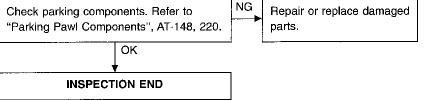
OΚ

OK

INSPECTION END



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



parts.

Repair or replace damaged

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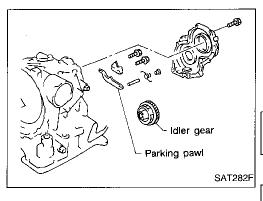
RS

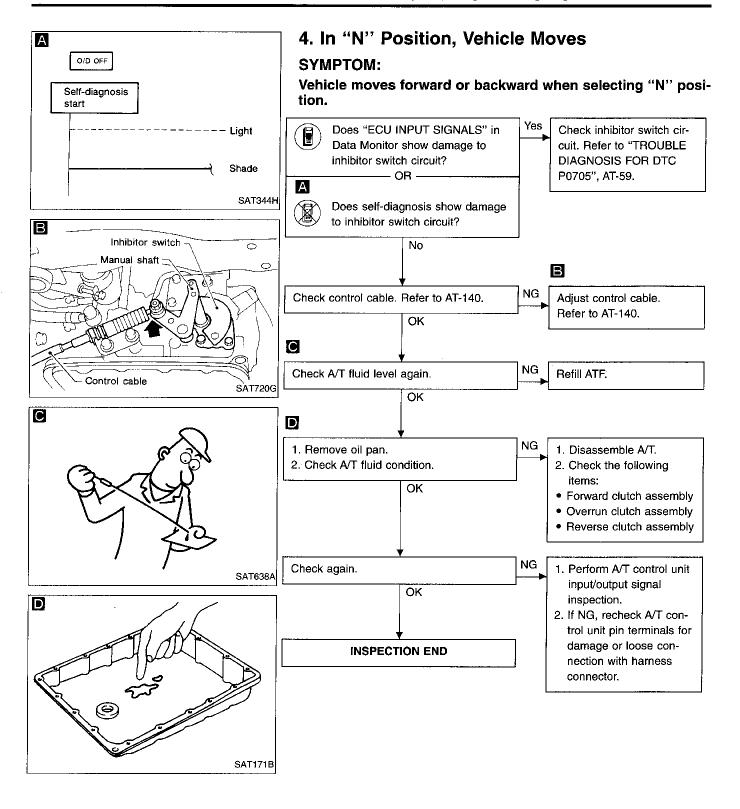
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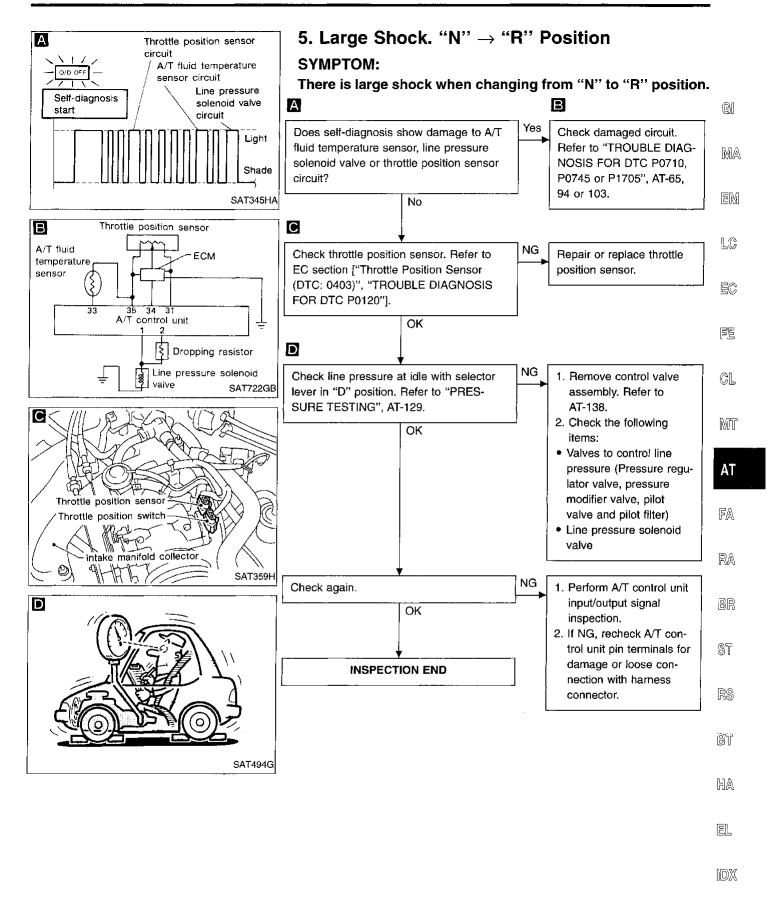
AT-111 721



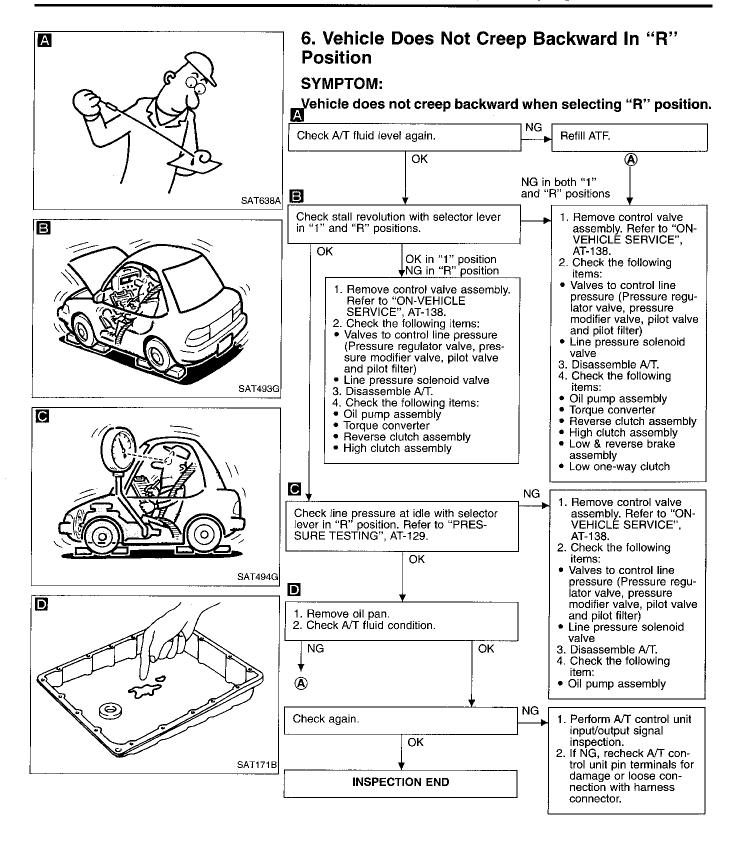


**AT-112** 722

# DIAGNOSTIC PROCEDURES FOR SYMPTOMS

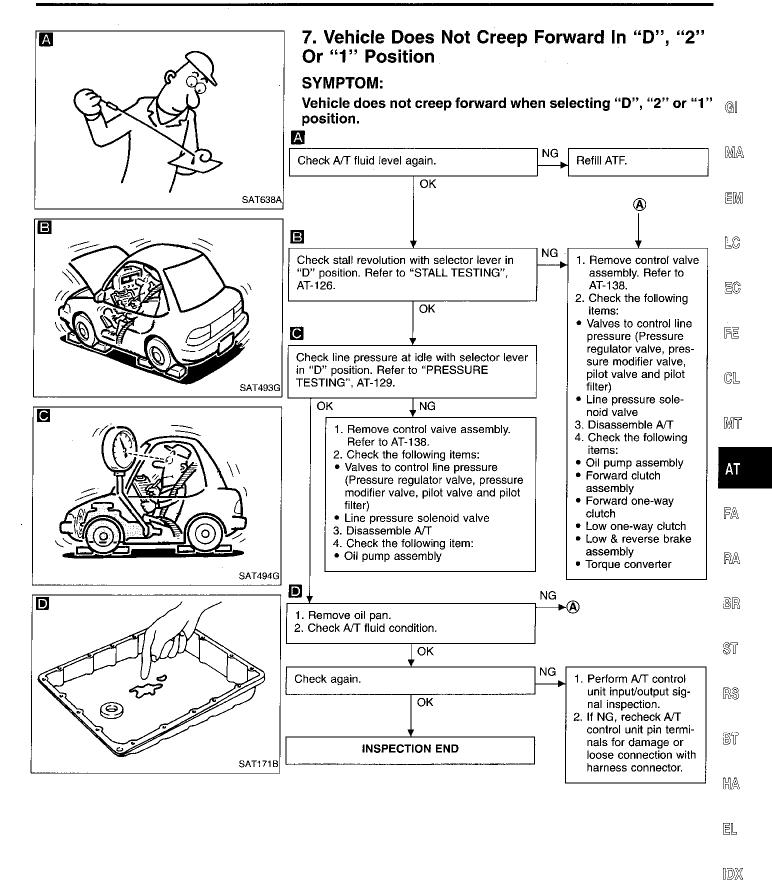


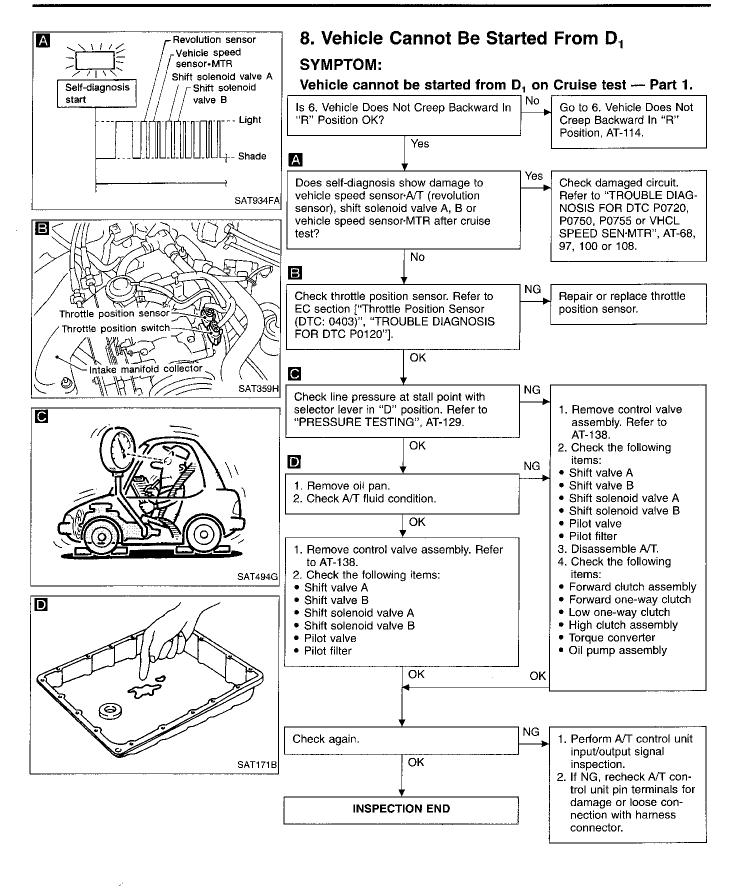
**AT-113** 723



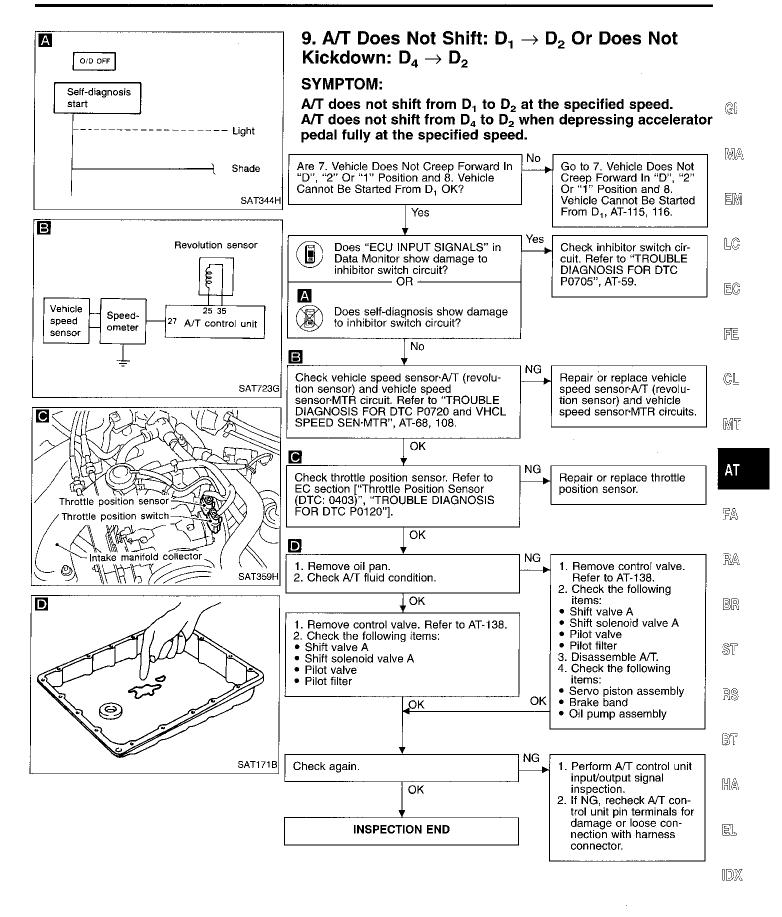
AT-114 724

## DIAGNOSTIC PROCEDURES FOR SYMPTOMS

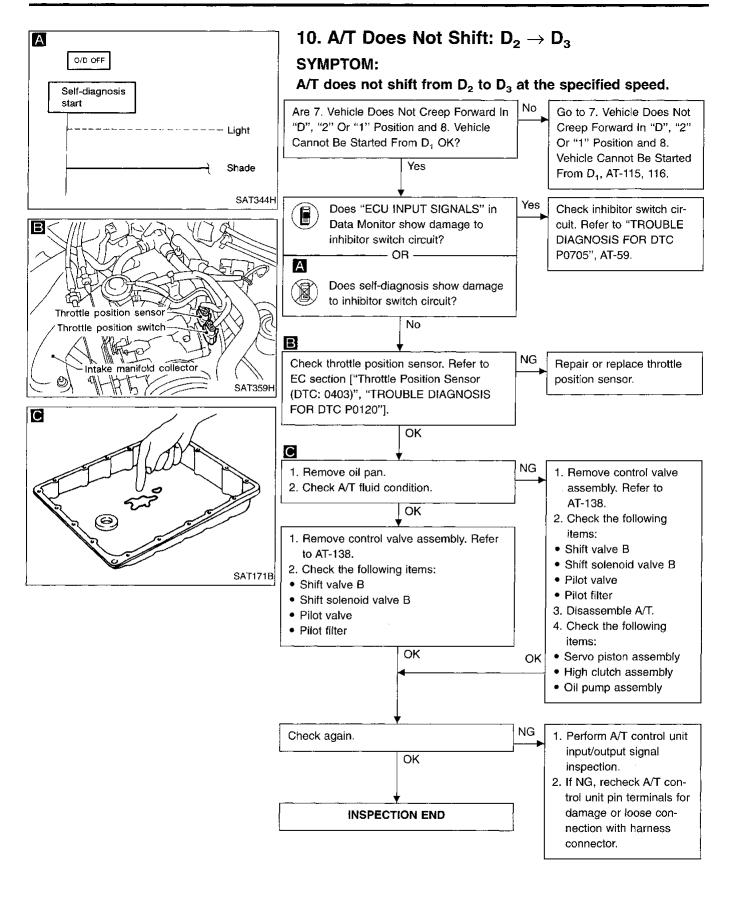




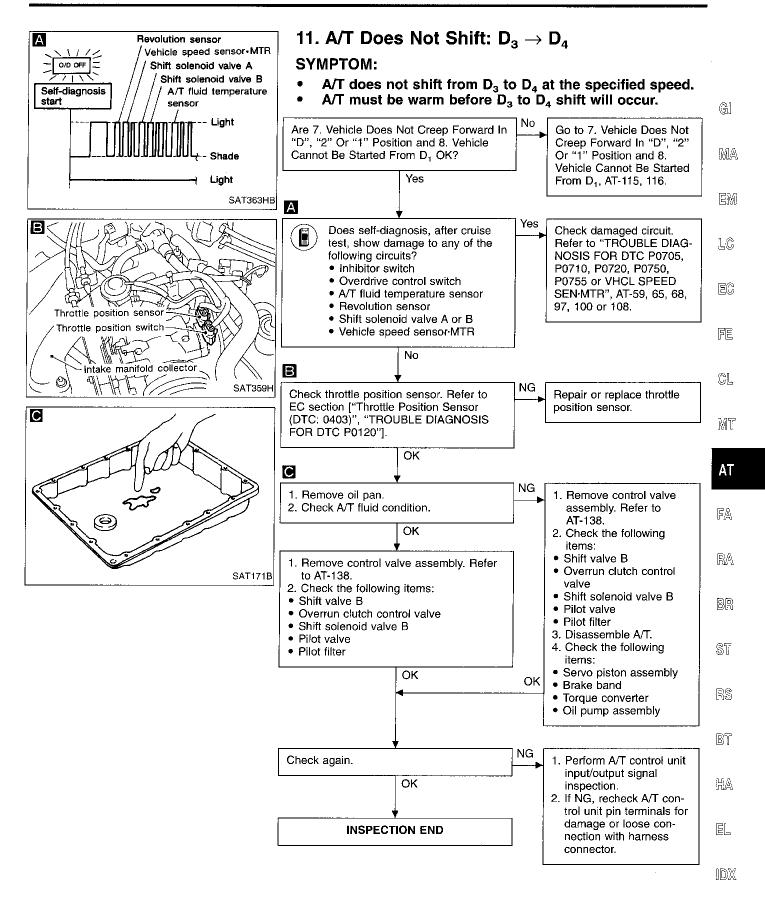
**AT-116** 726



**AT-117** 727

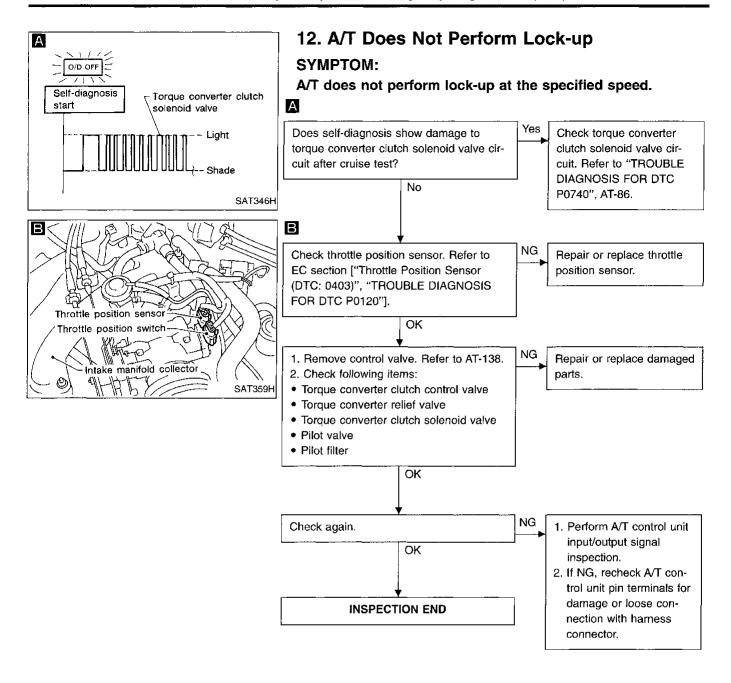


**AT-118** 728



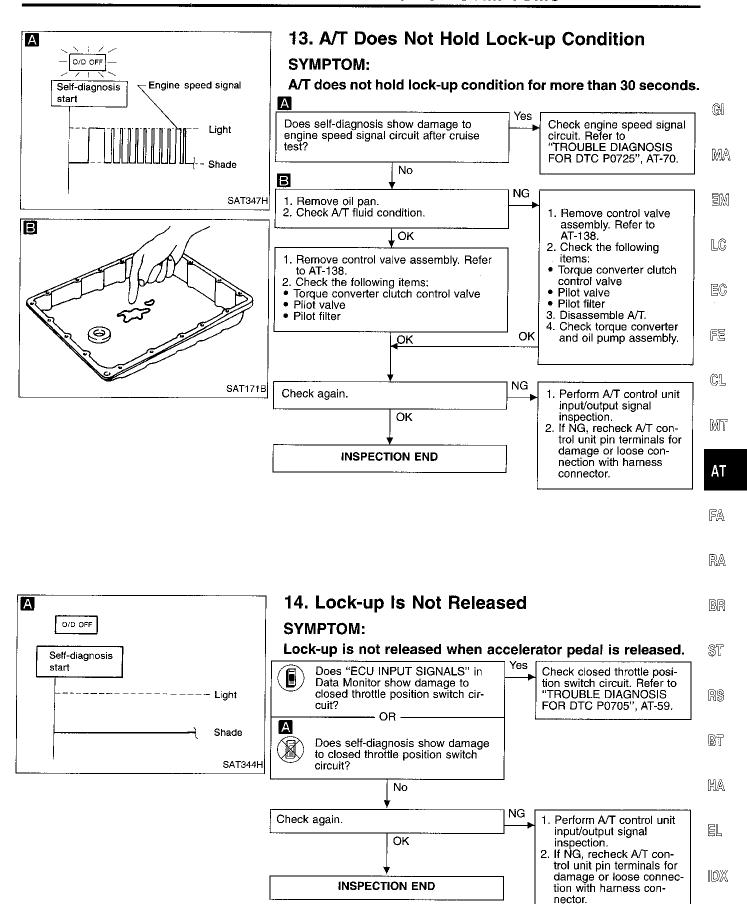
**AT-119** 729

# **DIAGNOSTIC PROCEDURES FOR SYMPTOMS**



**AT-120** 730

# **DIAGNOSTIC PROCEDURES FOR SYMPTOMS**



# Α 0/0 OFF Self-diagnosis Overrun clutch solenoid valve - Light SAT348H

# 15. Engine Speed Does Not Return To Idle (Light Braking $D_4 \rightarrow D_3$ )

#### SYMPTOM:

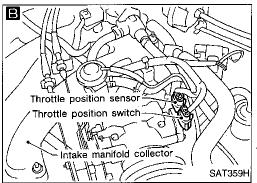
- Engine speed does not smoothly return to idle when A/T shifts from D<sub>4</sub> to D<sub>3</sub>.
- Vehicle does not decelerate by engine brake when turning overdrive control switch OFF.
- Vehicle does not decelerate by engine brake when shifting A/T from "D" to "2" position.

Yes

NG

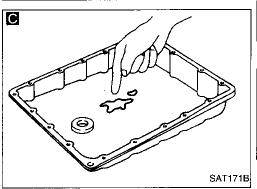
NG

OK





Α



Does self-diagnosis show damage to overrun clutch solenoid valve circuit after cruise test?

No

Check overrun clutch solenoid valve circuit. Refer to "TROUBLE DIAGNOSIS FOR DTC P1760", AT-105.

Check throttle position sensor. Refer to EC section ["Throttle Position Sensor (DTC: 0403)", "TROUBLE DIAGNOSIS FOR DTC P0120"]. Repair or replace throttle position sensor.

- 1. Remove oil pan.
- 2. Check A/T fluid condition.

OK

OK

- 1. Remove control valve assembly. Refer to AT-138.
- 2. Check the following items:
- Overrun clutch control valve
- Overrun clutch reducing valve
- · Overrun clutch solenoid valve

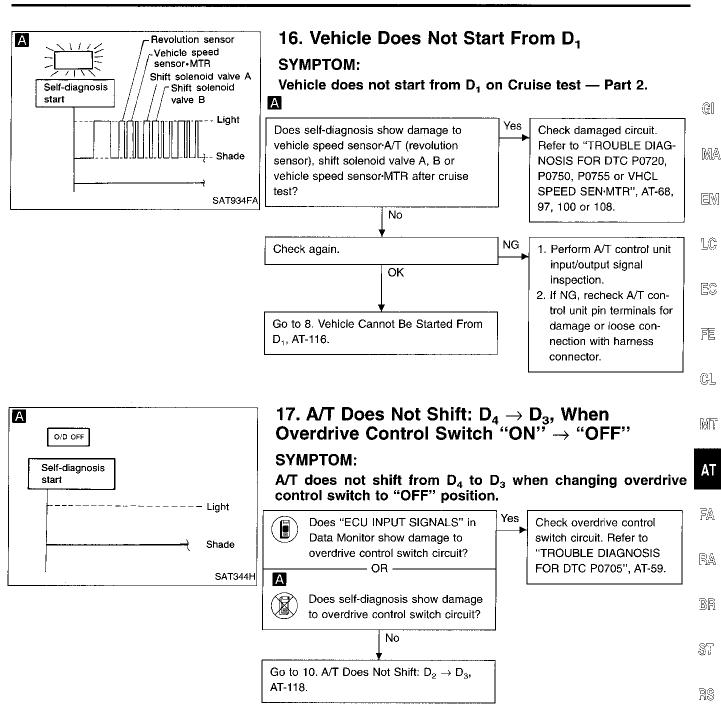
- 1. Remove control valve assembly. Refer to AT-138.
- 2. Check the following items:
- Overrun clutch control valve
- · Overrun clutch reducing valve
- · Overrun clutch solenoid valve
- 3. Disassemble A/T.
- 4. Check the following items:
- Overrun clutch assembly
- · Oil pump assembly

NG Check again. OK **INSPECTION END** 

OK

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

## DIAGNOSTIC PROCEDURES FOR SYMPTOMS



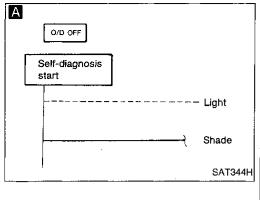
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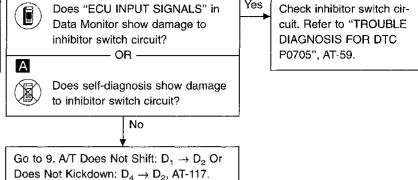
# **DIAGNOSTIC PROCEDURES FOR SYMPTOMS**

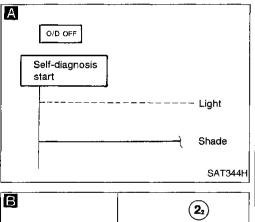


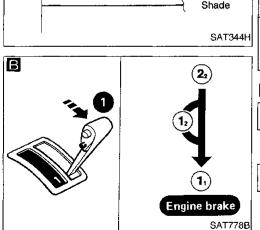
18. A/T Does Not Shift:  $D_3 \rightarrow 2_2$ , When Selector Lever "D"  $\rightarrow$  "2" Position

#### SYMPTOM:

A/T does not shift from  $D_3$  to  $2_2$  when changing selector lever from "D" to "2" position.



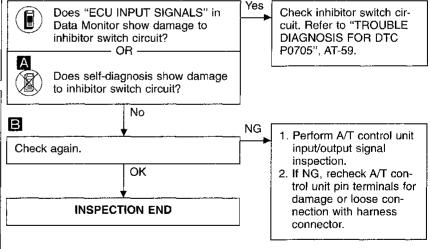




# 19. A/T Does Not Shift: $2_2 \rightarrow 1_1$ , When Selector Lever "2" $\rightarrow$ "1" Position

#### SYMPTOM:

A/T does not shift from  $2_2$  to  $1_1$  when changing selector lever from "2" to "1" position.

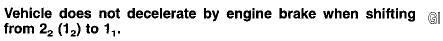


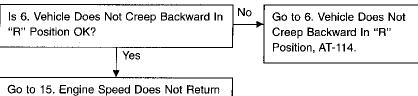
AT-124 734

To Idle (Light Braking  $D_4 \rightarrow D_3$ ), AT-122.

# 20. Vehicle Does Not Decelerate By Engine **Brake**

## **SYMPTOM:**





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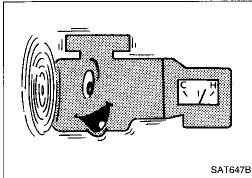
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# SAT513G



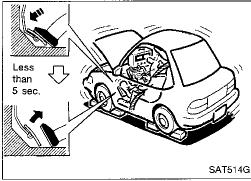
#### STALL TESTING

#### Stall test procedure

- Check A/T and engine fluid levels. If necessary, add.
- Drive vehicle for approx. 10 minutes or until engine oil and ATF reach operating temperature.

ATF operating temperature: 50 - 80°C (122 - 176°F)

- Set parking brake and block wheels.
- Install a tachometer where it can be seen by driver during test. 4.
- It is good practice to put a mark on point of specified engine rpm on indicator.

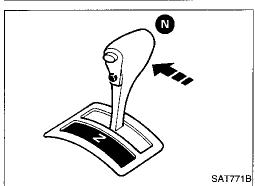


- Start engine, apply foot brake, and place selector lever in "D" 5. position.
- Accelerate to wide-open throttle gradually while applying foot brake.
- Quickly note the engine stall revolution and immediately 7. release throttle.
- During test, never hold throttle wide-open for more than 5 seconds.

Stall revolution: 2,000 - 2,300 rpm



- 9. Cool off ATF.
- Run engine at idle for at least one minute.
- 10. Repeat steps 5 through 9 with selector lever in "2", "1" and "R" positions.



## TROUBLE DIAGNOSES

# Final Check (Cont'd)

#### JUDGEMENT OF STALL TEST

The test result and possible damaged components relating to each result are shown in the illustration. In order to pinpoint the possible damaged components, follow the WORK FLOW shown in AT-38.

#### Note

## Stall revolution is too high in "D", "2" or "1" position:

G1

- Slippage occurs in 1st gear but not in 2nd and 3rd gears. .... Low one-way clutch slippage
- Slippage occurs in the following gears:
   1st through 3rd gears in "D" position and engine brake functions with overdrive switch set to "OFF".
   1st and 2nd gears in "2" position and engine brake functions with accelerator pedal released (fully closed throttle). ..... Forward clutch or forward one-way clutch slippage

MA

EM

#### Stall revolution is too high in "R" position:

- Engine brake does not function in "1" position. ..... Low & reverse brake slippage
- Engine brake functions in "1" position. ..... Reverse clutch slippage

LC

#### Stall revolution within specifications:

 Vehicle does not achieve speed of more than 80 km/h (50 MPH). .... One-way clutch seizure in torque converter housing

EC

#### **CAUTION:**

#### Be careful since automatic fluid temperature increases abnormally.

- Slippage occurs in 3rd and 4th gears in "D" position. ..... High clutch slippage
- Slippage occurs in 2nd and 4th gear in "D" position. ..... Brake band slippage
- Engine brake does not function in 2nd and 3rd gears in "D" position, 2nd gear in "2" position, and 1st gear in "1" position with overdrive switch set to "OFF".

CL

FE

#### Stall revolution less than specifications:

• Poor acceleration during starts. .... One-way clutch seizure in torque converter

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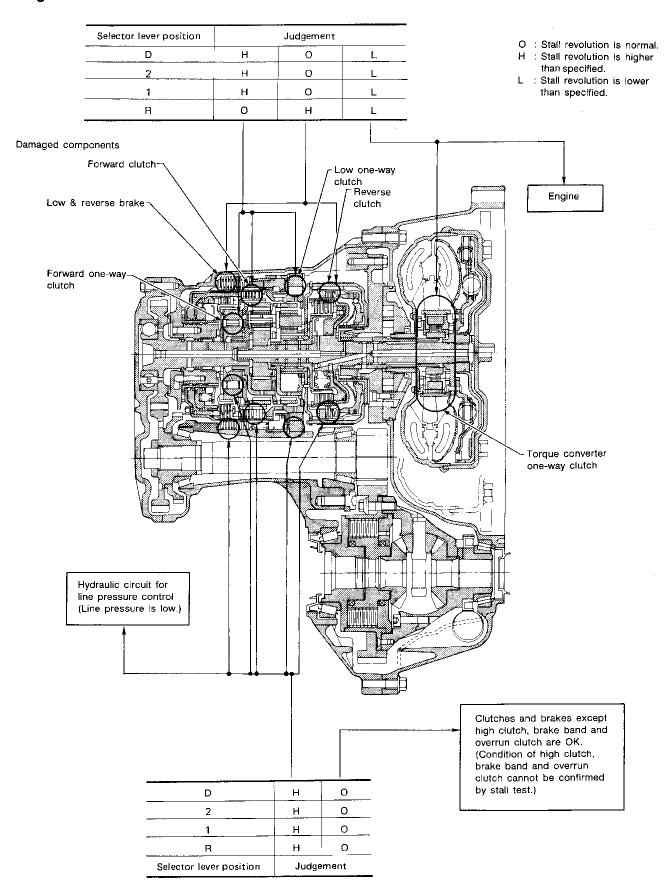
HA

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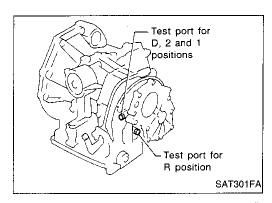
AT-127 737

# Final Check (Cont'd)

# Judgement of stall test



# **TROUBLE DIAGNOSES**



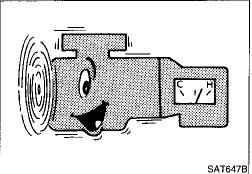
# Final Check (Cont'd) PRESSURE TESTING

- Location of pressure test ports.
- Always replace pressure plugs as they are self-sealing bolts.



MA

EM



#### Line pressure test procedure

- 1. Check A/T and engine fluid levels. If necessary, add fluid.
- 2. Drive vehicle for approx. 10 minutes or until engine oil and ATF reach operating temperature.

ATF operating temperature: 50 - 80°C (122 - 176°F)

EC

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3. Install pressure gauge to corresponding line pressure port.

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- 4. Set parking brake and block wheels.
- Continue to depress brake pedal fully while line pressure test is being performed at stall speed.

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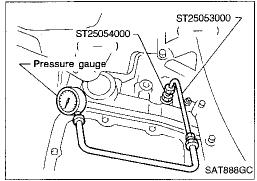
KA

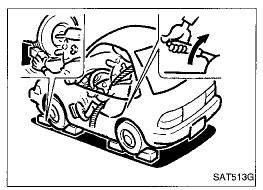
- . Start engine and measure line pressure at idle and stall speed.
- When measuring line pressure at stall speed, follow the stall test procedure.

EL

Line pressure: Refer to SDS, AT-239.

1DX







# TROUBLE DIAGNOSES

# Final Check (Cont'd) JUDGEMENT OF LINE PRESSURE TEST

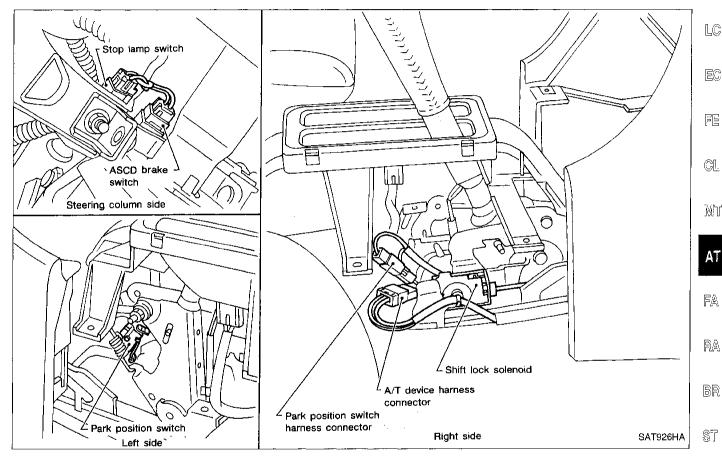
| Judgement      |  | Suspected parts   |  |
|----------------|--|---|--|
|                | Line pressure is low in all positions.       | Oil pump wear Control piston damage Pressure regulator valve or plug sticking Spring for pressure regulator valve damaged Fluid pressure leakage between oil strainer and pressure regulator valve Clogged strainer   |  |
| At idle        | Line pressure is low in particular position. | <ul> <li>Fluid pressure leakage between manual valve and particular clutch</li> <li>For example, line pressure is:         <ul> <li>Low in "R" and "1" positions, but</li> <li>Normal in "D" and "2" positions.</li> </ul> </li> <li>Therefore, fluid leakage exists at or around low and reverse brake circuit.</li> <li>Refer to "OPERATION OF CLUTCH AND BRAKE", AT-21.</li> </ul> |  |
|                | Line pressure is high.                       | Mal-adjustment of throttle position sensor     A/T fluid temperature sensor damaged     Line pressure solenoid valve sticking     Short circuit of line pressure solenoid valve circuit     Pressure modifier valve sticking     Pressure regulator valve or plug sticking     Open in dropping resistor circuit  |  |
| At stall speed | Line pressure is low.                        | Mal-adjustment of throttle position sensor     Line pressure solenoid valve sticking     Short circuit of line pressure solenoid valve circuit     Pressure regulator valve or plug sticking     Pressure modifier valve sticking     Pilot valve sticking  |  |

# A/T Shift Lock System

#### **DESCRIPTION**

- The mechanical key interlock mechanism also operates as a shift lock:
  With the key switch turned to "ON", the selector lever cannot be shifted from "P" (parking) to any other position unless the brake pedal is depressed.
  - With the key removed, the selector lever cannot be shifted from "P" to any other position.
  - The key cannot be removed unless the selector lever is placed in "P".
- The shift lock and key interlock mechanisms are controlled by the ON-OFF operation of the shift lock solenoid and by the operation of the rotator and slider located inside the key cylinder, respectively.

#### SHIFT LOCK SYSTEM ELECTRICAL PARTS LOCATION



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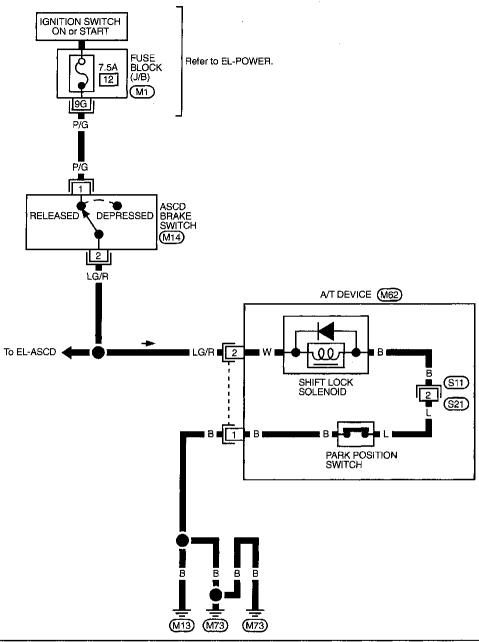
EL

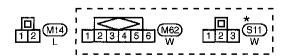
1DX

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# Wiring Diagram — SHIFT —

# AT-SHIFT-01





\* : This connector is not shown in "HARNESS LAYOUT" of EL section.

Refer to last page (Foldout page).

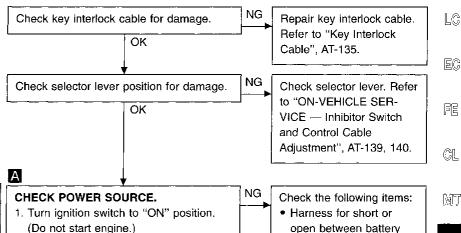
# **Diagnostic Procedure**

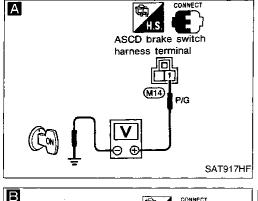
#### SYMPTOM 1:

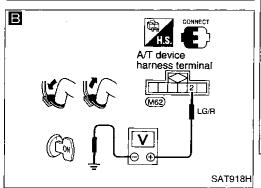
- Selector lever cannot be moved from "P" position with key in "ON" position and brake pedal applied.
- Selector lever can be moved from "P" position with key in "ON" position and brake pedal released.
- Selector lever can be moved from "P" position when key is removed from key cylinder.

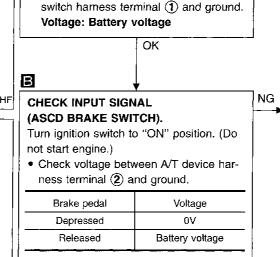
#### SYMPTOM 2:

Ignition key cannot be removed when selector lever is set to "P" position. It can be removed when selector lever is set to any position except "P".









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**(A**)

2. Check voltage between ASCD brake

open between battery and ASCD brake switch harness terminal (1) Fuse · Ignition switch (Refer to

EL section.)

Check the following items: · Harness for short or

open between A/T device harness connector (2) and ASCD brake switch harness connector (2)

 ASCD brake switch (Refer to "Component Check", AT-137.)

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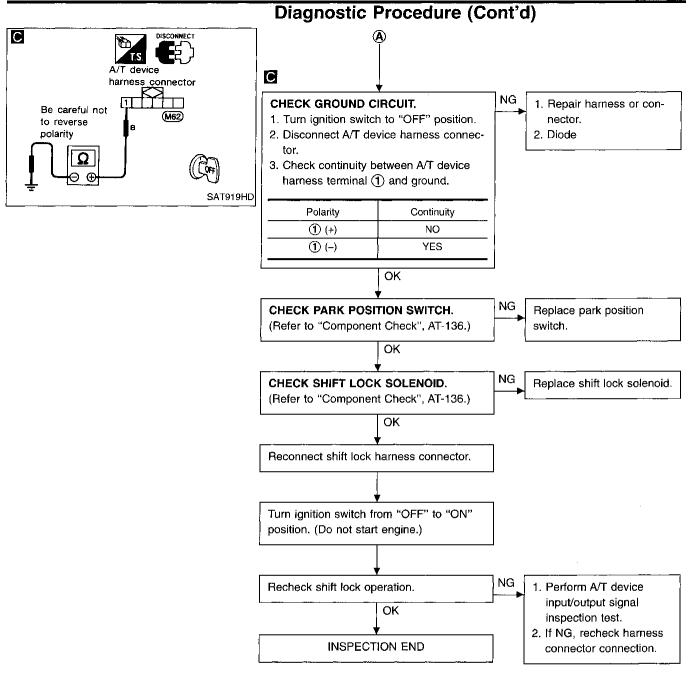
EM

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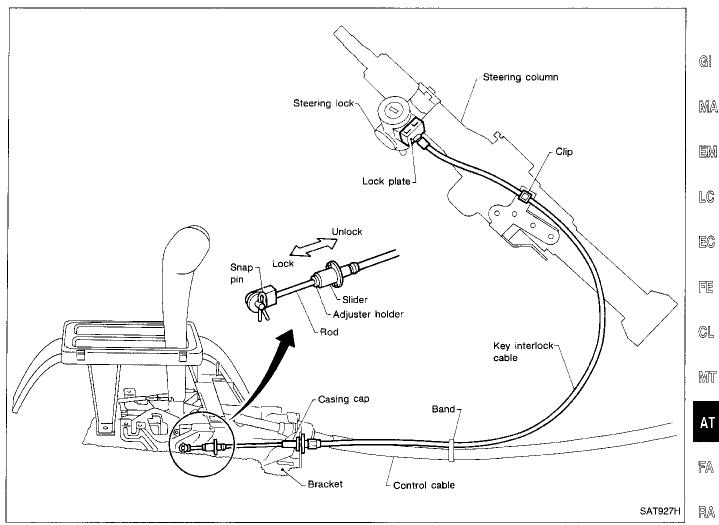
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# TROUBLE DIAGNOSES — A/T Shift Lock System



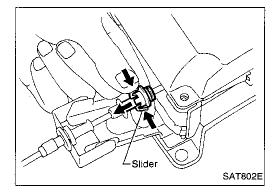
**AT-134** 744

# **Key Interlock Cable**



#### **CAUTION:**

- Install key interlock cable in such a way that it will not be damaged by sharp bends, twists or interference with adjacent parts.
- After installing key interlock cable to control device, make sure that casing cap and bracket are firmly secured in their positions. If casing cap can be removed with an external load of less than 39.2 N (4.0 kg, 8.8 lb), replace key interlock cable with new one.



#### **REMOVAL**

AT-135

Unlock slider from adjuster holder and remove rod from cable.

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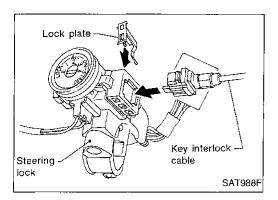
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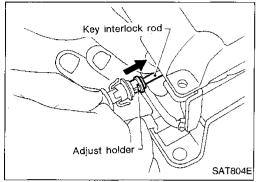
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# TROUBLE DIAGNOSES — A/T Shift Lock System

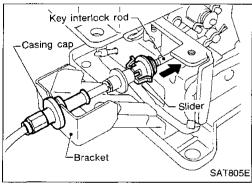


# Key Interlock Cable (Cont'd) INSTALLATION

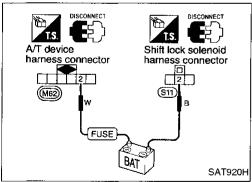
- 1. Set key interlock cable to steering lock assembly and install lock plate.
- Clamp cable to steering column and fix to control cable with band.
- 3. Set control lever to P position.



Insert interlock rod into adjuster holder.

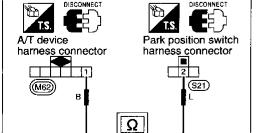


- 5. Install casing cap to bracket.
- 6. Move slider in order to fix adjuster holder to interlock rod.



# Component Check SHIFT LOCK SOLENOID

 Check operation by applying battery voltage to A/T device and shift lock solenoid harness terminal.



SAT921H

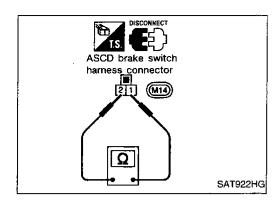
#### PARK POSITION SWITCH

• Check continuity between A/T device harness terminal (1) and park position switch harness terminal (2).

| Condition  | Continuity |
|--|------------|
| When selector lever is set in "P" position and selector lever button is released | Yes        |
| Except above   | No         |

**AT-136** 746

# TROUBLE DIAGNOSES — A/T Shift Lock System



# Component Check (Cont'd) ASCD BRAKE SWITCH

• Check continuity between terminals (1) and (2).

| Condition                     | Continuity |
|-------------------------------|------------|
| When brake pedal is depressed | No         |
| When brake pedal is released  | Yes        |

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Check ASCD brake switch after adjusting brake pedal — refer to BR section.

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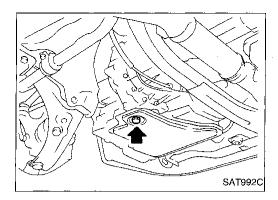
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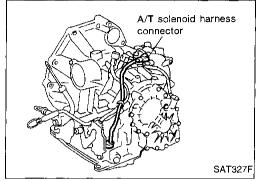
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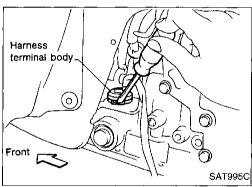


# **Control Valve Assembly and Accumulator REMOVAL**

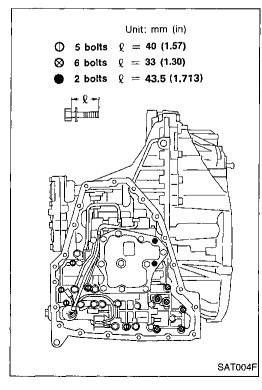
- 1. Drain ATF from transaxle.
- 2. Remove oil pan and gasket.



3. Disconnect A/T solenoid harness connector.

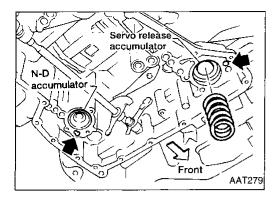


- Remove stopper ring from terminal cord assembly harness terminal body.
- 5. Remove terminal cord assembly harness from transmission case by pushing on terminal body.



- 8. Remove control valve assembly by removing fixing bolts (1), (**X**) and **●**.
- Be careful not to drop manual valve and servo release accumulator return spring.
- 7. Disassemble and inspect control valve assembly if necessary. Refer to AT-168.

# ON-VEHICLE SERVICE



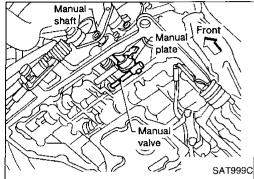
# **Control Valve Assembly and Accumulator** (Cont'd)

- 8. Remove servo release and N-D accumulators by applying compressed air if necessary.
- Hold each piston with a rag.



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#### INSTALLATION

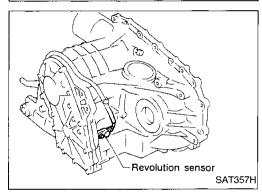
- Set manual shaft in Neutral, then align manual plate with groove in manual valve.
- After installing control valve assembly, make sure that selector lever can be moved to all positions.

EC

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# **Revolution Sensor Replacement**

Remove under cover.

- Remove revolution sensor from A/T. 2.
- Reinstall any part removed.
- Always use new sealing parts.

RA



SAT403F

Remove control cable from manual shaft.

Set manual shaft in "N" position.

Loosen inhibitor switch fixing bolts.

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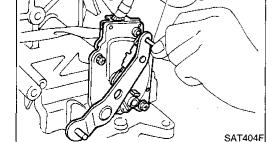
Insert pin into adjustment holes in both inhibitor switch and manual shaft as near vertical as possible.

HA EL

Reinstall any part removed.

Check continuity of inhibitor switch. Refer to AT-63.

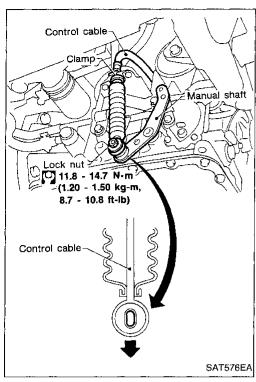
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mm (0.16 in) dia.

-Manual shaft

749 AT-139

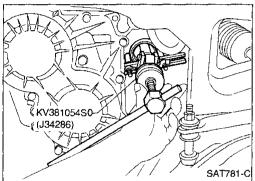




- Move selector lever from the "P" position to the "1" position. You should be able to feel the detents in each position. If the detents cannot be felt or the pointer indicating the position is improperly aligned, the control cable needs adjustment.
- 1. Place selector lever in "P" position.
- Loosen control cable lock nut and place manual shaft in "P" position.
- 3. Pull control cable in the direction of the arrow shown in the illustration by specified force.

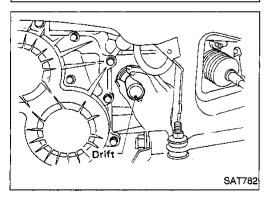
Specified force: 6.9 N (0.7 kg, 1.5 lb)

- 4. Return control cable in the opposite direction of the arrow for 1.0 mm (0.039 in).
- 5. Tighten control cable lock nut.
- 6. Move selector lever from "P" to "1" position again. Make sure that selector lever moves smoothly.
- Apply grease to contacting areas of selector lever and control cable. Install any part removed.



# **Differential Side Oil Seal Replacement**

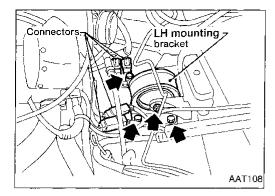
- Remove drive shaft assembly. Refer to FA section ("Drive Shaft", "FRONT AXLE").
- 2. Remove oil seal.

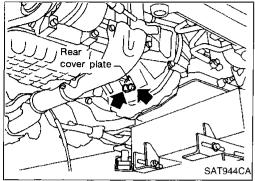


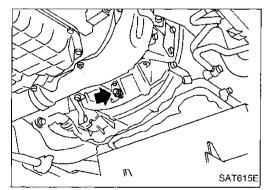
Install oil seal.

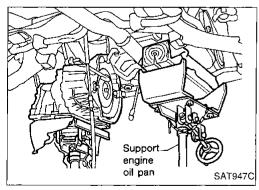
AT-140

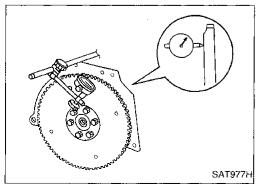
- Apply ATF before installing.
- 4. Reinstall any part removed.











#### Removal

#### **CAUTION:**

When removing the transaxle assembly from engine, first remove the crankshaft position sensor (POS) from the assembly.

Be careful not to damage sensor edge.

- Remove battery and bracket.
- Remove air cleaner and resonator.
- 3. Disconnect terminal cord assembly harness connector and inhibitor switch harness connectors.
- Disconnect harness connectors of revolution sensor and vehicle speed sensor.
- 5. Remove crankshaft position sensor (POS) from transaxle.
- Remove LH engine mounting from transaxle and body. Tighten LH engine mounting bolts to the specified torque. Refer to EM section ("ENGINE REMOVAL").
- 7. Disconnect control cable at transaxle side.
- 8. Drain ATF.
- 9. Remove drive shafts. Refer to FA section ("Drive Shaft", "FRONT AXLE").
- Disconnect oil cooler piping.
- 11. Remove starter motor from transaxle.
- 12. Support engine by placing a jack under oil pan.
- Do not place jack under oil pan drain plug.
- 13. Remove center member. Tighten center member bolts to the specified torque. Refer to EM section ("ENGINE REMOVAL"),
- Remove rear cover plate and bolts securing torque converter to drive plate. Tighten rear plate cover bolts to the specified torque. Refer to EM section ("OIL PAN").
- Rotate crankshaft for access to securing bolts.
- 15. Support transaxle with a jack.
- 16. Remove bolts fixing A/T to engine.
- 17. Lower transaxle while supporting it with a jack.

#### Installation

Drive plate runout

#### CAUTION:

Do not allow any magnetic materials to contact the ring gear teeth.

Maximum allowable runout:

Refer to EM section ("Inspection", "CYLINDER BLOCK")

If this runout is out of allowance, replace drive plate with ring gear.

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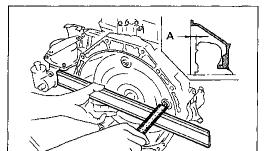
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# **REMOVAL AND INSTALLATION**

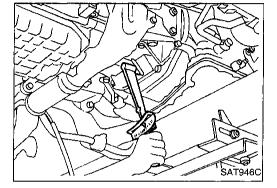
# Installation (Cont'd)



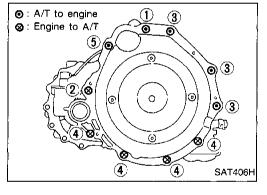
SAT044A

When connecting torque converter to transaxle, measure distance "A" to be certain that they are correctly assembled.
 Distance "A":

14 mm (0.55 in) or more



- Install bolts fixing converter to drive plate.
- With converter installed, rotate crankshaft several turns to check that transaxle rotates freely without binding.



• Tighten bolt securing transaxle.

| Bolt No. | Tightening torque<br>N⋅m (kg-m, ft-lb) | ℓmm (in)   |
|----------|--|------------|
| 1        | 70 - 79 (7.1 - 8.1, 51 - 59)           | 65 (2.56)  |
| 2        | 70 - 79 (7.1 - 8.1, 51 - 59)           | 52 (2.05)  |
| 3        | 70 - 79 (7.1 - 8.1, 51 - 59)           | 52 (2.05)  |
| 4        | 70 - 79 (7.1 - 8.1, 51 - 59)           | 40 (1.57)  |
| (5)      | 70 - 79 (7.1 - 8.1, 51 - 59)           | 124 (4.88) |

Reinstall any part removed.



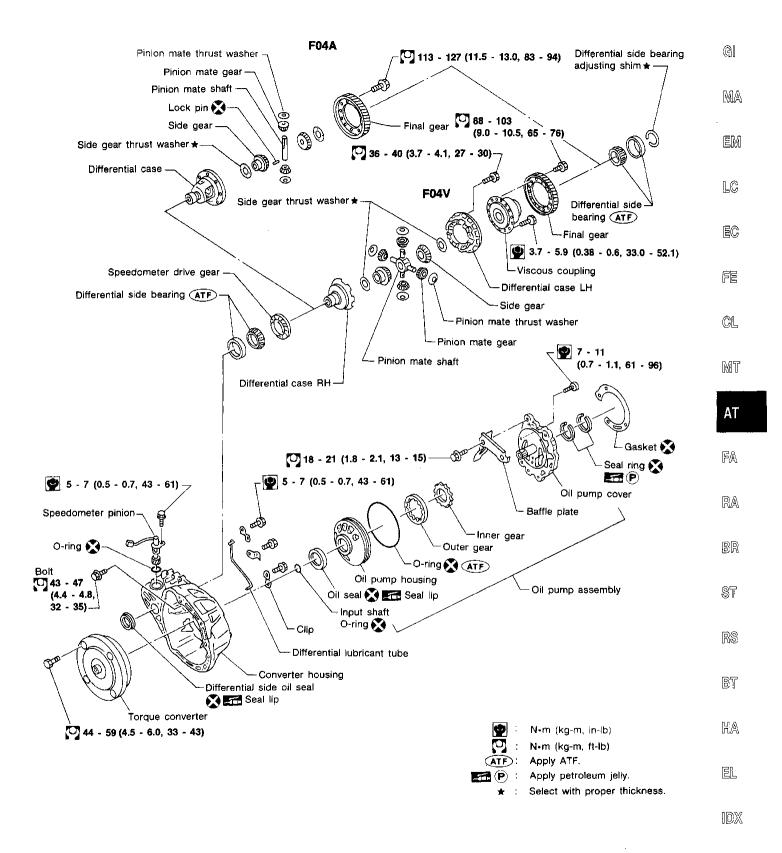
- Check fluid level in transaxle.
- Move selector lever through all positions to be sure that transaxle operates correctly.

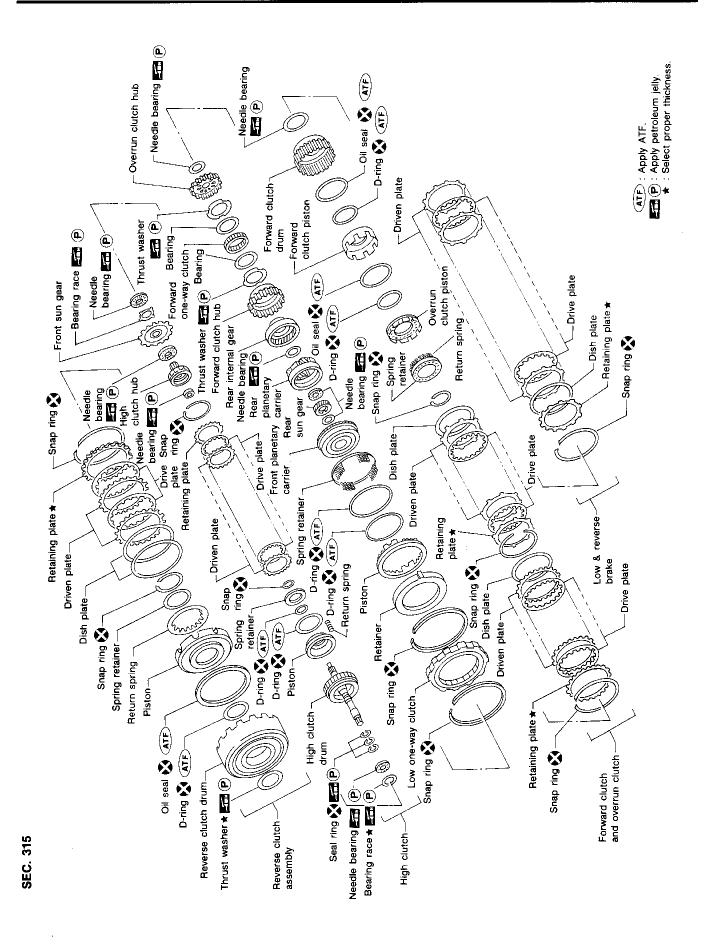
With parking brake applied, rotate engine at idling. Move selector lever through "N" to "D", to "2", to "1" and to "R" position. A slight shock should be felt by hand gripping selector each time transaxle is shifted.

Perform road test. Refer to AT-39.

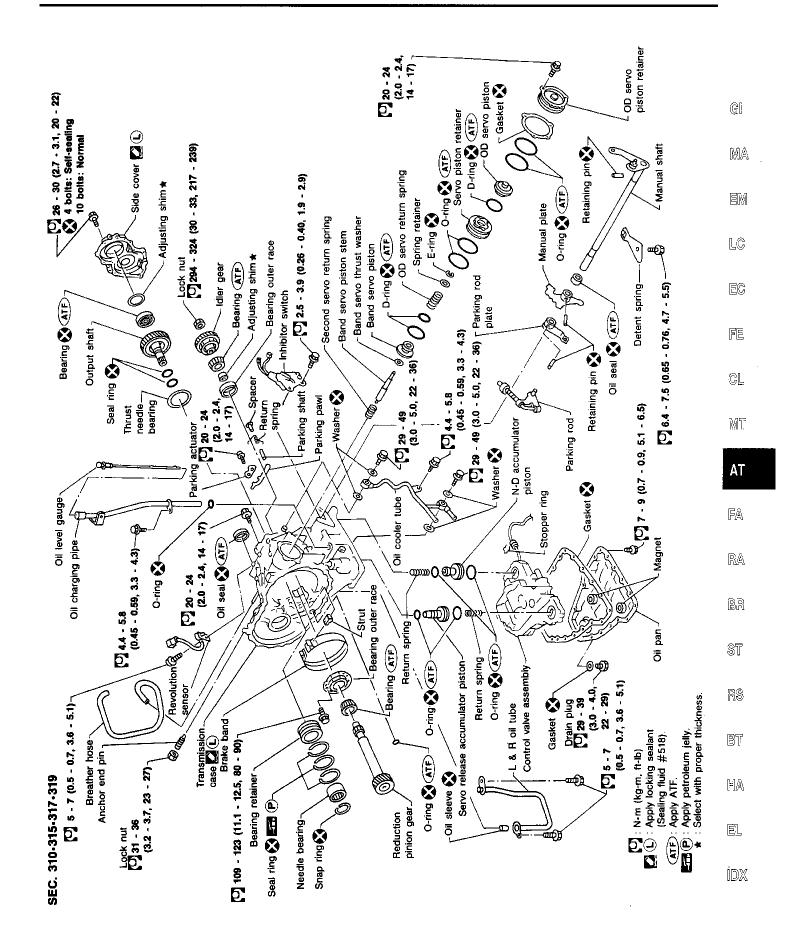
**AT-142** 752

#### SEC. 311-313-327-381

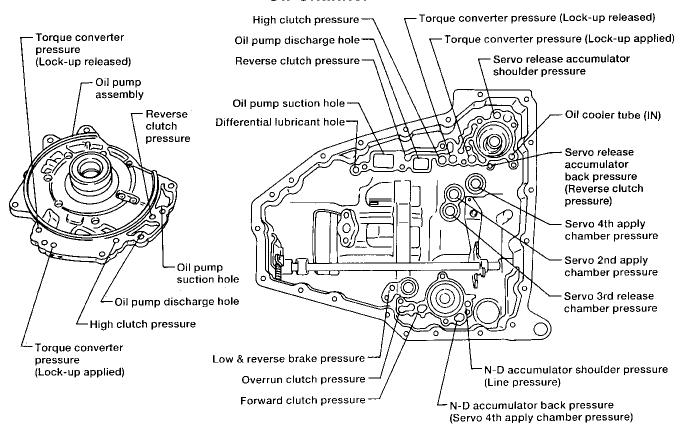


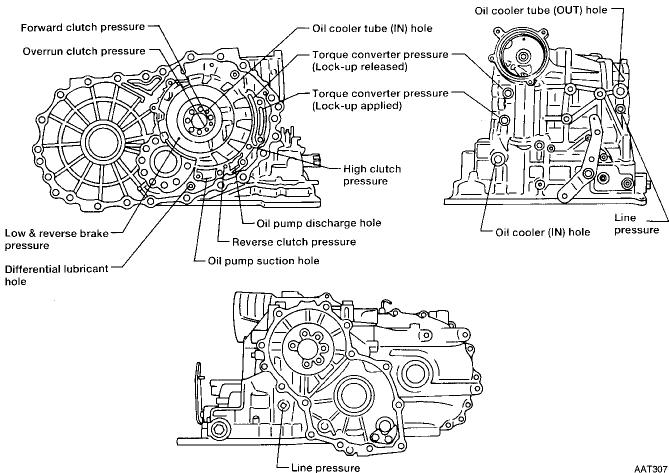


SAT114HD



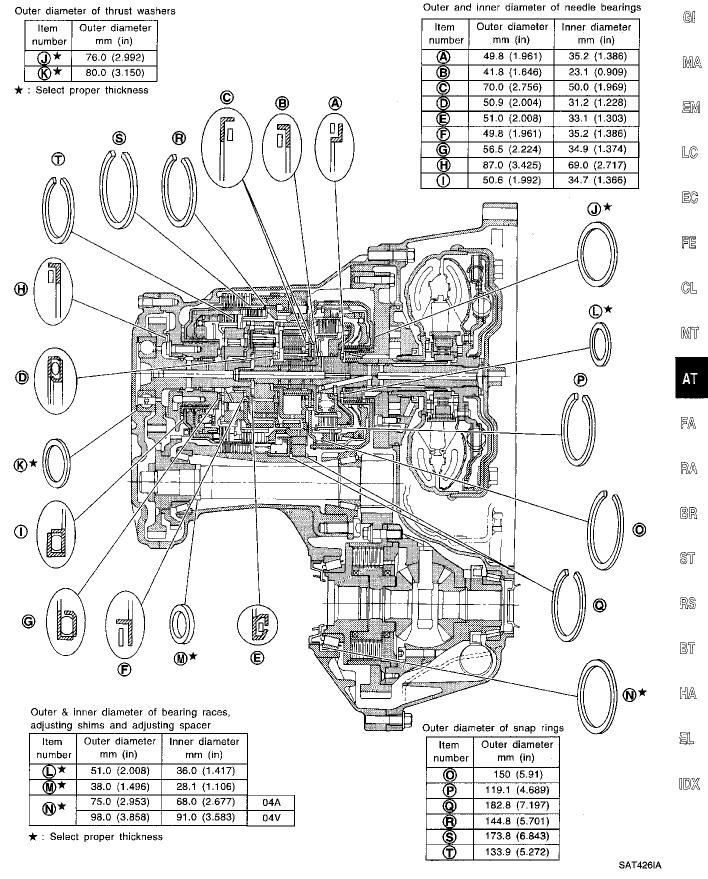
## Oil Channel



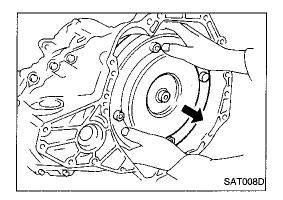


**AAT307** 

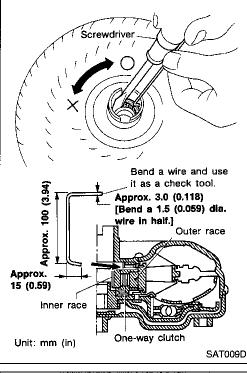
# Locations of Adjusting Shims, Needle Bearings, Thrust Washers and Snap Rings



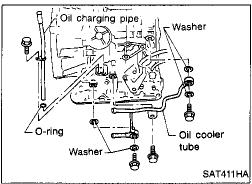
# **DISASSEMBLY**



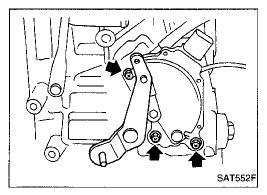
- 1. Drain ATF through drain plug.
- 2. Remove torque converter.



- Check torque converter one-way clutch using check tool as shown at left.
- Insert check tool into the groove of bearing support built into one-way clutch outer race.
- b. When fixing bearing support with check tool, rotate one- way clutch spline using screwdriver.
- c. Check that inner race rotates clockwise only. If not, replace torque converter assembly.

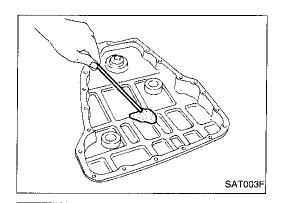


4. Remove oil charging pipe and oil cooler tube.



- 5. Set manual shaft to position "P".
- 6. Remove inhibitor switch.

# **DISASSEMBLY**

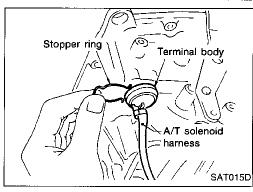


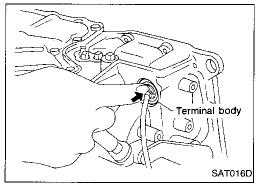
Unit: mm (in)

① 5 bolts ℓ = 40 (1.57)

② 6 bolts ℓ = 33 (1.30)

● 2 bolts ℓ = 43.5 (1.713)





- 7. Remove oil pan and oil pan gasket.
- Do not reuse oil pan bolts.
- 8. Check foreign materials in oil pan to help determine causes of malfunction. If the fluid is very dark, smells burned, or contains foreign particles, the frictional material (clutches, band) may need replacement. A tacky film that will not wipe clean indicates varnish build up. Varnish can cause valves, servo, and clutches to stick and may inhibit pump pressure.

 If frictional material is detected, replace radiator after repair of A/T. Refer to LC section ("Radiator", "ENGINE COOLING SYSTEM").

 Remove control valve assembly according to the following procedures.

a. Remove control valve assembly by removing fixing bolts ①, **③** and ●

 Be careful not to drop manual valve and servo release accumulator return spring.

b. Remove stopper ring from terminal body.

 Push terminal body into transmission case and draw out solenoid harness.

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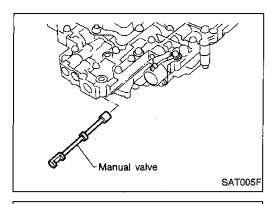
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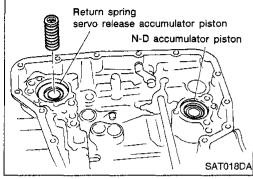
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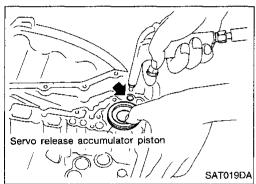
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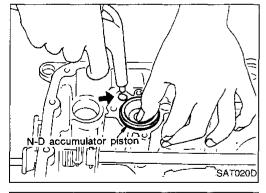
10. Remove manual valve from control valve assembly.



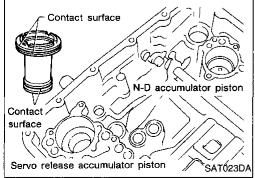
11. Remove return spring from servo release accumulator piston.



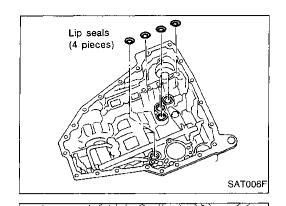
- 12. Remove servo release accumulator piston with compressed air.
- 13. Remove O-rings from servo release accumulator piston.



- 14. Remove N-D accumulator piston and return spring with compressed air.
- 15. Remove O-rings from N-D accumulator piston.



- 16. Check accumulator pistons and contact surface of transmission case for damage.
- 17. Check accumulator return springs for damage and free length.



18. Remove lip seals.



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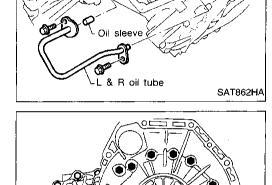
19. Remove L & R oil tube and oil sleeve.

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20. Remove converter housing according to the following procedures.

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a. Remove converter housing mounting bolts.

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p. Remove converter housing by tapping it lightly.

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Remove O-ring from differential oil port.

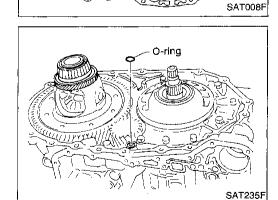
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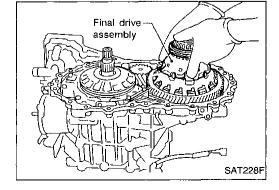
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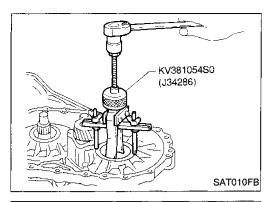
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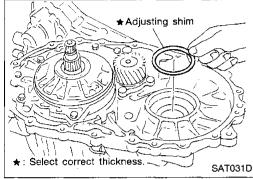
21. Remove final drive assembly from transmission case.



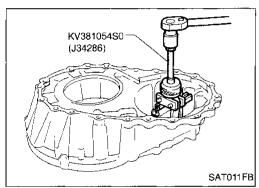
AT-151 761



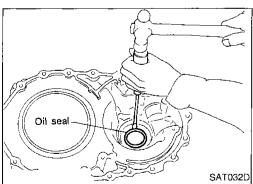
22. Remove differential side bearing outer race from transmission case.



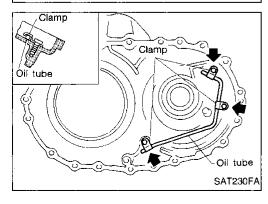
23. Remove differential side bearing adjusting shim from transmission case.



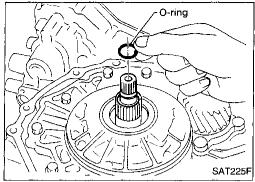
24. Remove differential side bearing outer race from converter housing.



- 25. Remove oil seal with screwdriver from converter housing.
- Be careful not to damage case.

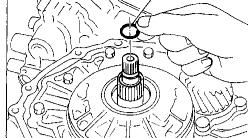


26. Remove oil tube from converter housing.

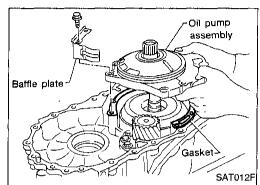




a. Remove O-ring from input shaft.



Remove oil pump assembly, baffle plate and gasket from trans-



mission case.



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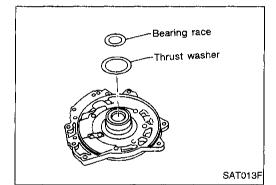
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Anchor end pin

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Remove thrust washer and bearing race from oil pump assembly.



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- 28. Remove brake band according to the following procedures.
- Loosen lock nut, then back off anchor end pin.

  - Do not reuse anchor end pin.

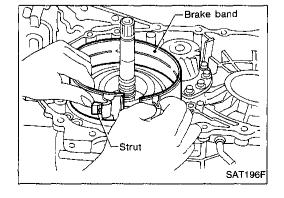


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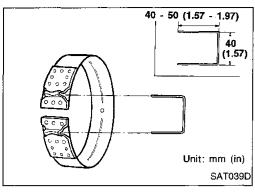
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Remove brake band and strut from transmission case.

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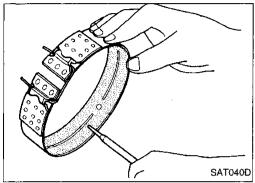


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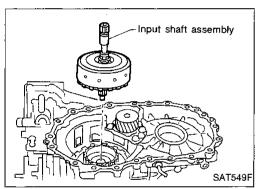


 To prevent brake linings from cracking or peeling, do not stretch the flexible band unnecessarily. When removing the brake band, always secure it with a clip as shown in the figure at left.

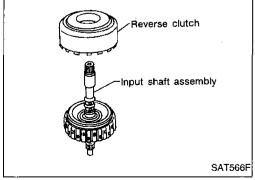
Leave the clip in position after removing the brake band.



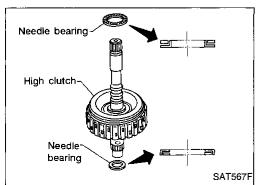
c. Check brake band facing for damage, cracks, wear or burns.



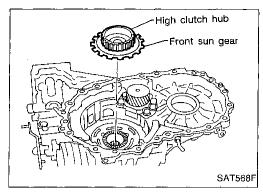
- 29. Remove input shaft assembly (high clutch) and reverse clutch according to the following procedures.
- a. Remove input shaft assembly (high clutch) with reverse clutch.



b. Remove input shaft assembly (high clutch) from reverse clutch.



 Remove needle bearings from high clutch drum and check for damage or wear.

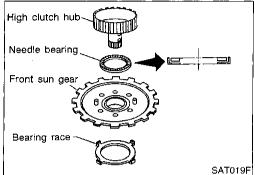


 Remove high clutch hub and front sun gear from transmission case.



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e. Remove front sun gear and needle bearing from high clutch hub and check for damage or wear.

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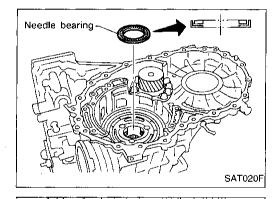
f. Remove bearing race from front sun gear and check for damage or wear.

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30. Remove needle bearing from transmission case and check for damage or wear.

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31. Apply compressed air and check to see that low and reverse brake operates.

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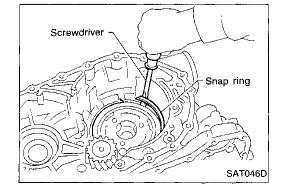
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32. Remove low one-way clutch and front planetary carrier assembly according to the following procedures.

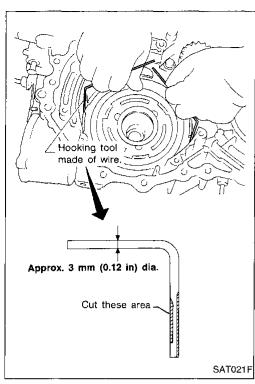
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a. Remove snap ring with flat-bladed screwdriver.

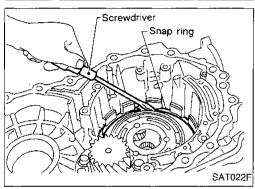
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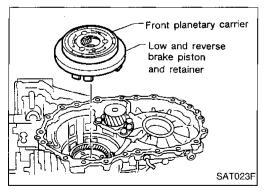
**AT-155** 765



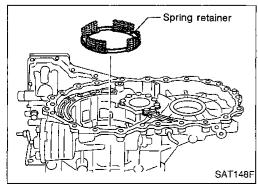
b. Remove low one way clutch with a hook made of wire.



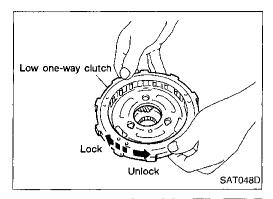
c. Remove snap ring with flat-bladed screwdriver.



 Remove front planetary carrier with low and reverse brake piston and retainer.



- e. Remove low and reverse brake spring retainer.
- Do not remove return springs from spring retainer.



Check that low one-way clutch rotates in the direction of the arrow and locks in the opposite direction.



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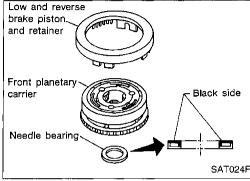
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Remove needle bearing, low and reverse brake piston and retainer from front planetary carrier.

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Feeler

gauge

Clearance

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Check front planetary carrier, low one-way clutch and needle bearing for damage or wear.

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Check clearance between planetary gears and planetary carrier with feeler gauge.

Standard clearance:

0.20 - 0.70 mm (0.0079 - 0.0276 in)

Allowable limit:

0.80 mm (0.0315 in)

Replace front planetary carrier if the clearance exceeds allow-

able limit.

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33. Remove rear planetary carrier assembly and rear sun gear according to the following procedures. Remove rear planetary carrier assembly from transmission

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case.

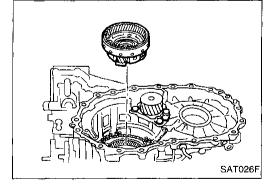
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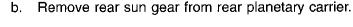
图下图

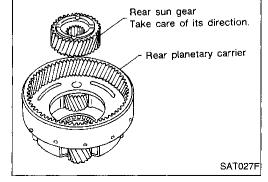
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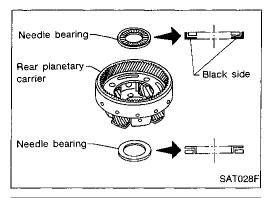
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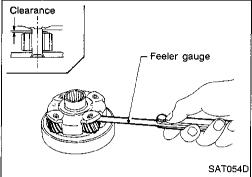








c. Remove needle bearings from rear planetary carrier assembly.



 d. Check rear planetary carrier, rear sun gear and needle bearings for damage or wear.

e. Check clearance between pinion washer and rear planetary carrier with feeler gauge.

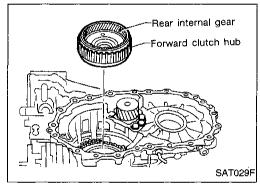
Standard clearance:

0.20 - 0.70 mm (0.0079 - 0.0276 in)

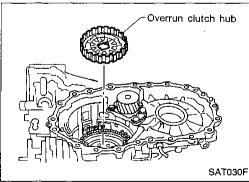
Allowable limit:

0.80 mm (0.0315 in)

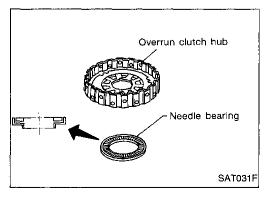
Replace rear planetary carrier if the clearance exceeds allowable limit.



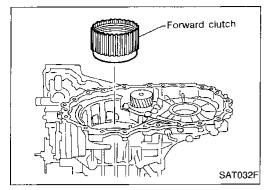
34. Remove rear internal gear and forward clutch hub from transmission case.



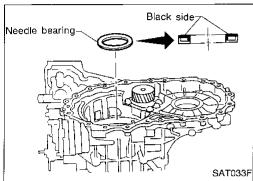
35. Remove overrun clutch hub from transmission case.



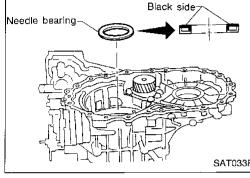
36. Remove needle bearing from overrun clutch hub and check for damage or wear.



37. Remove forward clutch assembly from transmission case.



38. Remove needle bearing from transmission case.



39. Remove output shaft assembly according to the following procedures.



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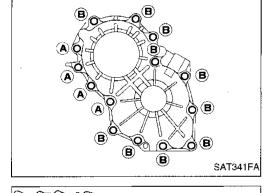
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- Remove side cover bolts. a.
- Do not mix bolts (A) and (B).
- Always replace bolts (A) as they are self-sealing bolts.

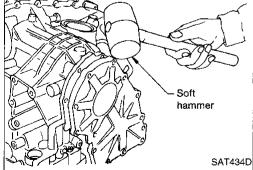


Remove side cover by lightly tapping it with a soft hammer.

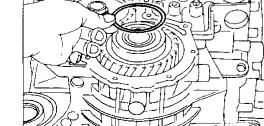


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Be careful not to drop output shaft assembly. It might come out when removing side cover.



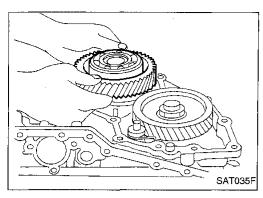
Remove adjusting shim.



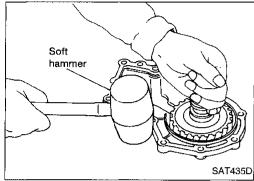
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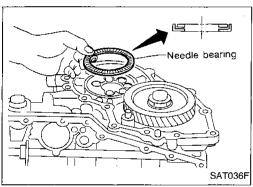
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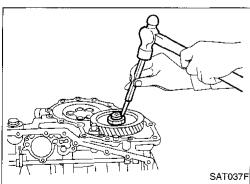
d. Remove output shaft assembly.



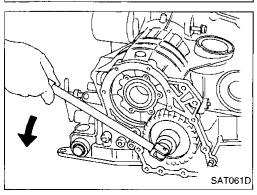
If output shaft assembly came off with side cover, tap cover with a soft hammer to separate.



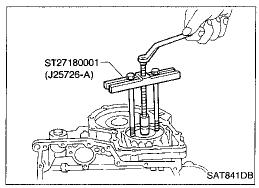
e. Remove needle bearing.



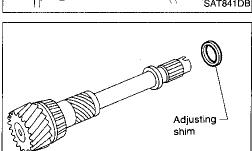
- 40. Disassemble reduction pinion gear according to the following procedures.
- Set manual lever to position "P" to fix idler gear. Unlock idler gear lock nut using a pin punch.



- Remove idler gear lock nut.
- Do not reuse idler gear lock nut.

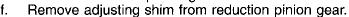


d. Remove idler gear with puller.



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e. Remove reduction pinion gear.





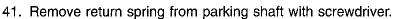
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42. Draw out parking shaft and remove parking pawl from transmission case.

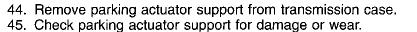
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43. Check parking pawl and shaft for damage or wear.

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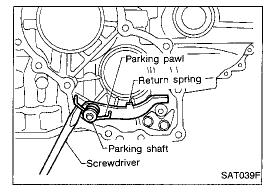
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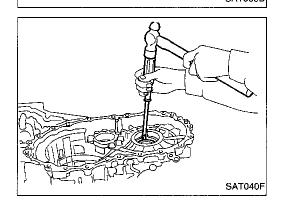
46. Remove side oil seal with screwdriver from transmission case.

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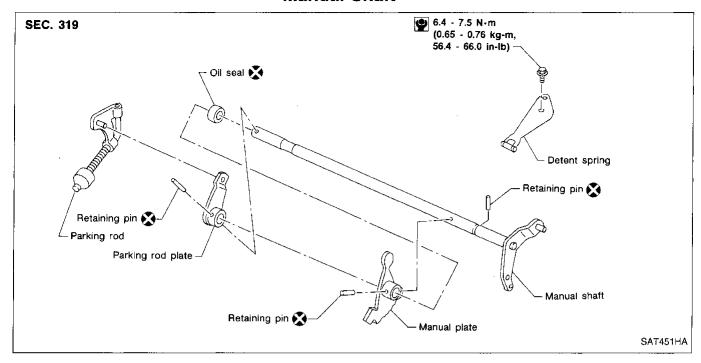


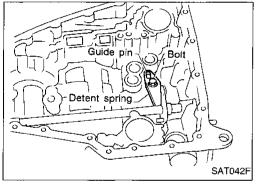
Parking actuator support

SAT066D



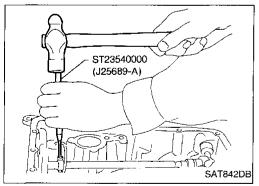
#### **Manual Shaft**



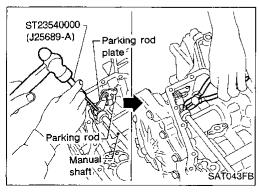


#### **REMOVAL**

1. Remove detent spring from transmission case.



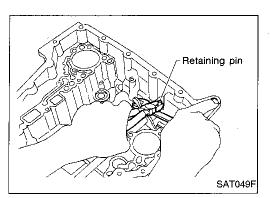
2. Drive out manual plate retaining pin.



- 3. Drive and pull out parking rod plate retaining pin.
- 4. Remove parking rod plate from manual shaft.
- 5. Draw out parking rod from transmission case.

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#### Manual Shaft (Cont'd)



6. Pull out manual shaft retaining pin.

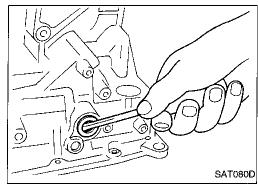
7. Remove manual shaft and manual plate from transmission case.



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. Remove manual shaft oil seal.



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#### **INSPECTION**

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Check component parts for wear or damage. Replace if necessary.

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#### **INSTALLATION**

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Manual shaft

1. Install manual shaft oil seal.

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Apply ATF to outer surface of oil seal.

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2. Install manual shaft and manual plate.

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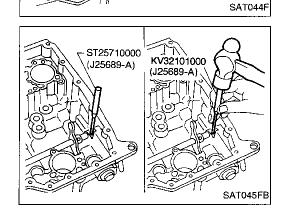
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B. Align groove of manual shaft and hole of transmission case.

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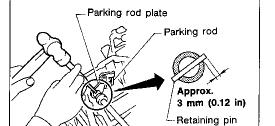
4. Install manual shaft retaining pin up to bottom of hole.

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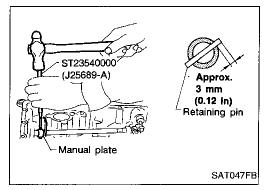
-Manual plate

#### Manual Shaft (Cont'd)

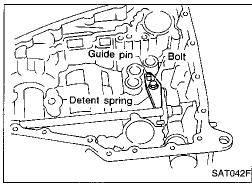


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- 5. Install parking rod to parking rod plate.
- 6. Set parking rod assembly onto manual shaft and drive retaining pin.
- Both ends of pin should protrude.

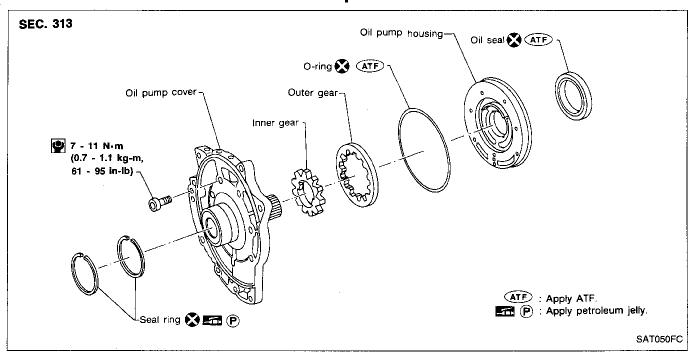


- 7. Drive manual plate retaining pin.
- Both ends of pin should protrude.



8. Install detent spring.

#### Oil Pump



# Seal ring

**SAT699H** 

SAT093D

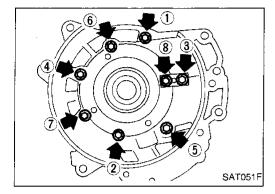
### Oil Pump (Cont'd) DISASSEMBLY

1. Remove seal rings.



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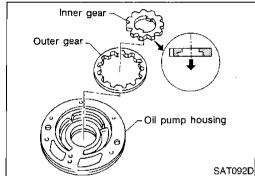


Loosen bolts in a crisscross pattern and remove oil pump cover.

EC

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3. Remove inner and outer gear from oil pump housing.

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Remove O-ring from oil pump housing.

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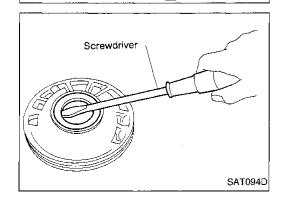
BT

5. Remove oil pump housing oil seal.

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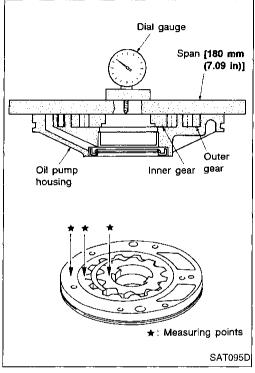


AT-165 775

#### Oil Pump (Cont'd) INSPECTION

#### Oil pump housing, oil pump cover, inner gear and outer gear

Check for wear or damage.



#### Side clearance

Measure side clearance of inner and outer gears in at least four places around each outside edge. Maximum measured values should be within specified positions.

#### Standard clearance:

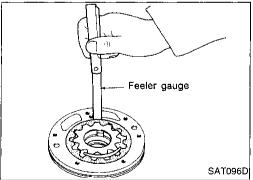
0.030 - 0.050 mm (0.0012 - 0.0020 in)

If clearance is less than standard, select inner and outer gear as a set so that clearance is within specifications.

#### Inner and outer gear:

Refer to SDS, AT-243.

If clearance is more than standard, replace whole oil pump assembly except oil pump cover.



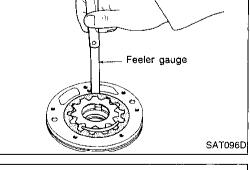
Measure clearance between outer gear and oil pump housing.

Standard clearance: 0.111 - 0.181 mm (0.0044 - 0.0071 in)

Allowable limit:

0.181 mm (0.0071 in)

If not within allowable limit, replace whole oil pump assembly except oil pump cover.



#### Seal ring clearance

Measure clearance between seal ring and ring groove.

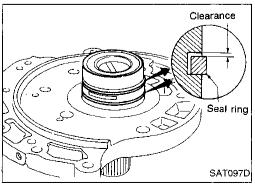
Standard clearance:

0.1 - 0.25 mm (0.0039 - 0.0098 in)

Allowable limit:

0.25 mm (0.0098 in)

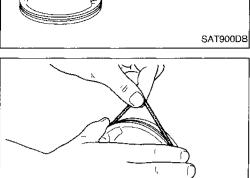
If not within allowable limit, replace oil pump cover assembly.



### ST33400001 (J26082)

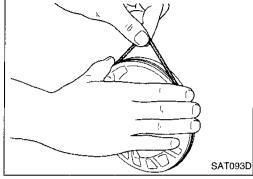
#### Oil Pump (Cont'd) **ASSEMBLY**

1. Install oil seal on oil pump housing.



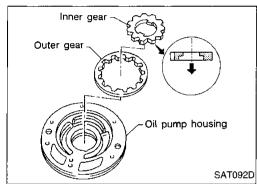
Install O-ring on oil pump housing.

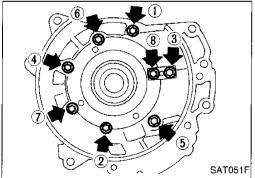
Apply ATF to O-ring.



Install inner and outer gears on oil pump housing.

Be careful of direction of inner gear.

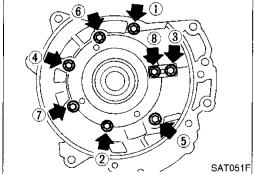




Install oil pump cover on oil pump housing.

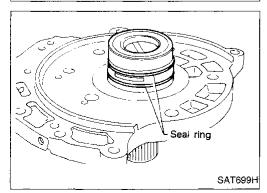
Wrap masking tape around splines of oil pump cover assembly to protect seal. Position oil pump cover assembly on oil pump housing assembly, then remove masking tape.

Tighten bolts in a crisscross pattern.



Install new seal rings carefully after packing ring groove with petroleum jelly.

Do not spread gap of seal ring excessively while installing. The ring may be deformed.



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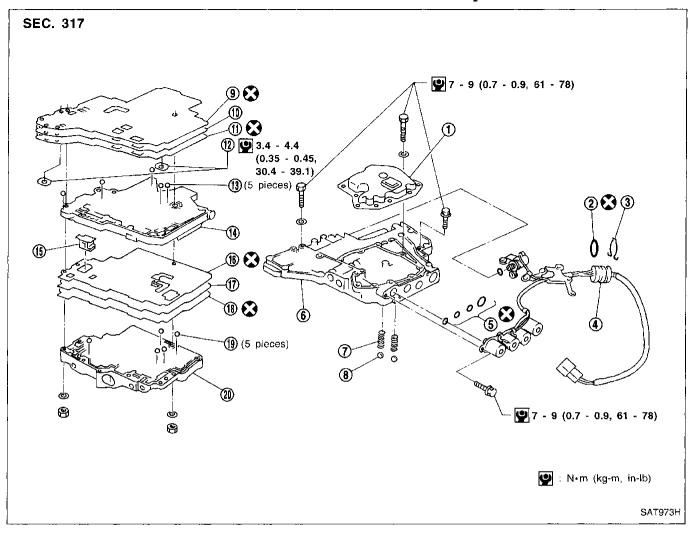
RS

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HA

777 AT-167

#### **Control Valve Assembly**



- (1) Oil strainer
- 2 O-ring
- 3 Clamp
- 4) Terminal body
- O-rings
- 6 Control valve lower body
- 7 Oil cooler relief valve spring
- 8 Check ball
- 9 Lower separating gasket
- (10) Separating plate
- 11) Lower inter separating gasket
- Support plate
- 13 Steel ball
  - Control valve inter body

- S Pilot filter
- 6 Upper inter separating gasket
- Separating plate
- (18) Upper separating gasket
- Steel ball
  - Control valve upper body

#### **DISASSEMBLY**

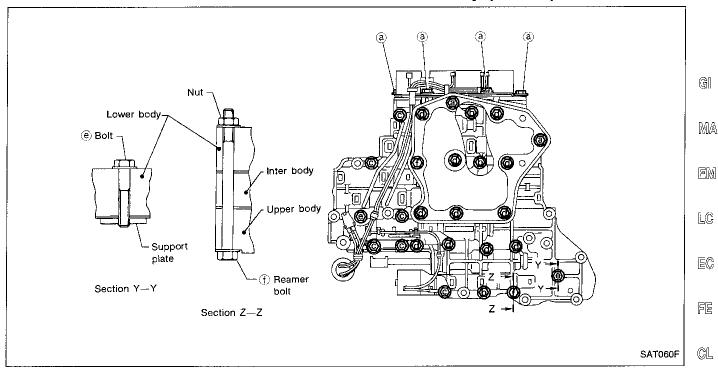
1. Disassemble upper, inter and lower bodies.

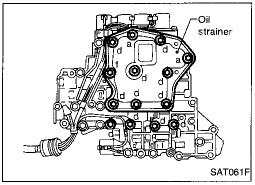
#### Bolt length, number and location:

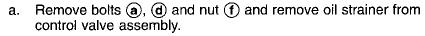
| Bolt symbol     |         | а       | <b>(b)</b> | ©       | <b>d</b> | e       | <b>①</b> |
|-----------------|---------|---------|------------|---------|----------|---------|----------|
| Bolt length "ℓ" | mm (in) | 13.5    | 58.0       | 40.0    | 66.0     | 33.0    | 78.0     |
| Q Q             |         | (0.531) | (2.283)    | (1.575) | (2.598)  | (1.299) | (3.071)  |
| Number of bolts |         | 6       | 3          | 6       | 11       | 2       | 2        |

f: Reamer bolt and nut.

#### Control Valve Assembly (Cont'd)





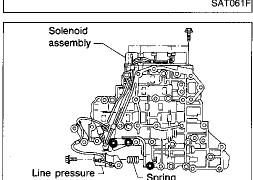




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SAT062F

solenoid

Remove solenoid valve assembly and line pressure solenoid valve from control valve assembly.

ST

RS

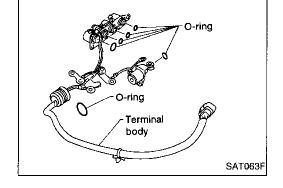
Remove O-rings from solenoid valves and terminal body.

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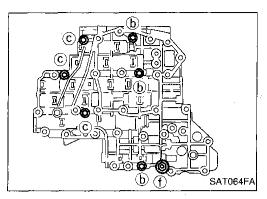
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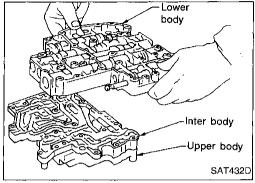


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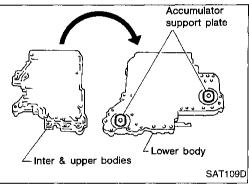
#### Control Valve Assembly (Cont'd)



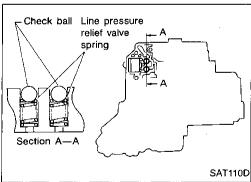
d. Place upper body facedown, and remove bolts **(b)**, **(c)** and nut **(f)**.



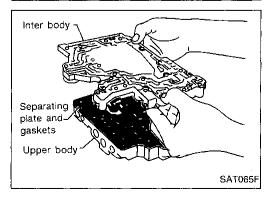
e. Remove inter body from lower body.



f. Turn over lower body, and remove accumulator support plate.



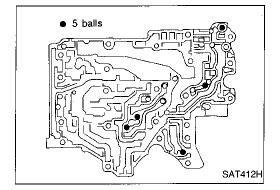
- g. Remove bolts (e), separating plate and separating gasket from lower body.
- h. Remove steel balls and relief valve springs from lower body.
- Be careful not to lose steel balls and relief valve springs.

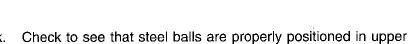


i. Remove inter body from upper body.

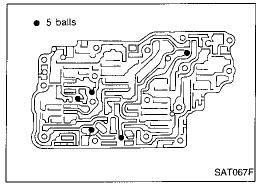
#### Control Valve Assembly (Cont'd)

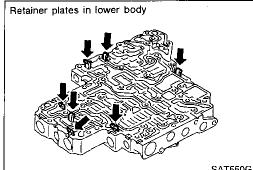
- Check to see that steel balls are properly positioned in inter body and then remove them.
- Be careful not to lose steel balls.

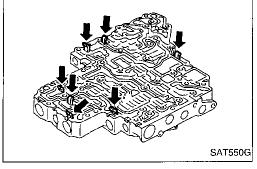


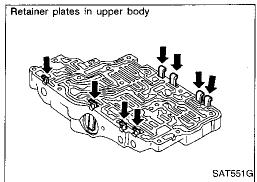


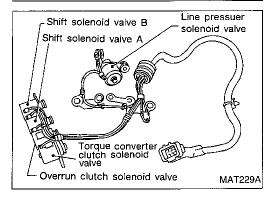
body and then remove them. Be careful not to lose steel balls.











#### INSPECTION

#### Lower and upper bodies

Check to see that retainer plates are properly positioned in lower body.

Check to see that retainer plates are properly positioned in upper body.

Be careful not to lose these parts.

#### Oil strainer

Check wire netting of oil strainer for damage.

Shift solenoid valves A and B, line pressure solenoid valve, torque converter clutch solenoid valve and overrun clutch solenoid valve.

Measure resistance. Refer to "Component Inspection". AT-85

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HA

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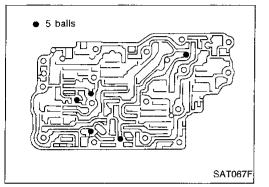
781

# diameter)

#### Control Valve Assembly (Cont'd)

- Oil cooler relief valve spring.
- Check springs for damage or deformation.
- Measure free length and outer diameter Inspection standard:

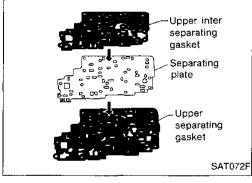
Refer to SDS, AT-240.



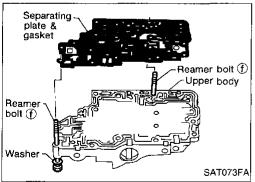
#### **ASSEMBLY**

SAT138D

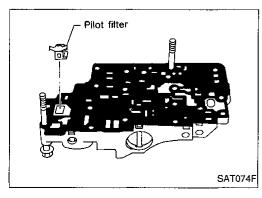
- 1. Install upper, inter and lower body.
- a. Place oil circuit of upper body face up. Install steel balls in their proper positions.



b. Install upper separating gasket, upper inter separating gasket and upper separating plate in order shown in illustration.

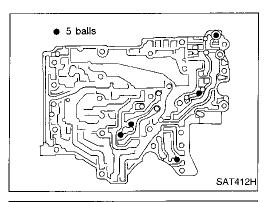


c. Install reamer bolts (f) from bottom of upper body. Using reamer bolts as guides, install separating plate and gaskets as a set.



d. Install pilot filter.

#### Control Valve Assembly (Cont'd)

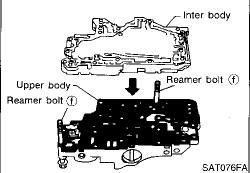


Place lower body as shown in illustration (side of inter body face up). Install steel balls in their proper positions.



MA

EM



Install inter body on upper body using reamer bolts (f) as f. guides.

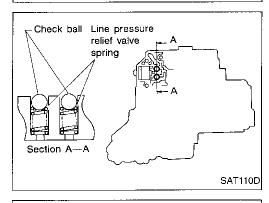
LC

Be careful not to dislocate or drop steel balls.

EC

FE

CL.



Lower separating

Lower separating

Lower separating

SAT077F

j.

gasket

plate

gasket

Install steel balls and relief valve springs in their proper positions in lower body.

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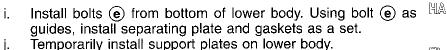
BR

Install lower separating gasket, inter separating gasket and lower separating plate in order shown in illustration.

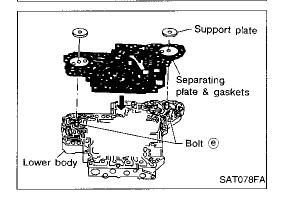
ST

RS

BT

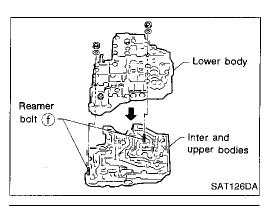


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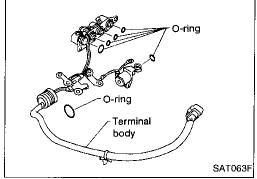


783 AT-173

#### **Control Valve Assembly (Cont'd)**



k. Install lower body on inter body using reamer bolts (f) as guides and tighten reamer bolts (f) slightly.

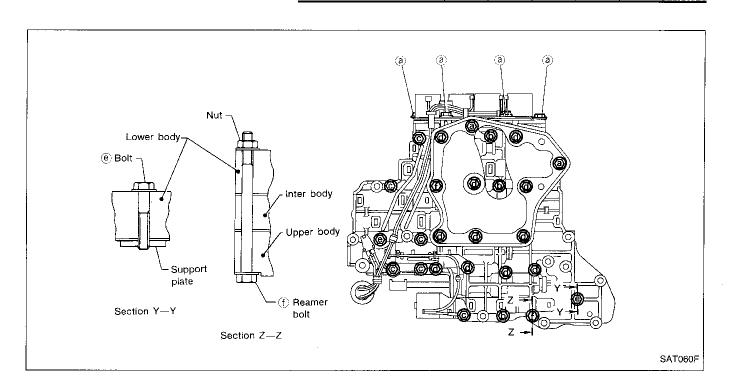


- 2. Install O-rings to solenoid valves and terminal body.
- Apply ATF to O-rings.

#### 3. Install and tighten bolts.

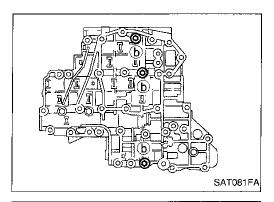
#### Bolt length, number and location:

| Bolt symbol     |         | a | Ю               | ©               | d               | <b>e</b>        | (f)             |
|-----------------|---------|---|-----------------|-----------------|-----------------|-----------------|-----------------|
| Bolt length "t" | mm (in) |   | 58.0<br>(2.283) | 40.0<br>(1.575) | 66.0<br>(2.598) | 33.0<br>(1.299) | 78.0<br>(3.071) |
| Number of bolts |         | 6 | 3               | 6               | 11              | 2               | 2               |



**AT-174** 784

#### Control Valve Assembly (Cont'd)



a. Install and tighten bolts **(b)** to specified torque. **(c)** : 7 - 9 N·m (0.7 - 0.9 kg-m, 61 - 78 in-lb)

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EM

Solenoid assembly

Line pressure Spring solenoid SAT062F

 Install solenoid valve assembly and line pressure solenoid valve to lower body.

EC

LC

FE

CL

c. Set oil strainer, then tighten bolts (a), (c), (d) and nuts (f) to specified torque.

MT

FA

RA

(0.7 - 0.9 kg-m, 61 - 78 in-lb)

Oil strainer

Oil strainer

Oil Strainer

d. Tighten bolts (e) to specified torque.

**(a)** : 3.4 - 4.4 N·m (0.35 - 0.45 kg-m, 30.4 - 39.1 in-lb)

BR

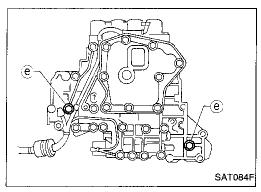
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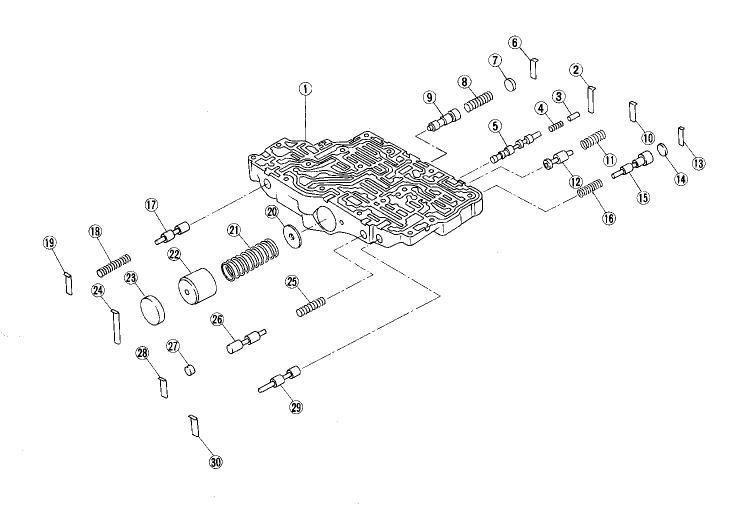
HA

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#### **Control Valve Upper Body**

SEC. 317



SAT859H

#### Apply ATF to all components before installation.

- Upper body
- Retainer plate
- ② ③ Plug
- Return spring
- Torque converter clutch control valve
- Retainer plate
- **6**7**8**9 Plug
- Return spring
- 1-2 accumulator valve
- Retainer plate

- Return spring
- 12 Torque converter relief valve
- Retainer plate
- (14)
- **(15)** Overrun clutch reducing valve
- Return spring
- $\bar{\mathfrak{D}}$ Pilot valve
- 18) Return spring
- 19 Retainer plate
- 20 1-2 accumulator retainer plate

- Return spring
- 22 1-2 accumulator piston
- Plug
- Retainer plate
- 25) Return spring
- **26** 1st reducing valve
- 27 Plug
- 28 Retainer plate
- 29 2-3 timing valve
- Retainer plate

## Retainer plates in upper body SAT551G

#### Control Valve Upper Body (Cont'd) DISASSEMBLY

- Remove valves at retainer plates.
- Do not use a magnetic "hand".



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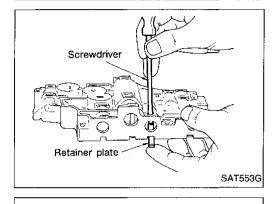
Use a screwdriver to remove retainer plates.



EC

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CL.



Screwdriver

Retainer plate

Plug

SAT554G

SAT137D

Remove retainer plates while holding spring, plugs or sleeves.

MT

Remove plugs slowly to prevent internal parts from jumping out.

FA

RA

Place mating surface of valve body face down, and remove BR internal parts.



If a valve is hard to remove, place valve body face down and lightly tap it with a soft hammer.



Be careful not to drop or damage valves and sleeves.

RS

BT



#### HA

#### Valve spring

Measure free length and outer diameter of each valve spring. Also check for damage or deformation.

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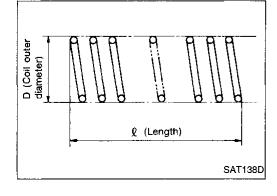
Inspection standard:

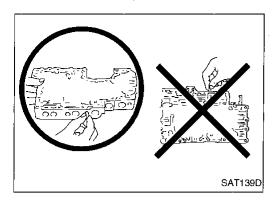
Refer to SDS, AT-240.

Replace valve springs if deformed or fatigued.

#### Control valves

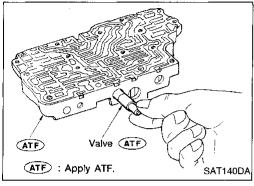
Check sliding surfaces of valves, sleeves and plugs.



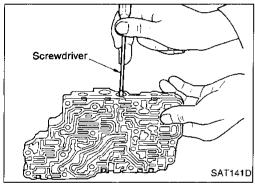


#### Control Valve Upper Body (Cont'd) ASSEMBLY

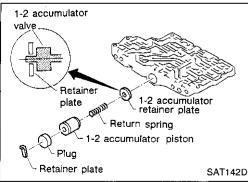
 Lay control valve body down when installing valves. Do not stand the control valve body upright.



- 1. Lubricate the control valve body and all valves with ATF. Install control valves by sliding them carefully into their bores.
- Be careful not to scratch or damage valve body.

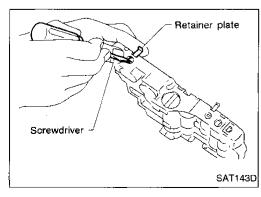


 Wrap a small screwdriver with vinyl tape and use it to insert the valves into their proper positions.

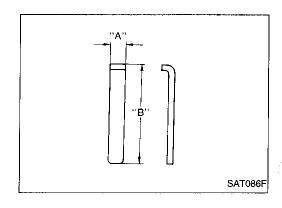


#### 1-2 accumulator valve

- Install 1-2 accumulator valve. Align 1-2 accumulator retainer plate from opposite side of control valve body.
- Install return spring, 1-2 accumulator piston and plug.



- 2. Install retainer plates.
- While pushing plug or return spring, install retainer plate.



### Control Valve Upper Body (Cont'd) Retainer plate

|                                       |   | Unit: mm (in) |
|---------------------------------------|---|---------------|
| Name of control valve                 | Length A                                | Length B      |
| Pilot valve                           |   | 21.5 (0.846)  |
| 1-2 accumulator valve                 | <del></del>                             | 00 5 (4 540)  |
| 1-2 accumulator piston valve          | *************************************** | 38.5 (1.516)  |
| 1st reducing valve                    | 6.0 (0.236)                             | 21.5 (0.846)  |
| Overrun clutch reducing valve         |   | 24.0 (0.945)  |
| Torque converter relief valve         |   | 21.5 (0.846)  |
| Torque converter clutch control valve |   | 28.0 (1.102)  |

Install proper retainer plates.

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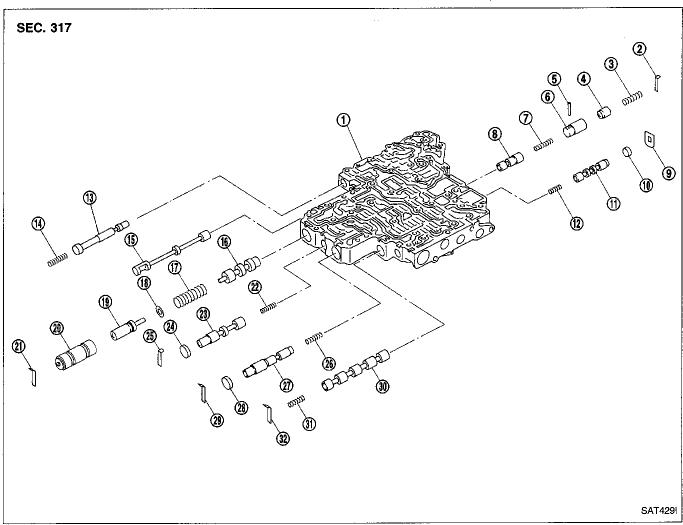
BT

 $\mathbb{H}\mathbb{A}$ 

EL

IDX

#### **Control Valve Lower Body**



#### Apply ATF to all components before installation.

- Lower body
- Retainer plate
- Return spring
- Piston
- Parallel pin
- Sleeve
- Return spring
- 23456789 Pressure modifier valve
- Retainer plate
- Plug
- Shift valve B

- Return spring 12
- Plug (3)
- Return spring
- (15) Manual valve
- Pressure regulator valve
- 17 Return spring
- **18**) Spring seat
- 19 Plug
- 20 Sleeve
- Retainer plate
- Return spring

- 23 Overrun clutch control valve
- 24) Plug
- Retainer plate
- 26) Return spring
- 27 Accumulator control valve
- 28) Plug
- 29 Retainer plate
- 30 Shift valve A
- **(31)** Retainer spring
- Retainer plate

## Retainer plates in lower body SAT550G

#### **Control Valve Lower Body (Cont'd) DISASSEMBLY**

Remove valves at retainer plate. For removal procedures, refer to "DISASSEMBLY" of Control Valve Upper Body. AT-177

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#### INSPECTION

#### Valve springs

LC

Check each valve spring for damage or deformation. Also measure free length and outer diameter.

EC

Inspection standard: Refer to SDS, AT-240.

Replace valve springs if deformed or fatigued.

FE

#### **Control valves**

Check sliding surfaces of control valves, sleeves and plugs for damage.

CL

MIT

Install control valves. For installation procedures, refer to "ASSEMBLY" of Control Valve Upper Body. AT-178

**AT** 



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#### Retainer plate

SAT550A

Unit: mm (in)

| Name of control valve and plug | Length A    | Length B     | Туре |
|--------------------------------|-------------|--------------|------|
| Plug                           |             | 19.5 (0.768) |      |
| Pressure regulator valve       | 7           |              |      |
| Accumulator control valve      | 6.0 (0.236) | 28.0 (1.102) | I    |
| Shift valve A                  |             |              |      |
| Overrun clutch control valve   |             |              |      |
| Pressure modifier valve        |             |              |      |
| Shift valve B                  | _           | _            | II.  |

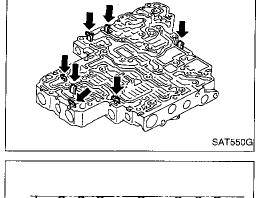
BR

Install proper retainer plates.

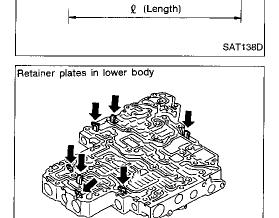
EL

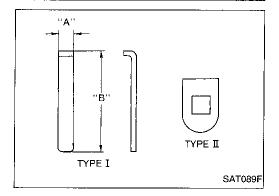
IDX



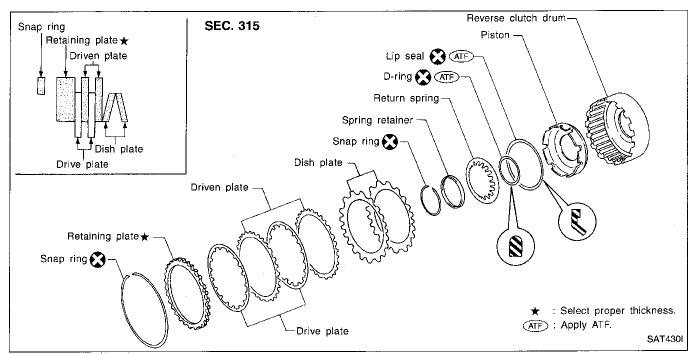


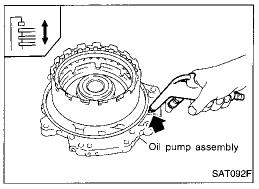
D (Coil ou diameter)





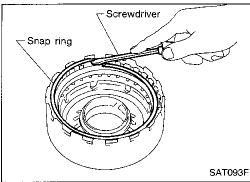
#### **Reverse Clutch**



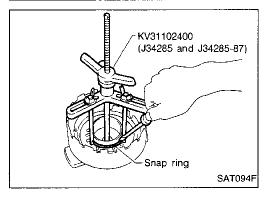




- 1. Check operation of reverse clutch
- a. Install seal ring onto drum support of oil pump cover and install reverse clutch assembly. Apply compressed air to oil hole.
- b. Check to see that retaining plate moves to snap ring.
- c. If retaining plate does not contact snap ring:
- D-ring might be damaged.
- Oil seal might be damaged.
- Fluid might be leaking past piston check ball.

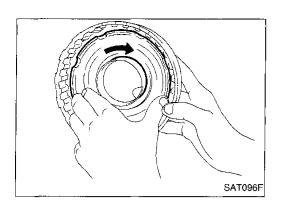


- Remove snap ring.
- 3. Remove drive plates, driven plates, retaining plate, and dish plates.



- 4. Set Tool on spring retainer and remove snap ring from reverse clutch drum while compressing return springs.
- Set Tool directly over springs.
- Do not expand snap ring excessively.
- 5. Remove spring retainer and return springs.

**AT-182** 792



#### Reverse Clutch (Cont'd)

- Remove piston from reverse clutch drum by turning it.
- Remove D-ring and oil seal from piston.

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#### INSPECTION

#### Reverse clutch snap ring, spring retainer and return springs

Check for deformation, fatigue or damage. If necessary, replace.

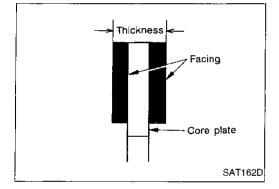
EC

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Piston

#### Reverse clutch drive plates

- Check facing for burns, cracks or damage.
- Measure thickness of facing.

Thickness of drive plate:

Standard value: 1.6 mm (0.063 in) Wear limit: 1.4 mm (0.055 in)

If not within wear limit, replace.

FA

RA

BR

#### Reverse clutch dish plates

- Check for deformation or damage.
- Measure thickness of dish plate.

Thickness of dish plate: 3.08 mm (0.1213 in)

If deformed or fatigued, replace.

ST

RS

#### Reverse clutch piston

- Make sure that check balls are not fixed.
- Apply compressed air to check ball oil hole opposite the return spring. Make sure there is no air leakage.
- Apply compressed air to oil hole on return spring side to make sure that air leaks past ball.

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#### ASSEMBLY

- Install D-ring and oil seal on piston.
- Take care with the direction of lip seal.
- Apply ATF to both parts.

AT-183

Oil seal D-ring

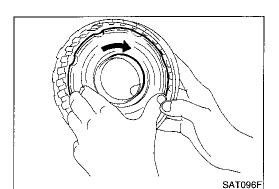


SAT097F

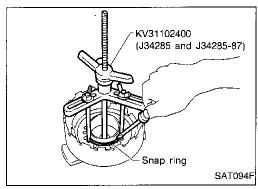
SAT163D

IDX

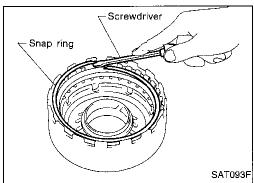
#### Reverse Clutch (Cont'd)



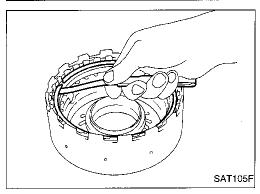
- 2. Install piston assembly by turning it slowly.
- Apply ATF to inner surface of drum.



- 3. Install return springs and spring retainer on piston.
- 4. Set Tool on spring retainer and install snap ring while compressing return springs.
- Set Tool directly over return springs.



- 5. Install drive plates, driven plates, retaining plate and dish plates.
- Take care with order of plates.
- 6. Install snap ring.



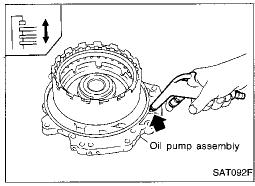
7. Measure clearance between retaining plate and snap ring. If not within allowable limit, select proper retaining plate.

Specified clearance:

Standard 0.5 - 0.8 mm (0.020 - 0.031 in) Allowable limit 1.2 mm (0.047 in)

Retaining plate:

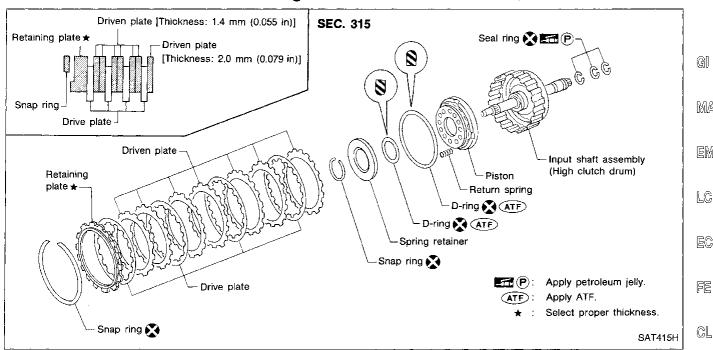
Refer to SDS, AT-241.

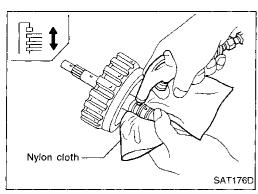


Check operation of reverse clutch.
 Refer to "DISASSEMBLY", "Reverse Clutch", AT-182.

**AT-184** 794

#### **High Clutch**





#### DISASSEMBLY

Check operation of high clutch.

Apply compressed air to oil hole of input shaft with nylon cloth.

Stop up hole on opposite side of input shaft with nylon

Check to see that retaining plate moves to snap ring.

If retaining plate does not contact snap ring: C.

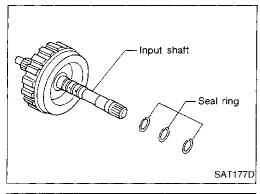
D-ring might be damaged.

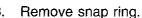
Oil seal might be damaged.

Fluid might be leaking past piston check ball.

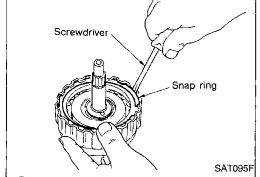
Remove seal rings from input shaft.

Always replace when removed.





Remove drive plates, driven plates and retaining plate.



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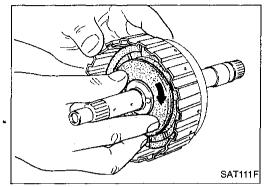
EL

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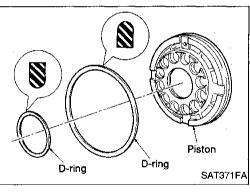
# KV31102400 (J34285 and J34285-87) Snap ring

#### High Clutch (Cont'd)

- 5. Set Tool on spring retainer and remove snap ring from high clutch drum while compressing return springs.
- Set Tool directly over springs.
- Do not expand snap ring excessively.
- 6. Remove spring retainer and return springs.



7. Remove piston from high clutch drum by turning it.

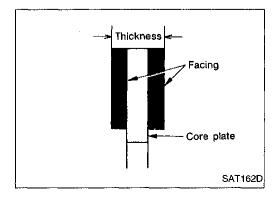


8. Remove D-rings from piston.

#### INSPECTION

High clutch snap ring, spring retainer and return springs.

- Check for deformation, fatigue or damage. If necessary, replace.
- When replacing spring retainer and return springs, replace them as a set.



#### High clutch drive plates

- Check facing for burns, cracks or damage.
- Measure thickness of facing.

Thickness of drive plate:
Standard value 1.6 mm (0.063 in)
Wear limit 1.4 mm (0.055 in)

If not within wear limit, replace.

### Check air does not Check air flows flow through through ball hole. SAT186D ball hole. hole.

#### High Clutch (Cont'd)

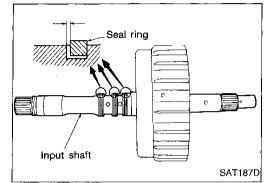
#### High clutch piston

- Make sure that check balls are not fixed.
- Apply compressed air to check ball oil hole opposite the return spring. Make sure there is no air leakage.
- Apply compressed air to oil hole on return spring side to make sure that air leaks past ball.



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LC



Piston

SAT371FA

D-ring

#### Seal ring clearance

- Install new seal rings onto input shaft.
- Measure clearance between seal ring and ring groove.

Standard clearance:

0.08 - 0.23 mm (0.0031 - 0.0091 in) Allowable limit: 0.23 mm (0.0091 in)

If not within allowable limit, replace input shaft assembly.

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- Install D-rings on piston.
- Take care with the direction of oil seal.
- Apply ATF to both parts.

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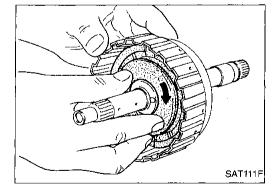
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BR

- Install piston assembly by turning it slowly.



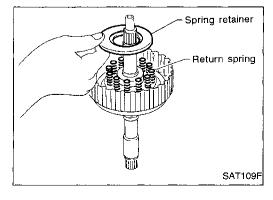
D-ring

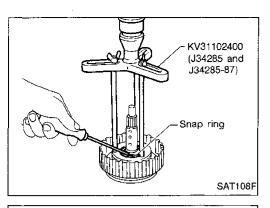
Apply ATF to inner surface of drum.

Install return springs and spring retainer on piston.

KA

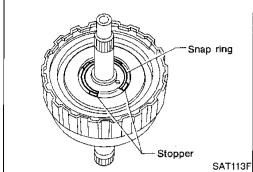
IDX



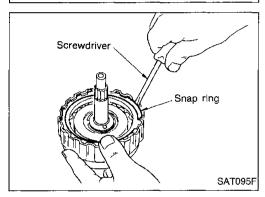


#### High Clutch (Cont'd)

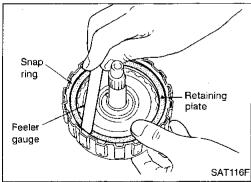
- 4. Set Tool on spring retainer and install snap ring while compressing return springs.
- Set Tool directly over return springs.



Do not align snap ring gap with spring retainer stopper.



- 5. Install drive plates, driven plates and retaining plate.
- Take care with the order and direction of plates.
- 6. Install snap ring.



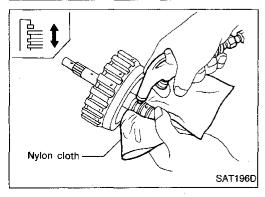
 Measure clearance between retaining plate and snap ring. If not within allowable limit, select proper retaining plate.

Specified clearance:

Standard 1.8 - 2.2 mm (0.071 - 0.087 in) Allowable limit 3.0 mm (0.118 in)

Retaining plate:

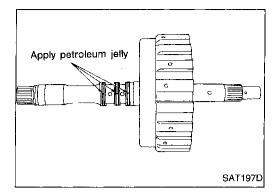
Refer to SDS, AT-241.



Check operation of high clutch.
 Refer to "DISASSEMBLY", "High Clutch", AT-185.

#### High Clutch (Cont'd)

- Install seal rings to input shaft.
- Apply petroleum jelly to seal rings.
- Always replace when removed.



Thick paper

SAT198D

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Roll paper around seal rings to prevent seal rings from spreading.

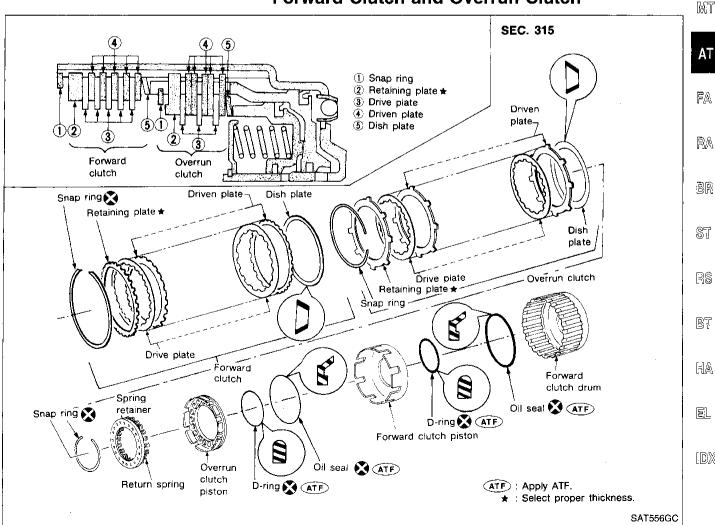
EC

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Cl

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Forward Clutch and Overrun Clutch

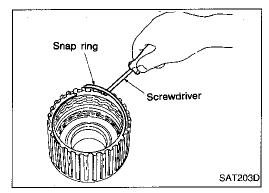


ΑT FA RA 38 ST RS BT  $\mathbb{A}$ EL 

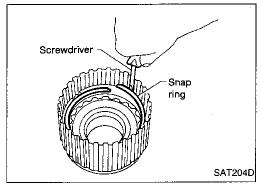
# Hole for overrun clutch inspection

# Forward Clutch and Overrun Clutch (Cont'd) DISASSEMBLY

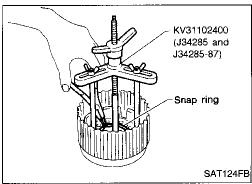
- 1. Check operation of forward clutch and overrun clutch.
- a. Install bearing retainer on forward clutch drum.
- b. Apply compressed air to oil hole of forward clutch drum.
- c. Check to see that retaining plate moves to snap ring.
- d. If retaining plate does not contact snap ring:
- D-ring might be damaged.
- Oil seal might be damaged.
- Fluid might be leaking past piston check ball.



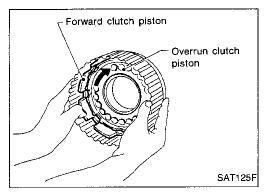
- 2. Remove snap ring for forward clutch.
- 3. Remove drive plates, driven plates, retaining plate and dish plate for forward clutch.



- 4. Remove snap ring for overrun clutch.
- 5. Remove drive plates, driven plates, retaining plate and dish plate for overrun clutch.

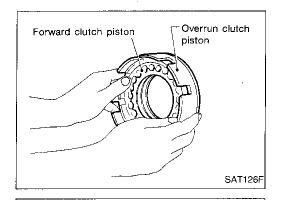


- 6. Set Tool on spring retainer and remove snap ring from forward clutch drum while compressing return springs.
- Set Tool directly over return springs.
- Do not expand snap ring excessively.
- Remove spring retainer and return springs.
- Do not remove return springs from spring retainer.



8. Remove forward clutch piston with overrun clutch piston from forward clutch drum by turning it.

AT-190 800

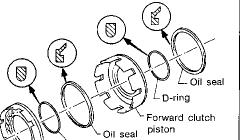


#### Forward Clutch and Overrun Clutch (Cont'd)

Remove overrun clutch piston from forward clutch piston by turning it.



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D-ring

Overrun clutch piston

10. Remove D-rings and oil seals from forward clutch piston and overrun clutch piston.

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#### **INSPECTION**

SAT127F

#### Snap rings, spring retainer and return springs

- Check for deformation, fatigue or damage.
- Replace if necessary.

When replacing spring retainer and return springs, replace them as a set.

ΑT

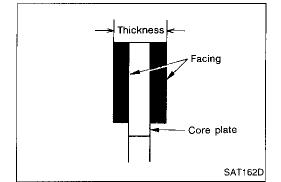
FA

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RS



#### Forward clutch and overrun clutch drive plates

Check facing for burns, cracks or damage.

Measure thickness of facing.

Thickness of drive plate:

Forward clutch

Standard value: 1.6 mm (0.063 in)

Wear limit: 1.4 mm (0.055 in)

Overrun clutch

Standard value: 1.6 mm (0.063 in)

Wear limit: 1.4 mm (0.055 in)

图T

If not within wear limit, replace.

#### Forward clutch and overrun clutch dish plates

Check for deformation or damage.

Measure thickness of dish plate.

Thickness of dish plate:

Forward clutch 2.7 mm (0.106 in) Overrun clutch 2.7 mm (0.106 in)

If deformed or fatigued, replace.

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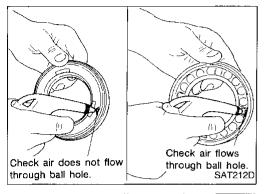


SAT163D

# Check air does not flow through ball hole. SAT213D

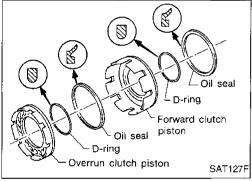
#### Forward Clutch and Overrun Clutch (Cont'd)

- Forward clutch drum
  Make sure that check balls are not fixed.
- Apply compressed air to check ball oil hole from outside of forward clutch drum. Make sure air leaks past ball.
- Apply compressed air to oil hole from inside of forward clutch drum. Make sure there is no air leakage.



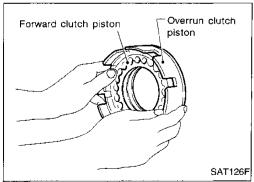
#### Overrun clutch piston

- Make sure that check balls are not fixed.
- Apply compressed air to check ball oil hole opposite the return spring. Make sure there is no air leakage.
- Apply compressed air to oil hole on return spring side. Make sure that air leaks past ball.

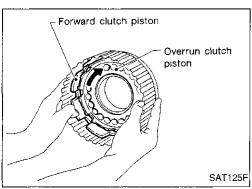


#### **ASSEMBLY**

- 1. Install D-rings and oil seals on forward clutch piston and overrun clutch piston.
- Take care with direction of lip seal.
- Apply ATF to both parts.



- Install overrun clutch piston assembly on forward clutch piston by turning it slowly.
- Apply ATF to inner surface of forward clutch piston.

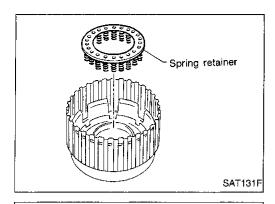


- Install forward clutch piston assembly on forward clutch drum by turning it slowly.
- Apply ATF to inner surface of drum.

AT-192 802

#### Forward Clutch and Overrun Clutch (Cont'd)

4. Install return spring on overrun clutch piston.



Check ball

Mark on the

spring retainer

(Overrun clutch piston)

Align the mark on spring retainer with check ball in overrun

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clutch piston.

EC

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Set Tool on spring retainer and install snap ring while com-

Do not align snap ring gap with spring retainer stopper.

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Set Tool directly over return springs.

pressing return springs.

ΑT

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ST

RS

BT

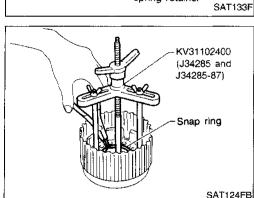
6. Install drive plates, driven plates, retaining plate and dish plate for overrun clutch.

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Take care with order of plates.

Install snap ring for overrun clutch.

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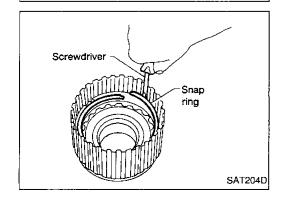
SAT124FB

Stopper

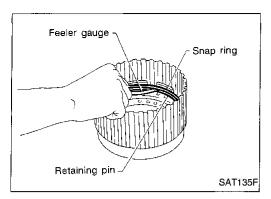
Snap ring

SAT134F

Ring gap



AT-193 803



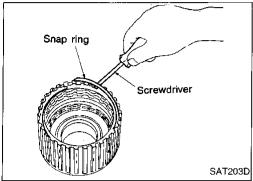
#### Forward Clutch and Overrun Clutch (Cont'd)

8. Measure clearance between overrun clutch retaining plate and snap ring.

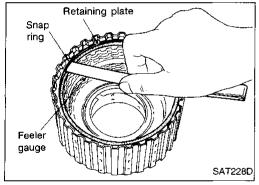
If not within allowable limit, select proper retaining plate.

Specified clearance:

Standard 0.7 - 1.1 mm (0.028 - 0.043 in) Allowable limit 1.7 mm (0.067 in) Overrun clutch retaining plate: Refer to SDS, AT-241.



- 9. Install drive plates, driven plates, retaining plate and dish plate for forward clutch.
- Take care with order of plates.
- 10. Install snap ring for forward clutch.

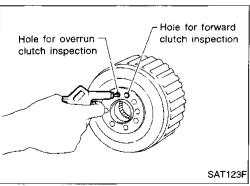


11. Measure clearance between forward clutch retaining plate and snap ring.

If not within allowable limit, select proper retaining plate.

Specified clearance:

Standard 0.45 - 0.85 mm (0.0177 - 0.0335 in) Allowable limit 1.85 mm (0.0728 in) Forward clutch retaining plate: Refer to SDS, AT-241.

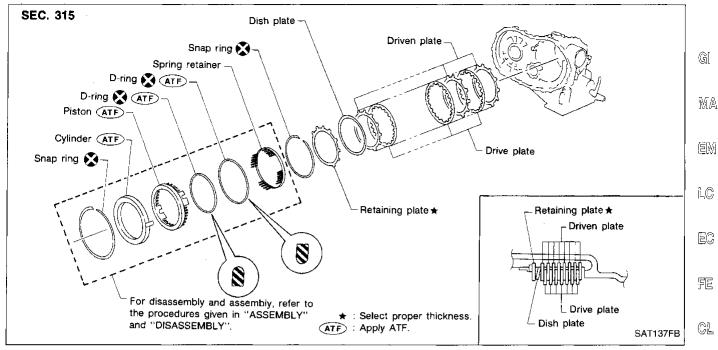


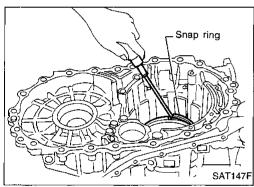
- Check operation of forward clutch.
   Refer to "DISASSEMBLY" of Forward Clutch and Overrun Clutch, AT-190
- 13. Check operation of overrun clutch.

  Refer to "DISASSEMBLY", "Forward Clutch and Overrun Clutch", AT-190.

AT-194 804

#### Low & Reverse Brake







1. Check operation of low & reverse brake.

a. Apply compressed air to oil hole of transmission case.

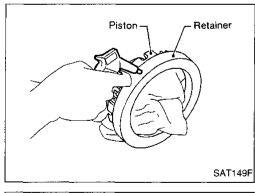
b. Check to see that retaining plate moves to snap ring.

c. If retaining plate does not contact snap ring:

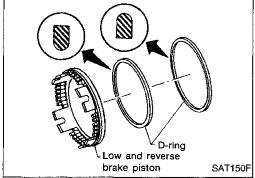
D-ring might be damaged.

Oil seal might be damaged.

Fluid might be leaking past piston check ball.



- 2. In order to remove piston, apply compressed air to oil hole of retainer while holding piston.
- Apply air gradually and allow piston to come out evenly.



3. Remove D-rings from piston.

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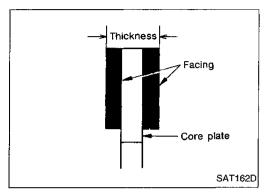
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### Low & Reverse Brake (Cont'd) INSPECTION

Low & reverse clutch snap ring, spring retainer and return springs

- Check for deformation, fatigue or damage.
   If necessary, replace.
- When replacing spring retainer and return springs, replace them as a set.

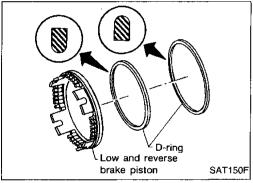


#### Low & reverse brake drive plate

- Check facing for burns, cracks or damage.
- Measure thickness of facing.

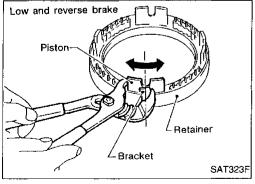
Thickness of drive plate:
Standard value 1.8 mm (0.071 in)
Wear limit 1.6 mm (0.063 in)

• If not within wear limit, replace.

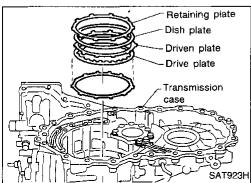


#### **ASSEMBLY**

- 1. Install D-rings on piston.
- Take care with the direction of oil seal.
- Apply ATF to both parts.



- Set and align piston with retainer.
- This operation is required in order to engage the protrusions of piston to return springs correctly.
   Further procedures are given in "ASSEMBLY".

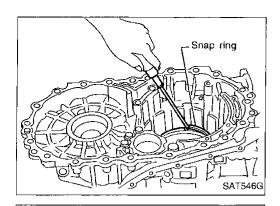


- Install driven plates, drive plates, dish plate and retaining plate on transmission case.
- Take care with order of plates and direction of dish plate.

AT-196 806

#### Low & Reverse Brake (Cont'd)

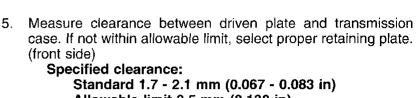
4. Install snap ring.



Transmission case

SAT155F

Feeler gauge



Allowable limit 3.5 mm (0.138 in) Retaining plate: Refer to SDS, AT-241.

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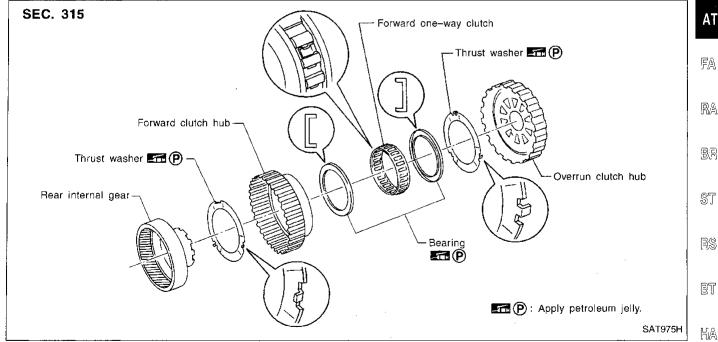
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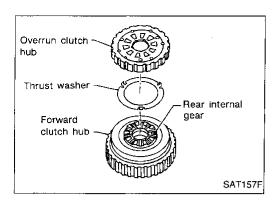
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Rear Internal Gear, Forward Clutch Hub and **Overrun Clutch Hub** 



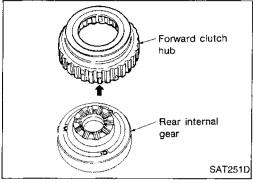


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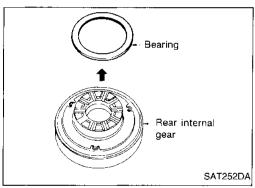


# Rear Internal Gear, Forward Clutch Hub and Overrun Clutch Hub (Cont'd) DISASSEMBLY

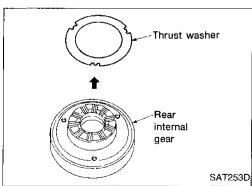
1. Remove overrun clutch hub and thrust washer from forward clutch hub.



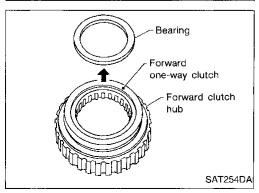
Remove forward clutch hub from rear internal gear.



3. Remove bearing from rear internal gear.

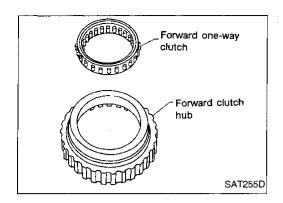


4. Remove thrust washer from rear internal gear.



5. Remove bearing from forward one-way clutch.

AT-198 808



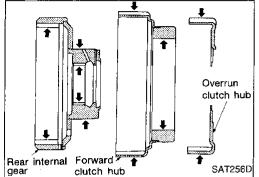
# Rear Internal Gear, Forward Clutch Hub and Overrun Clutch Hub (Cont'd)

6. Remove forward one-way clutch from forward clutch hub.



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Forward

one-way clutch

#### INSPECTION

### Rear internal gear, forward clutch hub and overrun clutch hub

Check rubbing surfaces for wear or damage.

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# Bearing

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#### Bearings and forward one-way clutch

Check bearings for deformation and damage.

Check forward one-way clutch for wear and damage.

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. Install forward one-way clutch on forward clutch.

Take care with the direction of forward one-way clutch.

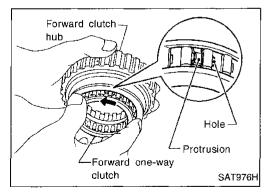
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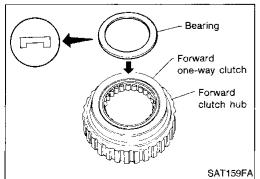
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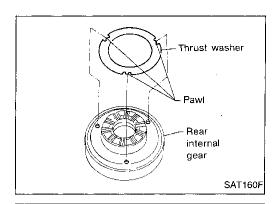
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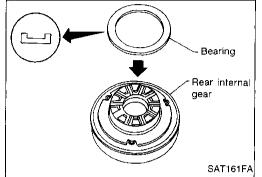


- 2. Install bearing on forward one-way clutch.
- Apply petroleum jelly to bearing.

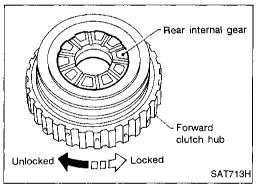


# Rear Internal Gear, Forward Clutch Hub and Overrun Clutch Hub (Cont'd)

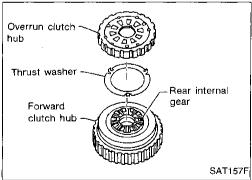
- 3. Install thrust washer on rear internal gear.
- Apply petroleum jelly to thrust washer.
- Align hooks of thrust washer with holes of rear internal gear.



- 4. Install bearing on rear internal gear.
- Apply petroleum jelly to bearing.

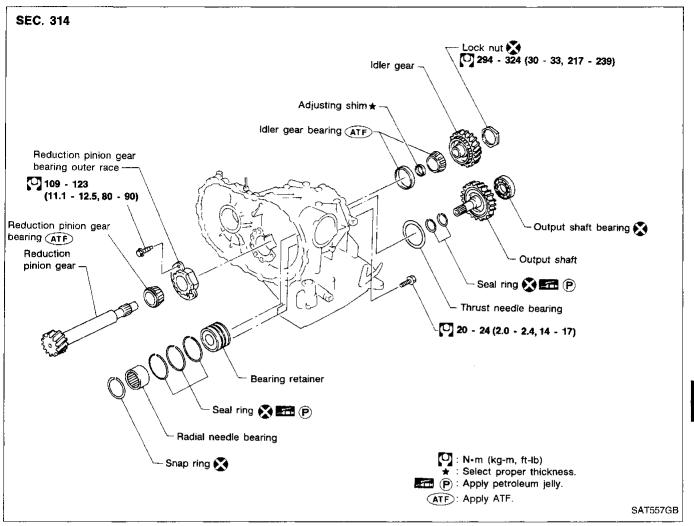


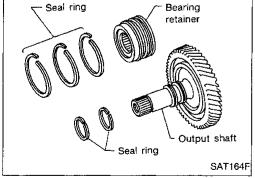
- 5. Install forward clutch hub on rear internal gear.
- Check operation of forward one-way clutch.
   Hold rear internal gear and turn forward clutch hub.
   Check forward clutch hub for correct locking and unlocking directions.
- If not as shown in illustration, check installation direction of forward one-way clutch.

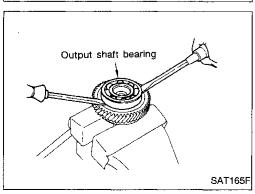


- 6. Install thrust washer and overrun clutch hub.
- Apply petroleum jelly to thrust washer.
- Align hooks of thrust washer with holes of overrun clutch hub.
- Align projections of rear internal gear with holes of overrun clutch hub.

#### Output Shaft, Idler Gear, Reduction Pinion Gear and Bearing Retainer







#### DISASSEMBLY

Remove seal rings from output shaft and bearing retainer.

Remove output shaft bearing with screwdrivers. 2.

Always replace bearing with a new one when removed.

Do not damage output shaft.

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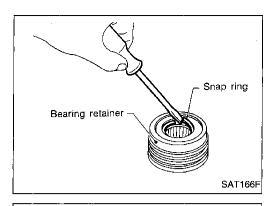
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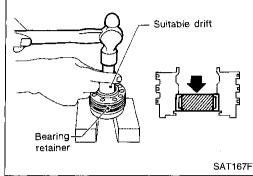
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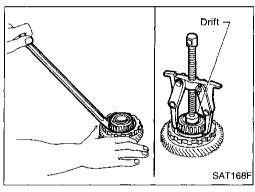


# Output Shaft, Idler Gear, Reduction Pinion Gear and Bearing Retainer (Cont'd)

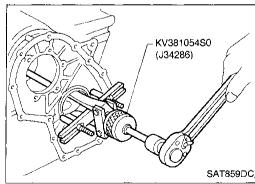
3. Remove snap ring from bearing retainer.



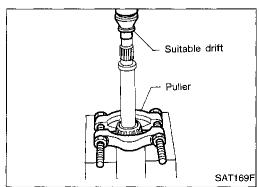
4. Remove needle bearing from bearing retainer.



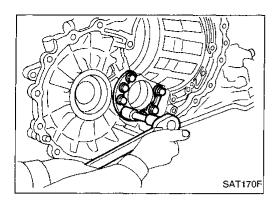
5. Remove idler gear bearing inner race from idler gear.



6. Remove idler gear bearing outer race from transmission case.



Press out reduction pinion gear bearing inner race from reduction pinion gear.



# Output Shaft, Idler Gear, Reduction Pinion Gear and Bearing Retainer (Cont'd)

8. Remove reduction pinion gear bearing outer race from transmission case.

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#### **INSPECTION**

#### Output shaft, idler gear and reduction pinion gear

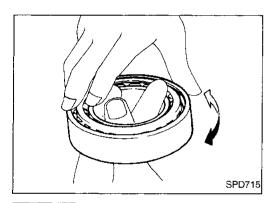
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Check shafts for cracks, wear or bending.
Check gears for wear, chips and cracks.

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Seal ring

Output shaft

Bearing

retainer

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Bearing

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

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When replacing taper roller bearing, replace outer and inner race as a set.

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Seal ring clearance

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Install new seal rings to output shaft.

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Measure clearance between seal ring and ring groove of output shaft.

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Standard clearance:

0.10 - 0.25 mm (0.0039 - 0.0098 in)

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Allowable limit:

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0.25 mm (0.0098 in)

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If not within allowable limit, replace output shaft.

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Install new seal rings to bearing retainer.

Measure clearance between seal ring and ring groove of bearing retainer.

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Standard clearance:

0.10 - 0.30 mm (0.0039 - 0.0118 in)

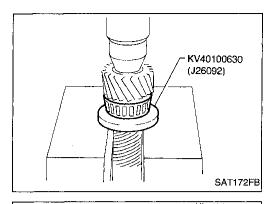
Allowable limit:

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**0.30 mm (0.0118 in)**If not within allowable limit, replace bearing retainer.

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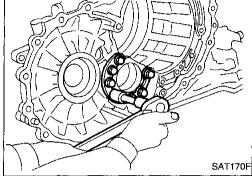




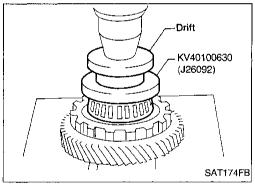
# Output Shaft, Idler Gear, Reduction Pinion Gear and Bearing Retainer (Cont'd)

#### **ASSEMBLY**

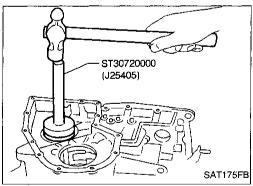
1. Press reduction pinion gear bearing inner race on reduction pinion gear.



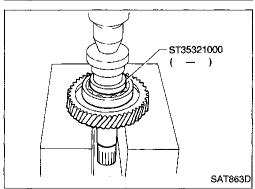
Install reduction pinion gear bearing outer race on transmission case.



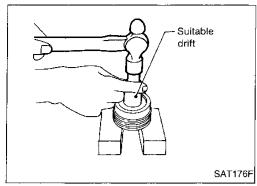
3. Press idler gear bearing inner race on idler gear.



4. Install idler gear bearing outer race on transmission case.

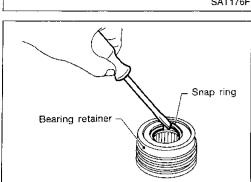


5. Press output shaft bearing on output shaft.

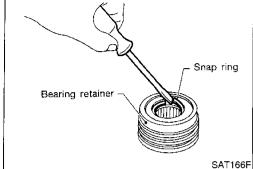


#### Output Shaft, Idler Gear, Reduction Pinion Gear and Bearing Retainer (Cont'd)

6. Press needle bearing on bearing retainer.



Install snap ring to bearing retainer.



After packing ring grooves with petroleum jelly, carefully install new seal rings on output shaft and bearing retainer.



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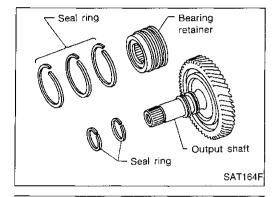
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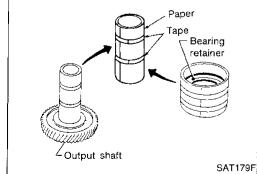
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Roll paper around seal rings to prevent seal rings from BR spreading.

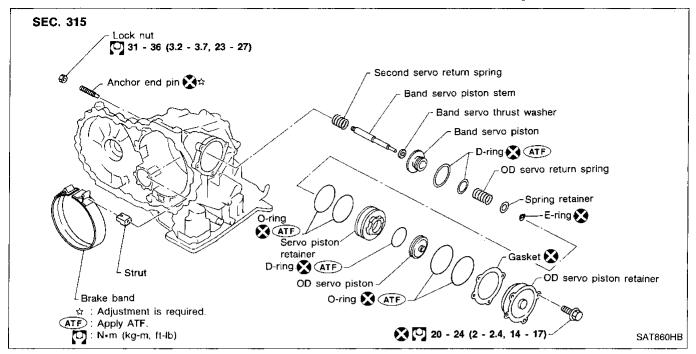


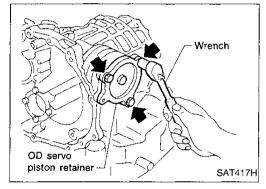
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#### **Band Servo Piston Assembly**

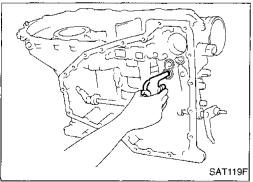




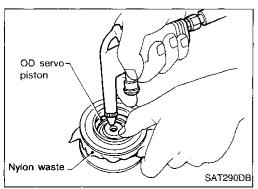
#### **DISASSEMBLY**

AT-206

Remove band servo piston fixing bolts.



- Apply compressed air to oil hole in transmission case to remove OD servo piston retainer and band servo piston assembly.
- Hold band servo piston assembly with a rag or nylon waste.



- 3. Apply compressed air to oil hole in OD servo piston retainer to remove OD servo piston from retainer.
- Hold OD servo piston while applying compressed air.

#### Band Servo Piston Assembly (Cont'd)

4. Remove D-ring from OD servo piston.

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Remove O-rings from OD servo piston retainer.

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Remove band servo piston assembly from servo piston retainer by pushing it forward.

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Place piston stem end on a wooden block. While pushing BR

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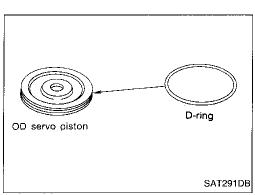
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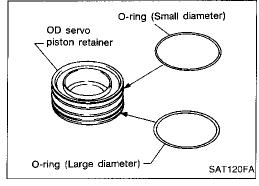
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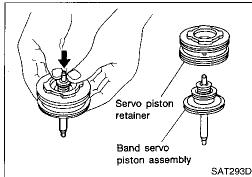
band servo piston stem from band servo piston.

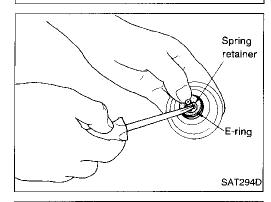
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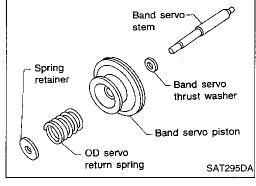
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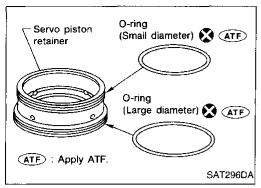


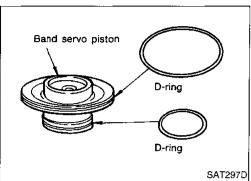


servo piston spring retainer down, remove E-ring.

#### Band Servo Piston Assembly (Cont'd)

9. Remove O-rings from servo piston retainer.



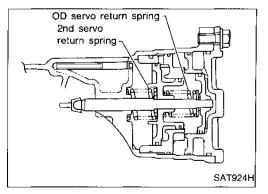


10. Remove D-rings from band servo piston.

#### INSPECTION

#### Pistons, retainers and piston stem

· Check frictional surfaces for abnormal wear or damage.

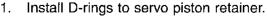


#### **Return springs**

- Check for deformation or damage.
- · Measure free length and outer diameter.

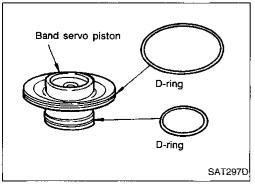
Inspection standard: Refer to SDS, AT-244.





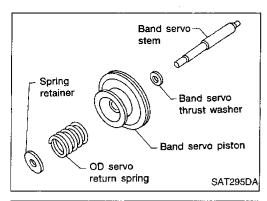
Apply ATF to D-rings.

Pay attention to position of each O-ring.



AT-208 818

#### **Band Servo Piston Assembly (Cont'd)**

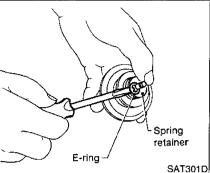


2. Install band servo piston stem, band servo thrust washer, OD servo return spring and spring retainer to band servo piston.



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O-ring

(Small diameter) (ATF)

(Large diameter) X ATF

Servo piston

ATF : Apply ATF.

retainer

Place piston stem end on a wooden block. While pushing servo piston spring retainer down, install E-ring.



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Install O-rings to servo piston retainer.



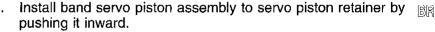
Apply ATF to O-rings.

Pay attention to position of each O-ring.



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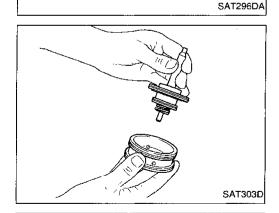




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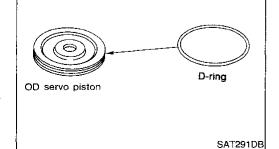






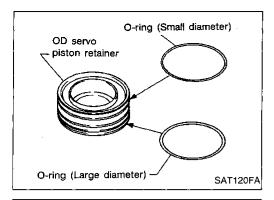
Install D-ring to OD servo piston.

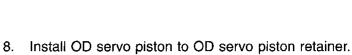
Apply ATF to D-ring.

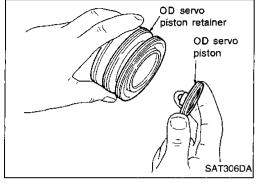


#### Band Servo Piston Assembly (Cont'd)

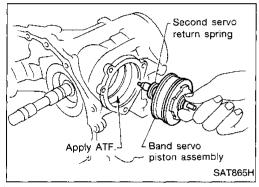
- 7. Install O-rings to OD servo piston retainer.Apply ATF to O-rings.
- Pay attention to position of each O-ring.



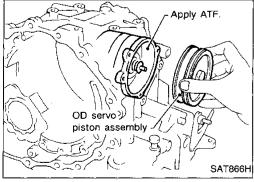




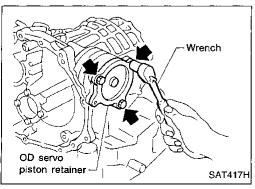
- 9. Install band servo piston assembly and 2nd servo return spring to transmission case.
- Apply ATF to O-ring of band servo piston and transmission case.



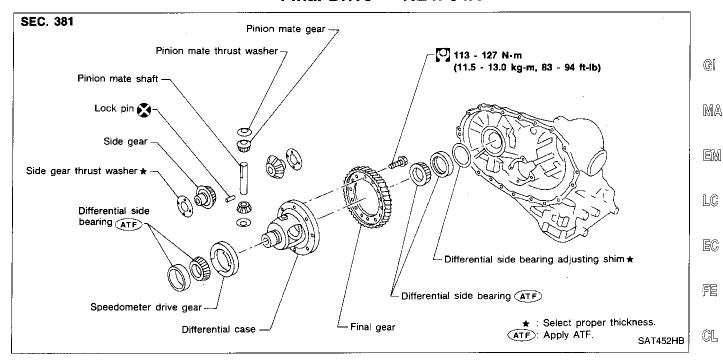
- 10. Install OD servo piston assembly to transmission case.
- Apply ATF to O-ring of band servo piston and transmission case.

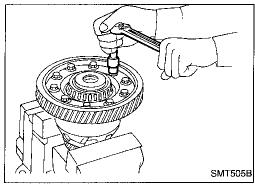


11. Install band servo piston snap ring to transmission case.



#### Final Drive — RE4F04A





#### **DISASSEMBLY**

1. Remove final gear.



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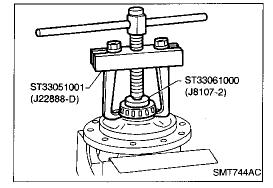
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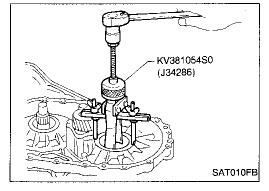
- 2. Press out differential side bearings.
- Be careful not to mix up the right and left bearings.



3. Remove differential side bearing outer race, and side bearing adjusting shim from transmission case.

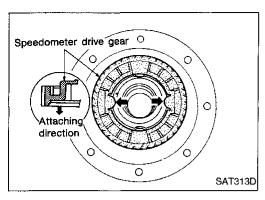
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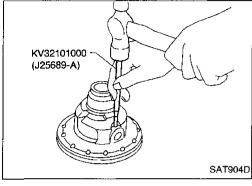


#### Final Drive — RE4F04A (Cont'd)

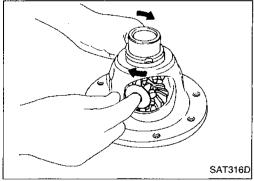
4. Remove speedometer drive gear.



5. Drive out pinion mate shaft lock pin.



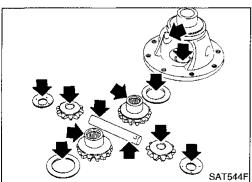
- 6. Draw out pinion mate shaft lock pin.
- 7. Remove pinion mate gears and side gears.



#### INSPECTION

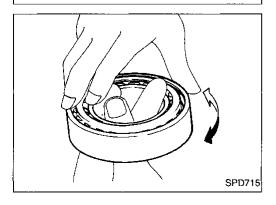
#### Gear, washer, shaft and case

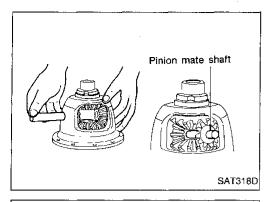
- Check mating surfaces of differential case, side gears and pinion mate gears.
- Check washers for wear.



#### **Bearings**

- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.
- When replacing taper roller bearing, replace outer and inner race as a set.





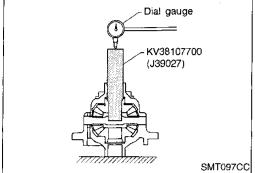
# Final Drive — RE4F04A (Cont'd) ASSEMBLY

- 1. Install side gears and thrust washers in differential case.
- 2. Install pinion mate gears and thrust washers in the differential case while rotating them.
- When inserting, be careful not to damage pinion mate gear washers.
- Apply ATF to all parts.



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Ifforential case



3. Measure clearance between side gear and differential case with washers following the procedure below:

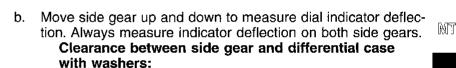
a. Set Tool and dial indicator on side gear.



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0.1 - 0.2 mm (0.004 - 0.008 in)



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 If not within specification, adjust clearance by changing thickness of side gear thrust washers.

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Side gear thrust washer: Refer to AT-242.

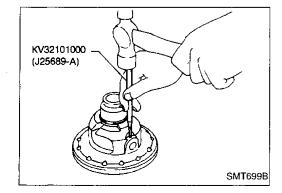


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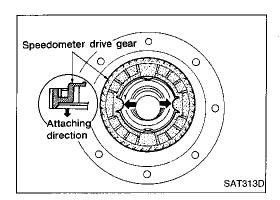
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4. Install lock pin.

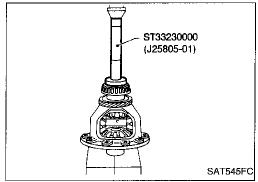
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Make sure that lock pin is flush with case.

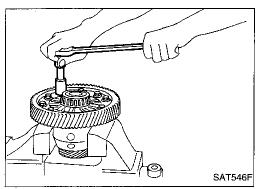


#### Final Drive — RE4F04A (Cont'd)

- 5. Install speedometer drive gear on differential case.
- Align the projection of speedometer drive gear with the groove of differential case.



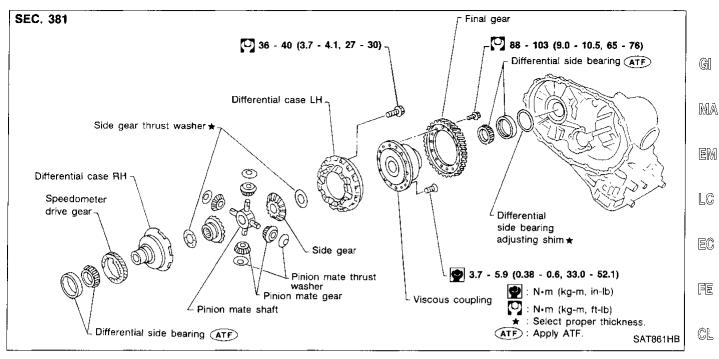
6. Press on differential side bearings.

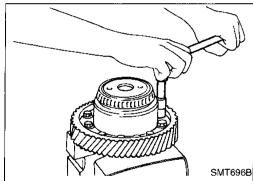


7. Install final gear and tighten fixing bolts in a crisscross pattern.

AT-214 824

#### Final Drive — RE4F04V

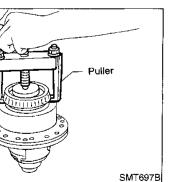






1. Remove final gear.





2. Press out differential side bearings.

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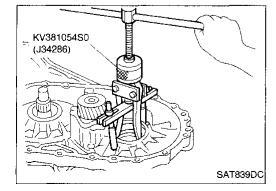
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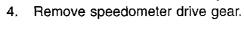
IDX

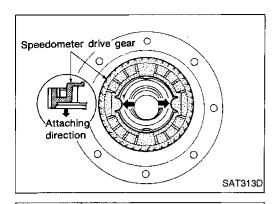
 Remove differential side bearing outer race, and side bearing adjusting shim from transmission case.



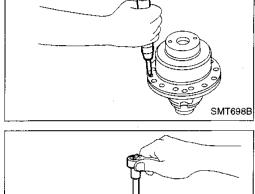
AT-215 825

#### Final Drive — RE4F04V (Cont'd)

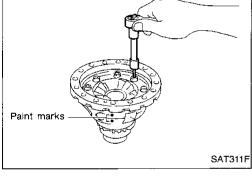




5. Remove viscous coupling.



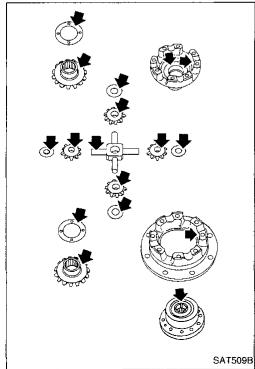
- Separate differential cases. Make paint marks to identify their original position.
- 7. Remove pinion mate shaft with gears.



#### **INSPECTION**

#### Gear, washer, shaft and case

- Check mating surfaces of differential case, side gears, pinion mate gears and viscous coupling.
- Check washers for wear.



# Viscous coupling SMT508B

#### Final Drive — RE4F04V (Cont'd)

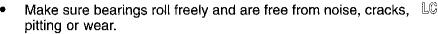
#### Viscous coupling

- Check case for cracks.
- Check silicone oil for leakage.



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When replacing taper roller bearing, replace outer and

inner race as a set.

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 Measure clearance between side gear and differential case & viscous coupling with washers using the following procedure:

#### Differential case side

a. Set tool on the differential case and lock gauging cylinder in place with set screw.

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b. Install gauging plunger into cylinder.

c. Install pinion mate gears and side gear with thrust washer on differential case.

d. Set tool and allow gauging plunger to rest on side gear thrust washer.

e. Measure gap between plunger and cylinder.

This measurement should give exact clearance between side gear and differential case with washers.

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Standard clearance:

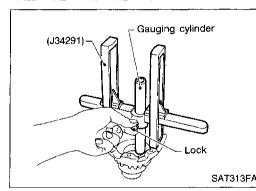
0.1 - 0.2 mm (0.004 - 0.008 in)

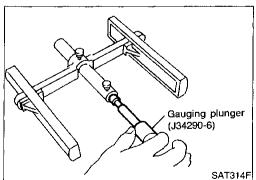
f. If not within specification adjust clearance by changing thickness of side gear thrust washer.

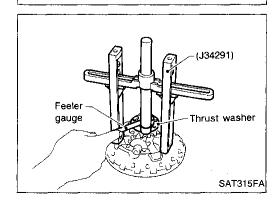
Side gear thrust washers for differential case side:
Refer to SDS, AT-242.

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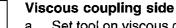
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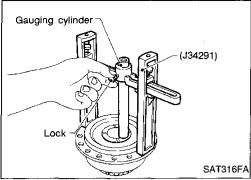




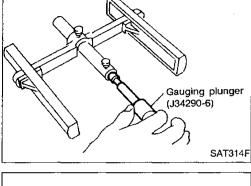
#### Final Drive — RE4F04V (Cont'd)



Set tool on viscous coupling and lock gauging cylinder in place with set screw.



Install gauging plunger into cylinder.



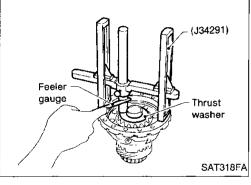
- Install pinion mate gears and side gears with original washers on differential cases.
- Align paint marks.
- Tighten differential case bolts.
- Set tool and allow plunger to rest on side gear thrust washer.
- Measure gap between plunger and cylinder. This measurement should give exact clearance between side gear and differential case with washers.

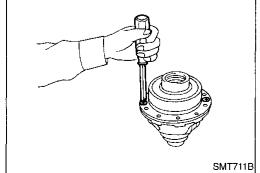
#### Standard clearance:

0.1 - 0.2 mm (0.004 - 0.008 in)

If not within specification, adjust clearance by changing thickg. ness of side gear thrust washer.

> Side gear thrust washers for viscous coupling side: Refer to SDS, AT-242.



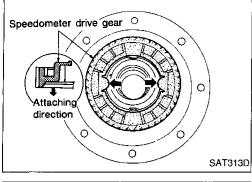


Install viscous coupling.

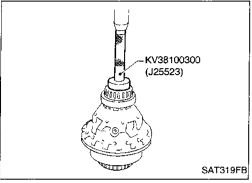
# Speedometer drive gear O Attaching direction

#### Final Drive — RE4F04V (Cont'd)

- Install speedometer drive gear on differential case.
- Align the projection of speedometer drive gear with the groove of differential case.



Press differential side bearings on differential case.



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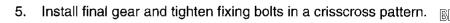
LC

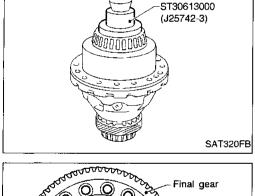
CL

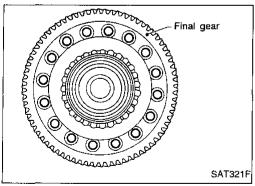
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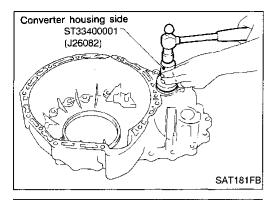
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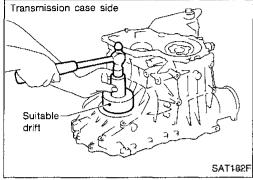
]DX

#### **ASSEMBLY**

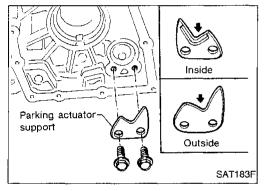


#### Assembly 1

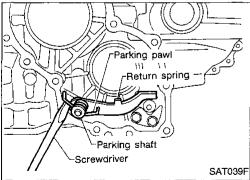
1. Install differential side oil seals on transmission case and converter housing.



- 2. Install parking actuator support to transmission case.
- · Pay attention to direction of parking actuator support.



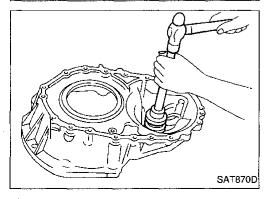
- Install parking pawl on transmission case and fix it with parking shaft.
- 4. Install return spring.



#### **Adjustment 1**

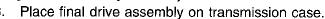
#### **DIFFERENTIAL SIDE BEARING PRELOAD**

- 1. Install differential side bearing outer race without adjusting shim on transmission case.
- 2. Install differential side bearing outer race on converter housing.

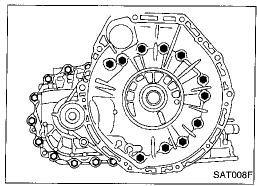


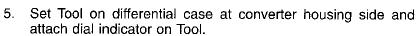
#### **ASSEMBLY**

#### Adjustment 1 (Cont'd)



Install transmission case on converter housing. Tighten transmission case fixing bolts to the specified torque.





Insert the other Tool viscous coupling from transmission case 6.

7. Move Tool up and down and measure dial indicator deflection.

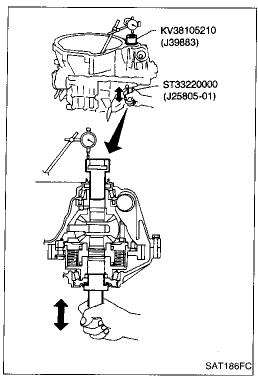
Select proper thickness of differential side bearing adjusting

Suitable shim thickness = Dial indicator deflection + Specified bearing preload

Differential side bearing adjusting shim: Refer to SDS, AT-242.

Bearing preload:

0.05 - 0.09 mm (0.0020 - 0.0035 in)



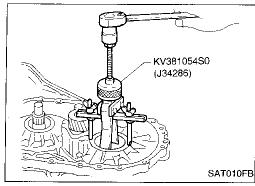


10. Remove final drive assembly from transmission case.

11. Remove differential side bearing outer race from transmission

12. Reinstall differential side bearing outer race and shim(s) selected from SDS table on transmission case.

13. Reinstall converter housing on transmission case and tighten transmission case fixing bolts to the specified torque.



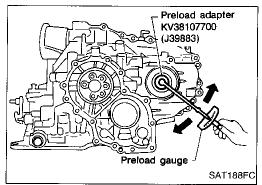
14. Insert Tool into viscous coupling and measure turning torque of final drive assembly.

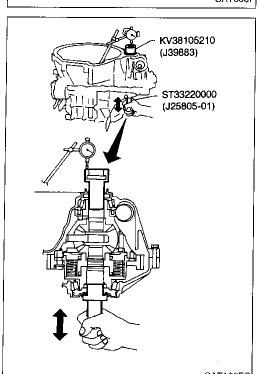
When measuring turning torque, turn final drive assembly in both directions several times to seat bearing rollers correctly.

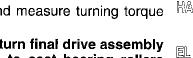
Turning torque of final drive assembly (New bearing): 0.78 - 1.37 N·m (8.0 - 14.0 kg-cm, 6.9 - 12.2 in-lb)

When old bearing is used again, turning torque will be slightly less than the above.

Make sure torque is close to the specified range.









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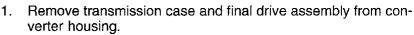
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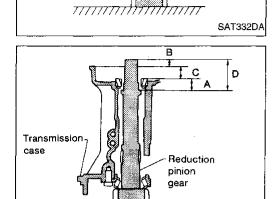
#### Adjustment 1 (Cont'd)

#### REDUCTION PINION GEAR BEARING PRELOAD



2. Select proper thickness of reduction pinion gear bearing adjusting shim using the following procedures.

a. Place reduction pinion gear on transmission case as shown.



Reduction pinion gear

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Transmission:

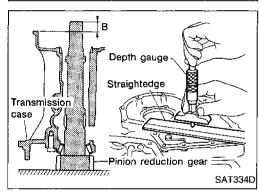
case

b. Place idler gear bearing on transmission case.

c. Measure dimensions "B" "C" and "D" and calculate dimension "A".

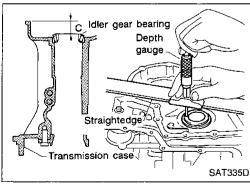
A = D - (B + C)

"A": Distance between the surface of idler gear bearing inner race and the adjusting shim mating surface of reduction pinion gear.

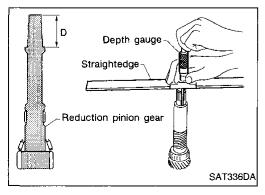


 Measure dimension "B" between the end of reduction pinion gear and the surface of transmission case.

Measure dimension "B" in at least two places.



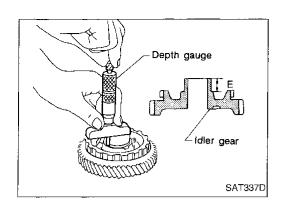
- Measure dimension "C" between the surface of idler gear bearing inner race and the surface of transmission case.
- . Measure dimension "C" in at least two places.



- Measure dimension "D" between the end of reduction pinion gear and the adjusting shim mating surface of reduction pinion gear.
- Measure dimension "D" in at least two places.
- · Calculate dimension "A".

A = D - (B + C)

AT-222



#### Adjustment 1 (Cont'd)

- d. Measure dimension "E" between the end of idler gear and the idler gear bearing inner race mating surface of idler gear.
- Measure dimension "E" in at least two places.

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Select proper thickness of reduction pinion gear bearing adjusting shim.

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Proper shim thickness = A - E - 0.5 mm (0.0020 in)\* (\* ... Bearing preload)

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Reduction pinion gear bearing adjusting shim: Refer to SDS, AT-243.

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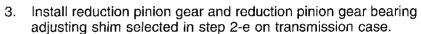
GL

Adjusting shim

Reduction pinion gear Idler gear

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- 4. Press idler gear bearing inner race on idler gear.
- 5. Press idler gear on reduction pinion gear.

Press idler gear until idler gear fully contacts adjusting

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- 6. Tighten idler gear lock nut to the specified torque.
- BR
- Lock idler gear with parking pawl when tightening lock nut.

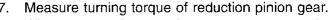
SAT189F

shim.

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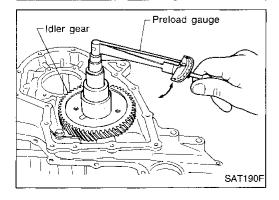
 When measuring turning torque, turn reduction pinion gear in both directions several times to seat bearing rollers correctly.



Turning torque of reduction pinion gear:

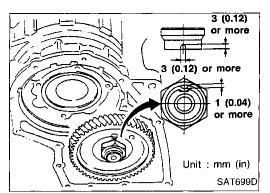
0.05 - 0.39 N·m (0.5 - 4.0 kg-cm, 0.43 - 3.47 in-lb)

If turning torque is out of specification, decrease or increase thickness of reduction pinion gear bearing adjusting shim.

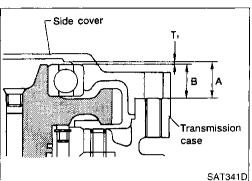


AT-223 833

#### Adjustment 1 (Cont'd)

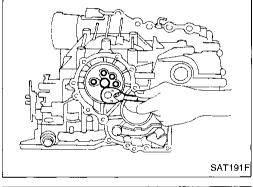


8. After properly adjusting turning torque, clinch idler gear lock nut as shown.

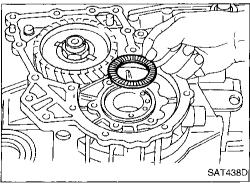


#### **OUTPUT SHAFT END PLAY**

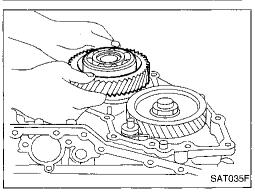
- Measure clearance between side cover and the end of the output shaft bearing.
- Select proper thickness of adjusting shim so that clearance is within specifications.



1. Install bearing retainer for output shaft.



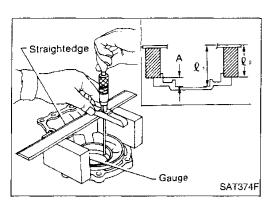
2. Install output shaft thrust needle bearing on bearing retainer.



3. Install output shaft on transmission case.

AT-224 834

#### Adjustment 1 (Cont'd)



Straightedge

3 - 5 (0.12 - 0.20)

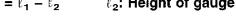
side

(0.059) dia 4 (0.16)

Unit: mm (in)

- 4. Measure dimensions " $\ell_1$ " and " $\ell_2$ " at side cover and then calculate dimension "A".
- Measure dimension " $\ell_1$ " and " $\ell_2$ " in at least two places. "A": Distance between transmission case fitting sur
  - face and adjusting shim mating surface.  $A = \ell_1 \ell_2$   $\ell_2$ : Height of gauge





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5. Measure dimensions " $\ell_2$ " and " $\ell_3$ " and then calculate dimension "B".



• Measure " $\ell_2$ " and " $\ell_3$ " in at least two places.

e EC

"B": Distance between the end of output shaft bearing outer race and the side cover fitting surface of transmission case.



 $\mathbf{B} = \ell_2 - \ell_3$ 

 $\ell_2$ : Height of gauge

GL

6. Select proper thickness of adjusting shim so that output shaft end play (clearance between side cover and output shaft bearing) is within specifications.

Output shaft end play (A – B):

0 - 0.15 mm (0 - 0.0059 in)

Output shaft end play adjusting shim:

SAT375F

SAT440D

SAT441D

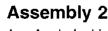
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Refer to SDS, AT-245.
7. Install adjusting shim on output shaft bearing.

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Apply locking sealant to transmission case as shown in illustration.

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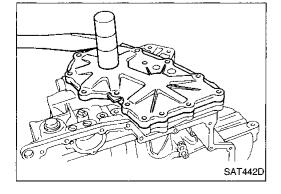
M

2. Set side cover on transmission case.

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 Apply locking sealant to the mating surface of transmission case.

EL



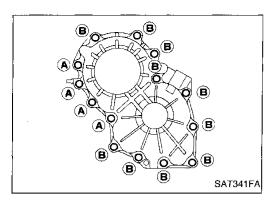
Locking

sealant

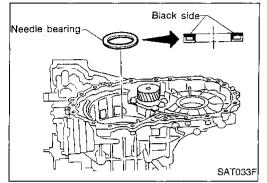
AT-225 835

#### Assembly 2 (Cont'd)

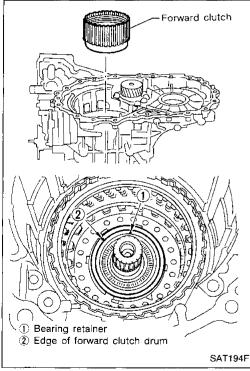
- 3. Tighten side cover fixing bolts to specified torque.
- Do not mix bolts (A) and (B).
- Always replace bolts (A) as they are self-sealing bolts.



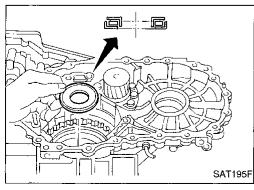
- 4. Remove paper rolled around bearing retainer.5. Install thrust washer on bearing retainer.
- Apply petroleum jelly to thrust washer.



- Install forward clutch assembly.
- Align teeth of low & reverse brake drive plates before installing.
- Make sure that bearing retainer seal rings are not spread.
- If forward clutch assembly is correctly seated, points (1) and (2) are at almost same level.



- 7. Install thrust needle bearing on bearing retainer.
- Apply petroleum jelly to thrust needle bearing.
- Pay attention to direction of thrust needle bearing.



**AT-226** 836

#### Assembly 2 (Cont'd)

- Install overrun clutch hub.
- Apply petroleum jelly to thrust washers.
- Align teeth of overrun clutch drive plates before installing.



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Hold forward clutch hub and turn rear internal gear. Check overrun clutch hub for correct directions of lock and unlock.

LC

If not shown as illustration, check installed direction of forward one-way clutch.

EC

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- 10. Install forward clutch hub and rear internal gear assembly.
- Align teeth of forward clutch drive plates before installing.

Check three hooks of thrust washer are correctly aligned after installing.



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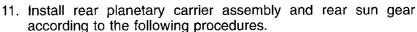
BR

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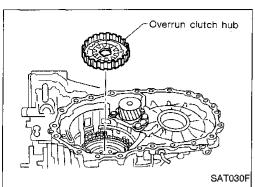


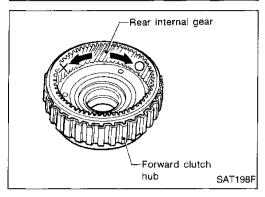
Install needle bearings on rear planetary carrier. Apply petroleum jelly to needle bearings.

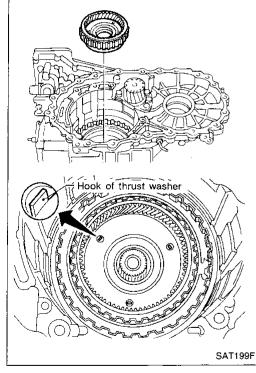
Pay attention to direction of needle bearings.

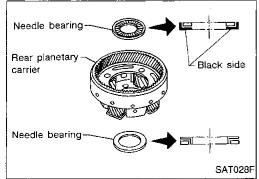
EL,

DX

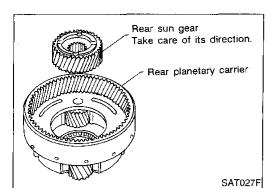




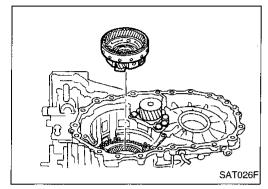




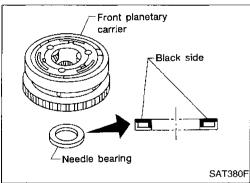
#### Assembly 2 (Cont'd)



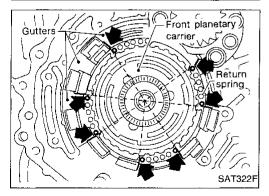
- b. Install rear sun gear on rear planetary carrier.
- Pay attention to direction of rear sun gear.



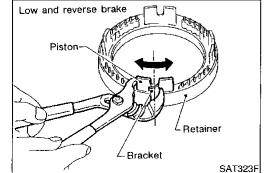
c. Install rear planetary carrier on transmission case.



- 12. Install thrust needle bearing on front planetary carrier, then install them together on transmission case.
- · Apply petroleum jelly to thrust needle bearing.
- Pay attention to direction of thrust needle bearing.



- Install low and reverse brake piston according to the following procedures.
- a. Set and align return springs to transmission case gutters as shown in illustration.

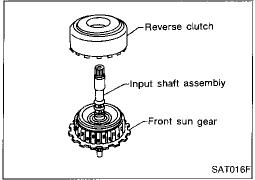


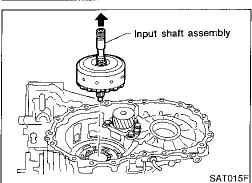
b. Set and align piston with retainer.

AT-228 838

#### Assembly 2 (Cont'd)

- 20. Remove paper rolled around input shaft.
- 21. Install input shaft assembly in reverse clutch.
- Align teeth of reverse clutch drive plates before installing.





- 22. Install reverse clutch assembly on transmission case.
- Align teeth of high clutch drive plates before installing.

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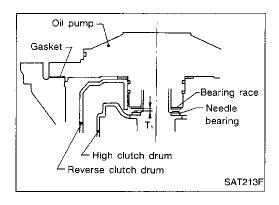
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#### **Adjustment 2**

 When any parts listed in the following table are replaced, total end play or reverse clutch end play must be adjusted.

| Part name               | Total end play | Reverse clutch<br>end play |
|-------------------------|----------------|----------------------------|
| Transmission case       | •              | •                          |
| Overrun clutch hub      | •              | •                          |
| Rear internal gear      | •              | •                          |
| Rear planetary carrier  | •              | •                          |
| Rear sun gear           | •              | • .                        |
| Front planetary carrier | •              | •                          |
| Front sun gear          | •              | •                          |
| High clutch hub         | •              | •                          |
| High clutch drum        | •              | •                          |
| Oil pump cover          | •              | •                          |
| Reverse clutch drum     | _              | •                          |



#### **TOTAL END PLAY**

1. Adjust total end play "T1".

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AT-231 839

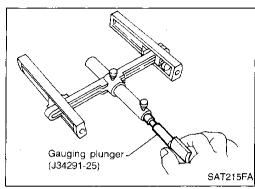
# (J34291) Bearing race Gauging cylinder

Oil pump

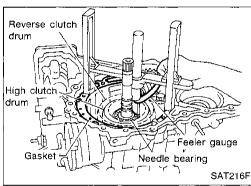
SAT214FA

#### Adjustment 2 (Cont'd)

a. With original bearing race installed, place Tool onto oil pump. The long ends of legs should be placed firmly on machined surface of oil pump assembly. The gauging cylinder should rest on top of bearing race. Lock gauging cylinder in place with set screw.



b. Install gauging plunger into cylinder.



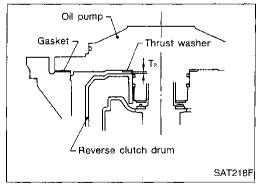
- c. With needle bearing installed on high clutch drum, place Tool legs on machined surface of transmission case (with gasket). Then allow plunger to rest on needle bearing.
- d. Measure gap between cylinder and plunger. This measurement should give exact total end play.

Total end play "T<sub>1</sub>":

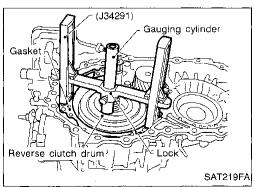
0.25 - 0.55 mm (0.0098 - 0.0217 in)

If end play is out of specification, decrease or increase thickness of bearing race as necessary.

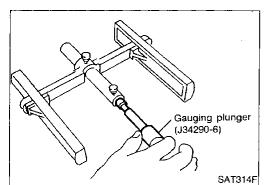
Available bearing race: Refer to SDS, AT-245.

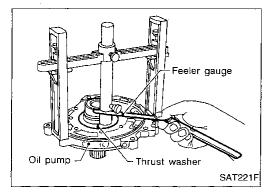


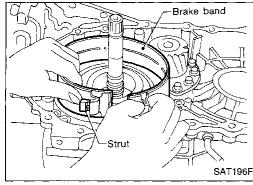
2. Adjust reverse clutch drum end play "T2".

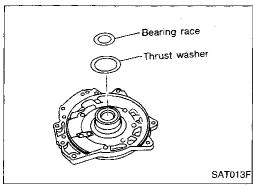


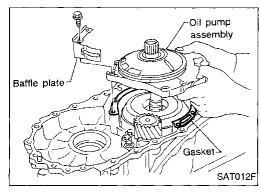
a. Place Tool on machined surface of transmission case (with gasket). Then allow gauging cylinder to rest on reverse clutch drum. Lock cylinder in place with set screw.











#### Adjustment 2 (Cont'd)

Install gauging plunger into cylinder.

C. With original thrust washer installed on oil pump, place Tool legs onto machined surface of oil pump assembly. Then allow plunger to rest on thrust washer.

Measure gap between cylinder and plunger with feeler gauge. This measurement should give exact reverse clutch drum end

> Reverse clutch drum end play "T2": 0.55 - 0.90 mm (0.0217 - 0.0354 in)

If end play is out of specification, decrease or increase thickness of thrust washer as necessary.

Available thrust washer: Refer to SDS, AT-244.

Assembly 3

Install anchor end pin and lock nut on transmission case.

Place brake band and strut on periphery of reverse clutch drum. Then, tighten anchor end pin just enough so that brake band is fitted on periphery of reverse clutch drum uniformly.

Place bearing race selected in total end play adjustment step on oil pump cover.

Apply petroleum jelly to bearing race.

Place thrust washer selected in reverse clutch end play step 4. on reverse clutch drum.

Apply petroleum jelly to thrust washer.

Install oil pump assembly, baffle plate and gasket on transmis-5.

Tighten oil pump fixing bolts to the specified torque.

sion case.

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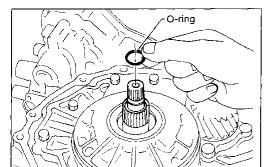
BT

āL

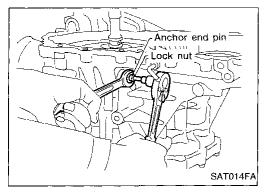




#### Assembly 3 (Cont'd)



- 7. Install O-ring to input shaft.
- Apply ATF to O-ring.



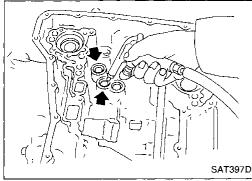
8. Adjust brake band.

SAT225F

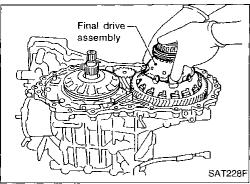
Tighten anchor end pin to the specified torque.

Anchor end pin:

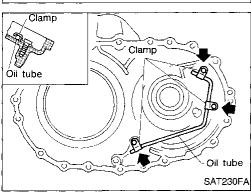
- **2.** 3.9 5.9 N·m (0.4 0.6 kg-m, 35 52 in-lb) b. Back off anchor end pin two and a half turns.
- c. While holding anchor end pin, tighten lock nut.



9. Apply compressed air to oil holes of transmission case and check operation of brake band.



10. Install final drive assembly on transmission case.

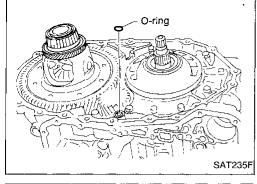


11. Install oil tube on converter housing.

#### Assembly 3 (Cont'd)



12. Install O-ring on differential oil port of transmission case.



13. Install converter housing on transmission case.



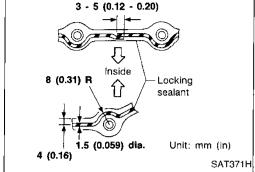
Apply locking sealant to mating surface of converter LC housing.



@[

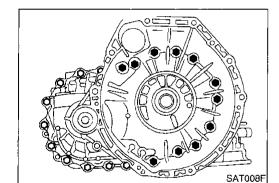
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Servo release

accumulator piston

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N-D accumulator

piston

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SAT236FA

14. Install accumulator piston.

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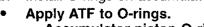
BT

Check contact surface of accumulator piston for damage.



Install O-rings on accumulator piston.

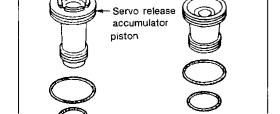
HA



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Accumulator piston O-rings: Refer to SDS, AT-244.

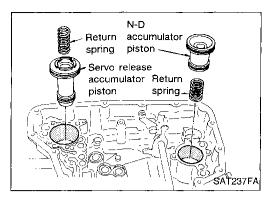




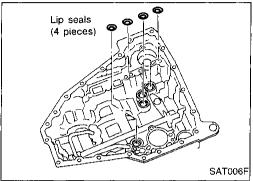
Contact surface

IDX

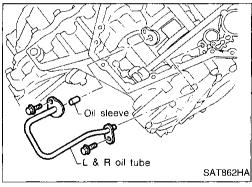
#### Assembly 3 (Cont'd)



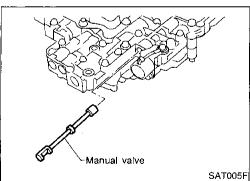
- Install accumulator pistons and return springs on transmission case.
- Apply ATF to inner surface of transmission case.
   Return springs:
   Refer to SDS, AT-244.



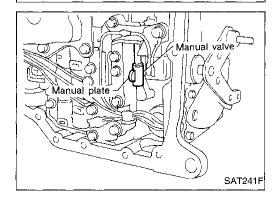
- 15. Install lip seals for band servo oil holes on transmission case.
- Apply petroleum jelly to lip seals.



16. Install L & R oil tube and oil sleeve.

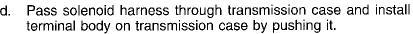


- 17. Install control valve assembly.
- a. Insert manual valve into control valve assembly.
- Apply ATF to manual valve.

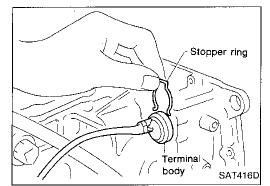


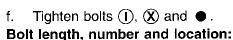
- o. Set manual shaft in Neutral position.
- c. Install control valve assembly on transmission case while aligning manual valve with manual plate.

#### Assembly 3 (Cont'd)



Install stopper ring to terminal body.





| Bolt            |     |         | 1               | <b>⊗</b>        | •               |
|-----------------|-----|---------|-----------------|-----------------|-----------------|
| Bolt length "ℓ" | Q Q | mm (in) | 40.0<br>(1.575) | 33.0<br>(1.299) | 43.5<br>(1.713) |
| Number of bolts |     |         | 5               | 6               | 2               |

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18. Install oil pan. Attach a magnet to oil pan.

Install new oil pan gasket on transmission case. Install oil pan on transmission case. C.

Always replace oil pan bolts as they are self-sealing bolts. •

Tighten four bolts in a criss-cross pattern to prevent dislocation of gasket.

d. Tighten drain plug to the specified torque.

SAT004F

19. Install inhibitor switch.

Set manual shaft in "P" position. a. Temporarily install inhibitor switch on manual shaft. b.

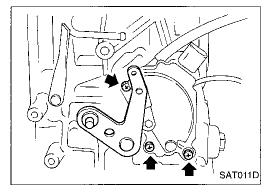
Move selector lever to "N" position.

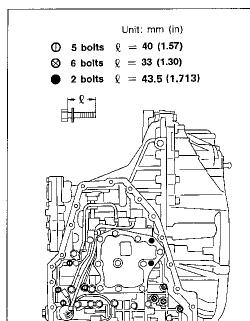
87:

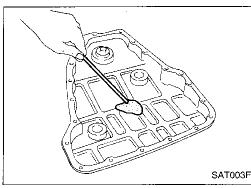
HA

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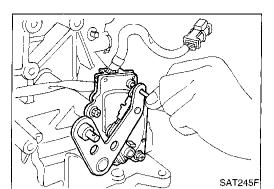
IDX



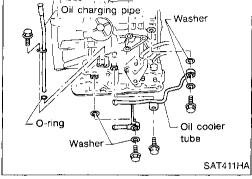




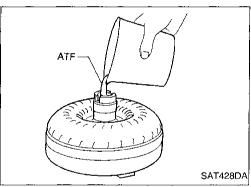
#### Assembly 3 (Cont'd)



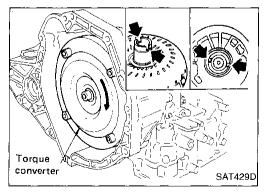
- d. Insert 4.0 mm (0.157 in) dia. pin into adjustment hole in both inhibitor switch and manual shaft as near vertically as possible.
- e. Tighten inhibitor switch fixing bolts.
- Remove pin from adjustment hole after adjusting inhibitor switch.



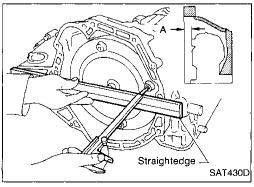
20. Install oil charging pipe and oil cooler tube to transmission case.



- 21. Install torque converter.
- a. Pour ATF into torque converter.
- Approximately 1 liters (1-1/8 US qt, 7/8 lmp qt) of fluid are required for a new torque converter.
- When reusing old torque converter, add the same amount of fluid as was drained.



b. Install torque converter while aligning notches of torque converter with notches of oil pump.



c. Measure distance "A" to check that torque converter is in proper position.

Distance "A": 14 mm (0.55 in) or more

AT-238 846

#### **General Specifications**

| Engine                       |                   | VQ30DE   |         |  |
|------------------------------|-------------------|--|---------|--|
| Automatic transaxle model    |                   | RE4F04A  | RE4F04V |  |
| Automatic transaxle assembly |                   |  |         |  |
| Model code number            |                   | 80X17  | 80X18   |  |
| Transaxle gear ratio         |                   |  |         |  |
| 1st                          | 2.785             |  |         |  |
| 2nd                          | 1.545             |  |         |  |
| 3rd                          |                   | 1.000  |         |  |
| 4th                          |                   | 0.694  |         |  |
| Reverse                      |                   | 2.272  |         |  |
| Final drive                  |                   | 3.619  |         |  |
| Recommended oil              |                   | Nissan Matic "D" (Continental U.S. and Alaska) or Genuine Nissan Automatic Transmission Fluid (Canada)*1 |         |  |
| Oil capacity                 | ť (US qt, Imp qt) | 9.4 (10, 8-1/4)  |         |  |

<sup>\*1:</sup> Refer to MA section ("Fluids and Lubricants", "RECOMMENDED FLUIDS AND LUBRICANTS").

#### **Specifications and Adjustments**

#### **VEHICLE SPEED WHEN SHIFTING GEARS**

| Throttle posi- | Vehicle speed km/h (MPH) |                       |                        |                          |                          |                        |                       |                                 |
|----------------|--------------------------|-----------------------|------------------------|--------------------------|--------------------------|------------------------|-----------------------|---------------------------------|
| tion           | Shift pattern            | $D_1 \rightarrow D_2$ | $D_2 \rightarrow D_3$  | $D_3 \rightarrow D_4$    | $D_4 \rightarrow D_3$    | $D_3 \rightarrow D_2$  | $D_2 \rightarrow D_1$ | 1 <sub>2</sub> → 1 <sub>1</sub> |
| Cuil Managed   | Comfort                  | 61 - 69<br>(38 - 43)  | 113 - 121<br>(70 - 75) | 177 - 185<br>(110 - 115) | 173 - 181<br>(108 - 112) | 103 - 111<br>(64 - 69) | 54 - 62<br>(34 - 39)  | 61 - 69<br>(38 - 43)            |
| Full throttle  | Auto power               | 61 - 69<br>(38 - 43)  | 113 - 121<br>(70 - 75) | 177 - 185<br>(110 - 115) | 173 - 181<br>(108 - 112) | 103 - 111<br>(64 - 69) | 54 - 62<br>(34 - 39)  | 61 - 69<br>(38 - 43)            |
| 11-16-16-11-11 | Comfort                  | 39 - 47<br>(24 - 29)  | 73 - 81<br>(45 - 50)   | 113 - 121<br>(70 - 75)   | 79 - 87<br>(49 - 54)     | 36 - 44<br>(22 - 27)   | 5 - 13<br>(3 - 8)     | 61 - 69<br>(38 - 43)            |
| Half throttle  | Auto power               | 46 - 54<br>(29 - 34)  | 85 - 93<br>(53 - 58)   | 134 - 142<br>(83 - 88)   | 85 - 93<br>(53 - 58)     | 51 - 59<br>(32 - 37)   | 5 - 13<br>(3 - 8)     | 61 - 69<br>(38 - 43)            |

#### VEHICLE SPEED WHEN PERFORMING LOCK-UP (Reference value)

| Model code No. |            |                       | 80X17     | 80X18 |
|----------------|------------|-----------------------|-----------|-------|
| Vehicle speed  | km/h (MPH) | Throttle position 1/8 | 49 - 65 ( |       |

#### STALL REVOLUTION

| Engine | Stall revolution rpm |
|--------|----------------------|
| VQ30DE | 2,000 - 2,300        |

#### LINE PRESSURE

| Engine speed | Line pressure kPa (kg/cm², psi) |                   |  |
|--------------|---------------------------------|-------------------|--|
| rpm          | D, 2 and 1 positions            | R position        |  |
| Idle         | 500 (5.1, 73)                   | 853 (8.7, 124)    |  |
| Stall        | 1,098 (11.2, 159)               | 1,863 (19.0, 270) |  |

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Note: 
• Lock-up vehicle speed indicates the speed in D<sub>4</sub> position.
• Make sure that lock-up is released under the following conditions:

Throttle opening 0/8
Vehicle speed is less than 120 km/h (75 MPH).

• Perform lock-up inspection after warming up engine.
• Lock-up vehicle speed may vary depending on the driving conditions and circumstances.

# SERVICE DATA AND SPECIFICATIONS (SDS) Specifications and Adjustments (Cont'd)

#### **CONTROL VALVES**

#### Control valve and plug return springs

Unit: mm (in)

| Parts                |  | ltem        |                |                |
|----------------------|--|-------------|----------------|----------------|
|                      | T dits                                   |             | Free length    | Outer diameter |
|                      | (B) Pilot valve spring                   | 31742-80X14 | 36.0 (1.417)   | 8.1 (0.319)    |
|                      | 1-2 accumulator valve spring             | 31742-80X10 | 20.5 (0.807)   | 7.0 (0.276)    |
|                      | 1-2 accumulator piston spring            | 31742-80X19 | 49.3 (1.941)   | 19.6 (0.772)   |
| Jpper body           | 25 1st reducing valve spring             | 31742-80X05 | 27.0 (1.063)   | 7.0 (0.276)    |
|                      | (6) Overrun clutch reducing valve spring | 31742-80X15 | 37.5 (1.476)   | 6.9 (0.272)    |
|                      | 1 Torque converter relief valve spring   | 31742-80X07 | 31.0 (1.220)   | 9.0 (0.354)    |
|                      | Torque converter clutch control valve    | 31742-80X17 | 39.5 (1.555)   | 11.0 (0.433)   |
|                      | Pressure regulator valve spring          | 31742-80X13 | 45.0 (1.772)   | 15.0 (0.591)   |
|                      | ② Overrun clutch control valve spring    | 31762-80X00 | 21.7 (0.854)   | 7.0 (0.276)    |
|                      | 26 Accumulator control valve spring      | 31742-80X02 | 22.0 (0.866)   | 6.5 (0.256)    |
|                      | (3) Shift valve A spring                 | 31762-80X00 | 21.7 (0.854)   | 7.0 (0.276)    |
| ower body            | ① Shift valve B spring                   | 31762-80X00 | 21.7 (0.854)   | 7.0 (0.276)    |
|                      | 3 Branchis and the second of             | 31742-41X15 | 30.5 (1.201)   | 9.8 (0.386)    |
|                      | Pressure modifier valve spring           | 31742-80X16 | 32.0 (1.260)   | 6.9 (0.272)    |
|                      | 14 Plug spring                           | 31742-80X11 | 17.0 (0.669)   | 10.7 (0.421)   |
| il cooler relief val | ve spring                                | 31872-31X00 | 17.02 (0.6701) | 8.0 (0.315)    |

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#### Specifications and Adjustments (Cont'd)

#### **CLUTCHES AND BRAKES**

| Reverse clutch                |                            |                            |  |
|-------------------------------|----------------------------|----------------------------|--|
| Number of drive plates        |                            | 2                          |  |
| Number of driven plates       | 2                          |                            |  |
| Drive plate thickness mm (in) |                            |                            |  |
| Standard                      | 1.6 (                      | 0.063)                     |  |
| Allowable limit               | 1.4 (                      | 0.055)                     |  |
| Clearance mm (in)             |                            |                            |  |
| Standard                      | 0.5 - 0.8 (0.              | .020 - 0.031)              |  |
| Allowable limit               |                            | ).047)                     |  |
|                               | Thickness                  | Γ                          |  |
|                               | mm (in)                    | Part number                |  |
|                               | 6.6 (0.260)                | 31537-80X05                |  |
| Thickness of retaining plates | 6.8 (0.268)                | 31537-80X06                |  |
| Frickriess of Tetaning plates | 7.0 (0.276)<br>7.2 (0.283) | 31537-80X07<br>31537-80X08 |  |
|                               | 7.4 (0.291)                | 31537-80X09                |  |
|                               | 7.6 (0.299)                | 31537-80X20                |  |
|                               | 7.8 (0.307)                | 31537-80X21                |  |
| High clutch                   |                            |                            |  |
| Number of drive plates        |                            | 4                          |  |
| Number of driven plates       | 6                          | + 1                        |  |
| Drive plate thickness mm (in) |                            |                            |  |
| Standard                      | 1.6 (0.063)                |                            |  |
| Allowable limit               | 1.4 (0.055)                |                            |  |
| Clearance mm (in)             |                            |                            |  |
| Standard                      | 1.8 - 2.2 (0.              | 071 - 0.087)               |  |
| Allowable limit               | 3.0 (0                     | D.118)                     |  |
|                               | Thickness                  | Part number                |  |
|                               | mm (in)                    | 2/22 2/2/2                 |  |
| Thickness of retaining plates | 3.0 (0.118)<br>3.2 (0.126) | 31537-81X10<br>31537-81X11 |  |
| <b>3</b>                      | 3.4 (0.134)                | 31537-81X12                |  |
|                               | 3.6 (0.142)                | 31537-81X13                |  |
|                               | 3.8 (0.150)                | 31537-81X14                |  |
| Forward clutch                |                            |                            |  |
| Number of drive plates        | 5                          |                            |  |
| Number of driven plates       |                            | <u> </u>                   |  |
| Drive plate thickness mm (in) |                            |                            |  |
| Standard                      | 1.6 (0.063)                |                            |  |
| Allowable limit               | 1.4 (0                     | 0.055)                     |  |
| Clearance mm (in)             |                            |                            |  |
| Standard                      | 0.45 - 0.85 (0.            | 0177 - 0.0335)             |  |
| Allowable limit               | 1.85 (0                    | 0.0728)                    |  |
|                               | Thickness<br>mm (in)       | Part number                |  |
|                               | 3.6 (0.142)                | 31537-80X70                |  |
| Thickness of retaining plates | 3.8 (0.150)                | 31537-80X71                |  |
| mickness of retaining plates  | 4.0 (0.157)<br>4.2 (0.165) | 31537-80X72<br>31537-80X73 |  |
|                               | 4.4 (0.173)                | 31537-80X74                |  |
|                               | •                          | <b></b>                    |  |
|                               | 3.4 (0.134)<br>3.2 (0.126) | 31537-80X75<br>31537-80X76 |  |

| <u></u>                         |                            |  |  |
|---------------------------------|----------------------------|--|--|
| Overrun clutch                  |                            |  |  |
| Number of drive plates          |                            | 3  |  |
| Number of driven plates         |                            | 5  |  |
| Drive plate thickness mm (i     | n)                         |  |  |
| Standard                        | 1.6 (                      | 0.063)                                   |  |
| Allowable limit                 | 1.4 (                      | 0.055)                                   |  |
| Clearance mm (i                 | n)                         |  |  |
| Standard                        | 0.7 - 1.1 (0               | .028 - 0.043)                            |  |
| Allowable limit                 |                            | 0.067)                                   |  |
|                                 | Thickness                  |  |  |
|                                 | mm (in)                    | Part number                              |  |
| <del>-</del>                    | 3.0 (0.118)                | 31537-80X65                              |  |
| Thickness of retaining plates   | 3.2 (0.126)                | 31537-80X66                              |  |
|                                 | 3.4 (0.134)<br>3.6 (0.142) | 31537-80X67<br>31537-80X68               |  |
|                                 | 3.8 (0.142)                | 31537-80X69                              |  |
| Low & reverse brake             |                            | <u> </u>                                 |  |
| Number of drive plates          |                            | 7  |  |
| Number of driven plates         |                            | 8  |  |
| Drive plate thickness mm (ii    |                            | <del>-</del>                             |  |
| Standard                        | "                          | 0.071)                                   |  |
| Allowable limit                 | · ·                        | 1.6 (0.063)                              |  |
| Clearance mm (ii                |                            | 0.000)                                   |  |
| Standard                        |                            | 067 - 0 083\                             |  |
| Allowable limit                 | ,                          | 1.7 - 2.1 (0.067 - 0.083)<br>3.5 (0.138) |  |
| Allowable milit                 | Thickness                  | 1.136)                                   |  |
|                                 | mm (in)                    | Part number                              |  |
|                                 | 2.0 (0.079)                | 31667-80X00                              |  |
|                                 | 2.2 (0.087)<br>2.4 (0.094) | 31667-80X01<br>31667-80X02               |  |
| Thickness of retaining plates   | 2.6 (0.102)                | 31667-80X03                              |  |
|                                 | 2.8 (0.110)                | 31667-80X04                              |  |
|                                 | 3.0 (0.118)                | 31667-80X05                              |  |
|                                 | 3.2 (0.126)                | 31667-80X06                              |  |
|                                 | 3.4 (0.134)                | 31667-80X07                              |  |
| Brake band                      |                            |  |  |
|                                 |                            | - 0.6, 35 - 52)                          |  |
| Anchor end pin tightening torqu | 1 39-591124                | 0.0, 50 52,                              |  |
| Anchor end pin tightening torqu | 3.9 - 5.9 (0.4             | .5                                       |  |

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#### Specifications and Adjustments (Cont'd)

#### **FINAL DRIVE**

#### Differential side gear clearance

| Clearance between side gear and differential case with washer mm (in) | 0.1 - 0.2 (0.004 - 0.008) |
|---|---------------------------|
| differential case with washer   | 0.1 - 0.2 (0.004 - 0.008) |

# Differential side gear thrust washers RE4F04A

| Thickness mm (in) | Part number |
|-------------------|-------------|
| 0.75 (0.0295)     | 38424-81X00 |
| 0.80 (0.0315)     | 38424-81X01 |
| 0.85 (0.0335)     | 38424-81X02 |
| 0.90 (0.0354)     | 38424-81X03 |
| 0.95 (0.0374)     | 38424-81X04 |

#### RE4F04V

| Thickness mm (in)      |                                  | Part number |
|------------------------|----------------------------------|-------------|
| Viscous coupling side  | 0.43 - 0.45<br>(0.0169 - 0.0177) | 38424-51E10 |
|                        | 0.52 - 0.54<br>(0.0205 - 0.0213) | 38424-51E11 |
|                        | 0.61 - 0.63<br>(0.0240 - 0.0248) | 38424-51E12 |
|                        | 0.70 - 0.72<br>(0:0276 - 0.0283) | 38424-51E13 |
|                        | 0.79 - 0.81<br>(0.0311 - 0.0319) | 38424-51E14 |
| Differential case side | 0.75 - 0.80<br>(0.0295 - 0.0315) | 38424-E3000 |
|                        | 0.80 - 0.85<br>(0.0315 - 0.0335) | 38424-E3001 |
|                        | 0.85 - 0.90<br>(0.0335 - 0.0354) | 38424-E3002 |
|                        | 0.90 - 0.95<br>(0.0354 - 0.0374) | 38424-E3003 |

# Differential side bearing preload adjusting shims

#### RE4F04A

| Thickness mm (in) | Part number |
|-------------------|-------------|
| 0.48 (0.0189)     | 31438-80X00 |
| 0.52 (0.0205)     | 31438-80X01 |
| 0.56 (0.0220)     | 31438-80X02 |
| 0.60 (0.0236)     | 31438-80X03 |
| 0.64 (0.0252)     | 31438-80X04 |
| 0.68 (0.0268)     | 31438-80X05 |
| 0.72 (0.0283)     | 31438-80X06 |
| 0.76 (0.0299)     | 31438-80X07 |
| 0.80 (0.0315)     | 31438-80X08 |
| 0.84 (0.0331)     | 31438-80X09 |
| 0.88 (0.0346)     | 31438-80X10 |
| 0.92 (0.0362)     | 31438-80X11 |

#### RE4F04V

| Thickness mm (in) | Part number |
|-------------------|-------------|
| 0.36 (0.0142)     | 38753-56E00 |
| 0.40 (0.0157)     | 38753-56E01 |
| 0.44 (0.0173)     | 38753-56E02 |
| 0.48 (0.0189)     | 38753-56E03 |
| 0.52 (0.0205)     | 38753-56E04 |
| 0.56 (0.0220)     | 38753-56E05 |
| 0.60 (0.0236)     | 38753-56E06 |
| 0.64 (0.0252)     | 38753-56E07 |
| 0.68 (0.0268)     | 38753-56E08 |
| 0.72 (0.0283)     | 38753-56E09 |
| 0.76 (0.0299)     | 38753-56E10 |
| 0.80 (0.0315)     | 38753-56E11 |
| 0.84 (0.0331)     | 38753-56E12 |
| 0.88 (0.0346)     | 38753-56E13 |
| 0.92 (0.0362)     | 38753-56E14 |
| 0.12 (0.0047)     | 38753-56E15 |
| 0.16 (0.0063)     | 38753-56E16 |
| 0.20 (0.0079)     | 38753-56E17 |
| 0.24 (0.0094)     | 38753-56E18 |
| 0.28 (0.0110)     | 38753-56E19 |
| 0.32 (0.0126)     | 38753-56E20 |

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#### **Specifications and Adjustments (Cont'd)**

#### Bearing preload

| Differential side bearing preload mm (in) | 0.05 - 0.09 (0.0020 - 0.0035) |
|---|-------------------------------|
|---|-------------------------------|

#### **Turning torque**

| Turning torque of final drive assembly N·m (kg-cm, in-tb) | 0.78 - 1.37 (8.0 - 14.0, 6.9 - 12.2) |
|---|--------------------------------------|
|---|--------------------------------------|

#### Clutch and brake return springs

| Unit: | mm | (in) |
|-------|----|------|
|-------|----|------|

| Parts  | Free length  | Outer diameter |
|--|--------------|----------------|
| Forward clutch<br>(Overrun clutch)<br>(22 pcs) | 21.4 (0.843) | 10.3 (0.406)   |
| High clutch<br>(12 pcs)                        | 22.5 (0.886) | 10.8 (0.425)   |

#### PLANETARY CARRIER AND OIL PUMP

| Planetary carrier Clearance between planetary carrier and pinion washer mm (in) |                                    |                  |
|---|------------------------------------|------------------|
| ` '   |                                    |                  |
| Standard  | 0.20 - 0.70 (0.                    | 0079 - 0.0276)   |
| Allowable limit   | 0.80 (0                            | 0.0315)          |
| Oil pump Oil pump side clearance mm (in)  | 0.030 - 0.050 (0                   | ).0012 - 0.0020) |
|   | Inner                              | gear             |
|   | Thickness<br>mm (in)               | Part number      |
|   | 11.99 - 12.0<br>(0.4720 - 0.4724)  | 31346-80X00      |
|   | 11.98 - 11.99<br>(0.4717 - 0.4720) | 31346-80X01      |
| Thickness of inner gears  | 11.97 - 11.98<br>(0.4713 - 0.4717) | 31346-80X02      |
| and outer gears   | Outer gear                         |                  |
|   | Thickness<br>mm (in)               | Part number      |
| ļ   | 11.99 - 12.0<br>(0.4720 - 0.4724)  | 31347-80X00      |
|   | 11.98 - 11.99<br>(0.4717 - 0.4720) | 31347-80X01      |
|   | 11.97 - 11.98<br>(0.4713 - 0.4717) | 31347-80X02      |
| Clearance between oil<br>pump housing and outer<br>gear                         |                                    |                  |
| mm (in)   |                                    |                  |
| Standard  | 0.111 - 0.181 (0                   | .0044 - 0.0071)  |
| Allowable limit   | 0.181 (0                           | 0.0071)          |
| Oil pump cover seal ring clearance  |                                    |                  |
| mm (in)   |                                    |                  |
| Standard  | 0.1 - 0.25 (0.0                    | 039 - 0.0098)    |
| Allowable limit   | 0.25 (0                            | ,                |

#### INPUT SHAFT

| Input shaft seal ring clearance mm (in) |                               |
|---|-------------------------------|
| Standard                                | 0.08 - 0.23 (0.0031 - 0.0091) |
| Allowable limit                         | 0.23 (0.0091)                 |

#### **REDUCTION PINION GEAR**

#### **Turning torque**

| Turning torque of reduction pinion gear | 0.05 - 0.39              |
|---|--------------------------|
| N·m (kg-cm, in-lb)                      | (0.5 - 4.0, 0.43 - 3.47) |

## Reduction pinion gear bearing adjusting shims

| shims             |             | . EC       |
|-------------------|-------------|------------|
| Thickness mm (in) | Part number |            |
| 5.10 (0.2008)     | 31439-81X05 |            |
| 5.12 (0.2016)     | 31439-81X06 | FE         |
| 5.14 (0.2024)     | 31439-81X07 |            |
| 5.16 (0.2031)     | 31439-81X08 |            |
| 5.18 (0.2039)     | 31439-81X09 | CL         |
| 5.20 (0.2047)     | 31439-81X10 | -          |
| 5.22 (0.2055)     | 31439-81X11 |            |
| 5.24 (0.2063)     | 31439-81X12 | MT         |
| 5.26 (0.2071)     | 31439-81X13 | 60.7       |
| 5.28 (0.2079)     | 31439-81X14 |            |
| 5.30 (0.2087)     | 31439-81X15 | AT         |
| 5.32 (0.2094)     | 31439-81X16 |            |
| 5.34 (0.2102)     | 31439-81X17 |            |
| 5.36 (0.2110)     | 31439-81X18 | FA         |
| 5.38 (0.2118)     | 31439-81X19 | II t—a     |
| 5.40 (0.2126)     | 31439-81X20 |            |
| 5.42 (0.2134)     | 31439-81X21 | RA         |
| 5.44 (0.2142)     | 31439-81X22 | L=02=2     |
| 5.46 (0.2150)     | 31439-81X23 |            |
| 5.48 (0.2157)     | 31439-81X24 | <b>a</b> a |
| 5.50 (0.2165)     | 31439-81X46 | BR         |
| 5.52 (0.2173)     | 31439-81X47 |            |
| 5.54 (0.2181)     | 31439-81X48 | @T         |
| 5.56 (0.2189)     | 31439-81X49 | Sī         |
| 5.58 (0.2197)     | 31439-81X60 |            |
| 5.60 (0.2205)     | 31439-81X61 | 7910       |
| 5.62 (0.2213)     | 31439-81X62 | RS         |
| 5.64 (0.2220)     | 31439-81X63 |            |
| 5.66 (0.2228)     | 31439-81X64 | [5352      |
| 5.68 (0.2236)     | 31439-81X65 | BT         |
| 5.70 (0.2244)     | 31439-81X66 |            |
| 5.72 (0.2252)     | 31439-81X67 | 250        |
| 5.74 (0.2260)     | 31439-81X68 | HA         |
| 5.76 (0.2268)     | 31439-81X69 |            |
| 5.78 (0.2276)     | 31439-81X70 |            |
| 5.80 (0.2283)     | 31439-81X71 |            |
| 5.82 (0.2291)     | 31439-81X72 |            |
| 5.84 (0.2299)     | 31439-81X73 |            |
| 5.86 (0.2307)     | 31439-81X74 | 10X        |
| 5.88 (0.2315)     | 31439-81X75 |            |
| 5.90 (0.2323)     | 31439-81X76 |            |
| 5.92 (0.2331)     | 31439-81X77 |            |
| 5.94 (0.2339)     | 31439-81X78 |            |
| 5.96 (0.2346)     | 31439-81X79 |            |

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# Specifications and Adjustments (Cont'd) ACCUMULATOR

| 5.98 (0.2354) | 31439-81X80 |
|---------------|-------------|
| 6.00 (0.2362) | 31439-81X81 |
| 6.02 (0.2370) | 31439-81X82 |
| 6.04 (0.2378) | 31439-81X83 |
| 6.06 (0.2386) | 31439-81X84 |
| 6.08 (0.2394) | 31439-82X00 |
| 6.10 (0.2402) | 31439-82X01 |
| 6.12 (0.2409) | 31439-82X02 |
| 6.14 (0.2417) | 31439-82X03 |
| 6.16 (0.2425) | 31439-82X04 |
| 6.18 (0.2433) | 31439-82X05 |
| 6.20 (0.2441) | 31439-82X06 |
| 6.22 (0.2449) | 31439-82X07 |
| 6.24 (0.2457) | 31439-82X08 |
| 6.26 (0.2465) | 31439-82X09 |
| 6.28 (0.2472) | 31439-82X10 |
| 6.30 (0.2480) | 31439-82X11 |
| 6.32 (0.2488) | 31439-82X12 |
| 6.34 (0.2496) | 31439-82X13 |
| 6.36 (0.2504) | 31439-82X14 |
| 6.38 (0.2512) | 31439-82X15 |
| 6.40 (0.2520) | 31439-82X16 |
| 6.42 (0.2528) | 31439-82X17 |
| 6.44 (0.2535) | 31439-82X18 |
| 6.46 (0.2543) | 31439-82X19 |
| 6.48 (0.2551) | 31439-82X20 |
| 6.50 (0.2559) | 31439-82X21 |
| 6.52 (0.2567) | 31439-82X22 |
| 6.54 (0.2575) | 31439-82X23 |
| 6.56 (0.2583) | 31439-82X24 |
| 6.58 (0.2591) | 31439-82X60 |
| 6.60 (0.2598) | 31439-82X61 |
|               |             |

#### **REVERSE CLUTCH END PLAY**

| Reverse clutch end play | mm (in) | 0.55 - 0.90 (0.0217 - 0.0354) |
|-------------------------|---------|-------------------------------|
|-------------------------|---------|-------------------------------|

# Thrust washers for adjusting reverse clutch drum end play

| Thickness mm (in) | Part number |
|-------------------|-------------|
| 0.80 (0.0315)     | 31508-80X13 |
| 0.95 (0.0374)     | 31508-80X15 |
| 1.10 (0.0433)     | 31508-80X16 |
| 1.25 (0.0492)     | 31508-80X17 |
| 1.40 (0.0551)     | 31508-80X14 |
| 1.55 (0.0610)     | 31508-80X18 |
| 1.70 (0.0669)     | 31508-80X19 |
| 1.85 (0.0728)     | 31508-80X20 |

#### O-ring

|                                |                           | Unit: mm (in)             |
|--------------------------------|---------------------------|---------------------------|
| Accumulator                    | Inner diameter<br>(Small) | Inner diameter<br>(Large) |
| Servo release accu-<br>mulator | 26.9 (1.059)              | 44.2 (1.740)              |
| N-D accumulator                | 34.6 (1.362)              | 39.4 (1.551)              |

#### Return spring

|                                |              | Unit: mm (in)  |
|--------------------------------|--------------|----------------|
| Accumulator                    | Free length  | Outer diameter |
| Servo release accu-<br>mulator | 52.5 (2.067) | 20.4 (0.803)   |
| N-D accumulator                | 43.5 (1.713) | 28.0 (1.102)   |

#### **BAND SERVO**

#### Return spring

|                         |              | Onic min (in)  |
|-------------------------|--------------|----------------|
| Return spring           | Free length  | Outer diameter |
| 2nd servo return spring | 32.5 (1.280) | 25.9 (1.020)   |
| OD servo return spring  | 31.0 (1.220) | 21.7 (0.854)   |

#### **REMOVAL AND INSTALLATION**

Unit: mm (in)

| Distance between end of converter housing and torque converter | 14 (0.55) |
|--|-----------|
|  |           |

#### **OUTPUT SHAFT**

#### Seal ring clearance

| Output shaft seal ring clearance mm (in) |                                  |
|--|----------------------------------|
| Standard                                 | 0.10 - 0.25<br>(0.0039 - 0.0098) |
| Allowable limit                          | 0.25 (0.0098)                    |

#### End play

| Output shaft end play | mm (in) | 0 - 0.15 (0 - 0.0059) |  |
|-----------------------|---------|-----------------------|--|

#### Specifications and Adjustments (Cont'd)

#### Output shaft adjusting shims

#### TOTAL END PLAY

Total end play

| Thickness mm (in) | Part number |
|-------------------|-------------|
| 0.80 (0.0315)     | 31438-80X60 |
| 0.84 (0.0331)     | 31438-80X61 |
| 0.88 (0.0346)     | 31438-80X62 |
| 0.92 (0.0362)     | 31438-80X63 |
| 0.96 (0.0378)     | 31438-80X64 |
| 1.00 (0.0394)     | 31438-80X65 |
| 1.04 (0.0409)     | 31438-80X66 |
| 1.08 (0.0425)     | 31438-80X67 |
| 1.12 (0.0441)     | 31438-80X68 |
| 1.16 (0.0457)     | 31438-80X69 |
| 1.20 (0.0472)     | 31438-80X70 |

| Bearing | race | for | adjus | sting | total | end | play |
|---------|------|-----|-------|-------|-------|-----|------|
|         |      |     |       |       |       |     |      |

0.25 - 0.55 (0.0098 - 0.0217)

mm (in)

| <u></u> |             |                   |
|---------|-------------|-------------------|
| - GI    | Part number | Thickness mm (in) |
|         | 31435-80X00 | 0.8 (0.031)       |
| MA      | 31435-80X01 | 1.0 (0.039)       |
|         | 31435-80X02 | 1.2 (0.047)       |
| EM      | 31435-80X03 | 1.4 (0.055)       |
|         | 31435-80X04 | 1.6 (0.063)       |
| LC      | 31435-80X05 | 1.8 (0.071)       |
|         | 31435-80X06 | 2.0 (0.079)       |
| 20      | 31435-80X09 | 0.9 (0.035)       |
| EC      | 31435-80X10 | 1.1 (0.043)       |
|         | 31435-80X11 | 1.3 (0.051)       |
|         | 31435-80X12 | 1.5 (0.059)       |
|         | 31435-80X13 | 1.7 (0.067)       |
| CL      | 31435-80X14 | 1.9 (0.075)       |
|         |             |                   |

#### BEARING RETAINER

#### Seal ring clearance

| Bearing retainer seal ring clearance mm (in) |                                  |
|--|----------------------------------|
| Standard                                     | 0.10 - 0.30<br>(0.0039 - 0.0118) |
| Allowable limit                              | 0.30 (0.0118)                    |



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# FRONT AXLE & FRONT SUSPENSION

# SECTION FA

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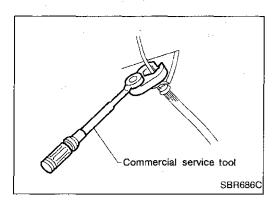
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#### PRECAUTIONS AND PREPARATION



#### **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.
- 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**

The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

| Tool number<br>(Kent-Moore No.)<br>Tool name     | Description |      |  |
|--|-------------|------|--|
| HT72520000<br>(J25730-A)<br>Ball joint remover   |             | ab   | Removing tie-rod outer end and lower ball joint                    |
| ball joint removel                               | NT546       | PATP | a: 33 mm (1.30 in)<br>b: 50 mm (1.97 in)<br>r: R11.5 mm (0.453 in) |
| HT71780000<br>( — )<br>Spring compressor         | NT144       |      | Removing and installing coil spring                                |
| ST35652000<br>( — )<br>Strut attachment          | NT144       |      | Fixing strut assembly  |
| KV38106700<br>(J34296)<br>KV38106800<br>(J34297) |             |      | Installing drive shaft   |
| Differential side oil seal protector             | NT147       |      | LH: KV38106700<br>RH: KV38106800                                   |

#### PRECAUTIONS AND PREPARATION

#### **Commercial Service Tools**

| Tool name                              | Description |  | <u>.</u>   |
|--|-------------|--|------------|
| Front wheel hub drift                  |             | Removing wheel hub                                 | <b>C</b> I |
|  | NT065       | a: 42 mm (1.65 in) dia.<br>b: 33 mm (1.30 in) dia. | MA         |
| Front wheel bearing outer race drift   | ab          | Removing and installing wheel bearing outer race   | EM         |
|  | NT115       | a: 76 mm (2.99 in) dia.<br>b: 72 mm (2.83 in) dia. | LG         |
| Grease seal drift                      | a b         | Installing outer grease seal                       |            |
|  | NT115       | a: 81 mm (3.19 in) dia.<br>b: 76 mm (2.99 in) dia. |            |
| Flare nut crows foot     Torque wrench |             | Removing and installing brake piping               | · CL       |
|  |             |  | MT         |
|  | NT360       | a: 10 mm (0.39 in)                                 | AT         |

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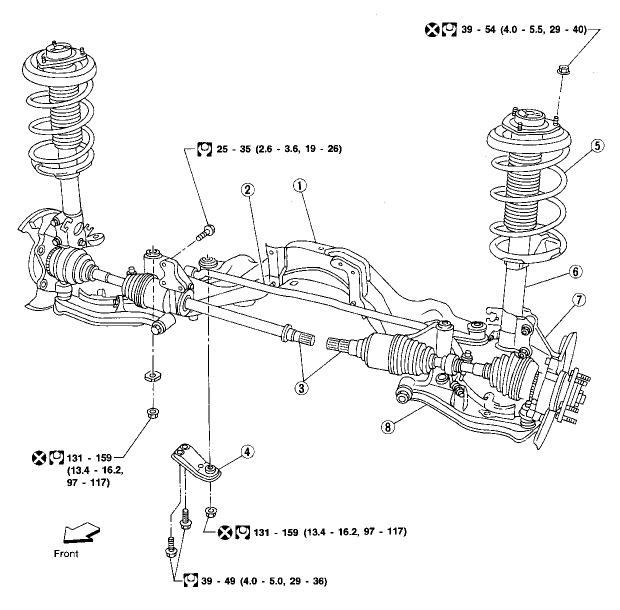
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#### SEC. 391-400-401

When installing rubber parts, final tightening must be carried out under unladen condition\* with tires on ground.

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



: N-m (kg-m, ft-lb)

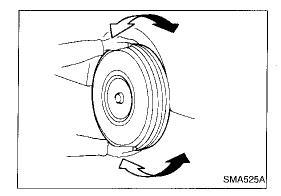
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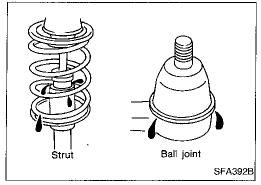
- Suspension member
- ② Stabilizer bar
- (3) Drive shaft

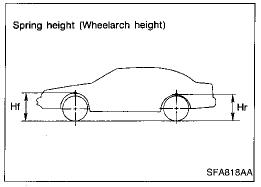
- (4) Rebound stopper
- (5) Coil spring
- 6 Strut assembly

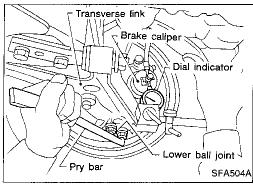
- 7) Knuckle
- 8 Transverse link

#### ON-VEHICLE SERVICE









#### Front Axle and Front Suspension Parts

Check front axle and front suspension parts for excessive play, cracks, wear or other damage.

- Shake each front wheel to check for excessive play.
- Make sure that cotter pins are inserted.
- Retighten all axle and suspension nuts and bolts to the specified torque.

Tightening torque: Refer to FRONT SUSPENSION (FA-20).

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 trans-

verse link.

Check spring height from top of wheelarch to ground using the following procedure.

- Park vehicle on a level surface with vehicle unladen\*.
  - \*: Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.
- Check tires for proper inflation and wear (tread wear indicator must not be showing).
- Bounce vehicle up and down several times and measure dimensions Hf and Hr. Refer to SDS, FA-25. Spring height is not adjustable. If out of specification, check for worn springs or suspension parts.
- Check suspension ball joint end play.
- Jack up front of vehicle and set the stands.
- Clamp dial indicator onto transverse link and place indicator tip on lower edge of brake caliper.
- C. Make sure front wheels are straight and brake pedal is depressed.
- Place a pry bar between transverse link and inner rim of road wheel.
- While raising and releasing pry bar, observe maximum dial indicator value. Vertical end play: 0 mm (0 in) If ball joint vertical end play exists, remove transverse link and recheck the ball joint. Refer to FA-23.

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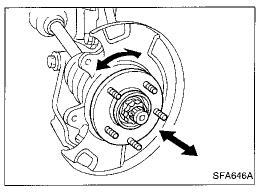
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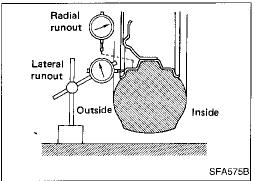
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#### Front Wheel Bearing

- 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.

#### PRELIMINARY INSPECTION

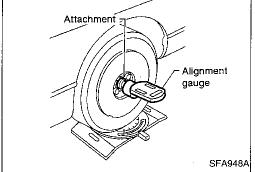
- Check tires for wear and improper inflation. 1.
- Check wheel runout.

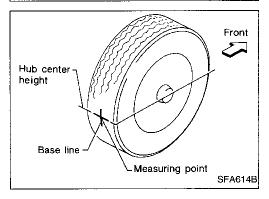
#### Wheel runout:

#### Refer to SDS (FA-26).

- 3. Check front wheel bearings for looseness.
- 4. Check front suspension for looseness.
- 5. Check steering linkage for looseness.
- 6. Check that struts work properly.
- Check vehicle posture (Unladen).

# Attachment





#### CAMBER, CASTER AND KINGPIN INCLINATION

Camber, caster and kingpin inclination are preset at factory and cannot be adjusted.

Measure camber, caster and kingpin inclination of both right and left wheels with a suitable alignment gauge.

#### Camber, Caster and Kingpin inclination: Refer to SDS (FA-26).

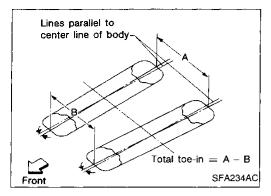
If camber, caster or kingpin inclination is not within specification, inspect front suspension parts. Replace damaged or worn out parts.

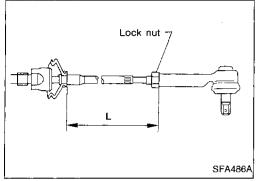
#### TOE-IN

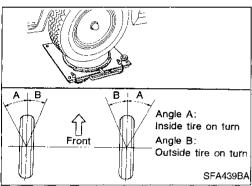
Measure toe-in using the following procedure. **WARNING:** 

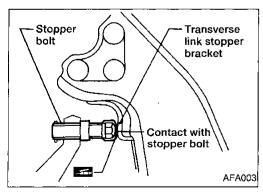
- Always perform the following procedure on a flat surface.
- Make sure that no person is in front of the vehicle before pushing it.
- Bounce front of vehicle up and down to stabilize the posture. 1.
- Push the vehicle straight ahead about 5 m (16 ft).
- Put a mark on base line of tread (rear side) of both tires at the same height as hub center. These are measuring points.

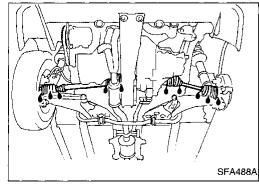
#### **ON-VEHICLE SERVICE**











#### Front Wheel Alignment (Cont'd)

4. Measure distance "A" (rear tires).

5. Push the vehicle slowly ahead to rotate the wheels 180 degrees (1/2 turn).

If the wheels have rotated more than 180 degrees (1/2 turn), try the above procedure again from the beginning. Never push vehicle backward.

Measure distance "B" (front tires).

Total toe-in:

Refer to SDS, (FA-26).

7. Adjust toe-in by varying the length of steering tie-rods.

a. Loosen lock nuts.

b. Adjust toe-in by screwing tie-rods in and out.

Standard length "L":

Refer to ST section.

Tighten lock nuts to specified torque.

Lock nut tightening torque:

Refer to ST section.

#### FRONT WHEEL TURNING ANGLE

 Set wheels in straight-ahead position. Then move vehicle forward until front wheels rest on turning radius gauge properly.

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-26).

 Check stopper bolt head to see whether it contacts stopper bracket at specified outside wheel angle. If not, adjust stopper bolt to contact stopper bracket at the correct angle.

Adjust protrusion of stopper bolt before placing stopper bolt cap.

Apply grease to face of stopper bracket that bolt touches.

Tighten stopper bolt lock nut.

(5.5 - 7.3 kg-m, 40 - 53 ft-lb)

#### **Drive Shaft**

Check for grease leakage or other damage.

Check for grease leakage of other damage.

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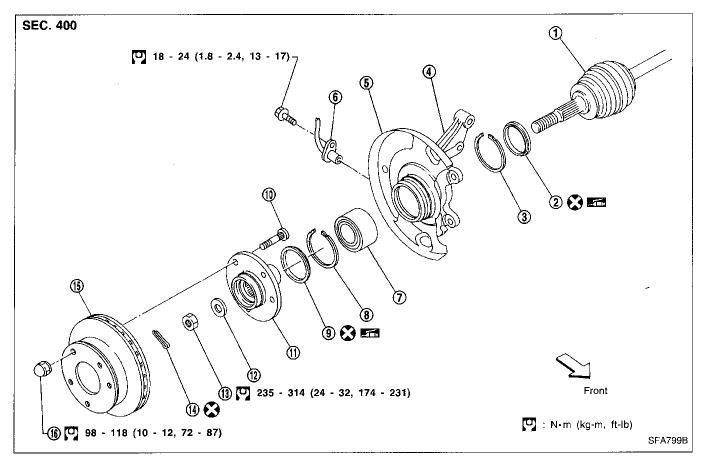
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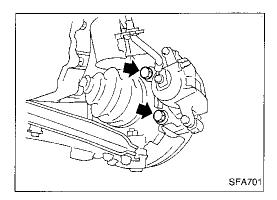
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- (1) Drive shaft
- (2) Inner grease seal
- 3 Snap ring
- (4) Knuckle
- (5) Baffle plate
- (6) ABS sensor

- (7) Wheel bearing assembly
- (8) Snap ring
- 9 Outer grease seal
- (10) Hub bolt
- 1) Wheel hub
- (12) Plain washer

- (3) Wheel bearing lock nut
- 14 Cotter pin
- (15) Disc rotor
- 16) Wheel nut



#### Wheel Hub and Knuckle

#### **REMOVAL**

#### **CAUTION:**

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 damage to the sensor wires and the sensor becoming inoperative.

- 1. Remove wheel bearing lock nut.
- 2. Remove brake caliper assembly and rotor.

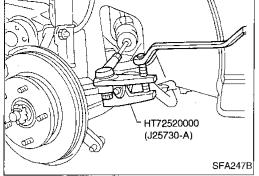
Brake hose need not be disconnected from brake caliper. In this case, suspend caliper assembly with wire so as not to stretch brake hose.

Be careful not to depress brake pedal, or piston will pop out. Make sure brake hose is not twisted.

#### Wheel Hub and Knuckle (Cont'd)

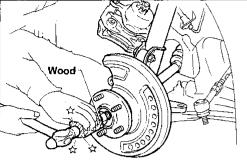
Separate tie-rod from knuckle with Tool.

Install stud nut on stud bolt to prevent damage to stud bolt.



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Separate drive shaft from knuckle by lightly tapping it. If it is hard to remove, use a puller.

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Cover boots with shop towel so as not to damage them when removing drive shaft.

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Loosen lower ball joint tightening nut.

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Separate knuckle from lower ball joint stud with Tool. 7. Remove knuckle from transverse link.

Remove strut lower mounting bolts.

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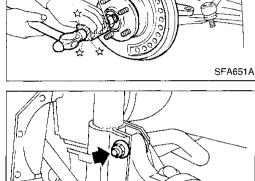


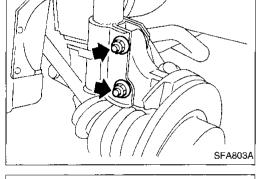




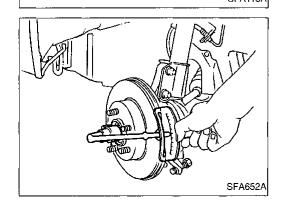
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6.

- Install knuckle with wheel hub.
- Replace strut lower mounting nuts.

When installing knuckle to strut, be sure to hold bolts and tighten nuts. [○]: 140 - 159 N·m (14.3 - 16.2 kg-m, 103 - 117 ft-lb) Before tightening, apply oil to threaded portion of drive shaft

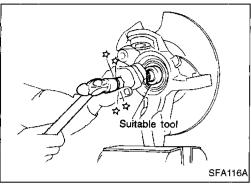
and both sides of plain washer. Tighten wheel bearing lock nut.

[○]: 235 - 314 N·m (24 - 32 kg-m, 174 - 231 ft-lb)

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#### Wheel Hub and Knuckle (Cont'd)

Check wheel bearing axial end play.
 Axial end play:
 0.05 mm (0.0020 in) or less.



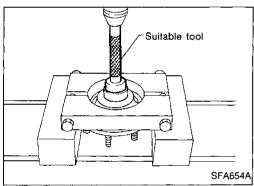
#### **DISASSEMBLY**

#### **CAUTION:**

When removing wheel hub or wheel bearing from knuckle, replace wheel bearing assembly (outer race, inner races and grease seals) with a new one.

#### Wheel hub

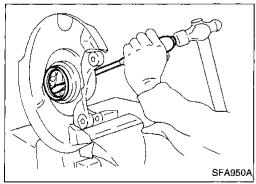
Drive out hub with inner race (outside) from knuckle with a suitable tool.



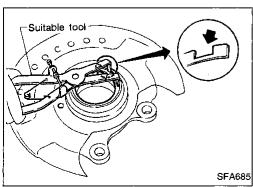
#### Wheel bearing

When replacing wheel bearing, replace wheel bearing assembly (inner races and outer race).

 Remove bearing inner race (outside), then remove outer grease seal.



2. Remove inner grease seal from knuckle.

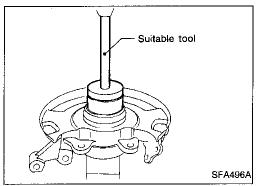


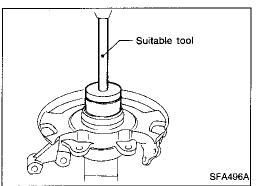
3. Remove snap ring.

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#### Wheel Hub and Knuckle (Cont'd)

4. Press out bearing outer race.





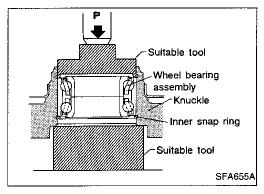
#### INSPECTION

#### Wheel hub and knuckle

Check wheel hub and knuckle for cracks by using a magnetic exploration or dyeing test.

#### Snap ring

Check snap ring for wear or cracks. Replace if necessary.



#### **ASSEMBLY**

Install inner snap ring into groove of knuckle.

Press new wheel bearing assembly into knuckle.

Maximum load P:

29 kN (3 ton, 3.3 US ton, 3.0 lmp ton)

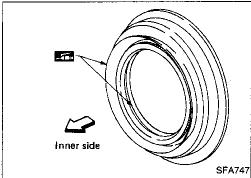
#### **CAUTION:**

Do not press inner race of wheel bearing assembly.

Do not apply oil or grease to mating surfaces of wheel bearing outer race and knuckle.

Install outer snap ring into groove of knuckle. 3.

Pack grease seal lip with multi-purpose grease.



Install outer grease seal.



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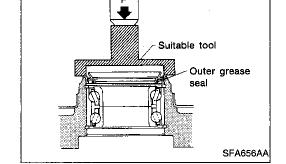
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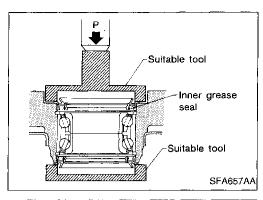
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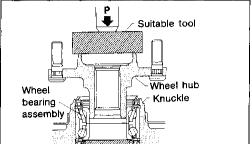
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#### Wheel Hub and Knuckle (Cont'd)

6. Install inner grease seal.





Suitable tool SFA658A

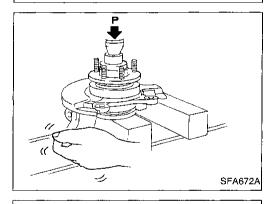
SFA649A

7. Press wheel hub into knuckle.

Maximum load P:

49 kN (5 ton, 5.5 US ton, 4.9 lmp ton)

Be careful not to damage grease seal.

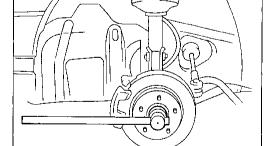


- 8. Check bearing operation.
- a. Add load P with press.

Load P:

49 kN (5 ton, 5.5 US ton, 4.9 Imp ton)

- b. Spin knuckle several turns in both directions.
- Make sure that wheel bearings operate smoothly.



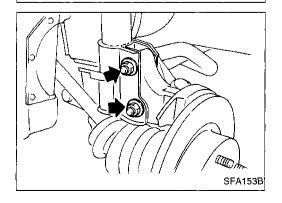
#### **Drive Shaft**

#### **REMOVAL**

1. Remove wheel bearing lock nut.

Brake caliper need not be disconnected.

Do not twist or stretch brake hose when moving components.



- 2. Remove strut lower mounting bolts.
- 3. Remove brake hose clip.

#### **Drive Shaft (Cont'd)**

SFA496B

4. Separate drive shaft from knuckle by slightly tapping it. When removing drive shaft, cover boots with shop towel to prevent damage to them.

Refer to FRONT AXLE — Wheel Hub and Knuckle (FA-8).



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Remove right drive shaft from transaxle.

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Remove left drive shaft from transaxle.

-For M/T models-

Pry off drive shaft from transaxle as shown at left.

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—For A/T models—

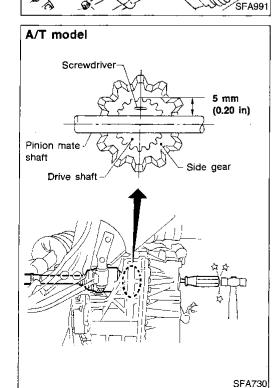
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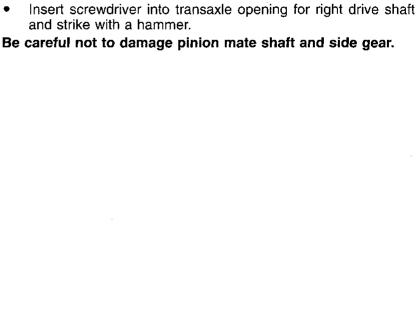
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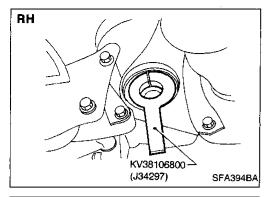
M/T model@

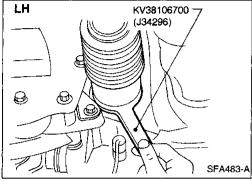


# Drive Shaft (Cont'd) INSTALLATION

#### Transaxle side

- 1. Drive a new oil seal to transaxle. Refer to MT or AT section.
- 2. Set Tool along the inner circumference of oil seal.





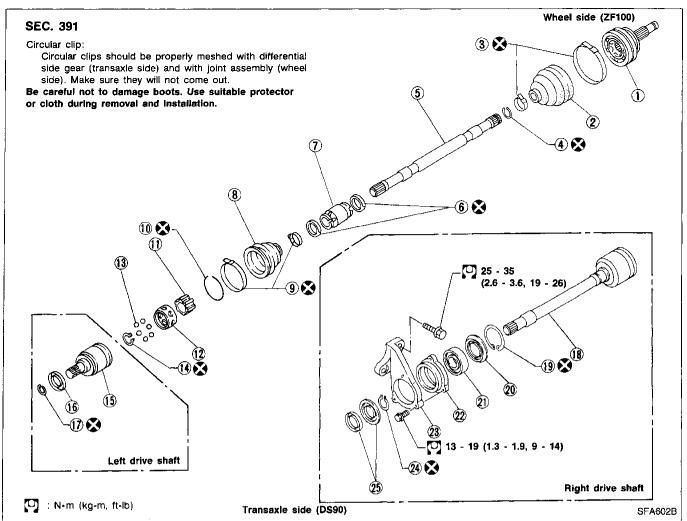
- 3. Insert drive shaft into transaxle. Be sure to properly align the serrations and then withdraw Tool.
- 4. Push drive shaft, then press-fit circular clip on the drive shaft into circular clip groove of side gear.
- After its insertion, try to pull the flange out of the slide joint by hand. If it pulls out, the circular clip is not properly meshed with the side gear.

#### Wheel side

- Install drive shaft into knuckle.
- Tighten wheel bearing lock nut.
   Refer to FRONT AXLE Wheel Hub and Knuckle (FA-8).

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## Drive Shaft (Cont'd) COMPONENTS



- Joint assembly
- 2 Boot
- 3 Boot band
- 4 Circular clip
- 5 Drive shaft
- 6 Dynamic damper band
- 7 Dynamic damper
- 8 Boot
- (9) Boot band

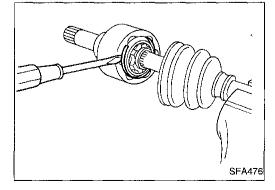
- Snap ring
- 11 Inner race
- 12 Cage
- (13) Ball
- (14) Snap ring
- (15) Slide joint housing
- 16 Dust shield
- (17) Circular clip
- Slide joint housing with extension shaft

- Snap ring
- 20 Dust shield
- Support bearing
- 2 Support bearing retainer
- ② Bracket
- (24) Snap ring
- Dust shield

#### DISASSEMBLY

#### Transaxle side

- 1. Remove boot bands.
- 2. Put matchmarks on slide joint housing and inner race, before separating joint assembly.
- Remove snap ring with a screwdriver, and pull out slide joint housing.





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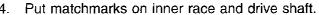
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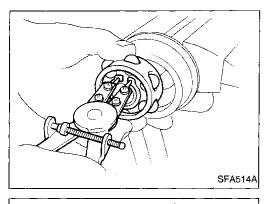
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#### Drive Shaft (Cont'd)



- Remove snap ring, then remove ball cage, inner race and balls as a unit.
- 6. Draw out boot.

Cover drive shaft serrations with tape so as not to damage the



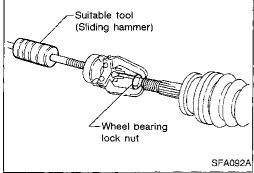
## Wheel side CAUTION:

The joint on the wheel side cannot be disassembled.

- 1. Before separating joint assembly, put matchmarks on drive shaft and joint assembly.
- 2. Separate joint assembly with a suitable tool.

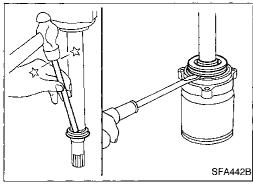
Be careful not to damage threads on drive shaft.

3. Remove boot bands.

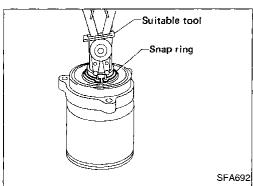


#### Support bearing

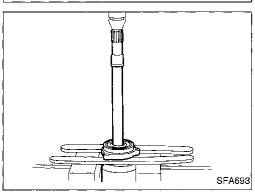
Remove dust shield.



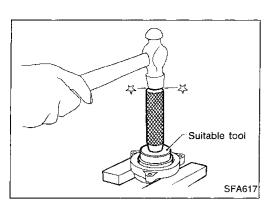
2. Remove snap ring.



3. Press support bearing assembly off of drive shaft.



#### **Drive Shaft (Cont'd)**



4. Separate support bearing from retainer.

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#### INSPECTION

Thoroughly clean all parts in cleaning solvent, and dry with compressed air. Check parts for evidence of deformation or other damage.

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#### **Drive shaft**

Replace drive shaft if it is twisted or cracked.

FE

#### **Boot**

Check boot for fatigue, cracks, or wear. Replace boot with new boot bands.

MT

CL.

#### Joint assembly

Replace joint assembly if it is deformed or damaged.

AT

#### Support bearing

Make sure wheel bearing rolls freely and is free from noise, cracks, pitting or wear.

FA

#### Support bearing bracket

Check support bearing bracket for cracks with a magnetic exploration or dyeing test.

图图

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#### **ASSEMBLY**

After drive shaft has been assembled, ensure that it moves smoothly over its entire range without binding.

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Use NISSAN GENUINE GREASE or equivalent after every overhaul.

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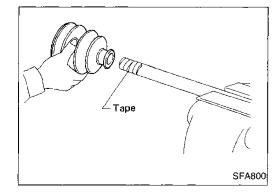
#### Wheel side

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Install boot and new small boot band on drive shaft.

Cover drive shaft serration with tape so as not to damage boot during installation.

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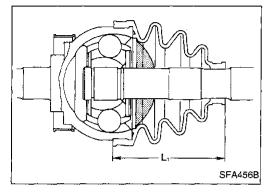


# Wheel bearing lock nut

SFA130A

#### Drive Shaft (Cont'd)

2. Set joint assembly onto drive shaft by lightly tapping it.
Install joint assembly securely, ensuring marks which were made during disassembly are properly aligned.

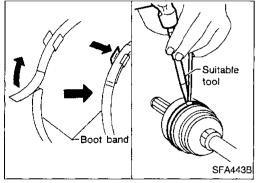


3. Pack drive shaft with specified amount of grease.

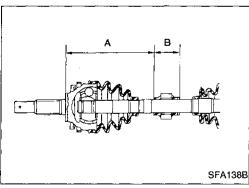
Specified amount of grease: 135 - 145 g (4.76 - 5.11 oz)

 Make sure that boot is properly installed on the drive shaft groove.

Set boot so that it does not swell and deform when its length is " $L_1$ ".



5. Lock new larger and smaller boot bands securely with a suitable tool.

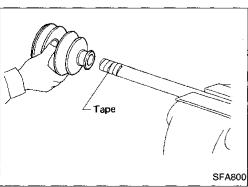


#### Dynamic damper

1. Use new damper band when reinstalling.

Install dynamic damper from stationary-joint side while holding it securely.

(Left side only)
Length "A" 205 - 215 mm
(8.07 - 8.46 in)
"B" 50 mm (1.97 in)

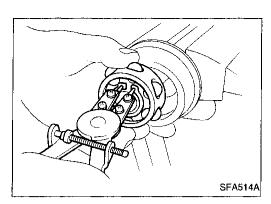


#### Transaxle side

Install boot and new small boot band on drive shaft.

Cover drive shaft serration with tape so as not to damage boot during installation.

#### **Drive Shaft (Cont'd)**

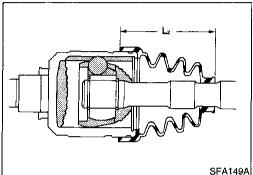


- 2. Install ball cage, inner race and balls as a unit, making sure the marks which were made during disassembly are properly aligned.
- 3. Install new snap ring.



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Pack drive shaft with specified amount of grease.

Specified amount of grease: 165 - 175 g (5.82 - 6.17 oz)

LC

- 5. Install slide joint housing, then install new snap ring.
- Make sure that boot is properly installed on the drive shaft groove.

Set boot so that it does not swell and deform when its length is " $L_2$ ".

FE

Length "L2": 97 - 99 mm (3.82 - 3.90 in)

Lock new larger and smaller boot bands securely with a suitable tool.

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#### Support bearing

· Press bearing into retainer.

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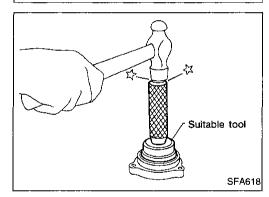
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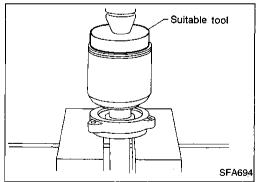
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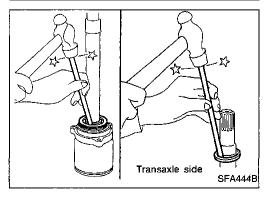
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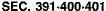


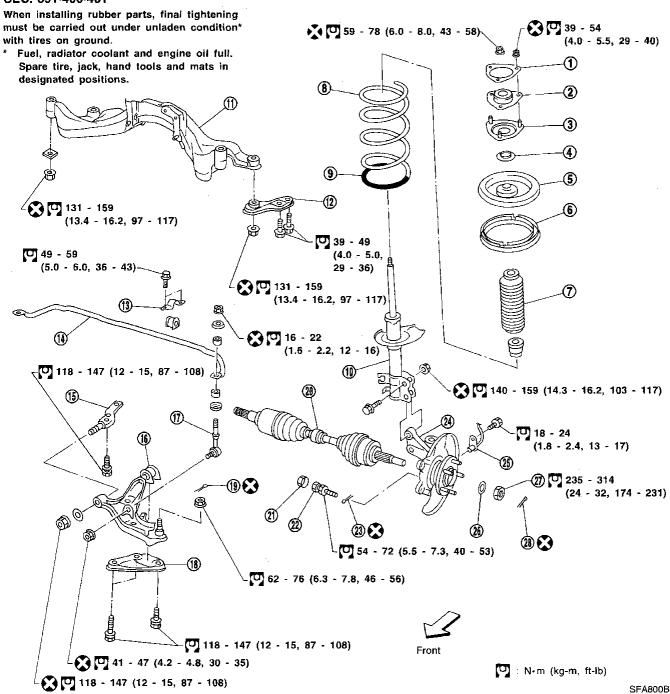




Press drive shaft into bearing.

- Install snap ring.
- Install new dust shield.

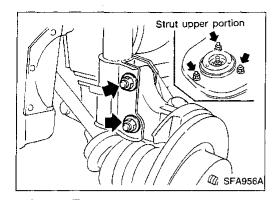




- (1) Spacer
- Strut mounting insulator
- 3 Strut mounting insulator bracket
- 4 Strut mounting bearing
- (5) Upper spring seat
- 6 Upper spring rubber seat
- 7 Bound bumper
- (8) Coil spring
- (Polyurethane tube)
- Strut assembly

- (1) Suspension member
- 12 Rebound stopper
- 3 Stabilizer clamp
- (14) Stabilizer bar
- (15) Link bushing pin
- (16) Transverse link
- (17) Connecting rod
- (18) Compression rod bushing clamp
- (19) Cotter pin
- 20 Drive shaft

- 21) Cap
- 22) Stopper bolt
- 23) Cotter pin
- 24) Knuckle
- 25 ABS sensor
- Plain washer
- Wheel bearing lock nut
- 28 Cotter pin



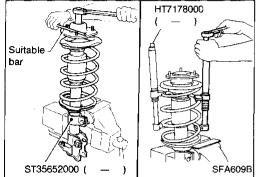
#### Coil Spring and Strut Assembly **REMOVAL AND INSTALLATION**

Remove strut assembly fixing bolts and nuts (to hood-ledge). Do not remove piston rod lock nut on vehicle.



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#### DISASSEMBLY

Set strut assembly on vise with Tool, then loosen piston rod LC lock nut.

Do not remove piston rod lock nut at this time.

Compress spring with Tool so that the strut mounting insulator can be turned by hand.

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Remove piston rod lock nut.

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INSPECTION

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#### 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.

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#### Mounting insulator and rubber parts

Check cemented rubber-to-metal portion for separation or cracks. Check rubber parts for deterioration.

Replace if necessary.

#### Thrust bearing

Check thrust bearing parts for abnormal noise or excessive rattle in axial direction.

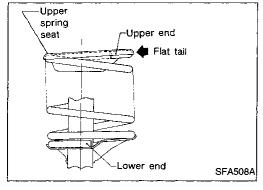
Replace if necessary.

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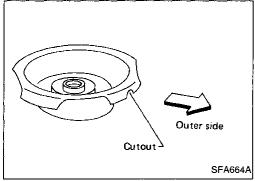
## Coil Spring and Strut Assembly (Cont'd) Coil spring

 Check for cracks, deformation or other damage. Replace if necessary.

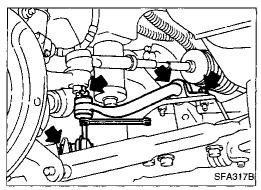


#### **ASSEMBLY**

 When installing coil spring on strut, it must be positioned as shown in the figure at left.



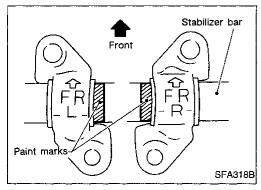
 Install upper spring seat with its cutout facing the outer side of vehicle.



#### Stabilizer Bar

#### **REMOVAL AND INSTALLATION**

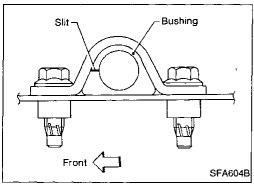
Remove stabilizer bar.



 When installing stabilizer, make sure that paint mark and clamp face in their correct directions.

#### FRONT SUSPENSION

#### Stabilizer Bar (Cont'd)



 Make sure that slit in bushing is in the position shown in the figure.

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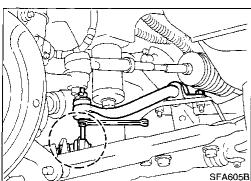
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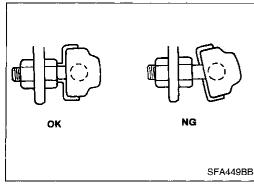
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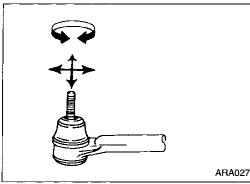
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When removing and installing stabilizer bar.

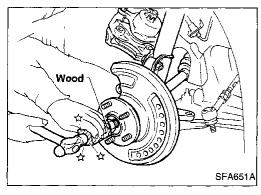


Install stabilizer bar with ball joint socket properly placed.



#### INSPECTION

- Check stabilizer for deformation or cracks. Replace if necessary
- Check rubber bushings for deterioration or cracks. Replace if necessary.
- Check ball joint can rotate in all directions. If movement is not smooth and free, replace stabilizer bar connecting rod.



#### Transverse Link and Lower Ball Joint

#### **REMOVAL AND INSTALLATION**

- 1. Remove wheel bearing lock nut.
- 2. Remove tie-rod ball joint.
- 3. Remove strut lower bracket fixing bolts and nuts.
- Separate drive shaft from knuckle by slightly tapping drive shaft end.

Cover boots with shop towel so as not to damage them when removing drive shaft.

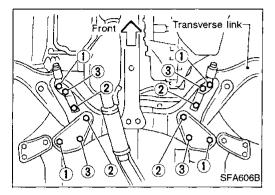
**FA-23** 877

#### FRONT SUSPENSION

## HT72520000 (J25730-A) SFA113A

#### Transverse Link and Lower Ball Joint (Cont'd)

5. Separate lower ball joint stud from knuckle with suitable tool. Refer to FRONT AXLE — Wheel Hub and Knuckle (FA-8).



- 6. Remove fixing bolts.
- 7. Remove transverse link and lower ball joint.
- 8. Install fixing bolts in order of number.

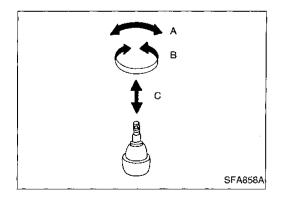
#### Tightening torque:

Refer to FRONT SUSPENSION (FA-20).

- During installation, final tightening must be carried out at curb weight with tires on the ground.
- 10. After installation, check wheel alignment. Refer to ON-VE-HICLE SERVICE Front Wheel Alignment (FA-6).

#### **INSPECTION**

- Check transverse link for damage, cracks or deformation.
   Replace it if necessary.
- Check rubber bushing for damage, cracks and deformation.
   Replace transverse link if necessary.



- Check ball joint for excessive play. Replace transverse link assembly if any of the following exists:
  - · Ball stud is worn.
  - · Joint is hard to swing.
  - · Play in axial direction is excessive.

Before checking, turn ball joint at least 10 revolutions so that ball joint is properly broken in.

Swinging force "A":

(measuring point: cotter pin hole of ball stud):

7.8 - 77.5 N (0.8 - 7.9 kg, 1.8 - 17.4 lb)

Turning torque "B":

0.49 - 4.90 N·m (5.0 - 50 kg-cm, 4.3 - 43.4 in-lb)

Vertical end play "C":

0 mm (0 in)

 Check dust cover for damage. Replace it and cover clamp if necessary.

FA-24 878

#### **SERVICE DATA AND SPECIFICATIONS (SDS)**

#### **General Specifications**

#### **COIL SPRING**

| Ар                   | plied model | M/T                         | A/T                         |  |
|----------------------|-------------|-----------------------------|-----------------------------|--|
| Wire diameter        | mm (in)     | 13.7 (0.539)                | 13.9 (0.547)                |  |
| Coil outer diameter  | mm (in)     | 171.9 - 174.9 (6.77 - 6.89) | 172.3 - 175.3 (6.78 - 6.90) |  |
| Free length          | mm (in)     | 390 (15.35)                 | 400 (15.75)                 |  |
| Identification color |             | Yellow x 2,<br>Yellow x 1   | Yellow x 2,<br>White x 1    |  |

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#### **STRUT**

| Applied model               | All       |
|-----------------------------|-----------|
| Piston rod diameter mm (in) | 22 (0.87) |

#### DRIVE SHAFT

|                               |                                     | 11 68 |
|-------------------------------|-------------------------------------|-------|
| Applied mode                  | All                                 | LC    |
| Joint type                    |                                     |       |
| Transaxle side                | DS90                                | EC    |
| Wheel side                    | ZF100                               |       |
| Boot length mm (in)           |                                     | FE    |
| Transaxle side L <sub>2</sub> | 97 - 99 (3.82 - 3.90)               |       |
| Wheel side L <sub>1</sub>     | 96 - 98 (3.78 - 3.86)               | C:L   |
| Grease                        | Nissan genuine grease or equivalent | .,,   |
| Capacity g (oz)               |                                     | MT    |
| Transaxle side                | 165 - 175 (5.82 - 6.17)             |       |
| Wheel side                    | 135 - 145 (4.76 - 5.11)             | AT    |
|                               |                                     |       |

#### FRONT STABILIZER BAR

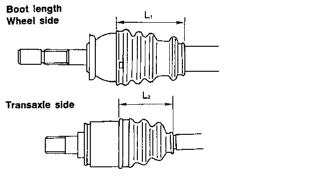
WHEELARCH HEIGHT (Unladen\*)

| A                    | plied model | All       |
|----------------------|-------------|-----------|
| Stabilizer diameter  | mm (in)     | 21 (0.83) |
| Identification color |             | White     |



| Applied model |         | *1          | *2          |
|---------------|---------|-------------|-------------|
| Front (Hf)    | mm (in) | 713 (28.07) | 713 (28.07) |
| Rear (Hr)     | mm (in) | 715 (28.15) | 713 (28.07) |

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



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**FA-25** 879

<sup>\*1:</sup> Models equipped with 205/65 R15 tires

<sup>\*2:</sup> Models equipped with 215/60 R15 tires

#### **SERVICE DATA AND SPECIFICATIONS (SDS)**

#### **Inspection and Adjustment**

#### WHEEL ALIGNMENT (Unladen\*1)

| Camber              |  |                                   | Minimum                   | -1°00' (-1.00°)     |
|---------------------|--|-----------------------------------|---------------------------|---------------------|
|                     |  | Nominal                           | -0°15′ (-0.25°)           |                     |
|                     |  | Degree minute                     | Maximum                   | 0°30′ (0.50°)       |
|                     |  | (Decimal degree)                  | Left and right difference | 45' (0.75°) or less |
| Caster              |  |                                   | Minimum                   | 2°00′ (2.00°)       |
|                     |  |                                   | Nominal                   | 2°45′ (2.75°)       |
|                     |  | Degree minute                     | Maximum                   | 3°30′ (3.50°)       |
|                     | ·                                      | (Decimal degree)                  | Left and right difference | 45' (0.75°) or less |
| Kingpin inclination | ·                                      |                                   | Minimum                   | 13°30′(13.50°)      |
|                     |  | Degree minute                     | Nominal                   | 14°15′ (14.25°)     |
|                     | Degree minute<br>(Decimal degree)      |                                   | Maximum                   | 15°00′ (15.00°)     |
| Total toe-in        |  | Minimum                           | 1 (0.04)                  |                     |
| Distance (A         | - B)                                   |                                   | Nominal                   | 2 (0.08)            |
| Distance (A         | Distance (A - B)<br>mm (in)            |                                   | Maximum                   | 3 (0.12)            |
|                     | Angle (left plus right)  Degree minute |                                   | Minimum                   | 5.5′ (0.09°)        |
| Angle (left p       |  |                                   | Nominal                   | 11' (0.18°)         |
| , Deg               |  | (Decimal degree)                  | Maximum                   | 16' (0.27°)         |
| Wheel turning angle |  | Minimum                           | 36°00′ (36.00°)           |                     |
|                     | Inside                                 |                                   | Nominal                   | 39°30′ (39.50°)     |
| Full turn*2         |  | Degree minute<br>(Decimal degree) | Maximum                   | 40°30′ (40.50°)     |
|                     | Outside                                | Degree minute<br>(Decimal degree) | Nominal                   | 32°00′ (32.00°)     |

<sup>\*1:</sup> Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.

#### WHEEL BEARING

| Wheel bearing axial end play limit mm (in)                    | 0.05 (0.0020)                  |  |
|---|--------------------------------|--|
| Wheel bearing lock nut tightening torque<br>N·m (kg-m, ft-lb) | 235 - 314 (24 - 32, 174 - 231) |  |

#### **LOWER BALL JOINT**

| Swinging force "A" (Measured at cotter pin hole) |                                    |
|--|------------------------------------|
| N (kg, lb)                                       | 7.8 - 77.5 (0.8 - 7.9, 1.8 - 17.4) |
| Turning torque "B" N·m (kg-cm, in-lb)            | 0.49 - 4.90 (5.0 - 50, 4.3 - 43.4) |
| Vertical end play limit "C" mm (in)              | 0 (0)                              |

#### WHEEL RUNOUT

Unit: mm (in)

| Wheel type                   | Aluminum wheel | Steel wheel |
|------------------------------|----------------|-------------|
| Maximum radiai runout limit  | 0.3 (0.012)    | 0.5 (0.020) |
| Maximum lateral runout limit | 0.3 (0.012)    | 0.8 (0.031) |

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<sup>\*2:</sup> On power steering models, wheel turning force (at circumference of steering wheel) of 98 to 147 N (10 to 15 kg, 22 to 33 lb) with engine idle.

## REAR AXLE & REAR SUSPENSION

## SECTION RA

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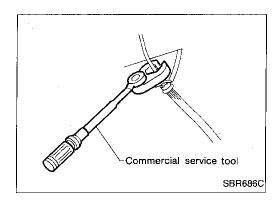
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#### PRECAUTIONS AND PREPARATION



#### **Precautions**

When installing each rubber part, final tightening must be carried out under unladen condition\* with tires on ground.
 \*: Fuel, radiator coolant and engine oil full. Spare tire,

jack, hand tools and mats in designated positions.

- Use flare nut wrench when removing or installing brake tubes.
- After installing removed suspension parts, check wheel alignment.
- Do not jack up at the trailing arm and lateral link.
- Always torque brake lines when installing.

#### **Preparation**

#### **SPECIAL SERVICE TOOLS**

| Tool number<br>(Kent-Moore No.)<br>Tool name | Description |   |
|--|-------------|---|
| HT71780000<br>( — )<br>Spring compressor     | NT144       | Removing and installing coil spring   |
| ST35652000<br>( — )<br>Strut attachment      | NT145       | Fixing strut assembly   |
| ST15310000<br>( — )<br>Drift                 | NT607 d c   | a: 84 mm (3.31 in) dia.<br>b: 96 mm (3.78 in) dia.<br>c: 8 mm (0.31 in)<br>d: 20 mm (0.79 in) |

#### **COMMERCIAL SERVICE TOOLS**

| Tool name   | Description |  |
|---|-------------|--|
| <ol> <li>Flare nut crowfoot</li> <li>Torque wrench</li> </ol> |             | Removing and installing brake piping               |
|   | NT360       | a: 10 mm (0.39 in)                                 |
| Drift   | NT371       | a: 75 mm (2.95 in) dia.<br>b: 62 mm (2.44 in) dia. |

98 - 118 (10 - 12, 72 - 87) -

#### SEC. 431

When installing each rubber part, final tightening must be carried out under unladen condition\* with tires on ground.

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







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(1.6 - 1.9, 12 - 14)



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1 Shock absorber cap

: N•m (kg-m, ft-lb)

- ② Shock absorber mounting seal
- 3 Coil spring

- (4) Shock absorber
- (5) Torsion beam

6 Lateral link

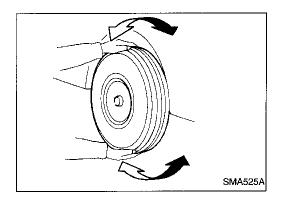
🐼 🏳 98 - 118 (10 - 12, 72 - 87)

Control rod

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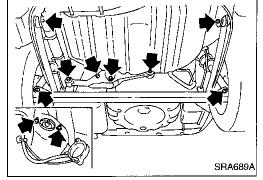
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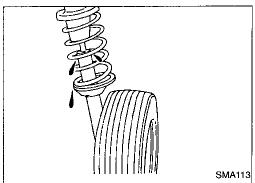
#### Rear Axle and Rear Suspension Parts

Check axle and suspension parts for excessive play, wear or damage.

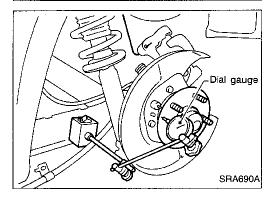
Shake each rear wheel to check for excessive play.



Retighten all nuts and bolts to the specified torque.
 Tightening torque:
 Refer to REAR SUSPENSION (RA-9).



- Check shock absorber for oil leakage or other damage.
- Check wheelarch height. Refer to FA section.



#### **Rear Wheel Bearing**

• Check axial end play.

Axial end play:

0.05 mm (0.0020 in) or less

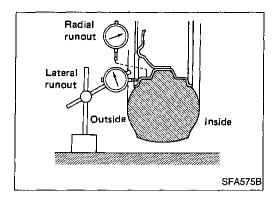
- Check that wheel hub bearings operate smoothly.
- Check tightening torque of wheel bearing lock nut.

(C): 186 - 255 N·m

(19 - 26 kg-m, 137 - 188 ft-lb)

 Replace wheel bearing assembly if there is axial end play or wheel bearing does not turn smoothly. Refer to REAR AXLE — Wheel Hub (RA-6).

**RA-4** 884



#### Rear Wheel Alignment

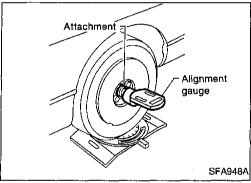
#### PRELIMINARY INSPECTION

Make following checks. Adjust, repair or replace if necessary.

- Check tires for wear and for proper inflation.
- Check rear wheel bearings for excessive play.
- Check wheel runout.

#### Wheel runout: Refer to SDS in FA section.

- Check that rear shock absorber works properly.
- Check rear axle and rear suspension parts for excessive play.
- Check vehicle posture (Unladen\*).
  - Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.





Camber is preset at factory and cannot be adjusted.

Camber:

Refer to SDS (RA-13).

If the camber is not within specification, inspect and replace any damaged or worn rear suspension parts.

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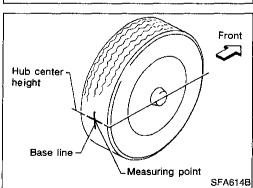
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## Lines parallel to center line of body Total toe-in = A - B SFA234AC

#### TOE-IN

Toe-in is preset at factory and cannot be adjusted. Measure toe-in using following procedure. If out of specification, inspect and replace any damaged or worn rear suspension parts.

**WARNING:** 

- Always perform the following procedure on a flat surface.
- Make sure that no person is in front of the vehicle before pushing it.
- Bounce rear of vehicle up and down to stabilize the posture.
- Push the vehicle straight ahead about 5 m (16 ft). 2.
- Put a mark on base line of the tread (rear side) of both tires at the same height as hub center. This mark is to be a measurina point.
- 4. Measure distance "A" (rear side).
- Push the vehicle slowly ahead to turn the wheels around 180 degrees (1/2 turn).

If the wheels have rotated more than 180 degrees (1/2 turn), try the above procedure again from the beginning. Never push vehicle backward.

Measure distance "B" (front side).

Total toe-in:

Refer to SDS (RA-13).

RA-5

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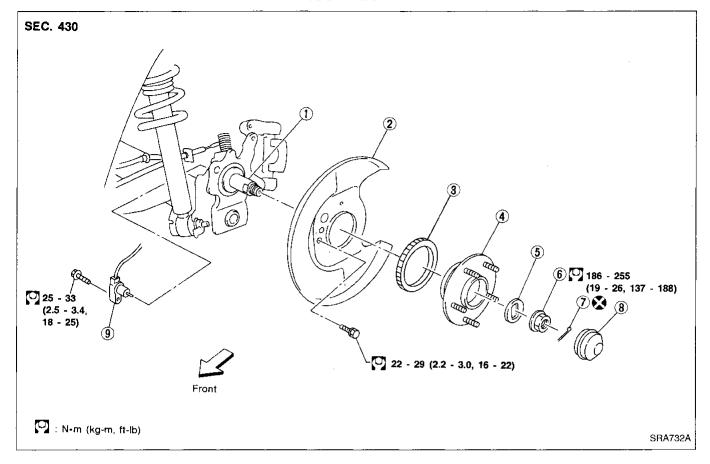
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#### Wheel Hub



- (1) Spindle
- (2) Baffle plate
- 3 ABS sensor rotor

- (4) Wheel hub bearing
- Washer
- 6 Wheel bearing lock nut
- (7) Cotter pin
- (8) Hub cap
- ABS sensor

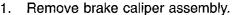
#### REMOVAL

#### **CAUTION:**

- Before removing the rear wheel hub assembly, disconnect the ABS wheel sensor from the assembly. Then move it away from the hub assembly. Failure to do so may result in damage to the sensor wires and the sensor becoming inoperative.
- Wheel hub bearing 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.

#### **REAR AXLE**

#### Wheel Hub (Cont'd)



- Remove wheel bearing lock nut.
- Remove brake rotor.
- Remove wheel hub bearing from spindle.

Brake hose does not need to be disconnected from brake

Suspend caliper assembly with wire so as not to stretch brake hose.

Be careful not to depress brake pedal, or piston will pop out.

Make sure brake hose is not twisted.

#### INSTALLATION

With vehicles equipped with ABS, press-fit ABS sensor rotor into wheel hub bearing using a drift.

Press-fit ABS sensor rotor as far as the location shown in fig-

ure at left.

Install wheel hub bearing.

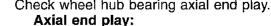
Tighten wheel bearing lock nut. Before tightening, apply oil to threaded portion of rear spindle and both sides of plain washer.

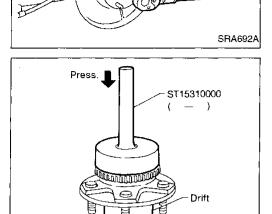
(I): 186 - 255 N·m (19 - 26 kg-m, 137 - 188 ft-lb)

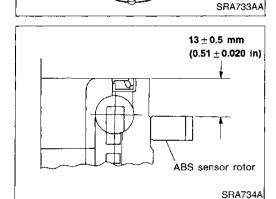
Check that wheel bearings operate smoothly.

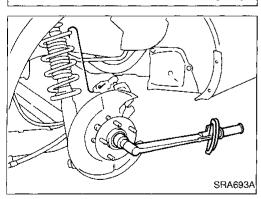
Check wheel hub bearing axial end play.

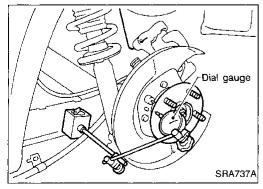
0.05 mm (0.0020 in) or less













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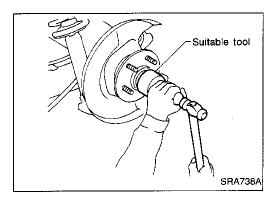
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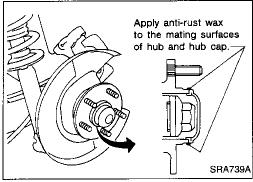
#### **REAR AXLE**

#### Wheel Hub (Cont'd)

• Install hub cap using a suitable tool.

Do not reuse hub cap. When installing, replace it with a new



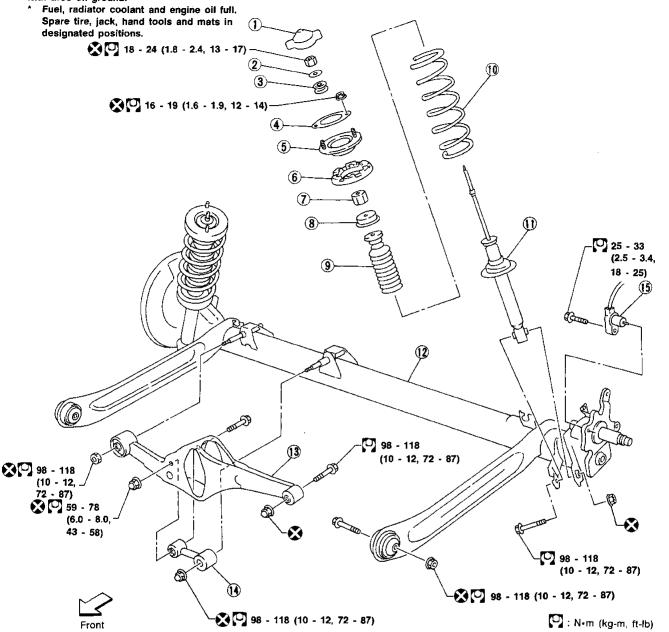


Apply anti-rust wax to the mating surfaces of hub and hub cap.

**RA-8** 

SEC. 431

When installing each rubber part, final tightening must be carried out under unladen condition\* with tires on ground.



SRA694A

- Shock absorber cap
- 2 Washer
- 3 Bushing
- Shock absorber mounting seal
- Shock absorber mounting bracket
- 6 Upper spring seat rubber
- Bushing
- 8 Bound bumper cover
- 9 Bound bumper
- Coil spring

- 1) Shock absorber
- 12 Torsion beam
- 13 Lateral link
- (4) Control rod
- (15) ABS sensor

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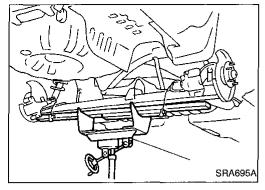
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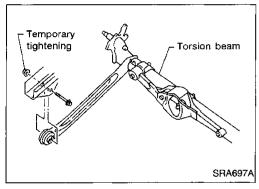
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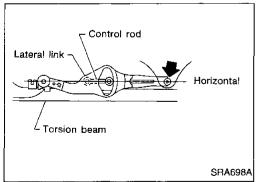
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#### **REAR SUSPENSION**



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#### Removal and Installation

#### **CAUTION:**

Before removing the rear suspension assembly, disconnect the ABS wheel sensor from the assembly. Failure to do so may result in damage to the sensor wires and the sensor becoming inoperative.

#### REMOVAL

1. Disconnect parking brake cable from caliper and remove brake caliper 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. Make sure brake hose is not twisted.

- Using a transmission jack, raise torsion beam a little, and remove nuts and bolts from the trailing arm, shock absorber assembly (lower side) and lateral link.
- 3. Lower transmission jack, and remove suspension.
- 4. Remove luggage compartment trim. Refer to BT section.
- Remove shock absorber securing nuts (upper side). Then pull out shock absorber assembly.

#### INSTALLATION

1. Attach torsion beam, at trailing arm and lateral link, to vehicle. Do not tighten bolts at this time.

- Using a transmission jack, place lateral link and control rod horizontally against torsion beam. Tighten lateral link on vehicle.
- 3. Attach shock absorber assembly to vehicle. Then tighten the lower side of shock absorber assembly.
- Lower torsion beam to fully extended position. Remove transmission jack and tighten torsion beam, at trailing arm, to specified torque. Refer to RA-9.

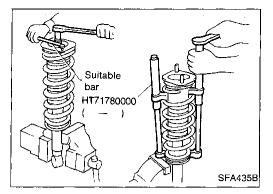
## Coil Spring and Shock Absorber REMOVAL

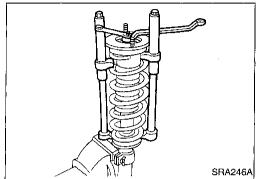
Remove shock absorber upper and lower fixing nuts.

Do not remove piston rod lock nut on vehicle.

**RA-10** 890

#### **REAR SUSPENSION**





## Coil Spring and Shock Absorber (Cont'd) DISASSEMBLY

 Set shock absorber in vise with attachment, then loosen piston rod lock nut.

Do not remove piston rod lock nut at this time.

2. Compress spring with Tool so that the shock absorber upper spring seat can be turned by hand.

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Remove piston rod lock nut.

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#### INSPECTION

#### Shock absorber assembly

Check for smooth operation through a full stroke, both compression and extension.

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Check for oil leakage on welded or gland packing portions.

Check piston rod for cracks, deformation or other damage.
 Replace if necessary.

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#### Upper rubber seat and bushing

Check rubber parts for deterioration or cracks. Replace if necessary.

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#### Coil spring

Check for cracks, deformation or other damage. Replace if necessary.

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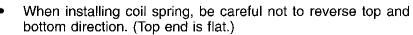
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#### **ASSEMBLY**

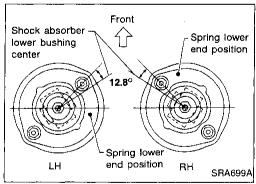
Locate upper spring seat as shown.

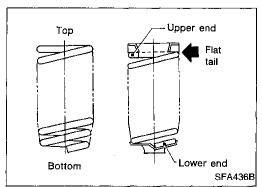
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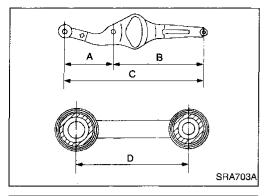


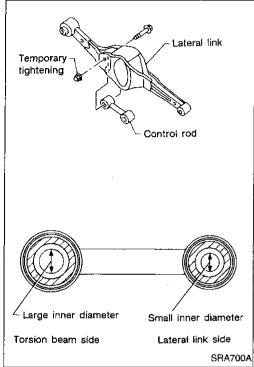
When installing coil spring on shock absorber, it must be positioned as shown in figure at left.

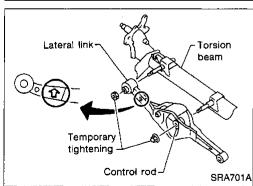


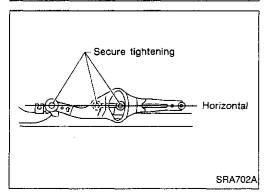


#### **REAR SUSPENSION**









## Torsion Beam, Lateral Link and Control Rod DISASSEMBLY

- Remove torsion beam assembly. Refer to Removal and Installation in REAR SUSPENSION (RA-10).
- Remove lateral link and control rod from torsion beam.

#### INSPECTION

Check for cracks, distorsion or other damage. Replace if necessary.

Standard length:

A 207 - 208 mm (8.15 - 8.19 in)

B 394 - 395 mm (15.51 - 15.55 in)

C 601 - 603 mm (23.66 - 23.74 in)

D 106 - 108 mm (4.17 - 4.25 in)

Check all rubber parts for wear, cracks or deformation.
 Replace if necessary.

#### **ASSEMBLY**

- Temporarily assemble lateral link and control rod.
- When installing the control rod, connect the end with the smaller inner diameter to the lateral link.

- 2. Temporarily install lateral link and control rod on torsion beam.
- Install lateral link with the arrow upward.

- Ensure lateral link and control rod are horizontal against torsion beam, and tighten to the specified torque. Refer to RA-9.
- 4. Install torsion beam assembly. Refer to Removal and Installation in REAR SUSPENSION (RA-10).

#### **SERVICE DATA AND SPECIFICATIONS (SDS)**

## General Specifications SHOCK ABSORBER OR STRUT

#### **COIL SPRING**

| Applied model     |         | Except SE                       | SE                                |
|-------------------|---------|---------------------------------|-----------------------------------|
| Wire diameter     | mm (in) | 11.9 (0.469)                    | 12.1 (0.476)                      |
| Coil diameter     | mm (in) | 90.9 - 100.5<br>(3.579 - 3.957) | 91.1 - 100.7<br>(3.587 - 3.965)   |
| Free length       | mm (în) | 320 (12.60)                     | 310 (12.20)                       |
| Identification co | olor    |                                 |                                   |
| RH                |         | Yellow x 1,<br>Gray x 1         | Yellow x 1,<br>Gray x 1, Blue x 1 |
| LH                |         | Blue x 1, Gray x 1              | Blue x 1, Gray x 1,<br>Blue x 1   |

| Strut type   |         | Double-acting hydraulic |
|--------------|---------|-------------------------|
| Piston rod   |         |                         |
| Rod diameter | mm (in) | 12.5 (0.492)            |

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## Inspection and Adjustment WHEEL BEARING

#### WHEEL ALIGNMENT (Unladen\*)

| Minimum | -1°45′ (-1.75°)   |
|---------|---|
| Nominal | -1°00′ (-1.00°)   |
| Maximum | -0°15′ (-0.25°)   |
| Minimum | -3 (-0.12)  |
| Nominal | 1 (0.04)  |
| Maximum | 5 (0.20)  |
| Minimum | -16' (0.27°)  |
| Nominal | 5.5′ (0.09°)  |
| Maximum | 26′ (0.43°)   |
|         | Nominal Maximum Minimum Nominal Maximum Minimum Nominal |

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

| Wheel bearing axial end play mm (in)                       | 0.05 (0.0020)                     |
|--|-----------------------------------|
| Wheel bearing lock nut tightening torque N·m (kg-m, ft-lb) | 186 - 255<br>(19 - 26, 137 - 188) |

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# SECTION BR

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## **CONTENTS** (Cont'd)

| CONTENT   | (Cont'd)  |
|---|---|
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| When you read witing diagrams.  | EM <sup>*</sup>   |
| <ul> <li>When you read wiring diagrams:</li> <li>Read GI section, "HOW TO READ WIRING DI</li> <li>See EL section, "POWER SUPPLY ROUTING When you perform trouble diagnoses, read GI sections."</li> </ul> | " for power distribution circuit.                             |
| IN TROUBLE DIAGNOSES" and "HOW TO PELECTRICAL INCIDENT".  | RFORM EFFICIENT DIAGNOSIS FOR AN                              |
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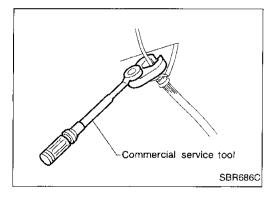
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## Supplemental Restraint System (SRS) "AIR BAG"

The Supplemental Restraint System "Air Bag", used along with a seat belt, helps 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 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.
- Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses are covered with yellow insulation either just before the harness connectors or for the complete harness, for easy identification.



#### **Precautions**

- Recommended fluid is brake fluid "DOT 3".
- Never reuse drained brake fluid.
- Be careful not to splash brake fluid on painted areas.
- To clean or wash all parts of master cylinder, disc brake caliper and wheel cylinder, use clean brake fluid.
- Never use mineral oils such as gasoline or kerosene. They will ruin rubber parts of the hydraulic system.
- Use flare nut wrench when removing and installing brake tube.
- Always torque brake lines when installing.

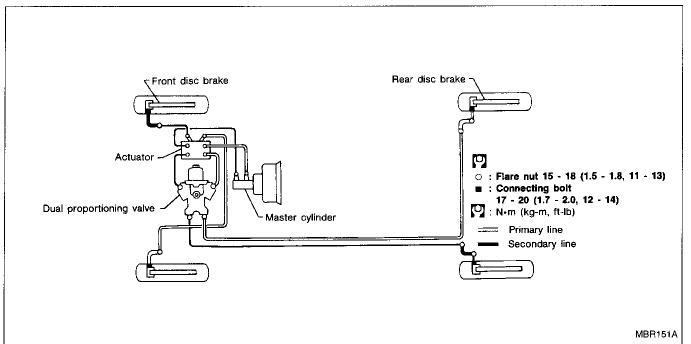
#### WARNING.

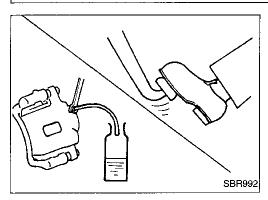
 Clean brake pads and shoes with a waste cloth, then wipe with a dust collector.

#### **Commercial Service Tools**

| Tool name                            | Description |   |
|--------------------------------------|-------------|---|
| Flare nut crowfoot     Torque wrench |             | Removing and installing each brake piping |
|                                      | NT360       | a: 10 mm (0.39 in)                        |
| Brake fluid pressure gauge           | NT151       | Measuring brake fluid pressure            |

#### **Brake Hydraulic Line**





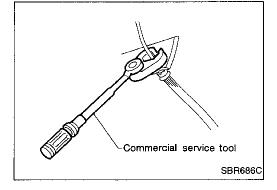
#### **REMOVAL**

#### 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.
- All hoses must be free from excessive bending, twisting and pulling.
- Connect vinyl tube to air bleeder valve.
- Drain brake fluid from each air bleeder valve by depressing brake pedal.
- Remove flare nut connecting brake tube and hose, then with-3. draw lock spring.
- 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.



#### INSTALLATION

#### **CAUTION:**

- Refill with new brake fluid "DOT 3".
- 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)

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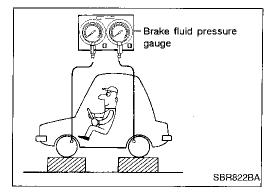
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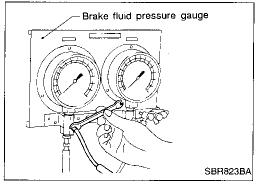
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#### BRAKE HYDRAULIC LINE/CONTROL VALVE

#### **Brake Hydraulic Line (Cont'd)**

- 2. Refill until new brake fluid comes out of each air bleeder valve.
- 3. Bleed air. Refer to "Bleeding Brake System" (BR-5).





## **Dual Proportioning Valve INSPECTION**

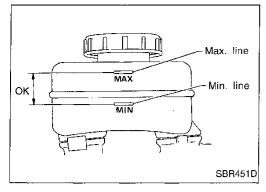
#### **CAUTION:**

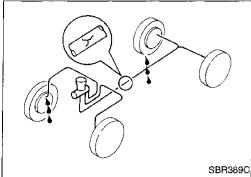
- Carefully monitor brake fluid level at master cylinder.
- Use new brake fluid "DOT 3".
- Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on paint areas, wash it away with water immediately.
- 1. Connect Tool to air bleeders of front and rear brakes on either LH and RH side.
- 2. Bleed air from the Tool.
- 3. Check fluid pressure by depressing brake pedal.

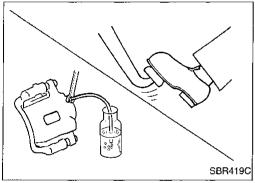
Unit: kPa (kg/cm<sup>2</sup>, psi)

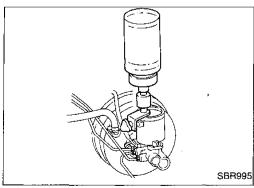
| Applied pressure (Front brake) | 5,394 (55, 782)                       |
|--------------------------------|---------------------------------------|
| Output pressure (Rear brake)   | 2,452 - 2,844<br>(25 - 29, 356 - 412) |

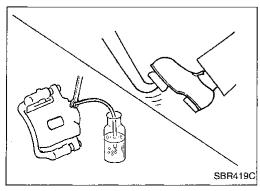
4. Bleed air after disconnecting the Tool. Refer to "Bleeding Brake System" (BR-5).











#### 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.
- Release parking brake lever and see if brake warning lamp goes off. If not, check brake system for leaks.

#### Checking Brake Line

#### **CAUTION:**

If leakage occurs around joints, retighten or, if necessary, replace damaged parts.

- Check brake lines (tubes and hoses) for cracks, deterioration or other damage. Replace any damaged parts.
- Check for oil leakage by fully depressing brake pedal while engine is running.

#### Changing Brake Fluid

#### **CAUTION:**

- Refill with new brake fluid "DOT 3".
- 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.
- Clean inside of reservoir tank, and refill with new brake fluid.
- 2. Connect a vinyl tube to each air bleeder valve.
- Drain brake fluid from each air bleeder valve by depressing brake pedal.
- 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" (BR-5).

#### Bleeding Brake System

#### **CAUTION:**

- Carefully monitor brake fluid level at master cylinder during bleeding operation.
- Fill reservoir with new brake fluid "DOT 3". Make sure it is full at all times while bleeding air out of system.
- Place a container under master cylinder to avoid spillage of brake fluid.
- For models with ABS, turn ignition switch OFF and disconnect ABS actuator connectors or battery ground cable.
- Bleed air in the following order. Right rear brake  $\rightarrow$  Left front brake  $\rightarrow$  Left rear brake  $\rightarrow$  Right 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.
- 4. Close air bleeder valve.
- Release brake pedal slowly. 5.
- Repeat steps 2, through 5, until clear brake fluid comes out of air bleeder valve.

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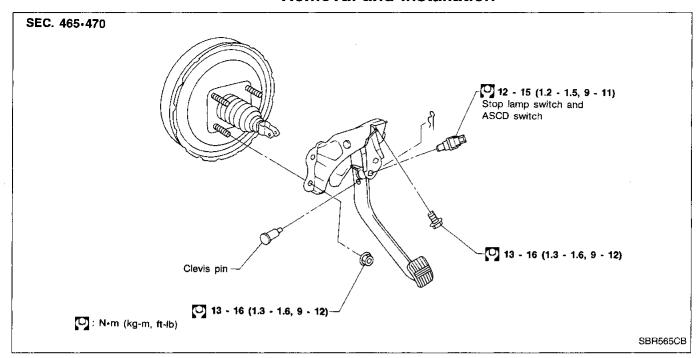
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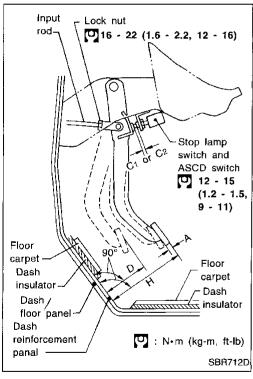
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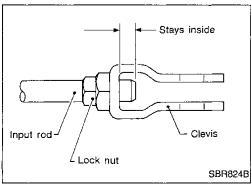
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#### Removal and Installation







#### 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-64).

D: Depressed height

Refer to SDS. (BR-64).

Under force of 490 N (50 kg, 110 lb)

with engine running

C<sub>1</sub>, C<sub>2</sub>: Clearance between pedal stopper and

threaded end of stop lamp switch and ASCD switch

WILCH

0.3 - 1.0 mm (0.012 - 0.039 in)

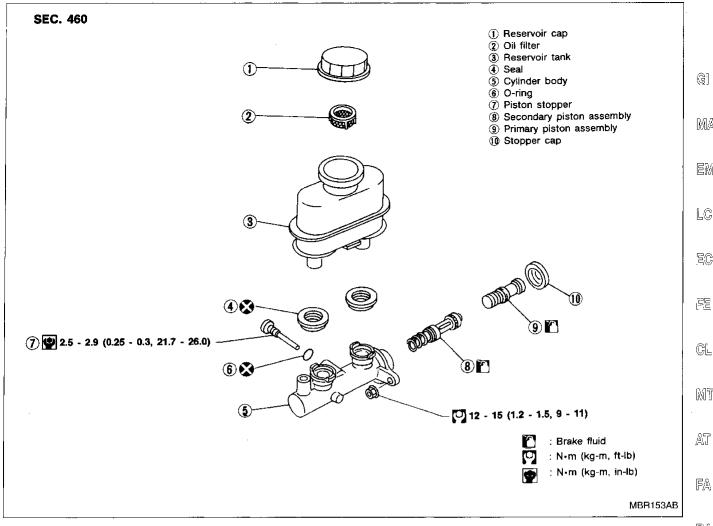
A: Pedal free play

1 - 3 mm (0.04 - 0.12 in)

- Loosen lock nut and adjust pedal free height by turning brake booster input rod. Then tighten lock nut.
- Check pedal free play.

#### Make sure that stop lamps go off when pedal is released.

Check brake pedal's depressed height while engine is running.
If lower than specification, check brake system for leaks, accumulation of air or any damage to components (master cylinder, wheel cylinder, etc.); then make necessary repairs.



#### Removal

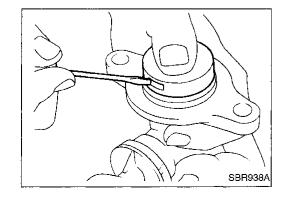
#### CAUTION:

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.
- Drain brake fluid from each air bleeder valve, depressing brake pedal to empty fluid from master cylinder.
- Remove brake pipe flare nuts.
- Remove master cylinder mounting nuts.

#### Disassembly

Bend claws of stopper cap outward.



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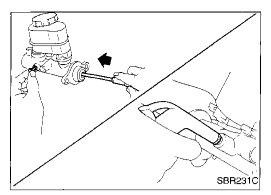
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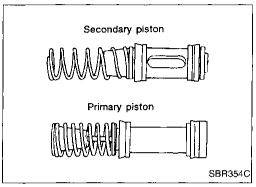
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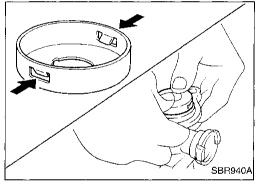
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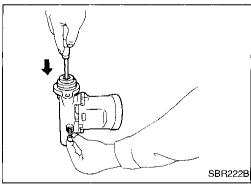
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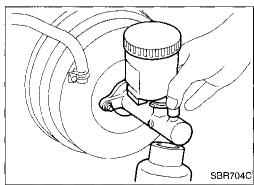
#### **MASTER CYLINDER**











#### 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**

- 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 into cylinder body.
- 4. Push reservoir tank into cylinder body.

5. Install valve stopper while piston is pushed into cylinder.

#### Installation

#### **CAUTION:**

- Refill with new brake fluid "DOT 3".
- 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)

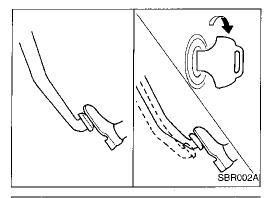
- 3. Fill up reservoir tank with new brake fluid.
- 4. Plug all ports on master cylinder with fingers to prevent air suction while releasing brake pedal.
- Have driver depress brake pedal slowly several times until no air comes out of master cylinder.
- 6. Fit brake lines to master cylinder.
- 7. Tighten flare nuts.

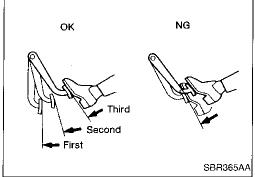
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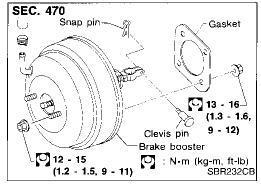
ັເວງ: 15 - 18 N⋅m (1.5 - 1.8 kg-m, 11 - 13 ft-lb)

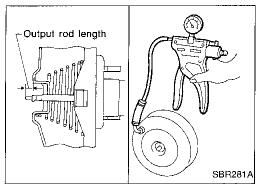
B. Bleed air from brake system. Refer to "Bleeding Brake System" (BR-5).

#### **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 (-500 mmHg, -19.69 inHg) to brake booster with a handy vacuum pump.
- 2. Check output rod length.

#### Specified length:

10.275 - 10.525 mm (0.4045 - 0.4144 in)

#### **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 "DOT 3".
- Never reuse drained brake fluid.
- Take care not to damage brake booster mounting bolt thread when installing. Due to the acute angle of installation, the threads can be damaged with the dash panel.

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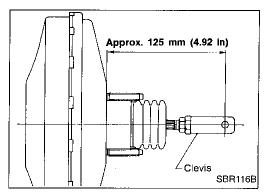
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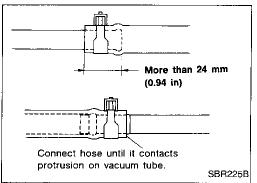
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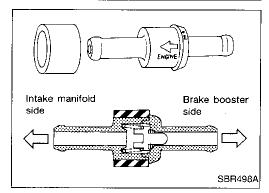
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#### **BRAKE BOOSTER/VACUUM HOSE**







#### Brake Booster (Cont'd)

- 1. Before fitting booster, temporarily adjust clevis to dimension shown.
- 2. Fit booster, then secure mounting nuts (brake pedal bracket to master cylinder) 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 "MASTÉR CYLINDER" (BR-8).
- 6. Bleed air. Refer to "Bleeding Brake System" (BR-5).

#### Vacuum Hose

#### **REMOVAL AND INSTALLATION**

#### **CAUTION:**

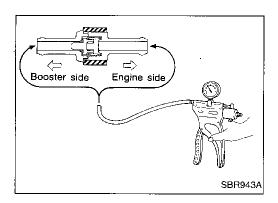
When installing vacuum hoses, pay attention to the following points.

- 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. |

## **Pad Replacement**

#### **WARNING:**

Clean brake pads with a vacuum dust collector to minimize the hazard of airborne particles or other materials.

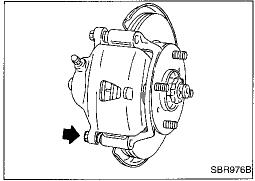
#### **CAUTION:**

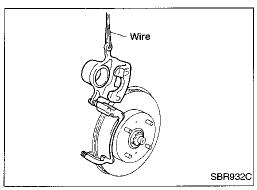
When cylinder body is open, do not depress brake pedal because piston will pop out.

Be careful not to damage piston boot or get oil on rotor. Always replace shims when replacing pads.

If shims are rusted or show peeling of the 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.

Remove pin bolt.

Open cylinder body upward. Then remove pad with retainers, inner and outer shims.

Standard pad thickness:

11 mm (0.43 in)

Pad wear limit:

2.0 mm (0.079 in)

Carefully monitor brake fluid level because brake fluid will return to reservoir when pushing back piston.

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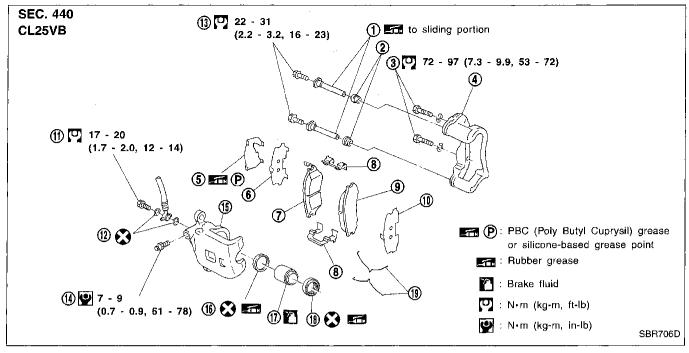
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# FRONT DISC BRAKE



- Main pin
- 2 Pin boot
- 3 Torque member fixing bolt
- (4) Torque member
- Shim cover
- 6 Inner shim
- 7 Inner pad

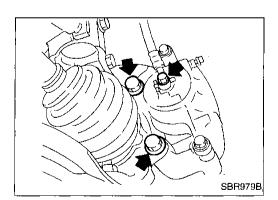
- (8) Pad retainer
- (9) Outer pad
- (10) Outer shim
- (1) Connecting bolt
- (12) Copper washer
- (13) Main pin bolt

- Bleed valve
- (15) Cylinder body
- (16) Piston seal
- (17) Piston
- (18) Piston boot
- Pad return spring

### Removal

### **WARNING:**

Clean brake pads with a vacuum dust collector to minimize the hazard of airborne particles or other materials.



Remove torque member fixing bolts and connecting bolt.

It is not necessary to remove connecting bolt except for disassembly or replacement of caliper assembly. In this case, suspend caliper assembly with wire so as not to stretch brake hose.

# Disassembly

#### **WARNING:**

Do not place your fingers in front of piston.

#### CAUTION:

Do not scratch or score cylinder wall.

- 1. Push out piston with piston boot with compressed air.
- 2. Remove piston seal with a suitable tool.

# Inspection — Caliper

### **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.

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### **CAUTION:**

Use brake fluid to clean. Never use mineral oil.

### PISTON

### **CAUTION:**

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Piston sliding surface is plated. Do not polish with emery paper even if rust or foreign materials are stuck to sliding

Check piston for score, rust, wear, damage or presence of foreign materials. Replace if any of the above conditions are observed.

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### SLIDE PIN, PIN BOLT AND PIN BOOT

Check for wear, cracks or other damage. Replace if any of the above conditions are observed.

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# Inspection — Rotor

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# **RUBBING SURFACE**

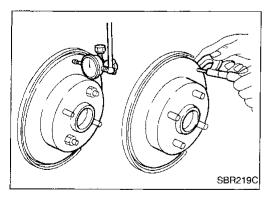
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Check rotor for roughness, cracks or chips.

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#### RUNOUT

- Secure rotor to wheel hub with at least two nuts (M12 x 1.25).
- 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.

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#### Maximum runout:

0.08 mm (0.0031 in)

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.

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- 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 IDX equivalent).

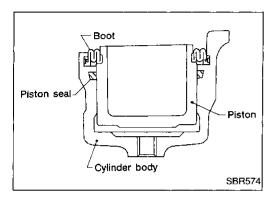
### FRONT DISC BRAKE

# Inspection — Rotor (Cont'd) THICKNESS

Thickness variation (At least 8 positions): Maximum 0.01 mm (0.0004 in)

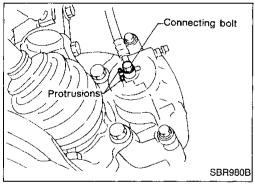
If thickness variation exceeds the specification, turn rotor with oncar brake lathe.

Rotor repair limit: 20.0 mm (0.787 in)



# **Assembly**

- 1. Insert piston seal into groove on cylinder body.
- 2. With piston boot fitted to piston, insert piston boot into groove on cylinder body and install piston.
- 3. Properly secure piston boot.



### Installation

### **CAUTION:**

- Refill with new brake fluid "DOT 3".
- · Never reuse drained brake fluid.
- 1. Install brake hose to caliper securely.
- 2. Install all parts and secure all bolts.
- 3. Bleed air. Refer to "Bleeding Brake System" (BR-5).

## 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.

Remove master cylinder reservoir cap.

Remove brake cable mounting bolt and lock spring.

Release parking brake control lever, then disconnect cable from the caliper.

4. Remove upper pin bolt.

5. Open cylinder body downward. Then remove pad retainers, and inner and outer shims.

Standard pad thickness:

10 mm (0.39 in)

Pad wear limit:

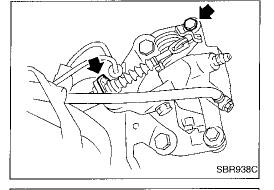
1.5 mm (0.059 in)

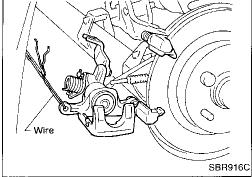
Carefully monitor brake fluid level because brake fluid will return to reservoir when pushing back piston.

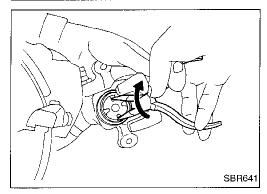
When installing new pads, push piston into cylinder body by

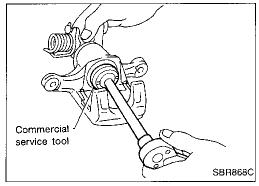
gently turning piston clockwise, as shown.













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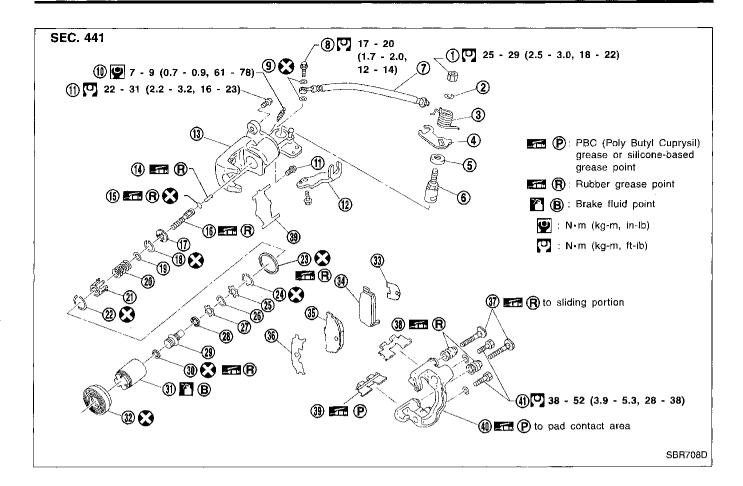
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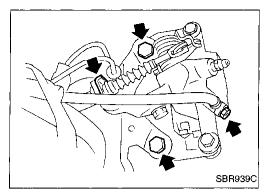
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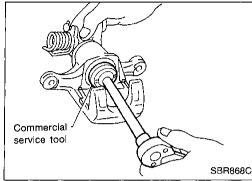


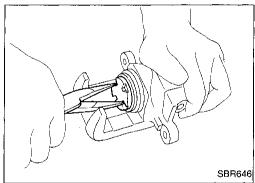
- ① Nut
- Washer
- 3 Return spring
- Parking brake lever
- **(5)** Cam boot
- **(6)** Cam
- 7 Brake hose
- (8) Connecting bolt
- (9) Copper washer
- 10 Bleed screw
- 11) Pin bolt
- (2) Cable mounting bracket
- (13) Cylinder
- (14) Strut

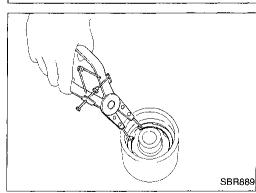
- 15 O-ring
- Push rod
- Key plate
- Ring C
- Seat
- 20) Spring
- 21 Spring cover
- 22 Ring B
- Piston seal
- Ring A
- Spacer
- Wave washer
- Spacer
- Ball bearing

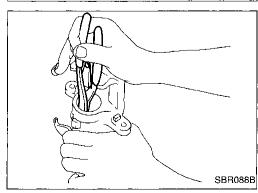
- Adjusting nut
- Cup
- Piston
- Dust seal Inner shim
- (34) Inner pad Outer pad 35
- Outer shim
- Pin
- 38 Pin boot
- Pad retainer
- (40) Torque member
- 41 Torque member fixing bolt











### Removal

### **WARNING:**

Clean brake pads with a vacuum dust collector to minimize the hazard of airborne particles or other materials.

- Remove brake cable mounting bolt and lock spring.
- 2. Release parking brake control lever, then disconnect cable from the caliper.
- 3. Remove torque member fixing bolts and connecting bolt.

It is not necessary to remove connecting bolt except for disassembly or replacement of caliper assembly. In this case, suspend caliper assembly with wire so as not to stretch brake hose.



1. Remove piston by turning it counterclockwise with suitable commercial service tool or long nose pliers.

SBR646

. Disassemble cylinder body.

adjusting nut.

 a. Pry off ring B with suitable pliers, then remove spring cover, spring and seat.

Pry off ring A from piston with suitable pliers and remove

b. Pry off ring C, then remove key plate, push rod and rod.

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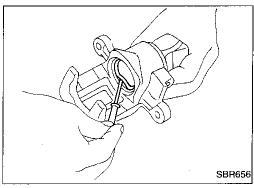
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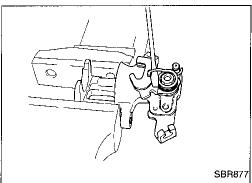
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# Disassembly (Cont'd)

c. Remove piston seal.

Be careful not to damage cylinder body.





4. Remove return spring, nut and 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.

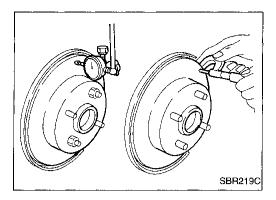
Replace if any of the above conditions are observed.

### **PIN AND PIN BOOT**

Check for wear, cracks or other damage.

Replace if any of the above conditions are observed.

BR-18 912



# Inspection — Rotor

### **RUBBING SURFACE**

Check rotor for roughness, cracks or chips.

### RUNOUT

Secure rotor to wheel hub with two nuts (M12 x 1.25). 1.

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 sec-

3. Change relative positions of rotor and wheel hub so that runout is minimized.

> **Maximum runout:** 0.15 mm (0.0059 in)

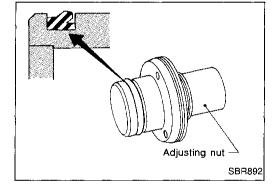
### **THICKNESS**

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.

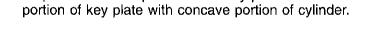


Concave portion

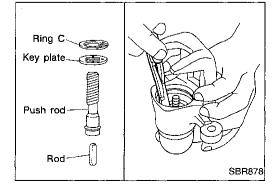
Convex portion

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Fit push rod into square hole in key plate. Also match convex portion of key plate with concave portion of cylinder.



Install ring C with a suitable tool.



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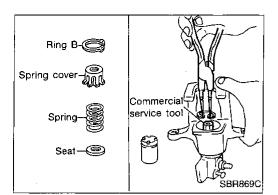
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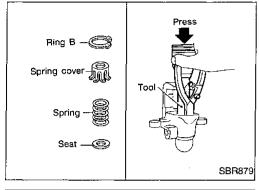
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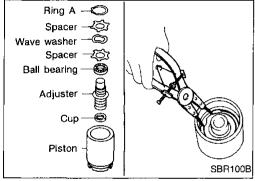
# Assembly (Cont'd)



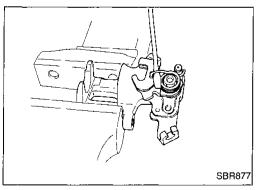
4. Install seat, spring, spring cover and ring B with suitable press and drift.



Install cup, adjuster, bearing, spacers, washers and ring A with a suitable tool.



- Fit lever and tighten nut.
- 7. Fit return spring in the order shown.



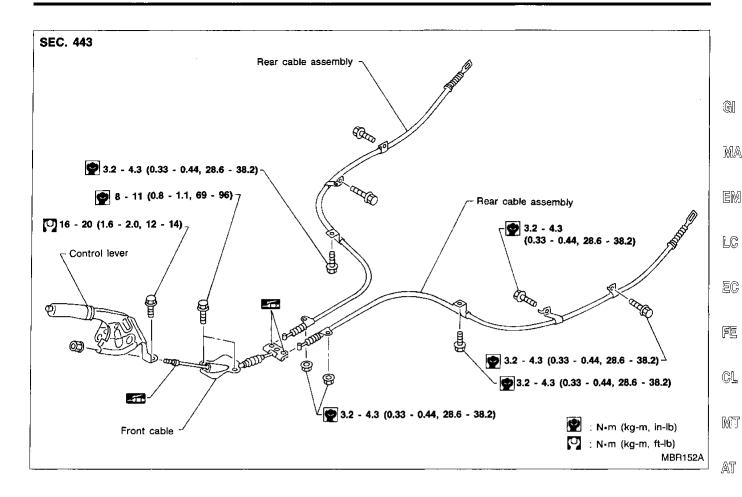
### Installation

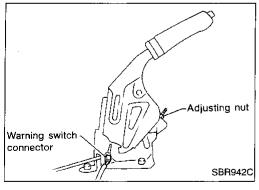
### **CAUTION:**

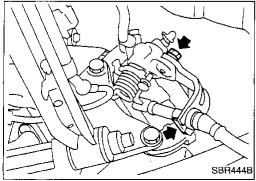
- · Refill with new brake fluid "DOT 3".
- Never reuse drained brake fluid.
- 1. Install brake hose to caliper securely.
- Install all parts and secure all bolts.
- 3. Bleed air. Refer to "Bleeding Brake System" (BR-5).

**BR-20** 914

# PARKING BRAKE CONTROL







### Removal and Installation

- 1. To remove parking brake cable, first remove center console.
- 2. Disconnect warning switch connector.
- 3. Remove bolts, slacken off and remove adjusting nut.

Remove parking brake cable lock plate.

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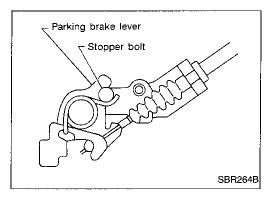
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### Inspection

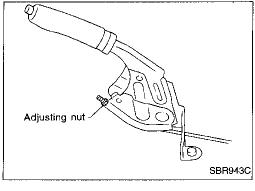
- 1. Check control lever for wear or other damage. Replace if necessary.
- 2. Check wires for discontinuity or deterioration. Replace if necessary.
- 3. Check warning lamp and switch. Replace if necessary.
- 4. Check parts at each connecting portion and, if found deformed or damaged, replace.



# **Adjustment**

### Pay attention to the following points after adjustment.

- a. There is no drag when control lever is being released.
- b. Parking brake lever returns to stopper bolt when control lever for rear disc brake models is released.



1. Loosen parking brake cable.

2. Depress brake pedal fully more than 5 times.

- 3. Operate control lever 10 times or more with a full stroke (213 mm).
- 4. Adjust control lever by turning adjusting nut.
- 5. Pull control lever with specified amount of force. Check lever stroke and ensure smooth operation.

Number of notches: 10 - 11 [196 N (20 kg, 44 lb)]

6. Bend warning lamp switchplate. Warning lamp should come on when lever is pulled "A" notches. It should go off when the lever is fully released.

Number of "A" notches: 1

# **Purpose**

The ABS consists of electronic and hydraulic components. It allows for control of braking force so that locking of the wheels can be avoided.

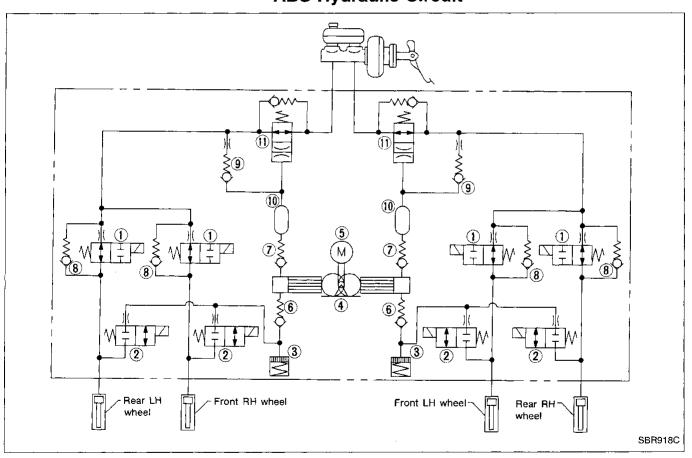
#### The ABS:

- 1) Ensures proper tracking performance through steering wheel operation.
- 2) Enables obstacles to be avoided through steering wheel operation.
- 3) Ensures vehicle stability by preventing flat spins.

# Operation

- When the vehicle speed is less than 10 km/h (6 MPH) this system does not work.
- The Anti-Lock Brake System (ABS) has self-test capabilities. The system turns on the ABS warning lamp for 1 second after turning the ignition switch ON. The system performs another test the first time the vehicle reaches 6 km/h (4 MPH). A mechanical noise may be heard as the ABS performs a self-test. This is a normal part of the self-test feature. If a malfunction is found during this check, the ABS warning lamp will come on.
- During ABS operation, a mechanical noise may be heard. This is a normal condition.

# **ABS Hydraulic Circuit**



- 1) Inlet solenoid valve
- Outlet solenoid valve
- 3 Reservoir
- 4 Pump

- Motor
- 6 Inlet valve
- (7) Outlet valve
- 8 Bypass check valve

- 9) Check valve
- (10) Damper
- (1) Gradient switch

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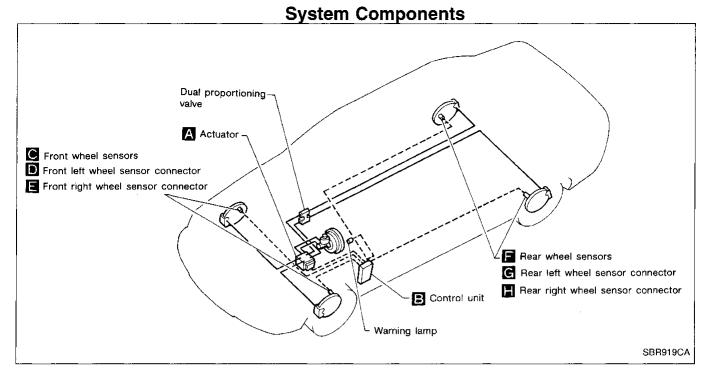
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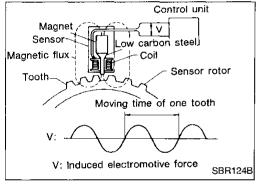
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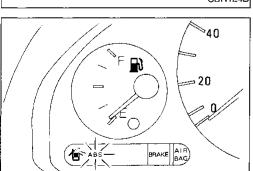
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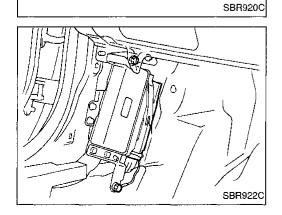
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# **System Description**

### **SENSOR**

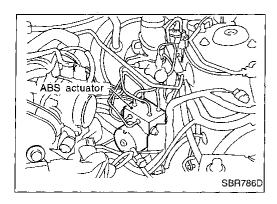
The sensor unit consists of a gear-shaped sensor rotor and a sensor element. The element contains a bar magnet around which a coil is wound. The sensor is installed on the back side of the brake rotor. Sine-wave current is generated by the sensor as the wheel rotates. The frequency and voltage increase(s) 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 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.

**BR-24** 918

# **ANTI-LOCK BRAKE SYSTEM**



# System Description (Cont'd)

### **ACTUATOR**

The actuator contains:

- An electric motor and pump
- Two relays
- Eight solenoid valves, each inlet and outlet for
  - LH front RH front

  - LH rear
  - 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.

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## **ABS** actuator operation

|                        |                      | Inlet solenoid valve | Outlet solenoid valve |  |
|------------------------|----------------------|----------------------|-----------------------|--|
| Normal brake operation |                      | OFF (Open)           | OFF (Closed)          | Master cylinder brake fluid pressure is directly transmitted to caliper via the inlet solenoid valve.                        |
| ABS operation          | Pressure hold        | ON (Closed)          | OFF (Closed)          | Hydraulic circuit is shut off to hold the caliper brake fluid pressure.  |
|                        | Pressure<br>decrease | ON (Closed)          | ON (Open)             | Caliper brake fluid is sent to reservoir via the outlet solenoid valve. Then it is pushed up to the master cylinder by pump. |
|                        | Pressure<br>increase | OFF (Open)           | OFF (Closed)          | Master cylinder brake fluid pressure is transmitted to caliper.  |

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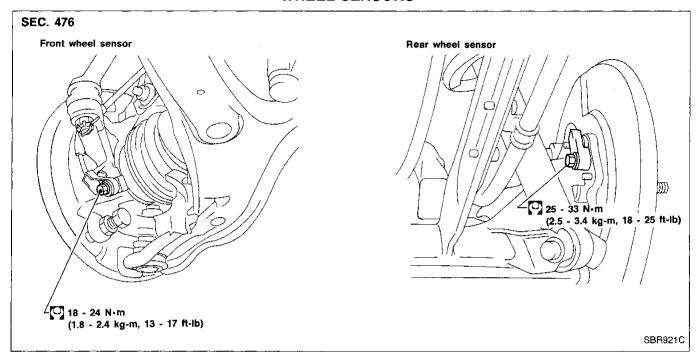
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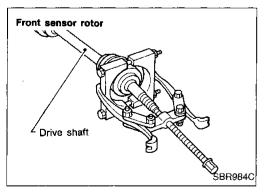
### Removal and Installation

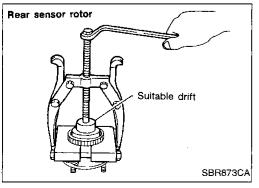
### **CAUTION:**

Be careful not to damage sensor edge and sensor rotor teeth. When removing the front or rear wheel hub assembly, 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





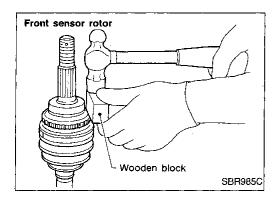


### **SENSOR ROTOR**

#### Removal

- 1. Remove the drive shaft and rear wheel hub. Refer to "Drive Shaft" in FA section and "Wheel Hub" in RA section.
- Remove the sensor rotor using suitable puller, drift and bearing replacer.

# **ANTI-LOCK BRAKE SYSTEM**



# Removal and Installation (Cont'd)

### Installation

Install the sensor rotor. For front sensor rotor, use hammer and wooden block. For rear sensor rotor, use suitable drift and press.

Always replace sensor rotor with new one.



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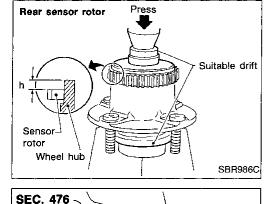
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Pay attention to the dimension of rear sensor rotor as show in figure.

h: 12.5 - 13.5 mm (0.492 - 0.531 in)



4.3 - 5.9 N·m (0.44 - 0.6 kg-m, 38.2 - 52.1 in-lb)

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Location: Driver side dash side lower.

 Make sure that the sensor shield ground cable is secured with lower mounting bolt.

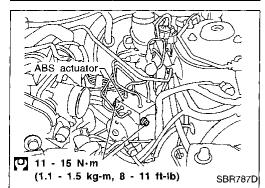
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#### **ACTUATOR**

### Removal

- 1. Disconnect battery cable.
- 2. Drain brake fluid. Refer to "Changing Brake Fluid" (BR-5).
- 3. Remove air cleaner and duct.
- Apply different colored paint to each pipe connector and actuator to prevent incorrect connection.
- Disconnect harness connectors, 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. Temporarily install actuator on the bracket.
- 2. Tighten actuator ground cable.
- 3. Connect brake pipes temporarily.
- 4. Tighten fixing nuts.
- 5. Tighten brake pipes.
- 6. Connect harness connectors and battery cable.
- 7. Install air cleaner and duct.

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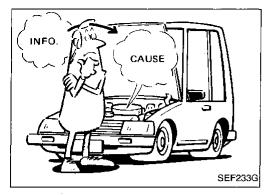
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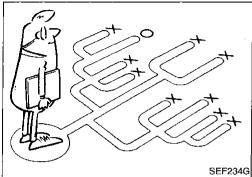
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# How to Perform Trouble Diagnoses for Quick and Accurate Repair

### INTRODUCTION

The ABS system has an electronic control unit to control major functions. The control unit accepts input signals from sensors and instantly drives actuator. 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.

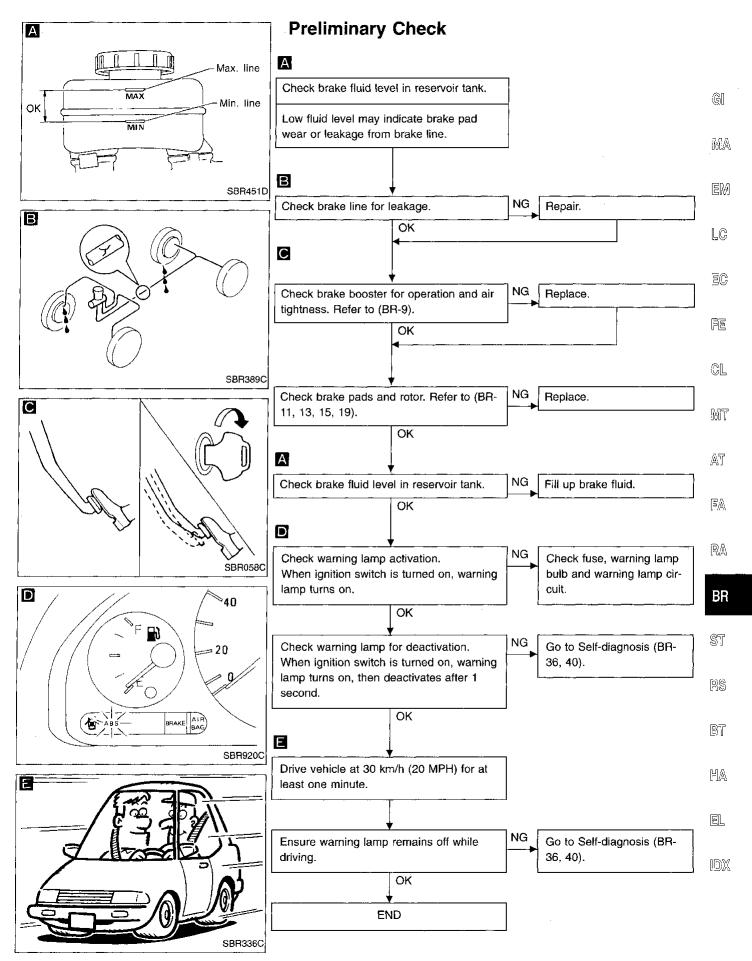
It is much more difficult to diagnose a problem that occurs intermittently rather than continuously. Most intermittent problems are caused by poor electric connections or faulty wiring. In this case, careful checking of suspicious circuits may help prevent the replacement of good parts.

A visual check only may not find the cause of the problems, so a road test should be performed.

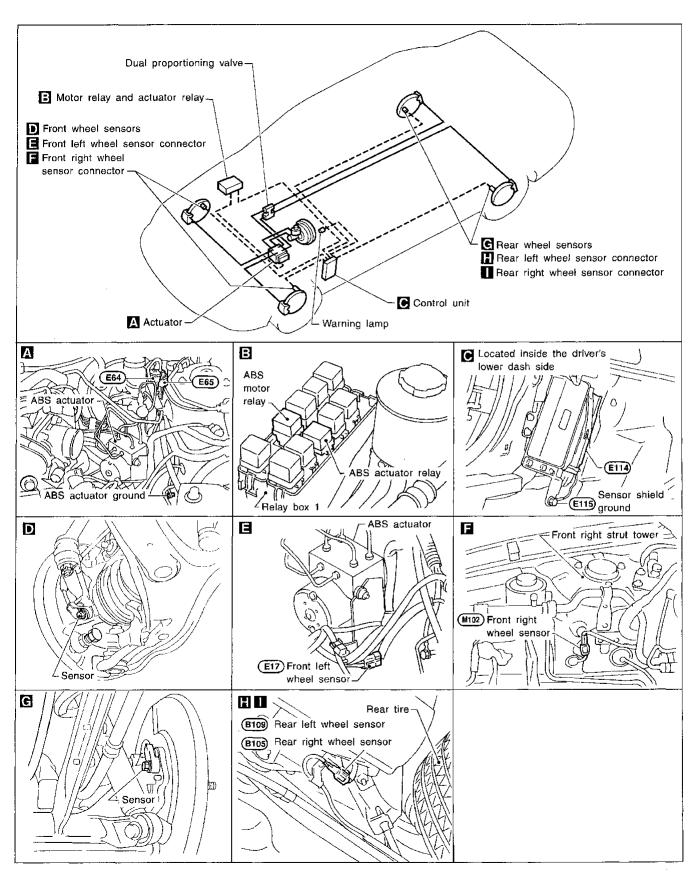
Before undertaking actual checks, take just a few minutes to talk with a customer who approaches with a ABS complaint. The customer is a very good source of information on such problems; especially intermittent ones. Through the talks with the customer, find out what symptoms are present and under what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

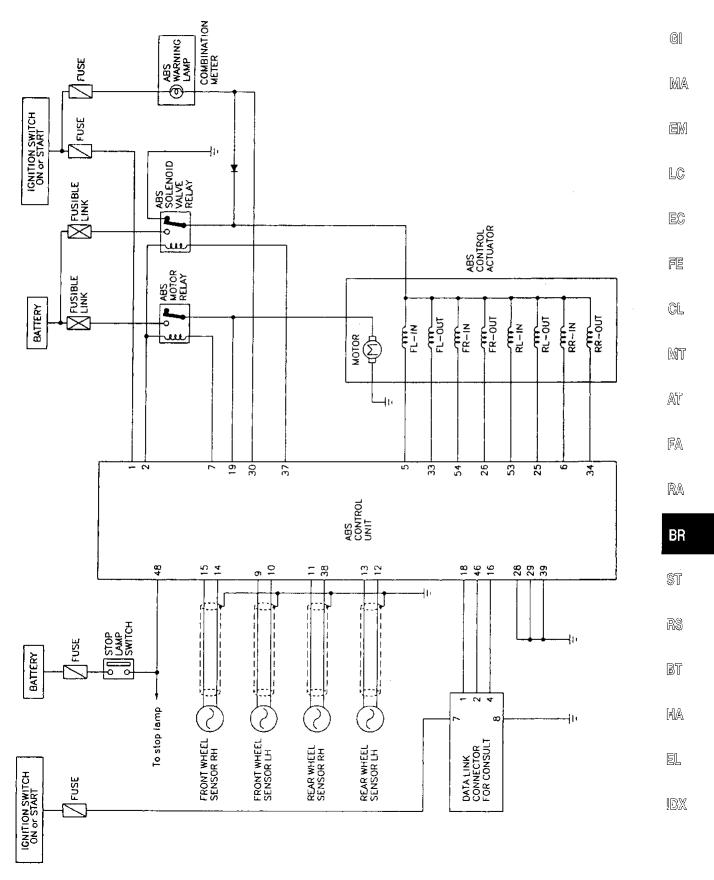
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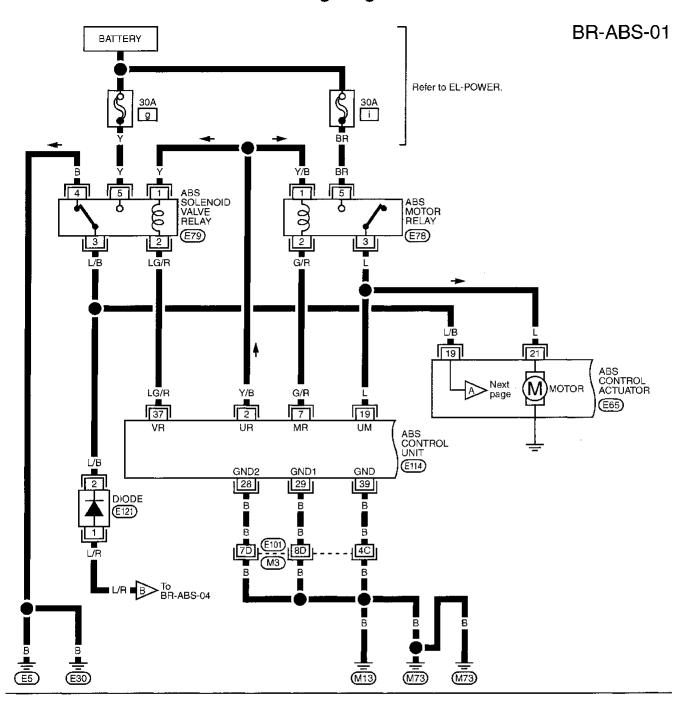
# **Component Parts and Harness Connector Location**

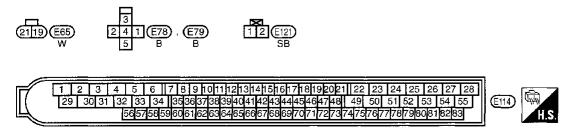


# Circuit Diagram for Quick Pinpoint Check

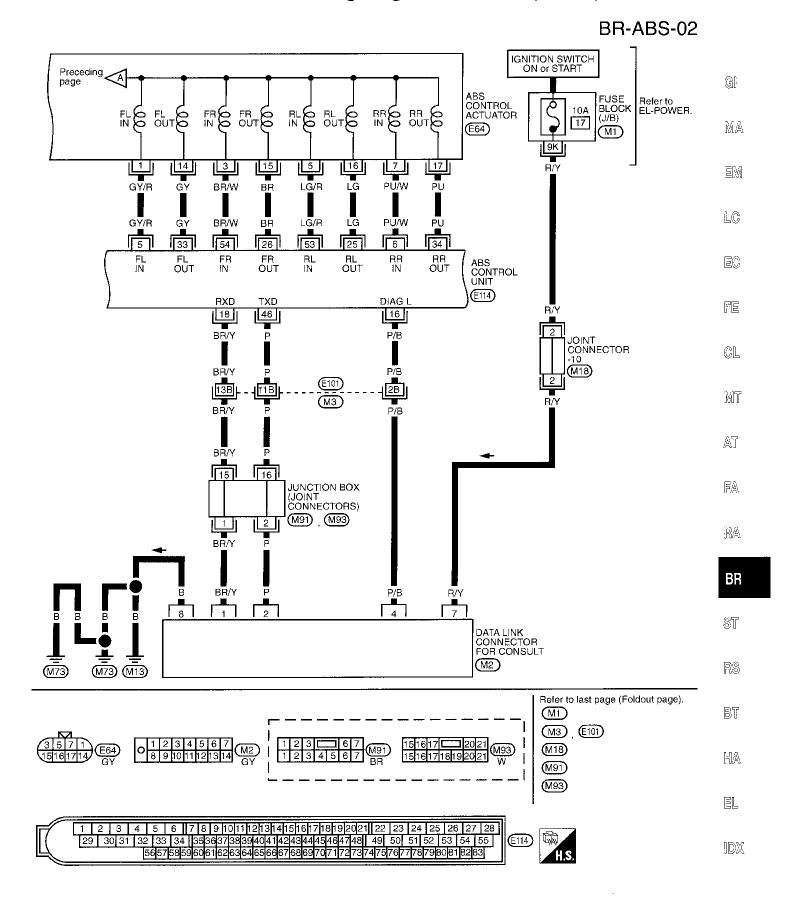


# Wiring Diagram — ABS —

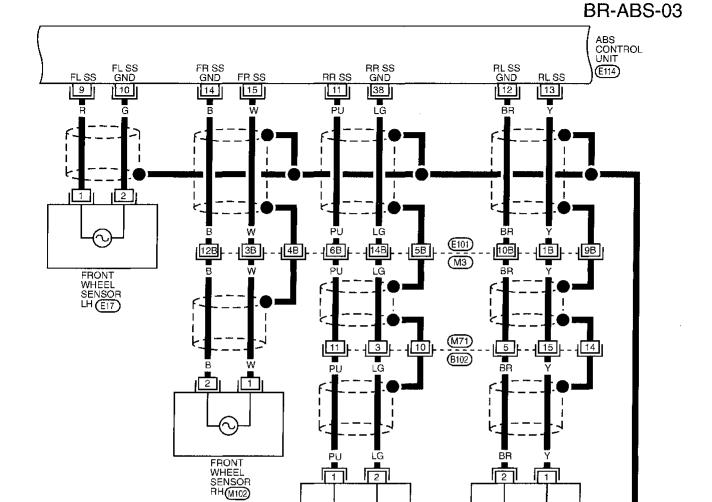


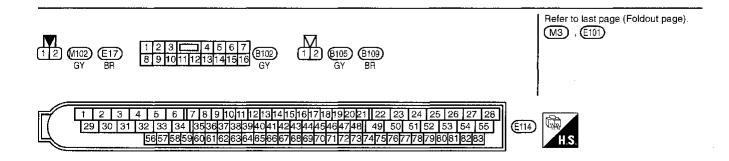


# Wiring Diagram — ABS — (Cont'd)



# Wiring Diagram — ABS — (Cont'd)



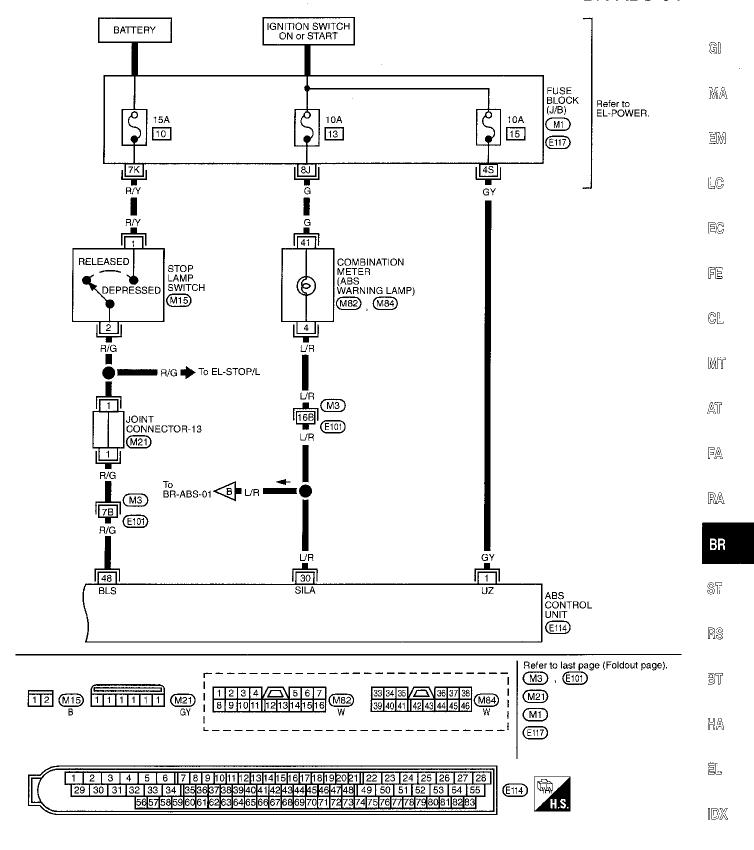


REAR WHEEL SENSOR RH (B105)

REAR WHEEL SENSOR LH (B109)

# Wiring Diagram — ABS — (Cont'd)

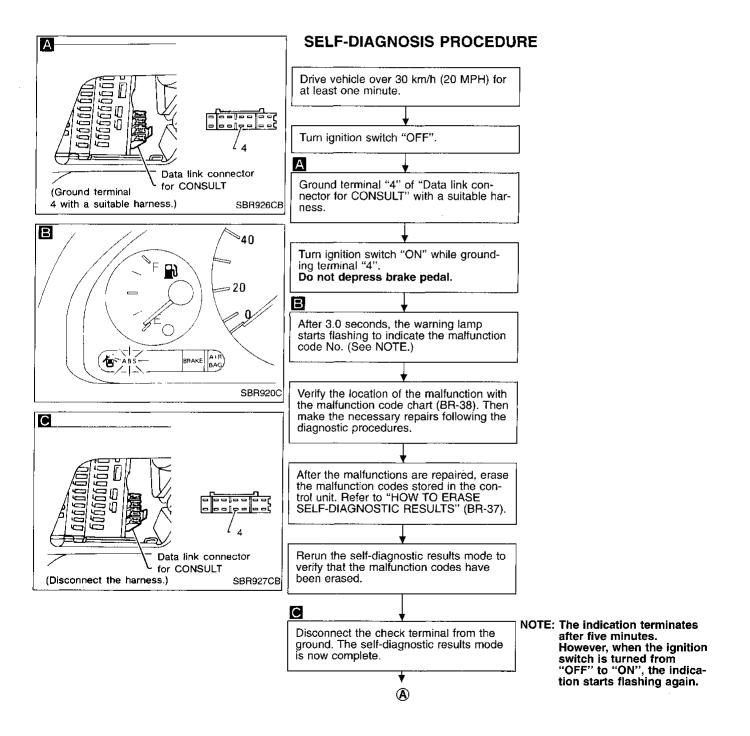
## BR-ABS-04



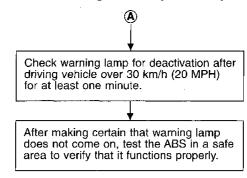
# Self-diagnosis

### **FUNCTION**

 When a problem occurs in the ABS, the warning lamp on the instrument panel comes on. To actuate the self-diagnostic results mode, ground the self-diagnostic (check) terminal located on "Data link connector for CONSULT". The location of the malfunction is indicated by the warning lamp flashing.

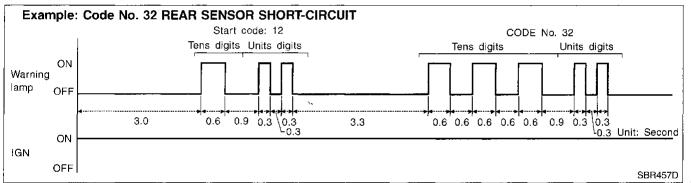


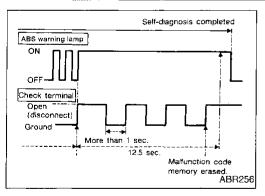
# Self-diagnosis (Cont'd)



### **HOW TO READ SELF-DIAGNOSTIC RESULTS (Malfunction codes)**

- · Determine the code No. by counting the number of times the warning lamp flashes on and off.
- When several malfunctions occur at one time, up to three code numbers can be stored; the latest malfunction will be indicated first.
- The indication begins with the start code 12. After that a maximum of three code numbers appear in the
  order of the latest one first. The indication then returns to the start code 12 to repeat (the indication will
  stay on for five minutes at the most).
- The malfunction code chart is given on the next page.





# HOW TO ERASE SELF-DIAGNOSTIC RESULTS (Malfunction codes)

- a. Under the self-diagnostic results mode, the malfunction memory erase mode starts when the check terminal is disconnected from the ground.
- b. The self-diagnostic results (malfunction codes) can be erased by grounding the check terminal more than three times in succession within 12.5 seconds after the erase mode starts. (Each grounding must be longer than one second.)
  - The ABS warning lamp stays on while the self-diagnosis is in the erase mode, and goes out after the erase operation has been completed.
- The self-diagnosis is also completed at the same time. (Refer to BR-36.)

After the erase operation is completed, it is necessary to rerun the self-diagnostic mode to verify that malfunction codes no longer appear. Only the start code (12) should be indicated when erase operation is completed and system is functioning normally. G[

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# Self-diagnosis (Cont'd) MALFUNCTION CODE/SYMPTOM CHART

| Code No. (No. of LED flashes)                       | Malfunctioning part  | Diagnostic procedure |
|---|--|----------------------|
| 45  | Actuator front left outlet solenoid valve  | 1                    |
| 46  | Actuator front left inlet solenoid valve   | 1                    |
| 41  | Actuator front right outlet solenoid valve   | 1                    |
| 42  | Actuator front right inlet solenoid valve  | 1                    |
| 51  | Actuator rear right outlet solenoid valve  | 1                    |
| 52  | Actuator rear right inlet solenoid valve   | 1                    |
| 55  | Actuator rear left inlet solenoid valve  | 1                    |
| 56  | Actuator rear left inlet solenoid valve  | 1                    |
| 25  | Front left sensor (open-circuit)   | 2                    |
| 26  | Front left sensor (short-circuit)  | 2                    |
| 21  | Front right sensor (open-circuit)  | 2                    |
| 22  | Front right sensor (short-circuit)   | 2                    |
| 35  | Rear left sensor (open-circuit)  | 2                    |
| 36  | Rear left sensor (short-circuit)   | 2                    |
| 31  | Rear right sensor (open-circuit)   | 2                    |
| 32  | Rear right sensor (short-circuit)  | 2                    |
| 18  | Sensor rotor   | 2                    |
| 61  | Actuator motor or motor relay  | 3                    |
| 63  | Solenoid valve relay   | 4                    |
| 57  | Power supply (Low voltage)   | 5                    |
| 71  | Control unit   | 6                    |
| Varning lamp stays on continu-<br>ously.            | Control unit power supply circuit Warning lamp bulb circuit Control unit or control unit connector Solenoid valve relay stuck Power supply for solenoid valve relay coil | 13                   |
| Varning lamp stays on, during self-<br>iagnosis.    | Control unit   | _                    |
| Varning lamp does not work before ngine starts.     | Fuse, warning lamp bulb or warning lamp circuit Control unit   | 12                   |
| larning lamp does not come on uring self-diagnosis. | Control unit   | _                    |
| edal vibration and noise                            | _  | 7                    |
| ong stopping distance                               | <del>-</del>   | 8                    |
| nexpected pedal action                              | _  | 9                    |
| BS does not work.                                   | _  | 10                   |
| BS works frequently.                                | _  | 11                   |

**BR-38** 932

# **CONSULT**

### **CONSULT APPLICATION TO ABS**

| ITEM  | SELF-DIAGNOSTIC<br>RESULTS | DATA MONITOR | ACTIVE TEST    | <b>G</b> ] |
|---|----------------------------|--------------|----------------|------------|
| Front right wheel sensor  | Х                          | Х            |                |            |
| Front left wheel sensor   | Х                          | х            |                | <br>Ma     |
| Rear right wheel sensor   | X                          | Х            | <del>_</del> . |            |
| Rear left wheel sensor  | X                          | Х            | <u> - 112</u>  | —<br>— EM  |
| Stop lamp switch  |                            | Х            | _              | — em       |
| Front right inlet solenoid valve                                      | X                          | X            | Х              | _          |
| Front right outlet solenoid valve                                     | Х                          | X            | Х              | — LC       |
| Front left inlet solenoid valve                                       | Х                          | X            | X              | _          |
| Front left outlet solenoid valve                                      | х                          | Х            | Х              | - EC       |
| Rear right inlet solenoid valve                                       | X                          | X            | Х              | _          |
| Rear left inlet solenoid valve  | X                          | X            | X              | FE         |
| Rear right outlet solenoid valve                                      | X                          | X            | X              |            |
| Rear left outlet solenoid valve                                       | Х                          | X            | Х              | —<br>CL    |
| Actuator solenoid valve relay   | х                          | X            | <del>_</del>   | _          |
| Actuator motor relay (ABS MOTOR is shown on the Data Monitor screen.) | х                          | х            | X              | —<br>M:T   |
| ABS warning lamp  |                            | Х            |                | - AT       |
| Battery voltage   | X                          | Х            | _              |            |
| Control unit  | Х                          | _            | <del>_</del>   | –<br>FA    |

X: Applicable

## ECU part number mode

Ignore the ECU part number displayed in the ECU PART NUMBER MODE. Refer to parts catalog to order the ECU.

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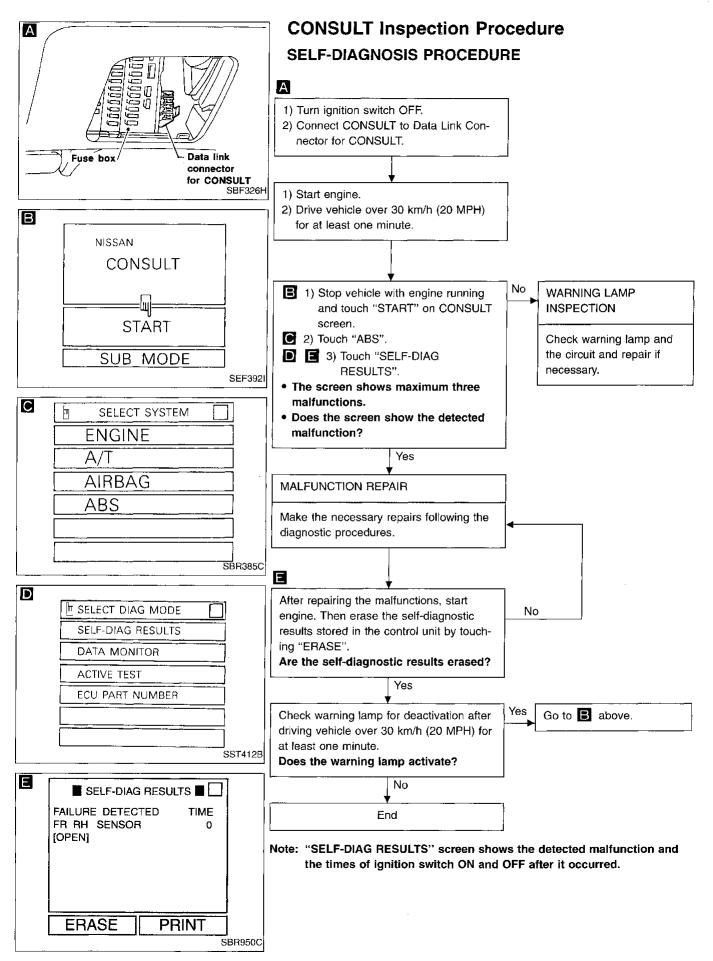
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<sup>—:</sup> Not applicable



**BR-40** 934

# **CONSULT Inspection Procedure (Cont'd)**

### **SELF-DIAGNOSTIC RESULTS MODE**

| Diagnostic item                | Diagnostic item is detected when   | Diagnostic procedure |
|--------------------------------|--|----------------------|
| FR RH SENSOR<br>[OPEN]*1       | Circuit for front right wheel sensor is open.  (An abnormally high input voltage is entered.)  | 2                    |
| FR LH SENSOR<br>[OPEN]*1       | Circuit for front left wheel sensor is open.     (An abnormally high input voltage is entered.)  | 2                    |
| RR RH SENSOR<br>[OPEN]*1       | Circuit for rear right sensor is open.     (An abnormally high input voltage is entered.)  | 2                    |
| RR LH SENSOR<br>[OPEN]*1       | Circuit for rear left sensor is open.     (An abnormally high input voltage is entered.)   | 2                    |
| FR RH SENSOR<br>[SHORT]*1      | <ul> <li>Circuit for front right wheel sensor is shorted.</li> <li>(An abnormally low input voltage is entered.)</li> </ul>  | 2                    |
| FR LH SENSOR<br>SHORT]*1       | Circuit for front left wheel sensor is shorted.  (An abnormally low input voltage is entered.)   | 2                    |
| RR RH SENSOR<br>[SHORT]*1      | <ul> <li>Circuit for rear right sensor is shorted.</li> <li>(An abnormally low input voltage is entered.)</li> </ul>   | 2                    |
| RR LH SENSOR<br>SHORT]*1       | Circuit for rear left sensor is shorted.     (An abnormally low input voltage is entered.)   | 2                    |
| ABS SENSOR<br>ABNORMAL SIGNAL] | <ul> <li>Teeth damage on sensor rotor or improper installation of wheel sensor.</li> <li>(Abnormal wheel sensor signal is entered.)</li> </ul>                                 | 2                    |
| FR RH IN ABS SOL<br>[OPEN]     | Circuit for front right inlet solenoid valve is open.     (An abnormally low output voltage is entered.)   | 1                    |
| FR LH IN ABS SOL<br>OPEN]      | <ul> <li>Circuit for front left inlet solenoid valve is open.</li> <li>(An abnormally low output voltage is entered.)</li> </ul>   | 1                    |
| RR RH IN ABS SOL<br>OPEN]      | Circuit for rear right inlet solenoid valve is open.     (An abnormally low output voltage is entered.)  | 1                    |
| RR LH IN ABS SOL<br>OPEN]      | <ul> <li>Circuit for rear left inlet solenoid valve is open.</li> <li>(An abnormally fow output voltage is entered.)</li> </ul>  | 1                    |
| FR RH IN ABS SOL<br>SHORT]     | Circuit for front right inlet solenoid valve is shorted.  (An abnormally high output voltage is entered.)  | 1                    |
| FR LH IN ABS SOL<br>SHORT]     | Circuit for front left inlet solenoid valve is shorted.  (An abnormally high output voltage is entered.)   | 1                    |
| RR RH IN ABS SOL<br>SHORT]     | Circuit for rear right inlet solenoid valve is shorted.  (An abnormally high output voltage is entered.)   | 1                    |
| RR LH IN ABS SOL<br>SHORT]     | <ul> <li>Circuit for rear left inlet solenoid valve is shorted.</li> <li>(An abnormally high output voltage is entered.)</li> </ul>  | 1                    |
| FR RH OUT ABS SOL<br>OPEN]     | Circuit for front right outlet solenoid valve is open.     (An abnormally low output voltage is entered.)  | 1                    |
| FR LH OUT ABS SOL<br>OPEN]     | Circuit for front left outlet solenoid valve is open.     (An abnormally low output voltage is entered.)   | 1                    |
| RR RH OUT ABS SOL<br>OPEN]     | Circuit for rear right outlet solenoid valve is open.     (An abnormally low output voltage is entered.)   | 1                    |
| RR LH OUT ABS SOL<br>OPEN]     | Circuit for rear left outlet solenoid valve is open.     (An abnormally low output voltage is entered.)  | 1                    |
| R RH OUT ABS SOL<br>SHORT]     | Circuit for front right outlet solenoid valve is shorted.  (An abnormally high output voltage is entered.)   | 1                    |
| R LH OUT ABS SOL<br>SHORT]     | Circuit for front left outlet solenoid valve is shorted.  (An abnormally high output voltage is entered.)  | 1                    |
| RR RH OUT ABS SOL<br>SHORT]    | Circuit for rear right outlet solenoid valve is shorted.  (An abnormally high output voltage is entered.)  | 1                    |
| RR LH OUT ABS SOL<br>SHORT]    | Circuit for rear left outlet solenoid valve is shorted.  (An abnormally high output voltage is entered.)   | 1                    |
| BS ACTUATOR RELAY<br>ABNORMAL] | <ul> <li>Actuator solenoid valve relay is ON, even control unit sends off signal.</li> <li>Actuator solenoid valve relay is OFF, even control unit sends on signal.</li> </ul> | 4                    |
| BS MOTOR<br>ABNORMAL]          | Circuit for actuator motor is open or shorted. Actuator motor relay is stuck.  | 3                    |
| ATTERY VOLT<br>VB-LOW]         | Power source voltage supplied to ABS control unit is abnormally low.   | 5                    |
| CONTROL UNIT                   | Function of calculation in ABS control unit has failed.  | 6                    |

<sup>\*1:</sup> Be sure to confirm the ABS warning lamp illuminates when the ignition switch is turned ON after repairing the shorted sensor circuit, but the lamp goes out when driving the vehicle over 30 km/h (20 MPH) for one minute in accordance with SELF-DIAGNO-SIS PROCEDURE.

**BR-41** 935

# **TROUBLE DIAGNOSES CONSULT Inspection Procedure (Cont'd) DATA MONITOR PROCEDURE** Α NISSAN 1) Turn ignition switch OFF. **CONSULT** 2) Connect CONSULT to Data link connector for CONSULT. 3) Turn ignition switch ON. **START** A 1) Touch "START" on CONSULT screen. B 2) Touch "ABS". SUB MODE C 3) Touch "DATA MONITOR". SEF3921 В SELECT SYSTEM 1) Touch "SETTING" on "SELECT MONITOR ITEM" screen. **ENGINE** 2) Touch "LONG TIME" on "SET RECORDING COND" screen. 3) Touch "START" on "SELECT MONITOR ITEM". A/T AIRBAG ABS SBR385C С SELECT DIAG MODE SELF-DIAG RESULTS DATA MONITOR **ACTIVE TEST** ECU PART NUMBER SST412B D SELECT MONITOR ITEM **ALL SIGNALS** SELECTION FROM MENU **START SETTING** SBR936C Ξ SET RECORDING COND

**AUTO TRIG** 

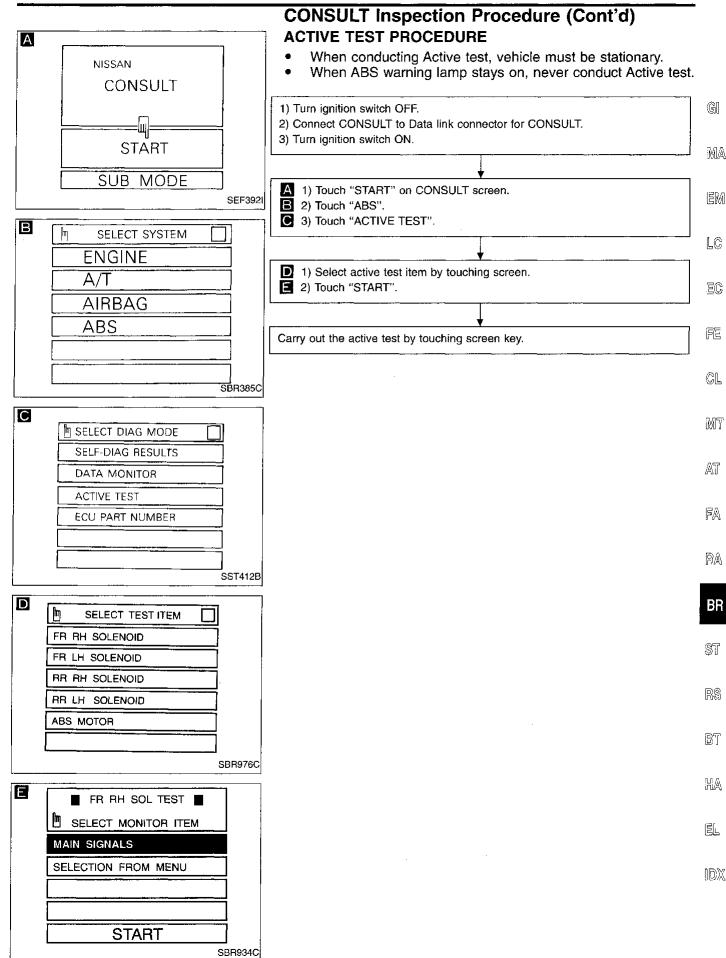
HI SPEED

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LONG TIME

SBR937C

**BR-42** 936



# **CONSULT Inspection Procedure (Cont'd)**

# **DATA MONITOR MODE**

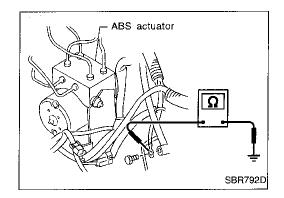
| MONITOR ITEM   | CONDITION  | SPECIFICATION   |  |
|--|--|---|--|
| FR RH SENSOR<br>FR LH SENSOR<br>RR RH SENSOR<br>RR LH SENSOR   | Drive vehicle.<br>(Each wheel is rotating.)        | Displays computed vehicle speed from wheel sensor signal.  Almost the same speed as speedometer.                  |  |
| STOP LAMP SW   | Turn ignition switch ON and depress brake pedal.   | Depress the pedal: ON<br>Release the pedal: OFF   |  |
| FR RH IN SOL FR RH OUT SOL FR LH IN SOL FR LH OUT SOL RR RH IN SOL RR RH OUT SOL RR LH IN SOL RR LH IN SOL | Ignition switch is turned ON or engine is running. | Operating conditions for each solenoid valve are indicated. ABS is not operating: OFF                             |  |
| ACTUATOR RLY   |  | Displays ON/OFF condition of ABS actuator relay. When turning ignition switch ON, ABS actuator relay is operated. |  |
| MOTOR RELAY  | Ignition switch is turned ON or engine is running. | ABS is not operating: OFF ABS is operating: ON  |  |
| WARNING LAMP   |  | Warning lamp is turned on: ON<br>Warning lamp is turned off: OFF  |  |
| BATTERY VOLT   | ,  | Power supply voltage for control unit   |  |

### **ACTIVE TEST MODE**

| TEST ITEM                     | CONDITION                     | JUDGEMENT                              |        |         |
|-------------------------------|-------------------------------|--|--------|---------|
|                               |                               | Brake fluid pressure control operation |        |         |
| FR RH SOLENOID FR LH SOLENOID |                               |  | IN SOL | OUT SOL |
| RR RH SOLENOID                |                               | UP (Increase):                         | OFF    | OFF     |
| RR LH SOLENOID                | Ignition switch is turned ON. | KEEP (Hold):                           | ON     | OFF     |
|                               |                               | DOWN (Decrease):                       | ON     | ON      |
|                               |                               | ABS actuator motor                     |        |         |
| ABS MOTOR                     |                               | ON: Motor runs                         |        |         |
|                               |                               | OFF: Motor stops                       |        |         |

Note: Active test will automatically stop ten seconds after the test starts. (TEST IS STOPPED monitor shows ON.)

**BR-44** 938



# **Ground Circuit Check ACTUATOR MOTOR GROUND**

Check resistance between actuator motor ground terminal and body ground.

Resistance:  $0\Omega$ 

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### **CONTROL UNIT GROUND**

Check resistance between the terminals and ground.

LC

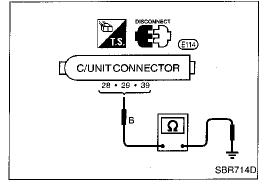
Resistance:  $0\Omega$ 

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### **ABS SOLENOID VALVE RELAY GROUND**

Check resistance between solenoid valve relay terminal (4) and ground.

AT

Resistance:  $0\Omega$ 

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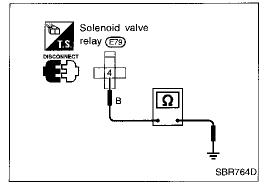
RS

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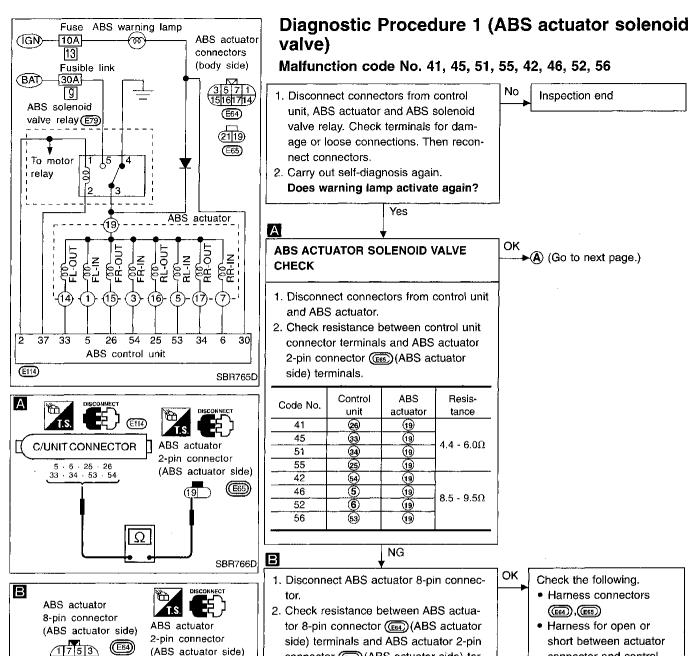
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# TROUBLE DIAGNOSES FOR SELF-DIAGNOSTIC ITEMS



SBR767D

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connector (Ess) (ABS actuator side) terminals.

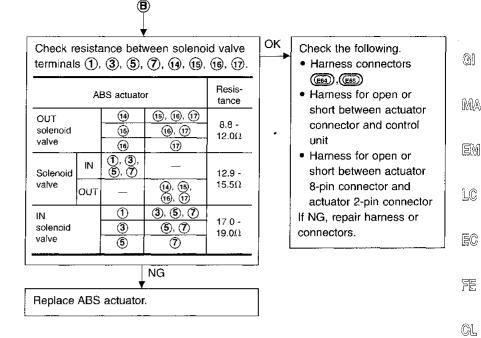
| ABS actuator |                                  | Resis-<br>tance   |  |
|--------------|----------------------------------|---|--|
| 15           | 19                               |   |  |
| 14           | 19                               | - 4.4 - 6.0Ω  |  |
| 17           | 19                               | 7 4.4 - 0.012   |  |
| 16           | 19                               | <u> </u>  |  |
| 3            | 19                               |   |  |
| ①            | (19)                             | $\frac{1}{8.5}$ - $9.5\Omega$   |  |
| 7            | 19)                              | 8.5 - 9.511   |  |
| 5            | 19                               |   |  |
|              |                                  |   |  |
|              | (1)<br>(1)<br>(16)<br>(3)<br>(7) | (i) (i) (ii) (ii) (iii) |  |

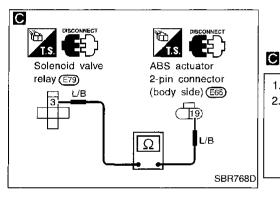
Check the following.

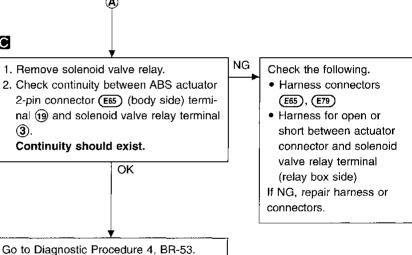
- · Harness connectors (E64),(E65)
- · Harness for open or short between actuator connector and control unit
- · Harness for open or short between actuator 8-pin connector and actuator 2-pin connector If NG, repair harness or connectors.

**(B)** 

## Diagnostic Procedure 1 (ABS actuator solenoid valve) (Cont'd)







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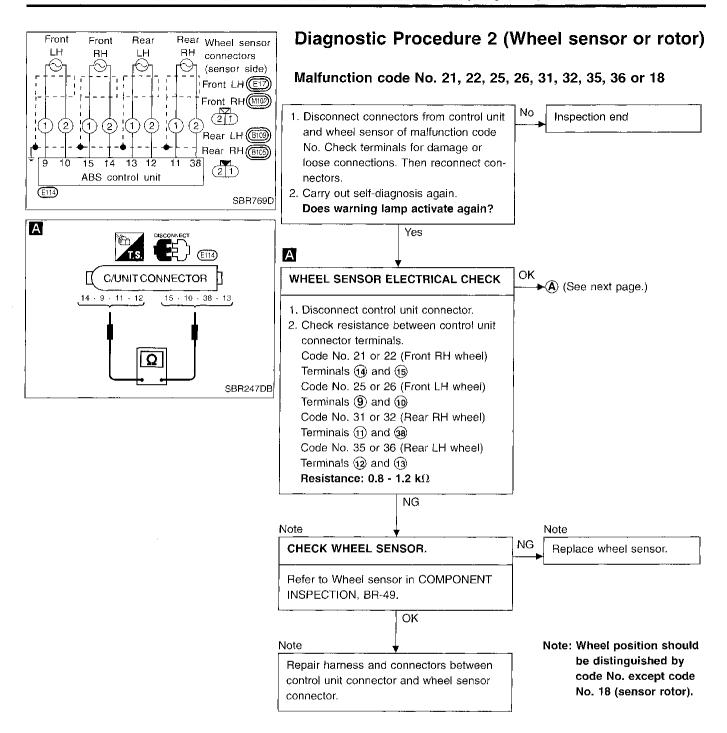
ST

RS

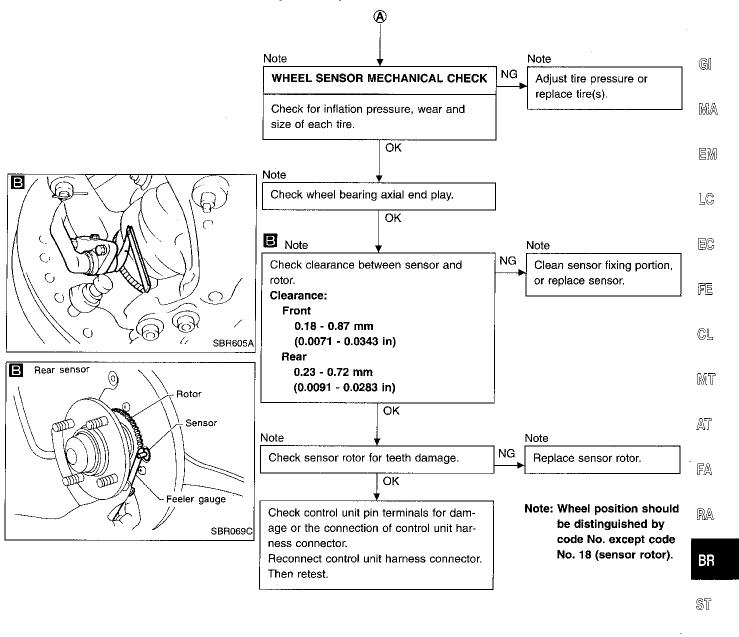
87

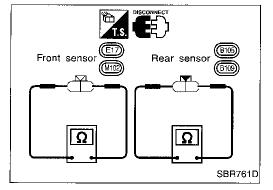
HA

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## Diagnostic Procedure 2 (Wheel sensor or rotor) (Cont'd)





#### **COMPONENT INSPECTION**

#### Wheel sensor

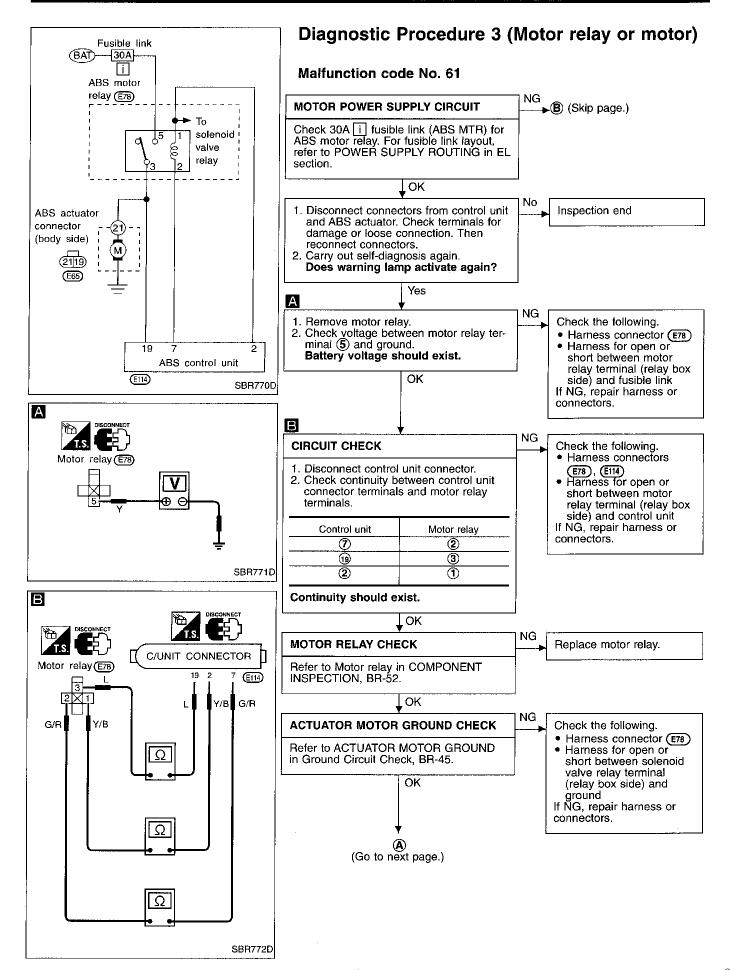
Check resistance for each sensor. **Resistance:** 0.8 - 1.2  $k\Omega$  RS

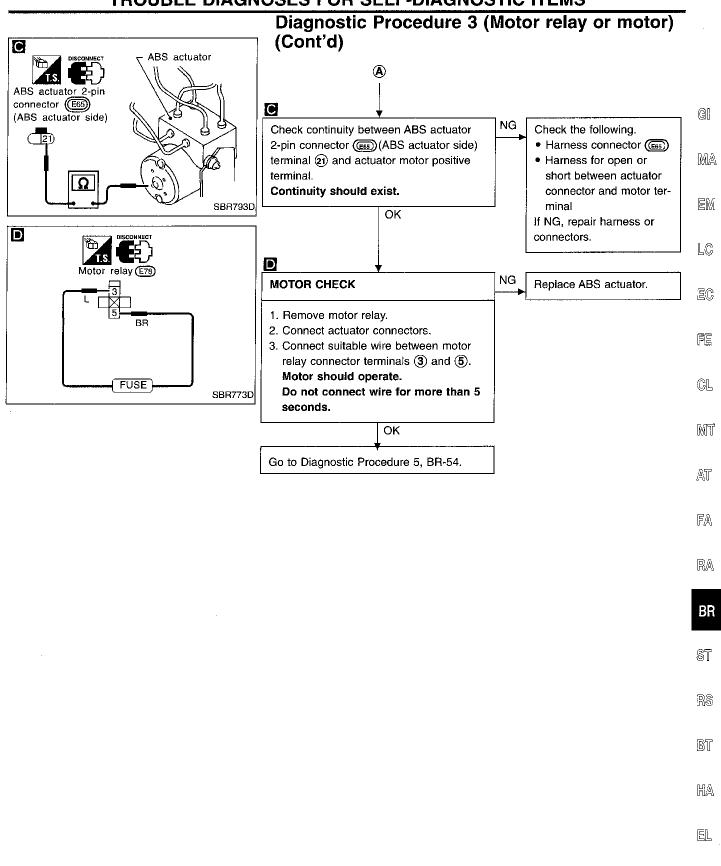
BT

HA

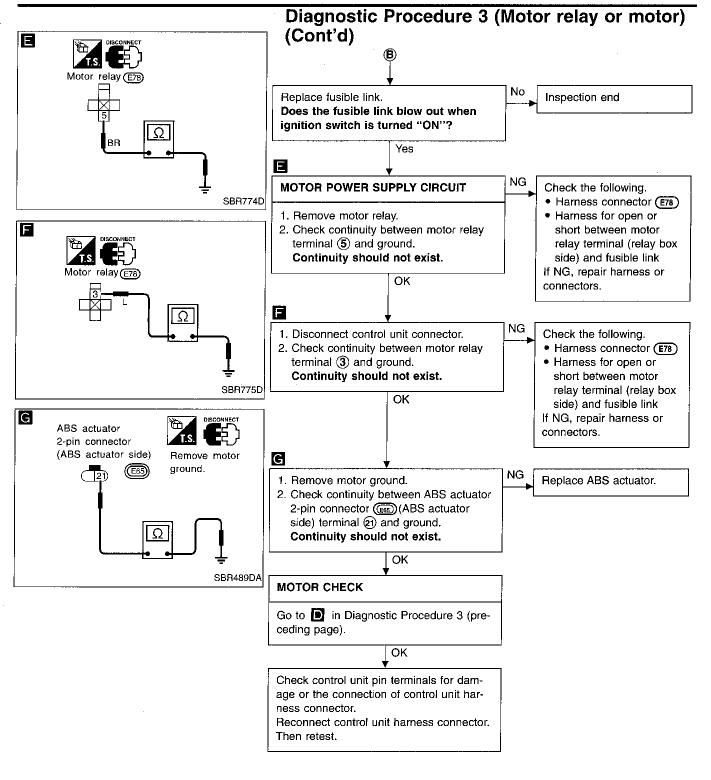
EL

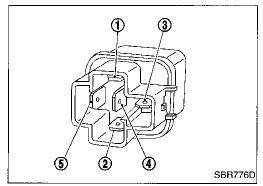
1DX





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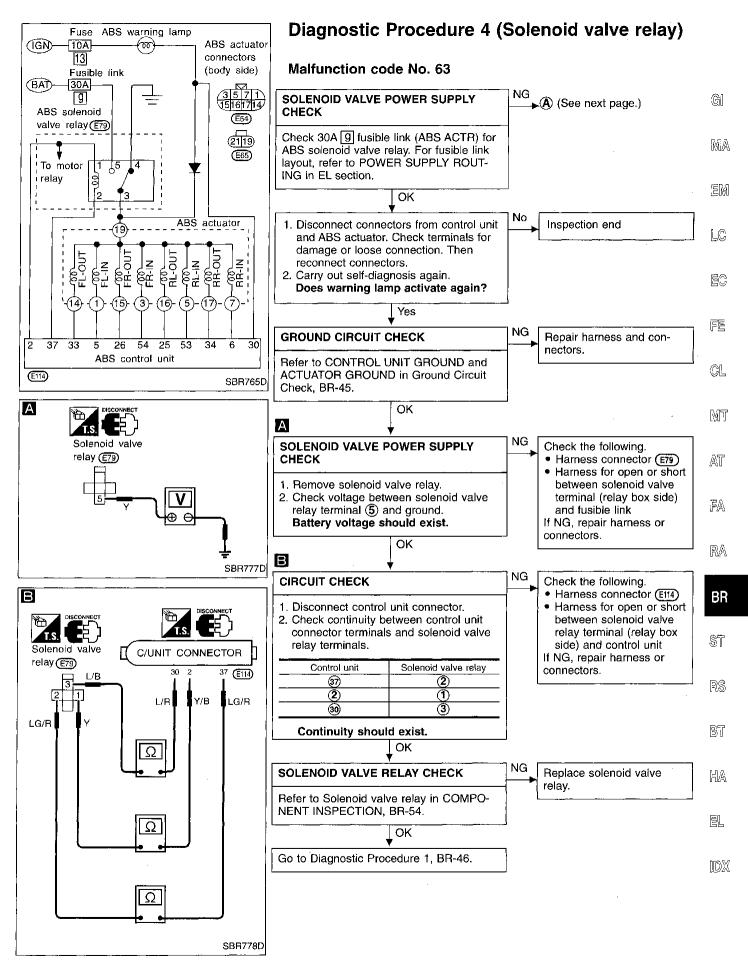


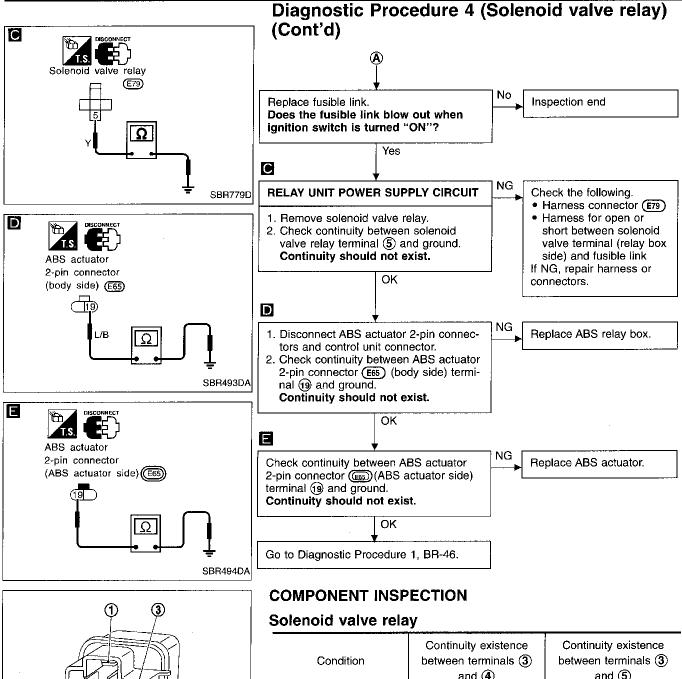
#### COMPONENT INSPECTION

**Actuator motor relay** 

| Condition  | Continuity existence between terminals ③ and ⑤ |
|--|--|
| Battery voltage not applied between terminals ① and ②. | No   |
| Battery voltage applied between terminals ① and ②.     | Yes  |

While applying battery voltage to relay terminals, insert fuse into the circuit.





| Condition  | Continuity existence between terminals ③ and ④ | Continuity existence<br>between terminals ③<br>and ⑤ |
|--|--|--|
| Battery voltage not applied between terminals ① and ②. | Yes  | No   |
| Battery voltage applied between terminals ① and ②.     | No   | Yes  |

While applying battery voltage to relay terminals, insert fuse into the circuit.

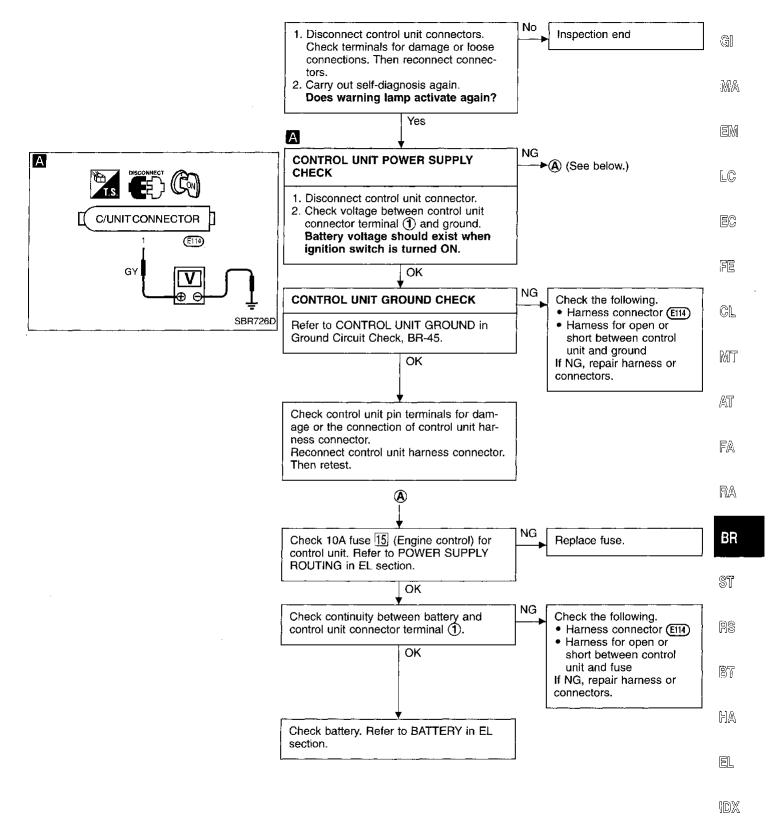
948

**(4**)

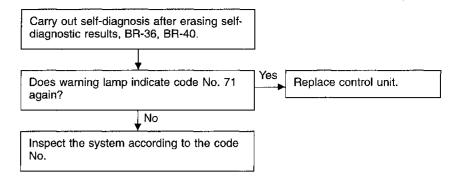
SBR776D

### Diagnostic Procedure 5 (Low voltage)

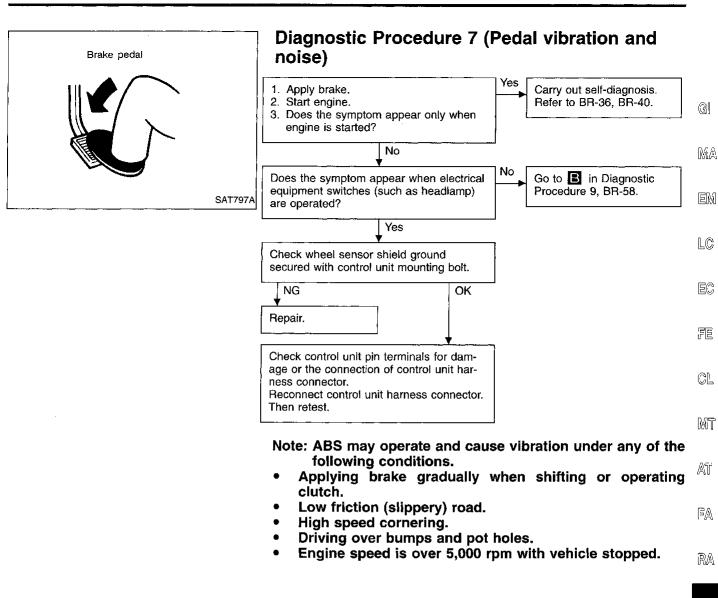
Malfunction code No. 57



## Diagnostic Procedure 6 (Control unit) Malfunction code No. 71



**BR-56** 950



BR

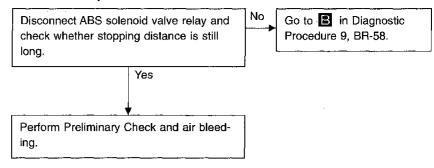
\$T

RS

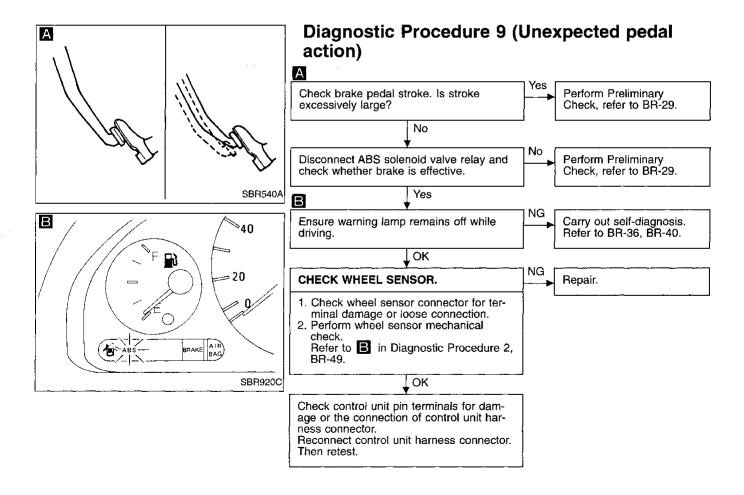
BT

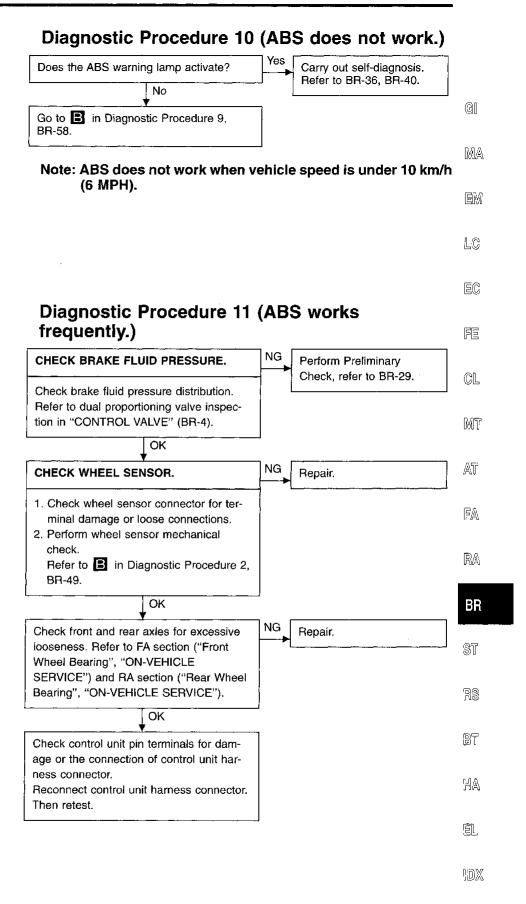
HA

## Diagnostic Procedure 8 (Long stopping distance)

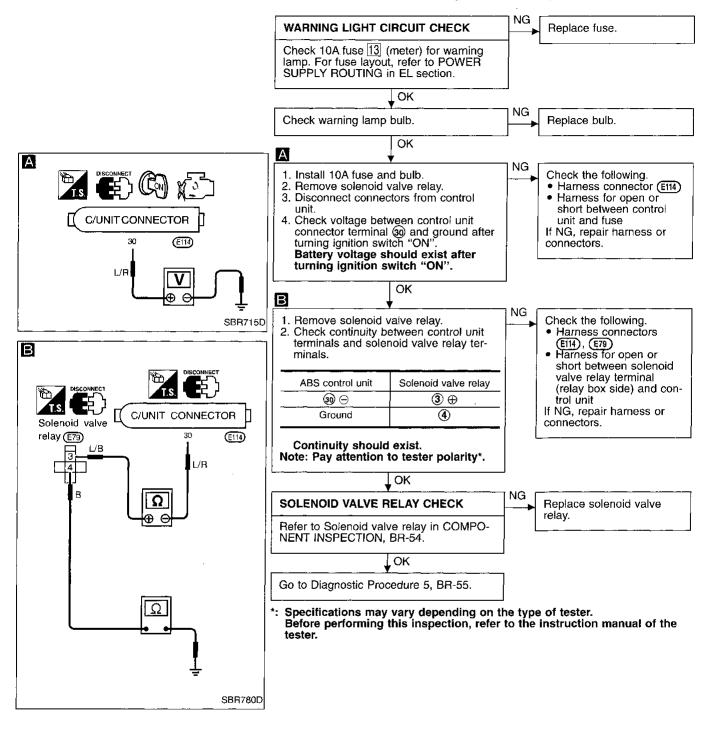


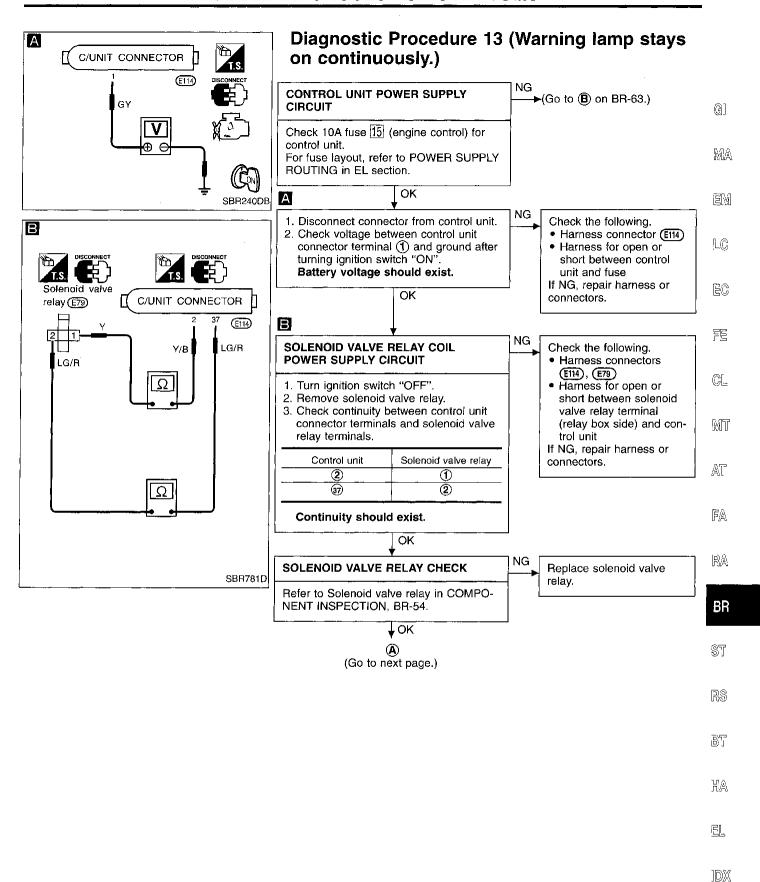
Note: Stopping distance may be larger than vehicles without ABS when road condition is slippery.

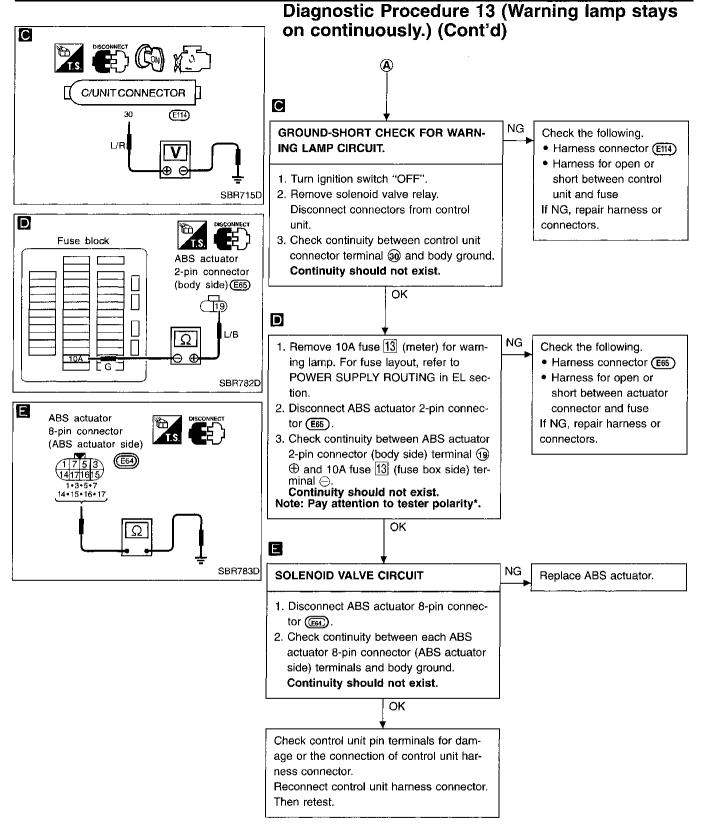




## Diagnostic Procedure 12 (Warning lamp does not work before engine starts.)

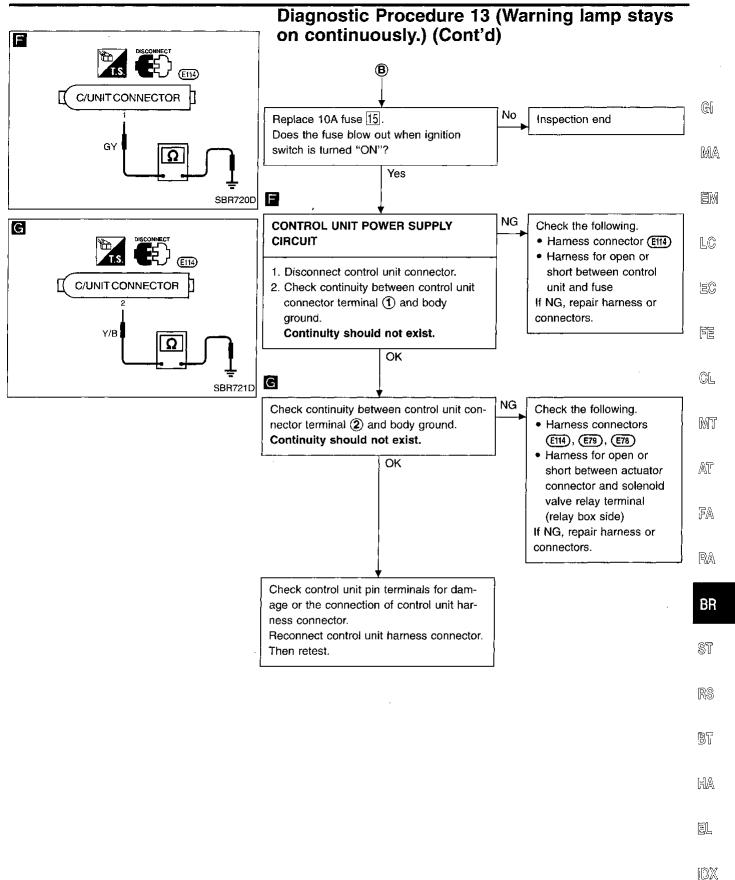






\*: Specifications may vary depending on the type of tester.

Before performing this inspection, refer to the instruction manual of the tester.



#### **SERVICE DATA AND SPECIFICATIONS (SDS)**

#### **General Specifications**

| CL25VB disc brake                          |
|--|
| 57.2 (2.252)                               |
| 125.6 x 45.3 x 11<br>(4.94 x 1.783 x 0.43) |
| 280 x 22 (11.02 x 0.87)                    |
|  |
| CL9HB disc brake                           |
| 33.96 (1.3370)                             |
| 89.1 x 39.5 x 10<br>(3.508 x 1.555 x 0.39) |
| 278 x 9 (10.94 x 0.35)                     |
|  |

| Master cylinder                                      |  |  |
|--|--|--|
| Cylinder bore diameter<br>mm (in)                    | 23.81 (15/16)                                |  |
| Control valve  |  |  |
| Valve model  | Dual proportioning valve                     |  |
| Spfit point<br>kPa (kg/cm², psi)<br>x reducing ratio | 1,961 (20, 284) x 0.2                        |  |
| Brake booster  |  |  |
| Booster model  | M215T  |  |
| Diaphragm diameter mm (in)                           | Primary: 230 (9.06)<br>Secondary: 205 (8.07) |  |
| Recommended brake fluid                              | DOT 3  |  |

## Inspection and Adjustment PARKING BRAKE

#### **DISC BRAKE**

| 2.0 (0.079)   | 1.5 (0.059)   |
|---------------|---------------|
|               |               |
| 0.08 (0.0031) | 0.15 (0.0059) |
| 20.0 (0.787)  | 8 (0.31)      |
|               | 0.08 (0.0031) |

| Туре                                     | Center lever |
|--|--------------|
| Number of notches                        |              |
| [under force of 196 N<br>(20 kg, 44 lb)] | 10 - 11      |
| Number of notches                        |              |
| when warning lamp switch comes on        | 1            |

#### **BRAKE PEDAL**

| Free height "H"* mm (in)   |                                  |
|--|----------------------------------|
| M/T  | 158 - 165 (6.22 - 6.50)          |
| A/T  | 167 - 174 (6.57 - 6.85)          |
| Depressed height "D" mm (in)   |                                  |
| [under force of 490 N (50 kg,<br>110 lb) with engine running]  | M/T: 70 (2.76)<br>A/T: 75 (2.95) |
| Pedal free play "A" mm (in)  | 1 - 3 (0.04 - 0.12)              |
| Clearance "C" between pedal stop-<br>per and threaded end of stop lamp<br>switch or ASCD switch<br>mm (in) | 0.3 - 1.0 (0.012 - 0.039)        |

<sup>\*:</sup> Measured from surface of dash reinforcement panel to surface of pedal pad

**BR-64** 958

## STEERING SYSTEM

## SECTION ST

#### GI

MA

#### EM

#### LC

## **CONTENTS**

FE

GL

MT

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BR

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#### **Precautions**

## SUPPLEMENTAL RESTRAINT SYSTEM (SRS) "AIR BAG"

The Supplemental Restraint System "Air Bag", used along with a seat belt, helps 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 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.
- Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses are covered with yellow insulation either just before the harness connectors or for the complete harness, for easy identification.

#### 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

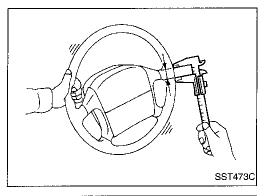
#### **Special Service Tools**

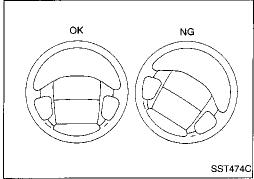
The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

| Tool number<br>(Kent-Moore No.)<br>Tool name      | Description | 1                  |                                   |  |
|---|-------------|--------------------|-----------------------------------|--|
| KV48103400<br>(See J26364)<br>Torque adapter      | NT236       |                    |                                   | Measuring pinion rotating torque       |
| KV48102500<br>( — )<br>Pressure gauge adapter     |             | PF3/8"             | M16 x 1.5 pit                     | Measuring oil pressure                 |
|   | NT542       |                    | M16 x 1.5 pitch                   |  |
| ST27180001<br>(J25726-A)<br>Steering wheel puller | NT544       | 29 mm<br>(1.14 in) | M10 x 1.25 pitch  M8 x 1.25 pitch | Removing and installing steering wheel |

#### PRECAUTIONS AND PREPARATION

|   | PRECAUTIONS AND PREPA<br>Special Service To          |  | <del></del>    |
|---|--|--|----------------|
| Tool number<br>(Kent-Moore No.)<br>Tool name              | Description  | oois (oont u)  |                |
| HT72520000<br>(J25730-A)<br>Ball joint remover            | a b  | Removing ball joint  | <u>—</u><br>G1 |
|   | NT546  | a: 33 mm (1.30 in)<br>b: 50 mm (1.97 in)<br>r: R11.5 mm (0.453 in) | MA             |
| ST27091000<br>(J26357 and J26357-10)<br>Pressure gauge    | To oil pump outlet PF3/8" (female)  To control valve | Measuring oil pressure   | <br>EM         |
|   | NT547 Shut-off valve                                 |  | LC             |
| KV48104400<br>( — )                                       | C b  | Reforming teflon ring  | — EC           |
| Rack seal ring reformer                                   |  | a: 50 mm (1.97 in) día.<br>b: 36 mm (1.42 in) día.                 | FE             |
|   | NT550 a Fine finishing                               | c: 100 mm (3.94 in)  | _ CL           |
| ST3127S000<br>(See J25765-A)<br>①GG91030000<br>(J25765-A) |  | Measuring turning torque   | MT             |
| Torque wrench (2)HT62940000                               | 1/4" Torque wrwith range 2.9 N-m (30 kg-cm 26 in b)  | of   | AT             |
| Socket adapter 3HT62900000                                | ভ 3/8" to 1/2" 26 in-lb)                             | ,  | FA             |
| Socket adapter  | NT541  |  | RA             |
|   | Commercial Servi                                     | ce Tools   | BR             |
| Tool name   | Description  |  |                |
| Rear oil seal drift                                       |  | Installing rear oil seal   | ST             |
|   | NT063  | a : 28 mm (1.10 in) dia.   | RS             |
| Pinion oil seal drift                                     |  | Installing pinion oil seal   | <br>BT         |
|   | a  | a . 25 may (4 20 in) dia   | HA             |
| Oil pump attachment                                       | NT063  R21 (0.83) Welding 11 (0.43) dia. 12 (0.47)   | a: 35 mm (1.38 in) dia.  Disassembling and assembling oil pump     | <u> </u>       |
|   | 42 (1.65)<br>42 (1.65)<br>42 (0.47)                  | •  | (DX            |
|   | 95 (3.74)<br>90 (3.54)<br>NT179                      | Unit: mm (in)  |                |





#### **Checking Steering Wheel Play**

• With wheels in a straight-ahead position, check steering wheel play.

Steering wheel play:

35 mm (1.38 in) or less

 If it is not within specification, check 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.

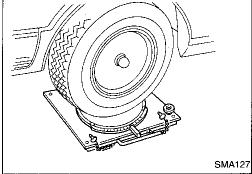
Wheel alignment:

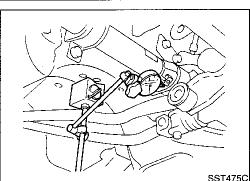
Refer to SDS in FA section.

 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.
- 2. If it is not in the neutral position, remove the steering wheel and reinstall it correctly.
- 3. If the neutral position is between two 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.

2. If it is not within specification, check rack stroke.

Rack stroke "S":

Refer to SDS (ST-25).

#### **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:

ST-4

±2 mm (±0.08 in) or less

If movement exceeds the limit, replace mount insulator after confirming proper installation of gear housing clamps.

#### Checking and Adjusting Drive Belts (For power steering)

Refer to "Checking Drive Belts" for "ENGINE MAINTENANCE" in MA section.

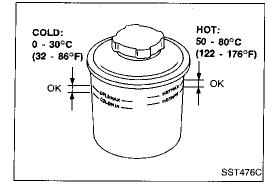
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#### Checking Fluid Level

Check fluid level.

Use the correct range of the tank depending on the fluid temperature. Use the "HOT" range at 50 to 80°C (122 to 176°F), or the

"COLD" range at 0 to 30°C (32 to 86°F).

**CAUTION:** 

Do not overfill.

Recommended fluid is Automatic Transmission Fluid type

DEXRON™IIE, DEXRON™III or equivalent.

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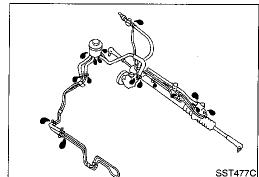
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#### Checking Fluid Leakage

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

Run engine between idle speed and 1.000 rpm.

Make sure temperature of fluid in oil tank rises to 60 to 80°C (140 to 176°F).

2. Turn steering wheel right-to-left several times.

Hold steering wheel at each "lock" position for five seconds and carefully check for fluid leakage.

Do not hold the steering wheel in a locked position for more than 15 seconds.

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.

Check rack boots for accumulation of power steering fluid.

BT

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Bleeding Hydraulic System

Raise front end of vehicle until wheels are clear of the ground.

Add fluid into oil tank to specified level. Then quickly turn steering wheel fully to right and left and lightly touch steering stop-

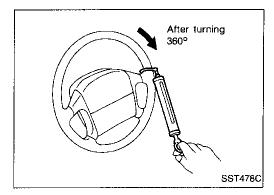
Repeat steering wheel operation until fluid level no longer IDX decreases.

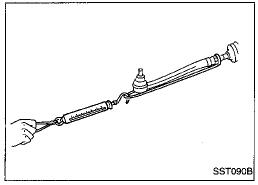
Start engine. Repeat step 2 above.

#### **Bleeding Hydraulic System (Cont'd)**

- 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 steering wheel slowly. This does not affect 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.
- Start engine.
- 3. Bring power steering fluid up to adequate operating temperature. [Make sure temperature of fluid is approximately 60 to 80°C (140 to 176°F).]

#### Tires need to be inflated to normal pressure.

4. Check steering wheel turning force when steering wheel has been turned 360° from the neutral position.

#### Steering wheel turning force:

#### 39 N (4 kg, 9 lb) or less

- 5. If steering wheel turning force is out of specification, check rack sliding force.
- 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 mm (0.138 in)/s. Check that rack sliding force is within specification.

#### Rack sliding force:

#### 186 - 284 N (19 - 29 kg, 42 - 64 lb)

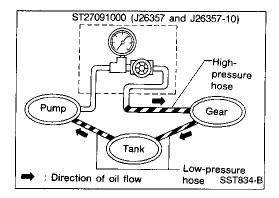
d. Check sliding force outside above range.

#### Rack sliding force:

#### Not more than 294 N (30 kg, 66 lb)

- 6. If rack sliding force is not within specification, overhaul steering gear assembly.
- 7. If rack sliding force is OK, inspect steering column. Refer to ST-11.

#### ON-VEHICLE SERVICE



#### Checking Hydraulic System

Before starting, check belt tension, driving pulley and tire pressure.

- Set Tool. Open shut-off valve. Then bleed air. (See "Bleeding" Hydraulic System" ST-5.)
- Run engine.

**G** 

Make sure temperature of fluid in tank rises to 60 to 80°C (140 to 176°F).

MA

#### **WARNING:**

Warm up engine with shut-off valve fully opened. If engine is started with shut-off valve closed, fluid pressure in oil pump will increase to maximum. This will raise oil temperature abnormally.

EW

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.

EC

Oil pump maximum standard pressure: 8,140 - 8,728 kPa (83 - 89 kg/cm<sup>2</sup>, 1,180 - 1,266 (iza

FE

- 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.

MIT

#### **CAUTION:**

Do not close shut-off valve for more than 15 seconds.

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If oil pressure is higher than standard pressure, check oil pump flow control valve.

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After checking hydraulic system, remove Tool and add fluid as necessary. Then completely bleed air out of system.

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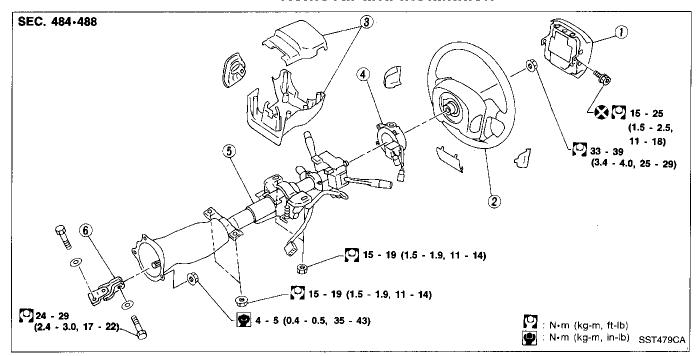
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#### **Removal and Installation**



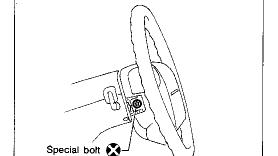
- 1 Air bag module
- ② Steering wheel

- 3 Column cover
- 4 Spiral cable

- Steering column assembly
- 6 Lower joint

#### **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.

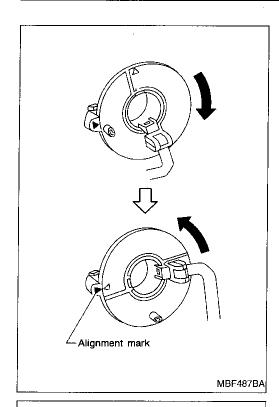


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#### STEERING WHEEL

Remove air bag module and spiral cable.
 Refer to "Removal — Air Bag Module and Spiral Cable",
 "SUPPLEMENTAL RESTRAINT SYSTEM" in RS section.

#### STEERING WHEEL AND STEERING COLUMN



#### Removal and Installation (Cont'd)

- Align spiral cable correctly when installing steering wheel.
- Set the front wheels in the straight-ahead position. a.
- 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.)



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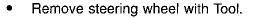
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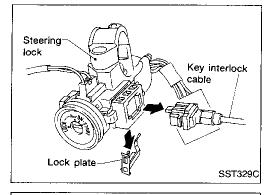
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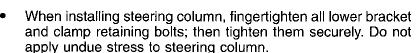
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#### STEERING COLUMN

SST480C

Remove key interlock cable (A/T models).

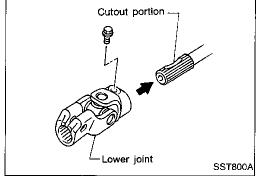




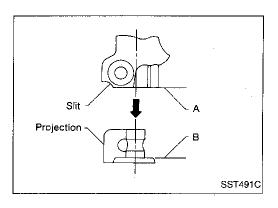
When attaching coupling joint, be sure tightening bolt faces cutout portion.

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#### STEERING WHEEL AND STEERING COLUMN



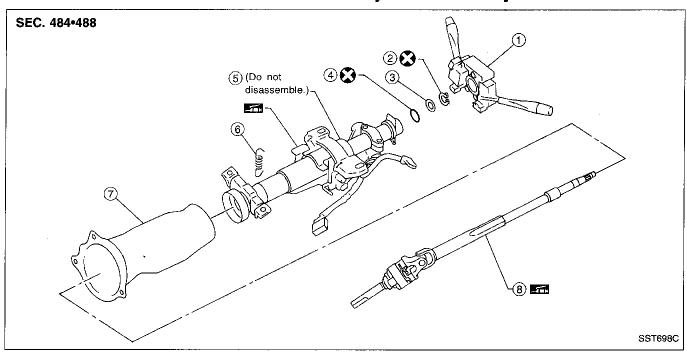
#### Removal and Installation (Cont'd)

 Align slit of lower joint with projection on dust cover. Insert joint until surface A contacts surface B.

#### **CAUTION:**

After installation, turn steering wheel to make sure it moves smoothly. Ensure the number of turns are the same from the straight forward position to left and right locks. Be sure that the steering wheel is in a neutral position when driving straight ahead.

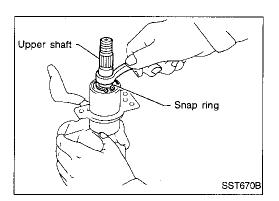
#### **Disassembly and Assembly**



- (1) Combination switch
- (2) Snap ring
- (3) Washer

- 4 O-ring
- 5 Jacket tube assembly
- (6) Spring

- Steering column lower cover
- 8) Column shaft assembly



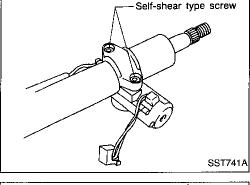
- When disassembling and assembling, unlock steering lock with key.
- Remove combination switch.
- Ensure that rounded surface of snap ring faces toward bearing when snap ring is installed.
- Install snap ring on upper shaft with a suitable tool.

#### STEERING WHEEL AND STEERING COLUMN

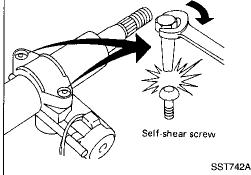
# Self-shear type screw

#### Disassembly and Assembly (Cont'd)

- Steering lock
- a. Break self-shear type screws with a drill or other appropriate tool.

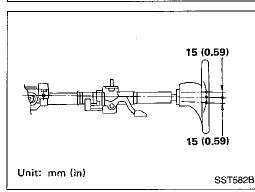


Install new self-shear type screws and then cut off self-shear type screw heads.



Tilt mechanism

After installing steering column, check tilt mechanism opera-



Inspection

When steering wheel does not turn smoothly, check the steering column as follows and replace damaged parts.

Check column bearings for damage or unevenness. Lubricate with recommended multi-purpose grease or replace steering column as an assembly, if necessary.

Check jacket tube for deformation or breakage. Replace if necessary. When the vehicle comes into a light collision, check length "L".

Column length "L":

525.9 - 528.1 mm (20.70 - 20.79 in)

If out of the specifications, replace steering column as an assembly.

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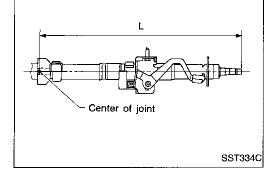
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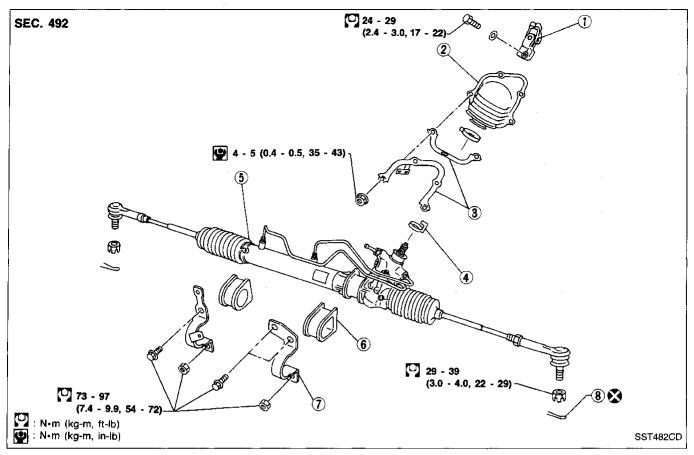
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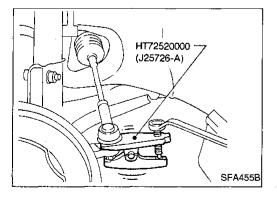


#### Removal and Installation



- 1 Lower joint
- (2) Hole cover
- (3) Insulator bracket

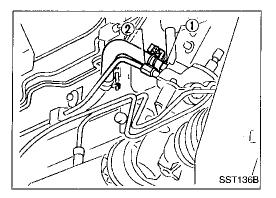
- 4 Rear cover cap
- Gear and linkage assembly
- Rack mounting insulator
- Gear housing mounting bracket
- (8) Cotter pin

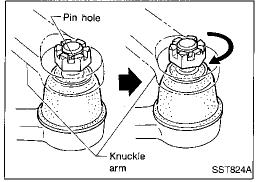


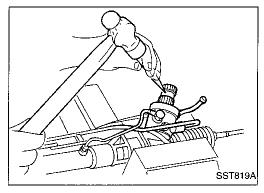
#### **CAUTION:**

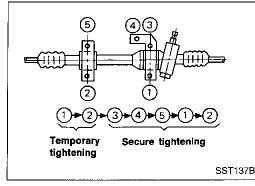
- The rotation of the spiral cable (SRS "Air bag" component part) is limited. If the steering gear must be removed, set the front wheels in the straight-ahead direction. Do not rotate the steering column while the steering gear is removed.
- Remove the steering wheel before removing the steering lower joint to avoid damaging the SRS spiral cable.
- Detach tie-rod outer sockets from knuckle arms with Tool.
- When disconnecting steering shaft lower joint, follow the procedure shown below.
- 1) Remove carbon canister, engine mounting center member and front suspension stabilizer bar. Refer to FA section.
- 2) Remove nuts for fitting the hole cover.
- 3) Disconnect the lower joint while shifting the hole cover.

#### **POWER STEERING GEAR AND LINKAGE**









#### Removal and Installation (Cont'd)

• Install pipe connector.

 Observe specified tightening torque when tightening highpressure and low-pressure pipe connectors. Excessive tightening will damage threads of connector or O-ring.

Connector tightening torque:

1 Low-pressure side

27 - 39 N·m (2.8 - 4.0 kg-m, 20 - 29 ft-lb)

2 High-pressure side

15 - 25 N·m (1.5 - 2.5 kg-m, 11 - 18 ft-lb)

The O-ring in low-pressure pipe connector is larger than that in high-pressure connector. Take care to install the proper O-ring.

Initially, tighten nut on tie-rod outer socket and knuckle arm to 29 to 39 N·m (3.0 to 4.0 kg-m, 22 to 29 ft-lb). Then tighten further to align nut groove with first pin hole so that cotter pin can be installed.

**CAUTION:** 

Do not tighten torque more than 49 N·m (5.0 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.

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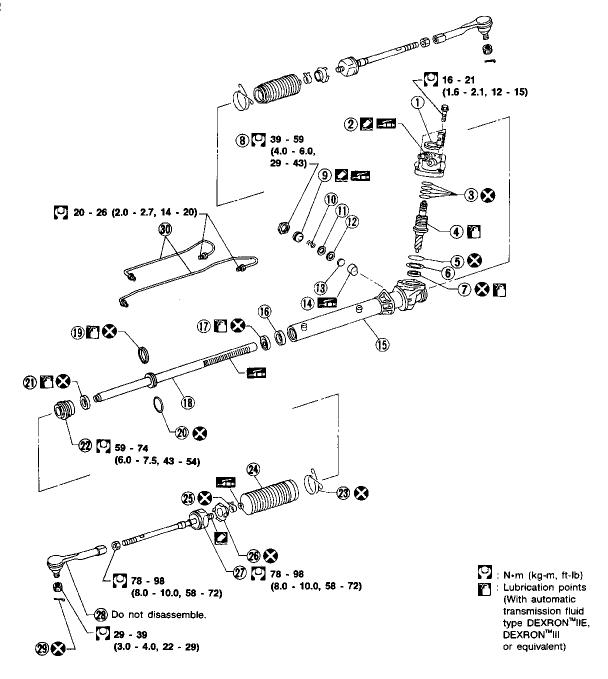
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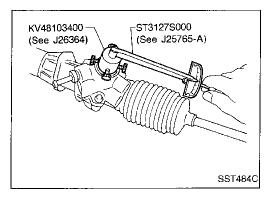
SST483CB

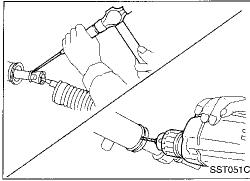
- Rear cover cap
- Rear housing assembly
- ③ Pinion seal ring
- Pinion assembly
- ⑤ O-ring
- 6 Shim
- (7) Pinion oil seal
- (8) Lock nut
- 9 Adjusting screw
- 10 Spring

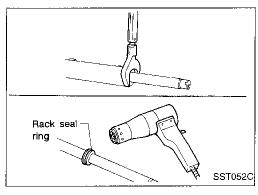
- (1) Spring disc
- (12) Washer
- (3) Spring seat
- (14) Retainer
- (15) Gear housing
- (6) Center bushing
- 17) Rack oil seal
- (18) Rack assembly
- (19) Rack seal ring
- ② O-ring

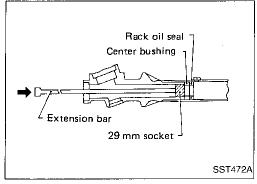
- 21) Rack oil seal
- 2 End cover assembly
- 23) Boot clamp
- (24) Dust boot
- 25) Boot band
- 26) Lock plate
- Tie-rod inner socket
- 28) Tie-rod outer socket
- 29 Cotter pin
- 30 Gear housing tube

#### POWER STEERING GEAR AND LINKAGE









#### **Disassembly**

- Prior to disassembling, measure pinion rotating torque. Record the pinion rotating torque as a reference.
- Before measuring, disconnect gear housing tube and drain fluid.
- Use soft jaws when holding steering gear housing. Handle gear housing carefully, as it is made of aluminum. Do not grip cylinder in a vise.
- Remove pinion gear.

Be careful not to damage pinion gear when removing pinion seal ring.

- Remove tie-rod outer sockets and boots.
- Loosen tie-rod inner socket by prying up staked portion, and 4. remove socket.
- 5. Remove retainer.
- Remove pinion assembly.
- Use a 2 to 2.5 mm (0.079 to 0.098 in) diameter drill to completely remove staked portion of gear housing end.
- Remove end cover assembly with a suitable tool.
- Draw out rack assembly.
- 10. Remove rack seal ring.
- Using a heat gun, heat rack seal to approximately 40°C (104°F).
- Remove rack seal ring.

ST-15

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.

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#### Inspection

Thoroughly clean all parts in cleaning solvent or automatic transmission fluid type DEXRON<sup>TM</sup>IIE, DEXRON<sup>TM</sup>III or equivalent. Blow dry with compressed air, if available.

#### **BOOT**

- Check condition of boot. If cracked excessively, replace it.
- Check boots for accumulation of power steering fluid.

#### **RACK**

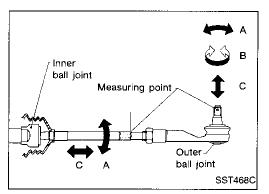
Thoroughly examine rack gear. If damaged, cracked or worn, replace it.

#### **PINION ASSEMBLY**

- Thoroughly examine pinion gear. If pinion gear is damaged, cracked or worn, replace it.
- Check that all bearings roll freely. Ensure that balls, rollers and races are not cracked, pitted or worn.

#### **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-25).

Check ball joint for rotating tórque.

Tie-rod outer ball joint rotating torque "B": Refer to SDS (ST-25).

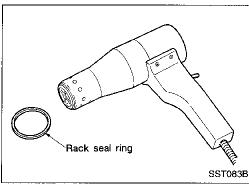
Check ball joints for axial end play.

Tie-rod outer and inner ball joints axial end play "C": Refer to SDS (ST-25).

 Check condition of dust cover. If cracked excessively, replace outer tie-rod.

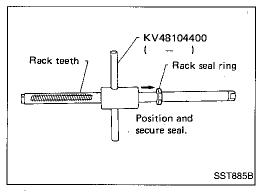


1. Using a heat gun, heat new teflon rack seal ring to approximately 40°C (104°F). Then place it onto rack.



2. Using Tool, compress rack seal ring securely on rack.

Always insert Tool from the rack gear side.



#### **POWER STEERING GEAR AND LINKAGE**

## Film Rack oil seal SST201A

#### Assembly (Cont'd)

- Insert new rack oil seal.
- Place plastic film into rack oil seal to prevent damage by rack teeth.
- Do not forget to remove plastic film after rack oil seal is positioned properly.
- Make sure lips of rack oil seal face each other.



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Install center bushing and rack oil seal with rack assembly.

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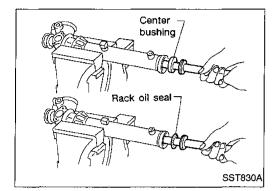
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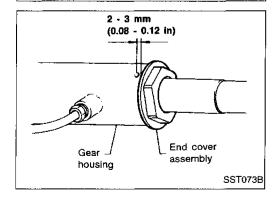


Rack oil seal

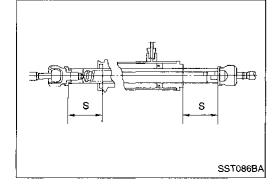
End cover assembly

SST321B

Insert rack oil seal and end cover assembly to rack. Then tighten end cover assembly.



Fasten end cover assembly to gear housing by staking.



Set rack gear in neutral position. Rack stroke "S": Refer to SDS (ST-25).

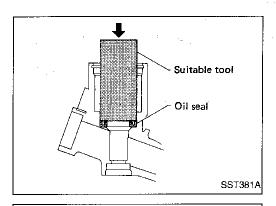
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#### **POWER STEERING GEAR AND LINKAGE**

#### 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.



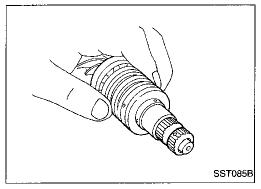
Gear housing?

Oil seal

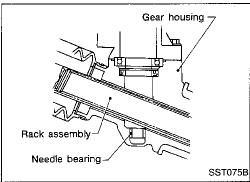
Rack assembly

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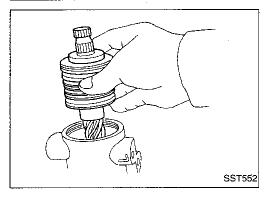
- 9. Install pinion bearing adjusting shim(s).
- Whenever pinion assembly, gear housing and rear housing are disassembled, replace shim(s) with new ones. Always use the same number of shim(s) when replacing.



- 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.



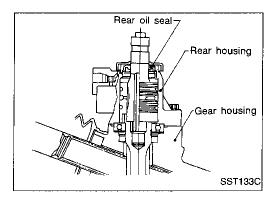
11. Apply a coat of multi-purpose grease to needle bearing roller and oil seal lip.



12. Install pinion assembly to rear housing. Be careful not to damage pinion oil seal.

#### **POWER STEERING GEAR AND LINKAGE**

#### Assembly (Cont'd)

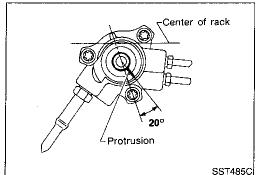


13. Apply a coat of multi-purpose grease to new rear oil seal lip before installing rear housing.



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Diaphragm.

Washer

Retainer

spring

14. Ensure that the rack is centered. Install rear cover cap so that protrusion of rear housing cover is positioned as shown in fig-

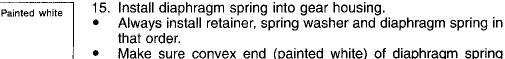
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Be careful not to damage worm ring and oil seal.

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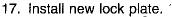
Make sure convex end (painted white) of diaphragm spring faces outward when installing.

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16. Install retainer spring and adjusting screw temporarily.

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Attach lock plate (2) to side rod inner socket (1). Apply locking sealant to inner socket threads 3.

Screw inner socket into rack (4) and tighten to specified torque.

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Clinch two places of lock plate at rack's groove.

#### **CAUTION:**

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SST135C

To prevent scratching the boot, remove burrs from lock plate.

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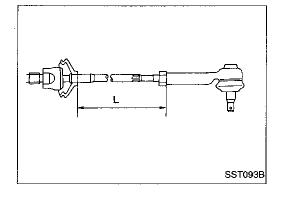
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18. Tighten outer socket lock nut.

Tie-rod length "L": Refer to SDS (ST-25).

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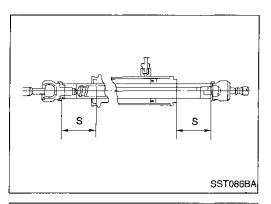


Clinch.

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#### **POWER STEERING GEAR AND LINKAGE**

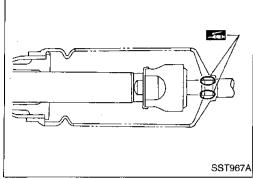
#### Assembly (Cont'd)



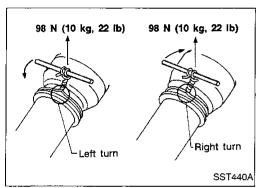
19. Measure rack stroke.

Rack stroke "S":

Refer to SDS (ST-25).

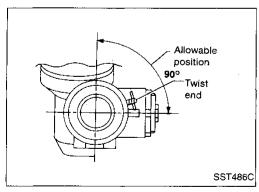


20. Before installing boot, coat the contact surfaces between boot and tie-rod with grease.

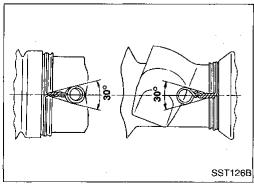


21. Install boot clamps.

- 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.

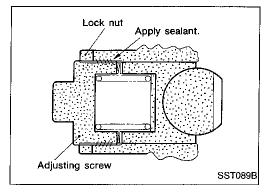


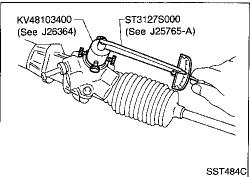
 Locate twisted end of boot clamp in the range shown. (This will prevent interference with other parts.)

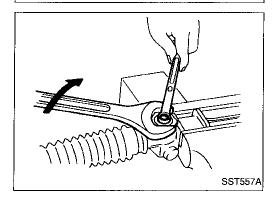


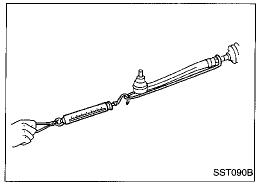
 After twisting boot clamp, bend twisted and diagonally so it does not contact boot.

#### **POWER STEERING GEAR AND LINKAGE**









#### **Adjustment**

Adjust pinion rotating torque as follows:

- 1. Set rack to the neutral position without fluid in the gear.
- 2. Coat the adjusting screw with locking sealant and screw it in.
- 3. Lightly tighten lock nut.
- Tighten adjusting screw to a torque of 4.9 to 5.9 N·m (50 to 60 kg-cm, 43 to 52 in-lb).
- 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.
- 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 40° to 60°.
- 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.
  - Rack sliding force: 186 284 N (19 29 kg, 42 64 lb) Check sliding force outside above range.
- g. Check sliding force outside above range.

  Rack sliding force: Not more than 294 N (30 kg, 66 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.

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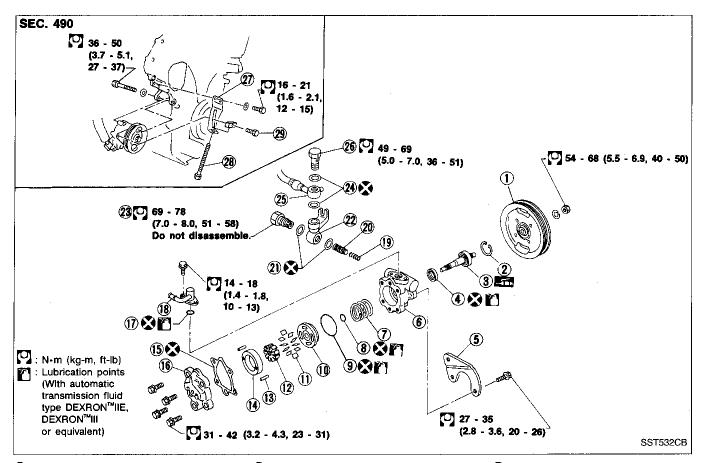
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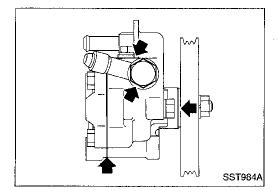
#### **POWER STEERING OIL PUMP**



- 1 Pulley
- 2 Snap ring
- 3 Drive shaft assembly
- (4) Oil seal
- ⑤ Bracket
- (6) Front housing
- (7) Spring
- 8 O-ring (Inner)
- 9 O-ring (Outer)
- (10) Front side plate

- (1) Vane
- 12 Rotor
- (13) Pin
- (14) Cam ring
- (15) Gasket
- (16) Rear housing
- (17) O-ring
- (18) Suction pipe
- (19) Spring
- 20 Control valve

- Copper washer
- 2 Joint
- 23 Connector
- (24) Copper washer
- 25) Hose
- 26 Eye boit
- 27) Adjusting bracket
- 28 Adjusting bolt
- 29 Lock bolt



#### **Pre-disassembly Inspection**

Disassemble the power steering oil pump only if the following items are found.

- Oil leak from any point shown in the figure
- Deformed or damaged pulley
- Poor performance

#### **Disassembly**

#### **CAUTION:**

- Parts which can be disassembled are strictly limited.
   Never disassemble parts other than those specified.
- Disassemble in as clean a place as possible.
- Clean your hands before disassembly.
- Do not use rags; use nylon cloths or paper towels.
- Follow the procedures and cautions in the Service Manual.
- When disassembling and reassembling, do not let foreign matter enter or contact the parts.
- Remove snap ring, then draw drive shaft out.

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Be careful not to drop drive shaft.

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Remove oil seal.

Be careful not to damage front housing.

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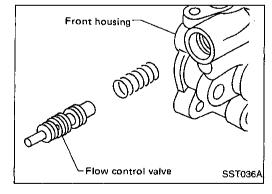
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• Remove connector and flow control valve with spring.

Be careful not to drop flow control valve.



Extension bar

Drive shaft

SST010B

SST034A



- If pulley is cracked or deformed, replace it.
- If an oil leak is found around pulley shaft oil seal, replace the seal
- If serration on pulley or pulley shaft is deformed or worn, replace it.



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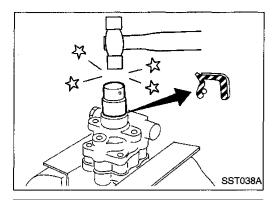
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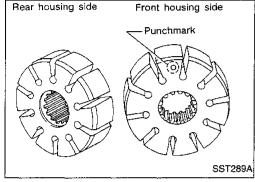
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#### **POWER STEERING OIL PUMP**

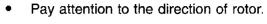


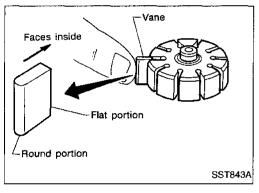




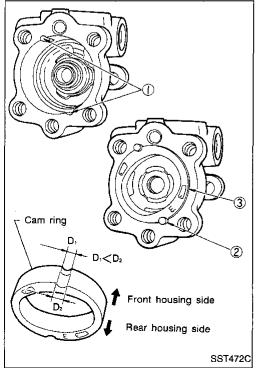
Assemble oil pump, noting the following instructions.

- Make sure O-rings and oil seal are properly installed.
- Always install new O-rings and oil seal.
- Be careful of oil seal direction.
- Cam ring, rotor and vanes must be replaced as a set if necessary.
- · Coat each part with ATF when assembling.





 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 rotor.
 Then install cam ring ③ as shown at left.

Cam ring:

D<sub>1</sub> is less than D<sub>2</sub>

## SERVICE DATA AND SPECIFICATIONS (SDS)

## **General Specifications**

| Applied model                          | All               |  |
|--|-------------------|--|
| Steering model                         | Power steering    |  |
| Steering gear type                     | PR26AC            |  |
| Steering overall gear ratio            | 16.7              |  |
| Turns of steering wheel (Lock to lock) | 2.95              |  |
| Steering column type                   | Collapsible, tilt |  |

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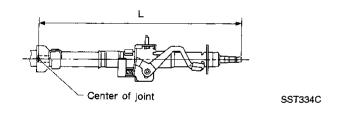
#### **Inspection and Adjustment** STEERING GEAR AND LINKAGE

#### **GENERAL**

| Steering wheel axial play mm (in) | 0 (0)              |
|-----------------------------------|--------------------|
| Steering wheel play mm (in)       | 35 (1.38) or less  |
| Movement of gear housing mm (in)  | ±2 (±0.08) or less |

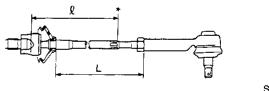
#### **STEERING COLUMN**

| Applied model              | All             |
|----------------------------|-----------------|
| Steering column length "L" | 525.9 - 528.1   |
| mm (in)                    | (20.70 - 20.79) |

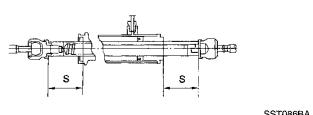


| Steering gear type            |                        | PR26AC  |
|-------------------------------|------------------------|---|
| Tie-rod outer ball joint "A"  |                        |   |
| Swinging force at cotter p    | oin hole<br>N (kg, lb) | 6.59 - 63.7<br>(0.672 - 6.497,<br>1.481 - 14.320) |
| Rotating torque "B"<br>N·m (k | (g-cm, in-lb)          | 0.3 - 2.9<br>(3 - 30, 2.6 - 26.0)                 |
| Axial end play "C"            | mm (in)                | 0.5 (0.020) or less                               |
| Fie-rod inner ball joint "A"  |                        |   |
| Swinging force*               | N (kg, lb)             | 6.4 - 50.0<br>(0.65 - 5.10,<br>1.44 - 11.24)      |
| Axial end play "C"            | mm (in)                | 0 (0)   |
| Tie-rod standard length "L"   | mm (in)                | 202.7 (7.98)                                      |

<sup>\*:</sup> Measuring point [1: 172 mm (6.77 in)]



|                 |         | SST4880      |
|-----------------|---------|--------------|
| Rack stroke "S" | mm (in) | 70.5 (2.776) |



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## SERVICE DATA AND SPECIFICATIONS (SDS) Inspection and Adjustment (Cont'd)

#### **POWER STEERING**

| Rack sliding force N (kg, lb) Under normal operating oil pressure at rack speed of 3.5 mm (0.138 in)/s |   |
|--|---|
| Range within $\pm 11.5$ mm ( $\pm 0.453$ in) from the neutral position                                 | 186 - 284<br>(19 - 29, 42 - 64)           |
| Except above range   | Not more than<br>294 (30, 66)             |
| Retainer adjustment  |   |
| Adjusting screw  |   |
| Initial tightening torque<br>N⋅m (kg-cm, in-lb)  | 4.9 - 5.9 (50 - 60, 43 - 52)              |
| Retightening torque after loosening  | 0.2 (2, 1.7)                              |
| Tightening torque after gear has settled   | 4.9 (50, 43)                              |
| Returning angle degree   | 40° - 60°                                 |
| Steering wheel turning force<br>(Measured at one full turn from the<br>neutral position)<br>N (kg, lb) | 39 (4, 9) or less                         |
| Fluid capacity (Approximate)  (US qt, Imp qt)  | 1.1 (1-1/8, 1)                            |
| Oil pump maximum pressure kPa (kg/cm², psi)  | 8,140 - 8,728<br>(83 - 89, 1,180 - 1,266) |

## **BODY AND TRIM**

# SECTION BT

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- ★ For seat belt, refer to MA and RS section.
- ★ For wiring diagrams of body electrical systems, refer to EL section.

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#### **PRECAUTIONS**

#### **Precaution**

- 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 installing. 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"

The Supplemental Restraint System "Air Bag", used along with a seat belt, helps 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 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.
- Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses are covered with yellow insulation either just before the harness connectors or for the complete harness, for easy identification.

#### **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.

| Symbol<br>No. | Shapes    | Removal & Installation   | (i)        |
|---------------|-----------|--|------------|
| CIB O         |           | Removal: Remove by bending up with flat-bladed screwdrivers or clip remover.         | MA<br>EM   |
|               | SBF302H   | SBF367BA   | LC<br>EC   |
|               |           |  | FE         |
| ©103          | THREA     | Removal:   | <u>C</u> L |
|               | SBF095    | Remove with a clip remover.  SBF423H   | MT         |
|               | 9 9       | Push center pin to catching position. Push (Do not remove center pin by hitting it.) | at<br>Fa   |
| (203)<br>I    |           | Push   | RA         |
| 8             |           | Installation:  | BR         |
|               | SBF258G   | SBF708E  | <b>S</b> T |
| ļ             |           | Removal:   | RS         |
|               |           |  | вт         |
|               | MBT080A   | Clip<br>Finisher<br>SBF638C  | HA         |
|               | NID 1000A | 351 0000   |            |

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## GENERAL SERVICING

## Clip and Fastener (Cont'd)

| Symbol<br>No.  | Shapes             | Removal & Installation  |
|----------------|--------------------|---|
| C206           | MBF519B            | MBF520B   |
| Œ103)<br>-     | SBF104B            | Removal:  |
| <b>(</b> E107) | SBF411H            | Panel Flat-bladed screwdriver Molding Clip SBF767B  |
| Œ117)<br>\     | SBF174D            | Removal: Remove by bending up with a flat-bladed screwdriver or pilers.  SBF175DA           |
| (E) (P-(II))   | Seal rubber Clip-B | Removal:  Clip-A  Finisher  Weatherstrip Clip-B Rubber seal Flat-bladed screwdriver SBF649B |

## **GENERAL SERVICING**

## Clip and Fastener (Cont'd)

|               | onpana raction (conta)                            |  |  |  |
|---------------|---|--|--|--|
| Symbol<br>No. | Shapes  | Removal & Installation   |  |  |
| <b>(F118)</b> | Clip-A  Clip-B (Grommet)  Sealing washer  SBF151D | Removal:  Flat-bladed screwdriver  Finisher  Clip-B  (Grommet)  panel  Sealing  washers  SBF259G                     |  |  |
| (310)<br>(2)  | SBF145B   | Removal: Installation:  Rotate 45° to remove.  Removal: SBF085B  |  |  |
| <b>নো</b> ত্ত | SBF768B   | Removal: Holder portion of clip must be spread out to remove rod.  SBF770B   |  |  |
| (F) (F)       | SBF078B   | Removal:  1. Screw out with a Phillips screwdriver.  2. Remove female portion with flat-bladed screwdriver.  SBF992G |  |  |

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#### **Body Front End**

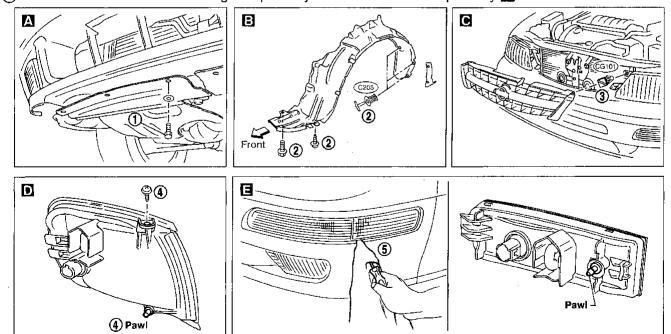
- When removing or installing hood, place a cloth or other padding on hood. This prevents vehicle body from being scratched.
- Bumper fascia is made of plastic. Do not use excessive force and be sure to keep oil away from it.
- Hood adjustment: Adjust at hinge portion.
- Hood lock adjustment: After adjusting, 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.

#### **WARNING:**

- Be careful not to scratch hood stay when installing hood. A scratched stay may cause gas leakage.
- The contents of the hood stay are under pressure. Do not take apart, puncture, apply heat or allow fire near it.

#### REMOVAL — Front bumper assembly

- (1) Remove bolts securing engine undercover from the front side. A
- Remove bolts, screws and clips (285) securing fender protectors in the wheelhouse. Then remove left and right fender protectors.
- 3) Remove clip securing grille and remove the grille.
- (4) Remove screws securing left and right side combination lamps and remove the lamps.
- (5) Insert flat-bladed screwdriver between side marker lamps and turn signal lamps. Then remove side marker lamps.
- (6) Remove screws securing left and right turn signal lamps and remove the lamps.
- Remove the clip (SID) securing fog lamp finisher and remove the finisher. Then remove the bolts securing fog lamps and remove the lamps.
- (8) Remove nuts and bolts securing headlamps. Then remove left and right headlamps.
- (9) Remove bolts securing both bumper side brackets and remove the brackets.
- (10) Remove bolts and clips (2003) securing bumper fascia.
- (ii) Remove nuts securing fascia from both bumper sides. Then pull bumper fascia out.
- Remove nuts and bolts securing retainer from center and both sides and remove retainer.
- Remove nuts securing bumper reinforcement and remove the reinforcement.
- (A) Remove bolts and nuts securing bumper stay and remove the bumper stay. N

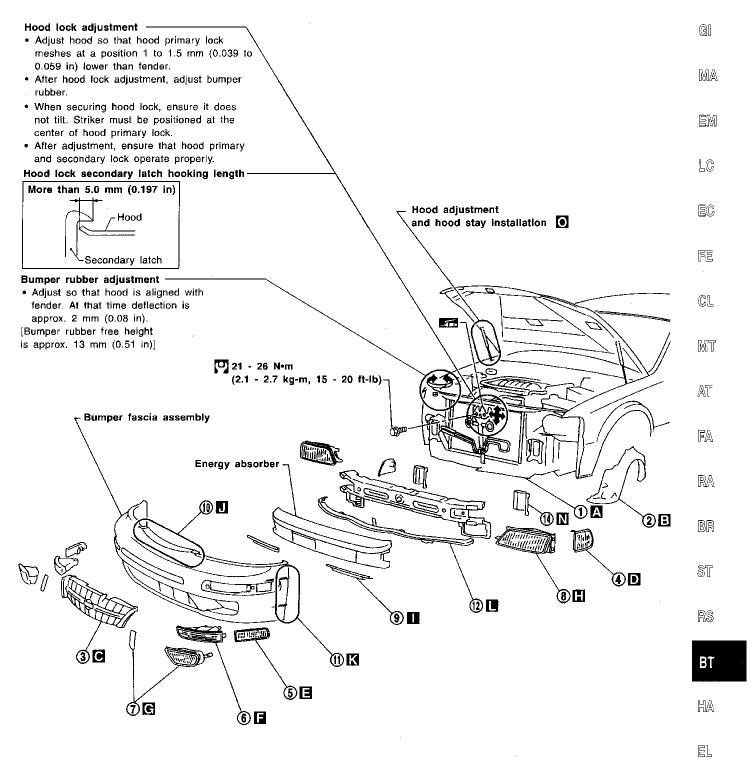


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#### **BODY END**

#### **Body Front End (Cont'd)**

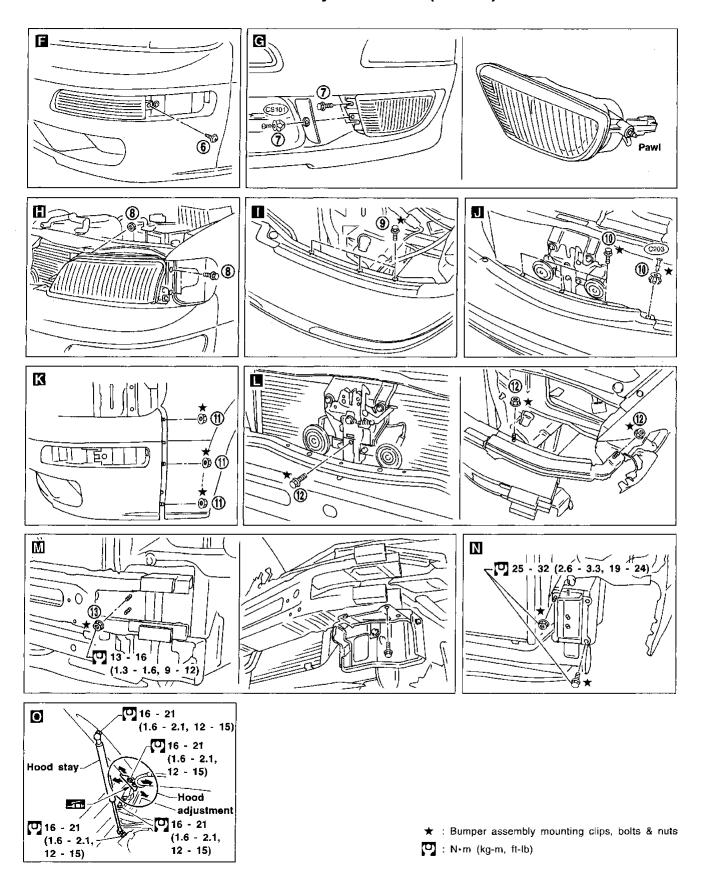
#### SEC. 260°261°262°620°630°650



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#### **BODY END**

## **Body Front End (Cont'd)**



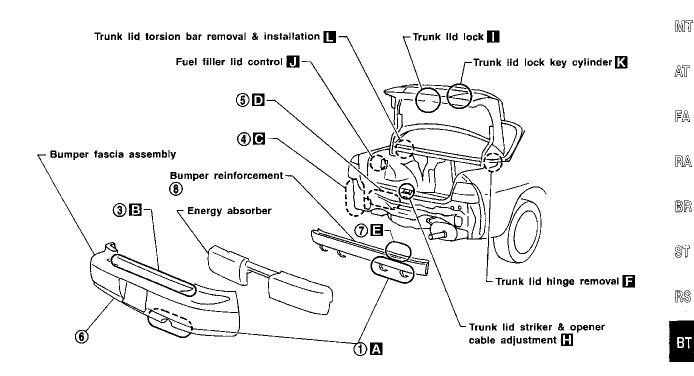
#### **Body Rear End and Opener**

- When removing or installing trunk lid, place a cloth or other padding on trunk lid. This prevents vehicle body from being scratched.
- Bumper fascia is made of plastic. Do not use excessive force and be sure to keep oil away from it.
- Trunk lid adjustment: Adjust at hinge-trunk lid portion for proper trunk lid fit.
- Trunk lid lock system adjustment: Adjust striker so that it is in the center of the lock. After adjustment, check trunk lid lock operation.
- After installation, make sure that trunk lid and fuel filler lid open smoothly.
- ★ For Wiring Diagram, refer to "TRUNK LID AND FUEL FILLER LID OPENER" in EL section.

#### **REMOVAL** — Rear bumper assembly

- (1) Remove bolts from lower side of rear bumper fascia. A
- 2 Remove trunk trim. Refer to "Trunk Room Trim" in "INTERIOR TRIM" for details, BT-21.
- Remove clips securing upper side of bumper fascia.
- (4) Remove nuts from each fender side.
- (5) Remove nuts securing fascia bracket from trunk compartment.
- (6) Pull bumper fascia out.
- (7) Remove left and right plugs from floor and then remove reinforcement mounting bolts.
- (8) Pull reinforcement out.

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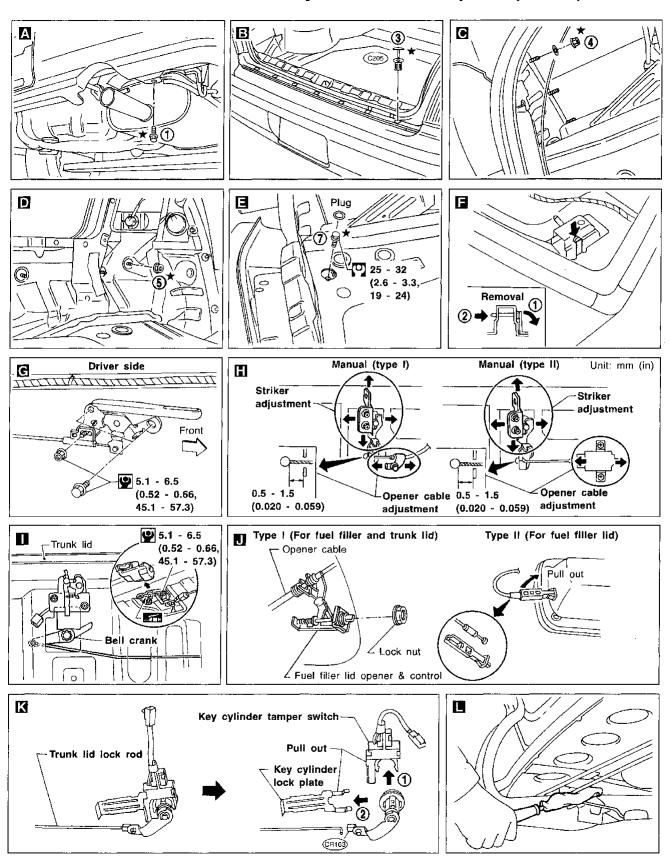
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## Body Rear End and Opener (Cont'd)



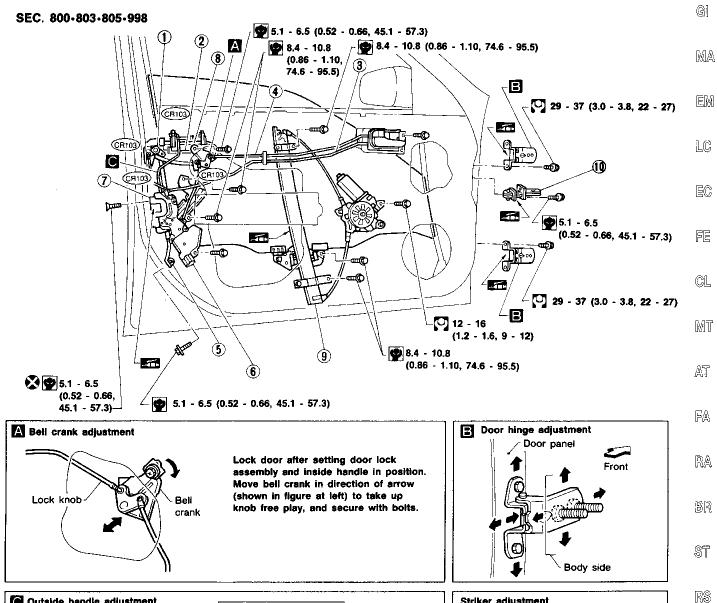
★: Bumper assembly mounting bolts, nuts and clips

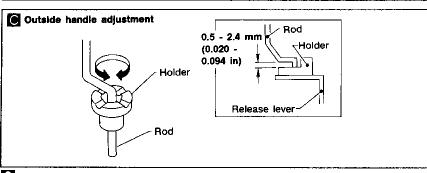
☑ : N•m (kg-m, in-lb)

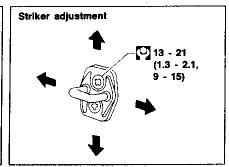
: N·m (kg-m, ft-lb)

#### **Front Door**

- For removal of door trim, refer to "Door Trim" in "INTERIOR TRIM" (BT-19).
- After adjusting door or door lock, check door lock operation.







: N•m (kg-m, ft-lb) : N•m (kg-m, in-lb)

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- Key cylinder
- ② Outside handle
- 3 Inside handle rod
- (4) Lock knob rod

- 5 Guide rail adjustment
- 6 Door lock actuator
- ⑦ Door lock assembly

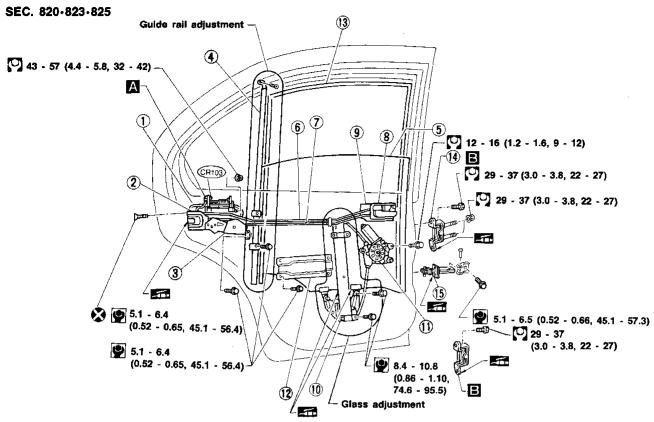
- 8 Bell crank adjustment
- Regulator assembly
- ① Check link assembly

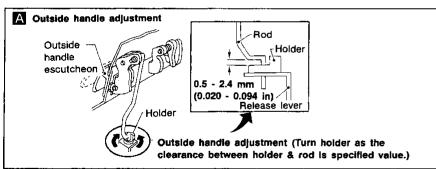
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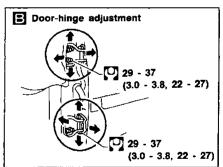
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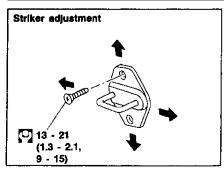
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#### **Rear Door**









- Outside handle
- ② Door lock assembly
- 3 Door lock actuator
- 4 Guide channel
- (5) Glass

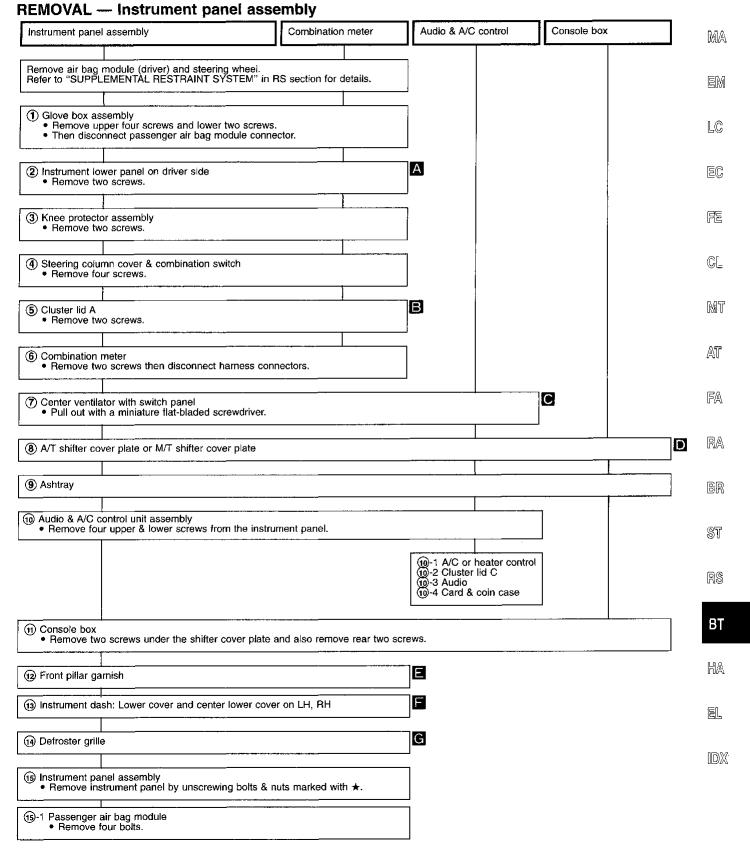
- N•m (kg-m, in-lb)
  N•m (kg-m, ft-lb)
  - 6 Lock knob rod
  - 7 Inside handle rod
  - 8 Inside handle
  - 9 Inside handle bracket
  - (10) Regulator assembly

- (11) Motor
- (12) Inner bracket
- (13) Glass run rubber
- 14 Door hinge
- (15) Check link assembly

SBF332HD

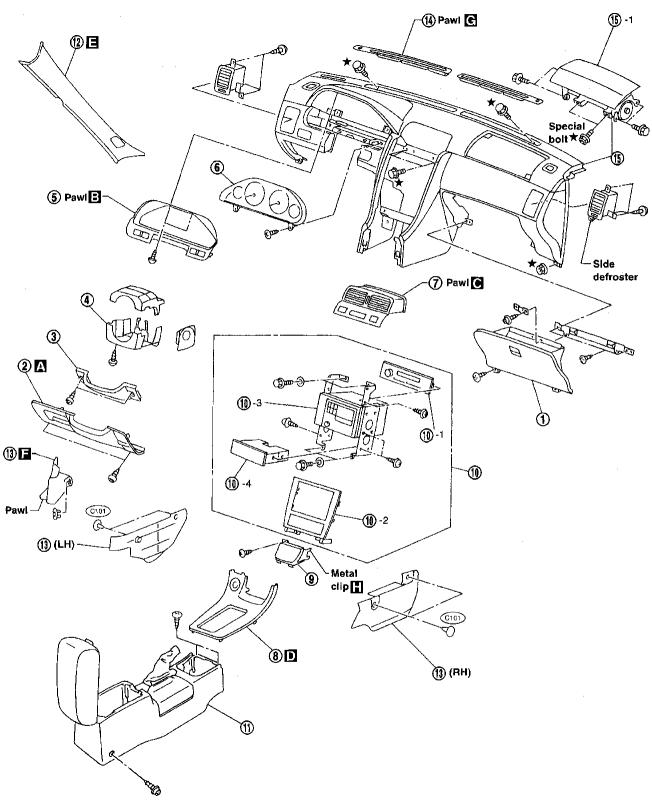
#### **CAUTION:**

- 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.



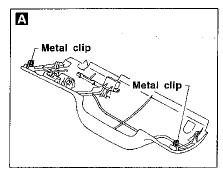
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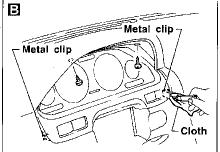
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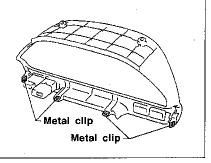


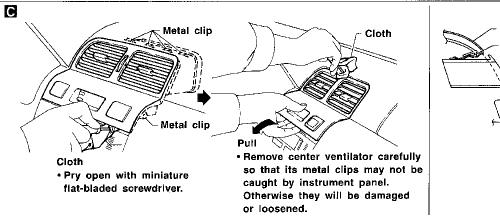
★: Instrument panel assembly mounting bolts and nuts

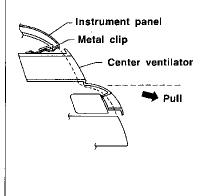
#### **INSTRUMENT PANEL**





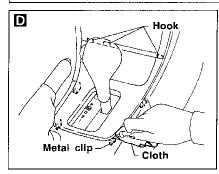


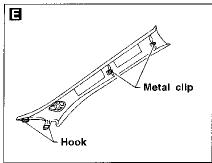


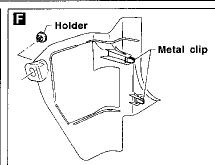


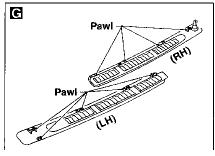
#### **CAUTION:**

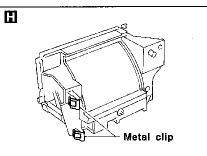
- Do not pull the center ventilator horizontally, but do so slightly downwards.
- If it is pulled upwards, the metal clips on the upper side of the center ventilator can be caught by the instrument panel, and if it is pulled out forcefully, the clips may be loosened or damaged.
- If it is inadvertently pulled out in the upward direction, check the metal clips for any looseness or detachment.
- If the center ventilator is dropped or knocked, check it for damage, and looseness or detachment of defroster grille, before reinstalling it.











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#### **INTERIOR TRIM**

#### Side and Floor Trim

#### **CAUTION:**

Wrap the tip of flat-bladed screwdriver with a cloth when removing metal clips from garnishes.

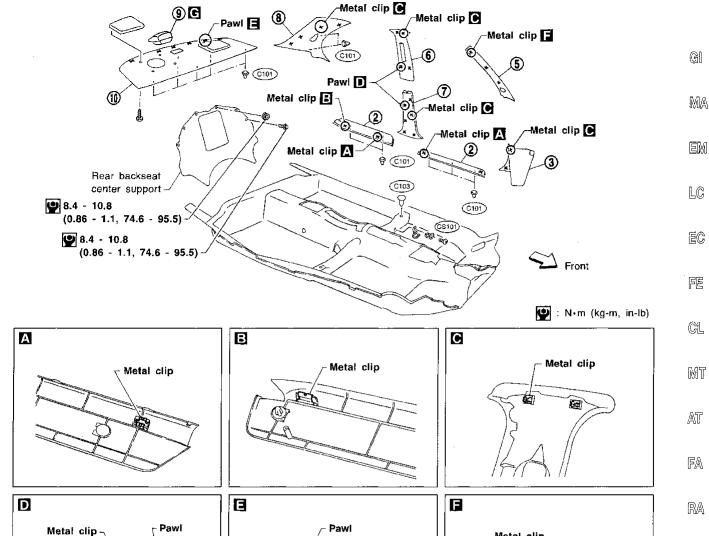
#### REMOVAL — Body side trim

- 1 Remove front and rear seats. Refer to "SEAT" for details, BT-27, 30.
- 2 Remove front and rear kicking plates.
- 3 Remove dash side lower finishers.
- (4) Remove front and rear body side welts. Refer to "Body side welt" in "EXTERIOR" for details, BT-23.
- 5 Remove front pillar garnishes.
- 6 Remove center pillar upper garnishes.
  7 Remove center pillar lower garnishes.
- 8 Remove rear pillar garnishes.
- (9) Remove high-mounted stop lamp.
- (10) Remove rear parcel shelf finisher.

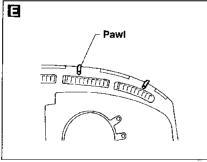
#### **INTERIOR TRIM**

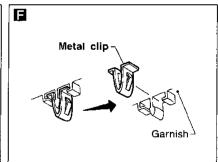
## Side and Floor Trim (Cont'd)

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Metal clip Pawl





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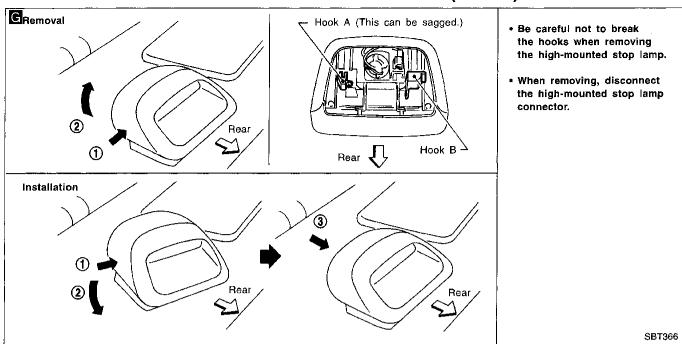
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#### **INTERIOR TRIM**

## Side and Floor Trim (Cont'd)



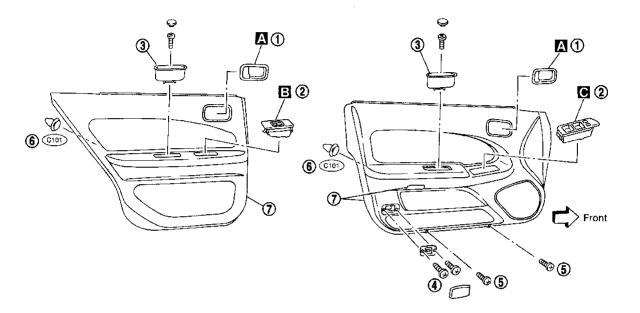
#### **Door Trim**

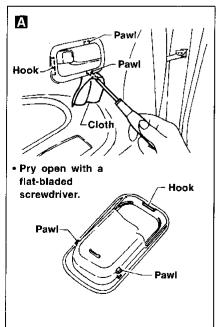
#### Removal — Door trim

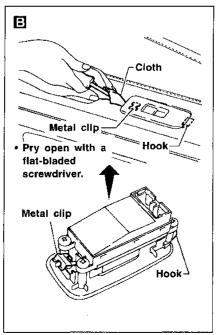
- (1) Remove inside handle escutcheon.

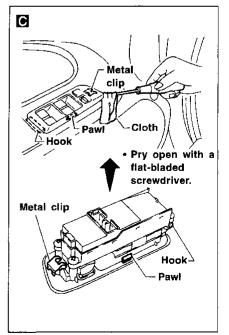
- Remove power window switches, then disconnect the connectors.
   Remove screw securing pull handle, and then remove pull handle.
   Remove step lamp lens and two screws securing step lamp, and then disconnect step lamp connector.
   Remove two screws. (Front door only)
- 6 Remove clips (1997) securing door finisher.
- (7) Lift out door finisher. Disconnect harness connectors.

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#### **Roof Trim**

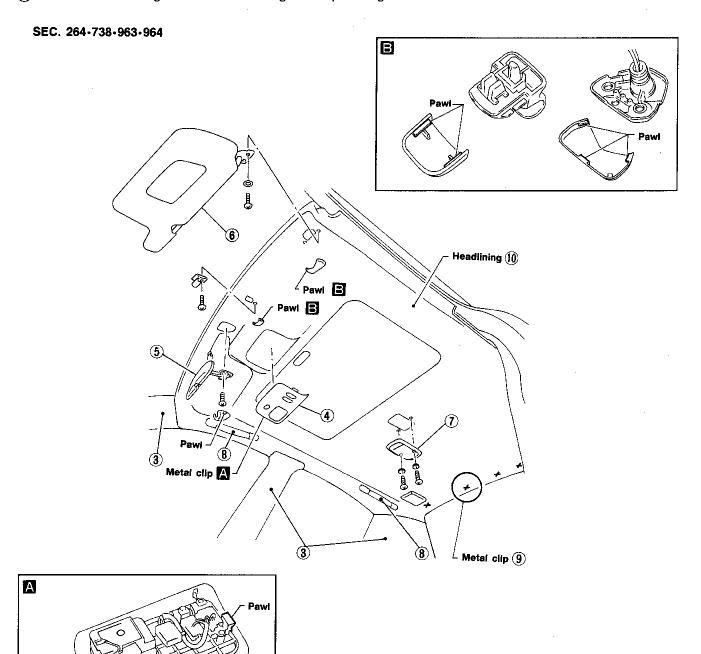
#### **REMOVAL** — Headlining

- Remove front and rear seats. Refer to "SEAT" for details, BT-27, 30.
   Remove front and rear seat belts. Refer to "SEAT BELTS" in RS section for details.
   Remove body side trim. Refer to "Side and Floor Trim" for details, BT-16.
   Remove sunroof switch or spot lamp switch.
   Remove inside mirror assembly.
   Remove sun visors.
   Remove interior lamp assembly.

- (8) Remove assist grips.

Metal clip

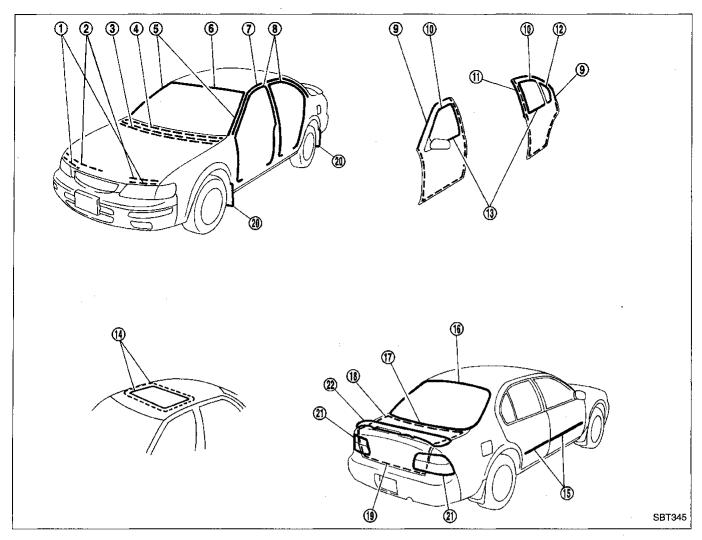
- 9 Remove metal clips securing headlining.
- Remove headlining from vehicle through front passenger side.



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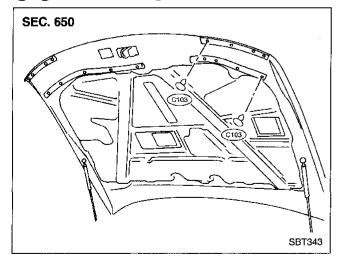
#### **Trunk Room Trim**

SEC. 849 GI Trunk lid trim MA **©103** EM LC EC Front Trunk room front trim FE Trunk room side trim (206) (A) CL Molding MT €-AT (III)  $\mathbb{F}\!\mathbb{A}$ (III) RA  $\Diamond$ C103 BR C103 ST RS Trunk rear plate C206 Trunk floor trim ВТ ©103  $\mathbb{H}\mathbb{A}$ EL Trunk rear trim IDX

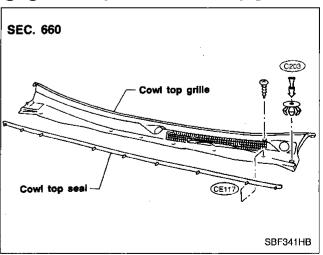


**BT-22** 

#### 1 2 Hood molding and hood front seal



3 4 Cowl top seal and cowl top grille



(5) Windshield side molding Mounted with screws.

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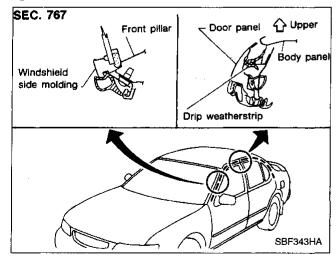
**BT-23** 

#### 6 Windshield upper molding

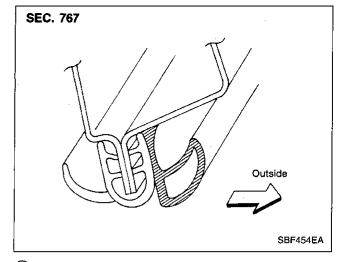
## SEC. 720 Cut off sealant at glass end. Remove old sealant from panel surface. Set molding fastener and apply primer to body panel, and apply sealant to body. Molding Clip Fastener Glass Double-faced adhesive tape Apply primer. Dam rubber Apply sealant. ∠ Sealant Install molding by aligning the molding mark located on center with vehicle center. Be sure to install tightly so that there is no gap

#### 7 Drip weatherstrip

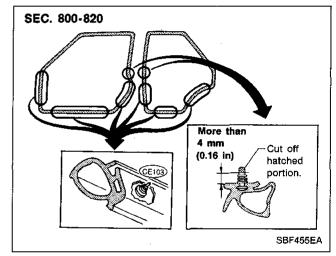
around the corner.



#### 8 Body side welt



#### 9 Door weatherstrip



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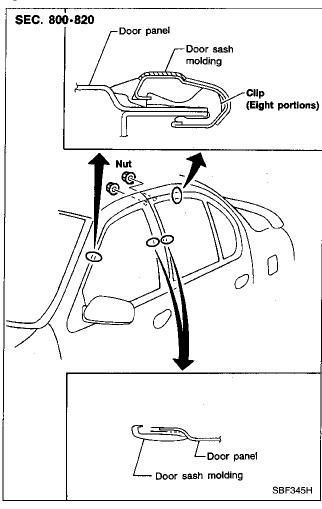
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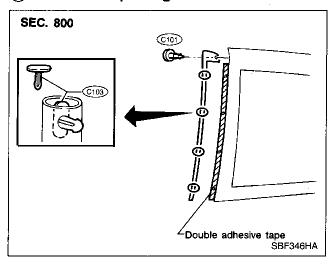
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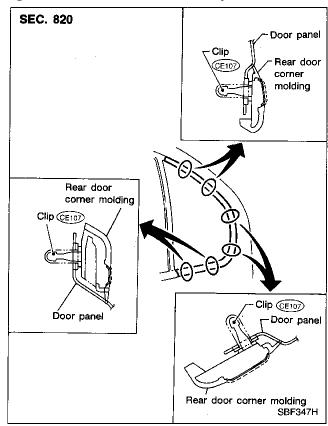
#### 10 Door sash molding



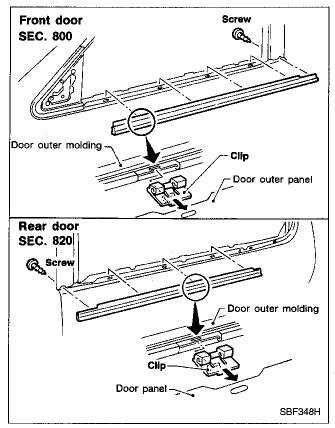
#### (1) Front door parting seal



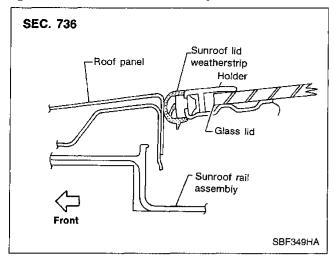
#### 12 Rear door corner molding



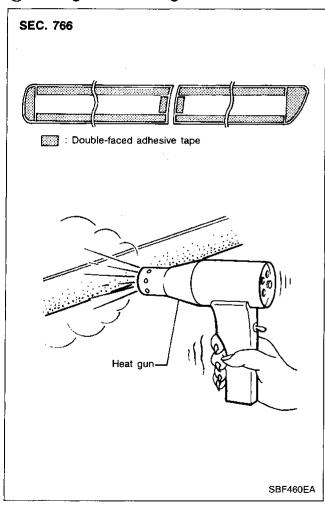
#### 13 Door outside molding



#### (14) Sunroof lid weatherstrip



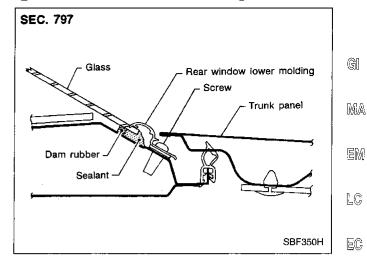
#### (5) Side guard molding



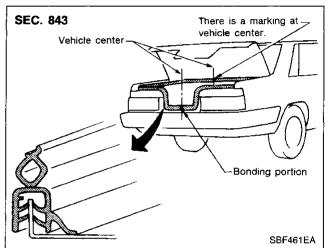
## (6) (7) Rear window upper molding and side molding

Basically the same as windshield upper molding. Refer to 6 Windshield upper molding.

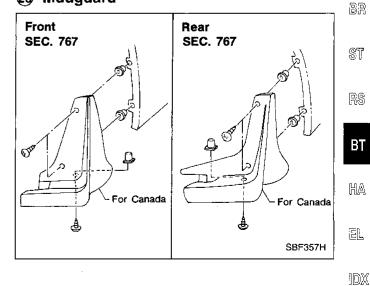
#### (18) Rear window lower molding



#### 19 Trunk lid weatherstrip



#### 20 Mudguard



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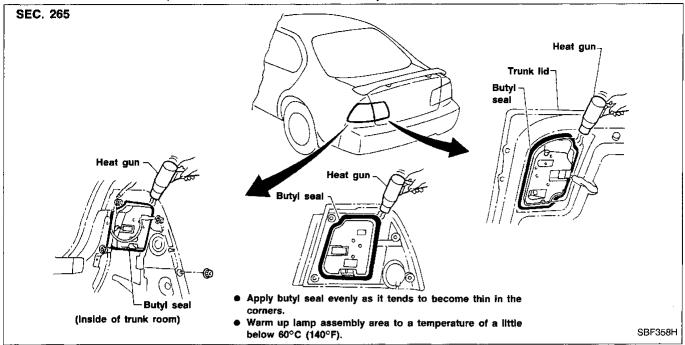
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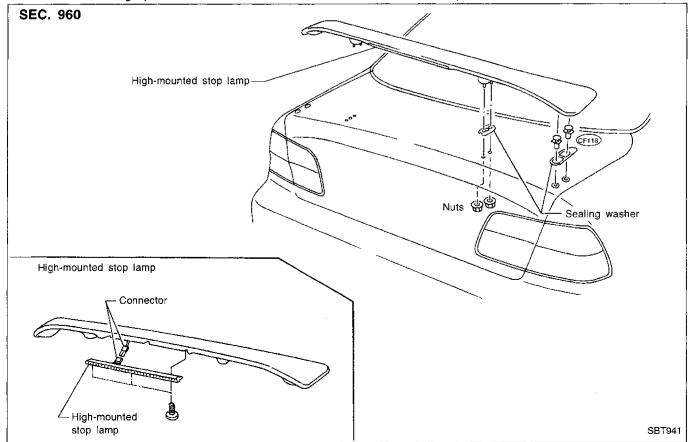
#### 21 Rear combination lamp

Rear combination lamps are installed with nuts and butyl seal.



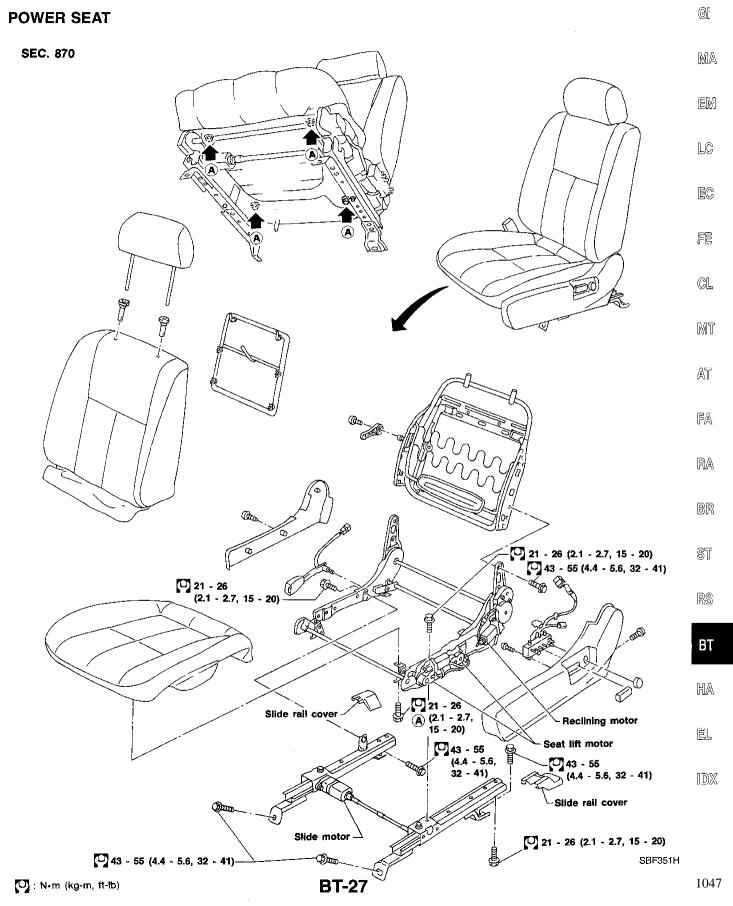
#### 22 Rear air spoiler

- When removing, first disconnect high-mounted stop lamp connector located on the back of trunk lid, then remove air spoiler taking care the stop lamp harness does not get caught.
- 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.



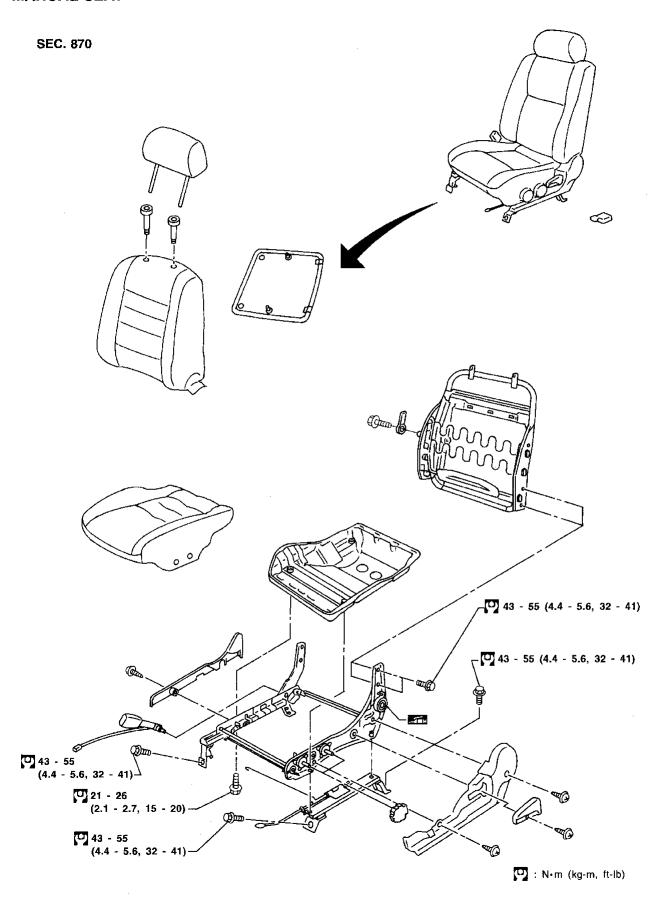
- When removing or installing the seat trim, carefully handle it to keep dirt out and avoid damage.
- ★ For Wiring Diagram, refer to "POWER SEAT" in EL section.

#### **Front Seat**



## Front Seat (Cont'd)

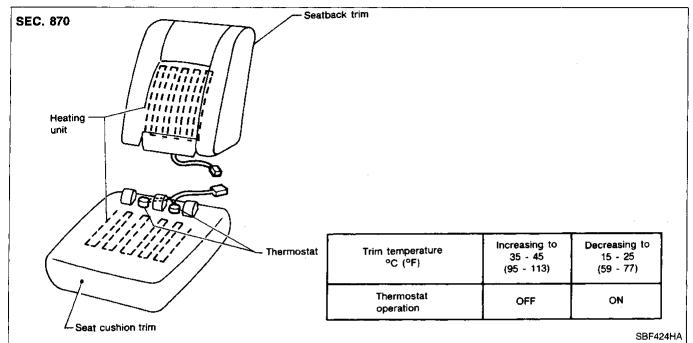
#### **MANUAL SEAT**



#### **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.
- ★ For Wiring Diagram, refer to "HEATED SEAT" in EL section.

#### Seatback heating unit removal & installation



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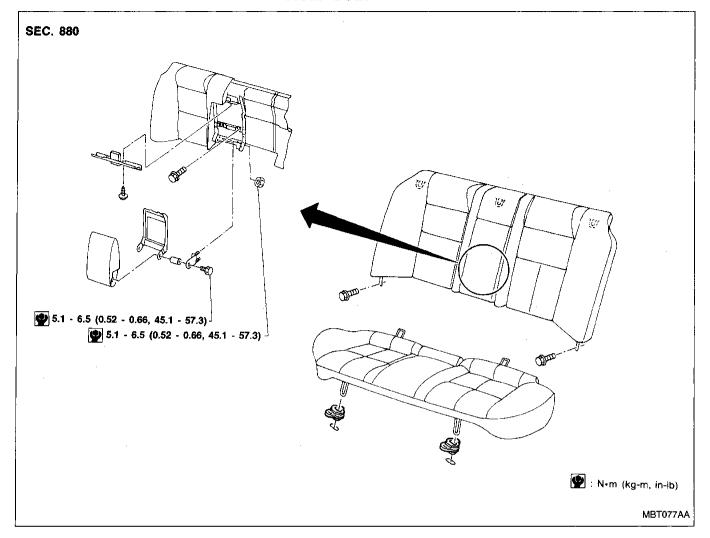
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#### **Rear Seat**

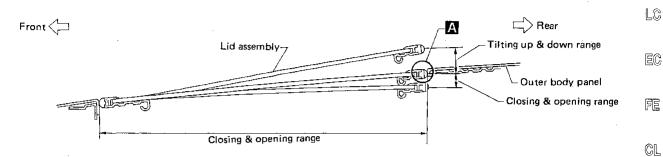


#### **SUNROOF**

#### **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 roof on body outer panel.
- 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).



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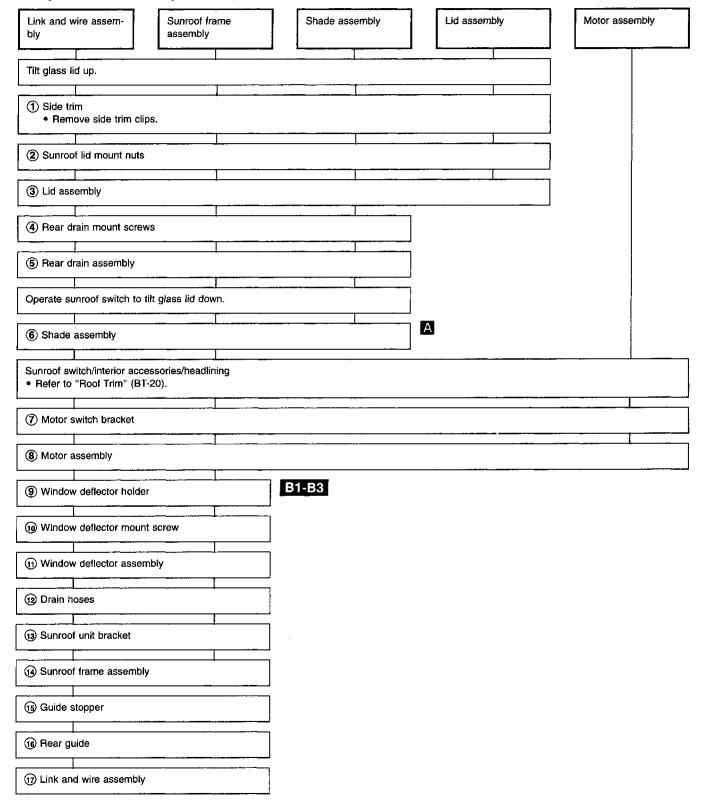
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#### **REMOVAL**

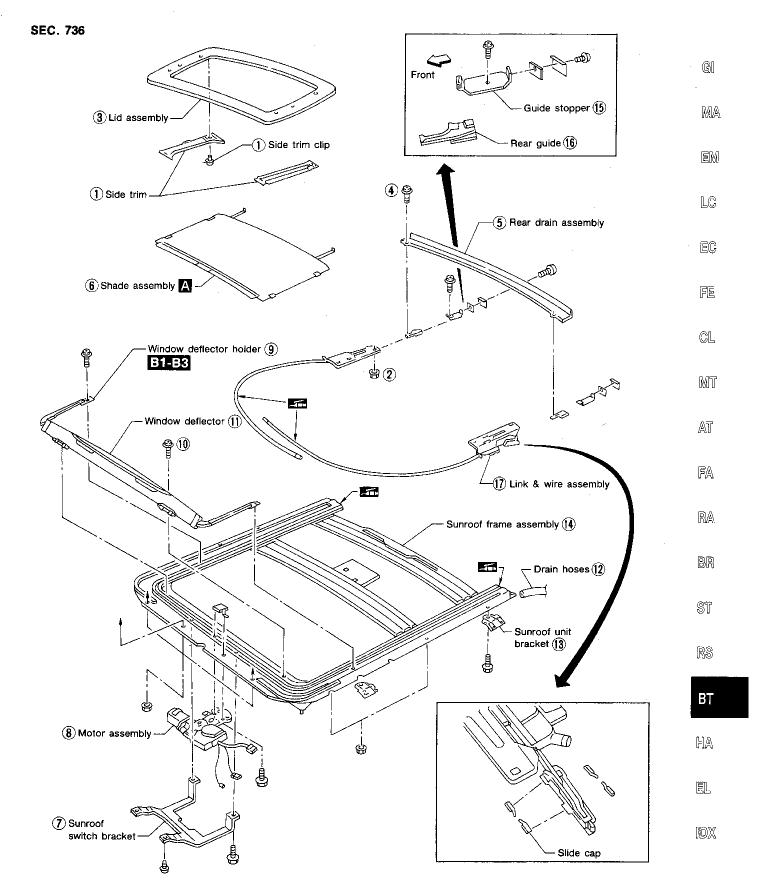
- After any adjustment, check sunroof operation and lid alignment.
- Handle finisher plate and glass lid with care so not to cause damage.
- It is desirable for easy installation to mark each point before removal.

#### **CAUTION:**

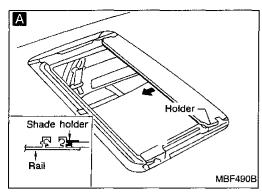
Always work with a helper.



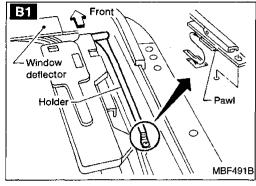
#### ★ For Wiring Diagram, refer to "ELECTRIC SUNROOF" in EL section.



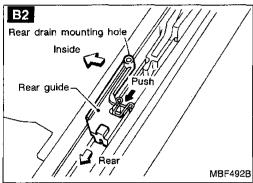
#### **SUNROOF**



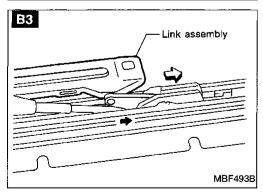
A Using flat-bladed screwdriver, pry shade assembly holder off rail. Then pull shade assembly forward to remove it from rail.



Disengage pawls from rail, then remove window deflector holder.

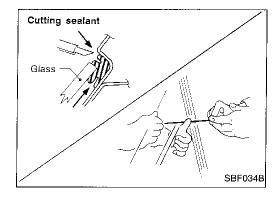


Using flat-bladed screwdriver, pry stopper spring off rail groove. Then slide rear guide backward to remove it from rail.



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.

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After installing the glass, the vehicle should remain stationary until the sealant hardens.

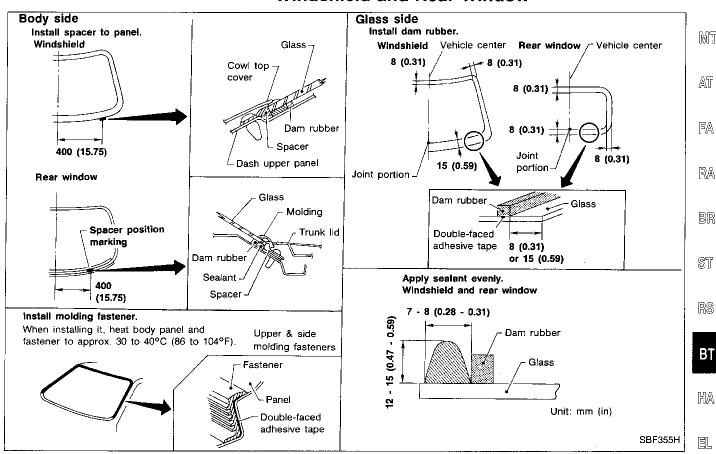
#### **WARNING:**

Keep heat and open flames away as primers are flammable. **CAUTION:** 

Advise user 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



#### REPAIRING WATER LEAKS FOR WINDSHIELD

Leaks can be repaired without removing and reinstalling glass.

If water is leaking between caulking material and body or glass, determine the extent of leakage. This can be determined by applying water while pushing glass outward.

To stop the leak, apply primer and then sealant to the leak point.

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#### **CAUTION:**

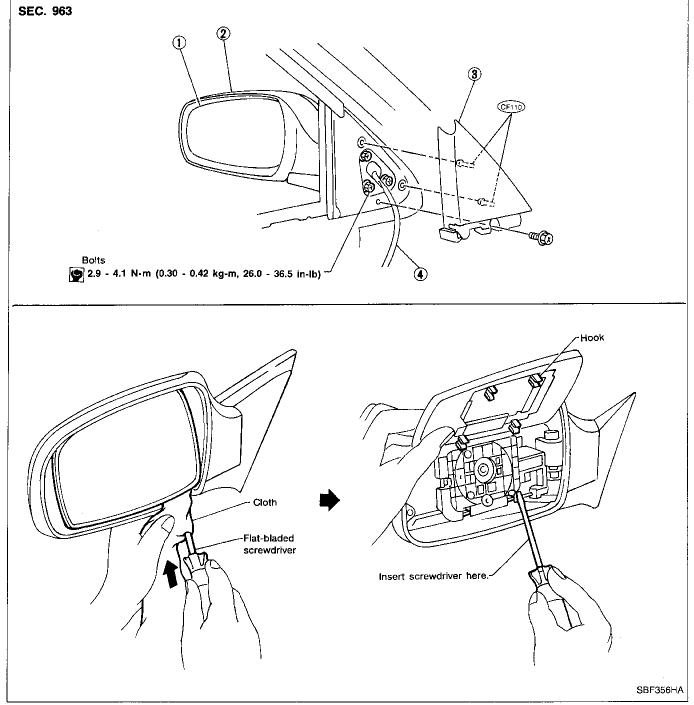
#### **Door Mirror**

Be careful not to scratch door rearview mirror body.

★ For Wiring Diagram, refer to "POWER DOOR MIRROR" in EL section.

#### **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.
- 3. Disconnect door mirror harness connector.
- 4. Remove door mirror harness clips.
- 5. Remove three bolts securing door mirror assembly.
- 6. Remove the mirror glass. Do not insert screwdriver too far.



Mirror glass

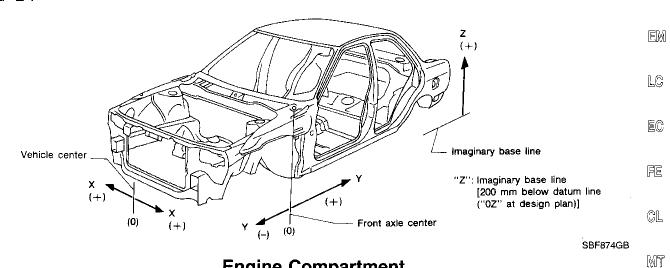
(2) Mirror body

(3) Inner cover

(4) Door mirror harness

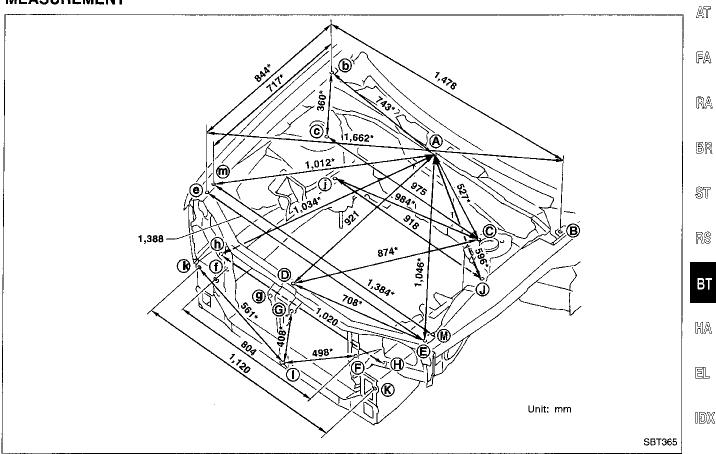
#### **BODY ALIGNMENT**

- All dimensions indicated in figures are actual ones.
- When using a tracking gauge, adjust both pointers to equal length. Then 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**

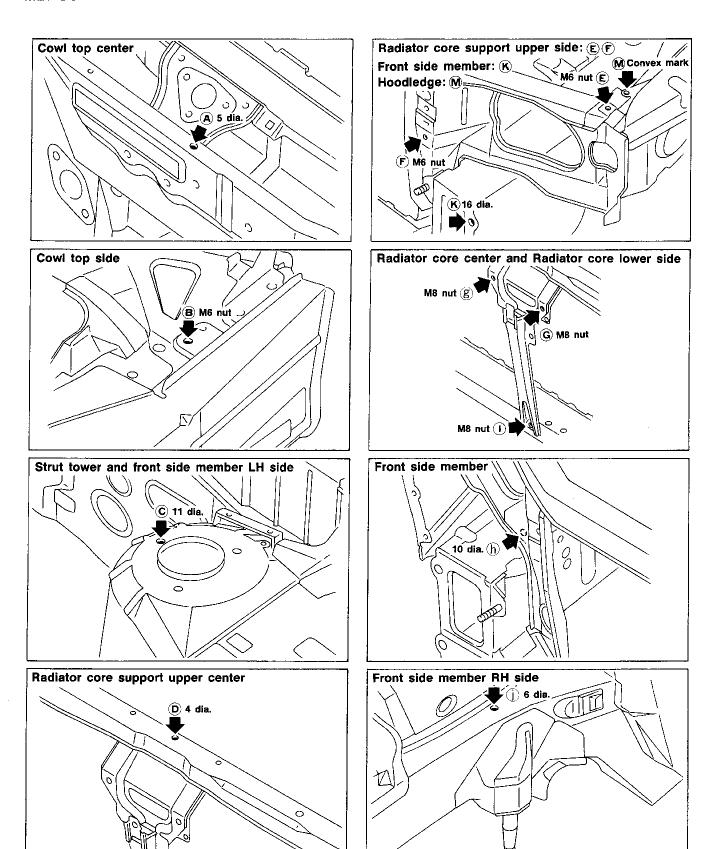


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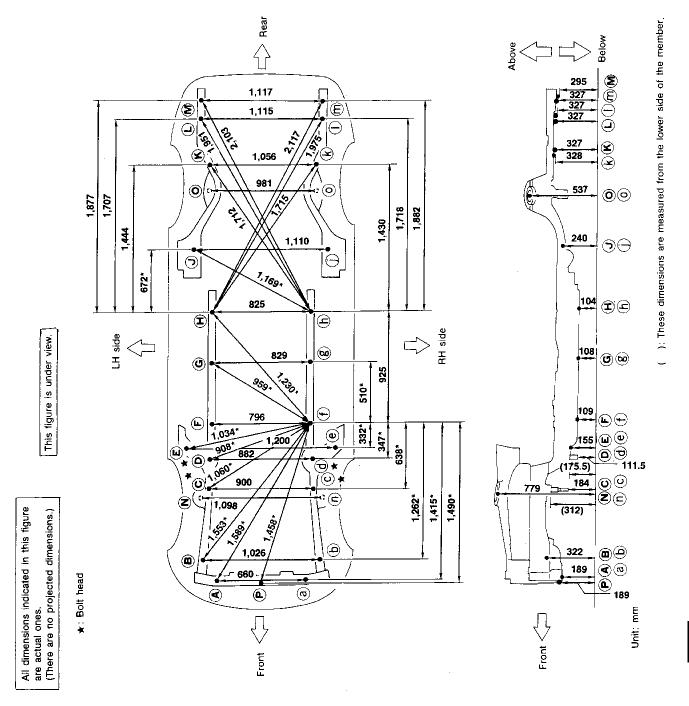
#### **Engine Compartment (Cont'd)**

#### **MEASUREMENT POINTS**



#### **Underbody**

#### **MEASUREMENT**



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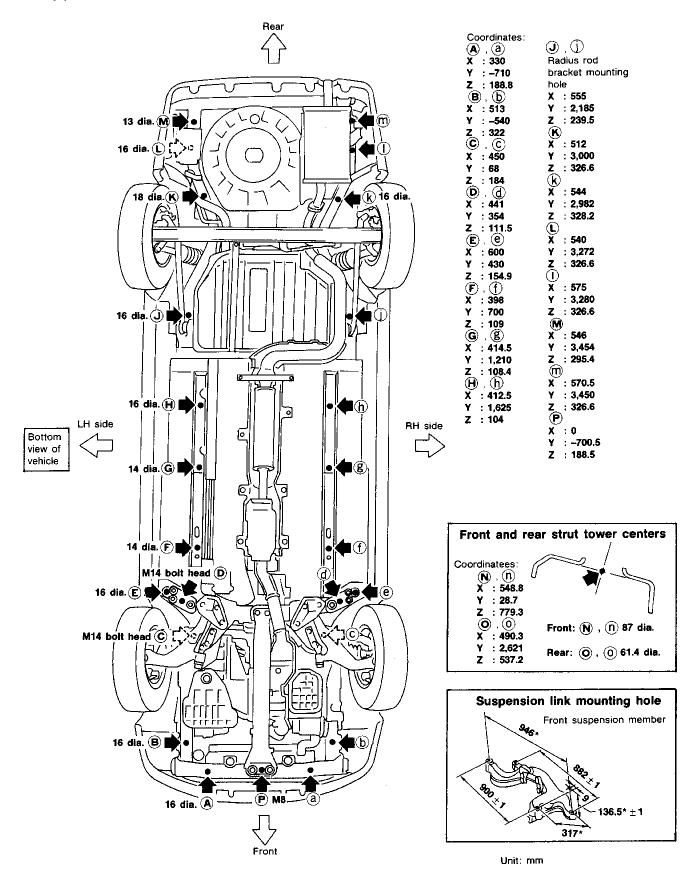
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#### **Underbody (Cont'd)**

#### **MEASUREMENT POINTS**



# HEATER & AIR CONDITIONER

# SECTION HA

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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".

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### Supplemental Restraint System (SRS) "AIR BAG"

The Supplemental Restraint System "Air Bag", used along with a seat belt, helps 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 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.
- Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses are covered with yellow insulation either just before the harness connectors or for the complete harness, for easy identification.

# Precautions for Working with HFC-134a (R-134a)

#### WARNING:

- 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 handling 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. Remove R-134a from the A/C system, using certified service equipment meeting requirements of SAE J2210 (R-134a recycling equipment), or J2209 (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.
  - 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 pail 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.

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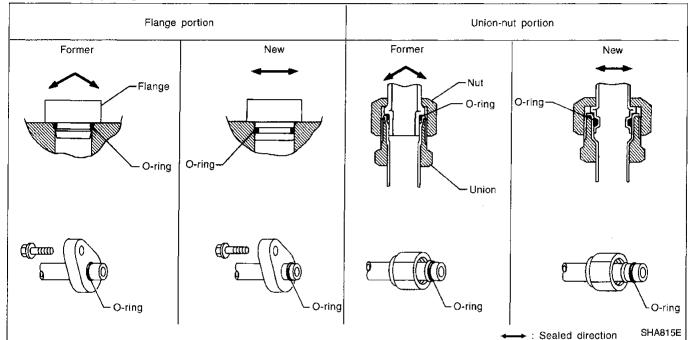
#### **Precautions for Refrigerant Connection**

A new type refrigerant connection has been introduced to all refrigerant lines except the following portion.

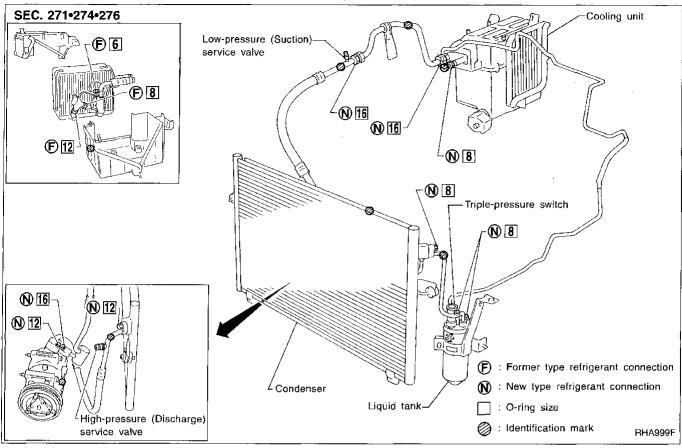
Expansion valve to cooling unit

#### FEATURES OF NEW TYPE REFRIGERANT CONNECTION

- The O-ring has been relocated. It has also been provided with a groove for proper installation. This eliminates the chance of the O-ring being caught in, or damaged by, the mating part. The sealing direction of the O-ring is now set vertically in relation to the contacting surface of the mating part to improve sealing characteristics.
- The reaction force of the O-ring will not occur in the direction that causes the joint to pull out, thereby facilitating piping connections.

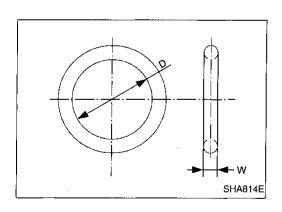


# Precautions for Refrigerant Connection (Cont'd) O-RING AND REFRIGERANT CONNECTION



#### **CAUTION:**

The new and former refrigerant connections use different O-ring configurations. Do not confuse O-rings since they are not interchangeable. If a wrong O-ring is installed, refrigerant will leak at, or around, the connection.



#### O-ring part numbers and specifications

| Connection type | O-ring<br>size | Part number | D mm (in)     | W mm (in)     |
|-----------------|----------------|-------------|---------------|---------------|
| Former          | 6              | 92472 N8200 | 4.5 (0.177)   | 1.40 (0.0551) |
| New             | 8              | 92471 N8210 | 6.8 (0.268)   | 1.87 (0.0736) |
| Former          | 0              | 92470 N8200 | 6.07 (0.2390) | 1.78 (0.0701) |
| New             | 12             | 92472 N8210 | 10.9 (0.429)  | 2.43 (0.0957) |
| Former          | _12            | 92471 N8200 | 10.8 (0.425)  | 1.78 (0.0701) |
| New             | 16             | 92473 N8210 | 13.6 (0.535)  | 2.43 (0.0957) |
| Former          | [10]           | 92475 72L00 | 14.3 (0.563)  | 2.3 (0.091)   |

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#### **Precautions for Refrigerant Connection** (Cont'd)

#### **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:**

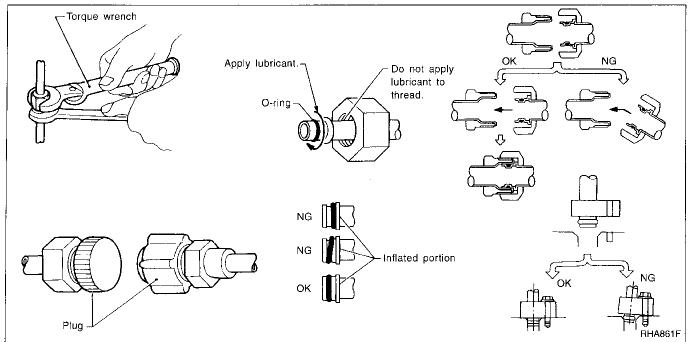
When replacing or cleaning refrigerant cycle components, observe the following.

- 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 circle of the O-rings shown in illustration. Be careful not to apply lubricant to threaded portion.

Lubricant name: Nissan A/C System Oil Type S

Part number: KLH00-PAGS0

- O-ring must be closely attached to dented portion of tube.
- When replacing the O-ring, be careful not to damage O-ring and tube.
- Connect tube until you hear it click, then tighten the nut or bolt by hand until snug. Make sure that the O-ring is installed to tube correctly.
- After connecting line, conduct leak test and make sure that there is no leakage from connections. When the gas leaking point is found, disconnect that line and replace the O-ring. Then tighten connections of seal seat to the specified torque.



#### **Precautions for Servicing Compressor**

- Plug all openings to prevent moisture and foreign matter from entering.
- When the compressor is removed, store it in the same position as it is when mounted on the car.
- When replacing or repairing compressor, follow "Maintenance of Oil Quantity in Compressor" exactly. Refer to HA-127.
- Keep friction surfaces between clutch and pulley clean. If the surface is contaminated, with lubricant, wipe it off by using a clean waste cloth moistened with thinner.
- After compressor service operation, turn the compressor shaft by hand more than five turns in both directions. This will equally distribute lubricant inside the compressor. After the compressor is installed, let the engine idle and operate the compressor for one hour.
- After replacing the compressor magnet clutch, apply voltage to the new one and check for normal operation.

#### **Special Service Tools**

The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

| Tool number<br>(Kent-Moore No.)<br>Tool name                             | Description               |   |                      | * |
|--|---------------------------|---|----------------------|---|
| KV99106100<br>(J-41260)<br>Clutch disc<br>wrench                         | NT232                     |   | Removing center bolt |   |
|  | clutch<br>use a<br>the pi | replacing the magnet in the above compressor, clutch disc wrench with in side on the clutch disc move it. |                      |   |
|  | NT378                     | Clutch disk wrench  |                      |   |
| KV99232340<br>(J-38874)<br>or<br>KV992T0001<br>( )<br>Clutch disc puller | NT376                     |   | Removing clutch disc |   |
| KV99106200<br>(J-41261)<br>Pulley installer                              |                           |   | Installing pulley    |   |
|  | NT235                     |   |                      |   |

#### 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 lubri-

Separate and non-interchangeable service equipment must be used for handling 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/lubricant.

Adapters that convert one size fitting to another must never be used: refrigerant/lubricant contamination will

| Tool number<br>(Kent-Moore No.)<br>Tool name                         | Description | Note   |
|--|-------------|--|
| HFC-134a (R-134a) refrigerant  | NT196       | Container color: Light blue Container marking: HFC-134a (R-134a) Fitting size: Thread size • large container 1/2"-16 ACME  |
| KLH00-PAGS0<br>( — )<br>Nissan A/C System Oil<br>Type S              | N 130       | Type: Poly alkyline glycol oil (PAG), type S<br>Application: HFC-134a (R-134a) swash plate<br>(piston) compressors (Nissan only)<br>Lubricity: 40 m? (1.4 US fl oz, 1.4 Imp fl oz) |
| (J-39500-NI)<br>Recovery/Recycling<br>Recharging equipment<br>(ACR4) | NT197       | Function: Refrigerant Recovery and Recycling and Recharging  |
| (J-39400)<br>Electrical leak detector                                | NT198       | Power supply:  • DC 12 V (Cigarette lighter)   |
| (J-39183)<br>Manifold gauge set (with<br>noses and couplers)         |             | Identification: • The gauge face indicates R-134a. Fitting size: Thread size • 1/2"-16 ACME  |
|  | NT199       |  |

#### PRECAUTIONS AND PREPARATION

# HFC-134a (R-134a) Service Tools and Equipment (Cont'd)

| Tool number<br>(Kent-Moore No.)<br>Tool name  | Description | Note   |
|---|-------------|--|
| Service hoses  • High side hose (J-39501-72)  • Low side hose (J-39502-72)  • Utility hose (J-39476-72) | NT201       | Hose color:  • Low hose: Blue with black stripe  • High hose: Red with black stripe  • Utility hose: Yellow with black stripe or green with black stripe  Hose fitting to gauge:  • 1/2"-16 ACME |
| Service couplers  High side coupler (J-39500-20)  Low side coupler (J-39500-24)                         | NT202       | Hose fitting to service hose:  • M14 x 1.5 fitting is optional or permanently attached.  |
| (J-39650)<br>Refrigerant weight scale   | NT200       | For measuring of refrigerant Fitting size: Thread size • 1/2"-16 ACME  |
| (J-39649)<br>Vacuum pump<br>(Including the isolator<br>valve)   | NT203       | Capacity:  • Air displacement: 4 CFM  • Micron rating: 20 microns  • Oil capacity: 482 g (17 oz)  Fitting size: Thread size  • 1/2"-16 ACME  |

# Precautions for Service Equipment RECOVERY/RECYCLING EQUIPMENT

Follow the manufacturer's instructions for machine operation and machine maintenance. Never introduce any refrigerant other than that specified into the machine.

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#### **ELECTRONIC LEAK DETECTOR**

Follow the manufacture's instructions for tester operation and tester maintenance.



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#### **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.



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To prevent this migration, use a manual valve situated 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.

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 For pumps without an isolator, use a hose equipped with a manual shut-off valve near the pump end. Close the valve to isolate the hose from the pump.

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 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 lubricating oil may migrate.

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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

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Be certain that the gauge face indicates R-134a or 134a. Make 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) along with specified lubricant.



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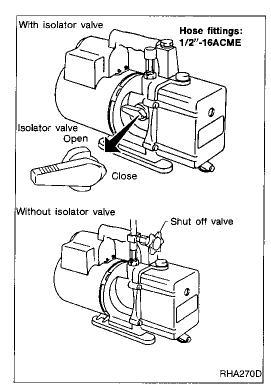
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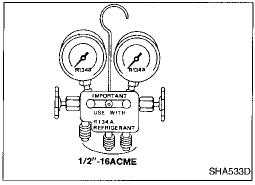
#### **SERVICE HOSES**

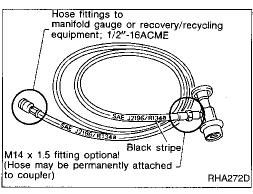
Be certain that the service hoses display the markings described (colored hose with black stripe). All hoses must include positive shut off devices (either manual or automatic) near the end of the hoses opposite the manifold gauge.

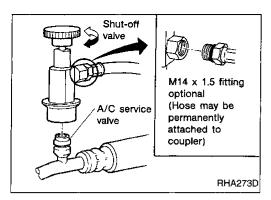


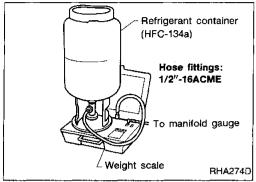
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# Precautions for Service Equipment (Cont'd) SERVICE COUPLERS

Never attempt to connect HFC-134a (R-134a) service couplers to an CFC-12 (R-12) A/C system. The HFC-134a (R-134a) couplers will not properly connect to the CFC-12 (R-12) system. However, if an improper connection is attempted, discharging and contamination may occur.

| Shut off valve rotation | A/C service valve |
|-------------------------|-------------------|
| Clockwise               | Open              |
| Counterclockwise        | Close             |

#### REFRIGERANT WEIGHT SCALE

Verify that no refrigerant other than HFC-134a (R-134a) and specified lubricants have been used with the scale. If the scale controls refrigerant flow electronically, the hose fitting must be 1/2"-16 ACME.

#### **CHARGING CYLINDER**

Using a charging cylinder is not recommended. Refrigerant may be vented into air from cylinder's top valve when filling the cylinder with refrigerant. Also, the accuracy of the cylinder is generally less than that of an electronic scale or of quality recycle/recharge equipment.

#### **Refrigeration Cycle**

#### 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.

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#### FREEZE PROTECTION

Under normal operating conditions, when the AUTO is switched on, the compressor runs continuously, and the evaporator pressure, and therefore temperature, is controlled by the V-6 variable displacement compressor to prevent freeze up.

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#### REFRIGERANT SYSTEM PROTECTION

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#### 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 to reduce system pressure.

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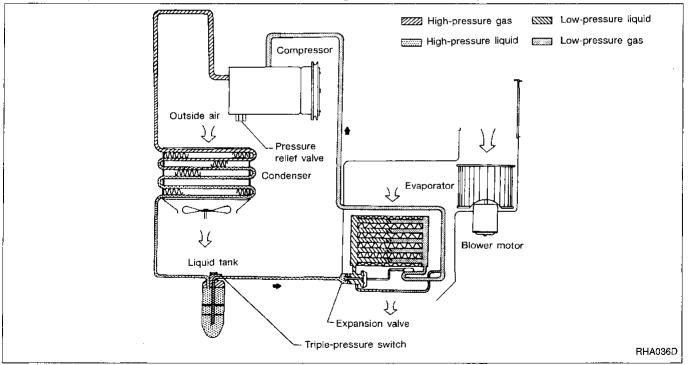
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#### Pressure relief valve

The refrigerant system is protected by a pressure relief valve. The valve is located on the bottom of the compressor. When refrigerant system pressure increases abnormally [over 3,727 kPa (38 kg/cm², 540 psi)], the relief valve's port opens. The valve then releases refrigerant into the atmosphere.



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#### V-6 Variable Displacement Compressor

#### **GENERAL INFORMATION**

- 1. The V-6 variable compressor differs from previous units. The vent temperatures of the V-6 variable compress do not drop too far below 5°C (41°F) when:
  - evaporator intake air temperature is less than 20°C (68°F)
  - engine is running at speeds less than 1,500 rpm.

This is because the V-6 compressor provides a means of "capacity" control.

- 2. The V-6 variable compressor provides refrigerant control under varying conditions. During cold winters, it may not produce high refrigerant pressure discharge (compared to previous units) when used with air conditioning systems.
- 3. A "clanking" sound may occasionally be heard during refrigerant charge. The sound indicates that the tilt angle of the swash plate has changed and is not a problem.
- 4. For air conditioning systems with the V-6 compressor, the clutch remains engaged unless: the system main switch, fan switch or ignition switch is turned OFF. When ambient (outside) temperatures are low or when the amount of refrigerant is insufficient, the clutch is disengaged to protect the compressor.
- 5. A constant range of suction pressure is maintained when engine speed is greater than a certain value. It normally ranges from 147 to 177 kPa (1.5 to 1.8 kg/cm², 21 to 26 psi) under varying conditions. In previous compressors, however, suction pressure was reduced with increases in engine speed.

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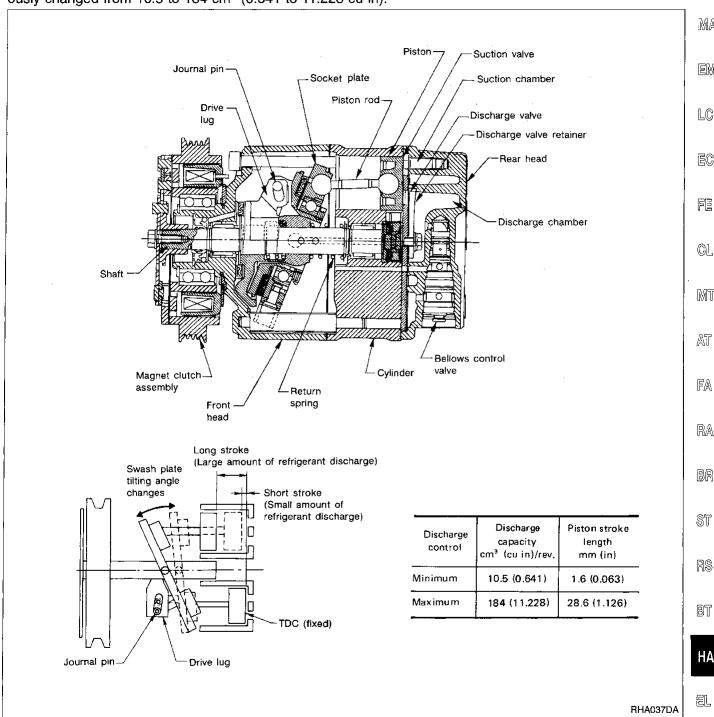
#### V-6 Variable Displacement Compressor (Cont'd)

#### DESCRIPTION

#### General

The variable compressor is basically a swash plate type that changes piston stroke in response to the required cooling capacity.

The tilt of the swash plate allows the piston's stroke to change so that refrigerant discharge can be continuously changed from 10.5 to 184 cm<sup>3</sup> (0.641 to 11.228 cu in).



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#### V-6 Variable Displacement Compressor (Cont'd)

#### **Operation**

#### 1. Operation control valve

Operation control valve is located in the suction port (low-pressure) side, and opens or closes in response to changes in refrigerant suction pressure.

Operation of the valve controls the internal pressure of the crankcase.

The angle of the swash plate is controlled between the crankcase's internal pressure and the piston cylinder pressure.

#### 2. Maximum cooling

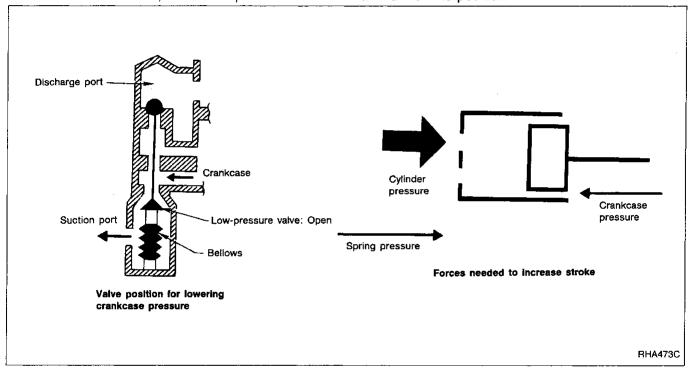
Refrigerant pressure on the low-pressure side increases with an increase in heat loads.

When this occurs, the control valve's bellows compress to open the low-pressure side valve and close the high-pressure side valve.

This causes the following pressure changes:

- the crankcase's internal pressure to equal the pressure on the low-pressure side;
- the cylinder's internal pressure to be greater than the crankcase's internal pressure.

Under this condition, the swash plate is set to the maximum stroke position.



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#### V-6 Variable Displacement Compressor (Cont'd)

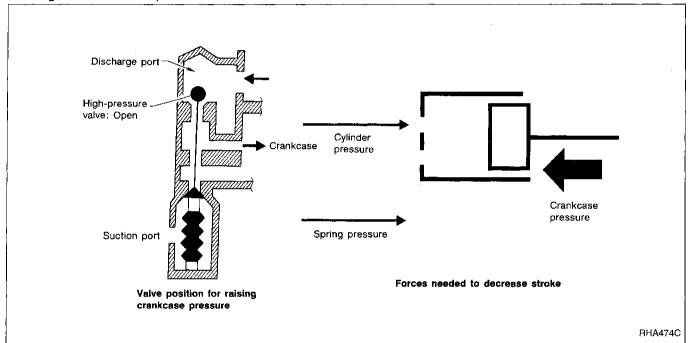
#### 3. Capacity control

- Refrigerant pressure on suction side is low during high speed driving or when ambient or interior temperature is low.
- The bellows expands when refrigerant pressure on the suction pressure side drops below approximately 177 kPa (1.8 kg/cm², 26 psi).

Since suction pressure is low, it makes the suction port close and the discharge port open. Thus, crank-case pressure becomes high as high pressure enters the crankcase.

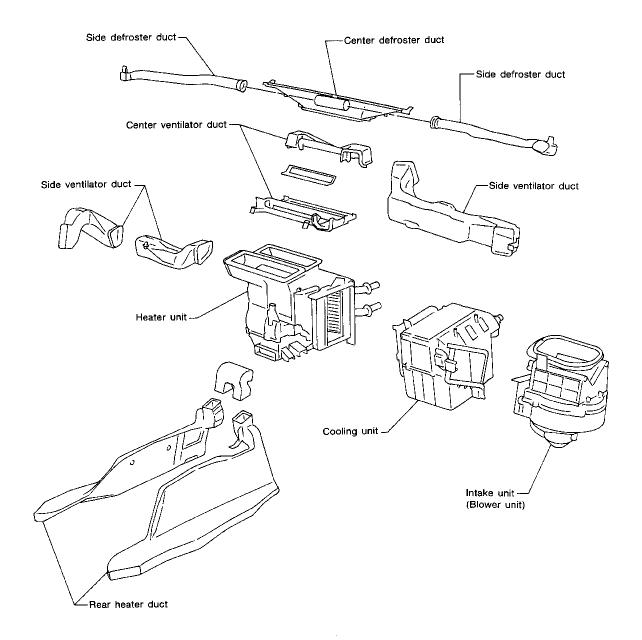
 The force acts around the journal pin near the swash plate, and is generated by the pressure difference before and behind the piston.

The drive lug and journal pin are located where the piston generates the highest pressure. Piston pressure is between suction pressure Ps and discharge pressure Pd, which is near suction pressure Ps. If crankcase pressure Pc rises due to capacity control, the force around the journal pin makes the swash plate angle decrease and also the piston stroke decrease. In other words, crankcase pressure increase triggers pressure difference between the piston and the crankcase. The pressure difference changes the angle of the swash plate.



#### **Component Layout**

SEC. 270-271-273



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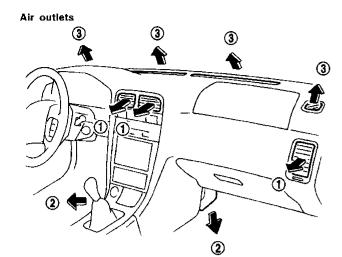
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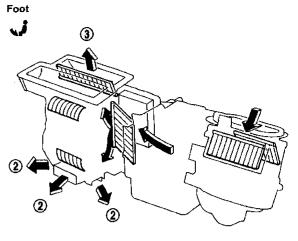
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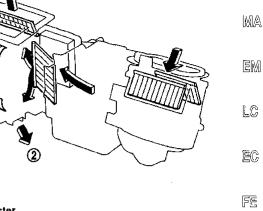
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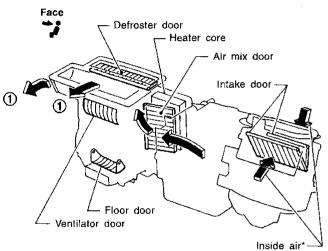
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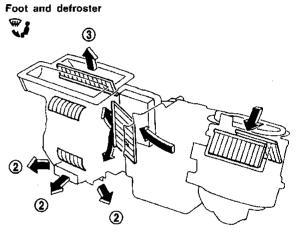
#### **Discharge Air Flow**

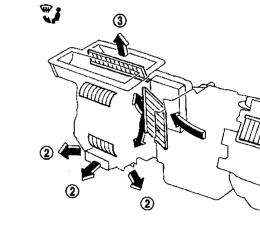


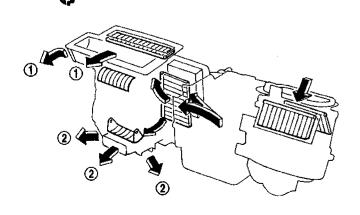




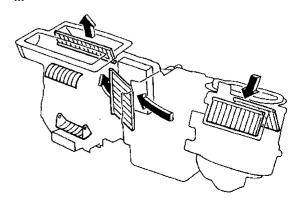












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For air flow %, refer to "Operational Check", "TROUBLE DIAGNOSES".

1 : To face

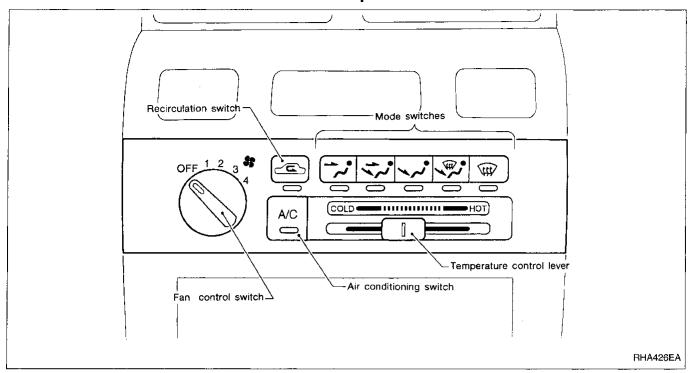
Bi-level

(2): To foot

3 : To defroster

: When recirculation switch is ON

#### **Control Operation**



#### **FAN CONTROL SWITCH**

This switch turns the fan ON and OFF, and controls fan speed.

#### MODE SWITCHES

These switches allow control of the air discharge outlets.

When the MODE switch is moved to "DEF" or "F/D", the push control amplifier sets the intake door to "FRESH". The compressor turns on when the MODE switch is moved to "DEF".

#### TEMPERATURE CONTROL LEVER

This lever allows you to adjust the temperature of the discharge air.

#### RECIRCULATION (REC) SWITCH

OFF position: Outside air is drawn into the passenger compartment.

ON position: Interior air is recirculated inside the vehicle.

Recirculation is canceled when DEF or F/D is selected, and resumes when another mode is chosen.

Intake door is set at recirculation position automatically when the following conditions are met:

- VENT position
  - Fan speed: speed 4 position
  - · Temperature control: Full cold position
  - Compressor: ON
- VENT, B/L, FOOT position
  - Engine coolant temperature: Over 105°C (221°F)
  - Compressor: ON

#### AIR CONDITIONING SWITCH

Start the engine, set the fan control switch to the desired (1 to 4) position and push the air conditioning switch to turn ON the air conditioning. The indicator lamp will come on when the air conditioning is ON. To stop the air conditioning, push the switch again to return it to the original position.

The air conditioning cooling function operates only when the engine is running.

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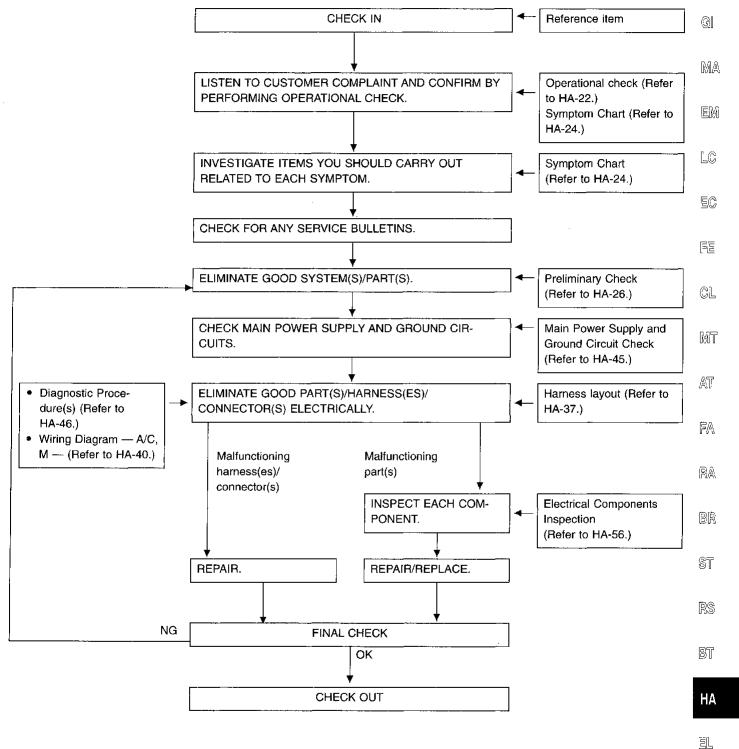
#### **TROUBLE DIAGNOSES**

#### **Contents**

| How to Perform Trouble Diagnoses for Quick and Accurate Repair                  | HA-21 |
|---|-------|
| Operational Check   | HA-22 |
| Symptom Chart   | HA-24 |
| Preliminary Check   | HA-26 |
| PRELIMINARY CHECK 1   |       |
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| PRELIMINARY CHECK 2   |       |
| (A/C does not blow cold air.) PRELIMINARY CHECK 3                               | HA-27 |
| (Magnet clutch does not engage in DEF mode.)                                    | HA-28 |
| PRELIMINARY CHECK 4   |       |
| (Air outlet does not change.)   | HA-28 |
| PRELIMINARY CHECK 5   |       |
| (Noise)   | HA-29 |
| PRELIMINARY CHECK 6 (Insufficient heating)                                      | HA-30 |
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| INSUFFICIENT COOLING  |       |
| Performance Chart   |       |
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| TEST READING  |       |
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| Harness Layout  |       |
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| Wiring Diagram — A/C, M —   |       |
| Main Power Supply and Ground Circuit Check                                      |       |
| Diagnostic Procedure 1  |       |
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| Diagnostic Procedure 2  |       |
| (SYMPTOM: Air outlet does not change.)  | HA-48 |
| Diagnostic Procedure 3  |       |
| (SYMPTOM: Intake door does not change in VENT, B/L or FOOT mode.)               | HA-50 |
| Diagnostic Procedure 4  |       |
| (SYMPTOM: Air mix door does not change.)  | HA-51 |
| Diagnostic Procedure 5  |       |
| (SYMPTOM: Magnet clutch does not engage when A/C switch and fan switch are ON.) | HA-53 |
| Electrical Components Inspection  |       |
| Control Linkage Adjustment  |       |

# How to Perform Trouble Diagnoses for Quick and Accurate Repair

#### **WORK FLOW**



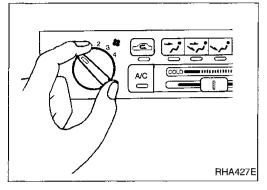
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#### **Operational Check**

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:

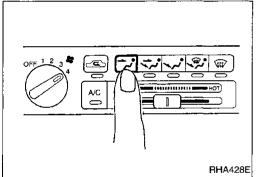
Engine running and at normal operating temperature.



#### PROCEDURE:

#### 1. Check blower

- Turn fan switch to speed 1.
   Blower should operate on low speed.
- 2) Then turn fan switch to speed 2.
- 3) Continue checking blower speed until all speeds are checked.
- 4) Leave blower on speed 4.



#### 2. Check discharge air

1) Press each mode switch.

| Switch mode/ | Air outlet/distribution |      |           |
|--------------|-------------------------|------|-----------|
| ndicator     | Face                    | Foot | Defroster |
| ~;           | 100%                    |      |           |
| **           | 60%                     | 40%  | _         |
| ·•           | _                       | 78%  | 22%       |
|              | _                       | 60%  | 40%       |
|              | _                       | _    | 100%      |

Confirm that discharge air comes out according to the air distribution table at left.

Refer to "Discharge Air Flow", "DESCRIPTION" (HA-17).

#### NOTE:

Confirm that 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

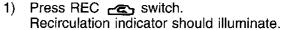
F/D button is pressed.

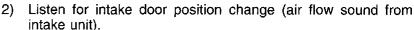
Intake door position is checked in the next step.

#### TROUBLE DIAGNOSES

#### Operational Check (Cont'd)

#### 3. Check recirculation



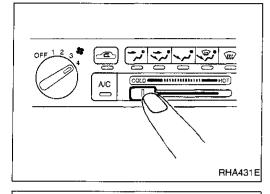


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#### Check temperature decrease

Slide temperature control lever to full cold. 1)

Check for cold air at discharge air outlets.

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Slide temperature control lever to full hot. 1)

Check for hot air at discharge air outlets.

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#### 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.

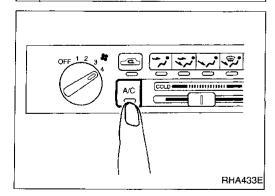
ST The indicator lamp should come on when air conditioner is ON.

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# **Symptom Chart**

## **DIAGNOSTIC TABLE**

| PROCEDURE  |                     |                     |                     | ninary<br>eck       |                     |                     |                        |                        | iagnos<br>rocedu       |                        |                        |                    | Supp<br>Ground  | Power<br>ly and<br>d Circui<br>eck | t                 |
|--|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|------------------------|------------------------|------------------------|------------------------|------------------------|--------------------|-----------------|------------------------------------|-------------------|
| REFERENCE PAGE   | HA-26               | HA-27               | HA-28               | HA-28               | HA-29               | HA-30               | HA-46                  | HA-48                  | HA-50                  | HA-51                  | HA-53                  | HA-45              | HA-45           | HA-45                              | HA-45             |
| SYMPTOM  | Preliminary check 1 | Preliminary check 2 | Preliminary check 3 | Preliminary check 4 | Preliminary check 5 | Preliminary check 6 | Diagnostic procedure 1 | Diagnostic procedure 2 | Diagnostic procedure 3 | Diagnostic procedure 4 | Diagnostic procedure 5 | 15A Fuses (#2, #3) | 7.5A Fuse (#16) | 7.5A Fuse (#61)                    | Push control unit |
| A/C does not blow cold air.  |                     | 0                   |                     |                     |                     |                     | 0                      |                        |                        | 0                      |                        | 0                  | 0               |                                    |                   |
| Insufficient heating.  |                     |                     |                     |                     |                     | 0                   | 0                      |                        |                        |                        | 0                      |                    |                 |                                    |                   |
| Blower motor does not rotate.  |                     | 0                   |                     |                     |                     |                     | 0                      |                        |                        |                        |                        | 0                  |                 |                                    |                   |
| Air outlet does not change.  |                     |                     |                     | 0                   |                     |                     |                        | 0                      |                        |                        |                        |                    | 0               |                                    | 0                 |
| Intake door does not change in VENT, B/L or FOOT mode.               |                     |                     |                     |                     |                     |                     | :                      |                        | •                      |                        |                        |                    | 0               |                                    | 0                 |
| Intake door is not set at<br>"FRESH" in DEF or F/D mode.             | 0                   | Ş                   |                     |                     |                     |                     |                        |                        | 0                      |                        |                        |                    | 0               |                                    | 0                 |
| Air mix door does not change.  |                     | 0                   |                     |                     |                     |                     |                        |                        |                        | 0                      |                        |                    | 0               |                                    | 0                 |
| Magnet clutch does not engage when A/C switch and fan switch are ON. |                     | •                   |                     |                     |                     |                     |                        |                        |                        |                        | 2                      |                    | 0               | 0                                  |                   |
| Magnet clutch does not engage in DEF mode.                           |                     | 0                   | 0                   |                     |                     |                     |                        |                        |                        |                        | 0                      |                    | 0               | 0                                  |                   |
| Noise  |                     |                     |                     |                     | 0                   |                     | _                      |                        |                        |                        |                        |                    |                 |                                    |                   |

The number means checking order.
 Checking order depends on malfunction in each flow chart.

# TROUBLE DIAGNOSES

# Symptom Chart (Cont'd)

|              | Electrical Components Inspection |            |            |             |                 |             |            |  |            |                 |                   |                    | Ğ1        |                        |                            |                           |         |                              |
|--------------|----------------------------------|------------|------------|-------------|-----------------|-------------|------------|--|------------|-----------------|-------------------|--------------------|-----------|------------------------|----------------------------|---------------------------|---------|------------------------------|
| HA-56        | HA-56                            | HA-56      | 1          |             | ļ               |             |            |  | HA-56      | HA-57           | HA-58             | HA-58              | HA-57     | HA-57                  | HA-133                     | Refer to EC section.      |         | ·<br>MA<br>EM                |
|              |                                  |            |            |             | Push<br>control | nnit        |            |  |            |                 |                   |                    |           | ;<br>;                 | Compressor                 | R                         |         | LC<br>EG<br>FE               |
| notor        |                                  | ų;         | tch        | vitch       | ih              | vitch       | ų,         | tch  | to.        | Mode door motor | Intake door motor | Air mix door motor |           | Triple-pressure switch | Compressor (Magnet clutch) | ECM (ECCS control module) |         | CL<br>MT                     |
| ⊏            |                                  | . ≅        | - ₹        | 5           | 일               | ે           | ₩          | \ <u>\\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \</u> | ₹          | 용               | ᇦ                 | 0                  | છે        | ¥                      | 8                          | 1 21                      | ဟ       |                              |
| Blower motor | Resistor                         | A/C switch | REC switch | VENT switch | B/L switch      | FOOT switch | F/D switch | DEF switch                                     | Fan switch | Mode            | Intake            | Air mix            | A/C relay | Triple-p               | Compr                      | ECM (F                    | Harness | AT                           |
|              | O Resisto                        | O A/C sw   | REC sv     | VENT 8      | B/L swi         | F00T        | F/D sw     | DEFS   | O Fan sv   | Mode            | Intake            | 0                  | O A/C rel | O Triple-p             | Compr                      | O ECM (B                  | 0       | at<br>- Fa                   |
|              |                                  |            | REC sv     | VENT 8      | B/L swi         | FOOT        | F/D sw     | DEFS   |            | Mode            | Intake            | ļ                  |           |                        |                            |                           | 0       | - FA<br>-                    |
| 0            | 0                                |            | REC sv     | O VENT 8    | O B/L swi       | O F00T      | F/D sw     | O DEF &  | 0          | Mode            | Intake            | 0                  |           |                        |                            |                           | 0       |                              |
| 0            | 0                                |            | O REC sı   |             |                 |             |            |  | 0          |                 | O Intake          | 0                  |           |                        |                            |                           | 0       | - FA<br>-                    |
| 0            | 0                                |            |            |             |                 |             |            |  | 0          |                 |                   | 0                  |           |                        |                            |                           | 0 0 0   | - FA<br>- RA<br>- RA         |
| 0            | 0                                |            | 0          |             |                 |             |            |  | 0          |                 | 0                 | 0                  |           |                        |                            |                           | 0 0 0 0 | - FA<br>- RA<br>- BR         |
| 0            | 0                                |            | 0          |             |                 |             |            |  | 0          |                 | 0                 | 0                  |           |                        |                            |                           | 0 0 0 0 | · FA<br>· RA<br>· BR<br>· ST |
| 0            | 0                                | 0          | 0          |             |                 |             |            |  | 0          |                 | 0                 | 0                  | 0         | 0                      | 0                          | 0                         | 0 0 0 0 | FA<br>RA<br>BR<br>ST         |

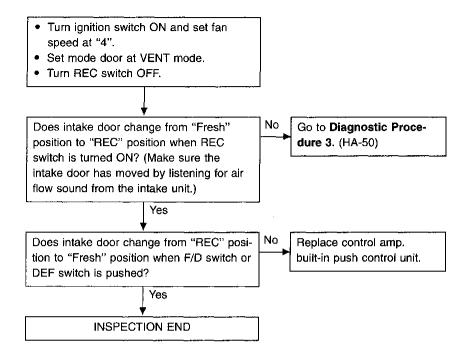
EL

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## **Preliminary Check**

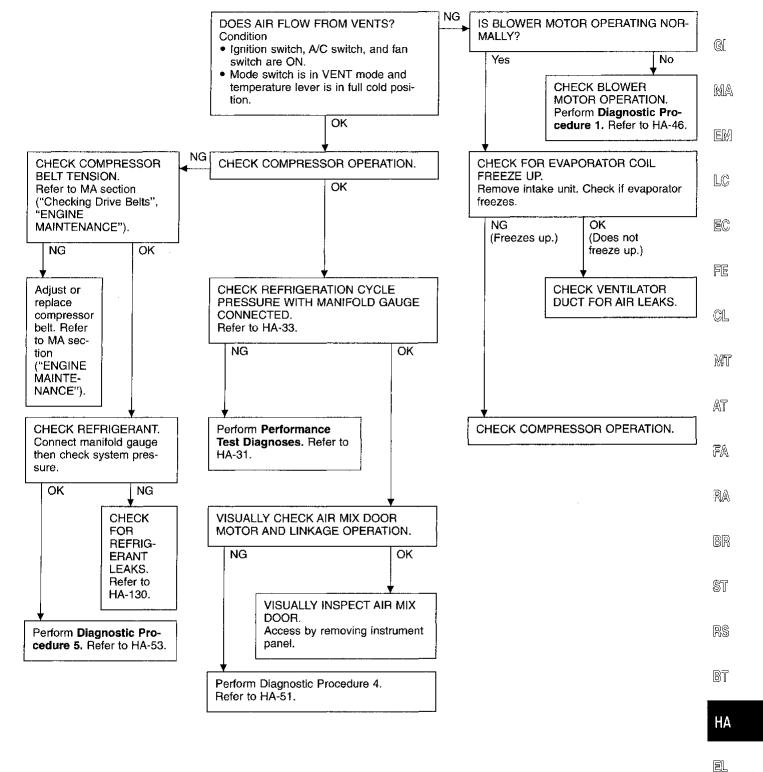
#### **PRELIMINARY CHECK 1**

Intake door is not set at "FRESH" in DEF or F/D mode.



#### **PRELIMINARY CHECK 2**

A/C does not blow cold air.

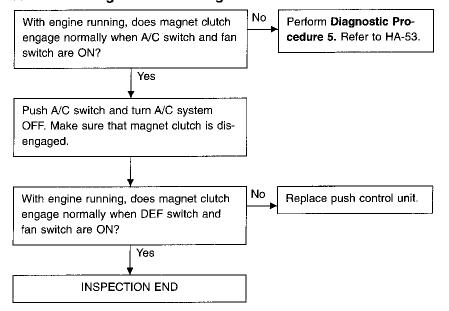


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#### **PRELIMINARY CHECK 3**

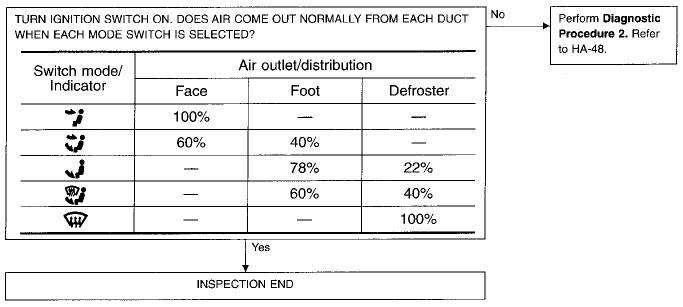
Magnet clutch does not engage in DEF mode.

• Perform PRELIMINARY CHECK 2 before referring to the following flow chart.



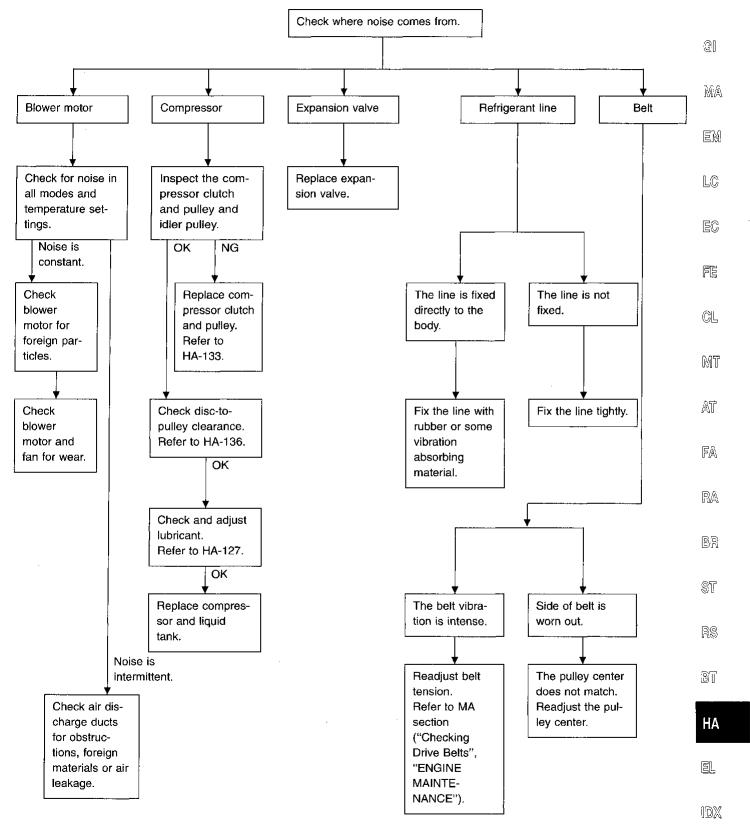
#### **PRELIMINARY CHECK 4**

Air outlet does not change.

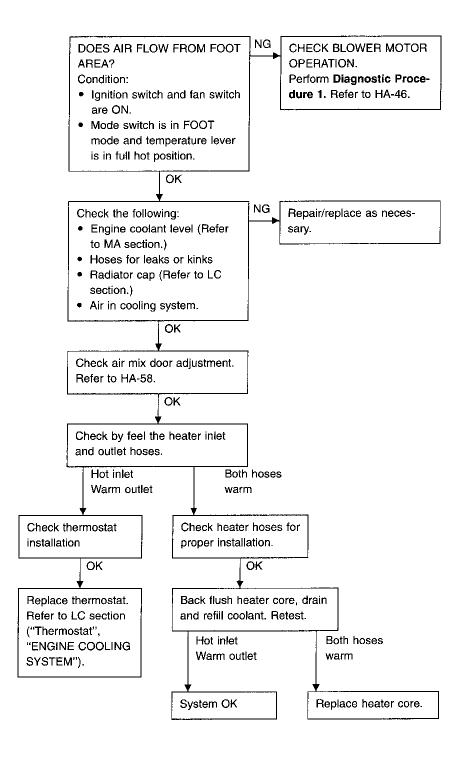


#### **PRELIMINARY CHECK 5**

Noise

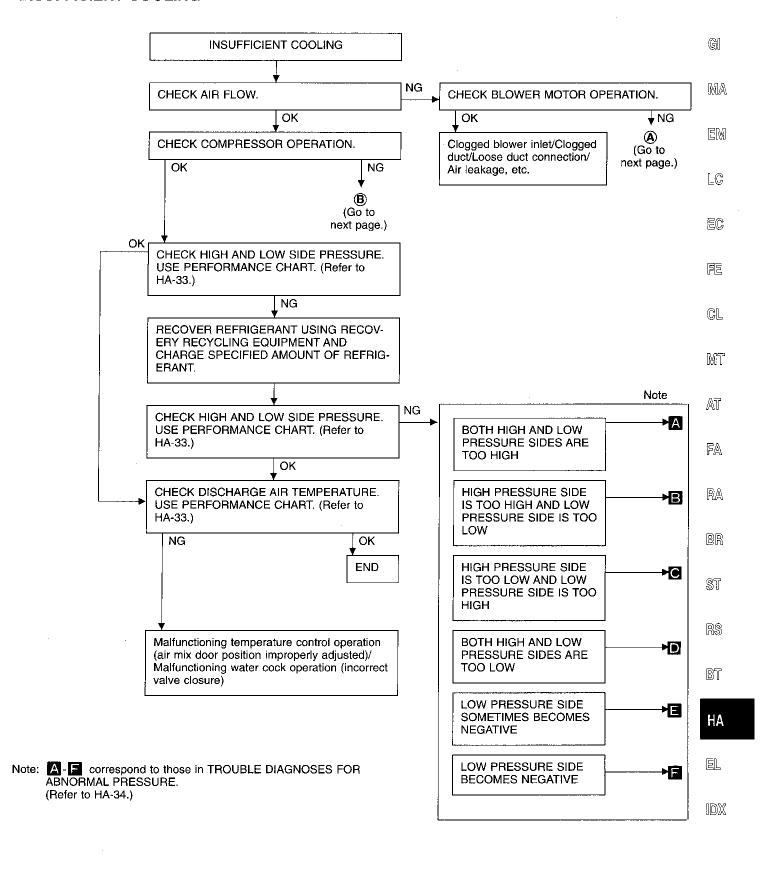


# PRELIMINARY CHECK 6 Insufficient heating

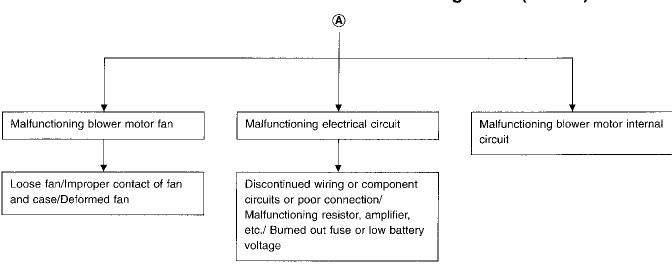


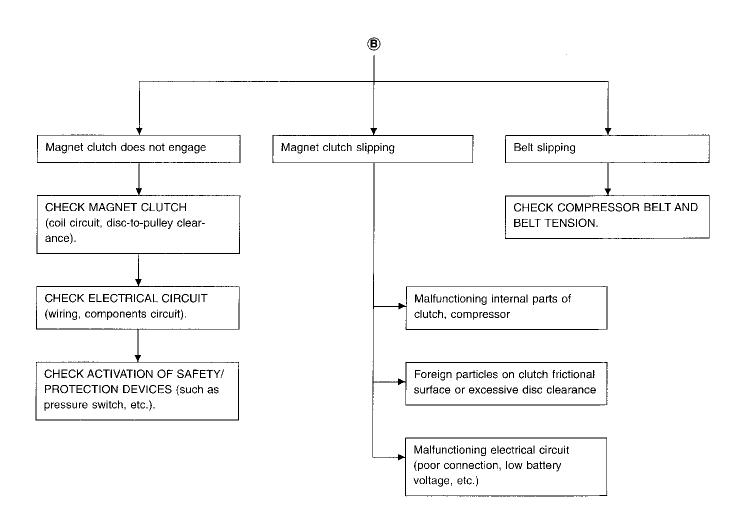
## **Performance Test Diagnoses**

#### **INSUFFICIENT COOLING**



# Performance Test Diagnoses (Cont'd)





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# Performance Chart TEST CONDITION

Testing must be performed as follows:

Vehicle location: Indoors or in the shade (in a well ventilated

place)

Doors: Closed Door window: Open Hood: Open

TEMP. setting: Max. COLD

Discharge Air: Face Vent RECIRC switch: (Recirculation) ON

FAN speed: 4-speed A/C switch: ON

Engine speed: 1,500 rpm

Operate the air conditioning system for 10 minutes before tak-

ing measurements.

# **TEST READING**

#### Recirculating-to-discharge air temperature table

| Inside air (Recirculating ai | r) at blower assembly inlet | Discharge air temperature at center venti- |   |
|------------------------------|-----------------------------|--|---|
| Relative humidity<br>%       | Air temperature<br>°C (°F)  | lator<br>°C (°F)                           |   |
|                              | 20 (68)                     | 1.5 - 2.6 (35 - 37)                        | • |
| 5000                         | 25 (77)                     | 3.7 - 5.7 (39 - 42)                        | • |
| 50 - 60<br>i                 | 30 (86)                     | 7.6 - 10.0 (46 - 50)                       | • |
|                              | 35 (95)                     | 12.4 - 15.2 (54 - 59)                      | • |
|                              | 20 (68)                     | 2.6 - 3.6 (37 - 38)                        | • |
| 00 70                        | 25 (77)                     | 5.7 - 7.6 (42 - 46)                        | • |
| 60 - 70                      | 30 (86)                     | 10.0 - 12.4 (50 - 54)                      | • |
|                              | 35 (95)                     | 15.2 - 18.0 (59 - 64)                      | • |

#### Ambient air temperature-to-operating pressure table

| Ambie                  | ent air                    | Lligh processes (Discharge side)                    | formula (Continuation also)                      |  |
|------------------------|----------------------------|---|--|--|
| Relative humidity<br>% | Air temperature<br>°C (°F) | High-pressure (Discharge side)<br>kPa (kg/cm², psi) | Low-pressure (Suction side)<br>kPa (kg/cm², psi) |  |
|                        | 20 (68)                    | 785 - 1,040   | 137 - 167  |  |
|                        | 20 (08)                    | (8.0 - 10.6, 114 - 151)                             | (1.4 - 1.7, 20 - 24)                             |  |
|                        | 25 (77)                    | 981 - 1,304   | 137 - 167  |  |
|                        | 25 (11)                    | (10.0 - 13.3, 142 - 189)                            | (1.4 - 1.7, 20 - 24)                             |  |
| 50 - 70                | 20. (00)                   | 1,167 - 1,550                                       | 147 - 177  |  |
| 50 - 70                | 30 (86)                    | (11.9 - 15.8, 169 - 225)                            | (1.5 - 1.8, 21 - 26)                             |  |
|                        | 35 (95)                    | 1,373 - 1,804                                       | 157 - 186  |  |
|                        | 33 (93)                    | (14.0 - 18.4, 199 - 262)                            | (1.6 - 1.9, 23 - 27)                             |  |
|                        | 40 (104)                   | 1,550 - 2,059                                       | 167 - 206  |  |
|                        | 40 (104)                   | (15.8 - 21.0, 225 - 299)                            | (1.7 - 2.1, 24 - 30)                             |  |

If pressure is not within range, refer to HA-34, "Trouble Diagnoses for Abnormal Pressure".



HA

# **Trouble Diagnoses for Abnormal Pressure**

Whenever system's high or low side pressure is abnormal, diagnose using a manifold 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-33 ("Ambient air temperature-to-operating pressure table").

| operating pressure table ).                                      | · · · · · · · · · · · · · · · · · · ·   | <del>,</del>   |   |
|--|---|--|---|
| Gauge indication   | Refrigerant cycle   | Probable cause   | Corrective action   |
| Both high and low-pressure sides are too high.                   | <ul> <li>Pressure is reduced soon<br/>after water is splashed on<br/>condenser.</li> </ul>  | Excessive refrigerant charge in refrigeration cycle  | Reduce refrigerant until speci-<br>fied pressure is obtained.   |
|  | Air suction by cooling fan is insufficient.   | Insufficient condenser cooling performance   1 Condenser fins are clogged. 2 Improper fan rotation of cooling fan  | Clean condenser. Check and repair cooling fan as necessary.   |
| AC359A   | <ul> <li>Low-pressure pipe is not cold.</li> <li>When compressor is stopped high-pressure value quickly drops by approximately 196 kPa (2 kg/cm², 28 psi). It then decreases gradually thereafter.</li> </ul> | Poor heat exchange in condenser (After compressor operation stops, high pressure decreases too slowly.)  Air in refrigeration cycle  | Evacuate repeatedly and recharge system.  |
|  | Engine tends to overheat.   | Engine cooling systems mal-<br>function.   | Check and repair each engine cooling system.  |
|  | <ul> <li>An area of the low-pressure pipe is colder than areas near the evaporator outlet.</li> <li>Plates are sometimes covered with frost.</li> </ul>   | <ul> <li>Excessive liquid refrigerant on low-pressure side</li> <li>Excessive refrigerant discharge flow</li> <li>Expansion valve is open a little compared with the specification.</li> <li>Improper thermal valve installation</li> <li>Improper expansion valve adjustment</li> </ul> | Replace expansion valve.  |
| High-pressure side is too high and low-pressure side is too low. | Upper side of condenser and high-pressure side are hot, however, liquid tank is not so hot.   | High-pressure tube or parts located between compressor and condenser are clogged or crushed.   | <ul> <li>Check and repair or replace<br/>malfunctioning parts.</li> <li>Check lubricant for contami-<br/>nation.</li> </ul> |
| AC360A   |   |  |   |

# TROUBLE DIAGNOSES

# Trouble Diagnoses for Abnormal Pressure (Cont'd)

|  | (Contra)   | l   |  | _       |
|--|--|---|--|---------|
| Gauge indication   | Refrigerant cycle  | Probable cause  | Corrective action  |         |
| High-pressure side is too low and low-pressure side is too high. | High and low-pressure sides become equal soon after compressor operation stops.          | Compressor pressure operation is improper.  | Replace compressor.  | Ğl      |
|  |  | Damaged inside compressor packings  | 30   | MA      |
|  |  |   |  | EM<br>- |
| LO HI  | No temperature difference<br>between high and low-pressure<br>sides                      | Compressor discharge capacity does not change. (Compressor stroke is set at maximum.)         | Replace compressor.  | LC      |
| <del>Q</del> <del>Q</del> <del>Q</del>                           |  |   |  | EC      |
| AC356A Both high- and low-pressure sides are too low.            | There is a big temperature<br>difference between liquid<br>tank outlet and inlet. Outlet | Liquid tank inside is clogged a little.   | Replace liquid tank.     Check lubricant for contamination.  | FE      |
|  | temperature is extremely low.  • Liquid tank inlet and expansion valve are frosted.      |   | Hason.   | GL      |
|  | Temperature of expansion valve inlet is extremely low as compared with areas near        | High-pressure pipe located between liquid tank and expansion valve is clogged.                | Check and repair malfunctioning parts.  Check lubricant for contami-                                   | - MT    |
|  | liquid tank.  • Expansion valve inlet may be frosted.                                    | Sion valve is clogged.  | nation.  | AT      |
| (ro) (HI)  | Temperature difference<br>occurs somewhere in high-                                      |   |  | FA      |
| AC353A   | pressure side     Expansion valve and liquid tank are warm or only cool to               | Low refrigerant charge.   | Check for refrigerant leaks.     Refer to "Checking Refriger-  """  """  """  """  """  """  """       | - RA    |
|  | the touch. There is a big temperature difference between expansion                       | Leaking fittings or components.  Expansion valve closes a little compared with the specifica- | ant Leaks", HA-130.  • Remove foreign particles by using compressed air.                               | . BR    |
|  | valve inlet and outlet while the valve itself is frosted.                                | tion.<br>↓<br>① Improper expansion valve  | Check lubricant for contami-<br>nation.  | ST      |
|  |  | adjustment  (2) Malfunctioning thermal valve  |  | RS      |
|  |  | ③ Outlet and inlet may be clogged.  |  | BT<br>  |
|  | An area of the low-pressure pipe is colder than areas near the evaporator outlet.        | Low-pressure pipe is clogged or crushed.  | <ul> <li>Check and repair malfunctioning parts.</li> <li>Check lubricant for contamination.</li> </ul> | НА      |
| ļ  | Air flow volume is not enough or is too low.   | Evaporator is frozen.   | Replace compressor.  |         |
|  |  | Compressor discharge capacity does not change. (Compressor stroke is set at maximum length.)  |  | IDX     |

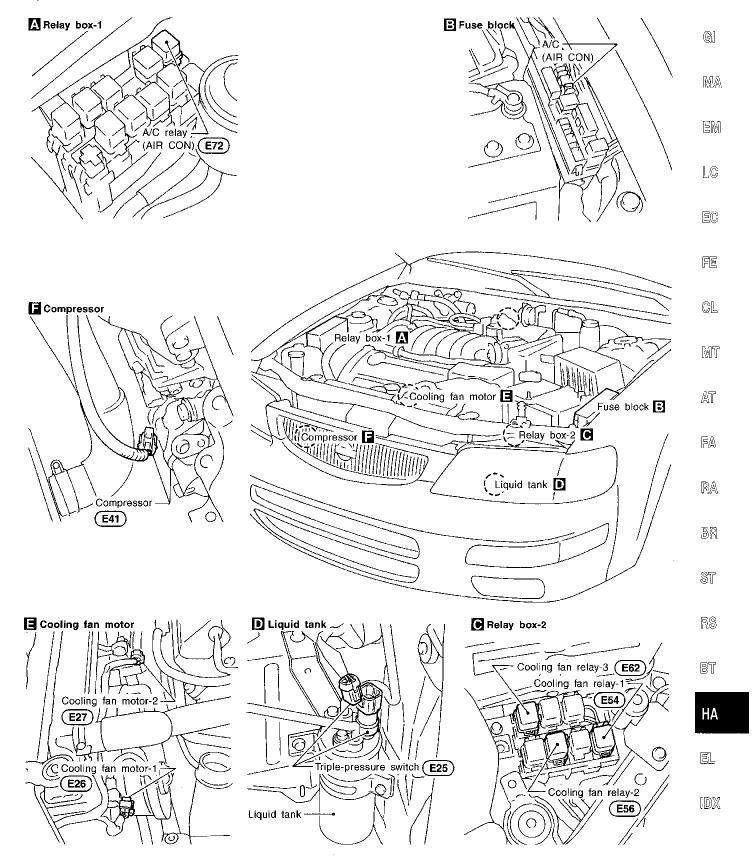
# TROUBLE DIAGNOSES

# Trouble Diagnoses for Abnormal Pressure (Cont'd)

| Gauge indication                              | Refrigerant cycle  | Probable cause  | Corrective action  |
|---|--|---|--|
| Low-pressure side sometimes becomes negative. | <ul> <li>Air conditioning system does not function and does not cyclically cool the compartment air.</li> <li>The system constantly functions for a certain period of time after compressor is stopped and restarted.</li> </ul> | Refrigerant does not discharge cyclically.  Moisture is frozen at expansion valve outlet and inlet.  Water is mixed with refrigerant. | Drain water from refrigerant or replace refrigerant.     Replace liquid tank.  |
| Low-pressure side becomes                     | Liquid tank or front/rear side of  | High-pressure side is closed  | Leave the system at rest until   |
| negative.                                     | expansion valve's pipe is  | and refrigerant does not flow.  | no frost is present. Start it  |
|   | frosted or dewed.  | <b>↓</b>  | again to check whether or not  |
| LO HI  AC362A                                 |  | Expansion valve or liquid tank is frosted.  | 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. Drain water from refrigerant or replace refrigerant.  If due to foreign particles, remove expansion valve and remove particles with dry and compressed air (not shop air).  If either of the above methods cannot correct the problem, replace expansion valve.  Replace liquid tank.  Check lubricant for contamination. |

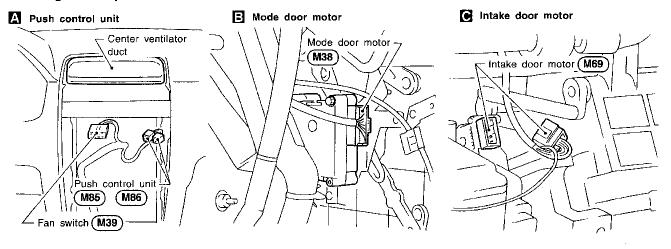
# **Harness Layout**

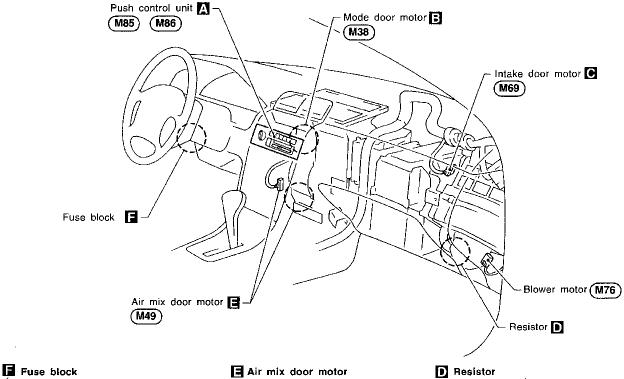
### **Engine compartment**

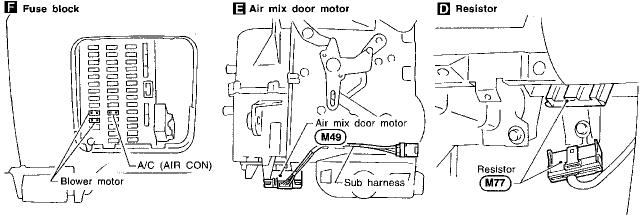


# Harness Layout (Cont'd)

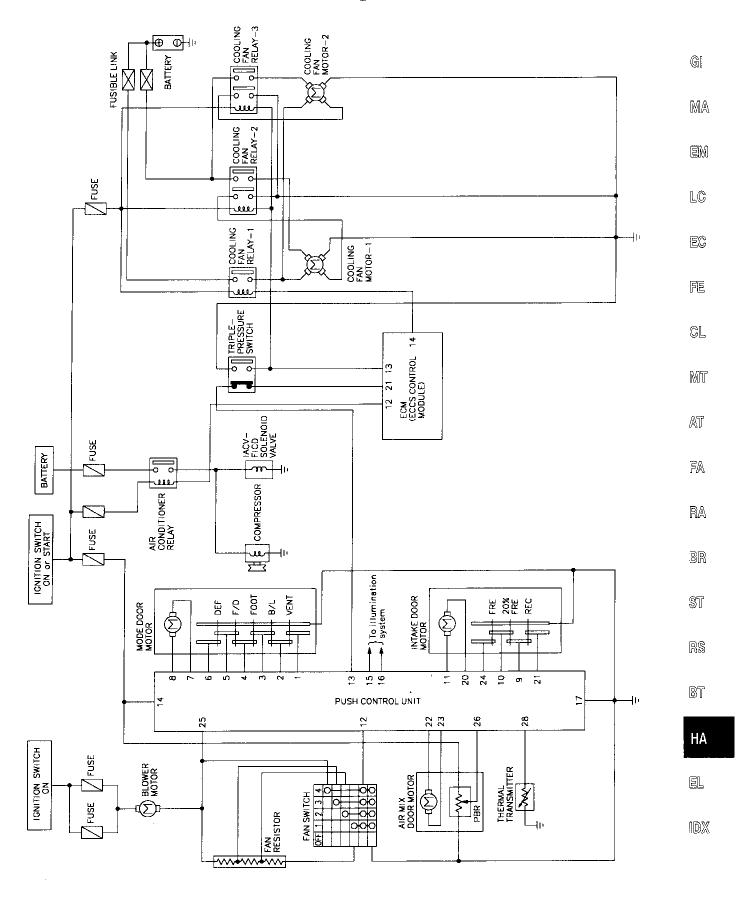
#### Passenger compartment



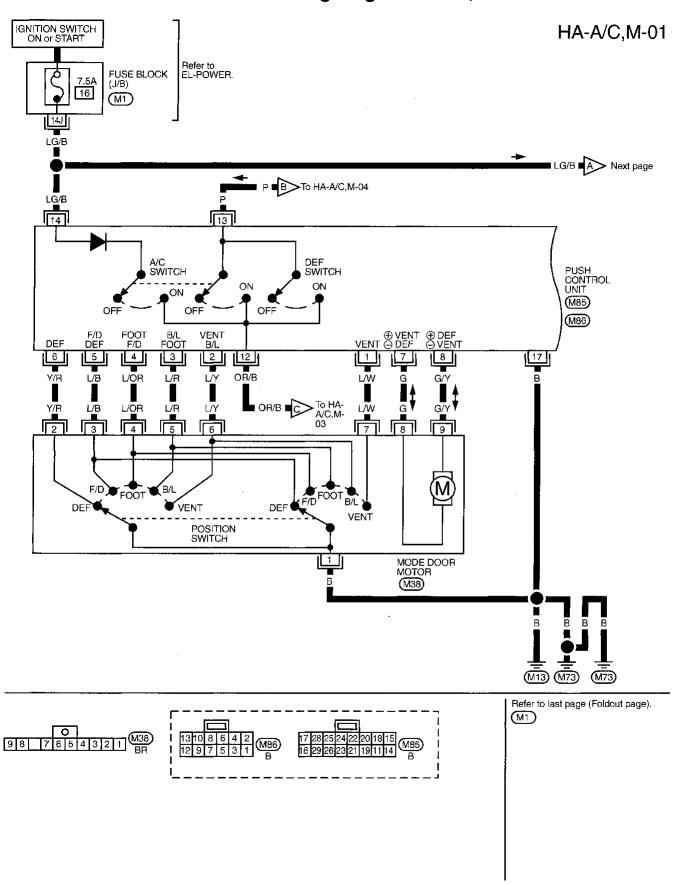




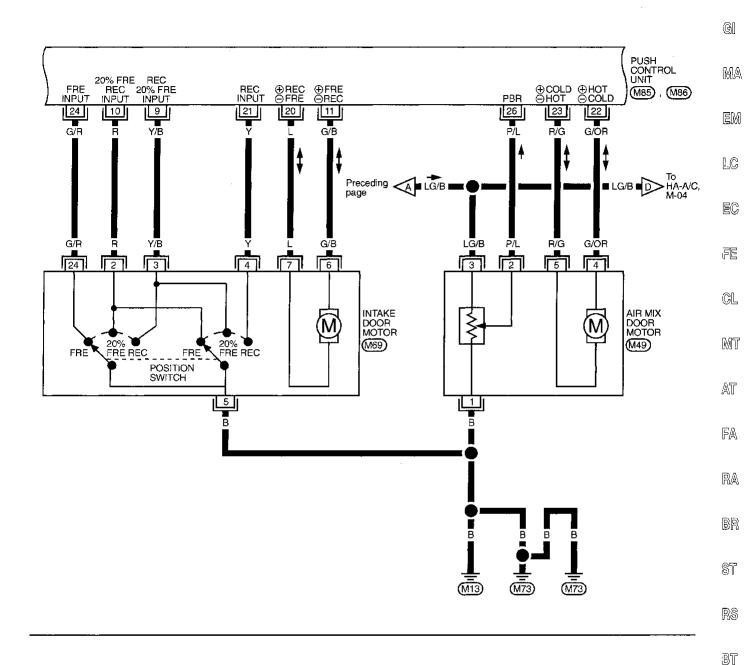
# **Circuit Diagram**

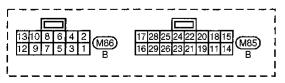


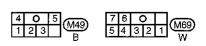
# Wiring Diagram — A/C, M —



HA-A/C,M-02



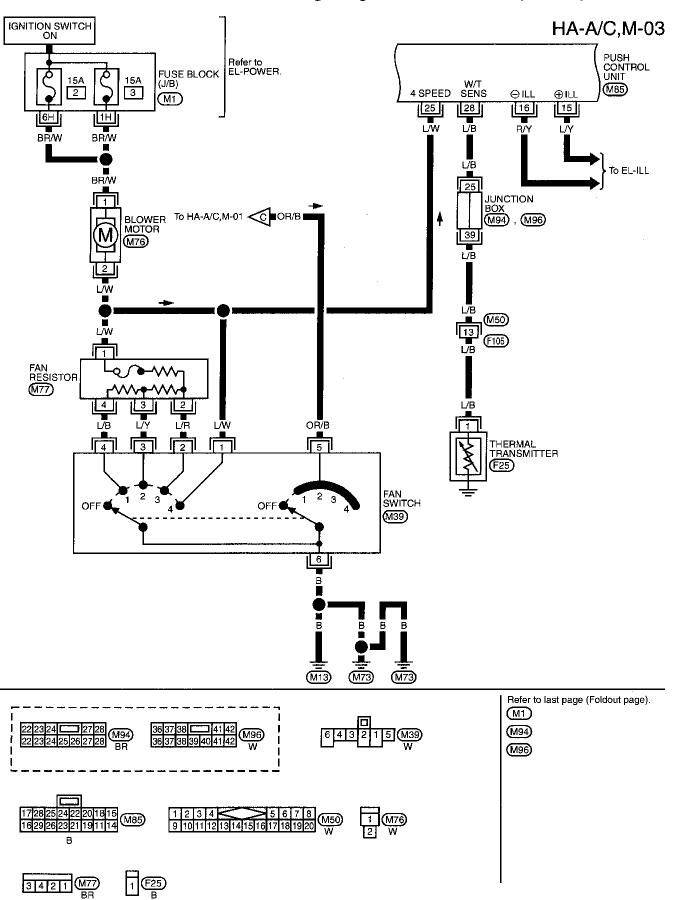


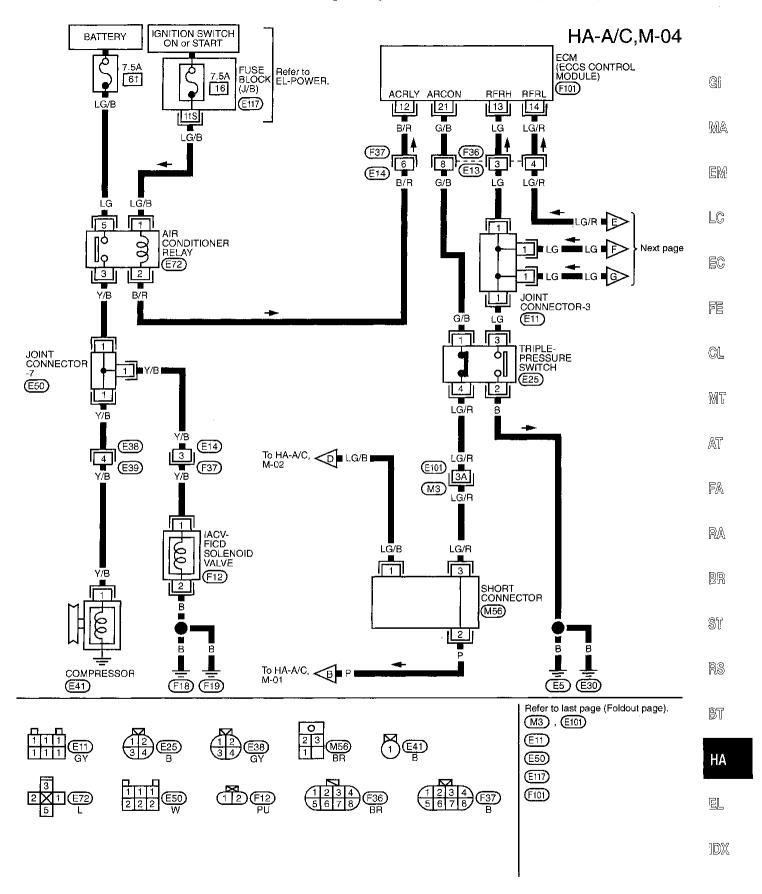


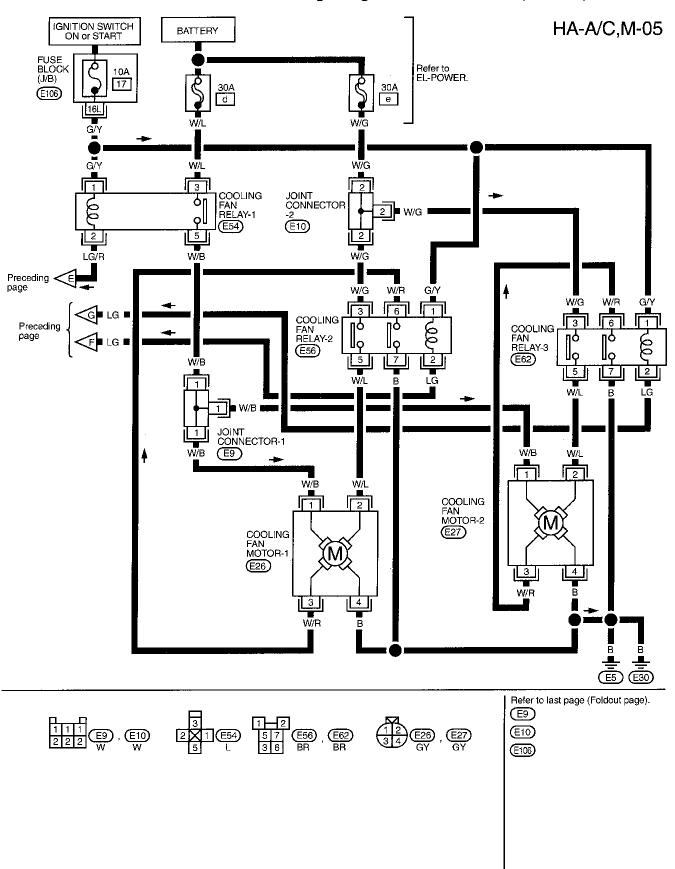
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# Main Power Supply and Ground Circuit Check **POWER SUPPLY CIRCUIT CHECK**

Check power supply circuit for air conditioning system.

Refer to EL section ("Wiring Diagram", "POWER SUPPLY ROUTING").





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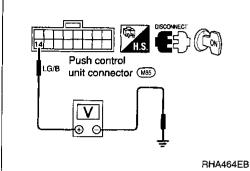
BR

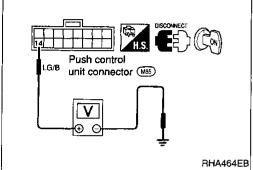
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#### **PUSH CONTROL UNIT CHECK**

Check power supply circuit for push control unit with ignition switch at ON.

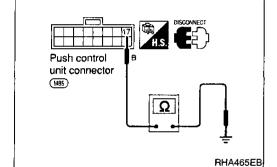
- 1. Disconnect push control unit harness connector.
- 2. Connect voltmeter from harness side.
- Measure voltage across terminal (14) and body ground.

| Voltmete | Voltmeter terminal |             |  |  |  |  |
|----------|--------------------|-------------|--|--|--|--|
| <b>⊕</b> | $\oplus$           | Voltage     |  |  |  |  |
| 14       | Body ground        | Approx. 12V |  |  |  |  |

Check body ground circuit for push control unit.

- 1. Disconnect push control unit harness connector.
- Connect ohmmeter from harness side.
- Check for continuity between terminal (17) and body ground.

| Ohmmete        |             |            |
|----------------|-------------|------------|
| <b>⊕</b>       | Θ           | Continuity |
| <del>(1)</del> | Body ground | Yes        |





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| • |   | INCIDENT                        | Flow chart<br>No. |
|---|---|---------------------------------|-------------------|
|   | 1 | Fan fails to rotate.            | 1                 |
|   | 2 | Fan does not rotate at 1-speed. | 2                 |
| • | 3 | Fan does not rotate at 2-speed. | <u> </u>          |
|   | 4 | Fan does not rotate at 3-speed. | 4                 |
|   | 5 | Fan does not rotate at 4-speed. | 5                 |

# **Diagnostic Procedure 1**

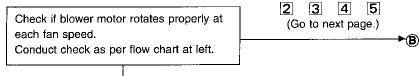
SYMPTOM: Blower motor does not rotate.

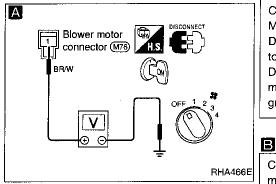
Perform PRELIMINARY CHECK 2 before referring to the following flow chart.

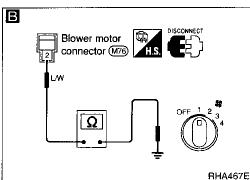
Νo

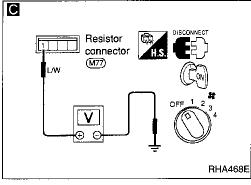
NG

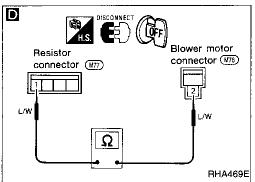
C

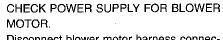












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Disconnect blower motor harness connec-

Do approx. 12 volts exist between blower motor harness terminal (1) and body ground?

Yes

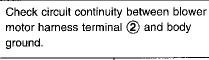
NG

Check power supply circuit and 15A fuses (No. 2 and 3 , located in the fuse block).

Refer to EL section ("Wiring Diagram", "POWER SUPPLY ROUTING").

Reconnect blower motor

harness connector.



OK

CHECK BLOWER MOTOR. (Refer to HA-56.)

Replace blower motor.

Disconnect blower motor and resistor harness connectors.

D Note

Check circuit continuity between blower motor harness terminal (2) and resistor harness terminal (1). Continuity should exist.

If OK, check harness for short.

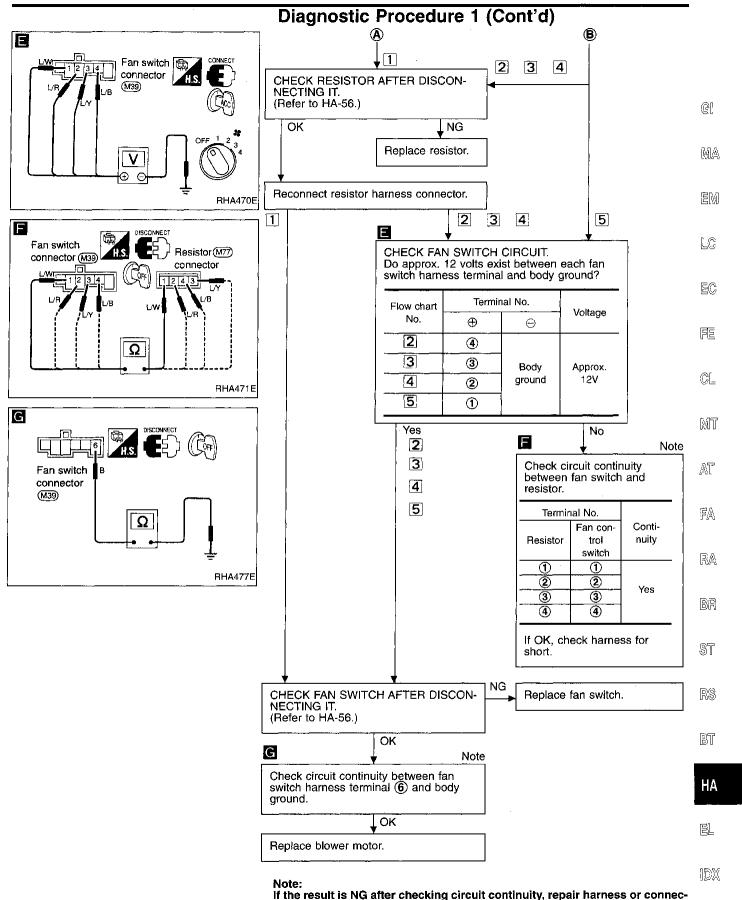
CHECK BLOWER MOTOR No CIRCUIT BETWEEN **BLOWER MOTOR AND** RESISTOR. Do approx. 12 volts exist

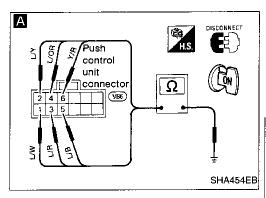
between resistor harness terminal (1) and body ground?

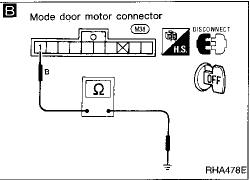
Yes

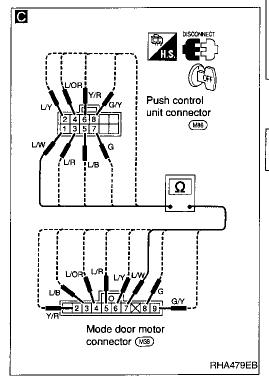
(Go to next page.)

If the result is NG after checking circuit continuity, repair harness or connec-





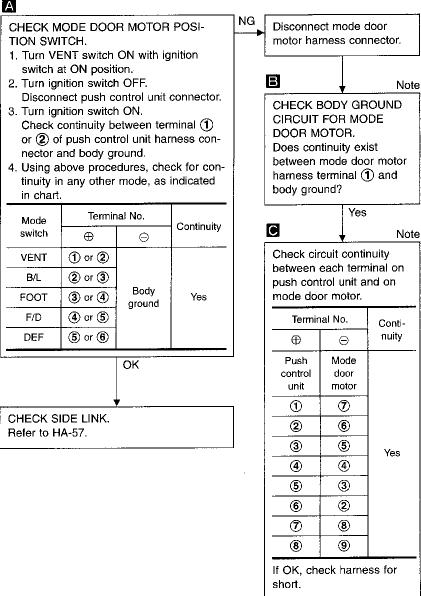




# **Diagnostic Procedure 2**

SYMPTOM: Air outlet does not change.

 Perform PRELIMINARY CHECK 4, Main Power Supply and Ground Circuit Check before referring to the flow chart below.



Note: If the result is NG or No after checking circuit continuity, repair harness or connector.

**↓**OK

**(A)** 

(Go to next page.)

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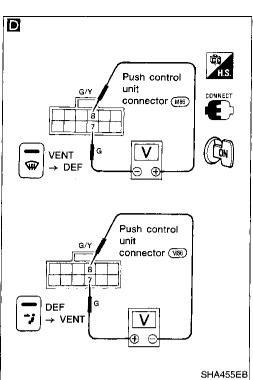
RS

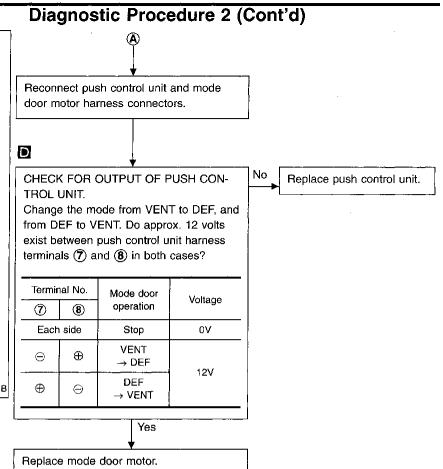
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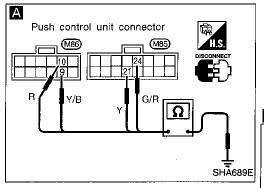
1111

Note

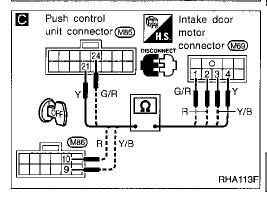
Note

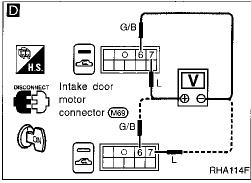
tinuity

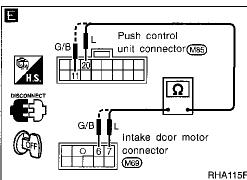
Yes



# В Intake door motor В connector (M69) RHA112F







### **Diagnostic Procedure 3**

SYMPTOM: Intake door does not change in VENT, B/L or FOOT mode.

Perform PRELIMINARY CHECK 1, Main Power Supply and Ground Circuit Check before referring to the following flow chart below.

NG

В

MOTOR.

Disconnect intake door motor

CHECK BODY GROUND CIR-

Does continuity exist between intake door motor harness termi-

CUIT FOR INTAKE DOOR

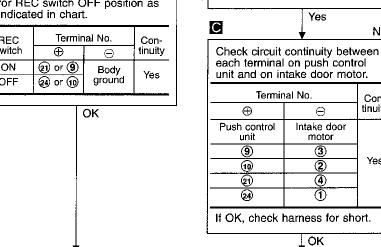
nal (5) and body ground?

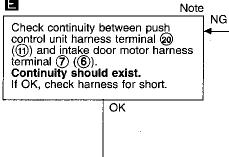
harness connector.

CHECK INTAKE DOOR MOTOR POSITION SWITCH.

- 1. Turn REC switch ON with ignition switch at ON position.
- Turn ignition switch OFF. Disconnect push control unit connector.
- Check if continuity exists between terminal (2) of push control unit harness connector and body ground.
- Using above procedures, check for REC switch OFF position as indicated in chart.

| REC    | Termir   | Con-           |         |
|--------|----------|----------------|---------|
| switch | ⊕        | Θ              | tinuity |
| ON     | 21 or 9  | Body<br>ground | Yes     |
| OFF    | 24 or 10 | ground         | 163     |





CHECK INTAKE DOOR LINK.

Refer to HA-58.

Replace push control unit.

CHECK FOR OUTPUT OF PUSH CONTROL UNIT. Check voltage between intake door motor harness terminals (6)

and (7), for conditions below.

Reconnect push control unit and

intake door motor harness con-

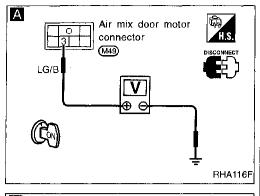
Terminal No. REC Voltage switch **(**  $\triangle$ <u>7</u> **6** ON 12V OFF **6**) (7) If OK, check harness for short.

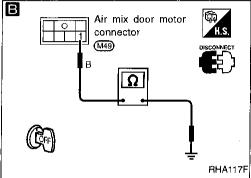
OK

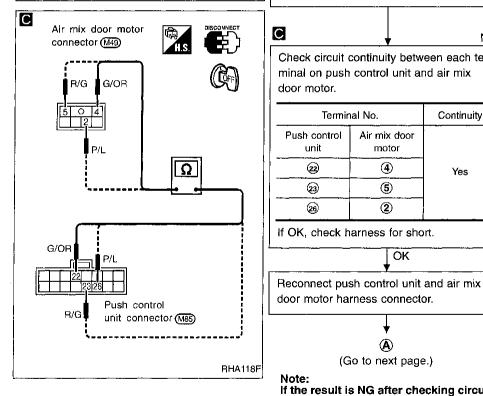
Replace intake door motor.

If the result is NG or No after checking circuit continuity, repair harness or connector.

D







## **Diagnostic Procedure 4**

SYMPTOM: Air mix door does not change.

Perform PRELIMINARY CHECK 2, Main Power Supply and Ground Circuit Check before referring to the following chart.

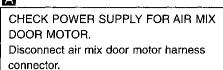
Note

Note

Continuity

Yes

No



Do approx. 12V exist between air mix door motor harness terminal (3) and body

Check circuit continuity between air mix door motor harness terminal No. (1) and

Disconnect push control unit harness con-

Check circuit continuity between each ter-

Air mix door

motor

4

**(5)** 

2

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

OK

minal on push control unit and air mix

Terminal No.

Yes

OK

ground?

body ground.

nector.

door motor.

Push control

unit

22

23

26

В

Check power supply circuit and 7.5A fuse (No. 16), located in the fuse block). Refer to EL section ("Wiring Diagram", "POWER SUPPLY ROUTING").

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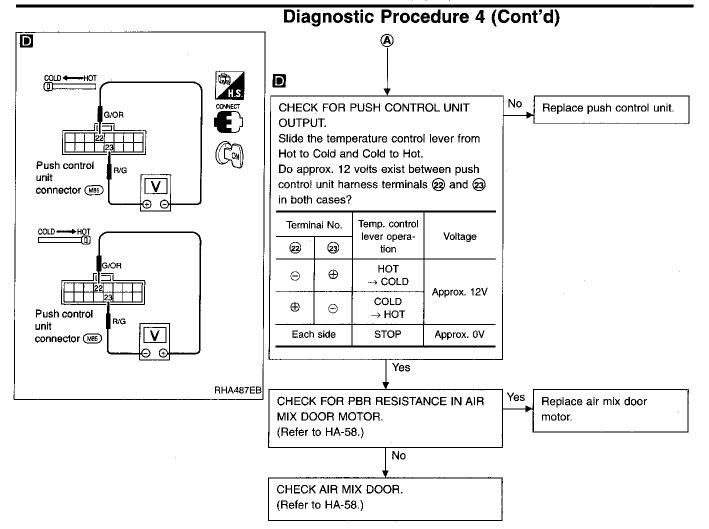
BT

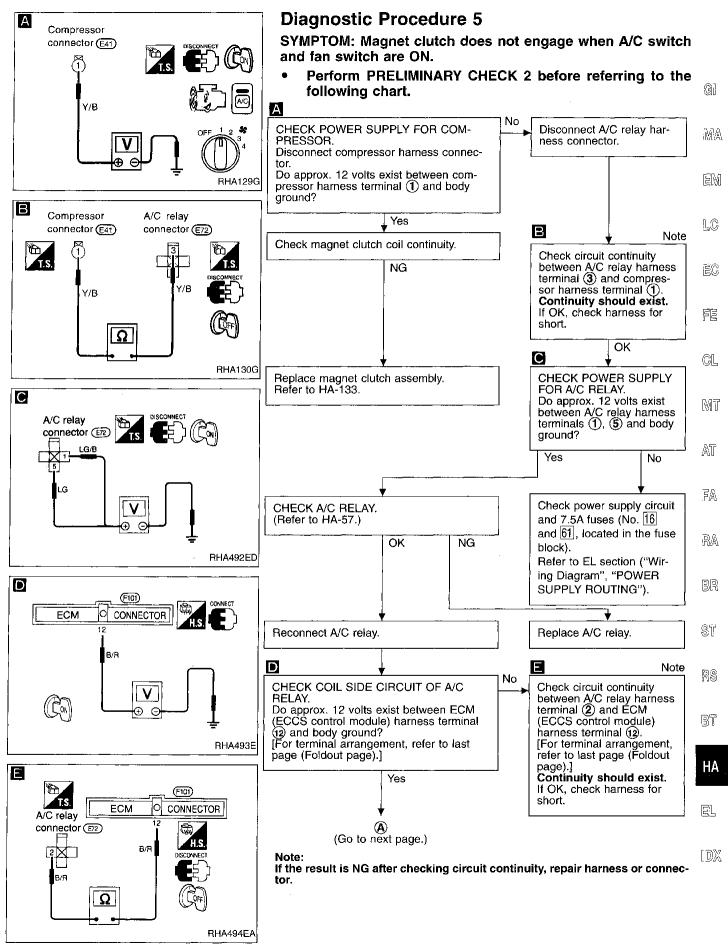
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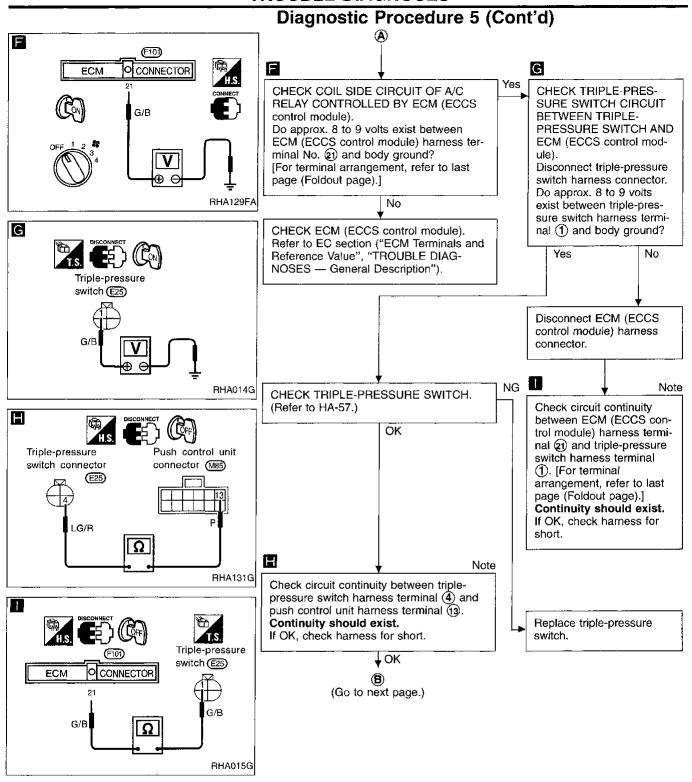
IDX

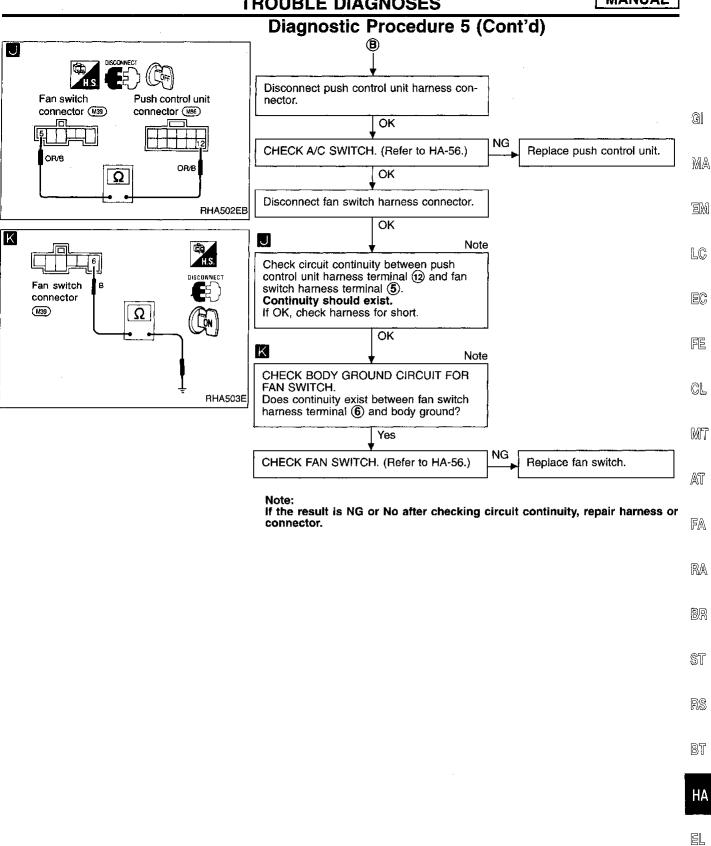


If the result is NG after checking circuit continuity, repair harness or connec-

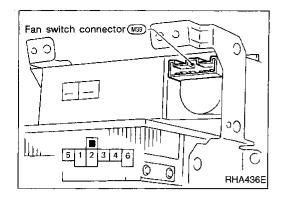








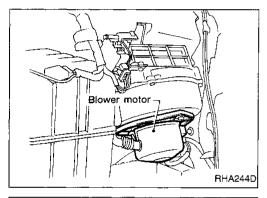
1DX



# **Electrical Components Inspection FAN SWITCH**

Check continuity between terminals at each position.

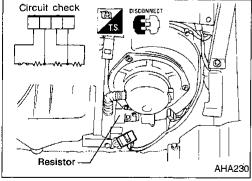
|          |          |          |      | <u>.</u> |             |                                       |
|----------|----------|----------|------|----------|-------------|---------------------------------------|
| DOCITION |          |          | TERN | INAL     |             |                                       |
| POSITION | 1        | 2        | 3    | 4        | 5           | 6                                     |
| OFF      |          |          |      |          |             | · · · · · · · · · · · · · · · · · · · |
| 1        |          |          |      | 0        | <del></del> |                                       |
| 2        |          |          | 0    |          | <del></del> |                                       |
| 3        |          | <u> </u> |      |          |             |                                       |
| 4        | <u> </u> |          |      |          |             |                                       |



#### **BLOWER MOTOR**

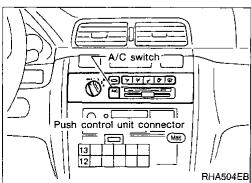
Check blower motor for smooth rotation.

Ensure that there are no foreign particles inside the intake unit.



#### **BLOWER RESISTOR**

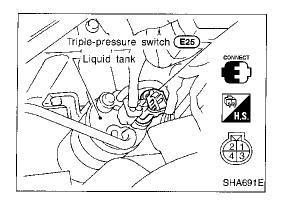
Check continuity between terminals.



## A/C SWITCH (Push control unit)

Check continuity between terminals.

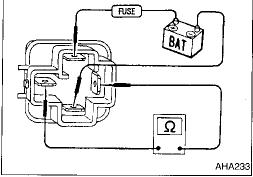
| A/C switch | Terminals               | Continuity      |  |
|------------|-------------------------|-----------------|--|
| ON         |                         | Exists.         |  |
| OFF        | <b>1</b> 2 - <b>1</b> 3 | Does not exist. |  |



# **Electrical Components Inspection (Cont'd)** TRIPLE-PRESSURE SWITCH

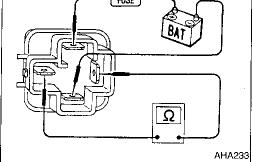
|                              | Terminals  | High-pressure side line<br>pressure<br>kPa (kg/cm², psi) | Operation       | Continuity |
|------------------------------|--|--|-----------------|------------|
| Low-pressure side            | Increasing to<br>157 - 226<br>(1.6 - 2.3, 23 - 33)           | ON   | Exists.         |            |
|                              | Decreasing to<br>152.0 - 201.0<br>(1.55 - 2.05, 22.0 - 29.2) | OFF  | Does not exist. |            |
| Medium-<br>pressure<br>side* | Increasing to<br>1,422 - 1,618<br>(14.5 - 16.5, 206 - 235)   | ON   | Exists.         |            |
|                              | Decreasing to<br>1,128 - 1,422<br>(11.5 - 14.5, 164 - 206)   | OFF  | Does not exist. |            |
| High-pressure side           | Decreasing to<br>1,667 - 2,059<br>(17 - 21, 242 - 299)       | ON   | Exists.         |            |
|                              | Increasing to<br>2,452 - 2,844<br>(25 - 29, 356 - 412)       | OFF  | Does not exist. |            |

<sup>\*</sup> For cooling fan motor operation.



#### A/C RELAY

Check circuit continuity between terminals by supplying 12 volts to coil side terminals of the relay.



ent mode

Mode door

RHA439E

motor

## **Control Linkage Adjustment MODE DOOR**

- Install mode door motor on heater unit and connect it to main harness.
  - Make sure lever of mode door motor is fitted into the slit of mode door link.
- 2. Turn ignition switch to ON.
- Turn VENT switch ON. 3.
- Turn DEF 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.





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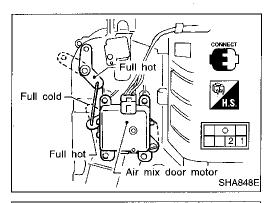
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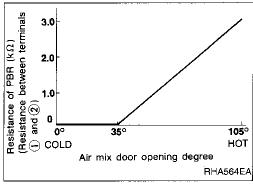
RS

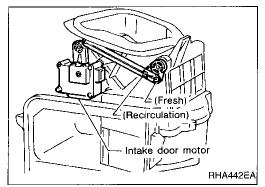
BT



IDX







# Control Linkage Adjustment (Cont'd) AIR MIX DOOR

- 1. Install air mix door motor on heater unit and connect sub- harness.
  - Make sure lever of air mix door is fitted into the slit of air mix door link.
- 2. Turn ignition switch to ON.
- 3. Slide temperature control lever to full cold.
- 4. Check that air mix door operates properly when temperature control lever is slid to full hot and full cold.
- 5. Check PBR characteristics, measure resistance between air mix door motor terminal between (1) and (2).

#### **INTAKE DOOR**

- Install intake door motor on intake unit and connect it to main harness.
  - Make sure lever of intake door motor is fitted into the slit of intake door link.
- 2. Turn ignition switch to ON.
- 3. Turn REC switch ON.
- Check that intake door operates properly when REC switch is turned ON and OFF.

#### Introduction

The Automatic Temperature Control (ATC) system provides automatic regulation of the vehicles 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, which receives input signals from several sensors. The automatic amplifier (BCM) uses these input signals (including the set temperature) to automatically control the ATC system's outlet air volume, air temperature, and air distribution.



#### **Features**

#### MA

#### 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 sunload.



#### Fan speed control



Blower speed is automatically controlled based on temperature setting, ambient temperature, in-vehicle temperature, amount of sunload and air mix door position.

With FAN switch set to "AUTO", the blower motor starts to gradually increase air flow volume.

When engine coolant temperature is low, the blower motor operation is delayed to prevent cool air from f

ĒĈ

When engine coolant temperature is low, the blower motor operation is delayed to prevent cool air from flowing.

FE

#### Intake door control

The intake doors are automatically controlled by: The temperature setting, ambient temperature, in-vehicle temperature, amount of sunload and ON-OFF operation of the compressor.

#### **Outlet door control**

MT

The outlet door is automatically controlled by: The temperature setting, ambient temperature, in-vehicle temperature and amount of sunload.

AT

#### Magnet clutch control

The ECM (ECCS control module) controls compressor operation using input signals from the throttle position sensor and auto amplifier.

FA

#### Self-diagnostic system

RA

The self-diagnostic system is built into the auto amplifier (BCM) to quickly locate the cause of problems.

BR

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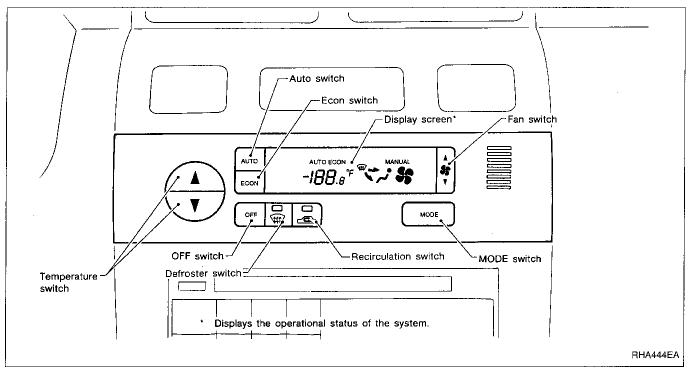
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### **Control Operation**



### **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 selected by the operator.

The air conditioning cooling function operates only when the engine is running.

### **ECON SWITCH**

Fully automatic control with the compressor off. With the compressor off, the system will not remove heat (cool) or de-humidify. The system will maintain the in-vehicle temperature at the set temperature when the set temperature is above the ambient (outside) temperature.

### **TEMPERATURE SWITCH (Potentio Temperature Control)**

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 (78% foot and 22% 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

### **DESCRIPTION**

AUTO

## **Control Operation (Cont'd)**

### **RECIRCULATION (REC) SWITCH**

ON position: Interior air is recirculated inside the vehicle.

OFF position: Automatic control resumes.

Recirculation is canceled when AUTO, DEF or ECON is selected. Recirculation resumes when another mode is chosen.

**G**]

## **DEFROSTER (DEF) SWITCH**

Positions the mode doors to the defrost position. Also positions the air intake doors to the outside air position. The compressor operates at ambient temperature approx. 2°C (35°F) or above.

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## **TROUBLE DIAGNOSES**

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| Symptom Chart  |       |     |
| Self-diagnosis   |       |     |
| CHECKING PROCEDURE   |       |     |
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| STEP 2: Checks each sensor circuit for open or short circuit                         |       |     |
| STEP 3: Checks mode and intake door positions  |       |     |
| STEP 4: Checks operation of each actuator  |       |     |
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| Diagnostic Procedure 1   |       |     |
| SYMPTOM: Ambient sensor circuit is open or shorted.                                  |       |     |
| (2) or -2) is indicated on display as a result of conducting Self-diagnosis STEP 2.) | HA-   | 97  |
| 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.) | ЫΔ_   | QΣ  |
|  | * I/\ | 30  |
| Diagnostic Procedure 3   |       |     |
| SYMPTOM: Thermal transmitter circuit is open or shorted.                             | ЦΑ    | 00  |
| (23 or -23 is indicated on display as a result of conducting Self-diagnosis STEP 2.) | пA-   | 99  |
| Diagnostic Procedure 4   |       |     |
| SYMPTOM: Sunload sensor circuit is open or shorted.                                  |       |     |
| (25 or -25 is indicated on display as a result of conducting Self-diagnosis STEP 2.) | HA-1  | 100 |

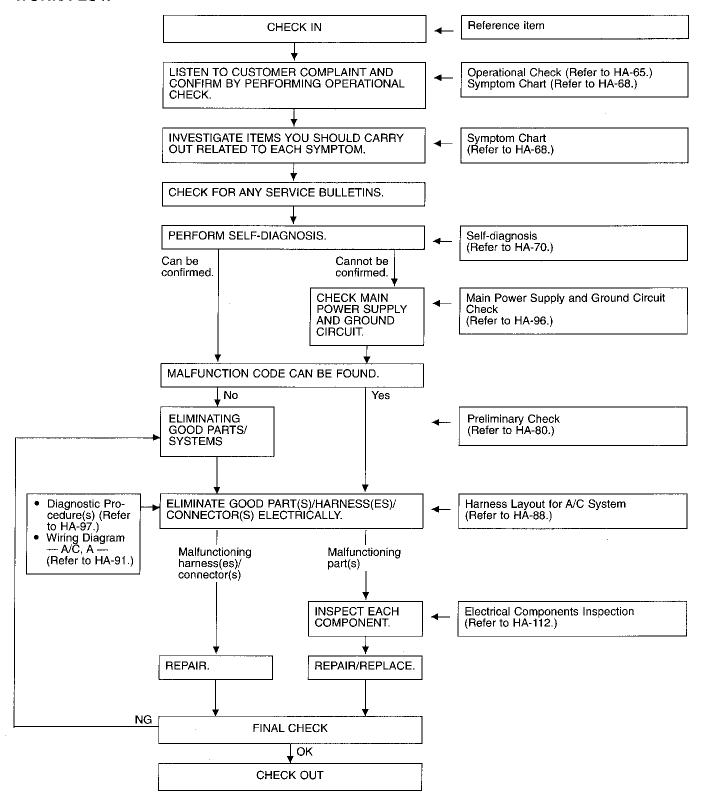
## **TROUBLE DIAGNOSES**

| Contents (Cont'd)   |          |            |  |  |
|---|----------|------------|--|--|
| Diagnostic Procedure 5  |          |            |  |  |
| SYMPTOM: PBR circuit is open or shorted.  |          |            |  |  |
| (공동 or -공동 is indicated on display as a result of conducting Self-diagnosis STEP 2.) HA-1 | .01      |            |  |  |
| Diagnostic Procedure 6  |          |            |  |  |
| SYMPTOM: Mode door motor does not operate normally  | 02 (     | <b>G</b> ] |  |  |
| Diagnostic Procedure 7  |          |            |  |  |
| SYMPTOM: Intake door motor does not operate normally                                      | 04       | MA         |  |  |
| Diagnostic Procedure 8  |          | BVd2~0     |  |  |
| SYMPTOM: Air mix door motor does not operate normally                                     |          |            |  |  |
| Diagnostic Procedure 9  | [        | ĒM         |  |  |
| SYMPTOM: Blower motor operation is malfunctioning under out of Starting Fan Speed Control | 07       |            |  |  |
| Diagnostic Procedure 10   |          | LC         |  |  |
| SYMPTOM: Magnet clutch does not engage after performing                                   |          |            |  |  |
| Preliminary Check 6   | 09 ,     | E@         |  |  |
| Diagnostic Procedure 11   | įį       | EC         |  |  |
| SYMPTOM: • Self-diagnosis cannot be performed.  |          |            |  |  |
| Multiplex communication error (52 with fan symbol detected as a result                    | [        | [E         |  |  |
| of conducting self-diagnosis STEP 5.)   |          |            |  |  |
| Electrical Component Inspection   | 0        | CL         |  |  |
| Control Linkage Adjustment HA-1   | 13 🖔     | 915        |  |  |
|   |          |            |  |  |
|   | <u> </u> | MT         |  |  |
|   |          |            |  |  |
|   |          | AT         |  |  |
|   |          |            |  |  |
|   | π̄.      | <b>2</b> 0 |  |  |
|   | Ţ        | FA         |  |  |
|   |          |            |  |  |
|   | F        | RA         |  |  |
|   |          |            |  |  |
|   | Ę        | 3R         |  |  |
|   |          | 500        |  |  |
|   | ,c       | ~~~        |  |  |
|   | 8        | ŝT         |  |  |
|   |          |            |  |  |
|   | F        | RS         |  |  |
|   |          |            |  |  |
|   | E        | 3T         |  |  |
|   |          | 크비         |  |  |
|   |          |            |  |  |

НА

# How to Perform Trouble Diagnoses for Quick and Accurate Repair

### **WORK FLOW**



### **Operational Check**

The purpose of the operational check is to confirm that the system 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.

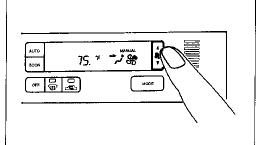
### GI

### **CONDITIONS:**

• Engine running and at normal operating temperature.



EM



RHA445E

### PROCEDURE:

### 1. Check blower

LC

Press fan switch (up side) one time.
 Blower should operate on low speed.
 The fan symbol should have one blade lit \$\mathbb{S}\$.



2) Press fan switch (up side) one more time.

Continue checking blower speed and fan symbol until all speeds are checked.

FE

4) Leave blower on MAX speed 🥰 .

GL

### 2. Check discharge air

Press mode switch four times and DEF button.

MT

ÆT

FA

RA

 Confirm that discharge air comes out according to the air distribution table at left.

BR

Refer to "Discharge Air Flow", "DESCRIPTION" (HA-17).

### ST

Confirm that the compressor clutch is engaged (visual inspection) and intake door position is at FRESH when the DEF button is pressed.

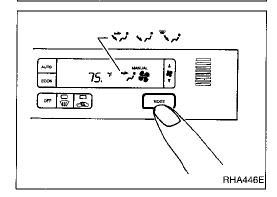
RS

Intake door position is checked in the next step.

BT

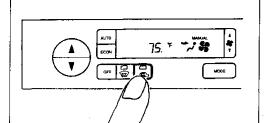
НА

EL



| Switch mode/ | Air ou | llet/distr | ibution   |  |  |
|--------------|--------|------------|-----------|--|--|
| ndicator     | Face   | Foot       | Defroster |  |  |
| ***          | 100%   | _          | _         |  |  |
| ₩.           | 60%    | 40%        | _         |  |  |
| <b>~</b> ;   | _      | 78%        | 22%       |  |  |
|              | _      | 60%        | 40%       |  |  |
| ₩            | _      | _          | 100%      |  |  |

## Operational Check (Cont'd)

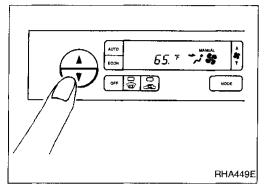


RHA448E

### 3. Check recirculation

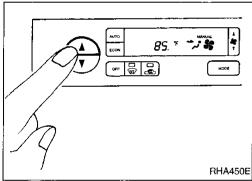
1) Press REC switch. Recirculation indicator should illuminate.

Listen for intake door position change (you should hear blower sound change slightly).



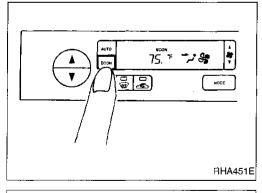
### 4. Check temperature decrease

- Press the temperature decrease button until 18°C (65°F) is displayed.
- 2) Check for cold air at discharge air outlets.



### 5. Check temperature increase

- Press the temperature increase button until 32°C (85°F) is displayed.
- Check for hot air at discharge air outlets.

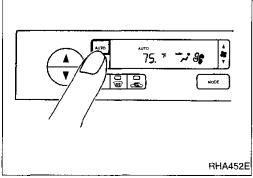


### Check ECON mode

- Press ECON switch. 1)
- Display should indicate ECON (no AUTO, no MANUAL). 2) Confirm that the compressor clutch is not engaged (visual inspection).

(Discharge air will depend on ambient, in-vehicle, and set temperatures.)

Check for intake air at Fresh position.

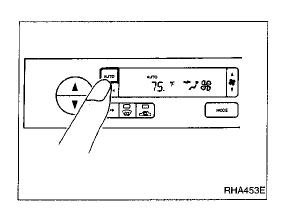


### **Check AUTO mode**

Press AUTO switch.

Display should indicate AUTO (no ECON, no MANUAL). Confirm that the compressor clutch engages (audio or visual inspection).

(Discharge air and suction air will depend on ambient, in-vehicle, and set temperatures.)



## Operational Check (Cont'd)

- 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.

G|

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## **Symptom Chart**

## **DIAGNOSTIC TABLE**

| PRO                           | CEDURE   |   | Self-diagnosis     |                    |  |                    |                    |                             | Preliminary Check           |                             |                             |                             |                             |                             |                             |                             | Diagnostic Procedure           |                                |                                |                                 |                                 |
|-------------------------------|--|---|--------------------|--------------------|--|--------------------|--------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|--------------------------------|--------------------------------|--------------------------------|---------------------------------|---------------------------------|
| SYM                           | РТОМ   | DIAGNOSTIC ITEM<br>AND REFERENCE PAGE               | STEP 1 (HA-71, 74) | STEP 2 (HA-71, 74) | STEP 3 (HA-72, 75)                               | STEP 4 (HA-72, 76) | STEP 5 (HA-73, 76) | AUXILIARY MECHANISM (HA-79) | Preliminary Check 1 (HA-80) | Preliminary Check 2 (HA-81) | Preliminary Check 3 (HA-82) | Preliminary Check 4 (HA-83) | Preliminary Check 5 (HA-84) | Preliminary Check 6 (HA-85) | Preliminary Check 7 (HA-86) | Preliminary Check 8 (HA-87) | Diagnostic Procedure 1 (HA-97) | Diagnostic Procedure 2 (HA-98) | Diagnostic Procedure 3 (HA-99) | Diagnostic Procedure 4 (HA-100) | Diagnostic Procedure 5 (HA-101) |
|                               | utlet does no                                      |   | 0                  | 0                  | 0  | 0                  | 0                  |                             | 0                           |                             |                             |                             | Ţ                           |                             |                             |                             | 0                              | 0                              |                                | 0                               | 0                               |
|                               | e door does  |   | 0                  | 0                  | <u> </u>   | 0                  | 0                  |                             |                             | 0                           |                             |                             |                             |                             |                             |                             | 0                              | 0                              | <u> </u>                       | 0                               | 0                               |
|                               | ficient coolin                                     | *   | 0                  | 0                  | 0  | 0                  | 0                  | 0                           | 0                           | 0                           | 0                           | 0                           | 0                           | 0.                          | <u> </u>                    | ├—                          | 0                              | 0                              | -                              | 0                               | 0                               |
|                               | ficient heatin                                     | g<br>eration is malfunctioning.                     | <u> </u>           | <u> </u>           | 0  | 0                  | 0                  | 0                           | 0                           | 0                           | <del> </del>                | T.                          | <u> </u>                    | -                           | 0                           | <del> </del>                | 0                              | 0                              | 0                              | 0                               | 0                               |
|                               |  | es not engage.                                      | ŏ                  | 0                  | <del>                                     </del> | 0                  | 0                  |                             |                             |                             | _                           |                             | -                           | 0                           |                             |                             | 0                              | 0                              | 1                              | 0                               | 0                               |
| Disch                         | narged air   | temperature does not                                | 0                  | 0                  |  | 0                  | 0                  |                             |                             |                             | -                           |                             |                             |                             | 0                           |                             | 0                              | 0                              |                                | Ō                               | 0                               |
| Noise                         | change.  |   |                    |                    | <del>                                     </del> |                    | <del></del>        | ļ <u>-</u>                  | <u> </u>                    |                             | _                           | <del> </del>                |                             |                             | <del>-</del>                | 0                           |                                |                                |                                |                                 |                                 |
| 140136                        | 21   | Ambient sensor circuit is open.                     | 0                  | 0                  |  |                    | 0                  |                             |                             |                             |                             |                             |                             |                             |                             |                             | 4                              |                                |                                |                                 |                                 |
|                               | 2  | In-vehicle sensor cir-<br>cuit is open.             | 0                  | 0                  |  |                    | 0                  |                             |                             |                             |                             | _                           |                             |                             |                             |                             |                                | Ø                              |                                |                                 |                                 |
| P 2                           | 23   | Thermal transmitter circuit is open.                | 0                  | 0                  |  |                    |                    |                             |                             |                             |                             |                             |                             |                             |                             |                             |                                |                                | 0                              |                                 |                                 |
| Result of self-diagnosis STEP | 25   | Sunload sensor circuit is open.                     | 0                  | 0                  |  |                    |                    |                             |                             |                             |                             |                             |                             |                             |                             |                             |                                |                                |                                | 0                               |                                 |
| agnos                         | 25   | PBR circuit is open.                                | 0                  | 0                  |  |                    |                    |                             |                             |                             |                             |                             |                             |                             |                             |                             |                                |                                |                                |                                 | 0                               |
| self-d                        | יי   | Ambient sensor circuit is shorted.                  | 0                  | 0                  |  |                    | 0                  |                             |                             |                             |                             |                             |                             |                             |                             |                             | 0                              |                                | ļ                              |                                 |                                 |
| sult of                       | -22  | cuit is snorted.                                    | 0                  | 0                  |  |                    | 0                  |                             |                             |                             |                             |                             |                             |                             |                             |                             |                                | 0                              |                                |                                 |                                 |
| æ                             | -23  | Thermal transmitter circuit is shorted.             | 0                  | 0                  |  |                    |                    |                             |                             |                             |                             |                             |                             |                             |                             |                             |                                |                                | 0                              |                                 |                                 |
|                               | <u>-25</u>   | Sunload sensor circuit is shorted.                  | 0                  | 0                  |  |                    |                    |                             |                             |                             |                             |                             |                             |                             |                             |                             |                                |                                | <b>-</b>                       | 0                               |                                 |
|                               | -25  | PBR circuit is shorted.                             | 0                  | 0                  |  |                    |                    |                             |                             |                             |                             |                             |                             |                             |                             |                             |                                |                                |                                |                                 | 0                               |
| mally.                        |  | r does not operate nor-                             | 0                  | 0                  | 0  | 0                  | 0                  |                             |                             |                             |                             |                             |                             |                             |                             |                             | 0                              | 0                              |                                | 0                               | 0                               |
| mally.                        | Intake door motor does not operate nor-<br>mally.  |   | 0                  | 0                  |  | 0                  | 0                  |                             |                             |                             |                             |                             |                             |                             |                             |                             | 0                              | 0                              |                                | 0                               | 0                               |
| mally.                        | Air mix door motor does not operate nor-<br>mally. |   |                    | 0                  |  | 0                  | 0                  |                             |                             |                             |                             |                             |                             |                             |                             |                             | ,0                             | 0                              |                                | 0                               | 0                               |
| under                         | out of Start                                       | eration is malfunctioning<br>ing Fan Speed Control. | 0                  | 0                  |  | 0                  | 0                  |                             |                             |                             |                             |                             | 0                           |                             |                             |                             | 0                              | 0                              | 0                              | 0                               | 0                               |
| formir                        | ng Prelimina                                       | , ,   | 0                  | 0                  |  | 0                  | 0                  | ·                           |                             |                             |                             |                             |                             | 0                           |                             |                             | 0                              |                                |                                |                                 |                                 |
|                               |  | nnot be performed.                                  |                    |                    |  |                    |                    |                             |                             |                             |                             | L                           |                             |                             |                             |                             |                                |                                |                                |                                 |                                 |

①, ②: The number means checking order.

O: As for checking order, refer to each flow chart. (It depends on malfunctioning portion.)

**G**]

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87

# TROUBLE DIAGNOSES Symptom Chart (Cont'd)

|                                 | Diag                            | nostic                          | Proc                            | cedur                            | е                                |                         | in Po<br>round            |                       |                             |                       |                         | Electrical Components Inspection |                          |                         |              |                             |                          |                            |                       |                           |                    |                                 |  |                            |                          |                                |                        |                        |         |
|---------------------------------|---------------------------------|---------------------------------|---------------------------------|----------------------------------|----------------------------------|-------------------------|---------------------------|-----------------------|-----------------------------|-----------------------|-------------------------|----------------------------------|--------------------------|-------------------------|--------------|-----------------------------|--------------------------|----------------------------|-----------------------|---------------------------|--------------------|---------------------------------|--|----------------------------|--------------------------|--------------------------------|------------------------|------------------------|---------|
| Diagnostic Procedure 6 (HA-102) | Diagnostic Procedure 7 (HA-104) | Diagnostic Procedure 8 (HA-106) | Diagnostic Procedure 9 (HA-107) | Diagnostic Procedure 10 (HA-109) | Diagnostic Procedure 11 (HA-111) | Auto amp. (BCM) (HA-96) | Push control unit (HA-96) | 7.5A Fuse #16 (HA-96) | 15A Fuses #2 and #3 (HA-96) | 7.5A Fuse #61 (HA-96) | Ambient sensor (HA-116) | In-vehicle sensor (HA-115)       | Thermal transmitter (EL) | Sunload sensor (HA-116) | PBR (HA-119) | Air mix door motor (HA-118) | Mode door motor (HA-120) | Intake door motor (HA-122) | Blower motor (HA-112) | Fan control amp. (HA-123) | A/C relay (HA-112) | Triple-pressure switch (HA-112) | Magnet clutch (Compressor)<br>(HA-133) | Push control unit (HA-115) | Auto amp. (BCM) (HA-117) | ECM (ECCS control module) (EC) | Cooling fan motor (EC) | Cooling fan relay (EC) | Harness |
| 0                               |                                 |                                 |                                 |                                  |                                  | 0                       | 0                         | 0                     | 0                           |                       | 0                       | 0                                |                          | 0                       | 0            |                             | 0                        |                            |                       |                           |                    |                                 |  | 0                          | 0                        |                                |                        |                        | С       |
| 0.                              | 00                              | 0                               | 0                               | 0                                | -                                | 0                       | 0                         | 0                     | 0                           |                       | 0                       | 0                                |                          | 0                       | 00           | 0                           | 0                        | 0                          | 0                     | 0                         | 0                  | 0                               |  | 00                         | 0                        | 0                              | 0                      | 0                      | C       |
| )                               |                                 |                                 |                                 |                                  | <del> </del>                     | 0                       | 0                         | 0                     | ŏ                           |                       | 0                       | 0                                |                          | 0                       | ŏ            | ŏ                           | 0                        | O                          | 0.                    | <u>o</u>                  |                    |                                 |  | 0                          | 0                        |                                |                        | $\vdash$               | 0       |
|                                 |                                 | <br>                            | 0                               |                                  |                                  | 0                       | 0                         | 0                     | 0                           |                       | 0                       | 0                                | 0                        | 0                       | 0            |                             |                          |                            |                       | 0                         |                    |                                 |  | 0                          | 0                        | 0                              |                        | -                      | 0       |
|                                 |                                 |                                 |                                 |                                  |                                  | 0                       | 0                         | 0                     | 0                           | 0                     | 0                       |                                  |                          |                         |              |                             |                          |                            |                       |                           |                    | 0                               | 0                                      | 0                          | 0                        | 0                              |                        | 1                      |         |
|                                 |                                 | 0                               |                                 |                                  |                                  | 0                       | 0                         |                       |                             | 0                     | 0                       |                                  |                          |                         | 0            | 0                           |                          |                            |                       |                           |                    |                                 |  |                            | 0                        |                                | <u> </u>               | <del> </del>           | ┼       |
|                                 |                                 |                                 |                                 |                                  |                                  |                         |                           |                       |                             |                       |                         |                                  |                          |                         |              |                             |                          |                            |                       |                           |                    |                                 |  |                            | 0                        |                                |                        | +                      | +       |
|                                 |                                 |                                 |                                 |                                  |                                  |                         |                           |                       |                             |                       |                         | 0                                |                          |                         |              |                             |                          |                            |                       |                           |                    |                                 |  |                            | 0                        |                                |                        |                        | 0       |
|                                 |                                 |                                 |                                 |                                  |                                  |                         | <u> </u>                  |                       |                             |                       |                         |                                  |                          |                         |              |                             |                          |                            |                       |                           |                    |                                 |  |                            |                          |                                |                        |                        | +       |
|                                 |                                 |                                 |                                 |                                  |                                  |                         |                           |                       |                             |                       |                         |                                  | 0                        | _                       |              |                             |                          |                            |                       |                           |                    |                                 |  |                            |                          |                                |                        |                        | +       |
|                                 |                                 |                                 |                                 |                                  |                                  |                         |                           |                       |                             |                       |                         |                                  |                          | 0                       |              |                             |                          |                            |                       |                           | ļ                  |                                 |  |                            | 0                        | ļ                              | ļ <u>-</u>             | <del> </del>           |         |
|                                 |                                 |                                 |                                 |                                  |                                  |                         |                           |                       |                             |                       |                         |                                  |                          |                         | 0            |                             |                          |                            |                       |                           | <u> </u>           |                                 | <del></del>                            | ·-··                       | 0                        | ļ                              |                        | <u> </u>               |         |
|                                 |                                 |                                 |                                 |                                  |                                  |                         |                           |                       |                             |                       | 0                       |                                  |                          |                         |              |                             |                          |                            |                       |                           |                    |                                 |  |                            | 0                        |                                |                        | <u> </u>               |         |
|                                 |                                 |                                 |                                 |                                  |                                  |                         |                           |                       |                             |                       | 0                       |                                  |                          |                         |              |                             |                          |                            |                       |                           |                    |                                 |  |                            |                          | 0                              |                        |                        | 0       |
|                                 |                                 |                                 |                                 |                                  |                                  |                         |                           |                       |                             |                       |                         |                                  | 0                        |                         |              |                             |                          |                            |                       |                           |                    |                                 |  |                            |                          |                                |                        |                        |         |
|                                 |                                 |                                 |                                 |                                  |                                  |                         |                           |                       |                             |                       |                         | i                                |                          | 0                       |              |                             |                          |                            |                       | :                         |                    |                                 |  |                            | 0                        |                                |                        |                        | C       |
|                                 |                                 |                                 |                                 |                                  |                                  |                         |                           |                       |                             |                       |                         |                                  |                          |                         | 0            |                             |                          |                            |                       |                           |                    |                                 |  |                            | 0                        |                                |                        |                        |         |
| •                               |                                 |                                 |                                 |                                  |                                  | 0                       | 0                         | 0                     | 0                           |                       | 0                       | 0                                |                          | 0                       | 0            |                             | 0                        |                            |                       |                           |                    |                                 |  | 0                          | 0                        |                                |                        |                        | С       |
| Ť                               | 0                               |                                 |                                 |                                  |                                  | 0                       | 0                         | 0                     | 0                           |                       | 0                       | 0                                |                          | 0                       | 0            |                             |                          | 0                          |                       |                           |                    |                                 |  | 0                          | 0                        |                                |                        |                        | C       |
|                                 |                                 | 0                               | •••                             |                                  |                                  | 0                       | 0                         | 0                     | 0                           |                       | 0                       | 0                                |                          | 0                       | 0            | 0                           |                          |                            |                       |                           |                    |                                 |  | 0                          | 0                        |                                |                        |                        | C       |
| 1                               |                                 |                                 | 0                               |                                  |                                  |                         | 0                         | 0                     | 0                           |                       | 0                       | 0                                | 0                        | 0                       | 0            |                             |                          |                            |                       | 0                         | 0                  |                                 |  |                            | 0                        | 0                              | 0                      |                        |         |
|                                 |                                 |                                 |                                 | 4                                |                                  | 0                       | 0                         | 0                     | 0                           | 0                     | 0                       | ,                                |                          | -                       |              |                             |                          |                            |                       | _                         | 0                  | 0                               | 0                                      | 0                          | 0                        | 0                              |                        |                        |         |
| -                               |                                 |                                 |                                 | _                                | 0                                | <u> </u>                | <u> </u>                  | $\overline{}$         |                             | $\overline{}$         |                         |                                  |                          |                         |              |                             |                          |                            |                       |                           | $\vdash$           | $\overline{}$                   |  |                            | 0                        | 0                              | <u> </u>               | <u> </u>               |         |

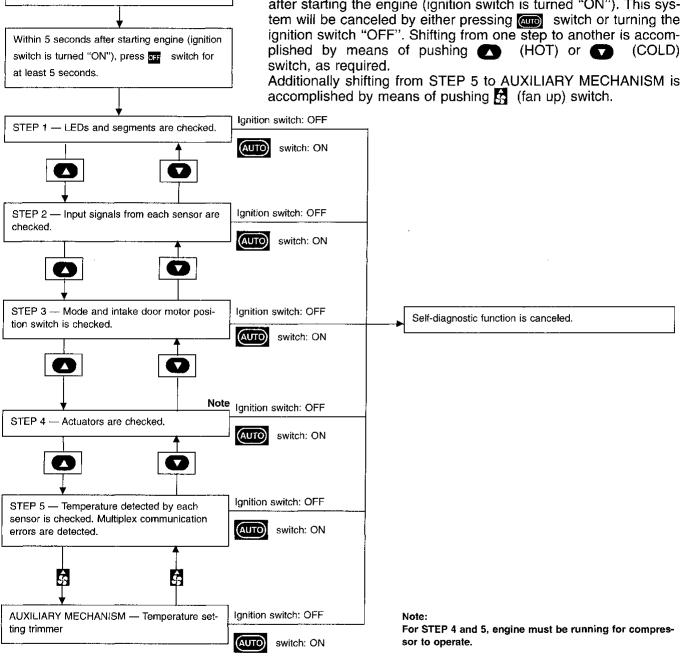
EĹ

HA

### Self-diagnosis

(Ignition switch OFF → ON)

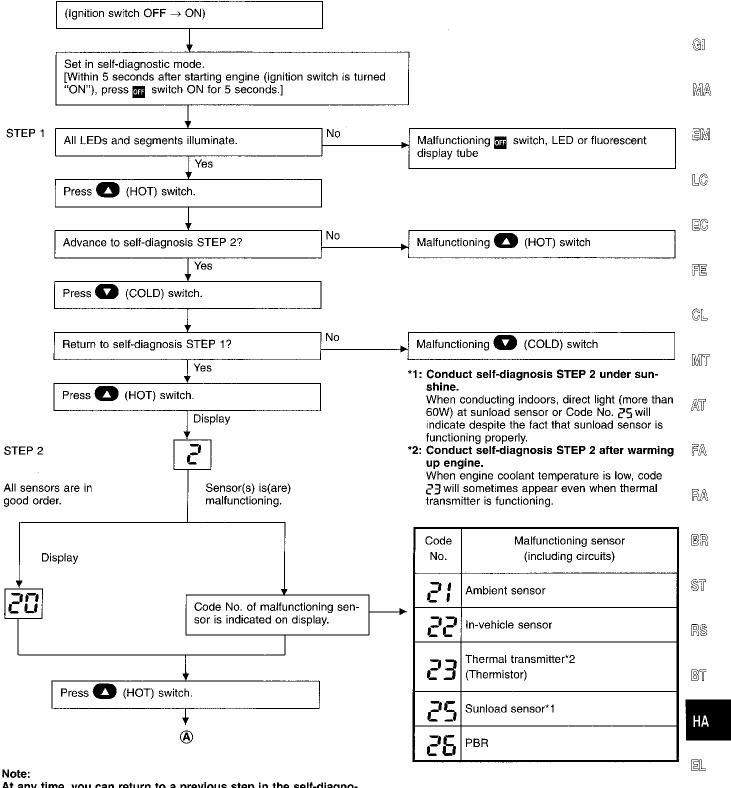
The self-diagnostic system diagnoses sensors, door motors, blower motor, etc. by system line. Refer to applicable sections (items) for details. Shifting from normal control to the self-diagnostic system is done as follows. Start the engine (turn the ignition switch from "OFF" to "ON"). And press " " switch for at least 5 seconds. The " " switch must be pressed within 5 seconds after starting the engine (ignition switch is turned "ON"). This system will be canceled by either pressing witch or turning the ignition switch "OFF". Shifting from one step to another is accomplished by means of pushing (HOT) or



1132

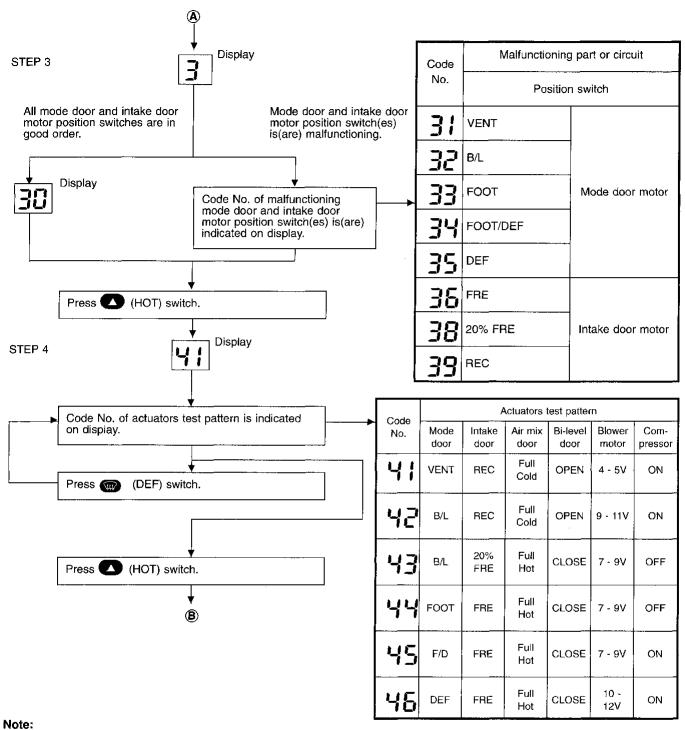
## Self-diagnosis (Cont'd)

### **CHECKING PROCEDURE**



At any time, you can return to a previous step in the self-diagnosis by pressing the (COLD) switch.

## Self-diagnosis (Cont'd)



For STEP 4, engine must be running for compressor to operate.

GI

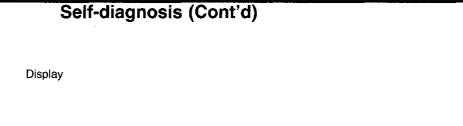
FE

CL

MT

AT

FA



AM

Temperature detected by each sensor is indicated on display.

Ambient sensor In-vehicle sensor

STEP 5

Press (DEF) switch.

Press REC switch.

END

□ Display

Turn ignition switch OFF or AUTO (AUTO) blinks two switch ON. times Auto amp. →

tch ON.

times

↓

52 \$\$

Auto amp. → Push control unit

RA

BR

ST

RS

BT

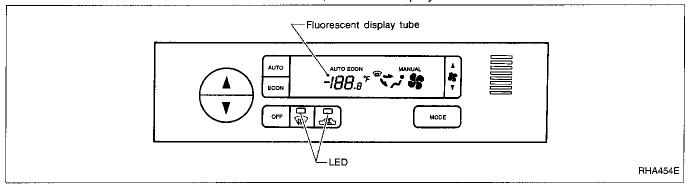
HA

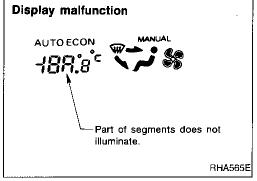
[DX

# Self-diagnosis (Cont'd) HOW TO INTERPRET THE RESULTS

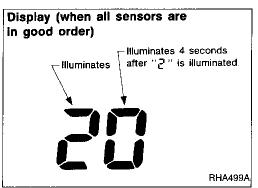
### STEP 1: Checks LEDs and segments

When switch's LED and segments are in functioning properly in STEP 1, LED and display will come on.



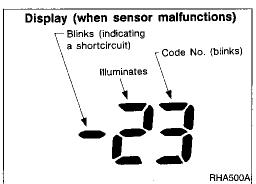


If LEDs or segments malfunction, LED will not come on or display will show incomplete segment.

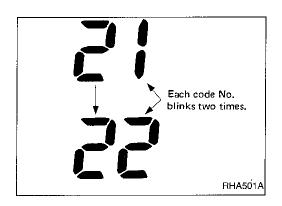


# STEP 2: Checks each sensor circuit for open or short circuit

Display shows "?" in STEP 2 mode. When all sensors are in good order, display shows "?". It takes approximately 4 seconds to check all sensors.



If a sensor is malfunctioning, the corresponding code No. blinks on display. A short circuit is identified by a blinking "- " mark preceding mode number.



## Self-diagnosis (Cont'd)

If two or more sensors malfunction, corresponding code Nos. respectively blink two times.

GI

MA

EM

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CL

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RA

BR

RS

BT

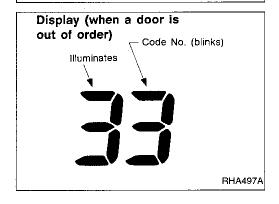
### Sensors and abnormalities

If a circuit is opened or shorted, display shows its code No. when  ${}^{\rm LG}$  input corresponds with any of following conditions.

| Code No.     | Sensor            | Open circuit     | Short circuit |  |  |  |
|--------------|-------------------|------------------|---------------|--|--|--|
| <b>,</b> ,   | 6 1 1 1           | Less than        | Greater than  |  |  |  |
| 21           | Ambient sensor    | -41.9°C (-43°F)  | 100°C (212°F) |  |  |  |
| -, -,        | I                 | Less than        | Greater than  |  |  |  |
| 22           | In-vehicle sensor | -41.9°C (-43°F)  | 100°C (212°F) |  |  |  |
| <b>-, -,</b> | Thermal transmit- | Less than        | Greater than  |  |  |  |
| _ 23         | ter*3             | –25.6°C (−14°F)  | 150°C (302°F) |  |  |  |
| -,,-         | C*0               | Less than        | Greater than  |  |  |  |
| 25           | Sunload sensor*2  | 0.01515 mA       | 0.545 mA      |  |  |  |
| 25           | PBR*1             | Greater than 50% | Less than 30% |  |  |  |

<sup>\*1: &</sup>quot;50%" and "30%" refer to percentage with respect to full stroke of air mix door. (Full cold: 0%, Full hot: 100%)

# Display (when all doors are in good order) illuminaters 20 seconds after "3" is shown on display. Illuminates:



### 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 "3".

It takes approximately 20 seconds to check all mode and intake doors.

When abnormalities are detected, display shows a code No. corresponding with malfunctioning part.

| Code No.            | 31   | 32  | 33   | 34           | 35  | 36  | 38         | 39  |
|---------------------|------|-----|------|--------------|-----|-----|------------|-----|
| Malfunctioning part | VENT | B/L | FOOT | FOOT/<br>DEF | DEF | FRE | 20%<br>FRE | REC |

НА

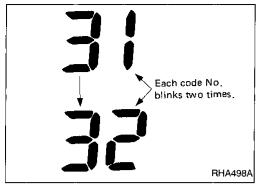
HA

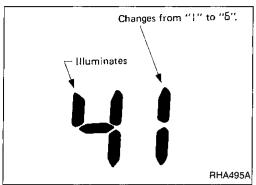




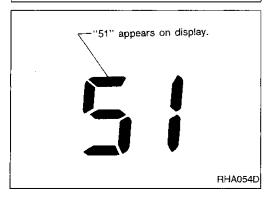
<sup>\*2:</sup> Conduct self-diagnosis STEP 2 under sunshine.
When conducting indoors, direct light (more than 60W) at sunload sensor.

<sup>\*3:</sup> Conduct self-diagnosis STEP 2 after warming up engine.





## 



RHA429E

## 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.

$$\stackrel{>}{3}$$
!  $\rightarrow$  32  $\rightarrow$  33  $\rightarrow$  34  $\rightarrow$ 35

If intake mode door harness connector is disconnected, the following display pattern will appear.

If any mode door motor position switch is malfunctioning, mode door motor will also malfunction.

### STEP 4: Checks operation of each actuator

Display shows "y;" in STEP 4 mode.

When DEF switch is pressed one time, display shows "42". Thereafter, each time the switch is pressed, display advances one number at a time, up to "45", then returns to "41".

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.

| Code No.     | 41           |              | ,,-,        | υų          | 115         | , , , -      |
|--------------|--------------|--------------|-------------|-------------|-------------|--------------|
| Actuator     | 711          | 42           | 43          | 77          | 45          | 45           |
| Mode door    | VENT         | B/L          | B/L         | FOOT        | F/D         | DEF          |
| Intake door  | REC          | REC          | 20%<br>FRE  | FRE         | FRE         | FRE          |
| Air mix door | Full<br>Cold | Full<br>Cold | Full<br>Hot | Full<br>Hot | Full<br>Hot | Full<br>Hot  |
| Blower motor | 4 - 5<br>V   | 9 -11<br>V   | 7 - 9<br>V  | 7 - 9<br>V  | 7 - 9<br>V  | 10 - 12<br>V |
| Compressor   | ON           | ON           | OFF         | OFF         | ON          | ON           |

Operating condition of each actuator cannot be checked by indicators.

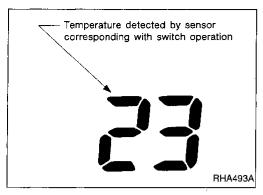
# STEP 5: Checks temperature detected by sensors, and detects multiplex communication error

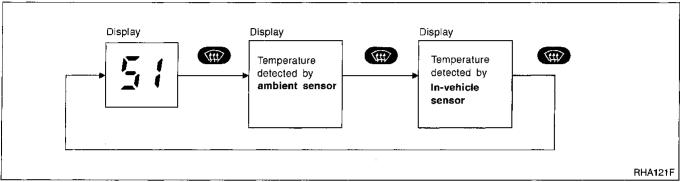
Checks temperature detected by sensors

Display shows "5;" in STEP 5 mode.

- When FRONT DEF switch is pressed one time, display shows temperature detected by ambient sensor.
- When FRONT DEF switch is pressed second time, display shows temperature detected by in-vehicle sensor.
- When FRONT DEF switch is pressed third time, display returns to original presentation "51".

## Self-diagnosis (Cont'd)





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-115.

EM

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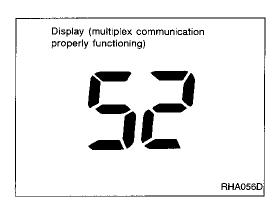
ST

RS

BT

HA

EL



## Self-diagnosis (Cont'd)

### **Detects multiplex communication error**

Display shows "52" in STEP 5 mode.

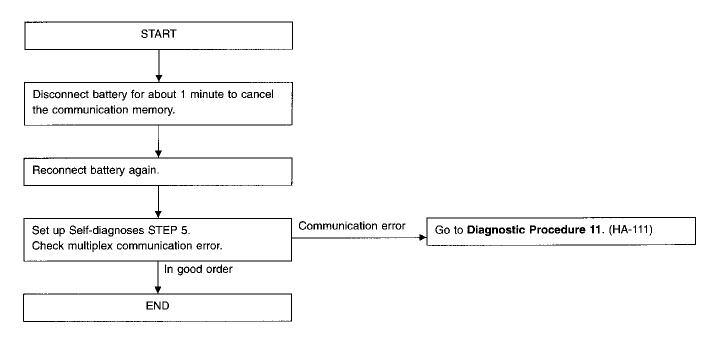
[Multiplex communication error between push control unit and auto amplifier is detected]

| Display           | Signal direction                          |
|-------------------|---|
| 52                | In good order                             |
| 52%               | Push control unit $\rightarrow$ auto amp. |
| blinks two times. | Auto amp. → Push control unit             |
| 52 <b>ss</b>      |   |

### **CAUTION:**

The auto amp. memorizes any communication error in the system in a normal control with battery connected. When there is an error, display will be as shown above. When plural errors occur, the display of each error will blink two times for 0.5 second intervals.

If a communication error is displayed, follow the flow chart below. Determine if the error occurred in the past or is currently happening.



G[

MA

## Self-diagnosis (Cont'd)

### **AUXILIARY MECHANISM: Temperature setting trimmer**

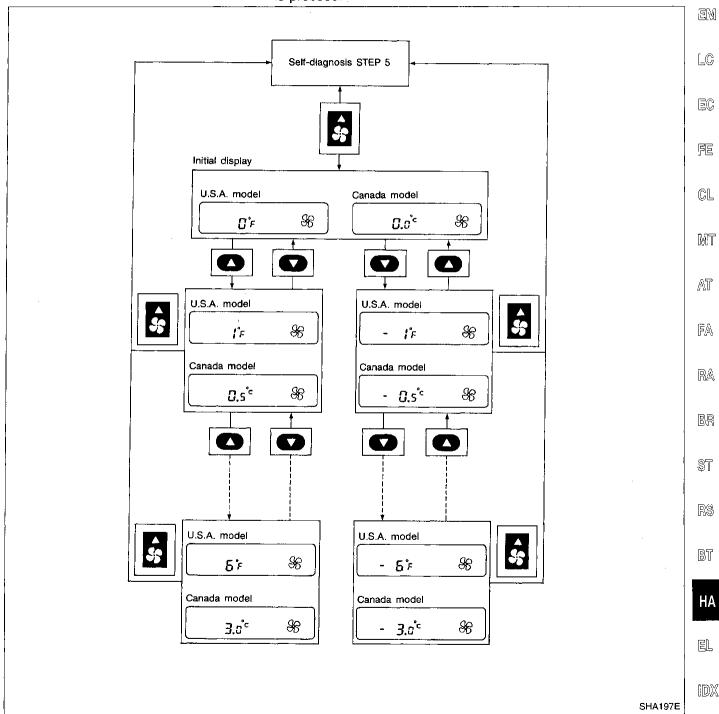
This trimmer compensates for differences between temperature setting (displayed digitally) and temperature felt by driver in a range of  $\pm 3^{\circ}$ C ( $\pm 6^{\circ}$ F).

Operating procedures for this trimmer are as follows:

Starting with STEP 5 under "Self-diagnostic mode", press

(fan up) switch to set air conditioning system in auxiliary mode. Then, press either (HOT) or (COLD) switch as desired. Temperature will change at a rate of 0.5°C (1°F) each time a switch

is pressed.



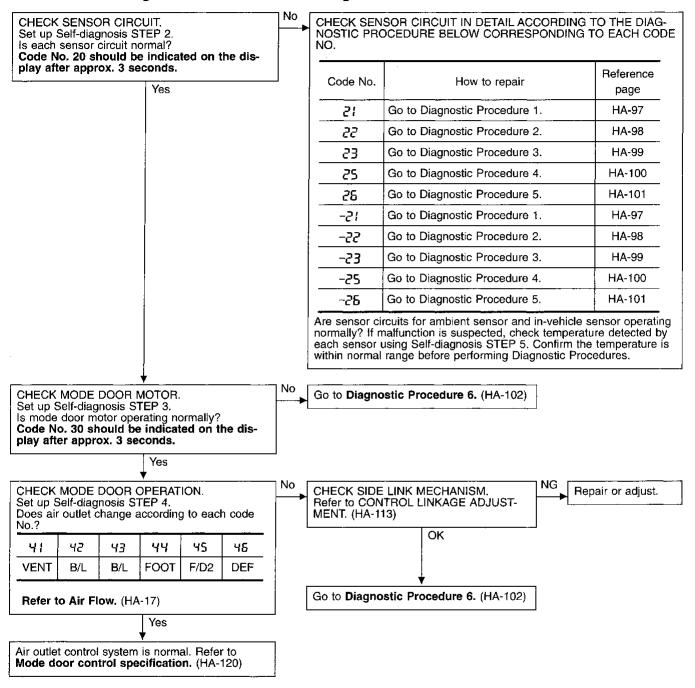
When battery cable is disconnected, trimmer operation is canceled and temperature set becomes that of initial condition, i.e. 0°C (0°F).

## **Preliminary Check**

### **PRELIMINARY CHECK 1**

Air outlet does not change.

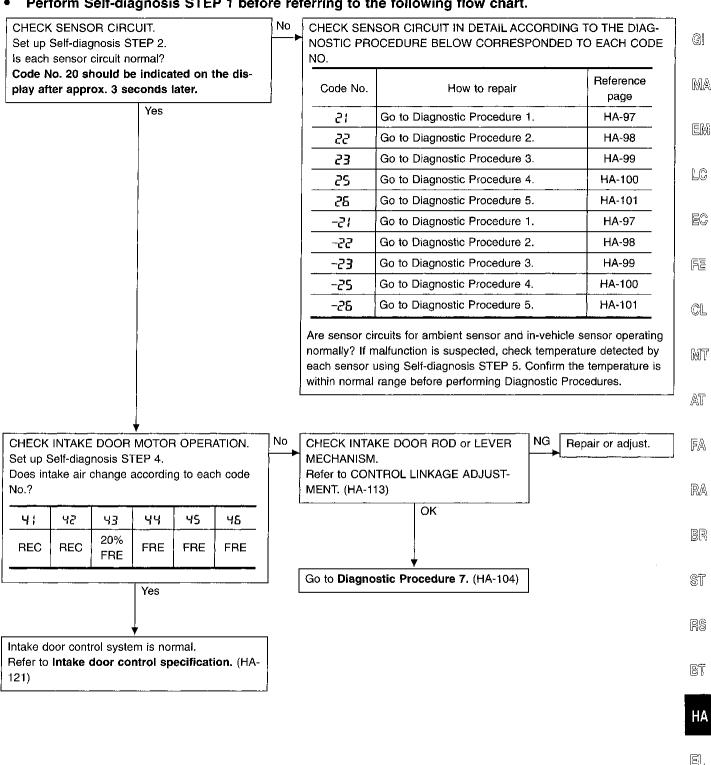
Perform Self-diagnosis STEP 1 before referring to the flow chart.



### **PRELIMINARY CHECK 2**

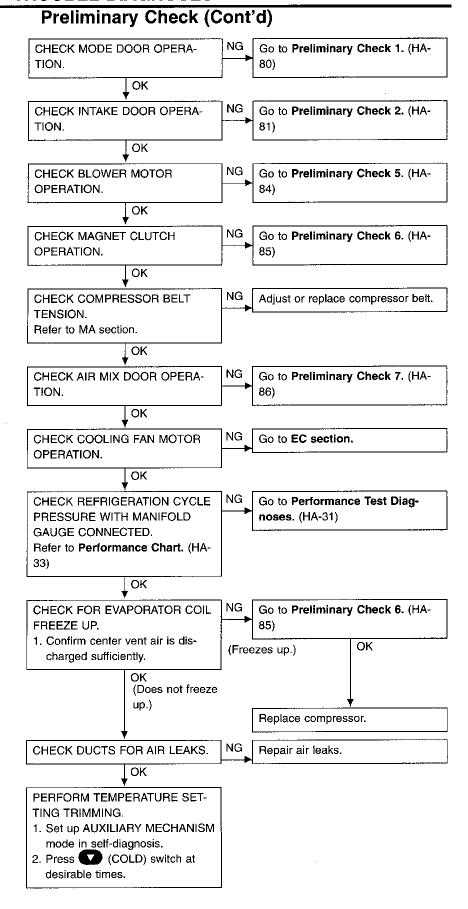
Intake door does not change.

Perform Self-diagnosis STEP 1 before referring to the following flow chart.



M

# PRELIMINARY CHECK 3 Insufficient cooling



# PRELIMINARY CHECK 4 Insufficient heating

### Preliminary Check (Cont'd) CHECK MODE DOOR OPERA-NG Perform Preliminary Check TION. 1. Refer to HA-80. OK @[ CHECK BLOWER MOTOR Perform Preliminary Check 5. Refer to HA-84. OPERATION. MA OK NG CHECK THE FOLLOWING: Repair/replace as neces-EM • Engine coolant level (Refer sary. to MA section) · Hoses for leaks or kinks LC • Radiator cap (Refer to LC section) Air in cooling system. ĒC OK FE CHECK AIR MIX DOOR Perform Preliminary Check OPERATION. 7. Refer to HA-86. Refer to HA-113. CL, OK MT NG CHECK DUCTS FOR AIR Repair leaks. LEAKS. AT OK CHECK BY FEEL THE FA HEATER INLET AND OUTLET HOSES. Hot inlet Both hoses RA Warm outlet warm BR Check thermostat Check heater hoses for installation. proper installation. ST OK OK Note Note RS Replace thermostat. Back flush heater core, drain Refer to LC section and refill coolant. Retest. ("Thermostat", BT Hot inlet Both hoses "ENGINE COOLING warm Warm outlet SYSTEM"). HΑ SYSTEM OK Replace heater core. Note: To avoid unnecessary service of heating system, first perform TEMPERATURE SETTING TRIMMING. Refer to "AUXILIARY MECHANISM", "Self-diagnosis".

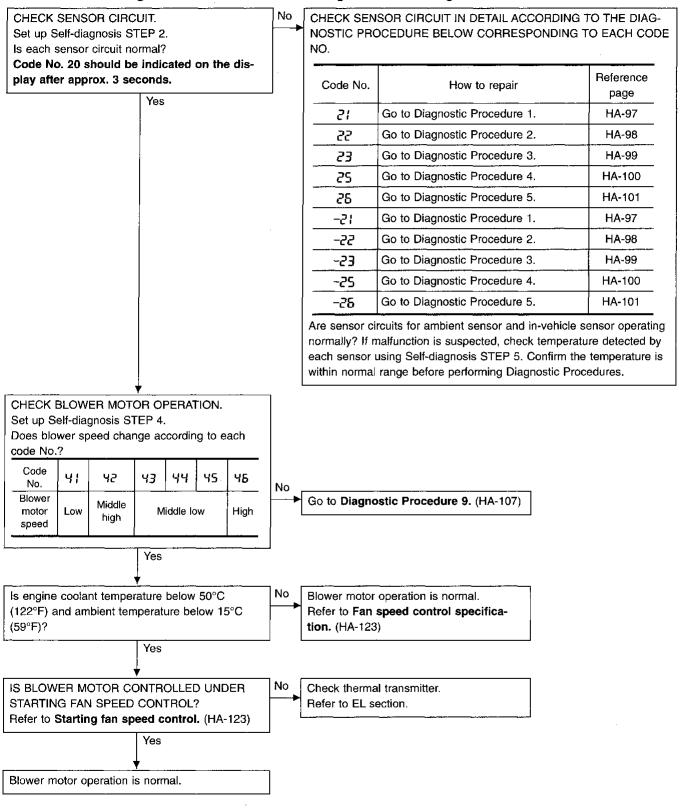
IDX

(HA-79)

### **PRELIMINARY CHECK 5**

Blower motor operation is malfunctioning.

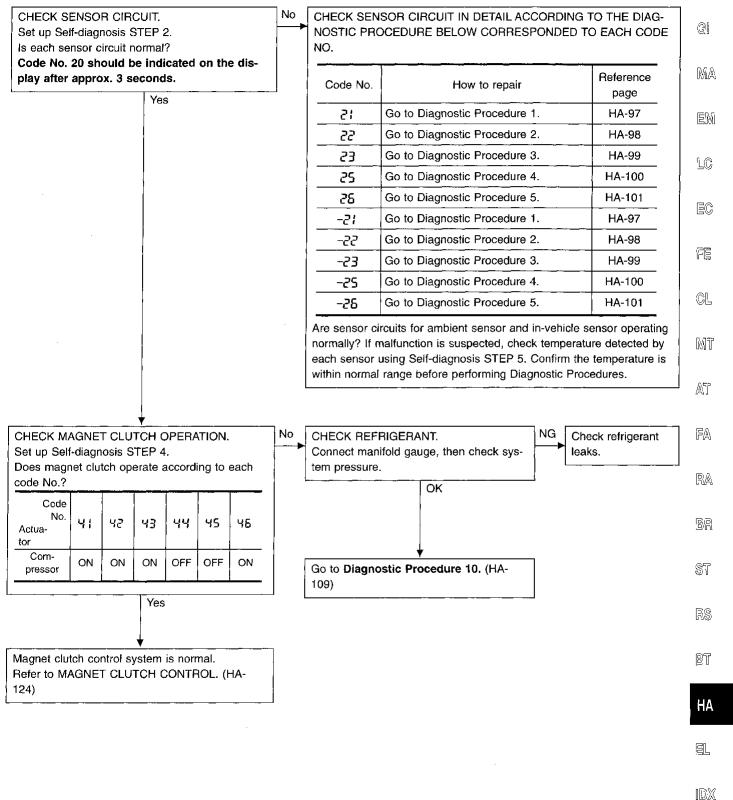
Perform Self-diagnosis STEP 1 before referring to the following flow chart.



### PRELIMINARY CHECK 6

Magnet clutch does not engage.

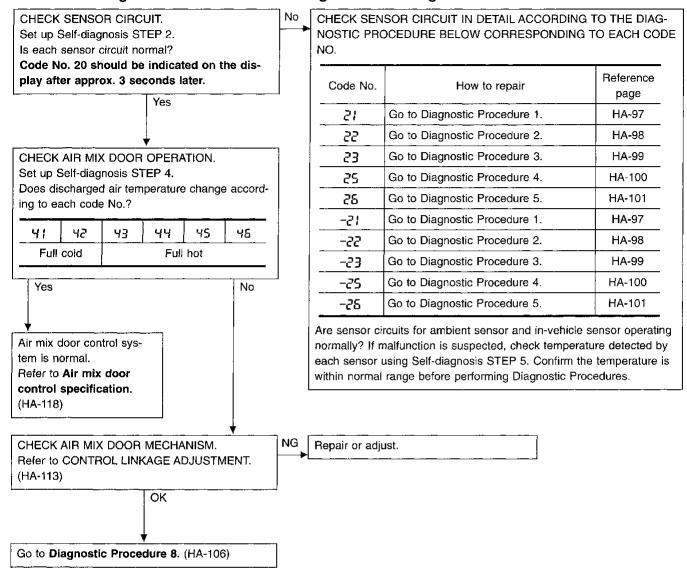
Perform Self-diagnosis STEP 1 before referring to the following flow chart.



### PRELIMINARY CHECK 7

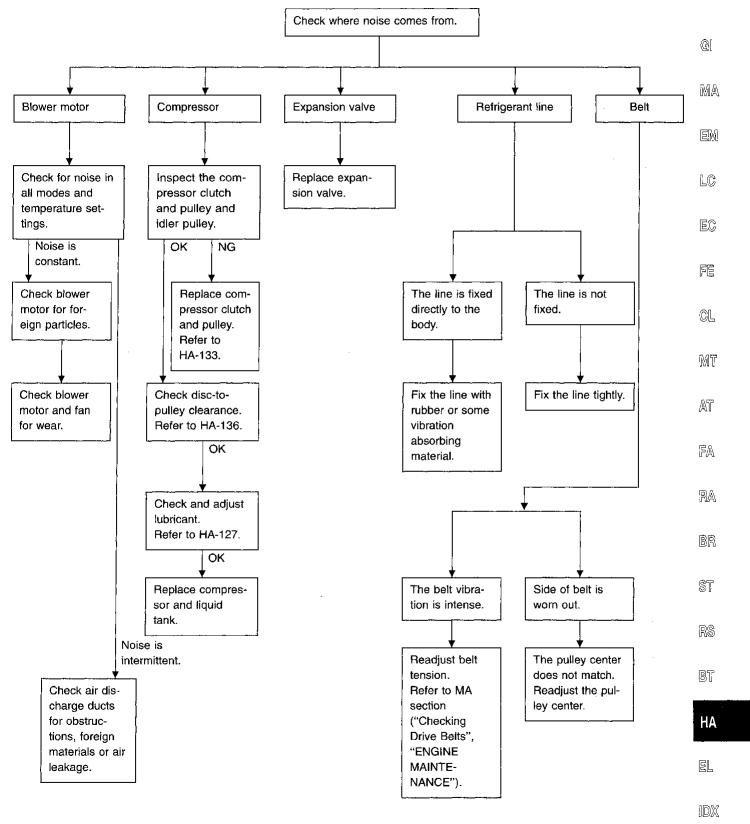
Discharged air temperature does not change.

Perform Self-diagnosis STEP 1 before referring to the following flow chart.



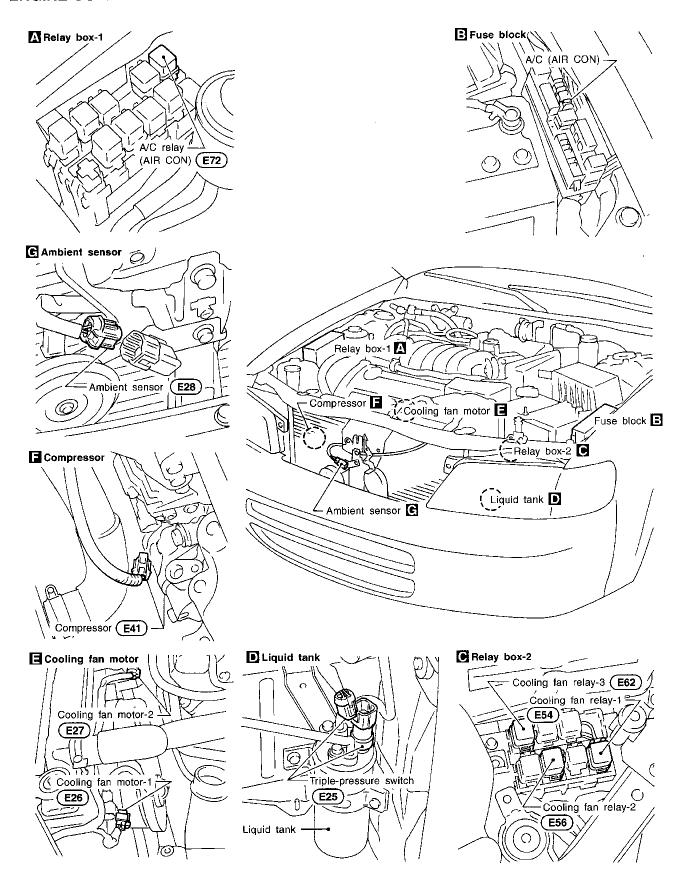
## PRELIMINARY CHECK 8

Noise



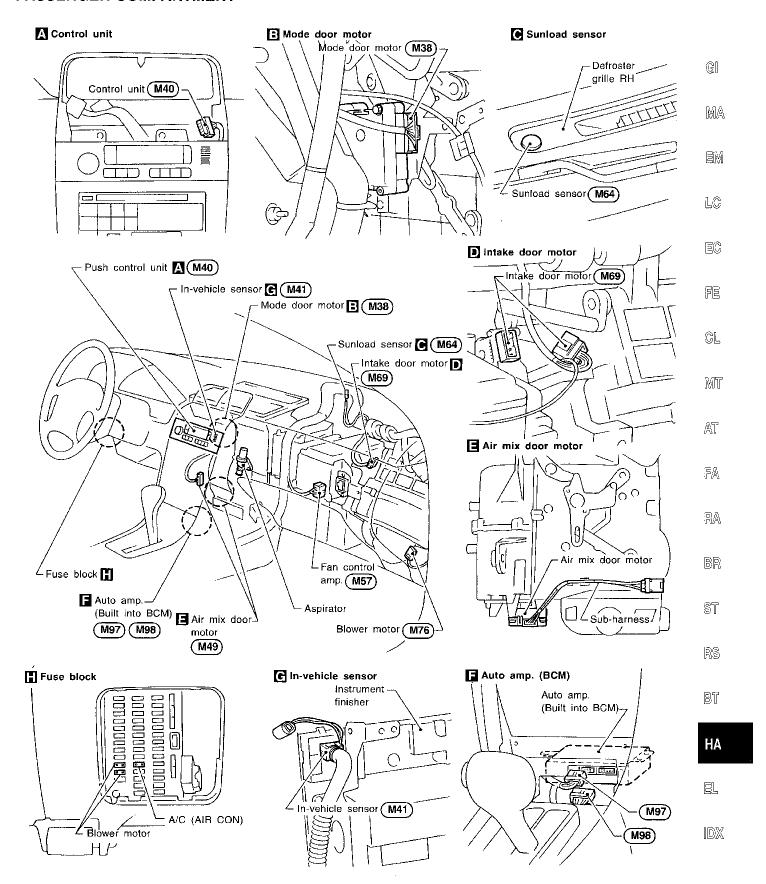
## **Harness Layout**

### **ENGINE COMPARTMENT**

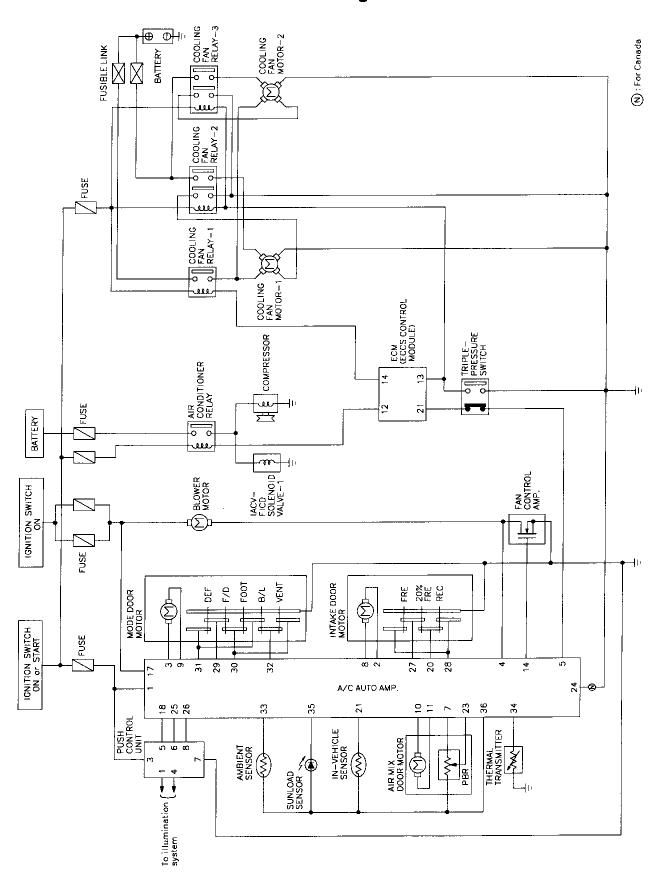


## Harness Layout (Cont'd)

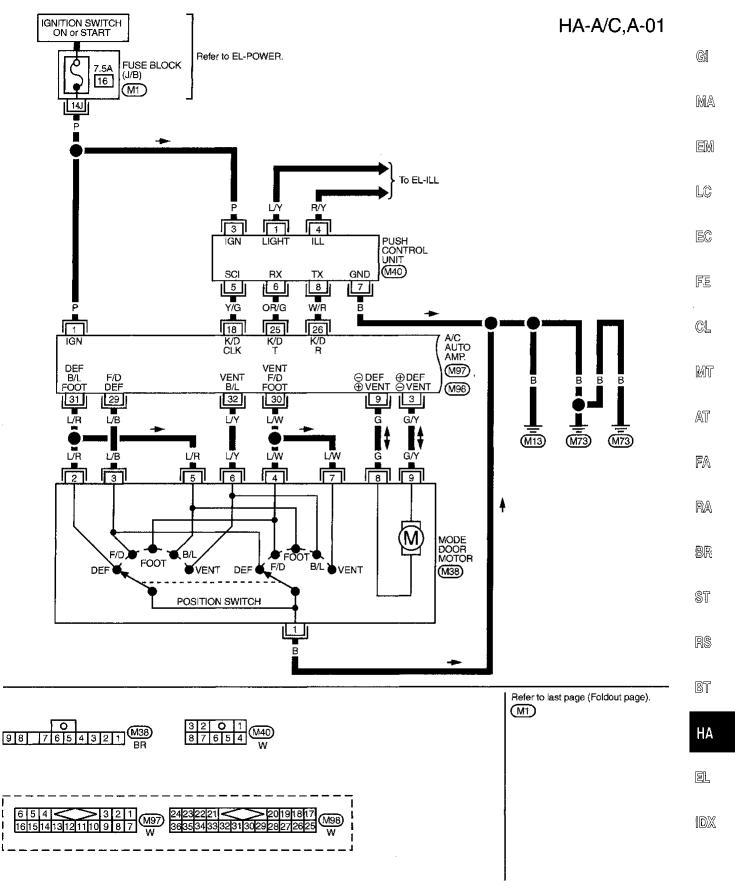
### PASSENGER COMPARTMENT



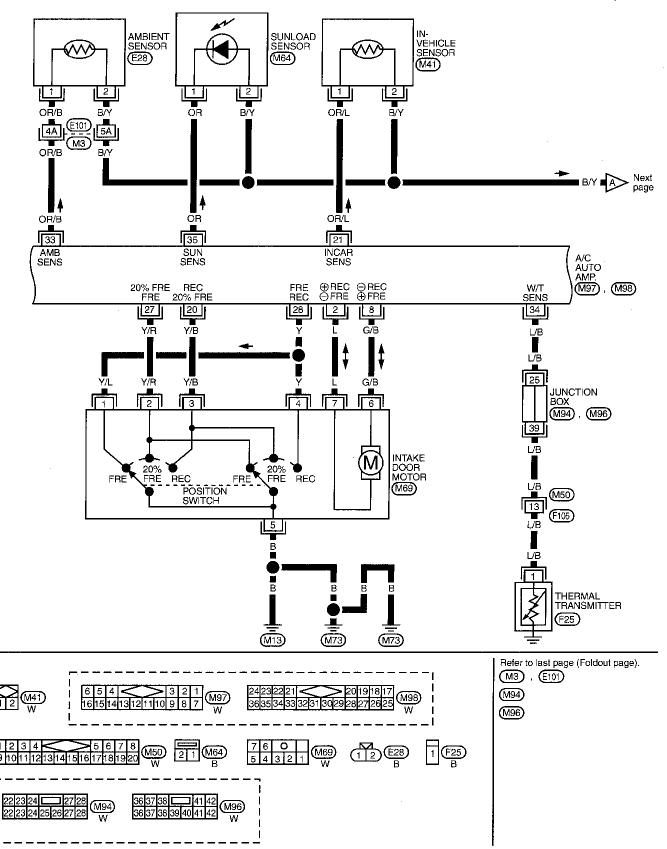
## **Circuit Diagram**

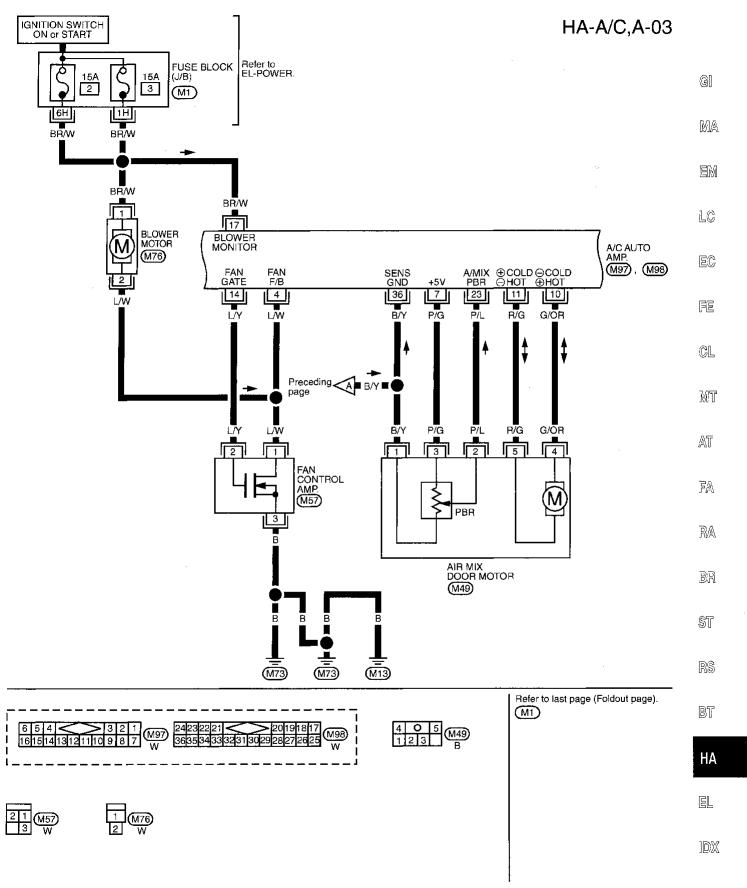


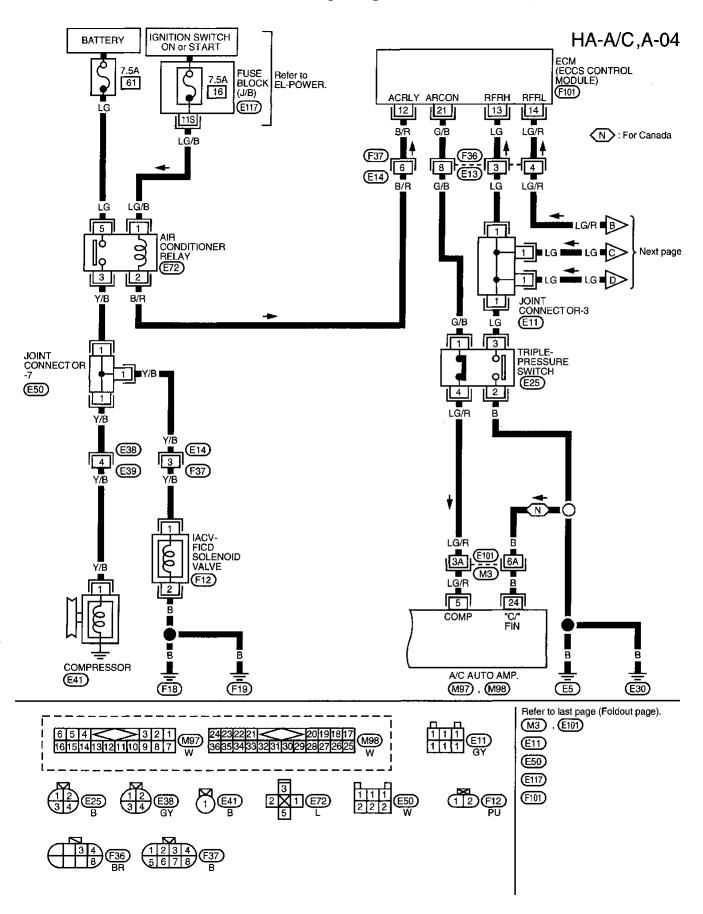
## Wiring Diagram — A/C, A —

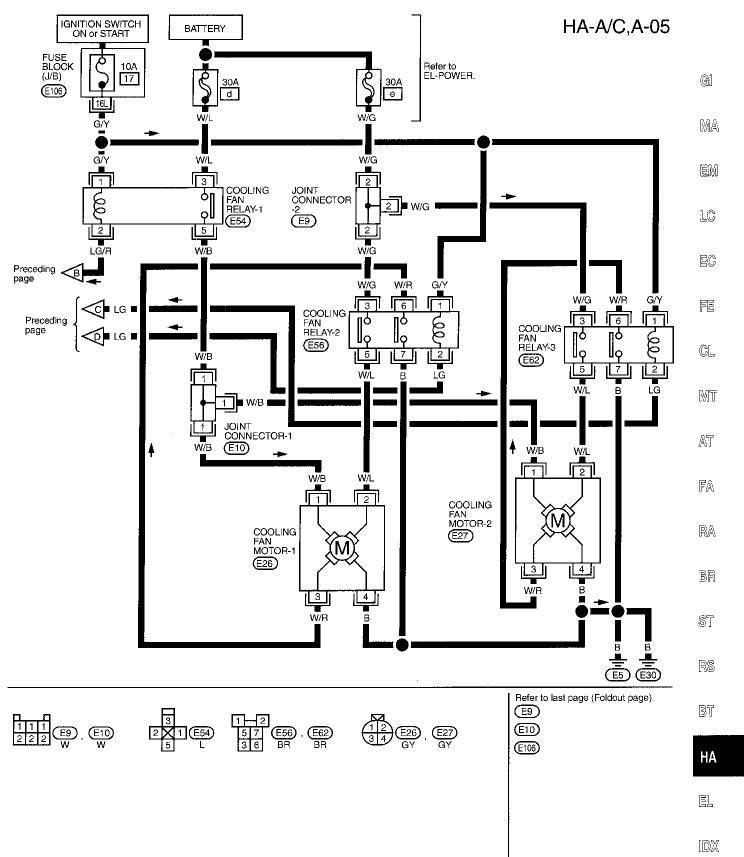


HA-A/C,A-02





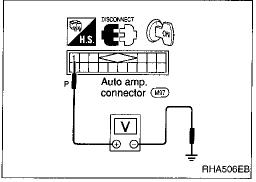


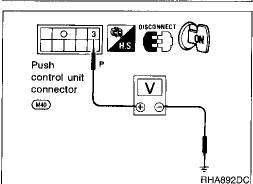


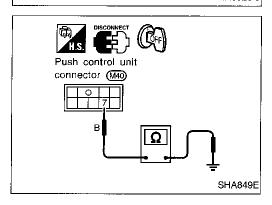
# Main Power Supply and Ground Circuit Check POWER SUPPLY CIRCUIT CHECK FOR AUTO A/C SYSTEM

Check power supply circuit for auto air conditioning system.

Refer to "POWER SUPPLY ROUTING" in EL section and Wiring Diagram.







#### **AUTO AMP. (BCM) CHECK**

Check power supply circuit for auto amp. (BCM) with ignition switch ON.

- 1. Disconnect auto amp. (BCM) harness connector.
- 2. Connect voltmeter from harness side.
- 3. Measure voltage across terminal (1) and body ground.

| Voltmete | Voltage     |             |
|----------|-------------|-------------|
| <b>⊕</b> | $\Theta$    | Voltage     |
| 1        | Body ground | Approx. 12V |

#### **PUSH CONTROL UNIT CHECK**

Check power supply circuit for push control unit with ignition switch ON.

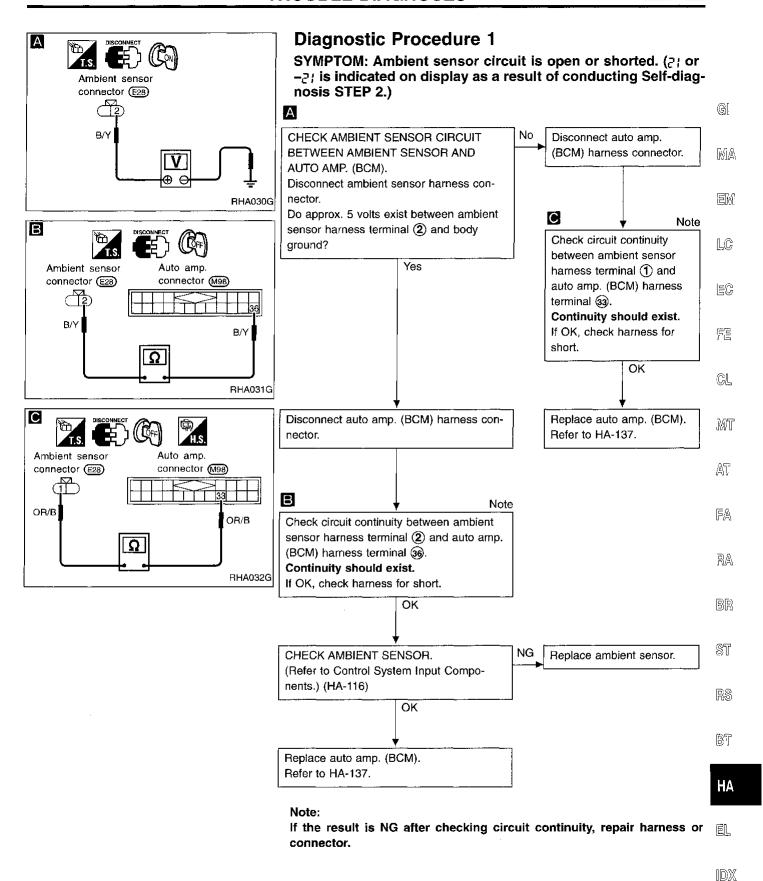
- 1. Disconnect push control unit harness connector.
- 2. Connect voltmeter from harness side.
- 3. Measure voltage across terminal (3) and body ground.

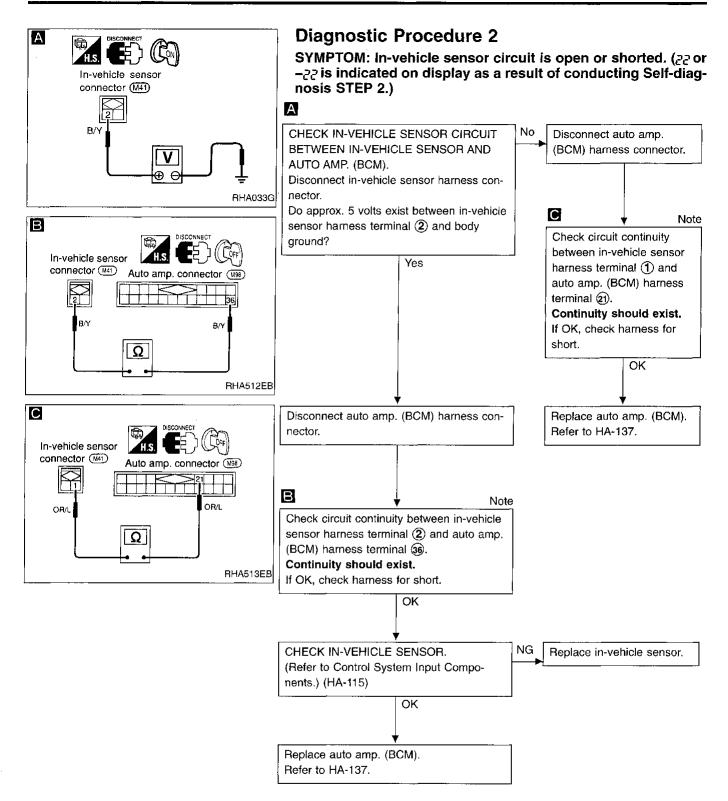
| Voltmete    | Voltage     |             |
|-------------|-------------|-------------|
| <del></del> | ⊕ ⊝         |             |
| 3           | Body ground | Approx. 12V |

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 (8) and body ground.

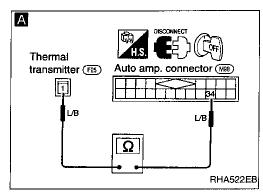
| Ohmmete  | Continuity  |            |
|----------|-------------|------------|
| ⊕ ⊝      |             | Continuity |
| <b>⑦</b> | Body ground | Yes        |





#### Note:

If the result is NG after checking circuit continuity, repair harness or connector.



#### **Diagnostic Procedure 3**

SYMPTOM: Thermal transmitter circuit is open or shorted. (23 or -23 is indicated on display as a result of conducting Self-diagnosis STEP 2.)

Α CHECK THERMAL TRANSMITTER CIR-**CUIT BETWEEN THERMAL TRANSMIT-**TER AND AUTO AMP. (BCM). Disconnect thermal transmitter harness connector and auto amp. (BCM) harness connector. Check circuit continuity between thermal transmitter harness terminal 1 and auto amp. (BCM) harness terminal 34. Continuity should exist. if OK, check harness for short. OK CHECK THERMAL TRANSMITTER. Refer to EL section. OK

Note:

Replace auto amp. (BCM).

Refer to HA-137.

If the result is NG after checking circuit continuity, repair harness or connector.

MT AT

(G)

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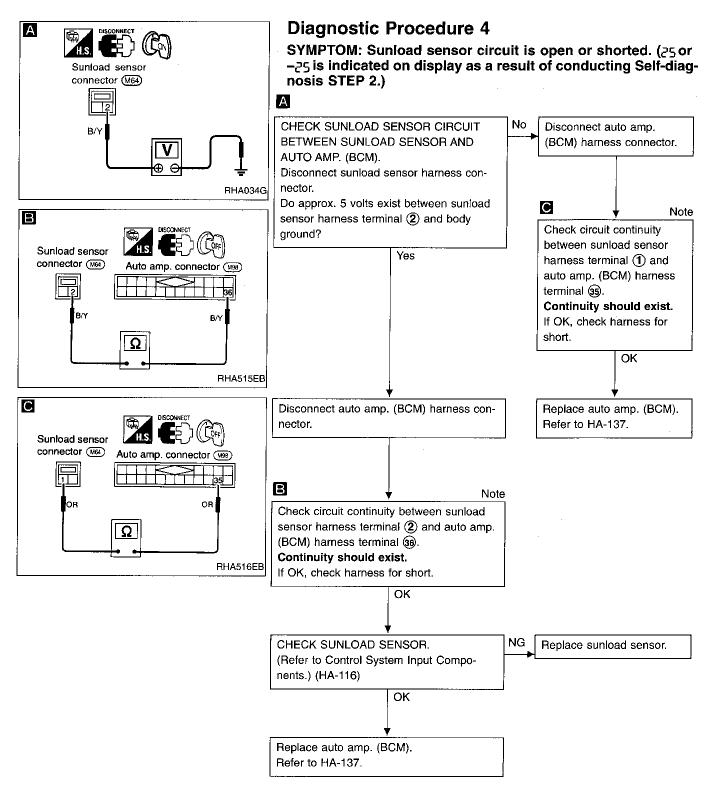
RS

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HA

EL

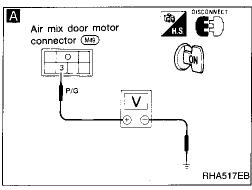
IDX

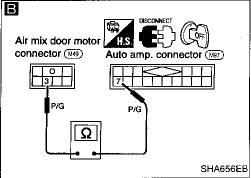


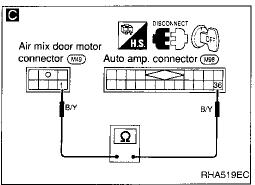
#### Note:

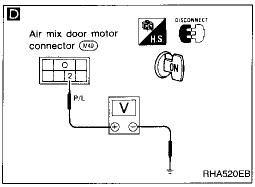
If the result is NG after checking circuit continuity, repair harness or connector.

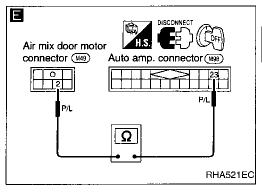
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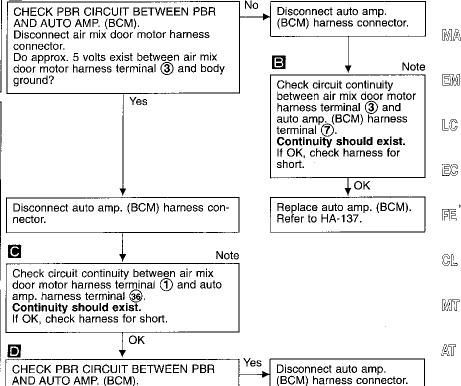






#### **Diagnostic Procedure 5**

SYMPTOM: PBR circuit is open or shorted. (26 or -26 is indicated on display as a result of conducting Self-diagnosis **STEP 2.)** 



AND AUTO AMP. (BCM). 1. Set temperature switch to full hot 32°C

(85°F) with ignition switch ON. Turn ignition switch OFF. 3. Reconnect auto amp. (BCM) harness

connector. Do approx. 5 volts exist between air mix door motor harness terminal (2) and

body ground? No

Check circuit continuity between air mix door motor harness terminal (2) and auto amp. (BCM) harness terminal ②.
Continuity should exist. If OK, check harness for short.

E

**↓**OK Replace auto amp. (BCM). Refer to HA-137.

CHECK PBR. Replace air mix door motor (Refer to Control System Output Compo-(PBR). nents.) (HA-119) OK

Replace auto amp. (BCM). Refer to HA-137.

#### Note:

If the result is NG after checking circuit continuity, repair harness or connector.

킲

HA

FA

RA

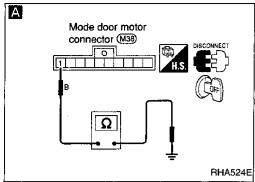
BR

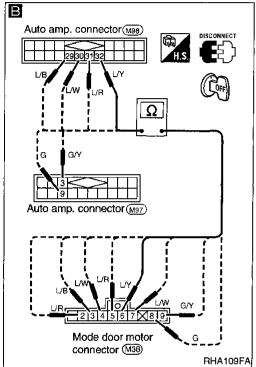
ST

RS

31

Note

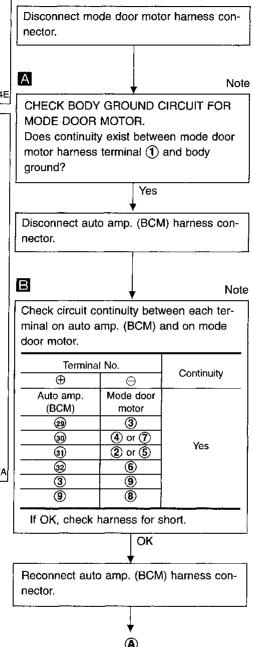




#### **Diagnostic Procedure 6**

SYMPTOM: Mode door motor does not operate normally.

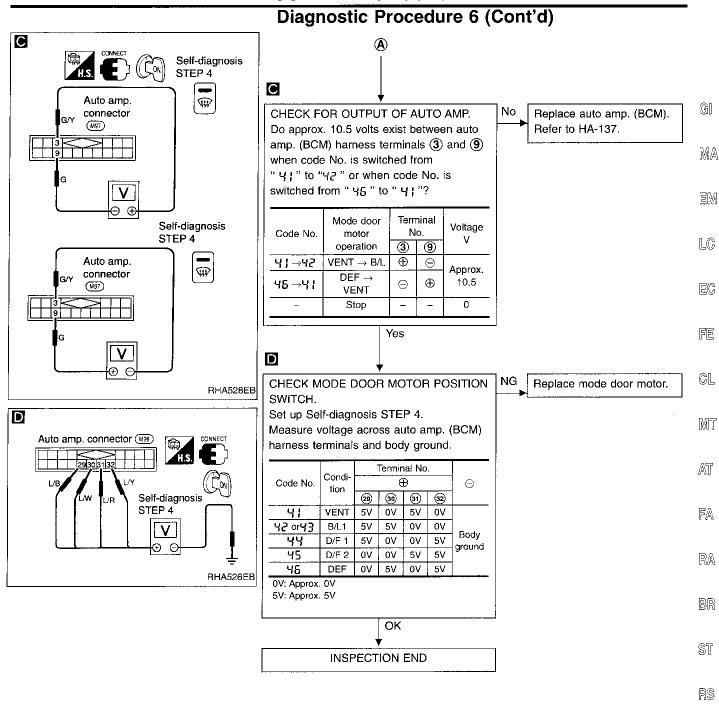
 Perform Self-diagnosis STEPS 1 to 4 before referring to the following flow chart.



(Go to next page.)

#### Note:

If the result is NG or No after checking circuit continuity, repair harness or connector.

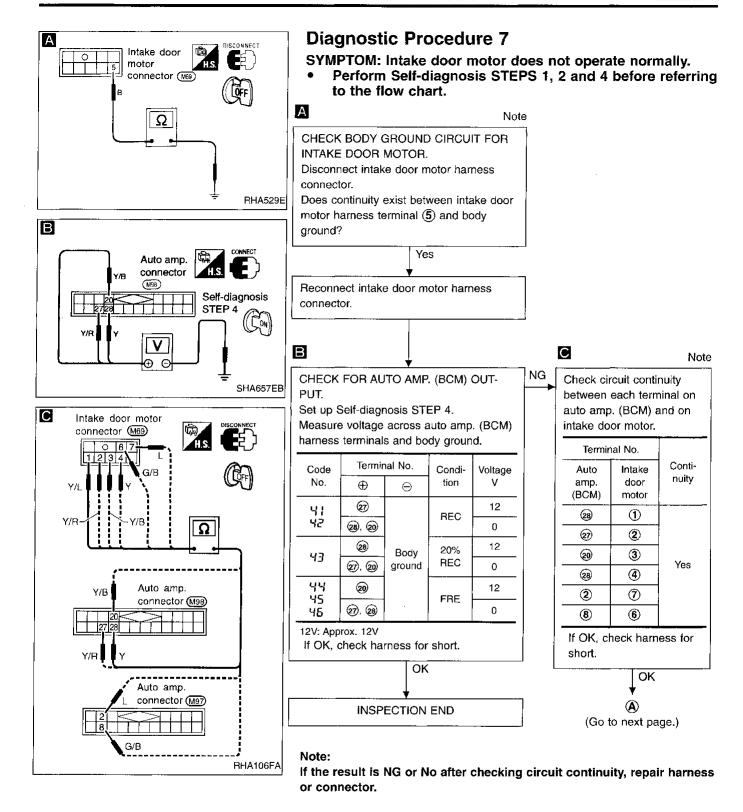


HA

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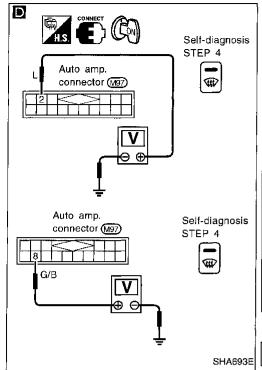
BT

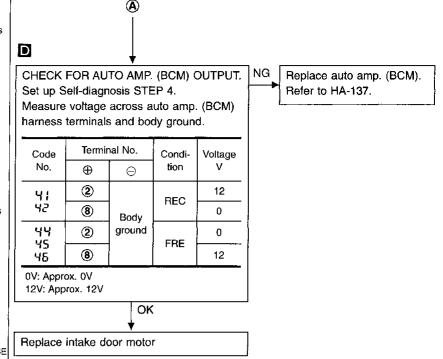
HA

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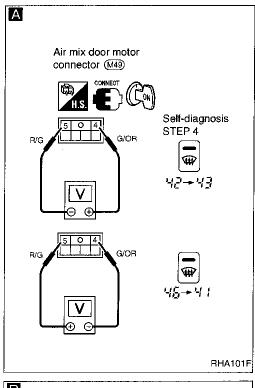
(DX

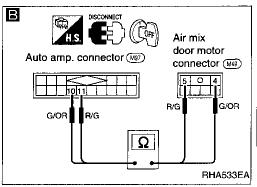
## Diagnostic Procedure 7 (Cont'd)





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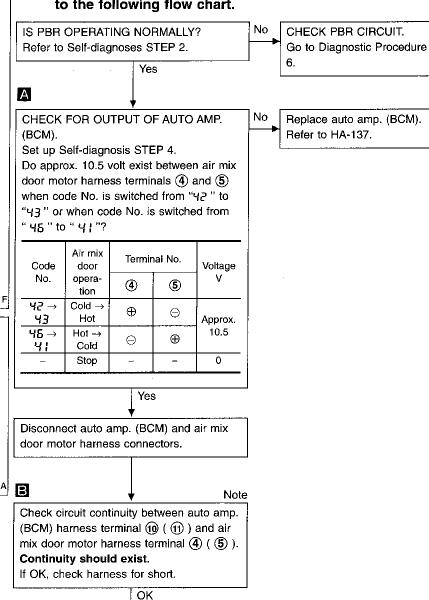




#### **Diagnostic Procedure 8**

SYMPTOM: Air mix door motor does not operate normally.

 Perform Self-diagnosis STEPS 1, 2 and 4 before referring to the following flow chart.



#### Note:

If the result is NG after checking circuit continuity, repair harness or connector.

Replace air mix door motor.

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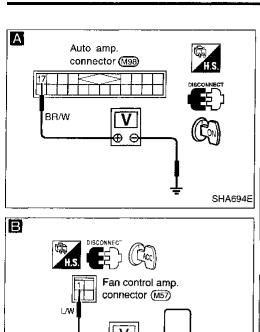
IDX

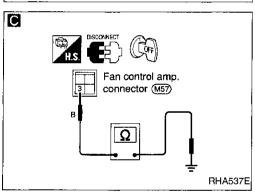
Note

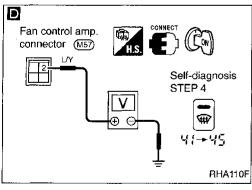
A

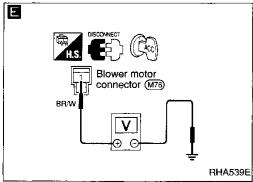
В

RHA536E





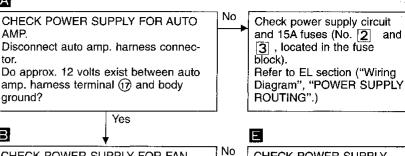




#### Diagnostic Procedure 9

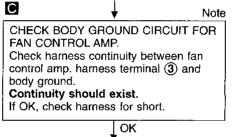
SYMPTOM: Blower motor operation is malfunctioning under out of Starting Fan Speed Control.

Perform Preliminary Check 5 before referring to the following flow chart.

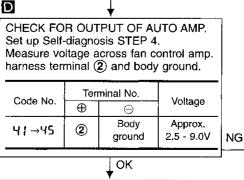


CHECK POWER SUPPLY FOR FAN CONTROL AMP. Disconnect fan control amp. harness connector. Do approx. 12 volts exist between fan control amp. harness terminal (1) and

body ground? Yes



Reconnect fan control amp. harness connector and auto amp, harnesses connector.



Replace fan control amp.

CHECK POWER SUPPLY FOR BLOWER MOTOR. Disconnect blower motor harness connector. Do approx. 12 volts exist between blower motor harness terminal (1) and body ground?

Yes

**3**,

Check power supply circuit and 15A fuses (No. 2 and 3 , located in the fuse block). Refer to EL section ("Wiring Diagram", POWER SUPPLY ROUTING").

No

Check circuit continuity between blower motor harness terminal (2) and fan control amp. harness terminal (1). Continuity should exist. If OK, check harness for short.

OK

NG

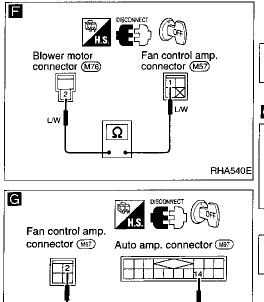
CHECK BLOWER MOTOR. (Refer to Electrical Components Inspection.) (HA-112)

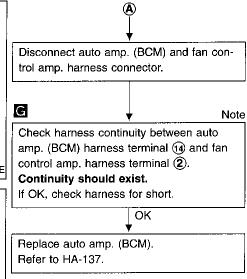
Replace blower motor.

(A) (Go to next page.) 

If the result is NG after checking circuit continuity, repair harness or connector.

## Diagnostic Procedure 9 (Cont'd)



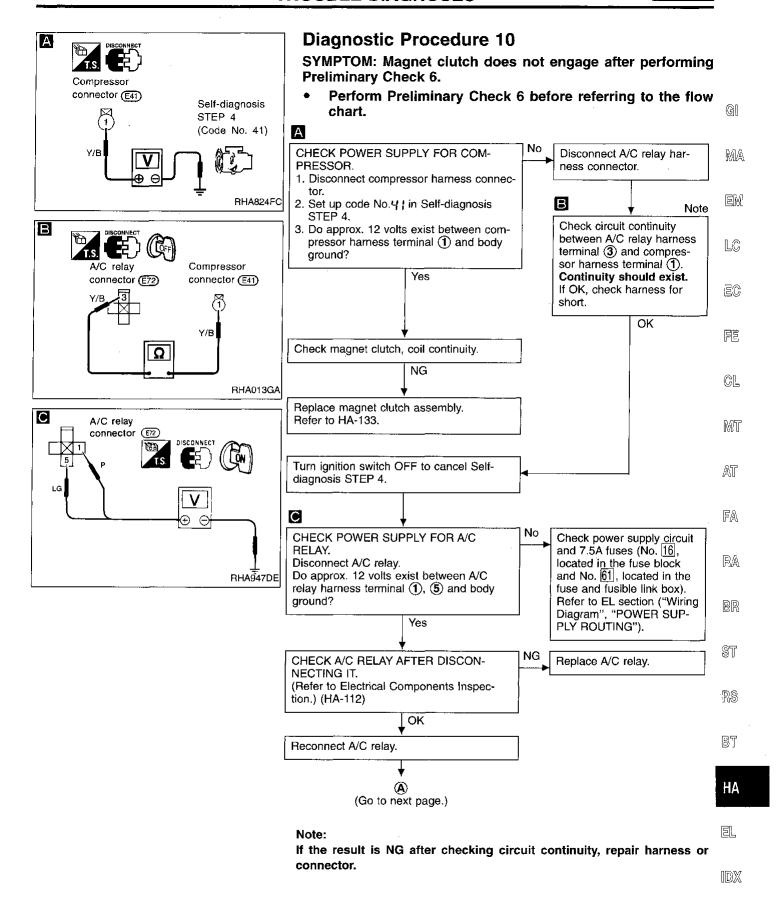


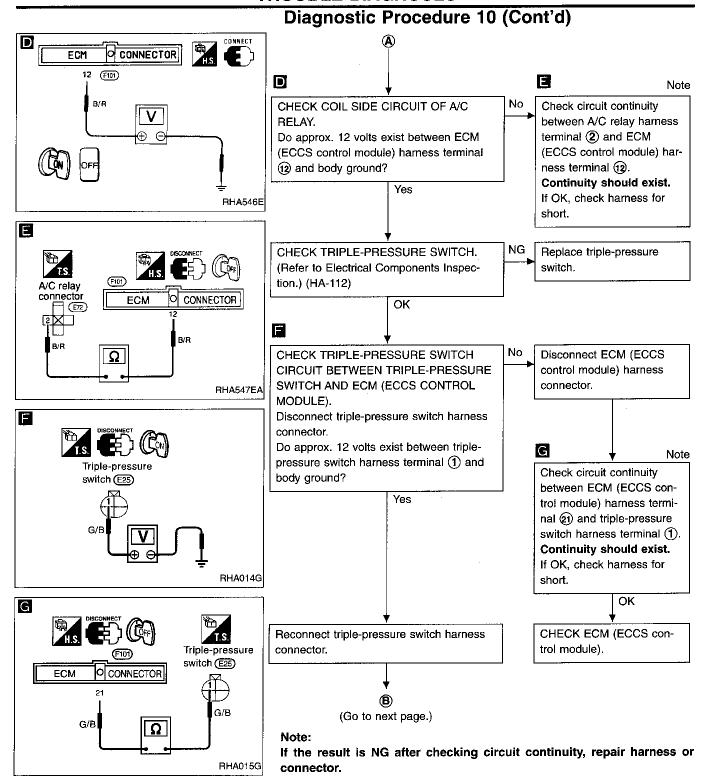
#### Note:

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If the result is NG after checking circuit continuity, repair harness or connector.





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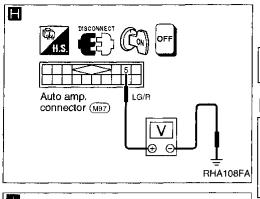
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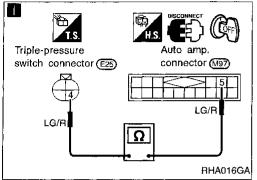
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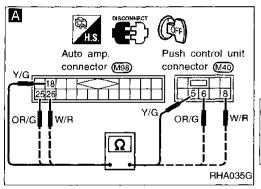
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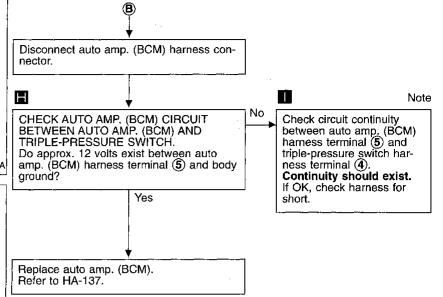
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If the result is NG after checking circuit continuity, repair harness or

#### **Diagnostic Procedure 11**

Note:

connector.

SYMPTOM: • Self-diagnosis cannot be performed.

Multiplex communication error (52 with fan symbol detected as a result of conducting self-diagnosis STEP 5.)

CHECK MAIN POWER SUPPLY AND GROUND CIRCUIT FOR AUTO AMP. (BCM) AND CONTROL UNIT. (Refer to HA-96.)

OK

Note

Check circuit continuity between each ter-

minal on auto amp. (BCM) and push control unit. Terminal No.  $\oplus$  $\Theta$ Continuity Auto amp. Push control (BCM) unit (5) 13 **(6)** 25) Yes **(8**) 26) If OK, check harness for short.

Replace auto amp. (BCM) or push control unit.
Refer to HA-137.

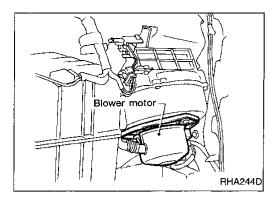
OK

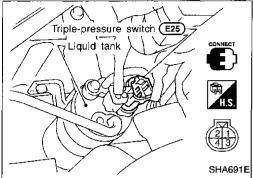
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#### Note:

If the result is NG after checking circuit continuity, repair harness or connector.





# **Electrical Components Inspection BLOWER MOTOR**

Check blower motor for smooth rotation.

Ensure that there are no foreign particles inside the intake unit.

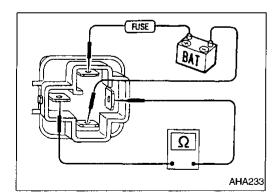
#### TRIPLE-PRESSURE SWITCH

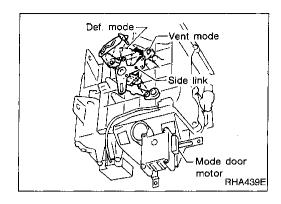
|                        | Terminals | High-pressure side line<br>pressure<br>kPa (kg/cm², psi)        | Operation | Continuity      |
|------------------------|-----------|---|-----------|-----------------|
| Low proc               |           | Increasing to<br>157 - 226<br>(1.6 - 2.3, 23 - 33)              | ON        | Exists.         |
| Low-pres-<br>sure side | 1 - 4     | Decreasing to<br>152.0 - 201.0<br>(1.55 - 2.05, 22.0 -<br>29.2) | OFF       | Does not exist. |
| Medium-                |           | Increasing to<br>1,422 - 1,618<br>(14.5 - 16.5, 206 - 235)      | ON        | Exists.         |
| pressure<br>side*      | 2-3       | Decreasing to<br>1,128 - 1,422<br>(11.5 - 14.5, 164 - 206)      | OFF       | Does not exist. |
| High-pres-             |           | Decreasing to<br>1,667 - 2,059<br>(17 - 21, 242 - 299)          | ON        | Exists.         |
| sure side              | ① - ④     | Increasing to<br>2,452 - 2,844<br>(25 - 29, 356 - 412)          | OFF       | Does not exist. |

<sup>\*</sup> For cooling fan motor operation.

## A/C RELAY

Check circuit continuity between terminals by supplying 12 volts to coil side terminals of the relay.

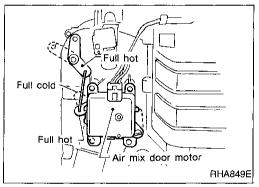


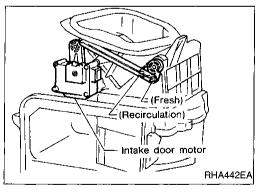


# Control Linkage Adjustment MODE DOOR

- 1. Install mode door motor on heater unit and connect it to main harness.
  - Make sure lever of mode door motor is fitted into the slit of mode door link.
- 2. Set up code No. 45 in Self-diagnosis STEP 4.
- 3. Make sure mode door operates properly when changing from code No. 4; to 46 by pushing DEF switch.

| - | 41   | 42  | 43  | 44   | 45  | 45  |
|---|------|-----|-----|------|-----|-----|
|   | VENT | B/L | B/L | FOOT | F/D | DEF |





#### **AIR MIX DOOR**

1. Install air mix door motor on heater unit and connect it to main harness.

Make sure lever of Air mix door is fitted into the slit of air mix door link.

- 2. Set up code No. 4; in Self-diagnosis STEP 4.
- 3. Make sure air mix door operates properly when changing from code No. 4; to 45 by pushing DEF switch.

| 4:   | 42   | 43 | ]-<br>]- | 45 | 48 |
|------|------|----|----------|----|----|
| Full | cold |    | Full     |    |    |

#### **INTAKE DOOR**

 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. 4; in Self-diagnosis STEP 4.
- 3. Make sure intake door operates properly when changing from code No. 41 to 46 by pushing DEF switch.

| 41  | ار<br>10 | 43      | 7 | 5<br>4 | 45 |
|-----|----------|---------|---|--------|----|
| REC |          | 20% FRE |   | FRE    |    |

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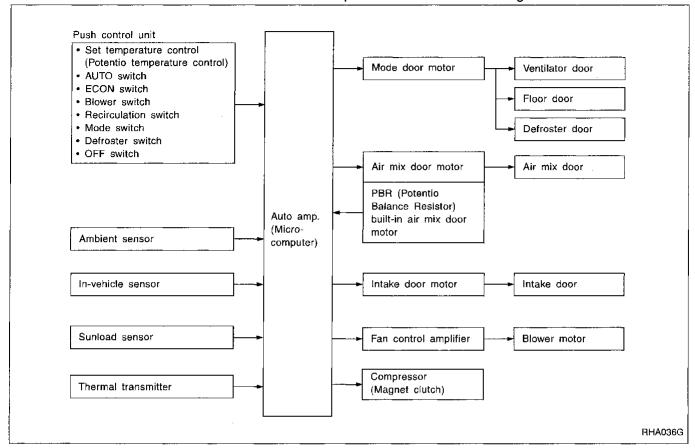
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#### **Overview of Control System**

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:



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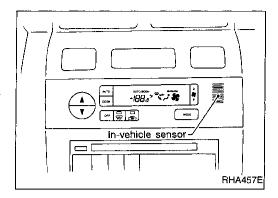
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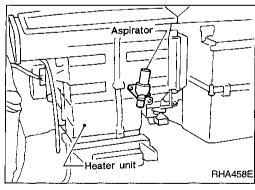
# Control System Input Components POTENTIO TEMPERATURE CONTROL (PTC)

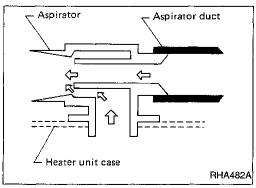
The PTC is built into the push control unit. It can be set at an interval of 1°C (2°F) through both (HOT) and (COLD) control switches. Setting temperature is digitally displayed.

#### **IN-VEHICLE SENSOR**

The in-vehicle sensor is attached to A/C control finisher. 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.

| Temperature °C (°F) | Resistance k $\Omega$ |
|---------------------|-----------------------|
| <b>–15 (5)</b>      | 12.73                 |
| -10 (14)            | 9.92                  |
| -5 (23)             | 7.80                  |
| 0 (32)              | 6.19                  |
| 5 (41)              | 4.95                  |
| 10 (50)             | 3.99                  |
| 15 (59)             | 3.24                  |
| 20 (68)             | 2.65                  |
| 25 (77)             | 2.19                  |
| 30 (86)             | 1.81                  |
| 35 (95)             | 1.51                  |
| 40 (104)            | 1.27                  |
| 45 (113)            | 1.07                  |





#### **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.

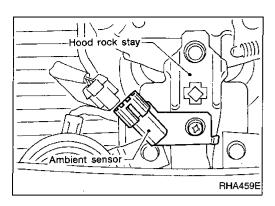
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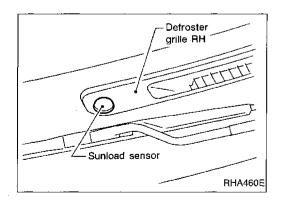


# Control System Input Components (Cont'd) AMBIENT SENSOR

The ambient sensor is attached to the radiator core support. It detects ambient temperature and converts it into a resistance value which is then input to the auto amp.

After disconnecting ambient sensor harness connector, measure resistance between terminals (1) and (2) at sensor harness side, using the table below.

| Temperature °C (°F) | Resistance k $\Omega$ |
|---------------------|-----------------------|
| -15 (5)             | 12.73                 |
| -10 (14)            | 9.92                  |
| -5 (23)             | 7.80                  |
| 0 (32)              | 6.19                  |
| 5 (41)              | 4.95                  |
| 10 (50)             | 3.99                  |
| 15 (59)             | 3.24                  |
| 20 (68)             | 2.65                  |
| 25 (77)             | 2.19                  |
| 30 (86)             | 1.81                  |
| 35 (95)             | 1.51                  |
| 40 (104)            | 1.27                  |
| 45 (113)            | 1.07                  |
|                     |                       |



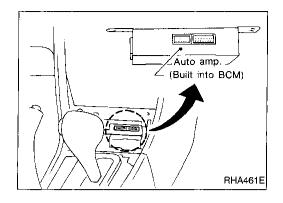
#### **SUNLOAD SENSOR**

The sunload sensor is located on the right 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.

| Input current mA | Output voltage<br>V |
|------------------|---------------------|
| 0                | 5.0                 |
| 0.1              | 4.1                 |
| 0.2              | 3.1                 |
| 0.3              | 2.2                 |
| 0.4              | 1.3                 |
| 0.5              | 0.4                 |

 When checking sunload sensor, select a place where sun shines directly on it.



# Control System Automatic Amplifier (Autoamp.)

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, blower motor, bi-level door motor and compressor are then controlled.

The auto amp. is unitized with control mechanisms. Signals from various switches and Potentio Temperature Control (PTC) 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.

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## 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 100 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 grille 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.

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## **Control System Output Components**

## AIR MIX DOOR CONTROL (Automatic temperature control) Component parts System or

Air mix door control system components are:

- 1) Auto amp.
- 2) Air mix door motor (PBR)
- 3) In-vehicle sensor
- Ambient sensor
- Sunload sensor

#### System operation

Temperature set by Potentio 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).



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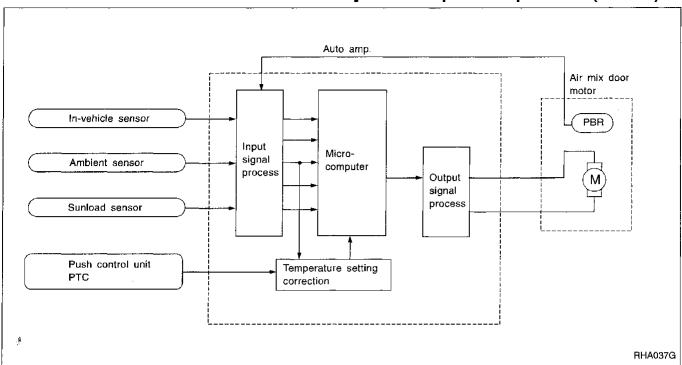
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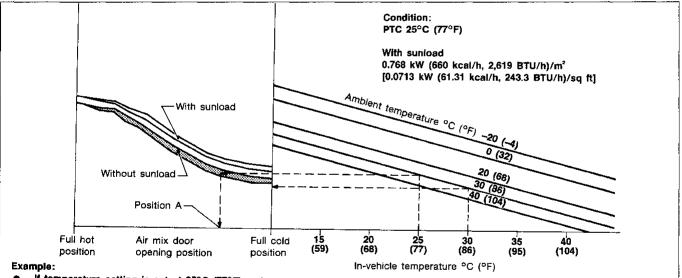
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## Control System Output Components (Cont'd)

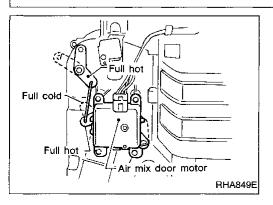


#### Air mix door control specification



- 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), air mix door is initially automatically set in full cold position.
- Within some period, in-vehicle temperature will lower towards the objective temperature, and the air mix door position will shift incrementally towards the hot side and finally stay in this position (A) if intake temperature is 10°C (50°F).
   Air mix door opening position is always fed back to auto amp. by PBR built-in air mix door motor.

RHA568E



#### 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.

# 4 5 3 2 1 PBR HOT COLD

# Control System Output Components (Cont'd) Air mix door operation

| 4        | 5 | Air mix door operation | Direction of lever movement                   |
|----------|---|------------------------|---|
| <b>⊕</b> | ⊖ | COLD → HOT             | Clockwise (Toward passen-<br>ger compartment) |
|          | _ | STOP                   | STOP  |
| $\Theta$ | 0 | HOT → COLD             | Counterclockwise (Toward engine compartment)  |

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#### PBR characteristics

Measure resistance between terminals (1) and (2) at vehicle harness side.

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#### MODE DOOR CONTROL

#### Component parts

Mode door control system components are:

Air mix door opening degree

35°

105° HOT

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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.

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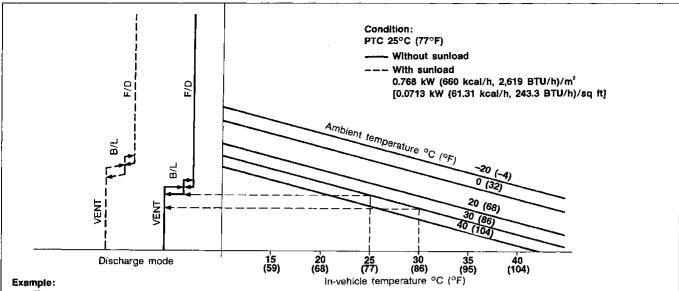
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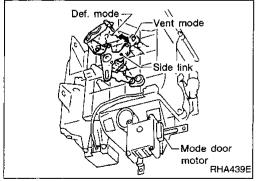
PBR Auto amp. Mode door motor In-vehicle sensor Output input Sunload sensor signal signal process process Ambient sensor Microcomputer Position switch Push control unit • PTC AUTO switch ECON switch MODE switch DEF switch RHA038G

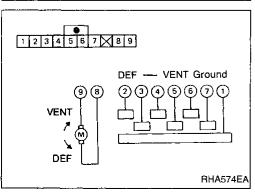
# Control System Output Components (Cont'd) Mode door control specification



- 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), mode door is set automatically at VENT position.
- Then in-vehicle temperature will lower and when objective temperature 25°C (77°F) is reached mode door will shift from VENT position to B/L.

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#### 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.

| 9        | 8        | Mode door operation | Direction of side link rotation |
|----------|----------|---------------------|---------------------------------|
| $\oplus$ | $\Theta$ | $VENT \to DEF$      | Clockwise                       |
|          | _        | STOP                | STOP                            |
| $\Theta$ | <b>⊕</b> | $DEF \to VENT$      | Counterclockwise                |

#### Control System Output Components (Cont'd) System operation

#### INTAKE DOOR CONTROL

#### Components parts

Intake door control system components are:

- Auto amp. 1)
- 2) Intake door motor
- 3) PBR
- 4) In-vehicle sensor
- Ambient sensor
- Sunload sensor

The intake door control determines intake door position based on the ambient temperature and the invehicle temperature. When the ECON, DEF, or OFF buttons are pushed, the auto amp. sets the intake door at the "Fresh" position.

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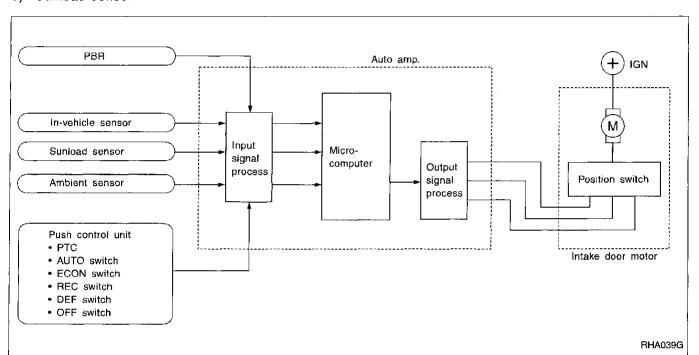
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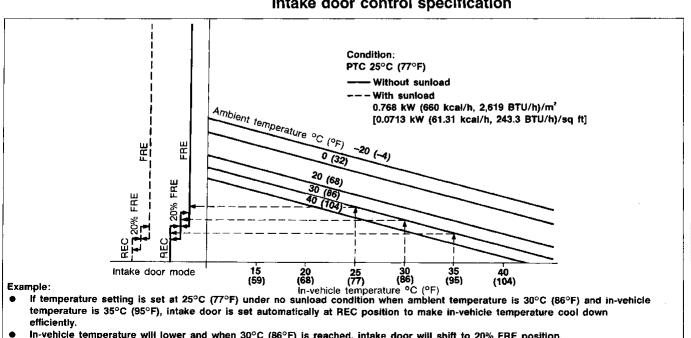
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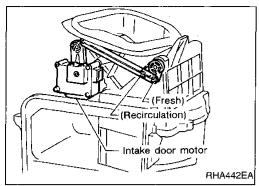


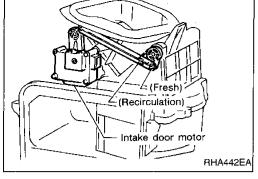
Intake door control specification

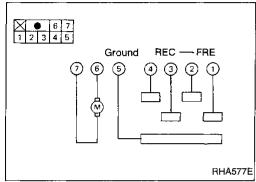


In-vehicle temperature will lower and when 30°C (86°F) is reached, intake door will shift to 20% FRE position.

In the state when in-vehicle temperature reaches the objective temperature 25°C (77°F), intake door is set at FRE position. RHA576EB







## Control System Output Components (Cont'd) INTAKE DOOR MOTOR

The intake door motor is attached to the intake unit. It rotates so that air is drawn from inlets set by the auto amp. Motor rotation is conveyed to a lever which activates the intake door.

#### Intake door motor operation

| 6         | 7        | Intake door operation | Movement of link rotation |
|-----------|----------|-----------------------|---------------------------|
| <b>⊕</b>  | $\Theta$ | REC → FRE             | Clockwise                 |
|           | -        | STOP                  | STOP                      |
| $\ominus$ | 0        | $FRE \to REC$         | Counterclockwise          |

#### **FAN SPEED CONTROL**

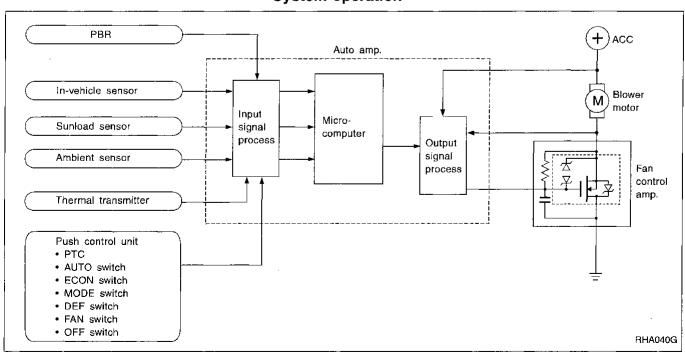
#### Component parts

Fan speed control system components are:

- 1) Auto amp.
- 2) Fan control amplifier

- PBR 3)
- In-vehicle sensor
- Ambient sensor
- Sunload sensor
- Thermal transmitter

#### System operation



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## Control System Output Components (Cont'd)

#### **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 4.5 volts (lowest speed) to 12 volts (highest speed).

To control blower speed, the auto amp. supplies a signal (in the range of 2.5V to 9V), 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), 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 engine coolant 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)

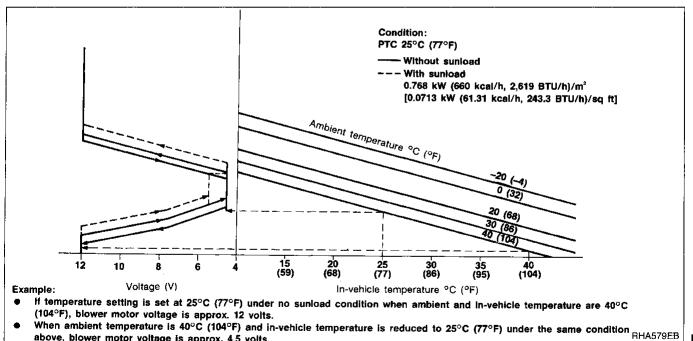
The blower will begin operation momentarily after the AUTO button is pushed. The blower speed will gradually rise to the objective speed over a time period of 5 seconds or less (actual time depends on the objective blower speed).

#### **BLOWER SPEED COMPENSATION**

#### Sunload

When the in-vehicle temperature and the set temperature are very close, the blower will operate at low speed. The low speed varies depending on the sunload. During conditions of high sunload, the blower low speed is "normal" low speed (approx. 5.5V). During lesser sunload conditions, the low speed will drop to "low" low speed (approx. 4.5V).

#### Fan speed control specification





Fan control amplifier

above, blower motor voltage is approx. 4.5 volts.

#### **FAN CONTROL AMPLIFIER**

The fan control amplifier is located on the cooling unit. It amplifies the base current flowing from the auto amp, to change the blower speed within the range of 4V to 12V.



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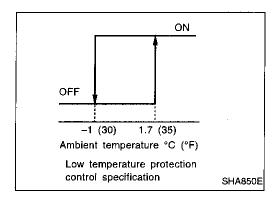
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#### SYSTEM DESCRIPTION

# Control System Output Components (Cont'd) MAGNET CLUTCH CONTROL

The ECM (ECCS control module) controls compressor operation using inputs from the throttle position sensor and auto amplifier.



#### Low temperature protection control

Auto amplifier will turn the compressor "ON" or "OFF" as determined by a signal detected by ambient temperature sensor. The compressor turns "OFF" when ambient temperatures are less than -1°C (30°F).

#### **Acceleration cut control**

The ECM (ECCS control module) will turn the compressor "ON" or "OFF" based on the signal from the throttle position sensor.

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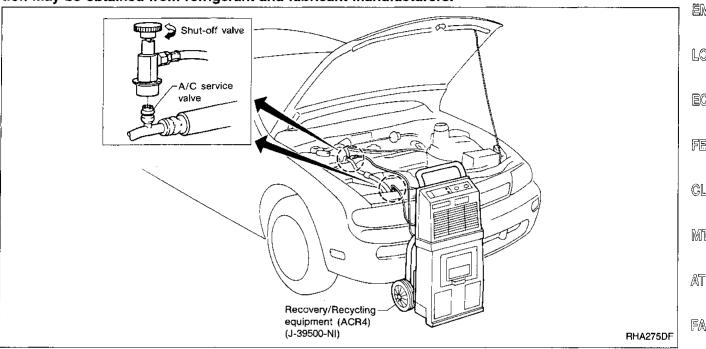
EL

## HFC-134a (R-134a) Service Procedure SETTING OF SERVICE TOOLS AND EQUIPMENT

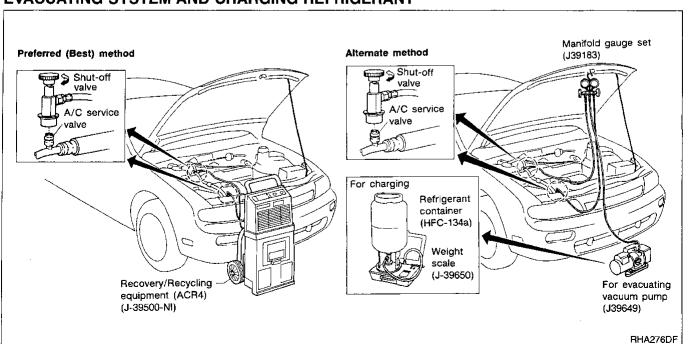
#### DISCHARGING REFRIGERANT

#### **WARNING:**

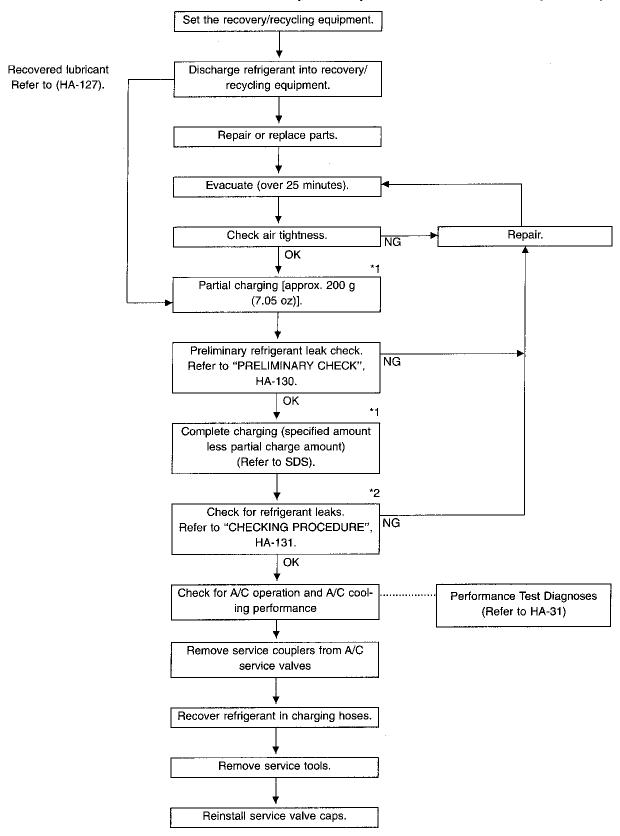
Avoid breathing A/C refrigerant and lubricant vapor or mist. Exposure may irritate eyes, nose and throat. Remove R-134a from A/C system, using certified service equipment meeting requirements of SAE J2210 (R-134a recycling equipment), or J2209 (R-134a recovery equipment). If accidental system discharge occurs, ventilate work area before resuming service. Additional health and safety information may be obtained from refrigerant and lubricant manufacturers.



#### **EVACUATING SYSTEM AND CHARGING REFRIGERANT**



## HFC-134a (R-134a) Service Procedure (Cont'd)



Note: \*1 Before charging refrigerant, ensure engine is off.

<sup>\*2</sup> Before checking for leaks, start engine to activate air conditioning system then turn engine off. Service valve caps must be installed to prevent leakage.

# Maintenance of Lubricant Quantity in Compressor

The lubricant in 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

Perform lubricant return operation, proceeding as follows:

1. Start engine, and set the following conditions:

Engine speed: Idling to 1,200 rpm

A/C or AUTO switch: ON

(6 kg/cm<sup>2</sup>, 85 psi) or higher.

Blower speed: Max. position

Excessive lubricant: Inadequate cooling (thermal exchange interference)

#### **LUBRICANT**

Name: Nissan A/C System Oil Type S

Part number: KLH00-PAGS0

Test condition

#### **CHECKING AND ADJUSTING**

Adjust the lubricant quantity according to the flowchart shown below.

Temp. control: Optional [Set so that intake air temperature is 25 to 30°C (77 to 86°F).]

If less than the reference level, attach a cover to the front face of

Next item is for V-5 or V-6 compressor. Connect the manifold gauge, and check that the high pressure side pressure is 588 kPa

Can lubricant return operation be performed?

• A/C system works properly.

• There is no evidence of a large amount of lubricant leakage.

START

the condenser to raise the pressure.
3. Perform lubricant return operation for about 10 minutes.
4. Stop engine.
CAUTION:

Yes

Yes

CAUTION:
If excessive lubricant leakage is noted, do not perform the lubricant return operation.

(Go to next page.)

Is there any part to be replaced?
(Evaporator, condenser, liquid tank or in case there is evidence of a large amount of

Should the compressor be replaced?

No

case there is evidence of a large amount of lubricant leakage.)

No

Carry out the A/C performance test.

After replacing any of the following major components, add the correct amount of lubricant to the system.

#### Amount of lubricant to be added

| Part replaced               | Lubricant to be added to<br>system<br>Amount of lubricant<br>mt (US fl oz, Imp fl oz) | Remarks                               |
|-----------------------------|---|---------------------------------------|
| Evaporator                  | 75 (2.5, 2.6)   | _                                     |
| Condenser                   | 75 (2.5, 2.6)   | _                                     |
| Liquid tank                 | 5 (0.2, 0.2)  | Add if compressor is not replaced. *1 |
| In annual refrigerent leads | 30 (1.0, 1.1)   | Large leak                            |
| In case of refrigerant leak |   | Small leak*2                          |

<sup>\*1:</sup> If compressor is replaced, addition of lubricant is included in the flow chart.

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<sup>\*2:</sup> If refrigerant leak is small, no addition of lubricant is needed.

# Maintenance of Lubricant Quantity in Compressor (Cont'd)



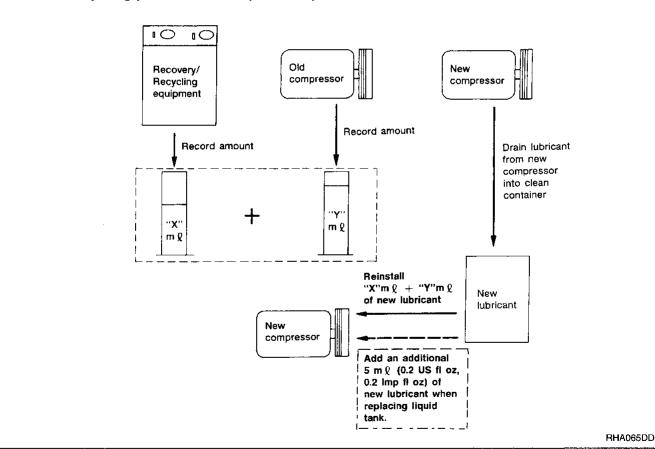
- 1. Discharge refrigerant into the refrigerant recovery/recycling equipment. Measure lubricant discharged into the recovery/recycling equipment.
- 2. Remove the drain plug of the "old" (removed) compressor (applicable only to V-5, V-6 or DKS-16H compressor). Drain the lubricant into a graduated container and record the amount of drained lubricant.
- 3. Remove the drain plug and drain the lubricant from the "new" compressor into a separate, clean container.
- 4. Measure an amount of new lubricant installed equal to amount drained from "old" compressor. Add this lubricant to "new" compressor through the suction port opening.
- Measure an amount of new lubricant equal to the amount recovered during discharging. Add this lubricant to "new" compressor through the suction port opening.
- 6. Torque the drain plug.

V-5 or V-6 compressor: 18 - 19 N·m (1.8 - 1.9 kg-m, 13 - 14 ft-lb) DKS-16H compressor: 14 - 16 N·m (1.4 - 1.6 kg-m, 10 - 12 ft-lb)

7. If the liquid tank also needs to be replaced, add an additional 5 m $\ell$  (0.2 US fl oz, 0.2 Imp fl oz) of lubricant at this time.

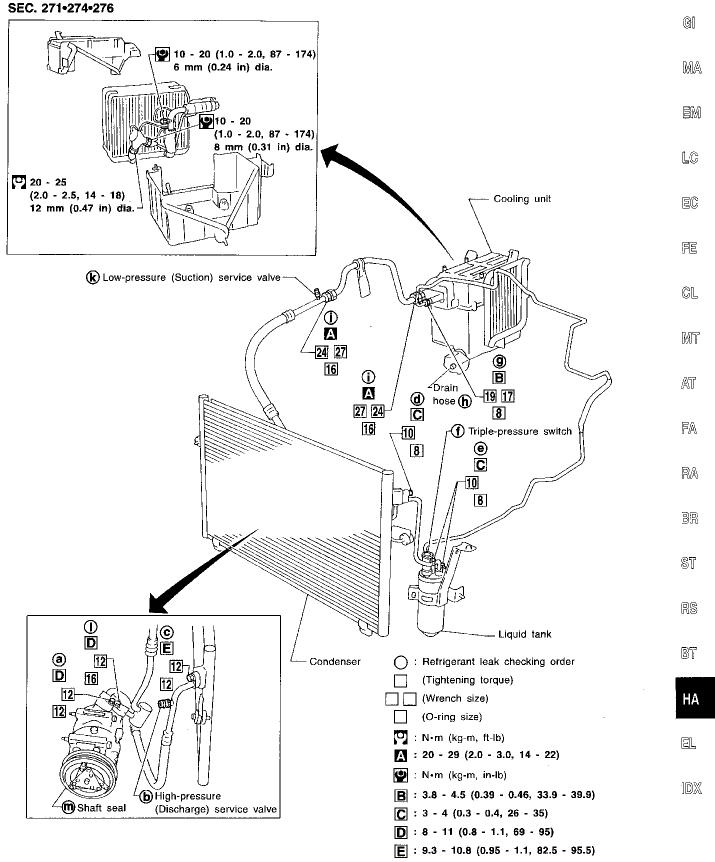
Do not add this 5 ml (0.2 US fl oz, 0.2 lmp fl oz) of lubricant if only replacing the compressor.

Lubricant adjusting procedure for compressor replacement



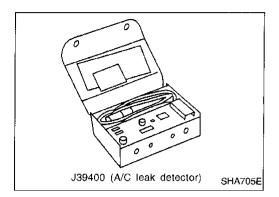
#### **Refrigerant Lines**

Refer to Precautions for Refrigerant Connection (HA-3).



# Checking Refrigerant Leaks PRELIMINARY CHECK

Perform a visual inspection of all refrigeration parts, fittings, hoses, and components for signs of A/C lubricant leakage, damage and corrosion.

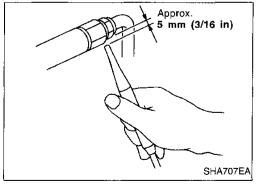


#### PRECAUTIONS FOR HANDLING LEAK DETECTOR

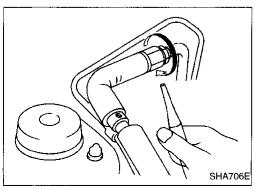
When performing a refrigerant leak check, use a J39400 A/C leak detector or equivalent. Ensure that the instrument is calibrated and set properly per the operating instructions.

The leak detector is a delicate device. In order to use the leak detector properly, read the operating instructions and perform any specified maintenance.

Other gases in the work area or substances on the A/C components, for example, anti-freeze, windshield washer fluid, solvents and cleaners, may falsely trigger the leak detector. Make sure the surfaces to be checked are clean. Do not allow the sensor tip of the detector to come into contact with any substance. This can also cause false readings and may damage the detector.

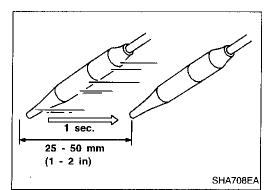


1. Position probe approximately 5 mm (3/16 in) away from point to be checked.



2. When testing, circle each fitting completely with probe.

## Checking Refrigerant Leaks (Cont'd)



Move probe along component approximately 25 to 50 mm (1 to 2 in)/sec.

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#### CHECKING PROCEDURE

To prevent inaccurate or false readings, make sure there is no refrigerant vapor or tobacco smoke in the vicinity of the vehicle. Perform the leak test in calm area (low air/wind movement so that the leaking refrigerant is not dispersed.

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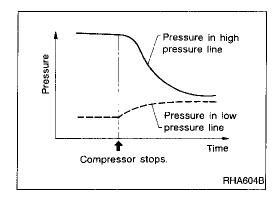
Charge the system with the specified amount of refrigerant.

Run the engine with the A/C compressor ON for at least 2 minutes.

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3. Stop engine.

CL.



Refrigerant leaks should be checked immediately after stopping the engine. Begin with the leak detector on the high pressure line. The pressure in the high pressure line will gradually drop after refrigerant circulation stops and pressure in the low pressure line will gradually rise, as shown in the graph. Leaks are more easily detected when pressure is high.

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Conduct the leak test from the high side to the low side at points (a) through (m). Refer to HA-129.

Perform a leak check for the following areas carefully. Clean the component to be checked and move the leak detector si probe completely around the connection/component.

Compressor

Check the fitting of high and low pressure hoses, relief valve and shaft seal.

RS

Liquid tank

Check the pressure switch, tube fitting and the fusible plug mounts.

BT

Service valves

HA

Check all around the service valves. Ensure service valve caps are secured on the service valves (to prevent leaks).

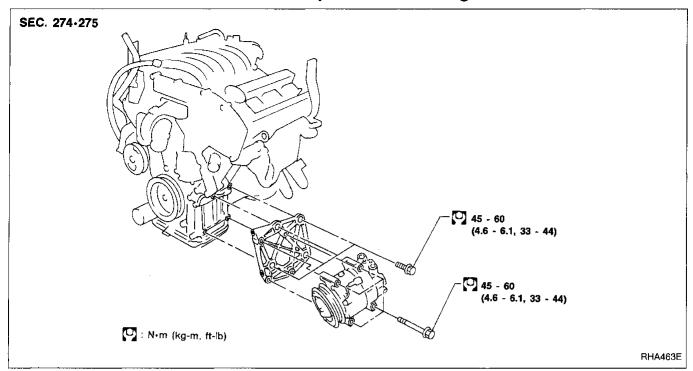
Cooling unit

EL

Turn blower fan on "High" for at least 15 seconds to dissipate any refrigerant trace in the cooling unit. Insert the leak detector probe into the drain hose immediately after stopping the engine. (Keep the probe inserted for at least ten seconds.)

IDX

#### **Compressor Mounting**



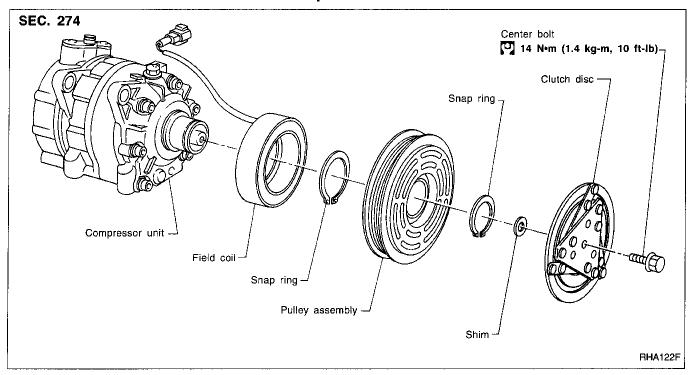
#### **Belt Tension**

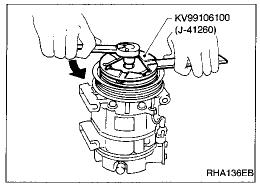
 Refer to MA section ("Checking Drive Belts", "ENGINE MAINTENANCE").

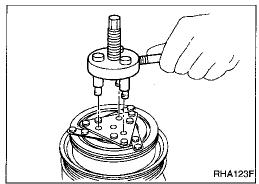
#### **Fast Idle Control Device (FICD)**

 Refer to EC section ("IACV-FICD SOLENOID VALVE", "TROUBLE DIAGNOSES FOR NON-DETECTIVE ITEMS").

#### Compressor







#### **Compressor Clutch REMOVAL**

When removing center bolt, hold clutch disc with clutch disc  $_{\ensuremath{\mathbb{ST}}}$ wrench.

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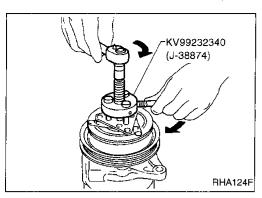
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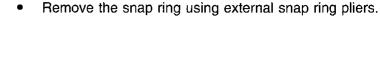
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the drive shaft or the clutch disc.

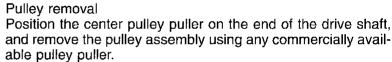


Remove the clutch disc using the clutch disc puller.
 Insert the holder's three pins into the holes in the clutch disc.
 Rotate the holder clockwise to hook it onto the plate. Then, tighten the center bolt to remove the clutch disc.
 After removing the clutch disc, remove the shims from either

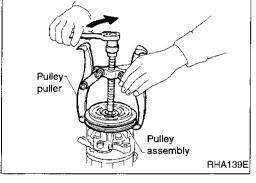


External snap ring pliers

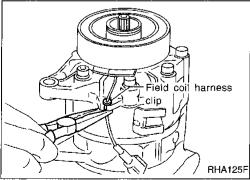
Snap ring
RHA138E



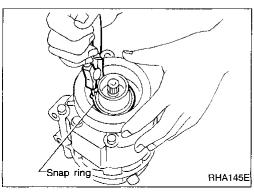
To prevent the pulley groove from being deformed, the puller claws should be positioned onto the edge of the pulley assembly.



Remove the field coil harness clip using a pair of pliers.



Remove the snap ring using external snap ring pliers.



# Pulley -Clutch disc RHA126F

Field coil

RHA142E

KV99106200 (J-41261)

RHA143EA

RHA127F

#### **Compressor Clutch (Cont'd) INSPECTION**

#### Clutch disc

If the contact surface shows signs of damage due to excessive heat, replace clutch disc and pulley.

@[

#### Pulley

Check the appearance of the pulley assembly. If the contact surface of pulley shows signs of excessive grooving, replace clutch disc and pulley. The contact surfaces of the pulley assembly should be cleaned with a suitable solvent before reinstallation.

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#### Coil

Check clubricant for loose connection or cracked insulation.

#### INSTALLATION

Install the field coil.

EC

Be sure to align the coil's pin with the hole in the compressor's front head.

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Install the field coil harness clip using a screwdriver.

CL

Install the pulley assembly using the installer and a hand press, and then install the snap ring using snap ring pliers.

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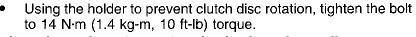
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Install the clutch disc on the drive shaft, together with the original shim(s). Press the clutch disc down by hand.

ST



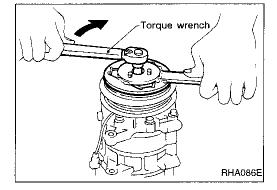
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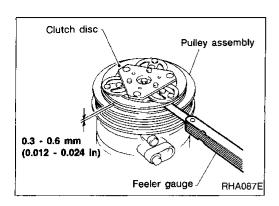
After tightening the bolt, check that the pulley rotates smoothly.

IDX



Snap ring Pulley

assembly



#### Compressor Clutch (Cont'd)

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 carry out 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.

#### Replacing A/C Auto Amp.

The BCM unit for models equipped with auto A/C's (air conditioners) is provided with an auto A/C amplifier.

The BCM and auto A/C amplifier must be replaced independently with new ones as described below:

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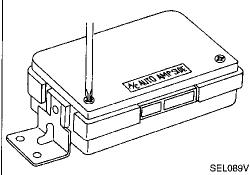
#### CAUTION:

- Never handle the BCM unit with dirty hands (wet with oil, grease, etc.).
- When handling the BCM unit, hold the case as much as possible.
- Do not attempt to touch parts on the PC board unless absolutely necessary. Doing so may damage affected circuits or parts.
- The BCM unit consists of two cases—the BCM case and the A/C auto amplifier case. These cases are interconnected with a sub-harness. Be careful not to break the sub-harness while handling them.
- The "BCM SIDE" is stamped on the BCM case.
   The "A/C AUTO AMP" is stamped on the A/C auto amplifier case.
  - Be careful not to confuse one case with the other during replacement.



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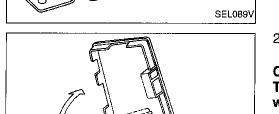
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To replace either of the cases with a new one, proceed as follows:

1. Using a cross-head screwdriver, remove the two screws.





2. With the "A/C AUTO AMP SIDE" mark toward you and facing up, open the front of the case and then flip it open to the right.



RA

#### **CAUTION:**

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The BCM case and A/C auto amplifier case are interconnected simple. Simple with a sub-harness. Be careful not to break the sub-harness.

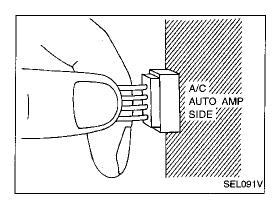




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#### Replacing A/C Auto Amp. (Cont'd)

While holding the 4 wires of sub-harness, disconnect the subharness connector from the mating connector.

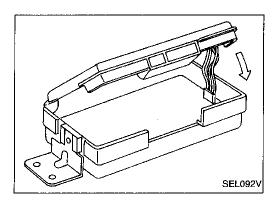
#### **CAUTION:**

Be sure to pull connector straight out.

- Prepare a new auto amplifier. The "BCM SIDE" case can be re-used.
- Connect the BCM-side connector to the A/C auto amplifier-side connector.

#### **CAUTION:**

Be sure to connect the BCM-side connector until a "click" is heard. If it does not connect properly, the auto A/C will not operate properly.



6. With the "A/C AUTO AMP SIDE" mark facing upward, engage the back side of the case first, then close the case.

#### **CAUTION:**

Do not allow the sub-harness to be caught in the cases.

7. Using a cross-head screwdriver, tighten the two screws to a torque of 0.4 to 0.6 N·m (4.1 to 6.1 kg-cm, 3.6 to 5.3 in-lb).

#### **CAUTION:**

- Be sure the two cases are in close contact with each other and are secure while tightening the screws.
- Do not overtighten the screws since it may break the case.
- 8. Following BCM case replacement, make sure that:
- The BCM and A/C auto amplifier-side connectors are properly connected to the main harness connector.
- b. Perform IVMS communication diagnosis. Refer to EL section.
- c. Check that the auto A/C operates properly.

#### **General Specifications**

#### **COMPRESSOR**

| Model                          | CALSONIC make<br>V-6                        |
|--------------------------------|---|
| Туре                           | V-6 variable displacement                   |
| Displacement cm³ (cu in)/rev.  |   |
| Max.                           | 184 (11.228)                                |
| Min.                           | 10.5 (0.641)                                |
| Cylinder bore x stroke mm (in) | 37 (1.46)<br>x [1.6 - 28.6 (0.063 - 1.126)] |
| Direction of rotation          | Clockwise<br>(viewed from drive end)        |
| Drive belt                     | Poly V                                      |

#### **LUBRICANT**

| Model                                     | CALSONIC make<br>V-6            |
|---|---------------------------------|
| Name                                      | Nissan A/C System Oil<br>Type S |
| Part number                               | KLH00-PAGS0                     |
| Capacity<br>mℓ (US fl oz, Imp fl oz)      |                                 |
| Total in system                           | 200 (6.8, 7.0)                  |
| Compressor (Service part) charging amount | 200 (6.8, 7.0)                  |

#### **REFRIGERANT**

| Туре     |         | HFC-134a (R-134a)     |
|----------|---------|-----------------------|
| Capacity | kg (lb) | 0.65±0.05 (1.43±0.11) |

#### **Inspection and Adjustment**

#### ENGINE IDLING SPEED (When A/C is ON)

• Refer to EC section.

#### **BELT TENSION**

• Refer to Checking Drive Belts (MA section).

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## **ELECTRICAL SYSTEM**



When you read wiring diagrams:

Read GI section, "HOW TO READ WIRING DIAGRAMS".

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".

• Check for any service bulletins before servicing the vehicle.

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| AUTOMATIC TRANSMISSION CONTROL SYS           | TEM. SHIFT L                            | OCK SYSTEM AT SECTION               |         | ED A           |
| ANTI-LOCK BRAKE SYSTEMSRS "AIR BAG"          |   | RS SECTION                          |         | RA             |
| HEATER AND AIR CONDITIONER                   | *************************************** | HA SECTION                          |         |                |
|  |   |                                     |         | BR             |
|  |   |                                     |         |                |
|  |   |                                     |         |                |
|  |   |                                     |         | ST             |
|  |   |                                     |         |                |
|  |   |                                     |         | കര             |
|  |   |                                     |         | RS             |
|  |   |                                     |         |                |
|  |   |                                     |         | BT             |
|  |   |                                     |         |                |
|  |   |                                     |         | n = -          |
|  |   |                                     |         | HA             |
|  |   |                                     |         |                |
|  |   |                                     |         | EL             |
|  |   |                                     |         |                |

#### **PRECAUTIONS**

## Supplemental Restraint System (SRS) "AIR BAG"

The Supplemental Restraint System "Air Bag", used along with a seat belt, helps 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 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.
- Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses are covered with yellow insulation either just before the harness connectors or the complete harness, for easy identification.

#### HARNESS CONNECTOR

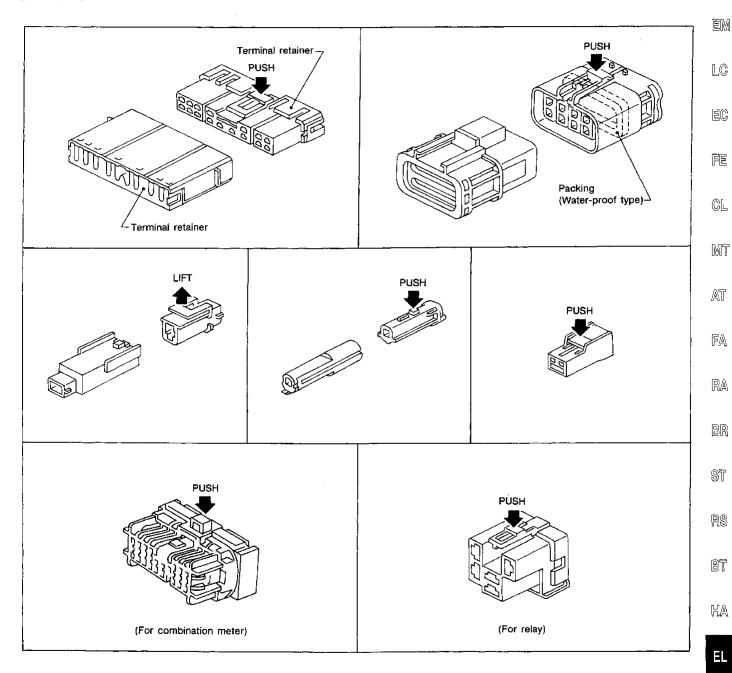
#### **Description**

#### HARNESS CONNECTOR

- All harness connectors have been modified to prevent accidental loosing or disconnection. The connector can be disconnected by pushing or lifting the locking section.

Do not pull the harness when disconnecting the connector.

#### [Example]



MEL343D

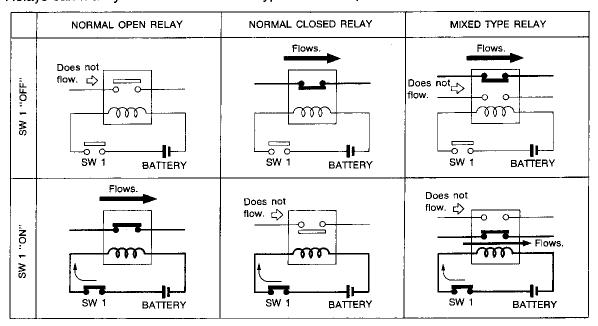
GI

MA

#### **Description**

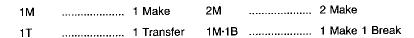
## NORMAL OPEN, NORMAL CLOSED AND MIXED TYPE RELAYS

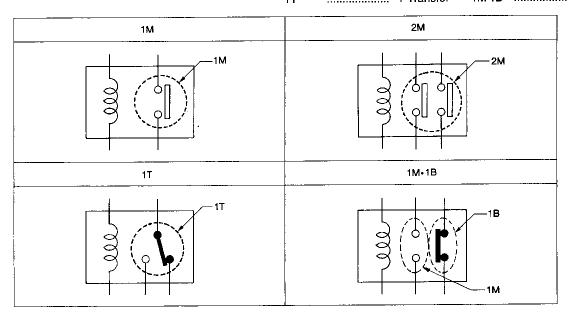
Relays can mainly be divided into three types: normal open, normal closed and mixed type relays.



SEL881H

#### TYPE OF STANDARDIZED RELAYS





SEL882H

#### STANDARDIZED RELAY

## Description (Cont'd)

| Туре       | Outer view | Circuit   | Connector symbol and connection | Case color |
|------------|------------|---|---------------------------------|------------|
| 1T         | 5 2 4      | 1) (5) (4)<br>(2) (3)   | 5 2 4 1                         | BLACK      |
| 2 <b>M</b> |            | () (§ (§ )<br>() (§ (§ )<br>() (§ (§ )<br>() (§ (§ )<br>() (§ (§ )<br>() (§ (§ )<br>() () (§ (§ )<br>() () () () () () () () () () () () () ( | 00<br>2 1<br>7 5<br>6 3         | BROWN      |
| 1M•1B      |            | 1) 6 3<br>000 4<br>2 7 4  | 2 1 6 7 3                       | GRAY       |
| 1M         | 3          | (1) (5) (7) (7) (7) (7) (7) (7) (7) (7) (7) (7  | 5 2 1                           | BLUE       |

The arrangement of terminal numbers on the actual relays may differ from those shown above.

EL

Œ[

MA

ĹĈ

EC

FE

ÇL

MT

AT

FA

 $\mathbb{R}\mathbb{A}$ 

BR

ST

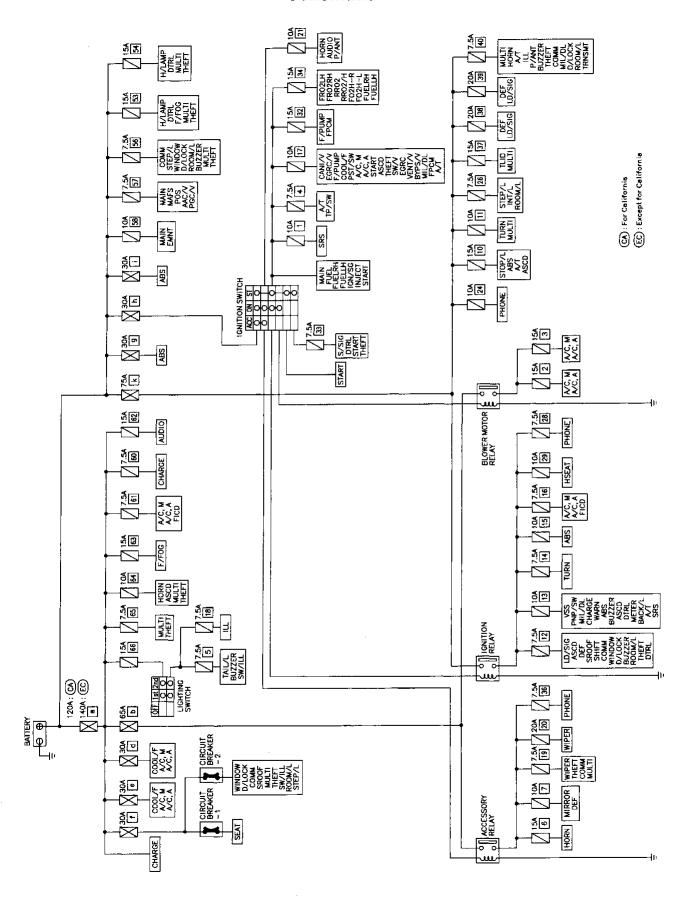
RS

BT

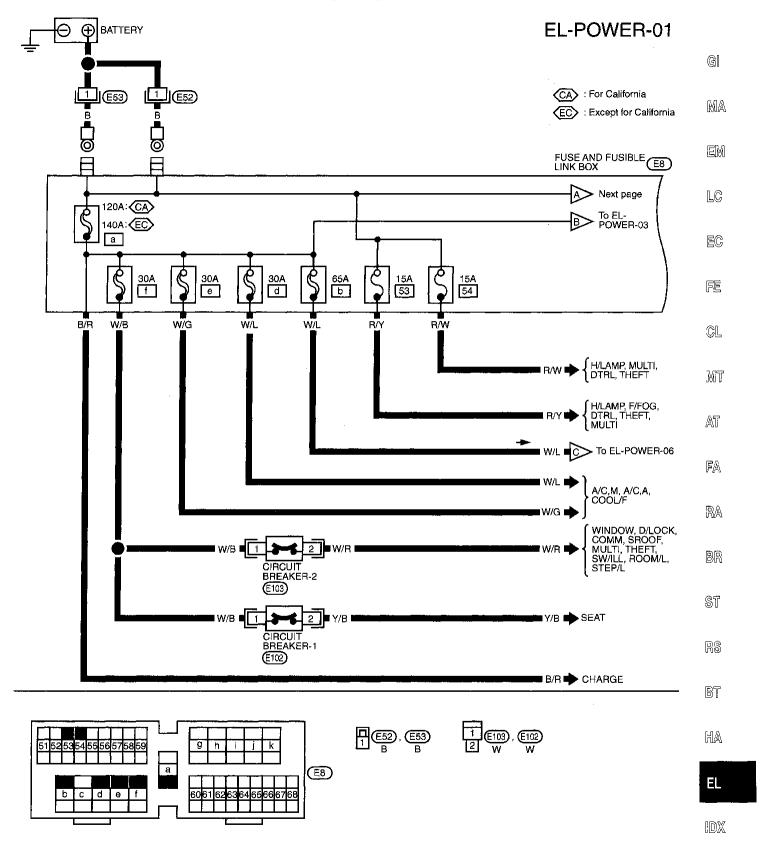
HA

 $\mathbb{D}X$ 

#### **Schematic**

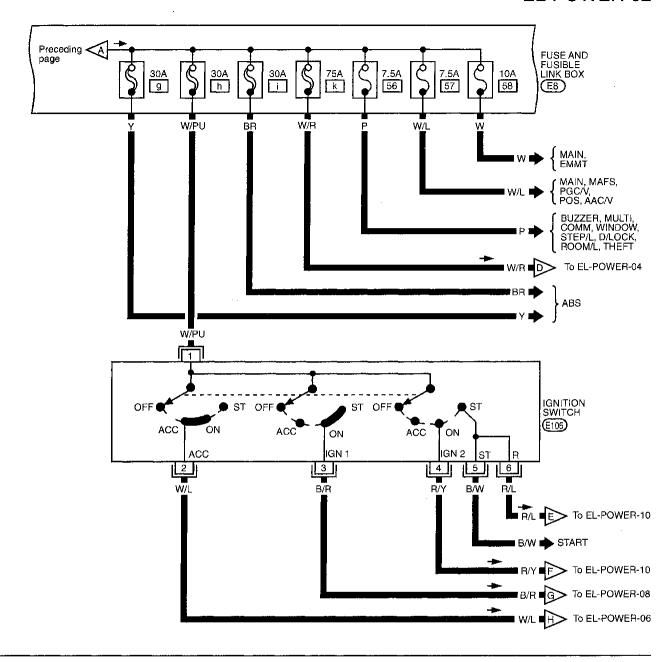


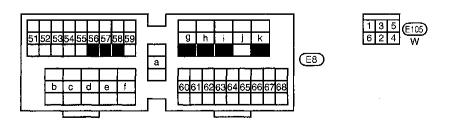
#### Wiring Diagram — POWER —



#### Wiring Diagram — POWER — (Cont'd)

#### **EL-POWER-02**

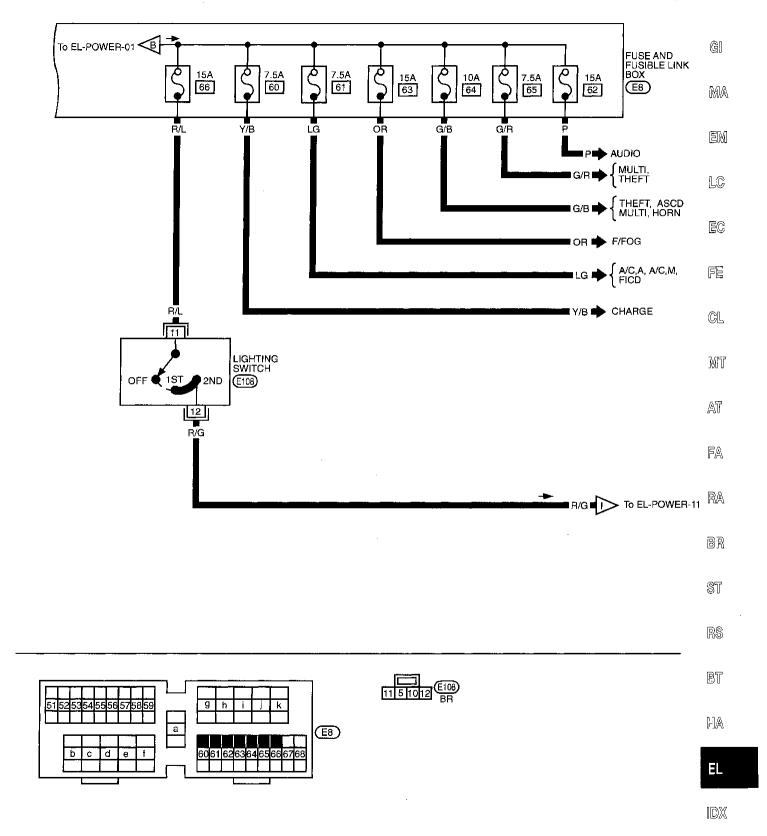




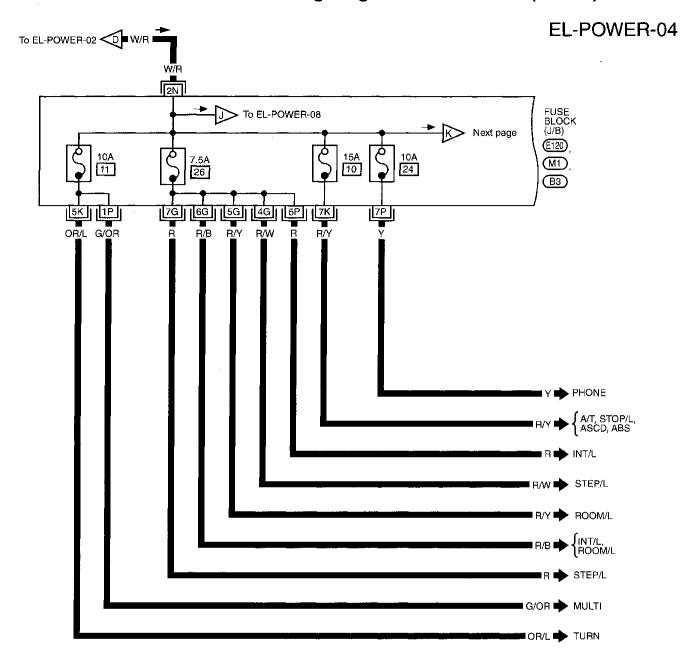
#### **POWER SUPPLY ROUTING**

#### Wiring Diagram — POWER — (Cont'd)

#### **EL-POWER-03**



#### Wiring Diagram — POWER — (Cont'd)



Refer to last page (Foldout page).

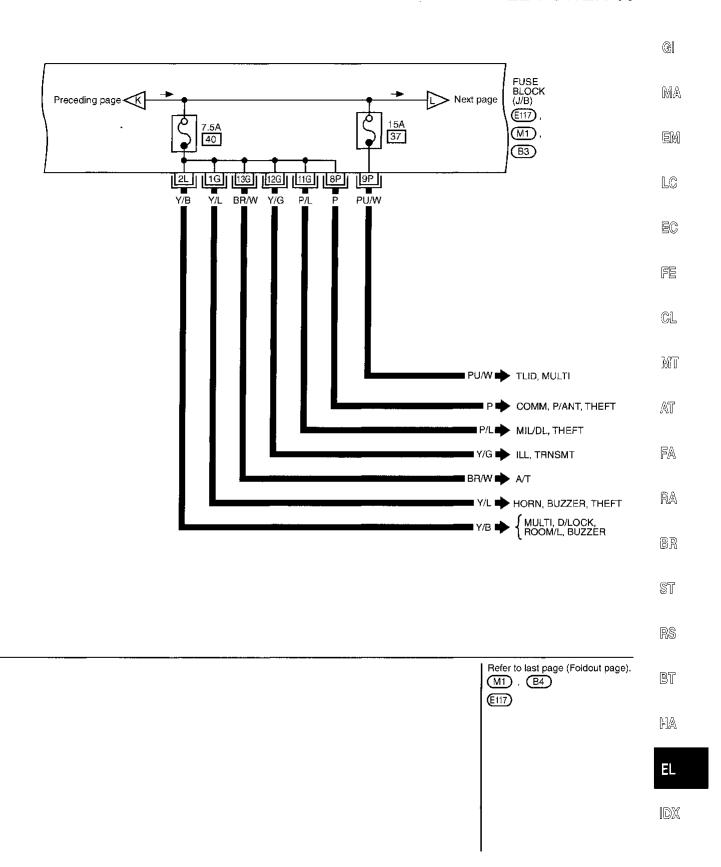
M1 , B3

E120

#### **POWER SUPPLY ROUTING**

#### Wiring Diagram — POWER — (Cont'd)

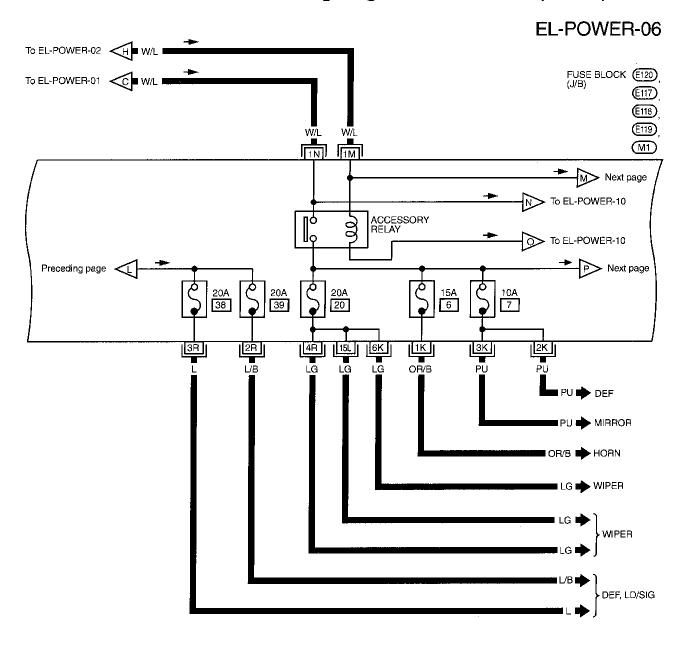
#### **EL-POWER-05**

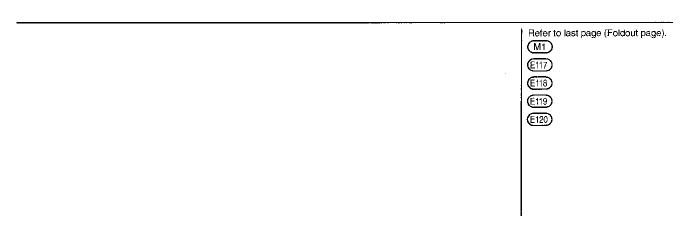


MEL856G

#### **POWER SUPPLY ROUTING**

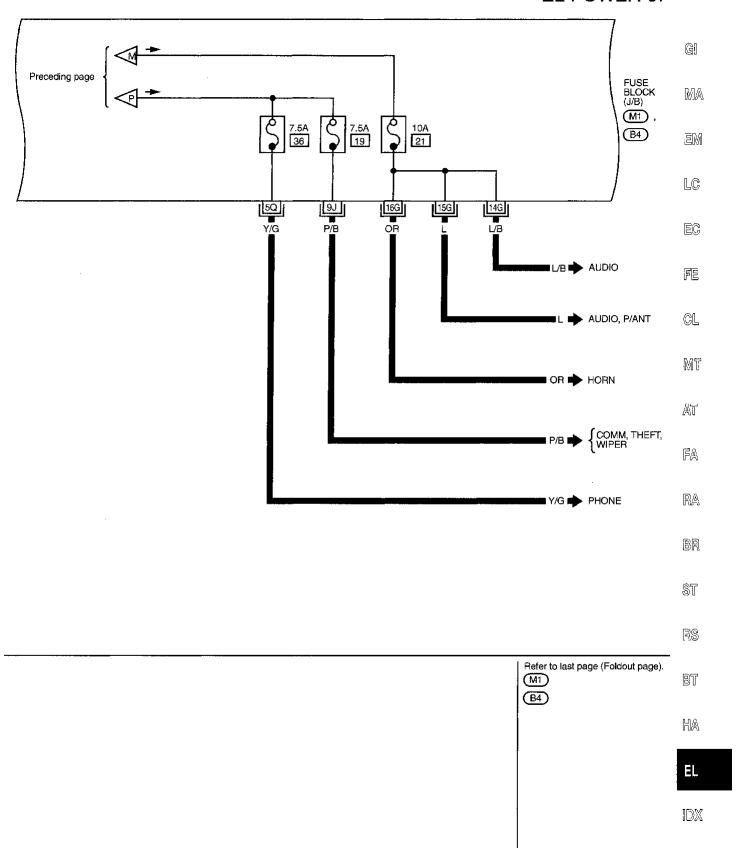
## Wiring Diagram — POWER — (Cont'd)





## Wiring Diagram — POWER — (Cont'd)

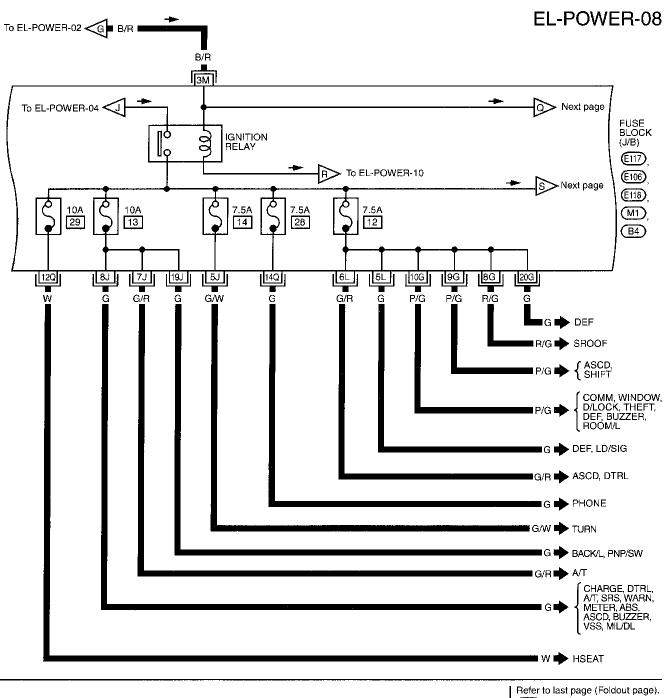
#### **EL-POWER-07**



MEL858G

#### **POWER SUPPLY ROUTING**

#### Wiring Diagram — POWER — (Cont'd)



(M1)**E117**)

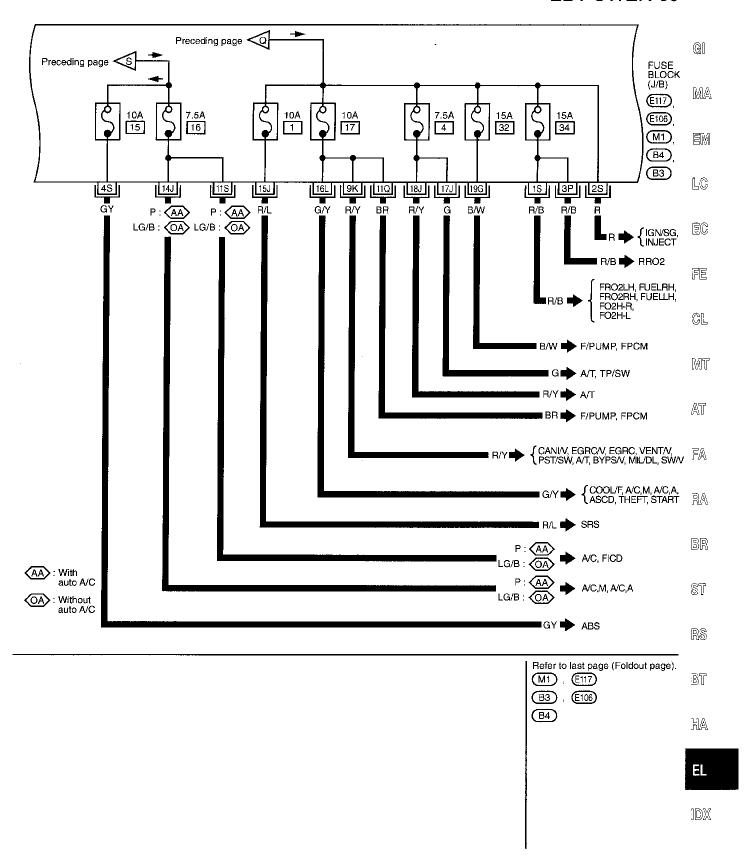
(E106)

**E118** 

(B4)

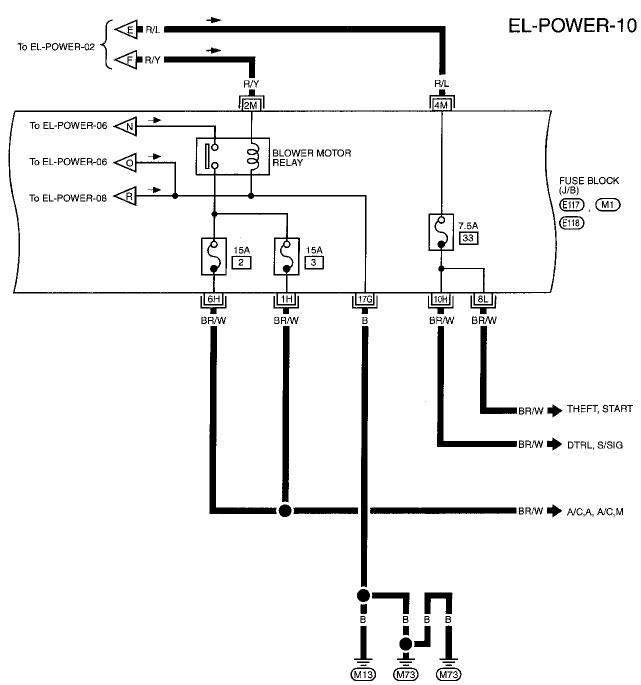
#### Wiring Diagram — POWER — (Cont'd)

#### **EL-POWER-09**



#### **POWER SUPPLY ROUTING**

## Wiring Diagram — POWER — (Cont'd)



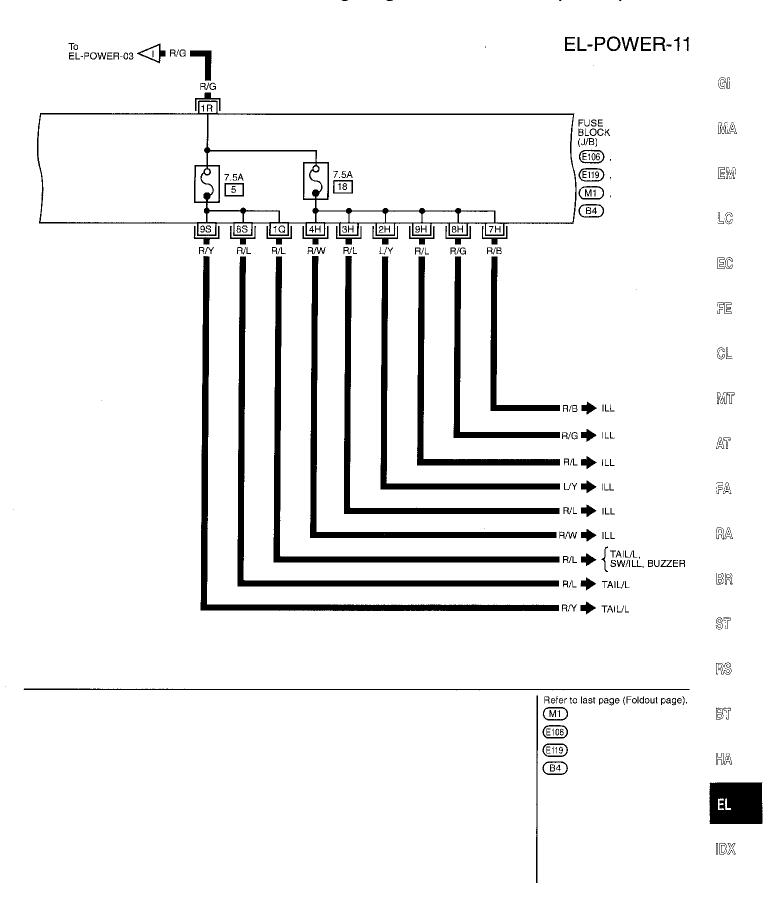
Refer to last page (Foldout page).

Mi (E117)

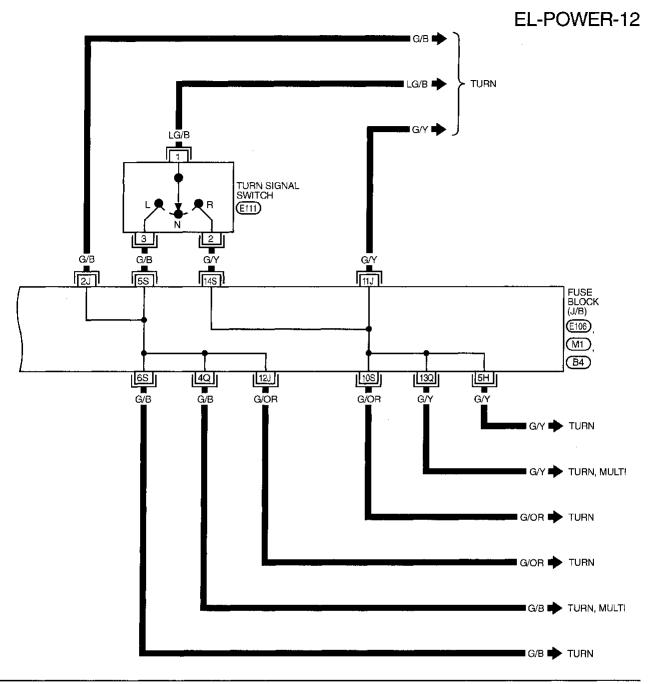
(E118)

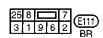
#### **POWER SUPPLY ROUTING**

#### Wiring Diagram — POWER — (Cont'd)



#### Wiring Diagram — POWER — (Cont'd)





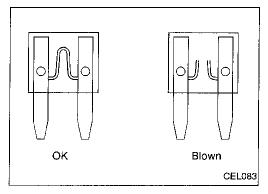
Refer to last page (Foldout page).

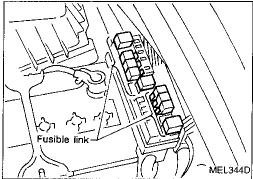
M1)

£106)

(B4)

#### POWER SUPPLY ROUTING





Time

(sec.)

100

50

20

10

20 30

60 Current (A)

SBF284E

#### **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 "ELECTRICAL PARTS (BAT)" if vehicle is not used for a long period of time.

GI

MA

EM

#### **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.

EC

写巨

LC

#### **CAUTION:**

a. If fusible link is melted, it is possible that a critical circuit (power supply or large current carrying circuit) is shorted. In such a case, carefully check these circuits and eliminate cause.

CL

Never wrap outside of fusible link with vinyl tape. Important: Never let fusible link touch any other wiring harness, vinyl or rubber parts.

MT

AT

FA

BA

BR

ST

#### Circuit Breaker Inspection

For example, when current is 30A, the circuit is broken within 8 to 20 seconds.

Circuit breakers are used in the following systems.



- Power window
- Power door lock

**IVMS** 

Electric sunroof

RS BT

HA

IDX



| EARTH    | CONNECT TO                          | CONN. NO. | CELL CORD                              |
|----------|-------------------------------------|-----------|--|
| E5/E30   | AMBIENT AIR TEMPERATURE SWITCH      | E80       | HA-A/C, A HA-A/C, M                    |
|          | ABS SOLENOID VALVE RELAY            | E79       | BR-ABS                                 |
|          | ASCD HOLD RELAY                     | E58, E59  | EL-ASCD                                |
|          | BRAKE FLUID LEVEL SWITCH            | E1        | EL-WARN                                |
|          | COOLING FAN MOTOR-1                 | E26       | EC-COOL/F HA-A/C, A HA-A/C, M          |
|          | COOLING FAN MOTOR-2                 | E27       | EC-COOL/F HA-A/C, A HA-A/C, M          |
|          | COOLING FAN RELAY-2                 | E56       | EC-COOL/F HA-A/C, A HA-A/C, M          |
|          | COOLING FAN RELAY-3                 | E62       | EC-COOL/F HA-A/C, A HA-A/C, M          |
|          | DAYTIME LIGHT CONTROL UNIT          | E66       | EL-DTRL                                |
|          | FRONT FOG LAMP LH                   | E21       | EL-F/FOG                               |
|          | FRONT FOG LAMP RH                   | E34       | EL-F/FOG                               |
|          | FRONT FOG LAMP SWITCH               | E113      | EL-F/FOG                               |
|          | FRONT SIDE MARKER LAMP LH           | E23       | EL-TAIL/L                              |
|          | FRONT SIDE MARKER LAMP RH           | E33       | EL-TAIL/L                              |
|          | FRONT TURN SIGNAL LAMP LH           | E22       | EL-TURN                                |
|          | FRONT TURN SIGNAL LAMP RH           | E32       | EL-TURN                                |
|          | FRONT WIPER RELAY                   | E75       | EL-WIPER                               |
|          | FRONT WIPER SWITCH                  | E112      | EL-WIPER                               |
|          | HEADLAMP LH                         | E24       | EL-H/LAMP EL-DTRL EL-MULTI<br>EL-THEFT |
|          | HEADLAMP RH                         | E31       | EL-H/LAMP EL-MULTI EL-THEFT            |
|          | HOOD SWITCH                         | E19       | EL-THEFT                               |
|          | PARKING LAMP LH                     | E6        | EL-TAIL/L                              |
|          | PARKING LAMP RH                     | E44       | EL-TAIL/L                              |
|          | THEFT WARNING HORN RELAY-1          | E68       | EL-MULTI                               |
|          | THEFT WARNING HORN RELAY-2          | E70       | EL-MULTI EL-THEFT                      |
|          | TRIPLE-PRESSURE SWITCH              | E25       | EC-COOL/F HA-A/C, A HA-A/C, M          |
|          | WASHER LEVEL SWITCH                 | E45       | EL-WARN                                |
|          | FRONT WIPER RELAY                   | E75       | EL-WIPER                               |
|          | A/C AUTO AMP (In BCM)               | M98       | HA-A/C, A                              |
| E35      | ALTERNATOR                          | E37       | EL-CHARGE                              |
| E115     | SHIELD WIRE (FRONT LH WHEEL SENSOR) | E17       | BR-ABS                                 |
|          | SHIELD WIRE (FRONT RH WHEEL SENSOR) | M102      | BR-ABS                                 |
|          | SHIELD WIRE (REAR LH WHEEL SENSOR)  | B109      | BR-ABS                                 |
|          | SHIELD WIRE (REAR RH WHEEL SENSOR)  | B105      | BR-ABS                                 |
| //13/M73 | ABS CONTROL UNIT                    | E114      | BR-ABS                                 |
|          | A/T DEVICE (OD CONTROL SWITCH)      | M62       | AT-A/T                                 |
|          | A/T DEVICE (PARK POSITION SWITCH)   | M62       | AT-SHIFT                               |
|          | ACCESSORY RELAY                     | M1        | EL-POWER                               |
|          | AIR MIX DOOR MOTOR                  | M49       | HA-A/C, M                              |
|          | ASCD CONTROL UNIT                   | M30       | EL-ASCD                                |
|          | ASCD MAIN SWITCH                    | M27       | EL-ASCD                                |
|          | ASHTRAY ILLUMINATION                | M46       | EL-ILL                                 |

**EL-20** 1224

| ARTH            | CONNECT TO                                       | CONN. NO. | CELL CORD   |
|-----------------|--|-----------|---|
| 13/M <b>7</b> 3 | AUDIO AMP RELAY                                  | M79       | EL-AUDIO  |
|                 | BCM (BODY CONTROL MODULE)                        | M105      | EL-BUZZER EL-COMM EL-WINDOW<br>EL-D/LOCK EL-MULTI EL-THEFT<br>EL-STEP/L |
|                 | BLOWER MOTOR RELAY                               | M1        | EL-POWER  |
|                 | CIGARETTE LIGHTER SOCKET                         | M45       | EL-HORN   |
|                 | CLOCK  | M59       | EL-HORN   |
|                 | CLOCK (ILLUMINATION)                             | M59       | EL-ILL  |
|                 | CLUTCH INTERLOCK SWITCH                          | M16       | EL-START  |
|                 | COMBINATION FLASHER UNIT                         | M34       | EL-TURN   |
|                 | COMBINATION METER (AIR BAG)                      | M82       | RS-SRS EL-WARN  |
|                 | COMBINATION METER (CRUISE INDICATOR)             | M83       | EL-ASCD   |
|                 | COMBINATION METER (FUEL GAUGE)                   | M84       | EL-METER  |
|                 | COMBINATION METER (HIGH BEAM INDICATOR)          | M83       | EL-H/LAMP EL-DTRL   |
|                 | COMBINATION METER (SPEEDOMETER)                  | M82, M8   | AT-A/T EL-METER EL-ASCD   |
|                 | COMBINATION METER (TACHOMETER)                   | M82, M8   | EL-METER  |
|                 | COMBINATION METER (TURN)                         | M83       | EL-TURN   |
|                 | COMBINATION METER (WATER TEMP GAUGE)             | M82       | EL-METER  |
|                 | DATA LINK CONNECTOR FOR CONSULT                  | M2        | EC-MIL/DL AT-A/T BR-ABS RS-SRS  |
|                 | DATA LINK CONNECTOR FOR GST                      | M63       | EC-MIL/DL   |
|                 | DOOR MIRROR REMOTE CONTROL SWITCH                | M26       | EL-MIRROR   |
|                 | FAN CONTROL AMP.                                 | M57       | HA-A/C, A   |
|                 | FAN SWITCH                                       | M39       | HA-A/C, M   |
|                 | FRONT WIPER MOTOR                                | M101      | EL-WIPER  |
|                 | GLOVE BOX LAMP SWITCH                            | M55       | EL-ILL  |
|                 | IGNITION RELAY                                   | M1        | EL-POWER  |
|                 | ILLUMINATION CONTROL SWITCH                      | M32       | EL-ILL  |
|                 | INTAKE DOOR MOTOR                                | M69       | HA-A/C, A HA-A/C, M   |
|                 | MODE DOOR MOTOR                                  | M38       | HA-A/C, A HA-A/C, M   |
|                 | PUSH CONTROL UNIT                                | M40, M85  | HA-A/C, A HA-A/C, M   |
|                 | REAR WINDOW DEFOGGER SWITCH                      | M60       | EL-DEF  |
|                 | SUNROOF RELAY                                    | M7        | EL-SROOF  |
|                 | DOOR MIRROR DEFOGGER LH                          | D5        | EL-DEF  |
|                 | DOOR MIRROR DEFOGGER RH                          | D35       | EL-DEF  |
|                 | DRIVER DOOR CONTROL UNIT (LCU01)                 | D9        | EL-COMM EL-WINDOW EL-D/LOCK EL-STEP/L                                   |
|                 | DRIVER SIDE KEY CYLINDER SWITCH                  | D7        | EL-D/LOCK EL-THEFT  |
|                 | PASSENGER SIDE KEY CYLINDER SWITCH               | D37       | EL-D/LOCK EL-THEFT  |
|                 | FRONT DOOR LOCK ACTUATOR LH (DOOR UNLOCK SENSOR) | D12       | EL-D/LOCK EL-THEFT EL-MULTI   |
|                 | FRONT DOOR LOCK ACTUATOR RH (DOOR UNLOCK SENSOR) | D41       | EL-D/LOCK EL-THEFT EL-MULTI   |

**EL-21** 1225

| EARTH   | CONNECT TO   | CONN. NO. | CELL CORD                     |
|---------|--|-----------|-------------------------------|
| M13/M73 | FRONT DOOR SPEAKER LH                                | D6        | EL-AUDIO                      |
|         | FRONT DOOR SPEAKER RH                                | D36       | EL-AUDIO                      |
|         | PASSENGER DOOR CONTROL UNIT (LCU02)                  | D39       | EL-COMM EL-WINDOW EL-STEP/L   |
|         | SHIELD WIRE (FRONT DOOR SPEAKER AND TWEETER LH)      | D6, D13   | EL-AUDIO                      |
|         | SHIELD WIRE (FRONT DOOR SPEAKER AND TWEETER RH)      | D36, D42  | EL-AUDIO                      |
|         | TRUNK LID OPENER SWITCH                              | D10       | EL-TLID EL-MULTI              |
|         | INTEGRATED HOMELINK™ TRANSMITTER                     | R2        | EL-TRNSMT                     |
|         | SPOT LAMP  | R4        | EL-INT/L                      |
|         | VANITY MIRROR ILLUMINATION LH                        | R2        | EL-ILL                        |
|         | VANITY MIRROR ILLUMINATION RH                        | R5        | EL-ILL                        |
|         | AIR BAG DIAGNOSIS SENSOR UNIT                        | Z4        | RS-SRS                        |
| F18/F19 | A/T CONTROL UNIT                                     | F103      | AT-A/T                        |
|         | CONDENSER  | F22       | EC-IGN/SG                     |
|         | ECM (ECCS CONTROL MODULE)                            | F101      | EC-MAIN AT-A/T                |
|         | IACV-FICD SOLENOID VALVE-1                           | F12       | EC-FICD                       |
|         | IGNITION COIL NO. 1                                  | F3        | EC-IGN/SG                     |
|         | IGNITION COIL NO. 2                                  | F31       | EC-IGN/SG                     |
|         | IGNITION COIL NO. 3                                  | F4        | EC-IGN/SG                     |
|         | IGNITION COIL NO. 4                                  | F30       | EC-IGN/SG                     |
|         | IGNITION COIL NO. 5                                  | F6        | EC-IGN/SG                     |
|         | IGNITION COIL NO. 6                                  | F29       | EC-IGN/SG                     |
|         | INHIBITOR SWITCH                                     | F51       | AT-A/T EL-START EL-ASCD       |
|         | NEUTRAL POSITION SWITCH                              | F32       | EC-PNP/SW                     |
|         | POWER STEERING OIL PRESSURE SWITCH                   | F1        | EC-PST/SW                     |
|         | SHIELD WIRE [CAMSHAFT POSITION SEN-<br>SOR (PHASE)]  | F15       | EC-PHASE                      |
|         | SHIELD WIRE [CRANKSHAFT POSITION SEN-<br>SOR (POS)]  | F112      | EC-POS                        |
|         | SHIELD WIRE [CRANKSHAFT POSITION SENSOR (REF)]       | F136      | EC-REF                        |
|         | SHIELD WIRE [FRONT HEATED OXYGEN SENSOR (Left bank)] | F28       | EC-FRO2LH EC-FUELLH EC-FO2H-L |
|         | SHIELD WIRE FRONT HEATED OXYGEN SENSOR (Right bank)] | F2        | EC-FRO2RH EC-FUELRH EC-FO2H-R |
|         | SHIELD WIRE (KNOCK SENSOR)                           | F122      | EC-KS                         |
|         | SHIELD WIRE (MASS AIR FLOW SENSOR)                   | F33       | EC-MAFS                       |
|         | SHIELD WIRE (THROTTLE POSITION SENSOR)               | F8        | EC-TPS AT-A/T                 |
|         | SHIELD WIRE (ABSOLUTE PRESSURE SENSOR)               | F45       | EC-AP/SEN                     |
|         | DATA LINK CONNECTOR FOR GST                          | M63       | EC-MIL/DL                     |
|         | FUEL PUMP  | B21       | EC-F/PUMP                     |
|         | SHIELD WIRE (FUEL TANK PRESSURE SENSOR)              | B52       | EC-PRE/SE                     |

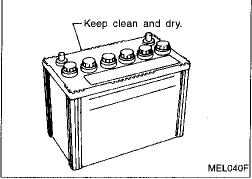
**EL-22** 1226

| EARTH   | CONNECT TO  | CONN. NO. | CELL CORD   |
|---------|---|-----------|---|
| B16/B19 | SHIELD WIRE (REAR HEATED OXYGEN SENSOR)           | B9        | EC-RRO2   |
|         | DROPPING RESISTOR                                 | B26       | EC-F/PUMP   |
|         | FRONT DOOR SWITCH LH                              | B18       | EL-BUZZER EL-MULTI RS-SRS<br>EL-ROOM/L EL-D/LOCK EL-THEFT |
|         | FRONT DOOR SWITCH RH                              | B15       | EL-D/LOCK EL-THEFT  |
|         | FUEL TANK GAUGE UNIT                              | B22       | EL-METER EL-WARN EC-TFTS                                  |
|         | FUEL PUMP CONTROL MODULE                          | B25 ·     | EC-FPCM EC-F/PUMP   |
|         | HEATED SEAT SWITCH LH                             | B11       | EL-HSEAT  |
| 4.      | HEATED SEAT SWITCH RH                             | B12       | EL-HSEAT  |
|         | HEATED SEAT LH                                    | B8        | EL-HSEAT  |
|         | HEATED SEAT RH                                    | B13       | EL-HSEAT  |
|         | REAR SPEAKER LH                                   | B37       | EL-AUDIO  |
|         | REAR SPEAKER RH                                   | B41       | EL-AUDIO  |
|         | SEAT BELT BUCKLE SWITCH                           | B7        | EL-WARN EL-BUZZER   |
|         | TELEPHONE (TELEPHONE PRE WIRE)                    | B54       | EL-PHONE  |
|         | TRUNK LID COMBINATION LAMP LH                     | B30       | EL-TAIL/L EL-STOP/L EL-BACK/L                             |
|         | TRUNK LID COMBINATION LAMP RH                     | B33       | EL-TAIL/L EL-STOP/L EL-BACK/L                             |
|         | REAR DOOR LOCK ACTUATOR LH                        | D55       | EL-D/LOCK EL-MULTI EL-THEFT                               |
|         | REAR DOOR LOCK ACTUATOR RH                        | D75       | EL-D/LOCK EL-MULTI EL-THEFT                               |
|         | REAR LH DOOR CONTROL UNIT (LCU04)                 | D53       | EL-COMM EL-WINDOW EL-D/LOCK                               |
|         | REAR RH DOOR CONTROL UNIT (LCU03)                 | D73       | EL-COMM EL-WINDOW EL-D/LOCK                               |
| T6/T9   | HIGH-MOUNTED STOP LAMP (With rear air spoiler)    | B29       | EL-STOP/L   |
|         | HIGH-MOUNTED STOP LAMP (Without rear air spoiler) | B40       | EL-STOP/L   |
|         | POWER SEAT LH                                     | B6        | EL-SEAT   |
|         | POWER SEAT RH                                     | B14       | EL-SEAT   |
|         | REAR SPEAKER LH                                   | B37       | EL-AUDIO  |
|         | REAR SPEAKER RH                                   | B41       | EL-AUDIO  |
|         | TELEPHONE PRE-WIRE                                | B54       | EL-PHONE  |
|         | TRUNK LID KEY CYLINDER SWITCH                     | B32       | EL-THEFT  |
|         | TRUNK ROOM LAMP SWITCH                            | B31       | EL-INT/L EL-THEFT   |
|         | REAR LH DOOR CONTROL UNIT (LCU04)                 | D53       | EL-COMM EL-THEFT  |
|         | REAR RH DOOR CONTROL UNIT (LCU03)                 | D73       | EL-COMM EL-THEFT  |
|         | HEATED SEAT SWITCH RH                             | B12       | EL-HSEAT  |
|         | REAR WINDOW DEFOGGER                              | B35       | EL-DEF  |
|         | LICENSE PLATE LAMP                                | T8        | EŁ-TAIL/L   |
|         | MULTI-REMOTE CONTROL UNIT (LCU05)                 | T12 .     | EL-COMM EL-MULTI EL-THEFT                                 |
|         | POWER ANTENNA TIMER                               | T13       | EL-P/ANT  |
|         | REAR COMBINATION LAMP LH                          | T4        | EL-TAIL/L EL-STOP/L EL-TURN                               |
| 4       | REAR COMBINATION LAMP RH                          | T10       | EL-TAIL/L EL-STOP/L EL-TURN                               |
|         | REAR SIDE MARKER LAMP LH                          | Т3        | EL-TAIL/L   |
|         | REAR SIDE MARKER LAMP RH                          | T11       | EL-TAIL/L   |

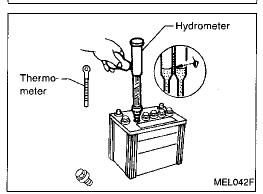
**EL-23** 1227

#### **CAUTION:**

- a. If it becomes necessary to start the engine with a booster battery and jumper cables, use a 12-volt booster battery.
- b. After connecting battery cables, ensure that they are tightly clamped to battery terminals for good contact.
- Never add distilled water through the hole used to check specific gravity.



# Remove negative terminal. MEL041F



#### **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.
   This also applies to batteries designated as "low maintenance" and "maintenance-free".
- When the vehicle is not going to be used over a long period of time, disconnect the negative battery terminal. (If the vehicle has an extended storage switch, turn it off.)

 Check the condition of the battery by checking the specific gravity of the electrolyte.

#### CHECKING ELECTROLYTE LEVEL

#### WARNING:

Do not allow battery fluid to come in contact with skin, eyes, fabrics, or painted surfaces. After touching a battery, do not touch or rub your eyes until you have thoroughly washed your hands. If the acid contacts the eyes, skin or clothing, immediately flush with water for 15 minutes and seek medical attention.

Normally the battery does not require additional water. However, when the battery is used under severe conditions, adding distilled water may be necessary during the battery life.

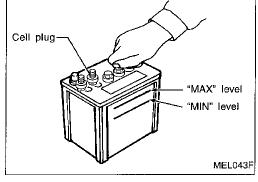
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#### **BATTERY**

## Cell plug-"MAX" level "MIN" level

#### **How to Handle Battery (Cont'd)**

- Remove the cell plug using a suitable tool.
- Add distilled water up to the MAX level.



Charging voltage

Charging current

Normal battery ---- Sulphated battery

Charging voltage

Charging current

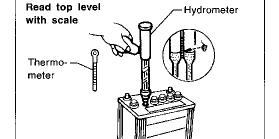
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#### **SULPHATION**

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 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 stages of charging.



Duration of charge

#### SPECIFIC GRAVITY CHECK

Read hydrometer and thermometer indications at eye level.

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#### **BATTERY**

#### **How to Handle Battery (Cont'd)**

• Use the chart below to correct your hydrometer reading according to electrolyte temperature.

#### **Hydrometer temperature correction**

| Battery electrolyte temperature °C (°F) | Add to specific gravity reading |
|---|---------------------------------|
| 71 (160)                                | 0.032                           |
| 66 (150)                                | 0.028                           |
| 60 (140)                                | 0.024                           |
| 54 (129)                                | 0.020                           |
| 49 (120)                                | 0.016                           |
| 43 (110)                                | 0.012                           |
| 38 (100)                                | 0.008                           |
| 32 (90)                                 | 0.004                           |
| 27 (80)                                 | 0                               |
| 21 (70)                                 | -0.004                          |
| 16 (60)                                 | -0.008                          |
| 10 (50)                                 | -0.012                          |
| 4 (39)                                  | -0.016                          |
| -1 (30)                                 | -0.020                          |
| -7 (20)                                 | -0.024                          |
| -12 (10)                                | -0.028                          |
| -18 (0)                                 | -0.032                          |

| Corrected specific gravity | Approximate charge condition |
|----------------------------|------------------------------|
| 1.260 - 1.280              | Fully charged                |
| 1.230 - 1.250              | 3/4 charged                  |
| 1.200 - 1.220              | 1/2 charged                  |
| 1.170 - 1.190              | 1/4 charged                  |
| 1.140 - 1.160              | Almost discharged            |
| 1.110 - 1.130              | Completely discharged        |
|                            |                              |

#### **CHARGING THE BATTERY**

#### CAUTION:

- a. Do not "quick charge" a fully discharged battery.
- b. Keep the battery away from open flame while it is being charged.
- c. When connecting the charger, connect the leads first, then turn on the charger. Do not turn on the charger first, as this may cause a spark.
- d. If battery electrolyte temperature rises above 60°C (140°F), stop charging. Always charge battery at a temperature below 60°C (140°F).

#### Charging rates:

| Amps | Time     |
|------|----------|
| 50   | 1 hour   |
| 25   | 2 hours  |
| 10   | 5 hours  |
| 5    | 10 hours |

Do not charge at more than 50 ampere rate.

1230

#### **BATTERY**

## How to Handle Battery (Cont'd)

Note: The ammeter reading on your battery charger will automatically decrease as the battery charges. This indicates that the voltage of the battery is increasing normally as the state of charge improves. The charging amps indicated above refer to initial charge rate.

• If, after charging, the specific gravity of any two cells varies more than .050, the battery should be replaced.

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#### **MEMORY RESET**

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If the battery is disconnected or goes dead, the following items must be reset:

EM

- Radio AM and FM preset
- Clock
- AUTO temperature setting trimmer

LC

## Service Data and Specifications (SDS)

EC

| Applied area                          |      | US       | Canada |          |  |
|---------------------------------------|------|----------|--------|----------|--|
| Applied area                          |      | Standard | Option | Standard |  |
| Туре                                  |      | 55D23L   | 800    | 26L      |  |
| Capacity                              | V-AH | 12-60    | 12     | -65      |  |
| Cold cranking current (For reference) | А    | 356      | 58     | 32       |  |

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### **System Description**

#### M/T MODELS

#### For models with theft warning system

Power is supplied at all times

- to ignition switch terminal (1)
- through 30A fusible link (letter h, located in the fuse and fusible link box).

With the ignition switch in the START position, power is supplied

- through terminal (5) of the ignition switch
- to clutch interlock relay terminal (3).

With the ignition switch in the ON or START position, power is supplied

- through 10A fuse [No. 17], located in the fuse block (J/B)]
- to theft warning relay terminal (1)

With the ignition switch in the START position, power is supplied

- through 7.5A fuse [No. 33], located in the fuse block (J/B)]
- to theft warning relay terminal (3)

If the theft warning system is not triggered, power is supplied

- through theft warning relay terminal (4)
- to clutch interlock relay terminal 1.

When the clutch pedal is depressed, ground is supplied to clutch interlock relay terminal (2) through the clutch interlock switch and body grounds (M13) and (M73).

The clutch interlock relay is energized and power is supplied

- from terminal (5) of the clutch interlock relay
- to terminal 1 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 cylinder block. With power and ground supplied, the starter motor operates. If the theft warning system is triggered, terminal ② of the theft warning relay is grounded and power to the clutch interlock relay is interrupted.

#### For models without theft warning system

Theft warning relay acts just as a path circuit between 7.5A fuse [No. 33], located in the fuse block (J/B)] and clutch interlock relay.

#### A/T MODELS

Power is supplied at all times

- to ignition switch terminal (1)
- through 30A fusible link (letter in letter i

#### With theft warning system

With the ignition switch in the ON or START position, power is supplied

- through 10A fuse [No. 17], located in the fuse block (J/B)]
- to theft warning relay terminal (1) and (3).

Also, with the ignition switch in the START position, power is supplied

- from ignition switch terminal (5)
- to inhibitor relay terminal 6

If the theft warning system is not triggered, power is supplied

- through theft warning relay terminal (4)
- to inhibitor relay terminal (1)

#### Without theft warning system

With the ignition switch in the ON or START position, power is supplied

- through 10A fuse [No. 17], located in the fuse block (J/B)]
- to inhibitor relay terminal (1).

Also, with the ignition switch in the START position, power is supplied

- from ignition switch terminal (5)
- to inhibitor relay terminal 6

With the selector lever in the P or N position, ground is supplied

• to inhibitor relay terminal (2) through the inhibitor switch and body grounds (FIB) and (FIB).

Then inhibitor relay is energized and power is supplied

- from ignition switch terminal (5)
- to terminal (1) of the starter motor windings

## STARTING SYSTEM

## System Description (Cont'd)

• through inhibitor relay terminals (6) and (7)

The starter motor plunger closes and provides a closed circuit between the battery and the starter motor. The starter motor is grounded to the cylinder block. With power and ground supplied, the starter motor operates. If the theft warning system is triggered, terminal ② of the theft warning relay is grounded and power to the inhibitor relay terminal ① is interrupted.

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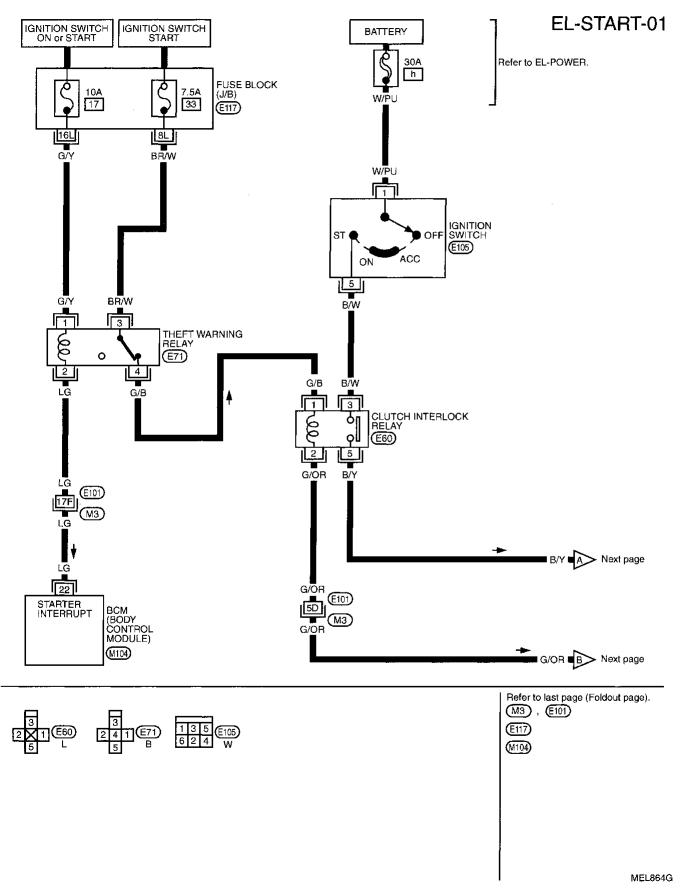
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## Wiring Diagram — START —

#### M/T MODELS



## Wiring Diagram — START — (Cont'd)



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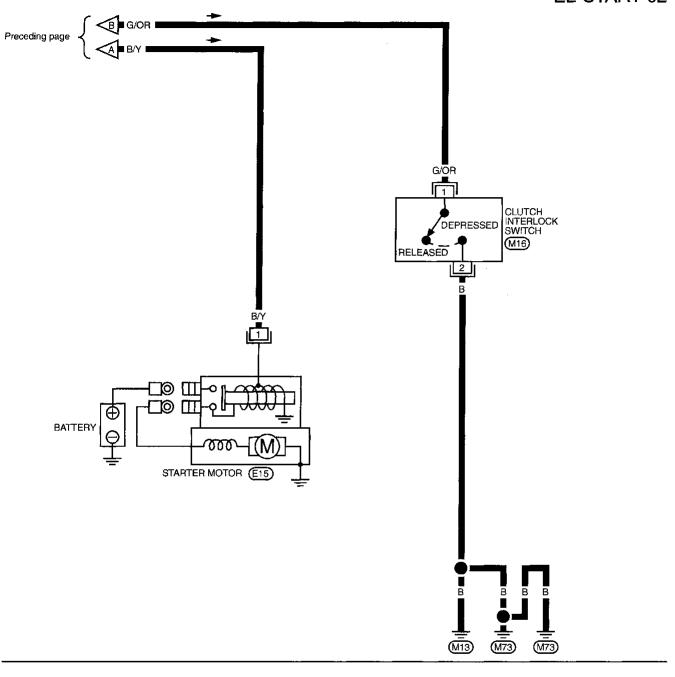
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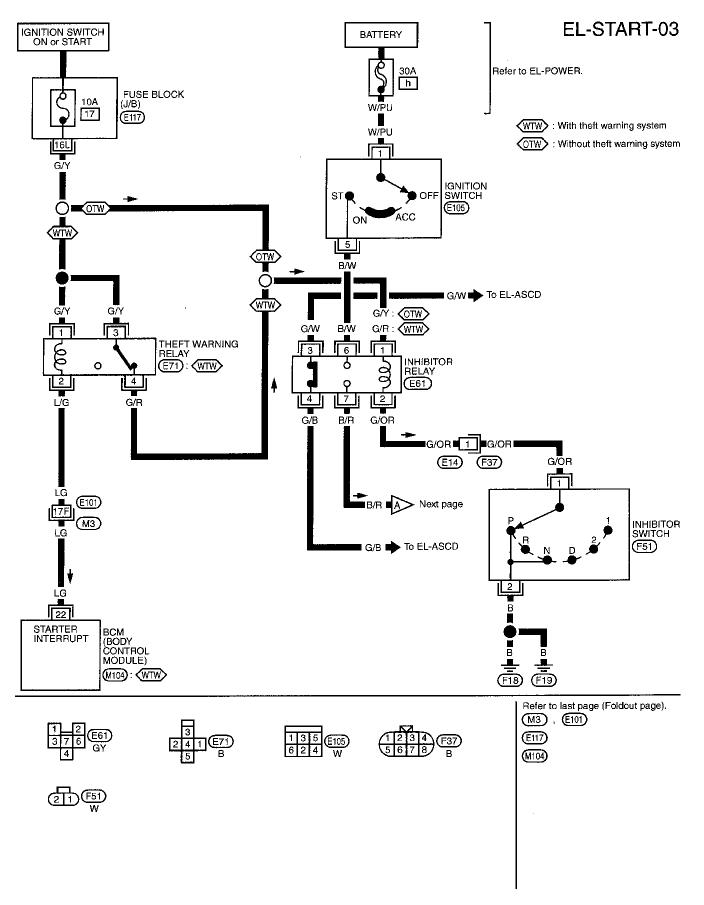


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## Wiring Diagram — START — (Cont'd)

#### A/T MODELS



## **STARTING SYSTEM**

## Wiring Diagram — START — (Cont'd)

## **EL-START-04**

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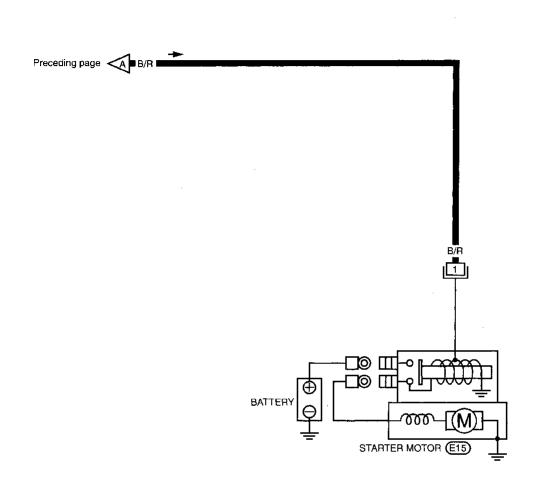
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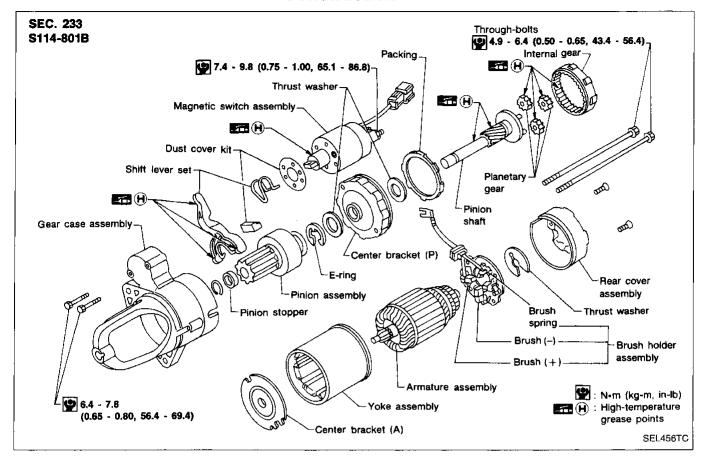
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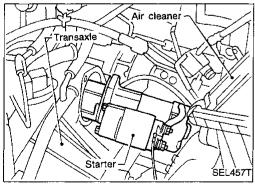
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#### Construction





# 77.5 - 98.1 (7.9 - 10.0, 57.1 - 72.3) 30.4 - 41.2 (3.1 - 4.2, 22.4 - 30.4) (3.1 - 4.2, 22.4 - 30.4)

## Removal and Installation

#### **REMOVAL**

- 1. Remove air duct assembly.
- Disconnect starter harness.
- Remove starter bolts (two).
- 4. Remove starter.

#### INSTALLATION

To install, reverse the removal procedure.

#### STARTING SYSTEM

### 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 MA smoothly in the opposite direction.
- If it locks or rotates in both directions, or unusual resistance is evident, replace.

# Service Data and Specifications (SDS) STARTER

|  |            | S114-801B                               | EC         |
|--|------------|---|------------|
| Туре   |            | HITACHI make                            | _          |
|  |            | Reduction gear type                     | —<br>FE    |
| System voltage                                   | ٧          | 12                                      | _          |
| No-load  |            |   | –<br>Cl    |
| Terminal voltage                                 | V          | 11.0                                    | <b>©</b> G |
| Current  | Α          | Less than 90                            |            |
| Revolution                                       | rpm        | More than 2,700                         | – MT       |
| Minimum diameter of commutator                   | mm (in)    | 28 (1.10)                               | _          |
| Minimum length of brush                          | mm (in)    | 10.5 (0.413)                            | AT         |
| Brush spring tension                             | N (kg, lb) | 12.7 - 17.7<br>(1.3 - 1.8, 2.9 - 4.0)   | –<br>– Fa  |
| Clearance of bearing metal and are               | mature     | , | — :ræ      |
| shaft  | mm (in)    | Less than 0.2 (0.008)                   | RA         |
| Clearance between pinion front ed pinion stopper |            | 0.3 - 2.5 (0.012 - 0.098)               | UNA        |
|  | mm (in)    |   | _ BR       |

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#### **CHARGING SYSTEM**

## **System Description**

The alternator provides DC voltage to operate the vehicle's electrical system and to keep the battery charged. AC voltage is converted into DC voltage by the diode assembly in the alternator.

Power is supplied at all times to alternator terminal (§) through:

- 120A (For California) or 140A (Except for California) fusible link (letter a, located in the fuse and fusible link box), and
- 7.5A fuse (No. 60, located in the fuse and fusible link box).

Voltage output through alternator terminal **(B)**, is controlled by the IC regulator at terminal **(S)**. The charging circuit is protected by the 120A or 140A fusible link.

Terminal (E) of the alternator supplies ground through body ground (E35).

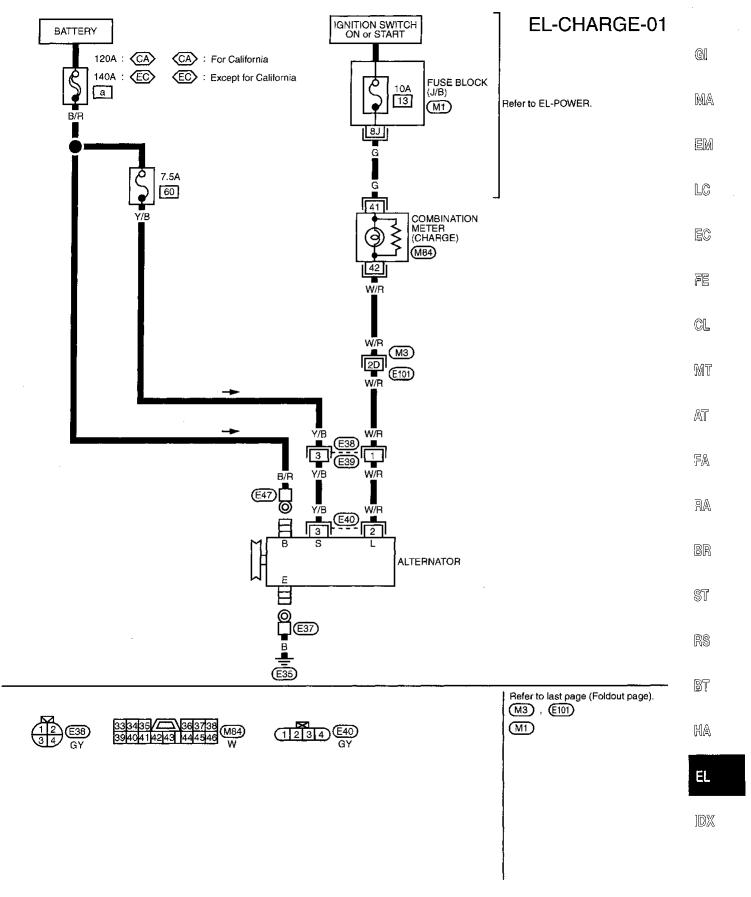
With the ignition switch in the ON or START position, power is supplied

- through 10A fuse [No. 13], located in the fuse block (J/B)]
- to combination meter terminal (4) for the charge warning indicator.

Ground is supplied to terminal ② of the combination meter through terminal ① of the alternator. With power and ground supplied, the charge warning indicator will illuminate. When the alternator is providing sufficient voltage, the ground is opened and the charge warning indicator will go off.

If the charge warning indicator illuminates with the engine running, a malfunction is indicated. Refer to "Trouble Diagnoses" (EL-38).

## Wiring Diagram — CHARGE —

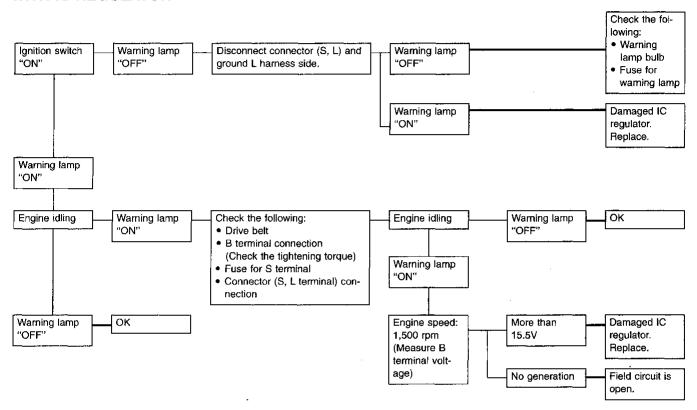


### **Trouble Diagnoses**

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, inspect the fusible link.
- Use fully charged battery.

#### WITH IC REGULATOR



Warning lamp: "CHARGE" warning lamp in combination meter

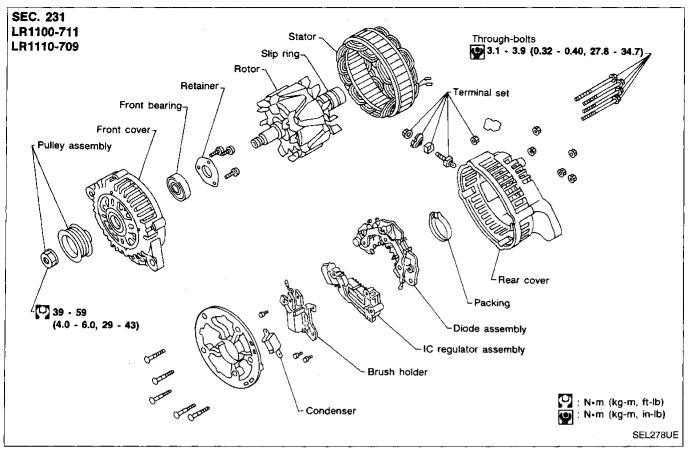
★: When field circuit is open, check condition of rotor coil, rotor slip ring and brush. If necessary, replace faulty parts with new ones.

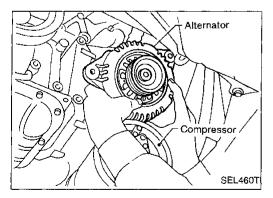
#### MALFUNCTION INDICATOR

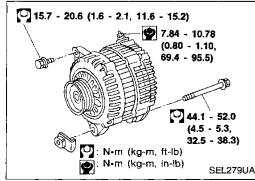
The IC regulator warning function activates to illuminate "CHARGE" warning lamp, if any of the following symptoms occur while alternator is operating:

- B terminal is disconnected.
- S terminal is disconnected or related circuit is open.
- Field circuit is open.
- Excessive voltage is produced.

#### Construction







# Removal and Installation REMOVAL

- 1. Remove engine undercover RH.
- Remove side inspection cover RH.
- 3. Loosen belt idler pulley.
- 4. Remove drive belt.
- 5. Remove A/C compressor mounting bolts (four).
- 6. Remove cooling fan and fan shroud.
- 7. Slide A/C compressor forward.
- 8. Disconnect alternator harness connector.
- 9. Remove alternator upper bolt and lower bolt.

#### **INSTALLATION**

To install, reverse the removal procedure.

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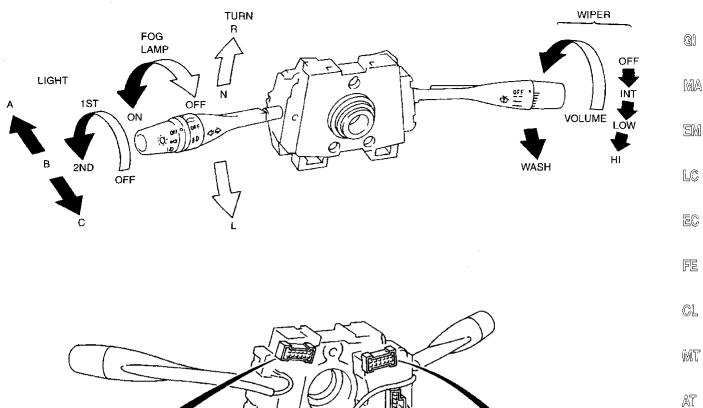
**EL-40** 

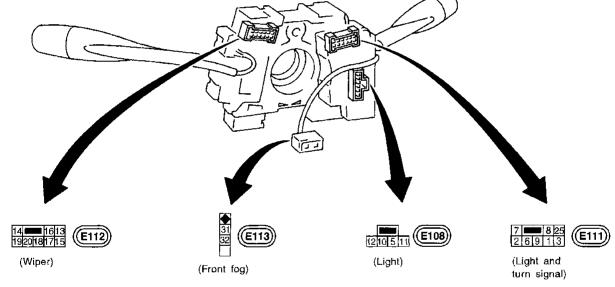
# Service Data and Specifications (SDS) ALTERNATOR

| Туре  |           | LR1100-711   | LR1110-709  |  |  |
|---|-----------|--|---|--|--|
| туре  |           | HITACH   | H make  |  |  |
| Applied model   |           | Standard   | Option  |  |  |
| Nominal rating  | V-A       | 12-100   | 12-110  |  |  |
| Ground polarity   |           | Neg  | ative   |  |  |
| Minimum revolution under no-lo (When 13.5 volts is applied) | ad<br>rpm | Less tha   | an 1,000  |  |  |
| Hot output current<br>(When 13.5 volts is applied)          | A/rpm     | More than 35/1,300<br>More than 83/2,500<br>More than 95/9,000 | More than 35/1,300<br>More than 85/2,500<br>More than 110/9,000 |  |  |
| Regulated output voltage                                    | ٧         | 14.1   | - 14.7  |  |  |
| Minimum length of brush                                     | mm (in)   | More than 6  | .00 (0.2362)  |  |  |
| Brush spring pressure                                       | N (g, oz) | 1.000 - 3.432 (102 - 350, 3.60 - 12.34)                        |   |  |  |
| Slip ring minimum diameter                                  | mm (in)   | More than 2  | 26.0 (1.024)  |  |  |
| Rotor (field coil) resistance                               | Ω         | 2.31   |   |  |  |

1244

## **Combination Switch/Check**



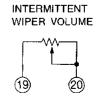


| V  | ( | )FI | F          |   | 1 |   |   | 2       |   |
|----|---|-----|------------|---|---|---|---|---------|---|
|    | Α | ₿   | Ç          | Α | В | С | Α | В       | С |
| 5  |   |     | Q          |   |   | Q | Q | Q       | Ç |
| 6  |   |     | $\Diamond$ |   |   | Ō | Ò | $\prod$ | Ċ |
| 7  |   |     |            |   |   |   |   | Ō.      |   |
| 8  |   |     | Ó          |   |   | Q | Q | Q       | Ç |
| 9  |   |     | Q          |   |   | Ò | Ò |         | Č |
| 10 |   |     |            |   |   |   |   | Ō       |   |
| 11 |   |     |            | Q | Q | Q | 0 | Q       | Ç |
| 12 |   | _   |            | Ō | Ō | Ō | Ó | Ō       | Ċ |

| - [ |    | OFF   | INT | LO | HI | WASH |
|-----|----|-------|-----|----|----|------|
|     | 13 | Q     | Q   |    |    | Ī    |
| Į   | 14 | Ò     | Ŏ   | Q  |    |      |
|     | 15 |       | Q   |    |    |      |
|     | 16 |       |     | П  | Q  |      |
| [   | 17 |       | Ŏ   | Ò  | Ò  | Q    |
| [   | 18 |       |     |    |    |      |
|     |    | N SIG |     |    |    |      |

WIPER SWITCH

| 10 | 6     | !             |   | Q |   |
|----|-------|---------------|---|---|---|
| 1  | 7     | 0             | Ò | Ò | Q |
| 1  | 3     |               |   |   | Ò |
|    | IP SV | GNAL<br>VITCH |   |   |   |



|    | NT F |    |
|----|------|----|
|    | OFF  | ON |
| 31 |      | Ŷ  |

|    | OFF | ON |
|----|-----|----|
| 31 |     | Ŷ  |
| 32 |     | Ò  |

EL

FA

 $\mathbb{R}\mathbb{A}$ 

BR

ST

RS

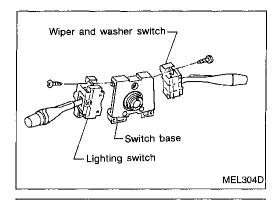
BT

HA

DX

MEL868G

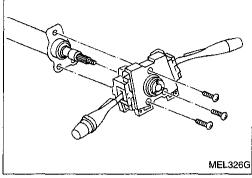
## **COMBINATION SWITCH**



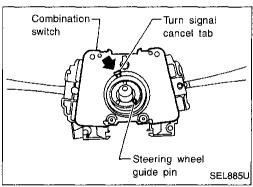
## Replacement

For removal and installation of spiral cable, refer to RS section ["Installation — Air Bag Module and Spiral Cable", "SUPPLE-MENTAL RESTRAINT SYSTEM (SRS)"].

 Each switch can be replaced without removing combination switch base.

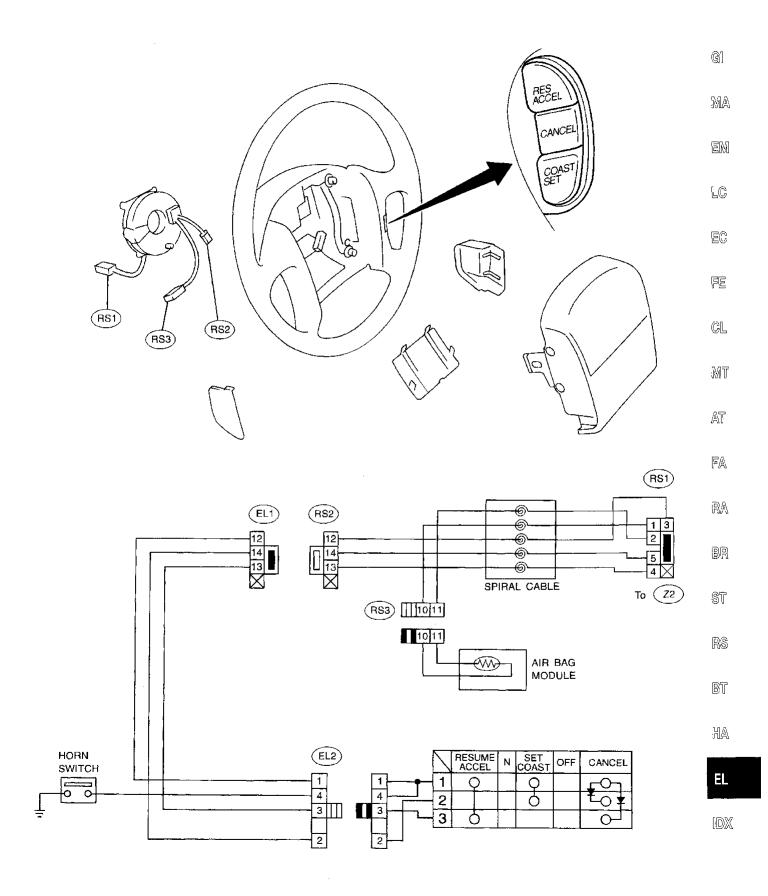


 To remove combination switch base, remove base attaching screw.



 Before installing the steering wheel, align the turn signal cancel tab with the notch of combination switch.

## Steering Switch/Check



#### **HEADLAMP**

## System Description (For USA)

Power is supplied at all times

- through 15A fuse (No. 54, located in the fuse and fusible link box)
- to lighting switch terminal (5), and through 15A fuse (No. 53, located in the fuse and fusible link box)
- to lighting switch terminal (8).

When the lighting switch is turned to the 2ND and LOW ("B") position, power is supplied

- from lighting switch terminal (10)
- to terminal (2) of the LH headlamp, and
- from lighting switch terminal (7)
- to terminal (2) of the RH headlamp.

Terminal (3) of each headlamp supplies ground through body grounds (55) and (530).

With power and ground supplied, the headlamps will illuminate.

When the lighting switch is placed in the 2ND and HIGH ("A") or PASS ("C") position, power is supplied

- from lighting switch terminal (9)
- to terminal (1) of the LH headlamp, and
- to combination meter terminal (21) for the HIGH BEAM indicator, and
- from lighting switch terminal (6)
- to terminal (1) of the RH headlamp.

Ground is supplied to terminal (3) of the combination meter through body grounds (413) and (413).

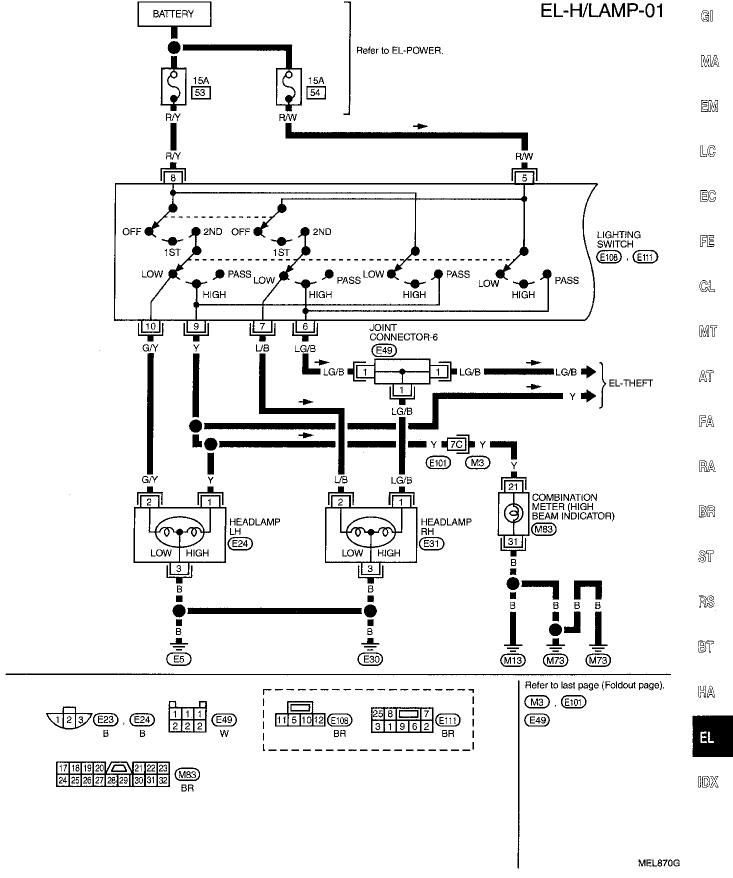
With power and ground supplied, the high beams and the HIGH BEAM indicator illuminate.

#### With theft warning system

The theft warning system will flash the high beams if the system is triggered. Refer to "THEFT WARNING SYSTEM — IVMS" (EL-261).

## Wiring Diagram — H/LAMP —

#### FOR U.S.A.



## **HEADLAMP**

## Trouble Diagnoses (For USA)

| Symptom   | Possible cause  | Repair order   |
|---|---|--|
| LH headlamps do not operate.                                | 1. Bulb 2. Grounds (E5) and (E30) 3. 15A fuse 4. Lighting switch                          | <ol> <li>Check bulb.</li> <li>Check grounds (E5) and (E30).</li> <li>Check 15A fuse (No. 53), located in fusible link and fuse box). Verify battery positive voltage is present at terminal (a) of lighting switch.</li> <li>Check lighting switch.</li> </ol> |
| RH headlamps do not operate.                                | 1. Bulb 2. Grounds (E5) and (E30) 3. 15A fuse 4. Lighting switch                          | <ol> <li>Check bulb.</li> <li>Check grounds (E5) and (E30).</li> <li>Check 15A fuse (No. 54), located in fusible link and fuse box). Verify battery positive voltage is present at terminal (5) of lighting switch.</li> <li>Check lighting switch.</li> </ol> |
| LH high beam does not operate, but<br>LH low beam operates. | Bulb     Open in LH high beam circuit     Lighting switch                                 | <ol> <li>Check bulb.</li> <li>Check Y wire between lighting switch and LH head-lamp for an open circuit.</li> <li>Check lighting switch.</li> </ol>  |
| LH low beam does not operate, but LH high beam operates.    | Bulb     Open in LH low beam circuit     Lighting switch                                  | <ol> <li>Check bulb.</li> <li>Check G/Y wire between lighting switch and LH head-lamp for an open circuit.</li> <li>Check lighting switch.</li> </ol>  |
| RH high beam does not operate, but RH low beam operates.    | <ol> <li>Bulb.</li> <li>Open in RH high beam circuit</li> <li>Lighting switch.</li> </ol> | Check bulb.     Check LG/B wire between lighting switch and RH headlamp for an open circuit.     Check lighting switch.  |
| RH low beam does not operate, but RH high beam operates.    | Bulb     Open in RH low beam circuit     Lighting switch                                  | <ol> <li>Check bulb.</li> <li>Check L/B wire between lighting switch and RH head-lamp for an open circuit.</li> <li>Check lighting switch.</li> </ol>  |
| High beam indicator does not work.                          | 1. Bulb 2. Grounds (M13) and (M73) 3. Open in high beam circuit                           | <ol> <li>Check bulb in combination meter.</li> <li>Check grounds (M13) and (M73).</li> <li>Check Y wire between lighting switch and combination meter for an open circuit.</li> </ol>  |

#### **HEADLAMP**

## **System Description (For Canada)**

The headlamp system on vehicles for Canada contains a daytime light unit. The unit activates the high beam headlamps at approximately half illumination whenever the engine is running. If the parking brake is applied before the engine is started, the daytime lights will not be illuminated. The daytime lights will illuminate once the parking brake is released. After that, the daytime lights will continue to operate even when the parking GI brake is applied. Power is supplied at all times through 15A fuse (No. [53], located in the fuse and fusible link box) MA to daytime light control unit terminal (3) and to lighting switch terminal (8). Power is also supplied at all times through 15A fuse (No. 54, located in the fuse and fusible link box) to daytime light control unit terminal (2), to lighting switch terminal (5) and LC With the ignition switch in the ON or START position, power is supplied through 7.5A fuse [No. 12], located in the fuse block (J/B)] EC to daytime light control unit terminal (12). Ground is supplied to daytime light control unit terminal (9) through body grounds (E5) and (E30). FE **HEADLAMP OPERATION** Low beam operation When the lighting switch is moved to the 2ND and LOW ("B") position, power is supplied CL from lighting switch terminal (10) to LH headlamp terminal (2). Ground is supplied to LH headlamp terminal (3) through body grounds (5) and (59). MIT Also, when the lighting switch is moved to the 2ND and LOW ("B") position, power is supplied from lighting switch terminal (7) to RH headlamp terminal (2). AT Ground is supplied to RH headlamp terminal (3) from daytime light control unit terminal (7) FA through daytime light control unit terminal (9) through body grounds (E5) and (E30). With power and ground supplied, the low beam headlamps illuminate. RA High beam operation When the lighting switch is moved to the 2ND and HIGH ("A") or PASS ("C") position, power is supplied BR from lighting switch terminal (9) to LH headlamp terminal (1). Also, when the lighting switch is moved to the 2ND and HIGH ("A") or PASS ("C") position, power is supplied ST from lighting switch terminal (6) to daytime light control unit terminal (5) to combination meter terminal (21) for the high beam indicator RS through daytime light control unit terminal (6) to RH headlamp terminal (1). Ground is supplied in the same manner as low beam operation. BT Ground is supplied to terminal (31) of the combination meter through body grounds (MT3) and (MT3). With power and ground supplied, the high beam headlamps illuminate. HA **DAYTIME LIGHT OPERATION** With the engine running and the lighting switch in the OFF position, power is supplied to daytime light control unit terminal (3) through daytime light control unit terminal (6) to headlamp RH terminal (1) through headlamp RH terminal (3) IDX to daytime light control unit terminal (7) through daytime light control unit terminal (8)

1251

Because the high beam headlamps are now connected in series, they operate at half illumination.

Ground is supplied to headlamp LH terminal (3) through body grounds (5) and (53).

to headlamp LH terminal (1).

## **Operation (For Canada)**

After starting the engine with the lighting switch in the "OFF" position or "1ST" position, the headlamp high beam automatically turns on. Lighting switch operations other than the above are the same as conventional light systems.

| Ег                    | ngine                  |   |     | \ | Vith e | ngine : | stoppe | ed |     |   |   | •   | 1 | Vith e | ngine | runnin | g |     |   |
|-----------------------|------------------------|---|-----|---|--------|---------|--------|----|-----|---|---|-----|---|--------|-------|--------|---|-----|---|
| I (whaten a contacts  |                        |   | OFF |   |        | 1ST     |        |    | 2ND |   |   | OFF |   |        | 1ST   |        |   | 2ND |   |
| Lighting switch       |                        | Α | В   | С | Α      | В       | С      | Α  | В   | С | Α | В   | C | Α      | В     | С      | Α | В   | С |
| Llaadlama             | High beam              | Х | Х   | 0 | Х      | Х       | 0      | 0  | Х   | 0 | Δ | Δ*  | 0 | Δ*     | Δ*    | 0      | 0 | Х   | 0 |
| Headlamp              | Low beam               | Х | Х   | Х | Х      | Х       | Х      | Х  | 0   | Х | Х | Х   | Х | Х      | Х     | Х      | Х | 0   | Х |
| Clearance and tail la | amp                    | Х | Х   | Х | 0      | 0       | 0      | 0  | 0   | 0 | Х | Х   | Х | 0      | 0     | 0      | 0 | 0   | 0 |
| License and instrum   | nent illumination lamp | Х | х   | х | 0      | 0       | 0      | 0  | 0   | 0 | х | Х   | Х | 0      | 0     | 0      | 0 | 0   | 0 |

A: HIGH

B: LOW

C: PASS

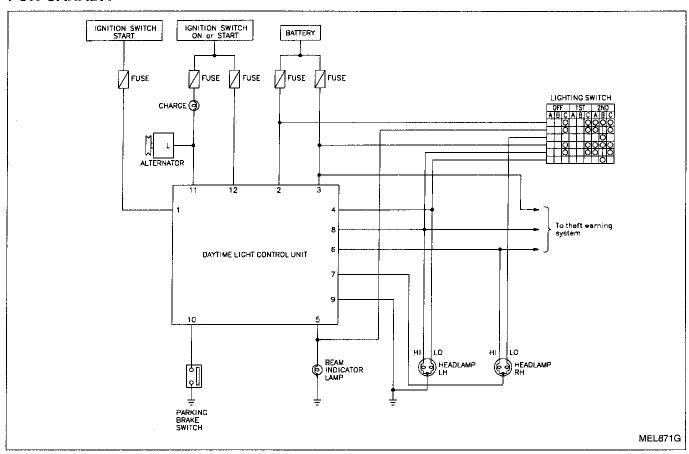
O: Lamp "ON" X: Lamp "OFF"

 $\triangle$ : Lamp dims.

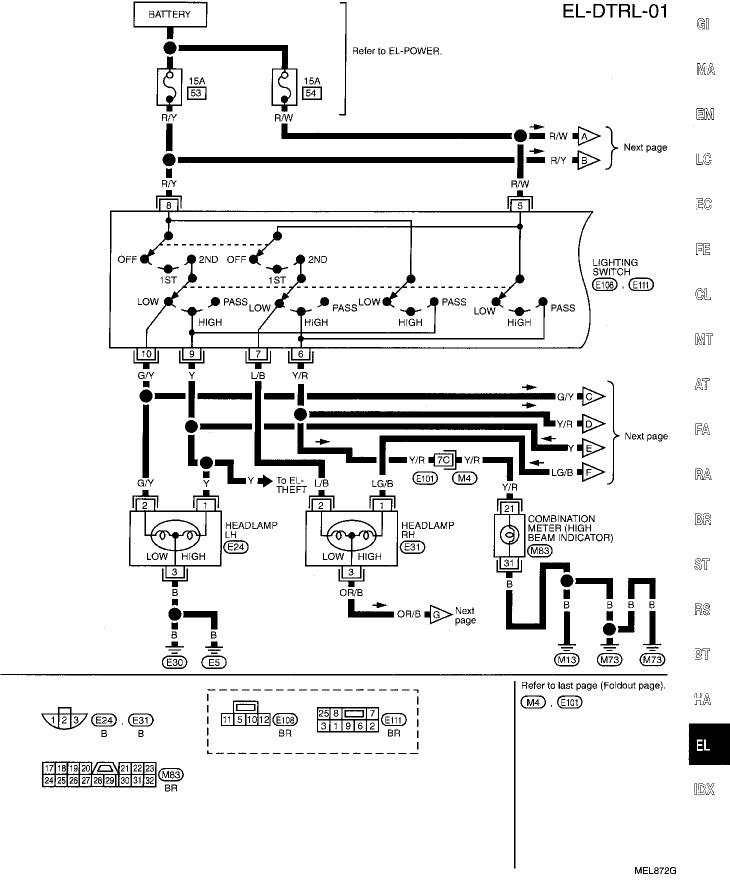
: When starting the engine with the parking brake released, the daytime lamp will come ON. When starting the engine with the parking brake pulled, the daytime lamp won't come ON.

#### **Schematic**

#### **FOR CANADA**

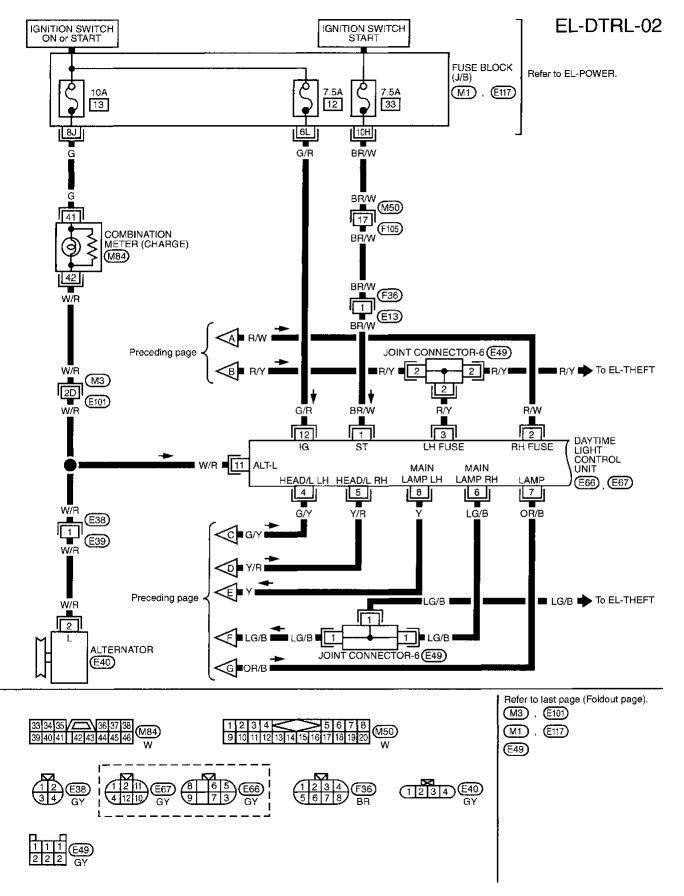


## Wiring Diagram (For Canada) — DTRL —



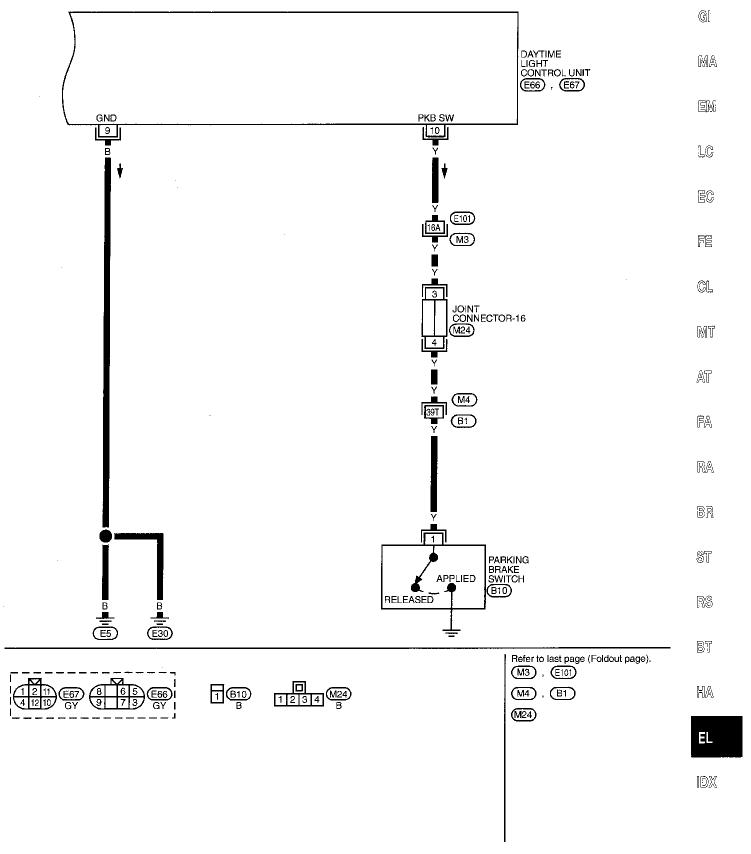
## **HEADLAMP**

# Wiring Diagram (For Canada) — DTRL — (Cont'd)



# Wiring Diagram (For Canada) — DTRL — (Cont'd)

## EL-DTRL-03



MEL705E

## **Trouble Diagnoses (For Canada)**

## **DAYTIME LIGHT CONTROL UNIT INSPECTION TABLE**

(Data are reference values.)

| Ter-<br>minal<br>No. | ltem                            | es.)    | Condition   | Judgement<br>standard        |
|----------------------|---------------------------------|---------|---|------------------------------|
| 1                    | Start signal                    | (Cs)    | When turning ignition switch to "ST"  | Battery positive voltage     |
|                      |                                 | Con     | When turning ignition switch to "ON" from "ST"  | 1V or less                   |
| :                    |                                 | Corp    | When turning ignition switch to "OFF"   | 1V or less                   |
| 2                    | Power source                    | CON     | When turning ignition switch to "ON"  | Battery positive voltage     |
|                      |                                 | (Corp.) | When turning ignition switch to "OFF"   | Battery positive voltage     |
| 3                    | Power source                    | Con     | When turning ignition switch to "ON"  | Battery positive voltage     |
|                      |                                 | (Cori   | When turning ignition switch to "OFF"   | Battery positive voltage     |
| 4                    | Lighting switch (Low beam)      |         | When turning lighting switch to "2ND" ("B")   | Battery positive voltage     |
| 5                    | Lighting switch<br>(High beam)  |         | When turning lighting switch to "HIGH" ("A")  | Battery positive voltage     |
| į                    |                                 |         | When turning lighting switch to "PASS" ("C")  | Battery positive voltage     |
| 6                    | RH high beam                    |         | When turning lighting switch to "HIGH" ("C")  | Battery positive voltage     |
|                      |                                 |         | When releasing parking brake with engine running and turning lighting switch to "OFF" (daytime light operation)  CAUTION: Block wheels and ensure selector lever is in N or P position. | Battery positive voltage     |
| 7                    | RH headlamp<br>control (ground) |         | When lighting switch is turned to "2ND" ("B")   | 1V or less                   |
|                      |                                 |         | When releasing parking brake with engine running and turning lighting switch to "OFF" (daytime light operation)  CAUTION: Block wheels and ensure selector lever is in N or P position. | Approx. half battery voltage |
| 8                    | LH high beam                    |         | When turning lighting switch to "HIGH" ("A")  | Battery positive voltage     |
|                      |                                 |         | When releasing parking brake with engine running and turning lighting switch to "OFF" (daytime light operation)  CAUTION: Block wheels and ensure selector lever is in N or P position. | Approx. half battery voltage |

## **HEADLAMP**

## Trouble Diagnoses (For Canada) (Cont'd)

| Ter-<br>minal<br>No. | Item                 |        | Condition                             | Judgement<br>standard    |
|----------------------|----------------------|--------|---------------------------------------|--------------------------|
| 9                    | Ground               |        | _                                     |                          |
| 10                   | Parking brake switch | 2      | When parking brake is released        | Battery positive voltage |
|                      |                      | (LON)  | When parking brake is set             | 1.5V or less             |
| 11                   | Alternator           | (Con)  | When turning ignition switch to "ON"  | 1V or less               |
|                      |                      |        | When engine is running                | Battery positive voltage |
|                      |                      | COFF   | When turning ignition switch to "OFF" | 1V or less               |
| 12                   | Power source         | (CON)  | When turning ignition switch to "ON"  | Battery positive voltage |
|                      |                      |        | When turning ignition switch to "ST"  | Battery positive voltage |
|                      |                      | (COFF) | When turning ignition switch to "OFF" | 1V or less               |

G!

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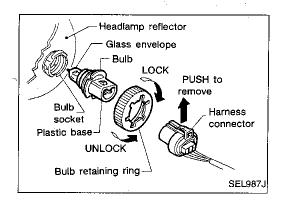
RS

BT

HA

EL

IDX



### **Bulb Replacement**

The headlamp is a semi-sealed beam type which uses a replaceable halogen bulb. The bulb can be replaced from the engine compartment side without removing the headlamp body.

- Grasp only the plastic base when handling the bulb. Never touch the glass envelope.
- 1. Disconnect the battery cable.
- 2. Turn the bulb retaining ring counterclockwise until it is free from the headlamp reflector, and then remove it.
- 3. Disconnect the harness connector from the back side of the bulb.
- 4. Remove the headlamp bulb carefully. Do not shake or rotate the bulb when removing it.
- 5. Install in the reverse order of removal.

#### **CAUTION:**

 Do not leave the bulb out of the headlamp reflector for a long period of time. Dust, moisture, smoke, etc. entering headlamp may affect the performance of the headlamp. Remove headlamp bulb from the headlamp reflector just before a replacement bulb is installed.

#### **Bulb Specifications**

| Item                         | Wattage (W) |
|------------------------------|-------------|
| Semi-sealed beam<br>High/Low | 60/55       |

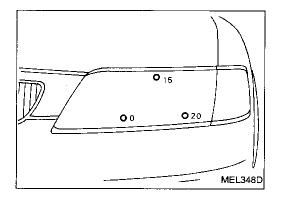
### **Aiming Adjustment**

When performing headlamp aiming adjustment, use an aiming machine, aiming wall screen or headlamp tester. Aimers should be in good repair, calibrated and operated in accordance with respective 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.

- a. Keep all tires inflated to correct pressures.
- b. Place vehicle and tester on one and same flat surface.
- c. See that there is no-load in vehicle (coolant, engine oil filled up to correct level and full fuel tank) other than the driver (or equivalent weight placed in driver's position).



#### AIMER ADJUSTMENT MARK

When using a mechanical aimer, adjust adapter legs to the data marked on the headlamps.

#### Adjustment value for mechanical aimer

|                 | Mechanical aimer level |
|-----------------|------------------------|
| Horizontal side | -4 to 4                |
| Vertical side   | -4 to 4                |

### **HEADLAMP**

## Aiming Adjustment (Cont'd) **LOW BEAM** 1. 2.



Use adjusting screws to perform aiming adjustment.

First tighten the adjusting screw all the way and then make adjustment by loosening the screw.

GI

MA

EM

If the vehicle front body has been repaired and/or the headlamp assembly has been replaced, check aiming. Use the aiming chart LC shown in the figure.

Upper edge and left edge of high intensity zone should be within the range shown at left. Adjust headlamps accord-

EC

Dotted lines in illustration show center of headlamp.

"H": Horizontal center line of headlamps

"W<sub>L</sub>": Distance between each headlamp center

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MT

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BR

ST

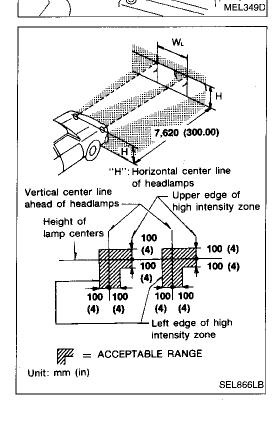
RS

BT

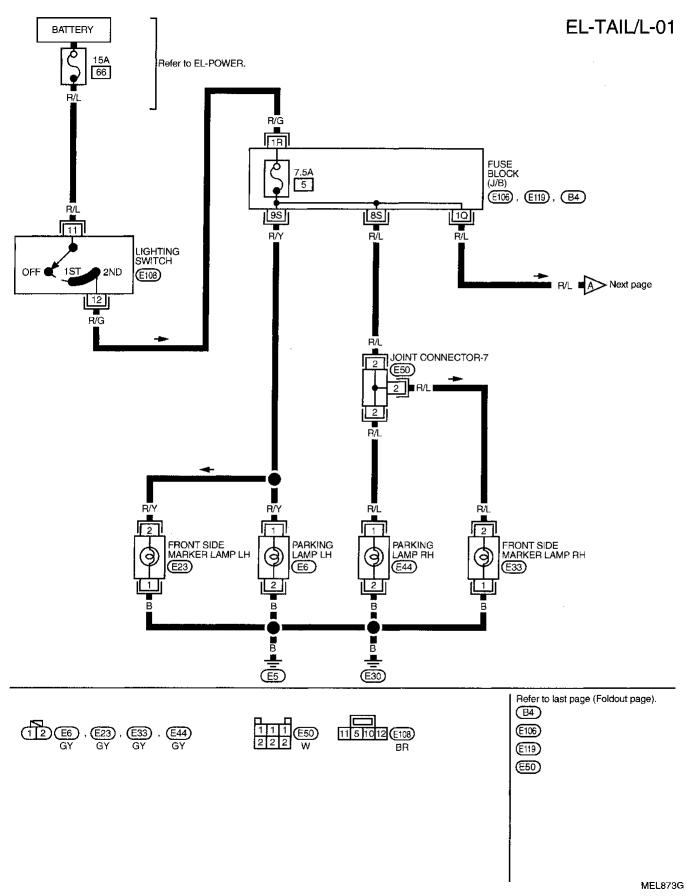
HA



1DX



# Parking, License and Tail Lamps/Wiring Diagram — TAIL/L —



# Parking, License and Tail Lamps/Wiring Diagram — TAIL/L — (Cont'd)

#### EL-TAIL/L-02

**G** 

MA

EM

LC

EC

FE

GL

MT

Æ

 $\mathbb{F}\!\mathbb{A}$ 

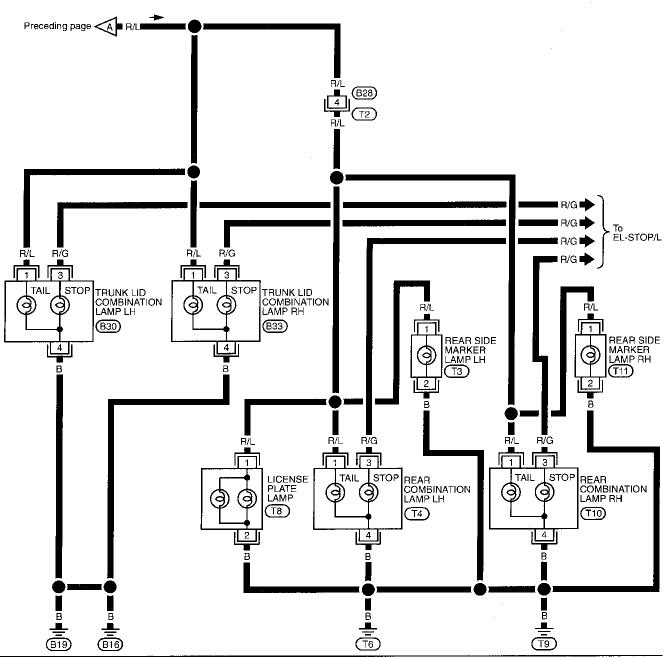
RA

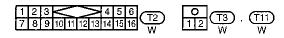
BR

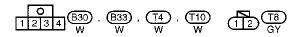
ST

RS

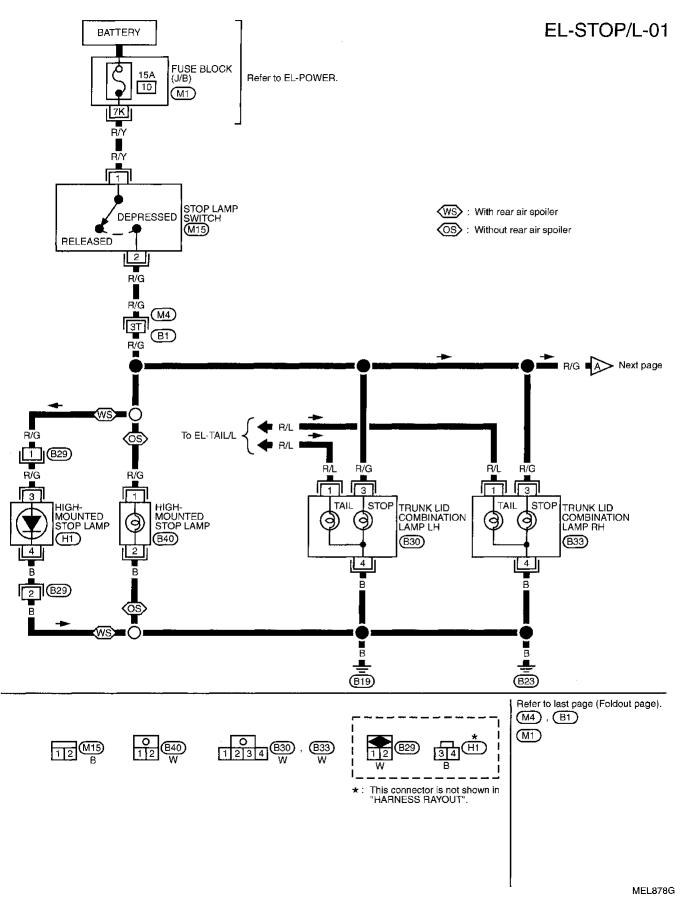
BT



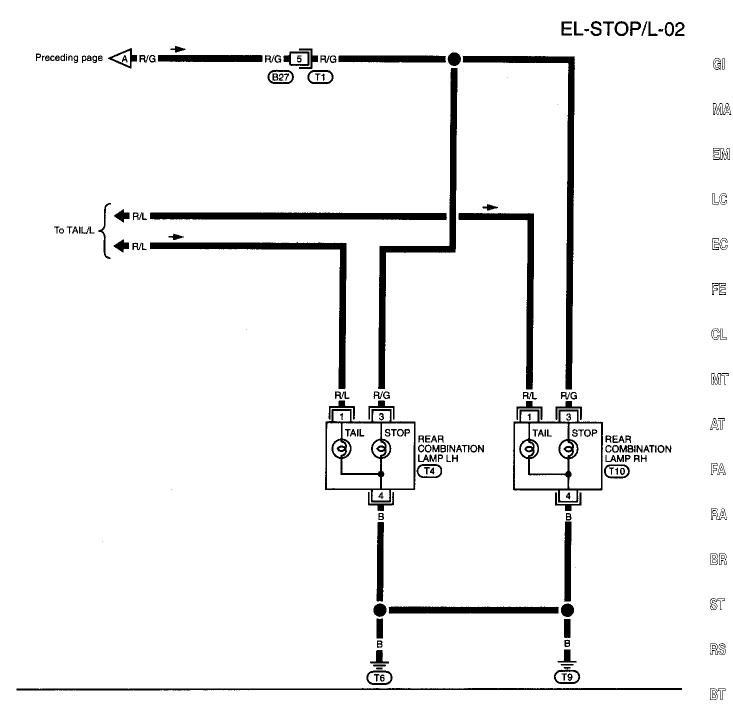


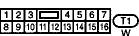


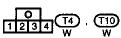
## Stop Lamp/Wiring Diagram — STOP/L —



# Stop Lamp/Wiring Diagram — STOP/L — (Cont'd)

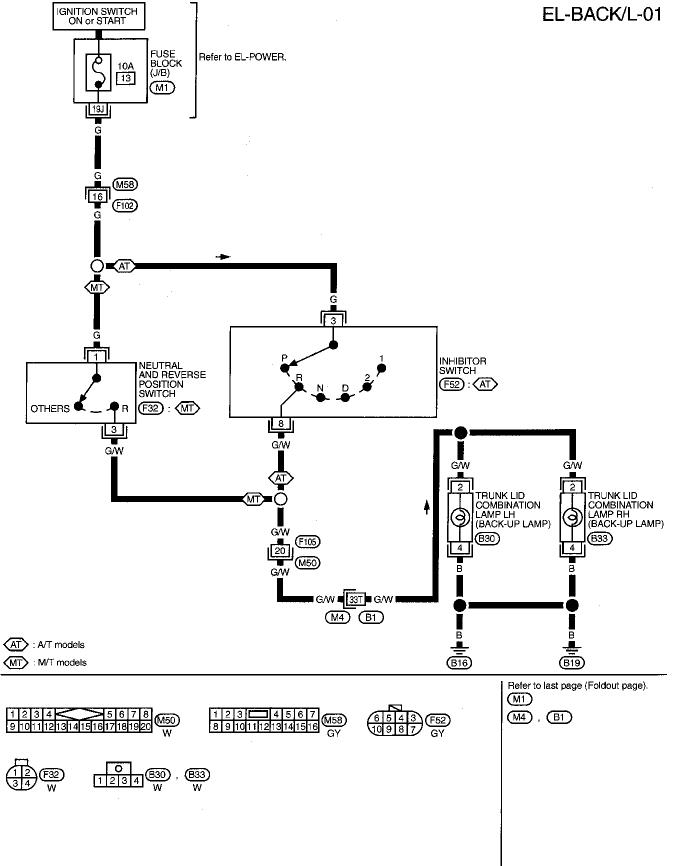






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## Back-up Lamp/Wiring Diagram — BACK/L —



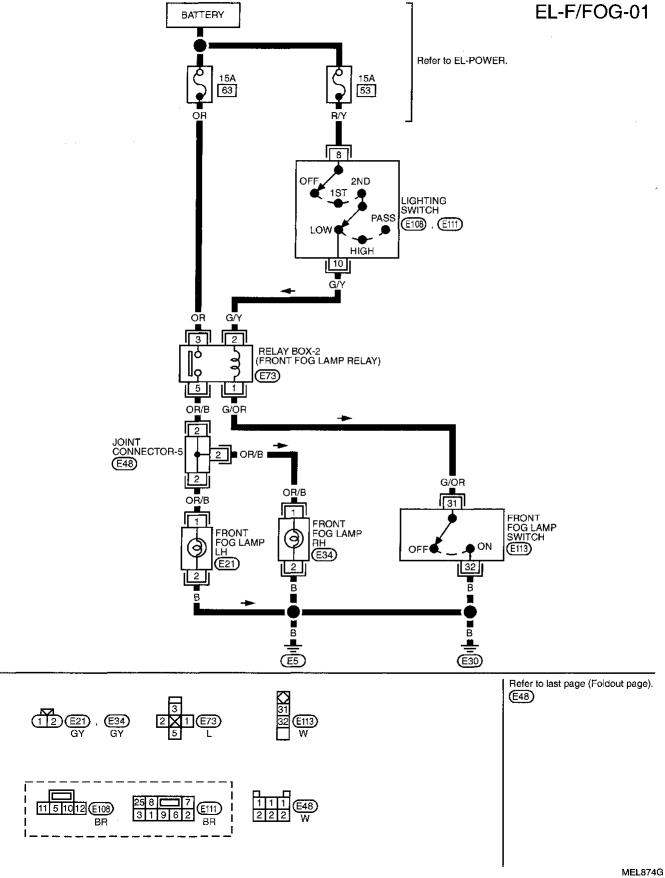
#### **EXTERIOR LAMP**

## Front Fog Lamp/System Description

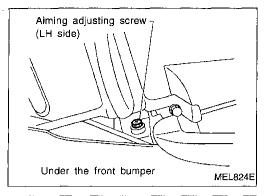
Power is supplied at all times to front fog lamp relay terminal (3) through 15A fuse (No. 63, located in the fuse and fusible link box). With the lighting switch in the 2ND and LOW ("B") position, power is supplied through 15A fuse (No. 53], located in the fuse and fusible link box) Gl to lighting switch terminal (8) through terminal (10) of the lighting switch to front fog lamp relay terminal (2). MA Front fog lamp operation The lighting switch must be in the 2ND and LOW ("B") position for front fog lamp operation. EM With the front fog lamp switch in the ON position ground is supplied to front fog lamp relay terminal (1) through the front fog lamp switch and body grounds **€5** and **€30**. LC The front fog lamp relay is energized and power is supplied • from front fog lamp relay terminal (5) to terminal (1) of each front fog lamp. EC Ground is supplied to terminal (2) of each front fog lamp through body grounds (E5) and (E30). With power and ground supplied, the front fog lamps illuminate. FE CL MT AT FA RA BR ST RS BT HA ΞL

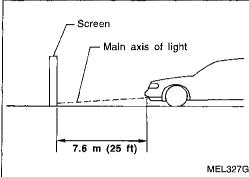
1265

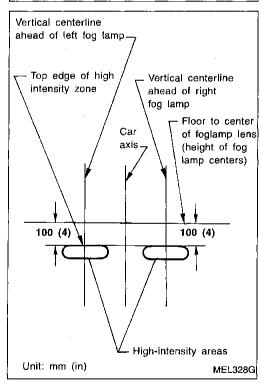
## Front Fog Lamp/Wiring Diagram — F/FOG —



#### **EXTERIOR LAMP**







## **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 seat.

Adjust aiming in the vertical direction by turning the adjusting screw.

- . Set the distance between the screen and the center of the fog lamp lens as shown at left.
- 2. Turn front fog lamps ON.

Adjust front fog lamps so that the top edge of the high intensity zone is 100 mm (4 in) below the height of the fog lamp centers as shown at left.

 When performing adjustment, if necessary, cover the headlamps and opposite fog lamp.

**Bulb Specifications** 

| ltem           | Wattage (W) |  |  |
|----------------|-------------|--|--|
| Front fog lamp | 55          |  |  |

MT

MA

LC

EG

EE

CL

AT

FA

RA

BR

ST

R\$

BT

HA

IDX

## Turn Signal and Hazard Warning Lamps/ **System Description**

#### TURN SIGNAL OPERATION

With the hazard switch in the OFF position and the ignition switch in the ON or START position, power is supplied

- through 7.5A fuse [No. 14], located in the fuse block (J/B)]
- to hazard switch terminal (2)
- through terminal (1) of the hazard switch
- to combination flasher unit terminal (B)
- through terminal (L) of the combination flasher unit
- to turn signal switch terminal (1).

Ground is supplied to combination flasher unit terminal (E) through body grounds (MI3) and (M73).

#### LH turn

When the turn signal switch is moved to the LH position, power is supplied from turn signal switch terminal (3)

- front turn signal lamp LH terminal (1) (through fuse block (J/B) terminals (55) and (65))
- rear combination lamp LH terminal (2) (through fuse block (J/B) terminals (55) and (40)) and
- combination meter terminal (22) (through fuse block (J/B) terminals (55) and (12J).

Ground is supplied to the front turn signal lamp LH terminal (2) through body grounds (E5) and (E30).

Ground is supplied to the rear combination lamp LH terminal (4) through body grounds (76) and (79).

Ground is supplied to combination meter terminal (31) through body grounds (413) and (413).

With power and grounds supplied, the combination flasher unit controls the flashing interval 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

- front turn signal lamp RH terminal (1) (through fuse block (J/B) terminals (48) and (108))
- rear combination lamp RH terminal (2) (through fuse block (J/B) terminals (145) and (130) and
- combination meter terminal (19) (through fuse block (J/B) terminals (145) and (151)).

Ground is supplied to the front turn signal lamp RH terminal (2) through body grounds (E5) and (E50).

Ground is supplied to the rear combination lamp RH terminal (4) through body grounds (16) and (19).

Ground is supplied to combination meter terminal (31) through body grounds (M13) and (M73).

With power and ground supplied, the combination flasher unit controls the flashing interval of the RH turn signal lamps.

#### HAZARD LAMP OPERATION

Power is supplied at all times to hazard switch terminal (3) through

10A fuse [No. 11], located in the fuse block (J/B)].

With the hazard switch in the ON position, power is supplied

- through terminal (1) of the hazard switch
- to combination flasher unit terminal (B)
- through terminal (L) of the combination flasher unit
- to hazard switch terminal (4).

Ground is supplied to the combination flasher unit terminal (E) through body grounds (MI3) and (MI3).

Power is supplied through terminal (5) of the hazard switch to

- front turn signal lamp LH terminal (1) (through fuse block (J/B) terminals (2) and (6))
- rear combination lamp LH terminal (2) (through fuse block (J/B) terminals (2) and (40) and
- combination meter terminal (32) (through fuse block (J/B) terminals (21) and (121)).

Power is also supplied through terminal (6) of the hazard switch to

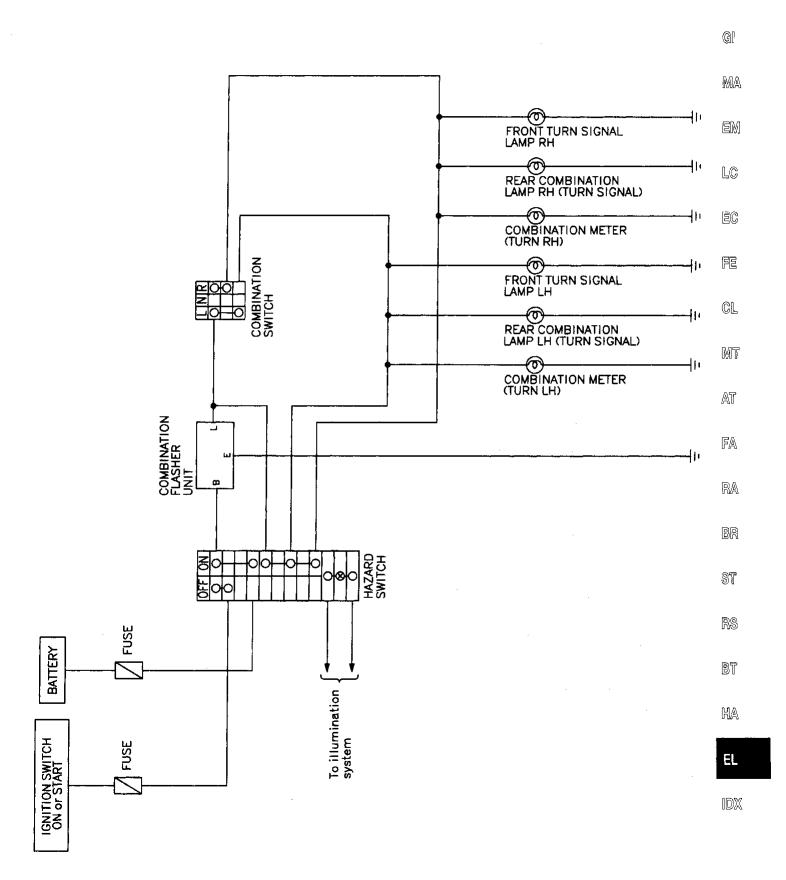
- front turn signal lamp RH terminal (1) (through fuse block (J/B) terminals (11) and (10s)
- rear combination lamp RH terminal (2) (through fuse block (J/B) terminals (11) and (130) and
- combination meter terminal (19) (through fuse block (J/B) terminals (111) and (115)).

Ground is supplied to terminal ② of the front turn signal lamps through body grounds E5 and E30. Ground is supplied to terminal ④ of the rear combination lamps through body grounds © and ①.

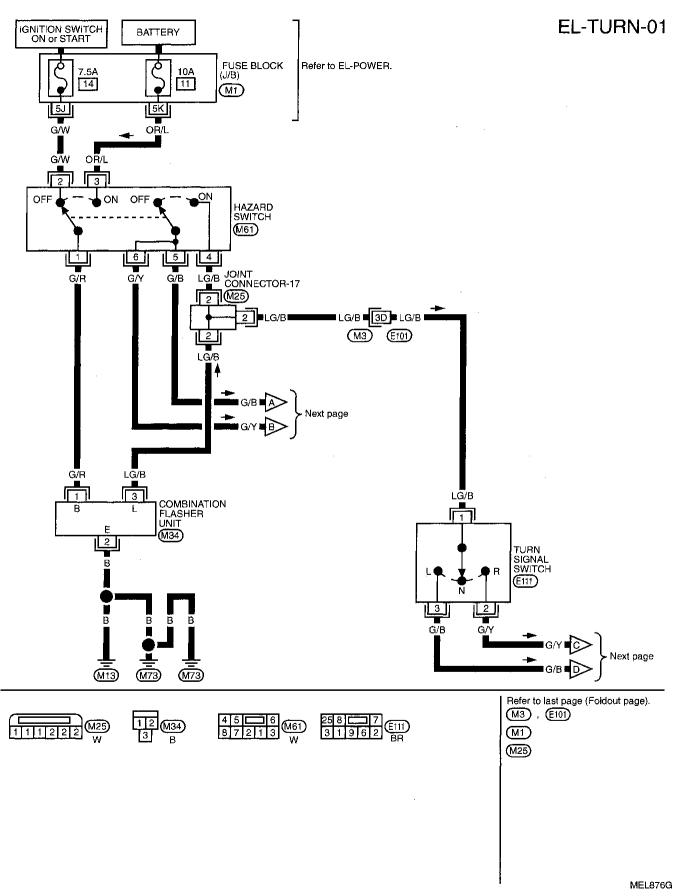
Ground is supplied to combination meter terminal (3) through body grounds (413) and (473).

With power and ground supplied, the combination flasher unit controls the flashing interval of the hazard warning lamps.

## Turn Signal and Hazard Warning Lamps/ Schematic

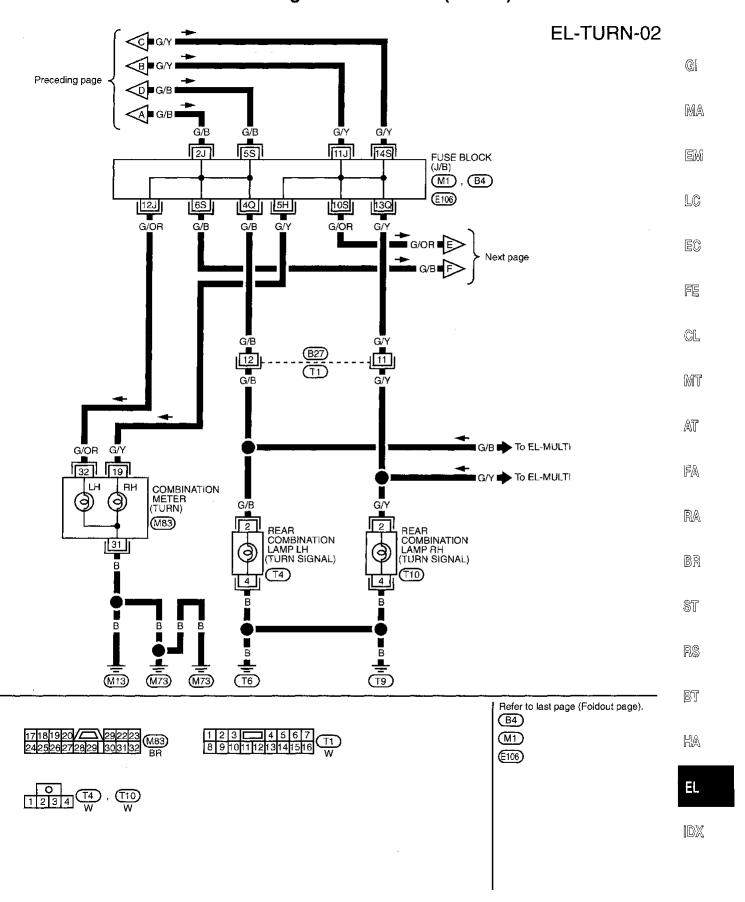


# Turn Signal and Hazard Warning Lamps/Wiring Diagram — TURN —

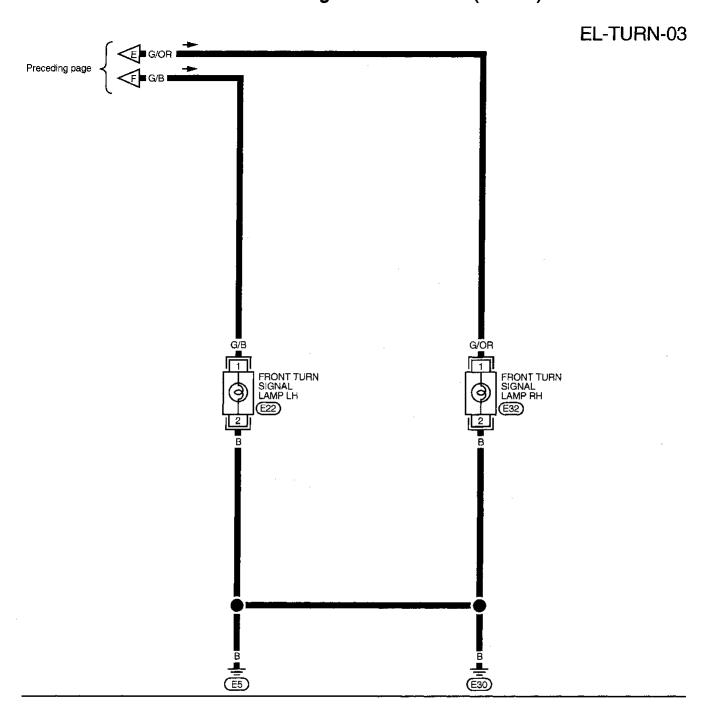


## **EXTERIOR LAMP**

# Turn Signal and Hazard Warning Lamps/Wiring Diagram — TURN — (Cont'd)



# Turn Signal and Hazard Warning Lamps/Wiring Diagram — TURN — (Cont'd)

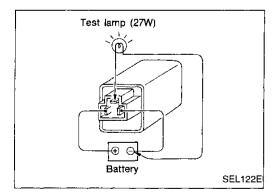




## **EXTERIOR LAMP**

## Turn Signal and Hazard Warning Lamps/ Trouble Diagnoses

| Symptom  | Possible cause  | Repair order   |
|--|---|--|
| Turn signal and hazard warning lamps do not operate.               | Hazard switch     Combination flasher unit     Open in combination flasher unit circuit | Check hazard switch.     Refer to combination flasher unit check.     Check wiring to combination flasher unit for open circuit.   |
| Turn signal lamps do not operate but hazard warning lamps operate. | 1. 7.5A fuse  | Check 7.5A fuse (No. 14), located in fuse block). Turn ignition switch ON and verify battery positive voltage is present at terminal ② of hazard switch.   |
|  | Hazard switch     Turn signal switch     Open in turn signal switch circuit             | <ol> <li>Check hazard switch.</li> <li>Check turn signal switch.</li> <li>Check LG/B wire between combination flasher unit and turn signal switch for open circuit.</li> </ol>   |
| Hazard warning lamps do not operate but turn signal lamps operate. | 1. 10A fuse     2. Hazard switch     3. Open in hazard switch circuit                   | <ol> <li>Check 10A fuse (No. 11, located in fuse block).         Verify battery positive voltage is present at terminal 3 of hazard switch.</li> <li>Check hazard switch.</li> <li>Check LG/B wire between combination flasher unit and hazard switch for open circuit.</li> </ol> |
| Front turn signal lamp LH or RH does not operate.                  | Bulb     Grounds    E5 and    E30   | Check bulb.     Check grounds  |
| Rear turn signal lamp LH or RH does not operate.                   | 1. Bulb 2. Grounds T6 and T9  | 1. Check bulb. 2. Check grounds 16 and 19.   |
| LH and RH turn indicators do not operate.                          | 1. Ground   | 1. Check grounds (M13) and (M73).  |
| LH or RH turn indicator does not operate.                          | 1. Bulb   | Check bulb in combination meter.   |



## **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.

**G**]

MA

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EC

FE

CL

MT

AT

FA

RA

BR

ST

RS

BT

KA

EL

1DX

**EL-69** 1273

## **EXTERIOR LAMP**

# **Bulb Specifications**

|                             | Wattage (12 volt) |  |
|-----------------------------|-------------------|--|
| Headlamp (Semi-sealed beam) |                   |  |
| High/low                    | 65/45 (HB1)       |  |
| Front turn signal lamp      | 27                |  |
| Front combination lamp      |                   |  |
| Cornering/Parking           | 27/8              |  |
| Front side marker           | 3.8               |  |
| Front fog lamp              | 55 (H3)           |  |
| Rear combination lamp       |                   |  |
| Turn signal                 | 27                |  |
| Stop/Tail                   | 27/8              |  |
| Back-up                     | 27                |  |
| Rear side marker lamp       | 3.8               |  |
| License plate lamp          | 5                 |  |
| High-mounted stop lamp      | 27                |  |

**EL-70** 1274

#### INTERIOR LAMP

## **Illumination/System Description**

Power is supplied at all times

• through 15A fuse (No. 66, located in the fuse and fusible link box)

to lighting switch terminal (1).

The lighting switch must be in the 1ST or 2ND position for illumination.

Power is also supplied at all times

through 7.5A fuse [No. 40], located in the fuse block (J/B)]

to vanity mirror illumination terminal (1).

A variable resistor is built in the illumination control switch to control the amount of current to the illumination system.

The ashtray, clock, vanity mirror illumination and the glove box lamp are not controlled by the illumination control switch. The brightness of these lamps does not change.

The following chart shows the power and ground connector terminals for the components included in the illumination system.

| Component                                   | Power terminal | Ground terminal  (5) and (4) |  |
|---|----------------|------------------------------|--|
| Combination meter                           | 36             |                              |  |
| Push control unit (Models without auto A/C) | 15)            | 16                           |  |
| Push control unit (Models with auto A/C)    | 1              | 4                            |  |
| Illumination control switch                 | <b>①</b>       | ② and ③                      |  |
| Audio                                       | 8              | 7                            |  |
| A/T device                                  | 4              | 3                            |  |
| CD player                                   | <b>3</b>       | 22                           |  |
| ASCD main switch                            | <b>⑤</b>       | 6                            |  |
| Power window switch (Front LH/RH)           | 7/14           | 10/10                        |  |
| Rear window defogger switch                 | <b>⑤</b>       | 6                            |  |
| Hazard switch                               | 7              | 8                            |  |
| Ashtray                                     | 1              | 2                            |  |
| Glove box lamp                              | 1              | 2                            |  |
| Clock                                       | 2              | 1                            |  |
| Vanity mirror                               | 1              | 2                            |  |

With the exception of the glove box lamp, clock illumination, vanity mirror illumination and the ashtray illumination, the ground for all of the components are controlled through terminals (2) and (3) of the illumination control switch and body grounds (M13) and (M73).

When the glove box is open, glove box lamp terminal (2) is grounded through the glove box lamp switch terminal (1) and body grounds (MT3) and (MT3).

The ashtray illumination terminal (2), clock illumination terminal (1) and vanity mirror illumination terminal (2) are grounded directly through body grounds (M3) and (M3).

Vanity mirror will illuminate when cover of the vanity mirror is opened.

MA

(G)

EM

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EC

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MT

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FA

RA

BR

**31** 

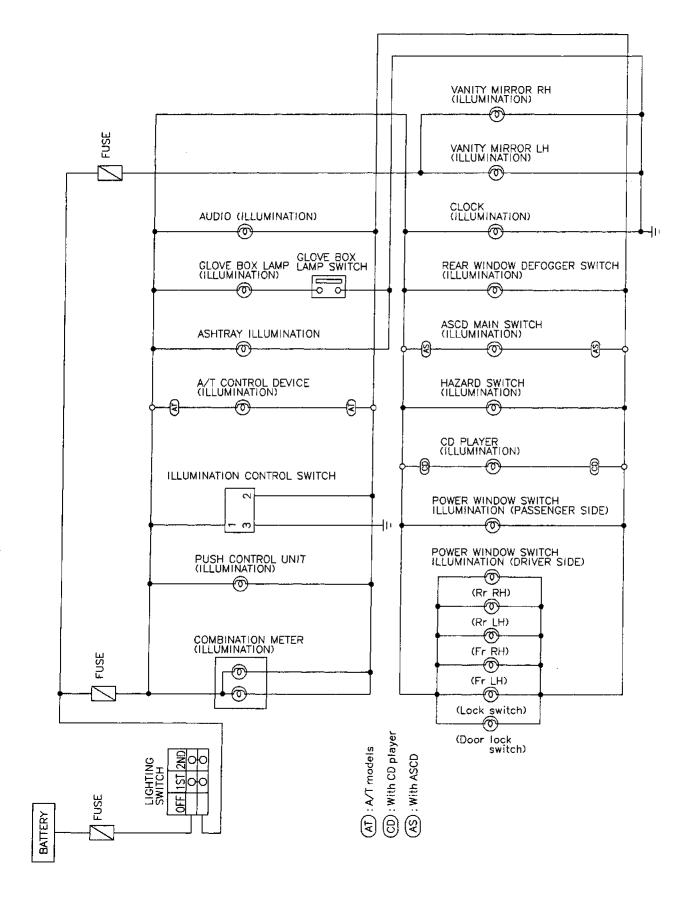
RS

BT

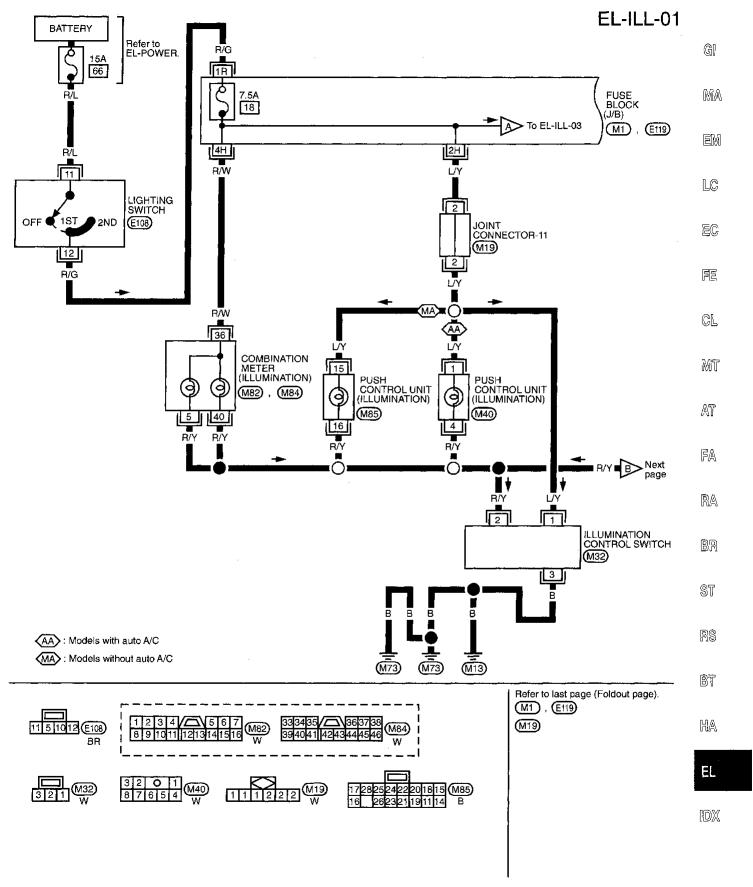
HA

EI

#### Illumination/Schematic

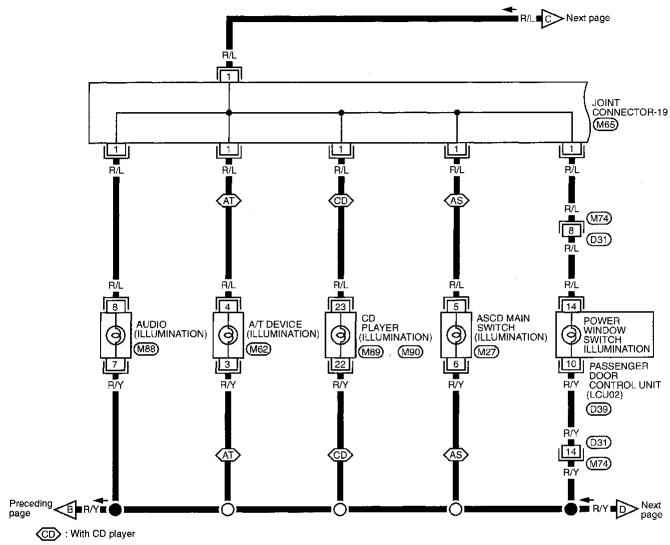


## Illumination/Wiring Diagram — ILL —



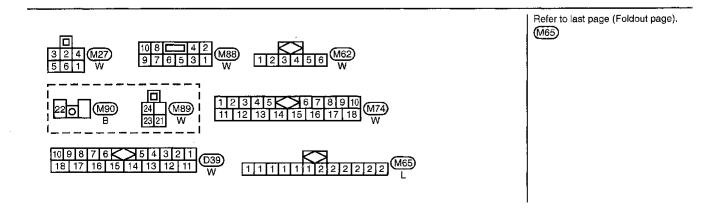
## Illumination/Wiring Diagram — ILL — (Cont'd)

EL-ILL-02



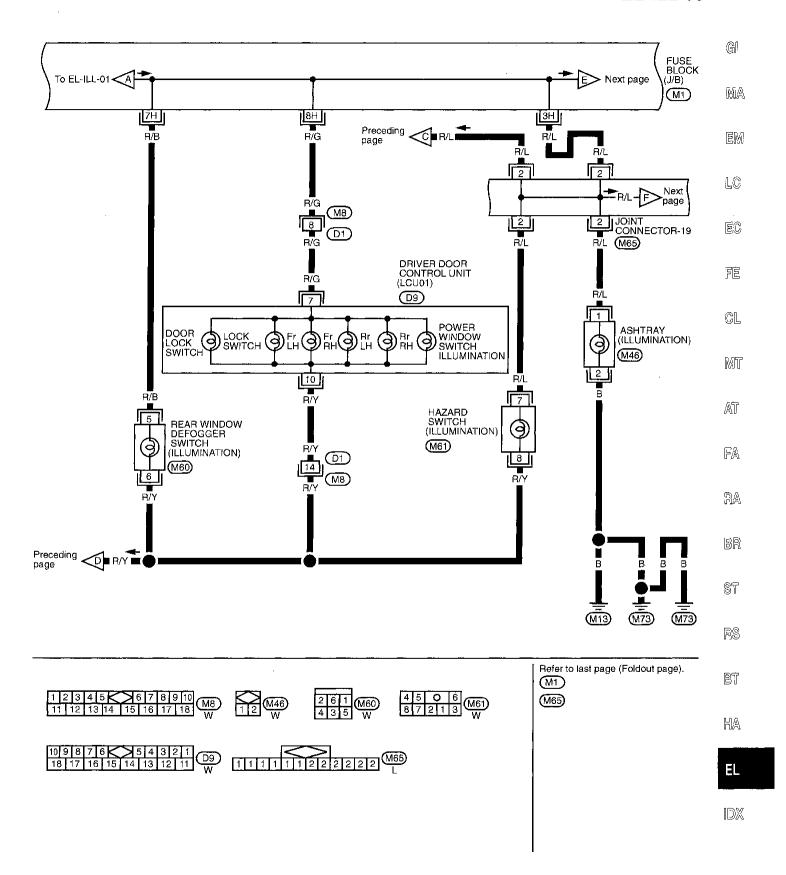
AS : With ASCD

AT : A/T models



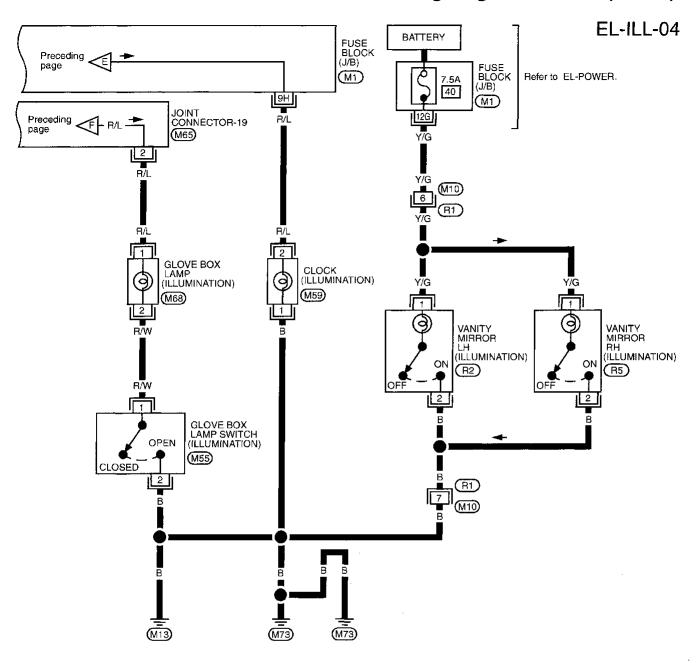
### Illumination/Wiring Diagram — ILL — (Cont'd)

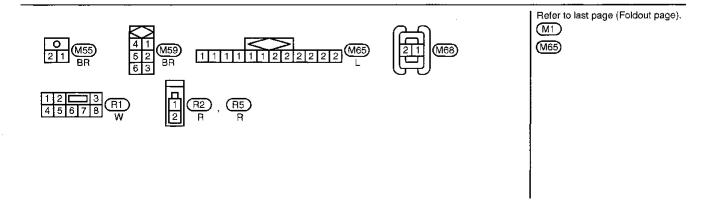
#### EL-ILL-03



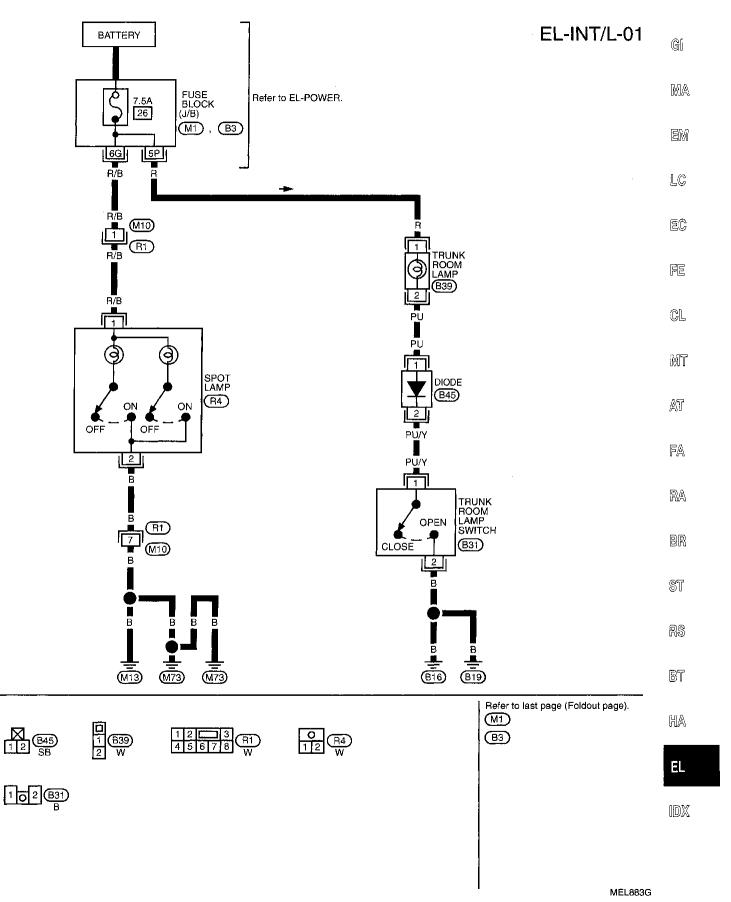
## **INTERIOR LAMP**

## Illumination/Wiring Diagram — ILL — (Cont'd)





# Spot and Trunk Room Lamp/Wiring Diagram — INT/L —



## INTERIOR LAMP

# **Bulb Specifications**

|                 | Wattage (12 volt) |  |  |
|-----------------|-------------------|--|--|
| Interior lamp   | 10                |  |  |
| Spot lamp       | 10                |  |  |
| Step lamp       | 3.4               |  |  |
| Trunk room lamp | 3.4               |  |  |

**EL-78** 1282

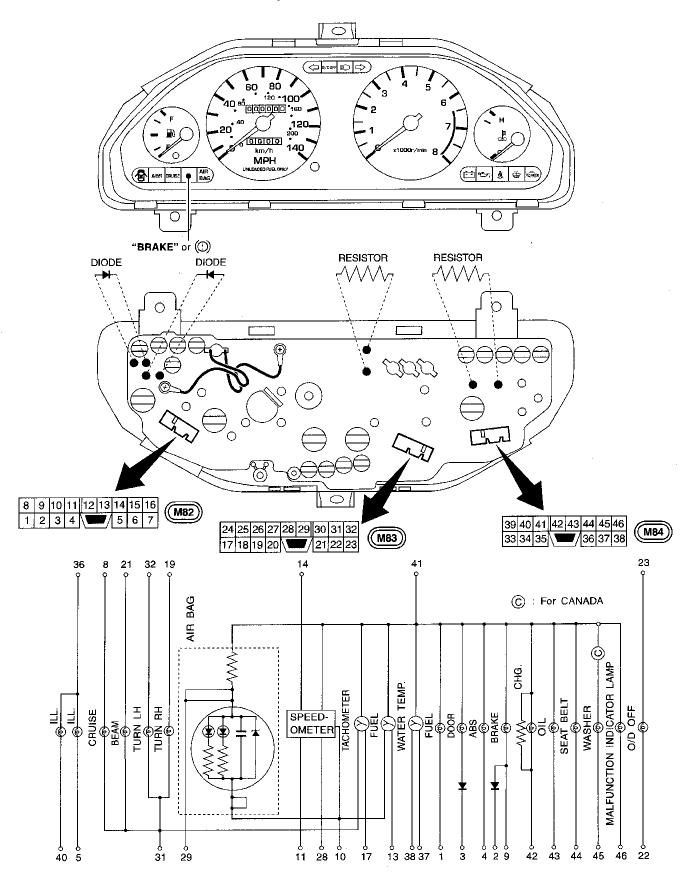
#### **System Description**

With the ignition switch in the ON or START position, power is supplied through 10A fuse [No. 13], located in the fuse block (J/B)] to combination meter terminal (41). Ground is supplied **G** to combination meter terminal (31), (10) and (38) through body grounds (M13) and (M73). MA **FUEL GAUGE** The fuel gauge indicates the approximate fuel level in the fuel tank. EM The fuel gauge is regulated by a variable ground signal supplied to combination meter terminal (13) for the fuel gauge from terminal (3) of the fuel tank gauge unit LC through terminal (2) of the fuel tank gauge unit and through body grounds (B16) and (B19). EC 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. FE As the temperature of the coolant increases, the resistance of the thermal transmitter decreases. A variable ground is supplied to terminal 37 of the combination meter for the water temperature gauge. The needle on the gauge moves from "C" to "H". CL. **TACHOMETER** MT The tachometer indicates engine speed in revolutions per minute (rpm). The tachometer is regulated by a signal from terminal (5) of the ECM (ECCS control module) AT to combination meter terminal (17) for the tachometer. **SPEEDOMETER** FA The vehicle speed sensor provides a voltage signal to the combination meter for the speedometer. The voltage is supplied to combination meter terminals 28 and (1) for the speedometer RA from terminals (1) and (2) of the vehicle speed sensor. The speedometer converts the voltage into the vehicle speed displayed. BR ST RS BT HA

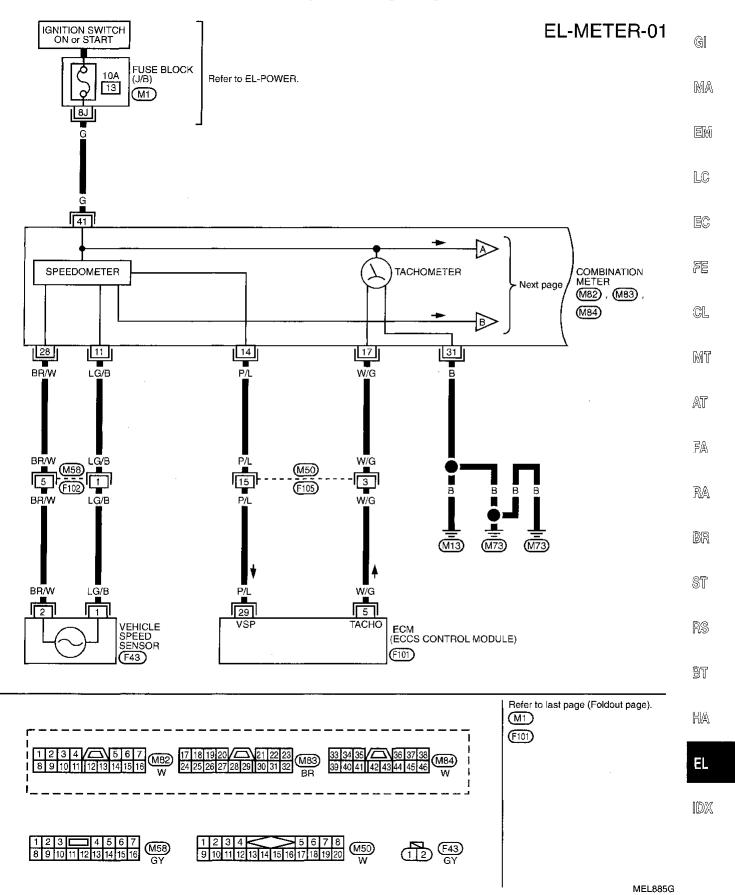
1283

IDX

## **Combination Meter**

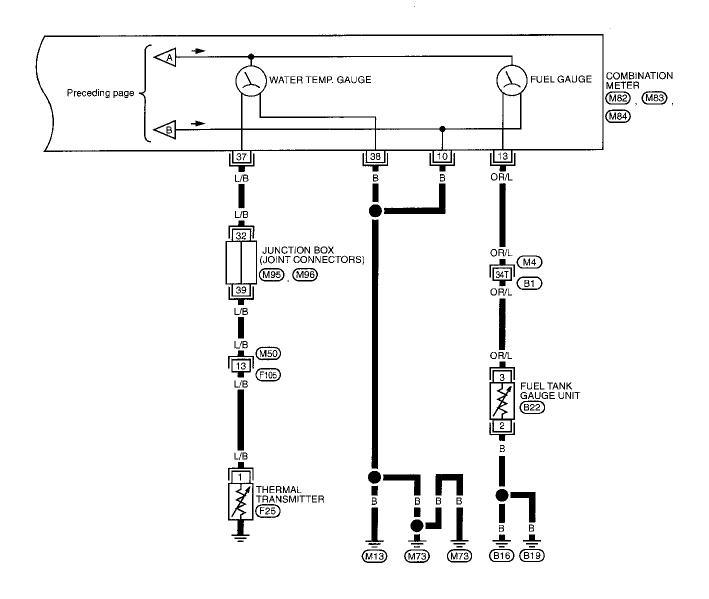


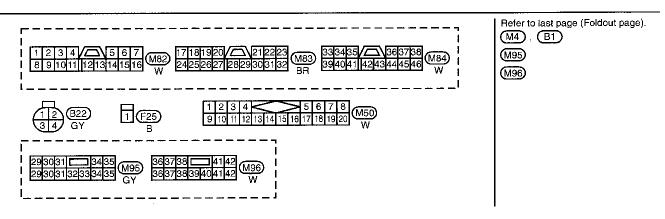
# Speedometer, Tachometer, Temp. and Fuel Gauges/Wiring Diagram — METER —

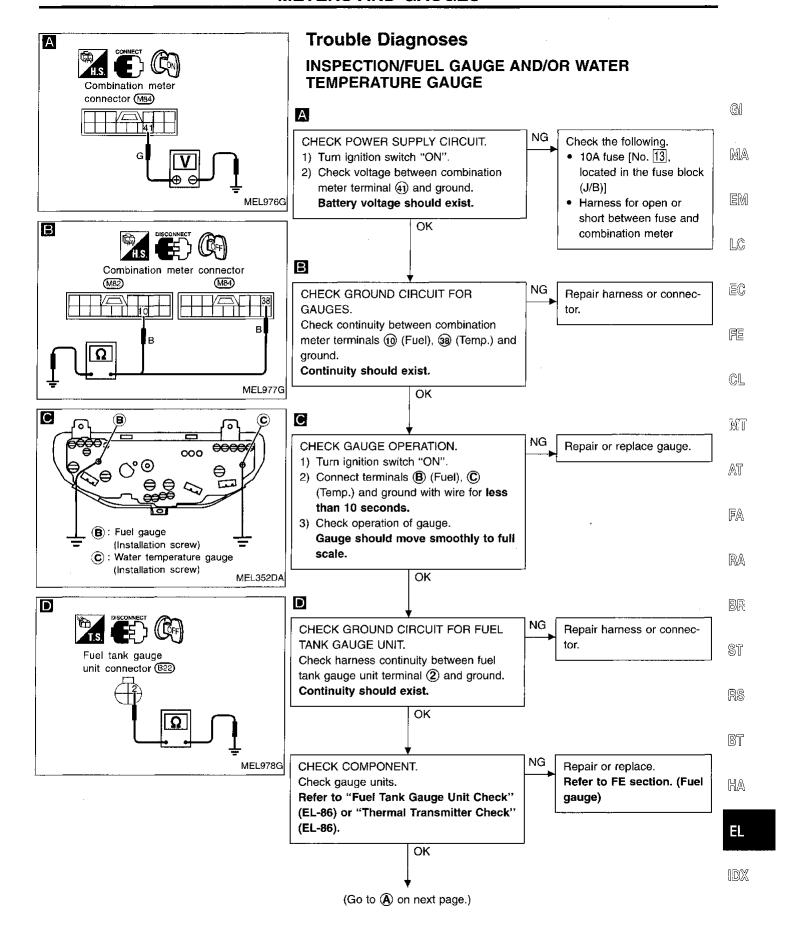


# Speedometer, Tachometer, Temp. and Fuel Gauges/Wiring Diagram — METER — (Cont'd)

#### **EL-METER-02**

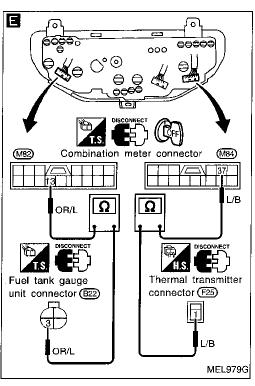


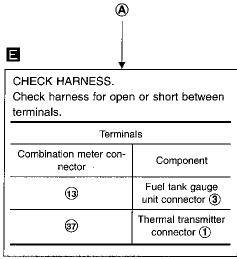


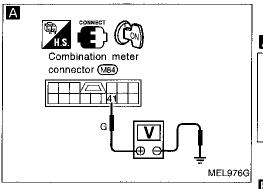


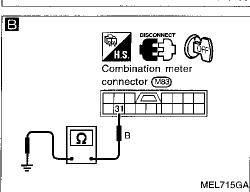
**EL-83** 1287

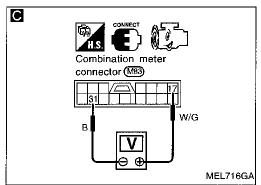
## **Trouble Diagnoses (Cont'd)**



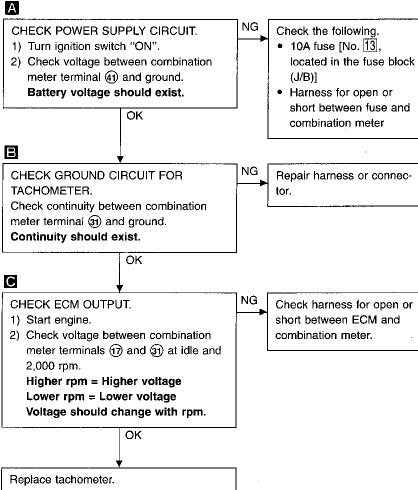


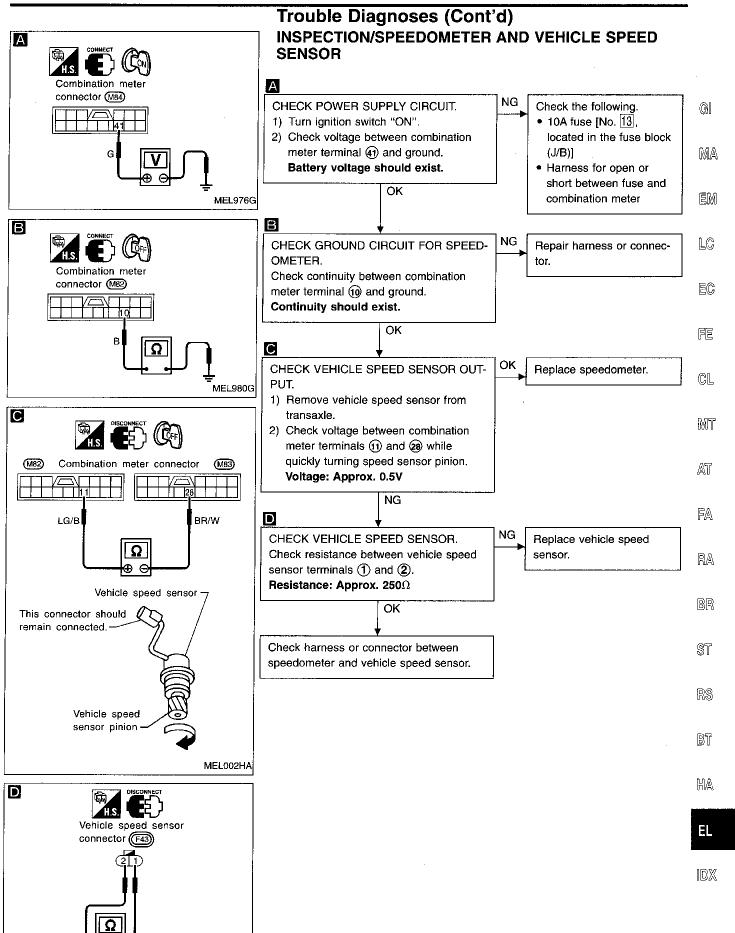




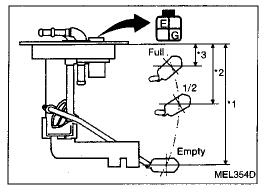


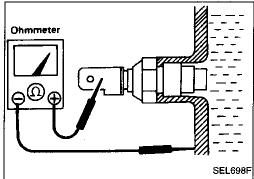
#### INSPECTION/TACHOMETER

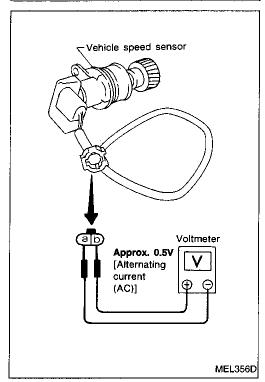




MEL826FC







## **Fuel Tank Gauge Unit Check**

• For removal, refer to FE section "FUEL SYSTEM". Check the resistance between terminals **(G)** and **(E)**.

| Ohm | meter | Float position |         | Resistance value |               |
|-----|-------|----------------|---------|------------------|---------------|
| (+) | (-)   |                | mm (in) | (Ω)              |               |
|     |       | *3             | Full    | 32 (1.26)        | Approx. 5 - 8 |
| G   | Е     | *2             | 1/2     | 93 (3.66)        | 32 - 34       |
|     |       | *1             | Empty   | 157 (6.18)       | 80 - 81       |

\*1 and \*3: When float rod is in contact with stopper.

#### **Thermal Transmitter Check**

Check the resistance between the terminals of thermal transmitter and body ground.

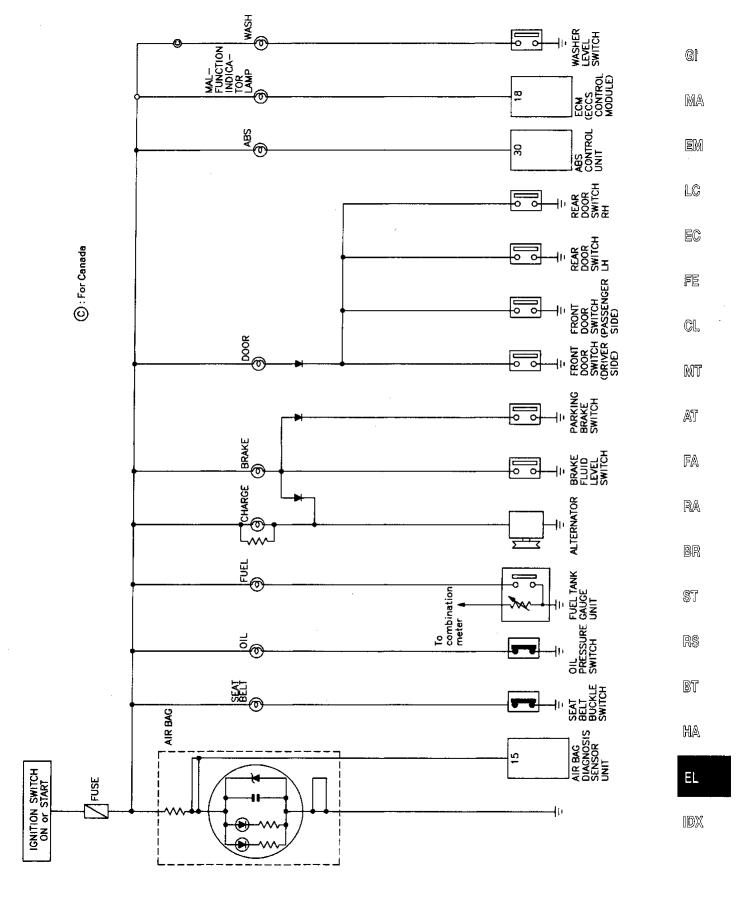
| Water temperature | Resistance       |
|-------------------|------------------|
| 60°C (140°F)      | Approx. 70 - 90Ω |
| 100°C (212°F)     | Approx. 21 - 24Ω |

## Vehicle Speed Sensor Signal Check

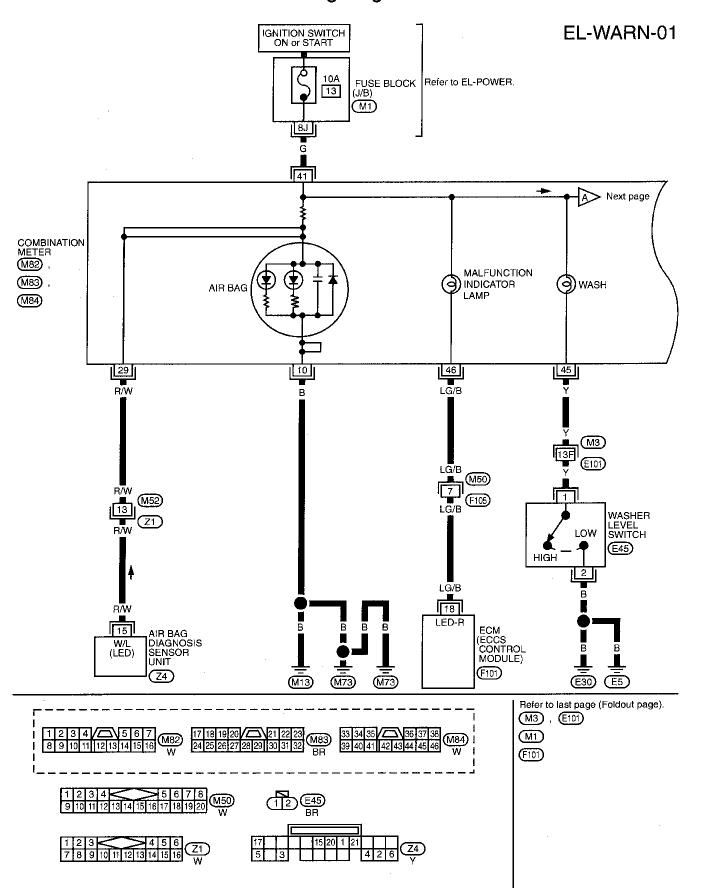
- 1. Remove vehicle speed sensor from transmission.
- 2. Turn vehicle speed sensor pinion quickly with fingers and measure voltage across (a) and (b).

1290

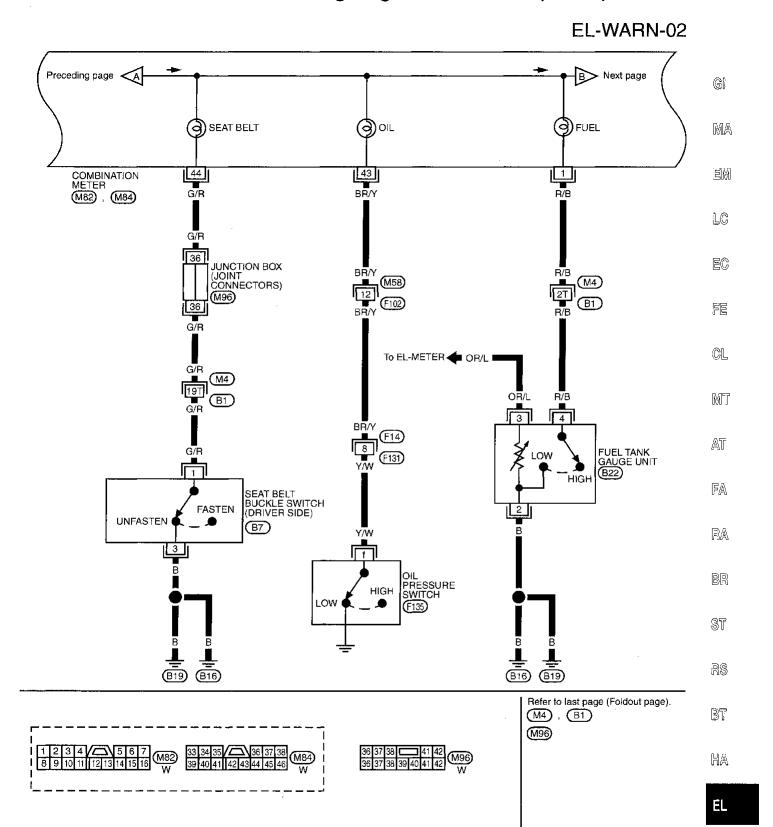
## **Schematic**



## Wiring Diagram — WARN —



## Wiring Diagram — WARN — (Cont'd)

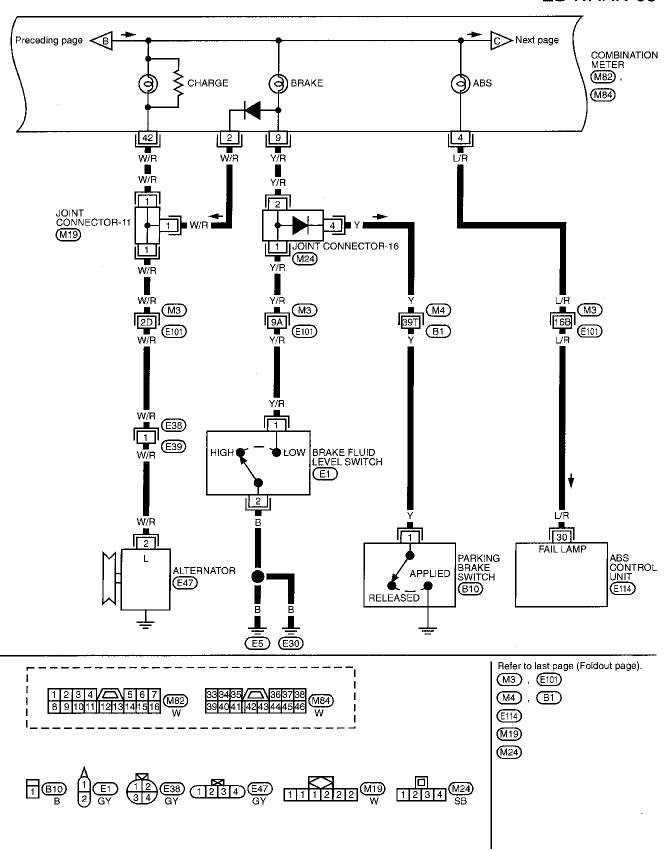


MEL888G

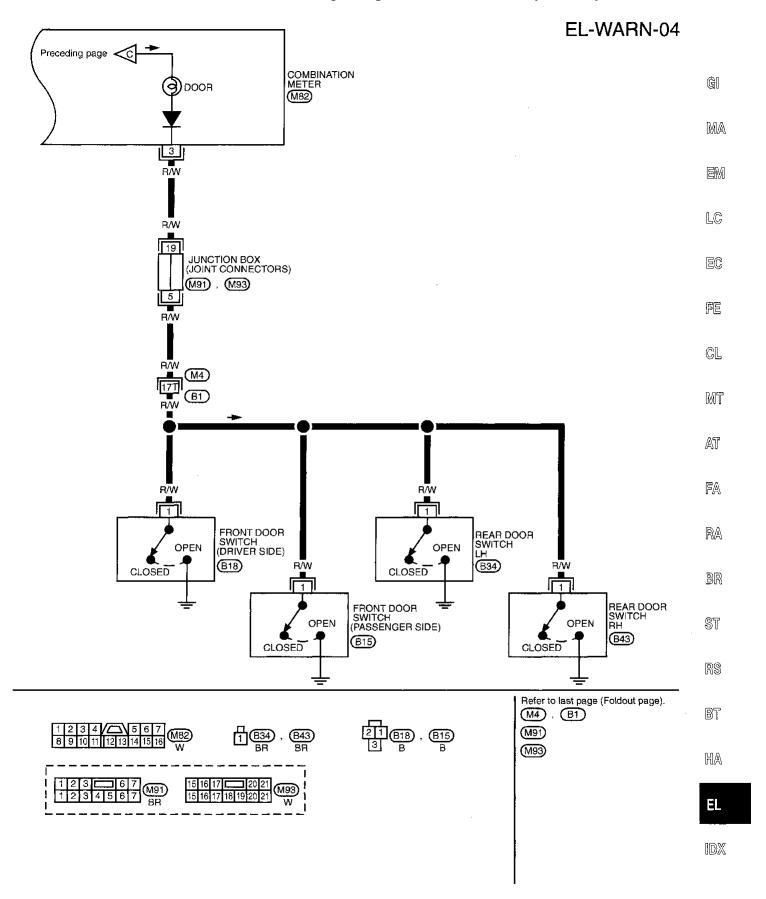
IDX

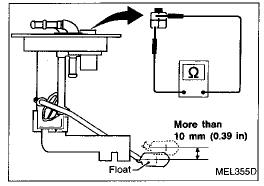
## Wiring Diagram — WARN — (Cont'd)

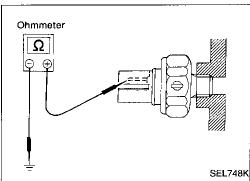
## **EL-WARN-03**

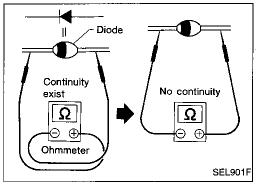


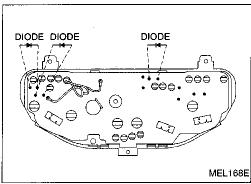
## Wiring Diagram — WARN — (Cont'd)











## **Fuel Warning Lamp Sensor Check**

• Raise the float with fingers more than the distance shown in the figure at left. Make sure that continuity does not exist.

#### **CAUTION:**

Do not move the float beyond its mobile range.

#### **Oil Pressure Switch Check**

|              | Oil pressure<br>kPa (kg/cm², psi)       | Continuity |
|--------------|---|------------|
| Engine start | More than 10 - 20<br>(0.1 - 0.2, 1 - 3) | NO         |
| Engine stop  | Less than 10 - 20<br>(0.1 - 0.2, 1 - 3) | YES        |

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: Specifications may vary depending on the type of tester. Before performing this inspection, be sure to refer to the instruction manual of your tester.

• Diodes for warning lamps are built into the combination meter printed circuit.

Refer to "Combination Meter" (EL-80).

1296

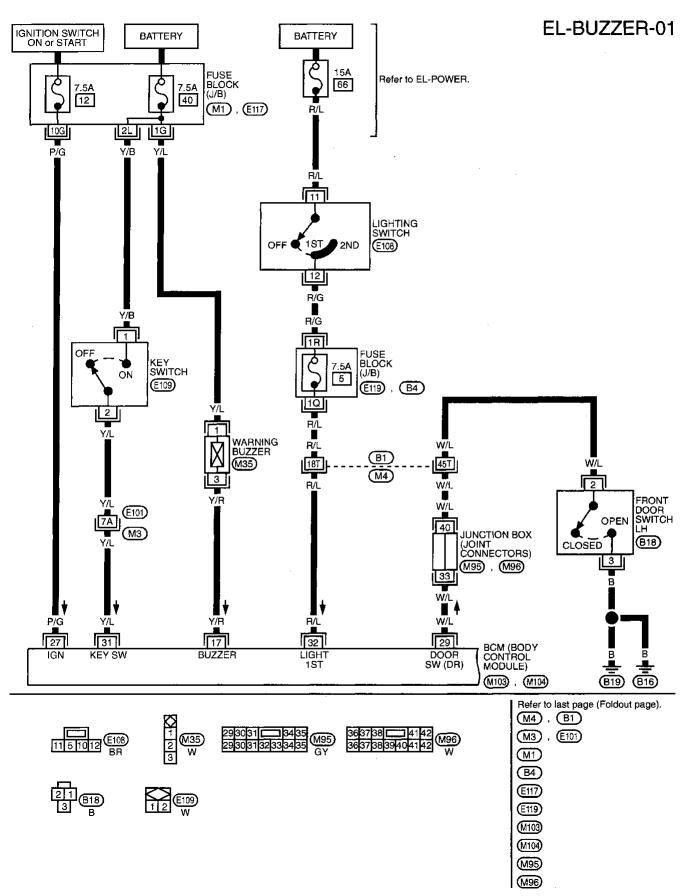
# **System Description**

| The warning buzzer is controlled by the BCM.  Power is supplied at all times  |                   |
|---|-------------------|
| <ul> <li>through 7.5A fuse [No. 40], located in the fuse block (J/B)]</li> <li>to warning buzzer terminal (1)</li> </ul>  | ⊜n                |
| • to key switch terminal (1).   | Gi                |
| Power is supplied at all times  |                   |
| <ul> <li>through 15A fuse (No. 66), located in the fuse and fusible link box)</li> <li>to lighting switch terminal (1).</li> </ul>  | MA                |
| Power is supplied at all times  |                   |
| • through 7.5A fuse (No. 56, located in the fuse and fusible link box)  | EM                |
| <ul> <li>to BCM terminal ①.</li> <li>With the ignition switch in the ON or START position, power is supplied</li> </ul>   |                   |
| <ul> <li>through 7.5A fuse [No. 12] located in the fuse block (J/B)]</li> </ul>   | LG                |
| • to BCM terminal ②.  |                   |
| Ground is supplied to BCM terminal ③ through body grounds (M13) and (M73).  |                   |
| When a signal, or combination of signals, is received by the BCM, ground is supplied  | ĒĈ                |
| <ul> <li>through BCM terminal (1)</li> <li>to warning buzzer terminal (3).</li> </ul>   |                   |
| With power and ground supplied, the warning buzzer will sound.  | FE                |
| Ignition key warning buzzer   |                   |
| With the key in the ignition switch in the OFF or ACC position, and the driver's door open, the warning buzzer  | CL.               |
| will sound. A battery positive voltage is supplied  | () <sub>(</sub> ( |
| • from key switch terminal ② • to PCM terminal ②  |                   |
| ● to BCM terminal ③. Ground is supplied   | MT                |
| • from front door switch LH terminal ②  |                   |
| • to BCM terminal @9.   | AT                |
| Front door switch LH terminal ③ is grounded through body grounds (B16) and (B19).   | 2700              |
| Light warning buzzer  |                   |
| With ignition switch OFF or ACC, driver's door open, and lighting switch in 1ST or 2ND position, warning buzzer   | FA                |
| will sound. A battery positive voltage is supplied.  • from lighting switch terminal (12)   |                   |
| <ul> <li>through 7.5A fuse [No. 5], located in the fuse block (J/B)]</li> </ul>   | RA                |
| • to BCM terminal 32.   |                   |
| Ground is supplied  | 90                |
| • from front door switch LH terminal ②  | BR                |
| <ul> <li>to BCM terminal ②</li> <li>Front door switch LH terminal ③ is grounded through body grounds (B16) and (B19).</li> </ul>  |                   |
| Seat belt warning buzzer  | ST                |
| With ignition switch turned ON and seat belt unfastened (seat belt switch ON), warning buzzer will sound for  |                   |
| approximately 6 seconds.  | RS                |
| Ground is supplied  | u 100             |
| • from seat belt switch terminal ① • to RCM terminal ②  |                   |
| • to BCM terminal <b>(8)</b> . Seat belt switch terminal <b>(3)</b> is grounded through body grounds <b>(B16)</b> and <b>(B19)</b> .  | BT                |
| The state of the grounded and agree and a ground a ground and a ground and a ground |                   |
|   | HA                |
|   |                   |

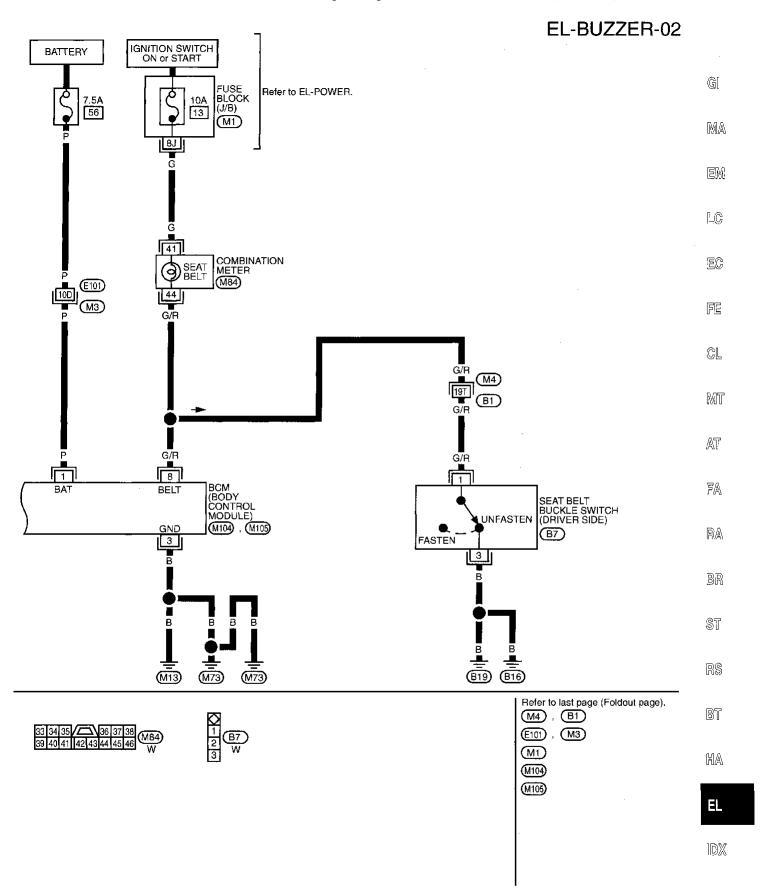
EL

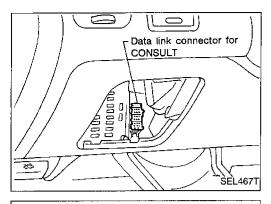
DX

## Wiring Diagram — BUZZER —



## Wiring Diagram — BUZZER — (Cont'd)



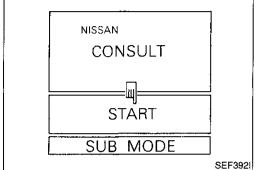


## **Trouble Diagnoses**

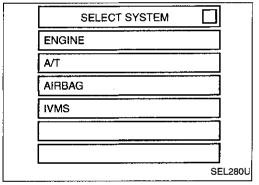
#### CONSULT

#### **CONSULT** inspection procedure

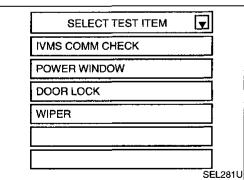
- 1. Turn ignition switch "OFF".
- 2. Connect "CONSULT" to the data link connector.



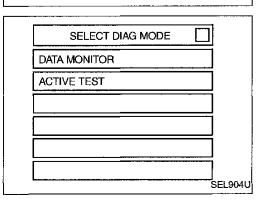
- 3. Turn ignition switch "ON".
- 4. Touch "START".



5. Touch "IVMS".



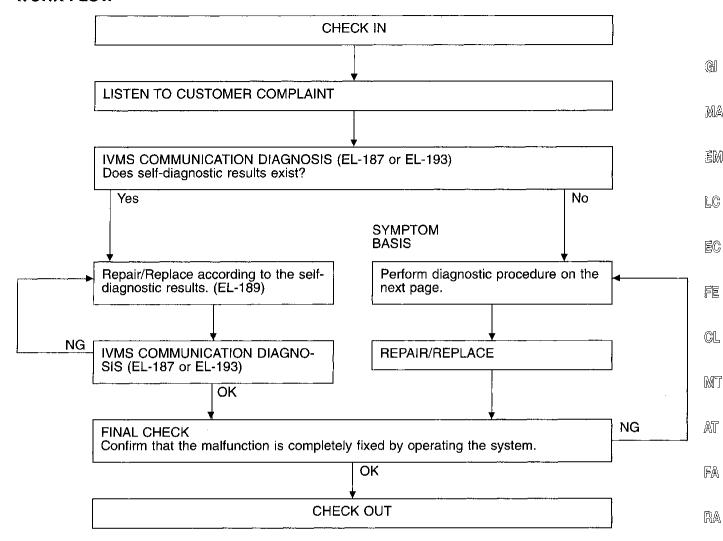
Touch "IGN KEY WARN ALM", "LIGHT WARN ALM" or "SEAT BELT TIMER".



DATA MONITOR and ACTIVE TEST are available for the warning buzzer.

### Trouble Diagnoses (Cont'd)

#### **WORK FLOW**



#### NOTICE:

 When LCU connectors are disconnected for more than 1 minute such as during trouble diagnoses, the "disconnected" data will be memorized by the BCM. Therefore, after reconnecting the LCU connectors, erase the memory.

• To erase the memory, perform the procedure below.

Erase the memory with CONSULT (refer to EL-187) or turn the ignition switch to "OFF" position and remove 7.5A fuse (No. 56) located in the fuse and fusible link box).

HA

BT

**B**R

ST

RS

EL

IDX

## Trouble Diagnoses (Cont'd)

## **SYMPTOM CHART**

| REFERENCE PAGE                                 | EL-99  | EL-99   | EL-100   | EL-100                 |
|--|--|---|--|------------------------|
| SYMPTOM  | DIAGNOSTIC PROCEDURE 1<br>(Lighting switch input signal check) | DIAGNOSTIC PROCEDURE 2<br>(Key switch input signal check) | DIAGNOSTIC PROCEDURE 3<br>(Seat belt buckle switch input signal check) | DIAGNOSTIC PROCEDURE 4 |
| Light warning buzzer does not activate.        | x  |   |  | x                      |
| Ignition key warning buzzer does not activate. |  | Х   |  | Х                      |
| Seat belt warning buzzer does not activate.    |  |   | Х  | х                      |
| All warning buzzers do not activate.           |  |   |  | Х                      |

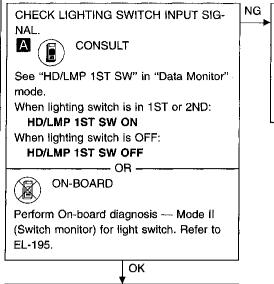
1302

#### **WARNING BUZZER**

# A \$\pm MONITOR HD/LMP 1ST SW OFF RECORD SEL351S

# Trouble Diagnoses (Cont'd) DIAGNOSTIC PROCEDURE 1

#### (Lighting switch input signal check)



Check the following.

• 7.5A fuse (No. 5, located in the fuse

block)

 Harness for open or short between fuse and BCM

G

MA

EM

LC

EC

FE

CL.

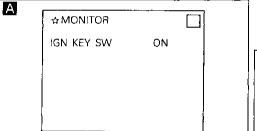
MT

AT

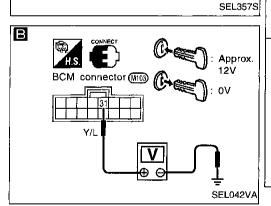
FA

RA

BR



RECORD



# DIAGNOSTIC PROCEDURE 2

(Key switch input signal check)

CHECK KEY SWITCH INPUT SIGNAL.

CONSULT

See "IGN KEY SW" in "Data Monitor" mode.

When key is in ignition:

IGN KEY SW ON

Go to Procedure 4.

When key is out of ignition:

IGN KEY SW OFF

TESTER

Check voltage between BCM terminal (3) and ground.

- OR

| Condition of key switch | Voltage [V] |
|-------------------------|-------------|
| Key is inserted         | Approx. 12  |
| Key is withdrawn        | 0           |
|                         |             |

Go to Procedure 4.

Check the following.

NG

- 7.5A fuse [No. 40], located in the fuse block (J/B)]
- Key switch (insert)
- Harness for open or short between key switch and fuse
- Harness for open or short between BCM and key switch

ST

RS

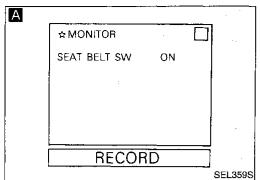
BT

HA

EL

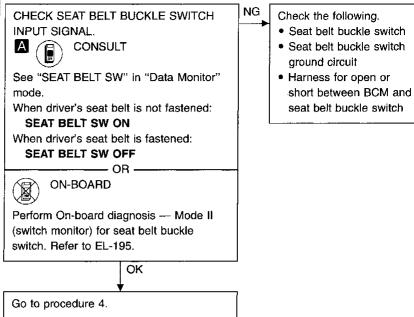
IDX

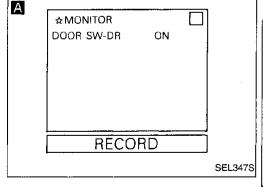
#### **WARNING BUZZER**



# Trouble Diagnoses (Cont'd) DIAGNOSTIC PROCEDURE 3

(Seat belt buckle switch input signal check)





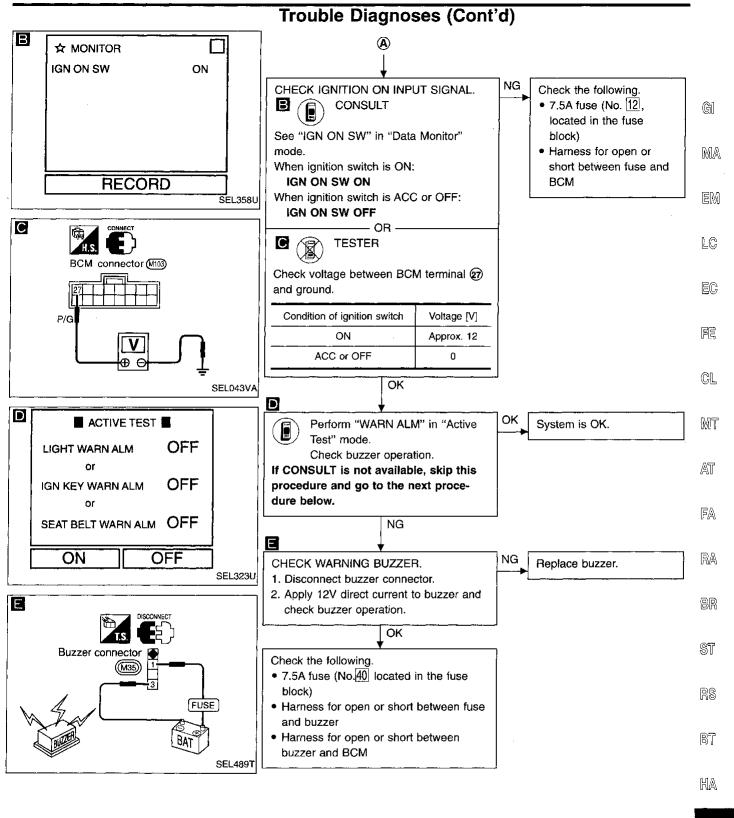
#### **DIAGNOSTIC PROCEDURE 4**

NG CHECK DRIVER DOOR SWITCH INPUT SIGNAL. CONSULT See "DOOR SW-DR" in "Data monitor" mode. When driver's door is open: DOOR SW-DR ON When driver's door is closed: DOOR SW-DR OFF - OR -ON-BOARD Perform On-board diagnosis - Mode II (switch monitor) for door switch (driver side). Refer to EL-195. Ĺ OK

Check the following.

- Driver door switch
- Driver door switch ground circuit
- Harness for open or short between driver door switch and BCM

#### **WARNING BUZZER**



IDX

## **System Description**

#### WIPER OPERATION

With the ignition switch in the ACC or ON position, power is supplied

- through 20A fuse [No. 20], located in the fuse block (J/B)]
- to front wiper motor terminal (4).

#### Low and high speed wiper operation

Ground is supplied to front wiper switch terminal (17) through body grounds (E5) and (E30).

When the front wiper switch is placed in the LO position, ground is supplied

- through terminal (14) of the front wiper switch
- to front wiper motor terminal 2.

With power and ground supplied, the front wiper motor operates at low speed.

When the front wiper switch is placed in the HI position, ground is supplied

- through terminal (6) of the front wiper switch
- to front wiper motor terminal 3.

With power and ground supplied, the front wiper motor operates at high speed.

#### Auto stop operation

When the front wiper switch is placed in the OFF position, the front wiper motor will continue to operate until the wiper arms reach the base of the windshield (Auto stop).

When the front wiper switch is placed in the OFF position, ground is supplied

- from terminal (4) of the front wiper switch
- to front wiper motor terminal (2), in order to continue front wiper motor operation at low speed.

Ground is also supplied until the wiper arms reaches the base of the windshield

- through terminal (3) of the front wiper switch,
- to front wiper relay terminal 3
- through terminal (4) of the front wiper relay,
- to front wiper motor terminal (5)
- through terminal (6) of the front wiper motor, and
- through body grounds (M13) and (M73).

When the wiper arms reach the base of the windshield, the switch in the front wiper motor moves to the "STOP" position. The ground path is interrupted and the front wiper motor stops.

#### Intermittent operation

Intermittent operation is controlled by the BCM.

When the front wiper switch is placed in the INT position, ground is supplied

- to BCM terminal 33
- from front wiper switch terminal (15)
- through body grounds (E5) and (E30).

The desired interval time is input

- to BCM terminal 24
- from front wiper switch terminal (19).

Based on these two inputs, an intermittent ground is supplied

- to front wiper relay terminal (2)
- from BCM terminal 9.

With power and ground supplied, the front wiper relay is activated.

When activated, an intermittent ground is supplied

- to front wiper motor terminal (2)
- through the front wiper switch terminal (4),
- to front wiper switch terminal (13)
- through front wiper relay terminal (3),
- to front wiper relay terminal (5)
- through body grounds (E5) and (E30).

Front wiper motor operates at desired low speeds with BCM terminal (3) grounded.

#### WASHER OPERATION

With the ignition switch in the ACC or ON position, power is supplied

- through 20A fuse [No. 20], located in the fuse block (J/B)]
- to front washer motor terminal 1.

When the lever is pulled to the WASH position, ground is supplied

• to washer motor terminal (2), and

# System Description (Cont'd)

- to BCM terminal (3) from terminal (1) of the front wiper switch through terminal (7) of the front wiper switch, and
- through body grounds (5) and (59).

With power and ground supplied, the washer motor operates.

The front wiper motor operates at low speed for about 3 seconds. This feature is controlled by the BCM in the same manner as the intermittent operation.

Gi

MA

ΞM

LC

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37

CL

MT

AT

FA

RA

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ST

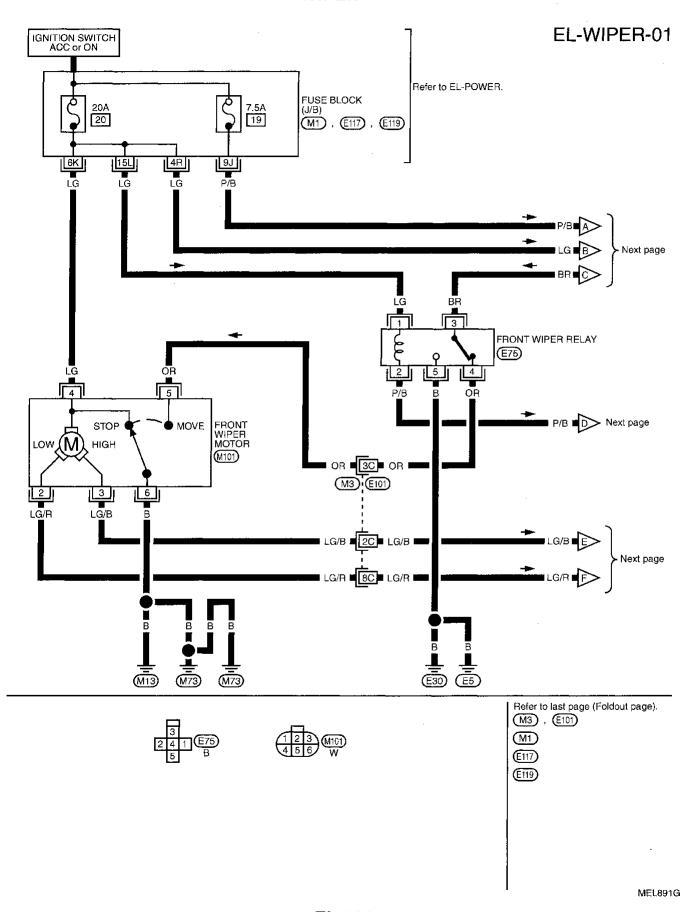
RS

BT

HA

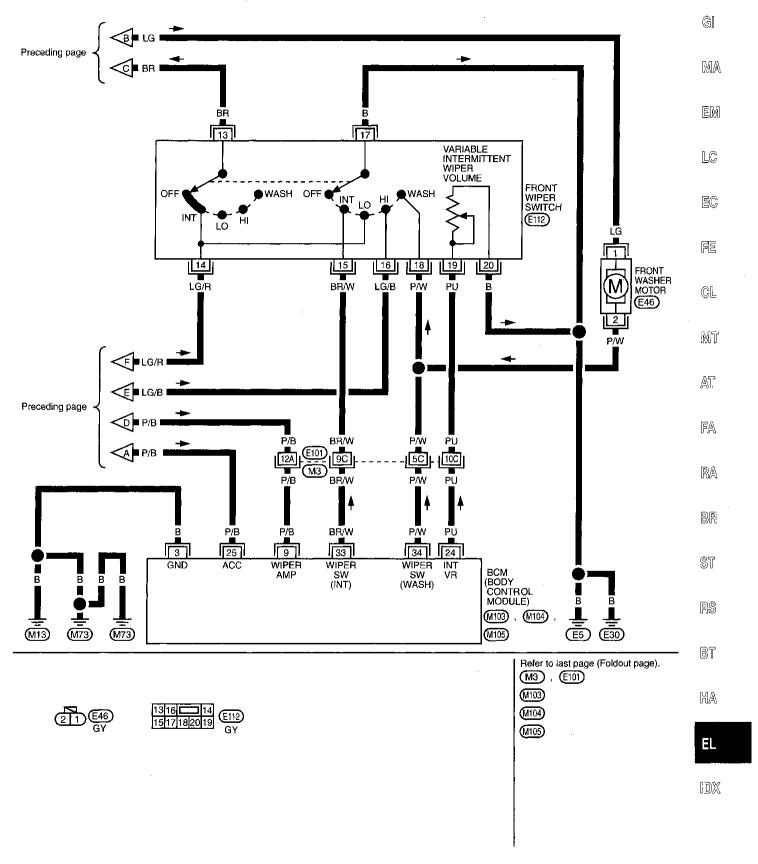
IDX

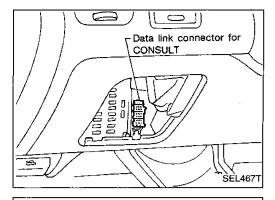
# Front Wiper and Washer/Wiring Diagram — WIPER —



# Front Wiper and Washer/Wiring Diagram — WIPER — (Cont'd)

# **EL-WIPER-02**



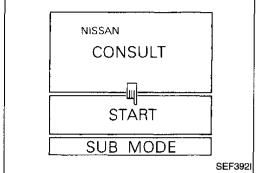


# **Trouble Diagnoses**

#### **CONSULT**

#### **CONSULT** inspection procedure

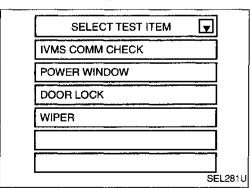
- 1. Turn ignition switch "OFF".
- 2. Connect "CONSULT" to the data link connector.



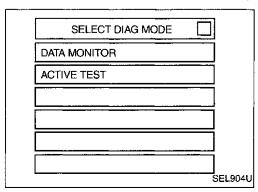
- 3. Turn ignition switch "ON".
- 4. Touch "START".

| SELECT SYSTEM |        |
|---------------|--------|
| ENGINE        |        |
| A/T           |        |
| AIRBAG        |        |
| IVMS          |        |
|               |        |
|               |        |
|               | SEL280 |

5. Touch "IVMS".



6. Touch "WIPER".

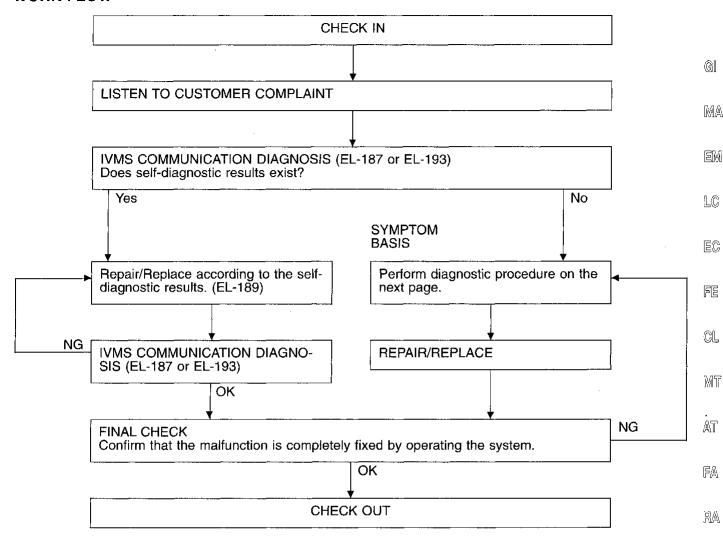


 DATA MONITOR and ACTIVE TEST are available for the wiper and washer.

**EL-106** 1310

# Trouble Diagnoses (Cont'd)

#### **WORK FLOW**



#### NOTICE:

 When LCU connectors are disconnected for more than 1 minute such as during trouble diagnoses, the "disconnected" data will be memorized by the BCM. Therefore, after reconnecting the LCU connectors, erase the memory.

To erase the memory, perform the procedure below.

Erase the memory with CONSULT (refer to EL-187) or turn the ignition switch to "OFF" position and remove 7.5A fuse (No. 56 located in the fuse and fusible link box).

HA

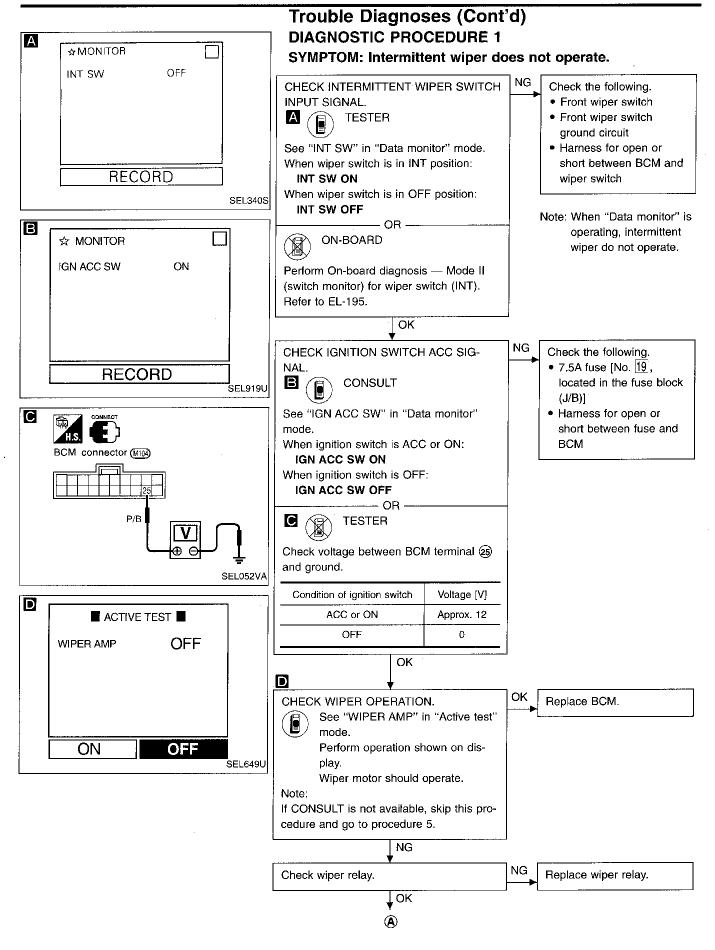
BR

ST

RS

BT

EL

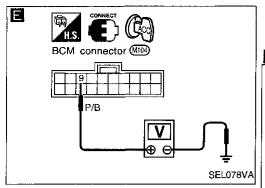


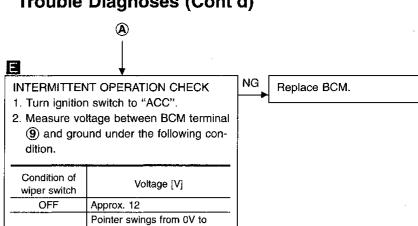
# Trouble Diagnoses (Cont'd)

battery voltage every 2 to 21

seconds depending on intermittent wiper volume setting.

OK





Check the following.

INT

- 20A fuse [No. 20], located in the fuse block (J/B)]
- Harness for open or short between fuse and wiper relay
- Harness for open or short between wiper relay and BCM

FE

Gl

MA

LC

EC

CL

MT

AT

FA

RA

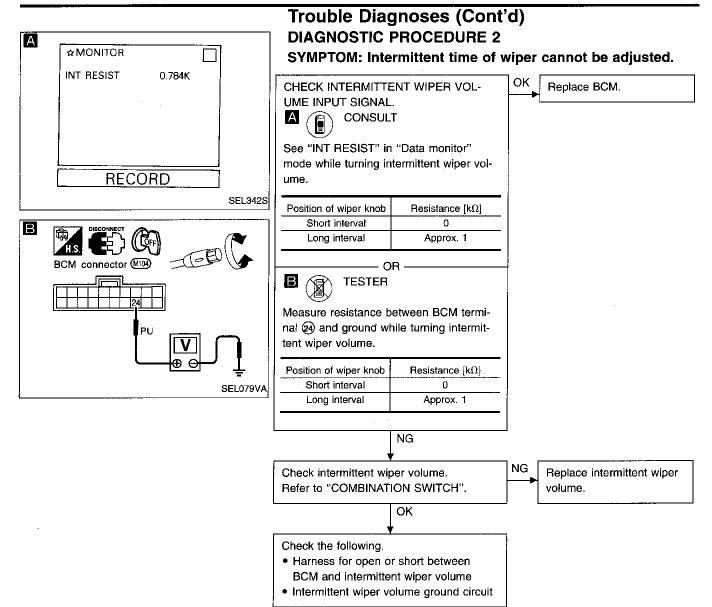
BR

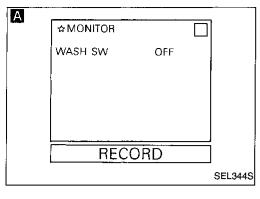
ST

RS

BT HA

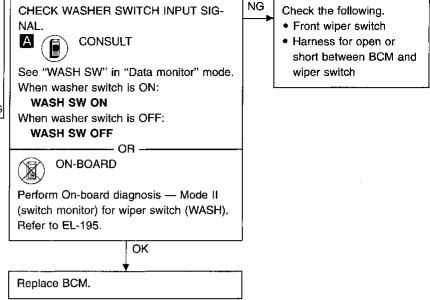
EL





# Trouble Diagnoses (Cont'd) DIAGNOSTIC PROCEDURE 3

SYMPTOM: Wiper and washer activate individually but not in combination.



G

MA

EM

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EC

FE

CL

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FA

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BR

ST

RS

BT

HA

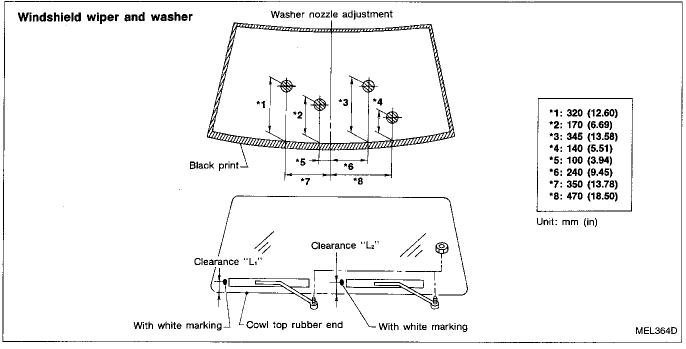
IDX

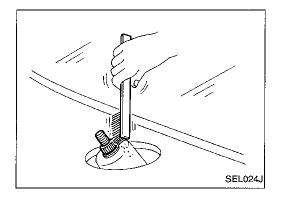
#### Installation

- 1. 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. Set the blade center to clearance "L<sub>1</sub>" or "L<sub>2</sub>" immediately before tightening nut.
- 3. Eject washer fluid. Turn on wiper switch to operate wiper motor and then turn it "OFF".
- 4. Ensure that wiper blades stop within clearance " $L_1$ " & " $L_2$ ". Clearance " $L_1$ ": 40 56 mm (1.57 2.20 in) Clearance " $L_2$ ": 37 47 mm (1.46 1.85 in)
- Tighten windshield wiper arm nuts to specified torque.

Windshield wiper:

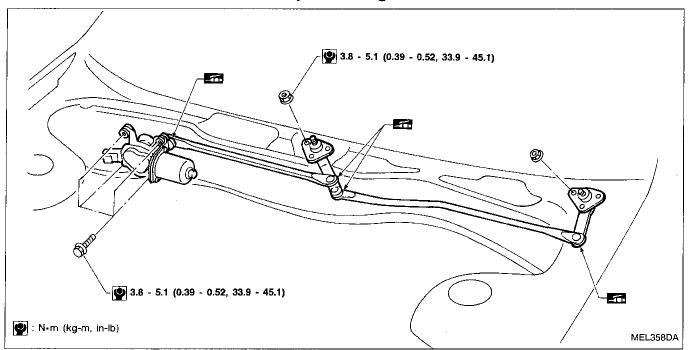
21 - 26 N·m (2.1 - 2.7 kg-m, 15 - 20 ft-lb)





 Before reinstalling wiper arm, clean up the pivot area as illustrated. This will reduce possibility of wiper arm looseness.

# Wiper Linkage



#### **REMOVAL**

- Remove 4 bolts that secure wiper motor.
- Detach wiper motor from wiper linkage at ball joint.
- Remove wiper linkage.

Be careful not to break ball joint rubber boot.

#### **INSTALLATION**

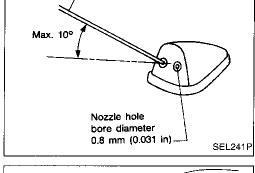
Grease ball joint portion before installation. Installation is in reverse order of removal.

# **Washer Nozzle Adjustment**

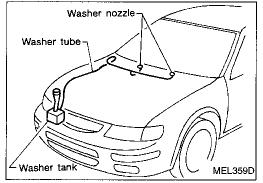
Adjust washer nozzle with suitable tool as shown in the figure at left.

Adjustable range: ±10°

Check Valve (Built in washer nozzles)



Suitable tool



EL

**G**1

MA

EM

LC

EC

FE

CL

MT

AT

FA

RA

88

ST

RS

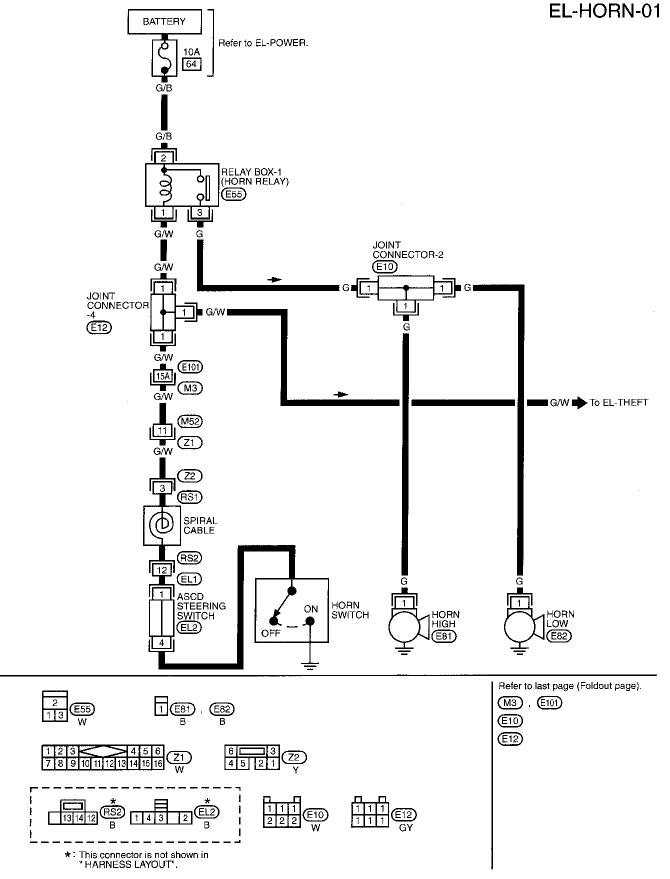
BT

HA

[DX

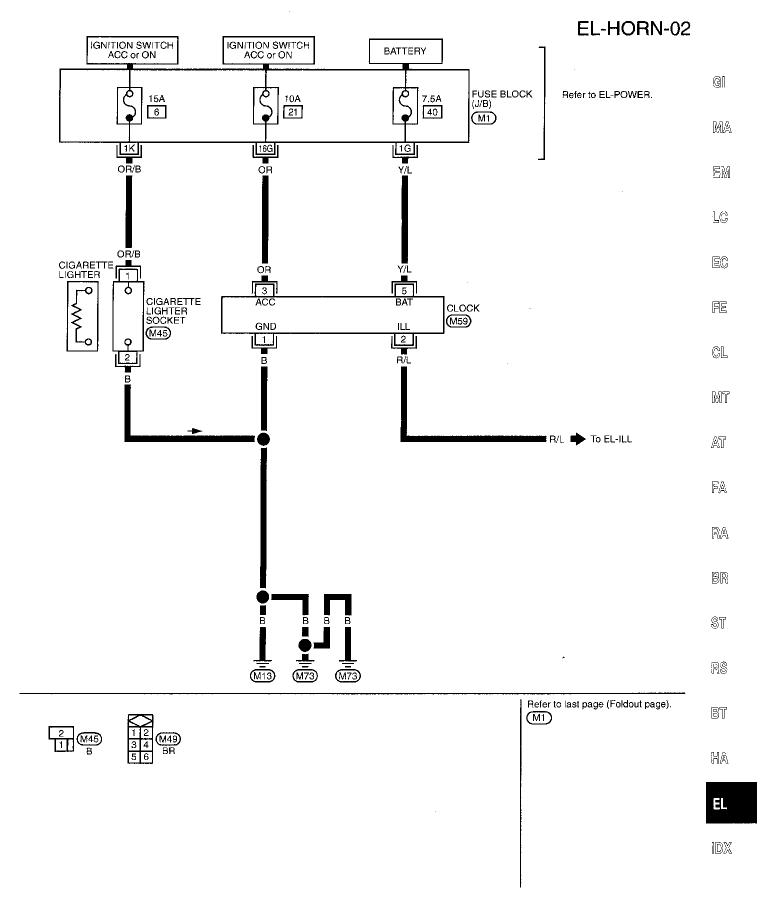
1317 **EL-113** 

# Wiring Diagram — HORN —



# HORN, CIGARETTE LIGHTER, CLOCK

# Wiring Diagram — HORN — (Cont'd)



## **System Description**

#### **FUNCTION**

The following time control function is controlled by BCM.

| Item                       | Details of control   |
|----------------------------|--|
| Rear window defogger timer | Turn off rear window defogger about 15 minutes after the rear window defogger switch is turned "ON". |

#### **REAR WINDOW DEFOGGER TIMER**

The rear window defogger system is controlled by the BCM.

Power is supplied at all times

- through 20A fuse [No. 38], located in the fuse block (J/B)]
- to the rear window defogger relay terminal ③, and
- through 20A fuse [No. 39, located in the fuse block (J/B)]
- to the rear window defogger relay terminal 6.

With the ignition switch in the ON or START position, power is supplied

- to the rear window defogger relay terminal (1) and,
- to BCM terminal 27
- through 7.5A fuse [No. 12], located in the fuse block (J/B)].

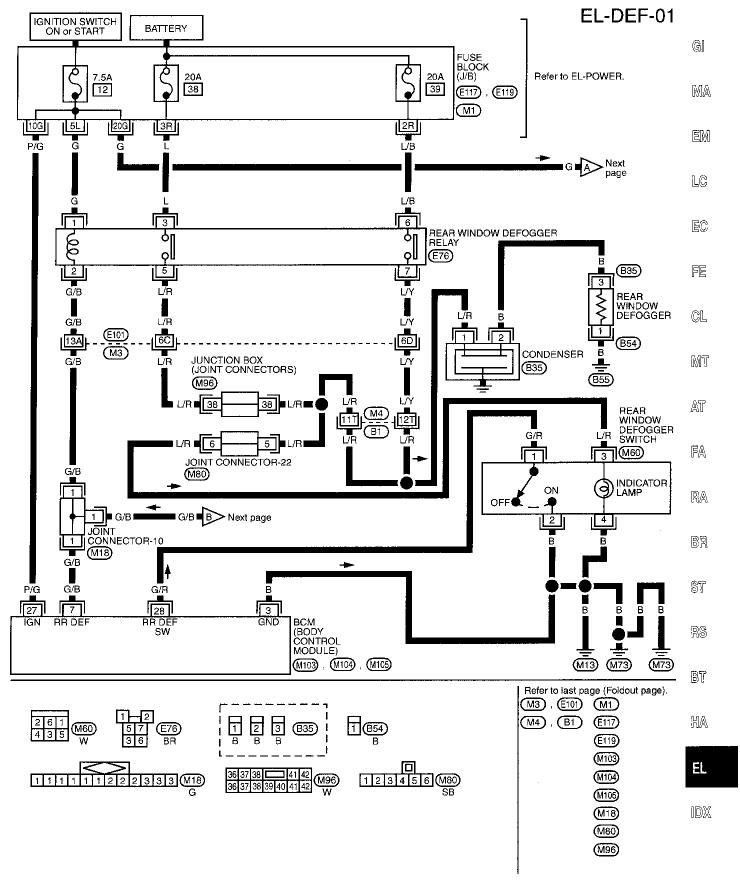
When the rear window defogger switch is ON, ground is supplied

- through terminal 1 of the rear window defogger switch
- to BCM terminal (28).

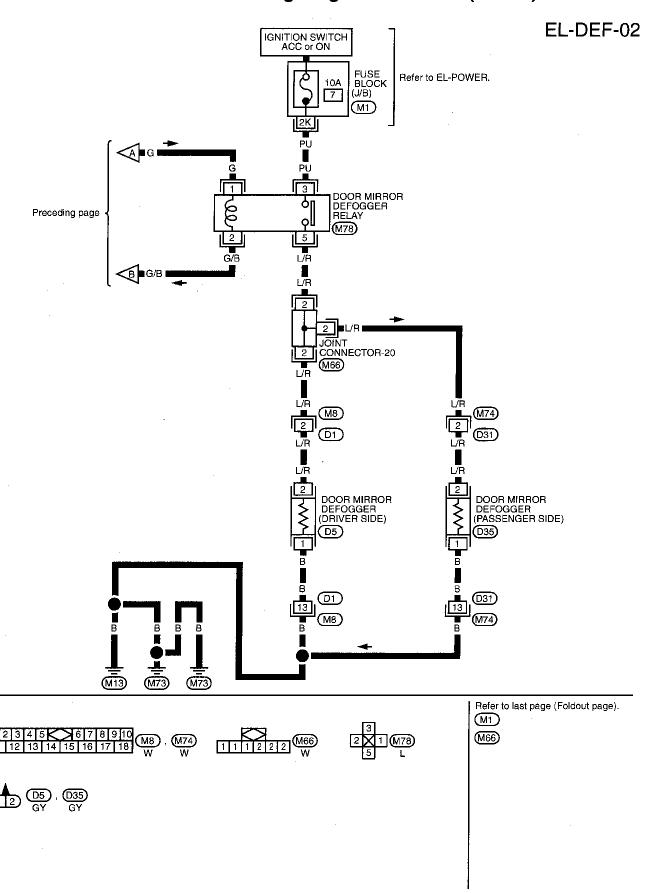
Terminal 7 of the BCM then supplies ground to the rear window defogger relay terminal 2.

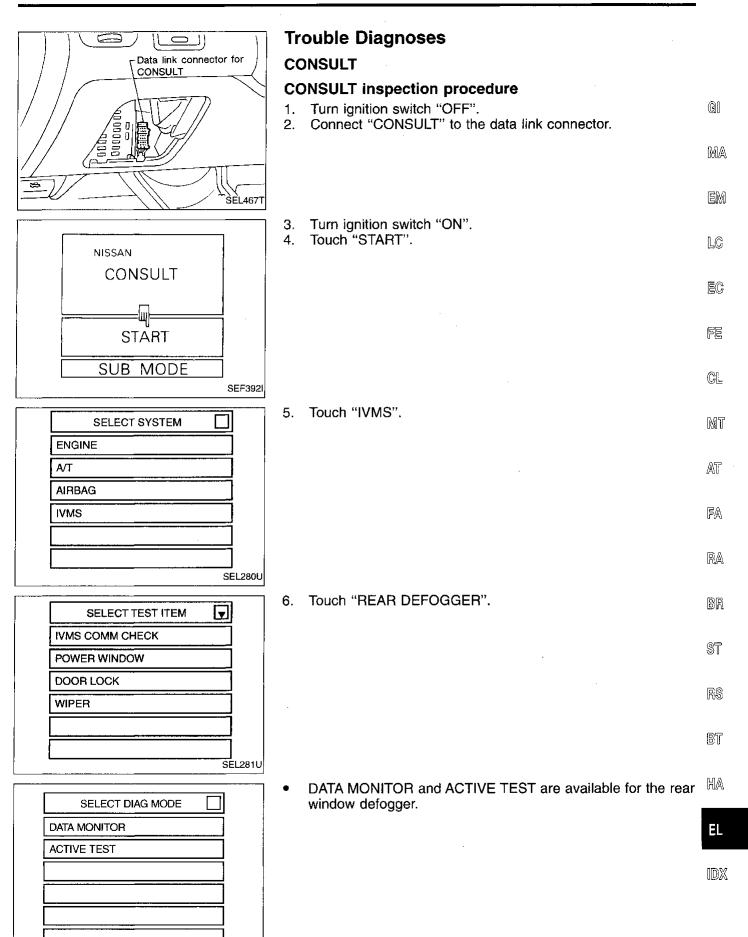
With power and ground supplied, the rear window defogger relay is energized to operate rear window defogger for about 15 minutes.

# Wiring Diagram — DEF —



# Wiring Diagram — DEF — (Cont'd)

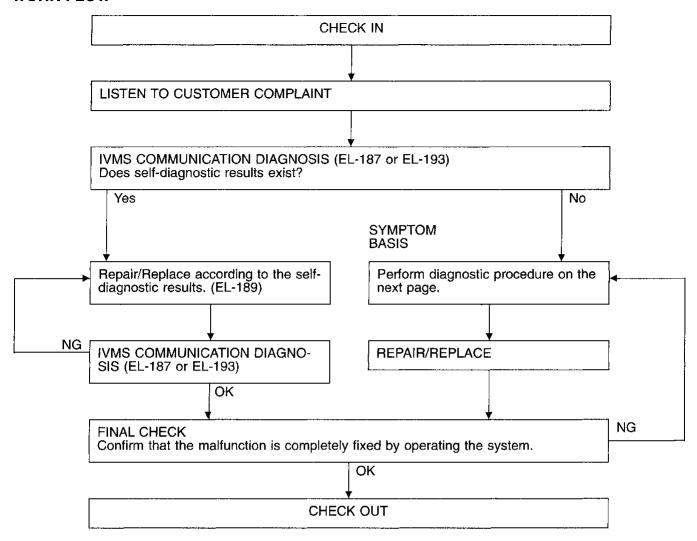




SEL904U

## Trouble Diagnoses (Cont'd)

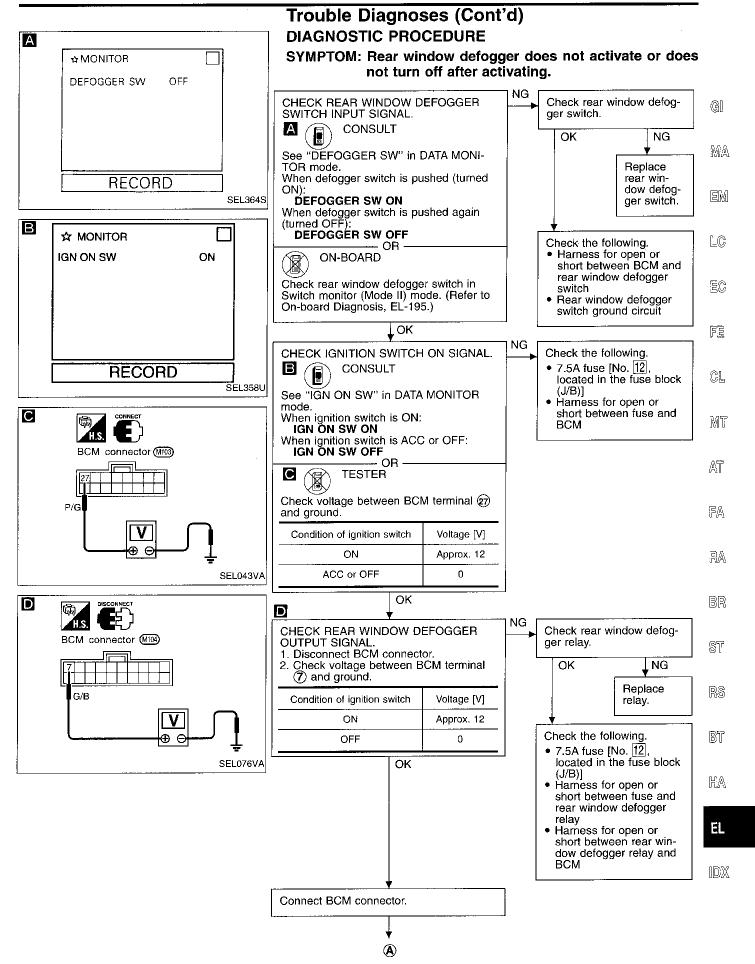
#### **WORK FLOW**

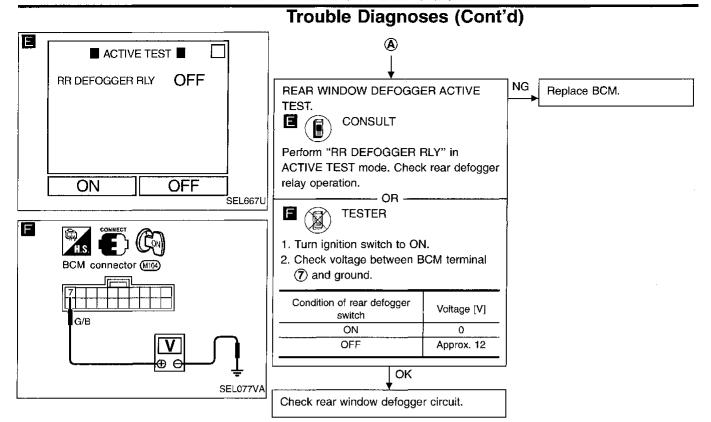


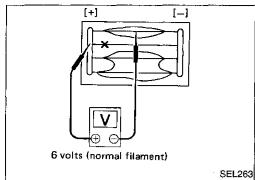
#### NOTICE:

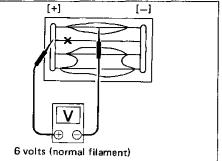
- When LCU connectors are disconnected for more than 1 minute such as during trouble diagnoses, the "disconnected" data will be memorized by the BCM. Therefore, after reconnecting the LCU connectors, erase the memory.
- To erase the memory, perform the procedure below.

  Erase the memory with CONSULT (refer to EL-187) or turn the ignition switch to "OFF" position and remove 7.5A fuse (No. 56) located in the fuse and fusible link box).









# **Filament Check**

1. Attach probe circuit tester (in volt range) to middle portion of each filament.



MA

EM

When measuring voltage, wrap tin foil around the top of the negative probe. Then press the foil against the wire with your finger.

LC

EC

Æ

CL

If a filament is burned out, circuit tester registers 0 or 12 volts.

MT

AT

FA

RA

BR

ST

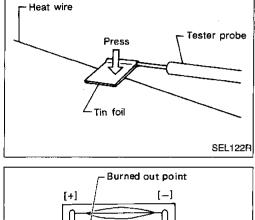
RS

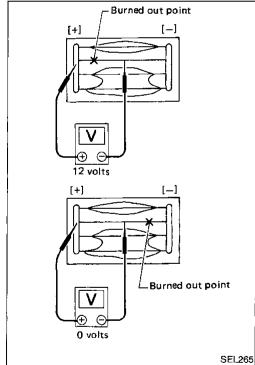
BT

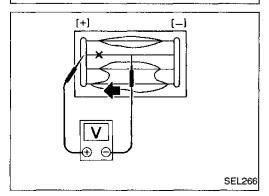
To locate burned out point, move probe along filament. Tester needle will swing abruptly when probe passes the point.

HA

IDX



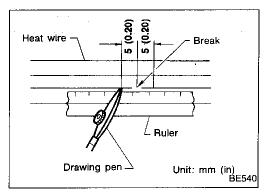


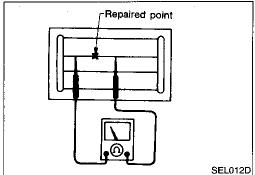


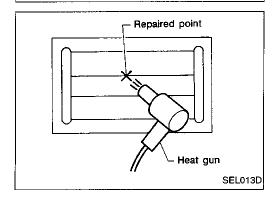
## **Filament Repair**

#### REPAIR EQUIPMENT

- Conductive silver composition (Dupont No. 4817 or equivalent)
- 2. Ruler 30 cm (11.8 in) long
- 3. Drawing pen
- 4. Heat gun
- 5. Alcohol
- 6. Cloth







#### REPAIRING PROCEDURE

- Wipe broken heat wire and its surrounding area clean with a cloth dampened in alcohol.
- 2. Apply a small amount of conductive silver composition to tip of drawing pen.

#### Shake silver composition container before use.

- Place ruler on glass along broken line. Deposit conductive silver composition on break with drawing pen. Slightly overlap existing heat wire on both sides [preferably 5 mm (0.20 in)] of the break.
- 4. After repair has been completed, check repaired wire for continuity. This check should be conducted 10 minutes after silver composition is deposited.

Do not touch repaired area while test is being conducted.

5. Apply a constant stream of hot air directly to the repaired area for approximately 20 minutes with a heat gun. A minimum distance of 3 cm (1.2 in) should be kept between repaired area and hot air outlet. If a heat gun is not available, let the repaired area dry for 24 hours.

# **AUDIO AND POWER ANTENNA**

# **Audio/System Description**

Refer to Owner's Manual for audio system operating instructions.

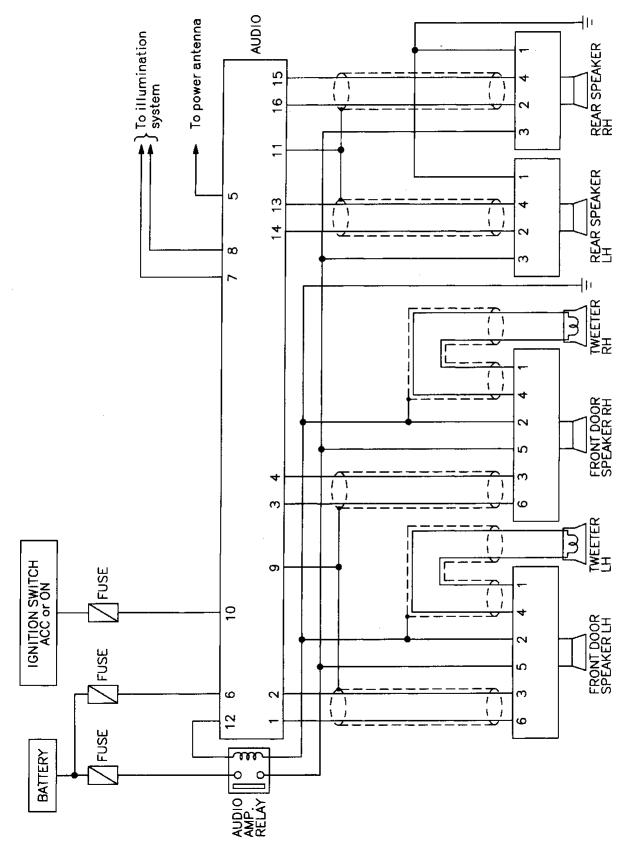
| Power is supplied at all times  • through 15A fuse (No. 12, located in the fuse and fusible link box)  • to audio terminal 6.  Power is supplied at all times  • through 15A fuse [No. 22, located in the fuse block (J/B)]  • to audio amp. relay terminal 3.  With the ignition switch in the ACC or ON position, power is supplied  • through 10A fuse [No. 21, located in the fuse block (J/B)]  • to audio terminal 1.  Ground is supplied through the case of the radio.  Ground is also supplied | GI<br>MA<br>EM<br>LC |
|---|----------------------|
| <ul> <li>to audio amp. relay terminal ②,</li> <li>to front door speaker LH terminal ② and</li> <li>to front door speaker RH terminal ②</li> <li>through body grounds (MI3) and (MI3)</li> <li>to rear speaker LH terminal ① and</li> <li>to rear speaker RH terminal ①</li> </ul>   |                      |
| <ul> <li>through body grounds (BIE) and (BIE).</li> <li>When the audio POWER button is pressed, power is supplied to audio amp. relay (1) from audio terminal (12).</li> <li>Then audio amp. relay is energized and power is supplied</li> <li>to front door speaker LH terminal (5)</li> <li>to front door speaker RH terminal (5) and</li> <li>to rear speaker LH terminal (3) and RH terminal (3).</li> </ul>  | CL<br>MT             |
| <ul> <li>Audio signals are supplied</li> <li>through audio terminals ①, ②, ③, ④, ⑥, ⑥, ⑥, ② and ⑥</li> <li>to terminals ③ and ⑥ of the LH and RH front speakers and terminals ② and ④ of the LH and RH rear speakers</li> <li>to LH and RH tweeters through terminals ① and ④ of the front and rear speakers.</li> </ul>  | AT<br>FA             |
| EXCEPT FOR BOSE SYSTEM  | RA                   |
| <ul> <li>Power is supplied at all times</li> <li>through 15A fuse [No. 2], located in the fuse and fusible link box]</li> <li>to audio terminal 6 and,</li> <li>through 7.5A fuse [No. 4], located in the fuse block (J/B)]</li> </ul>  | <b>B</b> R           |
| <ul> <li>to CD player terminal ②.</li> <li>With the ignition switch in the ACC or ON position, power is supplied</li> <li>through 10A fuse [No. 21], located in the fuse block (J/B)]</li> </ul>  | ST                   |
| <ul> <li>to audio terminal (1) and CD player terminal (2).</li> <li>Ground is supplied through the case of the audio and CD player.</li> <li>When the audio power knob is pushed to the ON position, the audio signal is supplied</li> </ul>  | RS                   |
| <ul> <li>through radio terminal ①, ②, ③, ④, ③, ①, ① and ⑥</li> <li>to terminal ① and ② of the LH and RH front speaker, LH and RH tweeter and LH and RH rear speaker.</li> </ul>   | BT                   |
|   | HA                   |

Fl

IDX

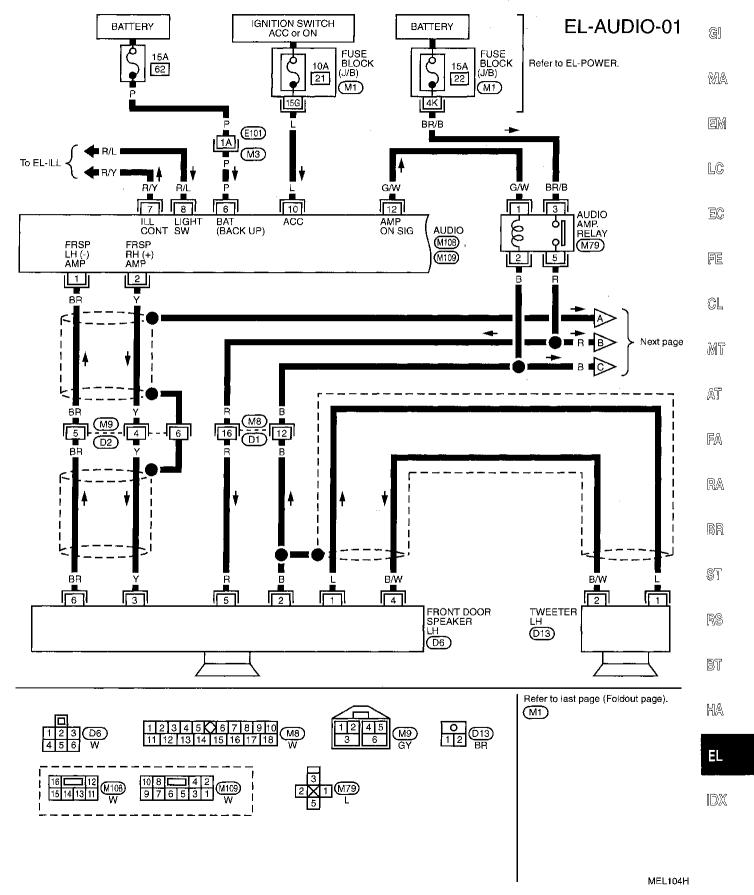
# **Audio/Schematic**

# **BOSE SYSTEM**



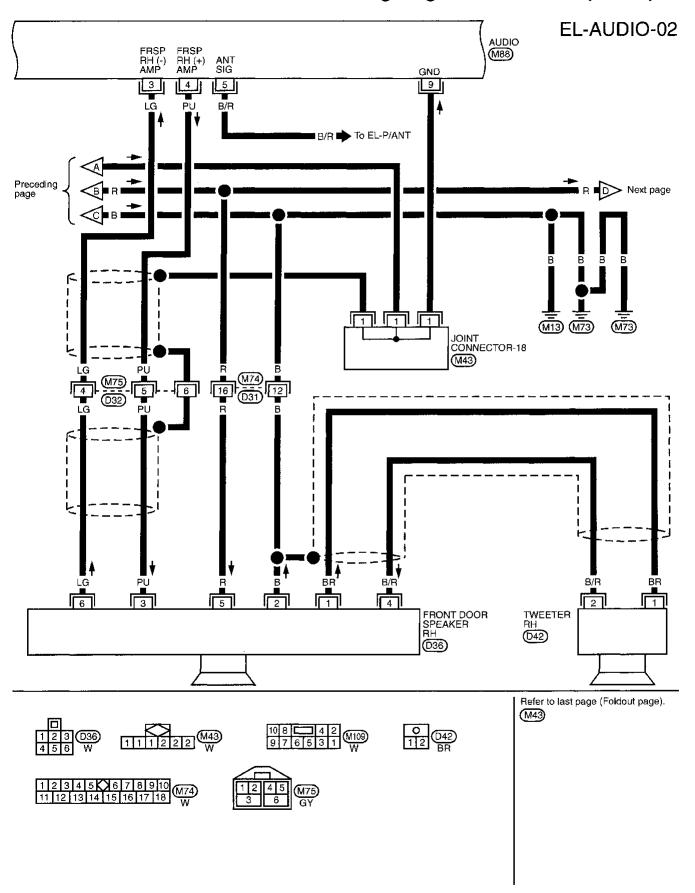
# Audio/Wiring Diagram — AUDIO —

#### **BOSE SYSTEM**



# **AUDIO AND POWER ANTENNA**

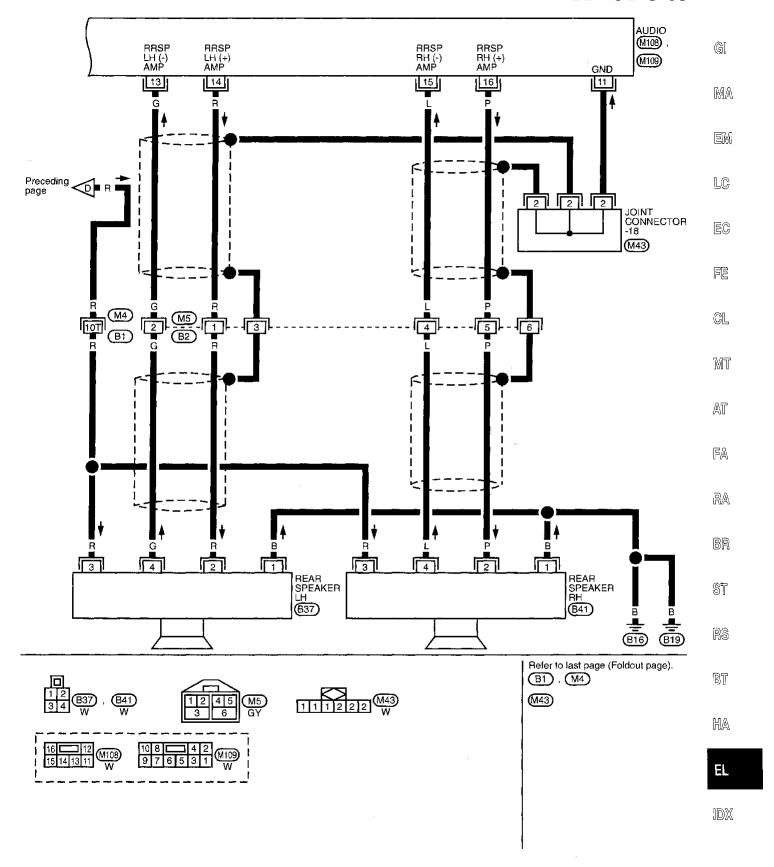
# Audio/Wiring Diagram — AUDIO — (Cont'd)



# **AUDIO AND POWER ANTENNA**

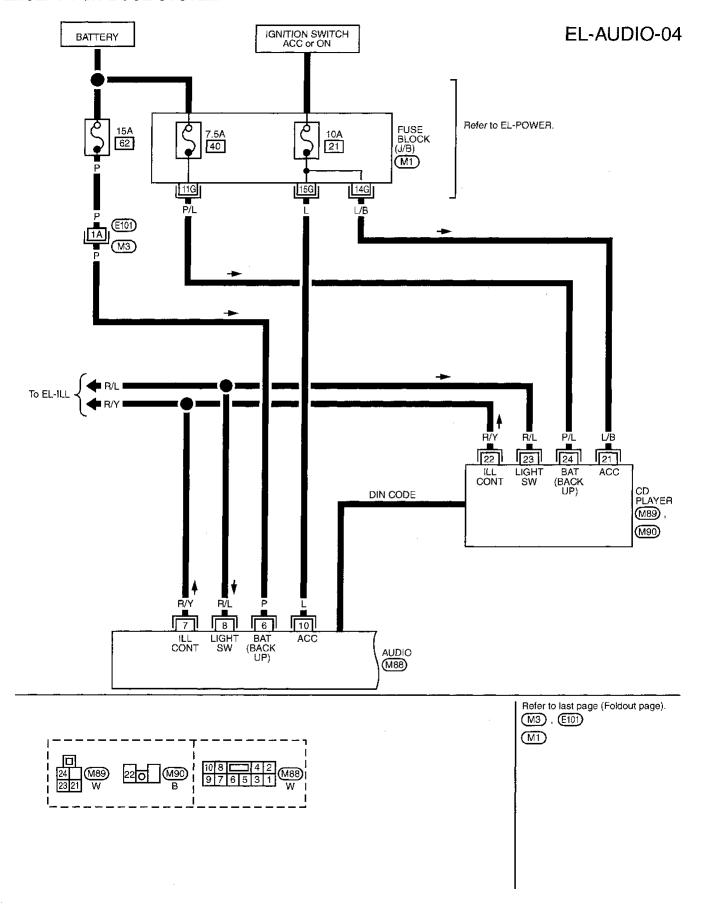
# Audio/Wiring Diagram — AUDIO — (Cont'd)

# **EL-AUDIO-03**



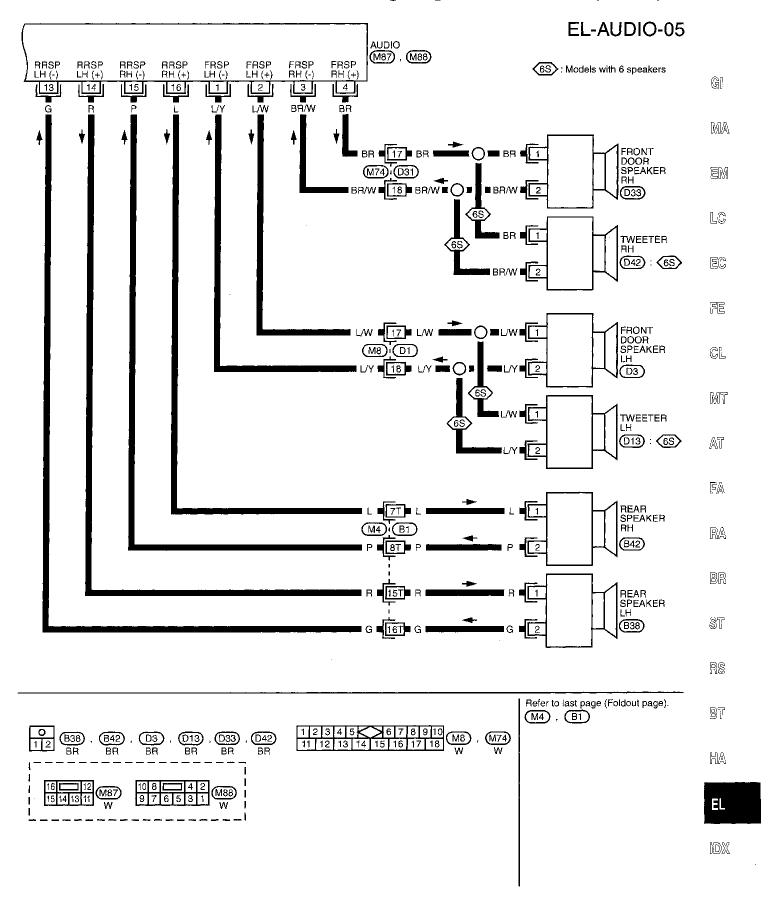
# Audio/Wiring Diagram — AUDIO — (Cont'd)

#### **EXCEPT FOR BOSE SYSTEM**



#### **AUDIO AND POWER ANTENNA**

# Audio/Wiring Diagram — AUDIO — (Cont'd)



## **AUDIO AND POWER ANTENNA**

# **Power Antenna/System Description**

Power is supplied at all times

• through 7.5A fuse [No. 40], located in the fuse block (J/B)]

to power antenna timer and motor terminal (3).

With the ignition switch in the ACC or ON position, power is supplied

through 10A fuse [No. 21], located in the fuse block (J/B)]

• to audio terminal (10).

Ground is supplied to the power antenna timer and motor through body grounds (T6) and (T9).

When the radio is turned to the ON position, battery voltage is supplied

• through audio terminal (5)

to power antenna timer and motor terminal (4).

When battery voltage is supplied to the power antenna timer and motor terminal (4), power supplied to the power antenna timer and motor terminal (3) drives the motor.

The antenna rises and is held in the extended position.

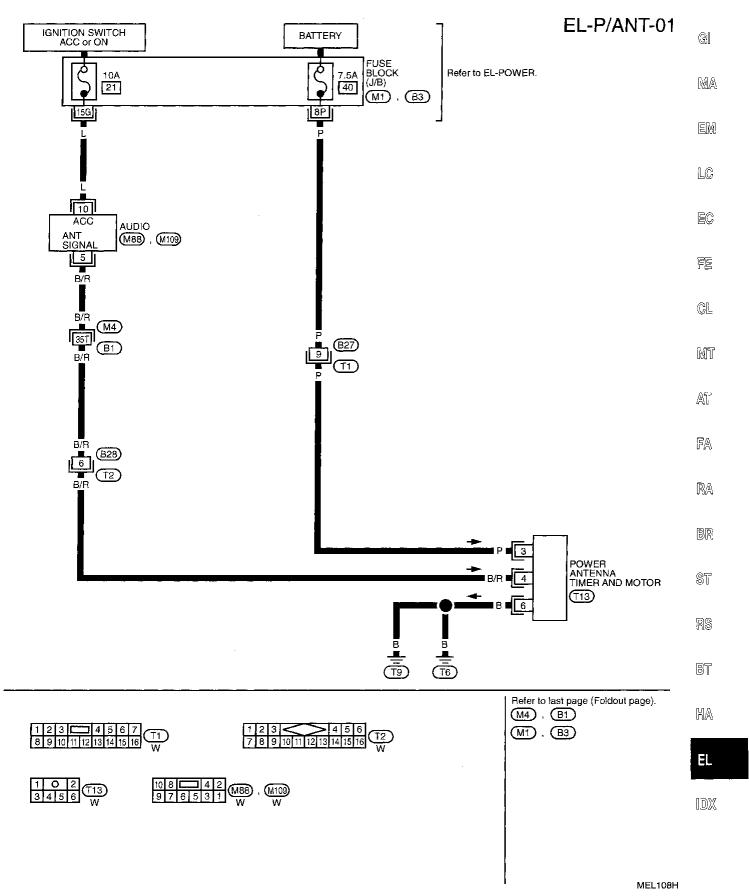
When the audio is turned to the OFF position, battery voltage is interrupted

• from audio terminal ⑤

to power antenna terminal 4.

The antenna retracts.

# Power Antenna/Wiring Diagram — P/ANT —



# AUDIO AND POWER ANTENNA

# **Trouble Diagnoses**

# **RADIO**

| Symptom   | Possible causes   | Repair order  |
|---|---|---|
| Radio is inoperative (no digital display and no sound from speakers).                       | 1. 10A fuse     2. Poor radio case ground     3. Radio  | Check 10A fuse [No. 21], located in fuse block (J/B)]. Turn ignition switch ON and verify battery positive voltage is present at terminal (1) of radio.     Check radio case ground.     Remove radio for repair.   |
| Radio presets are lost when ignition switch is turned OFF.                                  | 1. 15A fuse     2. Radio  | Check 15A fuse (No. 62, located in fuse and fusible link box). Verify battery positive voltage is present at terminal 6 of radio.     Remove radio for repair.  |
| AM stations are weak or noisy (FM stations OK).   | Antenna     Poor radio ground     Radio   | Check antenna.     Check radio ground.     Remove radio for repair.   |
| FM stations are weak or noisy (AM stations OK).   | Window antenna     Radio  | Check antenna.     Remove radio for repair.   |
| Radio generates noise in AM and FM modes with engine running.                               | Poor radio ground     Loose or missing ground bonding straps     Ignition condenser or rear window defogger noise suppressor condenser     Alternator     Ignition coil or secondary wiring     Radio | <ol> <li>Check radio ground.</li> <li>Check ground bonding straps.</li> <li>Replace ignition condenser or rear window defogger noise suppressor condenser.</li> <li>Check alternator.</li> <li>Check ignition coil and secondary wiring.</li> <li>Remove radio for repair.</li> </ol> |
| Radio generates noise in AM and FM modes with accessories on (switch pops and motor noise). | Poor radio ground     Antenna     Accessory ground     Faulty accessory   | 1. Check radio ground. 2. Check antenna. 3. Check accessory ground. 4. Replace accessory.   |

# **BOSE SYSTEM**

| Symptom  | Possible causes            | Repair order   |
|--|----------------------------|--|
| but no sound is heard from any speaker.  2. Aug. 3. Aug. 4. Am. 5. Rad | 1. 15A fuse                | Check 15A fuse [No. 22], located in fuse block (J/B)]. Verify battery positive voltage is present at terminal ③ of audio amp. relay. |
|  | 2. Audio amp. relay        | 2. Check audio amp. relay.   |
|  | 3. Audio amp. relay ground | 3. Check audio amp. relay ground (Terminal 2).   |
|  | 4. Amp. ON signal          | 4. Turn ignition switch ACC and radio ON. Verify battery positive voltage is present at terminal ① of audio amp. relay.              |
|  | 5. Radio output            | 5. Check radio output voltage.   |
|  | 6. Radio                   | 6. Remove radio for repair.  |
| inoperative.   | Speaker ground             | 1. Check speaker ground (Terminal ②: FR LH, ②: FR RH, ①: RR LH, ①: RR RH).   |
|  | 2. Power supply            | 2. Check power supply for speaker.   |
|  | 3. Radio output            | 3. Check radio output voltage for amp.   |
|  | 4. Speaker                 | 4. Replace speaker.  |

#### Trouble Diagnoses (Cont'd)

#### **EXCEPT FOR BOSE SYSTEM**

| Symptom                                     | Possible causes                                | Repair order   |   |
|---|--|--|---|
| Individual speaker is noisy or inoperative. | Speaker     Harness     Radio output     Radio | Check speaker.     Check harness between radio and speaker.     Check radio output voltage for speaker.     Remove radio for repair. | _ |

#### G

#### **POWER ANTENNA**

| Symptom                         | Possible causes      | Repair order  |
|---------------------------------|----------------------|---|
| Power antenna does not operate. | 1. 7.5A fuse         | Check 7.5A fuse [No. 40], located in fuse block (J/B)]. Verify that battery positive voltage is present at terminal 3 of power antenna. |
|                                 | 2. Radio signal      | 2. Turn ignition switch and radio ON. Verify that battery positive voltage is present at terminal <b>(4)</b> of power antenna.          |
|                                 | 3. Grounds T6 and T9 | 3. Check grounds (76) and (79).   |

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#### SPEAKER INSPECTION (EXCEPT FOR BOSE SYSTEM)

- 1. Disconnect speaker harness connector.
- 2. Measure the resistance between front and rear speaker terminals ① and ② or terminals ① and ② of tweeter (for 6-speaker type).
- The resistance should be 2 to  $4\Omega$ .
- Using jumper wires, momentarily connect a 9V battery between front and rear speaker terminals 1 and 2.
- A momentary hum or pop should be heard.

#### MT

#### **ANTENNA INSPECTION**

- 1. Using a jumper wire, clip an auxiliary ground between antenna and body.
- If reception improves, check antenna ground (at body surface).
- If reception does not improve, check main feeder cable for short circuit or open circuit.

#### FA

AT

#### RADIO INSPECTION

All voltage inspections are made with:

- Ignition switch ON or ACC
- Radio ON
- Radio and speakers connected (If radio or speaker is removed for inspection, supply a ground to the case using a jumper wire.)



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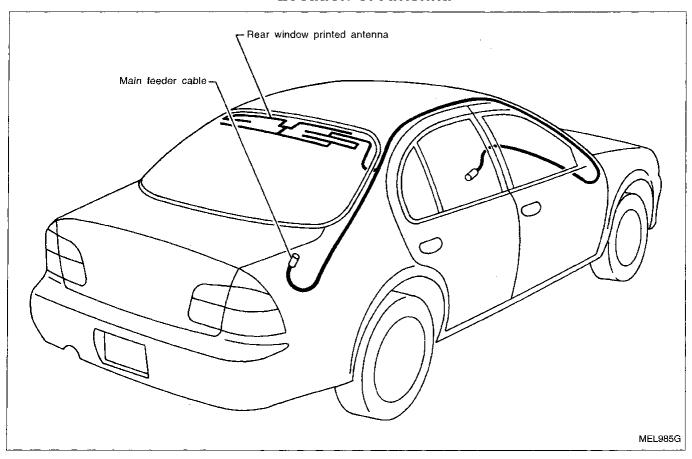


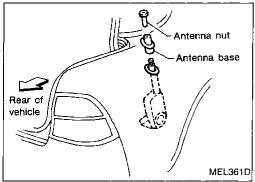
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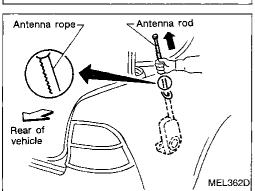
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#### **Location of Antenna**







# Antenna Rod Replacement REMOVAL

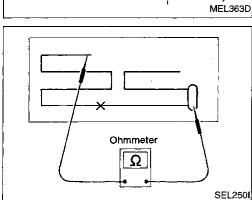
1. Remove antenna nut and antenna base.

2. Withdraw antenna rod while raising it by operating antenna motor.

# Extend antenna prope end. Antenna rope Antenna rod Rear of vehicle

# Antenna Rod Replacement (Cont'd) INSTALLATION

- 1. Lower antenna rod by operating antenna motor.
- Insert gear section of antenna rope into place with it facing toward antenna motor.
- As soon as antenna rope is wound on antenna motor, stop antenna motor. Insert antenna rod lower end into antenna motor pipe.
- Retract antenna rod completely by operating antenna motor.
- 5. Install antenna nut and base.

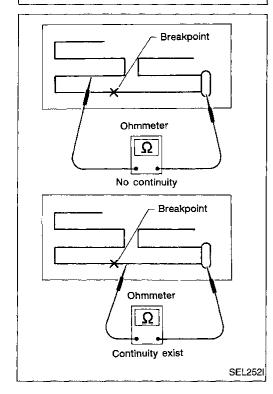


#### Window Antenna Repair

#### **ELEMENT CHECK**

 Attach probe circuit tester (in ohm range) to antenna terminal on each side.

2. If an element is broken, no continuity will exist.





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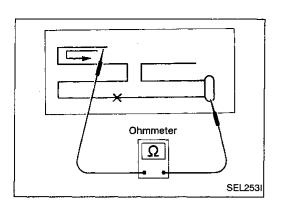
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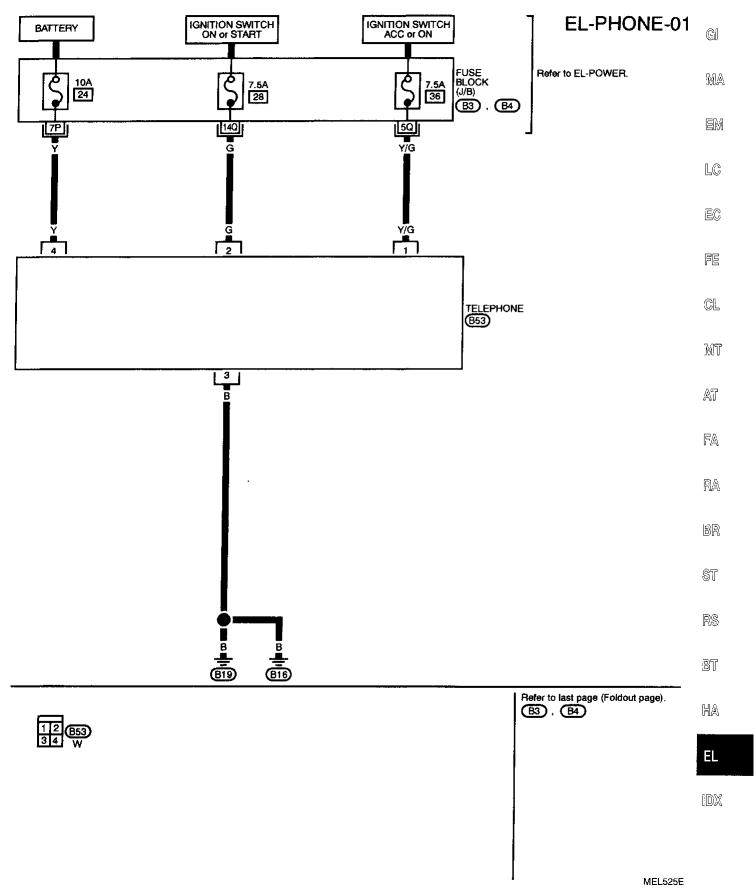
#### Window Antenna Repair (Cont'd)

3. To locate broken point, move probe along element. Tester needle will swing abruptly when probe passes the point.

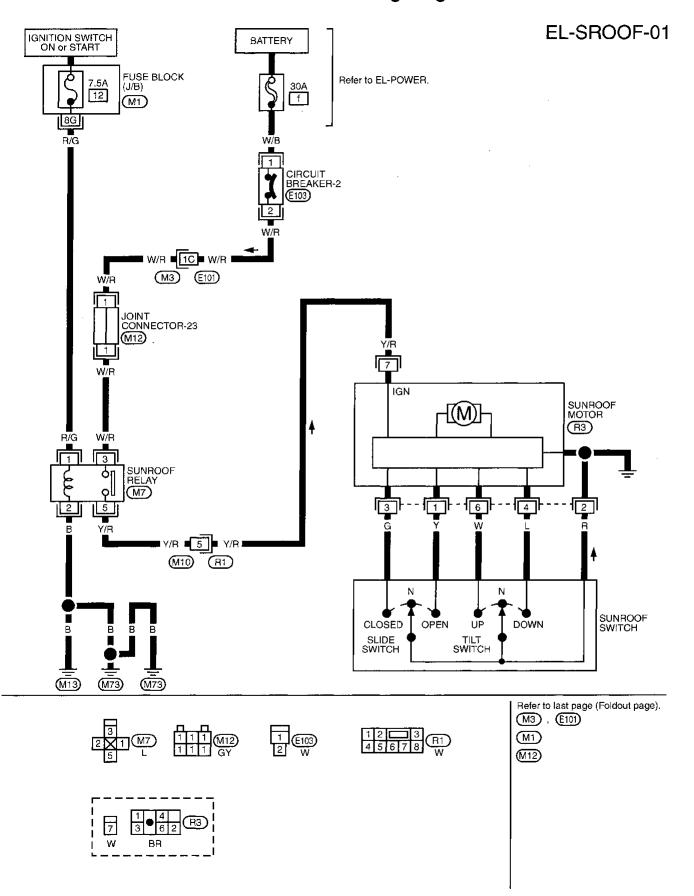
#### **ELEMENT REPAIR**

Refer to REAR WINDOW DEFOGGER "Filament Repair" (EL-124).

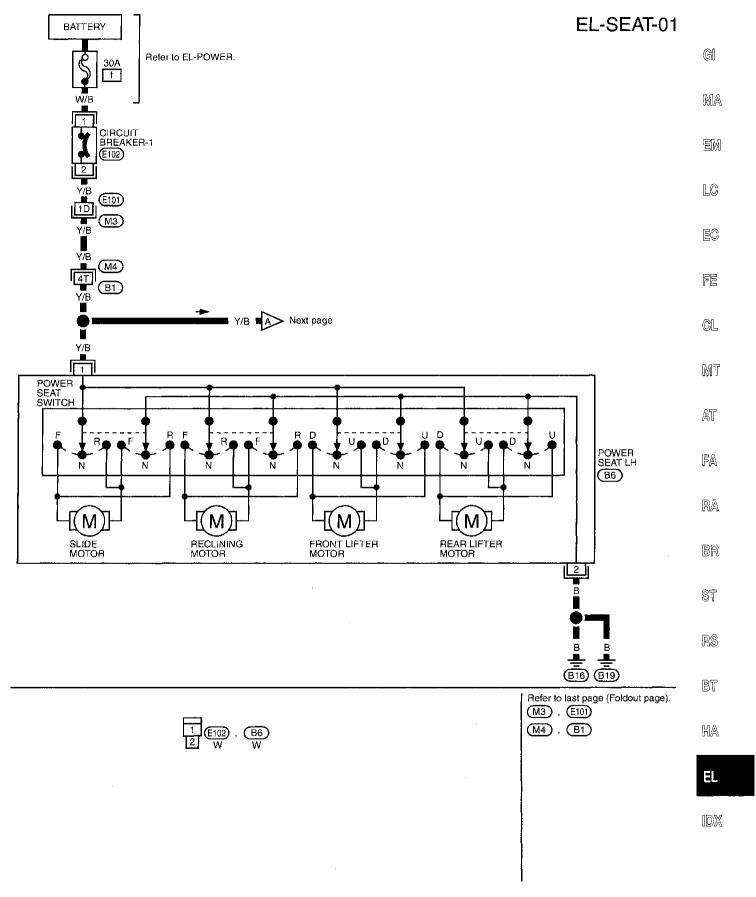
# Telephone Pre Wire/Wiring Diagram — PHONE —



#### Sunroof/Wiring Diagram — SROOF —

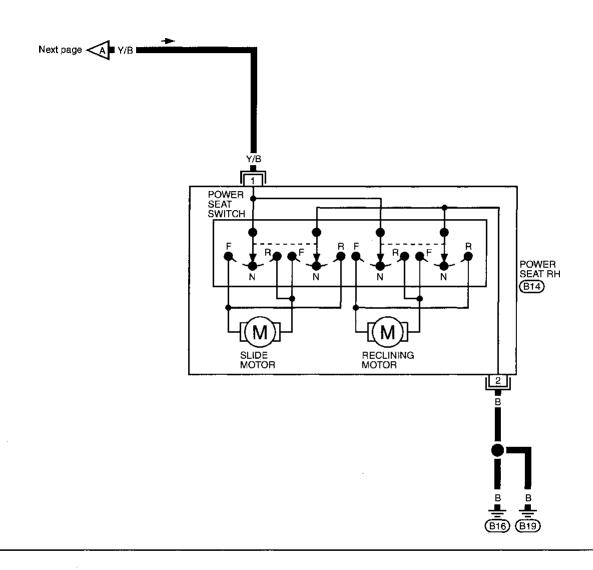


#### Power Seat/Wiring Diagram — SEAT —



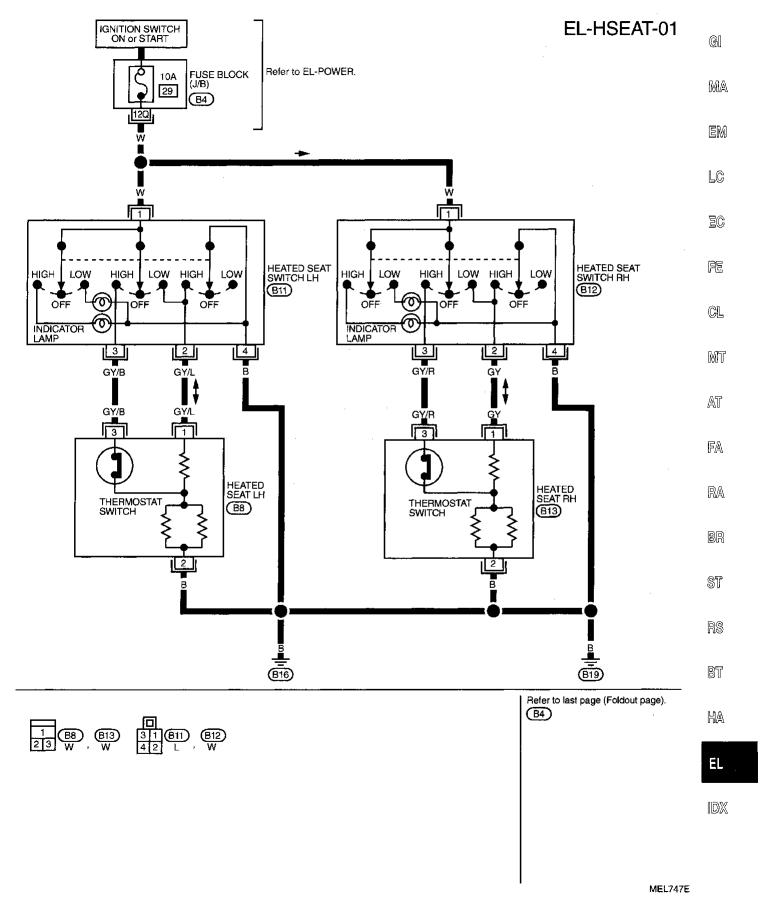
# Power Seat/Wiring Diagram — SEAT — (Cont'd)

EL-SEAT-02

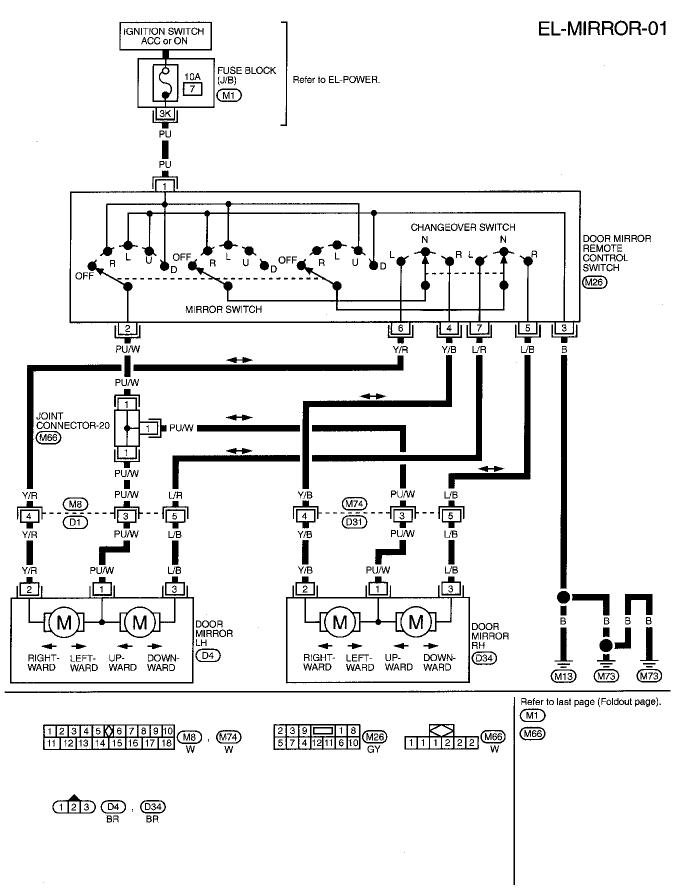




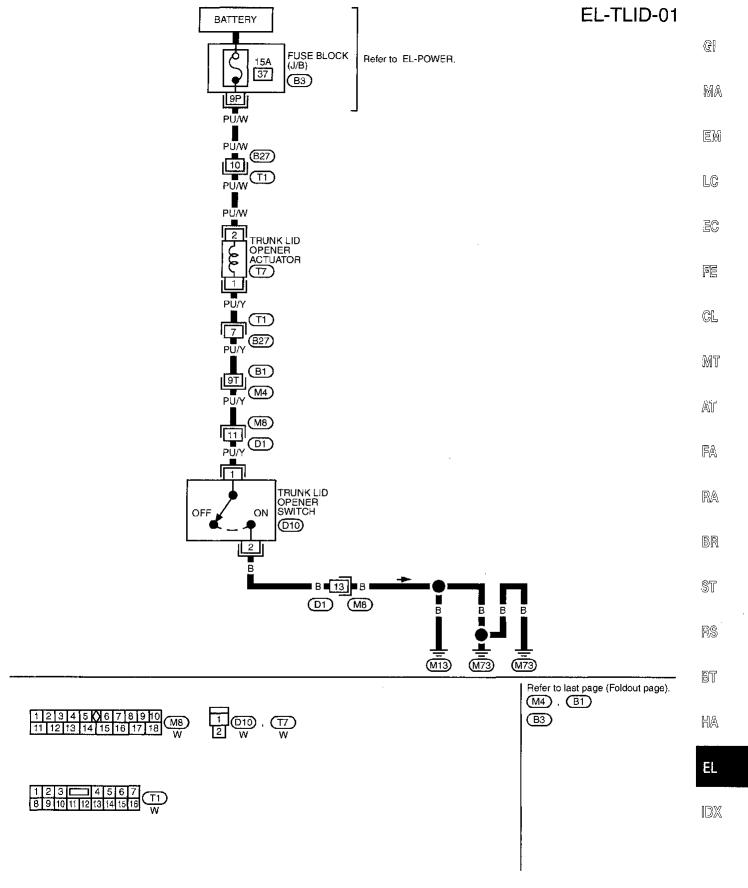
#### Heated Seat/Wiring Diagram — HSEAT —



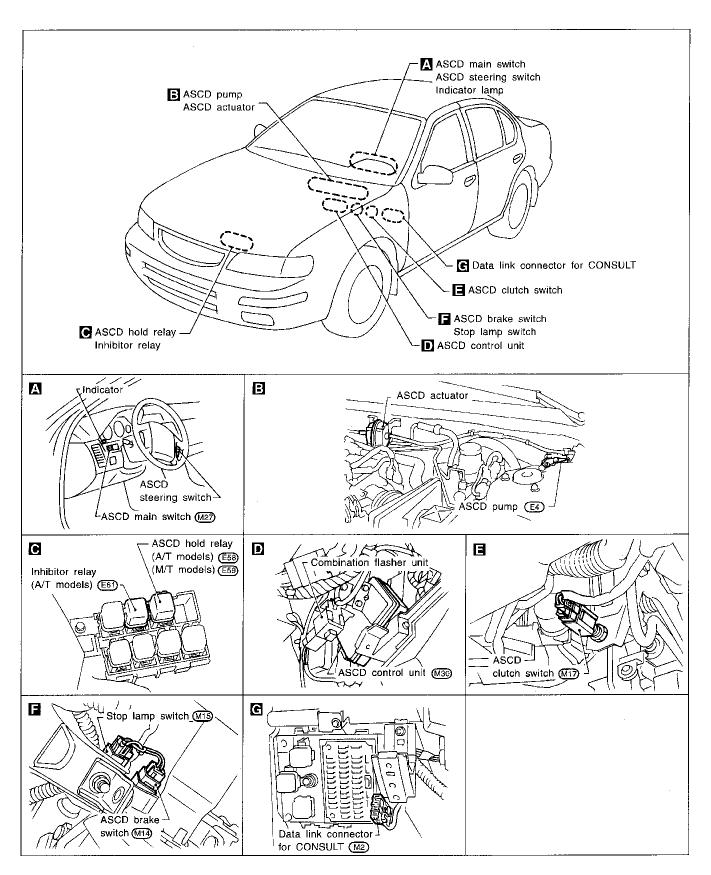
#### Wiring Diagram — MIRROR —



#### Wiring Diagram - TLID -



### **Component Parts and Harness Connector Location**



#### **System Description**

| Refer to Owner's Manual for ASCD operating instructions.  When the ignition switch is in the ON or START position, power is supplied                 |        |
|--|--------|
| • through 7.5A fuse [No. 12], located in the fuse block (J/B)]   | 0.0    |
| to ASCD main switch terminal ① and     to ASCD hold relay terminal ② and   | G      |
| to ASCD hold relay terminal (5) and     to ASCD heaks switch terminal (1) (A/T models)   |        |
| <ul> <li>to ASCD brake switch terminal ① (A/T models).</li> <li>When ASCD main switch is in the ON position, power is supplied</li> </ul>            | MA     |
| • from terminal (2) of the ASCD main switch  | aveb c |
| to ASCD control unit terminal (4) and  |        |
| to ASCD clutch switch terminal (1) (M/T models)  | EM     |
| from terminal ③ of the ASCD main switch  |        |
| • to ASCD hold relay terminal (1).   | [ @    |
| Ground is supplied   | LC     |
| • to ASCD hold relay terminal ②  |        |
| • through body grounds (E5) and (E30).   | EC     |
| With power and ground supplied, the ASCD hold relay is activated, and power is supplied  |        |
| • from terminal ③ of ASCD hold relay   |        |
| through ASCD main switch terminals ② and ③     to ASCD hold relay terminal ③   | FE     |
| <ul> <li>to ASCD hold relay terminal ①</li> <li>When the ASCD main switch is released to the N (neutral) position, power remains supplied</li> </ul> |        |
| • from terminal (3) of the ASCD hold relay   |        |
| to ASCD control unit terminal 4 and  | CL     |
| • to ASCD clutch switch terminal (1) (M/T models) or   |        |
| from terminal 6 of the ASCD hold relay   | MT     |
| • to inhibitor relay terminal 3 (A/T models).  | DOU L  |
| Ground is supplied   |        |
| • to ASCD control unit terminal ③  | AT     |
| • through body grounds (M13) and (M73).  | 2 00   |
| Inputs   |        |
| At this point, the system is ready to activate or deactivate, based on inputs from the following:  | FA     |
| speedometer in the combination meter   |        |
| stop lamp switch   | ET A   |
| ASCD steering switch   | RA     |
| • inhibitor relay (A/T models)   |        |
| <ul> <li>ASCD clutch switch (M/T models) and</li> <li>ASCD brake switch.</li> </ul>  | BR     |
| A vehicle speed input is supplied  | 1.00   |
| • from terminal (14) of the combination meter  |        |
| • to ASCD control unit terminal ⑦  | ST     |
| Power is supplied at all times   |        |
| • to stop lamp switch terminal (1)   | (B)(A) |
| • through 15A fuse [No. 10, located in the fuse block (J/B)].  | RS     |
| When the brake pedal is depressed, power is supplied   |        |
| • from terminal ② of the stop lamp switch  | 37     |
| • to ASCD control unit terminal (1).   | الاطا  |
| Power is supplied at all times   |        |
| <ul> <li>through 10A fuse (No. 64, located in the fuse and fusible link box)</li> <li>to horn relay terminal (2),</li> </ul>                         | HA     |
| • through terminal ① of the horn relay   |        |
| • to ASCD steering switch terminal (1).  |        |
| When the SET/COAST switch is depressed, power is supplied  | EL     |
| • from terminal ② of the ASCD steering switch  |        |
| • to ASCD control unit terminal 2.   | IDX    |
| When the RESUME/ACCEL switch is depressed, power is supplied   | אמשונו |
| from terminal ③ of the ASCD steering switch  |        |
| • to ASCD control unit terminal (1).   |        |
| When the ASCD CANCEL switch is depressed, power is supplied  |        |
| • to ASCD control unit terminals ① and ②.  When the system is activated, power is symplical.   |        |
| When the system is activated, power is supplied  |        |

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#### **System Description (Cont'd)**

• to ASCD control unit terminal (5) and

Power is interrupted when

- the selector is placed in P or N (A/T models)
- the clutch pedal is depressed (M/T models) or
- the brake pedal is depressed.

#### **Outputs**

The ASCD actuator controls the throttle drum via the ASCD wire based on inputs from the ASCD control unit. The ASCD actuator consists of a vacuum motor, an air valve, and a release valve. Power is supplied

- from terminal (8) of the ASCD control unit
- to ASCD pump terminal (1).

Ground is supplied to the vacuum motor

- from terminal (9) of the ASCD control unit
- to ASCD pump terminal 4.

Ground is supplied to the air valve

- from terminal (10) of the ASCD control unit
- to ASCD pump terminal (2).

Ground is supplied to the release valve

- from terminal (4) of the ASCD control unit
- to ASCD pump terminal (3).

When the system is activated, power is supplied

- from terminal (3) of the ASCD control unit
- to combination meter terminal (8) and
- to A/T control unit terminal (37) (A/T models).

Ground is supplied

- to combination meter terminal 31)
- through body grounds M13 and M73.

With power and ground supplied, the CRUISE indicator illuminates.

When vehicle speed is approximately 8 km/h (5 MPH) below set speed on A/T models, a signal is sent

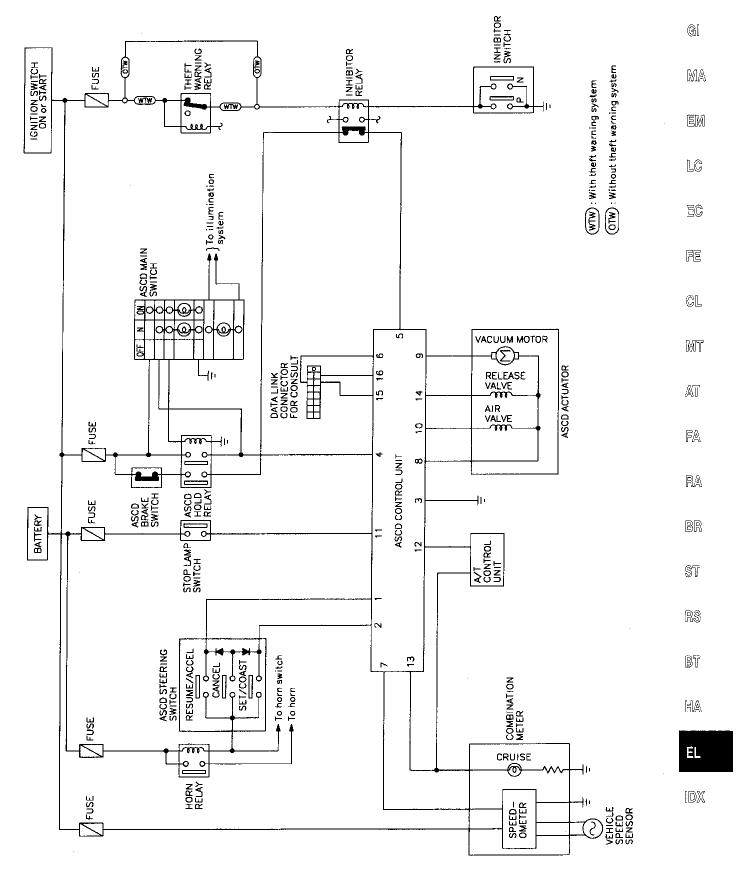
- from terminal (12) of the ASCD control unit
- to A/T control unit terminal (40).

When this occurs, the A/T control unit cancels overdrive.

After vehicle speed is approximately 3 km/h (2 MPH) above set speed, overdrive is reactivated.

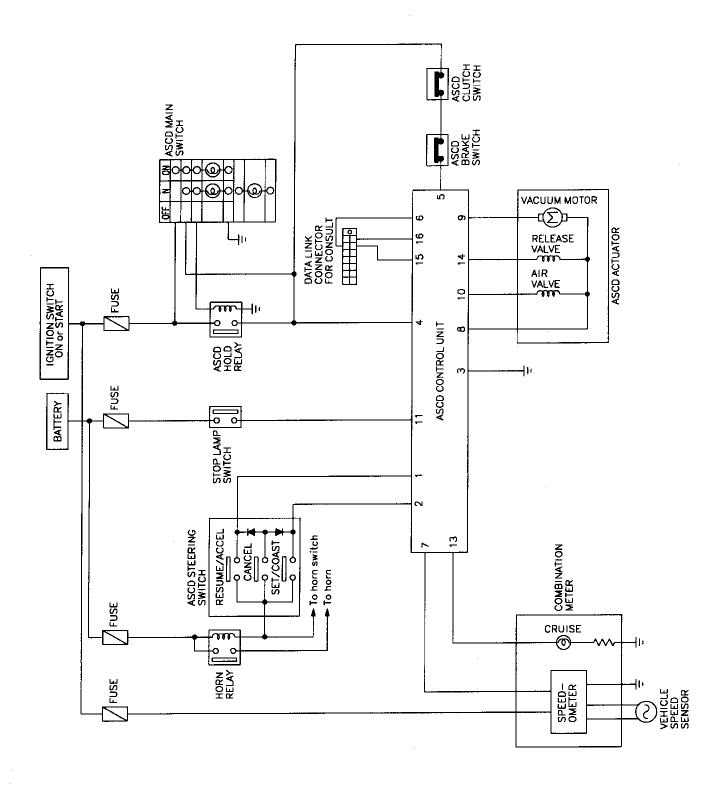
#### **Schematic**

#### A/T MODELS

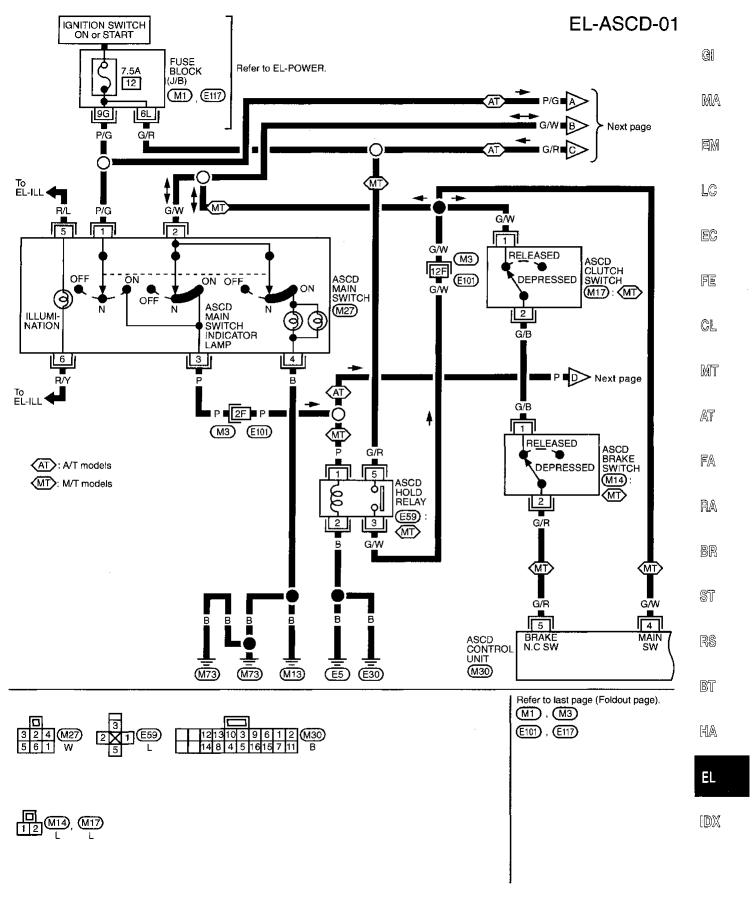


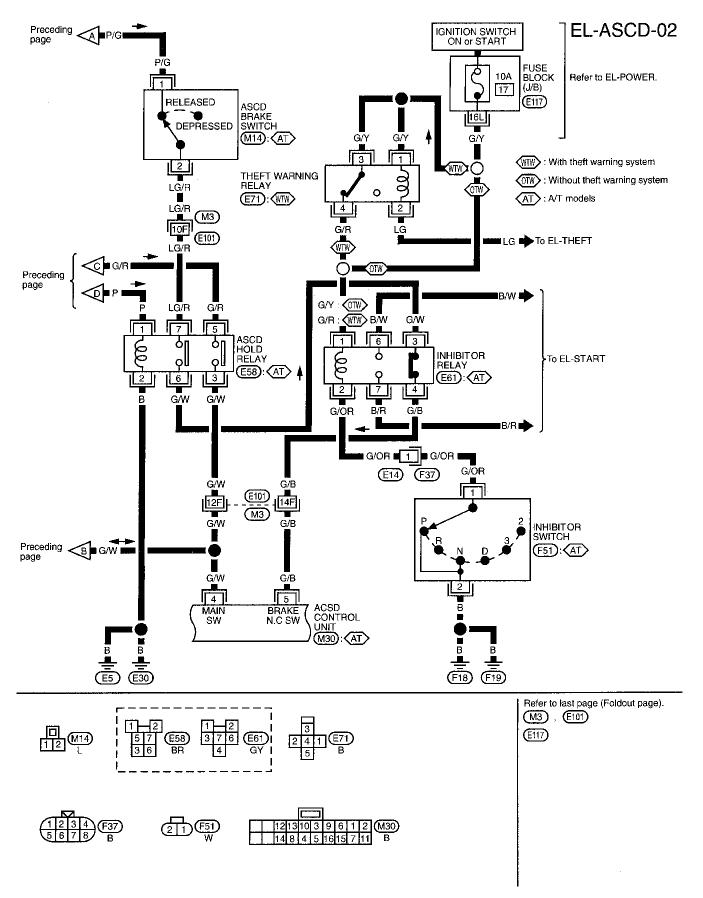
#### Schematic (Cont'd)

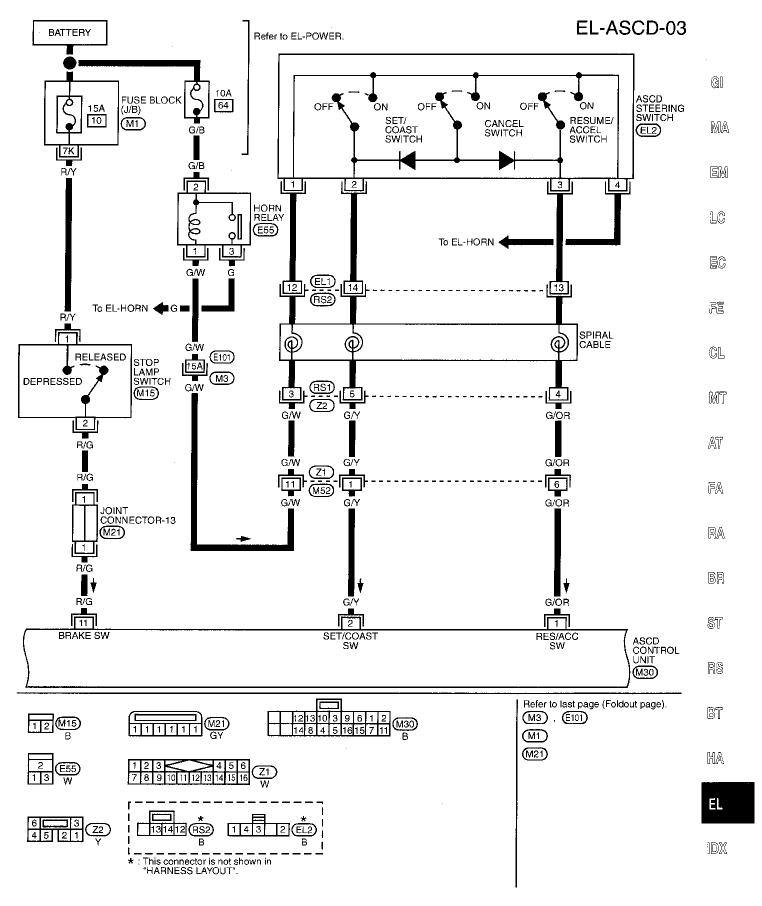
#### M/T MODELS

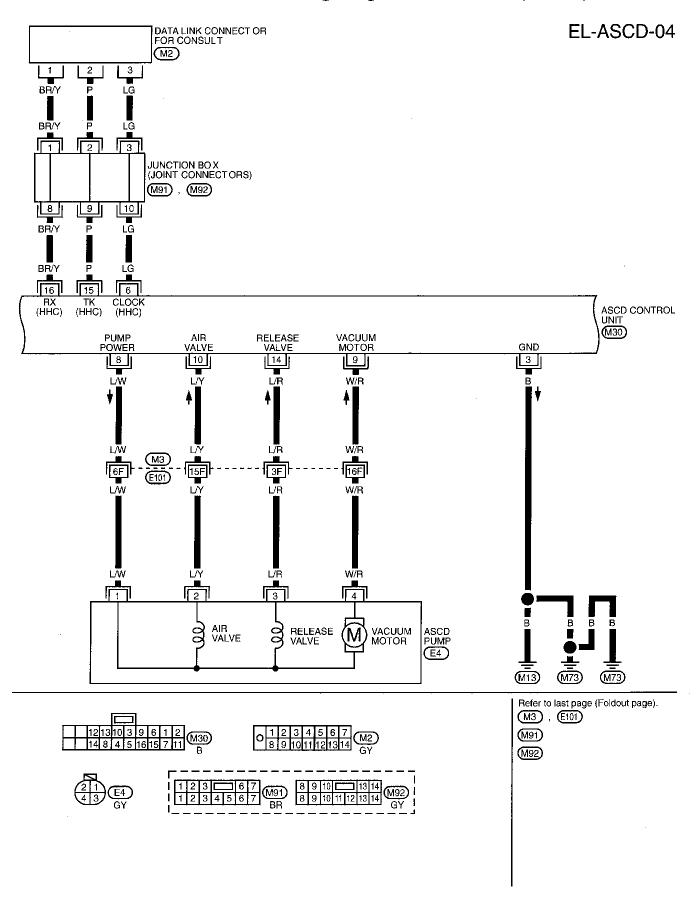


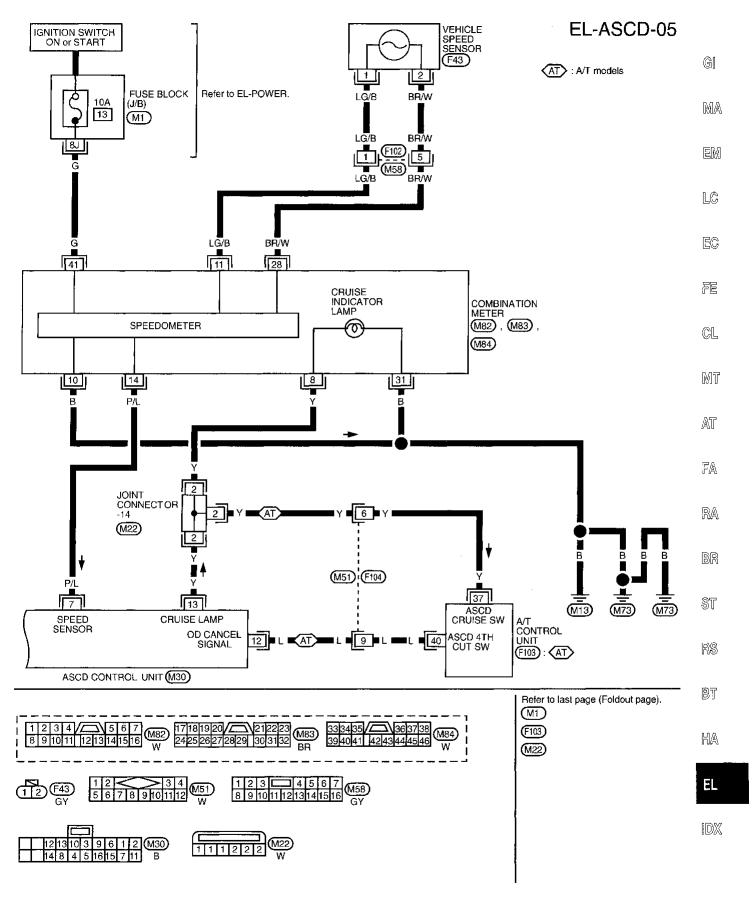
#### Wiring Diagram — ASCD —

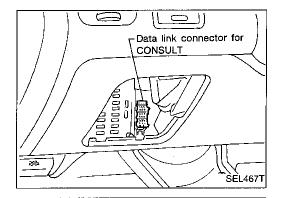








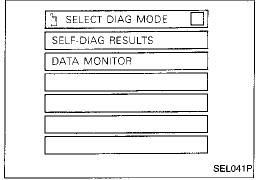




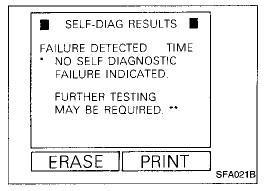
#### **Trouble Diagnoses**

#### **CONSULT**

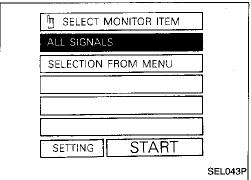
- 1. Turn off ignition switch.
- Connect "CONSULT" to data link connector for CONSULT.



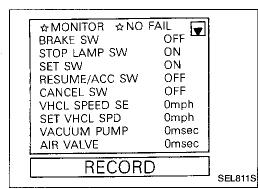
- 3. Turn on ignition switch.
- 4. Turn on ASCD main switch.
- 5. Touch START (on CONSULT display).
- 6. Touch ASCD.
- 7. Touch SELF-DIAG RESULTS.



Self-diagnostic results are shown on display.
 Refer to table on the next page.



Touch DATA MONITOR.



- Touch START.
- Data monitor results are shown on display.
   Refer to table on the next page.

For further information, read the CONSULT Operation Manual.

#### Trouble Diagnoses (Cont'd)

#### Self-diagnostic results

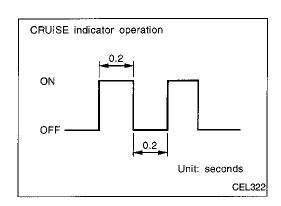
| Diagnostic item   | Description   | Repair/Check order                 |           |
|---|---|------------------------------------|-----------|
| * NO SELF DIAGNOSTIC<br>FAILURE INDICATED.<br>FURTHER TESTING MAY BE<br>REQUIRED.** | Even if no self diagnostic failure is indicated, further testing may be required as far as the customer complains.    | _                                  | Gí        |
| POWER SUPPLY-VALVE  | The power supply circuit for the ASCD pump is open. (An abnormally high voltage is entered.)                          | Diagnostic procedure 7 (EL-166)    | MA        |
| VACUUM PUMP   | <ul> <li>The vacuum pump circuit is open or shorted, (An abnormally<br/>high or low voltage is entered.</li> </ul>    | Diagnostic procedure 7 (EL-166)    | —<br>EM   |
| AIR VALVE   | <ul> <li>The air valve circuit is open or shorted. (An abnormally high<br/>or low voltage is entered.)</li> </ul>     | Diagnostic procedure 7 (EL-166)    | LC        |
| RELEASE VALVE   | <ul> <li>The release valve circuit is open or shorted. (An abnormally<br/>high or low voltage is entered.)</li> </ul> | Diagnostic procedure 7 (EL-166)    | —<br>— EC |
| VHCL SP·S/FAILSAFE  | <ul> <li>The vehicle speed sensor or the fail-safe circuit is malfunctioning.</li> </ul>                              | Diagnostic procedure 6 (EL-165)    |           |
| CONTROL UNIT  | The ASCD control unit is malfunctioning.  | Replace ASCD control unit.         | FE        |
| BRAKE SW/STOP/L SW  | The brake switch or stop lamp switch is malfunctioning.   | Diagnostic procedure 4<br>(EL-163) | —<br>Cl   |

#### **Data monitor**

| Monitored item | Description   | - |
|----------------|---|---|
| BRAKE SW       | Indicates [ON/OFF] condition of the brake switch circuit.                             | _ |
| STOP LAMP SW   | Indicates [ON/OFF] condition of the stop lamp switch circuit.                         |   |
| SET SW         | Indicates [ON/OFF] condition of the set switch circuit.                               | _ |
| RESUME/ACC SW  | Indicates [ON/OFF] condition of the resume/accelerate switch circuit.                 |   |
| CANCEL SW      | Indicates [ON/OFF] condition of the cancel circuit.                                   |   |
| VHCL SPEED SE  | The present vehicle speed computed from the vehicle speed sensor signal is displayed. |   |
| SET VHCL SPD   | The preset vehicle speed is displayed.  |   |
| VACUUM PUMP    | The operation time of the vacuum pump is displayed.                                   |   |
| AIR VALVE      | The operation time of the air valve is displayed.                                     |   |
| PW SUP-VALVE   | Indicates [ON/OFF] condition of the circuit for the air valve and the release valve.  |   |
| CRUISE LAMP    | Indicates [ON/OFF] condition of the cruise lamp circuit.                              |   |
| A/T-OD CANCEL  | Indicates [ON/OFF] condition of the OD cancel circuit.                                |   |
| FAIL SAFE·LOW  | The fail-safe (LOW) circuit function is displayed.                                    |   |
| FAIL SAFE-SPD  | The fail-safe (SPEED) circuit function is displayed.                                  | _ |

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# Trouble Diagnoses (Cont'd) FAIL-SAFE SYSTEM

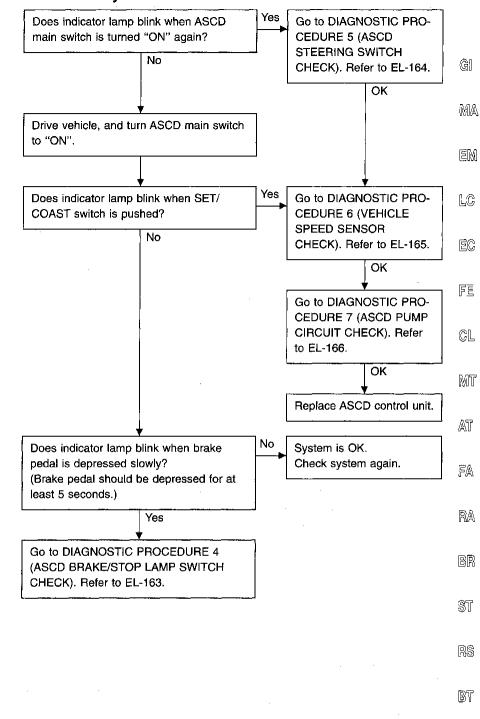
When the fail-safe system senses a malfunction, it deactivates ASCD operation. The CRUISE indicator in the combination meter will then flash.

#### **Malfunction detection conditions**

| Detection conditions   | ASCD operation during malfunction detection                    |
|--|--|
| <ul> <li>ASCD steering (RESUME/ACCEL, CANCEL, SET/COAST) switch is stuck.</li> <li>Vacuum motor ground circuit or power circuit is open or shorted.</li> <li>Air valve ground circuit or power circuit is open or shorted.</li> <li>Release valve ground circuit or power circuit is open or shorted.</li> <li>Vehicle speed sensor is faulty.</li> <li>ASCD control unit internal circuit is malfunctioning.</li> </ul> | ASCD is deactivated.     Vehicle speed memory is canceled.     |
| ASCD brake switch or stop lamp switch is faulty.   | ASCD is deactivated.     Vehicle speed memory is not canceled. |

**EL-158** 1362

# Trouble Diagnoses (Cont'd) Fail-safe system check



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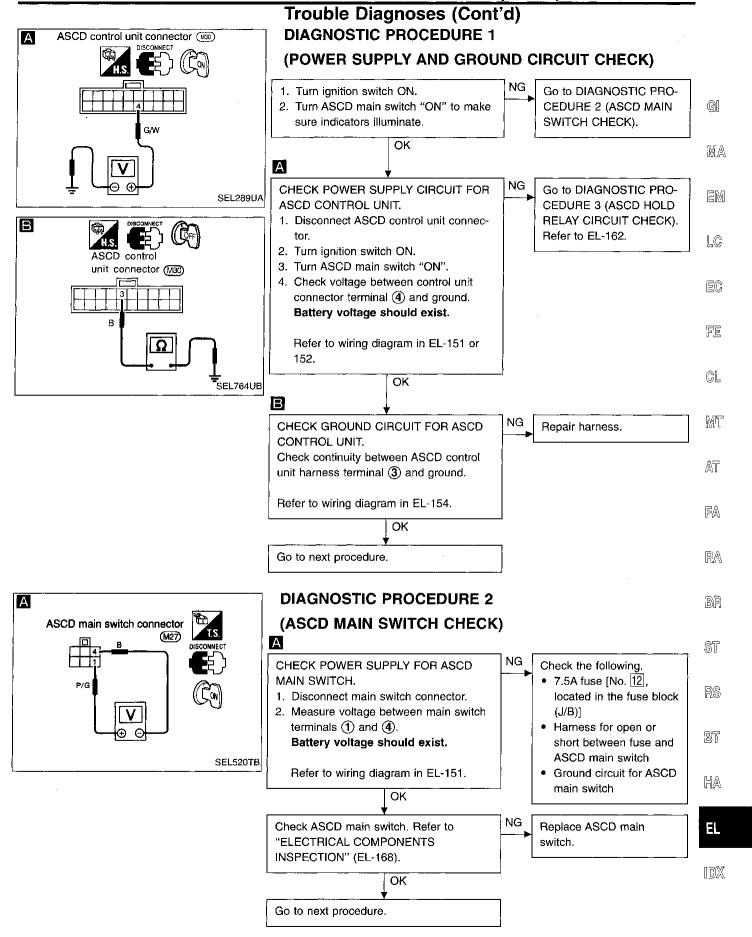
#### Trouble Diagnoses (Cont'd)

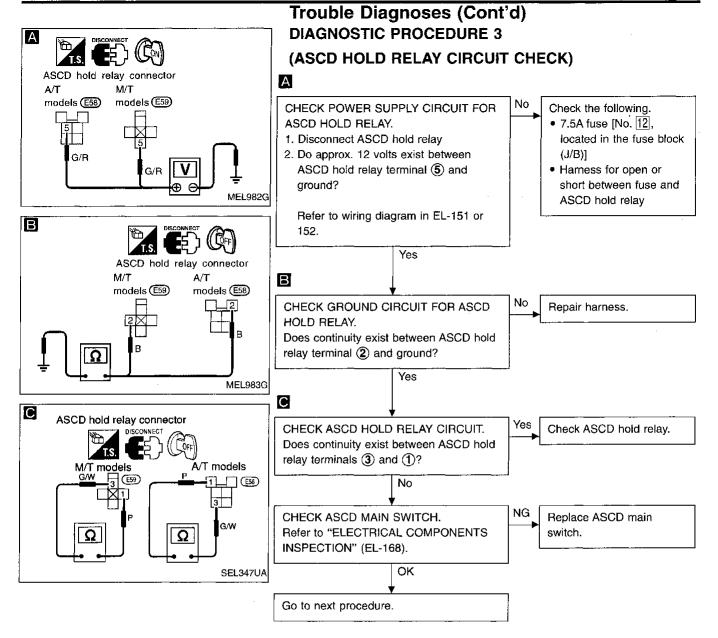
#### **SYMPTOM CHART**

| PROCEDURE  |                           |                        | Diagnostic procedure  |  |  |  |  |  |   |   |
|--|---------------------------|------------------------|---|--|--|--|--|--|---|---|
| REFERENCE PAGE   | EL-156                    | EL-159                 | EL-161  | EL-161   | EL-162   | EL-163   | EL-164   | EL-165   | EL-166  | EL-167  |
| SYMPTOM  | Self-diagnosis in CONSULT | Fail-safe system check | DIAGNOSTIC PROCEDURE 1<br>(POWER SUPPLY AND GROUND CIRCUIT CHECK) | DIAGNOSTIC PROCEDURE 2<br>(ASCD MAIN SWITCH CHECK) | DIAGNOSTIC PROCEDURE 3 (ASCD HOLD RELAY CHECK) | DIAGNOSTIC PROCEDURE 4 (ASCD BRAKE/STOP LAMP SWITCH CHECK) | DIAGNOSTIC PROCEDURE 5<br>(ASCD STEERING SWITCH CHECK) | DIAGNOSTIC PROCEDURE 6<br>(VEHICLE SPEED SENSOR CHECK) | DIAGNOSTIC PROCEDURE 7<br>(ASCD PUMP CIRCUIT CHECK) | DIAGNOSTIC PROCEDURE 8 (ASCD ACTUATOR/PUMP CHECK) |
| ASCD cannot be set. ("CRUISE" indicator lamp does not blink.)                                | х                         |                        | Х   | Х  | х  |  | Х  | Х  |   |   |
| ASCD cannot be set. ("CRUISE" indicator lamp blinks.★1)                                      | х                         | х                      |   |  |  | х  | Х  | Х  | x   |   |
| Vehicle speed does not decrease after SET/COAST switch has been pressed.                     | х                         |                        |   |  |  | ,  | х  |  |   | х   |
| Vehicle speed does not return to the set speed after RESUME/ACCEL switch has been pressed.★2 | X                         |                        |   |  |  |  | X  |  |   | x   |
| Vehicle speed does not increase after RESUME/ACCEL switch has been pressed.                  | х                         |                        |   |  |  |  | х  |  |   | X   |
| System is not released after CAN-<br>CEL switch (steering) has been<br>pressed.              | х                         |                        |   |  | 100  |  | Х  |  | 1   | х   |
| Large difference between set speed and actual vehicle speed.                                 | Х                         |                        |   |  |  |  |  |  |   | х   |
| Deceleration is greatest immediately after ASCD has been set.                                | х                         |                        |   |  |  |  |  |  |   | Х   |

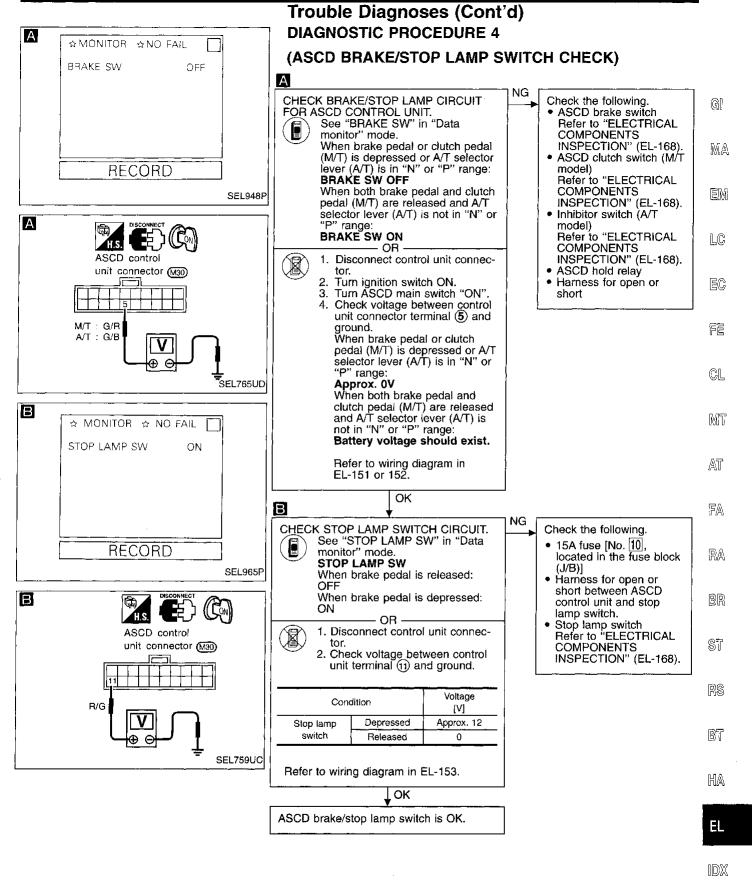
<sup>★1:</sup> It indicates that system is in fail-safe.

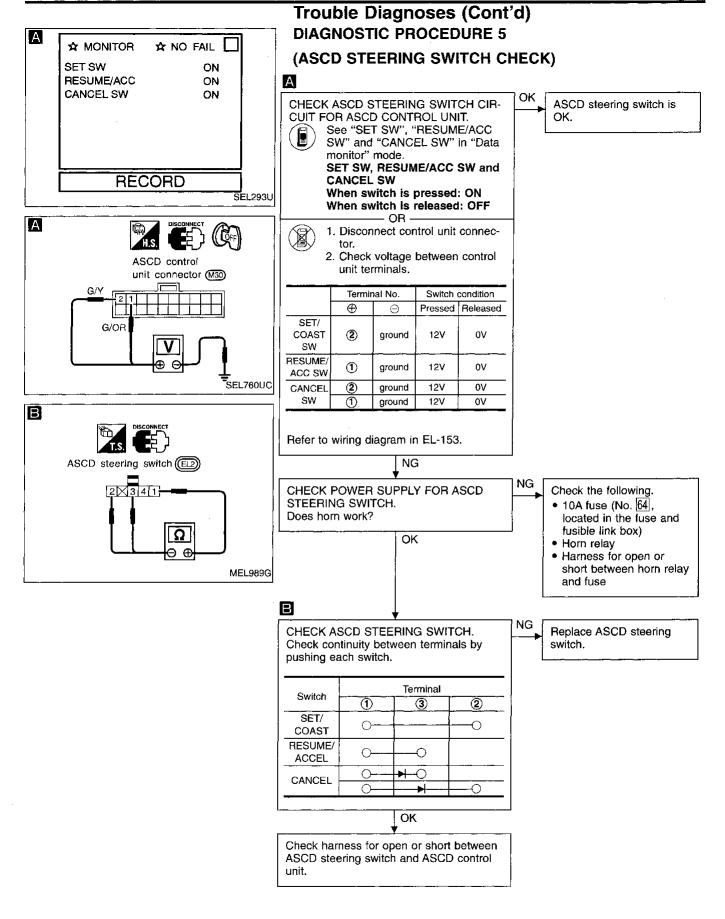
<sup>★2:</sup> If vehicle speed is greater than 48 km/h (30 MPH) after system has been released, pressing RESUME/ACCEL switch returns vehicle speed to the set speed previously achieved. However, doing so when the ASCD main switch is turned to "OFF", vehicle speed will not return to the set speed since the memory is canceled.

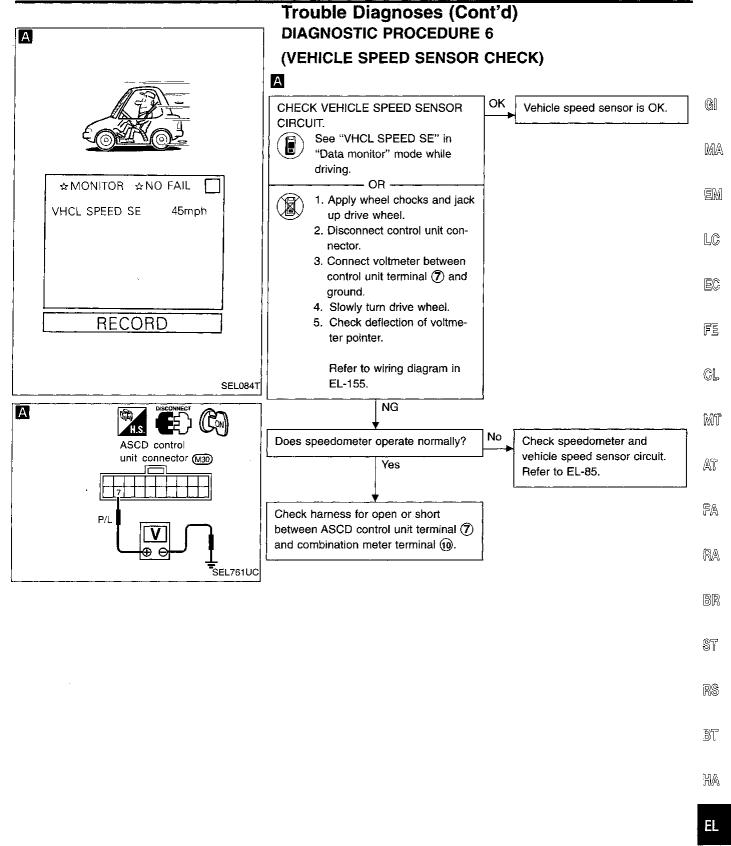




**EL-162** 

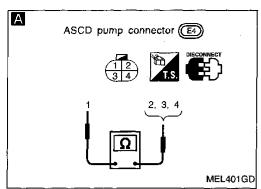






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# Trouble Diagnoses (Cont'd) DIAGNOSTIC PROCEDURE 7 (ASCD PUMP CIRCUIT CHECK)

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Replace ASCD pump.

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#### CHECK ASCD PUMP.

- 1. Disconnect ASCD pump connector.
- 2. Measure resistance between ASCD pump terminals ① and ②, ③, ④.

| Tern     | ninals | Resistance [Ω] |
|----------|--------|----------------|
|          | 4      | Approx. 3      |
| <b>①</b> | 2      | Approx. 65     |
| Ť        | 3      | Approx. 65     |

Refer to wiring diagram in EL-154.

OK

Check harness for open or short between ASCD pump and ASCD control unit.

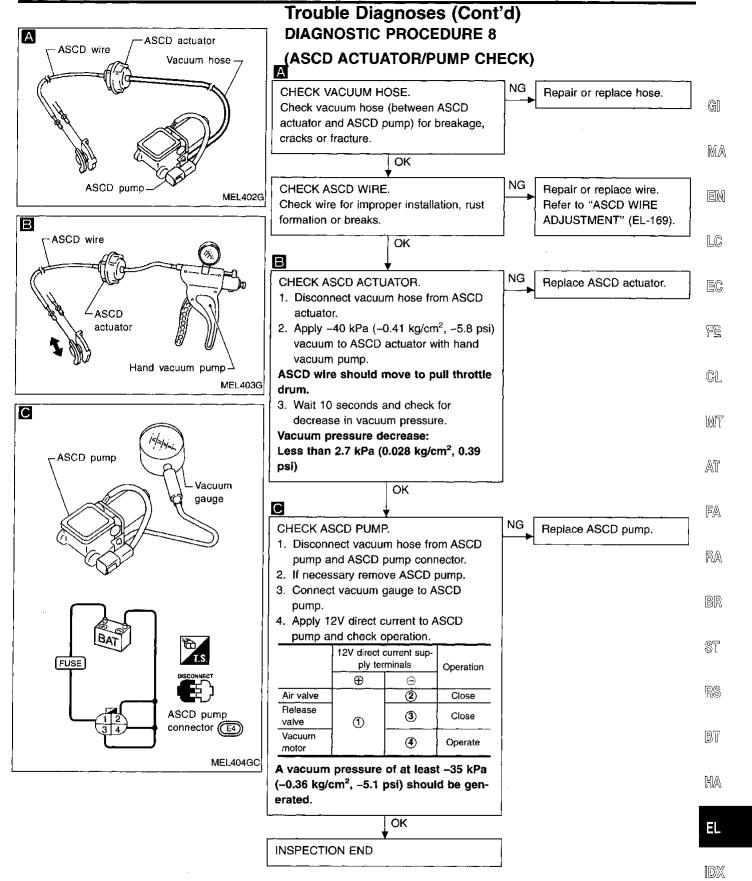


If a self-diagnostic result has already been accomplished, check using the following table.

| CONSULT                   | Check circuit              |                       |  |  |  |
|---------------------------|----------------------------|-----------------------|--|--|--|
| self-diagnostic<br>result | ASCD control unit terminal | ASCD pump<br>terminal |  |  |  |
| POWER SUP-<br>PLY-VALVE   | 8                          | •                     |  |  |  |
| VACUUM<br>PUMP            | 9                          | 4                     |  |  |  |
| AIR VALVE                 | 10                         | 2                     |  |  |  |
| RELEASE<br>VALVE          | 14                         | 3                     |  |  |  |

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**EL-166** 



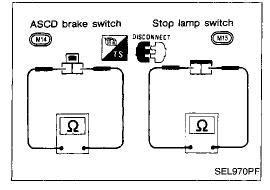
# ASCD main switch connector (M2) 4 2 3 1 6 5 MEL984G

#### Trouble Diagnoses (Cont'd)

#### **ASCD** main switch

Check continuity between terminals by pushing switch to each position.

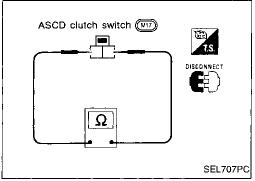
| Cuitab position |   | Terminals |          |   |      |   |  |  |
|-----------------|---|-----------|----------|---|------|---|--|--|
| Switch position | 1 | 2         | 3        | 4 | 5    | 6 |  |  |
| ON              | 0 |           | <u> </u> |   | FB 1 |   |  |  |
| N               |   | 0-        | 0-       |   |      |   |  |  |
| OFF             |   |           |          |   |      |   |  |  |



#### ASCD brake switch and stop lamp switch

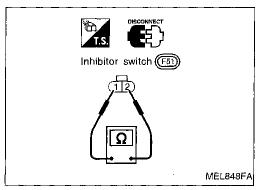
|                               | Con                  | Continuity       |  |  |  |  |
|-------------------------------|----------------------|------------------|--|--|--|--|
| Condition                     | ASCD brake<br>switch | Stop lamp switch |  |  |  |  |
| When brake pedal is depressed | No                   | Yes              |  |  |  |  |
| When brake pedal is released  | Yes                  | No               |  |  |  |  |

Check each switch after adjusting brake pedal — refer to BR section.



#### ASCD clutch switch (For M/T models)

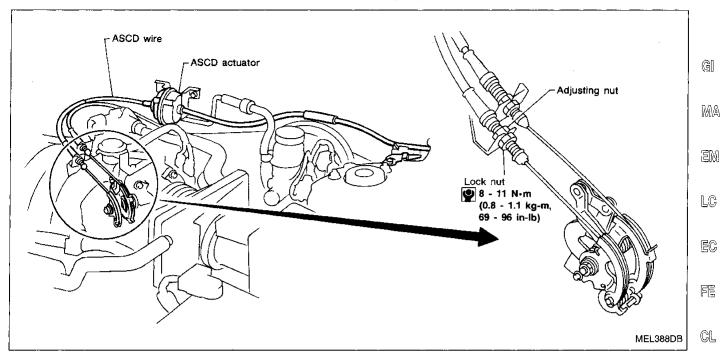
| Condition                      | Continuity |
|--------------------------------|------------|
| When clutch pedal is depressed | No         |
| When clutch pedal is released  | Yes        |



#### Inhibitor switch (For A/T models)

| Shift lever position | Continuity                    |
|----------------------|-------------------------------|
|                      | Between terminals (1) and (2) |
| "P"                  | Yes                           |
| "N"                  | Yes                           |
| Except "P" and "N"   | No                            |

#### Trouble Diagnoses (Cont'd) **ASCD WIRE ADJUSTMENT**



#### **CAUTION:**

- Be careful not to twist ASCD wire when removing it.
- Do not tense ASCD wire excessively during adjustment.

Adjust the tension of ASCD wire in the following manner.

- 1. Loosen lock nut and adjusting nut.
- Make sure that accelerator wire is properly adjusted. (Refer to FE section, "ACCELERATOR CONTROL SYSTEM".)
- 3. Tighten adjusting nut until throttle drum just starts to move.
- Loosen adjusting nut again 1/2 to 1 turn. 4.
- 5. Tighten lock nut.

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MA

BR

ST

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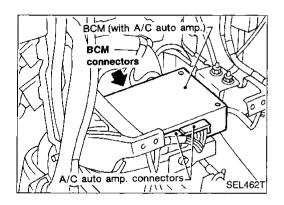
#### **Overall Description**

#### OUTLINE

The In-Vehicle Multiplexing System, IVMS (LAN system), consists of a BCM (Body Control Module) and five LCUs (Local Control Units). Some switches and electrical loads are connected to each LCU. Some electrical systems are directly connected to the BCM. Control of each LCU, (which is provided by a switch and electrical load), is accomplished by the BCM, via multiplex data lines (A-1, A-2) connected between them.

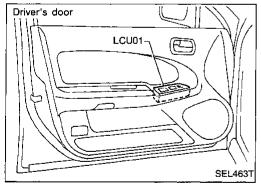
#### **BCM (Body Control Module)**

The BCM, which is a master unit of the IVMS (LAN), consists of microprocessor, memory and communication LSI sections and has communication and control functions. It receives data signals from the LCUs and sends electrical load data signals to them.



The auto amp. for auto air conditioner, if equipped, is built into the BCM. The BCM connectors are located on the front side of the BCM. Do not be confused with the auto amp. connectors on the rear side of the BCM.

NOTE: The auto amp. function has nothing to do with the IVMS.



#### LCU (Local Control Unit)

The LCUs, which are slave units of the BCM, have only a communication function and consist of communication LSI and input-output interface circuits. They receive data signals from the BCM, control the ON/OFF operations of electrical loads and the sleep operation, as well as send switch signals to the BCM.

#### **CONTROLLED SYSTEMS**

The IVMS controls several body-electrical systems. The systems included in the IVMS are as follows:

- Power window
- Power door lock
- Multi-remote control system
- Theft warning system
- Interior lamp (ON-OFF control)
- Step lamp
- Illumination (Power window switch illumination)
- Ignition key warning (Refer to "WARNING BUZZER".)
- Light warning (Refer to "WARNING BUZZER".)

# IVMS (LAN) — SYSTEM DESCRIPTION

# **Overall Description (Cont'd)**

- Seat belt warning (Refer to "WARNING BUZZER".)
- Wiper amp. (Refer to "WIPER AND WASHER".)
- Rear window defogger timer (Refer to "REAR WINDOW DEFOGGER".)
- Trouble-diagnosing system
  - with CONSULT
  - ON-BOARD

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Also, IVMS has the "sleep/wake-up control" function. IVMS puts itself (the whole IVMS system) to sleep under certain conditions to prevent unnecessary power consumption. Then, when a certain input is detected, the system wakes itself up. For more detailed information, refer to "Sleep/Wake-up Control".

MA

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LC

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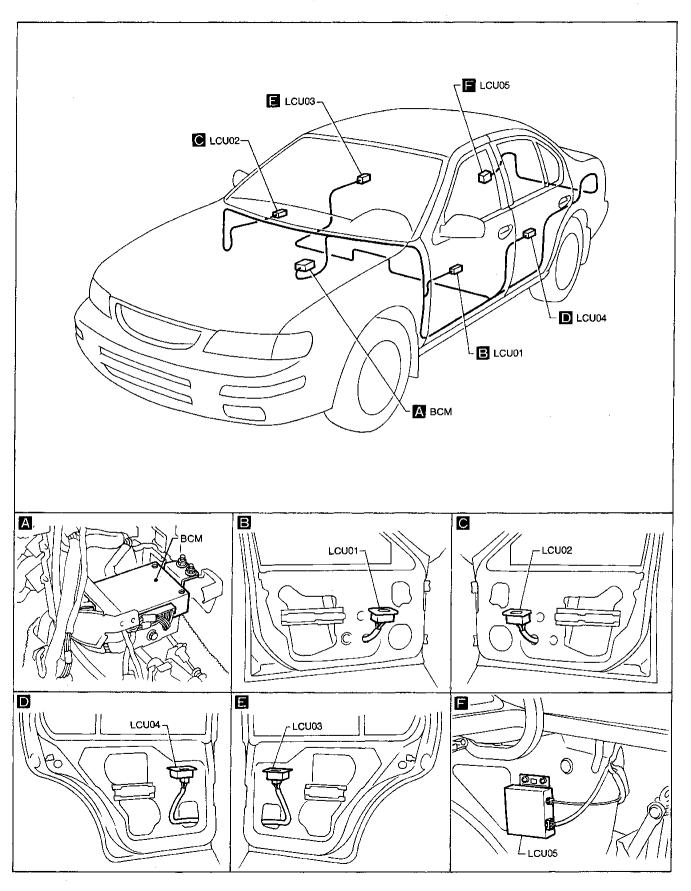
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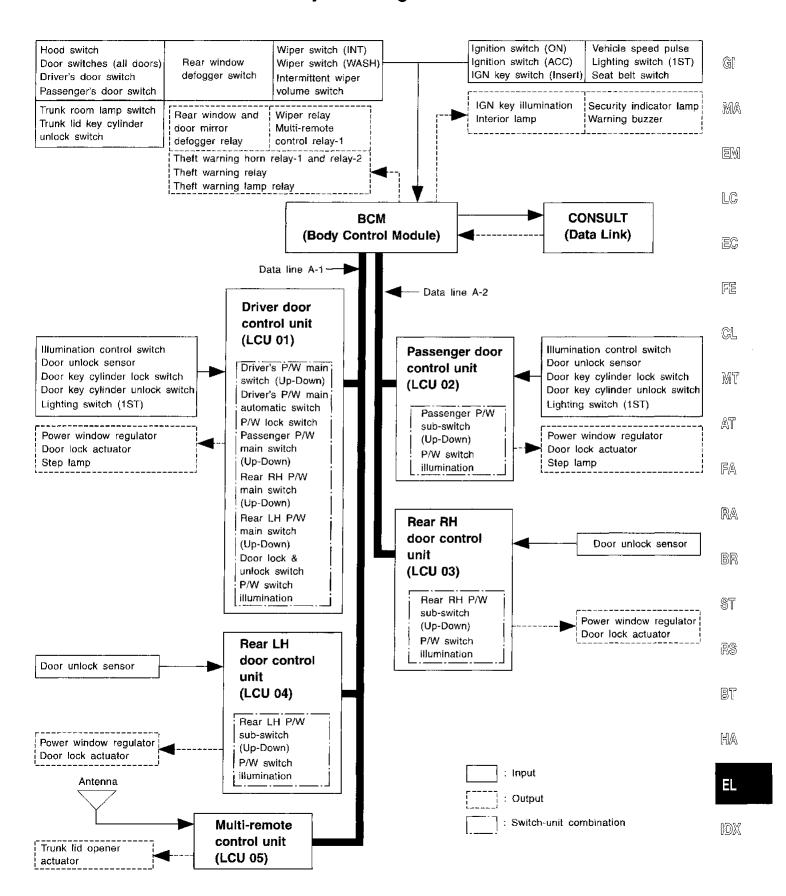
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# **Component Parts Location**

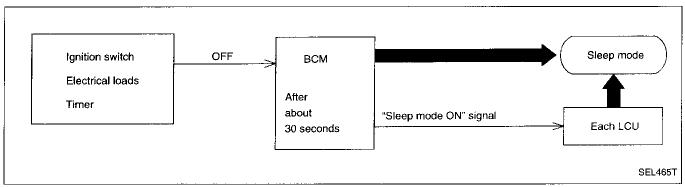


#### System Diagram



#### Sleep/Wake-up Control

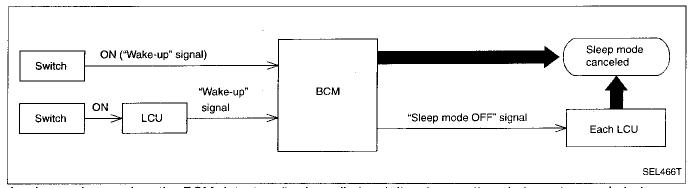
#### SLEEP CONTROL



"Sleep" control prevents unnecessary power consumption. About 30 seconds after the following conditions are met, the BCM suspends the communication between itself and all LCUs. The whole IVMS system is set in the "sleep" mode.

- lanition switch "OFF"
- All electrical loads (in the IVMS) "OFF" (except the security indicator lamp)
- Timer "OFF"

#### **WAKE-UP CONTROL**



As shown above, when the BCM detects a "wake-up" signal, it wakes up the whole system and starts communicating again. The "sleep" mode of all LCUs is now canceled, and the BCM returns to the normal control mode. When any one of the following switches are turned ON, the "sleep" mode is canceled:

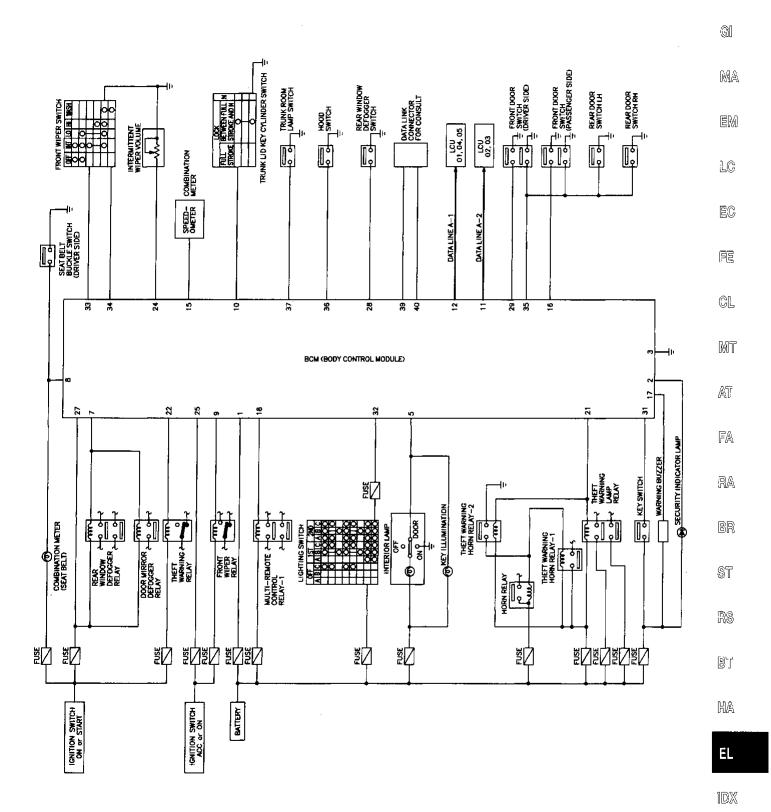
- Ignition key switch (Insert)\*
- Ignition switch "ACC" or "ON"
- Lighting switch (1st)
- Door switches (all doors)
- Trunk room lamp switch
- Hood switch
- Door unlock sensors (all doors)
- \* Also, when key is pulled out of ignition (ignition key switch is turned from ON to OFF), the "sleep" mode is canceled.

#### Fail-safe System

Fail-safe system operates when the signal from LCU is judged to be malfunctioning by BCM. If LCU sends no signal or an abnormal signal to BCM a certain number of times in succession, the IVMS is set in a fail-safe condition. In the fail-safe condition, no electrical loads on the questionable LCU will operate.

## **Body Control Module (BCM)**

#### **CIRCUIT DIAGRAM**



# IVMS (LAN) — SYSTEM DESCRIPTION Body Control Module (BCM) (Cont'd)

# INPUT/OUTPUT OPERATION SIGNAL

| Terminal No. | Connections  | INPUT (I)/<br>OUTPUT (O) | Operated condition                |  | Voltage (V) (Approximate va |
|--------------|--|--------------------------|-----------------------------------|--|-----------------------------|
| 1            | Power source   | _                        |                                   | <del>_</del>                               |                             |
|              | On a distribution la constitución de la constitució |                          | Theft warning                     | Illuminated                                | 0                           |
| 2            | Security indicator lamp  | 0                        | control                           | Turned off                                 | 12                          |
| 3            | Ground   | _                        |                                   |  |                             |
| 5            | Interior lamp/Ignition key hole illumina-  | 0                        | ON (Illuminated)                  |  | 0                           |
| 5            | tion   |                          | OFF                               |  | 12                          |
| 7            | Door window defeator rainy   | 0                        | Ignition switch "ON"              | ON   | 0                           |
| 7            | Rear window defogger relay   | O                        | Time control                      | OFF  | 12                          |
|              |  |                          |                                   | When the seat belt is fastened             | 12                          |
| 8            | Seat belt switch   | I                        | Ignition switch<br>"ON"           | When the seat<br>belt is not fas-<br>tened | 0                           |
| _            |  | _                        | Wiper motor                       | Operate                                    | 0                           |
| 9            | Front wiper relay  | 0                        | intermittent/<br>washer operation | Stop                                       | 12                          |
|              | T. I P.J. alan bandala   |                          | Unlocked (ON)                     |  | 0                           |
| 10           | Trunk lid unlock switch  | 1                        | Neutral (OFF)                     |  | 5                           |
| 11           | Data line A-2  | 1/0                      |                                   |  | <u> </u>                    |
| 12           | Data line A-1  | 1/0                      |                                   |  | <del>-</del>                |
| 15           | Vehicle speed pulse  | I                        | Pulse                             |  | 0 - 5                       |
| 16           | Door switch  | 1                        | ON (Open)                         |  | 0                           |
|              | (Passenger side)   |                          | OFF (Closed)                      |  | 12                          |
| 17           | Warning buzzer   | 0                        | ON                                |  | 0                           |
| 17           | vvarining bazzer   |                          | OFF                               |  | 12                          |
| 18           | Multi-remote control relay   | 0                        | Hazard lamp                       | ON   | 0                           |
| 10           | Walti-remote control relay   |                          | Tiazaid lamp                      | OFF  | 12                          |
| 21           | Theft warning horn relays and theft  | 0                        | ON                                |  | 0                           |
| 2.1          | warning lamp relay   |                          | OFF                               |  | 12                          |
| 22           | Theft warning relay  | 0                        | Theft warning                     | ON   | 0                           |
|              | (Starter interrupt)  |                          | control                           | OFF  | 12                          |
|              | Intermittent wiper volume switch   | 1                        | Ignition switch "ACC" or "ON"     | Max. (20 sec)                              | 3.6                         |
| 24           | internition wher voiding switch  |                          | Wiper switch<br>Intermittent time | Min. (2 sec)                               | 0                           |

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# IVMS (LAN) — SYSTEM DESCRIPTION

|              |                   |               | Body Contre              | oi Moanie (   | BCM) (Contro      | a)                                      |
|--------------|-------------------|---------------|--------------------------|---|-------------------|---|
| Terminal No. | Co                | nnections     | INPUT (I)/<br>OUTPUT (O) | Operated condition                                    |                   | Voltage (V)<br>(Approximate val<br>ues) |
| 25           | Ignition switch ( | ACC)          | ı                        | Ignition switch "A                                    | CC"               | 12                                      |
| 27           | Ignition switch ( | ON)           | ı                        | Ignition switch "O                                    | N"                | 12                                      |
| 00           | Dan window do     | forces quitab |                          | Ignition switch                                       | ON                | 0                                       |
| 28           | Rear window de    | logger switch | '                        | "ON"  | OFF               | 5                                       |
| 00           | Door switch       |               |                          | Open (ON)   |                   | 0                                       |
| 29           | (Driver side)     |               | '                        | Closed (OFF)  |                   | 12                                      |
| 6.4          | Key switch        |               |                          | IGN key removed cylinder (OFF)                        | from ignition key | 0                                       |
| 31 1 1       | (Insert)          | •             |                          | IGN key inserted into ignition key cyl-<br>inder (ON) |                   | 12                                      |
|              | Lighting switch   |               |                          | 1ST, 2ND positions: ON                                |                   | 12                                      |
| 32           | (1ST)             |               | <b>I</b>                 | OFF   |                   | 0                                       |
|              | Wiper switch      |               |                          | Ignition switch                                       | INT               | 0                                       |
| 33           | (Intermittent)    |               | ı                        | "ACC" or "ON"   | OFF               | 12                                      |
|              | Wiper switch      |               |                          | Ignition switch                                       | WASH              | 0                                       |
| 34           | (Wash)            |               | 1                        | "ACC" or "ON"   | OFF               | 12                                      |
| DE.          | Door switches     |               |                          | Dean suiteb   | ON (Open)         | 0                                       |
| 35           | (All doors)       |               | '                        | Door switch   | OFF (Closed)      | 12                                      |
| 00           |                   |               |                          | Open (ON)   |                   | 0                                       |
| 36           | Hood switch       |               | į į                      | Closed (OFF)  |                   | 5                                       |
| 07           |                   |               |                          | Open (ON)   |                   | 0                                       |
| 37           | Trunk room lam    | SWITCH        | '                        | Closed (OFF)  |                   | 12                                      |
| 39           | CONCLUT           | TX signal     | -                        |   |                   | _                                       |
| 40           | CONSULT           | RX signal     | _                        |   | _                 |   |

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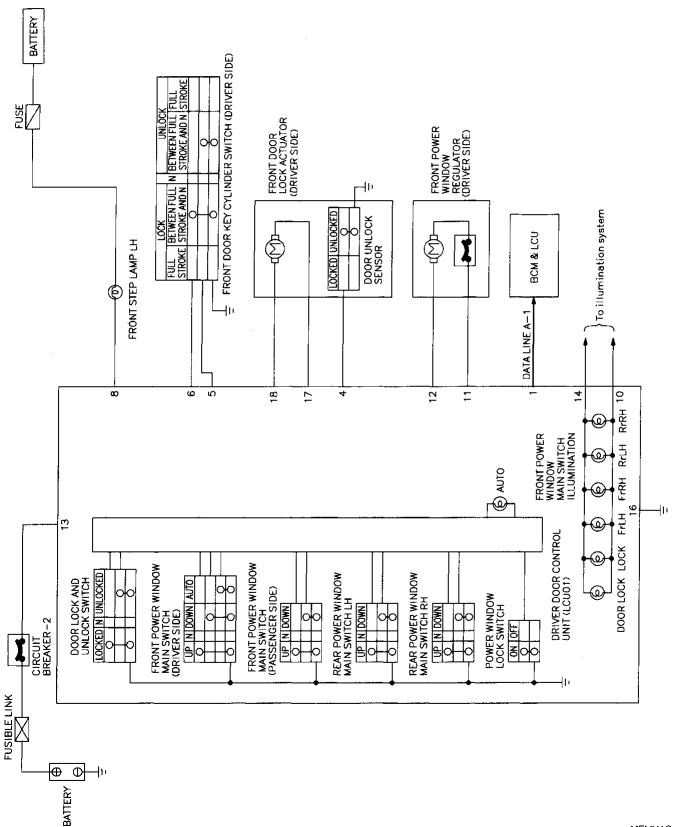
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## **Local Control Units (LCUs)**

#### **CIRCUIT DIAGRAM**

**Driver door control unit (LCU01)** 



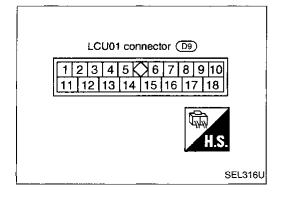
# IVMS (LAN) — SYSTEM DESCRIPTION

# Local Control Units (LCUs) (Cont'd)

#### **INPUT/OUTPUT OPERATION SIGNAL**

#### **Driver door control unit (LCU01)**

| Terminal No. | Connections                 | INPUT (I)/<br>OUTPUT (O) | Operated condition         |          | Voltage (V)<br>(Approximat<br>values) |
|--------------|-----------------------------|--------------------------|----------------------------|----------|---------------------------------------|
| 1            | Data line A-1               | 1/0                      |                            |          | _                                     |
| 2            |                             | _                        |                            |          | _                                     |
| 3            | _                           | _                        |                            | _        | _                                     |
| 4            | Dani valada assissi         |                          | Unlocked (ON)              |          | 0                                     |
| 4            | Door unlock sensor          | l I                      | Locked (OFF)               |          | 5                                     |
|              | Door key cylinder unlock    |                          | Unlocked (ON)              |          | 0                                     |
| 5            | switch                      |                          | Locked (OFF) or neutral (0 | DFF)     | 5                                     |
|              | Door key cylinder lock      |                          | Locked (ON)                |          | 0                                     |
| 6            | switch                      | I                        | Unlocked (OFF) or neutral  | (OFF)    | 5                                     |
| 7            |                             |                          |                            |          | _                                     |
|              |                             | 0                        | ON                         |          | 0                                     |
| 8            | Step lamp                   | 0                        | OFF                        |          | 12                                    |
| 9            | <u> </u>                    |                          | <del>-</del>               |          | _                                     |
| 10           | Illumination control signal |                          | Brightened - Darkened      |          | 0 - 12                                |
| 4 4          | Power window regulator      | •                        | Daine de DAM en itale      | Up       | 12                                    |
| 11           | (P/W) — Up                  | 0                        | Driver's P/W switch        | Free     | 0                                     |
| 10           | Power window regulator      | 0                        | Daireada DAM accidate      | Down     | 12                                    |
| 12           | (P/W) — Down                | 0                        | Driver's P/W switch        | Free     | 0                                     |
| 13           | Power source (C/B)          | <u> </u>                 | -                          |          | 12                                    |
| * 4          |                             |                          | 1st, 2nd: ON               |          | 12                                    |
| 14           | Lighting switch (1st)       |                          | OFF                        |          | 0                                     |
| 15           | <u> </u>                    | <u> </u>                 | _                          |          | _                                     |
| 16           | Ground                      |                          | -                          |          |                                       |
| 17           | Door lock actuator —        | ^                        | Door look 9 (valant nuit-f | Locked   | 12                                    |
| 17           | Lock                        | 0                        | Door lock & unlock switch  | Free     | 0                                     |
| 10           | Door lock actuator —        |                          | Deer leek 9 unleek         | Unlocked | 12                                    |
| 18           | Unlock                      | O Doo                    | Door lock & unlock switch  | Free     | 0                                     |



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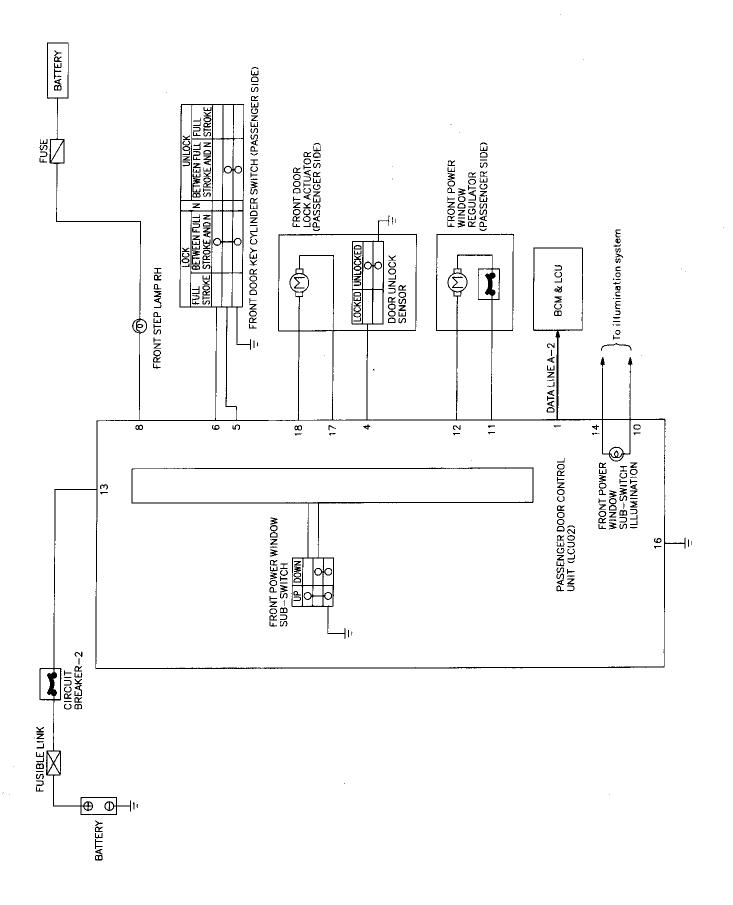
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# Local Control Units (LCUs) (Cont'd)

## Passenger door control unit (LCU02)



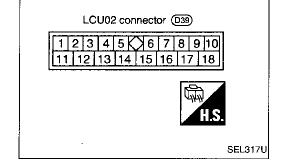
# IVMS (LAN) — SYSTEM DESCRIPTION

# Local Control Units (LCUs) (Cont'd)

# Passenger door control unit (LCU02)

| Terminal No. | Connections                 | INPUT (I)/<br>OUTPUT (O) | Operated condition        |              | Voltage (V)<br>(Approximate<br>values) |
|--------------|-----------------------------|--------------------------|---------------------------|--------------|--|
| 1            | Data line A-2               | 1/0                      |                           | <u> </u>     | <del>-</del>                           |
| 2            | _                           | _                        |                           | <del>_</del> | _                                      |
| 3            | <u> </u>                    | _                        |                           |              | _                                      |
|              | Description                 | 1                        | Unlocked (ON)             |              | 0                                      |
| 4            | Door unlock sensor          | ļ<br>ļ                   | Locked (OFF)              |              | 5                                      |
| 5            | Door key cylinder unlock    | 1                        | Unlocked (ON)             | <del>.</del> | 0                                      |
| 5            | switch                      | l<br>l                   | Locked (OFF) or neutral   |              | 5                                      |
| 6            | Door key cylinder lock      | 1                        | Locked (ON)               |              | 0                                      |
| 6            | switch                      |                          | Unlocked (OFF) or neutral |              | 5                                      |
| 7            | <del>-</del>                | _                        |                           |              | _                                      |
| 8            |                             |                          | ON                        |              | 0                                      |
| o            | Step lamp                   | 0                        | OFF                       |              | 12                                     |
| 9            | _                           | _                        |                           |              |  |
| 10           | Illumination control signal | I                        | Brightened - Darkened     |              | 0 - 12                                 |
| 11           | Power window regulator      | 0                        | Passenger's P/W switch    | Up           | 12                                     |
|              | (P/W) — Up                  | J                        | Fassengers F/W SWILCH     | Free         | 0                                      |
| 12           | Power window regulator      | 0                        | Pagangaria PAM awitah     | Down         | 12                                     |
| 12           | (P/W) — Down                | U                        | Passenger's P/W switch    | Free         | 0                                      |
| 13           | Power source (C/B)          | =                        | -                         | _            | 12                                     |
| 14           | Lighting outstab (1at)      | ı                        | 1st, 2nd: ON              |              | 12                                     |
| 14           | Lighting switch (1st)       | <u>l</u>                 | OFF                       |              | 0                                      |
| 15           | <del>_</del>                | _                        |                           |              |  |
| 16           | Ground                      | =                        | -                         | _            | _                                      |
| 17           | Door lock actuator —        | 0                        | Door lock & unlock switch | Locked       | 12                                     |
|              | Lock                        | U                        | DOOL LOCK & UNIOCK SWITCH | Free         | 0                                      |
| 18           | Door lock actuator —        | 0                        | Door look 9 unlook mittel | Unlocked     | 12                                     |
| 10           | Unlock                      | Ų                        | Door lock & unlock switch | Free         | 0                                      |





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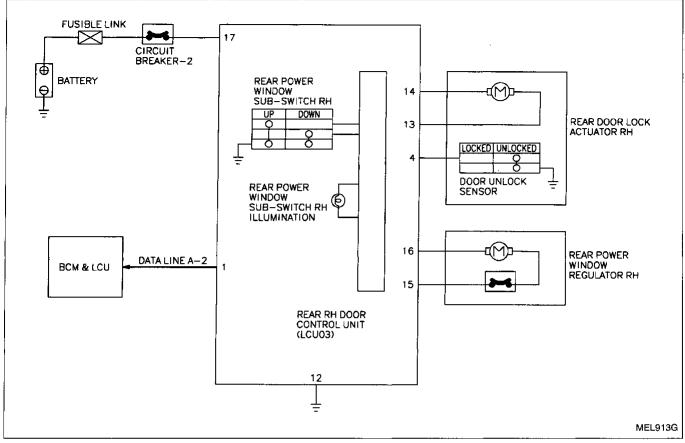
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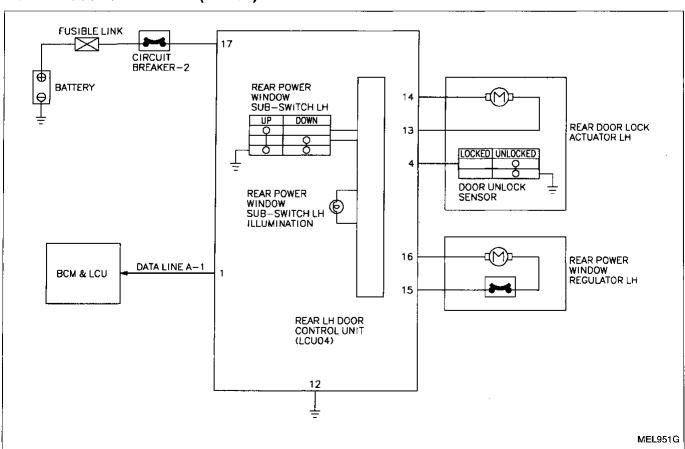
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# Local Control Units (LCUs) (Cont'd)

#### Rear RH door control unit (LCU03)



#### Rear LH door control unit (LCU04)



# IVMS (LAN) — SYSTEM DESCRIPTION

# Local Control Units (LCUs) (Cont'd)

# Rear RH door control unit (LCU03) and rear LH door control unit (LCU04)

| Terminal No. | Connections            | INPUT (I)/<br>OUTPUT (O) | Operated condition          |             | Voltage (V)<br>(Approximate<br>values) |          |
|--------------|------------------------|--------------------------|-----------------------------|-------------|--|----------|
| 1            | Data line A-1 or A-2   | I/O                      |                             | <del></del> | _                                      | G[       |
| 2            |                        | _                        | -                           | _           | _                                      |          |
| 3            |                        | _                        |                             |             |  | MA       |
| 4            | Door unlock sensor     | 1                        | Unlocked (ON)               | ·           | 0                                      |          |
|              | Door unlock sensor     | l                        | Locked (OFF)                |             | 5                                      |          |
| 5            | _                      |                          | -                           |             |  |          |
| 6            | _                      | _                        | -                           |             |  | LC       |
| 7            | _                      | 4                        |                             |             | _                                      |          |
| 8            | _                      |                          | -                           | _           | _                                      | EC       |
| 9            |                        | <del>-</del>             | <del>-</del>                |             | _                                      |          |
| 10           | <del>-</del>           | _                        |                             |             |  |          |
| 11           | _                      |                          | _                           |             |  | IT IS    |
| 12           | Ground                 |                          |                             |             |  | ar<br>Is |
| 13           | Door lock actuator —   | 0                        | Door lock & unlock switch   | Locked      | 12                                     | ŒL.      |
|              | Lock                   |                          | Boot lock & afficial switch | Free        | 0                                      |          |
| 14           | Door lock actuator —   | 0                        | Door lock & unlock switch   | Unlocked    | 12                                     | MT       |
|              | Unlock                 |                          | Boot look & difficon switch | Free        | 0                                      |          |
| 15           | Power window regulator | 0                        | Rear P/W switch             | Up          | 12                                     | AT       |
|              | (P/W) — Up             |                          | Tical 1777 Switch           | Free        | 0                                      |          |
| 16           | Power window regulator | 0                        | Rear P/W switch             | Down        | 12                                     | FA       |
|              | (P/W) — Down           |                          | Free                        |             | 0                                      |          |
| 17           | Power source (C/B)     | _                        | <u>-</u>                    |             | 12                                     | RA       |
| 18           | _                      | _                        | -                           | -           |  |          |

LCU03 connector (D73) LCU04 connector (D53) 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 SEL318U BR

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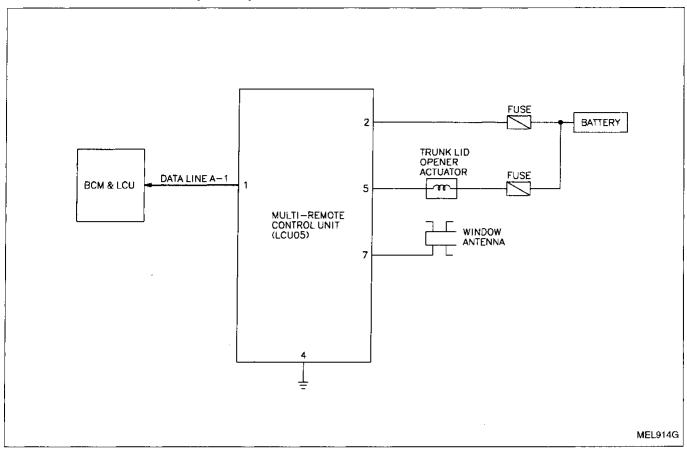
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# IVMS (LAN) — SYSTEM DESCRIPTION

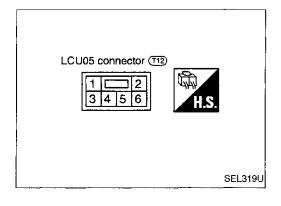
# Local Control Units (LCUs) (Cont'd)

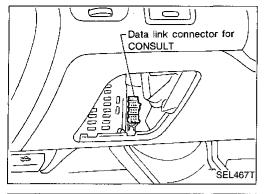
# Multi-remote control unit (LCU05)



## Multi-remote control unit (LCU05)

| Terminal No. | Connections               | INPUT (I)/<br>OUTPUT (O) | Operated condition | Voltage (V)<br>(Approximate<br>values) |
|--------------|---------------------------|--------------------------|--------------------|--|
| 1            | Data line A-1             | I/O                      | _                  |  |
| 2            | Power source              |                          | _                  | 12                                     |
| 3            | _                         |                          | _                  |  |
| 4            | Ground                    |                          | _                  |  |
|              | Trunk lid opener actuator | 0                        | Open               | 0                                      |
| 5            |                           |                          | OFF                | 12                                     |
| 6            |                           |                          | _                  |  |





#### CONSULT

#### **CONSULT INSPECTION PROCEDURE**

- 1. Turn ignition switch "OFF".
- Connect "CONSULT" to the data link connector.

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Turn ignition switch "ON". Touch "START". LC

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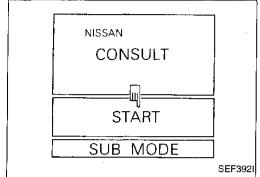
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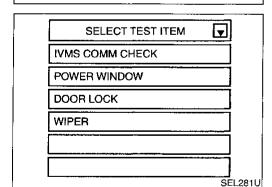
SELECT SYSTEM

**ENGINE** 

**AIRBAG IVM\$** 

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5. Touch "IVMS".



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6. Perform each diagnostic item according to the item application chart as follows:

For further information, read the CONSULT Operation Manual.

# CONSULT (Cont'd)

#### **DIAGNOSTIC ITEMS APPLICATION**

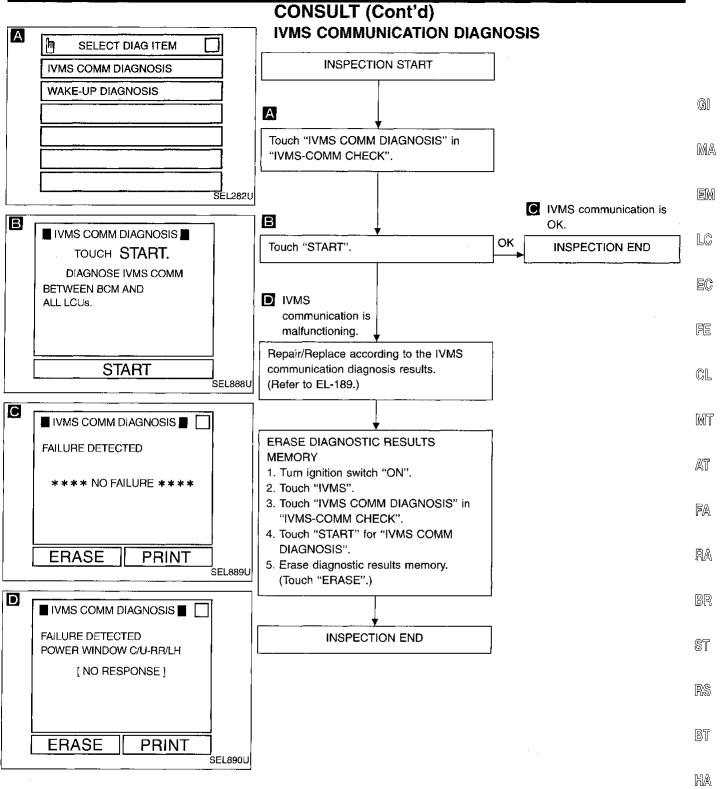
|                           |   |                        |                      | MODE                            |                   |                |
|---------------------------|---|------------------------|----------------------|---------------------------------|-------------------|----------------|
| Test item                 | Diagnosed system                        | IVMS COMM<br>DIAGNOSIS | WAKE-UP<br>DIAGNOSIS | SELF-DIAG-<br>NOSTIC<br>RESULTS | DATA MONI-<br>TOR | ACTIVE<br>TEST |
| IVMS-COMM CHECK           | IVMS communication and wake-up function | х                      | х                    |                                 |                   |                |
| POWER WINDOW              | Power window                            |                        |                      |                                 | Х                 | Х              |
| DOOR LOCK                 | Power door lock                         |                        |                      | Х                               | Х                 | Х              |
| MULTI-REMOTE CONT<br>SYS  | Multi-remote control                    |                        |                      |                                 | х                 | X              |
| THEFT WARNING SYS-<br>TEM | Theft warning system                    |                        |                      |                                 | Х                 | X              |
| ROOM LAMP TIMER           | Interior lamp control                   |                        |                      |                                 | х                 | Х              |
| STEP LAMP                 | Step lamps                              |                        |                      | _                               | Х                 | Х              |
| ILLUM LAMP                | Illumination                            |                        |                      |                                 | Х                 | Х              |
| IGN KEY WARN ALM          | Warning buzzer                          |                        |                      |                                 | Х                 | Х              |
| LIGHT WARN ALM            | Warning buzzer                          |                        |                      |                                 | х                 | Х              |
| SEAT BELT TIMER           | Warning buzzer                          |                        |                      |                                 | Х                 | Х              |
| WIPER                     | Wiper and washer                        |                        | ,                    |                                 | Х                 | Х              |
| REAR DEFOGGER             | Rear window defogger                    |                        |                      |                                 | х                 | X              |

X: Applicable
For diagnostic item in each control system, read the CONSULT Operation Manual.

#### **DIAGNOSTIC ITEMS DESCRIPTION**

| MODE                    | Description  |
|-------------------------|--|
| IVMS COMM DIAGNOSIS     | Diagnosis of continuity in the communication line(s), and of the function of the communication interface between the body control module and the local control units, accomplished by transmitting a signal from the body control module to the local control units. |
| WAKE-UP DIAGNOSIS       | Diagnosis of the "wake-up" function of local control units by having a technician input the switch data into the local control unit that is in the temporary "sleep" condition.  |
| SELF-DIAGNOSTIC RESULTS | _  |
| DATA MONITOR            | Displays data relative to the body control module (BCM) input signals and various control related data for each system.  |
| ACTIVE TEST             | Turns on/off actuators, relay and lamps according to the commands transmitted by the CONSULT unit.   |

NOTE: When CONSULT diagnosis is operating, some systems under IVMS control do not operate.



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#### IVMS (LAN) — TROUBLE DIAGNOSES SYSTEM CONSULT (Cont'd) **WAKE-UP DIAGNOSIS** Α ■ WAKE-UP DIAGNOSIS ■ INSPECTION START TOUCH START. DIAGNOSE WAKE-UP Α **FUNCTION FOR ALL** 1. Touch "WAKE-UP DIAGNOSIS" in LCUs IN ORDER. "IVMS-COMM CHECK". 2. Touch "START" for "WAKE-UP START DIAGNOSIS". **SEL513S** В ■ WAKE-UP DIAGNOSIS В D LCU is malfunctioning. C/U:POWER WINDOW C/U-DR Touch "START", then turn ON switch des-Replace LCU. AFTER TOUCH START, ignated on the display within 15 seconds. TURN ON P/W SW DR-UP Switch data is unmatch-WITHIN 15sec. ing. Touch "RETEST" and perform wake-up diagnosis again. NEXT START SEL891U C LCU is OK. С WAKE-UP DIAGNOSIS Touch "NEXT" and perform wake-up diagnosis for next LCU. **FAILURE DETECTED** - OR -Touch "END". (INSPECTION END) \*\*\*\* NO FAILURE \*\*\*\* PRINT | NEXT END SEL657U D ■ WAKE-UP DIAGNOSIS ■ FAILURE DETECTED POWER WINDOW C/U-DR END **PRINT** NEXT SEL892U Ε ■ WAKE-UP DIAGNOSIS ■ **FAILURE DETECTED** SW DATA UNMATCH

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**END** 

**PRINT** 

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# **IVMS Communication Diagnoses Results List**

| Diagnostic item                   | Number of malfunc-<br>tioning LCU | CONSULT diagnosis result  | On-board diagnosis (Mode 1) code No.         | Expected cause                                | Service procedure   |
|-----------------------------------|-----------------------------------|---|--|---|---|
| IVMS system is in<br>good order   | _                                 | NO FAILURE  | 11   |   | _   |
|                                   |                                   | POWER WINDOW<br>C/U-DR<br>[COMM FAIL]   | 24   |   |   |
|                                   |                                   | POWER WINDOW<br>C/U-AS<br>[COMM FAIL]   | 34   |   |   |
|                                   | One                               | POWER WINDOW<br>C/U-RR<br>[COMM FAIL]   | 41   | Malfunctioning     LCU                        | 1. Replace LCU.*  |
| ı                                 |                                   | POWER WINDOW<br>C/U-RL<br>[COMM FAIL]   | 44   |   |   |
|                                   |                                   | MULTI-REMOTE<br>[COMM FAIL]   | 54   |   | ,   |
| Communication mal-<br>functioning | Two or more                       | Combination of POWER WINDOW C/U-DR [COMM FAIL] POWER WINDOW C/U-AS [COMM FAIL] POWER WINDOW C/U-RR [COMM FAIL] POWER WINDOW C/U-RL [COMM FAIL] MULTI-REMOTE [COMM FAIL] | Combination of<br>24<br>34<br>41<br>44<br>54 | 1. Malfunctioning<br>LCU                      | 1. Replace LCU.*  |
|                                   | Ali                               |   | 24, 34, 41, 44 and<br>54                     | Malfunctioning     BCM     Malfunctioning all | 1. Replace BCM.* (For models with auto A/C, refer to EL-204.) |
|                                   | BCM<br>[COMM FAIL 2]              |   | LCUs   | 2. Replace all LCUs.*                         |   |

<sup>\*:</sup> Before replacing BCM/LCU, clear the memory of diagnoses result and perform communication diagnoses again. If the diagnoses result is still NG, replace BCM/LCU.

To erase the memory, perform the procedure below.

Erase the memory by CONSULT (refer to EL-187) or turn the ignition to "OFF" position and remove 7.5A fuse (No. 56), located in the fuse and fusible link box).

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NOTE: When CONSULT indicates [PAST COMM FAIL] or [PAST NO RESPONSE], erase the memory and perform communication diagnoses again.

# **IVMS Communication Diagnoses Results List** (Cont'd)

| Diagnostic item                           | Number of malfunctioning LCU | CONSULT diagnosis result  | On-board diagnosis<br>(Mode 1) code No. | Expected cause   | Service procedure<br>(Reference page)  |
|---|------------------------------|---|---|--|--|
|   |                              | POWER WINDOW<br>C/U-DR<br>[NO RESPONSE]   | 25                                      | Power supply circuit for LCU   | Check power     supply circuit of     the LCU in question. (EL-202)  |
|   |                              | POWER WINDOW<br>C/U-AS<br>[NO RESPONSE]   | 35                                      | Poor connection     at LCU connector.  | Check connector connection of LCU in question.     Check ground  |
|   | One                          | POWER WINDOW<br>C/U-RR<br>[NO RESPONSE]   | 42                                      | 3. Ground circuit of the LCU   | circuit of the LCU<br>in question. (EL-<br>201)  |
|   |                              | POWER WINDOW<br>C/U-RL<br>[NO RESPONSE]   | 45                                      | 4. Open circuit in the data line 5. Malfunctioning   | 4. Check open circuit in the data line between BCM and LCU in  |
|   | 1                            | MULTI-REMOTE<br>[NO RESPONSE]   | 55                                      | LCU  | question. (EL-<br>203)<br>5. Replace LCU.*   |
| Communication via data line not responsed | Two or more                  | Combination of POWER WINDOW C/U-DR [NO RESPONSE] POWER WINDOW C/U-AS [NO RESPONSE] POWER WINDOW C/U-RR [NO RESPONSE] POWER WINDOW C/U-RL [NO RESPONSE] MULTI-REMOTE [NO RESPONSE] | Combination of 25 35 42 45 55           | Combination of causes below  1. Power supply circuit for LCU  2. Poor connection at LCU connector  3. Open circuit in the data line  | 1. Check power supply circuit of the LCU in question. (EL-202) 2. Check connector connection of LCU in question. 3. Check open circuit in the data line between BCM and LCU in question. (EL-203)  |
|   | All                          | BCM/HARNESS<br>[COMM LINE]  | 25, 35, 42, 45 and<br>55                | 1. Short circuit in the data line  2. Poor connection at BCM connector  3. Open circuit in the data line between BCM and all LCUs.  4. Malfunctioning BCM  5. Short circuit in the data line of LCU internal circuit | 1. Short circuit in the data line between BCM and any LCU. (EL-203) 2. Check connector connection of BCM. 3. Check open circuit in the data line between BCM and all LCUs. (EL-203) 4. Replace BCM.* (For models with auto A/C, refer to EL-204.) 5. Disconnect each LCUs one by one to check whether the other LCUs operate properly. |

<sup>\*:</sup> Before replacing BCM/LCU, clear the memory of diagnoses result and perform communication diagnoses again. If the diagnoses result is still NG, replace BCM/LCU.

To erase the memory, perform the procedure below. Erase the memory by CONSULT (refer to EL-187) or turn the ignition to "OFF" position and remove 7.5A fuse (No.  $\overline{\underline{56}}$ , located in the fuse and fusible link box).

NOTE: When CONSULT indicates [PAST COMM FAIL] or [PAST NO RESPONSE], erase the memory and perform communication diagnoses again.

# IVMS Communication Diagnoses Results List (Cont'd)

| Diagnostic item                                | Number of malfunc-<br>tioning LCU | CONSULT diagnosis result   | On-board diagnosis (Mode 1) code No. | Expected cause                                   | Service procedure  | @l      |
|--|-----------------------------------|--|--------------------------------------|--|--|---------|
| Sleep control of<br>LCU is malfunction-<br>ing | One                               | POWER WINDOW C/U-DR [SLEEP] POWER WINDOW C/U-AS [SLEEP] POWER WINDOW C/U-RR [SLEEP] POWER WINDOW C/U-RL [SLEEP] MULTI-REMOTE [SLEEP] | _                                    | 1. Malfunctioning<br>LCU                         | 1. Replace LCU.  | · G(    |
|  |                                   | Combination of above results   | -                                    | Malfunctioning     LCU                           | Replace LCU.   |         |
|  | Two or more  All of above results | All of above results   | _                                    | 1. Malfunctioning BCM 2. Malfunctioning all LCUs | 1. Replace BCM.* (For models with auto A/C, refer to EL-204.) 2. Replace all LCUs. | Ci<br>M |

<sup>\*:</sup> Before replacing BCM/LCU, clear the memory of diagnoses result and perform communication diagnoses again. If the diagnoses result is still NG, replace BCM/LCU.

NOTE: When CONSULT indicates [PAST COMM FAIL] or [PAST NO RESPONSE], erase the memory and perform communication diagnoses again.

To erase the memory, perform the procedure below.

Erase the memory by CONSULT (refer to EL-187) or turn the ignition to "OFF" position and remove 7.5A fuse (No. 56, located in the fuse and fusible link box).

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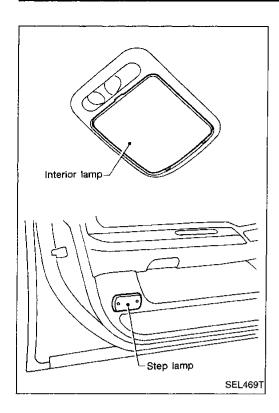
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#### **On-board Diagnosis**

#### **ON-BOARD DIAGNOSTIC RESULTS INDICATOR LAMP**

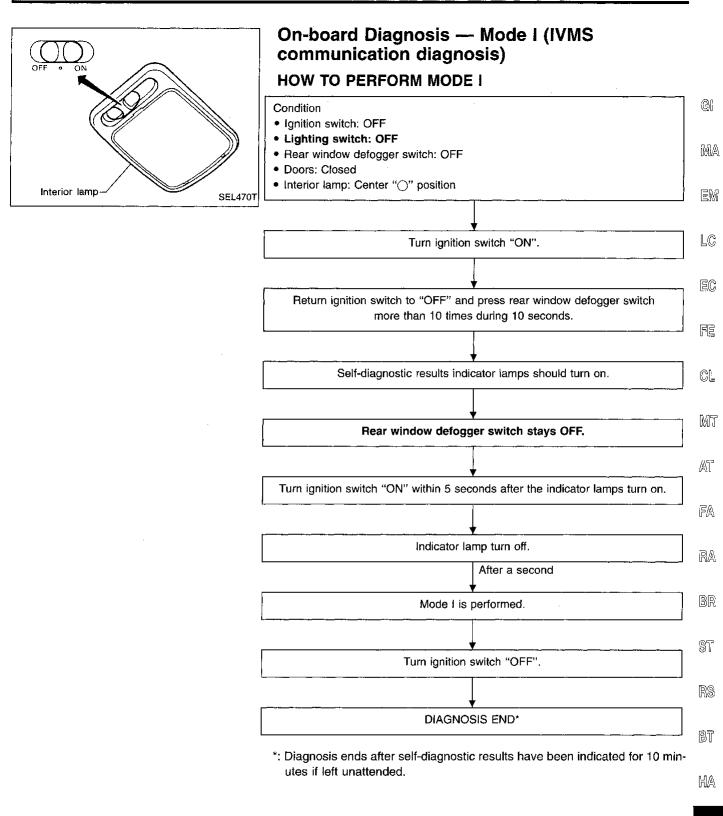
The interior lamp and step lamps (front seats) act as the indicators for the on-board diagnosis. These lamps blink simultaneously in response to diagnostic results.

#### **ON-BOARD DIAGNOSTIC FUNCTION**

| Mode     |  | Function  | Refer page |
|----------|--|---|------------|
| Mode I   | IVMS commu-<br>nication diag-<br>nosis | Diagnosing any abnormality or inability of communication between BCM and LCUs (DATA LINES A-1 and A-2). | EL-193     |
| Mode II  | Switch monitor                         | Monitoring conditions of switches connected to BCM and LCUs.  | EL-195     |
| Mode III | Power door<br>lock self-diag-<br>nosis | _   | EL-230     |
| Mode IV  | Power window operation                 | Operation of driver side window   | EL-213     |

NOTE: • When ON-BOARD diagnosis is operating, some systems under IVMS control do not operate.

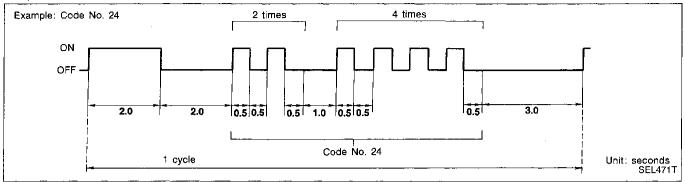
• The step lamp of malfunctioning LCU does not blink.



# On-board Diagnosis — Mode I (IVMS communication diagnosis) (Cont'd)

#### **DESCRIPTION**

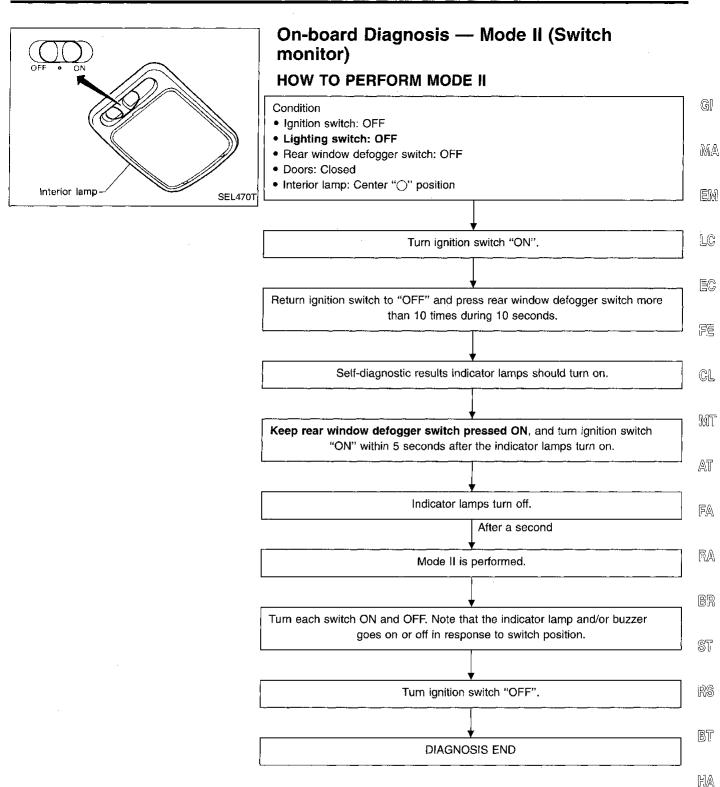
In this mode, a malfunction code is indicated by the number of flashes from the front map lamps and step lamps as shown below:



After indicator lamp turns on for 2 seconds then off for 2 seconds, it flashes [cycling ON (0.5 sec.)/OFF (0.5 sec.)] to indicate a malfunction code of the first digit. Then, 1 second after indicator lamp turns off, it again flashes [cycling ON (0.5 sec.)/OFF (0.5 sec.)] to indicate a malfunction code of the second digit. For example, the indicator lamp goes on and off for 0.5 seconds twice and after 1.0 second, it goes on and off for 0.5 seconds four times. This indicates malfunction code "24".

#### Malfunction code table

| Code No. | Malfunctioning LCU                  | Detected items                 | Diagnostic procedure                                       |
|----------|-------------------------------------|--------------------------------|--|
| 24       | Driver door control unit (LCU01)    | Malfunctioning communication   | Refer to Consult DIAGNOSTIC CHART, "COMM FAIL" (EL-189).   |
| 25       |                                     | No response from data line A-1 | Refer to Consult DIAGNOSTIC CHART, "NO RESPONSE" (EL-189). |
| 34       | Passenger door control unit (LCU02) | Malfunctioning communication   | Refer to Consult DIAGNOSTIC CHART, "COMM FAIL" (EL-189).   |
| 35       |                                     | No response from data line A-2 | Refer to Consult DIAGNOSTIC CHART, "NO RESPONSE" (EL-189). |
| 41       | Rear RH door control unit (LCU03)   | Malfunctioning communication   | Refer to Consult DIAGNOSTIC CHART, "COMM FAIL" (EL-189).   |
| 42       |                                     | No response from data line A-2 | Refer to Consult DIAGNOSTIC CHART, "NO RESPONSE" (EL-189). |
| 44       | Rear LH door control unit           | Malfunctioning communication   | Refer to Consult DIAGNOSTIC CHART, "COMM FAIL" (EL-189).   |
| 45       | (LCU04)                             | No response from data line A-1 | Refer to Consult DIAGNOSTIC CHART, "NO RESPONSE" (EL-189). |
| 54       | Multi-remote control unit (LCU05)   | Malfunctioning communication   | Refer to Consult DIAGNOSTIC CHART, "COMM FAIL" (EL-189).   |
| 55       |                                     | No response from data line A-1 | Refer to Consult DIAGNOSTIC CHART, "NO RESPONSE" (EL-189). |
| 11       | No malfunction                      | ·                              | _  |



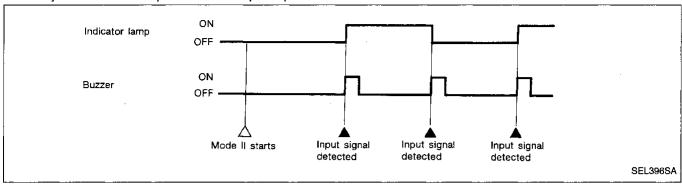
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**EL-195** 1399

# On-board Diagnosis — Mode II (Switch monitor) (Cont'd)

#### **DESCRIPTION**

In this mode, when BCM detects the input signal from a switch in IVMS as shown below, the detection is indicated by the interior lamp and front step lamps with buzzer.

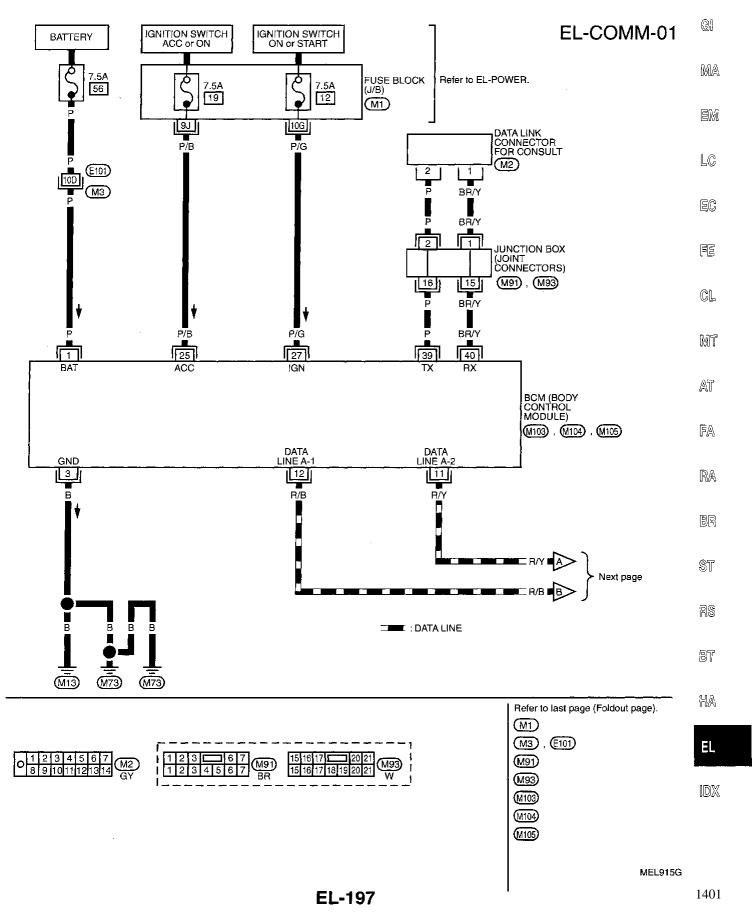


#### Switch monitor item

|         | · · · · · · · · · · · · · · · · · · ·  |        |
|---------|--|--------|
|         | <ul> <li>Hood switch</li> <li>Trunk room lamp switch</li> <li>Trunk lid key cylinder switch (UNLOCK)</li> <li>Door switches</li> </ul>   | LCU 02 |
| BCM ·   | <ul> <li>Lighting switch (1st)</li> <li>Wiper switch (INT)</li> <li>Wiper switch (WASH)</li> <li>Door switch (driver's side)</li> </ul>  | LCU 03 |
|         | Door switch (passenger side)     Seat belt buckle switch   | LCU 04 |
| .LCU 01 | <ul> <li>Power window lock switch</li> <li>Power window main switches (UP/DOWN)</li> <li>Power window automatic switch</li> <li>Door lock &amp; unlock switch (LOCK/UNLOCK)</li> <li>Door unlock sensor</li> <li>Door key cylinder switch (LOCK/UNLOCK)</li> </ul> | LCU 05 |
|         | Door key cynnicer switch (LOCK/ONLOCK)   |        |

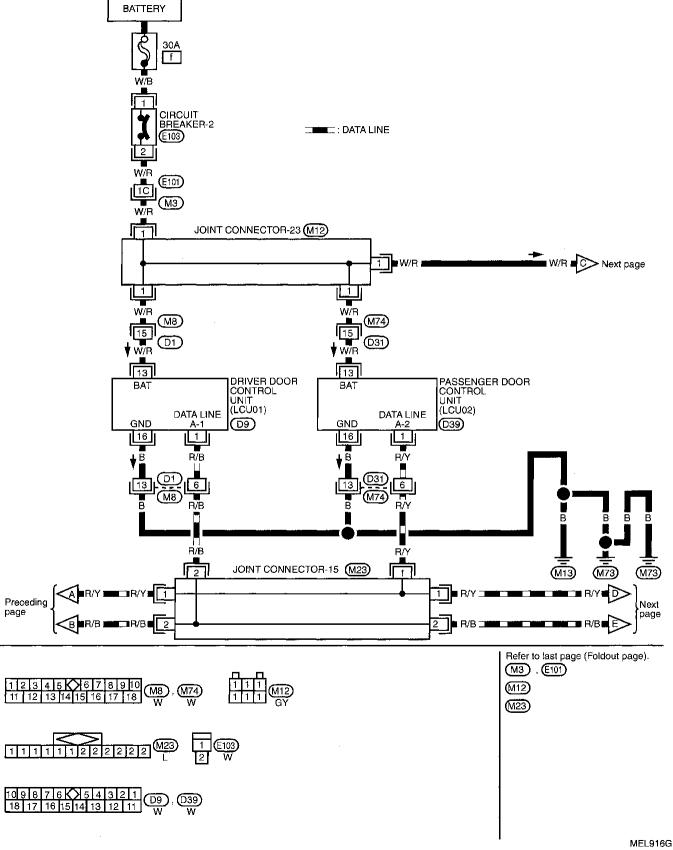
| LCU 02 | Door key cylinder switch (LOCK/UNLOCK)     Door unlock sensor     Passenger power window sub-switch (UP/DOWN) |   |  |
|--------|---|---|--|
| LCU 03 | Door unlock sensor     Power window sub-switch (Rear RH) (UP/DOWN)  |   |  |
| LCU 04 | Door unlock sensor     Power window sub-switch (Rear LH) (UP/DOWN)  |   |  |
| LCU 05 | Door lock button     Door unlock button     Panic alarm button     Trunk lid opener button                    | Operated by multi-<br>remote controller |  |

# Main Power Supply, Ground and Communication Circuits/Wiring Diagram — COMM —

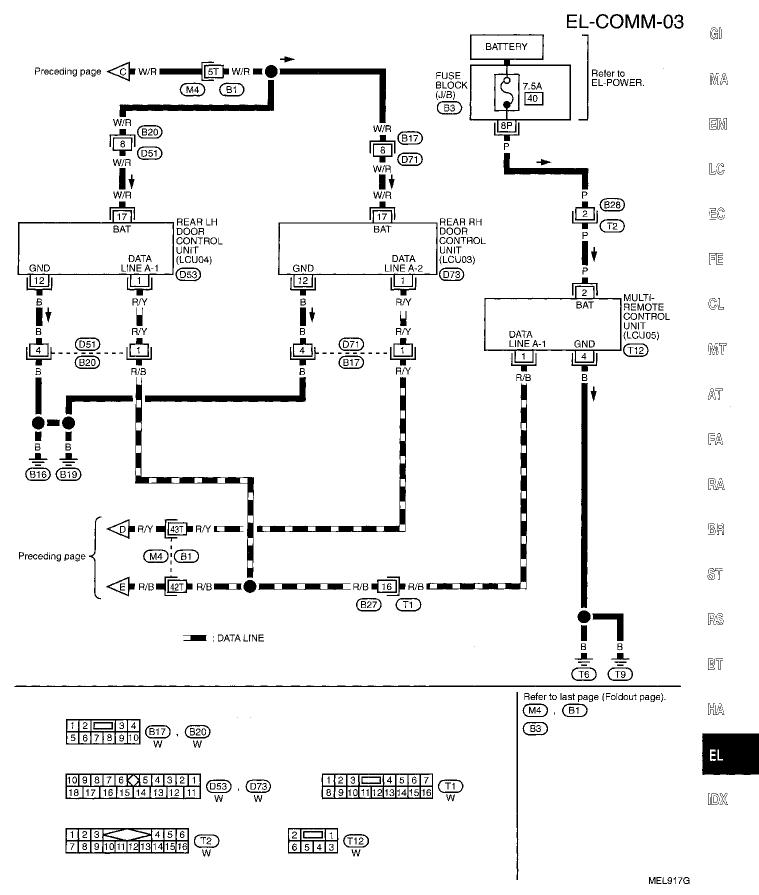


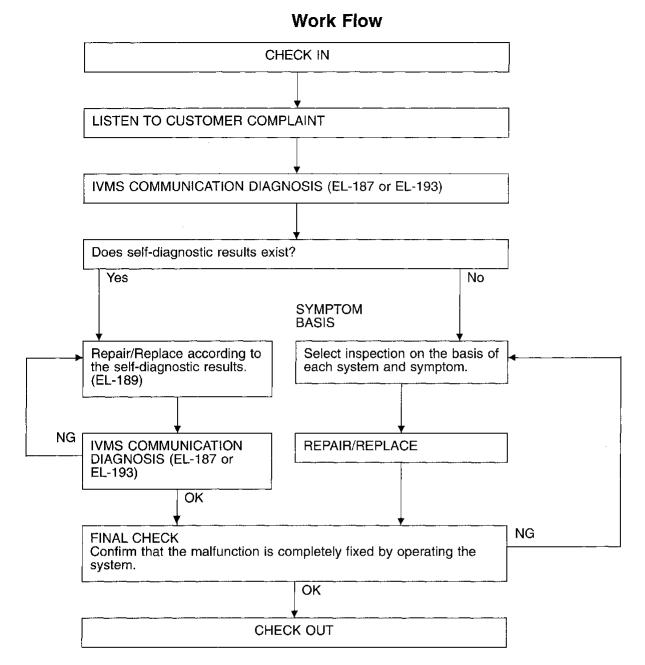
# Main Power Supply, Ground and Communication Circuits/Wiring Diagram — COMM — (Cont'd)

EL-COMM-02



# Main Power Supply, Ground and Communication Circuits/Wiring Diagram — COMM — (Cont'd)

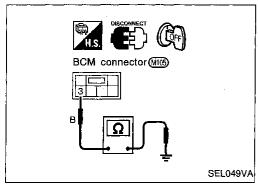


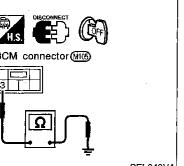


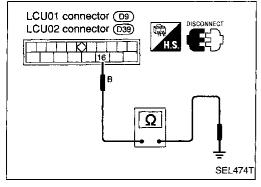
#### NOTICE:

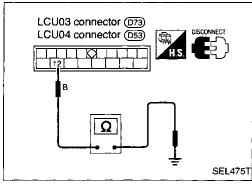
- When LCU connectors are disconnected for more than 1 minute such as during trouble diagnoses, the "disconnected" data will be memorized by the BCM. Therefore, after reconnecting the LCU connectors, erase the memory.
- To erase the memory, perform the procedure below.

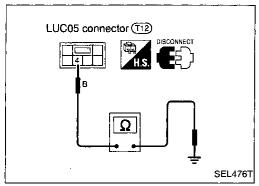
  Erase the memory with CONSULT (refer to EL-187) or turn the ignition switch to "OFF" position and remove 7.5A fuse (No. 56) located in the fuse and fusible link box).











# **Power Supply and Ground Circuit Check GROUND CIRCUIT CHECK**

| Control unit | Terminals     | Continuity | ='     |
|--------------|---------------|------------|--------|
| ВСМ          | ③ - Ground    |            | GI     |
| LCU01        | Ground        | Yes        |        |
| LCU02        | (16) - Ground |            | MA     |
| LCU03        | 12) - Ground  |            | IMIZ#1 |
| LCU04        | 12) - Giodilo |            |        |
| LCU05        | 4 - Ground    |            | EM     |

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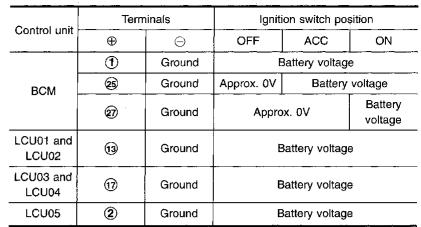
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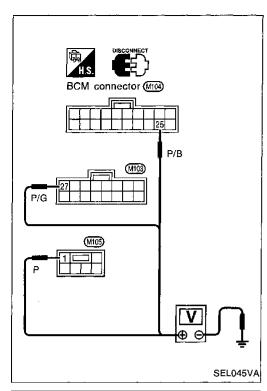
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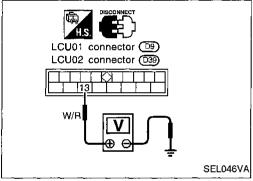
# Power Supply and Ground Circuit Check (Cont'd)

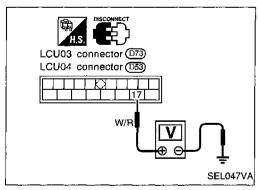
#### **POWER SUPPLY CIRCUIT CHECK**

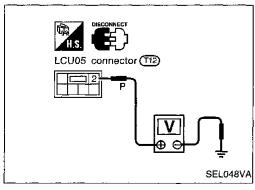


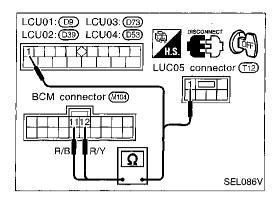
\*CONSULT (data monitor) may be used to check for the ignition switch input (ACC, ON).











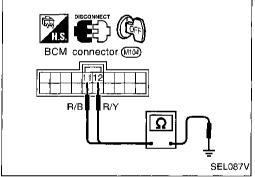
#### **Data Lines Circuit Check**

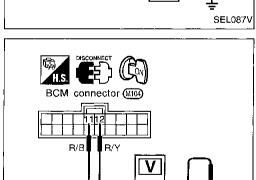
#### **DATA LINES OPEN CIRCUIT CHECK**

NOTE: When checking data line circuit, disconnect BCM and all LCU connectors.

- 1. Disconnect BCM and LCU connectors.
- 2. Check continuity between BCM and LCU terminals.

| Control unit | Terminals |     | Continuity |
|--------------|-----------|-----|------------|
| Control unit | LCU       | всм | Continuity |
| LCU01        | 1         | 12  |            |
| LCU02        | 1         | 11) |            |
| LCU03        | 1         | 11) | Yes        |
| LCU04        | 1         | 12  |            |
| LCU05        | <b>①</b>  | 12  |            |





SEL088V

#### **DATA LINES SHORT CIRCUIT CHECK**

- Disconnect BCM and all LCU connectors.
- 2. Check continuity between BCM terminal and body ground.

| Terminals   | Continuity |  |
|-------------|------------|--|
| 1 - Ground  | No         |  |
| 12 - Ground | NO         |  |

3. Check voltage between BCM terminal and body ground.

| Terminals    | Voltage [V] |
|--------------|-------------|
| 11) - Ground | 0           |
| 12 - Ground  | 0           |

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# Replacing the BCM (Body Control Module) for Models with Auto A/C

The BCM unit for models equipped with auto A/C's (air conditioners) is provided with an auto A/C amplifier.

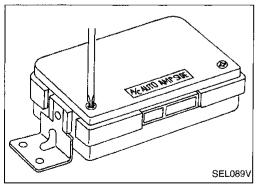
The BCM and auto A/C amplifier must be replaced independently with new ones as described below:

#### **CAUTION:**

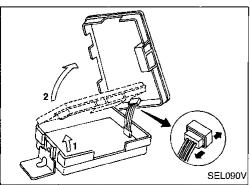
- Never handle the BCM unit with dirty hands (wet with oil, grease, etc.).
- When handling the BCM unit, hold the case as much as possible.
- Do not attempt to touch parts on the PC board unless absolutely necessary. Doing so may damage affected circuits or parts.
- The BCM unit consists of two cases—the BCM case and the A/C auto amplifier case. These cases are interconnected with a sub-harness. Be careful not to break the sub-harness while handling them.
- The "BCM SIDE" is stamped on the BCM case.
   The "A/C AUTO AMP" is stamped on the A/C auto amplifier case.

Be careful not to confuse one case with the other during replacement.

To replace either of the cases with a new one, proceed as follows:



Using a Phillips driver, remove the two screws.

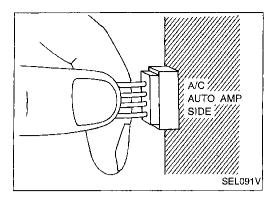


With the "A/C AUTO AMP SIDE" mark toward you and facing up, open the front of the case and then flip it open to the right.

#### CAUTION:

The BCM case and A/C auto amplifier case are interconnected with a sub-harness. Be careful not to break the sub-harness.

1408

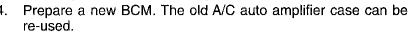


# Replacing the BCM (Body Control Module) for Models with Auto A/C (Cont'd)

While holding the 4 wires of sub-harness, disconnect the subharness connector from the mating connector.

#### **CAUTION:**

Be sure to pull connector straight out.



5. Connect the BCM-side connector to the A/C auto amplifier-side connector.

#### CAUTION:

Be sure to connect the BCM-side connector until a "click" is heard. If it does not connect properly, the auto A/C will not operate properly.

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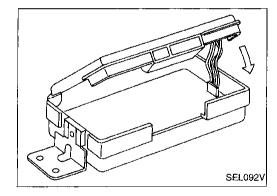
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3. With the "A/C AUTO AMP SIDE" mark facing upward, engage the back side of the case first, then close the case.

#### **CAUTION:**

Do not allow the sub-harness to be caught in the cases.

7. Using a Phillips driver, tighten the two screws to a torque of 0.4 to 0.6 N·m (4.1 to 6.1 kg-cm, 3.6 to 5.3 in-lb).

#### CAUTION

- Be sure the two cases are in close contact with each other and are secure while tightening the screws.
- Do not overtighten the screws since it may break the case.
- 8. Following BCM case replacement, make sure that:
- a. The BCM and A/C auto amplifier-side connectors are properly connected to the body-side connector.
- b. Perform IVMS communication diagnosis. Refer to page EL-187 or EL-193 for diagnostic procedures.
- c. Check that the auto A/C operates properly.

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#### **POWER WINDOW — IVMS**

#### **System Description**

#### **OUTLINE**

Power window system consists of

- a BCM (Body Control Module)
- four LCUs (Local Control Module)
- four power window regulators

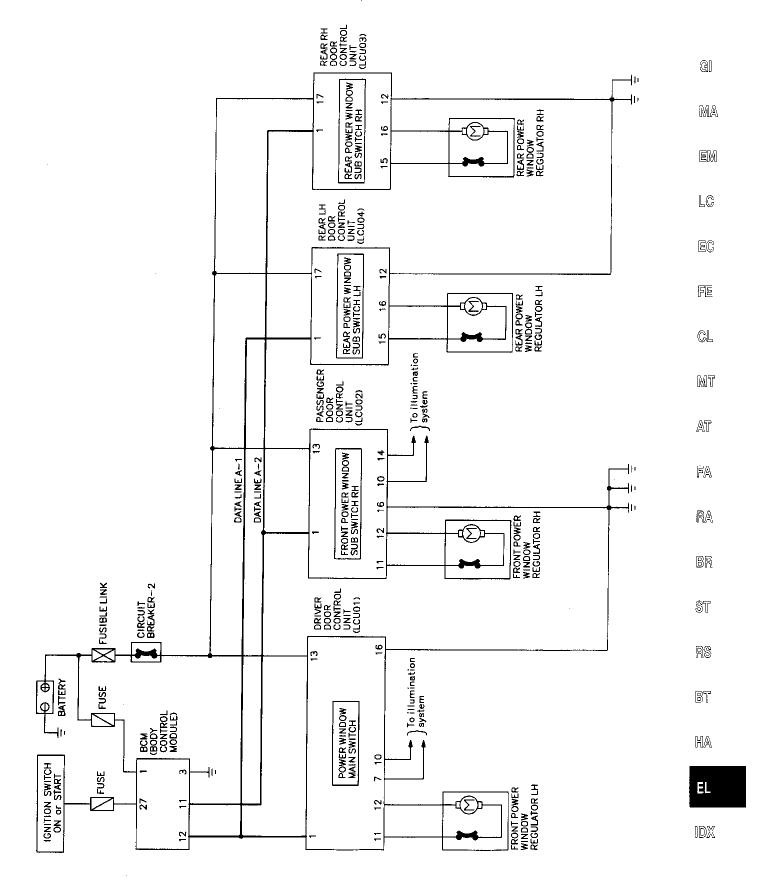
BCM is connected to each LCU via DATA LINE A-1 or A-2 and LCUs supply power and ground to each power window regulator.

When ignition switch is in the "ON" position, power window will be operated depending on power window sub/main switch (which is combined with each LCU) condition.

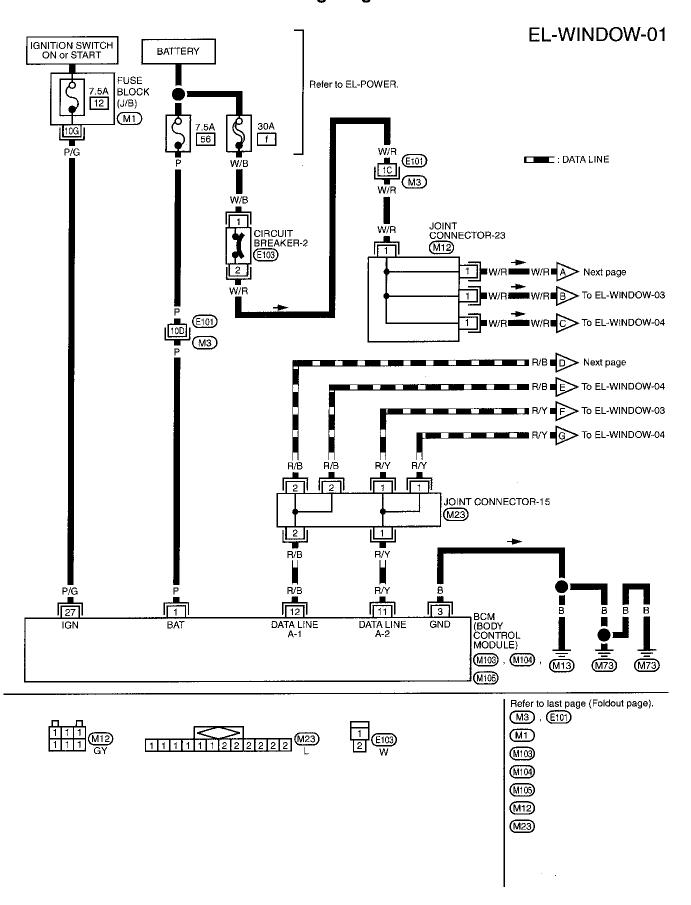
#### **OPERATIVE CONDITION**

- Power windows can be raised or lowered with each sub-switch or the power window main switch located
  on the driver's door trim when ignition key is in the "ON" position and power window lock switch on the
  driver's door trim is unlocked.
- When power window lock switch is locked, no windows can be raised or lowered except for driver side window.
- When ignition key is in the "ON" position, to fully open the driver side window, press down completely on the automatic switch (main switch) and release it; it needs not be held. The window will automatically open all the way. To stop the window, pull up down then release the switch.

# **Schematic**



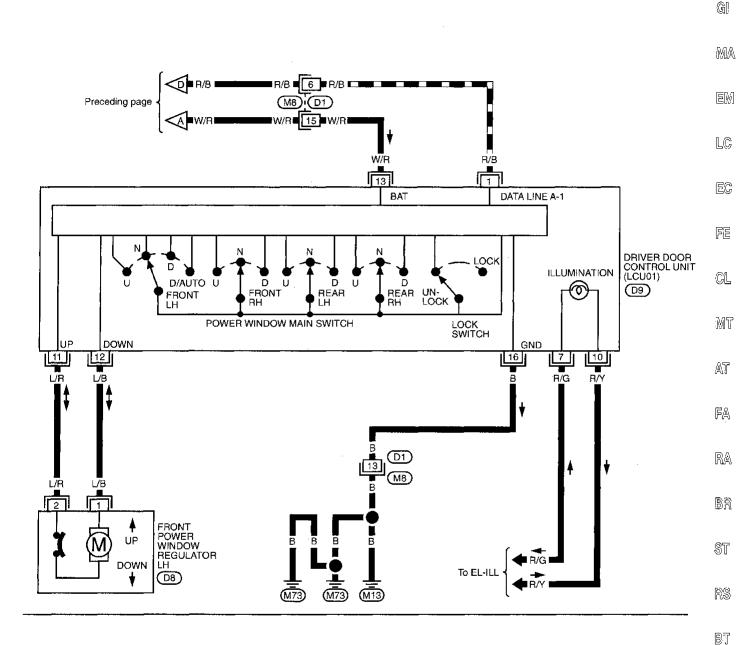
# Wiring Diagram — WINDOW —



# Wiring Diagram — WINDOW — (Cont'd)

### **EL-WINDOW-02**

□■□ : DATA LINE



1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 W

12 D8 10 9 8 7 6 5 4 3 2 1 D9 W

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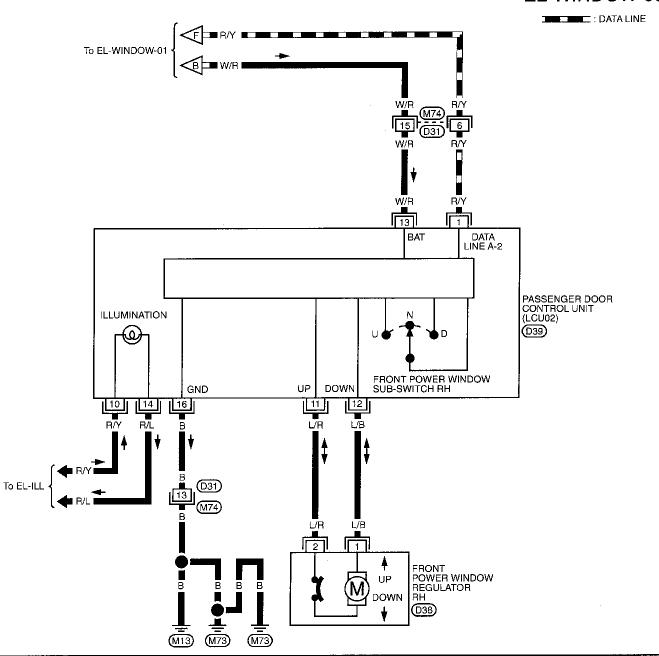
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# Wiring Diagram — WINDOW — (Cont'd)

# **EL-WINDOW-03**

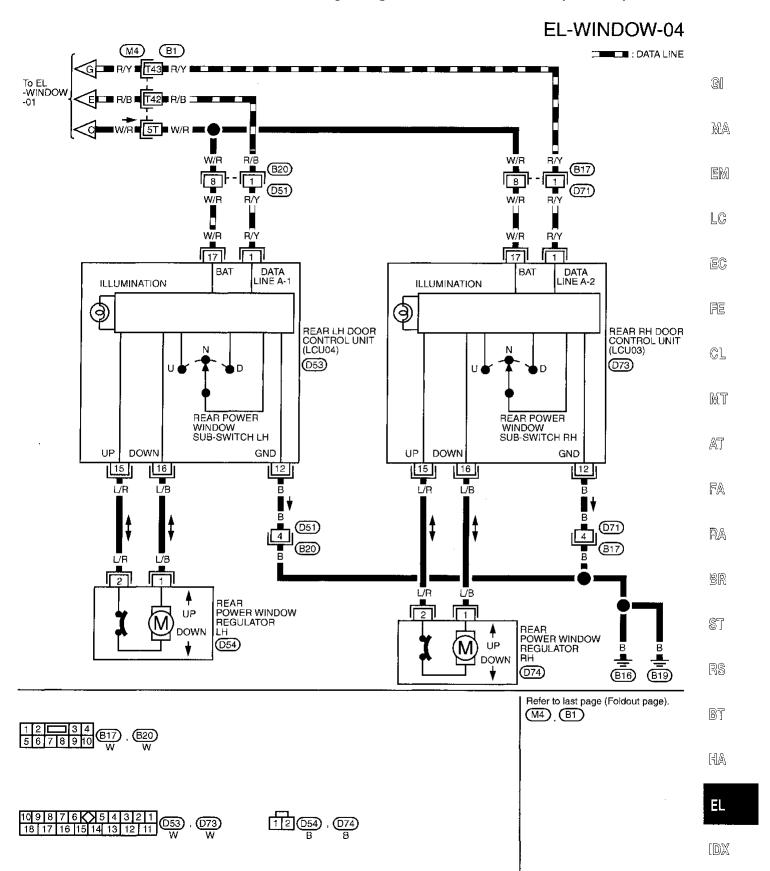


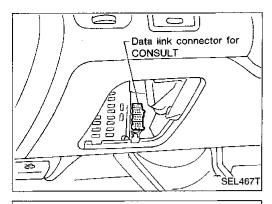
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 W



10 9 8 7 6 5 4 3 2 1 18 17 16 15 14 13 12 11 W

# Wiring Diagram — WINDOW — (Cont'd)



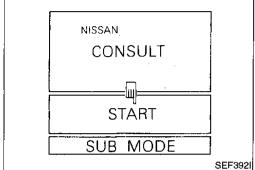


# **Trouble Diagnoses**

### CONSULT

### **CONSULT** inspection procedure

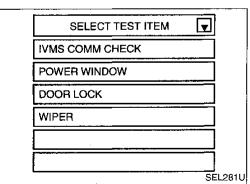
- 1. Turn ignition switch "OFF".
- 2. Connect "CONSULT" to the data link connector.



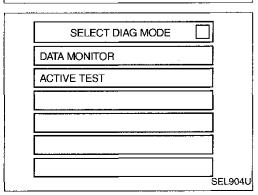
- 3. Turn ignition switch "ON".
- 4. Touch "START".

| SELECT SYSTEM |         |
|---------------|---------|
| ENGINE        |         |
| A/T           |         |
| AIRBAG        |         |
| IVMS          |         |
|               |         |
|               |         |
|               | SEL280U |

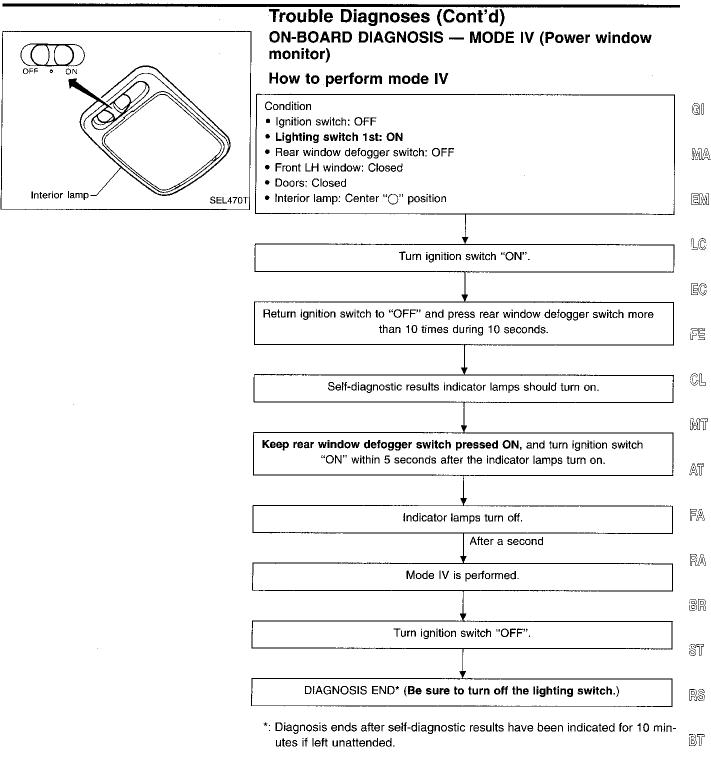
5. Touch "IVMS".



6. Touch "POWER WINDOW".



 DATA MONITOR and ACTIVE TEST are available for the power window.



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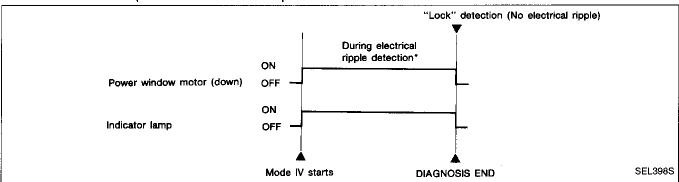
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# Trouble Diagnoses (Cont'd)

### **Description**

In mode IV, driver window is automatically operated. In conjunction with power window motor (DOWN) "ON", indicator lamps (interior lamp and front step lamps) turn on. When power window "lock" is detected, power window motor will stop and the indicator lamps will turn off.

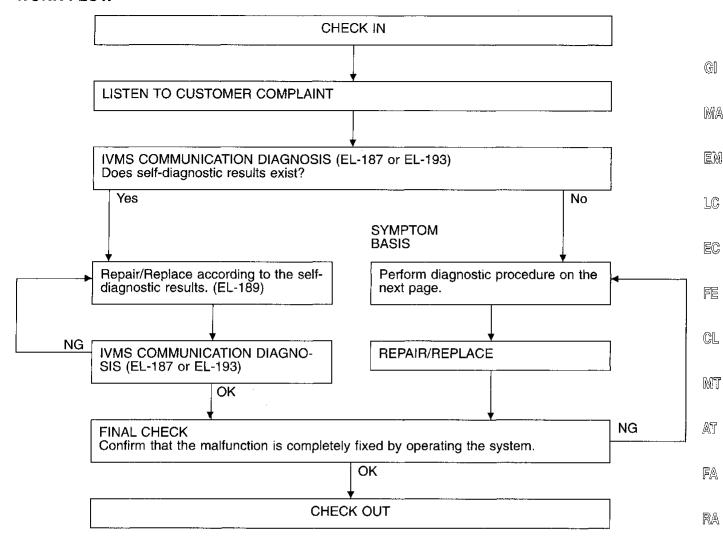


NOTE: As soon as manual switches (each seat's power window switch) turn ON, driver power window motor (DOWN) stops and diagnosis ends.

<sup>\*</sup> While power window motor is being operated, electrical ripple occurs.

## Trouble Diagnoses (Cont'd)

### **WORK FLOW**



#### NOTICE:

- When LCU connectors are disconnected for more than 1 minute such as during trouble diagnoses, the "disconnected" data will be memorized by the BCM. Therefore, after reconnecting the LCU connectors, erase the memory.
- To erase the memory, perform the procedure below.

  Erase the memory with CONSULT (refer to EL-187) or turn the ignition switch to "OFF" position and remove 7.5A fuse (No. 56) located in the fuse and fusible link box).

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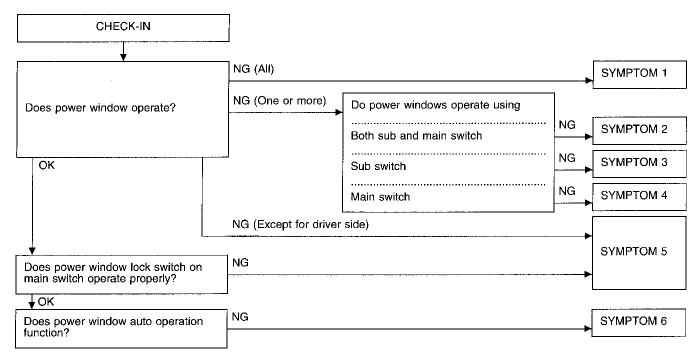
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# Trouble Diagnoses (Cont'd)

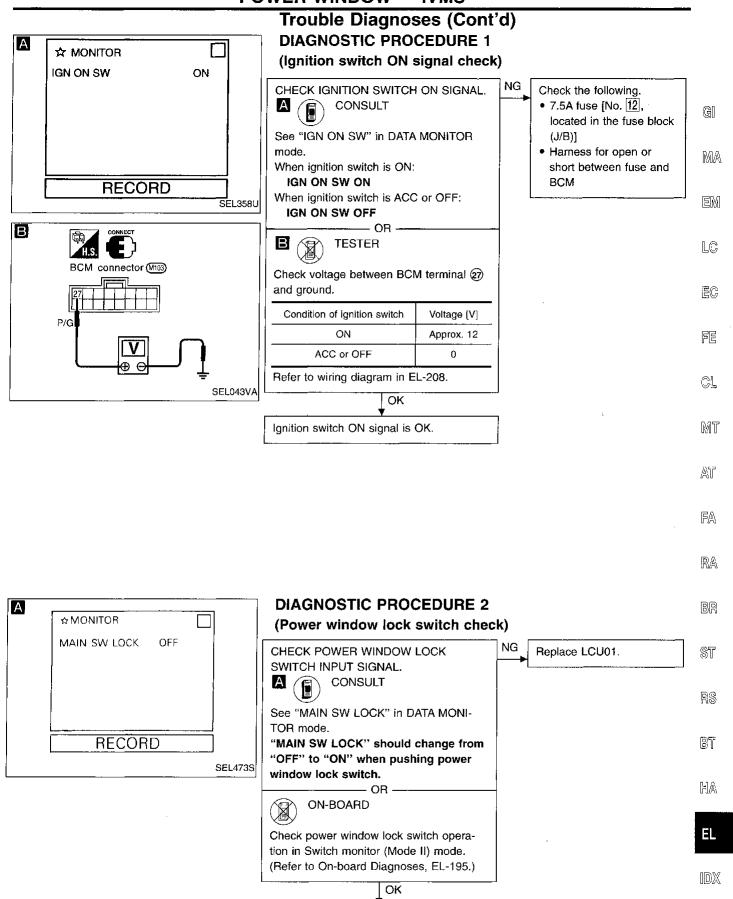
### PRELIMINARY CHECK



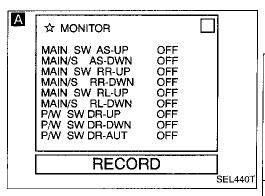
### **SYMPTOM CHART**

| PR  | OCEDURE   | Diagnostic procedure                             |   |   |  |   |  |
|-----|---|--|---|---|--|---|--|
| RE  | FERENCE PAGE  | EL-217   | EL-217  | EL-218  | EL-218   | EL-219  | EL-220   |
| SYI | иртом   | Procedure 1<br>(Ignition switch ON signal check) | Procedure 2<br>(Power window lock switch check) | Procedure 3<br>(Power window main switch check) | Procedure 4<br>(Power window sub-switch check) | Procedure 5<br>(Power window regulator check) | Procedure 6<br>(Power window automatic switch check) |
| 1   | All power window do not operate.  | Х  |   |   | ***  |   |  |
| 2   | One or more of the power windows do not operate by turning either sub or main switch. |  |   |   |  | X   |  |
| 3   | One or more of the sub-switches do not function.                                      |  |   |   | Х  |   |  |
| 4   | One or more of the main switches on driver's door trim do not function.               |  |   | Х   |  |   |  |
| 5   | Power window lock switch on main switch does not lock and/or unlock all windows.      |  | Х   |   |  |   |  |
| 6   | Driver power window automatic operation does not function.                            |  |   |   |  |   | Х  |

**EL-216** 1420

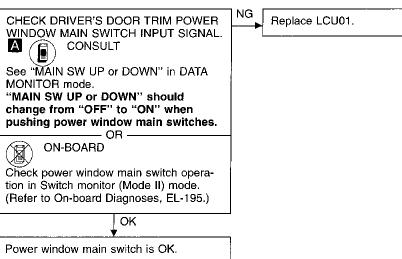


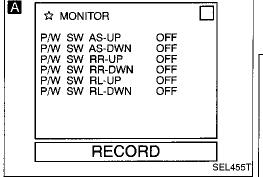
Power window lock switch is OK.



# Trouble Diagnoses (Cont'd) DIAGNOSTIC PROCEDURE 3

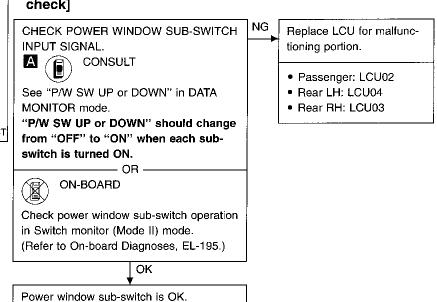
(Power window main switch)

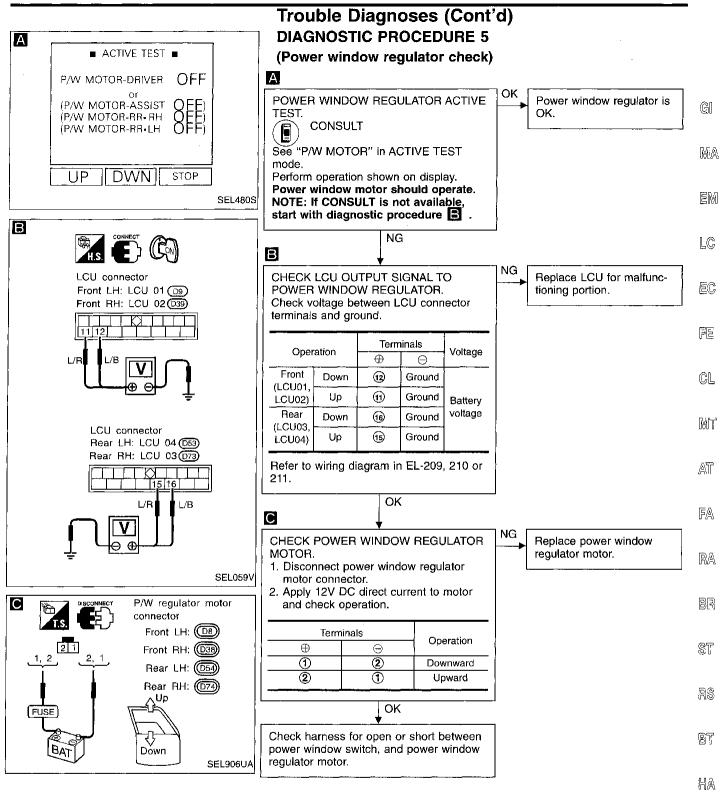




### **DIAGNOSTIC PROCEDURE 4**

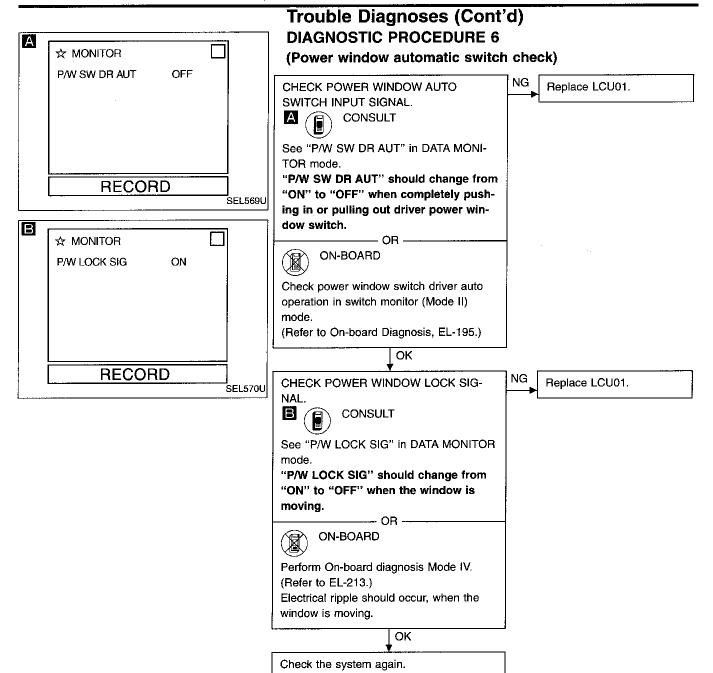
[Power window sub-switch (Passenger side, Rear LH, RH) check]





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## **System Description**

### POWER SUPPLY AND GROUND

Power is supplied at all times

- through 7.5A fuse [No. 40], located in the fuse block (J/B)]
- to key switch terminal ①.

Gl

MA

Power is supplied to BCM terminal 31 through key switch terminal 2 when key switch is in ON position (ignition key is inserted in the key cylinder).

BCM is connected to LCU01, LCU02, LCU03 and LCU04 as DATA LINE A-1 or A-2.

Ground is supplied

- to BCM terminal 29 or 16
- from front LH or RH door switch terminal (2)

ĒM

- through front LH or RH door switch terminal 3 when door switch is in OPEN position and
- through body grounds (B16) and (B19).

LC

Ground is supplied

- to driver door control unit (LCU01) terminals (6) or (5)
- from front LH door key cylinder switch terminals 1 or 2 when door key cylinder is in BETWEEN FULL STROKE AND N position

EC

- through front LH door key cylinder switch terminal (4) and
- through body grounds M<sup>13</sup> and M<sup>73</sup>.

Front RH door key cylinder switch will supply ground to passenger door control unit (LCU02) in the same manner as driver side.

FE

Ground is supplied

to driver door control unit (LCU01) terminal (4)

CL

MT

- from door unlock sensor (in the front LH door lock actuator) terminal ② when door lock is in UNLOCKED position
- through front LH door lock actuator terminal (4) and

SEL309U

through body grounds M13 and M73.

Front passenger and rear door unlock sensors (in the door lock actuators) will supply ground to each door control unit (LCU02, 03 and 04) in the same manner as driver side.

E A-1 FA

When lock/unlock signal is sent to BCM or LCU, BCM sends a lock/unlock signal to LCUs via DATA LINE A-1 or A-2. LCUs then supply power and ground to each door lock actuator.

**OPERATION** 

The lock & unlock switch (SW) on driver's door trim can lock and unlock all doors.

RA

- With the lock knob on front LH or RH door set to "LOCK", all doors are locked.
- With the door key inserted in the key cylinder on front LH or RH door, turning it to "LOCK", will lock all doors; turning it to "UNLOCK" once unlocks the corresponding door; turning it to "UNLOCK" again within 5 seconds after the first unlock operation unlocks all of the other doors.

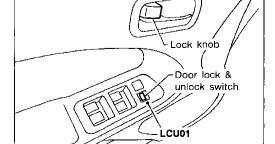
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However, if the ignition key is in the ignition key cylinder and one or more of the front doors are open, setting the lock & unlock switch, lock knob, or the door key to "LOCK" locks the doors once but then immediately unlocks them. — (KEY REMINDER DOOR SYSTEM)

RS

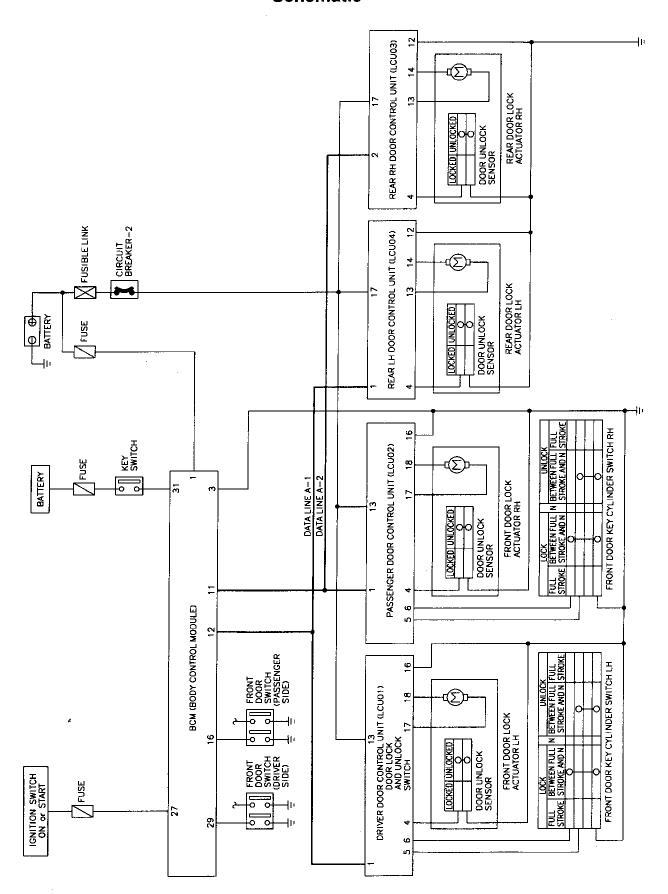
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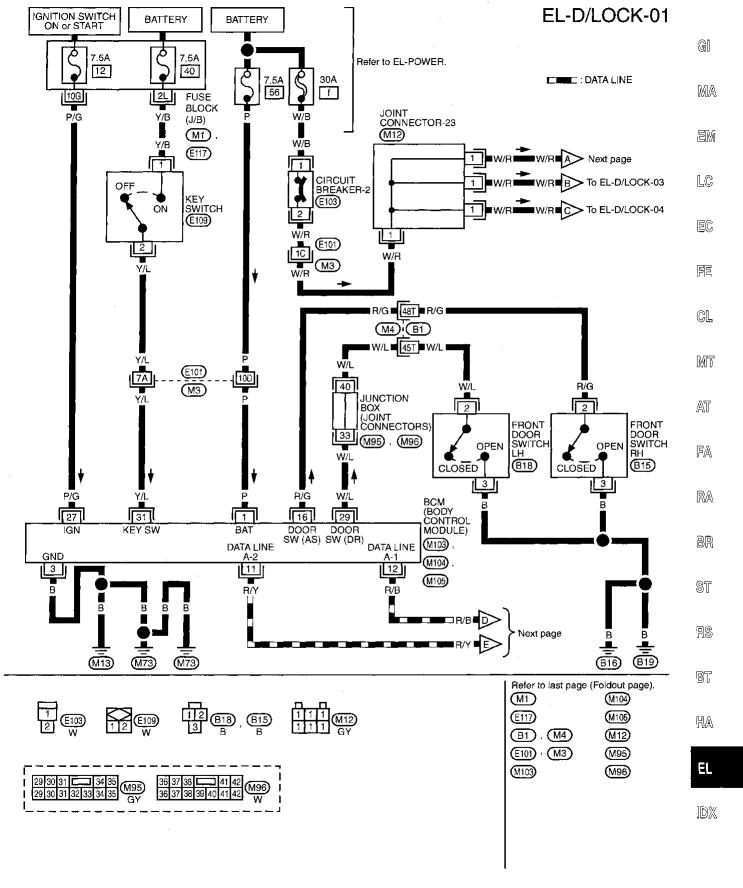
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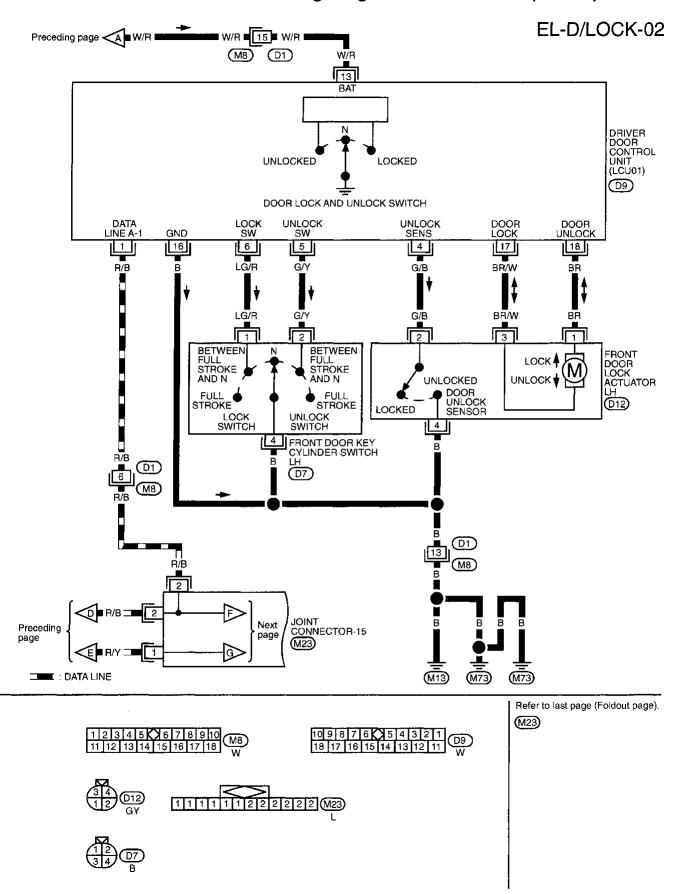
# **Schematic**



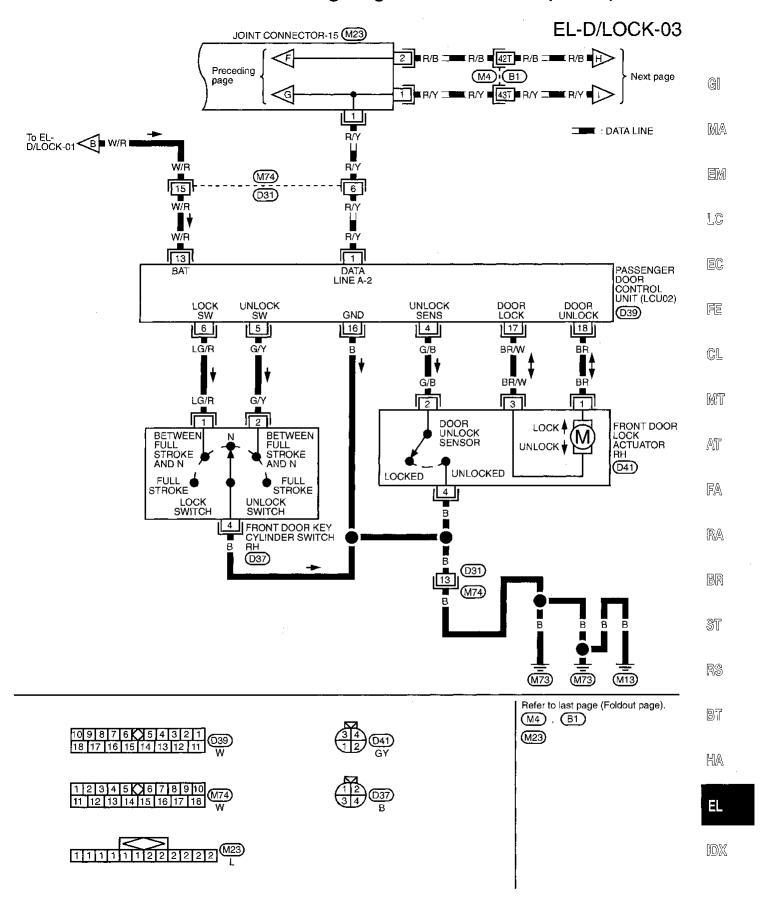
# Wiring Diagram — D/LOCK —



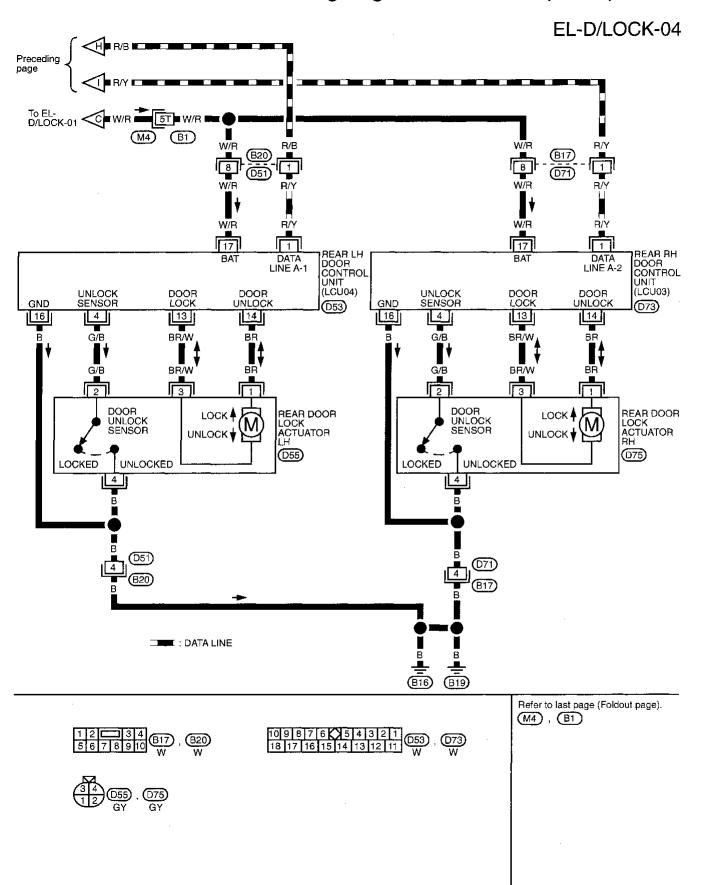
# Wiring Diagram — D/LOCK — (Cont'd)

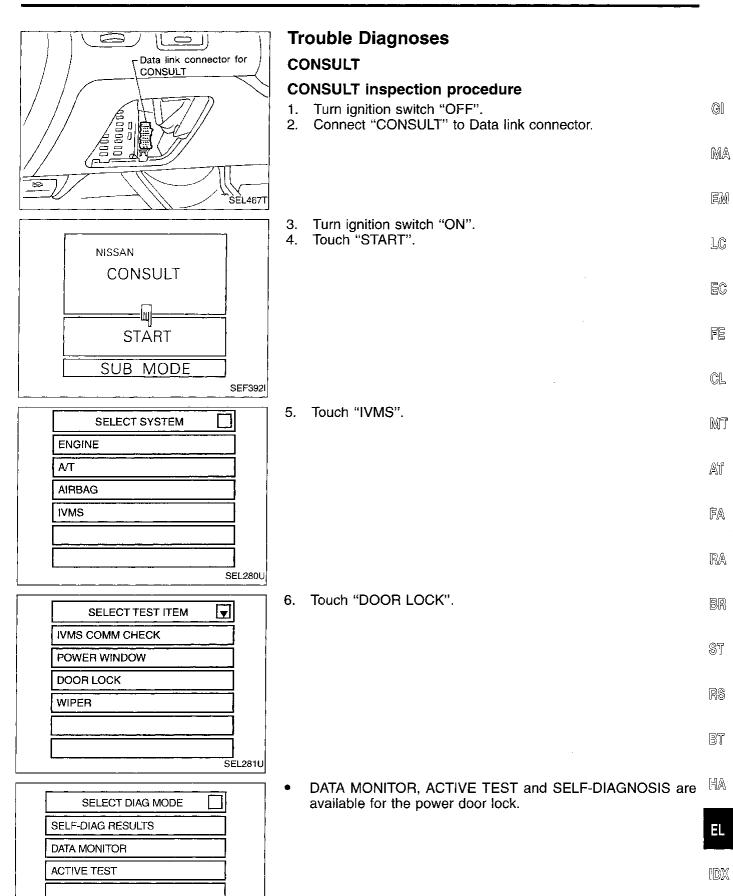


# Wiring Diagram — D/LOCK — (Cont'd)



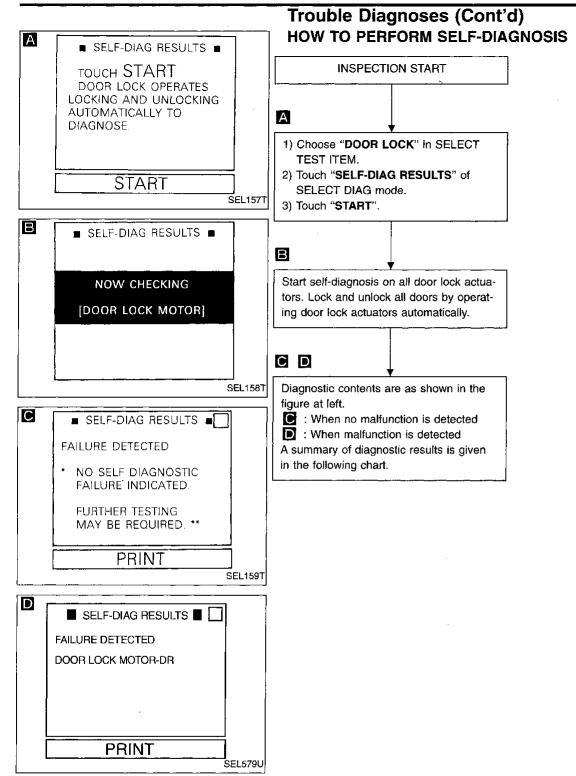
# Wiring Diagram — D/LOCK — (Cont'd)





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SEL905U



# ${\bf POWER\ DOOR\ LOCK-IVMS}$

# Trouble Diagnoses (Cont'd)

# **SELF-DIAGNOSTIC RESULT LIST**

| Diagnostic result                                  | Explanation  | Diagnostic procedure                      | Reference page |    |
|--|--|---|----------------|----|
| DOOR LOCK MOTOR-DR                                 | The circuit for the driver side door lock actuator/unlock sensor is malfunctioning.    |   |                | G1 |
| DOOR LOCK MOTOR-AS                                 | The circuit for the passenger side door lock actuator/unlock sensor is malfunctioning. | Procedure 5<br>(Door unlock sensor check) | EL-238         | MA |
| DOOR LOCK MOTOR-RR/RH                              | The circuit for the rear RH side door lock actuator/unlock sensor is malfunctioning.   | Procedure 6<br>(Door lock actuator check) | EL-239         | EM |
| DOOR LOCK MOTOR-RR/LH                              | The circuit for the rear LH side door lock actuator/unlock sensor is malfunctioning.   |   |                | LC |
| *NO SELF DIAGNOSTIC FAIL-<br>URE INDICATED/FURTHER | No malfunction in the above  | _   |                | EC |
| TESTING MAY BE<br>REQUIRED.**                      | items.   |   |                | FE |

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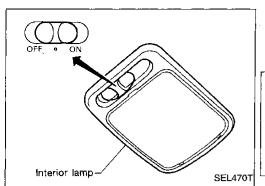
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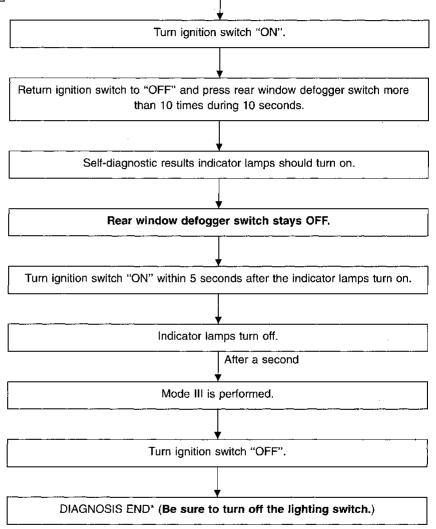
# **Trouble Diagnoses (Cont'd)**

# ON-BOARD DIAGNOSIS — MODE III (Power door lock operation)

### How to perform mode III

#### Condition

- Ignition switch: OFF
- . Lighting switch 1st: ON
- Rear window defogger switch: OFF
- · Doors: Closed
- Interior lamp: Center "O" position

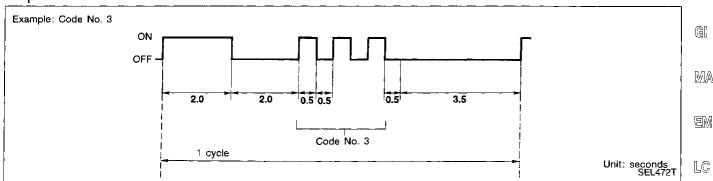


<sup>\*:</sup> Diagnosis ends after self-diagnostic results have been indicated for 10 minutes if left unattended.

# Trouble Diagnoses (Cont'd)

### Description

In this mode, a malfunction code is indicated by the number of flashes from the front map lamps and step lamps as shown below:



After indicator lamp turns ON for 2 seconds and then turns OFF, it flashes to indicate a malfunction code. For example, the indicator lamp goes on and off for 0.5 seconds three times. This indicates malfunction code "3".

The self-diagnostic results will remain in the BCM memory.

### Malfunction code table

|          | ,  | <del> </del>                             |                | _         |
|----------|--|--|----------------|-----------|
| Code No. | Detected items                             | Diagnostic procedure                     | Reference page |           |
| 1        | Driver door lock actuator/unlock sensor    | Procedure 5 (Door unlock sensor check)   | EL-238         | -<br>CL   |
| 2        | Passenger door lock actuator/unlock sensor | 1 Tooledule 3 (Boot unlock sensor check) | LL-250         |           |
| 3        | Rear RH door lock actuator/unlock sensor   |  |                | MT        |
| 4        | Rear LH door lock actuator/unlock sensor   | Procedure 6 (Door lock actuator check)   | EL-239         |           |
| 9        | No malfunction in the above items          | _  |                | -<br>_ AT |

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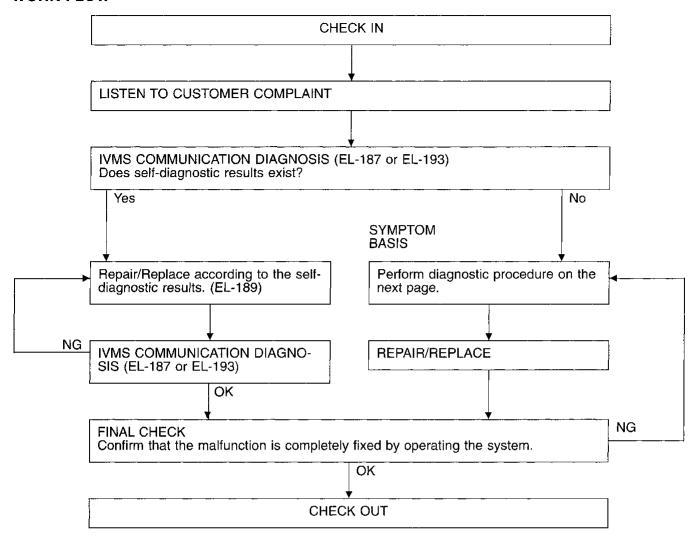
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## **Trouble Diagnoses (Cont'd)**

### **WORK FLOW**



#### NOTICE:

- When LCU connectors are disconnected for more than 1 minute such as during trouble diagnoses, the "disconnected" data will be memorized by the BCM. Therefore, after reconnecting the LCU connectors, erase the memory.
- To erase the memory, perform the procedure below.

  Erase the memory with CONSULT (refer to EL-187) or turn the ignition switch to "OFF" position and remove 7.5A fuse (No. 56) located in the fuse block and fusible link box).

# Trouble Diagnoses (Cont'd)

# **SYMPTOM CHART**

| PROCEDURE  | Self-dia | agnosis                          |  |                                   | Diagnostic                                  | procedure                                       | •   |   | _                      |
|--|----------|----------------------------------|--|-----------------------------------|---|---|---|---|------------------------|
| REFERENCE PAGE   | EL-228   | EL-230                           | EL-234                                   | EL-235                            | EL-236                                      | EL-237  | EL-238                                    | EL-239                                    | EL-188                 |
| SYMPTOM  | CONSULT  | On-board diagnosis<br>(Mode III) | Procedure 1<br>(Front door switch check) | Procedure 2<br>(Key switch check) | Procedure 3<br>(Lock & unlock switch check) | Procedure 4<br>(Door key cylinder switch check) | Procedure 5<br>(Door unlock sensor check) | Procedure 6<br>(Door lock actuator check) | Wake-up diagnosis      |
| Key reminder door system does not operate properly.  | Х        | х                                | х  | Х                                 | ,   |   | х   | x   |                        |
| Specific door lock actuator does not operate.  | х        | Х                                |  |                                   |   |   | х   | Х   |                        |
| Power door lock does not operate with door lock and unlock switch on power window main switch. | х        | х                                |  |                                   | х   |   |   |   | X<br>(LCU01)           |
| Power door lock does not operate with front door key cylinder operation.                       | х        | Х                                | i  |                                   |   | Х   | ·   |   | X<br>(LCU01,<br>LCU02) |
| Power door lock does not operate with front door lock knob switch.                             | х        | Х                                |  |                                   |   |   | х   |   | X<br>(LCU01,<br>LCU02) |

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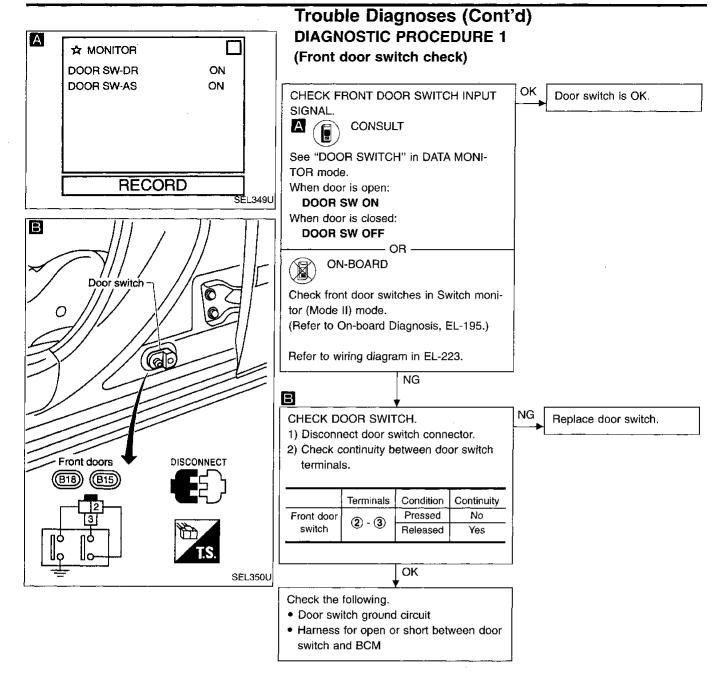
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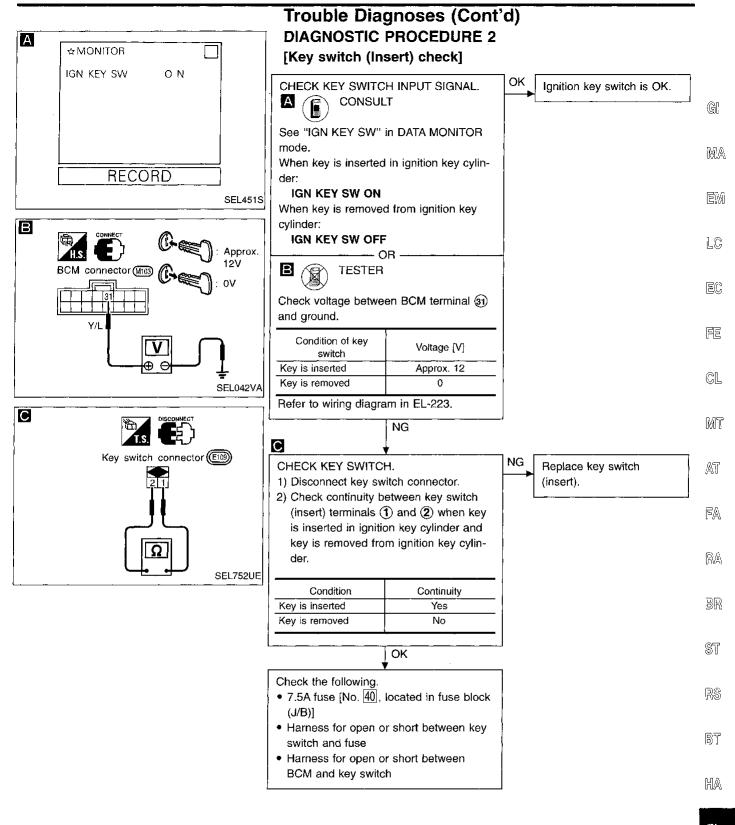
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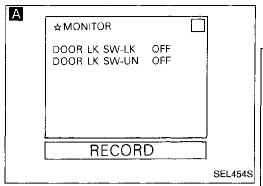
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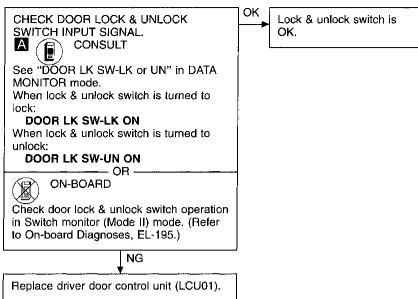


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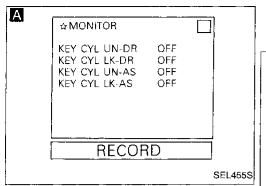


# Trouble Diagnoses (Cont'd) DIAGNOSTIC PROCEDURE 3

(Lock & unlock switch check)



**EL-236** 1440



Neutral

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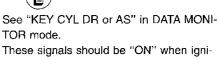
Full stroke >

Driver side (D7)

Passenger side (D37)

# Trouble Diagnoses (Cont'd) DIAGNOSTIC PROCEDURE 4

### (Door key cylinder switch check)



CHECK DOOR KEY CYLINDER SIGNAL.

CONSULT

tion key inserted in the door key cylinder was turned to lock or unlock.

If signals turn from "OFF" to "ON" too quickly on CONSULT display when key cylinder is turned, check these signals in the graphic mode.

- OR -

(Refer to CONSULT OPERATION MANUAL.)



Α

### ON-BOARD

Check front LH or RH door lock key cylinder lock and unlock switch in Switch monitor (Mode II) mode.

(Refer to On-board Diagnoses, EL-195.)

Refer to wiring diagram in EL-224 or 225.

NG



Full stroke

Door lock switch Door unlock switch

SEL320U

Key cylinder tamper switch

### CHECK DOOR KEY CYLINDER SWITCH.

- Disconnect door key cylinder switch connector.
- Check continuity between door key cylinder switch terminals.

| Terminals  | Condition | Continuity |
|------------|-----------|------------|
| (T) (A)    | Neutral   | No         |
| ① - ④      | Locked    | No         |
| <b>0 0</b> | Neutral   | No         |
| 2 - 4      | Unlocked  | Yes        |
|            |           |            |

OK •

Check the following.

- · Door key cylinder switch ground circuit
- Harness for open or short between door key cylinder switch and LCU01/02

Replace door key cylinder switch.

NG

Door key cylinder switch is

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OK.

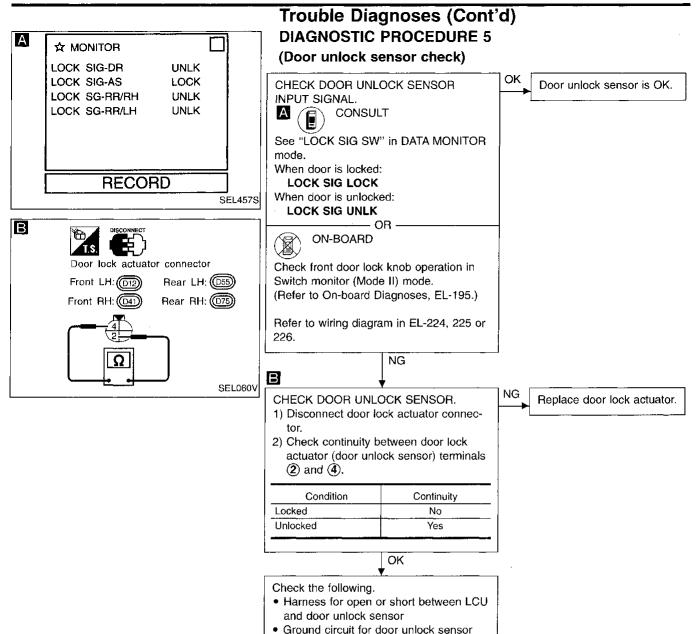
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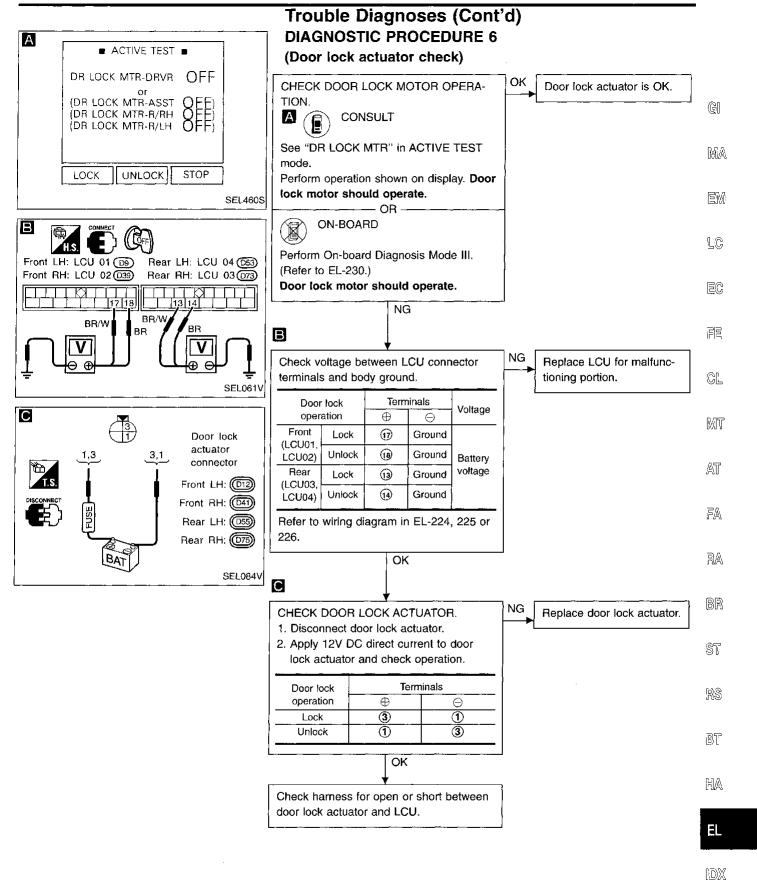
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**EL-238** 1442



1443

### **MULTI-REMOTE CONTROL SYSTEM — IVMS**

# **System Description**

### POWER SUPPLY AND GROUND

Power is supplied at all times

• through 10A fuse [No. 11], located in the fuse block (J/B)]

• to multi-remote control relay-1 terminals (1), (3) and (6).

Terminals ② of multi-remote control relay-1 is connected to BCM terminal (8).

Power is supplied at all times

through 7.5A fuse (No. 65, located in the fuse and fusible link box)

to theft warning lamp relay terminal (1) and

to theft warning horn relay-1 and 2 terminal 1.

Theft warning lamp relay terminal ② and theft warning horn relay-2 terminal ② are connected to BCM terminal ②).

Power is supplied at all times

through 15A fuse [No. 37], located in the fuse block (J/B)]

to trunk lid opener actuator terminal ②.

Trunk lid opener actuator terminal ① is connected to multi-remote control unit (LCU05) terminal ⑤ BCM is connected to Multi-remote control unit (LCU05) and each door control unit (LCU01, 02, 03 and 04) via DATA LINE A-1 or A-2.

Power is supplied at all times

through 7.5A fuse [No. 40], located in the fuse block (J/B)]

to key switch terminal (1).

When the key switch is in ON position (ignition key is inserted in key cylinder), power is supplied

through key switch terminal (2)

to BCM terminal 31.

When any of the four door switches is in OPEN position, ground is supplied

to BCM terminal 35

through door switches body grounds.

When the driver side door lock actuator (door unlock sensor) is in UNLOCKED position, ground is supplied

to driver door control unit (LCU01) terminal 4

through driver side door lock actuator (door unlock sensor) terminal ②,

to driver side door lock actuator (door unlock sensor) terminal (4)

through body grounds M13 and M73.

When the passenger side door lock actuator (door unlock sensor) is in UNLOCKED position, ground is supplied

to passenger door control unit (LCU02) terminal (4)

through passenger side door lock actuator (door unlock sensor) terminal (2).

to passenger side door lock actuator (door unlock sensor) terminal (4)

through body grounds Mi3 and M73.

When the rear door lock actuator LH and/or RH (door unlock sensor) is in UNLOCKED position, ground is supplied

to rear LH and/or RH door control unit (LCU04/03) terminal (4)

- through rear door lock actuator LH (door unlock sensor) terminal ② and/or
- through rear door lock actuator RH (door unlock sensor) terminal (2)
- to rear door lock actuator LH (door unlock sensor) terminal (4) and/or
- to rear door lock actuator RH (door unlock sensor) terminal (4)

through body grounds (B16) and (B19).

Remote controller signal input

- through window antenna
- to multi-remote control unit (LCU05) terminal 7.

### **MULTI-REMOTE CONTROL SYSTEM — IVMS**

# System Description (Cont'd)

The multi-remote control system controls operation of the

- power window
- power door lock
- trunk lid opener
- panic alarm
- hazard reminder

GI

#### **OPERATING PROCEDURE**

Multi-remote control unit (LCU05) can receive signals from remote controller when key switch is in OFF position (key not in cylinder). And it sends the signals to BCM and LCUs as DATA LINES A-1 or A-2.

# Power door lock operation

EM

MA

- Key switch OFF signal (ignition key is not in key cylinder)
- Door switch CLOSE signal (all doors closed)

The two above signals are already input into BCM. At this point, multi-remote control unit receives a LOCK signal from remote controller. Multi-remote control unit (LCU05) will then send a LOCK signal

- from its terminals (1) (DATA LINES A-1)
- to BCM terminal (12).

EC

When multi-remote control unit (LCU05) receives a LOCK signal, ground is supplied

- to multi-remote control relay-1 terminal ②
- through BCM terminal (18).

FE

Multi-remote control relay is now energized and door lock actuators lock all doors. (Hazard warning lamps flash twice as a reminder — HAZARD REMINDER.)

When an UNLOCK signal is sent from remote controller, door lock actuators unlock all doors.

For detailed description, refer to "POWER DOOR LOCK — IVMS" (EL-221).

### Trunk lid opener operation

MT

CL

- Ground is supplied
- to trunk lid opener actuator terminal ①
- through multi-remote control unit (LCU05) terminal (5).

AT?

When power and ground are supplied, trunk lid opener actuator opens trunk lid.

### Panic alarm operation

Multi-remote control system activates horn and headlamps intermittently when an alarm signal is sent from remote controller to multi-remote control system.

For detailed description, refer to "THEFT WARNING SYSTEM — IVMS" (EL-261).

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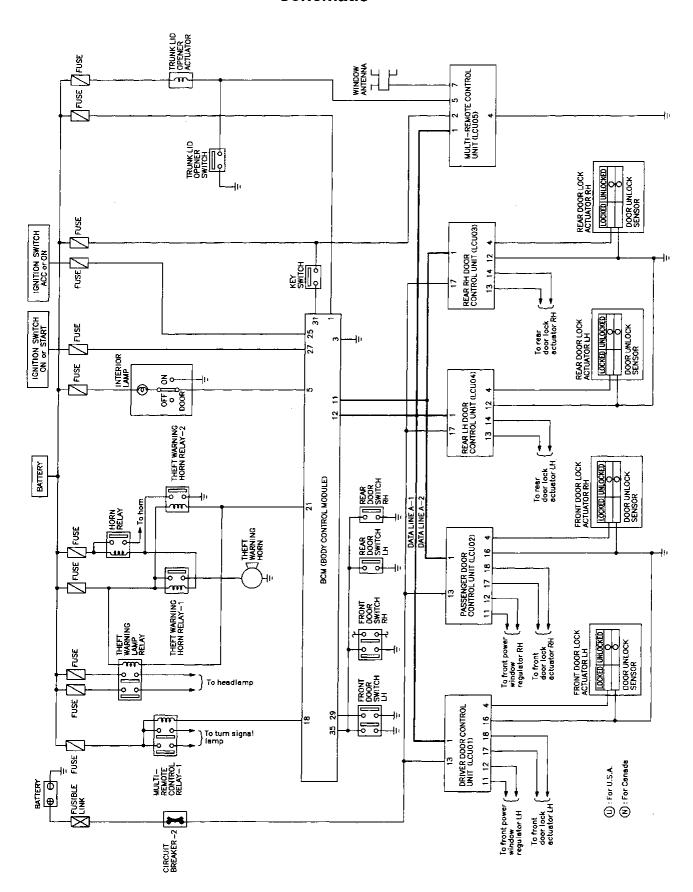
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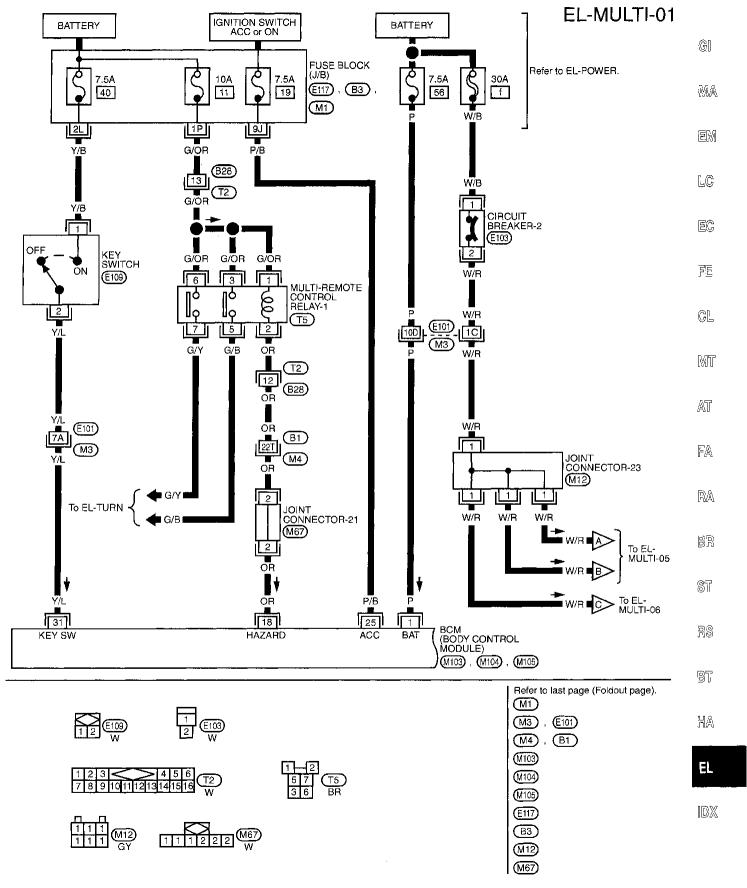
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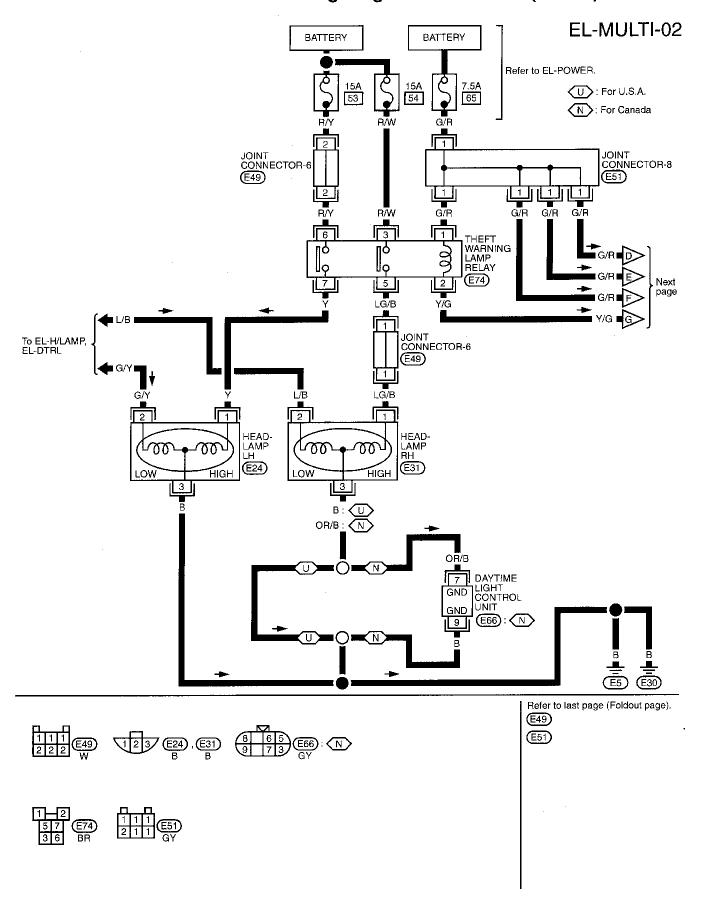
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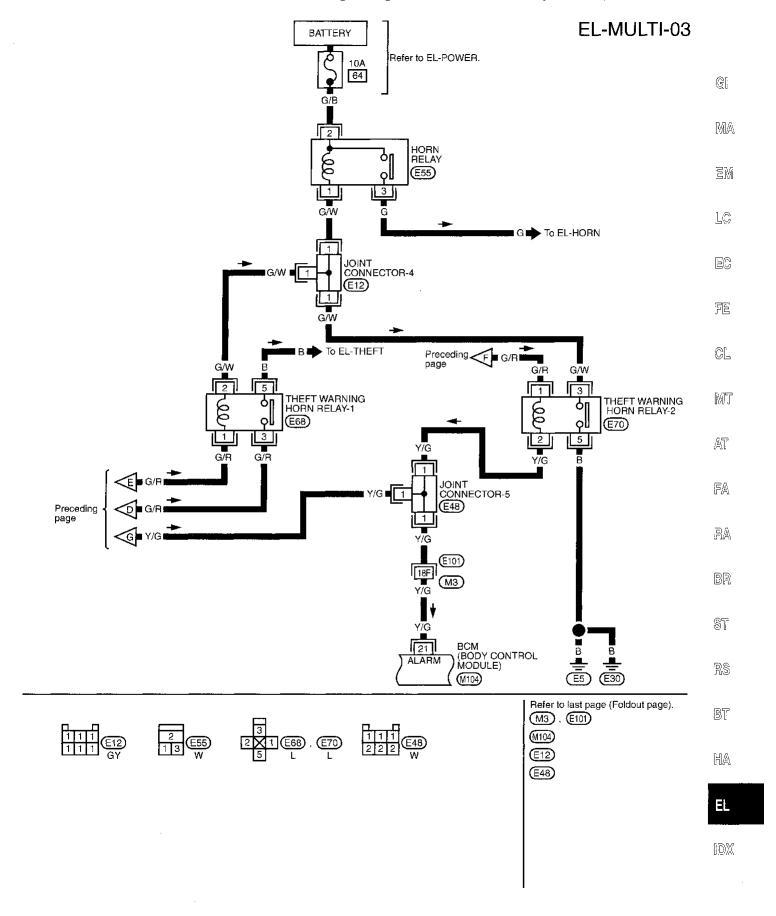
# **Schematic**

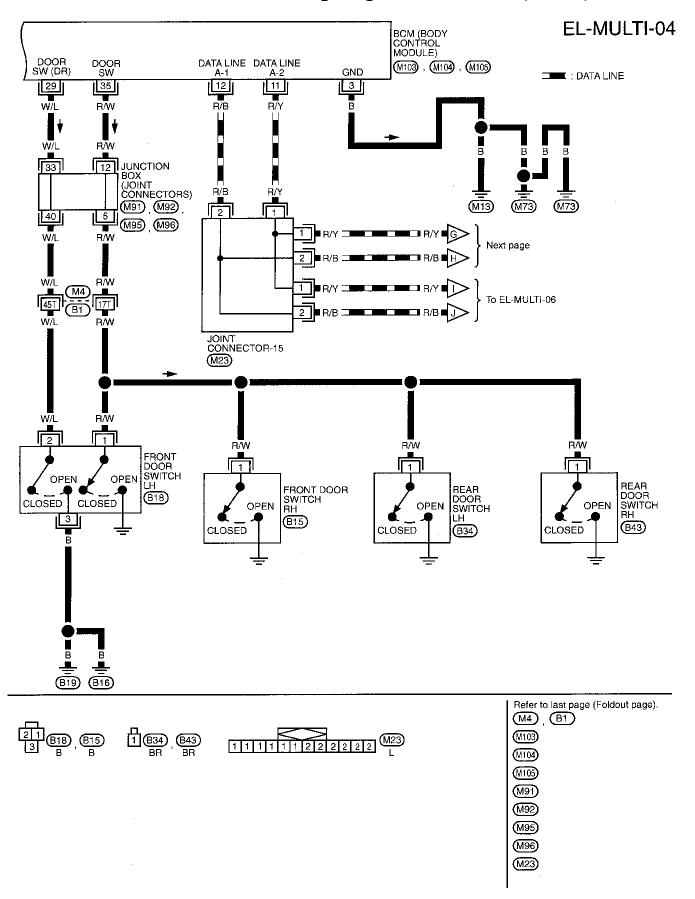


# Wiring Diagram — MULTI —

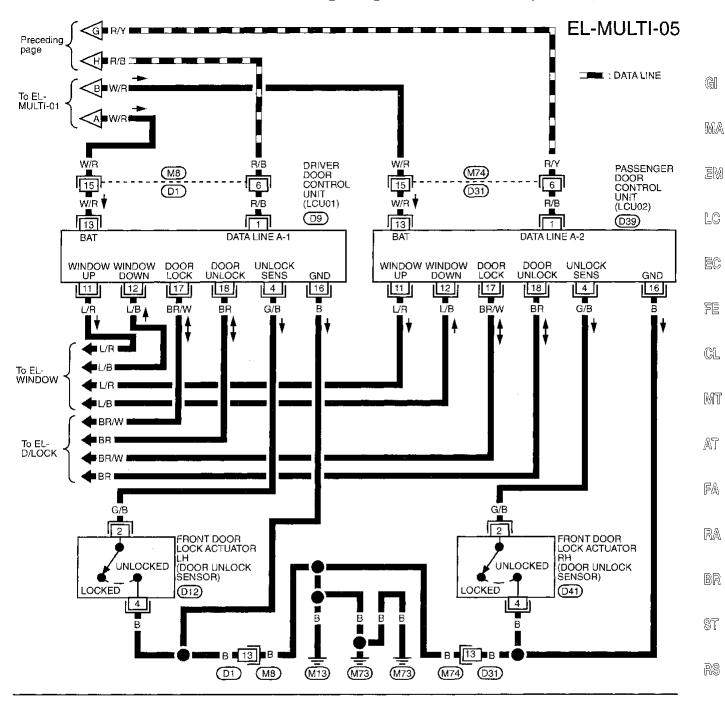


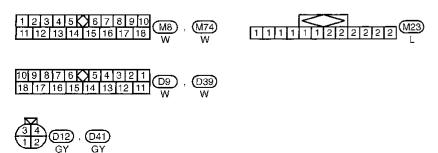






# Wiring Diagram — MULTI — (Cont'd)

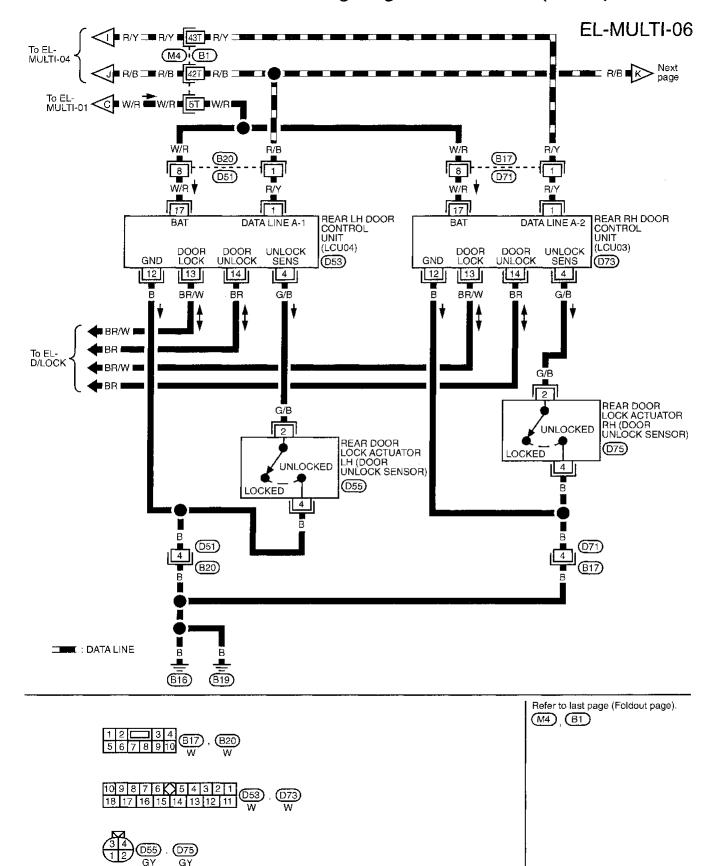


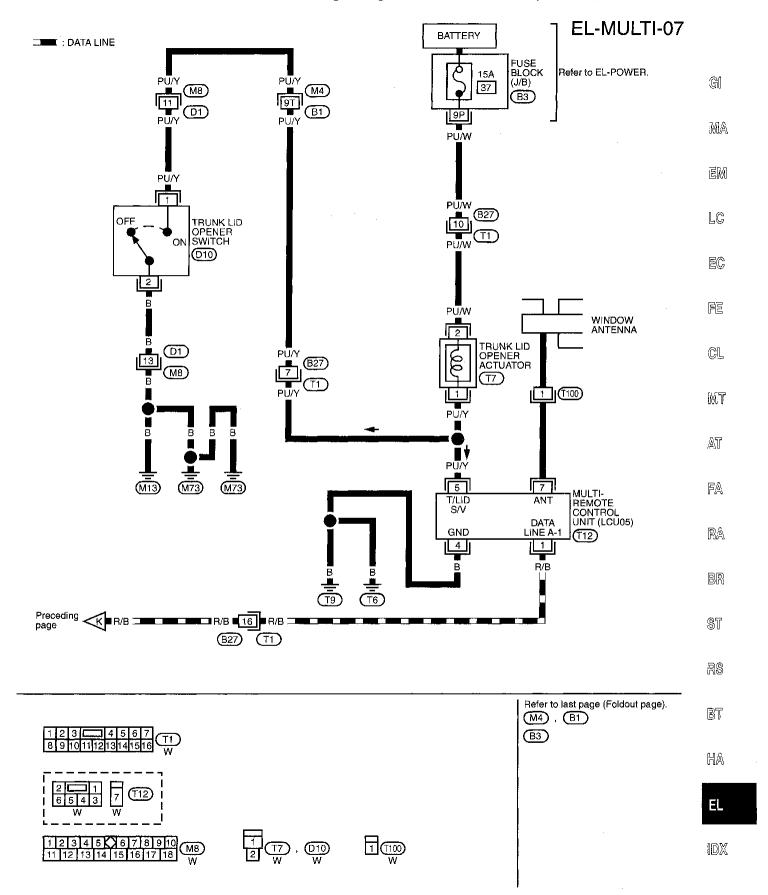


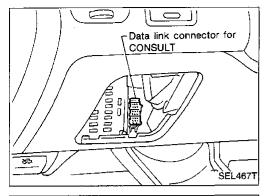
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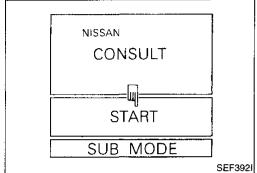


# **Trouble Diagnoses**

#### **CONSULT**

# **CONSULT** inspection procedure

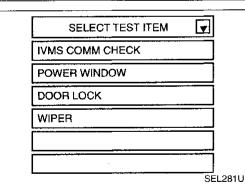
- 1. Turn ignition switch "OFF".
- 2. Connect "CONSULT" to the data link connector.



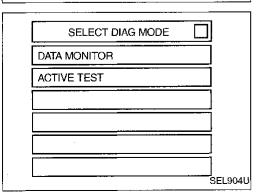
- 3. Turn ignition switch "ON".4. Touch "START".

|               | _      |
|---------------|--------|
| SELECT SYSTEM | ]      |
| ENGINE        | ]      |
| A/T           | ]      |
| AIRBAG        |        |
| IVMS          |        |
|               | ]      |
|               | ]      |
| S             | EL280U |

Touch "IVMS".



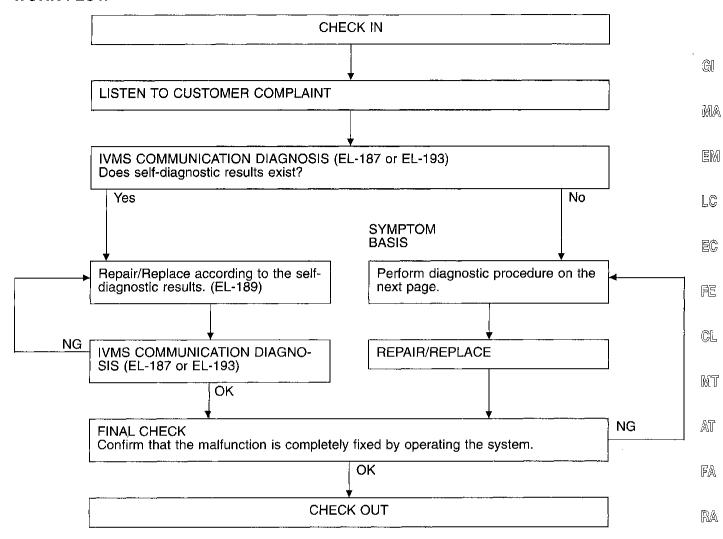
6. Touch "MULTI-REMOTE CONT SYS".



DATA MONITOR and ACTIVE TEST are available for the multiremote control system.

# **Trouble Diagnoses (Cont'd)**

#### **WORK FLOW**



#### NOTICE:

- When LCU connectors are disconnected for more than 1 minute such as during trouble diagnoses, the "disconnected" data will be memorized by the BCM. Therefore, after reconnecting the LCU connectors, erase the memory.
- To erase the memory, perform the procedure below.
   Erase the memory with CONSULT (refer to EL-187) or turn the ignition switch to "OFF" position and remove 7.5A fuse (No. 56 located in the fuse and fusible link box).

IDX

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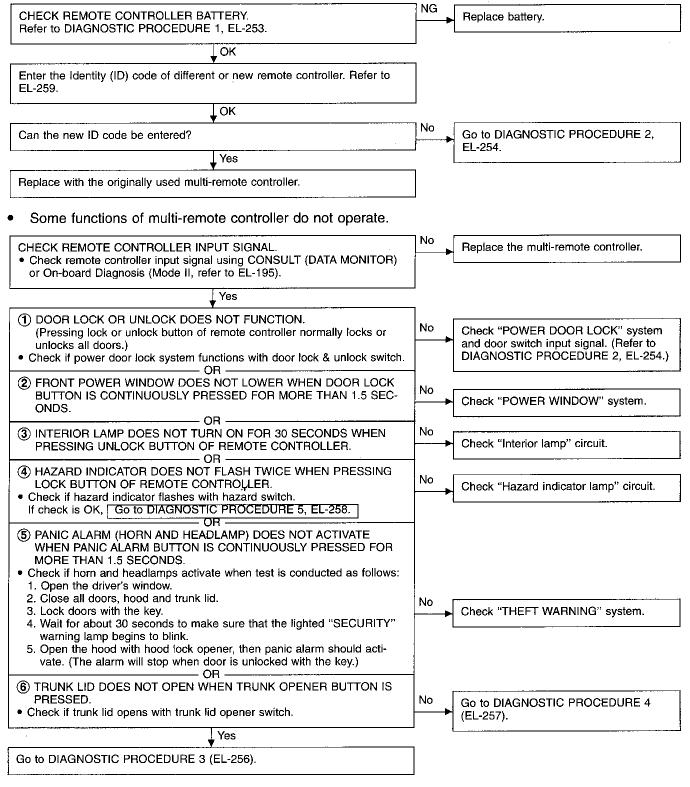
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# Trouble Diagnoses (Cont'd) TROUBLE SYMPTOM

All functions of remote control system do not operate.

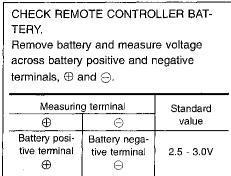


- Note: The unlock and trunk open operation of multi-remote control system does not activate with the ignition key inserted in the ignition key cylinder.
  - The lock operation of multi-remote control system does not activate with the key inserted in the ignition key cylinder or if one of the doors is opened.

# Stamped (+) SEL672U

# Trouble Diagnoses (Cont'd) DIAGNOSTIC PROCEDURE 1

# Α



Note:

Remote controller does not function if battery is not set correctly.

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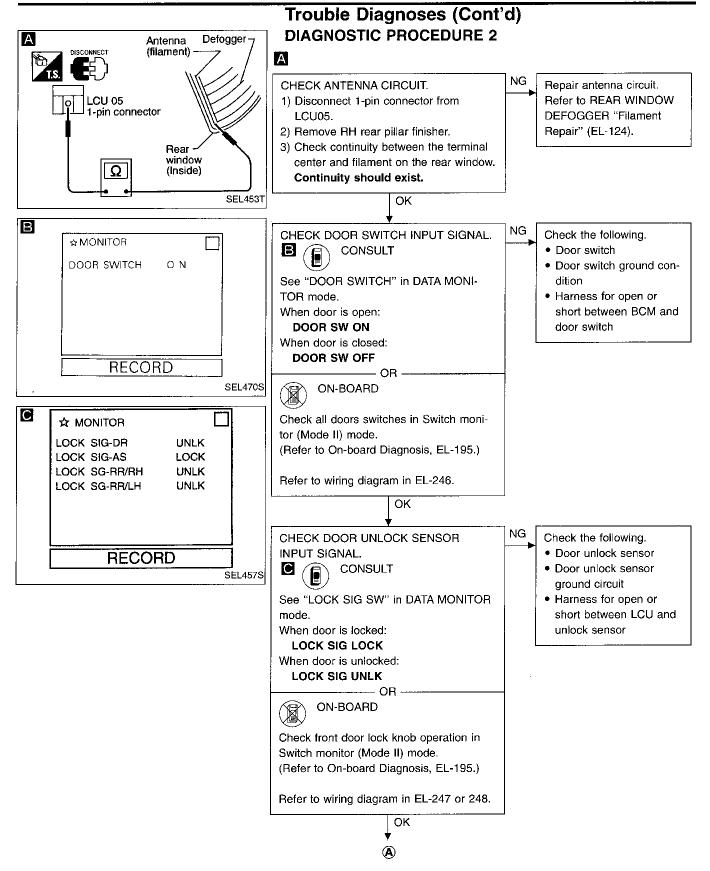
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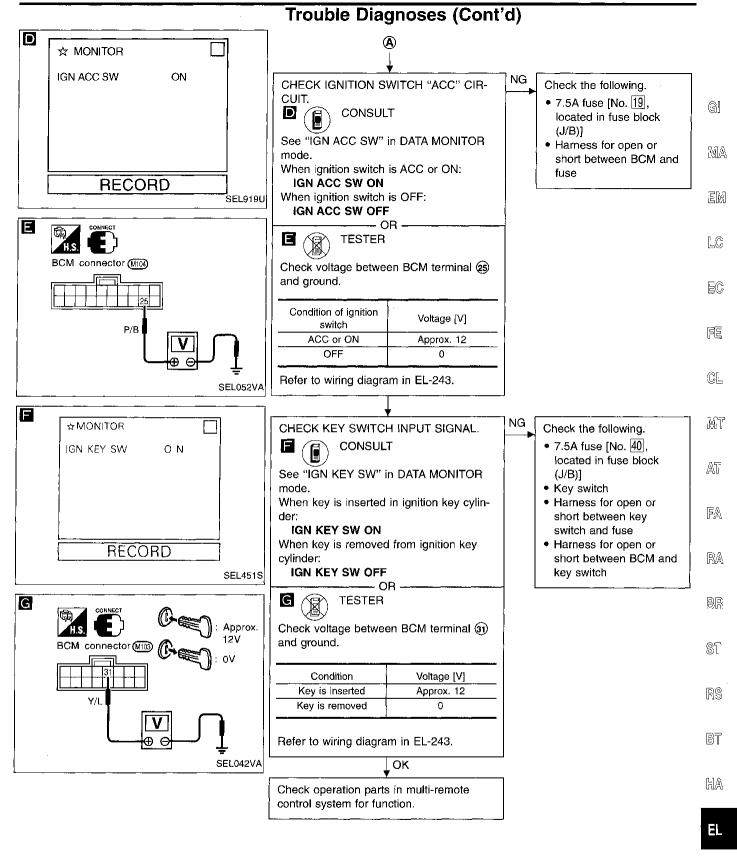
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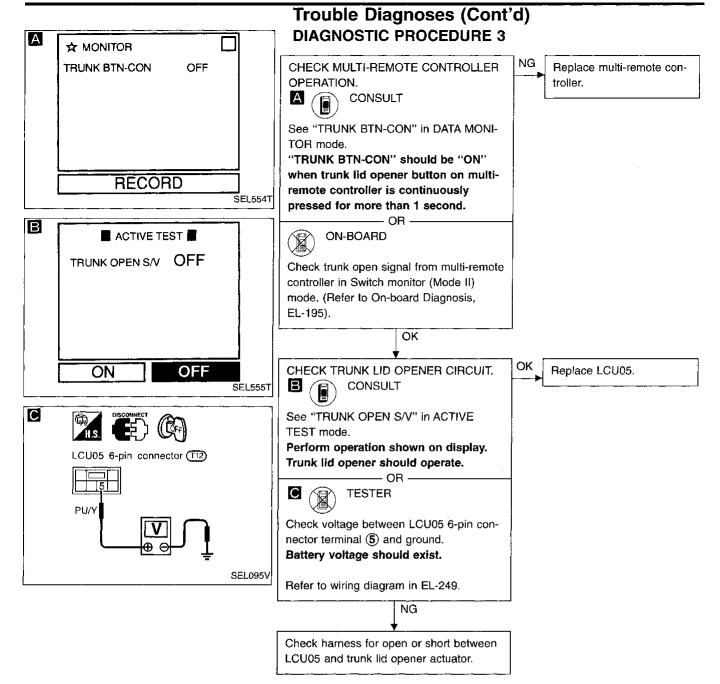
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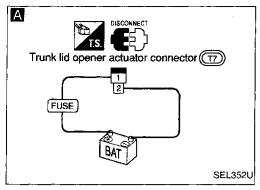
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Trouble Diagnoses (Cont'd)
DIAGNOSTIC PROCEDURE 4

Α

CHECK TRUNK LID OPENER ACTUATOR.

- Disconnect trunk lid opener actuator connector.
- Check to see if trunk lid opens when 12V DC is applied across trunk lid opener actuator connector terminals (1) and (2).

Refer to wiring diagram in EL-249.

OK

Check the following.

- 15A fuse [No. 37], located in the fuse block (J/B)]
- Harness for open or short between fuse and trunk lid actuator
- Harness for open or short between trunk lid actuator and LCU05

Replace trunk lid opener actuator.

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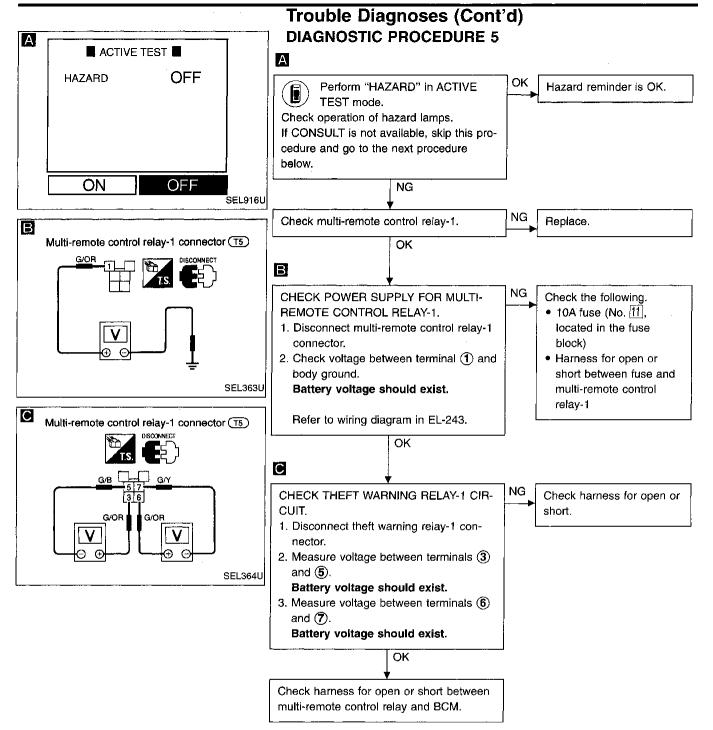
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# **Replacing Remote Controller or Control Unit**

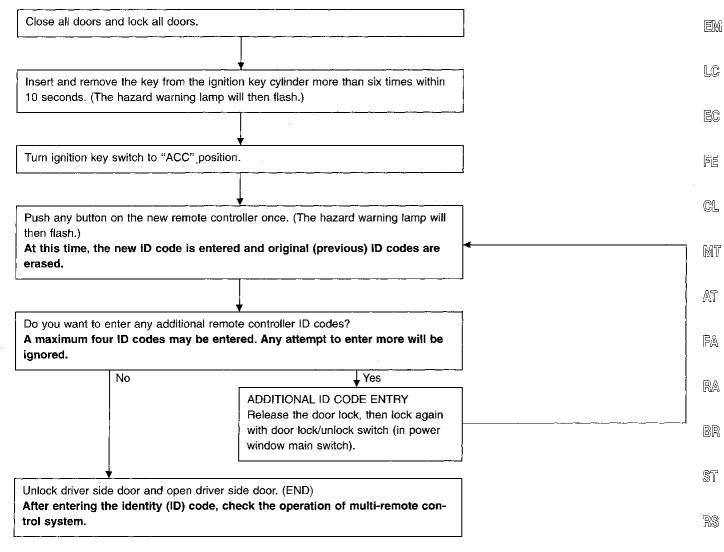
Enter the identity (ID) code manually when:

- remote controller or control unit (LCU05) is replaced.
- an additional remote controller is activated.

#### **ID Code Entry Procedure**

To enter the ID code, follow the procedures below.

#### **PROCEDURE**



#### NOTE

- If you need to activate more than two additional new remote controllers, repeat the procedure "Additional ID code entry" for each new remote controller.
- If the same ID code that exists in the memory is input, the entry will be ignored.
- Entry of maximum four ID codes is allowed and any attempt to enter more will be ignored.

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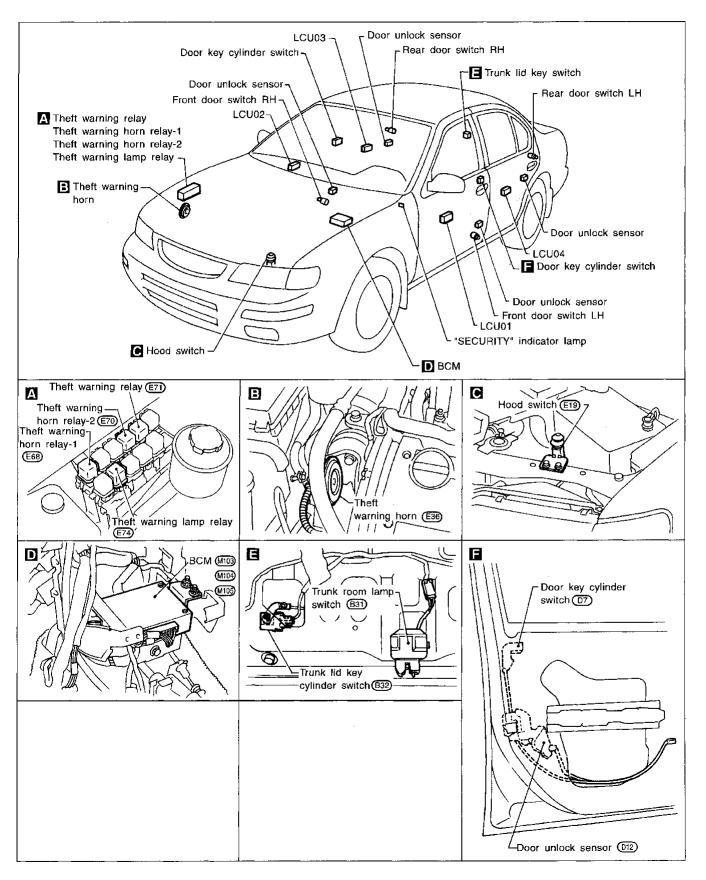
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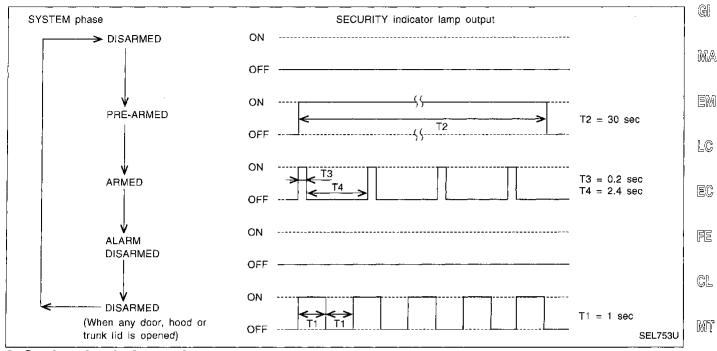
# **Component Parts and Harness Connector Location**



# System Description

#### DESCRIPTION

#### 1. Operation flow



# 2. Setting the theft warning system

#### Initial condition

- Close all doors.
- (2) Close hood and trunk lid.

#### Disarmed phase

The theft warning system is in the disarmed phase when any door(s), hood or trunk lid is opened. The security indicator lamp blinks every second.

#### Pre-armed phase and armed phase

The theft warning system turns into the "pre-armed" phase when hood, trunk lid and all doors are closed and locked by key or multi-remote controller. (The security indicator lamp illuminates.)

After about 30 seconds, the system automatically shifts into the "armed" phase (the system is set). (The security indicator lamp blinks every 2.4 seconds.)

#### 3. Canceling the set theft warning system

When the following (a) or (b) operation is performed, the armed phase is canceled.

- (a) Unlock the doors with the key or multi-remote controller.
- (b) Open the trunk lid with the key. When the trunk lid is closed after opening the trunk lid with the key, the system returns to the armed phase.

#### 4. Activating the alarm operation of the theft warning system

Make sure the system is in the armed phase. (The security indicator lamp blinks every 2.4 seconds.) When the following operation (a) or (b) is performed, the system sounds the horns and flashes the headlamps for about 2.5 minutes. (At the same time, the system disconnects the starting system circuit.)

- (a) Engine hood, trunk lid or any door is opened before unlocking door with key or multi remote controller.
- (b) Door is unlocked without using key or multi remote controller.

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# System Description (Cont'd)

Refer to Owner's Manual for theft warning system operating instructions. Power is supplied at all times

through 7.5A fuse [No. 40], located in the fuse block (J/B)]

to security indicator lamp terminal 2.

With the ignition switch in the ACC or ON position, power is supplied

- through 7.5A fuse [No. 19], located in the fuse block (J/B)]
- to BCM terminal 25.

BCM is connected to LCU01, LCU02, LCU03, LCU04 and LCU05 as DATA LINES A-1 or A-2.

# 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 BCM must receive signals indicating the doors, hood and trunk lid are closed and the doors are locked.

When a door is open, BCM terminal (35) receives a ground signal from each door switch.

When a door is unlocked, each door LCU terminal (4) receives a ground signal from terminal (2) of each door unlock sensor.

When the hood is open, BCM terminal 36 receives a ground signal

- from terminal (1) of the hood switch
- through body grounds (E5) and (E30).

When the trunk lid is open, BCM terminal (37) receives a ground signal

- from terminal 1 of the trunk room lamp switch
- through body grounds (BIS) and (BIS).

When the theft warning system is in armed phase

If none of the described conditions exist, the theft warning system will alarm automatically.

## THEFT WARNING SYSTEM ACTIVATION (With key or remote controller used to lock doors)

If the key is used to lock doors, LCU01/02 terminal (6) receives a ground signal

- from terminal (1) of the door key cylinder switch
- through body grounds (M13) and (M73).

If this signal or lock signal from remote controller is received by the LCU01/02, the theft warning system will activate automatically.

Once the theft warning system has been activated, BCM terminal ② supplies ground to terminal ① of the security indicator lamp.

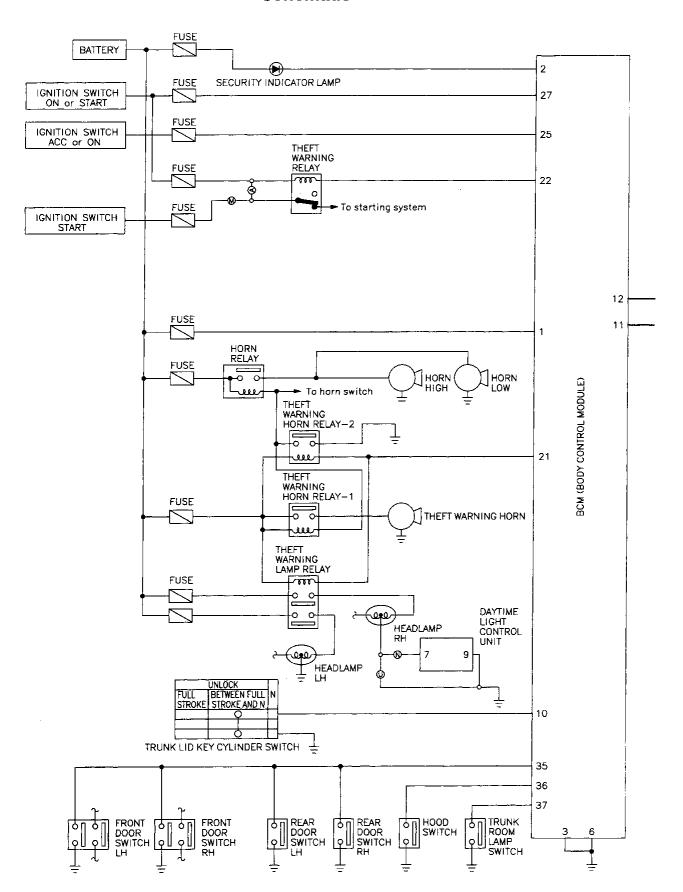
The security lamp will illuminate for approximately 30 seconds and then blink.

Now the theft warning system is in armed phase.

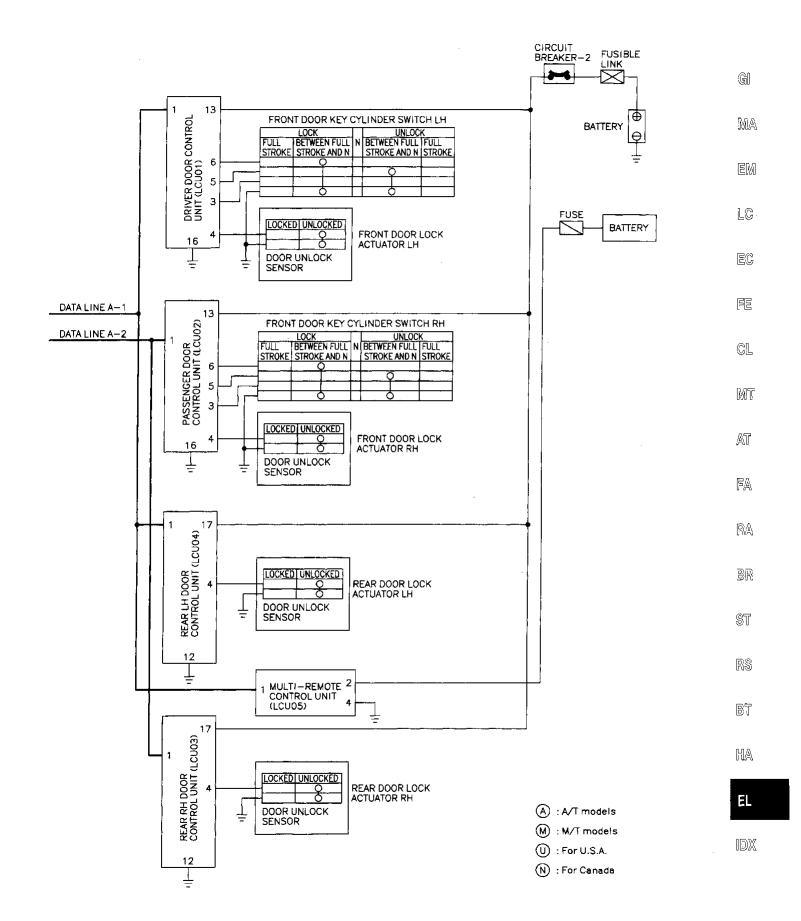
# System Description (Cont'd) THEFT WARNING SYSTEM ALARM OPERATION

| The theft warning system is triggered by  |       |
|---|-------|
| opening a door  |       |
| opening the trunk lid   |       |
| opening the hood  | Gl    |
| <ul> <li>unlocking door without using the key or multi-remote controller.</li> </ul>  | GIL   |
| Once the theft warning system is in armed phase, if BCM receives a ground signal at terminal 35 (door switch),  |       |
| (trunk room lamp switch) or (hood switch) or LCU receives a ground signal at terminal (4) (door unlock  | MA    |
| sensor), the theft warning system will be triggered. The headlamps flash and the horn sounds intermittently,  | 0200  |
| and the starting system is interrupted.   |       |
| Power is supplied at all times  |       |
| <ul> <li>through 10A fuse [No. 17], located in the fuse block (J/B)].</li> </ul>  |       |
| <ul> <li>to theft warning relay terminal ①.</li> </ul>  |       |
| If the theft warning_system is triggered, ground is supplied  | LC    |
| <ul> <li>from terminal 22 of the BCM</li> </ul>   |       |
| <ul> <li>to theft warning relay terminal ②.</li> </ul>  |       |
| With power and ground supplied, power to the clutch interlock relay (M/T models) or inhibitor relay (A/T mod-   | EG    |
| els) is interrupted. The starter motor will not crank and the engine will not start.  |       |
| Power is supplied at all times  |       |
| <ul> <li>through 7.5A fuse (No. 65), located in fuse and fusible link box)</li> </ul>   | FE    |
| • to theft warning lamp relay terminal ①_   |       |
| • to theft warning horn relay-2 terminal ①.   |       |
| When the theft warning system is triggered, ground is supplied intermittently   | (C)   |
| • from terminal ② of the BCM  |       |
| <ul> <li>to theft warning lamp relay terminal ② and</li> </ul>  |       |
| • to theft warning horn relay-2 terminal ②.   | MT    |
| The headlamps flash and the horn sounds intermittently.   |       |
| The alarm automatically turns off after 2 or 3 minutes but will reactivate if the vehicle is tampered with again.   | e     |
|   | AT    |
| THEFT WARNING SYSTEM DEACTIVATION   |       |
| To deactivate the theft warning system, a door or the trunk lid must be unlocked with the key or remote con-  | ZΛ    |
| troller.  | FA    |
| When the key is used to unlock a door, LCU01/02 terminal (5) receives a ground signal   |       |
| from terminal (2) of the door key cylinder switch.  | RA    |
| When the key is used to unlock the trunk lid, BCM terminal (10) receives a ground signal from terminal (1) of   | IFYA  |
| the trunk lid key cylinder switch.  |       |
| When the BCM/LCUs receives either one of these signals or unlock signal from remote controller, the theft   | BR    |
| warning system is deactivated. (Disarmed phase)   | 5)U   |
|   |       |
| PANIC ALARM OPERATION   | SŢ    |
| Multi-remote control system may or may not operate theft warning system (horn and headlamps) as required.   | ଭା    |
| When the multi-remote control system is triggered, ground is supplied intermittently.   |       |
| • from BCM terminal (21)  | RS    |
| to theft warning lamp relay terminal ② and  | 0.100 |
| to their warning ramp relay terminal (2) and  to their warning horn relay-2 terminal (2).   |       |
| The headlamp flashes and the horn sounds intermittently.  | BT    |
| The fleatilating hashes and the north sounds intermittently.  The alarm automatically turns off after 30 seconds or when LCU05 (multi-remote control unit) receives any | ں ب   |
| signal from multi-remote controller.  |       |
| nghar nom multi temote controller.  | HA    |
|   |       |

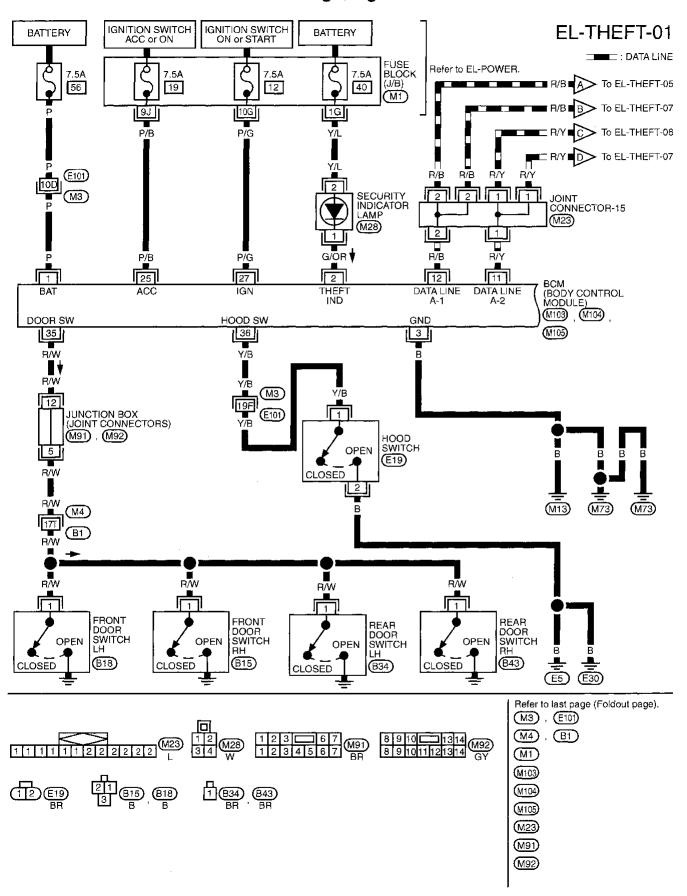
# **Schematic**

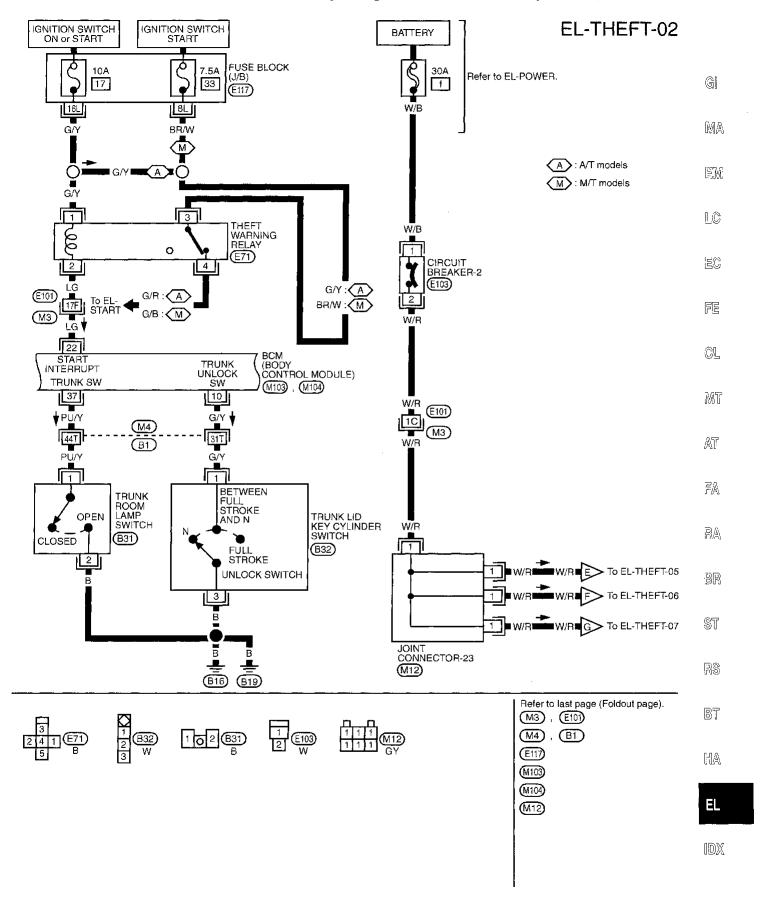


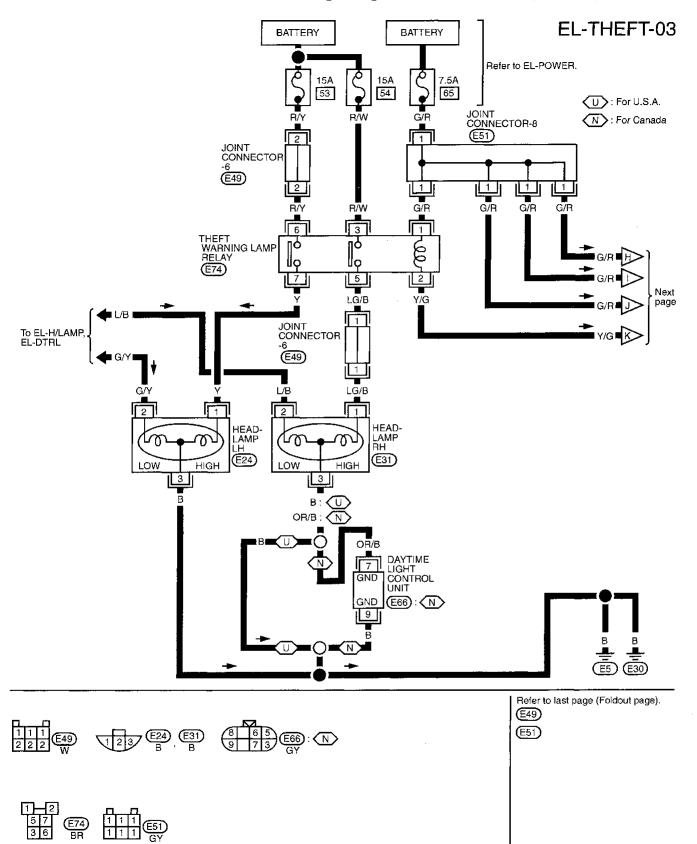
# Schematic (Cont'd)

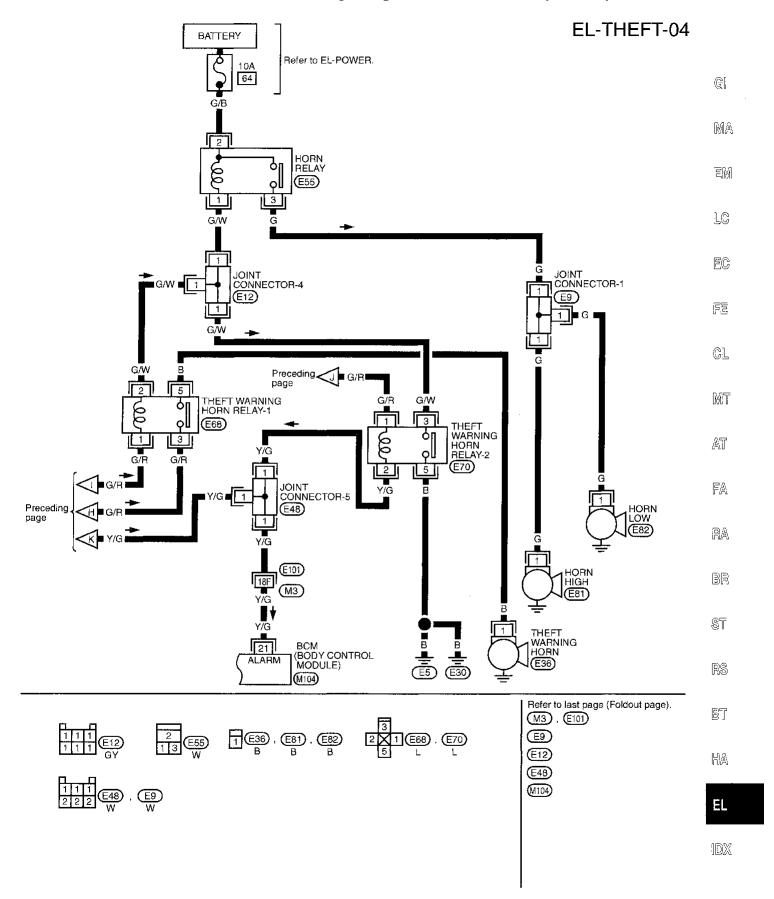


# Wiring Diagram — THEFT —

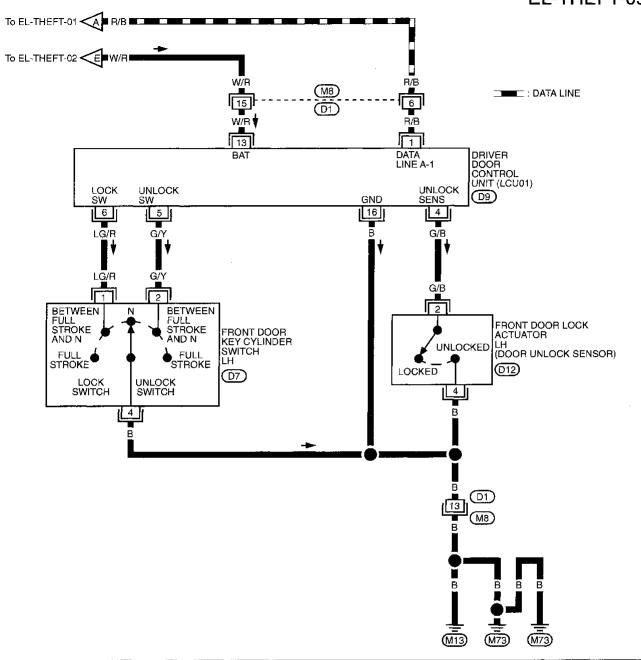






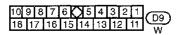








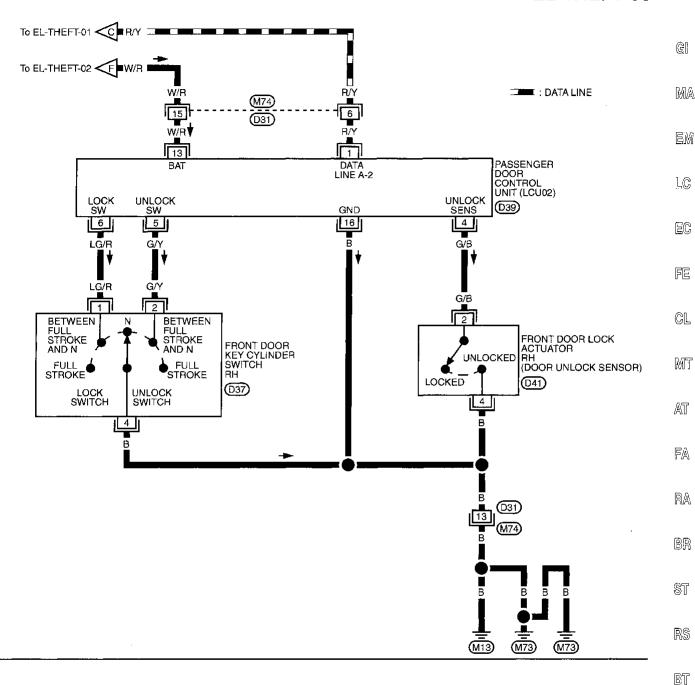






# Wiring Diagram — THEFT — (Cont'd)

# **EL-THEFT-06**







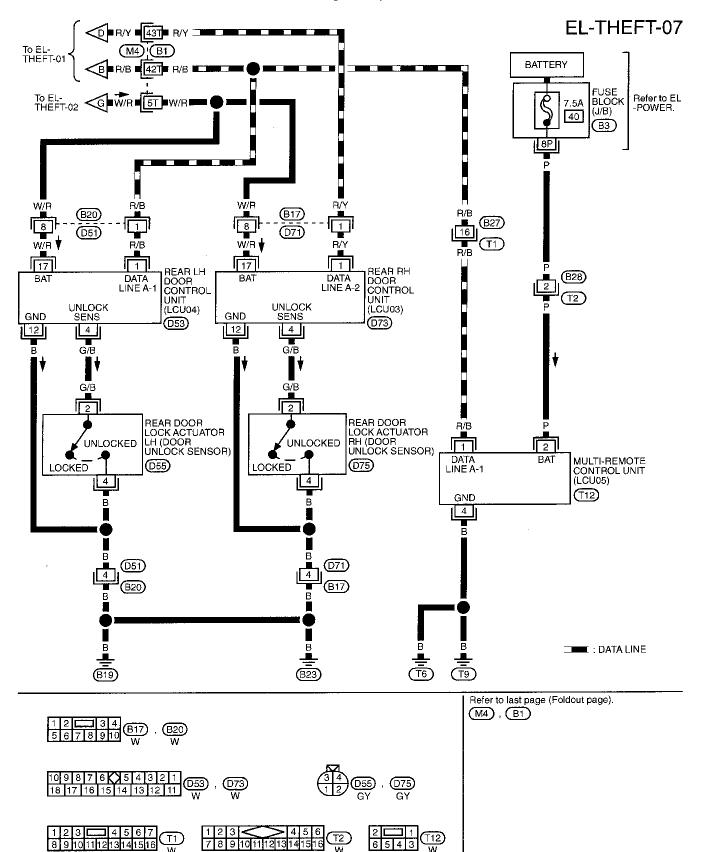


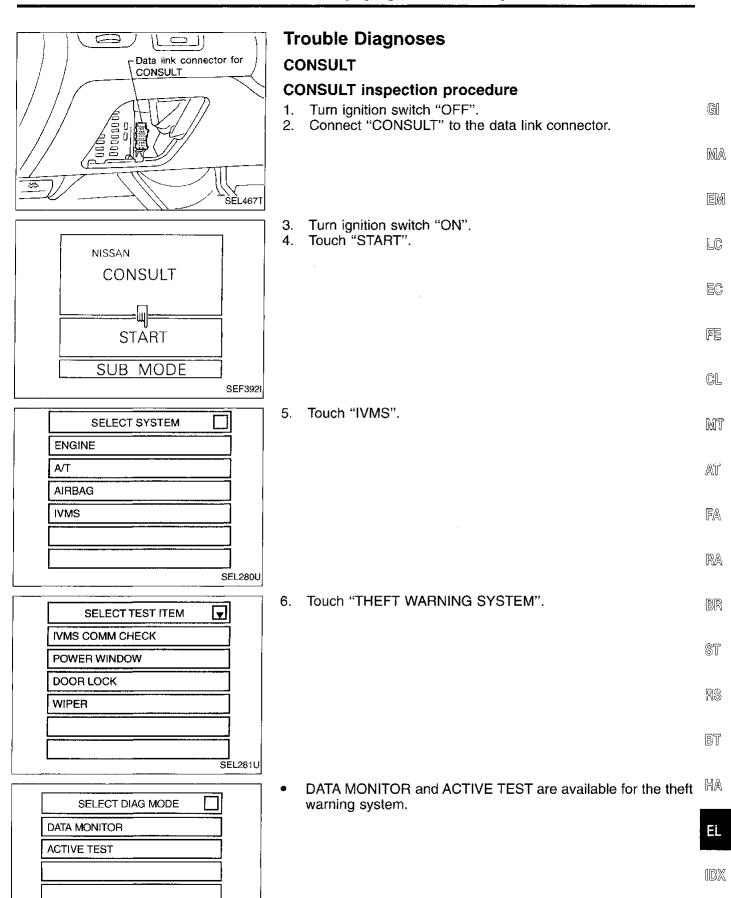


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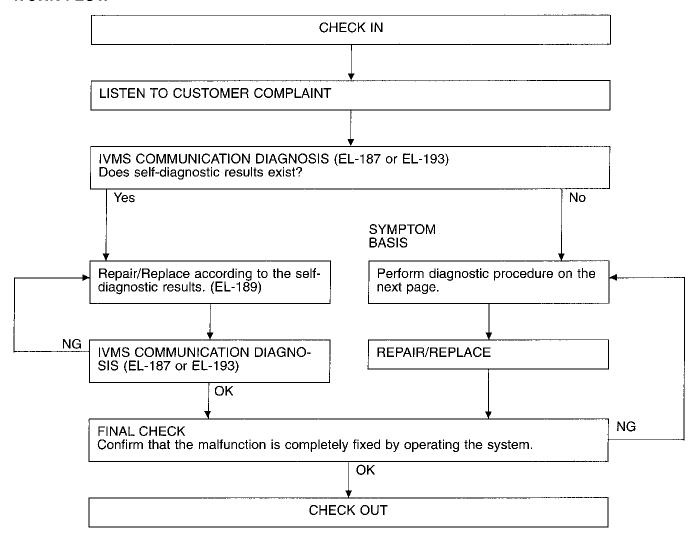


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**EL-273** 

# **Trouble Diagnoses (Cont'd)**

#### **WORK FLOW**



#### NOTICE:

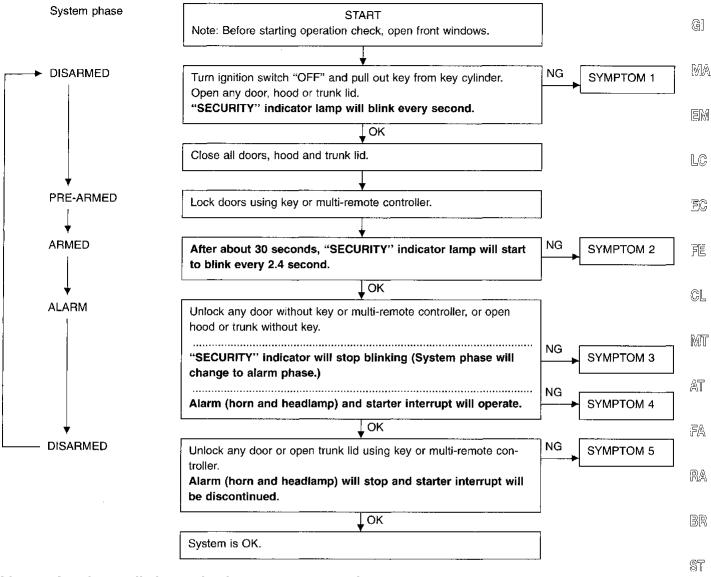
- When LCU connectors are disconnected for more than 1 minute such as during trouble diagnoses, the "disconnected" data will be memorized by the BCM. Therefore, after reconnecting the LCU connectors, erase the memory.
- To erase the memory, perform the procedure below.

  Erase the memory with CONSULT (refer to EL-187) or turn the ignition switch to "OFF" position and remove 7.5A fuse (No. 56) located in the fuse and fusible link box).

# **Trouble Diagnoses (Cont'd)**

#### **PRELIMINARY CHECK**

The system operation is canceled by turning ignition switch to "ACC" at any step between START and ARMED in the following flow chart.



After performing preliminary check, go to symptom chart on next page.

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# Trouble Diagnoses (Cont'd)

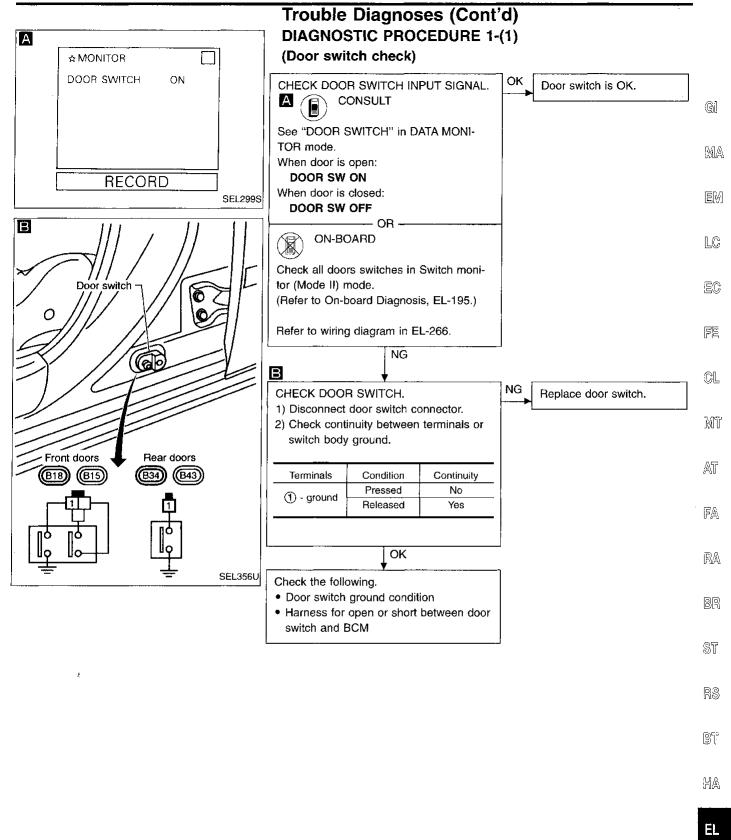
Before starting trouble diagnoses below, perform preliminary check, EL-275.

Symptom numbers in the symptom chart correspond with those of preliminary check.

## **SYMPTOM CHART**

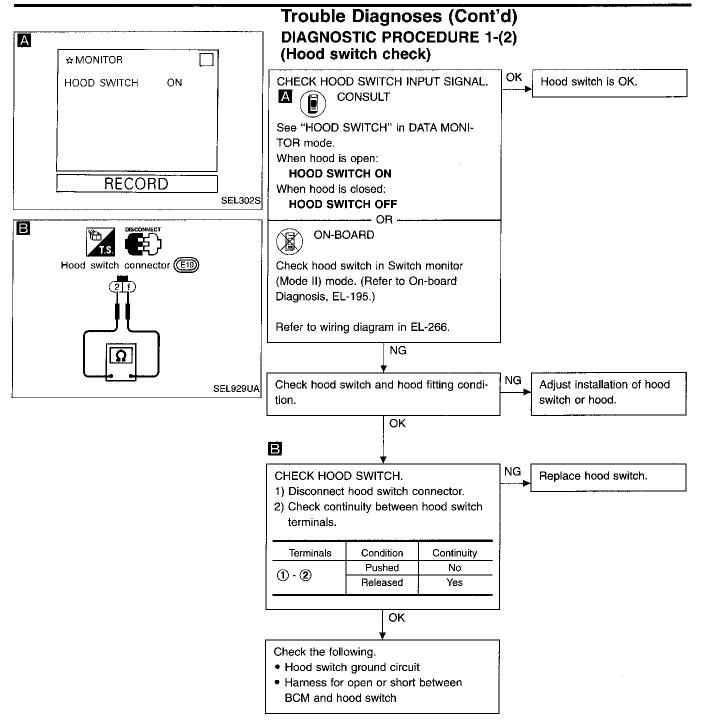
| PROCEDURE      |   |   | Diagnostic procedure |  |   |  |  |   |  |  | _  |   |                                |
|----------------|---|---|----------------------|--|---|--|--|---|--|--|--|---|--------------------------------|
| REFERENCE PAGE |   |   | EL-275               | EL-277   | EL-280  | EL-281   | EL-282   | EL-283  | EL-284   | EL-285   | EL-286   | EL-252                                  | EL-188                         |
| SYMPTOM        |   |   | Preliminary check    | Diagnostic Procedure 1<br>(Door, hood and trunk room<br>lamp switch check) | Diagnostic Procedure 2<br>(Security indicator lamp check) | Diagnostic Procedure 3<br>(Door unlock sensor check) | Diagnostic Procedure 4<br>(Door key cylinder switch check) | Diagnostic Procedure 5<br>(Trunk lid key cylinder switch check) | Diagnostic Procedure 6<br>(Theft warning horn alarm check) | Diagnostic Procedure 7<br>(Headlamp alarm check) | Diagnostic Procedure 8<br>(Starter interrupt system check) | Check "MULTI-REMOTE<br>CONTROL" system. | WAKE-UP DIAGNOSES              |
| 1              | Theft warning indicator does not turn "ON" or blinking. |   | Х                    |  | Х   |  |  |   |  |  |  |   |                                |
| 2              | Theft warning system cannot be set by                   | All items   | Х                    | Х  |   | Х  |  |   |  |  |  |   |                                |
|                |   | Door out side key   | x                    |  | į   |  | ×  |   |  |  |  |   | X<br>(LCU01,<br>LCU02)         |
|                |   | Multi-remote con-<br>trol   | Х                    |  |   |  |  |   |  |  |  | Х                                       |                                |
| 3              | *1 Theft warning<br>system does not<br>alarm when       | Any door is opened.   | X                    | X  |   |  |  |   |  |  |  |   |                                |
|                |   | Any door is<br>unlocked without<br>using key or multi-<br>remote controller | Х                    |  |   | ×  |  |   |  |  |  |   | X<br>(LCU01,<br>02, 03,<br>04) |
| 4              | Theft warning alarm does not activate.                  | All function  | Х                    | Х  |   | Х  |  |   |  |  |  |   |                                |
|                |   | Horn alarm  | Х                    |  |   |  |  |   | X  |  |  |   |                                |
|                |   | Headlamp alarm  | Х                    |  |   |  |  |   |  | Х  |  |   |                                |
|                |   | Starter interrupt   | Х                    |  |   |  |  |   |  |  | Х  |   |                                |
| 5              | Theft warning system cannot be canceled by              | Door out side key   | Х                    |  |   |  | х  |   |  |  |  |   | X<br>(LCU01,<br>LCU02)         |
|                |   | Trunk lid key   | Х                    |  |   |  | •  | Х   |  |  |  |   |                                |
|                |   | Multi-remote con-<br>trol   | Х                    |  |   |  |  |   |  |  |  | Х                                       |                                |

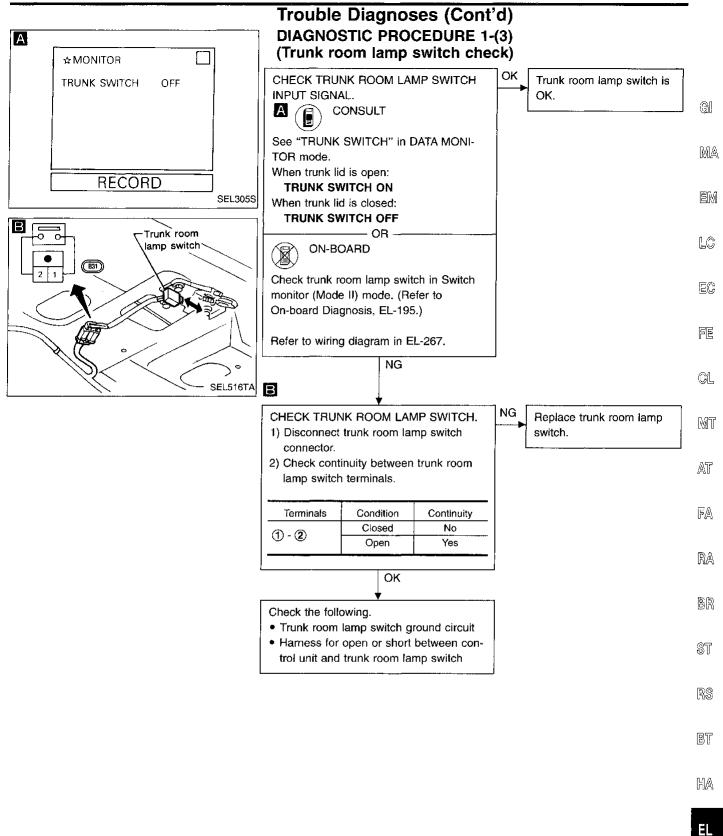
X : Applicable \*1: Make sure the system is in the armed phase.



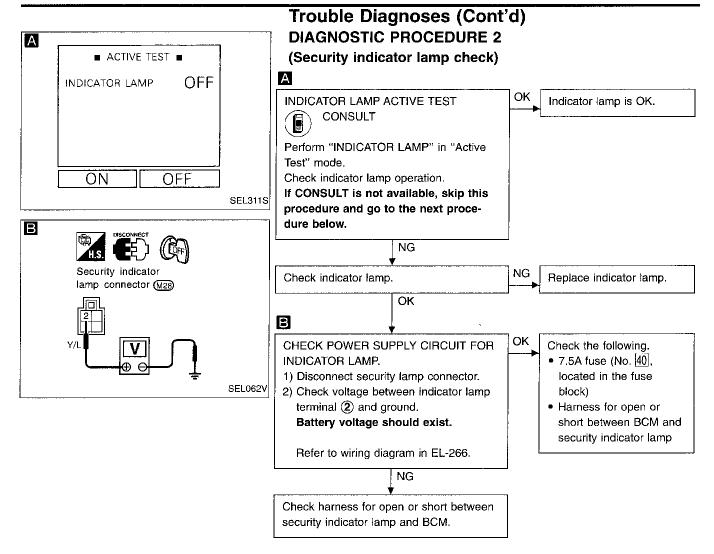
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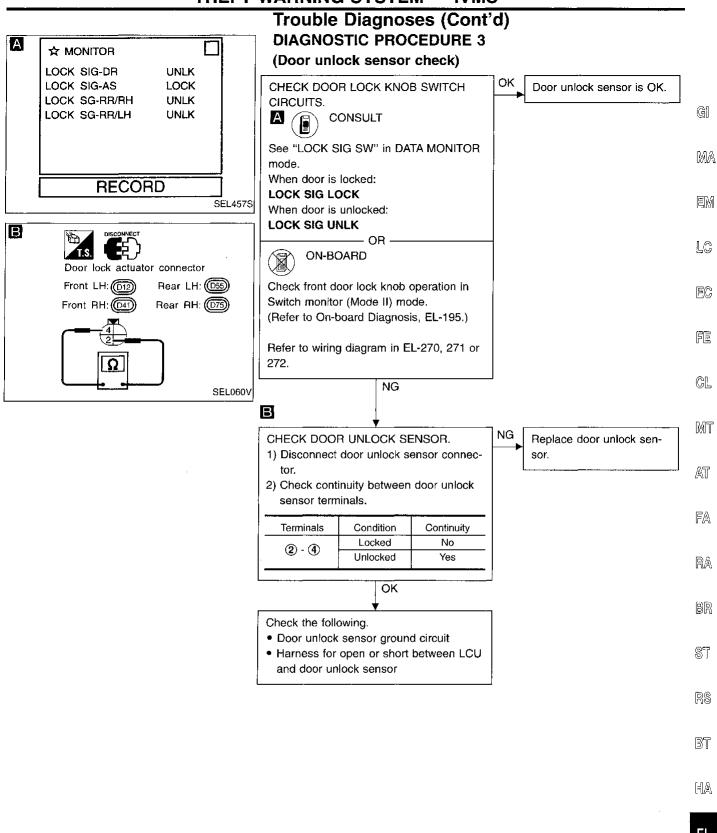
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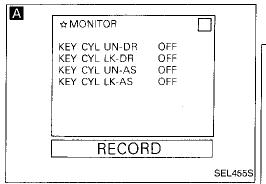


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**EL-281** 1485



# Trouble Diagnoses (Cont'd) DIAGNOSTIC PROCEDURE 4

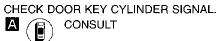
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switch.

OK.

(Door key cylinder switch check)



See "KEY CYL DR or AS" in DATA MONITOR mode.

These signals should be "ON" when ignition key inserted in the door key cylinder was turned to lock or unlock.

If signals turn from "OFF" to "ON" too quickly on CONSULT display when key cylinder is turned, check these signals in the graphic mode.

(Refer to CONSULT OPERATION MANUAL.)



#### ON-BOARD

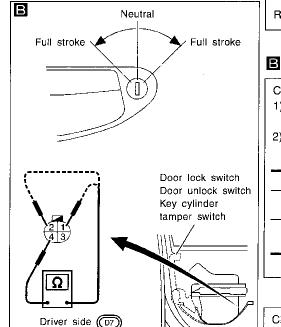
Check front LH or RH door lock key cylinder lock and unlock switch in Switch monitor (Mode II) mode.

- OR -

(Refer to On-board Diagnosis, EL-195.)

Refer to wiring diagram in EL-270 or 271.

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Passenger side (D37)



CHECK DOOR KEY CYLINDER SWITCH.

1) Disconnect door key cylinder switch connector.

2) Check continuity between door key cylinder switch terminals.

| Condition  | Continuity                   |
|------------|------------------------------|
| Neutral No |                              |
| Locked     | No                           |
| Neutral    | No                           |
| Unlocked   | Yes                          |
|            | Neutral<br>Locked<br>Neutral |

ОК

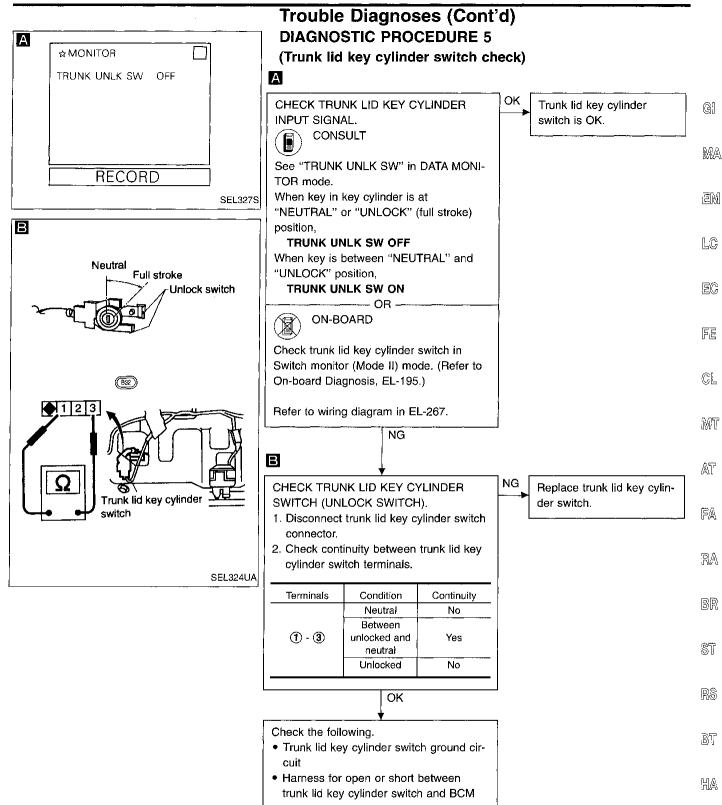
Check the following.

SEL320U

- Door key cylinder switch ground circuit
- Harness for open or short between door key cylinder switch and LCU01/02

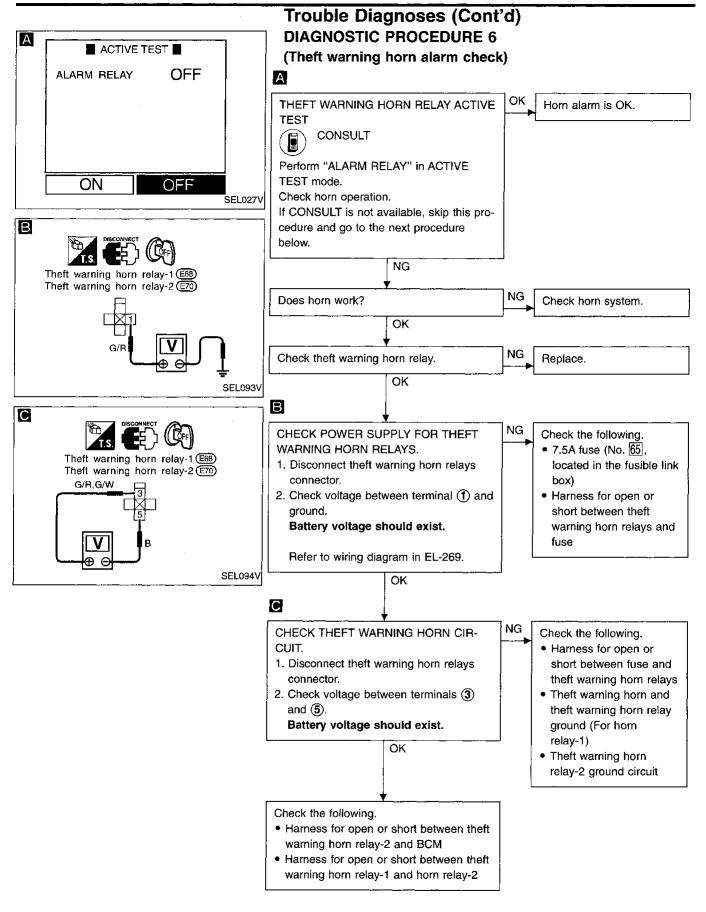
Replace door key cylinder

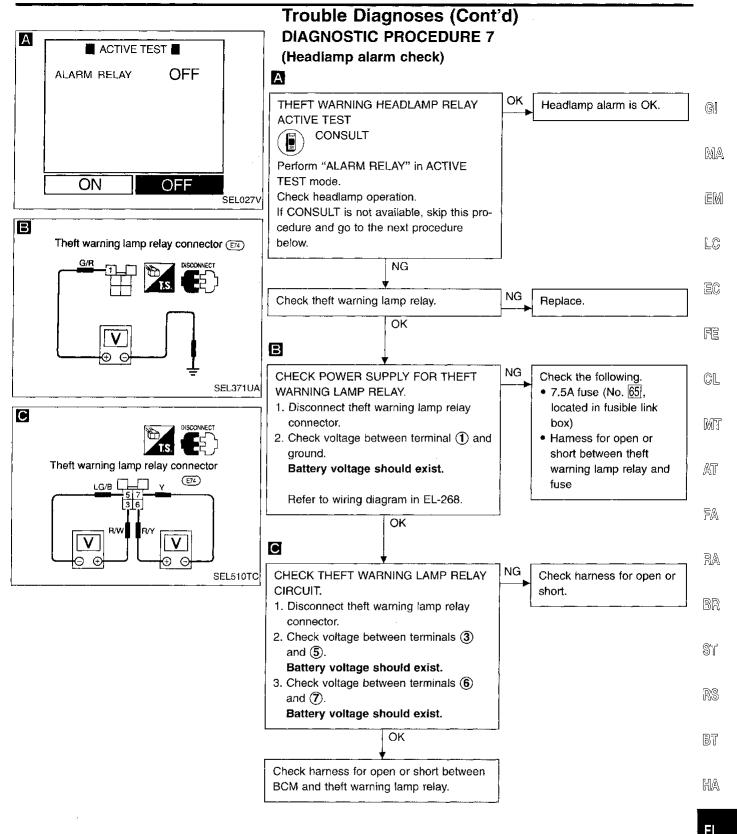
Door key cylinder switch is



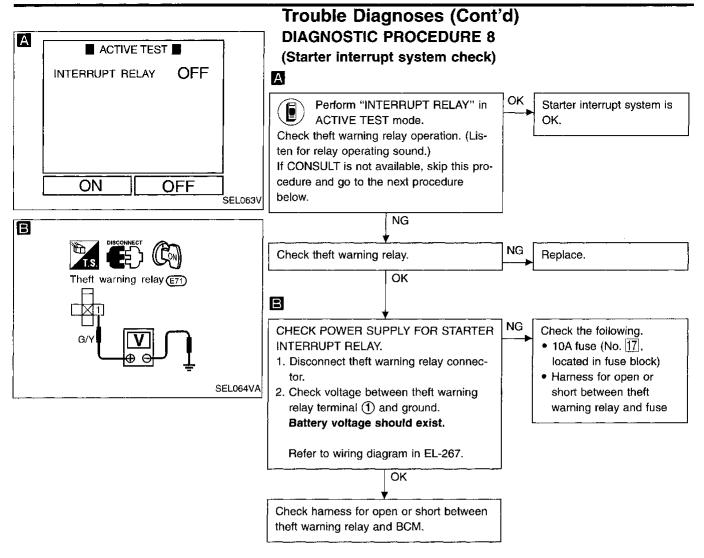
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#### **ILLUMINATION** — IVMS

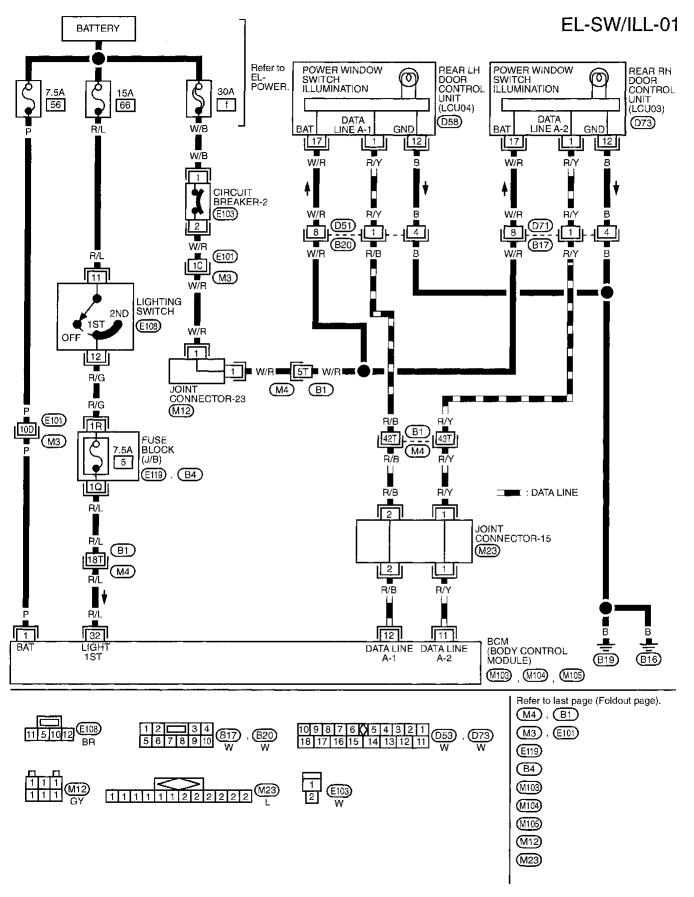
**System Description** Power is supplied at all times to lighting switch terminal (1) through 15A fuse (No. 66), located in the fuse and fusible link box). With the lighting switch in the 1ST or 2ND position, power is supplied (F) to BCM terminal (32) through lighting switch terminal (12) and 7.5A fuse [No. 5], located in the fuse block (J/B)]. MA Terminal (1) of the power window switch illumination (located in the rear LH and RH door control units) is connected to BCM terminals 11 or 12 by DATA LINE A-1 or A-2 respectively. When power is supplied to BCM, BCM sends a signal to rear LH and RH door control units to turn on power window switch illumination. Power and ground are supplied to power window switch illumination, then power window switch illumination turns on. LC EC FE (CIL MT AT FA RA 1818 ST RS

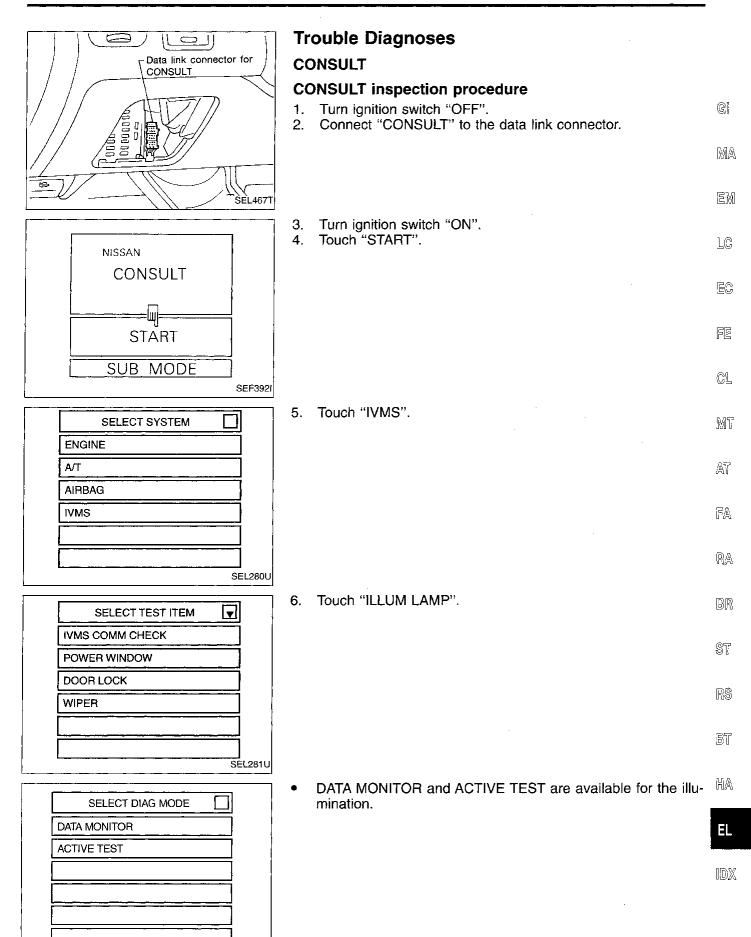
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## Wiring Diagram — SW/ILL —

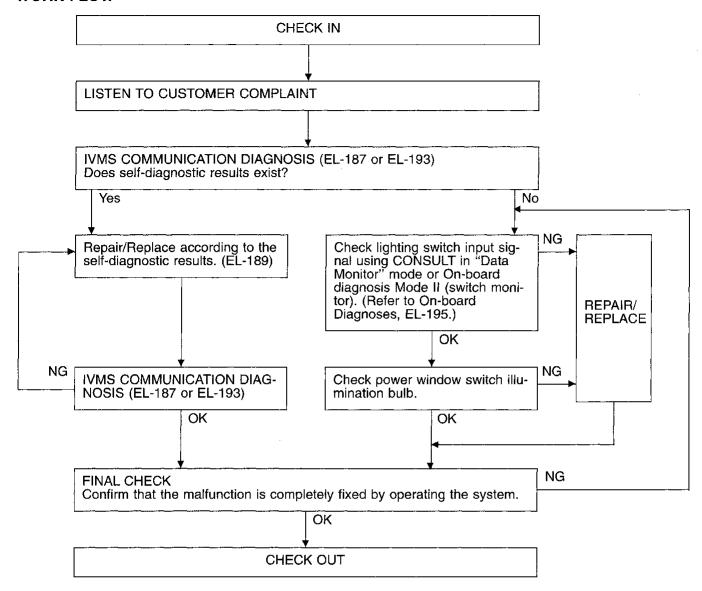




SEL904U

## **Trouble Diagnoses (Cont'd)**

#### **WORK FLOW**



#### NOTICE:

- When LCU connectors are disconnected for more than 1 minute such as during trouble diagnoses, the "disconnected" data will be memorized by the BCM. Therefore, after reconnecting the LCU connectors, erase the memory.
- To erase the memory, perform the procedure below.

  Erase the memory with CONSULT (refer to EL-187) or remove turn the ignition switch to "OFF" position and remove 7.5A fuse (No. 56) located in the fuse and fusible link box).

## **System Description**

#### INTERIOR LAMP, IGNITION KEYHOLE ILLUMINATION TIMER CONTROL

#### **Function**

Interior lamp timer keeps interior lamp and ignition keyhole illuminated for about 30 seconds when: driver's door is unlocked while key is out of ignition, key is withdrawn from ignition key cylinder while driver's door is closed, and key is withdrawn from ignition key cylinder and driver's door is opened and then closed. The timer is cancelled, and interior lamp and ignition keyhole illumination turn off when: driver's door is locked, or ignition switch is turned "ON". Power supply and ground Power is supplied at all times through 7.5A fuse [No. 26], located in the fuse block (J/B)] to interior lamp terminal (1). to ignition keyhole illumination terminal (1). Power is also supplied at all times through 7.5A fuse [No. 40], located in the fuse block (J/B)] to key switch terminal (1). With the ignition switch in the ON or START position, power is supplied through 7.5A fuse [No. 12], located in the fuse block (J/B)] to BCM terminal (27). Driver door control unit (LCU01) terminal (1) is connected to BCM terminal (2) by DATA LINE A-1. Ground is supplied to driver door control unit terminal (4) through front driver side door lock actuator (unlock sensor) terminals (2) and (4) when front door lock actuator is in UNLOCK position through body grounds (M13) and (M73). Timer operation Driver's door is unlocked, driver's door is opened and then closed or key is withdrawn from ignition key cyl-Ground is then supplied to interior lamp terminal (2) and ignition key hole illumination terminal (2) to illumi-While timer is activated, ignition switch is turned ON or driver's door is locked. Timer will then be canceled. INTERIOR LAMP ON-OFF CONTROL Power is supplied at all times through 7.5A fuse [No. 26], located in the fuse block (J/B)] to interior lamp terminal (1). BCM terminal (35) is grounded when any door switch is in OPEN position. When the front driver side door switch, front passenger side door switch, rear LH door switch or rear RH door switch is in OPEN position, interior lamp turns on.

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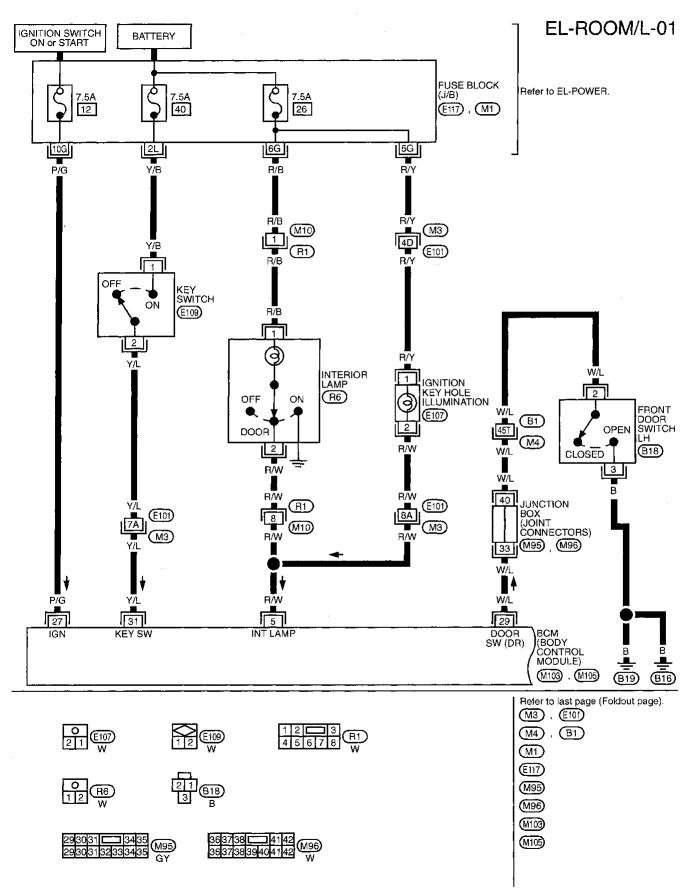
BT

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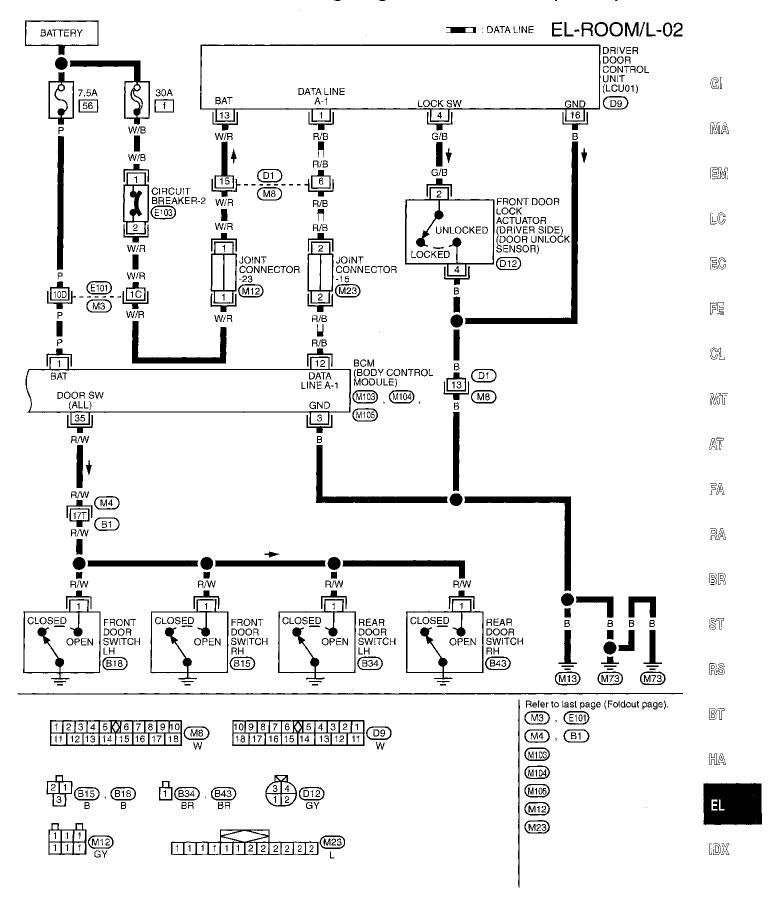
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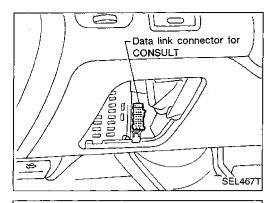
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## Wiring Diagram — ROOM/L —



## Wiring Diagram — ROOM/L — (Cont'd)



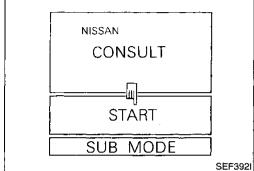


## **Trouble Diagnoses**

#### **CONSULT**

#### **CONSULT** inspection procedure

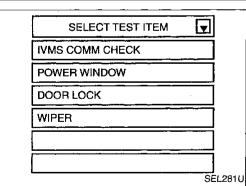
- 1. Turn ignition switch "OFF".
- 2. Connect "CONSULT" to the data link connector.



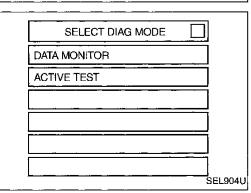
- Turn ignition switch "ON".
   Touch "START".

| SELECT SYSTEM |        |
|---------------|--------|
| ENGINE        |        |
| A/T           |        |
| AIRBAG        |        |
| IVMS          |        |
|               |        |
|               |        |
|               | SEL280 |

5. Touch "IVMS".



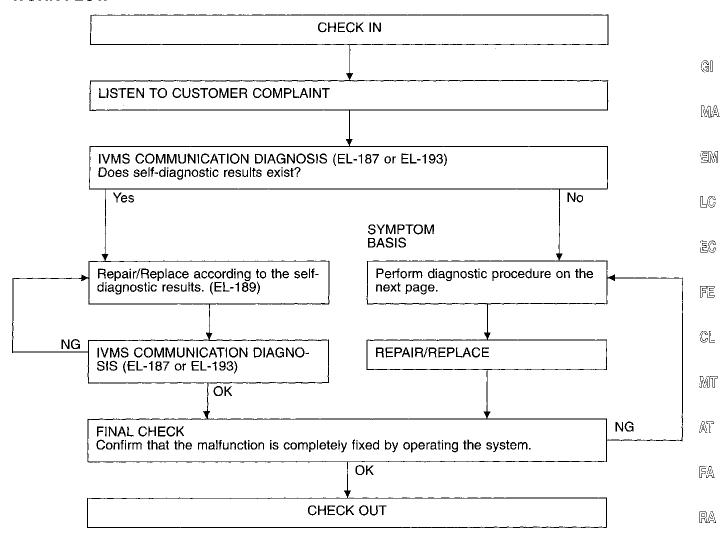
Touch "ROOM LAMP TIMER".



DATA MONITOR and ACTIVE TEST are available for the interior lamp control.

## Trouble Diagnoses (Cont'd)

#### **WORK FLOW**



#### **NOTICE:**

- When LCU connectors are disconnected for more than 1 minute such as during trouble diagnoses, the "disconnected" data will be memorized by the BCM. Therefore, after reconnecting the LCU connectors, erase the memory.
- To erase the memory, perform the procedure below.

  Erase the memory with CONSULT (refer to EL-187) or turn the ignition switch to "OFF" position and remove 7.5A fuse (No. 56 located in the fuse and fusible link box).

**\$**1

副常

B17

RS

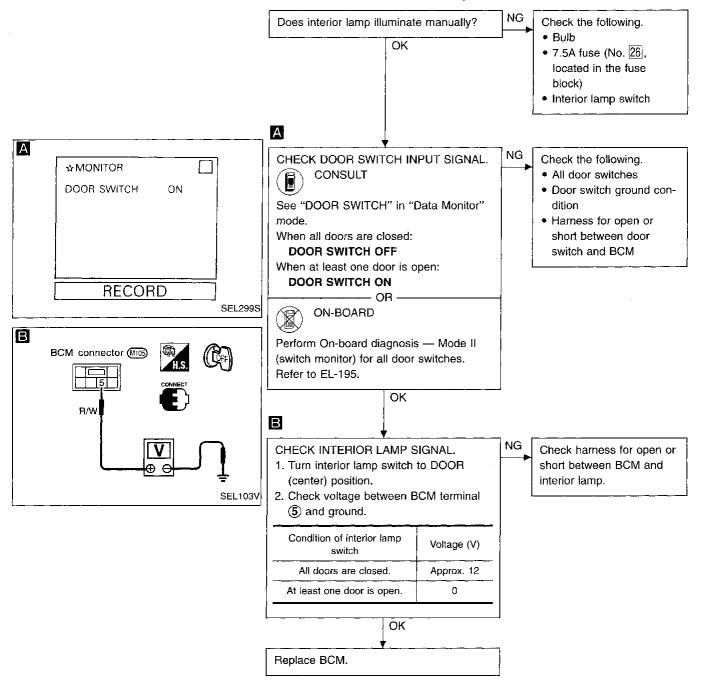
MA

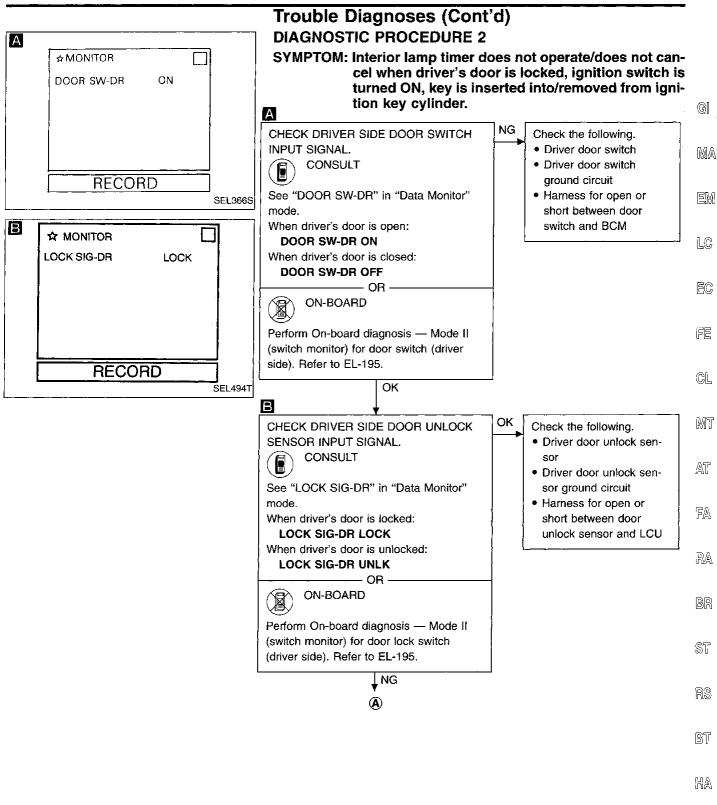
EL

[DX

# Trouble Diagnoses (Cont'd) DIAGNOSTIC PROCEDURE 1

SYMPTOM: Interior lamp does not illuminate/does not turn off when door is opened/closed.

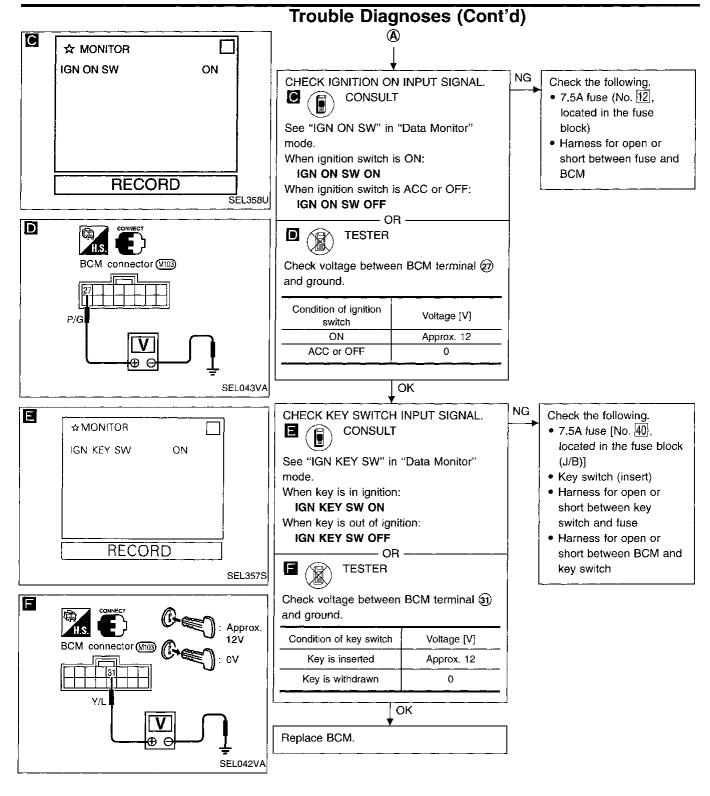




**EL-297** 

1501

MOX



#### STEP LAMP — IVMS

## **System Description**

Power is supplied at all times

- to BCM terminal (1)
- through 7.5A fuse (No. 56, located in the fuse and fusible link box).

Power is supplied at all times

- to front step lamp LH and RH terminals (1)
- through 7.5A fuse [No. 26], located in the fuse block (J/B)].

Ground is supplied to terminal (6) of LCU01 and LCU02 through body grounds (M13) and (M73).

BCM is connected to LCU01 and LCU02 as DATA LINE A-1 or A-2.

BCM terminal (21) is grounded when any door switch is in OPEN position.

When the driver door switch, passenger door switch, rear RH door switch, or rear LH door switch is in OPEN position, BCM sends a signal to driver and passenger door control units to turn on front LH and RH step lamps.

With power and ground supplied, front step lamps turn on.

G]

MA

EM

LC

EC

FE

CL

MT

AT

FA

RA

88

ST

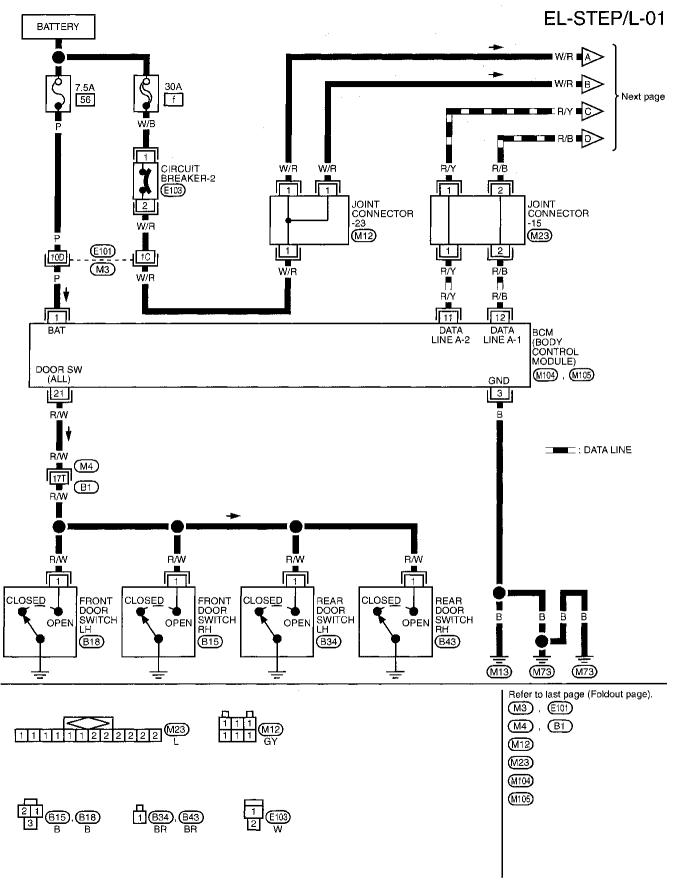
RS

BT

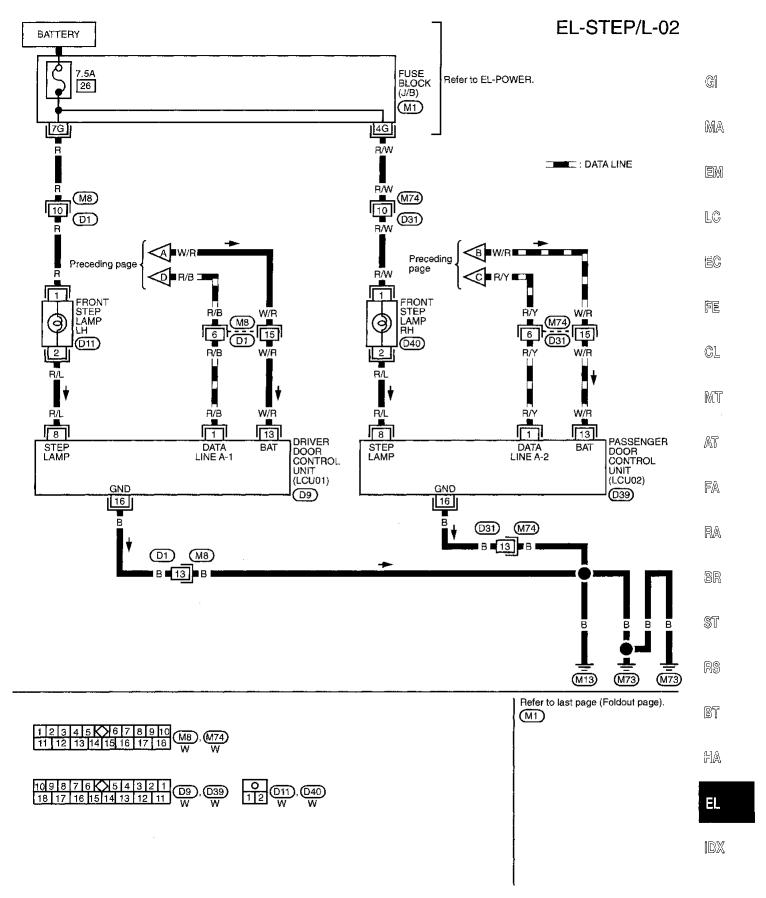
HA

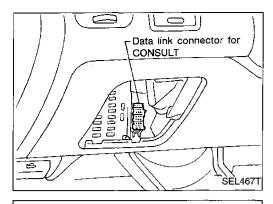
EL

## Wiring Diagram — STEP/L —



## Wiring Diagram — STEP/L — (Cont'd)



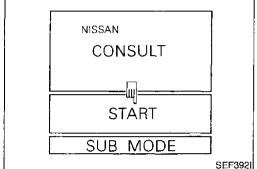


## **Trouble Diagnoses**

## **CONSULT**

#### **CONSULT** inspection procedure

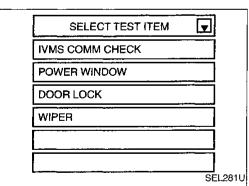
- 1. Turn ignition switch "OFF".
- 2. Connect "CONSULT" to the data link connector.



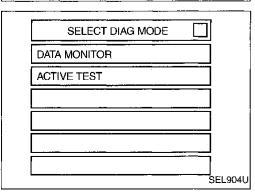
- Turn ignition switch "ON".
   Touch "START".

| SELECT SYSTEM |    |        |
|---------------|----|--------|
| ENGINE        |    |        |
| AT            |    |        |
| AIRBAG        |    |        |
| IVMS          |    |        |
| ***           |    |        |
|               |    |        |
|               | SE | EL280U |

5. Touch "IVMS".



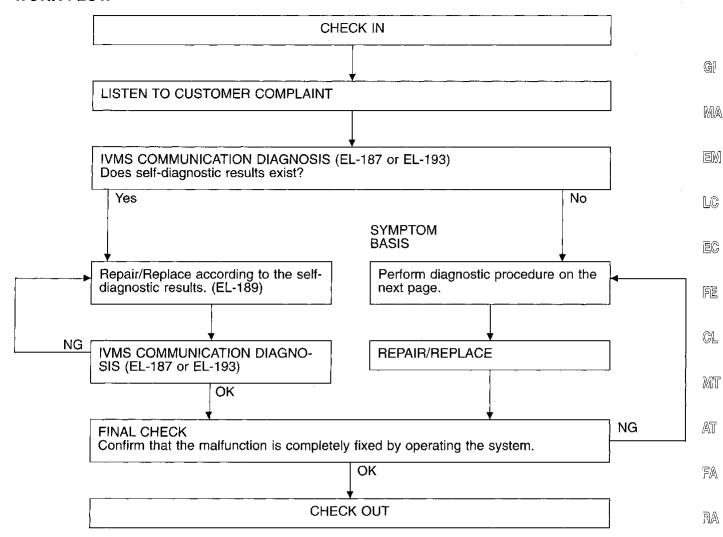
6. Touch "STEP LAMP".



DATA MONITOR and ACTIVE TEST are available for the step lamp.

## **Trouble Diagnoses (Cont'd)**

#### **WORK FLOW**



#### NOTICE:

- When LCU connectors are disconnected for more than 1 minute such as during trouble diagnoses, the "disconnected" data will be memorized by the BCM. Therefore, after reconnecting the LCU connectors, erase the memory.
- To erase the memory, perform the procedure below.

  Erase the memory with CONSULT (refer to EL-187) or turn the ignition switch to "OFF" position and remove 7.5A fuse (No. 56) located in the fuse and fusible link box).

EL

BR

ST

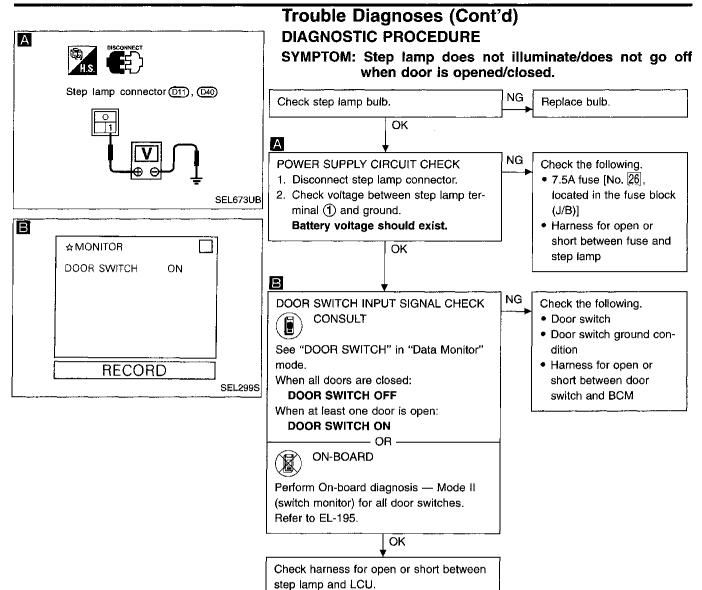
RS

Ta

HA

IDX

#### STEP LAMP — IVMS



EL-304 1508

## Wiring Diagram — TRNSMT —

## **EL-TRNSMT-01**

GI

MA

LC

EC

FE

CL

MT

AT

FA

 $\mathbb{R}\mathbb{A}$ 

BR

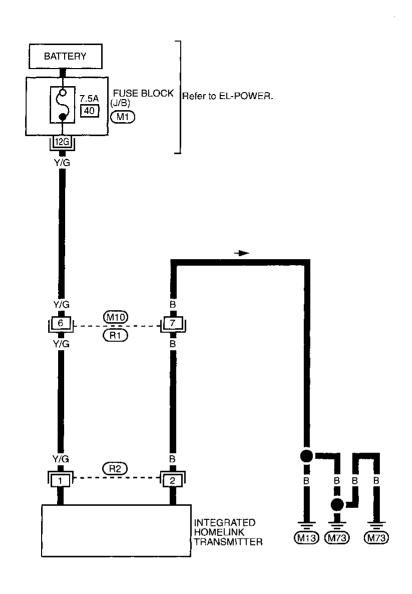
ST

RS

BT

KA

=



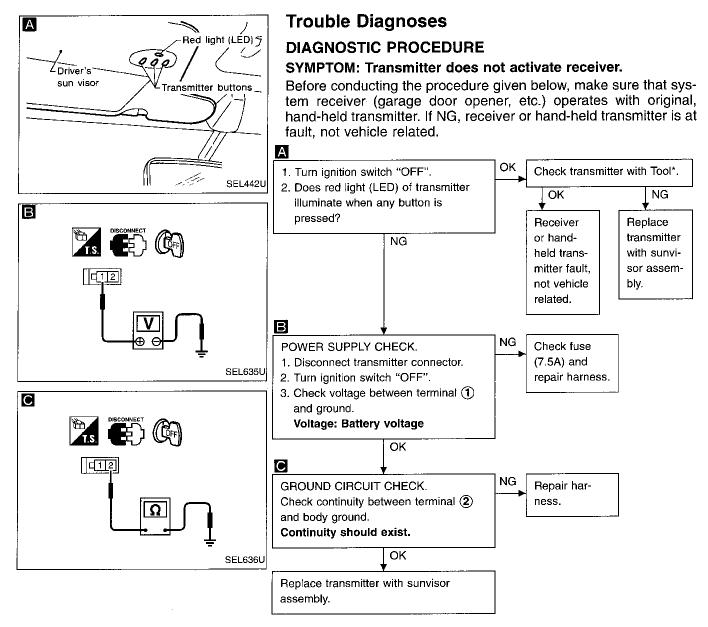
Refer to last page (Foldout page).





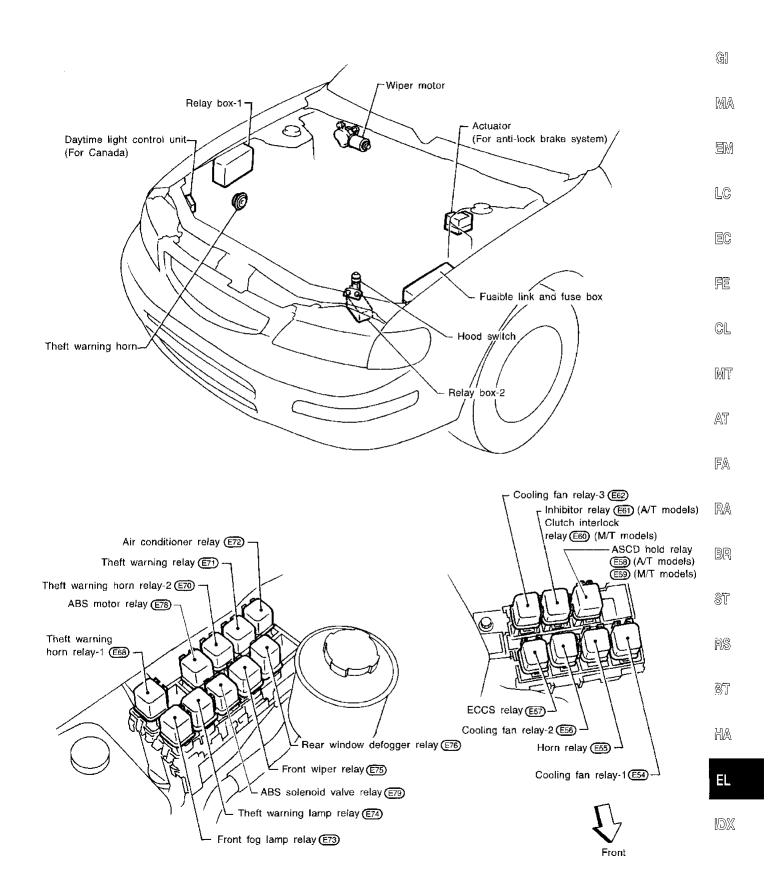
MEL696G

## INTEGRATED HOMELINK TRANSMITTER

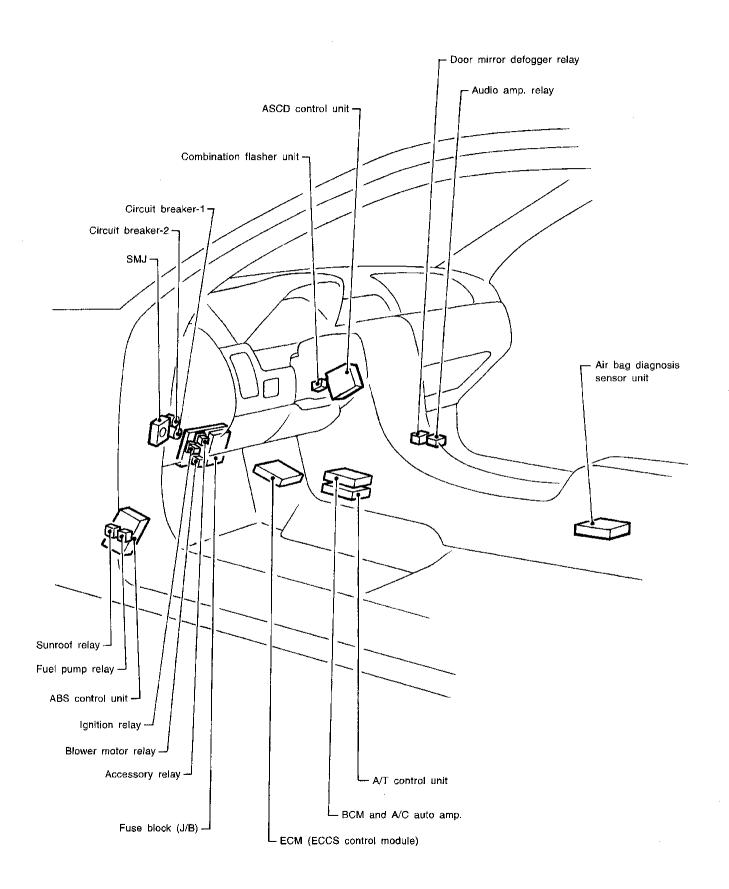


\*For details, refer to Technical Service Bulletin.

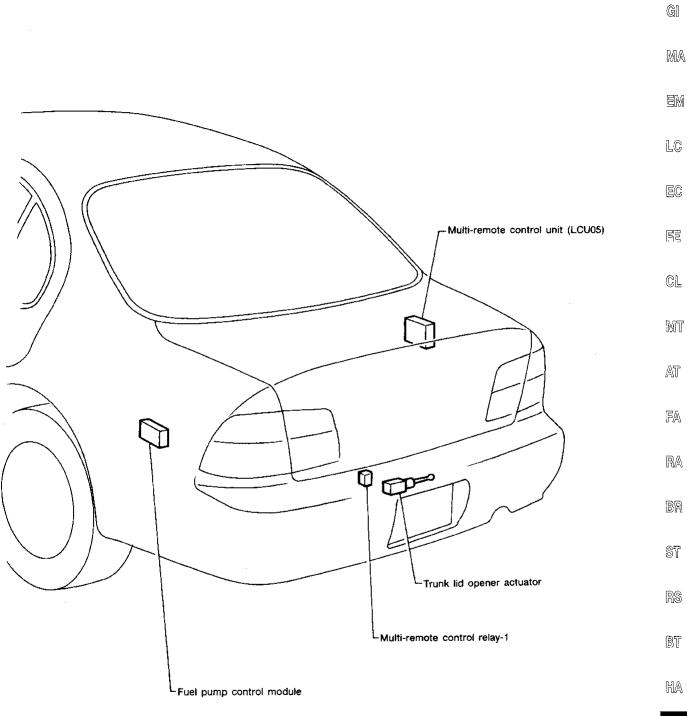
## **Engine Compartment**



## **Passenger Compartment**



## **Luggage Compartment**



MT

EL

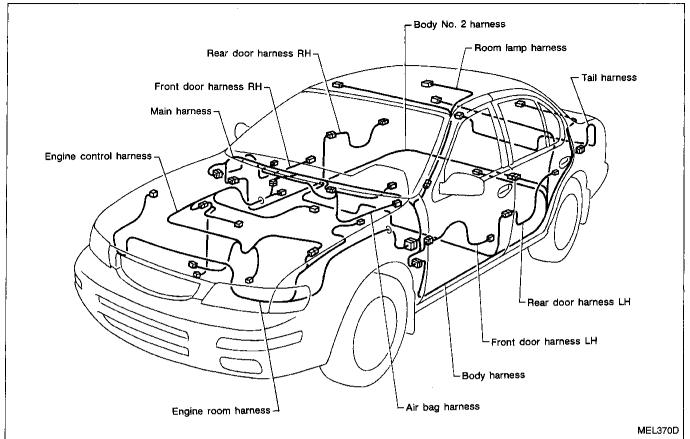
## LOCATION OF ELECTRICAL UNITS

NOTE

**EL-310** 1514

## **HARNESS LAYOUT**

## **Outline**



G[

MA

LC

EC

FE

CL

MT

AT

FA

 $\mathbb{R}\mathbb{A}$ 

BR

ST

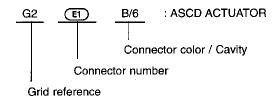
RS

BT

HA

## **How to Read Harness Layout**

#### Example:



The following Harness Layouts use a map style grid to help locate connectors on the drawings:

- Engine Room Harness (Engine Compartment)
- Main Harness
- Engine Control Harness
- Body Harness

#### To use the grid reference

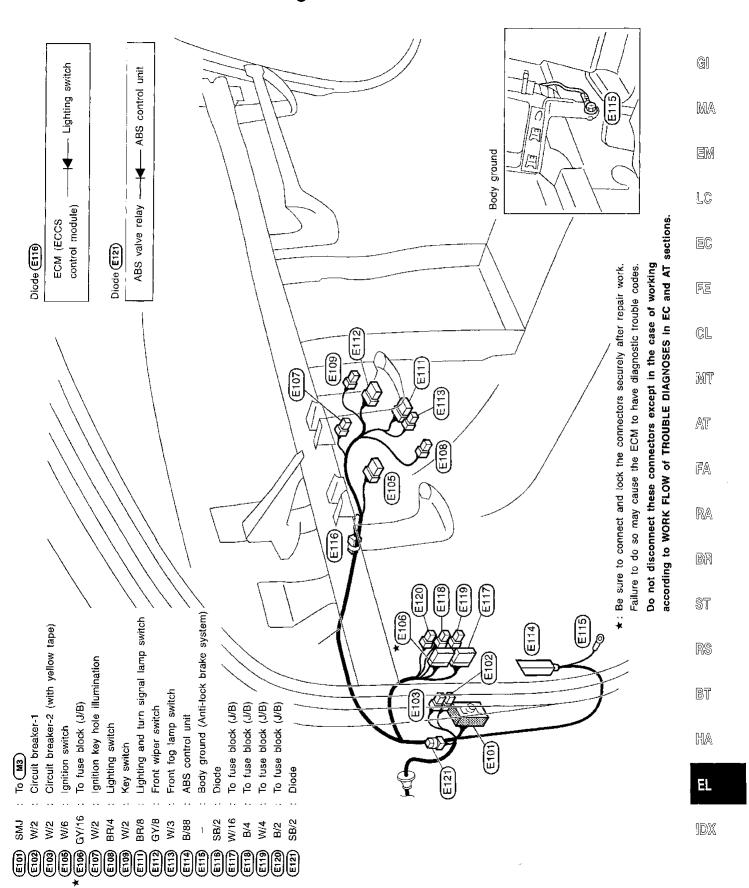
- 1) Find the desired connector number on the connector list.
- 2) Find the grid reference.
- 3) On the drawing, find the crossing of the grid reference letter column and number row.
- 4) Find the connector number in the crossing zone.
- 5) Follow the line (if used) to the connector.

#### **CONNECTOR SYMBOL**

Main symbols of connector (in Harness Layout) are indicated in the below.

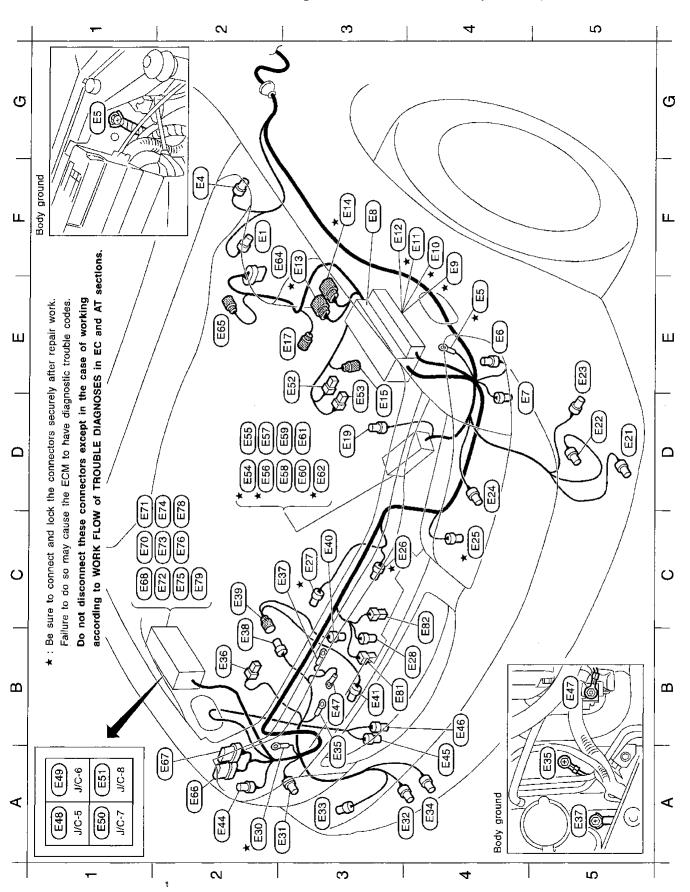
| Connector type                          | Water proof type |        | Standard type |            |  |
|---|------------------|--------|---------------|------------|--|
|   | Male             | Female | Male          | Female     |  |
| Cavity: Less than 4     Relay connector | <b>Ø</b>         | 0      | <b>Ø</b>      |            |  |
| Cavity: From 5 to 8                     | <b>®</b>         |        |               |            |  |
| Cavity: More than 9                     |                  | _      |               | $\Diamond$ |  |
| Ground terminal etc.                    | <del>-</del>     |        | - 0           |            |  |

## **Engine Room Harness**



## **HARNESS LAYOUT**

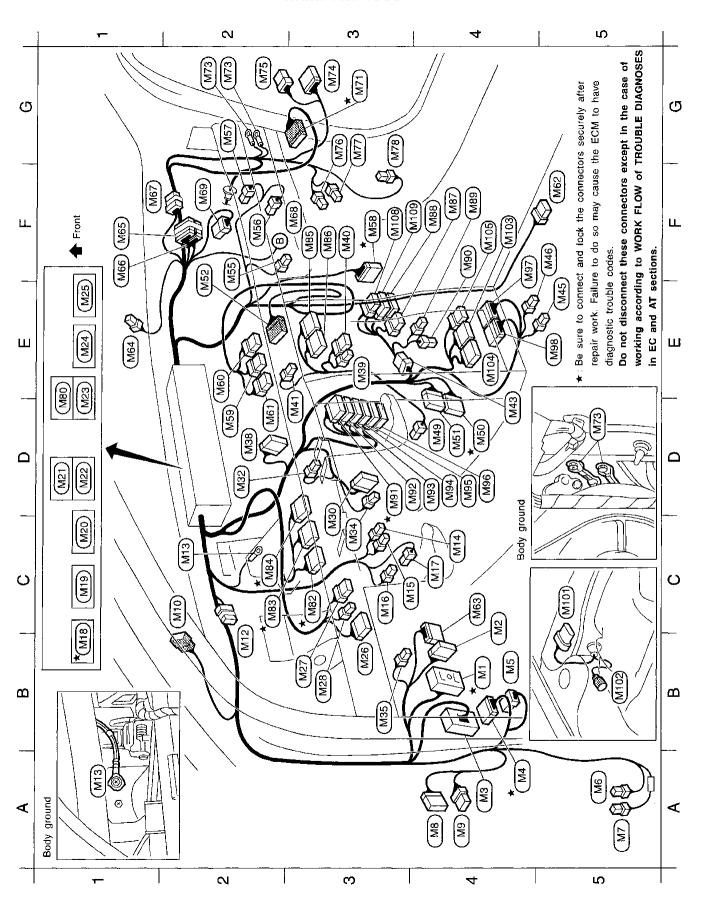
## **Engine Room Harness (Cont'd)**



# Engine Room Harness (Cont'd)

| ATS.;   |     |
|---|-----|
| ELECTRICAL UNITS".)  ELECTRICAL UNITS".)  | GI  |
|   | MA  |
| Relay box-1 (Refer to "LOCATION OF ELECTRICAL UNITS".)  "LOCATION OF ELECTRICAL UNITS".)  "LOCATION OF ELECTRICAL UNITS".)  "LOCATION OF ELECTRICAL UNITS".)  "In EC and AT sections.   | EM  |
| 102   | LC  |
| models) models) models) unit (For 0 ay-1 ay-2 ay-2 ay-2 ay-2 ay-2 ay-2 ay-2 ay-2  | EC  |
| ng fan relay-1 relay ng fan relay-2 s relay hold relay (M/T m h interlock relay tor relay ng fan relay-3 control actuator me light control unit warning horn relay warning horn relay warning lamp relay warning lamp relay warning lamp relay window defogger re motor relay soelnoid valve relay high low  low  soe the ECM to hav e connectors see the ECM to hav of TROUBLE D   |     |
| Battery Cooling fan relay-1 Horn relay Cooling fan relay-2 ECCS relay ASCD hold relay (M/T models) ASCD hold relay (M/T models) ASCD hold relay (M/T models) Clutch interfock relay Inhibitor relay Cooling fan relay-3 ABS control actuator Daytime light control unit (For Canada) Theft warning horn relay-2 Theft warning horn relay-2 Theft warning horn relay ABS control actuator Daytime light control unit (For Canada) Theft warning horn relay-2 Theft warning horn relay-2 Theft warning lamp relay ABS control actuator ABS control actuator ABS motor relay ABS motor relay ABS motor relay Horn low ABS scelnoid valve relay Horn low ABS scelnoid valve relay Horn low These connectors securely after and lock the connectors securely after as these connectors except in the case K FLOW of TROUBLE DIAGNOSES in   | CL  |
| Batte Cooling | MT  |
| Sure to do so and this con to the conding to V  | AT  |
| <ul><li>2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2</li></ul>   | FA  |
| system)   | RA  |
| ok brake stem)  | BR  |
| witch harness (Fo link box (White) (Gray) (Gray) (Gray) (Gray) (Gray)  Hamp LH lamp LH lamp RH lamp RH lamp RH lamp RH or  (White) or  (White) (White) (Gray)   | \$T |
| level switch by lamp harnes lamp harnes sible link bo ctor-1 (White) ctor-3 (Gray) ctor-4 (Gray) ctor-4 (Gray) ctor-4 (Gray) ctor-4 (Gray) ctor-4 (Gray) ctor-6 (White) ctor-5 (White) ctor-7 (White) ctor-7 (White)  | RS  |
| ASCD pump Body ground Parking lamp LH To front fog lamp harness (For optional) Fuse and fusible link box Joint connector-1 (White) Joint connector-2 (White) Joint connector-3 (Gray) Joint connector-3 (Gray) To (F38) To (F39) To | BT  |
|   | HA  |
|   | EL  |
| 5         | IDX |

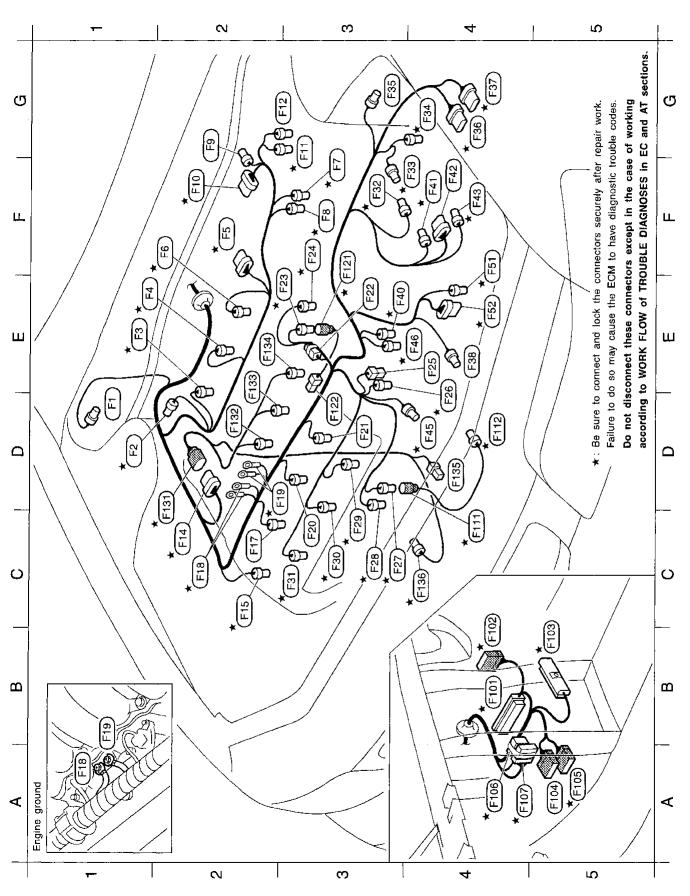
### **Main Harness**



# Main Harness (Cont'd)

| Front wheel sensor BH (Anti-lock brake system)  BCM (Body control module)  BCM (Body control module)  BCM (Body control module)  Audio (BOSE system)  Audio (BOSE system)  | GI<br>MA |
|--|----------|
|  | EM       |
| B5 (M102) GY/26 : F4 (M103) W/6 : F4 (M103) W/6 : F4 (M103) W/6 : F4 (M103) W/10 : Parking brake switch—  Parking brake switch—  box  box  box  Be case of working SES in EC and AT se   | LG       |
| Parking the case of the case o | EÇ       |
| witch F4 SST F4 SST F4 ASST F4 AVC) system) system) system) system) system) system) system) except in the c LE DIAGNOSES   | FE       |
| efogger swi efogger swi e-19 (Blue) -20 (White) -21 (White) tor  anual A/C) logger relay tor  it (Manual ini (Manu | CL       |
| trol am nadow d switch c connector nnector nnector nnector nnector nnector nnector nnector motor stantion mution mution mution mution mution mution mution mution mution nnector nnect | MT       |
| Fan contro  To (F102)  Clock  Hear winde  Hazard swi  A/T device  Data link c  Sunload se  Joint conne  Glove box  Intake dool  To (B102)  Door mirro  Combinatio  Combinatio  Combinatio  Push contr  Push contr  Push contr  Push contr  CD player  CD player  CD player  CD player  CD player  CD player  CD player  Joint conne   | AT       |
| W/4  GY/16  BR/6  W/8  W/8  W/16  W/16  W/16  W/16  W/16  W/10  W/ | FA       |
|  | RA       |
|  |          |
| Fuse block (J/B) Data link connector for CONSULT To (E10) To (E2) To (E2) To (E2) To (E1) To (E1) To (E1) To (E1) To (E1) To (E1) To (E1) Joint connector-23 (Gray) Body ground ASCD brake switch Stop lamp switch Clutch interlock switch (M/T models) ASCD clutch switch Joint connector-10 (Green) Joint connector-11 (White) Joint connector-12 (White) Joint connector-13 (Gray) Joint connector-13 (Gray) Joint connector-17 (White) Joint connector-17 (White) Joint connector-17 (White) Joint connector-18 (Sky blue-Diode) Joint connector-17 (White) Count onnector-17 (White) Joint connector-18 (Sky blue-Diode) Joint connector-18 (Sky blue-Diode) Joint connector-19 (Mhite) Security indicator lamp ASCD main switch Security indicator lamp ASCD control unit Illumination control unit (Auto A/C) Push control unit (Auto A/C) Push control unit (Auto A/C) Fush contr | \$T      |
| lay (with yellow (with yellow switch itch kk switch or-12 (Greer or-12 (White or-12 (White or-13 (Gray) or-14 (White or-15 (Blue) or-15 (Blue) or-17 (White or-17 (White or-18 (Sky b or-17 (White or-18 (Sky b or-17 (White or-18 (White er ofor or-18 (White sor or-18 (White er or-18 (White or-19 (Wanual)   | RS       |
| Fuse block (J/B)  Data link connector for CONS  To (E101)  To (E1)  To (E2)  Fuel pump relay  Sunroof relay (with yellow tap  To (E1)  To (E1)  Joint connector-23 (Gray)  Body ground  ASCD brake switch  Clutch interlock switch (M/T m  ASCD brake switch  Joint connector-11 (White)  Joint connector-12 (White)  Joint connector-12 (White)  Joint connector-13 (Gray)  Joint connector-14 (White)  Joint connector-15 (Blue)  Joint connector-17 (White)  Joint connector-18 (White)  Joint connector-18 (Sky blue-I  Joint connector-19 (Green)  Joint connector-18 (White)  Security indicator lamp  ASCD main switch  Security indicator lamp  ASCD control unit  Illumination control switch  Combination flasher unit  Warning buzzer  Mode door motor  Fan switch (Manual A/C)  Push control unit (Auto A/C)  In-vehicle sensor  Joint connector-18 (White)  Cigarette lighter  Ashtray illumination  Air mix door motor  To (E104)  To (E104)  Glove box lamp switch  Short connector (Manual A/C)  | BT       |
| Fuse blo  Data link  Data link  Data link  Do ED  D | KA       |
| SMJ<br>SMJ<br>SMJ<br>SMJ<br>W//32<br>GV//6<br>U/4<br>U/4<br>U/2<br>U/2<br>U/2<br>U/2<br>U/2<br>U/2<br>U/2<br>U/2   | EL       |
| MAGE WAS DEED WAS DEE | 1600     |
| 2       2       4  | IDX      |

# **Engine Control Harness**

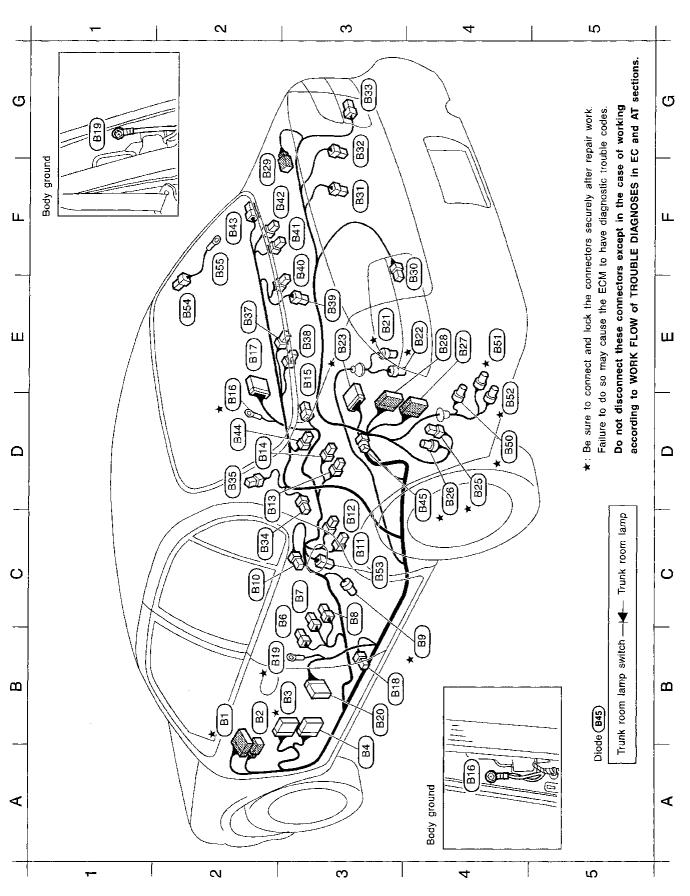


# Engine Control Harness (Cont'd)

| ons.   | G[        |
|--|-----------|
| air work. e codes. working and AT sections.  | MA        |
| repair vouble oc   |           |
| y after oostic tree case in a case i | EM        |
| ule) vr (POS secure e dlagn nAGNO;   | LG        |
| atrol module) (A/T models) 24 (Gray) 25 (Blue) on sensor (F on sexcept i ors except i ouble DIAG   | EC        |
| ECM (ECCS control module) To (MSB) A/T control unit (A/T models) To (MSD) Joint connector-24 (Gray) Joint connector-25 (Blue) To (F27) Crankshaft position sensor (POS) To (F23) Knock sensor To (F14) Injector No.3 Injector No.3 Injector No.3 Injector No.3 Injector No.3 Injector No.3 Injector No.3 Injector No.3 Injector No.3 Injector No.3 Injector No.3 Injector No.3 Injector No.3 Injector No.3 Injector No.3 Injector No.3 Injector No.3 Injector No.3 Injector No.4 Injector No.4 Injector No.7 Injector No.6 Injector No.7 Injector No.7 Injector No.7 Injector No.7 Injector No.6 Injector No.7 |           |
| **Fig. GY/68 : ECM (ECCS control module)  **Fig. GY/16 : To (ME)  **Fig. W/12 : To (ME)  **Fig. W/12 : To (ME)  **Fig. W/12 : To (ME)  **Fig. W/12 : To (ME)  **Fig. W/12 : To (ME)  **Fig. W/12 : Joint connector-24 (Gray)  **Fig. U/12 : Joint connector-25 (Blue)  **Fig. U/12 : Joint connector-25 (Blue)  **Fig. B/2 : To (F23)  **Fig. B/2 : Knock sensor  **Fig. B/2 : Knock sensor  **Fig. B/2 : Injector No.3  **Fig. B/3 : Injector No.3  **Fig. B/3 : Injector No.3  **Fig. B/3 : Injector No.3  **Fig. B/3 : Injector No.3  **Fig. B/3 : Injector No.3  **Fig. B/3 : Injector No.3  **Fig. B/3 : Injector No.3  **Fig. B/3 : Injector No.3  **Fig. B/3 : Injector No.3  **Fig. B/3 : Injector No.3  **Fig. B/3 : Injector No.3  **Fig. B/3 : Injector No.3  **Fig. B/3 : Injector No.3  **Fig. B/3 : Injector No.3  **Fig. B/3 :  | <u>CL</u> |
| GY/68 :: GY/16 :: L/48 :: W/12 :: W/12 :: W/20 :: GY/6 :: L/12 :: GY/8 :: B/2 :: B/2 :: B/2 :: GY/8 :: | MT        |
| B4 * FEB GY/68 : ECM (ECCS control module) C4 * FEB GY/16 : To (MEB) B5 * FEB W/12 : To (MEB) B5 * FEB W/12 : To (MEB) A5 * FEB W/12 : To (MEB) A6 * FEB W/12 : To (MEB) A7 * FEB W/12 : To (MEB) A4 * FEB W/12 : To (MEB) A4 * FEB W/20 : To (MEB) A4 * FEB W/20 : To (MEB) A4 * FEB W/20 : To (FEB) B4 * FEB W/3 : To (FEB) B4 * FEB W/3 : To (FEB) B5 * FEB W/3 : To (FEB) B6 * FEB W/3 : To (FEB) B7 * FEB W/3 : To (FEB) B7 * FEB W/3 : To (FEB) B7 * FEB W/3 : To (FEB) B7 * FEB W/4 : To (FEB) B7 * FEB W/4 : To (FEB) B7 * FEB W/4 : To (FEB) B7 * FEB W/4 : To (FEB) B7 * FEB W/4 : To (FEB) B7 * FEB W/4 : To (FEB) B7 * FEB W/4 : To (FEB) B7 * FEB W/4 : To (FEB) B7 * FEB W/4 : To (FEB) B7 * FEB W/4 : To (FEB) B7 * FEB W/4 : To (FEB) B7 * FEB W/4 : To (FEB) B7 * FEB W/4 : To (FEB) B7 * FEB W/4 : To (FEB) B7 * FEB W/4 : To (FEB) B7 * FEB W/4 : TO (FEB W | AT        |
|  | FA        |
| id valve   | RA        |
| e switch or RH 1 1 or LH or LH sor odels) vT model d valve   | BR        |
| Power steering oil pressure switch Front heated oxygen sensor RH Ignition coil No.1 Ignition coil No.3 Canister purge control valve Ignition coil No.5 Throttle position switch Throttle position switch TACV-RICD solenoid valve-2 ACV-RICD solenoid valve-1 To (F131) Camshaft position sensor (PHASE) Injector No.2 Engine ground Injector No.6 Condenser To (F131) Front heated oxygen sensor LH Ignition coil No.6 Ignition coil No.6 Ignition coil No.6 Intake air temperature sensor Intake air temperature sensor Intake air temperature sensor To (E13) Terrin heated oxygen sensor Intake air temperature sensor Intake air temperature sensor Intake air temperature sensor Intake air temperature sensor Subopping resistor To (E13) Terrinal cord assembly (A/T models) Vehicle speed sensor Absolute pressure sensor Absolute pressure sensor Inhibitor switch Inhibitor switch  | ST        |
| Power steering oil pressu fanition coil No.1  Ignition coil No.3  Canister purge control va ignition coil No.3  Throttle position switch Throttle position switch Throttle position switch Throttle position switch TACV-FICD solenoid valve TO (F13)  Camshaft position sensor injector No.2  Engine ground Injector No.2  Engine ground Injector No.6  Condenser To (F13)  EGRC-solenoid valve To (F11)  Front heated oxygen sensignition coil No.6  Injector No.6  Condenser To (F11)  Front heated oxygen sensignition coil No.6  Intake air temperature se Dropping resistor To (E13)  To (E13)  To (E13)  To (E14)  Front engine mounting EVAP canister purge con Revolution sensor (A/T manger of the tent engine general sensor (A/T manger of the tent engine pressure sensor (ANF manger of the tent engine pressure sensor (ANF manger of the tent engine pressure sensor (ANF manger of the tent engine pressure sensor (ANF manger of the tent engine pressure sensor (ANF)  Absolute pressure sensor (ANF) Inhibitor switch  | RS        |
| Power steering Front heated of Ignition coil No Ignition coil No Canister purge lignition coil No Throttle position Throttle position Throttle position Throttle position Throttle position TACV-FICD sole TACV-FICD sole TACV-FICD sole To F131) Camshaft position of F131 Camshaft position coil No.2 Engine ground Engine ground Engine ground Injector No.2 Engine ground Injector No.4 Injector No.6 Condenser To F131 Condenser To F131 Front heated of Ignition coil No Ignition coil No Ignition coil No Ignition coil No Ignition coil No Ignition coil No Ignition coil No Ignition coil No Ignition coil No Ignition coil No Ignition coil No Ignition coil No Ignition coil No Ignition coil No Ignition coil No Ignition coil No Ignition coil No Ignition coil No Ignition coil No Ignition sent Terminal cord (Vehicle speed Absolute press) MAP/BARO switch Inhibitor switch   | BT        |
| GY/2 GY/3 GY/3 W/6 SW/6 SW/6 SW/6 SW/6 SW/6 SW/6 SW/6  | HA        |
|  | EL        |
| 2       2       2       3  | dC) No.   |

1DX

### **Body Harness**



# Body Harness (Cont'd)

| Dropping resistor  To (T2)  To (T2)  To high-mounted stop lamp sub-harness (Models equipped with rear air spoiler)  Trunk lid combination lamp LH  Trunk lid key cylinder switch  Trunk lid combination lamp RH  Rear door switch LH  Rear speaker LH (For BOSE system)  Hear speaker LH (Except for BOSE system)  High-mounted stop lamp (Models without rear air spoiler)  Rear speaker RH (For BOSE system)  Rear speaker RH (For BOSE system)  Rear speaker RH (For BOSE system)  Rear speaker RH (For BOSE system)  Rear speaker RH (Except for BOSE system)  Rear speaker RH (Except for BOSE system)  Rear speaker RH (Except for BOSE system)  Rear speaker RH (Except for BOSE system)  |   |
|--|---|
| 826 GY/2<br>W/16<br>W/16<br>W/16<br>W/16<br>W/16<br>W/16<br>W/16<br>W/16   | 854 852 8841<br>855 855 8851  |
| 42 42 42 42 42 42 42 42 42 42 42 42 42 4   | . 4 4 4 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8                                     |
| To M4  To M5  Fuse block (J/B)  Fuse block (J/B)  To power seat hamess LH  Seat belt buckle switch  Heated seat LH  Parking brake switch  Heated seat switch LH  Heated seat switch RH  Heated seat switch RH  To power seat harness RH  Front door switch RH  Body ground  To D71  Front door switch LH  Body ground  To (D71)  | : Fuel tank gauge unit<br>: To ( <u>B110)</u><br>: Fuel pump control module |
| B2 * B1 W/32 B3 * B1 W/32 B3 * B2 W/12 A3 B2 W/12 A3 B2 W/12 C3 B2 W/3 C3 B1 W/3 C3 B1 W/3 C3 B1 W/3 C3 B1 W/3 C3 B1 W/3 C3 B1 W/3 C3 B1 W/3 C3 B1 W/3 C3 B1 W/3 C3 B1 W/3 C3 B1 W/3 C3 B1 W/3 C3 B1 W/3 C3 B1 W/3 C4 B1 W/3 C5 B1 W/3 C6 B1 W/3 C7 B1 |   |

★: Be sure to connect and lock the connectors securely after repair work.

Failure to do so may cause the ECM to have diagnostic trouble codes.

Do not disconnect these connectors except in the case of working according to WORK FLOW of TROUBLE DIAGNOSES in EC and AT sections.

Diode (B45)

G

MA

EM

\_\_\_\_

EC

FE

CĹ

MT

AT

FA

RA

BR

ST

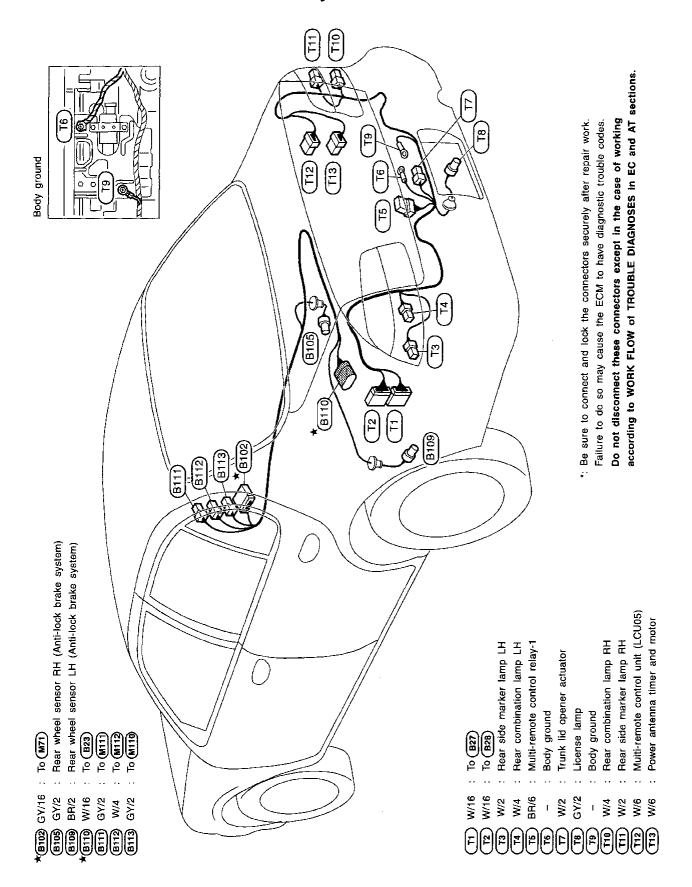
RS

BT

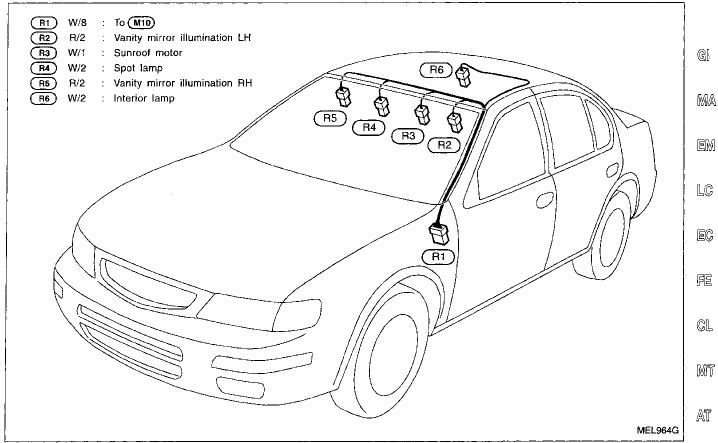
HA

EL

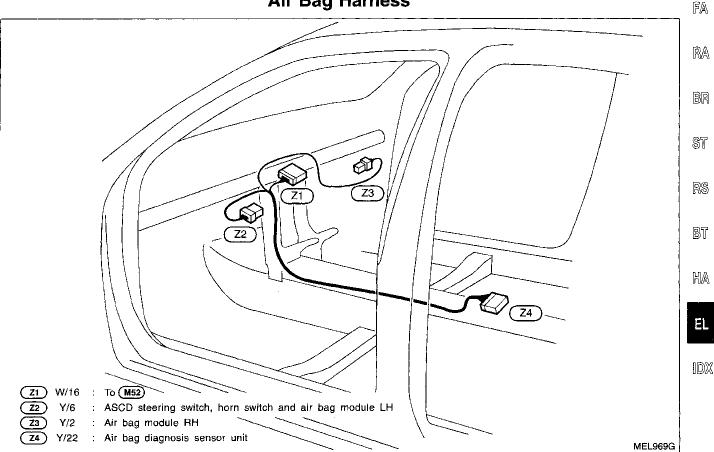
### Body No. 2 Harness and Tail Harness



### **Room Lamp Harness**

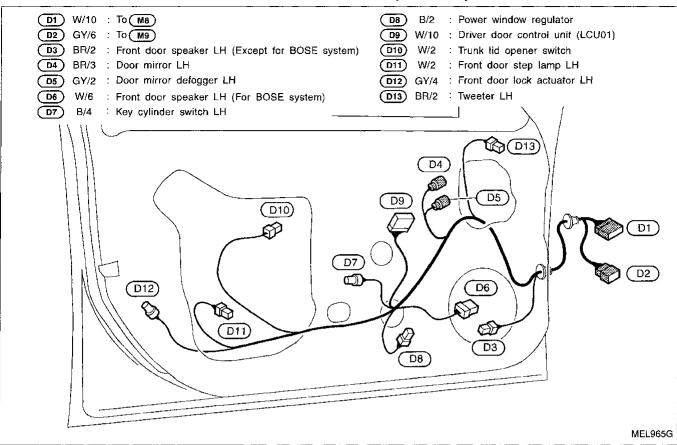


### Air Bag Harness

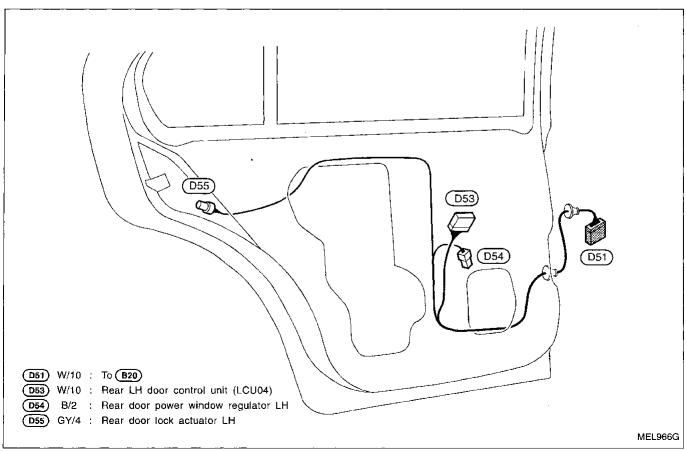


### **FRONT**

### Door Harness (LH side)

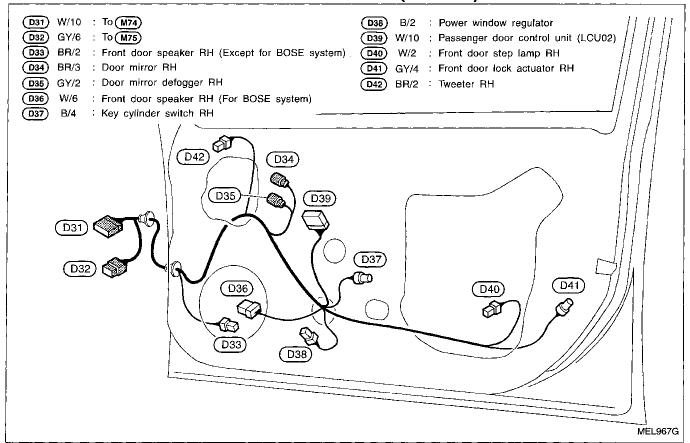


### REAR

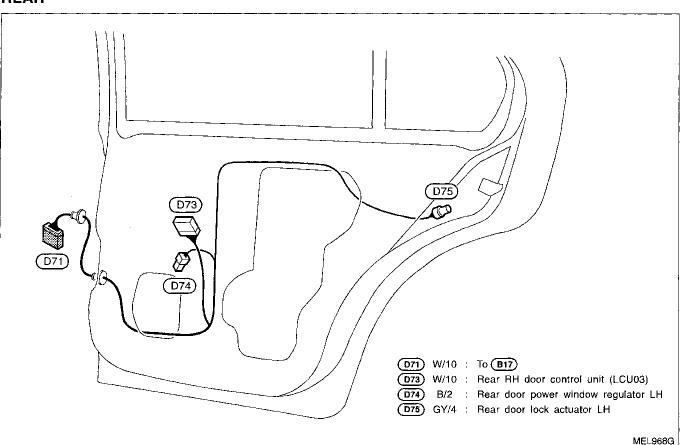


### **FRONT**

### Door Harness (RH side)



### **REAR**



1529

GI

MA

EM

LC

EC

FE

GL

MT

AT

 $\mathbb{F}\!\mathbb{A}$ 

RA

BR

ST

RS

BT

HA

EL

IDX

# SECTION IDX

Gi

MA

EM

LC

EC

FE

CL

MT

AT

FA

RA

BR

ST

RS

BT

HA

IDX

| Δ.   | Air mix. door motor   | HA-118   |
|--|---|--|
| Α  | Air spoiler, rear   | BT-22  |
| <u>.                                      </u>                             | Alternator  | EL-40  |
| ABS (anti-lock brake system) BR-23   | Ambient sensor  | HA-116   |
| ABS - Wiring diagram BR-32   | Angular tightening application  | EM-2   |
| Absolute pressure sensor EC-110  | Antenna   | EL-132   |
| A/C air flowHA-17  | Anti-lock brake system - See ABS  | BR-23  |
| A/C component layout   | Anti-lock brake system - Wiring   |  |
| A/C compressor clutch removal and  | diagram   | BR-32  |
| installation   | ASCD (automatic speed control device  |  |
| A/C compressor description   | ASCD - Wiring diagram   |  |
| A/C compressor description   | A/T - Wiring diagram  |  |
| A/C compressor mounting  | A/T control   |  |
| A/C compressor special service tool  | AT control unit   |  |
| A/C control linkage adjustment (auto                                       | A/T diagnosis communication line  | EC-337   |
| A/C) HA-113  | AT fluid temperature sensor   |  |
| A/C control operation (auto A/C)   | AT removal and installation   |  |
| A/C control operation (manual A/C) HA-18                                   | AT self-diagnoses   | AT-26  |
| A/C diagnostic work flow (auto A/C) HA-64                                  | AT shift lock system  |  |
| A/C diagnostic work flow (auto A/C) HA-21                                  | A/T shift lock system - Wiring diagram  |  |
| A/C harness layout (auto A/C) HA-88  | Audio   |  |
| A/C harness layout (auto A/C) HA-99  A/C harness layout (manual A/C) HA-37 | AUDIO - Wiring diagram  |  |
| A/C HFC134a (R134a) system   | Audio and A/C control removal and   |  |
| precaution HA-2  | installation - See Instrument panel.  | BT-13  |
| A/C HFC134a (R134a) system service   | Auto air conditioner - Wiring diagram.  |  |
| procedure HA-125   | Automatic speed control system - See  |  |
| A/C HFC134a (R134a) system service   | ASCD  |  |
| tools  | Automatic transmission fluid  | •  |
| A/C HFC134a system service equip-  | replacement   | MA-18  |
|  |   |  |
| ment precaution HA-9   | Auxiliary air control (AAC) valve   | =0-200   |
| ment precaution HA-9 A/C lubricant (R134a) HA-127                          | Auxiliary air control (AAC) valve   | EU-200   |
| A/C lubricant (R134a) HA-127   |   |  |
| A/C lubricant (R134a) HA-127<br>A/C operational check (auto A/C) HA-65     | Auxiliary air control (AAC) valve   | EU-255   |
| A/C lubricant (R134a)  |   | EG-299   |
| A/C lubricant (R134a)  | В   |  |
| A/C lubricant (R134a)  | B Back-up lamp  | EL-60  |
| A/C lubricant (R134a)  | Back-up lampBack-up lamp switch (MT)  | EL-60<br>MT-7  |
| A/C lubricant (R134a)  | Back-up lampBack-up lamp switch (MT)BACK/L - Wiring diagram                                   | EL-60<br>MT-7<br>EL-60   |
| A/C lubricant (R134a)  | Back-up lamp<br>Back-up lamp switch (MT)<br>BACK/L - Wiring diagram<br>Battery                | EL-60<br>MT-7<br>EL-60<br>EL-24  |
| A/C lubricant (R134a)  | Back-up lampBack-up lamp switch (MT)BACK/L - Wiring diagram BatteryBaulk ring (MT)            | EL-60<br>MT-7<br>EL-60<br>EL-24  |
| A/C lubricant (R134a)  | Back-up lampBack-up lamp switch (MT)BACK/L - Wiring diagramBatteryBaulk ring (MT)Blower motor | EL-60<br>MT-7<br>EL-60<br>EL-24<br>MT-11<br>HA-56, 112   |
| A/C lubricant (R134a)  | Back-up lamp  | EL-60<br>MT-7<br>EL-60<br>EL-24<br>MT-11<br>HA-56, 112   |
| A/C lubricant (R134a)  | Back-up lamp  | EL-60<br>MT-7<br>EL-60<br>EL-24<br>MT-11<br>HA-56, 112<br>HA-56  |
| A/C lubricant (R134a)  | Back-up lamp  | EL-60<br>MT-7<br>EL-60<br>EL-24<br>MT-11<br>HA-56, 112<br>HA-56<br>GI-39   |
| A/C lubricant (R134a)  | Back-up lamp  | EL-60<br>MT-7<br>EL-60<br>EL-24<br>MT-11<br>HA-56, 112<br>HA-56<br>GI-39<br>BT-37  |
| A/C lubricant (R134a)  | Back-up lamp  | EL-60<br>MT-7<br>EL-60<br>EL-24<br>MT-11<br>HA-56, 112<br>HA-56<br>GI-39<br>BT-37  |
| A/C lubricant (R134a)  | Back-up lamp  | EL-60<br>MT-7<br>EL-60<br>EL-24<br>MT-11<br>HA-56, 112<br>HA-56<br>GI-39<br>BT-37<br>EC-221  |
| A/C lubricant (R134a)  | Back-up lamp  | EL-60<br>MT-7<br>EL-60<br>EL-24<br>MT-11<br>HA-56, 112<br>HA-56<br>GI-39<br>BT-37<br>EC-221<br>BR-9                                |
| A/C lubricant (R134a)  | Back-up lamp  | EL-60<br>MT-7<br>EL-60<br>MT-11<br>MA-56, 112<br>HA-56<br>BT-37<br>BT-37<br>BT-37  |
| A/C lubricant (R134a)  | Back-up lamp  | EL-60<br>MT-7<br>EL-60<br>MT-11<br>HA-56, 112<br>HA-56<br>GI-39<br>BT-37<br>EC-221<br>BR-9<br>BR-4                                 |
| A/C lubricant (R134a)  | Back-up lamp  | EL-60  |
| A/C lubricant (R134a)  | Back-up lamp  | EL-60<br>MT-7<br>EL-60<br>MT-11<br>MA-56, 112<br>HA-56<br>BT-37<br>EC-221<br>BR-9<br>BR-9  |
| A/C lubricant (R134a)  | Back-up lamp  | EL-60  |
| A/C lubricant (R134a)  | Back-up lamp  | EL-60 MT-7 EL-60 EL-24 MT-11 HA-56, 112 HA-56 GI-39 BT-37 EC-221 BR-9 BR-4 BR-5 MA-19 MA-19 MA-19                                  |
| A/C lubricant (R134a)  | Back-up lamp  | EL-60<br>MT-7<br>EL-60<br>MT-11<br>MA-56, 112<br>BT-37<br>BT-37<br>BT-37<br>BR-9<br>BR-9<br>BR-9<br>BR-19<br>BR-5<br>MA-19<br>BR-3 |
| A/C lubricant (R134a)  | Back-up lamp  | EL-60MT-7EL-60MT-11HA-56, 112HA-56BT-37EC-221BR-9BR-4BR-5BR-5BR-19BR-3BR-3   |
| A/C lubricant (R134a)  | Back-up lamp  | EL-60MT-7EL-60MT-11HA-56, 112HA-56BT-37EC-221BR-9BR-4BR-5MA-19BR-3MA-19BR-7BR-7  |

|   |           | Crankshaft EM-58  |             |
|---|-----------|---|-------------|
| C   | i         | Crankshaft position sensor (POS) EC-199                                   |             |
|   |           | Crankshaft position sensor (POS)  |             |
| Onwahaft inggastian                             | EM 07     | chipping EC-303   |             |
| Camshaft inspection(CMDS)                       |           | Crankshaft position sensor (REF) EC-298                                   | <b>○</b> 0  |
| Camshaft position sensor (CMPS)                 |           | Cruise control - See ASCD EL-146  | Gi          |
| Camshaft position sensor (PHASE)                |           | Cylinder block EM-54  |             |
| Canister-See EVAP canister                      |           | Cylinder head EM-34   | MA          |
| CHARGE - Wiring diagram                         |           | Cylinder head bolt tightening EM-43                                       | IMUA        |
| Charging system                                 |           |   |             |
| Chassis and body maintenance                    |           |   | EM          |
| Cigarette lighter                               |           | D   | E DO J      |
| Circuit breaker                                 |           |   |             |
| Clock   |           | Daytime light system EL-47  | LC          |
| Closed loop control                             |           | Daytime running light - See Daytime                                       |             |
| Closed throttle position switch                 |           | light system EL-47  |             |
| Clutch cover                                    |           | DEF - Wiring diagram EL-117   | EC          |
| Clutch disc                                     |           | Detonation sensor - See Knock sensor EC-196                               |             |
| Clutch fluid level                              |           | Diagnosis sensor unitRS-8   |             |
| Clutch master cylinder                          |           | Differential gear (FF AT) AT-211, 215                                     | FE          |
| Clutch operating cylinder                       |           | Differential gear (FF MT)   |             |
| Clutch pedal                                    |           | Direct ignition system EC-29  | As          |
| Clutch release bearing  Clutch withdrawal lever |           | Distributor ignition (DI) system EC-18                                    | ©L          |
|   |           | D/LOCK - Wiring diagram EL-223  |             |
| Coil spring (front) Coil spring (rear)          |           | Door lock BT-11   | MT          |
| Collision diagnosis                             |           | Door mirror BT-36   | UVUU        |
| Combination lamp, front, removal and            | 110-00    | Door trim BT-19   |             |
| installation                                    | BT-6      | Door, front BT-11   | AT.         |
| Combination lamp, rear, removal and             |           | Door, rear BT-12  |             |
| installation                                    | BT-22     | Drive belt inspection MA-10   |             |
| Combination meter                               |           | Drive plate runout EM-61  | FA          |
| Combination meter removal and                   |           | Drive shaft (front) FA-12   |             |
| installation - See Instrument panel             | BT-13     | Dropping resistor (AT)  |             |
| Combination switch                              | EL-41     | DTRL - Wiring diagram EL-49   | RA          |
| COMM - Wiring diagram                           |           |   |             |
| Compression pressure                            | EM-10     | [ E   | ia) Fit     |
| Compressor clutch removal and                   |           |   | 18<br>18    |
| installation                                    |           | F0.70   |             |
| Compressor description                          |           | ECCS basic inspection EC-78   | \$7         |
| Compressor mounting                             |           | ECCS circuit diagram EC-9   | <b>9</b> 11 |
| Compressor precaution                           |           | ECCS component parts location EC-11 ECCS on board diagnostic system EC-38 |             |
| Compressor special service tool  Connecting rod |           | ECCS on board diagnostic system EC-36 ECCS system diagram and chart EC-10 | RS          |
| Connecting rod bearing clearance                |           | ECM input/output signal EC-91   |             |
| Connecting rod bearing clearance                |           | EGR control (EGRC) - BPT valve EC-220                                     |             |
| Console box - See Instrument panel              |           | EGR control (EGRC) - solenoid valve EC-309                                | BT          |
| CONSULT for ABS                                 |           | EGR control valve EC-218  |             |
| CONSULT for ECCS                                |           | EGR temperature sensor EC-314   |             |
| CONSULT general information                     |           | EGR valve & EVAP canister purge con-                                      | HA          |
| Control lever (MT)                              |           | trol solenoid valve EC-313  |             |
| Control valve (AT)                              |           | Electric sun roof EL-140  | <u>[</u>    |
| Converter housing installation                  |           | Electrical load signal circuit EC-376                                     |             |
| Coolant mixture ratio                           |           | Electrical unit Foldout   |             |
| Coolant replacement                             |           | Electronic ignition system EC-18  | ЮX          |
| Cooling circuit (engine)                        |           | Engine compartmentBT-37   | 15/1        |
| Cooling fan control                             |           | Engine control module (ECM) EC-269  |             |
| Cooling fan control system                      |           | Engine coolant temperature sensor   |             |
| Cooling fan motor                               |           | (ECTS) EC-123, 134  |             |
| Cooling fan relay                               |           | Engine mounting control (Front) EC-365                                    |             |
| Coupling sleeve (MT)                            | 171 - 1 1 | Engine oil filter replacement MA-14                                       |             |

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| Engine oil replacement MA-14                 | Front heated oxygen sensor heater   |                                       |
|--|-------------------------------------|---------------------------------------|
| Engine outer component parts EM-6            | (Right bank)                        | FC-146                                |
| Engine removal                               | Front passenger air bag             |                                       |
| Engine room - See Engine                     | Front seat                          |                                       |
| compartment BT-37                            | Front seat belt                     |                                       |
| EVAP canister EC-21                          |                                     |                                       |
| EVAP canister purge control valve EC-233     | Front suspension                    |                                       |
| EVAP canister purge volume control           | Front washer                        |                                       |
| valve EC-323                                 | Front wiper                         | EL-102                                |
| EVAP canister vent control valve EC-323      | Fuel cut control (at no load & high |                                       |
|  | engine speed)                       | EC-20                                 |
| EVAP control system (small leak)             | Fuel filler lid                     | BT-9                                  |
| diagnosis EC-225                             | Fuel filter replacement             | MA-12                                 |
| EVAP control system purge flow               | Fuel gauge                          |                                       |
| monitoring diagnosis EC-330                  | Fuel injection system (Left bank)   |                                       |
| EVAP vapor lines inspection MA-16            | Fuel injection system (Right bank)  |                                       |
| Evaporative emission (EVAP) system EC-21     | Fuel lid opener, electric           |                                       |
| Exhaust system FE-4                          | Fuel line inspection                |                                       |
| Exhaust system inspection MA-17              |                                     |                                       |
| Exterior BT-22                               | Fuel pressure check                 |                                       |
| Exterior lamp EL-56                          | Fuel pressure release               |                                       |
|  | Fuel pump                           |                                       |
| F 1  | Fuel pump control module            |                                       |
| F  | Fuel pump relay                     |                                       |
|  | Fuel system                         |                                       |
| For control arms                             | Fuse                                |                                       |
| Fan control amp HA-123                       | Fuse block                          |                                       |
| Fan switch                                   | Fusible link                        | EL-19                                 |
| Fast idle cam (FIC) inspection and           |                                     |                                       |
| adjustment EC-28                             | G                                   |                                       |
| F/FOG - Wiring diagram EL-62                 | <b>1</b>                            |                                       |
| Final drive (FF AT) AT-211, 215              |                                     |                                       |
| Final drive (FF MT) MT-11, 25                | Garage jack and safety stand        | GI-40                                 |
| Finisher, interior - See Trim BT-16          | Gauges                              |                                       |
| Floor trim BT-16                             | Gears (MT)                          |                                       |
| Fluid temperature sensor (AT) AT-67          |                                     |                                       |
| Fluids MA-8                                  | Generic scan tool (GST)             |                                       |
| Flywheel (clutch)                            | Ground distribution                 | EL-20                                 |
| Flywheel runout EM-61                        | <u> </u>                            | · · · · · · · · · · · · · · · · · · · |
| Fog lamp, front EL-61                        | Н                                   |                                       |
| Fog lamp, front, removal and                 |                                     |                                       |
| installation BT-6                            |                                     |                                       |
| Fork rod (MT) MT-12                          | Harness connector                   | EL-3                                  |
| Forward clutch AT-189                        | Harness layout                      | EL-311                                |
| Freeze frame data EC-40                      | Hazard warning lamp                 |                                       |
| Front axle FA-8                              | Headlamp                            |                                       |
| Front bumper BT-6                            | Headlamp removal and installation   |                                       |
| Front combination lamp removal and           | Headlining - See Roof trim          | BT-20                                 |
| installation BT-6                            | Heated oxygen sensor (HO2S) (front) |                                       |
| Front disc brake                             | Heated oxygen sensor (HO2S) (Front  |                                       |
|  | (Left bank)                         | ·/<br>⊑C_150.                         |
| Front door                                   |                                     |                                       |
| Front engine mounting control EC-365         | Heated oxygen sensor (HO2S) (Front  | EC 141                                |
| Front fog lamp EL-61                         | (Right bank)(IJOSS) manit           | EU-141                                |
| Front fog lamp removal and installation BT-6 | Heated oxygen sensor (HO2S) monitor |                                       |
| Front heated oxygen sensor (HO2S) EC-141     | Heated oxygen sensor (rear)         | EC-150                                |
| Front heated oxygen sensor (HO2S)            | Heated oxygen sensor heater         | pm 🙉 🗸 🗢                              |
| (Left bank) EC-159                           | (Front)(Left bank)                  | EC-165                                |
| Front heated oxygen sensor (HO2S)            | Heated oxygen sensor heater (Fron-  |                                       |
| (Right bank) EC-141                          | t)(Right bank)                      | EC-146                                |
| Front heated oxygen sensor (HO2S)            | Heated oxygen sensor monitor (HO25  |                                       |
| monitor EC-50, 53                            | (front)                             | EC-53                                 |
| Front heated oxygen sensor heater            | Heated seat E                       | 3T-29, EL-143                         |
| (Loft bonk)                                  | HEC124a (D124a) eyetom progention   | шло                                   |

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| HFC134a (R134a) system service                    |         | Keyless entry system - See Multi-re-          |         |
|---|---------|---|---------|
| procedure   |         | mote control system EL-240                    |         |
| HFC134a (R134a) system service tools              | s HA-7  | Knock sensor (KS) EC-196                      | ı       |
| HFC134a system service equipment                  |         | ,   |         |
| precaution  | HA-9    |   |         |
| High clutch                                       |         | L   | Gi      |
| H/LAMP - Wiring diagram                           | FI -45  |   |         |
| Hood  | BT-6    |   |         |
| Horn  |         | License lamp EL-56                            |         |
| HORN - Wiring diagram                             |         | Lifting points GI-41                          |         |
| How to erase DTC for ECCS OBD                     | 66-114  | Line pressure solenoid valve AT-85, 93, 96    |         |
| system  | EC 40   | Line pressure test (AT) AT-129                |         |
| HSEAT - Wiring diagram                            |         | Liquid gasket application EM-2                |         |
| HSEAT - Willing Glagram                           | EL-143  | Location of electrical units EL-307           |         |
|   |         | Lock, door BT-11                              | LC      |
| 1   |         | Low and reverse brake AT-195                  |         |
|   |         | Lubricant (R134a) A/C HA-127                  |         |
|   |         | Lubricants MA-8                               | EC      |
| IACV - FICD solenoid valve                        | EC-375  | Lubrication circuit (engine) LC-4             |         |
| IACV-AAC valve                                    | EC-260  | Lubrication-locks, hinges and hood            |         |
| IACV-FICD solenoid valve                          |         | latchesMA-21                                  | FE      |
| Idle air control valve (IACV)                     |         |   |         |
| Idle mixture ratio                                |         |   |         |
| Idle speed  |         | M   | CL      |
| Ignition coil                                     |         |   |         |
| Ignition timing                                   |         |   |         |
| ILL - Wiring diagram                              |         | Magnet clutch HA-133                          | MT      |
| Illumination                                      |         | Main drive gear (MT) MT-11                    |         |
| In vehicle sensor                                 |         | Mainshaft (MT) MT-11, 21                      |         |
| Inhibitor switch                                  |         | Maintenance MA-1                              | AT      |
|   |         | Maintenance (engine) MA-10                    |         |
| Injectorlpiector.rameval and installation         |         | Malfunction indicator lamp (MIL) EC-50        |         |
| Injector removal and installation                 | EU-2/   | Manual air conditioner - Wiring diagram HA-40 | FA      |
| Input shaft                                       |         | Manual transmission oil replacement MA-17     | 002     |
| Instrument panel                                  | BI-13   | MAP/BARO switch solenoid valve EC-277         |         |
| INT/L - Wiring diagram                            |         | Mass air flow sensor (MAFS) EC-104            | RA      |
| Intake air temperature sensor                     | EC-11/  | Master cylinder (brake) BR-7                  | 6 36 G  |
| Intake door control linkage adjustment            | 114     | Master cylinder (clutch) CL-6                 |         |
| (auto A/C)  | HA-113  | Meter EL-79                                   | BR      |
| Intake door control linkage adjustment            |         | METER - Wiring diagram EL-81                  |         |
| (manual A/C)                                      |         | MIL & Data link connectors circuit EC-379     |         |
| Intake door motor                                 |         | MIRROR - Wiring diagram EL-144                | ST      |
| Intake manifold                                   |         | Mirror, door BT-36                            | இர      |
| Integrated homelink transmitter                   | EL-305  | Mirror, out side                              |         |
| Interior  | BT-16   | Misfire EC-192                                | RS      |
| Interior lamp                                     | EL-71   | Mode door control linkage adjustment          | i ve    |
| Interior lamp on-off control                      |         |   |         |
| IVMS (In-Vehicle Multiplexing System)             |         | (auto A/C)                                    | BT      |
| IVMS-System description                           |         | Mode door control linkage adjustment          |         |
| IVMS-Trouble diagnoses                            |         | (manual A/C)                                  |         |
| IVMS-Trouble diagnoses system                     |         | Mode door motor HA-120                        | SLIL ØA |
| Trino Trouble diagnoses system                    | 22 100  | Molding - See ExteriorBT-22                   | HA      |
| <del>                                      </del> |         | MT removal and installationMT-7               |         |
| J   |         | Mud guard - See Exterior BT-22                | æ       |
|   |         | MULTI - Wiring diagram EL-243                 |         |
|   |         | Multi-remote control system EL-240            |         |
| Jacking points                                    |         | Multiport fuel injection (MFI) system EC-16   |         |
| Junction box (J/B)                                | Foldout |   | IDX     |
|   |         | N   |         |
| К   |         | IN .  |         |
| <b>N</b>  |         |   |         |
|   |         | Neutral position switch (MT) MT-7             |         |
|   |         | 140dital position synton (wit)                |         |

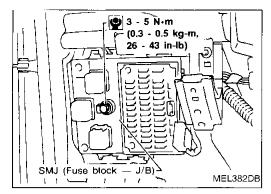
Key illumination..... EL-291

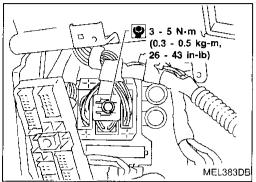
|                                      |        | Rear seat                            | BT-30           |
|--------------------------------------|--------|--------------------------------------|-----------------|
| 0                                    |        | Rear seat belt                       |                 |
|                                      |        | Rear suspension                      |                 |
|                                      |        |                                      |                 |
| Oil pan (engine)                     | EM-11  | Rear window                          |                 |
| Oil pressure (engine)                |        | Rear window defogger                 |                 |
|                                      |        | Refrigerant connection precaution    | HA-3            |
| Oil pump (AT)                        |        | Refrigerant general precaution       | HA-2            |
| Oil pump (engine)                    |        | Refrigerant lines                    |                 |
| Oil pump regulator valve (engine)    |        | Release bearing (clutch)             |                 |
| Oil seal replacement (engine)        | EM-31  | Reverse clutch                       |                 |
| Operating cylinder (clutch)          | CL-7   | Reverse gear (MT)                    |                 |
| Out side mirror                      |        |                                      |                 |
| Overdrive control switch             |        | Reverse idler shaft (MT)             |                 |
| Overrun clutch                       |        | Reverse lamp switch (MT) - See       |                 |
| Overrun clutch solenoid valve AT-    |        | Back-up lamp switch (MT)             |                 |
|                                      |        | Revolution sensor (AT)               | AT-69           |
| Oxygen sensor monitor (O2S) (front)  | EU-53  | Road wheel size                      | GI-38           |
|                                      |        | Roof trim                            | BT-20           |
| Р                                    |        | ROOM/L - Wiring diagram              |                 |
| ·                                    |        | TOOM = Trining diagram               |                 |
| DANKE AND P                          | EL 100 | S                                    |                 |
| P/ANT - Wiring diagram               |        |                                      |                 |
| Park/Neutral position switch         |        |                                      |                 |
| Parking brake control                | BR-21  | SAE J1979 - Mode 1 ~ 7               | EC-38 73        |
| Parking lamp                         | EL-56  | Seal - See Exterior                  |                 |
| PCV (positive crankcase ventilation) |        |                                      |                 |
| PHONE - Wiring diagram               |        | SEAT - Wiring diagram                |                 |
| Piston assembly                      |        | Seat belt inspection                 |                 |
|                                      |        | Seat belt, front                     | RS-3            |
| Piston pin inspection                |        | Seat belt, rear                      | RS-4            |
| Piston ring inspection               |        | Seat, front                          |                 |
| Piston to bore clearance             |        | Seat, rear                           |                 |
| POWER - Wiring diagram               | EL-7   | Self-diagnostic results              | FC-50           |
| Power antenna                        | EL-132 | SHIFT - Wiring diagram               |                 |
| Power door lock                      | EL-221 |                                      |                 |
| Power door mirror                    |        | Shift control (MT)                   |                 |
| Power seat                           |        | Shift fork (MT)                      |                 |
| Power steering fluid level M         |        | Shift lock system                    |                 |
|                                      |        | Shift schedule                       | AT-49           |
| Power steering gear                  |        | Shift solenoid                       |                 |
| Power steering hydraulic pressure    |        | valve (AT) AT-73, 76, 79, 8          | 35, 93, 99, 102 |
| Power steering oil pressure switch E |        | Shock absorber (rear)                |                 |
| Power steering oil pump              |        | Side trim                            |                 |
| Power steering system bleeding       | ST-5   | SMJ (super multiple junction)        |                 |
| Power supply routing                 | EL-6   |                                      |                 |
| Power transistor                     |        | Spark plug replacement               |                 |
| Power transistor & ignition coil     |        | Speedometer                          |                 |
| Power window                         |        | Spiral cable                         |                 |
| Pressure plate - See Clutch cover    |        | Spot lamp                            |                 |
|                                      |        | Spring (Wheelarch) height            | FA-5            |
| Pressure test (AT)                   | AI-129 | SROOF - Wiring diagram               |                 |
|                                      |        | SRS - See Supplemental Restraint     |                 |
| R                                    |        | System                               | BS-5            |
| Π                                    | ł      | SRS - Wiring diagram                 | DC 20           |
|                                      |        |                                      |                 |
| Darkata a                            | 1045   | SRS Trouble diagnoses                |                 |
| Radiator                             |        | Stabilizer bar (front)               |                 |
| Radio - See Audio                    |        | Stall test (AT)                      |                 |
| Rear air spoiler                     |        | Standardized relay                   |                 |
| Rear axle                            |        | START - Wiring diagram               | EL-30           |
| Rear bumper                          | BT-9   | Starter                              |                 |
| Rear disc brake                      |        | Starting system                      |                 |
| Rear door                            |        | Steering gear and linkage inspection |                 |
| Rear heated oxygen sensor (HO2S)     |        | Steering linkage                     |                 |
|                                      | LO 100 |                                      |                 |
| Rear heated oxygen sensor (HO2S)     | EC 454 | Steering switch                      |                 |
| heater                               | ⊏∪-154 | Steering wheel and column            | 51-8            |

| Steering wheel play                     | ST-4          | TURN - Wiring diagram                 | EL-66         |            |
|---|---------------|---------------------------------------|---------------|------------|
| Steering wheel turning force            | ST-6          | Turn signal lamp                      |               |            |
| Step lamp                               |               | Two trip detection logic              |               |            |
| STEP/L - Wiring diagram                 | EL-300        | ,                                     |               |            |
| Stop lamp                               |               |                                       |               | ~.         |
| STOP/L - Wiring diagram                 | EL-58         | U                                     |               | G1         |
| Striking rod (MT)                       |               |                                       |               |            |
| Strut (front)                           |               | Harden beeck                          | DT 00         |            |
| Sunload sensor                          |               | Under body                            | B1-39         | MA         |
| Sunroof                                 |               |                                       |               |            |
| Supplemental Restraint System           |               | V                                     |               |            |
| Supplemental restraint system - Wiring  |               |                                       |               | EM         |
| diagram                                 |               |                                       |               |            |
| SW/ILL - Wiring diagram                 |               | Vacuum cut valve                      | FC-322        |            |
| Synchronizer (MT)                       |               | Vacuum cut valve bypass valve         |               | LC         |
| System readiness test (SRT) code        |               | Vacuum hose (brake system)            |               |            |
| System readiness test (Strr) code       | 0-40          | Vacuum hose drawing (ECCS)            | FC-14         |            |
|   | <del></del> 1 | Valve clearance                       | EM-47         | EC         |
| ] T                                     |               | Valve guide                           |               |            |
|   |               | Valve seat                            |               |            |
|   |               |                                       |               | FE         |
| 2-pole lift                             | Gl-41         | Valve spring                          | ENI-40        |            |
| Tachometer                              | EL-81         | Vehicle recovery (freeing a stuck     | 01.40         |            |
| Tail lamp                               | EL-56         | vehicle)                              |               | CL         |
| TAIL/L - Wiring diagram                 |               | Vehicle speed sensor (VSS)            |               |            |
| Tank fuel temperature sensor            |               | Viscosity number (SAE)                |               |            |
| Telephone                               |               | Viscous coupling (FF AT)              | AT-215        | MT         |
| THEFT - Wiring diagram                  |               | Viscous coupling (FF MT)              | MT-7, 11      | 0000       |
| Theft warning system                    |               |                                       |               |            |
| Thermostat                              |               | W                                     |               | AT         |
| Three way catalyst                      |               | VV                                    |               | 2-40       |
|   |               |                                       |               |            |
| Three way catalyst function (Left bank) | J EU-222      | MADN Miring diagram                   | EI 00         | FA         |
| Three way catalyst function (Right      | FC 000        | WARN - Wiring diagram                 |               | n 10—77    |
| bank)                                   |               | Warning buzzer                        |               |            |
| Throttle bodies                         |               | Warning lamps                         |               | RA         |
| Throttle position sensor (TPS)          |               | Washer, front                         |               | n_0r=1     |
| Throttle position switch                |               | Water pump                            |               |            |
| Throwout bearing - See Clutch release   |               | Water temperature gauge               |               | <b>©</b>   |
| _ bearing                               |               | Weatherstrip - See Exterior           |               | BR         |
| Tie-rod                                 |               | Wheel alignment (front)               |               |            |
| Tie-rod ball joints                     |               | Wheel alignment (rear)                |               | <b>©</b> Т |
| Timing chain                            | EM-17         | Wheel balance                         |               | ST         |
| Tire rotation                           | MA-19         | Wheel bearing (front axle)            | FA-6          |            |
| Tire size                               | GI-38         | Wheel bearing (rear)                  | RA-4          | DØ.        |
| TLID - Wiring diagram                   | EL-145        | Wheel hub (rear)                      | RA-6          | RS         |
| Torque converter clutch                 |               | Wheel hub and steering knuckle        | FA-8          |            |
| solenoid valve A                        | T-85, 88, 93  | Wheel sensors (ABS)                   |               |            |
| Torque converter installation           |               | Wheelarch height                      |               | BT         |
| Tow truck towing                        |               | Wide open & closed throttle position  |               |            |
| Transmission case (MT)                  |               | switch                                | FC-128        |            |
| TRANSMT - Wiring diagram                |               | WINDOW - Wiring diagram               |               | HA         |
| Transverse link (front)                 |               | Window antenna                        |               |            |
| Trim                                    |               | Windshield                            |               |            |
|   |               |                                       |               | EL         |
| Triple pressure switch HA               |               | WIPER - Wiring diagram                |               |            |
| Trunk lid                               | B1-9          | Wiper and washer                      |               |            |
| Trunk lid opener - See Trunk lid        |               | Wiper, front                          |               | IDX        |
| Trunk lid opener, electric              |               | Withdrawal lever (clutch)             |               |            |
| Trunk room lamp                         |               | Wrist pin - See Piston pin inspection | <b>೬</b> M-55 |            |
| Trunk room trim                         | BT-21         |                                       |               |            |

**IDX-7** 1537

### SUPER MULTIPLE JUNCTION (SMJ)





### **INSTALLATION**

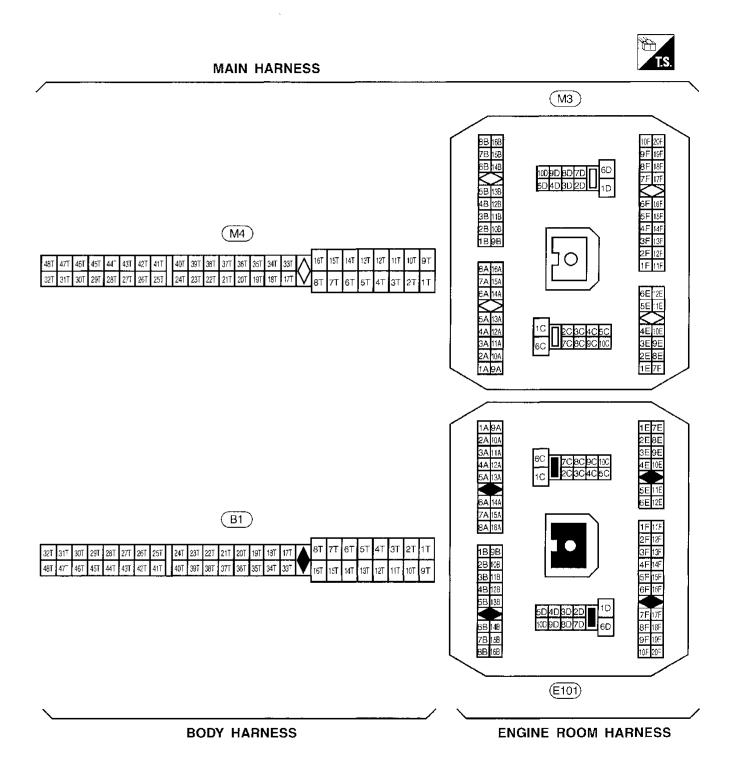
To install SMJ, tighten bolts until orange "fulltight" mark appears and then retighten to specified torque as required.

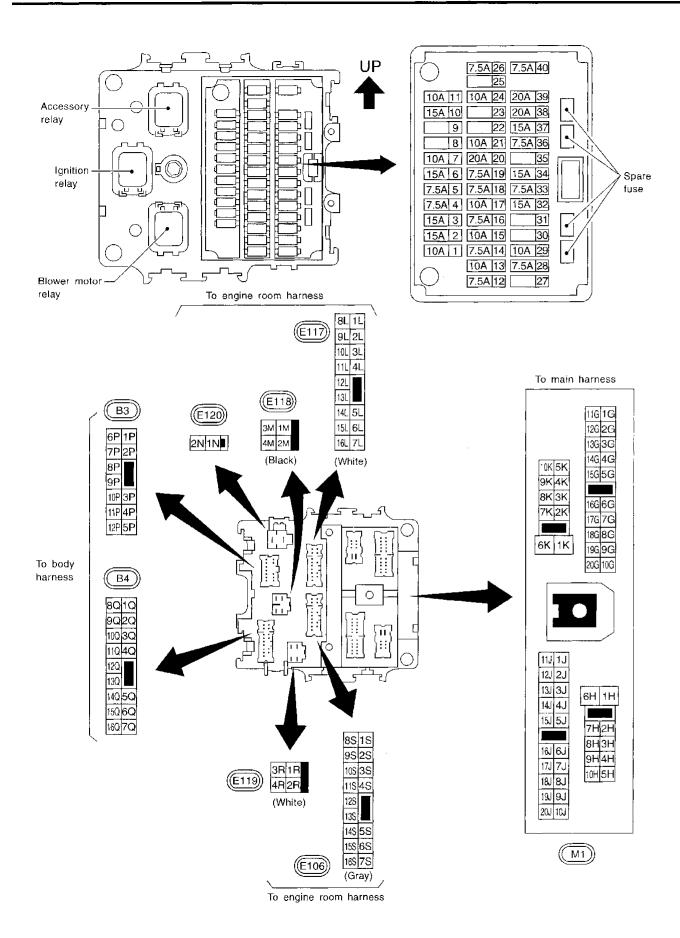
( : 3 - 5 N·m

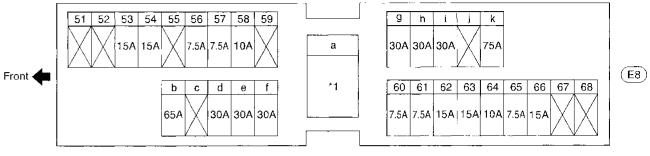
(0.3 - 0.5 kg-m, 26 - 43 in-lb)

**CAUTION:** 

Do not overtighten bolts, otherwise, they may be damaged.







No. 51-68 : FUSE

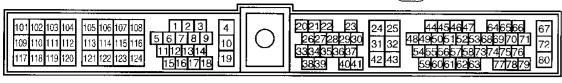
a-k : FUSIBLE LINK

\*1 120A : For California

140A: Except for California

MEL970G

### ECM (ECCS CONTROL MODULE) (F101)





### A/T CONTROL UNIT (F103)



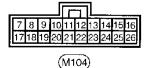


### ABS CONTROL UNIT (E114)

1 2 3 4 5 6 7 8 9 101112131415161718192021 22 23 24 25 26 27 28 29 30 31 32 33 34 3536373839404142434445464748 49 50 51 52 53 54 55 56575859606162636465666768697071727374757677787980818283



### **BCM (BODY CONTROL MODULE)**









A/C AUTO AMP. (In BCM)

