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# NISSAN

## MURANO

MODEL Z50 SERIES

### QUICK REFERENCE INDEX

| A GENERAL INFORMATION        | GI General Information                         |
|------------------------------|--|
| B ENGINE                     | EM Engine Mechanical                           |
|                              | LU Engine Lubrication System                   |
|                              | CO Engine Cooling System                       |
|                              | EC Engine Control System                       |
|                              | FL Fuel System                                 |
|                              | EX Exhaust System                              |
|                              | ACC Accelerator Control System                 |
| C TRANSMISSION/<br>TRANSAXLE | CVT CVT  |
| D DRIVELINE/AXLE             | TF Transfer                                    |
|                              | PR Propeller Shaft                             |
|                              | RFD Rear Final Drive                           |
|                              | FAX Front Axle                                 |
|                              | RAX Rear Axle                                  |
|                              | FSU Front Suspension                           |
| E SUSPENSION                 | RSU Rear Suspension                            |
|                              | WT Road Wheels & Tires                         |
|                              | BR Brake System                                |
| F BRAKES                     | PB Parking Brake System                        |
|                              | BRC Brake Control System                       |
|                              | PS Power Steering System                       |
| G STEERING                   | SB Seat Belts                                  |
| H RESTRAINTS                 | SRS Supplemental Restraint System (SRS)        |
|                              | BL Body, Lock & Security System                |
| I BODY                       | GW Glasses, Window System & Mirrors            |
|                              | RF Roof  |
|                              | EI Exterior & Interior                         |
|                              | IP Instrument Panel                            |
|                              | SE Seat  |
|                              | AP Adjustable Pedal                            |
|                              | ATC Automatic Air Conditioner                  |
|                              | SC Starting & Charging System                  |
| J AIR CONDITIONER            | LT Lighting System                             |
|                              | DI Driver Information System                   |
|                              | WW Wiper, Washer & Horn                        |
|                              | BCS Body Control System                        |
|                              | LAN LAN System                                 |
|                              | AV Audio Visual, Navigation & Telephone System |
|                              | ACS Auto Cruise Control System                 |
|                              | PG Power Supply, Ground & Circuit Elements     |
|                              | MA Maintenance                                 |
|                              | IDX Alphabetical Index                         |
| K ELECTRICAL                 |  |
|                              |  |
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| L MAINTENANCE                |  |
| M INDEX                      |  |

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# FOREWORD

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**This manual contains maintenance and repair procedure for the 2007 NISSAN MURANO.**

**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

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**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.**

**NISSAN MOTOR CO., LTD.**

QUICK REFERENCE CHART MURANO

PFP:00000

ENGINE TUNE-UP DATA (VQ35DE)

ELS0003W

|   |                       |                            |                              |                                      |  |  |
|---|-----------------------|----------------------------|------------------------------|--------------------------------------|--|--|
| Engine model  |                       |                            |                              | VQ35DE                               |  |  |
| Firing order  |                       |                            |                              | 1-2-3-4-5-6                          |  |  |
| Idle speed<br>CVT (In “P” or “N” position)rpm                         |                       |                            |                              | 650 ± 50                             |  |  |
| Ignition timing (BTDC at idle speed)<br>CVT (In “P” or “N” position)  |                       |                            |                              | 15° ± 5°                             |  |  |
| CO% at idle   |                       |                            |                              | 0.7 - 9.9 % and engine runs smoothly |  |  |
| Drive Belt  | Deflection adjustment |                            | Unit: mm (in)                | Tension adjustmentUnit: N (kg, lb)   |  |  |
|   | Used belt             |                            | New belt                     | Used belt                            |  | New belt                                     |
|   | Limit                 | After adjustment           |                              | Limit                                | After adjustment                         |  |
| Alternator and A/C compressor belt                                    | 7 (0.28)              | 4.2 - 4.6<br>(0.17 - 0.18) | 3.7 - 4.1<br>(0.15 - 0.16)   | 294 (30, 66)                         | 730 - 818<br>(74.5 - 83.5,<br>164 - 184) | 838 - 926<br>(85.5 - 94.5,<br>188 - 208)     |
| Power steering oil pump belt  | 11 (0.43)             | 7.3 - 8<br>(0.29 - 0.30)   | 6.5 - 7.2<br>(0.26- 0.28)    | 196 (20, 44)                         | 495 - 583<br>(50.5 - 59.5,<br>111 - 131) | 603 - 691<br>(61.5 - 70.5,<br>135.6 - 155.4) |
| Applied pushing force   | 98N (10kg, 22lb)      |                            |                              | —                                    |  |  |
| Radiator cap relief pressurekPa (kg/cm <sup>2</sup> , psi)            |                       |                            | 78 - 98 (0.8 - 1.0, 11 - 14) |                                      |  |  |
| Standard  |                       |                            |                              |                                      |  |  |
| Limit   |                       |                            |                              |                                      |  |  |
| Cooling system leakage testing pressurekPa (kg/cm <sup>2</sup> , psi) |                       |                            | 157 (1.6, 23)                |                                      |  |  |
| Compression pressurekPa (kg/cm <sup>2</sup> , psi)/rpm                |                       |                            | 1,275 (13.0, 185)/300        |                                      |  |  |
| Standard  |                       |                            |                              |                                      |  |  |
| Minimum   |                       |                            |                              |                                      |  |  |
| Spark plug  | Make                  |                            |                              | NGK                                  |  |  |
|   | Standard type         |                            |                              | PLFR5A-11                            |  |  |
|   | Hot type              |                            |                              | PLFR4A-11                            |  |  |
|   | Cold type             |                            |                              | PLFR6A-11                            |  |  |
|   | Gap (Nominal)mm (in)  |                            |                              | 1.1 (0.043)                          |  |  |

# FRONT WHEEL ALIGNMENT (Unladen\* )

ELS0003X

| Axle  |   |                           | 2DW                 | AWD            |
|---|---|---------------------------|---------------------|----------------|
| Camber<br>Degree minute (Decimal degree)              |   | Minimum                   | -1° 05' (-1.08°)    |                |
|   |   | Nominal                   | -0° 20' (-0.33°)    |                |
|   |   | Maximum                   | 0° 25' (0.41°)      |                |
|   |   | Left and right difference | 45' (0.75°) or less |                |
| Caster<br>Degree minute (Decimal degree)              |   | Minimum                   | 1° 45' (1.75°)      | 1° 50' (1.83°) |
|   |   | Nominal                   | 2° 30' (2.50°)      | 2° 35' (2.58°) |
|   |   | Maximum                   | 3° 15' (3.25°)      | 3° 20' (3.33°) |
|   |   | Left and right difference | 45' (0.75°) or less |                |
| Kingpin inclination<br>Degree minute (Decimal degree) |   | Minimum                   | 13° 35' (13.58°)    |                |
|   |   | Nominal                   | 14° 20' (14.33°)    |                |
|   |   | Maximum                   | 15° 05' (15.08°)    |                |
| Total toe-in  | Distance  | Minimum                   | -0.5 mm (-0.02 in)  |                |
|   |   | Nominal                   | 0.5 mm (0.02 in)    |                |
|   |   | Maximum                   | 1.5 mm (0.06 in)    |                |
|   | Angle (left wheel or right wheel)<br>Degree minute (Decimal degree) | Minimum                   | -1' (-0.02°)        |                |
|   |   | Nominal                   | 1' (0.02°)          |                |
|   |   | Maximum                   | 3' (0.05°)          |                |
| Wheel turning angle<br>(Full turn)                    | Inside<br>Degree minute (Decimal degree)                            | Minimum                   | 34° 30' (34.5°)     |                |
|   |   | Nominal                   | 38° 00' (38.0°)     |                |
|   |   | Maximum                   | 39° 00' (39.0°)     |                |
|   | Outside<br>Degree minute (Decimal degree)                           | Nominal                   | 31° 30' (31.5°)     |                |

\* : Fuel, engine coolant and lubricant are oil full. Spare tire, jack, hand tools and mats are in designated positions.

# REAR WHEEL ALIGNMENT (Unladen\*)

ELS0003Y

|  |   |         |                   |  |
|--|---|---------|-------------------|--|
| Camber<br>Degree minute (Decimal degree) |   | Minimum | -1° 16' (-1.27°)  |  |
|  |   | Nominal | -0° 46' (-0.77°)  |  |
|  |   | Maximum | -0° 16' (-0.27°)  |  |
| Total toe-in                             | Distance  | Minimum | 1.4 mm (0.055 in) |  |
|  |   | Nominal | 3.2 mm (0.126 in) |  |
|  |   | Maximum | 5.0 mm (0.197 in) |  |
|  | Angle (left wheel or right wheel)<br>Degree minute (Decimal degree) | Minimum | 3' (0.05°)        |  |
|  |   | Nominal | 7' (0.12°)        |  |
|  |   | Maximum | 11' (0.18°)       |  |

\* : Fuel, engine coolant and lubricant are oil full. Spare tire, jack, hand tools and mats are in designated positions.

**BRAKE**

ELS0003Z

|                         |                            |                                   |
|-------------------------|----------------------------|-----------------------------------|
| Front brake             | Pad repair limit thickness | 2.0mm (0.079 in)                  |
|                         | Rotor wear limit           | 26.0 mm (1.024 in)                |
| Rear brake              | Pad repair limit thickness | 2.0 mm (0.079 in)                 |
|                         | Rotor wear limit           | 14.0 mm (0.551 in)                |
| Brake pedal height      |                            | 199.5 - 209.5 mm (7.85 - 8.25 in) |
| Depressed pedal height* |                            | More than 120 mm (4.72 in)        |

\* : Under a force of 490 N( 50 kg, 110 lb ) with engine running.

**REFILL CAPACITIES**

ELS00040

| UNIT   |                           | Liter    | US measure |
|--|---------------------------|----------|------------|
| Fuel tank                                      |                           | 82       | 21-5/8 gal |
| Coolant ( With reservoir tank at "MAX" level ) |                           | 9.1      | 9-5/8 qt   |
| Engine   | Drain and refill          |          |            |
|  | With oil filter change    | 4.0      | 4-1/4 qt   |
|  | Without oil filter change | 3.7      | 3-7/8 qt   |
|  | Dry engine (Overhaul)     | 5.0      | 5-1/4 qt   |
| Transmission                                   | CVT                       | 10.2     | 10-6/8 qt  |
| Transfer                                       |                           | 0.31     | 5/8 pt     |
| Differential carrier                           |                           | 0.55     | 1-1/8 pt   |
| Power steering system                          |                           | 1.0      | 1-1/8 qt   |
| Air conditioning system                        | Compressor oil            | 0.15     | 5.03 fl oz |
|  | Refrigerant               | 0.525 kg | 1.16 lb    |

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## SECTION

## GI

## GENERAL INFORMATION

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## PRECAUTIONS

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### Description

NAS0004K

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

### Precautions for Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER"

NAS0004L

The Supplemental Restraint System such as "AIR BAG" and "SEAT BELT PRE-TENSIONER", used along with a front seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. This system includes seat belt switch inputs and dual stage front air bag modules. The SRS system uses the seat belt switches to determine the front air bag deployment, and may only deploy one front air bag, depending on the severity of a collision and whether the front occupants are belted or unbelted. Information necessary to service the system safely is included in the SRS and SB 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/INFINITI dealer.
- Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see the SRS section.
- Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses can be identified by yellow and/or orange harnesses or harness connectors.

### Precautions for NVIS/IVIS (NISSAN/INFINITI VEHICLE IMMOBILIZER SYSTEM - NATS) (If Equipped)

NAS0004M

NVIS/IVIS (NATS) will immobilize the engine if someone tries to start it without the registered key of NVIS/IVIS (NATS).

Both of the originally supplied ignition key IDs have been NVIS/IVIS (NATS) registered.

The security indicator is located on the instrument panel. The indicator blinks when the immobilizer system is functioning.

Therefore, NVIS/IVIS (NATS) warns outsiders that the vehicle is equipped with the anti-theft system.

- When NVIS/IVIS (NATS) detects trouble, the security indicator lamp lights up while ignition switch is in "ON" position.  
This lighting up indicates that the anti-theft is not functioning, so prompt service is required.
- When servicing NVIS/IVIS (NATS) (trouble diagnoses, system initialization and additional registration of other NVIS/IVIS (NATS) ignition key IDs), CONSULT-II hardware and CONSULT-II NVIS/IVIS (NATS) software is necessary.  
Regarding the procedures of NVIS/IVIS (NATS) initialization and NVIS/IVIS (NATS) ignition key ID registration, refer to CONSULT-II operation manual, NVIS/IVIS (NATS).

**Therefore, CONSULT-II NVIS/IVIS (NATS) software (program card and operation manual) must be kept strictly confidential to maintain the integrity of the anti-theft function.**

- When servicing NVIS/IVIS (NATS) (trouble diagnoses, system initialization and additional registration of other NVIS/IVIS (NATS) ignition key IDs), it may be necessary to re-register original key identification. Therefore, be sure to receive all keys from vehicle owner. A maximum of four or five key IDs can be registered into NVIS/IVIS (NATS).
- When failing to start the engine first time using the key of NVIS/IVIS (NATS), start as follows.
  1. Leave the ignition key in "ON" position for approximately 5 seconds.
  2. Turn ignition key to "OFF" or "LOCK" position and wait approximately 5 seconds.
  3. Repeat step 1 and 2 again.
  4. Restart the engine while keeping the key separate from any others on key-chain.

# PRECAUTIONS

## Precautions Necessary for Steering Wheel Rotation After Battery Disconnect

NAS0005T

### NOTE:

- This Procedure is applied only to models with Intelligent Key system and NVIS/IVIS (NISSAN/INFINITI VEHICLE IMMOBILIZER SYSTEM - NATS).
- Remove and install all control units after disconnecting both battery cables with the ignition knob in the "LOCK" position.
- Always use CONSULT-II to perform self-diagnosis as a part of each function inspection after finishing work. If DTC is detected, perform trouble diagnosis according to self-diagnostic results.

For models equipped with the Intelligent Key system and NVIS/IVIS, an electrically controlled steering lock mechanism is adopted on the key cylinder.

For this reason, if the battery is disconnected or if the battery is discharged, the steering wheel will lock and steering wheel rotation will become impossible.

If steering wheel rotation is required when battery power is interrupted, follow the procedure below before starting the repair operation.

### OPERATION PROCEDURE

1. Connect both battery cables.

#### NOTE:

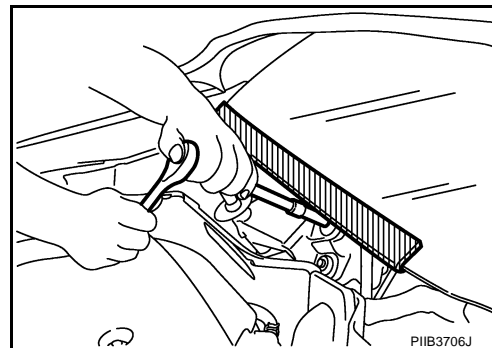
Supply power using jumper cables if battery is discharged.

2. Use the Intelligent Key or mechanical key to turn the ignition switch to the "ACC" position. At this time, the steering lock will be released.
3. Disconnect both battery cables. The steering lock will remain released and the steering wheel can be rotated.
4. Perform the necessary repair operation.
5. When the repair work is completed, return the ignition switch to the "LOCK" position before connecting the battery cables. (At this time, the steering lock mechanism will engage.)
6. Perform a self-diagnosis check of all control units using CONSULT-II.

## Precautions for Procedures without Cowl Top Cover

NAS0005U

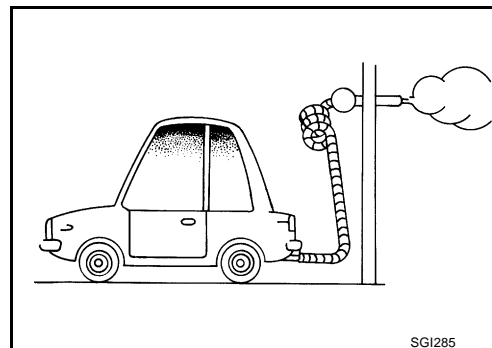
When performing the procedure after removing cowl top cover, cover the lower end of windshield with urethane, etc.



## General Precautions

NAS0004O

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

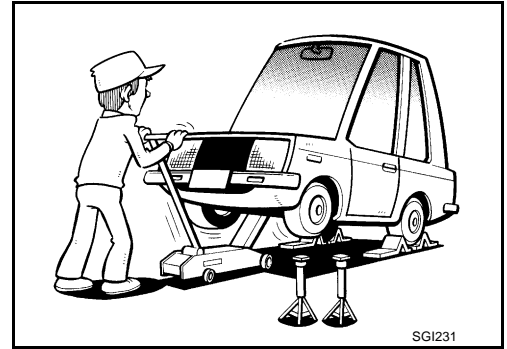


## PRECAUTIONS

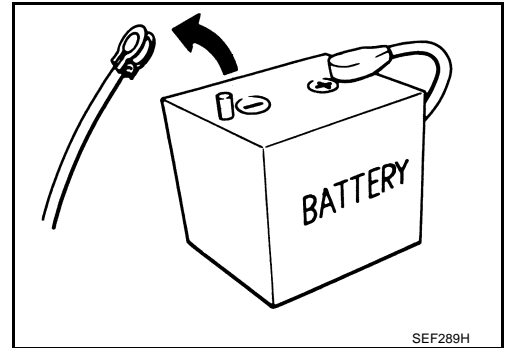
- Before jacking up the vehicle, apply wheel chocks or other tire blocks to the wheels to prevent the vehicle from moving. After jacking up the vehicle, support the vehicle weight with safety stands at the points designated for proper lifting before working on the vehicle.

These operations should be done on a level surface.

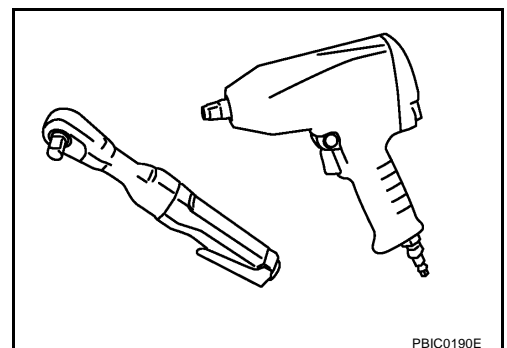
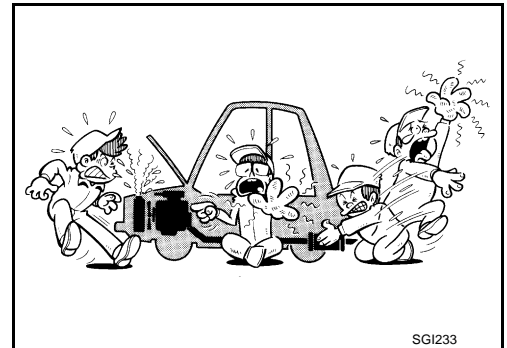
- When removing a heavy component such as the engine or transaxle/transmission, be careful not to lose your balance and drop them. Also, do not allow them to strike adjacent parts, especially the brake tubes and master cylinder.



- Before starting repairs which do not require battery power:  
Turn off ignition switch.  
Disconnect the negative battery terminal.
- If the battery terminals are disconnected, recorded memory of radio and each control unit is erased.
- Battery posts, terminals and related accessories contain lead and lead compounds. Wash hands after handling.



- To prevent serious burns:  
Avoid contact with hot metal parts.  
Do not remove the radiator cap when the engine is hot.
- Dispose of or recycle drained oil or the solvent used for cleaning parts in an appropriate manner.
- Do not attempt to top off the fuel tank after the fuel pump nozzle shuts off automatically.  
Continued refueling may cause fuel overflow, resulting in fuel spray and possibly a fire.
- Clean all disassembled parts in the designated liquid or solvent prior to inspection or assembly.
- Replace oil seals, gaskets, packings, O-rings, locking washers, cotter pins, self-locking nuts, etc. with new ones.
- Replace inner and outer races of tapered roller bearings and needle bearings as a set.
- Arrange the disassembled parts in accordance with their assembled locations and sequence.
- Do not touch the terminals of electrical components which use microcomputers (such as ECM).  
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 hand tools, power tools (disassembly only) 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.



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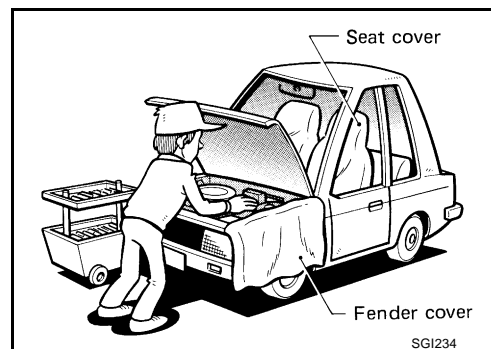
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## PRECAUTIONS

- Before servicing the vehicle:
  - Protect fenders, upholstery and carpeting with appropriate covers.
  - Take caution that keys, buckles or buttons do not scratch paint.



### **WARNING:**

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

### **Precautions for Three Way Catalyst**

NAS0004P

If a large amount of unburned fuel flows into the catalyst, the catalyst temperature will be excessively high. To prevent this, follow the instructions.

- 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 Fuel (Unleaded Premium Gasoline Recommended)**

NAS0004Q

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

For improved vehicle performance, NISSAN/INFINITI recommend the use of unleaded premium gasoline with an octane rating of at least 91 AKI number (Research octane number 96).

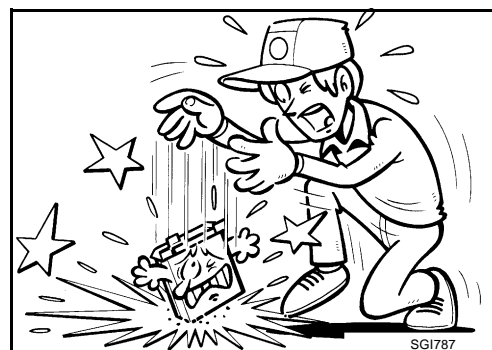
### **CAUTION:**

**Do not use leaded gasoline. Using leaded gasoline will damage the three way catalyst. Do not use E-85 fuel (85% fuel ethanol, 15% unleaded gasoline) unless the vehicle is specifically designed for E-85 fuel (i.e. Flexible Fuel Vehicle - FFV models). 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 Multiport Fuel Injection System or Engine Control System**

NAS0004R

- Before connecting or disconnecting any harness connector for the multiport fuel injection system or ECM:
  - 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.



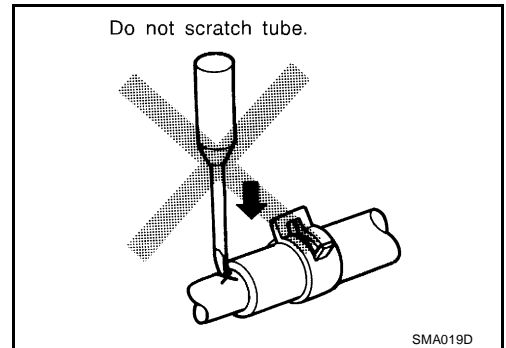
# PRECAUTIONS

## Precautions for Hoses

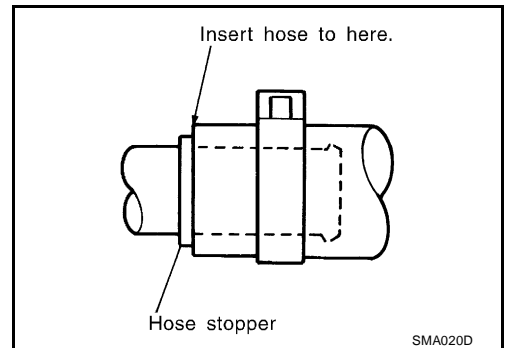
NAS0004S

### HOSE REMOVAL AND INSTALLATION

- To prevent damage to rubber hose, do not pry off rubber hose with tapered tool or screwdriver.

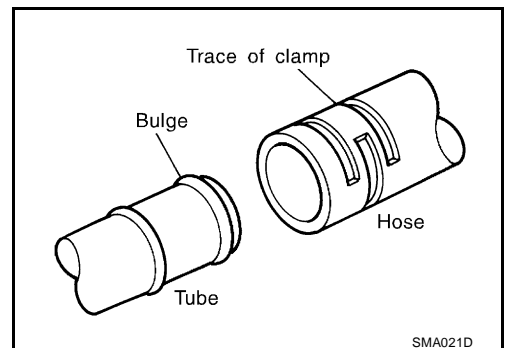


- To reinstall the rubber hose securely, make sure that hose insertion length and orientation is correct. (If tube is equipped with hose stopper, insert rubber hose into tube until it butts up against hose stopper.)

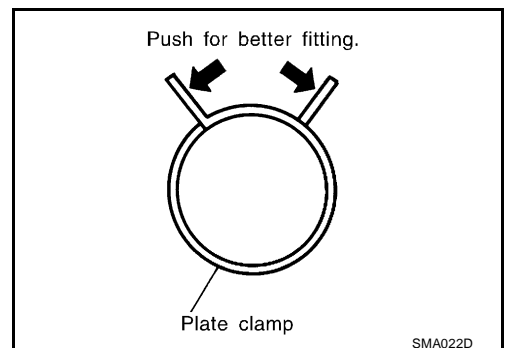


### HOSE CLAMPING

- If old rubber hose is re-used, install hose clamp in its original position (at the indentation where the old clamp was). If there is a trace of tube bulging left on the old rubber hose, align rubber hose at that position.
- Discard old clamps; replace with new ones.



- After installing plate clamps, apply force to them in the direction of the arrow, tightening rubber hose equally all around.



## Precautions for Engine Oils

NAS0004T

Prolonged and repeated contact with used engine oil may cause skin cancer. Try to avoid direct skin contact with used oil.

If skin contact is made, wash thoroughly with soap or hand cleaner as soon as possible.

### HEALTH PROTECTION PRECAUTIONS

- Avoid prolonged and repeated contact with oils, particularly used engine oils.

## PRECAUTIONS

---

- Wear protective clothing, including impervious gloves where practicable.
- Do not put oily rags in pockets.
- Avoid contaminating clothes, particularly underpants, with oil.
- Heavily soiled clothing and oil-impregnated footwear should not be worn. Overalls must be cleaned regularly.
- First aid treatment should be obtained immediately for open cuts and wounds.
- Use barrier creams, applying them before each work period, to help the removal of oil from the skin.
- Wash with soap and water to ensure all oil is removed (skin cleansers and nail brushes will help). Preparations containing lanolin replace the natural skin oils which have been removed.
- Do not use gasoline, kerosene, diesel fuel, gas oil, thinners or solvents for cleaning skin.
- If skin disorders develop, obtain medical advice without delay.
- Where practical, 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.

### Precautions for Air Conditioning

NAS0004U

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

## HOW TO USE THIS MANUAL

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GI

### Description

NAS0004V

This volume explains "Removal, Disassembly, Installation, Inspection and Adjustment" and "Trouble Diagnoses".

### Terms

NAS0004W

- 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.  
Standard value: Tolerance at inspection and adjustment.  
Limit value: The maximum or minimum limit value that should not be exceeded at inspection and adjustment.

### Units

NAS0004X

- The **UNITS** given in this manual are primarily expressed as the SI UNIT (International System of Unit), and alternatively expressed in the metric system and in the yard/pound system.  
Also with regard to tightening torque of bolts and nuts, there are descriptions both about range and about the standard tightening torque.

#### "Example"

##### Range

**Outer Socket Lock Nut : 59 - 78 N-m (6.0 - 8.0 kg-m, 43 - 58 ft-lb)**

##### Standard

**Drive Shaft Installation Bolt : 44.3 N-m (4.5 kg-m, 33 ft-lb)**

### Contents

NAS0004Y

- 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. **BR**) is provided on the first page. You can quickly find the first page of each section by matching 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 or three letters which designate the particular section and a number (e.g. "BR-5").
- THE SMALL ILLUSTRATIONS** show the important steps such as inspection, use of special tools, knacks of work and hidden or tricky steps which are not shown in the previous large illustrations.  
Assembly, inspection and adjustment procedures for the complicated units such as the automatic transaxle or transmission, etc. are presented in a step-by-step format where necessary.

# HOW TO USE THIS MANUAL

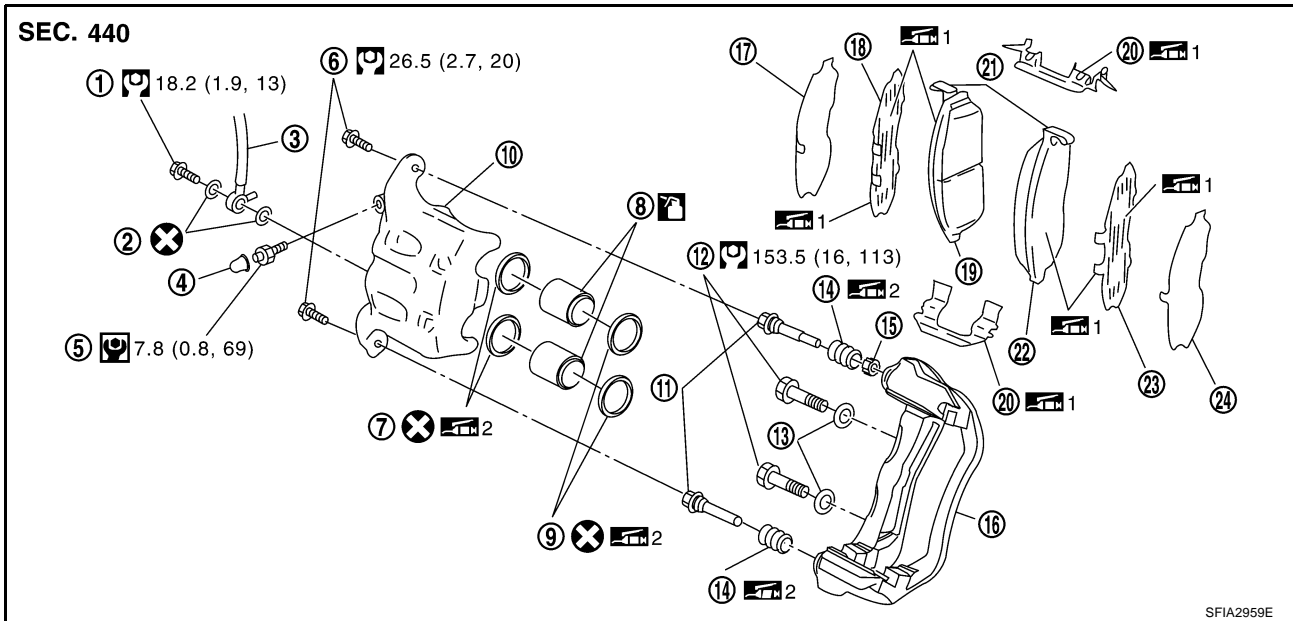
## Components

NAS0004Z

- **THE LARGE ILLUSTRATIONS** are exploded views (see the following) 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**.

Components shown in an illustration may be identified by a circled number. When this style of illustration is used, the text description of the components will follow the illustration.



- |                   |                      |                                 |
|-------------------|----------------------|---------------------------------|
| 1. Union bolt     | 2. Copper washer     | 3. Brake hose                   |
| 4. Cap            | 5. Bleed valve       | 6. Sliding pin bolt             |
| 7. Piston seal    | 8. Piston            | 9. Piston boot                  |
| 10. Cylinder body | 11. Sliding pin      | 12. Torque member mounting bolt |
| 13. Washer        | 14. Sliding pin boot | 15. Bushing                     |
| 16. Torque member | 17. Inner shim cover | 18. Inner shim                  |
| 19. Inner pad     | 20. Pad retainer     | 21. Pad wear sensor             |
| 22. Outer pad     | 23. Outer shim       | 24. Outer shim cover            |

1: PBC (Poly Butyl Cuprysil) grease 2: Rubber grease or silicone-based grease

: Brake fluid

Refer to GI section for additional symbol definitions.

## SYMBOLS

| SYMBOL | DESCRIPTION   | SYMBOL | DESCRIPTION                             |
|--------|---|--------|---|
|        | Tightening torque<br>The tightening torque specifications of bolts and nuts may be presented as either a range or a standard tightening torque. |        | Always replace after every disassembly. |
|        | : N•m (kg-m, ft-lb)<br>: N•m (kg-m, in-lb)  |        | Apply petroleum jelly.                  |
|        | Should be lubricated with grease. Unless otherwise indicated, use recommended multi-purpose grease.   |        | Apply molybdenum added petroleum jelly. |
|        | Should be lubricated with oil.  |        | Apply ATF.                              |
|        | Sealing point   |        | Select with proper thickness.           |
|        | Sealing point with locking sealant.   |        | Adjustment is required.                 |
|        | Checking point  |        |   |

SAIA0749E



# HOW TO USE THIS MANUAL

## How to Follow Trouble Diagnoses

NAS00050

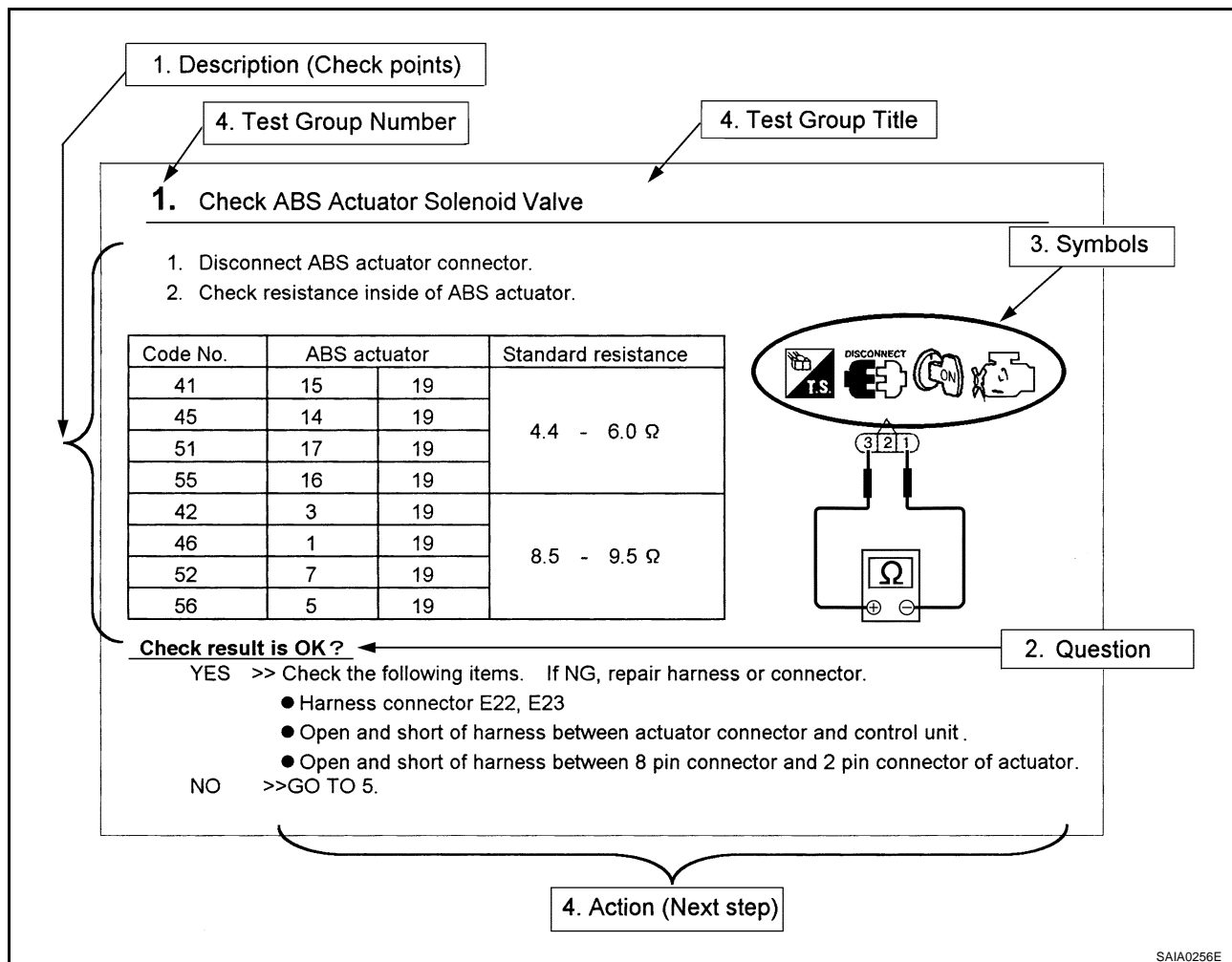
### DESCRIPTION

#### NOTICE:

Trouble diagnoses indicate work procedures required to diagnose problems effectively. Observe the following instructions before diagnosing.

1. Before performing trouble diagnoses, read the "Preliminary Check", the "Symptom Chart" or the "Work Flow".
2. After repairs, re-check that the problem has been completely eliminated.
3. Refer to Component Parts and Harness Connector Location for the Systems described in each section for identification/location of components and harness connectors.
4. Refer to the Circuit Diagram for quick pinpoint check.  
If you need to 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 PG section for identification of harness connectors.
5. When checking circuit continuity, ignition switch should be OFF.
6. Before checking voltage at connectors, check battery voltage.
7. After accomplishing the Diagnostic Procedures and Electrical Components Inspection, make sure that all harness connectors are reconnected as they were.

### HOW TO FOLLOW TEST GROUPS IN TROUBLE DIAGNOSES



1. **Work and diagnostic procedure**  
Start to diagnose a problem using procedures indicated in enclosed test groups.
2. **Questions and required results**  
Questions and required results are indicated in bold type in test group.  
The meaning of are as follows:

## HOW TO USE THIS MANUAL

a. Battery voltage → 11 - 14V or approximately 12V

b. Voltage : Approximately 0V → Less than 1V

3. **Symbol used in illustration**

Symbols included in illustrations refer to measurements or procedures. Before diagnosing a problem, familiarize yourself with each symbol. Refer to "Connector Symbols" in GI Section and "KEY TO SYMBOLS SIGNIFYING MEASUREMENTS OR PROCEDURES" below.

4. **Action items**

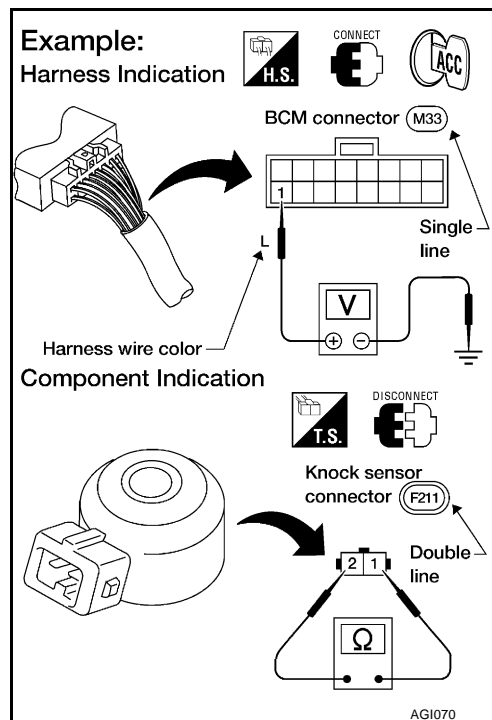
Next action for each test group is indicated based on result of each question. Test group number is shown in the left upper portion of each test group.

### HARNESS WIRE COLOR AND CONNECTOR NUMBER INDICATION

There are two types of harness wire color and connector number indication.

#### TYPE 1: Harness Wire Color and Connector Number are Shown in Illustration

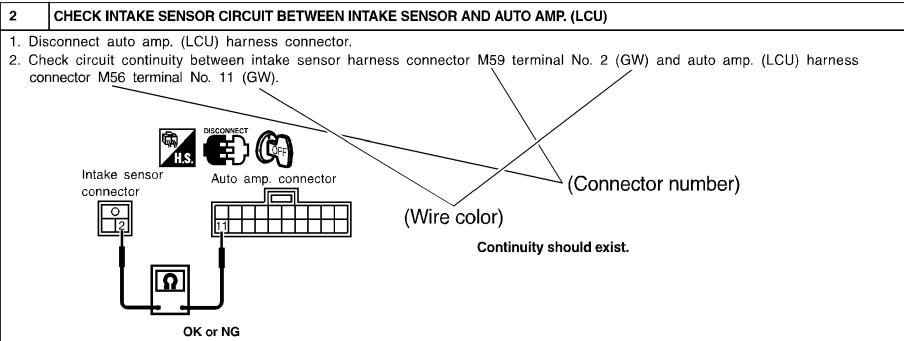
- Letter designations next to test meter probe indicate harness wire color.
- Connector numbers in a single circle (e.g. M33) indicate harness connectors.
- Connector numbers in a double circle (e.g. F211) indicate component connectors.



# HOW TO USE THIS MANUAL

## TYPE 2: Harness Wire Color and Connector Number are Shown in Text

### Example 1:



### Example 2:

**POWER SUPPLY AND GROUND CIRCUIT CHECK**

**Power Supply Circuit Check**

~NCEL00-16507  
NCEL00-1650701

| Terminals |                       | Ignition switch position |                 |                 |
|-----------|-----------------------|--------------------------|-----------------|-----------------|
| (+)       | (-)                   | OFF                      | ACC             | ON              |
| Connector | Terminal (Wire color) |                          |                 |                 |
| M40       | 37 (Y)                | Ground                   | Battery voltage | Battery voltage |
| M41       | 1 (Y)                 | Ground                   | 0V              | 0V              |
|           |                       |                          | Battery voltage | Battery voltage |

If NG, check the following.

- 7.5A fuse (No. 5, located in fuse block (J/B))
- 10A fuse (No. 11, located in fuse block (J/B))
- Harness for open or short between fuse and combination meter

Connector number    Wire color
















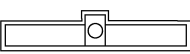
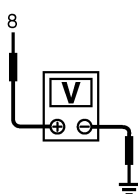













SGI144A

## KEY TO SYMBOLS SIGNIFYING MEASUREMENTS OR PROCEDURES

| SYMBOL | DESCRIPTION   | SYMBOL | DESCRIPTION   |
|--------|---|--------|---|
|        | Check after disconnecting the connector to be measured. |        | Procedure with Generic Scan Tool. (GST, OBD-II scan tool)             |
|        | Check after connecting the connector to be measured.    |        | Procedure without CONSULT, CONSULT-II or GST                          |
|        | Insert key into ignition switch.                        |        | A/C switch is "OFF".  |
|        | Remove key from ignition switch.                        |        | A/C switch is "ON".   |
|        | Insert and remove key repeatedly.                       |        | REC switch is "ON".   |
|        | Turn ignition switch to "OFF" position.                 |        | REC switch is "OFF".  |
|        | Turn ignition switch to "ACC" position.                 |        | Fan switch is "ON". (At any position except for "OFF" position)       |
|        | Turn ignition switch to "ON" position.                  |        | Fan switch is "OFF".  |
|        | Turn ignition switch to "START" position.               |        | Apply fuse.   |
|        | Turn ignition switch from "OFF" to "ACC" position.      |        | Apply positive voltage from battery with fuse directly to components. |
|        | Turn ignition switch from "ACC" to "ON" position.       |        |   |
|        | Turn ignition switch from "ACC" to "OFF" position.      |        |   |

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# HOW TO USE THIS MANUAL

| SYMBOL  | DESCRIPTION   | SYMBOL   | DESCRIPTION  |
|---|---|--|--|
|    | Turn ignition switch from "OFF" to "ON" position.       |   | Drive vehicle.   |
|    | Turn ignition switch from "ON" to "OFF" position.       |  |  |
|    | Do not start engine, or check with engine stopped.      |   | Disconnect battery negative cable.   |
|    | Start engine, or check with engine running.             |   | Depress brake pedal.   |
|    | Apply parking brake.                                    |   | Release brake pedal.   |
|    | Release parking brake.                                  |   | Depress accelerator pedal.   |
|    | Check after engine is warmed up sufficiently.           |   | Release accelerator pedal.   |
|    | Voltage should be measured with a voltmeter.            | <br><br> | Pin terminal check for SMJ type ECM or TCM connectors.<br><b>For details regarding the terminal arrangement, refer to the "ELECTRICAL UNITS" electrical reference page at the end of the manual.</b> |
|    | Circuit resistance should be measured with an ohmmeter. |  |  |
|    |   |  |  |
|  | Current should be measured with an ammeter.             |  |  |
|  | Pulse signal should be checked with an oscilloscope.    |  |  |
|  | Procedure with CONSULT-II                               |  |  |
|  | Procedure without CONSULT-II                            |  |  |
|  | Place selector lever in "P" position.                   |  |  |
|  | Place selector lever in "N" position.                   |  |  |
|  | Jack up front portion.                                  |  |  |
|  | Jack up rear portion.                                   |  |  |
|  | Inspect under engine room.                              |  |  |
|  | Inspect under floor.                                    |  |  |
|  | Inspect rear under floor.                               |  |  |

SAIA0751E

SAIA0751E

# HOW TO USE THIS MANUAL

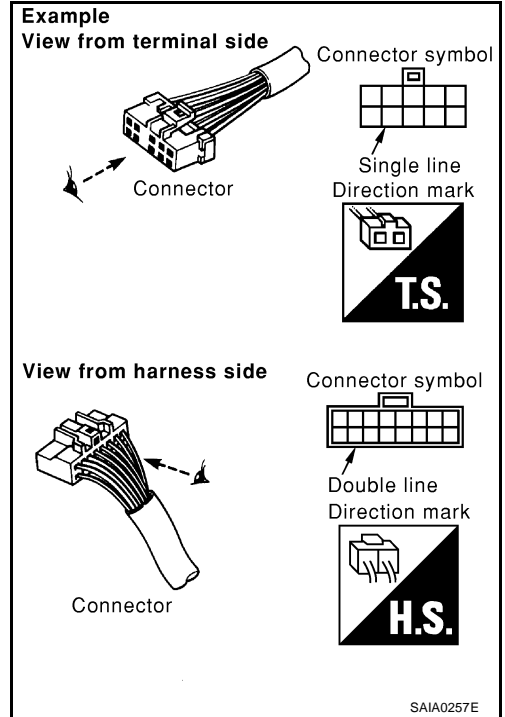
## How to Read Wiring Diagrams CONNECTOR SYMBOLS

NAS00051

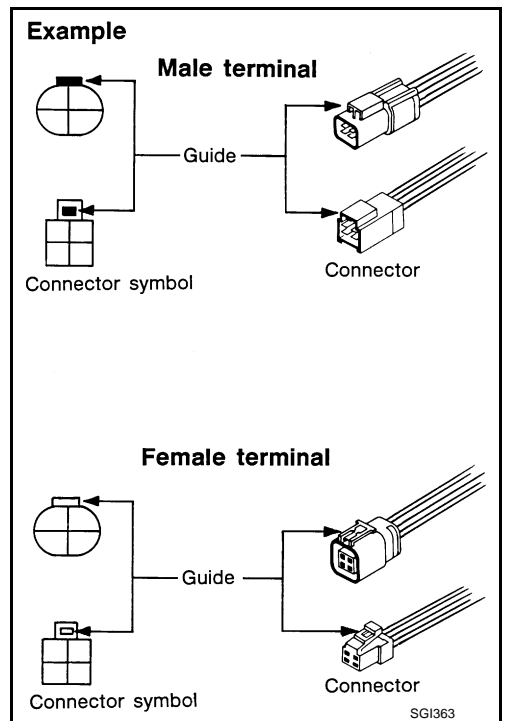
GI

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

- Connector symbols shown from the terminal side are enclosed by a single line and followed by the direction mark.
- Connector symbols shown from the harness side are enclosed by a double line and followed by the direction mark.
- Certain systems and components, especially those related to OBD, may use a new style slide-locking type harness connector. For description and how to disconnect, refer to PG section, "Description", "HARNESS CONNECTOR".



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



B

C

D

E

F

G

H

I

J

K

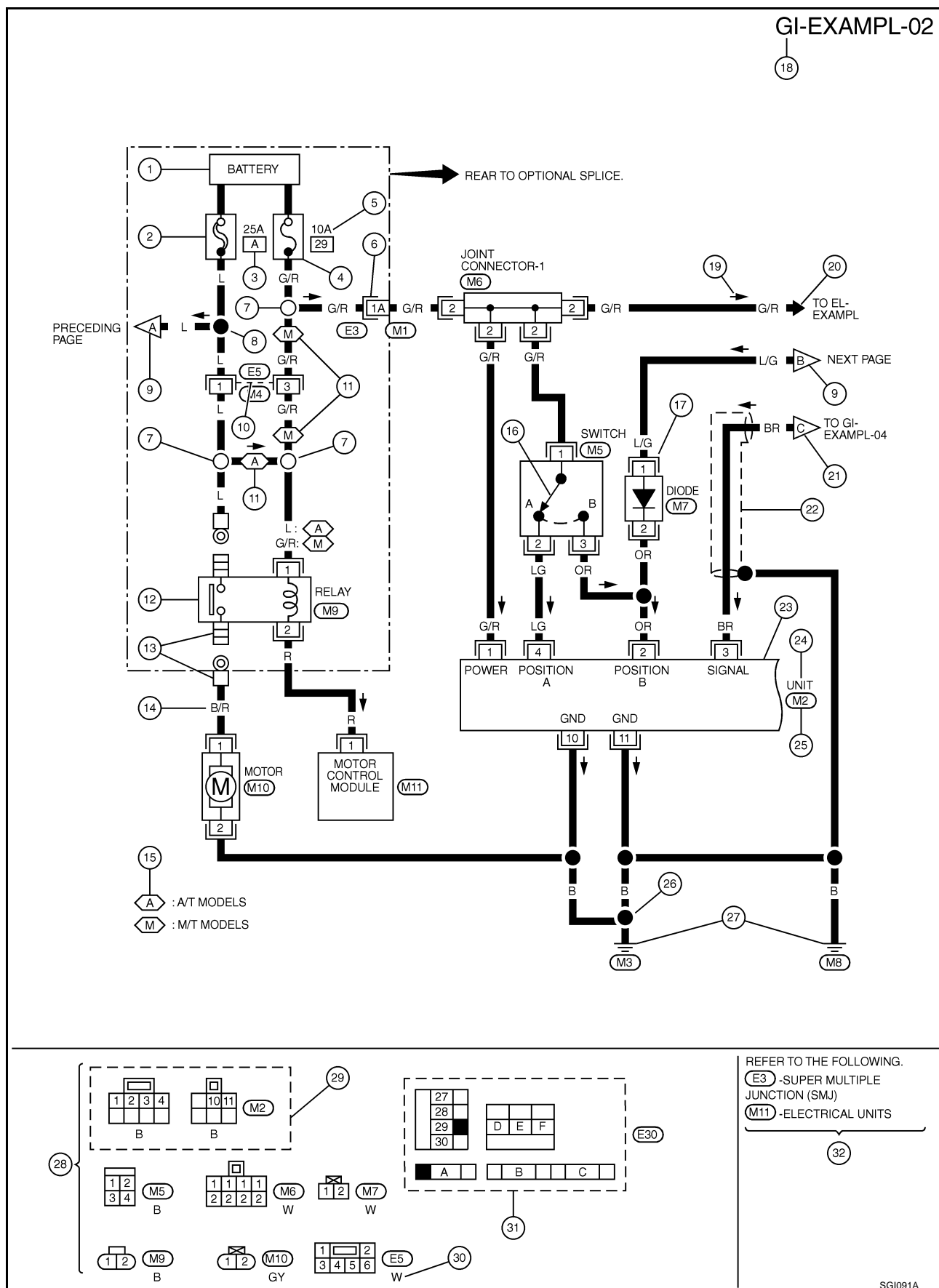
L

M

## HOW TO USE THIS MANUAL

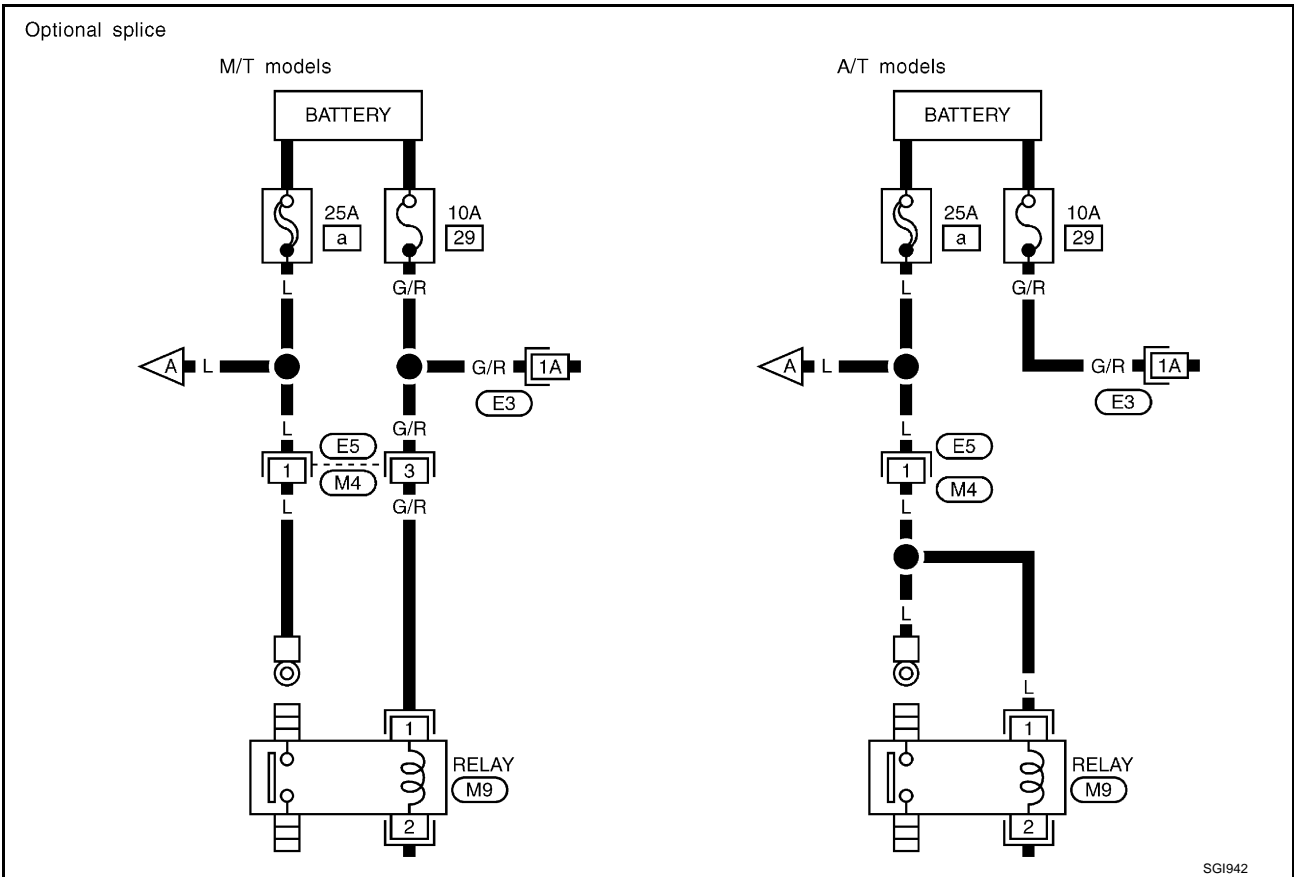
### SAMPLE/WIRING DIAGRAM - EXAMPL -

- For detail, refer to following “DESCRIPTION”.



# HOW TO USE THIS MANUAL

## Optional Splice



## DESCRIPTION

| Number | Item                       | Description  |
|--------|----------------------------|--|
| 1      | Power condition            | <ul style="list-style-type: none"> <li>This shows the condition when the system receives battery positive voltage (can be operated).</li> </ul>  |
| 2      | Fusible link               | <ul style="list-style-type: none"> <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 | <ul style="list-style-type: none"> <li>This shows the location of the fusible link or fuse in the fusible link or fuse box. For arrangement, refer to PG section, POWER SUPPLY ROUTING.</li> </ul>   |
| 4      | Fuse                       | <ul style="list-style-type: none"> <li>The single line shows that this is a fuse.</li> <li>The open circle shows current flow in, and the shaded circle shows current flow out.</li> </ul>   |
| 5      | Current rating             | <ul style="list-style-type: none"> <li>This shows the current rating of the fusible link or fuse.</li> </ul>   |
| 6      | Connectors                 | <ul style="list-style-type: none"> <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 PG section, SMJ (SUPER MULTIPLE JUNCTION).</li> </ul> |
| 7      | Optional splice            | <ul style="list-style-type: none"> <li>The open circle shows that the splice is optional depending on vehicle application.</li> </ul>  |
| 8      | Splice                     | <ul style="list-style-type: none"> <li>The shaded circle shows that the splice is always on the vehicle.</li> </ul>  |
| 9      | Page crossing              | <ul style="list-style-type: none"> <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           | <ul style="list-style-type: none"> <li>The dotted lines between terminals show that these terminals are part of the same connector.</li> </ul>   |
| 11     | Option abbreviation        | <ul style="list-style-type: none"> <li>This shows that the circuit is optional depending on vehicle application.</li> </ul>  |
| 12     | Relay                      | <ul style="list-style-type: none"> <li>This shows an internal representation of the relay. For details, refer to PG section, STANDARDIZED RELAY.</li> </ul>  |
| 13     | Connectors                 | <ul style="list-style-type: none"> <li>This shows that the connector is connected to the body or a terminal with bolt or nut.</li> </ul>   |

## HOW TO USE THIS MANUAL

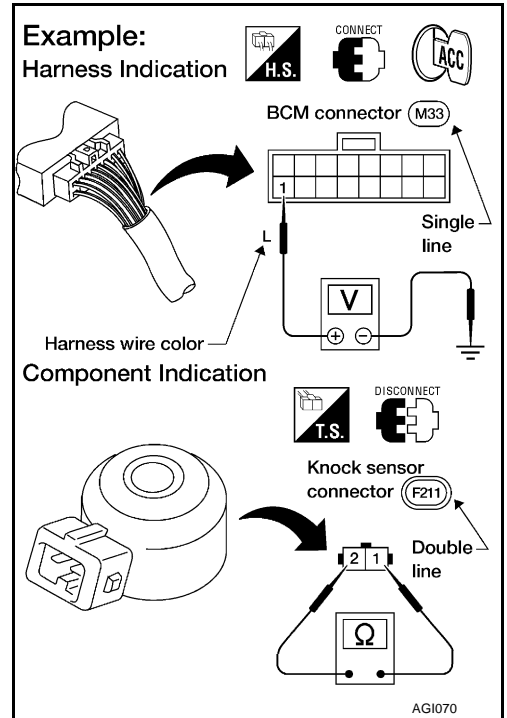
| Number   | Item                       | Description  |            |            |           |                  |         |          |           |                           |          |                 |            |               |                  |                 |  |                 |
|--|----------------------------|--|------------|------------|-----------|------------------|---------|----------|-----------|---------------------------|----------|-----------------|------------|---------------|------------------|-----------------|--|-----------------|
| 14   | Wire color                 | <ul style="list-style-type: none"><li>This shows a code for the color of the wire.</li></ul>   |            |            |           |                  |         |          |           |                           |          |                 |            |               |                  |                 |  |                 |
|  |                            | <table><tr><td>B = Black</td><td>BR = Brown</td></tr><tr><td>W = White</td><td>OR or O = Orange</td></tr><tr><td>R = Red</td><td>P = Pink</td></tr><tr><td>G = Green</td><td>PU or V (Violet) = Purple</td></tr><tr><td>L = Blue</td><td>GY or GR = Gray</td></tr><tr><td>Y = Yellow</td><td>SB = Sky Blue</td></tr><tr><td>LG = Light Green</td><td>CH = Dark Brown</td></tr><tr><td></td><td>DG = Dark Green</td></tr></table> | B = Black  | BR = Brown | W = White | OR or O = Orange | R = Red | P = Pink | G = Green | PU or V (Violet) = Purple | L = Blue | GY or GR = Gray | Y = Yellow | SB = Sky Blue | LG = Light Green | CH = Dark Brown |  | DG = Dark Green |
|  |                            | B = Black  | BR = Brown |            |           |                  |         |          |           |                           |          |                 |            |               |                  |                 |  |                 |
| W = White  | OR or O = Orange           |  |            |            |           |                  |         |          |           |                           |          |                 |            |               |                  |                 |  |                 |
| R = Red  | P = Pink                   |  |            |            |           |                  |         |          |           |                           |          |                 |            |               |                  |                 |  |                 |
| G = Green  | PU or V (Violet) = Purple  |  |            |            |           |                  |         |          |           |                           |          |                 |            |               |                  |                 |  |                 |
| L = Blue   | GY or GR = 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:<br>Example: L/W = Blue with White Stripe |                            |  |            |            |           |                  |         |          |           |                           |          |                 |            |               |                  |                 |  |                 |
| 15   | Option description         | <ul style="list-style-type: none"><li>This shows a description of the option abbreviation used on the page.</li></ul>  |            |            |           |                  |         |          |           |                           |          |                 |            |               |                  |                 |  |                 |
| 16   | Switch                     | <ul style="list-style-type: none"><li>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.</li></ul>  |            |            |           |                  |         |          |           |                           |          |                 |            |               |                  |                 |  |                 |
| 17   | Assembly parts             | <ul style="list-style-type: none"><li>Connector terminal in component shows that it is a harness incorporated assembly.</li></ul>  |            |            |           |                  |         |          |           |                           |          |                 |            |               |                  |                 |  |                 |
| 18   | Cell code                  | <ul style="list-style-type: none"><li>This identifies each page of the wiring diagram by section, system and wiring diagram page number.</li></ul>   |            |            |           |                  |         |          |           |                           |          |                 |            |               |                  |                 |  |                 |
| 19   | Current flow arrow         | <ul style="list-style-type: none"><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>               |            |            |           |                  |         |          |           |                           |          |                 |            |               |                  |                 |  |                 |
| 20   | System branch              | <ul style="list-style-type: none"><li>This shows that the system branches to another system identified by cell code (section and system).</li></ul>  |            |            |           |                  |         |          |           |                           |          |                 |            |               |                  |                 |  |                 |
| 21   | Page crossing              | <ul style="list-style-type: none"><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              | <ul style="list-style-type: none"><li>The line enclosed by broken line circle shows shield wire.</li></ul>   |            |            |           |                  |         |          |           |                           |          |                 |            |               |                  |                 |  |                 |
| 23   | Component box in wave line | <ul style="list-style-type: none"><li>This shows that another part of the component is also shown on another page (indicated by wave line) within the system.</li></ul>  |            |            |           |                  |         |          |           |                           |          |                 |            |               |                  |                 |  |                 |
| 24   | Component name             | <ul style="list-style-type: none"><li>This shows the name of a component.</li></ul>  |            |            |           |                  |         |          |           |                           |          |                 |            |               |                  |                 |  |                 |
| 25   | Connector number           | <ul style="list-style-type: none"><li>This shows the connector number.</li><li>The letter shows which harness the connector is located in.</li><li>Example: <b>M</b> : main harness. For detail and to locate the connector, refer to PG section "Main Harness", "Harness Layout". A coordinate grid is included for complex harnesses to aid in locating connectors.</li></ul>  |            |            |           |                  |         |          |           |                           |          |                 |            |               |                  |                 |  |                 |
| 26   | Ground (GND)               | <ul style="list-style-type: none"><li>The line spliced and grounded under wire color shows that ground line is spliced at the grounded connector.</li></ul>  |            |            |           |                  |         |          |           |                           |          |                 |            |               |                  |                 |  |                 |
| 27   | Ground (GND)               | <ul style="list-style-type: none"><li>This shows the ground connection. For detailed ground distribution information, refer to "Ground Distribution" in PG section.</li></ul>  |            |            |           |                  |         |          |           |                           |          |                 |            |               |                  |                 |  |                 |
| 28   | Connector views            | <ul style="list-style-type: none"><li>This area shows the connector faces of the components in the wiring diagram on the page.</li></ul>   |            |            |           |                  |         |          |           |                           |          |                 |            |               |                  |                 |  |                 |
| 29   | Common component           | <ul style="list-style-type: none"><li>Connectors enclosed in broken line show that these connectors belong to the same component.</li></ul>  |            |            |           |                  |         |          |           |                           |          |                 |            |               |                  |                 |  |                 |
| 30   | Connector color            | <ul style="list-style-type: none"><li>This shows a code for the color of the connector. For code meaning, refer to wire color codes, Number 14 of this chart.</li></ul>  |            |            |           |                  |         |          |           |                           |          |                 |            |               |                  |                 |  |                 |
| 31   | Fusible link and fuse box  | <ul style="list-style-type: none"><li>This shows the arrangement of fusible link(s) and fuse(s), used for connector views of "POWER SUPPLY ROUTING" in PG section.</li><li>The open square shows current flow in, and the shaded square shows current flow out.</li></ul>  |            |            |           |                  |         |          |           |                           |          |                 |            |               |                  |                 |  |                 |
| 32   | Reference area             | <ul style="list-style-type: none"><li>This shows that more information on the Super Multiple Junction (SMJ) and Joint Connectors (J/C) exists on the PG section. Refer to "Reference Area" for details.</li></ul>  |            |            |           |                  |         |          |           |                           |          |                 |            |               |                  |                 |  |                 |



# HOW TO USE THIS MANUAL

## Harness Indication

- Letter designations next to test meter probe indicate harness (connector) wire color.
- Connector numbers in a single circle M33 indicate harness connectors.



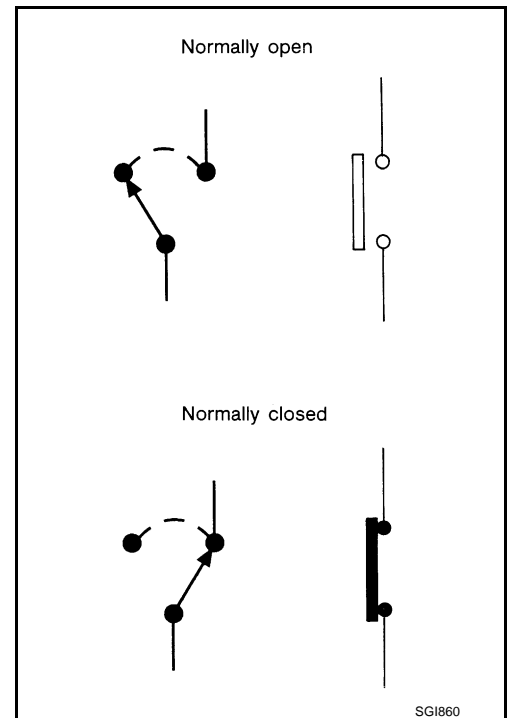
## Component Indication

Connector numbers in a double circle F211 indicate component connectors.

## 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.

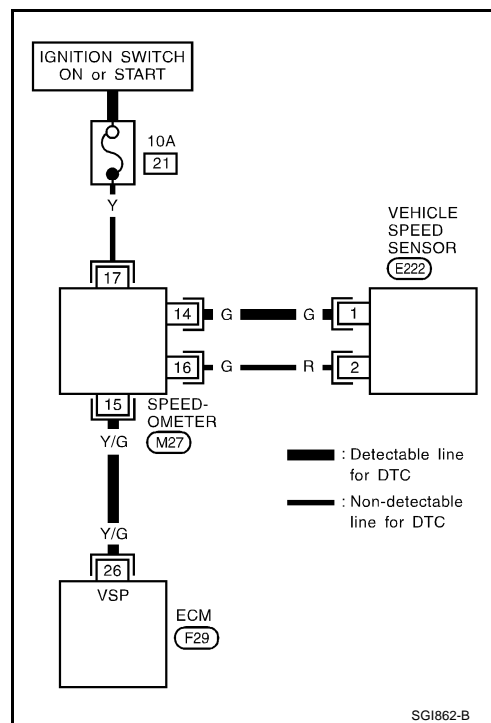


# HOW TO USE THIS MANUAL

## 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 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.



# HOW TO USE THIS MANUAL

## Multiple Switch

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

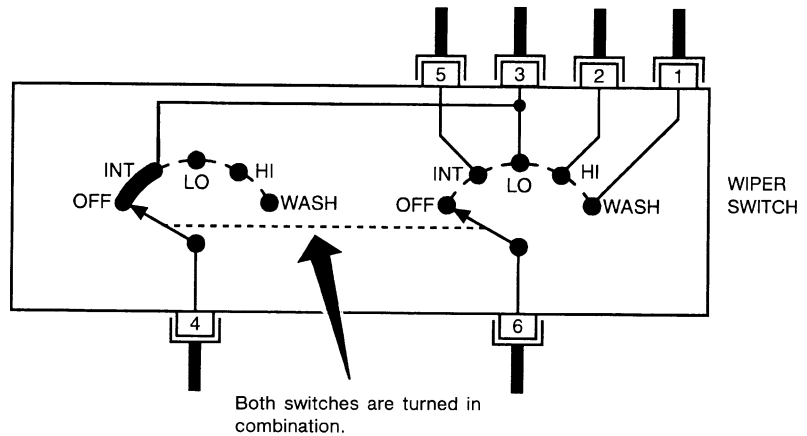
- The switch chart is used in schematic diagrams.
- The switch diagram is used in wiring diagrams.

### Example

(SWITCH CHART)

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

(SWITCH DIAGRAM)



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                |

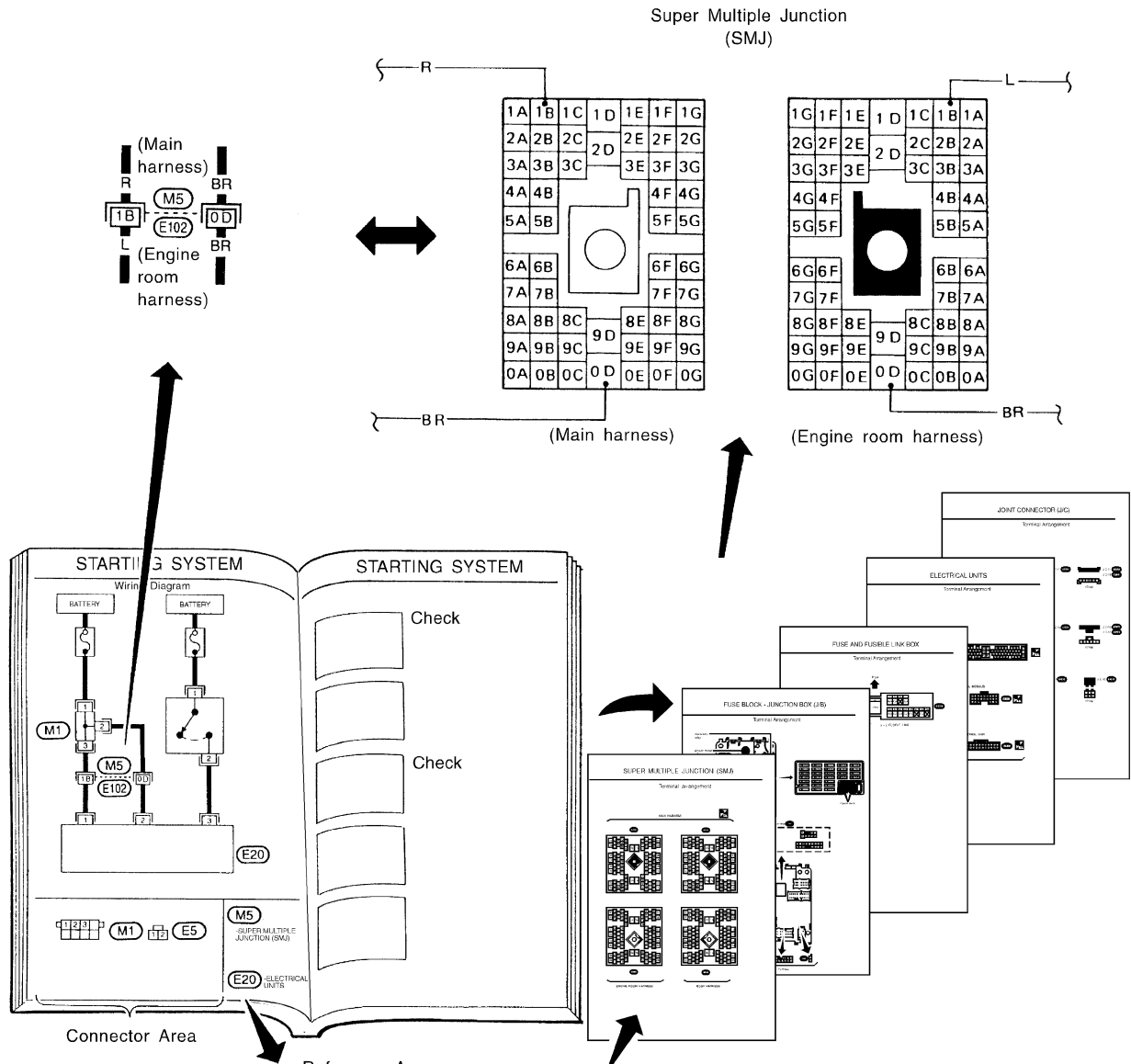
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# HOW TO USE THIS MANUAL

## Reference Area

The Reference Area of the wiring diagram contains references to additional electrical reference pages at the end of the manual. If connector numbers and titles are shown in the Reference Area of the wiring diagram, these connector symbols are not shown in the Connector Area.

### Example



Reference Area:  
Refer to the electrical reference pages at the end of the manual for the terminal arrangement of the connectors shown here in the "Reference Area".

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# HOW TO USE THIS MANUAL

## Abbreviations

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The following **ABBREVIATIONS** are used:

| ABBREVIATION | DESCRIPTION                           |
|--------------|---------------------------------------|
| A/C          | Air Conditioner                       |
| A/T          | Automatic Transaxle/Transmission      |
| ATF          | Automatic Transmission Fluid          |
| D1           | Drive range 1st gear                  |
| D2           | Drive range 2nd gear                  |
| D3           | Drive range 3rd gear                  |
| D4           | Drive range 4th gear                  |
| FR, RR       | Front, Rear                           |
| LH, RH       | Left-Hand, Right-Hand                 |
| M/T          | Manual Transaxle/Transmission         |
| OD           | Overdrive                             |
| P/S          | Power Steering                        |
| SAE          | Society of Automotive Engineers, Inc. |
| SDS          | Service Data and Specifications       |
| SST          | Special Service Tools                 |
| 2WD          | 2-Wheel Drive                         |
| 22           | 2nd range 2nd gear                    |
| 21           | 2nd range 1st gear                    |
| 12           | 1st range 2nd gear                    |
| 11           | 1st range 1st gear                    |

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# SERVICE INFORMATION FOR ELECTRICAL INCIDENT

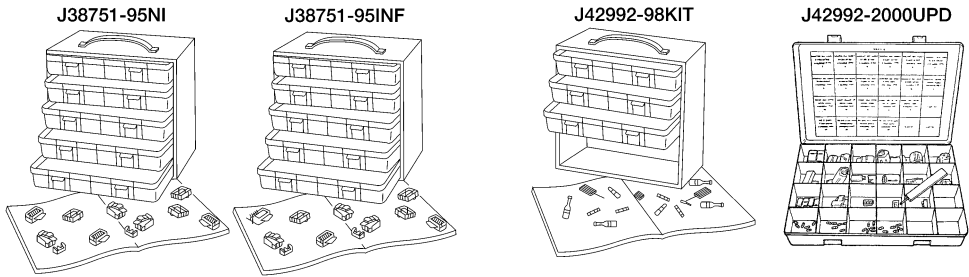
## SERVICE INFORMATION FOR ELECTRICAL INCIDENT

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### How to Check Terminal CONNECTOR AND TERMINAL PIN KIT

NAS00053

Use the connector and terminal pin kits listed below when replacing connectors or terminals. The connector and terminal pin kits contain some of the most commonly used NISSAN/INFINITI connectors and terminals. For detailed connector and terminal pin replacement procedures, refer to the latest NISSAN/INFINITI CONNECTOR AND TERMINAL PIN SERVICE MANUAL.

| Tool number<br>(Kent-Moore No.)<br>Tool name  | Description   |
|---|---|
| -<br>(J38751-95NI)<br>Connector and terminal<br>pin kit (NISSAN)<br>-<br>(J38751-95INF)<br>Connector and terminal<br>pin kit (INFINITI)<br>-<br>(J42992-98KIT)<br>OBD and terminal repair<br>kit<br>-<br>(J42992-2000UPD)<br>OBD-II Connector Kit<br>Update |  <p>J38751-95NI      J38751-95INF      J42992-98KIT      J42992-2000UPD</p> <p>WAIA0004E      WAIA0005E</p> |

### HOW TO PROBE CONNECTORS

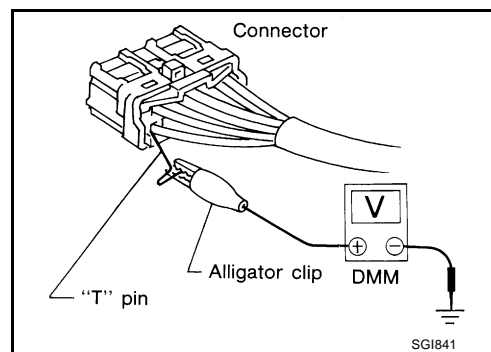
Connector damage and an intermittent connection can result from improperly probing of the connector during circuit checks.

The probe of a digital multimeter (DMM) may not correctly fit the connector cavity. To correctly probe the connector, follow the procedures below using a "T" pin. For the best contact grasp the "T" pin using an alligator clip.

#### Probing from Harness Side

Standard type (not waterproof type) connector should be probed from harness side with "T" pin.

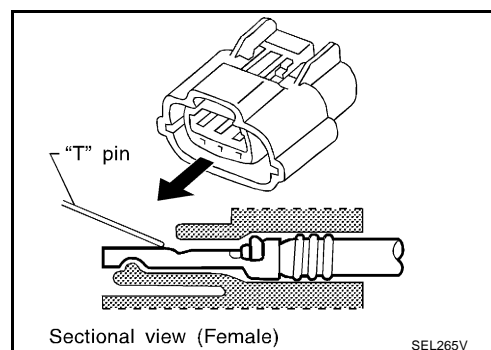
- If the connector has a rear cover such as a ECM connector, remove the rear cover before probing the terminal.
- Do not probe waterproof connector from harness side. Damage to the seal between wire and connector may result.



#### Probing from Terminal Side

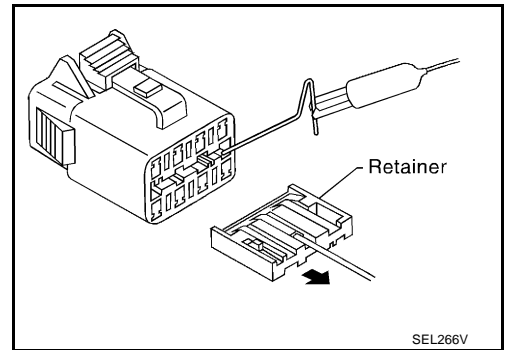
##### FEMALE TERMINAL

- There is a small notch above each female terminal. Probe each terminal with the "T" pin through the notch. Do not insert any object other than the same type male terminal into female terminal.



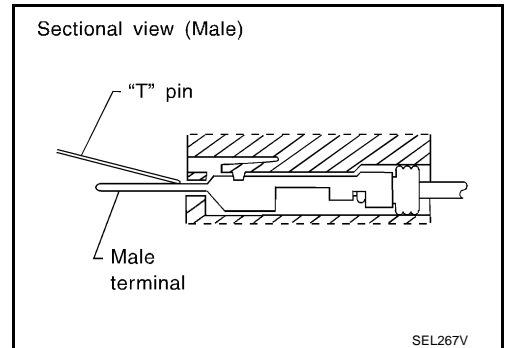
# SERVICE INFORMATION FOR ELECTRICAL INCIDENT

- Some connectors do not have a notch above each terminal. To probe each terminal, remove the connector retainer to make contact space for probing.



## MALE TERMINAL

Carefully probe the contact surface of each terminal using a "T" pin.  
**Do not bend terminal.**

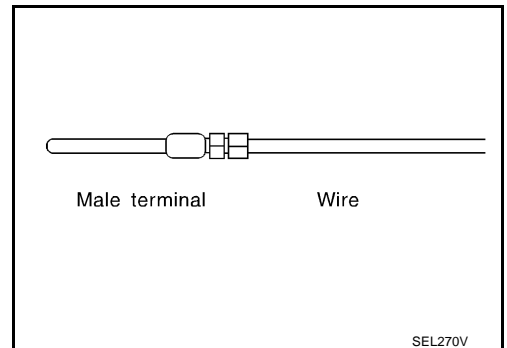


## How to Check Enlarged Contact Spring of Terminal

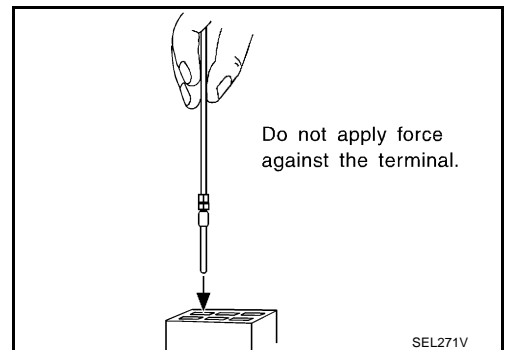
An enlarged contact spring of a terminal may create intermittent signals in the circuit.

If the intermittent open circuit occurs, follow the procedure below to inspect for open wires and enlarged contact spring of female terminal.

- Assemble a male terminal and approx. 10 cm (3.9 in) of wire.  
**Use a male terminal which matches the female terminal.**
- Disconnect the suspected faulty connector and hold it terminal side up.

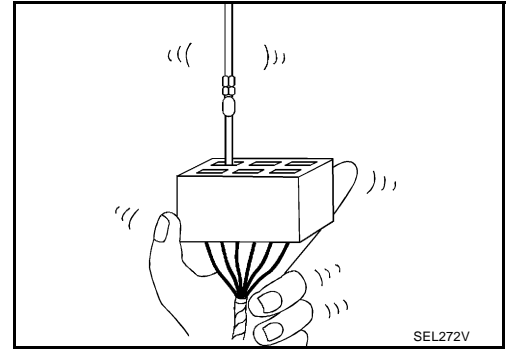


- While holding the wire of the male terminal, try to insert the male terminal into the female terminal.  
**Do not force the male terminal into the female terminal with your hands.**

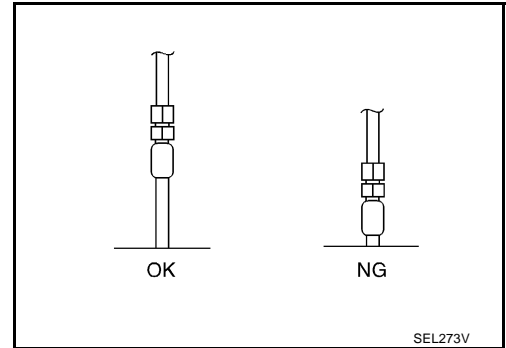


## SERVICE INFORMATION FOR ELECTRICAL INCIDENT

4. While moving the connector, check whether the male terminal can be easily inserted or not.



- If the male terminal can be easily inserted into the female terminal, replace the female terminal.

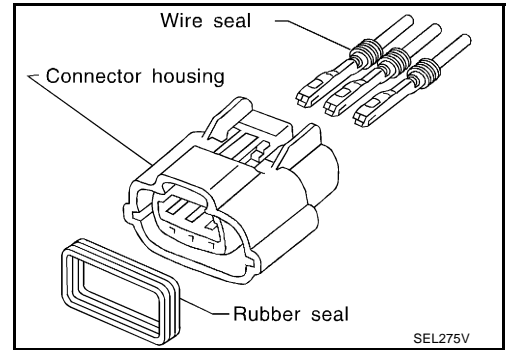


### Waterproof Connector Inspection

If water enters the connector, it can short interior circuits. This may lead to intermittent problems. Check the following items to maintain the original waterproof characteristics.

#### RUBBER SEAL INSPECTION

- Most waterproof connectors are provided with a rubber seal between the male and female connectors. If the seal is missing, the waterproof performance may not meet specifications.
- The rubber seal may come off when connectors are disconnected. Whenever connectors are reconnected, make sure the rubber seal is properly installed on either side of male or female connector.

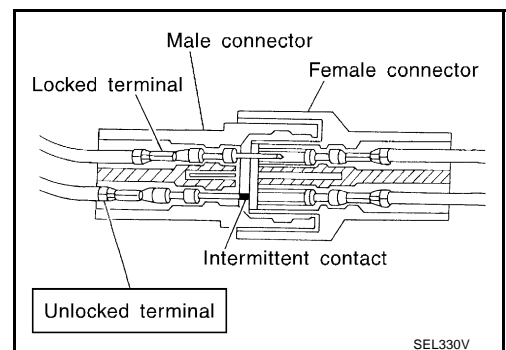


#### WIRE SEAL INSPECTION

The wire seal must be installed on the wire insertion area of a waterproof connector. Be sure that the seal is installed properly.

#### Terminal Lock Inspection

Check for unlocked terminals by pulling wire at the end of connector. An unlocked terminal may create intermittent signals in the circuit.



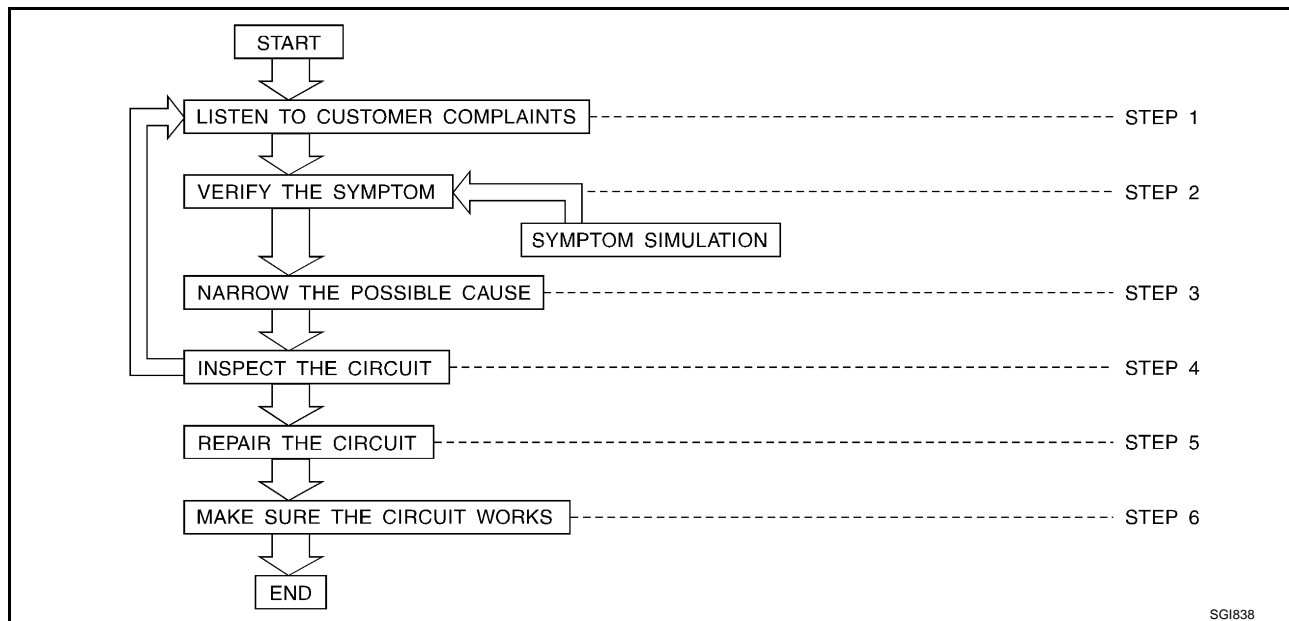


# SERVICE INFORMATION FOR ELECTRICAL INCIDENT

## How to Perform Efficient Diagnosis for an Electrical Incident WORK FLOW

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| 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:  |  |
|        | <b>WHAT</b>  | Vehicle Model, Engine, Transmission/Transaxle and the System (i.e. Radio).   |
|        | <b>WHEN</b>  | Date, Time of Day, Weather Conditions, Frequency.  |
|        | <b>WHERE</b>   | Road Conditions, Altitude and Traffic Situation.   |
| STEP 2 | <b>HOW</b>   | System Symptoms, Operating Conditions (Other Components Interaction). Service History and if any After Market Accessories have been installed. |
|        | Operate the system, road test if necessary. Verify the parameter of the incident. If the problem cannot be duplicated, refer to "Incident Simulation Tests".   |  |
|        | Get the proper diagnosis materials together including:   |  |
|        | <ul style="list-style-type: none"><li>● Power Supply Routing</li><li>● System Operation Descriptions</li><li>● Applicable Service Manual Sections</li><li>● Check for any Service Bulletins</li></ul> Identify where to begin diagnosis based upon your knowledge of the system operation and the customer comments. |  |
| STEP 3 | 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 4 | Repair or replace the incident circuit or component.   |  |
| STEP 5 | Operate the system in all modes. Verify the system works properly under all conditions. Make sure you have not inadvertently created a new incident during your diagnosis or repair steps.   |  |
| STEP 6 |  |  |

## 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.

The section is broken into the six following topics:

- Vehicle vibration
- Heat sensitive

# SERVICE INFORMATION FOR ELECTRICAL INCIDENT

- 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.

## 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 following illustration.

## CONNECTORS & HARNESS

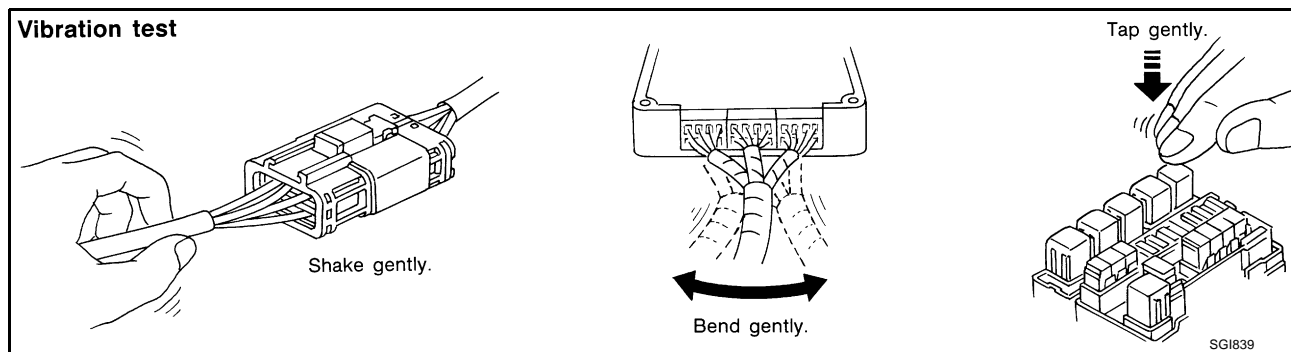
Determine which connectors and wiring harness would affect the electrical system you are inspecting. Gently shake each connector and harness while monitoring the system for the incident you are trying to duplicate. This test may indicate a loose or poor electrical connection.

## HINT

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

## SENSORS & RELAYS

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



## 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.

# SERVICE INFORMATION FOR ELECTRICAL INCIDENT

## UNDER SEATING AREAS

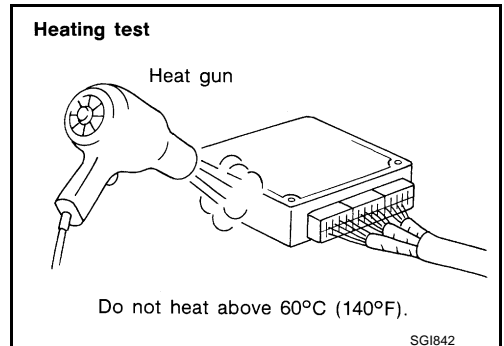
An unclamped or loose harness can cause wiring to be pinched by seat components (such as slide guides) during vehicle vibration. If the wiring runs under seating areas, inspect wire routing for possible damage or pinching.

## Heat Sensitive

The customer's concern 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.

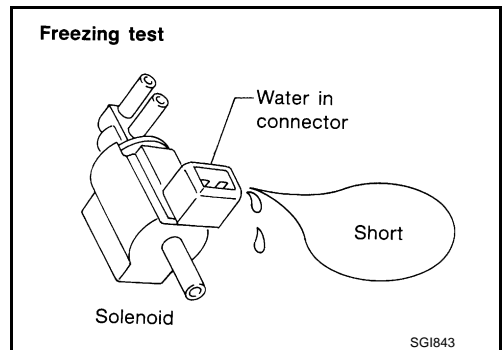


## Freezing

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.

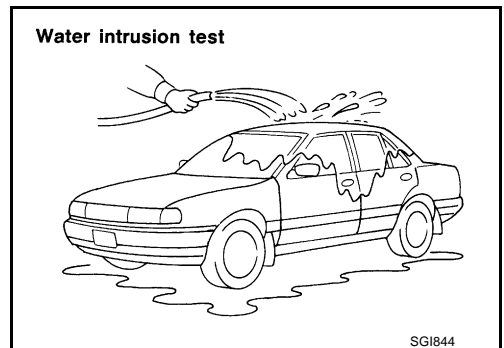
The second method is to put the suspect component into a freezer long enough for any water to freeze. Reinstall the part into the car and check for the reoccurrence of the incident. If it occurs, repair or replace the component.



## Water Intrusion

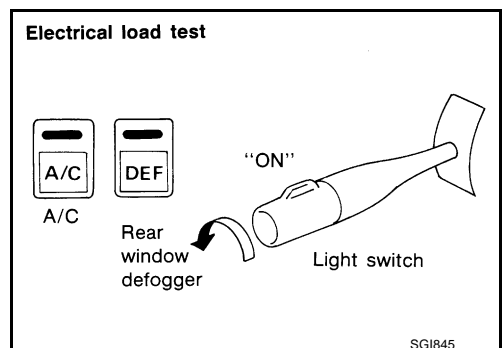
The incident may occur only during high humidity or in rainy/snowy weather. In such cases the incident could be caused by water intrusion on an electrical part. This can be simulated by soaking the car or running it through a car wash.

**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.



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# SERVICE INFORMATION FOR ELECTRICAL INCIDENT

## Cold or Hot Start Up

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

## CIRCUIT INSPECTION

### Introduction

In general, testing electrical circuits is an easy task if it is approached in a logical and organized method. Before beginning it is important to have all available information on the system to be tested. Also, get a thorough understanding of system operation. Then you will be able to use the appropriate equipment and follow the correct test procedure.

You may have to simulate vehicle vibrations while testing electrical components. Gently shake the wiring harness or electrical component to do this.

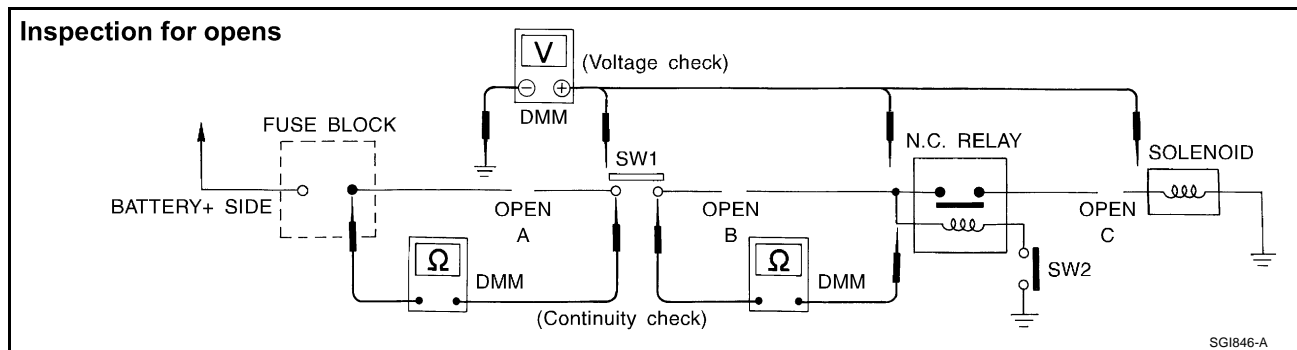
|       |   |   |
|-------|---|---|
| OPEN  | A circuit is open when there is no continuity through a section of the circuit. |   |
| SHORT | There are two types of shorts.  |   |
|       | ● SHORT CIRCUIT   | When a circuit contacts another circuit and causes the normal resistance to change. |
|       | ● SHORT TO GROUND   | When a circuit contacts a ground source and grounds the circuit.                    |

### NOTE:

Refer to "How to Check Terminal" to probe or check terminal.

### 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.



### 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 (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 previous schematic.

- Disconnect the battery negative cable.
- Start at one end of the circuit and work your way to the other end. (At the fuse block in this example)
- Connect one probe of the DMM to the fuse block terminal on the load side.
- 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)
- 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)
- 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 previous example.

# SERVICE INFORMATION FOR ELECTRICAL INCIDENT

## VOLTAGE CHECK METHOD

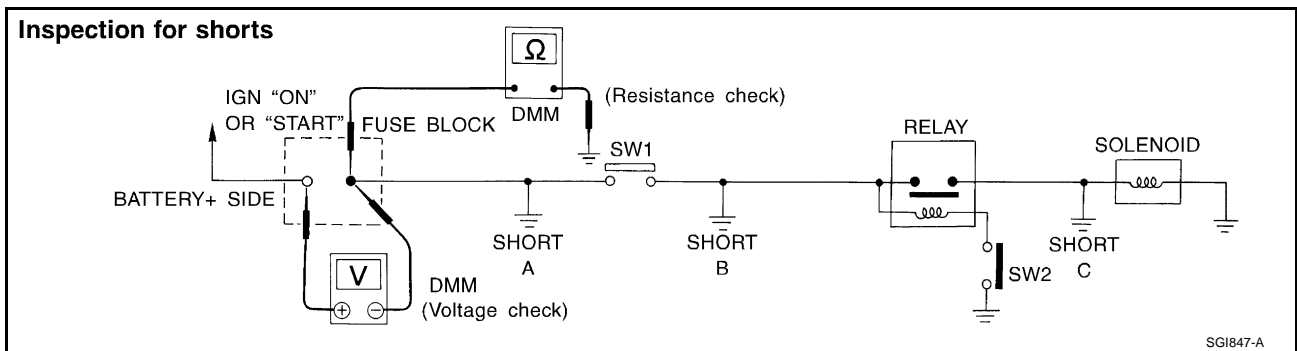
To help in understanding the diagnosis of open circuits please refer to the previous schematic. In any powered circuit, an open can be found by methodically checking the system for the presence of voltage. This is done by switching the DMM to the voltage function.

- Connect one probe of the DMM to a known good ground.
- Begin probing at one end of the circuit and work your way to the other end.
- 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).
- 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).
- 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 previous example.

## Testing for “Shorts” in the Circuit

To simplify the discussion of shorts in the system, please refer to the following schematic.



## RESISTANCE CHECK METHOD

- Disconnect the battery negative cable and remove the blown fuse.
- Disconnect all loads (SW1 open, relay disconnected and solenoid disconnected) powered through the fuse.
- Connect one probe of the DMM to the load side of the fuse terminal. Connect the other probe to a known good ground.
- With SW1 open, check for continuity.  
continuity; short is between fuse terminal and SW1 (point A).  
no continuity; short is further down the circuit than SW1.
- Close SW1 and disconnect the relay. Put probes at the load side of fuse terminal and a known good ground. Then, check for continuity.  
continuity; short is between SW1 and the relay (point B).  
no continuity; short is further down the circuit than the relay.
- 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

- 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 battery + side of the fuse terminal (one lead on the battery + 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.  
voltage; short is between fuse block and SW1 (point A).

## SERVICE INFORMATION FOR ELECTRICAL INCIDENT

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

- 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.
- 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 (point C).  
no voltage; retrace steps and check power to fuse block.

### Ground Inspection

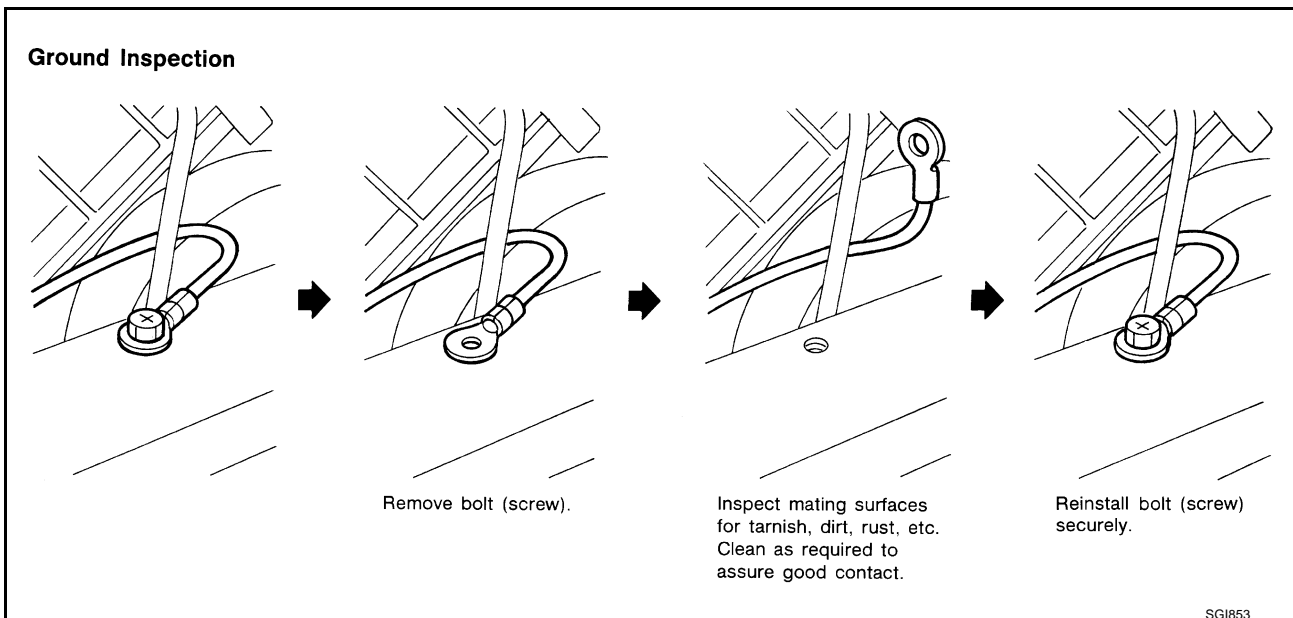
Ground connections are very important to the proper operation of electrical and electronic circuits. Ground connections are often exposed to moisture, dirt and other corrosive elements. The corrosion (rust) can become an unwanted resistance. This unwanted resistance can change the way a circuit works.

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:

- Remove the ground bolt or screw.
- Inspect all mating surfaces for tarnish, dirt, rust, etc.
- Clean as required to assure good contact.
- Reinstall bolt or screw securely.
- 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 eyelet make sure no ground wires have excess wire insulation.

For detailed ground distribution information, refer to “Ground Distribution” in PG section.



### 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 DMM, 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.

# SERVICE INFORMATION FOR ELECTRICAL INCIDENT

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

GI

## MEASURING VOLTAGE DROP — ACCUMULATED METHOD

- Connect the DMM across the connector or part of the circuit you want to check. The positive lead of the DMM should be closer to power and the negative lead closer to ground.
- Operate the circuit.
- The DMM 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.**

B

C

D

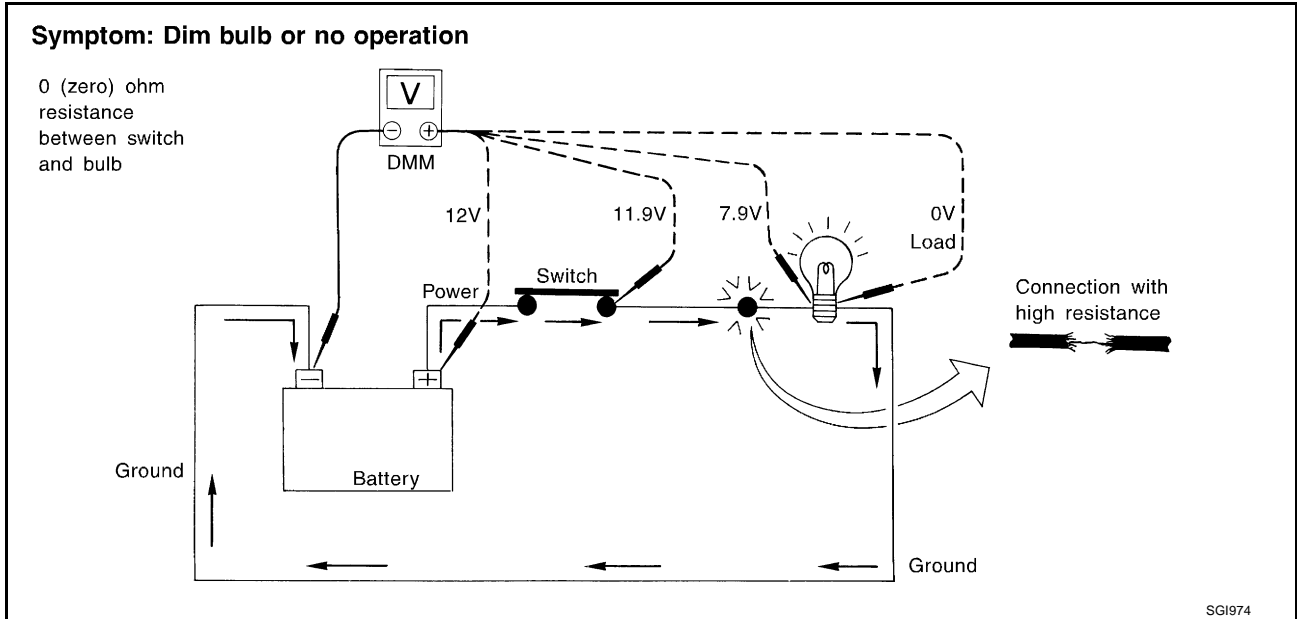
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## MEASURING VOLTAGE DROP — STEP-BY-STEP

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.

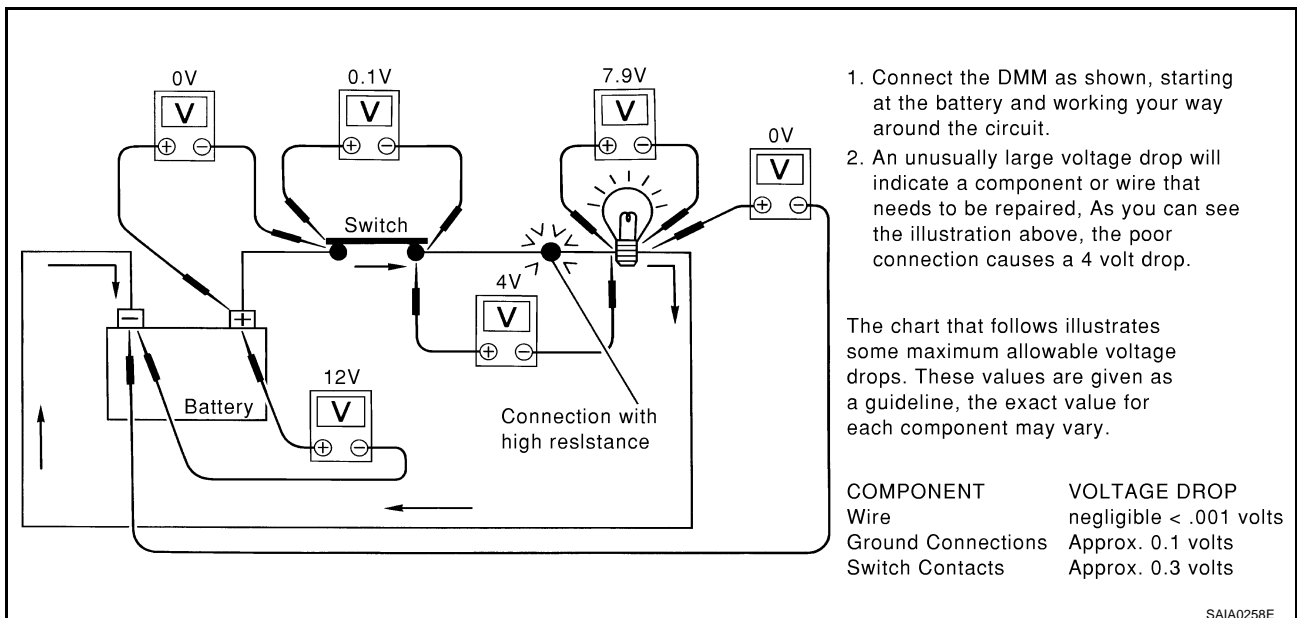
The step by step voltage drop test can identify a component or wire with too much resistance.

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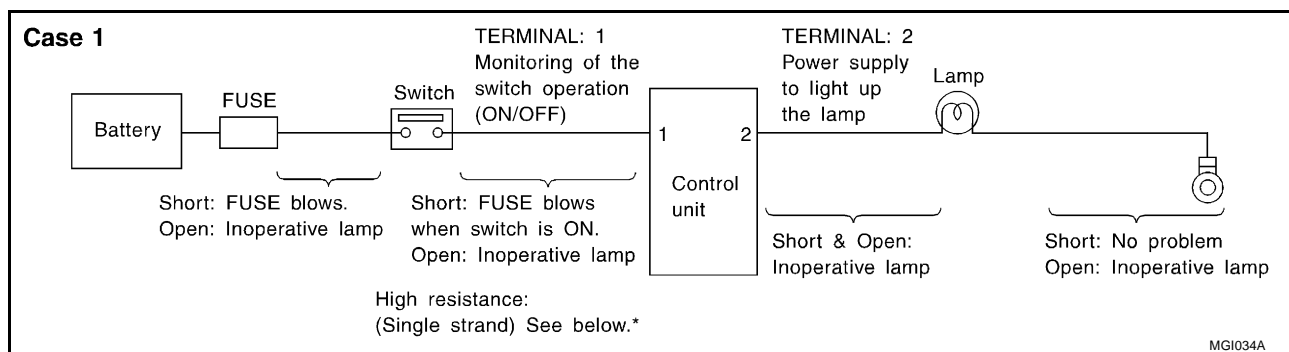
M



# SERVICE INFORMATION FOR ELECTRICAL INCIDENT

## Control Unit Circuit Test

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

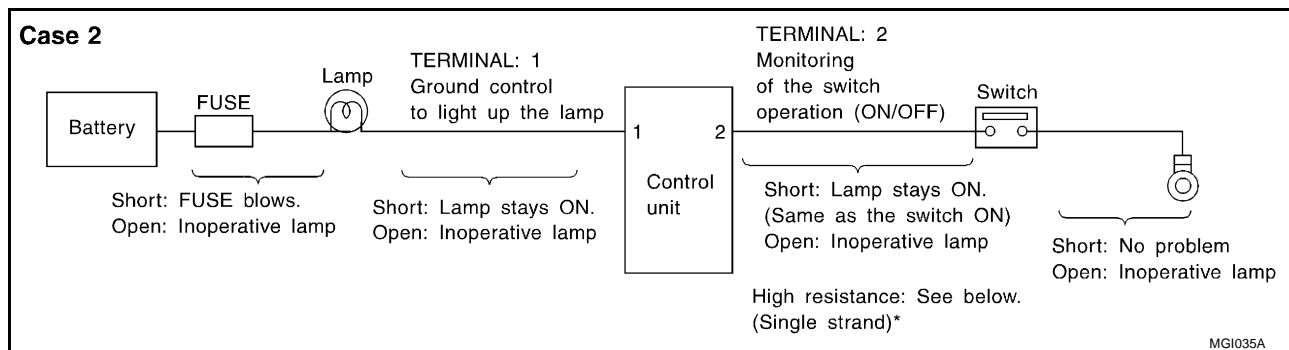


## INPUT-OUTPUT VOLTAGE CHART

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

The voltage value is based on the body ground.

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



## INPUT-OUTPUT VOLTAGE CHART

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

The voltage value is based on the body ground.

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



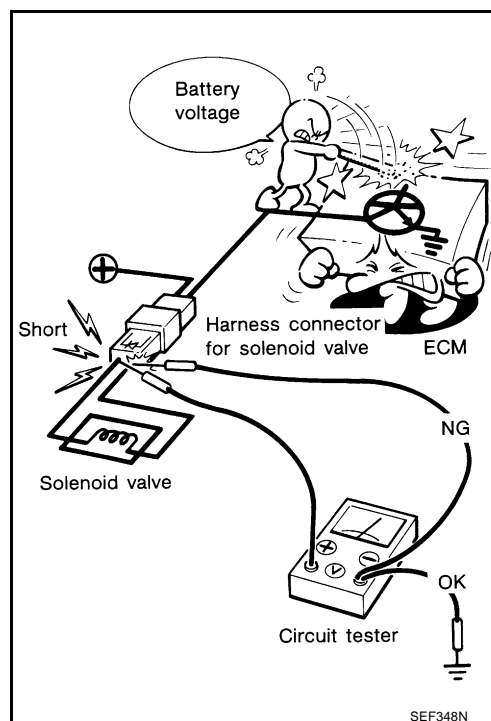
# SERVICE INFORMATION FOR ELECTRICAL INCIDENT

## Control Units and Electrical Parts PRECAUTIONS

NAS0009N

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- Never reverse polarity of battery terminals.
  - Install only parts specified for a vehicle.
  - Before replacing the control unit, check the input and output and functions of the component parts.
  - Do not apply excessive force when disconnecting a connector.
  - Do not apply excessive shock to the control unit by dropping or hitting it.
  - Be careful to prevent condensation in the control unit due to rapid temperature changes and do not let water or rain get on it. If water is found in the control unit, dry it fully and then install it in the vehicle.
  - Be careful not to let oil get on the control unit connector.
  - Avoid cleaning the control unit with volatile oil.
  - Do not disassemble the control unit, and do not remove the upper and lower covers.
- 
- When using a DMM, be careful not to let test probes get close to each other to prevent the power transistor in the control unit from damaging battery voltage because of short circuiting.
  - When checking input and output signals of the control unit, use the specified check adapter.



# CONSULT-II CHECKING SYSTEM

## CONSULT-II CHECKING SYSTEM

PFP:00000

### Description

NAS00056

- CONSULT-II is a hand-held type tester. When it is connected with a diagnostic connector equipped on the vehicle side, it will communicate with the control unit equipped in the vehicle and then enable various kinds of diagnostic tests.
- Refer to "CONSULT-II Software Operation Manual" for more information.

### Function and System Application

NAS00057

| Diagnostic test mode          | Function   | ENGINE | TRANSMISSION | ALL MODE AWD/ 4WD | AIR BAG | METER A/C AMP | BCM | IPDM E/R | AUTO DRIVE POS. | ABS | ABS (including VDC) | AIR PRESSURE MONITOR | NVIS (NATS)* | REARVIEW CAMERA | INTELLIGENT KEY |
|-------------------------------|--|--------|--------------|-------------------|---------|---------------|-----|----------|-----------------|-----|---------------------|----------------------|--------------|-----------------|-----------------|
| Work support                  | This mode enables a technician to adjust some devices faster and more accurately by following the indications on CONSULT-II.   | x      | x            | -                 | -       | -             | x   | -        | x               | -   | x                   | x                    | -            | x               | x               |
| Self-diagnostic results       | Self-diagnostic results can be read and erased quickly.  | x      | x            | x                 | x       | x             | x   | x        | x               | x   | x                   | x                    | x            | -               | x               |
| Trouble diagnostic record     | Current self-diagnostic results and all trouble diagnostic records previously stored can be read.  | -      | -            | -                 | x       | -             | -   | -        | -               | -   | -                   | -                    | -            | -               | -               |
| Data monitor                  | Input/Output data in the ECU can be read.  | x      | x            | x                 | -       | x             | x   | x        | x               | x   | x                   | x                    | -            | x               | x               |
| CAN diagnosis support monitor | The condition of CAN communication line can be indicated.  | x      | x            | x                 | -       | x             | x   | x        | x               | x   | x                   | -                    | -            | -               | x               |
| Active test                   | Diagnostic Test Mode in which CONSULT-II drives some actuators apart from the ECUs and also shifts some parameters in a specified range.                                   | x      | -            | x                 | -       | -             | x   | x        | x               | x   | x                   | x                    | -            | -               | x               |
| DTC & SRT confirmation        | The results of SRT (System Readiness Test) and the self-diagnosis status/result can be confirmed.  | x      | -            | -                 | -       | -             | -   | -        | -               | -   | -                   | -                    | -            | -               | -               |
| ECU (ECM/TCM) part number     | ECU (ECM/TCM) part number can be read.   | x      | x            | x                 | -       | -             | x   | -        | x               | x   | x                   | -                    | -            | x               | x               |
| ECU discriminated No.         | Classification number of a replacement ECU can be read to prevent an incorrect ECU from being installed.   | -      | -            | -                 | x       | -             | -   | -        | -               | -   | -                   | -                    | -            | -               | -               |
| Function test                 | This mode can show results of self-diagnosis of ECU with either "OK" or "NG". For engines, more practical tests regarding sensors/switches and/or actuators are available. | x      | x            | -                 | x       | -             | -   | -        | -               | x   | x                   | -                    | -            | -               | -               |
| Control unit initialization   | All registered ignition key IDs in NATS components can be initialized and new IDs can be registered.   | -      | -            | -                 | -       | -             | -   | -        | -               | -   | -                   | -                    | x            | -               | -               |
| CALIB data                    | Characteristic information for TCM and CVT assembly can be read.   | -      | x            | -                 | -       | -             | -   | -        | -               | -   | -                   | -                    | -            | -               | -               |
| Configuration                 | —  | -      | -            | -                 | -       | -             | x   | -        | -               | -   | -                   | -                    | -            | -               | -               |

x: Applicable

\*:Nissan Vehicle Immobilizer System (Nissan Anti-Theft System)

# CONSULT-II CHECKING SYSTEM

## Nickel Metal Hydride Battery Replacement

NAS00058

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CONSULT-II contains a nickel metal hydride battery. When replacing the battery obey the following:

### **WARNING:**

Replace the nickel metal hydride battery with **Genuine CONSULT-II battery only**. Use of another battery may present a risk of fire or explosion. The battery may present a fire or chemical burn hazard if mistreated. Do not recharge, disassemble or dispose of in fire.

Keep the battery out of reach of children and discard used battery conforming to the local regulations.

## Checking Equipment

NAS00059

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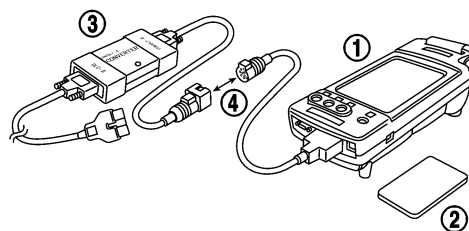
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When ordering the following equipment, contact your NISSAN/INFINITI distributor.

| Tool name   | Description |
|---|-------------|
| NISSAN CONSULT-II   |             |
| 1. CONSULT-II unit (Tester internal soft: Resident version 3.3.0) and accessories |             |
| 2. Program card UED06C and AEN06B (For NATS)                                      |             |
| 3. CONSULT-II CONVERTER (version 0017)  |             |
| 4. "CONSULT-II Pigtail" Cable   |             |



SAIA0363E

### **CAUTION:**

- If CONSULT-II is used with no connection of CONSULT-II CONVERTER, malfunctions might be detected in self-diagnosis depending on control unit which carry out CAN communication.
- If CONSULT-II CONVERTER is not connected with CONSULT-II, vehicle occur the "FAIL SAFE MODE" which is "LIGHT UP the HEAD LIGHT" and/or "COOLING FAN ROTATING" when CONSULT-II is started.
- Previous CONSULT-II "I" and "Y" DLC-I and DLC-II cables should NOT be used anymore because their DDL connector pins can be damaged during cable swapping.

### **NOTE:**

- The CONSULT-II must be used in conjunction with a program card. CONSULT-II does not require loading (Initialization) procedure.
- Be sure the CONSULT-II is turned off before installing or removing a program card.

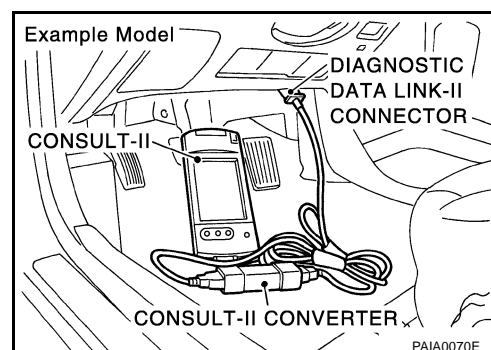
## CONSULT-II Start Procedure

NAS0005A

### **NOTE:**

Turning ignition switch off when performing CAN diagnosis could cause CAN memory to be erased.

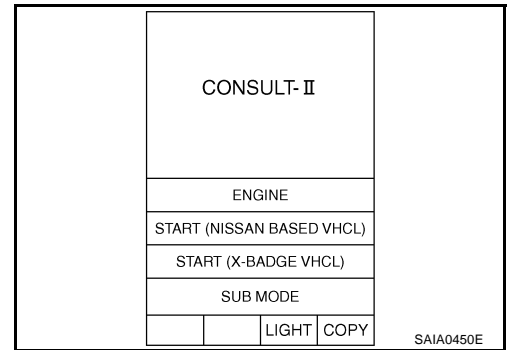
1. Connect CONSULT-II and CONSULT-II CONVERTER to the data link connector.



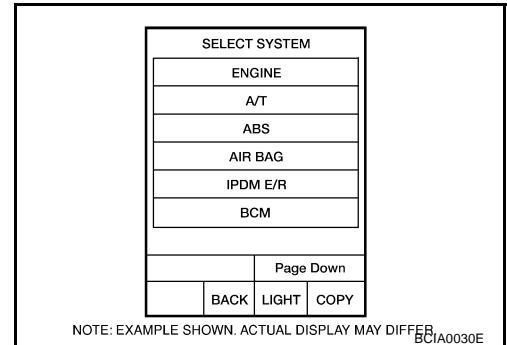
PAIA0070E

# CONSULT-II CHECKING SYSTEM

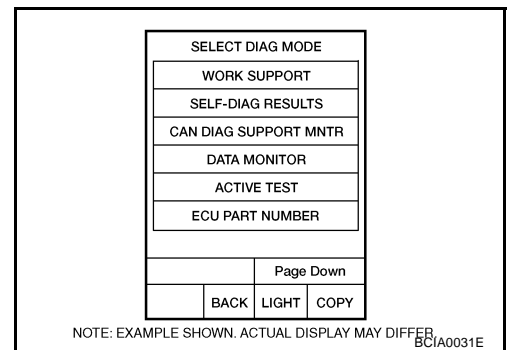
2. If necessary, turn on the ignition switch.
3. Touch "START (NISSAN BASED VHCL)" or System Shortcut key (eg: ENGINE) on the screen.



4. Touch necessary system on "SELECT SYSTEM" screen. If necessary system is not indicated, check power supply and ground of system control unit. If it is normal, refer to [GI-38, "CONSULT-II Data Link Connector \(DLC\) Circuit"](#).



5. Select the desired part to be diagnosed on the "SELECT DIAG MODE" screen.



## CONSULT-II Data Link Connector (DLC) Circuit INSPECTION PROCEDURE

NAS0005B

If the CONSULT-II cannot diagnose the system properly, check the following items.

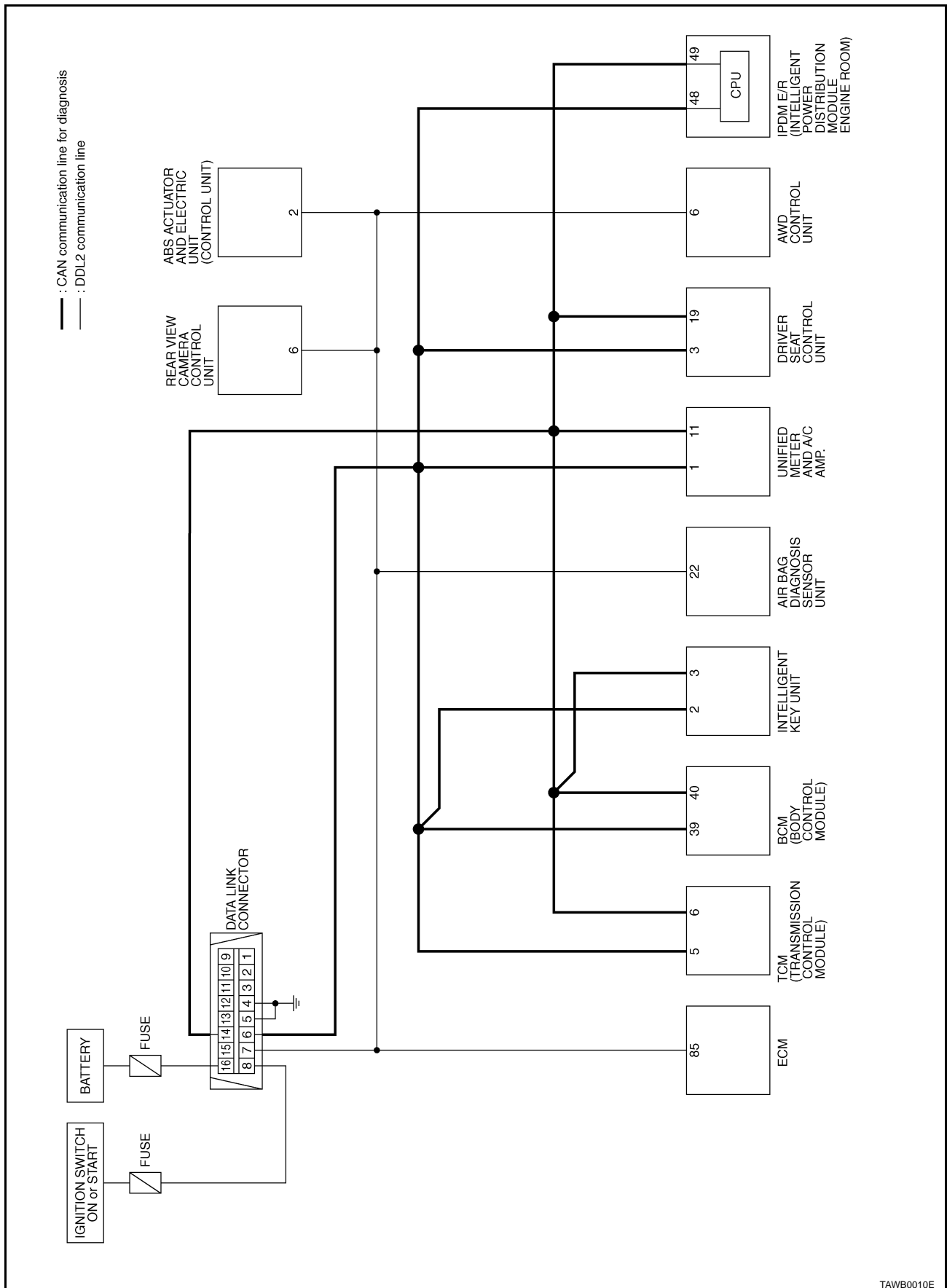
| Symptom  | Check item   |
|--|--|
| CONSULT-II cannot access any system.   | <ul style="list-style-type: none"> <li>● CONSULT-II DLC power supply circuit (Terminal 8) and ground circuit (Terminal 4) (For detailed circuit, refer to "MIL &amp; Data Link Connectors Wiring Diagram" in EC section.)</li> <li>● CONSULT-II DLC cable and CONSULT-II CONVERTER</li> </ul>  |
| CONSULT-II cannot access individual system. (Other systems can be accessed.) | <ul style="list-style-type: none"> <li>● CONSULT-II program card (Check the appropriate CONSULT-II program card for the system. Refer to "Checking Equipment".)</li> <li>● Power supply and ground circuit for the control unit of the system (For detailed circuit, refer to wiring diagram for each system.)</li> <li>● Open or short circuit between the system and CONSULT-II DLC (For detailed circuit, refer to wiring diagram for each system.)</li> <li>● Open or short circuit CAN communication line. Refer to <a href="#">LAN-49, "CAN System Specification Chart"</a></li> </ul> |

### NOTE:

The DDL1 and DDL2 circuits from DLC pins 12, 13, 14 and 15 may be connected to more than one system. A short in a DDL circuit connected to a control unit in one system may affect CONSULT-II access to other systems.

# CONSULT-II CHECKING SYSTEM

## CIRCUIT DIAGRAM



TAWB0010E

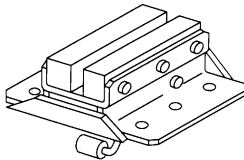
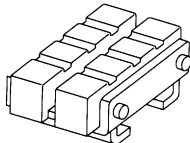
## LIFTING POINT

### LIFTING POINT

PFP:00000

### Commercial Service Tools

NAS0005C

| Tool name               | Description   |
|-------------------------|---|
| Board on attachment     | <br>S-NT001 |
| Safety stand attachment | <br>S-NT002 |

#### CAUTION:

- Every time the vehicle is lifted up, maintain the complete vehicle curb condition.
- Since the vehicle's center of gravity changes when removing main parts on the front side (engine, transmission, suspension etc.), support a jack up point on the rear side garage jack with a mission jack or equivalent.
- Since the vehicle's center of gravity changes when removing main parts on the rear side (rear axle, suspension, etc.), support a jack up point on the front side garage jack with a mission jack or equivalent.
- Be careful not to smash or do not do anything that would affect piping parts.

### Garage Jack and Safety Stand

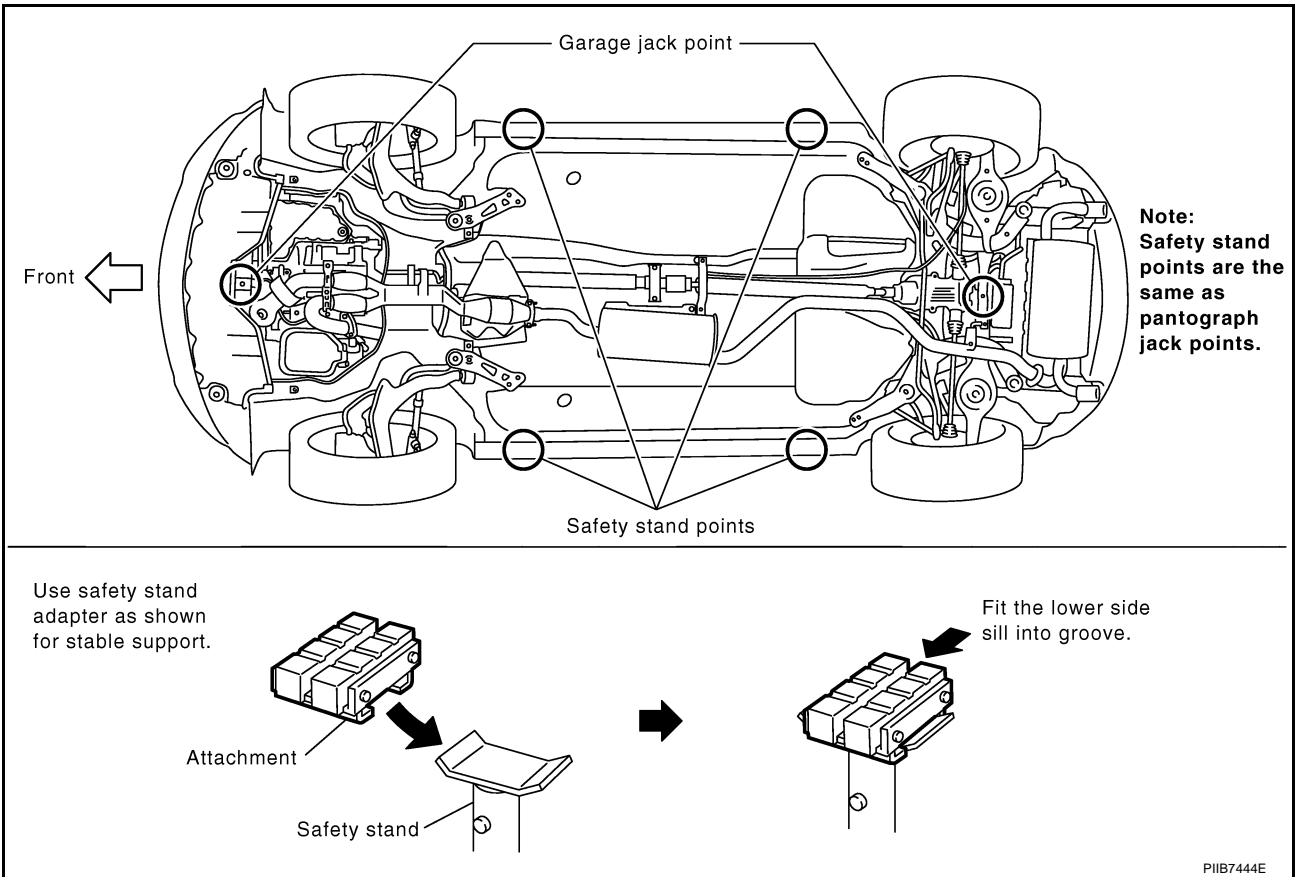
NAS0005D

#### WARNING:

- Park the vehicle on a level surface when using the jack. Make sure to avoid damaging pipes, tubes, etc. under the vehicle.
- 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.

## LIFTING POINT

- Place wheel chocks at both front and back of the wheels on the ground.



### CAUTION:

There is canister just behind Garage jack point rear. Jack up be carefully.

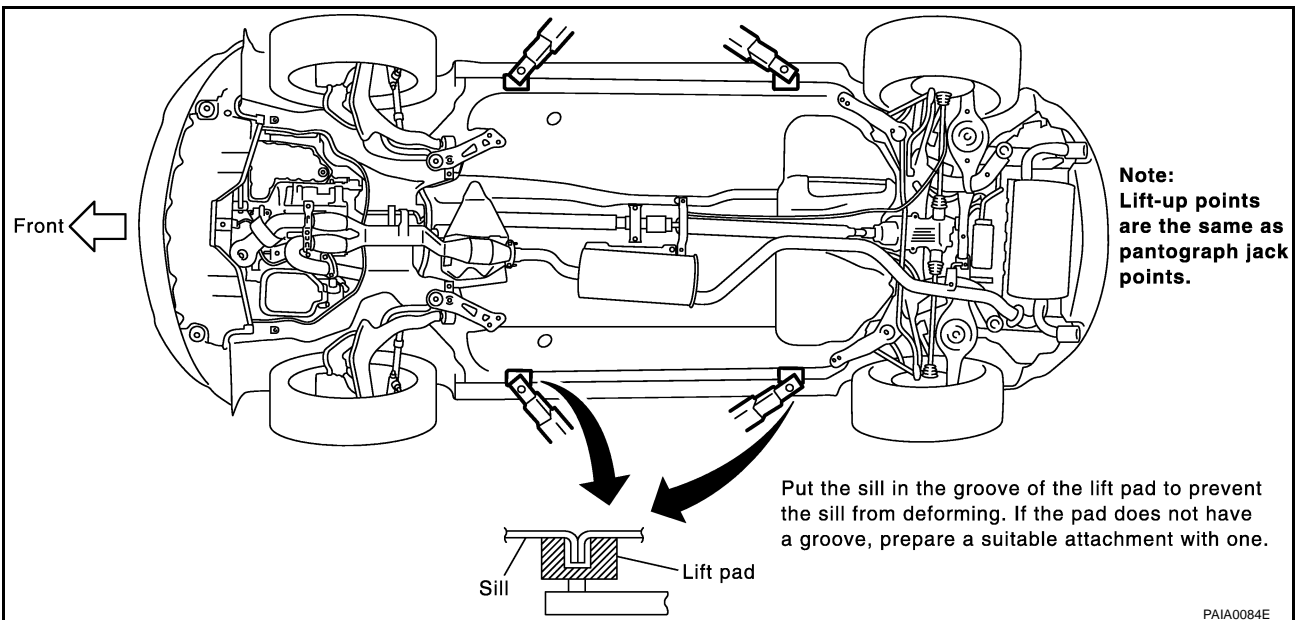
## 2-Pole Lift

NAS0005E

### 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, brake cable, fuel lines and sill spoiler.



# LIFTING POINT

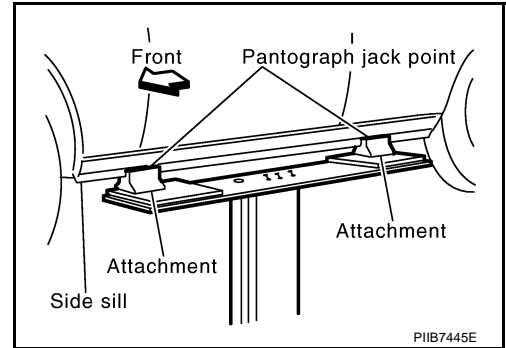
## Board-On Lift

NAS0005F

### CAUTION:

Make sure vehicle is empty when lifting.

- The board-on lift attachment set at front end of vehicle should be set on the front of the sill under the front door opening.
- Position attachments at front and rear ends of board-on lift.





## TOW TRUCK TOWING

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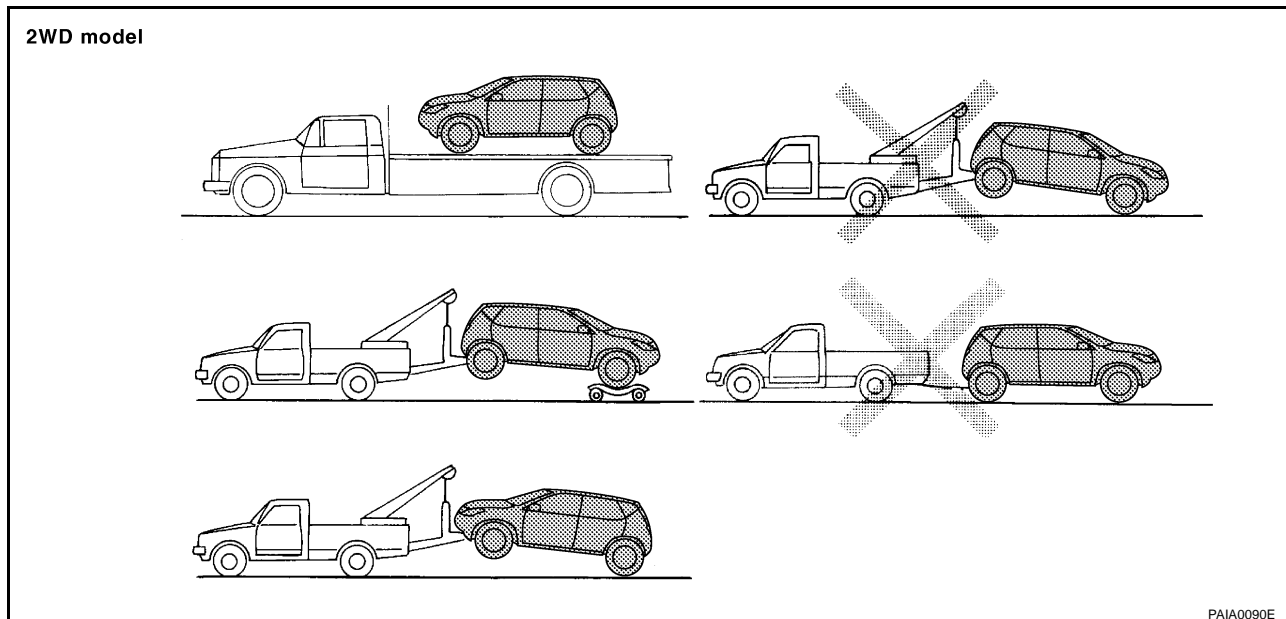
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NAS0005G

### 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.
- Always attach safety chains before towing.
- When towing, make sure that the transmission, steering system and power train are in good order. If any unit is damaged, dollies must be used.
- Never tow an CVT model from the rear (that is backward) with four wheels on the ground. This may cause serious and expensive damage to the transmission.



### 2WD MODELS

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

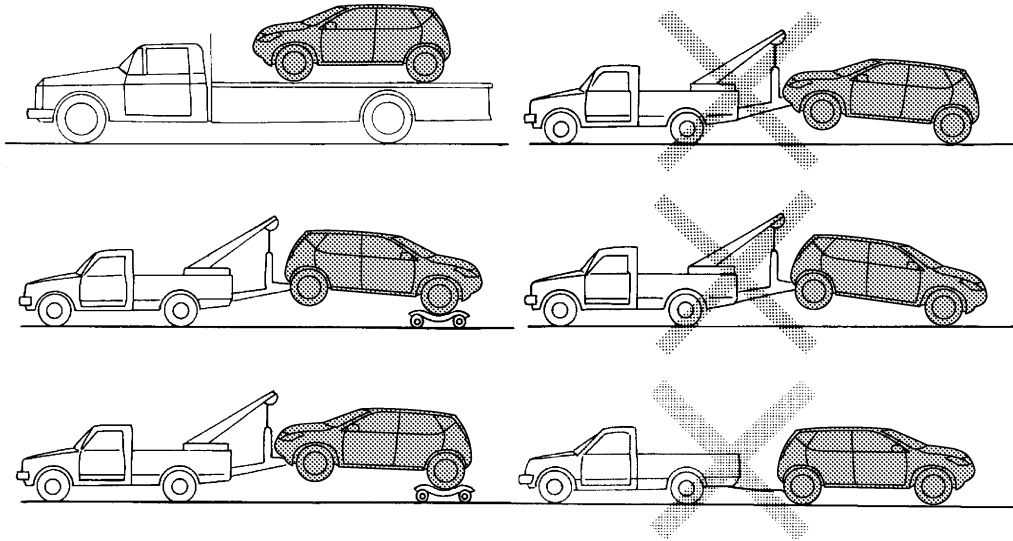
#### CAUTION:

- Never tow CVT models with the front wheels on the ground or four wheels on the ground (forward or backward) as this may cause serious and expensive damage to the transmission. If it is necessary to tow the vehicle with the rear wheels raised, always use towing dollies under the front wheels.
- When towing CVT models with the front wheels on towing dollies:
  - Turn the ignition key to the OFF position, and secure the steering wheel in a straight ahead position with a rope or similar device. Never secure the steering wheel by turning the ignition key to the LOCK position. This may damage the steering lock mechanism.
  - Move the selector lever to the N (Neutral) position.

## TOW TRUCK TOWING

- When towing two wheel drive CVT model with the rear wheels on the ground (if you do not use towing dollies): Always release the parking brake.

AWD model



### AWD MODELS

NISSAN recommends that a dolly be used as illustrated when towing AWD models.

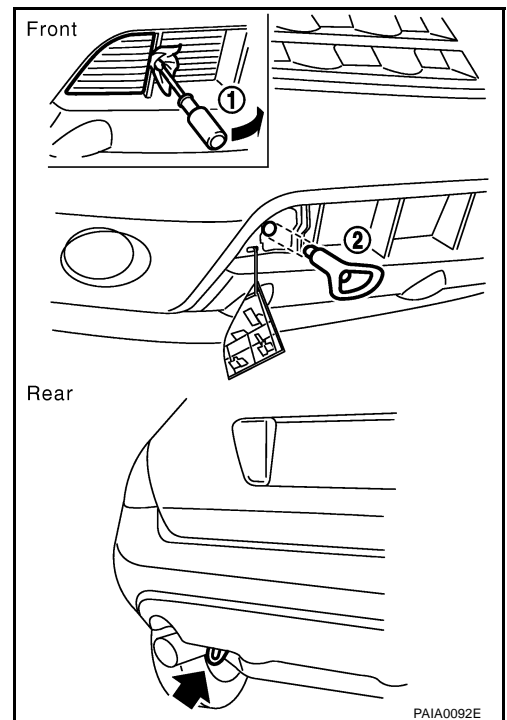
#### CAUTION:

Never tow CVT AWD models with any of the wheels on the ground as this may cause serious and expensive damage to the drive train.

### Vehicle Recovery (Freeing a Stuck Vehicle)

NAS0005H

- Tow chains or cables must be attached only to the vehicle recovery hooks or main structural members of the vehicle. Otherwise, the vehicle body will be damaged.
- 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 the vehicle at an angle.
- Pull devices such as ropes or canvas straps are not recommended for use in vehicle towing or recovery.
- Use the hook as illustrated only, not other parts of the vehicle. Otherwise, the vehicle body will be damaged.
- Use the hook as illustrated only to free a vehicle stuck in sand, snow, mud, etc. Never tow the vehicle for a long distance using only the towing hook.
- The hook is under tremendous force when used to free a stuck vehicle.
- Stand clear of a stuck vehicle.



### FRONT

- Remove the hook cover from the bumper using a suitable tool.
  - Securely install the hook. (Towing hook is stored with jacking tools.)
- Make sure that the hook is properly secured in the stored place after use.

# TIGHTENING TORQUE OF STANDARD BOLTS

## TIGHTENING TORQUE OF STANDARD BOLTS

PFP:00000

### Tightening Torque Table

NAS0005I

| Grade | Bolt size | Bolt diameter * mm | Pitch mm | Tightening torque (Without lubricant) |      |       |       |                     |      |       |       |
|-------|-----------|--------------------|----------|---------------------------------------|------|-------|-------|---------------------|------|-------|-------|
|       |           |                    |          | Hexagon head bolt                     |      |       |       | Hexagon flange bolt |      |       |       |
|       |           |                    |          | N·m                                   | kg-m | ft-lb | in-lb | N·m                 | kg-m | ft-lb | in-lb |
| 4T    | M6        | 6.0                | 1.0      | 5.5                                   | 0.56 | 4     | 49    | 7                   | 0.71 | 5     | 62    |
|       | M8        | 8.0                | 1.25     | 13.5                                  | 1.4  | 10    | —     | 17                  | 1.7  | 13    | —     |
|       |           |                    | 1.0      | 13.5                                  | 1.4  | 10    | —     | 17                  | 1.7  | 13    | —     |
|       | M10       | 10.0               | 1.5      | 28                                    | 2.9  | 21    | —     | 35                  | 3.6  | 26    | —     |
|       |           |                    | 1.25     | 28                                    | 2.9  | 21    | —     | 35                  | 3.6  | 26    | —     |
|       | M12       | 12.0               | 1.75     | 45                                    | 4.6  | 33    | —     | 55                  | 5.6  | 41    | —     |
|       |           |                    | 1.25     | 45                                    | 4.6  | 33    | —     | 65                  | 6.6  | 48    | —     |
| 7T    | M14       | 14.0               | 1.5      | 80                                    | 8.2  | 59    | —     | 100                 | 10   | 74    | —     |
|       | M6        | 6.0                | 1.0      | 9                                     | 0.92 | 7     | 80    | 11                  | 1.1  | 8     | 97    |
|       |           |                    | 1.25     | 22                                    | 2.2  | 16    | —     | 28                  | 2.9  | 21    | —     |
|       | M8        | 8.0                | 1.0      | 22                                    | 2.2  | 16    | —     | 28                  | 2.9  | 21    | —     |
|       |           |                    | 1.5      | 45                                    | 4.6  | 33    | —     | 55                  | 5.6  | 41    | —     |
|       | M10       | 10.0               | 1.25     | 45                                    | 4.6  | 33    | —     | 55                  | 5.6  | 41    | —     |
|       |           |                    | 1.75     | 80                                    | 8.2  | 59    | —     | 100                 | 10   | 74    | —     |
| 9T    | M12       | 12.0               | 1.25     | 80                                    | 8.2  | 59    | —     | 100                 | 10   | 74    | —     |
|       |           |                    | 1.5      | 130                                   | 13   | 96    | —     | 170                 | 17   | 125   | —     |
|       | M6        | 6.0                | 1.0      | 11                                    | 1.1  | 8     | —     | 13.5                | 1.4  | 10    | —     |
|       |           |                    | 1.25     | 28                                    | 2.9  | 21    | —     | 35                  | 3.6  | 26    | —     |
|       | M8        | 8.0                | 1.0      | 28                                    | 2.9  | 21    | —     | 35                  | 3.6  | 26    | —     |
|       |           |                    | 1.5      | 55                                    | 5.6  | 41    | —     | 80                  | 8.2  | 59    | —     |
| 9T    | M10       | 10.0               | 1.25     | 55                                    | 5.6  | 41    | —     | 80                  | 8.2  | 59    | —     |
|       |           |                    | 1.75     | 100                                   | 10   | 74    | —     | 130                 | 13   | 96    | —     |
|       | M12       | 12.0               | 1.25     | 100                                   | 10   | 74    | —     | 130                 | 13   | 96    | —     |
|       |           |                    | 1.5      | 170                                   | 17   | 125   | —     | 210                 | 21   | 155   | —     |

\*: Nominal diameter

1. Special parts are excluded.

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

| Grade | Mark |   |   |
|-------|------|---|---|
| 4T    | 4    | M | 6 |
| 7T    | 7    |   |   |
| 9T    | 9    |   |   |

Nominal diameter of bolt threads (Unit: mm)

Metric screw threads

MG1044A

# RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS

## RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS

PFP:00000

### Recommended Chemical Products and Sealants

NAS0005J

Refer to the following chart for help in selecting the appropriate chemical product or sealant.

|   | Product Description  | Purpose  | Nissan North America Part No. (USA) | Nissan Canada Part No. (Canada) | Aftermarket Cross-reference Part Nos.   |
|---|--|--|-------------------------------------|---------------------------------|---|
| 1 | Rear View Mirror Adhesive                                    | Used to permanently remount rear view mirrors to windows.  | 999MP-AM000P                        | 99998-50505                     | Permatex 81844  |
| 2 | Anaerobic Liquid Gasket                                      | For metal-to-metal flange sealing.<br>Can fill a 0.38 mm (0.015 inch) gap and provide instant sealing for most powertrain applications.                | 999MP-AM001P                        | 99998-50503                     | Permatex 51813 and 51817  |
| 3 | High Performance Thread Sealant                              | Provides instant sealing on any threaded straight or parallel threaded fitting. (Thread sealant only, no locking ability.)<br>● Do not use on plastic. | 999MP-AM002P                        | 999MP-AM002P                    | Permatex 56521  |
| 4 | Silicone RTV   | Gasket Maker   | 999MP-AM003P (Ultra Grey)           | 99998-50506 (Ultra Grey)        | Permatex Ultra Grey 82194;<br>Three Bond 1207, 1215, 1216, 1217F, 1217G and 1217H<br>Nissan RTV Part No. 999MP-A7007      |
|   |  | Gasket Maker for Maxima/Quest 5-speed automatic transmission (RE5F22A)   | —                                   | —                               | Three Bond 1281B or exact equivalent in its quality   |
| 5 | High Temperature, High Strength Thread Locking Sealant (Red) | Threadlocker   | 999MP-AM004P                        | 999MP-AM004P                    | Permatex 27200;<br>Three Bond 1360, 1360N, 1305 N&P, 1307N, 1335, 1335B, 1363B, 1377C, 1386B, D&E and 1388<br>Loctite 648 |
| 6 | Medium Strength Thread Locking Sealant (Blue)                | Threadlocker (service tool removable)  | 999MP-AM005P                        | 999MP-AM005P                    | Permatex 24200, 24206, 24240, 24283 and 09178;<br>Three Bond 1322, 1322N, 1324 D&N, 1333D, 1361C, 1364D, 1370C and 1374   |

# IDENTIFICATION INFORMATION

## IDENTIFICATION INFORMATION

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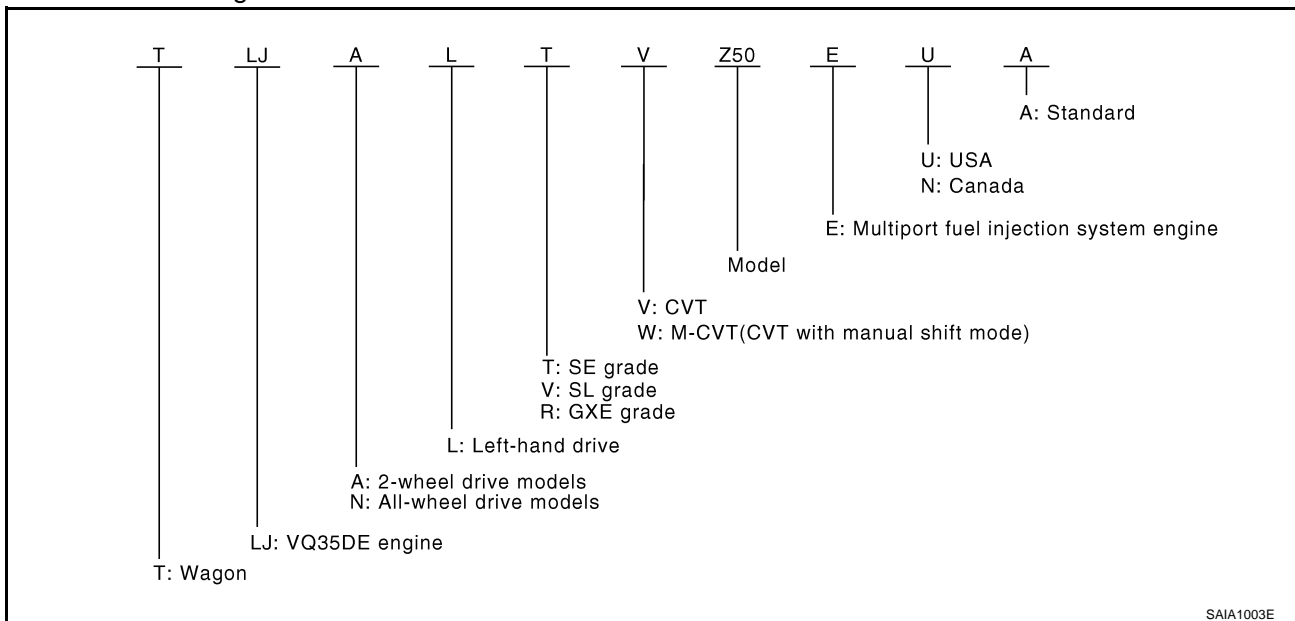
### Model Variation

NAS0005K

| Body  | Engine | Axle | Transmission | Model       | Destination |
|-------|--------|------|--------------|-------------|-------------|
| Wagon | VQ35DE | 2WD  | CVT          | TLJALRV-EUA | USA         |
|       |        |      |              | TLJALVV-EUA |             |
|       |        |      |              | TLJALVV-ENA | CANADA      |
|       |        | AWD  | M-CVT*       | TLJNLTW-EUA | USA         |
|       |        |      | CVT          | TLJNLRV-EUA |             |
|       |        |      |              | TLJNLVV-EUA |             |
|       |        |      | M-CVT*       | TLJNLTW-ENA | CANADA      |
|       |        |      | CVT          | TLJNLVV-ENA |             |

\*: CVT with manual shift mode

Prefix and suffix designations:



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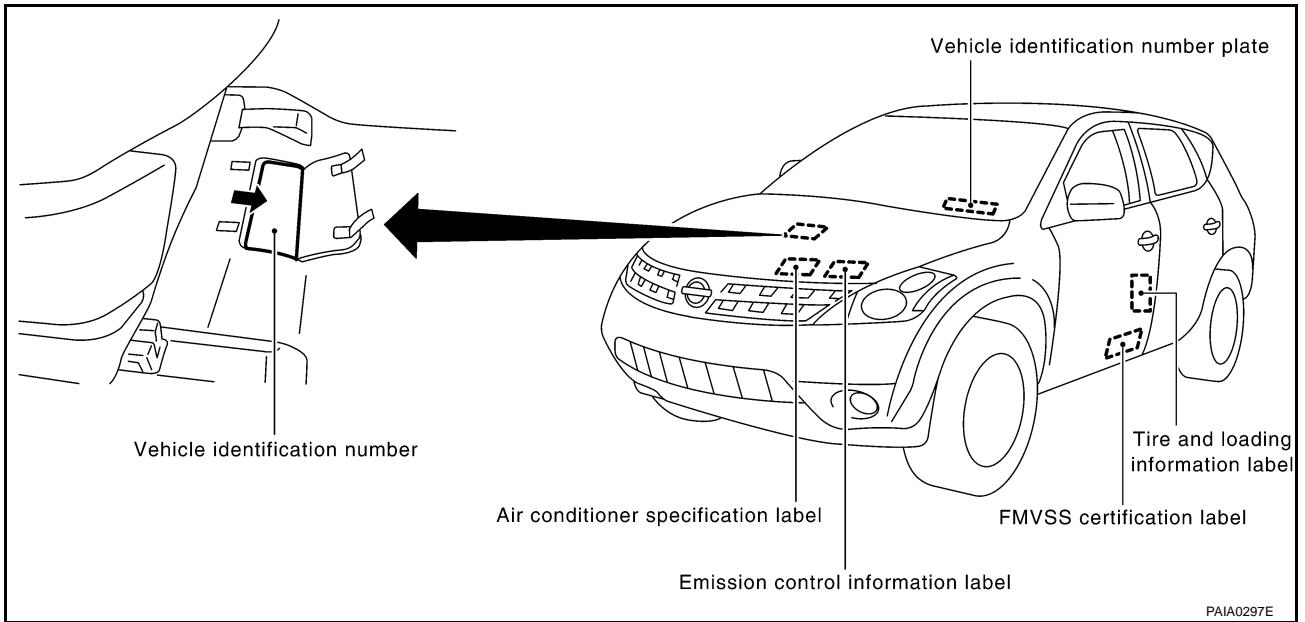
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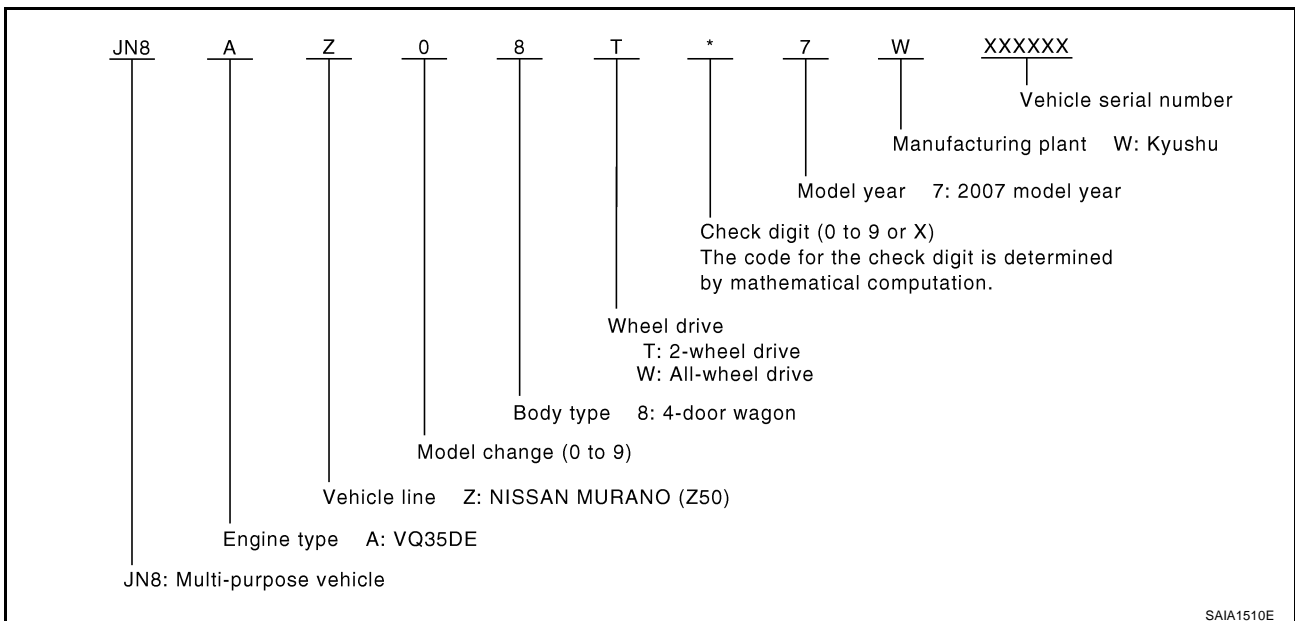
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# IDENTIFICATION INFORMATION

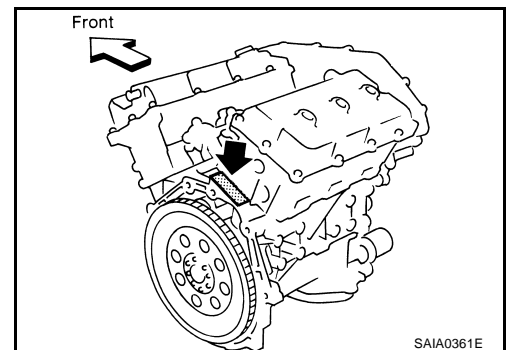
## IDENTIFICATION NUMBER



## VEHICLE Identification Number ARRANGEMENT



## ENGINE SERIAL NUMBER

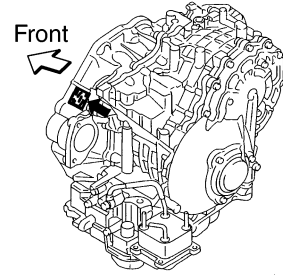


# IDENTIFICATION INFORMATION

## AUTOMATIC TRANSMISSION NUMBER

SEC.310

Front



SAIA0360E

## Dimensions

NAS0005L

Unit: mm (in)

|                |                        |               |
|----------------|------------------------|---------------|
| Overall length |                        | 4,767 (187.6) |
| Overall width  |                        | 1,880 (74.0)  |
| Overall height | without roof rack rail | 1,689 (66.5)  |
|                | with roof rack rail    | 1,709 (67.3)  |
| Front tread    |                        | 1,630 (64.2)  |
| Rear tread     |                        | 1,630 (64.2)  |
| Wheelbase      |                        | 2,825 (111.2) |

## Wheels & Tires

NAS0005M

| Application               | Conventional                    | Spare                            |
|---------------------------|---------------------------------|----------------------------------|
| Road wheel/offset mm (in) | 18 X 7-1/2JJ Aluminum/35 (1.38) | 18 X 4T Steel/25 (0.98)          |
| Tire size                 | P235/65R18 104T                 | T165/90D18 107M<br>Conventional* |

\*: for Canada

# TERMINOLOGY

## TERMINOLOGY

PFP:00011

### SAE J1930 Terminology List

NAS0005N

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.

| 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                                 | CKP                           | ***                                 |
| Crankshaft position sensor                          | CKPS                          | ***                                 |
| Data link connector                                 | DLC                           | ***                                 |
| Data link connector for CONSULT-II                  | DLC for CONSULT-II            | Diagnostic connector for CONSULT-II |
| 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                          | EI 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                            |
| Evaporative emission system                         | EVAP system                   | Canister control solenoid valve     |
| Exhaust gas recirculation valve                     | EGR valve                     | EGR valve                           |



# TERMINOLOGY

| NEW TERM  | NEW ACRONYM /<br>ABBREVIATION       | OLD TERM                              |
|---|-------------------------------------|---------------------------------------|
| 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              | EGRT sensor                         | Exhaust gas temperature sensor        |
| EGR temperature sensor                                    |                                     |                                       |
| Flash electrically erasable programmable read only memory | FEEPROM                             | ***                                   |
| Flash erasable programmable read only memory              | FEPROM                              | ***                                   |
| Flexible fuel sensor                                      | FFS                                 | ***                                   |
| Flexible fuel system                                      | FF system                           | ***                                   |
| 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                    |
| Idle air control system                                   | IAC system                          | Idle speed control                    |
| Idle air control valve-air regulator                      | IACV-air regulator                  | Air regulator                         |
| Idle air control valve-auxiliary air control valve        | IACV-AAC valve                      | Auxiliary air control (AAC) valve     |
| Idle air control valve-FICD solenoid valve                | IACV-FICD solenoid valve            | FICD solenoid valve                   |
| Idle air control valve-idle up control solenoid valve     | IACV-idle up control solenoid valve | Idle up control solenoid valve        |
| Idle speed control-FI pot                                 | ISC-FI pot                          | FI pot                                |
| Idle speed control system                                 | ISC system                          | ***                                   |
| Ignition control  | IC                                  | ***                                   |
| Ignition control module                                   | ICM                                 | ***                                   |
| Indirect fuel injection system                            | IFI system                          | ***                                   |
| Intake air  | IA                                  | Air                                   |
| Intake air temperature sensor                             | IAT sensor                          | Air temperature sensor                |
| Knock   | ***                                 | Detonation                            |
| Knock sensor  | KS                                  | Detonation sensor                     |
| Malfunction indicator lamp                                | MIL                                 | Check engine light                    |
| Manifold absolute pressure                                | MAP                                 | ***                                   |
| Manifold absolute pressure sensor                         | MAPS                                | ***                                   |
| Manifold differential pressure                            | MDP                                 | ***                                   |
| Manifold differential pressure sensor                     | MDPS                                | ***                                   |
| Manifold surface temperature                              | MST                                 | ***                                   |
| Manifold surface temperature sensor                       | MSTS                                | ***                                   |
| Manifold vacuum zone                                      | MVZ                                 | ***                                   |
| Manifold vacuum zone sensor                               | MVZS                                | ***                                   |
| 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                |

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# TERMINOLOGY

| NEW TERM  | NEW ACRONYM /<br>ABBREVIATION | OLD TERM   |
|---|-------------------------------|--|
| Nonvolatile random access memory                      | NVRAM                         | ***  |
| On board diagnostic system                            | OBD system                    | Self-diagnosis   |
| Open loop   | OL                            | Open loop  |
| Oxidation catalyst                                    | OC                            | 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<br>Inhibitor switch<br>Neutral position 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                             | PCM                           | ***  |
| 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                    | ***  |
| Three way + oxidation catalyst                        | TWC + OC                      | Catalyst   |
| Three way + oxidation catalytic converter system      | TWC + OC system               | ***  |
| Throttle body   | TB                            | Throttle chamber<br>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<br>Lock-up solenoid                        |

# TERMINOLOGY

| NEW TERM                                     | NEW ACRONYM /<br>ABBREVIATION | OLD TERM             |
|--|-------------------------------|----------------------|
| Transmission control module                  | TCM                           | A/T control unit     |
| Turbocharger                                 | TC                            | 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                  | ***                  |
| 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          |

\*\*\*: Not applicable

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## TERMINOLOGY

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# SECTION **EM**

## ENGINE MECHANICAL

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# PRECAUTIONS

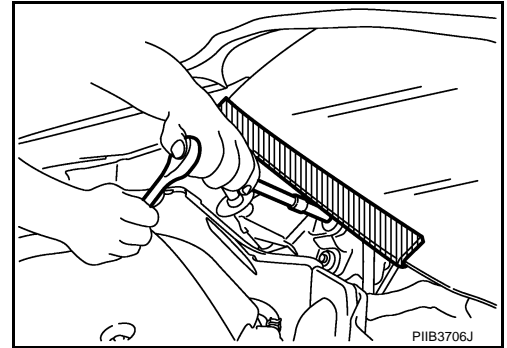
## PRECAUTIONS

PFP:00001

### Precautions for Procedures without Cowl Top Cover

NBS002W9

When performing the procedure after removing cowl top cover, cover the lower end of windshield with urethane, etc.



### Precautions for Drain Engine Coolant and Engine Oil

NBS0028X

Drain engine coolant and engine oil when the engine is cooled.

### Precautions for Disconnecting Fuel Piping

NBS0028Y

- Before starting work, make sure no fire or spark producing items are in the work area.
- Release fuel pressure before disconnecting and disassembly.
- After disconnecting pipes, plug openings to stop fuel leakage.

### Precautions for Removal and Disassembly

NBS0028Z

- When instructed to use SST, use the specified tools. Always be careful to work safely, avoid forceful or uninstructed operations.
- Exercise maximum care to avoid damage to mating or sliding surfaces.
- Dowel pins are used for several parts alignment. When replacing and reassembling parts with dowel pins, make sure that dowel pins are installed in the original position.
- Cover openings of engine system with a tape or the equivalent, if necessary, to seal out foreign materials.
- Mark and arrange disassembly parts in an organized way for easy troubleshooting and re-assembly.
- When loosening nuts and bolts, as a basic rule, start with the one furthest outside, then the one diagonally opposite, and so on. If the order of loosening is specified, do exactly as specified. Power tools may be used in the step.

### Precautions for Inspection, Repair and Replacement

NBS00290

Before repairing or replacing, thoroughly inspect parts. Inspect new replacement parts in the same way, and replace if necessary.

### Precautions for Assembly and Installation

NBS00291

- Use torque wrench to tighten bolts or nuts to specification.
- When tightening nuts and bolts, as a basic rule, equally tighten in several different steps starting with the ones in center, then ones on inside and outside diagonally in this order. If the order of tightening is specified, do exactly as specified.
- Replace with new gasket, packing, oil seal or O-ring.
- Dowel pins are used for several parts alignment. When replacing and reassembling parts with dowel pins, make sure that dowel pins are installed in the original position.
- Thoroughly wash, clean, and air-blow each part. Carefully check engine oil or engine coolant passages for any restriction and blockage.
- Avoid damaging sliding or mating surfaces. Completely remove foreign materials such as cloth lint or dust. Before assembly, oil sliding surfaces well.
- Release air within route when refilling after draining engine coolant.
- After repairing, start the engine and increase engine speed to check engine coolant, fuel, engine oil, and exhaust gases for leakage.

# PRECAUTIONS

## Precautions for Angle Tightening

NBS00292

- Use the angle wrench [SST: KV10112100 (BT8653-A)] for the final tightening of the following engine parts:
  - Cylinder head bolts
  - Main bearing cap bolts
  - Connecting rod cap bolts
  - Crankshaft pulley bolt (No the angle wrench is required as bolt flange is provided with notches for angle tightening)
- 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.

## Precautions for Liquid Gasket REMOVAL OF LIQUID GASKET SEALING

NBS00293

- After removing mounting nuts and bolts, separate the mating surface using the seal cutter (SST) and remove old liquid gasket sealing.

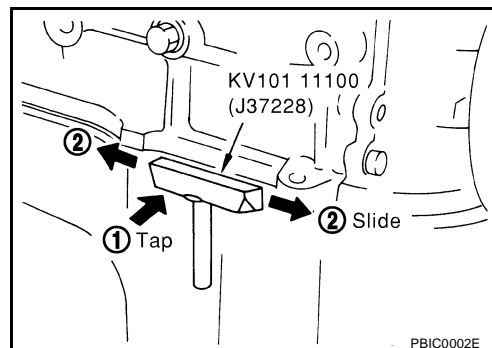
### CAUTION:

**Be careful not to damage the mating surfaces.**

- Tap the seal cutter to insert it, and then slide it by tapping on the side as shown in the figure.
- In areas where the seal cutter is difficult to use, use a plastic hammer to lightly tap the parts, to remove it.

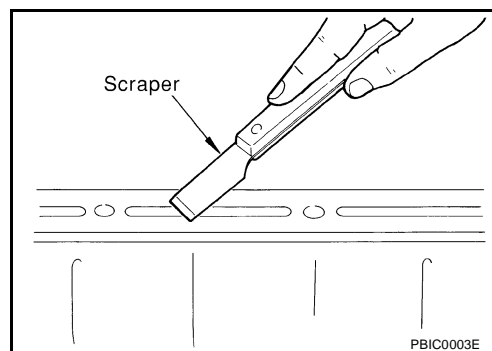
### CAUTION:

**If for some unavoidable reason tool such as a screwdriver is used, be careful not to damage the mating surfaces.**



## LIQUID GASKET APPLICATION PROCEDURE

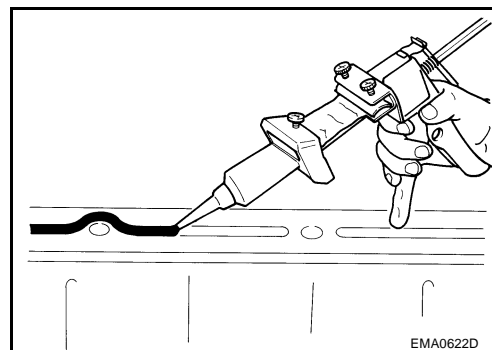
1. Using a scraper, remove old liquid gasket adhering to the gasket application surface and the mating surface.
  - Remove liquid gasket completely from the groove of the gasket application surface, mounting bolts, and bolt holes.
2. Wipe the liquid gasket application surface and the mating surface with white gasoline (lighting and heating use) to remove adhering moisture, grease and foreign materials.



3. Attach liquid gasket tube to the tube presser [SST: WS39930000 ( — )].

**Use Genuine RTV Silicone Sealant or equivalent. Refer to [GI-46, "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS"](#).**

4. Apply liquid gasket without breaks to the specified location with the specified dimensions.
  - If there is a groove for liquid gasket application, apply liquid gasket to the groove.



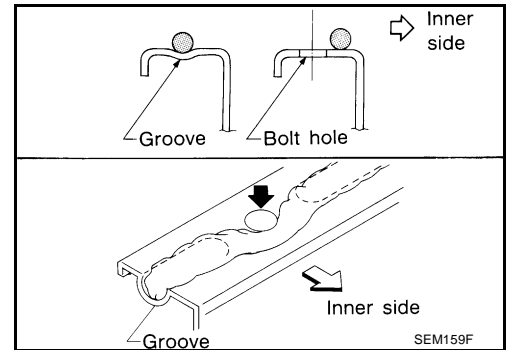


## PRECAUTIONS

- As for bolt holes, normally apply liquid gasket inside the holes. Occasionally, it should be applied outside the holes. Make sure to read the text of this manual.
- Within 5 minutes of liquid gasket application, install the mating component.
- If liquid gasket protrudes, wipe it off immediately.
- Do not retighten mounting bolts or nuts after the installation.
- After 30 minutes or more have passed from the installation, fill engine oil and engine coolant.

### CAUTION:

If there are specific instructions in this manual, observe them.



A

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M

# PREPARATION

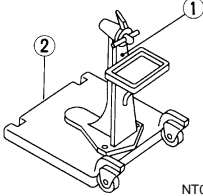
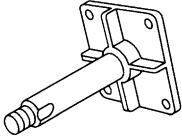
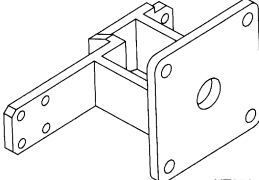
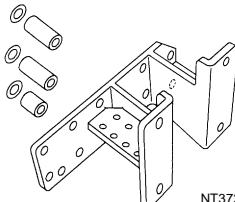
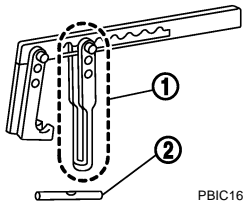
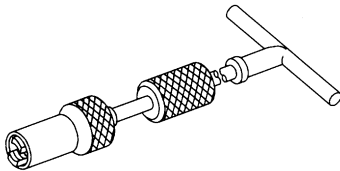
## PREPARATION

PFP:00002

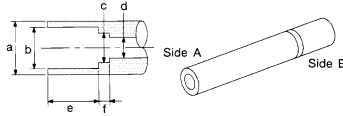
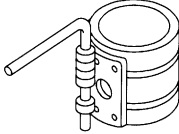
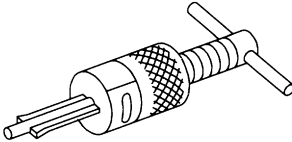
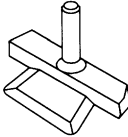
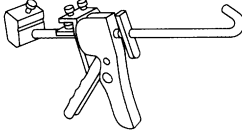
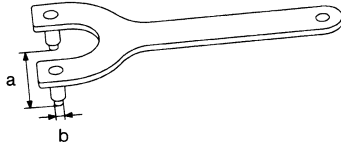
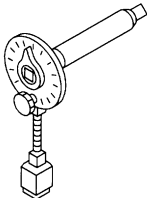
### Special Service Tools

NBS00294

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  |
|--|--|--|
| ST0501S000<br>( — )<br>Engine stand assembly<br>1. ST05011000<br>( — )<br>Engine stand<br>2. ST05012000<br>( — )<br>Base               |  <p>NT042</p>       | Disassembling and assembling the engine  |
| KV10106500<br>( — )<br>Engine stand shaft  |  <p>NT028</p>       |  |
| KV10117000<br>(J41262)<br>Engine sub-attachment  |  <p>NT373</p>      | KV10117000 has been replaced with KV10117001 (KV10117000 is no longer in production, but it is usable).    |
| KV10117001<br>( — )<br>Engine sub-attachment   |  <p>NT372</p>     | Installing on cylinder block   |
| KV10116200<br>(J26336-A)<br>Valve spring compressor<br>1. KV10115900<br>(J26336-20)<br>Attachment<br>2. KV10109220<br>( — )<br>Adapter |  <p>PBIC1650E</p> | Disassembling valve mechanism<br>Part (1) is a component of KV10116200 (J26336-A), but Part (2) is not so. |
| KV10107902<br>(J38959)<br>Valve oil seal puller  |  <p>NT011</p>     | Replacing valve oil seal   |

# PREPARATION

| Tool number<br>(Kent-Moore No.)<br>Tool name    |  | Description  | A           |
|---|--|--|-------------|
| KV10115600<br>(J-38958)<br>Valve oil seal drift | <br>S-NT603 | Installing valve oil seal<br><b>Use side A.</b><br><b>a: 20 (0.79) dia.</b><br><b>b: 13 (0.51) dia.</b><br><b>c: 10.3 (0.406) dia.</b><br><b>d: 8 (0.31) dia.</b><br><b>e: 10.7 (0.421)</b><br><b>f: 5 (0.20)</b><br>Unit: mm (in) | EM<br>C     |
| EM03470000<br>(J8037)<br>Piston ring compressor | <br>NT044   | Installing piston assembly into cylinder bore  | D<br>E      |
| ST16610001<br>(J23907)<br>Pilot bushing puller  | <br>NT045   | Removing pilot converter   | F<br>G<br>H |
| KV10111100<br>(J37228)<br>Seal cutter           | <br>NT046 | Removing oil pan (lower and upper), front and rear timing chain case, etc.   | I<br>J      |
| WS39930000<br>( — )<br>Tube presser             | <br>NT052 | Pressing the tube of liquid gasket   | K<br>L      |
| KV10109300<br>( — )<br>Pulley holder            | <br>NT628 | Removing and installing crankshaft pulley<br><b>a: 68 mm (2.68 in)</b><br><b>b: 8 mm (0.31 in) dia.</b>  | M           |
| KV10112100<br>(BT8653-A)<br>Angle wrench        | <br>NT014 | Tightening bolts for connecting rod bearing cap, cylinder head, etc. in angle  |             |

# PREPARATION

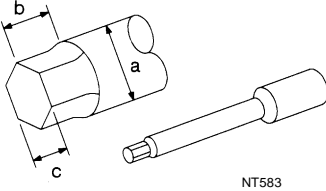
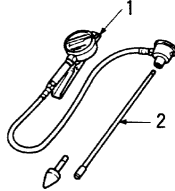
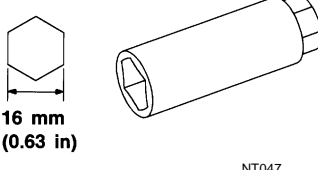

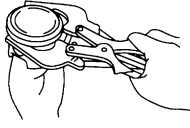
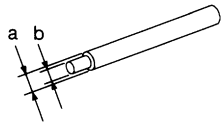
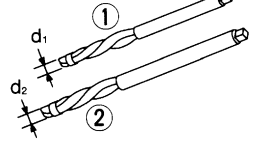
| Tool number<br>(Kent-Moore No.)<br>Tool name           | Description   |
|--|---|
| KV10117100<br>(J3647-A)<br>Heated oxygen sensor wrench | Loosening or tightening air fuel ratio sensor 1<br><b>For 22 mm (0.87 in) width hexagon nut</b> |
| KV10114400<br>(J38365)<br>Heated oxygen sensor wrench  | Loosening or tightening heated oxygen sensor 2<br><b>a: 22 mm (0.87 in)</b>                     |
| —<br>(J-45488)<br>Quick connector release              | Removing fuel tube quick connectors in engine room  |

## Commercial Service Tools

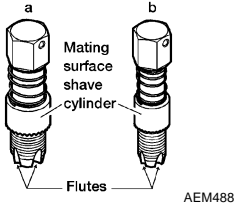

NBS00295

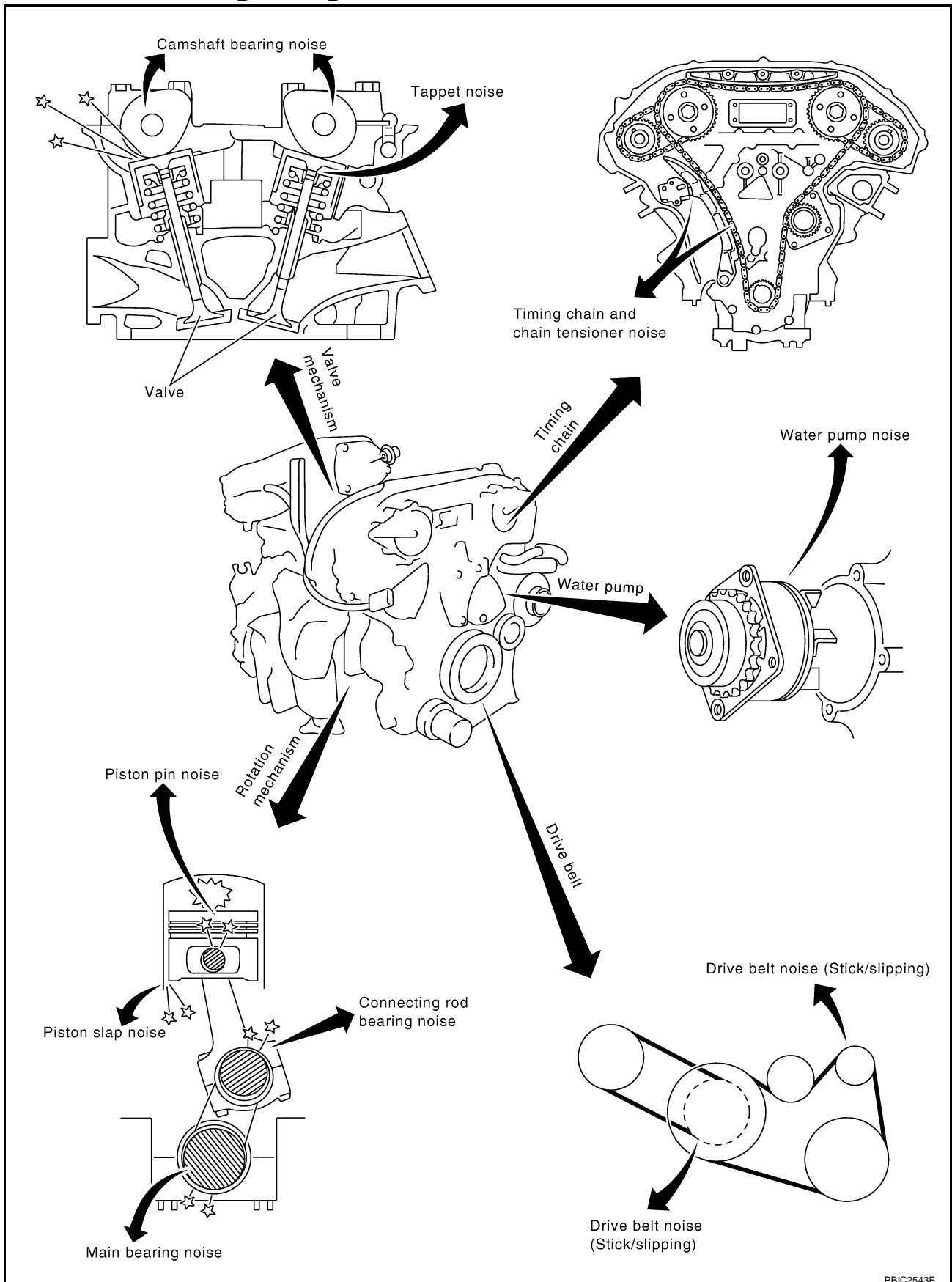
| (Kent-Moore No.)<br>Tool name    | Description                    |
|----------------------------------|--------------------------------|
| ( — )<br>Power tool              | Loosening bolts and nuts       |
| (BT3373-F)<br>Belt tension gauge | Checking drive belt tension    |
| ( — )<br>Manual lift table caddy | Removing and installing engine |

# PREPARATION

| (Kent-Moore No.)<br>Tool name  | Description   | A  |
|--|---|----|
| (J24239-01)<br>Cylinder head bolt wrench <br>NT583      | Loosening and tightening cylinder head bolt, and used with the angle wrench [SST: KV10112100 (BT8653-A)]<br><b>a: 13 (0.51) dia.</b><br><b>b: 12 (0.47)</b><br><b>c: 10 (0.39)</b><br>Unit: mm (in) | EM |
| ( — )<br>1.Compression tester<br>2.Adapter <br>ZZA0008D | Checking compression pressure   | D  |
| ( — )<br>Spark plug wrench <br>NT047                    | Removing and installing spark plug  | F  |
| ( — )<br>Valve seat cutter set <br>NT048               | Finishing valve seat dimensions   | H  |
| ( — )<br>Piston ring expander <br>NT030               | Removing and installing piston ring   | K  |
| ( — )<br>Valve guide drift <br>NT015                  | Removing and installing valve guide<br><b>Intake and Exhaust:</b><br><b>a: 9.5 mm (0.374 in) dia.</b><br><b>b: 5.5 mm (0.217 in) dia.</b>   | M  |
| ( — )<br>Valve guide reamer <br>NT016                 | (1): Reaming valve guide inner hole<br>(2): Reaming hole for oversize valve guide<br><b>Intake and Exhaust:</b><br><b>d1 : 6.0 mm (0.236 in) dia.</b><br><b>d2 : 10.2 mm (0.402 in) dia.</b>        |    |

# PREPARATION

| (Kent-Moore No.)<br>Tool name  | Description   |
|--|---|
| a: (J-43897-18)<br>b: (J-43897-12)<br>Oxygen sensor thread cleaner                               |  <p>Reconditioning the exhaust system threads before installing a new air fuel ratio sensor and heated oxygen sensor (Use with anti-seize lubricant shown below.)<br/> <b>a: J-43897-18 [18 mm (0.71 in) dia.] for zirconia heated oxygen sensor and air fuel ratio sensor</b><br/> <b>b: J-43897-12 [12 mm (0.47 in) dia.] for titania heated oxygen sensor</b></p> |
| ( — )<br>Anti-seize lubricant (Permatex 133AR or equivalent meeting MIL specification MIL-A-907) |  <p>Lubricating air fuel ratio sensor and oxygen sensor threads cleaning tool when reconditioning exhaust system threads</p>   |



# NOISE, VIBRATION AND HARSHNESS (NVH) TROUBLESHOOTING

## Use the Chart Below to Help You Find the Cause of the Symptom.

NBS00297

1. Locate the area where noise occurs.
2. Confirm the type of noise.
3. Specify the operating condition of the engine.
4. Check specified noise source.  
If necessary, repair or replace these parts.

| Location of noise   | Type of noise        | Operating condition of engine |               |               |             |             |               | Source of noise                               | Check item  | Reference page   |
|---|----------------------|-------------------------------|---------------|---------------|-------------|-------------|---------------|---|---|--|
|   |                      | Before warm-up                | After warm-up | When starting | When idling | When racing | While driving |   |   |  |
| Top of engine<br>Rocker cover<br>Cylinder head                  | Ticking or clicking  | C                             | A             | —             | A           | B           | —             | Tappet noise                                  | Valve clearance   | <a href="#">EM-88</a>  |
|   | Rattle               | C                             | A             | —             | A           | B           | C             | Camshaft bearing noise                        | Camshaft runout<br>Camshaft journal oil clearance   | <a href="#">EM-81</a><br><a href="#">EM-81</a>   |
| Crankshaft pulley<br>Cylinder block (Side of engine)<br>Oil pan | Slap or knock        | —                             | A             | —             | B           | B           | —             | Piston pin noise                              | Piston to piston pin oil clearance<br>Connecting rod bushing oil clearance  | <a href="#">EM-132</a><br><a href="#">EM-134</a>   |
|   | Slap or rap          | A                             | —             | —             | B           | B           | A             | Piston slap noise                             | Piston to cylinder bore clearance<br>Piston ring side clearance<br>Piston ring end gap<br>Connecting rod bend and torsion | <a href="#">EM-136</a><br><a href="#">EM-133</a><br><a href="#">EM-133</a><br><a href="#">EM-134</a> |
|   | Knock                | A                             | B             | C             | B           | B           | B             | Connecting rod bearing noise                  | Connecting rod bushing oil clearance<br>Connecting rod bearing oil clearance  | <a href="#">EM-134</a><br><a href="#">EM-138</a>   |
|   | Knock                | A                             | B             | —             | A           | B           | C             | Main bearing noise                            | Main bearing oil clearance<br>Crankshaft runout   | <a href="#">EM-139</a><br><a href="#">EM-138</a>   |
| Front of engine<br>Timing chain case                            | Tapping or ticking   | A                             | A             | —             | B           | B           | B             | Timing chain and timing chain tensioner noise | Timing chain cracks and wear<br>Timing chain tensioner operation  | <a href="#">EM-67</a><br><a href="#">EM-60</a>   |
| Front of engine   | Squeaking or fizzing | A                             | B             | —             | B           | —           | C             | Drive belts (Sticking or slipping)            | Drive belts deflection  | <a href="#">EM-13</a>  |
|   | Creaking             | A                             | B             | A             | B           | A           | B             | Drive belts (Slipping)                        | Idler pulley bearing operation  |  |
|   | Squall Creak         | A                             | B             | —             | B           | A           | B             | Water pump noise                              | Water pump operation  | <a href="#">CO-22</a><br><a href="#">"WATER PUMP"</a>  |

A: Closely related B: Related C: Sometimes related —: Not related



# DRIVE BELTS

## DRIVE BELTS

PFP:02117

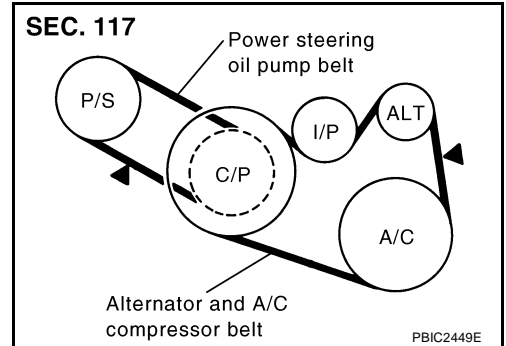
### Checking Drive Belts

NBS00298

#### WARNING:

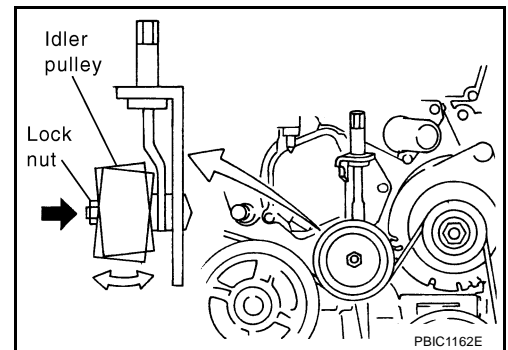
Be sure to perform when the engine is stopped.

1. Inspect belts for cracks, fraying, wear and oil. If necessary, replace.
2. Inspect drive belt deflection or tension at a point on belt midway between pulleys.
  - Inspection should be done only when the engine is cold, or over 30 minutes after engine is stopped.
  - Measure the belt tension with belt tension gauge (commercial service tool: BT3373-F or equivalent) at points marked ▼ shown in the figure.
  - When measuring deflection, apply 98 N (10 kg, 22 lb) at the ▼ marked point.
  - Adjust if the belt deflection exceeds the limit or if the belt tension is not within specifications.



#### CAUTION:

- When checking the belt deflection or the tension immediately after installation, first adjust it to the specified value. Then, after turning the crankshaft two turns or more, re-adjust to the specified value to avoid variation in deflection between pulleys.
- Release the tension by loosening lock nut and turning adjusting bolt when adjusting the belt. Tighten once the lock nut at 4.9 N·m(0.50 Kg-m,43 in-lb). Then, adjust the belt tension by loosening lock nut between 45° and 90°.



### Belt Deflection and Tension

|                               | Deflection adjustment |                            | Unit: mm (in)              | Tension adjustment* |  | Unit: N (Kg, lb)                             |
|-------------------------------|-----------------------|----------------------------|----------------------------|---------------------|--|--|
|                               | Used belt             |                            |                            | Used belt           |  |  |
|                               | Limit                 | After adjustment           | New belt                   | Limit               | After adjustment                         | New belt                                     |
| Alternator and A/C compressor | 7 (0.28)              | 4.2 - 4.6<br>(0.17 - 0.18) | 3.7 - 4.1<br>(0.15 - 0.16) | 294 (30, 66)        | 730 - 818<br>(74.5 - 83.5,<br>164 - 184) | 838 - 926<br>(85.5 - 94.5,<br>188 - 208)     |
| Power steering oil pump       | 11 (0.43)             | 7.3 - 8<br>(0.29 - 0.30)   | 6.5 - 7.2<br>(0.26 - 0.28) | 196 (20, 44)        | 495 - 583<br>(50.5 - 59.5,<br>111 - 131) | 603 - 691<br>(61.5 - 70.5,<br>135.6 - 155.4) |
| Applied pushing force         | 98 N (10 Kg, 22 lb)   |                            |                            | —                   |  |  |

\*: If belt tension gauge cannot be installed at check points shown, check drive belt tension at different location on the belt.

### Tension Adjustment

NBS00299

| Portion                            | Belt tightening method for adjustment     |
|------------------------------------|---|
| Power steering oil pump belt       | Adjusting bolt on power steering oil pump |
| Alternator and A/C compressor belt | Adjusting nut on idler pulley             |

#### CAUTION:

- When belt is replaced with a new one, adjust it to value for “New belt” to accommodate for insufficient adaptability with pulley grooves.

# DRIVE BELTS

- When deflection or tension of belt being used exceeds “Limit”, adjust it to value for “After adjustment”.
- When checking belt deflection or tension immediately after installation, first adjust it to the specified value. Then, after turning the crankshaft two turns or more, re-adjust to the specified value to avoid variation in deflection between pulleys.
- Release the tension by loosening lock nut and turning adjusting nut when adjusting the belt. Tighten once the lock nut at 4.9 N·m (0.50 Kg-m, 43 in-lb). Then, adjust the belt tension by loosening lock nut between 45° and 90°.
- When installing belt, make sure that it is correctly engaged with pulley groove.
- Keep engine oil, working fluid and engine coolant away from belt.
- Do not twist or bend belt excessively.

## ALTERNATOR AND A/C COMPRESSOR BELT

1. Remove splash guard (RH).
2. Loosen idler pulley lock nut (A).
3. Release the belt tension on idler pulley by turning adjusting nut (B).
4. Tighten lock nut (A). Then, loosen lock nut between 45° and 90°.

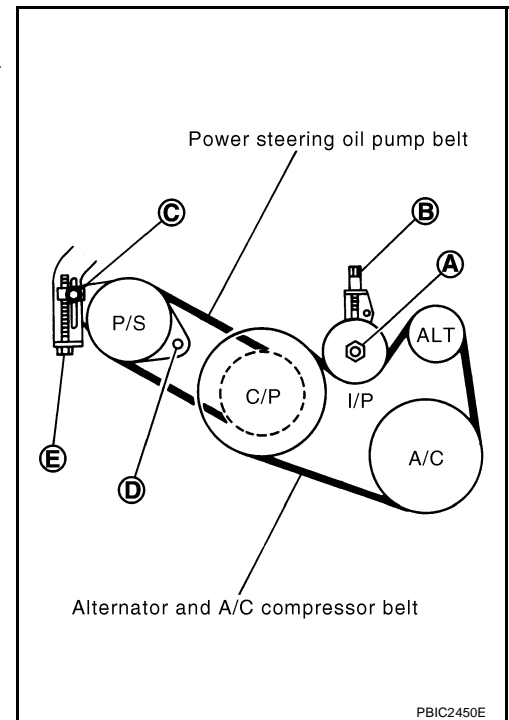
 : 4.9 N·m (0.50 kg-m, 43 in-lb)

5. Adjust tension by turning adjusting nut (B).
  - For the specified belt tension, refer to [EM-13, "Checking Drive Belts"](#).
6. Tighten lock nut (A).

 : 34.8 N·m (3.5 kg-m, 26 ft-lb)

7. Tighten adjusting nut (B).

 : 5.4 N·m (0.55 kg-m, 48 in-lb)



## POWER STEERING OIL PUMP BELT

1. Remove splash guard (RH).
2. Loosen lock bolt (C).
3. Loosen power steering oil pump mounting bolt (D).
  - Bolt head (D) is engine rear side.
4. Adjust tension by turning adjusting bolt (E).
  - For the specified belt tension, refer to [EM-13, "Checking Drive Belts"](#).

### NOTE:

Adjusting bolt (E) is loosened with counterclockwise rotation.

5. Tighten lock bolt (C).

 : 28.0 N·m (2.9 kg-m, 21 ft-lb)

6. Tighten power steering oil pump mounting bolt (D).

# DRIVE BELTS

 : 43.2 N·m (4.4 kg-m, 32 ft-lb)

A

## Removal and Installation

NBS0029A

### REMOVAL

EM

1. Remove splash guard (RH).
2. Fully loosen each belt by following the guidelines in [EM-13, "Tension Adjustment"](#) . Remove alternator and A/C compressor belt and then power steering oil pump belt.

#### **CAUTION:**

**Grease is applied to idler pulley adjusting bolt. Be careful to keep grease away from belt.**

C

### INSTALLATION

D

1. Install each belt to pulley in the reverse order of removal.

#### **CAUTION:**

- **Make sure belt is correctly engaged with the pulley groove.**
- **Make sure that for engine oil, working fluid and engine coolant do not adhere to belt and each pulley groove.**

E

2. Adjust belt tension. Refer to [EM-13, "Tension Adjustment"](#) .
3. Tighten each nuts and bolts to the specified torque.
4. Make sure that tension of each belt is within the standard. Refer to [EM-13, "Checking Drive Belts"](#) .

F

G

H

I

J

K

L

M

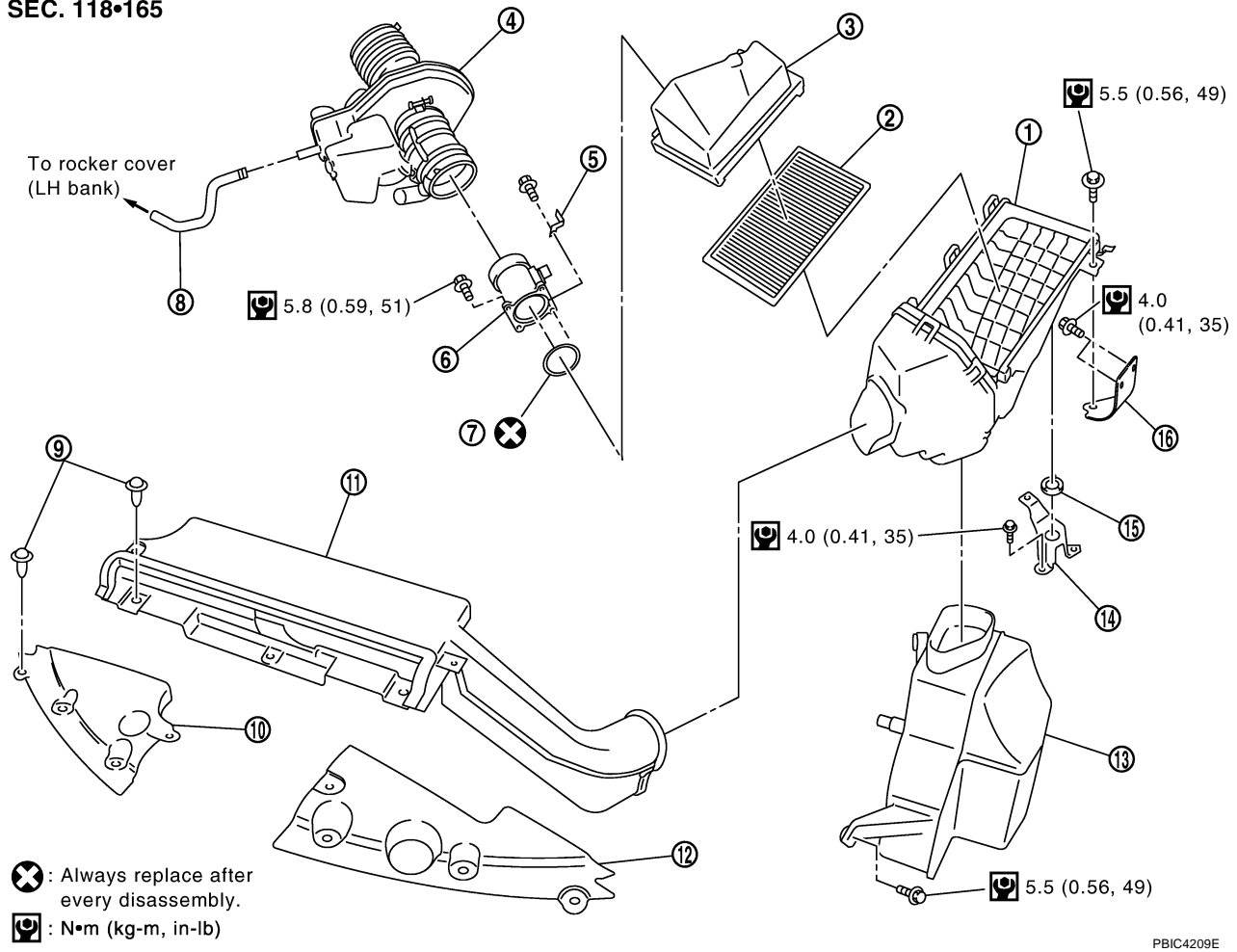
## AIR CLEANER AND AIR DUCT

PFP:16500

### Removal and Installation

NBS0029B

SEC. 118•165



PBIC4209E

- |                                       |                       |                                      |
|---------------------------------------|-----------------------|--------------------------------------|
| 1. Air cleaner case (lower)           | 2. Air cleaner filter | 3. Air cleaner case (upper)          |
| 4. Air duct assembly                  | 5. Harness bracket    | 6. Mass air flow sensor              |
| 7. O-ring                             | 8. PCV hose           | 9. Clip                              |
| 10. Radiator cover grill (right side) | 11. Air duct (inlet)  | 12. Radiator cover grill (left side) |
| 13. Resonator                         | 14. Bracket           | 15. Grommet                          |
| 16. Bracket                           |                       |                                      |

### REMOVAL

- Remove radiator cover grills (right and left side).
- Remove air duct (inlet).
- Disconnect harness connector from mass air flow sensor.
- Disconnect PCV hose.
- Remove air cleaner cases (upper and lower) with mass air flow sensor and air duct assembly disconnecting their joints.
  - Add mating marks as necessary for easier installation.
- Remove mass air flow sensor from air cleaner case (upper), as necessary.

### CAUTION:

Handle mass air flow sensor with following cares.

- Do not shock it.
- Do not disassemble it.
- Do not touch its sensor.

# AIR CLEANER AND AIR DUCT

7. Remove resonator, removing left side fender protector (front), as necessary.

## INSPECTION AFTER REMOVAL

Inspect air duct assembly for crack or tear.

- If anything found, replace air duct assembly.

## INSTALLATION

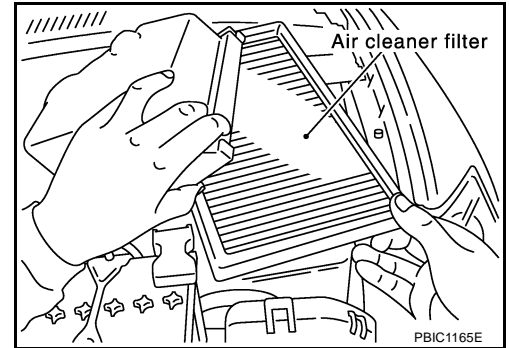
Note the following, and install in the reverse order of removal.

- Align marks. Attach each joint. Screw clamps firmly.

## Changing Air Cleaner Filter

### REMOVAL

1. Unhook air cleaner case (lower) side clips and lift up air cleaner case (upper).
2. Remove air cleaner filter.



## INSTALLATION

Install in the reverse order of removal.

A

EM

C

D

E

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G

H

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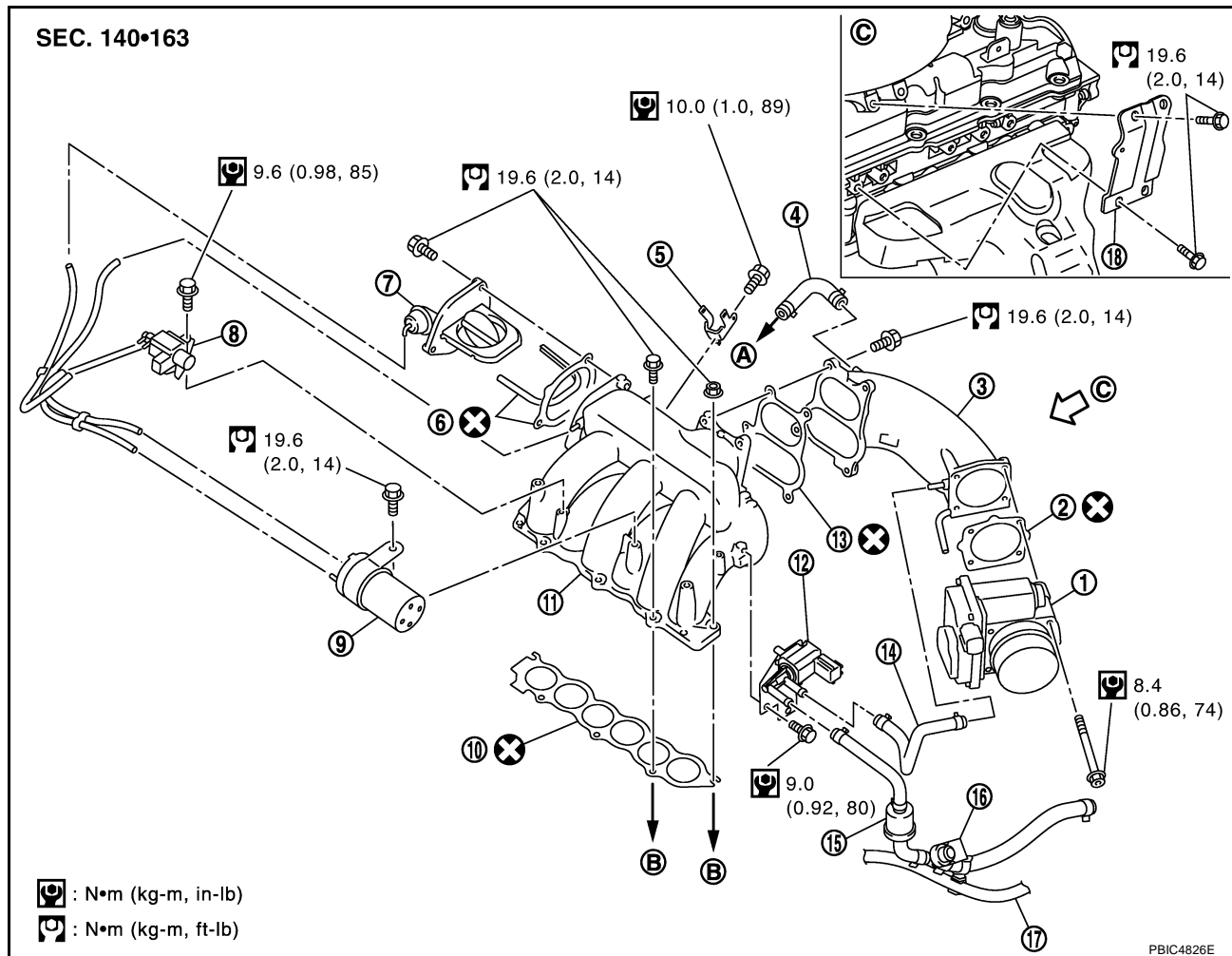
K

L

M

## Removal and Installation

NBS0029D



- |                                       |                                       |   |
|---------------------------------------|---------------------------------------|---|
| 1. Electric throttle control actuator | 2. Gasket                             | 3. Intake manifold collector (upper)                  |
| 4. PCV hose                           | 5. Harness bracket                    | 6. Gasket   |
| 7. Power valve                        | 8. VIAS control solenoid valve        | 9. Vacuum tank  |
| 10. Gasket                            | 11. Intake manifold collector (lower) | 12. EVAP canister purge volume control solenoid valve |
| 13. Gasket                            | 14. EVAP hose                         | 15. Purge resonator                                   |
| 16. Service port                      | 17. Fuel hose                         | 18. Intake manifold collector support                 |
| A. To rocker cover                    | B. To intake manifold                 | C. A View   |

- Refer to GI-10, "Components" for symbol marks in the figure.

## REMOVAL

**WARNING:**

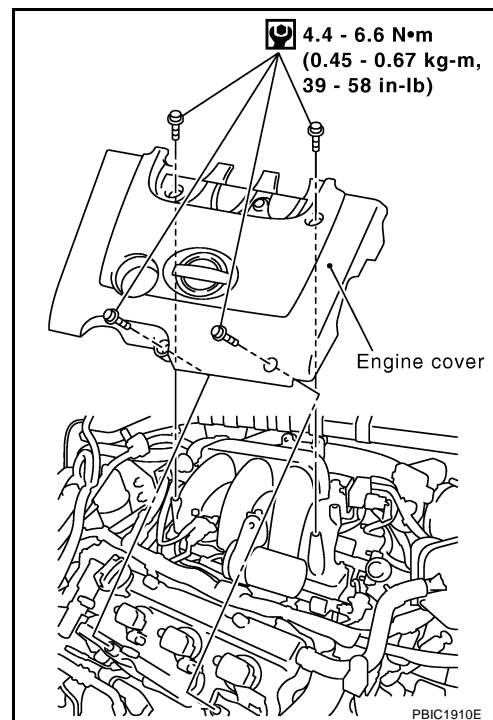
**To avoid the danger of being scalded, never drain engine coolant when the engine is hot.**

# INTAKE MANIFOLD COLLECTOR

1. Remove engine cover.

**CAUTION:**

Be careful not to damage or scratch engine cover.



2. Remove air cleaner case (upper) with mass air flow sensor and air duct assembly. Refer to [EM-16, "AIR CLEANER AND AIR DUCT"](#).
3. Drain engine coolant, or when water hoses are disconnected, attach plug to prevent engine coolant leakage. Refer to [CO-9, "Changing Engine Coolant"](#).

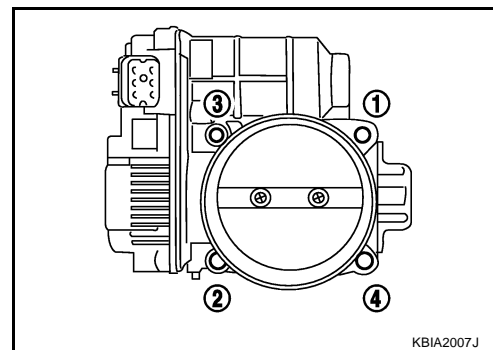
**CAUTION:**

Perform this step when the engine is cold.

4. Remove front wiper arm and extension cowl top panel (lower and upper). Refer to [WW-4, "FRONT WIPER AND WASHER SYSTEM"](#) and [EI-20, "COWL TOP"](#).
5. Remove electric throttle control actuator as follows:
  - a. Disconnect harness connector.
  - b. Loosen mounting bolts in reverse order as shown in the figure.

**CAUTION:**

- Handle carefully to avoid any shock to electric throttle control actuator.
- Do not disassemble.

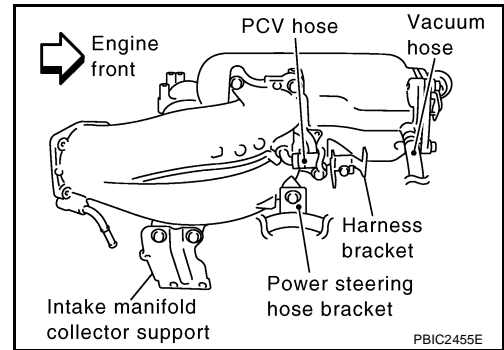


6. Disconnect water hoses from intake manifold collector (upper).
  - When engine coolant is not drained from radiator, attach plug to water hoses to prevent engine coolant leakage.

## INTAKE MANIFOLD COLLECTOR

7. Remove the following parts:

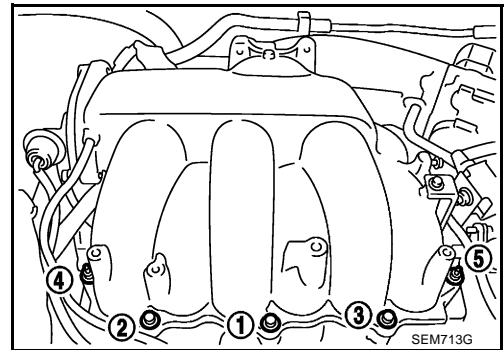
- Vacuum hose
- PCV hose
- Power steering hose bracket
- Intake manifold collector support
- Harness bracket



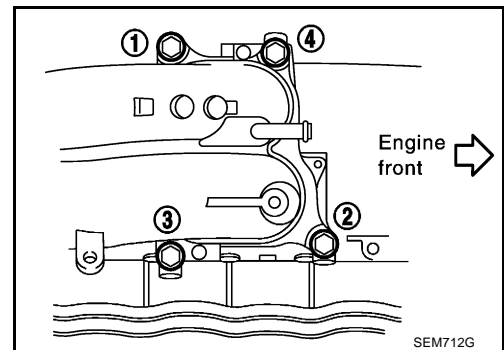
8. Disconnect EVAP hoses and harness connector from EVAP canister purge volume control solenoid valve.
9. Remove EVAP canister purge volume control solenoid valve.
10. Remove VIAS control solenoid valve and vacuum tank.
- Add mating marks as necessary for easier installation.
11. Loosen mounting nuts and bolts in reverse order as shown in the figure with power tool, and remove intake manifold collector (upper and lower) assembly and gasket.

**CAUTION:**

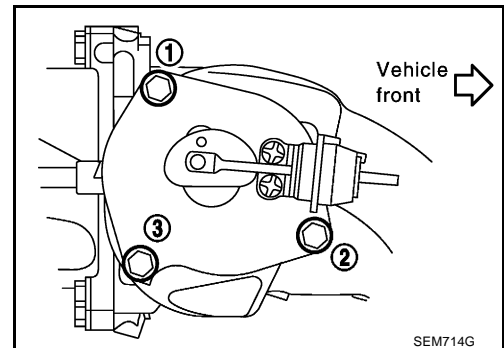
**Cover engine openings to avoid entry of foreign materials.**



12. Loosen mounting bolts in reverse order as shown in the figure to remove intake manifold collector (upper) from intake manifold collector (lower) with power tool.



13. Loosen mounting bolts in reverse order as shown in the figure to remove power valve from intake manifold collector (lower).





# INTAKE MANIFOLD COLLECTOR

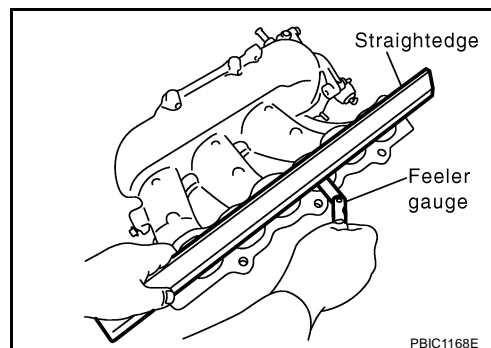
## INSPECTION AFTER REMOVAL

### Surface Distortion

- Check the surface distortion of intake manifold collector (lower) with a straightedge and a feeler gauge.

**Limit : 0.1 mm (0.004 in)**

- If it exceeds the limit, replace intake manifold collector (lower).

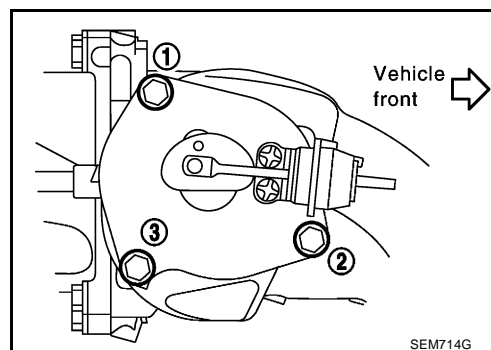


## INSTALLATION

Note the following, and install in the reverse order of removal.

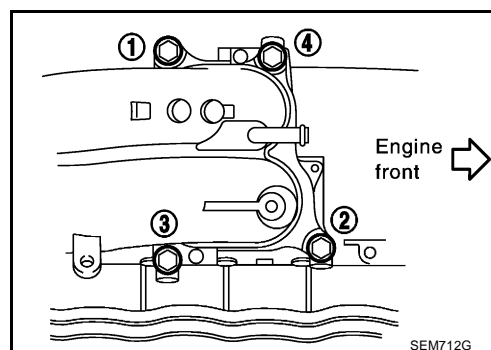
### Power Valve

Tighten mounting bolts in numerical order as shown in the figure.



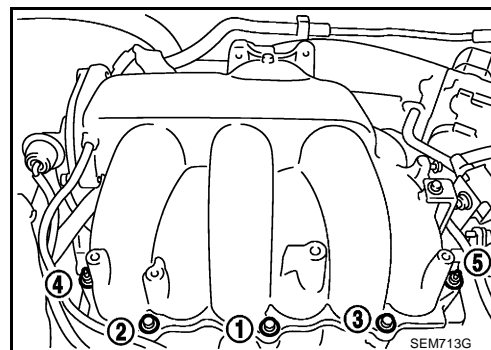
### Intake Manifold Collector (Upper)

Tighten mounting bolts in numerical order as shown in the figure.



### Intake Manifold Collector (Lower)

Tighten mounting nuts and bolts in numerical order as shown in the figure.

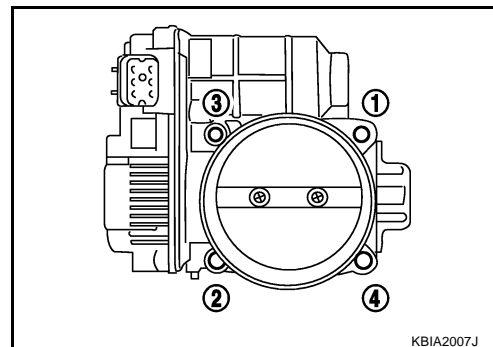


### Electric Throttle Control Actuator

- Install gasket with positioning no-protrusion surface upward or downward.

## INTAKE MANIFOLD COLLECTOR

- Tighten mounting bolts in numerical order as shown in the figure.
- Perform the "Throttle Valve Closed Position Learning" when harness connector of electric throttle control actuator is disconnected. Refer to [EC-76, "Throttle Valve Closed Position Learning"](#).
- Perform the "Idle Air Volume Learning" and "Throttle Valve Closed Position Learning" when electric throttle control actuator is replaced. Refer to [EC-76, "Idle Air Volume Learning"](#).



# INTAKE MANIFOLD

## INTAKE MANIFOLD

PFP:14003

### Removal and Installation

NBS0029E

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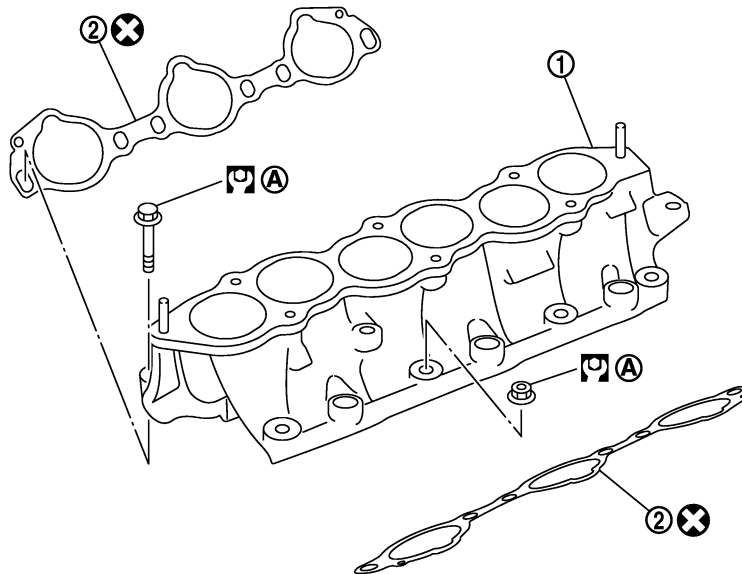
J

K

L

M

SEC. 140



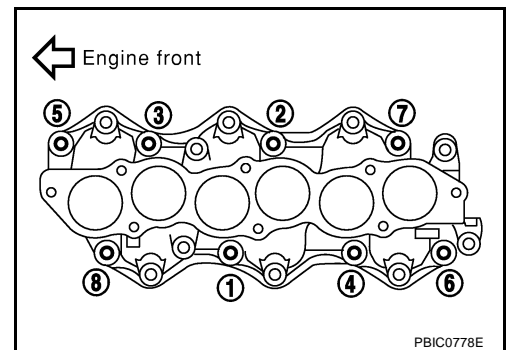
PBIC4182E

1. Intake manifold
  2. Gasket
- A. Refer to [EM-24](#)

- Refer to [GI-10, "Components"](#) for symbol marks in the figure.

### REMOVAL

1. Release fuel pressure. Refer to [EC-78, "FUEL PRESSURE RELEASE"](#).
2. Remove intake manifold collectors (upper and lower). Refer to [EM-18, "INTAKE MANIFOLD COLLECTOR"](#).
3. Remove fuel tube and fuel injector assembly. Refer to [EM-41, "FUEL INJECTOR AND FUEL TUBE"](#).
4. Loosen mounting nuts and bolts in reverse order as shown in the figure to remove intake manifold with power tool.



5. Remove gaskets.

### CAUTION:

Cover engine openings to avoid entry of foreign materials.

# INTAKE MANIFOLD

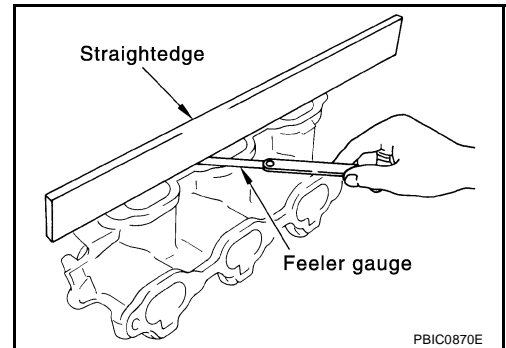
## INSPECTION AFTER REMOVAL

### Surface Distortion

- Check the surface distortion of the intake manifold mating surfaces with a straightedge and a feeler gauge.

**Limit : 0.1 mm (0.004 in)**

- If it exceeds the limit, replace intake manifold.




## INSTALLATION

Note the following, and install in the reverse order of removal.

### Intake Manifold

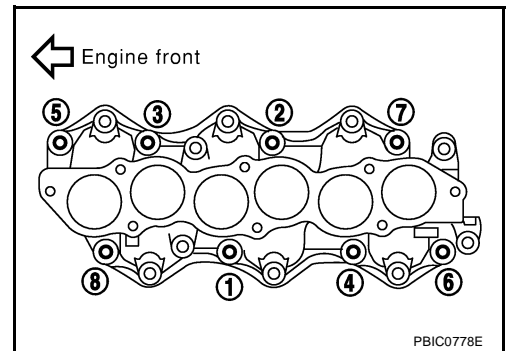
- If stud bolts were removed, install them and tighten to the specified torque below.

 : **10.8 N·m (1.1 kg-m, 8 ft-lb)**

- Tighten all mounting nuts and bolts to the specified torque in two or more steps in numerical order shown in figure.

 **1st step**  
: **7.4 N·m (0.8 kg-m, 5 ft-lb)**

 **2nd step and after**  
: **29.0 N·m (3.0 kg-m, 21 ft-lb)**



# EXHAUST MANIFOLD AND THREE WAY CATALYST

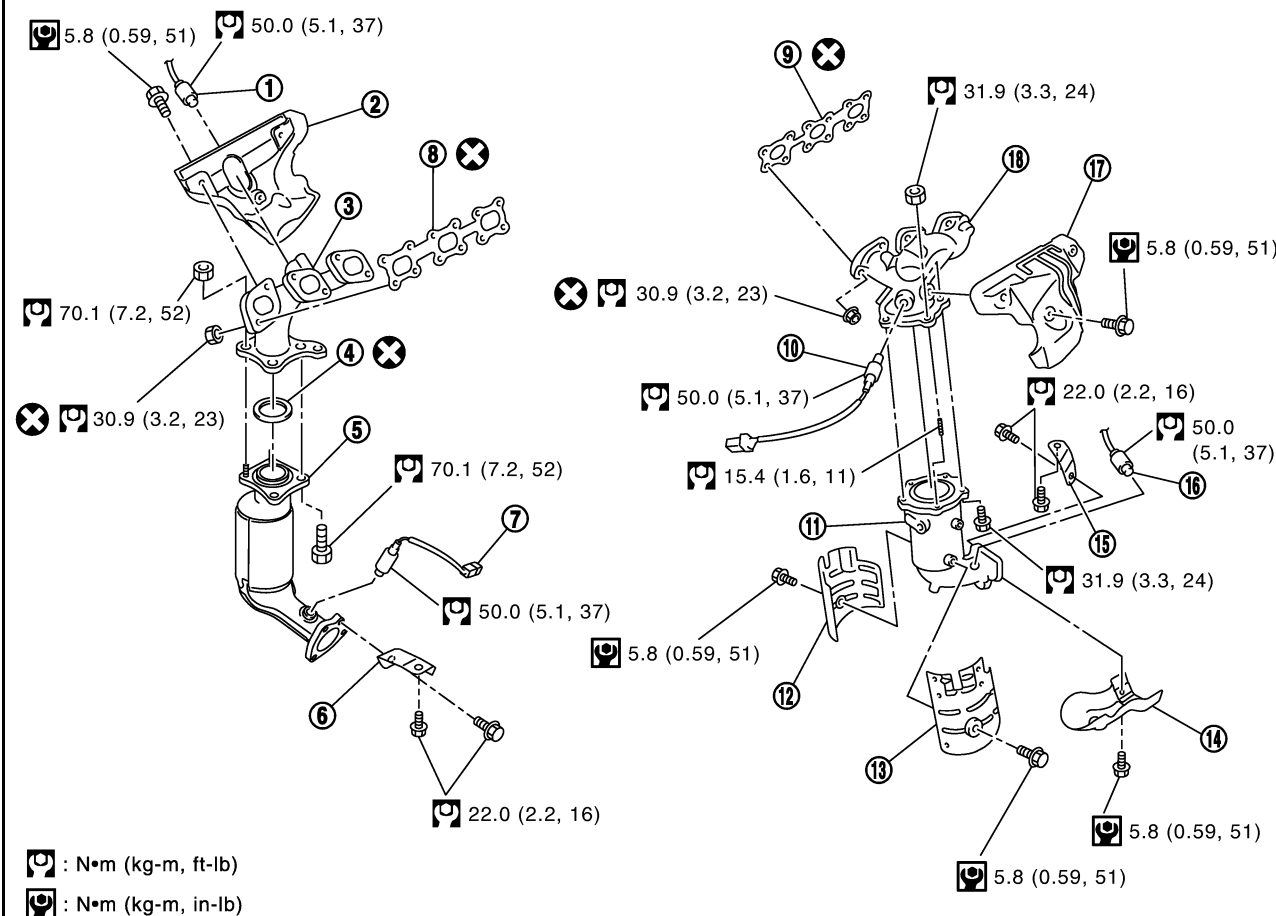
## EXHAUST MANIFOLD AND THREE WAY CATALYST

PFP:14004

### Removal and Installation

NBS0029F

SEC. 140•208•226



PBIC4599J

- |                                      |  |  |
|--------------------------------------|--|--|
| 1. Air fuel ratio sensor 1 (bank 1)  | 2. Exhaust manifold cover (right bank) | 3. Exhaust manifold (right bank)           |
| 4. Ring gasket                       | 5. Three way catalyst (right bank)     | 6. Three way catalyst support (right bank) |
| 7. Heated oxygen sensor 2 (bank 1)   | 8. Gasket                              | 9. Gasket                                  |
| 10. Air fuel ratio sensor 1 (bank 2) | 11. Three way catalyst (left bank)     | 12. Three way catalyst cover               |
| 13. Three way catalyst cover         | 14. Three way catalyst cover           | 15. Three way catalyst support (left bank) |
| 16. Heated oxygen sensor 2 (bank 2)  | 17. Exhaust manifold cover (left bank) | 18. Exhaust manifold (left bank)           |

- Refer to [GI-10, "Components"](#) for symbol marks in the figure.

### REMOVAL

#### WARNING:

Perform the work when the exhaust and cooling system have completely cooled down.

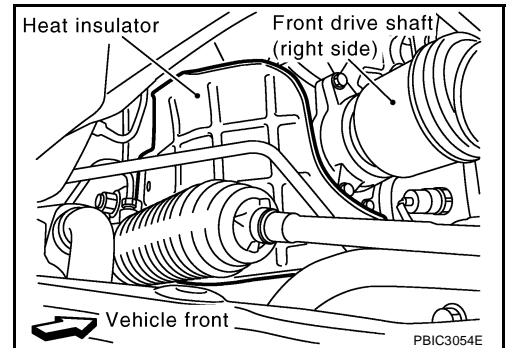
- Drain engine coolant. Refer to [CO-9, "Changing Engine Coolant"](#).

#### CAUTION:

- Perform this step when the engine is cold.
  - Do not spill engine coolant on drive belts.
- Remove following parts:
    - Engine cover: Refer to [EM-18, "INTAKE MANIFOLD COLLECTOR"](#).
    - Radiator cover grilles, air duct (inlet), air cleaner cases (upper) with mass air flow sensor and air duct assembly: Refer to [EM-16, "AIR CLEANER AND AIR DUCT"](#).
    - Undercover

## EXHAUST MANIFOLD AND THREE WAY CATALYST

- Radiator and radiator cooling fan assembly: Refer to [CO-13, "RADIATOR"](#) .
  - Front wiper arm: Refer to [WW-4, "FRONT WIPER AND WASHER SYSTEM"](#) .
  - Extension cowl top panel (lower and upper): Refer to [EI-20, "COWL TOP"](#) .
  - Intake manifold collectors (upper and lower): Refer to [EM-18, "INTAKE MANIFOLD COLLECTOR"](#) .
3. Remove exhaust front tube mounting bracket and then remove exhaust front tube. Refer to [EX-3, "EXHAUST SYSTEM"](#) .
  4. Remove heat insulator.



5. Disconnect harness connector and remove air fuel ratio sensor 1 on both banks with the heated oxygen sensor wrench (SST).
  - Put marks to identify installation positions of each air fuel ratio sensor 1.

### CAUTION:

- Be careful not to damage air fuel ratio sensor 1.
- Discard any air fuel ratio sensor 1 which has been dropped onto a hard surface such as a concrete floor, replace with a new sensor.

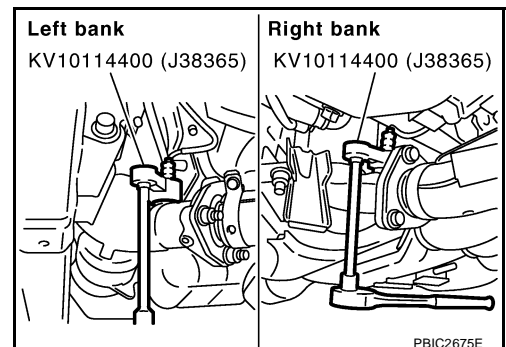
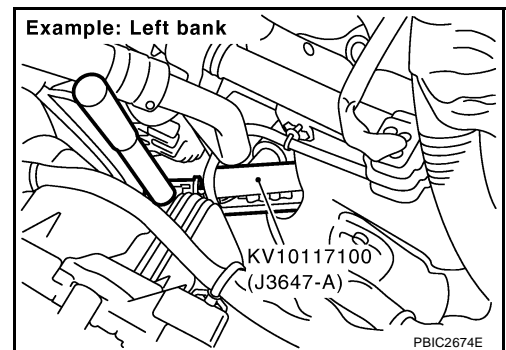
### NOTE:

Figure is shown as an example of left bank.

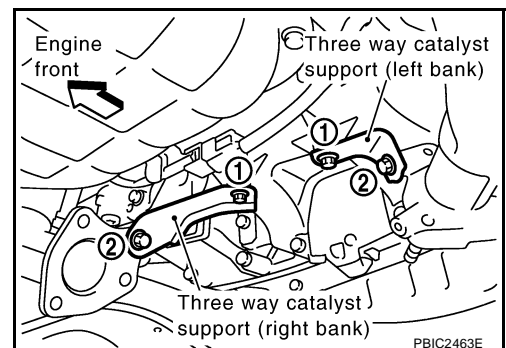
6. Disconnect harness connector and remove heated oxygen sensor 2 on both banks with the heated oxygen sensor wrench (SST).
  - Put marks to identify installation positions of each heated oxygen sensor 2.

### CAUTION:

- Be careful not to damage heated oxygen sensor 2.
- Discard any heated oxygen sensor 2 which has been dropped onto a hard surface such as a concrete floor, replace with a new sensor.



7. Remove exhaust manifold covers (right and left banks) and three way catalyst covers.
8. Remove mounting bolts in reverse order as shown in the figure to remove three way catalyst supports (right and left banks).



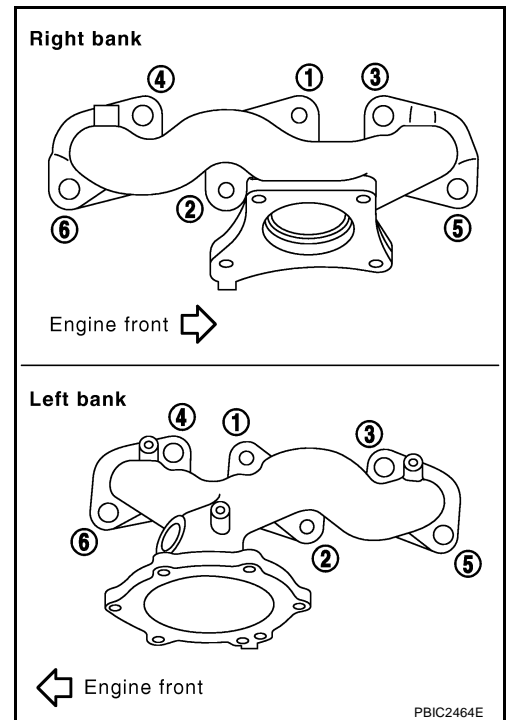
9. Remove three way catalysts (right and left banks) by loosening bolts first and then removing nuts.

### CAUTION:

Handle carefully to avoid any shock to three way catalyst.

# EXHAUST MANIFOLD AND THREE WAY CATALYST

10. Loosen mounting nuts in reverse order as shown in the figure to remove exhaust manifolds (right and left banks).



11. Remove gaskets.

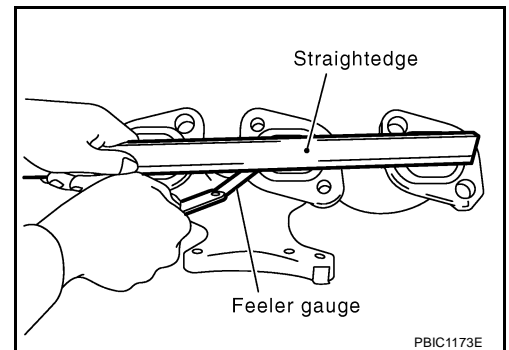
## CAUTION:

Cover engine openings to avoid entry of foreign materials.

## INSPECTION AFTER REMOVAL

### Surface Distortion

- Check the surface distortion of the exhaust manifold mating surfaces with a straightedge and a feeler gauge.
- Limit : 0.3 mm (0.012 in)**
- If it exceeds the limit, replace exhaust manifold.

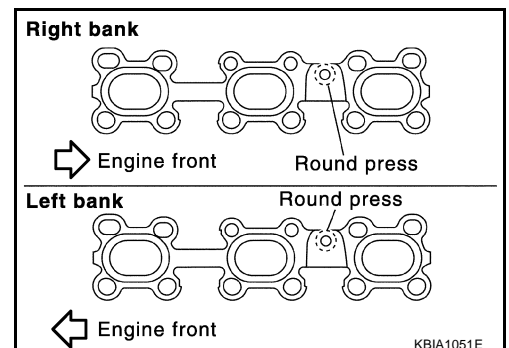


## INSTALLATION

Note the following, and install in the reverse order of removal.

### Exhaust Manifold Gasket

Install in the direction indicated in the figure.



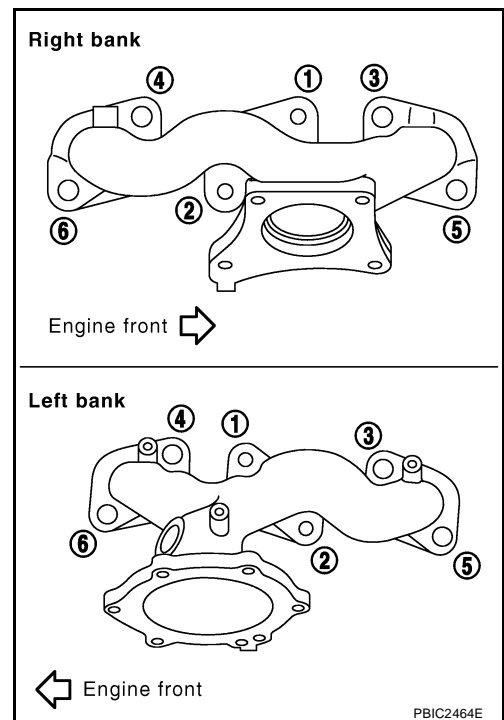
### Exhaust Manifold

- If stud bolts were removed, install them and tighten to the torque specified below.

# EXHAUST MANIFOLD AND THREE WAY CATALYST

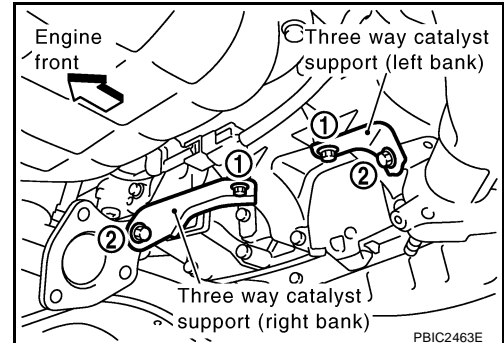
: 15.4 N-m (1.6 kg-m, 11 ft-lb)

- Tighten mounting nuts in numerical order as shown in the figure.



## Three Way Catalyst Supports

1. Temporarily tighten three way catalyst support mounting bolts.
2. Tighten three way catalyst support mounting bolts to specified torque in numerical order as shown in the figure.



## Air Fuel Ratio Sensor 1 and Heated Oxygen Sensor 2

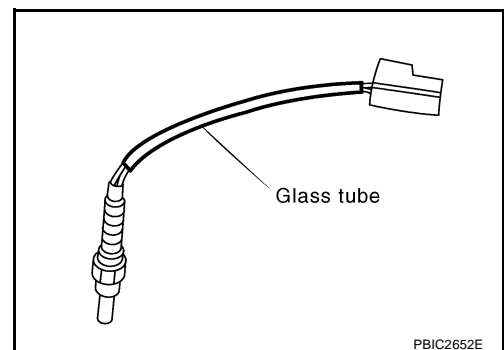
- Install air fuel ratio sensor 1 and heated oxygen sensor 2 in the original position.
- Install referring the following if the installation positions cannot be identified.

### Glass tube color

Air fuel ratio sensor 1 : Black  
Heated oxygen sensor 2 : White

### CAUTION:

- Before installing a new air fuel ratio sensor and a new heated oxygen sensor, clean exhaust system threads using oxygen sensor thread cleaner (commercial service tool: J-43897-18 or J43897-12) and apply anti-seize lubricant (commercial service tool).
- Do not over torque air fuel ratio sensor and heated oxygen sensor. Doing so may cause damage to air fuel ratio sensor and heated oxygen sensor, resulting in "MIL" coming on.





# OIL PAN AND OIL STRAINER

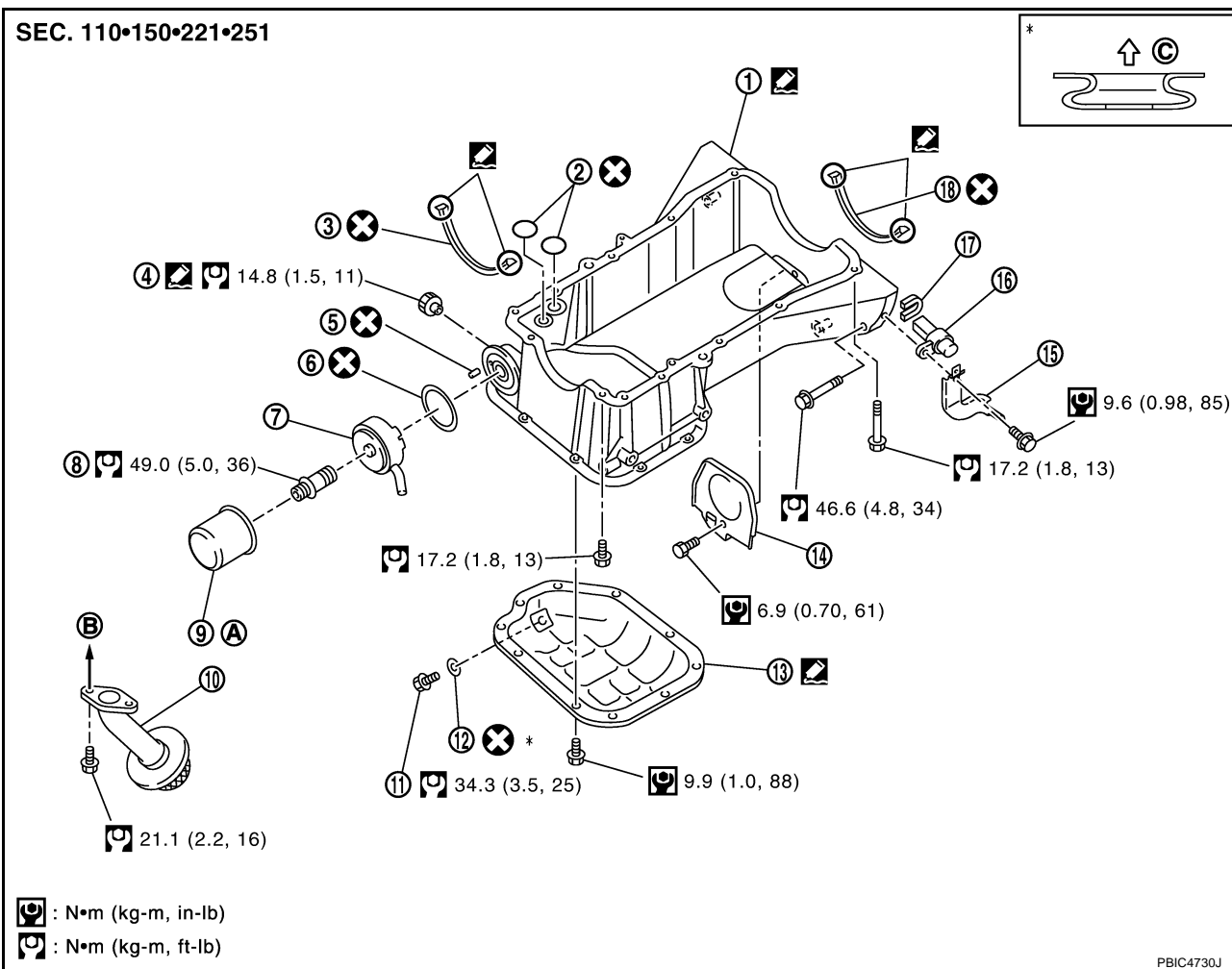
## OIL PAN AND OIL STRAINER

PFP:11110

### Removal and Installation

NBS003FM

SEC. 110•150•221•251



- |                                      |                      |                                  |
|--------------------------------------|----------------------|----------------------------------|
| 1. Oil pan (upper)                   | 2. O-ring            | 3. Oil pan gasket (front)        |
| 4. Oil pressure switch               | 5. Relief valve      | 6. O-ring                        |
| 7. Oil cooler                        | 8. Connector bolt    | 9. Oil filter                    |
| 10. Oil strainer                     | 11. Drain plug       | 12. Drain plug washer            |
| 13. Oil pan (lower)                  | 14. Rear plate cover | 15. Harness bracket (2WD models) |
| 16. Crankshaft position sensor (POS) | 17. Seal rubber      | 18. Oil pan gasket (rear)        |
| A. Refer to <a href="#">LU-9</a>     | B. To oil pump       | C. Oil pan side                  |

- Refer to [GI-10, "Components"](#) for symbol marks in the figure.

### REMOVAL

#### 2WD Models

#### WARNING:

To avoid the danger of being scalded, do not drain engine oil when the engine is hot.

#### NOTE:

When removing oil pan (lower) or oil strainer only, take step 1 then step 10 and 11.

1. Drain engine oil. Refer to [LU-8, "Changing Engine Oil"](#).

#### CAUTION:

- Perform this step when the engine is cold.
- Do not spill engine oil on drive belts.

2. Drain engine coolant. Refer to [CO-9, "Changing Engine Coolant"](#).

#### CAUTION:

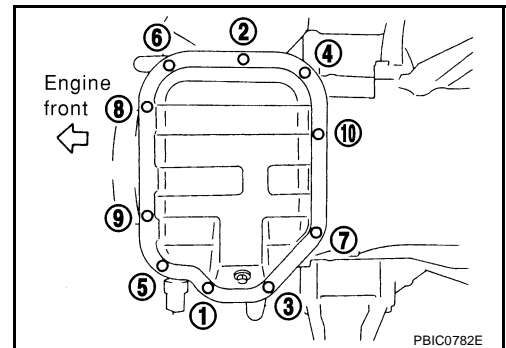
- Perform this step when engine is cold.

## OIL PAN AND OIL STRAINER

- **Do not spill engine coolant on drive belts.**
3. Remove following parts:
    - Engine cover: Refer to [EM-18, "INTAKE MANIFOLD COLLECTOR"](#) .
    - Undercover
    - Splash guard (RH)
    - Exhaust front tube: Refer to [EX-3, "EXHAUST SYSTEM"](#) .
    - Drive belts: Refer to [EM-13, "DRIVE BELTS"](#) .
  4. Remove A/C compressor with piping connected, and temporarily secure it to aside. Refer to [ATC-133, "Components"](#) .
  5. Remove three way catalysts (right and left banks) from exhaust manifolds (right and left banks). Refer to [EM-25, "EXHAUST MANIFOLD AND THREE WAY CATALYST"](#) .
  6. Remove oil pressure switch. Refer to [LU-7, "OIL PRESSURE CHECK"](#) .
  7. Remove crankshaft position sensor (POS) and harness bracket.

### CAUTION:

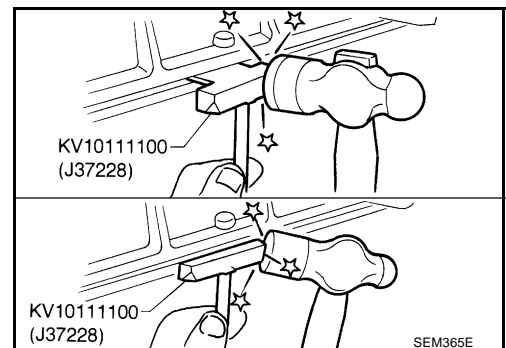
- **Handle carefully to avoid dropping and shocks.**
  - **Do not disassemble.**
  - **Do not allow metal powder to adhere to magnetic part at sensor tip.**
  - **Do not place sensor in a location where it is exposed to magnetism.**
8. Remove oil filter. Refer to [LU-9, "OIL FILTER"](#) .
  9. Remove oil cooler and water pipes. Refer to [LU-10, "OIL COOLER"](#) .
  10. Remove oil pan (lower) as follows:
    - a. Loosen mounting bolts in reverse order as shown in the figure.



- b. Insert the seal cutter (SST) between oil pan (lower) and oil pan (upper).

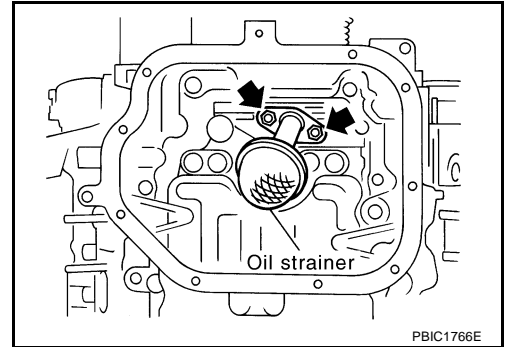
### CAUTION:

- **Be careful not to damage the mating surfaces.**
  - **Do not insert a screwdriver, this will damage the mating surfaces.**
- c. Slide the seal cutter by tapping on the side of the tool with a hammer. Remove oil pan (lower).



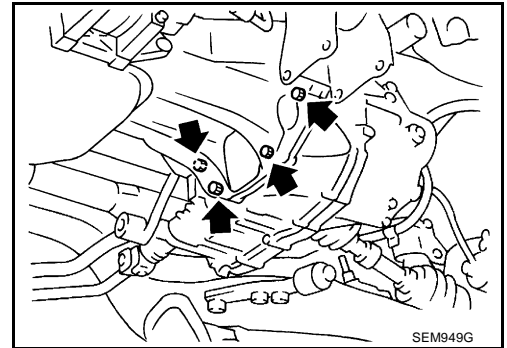
## OIL PAN AND OIL STRAINER

11. Remove oil strainer.

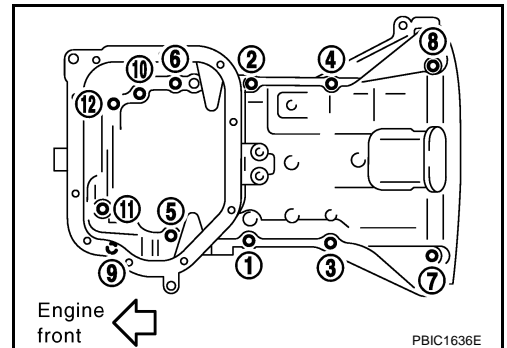


12. Remove oil pan (upper) as follows:

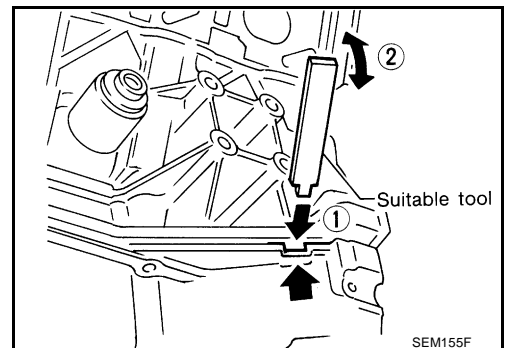
a. Remove transaxle joint bolts which pierce oil pan (upper). Refer to [CVT-215, "TRANSAXLE ASSEMBLY"](#).



b. Loosen mounting bolts in reverse order as shown in the figure.

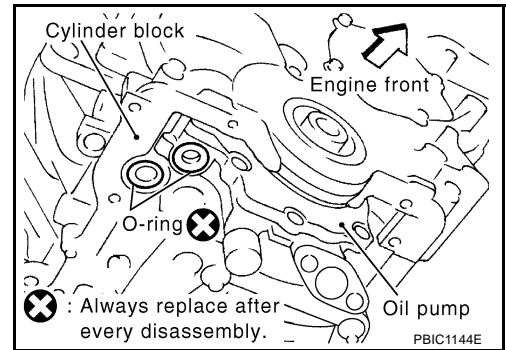


c. Insert a suitable tool into the notch of oil pan (upper) as shown (1).  
Pry off oil pan (upper) by moving tool up and down as shown (2) to remove oil pan (upper).

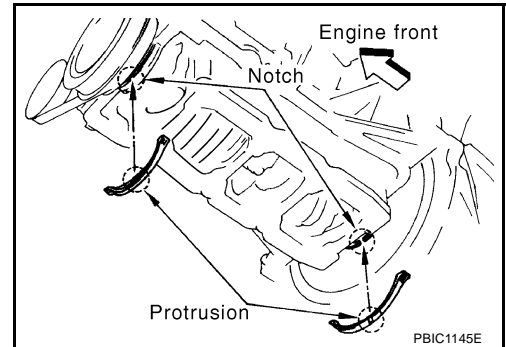


## OIL PAN AND OIL STRAINER

13. Remove O-rings from the bottom of cylinder block and oil pump.



14. Remove oil pan gaskets.



### AWD Models

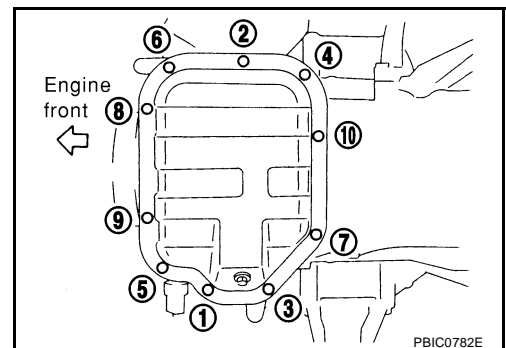
#### **WARNING:**

To avoid the danger of being scalded, do not drain engine oil when engine is hot.

#### **NOTE:**

When removing oil pan (lower) or oil strainer only, take step 3 then step 8 and 9.

1. Remove engine assembly from vehicle, and separate front suspension member, transaxle and transfer assembly from engine. Refer to [EM-108, "ENGINE ASSEMBLY"](#).
2. install engine sub-attachment to right side of cylinder block, then lift engine, and mount it onto engine stand. Refer to [EM-114, "CYLINDER BLOCK"](#).
3. Drain engine oil. Refer to [LU-8, "Changing Engine Oil"](#).
4. Remove oil pressure switch. Refer to [LU-7, "OIL PRESSURE CHECK"](#).
5. Remove oil filter. Refer to [LU-9, "OIL FILTER"](#).
6. Remove oil cooler and water pipes. Refer to [LU-10, "OIL COOLER"](#).
7. Remove three way catalysts (right and left banks) from exhaust manifolds (right and left banks). Refer to [EM-25, "EXHAUST MANIFOLD AND THREE WAY CATALYST"](#).
8. Remove oil pan (lower) as follows:
  - a. Loosen mounting bolts in reverse order as shown in the figure.



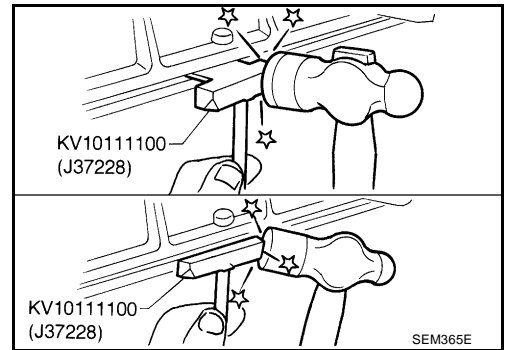
## OIL PAN AND OIL STRAINER

- b. Insert the seal cutter (SST) between oil pan (lower) and oil pan (upper).

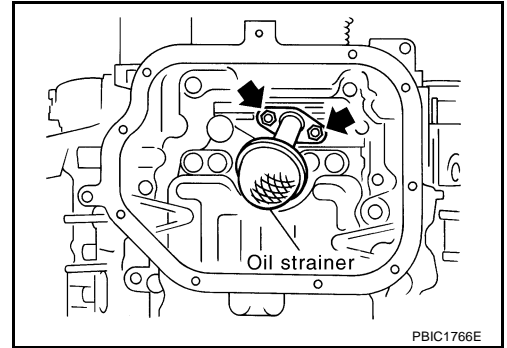
**CAUTION:**

- Be careful not to damage the mating surfaces.
- Do not insert screwdriver, this will damage the mating surfaces.

- c. Slide the seal cutter by tapping on the side of the tool with a hammer. Remove oil pan (lower).

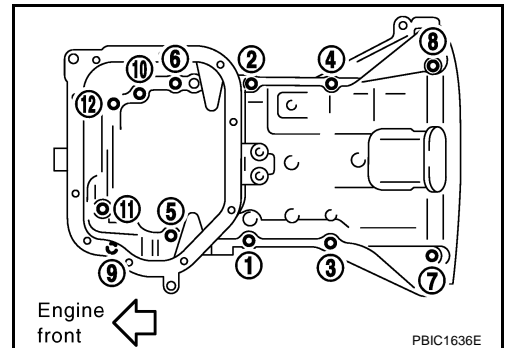


9. Remove oil strainer.

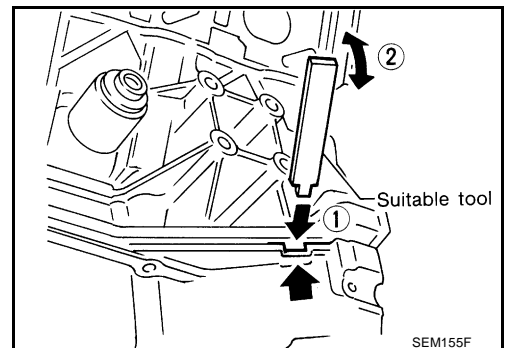


10. Remove oil pan (upper) as follows:

- a. Loosen mounting bolts in reverse order as shown in the figure.

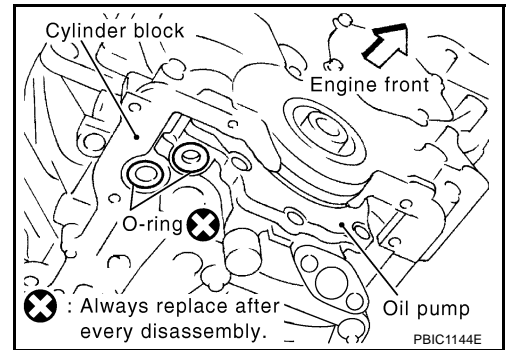


- b. Insert a suitable tool into the notch of oil pan (upper) as shown (1).  
Pry off oil pan (upper) by moving tool up and down as shown (2) to remove oil pan (upper).

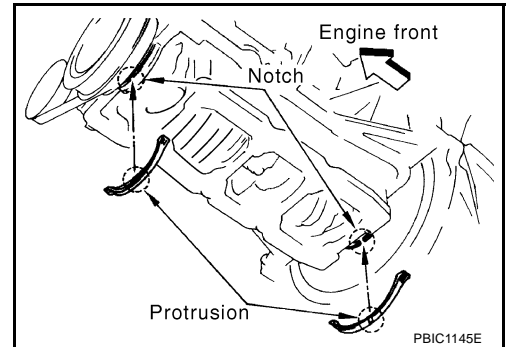


## OIL PAN AND OIL STRAINER

11. Remove O-rings from the bottom of cylinder block and oil pump.



12. Remove oil pan gaskets.



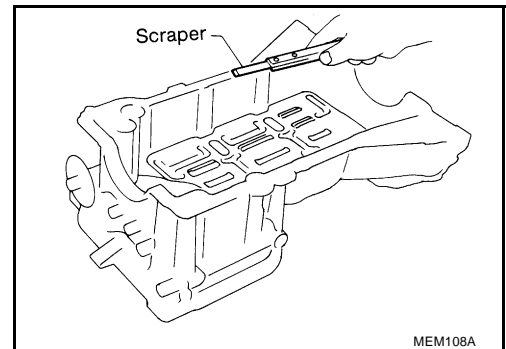
### INSTALLATION

1. Install oil pan (upper) as follows:  
a. Use a scraper to remove old liquid gasket from mating surfaces.

**CAUTION:**

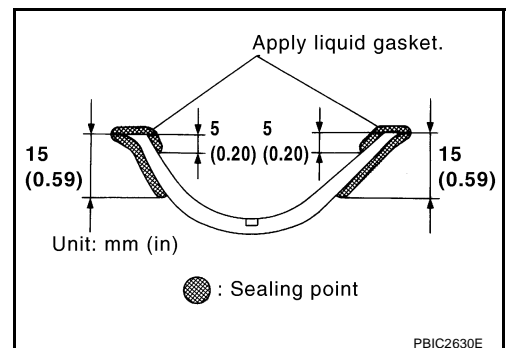
**Do not scratch or damage the mating surfaces when cleaning off old liquid gasket.**

- Also remove old liquid gasket from mating surface of cylinder block.
- Remove oil liquid gasket from bolt holes and threads.



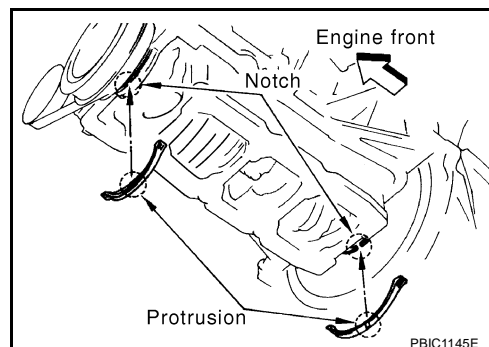
- b. Install new oil pan gaskets.  
● Apply liquid gasket to new oil pan gaskets as shown in the figure.

**Use Genuine RTV Silicone Sealant or equivalent. Refer to [GI-46, "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS"](#).**

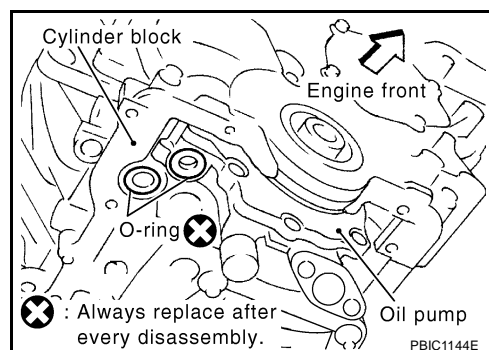


## OIL PAN AND OIL STRAINER

- To install, align protrusion of oil pan gasket with notches of front timing chain case and rear oil seal retainer.
- Install oil pan gasket with smaller arc to front timing chain case side.



- c. Install new O-rings on the bottom of cylinder block and oil pump.

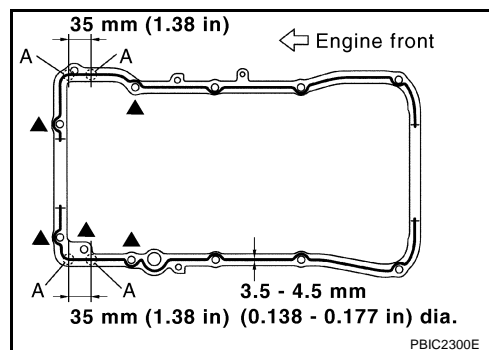


- d. Apply a continuous bead of liquid gasket with the tube presser [SST: WS39930000 ( — )] to cylinder block mating surface of oil pan (upper) to a limited portion as shown in the figure.

**Use Genuine RTV Silicone Sealant or equivalent. Refer to [GI-46, "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS"](#).**

**CAUTION:**

- For bolt holes with ▲ marks (5 locations), apply liquid gasket outside the holes.
- Apply a bead of 4.5 to 5.5 mm (0.177 to 0.217 in) diameter to area "A".
- Attaching should be done within 5 minutes after coating.



- e. Install oil pan (upper).

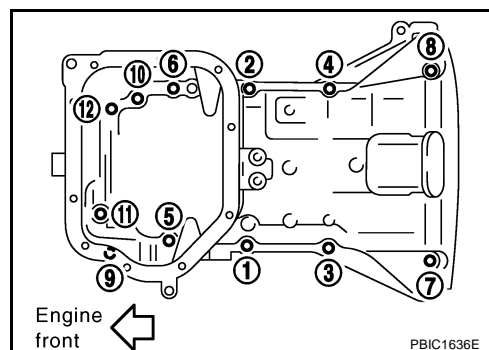
**CAUTION:**

**Install avoiding misalignment of both oil pan gasket and O-rings.**

- Tighten mounting bolts in numerical order as shown in the figure.
- There are two types of mounting bolt. Refer to the following for locating bolts.

**M8 × 100 mm (3.94 in) : 5, 7, 8, 11**

**M8 × 25 mm (0.98 in) : Except the above**



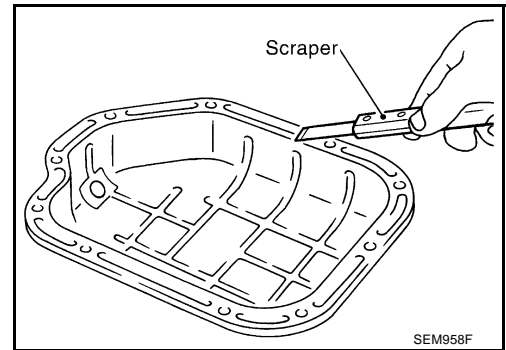
- f. Install transaxle joint bolts. (2WD models) Refer to [CVT-215, "TRANSAXLE ASSEMBLY"](#).
2. Install oil strainer to oil pump.
  3. Install oil pan (lower) as follows:

## OIL PAN AND OIL STRAINER

- a. Use scraper to remove old liquid gasket from mating surfaces.
- Also remove old liquid gasket from mating surface of oil pan (upper).
  - Remove old liquid gasket from the bolt holes and thread.

**CAUTION:**

**Do not scratch or damage the mating surfaces when cleaning off old liquid gasket.**

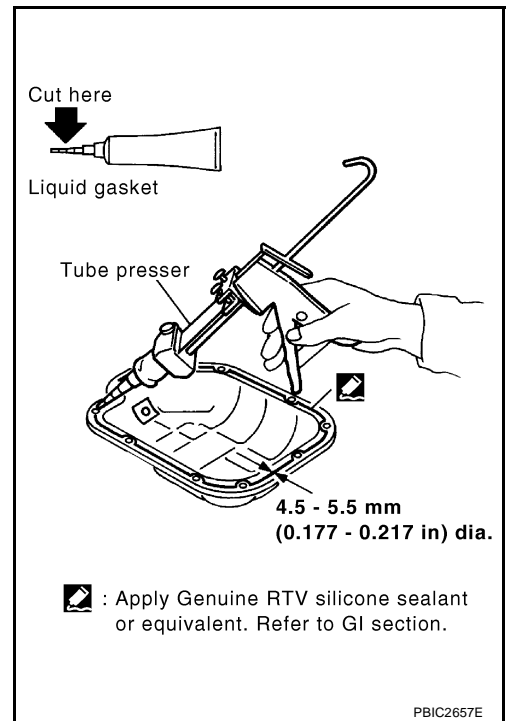


- b. Apply a continuous bead of liquid gasket with the tube presser [SST: WS39930000 ( — )] to oil pan (lower) as shown in the figure.

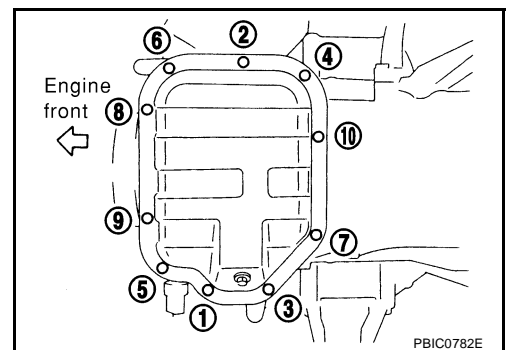
**Use Genuine RTV Silicone Sealant or equivalent. Refer to [GI-46, "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS"](#).**

**CAUTION:**

**Attaching should be done within 5 minutes after coating.**



- c. Install oil pan (lower).
- Tighten mounting bolts in numerical order as shown in the figure.



4. Install oil pan drain plug.
- Refer to the figure of components of former page for installation direction of drain plug washer. Refer to [EM-29, "Removal and Installation"](#).
5. Install in the reverse order of removal after this step.

**NOTE:**

At least 30 minutes after oil pan is installed, pour engine oil.



# OIL PAN AND OIL STRAINER

## INSPECTION AFTER INSTALLATION

### Inspection for Leaks

The following are procedures for checking fluids leak, lubricates leak and exhaust gases leak.

- Before starting engine, check oil/fluid levels including engine coolant and engine oil. If less than required quantity, fill to the specified level. Refer to [MA-10, "RECOMMENDED FLUIDS AND LUBRICANTS"](#).
- Use procedure below to check for fuel leakage.
  - Turn ignition switch "ON" (with engine stopped). With fuel pressure applied to fuel piping, check for fuel leakage at connection points.
  - Start engine. With engine speed increased, check again for fuel leakage at connection points.
- Run engine to check for unusual noise and vibration.
- Warm up engine thoroughly to make sure there is no leakage of fuel, exhaust gases, or any oil/fluids including engine oil and engine coolant.
- Bleed air from lines and hoses of applicable lines, such as in cooling system.
- After cooling down engine, again check oil/fluid levels including engine oil and engine coolant. Refill to the specified level, if necessary.

### Summary of the inspection items:

| Items                 | Before starting engine | Engine running | After engine stopped |
|-----------------------|------------------------|----------------|----------------------|
| Engine coolant        | Level                  | Leakage        | Level                |
| Engine oil            | Level                  | Leakage        | Level                |
| Other oils and fluid* | Level                  | Leakage        | Level                |
| Fuel                  | Leakage                | Leakage        | Leakage              |
| Exhaust gases         | —                      | Leakage        | —                    |

\*: Transmission/transaxle/CVT fluid, power steering fluid, brake fluid, etc.

# IGNITION COIL

## IGNITION COIL

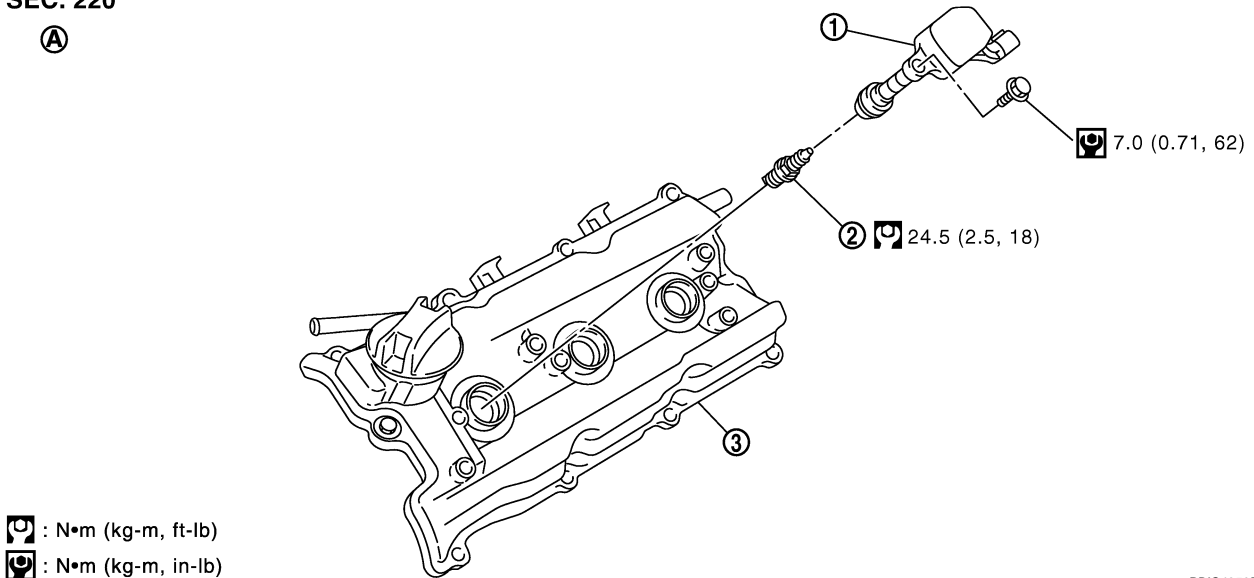
PFP:22448

### Removal and Installation

NBS0029H

SEC. 220

A



PBIC4359E

1. Ignition coil

2. Spark plug

3. Rocker cover (left bank)

A. Left bank

### REMOVAL

1. Remove engine cover. Refer to [EM-18, "INTAKE MANIFOLD COLLECTOR"](#).
2. Remove front wiper arm and extension cowl top (lower and upper). Refer to [WW-4, "FRONT WIPER AND WASHER SYSTEM"](#) and [EI-20, "COWL TOP"](#).
3. Remove intake manifold collectors (upper and lower), to remove ignition coil (right bank). Refer to [EM-18, "INTAKE MANIFOLD COLLECTOR"](#).
4. Move aside harness, harness bracket, and hoses located above ignition coil.
5. Disconnect harness connector from ignition coil.
6. Remove ignition coil.

#### CAUTION:

**Do not drop or shock it.**

### INSTALLATION

Install in the reverse order of removal.

# SPARK PLUG (PLATINUM-TIPPED TYPE)

## SPARK PLUG (PLATINUM-TIPPED TYPE)

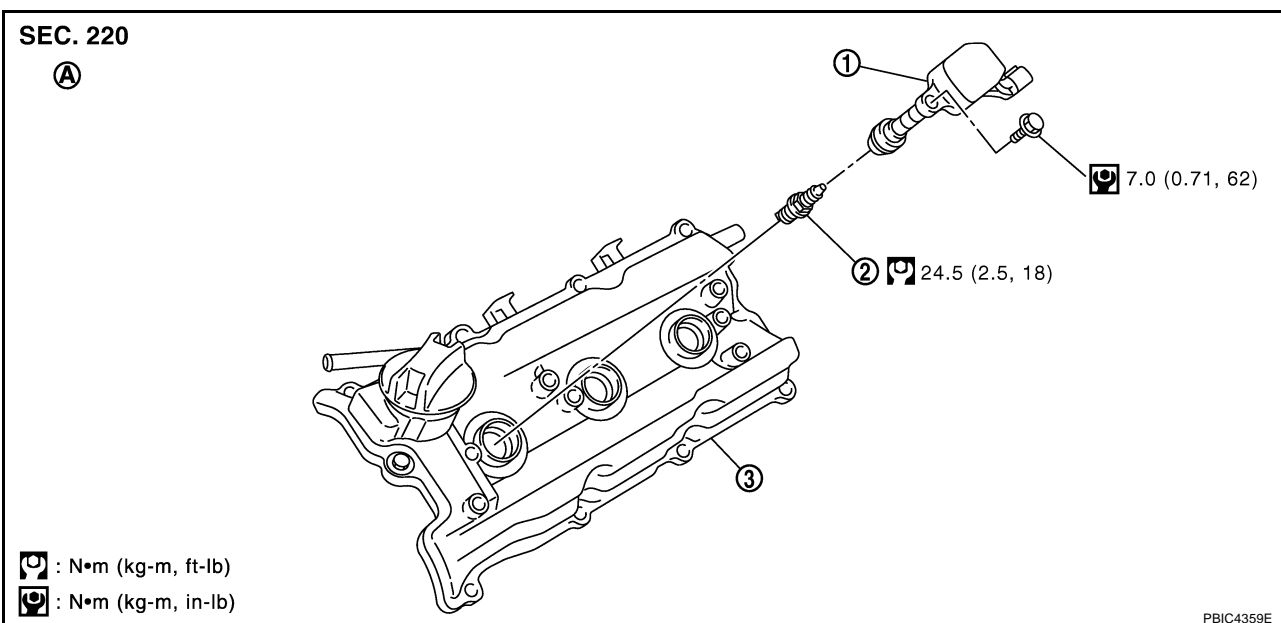
PFP:22401

### Removal and Installation

NBS0029I

SEC. 220

A

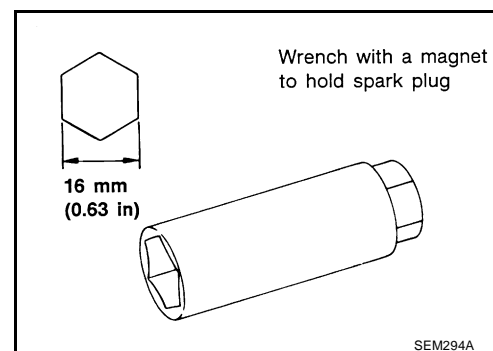


### REMOVAL

1. Remove engine cover. Refer to [EM-18. "INTAKE MANIFOLD COLLECTOR"](#).
2. Remove ignition coil. Refer to [EM-38. "IGNITION COIL"](#).
3. Remove spark plug using spark plug wrench (commercial service tool).

#### CAUTION:

Do not drop or shock it.



### INSPECTION AFTER REMOVAL

Use the standard type spark plug for normal condition.

The hot type spark plug is suitable when fouling occurs with the standard type spark plug under conditions such as:

- Frequent engine starts
- Low ambient temperatures

The cold type spark plug is suitable when spark plug knock occurs with the standard type spark plug under conditions such as:

- Extended highway driving
- Frequent high engine revolution

|               |           |
|---------------|-----------|
| Make          | NGK       |
| Standard type | PLFR5A-11 |
| Hot type      | PLFR4A-11 |
| Cold type     | PLFR6A-11 |

# SPARK PLUG (PLATINUM-TIPPED TYPE)

Gap (Nominal) : 1.1 mm (0.043 in)

**CAUTION:**

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

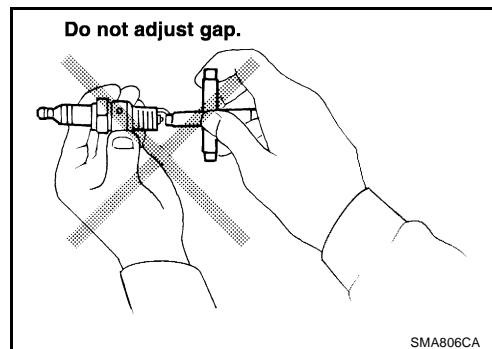
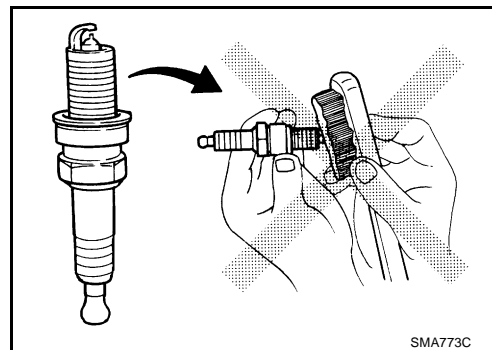
Cleaner air pressure:

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

Cleaning time:

Less than 20 seconds

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



## INSTALLATION

Install in the reverse order of removal.

# FUEL INJECTOR AND FUEL TUBE

## FUEL INJECTOR AND FUEL TUBE

PFP:16600

### Removal and Installation

NBS0029J

A

EM

C

D

E

F

G

H

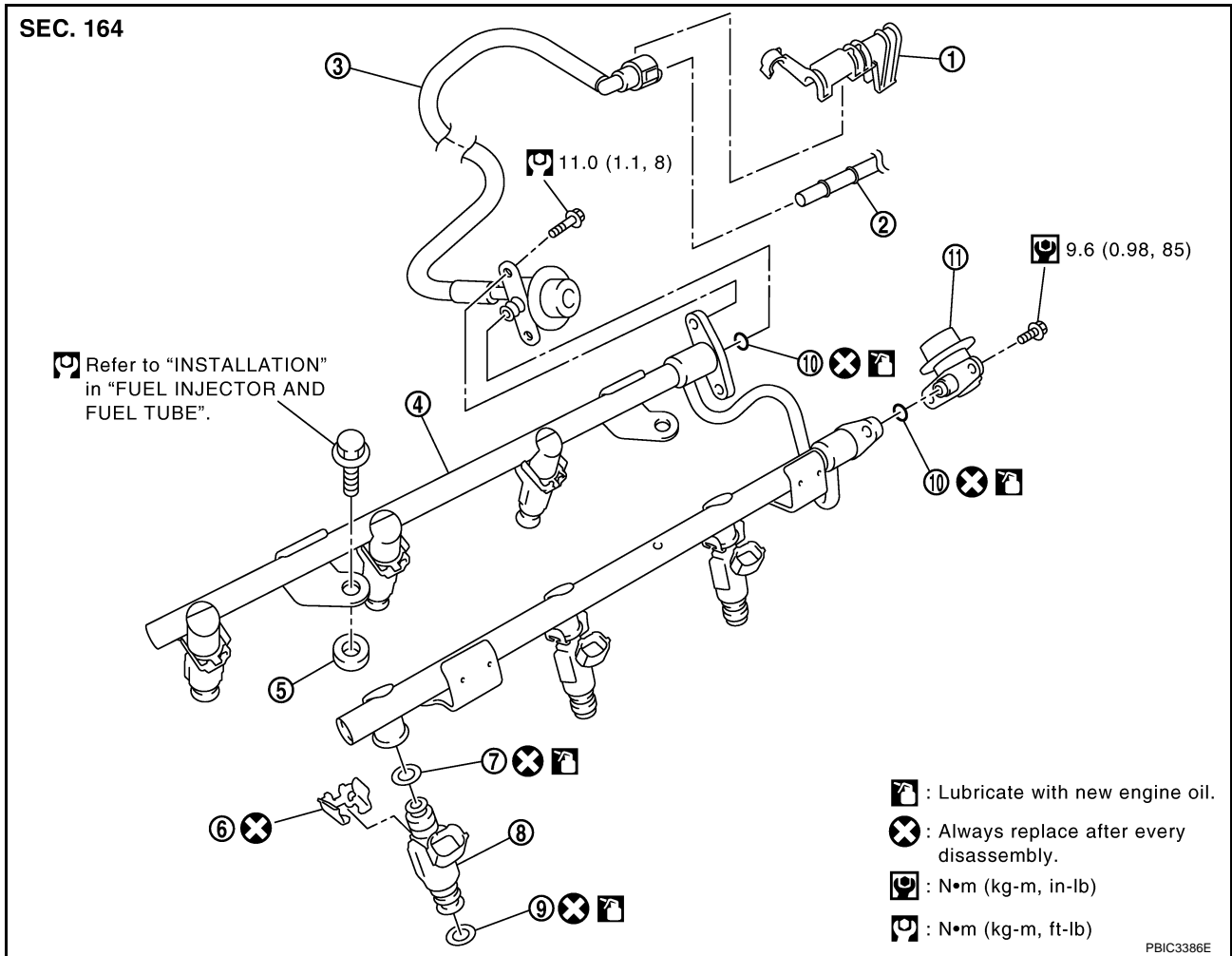
I

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M



- |                        |                                   |                                 |
|------------------------|-----------------------------------|---------------------------------|
| 1. Quick connector cap | 2. Centralized under-floor piping | 3. Fuel feed hose (with damper) |
| 4. Fuel tube           | 5. Spacer                         | 6. Clip                         |
| 7. O-ring (blue)       | 8. Fuel injector                  | 9. O-ring (brown)               |
| 10. O-ring             | 11. Fuel damper                   |                                 |

### CAUTION:

Do not remove or disassemble parts unless instructed as shown in the figure.

### REMOVAL

#### WARNING:

- Put a "CAUTION: FLAMMABLE" sign in the workshop.
- Be sure to work in a well ventilated area and furnish workshop with a CO<sub>2</sub> fire extinguisher.
- Do not smoke while servicing fuel system. Keep open flames and sparks away from the work area.
- To avoid the danger of being scalded, do not drain engine coolant when engine is hot.

1. Remove engine cover. Refer to [EM-18, "INTAKE MANIFOLD COLLECTOR"](#).
2. Release the fuel pressure. Refer to [EC-78, "FUEL PRESSURE RELEASE"](#).
3. Drain engine coolant, or when water hoses are disconnected, attach plug to prevent engine coolant leakage. Refer to [CO-9, "Changing Engine Coolant"](#) and [EM-18, "INTAKE MANIFOLD COLLECTOR"](#).

### CAUTION:

Perform this step when the engine is cold.

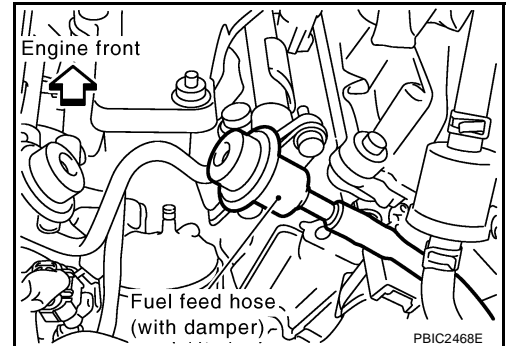
4. Remove front wiper arm and extension cowl top panel (lower and upper). Refer to [WW-4, "FRONT WIPER AND WASHER SYSTEM"](#) and [EI-20, "COWL TOP"](#).

## FUEL INJECTOR AND FUEL TUBE

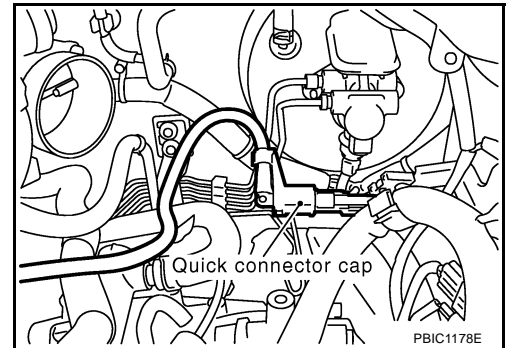
5. Remove radiator cover grilles, air duct (inlet), air cleaner case (upper) with mass air flow sensor and air duct assembly. Refer to [EM-16, "AIR CLEANER AND AIR DUCT"](#).
6. Remove intake manifold collectors (upper and lower). Refer to [EM-18, "INTAKE MANIFOLD COLLECTOR"](#).
  - Intake manifold collector (upper) should be moved aside with water hoses connected.
7. Remove fuel feed hose (with damper) from fuel tube.

**CAUTION:**

- While hose disconnected, plug it to prevent fuel from draining.
- Do not separate fuel damper and fuel feed hose.



8. When separating fuel feed hose (with damper) and centralized under-floor piping connection, disconnect quick connector as follows:
  - a. Remove quick connector cap from quick connector.

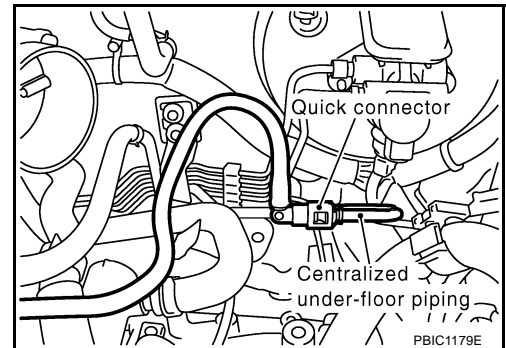


- b. Disconnect quick connector from centralized under-floor piping as follows:

**CAUTION:**

**Disconnect quick connector by using the quick connector release [SST: J-45488], not by picking out retainer tabs.**

- i. With the sleeve side of quick connector release facing to quick connector, install the quick connector release onto fuel tube.



- ii. Insert the quick connector release into quick connector until sleeve contacts and goes no further. Hold quick connector release on that position.

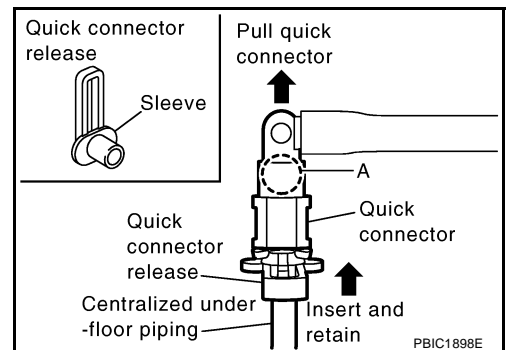
**CAUTION:**

**Inserting quick connector release hard will not disconnect quick connector. Hold quick connector release where it contacts and goes no further.**

- iii. Draw and pull out quick connector straight from centralized under-floor piping.

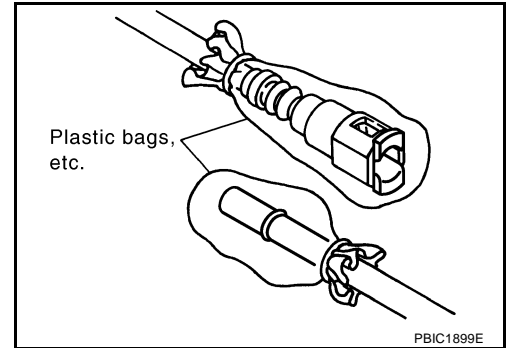
**CAUTION:**

- Pull quick connector holding "A" position as shown in the figure.
- Do not pull with lateral force applied. O-ring inside quick connector may be damaged.
- Prepare container and cloth beforehand as fuel will leak out.



## FUEL INJECTOR AND FUEL TUBE

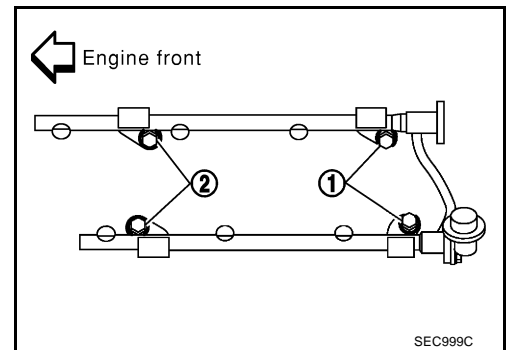
- Avoid fire and sparks.
- Keep parts away from heat source. Especially, be careful when welding is performed around them.
- Do not expose parts to battery electrolyte or other acids.
- Do not bend or twist connection between quick connector and fuel feed hose (with damper) during installation/removal.
- To keep clean the connecting portion and to avoid damage and foreign materials, cover them completely with plastic bags or something similar.



9. Disconnect harness connector from fuel injector.
10. Loosen mounting bolts in reverse order as shown in the figure, and remove fuel tube and fuel injector assembly.

**CAUTION:**

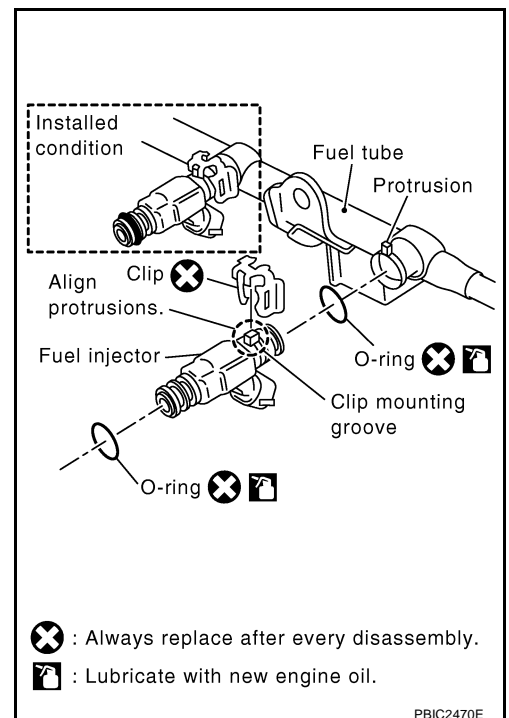
Do not tilt it, or remaining fuel in pipes may flow out from pipes.



11. Remove spacers on intake manifold.
12. Remove fuel injector from fuel tube as follows:
  - a. Open and remove clip.
  - b. Remove fuel injector from fuel tube by pulling straight.

**CAUTION:**

- Be careful with remaining fuel that may go out from fuel tube.
- Be careful not to damage injector nozzle during removal.
- Do not bump or drop fuel injector.
- Do not disassemble fuel injector.



13. Remove fuel damper from fuel tube.

# FUEL INJECTOR AND FUEL TUBE

## INSTALLATION

### 1. Install fuel damper.

- When handling new O-rings, be careful of the following caution:

#### CAUTION:

- Handle O-ring with bare hands. Do not wear gloves.
- Lubricate O-ring with new engine oil.
- Do not clean O-ring with solvent.
- Make sure that O-ring and its mating part are free of foreign material.
- When installing O-ring, be careful not to scratch it with tool or fingernails. Also be careful not to twist or stretch O-ring. If O-ring was stretched while it was being attached, do not insert it quickly into fuel tube.
- Insert new O-ring straight into fuel damper. Do not decenter or twist it.

- Insert fuel damper straight into fuel tube.
- Tighten mounting bolts evenly in turn.
- After tightening mounting bolts, make sure that there is no gap between flange and fuel tube.

### 2. Install new O-rings to fuel injector paying attention to the following.

#### CAUTION:

- Upper and lower O-ring are different. Be careful not to confuse them.

Fuel tube side : Blue

Nozzle side : Brown

- Handle O-ring with bare hands. Never wear gloves.
- Lubricate O-ring with new engine oil.
- Do not clean O-ring with solvent.
- Make sure that O-ring and its mating part are free of foreign material.
- When installing O-ring, be careful not to scratch it with tool or fingernails. Also be careful not to twist or stretch O-ring. If O-ring was stretched while it was being attached, do not insert it quickly into fuel tube.
- Insert O-ring straight into fuel injector. Do not decenter or twist it.

### 3. Install fuel injector to fuel tube as follows:

#### a. Insert clip into clip mounting groove on fuel injector.

- Insert clip so that protrusion "A" of fuel injector matches cutout "A" of clip.

#### CAUTION:

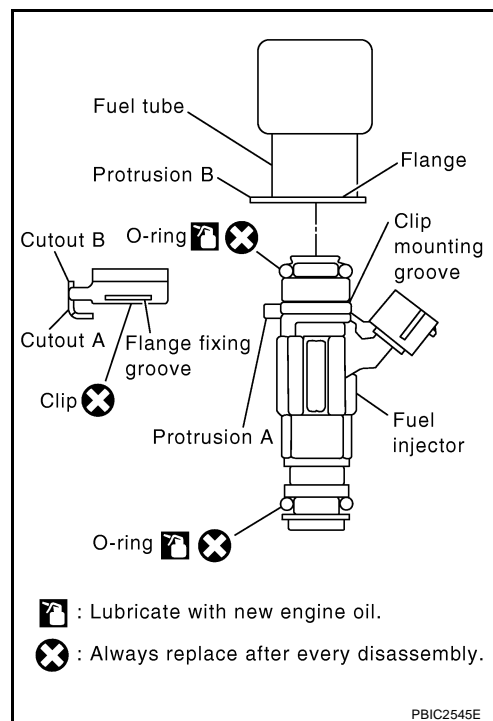
- Do not reuse clip. Replace it with new one.
- Be careful to keep clip from interfering with O-ring. If interference occurs, replace O-ring.

#### b. Insert fuel injector into fuel tube with clip attached.

- Insert it while matching it to the axial center.
- Insert fuel injector so that protrusion "B" of fuel tube matches cutout "B" of clip.
- Make sure that fuel tube flange is securely fixed in flange fixing groove on clip.

#### c. Make sure that installation is complete by checking that fuel injector does not rotate or come off.

- Make sure that protrusions of fuel injectors are aligned with cutouts of clips after installation.



### 4. Install spacers on intake manifold.

### 5. Install fuel tube and fuel injector assembly to intake manifold.



# FUEL INJECTOR AND FUEL TUBE

## CAUTION:

Be careful not to let tip of injector nozzle come in contact with other parts.

- Tighten mounting bolts in two steps in numerical order as shown in figure.



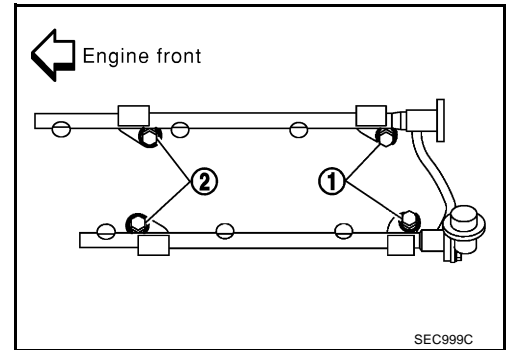
**1st step**

: 10.1 N·m (1.0 kg-m, 7 ft-lb)



**2nd step**

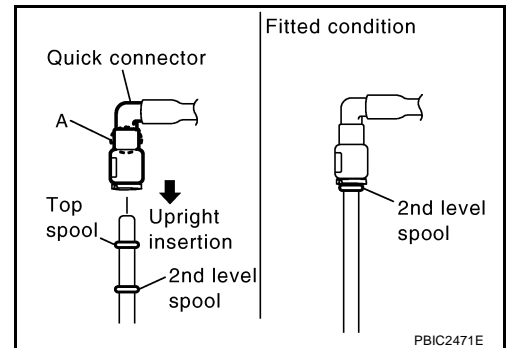
: 23.6 N·m (2.4 kg-m, 17 ft-lb)



6. Connect fuel injector harness.
7. Install intake manifold collectors (upper and lower). Refer to [EM-18, "INTAKE MANIFOLD COLLECTOR"](#).
8. Connect fuel feed hose (with damper).
  - Handling procedure of O-ring is the same as that of fuel damper.
  - Insert fuel damper straight into fuel tube.
  - Tighten mounting bolts evenly in turn.
  - After tightening mounting bolts, make sure that there is no gap between flange and fuel tube.
9. Connect quick connector between fuel feed hose (with damper) and centralized under-floor piping connection with the following procedure:
  - a. Make sure no foreign substances are deposited in and around centralized under-floor piping and quick connector, and no damage on them.
  - b. Thinly apply new engine oil around centralized under-floor piping from tip end to spool end.
  - c. Align center to insert quick connector straightly into centralized under-floor piping.
    - Insert quick connector to centralized under-floor piping until top spool is completely inside quick connector, and 2nd level spool exposes right below quick connector.

## CAUTION:

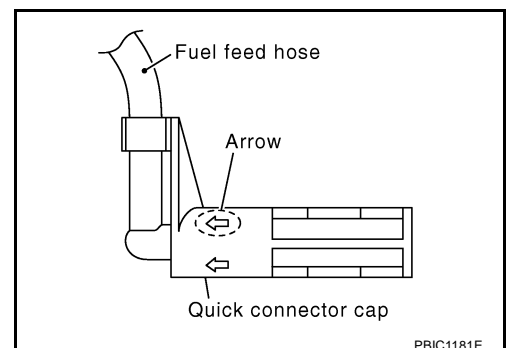
- Hold "A" position as shown in the figure when inserting centralized under-floor piping into quick connector.
- Carefully align center to avoid inclined insertion to prevent damage to O-ring inside quick connector.
- Insert until you hear a "click" sound and actually feel the engagement.
- To avoid misidentification of engagement with a similar sound, be sure to perform the next step.



- d. Pull quick connector by hand holding "A" position. Make sure it is completely engaged (connected) so that it does not come out from centralized under-floor piping.
- e. Install quick connector cap to quick connector.
  - Install quick connector cap with arrow on surface facing in direction of quick connector [fuel feed hose (with damper) side].
- f. Secure fuel feed hose (with damper) to clamp of quick connector cap.

## CAUTION:

If quick connector cap cannot be installed smoothly, quick connector may have not been installed correctly. Check connection again.



10. Install in the reverse order of removal after this step.

## FUEL INJECTOR AND FUEL TUBE

---

### INSPECTION AFTER INSTALLATION

#### Check on Fuel Leakage

1. Turn ignition switch "ON" (with engine stopped). With fuel pressure applied to fuel piping, make sure there is no fuel leakage at connection points.

**NOTE:**

Use mirrors for checking at points out of clear sight.

2. Start engine. With engine speed increased, make sure again that there is no fuel leakage at connection points.

**CAUTION:**

**Do not touch the engine immediately after stopped, as the engine becomes extremely hot.**

# ROCKER COVER

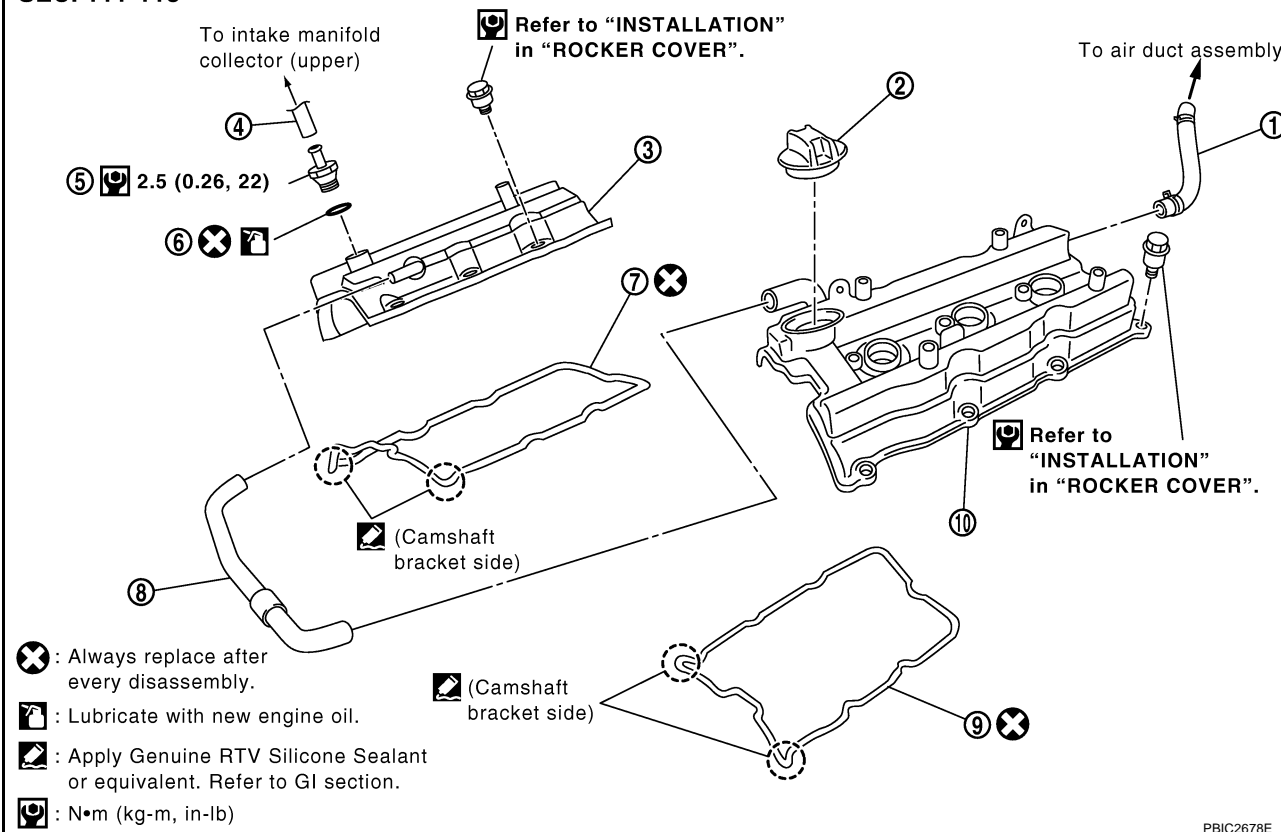
PFP:13264

NBS0029K

## ROCKER COVER

### Removal and Installation

SEC. 111•118



- |                                     |                   |                                    |
|-------------------------------------|-------------------|------------------------------------|
| 1. PCV hose                         | 2. Oil filler cap | 3. Rocker cover (right bank)       |
| 4. PCV hose                         | 5. PCV valve      | 6. O-ring                          |
| 7. Rocker cover gasket (right bank) | 8. PCV hose       | 9. Rocker cover gasket (left bank) |
| 10. Rocker cover (left bank)        |                   |                                    |

### REMOVAL

1. Remove engine cover. Refer to [EM-18, "INTAKE MANIFOLD COLLECTOR"](#).
2. Drain engine coolant, or when water hoses are disconnected, attach plug to prevent engine coolant leakage. Refer to [CO-9, "Changing Engine Coolant"](#) and [EM-18, "INTAKE MANIFOLD COLLECTOR"](#).

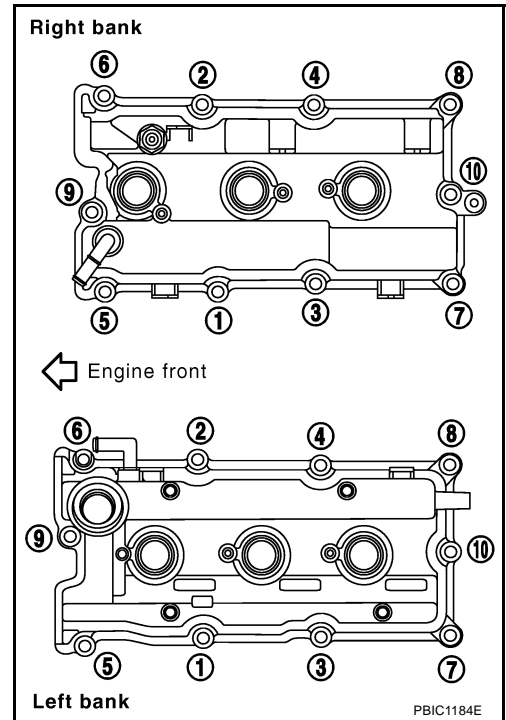
#### CAUTION:

**Perform this step when the engine is cold.**

3. Remove front wiper arm and extension cowl top panel (lower and upper). Refer to [WW-4, "FRONT WIPER AND WASHER SYSTEM"](#) and [EI-20, "COWL TOP"](#).
4. Remove intake manifold collectors (upper and lower). (At the right bank side remove) Refer to [EM-18, "INTAKE MANIFOLD COLLECTOR"](#).
5. Remove ignition coil. Refer to [EM-38, "IGNITION COIL"](#).
6. Remove PCV hoses from rocker covers.
7. Remove PCV valve and O-ring from rocker cover (right bank), if necessary.
8. Remove oil filler cap from rocker cover (left bank), if necessary.

# ROCKER COVER

9. Loosen mounting bolts in reverse order shown in the figure.



10. Remove rocker cover gaskets from rocker covers.
11. Use a scraper to remove all traces of liquid gasket from cylinder head and camshaft bracket (No. 1).

## CAUTION:

**Do not scratch or damage the mating surface when cleaning off old liquid gasket.**

## INSTALLATION

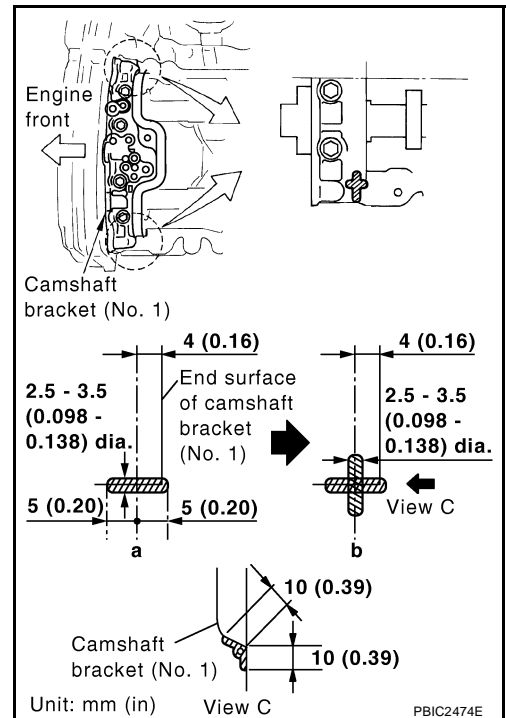
1. Apply liquid gasket with the tube presser [SST: WS39930000 ( — )] to joint part among rocker cover, cylinder head and camshaft bracket (No. 1) as follows:

**Use Genuine RTV Silicone Sealant or equivalent. Refer to GI-46, "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS".**

## NOTE:

The figure shows an example of left bank side [zoomed in shows camshaft bracket (No. 1)].

- a. Refer to the figure "a" to apply liquid gasket to joint part of camshaft bracket (No. 1) and cylinder head.
- b. Refer to the figure "b" to apply liquid gasket to the figure "a" squarely.



2. Install new rocker cover gasket to rocker cover.
3. Install rocker cover.
  - Check if rocker cover gasket is not dropped from installation groove of rocker cover.

## ROCKER COVER

4. Tighten mounting bolts two steps separately in numerical order as shown in the figure.



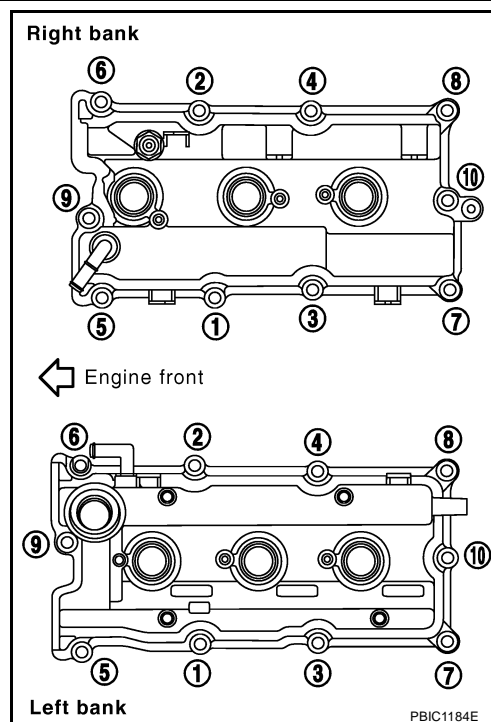
**1st step**

: 1.96 N·m (0.20 kg-m, 17 in-lb)



**2nd step**

: 8.33 N·m (0.85 kg-m, 74 in-lb)



5. Install oil filter cap to rocker cover (left bank), if removed.
6. Install new O-ring and PCV valve to rocker cover (right bank), if removed.
7. Install PCV hoses.
- Insert PCV hose by 25 to 30 mm (0.98 to 1.18 in) from connector end.
  - When installing, be careful not to twist or come in contact with other parts.
8. Install in the reverse order of removal after this step.

## FRONT TIMING CHAIN CASE

PFP:13599

### Removal and Installation

NBS0029L

#### NOTE:

- This section describes removal/installation procedure of front timing chain case and timing chain related parts without removing oil pan (upper) on vehicle.
- When oil pan (upper) needs to be removed or installed, or when rear timing chain case is removed or installed, remove oil pans (lower and upper) first. Then remove front timing chain case, timing chain related parts, and rear timing chain case in this order, and install in reverse order of removal. Refer to [EM-60, "TIMING CHAIN"](#).
- Refer to [EM-60, "TIMING CHAIN"](#) for component parts location.

#### REMOVAL

1. Remove engine cover. Refer to [EM-18, "INTAKE MANIFOLD COLLECTOR"](#).
2. Remove air duct (inlet), air cleaner case (upper) with mass air flow sensor and air duct assembly. Refer to [EM-16, "AIR CLEANER AND AIR DUCT"](#).
3. Remove undercover and splash guard (RH).
4. Remove right side front road wheel and tire.
5. Drain engine oil. Refer to [LU-8, "Changing Engine Oil"](#).

#### CAUTION:

- Perform this step when the engine is cold.
  - Do not spill engine oil on drive belts.
6. Drain engine coolant from radiator. Refer to [CO-9, "Changing Engine Coolant"](#).

#### CAUTION:

- Perform this step when the engine is cold.
  - Do not spill engine coolant on drive belts.
7. Remove intake manifold collectors (upper and lower). Refer to [EM-18, "INTAKE MANIFOLD COLLECTOR"](#).
  8. Remove drive belts. Refer to [EM-13, "DRIVE BELTS"](#).
  9. Remove alternator. Refer to [SC-17, "CHARGING SYSTEM"](#).
  10. Remove power steering oil pump from bracket with piping connected, and temporarily secure it to aside. Refer to [PS-30, "POWER STEERING OIL PUMP"](#).
  11. Remove power steering oil pump bracket. Refer to [PS-30, "POWER STEERING OIL PUMP"](#).
  12. Remove idler pulley and bracket. Refer to [EM-60, "TIMING CHAIN"](#).
  13. Separate engine harnesses removing their brackets from front timing chain case.
  14. Remove rocker covers (right and left banks). Refer to [EM-47, "ROCKER COVER"](#).

#### NOTE:

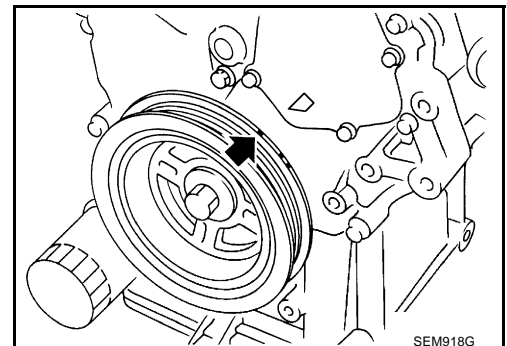
When only timing chain (primary) is removed, rocker cover does not need to be removed.

15. Obtain No. 1 cylinder at TDC of its compression stroke as follows:

#### NOTE:

When timing chain is not removed/installed, this step is not required.

- a. Rotate crankshaft pulley clockwise to align timing mark (grooved line without color) with timing indicator.

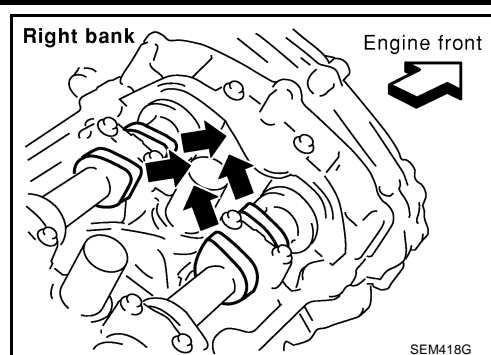


## FRONT TIMING CHAIN CASE

- b. Make sure that intake and exhaust cam noses on No. 1 cylinder (engine front side of right bank) are located as shown in the figure.
- If not, turn crankshaft one revolution (360 degrees) and align as shown in the figure.

**NOTE:**

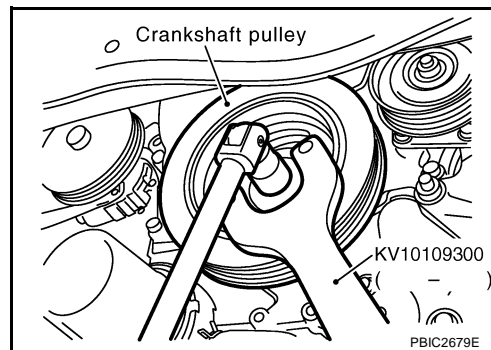
When only timing chain (primary) is removed, rocker cover does not need to be removed. To make sure that No. 1 cylinder is at its compression TDC, remove front timing chain case first. Then check mating marks on camshaft sprockets. Refer to [EM-68, "INSTALLATION"](#).



16. Remove crankshaft pulley as follows:
- a. Fix crankshaft with the pulley holder (SST).
  - b. Loosen crankshaft pulley bolt and locate bolt seating surface at 10 mm (0.39 in) from its original position.

**CAUTION:**

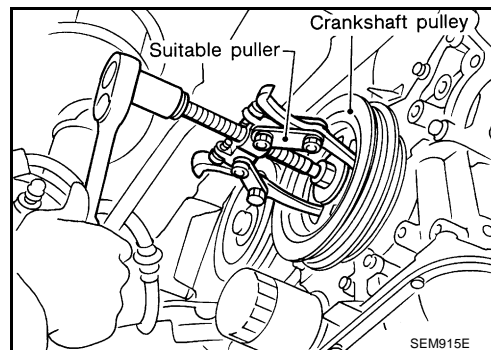
**Do not remove crankshaft pulley bolt as it will be used as a supporting point for suitable puller.**



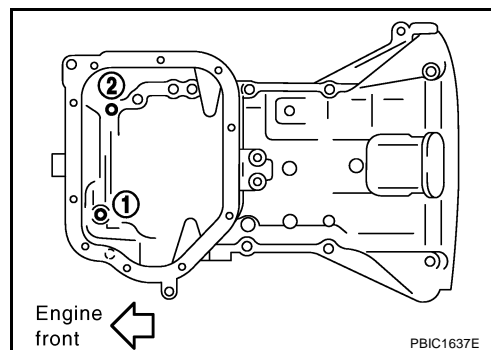
- c. Place suitable puller tab on holes of crankshaft pulley, and pull crankshaft pulley through.

**CAUTION:**

**Do not put suitable puller tab on crankshaft pulley periphery, as this will damage internal damper.**



17. Remove oil pan (lower). Refer to [EM-29, "OIL PAN AND OIL STRAINER"](#).
18. Loosen two mounting bolts in front of oil pan (upper) in reverse order as shown in the figure.



19. Install oil pan (lower) temporarily.
- Applying liquid gasket is unnecessary.
20. Support the oil pan (lower) bottom with jack.
- Perform following operations with engine front-side supported with jack.

**CAUTION:**

**Put a piece of wood or something similar as the supporting surface, be careful not to damage oil pan (lower).**

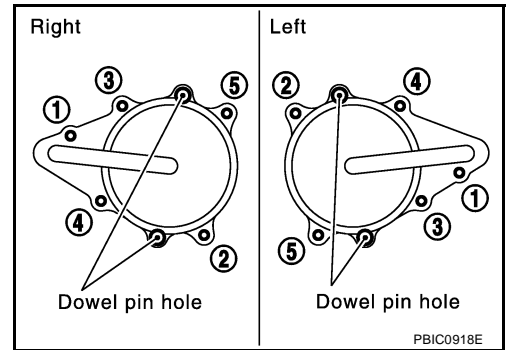
21. Remove intake valve timing control covers.

## FRONT TIMING CHAIN CASE

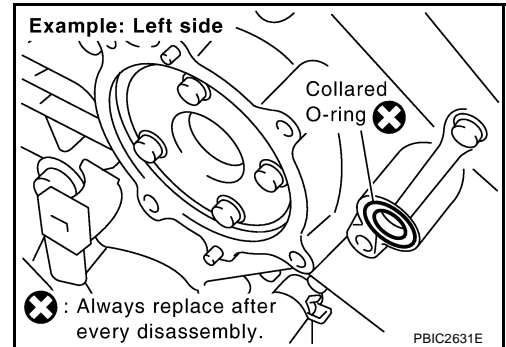
- Loosen mounting bolts in reverse order as shown in the figure.
- Use the seal cutter [SST: KV10111100 (J37228)] to cut liquid gasket for removal.

**CAUTION:**

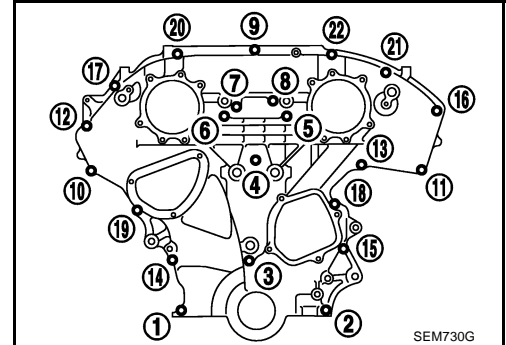
Shaft is internally jointed with camshaft sprocket (INT) center hole. When removing, keep it horizontal until it is completely disconnected.



22. Remove collared O-rings from front timing chain case oil holes (left and right sides).



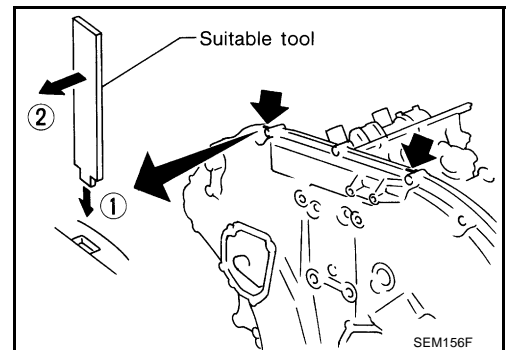
23. Remove engine mounting insulator (RH) and engine mounting bracket (RH). Refer to [EM-108, "ENGINE ASSEMBLY"](#).
24. Raise engine front-side with jack. (This secures workspace to remove front timing chain case.)
25. Remove front timing chain case as follows:
- Loosen mounting bolts in reverse order as shown in the figure.



- Insert a suitable tool into the notch at the top of front timing chain case as shown (1).
  - Pry off case by moving the tool as shown (2).
- Use the seal cutter [SST: KV10111100 (J37228)] to cut liquid gasket for removal.

**CAUTION:**

- Do not use a screwdriver or something similar.
- After removal, handle front timing chain case carefully so it does not tilt, cant, or warp under a load.

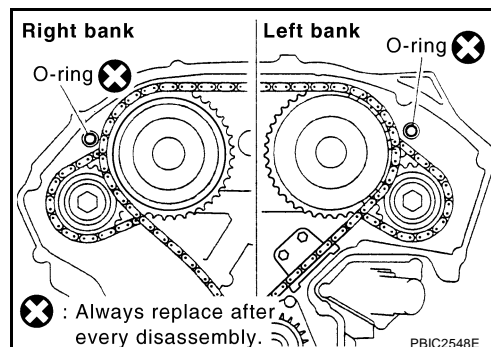


26. Remove oil pan gasket (front). Refer to [EM-29, "OIL PAN AND OIL STRAINER"](#).



## FRONT TIMING CHAIN CASE

27. Remove O-rings from rear timing chain case.



28. Remove water pump cover and chain tensioner cover from front timing chain case, if necessary.

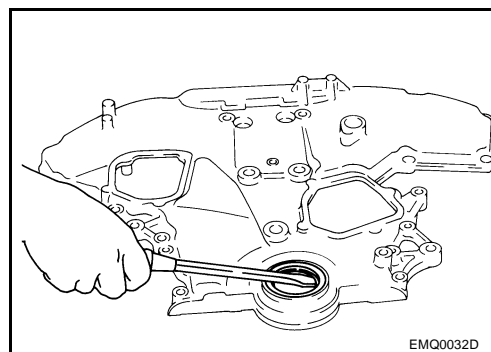
- Use the seal cutter [SST: KV10111100 (J37228)] to cut liquid gasket for removal.

29. Remove front oil seal from front timing chain case using a suitable tool.

- Use a screwdriver for removal.

**CAUTION:**

**Be careful not to damage front timing chain case.**

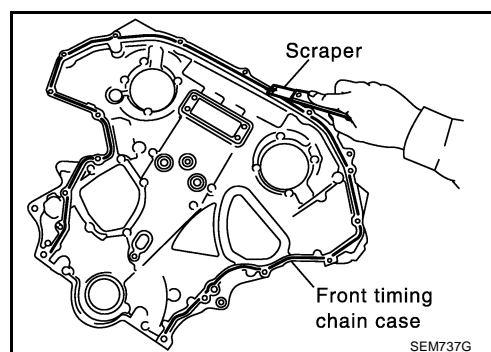


30. Remove timing chain and related parts. Refer to [EM-60, "TIMING CHAIN"](#).

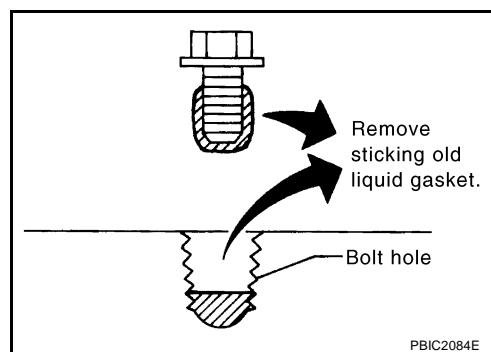
31. Use a scraper to remove all traces of old liquid gasket from front and rear timing chain cases and oil pan (upper), and liquid gasket mating surfaces.

**CAUTION:**

**Be careful not to allow gasket fragments to enter oil pan.**

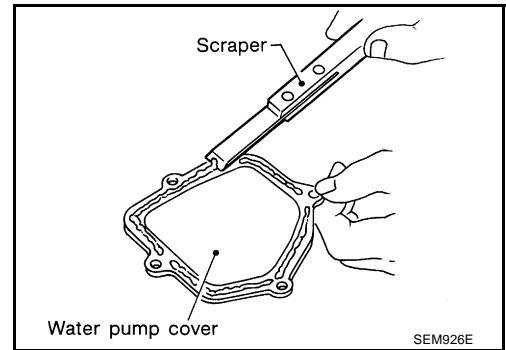


- Remove old liquid gasket from bolt hole and thread.



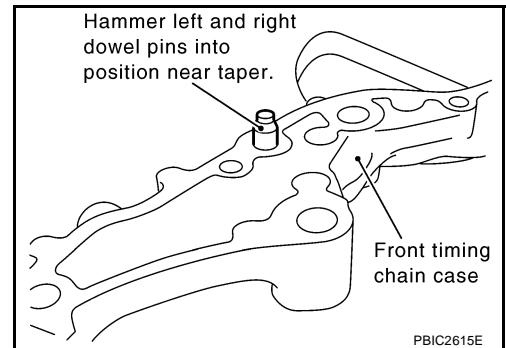
## FRONT TIMING CHAIN CASE

32. Use a scraper to remove all traces of liquid gasket from water pump cover, chain tensioner cover and intake valve timing control covers.

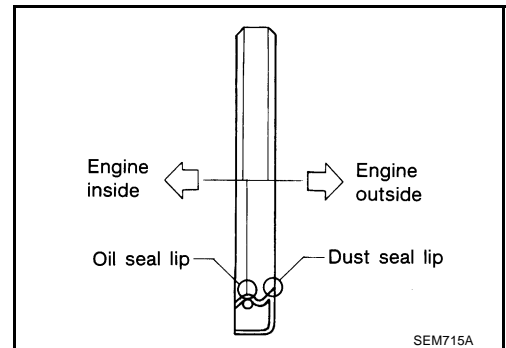


### INSTALLATION

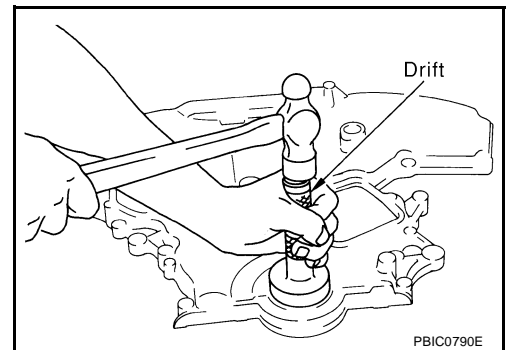
1. Install timing chain and related parts. Refer to [EM-60, "TIMING CHAIN"](#).
2. Hammer dowel pins (right and left) into front timing chain case up to a point close to taper in order to shorten protrusion length.



3. Install new front oil seal on front timing chain case.
  - Apply new engine oil to both oil seal lip and dust seal lip.
  - Install it so that each seal lip is oriented as shown in the figure.



- Using a suitable drift [outer diameter: 60 mm (2.36 in)], press-fit oil seal until it becomes flush with front timing chain case end face.
- Make sure the garter spring is in position and seal lip is not inverted.

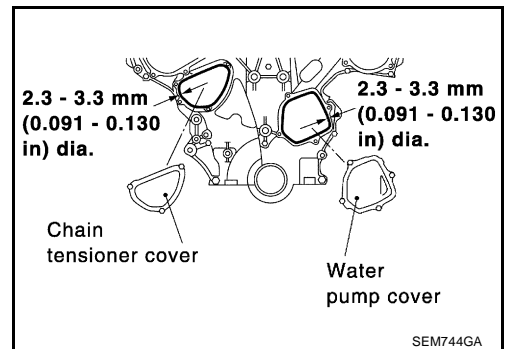


4. Install water pump cover and chain tensioner cover to front timing chain case, if removed.

## FRONT TIMING CHAIN CASE

- Apply a continuous bead of liquid gasket with the tube presser [SST: WS39930000 ( — )] to front timing chain case as shown in the figure.

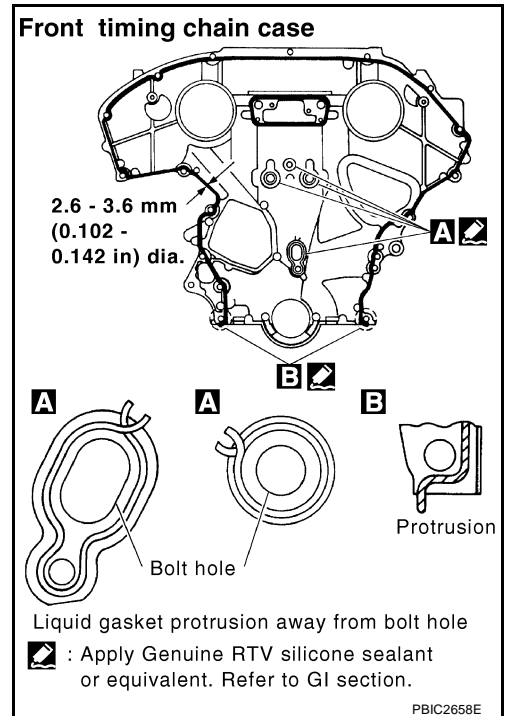
**Use Genuine RTV Silicone Sealant or equivalent. Refer to [GI-46, "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS"](#).**



5. Install front timing chain case as follows:

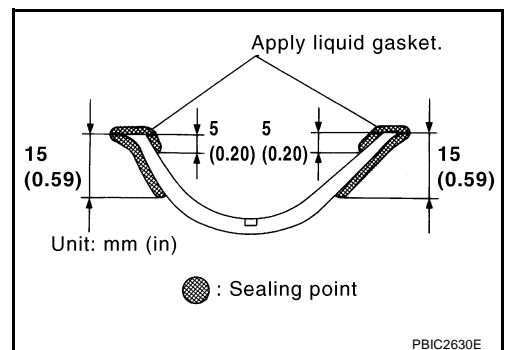
- a. Apply a continuous bead of liquid gasket with the tube presser [SST: WS39930000 ( — )] to front timing chain case back side as shown in the figure.

**Use Genuine RTV Silicone Sealant or equivalent. Refer to [GI-46, "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS"](#).**



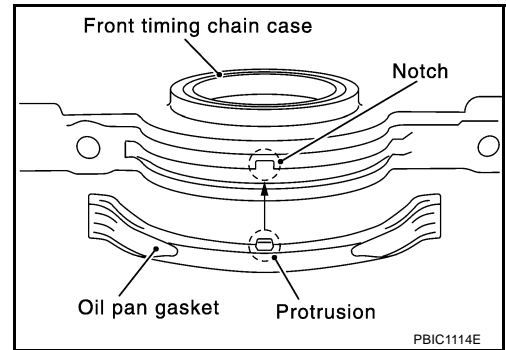
- b. Install new oil pan gasket (front).

- Apply liquid gasket to oil pan gasket as shown in the figure. **Use Genuine RTV Silicone Sealant or equivalent. Refer to [GI-46, "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS"](#).**



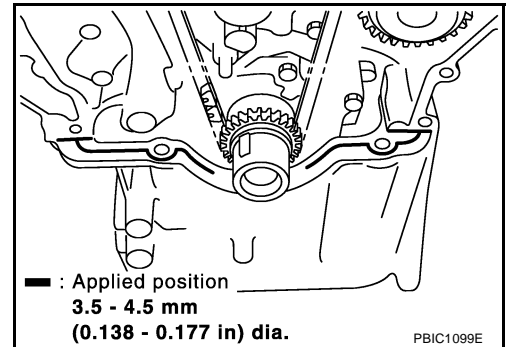
## FRONT TIMING CHAIN CASE

- Align notch of front timing chain case with protrusion of oil pan gasket.

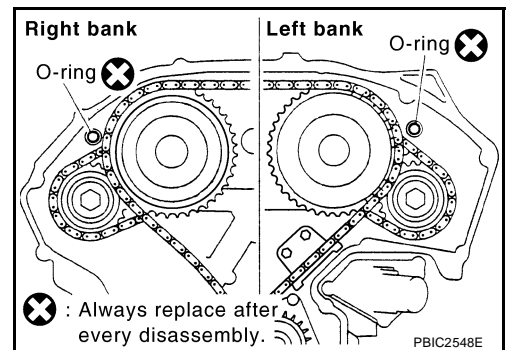


- Apply liquid gasket with the tube presser [SST: WS39930000 ( — )] to top surface of oil pan (upper) as shown in the figure.

**Use Genuine RTV Silicone Sealant or equivalent. Refer to [GI-46, "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS"](#).**



- c. Install new O-rings on rear timing chain case.

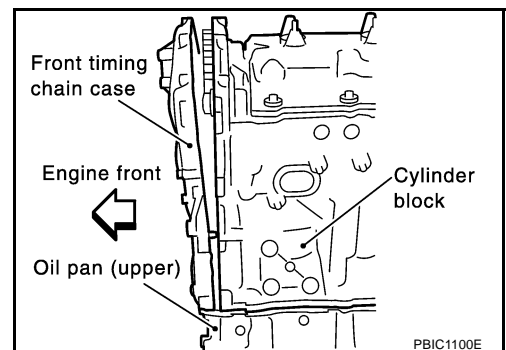


- d. Assemble front timing chain case as follows:

- i. Fit lower end of front timing chain case tightly onto top face of oil pan (upper). From the fitting point, make entire front timing chain case contact rear timing chain case completely.

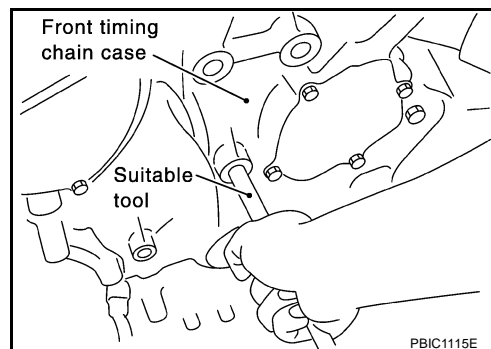
**CAUTION:**

**Be careful that oil pan gasket is in place.**



## FRONT TIMING CHAIN CASE

- ii. Since front timing chain case is offset for difference of bolt holes, tighten bolts temporarily with holding front timing chain case from front and top as shown in the figure.  
For bolt length and positions, refer to step e.
- iii. Same as the step ii, insert dowel pin with holding front timing chain case from front and top completely.



- e. Tighten mounting bolts to the specified torque in numerical order as shown in the figure.

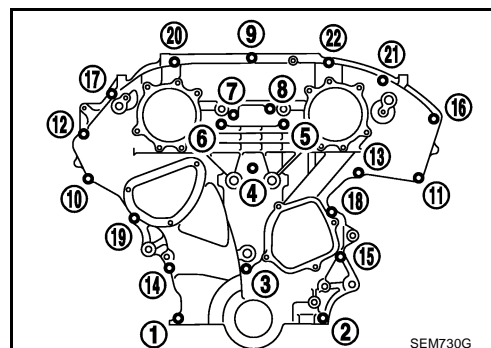
- There are two types of mounting bolt. Refer to the following for locating bolts.

**M8 bolts : 1, 2**

: **28.4 N·m (2.9 kg-m, 21 ft-lb)**

**M6 bolts : Except the above**

: **12.7 N·m (1.3 kg-m, 9 ft-lb)**



- f. After all bolts tightening, retighten them to the specified torque in numerical order as shown in the figure.

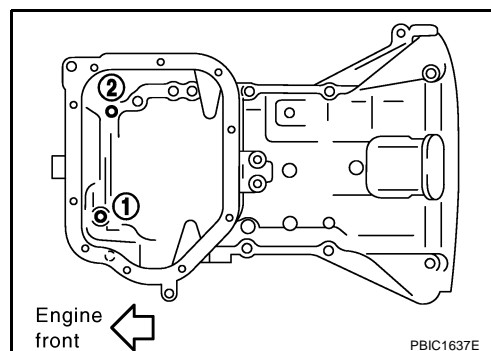
6. Install engine mounting bracket (RH) and engine mounting insulator (RH). Refer to [EM-108, "ENGINE ASSEMBLY"](#).

7. Remove jack which supports the oil pan (lower) bottom.

8. Remove oil pan (lower).

9. Install two mounting bolts in front of oil pan (upper) in numerical order as shown in the figure.

: **17.2 N·m (1.8 kg-m, 13 ft-lb)**



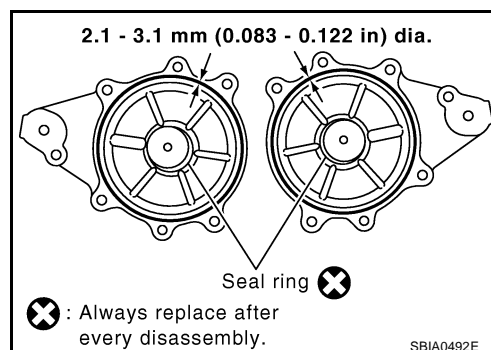
10. Install oil pan (lower). Refer to [EM-29, "OIL PAN AND OIL STRAINER"](#).

11. Install intake valve timing control covers as follows:

- a. Install new seal rings in shaft grooves.

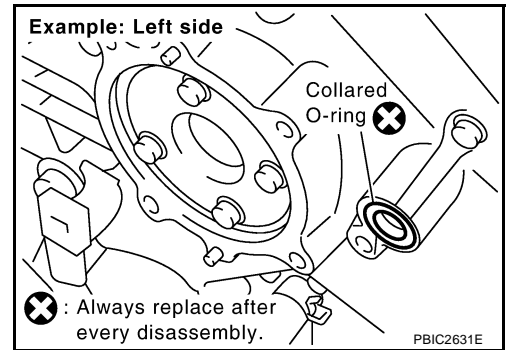
- b. Apply a continuous bead of liquid gasket with the tube presser [SST: WS39930000 ( — )] to intake valve timing control covers as shown in the figure.

**Use Genuine RTV Silicone Sealant or equivalent. Refer to [GI-46, "RECOMMENDED CHEMICAL PRODUCTS AND SEALANTS"](#).**

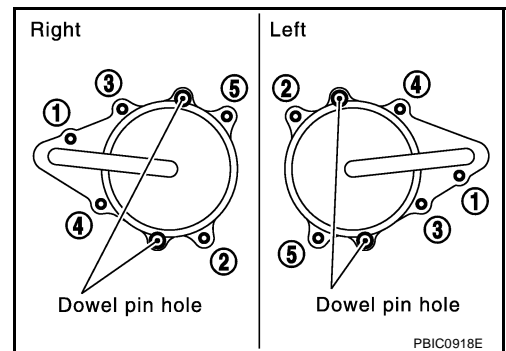


## FRONT TIMING CHAIN CASE

- c. Install new collared O-rings in front timing chain case oil holes (left and right sides).



- d. Being careful not to move seal rings from the installation grooves, align dowel pins on front timing chain case with the holes to install intake valve timing control covers.
- e. Tighten mounting bolts in numerical order as shown in the figure.

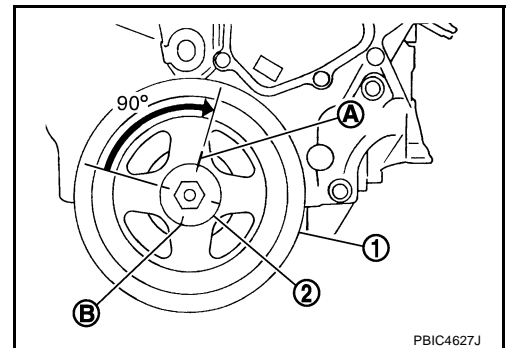


12. Install crankshaft pulley as follows:

- a. Install crankshaft pulley, taking care not to damage front oil seal.
- When press-fitting crankshaft pulley with plastic hammer, tap on its center portion (not circumference).
- b. Fix crankshaft with the pulley holder [SST: KV10109300 ( — )].
- c. Tighten crankshaft pulley bolt.

: **44.1 N·m (4.5 kg-m, 33 ft-lb)**

- d. Place a paint mark (A) on crankshaft pulley (1) aligning with the angle mark (B) on crankshaft pulley bolt (2). Tighten the bolt 90 degrees (angle tightening).



13. Rotate crankshaft pulley in normal direction (clockwise when viewed from engine front) to confirm it turns smoothly.
14. Install in the reverse order of removal after this step.

## INSPECTION AFTER INSTALLATION

### Inspection for Leaks

The following are procedures for checking fluid leak, lubricates leak and exhaust gases leak.

- Before starting engine, check oil/fluid levels including engine coolant and engine oil. If less than required quantity, fill to the specified level. Refer to [MA-10, "RECOMMENDED FLUIDS AND LUBRICANTS"](#).
- Run engine to check for unusual noise and vibration.

# FRONT TIMING CHAIN CASE

**NOTE:**

If hydraulic pressure inside timing chain tensioner drops after removal/installation, slack guide may generate a pounding noise during and just after engine start. However, this is normal. Noise will stop after hydraulic pressure rises.

- Warm up engine thoroughly to make sure there is no leakage of exhaust gases, or any oil/fluids including engine oil and engine coolant.
- Bleed air from lines and hoses of applicable lines, such as in cooling system.
- After cooling down engine, again check oil/fluid levels including engine oil and engine coolant. Refill to the specified level, if necessary.

**Summary of the inspection items:**

| Items                 | Before starting engine | Engine running | After engine stopped |
|-----------------------|------------------------|----------------|----------------------|
| Engine coolant        | Level                  | Leakage        | Level                |
| Engine oil            | Level                  | Leakage        | Level                |
| Other oils and fluid* | Level                  | Leakage        | Level                |

\*: Transmission/transaxle/CVT fluid, power steering fluid, brake fluid, etc.

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