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NISSAN

NISSAN

TERRANO II
model R20 series



SERVICE MANUAL

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NISSAN

TERRANO

MODEL R20 SERIES

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QUICK REFERENCE INDEX

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MAINTENANCE — MA
ENGINE MECHANICAL — EM
ENGINE LUBRICATION & COOLING SYSTEMS — LC
ENGINE CONTROL SYSTEM — EC
ACCELERATOR CONTROL, FUEL & EXHAUST SYSTEM — FE
CLUTCH — CL
MANUAL TRANSMISSION — MT
AUTOMATIC TRANSMISSION — AT
TRANSFER — TF
PROPELLER SHAFT & DIFFERENTIAL CARRIER — PD
FRONT AXLE & FRONT SUSPENSION — FA
REAR AXLE & REAR SUSPENSION — RA
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BODY & TRIM — BT
HEATER & AIR CONDITIONER — HA
STARTING & CHARGING SYSTEMS — SC
ELECTRICAL SYSTEM — EL
ALPHABETICAL INDEX — IDX

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FOREWORD

This manual contains maintenance and repair procedures for NISSAN TERRANO, model R20 series.

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

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

IMPORTANT SAFETY NOTICE

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

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Service Engineering Section

Paris, France

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GENERAL INFORMATION

SECTION GI

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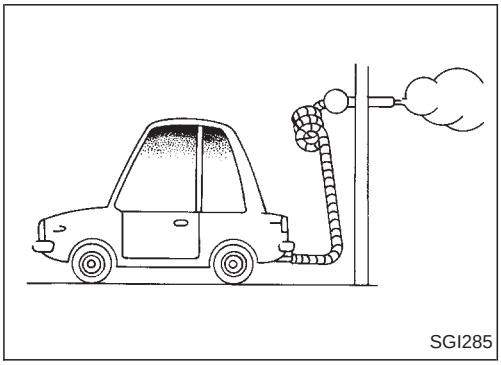
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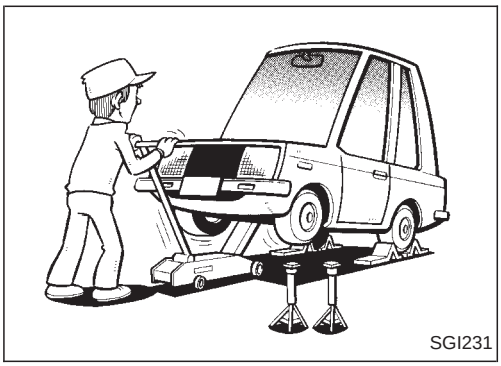
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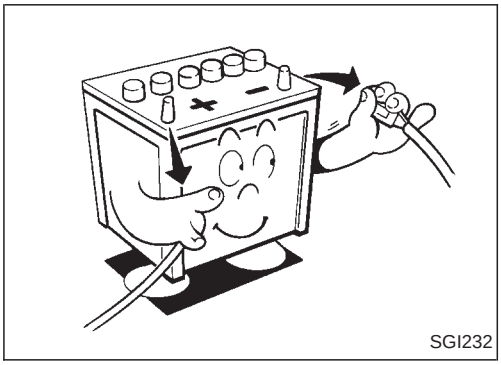
Observe the following precautions to ensure safe and proper servicing. These precautions are not described in each individual section.


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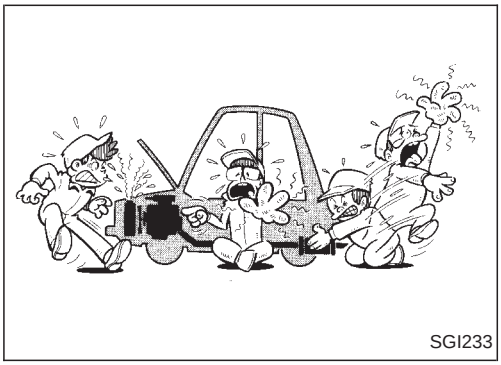
1. Do not operate the engine for an extended period of time without proper exhaust ventilation.
   Keep the work area well ventilated and free of any inflammable materials. Special care should be taken when handling any inflammable or poisonous materials, such as gasoline, refrigerant gas, etc. When working in a pit or other enclosed area, be sure to properly ventilate the area before working with hazardous materials.
   Do not smoke while working on the vehicle.


SGI231

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

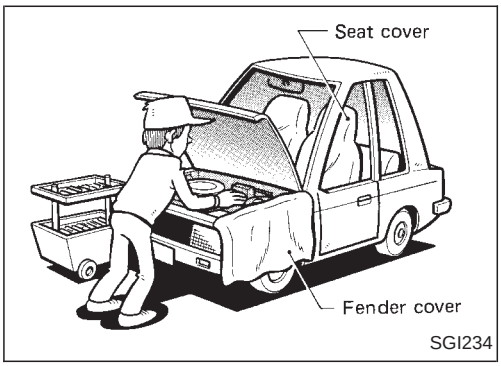

SGI232

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


SGI233

5. To prevent serious burns, avoid contact with hot metal parts such as the radiator, exhaust manifold, tail pipe and muffler. Do not remove the radiator cap when the engine is hot.

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



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

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

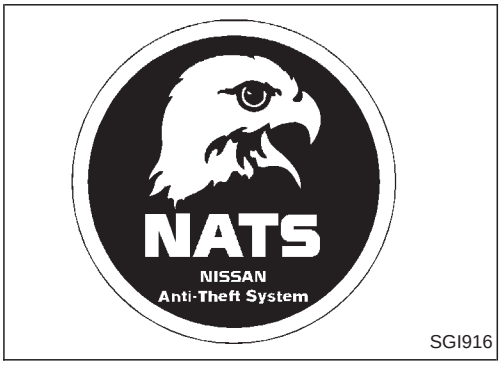
WARNING:

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

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Supplemental Restraint System (SRS) “AIR BAG” and “SEAT BELT PRE-TENSIONER” (Dual Air Bag System) (Cont’d)

insulation (either just before the harness connectors or for the complete harness), for easy identification.



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Precautions for NATS

NATS (Nissan Anti-Theft System)

NATS will immobilize the engine if someone tries to start it without the registered key of NATS.
Both of the originally supplied ignition key IDs have been NATS registered.
The NATS security indicator is located on the instrument panel. The indicator blinks when the ignition switch is in “OFF” or “ACC” position. Therefore, NATS warns outsiders that the vehicle is equipped with the anti-theft system.

- When NATS detects trouble, the malfunction indicator lamp (MIL) blinks.
  This blinking indicates that the anti-theft is not functioning, so prompt service is required.
- If the malfunction indicator lamp comes on while the engine is running, return the vehicle to the workshop before turning the ignition switch “OFF”.
  Once the ignition switch is turned “OFF”, the engine can not be started.
- When servicing NATS (trouble diagnoses, system initialization and additional registration of other NATS ignition key IDs) CONSULT-II hardware and CONSULT-II NATS software is necessary.
  Regarding the procedures of NATS initialization and NATS ignition key ID registration, refer to CONSULT-II operation manual, NATS.

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

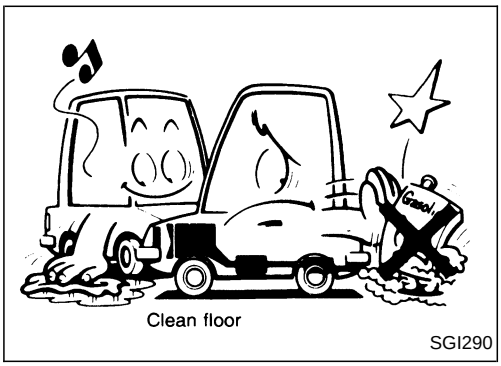
- When servicing NATS (trouble diagnoses, system initialization and additional registration of other NATS ignition key IDs), it may be necessary to re-register original key identification. Therefore, be sure to receive all keys from vehicle owner.
  A maximum of five key IDs can be registered into NATS.
- When failing to start the engine first-time using the key of NATS, starts as follows:
  (1) Turn ignition key to “OFF”.
  (2) Wait approx. 5 seconds.
  (3) Turn ignition key to “START” again while keeping the key apart from any others on key-chain.

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Precautions for Multiport Fuel Injection System or Engine Control System

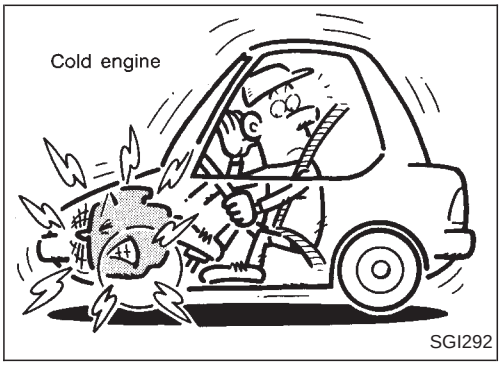
1. Before connecting or disconnecting any harness connector for the multiport fuel injection system or ECM (Engine Control Module):
   Turn ignition switch to “OFF” position.
   Disconnect negative battery terminal.
   Otherwise, there may be damage to ECM.
2. Before disconnecting pressurized fuel line from fuel pump to injectors, be sure to release fuel pressure to eliminate danger.
3. Be careful not to jar components such as control unit and air flow meter.



Precautions for Catalyst

If a large amount of unburned fuel enters the converter, the converter temperature will rise to excessively high values. To prevent this, follow the procedure below:

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



Precautions for Turbocharger

The turbocharger turbine revolves at extremely high speeds and becomes very hot. Therefore, it is essential to maintain a clean supply of oil flowing through the turbocharger and to follow all required maintenance instructions and operating procedures.
For proper operation of the system, follow the procedure below:

1. Always use the recommended oil. Follow the instructions for proper time to change the oil and proper oil level.
2. Avoid accelerating engine to a high rpm immediately after starting.
3. If engine had been operating at high rpm for an extended period of time, let it idle for a few minutes prior to shutting it off.

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Precautions for Fuel

DIESEL ENGINE*:

Diesel fuel of at least 50 cetane for ZD30DDTi engine.

* If two types of diesel fuel are available, use summer or winter fuel properly according to the following temperature conditions.

- Above −7°C (20°F) ... Summer type diesel fuel.
- Below −7°C (20°F) ... Winter type diesel fuel.

CAUTION:

- **Do not use home heating oil, gasoline, or other alternate fuels in your diesel engine. The use of those can cause engine damage.**
- **Do not use summer fuel at temperature below −7°C (20°F). The cold temperature will cause wax to form in the fuel. As a result, it may prevent the engine from running smoothly.**
- **Do not add gasoline or other alternate fuels to diesel fuel.**

Precautions for Engine Oils

Prolonged and repeated contact with mineral oil will result in the removal of natural fats from the skin, leading to dryness, irritation and dermatitis. In addition, used engine oil contains potentially harmful contaminants which may cause skin cancer. Adequate means of skin protection and washing facilities must be provided.

HEALTH PROTECTION PRECAUTIONS

1. Avoid prolonged and repeated contact with oils, particularly used engine oils.
2. Wear protective clothing, including impervious gloves where practicable.
3. Do not put oily rags in pockets.
4. Avoid contaminating clothes, particularly underwear, with oil.
5. Heavily soiled clothing and oil-impregnated footwear should not be worn. Overalls must be cleaned regularly.
6. First Aid treatment should be obtained immediately for open cuts and wounds.
7. Use barrier creams, applying them before each work period, to help the removal of oil from the skin.
8. 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.
9. Do not use petrol, kerosine, diesel fuel, gas oil, thinners or solvents for cleaning skin.
10. If skin disorders develop, obtain medical advice without delay.
11. Where practicable, degrease components prior to handling.
12. 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.

(For the United Kingdom, see also HSE Cautionary Notice SHW 397 “Effects of Mineral Oil on the Skin”.)

ENVIRONMENTAL PROTECTION PRECAUTIONS

Burning used engine oil in small space heaters or boilers can be recommended only for units of approved design. The heating system must meet the requirements of HM Inspectorate of Pollution for small burners of less than 0.4 MW. If in doubt check with the appropriate local authority and/or manufacturer of the approved appliance.

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Precautions for Engine Oils (Cont'd)

Dispose of used oil and used oil filters through authorized waste disposal contractors to licensed waste disposal sites, or to the waste oil reclamation trade. If in doubt, contact the local authority for advice on disposal facilities.

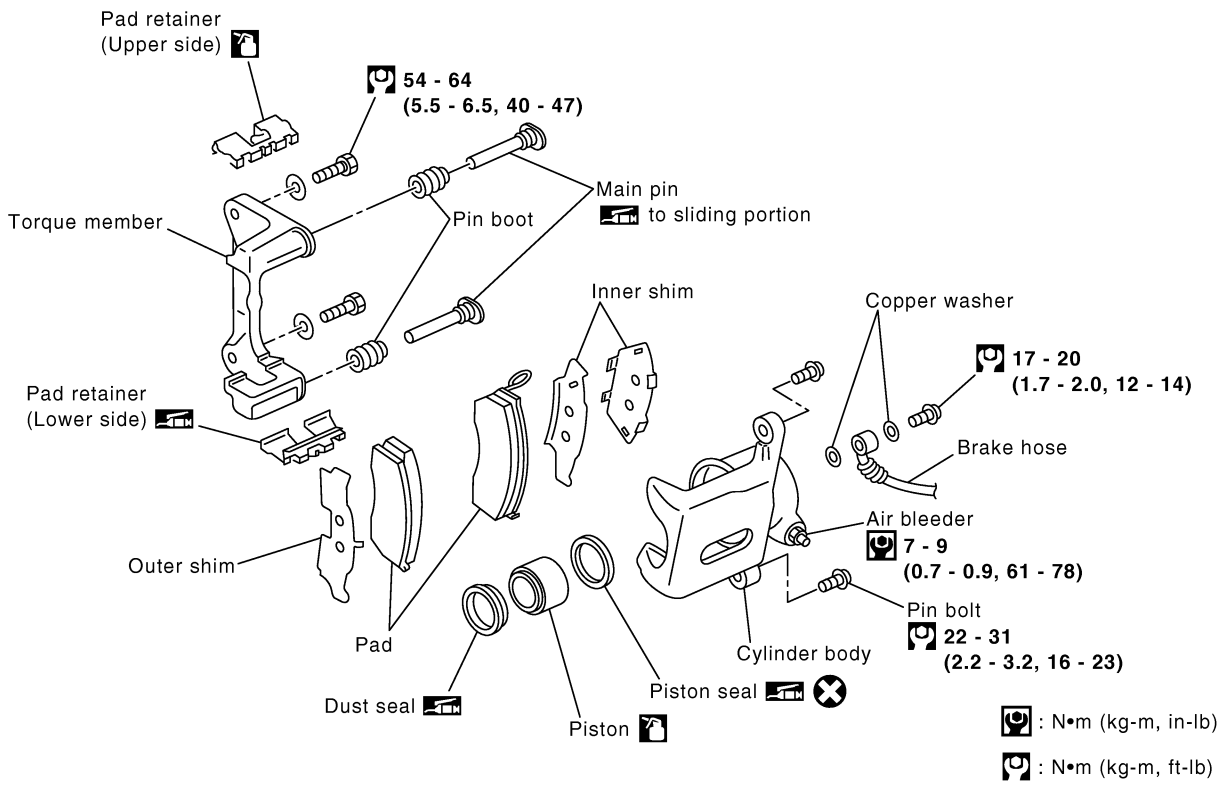
It is illegal to pour used oil on to the ground, down sewers or drains, or into water courses.

The regulations concerning the pollution of the environment will vary from country to country.

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1. **A QUICK REFERENCE INDEX**, a black tab (e.g. BR) is provided on the first page. You can quickly find the first page of each section by mating it to the section's black tab.
2. **THE CONTENTS** are listed on the first page of each section.
3. **THE TITLE** is indicated on the upper portion of each page and shows the part or system.
4. **THE PAGE NUMBER** of each section consists of two letters which designate the particular section and a number (e.g. "BR-5").
5. **THE LARGE ILLUSTRATIONS** are exploded views (See below) and contain tightening torques, lubrication points and other information necessary to perform repairs.
   The illustrations should be used in reference to service matters only. When ordering parts, refer to the appropriate **PARTS CATALOG**.

"Example"



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

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

 : Tightening torque

 : Should be lubricated with grease. Unless otherwise indicated, use recommended multi-purpose grease.

 : Should be lubricated with oil.

 : Sealing point

 : Checking point

 : Always replace after every disassembly.

L.H., R.H.: Left-Hand, Right-Hand
FR, RR : Front, Rear
2WD : 2-Wheel Drive
4WD : 4-Wheel Drive

 : Apply petroleum jelly.

 : Apply A.T.F.

A.T.F. : Automatic Transmission Fluid
★ : Select with proper thickness.
☆ : Adjustment is required.
M/T : Manual Transaxle/Transmission
A/C : Air Conditioner
P/S : Power Steering
S.S.T. : Special Service Tools
S.D.S. : Service Data and Specifications
SAE : Society of Automotive Engineers, Inc.
L.H.D. : Left-Hand Drive
R.H.D. : Right-Hand Drive

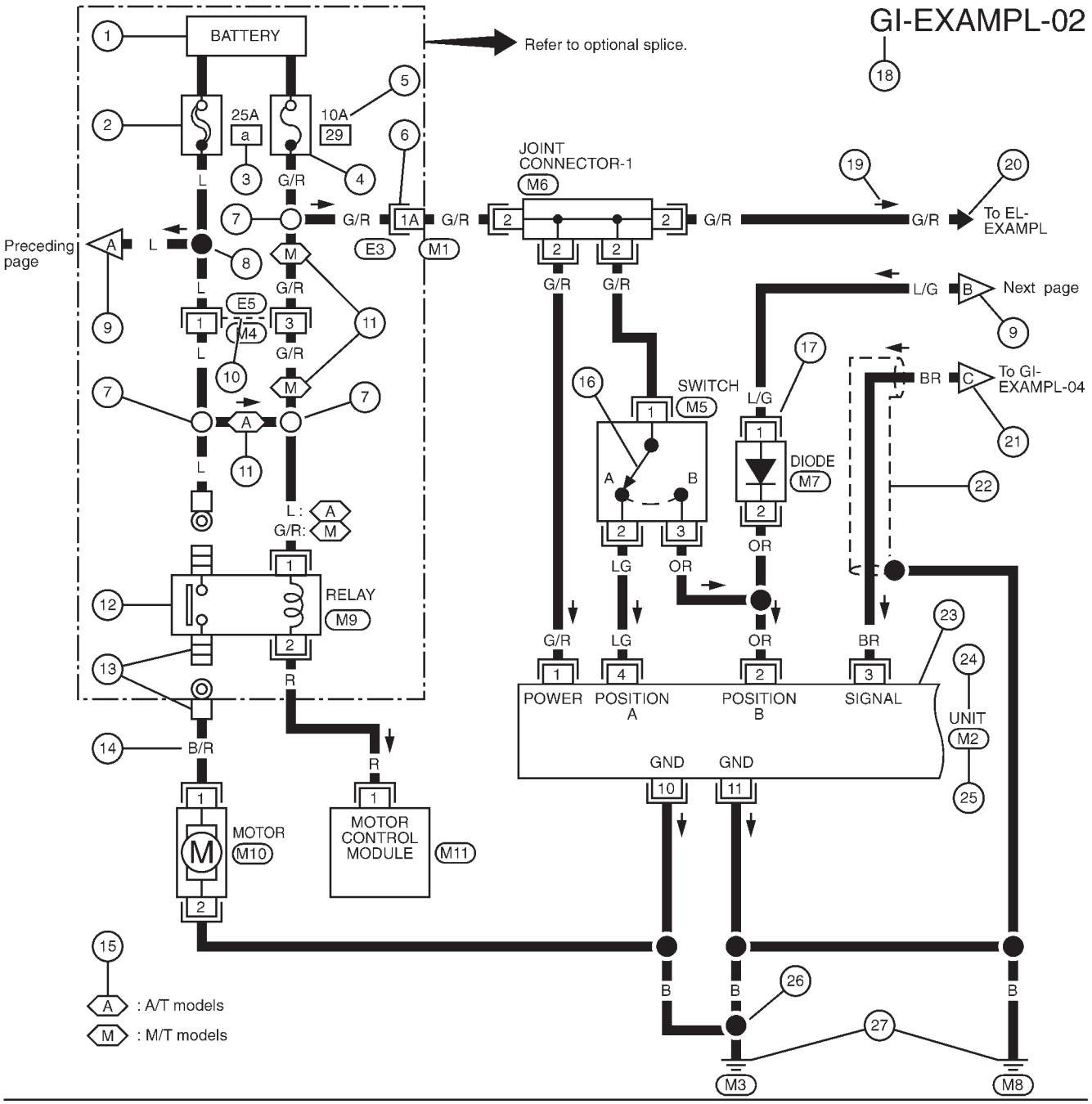
8. The **UNITS** given in this manual are primarily expressed as the SI UNIT (International System of Unit), and alternatively expressed in the metric system and in the yard/pound system.
   "Example"
   Tightening torque:
   59 - 78 N·m (6.0 - 8.0 kg-m, 43 - 58 ft-lb)
9. **TROUBLE DIAGNOSES** are included in sections dealing with complicated components.
10. **SERVICE DATA AND SPECIFICATIONS** are contained at the end of each section for quick reference of data.
11. The captions **WARNING** and **CAUTION** warn you of steps that must be followed to prevent personal injury and/or damage to some part of the vehicle.

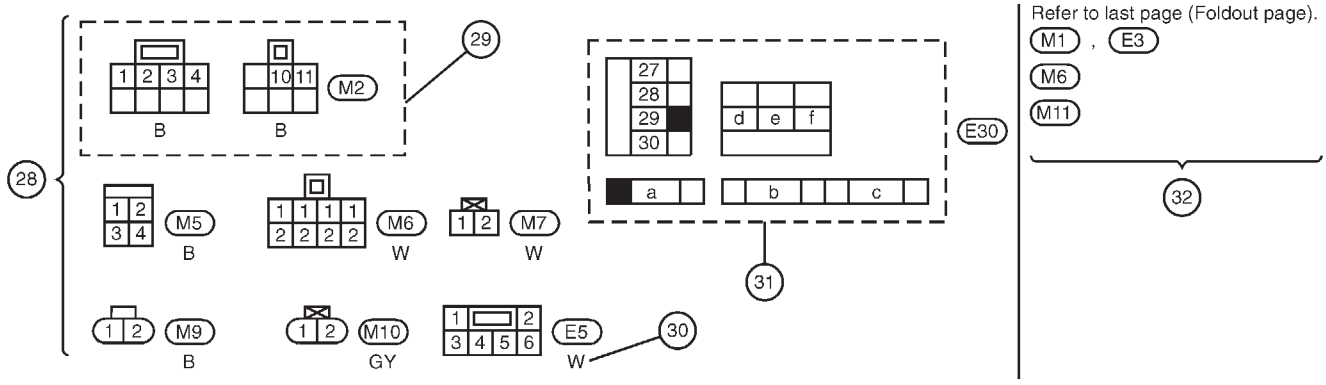
- **WARNING** indicates the possibility of personal injury if instructions are not followed.
- **CAUTION** indicates the possibility of component damage if instructions are not followed.
- **BOLD TYPED STATEMENTS** except **WARNING** and **CAUTION** give you helpful information.

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Sample/Wiring Diagram — EXAMPL —

- For Description, refer to GI-10.



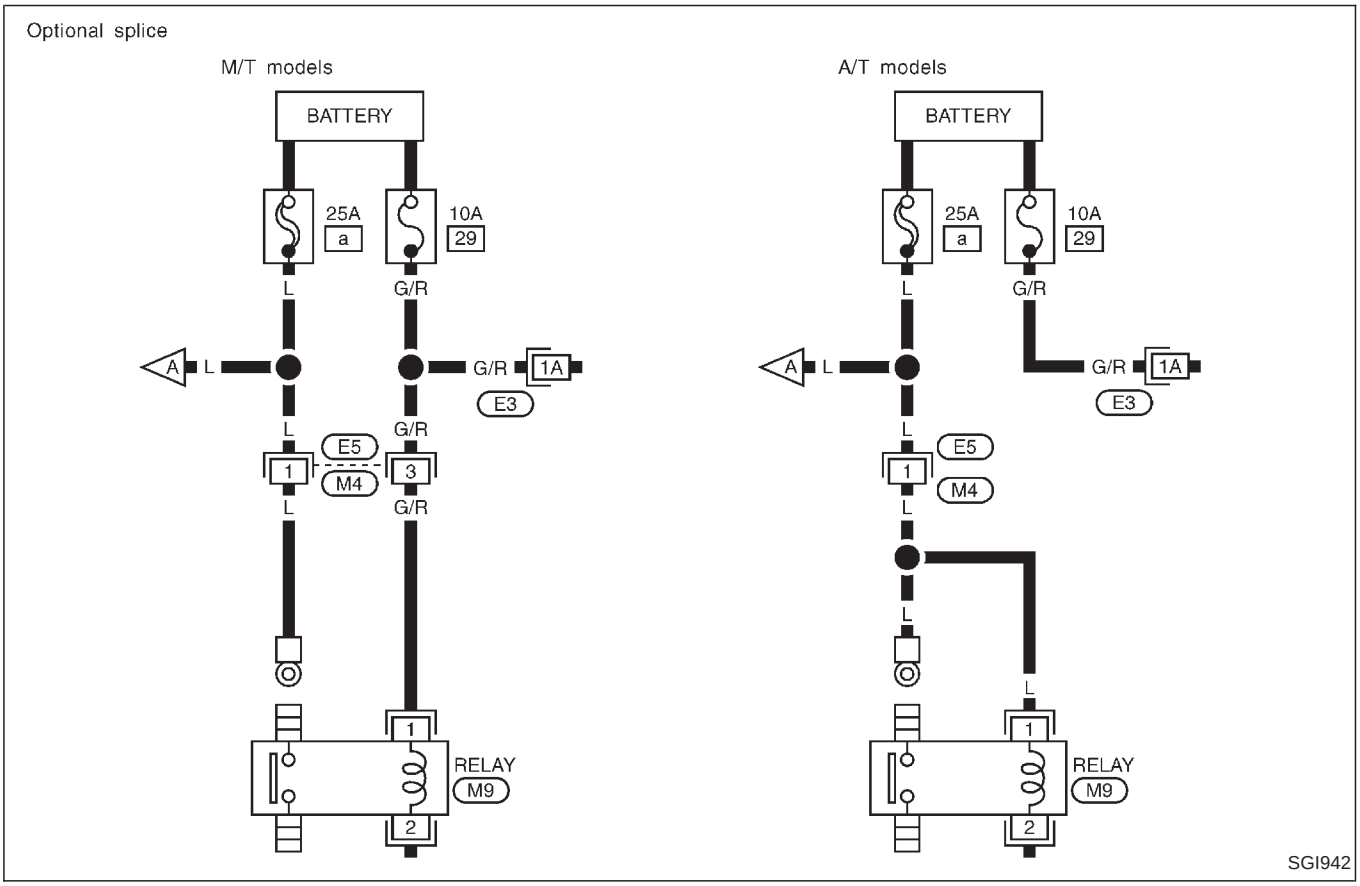


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Sample/Wiring Diagram — EXAMPL — (Cont'd)

OPTIONAL SPLICE



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Description

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

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Description (Cont'd)

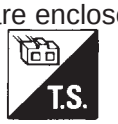
Number	Item	Description
⑲	Current flow arrow	• Arrow indicates electric current flow, especially where the direction of standard flow (vertically downward or horizontally from left to right) is difficult to follow. • A double arrow "◀▶" shows that current can flow in either direction depending on circuit operation.
⑳	System branch	• This shows that the system branches to another system identified by cell code (section and system).
㉑	Page crossing	• This arrow shows that the circuit continues to another page identified by cell code. • The C will match with the C on another page within the system other than the next or preceding pages.
㉒	Shielded line	• The line enclosed by broken line circle shows shield wire.
㉓	Component box in wave line	• This shows that another part of the component is also shown on another page (indicated by wave line) within the system.
㉔	Component name	• This shows the name of a component.
㉕	Connector number	• This shows the connector number. • The letter shows which harness the connector is located in. Example: **M**: main harness. For detail and to locate the connector, refer to EL section ("Main Harness", "HARNESS LAYOUT"). A coordinate grid is included for complex harnesses to aid in locating connectors.
㉖	Ground (GND)	• The line spliced and grounded under wire color shows that ground line is spliced at the grounded connector.
㉗	Ground (GND)	• This shows the ground connection.
㉘	Connector views	• This area shows the connector faces of the components in the wiring diagram on the page.
㉙	Common component	• Connectors enclosed in broken line show that these connectors belong to the same component.
㉚	Connector color	• This shows a code for the color of the connector. For code meaning, refer to wire color codes, Number ⑭ of this chart.
㉛	Fusible link and fuse box	• This shows the arrangement of fusible link(s) and fuse(s), used for connector views of "POWER SUPPLY ROUTING" in EL section. The open square shows current flow in, and the shaded square shows current flow out.
㉜	Reference area	• This shows that more information on the Super Multiple Junction (SMJ) and Joint Connectors (J/C) exists on the foldout page. Refer to GI-18 for details.

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Description (Cont'd)

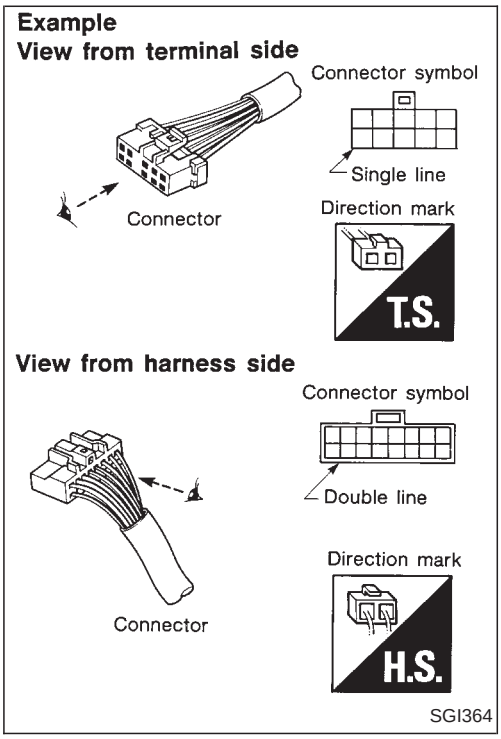
CONNECTOR SYMBOLS

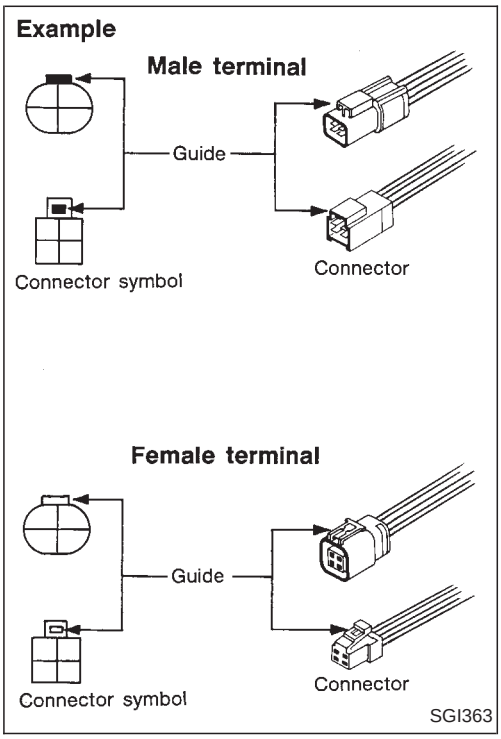
Most of connector symbols in wiring diagrams are shown from the terminal side.

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

.

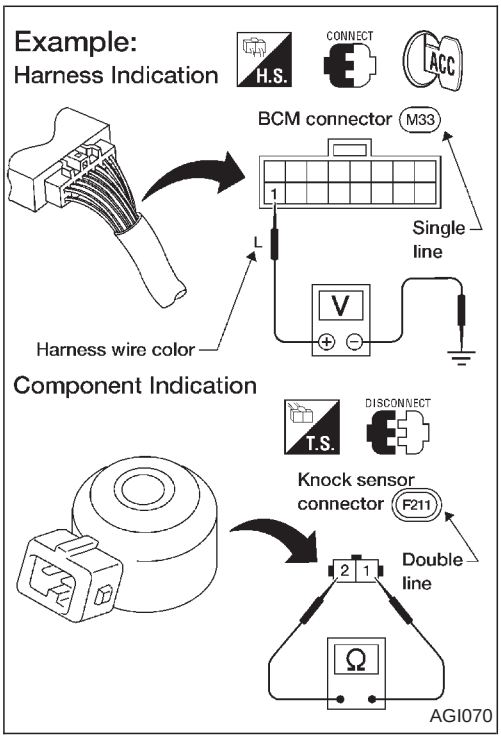




- Male and female terminals
  Connector guides for male terminals are shown in black and female terminals in white in wiring diagrams.

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Description (Cont'd)

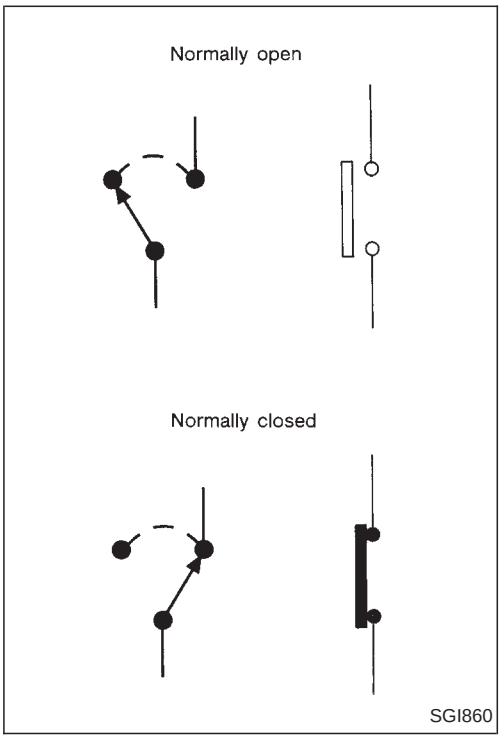


Harness indication

- 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 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.

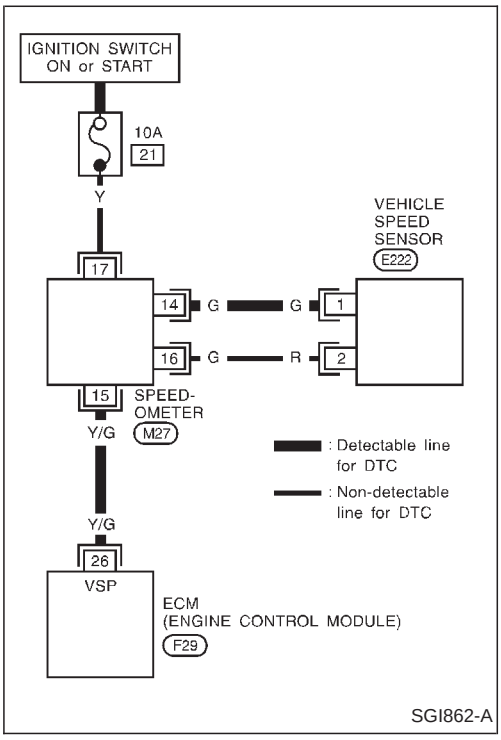
http://vnx.su/

Description (Cont'd)

DETECTABLE LINES AND NON-DETECTABLE LINES

In some wiring diagrams, two kinds of lines, representing wires, with different weight are used.

- A line with regular weight (wider line) represents a "detectable line for DTC (Diagnostic Trouble Code)". A "detectable line for DTC" is a circuit in which ECM (Engine Control Module) can detect its malfunctions with the on board diagnostic system.
- A line with less weight (thinner line) represents a "non-detectable line for DTC". A "non-detectable line for DTC" is a circuit in which ECM cannot detect its malfunctions with the on board diagnostic system.



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Description (Cont'd)

MULTIPLE SWITCH

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

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

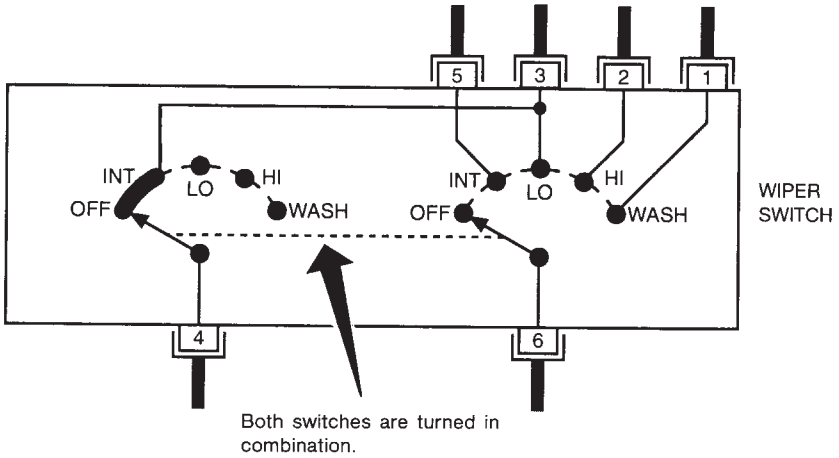
Example

(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

SGI875

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Description (Cont'd)

FOLDOUT PAGE

The foldout page should be opened when reading wiring diagram.

Super multiple junction (SMJ)

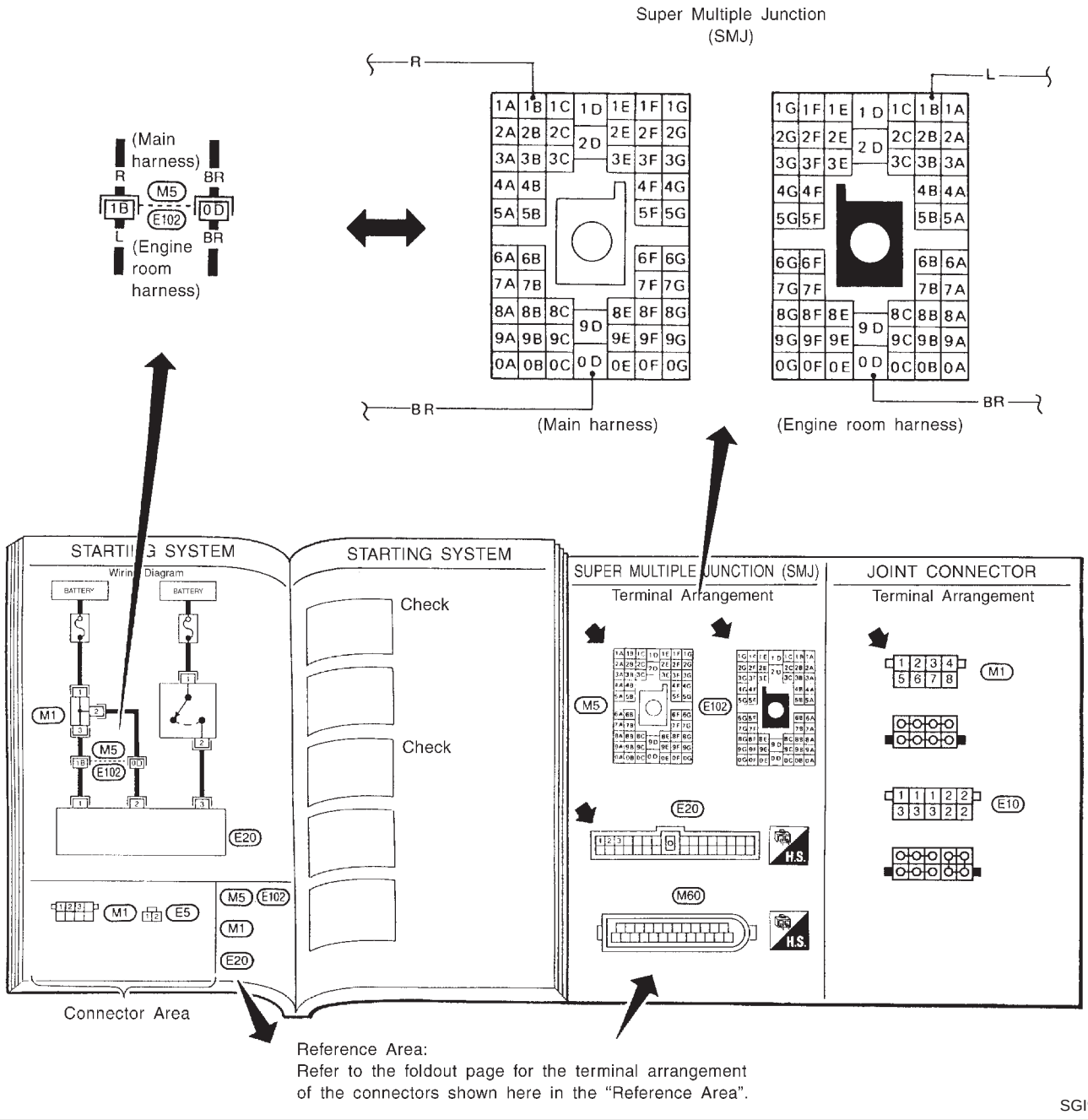
In wiring diagram, connectors consisting of terminals having terminal numbers with an alphabet (1B, 0D, etc.) are SMJ connectors.

If connector numbers are shown in Reference Area, these connector symbols are not shown in Connector Area. For terminal arrangement of these connectors, refer to the foldout page at the end of this manual.

Joint connector

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

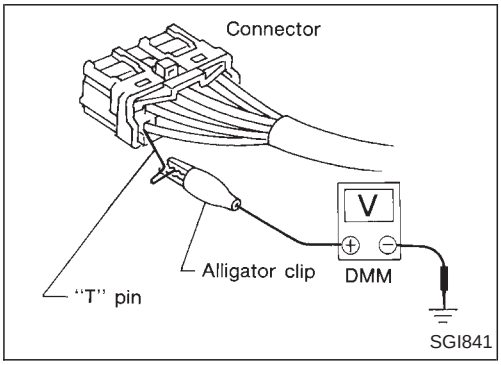
Example



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How to Probe Connectors

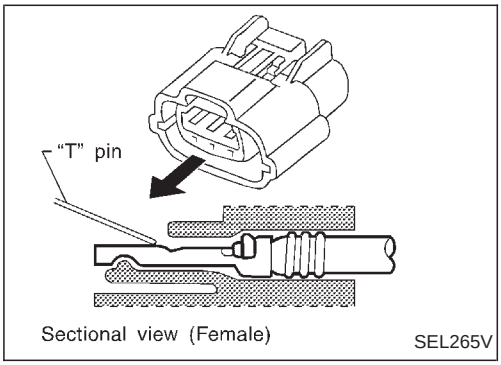
Connector damage and an intermittent connection can result from improperly probing of the connector during circuit checks.
The probe of a digital multimeter (DMM) may not correctly fit the connector cavity. To correctly probe the connector, follow the procedures below using a “T” pin. For the best contact 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.**

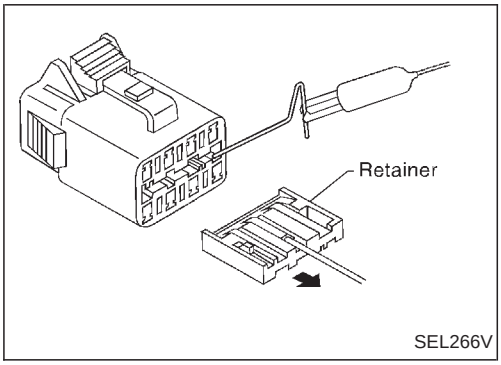


PROBING FROM TERMINAL SIDE

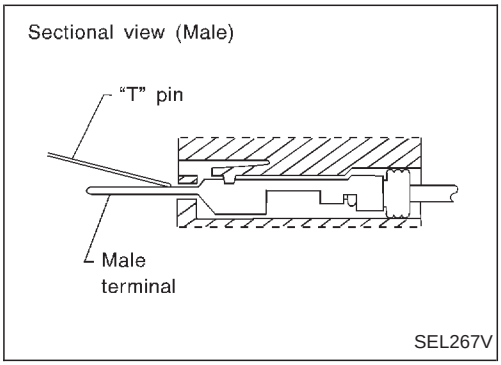
Female terminal

- 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.



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



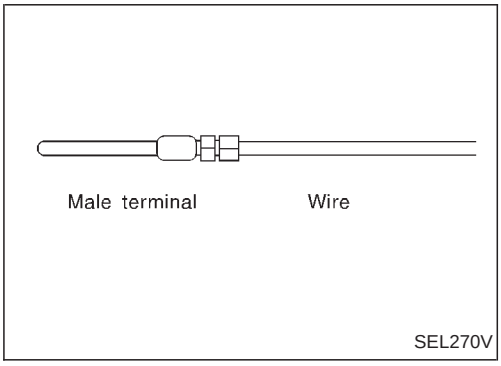
Male terminal

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

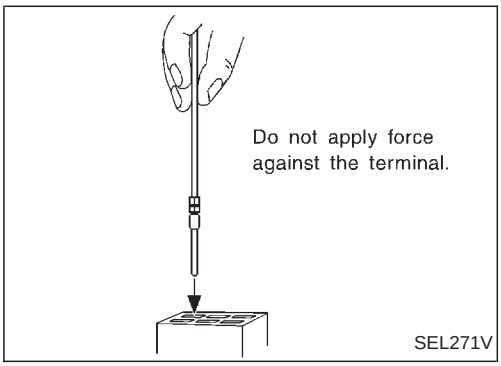
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How to Check Enlarged Contact Spring of Terminal

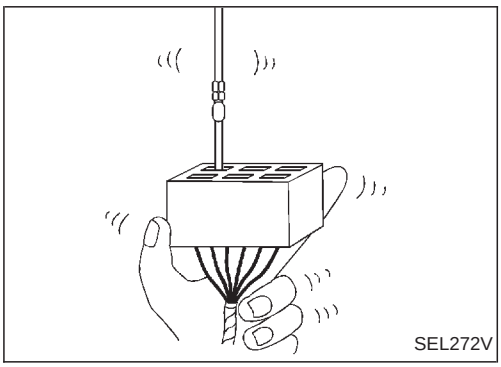
An enlarged contact spring of a terminal may create intermittent signals in the circuit.
If the intermittent open circuit occurs, follow the procedure below to inspect for open wires and enlarged contact spring of female terminal.



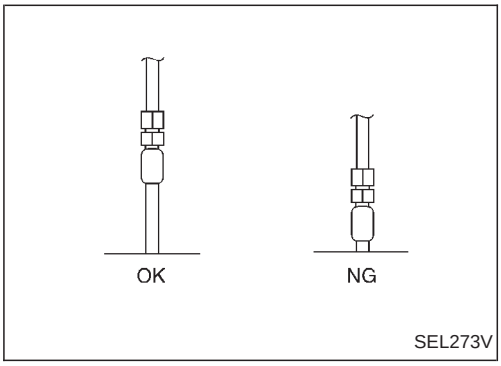
1. Assemble a male terminal and approx. 10 cm (3.9 in) of wire.
Use a male terminal which matches the female terminal.
2. Disconnect the suspected faulty connector and hold it terminal side up.



3. 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.

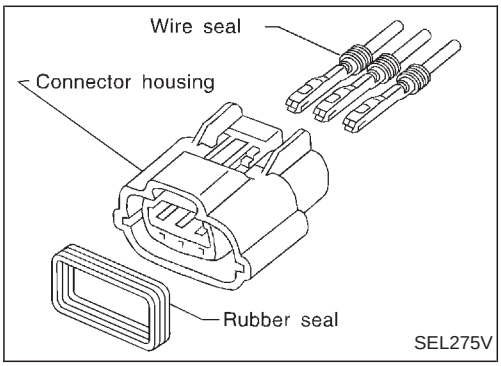


4. While moving the connector, check whether the male terminal can be easily inserted or not.



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

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Waterproof Connector Inspection

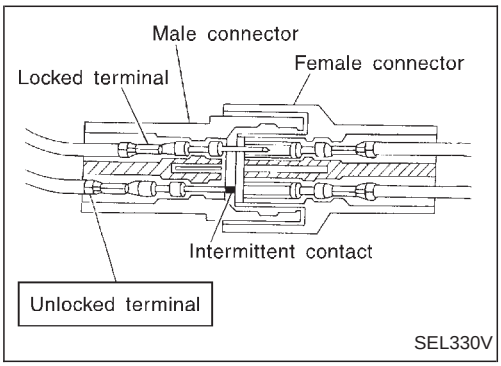
If water enters the connector, it can short interior circuits. This may lead to intermittent problems.
Check the following items to maintain the original waterproof characteristics.

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.

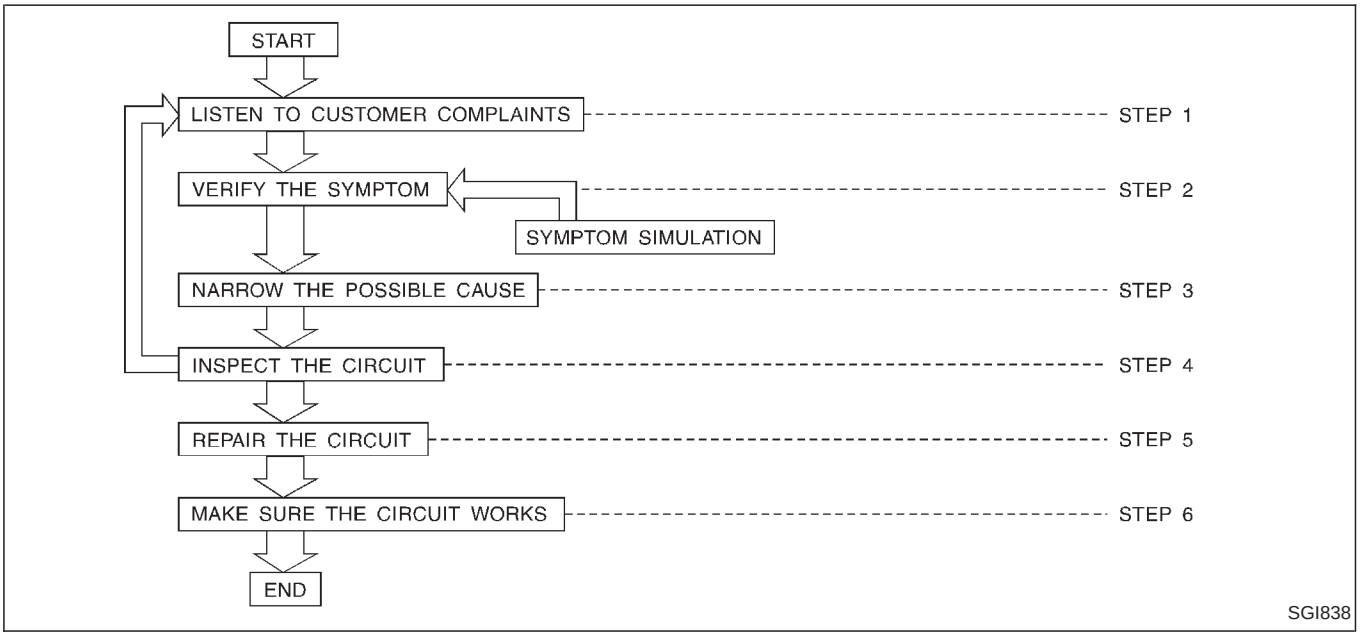


Terminal Lock Inspection

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

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Work Flow



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

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Incident Simulation Tests

INTRODUCTION

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

The section is broken into the six following topics:

- Vehicle vibration
- Heat sensitive
- Freezing
- Water intrusion
- Electrical load
- Cold or hot start up

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

VEHICLE VIBRATION

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

Connectors & harness

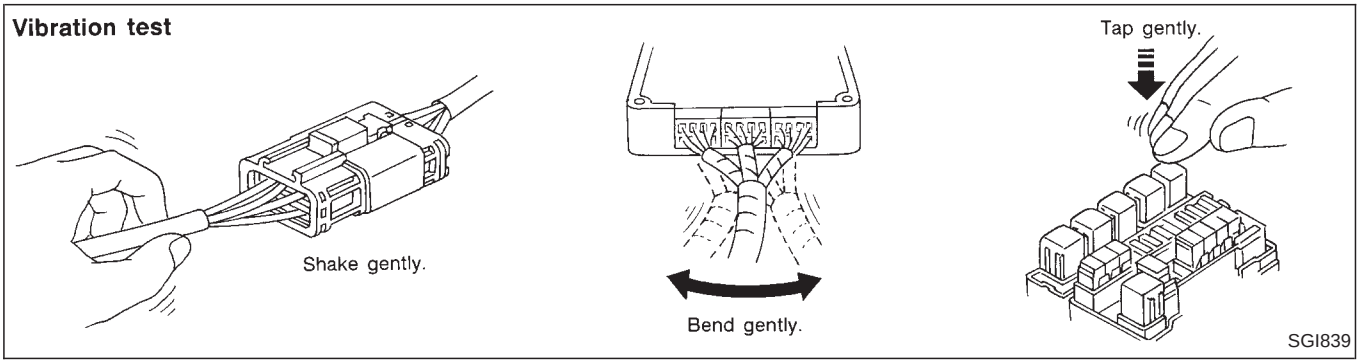
Determine which connectors and wiring harness would affect the electrical system you are inspecting. **Gently** shake each connector and harness while monitoring the system for the incident you are trying to duplicate. This test may indicate a loose or poor electrical connection.

Hint

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

Sensors & relays

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



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Incident Simulation Tests (Cont'd)

Engine compartment

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

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

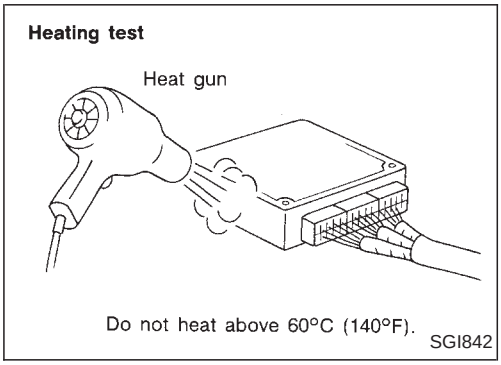
To inspect components under the hood, start by verifying the integrity of ground connections. (Refer to GROUND INSPECTION described later.) First check that the system is properly grounded. Then check for loose connection by **gently shaking** the wiring or components as previously explained. Using the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

Behind the instrument panel

An improperly routed or improperly clamped harness can become pinched during accessory installation. Vehicle vibration can aggravate a harness which is routed along a bracket or near a screw.

Under seating areas

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

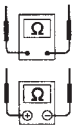
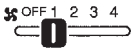
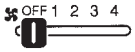
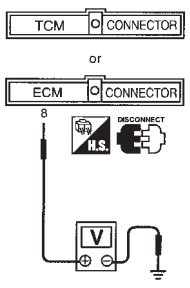


HEAT SENSITIVE

The owner's problem may occur during hot weather or after car has sat for a short time. In such cases you will want to check for a heat sensitive condition.
To determine if an electrical component is heat sensitive, heat the component with a heat gun or equivalent.
Do not heat components above 60°C (140°F). If incident occurs while heating the unit, either replace or properly insulate the component.

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Key to symbols signifying measurements or procedures

Symbol	Symbol explanation	Symbol	Symbol explanation
	Check after disconnecting the connector to be measured.		Circuit resistance should be measured with an ohmmeter.
	Check after connecting the connector to be measured.		Current should be measured with an ammeter.
	Insert key into ignition switch.		Procedure with CONSULT-II
	Remove key from ignition switch.		Procedure without CONSULT-II
	Turn ignition switch to “OFF” position.		A/C switch is “OFF”.
	Turn ignition switch to “ON” position.		A/C switch is “ON”.
	Turn ignition switch to “START” position.		Fan switch is “ON”. (At any position except for “OFF” position)
	Turn ignition switch from “OFF” to “ACC” position.		Fan switch is “OFF”.
	Turn ignition switch from “ACC” to “OFF” position.		Apply battery voltage directly to components.
	Turn ignition switch from “OFF” to “ON” position.		Drive vehicle.
	Turn ignition switch from “ON” to “OFF” position.		Disconnect battery negative cable.
	Do not start engine, or check with engine stopped.		Depress brake pedal.
	Start engine, or check with engine running.		Release brake pedal.
	Apply parking brake.		Depress accelerator pedal.
	Release parking brake.		Release accelerator pedal.
	Check after engine is warmed up sufficiently.		Pin terminal check for SMJ type connector (e.g. ECM and TCM, etc.) **For details regarding the terminal arrangement, refer to the foldout page.**
	Voltage should be measured with a voltmeter.		

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Function and System Application

Diagnostic test mode	Function	ENGINE	A/T	Air bag	ABS	NATS*1
Self-diagnostic results	Self-diagnostic results can be read and erased quickly.	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	—	—
Data monitor	Input/Output data in the ECM can be read.	x	x	—	x	—
Active test	Diagnostic Test Mode in which CONSULT-II drives some actuators apart from the ECMs and also shifts some parameters in a specified range.	x	—	—	x	—
ECU (ECM) part number	ECU (ECM) part number can be read.	x	x	—	x	—
Control unit initialisation	All registered ignition key IDs in NATS components can be initialised and new IDs can be registered.	—	—	—	—	x
Self-function check	ECM checks its own NATS communication interface.	—	—	—	—	x

x: Applicable
*1: NATS: Nissan Anti-Theft System

Nickel Metal Hydride Battery Replacement

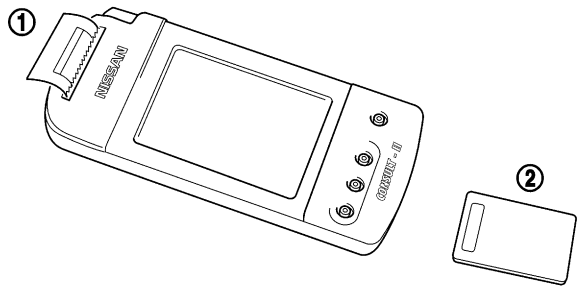
CONSULT-II contains a nickel metal hydride battery. When replacing the battery obey the following:

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 mis-treated. Do not recharge, disassemble of dispose of in fire.
Keep the battery out of reach of children and discard used battery conforming to the local regulations.

Checking Equipment

When ordering this equipment, contact your NISSAN distributor.

Tool name	Description
NISSAN CONSULT-II ① CONSULT-II unit and accessories ② Program card AED03E for diagnosis, AEN02C-1 for NATS To confirm the best combination of these softwares, refer to CONSULT-II Operation Manual.	 YGI004

NOTE:

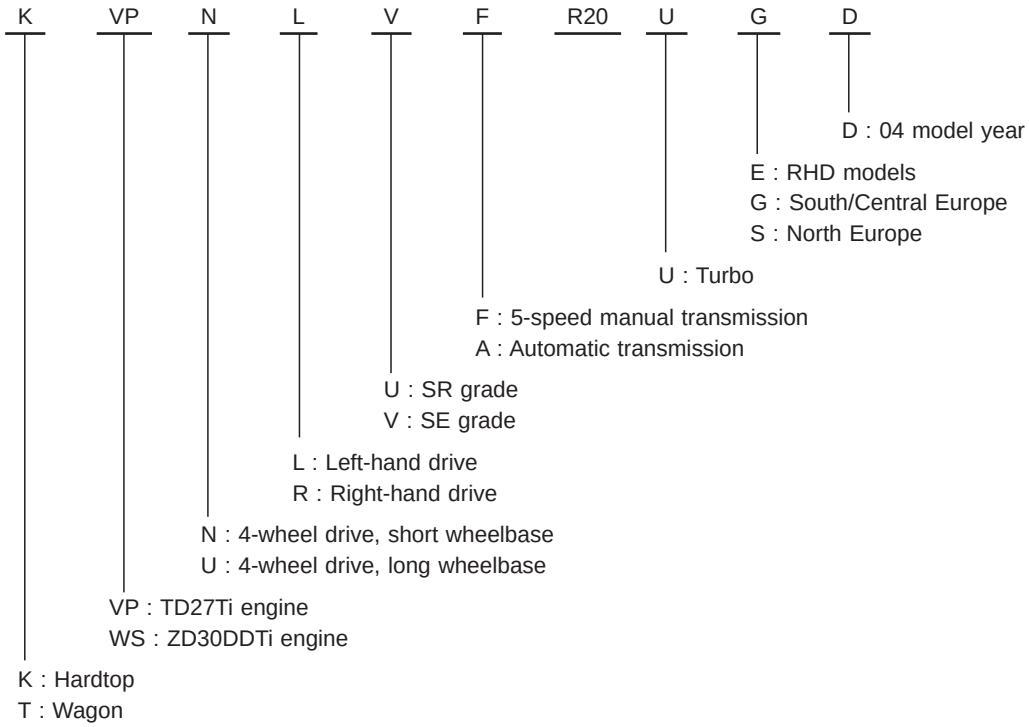
- **The CONSULT-II must be used in conjunction with a program card. CONSULT-II does not require loading (Initialisation) procedure.**
- **Be sure the CONSULT-II is turned off before installing or removing a program card.**

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Model Variation

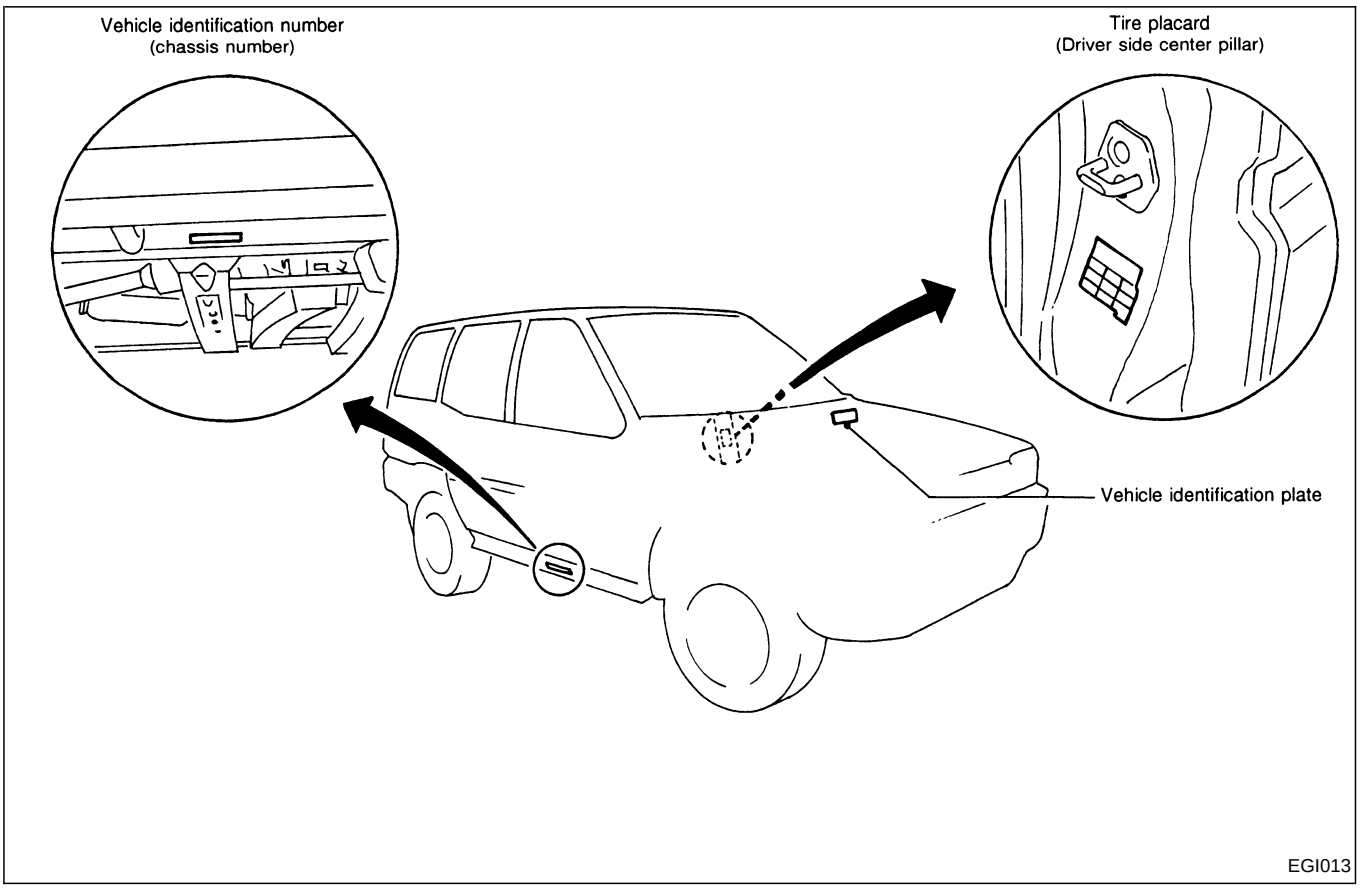
Body	Grade	Engine	Transmission	Group A (RHD)	Group B (South) Group C (Central)	Group D (North)
H/T	SE "Luxury/ Elegance"	TD27Ti	FS5R30A	KVPNRVF-UED	KVPNLVF-UGD	KVPNLVF-USD
		ZD30DDTi	FS5R30A	KWSNRVF-UED	KWSNLVF-UGD	KWSNLVF-USD
			RE4R01A	KWSNRVA-UED	KWSNLVA-UGD	KWSNLVA-USD
	SR "Sport"	TD27Ti	FS5R30A	KVPNRUF-UED	KVPNLUF-UGD	KVPNLUF-USD
Wagon	SE "Luxury/ Elegance"	TD27Ti	FS5R30A	TVPURVF-UED	TVPULVF-UGD	TVPULVF-USD
		ZD30DDTi	FS5R30A	TWSURVF-UED	TWSULVF-UGD	TWSULVF-USD
			RE4R01A	TWSURVA-UED	TWSULVA-UGD	TWSULVA-USD
	SR "Sport"	TD27Ti	FS5R30A	TVPURUF-UED	TVPULUF-UGD	TVPULUF-USD

Prefix and suffix designations:



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Identification Number



VEHICLE IDENTIFICATION NUMBER (Chassis number)

Prefix and suffix designations:

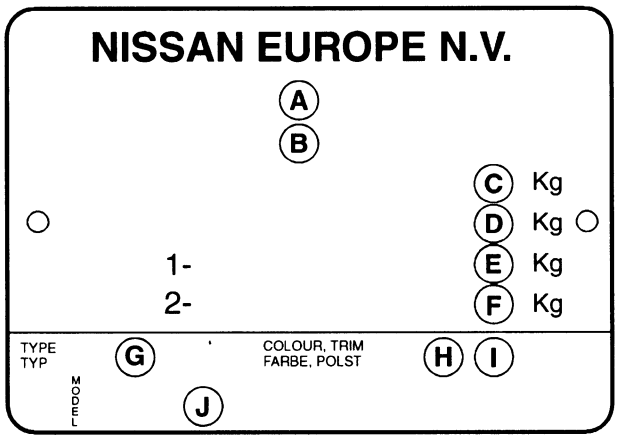
VSK K V N R20 U O XXXXXX

- XXXXXX: Vehicle serial number
- O: Stopgap (no meaning)
- U: U : Europe
- R20: Model
- N: Axle
  - N : 4-wheel drive, short wheelbase
  - U : 4-wheel drive, long wheelbase
- V: Engine
  - V : TD27Ti
  - W : ZD30DDTi
- K: Body
  - K : Hardtop
  - T : Wagon
- VSK: Manufacturer code

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Identification Number (Cont'd)

IDENTIFICATION PLATE

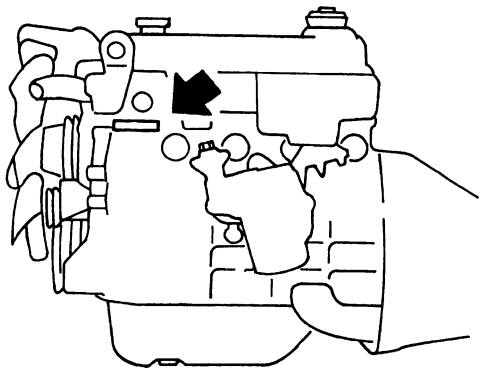


A Type approval number
B Vehicle identification number (chassis number)
C Gross vehicle weight (GVW)
D Gross combination weight (GCW)
E Gross axle weight (Front)
F Gross axle weight (Rear)
G Vehicle type specification
H Body colour code
I Trim colour code
J Model

NGI011

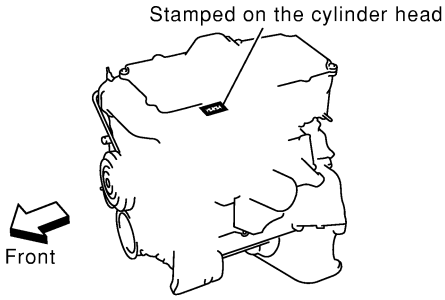
ENGINE SERIAL NUMBER

TD27Ti engine



NGI012

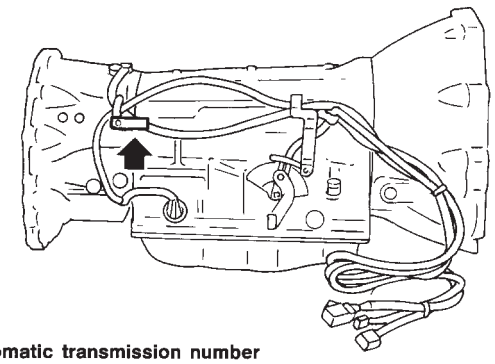
ZD30DDTi engine



SGI137A

AUTOMATIC TRANSMISSION NUMBER

RE4R01A

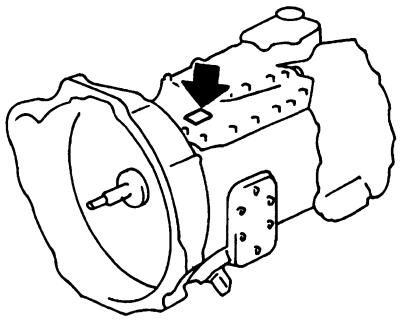


Automatic transmission number

SGI760-A

MANUAL TRANSMISSION NUMBER

FS5R30A



NGI014

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Dimensions

Unit: mm (in)

	Hardtop	Wagon
Overall length	4,242 (167.0)	4,722 (185.9)
Overall width (*)	1,755 (69.1)	1,755 (69.1)
Overall height	1,805 (71.1)	1,810 (71.3)
Front tread	1,455 (57.3)	1,455 (57.3)
Rear tread	1,430 (56.3)	1,430 (56.3)
Wheelbase	2,450 (96.5)	2,650 (104.3)
Ground clearance	210 (8.3)	205 (8.1)
Front overhang	837 (33.0)	837 (33.0)
Rear overhang		
bumper	835 (32.9)	1,115 (43.9)
spare wheel	955 (37.6)	1,235 (48.6)

(*): without mirrors

Wheels and Tires

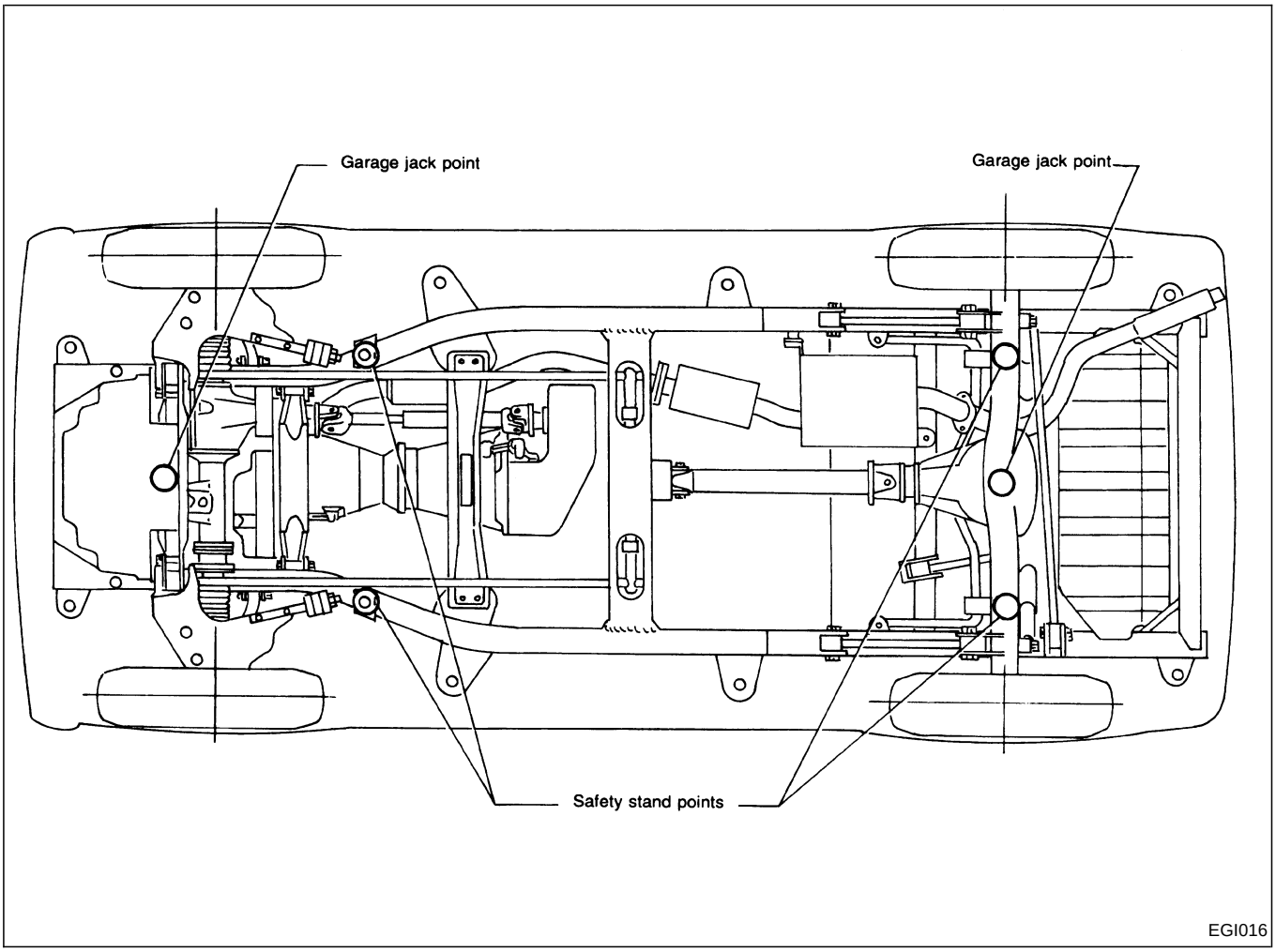
Road wheel size		16 x 7J
Offset	[mm (in)]	25 (0.98)
Tire size		235/70 R16

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Garage Jack and Safety Stand

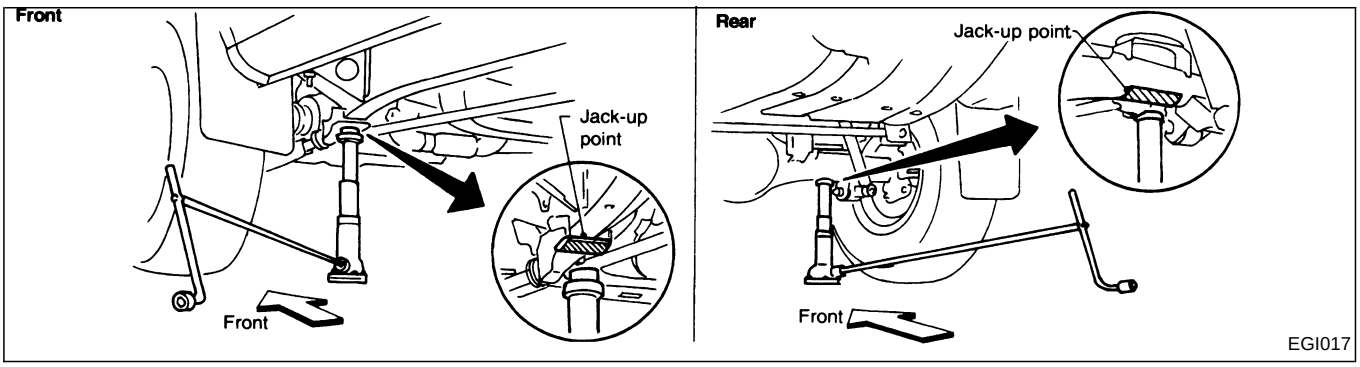
WARNING:

- **Never get under the vehicle while it is supported only by the jack. Always use safety stands when you have to get under the vehicle.**
- **Place wheel chocks at both front and back of the wheels on the ground, and apply handbrake where appropriate.**
- **Do not start the engine while the vehicle is supported only by the jack.**



EGI016

Screw Jack



EGI017

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4-pole Lift

WARNING:

Do not use a 2-pole lift.
Due to weight balance of the vehicle and shape of underbody, lift arms can not be attached in a safe way. Therefore it is recommended to use a 4-pole lift only.

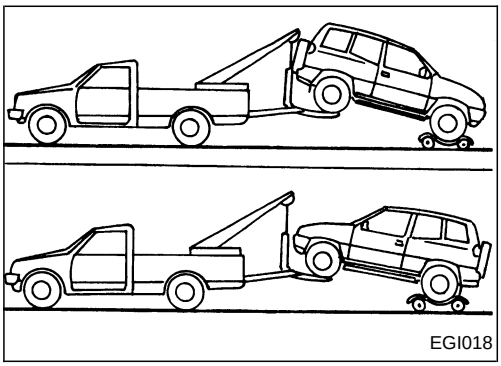
Tow Truck Towing

CAUTION:

- **All applicable 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 a towing operation.**
- **Attach safety chains for all towing.**
- **When towing, make sure that the transmission, steering system and power train are in good order. If any unit is damaged, a dolly must be used.**
- **When towing with the front wheels on the ground:**
  Move both the gearshift and transfer levers to neutral ("N" position).
  Turn the ignition key to the "OFF" position and secure the steering wheel in a straightahead position with a rope or similar device. Never place the ignition key in the "LOCK" position. This will result in damage to the steering lock mechanism.
- **When towing with the rear wheels on the ground, release the parking brake and move both the gearshift and transfer levers to neutral ("N" position).**
- **Never tow vehicle from the rear (i.e., backward) with four wheels on the ground as this may cause serious and expensive damage to the transmission.**

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Tow Truck Towing (Cont'd)


EGI018

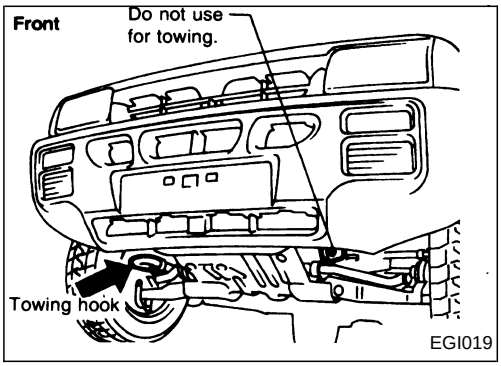
NISSAN recommends that a dolly be used as illustrated when towing 4-wheel drive models.

Towing with four wheels on ground or towing with front (rear wheels on ground) or rear wheels (front wheels on ground) raised

Observe the following restricted towing speeds and distances.

Speed:
Below 50 km/h (30 MPH)
Distance:
Less than 65 km (40 miles)

If the speed or distance must necessarily be greater, remove the front and rear propeller shafts beforehand to prevent damage to the transmission.



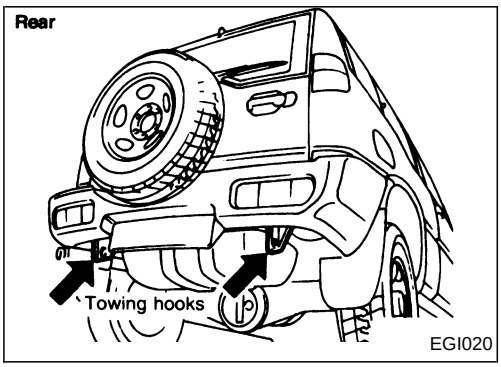
EGI019

TOWING POINT

- **Always pull the cable straight out from the vehicle. Never pull on the hook at a sideways angle.**
- **Use proper towing equipment when towing. Otherwise, the vehicle body will be damaged.**

Front

- **Only R.H. hook may be used for towing purposes. Use L.H. hook only for securing the vehicle during transportation.**



EGI020

Rear

- **Either hook can be used for towing purposes.**
  A platform should be used.

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ISO 15031-2 Terminology List

All emission related terms used in this publication in accordance with ISO 15031-2 are listed. Accordingly, new terms, new acronyms/abbreviations and old terms are listed in the following chart.

***: Not applicable

NEW TERM	NEW ACRONYM/ 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
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	DLC for CONSULT	Diagnostic connector for CONSULT
Diagnostic test mode	DTM	Diagnostic mode
Diagnostic test mode selector	DTM selector	Diagnostic mode selector
Diagnostic test mode I	DTM I	Mode I
Diagnostic test mode II	DTM II	Mode II
Diagnostic trouble code	DTC	Malfunction code
Direct fuel injection system	DFI system	***
Distributor ignition system	DI system	Ignition timing control
Early fuel evaporation-mixture heater	EFE-mixture heater	Mixture heater
Early fuel evaporation system	EFE system	Mixture heater control
Electrically erasable programmable read only memory	EEPROM	***
Electronic ignition system	EI system	Ignition timing control
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 system	EVAP system	Evaporative emission control system
Exhaust gas recirculation valve	EGR valve	EGR valve
Exhaust gas recirculation control-BPT valve	EGRC-BPT valve	BPT valve
Exhaust gas recirculation control-solenoid valve	EGRC-solenoid valve	EGR control solenoid valve

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ISO 15031-2 Terminology List (Cont'd)

***: Not applicable

NEW TERM	NEW ACRONYM/ ABBREVIATION	OLD TERM
Exhaust gas recirculation temperature sensor	EGR temperature sensor	Exhaust gas 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	***
Heated Oxygen sensor	HO_2S	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 module	ICM	***
Indirect fuel injection system	IFI system	***
Intake air temperature sensor	IATS	Air temperature sensor
Knock	***	Detonation
Knock sensor	KS	Detonation sensor
Malfunction indicator	MI	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 control solenoid valve
Multiport fuel injection system	MFI system	Fuel injection control
Neutral position switch	***	Neutral switch
Non-volatile 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	O_2S	Exhaust gas sensor
Park position switch	***	Park switch
Park/neutral position switch	PNP switch	Park/neutral switch
Periodic trap oxidizer system	PTOX system	***

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ISO 15031-2 Terminology List (Cont'd)

***: Not applicable

NEW TERM	NEW ACRONYM/ ABBREVIATION	OLD TERM
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 SPI body
Throttle body fuel injection system	TBI system	Fuel injection control
Throttle position	TP	Throttle position
Throttle position sensor	TPS	Throttle sensor
Throttle position switch	TP switch	Throttle switch
Torque converter clutch solenoid valve	TCC solenoid valve	Lock-up cancel solenoid lock-up solenoid
Turbocharger	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	WOP switch	Full switch

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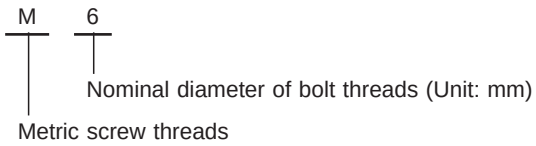
TIGHTENING TORQUE OF STANDARD BOLTS

Grade	Bolt size	Bolt diameter* mm	Pitch mm	Tightening torque (Without lubricant)							
				Hexagon head bolt				Hexagon flange bolt			
				N·m	kg-m	ft-lb	in-lb	N·m	kg-m	ft-lb	in-lb
4T	M6	6.0	1.0	5.1	0.52	3.8	45	6.1	0.62	4.5	54
	M8	8.0	1.25	13	1.3	9		15	1.5	11	
			1.0	13	1.3	9		16	1.6	12	
	M10	10.0	1.5	25	2.5	18		29	3.0	22	
			1.25	25	2.6	19		30	3.1	22	
	M12	12.0	1.75	42	4.3	31		51	5.2	38	
			1.25	46	4.7	34		56	5.7	41	
	M14	14.0	1.5	74	7.5	54		88	9.0	65	
7T	M6	6.0	1.0	8.4	0.86	6.2	75	10	1.0	7	87
	M8	8.0	1.25	21	2.1	15		25	2.5	18	
			1.0	22	2.2	16		26	2.7	20	
	M10	10.0	1.5	41	4.2	30		48	4.9	35	
			1.25	43	4.4	32		51	5.2	38	
	M12	12.0	1.75	71	7.2	52		84	8.6	62	
			1.25	77	7.9	57		92	9.4	68	
	M14	14.0	1.5	127	13.0	94		147	15.0	108	
9T	M6	6.0	1.0	12	1.2	9		15	1.5	11	
	M8	8.0	1.25	29	3.0	22		35	3.6	26	
			1.0	31	3.2	23		37	3.8	27	
	M10	10.0	1.5	59	6.0	43		70	7.1	51	
			1.25	62	6.3	46		74	7.5	54	
	M12	12.0	1.75	98	10.0	72		118	12.0	87	
			1.25	108	11.0	80		137	14.0	101	
	M14	14.0	1.5	177	18.0	130		206	21.0	152	

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

Grade	Mark
4T	4
7T	7
9T	9

* : Nominal diameter



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NOTES

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

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

UNDER HOOD — engine off

- ☐ Radiator coolant level and coolant hose connections for leaks
- ☐ Battery fluid level, specific gravity and conditions of battery terminals
- ☐ Drive belts tension
- ☐ Fuel filter for water or dust, and fuel lines and connections for leaks
- ☐ Engine oil level and oil leaks
- ☐ Brake and clutch reservoirs fluid level and fluid lines for leaks
- ☐ Windshield and rear window washer and headlamp cleaner reservoir fluid level
- ☐ Power steering reservoir fluid level and hose connections for leaks

ON INSIDE AND OUTSIDE

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

UNDER BODY

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

ROAD TEST

- ☐ Clutch operation
- ☐ Parking brake operation
- ☐ Service brake operation
- ☐ Automatic transmission/transaxle shift timing and kickdown (if applicable)
- ☐ Steering control and returnability
- ☐ Engine performance
- ☐ Squeaks and rattles

ENGINE OPERATING AND HOT

- ☐ Adjust idle speed
- ☐ Automatic transmission/transaxle fluid level (if applicable)
- ☐ Engine idling and stop knob operation

FINAL INSPECTION

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

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General maintenance includes those items which should be checked during normal day-to-day operation of the vehicle. They are essential if the vehicle is to continue functioning correctly. Owners can perform the checks and inspections themselves, or they can be carried out by a NISSAN dealer.

Item	Reference pages
OUTSIDE THE VEHICLE The maintenance items listed here should be checked periodically, unless otherwise specified.	
Tires Check the pressure with a gauge weekly when at a service station, including the spare, and adjust to the specified pressure if necessary. Check carefully for damage, cuts or excessive wear.	—
Windshield wiper blades Check for cracks or wear if not functioning correctly.	—
Doors and engine hood Check that all doors, the engine hood, the trunk lid and back door function correctly. Also ensure that all latches lock securely. Lubricate if necessary. Make sure that the secondary latch prevents the hood from opening when the primary latch is released. When driving in areas using road salt or other corrosive materials, check for lubrication more often.	MA-45
Tire rotation Tires should be rotated every 5,000 km (3,000 miles).	MA-43
INSIDE THE VEHICLE The maintenance items listed here should be checked on a regular basis, such as when performing periodic maintenance, cleaning the vehicle etc.	
Lights Make sure that the headlights, stop lights, tail lights, turn signal lights, and other lights are all operating correctly and installed securely. Also check headlight aim.	—
Warning lights and buzzers/chimes Make sure that all warning lights and buzzers/chimes are functioning correctly.	—
Steering wheel Check that it has the specified play. Check for changes in the steering operation, such as excessive free play, hard steering or strange noises. **Free play: Less than 35 mm (1.38 in)**	—
Seat belts Check that all parts of the seat belt system (e.g. buckles, anchors, adjusters and retractors) operate properly and smoothly, and are installed securely. Check the belt webbing for cuts, fraying, wear of damage.	MA-46
UNDER THE HOOD AND VEHICLE The maintenance items listed here should be checked periodically e.g. each time you check the engine oil or refuel.	
Windshield washer fluid Check that there is adequate fluid in the tank.	
Engine coolant level Check the coolant level when the engine is cold.	MA-22
Engine oil level Check the level after parking the vehicle (on level ground) and turning off the engine.	MA-21
Brake and clutch fluid level Make sure that the brake fluid level is between the “MAX” and “MIN” lines on the reservoir.	MA-36/MA-40
Battery Check the fluid level in each cell. It should be between the “MAX” and “MIN” lines.	—

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

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

Maintenance Schedule for Diesel Engine Models (annual mileage < 30,000 km/year)

Engine Maintenance

TD27Ti engine

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

MAINTENANCE OPERATION		MAINTENANCE INTERVAL												
Perform on a kilometer basis, but on a semi-annual basis when driving less than 20,000 km (12,000 miles) per year.	km x 1,000	10	20	30	40	50	60	70	80	90	100	110	120	Reference page
	(miles x 1,000)	(6)	(12)	(18)	(24)	(30)	(36)	(42)	(48)	(54)	(60)	(66)	(72)	
	Months	6	12	18	24	30	36	42	48	54	50	66	72	
Engine compartment and under vehicle														
Engine oil (Use recommended oil)*		R	R	R	R	R	R	R	R	R	R	R	R	MA-21
Engine oil filter (Use Nissan genuine part or equivalent)*		R	R	R	R	R	R	R	R	R	R	R	R	MA-21
Drive belts		I	I	I	I	I	I	I	I	I	I	I	I	MA-20
Cooling system			I		I		I		I		I		I	MA-23
Engine anti-freeze coolant (Ethylene glycol base)	See NOTE (1)													MA-22
Air cleaner filter (dry paper type)*			C		R		C		R		C		R	MA-24
Intake and exhaust valve clearance			I		I		I		I		I		I	MA-20
Fuel lines					I				I				I	—
Fuel filter*					R				R				R	MA-23
Injection nozzle	See NOTE (2)													MA-25

NOTE: (1) First replace at 80,000 km (48,000 miles), then every 60,000 km (36,000 miles).

(2) If engine power decreases, black exhaust smoke is emitted or engine noise increases, check the fuel injection nozzles' starting pressure and spray pattern.

*** Maintenance items with "*" should be performed more frequently according to "Maintenance under severe driving conditions".**

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Maintenance Schedule for Diesel Engine Models (annual mileage < 30,000 km/year) (Cont'd)

ZD30DDTi engine

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

MAINTENANCE OPERATION		MAINTENANCE INTERVAL						
Perform on a kilometer basis, but on an annual basis when driving less than 15,000 km (9,000 miles) per year.	km x 1,000	15	30	45	60	75	90	Reference page
	(miles x 1,000)	(9)	(18)	(27)	(36)	(45)	(54)	
	Months	**12**	**24**	**36**	**48**	**60**	**72**	
Engine compartment and under vehicle								
Engine oil (Use recommended oil)*	See NOTE (5)	R	R	R	R	R	R	MA-29
Engine oil filter (Use Eco filter or equivalent)*	See NOTE (1)	R	R	R	R	R	R	MA-30
Drive belts		I	I	I	I	I	I	MA-28
Cooling system		I	I	I	I	I	I	MA-32
Engine anti-freeze coolant (Use genuine NISSAN Anti-freeze Coolant (L2N) or equivalent)	See NOTE (2)			I				MA-31
Air cleaner filter*					R			MA-35
Fuel lines			I		I		I	MA-34
Injection nozzles	See NOTE (3)							*1
Intake & exhaust valve clearance	See NOTE (4)							MA-28
Fuel filter*				R			R	MA-33

NOTE: (1) Oil filter element assembly and O-ring seal are replacement parts.
(2) First replace at 90,000 km (54,000 miles)/60 months, then every 60,000 km (36,000 miles)/48 months. Perform "I" (Checking the mixture ratio and correcting the mixture ratio if necessary) at the middle of replacement interval.
(3) If engine power decreases, black exhaust smoke is emitted or engine noise increases, check injection nozzles and, if necessary, replace injection nozzle assembly.
(4) If valve noise increases, check valve clearance.
(5) Check the oil level every 7,500 km (4,700 miles).
*** Maintenance items with "*" should be performed more frequently according to "Maintenance under severe driving conditions".**

*1: "Injection Tube and Injection Nozzle" in EC section

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Maintenance Schedule for Diesel Engine Models (annual mileage < 30,000 km/year) (Cont'd)

Chassis and Body Maintenance

Abbreviations: R = Replace I = Inspect. Correct or replace if necessary L = Lubricate T = Tighten
[ ] = At the specified mileage only

MAINTENANCE OPERATION		MAINTENANCE INTERVAL												
Perform on a kilometer basis, but on a semi-annual basis when driving less than 20,000 km (12,000 miles) per year.	km x 1,000	10	20	30	40	50	60	70	80	90	100	110	120	Reference page
	(miles x 1,000)	(6)	(12)	(18)	(24)	(30)	(36)	(42)	(48)	(54)	(60)	(66)	(72)	
	Months	6	12	18	24	30	36	42	48	54	50	66	72	
Underhood and under vehicle														
Headlamp aiming			I		I		I		I		I		I	EL-41
Wheel alignment (if necessary, rotate & balance wheels)			I		I		I		I		I		I	MA-43
Brake pads, discs & other components*			I		I		I		I		I		I	MA-40
Brake linings, drums & other components*			I		I		I		I		I		I	MA-41
Foot brake, parking brake & clutch (for free play, stroke & operation)			I		I		I		I		I		I	MA-42
Brake booster vacuum hoses, connections, check valve					I				I				I	MA-40
Brake & clutch, systems and fluid (for level and leaks)			I		I		I		I		I		I	MA-36/ MA-40
Brake fluid*					R				R				R	MA-43
Power steering fluid and lines (for level and leaks)			I		I		I		I		I		I	MA-44
Air bag system	See NOTE (1)													RS-17
Ventilation air filter*				R			R			R			R	MA-44
Transfer and standard differential gear oil*			I		I		R		I		I		R	MA-37/ MA-38
Manual transmission oil			I		I		I		[R]		I		I	MA-36
LSD gear oil (for level and leaks)*			I		I		R		I		I		R	MA-38
Steering gear & linkage, axle & suspension parts, propeller shaft and exhaust system*			I		I		I		I		I		I	MA-43/ FA-4/ RA-4/ MA-38/ MA-36
Greasing points of steering gear linkage, propeller shaft and suspension*	See NOTE (2)		L		L		L		L		L		L	MA-44/ MA-38
Drive shafts*			I		I		I		I		I		I	FA-13
Front wheel bearing grease*			I		R		I		R		I		R	MA-39
Free running hub grease*			I		I		I		I		I		I	MA-40
Body mounting bolts and nuts			T		T		T		T		T		T	BT-48
Body corrosion	See NOTE (3)													MA-47

NOTE: (1) Inspect after 10 years, then every 2 years.
(2) The propeller shaft should be re-greased daily if it is immersed in water.
(3) Inspect once per year.
*** Maintenance items with "*" should be performed more frequently according to "Maintenance under severe driving conditions".**

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Maintenance Schedule for Diesel Engine Models (annual mileage > 30,000 km/year)

Engine Maintenance

TD27Ti engine

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

MAINTENANCE OPERATION		MAINTENANCE INTERVAL												
Perform on a kilometer basis only.	km x 1,000	10	20	30	40	50	60	70	80	90	100	110	120	Reference page
	(miles x 1,000)	(6)	(12)	(18)	(24)	(30)	(36)	(42)	(48)	(54)	(60)	(66)	(72)	
Engine compartment and under vehicle														
Engine oil (Use recommended oil)*		R	R	R	R	R	R	R	R	R	R	R	R	MA-21
Engine oil filter (Use Nissan genuine part or equivalent)*		R	R	R	R	R	R	R	R	R	R	R	R	MA-21
Drive belts		I	I	I	I	I	I	I	I	I	I	I	I	MA-20
Cooling system				I			I			I			I	MA-23
Engine anti-freeze coolant (Ethylene glycol base)	See NOTE (1)													MA-22
Air cleaner filter (dry paper type)*			C		R		C		R		C		R	MA-24
Intake & exhaust valve clearance				I			I			I			I	MA-20
Fuel lines							I						I	—
Fuel filter*							R						R	MA-23
Injection nozzles	See NOTE (2)													MA-25

NOTE: (1) First replace at 90,000 km (54,000 miles), then every 60,000 km (36,000 miles).
(2) If engine power decreases, black exhaust smoke is emitted or engine noise increases, check the fuel injection nozzles' starting pressure and spray pattern.
*** Maintenance items with "*" should be performed more frequently according to "Maintenance under severe driving conditions".**

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Maintenance Schedule for Diesel Engine Models (annual mileage > 30,000 km/year) (Cont'd)

ZD30DDTi engine

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

MAINTENANCE OPERATION		MAINTENANCE INTERVAL						
Perform on a kilometer basis only.	km x 1,000	15	30	45	60	75	90	Reference page
	(miles x 1,000)	(9)	(18)	(27)	(36)	(45)	(54)	
Engine compartment and under vehicle								
Engine oil (Use recommended oil)*	See NOTE (5)	R	R	R	R	R	R	MA-29
Engine oil filter (Use Eco filter or equivalent)*	See NOTE (1)	R	R	R	R	R	R	MA-29
Drive belts		I	I	I	I	I	I	MA-28
Cooling system			I		I		I	MA-32
Engine anti-freeze coolant (Use genuine NISSAN Anti-freeze Coolant (L2N) or equivalent)	See NOTE (2)			I			R	MA-31
Air cleaner filter*					R			MA-35
Fuel lines					I			MA-34
Injection nozzles	See NOTE (3)							*1
Intake & exhaust valve clearance	See NOTE (4)							MA-28
Fuel filter*					R			MA-33

NOTE: (1) Oil filter element assembly and O-ring seal are replacement parts.
(2) First replace at 90,000 km (54,000 miles), then every 60,000 km (36,000 miles). Perform "I" (Checking the mixture ratio and correcting the mixture ratio if necessary) at the middle of replacement interval.
(3) If engine power decreases, black exhaust smoke is emitted or engine noise increases, check injection nozzles and, if necessary, replace injection nozzle assembly.
(4) If valve noise increases, check valve clearance.
(5) Check the oil level every 7,500 km (4,700 miles).
*** Maintenance items with "*" should be performed more frequently according to "Maintenance under severe driving conditions".**

*1: "Injection Tube and Injection Nozzle" in EC section

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Maintenance Schedule for Diesel Engine Models (annual mileage > 30,000 km/year) (Cont'd)

Chassis and Body Maintenance

Abbreviations: R = Replace I = Inspect. Correct or replace if necessary L = Lubricate T = Tighten

MAINTENANCE OPERATION		MAINTENANCE INTERVAL												Refer-ence page
Perform on a kilometer basis only.	km x 1,000	10	20	30	40	50	60	70	80	90	100	110	120	
	(miles x 1,000)	(6)	(12)	(18)	(24)	(30)	(36)	(42)	(48)	(54)	(60)	(66)	(72)	
Underhood and under vehicle														
Headlamp aiming				I			I			I			I	EL-41
Wheel alignment (it necessary, rotate & balance wheels)				I			I			I			I	MA-43
Brake pads, discs & other components*				I			I			I			I	MA-40
Brake linings, drums & other components*				I			I			I			I	MA-41
Foot brake, parking brake & clutch (for free play, stroke & operation)				I			I			I			I	MA-42
Brake booster vacuum hoses, connections, check valve							I						I	MA-40
Brake & clutch, systems and fluid (for level and leaks)				I			I			I			I	MA-36/ MA-40
Brake fluid*							R						R	MA-43
Power steering fluid and lines (for level and leaks)				I			I			I			I	MA-44
Air bag system	See NOTE (1)													RS-17
Ventilation air filter*				R			R			R			R	MA-44
Transfer and standard differential gear oil*				I			R			I			R	MA-37/ MA-38
Manual transmission oil				I			I			R			I	MA-36
LSD gear oil*				I			R			I			R	MA-38
Steering gar & linkage, axle & suspension parts, propeller shaft and exhaust system*				I			I			I			I	MA-43/ FA-4/ RA-4/ MA-38/ MA-36
Greasing points of steering gear linkage, propeller shaft and suspension*	See NOTE (2)			L			L			L			L	MA-44/ MA-38
Drive shafts*				I			I			I			I	FA-13
Front wheel bearing grease*				I			R			I			R	MA-39
Free running hub grease*				I			I			I			I	MA-40
Body mounting bolts and nuts				T			T			T			T	BT-48
Body corrosion	See NOTE (3)													MA-47

NOTE: (1) Inspect after 10 years, then every 2 years.
(2) The propeller shaft should be re-greased daily if it is immersed in water.
(3) Inspect once per year.
*** Maintenance items with "*" should be performed more frequently according to "Maintenance under severe driving conditions".**

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Maintenance Under Severe Driving Conditions (annual mileage < 30,000 km/year)

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

TD27Ti engine

Severe driving conditions

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

Driving condition	Maintenance item	Maintenance operation	Maintenance interval	Reference page
A B C D	**Engine oil & engine oil filter**			
		Replace	Every 5,000 km (3,000 miles) or 3 months	MA-21
A	**Air cleaner filter (dry paper type)**			
		Clean	Every 10,000 km (6,000 miles) or 6 months	MA-24
		Replace	Every 20,000 km (12,000 miles) or 12 months	
A . . . E	**Fuel filter**			
		Replace	Every 20,000 km (12,000 miles) or 12 months	MA-23
A . . . . F	**Ventilation air filter**			
		Replace	Every 20,000 km (12,000 miles) or 12 months	MA-44
. . . . . F	**Brake fluid**			
		Replace	Every 20,000 km (12,000 miles) or 12 months	MA-43
. . C . . . . H . .	**Limited-slip differential (L.S.D.) gear oil**			
		Replace	Every 30,000 km (18,000 miles) or 18 months	MA-38
. . C . . . . H . .	**Transfer & standard differential gear oil**			
		Replace	Every 60,000 km (36,000 miles) or 24 months	MA-36/MA-37/ MA-38
A . C . . . G H I .	**Brake pads/linings, discs/drums & other brake system components**			
		Inspect	Every 10,000 km (6,000 miles) or 6 months	MA-40/MA-41
. . . . . G H . J	**Greasing points of steering linkage, propeller shafts and suspension**			
		Lubricate	Every 10,000 km (6,000 miles) or 6 months	MA-44/MA-38
. . . . . G H . .	**Steering gear & linkage, axle & suspension parts, propeller shaft & exhaust system**			
		Inspect	Every 10,000 km (6,000 miles) or 6 months	MA-43/FA-4/ RA-4/MA-38/ MA-36

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Maintenance Under Severe Driving Conditions (annual mileage < 30,000 km/year) (Cont'd)

Driving condition	Maintenance item	Maintenance operation	Maintenance interval	Reference page
. . C . . . . H . .	**Drive shafts**			
		Inspect	Every 10,000 km (6,000 miles) or 6 months	FA-22
. . . . . J	**Front wheel bearing grease & free running hub grease**			
		Inspect	Every 10,000 km (6,000 miles) or 6 months	MA-39/MA-40

ZD30DDTi engine

Severe driving conditions

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

Driving condition	Maintenance item	Maintenance operation	Maintenance interval
A B C D	**Engine oil & engine oil filter**		
		Replace	Every 7,500 km (4,500 miles) or 6 months
A	**Air cleaner filter**		
		Replace	Every 30,000 km (18,000 miles) or 24 months
A . . . E	**Fuel filter**		
		Replace	Every 22,500 km (13,500 miles) or 18 months
A . C . . . G H I .	**Brake pads, rotors & other brake components**		
		Inspect	Every 7,500 km (4,500 miles) or 6 months
. . . . . F	**Brake fluid**		
		Replace	Every 15,000 km (9,000 miles) or 12 months
A	**Ventilation air filter**		
		Replace	Every 15,000 km (9,000 miles) or 12 months
. . C . . . . H . .	**Automatic transmission fluid**		
		Replace	Every 30,000 km (18,000 miles) or 24 months
. . C . . . . H . .	**Transfer fluid and limited-slip differential (LSD) gear oil**		
		Replace	Every 30,000 km (18,000 miles) or 24 months
. . C . . . . H . .	**Drive shaft & steering damper**		
		Inspect	Every 7,500 km (4,500 miles) or 6 months
. . . . . J	**Front wheel bearing grease**		
		Inspect	Every 7,500 km (4,500 miles) or 6 months
. . . . . J	**Free-running hub grease**		
		Inspect	Every 7,500 km (4,500 miles) or 6 months
. . . . . G H . .	**Steering gear & linkage, axle & suspension parts, propeller shaft & exhaust system**		
		Inspect	Every 7,500 km (4,500 miles) or 6 months

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Maintenance Under Severe Driving Conditions (annual mileage < 30,000 km/year) (Cont'd)

Maintenance for off-road driving

Whenever you drive off-road through sand, mud or water as deep as the wheel hub, more frequent maintenance may be required of the following items:

- ▲ Brake pads and discs
- ▲ Brake lining and drums
- ▲ Brake lines and hoses
- ▲ Wheel bearing grease and free-running hub grease
- ▲ Differential, transmission and transfer oil
- ▲ Steering linkage
- ▲ Propeller shafts and front drive shafts
- ▲ Air cleaner filter
- ▲ Clutch housing (Check water entry.)

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Maintenance Under Severe Driving Conditions (annual mileage > 30,000 km/year)

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

TD27Ti engine

Severe driving conditions

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

Driving condition	Maintenance item	Maintenance operation	Maintenance interval	Reference page
A B C D	**Engine oil & engine oil filter**			
		Replace	Every 5,000 km (3,000 miles)	MA-21
A	**Air cleaner filter (dry paper type)**			
		Clean	Every 10,000 km (6,000 miles)	MA-24
		Replace	Every 20,000 km (12,000 miles)	
A . . . E	**Fuel filter**			
		Replace	Every 30,000 km (18,000 miles)	MA-23
A . . . . F	**Ventilation air filter**			
		Replace	Every 15,000 km (9,000 miles)	MA-44
. . . . . F	**Brake fluid**			
		Replace	Every 30,000 km (18,000 miles)	MA-43
. . C . . . . H . .	**Limited-slip differential (L.S.D.) gear oil**			
		Replace	Every 30,000 km (18,000 miles)	MA-38
. . C . . . . H . .	**Transfer & standard differential gear oil**			
		Replace	Every 60,000 km (36,000 miles)	MA-36/MA-37/ MA-38
A . C . . . G H I .	**Brake pads/linings, discs/drums & other brake system components**			
		Inspect	Every 15,000 km (9,000 miles)	MA-40/MA-41
. . . . . G H . J	**Greasing points of steering linkage, propeller shafts and suspension**			
		Lubricate	Every 15,000 km (9,000 miles)	MA-44/MA-38
. . . . . G H . .	**Steering gear & linkage, axle & suspension parts, propeller shaft & exhaust system**			
		Inspect	Every 30,000 km (18,000 miles)	MA-43/FA-4/ RA-4/MA-38/ MA-36
. . C . . . . H . .	**Drive shafts**			
		Inspect	Every 15,000 km (9,000 miles)	FA-22
. . . . . J	**Front wheel bearing grease & free running hub grease**			
		Inspect	Every 15,000 km (9,000 miles)	MA-39/MA-40

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Maintenance Under Severe Driving Conditions (annual mileage > 30,000 km/year) (Cont'd)

ZD30DDTi engine

Severe driving conditions

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

Driving condition	Maintenance item	Maintenance operation	Maintenance interval
A B C D	**Engine oil & engine oil filter**		
		Replace	Every 7,500 km (4,500 miles)
A	**Air cleaner filter**		
		Replace	Every 30,000 km (18,000 miles)
A . . . E	**Fuel filter**		
		Replace	Every 30,000 km (18,000 miles)
A . C . . . G H I .	**Brake pads, rotors & other brake components**		
		Inspect	Every 15,000 km (9,000 miles)
. . . . . F	**Brake fluid**		
		Replace	Every 30,000 km (18,000 miles)
A	**Ventilation air filter**		
		Replace	Every 15,000 km (9,000 miles)
. . C . . . . H . .	**Automatic transmission fluid**		
		Replace	Every 60,000 km (36,000 miles)
. . C . . . . H . .	**Transfer fluid and limited-slip differential (LSD) gear oil**		
		Replace	Every 30,000 km (18,000 miles)
. . C . . . . H . .	**Drive shaft & steering damper**		
		Inspect	Every 15,000 km (9,000 miles)
. . . . . J	**Front wheel bearing grease**		
		Inspect	Every 15,000 km (9,000 miles)
. . . . . J	**Free-running hub grease**		
		Inspect	Every 15,000 km (9,000 miles)
. . . . . G H . .	**Steering gear & linkage, axle & suspension parts, propeller shaft & exhaust system**		
		Inspect	Every 15,000 km (9,000 miles)

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Maintenance Under Severe Driving Conditions (annual mileage > 30,000 km/year) (Cont'd)

Maintenance for off-road driving

Whenever you drive off-road through sand, mud or water as deep as the wheel hub, more frequent maintenance may be required of the following items:

- ▲ Brake pads and discs
- ▲ Brake lining and drums
- ▲ Brake lines and hoses
- ▲ Wheel bearing grease and free-running hub grease
- ▲ Differential, transmission and transfer oil
- ▲ Steering linkage
- ▲ Propeller shafts and front drive shafts
- ▲ Air cleaner filter

  Clutch housing (Check water entry.)

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Fluids and Lubricants

		Capacity (Approximate)		Recommended fluids and lubricants
		Liter	Imp qt	
Engine oil (Refill)				
With oil filter	TD27Ti	6.2	5-1/2	API CE, ACEA B2-96 (CCMC PD1), D5 level SHPD Global DHD-1 (*1) (*4)
Without oil filter	TD27Ti	5.5	4-7/8	
With oil filter	ZD30DDTi	6.7	5-7/8	API CF4, ACEA B3-96. 98, ACEA B3/E3-96. 98 Global DHD-1 (*4)
Without oil filter	ZD30DDTi	6.2	5-1/2	
Cooling system				
Total capacity (With reservoir tank)	TD27Ti	10.0	8-3/4	Anti-freeze coolant (Ethylene glycol base)
	ZD30DDTi	10.6	9-3/8	Genuine Nissan Anti-freeze Coolant (L250) or equivalent (*5)
Manual transaxle gear oil	FS5W71C	3.5	6-1/8 pt	API GL-4 (*1)
	FS5R30A	3.6	6-3/8 pt	API GL-4 (*1)
Transfer	TX10A	2.3	2	API GL-4 (*1)
Differential oil				
	R180A	1.3	2-1/4	STANDARD: API GL-5 (*1)
	H233B (LSD)	2.8	4-7/8	Use only LSD gear oil API GL-5 and SAE 80W-90 (*2) approved for NISSAN LSD
Power steering fluid		1.0	7/8	DEXRON™
Brake and clutch fluid		—	—	DOT 4 (USFMVSS No. 116)
Multi-purpose grease		—	—	NLGI No. 2 (Lithium soap base)
Air conditioner system			refrigerant	R134A
			lubrication oil	KLH00-PAGRO

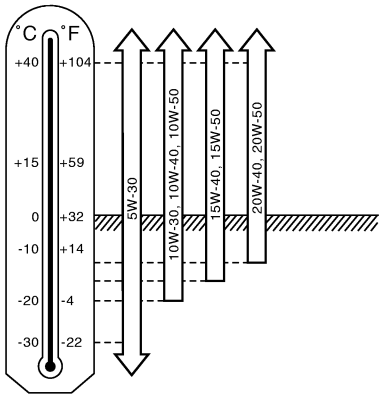
*1: For further details, see “SAE Viscosity Number”.
*2: SAE 90 is acceptable in ambient temperatures above −18°C (0°F)
*3: Do not mix automatic transmission fluid and gear oil.
*4: Never use API CG-4.
*5: Use Genuine Nissan Anti-freeze Coolant (L250) or equivalent in its quality, in order to avoid possible aluminum corrosion within the engine cooling system caused by the use of non-genuine engine coolant.
Note that any repairs for the incidents within the engine cooling system while using non-genuine engine coolant may not be covered by the warranty even if such incidents occurred during the warranty period.

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SAE Viscosity Number

Outside Temperature Range Anticipated Before Next Oil Change

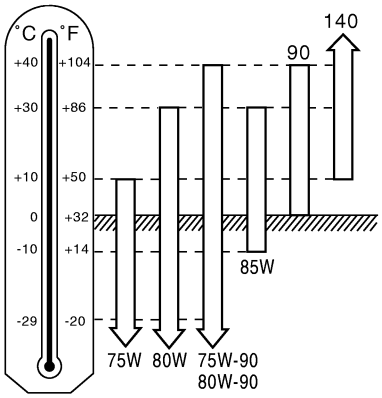
DIESEL ENGINE OIL



- **For cold areas: 5W-30 is preferable.**
- **For hot and warm areas: 20W-40 and 20W-50 are suitable.**
- **On turbo models, 5W-20 is not recommended.**

Outside Temperature Range Anticipated Before Next Oil Change

GEAR OIL



YMA017

- **For cold and warm areas:**
  75W-90 for transmission and 80W-90 for differential carrier are preferable.
- **For hot areas:**
  90 is suitable for ambient temperatures below 40°C (104°F)

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Engine Coolant Mixture Ratio

The engine cooling system is filled at the factory with a high-quality, year-round and extended life engine coolant. The high quality engine coolant contains the specific solutions effective for the anti-corrosion and the anti-freeze function. Therefore, additional cooling system additives are not necessary.

CAUTION:

- **When adding or replacing coolant, be sure to use only Genuine Nissan Anti-freeze Coolant (L2N) or equivalent. Because L2N is premixed type coolant (Mixture ratio 50%).**

The use of other types of engine coolant may damage your cooling system.

- When checking the engine coolant mixture ratio by the coolant hydrometer, use the chart below to correct your hydrometer reading (specific gravity) according to coolant temperature.

Mixed coolant specific gravity

Unit: Specific gravity

Engine coolant mixture ratio	Coolant temperature °C (°F)			
	15 (59)	25 (77)	35 (95)	45 (113)
30%	1.046 - 1.050	1.042 - 1.046	1.038 - 1.042	1.033 - 1.038
50%	1.076 - 1.080	1.070 - 1.076	1.065 - 1.071	1.059 - 1.065

WARNING:

Never remove the radiator cap when the engine is hot. Serious burns could be caused by high pressure fluid escaping from the radiator. Wait until the engine and radiator cool down.

http://vnx.su/

Retightening Manifold Bolts and Nuts

MANIFOLD BOLTS AND NUTS

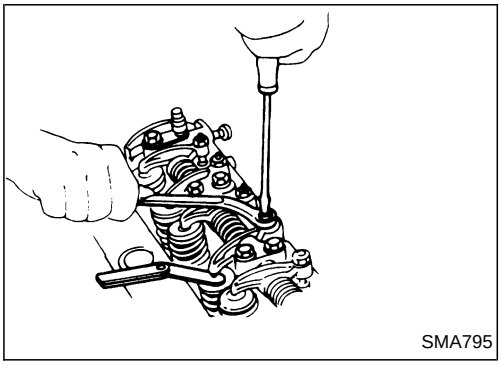
Intake:

: 17 - 23 N·m (1.7 - 2.3 kg-m, 12 - 17 ft-lb)

Exhaust:

: 31 - 38 N·m (3.2 - 3.9 kg-m, 22 - 28 ft-lb)

Retightening should be performed while engine is cold [approximately 20°C (68°F)].


SMA795

Adjusting Intake and Exhaust Valve Clearance

Adjustment should be made while engine is warm but not running.

1. Set No. 1 cylinder in top dead center on its compression stroke, and adjust valve clearance ① , ② , ③ and ⑥ .
2. Set No. 4 cylinder in top dead center on its compression stroke, and adjust valve clearance ④ , ⑤ , ⑦ and ⑧ .

Valve clearance:

Intake ① , ③ , ⑤ and ⑦

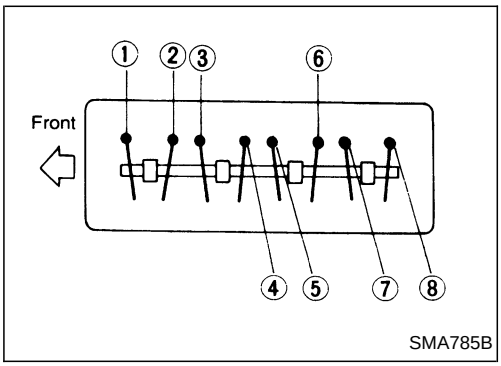
0.25 mm (0.0098 in)

Exhaust ② , ④ , ⑥ and ⑧

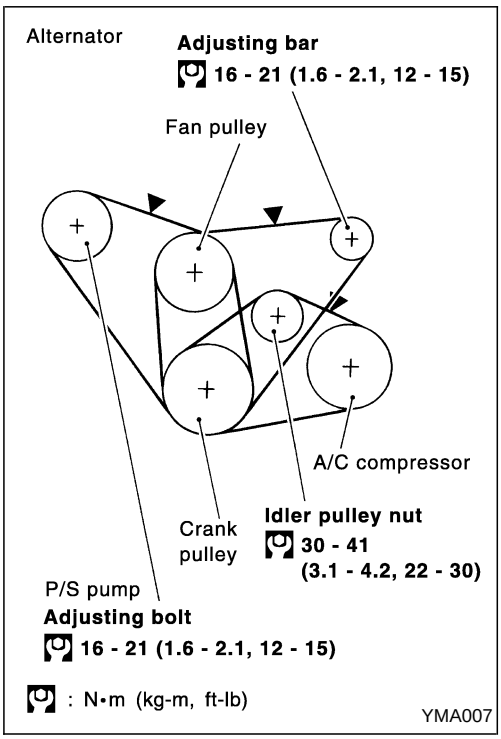
0.25 mm (0.0098 in)

Adjusting screw lock nuts:

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



SMA785B



YMA007

Drive Belt Inspection

1. Inspect for cracks, fraying, wear or oil adhesion. Replace if necessary.

The belts should not touch the bottom of the pulley groove.

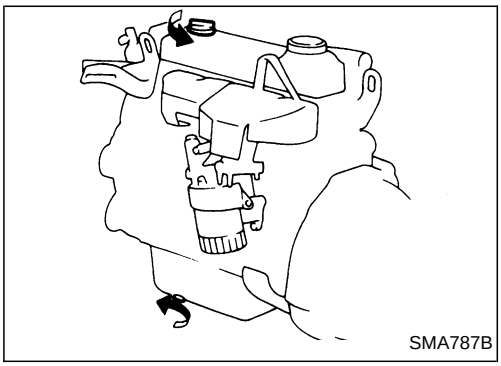
2. Check drive belt deflection by pushing on the belt midway between pulleys. (▼)
3. Adjust if belt deflections exceed the limit.

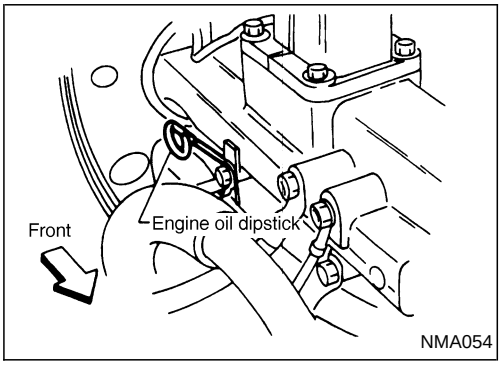
Unit: mm (in)

Drive belts	Used belt deflection		Deflection of new belt
	Limit	Deflection after adjustment	
Alternator	20 (0.79)	11 - 13 (0.43 - 0.51)	9 - 11 (0.35 - 0.43)
Air conditioner compressor	12 (0.47)	6 - 7.5 (0.236 - 0.295)	5 - 6.5 (0.197 - 0.256)
Power steering oil pump	15 (0.59)	8 - 9.5 (0.315 - 0.374)	7 - 8.5 (0.276 - 0.335)
Applied pushing force	98 N (10 kg, 22 lb)		

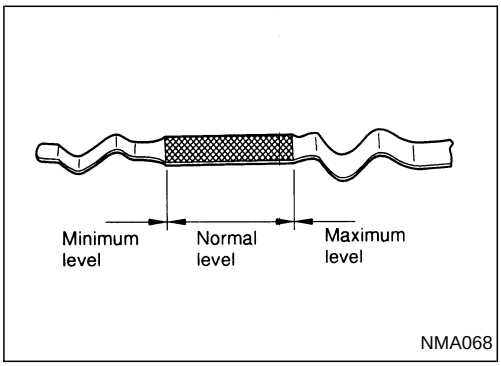
Check drive belt deflections when engine is cold.
If engine is hot, check deflections after 30 minutes or more.

http://vnx.su/


SMA787B



NMA054



NMA068

Changing Engine Oil

WARNING:

- **Be careful not to burn yourself, as the engine oil is hot.**
- **Prolonged and repeated contact with used engine oil may cause skin cancer; try to avoid direct skin contact with used oil. If skin contact is made, wash thoroughly with soap or hand cleaner as soon as possible.**

1. Warm up engine, and check for oil leakage from engine components.
2. Stop engine.
3. Remove dipstick, oil filler cap and drain plug.
4. Drain oil.
5. Install drain plug.

CAUTION:

- **Be sure to clean drain plug and install with new washer.**
  Drain plug:
  : 29 - 39 N·m(3.0 - 4.0 kg-m, 21 - 29 ft-lb)

6. Fill slowly with new oil whilst not exceeding the maximum level.

Oil specification and viscosity:

- **See “RECOMMENDED FLUIDS AND LUBRICANTS” (MA-17).**

Oil capacity (Approximately):

Unit: ℓ (Imp qt)

Drain and refill	
With oil filter change	6.2 (5-1/2)
Without oil filter change	5.5 (4-7/8)

CAUTION:

- **The refill capacity depends on the oil temperature and drain time. Use these specifications for reference only. Always use the dipstick to determine when the proper amount of oil is in the engine.**

7. Install dipstick and filler cap.
8. Start engine. Check area around drain plug and oil filter for any sign of oil leakage.
9. Run engine for a few minutes, then turn it off. After several minutes check oil level again.
10. If necessary, add oil whilst not exceeding the maximum level.

Changing Oil Filter

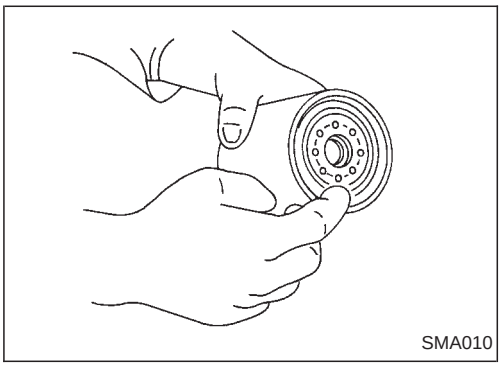
1. Remove oil filter with a suitable wrench.

WARNING:

Be careful not to burn yourself as engine and oil is hot.

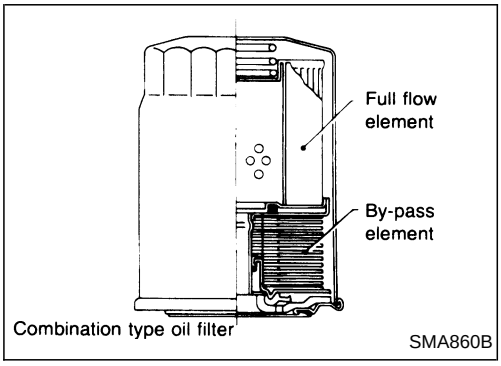
http://vnx.su/

Changing Oil Filter (Cont'd)


SMA010

2. Before installing new oil filter, clan the oil filter mounting surface on cylinder block and coat the rubber seal of the oil filter with a little engine oil.
3. Install oil filter.
   When installing oil filter, screw it in until a slight resistance is felt, then tighten an additional 2/3 turn or more.
4. Add engine oil.

Refer to Changing Engine Oil.



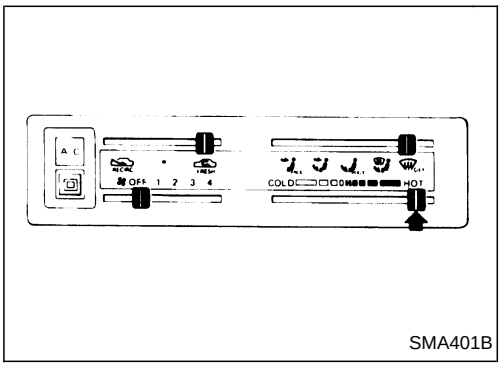
Combination type oil filter
SMA860B

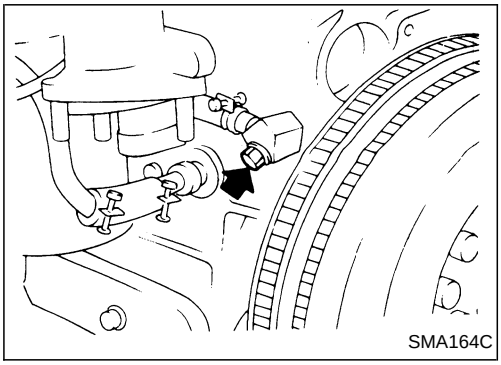
Changing Engine Coolant

WARNING:

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

1. Set heater "TEMP" control lever all the way to "HOT" position.
2. Remove radiator cap and engine under cover.
3. Disconnect lower radiator hose to drain coolant.
   Remove reservoir tank, drain coolant, then clean reservoir tank.
   Re-install tank temporarily.


SMA401B

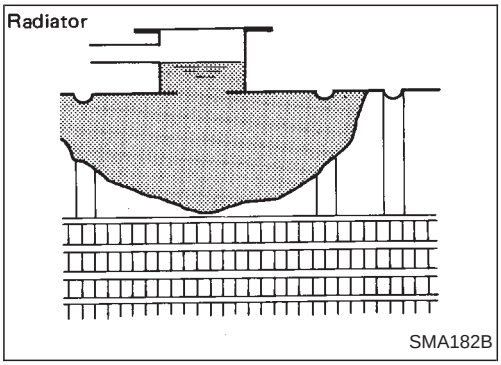

SMA164C

4. Remove cylinder block drain plug located at left rear of cylinder block.
5. Drain coolant and then tighten drain plug securely.

- **Apply sealant to the thread of drain**
  : 30 - 40 N·m (3.1 - 4.1 kg-m, 22.1 - 29.5 ft-lb)

6. Connect lower radiator hose.
7. Fill radiator and reservoir tank with water. Re-install radiator cap and warm up engine.
8. Stop engine and wait until cools down.
9. Drain water.
10. Repeat step 2 through step 9 two or three times, until clear water begins to drain from radiator.
11. Fill radiator with coolant up to the specified level.
    Follow instructions attached to anti-freeze container for mixing ratio of anti-freeze to water.
    Coolant capacity (with reservoir tank):
    10.0 ℓ (8-3/4 Imp qt)

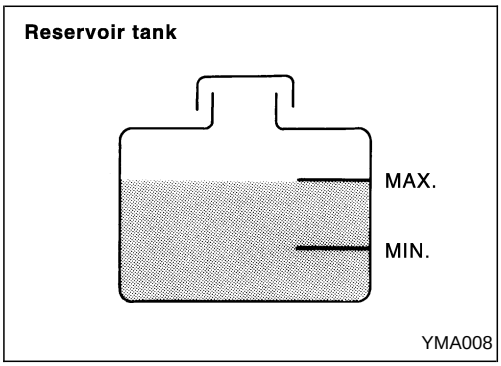
Slowly pour coolant through coolant filler neck to allow air in system to escape.



SMA182B

http://vnx.su/

Changing Engine Coolant (Cont'd)

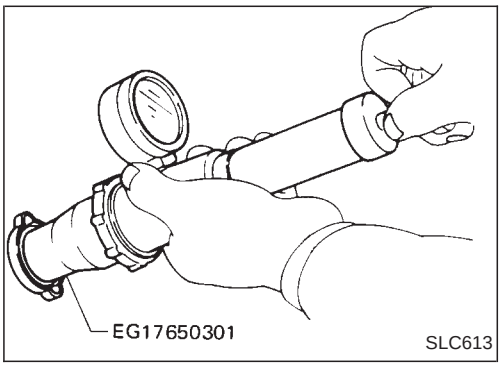


12. Fill reservoir tank up to "MAX" level, and re-install radiator cap.
13. Run the engine at approximately 2,000 rpm for about one minute.
14. Stop engine and cool it down, then refill the radiator and the reservoir tank up to the specified level.

Checking Cooling System

CHECKING HOSES

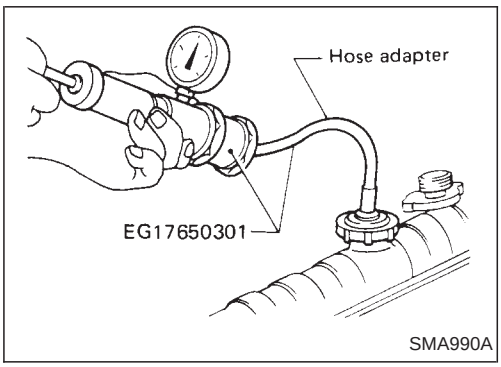
Check hoses for proper attachment, leaks, cracks, damage, loose connections, chafing and deterioration.



CHECKING RADIATOR CAP

Apply pressure to radiator cap by means of a cap tester to see if it is satisfactory.

Radiator cap relief pressure:
78 - 98 kPa
(0.78 - 0.98 bar, 0.8 - 1.0 kg/cm^2, 11 - 14 psi)

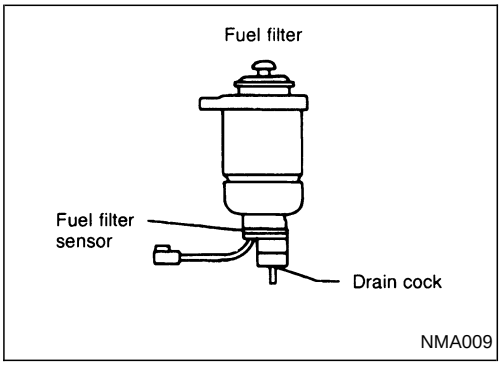


CHECKING COOLING SYSTEM FOR LEAKS

Apply pressure to the cooling system by means of a tester to check for leakage.

Testing pressure:
157 kPa (1.57 bar, 1.6 kg/cm^2, 23 psi)

CAUTION:
Higher than the specified pressure may cause radiator damage.



Checking and Replacing fuel filter and Draining Water

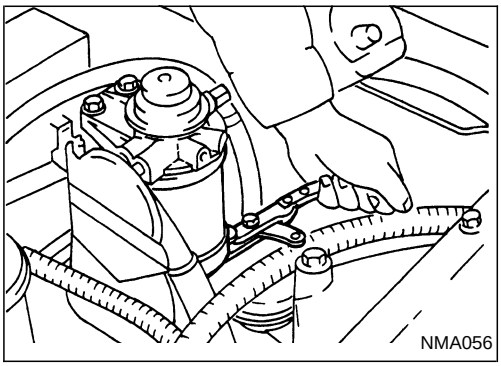
Be careful not to spill fuel in engine compartment. Place a rag to absorb fuel.

REPLACING FUEL FILTER

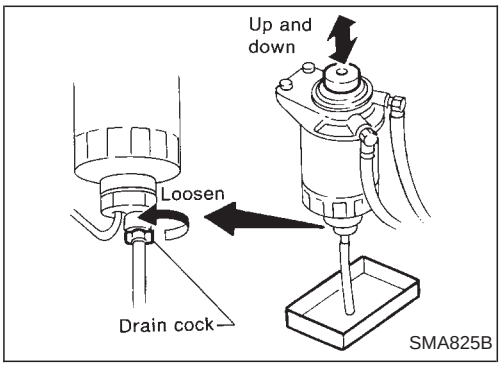
1. Remove fuel filter sensor and drain fuel.

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Checking and Replacing fuel filter and Draining Water (Cont'd)


NMA056

2. Remove fuel filter, using a suitable tool.
3. Wipe clean fuel filter mounting surface on fuel filter bracket and smear a little fuel on rubber seal of fuel filter.
4. Screw fuel filter on until a slight resistance is felt, then tighten and additional more than 2/3 turn.
5. Install fuel filter sensor to new filter.
6. Bleed air from fuel line.
   Refer to Bleeding Fuel System in EC section.
7. Start engine and check for leaks.



SMA825B

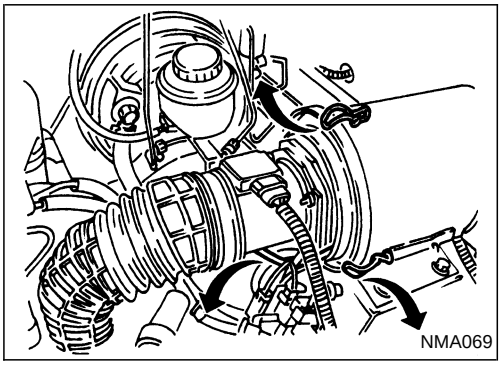
DRAINING WATER

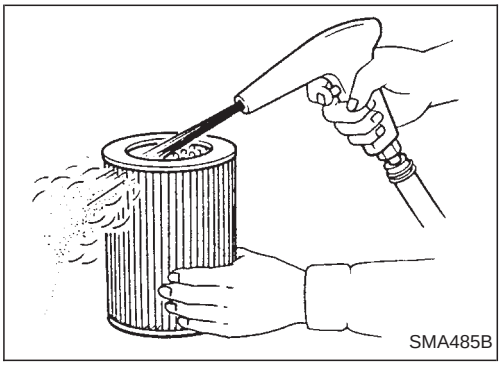
1. Loosen drain cock and drain water.

Loosening drain cock 4 to 5 turns causes water to start draining. Do not remove drain cock by loosening it excessively.

   If water does not drain properly, move the priming pump up and down.
2. Bleed air.
   Refer to section EC for fuel system bleeding instructions.

Cleaning and Replacing Air Cleaner Filter (Dry paper type)

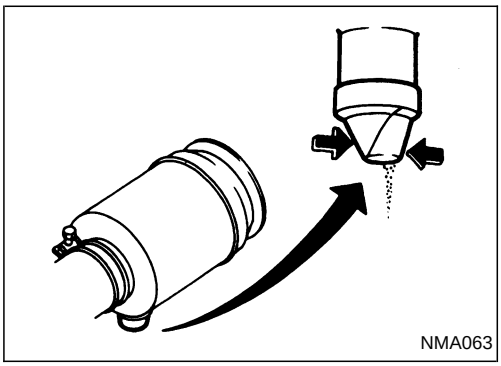

NMA069


SMA485B

Clean or replace element more often under dusty driving conditions.

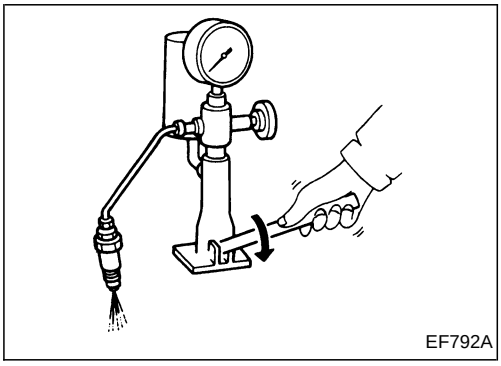
http://vnx.su/

Cleaning and Replacing Air Cleaner Filter (Dry paper type) (Cont'd)


NMA063

Pinch the rubber cap located under the cyclone air cleaner assembly to remove dust.

Checking Injection Nozzle


EF792A

WARNING:

When using nozzle tester, do not allow fuel sprayed from nozzle to contact your hand or body, and make sure that your eyes are properly protected with goggles.

1. Check initial injection pressure by pumping tester handle one time per second.

   Initial injection pressure:

   Used Nozzle

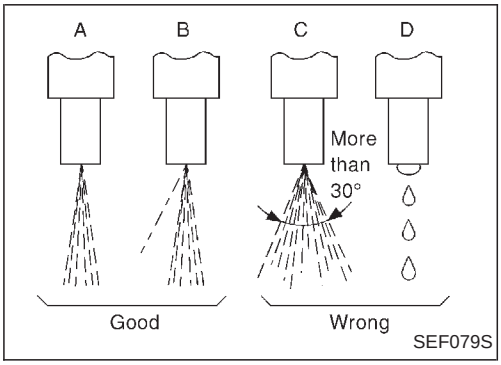
   12,259 - 12,749 kPa
   (122.6 - 127.5 bar, 125 - 130 kg/cm^2,
   1,778 - 1,849 psi)

   New Nozzle

   12,749 - 13,730 kPa
   (127.5 - 137.3 bar, 130 - 140 kg/cm^2,
   1,849 - 1,991 psi)

- **Always check initial injection pressure before installing new nozzle.**

Do not disassemble injection nozzle assembly. Entrust disassembly or adjustment to BOSCH service shop.



SEF079S

2. Check spray pattern by pumping tester handle 4 to 6 times or more per second.
   a. If main spray angle is within 30 degrees as shown, injection nozzle is good.
   b. It is still normal even if a thin stream of spray deviates from the main spray (pattern B).
3. If spray is not correct, clean injection nozzle tip or replace it.

- **For details, refer to INJECTION NOZZLE ASSEMBLY in EC section.**

http://vnx.su/

Checking Idle Speed

Preparation

1. Make sure that injection timing is correct.
2. Make sure that injection nozzle are in good condition.
3. Make sure that the following parts are in good condition.

- Air cleaner clogging
- Glow system
- Engine oil and coolant levels
- Valve clearance
- Air intake system (Oil filler cap, oil level gauge, etc.)

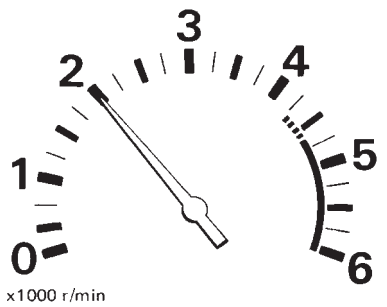
4. Set shift lever in “Neutral” position. Engage parking brake and lock both front and rear wheels with wheel chocks.
5. Turn off air conditioner, lights and accessories.

- Warm up engine until water temperature indicator points to middle of gauge.
- Lights, heater fan and all accessories are off.
- Attach tachometer’s pick-up to No. 1 fuel injection tube.

In order to take accurate reading of engine rpm, remove clamps that secure No. 1 fuel injection tube.

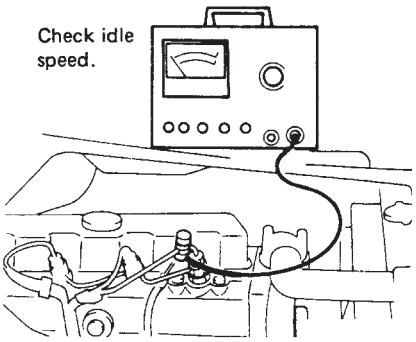
Start engine.

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



SMA406B

Run engine for one minute at idle speed.



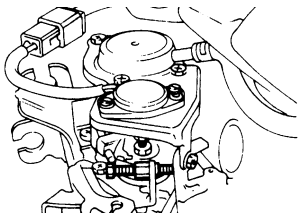
SMA021A

Check idle speed.

IDLE SPEED:
700+ 50 rpm

NG → Adjust idle speed by turning idle speed adjusting screw.

OK



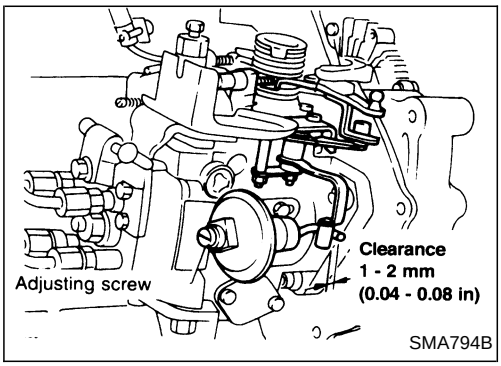
EMA049

END

- **Race engine two or three times and allow engine to return to idle speed. If idle speed is not within the specified range, check acceleration linkage for binding and correct it if necessary.**

http://vnx.su/

Checking Idle Speed (Cont'd)



AIR CONDITIONER EQUIPPED MODEL

1. Make certain that the clearance between the actuator idle control lever pin and the injection pump control lever is within the specified limits.
2. Adjust idle speed to specified rpm without the air conditioner operating.
3. Then check the idle speed when the air conditioner is operating and make sure it is correct.

Unit: rpm

Idle speed (Air conditioner: "ON")	850±50

If not, adjust it by turning FICD actuator stroke adjusting screw.

http://vnx.su/

Checking Tightening Torque

Checking should be performed while engine is cold.

MANIFOLD BOLTS AND NUTS

Intake and exhaust manifolds:

Intake

: 25 - 28 N·m (2.5 - 2.9 kg-m, 18 - 20 ft-lb)

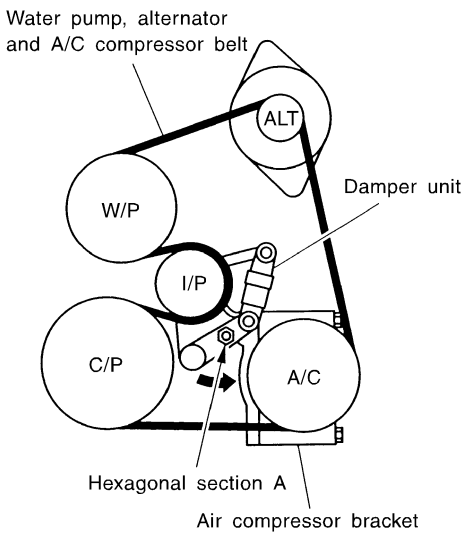
Exhaust

: 40 - 44 N·m (4.0 - 4.5 kg-m, 29 - 32 ft-lb)

Adjusting Intake and Exhaust Valve Clearance

Refer to EM section.

SEC. 117



JMA088D

Checking Drive Belt

- **Because an auto tensioner adjustment mechanism is provided, it is not necessary to check or adjust the tension of accessory belt.**

1. Inspect for cracks, fraying, wear or oil adhesion. Replace if necessary.

The belts should not touch the bottom of the pulley groove.

2. Check the damper unit of the auto tensioner for oil leaks.

Part	Belt specifications	Tension	Belt deflection
Water pump, alternator, air conditioner compressor belt	V-ribbed belt (7 ribs)	Automatic adjustment by auto tensioner	Automatic adjustment by auto tensioner

http://vnx.su/

Removal

WATER PUMP, ALTERNATOR AND AIR CONDITIONER BELT

1. Remove radiator shroud.
2. Contract and hold the auto tensioner using the following procedure.

a. Securely hold the 19 mm (0.75 in) hexagonal portion A of auto tensioner with a closed wrench.

- Preferably use a tool with a handhold of 500 mm (19.69 in) or more in length.
- No bolts or nuts are required to be loosened during the operation.

b. Turn the hexagonal portion A in the direction shown by the arrow to contract the damper unit of the auto tensioner.

CAUTION:

- **Because the tensioner has a high tension, it shall be securely held and turned with a closed wrench.**
- **Because the hexagonal portion A of the tensioner is made of aluminum and may be damaged by sudden input, turn it slowly according to the contraction of the damper unit.**

3. Remove the belt from the alternator pulley first, and then remove it from the other pulleys.

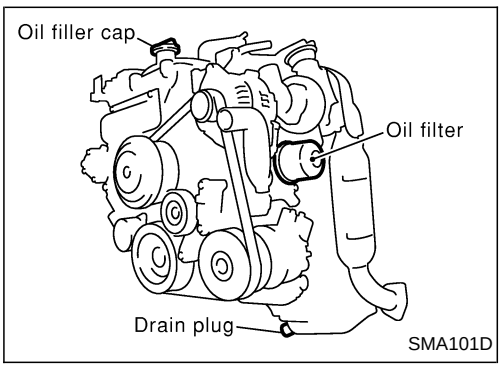
- If the tensioner is not held firmly, your finger may get caught between the belt and the pulleys. Confirm the holding of the tensioner, and then hold the belt side in the place away from the pulleys to attach or remove the belt, paying attention to prevent your finger from being caught.

CAUTION:

- **When handling the belt, pay attention to prevent the oil or coolant from adhering to the belt.**
- **Do not distort or bend the belt intensively.**

Installation

- Install the belt in the reverse order of removal.
- After installation of the belt, confirm that the belt engages the pulleys securely.
- Depending on the engagement between the belt and the idler pulley, noise (belt noise) may be heard when the engine is started just after installation. This noise will stop with time.



Changing Engine Oil

WARNING:

- **Be careful not to burn yourself, as engine oil is hot.**
- **Prolonged and repeated contact with used engine oil may cause skin cancer; try to avoid direct skin contact with used oil. If skin contact is made, wash thoroughly with soap or hand cleaner as soon as possible.**

1. Warm up engine, and check for oil leakage from engine components.
2. Remove drain plug and oil filler cap.

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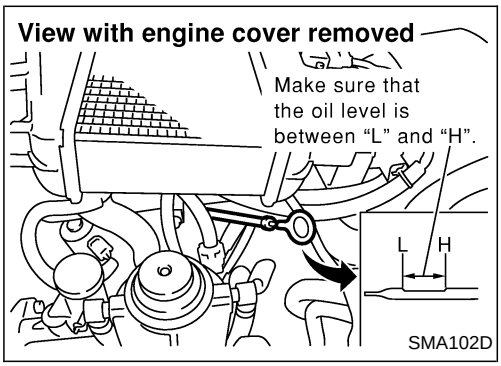
Changing Engine Oil (Cont'd)

3. Drain oil and fill with new engine oil.

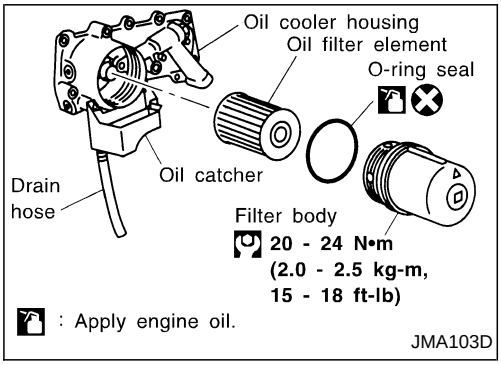
Oil grade:
API CF4 or ACEA B3-96.98 or ACEA B3/E3-96.98
Viscosity:
See "RECOMMENDED FLUIDS AND LUBRICANTS", MA-1009.
Refill oil capacity (approximate):
Without oil filter change
5.2ℓ (4-5/8 Imp qt)
With oil filter change
5.7ℓ (5 Imp qt)

CAUTION:

- **Be sure to clean and install oil pan drain plug with washer.**
  Drain plug:
  : 54 - 58 N·m (5.5 - 6.0 kg-m, 40 - 43 ft-lb)
- **The refill capacity changes depending on the oil temperature and drain time; use these valves as a reference and be certain to check with the dipstick when changing the oil.**



4. Check oil level.
5. Start engine. Check area around drain plug and oil filter for any sign of oil leakage.
6. Run engine for a few minutes, then turn it off. After 10 minutes check oil level.



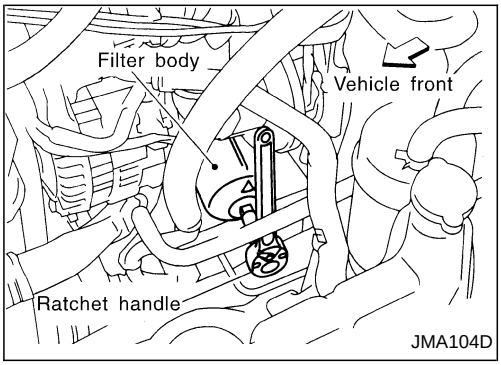
Changing Engine Oil Filter

REMOVAL

1. Insert a suitable tool with a 12.7 mm square (1/2 inch square) such as an extension bar and ratchet handle into the filter body, and loosen the body by approximately 4 turns.

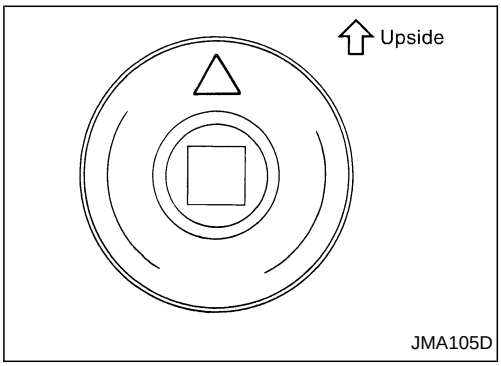
WARNING:

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



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Changing Engine Oil Filter (Cont'd)



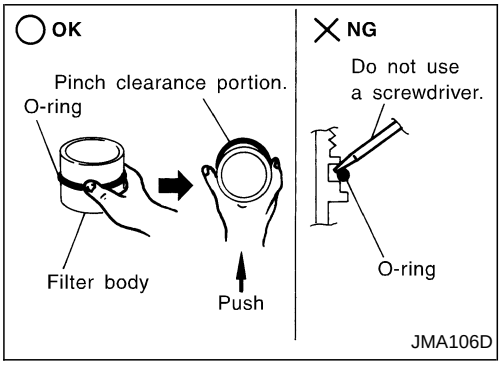
2. Set the ▲ mark of the filter body to the top position and discharge the oil.
- Receive the oil discharged from the drain hose in a tray.
- About 500 cc (17.6 Imp fl oz) of oil will be discharged in about 3 minutes.
- The oil is discharged from the oil catcher to under the vehicle through the drain hose.

3. Remove the filter body, and then remove the oil filter element.

CAUTION:
- **If the engine oil gets on the engine or vehicle, thoroughly wipe it off.**
- **Thoroughly wipe off the oil remaining in the oil catcher. (This is to prevent misidentifying oil leaking from the oil catcher as oil leaking from the engine.)**

4. Remove the O-ring from the filter body.
- Press the O-ring in any direction with your finger, and pull on the portion of the O-ring separated from the filter body to remove it.

CAUTION:
Because wire and screwdrivers may cause damage to the filter body, do not use such tools.



INSTALLATION

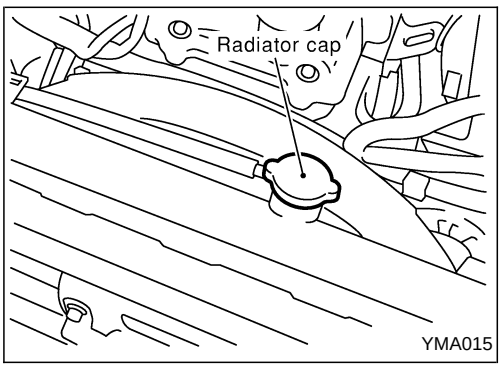
1. Thoroughly remove foreign matter adhering to the inside of filter body and O-ring mounting areas (of the body and oil cooler).
2. Install the oil filter element and O-ring to the filter body.
- Securely press the oil filter element into the filter body.

3. Install the filter body.
   : 20 - 24 N·m (2.0 - 2.5 kg-m, 15 - 18 ft-lb)
4. After warming up the engine, check that no engine oil leaks.

Changing Engine Coolant

WARNING:
To avoid the danger of being scalded, never change the coolant when the engine is hot.
—DRAINING ENGINE COOLANT—

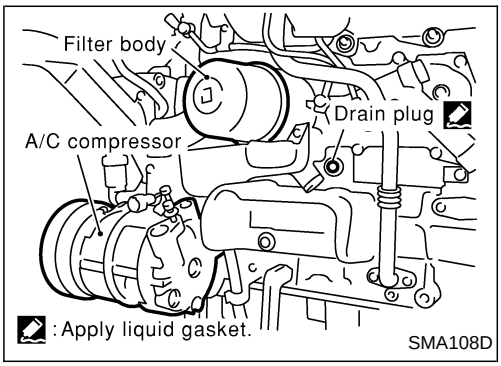
1. Move heater TEMP control knob all the way to HOT.
2. Remove undercover and disconnect lower radiator hose to drain coolant.



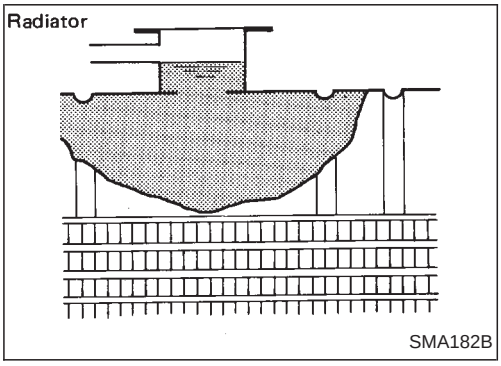
3. Remove radiator filler cap.

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Changing Engine Coolant (Cont'd)



4. Remove cylinder block drain plug located at left center of cylinder block.
5. Remove reservoir tank and drain coolant.



—REFILLING ENGINE COOLANT—

6. Install reservoir tank, radiator drain plug, and cylinder block drain plugs.

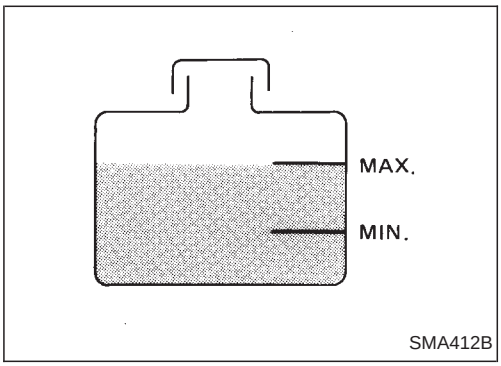
- **Apply sealant to the thread of cylinder block drain plug.**

Cylinder block drain plug:
: 24 - 26 N·m (2.4 - 2.7 kg-m, 18 - 19 ft-lb)

7. Move heater TEMP control knob all the way to HOT.
8. Fill radiator with coolant up to the filler neck.

For coolant mixture ratio, refer to MA-19.

9. Fill reservoir tank with coolant up to the MAX level.



Coolant capacity (With reservoir tank):
10.6 ℓ (9-3/8 Imp qt)
Reservoir tank capacity (for MAX level):
0.75ℓ (5/8 Imp qt)

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

10. Install radiator cap.
11. Warm up engine to normal operating temperature.
12. Run engine at 2,000 rpm for 10 seconds and return to idle speed.

- Repeat 2 or 3 times.

Watch coolant temperature gauge so as not to overheat the engine.

13. Stop engine and cool it down.

- Cool down using a fan to reduce the time.

14. Remove the radiator cap and check coolant level.

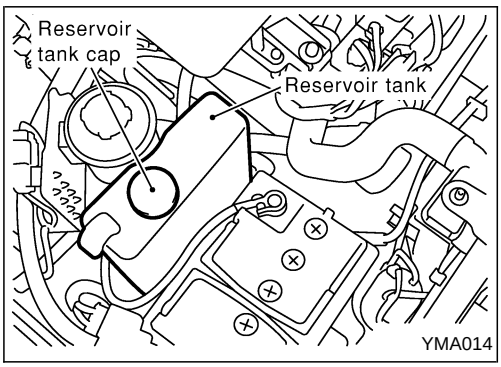
- If necessary, refill radiator up to filler neck with coolant.

15. Refill reservoir tank to Max line with coolant.
16. Repeat step 9 through step 15 two or more times.
17. Warm up engine, and check for sound of coolant flow while running engine from idle up to 2,000 rpm with heater temperature control set at several positions between COOL and HOT.

- Sound may be noticeable at heater water core.

18. If sound is heard, bleed air from cooling system by repeating steps 11 through 17 until coolant level no longer drops.

- **Clean excess coolant from engine.**



Checking Cooling System

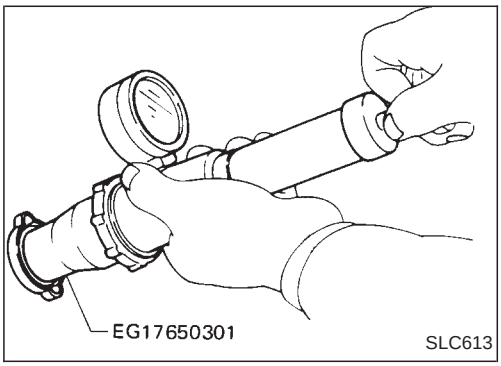
CHECKING HOSES AND CLAMPS

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

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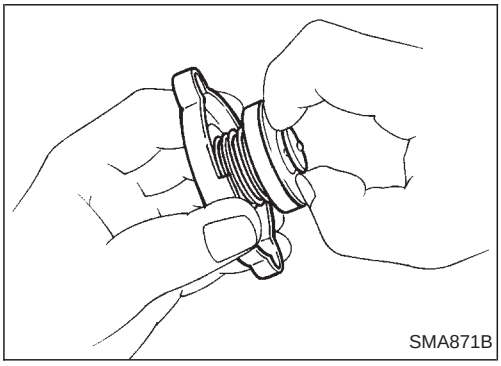
Checking Cooling System (Cont'd)

CHECKING RADIATOR CAP



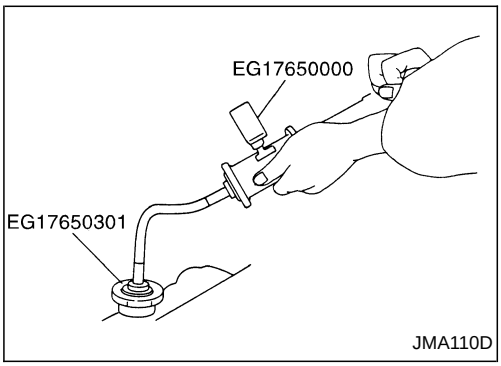
Apply pressure to radiator cap (side with pressure valve) with cap tester to see if it is satisfactory.

Radiator cap relief pressure:
108 - 128 kPa
(1.08 - 1.28 bar, 1.1 - 1.3 kg/cm^2, 16 - 18 psi)



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

CHECKING COOLING SYSTEM FOR LEAKS



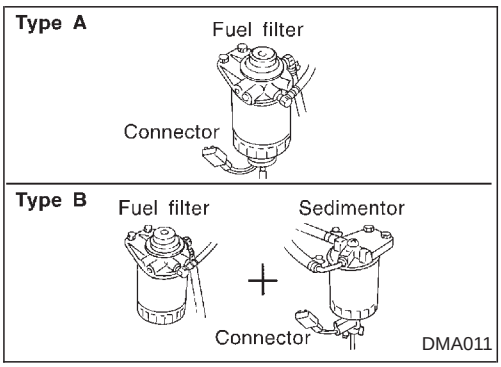
Apply pressure to the cooling system with cap tester to check for leakage.

Testing pressure:
157 kPa (1.57 bar, 1.6 kg/cm^2, 23 psi)

CAUTION:
Use of higher pressure than the specified value may cause damage to radiator.

Checking and Replacing Fuel Filter and Draining Water

Be careful not to spill fuel in engine compartment. Place a rag to absorb fuel.



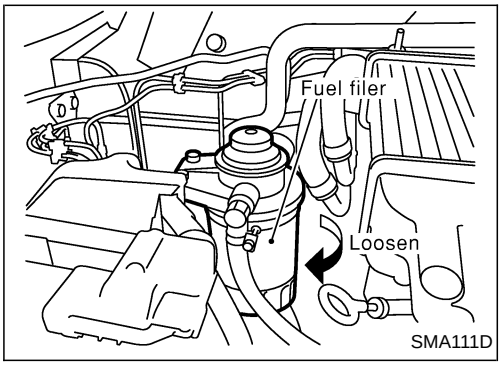
CHECKING FUEL FILTER

Check fuel filter for fuel leakage, damage and other abnormal signs.

REPLACING FUEL FILTER

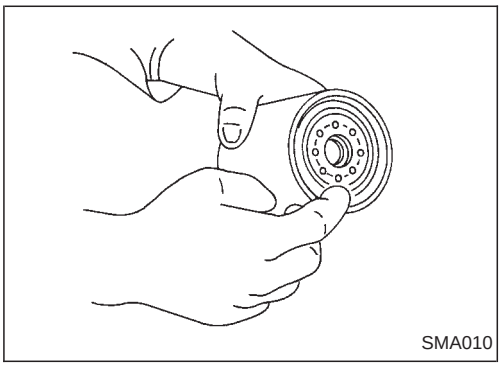
1. Disconnect harness connector and drain fuel.
2. Remove fuel filter using band-type filter wrench.
3. Remove fuel filter and fuel filter sensor.

CAUTION:
Remove fuel filter without spilling fuel. If spilt, wipe off immediately. Be specially careful not to spill fuel on engine mount insulator.



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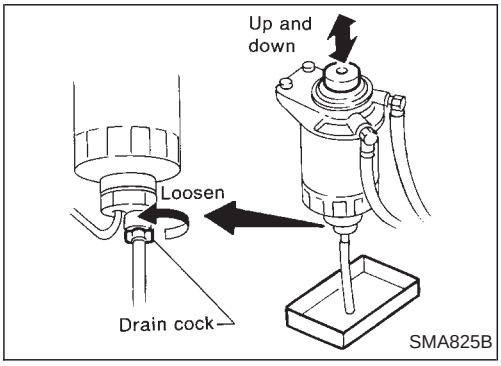
Checking and Replacing Fuel Filter and Draining Water (Cont'd)


SMA010

4. Wipe clean fuel filter mounting surface on fuel filter bracket and smear a little fuel on rubber seal of fuel filter.
5. Screw fuel filter on until a slight resistance is felt, then tighten an additional more than 2/3 or a turn.
6. Install fuel filter sensor to new fuel filter. (Type A)
7. Bleed air from fuel filter.

Refer to "Air Bleeding" in EC section.

8. Start engine and check for leaks.



SMA825B

DRAINING WATER

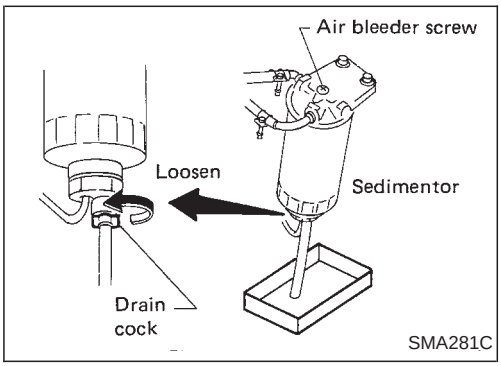
1. Drain water as follows.

Type A

Loosen drain cock and drain water.

Loosening drain cock four to five turns causes water to start draining. Do not remove drain cock by loosening it excessively.

If water does not drain properly, move the priming pump up and down.



SMA281C

Type B

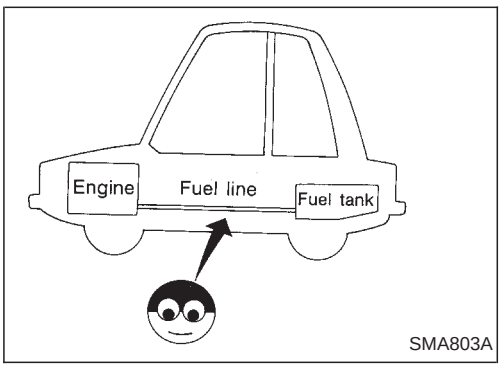
Loosen air bleeder screw from the sedimentor cover and then loosen drain cock and drain water.

Loosening drain cock four to five turns causes water to start draining. Do not remove drain cock by loosening it excessively.

2. Bleed air.

Refer to "Air Bleeding" in EC section.

Checking Fuel Lines



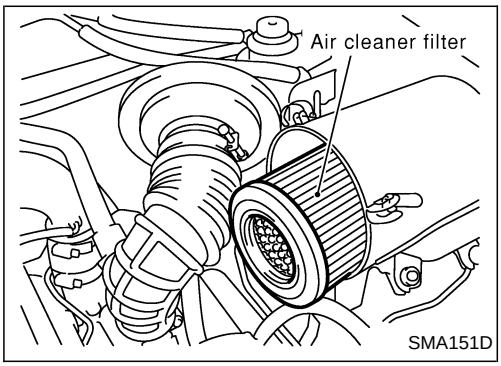
SMA803A

Check fuel lines and tank for proper attachment, leaks, cracks, damage, loose connections, chafing and deterioration.

CAUTION:

Keep clean parts with compressed air when assembling.

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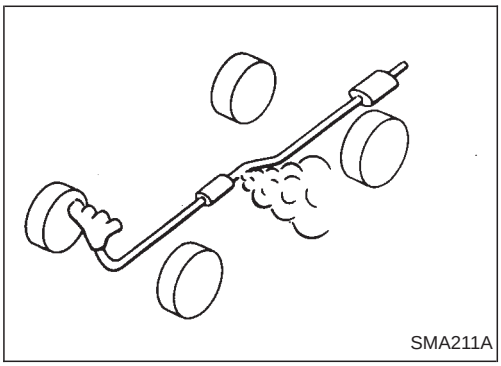


Cleaning and Replacing Air Cleaner Filter

VISCOUS PAPER TYPE

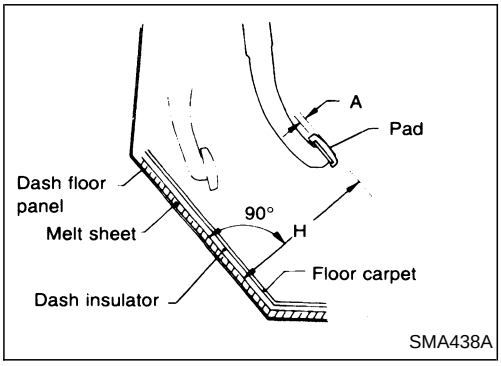
The viscous paper type air cleaner filter does not require any cleaning operation between renewal.

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SMA211A

Checking Exhaust System

Check exhaust pipes, muffler and mounting for proper attachment, leaks, cracks, damage, loose connections, chafing and deterioration. Replace all defective parts.



SMA438A

Checking Clutch Operation

Check clutch pedal height, free play and smooth operation.

Pedal height "H":

RHD:

210 - 220 mm (8.27 - 8.66 in)

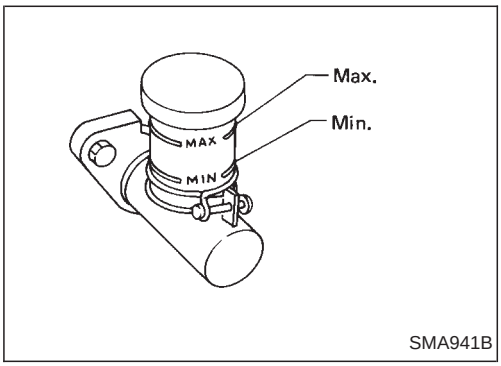
LHD:

227 - 237 mm (8.94 - 9.33 in)

Pedal free play "A":

1.0 - 3.0 mm (0.039 - 0.118 in)

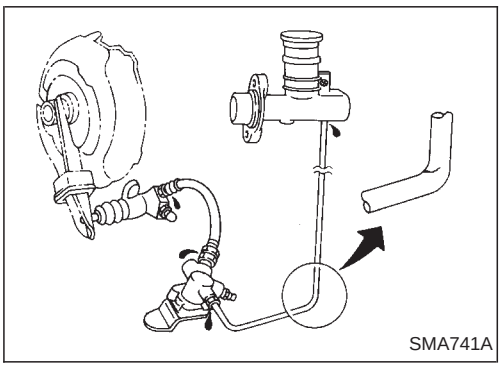
If necessary, adjust clutch pedal height and pedal free play. Refer to Section CL.



SMA941B

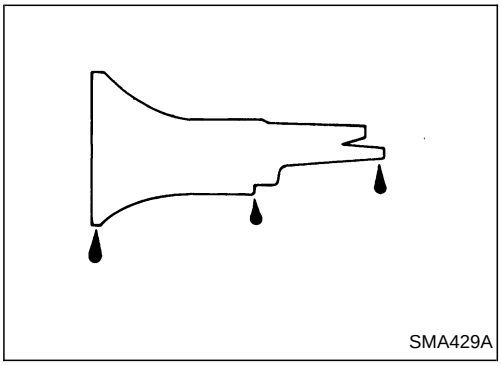
Checking Clutch Fluid Level and Leaks

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


SMA741A

Checking Clutch System

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

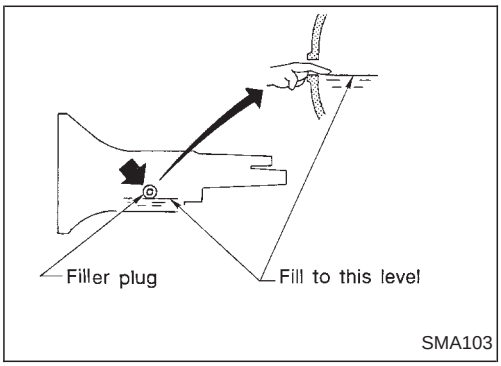

SMA429A

Checking M/T Oil

1. Check for oil leakage.

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Checking M/T Oil (Cont'd)



2. Check oil level.

Never start engine while checking oil level.

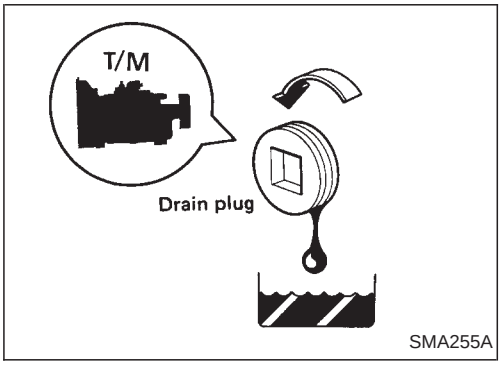
Filler plug:

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

Changing M/T Oil

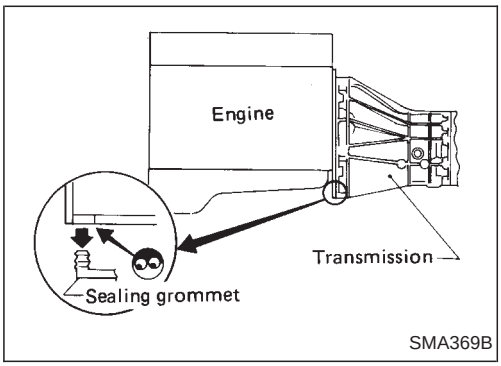
Oil capacity:

3.5 liters (6-1/8 Imp pt)



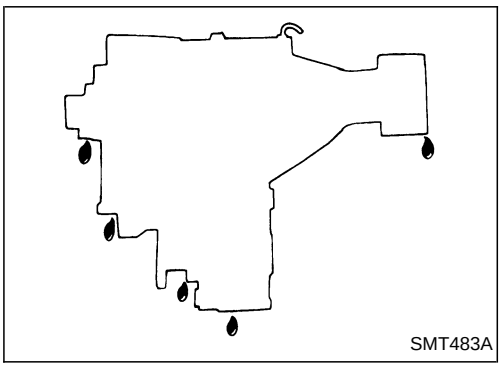
Checking Water Entry

Check water entry in the clutch housing by removing the sealing grommet, whenever driving in deep water or mud.



Checking Transfer Oil

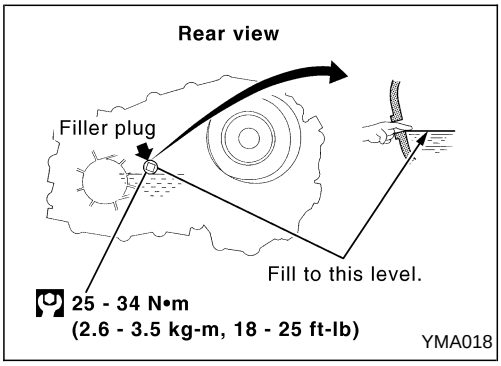
1. Check transfer for leakage.



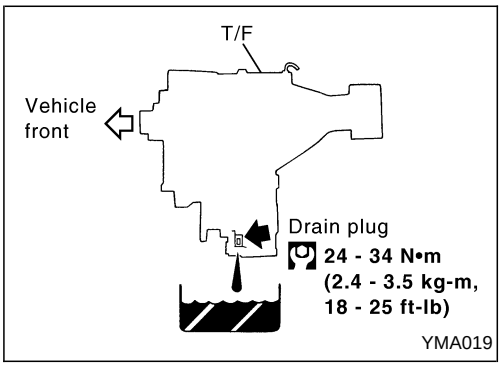
2. Check oil level.

Never start engine while checking oil level.

"DEXRON™" type Automatic Transmission Fluid is used for the transfer in the factory. Never add gear oil (API GL-4) to Automatic Transmission Fluid.



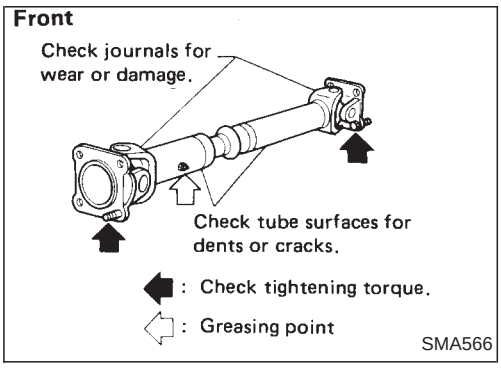
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Changing Transfer Oil

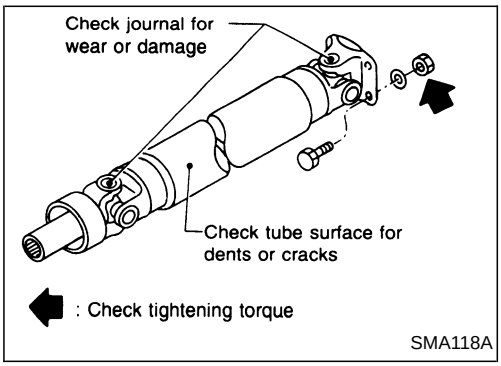
Oil capacity:
2.3 liters (2 Imp qt)

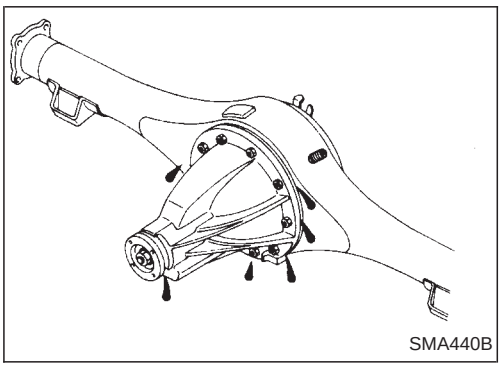
When changing transfer oil completely, either "DEXRON™" type Automatic Transmission Fluid or gear oil (API GL-4) may be used.
Do not mix Automatic Transmission Fluid and gear oil.



Checking Propeller Shaft

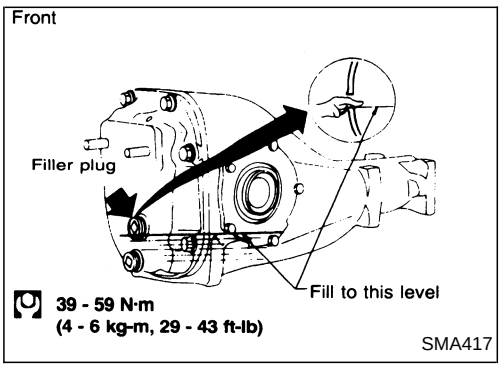
Check propeller shaft for damage, looseness or grease leakage.





Checking Differential Gear Oil

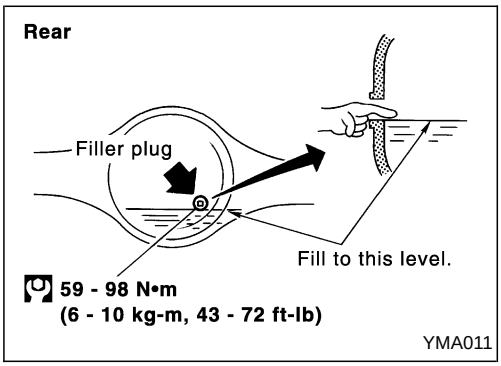
1. Check differential for oil leakage.

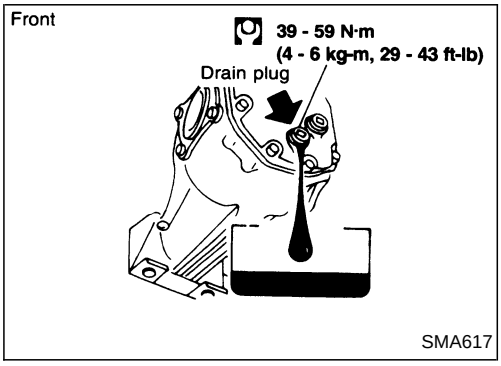


2. Check oil level.

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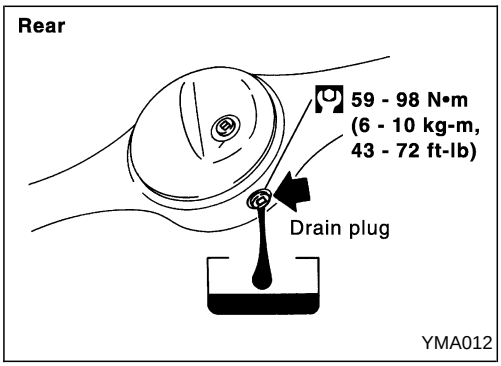
Checking Differential Gear Oil (Cont'd)



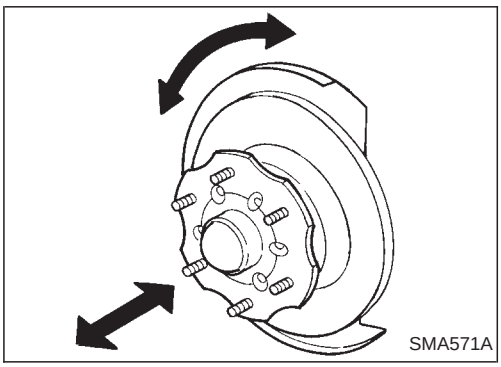


Changing Differential Gear Oil

Oil capacity:
Front
R180A
1.3 liters (2-1/4 Imp pt)

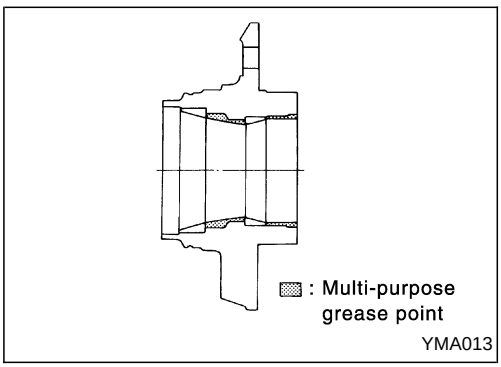


Oil capacity:
Rear
H233B
2.8 liters (4-7/8 Imp pt)



Checking Front Wheel Bearing Grease

- Check that wheel bearings operate smoothly.
- Check front wheel bearings for grease leakage and water or dust entry.
- Replace front wheel bearings or front wheel bearing grease if wheel bearings do not turn smoothly.

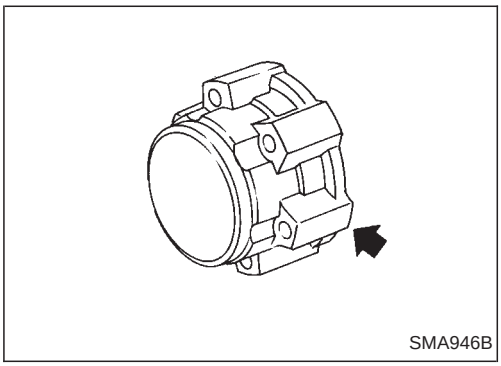


Repacking Front Wheel Bearing Grease

Apply multi-purpose grease sparingly to the following parts:

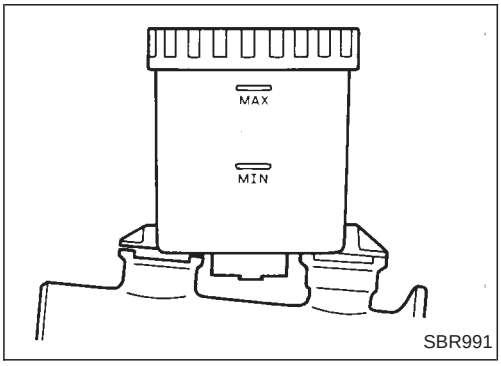
- Threaded portion of spindle
- Contact surface between wheel bearing washer and outer wheel bearing
- Grease seal lip
- Hub cap or wheel hub (as shown at left)

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SMA946B

Checking Free-running Hub Grease

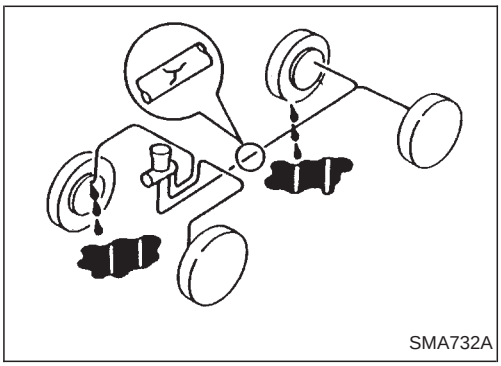
Check free-running hub grease for leakage and water or dust entry.



SBR991

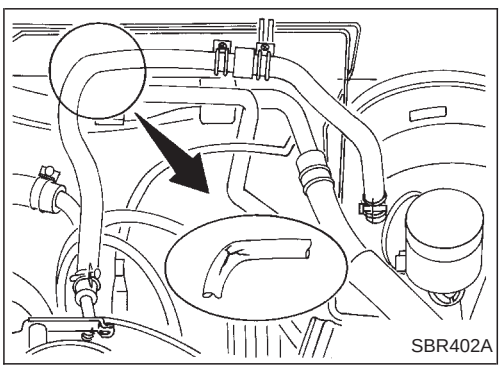
Checking Brake Fluid Level and Leaks

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


SMA732A

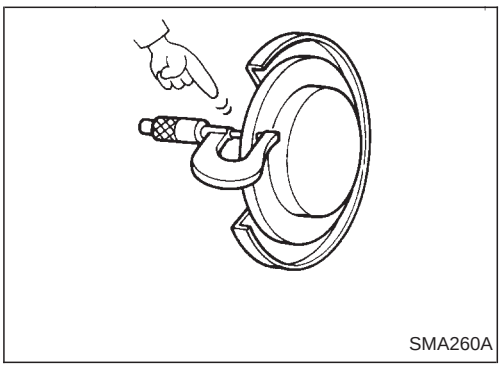
Checking Brake System

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


SBR402A

Checking Brake Booster, Vacuum Hoses, Connections and Check Valve

Check vacuum lines, connections and check valve for improper attachment, air tightness, chafing and deterioration.


SMA260A

Checking Disc Brake

Check condition of disc brake components.

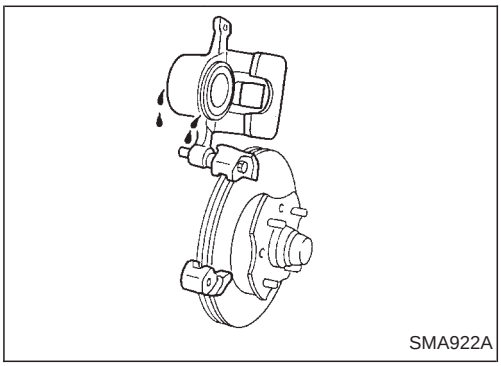
ROTOR

Check condition and thickness.

Standard thickness:
26 mm (1.02 in)
Minimum thickness:
24 mm (0.94 in)

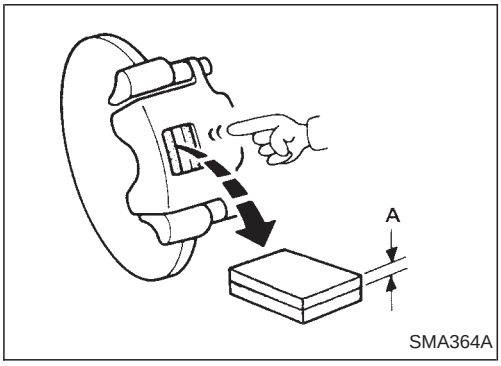
http://vnx.su/

Checking Disc Brake (Cont'd)


SMA922A

CALIPER

Check operation and leakage.



SMA364A

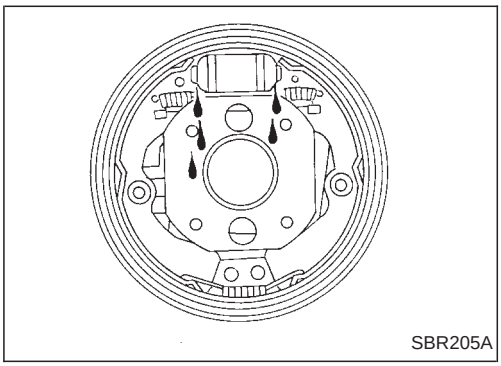
PAD

Check wear or damage.

Standard thickness:
15.5 mm (0.610 in)
Minimum thickness:
2.0 mm (0.079 in)

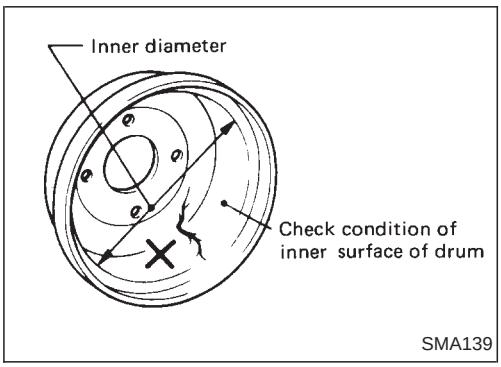
Checking Drum Brake

Check condition of drum brake components.


SBR205A

WHEEL CYLINDER

Check operation and leakage.

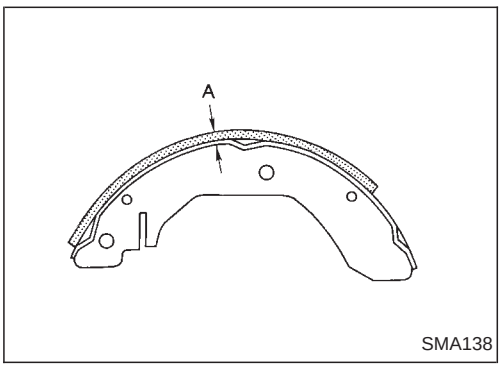


SMA139

DRUM

Check condition of inner surface.

Nominal diameter:
280 mm (11.02 in)
Maximum diameter:
282 mm (11.10 in)
Out of round maximum:
0.05 mm (0.0020 in) or less



SMA138

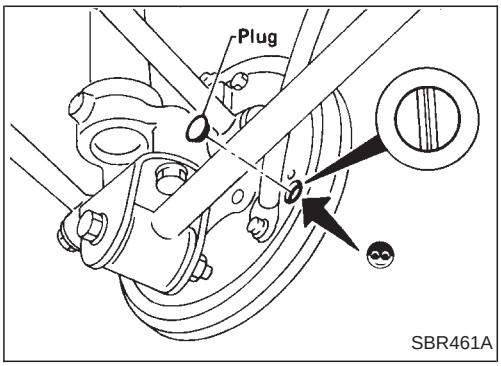
LINING

Check wear or damage.

Standard thickness:
Trailing: 3.95 mm (0.1555 in)
Leading: 8.95 mm (0.3524 in)
Lining wear limit (Minimum thickness):
1.52 mm (0.0598 in)

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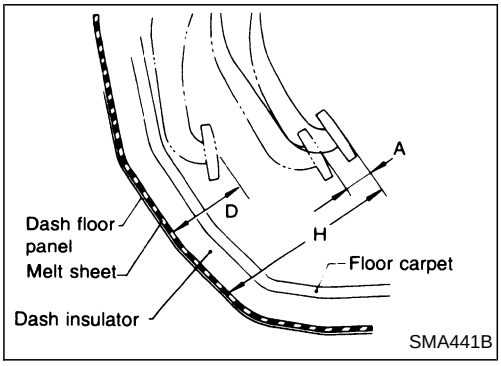
Checking Drum Brake (Cont'd)



TEMPORARY METHOD FOR CHECKING LINING WEAR

Remove inspection hole plug and check for lining wear.

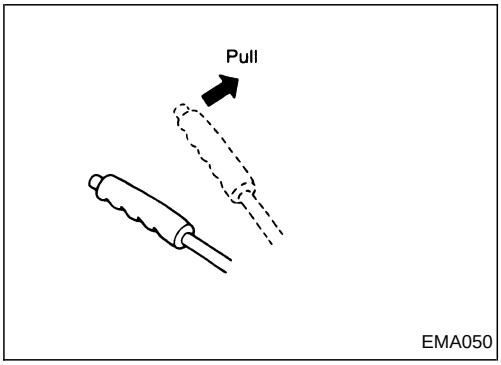
Checking Foot Brake Pedal Operation



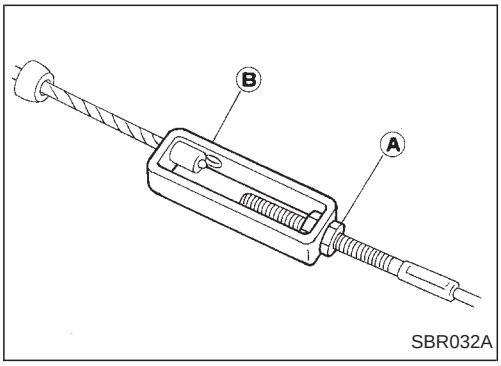
Check brake pedal free height, depressed height and for smooth operation.

H: Free height:
RHD: 196 - 206 mm (7.72 - 8.11 in)
LHD: 210 - 220 mm (8.27 - 8.66 in)
D: Depressed height:
Under force of 490 N (50 kg, 110 lb) with engine running
RHD: 137.7 - 147.7 mm (5.42 - 5.81 in)
LHD: 142.5 - 152.5 mm (5.61 - 6.00 in)
A: Pedal free play
1.0 - 3.0 mm (0.039 - 0.118 in)

Checking Parking Brake

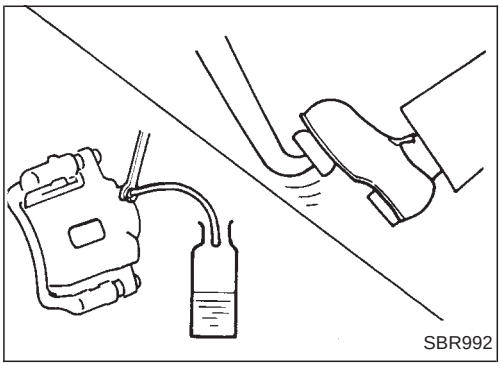


1. Pull lever with specified amount of force.
   Check lever stroke and for smooth operation.
   Number of notches
   [At pulling force of 196 N (20 kg, 44 lb)]:
   9 - 10



2. Use adjuster to adjust lever stroke.
(1) Loosen lock nut Ⓐ, rotate adjuster Ⓑ.
(2) Tighten lock nut Ⓐ.

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SBR992

Changing Brake Fluid

1. Drain brake fluid from each air bleeder valve.
2. Refill until new brake fluid comes out from each air bleeder valve. Use same procedure as in bleeding hydraulic system to refill brake fluid.

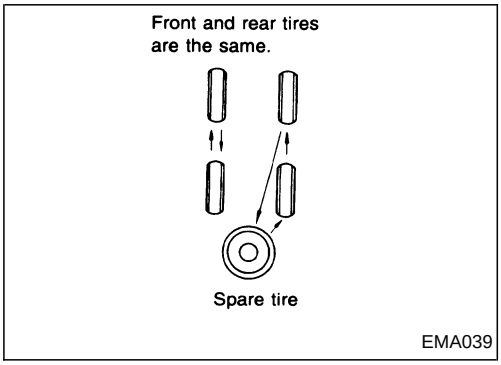
Refer to section BR.

- **Refill with recommended brake fluid “DOT 4”.**
- **Never reuse drained brake fluid.**
- **Be careful not to splash brake fluid on painted areas.**

Balancing Wheels

Adjust wheel balance using the road wheel center.

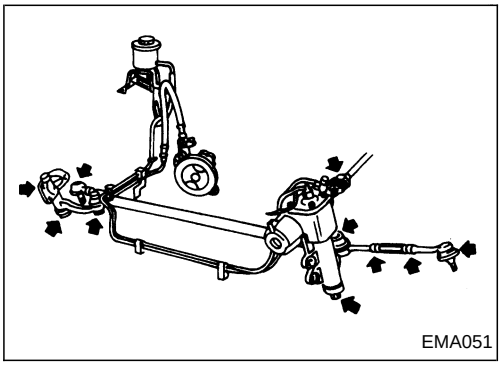
Radial runout limit:
Steel wheel:
0.5 mm (0.020 in)
Aluminum wheel:
0.3 mm (0.012 in)
Lateral runout limit:
Steel wheel:
0.8 mm (0.031 in)
Aluminum wheel:
0.3 mm (0.012 in)



EMA039

Tire Rotation

Wheel nuts
: 118 - 147 N·m (12 - 15 kg-m, 87 - 108 ft-lb)


EMA051

Checking Steering Gear and Linkage

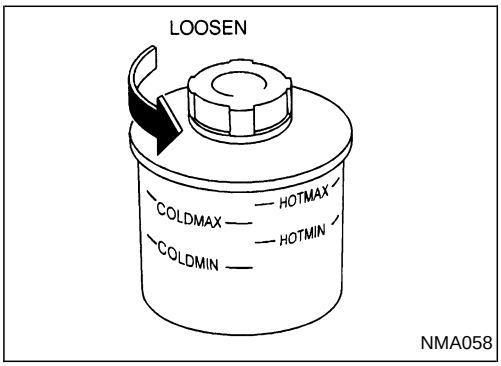
STEERING GEAR

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

STEERING LINKAGE

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

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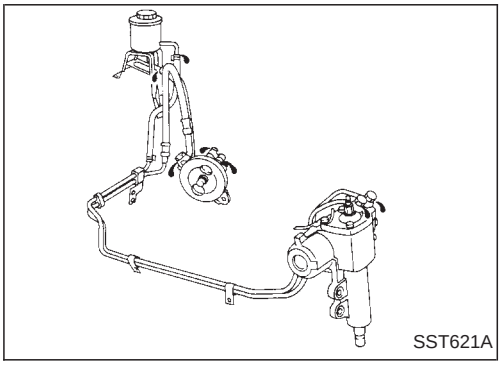


Checking Fluid Level and Leaks (Power steering)

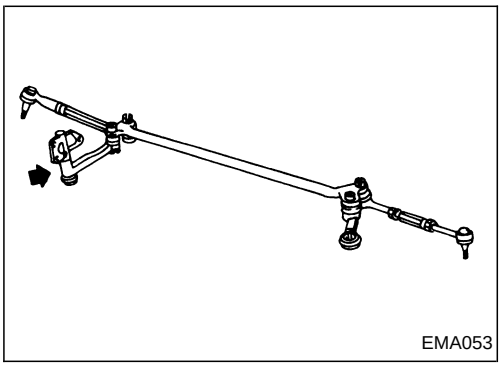
Check fluid level.
Fluid level can be checked when the fluid is either hot or cold.

CAUTION:

- **Do not overfill.**
- **Recommended fluid is Automatic Transmission Fluid "DEXRON™" type.**

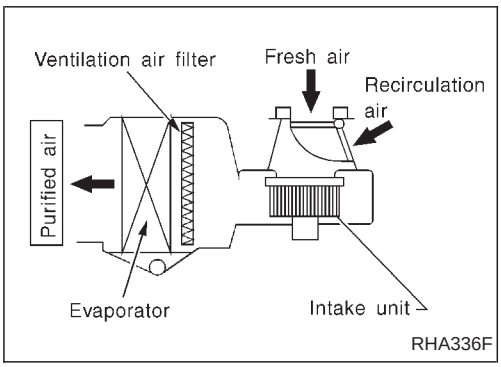


- Check lines for improper attachment, leaks, cracks, damage, loose connections, chafing and deterioration.



Greasing Steering Linkage

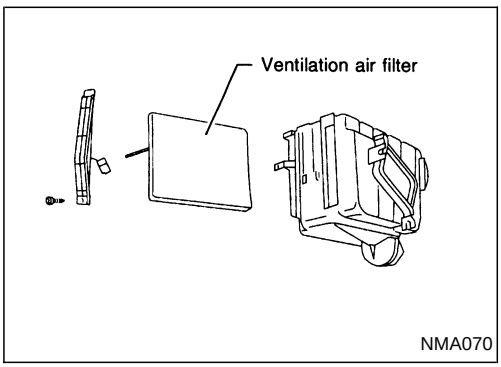
Apply multi-purpose grease to point shown in the illustration.



Ventilation Air Filter

FUNCTION

Air inside passenger compartment is kept clean at either recirculation or fresh mode by installing ventilation air filter into cooling unit.



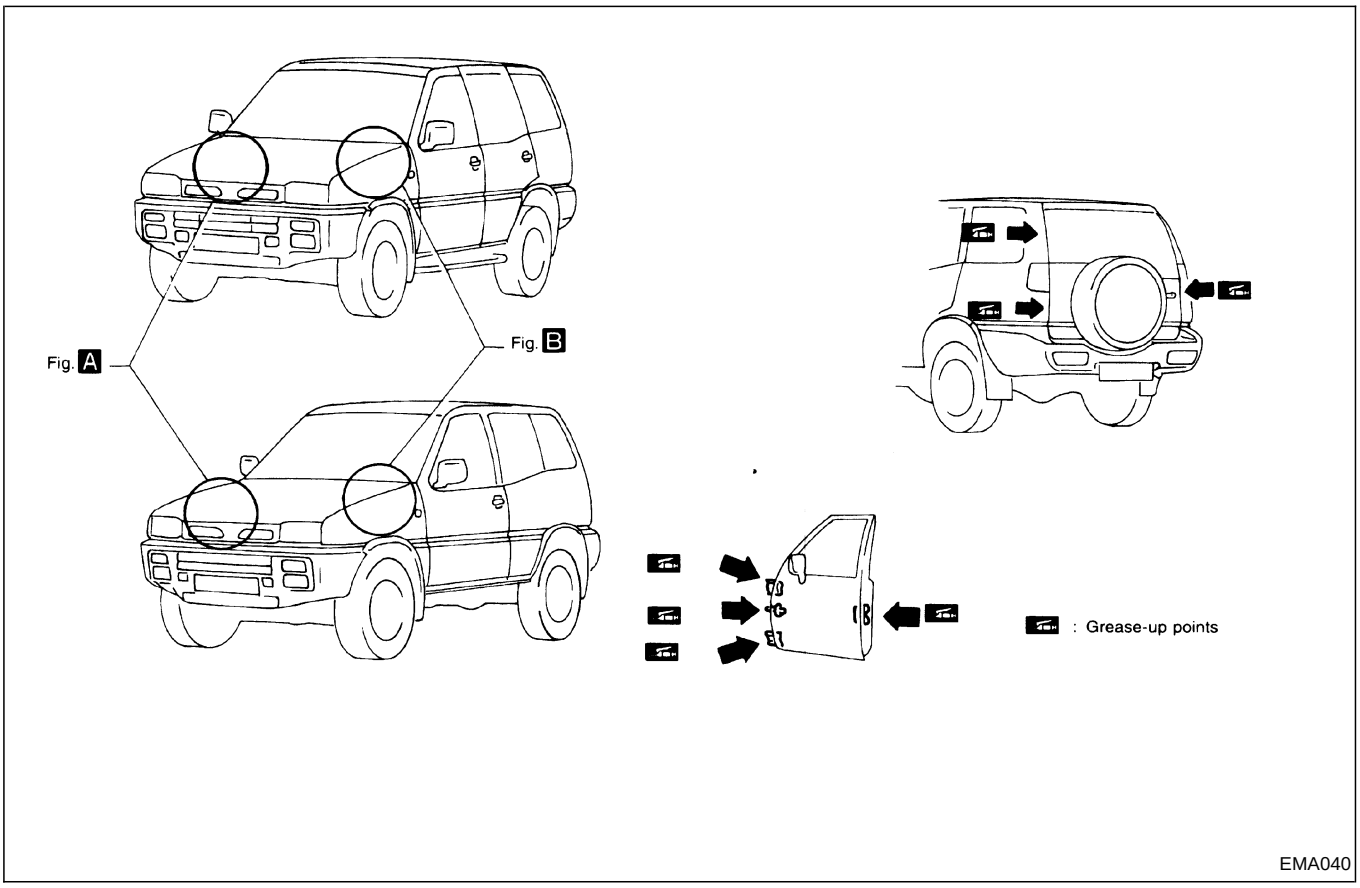
REPLACEMENT PROCEDURES

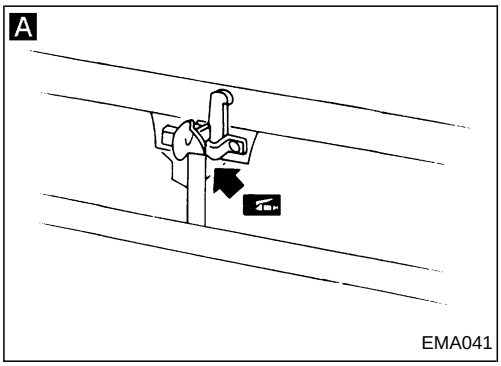
- Remove glove box.
  Refer to BT section.
- Take out ventilation air filter which is secured with one screw, from cooling unit.
- Replace with new one and reinstall glove box.

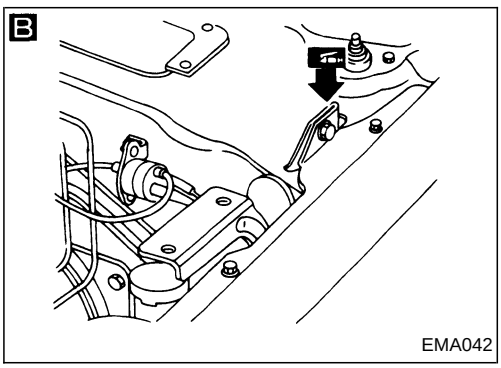
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Body

LUBRICATING HOOD LATCHES, LOCKS AND HINGES



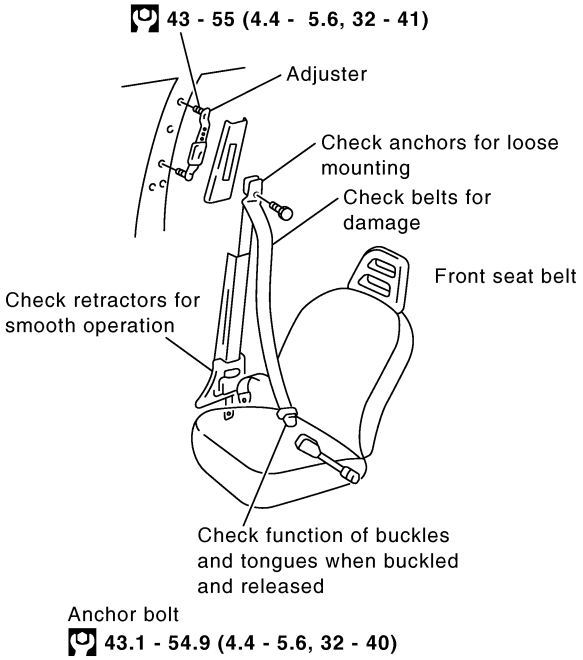




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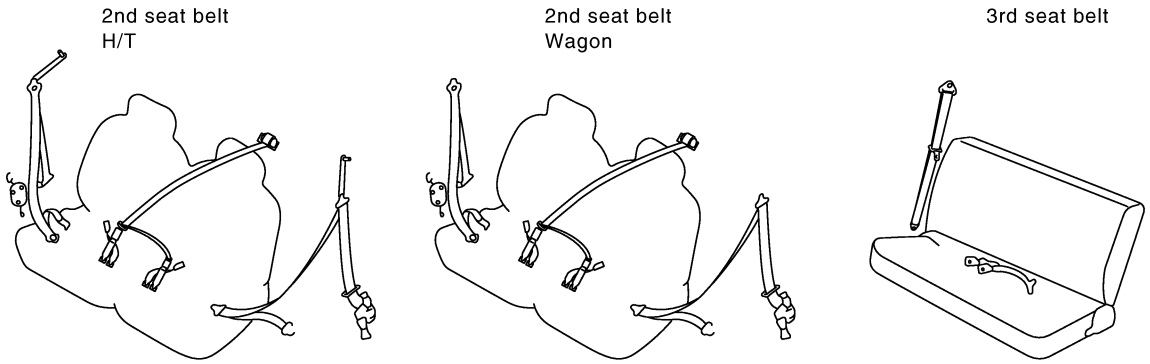
Body (Cont'd)

CHECKING SEAT BELTS, BUCKLES, RETRACTORS, ANCHORS AND ADJUSTERS



CAUTION:

- **After any collision ,inspect all seat belt assemblies, including retractors and other attached hardwares (i.e. anchor bolt, guide rail set). Nissan recommends to replace all seat belt assemblies in use during a collision, unless not damaged and properly operating after minor collision.**
  Replace the seat belt assembly if any damage or improper operation were found even if the belt had not been used during a collision.
  Also inspect seat belt assemblies not in use during a collision, and replace if damaged or improperly operating. Front seat belt pre-tensioner should be replaced even if the seat belt are not in use during a frontal collision where the driver and passenger air bags are deployed.
- **If any component of seat belt assembly is questionable, do not repair. Replace as seat belt assembly.**
- **If webbing is cut, frayed, or damaged, replace belt assembly.**
- **Do not spill drinks, oil etc. on inner lap belt buckle. Never oil tongue and buckle.**
- **Use a NISSAN genuine seat belt assembly.**



CAUTION:
When removing the seat belt and seat belt pre-tensioner retractor, be sure to make the seat belt pre-tensioner inoperative. Refer to "SUPPLEMENTAL RESTRAINT SYSTEM (SRS)" –Removal and Installation– Seat belt pre-tensioner in section RS

: N•m (kg-m, ft-lb)

YMA020

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Checking Body Corrosion

Visually check the body sheet metal panel for corrosion, paint damage (scratches, chipping, rubbing, etc.) or damage to the anti-corrosion materials. In particular, check the following locations.

Hemmed portion

Hood front end, door lower end, trunk lid rear end, etc.

Panel joint

Side sill of rear fender and center pillar, rear wheel housing of rear fender, around strut lower in engine compartment, etc.

Panel edge

Back door lid opening, sun roof opening, fender wheel-arch flange, fuel filler lid flange, around holes in panel, etc.

Parts contact

Waist moulding, windshield moulding, bumper, etc.

Protectors

Damage or condition of mudguard, fender protector, chipping protector, etc.

Anti-corrosion materials

Damage or separation of anti-corrosion materials under the body.

Drain holes

Condition of drain holes at door and side sill.
When repairing corroded areas, refer to the Corrosion Repair Manual.

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Engine Maintenance

INSPECTION AND ADJUSTMENT

Drive belt deflection

Unit: mm (in)

	Used belt deflection		Deflection of new belt
	Limit	Deflection after adjustment	
Engine	TD27Ti	TD27Ti	TD27Ti
Alternator	20 (0.79)	11 - 13 (0.43 - 0.51)	9 - 11 (0.35 - 0.43)
Air conditioner	12 (0.47)	6 - 7.5 (0.236 - 0.295)	5 - 6.5 (0.197 - 0.256)
Power steering oil pump	15 (0.59)	8 - 9.5 (0.315 - 0.374)	7 - 8.5 (0.276 - 0.335)
Applied pushing force	98 N (10 kg, 22 lb)		

Oil capacity (Refill capacity)

TD27Ti engine

Unit: ℓ (Imp qt)

With oil filter change	6.2 (5-1/2)
Without oil filter change	5.5 (4-7/8)

ZD30DDTi engine

Unit: ℓ (Imp qt)

With oil filter change	6.7 (5-7/8)
Without oil filter change	6.2 (5-1/2)

Cooling system check

TD27Ti engine

Unit: kPa (bar, kg/cm^2, psi)

Cooling system testing pressure	157 (1.57, 1.6, 23)
Radiator cap relief pressure	78 - 98 (0.78 - 0.98, 0.8 - 1.0, 11 - 14)

ZD30DDTi engine

Unit: kPa (bar, kg/cm^2, psi)

Cooling system testing pressure	157 (1.57, 1.6, 23)
Radiator cap relief pressure	108 - 128 (1.08 - 1.28, 1.1 - 1.3, 16 - 18)

Coolant capacity (Refill capacity)

Unit: ℓ (Imp qt)

Engine	TD27Ti	ZD30DDTi
Without reservoir tank	10 (8-3/4)	10.6 (9-3/8)
Reservoir tank	0.8 (3/4)	0.75 (5/8)

Valve clearance (Hot)

Unit: mm (in)

Engine	TD27Ti
Intake	0.25 (0.0098)
Exhaust	

Injection nozzle

Unit: kPa (bar, kg/cm^2, psi)

Engine	TD27Ti
Initial injection pressure	
New	12,259 - 12,749 (122.6 - 127.5, 125 - 130, 1,778 - 1,849)
Used	12,749 - 13,730 (127.5 - 137.3, 130 - 140, 1,849 - 1,991)

Idle speed

Unit: rpm

Engine	TD27Ti
With A/C	850±50
Without A/C	700±50

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Chassis and Body Maintenance

INSPECTION AND ADJUSTMENT

Clutch

Unit: mm (in)

Vehicle model	All	
Pedal free height	RHD 210 - 220 (8.27 - 8.66)	LHD 227 - 237 (8.94 - 9.33)
Pedal free play	1.0 - 3.0 (0.039 - 0.118)	
Pedal free travel	155 - 160 (6.10 - 6.30)	

Front axle and front suspension (Unladen)*1

Unit: degree

Model	H/T VAN	H/T	WAGON
Camber	0°30′±30′		
Caster	0°29′±30′	0°30′±30′	0°30′±30′
Kingpin inclination	12°37′		
Toe-in A-B mm (in)	3.5 - 5.5 (0.14 - 0.22)	3 - 5 (0.12 - 0.20)	3 - 5 (0.12 - 0.20)
Front wheel turning angle (degrees) (Full turn)*2 Inside	34°27′		
Outside	33°38′		

*1: Fuel, radiator coolant and engine oil full.
Spare tire, jack, hand tools and mats in designated positions.
*2: Wheel turning force (at circumference of steering wheel) of 98 to 147 N (10 to 15 kg, 22 to 33 lb) with engine idle.

Brake

Disc brake mm (in) LD28VA		
Pad		
	Standard thickness	15.5 (0.610)
	Minimum thickness	2.0 (0.079)
Rotor		
	Standard thickness	2.60 (0.1024)
	Minimum thickness	24.0 (0.945)
Drum brake mm (in) LT28		
Lining		
	Standard thickness	
	Leading	8.95 (0.3524)
	Trailing	3.95 (0.1555)
	Minimum thickness	1.52 (0.0598)
Drum		
	Standard diameter	280 (11.02)
	Maximum diameter	282 (11.10)

Pedal mm (in)	RHD	LHD
Free height	196 - 206 (7.7 - 8.1)	210 - 220 (8.3 - 8.7)
Free play	1.0 - 3.0 (0.039 - 0.118)	
Full stroke	137.7 - 148.7 (5.42 - 5.85)	142.5 - 152.5 (5.61 - 6.00)
Parking brake Number of notches [at pulling force 196 N (20 kg, 44 lb)]	9 - 10	

Wheel runout

Unit: mm (in)

Wheel type	Steel	Aluminum
	16″ x 7J	16″ x 7J
Radial runout limit	0.5 (0.020)	0.3 (0.012)
Lateral runout limit	0.8 (0.031)	0.3 (0.012)

Wheel bearing

Axial end play limit mm (in)	0

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TIGHTENING TORQUE

Unit	N·m	kg-m	ft-lb
Clutch			
Pedal stopper lock nut	12 - 15	1.2 - 1.5	8.7 - 10.8
Master cylinder push rod lock nut	8 - 11	0.8 - 1.1	5.8 - 8.0
Manual transmission			
Drain and filler plugs			
FS5R30A	25 - 34	2.5 - 3.5	18 - 25
Differential carrier			
Drain and filler plugs			
R180A	39 - 59	4 - 6	28.8 - 43.5
H233B	59 - 98	6 - 10	43.5 - 72.3
Front axle and front suspension			
Tie-rod lock nut	60 - 70	6.1 - 7.1	44.3 - 51.6
Brake system			
Air bleeder valve	7 - 9	0.7 - 0.9	5.1 - 6.5
Wheel and tire			
Wheel nut	118 - 147	12.0 - 15.0	87.0 - 108.4

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ENGINE MECHANICAL

SECTION EM

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ZD

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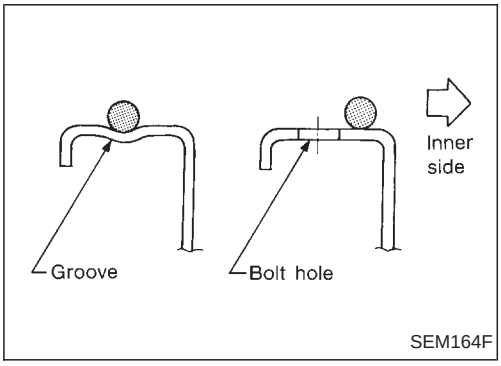
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Parts Requiring Angular Tightening

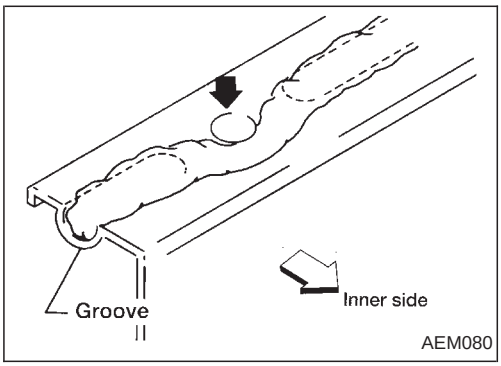
- Use an angle wrench for the final tightening of the cylinder head bolts.
- Do not use a torque value for final tightening.
- The torque value for these parts are for a preliminary step.
- Ensure thread and seat surfaces are clean and coated with engine oil.



SEM164F

Liquid Gasket Application Procedure

1. **Use a scraper to remove old liquid gasket from mating surfaces and grooves. Also, completely clean any oil from these areas.**
2. **Apply a continuous bead of liquid gasket to mating surfaces. (Use Genuine Liquid Gasket or equivalent.)**
   - Be sure liquid gasket diameter is as specified.

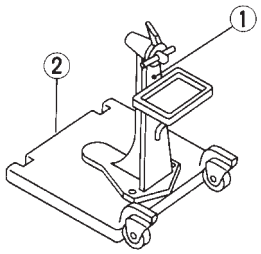
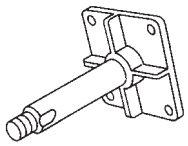
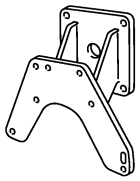
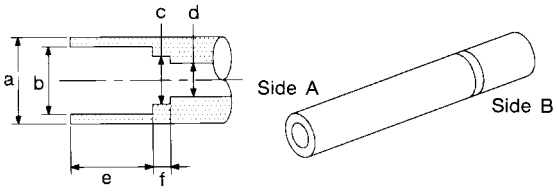
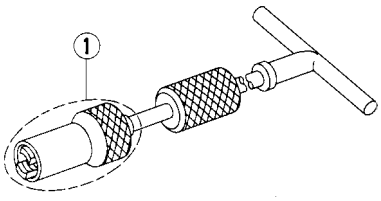
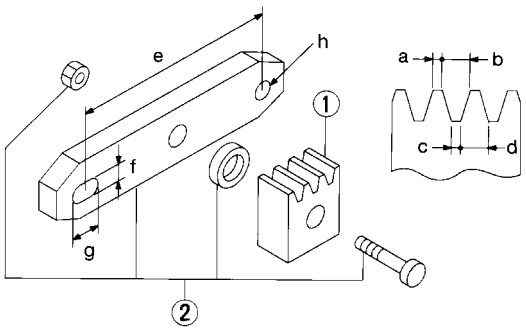


AEM080

3. **Apply liquid gasket around the inner side of bolt holes (unless otherwise specified).**
4. **Assembly should be done within 5 minutes after coating.**
5. **Wait at least 30 minutes before refilling engine oil and engine coolant.**

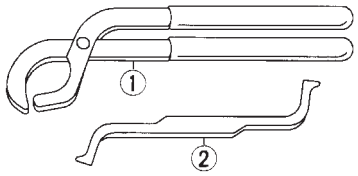
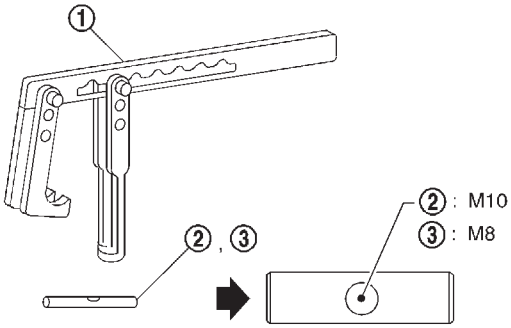
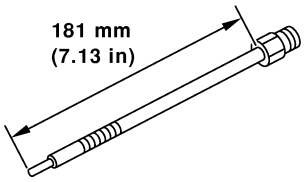
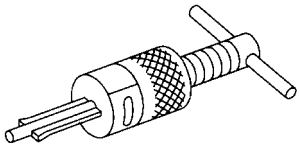
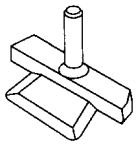
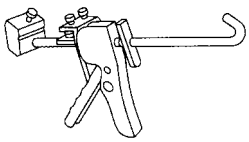
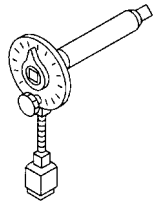
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Special Service Tools

Tool number Tool name	Description
ST0501S000 Engine stand assembly ① ST05011000 Engine stand ② ST05012000 Base	 NT042 Disassembling and assembling
KV10106500 Engine stand shaft	 NT028
KV11106101 Engine sub-attachment	 NT819
KV10115600 Valve oil seal drift	 NT603 Installing valve oil seal **Use side A.** **Side A** **a: 20 (0.79) dia.** **b: 13 (0.51) dia.** **c: 10.3 (0.406) dia.** **d: 8 (0.31) dia.** **e: 10.7 (0.421)** **f: 5 (0.20)** Unit: mm (in)
KV10107902 Valve oil seal puller ① KV10116100 Valve oil seal puller adapter	 NT605 Removing valve oil seal
KV101056S0 Ring gear stopper ① KV10105630 Adapter ② KV10105610 Plate	 NT617 Preventing crankshaft from rotating **a: 3 (0.12)** **b: 6.4 (0.252)** **c: 2.8 (0.110)** **d: 6.6 (0.260)** **e: 107 (4.21)** **f: 14 (0.55)** **g: 20 (0.79)** **h: 14 (0.55) dia.** Unit: mm (in)

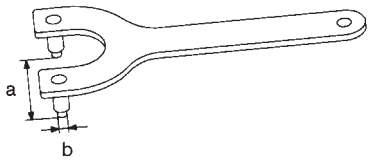
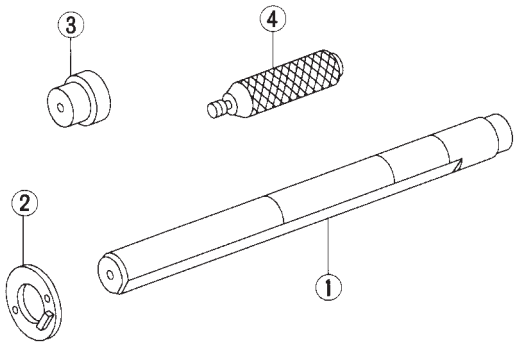
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Special Service Tools (Cont'd)

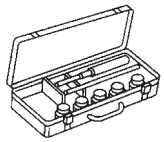
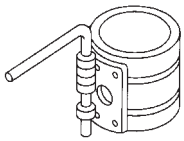
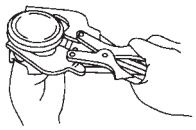
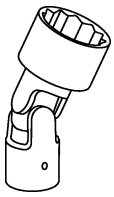
Tool number Tool name	Description	
KV101151S0 Lifter stopper set ① KV10115110 Camshaft pliers ② KV10115120 Lifter stopper	 NT041	Changing shims
KV101092S0 Valve spring compressor ① KV10109210 Compressor ② KV10109220 Adapter	 NT718	Disassembling and assembling valve components
ED19600620 Compression gauge adapter	 NT820	Checking compression pressure
ST16610000 Pilot bushing puller	 NT045	Removing crankshaft pilot bushing
KV10111100 Seal cutter	 NT046	Removing steel oil pan and rear timing chain case
WS39930000 Tube presser	 NT052	Pressing the tube of liquid gasket
KV10112100 Angle wrench	 NT014	Tightening bolts for bearing cap, cylinder head, etc.

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Special Service Tools (Cont'd)

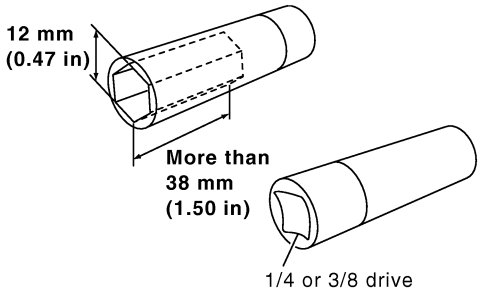
Tool number Tool name	Description	
KV10109300 Pulley holder	 NT628	**a: 68 mm (2.68 in)** **b: 8 mm (0.31 in) dia.**
KV111045S1 Balancer shaft bearing replacer set ① KV11104510 Replacer bar ② KV11104521 Guide plate ③ KV11104530 Adapter (Front bearing) ④ ST15243000 Drift	 NT258	Removing and installing balancer shaft bearing

Commercial Service Tools

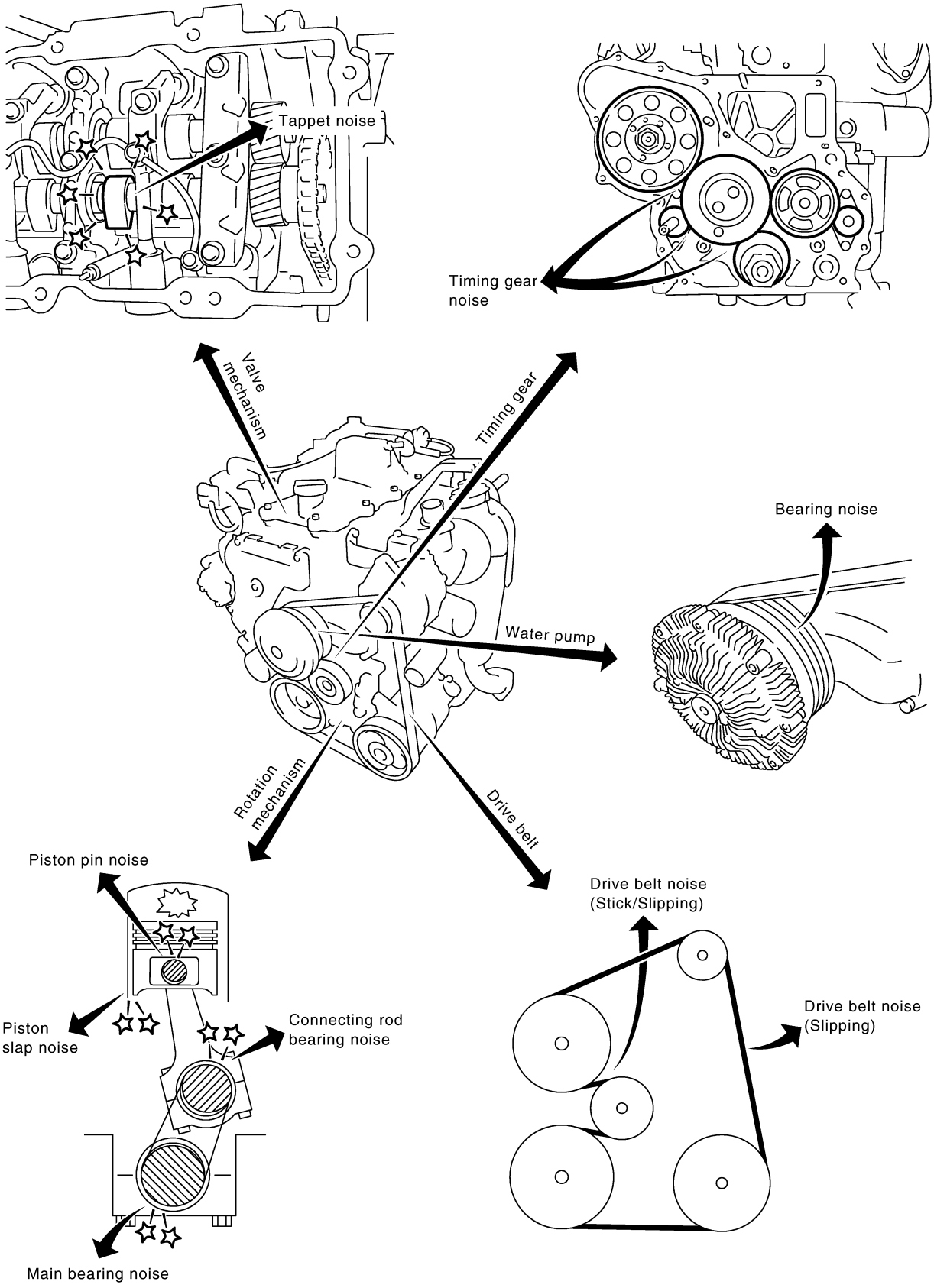
Tool name	Description	
Valve seat cutter set	 NT048	Finishing valve seat dimensions
Piston ring compressor	 NT044	Installing piston assembly into cylinder bore
Piston ring expander	 NT030	Removing and installing piston ring
Standard Universal	 NT808	Removing and installing transmission mount

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Commercial Service Tools (Cont'd)

Tool name	Description
Deep socket (12 mm)	 NT821 Removing and installing glow plugs

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SEM290G

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NVH Troubleshooting Chart — Engine Noise

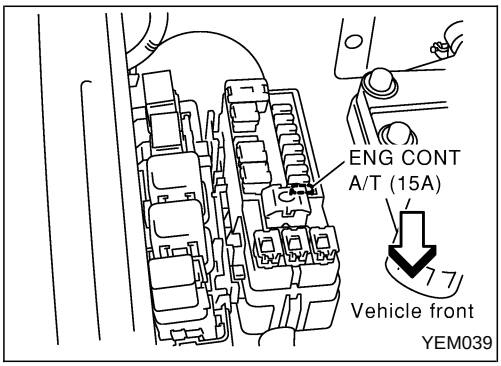
Use the chart below to help you find the cause of the symptom.
1. Locate the area where noise occurs.
2. Confirm the type of noise.
3. Specify the operating condition of engine.
4. Check specified noise source.

If necessary, repair or replace these parts.

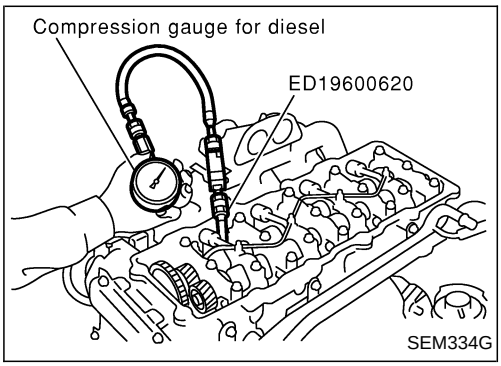
Location of noise	Type of noise	Operating condition of engine						Source of noise	Check item	Reference page
		Before warm-up	After warm-up	When starting	When idling	When racing	While driving			
Top of engine Rocker cover Cylinder head	Ticking or clicking	C	A	—	A	B	—	Tappet noise	Valve clearance	MA section (“Adjusting Intake & Exhaust Valve Clearance”, “ENGINE MAINTE-NANCE”)
	Rattle	C	A	—	A	B	C	Camshaft bearing noise	Camshaft bushing clearance Camshaft runout	EM-31, 31
Crankshaft pulley Cylinder block (Side of engine) Oil pan	Slap or knock	—	A	—	B	B	—	Piston pin noise	Piston and piston pin clear-ance Connecting rod bushing clearance	EM-71, 73
	Slap or rap	A	—	—	B	B	A	Piston slap noise	Piston-to-bore clearance Piston ring side clearance Piston ring end gap Connecting rod bend and torsion	EM-75, 72, 72, 73
	Knock	A	B	C	B	B	B	Connecting rod bearing noise	Connecting rod bushing clearance (Small end) Connecting rod bearing clearance (Big end)	EM-73, 77
	Knock	A	B	—	A	B	C	Main bear-ing noise	Main bearing oil clearance Crankshaft runout	EM-78, 76
Front of engine Timing gear cover	Tapping or ticking	A	A	—	B	B	B	Timing gear noise	Timing gear backlash	EM-41
Front of engine	Squeaking or fizzing	A	B	—	B	—	C	Other drive belts (Stick-ing or slip-ping)	Drive belts deflection	MA section (“Checking Drive Belts”, “ENGINE MAINTE-NANCE”)
	Creaking	A	B	A	B	A	B	Other drive belts (Slip-ping)	Idler pulley bearing operation	
	Squall Creak	A	B	—	B	A	B	Water pump bearing noise	Water pump bearing opera-tion	LC section (“Water Pump Inspection”, “ENGINE COOLING SYSTEM”)

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

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1. Warm up engine.
2. Turn ignition switch OFF.
3. Using CONSULT-II, make sure no error codes are indicated for self-diagnosis items. Refer to EC section, “Fuel Pressure Release”.
- Do not disconnect CONSULT-II until the end of this operation; it will be used to check engine rpm and for error detection at the end of this operation.
4. Disconnect the negative battery terminal.
5. Remove the following parts.
- Intercooler
- Throttle body
- Rocker cover
6. To prevent fuel from being injected during inspection, remove fuel injection pump fuse [ENG CONT A/T (15A)] from fuse box on the right side of engine compartment.
7. Remove glow plugs from all the cylinders.
- **Before removal, clean the surrounding area to prevent entry of any foreign materials into the engine.**
- **Carefully remove glow plugs to prevent any damage or breakage.**
- **Handle with care to avoid applying any shock to glow plugs.**



8. Install adapter (SST) to installation holes of glow plugs and connect compression gauge for diesel engine.
   : 15 - 19 N·m (1.5 - 2.0 kg-m, 11 - 14 ft-lb)
9. Connect battery negative terminal.
10. Set the ignition switch to “START” and crank. When gauge pointer stabilizes, read compression pressure and engine rpm. Repeat the above steps for each cylinder.
- **Always use a fully-charged battery to obtain specified engine speed.**

Unit: kPa (bar, kg/cm^2, psi)/rpm

Standard	Minimum	Difference limit between cylinders
2,942 (29.42, 30.0, 427)/200	2,452 (24.52, 25.0, 356)/200	294 (2.94, 3.0, 43)/200

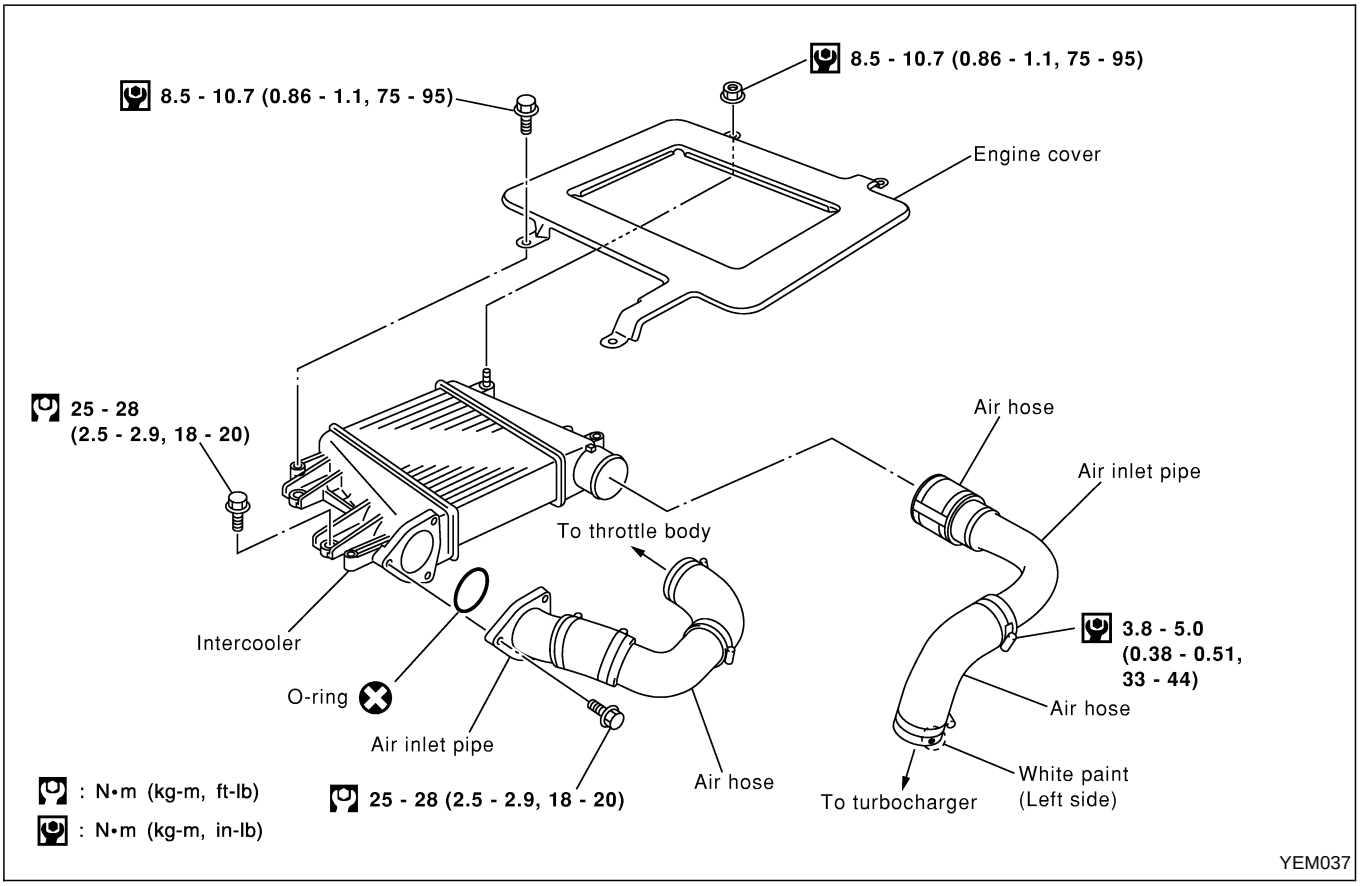
- When engine rpm is out of the specified range, check the specific gravity of battery liquid. Measure again under corrected conditions.
- If engine rpm exceeds the limit, check valve clearance and combustion chamber components (valves, valve seats, cylinder head gaskets, piston rings, pistons, cylinder bores, cylinder block upper and lower surfaces) and measure again.

11. Complete this operation as follows:

a. Turn the ignition switch to “OFF”.
b. Disconnect battery negative terminal.
c. Replace glow plug oil seals and install glow plugs.
d. Install fuel injection pump fuse [ENG CONT A/T (15A)].
e. Connect battery negative terminal.
f. Using CONSULT-II make sure no error code is indicated for items of self-diagnosis. Refer to EC section, “Trouble Diagnosis — Index”.

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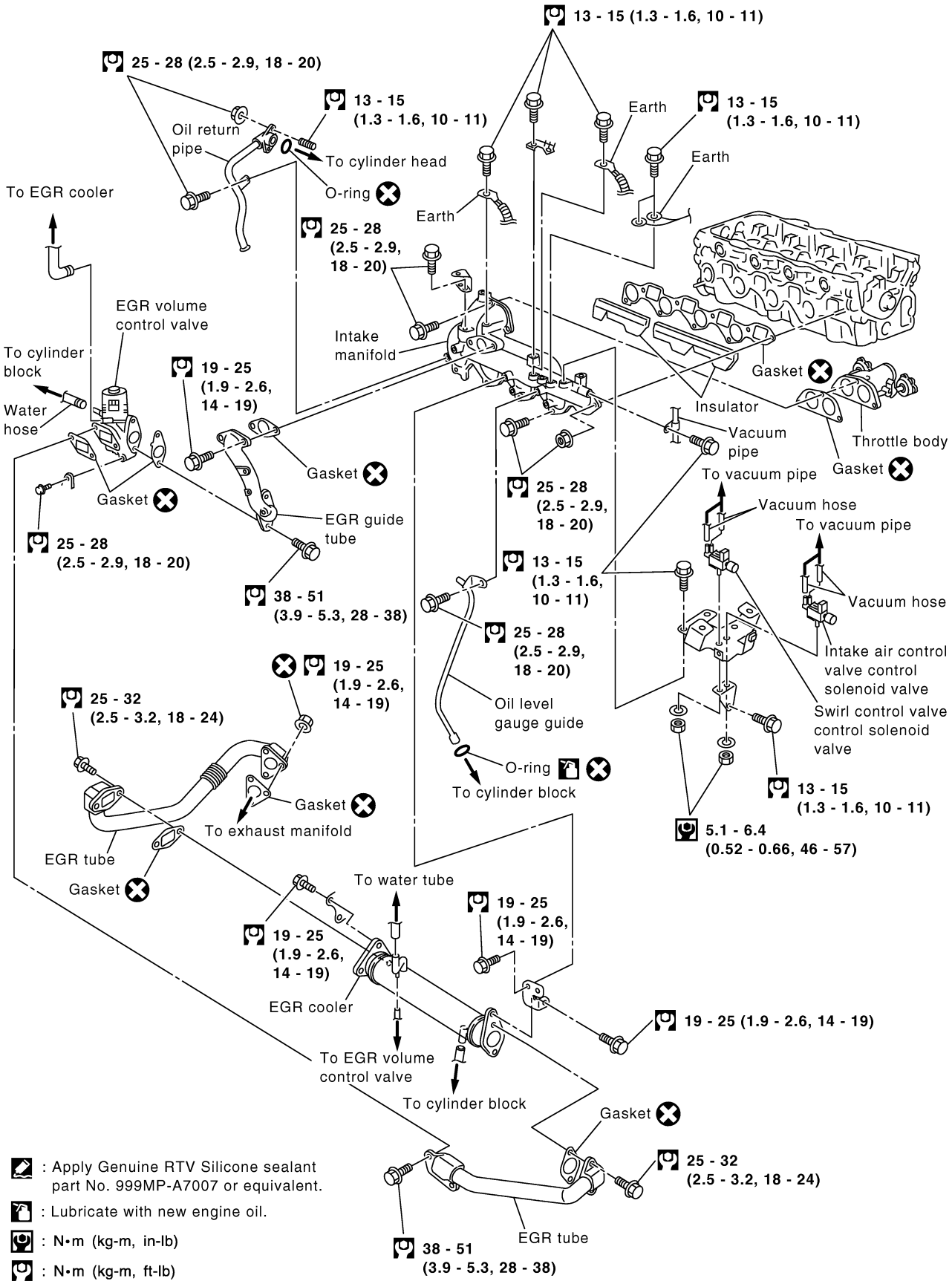
Removal and Installation



CAUTION:
To avoid damaging intercooler core when flushing intercooler with high pressure water, apply water straight to the core face.

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Removal and Installation



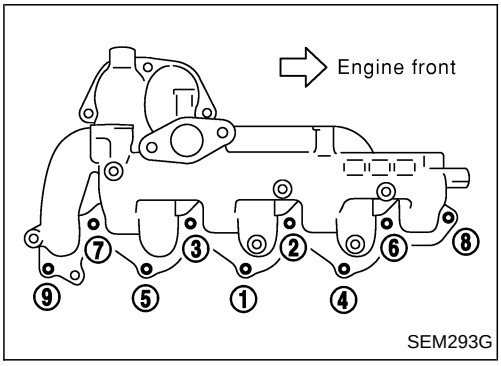
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Removal and Installation (Cont'd)

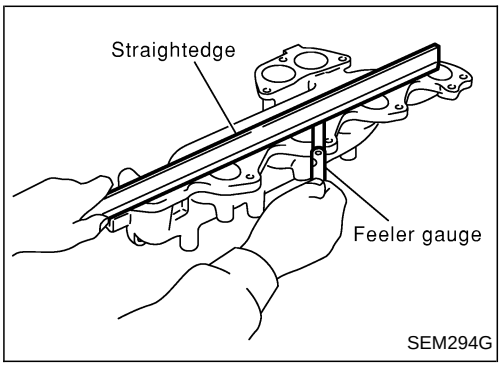
REMOVAL

1. Remove the following parts.
- Drain engine coolant. Refer to MA section, "Changing Engine Coolant".
- Remove engine cover. Refer to the figure at left.
- Remove intercooler.
- Remove air hose (on throttle body side).
- Remove injection tube.
- Remove or relocate wires/harnesses and tubes/pipes.



SEM293G

2. Remove intake manifold in the reverse order of that shown in the figure.



SEM294G

Inspection

Clean surface of intake manifold.
Use a reliable straightedge and feeler gauge to check the flatness of intake manifold surface.

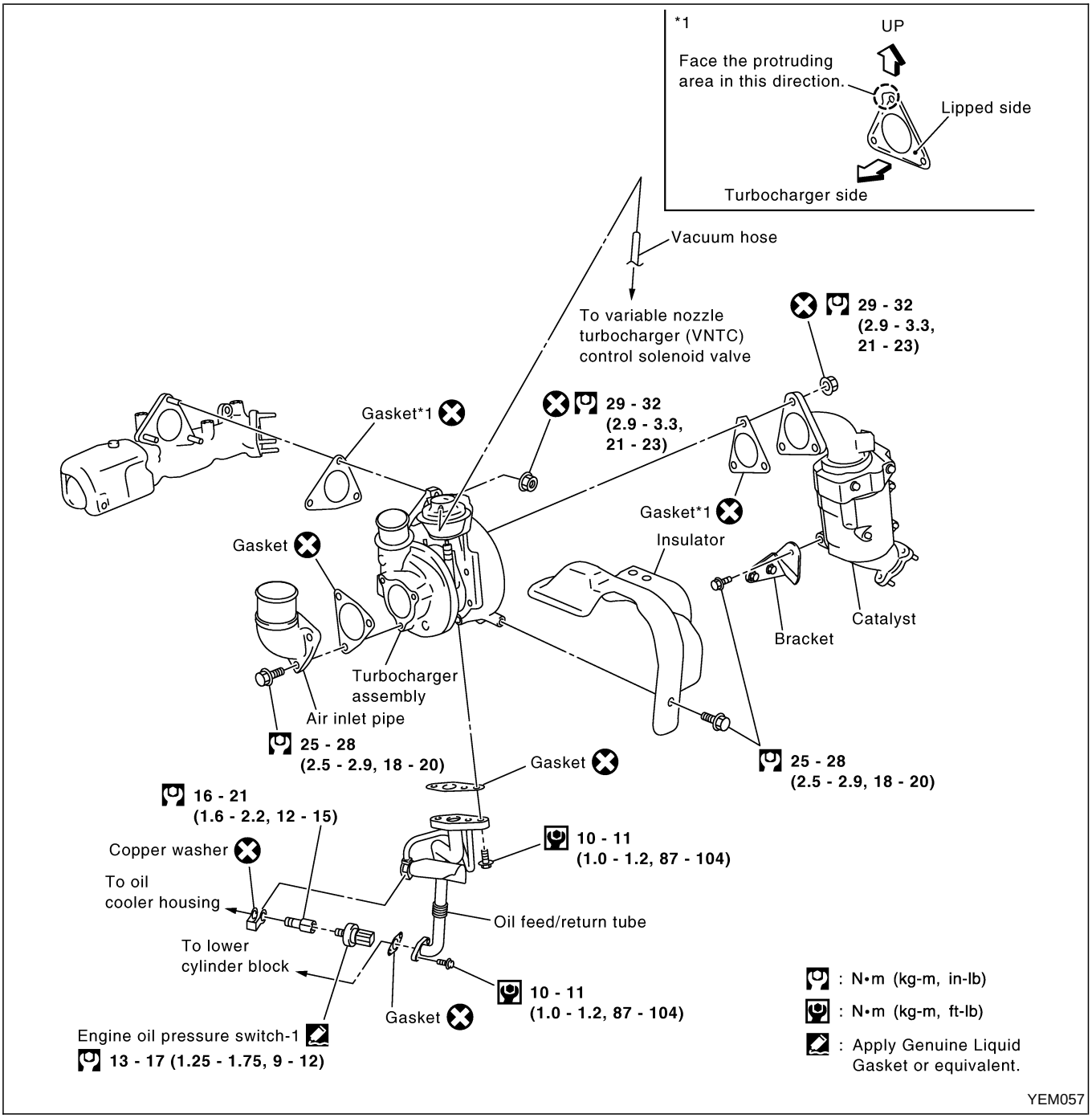
Intake manifold surface flatness:
Limit 0.2 mm (0.008 in)

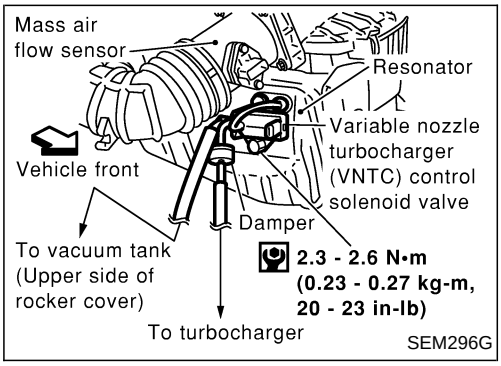
INSTALLATION

1. Tighten intake manifold in the numerical order shown in the figure.
: 25 - 28 N·m (2.5 - 2.9 kg-m, 18 - 20 ft-lb)
2. Install in the reverse order of removal.

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Removal and Installation





REMOVAL

1. Remove the following parts.
- Undercover
- Under guard
- Engine coolant (drain)
  Refer to MA section, “Changing Engine Coolant”.
- Exhaust front tube
  Refer to FE section, “Removal and Installation”, “EXHAUST SYSTEM”.
- Remove wires, harnesses, tubes and pipes.

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Removal and Installation (Cont'd)

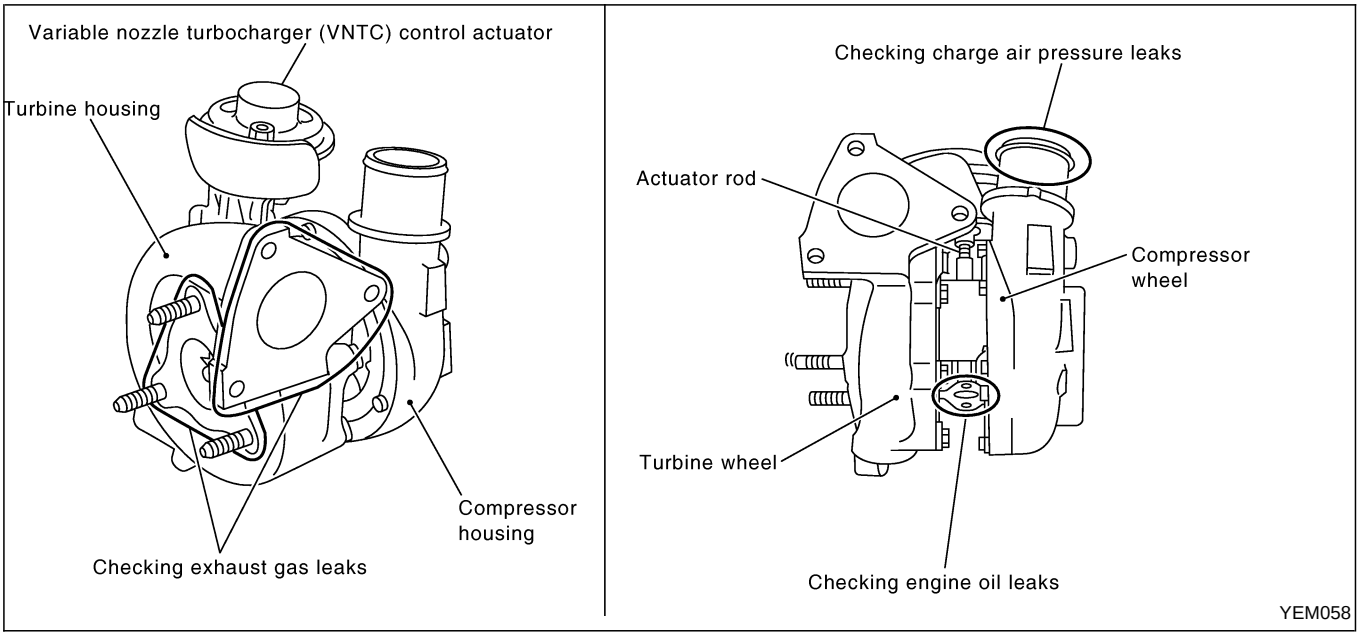
2. Remove catalyst.

CAUTION:

Do not disassemble catalyst.

Inspection

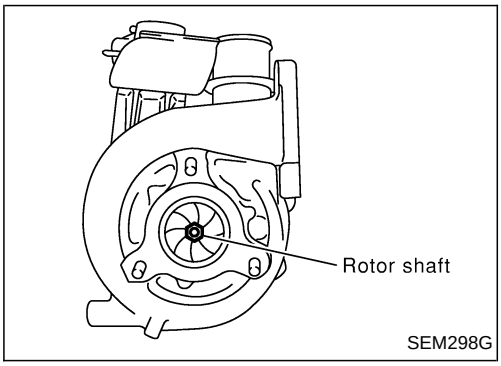
TURBOCHARGER



CAUTION:

When the compressor wheel, turbine wheel, or rotor shaft is damaged, remove all the fragments and foreign matter left in the following passages in order to prevent a secondary failure:

Suction side: Between turbocharger and intercooler
Exhaust side: Between turbocharger and catalytic converter



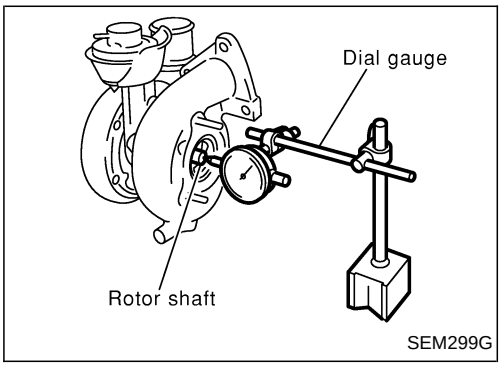
Rotor shaft

- Check that the rotor shaft rotates smoothly without any resistance when it is rotated by your fingertips.
- Check that the rotor shaft is not loose when it is moved vertically or horizontally.

Standard value for rotor shaft oil clearance:
0.086 - 0.177 mm (0.0034 - 0.0070 in)

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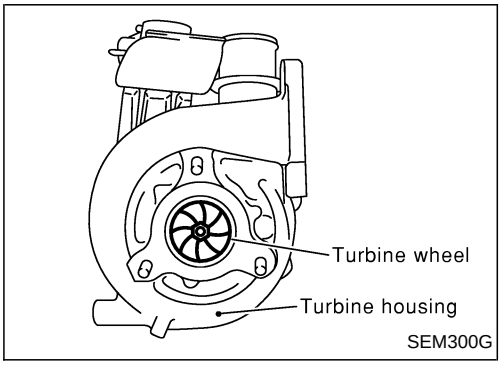
Inspection (Cont'd)



Rotor shaft end play

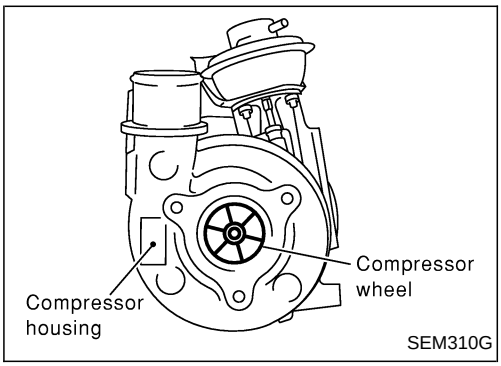
Place a dial gauge at the rotor shaft end in the axial direction to measure the end play.

Standard: 0.044 - 0.083 mm (0.0017 - 0.0033 in)



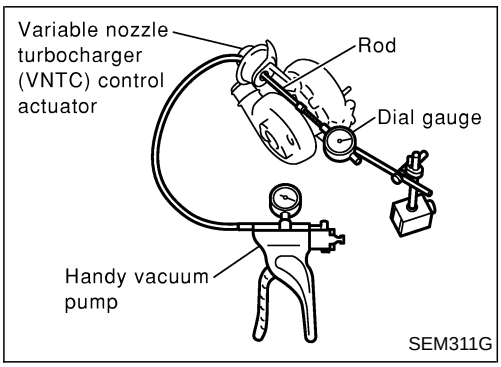
Turbine wheel

- Check that there is no oil adhesion.
- Check that there is no carbon accumulation.
- Check that blades of the turbine wheel are not bent or broken.
- Check that the turbine wheel does not interfere with the turbine housing.



Compressor wheel

- Check that there is no oil adhesion inside the air inlet.
- Check that the compressor wheel does not interfere with the compressor housing.
- Check that the wheel is not bent or broken.



VNT control actuator

- Connect the handy pump to the actuator, and check that the rod strokes smoothly in compliance with the following pressure.
- First, apply the inspection negative pressure of about −66.7 kPa (−667 mbar, −500 mmHg, 19.69 inHg), and then measure the values while reducing the negative pressure to 0.

  Standard (Vacuum pressure/rod stroke amount):

  −46.9±1.3 kPa (−469±13 mbar, −352±10 mmHg, −13.86±0.39 inHg)/0.2 mm (0.008 in)
  −30.8±0.7 kPa (−308±7 mbar, −231±5 mmHg, −9.09±0.20 inHg)/5.0 mm (0.197 in)
  Approximately −22.7 kPa (−227 mbar, −170 mmHg, −6.69 inHg)/Rod stroke end

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Inspection (Cont'd)

Trouble diagnosis of turbocharger

Preliminary check:
Check that the VNT control valve system has no malfunction. Refer to EC section, "ECM Terminals and Reference Value" in "TROUBLE DIAGNOSIS — GENERAL DESCRIPTION".

- Check that the engine oil level is between MIN and MAX of the dipstick. (When the engine oil amount is more than MAX, the oil flows into the inlet duct through the blow-by gas passage, and the turbocharger is misjudged failure.)
- Ask the customer if he/she always runs the vehicle in idle engine speed to cool the oil down after driving.
- Replace the turbocharger assembly when any malfunction is found after unit inspections specified in the table below.
- If no malfunction is found after the unit inspections, judge that the turbocharger body has no failure. Check the other parts again.

Inspection item	Inspection result	Symptom (when each inspection item meets each inspection result)			
		Oil leakage	Smoke	Noise	Insufficient power/ acceleration failure
Turbine wheel	Oil leaks.	△	◎	△	△
	Carbon is accumulated.	△	◎	○	○
	Friction with housing.	△	○	◎	○
	Blades are bent or broken.			◎	◎
Compressor wheel	Inside the air inlet is seriously contaminated by oil.	○	○		
	Friction with housing.	△	○	◎	○
	Blades are bent or broken.			◎	◎
After checking both turbine and compressor, inspect rotor shaft end play.	There is resistance when the rotor shaft is rotated by your fingertips.		△	△	○
	The rotor shaft sometimes does not rotate by your fingertips.				◎
	There is too much play in the bearing.	△	△	○	△
Oil return port	Carbon or sludge is accumulated in the waste oil hole.	△	◎	△	△
Operation of VNT control actuator	● The actuator does not operate smoothly when vacuum pressure is gradually applied. ● Stroke amount is not in compliance with the vacuum pressure.		○		◎

◎: Large possibility
○: Medium possibility
△: Small possibility

INSTALLATION

1. Install catalyst.

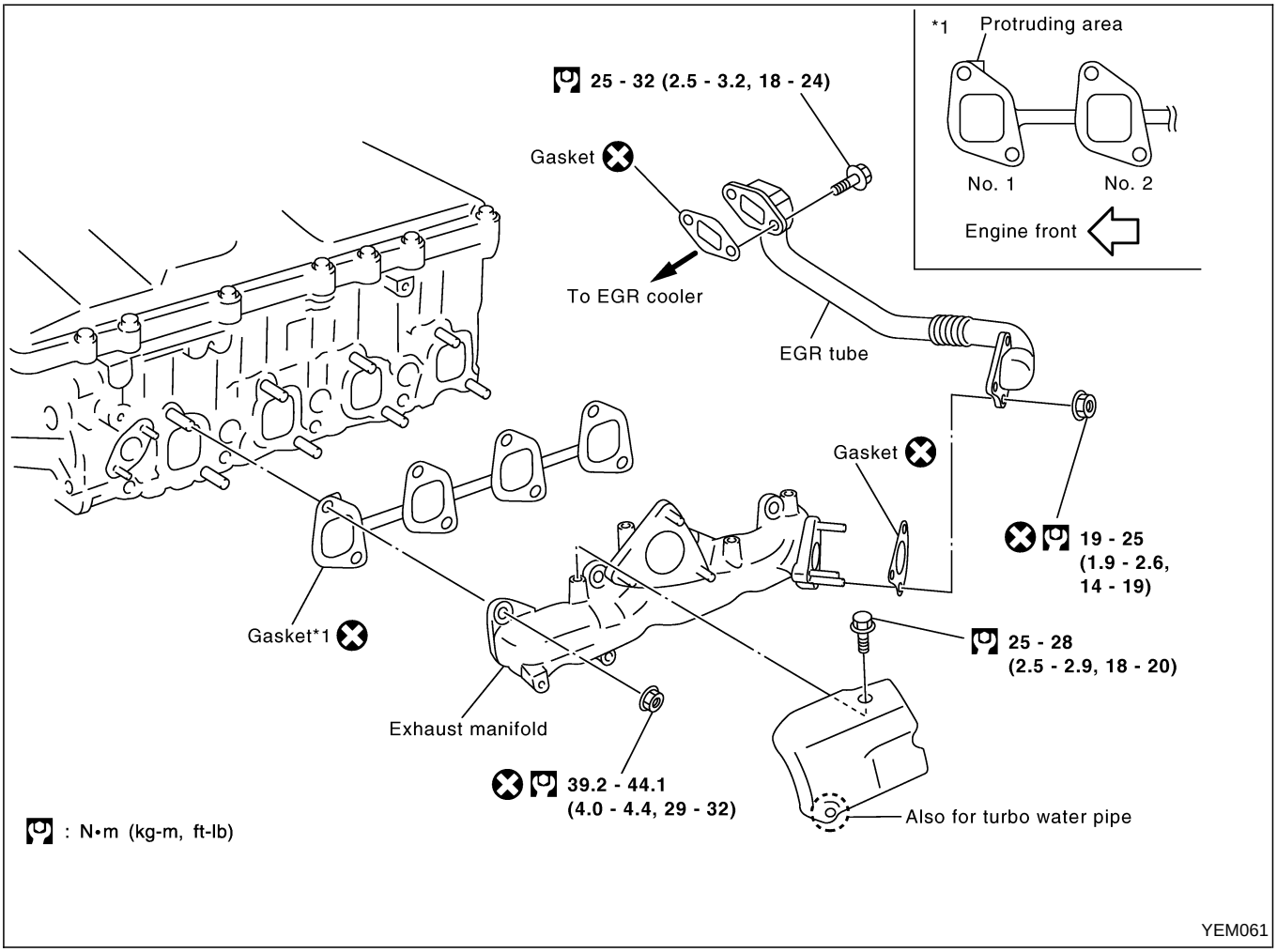
: 29 - 39 N·m (2.9 - 3.3 kg-m, 21 - 23 ft-lb)

Place the protruding area of the gasket between the turbocharger and the exhaust outlet upwards, and install the lipped side to the turbocharger side. Refer to the figure, EM-14.

2. Install in the reverse order of removal.

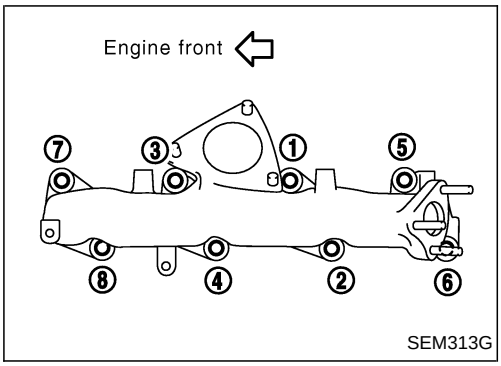
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Removal and Installation



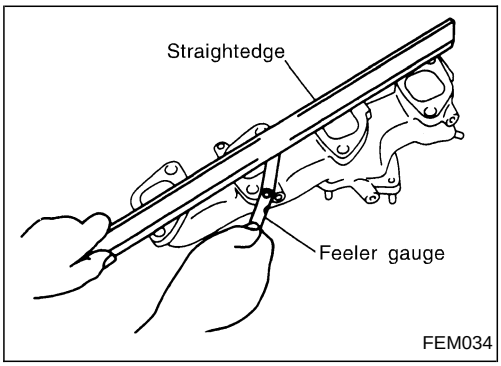
REMOVAL

1. Remove the following parts.
- Refer to “PREPARATIVE WORK” in “CATALYST AND TURBOCHARGER”, EM-14.
- Remove catalytic converter.
- Remove turbocharger.



2. Loosen nuts holding the exhaust manifold in the reverse order of that shown in the figure.

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Inspection

EXHAUST MANIFOLD

Check distortion on mounting surface with straightedge and feeler gauge.

Limit: 0.2 mm (0.008 in)

INSTALLATION

1. Tighten exhaust manifold holding nuts in the numerical order shown in the figure.

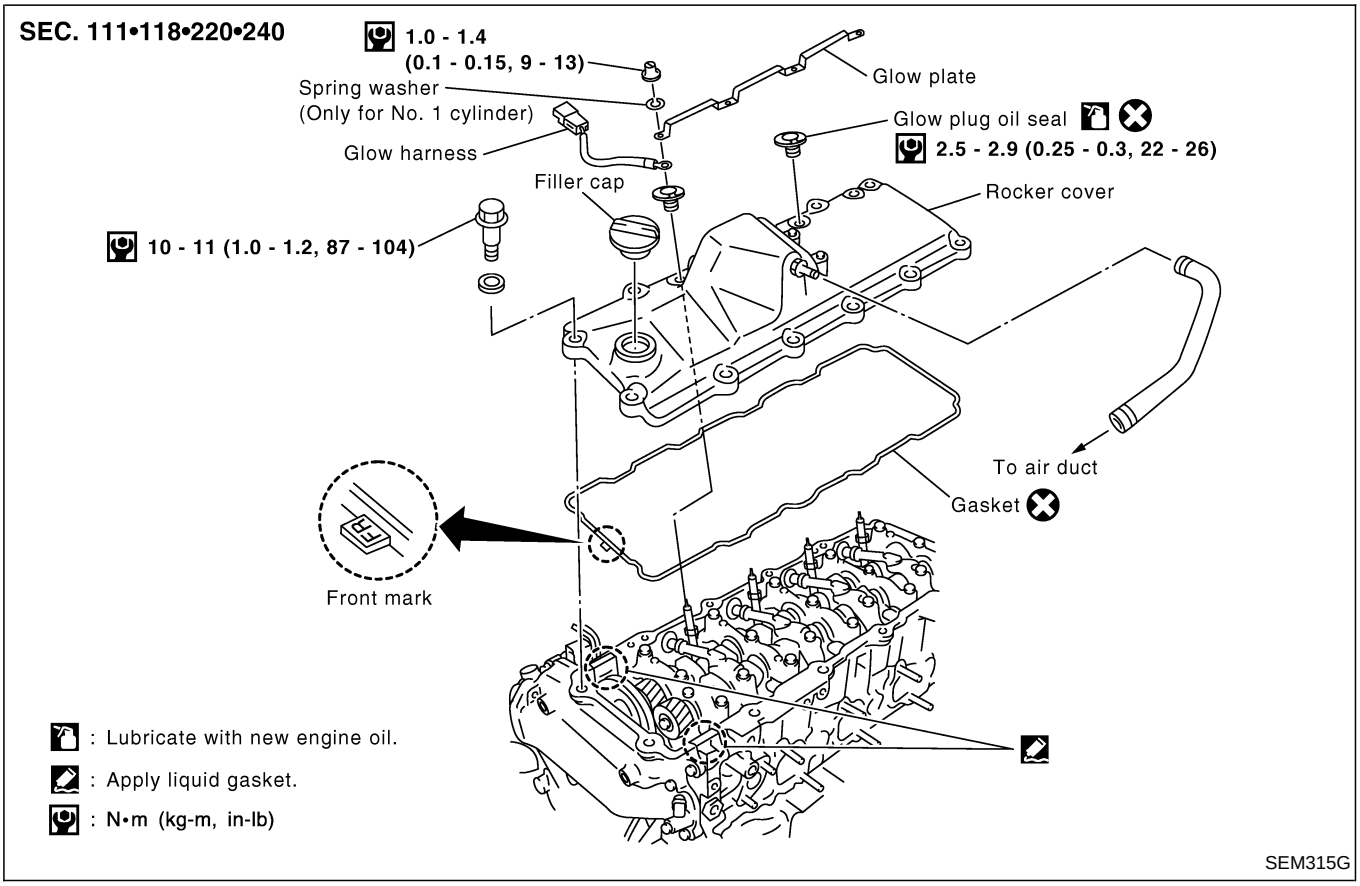
   : 39.2 - 44.1 N·m (4.0 - 4.4 kg-m, 29 - 32 ft-lb)

NOTE:
Install gasket so that the protruding tab (mark for correct installation) is positioned on the side of No. 1 port (front side). Refer to component structure diagram on the previous page.

2. Install in the reverse order of removal.

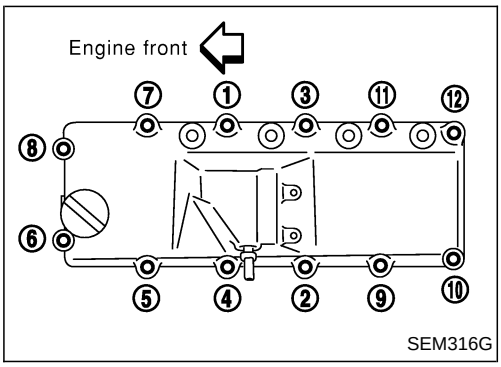
http://vnx.su/

Removal and Installation



REMOVAL

1. Remove the following parts.
- Engine cover
- Intercooler
- Air inlet pipe
- Throttle body
- Wires, harnesses, tubes and pipes

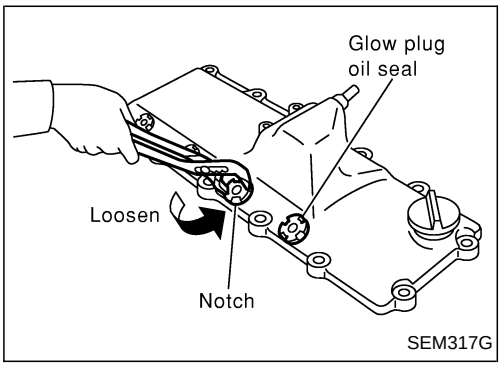


2. Loosen holding bolts in the reverse order of that shown in the figure and remove.
3. Remove rocker cover to the direction of glow plug tilt.
4. Remove glow plug oil seals.

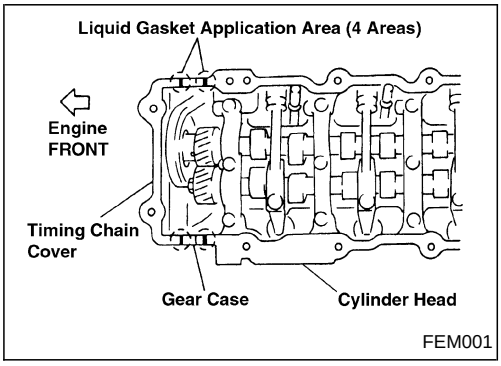
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Removal and Installation (Cont'd)

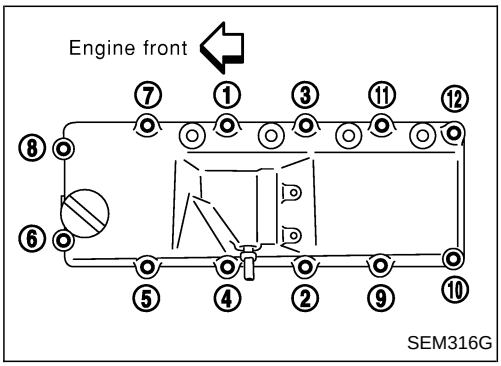
INSTALLATION



1. Temporarily tighten holding bolts in the numerical order shown in the figure.



2. Apply Three Bond 1207C (KP510 00150) to the area shown in the figure.
3. Use a scraper to remove old liquid gasket.
4. Apply once more.
5. Apply engine oil to glow plug oil seals and install them.

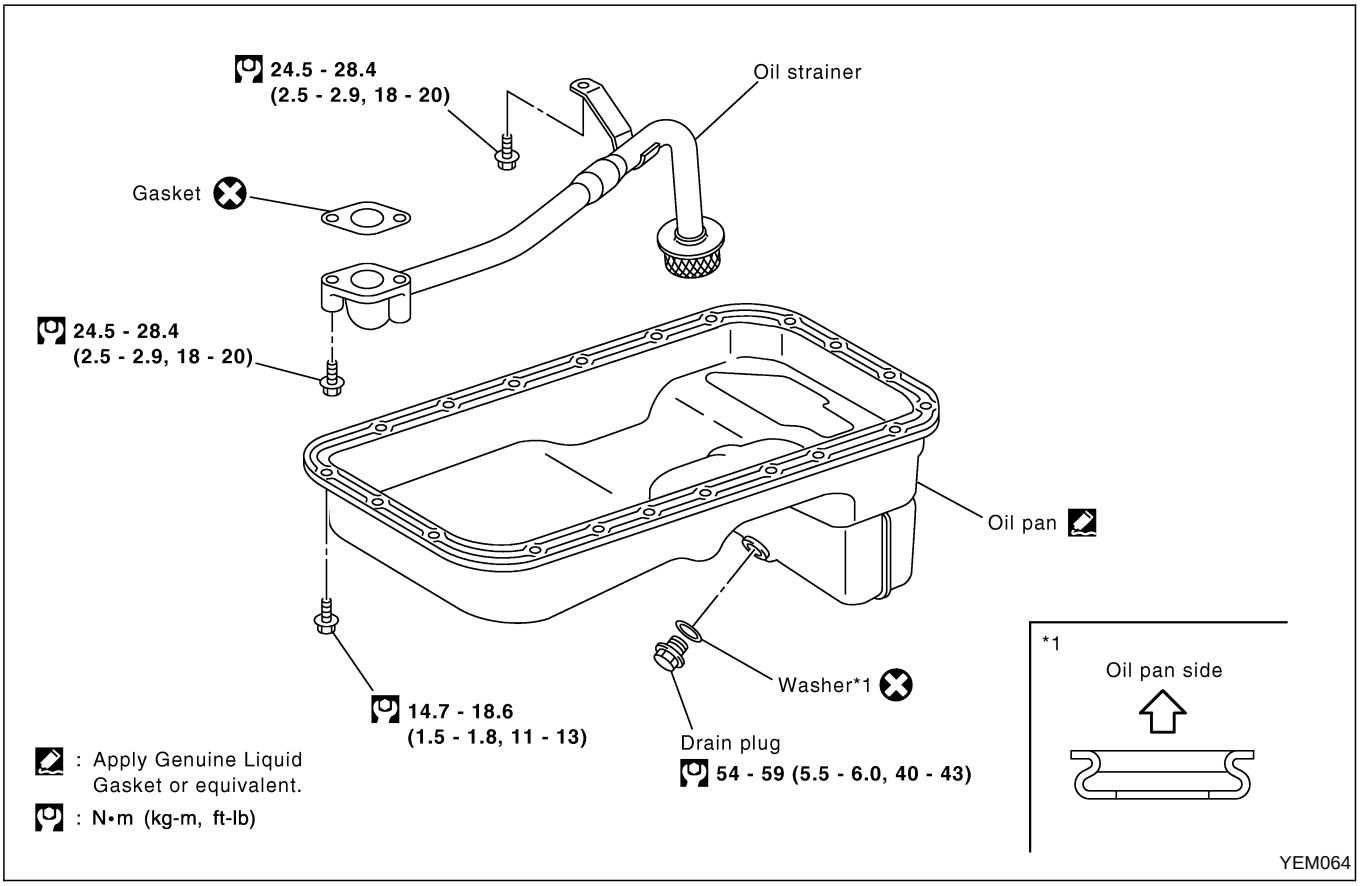


6. Tighten holding bolts in the numerical order shown in the figure.
7. Re-tighten to the same torque in the same order as above.

8. Install in the reverse order of removal.

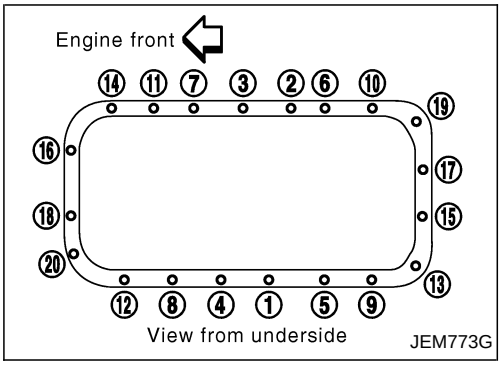
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Removal and Installation



REMOVAL

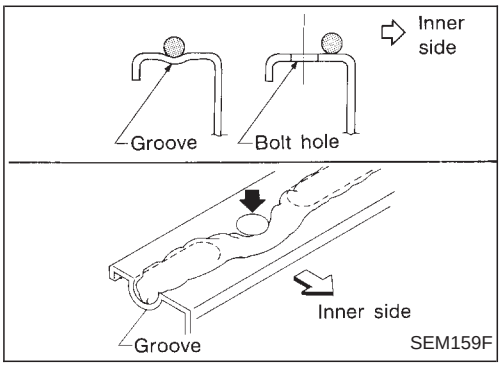
1. Drain engine oil.
2. Remove the following parts.
- Under guard
- Crossmember, differential member, front final drive assembly
- Engine gusset



3. Loosen and remove oil pan installation bolts in reverse order of numbers in the figure.
4. Use a seal cutter (special service tool) to cut away liquid gasket and remove oil pan.
5. Remove oil strainer.

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Removal and Installation (Cont'd)



INSTALLATION

1. Install oil strainer.
2. Install oil pan.

a. Use a scraper to remove all traces of liquid gasket from mating surfaces.

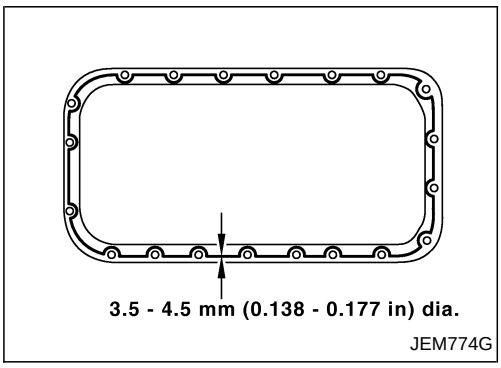
- Also remove traces of liquid gasket from mating surface of cylinder block, front cover.
- **Remove old liquid gasket from the bolt hole and thread.**

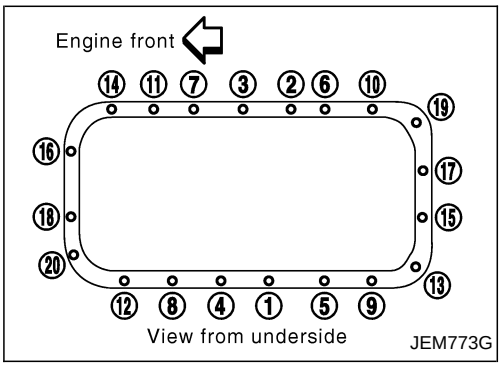
b. Apply a continuous bead of liquid gasket to mating surface of oil pan.

- **Use Genuine Liquid Gasket or equivalent.**
- **Apply liquid gasket to the groove on the mating surface.**
- **Allow 8 mm (0.31 in) clearance around center of bolt holes.**

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

- **Be sure liquid gasket is 3.5 to 4.5 mm (0.138 to 0.177 in).**
- **Attaching should be done within 5 minutes after coating.**

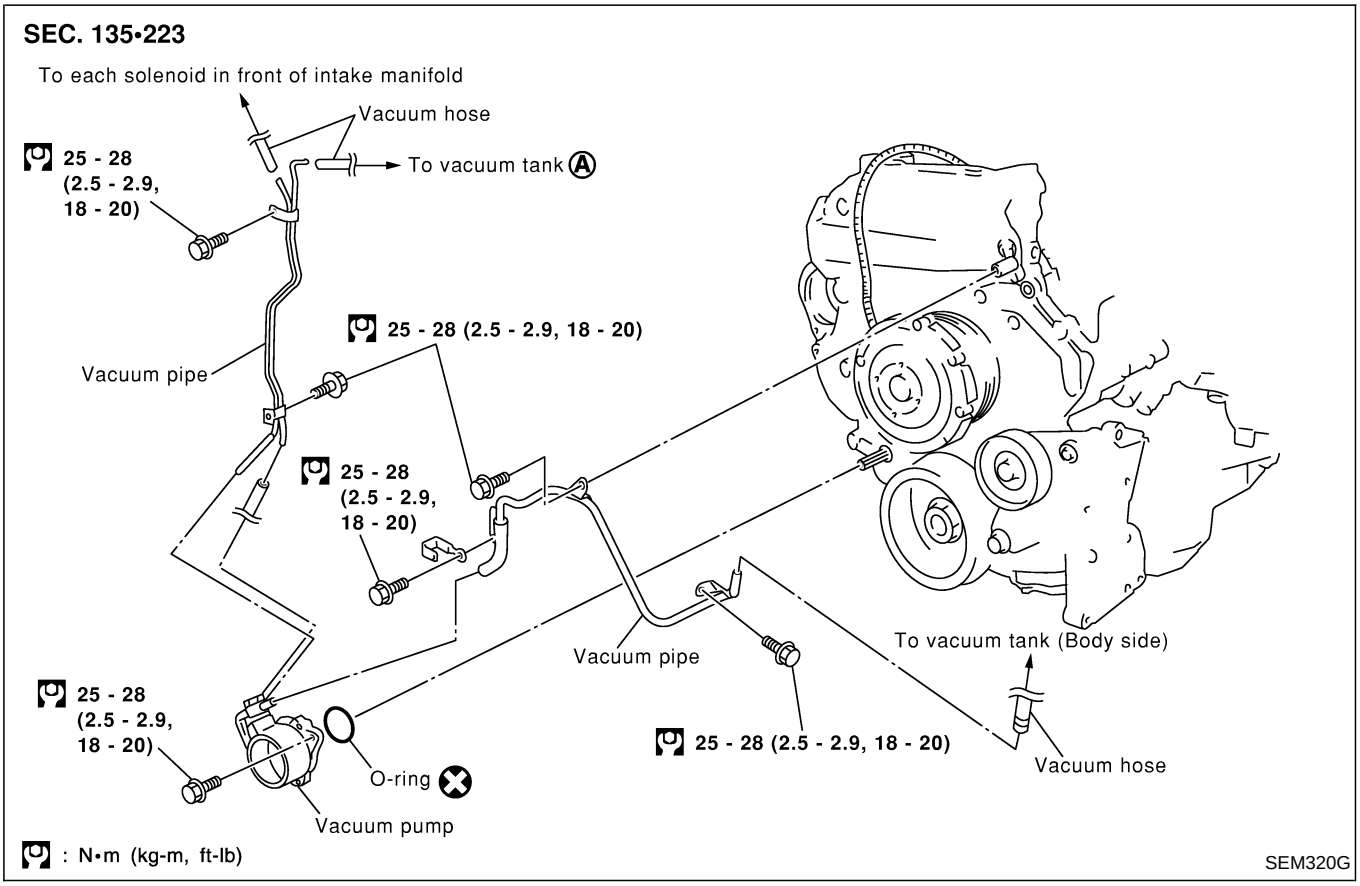


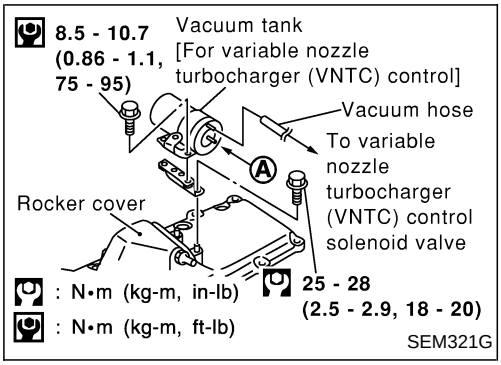


2. Tighten the mounting bolts in the order shown in the figure. Then tighten in the same order to the torque stated.
3. The torque of the installation bolts will differ depending on position.
4. Install in the reverse order of removal.

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Removal and Installation





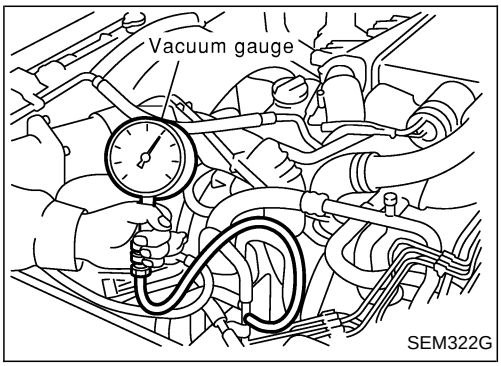
REMOVAL

1. Remove the following parts.
- Radiator under side
- Radiator shroud
- Cooling fan
- Chain cover front side
- A/T cooler hose (Disconnect)
- Vacuum hose
- Intercooler cover (When removing vacuum tank)

2. Remove the installation bolts and pull the vacuum pump from the engine front directly.
3. If it is difficult to remove from the spline shaft connection, tap lightly with a plastic hammer.

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Removal and Installation (Cont'd)



INSPECTION

1. Remove the vacuum hose. Connect the vacuum gauge through the 3-way connector. Otherwise, remove the welch valve of the vacuum pipe and attach the vacuum gauge directly. (The illustration shows the second method.)

- Remove an appropriate part to measure the vacuum pump load pressure directly and install the vacuum gauge. Refer to the figure.

2. Start the engine, and measure the load pressure with the engine idling.

Vacuum pressure:

Standard

−93.3 to −101.3 kPa (−933 to −1,013 mbar, −700 to −760 mmHg, −27.56 to −29.92 inHg)

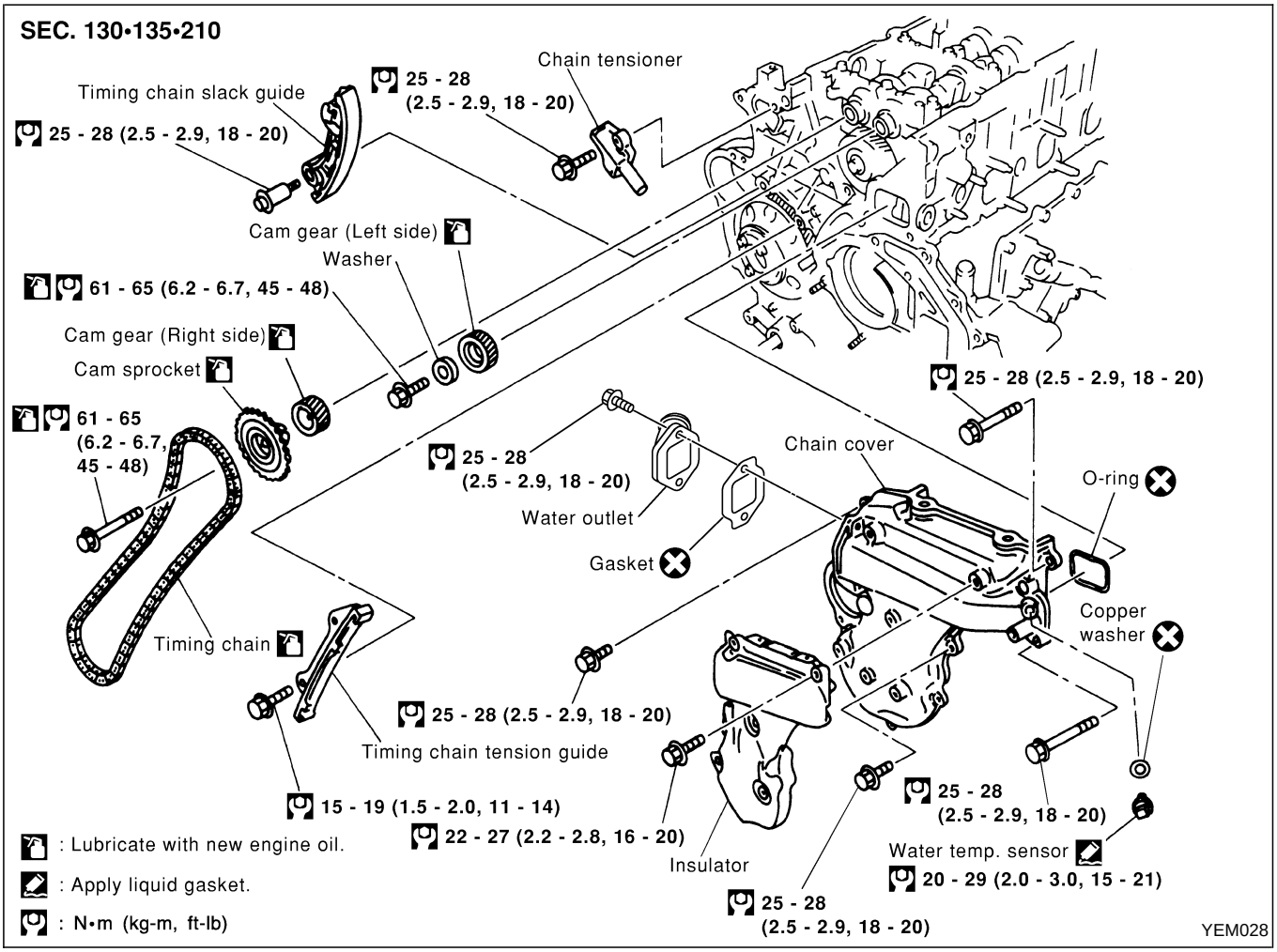
3. If outside the standard value, make sure that there is no intake of air within the circuit and measure again.
4. Replace the vacuum pump if still outside the standard value.

INSTALLATION

- Install in the reverse order of removal.

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Removal and Installation



CAUTION:

As the internal mechanism of the idler gear must first of all, and always, be set by a bolt when removing the timing chain before removing the fuel injection pump and timing gear, follow the procedures on EM-38, "Removal of timing chain after setting idler gear", "Electronic controlled fuel injection pump".

- This chapter will deal with the summary of removing the timing chain before removing the camshaft and cylinder head.

Removal

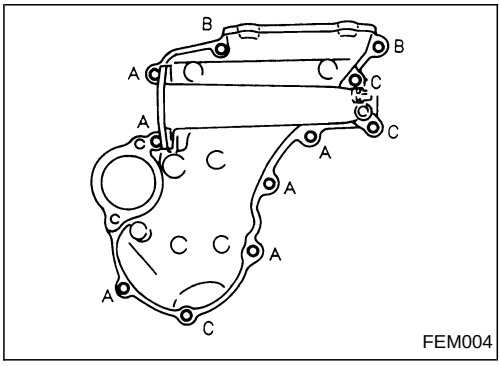
1. Remove the following parts.

- Engine cover
- Intercooler
- Air inlet pipe
- Throttle body
- Rocker cover
- Spill tube
- Coolant (Drain)
- Radiator upper hose
- Water outlet
- Radiator shroud
- Cooling fan
- Auxiliary belt
- Vacuum pipe
- Vacuum pump

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Removal (Cont'd)

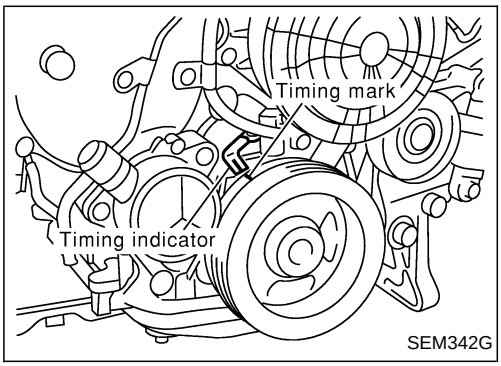
2. Move the following parts.
- TDC sensor harness
- Power steering oil pump



FEM004

3. Remove the chain cover.
- Remove the holding bolts A to C shown in the figure.

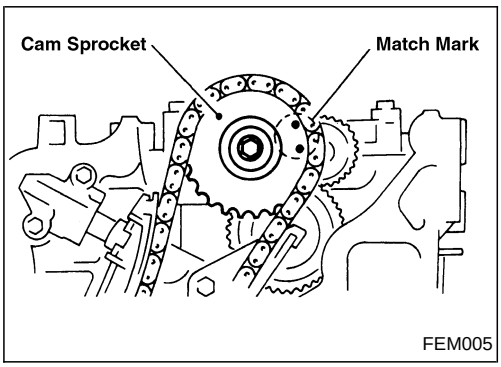
CAUTION:
While the chain cover is removed, be careful not to allow entry of dust or foreign objects.



SEM342G

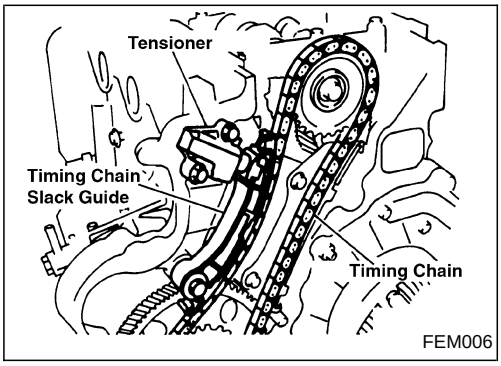
4. Set the No. 1 cylinder to the TDC.

1) Turn the crankshaft pulley clockwise, and match the timing indicator of the gear case to the timing mark of the crankshaft pulley.



FEM005

2) Make sure that the cam sprocket match mark is in the position shown in the figure.
- If the match mark is not in position, turn the crankshaft pulley once more and position it.
- When removing at No. 1 cylinder TDC, each sprocket and chain is fitted using the match mark, therefore there is no need to apply any match marks beforehand.



FEM006

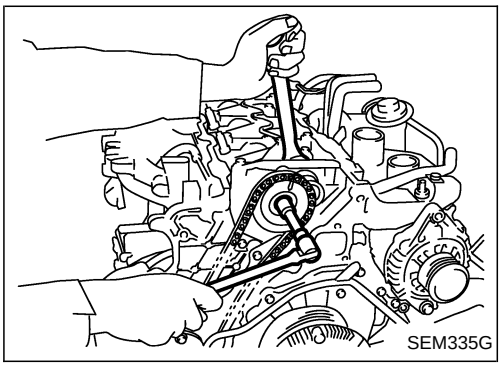
5. Remove the chain tensioner.

1) Loosen upper and lower holding bolts.
2) Holding the chain tensioner in your hand, remove the upper holding bolt and release the spring tension.
3) Remove the lower holding bolt, then remove the chain tensioner.
- The chain tensioner does not have a mechanism which prevents the ejection of the plunger. (It does have a mechanism which prevents the plunger from returning.)

CAUTION:
Be careful not to drop the plunger and spring.

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Removal (Cont'd)


SEM335G

6. Remove the timing chain slack guide.
7. Remove the timing chain with cam sprocket.

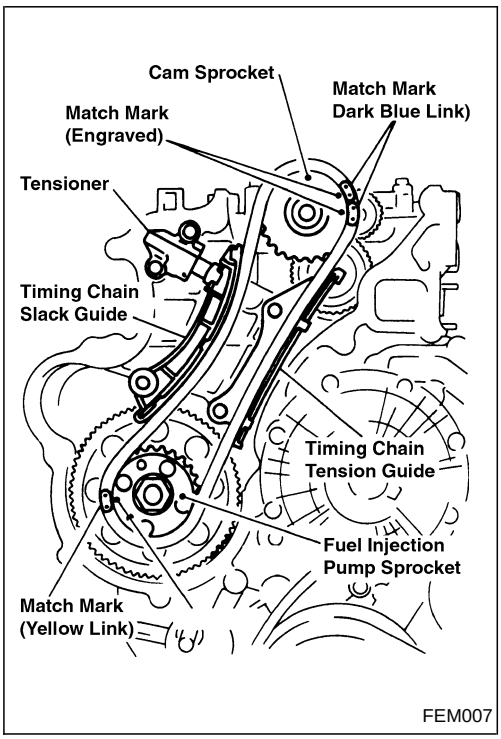
- Loosen the cam sprocket holding bolt by fixing the hexagonal portion of the intake manifold side camshaft with a spanner, etc.
- If the spill tube is not removed, fix the hexagonal portion of the exhaust manifold side camshaft.

CAUTION:

Do not loosen the holding bolt by using the tension of the chain.

8. Remove the timing chain tension guide.

Installation



FEM007

1. Install the timing chain tension guide.
2. Install the cam sprocket and the timing chain together.

- Install by aligning the sprocket and timing chain match marks.
- Tighten the cam sprocket holding bolt by fixing the hexagonal portion of the camshaft.

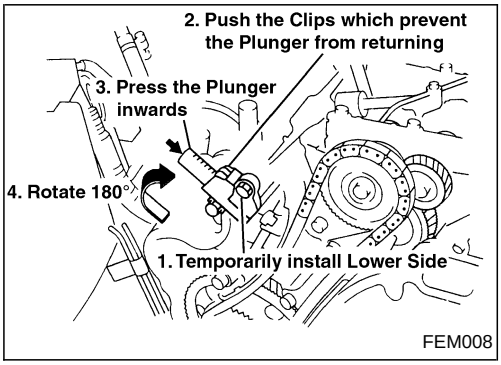
CAUTION:

Do not tighten in the holding bolt using the tension of the chain.

3. Install the timing chain slack guide.

CAUTION:

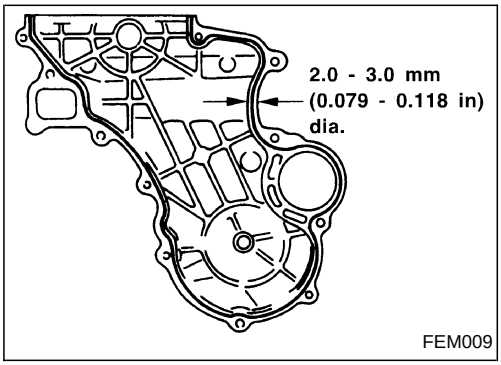
When the holding bolt is tightened to the specified torque, there is a gap between the guide and bolt. Do not over-tighten.



FEM008

4. Install the chain tensioner.

1) With the chain tensioner in the position shown in the figure (with the plunger on the outer side), temporarily tighten the holding bolt.
2) Press the plunger into the tensioner body while pressing on the clips which prevent the plunger from returning.
3) Install the upper side holding bolt while holding the plunger down with your finger and rotating it 180 degrees.
4) Tighten the holding bolt to the specified torque.



FEM009

5. Install the chain cover.

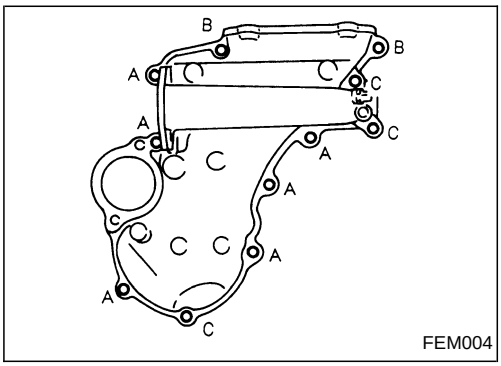
1) Before installing chain cover, remove all traces of liquid gasket from mating surface using a scraper.
2) Apply a continuous bead of liquid gasket to chain cover.

- **Use Genuine Liquid Gasket or equivalent.**

a. Coat of liquid gasket should be maintained within 2.0 to 3.0 mm (0.079 to 0.118 in) dia. range.
b. Attach chain cover to gear case within 5 minutes after coating.
c. Wait at least 30 minutes before refilling engine oil or starting engine.

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Installation (Cont'd)

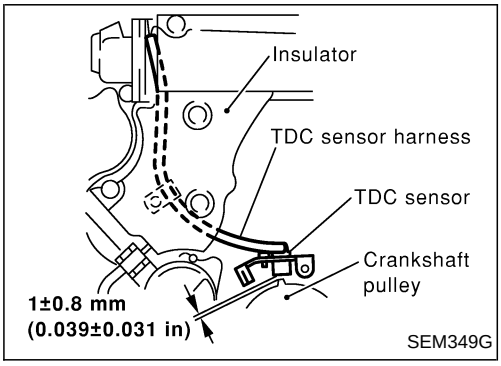


3) Install the chain cover.

- The dimension below the neck of the holding bolt will vary depending on the part.

Dimension below the neck:

A: 20 mm (0.79 in)
B: 50 mm (1.97 in)
C: 60 mm (2.36 in)



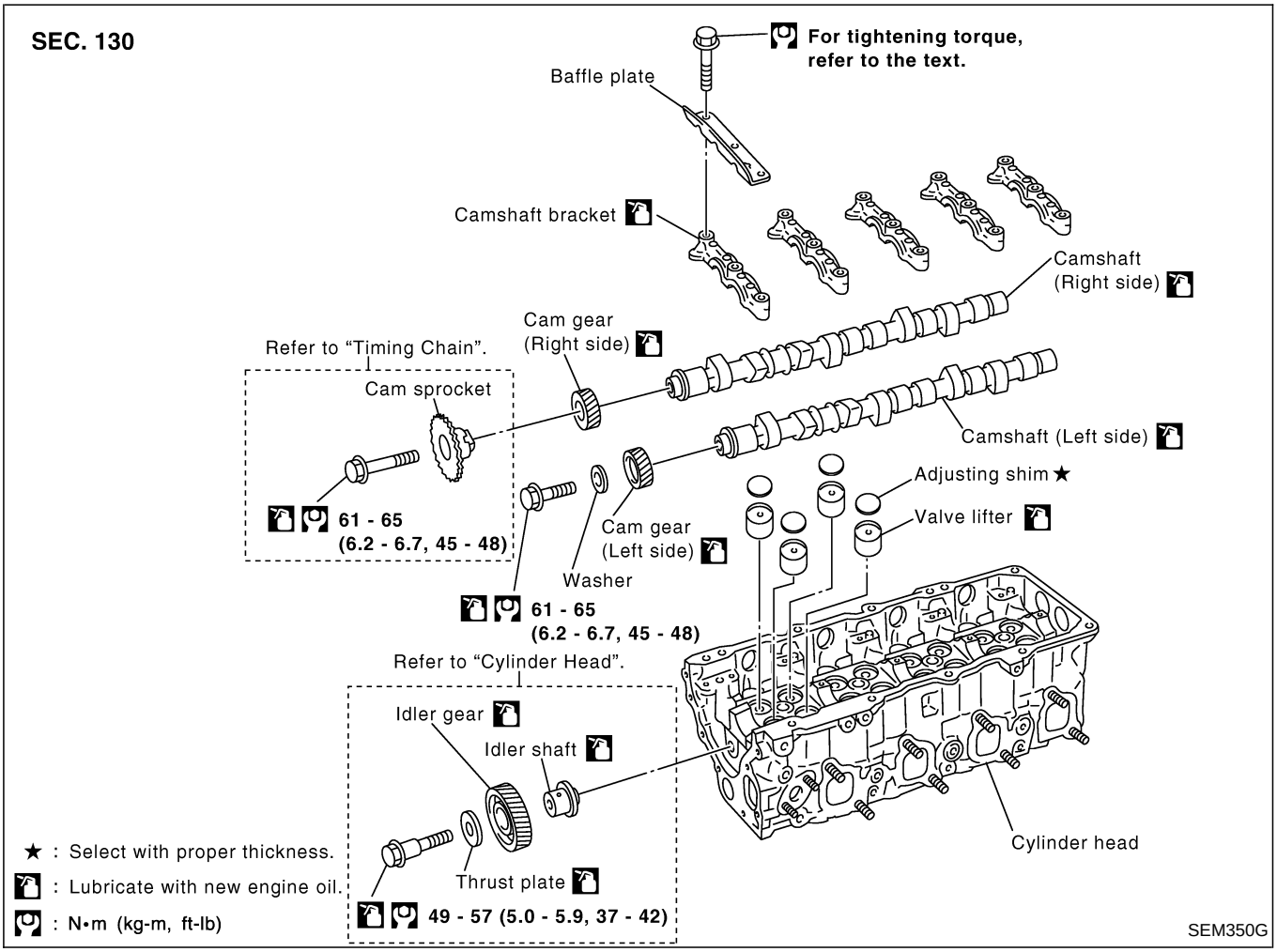
6. Install by following all removal procedures in reverse.

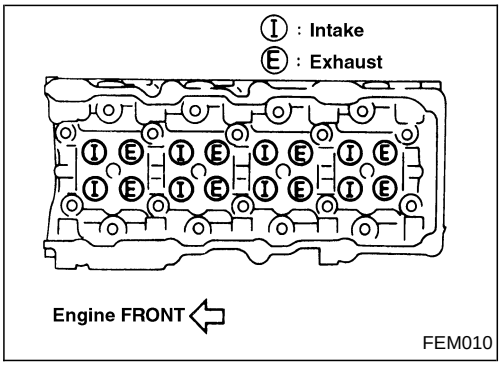
CAUTION:

- **Arrange the TDC sensor harness in the position shown in the figure.**
- **Make sure that the harness has no deflection around the vicinity of the crankshaft pulley when installing the clamp.**

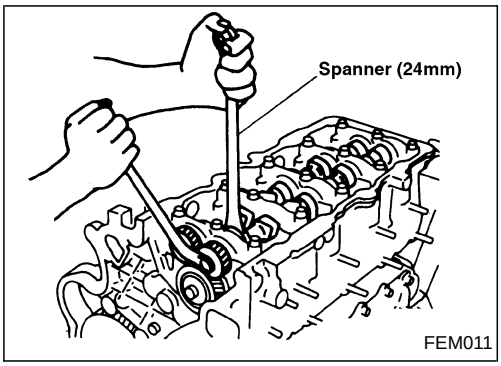
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Removal and Installation





- This engine will have a different valve arrangement from normal DOHC 4-valve type engines. As both camshafts on this engine have intake and exhaust cams, in this chapter they are named as follows:
  Camshaft (Right side): Intake manifold side camshaft
  Camshaft (Left side): Exhaust manifold side camshaft
- The same parts are used for the right and left sides.
- Refer to the figure for intake and exhaust valve arrangement. (The camshafts have, alternately, either an intake valve or an exhaust valve.)



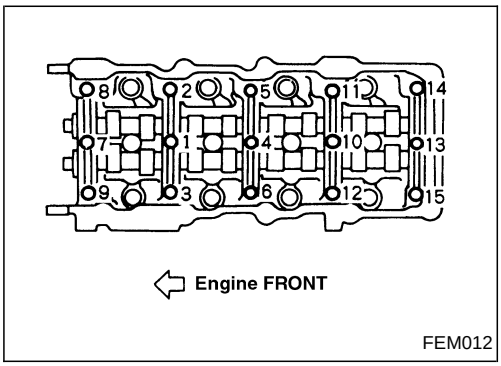
Removal

1. Set the No. 1 cylinder at TDC, then remove the chain case, timing chain and other parts in connection. Refer to “TIMING CHAIN”, EM-26.
2. Remove the cam gear.

- Loosen the cam gear installation bolt by fixing the hexagonal portion of the camshaft.
- The idler gear cannot be removed at this point as the gear case is in the way. (The cylinder head can be removed as a single unit.)

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Removal (Cont'd)



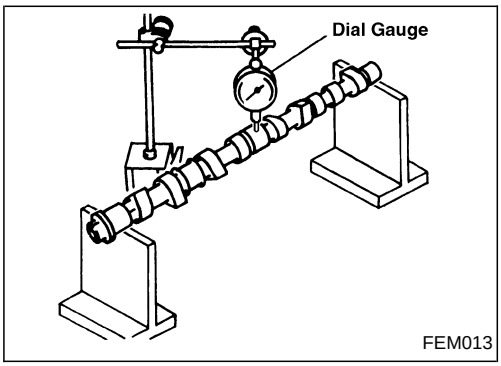
FEM012

3. Remove injection tube and injection nozzle assembly. Refer to EC section, "Injection Tube and Injection Nozzle" in "BASIC SERVICE PROCEDURE".
4. Remove the camshaft.
- Place distinguishing marks on the right and left sides with paint.
- Loosen and remove the installation bolt in reverse order shown in the figure.
5. Remove the adjusting shim and valve lifter.
- Remove by taking notice of the installation position, and place outside engine in order to prevent confusion.

Inspection

VISUAL CHECK OF CAMSHAFT

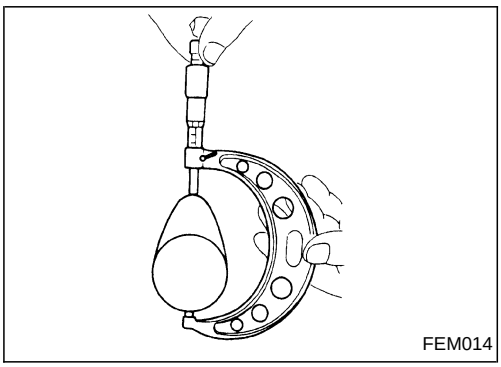
- Check the camshaft for one sided wear or scratches.
- Replace the camshaft if there are abnormalities.



FEM013

CAMSHAFT RUNOUT

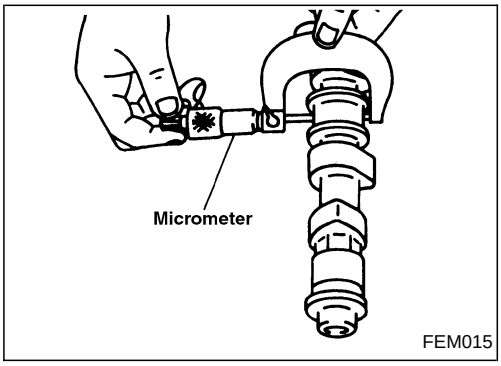
- Prepare V-block on a flat surface and secure camshaft journals No. 1 and No. 5.
- Set the dial gauge vertically on journal No. 3.
- Rotate camshaft in one direction by hand, then read needle movement on dial indicator.
  Camshaft bend value is 1/2 of needle movement.
  Limit: 0.02 mm (0.0008 in)


FEM014

HEIGHT OF CAM NOSE

Measure by using a micrometer.

Standard:
Intake
40.468 - 40.508 mm (1.5932 - 1.5948 in)
Exhaust
40.830 - 40.870 mm (1.6075 - 1.6091 in)



FEM015

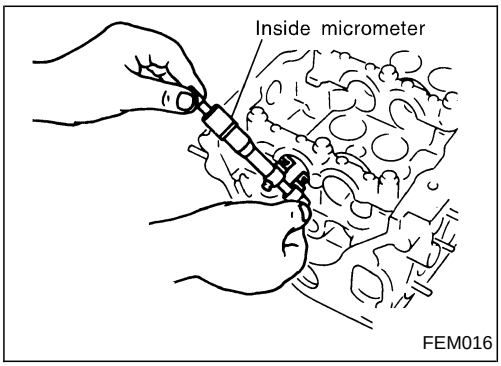
CAMSHAFT OIL CLEARANCE

Measure by using a micrometer.

Cam journal outer diameter:
Standard
29.931 - 29.955 mm (1.1784 - 1.1793 in) dia.

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Inspection (Cont'd)



CAMSHAFT BRACKET INNER DIAMETER

- Install camshaft bracket and tighten bolts to the specified torque.
- Measure inner diameter of camshaft bracket using an inside micrometer.

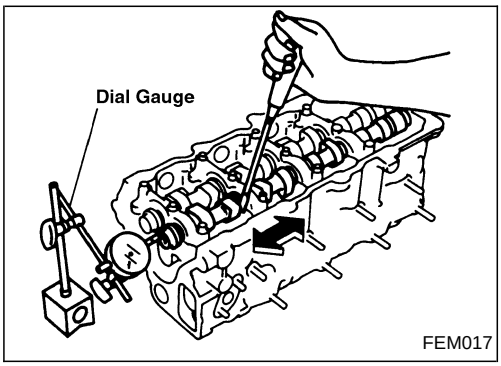
Standard: 30.000 - 30.021 mm (1.1811 - 1.1819 in) dia.

CAMSHAFT OIL CLEARANCE CALCULATIONS

Oil clearance = Cam bracket inner diameter − Cam journal outer diameter

Standard: 0.045 - 0.090 mm (0.0018 - 0.0035 in) dia.

- If it exceeds the standard value, refer to the standard value of each unit, then replace the camshaft and/or cylinder head.
- As the camshaft bracket is manufactured with the cylinder head, it is impossible to replace only the camshaft bracket.



CAMSHAFT END PLAY

- Set the dial gauge to the front end of the camshaft. Measure the end play by moving the camshaft in the direction of the axle.

Standard: 0.065 - 0.169 mm (0.0026 - 0.0067 in)
Limit: 0.2 mm (0.0079 in)

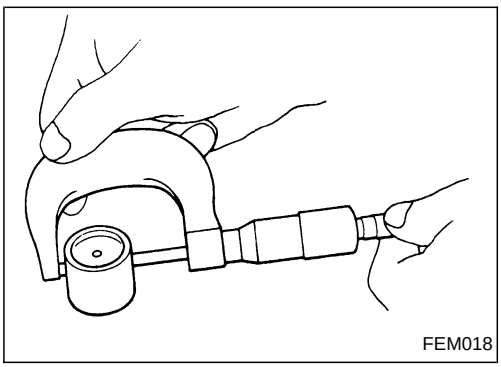
- If end play exceeds the limit, replace camshaft and measure camshaft end play again.
- If end play still exceeds the limit after replacing camshaft, replace cylinder head.

VISUAL INSPECTION OF VALVE LIFTER

Check lifter side for any signs of wear or damage. Replace if there are any abnormalities.

VISUAL INSPECTION OF ADJUSTING SHIM

Check cam nose contact and sliding surfaces for wear and scratches. Replace if there are any abnormalities.



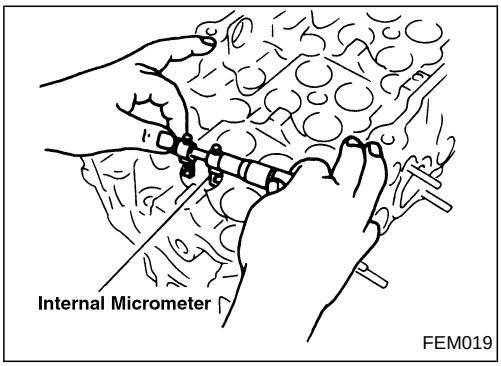
VALVE LIFTER CLEARANCE

Measure the outer diameter of the valve lifter with a micrometer.

Standard: 34.455 - 34.465 mm (1.3565 - 1.3569 in) dia.

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Inspection (Cont'd)



VALVE LIFTER BORE DIAMETER

Measure the bore diameter of the cylinder head valve lifter with an inside micrometer.

Standard: 34.495 - 34.515 mm (1.3581 - 1.3589 in) dia.

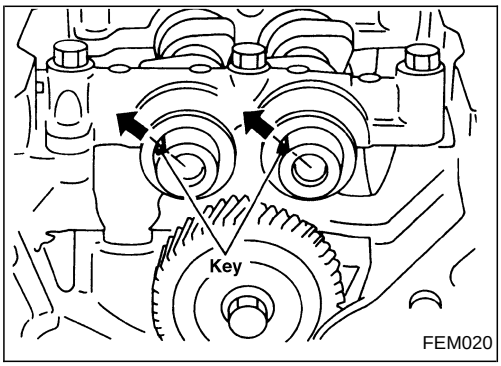
VALVE LIFTER CLEARANCE CALCULATIONS

Clearance = Valve lifter bore diameter − Valve lifter outer diameter

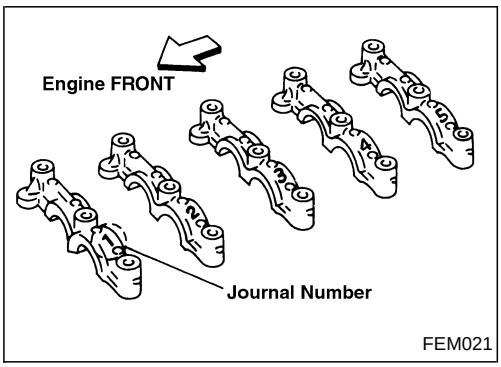
Standard: 0.030 - 0.060 mm (0.0012 - 0.0024 in)

If it exceeds the standard value, refer to the outer diameter and bore diameter standard values and replace valve lifter and/or cylinder head.

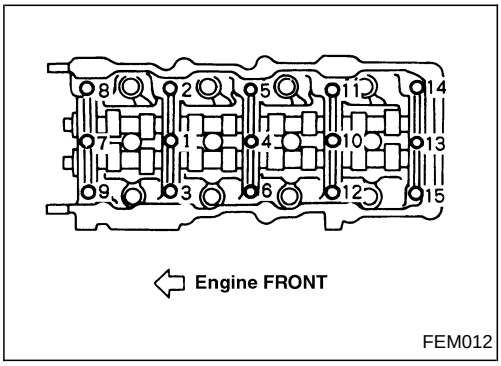
Installation



1. Install the valve lifter and adjusting shim.
- Make sure that these are installed in the same position as before the removal process.
2. Install the camshaft.
- Follow the distinguishing marks that were placed on in the removal process.
- Face the key in the direction shown in the figure.



3. Install the camshaft bracket.
- Refer to the camshaft bracket upper side journal No. and install.
- Looking from the exhaust manifold side (left side of engine), install in the direction that the journal number can be read correctly.
- Place baffle plate onto upper face of No. 1 camshaft bracket, and tighten together.



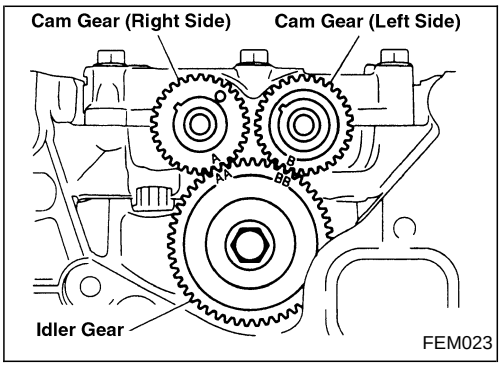
4. Tighten the installation bolts in numerical order in the figure.

1) Tighten to 10 to 14 N·m (1.0 to 1.5 kg-m, 8 to 10 ft-lb).
- Make sure that the thrust portion of the camshaft is fitted properly in the head installation side.

2) Tighten to 20 to 23 N·m (2.0 to 2.4 kg-m, 15 to 17 ft-lb).

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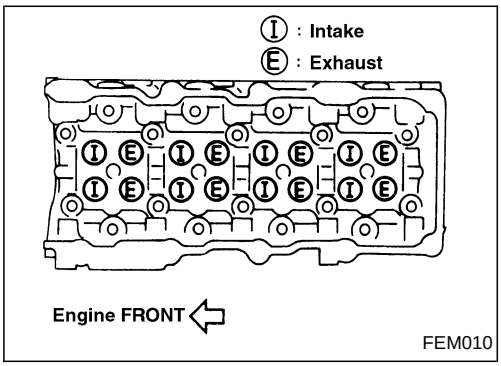
Installation (Cont'd)



5. Install the cam gear.
- Align the match marks, and install the idler gear and each cam gear to the position shown in the figure.
- Tighten the cam gear installation bolt by fixing the hexagonal portion of the camshaft.

6. Install the timing chain, all other related parts and chain cover. Refer to "TIMING CHAIN", EM-26.
7. After installing the timing chain, check and adjust the valve clearance before installing the spill tube. Refer to "VALVE CLEARANCE", EM-35.
8. Install in the reverse order of removal.

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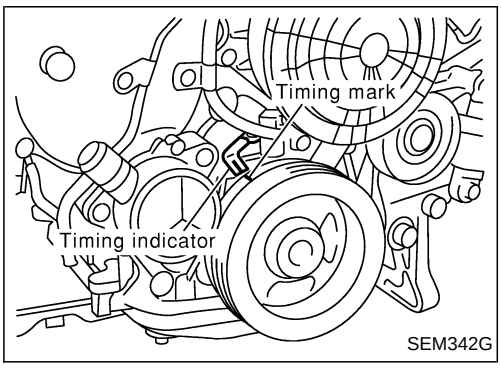


Inspection

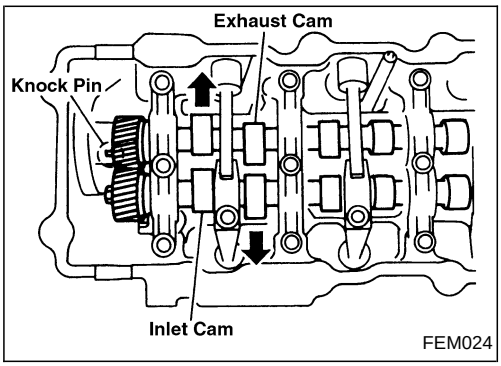
- When the camshaft or parts in connection with valves are removed or replaced, and a fault has occurred (poor starting, idling, or other faults) due to the misadjustment of the valve clearance, inspect as follows.
- Inspect and adjust when the engine is cool (at normal temperature).
- Be careful of the intake and exhaust valve arrangement. (The valve arrangement is different from that in a normal engine.) (The camshafts have, alternately, either an intake valve or an exhaust valve.)

1. Remove the following parts.
- Intercooler cover
- Intercooler
- Rocker cover
2. Set the No. 1 cylinder at TDC.

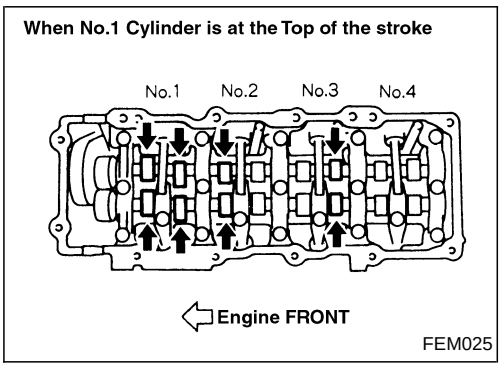
1) Rotate the crankshaft pulley clockwise, and align the TDC mark of the crankshaft pulley with the timing indicator of the TDC sensor bracket.



2) Confirm that the cam nose of the No. 1 cylinder and the knock pin of the cam sprocket is in the position shown in the figure.
- Rotate the crankshaft pulley again if not in the position shown in the figure.

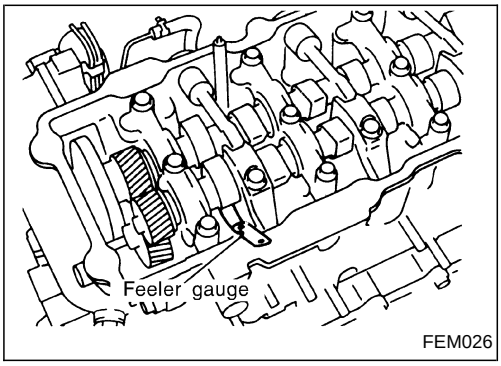


3. While referring to the figure, measure the valve clearance in the circled area of the table below.



Measuring point	No. 1		No. 2		No. 3		No. 4	
	INT	EXH	INT	EXH	INT	EXH	INT	EXH
When the No. 1 cylinder is in the TDC	○	○	○			○		

- The injection order is 1-3-4-2.



- Measure the valve clearance using a JIS high grade feeler gauge when the engine is cool (at normal temperature).

Standard:

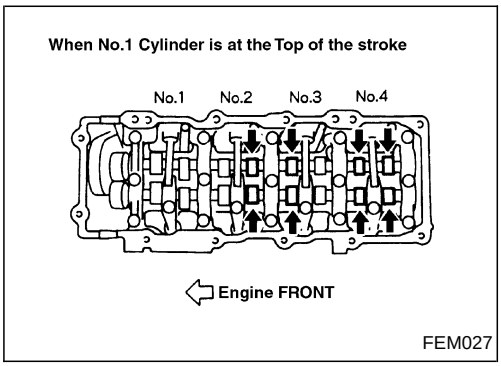
Intake and exhaust

0.35±0.05 mm (0.0138±0.0020 in)

4. Set the No. 4 cylinder at TDC by rotating the crankshaft clockwise once.

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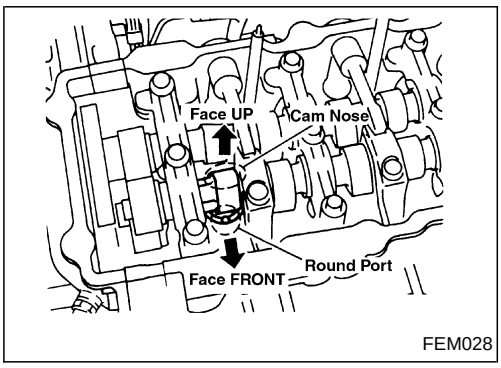
Inspection (Cont'd)



5. While referring to the figure, measure the valve clearance in the circled area of the table below.

Measuring point	No. 1		No. 2		No. 3		No. 4	
	INT	EXH	INT	EXH	INT	EXH	INT	EXH
When the No. 4 cylinder is in the TDC				○	○		○	○

6. If the valve clearance is outside the specification, adjust as follows.



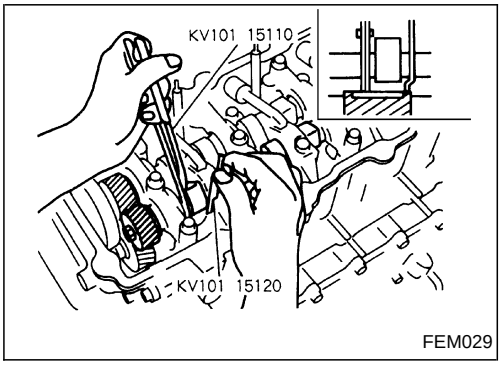
Adjustments

- Remove the adjusting shim for parts which are outside the specified valve clearance.

1. Remove the spill tube.
2. Extract the engine oil on the upper side of the cylinder head (for the air gun used in step 7).
3. Rotate the crankshaft to face the cam for adjusting shims that are to be removed upward.
4. Grip the camshaft with camshaft pliers (SST), the using the camshaft as a support point, push the adjusting shim downward to compress the valve spring.

CAUTION:

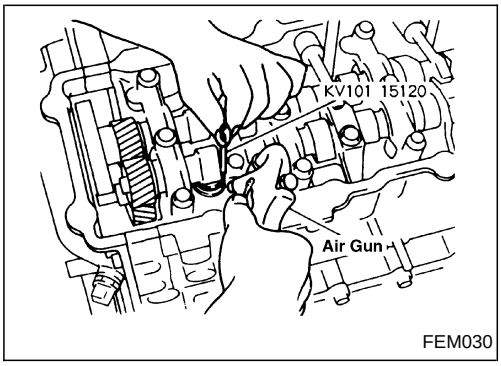
Do not damage the camshaft, cylinder head, or the outer circumference of the valve lifter.



5. With the valve spring in a compressed state, remove the camshaft pliers (SST) by securely setting the outer circumference of the valve lifter with the end of the lifter stopper (SST).
- Hold the lifter stopper by hand until the shim is removed.

CAUTION:

Do not retrieve the camshaft pliers forcefully, as the camshaft will be damaged.



6. Move the rounded hole of the adjusting shim to the front with a very thin screwdriver.
- When the adjusting shim on the valve lifter will not rotate smoothly, restart from step 4 with the end of the lifter stopper (SST) touching the adjusting shim.

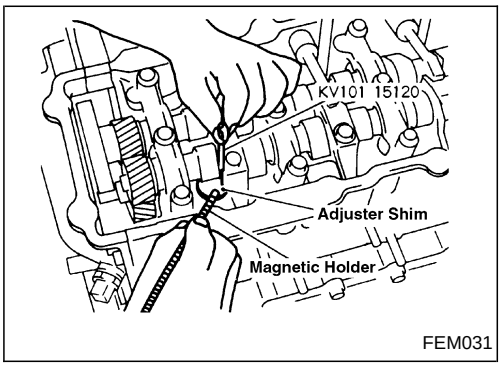
7. Remove the adjusting shim from the valve lifter by blowing air through the rounded hole of the shim with an air gun.

CAUTION:

To prevent any remaining oil from being blown around, thoroughly wipe the area clean and wear protective goggles.

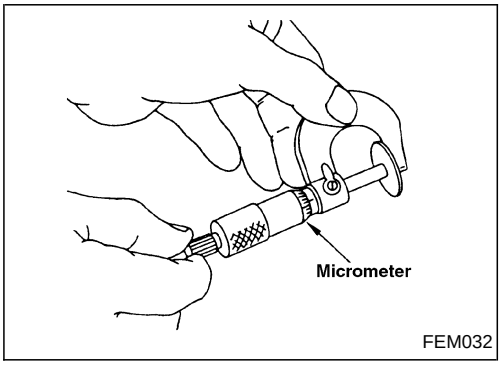
http://vnx.su/

Adjustments (Cont'd)



FEM031

8. Remove the adjusting shim by using a magnetic hand.



FEM032

9. Measure the thickness of the adjusting shim using a micrometer.
- Measure near the center of the shim (the part that touches the cam).

10. Select the new adjusting shim from the following methods.

Calculation method of the adjusting shim thickness:

$t = t_1 + (C_1 - C_2)$

t = Adjusting shim thickness

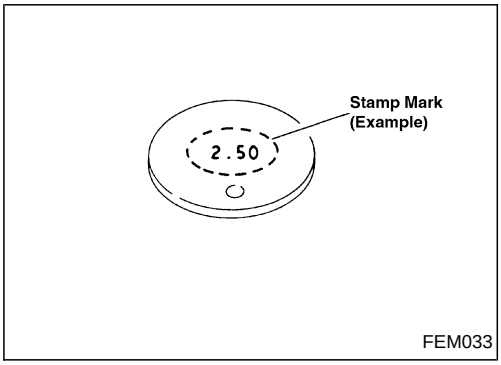
t_1 = Thickness of the removed shim

C_1 = Measured valve clearance

C_2 = Specified valve clearance

[when the engine is cool (at normal temperature)]

0.35 mm (0.0138 in)



FEM033

- New adjusting shims have the thickness stamped on the rear side.

Stamped	Shim thickness mm (in)
2.35	2.35 (0.0925)
2.40	2.40 (0.0945)
.	.
.	.
.	.
3.05	3.05 (0.1201)

- The thickness of the adjusting shim ranges from 2.35 to 3.05 mm (0.0925 to 0.1201 in), where in the space of 0.05 mm (0.0020 in). There are 15 types of shims available.

11. Fix the selected adjusting shim to the valve lifter.

CAUTION:

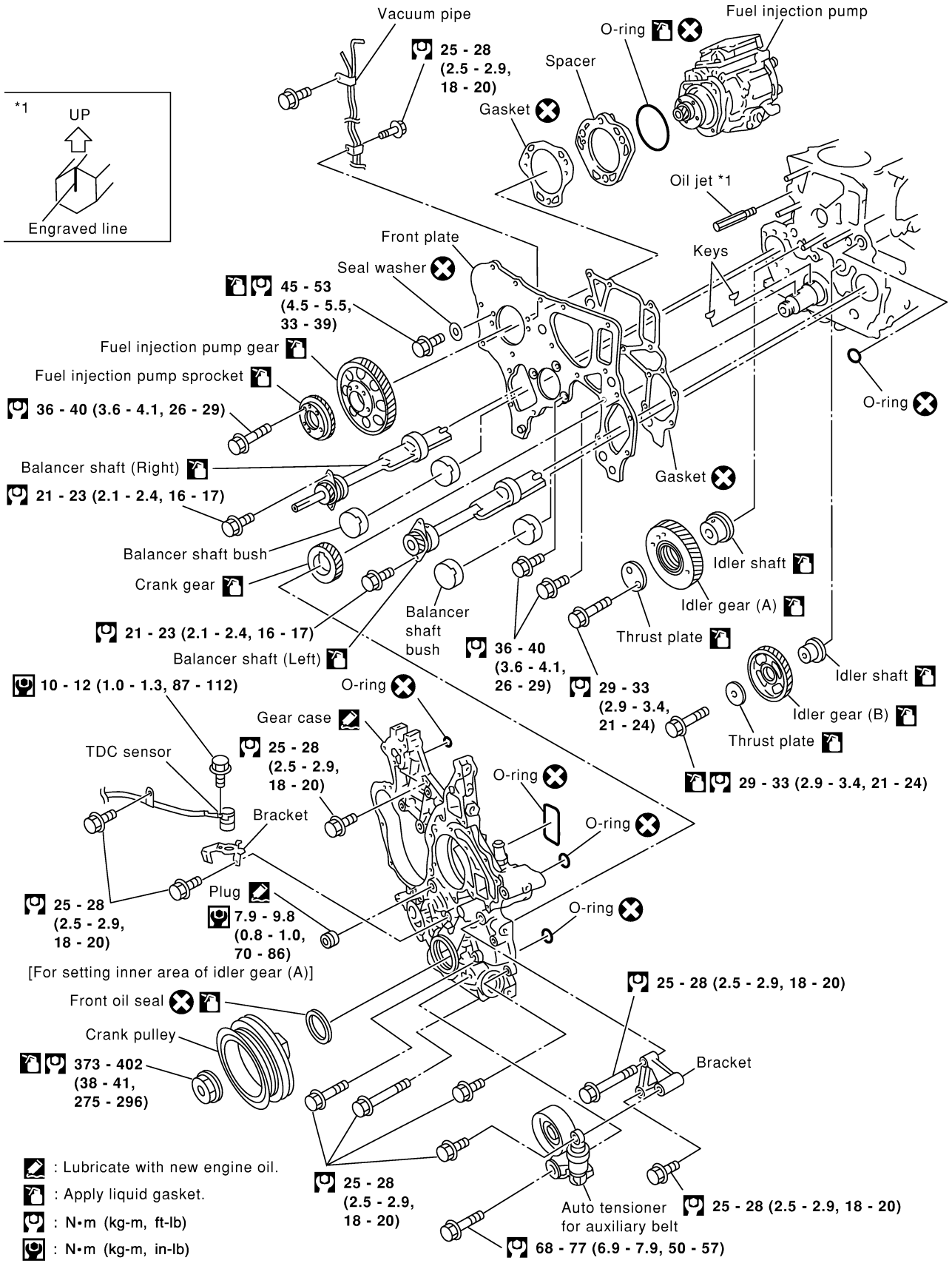
Place the stamped side of the adjusting shim to the valve lifter.

12. Compress the valve spring using the camshaft pliers and remove the lifter stopper (SST).
13. Rotate the crankshaft 2 to 3 times by hand.
14. Confirm that the valve clearance is within the specification.

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Removal and Installation

2 idler gears are shown in this chapter. Idler gear (A) has scissors gear, and idler gear (B) does not.



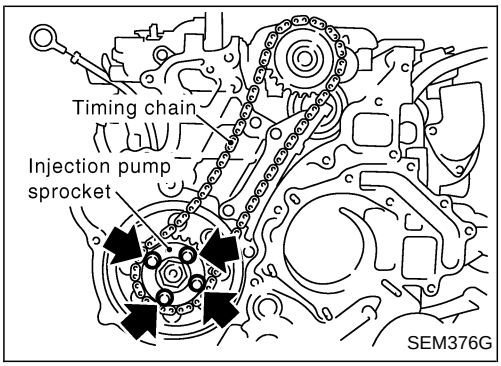
YEM029

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Removal

1. Remove the engine assembly.
   Refer to “ENGINE REMOVAL”, EM-63.
2. Place the engine on an engine stand (SST).
   Refer to “CYLINDER BLOCK”, EM-67.
3. Remove the following.

- Auto tensioner bracket
- Air conditioner bracket
- Alternator bracket
- Oil tube
- Vacuum pump
- Rocker cover
- Oil pan (upper, lower)
- Injection tube
- Spill tube
- High pressure nozzle assembly



4. Remove the chain cover, timing chain and other parts in connection.
   Before removing timing chain, remove injection pump sprocket with No. 1 cylinder being positioned at TDC. Refer to the figure. Refer to “TIMING CHAIN”, EM-26.

CAUTION:

After removing timing chain, never rotate crankshaft, or the piston will push the valve up and damage the valve.

- Do not paint the match mark on the timing chain beforehand as the No. 1 cylinder is set at the TDC during assembly.

5. Remove the TDC sensor.

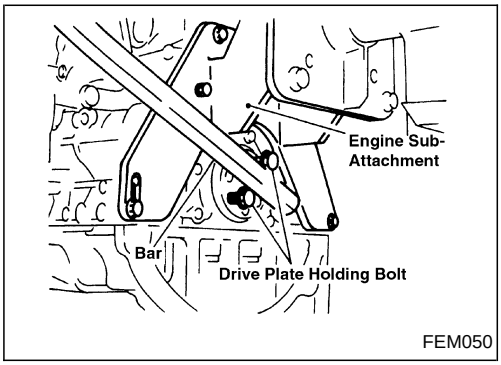
CAUTION:

- **Do not drop or hit the sensor.**
- **Store in a clean place free of iron filings, etc.**
- **Do not place near any magnetic equipment.**

6. Remove the water pump.
   Refer to “WATER PUMP” in LC section.
7. Remove the water inlet.

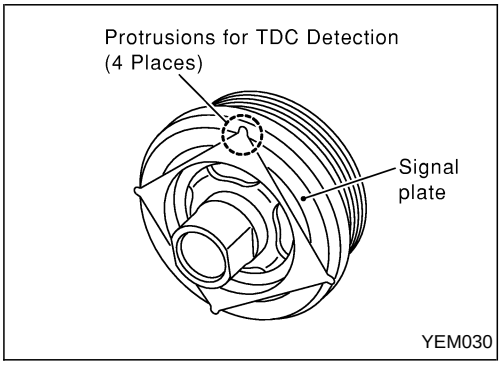
http://vnx.su/

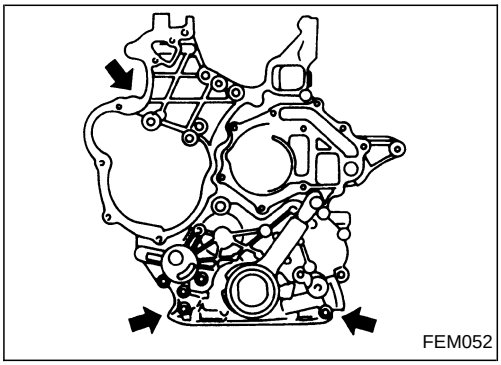
Removal (Cont'd)



8. Remove the crankshaft pulley.
- To fix the crankshaft, clamp the bar between the drive plate holding bolts, and set by touching the engine sub-attachment (SST).
- As another method, set by clamping a hammer handle, etc. in the counterweight portion of the crankshaft.

CAUTION:
- **Do not damage the crankshaft.**
- **Make sure that no foreign objects get inside the engine.**
- **Do not damage or magnetize the signal detection protrusions of the crankshaft pulley.**
- **After removing timing chain, never rotate crankshaft, or the piston will push the valve up and damage the valve.**

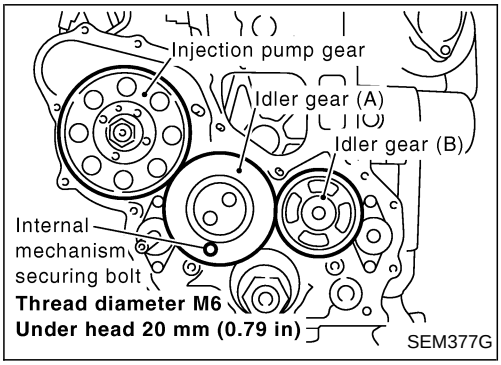




9. Remove the gear case.
- Using the grooved places shown in the figure, remove the gear case by using a screwdriver and a seal cutter (SST).

10. Remove the front oil seal from the gear case by using a screwdriver.

CAUTION:
Do not damage the gear case.

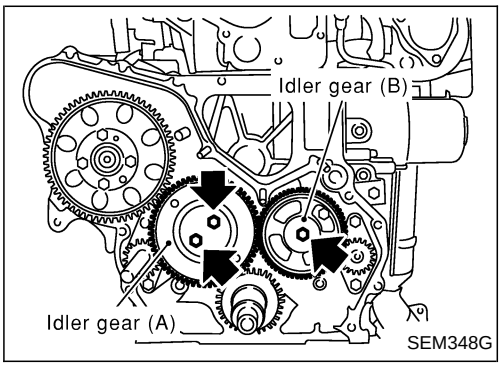


11. Fix the internal mechanism setting bolt [part No.: 81-20620-28, screw dia.: M6, dimension below neck: 20 mm (0.79 in)] to the bolt hole of the idler gear (A) and tighten to the specification.
: 2.5 - 3.4 N·m (0.25 - 0.35 kg-m, 22 - 30 in-lb)

CAUTION:
- **Only use the genuine setting bolt, or the idler gear (A) will be damaged.**
- **Do not rotate the crankshaft as the head of the setting bolts interferes with the gear case.**
- **Do not remove the setting bolt from the idler gear (A) until the timing chain and all of the parts in connection have been installed.**
- **If these bolts are not installed, internal mechanism will disengage after the idler gear is removed. This will prohibit the idler gear from being reusable.**

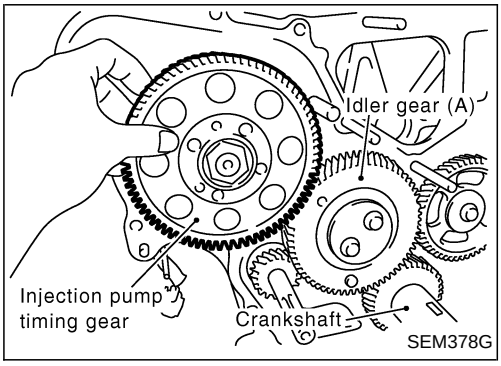
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Removal (Cont'd)

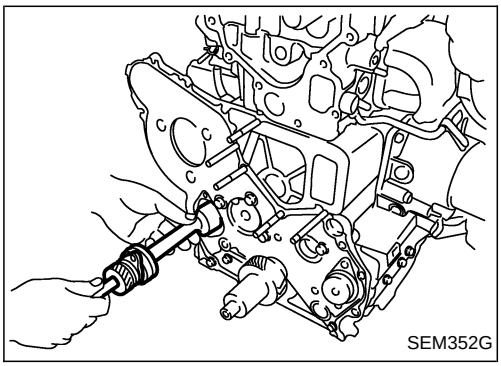


12. Remove the idler gears (A) and (B).
- Check the backlash of each gear before removing. Refer to "BACKLASH OF EACH GEAR", "Inspection".

CAUTION:
- **Do not loosen the internal mechanism setting bolt of the idler gear (A). (The idler gear cannot be reused when the internal mechanism is released.)**
- **During removal of the idler gears (A) and (B), do not face the rear side downward as the idler shaft will drop.**



13. Set the fuel injection timing gear with the pulley holder (SST).
14. Remove injection pump timing gear.

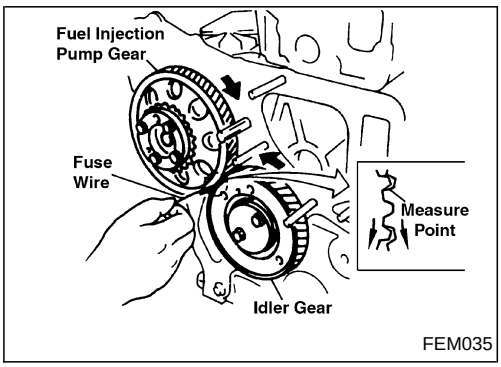


15. Extract the balancer shaft taking care not to damage the inner bushes of the cylinder block.
16. Remove the fuel injection pump.
17. Remove the front plate.

Inspection

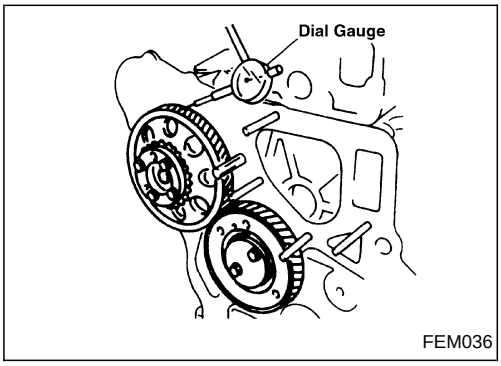
BACKLASH OF EACH GEAR

Method using a fuse wire



- Tighten the holding bolts of each gear to specification.
- Place a wire in the biting area of the teeth between the gears to be checked, rotate the crankshaft in the operating direction so that the wire is taken inwards.
- Measure the crushed area of the wire with a micrometer.

Method using dial gauge



- Tighten the holding bolts of each gear to specification.
- Place the dial gauge on the tooth surface area of the gear to be checked.
- With the other gear in a set position, measure the dial gauge value while moving the gear left and right.
  Standard: 0.07 - 0.11 mm (0.0028 - 0.0043 in)
  Limit: 0.20 mm (0.0079 in)
- If it exceeds the limit, replace the gear and measure again.
- If it exceeds the limit again, check for the installation condition of the gear driving parts, wear of shaft and gear, and oil clearance.

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Inspection (Cont'd)

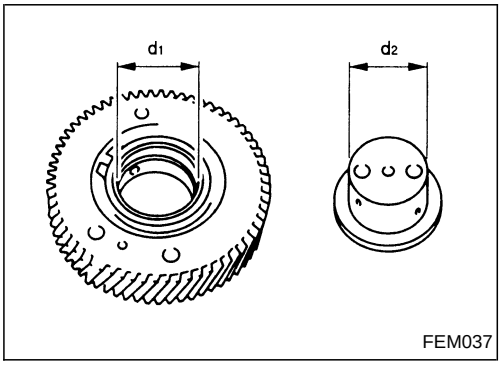
IDLER GEAR END PLAY

- Tighten the holding bolts to the specification.
- Measure the clearance between the gear plate and idler gear using a feeler gauge.

Unit: mm (in)

	Standard	Limit
Idler gear (A)	0.06 - 0.12 (0.0024 - 0.0047)	0.15 (0.0059)
Idler gear (B)		

- If it exceeds the limit, replace the idler gear, shaft, and gear plate.



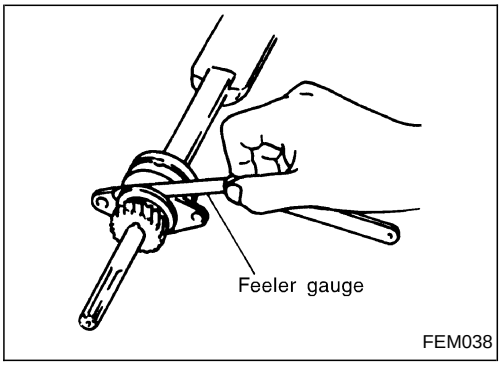
IDLER GEAR OIL CLEARANCE

- Measure the inner diameter (d1) of the idler gear shaft.
  Standard:
  Idler gear (A)
  43.000 - 43.020 mm (1.6929 - 1.6937 in) dia.
  Idler gear (B)
  28.600 - 28.620 mm (1.1260 - 1.1268 in) dia.
- Measure the outer diameter (d2) of the idler shaft.
  Standard:
  Idler gear (A)
  42.959 - 42.975 mm (1.6913 - 1.6919 in) dia.
  Idler gear (B)
  28.567 - 28.580 mm (1.1247 - 1.1252 in) dia.
- Calculate the oil clearance.
  Clearance = d1 − d2

Unit: mm (in)

	Standard	Limit
Idler gear (A)	0.025 - 0.061 (0.0010 - 0.0024)	0.2 (0.0079)
Idler gear (B)	0.020 - 0.053 (0.0008 - 0.0021)	

- If it exceeds the limit, refer to each standard specification and replace the idler gear and/or shaft.



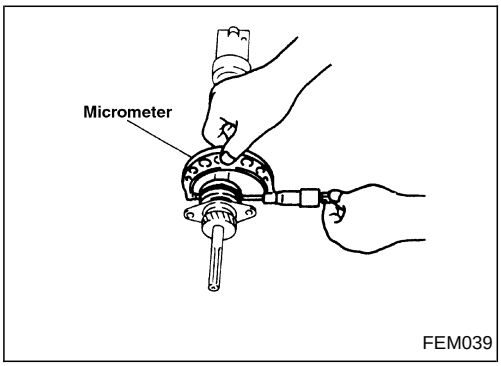
BALANCER SHAFT END PLAY

- Measure the clearance between the plate and gear using a feeler gauge.
  Standard: 0.07 - 0.22 mm (0.0028 - 0.0087 in)
- If it exceeds the specification, replace the balancer shaft assembly.
- As the gears are press-fitted, there are no setting for individual parts.

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Inspection (Cont'd)

BALANCER SHAFT OIL CLEARANCE



Outer diameter of balancer shaft journal

Measure the outer diameter of the balancer shaft journal with a micrometer.

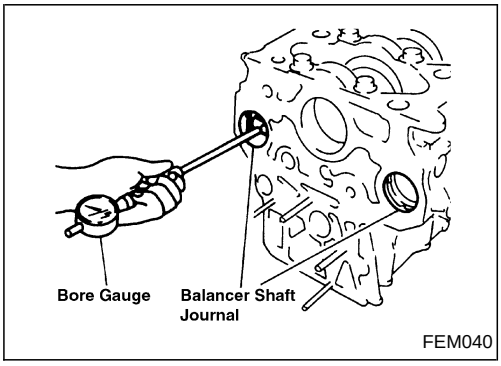
Standard:

Front side

50.875 - 50.895 mm (2.0029 - 2.0037 in) dia.

Rear side

50.675 - 50.695 mm (1.9951 - 1.9959 in) dia.



Inner diameter of balancer shaft bearing

Measure the inner diameter of the balancer shaft bearing using a bore gauge.

Standard:

Front side

50.940 - 51.010 mm (2.0055 - 2.0083 in) dia.

Rear side

50.740 - 50.810 mm (1.9976 - 2.0004 in) dia.

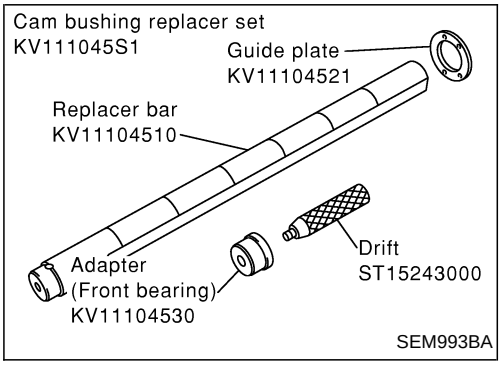
Oil clearance calculations

Oil clearance = Bearing inner diameter − Journal outer diameter

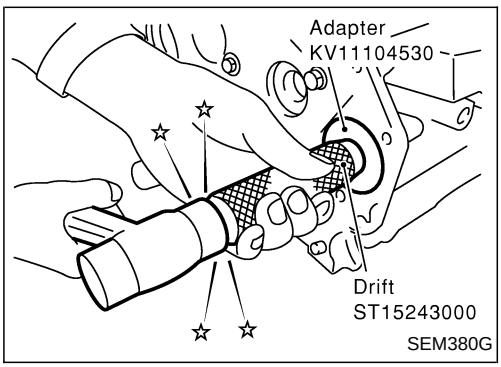
Standard: 0.045 - 0.135 mm (0.0018 - 0.0053 in)

Limit: 0.180 mm (0.0071 in)

BALANCER SHAFT BEARING REMOVAL AND INSTALLATION



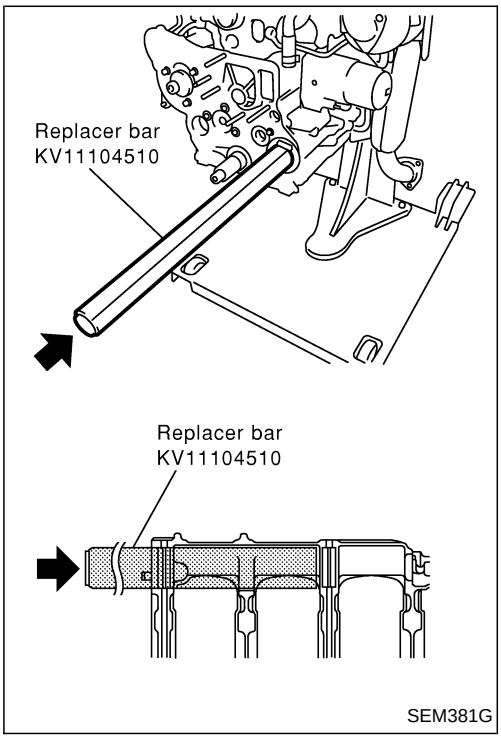
1. Remove balancer shaft front bearing.



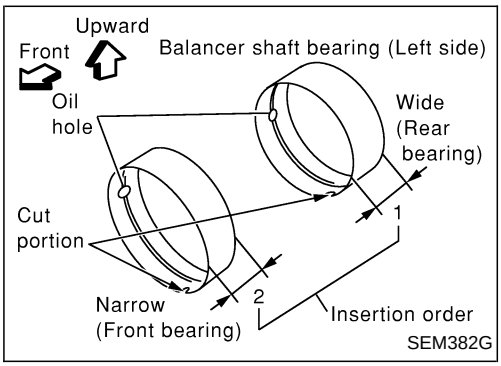
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Inspection (Cont'd)

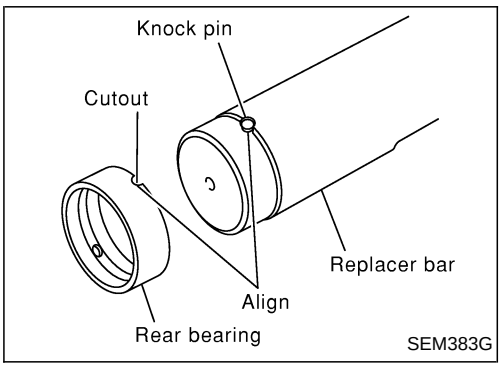
2. Using Tool, remove balancer shaft rear bearing from engine.



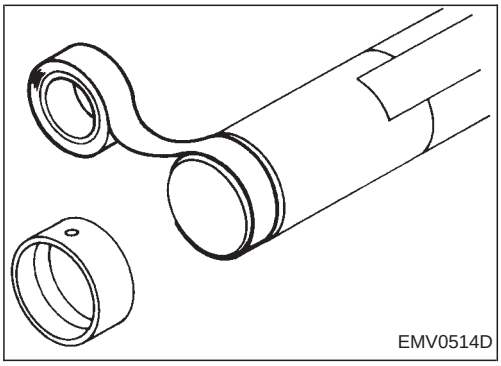
3. Install the rear and front balancer shaft bearings.
- Install from the cylinder block hole to the rear journal and then the front journal.
- Install the groove of the balancer shaft bearing facing the front and the under right direction.
  (Align the guide plate and bar knock pin and then force in the balancer shaft bearing.)



- Align the balancer shaft bearing groove with the knock pin of the bar (SST) and install the balancer shaft bearing.)

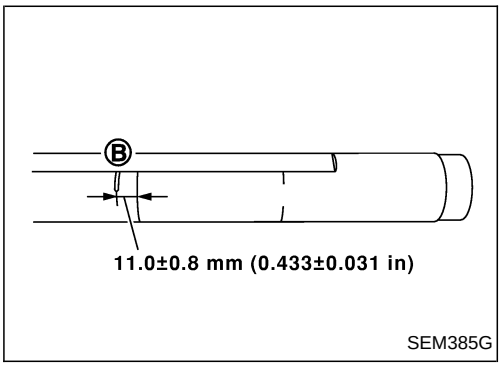


- On rear journals, so the bearing does not get out of position, wrap tape around the bar.

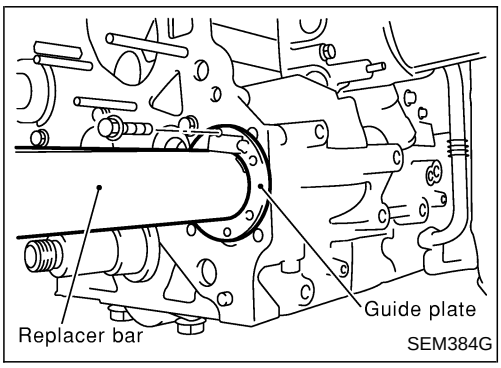


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Inspection (Cont'd)



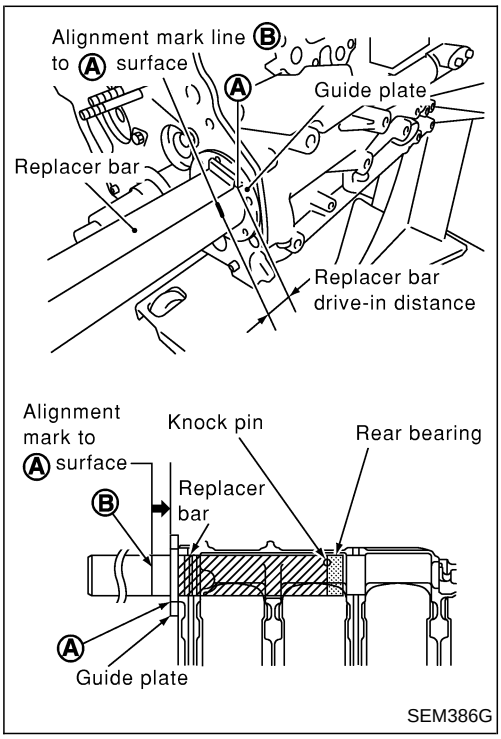
- Make an alignment mark 11.0±0.8 mm (0.433±0.031 in) from the bar No. 2 engraved line with a marker pen. This alignment mark Ⓑ will be the point to where the rear bearing is pushed.



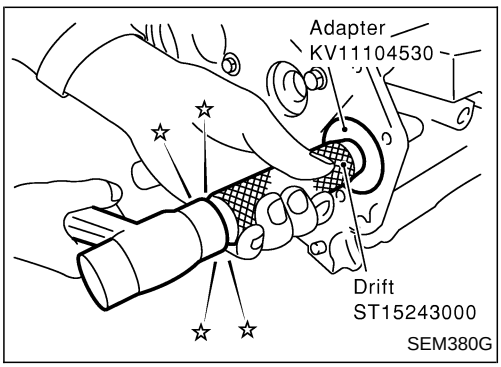
- Insert the bar with the bearing installed into the cylinder block and install the guide plate (SST).
- Align the guide plate with the ZD engraving and install the bolts.

CAUTION:

Use a washer of the same thickness used on the front plate to prevent the guide plate from bending.



- Push the engraved bar alignment mark Ⓑ to the same position of the guide plate tip Ⓐ.
- After all the journals have been installed, make sure that all the journal and cylinder block oil holes are aligned.

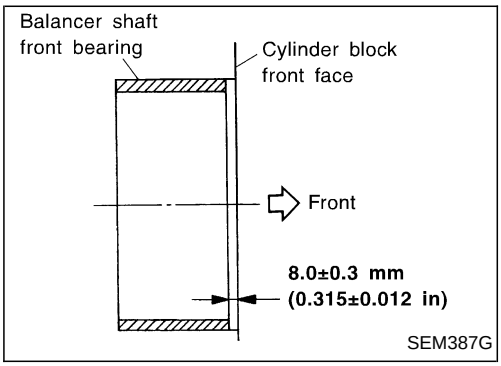


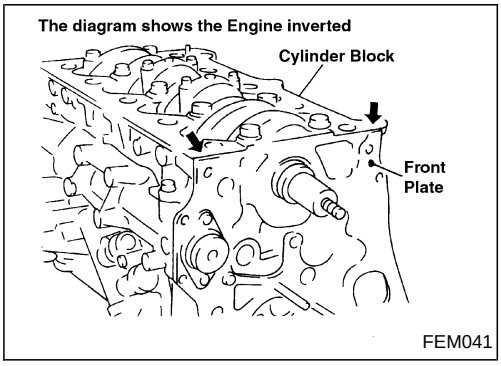
4. Install the front balancer shaft bearing.

- Align the journal and cylinder block oil holes.
- Use a drift (SST) to force in the tip of the journal to 8.0±0.3 mm (0.315±0.012 in) inside the cylinder block.
- After installing the journal, make sure that the journal and cylinder block oil holes are aligned.

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Inspection (Cont'd)





Installation

1. Install the front plate.

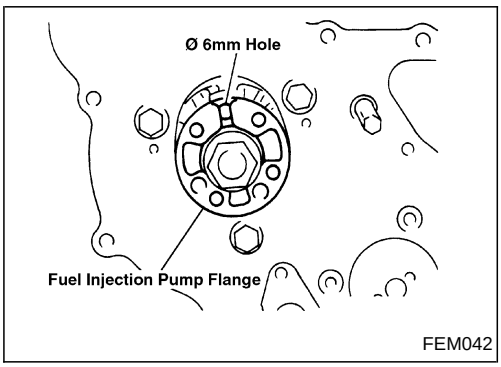
1) Install the O-ring and gasket to the cylinder block.
2) Install the front plate.

- Lightly tap with a hammer if the dowel pin cannot be inserted easily.

CAUTION:

Make sure that the O-ring does not pop out.

3) Apply Three Bond 1207C (KP510 00150) with a spreader between the cylinder block plate under the cylinder block (oil pan side) and the front plate (shown by the arrows in the figure).



2. Install the fuel injection pump.

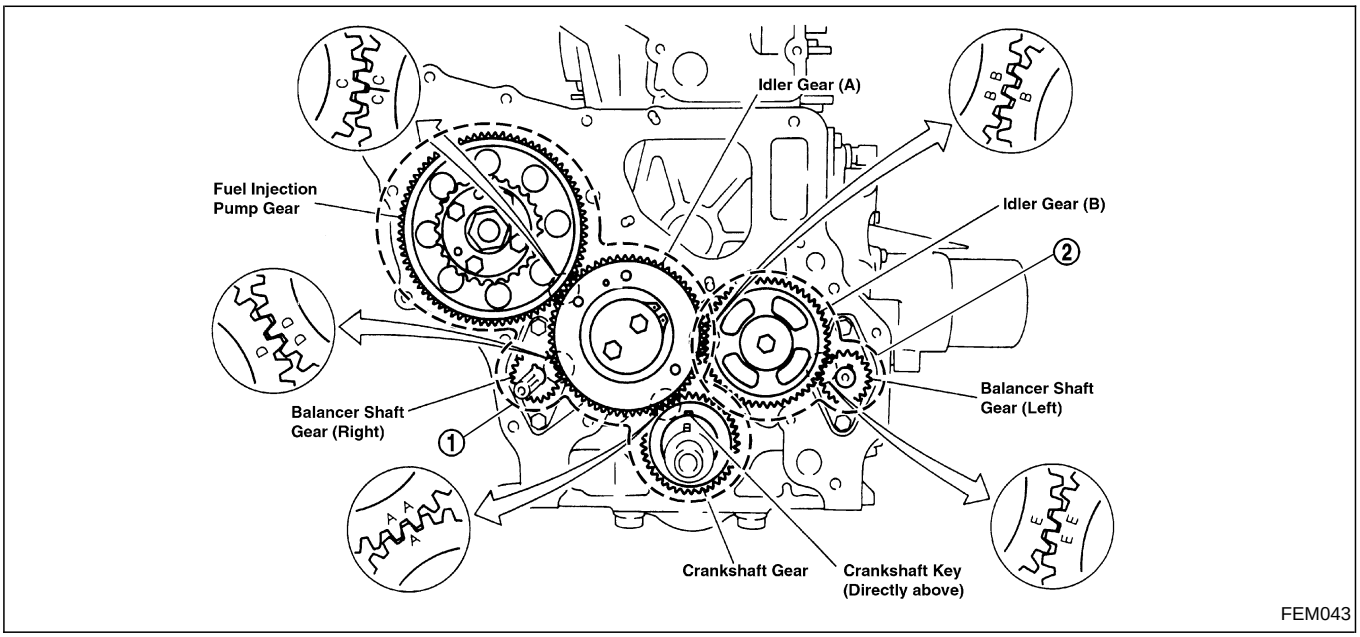
- After installing the front plate, align the 6 mm (0.24 in) dia. hole of the pump flange and the 6 mm (0.24 in) dia. hole position of the pump body.

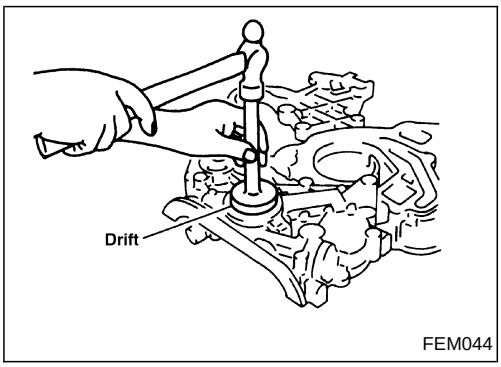
3. Install each timing gear.

- Align the match marks of the timing gears by referring to the figure below.
- When installing timing gear, follow the order (① , ②) shown in the dotted box in the figure below to facilitate installation.

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Installation (Cont'd)

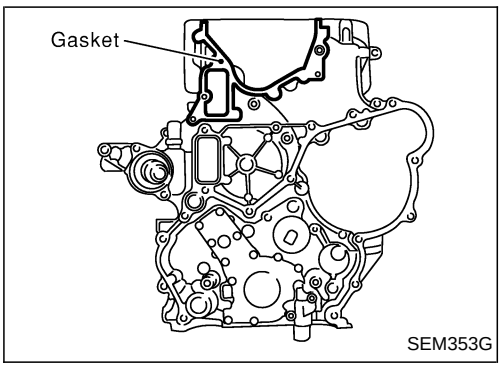




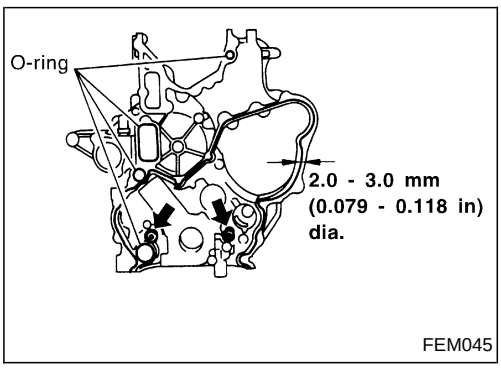
4. Install the front oil seal to the gear case.
- Apply engine oil to the fitting side.
- Evenly insert the front oil seal using a drift [outer dia.: approx. 64 mm (2.52 in)] completely.

CAUTION:

Make sure the oil seal does not spill off the end side of the gear case.



5. Install the gear case.
1) Before installing gear case, remove all traces of liquid gasket from mating surface using a scraper.
2) Align gasket with dowel and install.



3) Install the O-rings to the gear case.
- The O-ring at the top position shown in the figure can be installed in during cylinder head installation.

4) Apply a continuous bead of liquid gasket to gear case.
- **Use Genuine Liquid Gasket or equivalent.**

a. Coat of liquid gasket should be maintained within 2.0 to 3.0 mm (0.079 to 0.118 in) dia. range.
b. Attach gear case to cylinder block within 5 minutes after coating.
c. Wait at least 30 minutes before refilling engine oil or starting engine.

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Installation (Cont'd)

CAUTION:

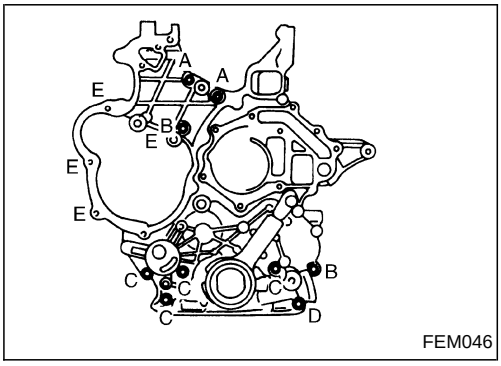
Apply the liquid gasket around the bolt holes shown by the arrows in the figure.

4) Install the gear case.

- Tap the area around the dowel pin with a plastic hammer if it cannot be inserted easily.

CAUTION:

Do not pop out the O-rings.



FEM046

5) Install the holding bolt referring to the figure.

Dimension below neck:

A: 25 mm (0.98 in)
B: 30 mm (1.18 in)
C: 50 mm (1.97 in)
D: 80 mm (3.15 in)
E: 20 mm (0.79 in)

6) Install the holding bolts from the rear side of the front plate.

6. Install the crankshaft pulley.

- Insert by aligning the 2 sides of the oil pump with the 2 sides of the shaft on the rear side of the crankshaft pulley.

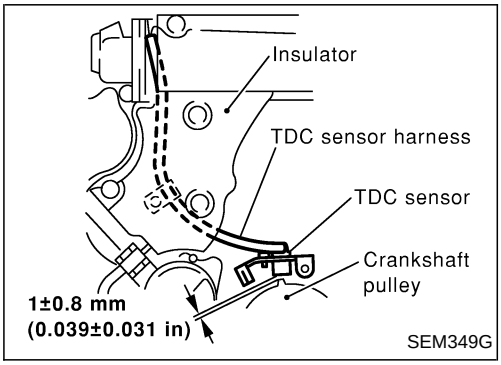
CAUTION:

Do not damage the oil seal lip when inserting.

- Refer to EM-40, "Removal" for the crankshaft setting procedures when tightening the holding nut.

7. Install the water pump.

- Install it before installing the TDC sensor. Refer to "Water Pump" in LC section.



SEM349G

8. Install the TDC sensor.

- Align the bracket knock pin with the hole on the gear case side and tighten the holding bolt.
- Confirm that the clearance between the end of the sensor and the signal detection protrusion of the crankshaft pulley is within the specification.

Standard: 1±0.8 mm (0.039±0.031 in)

- Arrange the TDC sensor harness to the position shown in the figure.

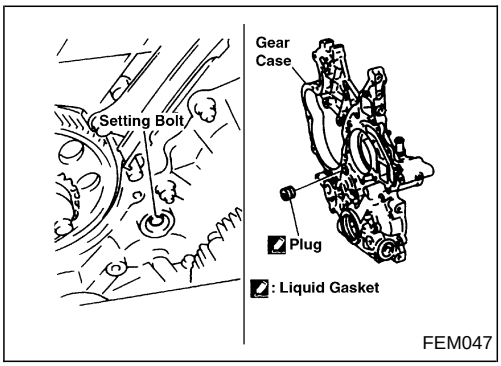
CAUTION:

Confirm that the harness has no deflection around the crankshaft pulley when installing the clamp.

9. Install the timing chain, other parts in connection with the timing chain, and the chain cover. Refer to EM-26, "TIMING CHAIN".

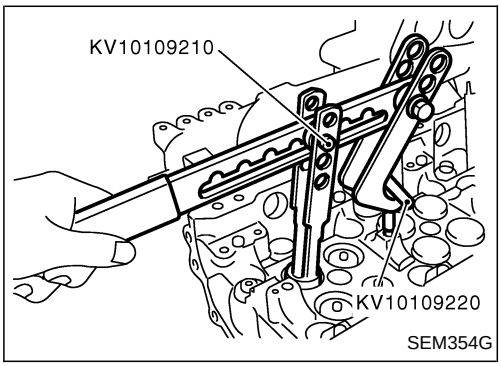
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Installation (Cont'd)



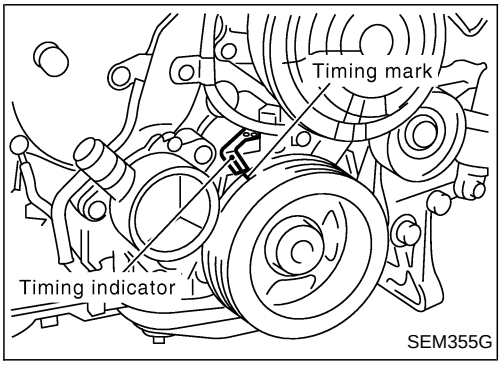
10. Remove the internal mechanism setting bolt of the idler gear (A).
11. Apply liquid gasket to the plug thread.
12. Install in the reverse order of removal.

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VALVE OIL SEAL

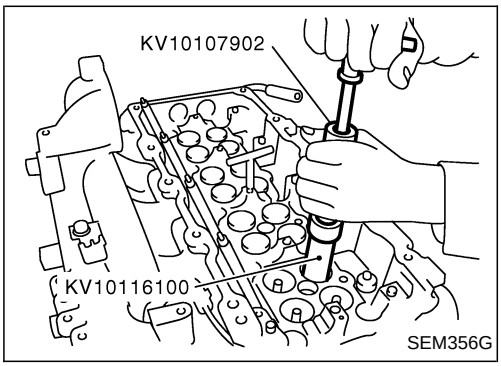
1. Remove timing chain. Refer to EM-26, “TIMING CHAIN”.
2. Remove injection nozzle assembly. Refer to “Injection Tube and Injection Nozzle” in “BASIC SERVICE PROCEDURE” in EC section.
3. Remove camshaft. Refer to EM-30, “CAMSHAFT”.



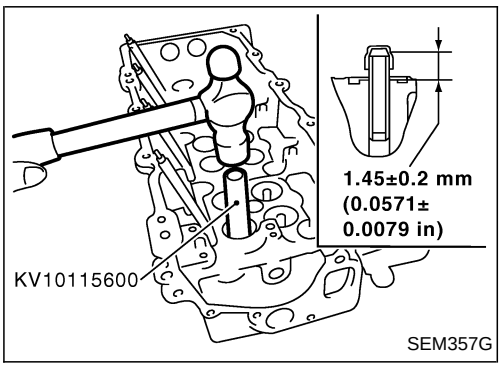
4. Remove valve lifters and mark order No. on each lifter.
5. Replace valve oil seal according to the following procedure.

When replacing valve oil seal, set the corresponding piston at TDC. Failure to do so causes the valve to drop into the cylinder.

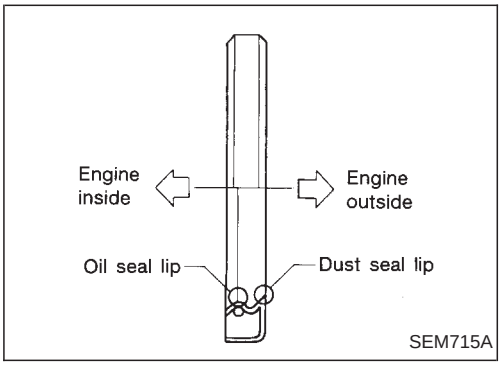
1) Set No. 1 cylinder at TDC.



2) Remove valve springs and valve oil seals for No. 1 and No. 4 cylinders. Valve spring seats should not be removed.



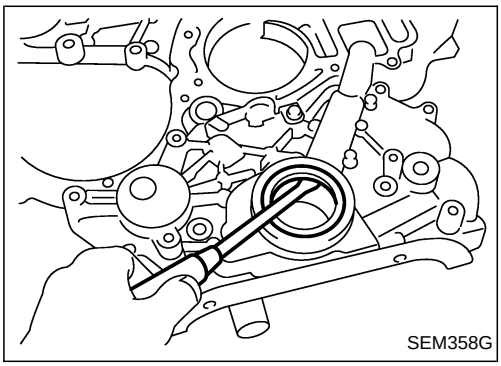
3) Install new valve oil seals for No. 1 and No. 4 cylinders as illustrated. Reinstall valve springs. (pink paint side toward cylinder head)
4) Install valve spring retainers on intake valves and valve rotators on exhaust valves, and remount valve assembly.
5) Set No. 2 cylinder at TDC.
6) Replace valve oil seals for No. 2 and No. 3 cylinders according to steps 2) and 3).
7) Install valve lifters in original positions.



CRANKSHAFT OIL SEAL INSTALLING DIRECTION AND MANNER

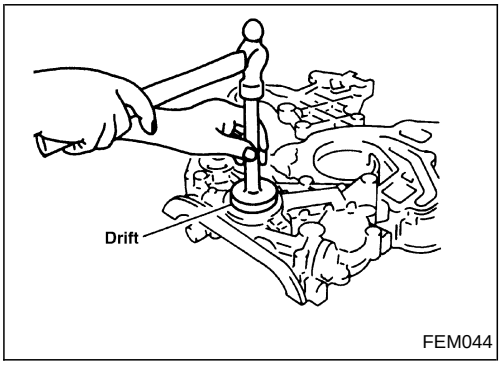
- **When installing crankshaft oil seals, be careful to install them correctly, as shown in the figure.**
- **Wipe off excess oil after installing oil seal.**

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SEM358G

CRANKSHAFT FRONT OIL SEAL

1. Remove the front cover. Refer to “TIMING GEAR”.
2. Remove front oil seal with a suitable tool.

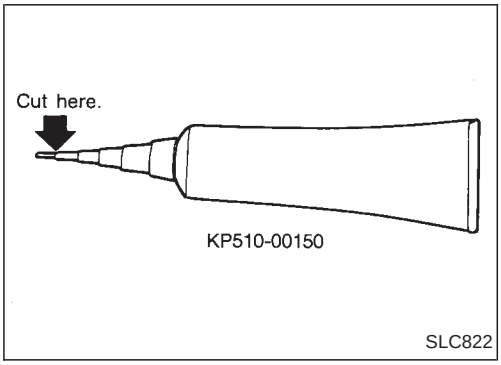


FEM044

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

CRANKSHAFT REAR OIL SEAL

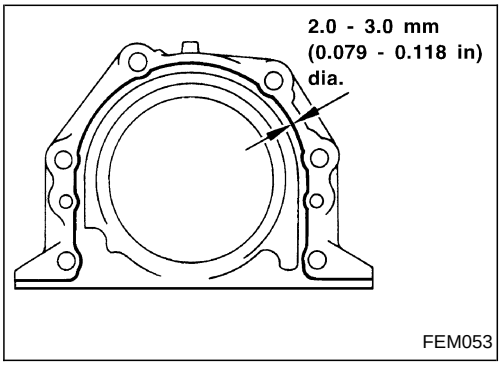
1. Remove oil pan assembly. Refer to EM-22, “OIL PAN”.
2. Remove clutch cover assembly.
3. Remove flywheel and rear plate.
4. Remove oil seal retainer assembly.



SLC822

5. Apply a continuous bead of liquid gasket to rear oil seal retainer.

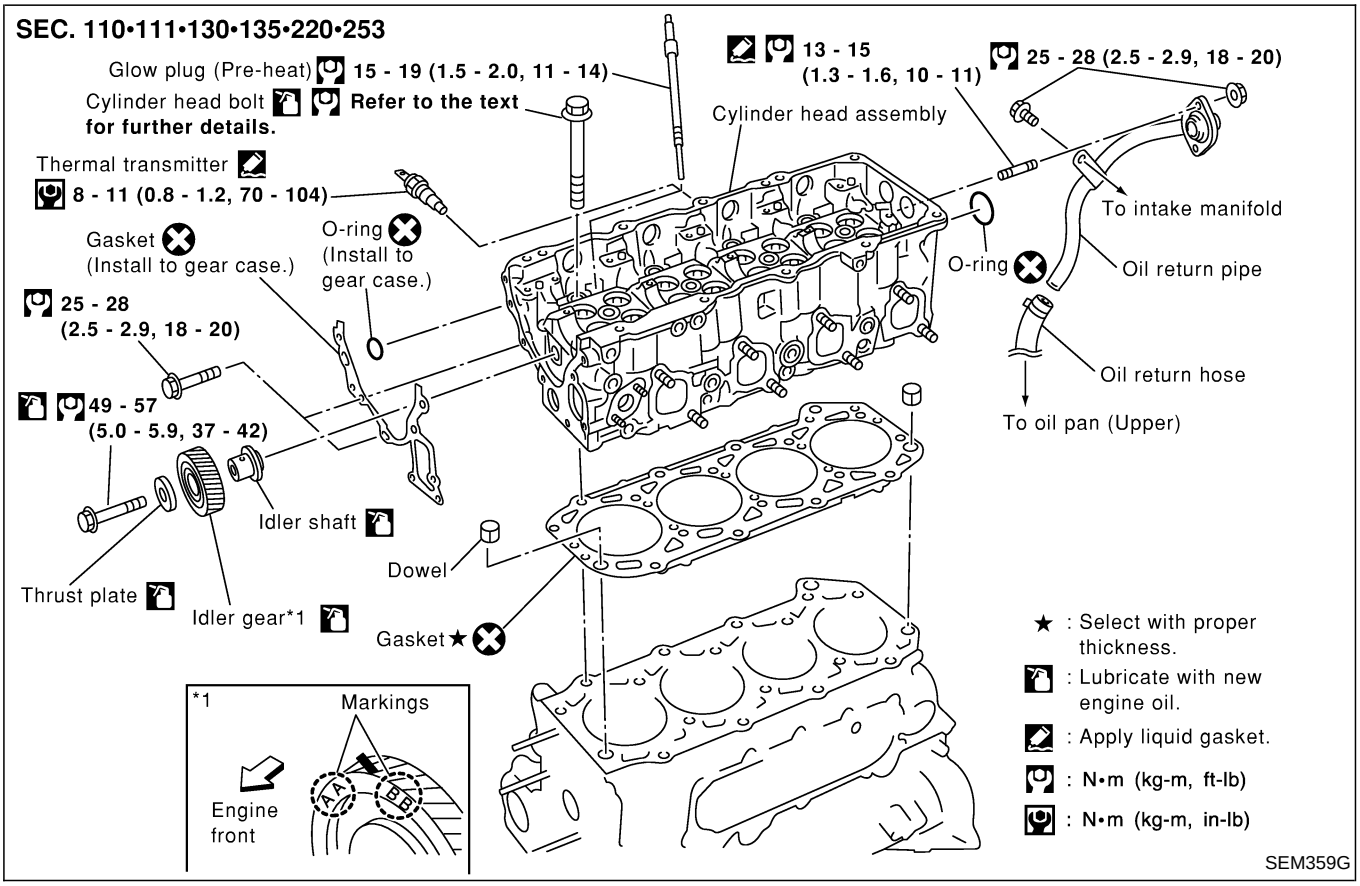
a. Coat of liquid gasket should be maintained within 2.0 to 3.0 mm (0.079 to 0.118 in) dia. range.
b. Attach oil seal retainer to cylinder block within five minutes after coating.
c. Wait at least 30 minutes before refilling engine oil or starting engine.
d. Use Genuine Liquid Gasket or equivalent.

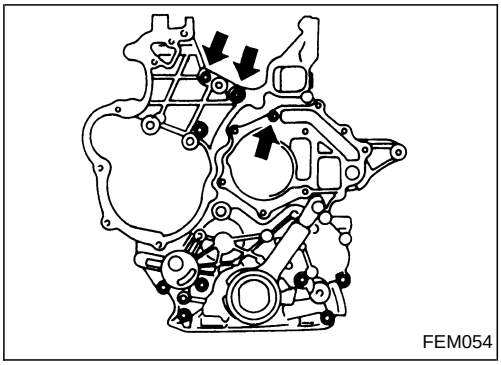


FEM053

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Removal and Installation





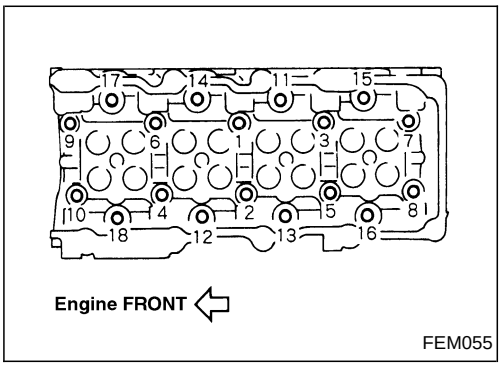
Removal

1. Remove the following. (Refer to corresponding chapter for detailed auxiliary work.)
- Drain coolant
- Rocker cover
- Injection tube
- Spill tube
- High pressure injection nozzle assembly
- Timing chain
- Camshaft
- Catalytic converter
- Turbocharger assembly
- Exhaust manifold

2. Remove mounting bolts of the gear case and water pump as shown by arrows in the figure.
3. Remove oil return pipe from the rear side of cylinder head.
4. Remove intake manifold.

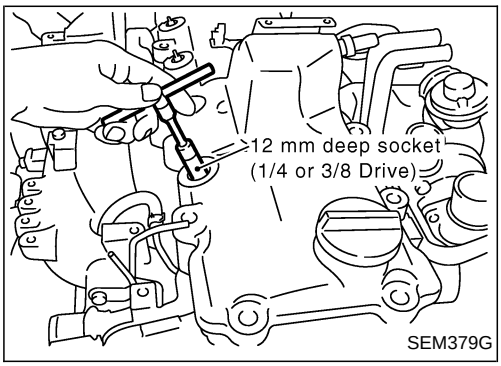
http://vnx.su/

Removal (Cont'd)



5. Remove cylinder head assembly.
- Loosen and remove mounting bolts in the reverse order shown in the figure.
- Lift up the cylinder head assembly to avoid interference with dowel pins located between the block and head, and remove cylinder head assembly.

CAUTION:
- **Do not drop the O-ring located between the front of cylinder head and the rear of gear case into the engine.**
- **Remove glow plug in advance to avoid damage as the tip of the glow plug projects from the bottom of the cylinder head, or, place wood blocks beneath both ends of the cylinder head to keep the cylinder bottom from any contact.**



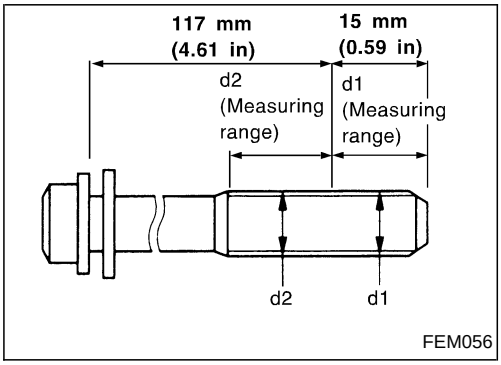
- For glow plug removal, the following shall be noted.

CAUTION:
- **To avoid breakage, do not remove glow plug unless necessary.**
- **Perform continuity test with glow plug installed.**
- **Keep glow plug from any impact. (Replace if dropped from a height 10 cm (3.94 in) or higher.)**
- **Do not use air impact wrench.**

6. Remove idler gear.

CAUTION:
While removing idler gear, keep the rear of idler gear facing up to prevent idler shaft from falling.

Inspection



CYLINDER HEAD BOLT DEFORMATION (ELONGATION)

- Using micrometer, measure the outer diameters d1 and d2 of bolt thread as shown in the figure.
- If the necking point can be identified, set it as measuring point d2.
- Calculate the difference between d1 and d2.
  Limit: 0.15 mm (0.0059 in)

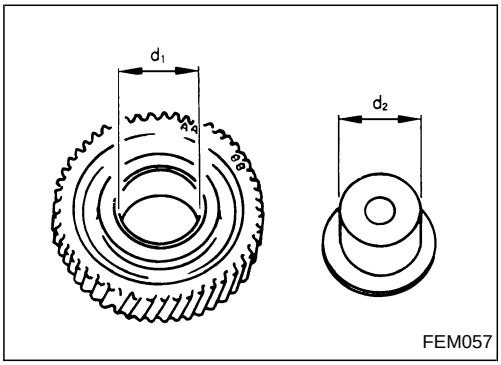
IDLER GEAR END PLAY

- Tighten mounting bolts to the specified torque.
- Using feeler gauge, measure the clearance between gear plate and idler gear.
  Standard: 0.07 - 0.14 mm (0.0028 - 0.0055 in)
  Limit: 0.2 mm (0.0079 in)
- If the measured value exceeds the limit value, replace idler gear, shaft, and gear plate.

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Inspection (Cont'd)

IDLER GEAR OIL CLEARANCE



FEM057

- Measure the inner diameter (d_1) of idler gear shaft hole.
  Standard: 26.000 - 26.020 mm (1.0236 - 1.0244 in)
- Measure the outer diameter (d_2) of idler shaft.
  Standard: 25.967 - 25.980 mm (1.0223 - 1.0228 in)
- Calculate gear clearance.
  Clearance = $d_1 - d_2$
  Standard: 0.023 - 0.053 mm (0.0009 - 0.0021 in)

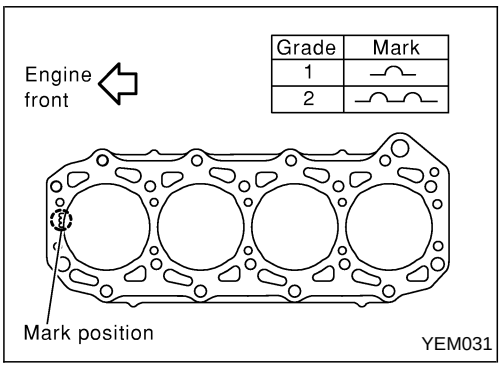
Installation

1. Install cylinder head gasket.

- Cylinder head gasket to be installed is selected by its thickness through the following procedure.

When replacing gasket only

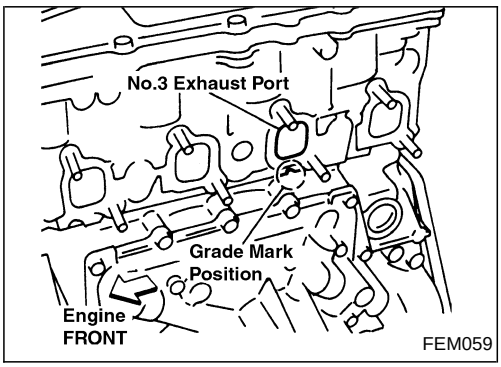
- Install gasket with same thickness as the one removed.
- Gasket thickness is identified by the number of notches located on rear-left side.



YEM031

Grade	Gasket thickness* mm (in)	No. of notches
1	0.65 (0.0256)	1
2	0.70 (0.0276)	2

*: Thickness of gasket tightened with head bolts



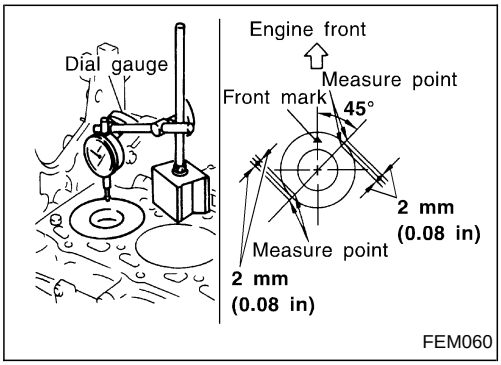
FEM059

- The number of notches can be checked at the position shown in the figure before cylinder head is removed. (It is necessary to remove exhaust manifold.)

When repairing/replacing the following

- When the top of cylinder block or crankshaft pin/journal is ground, or
- When cylinder block, piston, connecting rod, or crankshaft is replaced

1) Move piston toward TDC.
2) Position dial indicator on cylinder block as shown in the figure, and adjust the needle to "0".
3) Move dial indicator stand aside, and position the dial indicator to the measuring point as shown in the figure.
4) Rotate crankshaft slowly, and read the value on dial indicator at piston's maximum height.
5) Repeat above procedure at 2 positions of each cylinder (8 positions in total for 4 cylinders), and select the appropriate gasket by comparing the maximum crown depression with the table.



FEM060

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Installation (Cont'd)

Unit: mm (in)

Grade	Piston crown depression	Gasket thickness*1	No. of notches
1	Less than −0.078 (−0.0031)*2	0.65 (0.0256)	1
2	More than −0.078 (−0.0031)*3	0.70 (0.0276)	2

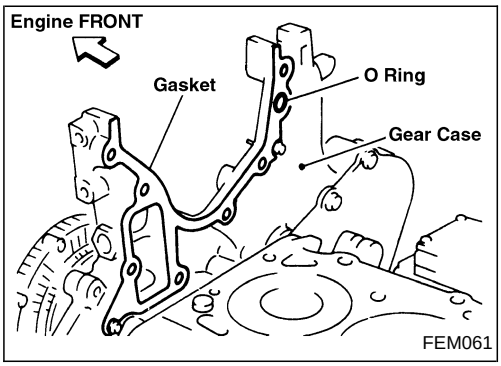
*1: Thickness of gasket tightened with head bolts
*2: Indicates values such as −0.080 mm (−0.0031 in).
*3: Indicates values such as −0.075 mm (−0.0030 in).

2. Install idler gear and idler shaft.

- Check that the counter marks with cam gear, "AA" and "BB", are located on the front side of the engine.
  Refer to EM-52.

CAUTION:

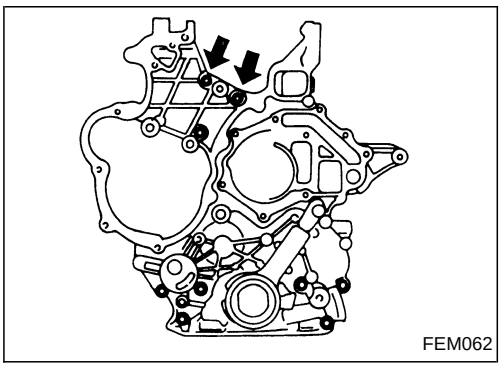
Since idler gear cannot be installed or removed with cylinder head assembly mounted on the engine because of interference with gear case, make sure that there are no reverse installations or uninstalled parts.



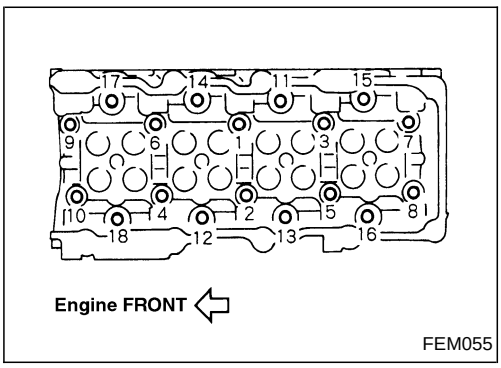
3. Install cylinder head assembly.
1) Attach gasket onto the rear of gear case.
2) Install O-ring to the rear of gear case.
3) Align cylinder head assembly with dowel pin of cylinder block and install.

CAUTION:

- **Make sure the O-ring does not fall off. Be careful not to drop the O-ring.**
- **Do not damage gasket located at the front.**



4. Position cylinder head assembly close to the rear of the gear case.
1) Install cylinder head bolts to the front and rear of cylinder head respectively, and tighten to the specified torque.
   : 40 - 49 N·m (4.0 - 5.0 kg-m, 29 - 36 ft-lb)
2) Loosen cylinder head bolts completely.
3) Install gear case mounting bolts to 2 positions shown by arrows in the figure, and tighten to the specified torque.
   : Less than 9.8 N·m (1.0 kg-m, 87 in-lb)



5. Tighten cylinder head bolts in the order indicated in the figure.
1) Apply engine oil to installation bolt threads and washers.
2) Tighten bolts to 98 to 102 N·m (10.0 to 10.5 kg-m, 73 to 75 ft-lb).
3) Loosen bolts completely until the torque becomes 0 N·m (0 kg-m, 0 in-lb).

CAUTION:

For procedure 3), loosen bolts in the reverse order as indicated in the figure.

4) Tighten bolts to 40 to 44 N·m (4.0 to 4.5 kg-m, 29 to 32 ft-lb).
5) Tighten bolts at the angle of 90 to 95° (target is 95°). (Angle tightening)

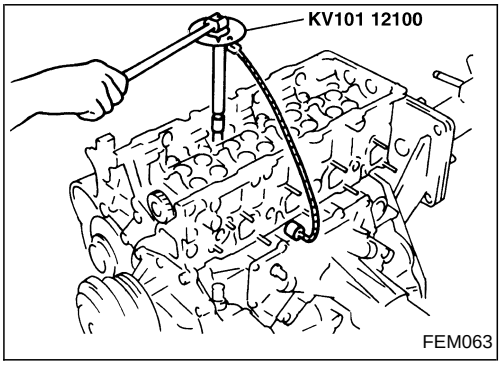
http://vnx.su/

Installation (Cont'd)

6) Once again, tighten bolts at the angle of 90 to 95° (target is 95°). (Angle tightening)

CAUTION:

Perform the following procedure to check turning angle of angle tightening, and do not judge by visual check.



ANGLE TIGHTENING PROCEDURE

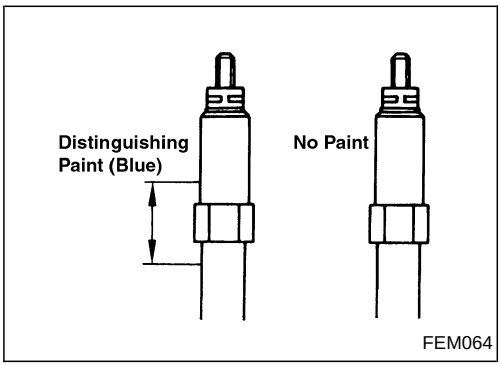
With protractor

- Make counter marks on the bolt head of cylinder head and cylinder head surface with paint, and check the turning angle.

With angle wrench (SST)

- Check the turning angle using angle indicator of angle wrench.

6. Loosen gear case mounting bolts which were tightened in 3) of procedure 4, retighten them to the specified torque.



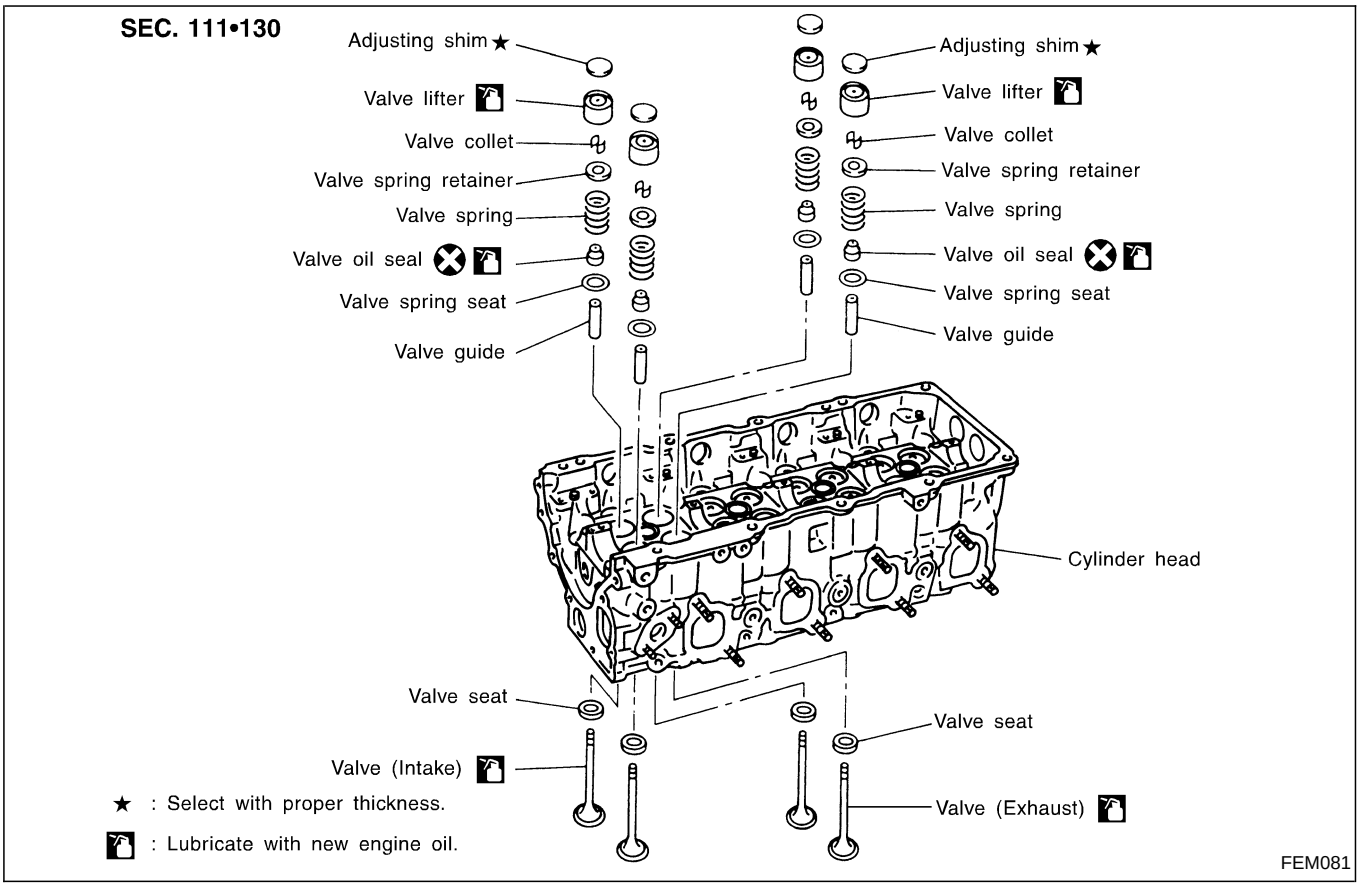
7. Install glow plug.

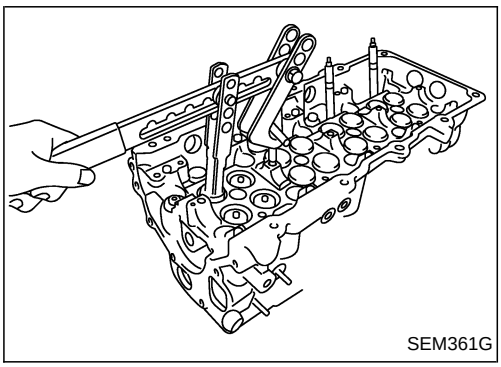
- 2 different types (manufacturers) of glow plugs are provided in parallel. (Refer to the figure for identification.)
- Do not install 2 different types of glow plugs in the engine. Make sure that the same glow plugs are installed.
- Using reamer, remove the carbon adhering to the installation hole of glow plug, and install glow plug.

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Installation (Cont'd)

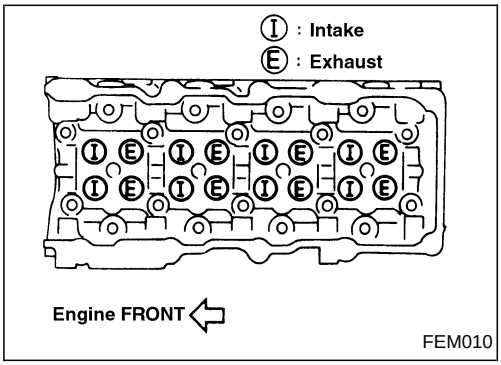
8. Install oil return pipe to the rear side of the cylinder head.
- When reinstalling a stud bolt, apply Three Bond 1207C (KP510 00150) to the thread of the bolt.





Disassembly

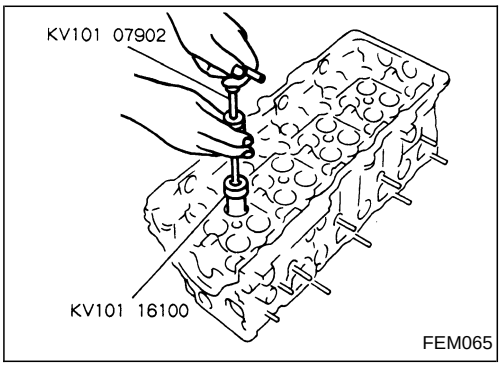
1. Remove adjusting shims and valve lifters.
   Check the installation positions, and keep them to avoid being confused.
2. Using valve spring compressor (SST), compress valve spring. Using magnetic hand, remove valve collets.
3. Remove valve spring retainers and valve springs.
4. Remove valves as pressing valve stems toward combustion chamber.



- Before removing the valve, check the valve guide clearance. (Refer to EM-58.)
- Check installation positions, and keep them to avoid being confused.
- Refer to the figure for intake/exhaust valve positions. (Intake and exhaust valve driving cams are provided alternately for each camshaft.)

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Disassembly (Cont'd)



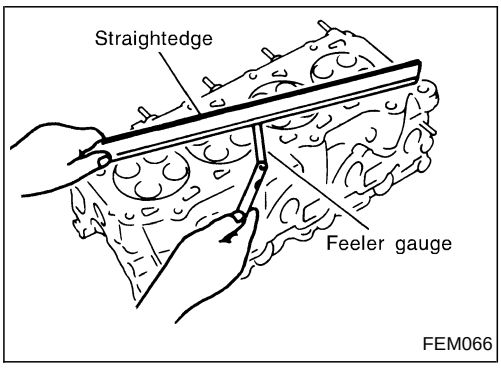
5. Remove valve oil seals using valve oil seal puller (SST).
6. Remove valve spring seats.
7. Before removing valve spring seats, perform valve seat contact check. (Refer to EM-60.)
8. Before removing valve guides, perform valve guide clearance check. (Refer to below.)

Inspection

CYLINDER HEAD DISTORTION

Using straightedge and feeler gauge, check the bottom of the cylinder head for distortion.

Limit: 0.2 mm (0.008 in)



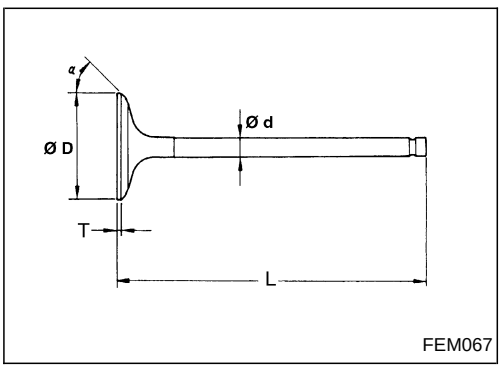
VALVE DIMENSION

Using micrometer, measure the dimensions of each part.

Standard

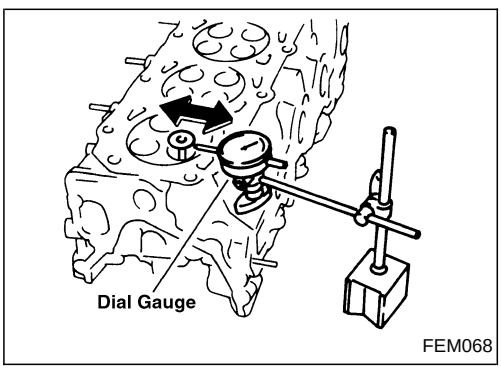
Unit: mm (in)

	Intake valve	Exhaust valve
L	113.5 (4.4685)	113.5 (4.4685)
T	1.5 (0.059)	1.5 (0.059)
ϕd	6.962 - 6.977 (0.2741 - 0.2747)	6.945 - 6.960 (0.2734 - 0.2740)
ϕD	31.9 - 32.1 (1.256 - 1.264)	29.9 - 30.1 (1.177 - 1.185)
α (degree)	45°00′ - 45°30′	45°00′ - 45°30′



VALVE GUIDE CLEARANCE

- Perform the inspection before removing valve guides.
- Check that the valve stem diameter is within specifications.
- Push valve approximately 25 mm (0.98 in) toward combustion chamber, move valve toward dial indicator to measure valve movement.
- Valve guide clearance is 1/2 of movement on dial indicator.



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Inspection (Cont'd)

Unit: mm (in)

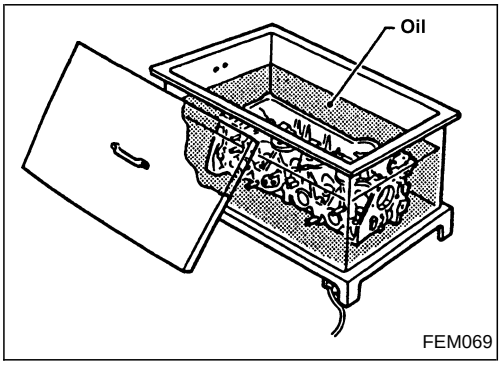
	Standard	Limit
Intake	0.023 - 0.056 (0.0009 - 0.0022)	0.18 (0.0071)
Exhaust	0.040 - 0.073 (0.0016 - 0.0029)	0.10 (0.0039)

- If the measured value exceeds the limit, replace valve guide.

VALVE GUIDE REPLACEMENT

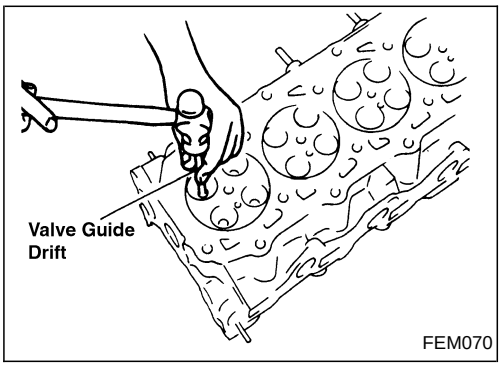
- There is no setup for oversized valve guide.

1. Heat cylinder head to 110 to 130°C (230 to 266°F) in oil bath.



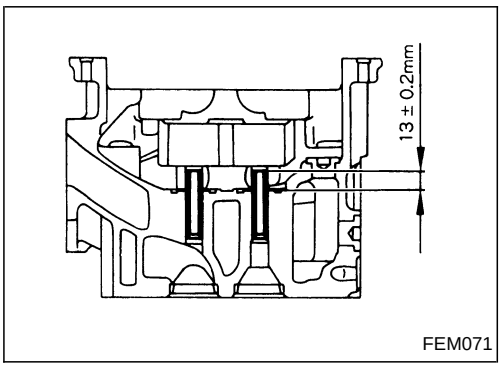
FEM069

2. Using valve guide drift (multi-purpose tool: for 7.0 mm dia.), tap valve guides out from the combustion chamber side.



FEM070

3. Heat cylinder head to 110 to 130°C (230 to 266°F) in oil bath.
4. Using valve guide drift (multi-purpose tool: for 7.0 mm dia.), press fit valve guides from camshaft side, referring to the dimension shown in the figure.



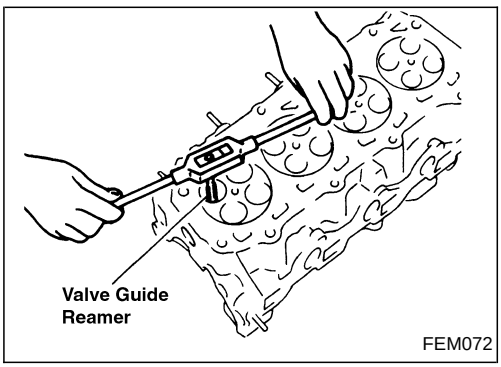
FEM071

5. Using valve guide reamer (multi-purpose tool), perform reaming to the press-fitted valve guides.

Reaming specifications:

Intake/Exhaust

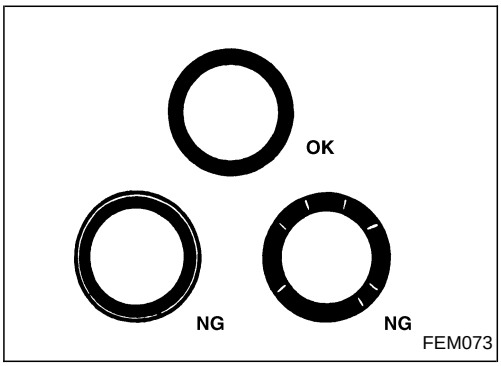
7.000 - 7.018 mm (0.2756 - 0.2763 in)



FEM072

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Inspection (Cont'd)



VALVE SEAT CONTACT

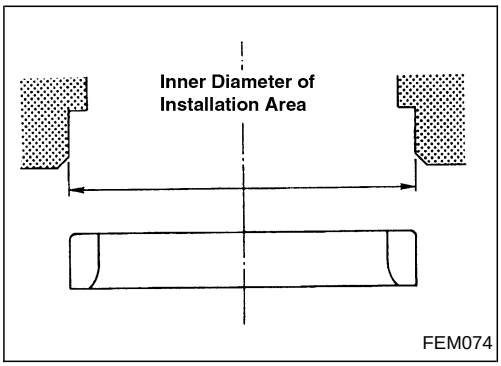
Check valve for any evidence of pitting at valve contact surface, and reseat or replace if worn out excessively.

- **When repairing valve seats, check valve and valve guide for wear beforehand. If worn, replace them. Then correct valve seat.**
- **The cutting should be done with both hands for uniform cutting.**

VALVE SEAT REPLACEMENT

- When removing valve seat, replace it with oversized [0.5 mm (0.0020 in)] valve seat.

1. Cut valve seat to make it thin, and pull it out.



2. Machine cylinder head inner diameter at valve seat installation position.

   Machining dimension:

   Intake

   33.500 - 33.515 mm (1.3189 - 1.3195 in) dia.

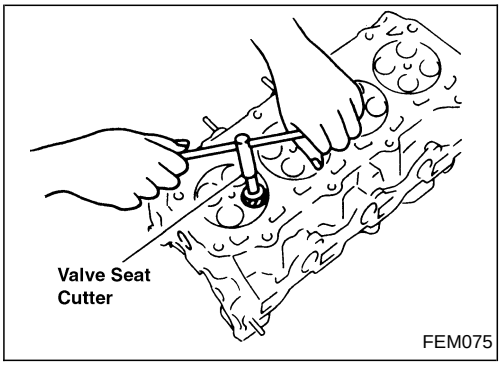
   Exhaust

   31.995 - 32.010 mm (1.2596 - 1.2602 in) dia.

3. Heat cylinder head to approximately 110 to 130°C (230 to 266°F) in oil bath.
4. After cooling valve seats sufficiently with dry ice, press fit it to cylinder head.

CAUTION:

Do not touch the cooled valve seats directly by hand.



5. Using valve seat cutter (multi-purpose tool), finish processing referring to the dimensions shown in the figure.

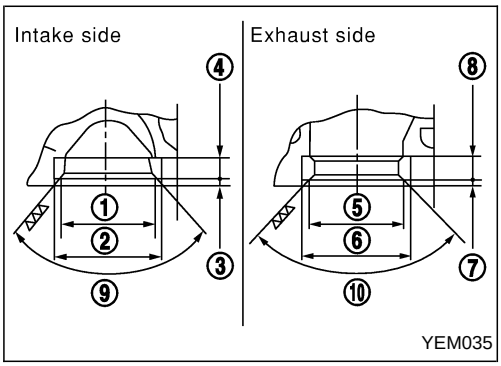
CAUTION:

When using valve seat cutter, grasp cutter handle with both hands, press cutter onto contacting face all around, and cut thoroughly. If cutter is pressed unevenly or repeatedly, the valve seat surface may be damaged.

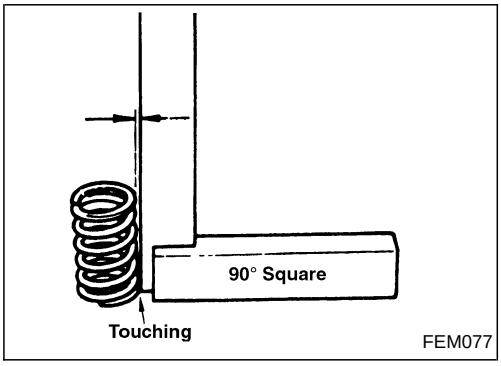
6. Using compound, perform valve fitting.
7. Check again to make sure that contacting status is satisfactory.

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Inspection (Cont'd)



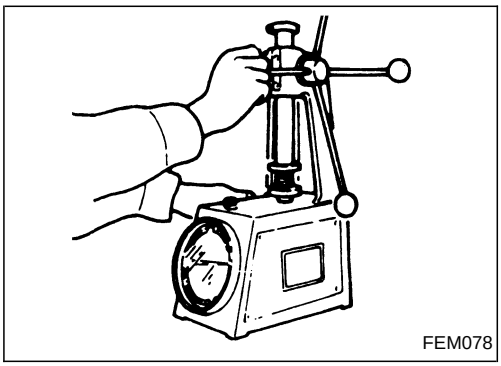
For details of values (① to ⑩), refer to EM-87, "Valve Seat" in "SERVICE DATA AND SPECIFICATIONS (SDS)".



VALVE SPRING RIGHT ANGLE

Position a straightedge to valve spring, turn the spring, and measure the maximum clearance value between top surface of spring and the straightedge

Limit: 2.4 mm (0.094 in)



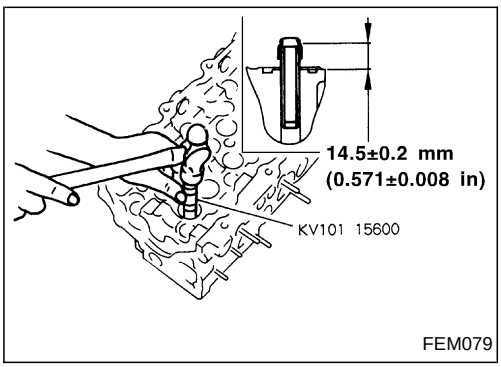
VALVE SPRING FREE LENGTH AND COMPRESSIVE LOAD

Using valve spring tester, check the following.

Free length: 55.43 mm (2.1823 in)
Installation height: 40.8 mm (1.6063 in)
Installation load: 180 - 206 N (18.4 - 21.0 kg, 40.6 - 46.3 lb)
Height at valve open: 32.3 mm (1.2717 in)
Load at valve open: 336 - 372 N (34.3 - 37.9 kg, 75.6 - 83.6 lb)

Assembly

1. Install valve guides, referring to EM-60, "VALVE SEAT REPLACEMENT".
2. Install valve seats, referring to EM-60, "VALVE SEAT CONTACT".



3. Using valve oil seal drift (SST), install valve oil seals referring to the dimension shown in the figure.

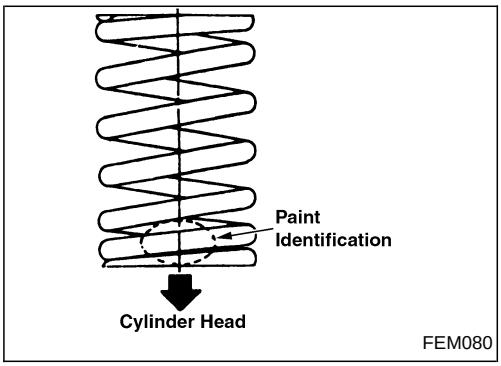
- The figure shows the dimension before valve spring seats are installed.

4. Install valve spring seats.
5. Install valves.

- Install the valves with bigger openings to intake valve side.
- Note that valve layout here is different from that of conventional the engine.

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Assembly (Cont'd)

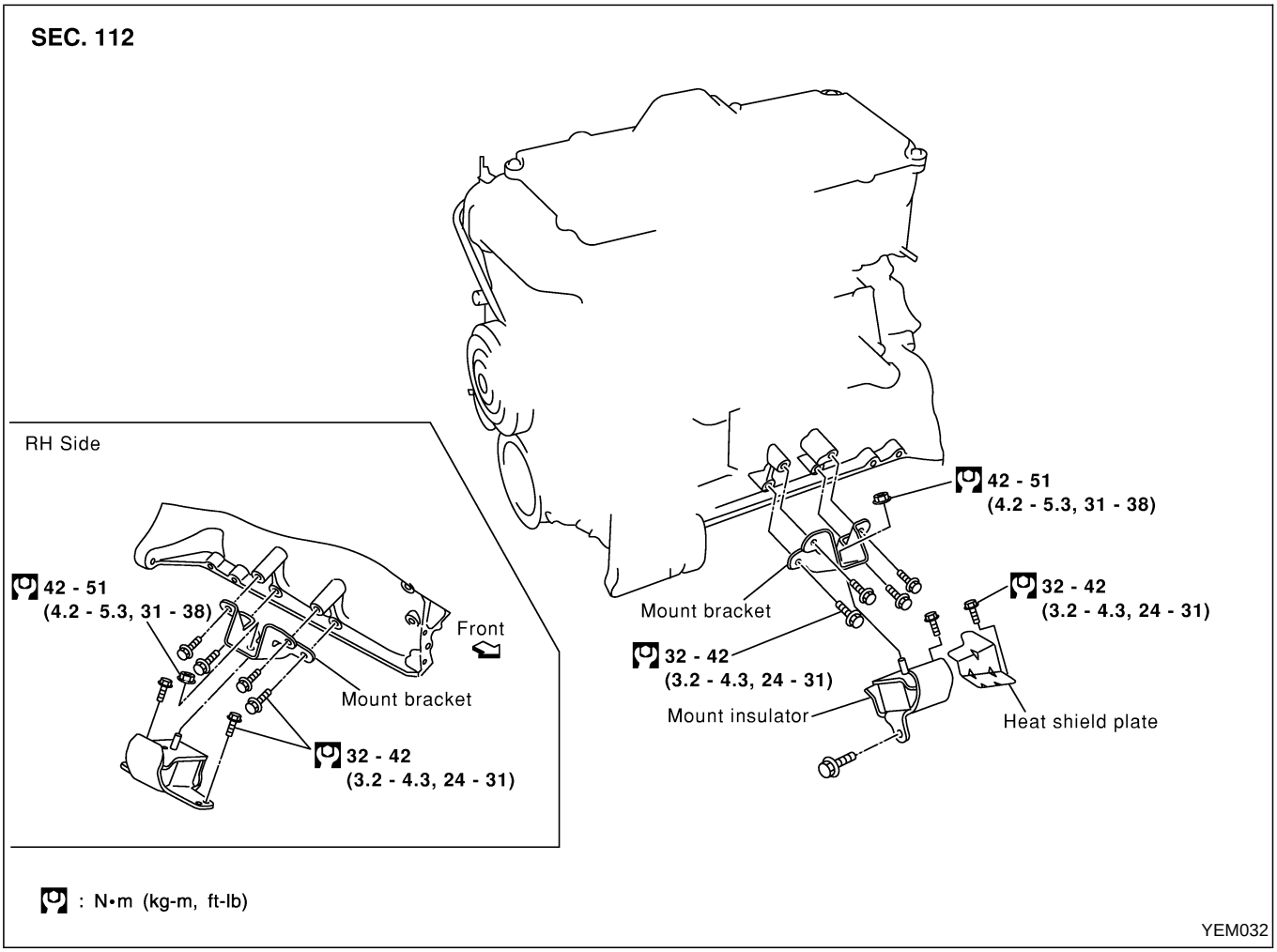


6. Install valve spring.
- When installing valve spring, make sure that a smaller pitch side (identification paint-applied side) faces the cylinder head.
  Identification color: pink
7. Install valve spring retainers.
8. Using valve spring compressor (SST), compress valve springs. Using magnetic hand, install valve collets.
- After installing valve collets, tap the stem end using a plastic hammer, and check the installation status.
9. Install valve lifters and adjusting shims to the same positions as before.

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Precautions

- Do not perform operation unless it is perfectly safe.
- Do not start operation unless the exhaust system and coolant are cooled down.
- Lift the engine at the designated support points only.
- Perform operations for the items other than the engine body, referring to the applicable sections.



- Refer to MT section and AT section for rear mount.

Removal

- After removing transmission, hoist the engine and remove it.

Preparation

1. Drain coolant from radiator drain plugs.
2. Remove the following parts.

- Engine hood
- Undercover
- Under protector
- Battery
- Intercooler
- Radiator shroud
- Radiator
- Accessory belt
- Cooling fan
- Exhaust front tube

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Removal (Cont'd)

Engine room (Left)

3. Remove air duct and air cleaner case.
4. Disconnect vacuum hose to the vehicle on the engine.
5. Disconnect harness connectors from alternator and air compressor.
6. Remove alternator.
7. After removing refrigerant, remove pipes of air compressor and inlet/outlet.
8. Disconnect heating hose, install blank cap to hose to prevent coolant from leaking.
9. Remove heating pipe.
10. Remove heat insulator.
11. Remove catalytic converter.

Engine room (Right)

12. Remove power steering reservoir tank from bracket, and fix it to the vehicle with a rope.

CAUTION:

Keep the reservoir tank level when fixing to prevent oil leak.

13. Remove fuel feed and return hoses.

CAUTION:

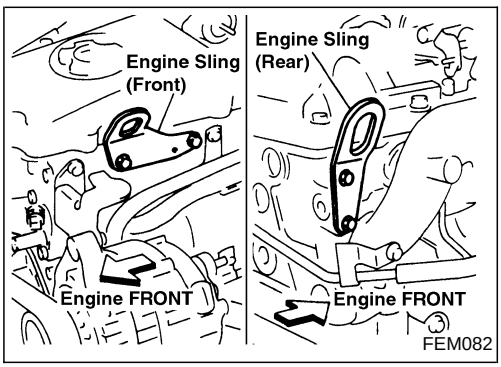
Install blank caps immediately to avoid fuel leakage.

14. Remove all harness connectors on the engine, and move harnesses to the side of the vehicle.

Vehicle underfloor

15. Remove starter motor.
16. Detach A/T oil cooler pipes from oil pan. (A/T model)
17. Remove rear propeller shaft.
18. Remove mounting bolts to secure the engine to transmission.

1) Remove torque converter installation bolt. (A/T model)
2) Lift transmission bottom with transmission jack, and remove rear mount members from the vehicle.
3) Lower transmission with the jack, and remove upper mounting bolts securing the engine to transmission.
4) Lift transmission with the jack, and reinstall rear mount members to the vehicle.
5) Position the jack to the front side of transmission.
6) Remove remaining mounting bolts securing the engine to transmission.



Removal operation

19. Remove air conditioner high pressure pipes at the rear of the engine room.

- This is due to some inconvenience in the rear slinger installation.

20. Install the engine slingers (standard service part) to front-left and rear-right.

: 25 - 28 N·m (2.5 - 2.9 kg-m, 18 - 20 ft-lb)

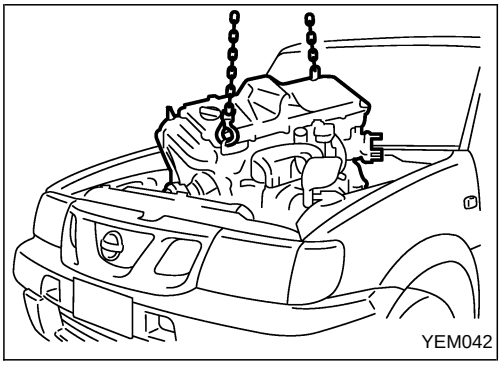
WARNING:

For engines without engine slingers, attach proper slingers and bolts described in the PARTS CATALOG.

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Removal (Cont'd)

21. Hook hoists to slingers to secure the position.
22. Remove installation nuts for left and right engine mount insulators.



23. While adjusting position frequently, hoist and remove the engine.

CAUTION:

- **While performing operation, check that all necessary wires and pipes are disconnected.**
- **Avoid interference with parts on the vehicle.**

Installation

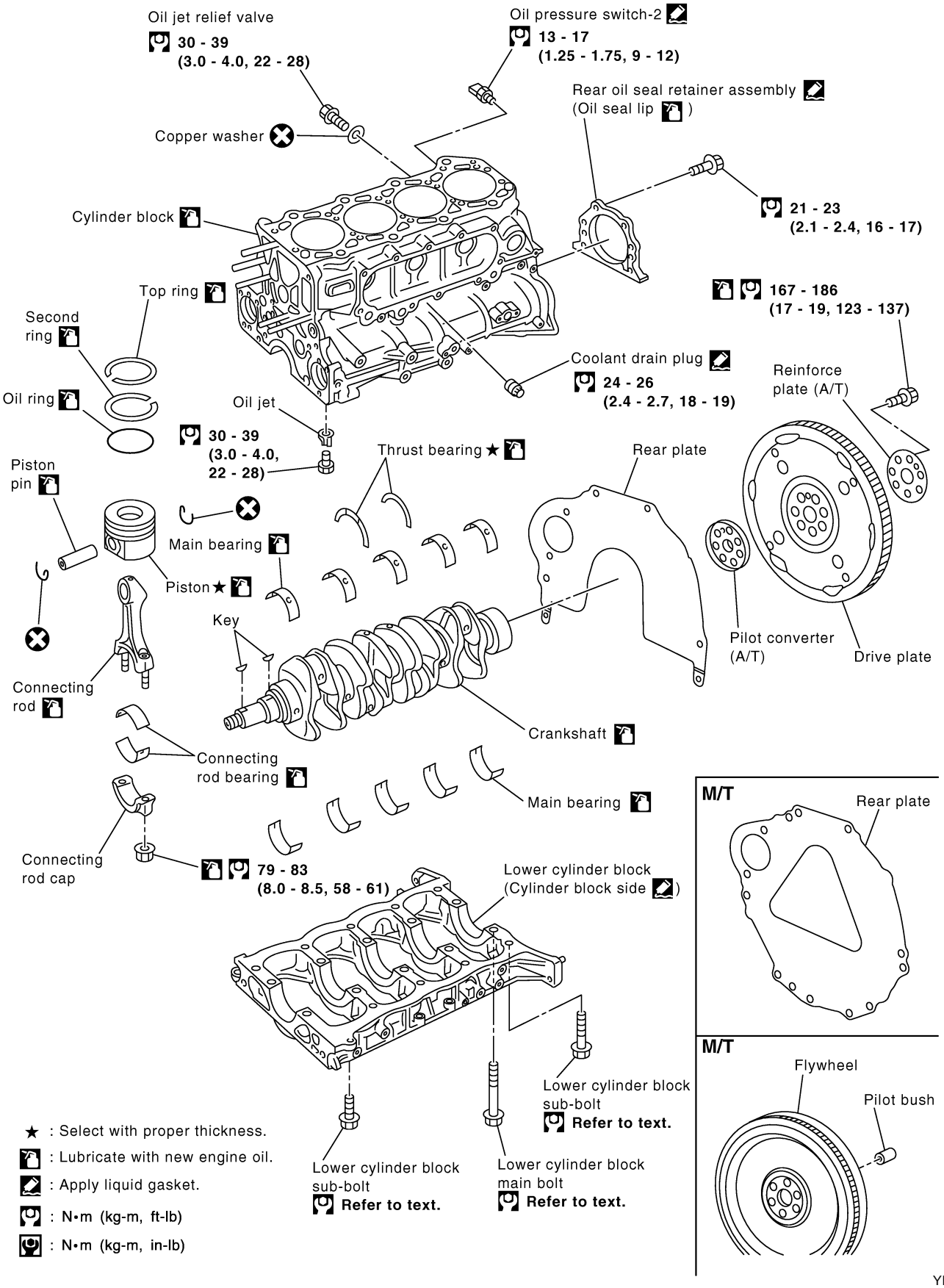
Install the engine in the reverse order of the removal procedure.

- Keep each mount insulator from oil adherence and damage.
- While keeping each mount insulator free from twisting, tighten mounting bolts and nuts for the engine mount.

Inspection

- Before starting the engine, check coolant level and grease amount, and if necessary, refill them to the specified level.
- Start the engine, and check that there is no abnormal noise or vibration.
- Warm up the engine to the sufficient temperature, and check that there is no leakage of coolant, greases, fuel, or exhaust gas.

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YEM059

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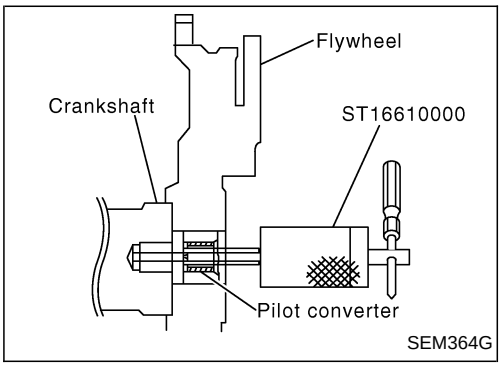
Selection Procedure for Selective Part Combination

Location	Selective part combination	Item	Method
Cylinder block - piston	Piston and piston assembly (Part No. is given to a piston and piston pin as a set.)	Piston grade (Piston outer diameter)	Refer to “Selective combination chart”.

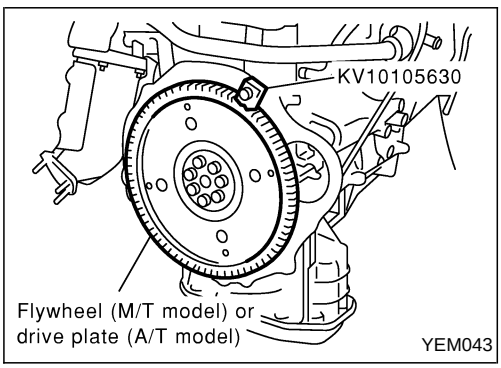
- Identification grade stamped on each part represents initial dimension of new part. This grade will not be applied to a reused part.
- Measure correct dimensions of a reused or modified part, then refer to “Selective combination chart” in this manual to identify the grade.
- Refer to the applicable pages for measurement method for each part, standards for reuse, and selecting method for selective part combination.

Disassembly

1. Remove engine assembly from vehicle.
   Refer to EM-63, “ENGINE REMOVAL”.



2. Remove pilot bushing from flywheel using pilot bearing puller (SST), if necessary (M/T model).
3. Install engine to engine stand (SST).



1) Remove flywheel (M/T model) or drive plate (A/T model).
- Using ring gear stopper (SST), secure ring gear, and remove mounting bolts.

CAUTION:

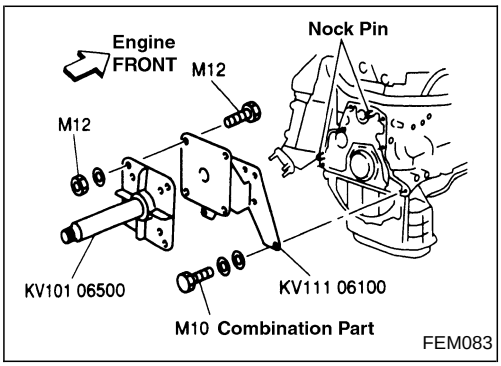
Do not disassemble flywheel.

- Flywheel has a two-piece structure. When being pressed forward/backward, or twisted in rotating direction, transmission-side mass will be moved with audible sound. This is not a problem.

2) Remove pilot converter (A/T model) and rear plate.

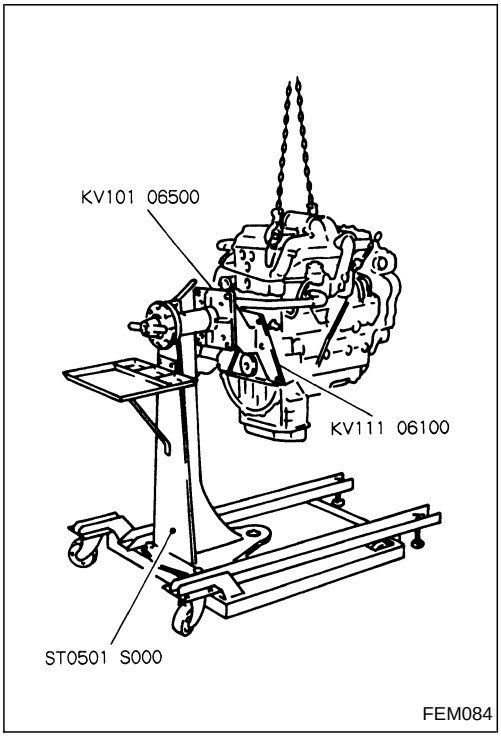
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Disassembly (Cont'd)



3) Install engine sub-attachment (SST) to the rear side of cylinder block.
- Align knock pin on cylinder block with pin hole on attachment to install engine sub-attachment.
- Mounting bolts are provided with engine sub-attachment.

4) Install engine attachment (SST).
- Use commercially available M12 mounting bolts and nuts (4 sets) with strength grade of 9T (minimum).



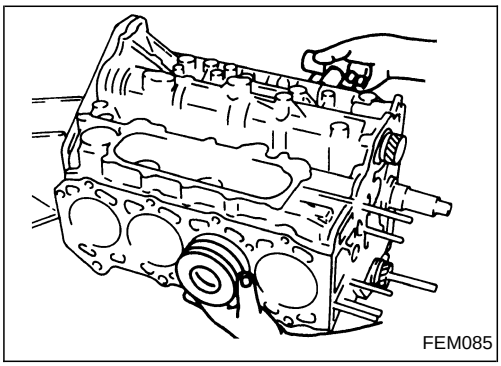
5) Hoist engine and install it to the engine stand (SST).
- Engine attachment and engine sub-attachment can be installed to engine stand before engine installation.

4. Drain engine oil and coolant from engine.
5. Remove the following parts and related parts. (Only major parts are listed.)
- Accessory belt
- Catalytic converter
- Turbocharger
- Exhaust manifold
- Injection tube
- Intake manifold
- Rocker cover
- Oil pan (upper/lower)
- Water pump
- Thermostat and water pipes
- Vacuum pump
- Injection tube
- Timing chain
- Electronic high pressure fuel injection pump
- Timing gear
- High pressure injection nozzle assembly
- Camshaft
- Cylinder head
- Oil cooler
- Accessory and accessory brackets

6. Remove rear oil seal and retainer assembly.
- Insert flat-bladed screwdriver between lower cylinder block and rear oil seal retainer to remove the assembly.
- No part No. is given to oil seal.

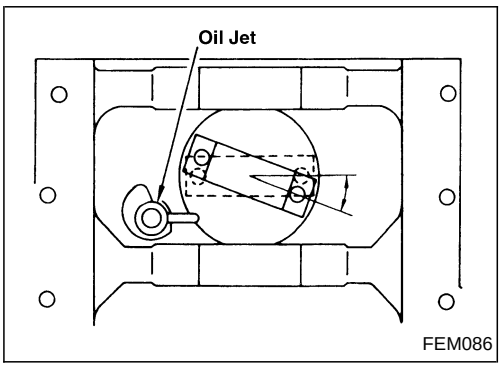
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Disassembly (Cont'd)


FEM085

7. Remove piston and connecting rod assembly.
- Before removing piston and connecting rod assembly, check connecting rod side clearance.
  Refer to EM-71, "CONNECTING ROD SIDE CLEARANCE".

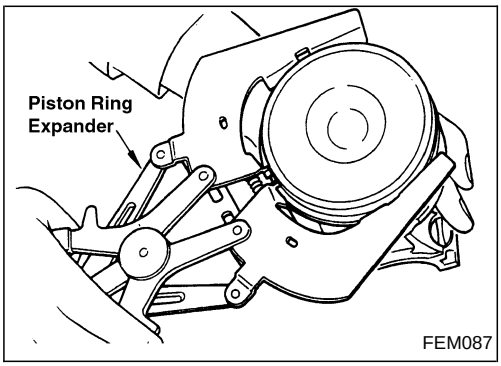
1) Move crankshaft pin to be removed to approximately BDC.
2) Remove connecting rod caps.
3) Using the grip of a hammer, press the piston and connecting rod assembly out to cylinder head side.



FEM086

CAUTION:
When removing the piston and connecting rod assembly, prevent the big end of the connecting rod from interfering with the oil jet.

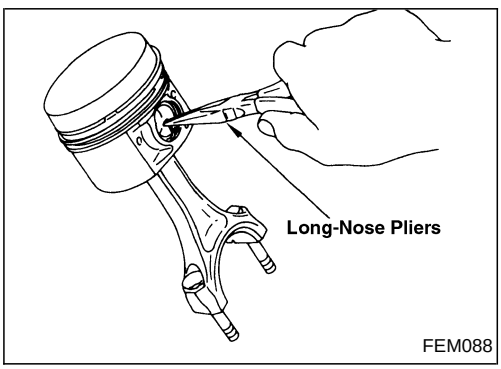
8. Remove connecting rod bearings from connecting rods and caps.
- Keep them by cylinder to avoid confusion.



FEM087

9. Remove piston rings from pistons using piston ring expander (multi-purpose tool).

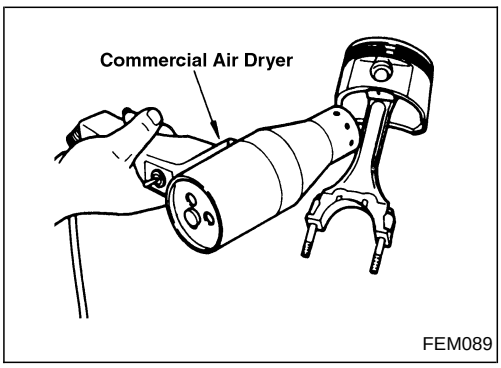
CAUTION:
- **When removing, prevent pistons from being damaged.**
- **Do not expand piston rings excessively. This may damage the piston rings.**



FEM088

10. Remove pistons from connecting rods.

1) Using long nose pliers, remove snap rings.

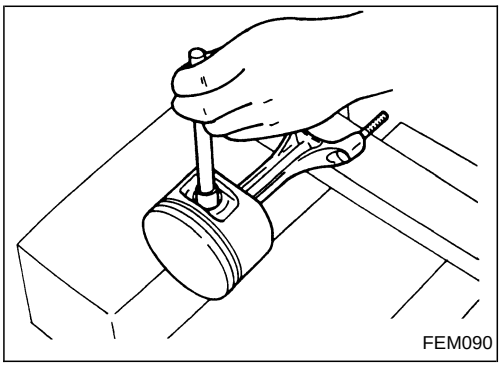


FEM089

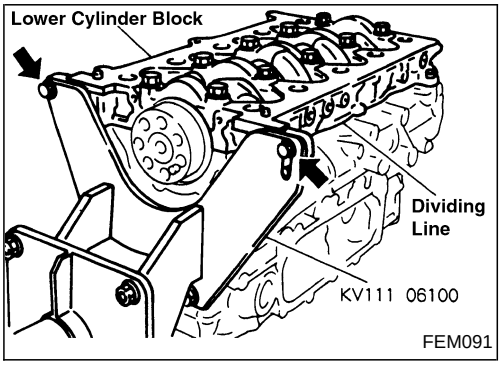
2) Using industrial dryer, heat pistons up to 60 to 70°C (140 to 158°F).

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Disassembly (Cont'd)


FEM090

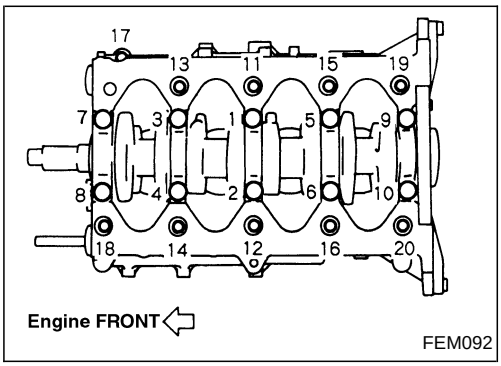
3) Using rod with outer diameter of 30 mm (1.18 in), press piston pins out.



FEM091

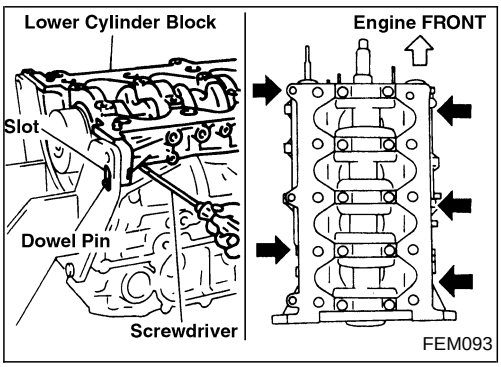
11. Remove lower cylinder block.
- The lower cylinder block is the lower part of the cylinder block, which works as the main bearing cap (beam) and oil pan mounting face.

1) Remove mounting bolts for engine sub-attachment shown by arrows in the figure.



FEM092

2) Loosen and remove mounting bolts in the reverse order shown in the figure.



FEM093

3) Insert flat-bladed screwdriver into 5 locations shown by arrows in the figure. Lift lower cylinder block evenly, and remove liquid gasket.

CAUTION:

Prevent mating faces from being damaged.

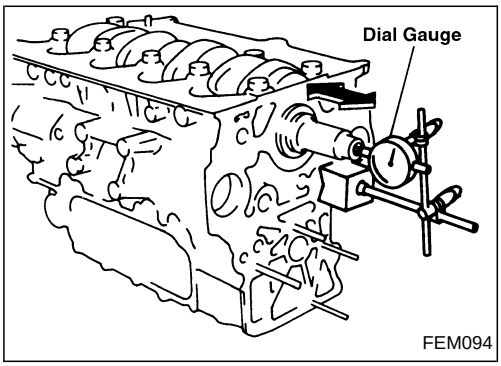
4) When removing lower cylinder block, use slot to prevent dowel pin from interfering with engine sub-attachment.
- No part No. is given to lower cylinder block, because it is machined with the cylinder block.

12. Remove crankshaft.
13. Remove main bearings and thrust bearings from cylinder block and lower cylinder block.

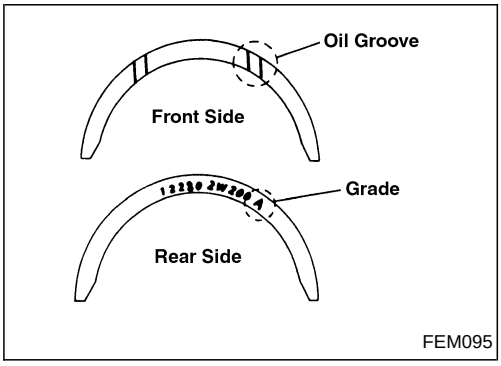
CAUTION:

Check mounting positions. Keep them to avoid confusion.

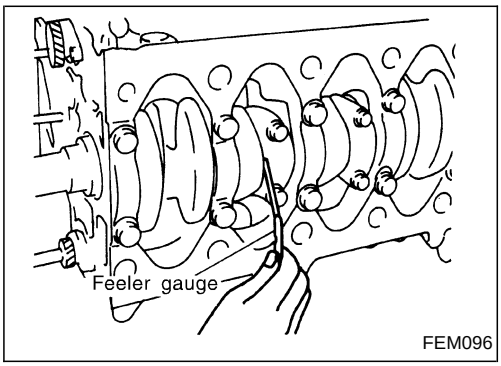
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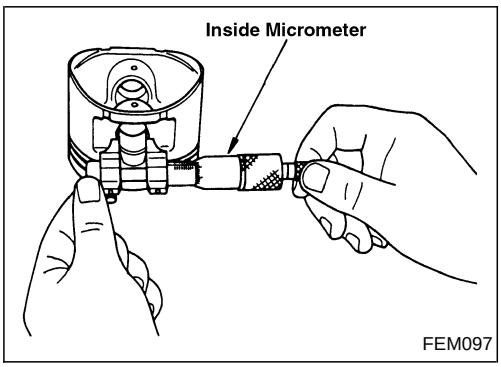
FEM094



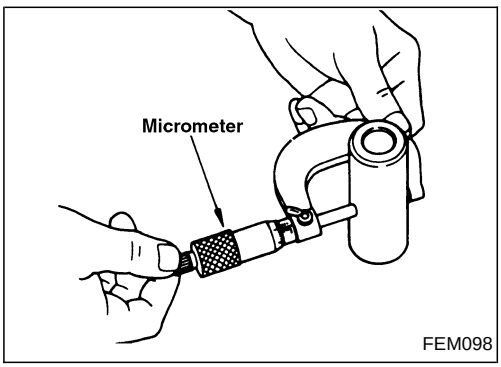
FEM095



FEM096



FEM097



FEM098

Inspection

CRANKSHAFT END PLAY

- Using dial indicator, measure crankshaft travel amount by moving the crankshaft forward or backward, or
- Using feeler gauge, measure crankshaft travel amount with the lower cylinder block removed.

Standard: 0.055 - 0.140 mm (0.0022 - 0.0055 in)
Limit: 0.250 mm (0.0098 in)

- If measured value exceeds the limit, select appropriate thrust bearings.

Unit: mm (in)

Grade symbol	Thickness of thrust bearing
A	2.275 - 2.325 (0.0896 - 0.0915)
B	2.300 - 2.350 (0.0906 - 0.0925)
C	2.325 - 2.375 (0.0915 - 0.0935)
OS 020	2.475 - 2.525 (0.0974 - 0.0994)

- OS 020 has part No. of 12280 2W215 and OS 0.20 marked on bearing surface.

CONNECTING ROD SIDE CLEARANCE

- Using feeler gauge, measure side clearance between connecting rod and crank arm.

Standard: 0.10 - 0.22 (0.0039 - 0.0087 in)
Limit: 0.22 mm (0.0087 in)

- If measured value exceeds the limit, replace connecting rod and repeat measurement.
  If measured value still exceeds the limit, replace crankshaft.

PISTON TO PISTON PIN CLEARANCE

Piston pin hole inner diameter

Using inside micrometer, measure piston pin hole inner diameter.

Standard: 32.997 - 33.005 mm (1.2991 - 1.2994 in) dia.

Piston pin outer diameter

Using micrometer, measure piston pin outer diameter.

Standard: 32.993 - 33.000 mm (1.2989 - 1.2992 in) dia.

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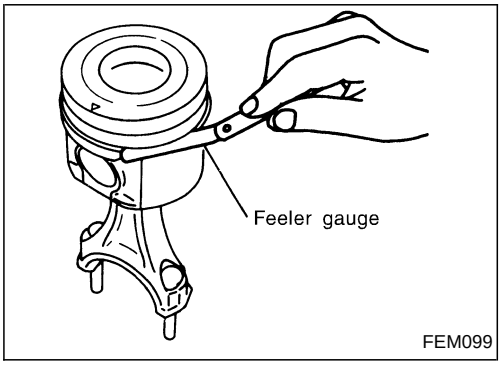
Inspection (Cont'd)

Calculation of piston to piston pin clearance

Piston pin clearance = Piston pin hole inner diameter − Piston pin outer diameter

Standard: −0.003 (Tightening clearance) to 0.012 mm (−0.0001 to 0.0005 in)

If out of specifications, replace piston and piston pin assembly.

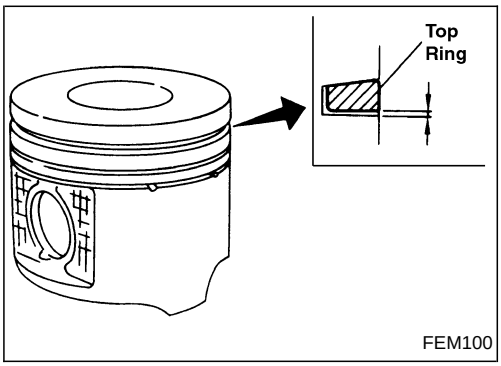


PISTON RING SIDE CLEARANCE

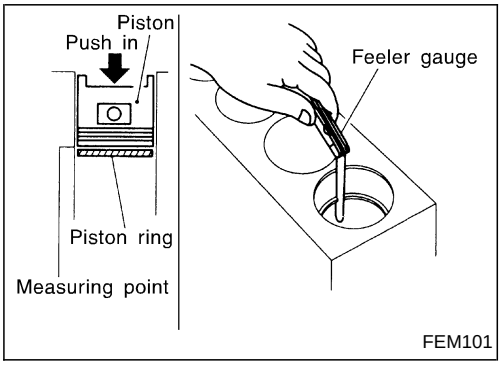
- Using feeler gauge, measure clearance between piston ring and piston ring groove.

Unit: mm (in)

	Standard	Limit
Top ring	0.05 - 0.07 (0.0020 - 0.0028)	0.5 (0.020)
Second ring	0.04 - 0.08 (0.0016 - 0.0031)	0.3 (0.012)
Oil ring	0.02 - 0.06 (0.0008 - 0.0024)	0.15 (0.0059)



- Align top ring and external surface of piston. Measure lower side clearance of top ring with top ring pressed onto upper side of ring groove.
- If side clearance exceeds the limit, replace piston ring.
- Check clearance again. If side clearance still exceeds the limit, replace piston.



PISTON RING END GAP

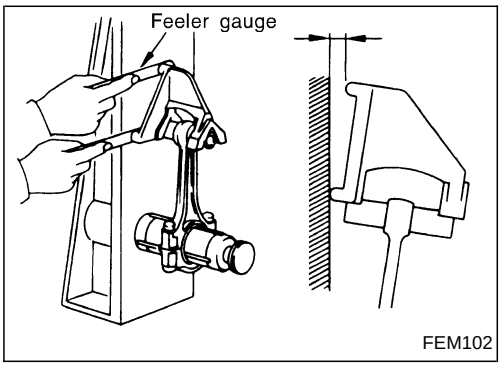
- Check that cylinder bore diameter is within specifications. Refer to EM-74, "PISTON TO CYLINDER BORE CLEARANCE".
- Using piston, press piston ring to cylinder mid point, and measure end gap.

Unit: mm (in)

	Standard	Limit
Top ring	0.25 - 0.45 (0.0098 - 0.0177)	1.5 (0.059)
Second ring	0.50 - 0.65 (0.0197 - 0.0256)	
Oil ring	0.25 - 0.50 (0.0098 - 0.0197)	

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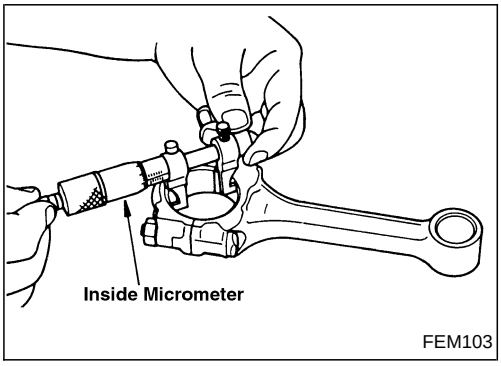
Inspection (Cont'd)



CONNECTING ROD BEND AND TORSION

Use connecting rod aligner to check bend and torsion.

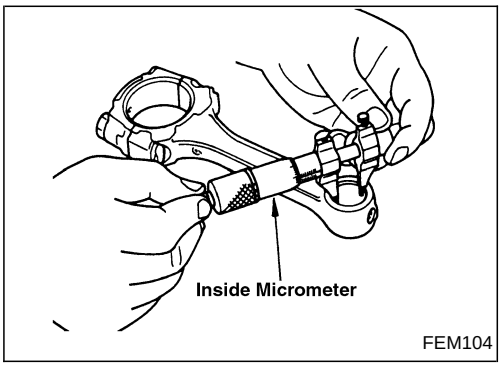
Bend limit:
0.05 mm (0.0020 in)/100 mm (3.94 in)
Torsion limit:
0.05 mm (0.0020 in)/100 mm (3.94 in)



Connecting rod big end inner diameter

Install connecting rod caps without connecting rod bearings and tighten connecting rod nuts to the specified torque. Using inside micrometer, measure connecting rod big end inner diameter.

Standard:
59.987 - 60.000 mm (2.3617 - 2.3622 in) dia.

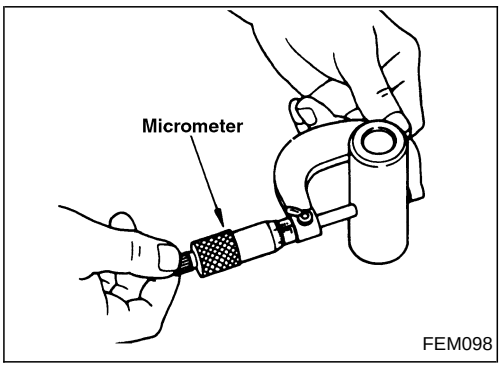


CONNECTING ROD BUSHING OIL CLEARANCE (SMALL END)

Connecting rod small end inner diameter

Use inside micrometer to measure small end inner diameter.

Standard:
33.025 - 33.038 mm (1.3002 - 1.3007 in) dia.



Piston pin outer diameter

Use micrometer to measure piston pin outer diameter.

Standard:
32.993 - 33.000 mm (1.2989 - 1.2992 in) dia.

Calculation of connecting rod bushing clearance

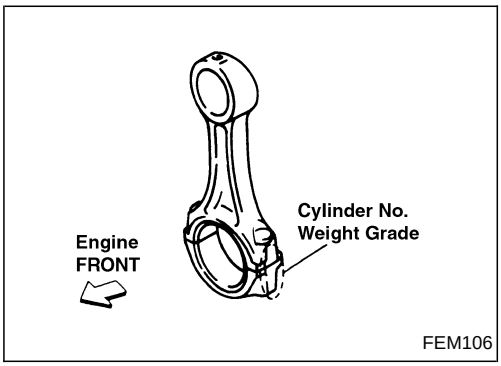
Connecting rod small end bushing clearance = Connecting rod small end inner diameter − Piston pin outer diameter

Standard:
0.025 - 0.045 mm (0.0010 - 0.0018 in)

- If out of specifications, replace connecting rod and/or piston and piston pin assembly.

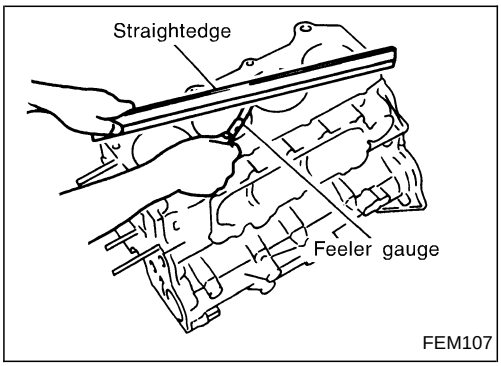
http://vnx.su/

Inspection (Cont'd)



- New connecting rods are classified into 8 weight classes at factory. The same class connecting rods are used on a engine.

Weight grade symbol	Weight class g (oz)
H	1,261 - 1,264 (44.5 - 44.6)
I	1,264 - 1,267 (44.6 - 44.7)
K	1,267 - 1,270 (44.7 - 44.8)
L	1,270 - 1,273 (44.8 - 44.9)
M	1,273 - 1,276 (44.9 - 45.0)
O	1,276 - 1,279 (45.0 - 45.1)
P	1,279 - 1,282 (45.1 - 45.2)
S	1,282 - 1,285 (45.2 - 45.3)



CYLINDER BLOCK TOP SURFACE DISTORTION

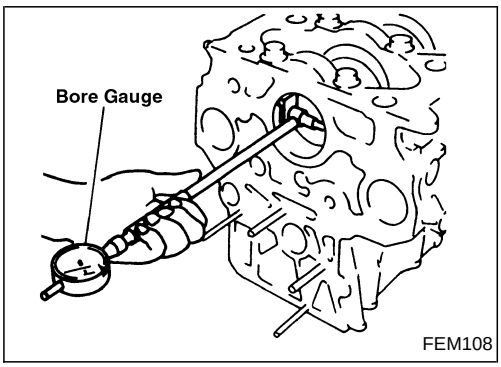
- Using scraper, remove gasket installed onto cylinder block surface. Remove contamination such as oil, scale, and carbon.

CAUTION:

Keep broken pieces of gasket clear of oil and coolant passages.

- Use straightedge and feeler gauge to check block upper surface for distortion.

  Limit: 0.1 mm (0.004 in)

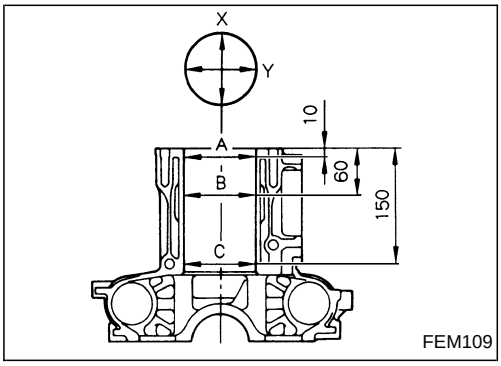


MAIN BEARING HOUSING INNER DIAMETER

- Install main bearing caps without main bearings. Tighten mounting bolts to the specified torque.
- Use bore gauge to measure main bearing housing inner diameter.

  Standard:

  74.981 - 75.000 mm (2.9520 - 2.9528 in) dia.
- If out of specification, replace cylinder block and lower cylinder block.



PISTON TO CYLINDER BORE CLEARANCE

Cylinder bore inner diameter

- Using bore gauge, measure cylinder inner diameters at 6 positions; top, middle, and bottom (A, B, C) in 2 directions (X, Y).

  Cylinder inner diameter (Standard):

  96.000 - 96.030 mm (3.7795 - 3.7807 in) dia.

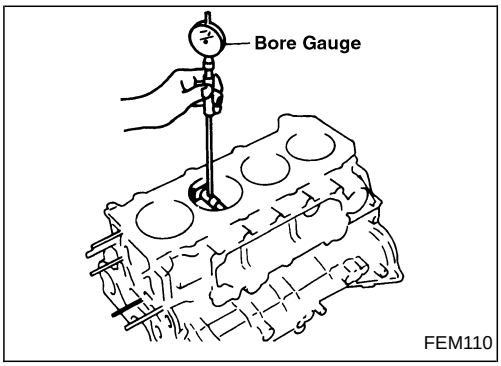
  Wear limit: 0.2 mm (0.008 in)

  Out-of-round limit (X - Y): 0.02 mm (0.0008 in)

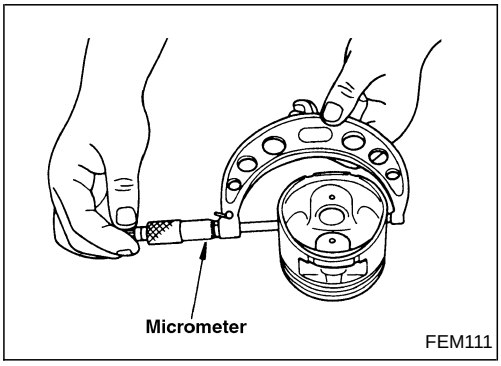
  Taper limit (A - C): 0.02 mm (0.0008 in)

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Inspection (Cont'd)



- If clearance exceeds the limit, or any flaws or seizures are found on inner surface of cylinder, horn or bore the applicable cylinder.



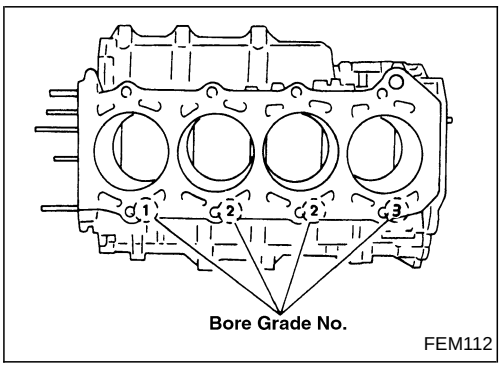
Piston outer diameter

Use micrometer to measure piston skirt outer diameter.

Measurement position:
10 mm (0.39 in) upper from the lower end of piston
Standard:
95.950 - 95.980 mm (3.7776 - 3.7787 in) dia.

Calculation of piston to piston bore clearance

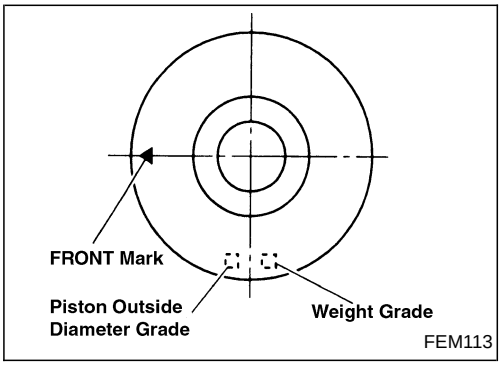
- Calculate using piston skirt outer diameter and cylinder inner diameter (direction X, position B).
  Clearance = Cylinder inner diameter − Piston skirt outer diameter
  Specifications at room temperature [20°C (68°F)]:
  0.040 - 0.060 mm (0.0016 - 0.0024 in)
- If out of specification, replace piston and piston pin assembly.



SELECTIVE PISTON COMBINATION

When using new cylinder block

- Confirm cylinder bore grade (1, 2, 3) on left upper surface of cylinder block, and refer to "Selective combination chart" below to select appropriate piston.
- Part No. is given to a piston and piston pin as a set.



When re-using an old cylinder block

1. Measure cylinder block bore inner diameter.
2. Referring to "Cylinder block bore inner diameter" in "Selective combination chart", select appropriate piston according to cylinder bore grade.

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Inspection (Cont'd)

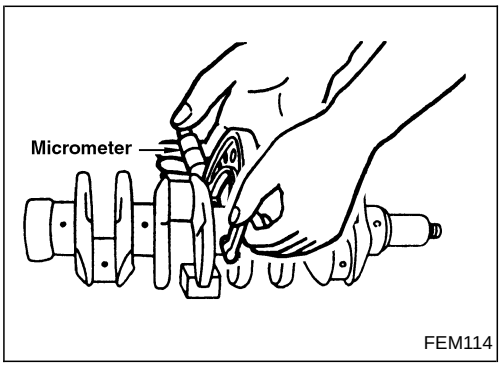
Selective combination chart

Unit: mm (in)

◯: Preferable combination △: Allowable combination X: NG combination			Piston grade	
			1	2
			95.950 - 95.960 (3.7776 - 3.7779)	95.960 - 95.970 (3.7779 - 3.7783)
Cylinder bore grade (Cylinder block bore inner diameter)	1	96.000 - 96.010 (3.7795 - 3.7799)	◯	X
	2	96.010 - 96.020 (3.7799 - 3.7803)	△	◯
	3	96.020 - 96.030 (3.7803 - 3.7807)	△	◯

- Piston grade 3 (piston diameter: 95.970 - 95.980 mm) is applicable at factory only.
- New pistons are classified into 4 weight classes at factory. The same class pistons are used on a engine.

Weight grade symbol	Weight class g (oz)
E	615 - 620 (21.7 - 21.9)
F	620 - 625 (21.9 - 22.0)
G	625 - 630 (22.0 - 22.2)
H	630 - 635 (22.2 - 22.4)



FEM114

CRANKSHAFT JOURNAL OUTER DIAMETER

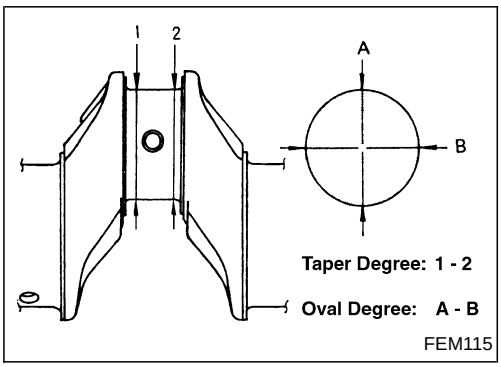
Use micrometer to measure journal outer diameter.

Standard: 70.907 - 70.920 mm (2.7916 - 2.7921 in) dia.

CRANKSHAFT PIN OUTER DIAMETER

Use micrometer to measure pin outer diameter.

Standard: 56.913 - 56.926 mm (2.2407 - 2.2412 in) dia.

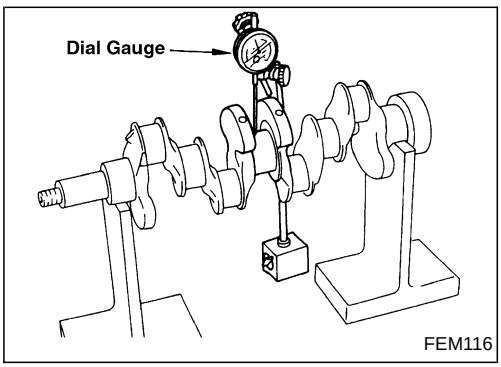


FEM115

CRANKSHAFT OUT-OF-ROUND AND TAPER

- Using micrometer, measure each journal and pin at 4 points shown in the figure.
- Out-of-round value is indicated by difference in dimensions between directions A and B at points 1 and 2.
- Taper value is indicated by difference in dimensions between points 1 and 2 in directions A and B.

Out-of-round limit: 0.01 mm (0.0004 in)
Taper limit: 0.01 mm (0.0004 in)



FEM116

CRANKSHAFT RUNOUT

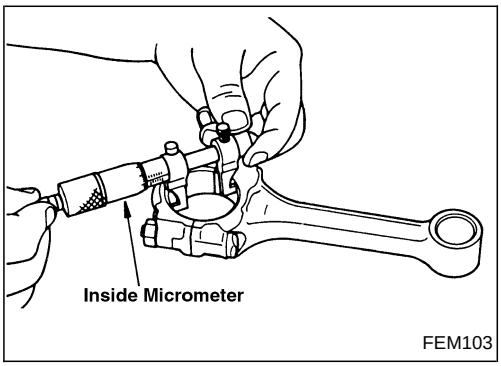
- Place V-block onto surface plate to support journals at both ends of crankshaft.
- Position dial indicator vertically onto No. 3 journal.
- Rotate crankshaft to read needle movement on dial indicator.
- Crankshaft bend value is 1/2 of needle movement.

Limit: 0.03 mm (0.0012 in)

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Inspection (Cont'd)

CONNECTING ROD BEARING OIL CLEARANCE

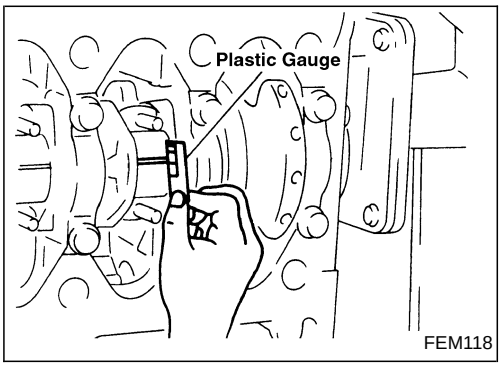


Method by measurement

- Install connecting rod bearings to connecting rods and caps, and tighten connecting nuts to the specified torque. Use inside micrometer to measure connecting rod bearing inner diameter. Bearing clearance = Connecting rod bearing inner diameter − Crankshaft pin outer diameter

  Standard: 0.035 - 0.077 mm (0.0014 - 0.0030 in)
- If out of specifications, check connecting rod big end inner diameter and crankshaft pin outer diameter, and select appropriate connecting rod bearing to adjust clearance to specifications.

  Refer to "Connecting rod bearing undersize list" on the next page.



Method using plastigage

- Remove contamination such as oil, dust completely from crankshaft pins and each bearing surface.
- Cut plastigage slightly shorter than bearing width, place it in crankshaft direction, avoiding oil holes.
- Install connecting rod bearings to caps, and tighten connecting rod nuts to the specified torque.

CAUTION:

Never rotate crankshaft.

- Remove connecting rod caps and bearings, and measure plastigage width using scale on plastigage bag.

CAUTION:

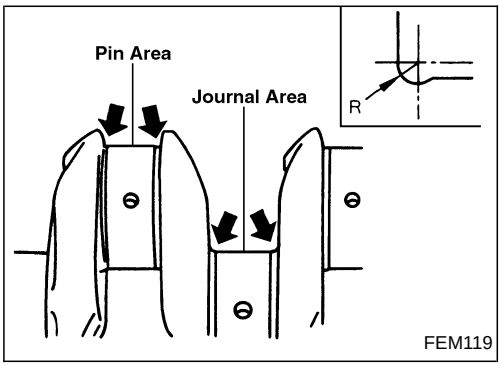
If out of specification, take same action mentioned in "Method by measurement".

Undersize bearing usage

- If bearing clearance is out of specifications for connecting rod bearings in standard size, use undersize bearings.
- When using undersize bearings, measure bearing inner diameter with bearing installed, and grind pins to adjust clearance to specification.

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Inspection (Cont'd)



Connecting rod bearing undersize list

Unit: mm (in)

Size	Thickness
US 0.25 (0.0098)	1.630 - 1.638 (0.0642 - 0.0645)
US 0.50 (0.0197)	1.755 - 1.763 (0.0691 - 0.0694)
US 0.75 (0.0295)	1.880 - 1.888 (0.0740 - 0.0743)
US 1.00 (0.0394)	2.005 - 2.013 (0.0789 - 0.0793)

CAUTION:

When grinding crank pins to use undersize bearings, avoid damaging corners of fillet.

Corner dimension (Standard):

Pin

3.3 - 3.7 mm (0.130 - 0.146 in)

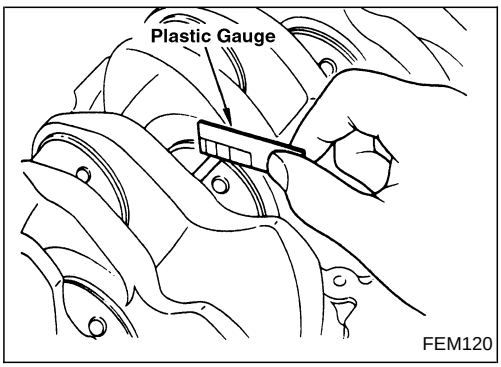
Journal

2.8 - 3.2 mm (0.110 - 0.126 in)

MAIN BEARING OIL CLEARANCE

Method by measurement

- Install main bearings to cylinder block and bearing caps, and tighten bearing cap bolts to the specified torque. Measure main bearing inner diameter.
  Bearing clearance = Bearing inner diameter − Crankshaft journal outer diameter
  Standard: 0.035 - 0.083 mm (0.0014 - 0.0033 in)
- If out of specification, check main bearing housing inner diameter and crankshaft journal outer diameter, and select appropriate main bearing to adjust clearance to specifications.
  Refer to "Main bearing undersize list" on the next page.



Method using plastigage

- Remove contamination such as oil, dust completely from crankshaft journals and each bearing surface.
- Cut plastigage slightly shorter than bearing width, place it in crankshaft direction, avoiding oil holes.
- Install main bearings to caps, and tighten connecting rod nuts to the specified torque.

CAUTION:

Never rotate crankshaft.

- Remove bearing caps and bearings, and measure plastigage width using scale on plastigage bag.

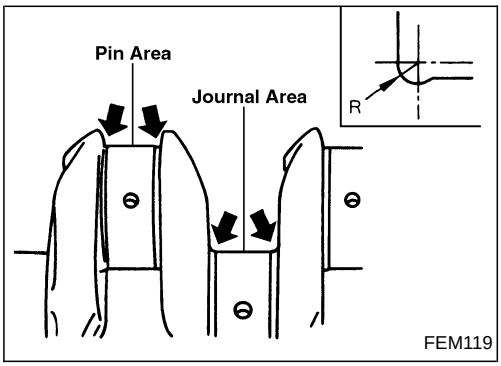
http://vnx.su/

Inspection (Cont'd)

CAUTION:
If out of specification, take same action mentioned in "Method by measurement".

Undersize bearing usage

- If bearing clearance is out of specifications for main bearings in standard size, use undersize bearings.
- When using undersize bearings, measure bearing inner diameter with bearing installed, and grind crank journals to adjust clearance to specification.



Main bearing undersize list

Unit: mm (in)

Size	Thickness
US 0.25 (0.0098)	2.130 - 2.138 (0.0839 - 0.0842)
US 0.50 (0.0197)	2.255 - 2.263 (0.0888 - 0.0891)
US 0.75 (0.0295)	2.380 - 2.388 (0.0937 - 0.0940)
US 1.00 (0.0394)	2.505 - 2.513 (0.0986 - 0.0989)

CAUTION:
When grinding crank journals to use undersize bearings, avoid damaging corners of fillet.

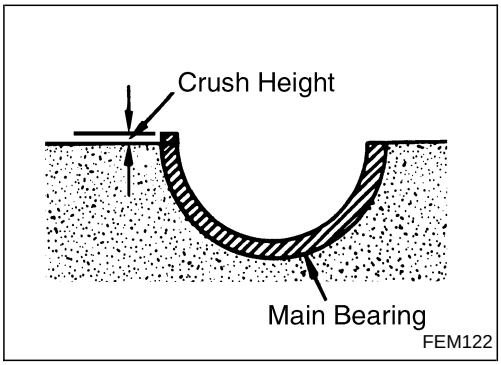
Corner dimension (Standard):

Pin

3.3 - 3.7 mm (0.130 - 0.146 in)

Journal

2.8 - 3.2 mm (0.110 - 0.126 in)



MAIN BEARING CRUSH HEIGHT

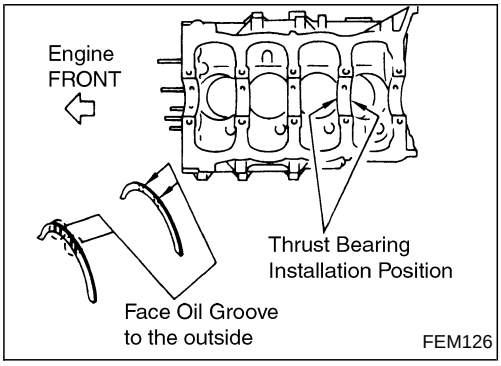
- Tighten bearing caps to the specified torque with main bearings installed, and remove caps. The bearing end must then be higher than the flat surface.

  Standard: Crush height must exist.
- If out of specification, replace main bearings.

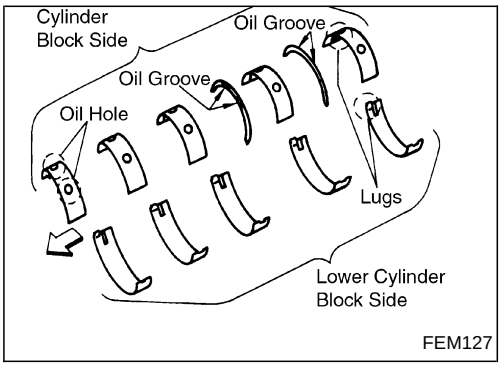
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Assembly

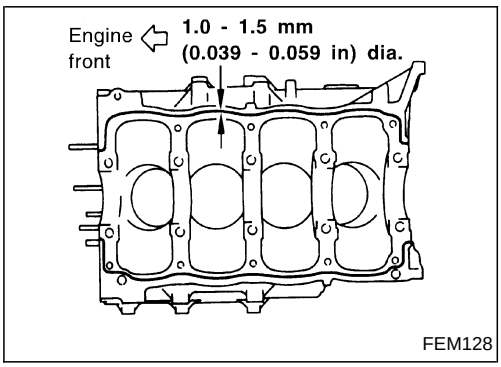
1. Blow air sufficiently to inside coolant passage, oil passage, crankcase, and cylinder bore to remove foreign matter.



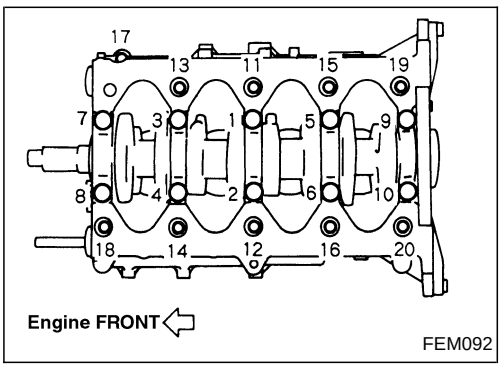
2. Install main bearings and thrust bearings.
1) Remove contamination, dust and oil from bearing mounting positions on cylinder block and main bearing caps.
2) Install thrust bearings on both sides of No. 4 housing on cylinder block.
- Install thrust bearings with oil groove facing to crankshaft arm (outside).



3) Being careful with the direction, install main bearings.
- Install main bearings with the oil holes and grooves onto the cylinder block side, and those without oil holes and grooves onto the lower cylinder block side.
- While installing bearings, apply engine oil to bearing surfaces (inside). Do not apply oil to rear surfaces, but clean them completely.
- Align stopper notches on bearings to install them.
- Check that the oil holes on the cylinder block body are mated with the oil hole positions on the bearings.



3. Install crankshaft to cylinder block.
- While rotating crankshaft by hand, check for smooth rotation.
4. Install lower cylinder block.
- Apply a continuous bead of liquid gasket to lower cylinder block as shown in the figure.
- Using slots on engine sub-attachment, install the lower cylinder block to the cylinder block, avoiding interference of dowel pins.



5. Tighten lower cylinder mounting bolts to the torque shown below in 3 consecutive steps in the order shown in the figure.

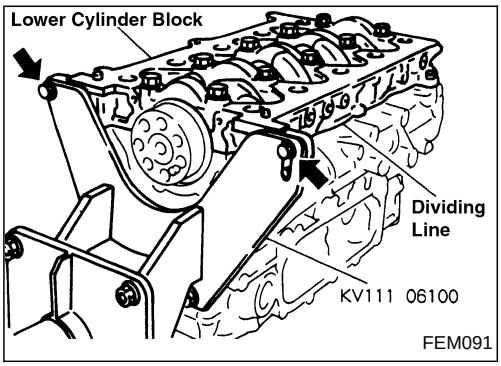
Unit: N·m (kg-m, ft-lb)

	Main bolt (Nos. 1 - 10)	Sub-bolt (Nos. 11 - 20)
1st	20 (2.0, 14)	98 (10, 72)
2nd	98 (10, 72)	20 (2.0, 14)
3rd	167 - 176 (17 - 18, 123 - 130)	40 - 46 (4.0 - 4.7, 29 - 33)

- Sub-bolt No. 17 has shorter length than that of other sub-bolts.

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Assembly (Cont'd)

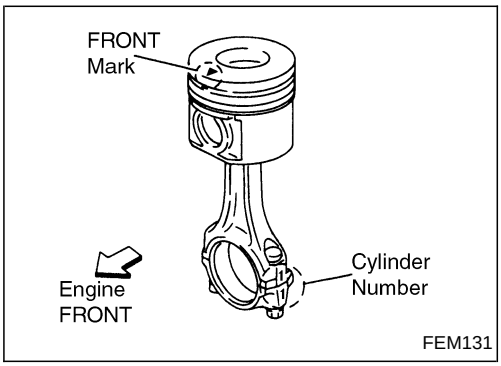


6. Install mounting bolts for engine sub-attachment shown by arrows in the figure.
- After tightening bolts to the specified torque, check crankshaft for smooth rotation.
- Check crankshaft end play.
  Refer to EM-71, "CRANKSHAFT END PLAY".

7. Install pistons to connecting rod.

1) Using long nose pliers, install snap rings to grooves on piston rear side.
- Fit snap rings correctly into grooves.

2) Install pistons to connecting rods.
- Using industrial dryer, heat pistons up to approx. 60 to 70°C (140 to 158°F) until piston pin can be pressed down by finger touch. Then insert piston pins into piston and connecting rod from front side of piston toward rear.

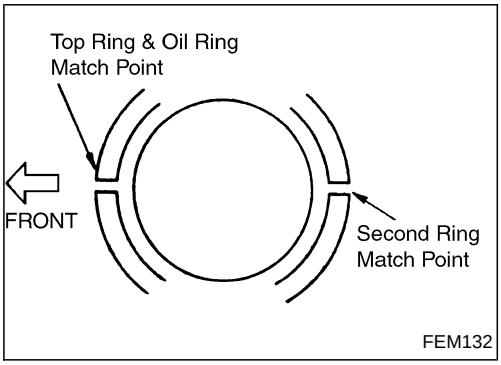


- Assemble piston and connecting rod with front mark of piston crown and cylinder No. stamped on connecting rod being positioned as shown in the figure.

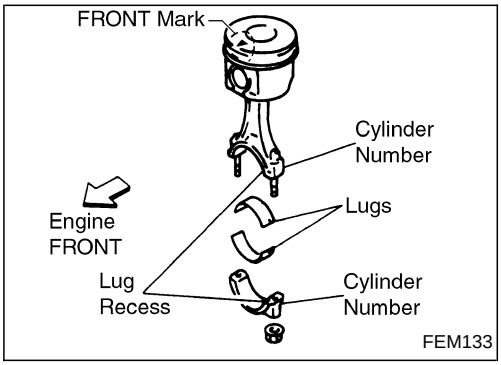
3) Install snap rings to front side of pistons.
- Refer to above 1) for precaution on snap ring installation.
- After installation, check connecting rods for smooth movement.

8. Use piston ring expander (multi-purpose tool) to install piston rings.

CAUTION:
When installing, prevent piston from being damaged.



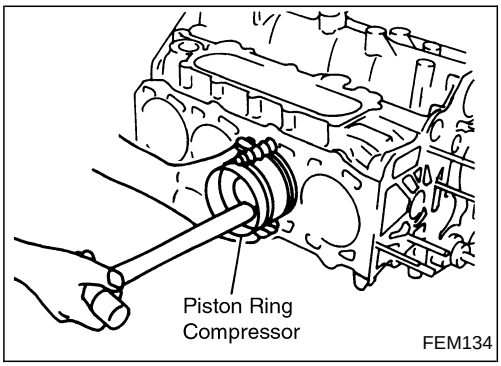
- Install top ring and second ring with stamped surfaces facing upward.
  Identification stamp:
  Top ring: R
  Second ring: RN



9. Install connecting rod bearings to connecting rods and caps.
- While installing connecting rod bearings, apply engine oil to bearing surfaces (inside). Do not apply oil to rear surfaces, but clean them completely.
- Align stoppers on connecting rod bearings with connecting rod stopper notches to install connecting rod bearings.

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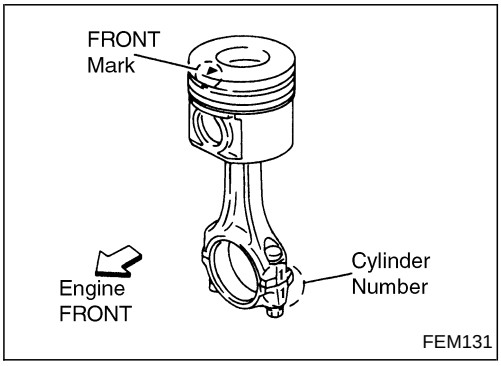
Assembly (Cont'd)



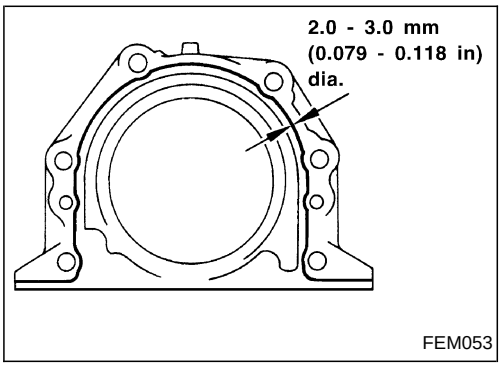
10. Install piston and connecting rod assembly to crankshaft.
- Move crankshaft pin to be removed to BDC.
- Align cylinder position with cylinder No. on connecting rod to install piston and connecting rod assembly.
- Using piston ring compressor (multi-purpose tool), install piston and connecting rod assembly with front mark on piston crown facing toward the front side of engine.

CAUTION:

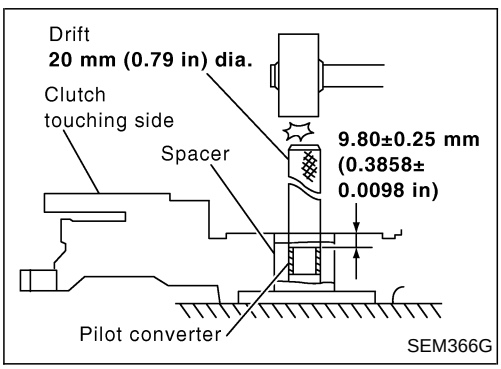
When installing piston and connecting rod assembly, prevent the big end of connecting rod from interfering with oil jet.



11. Install connecting rod caps and mounting nuts.
- Align cylinder No. stamped on connecting rod with that on cap to install connecting rod cap.
- After tightening nuts, check crankshaft for smooth rotation.
- Check connecting rod side clearance.
  Refer to EM-71, "CONNECTING ROD SIDE CLEARANCE".



12. Install rear oil seal and retainer assembly.
- Apply a continuous bead of liquid gasket to rear oil seal and retainer assembly as shown in the figure.

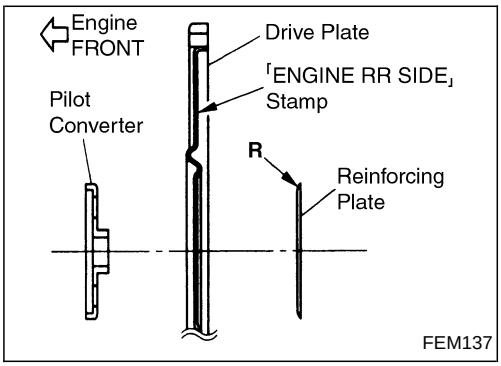


13. Press fit pilot bushing into flywheel (M/T model).
1) Using drift with outer diameter of 35 mm, press fit spacer until it is in contact with the flywheel to prevent displacement at removal.
2) Using drift with outer diameter of 20 mm, press fit pilot bushing by the length shown in the figure.

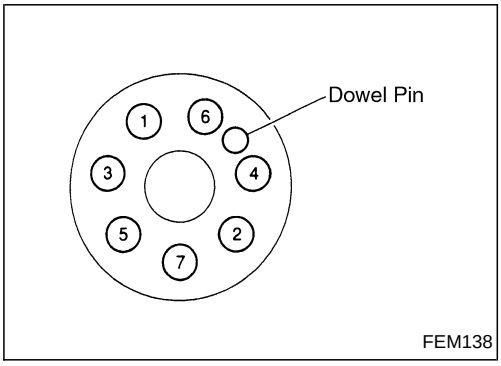
14. Install rear plate.
15. Install removed parts to engine in the reverse order of disassembly.
16. Remove engine from engine stand.

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Assembly (Cont'd)



17. Install flywheel (M/T model) or drive plate (A/T model).
- Install pilot converter, drive plate, and reinforcing plate in direction shown in the figure.
- Using the same method as disassembly, secure crankshaft and tighten mounting bolts.



- Tighten mounting bolts for flywheel or drive plate in order shown in the figure.

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General Specifications

Cylinder arrangement		In-line 4
Displacement	cm^3 (cu in)	2,953 (180.19)
Bore and stroke	mm (in)	96 x 102 (3.78 x 4.02)
Valve arrangement		DOHC
Firing order		1-3-4-2
Number of piston rings	Compression	2
	Oil	1
Number of main bearings		5
Compression ratio		17.9

Compression Pressure

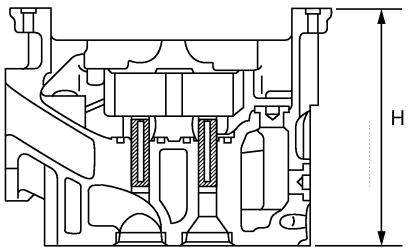
Unit: kPa (bar, kg/cm^2, psi)/200 rpm

Compression pressure	Standard	2,942 (29.42, 30.0, 427)
	Minimum	2,452 (24.52, 25.0, 356)
	Differential limit between cylinders	294 (2.94, 3.0, 43)

Cylinder Head

Unit: mm (in)

	Standard	Limit
Head surface distortion	Less than 0.05 (0.0020)	0.2 (0.008)



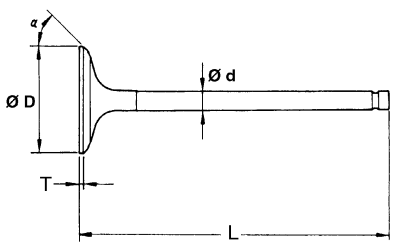
Nominal cylinder head height:
H = 156.9 - 157.1 mm (6.177 - 6.185 in)

SEM368G

Valve

VALVE

Unit: mm (in)



FEM067

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Valve (Cont'd)

Valve head diameter "D"	Intake	31.9 - 32.1 (1.256 - 1.264)
	Exhaust	29.9 - 30.1 (1.177 - 1.185)
Valve length "L"	Intake	113.5 (4.4685)
	Exhaust	113.5 (4.4685)
Valve stem diameter "d"	Intake	6.962 - 6.977 (0.2741 - 0.2747)
	Exhaust	6.945 - 6.960 (0.2734 - 0.2740)
Valve seat angle "α"	Intake	45°00′ - 45°30′
	Exhaust	
Valve margin "T"	Intake	1.5 (0.059)
	Exhaust	1.5 (0.059)
Valve stem end surface grinding limit		Less than 0.2 (0.008)

VALVE CLEARANCE

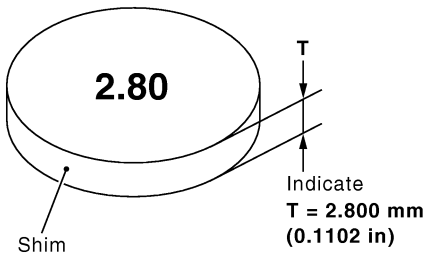
Unit: mm (in)

	Cold
Intake	0.30 - 0.40 (0.0118 - 0.0157)
Exhaust	0.30 - 0.40 (0.0118 - 0.0157)

*: Approximately 80°C (176°F)

AVAILABLE SHIMS

Thickness mm (in)	Identification mark
2.35 (0.0925)	2.35
2.40 (0.0945)	2.40
2.45 (0.0965)	2.45
2.50 (0.0984)	2.50
2.55 (0.1004)	2.55
2.60 (0.1024)	2.60
2.65 (0.1043)	2.65
2.70 (0.1063)	2.70
2.75 (0.1083)	2.75
2.80 (0.1102)	2.80
2.85 (0.1122)	2.85
2.90 (0.1142)	2.90
2.95 (0.1161)	2.95
3.00 (0.1181)	3.00
3.05 (0.1201)	3.05



SEM252G

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Valve (Cont'd)

VALVE SPRING

Free height	mm (in)	55.43 (2.1823)
Pressure	N (kg, lb) at height mm (in)	354 (36.1, 79.6) at 32.3 (1.2717)
Out-of-square	mm (in)	2.4 (0.094)

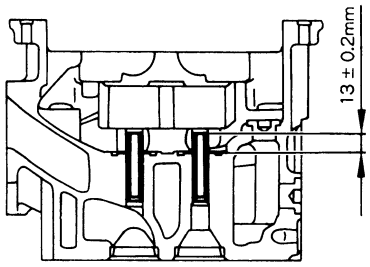
VALVE LIFTER

Unit: mm (in)

Valve lifter outer diameter	34.455 - 34.465 (1.3565 - 1.3569)
Lifter guide inner diameter	34.495 - 34.515 (1.3581 - 1.3589)
Clearance between lifter and lifter guide	0.030 - 0.060 (0.0012 - 0.0024)

VALVE GUIDE

Unit: mm (in)



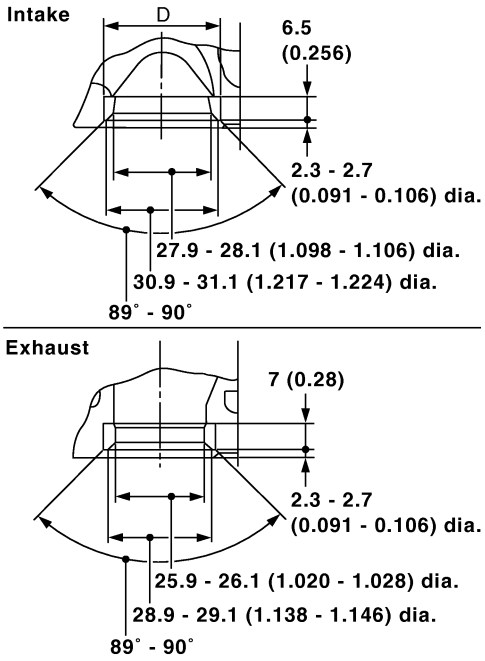
FEM071

		Standard
Valve guide	Outer diameter	11.023 - 11.034 (0.4340 - 0.4344)
	Inner diameter (Finished size)	7.000 - 7.018 (0.2756 - 0.2763)
Cylinder head valve guide hole diameter		10.975 - 10.996 (0.4321 - 0.4329)
Interference fit of valve guide		0.027 - 0.059 (0.0011 - 0.0023)
		Standard
Stem to guide clearance	Intake	0.023 - 0.056 (0.0009 - 0.0022)
	Exhaust	0.040 - 0.073 (0.0016 - 0.0029)
Valve deflection limit		0.2 (0.0079)
Projection length		12.8 - 13.2 (0.5309 - 0.5197)

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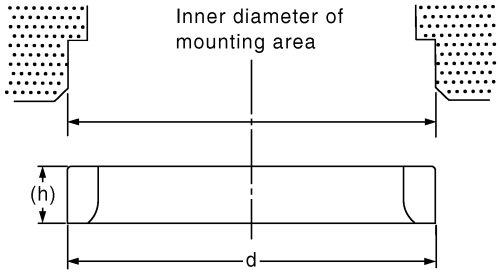
Valve Seat

Unit: mm (in)

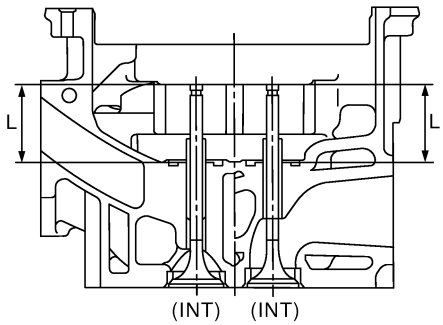


Unit: mm (in)

YEM062



SEM373G



SEM375G

		Standard	Service
Cylinder head seat recess diameter (D)	Intake	33.000 - 33.015 (1.2992 - 1.2998)	33.500 - 33.515 (1.3189 - 1.3195)
	Exhaust	31.495 - 31.510 (1.2400 - 1.2405)	31.995 - 32.010 (1.2596 - 1.2602)
Valve seat interference fit	Intake	0.050 - 0.078 (0.0020 - 0.0031)	
	Exhaust	0.040 - 0.066 (0.0016 - 0.0026)	

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Valve Seat (Cont'd)

Valve seat outer diameter (d)	Intake	33.065 - 33.078 (1.3018 - 1.3023)	33.565 - 33.578 (1.3215 - 1.3220)
	Exhaust	31.550 - 31.561 (1.2421 - 1.2426)	32.050 - 32.061 (1.2618 - 1.2622)
Height (h)	Intake	6.75 - 6.85 (0.2657 - 0.2697)	6.75 - 6.85 (0.2657 - 0.2697)
	Exhaust	7.35 - 7.45 (0.2894 - 0.2933)	7.35 - 7.45 (0.2894 - 0.2933)
Depth (L)	Intake	43.65 - 44.35 (1.7185 - 1.7461)	
	Exhaust	43.65 - 44.35 (1.7185 - 1.7461)	

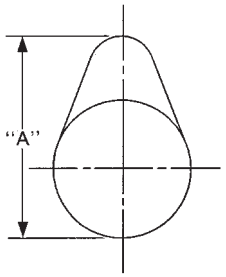
http://vnx.su/

Camshaft and Camshaft Bearing

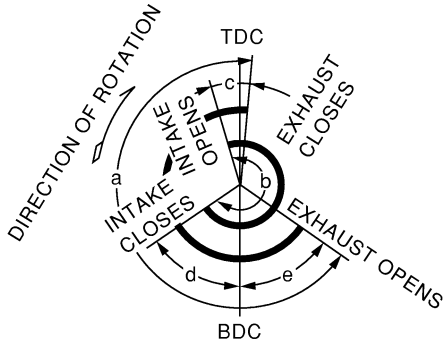
Unit: mm (in)

	Standard	Limit
Camshaft journal to bearing clearance	0.045 - 0.090 (0.0018 - 0.0035)	0.09 (0.0035)
Inner diameter of camshaft bearing	30.000 - 30.021 (1.1811 - 1.1819)	—
Outer diameter of camshaft journal	29.931 - 29.955 (1.1784 - 1.1793)	—
Camshaft runout [TIR*]	—	0.02 (0.0008)
Camshaft sprocket runout [TIR*]	Less than 0.15 (0.0059)	—
Camshaft end play	0.065 - 0.169 (0.0026 - 0.0067)	0.2 (0.008)

*: Total indicator reading



EM671

Cam height "A"	Intake	40.468 - 40.508 (1.5932 - 1.5948)
	Exhaust	40.830 - 40.870 (1.6075 - 1.6091)
Wear limit of cam height		0.15 (0.0059)
Valve timing		

SEM372G

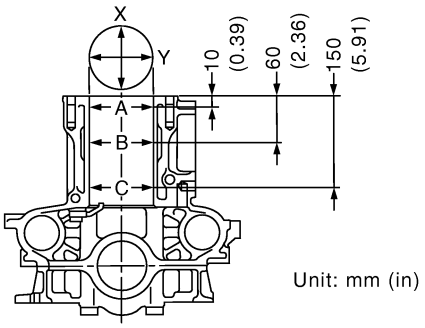
Unit: degree

a	b	c	d	e
234	220	10	34	50

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Cylinder Block

Unit: mm (in)



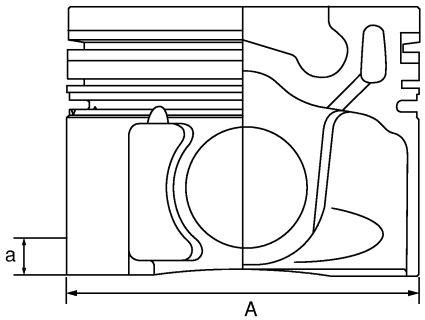
SEM370G

Surface flatness	Standard			Less than 0.03 (0.0012)
	Limit			0.10 (0.0039)
Cylinder bore	Inner diameter	Standard	Grade No. 1	96.000 - 96.010 (3.7795 - 3.7799)
			Grade No. 2	96.010 - 96.020 (3.7799 - 3.7803)
			Grade No. 3	96.020 - 96.030 (3.7803 - 3.7807)
		Wear limit		0.20 (0.0079)
Out-of-round (X − Y)				Less than 0.02 (0.0008)
Taper (A − B − C)				Less than 0.02 (0.0008)
Main journal inner diameter (Without bearing)				74.981 - 75.000 (2.9520 - 2.9528)
Difference in inner diameter between cylinders	Limit			Less than 0.05 (0.0020)

Piston, Piston Ring and Piston Pin

AVAILABLE PISTON

Unit: mm (in)



SEM369G

Piston skirt diameter “A”	Standard	Grade No. 1	95.950 - 95.960 (3.7776 - 3.7779)
		Grade No. 2	95.960 - 95.970 (3.7779 - 3.7783)
		Grade No. 3	95.970 - 95.980 (3.7783 - 3.7787)
“a” dimension			10 (0.39)
Piston pin hole diameter			32.997 - 33.005 (1.2991 - 1.2994)
Piston clearance to cylinder block			0.040 - 0.060 (0.0016 - 0.0024)

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Piston, Piston Ring and Piston Pin (Cont'd)

PISTON RING

Unit: mm (in)

		Standard	Limit
Side clearance	Top	0.05 - 0.07 (0.0020 - 0.0028)	0.5 (0.020)
	2nd	0.04 - 0.08 (0.0016 - 0.0031)	0.3 (0.012)
	Oil ring	0.02 - 0.06 (0.0008 - 0.0024)	0.15 (0.0059)
End gap	Top	0.25 - 0.45 (0.0098 - 0.0177)	1.5 (0.059)
	2nd	0.50 - 0.65 (0.0197 - 0.0256)	1.5 (0.059)
	Oil (rail ring)	0.25 - 0.50 (0.0098 - 0.0197)	1.5 (0.059)

PISTON PIN

Unit: mm (in)

Piston pin outer diameter		32.993 - 33.000 (1.2989 - 1.2992)
Interference fit of piston pin to piston		−0.003 to 0.012 (−0.0001 to 0.0005)
Piston pin to connecting rod bushing clearance	Standard	0.025 - 0.045 (0.0010 - 0.0018)
	Limit	0.045 (0.0018)

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

Connecting Rod

Unit: mm (in)

Center distance		154.5 (6.083)
Bend [per 100 (3.94)]	Limit	0.05 (0.0020)
Torsion [per 100 (3.94)]	Limit	0.05 (0.0020)
Connecting rod small end inner diameter		35.987 - 36.000 (1.4168 - 1.4173)
Piston pin bushing inner diameter*		33.025 - 33.038 (1.3002 - 1.3007)
Connecting rod big end inner diameter		59.987 - 60.000 (2.3617 - 2.3622)
Crankshaft journal bearing inner diameter*		70.955 - 70.990 (2.7935 - 2.7949)
Side clearance	Standard	0.10 - 0.22 (0.0039 - 0.0087)
	Limit	0.22 (0.0087)

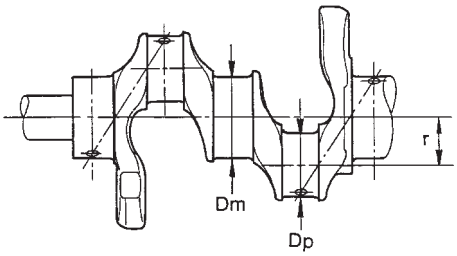
*: After installing in connecting rod

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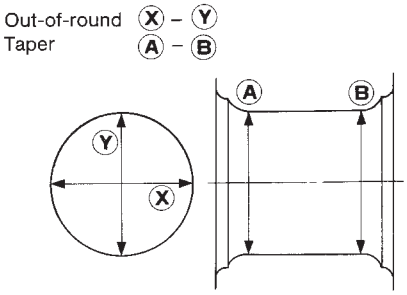
Crankshaft

Unit: mm (in)

Main journal dia. “Dm”		70.907 - 70.920 (2.7916 - 2.7921)
Pin journal dia. “Dp”	Grade No. 0	56.913 - 56.926 (2.2407 - 2.2412)
Center distance “r”		50.95 - 51.05 (2.0059 - 2.0098)
Out-of-round (X − Y)	Standard	Less than 0.01 (0.0004)
Taper (A − B)	Standard	Less than 0.01 (0.0004)
Runout [TIR*]	Standard	Less than 0.01 (0.0004)
	Limit	Less than 0.03 (0.0012)
Free end play	Standard	0.055 - 0.140 (0.0022 - 0.0055)
	Limit	0.25 (0.0098)



SEM645

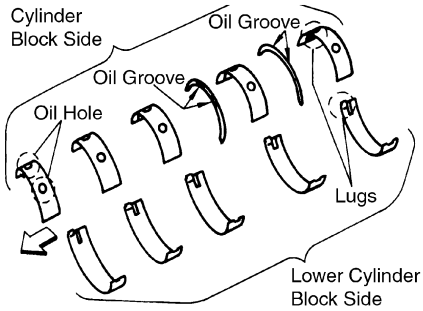


EM715

*: Total indicator reading

Available Main Bearing

UNDERSIZE



FEM127

Size	Thickness “T” mm (in)	Width “W” mm (in)	Main journal diameter “Dm”
Standard	2.005 - 2.013 (0.0789 - 0.0793)	25.74 - 26.00 (1.0134 - 1.0236)	Grind so that bearing clearance is the specified value.
US 025	2.130 - 2.138 (0.0839 - 0.0842)		
US 050	2.255 - 2.263 (0.0888 - 0.0891)		
US 075	2.380 - 2.388 (0.0937 - 0.0940)		
US 100	2.505 - 2.513 (0.0986 - 0.0989)		

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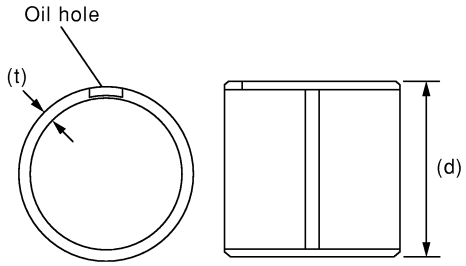
Available Connecting Rod Bearing

CONNECTING ROD BEARING

Grade number	Thickness “T” mm (in)	Width “W” mm (in)
Standard	1.505 - 1.513 (0.0593 - 0.0596)	25.9 - 26.1 (1.020 - 1.028)
US 025	1.630 - 1.638 (0.0642 - 0.0645)	
US 050	1.755 - 1.763 (0.0691 - 0.0694)	
US 075	1.880 - 1.888 (0.0740 - 0.0743)	
US 100	2.005 - 2.013 (0.0789 - 0.0793)	

BALANCER SHAFT BUSH

Unit: mm (in)



SEM371G

Balancer shaft journal outer diameter	Front	50.875 - 50.895 (2.0029 - 2.0037)
	Rear	50.675 - 50.695 (1.9951 - 1.9959)
Balancer shaft bearing inner diameter	Front	53.980 - 54.010 (2.1252 - 2.1264)
	Rear	53.780 - 53.810 (2.1173 - 2.1185)
Balancer shaft journal oil clearance	Standard	0.045 - 0.135 (0.0018 - 0.0053)
	Limit	0.180 (0.0071)
Balancer shaft bush outer diameter (d)	Front	54.090 - 54.130 (2.1295 - 2.1311)
	Rear	53.890 - 53.930 (2.1216 - 2.1232)
Thickness (t)	Front	0.2 - 0.4 (0.008 - 0.016)
	Rear	0.2 - 0.4 (0.008 - 0.016)

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Miscellaneous Components

Unit: mm (in)

Flywheel runout [TIR]*	Less than 0.15 (0.0059)
Drive plate runout [TIR]*	Less than 0.1 (0.0039)

*: Total indicator reading

BEARING CLEARANCE

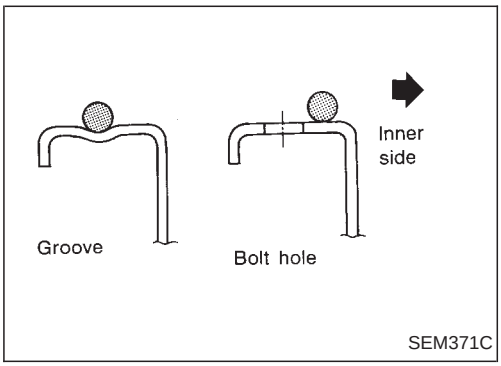
Unit: mm (in)

Main bearing clearance	Standard	0.035 - 0.083 (0.0014 - 0.0033)
Connecting rod bearing clearance	Standard	0.035 - 0.077 (0.0014 - 0.0030)

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Parts Requiring Angular Tightening

- Some important engine parts are tightened using an angular-tightening method rather than a torque setting method.
- If these parts are tightened using a torque setting method, dispersal of the tightening force (axial bolt force) will be two or three times that of the dispersal produced by using the correct angular-tightening method.
- Although the torque setting values (described in this manual) are equivalent to those used when bolts and nuts are tightened with an angular-tightening method, they should be used for reference only.
- To assure the satisfactory maintenance of the engine, bolts and nuts must be tightened using an angular-tightening method.
- Before tightening the bolts and nuts, ensure that the thread and seating surfaces are clean and then coated with engine oil.
- The bolts and nuts which require the angular-tightening method are as follows:
  (1) Cylinder head bolts
  (2) Connecting rod cap nuts



Liquid Gasket Application Procedure

a. Before applying liquid gasket, use a scraper to remove all traces of old liquid gasket from mating surface and grooves, and then completely clean any oil stains from these portions.

b. Apply a continuous bead of liquid gasket to mating surfaces. (Use Genuine Liquid Gasket or equivalent.)
- **Be sure liquid gasket is 3.5 to 4.5 mm (0.138 to 0.177 in) wide (oil pan).**
- **Be sure liquid gasket is 2.0 to 3.0 mm (0.079 to 0.118 in) wide (in areas except oil pan).**

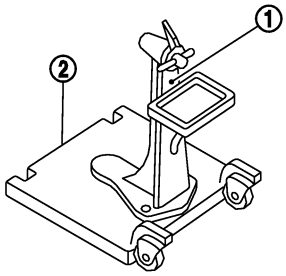
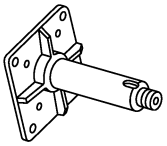
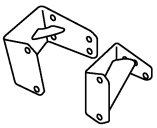
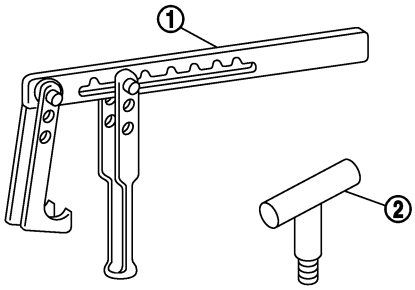
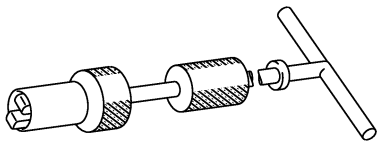
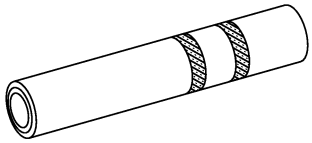
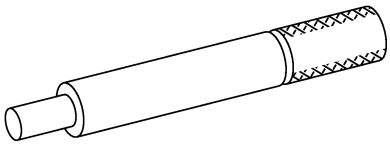
c. Apply liquid gasket to inner surface around hole perimeter. (Assembly should be done within 5 minutes after coating.)

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

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Special Service Tools

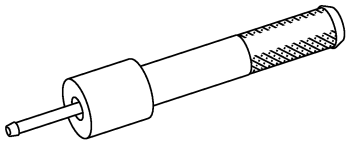
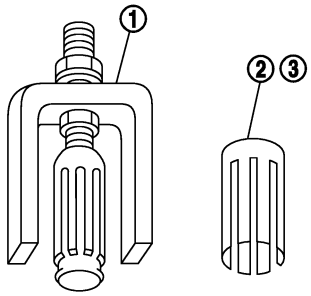
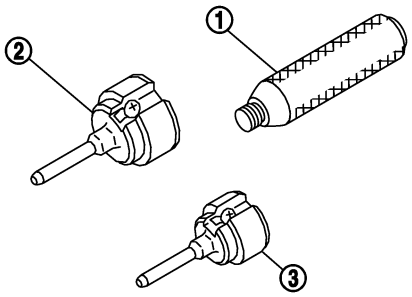
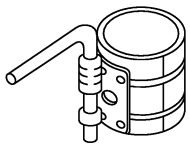
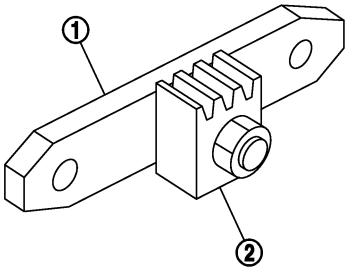
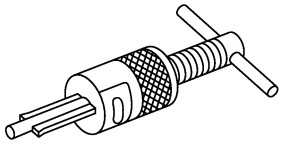
*: Special tool or commercial equivalent

Tool number Tool name	Description	
ST0501S000* Engine stand assembly ①ST05011000 Engine stand ②ST05012000 Base		Disassembling and assembling
KV10106500* Engine attachment		
KV11103200* Engine sub-attachment		
①KV10109210* Valve spring compressor ②KV10111200* Adapter		Disassembling and assembling valve components
KV10107900* Valve oil seal puller		Disassembling valve oil seal
KV11103400 Valve oil seal drift		Installing valve oil seal
ST11033000* Valve guide drift		Removing valve guide

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Special Service Tools (Cont'd)

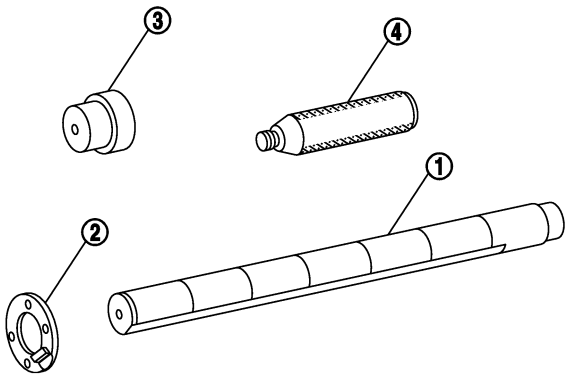
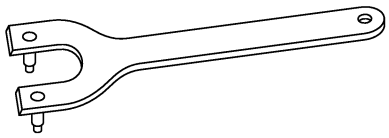
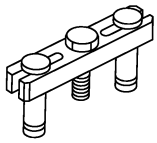
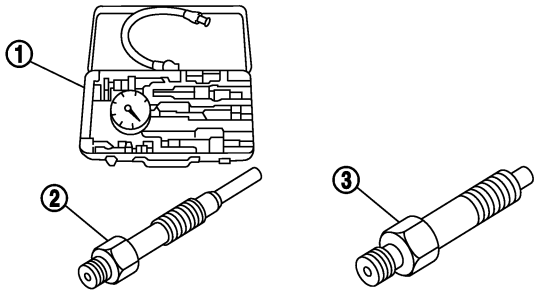
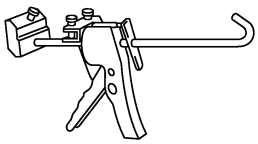
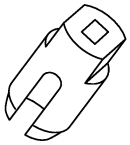
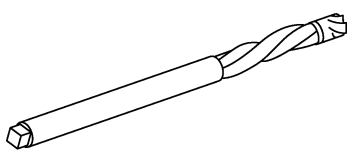
*: Special tool or commercial equivalent

Tool number Tool name	Description	
KV11103900* Valve guide drift		Installing valve guide
①KV11101110 Valve seat remover ②KV11103610 Adapter (Intake) ③KV11103620 Adapter (Exhaust)		Removing valve seat
①ST15243000 Valve seat drift ②KV11103810 Adapter (Intake) ③KV11103820 Adapter (Exhaust)		Installing valve seat
EM03470000* Piston ring compressor		Installing piston into cylinder
KV111033S0 Engine stopper ①KV11103310 Stopper plate ②KV10105630 Stopper gear		Preventing crankshaft from rotating
ST16610001* Pilot bushing puller		Removing pilot bushing

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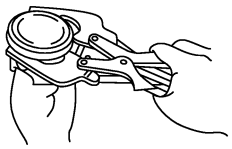
Special Service Tools (Cont'd)

*: Special tool or commercial equivalent

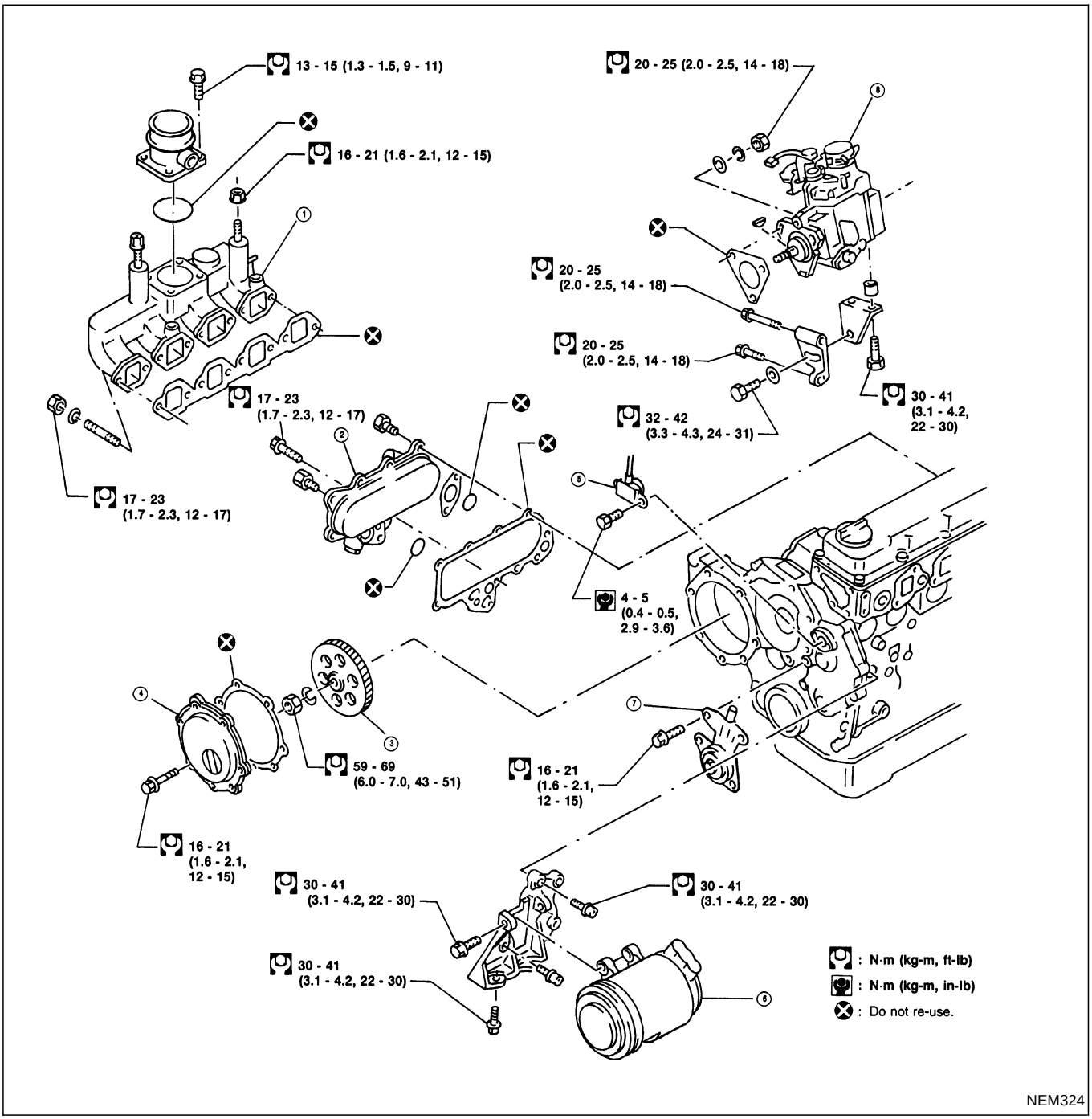
Tool number Tool name	Description	
KV111045SO Cam bushing replacer set ①KV11104510 Replacer bar ②KV1104520 Guide plate ③KV11104530 Adapter (1st bushing) ④ST15243000 Drift		Removing cam bushing or installing cam bushing
KV10109300* Injection pump drive gear holder		Preventing drive gear from rotating
KV11103000* Injection pump drive gear puller		Removing drive gear
①ED19601000 Compression gauge ②ED19600600 Compression gauge adapter (for glow plug hole) ③ED19600700 Compression gauge adapter (for injector hole)		Checking compression pressure
WS39930000* Tube presser		Pressing the tube of liquid gasket
KV119E0030 Nozzle holder socket		Removing and installation injection nozzle assembly
ST11032000* Valve guide reamer 8.0 mm (0.315 in) dia.		Reaming valve guide

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Commercial Service Tools

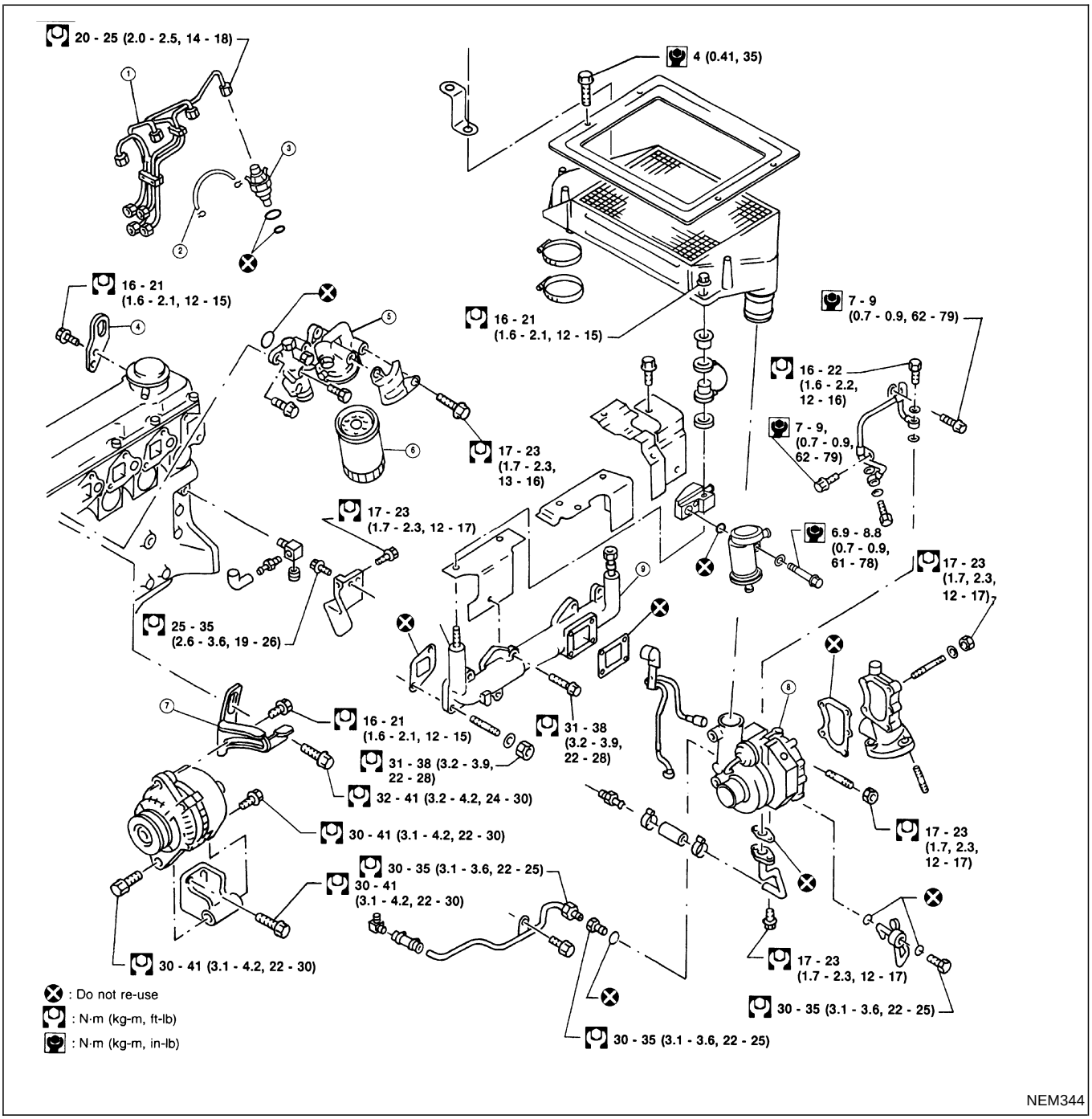
Tool name	Description
Piston ring expander	 Removing and installing piston ring

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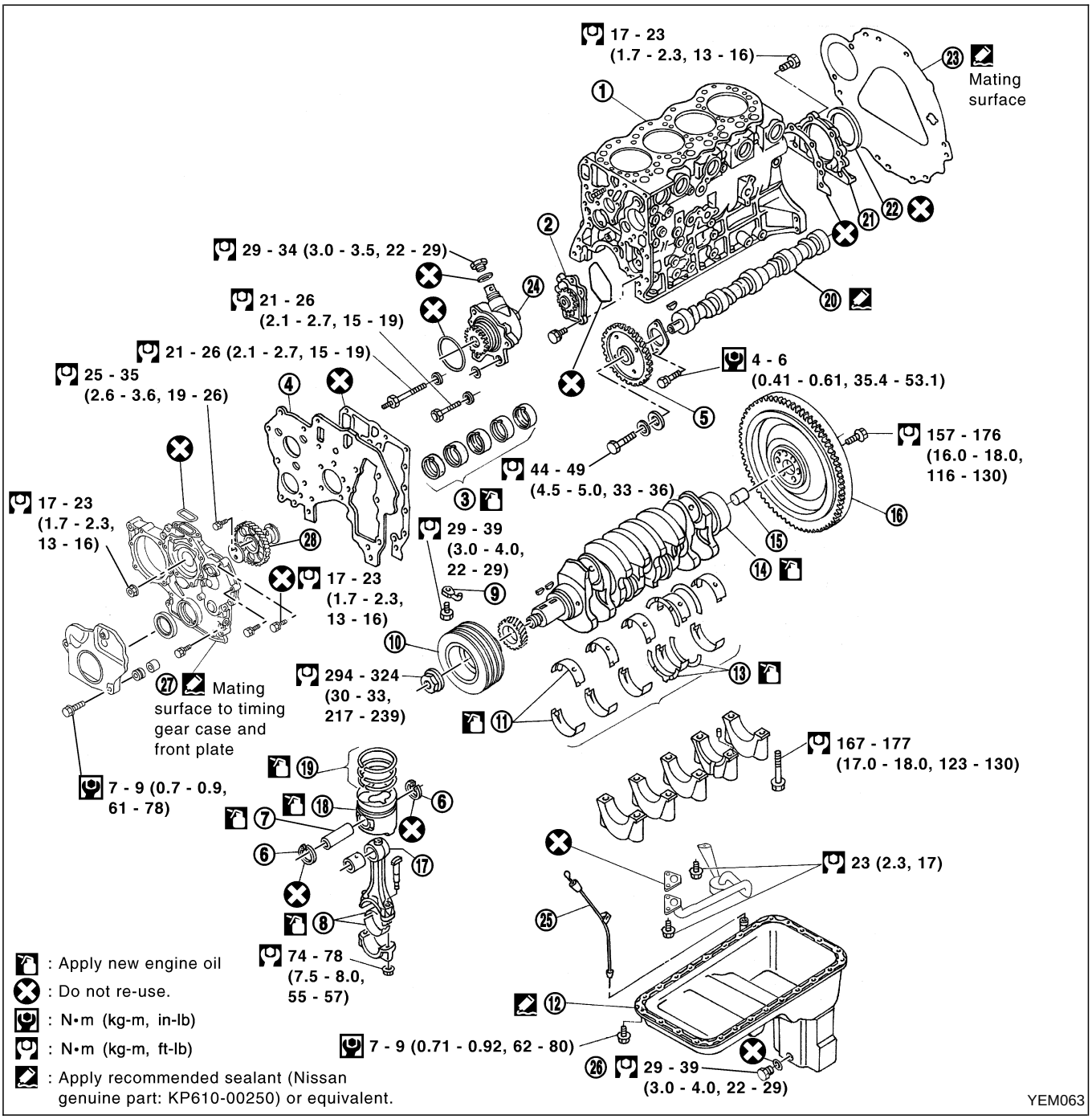
① Intake manifold
② Oil cooler
③ Injection pump drive gear
④ Dust cover
⑤ Engine revolution sensor
⑥ Air conditioner compressor
⑦ Idler pulley
⑧ Electronic injection pump

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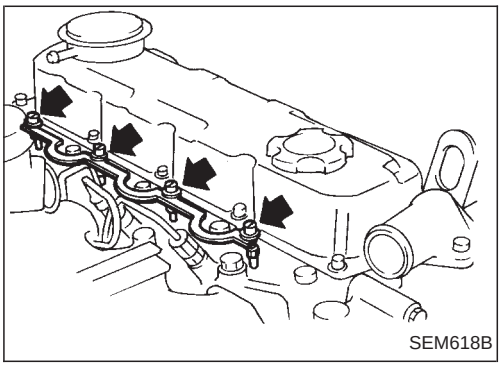
① Injection tube
② Spill tube
③ Injection nozzle
④ Engine slinger
⑤ Oil filter bracket
⑥ Oil filter
⑦ Alternator adjusting bar & engine slinger
⑧ Turbocharger
⑨ Exhaust manifold

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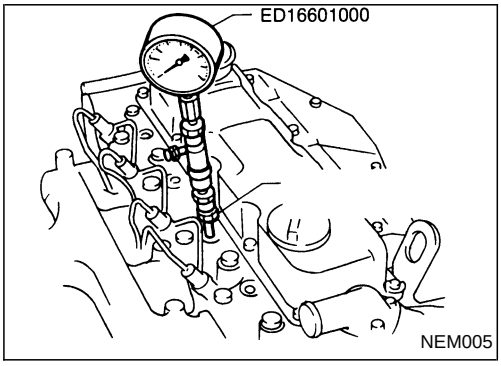
① Cylinder block
② Oil pump
③ Camshaft bushing
④ Front plate
⑤ Camshaft gear
⑥ Snap ring
⑦ Piston pin
⑧ Connecting rod bearing
⑨ Oil jet
⑩ Crank pulley
⑪ Main bearing
⑫ Oil pan
⑬ Thrust washer
⑭ Crankshaft
⑮ Pilot bushing
⑯ Flywheel
⑰ Connecting rod
⑱ Piston
⑲ Piston ring
⑳ Camshaft
㉑ Rear oil seal retainer
㉒ Rear oil seal
㉓ Rear plate
㉔ Vacuum pump
㉕ Dipstick
㉖ Drain plug
㉗ Timing gear case
㉘ Idler gear

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SEM618B

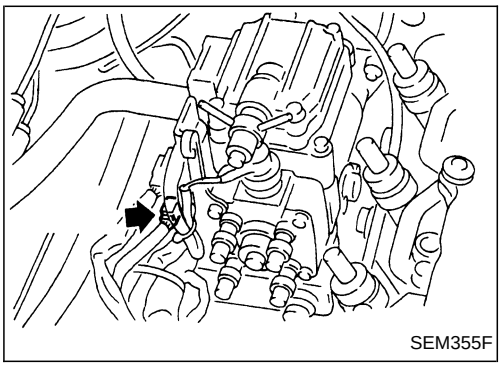
Measurement of Compression Pressure

1. Warm up engine and switch off the ignition switch.
2. Remove glow plate and glow plugs.



NEM005

3. Fit compression gauge adapter to cylinder head.
   Compression gauge adapter:
   : 15 - 20 N·m
   (1.5 - 2.0 kg-m, 11 - 14 ft-lb)


SEM355F

4. Ensure the ignition switch is in the “LOCK” position and disconnect harness connector (gray colored) from injection pump.
5. Crank engine, then read gauge indication.

- **Always use a fully-charged battery to obtain specified engine revolution.**
- **Engine compression measurement should be made as quickly as possible.**

Compression pressure:

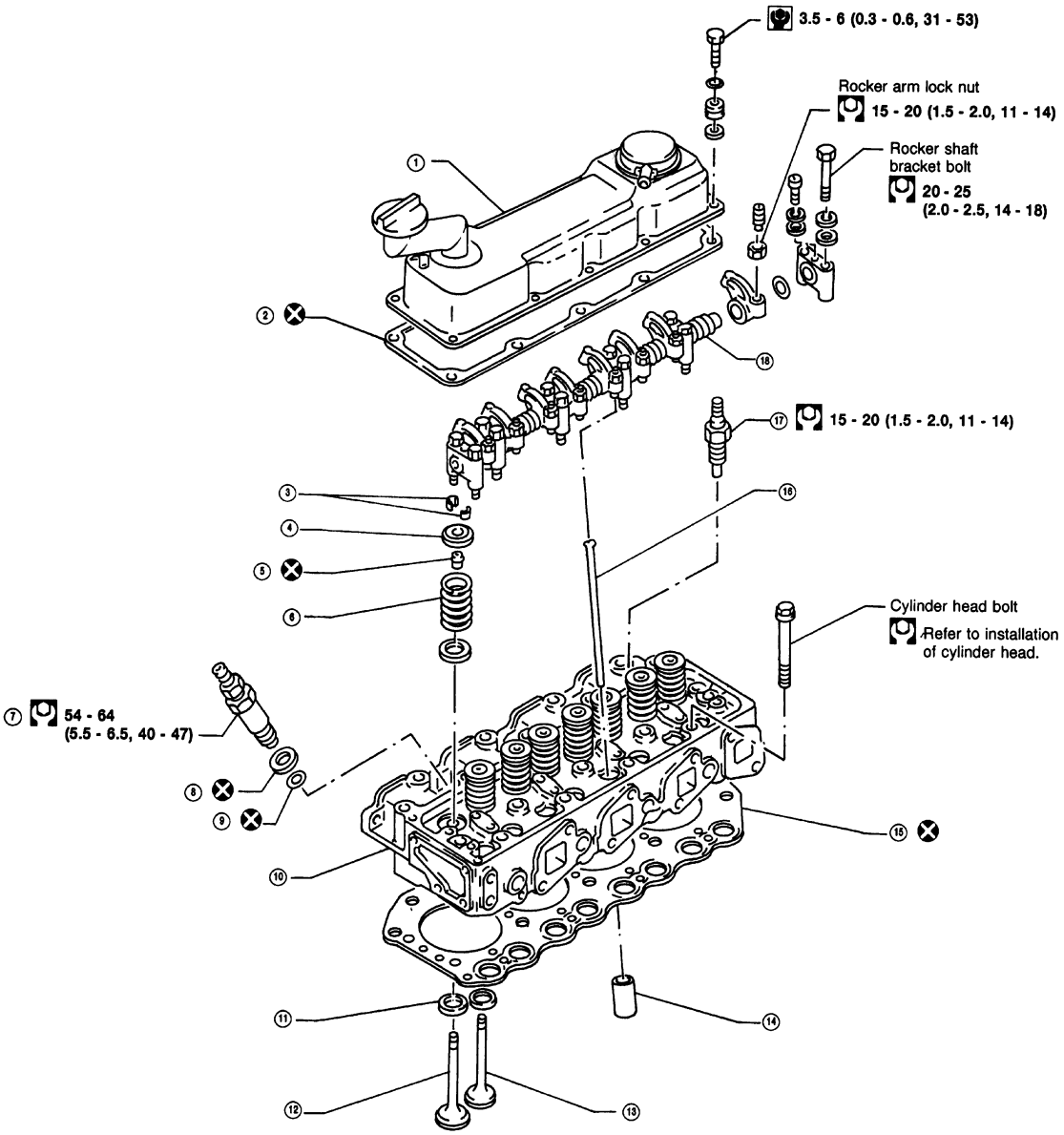
Unit: kPa (bar, kg/cm^2, psi)/200 rpm

Standard	2,942 (29.4, 30, 427)
Minimum	2,452 (24.5, 25, 356)
Differential limit between cylinders	294 (2.9, 3, 43)

6. If cylinder compression in one or more cylinders is low, pour a small amount of engine oil into cylinders through the glow holes and retest compression.

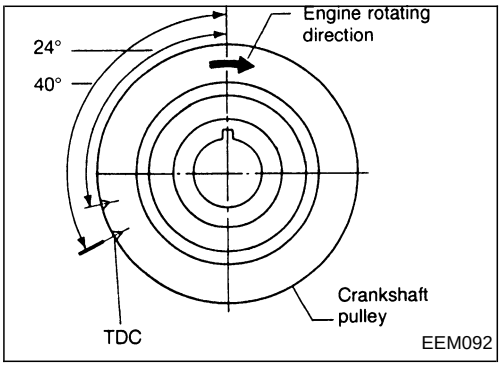
- **If adding oil helps the compression pressure, piston rings may be worn or damaged.**
- **If pressure stays low, valve may be sticking or seating incorrectly.**
- **If cylinder compression in any two adjacent cylinders is low, and if adding oil does not help the compression, there is leakage past the gasket surface.**
  Leakage past the cylinder gasket can result in oil and water becoming mixed in the engine block cooling and lubrication chambers.

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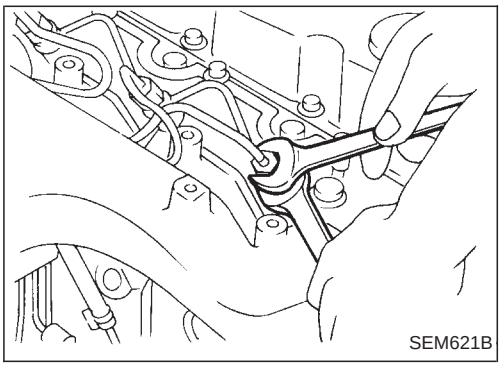
① Rocker cover
② Rocker cover gasket
③ Valve cotter
④ Spring retainer
⑤ Valve oil seal
⑥ Valve spring
Valve spring ring
⑦ Injection nozzle holder
⑧ Nozzle washer
⑨ Nozzle gasket
⑩ Cylinder head
⑪ Valve seat
⑫ Intake valve
⑬ Exhaust valve
⑭ Valve lifter
⑮ Cylinder head gasket
⑯ Push rod
⑰ Glow plug
⑱ Rocker shaft

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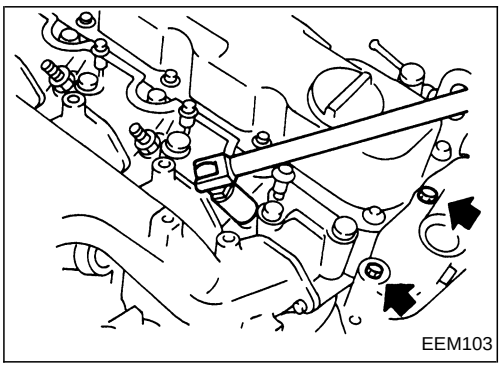


Removal

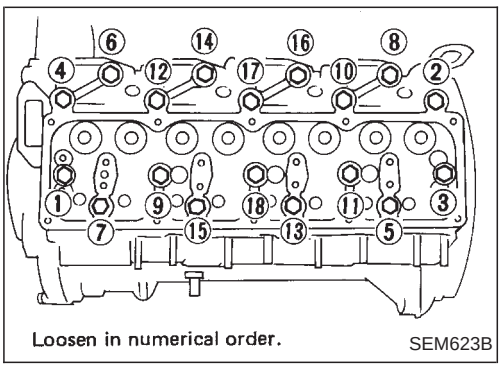
1. Set No. 1 cylinder at TDC on its compression stroke.
2. Drain engine coolant from drain plugs on cylinder block and radiator.
3. Remove air cleaner and intercooler components.
4. Remove the following parts:
   - Water temperature connectors
   - Throttle chamber vacuum hoses
   - EGR valve vacuum hose
   - Connectors located on the intake manifold
   - Connector located on the thermostat housing
   - Heater tubes
   - Connectors of the injection pump
5. Remove alternator adjusting bolt.
6. Disconnect exhaust manifold from front exhaust tube.
7. Remove turbocharger oil and water tubes.
8. Remove turbocharger bracket bolts.
9. Disconnect radiator outlet hose and thermostat housing water inlet hose.



10. Remove fuel injection tube assembly and spill tube.



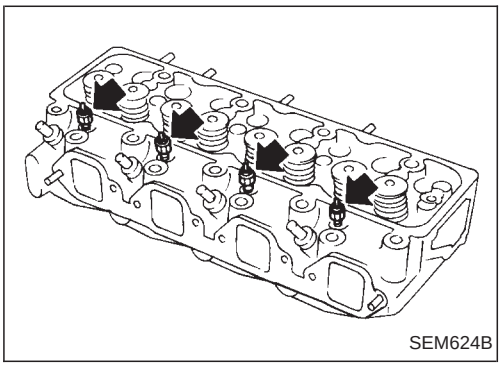
11. Remove injection nozzle holder from first cylinder with a special tool (KV119E0030). Remove injection nozzles from cylinders 2, 3 and 4 using a deep socket wrench.
12. Remove thermostat housing bolts shown at left.
13. Remove rocker cover and ventilation hose.
14. Remove rocker shaft with rocker arms.
15. Remove push rods.



16. Remove cylinder head bolts in numerical order and remove cylinder head.

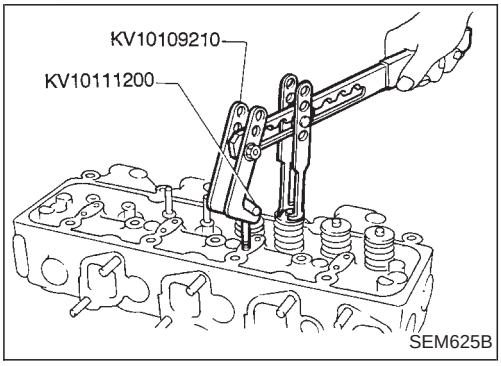
Head warpage or cracking could result from removing in incorrect order.

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SEM624B

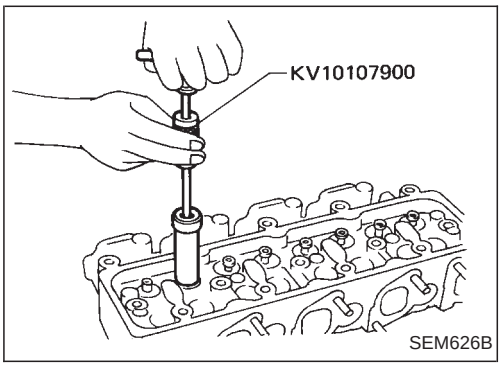
Disassembly

1. Remove following parts:
- EGR tube
- Intake manifold
- Heat shield plates
- Exhaust manifold
- Thermostat housing
- Alternator adjusting bar & engine slinger
- Glow plate and glow plugs



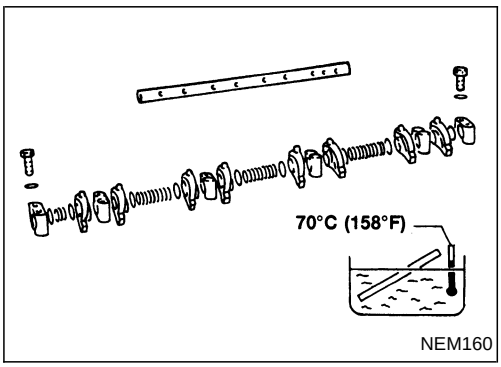
SEM625B

2. Remove valve component parts with Tool.



SEM626B

3. Remove valve oil seals with Tool.

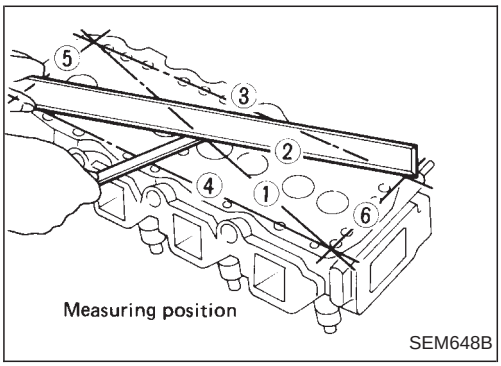


NEM160

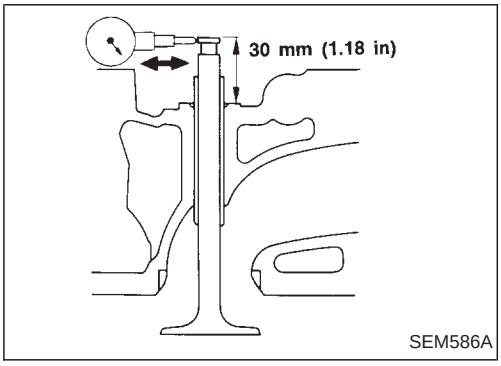
4. Disassemble rocker shaft assembly.
a. Remove rocker shaft lock bolt.
b. Remove valve rocker and rocker shaft bracket.

If it is difficult to remove rocker shaft brackets, immerse rocker shaft assembly in oil of 70°C (158°F) for a few minutes and then remove brackets.

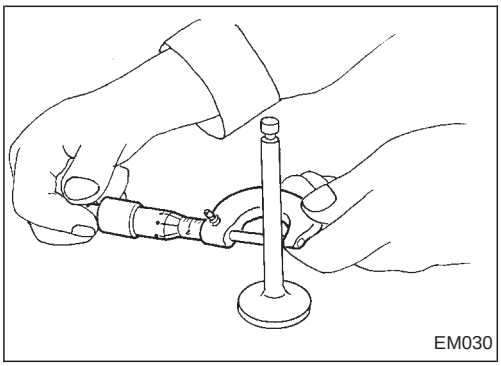
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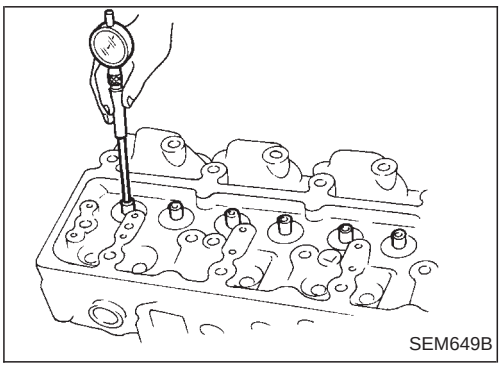


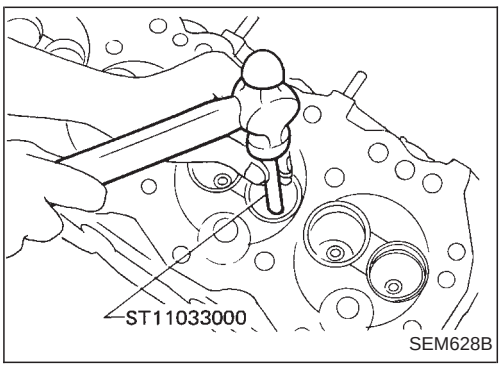
SEM648B



SEM586A


EM030


SEM649B



SEM628B

Inspection

CYLINDER HEAD DISTORTION

Cylinder head distortion:
Standard
Less than 0.07 mm (0.0028 in)
Limit
0.2 mm (0.008 in)

If beyond the specified limit, correct with a surface grinder.

Cylinder head minimum height:
89.9 mm (3.539 in)

VALVE GUIDE CLEARANCE

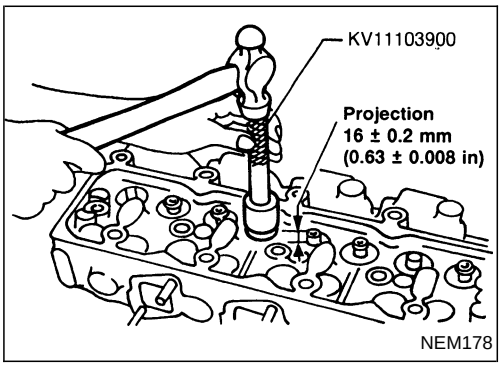
- **Valve guide clearance should be measured parallel with rocker arm. (Generally, a large amount of wear occurs in this direction.)**
  Valve to guide clearance:
  Limit
  Intake 0.15 mm (0.0059 in)
  Exhaust 0.15 mm (0.0059 in)
  Maximum allowable deflection
  (Dial indicator reading)
  Intake 0.35 mm (0.0138 in)
  Exhaust 0.35 mm (0.0138 in)
- **To determine the correct replacement part, measure valve stem diameter and valve guide inner diameter.**
  Valve stem diameter:
  Standard
  Intake
  7.965 - 7.980 mm (0.3135 - 0.3142 in)
  Exhaust
  7.945 - 7.960 mm (0.3128 - 0.3134 in)
  Valve guide inner diameter:
  8.000 - 8.015 mm (0.3150 - 0.3156 in)

VALVE GUIDE REPLACEMENT

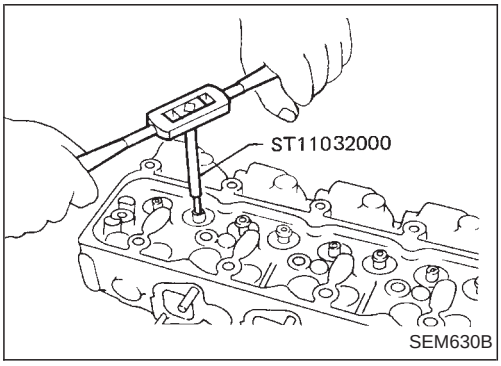
1. Heat cylinder head 150 to 160°C (302 to 320°F) in oil.
2. Drive out valve guide with a hammer and suitable tool.

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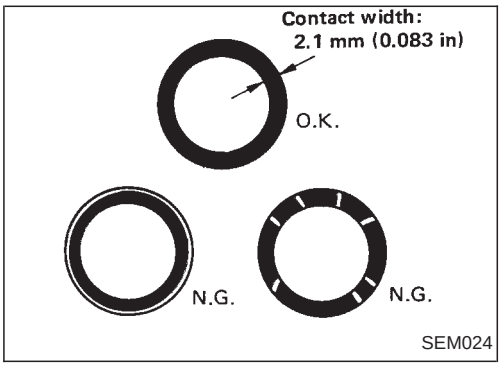
Inspection (Cont'd)



3. Press service valve guide into cylinder head using suitable tool until the guide projects out 16±0.2 mm (0.63±0.008 in).



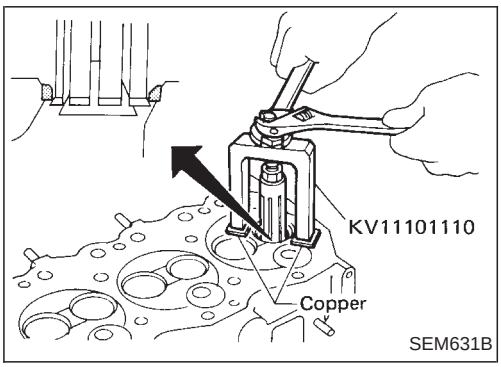
4. Ream valve guide.
   Finished size:
   8.000 - 8.015 mm (0.3150 - 0.3156 in)



VALVE SEATS

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

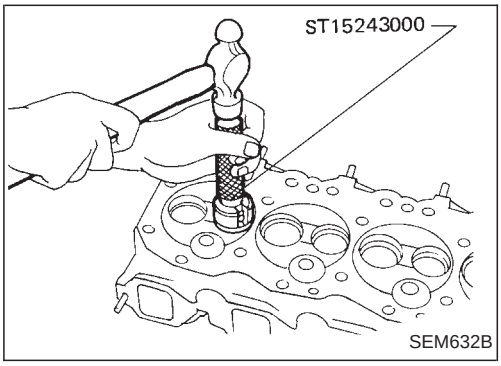
- **When repairing valve seats, check valve and valve guide for wear beforehand. If worn, replace them. Then correct valve seat.**
- **The cutting should be done with both hands for uniform cutting.**



REPLACING VALVE SEAT FOR SERVICE PARTS

1. Before out old seat until it collapses or remove valve seats with Tool.

Place a copper seat between contact surface of Tool and cylinder head.



2. Place new valve seats on dry ice and allow them to cool for five minutes.

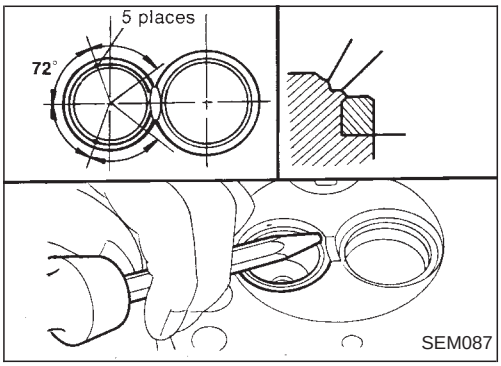
WARNING:

Do not touch cooled valve seats with bare hand.

3. Heat cylinder head to 80°C (176°F).
4. Install cooled valve seats on cylinder head with Tool.

http://vnx.su/

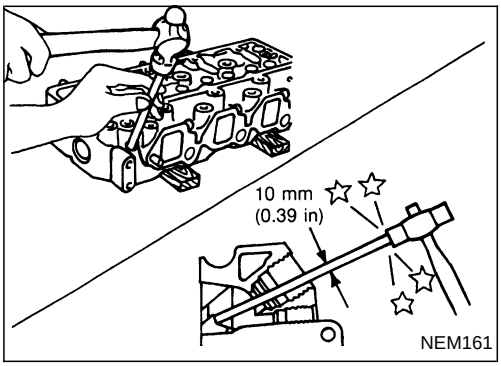
Inspection (Cont'd)



5. Stake exhaust valve seat at five places with punch.

When staking valve seat, select different places than those staked before.

6. Cut or grind valve seat using suitable tool at the specified dimensions. Refer to SDS.
7. After cutting, lap valve seat with a lapping compound.
8. Check contact condition of valve seat.



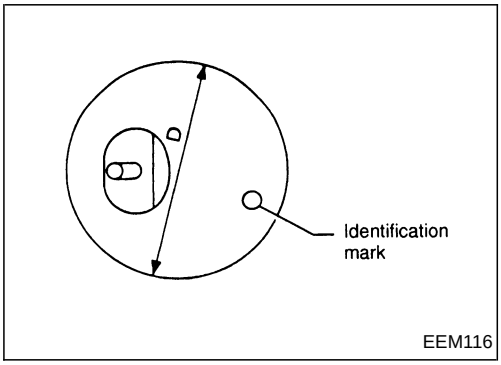
COMBUSTION CHAMBER

Check combustion chamber for cracks and other damage. If necessary, replace.

REPLACING COMBUSTION CHAMBER

Usually combustion chamber should not be removed.

1. Remove combustion chamber so that cylinder head cannot be damaged.



2. Install combustion chamber.

- **Identification of combustion chambers**

Identification mark (on combustion chamber)	Outer diameter "D" mm (in)
2	37 (1.46)

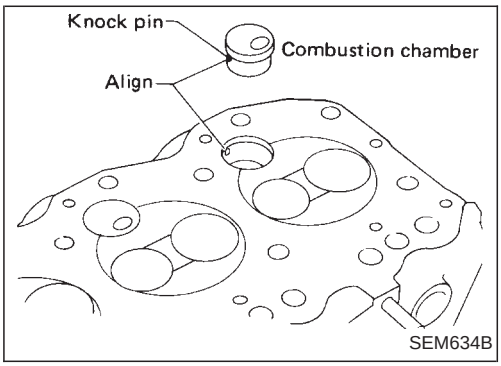
(1) Cool combustion chamber with dry ice for approximately 5 to 10 minutes.

WARNING:

Do not touch cooled combustion chamber with bare hands.

http://vnx.su/

Inspection (Cont'd)



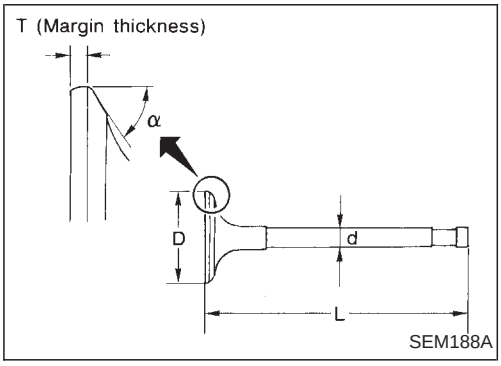
(2) Align combustion chamber knock pin with cylinder head notch, and drive in combustion chamber with a soft hammer.

3. Check amount of protrusion of combustion chamber.

Protrusion:

Standard

Less than 0.10 mm (0.0039 in)

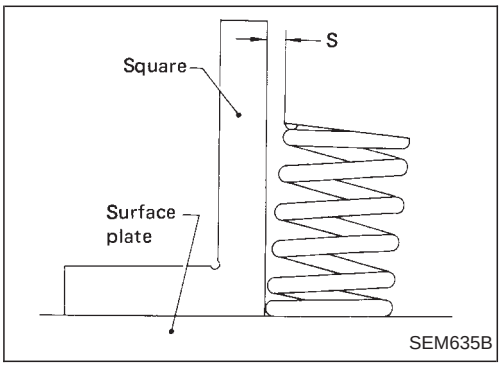


VALVE DIMENSIONS

Check dimensions in each valve. For dimensions, refer to SDS.

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

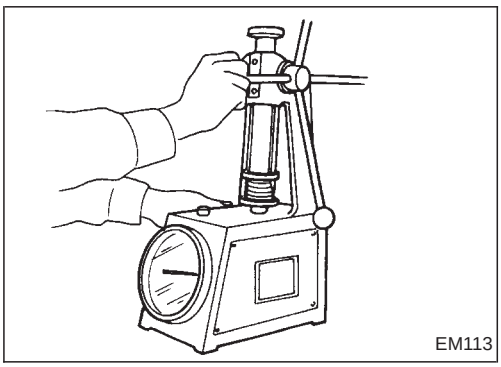
Grinding allowance for valve stem tip is 0.2 mm (0.008 in) or less.



VALVE SPRING SQUARENESS

Out-of-square "S":

Less than 2.0 mm (0.079 in)

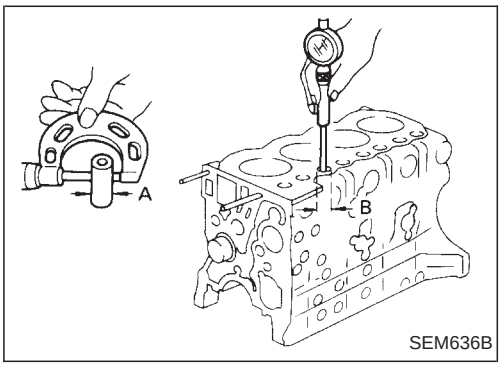


VALVE SPRING PRESSURE

Refer to SDS.

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Inspection (Cont'd)



VALVE LIFTER AND PUSH ROD

Valve lifter

1. Check valve lifters for excessive wear on the surfaces.
2. Replace with new ones if worn beyond repair.

a. Valve lifter end should be smooth.

b. Valve lifter to lifter hole clearance:

Standard

0.030 - 0.073 mm (0.0012 - 0.0029 in)

Limit

Less than 0.20 mm (0.0079 in)

Valve lifter outer diameter "A":

Standard

25.960 - 25.970 mm (1.0220 - 1.0224 in)

Cylinder block valve lifter hole diameter "B":

Standard

26.000 - 26.033 mm (1.0236 - 1.0249 in)

Push rod

1. Inspect push rod for excessive wear on the surfaces.
2. Replace if worn or damaged beyond repair.
3. Check push rod for bend using a dial gauge.

Maximum allowable bend
(Total indicator reading):

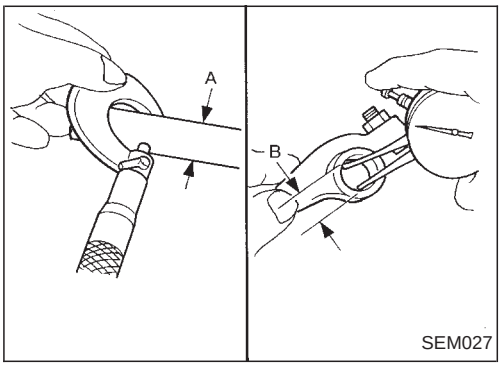
Less than 0.5 mm (0.020 in)

ROCKER SHAFT AND ROCKER ARM

1. Check valve rockers, brackets and rocker shafts for scoring, wear or distortion. Replace if necessary.

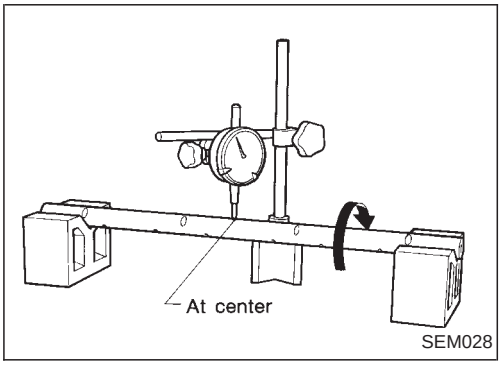
http://vnx.su/

Inspection (Cont'd)



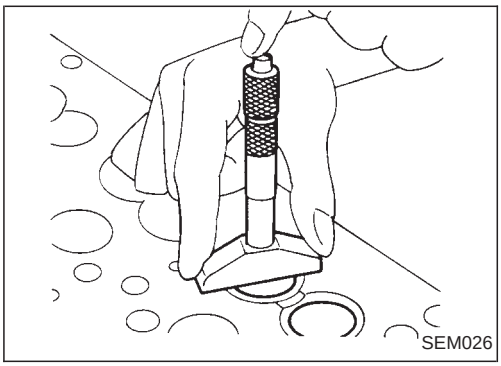
2. Check clearance between valve rockers and rocker shaft. If specified clearance is exceeded, replace affected valve rockers or shaft.

Specified clearance:
Limit
Less than 0.15 mm (0.0059 in)
Rocker shaft outer diameter "A":
Standard
19.979 - 20.000 mm (0.7866 - 0.7874 in)
Rocker arm inner diameter "B":
Standard
20.014 - 20.035 mm (0.7880 - 0.7888 in)



3. Check rocker shaft bend at its center. If bend is greater than specified limit, replace rocker shaft.

Rocker shaft bend
(Total indicator reading):
Limit
Less than 0.3 mm (0.012 in)

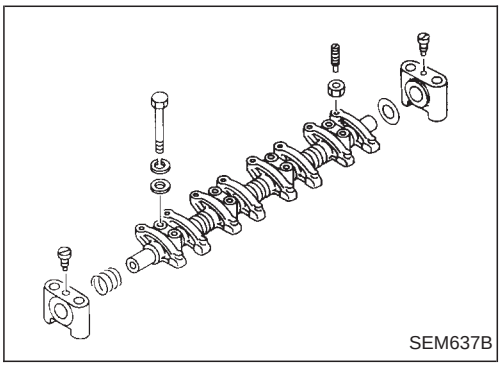


MEASURING CYLINDER HEAD TO VALVE DISTANCE

Measure distance from cylinder head surface to intake and exhaust valves. If specified distance is exceeded, replace valve(s) or valve seat(s).

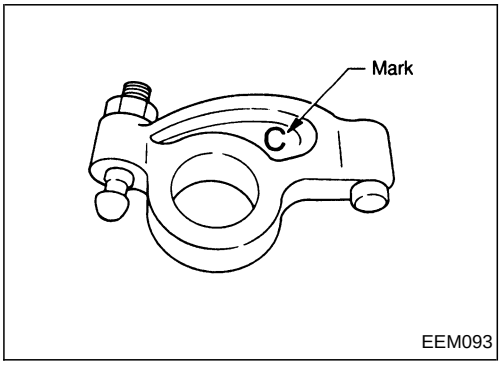
Specified distance:
Standard
Intake
0.8 - 1.2 mm
(0.031 - 0.047 in)
Exhaust
0.8 - 1.2 mm
(0.031 - 0.047 in)
Limit
Less than 1.75 mm (0.0689 in)
for intake and exhaust valves

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SEM637B

Assembly

1. Assemble rocker shaft component parts.



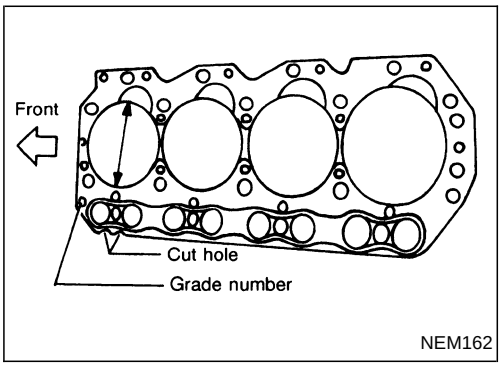
EEM093

- Identification of rocker arms

Identification mark (on rocker arm)	For use with
B	Intake valve
C	Exhaust valve

2. Install valve component parts.
- **Always use new valve oil seal. Refer to “VALVE STEM OIL SEAL”.**
- **Intake and exhaust valve springs are interchangeable.**
3. Assemble all removed parts in reverse order of disassembly.

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Installation

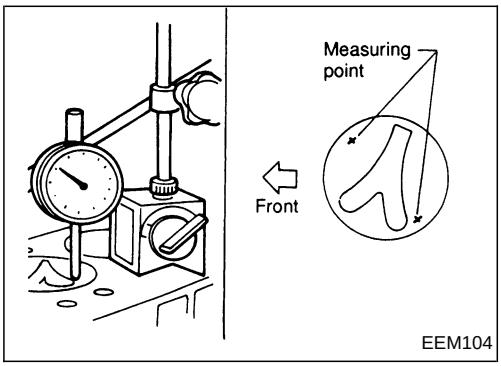
1. Install cylinder head gasket.

- **Identification of cylinder head gaskets**

Identification cut hole (on cylinder head gasket)	Inner diameter "d" mm (in)
—	97 + 0.3 (3.82 + 0.012)

a. When replacing only cylinder head gasket, install same grade gasket as the one formerly used.

b. When replacing or repairing cylinder block, cylinder head, piston, connecting rod and crankshaft, select gasket as follows:



(1) Measure piston projection.
- Set each piston at its Top Dead Center. With piston held in that position, measure its projections at two points.
- Calculate the average value of the two measurements.
- Determine the amount of projection of the other three pistons.

(2) Select suitable cylinder head gasket which conforms to the largest amount of projection of the four pistons.

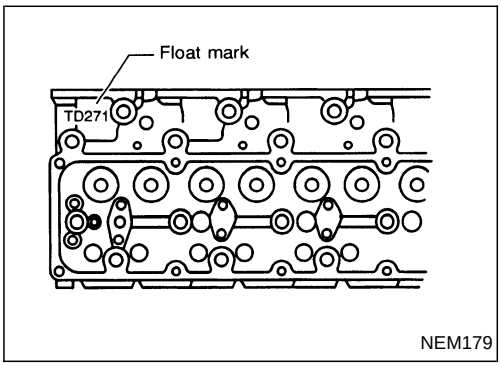
Unit: mm (in)

Average value piston projections	Gasket thickness	Gasket grade number	Part no.
Less than 0.368 (0.0145)	1.20±0.05 (0.047±0.002)	2	11044 0W800
0.368 - 0.418 (0.0145 - 0.0165)	1.25±0.05 (0.049±0.002)	3	11044 0W801
More than 0.418 (0.0165)	1.30±0.05 (0.051±0.002)	4	11044 0W802

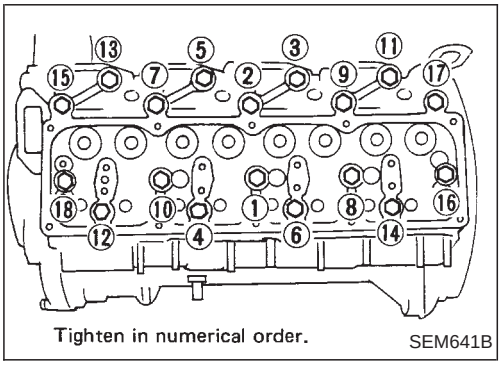
Make sure that No. 1 piston is at TDC on its compression stroke.

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Installation (Cont'd)



2. Install cylinder head.
- **Cylinder head identification mark**

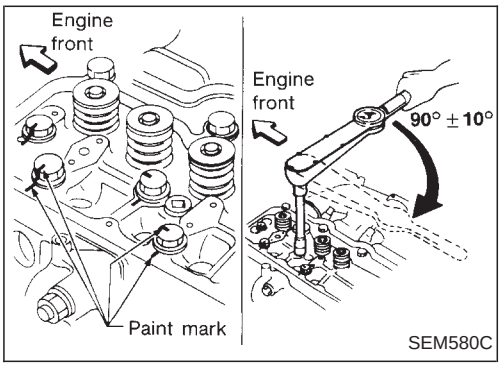


3. Apply oil to threaded portion and seat surface of bolts and tighten cylinder head bolts using Tool.

CAUTION:
- **Tightening procedure**

1st: Tighten bolts to 39 - 44 N·m (4.0 - 4.5 kg-m, 29 - 33 ft-lb)

2nd: Tighten bolts to 54 - 59 N·m (5.5 - 6.0 kg-m, 40 - 43 ft-lb)

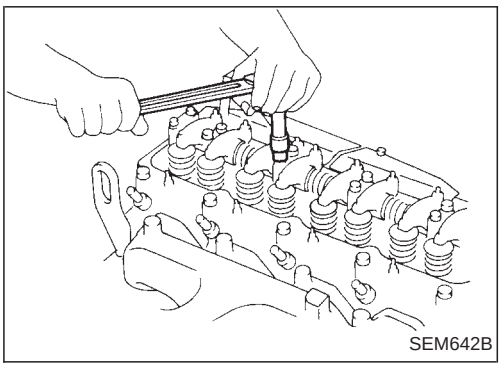


3rd:

(1) Mark exhaust side of cylinder head and cylinder head bolts with paint as shown.

(2) Turn all bolts 90 ± 10 degrees clockwise.

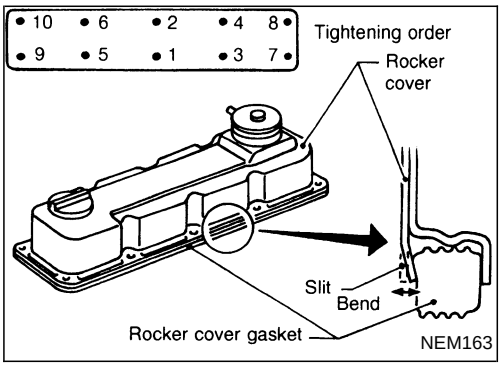
(3) Check that paint mark of each bolt is facing the front of the vehicle.



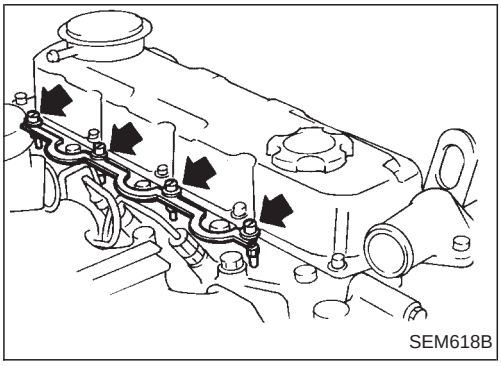
4. Apply engine oil and install push rods.
5. Install rocker shaft assembly.
   Adjust intake and exhaust valve clearance carefully.
   Refer to MA section in order to accomplish valve adjustment.

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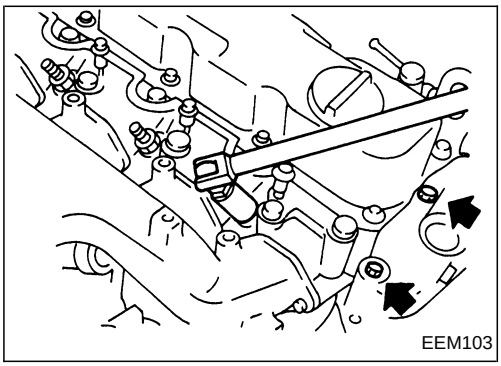
Installation (Cont'd)



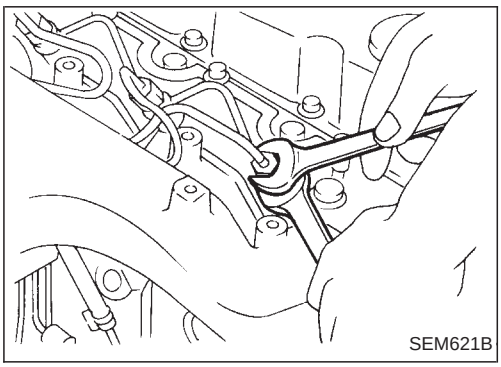
6. Install rocker cover.
- Be sure to tighten bolts in the order shown in the illustration.
- When replacing rocker cover gasket, bend slit of rocker cover baffle plate a little to hold the gasket. Do not twist gasket.



7. Install glow plugs and glow plate.



8. Install new top nozzle gasket and injection nozzle.
9. Install thermostat housing bolts shown at left.



10. Install spill tube and injection tube.

Spill tube nut:

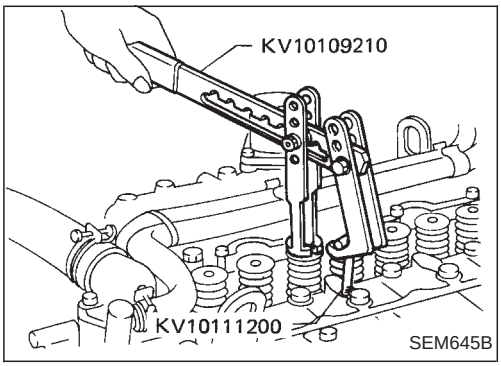
: 39 - 49 N·m (4.0 - 5.0 kg-m, 29 - 36 ft-lb)

Injection tubes:

: 20 - 25 N·m (2.0 - 2.5 kg-m, 14 - 18 ft-lb)

11. Connect thermostat housing water inlet hose and radiator hose.
12. Install all removed parts in reverse order of removal.
13. After assembling all disassembled parts, fill radiator and engine with new coolant up to filler opening.
    Refer to MA section.

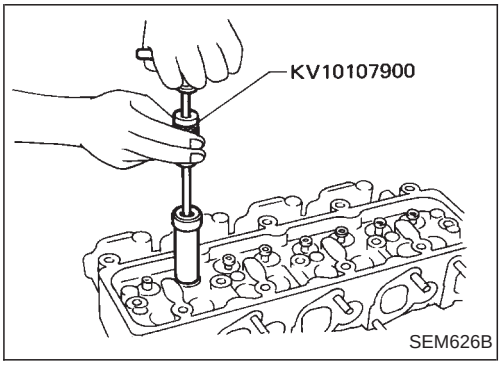
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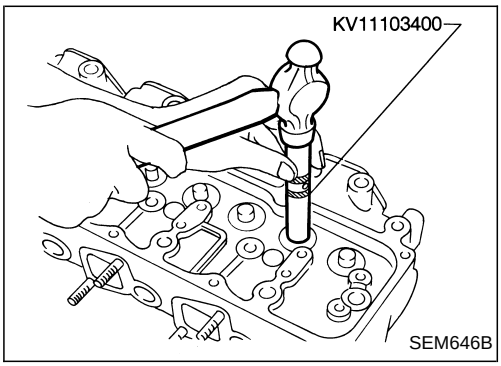
VALVE STEM OIL SEAL

1. Remove rocker cover.
2. Remove rocker shaft assembly.
3. Remove valve spring.

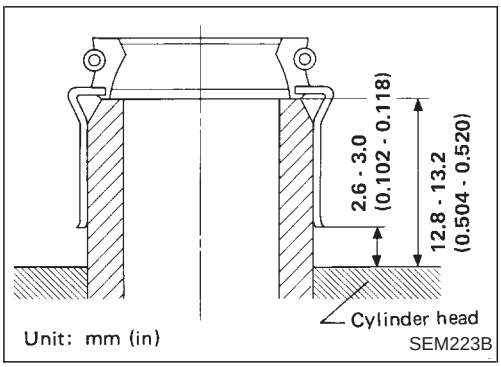
Piston concerned should be set at TDC to prevent valve from falling.



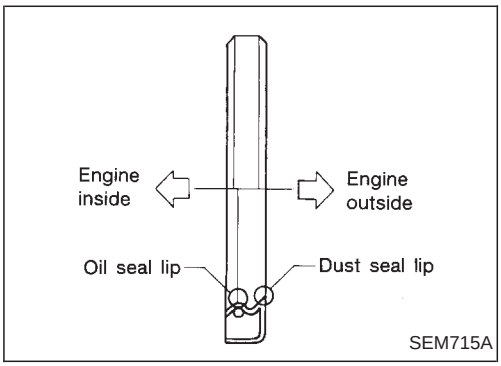
4. Remove valve oil seals.



5. Apply engine oil to valve oil seal and install it in place.

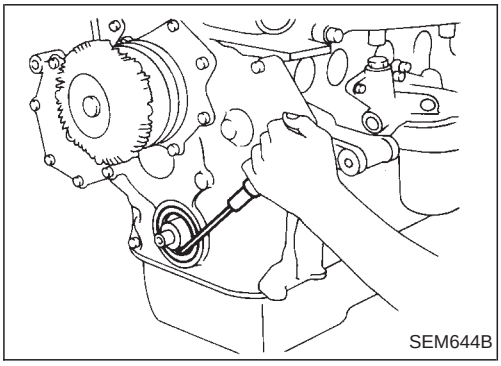


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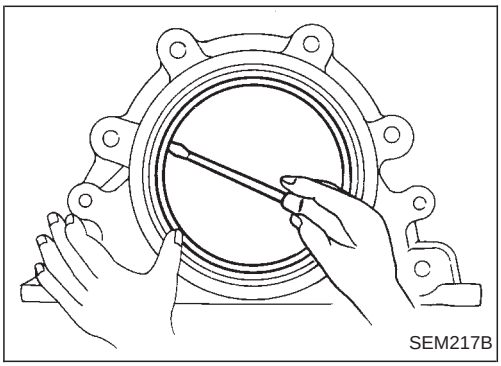
OIL SEAL INSTALLING DIRECTION

- When installing a new front or rear oil seal, make sure its mounting direction is correct.



CRANKSHAFT FRONT OIL SEAL

1. Remove protecting cover.
2. Remove radiator shroud.
3. Remove cooling fan.
4. Remove drive belts.
5. Remove crank pulley.
6. Remove crankshaft oil seal.
- Be careful not to damage sealing surfaces of crankshaft.
7. Coat new oil seal with engine oil and install it in place.



CRANKSHAFT REAR OIL SEAL

1. Dismount transmission.
2. Remove clutch cover assembly.
3. Remove flywheel and rear plate.
4. Remove oil seal retainer assembly, then remove oil seal.
- Be careful not to damage sealing surfaces of crankshaft.
5. Coat new oil seal with engine oil and install it in place.

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Removal and Installation

Turbocharger should not be disassembled.

1. Drain engine coolant.
2. Remove the following:
- Air duct and intercooler components
- Heat shield plates
- Exhaust front tube
- Oil tubes
- Water tubes
3. Remove turbocharger from exhaust manifold.
4. Remove turbocharger bracket bolts.

Inspection

Condition 1: Low engine power

Probable cause	Corrective action
Air leak at the connection of compressor housing and suction hose/inlet tube, or inlet and intake manifold.	Correct the connection.
Exhaust gas leak at the connection of turbine housing and exhaust manifold, connecting tube or exhaust outlet.	Correct the connection or replace gasket.
By-pass valve is stuck in open position.	Replace turbocharger assembly.
Stuck or worn journal or bearing.	
Broken shaft.	
Sludge on back of turbine wheel.	
Broken turbine wheel.	

Condition 2: Excessively high engine power

Probable cause	Corrective action
Disconnected or cracked rubber hose of by-pass valve controller.	Correct or replace rubber hose.
By-pass valve is stuck in closed position.	Replace turbocharger assembly.
Controller diaphragm is broken.	

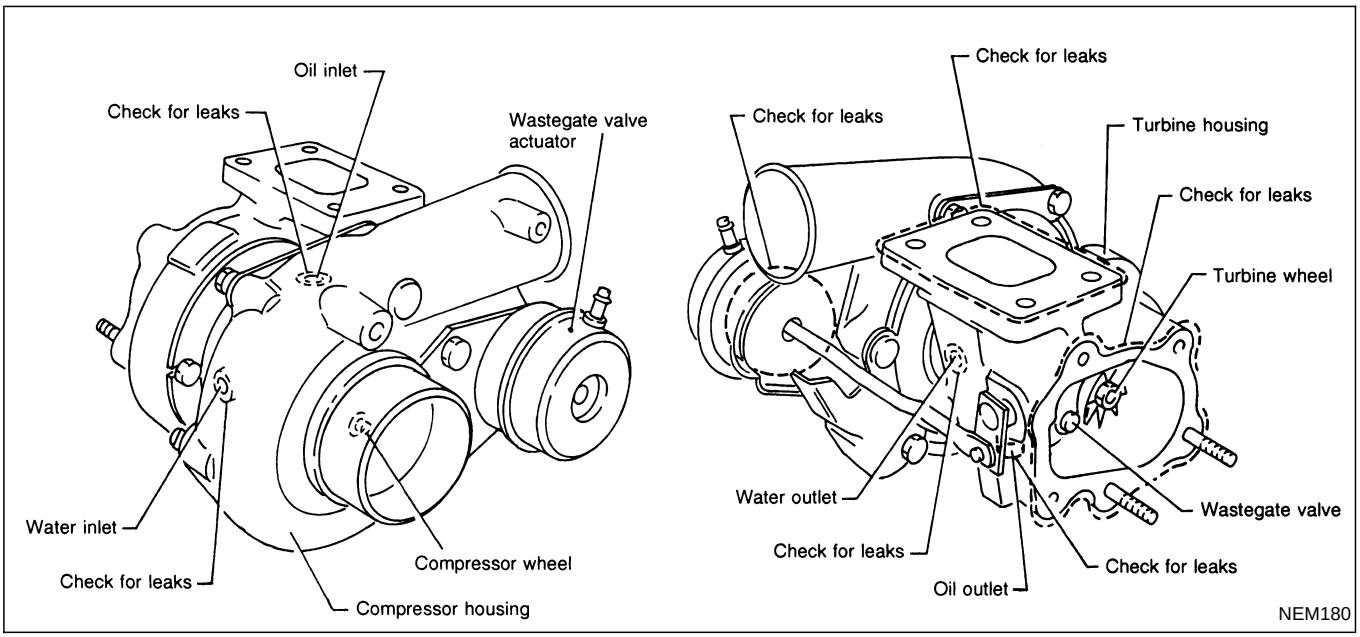
http://vnx.su/

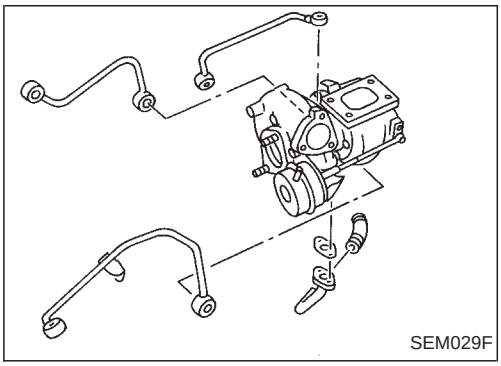
Inspection (Cont'd)

Condition 3: Excessively high oil consumption, or exhaust shows pale blue smoke

Probable cause	Corrective action
Oil leak at the connection of lubricating oil passage.	Correct the connection.
Oil leak at oil seal of turbine.	Replace turbocharger assembly.
Oil leak at oil seal of compressor.	
Worn journal or bearing.	

Perform the following checks. If NG, replace turbocharger unit.





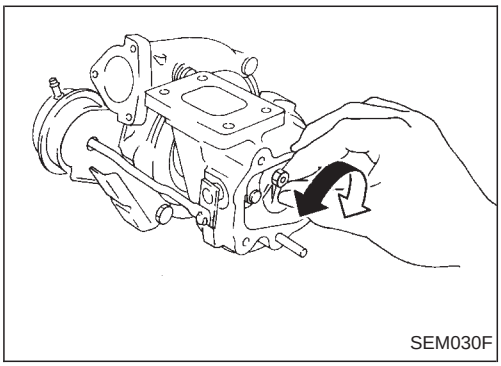
OIL AND WATER TUBES

Check tubes for clogging.

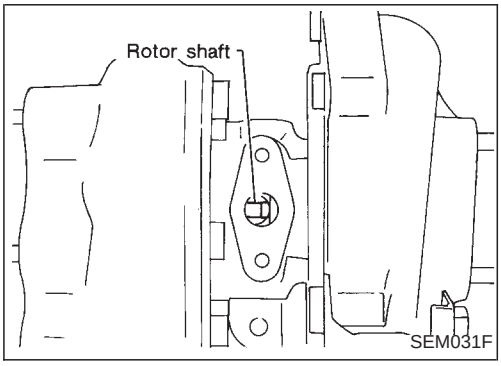
http://vnx.su/

Inspection (Cont'd)

ROTOR SHAFT

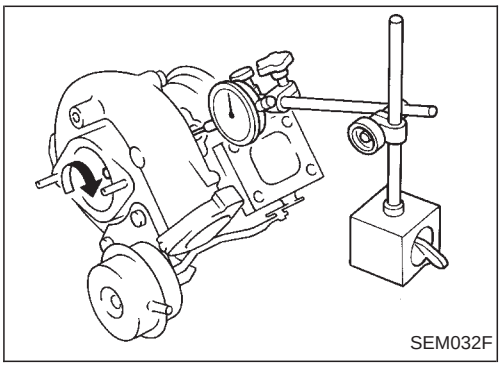

SEM030F

1. Check rotor shaft for smooth rotation.

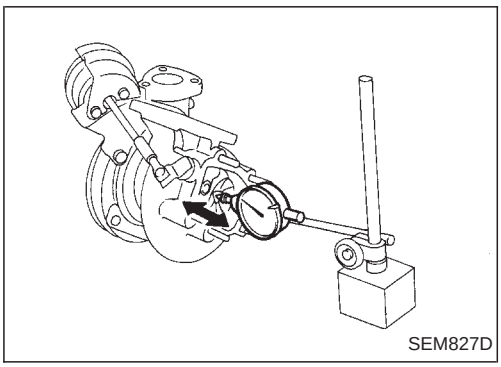


SEM031F

2. Check rotor shaft for carbon deposits.


SEM032F

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


SEM827D

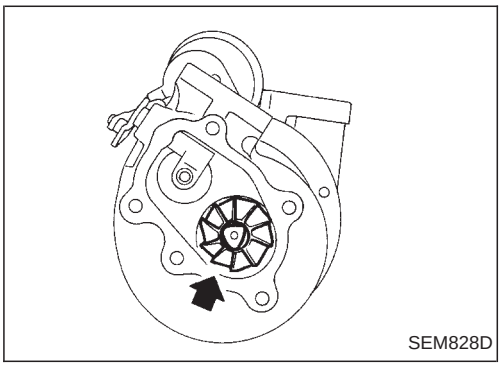
4. Measure rotor shaft end play.
   End play:
   Standard
   0.013 - 0.097 mm (0.0005 - 0.0038 in)

- **Do not allow wheels to turn when axial play is being measured.**

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Inspection (Cont'd)

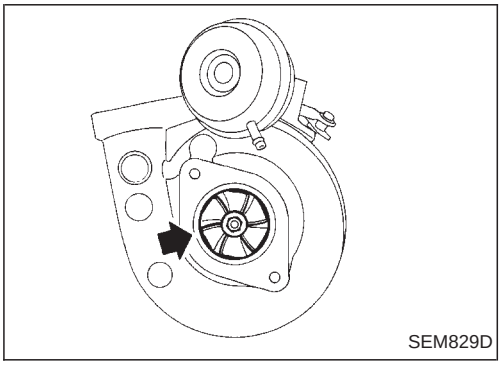
TURBINE WHEEL


SEM828D

Check turbine wheel for the following.

- Oil
- Carbon deposits
- Deformed fins
- Contact with turbine housing

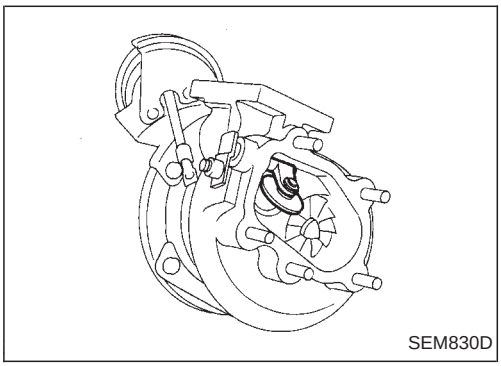
COMPRESSOR WHEEL


SEM829D

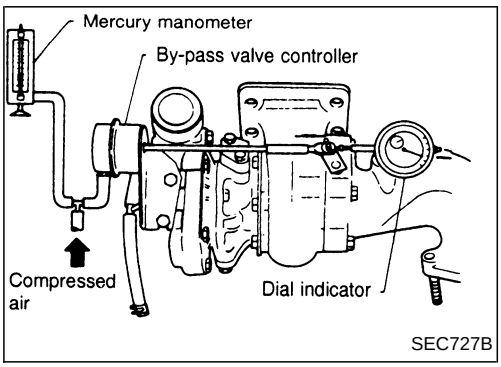
Check compressor wheel for the following.

- Oil
- Deformed fins
- Contact with compressor housing

WASTEGATE VALVE


SEM830D

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



SEC727B

Check operation of by-pass valve controller.

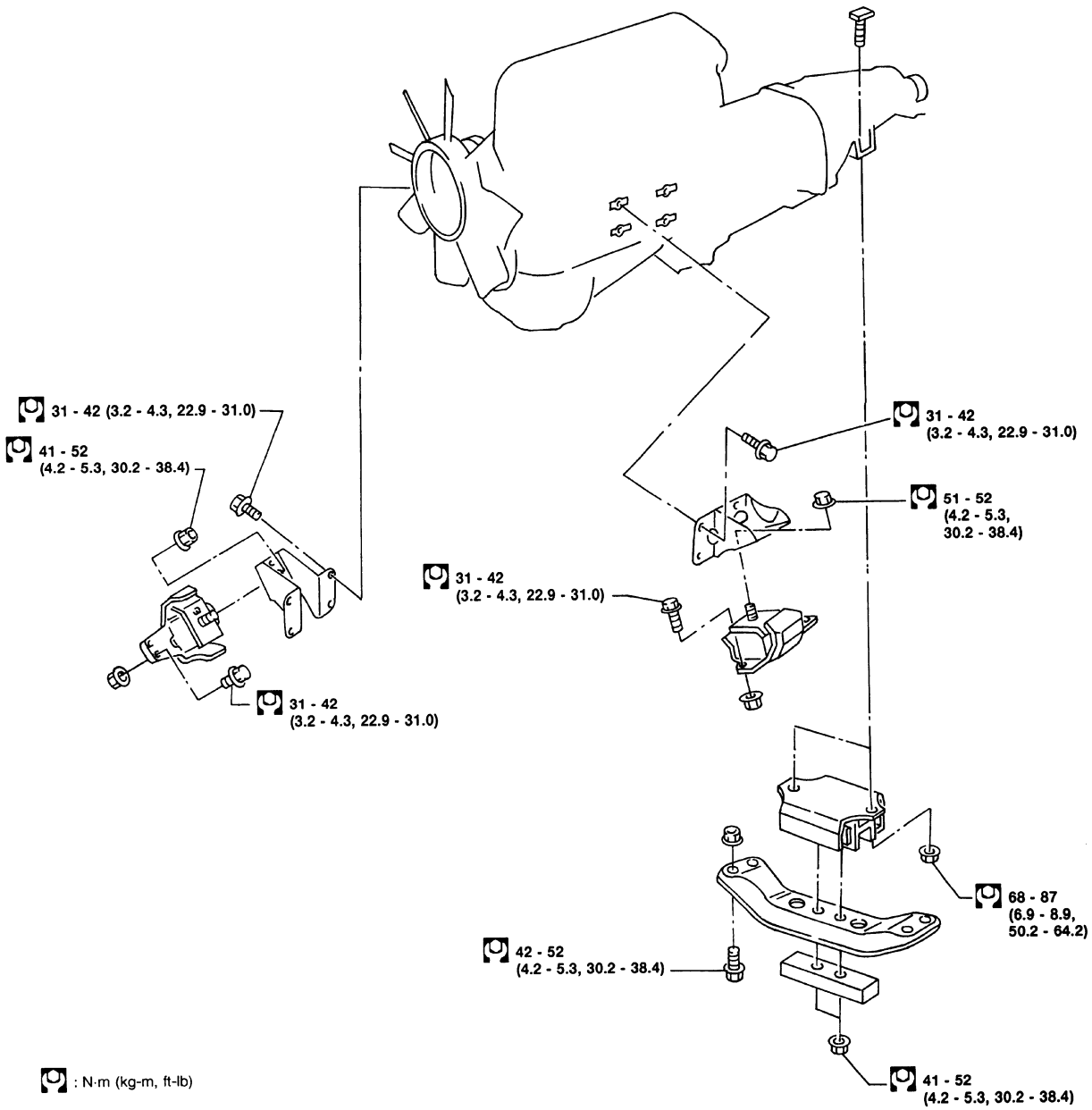
- Move by-pass valve to make sure that it is not sticking or scratched.
- Measure rod end play of the by-pass valve controller.

Do not apply more than 102.6 kPa (1,026 mbar, 770 mmHg, 30.31 inHg) pressure to controller diaphragm.

By-pass valve controller stroke/pressure:

0.38 mm (0.015 in)/92 kPa (920 mbar, 690 mmHg, 27.17 inHg)

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31 - 42 (3.2 - 4.3, 22.9 - 31.0)
41 - 52
(4.2 - 5.3, 30.2 - 38.4)
31 - 42
(3.2 - 4.3, 22.9 - 31.0)
31 - 42
(3.2 - 4.3, 22.9 - 31.0)
31 - 42
(3.2 - 4.3, 22.9 - 31.0)
51 - 52
(4.2 - 5.3,
30.2 - 38.4)
68 - 87
(6.9 - 8.9,
50.2 - 64.2)
42 - 52
(4.2 - 5.3, 30.2 - 38.4)
41 - 52
(4.2 - 5.3, 30.2 - 38.4)
: N·m (kg-m, ft-lb)
EEM097E

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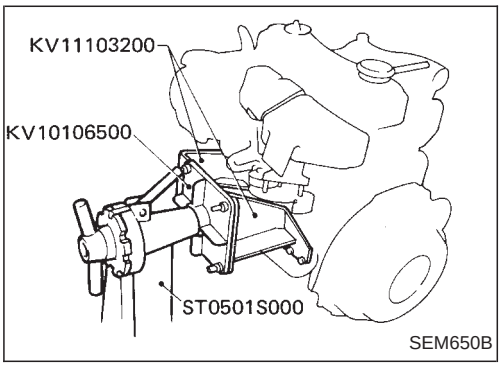
WARNING:

a. Situate vehicle on a flat and solid surface.
b. Place chocks at front and back of rear wheels.
c. Do not remove engine until exhaust system has completely cooled off.
d. For safety during subsequent steps, the tension of wires should be slackened against the engine.
e. Be sure to hoist engine in a safe manner.
f. For engines not equipped with engine slingers, attach proper slingers and bolts described in PARTS CATALOG.

CAUTION:

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

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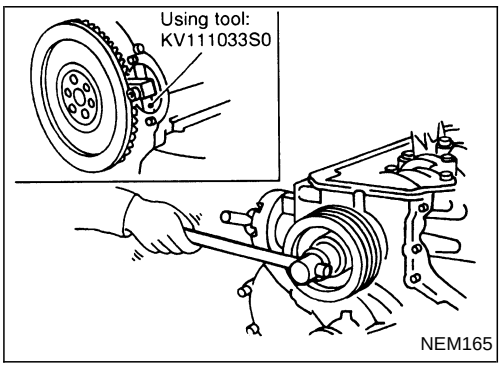


SEM650B

Disassembly

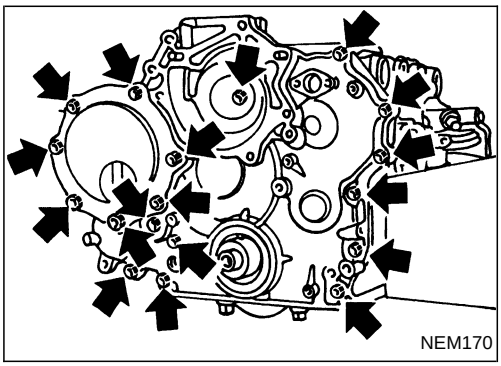
PISTON AND CRANKSHAFT

1. Remove oil filter.
2. Place engine on work stand.
3. Drain coolant and oil.
4. Remove drive belts.
5. Remove cylinder head. Refer to “CYLINDER HEAD”.
6. Remove oil pan.

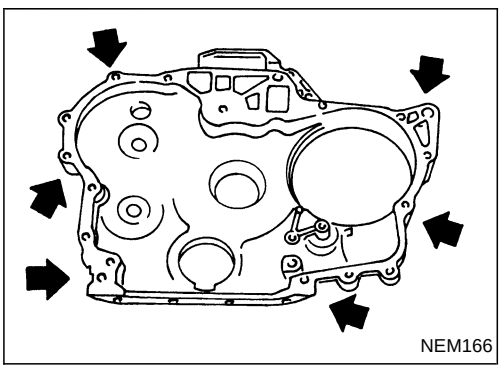


NEM165

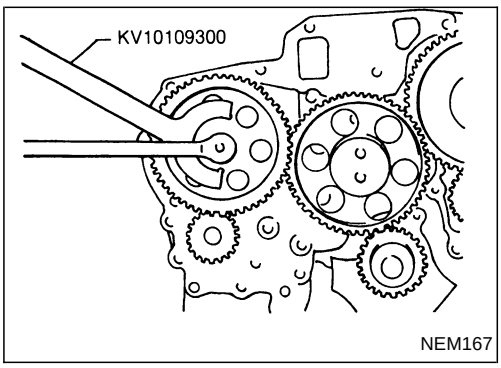
7. Remove crank pulley and timing gear plate cover.


NEM170

8. Remove water pump.
9. Remove timing gear case.


NEM166

If the timing case is hard to remove due to liquid gasket, pry it off with a suitable tool at the cutout section.

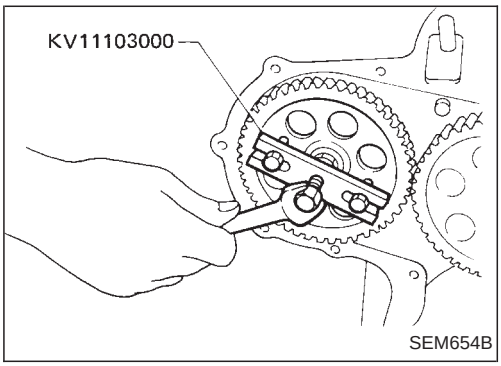


NEM167

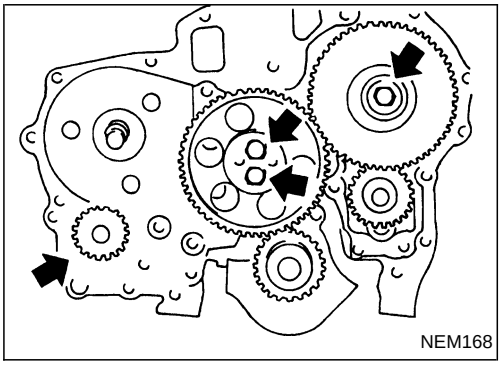
10. Remove injection pump gear nut.

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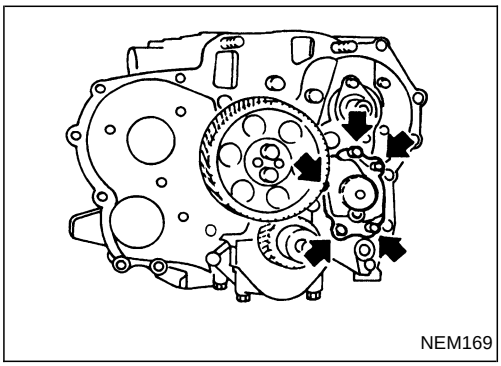
Disassembly (Cont'd)



11. Remove injection pump gear.
12. Remove injection pump.

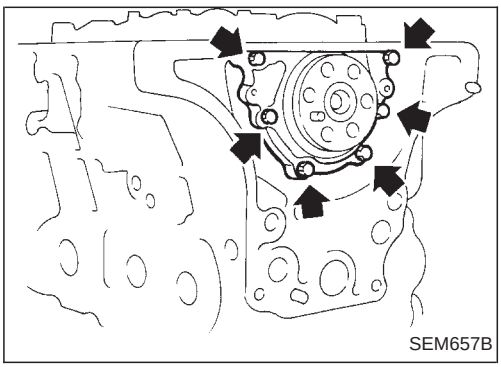


13. Remove idler gear and idler shaft.
14. Remove valve lifters, camshaft gear and camshaft.
15. Remove vacuum pump assembly.



16. Remove oil pump assembly.

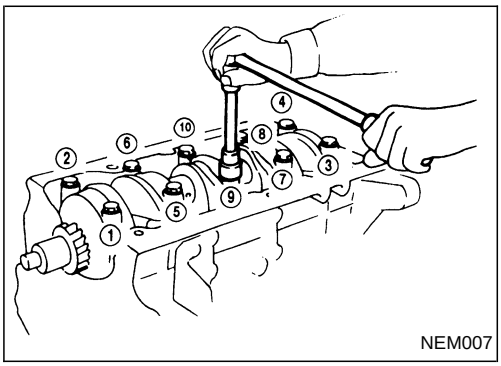
17. Remove crankshaft gear.
18. Remove flywheel and rear plate.
19. Remove connecting rod caps.
20. Remove pistons.



21. Remove rear oil seal retainer.
22. Remove oil strainer.

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Disassembly (Cont'd)

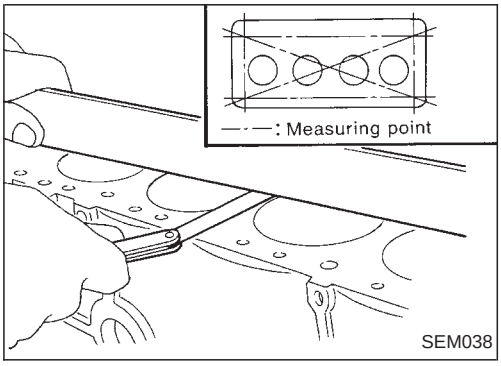


23. Remove bearing cap and crankshaft. Loosen bearing cap nuts in numerical order, as shown at left.

Place the bearings and caps in their proper order.

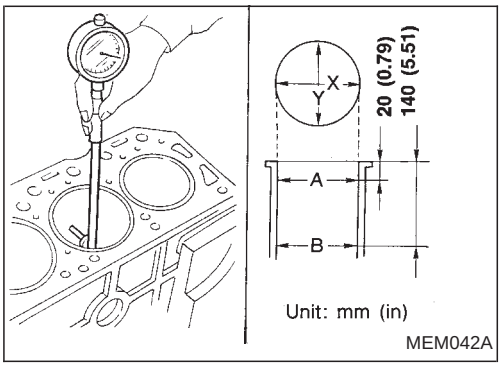
Inspection

CYLINDER BLOCK DISTORTION

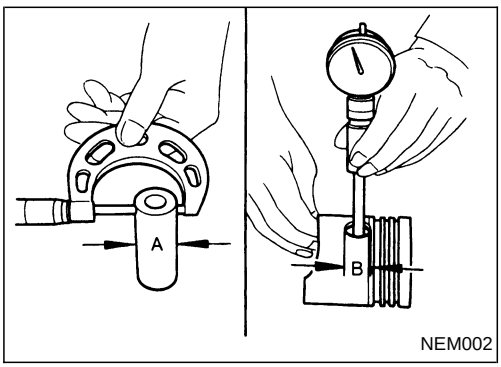


1. Clean upper face of cylinder block and measure the distortion.
   Standard:
   Less than 0.05 mm (0.0020 in)
   Limit:
   0.2 mm (0.008 in)
2. If out of specification, resurface it.

CYLINDER WEAR



1. Measure cylinder bore for out-of-round and taper with a bore gauge. If beyond the limit, rebore all 4 cylinders. Replace cylinder block if necessary.
   Standard inside diameter:
   96.000 - 96.030 mm (3.7795 - 3.7807 in)
   Refer to SDS
   Wear limit:
   Less than 0.20 mm (0.0079 in)
   Out-of-round (X − Y) limit:
   Less than 0.020 mm (0.0008 in)
   Taper (A − B) limit:
   0.20 mm (0.0079 in)
2. Check for scratches or abrasions. If abrasions are found, hone cylinder bore.



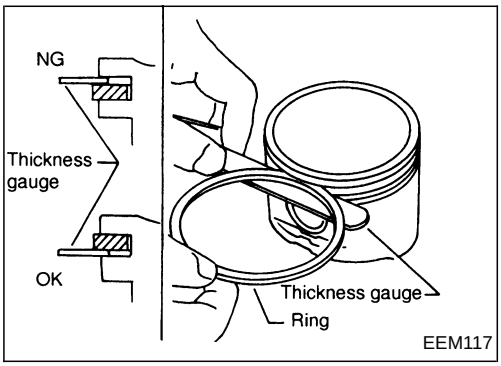
PISTON AND PISTON PIN CLEARANCE

Check clearance between pistons and piston pins.

Clearance (A − B):
Standard
0.002 to 0.012 mm (0.0001 to 0.0005 in)
Limit
Less than 0.1 mm (0.004 in)

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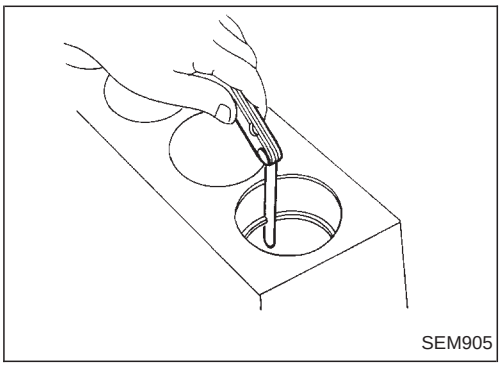
Inspection (Cont'd)



PISTON RING SIDE CLEARANCE

Side clearance:
- **Top ring**
  - **0.00 - 0.05 mm (0.0 - 0.0020 in)**
- **2nd ring**
  - **0.04 - 0.072 mm (0.0016 - 0.0028 in)**
- **Oil ring**
  - **0.02 - 0.055 mm (0.0008 - 0.0022 in)**

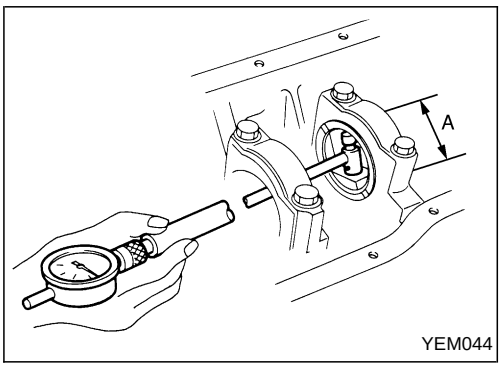
Max. limit of side clearance:
- **Top ring**
  - **0.50 mm (0.0197 in)**
- **2nd ring**
  - **0.30 mm (0.0118 in)**
- **Oil ring**
  - **0.15 mm (0.0059 in)**



PISTON RING END GAP

Standard ring gap:
- **Top ring**
  - **0.25 - 0.40 mm (0.0098 - 0.0157 in)**
- **2nd ring**
  - **0.40 - 0.55 mm (0.0157 - 0.0217 in)**
- **Oil ring**
  - **0.25 - 0.55 mm (0.0098 - 0.0217 in)**

Max. limit of ring gap:
- **1.5 mm (0.059 in)**



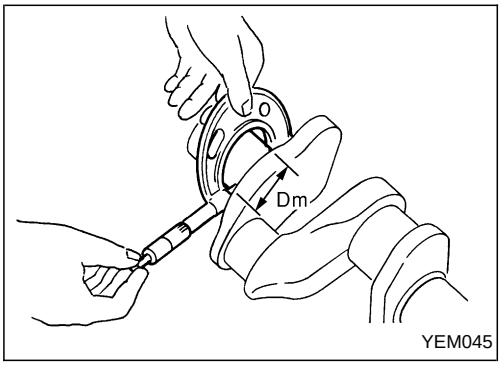
BEARING CLEARANCE

Main bearing

1. Install main bearings to cylinder block and main bearing cap.
2. Install main bearing cap to cylinder block.

Tighten all bolts in correct order and in two or three stages.

3. Measure inside diameter "A" of main bearing.



4. Measure outside diameter "Dm" of main journal in crankshaft.

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Inspection (Cont'd)

5. Calculate main bearing clearance.

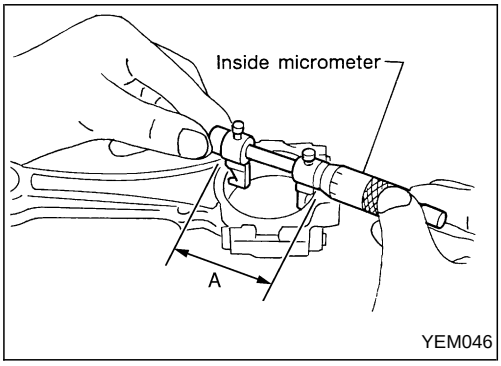
Main bearing clearance = A − Dm

Standard

0.035 - 0.083 mm (0.0014 - 0.0033 in)

Limit

Less than 0.15 mm (0.0059 in)



CONNECTING ROD BEARING (Big end)

1. Install connecting rod bearing to connecting rod and cap.
2. Install connecting rod cap to connecting rod.

Apply oil to the thread portion of bolts and seating surface of nuts.

3. Measure inside diameter "A" of bearing.
4. Measure outside diameter "Dp" of pin journal in crankshaft.
5. Calculate connecting rod bearing clearance.

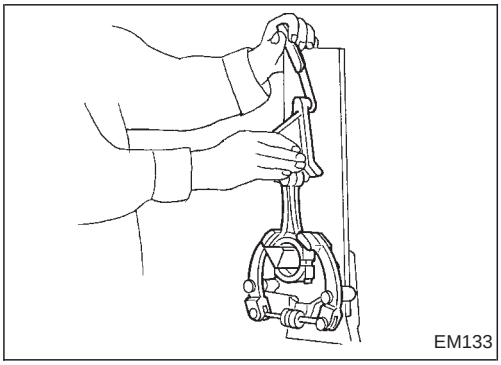
Connecting rod bearing clearance = A − Dp

Standard

0.035 - 0.077 mm
(0.0014 - 0.0030 in)

Limit

Less than 0.15 mm (0.0059 in)

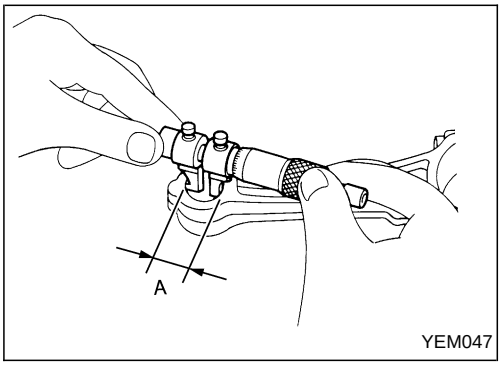


CONNECTING ROD BEND AND TORSION

Bend and torsion:

Limit

0.15 mm (0.0059 in)
per 200 mm (7.87 in) length

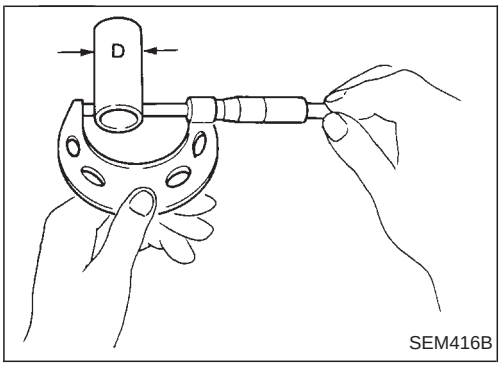


CONNECTING ROD BUSHING CLEARANCE (Small end)

1. Measure inside diameter "A" of connecting rod small end bushings.

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Inspection (Cont'd)



2. Measure outside diameter "D" of piston pin.
3. Calculate connecting rod small end bushing clearance.

Connecting rod small end bushing clearance = A − D
Standard
0.025 - 0.043 mm (0.0010 - 0.0017 in)
Limit
0.15 mm (0.0059 in)

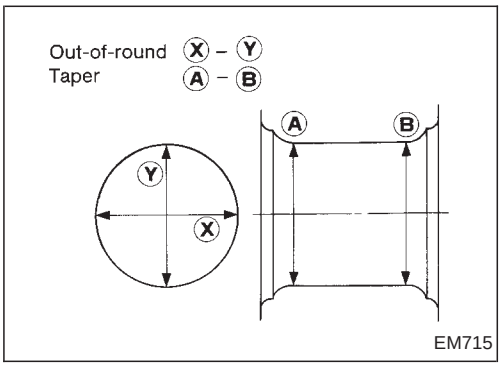
REPLACEMENT OF CONNECTING ROD BUSHING (Small end)

1. Drive in the small end bushing until it is flush with the end surface of the rod.

Be sure to align the oil holes.

2. After driving in the small end bushing, ream the bushing.

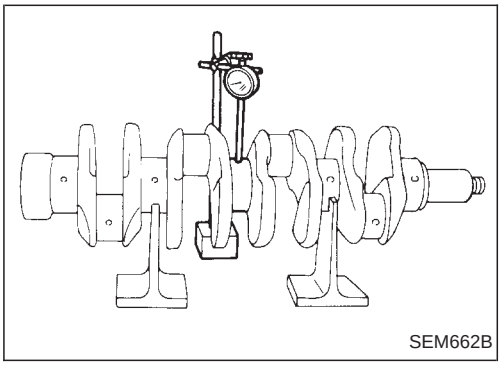
Small end bushing inside diameter:
Finished size
30.025 - 30.038 mm (1.1821 - 1.1826 in)



CRANKSHAFT

1. Check crankshaft journals and pins for score, bias, wear or cracks. If faults are minor, correct with fine emery paper.
2. Check journals and pins with a micrometer for taper and out-of-round.

Out-of-round (X − Y):
Standard
Less than 0.01 mm (0.0004 in)
Limit
0.02 mm (0.0008 in)
Taper (A − B):
Standard
Less than 0.01 mm (0.0004 in)
Limit
0.02 mm (0.0008 in)

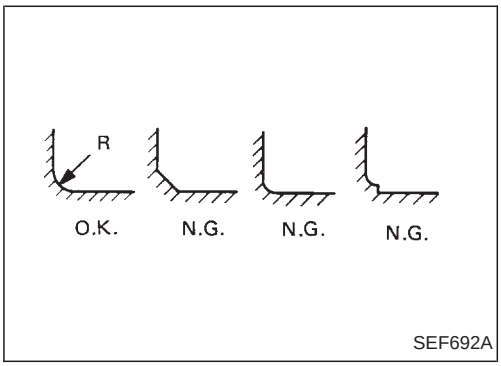


3. Check crankshaft runout.

Runout (Total Indicator Reading)
Standard
0 - 0.03 mm (0 - 0.0012 in)
Limit
0.10 mm (0.0039 in)

http://vnx.su/

Inspection (Cont'd)



SEF692A

RESURFACING OF CRANKSHAFT JOURNAL AND CRANK PIN

When using undersize main bearings and connecting rod bearings, the crankshaft journals or crank pins must be finished to match the bearings.

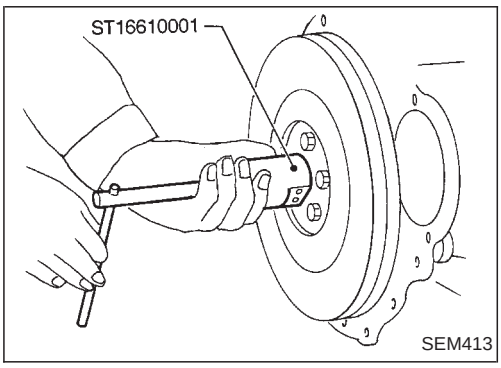
R: Crank journal 3.0 mm (0.118 in)
Crank pin 3.5 mm (0.138 in)

CAUTION:

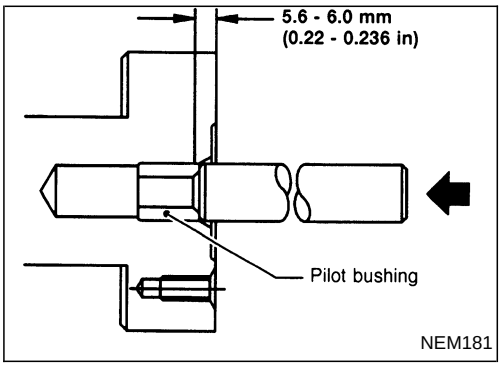
- **At the same time make sure that the surface width does not increase.**
- **Do not attempt to cut counterweight of crankshaft.**

PILOT BUSHING REPLACEMENT

1. Pull out bushing with Tool.



SEM413



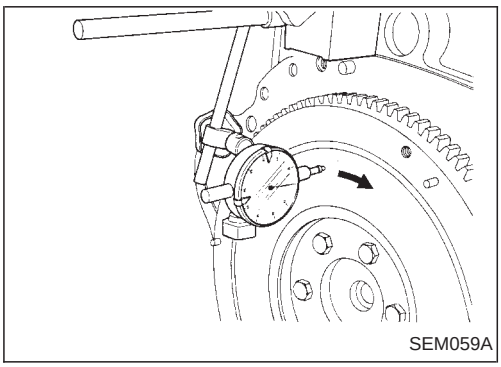
NEM181

2. Insert pilot bushing until distance between flange end and bushing is specified value.

Distance:
Approx. 5.6 - 6.0 mm (0.220 - 0.236 in)

FLYWHEEL RUNOUT

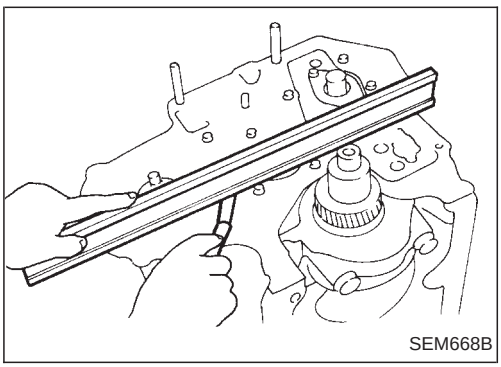
Runout (Total Indicator Reading):
Less than 0.15 mm (0.0059 in)


SEM059A

FRONT PLATE

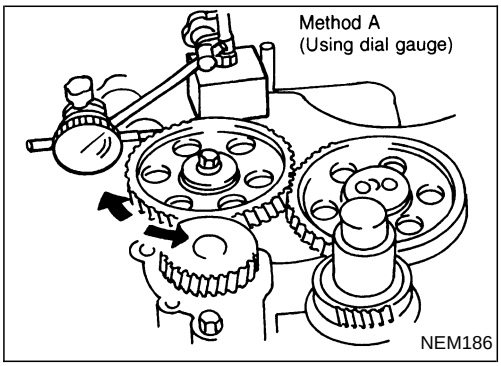
Check front plate for warpage. If not within the limit, make flat or replace front plate.

Warpage limit:
0.2 mm (0.008 in)


SEM668B

http://vnx.su/

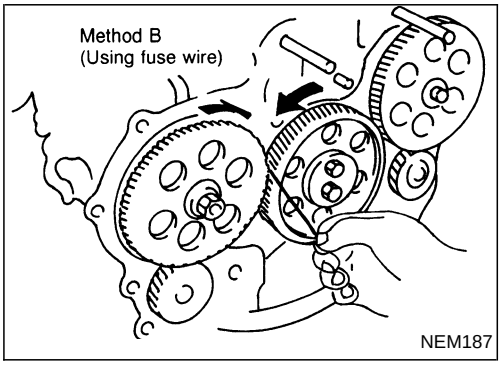
Inspection (Cont'd)



GEAR TRAIN

Camshaft drive gear, injection pump drive gear, oil pump gear, idler gear, crankshaft gear and vacuum pump gear.

1. If gear tooth and key have scratches or are excessively worn, replace gear and key.
2. Check gear train backlash before disassembling and after assembling.
   Method A (Using dial gauge)
   Method B (Using fuse wire)



If beyond the limit, replace gear.

Backlash:

Standard

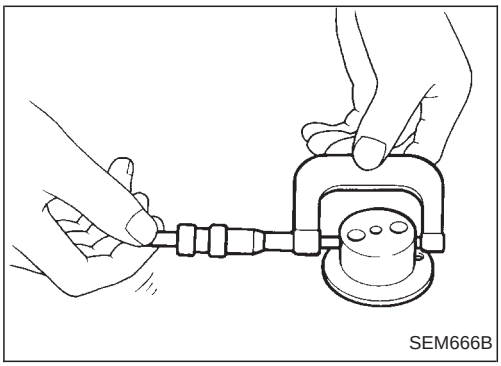
0.07 - 0.11 mm (0.0028 - 0.0043 in)

Limit

0.20 mm (0.0079 in)

IDLER GEAR BUSHING CLEARANCE

1. Measure idler gear shaft outer diameter.



2. Measure idler gear bushing inner diameter.
3. Calculate idler gear bushing clearance.

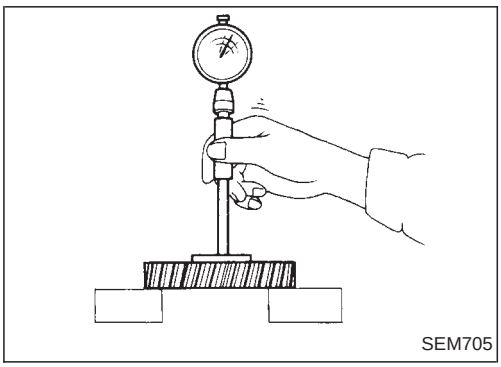
Bushing oil clearance:

Standard

0.025 - 0.061 mm (0.0010 - 0.0024 in)

Limit

0.20 mm (0.0079 in)



IDLER GEAR END PLAY

Measure idler gear end play between gear plate and gear.

Idler gear end play:

Standard

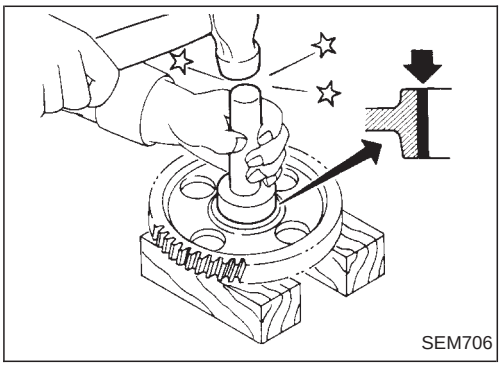
0.03 - 0.14 mm (0.0012 - 0.0055 in)

Limit

Less than 0.3 mm (0.012 in)

http://vnx.su/

Inspection (Cont'd)

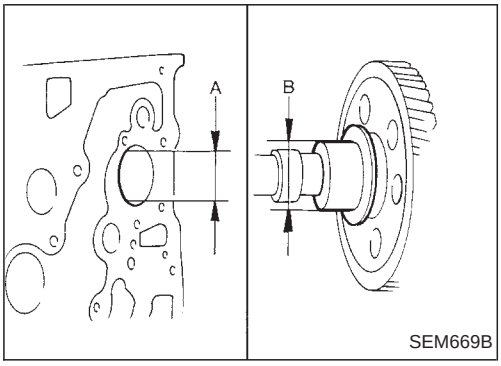

SEM706

REPLACEMENT OF IDLER GEAR BUSHING

1. Use a suitable tool to replace bushing.
2. Ream idler gear bushing.
   Finished size:
   42.00 - 42.02 mm (1.6535 - 1.6543 in)

Idler gear shaft

Install idler gear shaft so that oil hole of shaft faces upward.



SEM669B

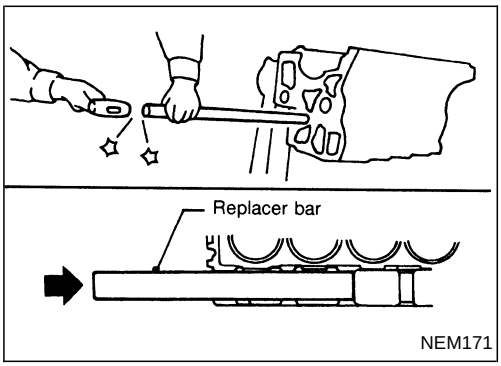
CAMSHAFT AND CAMSHAFT BUSHING

Camshaft bushing clearance

Measure inside diameter of camshaft bushing (A) and outside diameter of camshaft journal (B) with a suitable gauge.

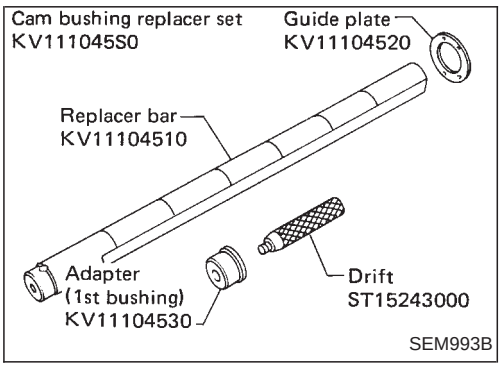
Clearance between camshaft and bushing (A − B):
Standard
0.020 - 0.109 mm
(0.0008 - 0.0043 in)
Limit
Less than 0.15 mm (0.0059 in)

REPLACING CAMSHAFT BUSHING



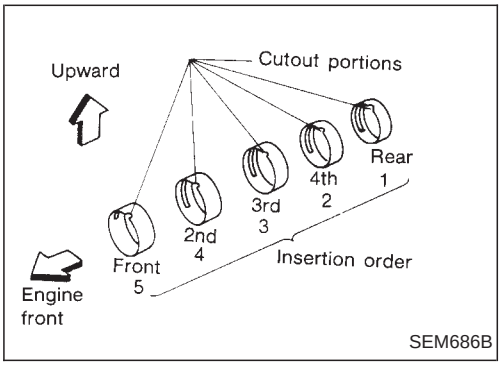
NEM171

1. Remove welch plug.
   Using Tool, remove camshaft bushings from the cylinder block. Some bushings must be broken in order to remove.



SEM993B

2. Using Tool, install camshaft bushings as follows:

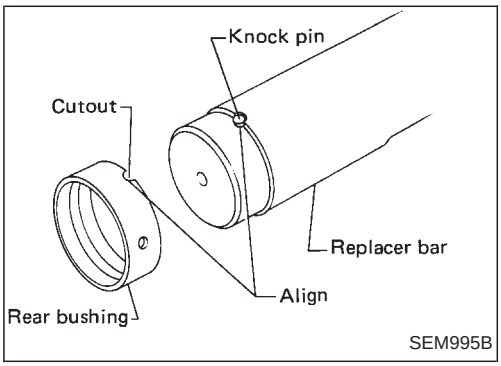


SEM686B

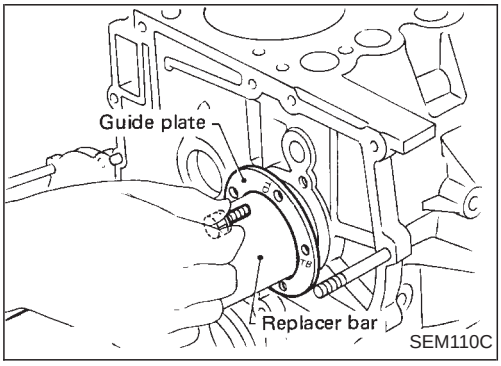
(1) Install camshaft bushings in the order of "rear", "4th", "3rd", "2nd" and "front". All bushings must be installed from the front.
(2) Face the cutout upward and toward the front of the engine during installation.

http://vnx.su/

Inspection (Cont'd)

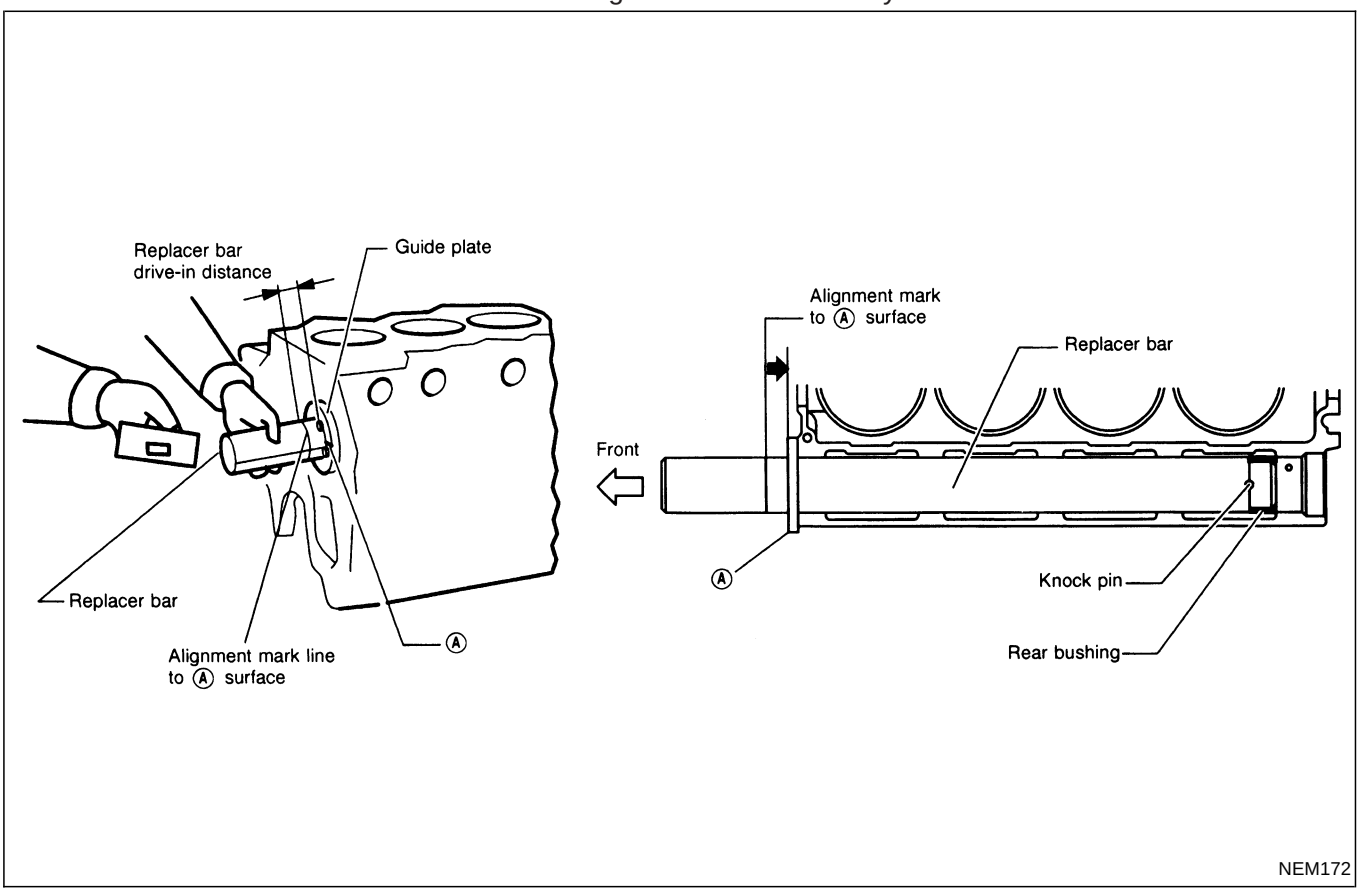


(3) Rear camshaft bushing.
Align the cutout of rear bushing with knock pin of replacer bar before installation.



Insert rear bushing with replacer bar into the cylinder block. Install guide plate with bolt holes (on the "TD" mark side) facing upper side of cylinder block. Tighten bolts.

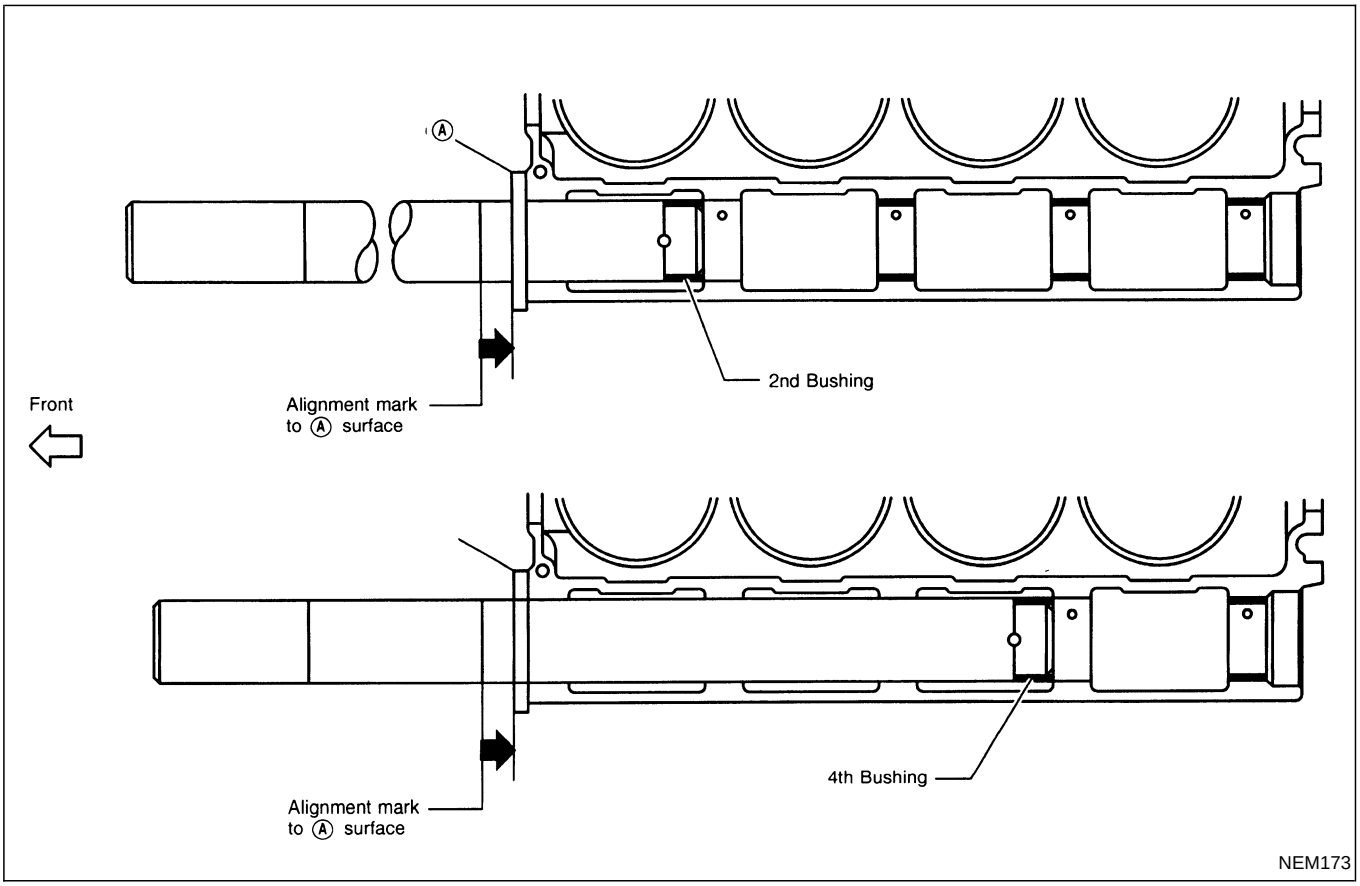
Drive replacer bar until the alignment mark on replacer bar is aligned with the end of replacer guide.
Remove replacer set.
After installation, check that oil hole in camshaft bushing are aligned with oil hole in cylinder block.

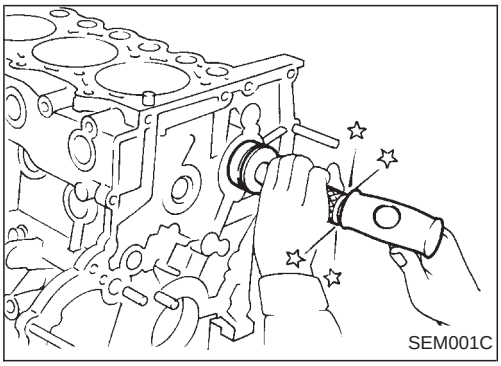


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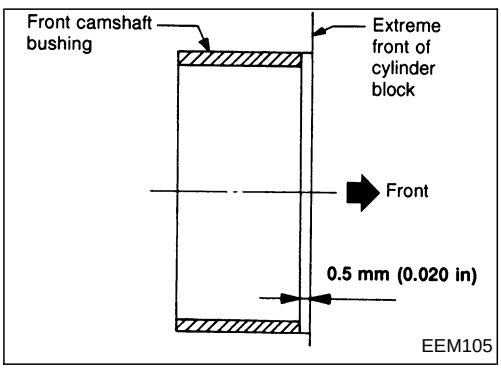
Inspection (Cont'd)

(4) 4th, 3rd and 2nd camshaft bushings.
Install in the same manner as rear camshaft bushing.





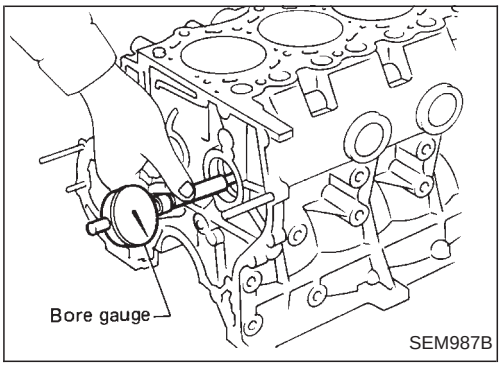
(5) Front camshaft bushing.
Using 1st bushing adapter, position front camshaft bushing so that oil hole in cylinder block is aligned with oil hole in bushing.



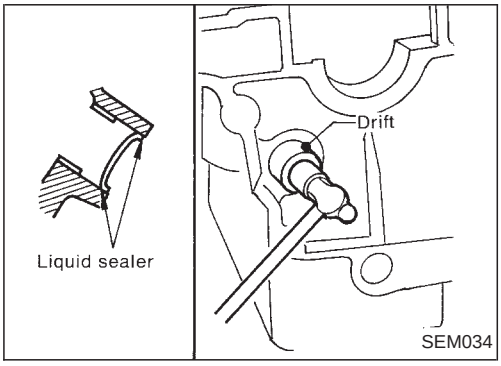
The camshaft bushing of the front side must be inserted at 0.5 mm (0.020 in) from the extreme front of cylinder block.

http://vnx.su/

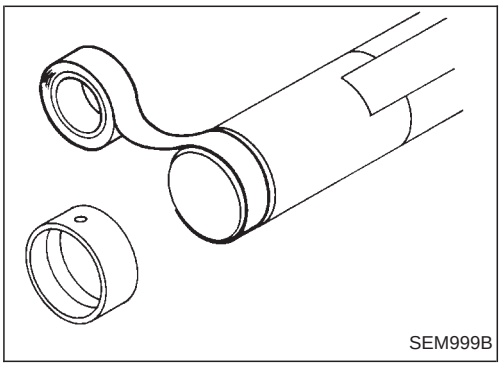
Inspection (Cont'd)



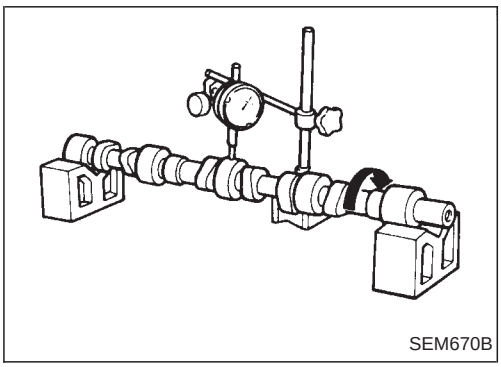
3. Check camshaft bushing clearance.



4. Install new welch plug with a drift.
Apply liquid sealer.



When setting 4th through 2nd bushings on replacer bar, tape the bar to prevent movement.



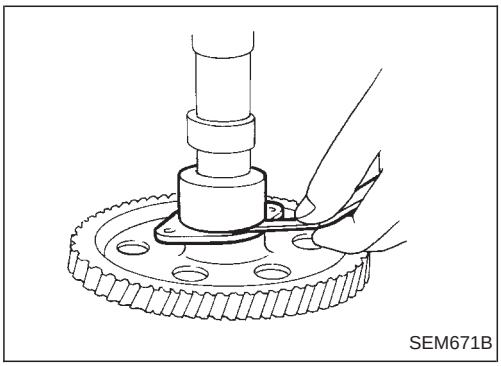
CAMSHAFT ALIGNMENT

1. Check camshaft journal and cam surface for cracks, wear or damage.
   If fault is beyond limit, replace.
2. Check camshaft runout at center journal.
   If runout is greater than specified limit, repair or replace camshaft.

Camshaft runout
(Total indicator reading):
Standard
Less than 0.02 mm (0.0008 in)
Limit
Less than 0.06 mm (0.0024 in)

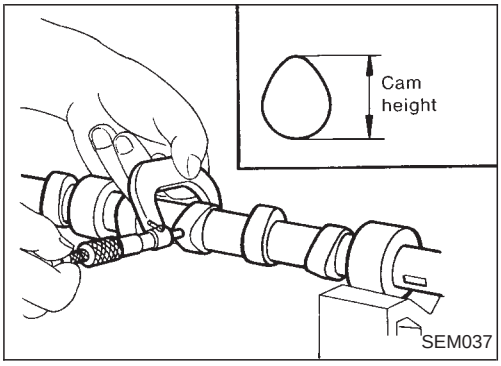
http://vnx.su/

Inspection (Cont'd)


SEM671B

3. Measure camshaft end play between locating plate and gear. If beyond the specified limit, replace camshaft locating plate.

Camshaft end play:
Standard
0.08 - 0.28 mm (0.0031 - 0.0110 in)
Limit
Less than 0.5 mm (0.020 in)

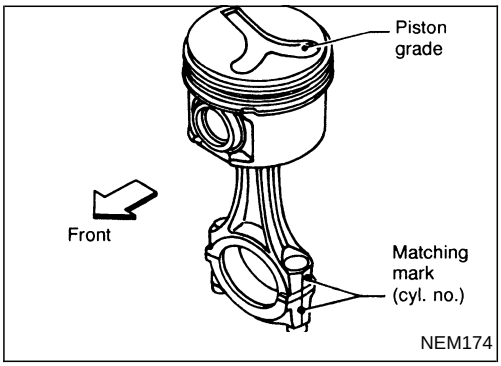


SEM037

4. Measure camshaft cam height. If beyond the specified limit, replace camshaft.

Cam height:
Standard
Intake
41.570 mm (1.6366 in)
Exhaust
41.900 mm (1.6496 in)
Limit
Intake
Less than 41.20 mm (1.6220 in)
Exhaust
Less than 41.40 mm (1.6299 in)

http://vnx.su/

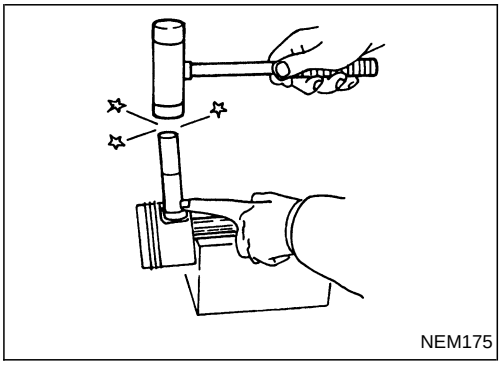


Assembly

PISTON

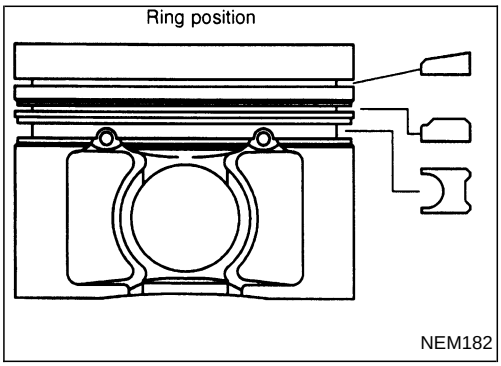
1. Assemble pistons, piston pins, snap rings and connecting rods.

a. Numbers are stamped on the connecting rod and cap corresponding to each cylinder. Care should be taken to avoid a wrong combination including bearing.



b. When inserting piston pin in connecting rod, heat piston with a heater or hot water [approximately 60 to 70°C (140 to 158°F)] and apply engine oil to pin and small end of connecting rod.

c. After assembling, ascertain that piston swings smoothly.

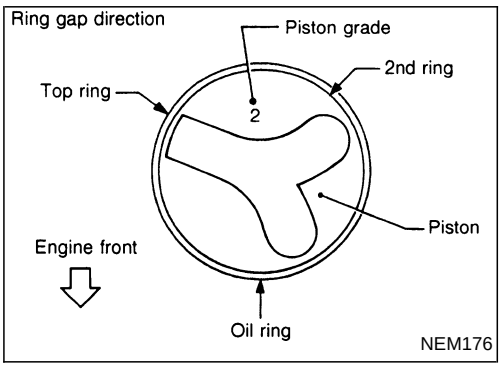


2. Install piston assembly.

CAUTION:

a. Stretch the piston rings just enough to fit them in the piston grooves.

b. Be sure the manufacturer's mark faces upward.



c. Install No. 1 piston ring (oil ring) in such a way that its gap faces the direction of engine front, as shown in illustration at left; and then install 2nd and top rings so that their gap is positioned at 120° one to another.

CRANKSHAFT

1. Install crankshaft.

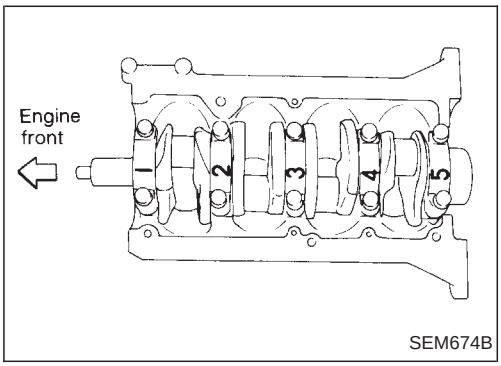
(1) Set main bearings in the proper position on cylinder block.

a. If either crankshaft, cylinder block or main bearing is reused again, it is necessary to measure main bearing clearance.

b. Upper bearings have oil hole and oil groove, however lower bearings do not.

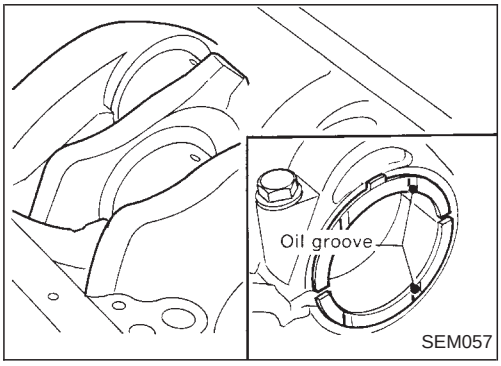
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Assembly (Cont'd)



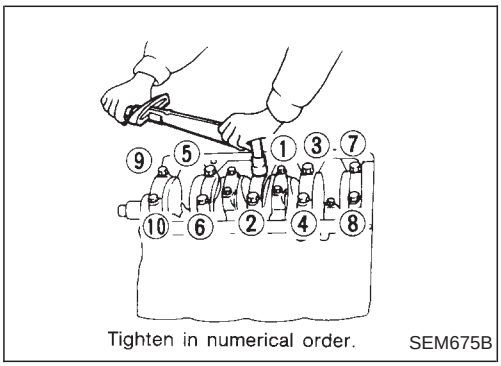
SEM674B

(2) Apply engine oil to crankshaft journal and pin and install crankshaft.
(3) Install main bearings caps.
a) Install main bearing cap with the lowest number facing the front of vehicle.
b) Apply engine oil to main bearing cap and cylinder block contact surfaces.
c) Install rear oil seal assembly. Apply engine oil to contact surface of rear end oil seal and crankshaft.



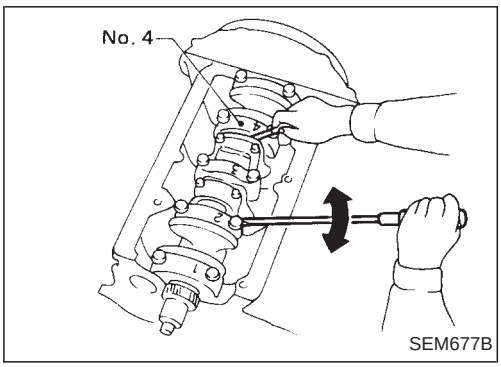
SEM057

(4) Install crankshaft thrust washer at the 4th journal from front.
Install thrust washer so that oil groove can face crankshaft.



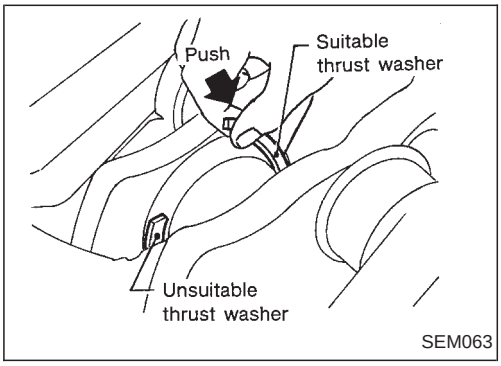
Tighten in numerical order.
SEM675B

(5) Tighten bearing cap bolts gradually in stages, starting from two to three separate stages, from center bearing and moving outward in sequence.



SEM677B

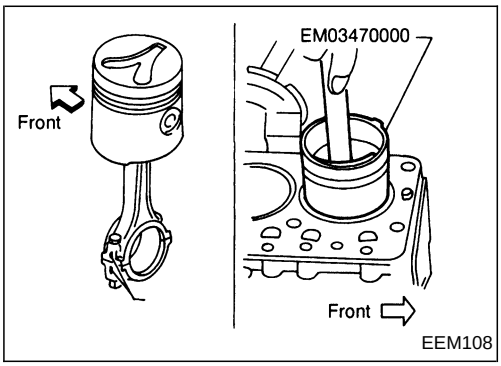
(6) Measure crankshaft free end play at No. 4 bearing.
Crankshaft free end play:
Standard
0.060 - 0.25 mm (0.0024 - 0.0098 in)
Limit
0.4 mm (0.016 in)
If beyond the limit, replace No. 4 main bearing thrust washer. Refer to SDS.



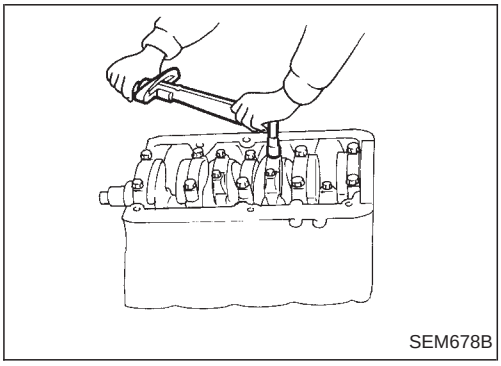
SEM063

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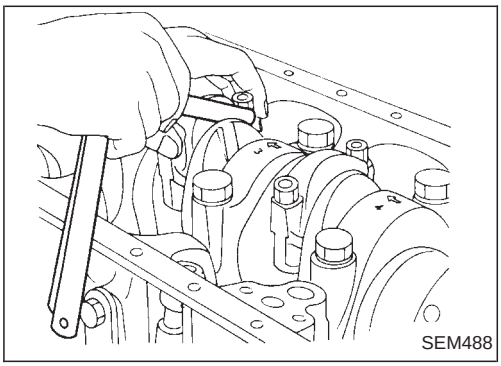
Assembly (Cont'd)



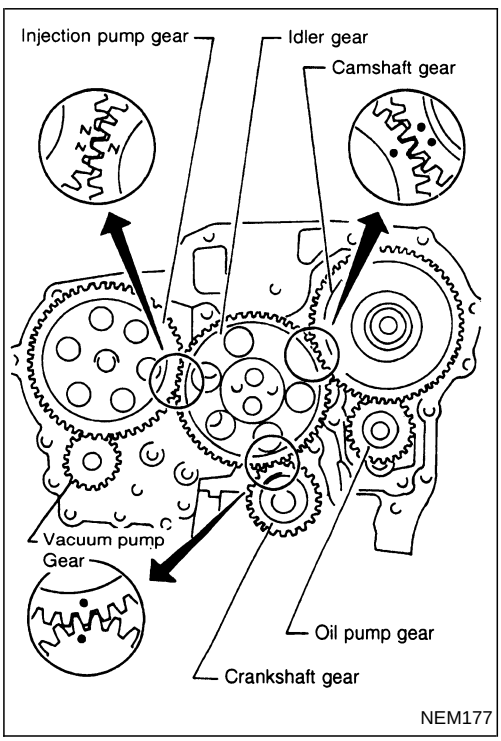
2. Install pistons with connecting rods.
(1) Install them into corresponding cylinder using Tool.
- **Be careful not to scratch cylinder wall with connecting rod.**
- **Apply engine oil to cylinder wall, piston and bearing.**
- **The leaf type combustion chamber on piston head must be facing toward the fuel pump side.**



(2) Install connecting rod bearing caps.



3. Measure connecting rod side clearance.
Connecting rod side clearance:
Standard
0.10 - 0.32 mm (0.0039 - 0.0126 in)
Limit
0.32 mm (0.0126 in)
If beyond the limit, replace connecting rod and/or crankshaft.
4. Install oil strainer and oil pan.
5. Install all removed parts.



GEAR TRAIN

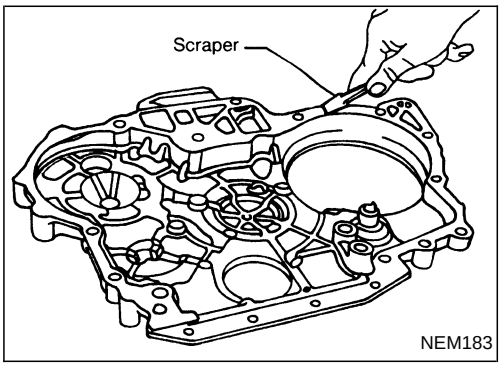
1. Set No. 1 piston at its Top Dead Center.
2. Align each gear mark and install gears.

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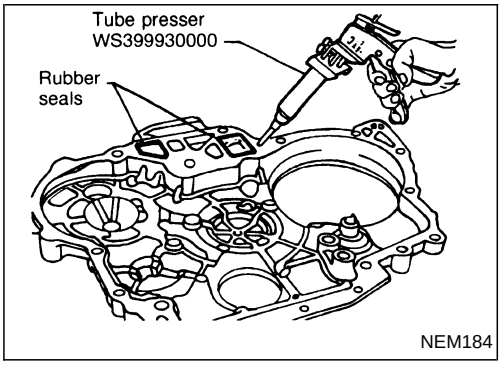
Assembly (Cont'd)

TIMING GEAR CASE

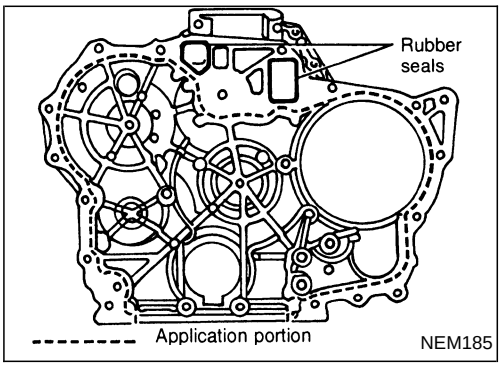
Installation

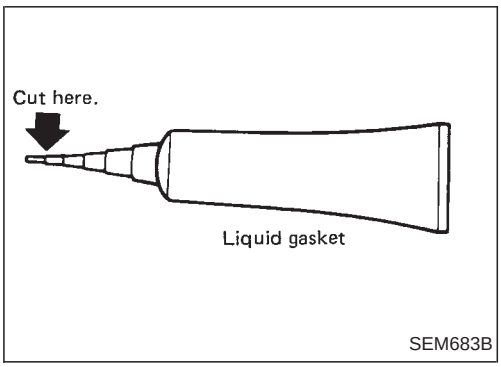


1. Before installing timing gear case, remove all traces of liquid gasket from mating surface using a scraper.
   Also remove traces of liquid gasket from mating surface of front plate.



2. Apply a continuous bead of liquid gasket to mating surface of timing gear case and install the two rubber seals as shown.



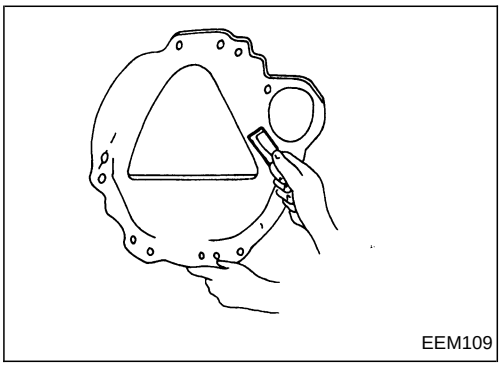


- **Be sure liquid gasket is 2.5 to 3.5 mm (0.098 to 0.138 in) wide.**
- **Attach timing gear case to front plate within 20 minutes after coating.**
- **Wait at least 30 minutes before refilling engine coolant or starting engine.**
- **use Genuine Liquid Gasket or equivalent.**

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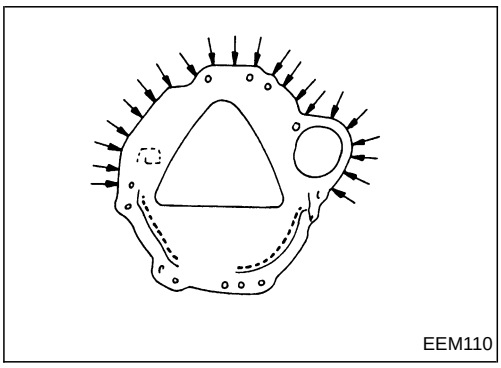
Assembly (Cont'd)

REAR PLATE


EEM109

Installation

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


EEM110

2. Apply a continuous bead of liquid gasket to mating surface of cylinder block.
3. Fit the rear plate into the cylinder block and apply liquid gasket in the area indicated by discontinuous line.
4. After the transmission is installed, apply liquid gasket in the area indicated by arrows.
5. Install all removed parts.

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General Specifications

Engine model	TD27Ti
Cylinder arrangement	4, in-line
Displacement cm^3 (cu in)	2,663 (162.5)
Bore x stroke mm (in)	96 x 92 (3.8 x 3.6)
Valve arrangement	OHV
Firing order	1-3-4-2
Number of piston rings	
Compression	2
Oil	1
Number of main bearings	5
Compression ratio	21.9±0.2

Unit: kPa (bar, kg/cm^2, psi)/rpm

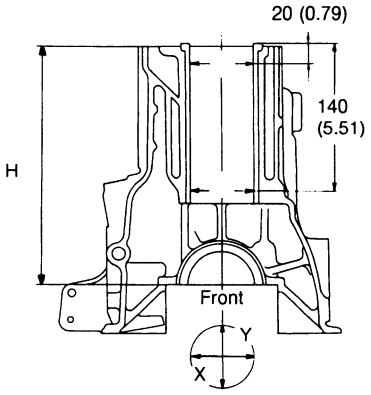
Compression pressure	
Standard	2,942 (29.4, 30, 427)/200
Minimum	2,452 (24.5, 25, 356)/200
Differential limit between cylinders	294 (2.9, 3, 43)/200

http://vnx.su/

Inspection and Adjustment

CYLINDER BLOCK AND CYLINDER LINER

Unit: mm (in)



NEM227

Nominal cylinder block height (H) (From crankshaft center)	252.95 - 253.05 (9.959 - 9.963)
Cylinder bore	
Inner diameter	
Standard	
Grade No. 1	96.000 - 96.010 (3.7795 - 3.7799)
Grade No. 2	96.010 - 96.020 (3.7799 - 3.7803)
Grade No. 3	96.020 - 96.030 (3.7803 - 3.7807)
Wear limit	0.20 (0.0079)
Out-of-round (X − Y)	Less than 0.020 (0.0008)
Taper (A − B)	Less than 0.20 (0.0079)
Division of each cylinder	Less than 0.05 (0.0020)

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Inspection and Adjustment (Cont'd)

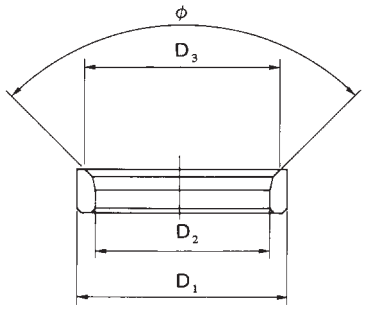
VALVE GUIDE

Unit: mm (in)

	Standard	Service
Valve guide outside diameter	12.233 - 12.244 (0.4816 - 0.4820)	—
Valve guide inner diameter (Finished size)	8.000 - 8.015 (0.3150 - 0.3156)	
Cylinder head valve guide hole diameter	12.200 - 12.211 (0.4803 - 0.4807)	—
Interference fit of valve guide	0.022 - 0.044 (0.0009 - 0.0017)	
	Standard	Limit
Valve to guide clearance		
Intake	0.020 - 0.050 (0.0008 - 0.0020)	0.15 (0.0059)
Exhaust	0.040 - 0.070 (0.0016 - 0.0028)	0.15 (0.0059)
Valve deflection limit		
Intake	0.35 (0.0138)	
Exhaust	0.35 (0.0138)	

VALVE SEAT

Unit: mm (in)



SEM953C

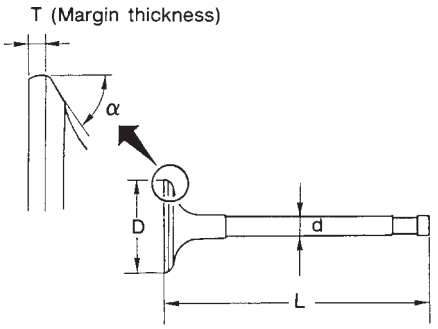
Intake	
Outer diameter "D_1"	
Standard	44.535 - 44.545 (1.7533 - 1.7537)
0.5 (0.020) Oversize (Service)	45.035 - 45.045 (1.7730 - 1.7734)
Inner diameter "D_2"	38.0±0.1 (1.50±0.0039)
Diameter of seat "D_3"	42.4 - 42.6 (1.669 - 1.677)
Cylinder head valve seat diameter	
Standard	44.515 - 45.035 (1.7526 - 1.7730)
0.5 (0.020) Oversize (Service)	45.015 - 45.535 (1.7722 - 1.7927)
Valve seat face angle "ϕ"	89 - 90°
Exhaust	
Outer diameter "D_1"	
Standard	39.535 - 39.545 (1.5565 - 1.5569)
0.5 (0.020) Oversize (Service)	40.035 - 40.045 (1.5762 - 1.5766)
Inner diameter "D_2"	32.9 - 33.1 (1.295 - 1.303)
Diameter of seat "D_3"	36.9 - 37.1 (1.453 - 1.461)
Cylinder head valve seat diameter	
Standard	39.495 - 39.510 (1.5549 - 1.555)
0.5 (0.020) Oversize	39.995 - 40.010 (1.5746 - 1.5758)
Valve seat face angle "ϕ"	89 - 90°

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Inspection and Adjustment (Cont'd)

VALVE

Unit: mm (in)



SEM188

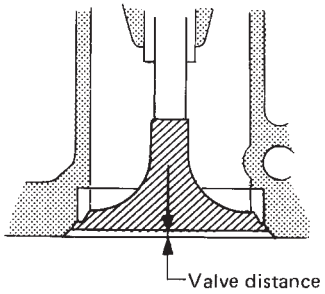
Valve head diameter "D"	
Intake	42.5 (1.67)
Exhaust	37 (1.5)
Valve length "L"	
Intake	117 (4.61)
Exhaust	
Valve stem diameter "d"	
Intake	7.965 - 7.980 (0.3136 - 0.3142)
Exhaust	7.945 - 7.960 (0.3128 - 0.3134)
Valve seat angle "α"	
Intake	45° - 45°30′
Exhaust	
Valve margin "T" limit	1.5 (0.059)
Valve stem end surface grinding limit	0.2 (0.008)
Valve clearance (Hot)	
Intake	0.25 (0.01)
Exhaust	

VALVE SPRING

Free length mm (in)	
Painted red	53.9 (2.12)
Pressure height mm/N (mm/kg, in/lb)	31.8/713.5 - 788.5 (31.8/72.7 - 80.4, 1.252/160.0 - 177.3)
Assembled height mm/N (mm/kg, in/lb)	
Standard	42.3/314.5 - 361.5 (42.3/32.1 - 36.9, 1.665/70.5 - 81.1)
Limit	42.3/296.2 (42.3/30.2, 1.665/66.6)
Out of square mm (in)	2.0 (0.079)

CYLINDER HEAD TO VALVE DISTANCE

Unit: mm (in)



SEM724C

	Standard	Limit
Intake	0.8 - 1.2 (0.031 - 0.047)	Less than 1.75 (0.0689)
Exhaust	0.8 - 1.2 (0.031 - 0.047)	Less than 1.75 (0.0689)

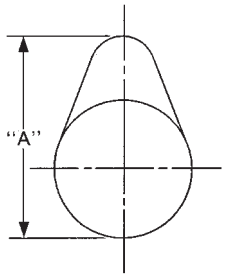
http://vnx.su/

Inspection and Adjustment (Cont'd)

CAMSHAFT AND CAMSHAFT BEARING

Unit: mm (in)

	Standard	Limit
Camshaft journal to bushing clearance	0.020 - 0.109 (0.0008 - 0.0043)	Less than 0.15 (0.0059)
Camshaft journal diameter		
Front	50.721 - 50.740 (1.9969 - 1.9976)	—
2nd	50.521 - 50.540 (1.9890 - 1.9898)	—
3rd	50.321 - 50.340 (1.9811 - 1.9819)	—
4th	50.121 - 50.140 (1.9733 - 1.9740)	—
Rear	49.921 - 49.940 (1.9654 - 1.9661)	—
Camshaft bend (Total indicator reading)	Less than 0.02 (0.0008)	Less than 0.06 (0.0024)
Camshaft end play	0.08 - 0.28 (0.0031 - 0.0110)	Less than 0.50 (0.0197)



EM671

	Standard	Limit
Cam height "A"	41.570 (1.6366)	Less than 41.20 (1.6220)
Intake		
Exhaust	41.900 (1.6496)	Less than 41.40 (1.6299)

VALVE LIFTER AND PUSH ROD

Unit: mm (in)

	Standard	Limit
Valve lifter outer diameter	24.960 - 24.970 (0.9827 - 0.9831)	—
Cylinder block valve lifter hole diameter	25.000 - 25.033 (0.9843 - 0.9855)	—
Valve lifter to lifter hole clearance	0.030 - 0.073 (0.0012 - 0.0029)	Less than 0.20 (0.0079)
Push rod bend (TIR)	Less than 0.3 (0.012°)	Less than 0.5 (0.020)

*: Total indicator reading

ROCKER SHAFT AND ROCKER ARM

	Standard	Limit
Rocker shaft		
Outer diameter	19.979 - 20.00 (0.7866 - 0.7874)	—
Rocker shaft bend (TIR)*	0 - 0.10 (0 - 0.0039)	less than 0.30 (0.0188)
Rocker arm		
Inner diameter	20.014 - 20.035 (0.7880 - 0.7888)	—
Clearance between rocker arm and rocker shaft	0.014 - 0.056 (0.0006 - 0.0022)	less than 0.15 (0.0059)

*: Total indicator reading

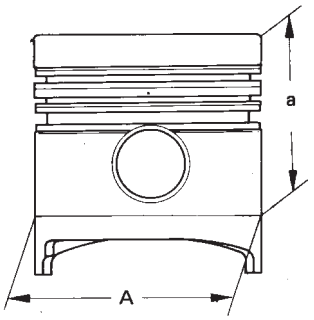
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Inspection and Adjustment (Cont'd)

PISTON, PISTON RING AND PISTON PIN

Available piston

Unit: mm (in)



SEM778A

Piston skirt diameter "A"	
Standard	
Grade No. 1	95.905 - 95.915 (3.7758 - 3.7762)
Grade No. 2	95.915 - 95.925 (3.7762 - 3.7766)
Grade No. 3*	95.925 - 95.935 (3.7766 - 3.7770)
"a" dimension	42.0 (1.654)
Piston pin hole diameter	30.002 - 30.007 (1.1812 - 1.1814)
Piston to cylinder liner clearance	0.043 - 0.077 (0.0017 - 0.0030)
"A" dimension	69.2 (2.724)

Grade No. 3 piston is not provided as a service part.

Piston pin

Unit: mm (in)

Piston pin outer diameter	29.995 - 30.000 (1.1809 - 1.1811)
Piston pin to piston clearance	0.002 to 0.012 (0.0001 to 0.0005)
Piston pin to connecting rod clearance	
Standard	0.025 - 0.043 (0.0010 - 0.0017)
Limit	0.15 (0.0059)

Piston ring

Unit: mm (in)

	Standard	Limit
Side clearance		
Top	0.00 - 0.05 (0.0 - 0.0020)	0.50 (0.0197)
2nd	0.04 - 0.072 (0.0016 - 0.0028)	0.30 (0.0118)
Oil	0.02 - 0.055 (0.0008 - 0.0022)	0.15 (0.0059)
Ring gap		
Top	0.25 - 0.40 (0.0098 - 0.0157)	1.5 (0.059)
2nd	0.40 - 0.55 (0.0157 - 0.0217)	
Oil (rail ring)	0.25 - 0.55 (0.0098 - 0.0217)	

CONNECTING ROD

Unit: mm (in)

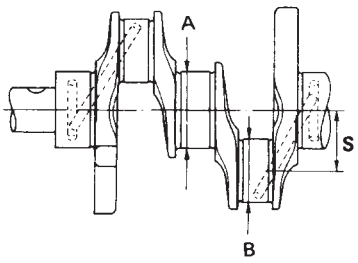
Center distance	156.975 - 157.025 (6.1801 - 6.1821)
Bend, torsion [per 200 (7.87)]	
Limit	0.15 (0.0059)
Piston pin bore dia.	30.025 - 30.038 (1.1821 - 1.1826)
Side clearance	
Standard	0.10 - 0.32 (0.0039 - 0.0126)
Limit	0.32 (0.0126)

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Inspection and Adjustment (Cont'd)

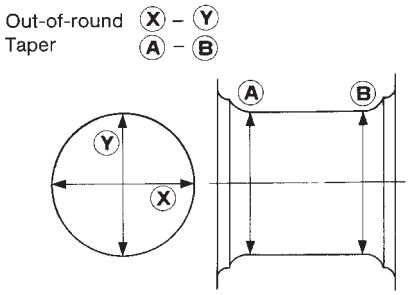
CRANKSHAFT

Unit: mm (in)



SEM100A

Journal diameter "A"	70.907 - 70.920 (2.7916 - 2.7921)
Pin diameter "B"	56.913 - 56.926 (2.2407 - 2.2412)
Center distance "S"	46.0 (1.811)



EM715

Taper of journal and pin "A-B"	
Standard	Less than 0.01 (0.0004)
Limit	0.02 (0.0008)
Out-of-round of journal and pin "X-Y"	
Standard	Less than 0.01 (0.0004)
Limit	0.02 (0.0008)
Crankshaft bend	
Standard	0 - 0.03 (0 - 0.0012)
Limit	0.10 (0.0039)
Crankshaft end play	
Standard	0.060 - 0.25 (0.0024 - 0.0098)
Limit	0.40 (0.0157)

AVAILABLE MAIN BEARING

Bearing clearance

Unit: mm (in)

Main bearing clearance	
Standard	0.035 - 0.083 (0.0014 - 0.0033)
Limit	Less than 0.15 (0.0059)
Connecting rod bearing clearance	
Standard	0.035 - 0.077 (0.0014 - 0.0030)
Limit	Lees than 0.15 (0.0059)

Mean bearing undersize

Unit: mm (in)

	Crank journal diameter
Standard	70.907 - 70.920 (2.7916 - 2.7921)
Undersize	
0.25 (0.0098)	70.657 - 70.670 (2.7818 - 2.7823)
0.50 (0.0197)	70.407 - 70.420 (2.7719 - 2.7724)
0.75 (0.0295)	70.157 - 70.170 (2.7621 - 2.7626)
1.00 (0.0394)	69.907 - 69.920 (2.7522 - 2.7528)

AVAILABLE CONNECTING ROD BEARING

Connecting rod bearing undersize

Unit: mm (in)

	Crank pin journal diameter
Standard	56.913 - 56.926 (2.2407 - 2.2412)
Undersize	
0.25 (0.0098)	56.663 - 56.676 (2.2308 - 2.2313)
0.50 (0.0197)	56.413 - 56.426 (2.2210 - 2.2215)
0.75 (0.0295)	56.163 - 56.176 (2.2111 - 2.2116)
1.00 (0.0394)	55.913 - 55.926 (2.2013 - 2.2018)

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Inspection and Adjustment (Cont'd)

AVAILABLE THRUST WASHER

Unit: mm (in)

	Thrust washer thickness
Standard	2.275 - 2.325 (0.0896 - 0.0915)
Oversize	
0.20 (0.0079)	2.475 - 2.525 (0.0974 - 0.0994)
0.40 (0.0157)	2.675 - 2.725 (0.1053 - 0.1073)

MISCELLANEOUS COMPONENTS

Unit: mm (in)

Gear train	
Backlash of each gear	
Standard	0.07 - 0.11 (0.0028 - 0.0043)
Limit	0.20 (0.0079)
Flywheel	
Runout (Total indicator reading)	Less than 0.15 (0.0059)
Front plate	
Warpage limit	0.2 (0.008)
Cylinder head	
Head surface distorsion	
Standard	Less than 0.07 (0.0028)
Limit	0.2 (0.008)
Minimum height	89.7 (3.532)

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ENGINE LUBRICATION & COOLING SYSTEMS

SECTION LC

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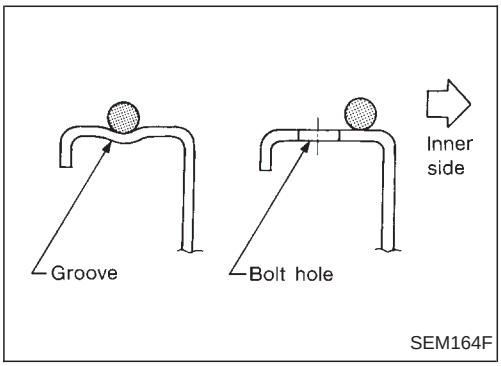
ZD

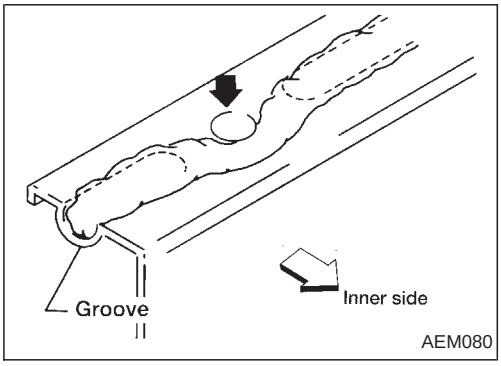
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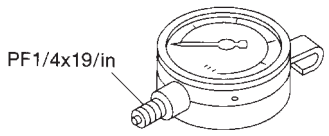
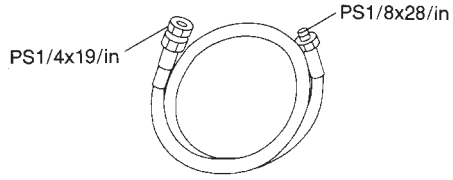
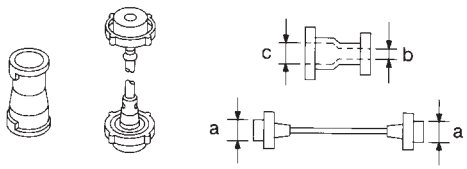


Liquid Gasket Application Procedure

a. Use a scraper to remove all traces of old liquid gasket from mating surfaces and grooves. Also, completely clean any oil from these areas.
b. Apply a continuous bead of liquid gasket to mating surfaces. (Use Genuine Liquid Gasket or equivalent.)
   - For oil pan, be sure liquid gasket diameter is 3.5 to 4.5 mm (0.138 to 0.177 in).
   - For areas except oil pan, be sure liquid gasket diameter is 2.0 to 3.0 mm (0.079 to 0.118 in).
c. Apply liquid gasket around the inner side of bolt holes (unless otherwise specified).
d. Assembly should be done within 5 minutes after coating.
e. Wait at least 30 minutes before refilling engine oil and engine coolant.

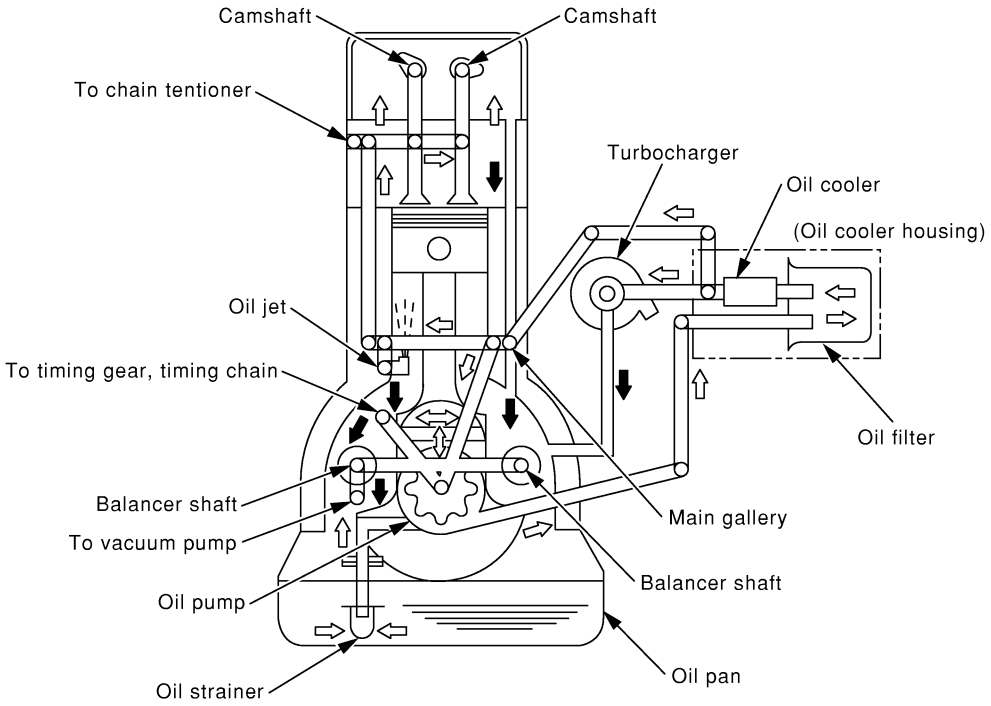
Special Service Tools

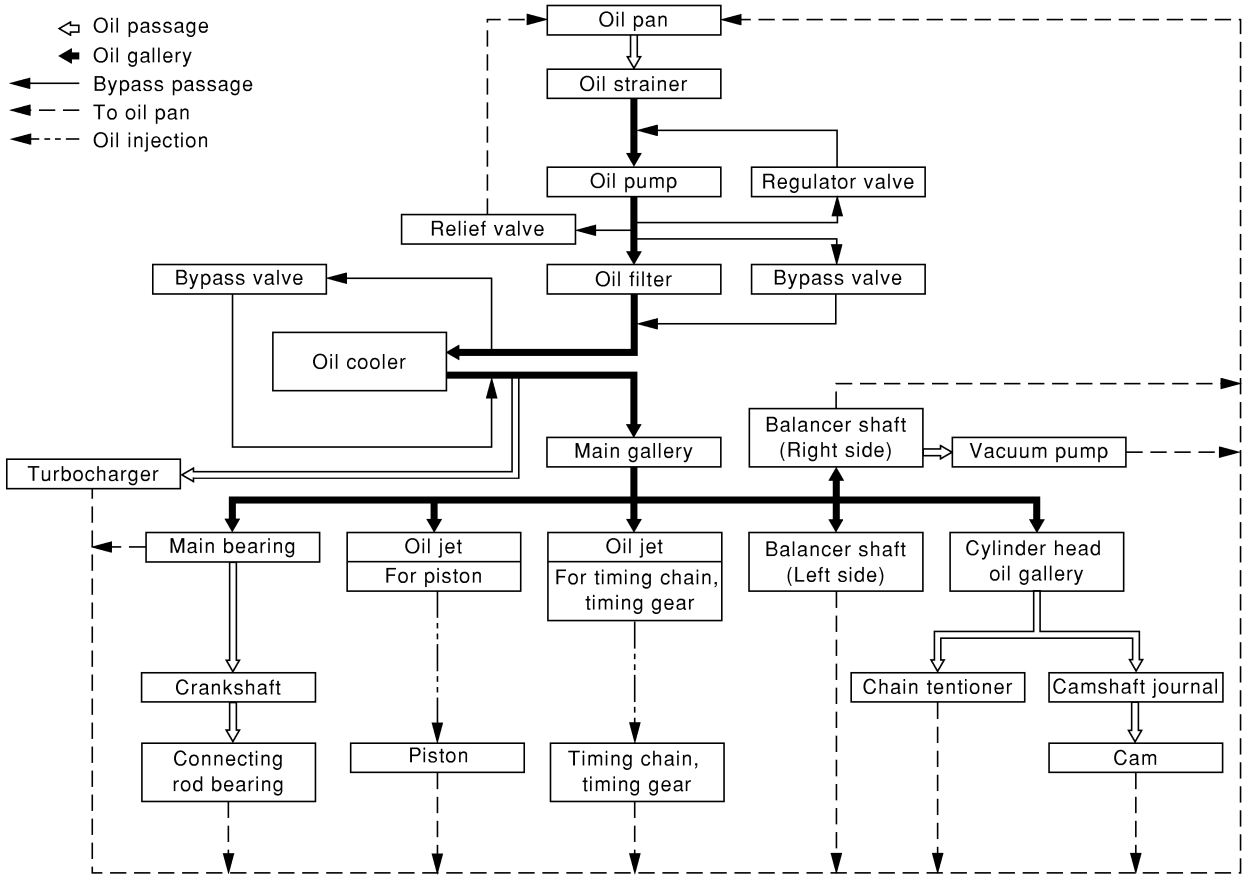
*: Special tool or commercial equivalent

Tool number Tool name	Description	
ST25051001* Oil pressure gauge	 NT558	Measuring oil pressure **Maximum measuring range: 2,452 kPa (24.5 bar, 25 kg/cm^2, 356 psi)**
ST25052000* Hose	 NT559	Adapting oil pressure gauge to cylinder block
EG17650301 Radiator cap tester adapter	 NT564	Adapting radiator cap tester to radiator filler neck and reservoir tank cap **a: 28 (1.10) dia.** **b: 31.4 (1.236) dia.** **c: 41.3 (1.626) dia.** Unit: mm (in)

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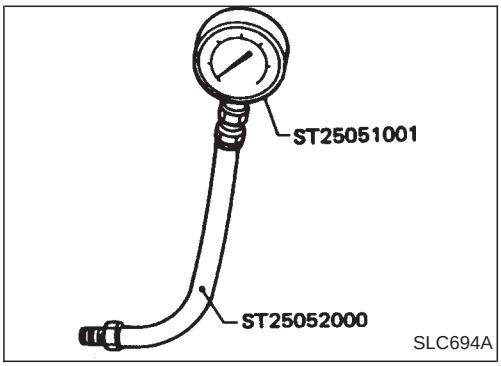
Lubricating Circuit

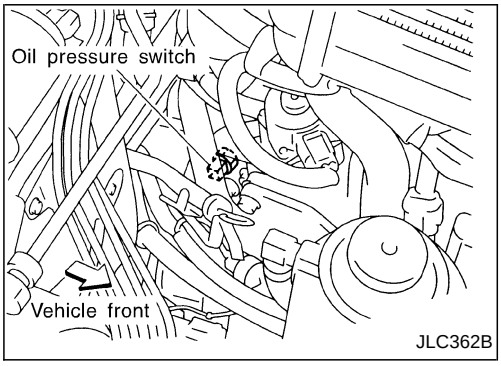




SLC361B

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Oil Pressure Check

WARNING:

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

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

Engine speed rpm	Approximate discharge pressure kPa (bar, kg/cm^2, psi)
Idle speed	More than 147 (1.47, 1.5, 21)
2,000	More than 539 (5.39, 5.5, 78)
4,000	More than 736 (7.36, 7.5, 107)

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

6. Install oil pressure switch with sealant.
   Oil pressure switch:
   : 13 - 17 N·m (1.25 - 1.75 kg-m, 9 - 12 ft-lb)

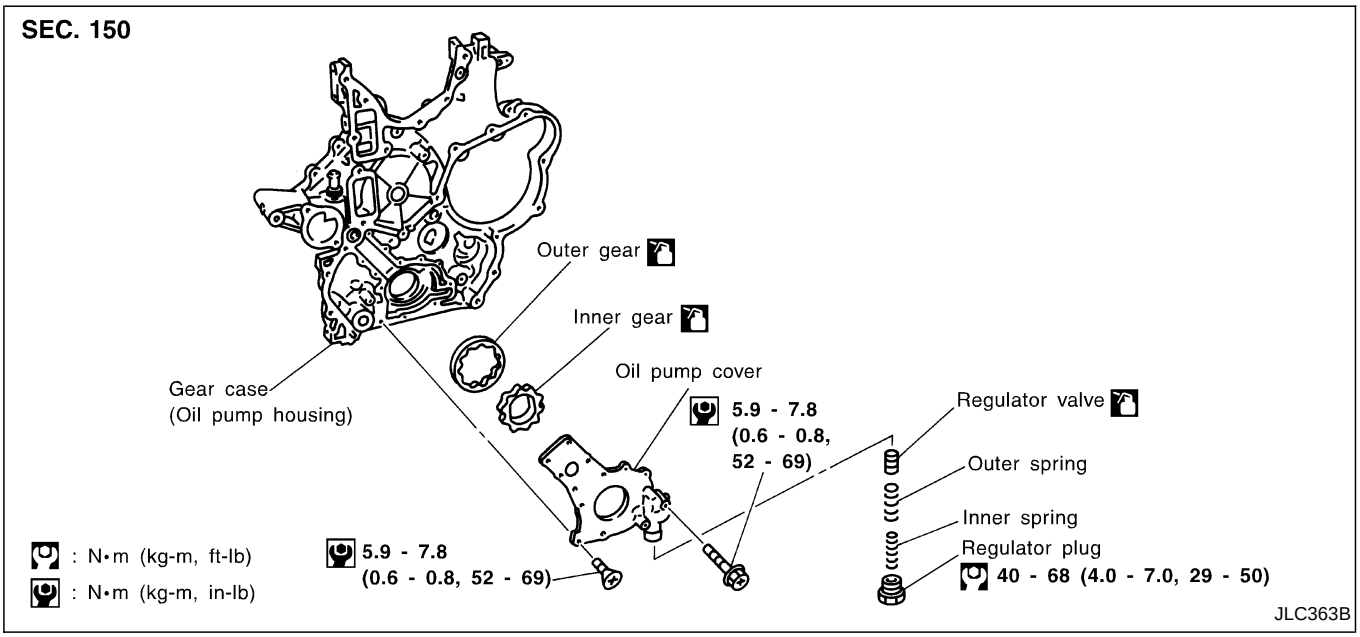
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Oil Pump

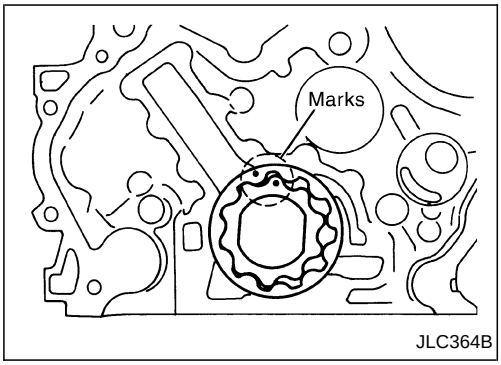
REMOVAL AND INSTALLATION

Refer to “TIMING GEAR” in EM section.

DISASSEMBLY AND ASSEMBLY



- **When installing oil pump, apply new engine oil to gears.**



- **When installing the inner and outer gear, face mating mark toward the oil pump cover as shown (left).**

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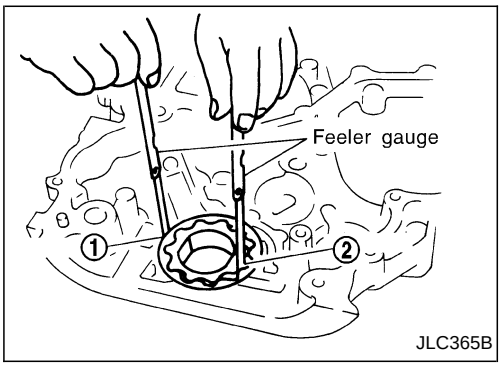
Oil Pump (Cont'd)

OIL PUMP INSPECTION

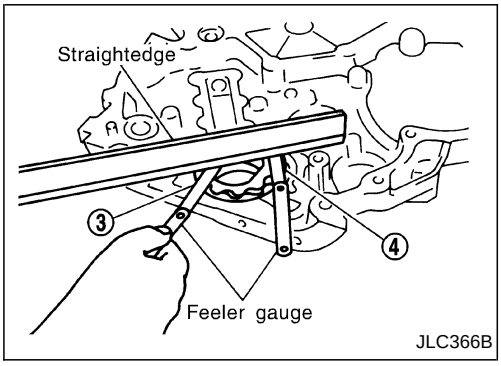
Using a feeler gauge, straightedge and micrometers, check the following clearances:

Unit: mm (in)

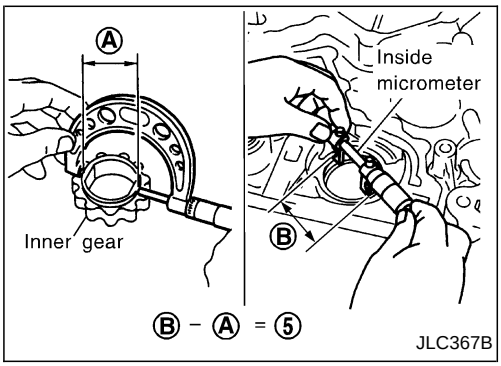
Body to outer gear radial clearance ①	0.114 - 0.200 (0.0045 - 0.0079)
Inner gear to outer gear tip clearance ②	Less than 0.180 (0.0071)
Body to inner gear axial clearance ③	0.05 - 0.09 (0.0020 - 0.0035)
Body to outer gear axial clearance ④	0.050 - 0.105 (0.0020 - 0.0041)
Inner gear to brazed portion of housing clearance ⑤	0.045 - 0.091 (0.0018 - 0.0036)
Regulator valve to oil pump cover clearance ⑥	0.040 - 0.097 (0.0016 - 0.0038)



JLC365B



JLC366B



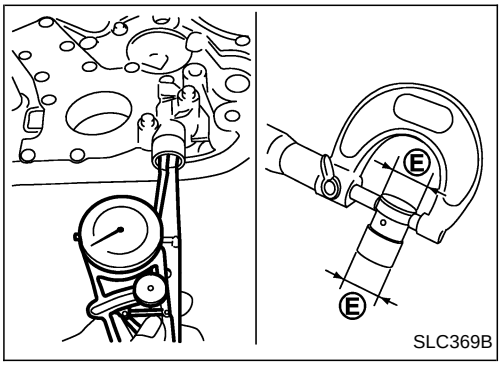
JLC367B

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

REGULATOR VALVE INSPECTION

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

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



SLC369B

4. Check regulator valve to oil pump cover clearance.

Clearance:

⑥ : 0.040 - 0.097 mm (0.0016 - 0.0038 in)

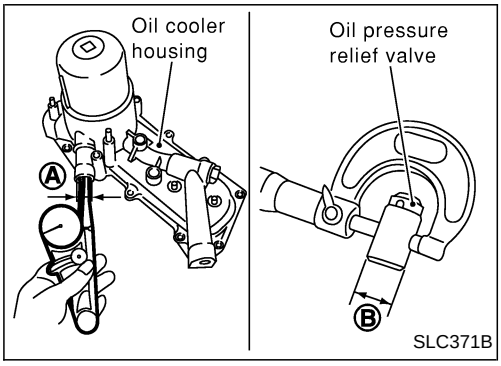
If it exceeds the limit, replace oil pump cover.

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Oil Pump (Cont'd)

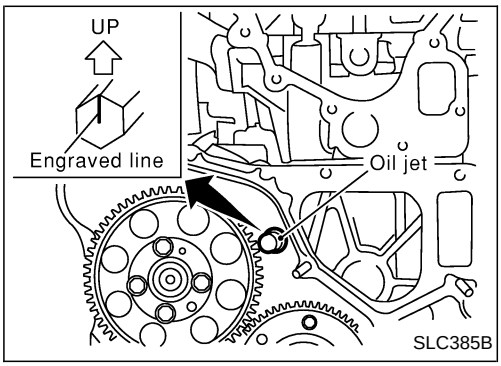
OIL PRESSURE RELIEF VALVE AND BYPASS VALVE INSPECTION (For oil cooler)

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



2. Check oil pressure relief valve to oil cooler housing clearance.
   Clearance:
   Ⓒ: 0.032 - 0.068 mm (0.0013 - 0.0027 in)

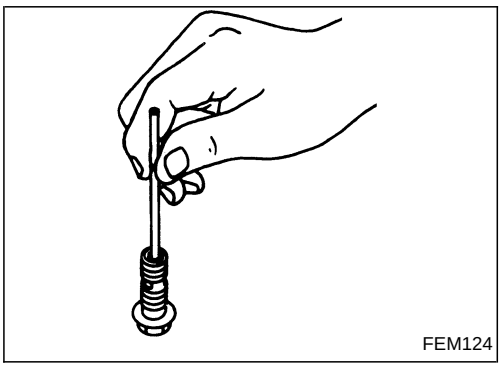
If it exceeds the limit, replace oil cooler housing.



Oil Jet

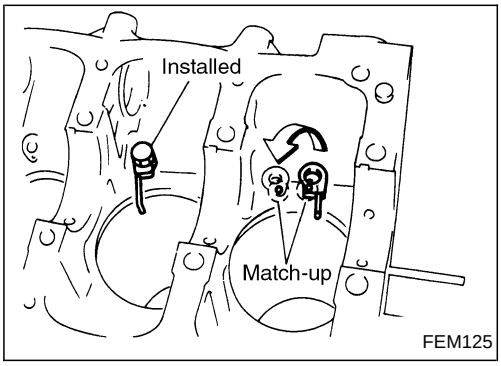
INSPECTION (For timing chain)

Make sure that the holes are not clogged. Clean them with a wire if necessary.
Drive oil jet into place after positioning alignment mark on.



INSPECTION (For piston)

1. Push cut-off valve of oil jet bolt with a clean resin or brass rod and make sure that cut-off valve moves smoothly with proper repulsion.
2. Make sure that the oil jet passage is not clogged. Clean with a wire if necessary.



When installing oil jet, align oil jet's boss with hole on cylinder block.

Oil jet:
: 30 - 39 N·m (3.0 - 4.0 kg-m, 22 - 28 ft-lb)

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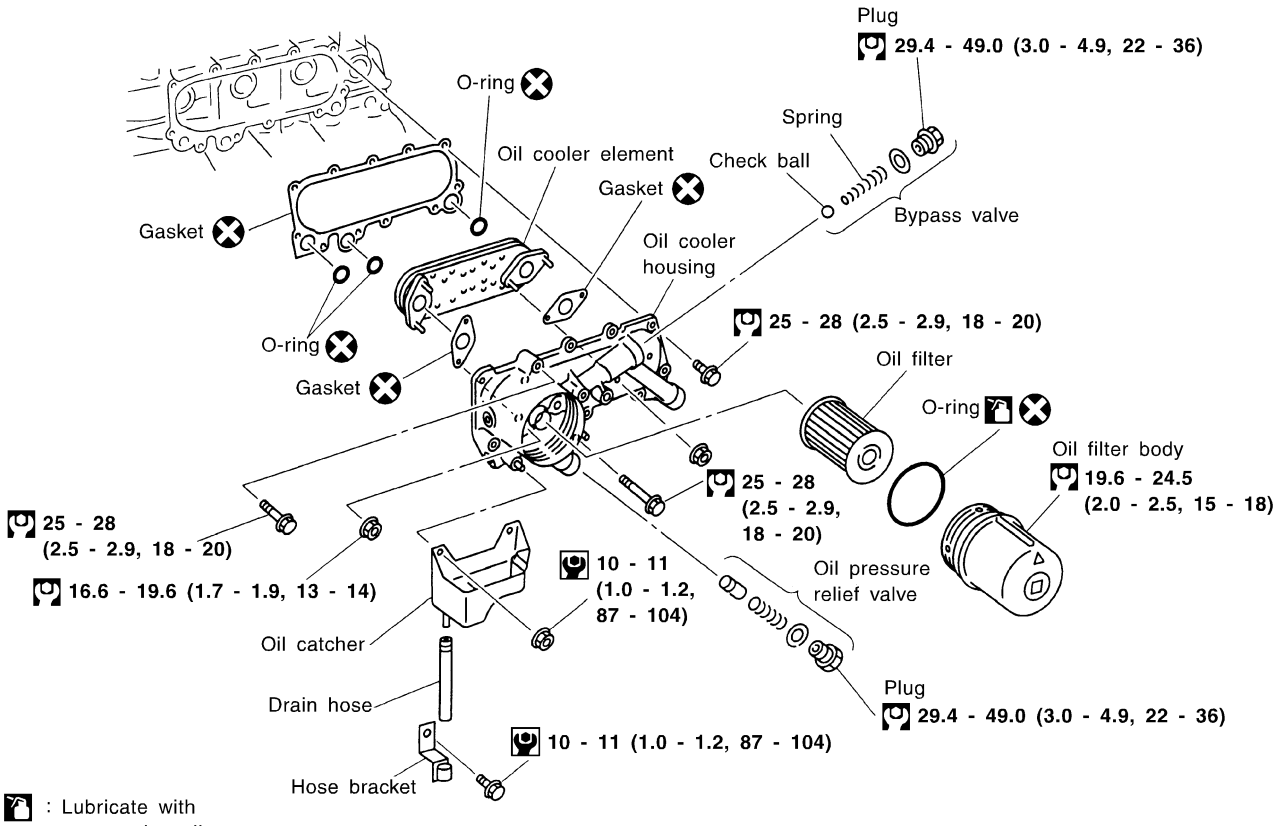
Oil Jet (Cont'd)

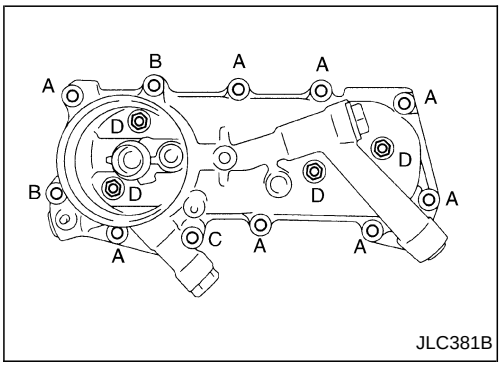
OIL FILTER

The oil filter is an element type. Refer to "Changing Oil Filter" in MA section.

Oil Cooler

SEC. 213





REMOVAL AND INSTALLATION

1. Drain engine oil and coolant.
   Remove catalyst and turbocharger. Refer to "CATALYST AND TURBOCHARGER" in EM section.
2. Remove bolts A to C then remove oil cooler assembly.

- **Do not remove "D" nuts when removing oil cooler assembly.**

  Bolt length:
  A: 20 mm (0.79 in)
  B: 45 mm (1.77 in)
  C: 65 mm (2.56 in)

3. Installation is in reverse order of removal.

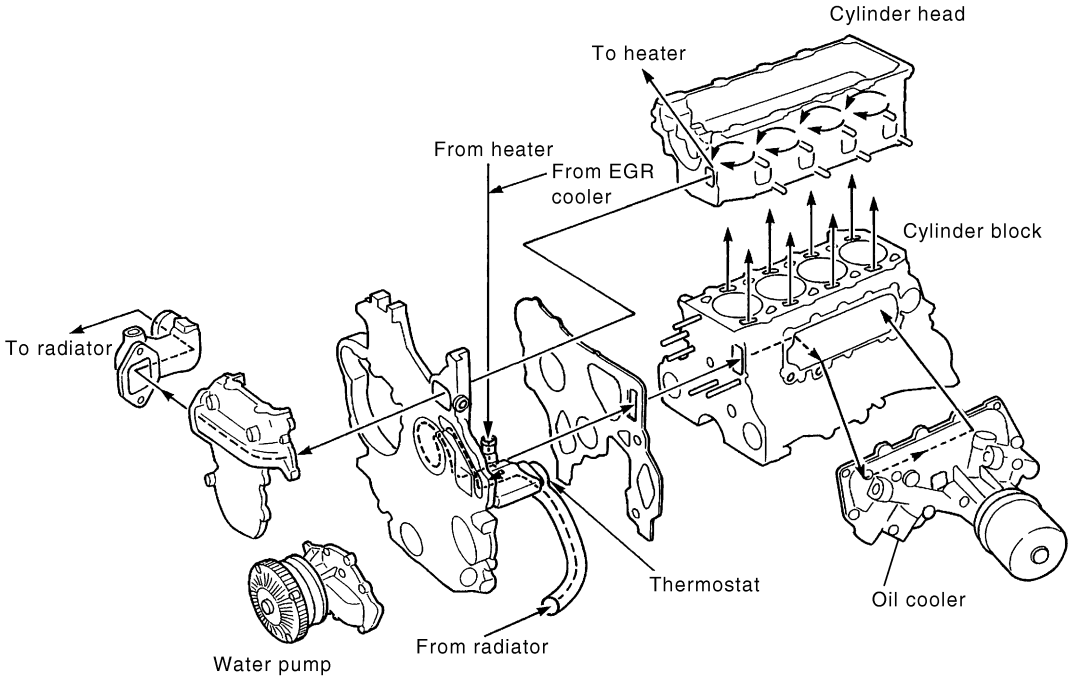
- **Do not spill coolant on the drive belt.**

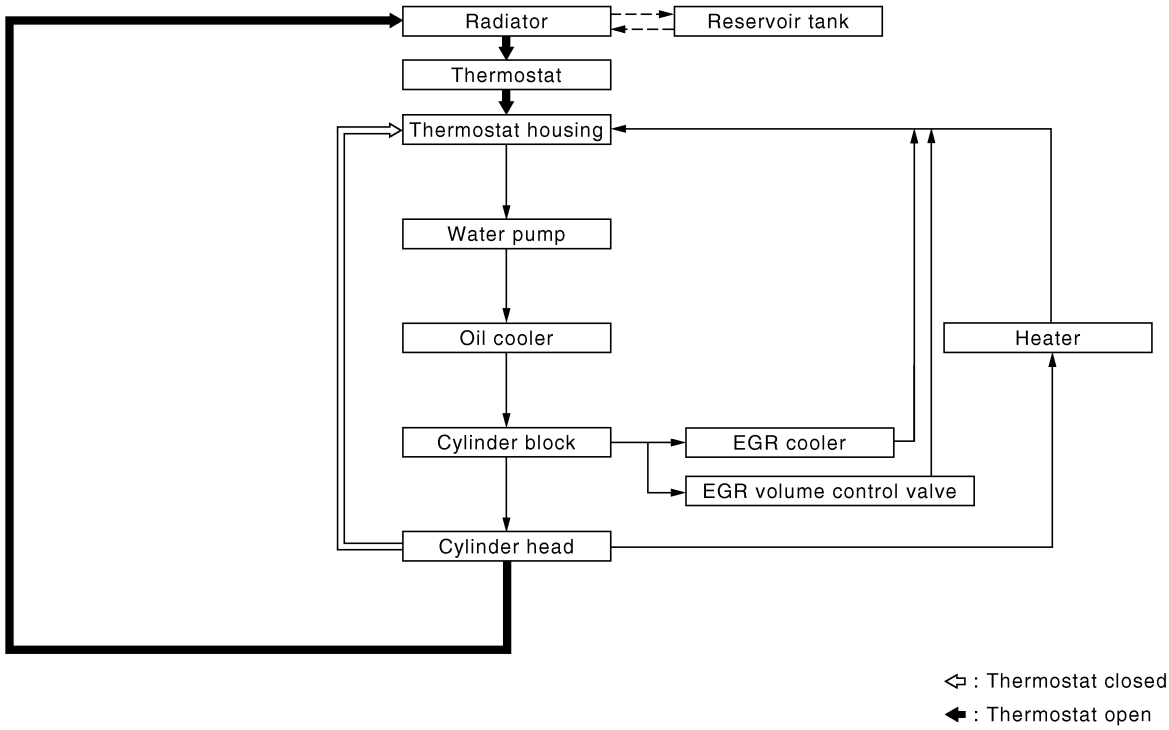
INSPECTION

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

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Cooling Circuit





YLC064

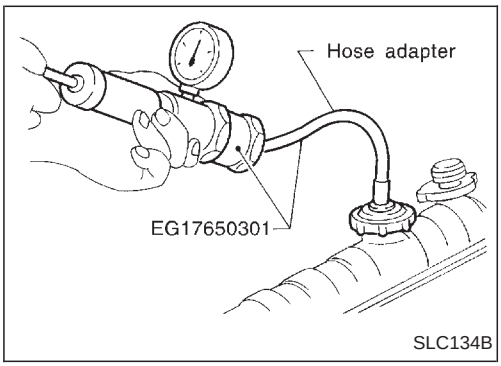
http://vnx.su/

System Check

WARNING:
Never remove the radiator cap when the engine is hot. Serious burns could occur from high pressure coolant escaping from the radiator.
Wrap a thick cloth around the cap. Slowly turn it a quarter turn to allow built-up pressure to escape. Carefully remove the cap by turning it all the way.

CHECKING COOLING SYSTEM HOSES

Check hoses for the following:
- Improper attachment
- Leaks
- Cracks
- Damage
- Chafing
- Deterioration

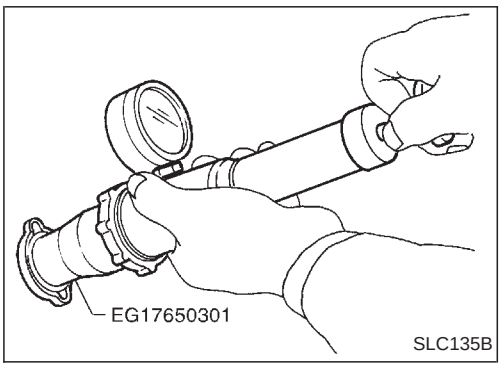


CHECKING COOLING SYSTEM FOR LEAKS

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

Testing pressure:
157 kPa (1.57 bar, 1.6 kg/cm^2, 23 psi)

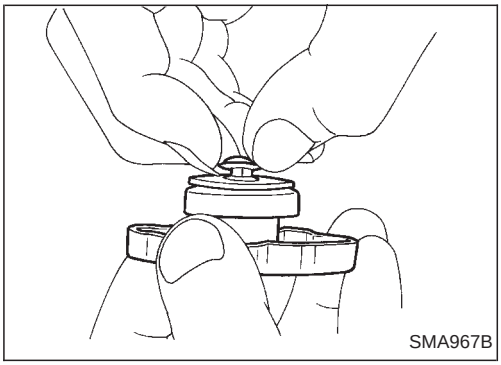
CAUTION:
Higher pressure than specified may cause radiator damage.



CHECKING RADIATOR CAP

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

Radiator cap relief pressure:
Standard
78 - 98 kPa
(0.78 - 0.98 bar, 0.8 - 1.0 kg/cm^2, 11 - 14 psi)



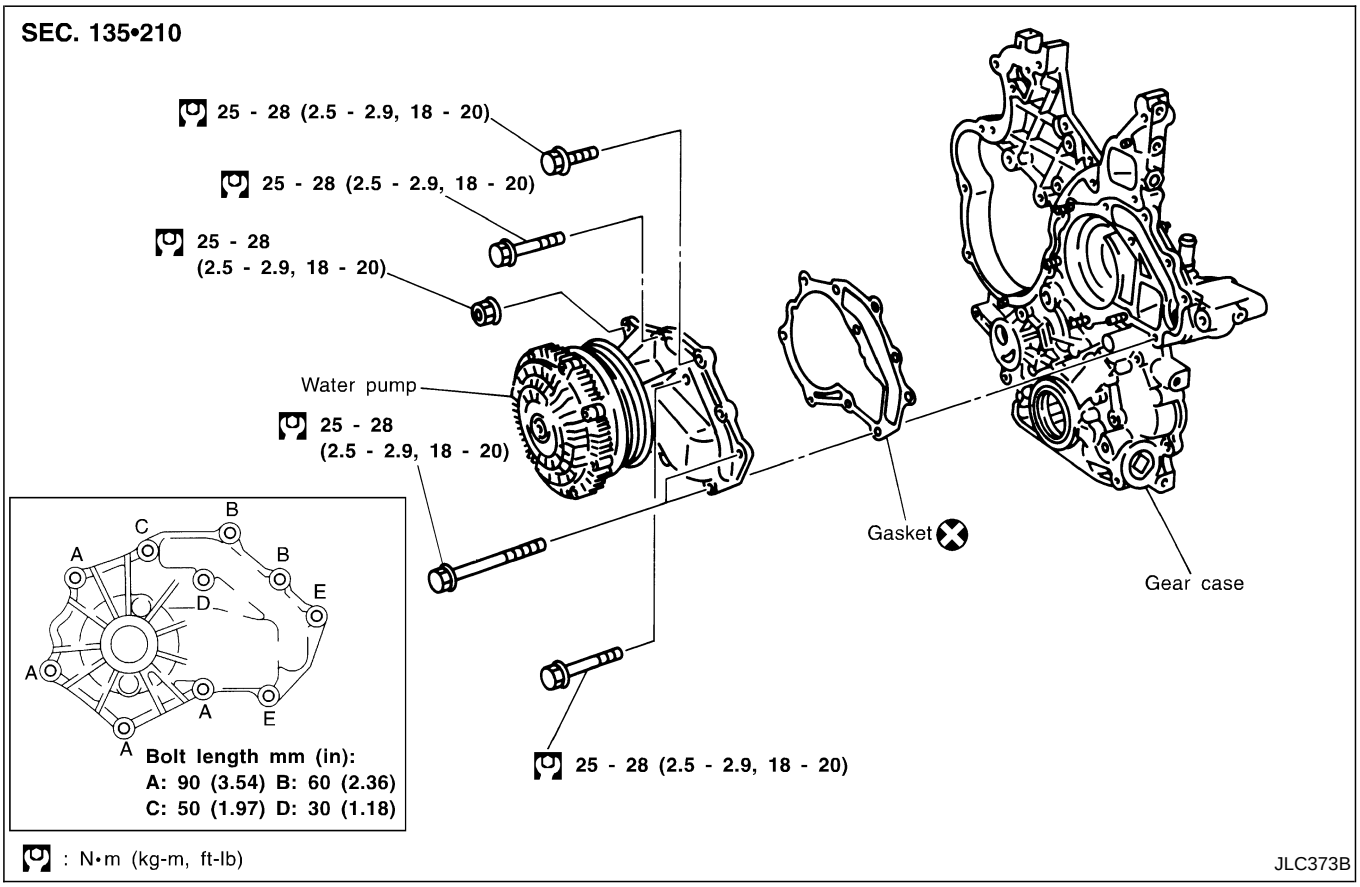
Pull the negative pressure valve to open it.
Check that it closes completely when released.

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Water Pump

CAUTION:

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

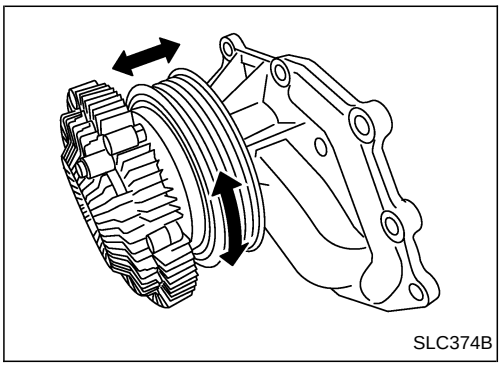


REMOVAL AND INSTALLATION

1. Drain coolant from radiator and cylinder block. Refer to MA section (“Changing Engine Coolant”, “ENGINE MAINTENANCE”).
2. Remove radiator upper hose.
3. Remove radiator shroud.
4. Remove cooling fan.
5. Remove drive belt. Refer to MA section, “Checking Drive Belt”.
6. Remove insulator.
7. Remove vacuum pipe.
8. Remove TDC sensor. Refer to EM section, “TDC sensor removal and installation” in “TIMING GEAR”.
9. Remove fan coupling with water pump.
10. Install in the reverse order of removal.

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Water Pump (Cont'd)


SLC374B

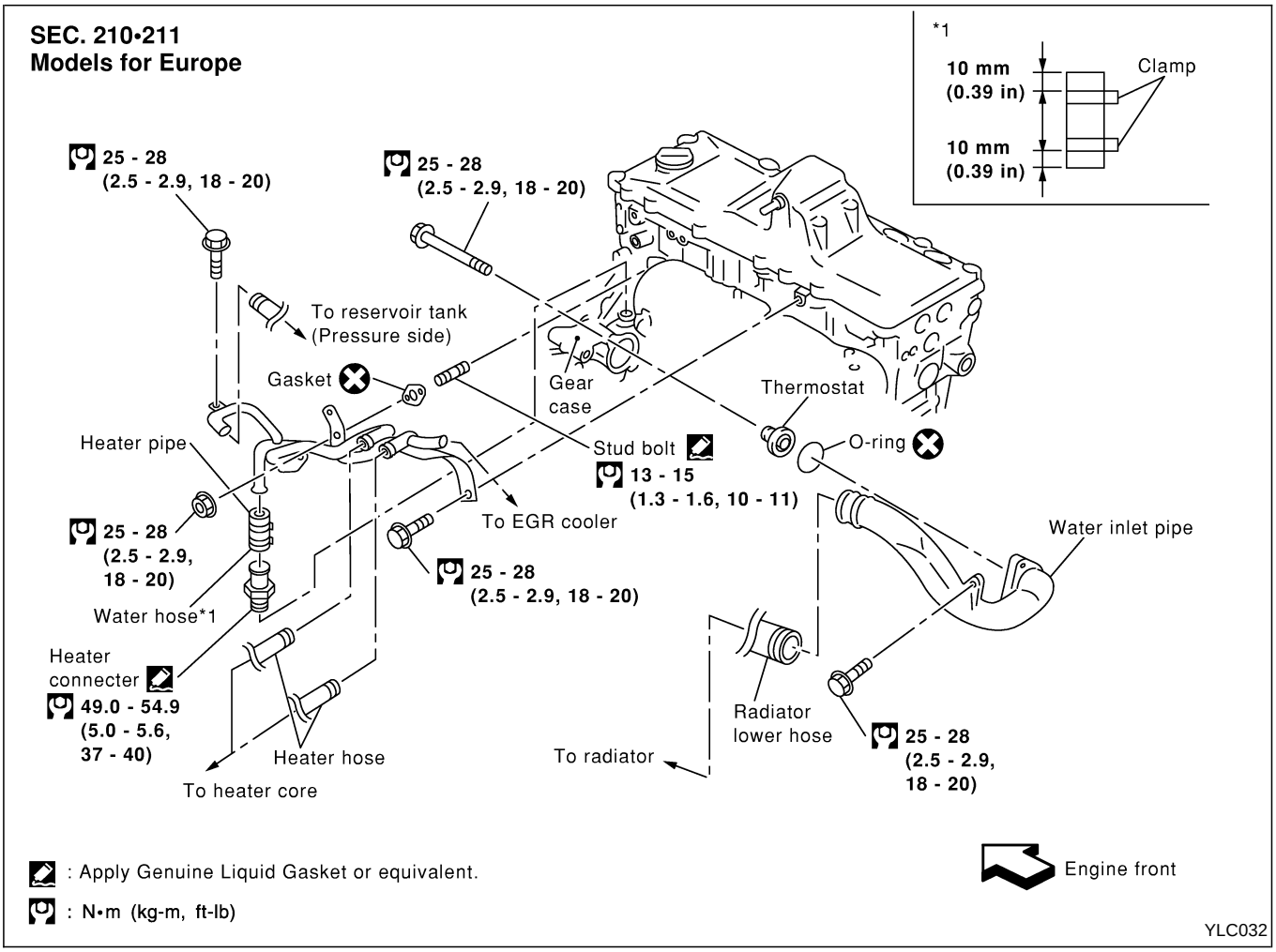
INSPECTION

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

CAUTION:

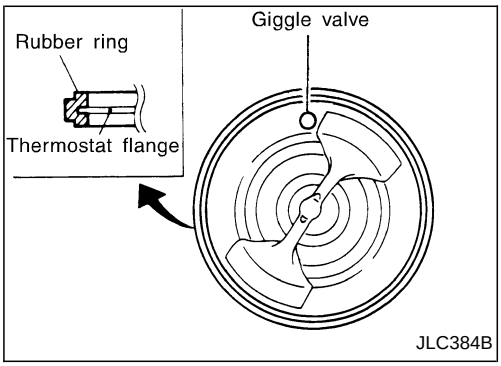
Do not disassemble water pump coupling assembly.

Thermostat



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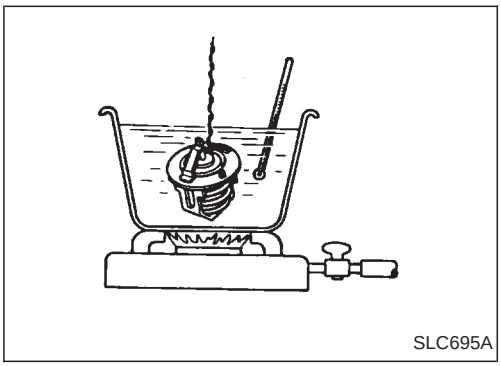
Thermostat (Cont'd)



REMOVAL AND INSTALLATION

1. Drain engine coolant. Refer to MA section, "Changing Engine Coolant".
2. Remove left side battery. (If so equipped)
3. Remove radiator upper hose.
4. Remove radiator shroud.
5. Remove intake air duct, inlet pipe.
6. Remove harness and connectors.
7. Install in reverse order of removal.

- **After installation, run engine for a few minutes and check for leaks.**
- **Be careful not to spill coolant in engine compartment. Use a rag to absorb coolant.**

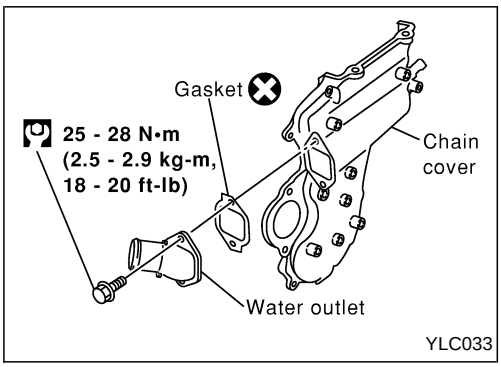


INSPECTION

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

Valve opening temperature	°C (°F)	82 (180)
Maximum valve lift	mm/°C (in/°F)	10/95 (0.39/203)

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



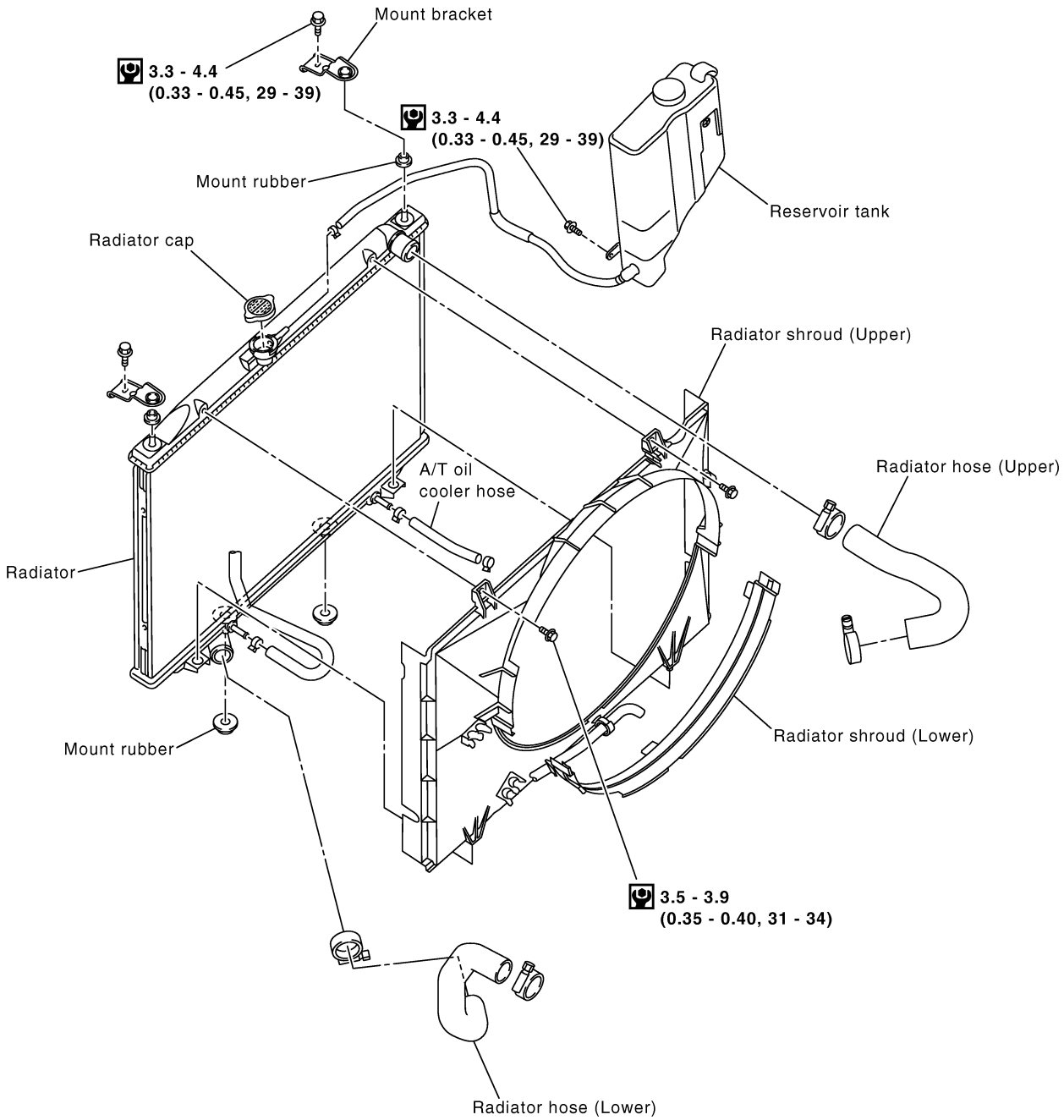
Water Outlet

INSPECTION

Visual inspection for water leaks. If there is leakage, replace gasket.

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Radiator



: N•m (kg-m, in-lb)

YLC065

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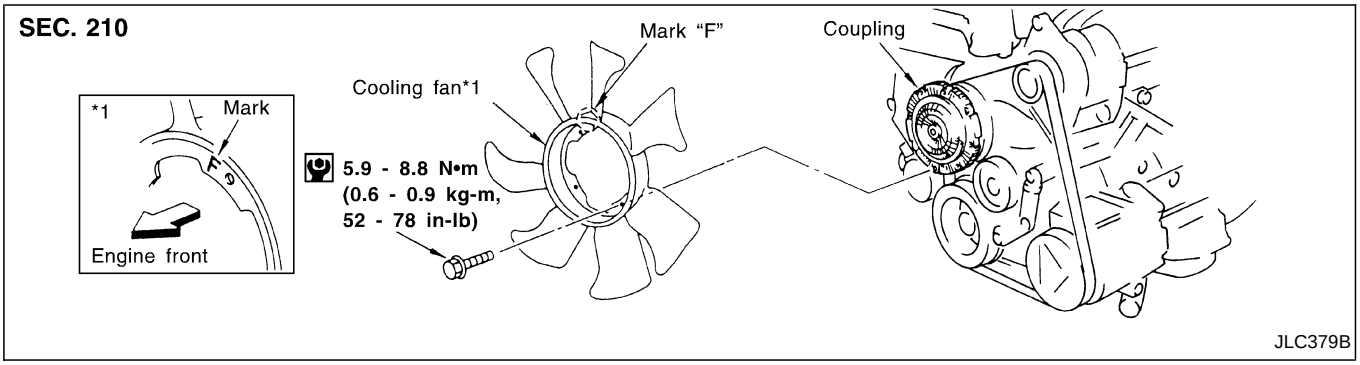
Radiator (Cont'd)

REMOVAL AND INSTALLATION

1. Remove under cover.
2. Drain engine coolant. Refer to MA section, "Changing Engine Coolant".
3. Remove air cleaner case, air duct and resonator.
4. Remove battery (right side).
5. Remove radiator shroud (lower).
6. Remove radiator shroud (front).
7. Disconnect radiator hose (upper and lower).
8. Disconnect reservoir tank hose.
9. Disconnect A/T oil cooler hose (Only A/T models).
10. Remove radiator.
11. After repairing or replacing radiator, install all removed parts in reverse order of removal.

Cooling Fan (Crankshaft driven)

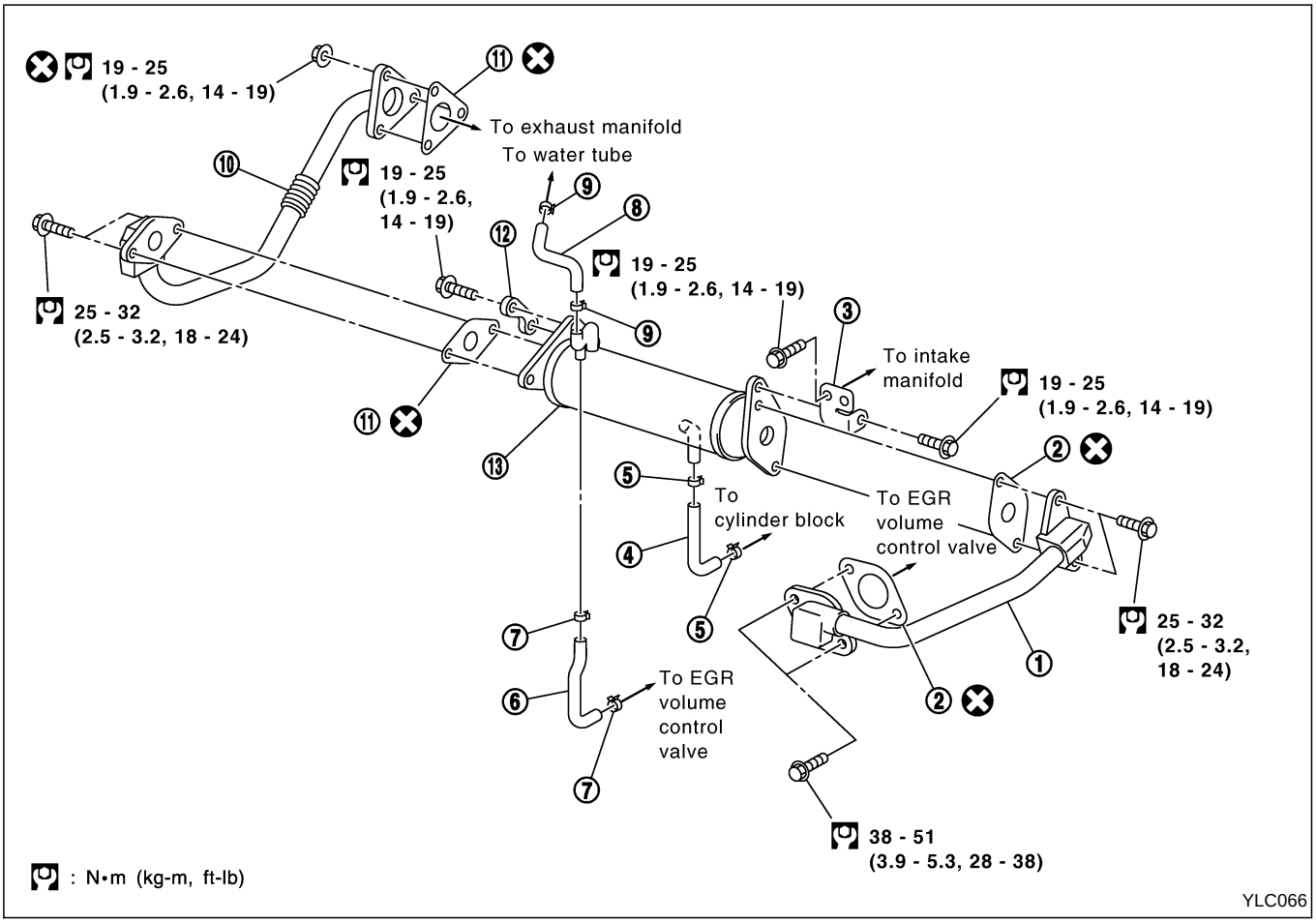
DISASSEMBLY AND INSTALLATION



- Do not release the drive belt tension by removing the fan/water pump pulley.
- Fan coupling cannot be disassembled and should be replaced as a unit. If front mark Ⓕ is present, install fan so that side marked Ⓕ faces the front.
- Proper alignment of these components is essential. Improper alignment will cause them to wobble and may eventually cause the fan to separate from the water pump causing extensive damage.

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EGR Cooler



① EGR tube assembly
② Gasket
③ EGR cooler bracket
④ Water hose
⑤ Clamp
⑥ Water hose
⑦ Clamp
⑧ Water hose
⑨ Clamp
⑩ EGR tube
⑪ Gasket
⑫ EGR cooler bracket
⑬ EGR cooler

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Engine Lubrication System

Oil pressure check

Engine speed rpm	Approximate discharge pressure kPa (bar, kg/cm^2, psi)
Idle speed	130 - 140 (1.3 - 1.4, 1.33 - 1.43, 18.9 - 20.3)
2,000	290 - 300 (2.9 - 3.0, 2.96 - 3.06, 42.1 - 43.5)
4,000	450 (4.5, 4.59, 65.3)

Oil pump

Unit: mm (in)

Body to outer gear radial clearance ①	0.114 - 0.200 (0.0045 - 0.0079)
Inner gear to outer gear tip clearance ②	Less than 0.180 (0.0071)
Body to inner gear axial clearance ③	0.05 - 0.09 (0.0020 - 0.0035)
Body to outer gear axial clearance ④	0.050 - 0.105 (0.0020 - 0.0041)
Inner gear to brazed portion of housing clearance ⑤	0.045 - 0.091 (0.0018 - 0.0036)
Regulator valve to oil pump cover clearance ⑥	0.040 - 0.097 (0.0016 - 0.0038)

Engine Cooling System

Radiator

Unit: kPa (bar, kg/cm^2, psi)

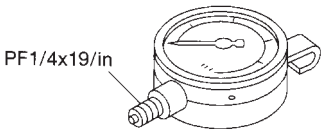
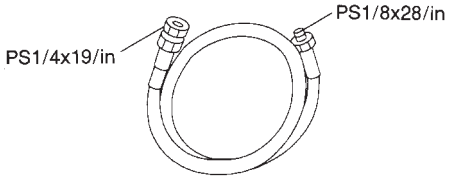
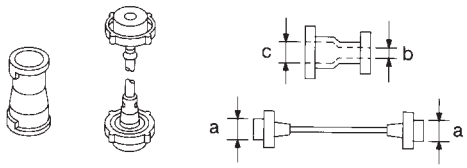
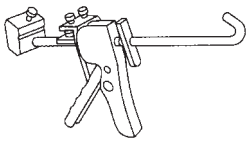
Cap relief pressure	108 - 128 (1.08 - 1.28, 1.1 - 1.3, 16 - 18)
Leakage test pressure	157 (1.57, 1.6, 23)

Thermostat

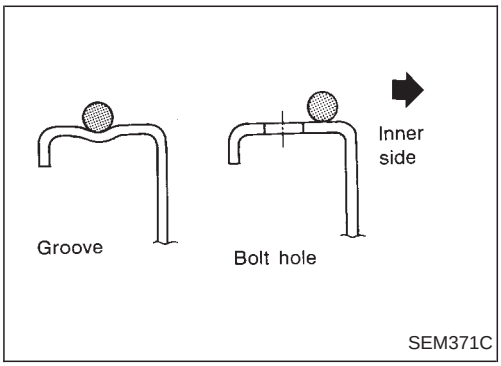
Valve opening temperature	°C (°F)	82 (180)
Valve lift	mm/°C (in/°F)	More than 10/95 (0.39/203)

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SPECIAL SERVICE TOOLS

Tool number Tool name	Description	
ST25051001 Oil pressure gauge	 NT558	Measuring oil pressure **Maximum measuring range:** **2,452 kPa (24.5 bar, 25 kg/cm^2, 356 psi)**
ST25052000 Hose	 NT559	Adapting oil pressure gauge to cylinder block
EG17650301 Radiator cap tester adapter	 NT564	Adapting radiator cap tester to radiator filler neck **a: 28 (1.10) dia.** **b: 31.4 (1.236) dia.** **c: 41.3 (1.626) dia.** Unit: mm (in)
WS39930000 Tube presser	 NT052	Pressing the tube of liquid gasket

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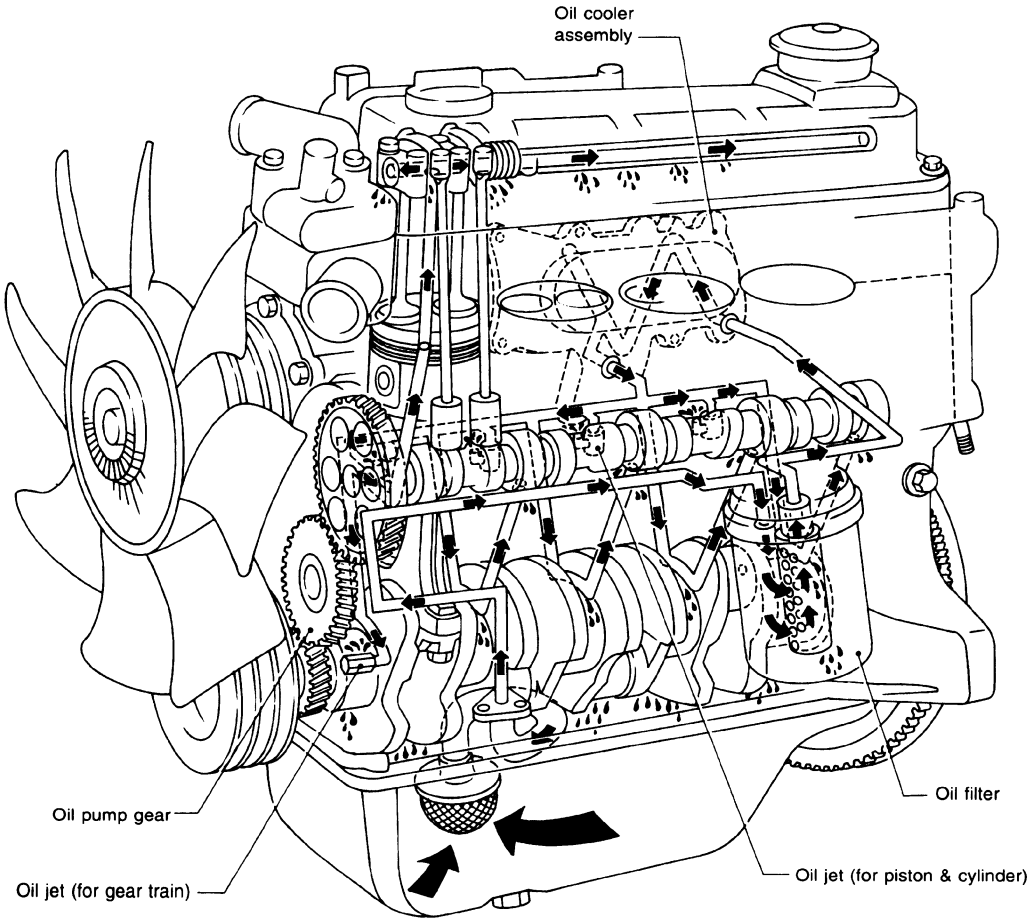
LIQUID GASKET APPLICATION PROCEDURE

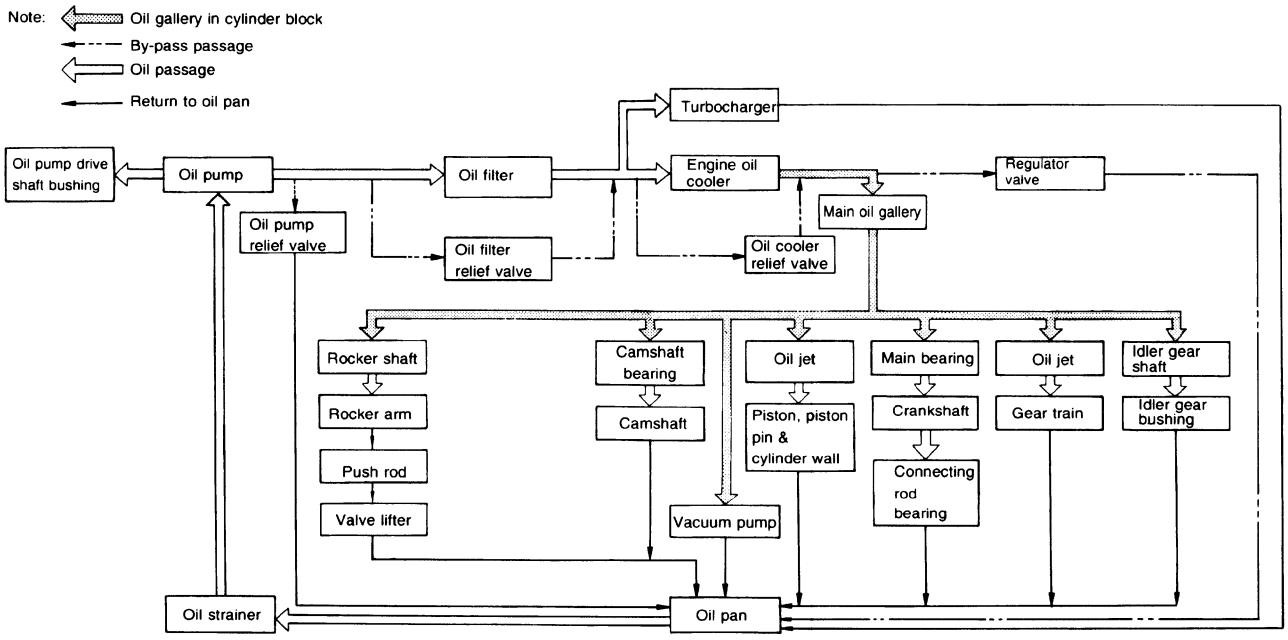
a. Before applying liquid gasket, use a scraper to remove all traces of old liquid gasket from mating surface.
b. Apply a continuous bead of liquid gasket to mating surfaces.
(Use Genuine Liquid Gasket or equivalent.)
   - Be sure liquid gasket is 3.5 to 4.5 mm (0.138 to 0.177 in) wide (for oil pan).
   - Be sure liquid gasket is 2.0 to 3.0 mm (0.079 to 0.118 in) wide (in areas except oil pan).

c. Apply liquid gasket to inner sealing surface around hole perimeter area.
(Assembly should be done within 5 minutes after coating.)
d. Wait at least 30 minutes before refilling engine oil and engine coolant.

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Lubrication Circuit





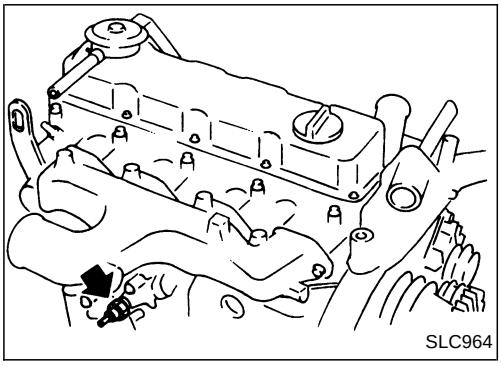
ELC037

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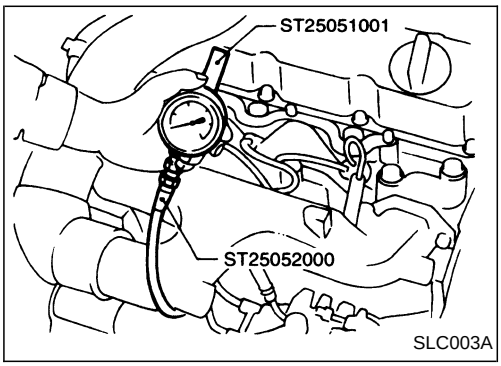
Oil Pressure Check

WARNING:

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


SLC964

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



SLC003A

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

Engine rpm	Approximate discharge pressure kPa (bar, kg/cm^2, psi)
Idle speed	More than 78 (0.78, 0.8, 11)
3,000	294 - 392 (2.94 - 3.92, 3.0 - 4.0, 43 - 57)

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

6. Install oil pressure switch.

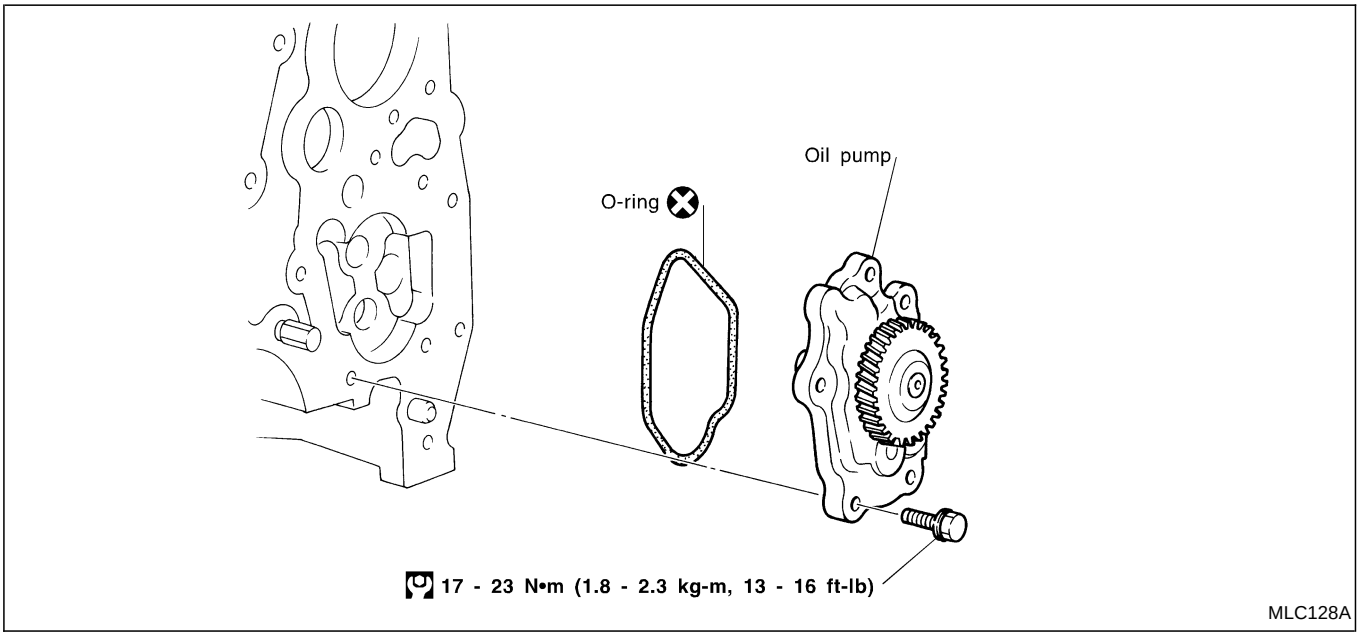
Use proper liquid sealant.

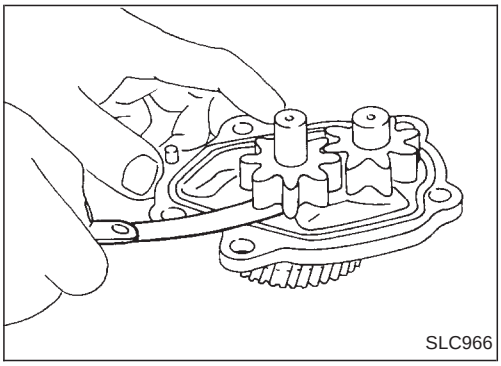
Oil pressure switch:

: 10 - 13 N·m (1.0 - 1.3 kg-m, 87 - 113 in-lb)

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Oil Pump

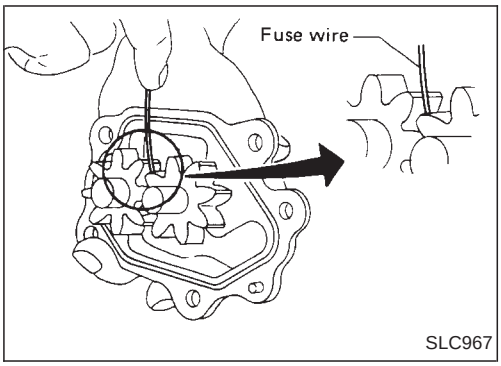




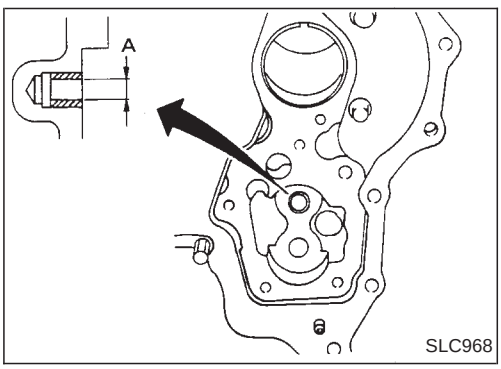
OIL PUMP INSPECTION

1. Inspect pump body, gears and drive shaft for wear and damage.
2. Using a feeler gauge and fuse wire, check the following clearances.

Gear side clearance:
Less than 0.13 mm (0.0051 in)



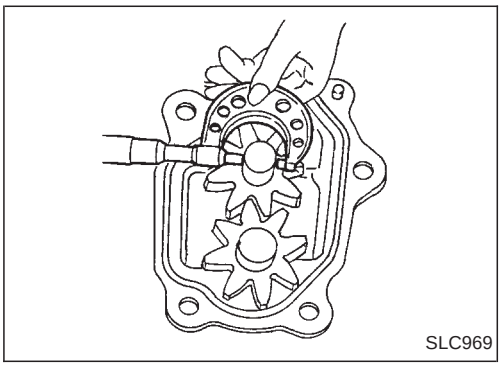
Gear backlash:
Less than 0.43 mm (0.0169 in)



3. Measure inside diameter “A” of bushing.
A: 13.012 - 13.098 mm (0.5123 - 0.5157 in)

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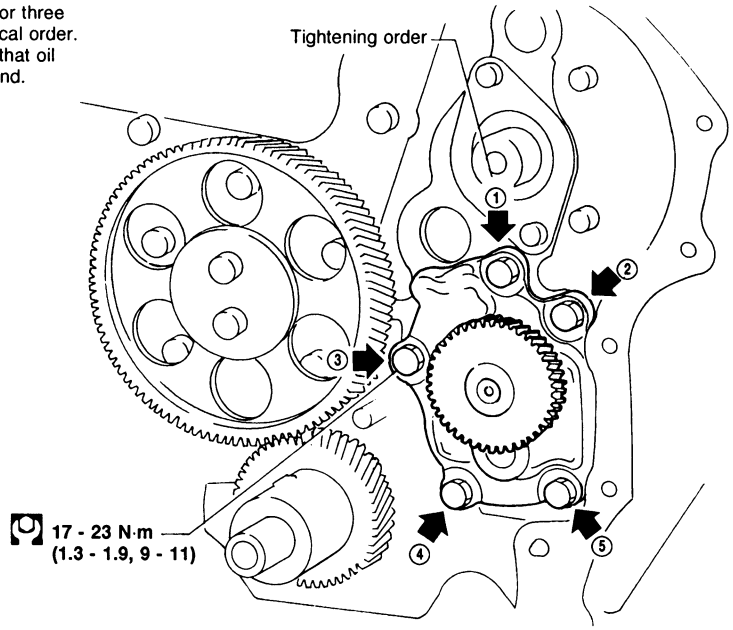
Oil Pump (Cont'd)


SLC969

4. Measure outside diameter "B" of drive gear shaft.
   B: 12.974 - 12.992 mm (0.5108 - 0.5115 in)
5. Calculate oil pump bushing clearance.
   Oil pump bushing clearance (A − B):
   Less than 0.15 mm (0.0059 in)

If it exceeds the limit replace oil pump bushing or entire oil pump assembly.

- When installing oil pump, the bolt should be tightened in two or three stages according to numerical order.
- After installation, ascertain that oil pump turns smoothly by hand.

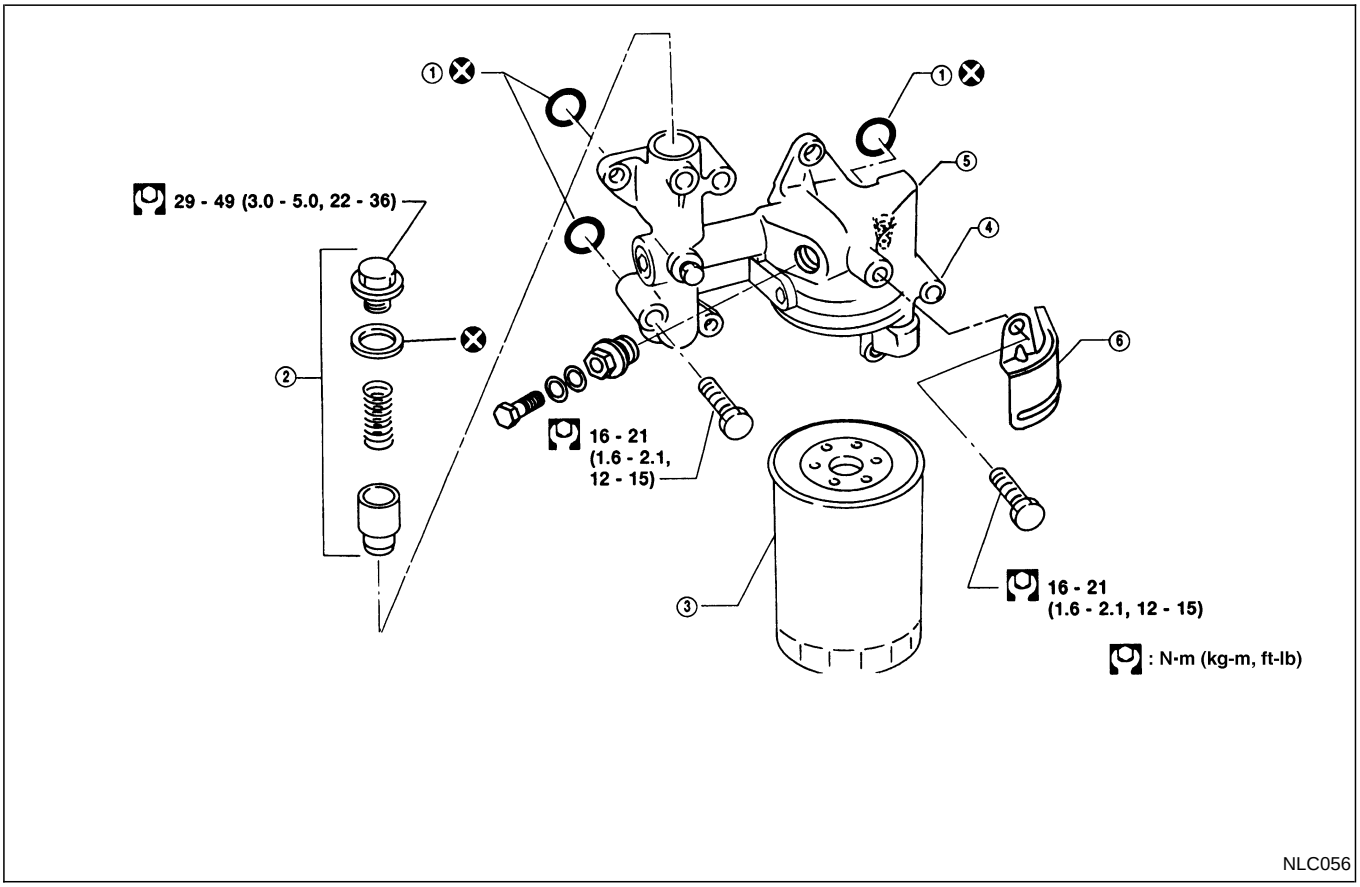


N·m (kg-m, ft-lb)

NLC057

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Oil Filter Bracket



① O-ring
② Oil pump relief valve
③ Oil filter
④ Oil filter bracket
⑤ Oil filter relief valve
⑥ Protection shield

OIL PUMP RELIEF VALVE INSPECTION

1. Visually inspect components for wear and damage.
2. Coat relief valve with engine oil and check that it falls smoothly into the valve hole by its own weight.

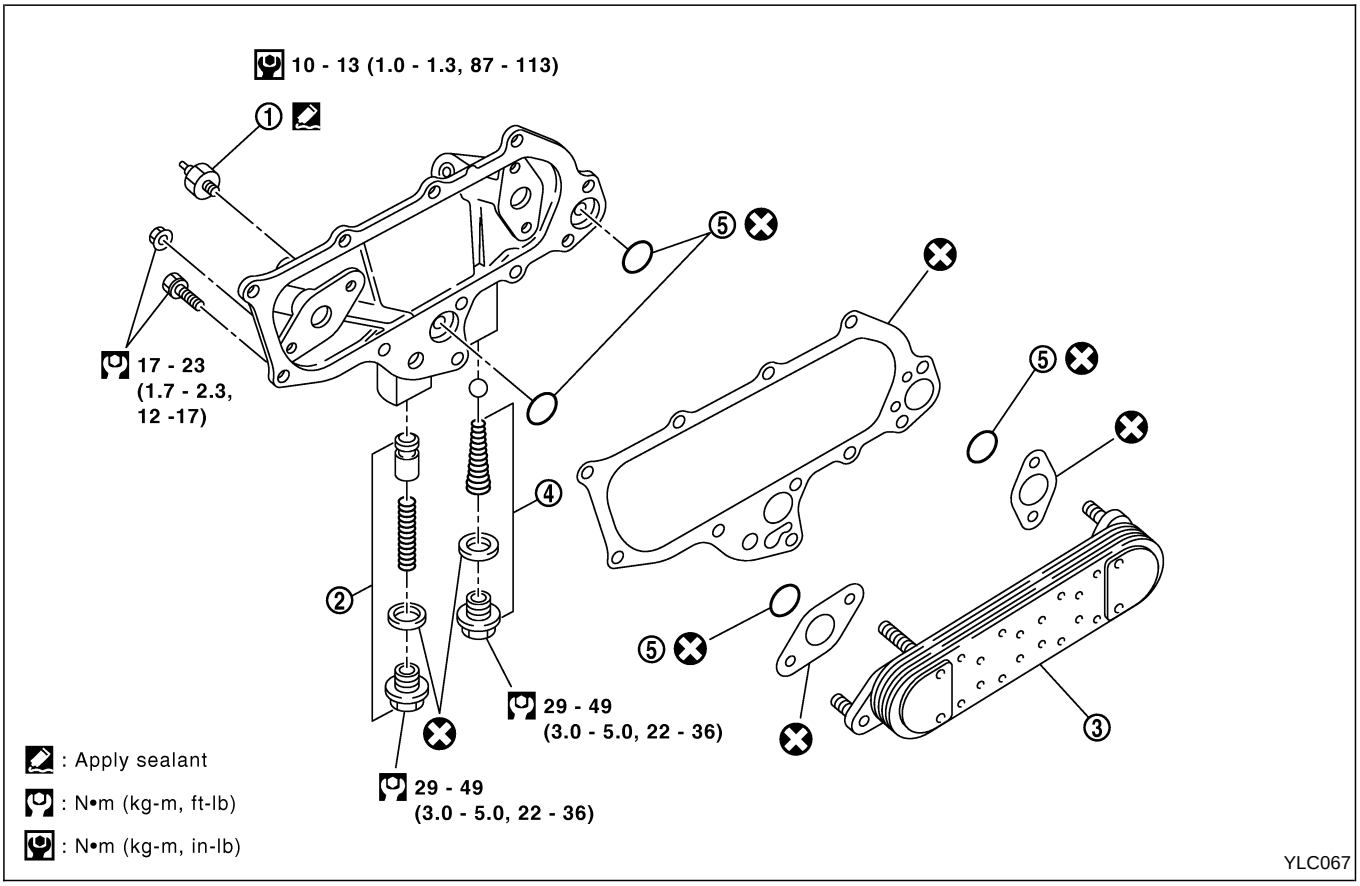
If damaged, replace oil pump relief valve set.

OIL FILTER RELIEF VALVE INSPECTION

Inspect oil filter short valve for movement, cracks and breaks by pushing the ball.
If damaged, replace oil filter bracket assembly.

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Oil Cooler



① Oil pressure switch
② Regulator valve
③ Oil cooler element
④ Oil filter relief valve
⑤ O-ring

OIL COOLER RELIEF VALVE INSPECTION

Inspect oil cooler relief valve for movement, cracks and breaks by pushing the ball.
If damaged, replace oil cooler relief valve set.

REGULATOR VALVE INSPECTION

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

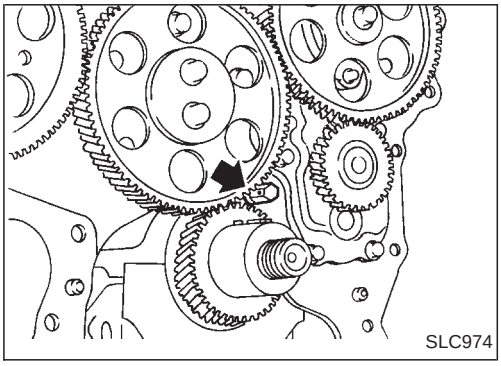
If damaged, replace regulator valve set.

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Oil Jet

INSPECTION (For gear train)

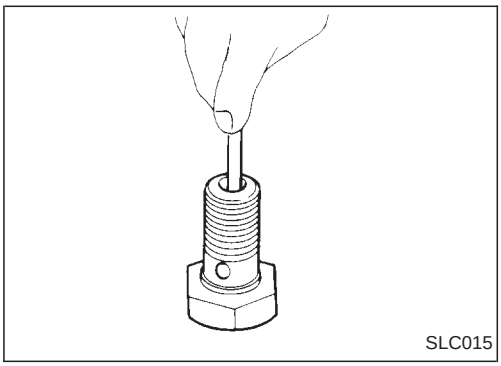
Make sure that the holes are not clogged. Clean them with a wire if necessary.

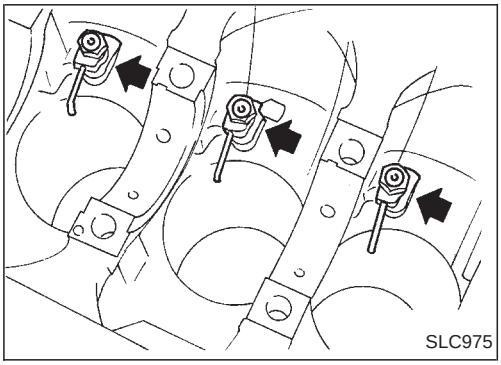

SLC974

Oil jet has to be installed with oil hole facing crank gear and idler gear.

INSPECTION (For piston)

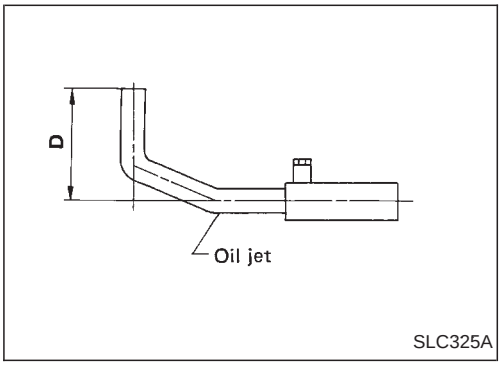
1. Blow through outlet of oil jet and make sure that air comes out of inlet.
2. Push cut-off valve of oil jet bolt with a clean resin or brass rod and make sure that cut-off valve moves smoothly with proper repulsion.


SLC015


SLC975

When installing oil jet, align oil jet's boss with hole on cylinder block.

Oil jet bolt:
: 29 - 39 N·m
(3.0 - 4.0 kg-m, 22 - 29 ft-lb)

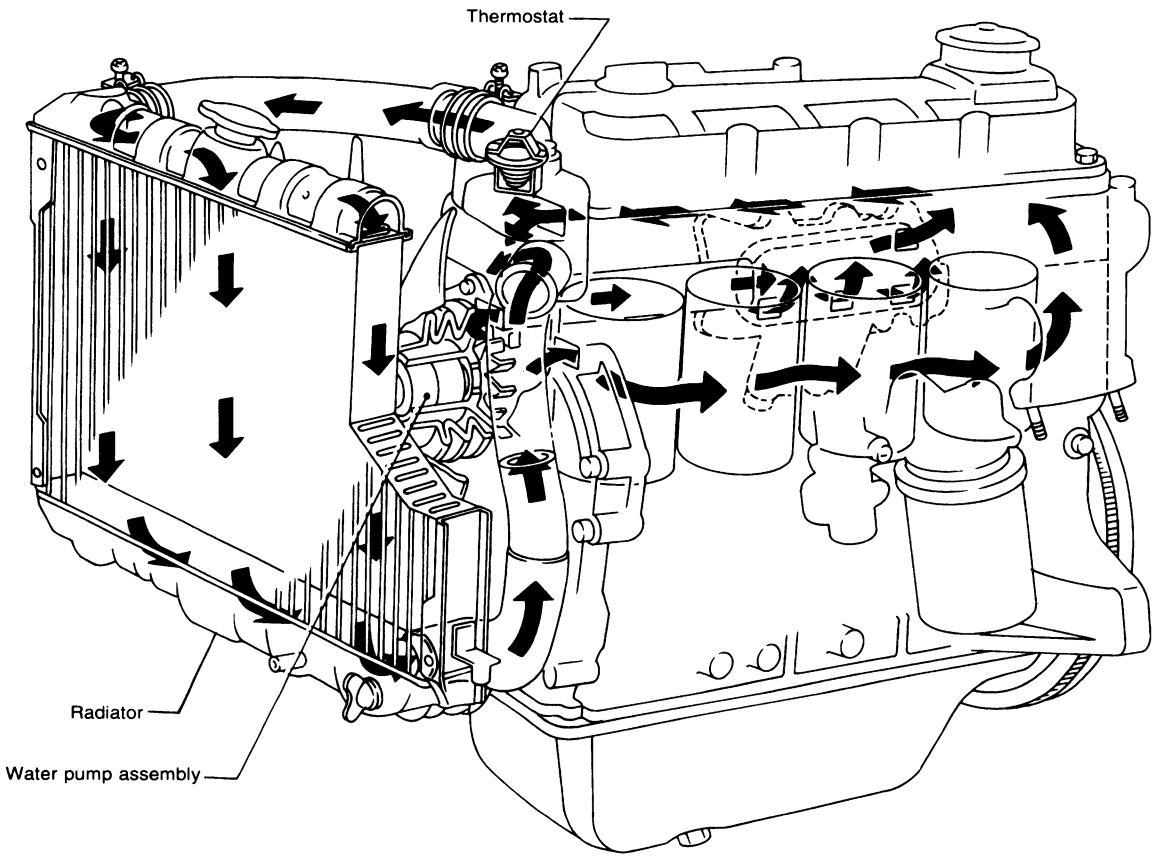


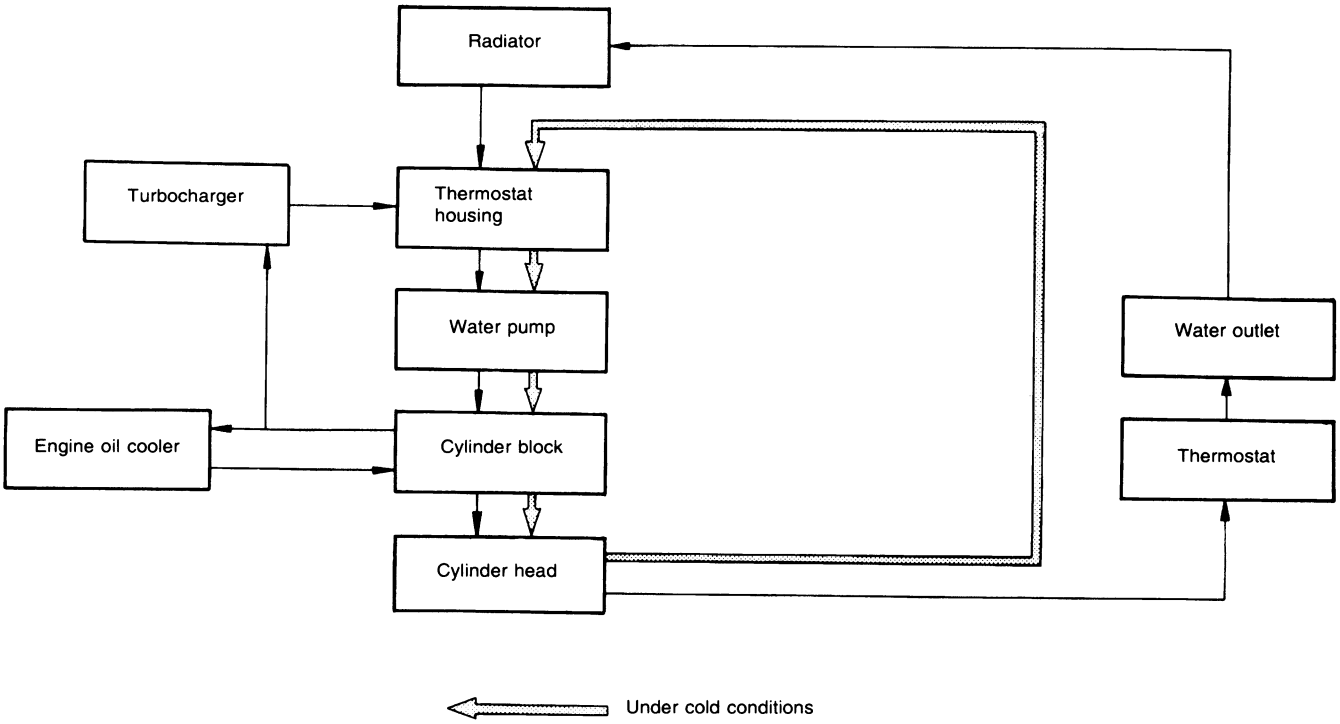
SLC325A

Dimension "D":
22 mm (0.87 in)

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Cooling Circuit





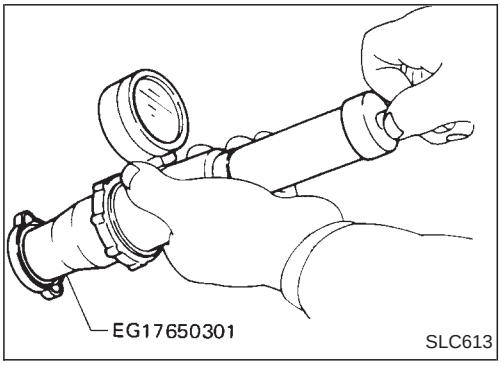
NLC011

http://vnx.su/

System Inspection

CHECKING HOSES

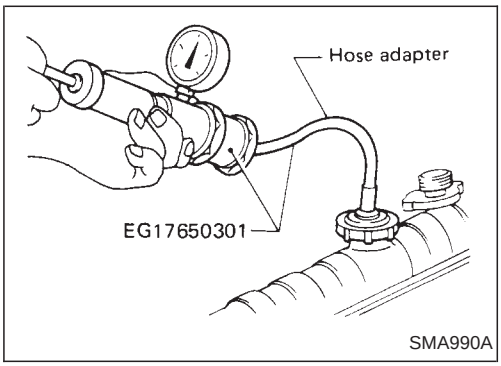
Check hoses for proper attachment, leaks, cracks, damage, loose connections, chafing and deterioration.



CHECKING RADIATOR CAP

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

Radiator cap relief pressure:
78 - 98 kPa
(0.78 - 0.98 bar, 0.8 - 1.0 kg/cm^2, 11 - 14 psi)



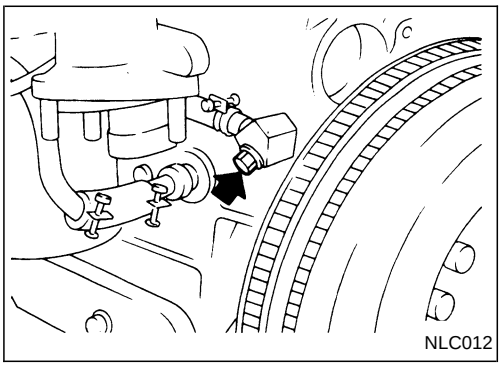
CHECKING COOLING SYSTEM FOR LEAKS

Appear pressure to the cooling system by means of a tester to check for leakage.

Testing pressure:
157 kPa (1.57 bar, 1.6 kg/cm^2, 23 psi)

CAUTION:
Higher than the specified pressure may cause radiator damage.

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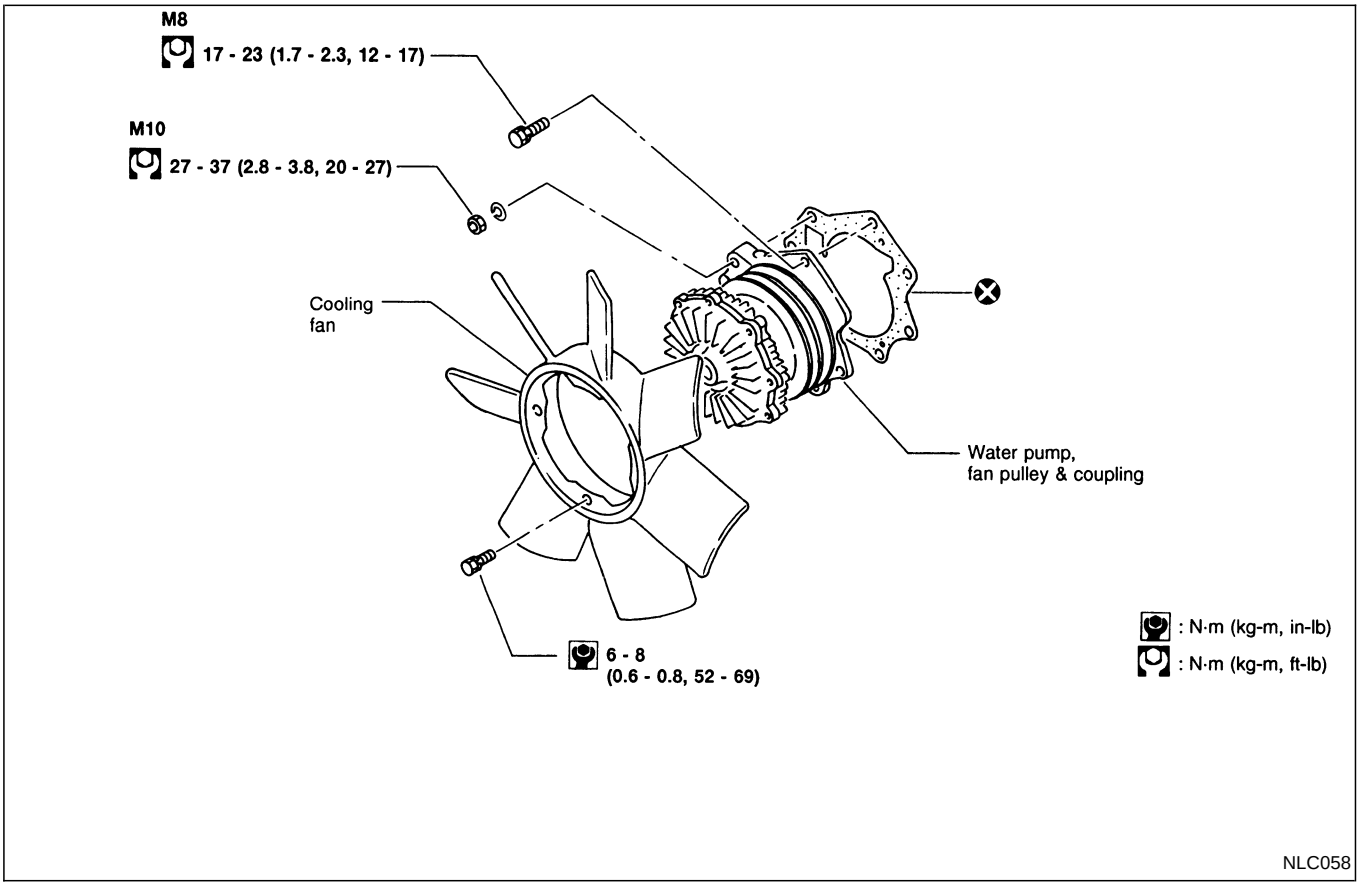

NLC012

Water Pump

REMOVAL AND INSTALLATION

Drain coolant from drain plugs on cylinder block and radiator.

Cylinder block drain plug:
(Use proper sealant)
: 20 - 29 N·m (2.0 - 3.0 kg-m, 14 - 22 ft-lb)



NLC058

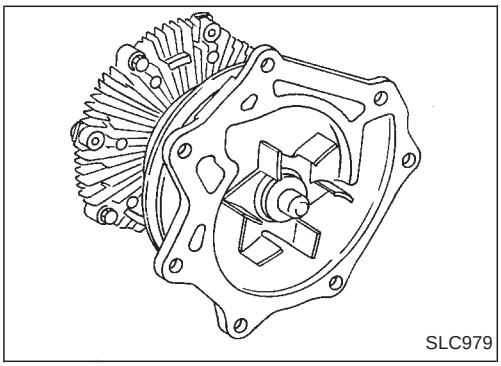
CAUTION:

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

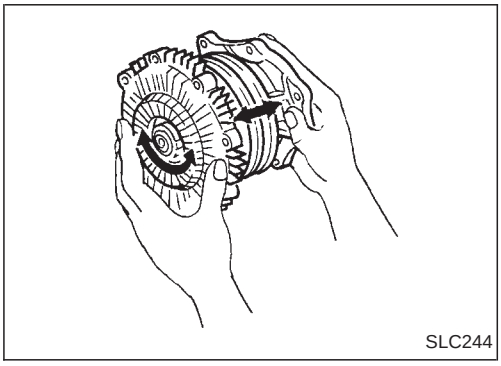
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Water Pump (Cont'd)

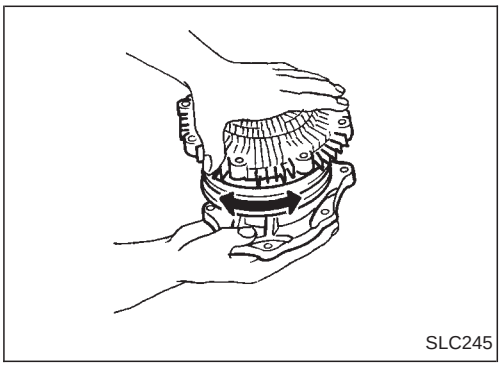
INSPECTION


SLC979

1. Check for badly rusted or corroded body assembly and vane.


SLC244

2. Check the water pump bushing for excessive end play and irregular movement.

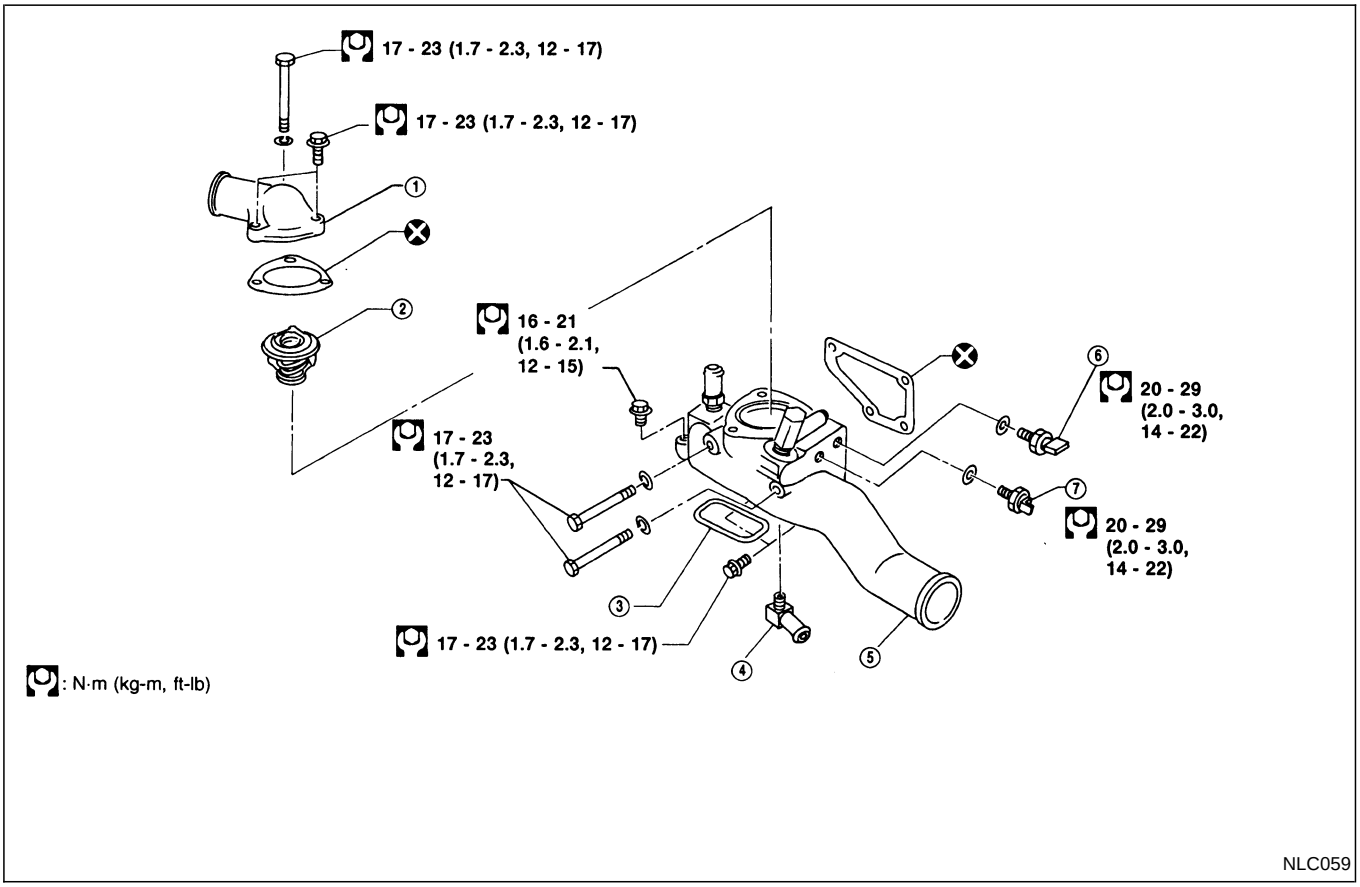

SLC245

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

The water pump and fan coupling cannot be disassembled and should be replaced as a unit.

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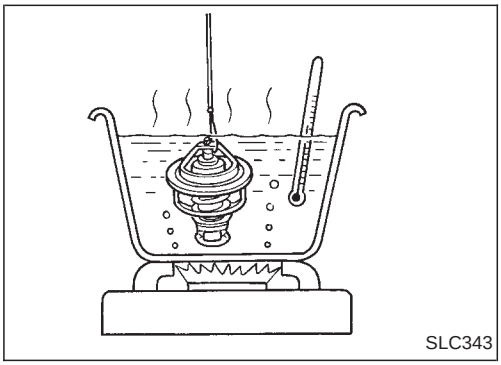
Thermostat



① Water outlet
② Thermostat with jiggle valve
③ Rubber seal
④ Water connector
⑤ Thermostat housing
⑥ Engine coolant temperature sensor
⑦ Thermal transmitter

CAUTION:

- **After installation, run engine for a few minutes, and check for leaks.**
- **Be careful not to spill coolant over engine compartment. Place a rag to absorb coolant.**



INSPECTION

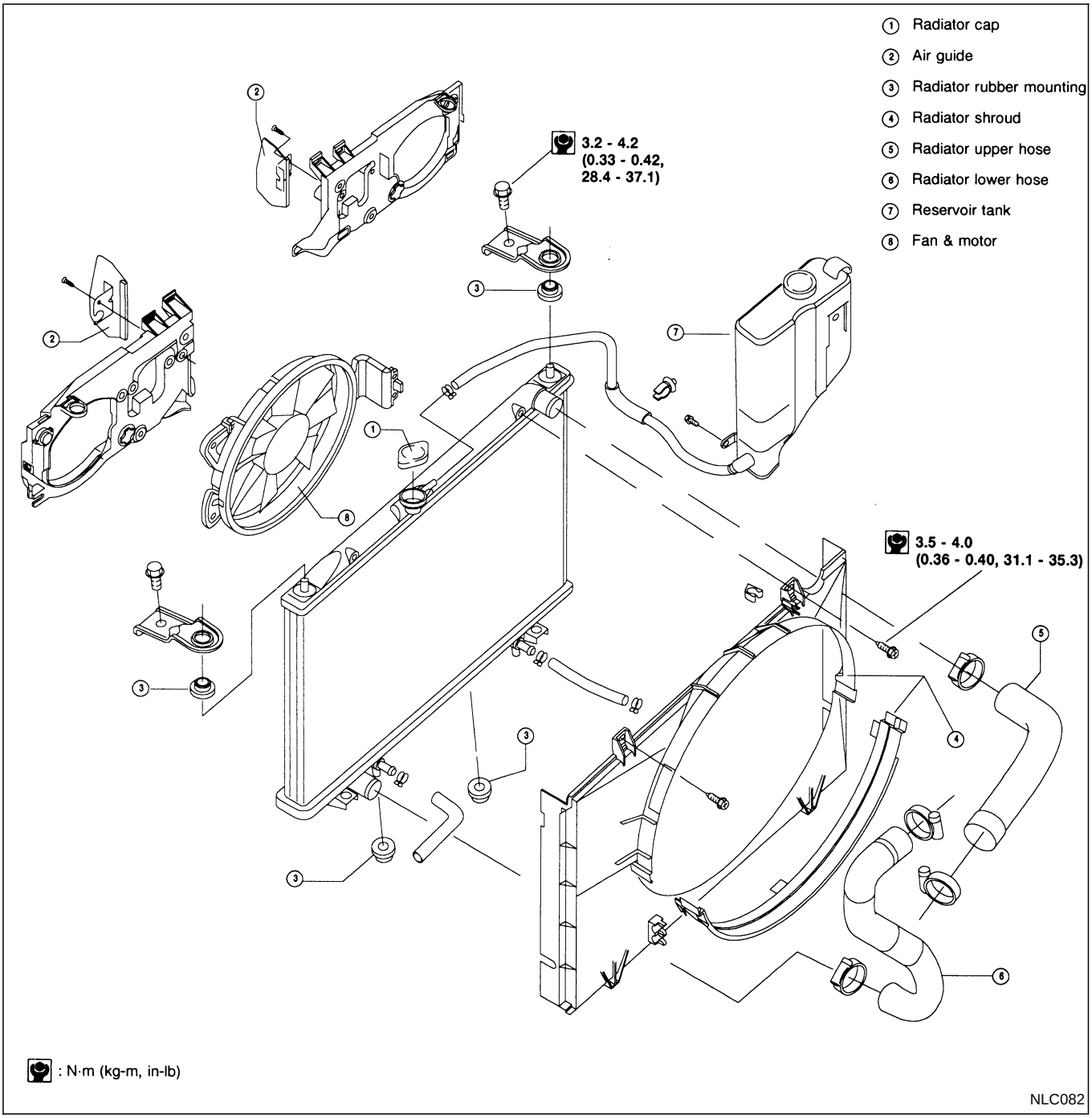
1. Check for valve seating condition at ordinary temperatures. It should seat tightly.
2. Check valve opening temperature and maximum valve lift.

Valve opening temperature	°C (°F)	88 (190)
Max. valve lift	mm/°C (in/°F)	8/100 (0.315/212)

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

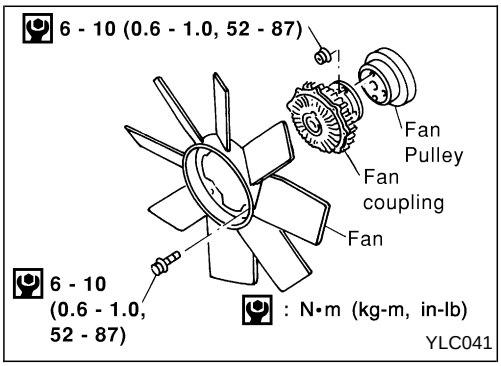
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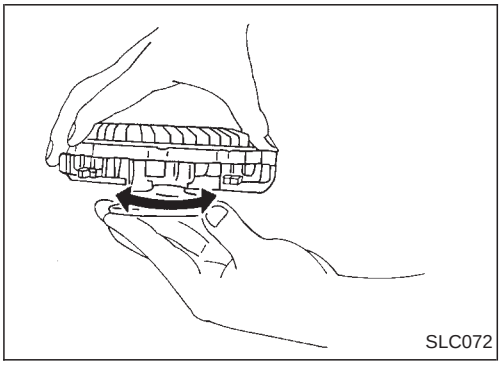
Radiator



CAUTION:
When filling radiator with coolant, refer to MA section.

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Cooling Fan

DISASSEMBLY AND ASSEMBLY

- Proper alignment of components is essential.
  Improper alignment will cause them to wobble and may eventually cause the fan to separate from the water pump causing extensive damage.
- If front mark Ⓕ is present, install fan so that side marked Ⓕ faces the front.

INSPECTION

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

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Engine Lubrication System

Oil pressure check

Engine rpm	Approximate discharge pressure kPa (bar, kg/cm^2, psi)
Idle speed	More than 78 (0.78, 0.8, 11)
3,000	294 - 392 (2.94 - 3.92, 3.0 - 4.0, 43 - 57)

Oil pump

Unit: mm (in)

Gear side clearance	Less than 0.13 (0.0051)
Gear backlash	Less than 0.43 (0.0169)
Oil pump bushing clearance	Less than 0.15 (0.0059)
Oil pump bushing inside diameter	13.012 - 13.098 (0.5123 - 0.5157)
Drive gear shaft outside diameter	12.974 - 12.992 (0.5108 - 0.5115)

Engine Cooling System

Thermostat

Valve opening temperature °C (°F)	88 (190)
Max. Valve lift mm/°C (in/°F)	8/100 (0.315/212)

Radiator

Unit: kPa (bar, kg/cm^2, psi)

Cap relief pressure	78 - 98 (0.78 - 0.98, 0.8 - 1.0, 11 - 14)
Leakage test pressure	157 (1.57, 1.6, 23)

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ENGINE CONTROL SYSTEM

SECTION EC

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ZD30DDTi

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Alphabetical & Numerical Index for DTC

ALPHABETICAL INDEX FOR DTC

X: Applicable —: Not applicable

Items (CONSULT-II screen terms)	DTC	MI (MIL) illumination	Reference page
ACCEL POS SENSOR	0403	—*1 or X*2	EC-130
ACCEL POS SW (F/C)*1	0203	—	EC-104
A/T COMM LINE*1	0504	—	EC-160
COOLANT TEMP SEN	0103	—	EC-95
CRANK POS SEN (TDC)	0407	X	EC-152
ECM 2	0301	X	EC-121
ECM 10	0802	—	EC-205
ECM 11	0804	—	EC-207
ECM 14	0807	—*1 or X*2	EC-209
ECM 15	0903	X	EC-218
ECM RLY	0902	—	EC-214
EGR VOLUME CONT/V	1003	—	EC-227
FUEL CUT SYSTEM1	1004	X	EC-237
INT/AIR VOLUME	0406	—	EC-150
MASS AIR FLOW SEN	0102	—	EC-88
NATS MALFUNCTION	1401 - 1408	—	EL section
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	0505	—	—
OVER HEAT	0208	—	EC-109
P1·CAM POS SEN	0701	X	EC-166
P2·TDC PULSE SIG	0702	—	EC-173
P3·PUMP COMM LINE	0703	X	EC-180
P4·SPILL/V CIRC	0704	X	EC-187
P5·PUMP C/MODULE	0705	X	EC-194
P6·SPILL VALVE	0706	X	EC-187
P7·F/INJ TIMG FB	0707	X	EC-197
P9·FUEL TEMP SEN	0402	—	EC-123
TURBO PRESSURE	0905	—	EC-220
VEHICLE SPEED SEN	0104	—	EC-99

*1: For A/T models
*2: For M/T models

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Alphabetical & Numerical Index for DTC (Cont'd)

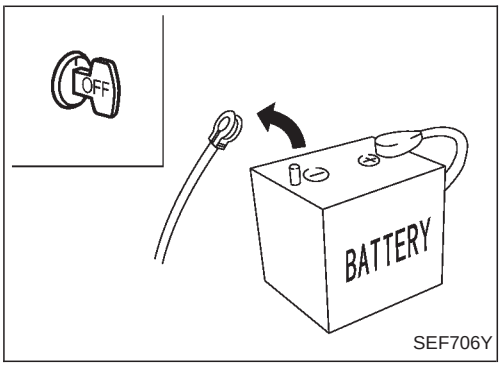
NUMERICAL INDEX FOR DTC

X: Applicable —: Not applicable

DTC	Items (CONSULT-II screen terms)	MI (MIL) illumination	Reference page
0102	MASS AIR FLOW SEN	—	EC-88
0103	COOLANT TEMP SEN	—	EC-95
0104	VEHICLE SPEED SEN	—	EC-99
0203*1	ACCEL POS SW (F/C)*1	—	EC-104
0208	OVER HEAT	—	EC-109
0301	ECM 2	X	EC-121
0402	P9·FUEL TEMP SEN	—	EC-123
0403	ACCEL POS SENSOR	—*1 or X*2	EC-130
0406	INT/AIR VOLUME	—	EC-150
0407	CRANK POS SEN (TDC)	X	EC-152
0504*1	A/T COMM LINE	—	EC-160
0505	**NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.**	—	—
0701	P1·CAM POS SEN	X	EC-166
0702	P2·TDC PULSE SIG	—	EC-173
0703	P3·PUMP COMM LINE	X	EC-180
0704	P4·SPILL/V CIRC	X	EC-187
0705	P5·PUMP C/MODULE	X	EC-194
0706	P6·SPILL VALVE	X	EC-187
0707	P7·F/INJ TIMG FB	X	EC-197
0802	ECM 10	—	EC-205
0804	ECM 11	—	EC-207
0807	ECM 14	—*1 or X*2	EC-209
0902	ECM RLY	—	EC-214
0903	ECM 15	X	EC-218
0905	TURBO PRESSURE	—	EC-220
1003	EGR VOLUME CONT/V	—	EC-227
1004	FUEL CUT SYSTEM1	X	EC-237
1401 - 1408	NATS MALFUNCTION	—	EL section

*1: For A/T models
*2: For M/T models

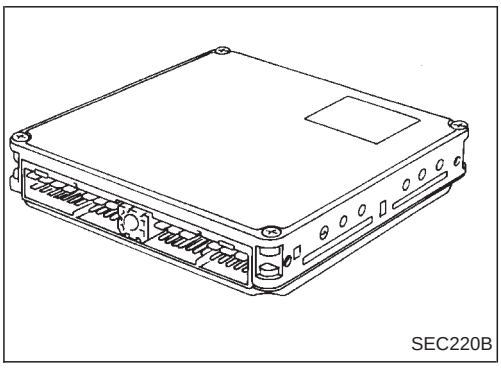
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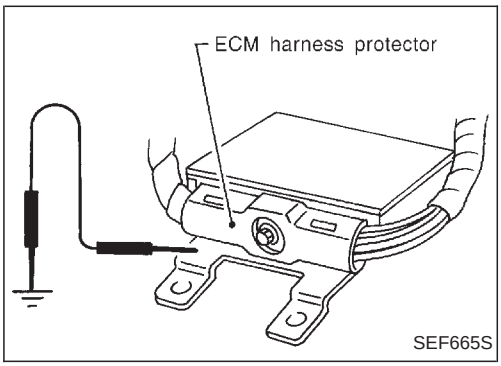
SEF706Y

Precautions

- Always use a 12 volt battery as power source.
- Do not attempt to disconnect battery cable while engine is running.
- Before connecting or disconnecting the ECM harness connector, turn ignition switch OFF and disconnect negative battery terminal. Failure to do so may damage the ECM because battery voltage is applied to ECM even if ignition switch is turned off.
- Before removing parts, turn off ignition switch and then disconnect battery ground cable.

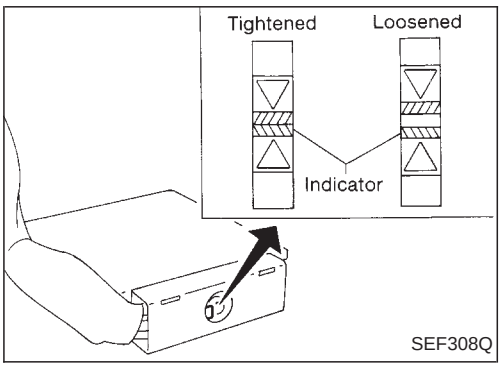

SEC220B

- Do not disassemble ECM.
- If a battery terminal is disconnected, the memory will return to the ECM value.
  The ECM will now start to self-control at its initial value. Engine operation can vary slightly when the terminal is disconnected. However, this is not an indication of a problem. Do not replace parts because of a slight variation.



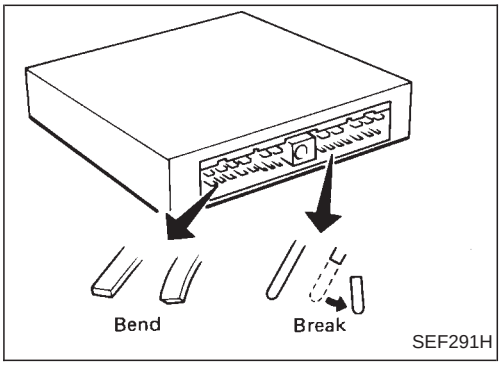
SEF665S

- When ECM is removed for inspection, make sure to ground the ECM mainframe.



SEF308Q

- When connecting ECM harness connector, tighten securing bolt until the gap between the orange indicators disappears.
  : 3.0 - 5.0 N·m (0.3 - 0.5 kg-m, 26 - 43 in-lb)



SEF291H

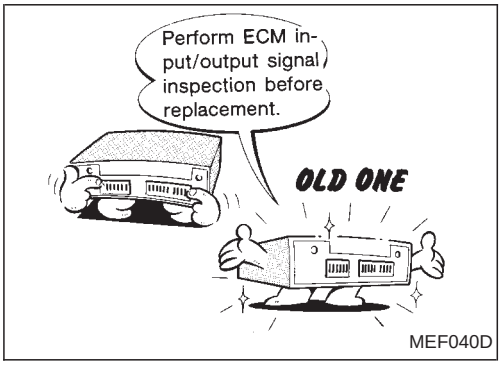
- When connecting or disconnecting pin connectors into or from ECM, take care not to damage pin terminals (bend or break).
  Make sure that there are not any bends or breaks on ECM pin terminal, when connecting pin connectors.
- Securely connect ECM harness connectors.
  A poor connection can cause an extremely high (surge) voltage to develop in the circuit, thus resulting in damage to ICs.
- Keep ECM harness at least 10 cm (3.9 in) away from adjacent harnesses, to prevent an ECM system malfunction

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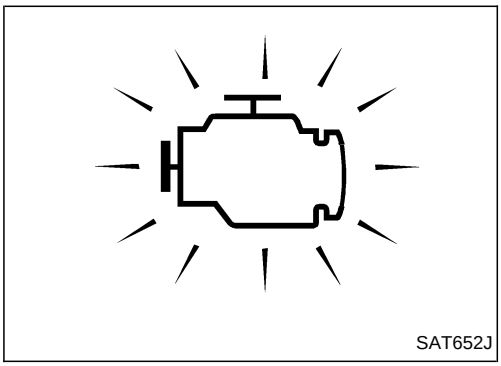
Precautions (Cont'd)

due to receiving external noise, degraded operation of ICs, etc.

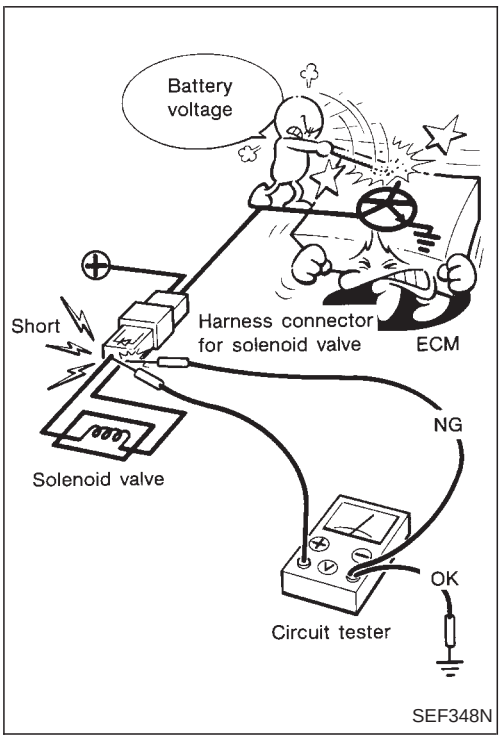
- Keep ECM parts and harnesses dry.



- Before replacing ECM, perform Terminals and Reference Value inspection and make sure ECM functions properly. Refer to EC-69.



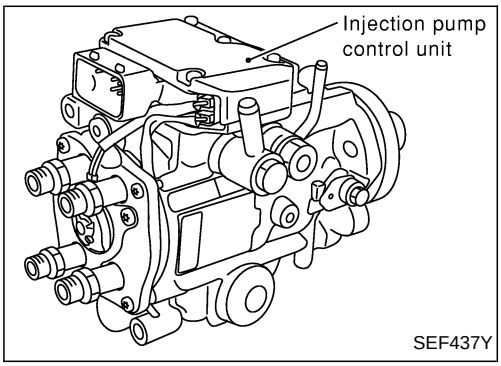
- If MI illuminates or blinks irregularly when engine is running, water may have accumulated in fuel filter. Drain water from fuel filter. If this does not correct the problem, perform specified trouble diagnostic procedures.
- After performing each TROUBLE DIAGNOSIS, perform "DTC Confirmation Procedure" or "Overall Function Check".
  The DTC should not be displayed in the "DTC Confirmation Procedure" if the repair is completed. The "Overall Function Check" should be a good result if the repair is completed.



- When measuring ECM signals with a circuit tester, never allow the two tester probes to contact.
  Accidental contact of probes will cause a short circuit and damage the ECM power transistor.
- Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

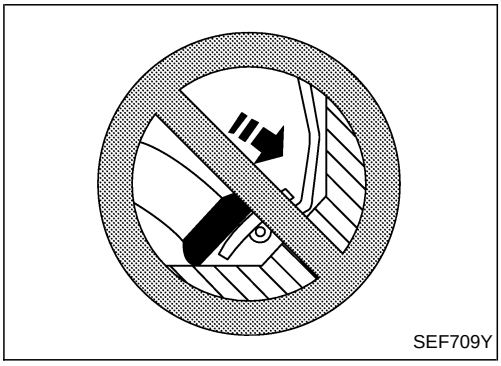
http://vnx.su/

Precautions (Cont'd)

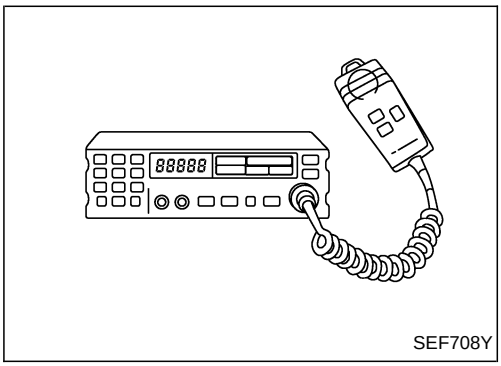


SEF437Y

- **Do not disconnect pump harness connector with engine running.**
- **Do not disassemble electronic fuel injection pump.**
  If NG, take proper action.
- **Do not disassemble injection nozzle.**
  If NG, replace injection nozzle.
- **Even a slight leak in the air intake system can cause serious problems.**
- **Do not shock or jar the crankshaft position sensor (TDC).**


SEF709Y

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

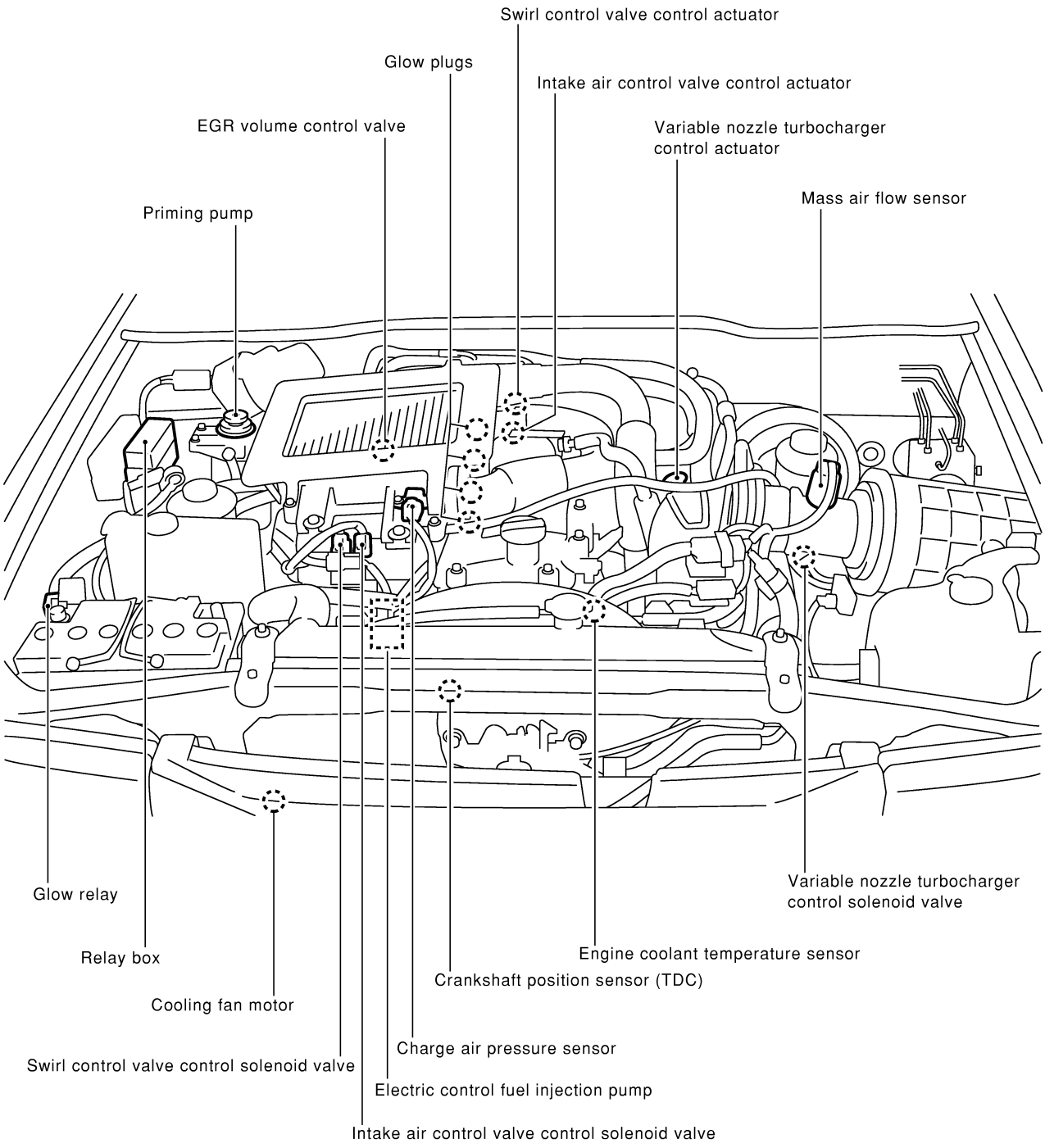

SEF708Y

- **When installing C.B. ham radio or a mobile phone, be sure to observe the following as it may adversely affect electronic control systems depending on its installation location.**

1) Keep the antenna as far as possible away from the ECM.
2) Keep the antenna feeder line more than 20 cm (7.9 in) away from the harness of electronic controls.
Do not let them run parallel for a long distance.
3) Adjust the antenna and feeder line so that the standing-wave ratio can be kept smaller.
4) Be sure to ground the radio to vehicle body.

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Engine Control Component Parts Location

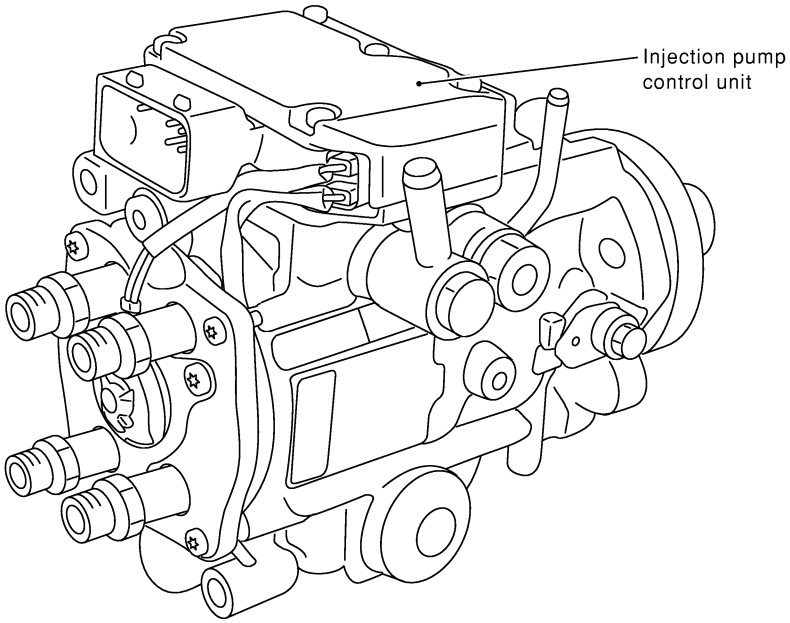


MEC988D

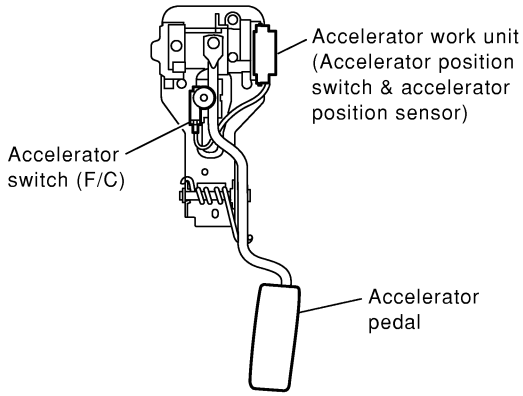
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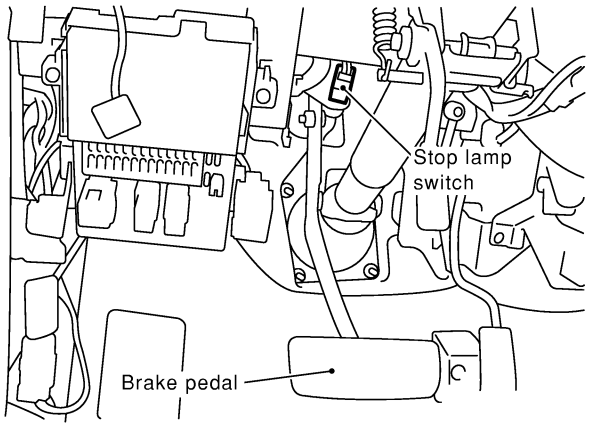
Engine Control Component Parts Location (Cont'd)

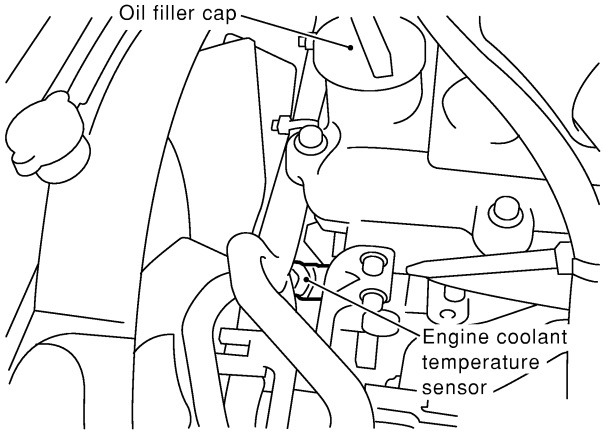
Electronic control fuel injection pump

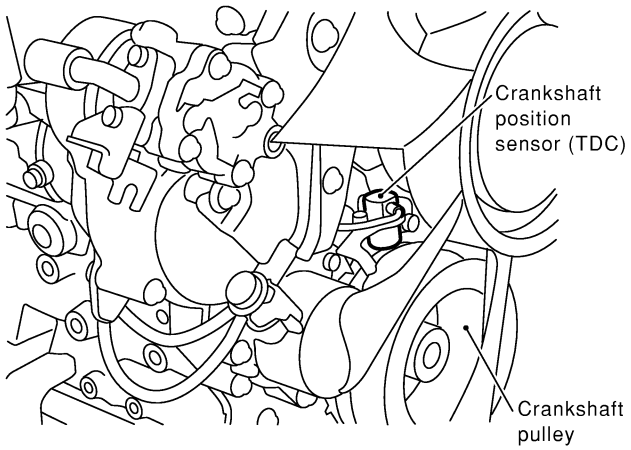


LHD models







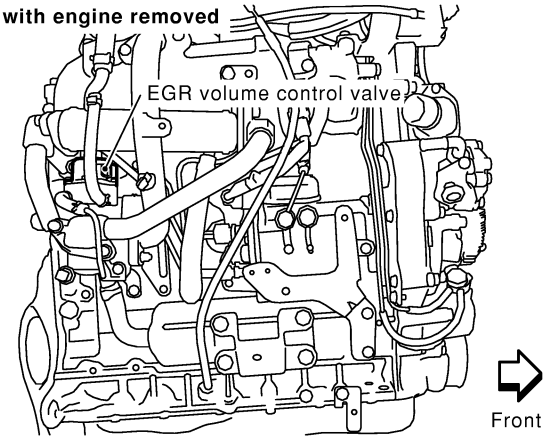


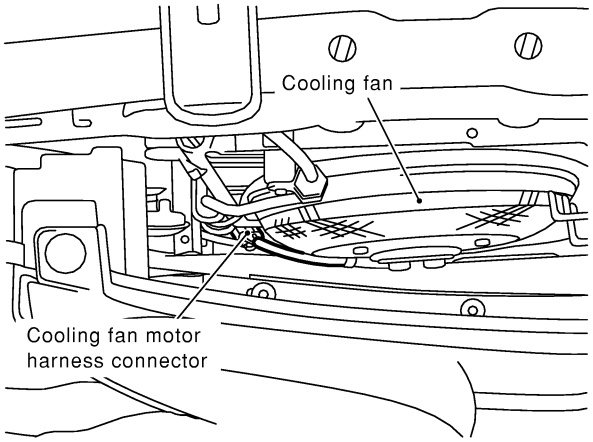
MEC989D

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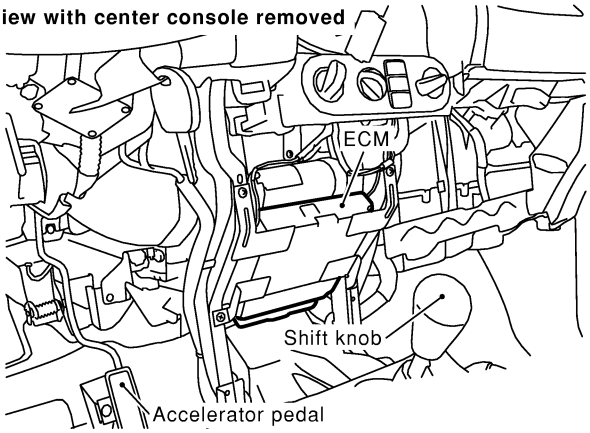
Engine Control Component Parts Location (Cont'd)

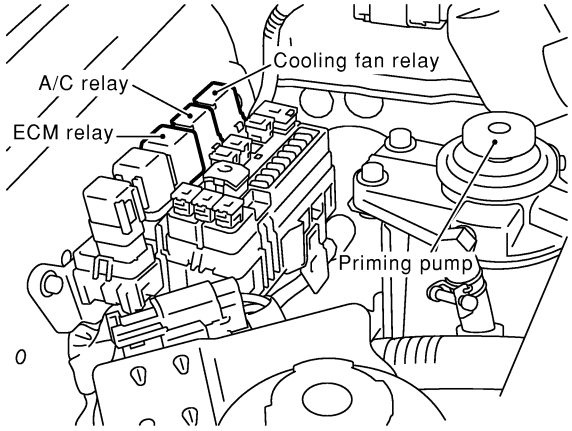
View with engine removed

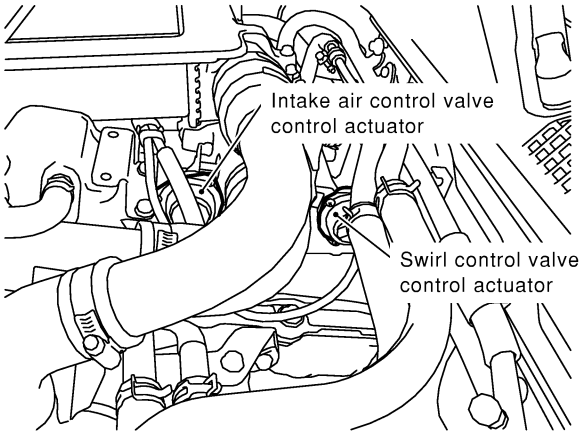




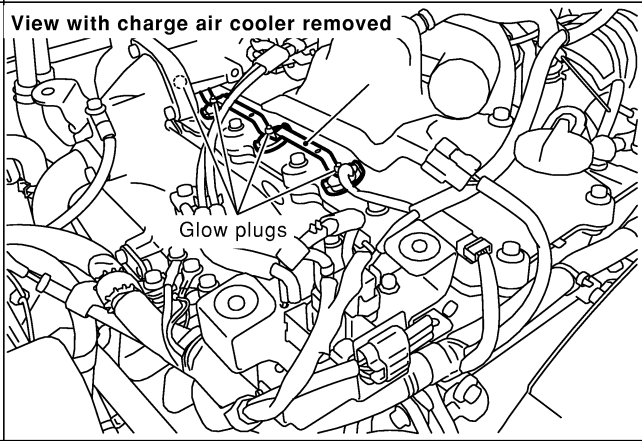
View with center console removed

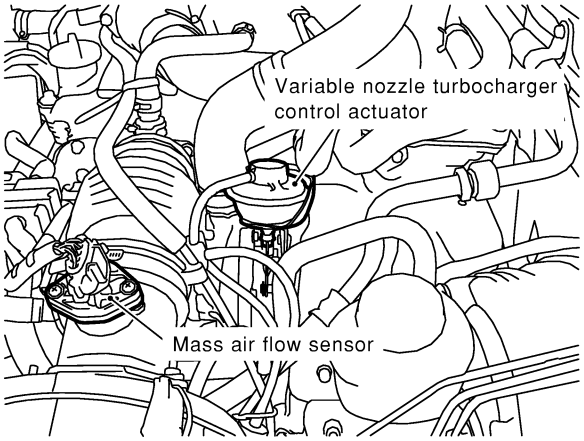


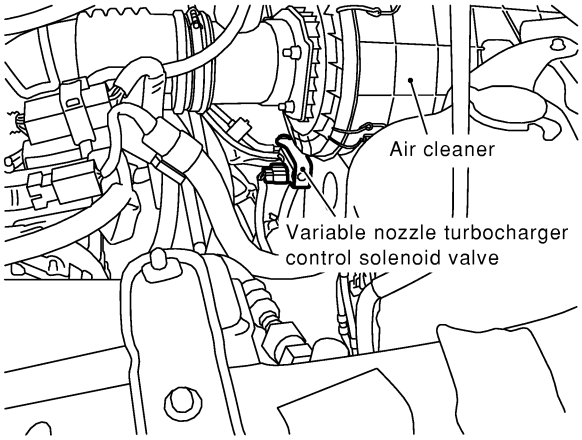




View with charge air cooler removed



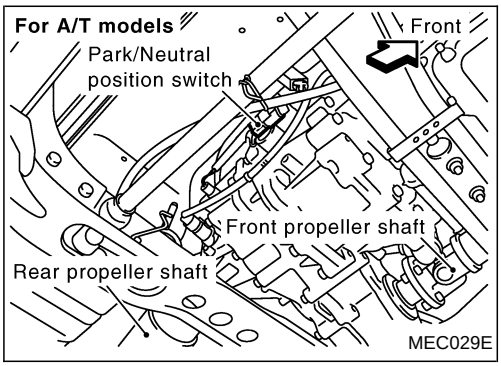




MEC990D

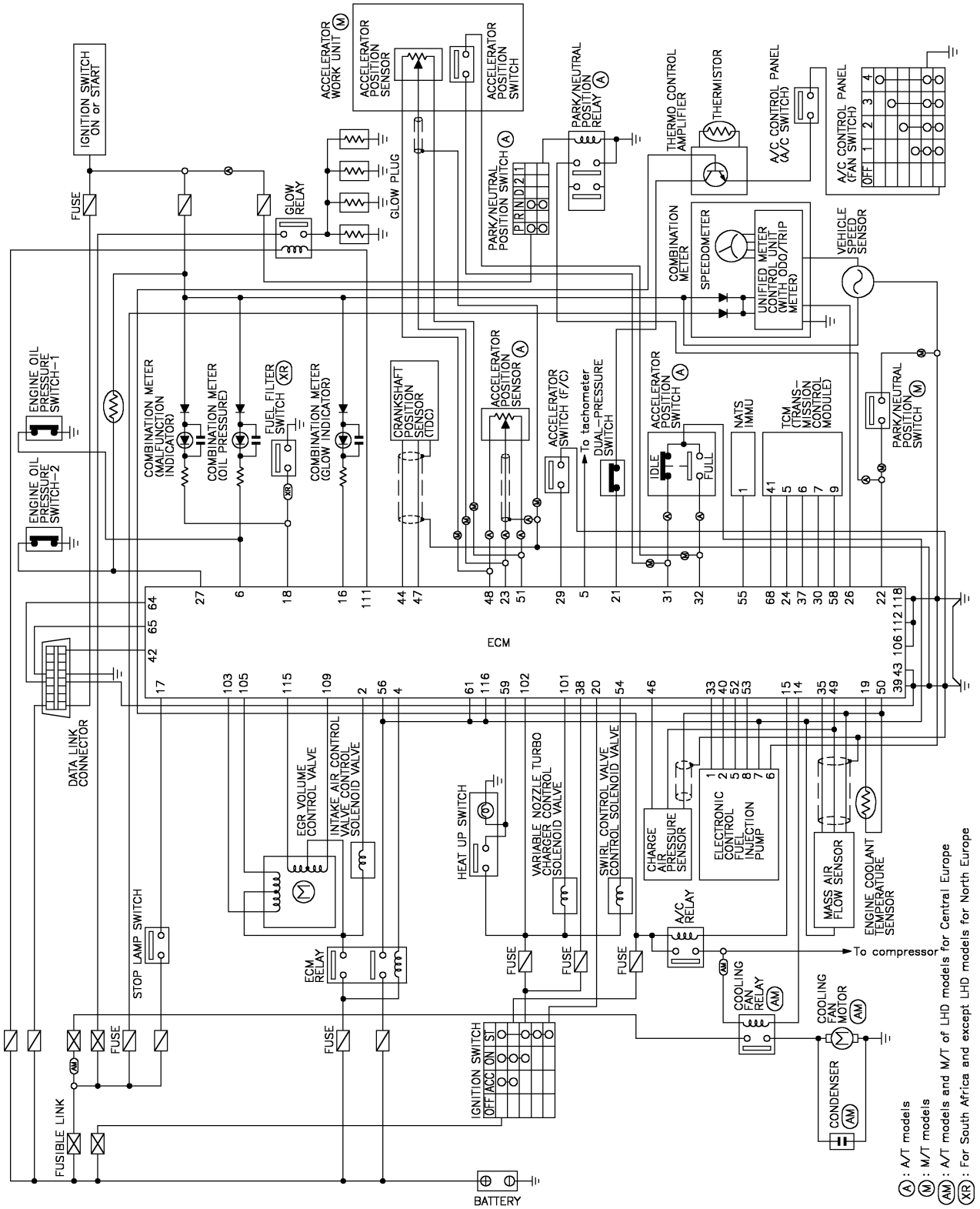
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Engine Control Component Parts Location (Cont'd)



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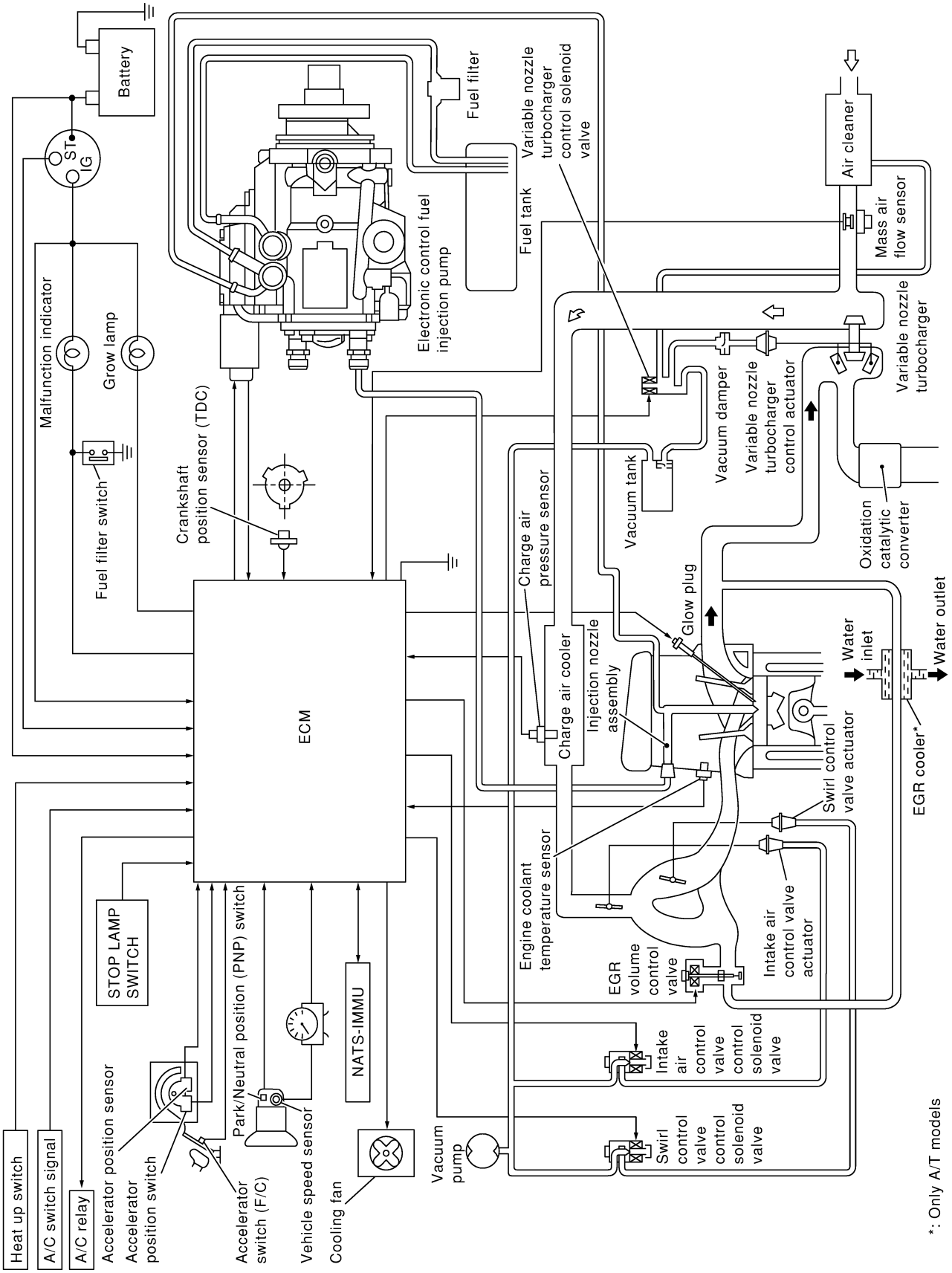
Circuit Diagram



YEC662A

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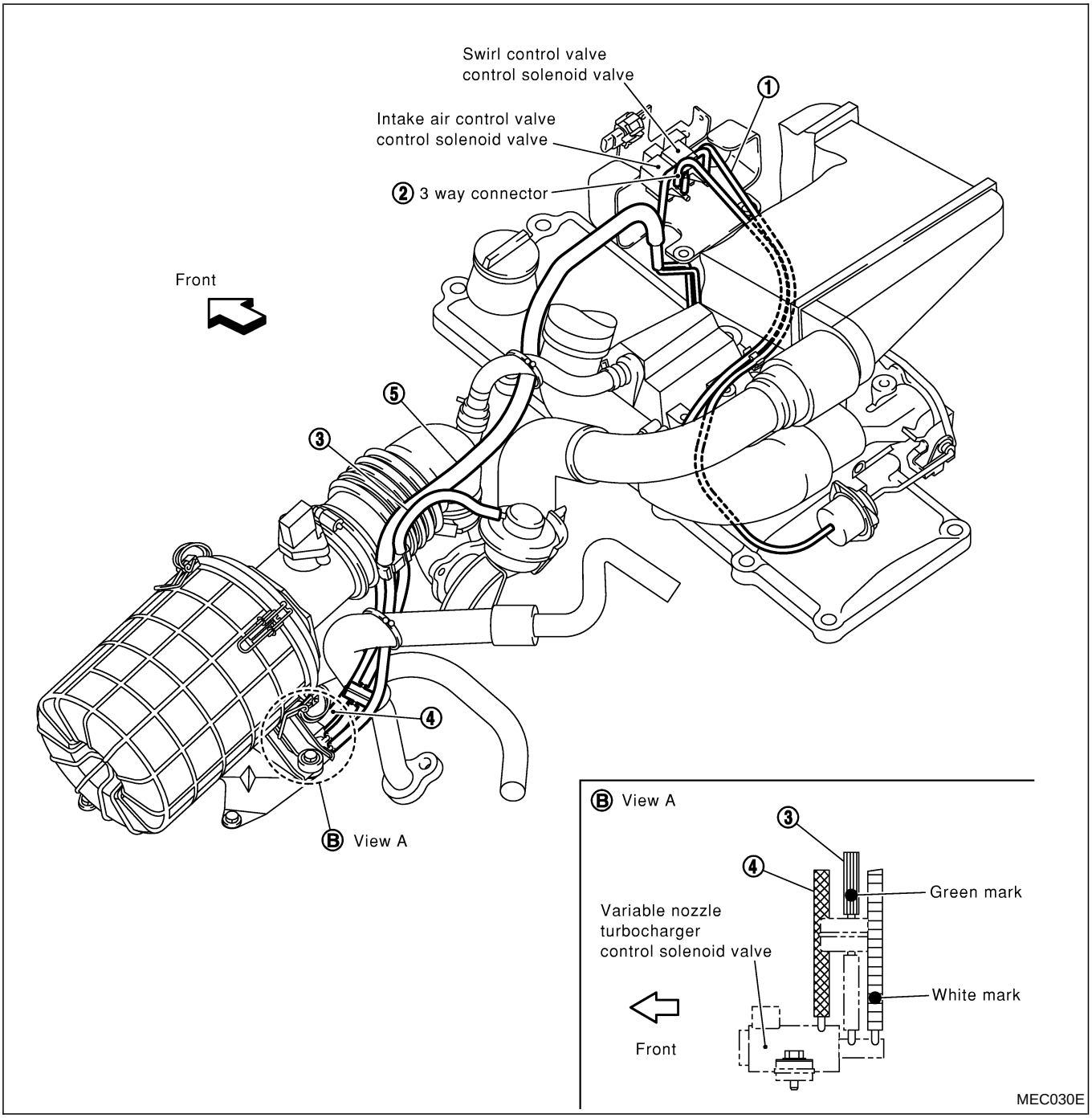
System Diagram



SEC390D

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Vacuum Hose Drawing



1. Swirl control valve control solenoid valve to swirl control valve actuator
2. Intake air control valve control solenoid valve to intake air control valve actuator
3. Variable nozzle turbocharger control actuator to vacuum damper
4. Variable nozzle turbocharger control solenoid valve to resonator
5. Variable nozzle turbocharger control solenoid valve to vacuum pump

Refer to “System Diagram”, EC-17 for vacuum control system.

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System Chart

Input (Sensor)	ECM Function	Output (Actuator)
● Electronic control fuel injection pump ● Crankshaft position sensor (TDC) ● Engine coolant temperature sensor ● Accelerator position sensor ● Accelerator position switch ● Accelerator switch (F/C) ● Park/Neutral position (PNP) switch ● Ignition switch ● Battery voltage ● Vehicle speed sensor ● Air conditioner switch ● Mass air flow sensor ● Stop lamp switch ● Heat up switch ● Charge air pressure sensor*1	Fuel injection control	Electronic control fuel injection pump
	Fuel injection timing control	Electronic control fuel injection pump
	Fuel cut control	Electronic control fuel injection pump
	Glow control system	Glow relay & glow lamp
	On board diagnostic system	MI (On the instrument panel)
	EGR volume control	EGR volume control valve
	Cooling fan control	Cooling fan relay
	Air conditioning cut control	Air conditioner relay
	Variable nozzle turbocharger control	Variable nozzle turbocharger control solenoid valve
	Swirl control valve control	Swirl control valve control solenoid valve
	Intake air control valve control	Intake air control valve control solenoid valve

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

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Fuel Injection Control System

DESCRIPTION

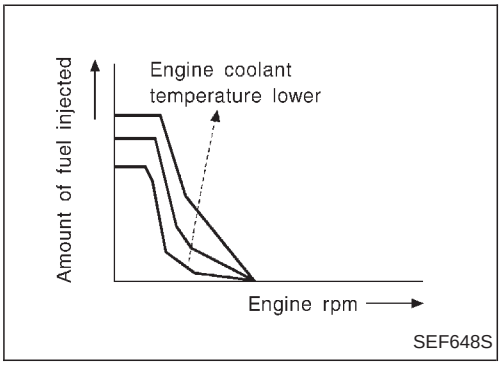
System description

Three types of fuel injection control are provided to accommodate engine operating conditions; normal control, idle control and start control. The ECM determines the appropriate fuel injection control. Under each control, the amount of fuel injected is compensated to improve engine performance.
Pulse signals are exchanged between ECM and electronic control fuel injection pump (control unit is built-in). The fuel injection pump control unit performs duty control on the spill valve (built into the fuel injection pump) according to the input signals to compensate the amount of fuel injected to the preset value.

Start control

Input/output signal chart

Sensor	Input Signal to ECM	ECM Function	Actuator
Engine coolant temperature sensor	Engine coolant temperature	Fuel injection control (start control)	Electronic control fuel injection pump
Crankshaft position sensor (TDC)	Engine speed		
Ignition switch	Start signal		



When the ECM receives a start signal from the ignition switch, the ECM adapts the fuel injection system for the start control. The amount of fuel injected at engine starting is a preset program value in the ECM. The program is determined by the engine speed and engine coolant temperature.
For better startability under cool engine conditions, the lower the coolant temperature becomes, the greater the amount of fuel injected. The ECM ends the start control when the engine speed reaches the specific value, and shifts the control to the normal or idle control.

Idle control

Input/output signal chart

Sensor	Input Signal to ECM	ECM Function	Actuator
Engine coolant temperature sensor	Engine coolant temperature	Fuel injection control (Idle control)	Electronic control fuel injection pump
Crankshaft position sensor (TDC)	Engine speed		
Park/Neutral position (PNP) switch	Gear position		
Battery	Battery voltage		
Accelerator position switch	Idle position		
Vehicle speed sensor	Vehicle speed		
Air conditioner switch	Air conditioner signal		
Heat up switch	Heat up switch signal		

When the ECM determines that the engine speed is at idle, the fuel injection system is adapted for the idle control. The ECM regulates the amount of fuel injected corresponding to changes in load applied to the engine to keep engine speed constant. The ECM also provides the system with a fast idle control in response to the engine coolant temperature and heat up switch signal.

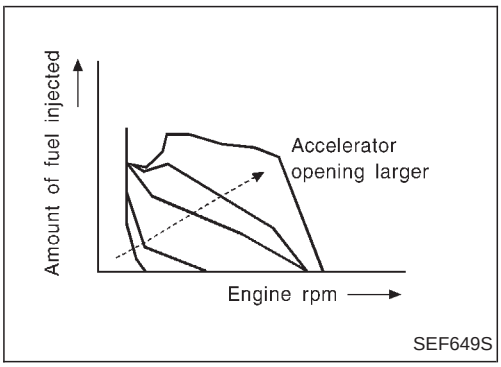
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Fuel Injection Control System (Cont'd)

Normal control

Input/output signal chart

Sensor	Input Signal to ECM	ECM Function	Actuator
Crankshaft position sensor (TDC)	Engine speed	Fuel injection control (Normal control)	Electronic control fuel injection pump
Accelerator position sensor	Accelerator position		
Vehicle speed sensor	Vehicle speed		



The amount of fuel injected under normal driving conditions is determined according to sensor signals. The crankshaft position sensor (TDC) detects engine speed and the accelerator position sensor detects accelerator position. These sensors send signals to the ECM.
The fuel injection data, predetermined by correlation between various engine speeds and accelerator positions, are stored in the ECM memory, forming a map. The ECM determines the optimal amount of fuel to be injected using the sensor signals in comparison with the map.

Maximum amount control

Input/output signal chart

Sensor	Input Signal to ECM	ECM Function	Actuator
Mass air flow sensor	Amount of intake air	Fuel injection control (Maximum amount control)	Electronic control fuel injection pump
Engine coolant temperature sensor	Engine coolant temperature		
Crankshaft position sensor (TDC)	Engine speed		
Accelerator position sensor	Accelerator position		

The maximum injection amount is controlled to an optimum by the engine speed, intake air amount, engine coolant temperature, and accelerator opening in accordance with the driving conditions.
This prevents the oversupply of the injection amount caused by decreased air density at a high altitude or during a system failure.

Deceleration control

Input/output signal chart

Sensor	Input Signal to ECM	ECM Function	Actuator
Accelerator switch (F/C)	Accelerator position	Fuel injection control (Deceleration control)	Electronic control fuel injection pump
Crankshaft position sensor (TDC)	Engine speed		

The ECM sends a fuel cut signal to the electronic control fuel injection pump during deceleration for better fuel efficiency. The ECM determines the time of deceleration according to signals from the accelerator switch (F/C) and crankshaft position sensor (TDC).

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Fuel Injection Timing Control System

DESCRIPTION

The target fuel injection timing in accordance with the engine speed and the fuel injection amount are recorded as a map in the ECM beforehand. The ECM and the injection pump control unit exchange signals and perform feedback control for optimum injection timing in accordance with the map.

Air Conditioning Cut Control

DESCRIPTION

Input/output signal chart

Sensor	Input Signal to ECM	ECM Function	Actuator
Air conditioner switch	Air conditioner “ON” signal	Air conditioner cut control	Air conditioner relay
Accelerator position sensor	Accelerator valve opening angle		
Vehicle speed sensor	Vehicle speed		
Engine coolant temperature sensor	Engine coolant temperature		

System description

This system improves acceleration when the air conditioner is used.
When the accelerator pedal is fully depressed, the air conditioner is turned off for a few seconds.
When engine coolant temperature becomes excessively high, the air conditioner is turned off. This continues until the engine coolant temperature returns to normal.

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

DESCRIPTION

Input/output signal chart

Sensor	Input Signal to ECM	ECM Function	Actuator
Vehicle speed sensor	Vehicle speed	Fuel cut control	Electronic control fuel injection pump
Park/Neutral position (PNP) switch	Neutral position		
Accelerator position switch or Accelerator switch (F/C)	Accelerator position		
Engine coolant temperature sensor	Engine coolant temperature		
Crankshaft position sensor (TDC)	Engine speed		

If the engine speed is above 2,700 rpm with no load (for example, in neutral and engine speed over 2,700 rpm) fuel will be cut off after some time. The exact time when the fuel is cut off varies based on engine speed. Fuel cut will operate until the engine speed reaches 1,500 rpm, then fuel cut is cancelled.

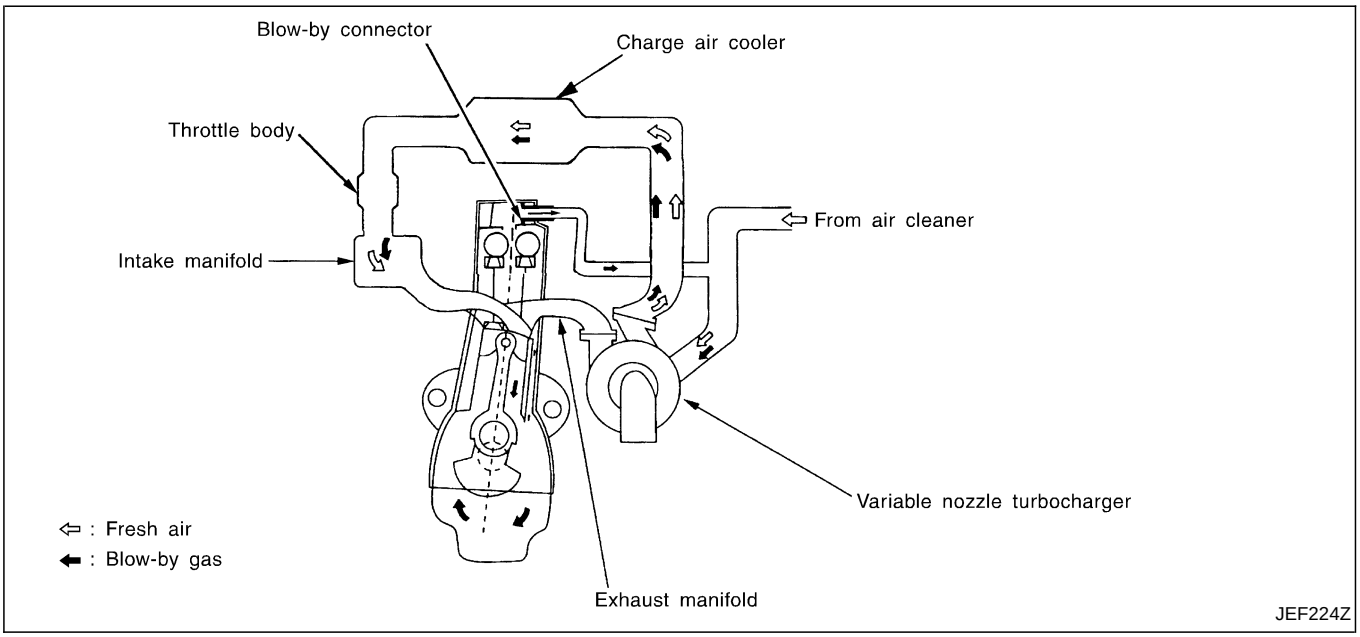
NOTE:
This function is different from deceleration control listed under “Fuel Injection Control System”, EC-20.

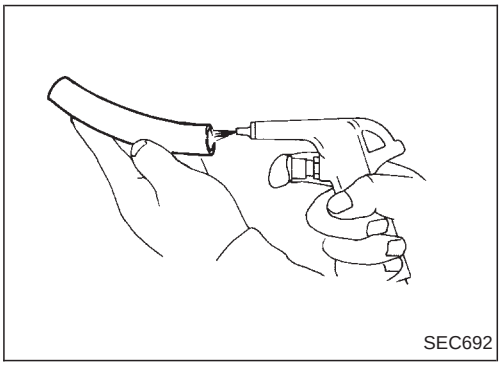
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Crankcase Ventilation System

DESCRIPTION

In this system, blow-by gas is sucked into the air inlet pipe after oil separation by oil separator in the rocker cover.





INSPECTION

Ventilation hose

1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air. If any hose cannot be freed of obstructions, replace.

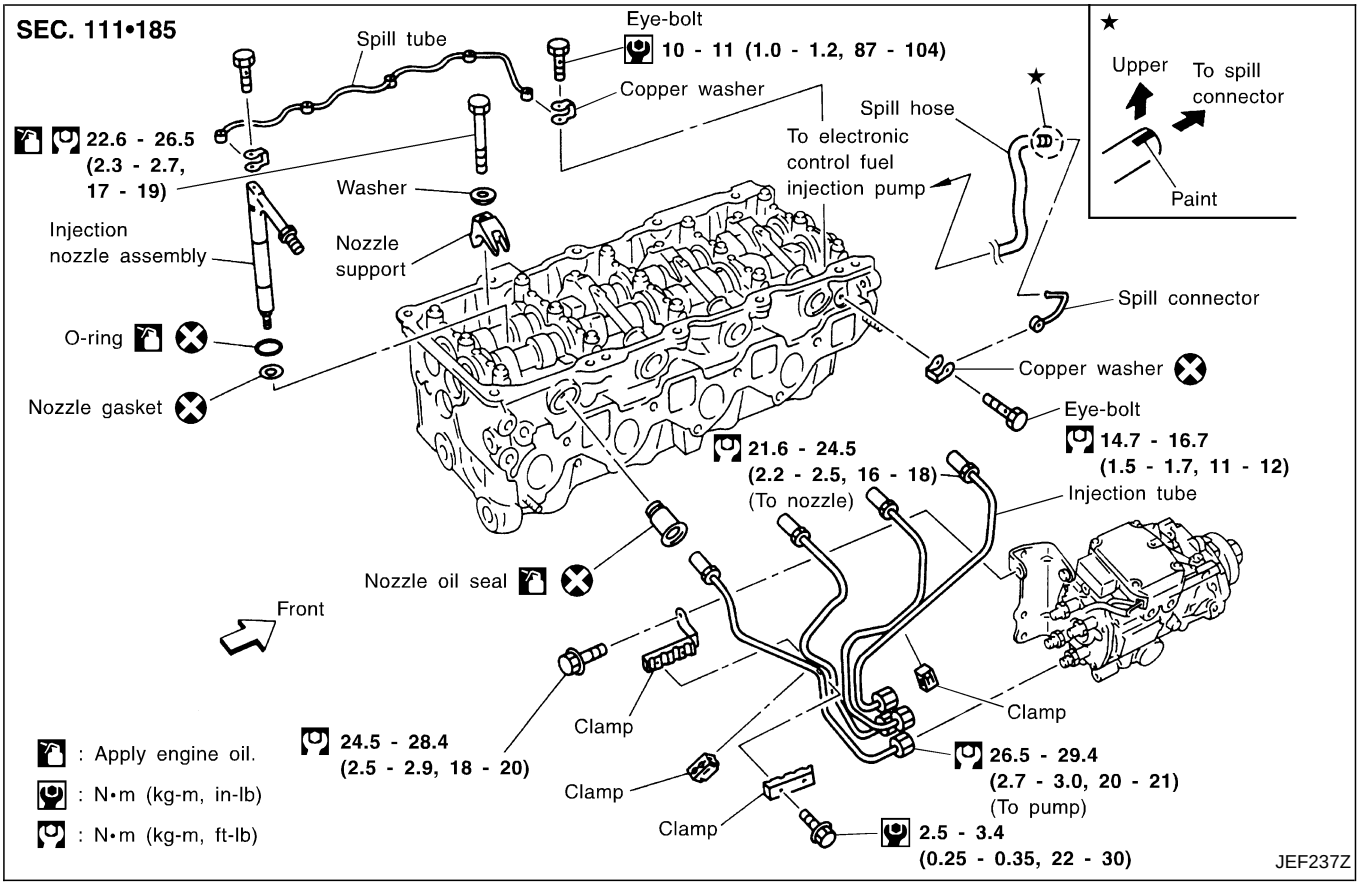
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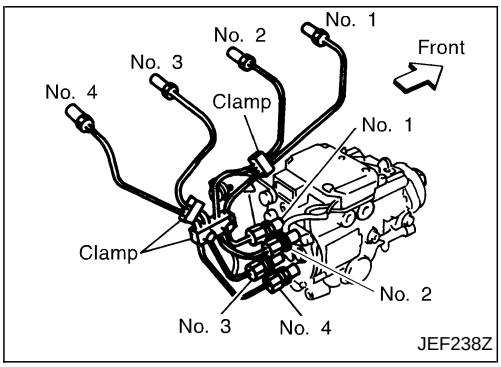
Injection Tube and Injection Nozzle

REMOVAL AND INSTALLATION

CAUTION:

- **Do not disassemble injection nozzle assembly. If NG, replace injection nozzle assembly.**
- **Plug flare nut with a cap or rag so that no dust enters the nozzle. Cover nozzle tip for protection of needle.**





Injection tube

Removal

1. Mark the cylinder Nos. to the injection tubes, then disconnect them.

- **Marking should be made at proper locations and by the proper method, so that they are not erased by fuel, etc.**

2. Remove the clamps, then disconnect the tubes one by one.

- **Avoid letting leaked fuel get on the interior walls of the engine compartment.**

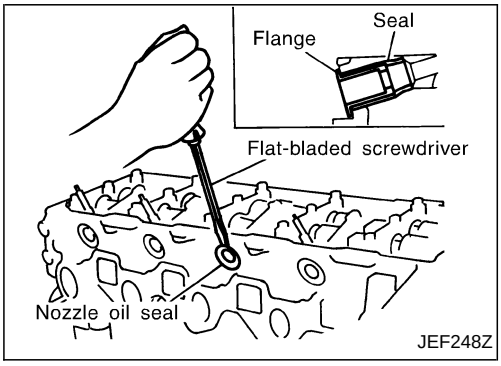
Take special care to prevent fuel from getting on the engine mount insulator.

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Injection Tube and Injection Nozzle (Cont'd)

Installation

- Install the injection tubes, referring to the markings made during removal.
- Install the injection tubes in the order of No. 3, No. 4, No. 1, and No. 2.



Injection nozzle oil seal

Removal

Using a tool such as a flat-bladed screwdriver, pry the flange of the seal, then remove it.

Installation

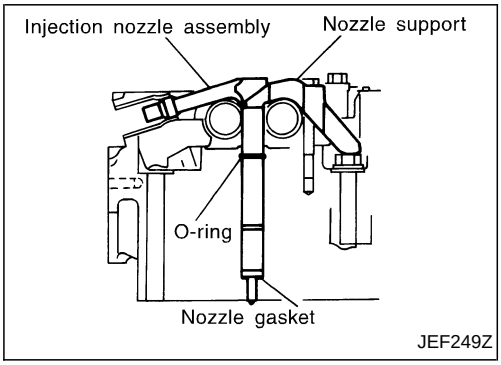
After the injection nozzle assembly is installed, push the seal from the cylinder head side until it contacts the flange.

- **Replace the oil seal with new one when the injection nozzle assembly is removed. (It is not necessary to replace the oil seal when only injection tubes are removed.)**

Spill tube

Installation

- **After the spill tube is installed, check the airtightness of the spill tube.**
- After the bolts are tightened, the joint of the spill tube gasket might be broken. However, this will not affect function.



Injection nozzle assembly

Removal

1. Remove the nozzle support, then pull out the injection nozzle assembly by turning it clockwise/counterclockwise.
2. Using a tool such as a flat-head screwdriver, remove the copper washer inside the cylinder head.

CAUTION:

Do not disassemble the injection nozzle.

Installation

1. Insert the nozzle gasket to the cylinder head hole.
2. Attach the O-ring to the mounting groove of the nozzle side, then insert it in the cylinder head.

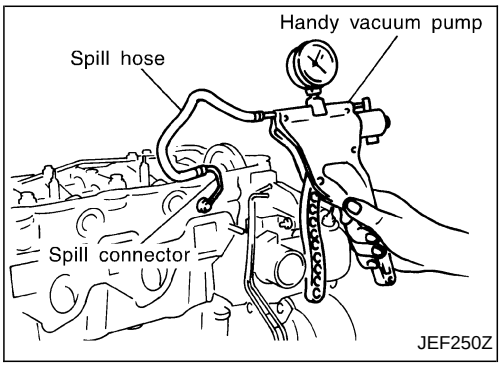
TEST AND ADJUSTMENT

WARNING:

When using nozzle tester, be careful not to allow diesel fuel sprayed from nozzle to contact your hands or body, and make sure your eyes are properly protected with goggles.

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Injection Tube and Injection Nozzle (Cont'd)



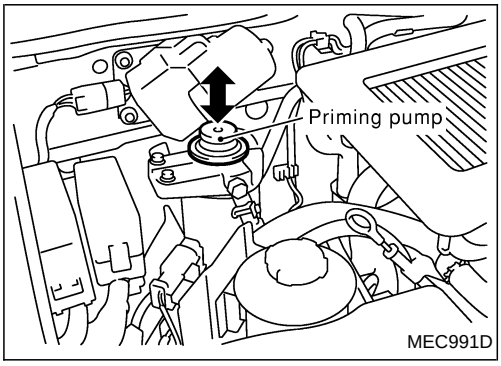
Inspection for spill tube airtightness

Before the rocker cover is installed, perform the inspection as follows.

1. Connect the handy vacuum pump to the spill hose.
2. Check that the airtightness is maintained after the negative pressure shown below is applied.

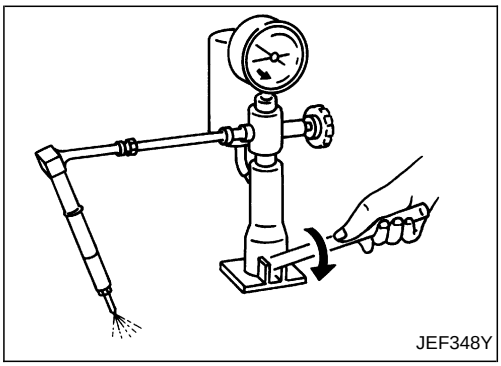
Standard:

−53.3 to −66.7 kPa (−533 to −667 mbar, −400 to −500 mmHg, −15.75 to −19.69 inHg)



Air bleeding of fuel piping

After the repair, bleed air in the piping by pumping the priming pump up and down until it becomes heavy.



Injection pressure test

1. Install injection nozzle assembly to injection nozzle tester and bleed air from flare nut.
2. Pump the tester handle slowly (one time per second) and watch the pressure gauge.
3. Read the pressure gauge when the injection pressure just starts dropping.

Initial injection pressure:

Used

19,026 kPa (190.3 bar, 194 kg/cm^2, 2,759 psi)

New

19,516 - 20,497 kPa (195.2 - 205.0 bar, 199 - 209 kg/cm^2, 2,830 - 2,972 psi)

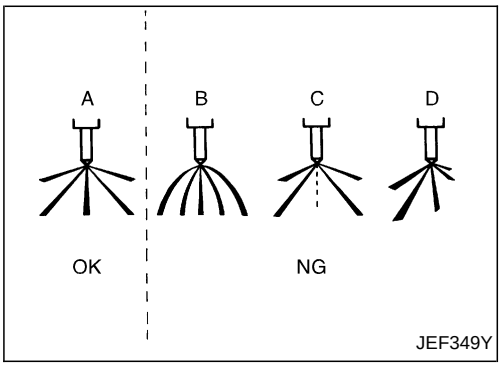
Limit

16,182 kPa (161.8 bar, 165 kg/cm^2, 2,346 psi)

- The injection nozzle assembly has a 2-stage pressure injection function. However, the judgement should be made at the first stage of the valve opening pressure.

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Injection Tube and Injection Nozzle (Cont'd)



Spray pattern test

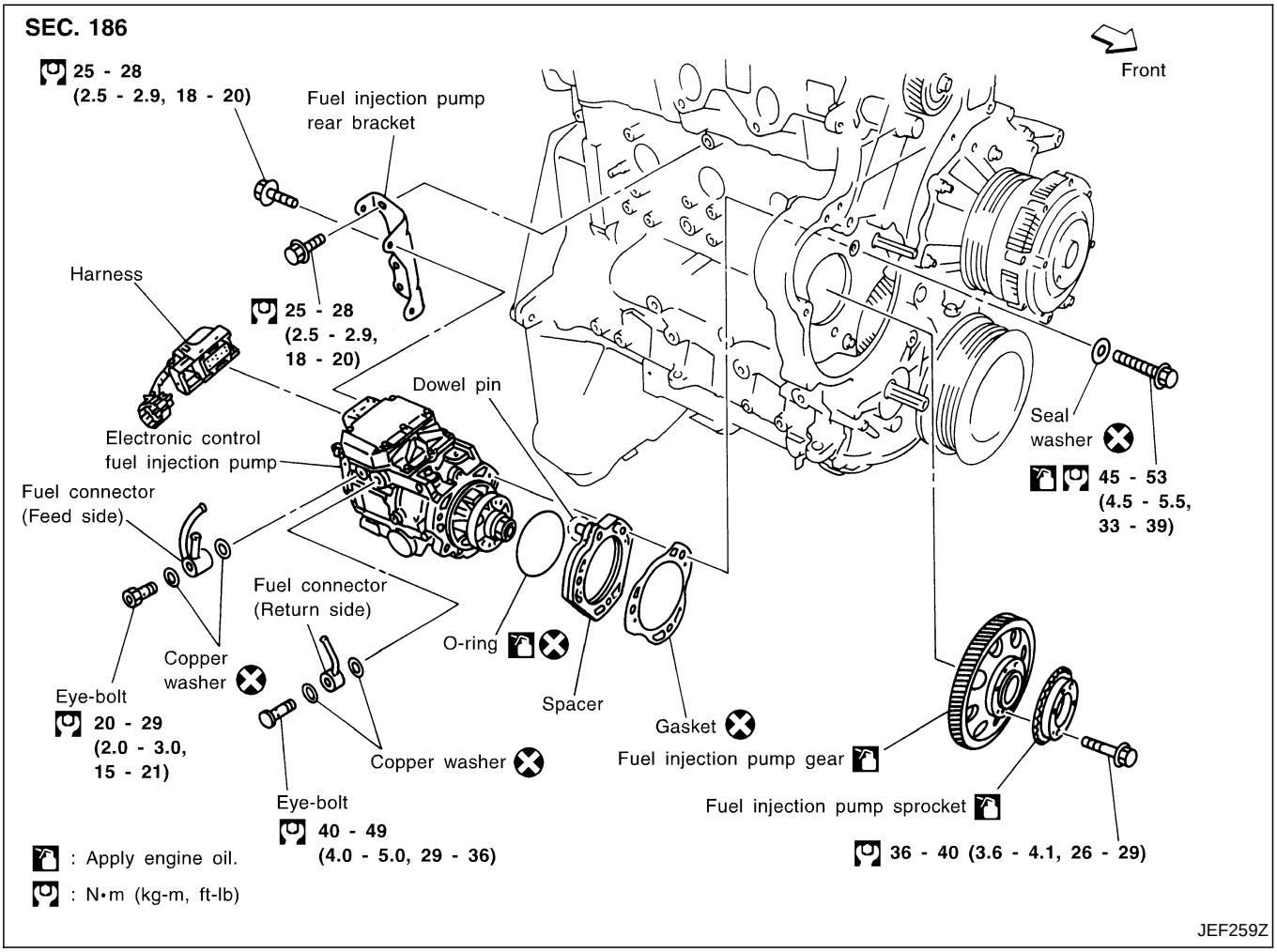
1. Check spray pattern by pumping tester handle one full stroke per second.
   NG spray pattern:
   Does not inject straight and strong (B in the figure).
   Fuel drips (C in the figure).
   Does not inject evenly (D in the figure).
2. If the spray pattern is not correct, replace injection nozzle assembly.

Electronic Control Fuel Injection Pump

REMOVAL AND INSTALLATION

CAUTION:

When removing or installing the timing chain as incidental work of the fuel injection pump removal/installation, always secure the internal mechanism of the idler gear with bolts before removing or installing the fuel injection pump sprocket. Do not refer to the procedure for "TIMING CHAIN" in EM section based on No. 1 cylinder compression top dead center. (Unless otherwise specified.)



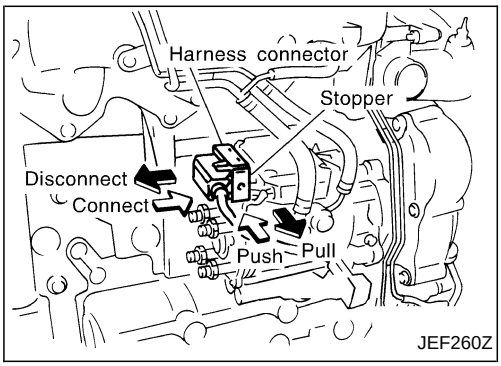
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Electronic Control Fuel Injection Pump (Cont'd)

REMOVAL

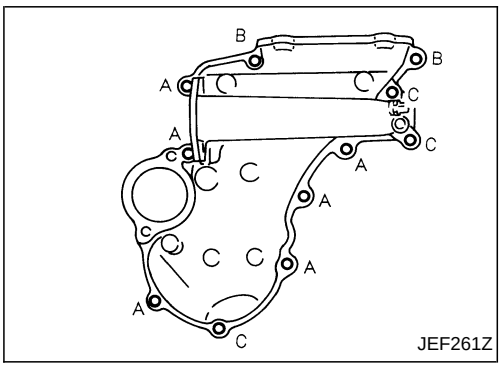
1. Remove the following:
- Engine coolant draining
- Charge air cooler
- Air inlet pipe
- Throttle body
- Rocker cover
- Oil level gauge guide
- EGR cooler
- EGR guide tube
- EGR volume control solenoid valve
- Fuel hose
- Injection tube
- Radiator upper hose
- Radiator shroud
- Cooling fan
- Drive belt
- Vacuum pipe
- Vacuum pump

2. Move the power steering pump.



3. Remove the harness connector from the fuel injection pump.
- After pulling the connector stopper all the way back, remove the connector.
- When the stopper is pulled all the way back, the interlocked-connector will come off.
  As for installation, when the connector is pushed all the way forward until the stopper locks, the interlocked-connector is inserted.

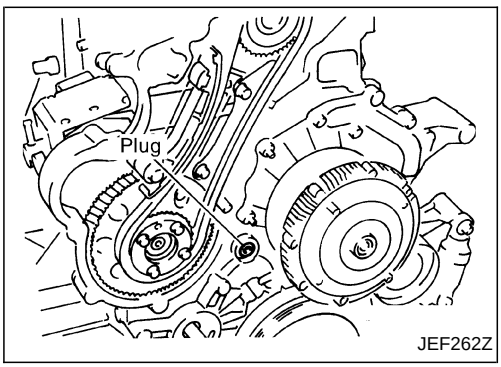
4. Remove the fuel injection pump rear bracket.



5. Remove the chain cover.
- Remove the installation bolts A, B, and C shown in the figure (left).

CAUTION:

During chain cover removal, seal the opening to prevent foreign objects from getting into the engine.



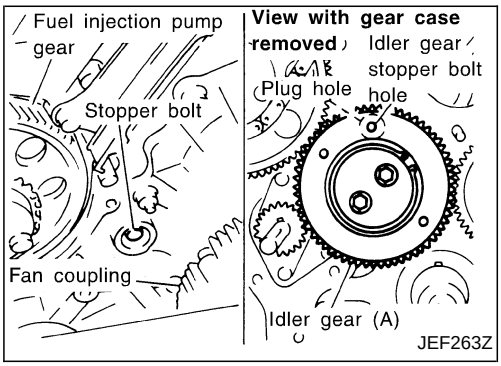
6. Fix the internal mechanism of the idler gear (scissors gear structure).

a. Remove the plug on the front side of the gear case.

b. While turning the crankshaft pulley clockwise, check the tightening bolt hole of the idler gear internal mechanism through the plug hole.
- Conduct the visual check using a mirror.
- When checking, note that there are 2 other holes (with no thread) beside the tightening bolt hole on the idler gear.

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Electronic Control Fuel Injection Pump (Cont'd)



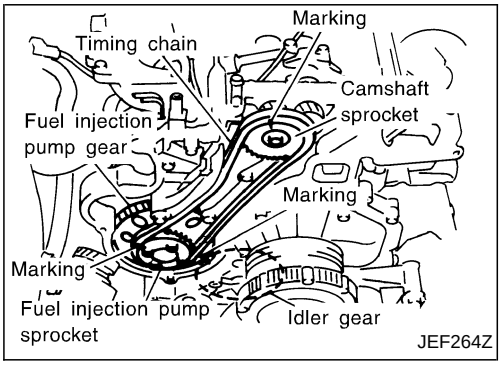
c. Install the tightening bolt [Part No.: 81-20620-28, thread diameter: M6, under head: 20 mm (0.79 in), pitch: 1.0 mm (0.039 in)] to the idler gear tightening bolt hole, and tighten to the specified torque:

: 2.5 - 3.4 N·m (0.25 - 0.35 kg-m, 22 - 30 in-lb)

CAUTION:

- **To protect the idler gear from damage, do not use the substitute part for the tightening bolt.**
- **Hereafter, do not turn the crankshaft to avoid hitting tightening bolt head against the gear case.**
- **Do not remove the idler gear tightening bolt before installations of the timing chain and related parts are completed.**

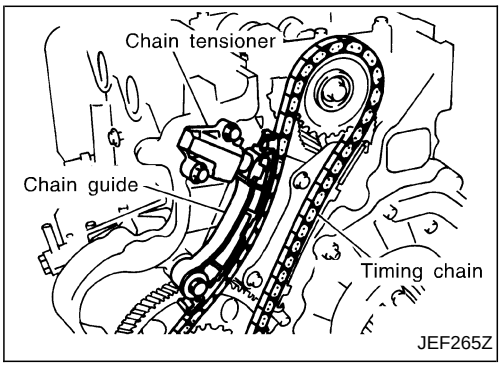
7. Make mating marks on the cam sprocket, fuel injection pump sprocket, and timing chain with paint.
8. Make mating marks on the fuel injection pump gear and idler gear with paint.



9. Remove the chain tensioner.

(1) Loosen the upper and lower installation bolts.
(2) While holding the chain tensioner by hand, remove the upper installation bolt to release the spring tension.
(3) Remove the lower installation bolt first, and then the chain tensioner.

- Since the chain tensioner does not have a mechanism to prevent the plunger pop-out, watch out for the fall of the plunger and spring. (Return prevention mechanism is available.)

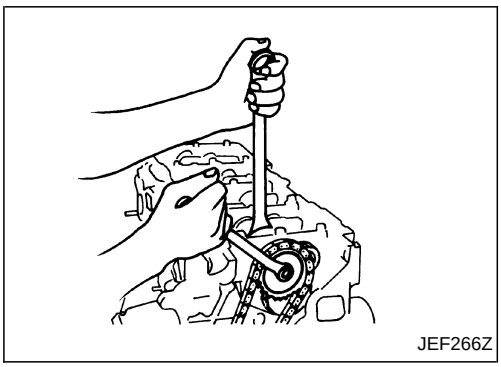


10. Remove the timing chain slack guide.
11. Remove the cam sprocket and timing chain at the same time.

- Make mating marks on each sprocket and timing chain.
- Hold the hexagon head of the camshaft on the exhaust manifold side, and loosen the cam sprocket installation bolt.

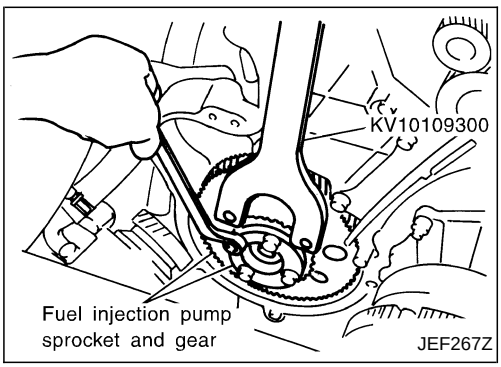
CAUTION:

Do not loosen the installation bolt using a chain tension.



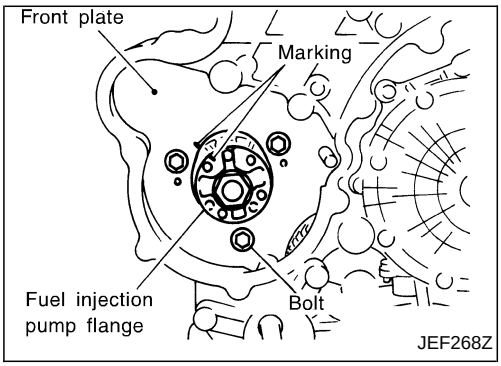
12. Remove the fuel injection pump sprocket and gear as an assembly.

- Fix the fuel injection pump gear with the pulley holder (SST), and loosen the installation bolt for removal.
- Try not to move the pump shaft when removing.
- Connect the sprocket and gear with a dowel pin, and tighten them together with the installation bolt.



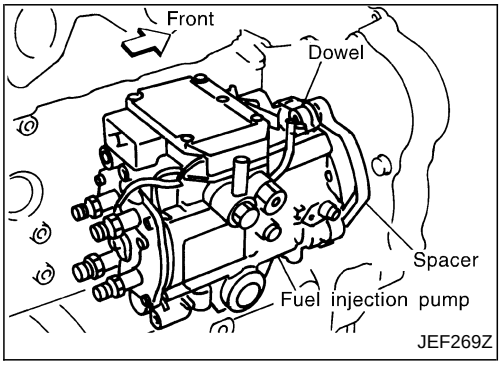
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Electronic Control Fuel Injection Pump (Cont'd)



13. Make the mating marks on the fuel injection pump flange and front plate with paint.
14. Remove installation bolts first, and then fuel injection pump toward the rear side of the engine.
- When the fuel injection pump is stationary, it can still be retained by the dowel without all bolts.

CAUTION:
Do not disassemble or adjust the fuel injection pump.

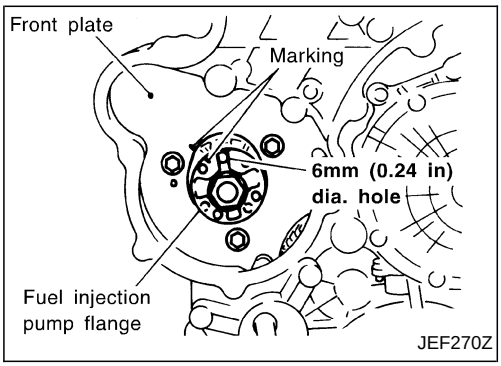


INSTALLATION

- The injection timing adjustment to correct the installation angle deviation is not necessary. Install the pump in the proper position according to the dowel and installation bolts.

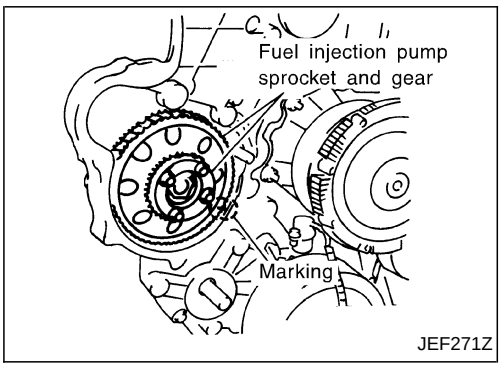
1. Install the fuel injection pump from the rear side of the engine.

- Match the dowel of the spacer to the dowel hole of the pump side for installation.
- Replace the seal washer of the installation bolt with a new one.



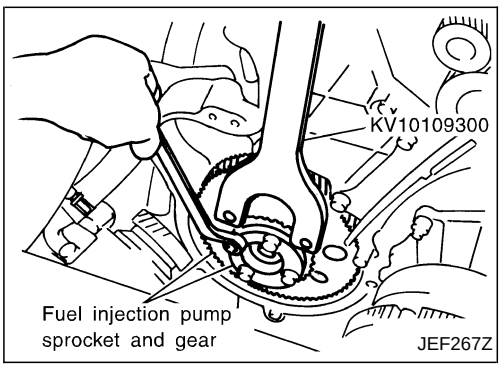
2. Align the mating marks of the fuel injection pump flange and front plate, and then adjust the approximate flange position.

- Each hole [6 mm (0.24 in) dia.] is used as a reference point for the fuel injection pump flange, fuel injection pump gear, and fuel injection pump sprocket.
- Only during removal/installation at No. 1 cylinder compression top dead center, can the hole [6 mm (0.24 in) dia.] of the pump body be aligned.



3. Install the fuel injection pump sprocket and gear as an assembly.

- Align the mating marks of the idler gear and fuel injection pump gear properly.



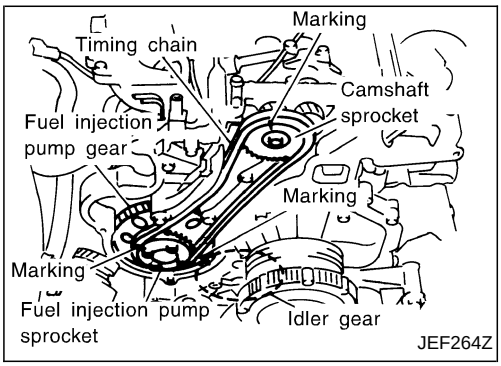
4. Tighten the installation bolt of the fuel injection pump sprocket.

- Fix the fuel injection pump gear with the pulley holder (SST), and tighten the installation bolt.

CAUTION:
Before tightening the installation bolt, check again that the mating marks of the idler gear and fuel injection pump gear are aligned.

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Electronic Control Fuel Injection Pump (Cont'd)

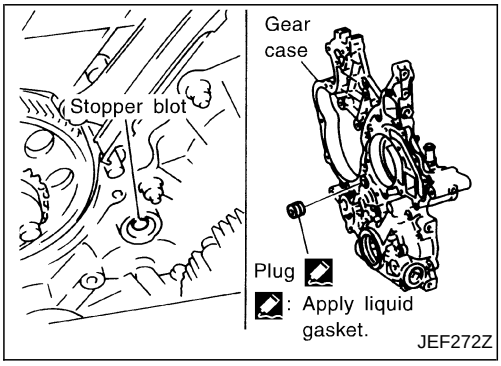


5. Install the cam sprocket and timing chain at the same time.
- Align the mating marks of the fuel injection pump sprocket and cam sprocket, and install the timing chain.
- Holding the hexagon head of the camshaft with a wrench, tighten the cam sprocket installation bolt.

CAUTION:

Do not tighten the installation bolt using a chain tension.

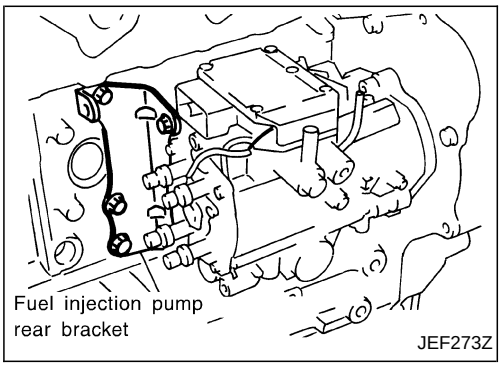
6. Install the timing chain, related parts, and the chain cover. Refer to EM section, "TIMING CHAIN".



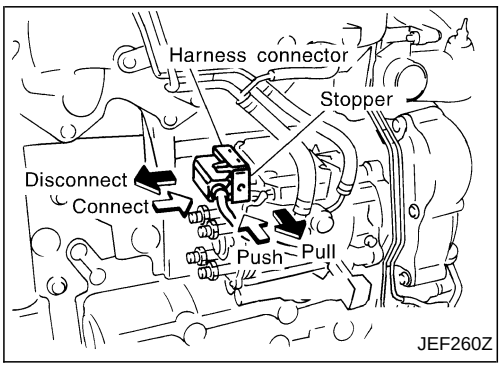
7. Remove the tightening bolt of the idler gear internal mechanism.
8. Apply the liquid gasket to the screw of the plug, and tighten the plug.

: 7.9 - 9.8 N·m (0.8 - 1.0 kg-m, 70 - 86 in-lb)

- Use Genuine Liquid Gasket or equivalent.



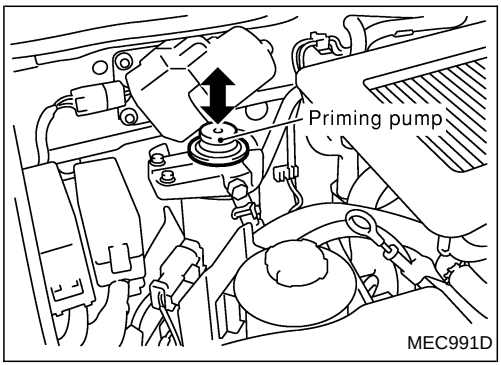
9. Install the fuel injection pump rear bracket.
- Tighten all the installation bolts temporarily, and then tighten them firmly with both surfaces of the fuel injection pump and cylinder block attached to the installation surface.



10. Connect the harness connector of the fuel injection pump.
- Insert the harness connector until the stopper is completely locked.
- When the connector is pushed fully to lock the stopper, the interlocked-connector is inserted.

11. Installation is in the reverse order of removal.

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Air Bleeding

Pump the priming pump to bleed air.

- **When air is bled completely, the pumping of the priming pump suddenly becomes heavy. Stop operation at that time.**
- **If it is difficult to bleed air by the pumping of the priming pump (the pumping of the priming pump does not become heavy), disconnect the fuel supply hose between the fuel filter and the injection pump. Then, perform the operation described above, and make sure that fuel comes out. (Use a pan, etc. so as not to spill fuel. Do not let fuel get on engine and other parts.) After that, connect the hose, and then bleed air again.**

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DTC and MI Detection Logic

When a malfunction is detected, the malfunction (DTC) is stored in the ECM memory.
The MI will light up each time the ECM detects malfunction. For diagnostic items causing the MI to light up, refer to “TROUBLE DIAGNOSIS — INDEX”, EC-7.

Diagnostic Trouble Code (DTC)

HOW TO READ DTC

The DTC can be read by the following methods.

Without CONSULT-II

ECM displays the DTC by a set of four digit numbers with MI illumination in the diagnostic test mode II (Self-diagnostic results). Example: 0102, 0407, 1004, etc.

With CONSULT-II

CONSULT-II displays the DTC in “SELF-DIAG RESULTS” mode. Examples: “CRANK POS SEN (TDC)”, etc.

- **Output of the trouble code means that the indicated circuit has a malfunction. However, in the Mode II it does not indicate whether the malfunction is still occurring or occurred in the past and returned to normal.**
  CONSULT-II can identify them. Therefore, using CONSULT-II (if available) is recommended.

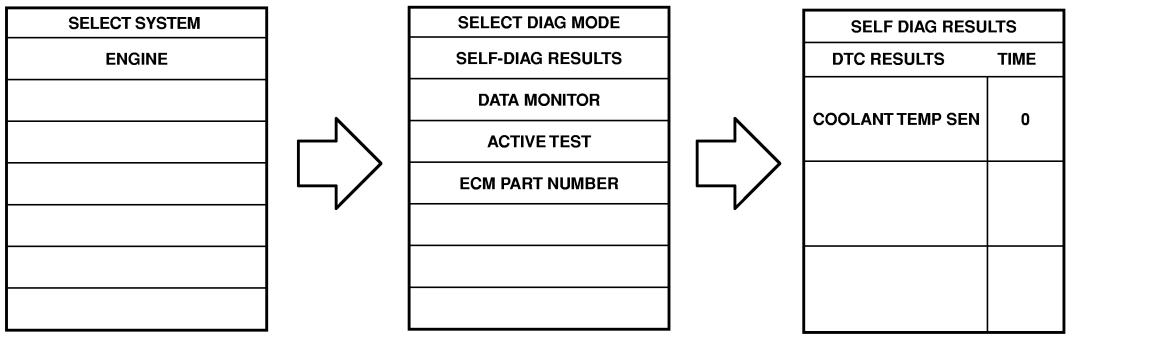
HOW TO ERASE DTC

How to erase DTC (With CONSULT-II)

1. If the ignition switch stays “ON” after repair work, be sure to turn ignition switch “OFF” once. Wait at least 5 seconds and then turn it “ON” (engine stopped) again.
2. Touch “ENGINE”.
3. Touch “SELF-DIAG RESULTS”.
4. Touch “ERASE”. (The DTC in the ECM will be erased.)

How to erase DTC (With CONSULT-II)

1. If the ignition switch stays “ON” after repair work, be sure to turn ignition switch “OFF” once. Wait at least 5 seconds and then turn it “ON” again.



2. Turn CONSULT-II “ON” and touch “ENGINE”.
3. Touch “SELF-DIAG RESULTS”.
4. Touch “ERASE”. (The DTC in the ECM will be erased.)

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The emission related diagnostic information in the ECM can be erased by selecting “ERASE” in the “SELF-DIAG RESULTS” mode with CONSULT-II.

How to erase DTC (Without CONSULT-II)

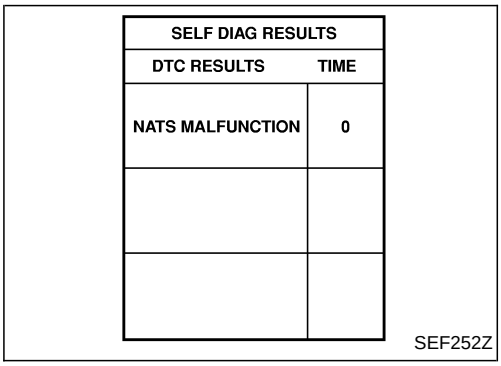
1. If the ignition switch stays “ON” after repair work, be sure to turn ignition switch “OFF” once. Wait at least 5 seconds and then turn it “ON” (engine stopped) again.
2. Change the diagnostic test mode from Mode II to Mode I by using the data link connector. (See EC-36.)

The emission related diagnostic information in the ECM can be erased by changing the diagnostic test mode.

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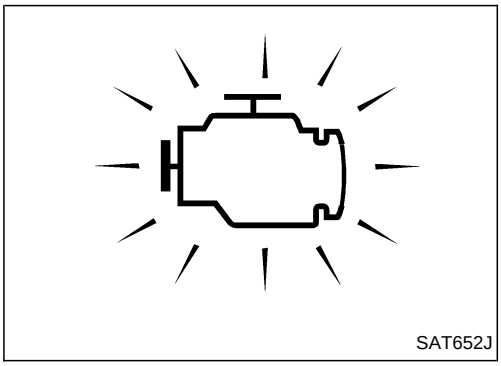
Diagnostic Trouble Code (DTC) (Cont'd)

- **If the battery is disconnected, the emission-related diagnostic information will be lost after approx. 24 hours.**
- **Erasing the emission-related diagnostic information using CONSULT-II is easier and quicker than switching the diagnostic test mode using the data link connector.**



NATS (Nissan Anti-Theft System)

- **If the security indicator lights up with the ignition switch in the "ON" position or "NATS MALFUNCTION" is displayed on "SELF-DIAG RESULTS" screen, perform self-diagnostic results mode with CONSULT-II using NATS program card. Refer to "NATS (Nissan Anti-Theft System)" in EL section.**
- **Confirm no self-diagnostic results of NATS is displayed before touching "ERASE" in "SELF-DIAG RESULTS" mode with CONSULT-II.**
- **When replacing ECM, initialization of NATS system and registration of all NATS ignition key IDs must be carried out with CONSULT-II using NATS program card.**
  Therefore, be sure to receive all keys from vehicle owner.
  Regarding the procedures of NATS initialization and NATS ignition key ID registration, refer to CONSULT-II operation manual, NATS.



Malfunction Indicator (MI)

DESCRIPTION

The MI is located on the instrument panel.

1. The MI will light up when the ignition switch is turned ON without the engine running. This is a bulb check.
   - If the MI does not light up, refer to EL section ("WARNING LAMPS AND CHIME") or see EC-310.
2. When the engine is started, the MI should go off.
   If the MI remains on, the on board diagnostic system has detected an engine system malfunction.

If MI illuminates or blinks irregularly after starting engine, water may have accumulated in fuel filter. Drain water from fuel filter. Refer to MA section.

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Malfunction Indicator (MI) (Cont'd)

On board diagnostic system function

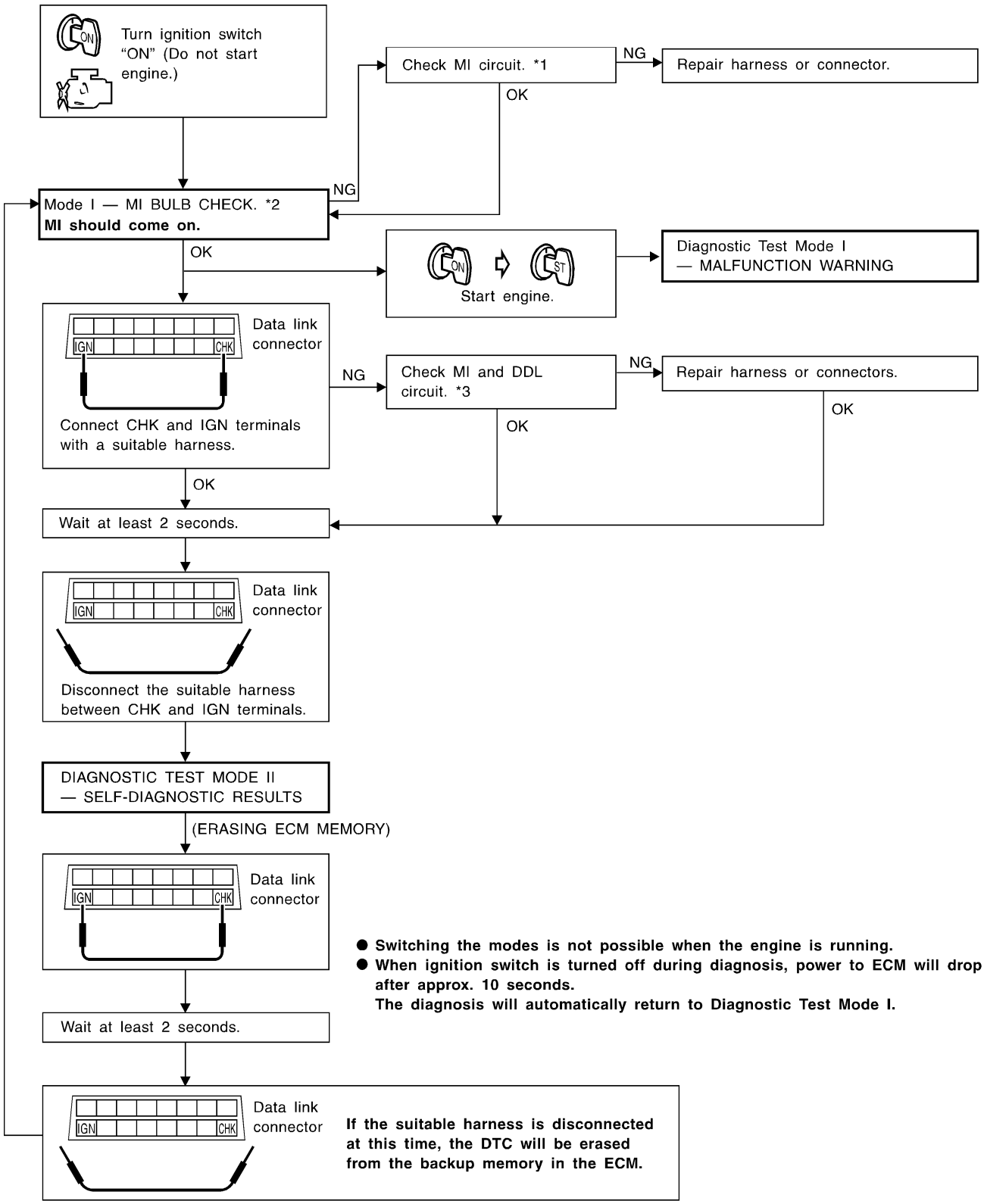
The on board diagnostic system has the following three functions.

Diagnostic Test Mode	KEY and ENG. Status	Function	Explanation of Function
Mode I	Ignition switch in ON position  Engine stopped 	BULB CHECK	This function checks the MI bulb for damage (blown, open circuit, etc.). If the MI does not come on, check MI circuit. (See EC-310.)
	Engine running 	MALFUNCTION WARNING	This is a usual driving condition. When ECM detects a malfunction, the MI will light up to inform the driver that a malfunction has been detected.
Mode II	Ignition switch in ON position  Engine stopped 	SELF-DIAGNOSTIC RESULTS	This function allows DTCs to be read.

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Malfunction Indicator (MI) (Cont'd)

How to switch diagnostic test modes



- **Switching the modes is not possible when the engine is running.**
- **When ignition switch is turned off during diagnosis, power to ECM will drop after approx. 10 seconds.**
  The diagnosis will automatically return to Diagnostic Test Mode I.

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*1: EC-310 *2: EC-35 *3: EC-310

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Malfunction Indicator (MI) (Cont'd)

Diagnostic test mode I — Bulb check

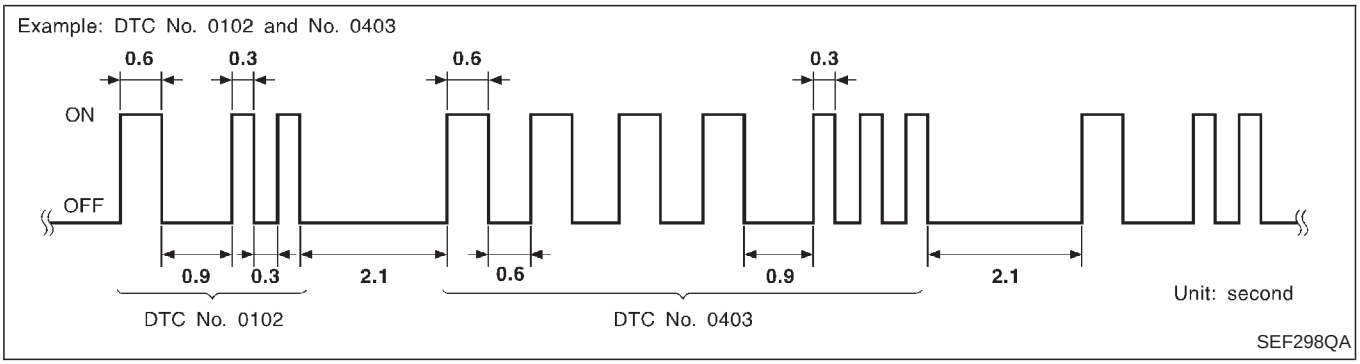
In this mode, the MI on the instrument panel should stay ON. If it remains OFF, check the bulb. Refer to EL section, "WARNING LAMPS AND CHIME" or see EC-310.

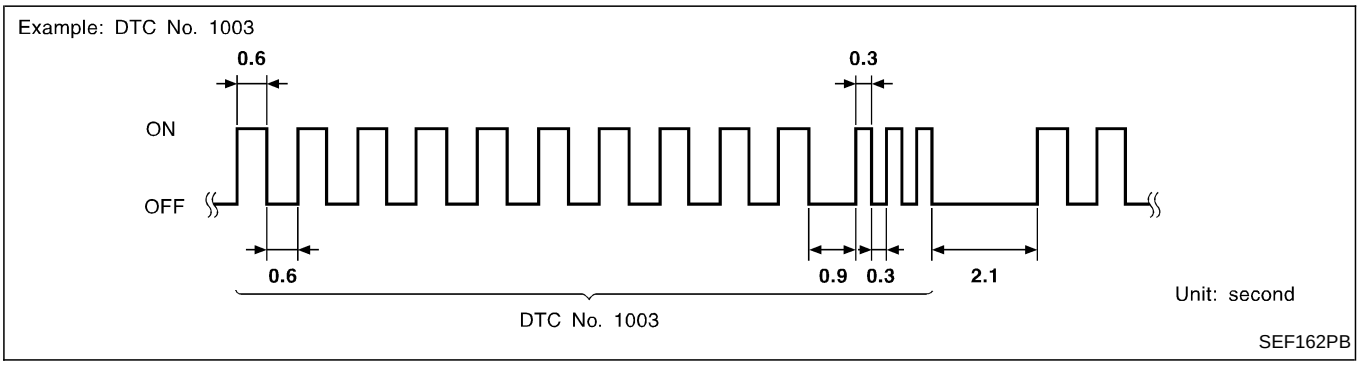
Diagnostic test mode I — Malfunction warning

MI	Condition
ON	When the malfunction is detected or the ECM's CPU is malfunctioning.
OFF	No malfunction.

Diagnostic test mode II — Self-diagnostic results

In this mode, DTC is indicated by the number of blinks of the MI as shown below.





Long (0.6 second) blinking indicates the two LH digits of number and short (0.3 second) blinking indicates the two RH digits of number. For example, the MI blinks 10 times for 6 seconds (0.6 sec x 10 times) and then it blinks three times for about 1 second (0.3 sec x 3 times). This indicates the DTC "1003".
In this way, all the detected malfunctions are classified by their DTC numbers. The DTC "0505" refers to no malfunction. (See TROUBLE DIAGNOSIS — INDEX, EC-7.)

How to erase diagnostic test mode II (Self-diagnostic results)

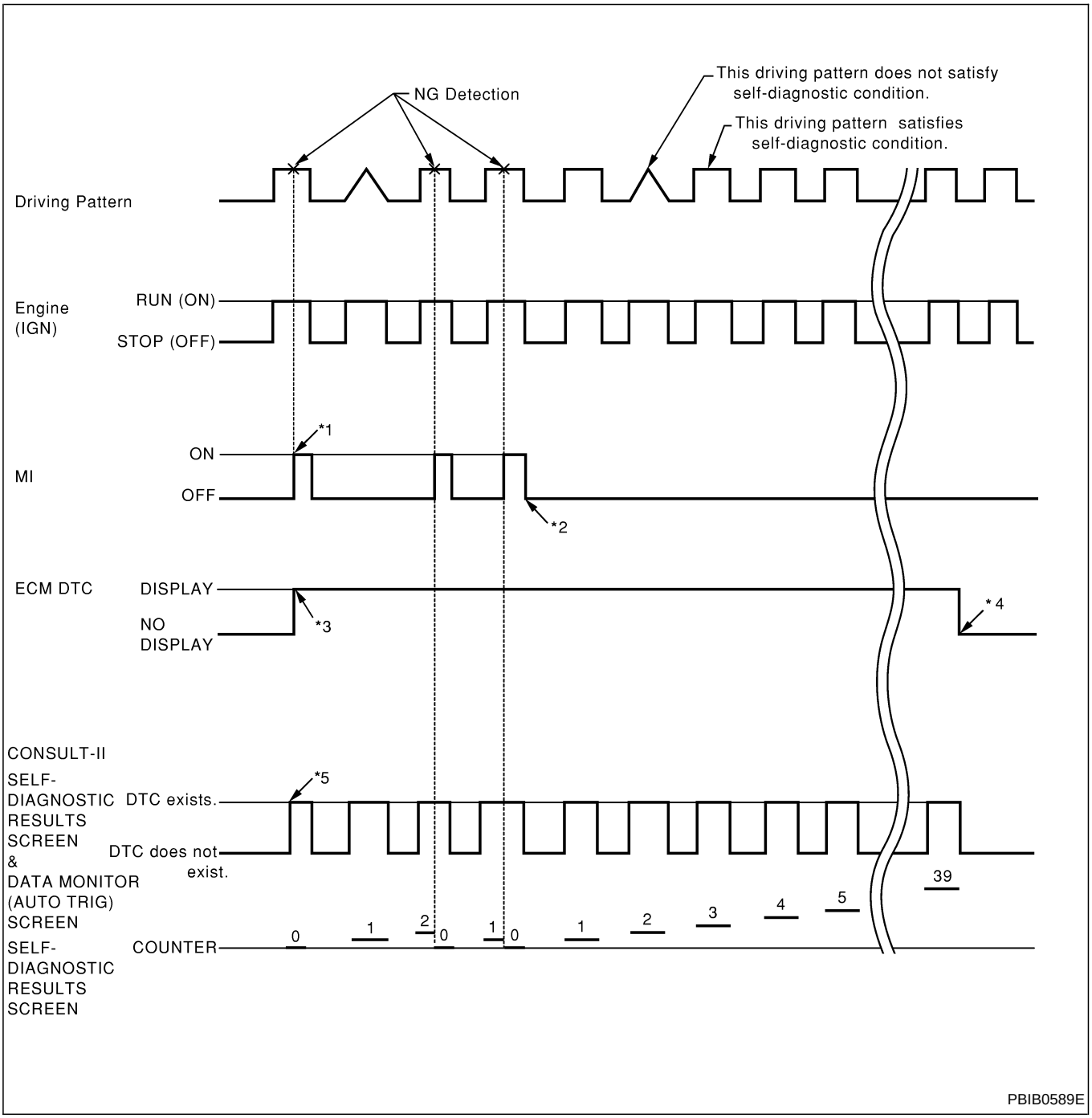
The DTC can be erased from the backup memory in the ECM when the diagnostic test mode is changed from Diagnostic Test Mode II to Diagnostic Test Mode I. (Refer to "How to Switch Diagnostic Test Modes", EC-36.)

- **If the battery terminal is disconnected, the DTC will be lost from the backup memory within 24 hours.**
- **Be careful not to erase the stored memory before starting trouble diagnoses.**

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Malfunction Indicator (MI) (Cont'd)

Relationship between MI, DTC, CONSULT-II and driving patterns



*1: When a malfunction is detected, MI will light up.

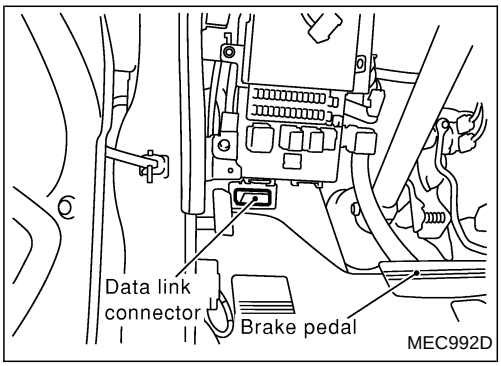
*2: MI will not light up after ignition switch is turned OFF.

*3: When a malfunction is detected for the first time, the DTC will be stored in ECM.

*4: The DTC will not be displayed any longer after vehicle is driven 40 times without the same malfunction. (The DTC still remain in ECM.)

*5: Other screens except SELF-DIAGNOSTIC RESULTS & DATA MONITOR (AUTO TRIG) cannot display the malfunction. DATA MONITOR (AUTO TRIG) can display the malfunction at the moment it is detected.

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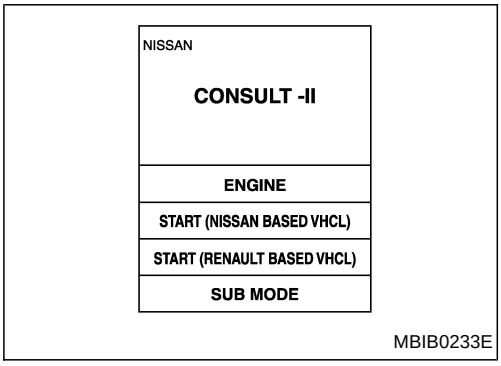


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CONSULT-II

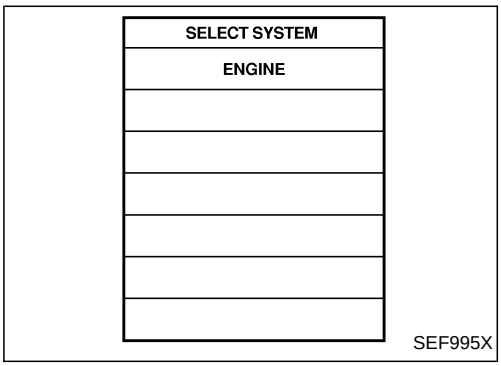
CONSULT-II INSPECTION PROCEDURE

1. Turn ignition switch OFF.
2. Connect CONSULT-II to data link connector, which is located under the driver side dash panel.
3. Turn ignition switch ON.



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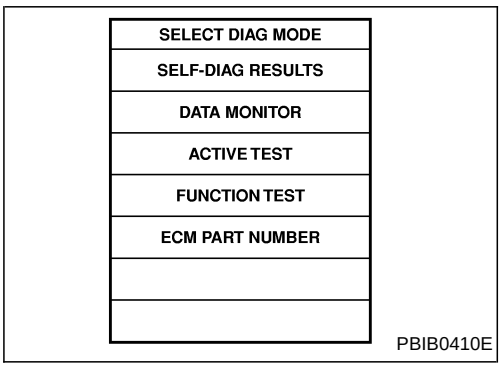
4. Touch “START (NISSAN BASED VHCL)”.



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5. Touch “ENGINE”.

If “ENGINE” is not indicated, go to GI section, “CONSULT-II Data Link Connector (DLC) Circuit”.



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6. Perform each diagnostic test mode according to each service procedure.

For further information, see the CONSULT-II Operation Manual.

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CONSULT-II (Cont'd)

ENGINE CONTROL COMPONENT PARTS/CONTROL SYSTEMS APPLICATION

Item			DIAGNOSTIC TEST MODE		
			SELF-DIAG RESULTS	DATA MONITOR	ACTIVE TEST
ENGINE CONTROL COMPONENT PARTS	INPUT	Engine coolant temperature sensor	X	X	
		Vehicle speed sensor	X	X	
		Accelerator position sensor	X	X	X
		Accelerator position switch	X	X	
		Accelerator switch (F/C)	X	X	
		Crankshaft position sensor (TDC)	X	X	
		Ignition switch (start signal)		X	
		Park/Neutral position (PNP) switch		X	
		Battery voltage		X	
		Air conditioner switch		X	
		Mass air flow sensor	X	X	
		Stop lamp switch	X	X	
		Heat up switch		X	
		Charge air pressure sensor	X		
	OUTPUT	Glow relay		X	X
		EGR volume control valve	X	X	X
		Cooling fan relay	X	X	X
		Air conditioner relay		X	
		Variable nozzle turbocharger control solenoid valve		X	
		Swirl control valve control solenoid valve		X	X

X: Applicable

SELF-DIAGNOSTIC MODE

Regarding items detected in "SELF-DIAG RESULTS" mode, refer to "TROUBLE DIAGNOSIS — INDEX", EC-7.

DATA MONITOR MODE

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
CKPS·RPM (TDC) [rpm]	○	○	● The engine speed computed from the crankshaft position sensor (TDC) signal is displayed.	
CMPS·RPM·PUMP [rpm]	○	○	● The engine speed computed from the pulse signal sent from electronic control fuel injection pump is displayed.	
COOLAN TEMP/S [°C] or [°F]	○	○	● The engine coolant temperature (determined by the signal voltage of the engine coolant temperature sensor) is displayed.	● When the engine coolant temperature sensor is open or short-circuited, ECM enters fail-safe mode. The engine coolant temperature determined by the ECM is displayed.
VHCL SPEED SE [km/h] or [mph]	○	○	● The vehicle speed computed from the vehicle speed sensor signal is displayed.	

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CONSULT-II (Cont'd)

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
FUEL TEMP SEN [°C] or [°F]	○	○	● The fuel temperature (sent from electronic control fuel injection pump) is displayed.	
ACCEL POS SEN [V]	○	○	● The accelerator position sensor signal voltage is displayed.	
FULL ACCEL SW [ON/OFF]	○	○	● Indicates [ON/OFF] condition from the accelerator position switch signal.	
ACCEL SW (FC) [OPEN/CLOSE]	○	○	● Indicates [OPEN/CLOSE] condition from the accelerator switch (FC) signal.	
OFF ACCEL SW [ON/OFF]	○	○	● Indicates [ON/OFF] condition from the accelerator position switch signal.	
SPILL/V [°CA]		○	● The control position of spill valve (sent from electronic control fuel injection pump) is displayed.	
BATTERY VOLT [V]	○	○	● The power supply voltage of ECM is displayed.	
P/N POSI SW [ON/OFF]	○	○	● Indicates [ON/OFF] condition from the park/neutral position switch signal.	
START SIGNAL [ON/OFF]	○	○	● Indicates [ON/OFF] condition from the starter signal.	● After starting the engine, [OFF] is displayed regardless of the starter signal.
AIR COND SIG [ON/OFF]	○	○	● Indicates [ON/OFF] condition of the air conditioner switch as determined by the air conditioner signal.	
BRAKE SW [ON/OFF]	○	○	● Indicates [ON/OFF] condition from the stop lamp switch signal.	
IGN SW [ON/OFF]	○	○	● Indicates [ON/OFF] condition from ignition switch signal.	
WARM UP SW [ON/OFF]	○		● Indicates [ON/OFF] condition from the heat up switch signal.	
MAS AIR/FL SE [V]	○	○	● The signal voltage of the mass air flow sensor is displayed.	● When the engine is stopped, a certain value is indicated.
DECELER F/CUT [ON/OFF]		○	● The [ON/OFF] condition from deceleration fuel cut signal (sent from electronic control fuel injection pump) is displayed.	
INJ TIMG C/V [%]		○	● The duty ratio of fuel injection timing control valve (sent from electronic control fuel injection pump) is displayed.	
AIR COND RLY [ON/OFF]		○	● Indicates the control condition of the air conditioner relay (determined by ECM according to the input signals).	
GLOW RLY [ON/OFF]		○	● The glow relay control condition (determined by ECM according to the input signal) is displayed.	
COOLING FAN [ON/OFF]		○	● Indicates the control condition of the cooling fans (determined by ECM according to the input signal). ● ON ... Operates. OFF ... Stopped.	

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CONSULT-II (Cont'd)

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
EGR VOL CON/V [step]		○	● Indicates the EGR volume control value computed by the ECM according to the input signals. ● The opening becomes larger as the value increases.	
VNT S/V 1 [%]			● Indicates the variable nozzle turbo-charger control solenoid valve control value computed by the ECM according to the input signals.	
BARO SEN [kPa]	○		● The barometric pressure (determined by the signal voltage from the barometric pressure sensor built into the ECM) is displayed.	
SWRL CON S/V 1 [ON/OFF]		○	● The control condition of the swirl control valve control solenoid valve (determined by ECM according to the input signals) is indicated. ● ON ... Swirl control valve is closed. ● OFF ... Swirl control valve is opened.	

NOTE:
Any monitored item that does not match the vehicle being diagnosed is deleted from the display automatically.

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CONSULT-II (Cont'd)

ACTIVE TEST MODE

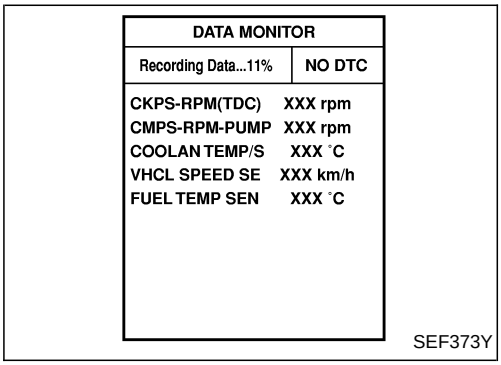
TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
COOLING FAN	● Ignition switch: ON ● Operate the cooling fan at "LOW", "HI" speed and turn "OFF" using CONSULT-II.	Cooling fan moves at "LOW", "HI" speed and stops.	● Harness and connector ● Cooling fan motor ● Cooling fan relay
OFF ACCEL PO SIG	● Clears the self-learning fully closed accelerator position, detected by accelerator position sensor, from the ECM.		
GLOW RLY	● Ignition switch: ON (Engine stopped) ● Turn the glow relay "ON" and "OFF" using CONSULT-II and listen to operating sound.	Glow relay makes the operating sound.	● Harness and connector ● Glow relay
INJ TIMING*	● Engine: Return to the original trouble condition ● Retard the injection timing using CONSULT-II.	If trouble symptom disappears, see CHECK ITEM.	● Electronic control fuel injection pump
SWIRL CONT S/V1	● Ignition switch: ON ● Turn solenoid valve "ON" and "OFF" with the CONSULT-II and listen to operating sound.	Solenoid valve makes an operating sound.	● Harness and connector ● Solenoid valve
EGR VOL CONT/V	● Ignition switch: ON ● Change EGR volume control valve opening step using CONSULT-II.	EGR volume control valve makes an operating sound.	● Harness and connector ● EGR volume control valve

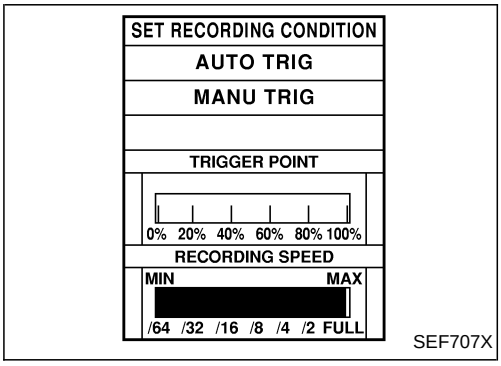
*: When using this item, DTC 0707 "P7·F/INJ TIMG FB" may be detected. If so, erase it because it is not a malfunction.

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CONSULT-II (Cont'd)

REAL TIME DIAGNOSIS IN DATA MONITOR MODE





CONSULT-II has two kinds of triggers and they can be selected by touching "SETTING" in "DATA MONITOR" mode.

1) "AUTO TRIG" (Automatic trigger):

- The malfunction will be identified on the CONSULT-II screen in real time.
  In other words, DTC will be displayed if the malfunction is detected by ECM.
  At the moment a malfunction is detected by ECM, "MONITOR" in "DATA MONITOR" screen is changed to "Recording Data ... xx%" as shown at left, and the data after the malfunction detection is recorded. Then when the percentage reached 100%, "REAL-TIME DIAG" screen is displayed. If "STOP" is touched on the screen during "Recording Data ... xx%", "REAL-TIME DIAG" screen is also displayed.
  The recording time after the malfunction detection and the recording speed can be changed by "TRIGGER POINT" and "Recording Speed". Refer to CONSULT-II OPERATION MANUAL.

2) "MANU TRIG" (Manual trigger):

- DTC will not be displayed automatically on CONSULT-II screen even though a malfunction is detected by ECM.
  DATA MONITOR can be performed continuously even though a malfunction is detected.

Use these triggers as follows:

1) "AUTO TRIG"

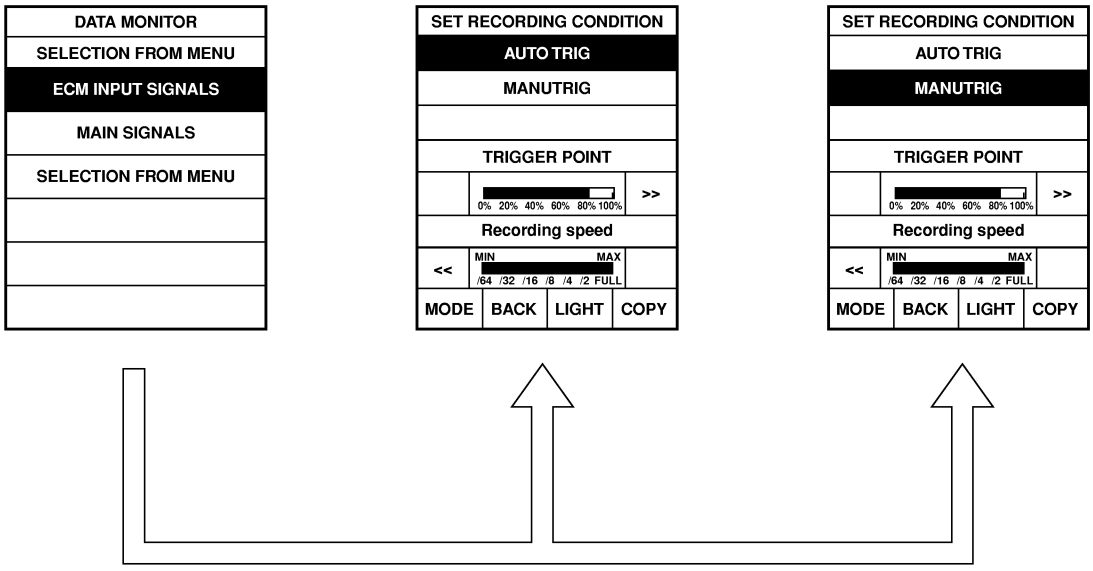
- While trying to detect the DTC by performing the "DTC Confirmation Procedure", be sure to select to "DATA MONITOR (AUTO TRIG)" mode. You can confirm the malfunction at the moment it is detected.
- While narrowing down the possible causes, CONSULT-II should be set in "DATA MONITOR (AUTO TRIG)" mode, especially in case the incident is intermittent.
  When you are inspecting the circuit by gently shaking (or twisting) the suspicious connectors, components and harness in the "DTC Confirmation Procedure", the moment a malfunction is found the DTC will be displayed. (Refer to GI section, "Incident Simulation Tests" in "HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT".)

2) "MANU TRIG"

- If the malfunction is displayed as soon as "DATA MONITOR" is selected, reset CONSULT-II to "MANU TRIG". By selecting "MANU TRIG" you can monitor and store the data. The data can be utilized for further diagnosis, such as a comparison with the value for the normal operating condition.

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CONSULT-II (Cont'd)



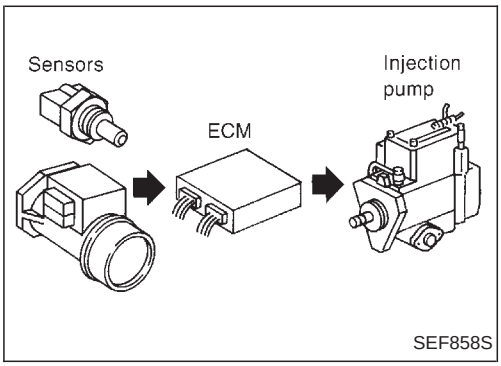
"SETTING"

"AUTO TRIG"
A malfunction can be displayed on "DATA MONITOR" screen automatically if detected.

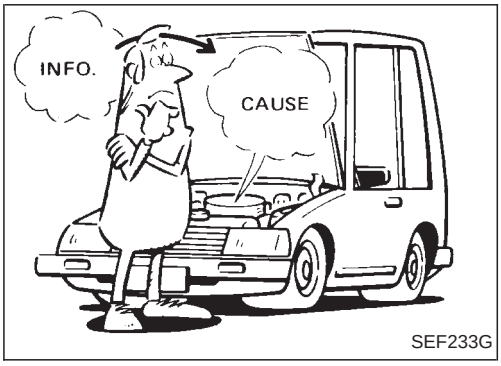
"MANU TRIG"
A malfunction can not be displayed on "DATA MONITOR" screen automatically even if detected.

SEF720X

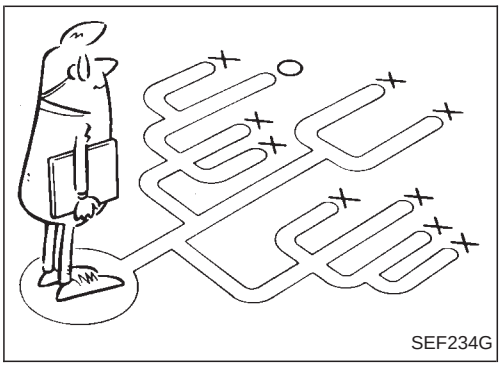
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SEF858S



SEF233G


SEF234G

KEY POINTS

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

SEF907L

Introduction

The engine has an ECM to control major systems such as fuel injection control, fuel injection timing control, glow control system, etc. The ECM accepts input signals from sensors and instantly drives electronic control fuel injection pump. It is essential that both input and output signals are proper and stable. At the same time, it is important that there are no problems such as vacuum leaks, or other problems with the engine.

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

A visual check only may not find the cause of the problems. A road test with CONSULT-II or a circuit tester connected should be performed. Follow the “Work Flow”, EC-48.

Before undertaking actual checks, take a few minutes to talk with a customer who approaches with a driveability complaint. The customer can supply good information about such problems, especially intermittent ones. Find out what symptoms are present and under what conditions they occur. A “Diagnostic Worksheet” like the example on next page should be used.

Start your diagnosis by looking for “conventional” problems first. This will help troubleshoot driveability problems on an electronically controlled engine vehicle.

DIAGNOSTIC WORKSHEET

There are many operating conditions that lead to the malfunction of engine components. A good grasp of such conditions can make troubleshooting faster and more accurate.

In general, each customer feels differently about a problem. It is important to fully understand the symptoms or conditions for a customer complaint.

Utilize a diagnostic worksheet like the one shown below in order to organize all the information for troubleshooting.

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Introduction (Cont'd)

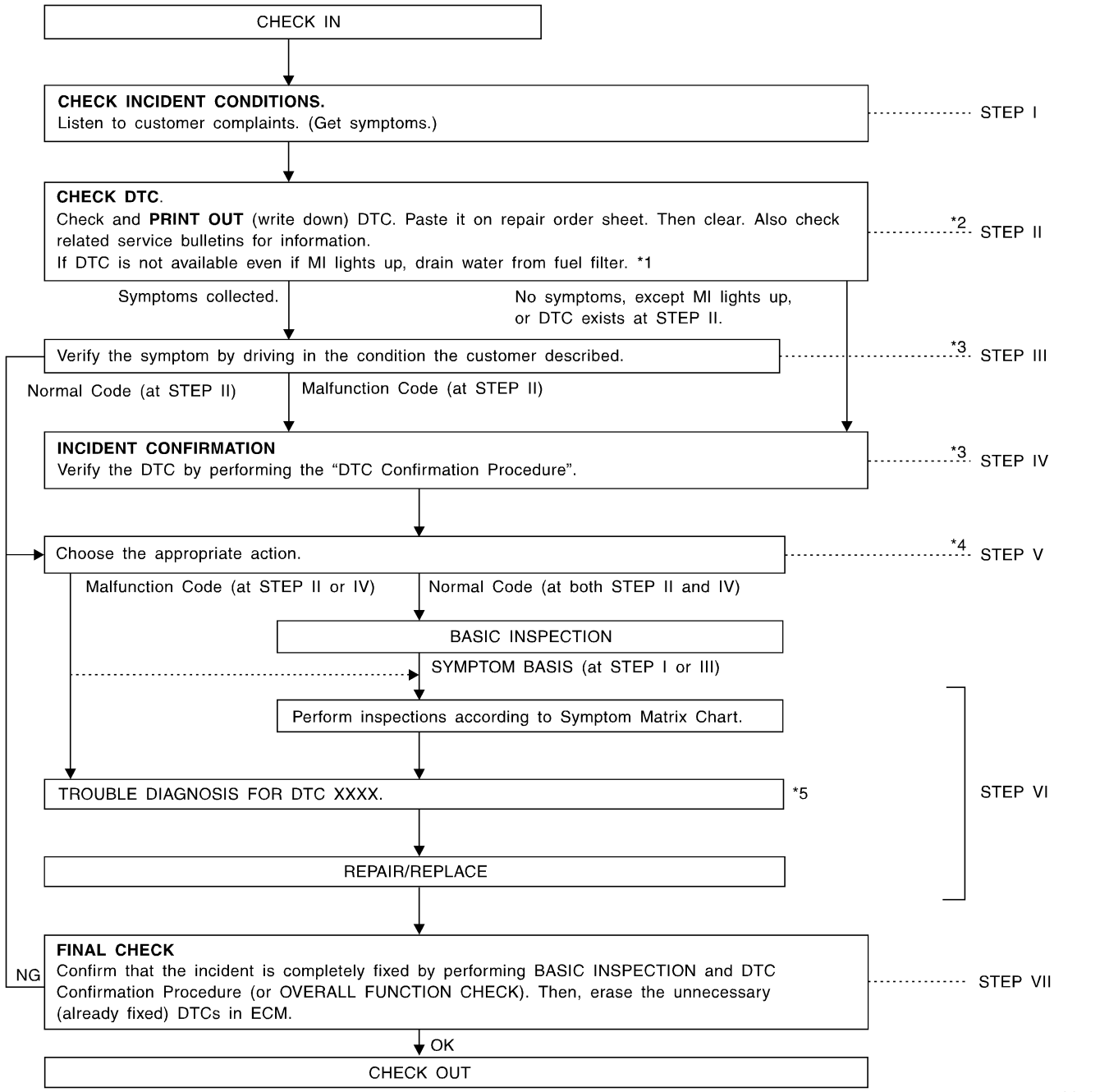
Worksheet sample

Customer name MR/MS		Model & Year	VIN
Engine #		Trans.	Mileage
Incident Date		Manuf. Date	In Service Date
Symptoms	☐ Startability	☐ Impossible to start ☐ No combustion ☐ Partial combustion ☐ Partial combustion affected by throttle position ☐ Partial combustion when engine is cool ☐ Possible but hard to start ☐ Others [ ]	
	☐ Idling	☐ No fast idle ☐ Unstable ☐ High idle ☐ Low idle ☐ Others [ ]	
	☐ Driveability	☐ Stumble ☐ Surge ☐ Knock ☐ Lack of power ☐ Others [ ]	
	☐ Engine stall	☐ At the time of start ☐ While idling ☐ While accelerating ☐ While decelerating ☐ Just after stopping ☐ While loading	
Incident occurrence		☐ Just after delivery ☐ Recently ☐ In the morning ☐ At night ☐ In the daytime	
Frequency		☐ All the time ☐ Under certain conditions ☐ Sometimes	
Weather conditions		☐ Not affected	
	Weather	☐ Fine ☐ Raining ☐ Snowing ☐ Others [ ]	
	Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold ☐ Humid ˚F	
Engine conditions		☐ Cold ☐ During warm-up ☐ After warm-up Engine speed 0 2,000 4,000 6,000 8,000 rpm	
Road conditions		☐ In town ☐ In suburbs ☐ Highway ☐ Off road (up/down)	
Driving conditions		☐ Not affected ☐ At starting ☐ While idling ☐ At racing ☐ While accelerating ☐ While cruising ☐ While decelerating ☐ While turning (RH/LH) Vehicle speed 0 10 20 30 40 50 60 MPH	
Malfunction indicator lamp		☐ Turned on ☐ Not turned on	

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Work Flow



YEC253A

*1 Refer to MA section ("Checking and Replacing Fuel Filter and Draining Water", "ENGINE MAINTENANCE").

*2 If time data of "SELF-DIAG RESULTS" is other than "0", perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-78.

*3 If the incident cannot be verified, perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-78.

*4 If the on board diagnostic system cannot be performed, check main power supply and ground circuit. Refer to "TROUBLE DIAGNOSIS FOR POWER SUPPLY", EC-79.

*5 If malfunctioning part cannot be detected, perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-78.

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Work Flow (Cont'd)

DESCRIPTION FOR WORK FLOW

STEP	DESCRIPTION
STEP I	Get detailed information about the conditions and the environment when the incident/symptom occurred using the "DIAGNOSTIC WORKSHEET", EC-46.
STEP II	Before confirming the concern, check and write down (print out using CONSULT-II) the DTC, then erase the DTC. Refer to EC-33. If the incident cannot be verified, perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-78. Study the relationship between the cause, specified by DTC, and the symptom described by the customer. (The "Symptom Matrix Chart" will be useful. Refer to EC-56.) Also check related service bulletins for information.
STEP III	Try to confirm the symptom and under what conditions the incident occurs. The "DIAGNOSTIC WORK SHEET" is useful to verify the incident. Connect CONSULT-II to the vehicle in DATA MONITOR (AUTO TRIG) mode and check real time diagnosis results. If the incident cannot be verified, perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-78. If the malfunction code is detected, skip STEP IV and perform STEP V.
STEP IV	Try to detect the DTC by driving in (or performing) the "DTC Confirmation Procedure". Check and read the DTC by using CONSULT-II. During the DTC verification, be sure to connect CONSULT-II to the vehicle in DATA MONITOR (AUTO TRIG) mode and check real time diagnosis results. If the incident cannot be verified, perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-78. In case the "DTC Confirmation Procedure" is not available, perform the "Overall Function Check" instead. The DTC cannot be displayed by this check, however, this simplified "check" is an effective alternative. The "NG" result of the "Overall Function Check" is the same as the DTC detection.
STEP V	Take the appropriate action based on the results of STEP I through IV. If the malfunction code is indicated, proceed to TROUBLE DIAGNOSIS FOR DTC XXXX. If the normal code is indicated, proceed to the Basic Inspection, EC-50. Then perform inspections according to the Symptom Matrix Chart. Refer to EC-56.
STEP VI	Identify where to begin diagnosis based on the relationship study between symptom and possible causes. Inspect the system for mechanical binding, loose connectors or wiring damage using (tracing) "Harness Layouts". Gently shake the related connectors, components or wiring harness with CONSULT-II set in "DATA MONITOR (AUTO TRIG)" mode. Check the voltage of the related ECM terminals or monitor the output data from the related sensors with CONSULT-II. Refer to EC-69 or EC-66. The "Diagnostic Procedure" in EC section contains a description based on open circuit inspection. A short circuit inspection is also required for the circuit check in the Diagnostic Procedure. For details, refer to GI section ("Circuit Inspection", "HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT"). Repair or replace the malfunction parts. If the malfunctioning part cannot be detected, perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-78.
STEP VII	Once you have repaired the circuit or replaced a component, you need to run the engine in the same conditions and circumstances which resulted in the customer's initial complaint. Perform the "DTC Confirmation Procedure" and confirm the normal code (DTC No. 0505) is detected. If the incident is still detected in the final check, perform STEP VI by using a different method from the previous one. Before returning the vehicle to the customer, be sure to erase the unnecessary (already fixed) DTC in ECM. (Refer to EC-33.)

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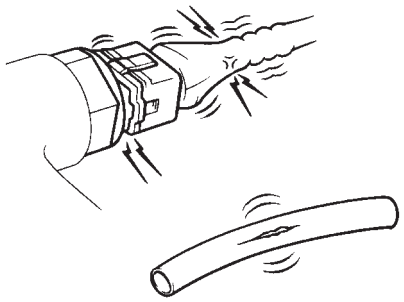
Basic Inspection

Precaution:
Perform Basic Inspection without electrical or mechanical loads applied;

- **Shift lever is in neutral position,**
- **Heat up switch is OFF,**
- **Headlamp switch is OFF,**
- **Air conditioner switch is OFF,**
- **Rear defogger switch is OFF,**
- **Steering wheel is in the straight-ahead position, etc.**

1	INSPECTION START

1. Check service records for any recent repairs that may indicate a related problem.
2. Check the current need for scheduled maintenance, especially for fuel filter and air cleaner filter. Refer to MA section.
3. Open engine hood and check the following:
- Harness connectors for improper connections
- Vacuum hoses for splits, kinks, or improper connections
- Wiring for improper connections, pinches, or cuts



SEF142I

4. Start engine and warm it up to the normal operating temperature.

▶	GO TO 2.

2	PREPARATION FOR CHECKING IDLE SPEED

With CONSULT-II
Connect CONSULT-II to the data link connector.

Without CONSULT-II
Install diesel tacho tester to the vehicle.

▶	GO TO 3.

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Basic Inspection (Cont'd)

3	CHECK IDLE SPEED

With CONSULT-II

1. Select "CKPS·RPM (TDC)" in "DATA MONITOR" mode with CONSULT-II.
2. Read idle speed.

DATA MONITOR	
MONITOR	NO DTC
CKPS-RPM (TDC)	XXX rpm

SEF817Y

750±25 rpm

Without CONSULT-II

Check idle speed.

750±25 rpm

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 4.

4	CHECK FOR INTAKE AIR LEAK

Listen for an intake air leak after the mass air flow sensor.

OK or NG

OK	▶	GO TO 5.
NG	▶	Repair or replace.

5	BLEED AIR FROM FUEL SYSTEM

1. Stop engine.
2. Using priming pump, bleed air from fuel system. Refer to "Air Bleeding", EC-32.

	▶	GO TO 6.

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Basic Inspection (Cont'd)

6	CHECK IDLE SPEED AGAIN

With CONSULT-II

1. Start engine and let it idle.
2. Select "CKPS·RPM (TDC)" in "DATA MONITOR" mode with CONSULT-II.
3. Read idle speed.

DATA MONITOR	
MONITOR	NO DTC
CKPS-RPM (TDC)	XXX rpm

SEF817Y

750±25 rpm

Without CONSULT-II

1. Start engine and let it idle.
2. Check idle speed.

750±25 rpm

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 7.

7	DRAIN WATER FROM FUEL FILTER

Drain water from fuel filter. Refer to MA section ("Checking and Replacing Fuel Filter and Draining Water", "ENGINE MAINTENANCE").

	▶	GO TO 8.

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Basic Inspection (Cont'd)

8	CHECK IDLE SPEED AGAIN

With CONSULT-II

1. Start engine and let it idle.
2. Select "CKPS·RPM (TDC)" in "DATA MONITOR" mode with CONSULT-II.
3. Read idle speed.

DATA MONITOR	
MONITOR	NO DTC
CKPS-RPM (TDC)	XXX rpm

SEF817Y

750±25 rpm

Without CONSULT-II

1. Start engine and let it idle.
2. Check idle speed.

750±25 rpm

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 9.

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Basic Inspection (Cont'd)

9	CHECK AIR CLEANER FILTER
Check air cleaner filter for clogging or breaks.	
OK or NG	
OK ▶	GO TO 10.
NG ▶	Replace air cleaner filter.

10	CHECK FUEL INJECTION NOZZLE
Check fuel injection nozzle opening pressure. Refer to "Injection pressure test", EC-26.	
OK or NG	
OK ▶	GO TO 11.
NG ▶	Replace fuel injection nozzle assembly.

11	CHECK IDLE SPEED AGAIN

With CONSULT-II

1. Start engine and let it idle.
2. Select "CKPS·RPM (TDC)" in "DATA MONITOR" mode with CONSULT-II.
3. Read idle speed.

DATA MONITOR	
MONITOR	NO DTC
CKPS-RPM (TDC)	XXX rpm

SEF817Y

750±25 rpm

Without CONSULT-II

1. Start engine and let it idle.
2. Check idle speed.

750±25 rpm

OK or NG	
OK ▶	**INSPECTION END**
NG ▶	GO TO 12.

12	CHECK COMPRESSION PRESSURE
Check compression pressure. Refer to EM section, "MEASUREMENT OF COMPRESSION PRESSURE".	
OK or NG	
OK ▶	GO TO 13.
NG ▶	Follow the instruction of "MEASUREMENT OF COMPRESSION PRESSURE".

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Basic Inspection (Cont'd)

13	CHECK IDLE SPEED AGAIN

With CONSULT-II

1. Start engine and let it idle.
2. Select "CKPS·RPM (TDC)" in "DATA MONITOR" mode with CONSULT-II.
3. Read idle speed.

DATA MONITOR	
MONITOR	NO DTC
CKPS-RPM (TDC)	XXX rpm

SEF817Y

750±25 rpm

Without CONSULT-II

1. Start engine and let it idle.
2. Check idle speed.

750±25 rpm

OK or NG

OK	▶	**INSPECTION END**
NG	▶	Replace electronic control fuel injection pump.

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Symptom Matrix Chart

SYSTEM — Basic engine control system	SYMPTOM													Reference page	Feature of symptom, Check point
	HARD/NO START/RESTART (EXCP. HA)				ENGINE STALL										
	NO START (with first firing)	NO START (without first firing)	HARD TO START WHEN ENGINE IS COLD	HARD TO START WHEN ENGINE IS HOT	AT IDLE	DURING DRIVING	WHEN DECELERATING	HESITATION/SURGING/FLAT SPOT	KNOCK/DETONATION	LACK OF POWER	POOR ACCELERATION	HI IDLE	LOW IDLE		
Warranty symptom code	AA				AB			AC	AD	AE		AF			
Electronic control fuel injection pump mainframe	4	4	4	4	4	4	4	4	4	5	5	3	4	—	*1
Injection nozzle	3	3	3	3	3	3	3	3	3	4	4		3	EC-24	*2
Glow system	1	1	1	1										EC-244	
Engine body	3	3	3	3	3	3	3		3	4	4		3	EM section	*3
EGR system										3	3			EC-227	
Air cleaner and ducts										3	3			MA section	*4

1 - 5: The numbers refer to the order of inspection.
(continued on next page)
*1: Fuel injection system malfunction or fuel injection timing control system malfunction may be the cause.
*2: Depends on open-valve pressure and spray pattern.
*3: Caused mainly by insufficient compression pressure.
*4: Symptom varies depending on off-position of air duct, etc.

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Symptom Matrix Chart (Cont'd)

SYSTEM — Basic engine control system	SYMPTOM												Reference page	Feature of symptom, Check point
	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEAT/HIGH ENGINE COOLANT TEMPERATURE	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	ABNORMAL SMOKE COLOR		DEAD BATTERY (UNDER CHARGE)	Malfunction indicator lamp illuminates.	Can be detected by CONSULT-II?	Fuel cut		
							BLACK SMOKE	WHITE SMOKE						
Warranty symptom code	AG	AH	AJ	AK	AL	AM	AP		HA					
Electronic control fuel injection pump mainframe	4	4	3		4		5	4		3	3	3	—	*1
Injection nozzle	3	3					4						EC-24	*2
Glow system								1					EC-244	
Engine body	3	3		3	3	3		3					EM section	*3
EGR system							3						EC-227	
Air cleaner and ducts							3				3		MA section	*4

1 - 5: The numbers refer to the order of inspection.
(continued on next page)
*1: Fuel injection system malfunction or fuel injection timing control system malfunction may be the cause.
*2: Depends on open-valve pressure and spray pattern.
*3: Caused mainly by insufficient compression pressure.
*4: Symptom varies depending on off-position of air duct, etc.

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Symptom Matrix Chart (Cont'd)

SYSTEM — ENGINE CONTROL system		Malfunction	SYMPTOM: HARD/NO START/RESTART (EXCP. HA): NO START (with first firing)	NO START (without first firing)	HARD TO START WHEN ENGINE IS COLD	HARD TO START WHEN ENGINE IS HOT	ENGINE STALL: AT IDLE	DURING DRIVING	WHEN DECELERATING	HESITATION/SURGING/FLAT SPOT	KNOCK/DETONATION	LACK OF POWER	POOR ACCELERATION	HI IDLE	LOW IDLE	Reference page	Feature of symptom, Check point
Warranty symptom code			AA				AB			AC	AD	AE		AF			
ENGINE CONTROL	Electronic control fuel injection pump circuit	*a, *b		1		1	1	1	1	1	1	1	1	1	1	—	
		*c, *d															
	Mass air flow sensor circuit	*a, *c								1		1	1			EC-88	
		*b															
	Engine coolant temperature sensor circuit	*a, *b			1		1		1						1	EC-95	*1
	Vehicle speed sensor circuit	*a, *b											1			EC-99	

1 - 5: The numbers refer to the order of inspection.
(continued on next page)
*a: Open
*b: Short
*c: Ground short
*d: Noise
*1: Compensation according to engine coolant temperature does not function.

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Symptom Matrix Chart (Cont'd)

SYSTEM — ENGINE CONTROL system		Malfunction	SYMPTOM: ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEAT/HIGH ENGINE COOLANT TEMPERATURE	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	ABNORMAL SMOKE COLOR: BLACK SMOKE	ABNORMAL SMOKE COLOR: WHITE SMOKE	DEAD BATTERY (UNDER CHARGE)	Malfunction indicator lamp illuminates.	Can be detected by CONSULT-II?	Fuel cut	Reference page	Feature of symptom, Check point
Warranty symptom code			AG	AH	AJ	AK	AL	AM	AP		HA					
ENGINE CONTROL	Electronic control fuel injection pump circuit	*a, *b								1		1	1	1	—	
		*c, *d							1							
	Mass air flow sensor circuit	*a, *c											1		EC-88	
		*b							1							
	Engine coolant temperature sensor circuit	*a, *b	1	1								1	1		EC-95	*1
	Vehicle speed sensor circuit	*a, *b											1		EC-99	

1 - 5: The numbers refer to the order of inspection.
(continued on next page)
*a: Open
*b: Short
*c: Ground short
*d: Noise
*1: Compensation according to engine coolant temperature does not function.

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Symptom Matrix Chart (Cont'd)

SYSTEM — ENGINE CONTROL system		Malfunction	SYMPTOM: HARD/NO START/RESTART (EXCP. HA) — NO START (with first firing)	NO START (without first firing)	HARD TO START WHEN ENGINE IS COLD	HARD TO START WHEN ENGINE IS HOT	SYMPTOM: ENGINE STALL — AT IDLE	DURING DRIVING	WHEN DECELERATING	HESITATION/SURGING/FLAT SPOT	KNOCK/DETONATION	LACK OF POWER	POOR ACCELERATION	HI IDLE	LOW IDLE	Reference page	Feature of symptom, Check point
Warranty symptom code			AA				AB			AC	AD	AE		AF			
ENGINE CONTROL	Accelerator switch (FC) circuit	*a, *b								1						EC-104	
		*c															
	Fuel cut system line	*a, *c														EC-237	
		*b	1				1	1	1								*2
	Accelerator position sensor circuit	*a, *b								1		1	1			EC-130	
	Crankshaft position sensor (TDC) circuit	*a, *b														EC-152	
		*d										1	1				
	Charge air pressure sensor circuit	*a, *b, *c										1	1			EC-220	
	Swirl control valve control solenoid valve circuit	*a, *b														EC-271	
		*c								1	1	1	1				
	Variable nozzle turbocharger control solenoid valve circuit	*a, *b										1	1			EC-289	
		*c										1	1				
	Intake air control valve control solenoid valve circuit	*c	1	1	1	1	1	1	1	1						EC-281	

1 - 5: The numbers refer to the order of inspection.
(continued on next page)
*a: Open
*b: Short
*c: Ground short
*d: Noise
*2: Engine runs on after turning ignition switch OFF.

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Symptom Matrix Chart (Cont'd)

SYSTEM — ENGINE CONTROL system		Malfunction	SYMPTOM: ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEAT/HIGH ENGINE COOLANT TEMPERATURE	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	ABNORMAL SMOKE COLOR: BLACK SMOKE	ABNORMAL SMOKE COLOR: WHITE SMOKE	DEAD BATTERY (UNDER CHARGE)	Malfunction indicator lamp illuminates.	Can be detected by CONSULT-II?	Fuel cut	Reference page	Feature of symptom, Check point
Warranty symptom code			AG	AH	AJ	AK	AL	AM	AP		HA					
ENGINE CONTROL	Accelerator switch (FC) circuit	*a, *b										1	1		EC-104	
		*c														
	Fuel cut system line	*a, *c										1	1		EC-237	
		*b												1		*2
	Accelerator position sensor circuit	*a, *b										1	1		EC-130	
	Crankshaft position sensor (TDC) circuit	*a, *b	1	1								1	1		EC-152	
		*d														
	Charge air pressure sensor circuit	*a, *b, *c										1	1		EC-220	
	Swirl control valve control solenoid valve circuit	*a, *b							1						EC-271	
		*c					1		1	1						
	Variable nozzle turbocharger control solenoid valve circuit	*a, *b					1		1						EC-289	
		*c					1						1			
	Intake air control valve control solenoid valve circuit	*c													EC-281	

1 - 5: The numbers refer to the order of inspection.
(continued on next page)
*a: Open
*b: Short
*c: Ground short
*d: Noise
*2: Engine runs on after turning ignition switch OFF.

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Symptom Matrix Chart (Cont'd)

SYSTEM — ENGINE CONTROL system		Malfunction	SYMPTOM: HARD/NO START/RESTART (EXCP. HA)				SYMPTOM: ENGINE STALL			SYMPTOM	SYMPTOM	SYMPTOM	SYMPTOM	SYMPTOM	SYMPTOM	Reference page	Feature of symptom, Check point
			NO START (with first firing)	NO START (without first firing)	HARD TO START WHEN ENGINE IS COLD	HARD TO START WHEN ENGINE IS HOT	AT IDLE	DURING DRIVING	WHEN DECELERATING	HESITATION/SURGING/FLAT SPOT	KNOCK/DETONATION	LACK OF POWER	POOR ACCELERATION	HI IDLE	LOW IDLE		
Warranty symptom code			AA				AB			AC	AD	AE		AF			
ENGINE CONTROL	Start signal circuit	*a, *b			1	1										EC-253	*3
	PNP switch circuit	*a, *b							1							EC-256	
		*c															
	Accelerator position switch (Idle) circuit	*a, *c					1		1						1	EC-130	
		*b								1		1	1				*4
	Accelerator position switch (Full) circuit	*a, *b								1		1	1			EC-130	
	Ignition switch circuit	*a		1			1	1	1							EC-79	
		*b															*5
	Power supply for ECM circuit	*a														EC-79	
		*b															

1 - 5: The numbers refer to the order of inspection.
(continued on next page)
*a: Open
*b: Short
*c: Ground short
*d: Noise
*3: Start control does not function.
*4: Accelerator position sensor NG signal is output.
*5: Engine does not stop.

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Symptom Matrix Chart (Cont'd)

SYSTEM — ENGINE CONTROL system		Malfunction	SYMPTOM: ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEAT/HIGH ENGINE COOLANT TEMPERATURE	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	ABNORMAL SMOKE COLOR: BLACK SMOKE	ABNORMAL SMOKE COLOR: WHITE SMOKE	DEAD BATTERY (UNDER CHARGE)	Malfunction indicator lamp illuminates.	Can be detected by CONSULT-II?	Fuel cut	Reference page	Feature of symptom, Check point
Warranty symptom code			AG	AH	AJ	AK	AL	AM	AP		HA					
ENGINE CONTROL	Start signal circuit	*a, *b													EC-253	*3
	PNP switch circuit	*a, *b	1	1											EC-256	
		*c														
	Accelerator position switch (Idle) circuit	*a, *c													EC-130	
		*b										1	1			*4
	Accelerator position switch (Full) circuit	*a, *b										1	1		EC-130	
	Ignition switch circuit	*a													EC-79	
		*b														*5
	Power supply for ECM circuit	*a										1	1	1	EC-79	
		*b														

1 - 5: The numbers refer to the order of inspection.
(continued on next page)
*a: Open
*b: Short
*c: Ground short
*d: Noise
*3: Start control does not function.
*4: Accelerator position sensor NG signal is output.
*5: Engine does not stop.

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Symptom Matrix Chart (Cont'd)

SYSTEM — ENGINE CONTROL system		Malfunction	SYMPTOM: HARD/NO START/RESTART (EXCP. HA) — NO START (with first firing)	NO START (without first firing)	HARD TO START WHEN ENGINE IS COLD	HARD TO START WHEN ENGINE IS HOT	ENGINE STALL — AT IDLE	DURING DRIVING	WHEN DECELERATING	HESITATION/SURGING/FLAT SPOT	KNOCK/DETONATION	LACK OF POWER	POOR ACCELERATION	HI IDLE	LOW IDLE	Reference page	Feature of symptom, Check point
Warranty symptom code			AA				AB			AC	AD	AE		AF			
ENGINE CONTROL	EGR volume control valve circuit	*a, *b														EC-227	
		*c															*8
	Glow relay circuit	*a	1	1	1	1										EC-244	*9
		*b															*10
	ECM relay (Self-shutoff) circuit	*a					1	1	1							EC-79	
		*b															*11
	ECM, Connector circuit	*a, *b	2	2	2	2	2	2	2	2	2	2	2	2	2	EC-121, 205, 218	
	Air conditioner relay circuit	*a														EC-308	*12
		*b															*13
	Air conditioner switch circuit	*a, *c														EC-308	*13
		*b															*14

1 - 5: The numbers refer to the order of inspection.
(continued on next page)
*a: Open
*b: Short
*c: Ground short
*d: Noise
*8: Does not stop operating.
*9: Glow lamp does not turn on.
*10: Glow lamp does not turn off. *11: Ground short makes engine unable to stop.
*12: Air conditioner does not operate.
*13: Air conditioner does not stop operating.
*14: Air conditioner does not work.

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Symptom Matrix Chart (Cont'd)

SYSTEM — ENGINE CONTROL system		Malfunction	SYMPTOM: ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEAT/HIGH ENGINE COOLANT TEMPERATURE	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	ABNORMAL SMOKE COLOR: BLACK SMOKE	ABNORMAL SMOKE COLOR: WHITE SMOKE	DEAD BATTERY (UNDER CHARGE)	Malfunction indicator lamp illuminates.	Can be detected by CONSULT-II?	Fuel cut	Reference page	Feature of symptom, Check point
Warranty symptom code			AG	AH	AJ	AK	AL	AM	AP		HA					
ENGINE CONTROL	EGR volume control valve circuit	*a, *b													EC-227	
		*c							1							*8
	Glow relay circuit	*a								1					EC-244	*9
		*b														*10
	ECM relay (Self-shutoff) circuit	*a												1	EC-79	
		*b	1	1												*11
	ECM, Connector circuit	*a, *b	2	2	2	2	2	2	2	2	2	2	2	2	EC-121, 205, 218	
	Air conditioner relay circuit	*a													EC-308	*12
		*b														*13
	Air conditioner switch circuit	*a, *c													EC-308	*13
		*b														*14

1 - 5: The numbers refer to the order of inspection.
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*11: Ground short makes engine unable to stop.
*12: Air conditioner does not operate.
*13: Air conditioner does not stop operating.
*14: Air conditioner does not work.

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CONSULT-II Reference Value in Data Monitor Mode

Remarks:
- Specification data are reference values.
- Specification data are output/input values which are detected or supplied by the ECM at the connector.

* Specification data may not be directly related to their components signals/values/operations.

MONITOR ITEM	CONDITION		SPECIFICATION
CKPS·RPM (TDC)	• Tachometer: Connect • Run engine and compare the CONSULT-II value with tachometer indication.		Almost the same speed as the tachometer indication.
CMPS·RPM-PUMP			
COOLAN TEMP/S	• Engine: After warming up		More than 70°C (158°F)
VHCL SPEED SE	• Turn drive wheels and compare the CONSULT-II value with speedometer indication.		Almost the same speed as the speedometer indication
FUEL TEMP SEN	• Engine: After warming up		More than 40°C (104°F)
ACCEL POS SEN	• Ignition switch: ON (Engine stopped)	Accelerator pedal: fully released	0.40 - 0.60V
		Accelerator pedal: fully depressed	Approx. 4.5V
FULL ACCEL SW	• Ignition switch: ON (Engine stopped)	Accelerator pedal: fully depressed	ON
		Except above	OFF
ACCEL SW (FC)	• Ignition switch: ON (Engine stopped)	Accelerator pedal: fully released	CLOSE
		Accelerator pedal: slightly open	OPEN
OFF ACCEL SW	• Ignition switch: ON (Engine stopped)	Accelerator pedal: fully released	ON
		Accelerator pedal: slightly open	OFF
SPILL/V	• Engine: After warming up		Approx. 13°CA
BATTERY VOLT	• Ignition switch: ON (Engine stopped)		11 - 14V
P/N POSI SW	• Ignition switch: ON	Shift lever: Park/Neutral	ON
		Except above	OFF
START SIGNAL	• Ignition switch: ON → START → ON		OFF → ON → OFF
AIR COND SIG	• Engine: After warming up, idle the engine	Air conditioner switch: OFF	OFF
		Air conditioner switch: ON (Compressor operates.)	ON
BRAKE SW	• Ignition switch: ON	Brake pedal: depressed	ON
		Brake pedal: released	OFF
IGN SW	• Ignition switch: ON → OFF		ON → OFF
WARM UP SW	• Ignition switch: ON	Heat up switch: ON	ON
		Heat up switch: OFF	OFF
MAS AIR/FL SE	• Engine: After warming up • Air conditioner switch: OFF • Shift lever: Neutral position • No-load	Idle	1.6 - 2.0V
DECELER F/CUT	• Engine: After warming up	Idle	OFF
INJ TIMG C/V	• Engine: After warming up, idle the engine.		Approx. 50 - 70%
AIR COND RLY	• Engine: After warming up, idle the engine	Air conditioner switch: OFF	OFF
		Air conditioner switch: ON (Compressor operates.)	ON
GLOW RLY	• Refer to EC-244.		
COOLING FAN	• When cooling fan is stopped.		OFF
	• When cooling fan operates.		ON

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CONSULT-II Reference Value in Data Monitor Mode (Cont'd)

MONITOR ITEM	CONDITION		SPECIFICATION
EGR VOL CON/V	● Engine: After warming up ● Air conditioner switch: "OFF" ● Shift lever: Neutral position ● No-load	After 1 minute of idling	More than 10 steps
		Revving engine from idle to 3,200 rpm	0 step
VNT S/V 1	● Engine: After warming up ● Air conditioner switch: "OFF" ● Shift lever: Neutral position ● No-load	Idle	Approx. 56%
		2,000 rpm	Approx. 20%
BARO SEN	● Ignition switch: ON		Altitude Approx. 0 m (0 ft): Approx. 100.62 kPa (1.0062 bar, 1.026 kg/cm^2, 14.59 psi) Approx. 1,000 m (3,281 ft): Approx. 88.95 kPa (0.8895 bar, 0.907 kg/cm^2, 12.90 psi) Approx. 1,500 m (4,922 ft): Approx. 83.16 kPa (0.8316 bar, 0.848 kg/cm^2, 12.06 psi) Approx. 2,000 m (6,562 ft): Approx. 78.36 kPa (0.7836 bar, 0.799 kg/cm^2, 11.36 psi)
SWRL CON S/V 1	● Lift up the vehicle ● Engine: After warming up let it idle for more than 1 second. ● Air conditioner switch: "OFF" ● No-load	Shift lever: Except "P" and "Neutral" positions	ON
		Shift lever: Neutral position	OFF

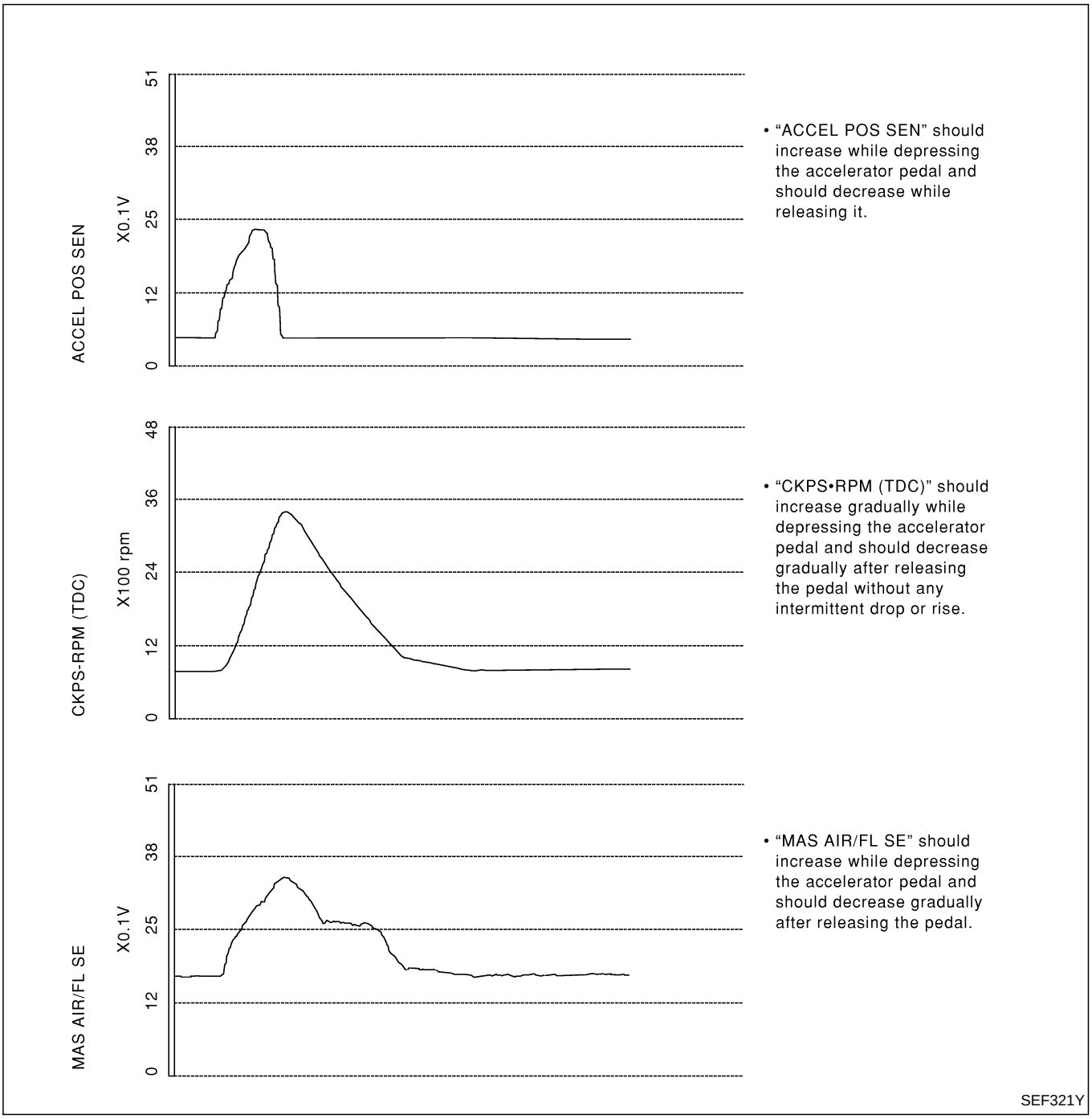
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Major Sensor Reference Graph in Data Monitor Mode

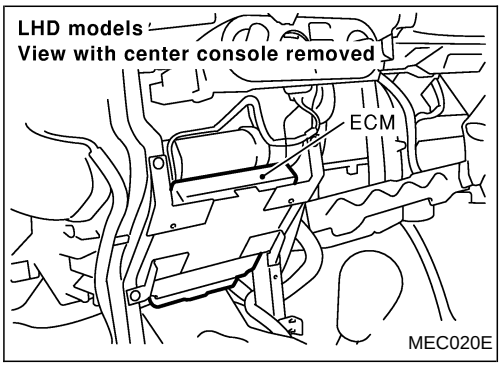
The following are the major sensor reference graphs in “DATA MONITOR” mode.

ACCEL POS SEN, “CKPS·RPM (TDC)”, “MAS AIR/FL SE”

Below is the data for “ACCEL POS SEN”, “CKPS·RPM (TDC)” and “MAS AIR/FL SE” when revving engine quickly up to 3,000 rpm under no load after warming up engine to the normal operating temperature.
Each value is for reference, the exact value may vary.



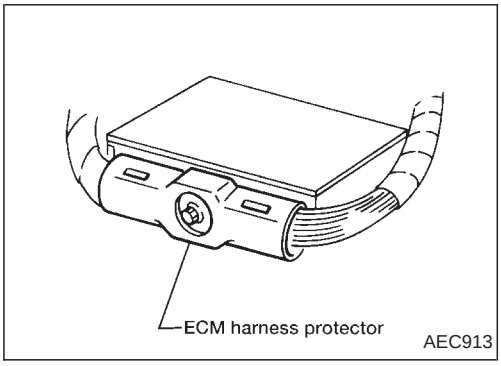
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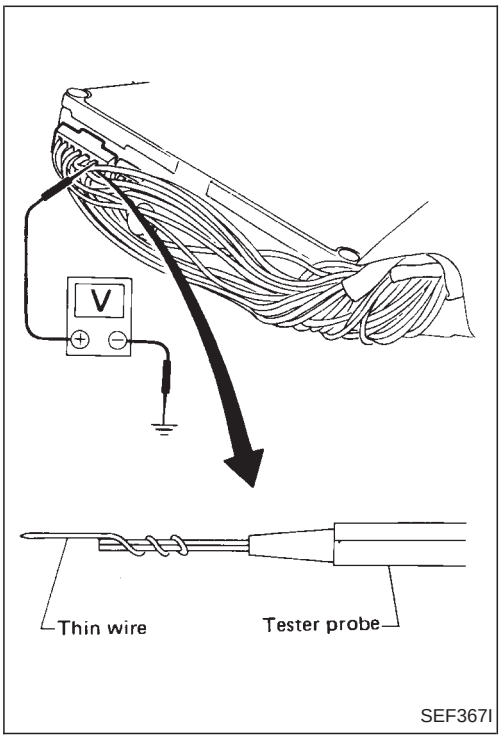
ECM Terminals and Reference Value

PREPARATION

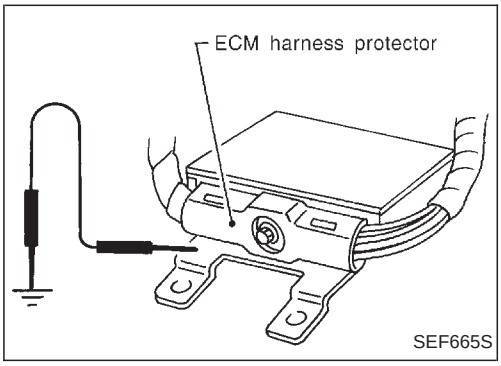
1. ECM is located behind the instrument lower panel. For this inspection, remove the driver's side instrument lower cover.



2. Remove ECM harness protector.



3. Perform all voltage measurements with the connector connected. Extend tester probe as shown to perform tests easily.
   - Open harness securing clip to make testing easier.
   - Use extreme care not to touch 2 pins at one time.
   - Data is for comparison and may not be exact.

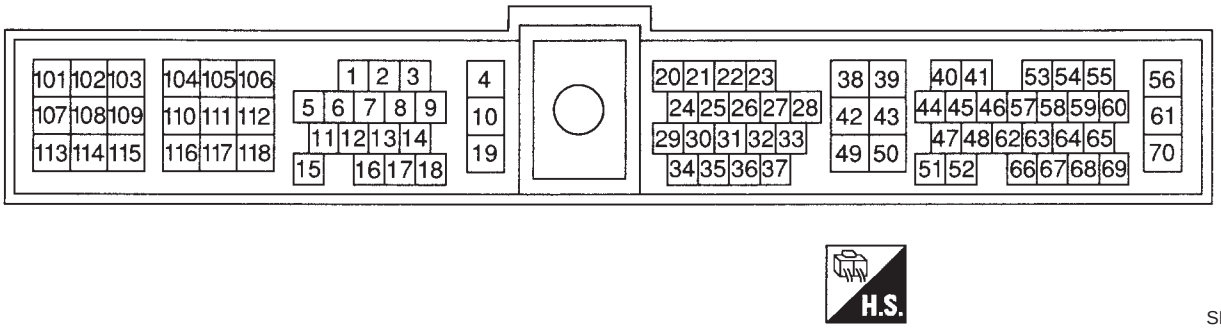


Be sure ECM unit is properly grounded before checking.

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ECM Terminals and Reference Value (Cont'd)

ECM HARNESS CONNECTOR TERMINAL LAYOUT



ECM INSPECTION TABLE

Remarks: Specification data are reference values and are measured between each terminal and ground.

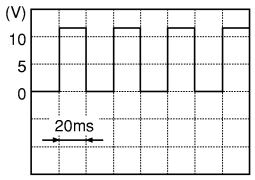
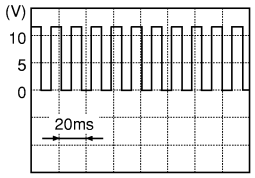
CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may damage the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
2	LG	Intake air control valve control solenoid valve	Engine is running.	BATTERY VOLTAGE (11 - 14V)
			Ignition switch "OFF" └ For a few seconds after turning ignition switch "OFF"	Approximately 0.1V
4	G	ECM relay (Self-shutoff)	Ignition switch "ON" Ignition switch "OFF" └ For a few seconds after turning ignition switch "OFF"	Approximately 0.25V
			Ignition switch "OFF" └ More than a few seconds after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)

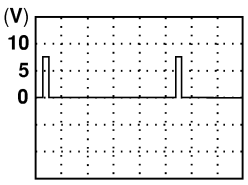
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ECM Terminals and Reference Value (Cont'd)

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
5	L/B	Tachometer	Engine is running. └ **Warm-up condition** Idle speed	Approximately 5.7V  SEF255Z
			Engine is running. └ **Warm-up condition** Engine speed is 2,000 rpm	Approximately 6V  SEF256Z
6	Y	Engine oil lamp	Ignition switch "ON"	Approximately 0V
			Engine is running.	BATTERY VOLTAGE (11 - 14V)
14	LG/R	Cooling fan relay	Engine is running. └ Cooling fan is not operating	BATTERY VOLTAGE (11 - 14V)
			Engine is running. └ Cooling fan is operating	Approximately 0.1V
15	G/PU	Air conditioner relay	Engine is running. └ Air conditioner switch is "OFF"	BATTERY VOLTAGE (11 - 14V)
			Engine is running. └ Both air conditioner switch and blower fan switch are "ON" (Compressor is operating)	Approximately 0.1V
16	G/W	Glow lamp	Ignition switch "ON" └ Glow lamp is "ON"	Approximately 1V
			Ignition switch "ON" └ Glow lamp is "OFF"	BATTERY VOLTAGE (11 - 14V)

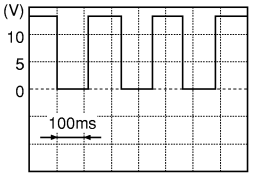
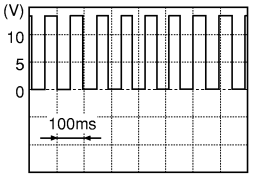
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ECM Terminals and Reference Value (Cont'd)

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
17	G/Y	Stop lamp switch	Ignition switch "ON" └ Brake pedal fully released	Approximately 0V
			Ignition switch "ON" └ Brake pedal depressed	BATTERY VOLTAGE (11 - 14V)
18	L	Malfunction indicator	Ignition switch "ON"	Approximately 1V
			Engine is running. └ Idle speed	BATTERY VOLTAGE (11 - 14V)
19	LG/W	Engine coolant temperature sensor	Engine is running.	Approximately 0 - 4.8V Output voltage varies with engine coolant temperature
20	PU	Start signal	Ignition switch "ON"	Approximately 0V
			Ignition switch "START"	BATTERY VOLTAGE (11 - 14V)
21	G/R	Air conditioner switch	Engine is running. └ Air conditioner switch is "OFF"	BATTERY VOLTAGE (11 - 14V)
			Engine is running. └ Both air conditioner switch and blower fan switch are "ON" (Compressor is operating)	Approximately 0.1V
22	BR/Y (A/T) G (M/T)	Park/Neutral position switch	Ignition switch "ON" └ Gear position is "Neutral" (M/T models) Gear position is "P" or "N" (A/T models)	Approximately 0V
			Ignition switch "ON" └ Except the above gear position	BATTERY VOLTAGE (11 - 14V)
23	G	Accelerator position sensor	Ignition switch "ON" └ Accelerator pedal fully released	0.4 - 0.6V
			Ignition switch "ON" └ Accelerator pedal fully depressed	Approximately 4.5V
24	G/Y	A/T signal No. 1	Engine is running. └ **Warm-up condition** Idle speed	Voltage goes high up once in a few seconds  SEF448Z

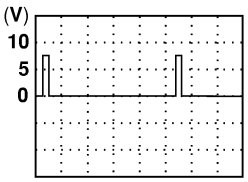
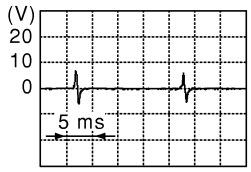
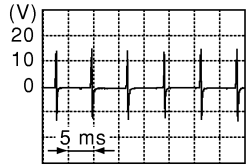
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ECM Terminals and Reference Value (Cont'd)

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
26	Y/B	Vehicle speed sensor	Engine is running. └ Lift up the vehicle In 1st gear position Vehicle speed is 10 km/h (6 MPH)	0 - Approximately 4.8V  SEF257Z
			Engine is running. └ Lift up the vehicle In 2nd gear position Vehicle speed is 30 km/h (19 MPH)	Approximately 2.2V  SEF258Z
27	R/L	Engine oil pressure switch-2	Ignition switch "ON"	Approximately 0V
			Engine is running.	BATTERY VOLTAGE (11 - 14V)
29	LG/R	Accelerator switch (F/C)	Ignition switch "ON" └ Accelerator pedal fully released	BATTERY VOLTAGE (11 - 14V)
			Ignition switch "ON" └ Accelerator pedal depressed	Approximately 0V
30	LG/Y	A/T signal No. 3	Engine is running. └ **Warm-up condition** Idle speed	Approximately 0V
			Engine is running. └ **Warm-up condition** Engine speed is 2,000 rpm	Approximately 7.7V
31	L/Y	Accelerator position switch (Idle)	Ignition switch "ON" └ Accelerator pedal fully released	BATTERY VOLTAGE (11 - 14V)
			Ignition switch "ON" └ Accelerator pedal depressed	Approximately 0V
32	R/L	Accelerator position switch (Full)	Ignition switch "ON" └ Accelerator pedal released	Approximately 0V
			Ignition switch "ON" └ Accelerator pedal fully depressed	BATTERY VOLTAGE (11 - 14V)
33	G	Electronic control fuel injection pump	Engine is running. └ **Warm-up condition** Idle speed	Approximately 2.5V

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ECM Terminals and Reference Value (Cont'd)

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
35	R	Mass air flow sensor	Engine is running. └ **Warm-up condition** Idle speed	1.6 - 2.0V
37	LG/R	A/T signal No. 2	Engine is running. └ **Warm-up condition** Idle speed	Voltage goes high up once in a few seconds  SEF448Z
38	B/W	Ignition switch	Ignition switch "OFF"	0V
			Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
39 43	B B	ECM ground	Engine is running. └ Idle speed	Approximately 0V
40	R	Electronic control fuel injection pump	Engine is running. └ **Warm-up condition** Idle speed	Approximately 2.5V
42	OR	Data link connector	Engine is running. └ Idle speed (CONSULT-II is connected and turned on)	Approximately 0V
64	OR/B			Approximately 0V
65	OR/W			Less than 9V
44	L/G	Crankshaft position sensor (TDC)	Engine is running. └ **Warm-up condition** Idle speed	Approximately 0V  SEF333Y
			Engine is running. └ **Warm-up condition** Engine speed is 2,000 rpm	Approximately 0V  SEF334Y

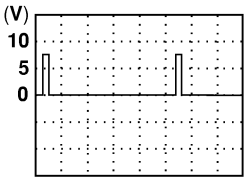
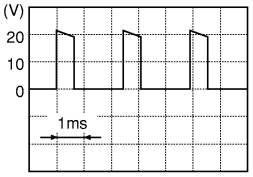
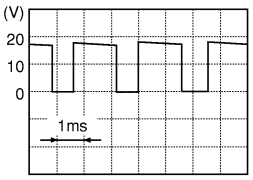
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ECM Terminals and Reference Value (Cont'd)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
46	G	Charge air pressure sensor	Engine is running. └ **Warm-up condition** Idle speed	Approximately 2.0V
47	L/R	Crankshaft position sensor (TDC) ground	Engine is running. └ **Warm-up condition** Idle speed	Approximately 0V
48	R/B	Accelerator position sensor power supply	Ignition switch "ON"	Approximately 5V
49	W	Sensor's power supply	Ignition switch "ON"	Approximately 5V
50	B	Sensors' ground	Engine is running. └ **Warm-up condition** Idle speed	Approximately 0V
51	B/W	Accelerator position sensor ground	Engine is running. └ **Warm-up condition** Idle speed	Approximately 0V
52	Y	Electronic control fuel injection pump	Engine is running. └ Idle speed	Approximately 0.1V
53	OR	Electronic control fuel injection pump	Engine is running. └ Idle speed	Approximately 1.0V
54	R	Swirl control valve control solenoid valve	Engine is running. └ **Warm-up condition** At idle speed for more than 1 second Lift up the vehicle Gear position is in positions other than "P" and "Neutral"	Approximately 0.1V
			Engine is running. └ Idle speed Lift up the vehicle Gear position is in "P" or "Neutral"	BATTERY VOLTAGE (11 - 14V)
56 61 116	B/W B/W B/W	Power supply for ECM	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)

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ECM Terminals and Reference Value (Cont'd)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
58	R/B	A/T signal No. 4	Engine is running. └ **Warm-up condition** Idle speed	Voltage goes high up once in a few seconds  SEF448Z
59	G	Heat up switch	Ignition switch "ON" └ Heat up switch is "ON"	Approximately 0V
			Ignition switch "ON" └ Heat up switch is "OFF"	BATTERY VOLTAGE (11 - 14V)
68	Y/G	Accelerator position sensor signal output	Ignition switch "ON" └ Accelerator pedal fully released	0.4 - 0.6V
			Ignition switch "ON" └ Accelerator pedal fully depressed	Approximately 4.5V
101	Y	Variable nozzle turbocharger control solenoid valve	Engine is running. └ **Warm-up condition** Idle speed	Approximately 6.8V  SEF253Z
			Engine is running. └ **Warm-up condition** Engine speed is 2,000 rpm	Approximately 11V  SEF254Z
102	G/W	Current return	Engine is running. └ Idle speed	BATTERY VOLTAGE (11 - 14V)

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ECM Terminals and Reference Value (Cont'd)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
103	R/Y (LHD models) L/R (RHD models)	EGR volume control valve	Engine is running. └ **Warm-up condition** Idle speed	0.1 - 14V
105 109 115	G/Y Y/B R/L			
106 112 118	B B B	ECM ground	Engine is running. └ Idle speed	Approximately 0V
111	LG	Glow relay	Refer to "GLOW CONTROL SYSTEM", EC-244.	

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Description

Intermittent incidents (I/I) may occur. In many cases, the problem resolves itself (the part or circuit function returns to normal without intervention). It is important to realize that the symptoms described in the customer's complaint often do not recur on DTC visits. Realize also that the most frequent cause of I/I occurrences is poor electrical connections. Because of this, the conditions under which the incident occurred may not be clear. Therefore, circuit checks made as part of the standard diagnostic procedure may not indicate the specific problem area.

COMMON I/I REPORT SITUATIONS

STEP in Work Flow	Situation
II	The CONSULT-II is used. The SELF-DIAG RESULTS screen shows time data other than "0".
III	The symptom described by the customer does not recur.
IV	DTC does not appear during the DTC Confirmation Procedure.
VI	The Diagnostic Procedure for XXXX does not indicate the problem area.

Diagnostic Procedure

1	**INSPECTION START**
Erase DTCs. Refer to "HOW TO ERASE DTC", EC-33.	
▶	GO TO 2.

2	**CHECK GROUND TERMINALS**
Check ground terminals for corroding or loose connection. Refer to GI section ("GROUND INSPECTION", "Circuit Inspection").	
OK or NG	
OK ▶	GO TO 3.
NG ▶	Repair or replace.

3	**SEARCH FOR ELECTRICAL INCIDENT**
Perform GI section, "Incident Simulation Tests".	
OK or NG	
OK ▶	**INSPECTION END**
NG ▶	Repair or replace.

http://vnx.su/

Main Power Supply and Ground Circuit

ECM TERMINALS AND REFERENCE VALUE

Remarks: Specification data are reference values and are measured between each terminal and ground.

CAUTION:

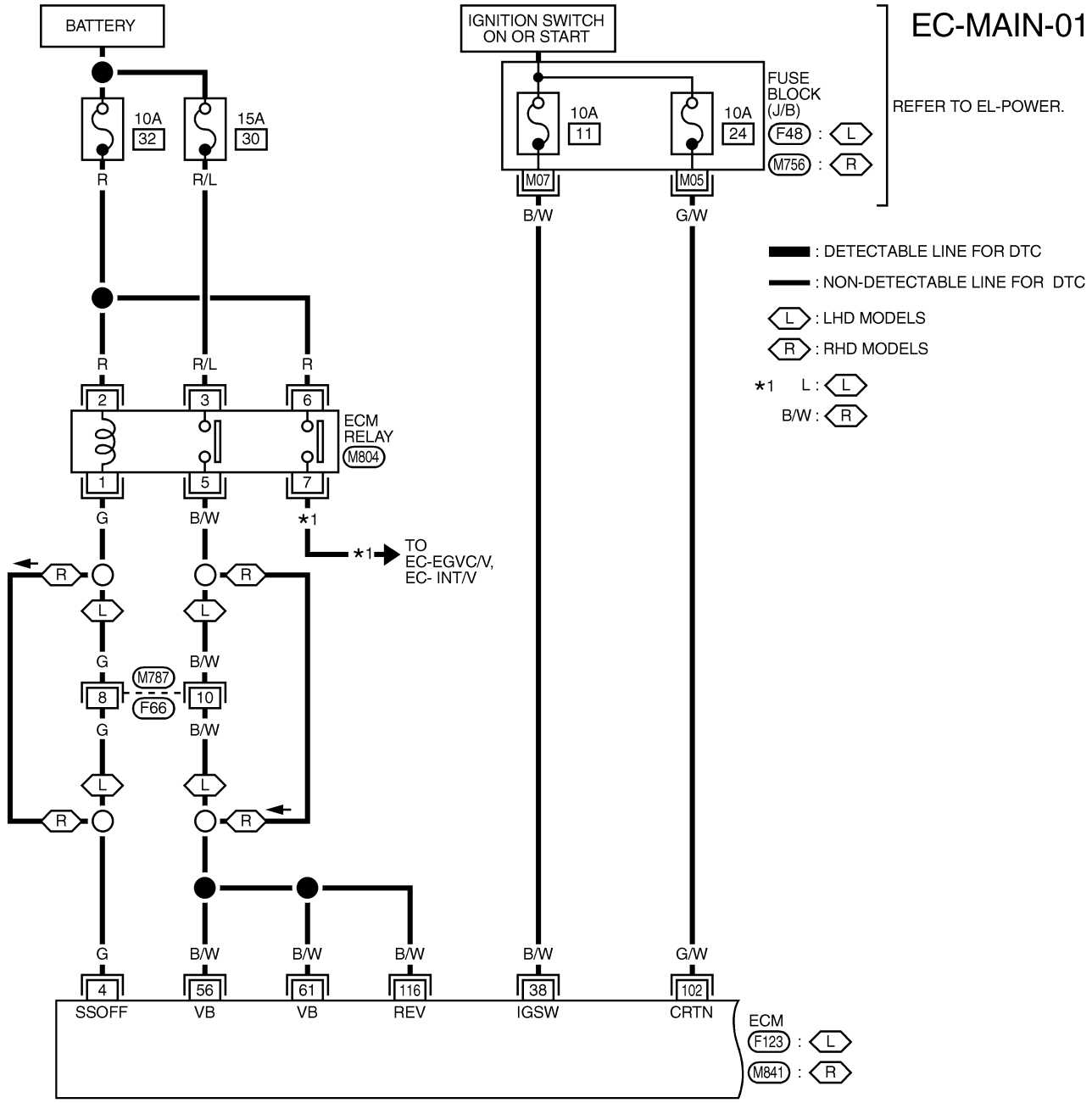
Do not use ECM ground terminals when measuring input/output voltage. Doing so may damage the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

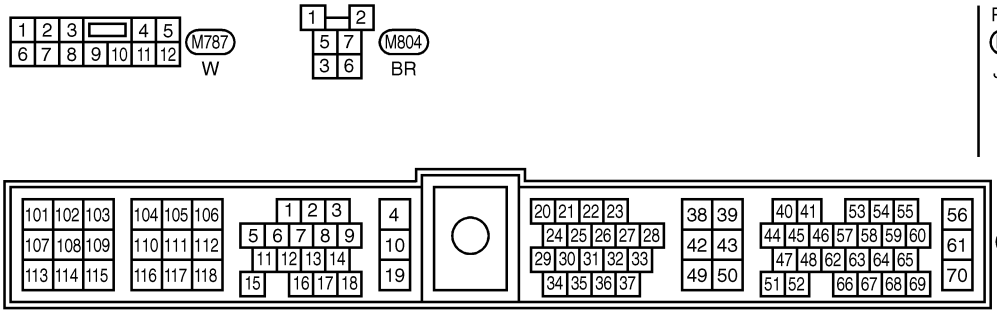
TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
4	G	ECM relay (Self-shutoff)	Ignition switch "ON" Ignition switch "OFF" └ For a few seconds after turning ignition switch "OFF"	Approximately 0.25V
			Ignition switch "OFF" └ More than a few seconds after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
38	B/W	Ignition switch	Ignition switch "OFF"	0V
			Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
39 43	B B	ECM ground	Engine is running. └ Idle speed	Approximately 0V
56 61 116	B/W B/W B/W	Power supply for ECM	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
102	G/W	Current return	Engine is running. └ Idle speed	BATTERY VOLTAGE (11 - 14V)
106 112 118	B B B	ECM ground	Engine is running. └ Idle speed	Approximately 0V

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Main Power Supply and Ground Circuit (Cont'd)

WIRING DIAGRAM





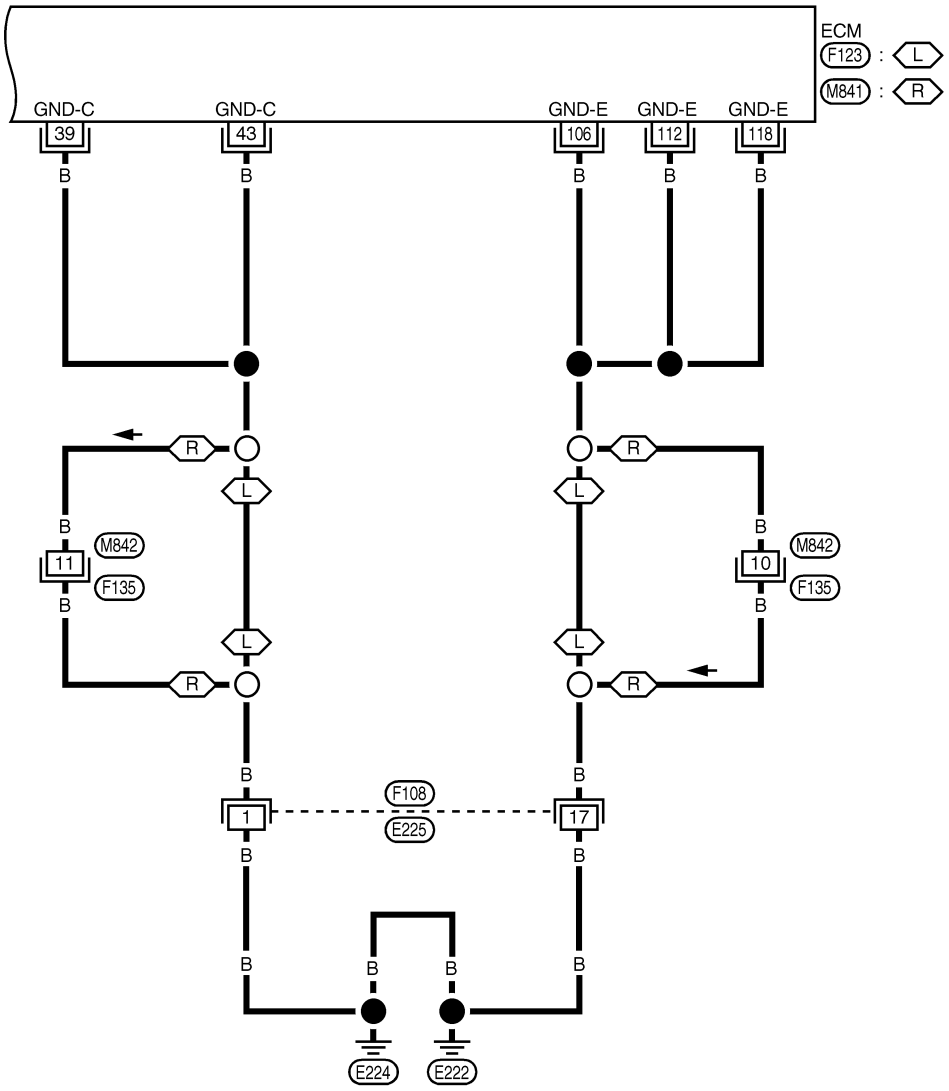
YEC171A

http://vnx.su/

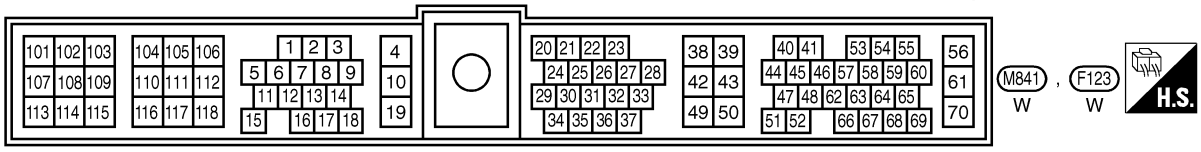
Main Power Supply and Ground Circuit (Cont'd)

EC-MAIN-02

: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC
L : LHD MODELS
R : RHD MODELS



REFER TO THE FOLLOWING.
F108 , F135 -SUPER MULTIPLE JUNCTION (SMJ)



YEC172A

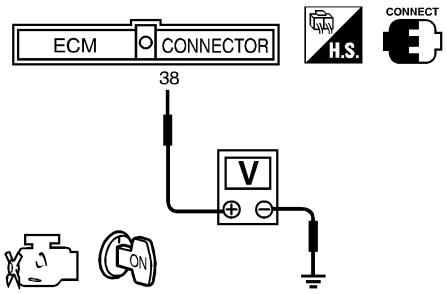
http://vnx.su/

Main Power Supply and Ground Circuit (Cont'd)

DIAGNOSTIC PROCEDURE

1	INSPECTION START
Start engine. Is engine running? **Yes or No**	
Yes ▶	GO TO 14.
No ▶	GO TO 2.

2	CHECK ECM POWER SUPPLY CIRCUIT-I
1. Turn ignition switch "ON". 2. Check voltage between ECM terminal 38 and ground with CONSULT-II or tester.	



Voltage: Battery voltage

SEF397Y

OK or NG

OK ▶	GO TO 4.
NG ▶	GO TO 3.

3	DETECT MALFUNCTIONING PART
Check the following. ● 10A fuse ● Harness for open or short between ECM and fuse	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

4	CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT
1. Turn ignition switch "OFF". 2. Disconnect ECM harness connector. 3. Check harness continuity between ECM terminals 39, 43, 106, 112, 118 and engine ground. Refer to Wiring Diagram. **Continuity should exist.** 4. Also check harness for short to ground and short to power. **OK or NG**	
OK ▶	GO TO 6.
NG ▶	GO TO 5.

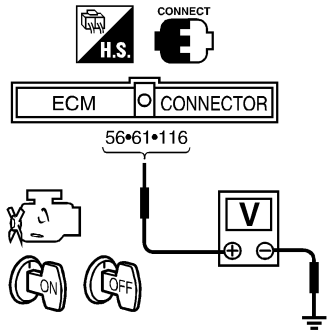
http://vnx.su/

Main Power Supply and Ground Circuit (Cont'd)

5	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors F108, E225 ● Harness connectors M842, F135 (RHD models) ● Harness for open or short between ECM and engine ground	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

6	CHECK ECM POWER SUPPLY CIRCUIT-II

1. Reconnect ECM harness connector.
2. Turn ignition switch "ON" and then "OFF".
3. Check voltage between ECM terminals 56, 61, 116 and ground with CONSULT-II or tester.



Voltage:
After turning ignition switch "OFF", battery voltage will exist for a few seconds, then drop to approximately 0V.

SEF288Z

OK or NG

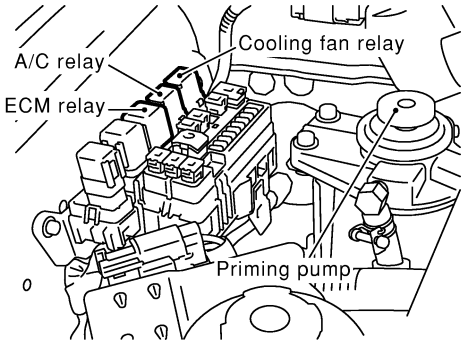
OK ▶	Check electronic control fuel injection pump power supply circuit. Refer to "Diagnostic Procedure", EC-185.
NG (Battery voltage does not exist.) ▶	GO TO 7.
NG (Battery voltage exists for more than a few seconds.) ▶	GO TO 13.

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Main Power Supply and Ground Circuit (Cont'd)

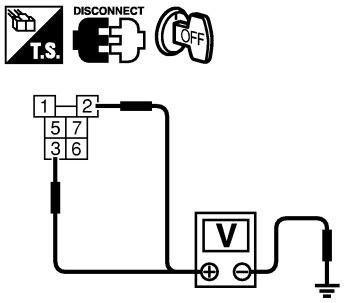
7	CHECK ECM POWER SUPPLY CIRCUIT-III

1. Disconnect ECM relay.



MEC021E

2. Check voltage between relay terminals 2, 3 and ground with CONSULT-II or tester.



MEC978D

Voltage: Battery Voltage

OK or NG

OK	▶	GO TO 9.
NG	▶	GO TO 8.

8	DETECT MALFUNCTIONING PART

Check the following.
- 10A fuse
- 15A fuse
- Harness for open or short between ECM relay and battery

	▶	Repair open circuit or short to ground or short to power in harness or connectors.

9	CHECK OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 4 and ECM relay terminal 1. Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 11.
NG	▶	GO TO 10.

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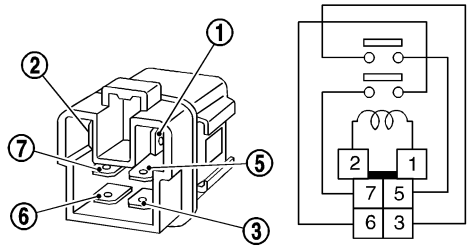
Main Power Supply and Ground Circuit (Cont'd)

10	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors M787, F66 (LHD models) ● Harness for open or short between ECM and ECM relay	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

11	CHECK ECM POWER SUPPLY CIRCUIT-IV
1. Check harness continuity between ECM terminals 56, 61, 116 and ECM relay terminal 5. Refer to Wiring Diagram. **Continuity should exist.** 2. Also check harness for short to ground and short to power. **OK or NG**	
OK ▶	GO TO 13.
NG ▶	GO TO 12.

12	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors M787, F66 (LHD models) ● Harness for open or short between ECM and ECM relay	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

13	CHECK ECM RELAY
1. Apply 12V direct current between ECM relay terminals 1 and 2. 2. Check continuity between ECM relay terminals 3 and 5, 6 and 7.	



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

SEF296X

OK or NG

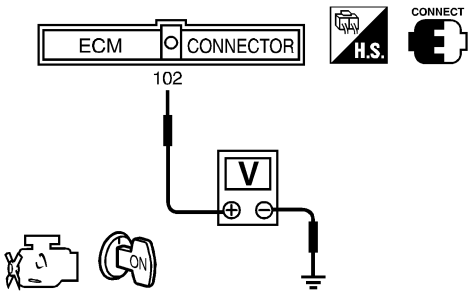
OK ▶	GO TO 14.
NG ▶	Replace ECM relay.

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Main Power Supply and Ground Circuit (Cont'd)

14	CHECK ECM POWER SUPPLY CIRCUIT-V

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch "ON".
3. Check voltage between ECM terminal 102 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF290Z

OK or NG

OK	▶	GO TO 16.
NG	▶	GO TO 15.

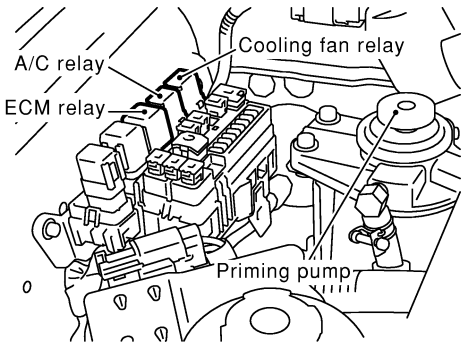
15	DETECT MALFUNCTIONING PART

Check the following.
- 10A fuse
- Harness for open or short between ECM and fuse

	▶	Repair open circuit or short to ground or short to power in harness or connectors.

16	CHECK ECM POWER SUPPLY CIRCUIT-VI

1. Turn ignition switch "OFF".
2. Disconnect ECM relay.



MEC021E

3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminals 56, 61, 116 and ECM relay terminal 5. Refer to Wiring Diagram.
   Continuity should exist.
5. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 18.
NG	▶	GO TO 17.

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Main Power Supply and Ground Circuit (Cont'd)

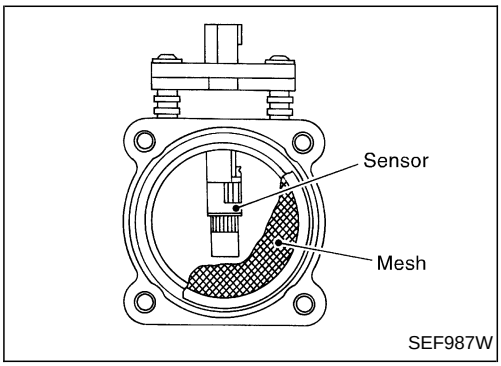
17	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors M787, F66 (LHD models) ● Harness for open or short between ECM and ECM relay	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

18	CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT
1. Check harness continuity between ECM terminals 39, 43, 106, 112, 118 and engine ground. Refer to Wiring Diagram. **Continuity should exist.** 2. Also check harness for short to ground and short to power. **OK or NG**	
OK ▶	GO TO 20.
NG ▶	GO TO 19.

19	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors F108, E225 ● Harness connectors M842, F135 (RHD models) ● Harness for open or short between ECM and engine ground	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

20	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-78.	
▶	**INSPECTION END**

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Component Description

The mass air flow sensor (MAFS) is placed in the stream of intake air. It measures the intake air flow rate by measuring a part of the entire intake air flow. It consists of a hot wire that is supplied with electric current from the ECM. The temperature of the hot wire is controlled by the ECM a certain amount. The heat generated by the hot wire is reduced as the intake air flows around it. The more air, the greater the heat loss.
Therefore, the ECM must supply more electric current to maintain the temperature of the hot wire as air flow increases. The ECM detects the air flow by means of this current change.

CONSULT-II Reference Value in Data Monitor Mode

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
MAS AIR/FL SE	● Engine: After warming up ● Air conditioner switch: “OFF” ● Shift lever: Neutral position ● No-load	Idle	1.6 - 2.0V

ECM Terminals and Reference Value

Specification data are reference values, and are measured between each terminal and ground.

CAUTION:

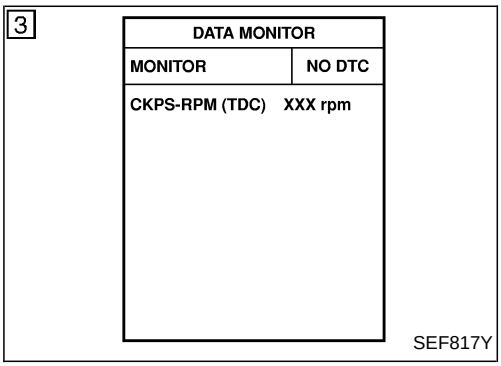
Do not use ECM ground terminals when measuring input/output voltage. Doing so may damage the ECM’s transistor. Use a ground other than ECM terminals, such as the ground.

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
35	R	Mass air flow sensor	Engine is running. └ **Warm-up condition** Idle speed	1.6 - 2.0V
49	W	Sensor’s power supply	Ignition switch “ON”	Approximately 5V
50	B	Sensor’s ground	Engine is running. └ **Warm-up condition** Idle speed	Approximately 0V

On Board Diagnosis Logic

Malfunction is detected when ...	Check Items (Possible Cause)
● An excessively high or low voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Mass air flow sensor

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DTC Confirmation Procedure

WITH CONSULT-II

1) Turn ignition switch “ON”, and wait at least 6 seconds.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Start engine and wait at least 3 seconds.
4) If DTC is detected, go to “Diagnostic Procedure”, EC-92.

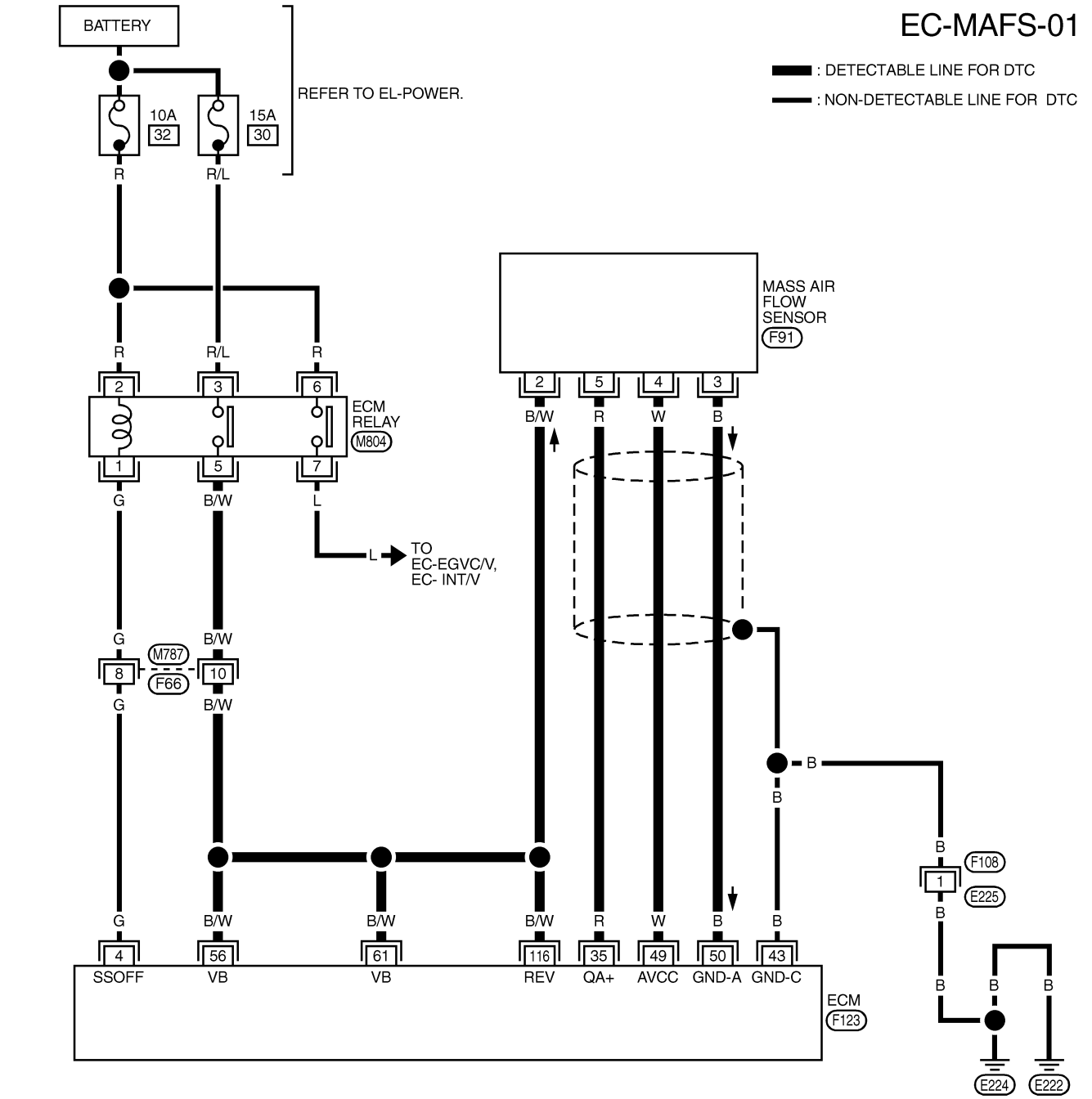
WITHOUT CONSULT-II

1) Turn ignition switch “ON”, and wait at least 6 seconds.
2) Start engine and wait at least 3 seconds.
3) Turn ignition switch “OFF”, wait at least 5 seconds and then turn “ON”.
4) Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
5) If DTC is detected, go to “Diagnostic Procedure”, EC-92.

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Wiring Diagram

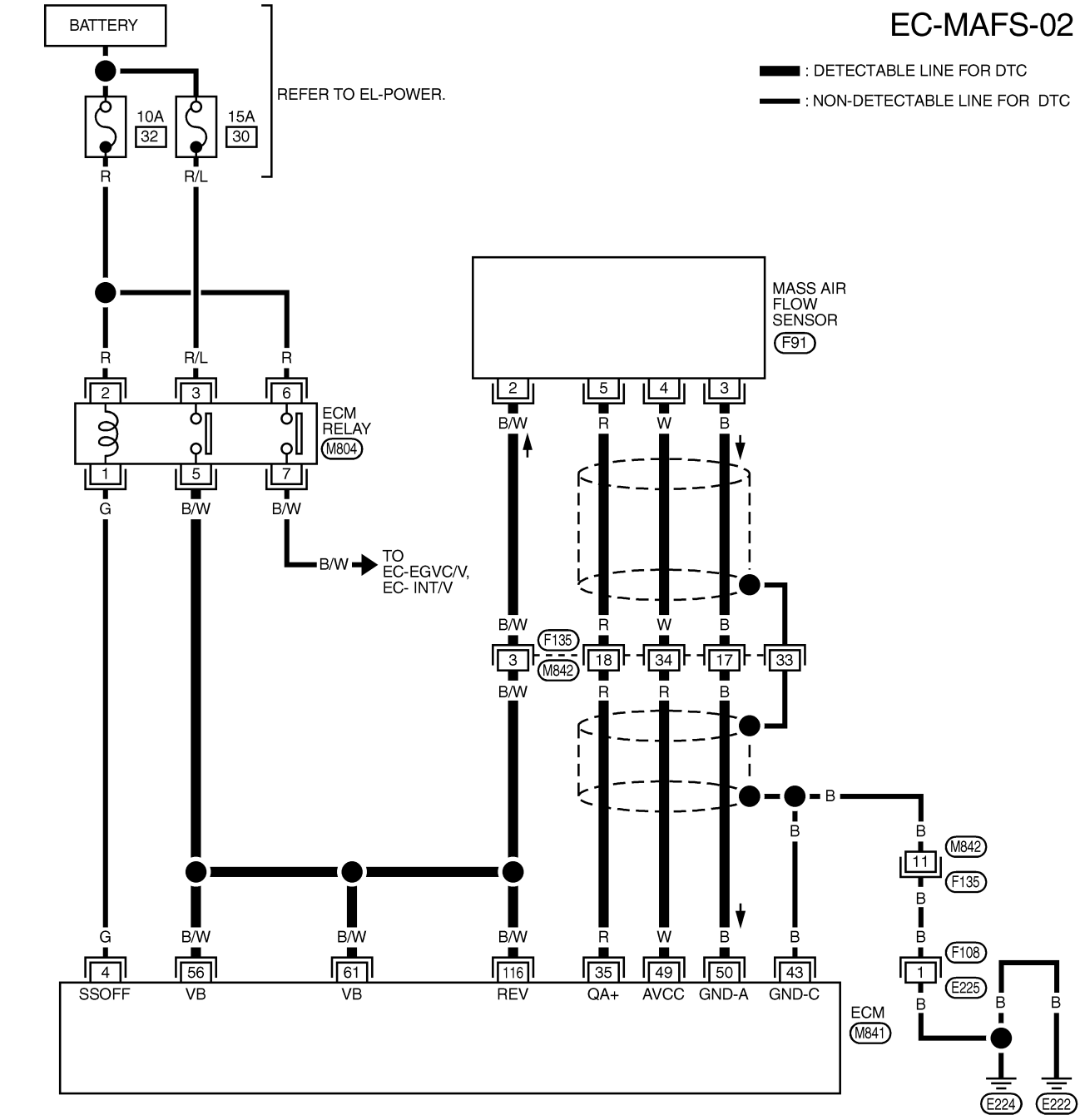
LHD MODELS



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Wiring Diagram (Cont'd)

RHD MODELS



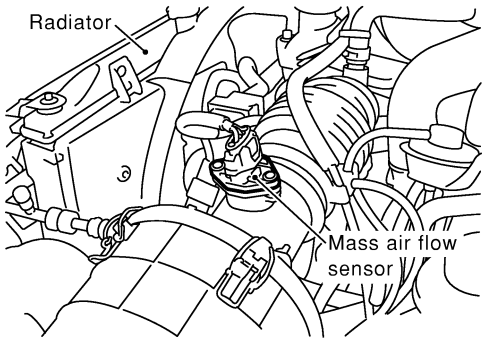
YEC174A

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Diagnostic Procedure

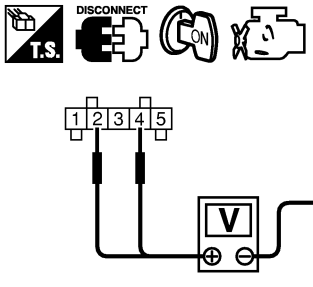
1	CHECK MAFS POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect mass air flow sensor harness connector.



MEC993D

3. Turn ignition switch “ON”.
4. Check voltage between mass air flow sensor terminals 2, 4 and ground with CONSULT-II or tester.



MEC973D

Terminal	Voltage V
2	Battery voltage
4	Approximately 5

MTBL1318

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M787, F66 (LHD models)
- Harness connectors F135, M842 (RHD models)
- Harness for open or short between mass air flow sensor and ECM
- Harness for open or short between mass air flow sensor and ECM relay

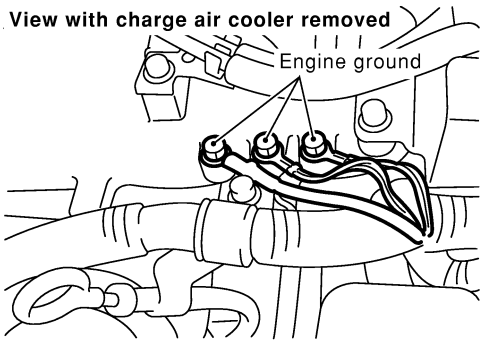
	▶	Repair open circuit or short to ground or short to power in harness or connector.

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Diagnostic Procedure (Cont'd)

3	CHECK MAFS GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.



MEC994D

3. Check harness continuity between mass air flow sensor terminal 3 and engine ground. Refer to Wiring Diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 4.

4	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F135, M842 (RHD models)
- Harness for open or short between mass air flow sensor and ECM

	▶	Repair open circuit or short to ground or short to power in harness or connectors.

5	CHECK MAFS INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between mass air flow sensor terminal 5 and ECM terminal 35. Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 7.
NG	▶	GO TO 6.

6	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F135, M842 (RHD models)
- Harness for open or short between mass air flow sensor and ECM

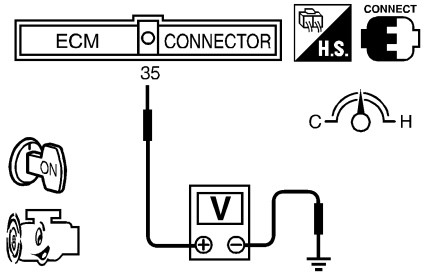
	▶	Repair open circuit or short to ground or short to power in harness or connectors.

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Diagnostic Procedure (Cont'd)

7	CHECK MASS AIR FLOW SENSOR

1. Reconnect harness connectors disconnected.
2. Start engine and warm it up to normal operating temperature.
3. Check voltage between ECM terminal 35 (Mass air flow sensor signal) and ground.



Condition	Voltage V
Ignition switch "ON" (Engine stopped.)	Approx. 1.0
Idle (Engine is warmed-up to normal operating temperature.)	1.6 - 2.0
Idle to about 4,000 rpm*	1.6 - 2.0 to Approx. 4.0

*: Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

SEF400Y

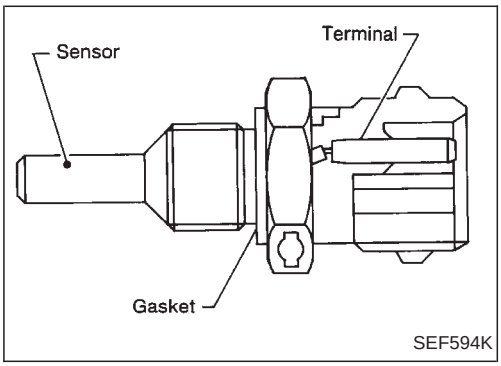
4. If the voltage is out of specification, disconnect mass air flow sensor harness connector and connect it again. Then repeat above check.

OK or NG

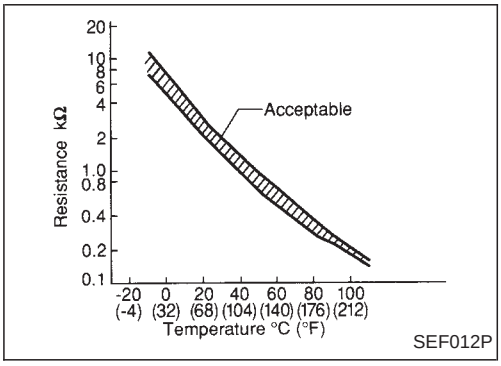
OK	▶	GO TO 8.
NG	▶	Replace mass air flow sensor.

8	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-78.	
▶	**INSPECTION END**

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SEF594K



SEF012P

Description

The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.

<Reference data>

Engine coolant temperature °C (°F)	Voltage* (V)	Resistance (kΩ)
−10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.1 - 2.9
50 (122)	2.3	0.68 - 1.00
90 (194)	1.0	0.236 - 0.260

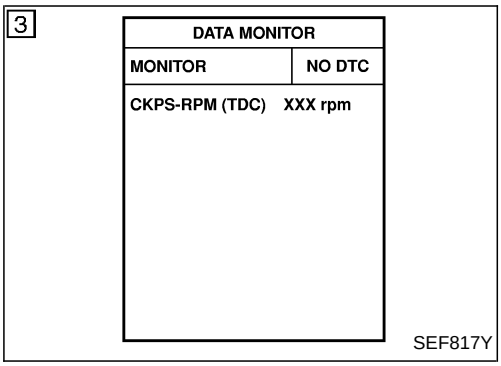
*: These data are reference values and measured between ECM terminal 19 (Engine coolant temperature sensor) and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may damage the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

On Board Diagnosis Logic

Malfunction is detected when ...	Check Items (Possible Cause)
• An excessively high or low voltage from the sensor is entered to ECM.	• Harness or connectors (The sensor circuit is open or shorted.) • Engine coolant temperature sensor



SEF817Y

DTC Confirmation Procedure

WITH CONSULT-II

1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT-II.
3) Wait at least 5 seconds.
4) If DTC is detected, go to "Diagnostic Procedure", EC-97.

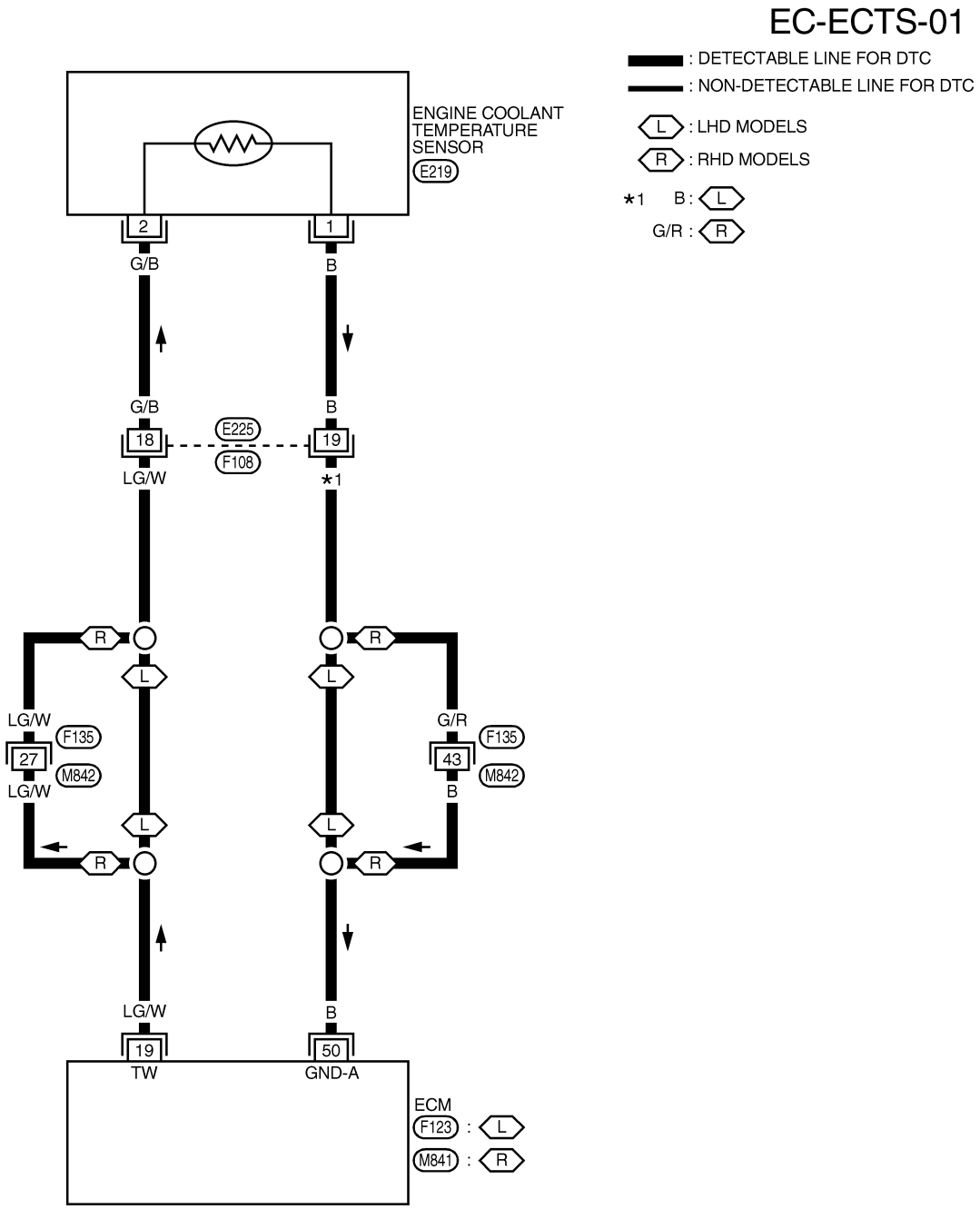
WITHOUT CONSULT-II

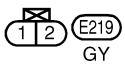
1) Turn ignition switch "ON" and wait at least 5 seconds.
2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
4) If DTC is detected, go to "Diagnostic Procedure", EC-97.

http://vnx.su/

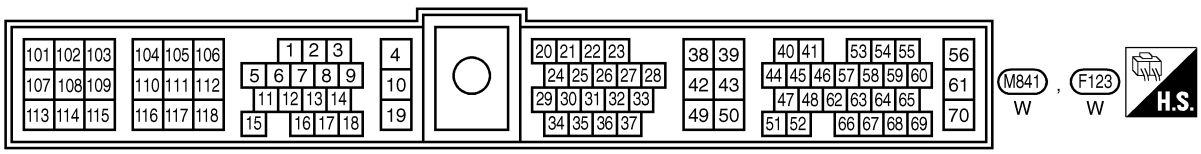
Wiring Diagram

EC-ECTS-01





REFER TO THE FOLLOWING.
F108 , F135 -SUPER MULTIPLE JUNCTION (SMJ)



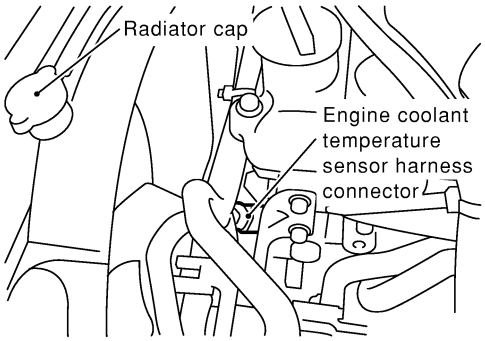
YEC175A

http://vnx.su/

Diagnostic Procedure

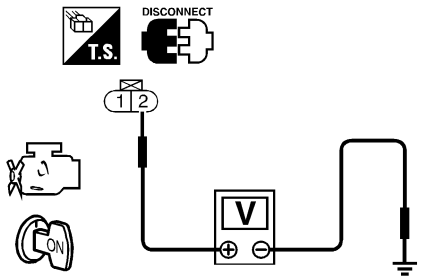
1	CHECK ECTS POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect engine coolant temperature sensor harness connector.



MEC022E

3. Turn ignition switch “ON”.
4. Check voltage between ECTS terminal 2 and ground with CONSULT-II or tester.



Voltage: Approximately 5V

SEF401Y

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E225, F108
- Harness connectors F135, M842 (RHD models)
- Harness for open or short between engine control temperature sensor and ECM

	▶	Repair open circuit or short to ground or short to power in harness or connectors.

3	CHECK ECTS GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between ECTS terminal 1 and engine ground. Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 4.

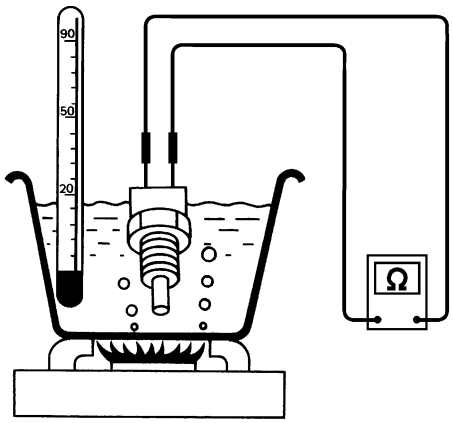
http://vnx.su/

Diagnostic Procedure (Cont'd)

4	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E225, F108 ● Harness connectors F135, M842 (RHD models) ● Harness for open or short between engine coolant temperature sensor and ECM	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

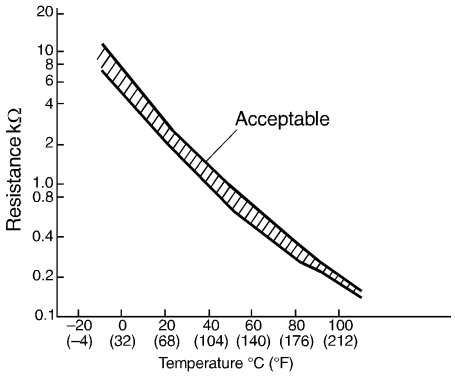
5	CHECK ENGINE COOLANT TEMPERATURE SENSOR

1. Remove engine coolant temperature sensor from the engine.
2. Check resistance between ECTS terminals 1 and 2 as shown in the figure.



<Reference data>

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.00
90 (194)	0.236 - 0.260



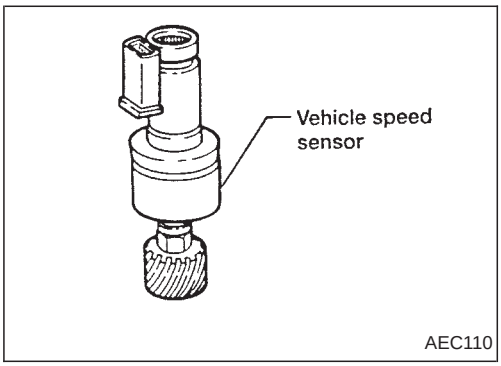
SEF304X

OK or NG

OK	▶	GO TO 6.
NG	▶	Replace engine coolant temperature sensor.

6	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-78.	
▶	**INSPECTION END**

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Description

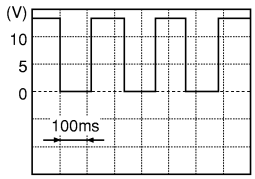
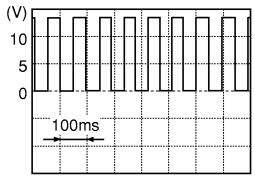
The vehicle speed sensor is installed in the transaxle. It contains a pulse generator which provides a vehicle speed signal to the speedometer. The speedometer then sends a signal to the ECM.

ECM Terminals and Reference Value

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

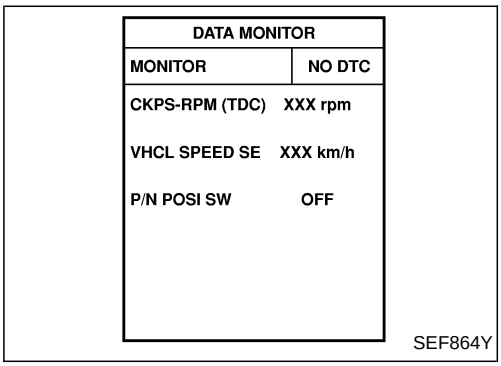
Do not use ECM ground terminals when measuring input/output voltage. Doing so may damage the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

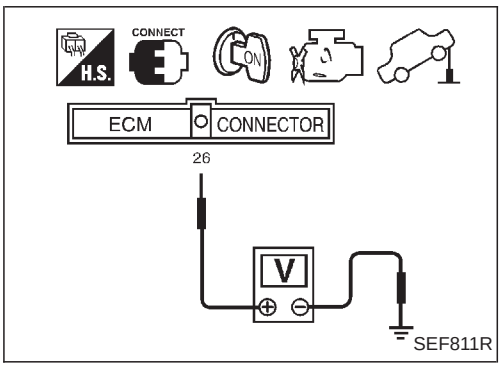
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
26	Y/B	Vehicle speed sensor	Engine is running. Lift up the vehicle In 1st gear position Vehicle speed is 10 km/h (6 MPH)	0 - Approximately 4.8V  SEF257Z
			Engine is running. Lift up the vehicle In 2nd gear position Vehicle speed is 30 km/h (19 MPH)	Approximately 2.2V  SEF258Z

On Board Diagnosis Logic

Malfunction is detected when	Check Items (Possible Cause)
• The almost 0 km/h (0 MPH) signal from vehicle speed sensor is sent to ECM even when vehicle is being driven.	• Harness or connector (The vehicle speed sensor circuit is open or shorted.) • Vehicle speed sensor

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Overall Function Check

Use this procedure to check the overall function of the vehicle speed sensor circuit. During this check, a DTC might not be confirmed.

WITH CONSULT-II

1) Lift up the vehicle.
2) Start engine.
3) Read vehicle speed sensor signal in “DATA MONITOR” mode with CONSULT-II.
   The vehicle speed on CONSULT-II should be able to exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.
4) If NG, go to “Diagnostic Procedure”, EC-103.

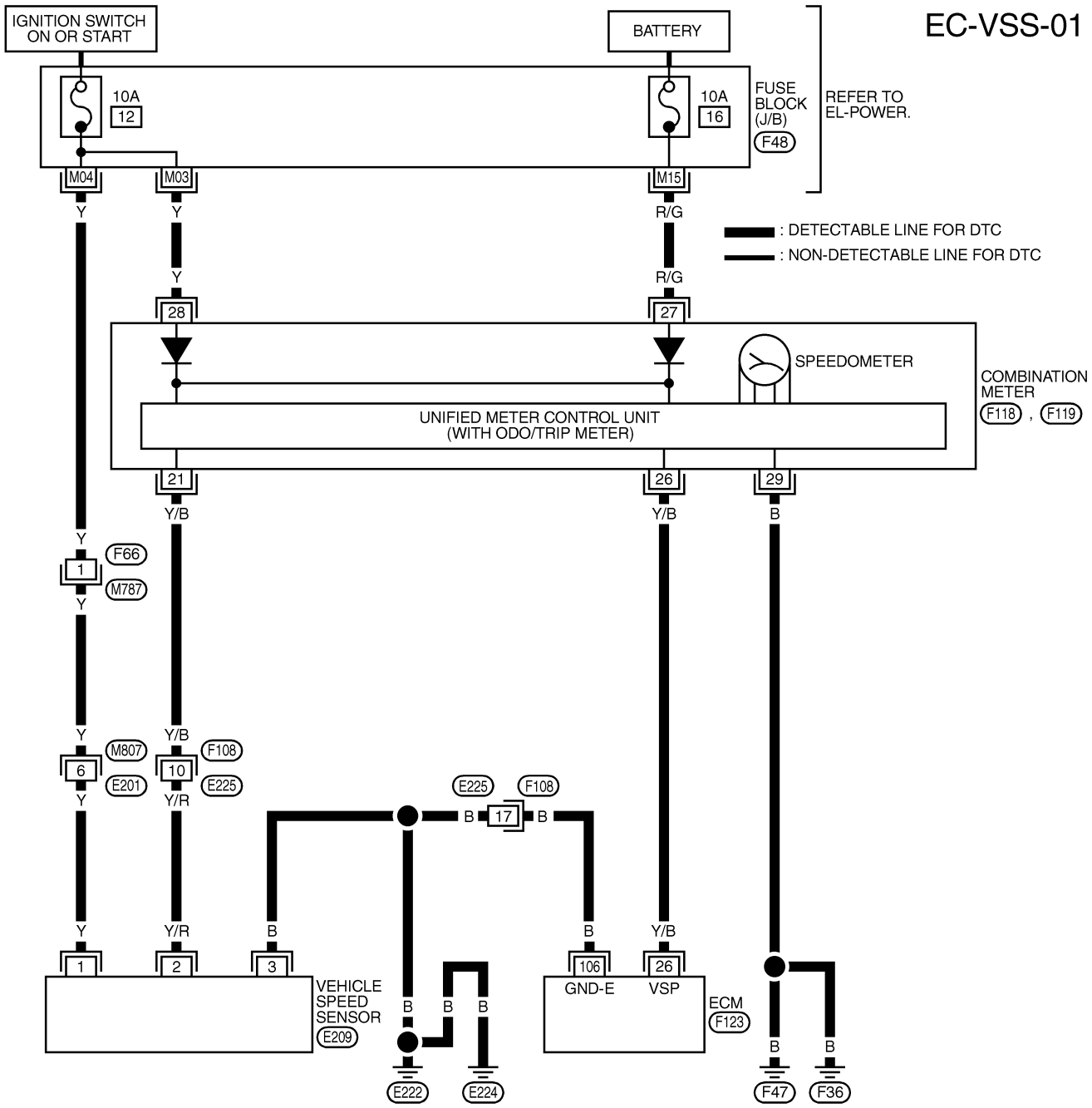
WITHOUT CONSULT-II

1) Lift up the vehicle.
2) Start engine.
3) Rotate drive wheel by hand.
4) Check voltage between ECM terminal 26 and ground with tester.
   Voltage should vary between 0 - BATTERY VOLTAGE.
5) If NG, go to “Diagnostic Procedure”, EC-103.

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Wiring Diagram

LHD MODELS

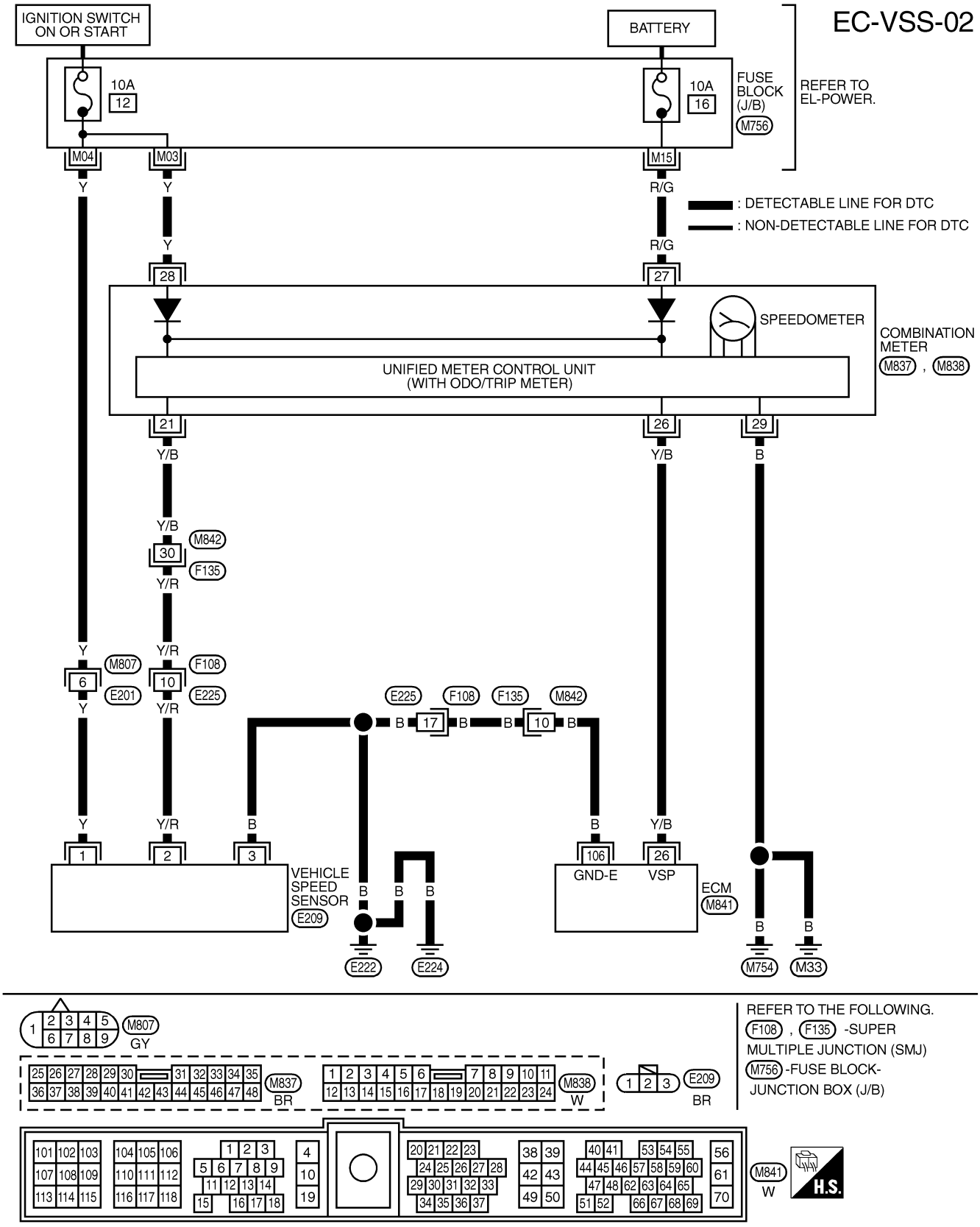


YEC176A

http://vnx.su/

Wiring Diagram (Cont'd)

RHD MODELS



YEC177A

http://vnx.su/

Diagnostic Procedure

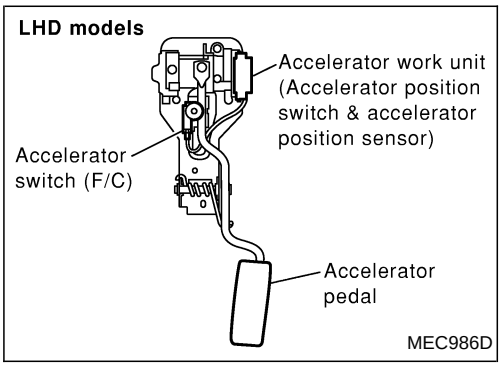
1	CHECK VEHICLE SPEED SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT
1. Turn ignition switch “OFF”. 2. Disconnect ECM harness connector and combination meter harness connector. 3. Check harness continuity between ECM terminal 26 and combination meter terminal 26. Refer to Wiring Diagram. **Continuity should exist.** 4. Also check harness for short to ground and short to power. **OK or NG**	
OK ▶	GO TO 2.
NG ▶	Repair open circuit or short to ground or short to power in harness or connectors.

2	CHECK SPEEDOMETER FUNCTION
Make sure that speedometer functions properly. **OK or NG**	
OK ▶	GO TO 4.
NG ▶	GO TO 3.

3	CHECK SPEEDOMETER CIRCUIT FOR OPEN AND SHORT
Check the following. ● Harness connectors F108, E225 ● Harness connectors M842, F135 (RHD models) ● Harness for open or short between combination meter and vehicle speed sensor **OK or NG**	
OK ▶	Check vehicle speed sensor and combination meter. Refer to EL section.
NG ▶	Repair open circuit or short to ground or short to power in harness or connectors.

4	CHECK INTERMITTENT INCIDENT
Refer to “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-78.	
▶	**INSPECTION END**

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Description

The accelerator switch is installed to the accelerator pedal assembly. The switch senses accelerator position and sends an ON-OFF signal to the ECM. The ECM uses the signal to control the fuel cut operation at deceleration for better fuel efficiency.

CONSULT-II Reference Value in Data Monitor Mode

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
ACCEL SW (FC)	• Ignition switch: ON (Engine stopped)	Accelerator pedal: fully released	CLOSE
		Accelerator pedal: slightly open	OPEN
DECELER F/CUT	• Engine: After warming up	Idle	OFF

ECM Terminals and Reference Value

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

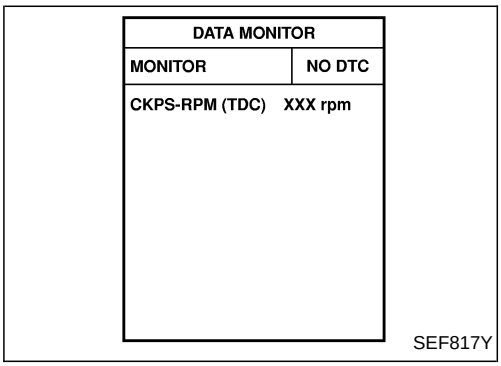
Do not use ECM ground terminals when measuring input/output voltage. Doing so may damage the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
29	LG/R	Accelerator switch (F/C)	Ignition switch "ON" └ Accelerator pedal fully released	BATTERY VOLTAGE (11 - 14V)
			Ignition switch "ON" └ Accelerator pedal depressed	Approximately 0V

On Board Diagnosis Logic

Malfunction is detected when	Check Items (Possible Cause)
• The OFF signal (short) is sent to the ECM for a certain period of time even when the accelerator pedal is not being depressed.	• Harness or connectors (The switch circuit is shorted.) • Accelerator switch (F/C)

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DTC Confirmation Procedure

WITH CONSULT-II

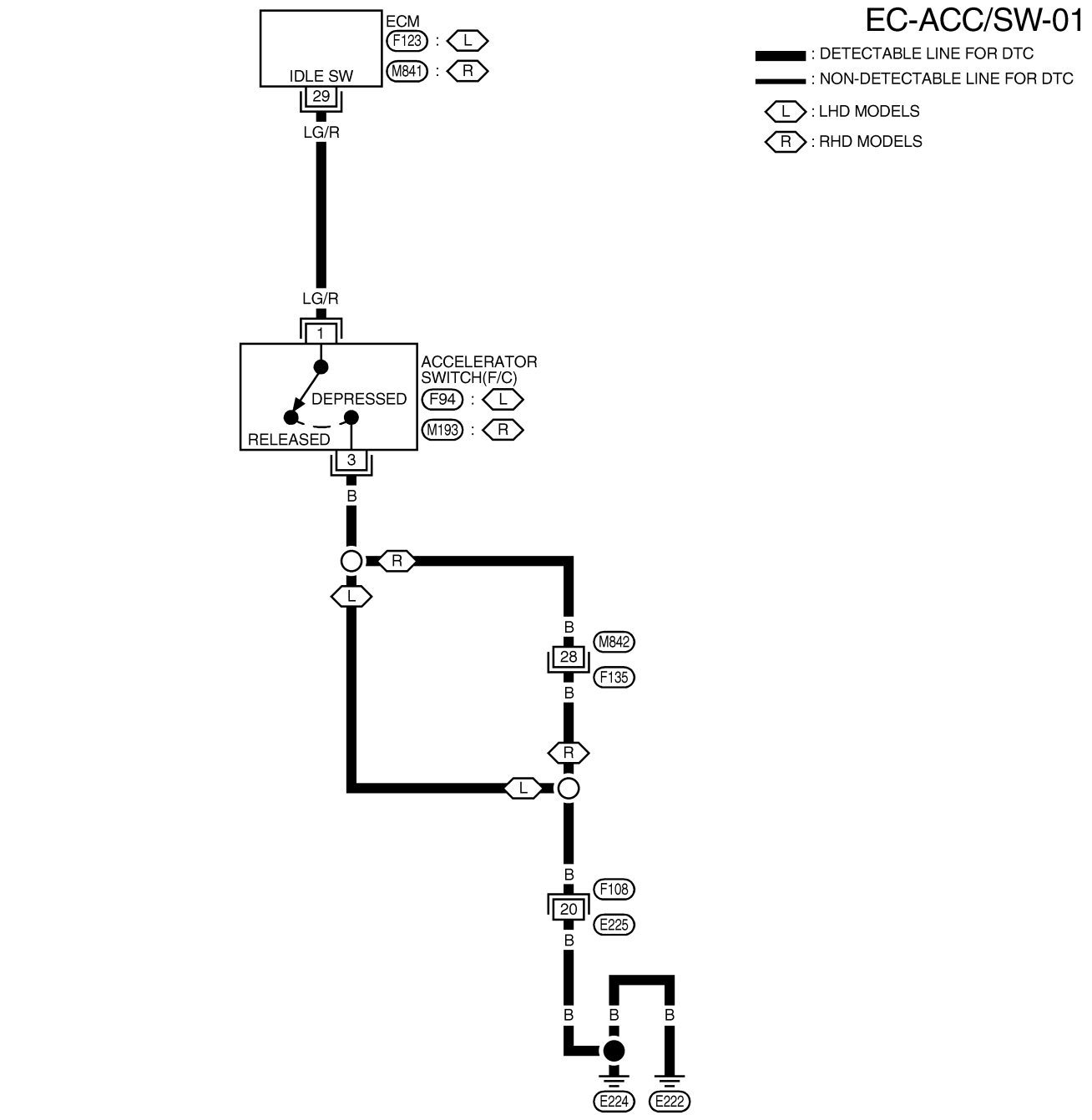
1) Turn ignition switch “ON”.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Fully depress and fully release accelerator pedal, and wait 15 seconds.
4) Repeat step 3 at least 29 times.
5) If DTC is detected, go to “Diagnostic Procedure”, EC-107.

WITHOUT CONSULT-II

1) Turn ignition switch “ON”.
2) Fully depress and fully release accelerator pedal, and then wait 15 seconds.
3) Repeat step 2 at least 29 times.
4) Turn ignition switch “OFF”, wait at least 5 seconds and then turn “ON”.
5) Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
6) If DTC is detected, go to “Diagnostic Procedure”, EC-107.

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Wiring Diagram



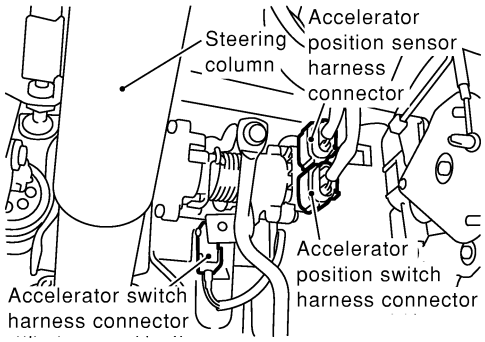
YEC178A

http://vnx.su/

Diagnostic Procedure

1	CHECK ACCELERATOR SWITCH (F/C) GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.
3. Disconnect accelerator switch (F/C) harness connector.



MEC995D

4. Check harness continuity between accelerator switch (F/C) terminal 3 and engine ground. Refer to Wiring Diagram.
   Continuity should exist.
5. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F108, E225
- Harness connectors M842, F135 (RHD models)
- Harness for open or short between accelerator switch (F/C) and engine ground

	▶	Repair open circuit or short to ground or short to power in harness or connectors.

3	CHECK ACCELERATOR SWITCH (F/C) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 29 and accelerator switch (F/C) terminal 1. Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to ground and short to power.

OK or NG

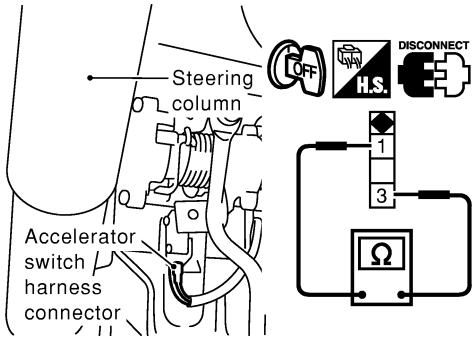
OK	▶	GO TO 4.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

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Diagnostic Procedure (Cont'd)

4	CHECK ACCELERATOR SWITCH (F/C)

1. Disconnect accelerator switch harness connector.
2. Check continuity between accelerator switch (F/C) connector terminals 1 and 3 under the following conditions.



MEC997D

Conditions	Continuity
Accelerator pedal fully released	Should not exist.
Accelerator pedal depressed	Should exist.

MTBL1323

OK or NG

OK	▶	GO TO 5.
NG	▶	Replace accelerator pedal assembly.

5	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-78.	
▶	**INSPECTION END**

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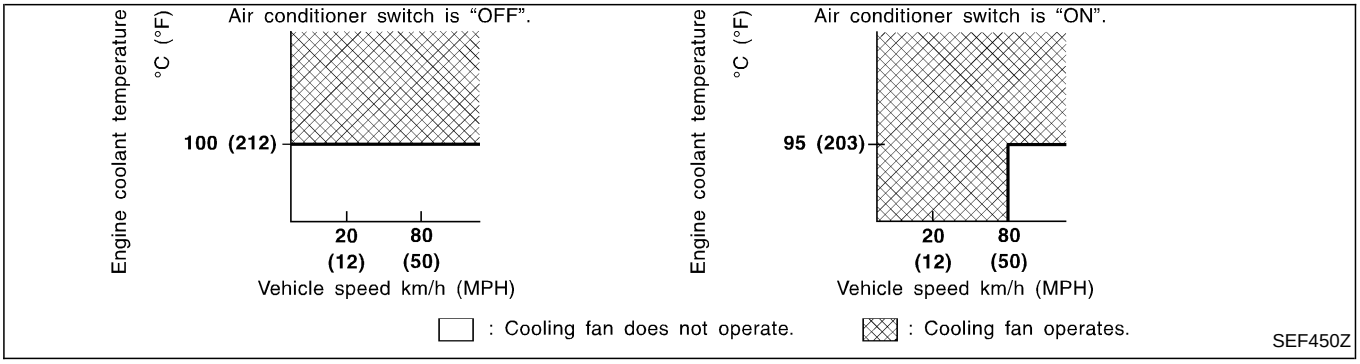
Description

SYSTEM DESCRIPTION

Sensor	Input signal to ECM	ECM function	Actuator
Vehicle speed sensor	Vehicle speed	Cooling fan control	Cooling fan relay
Engine coolant temperature sensor	Engine coolant temperature		
Air conditioner switch	Air conditioner “ON” signal		

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

OPERATION



CONSULT-II Reference Value in Data Monitor Mode

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
AIR COND SIG	● Engine: After warming up, idle the engine	Air conditioner switch: OFF	OFF
		Air conditioner switch: ON (Compressor operates.)	ON
COOLING FAN	● When cooling fan is stopped.		OFF
	● When cooling fan operates.		ON

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ECM Terminals and Reference Value

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may damage the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
14	LG/R	Cooling fan relay	Engine is running. └ Cooling fan is not operating	BATTERY VOLTAGE (11 - 14V)
			Engine is running. └ Cooling fan is operating	Approximately 0.1V

On Board Diagnosis Logic

This diagnosis continuously monitors the engine coolant temperature.
If the cooling fan or another component in the cooling system malfunctions, engine coolant temperature will rise.
When the engine coolant temperature reaches an abnormally high temperature condition, a malfunction is indicated.

Malfunction is detected when ...	Check Items (Possible Cause)
● Cooling fan does not operate properly (Overheat). ● Cooling fan system does not operate properly (Overheat). ● Engine coolant was not added to the system using the proper filling method. ● Engine coolant is not within the specified range.	● Harness or connectors (The cooling fan circuit is open or shorted.) ● Cooling fan ● Radiator hose ● Radiator ● Radiator cap ● Water pump ● Thermostat ● Fan belt ● Engine coolant temperature sensor For more information, refer to "MAIN 12 CAUSES OF OVERHEATING", EC-120.

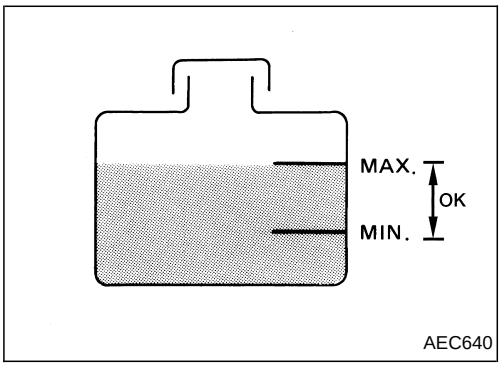
CAUTION:

When a malfunction is indicated, be sure to replace the coolant following the procedure in the MA section ("Changing Engine Coolant", "ENGINE MAINTENANCE"). Also, replace the engine oil.

1) Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute. Be sure to use coolant with the proper mixture ratio. Refer to MA section ("Anti-freeze Coolant Mixture Ratio", "RECOMMENDED LUBRICANTS AND FLUIDS").

2) After refilling coolant, run engine to ensure that no water-flow noise is emitted.

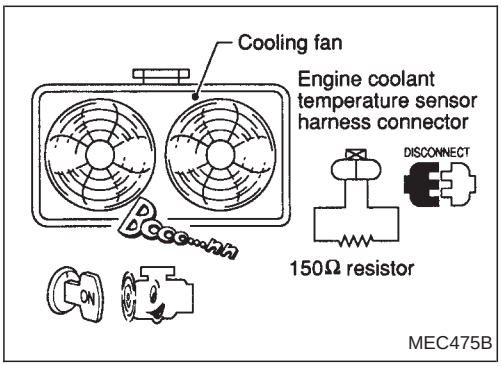
http://vnx.su/



AEC640

ACTIVE TEST	
COOLING FAN	OFF
MONITOR	
COOLAN TEMP/S	XXX °C

SEF111X



MEC475B

Overall Function Check

Use this procedure to check the overall function of the cooling fan. During this check, a DTC might not be confirmed.

WARNING:

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

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

WITH CONSULT-II

1) Check the coolant level in the reservoir tank and radiator.
   Allow engine to cool before checking coolant level.
   If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to “Diagnostic Procedure”, EC-114.
2) Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to “Diagnostic Procedure”, EC-114.
3) Turn ignition switch “ON”.
4) Perform “COOLING FAN” in “ACTIVE TEST” mode with CONSULT-II and make sure that cooling fans operate when touching “HIGH” or “LOW”.
   If NG, go to “Diagnostic Procedure”, EC-114.

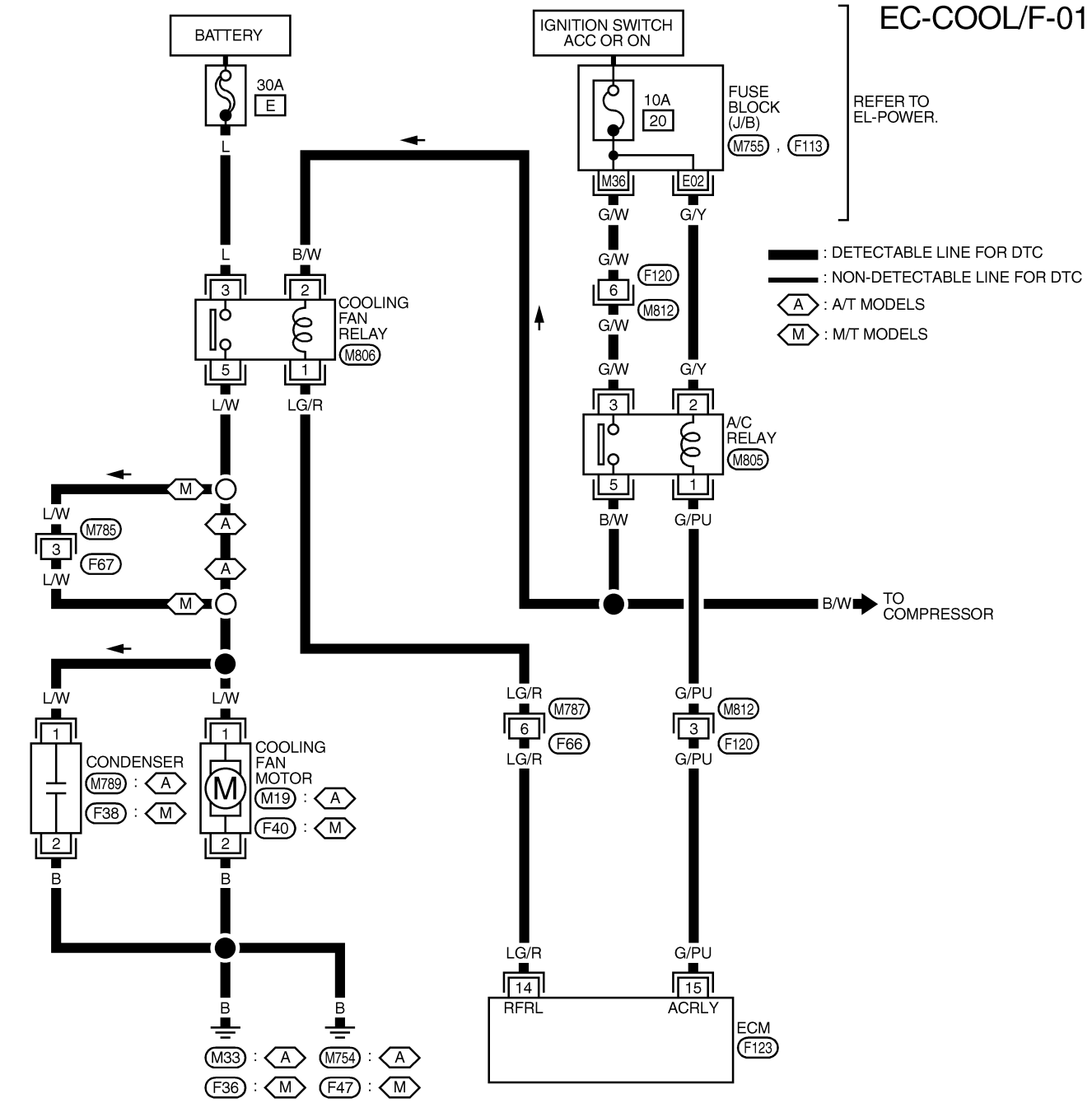
WITHOUT CONSULT-II

1) Check the coolant level in the reservoir tank and radiator.
   Allow engine to cool before checking coolant level.
   If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to “Diagnostic Procedure”, EC-114.
2) Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to “Diagnostic Procedure”, EC-114.
3) Disconnect engine coolant temperature sensor harness connector.
4) Connect 150Ω resistor to engine coolant temperature sensor harness connector.
5) Start engine and make sure that cooling fan operates.
   Be careful not to overheat engine.
6) If NG, go to “Diagnostic Procedure”, EC-114.

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Wiring Diagram

LHD MODELS

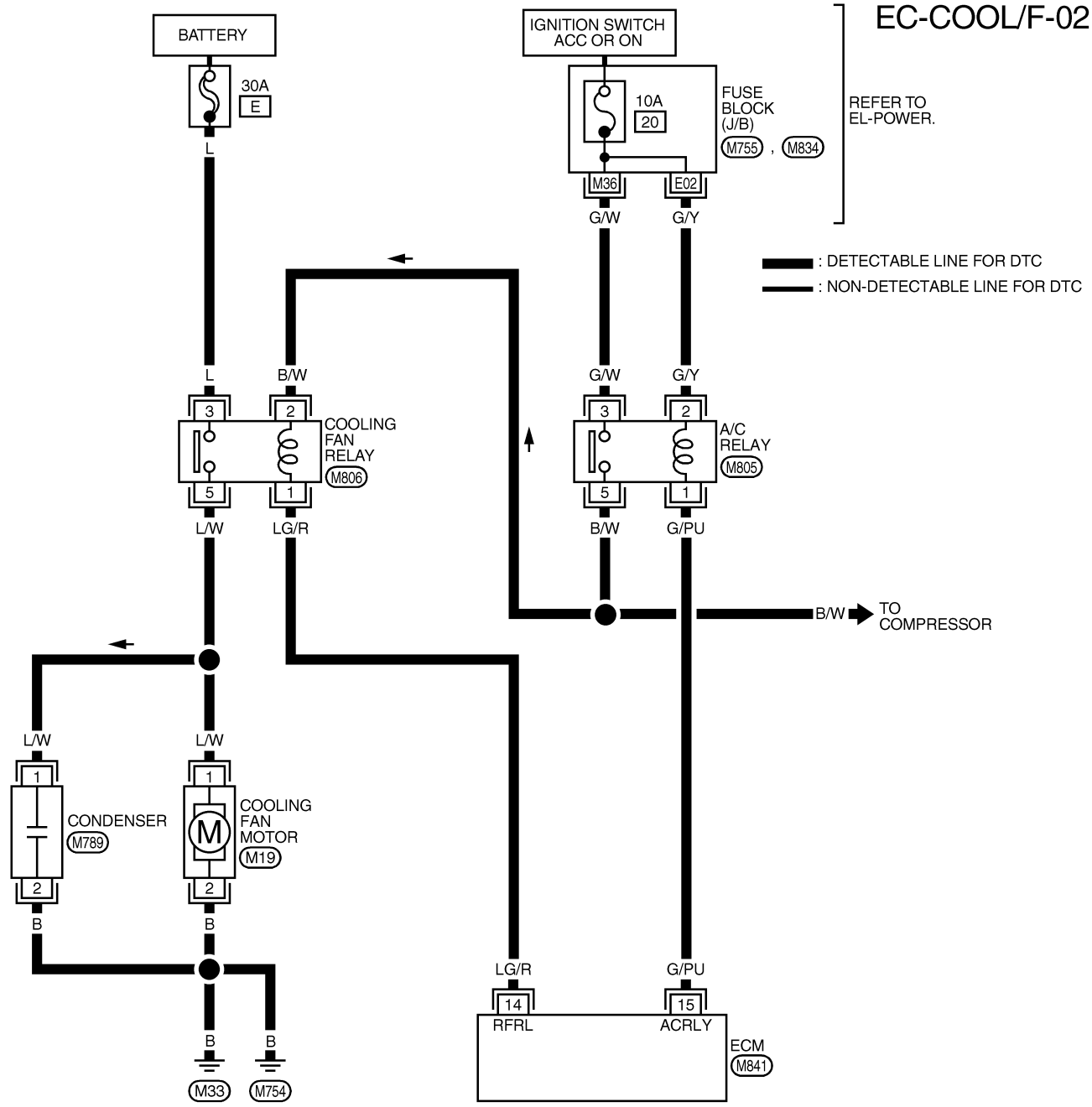


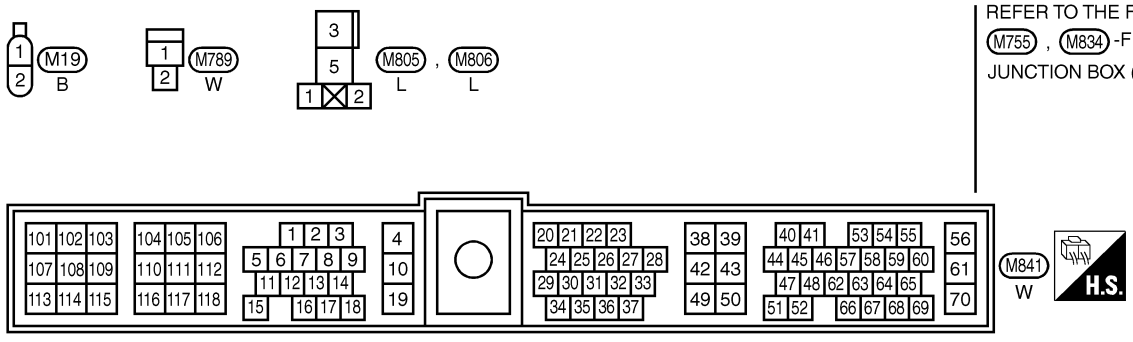
YEC179A

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Wiring Diagram (Cont'd)

RHD MODELS





YEC180A

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Diagnostic Procedure

1	INSPECTION START
Do you have CONSULT-II? **Yes or No**	
Yes ▶	GO TO 2.
No ▶	GO TO 3.

2	CHECK COOLING FAN OPERATION

With CONSULT-II

1. Turn ignition switch “ON”.
2. Perform “COOLING FAN” in “ACTIVE TEST” mode with CONSULT-II.

ACTIVE TEST	
COOLING FAN	OFF
MONITOR	
COOLAN TEMP/S	XXX °C

SEF646X

3. Make sure that cooling fan operates.

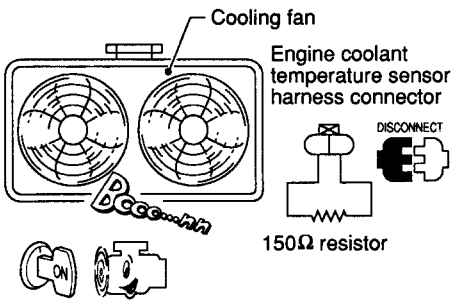
OK or NG

OK ▶	GO TO 13.
NG ▶	GO TO 4.

3	CHECK COOLING FAN OPERATION

Without CONSULT-II

1. Turn ignition switch “OFF”.
2. Disconnect engine coolant temperature sensor harness connector.
3. Connect 150Ω resistor to engine coolant temperature sensor harness connector.
4. Restart engine and make sure that cooling fan operates.



MEC475B

OK or NG

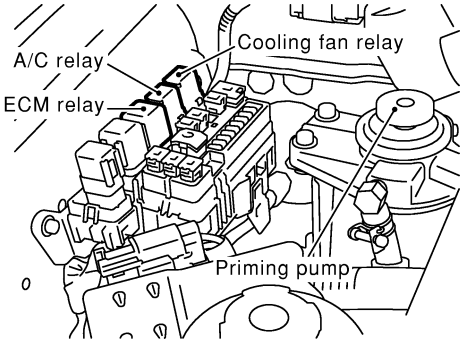
OK ▶	GO TO 13.
NG ▶	GO TO 4.

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Diagnostic Procedure (Cont'd)

4	CHECK COOLING FAN POWER SUPPLY CIRCUIT

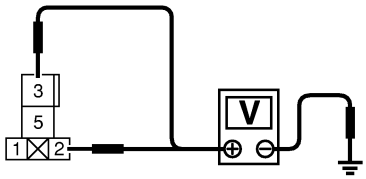
1. Turn ignition switch "OFF".
2. Disconnect cooling fan relay.



MEC021E

3. Turn ignition switch "ON".
4. Turn air conditioner switch "ON".
5. Turn blower fan switch "ON".
6. Check voltage between cooling fan relay terminals 2, 3 and ground with CONSULT-II or tester.





MEC974D

Voltage: Battery voltage

OK or NG

OK	▶	GO TO 6.
NG	▶	GO TO 5.

5	DETECT MALFUNCTIONING PART

Check the following.
- 10A fuse
- Harness connector F120, M812 (LHD models)
- A/C relay
- 30A fusible link
- Harness for open or short between cooling fan relay and fuse
- Harness for open or short between cooling fan relay and battery

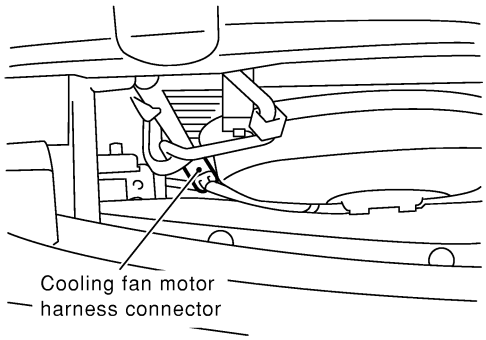
	▶	Repair open circuit or short to ground or short to power in harness or connectors.

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Diagnostic Procedure (Cont'd)

6	CHECK COOLING FAN GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Disconnect cooling fan motor harness connector.



MEC024E

3. Check harness continuity as follows. Refer to Wiring Diagram.

Terminals	Continuity
Cooling fan relay terminal 5 and cooling fan motor terminal 1	Continuity should exist.
Cooling fan relay terminal 5 and condenser terminal 1	
Cooling fan motor terminal 2 and ground	
Condenser terminal 2 and ground	

MTBL1322

4. Also check harness for short to ground and short to power.

OK or NG

OK ▶	GO TO 8.
NG ▶	GO TO 7.

7	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M785, F67 (M/T models)
- Harness for open or short between cooling fan relay and cooling fan motor
- Harness for open or short between cooling fan relay and condenser
- Harness for open or short between cooling fan motor and ground
- Harness for open or short between condenser and ground

▶ Repair open circuit or short to ground or short to power in harness or connectors.

8	CHECK COOLING FAN OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 14 and cooling fan relay terminal 1. Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to ground and short to power.

OK or NG

OK ▶	GO TO 10.
NG ▶	GO TO 9.

9	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M787, F66
- Harness for open or short between cooling fan relay and ECM

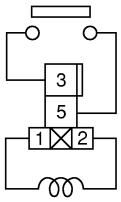
▶ Repair open circuit or short to ground or short to power in harness or connectors.

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Diagnostic Procedure (Cont'd)

10	CHECK COOLING FAN RELAY

Check continuity between cooling fan relay terminals 3 and 5 under the following conditions.



MEC975D

Conditions	Continuity
12V direct current supply between terminals 1 and 2	Yes
No current supply	No

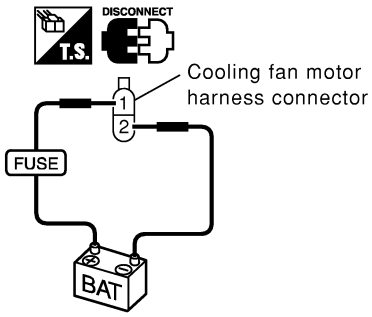
MTBL1319

OK or NG

OK	▶	GO TO 11.
NG	▶	Replace cooling fan relay.

11	CHECK COOLING FAN MOTOR

Supply battery voltage between cooling fan motor terminals 1 and 2.



MEC976D

Does the cooling fan motor operate normally?

OK or NG

OK	▶	GO TO 12.
NG	▶	Replace cooling fan motor.

12	CHECK INTERMITTENT INCIDENT
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-78.	
▶	**INSPECTION END**

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Diagnostic Procedure (Cont'd)

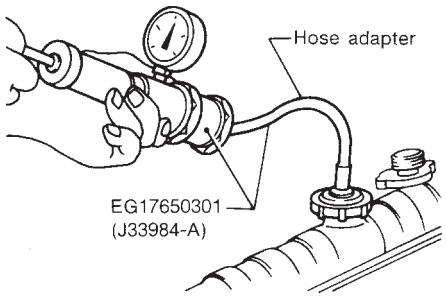
13	CHECK COOLING SYSTEM FOR LEAK

Apply pressure to the cooling system with a tester, and check if the pressure drops.

Testing pressure: 157 kPa (1.57 bar, 1.6 kg/cm^2, 23 psi)

CAUTION:

Higher than the specified pressure may cause radiator damage.



SLC754A

Pressure should not drop.

OK or NG

OK	▶	GO TO 15.
NG	▶	GO TO 14.

14	DETECT MALFUNCTIONING PART

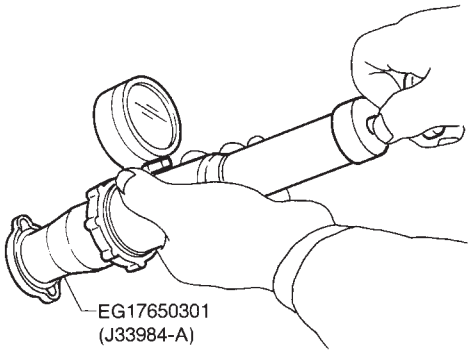
Check the following for leak.

- Hose
- Radiator
- Water pump (Refer to LC section, "Water Pump".)

	▶	Repair or replace.

15	CHECK RADIATOR CAP

Apply pressure to cap with a tester and check radiator cap relief pressure.



SLC755A

Radiator cap relief pressure:

79 - 98 kPa (0.78 - 0.98 bar, 0.8 - 1.0 kg/cm^2, 11 - 14 psi)

OK or NG

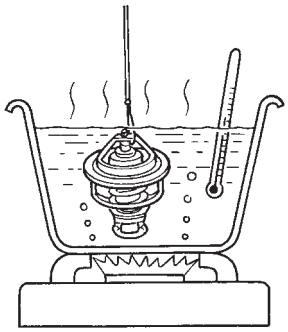
OK	▶	GO TO 16.
NG	▶	Replace radiator cap.

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Diagnostic Procedure (Cont'd)

16	CHECK THERMOSTAT

1. Remove thermostat.
2. Check valve seating condition at normal room temperatures.
   It should seat tightly.
3. Check valve opening temperature and valve lift.



SLC343

Valve opening temperature:
82°C (180°F) [standard] (Models for cold areas)
76.5°C (170°F) [standard] (Models for except cold areas)
Valve lift:
More than 10 mm/95°C (0.394 in/203°F)

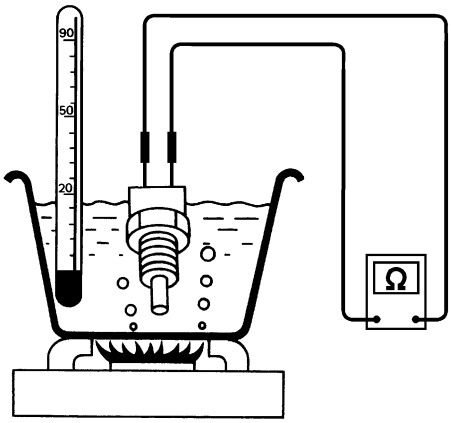
4. Check if valve is closed at 5°C (9°F) below valve opening temperature. For details, refer to LC section, "Thermostat".

OK or NG

OK	▶	GO TO 17.
NG	▶	Replace thermostat.

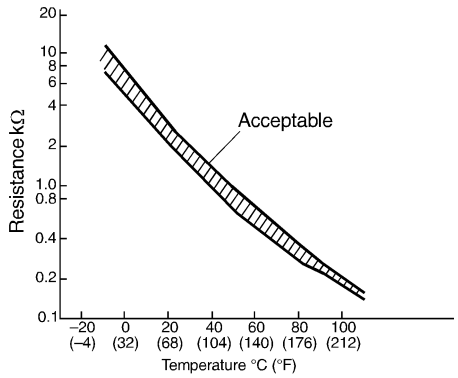
17	CHECK ENGINE COOLANT TEMPERATURE SENSOR

1. Remove engine coolant temperature sensor.
2. Check resistance between engine coolant temperature sensor terminals 1 and 2 as shown in the figure.



<Reference data>

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.00
90 (194)	0.236 - 0.260



SEF304X

OK or NG

OK	▶	GO TO 18.
NG	▶	Replace engine coolant temperature sensor.

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Diagnostic Procedure (Cont'd)

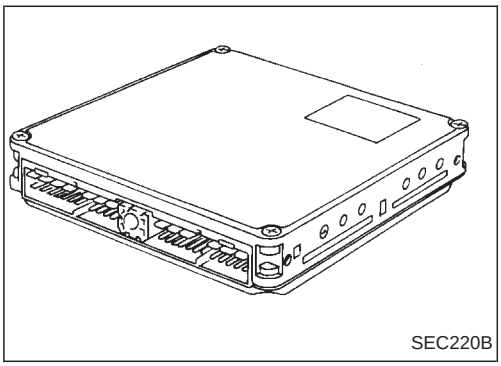
18	**CHECK MAIN 12 CAUSES**
If the cause cannot be isolated, go to "MAIN 12 CAUSES OF OVERHEATING", EC-120.	
▶	**INSPECTION END**

Main 12 Causes of Overheating

Engine	Step	Inspection item	Equipment	Standard	Reference page
OFF	1	● Blocked radiator ● Blocked condenser ● Blocked radiator grille ● Blocked bumper	● Visual	No blocking	—
	2	● Coolant mixture	● Coolant tester	30 - 50% coolant mixture	See "RECOMMENDED FLUIDS AND LUBRICANTS" in MA section.
	3	● Coolant level	● Visual	Coolant up to MAX level in reservoir tank and radiator filler neck	See "Changing Engine Coolant", "ENGINE MAINTENANCE" in MA section.
	4	● Radiator cap	● Pressure tester	78 - 98 kPa (0.78 - 0.98 bar, 0.8 - 1.0 kg/cm^2, 11 - 14 psi) 59 - 98 kPa (0.59 - 0.98 bar, 0.6 - 1.0 kg/cm^2, 9 - 14 psi) (Limit)	See "System Check", "ENGINE COOLING SYSTEM" in LC section.
ON*2	5	● Coolant leaks	● Visual	No leaks	See "System Check", "ENGINE COOLING SYSTEM" in LC section.
ON*2	6	● Thermostat	● Touch the upper and lower radiator hoses	Both hoses should be hot.	See "Thermostat" and "Radiator", "ENGINE COOLING SYSTEM" in LC section.
ON*1	7	● Cooling fan	● Visual	Operating	See "DTC 0208 OVER HEAT", EC-109.
OFF	8	● Combustion gas leak	● Color checker chemical tester 4 gas analyzer	Negative	—
ON*3	9	● Coolant temperature gauge	● Visual	Gauge less than 3/4 when driving	—
		● Coolant overflow to reservoir tank	● Visual	No overflow during driving and idling	See "Changing Engine Coolant", "ENGINE MAINTENANCE" in MA section.
OFF*4	10	● Coolant return from reservoir tank to radiator	● Visual	Should be initial level in reservoir tank	See "ENGINE MAINTENANCE" in MA section.
OFF	11	● Cylinder head	● Straight gauge feeler gauge	0.1 mm (0.004 in) Maximum distortion (warping)	See "Inspection", "CYLINDER HEAD" in EM section.
	12	● Cylinder block and pistons	● Visual	No scuffing on cylinder walls or piston	See "Inspection", "CYLINDER BLOCK" in EM section.

*1: Engine running at idle.
*2: Engine running at 3,000 rpm for 10 minutes.
*3: Drive at 90 km/h (55 MPH) for 30 minutes and then let idle for 10 minutes.
*4: After 60 minutes of cool down time.
For more information, refer to "OVERHEATING CAUSE ANALYSIS" in LC section.

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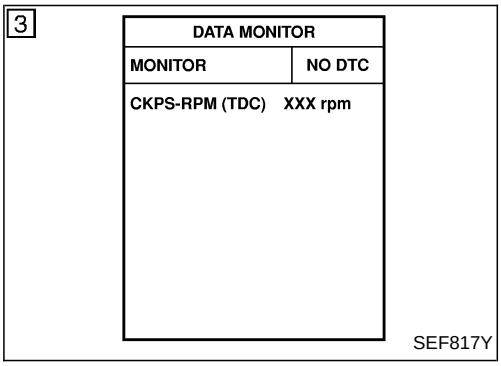

SEC220B

Description

The ECM consists of a microcomputer and connectors for signal input and output and for power supply. The unit controls the engine.

On Board Diagnosis Logic

Malfunction is detected when ...	Check Items (Possible Cause)
• ECM calculation function is malfunctioning.	• ECM



SEF817Y

DTC Confirmation Procedure

WITH CONSULT-II

1) Turn ignition switch “ON”.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Start engine and wait at least 2 seconds.
4) If DTC is detected, go to “Diagnostic Procedure”, EC-122.

WITHOUT CONSULT-II

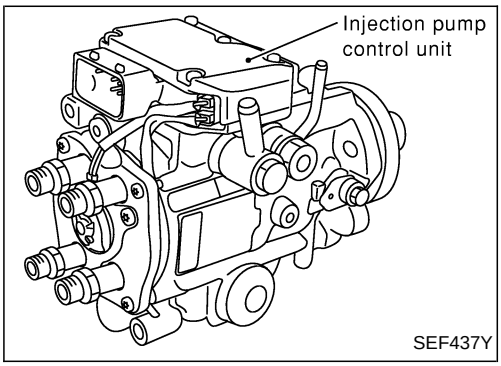
1) Turn ignition switch “ON” and wait at least 2 seconds.
2) Start engine and wait at least 2 seconds.
3) Turn ignition switch “OFF”, wait at least 5 seconds and then turn “ON”.
4) Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
5) If DTC is detected, go to “Diagnostic Procedure”, EC-122.

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Diagnostic Procedure

1	**INSPECTION START**
With CONSULT-II 1. Turn ignition switch “ON”. 2. Select “SELF DIAG RESULTS” mode with CONSULT-II. 3. Touch “ERASE”. 4. Perform “DTC Confirmation Procedure”, EC-121, again. 5. Is the malfunction displayed again?	
Without CONSULT-II 1. Turn ignition switch “ON”. 2. Erase the Diagnostic Test Mode II (Self-diagnostic results) memory. 3. Perform “DTC Confirmation Procedure”, EC-121, again. 4. Perform “Diagnostic Test Mode II (Self-diagnostic results)”. 5. Is the DTC 0301 displayed again?	
Yes or No	
Yes ▶	Replace ECM.
No ▶	**INSPECTION END**

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Description

SYSTEM DESCRIPTION

The ECM and the electronic control fuel injection pump control unit (abbreviated as the injection pump control unit) perform the real time communication (signal exchange).
The ECM transmits the signals of the target fuel injection amount, target fuel injection timing, and engine speed, etc., and receives the signals of the pump speed and fuel temperature, etc. from the injection pump control unit.
By those signals, the injection pump controls the optimum fuel injection amount and injection timing of the spill valve and timing control valve.
Injection pump control unit has an on board diagnostic system, which detects malfunctions related to sensors or actuators built-into electronic control fuel injection pump. These malfunction information are transferred through the line (circuit) from injection pump control unit to ECM.

FUEL INJECTION AMOUNT CONTROL

In accordance with the target fuel injection amount signal from the ECM, the injection amount is controlled by controlling the spill valve in the injection pump and by changing the needle opening time.

FUEL INJECTION TIMING CONTROL

Based on the target fuel injection timing signal from the ECM, the injection timing is controlled in accordance with the timer spring by performing the duty control of the timing control valve in the injection pump and by adjusting the pressure of the timer piston high pressure chamber.

FUEL TEMPERATURE SENSOR

The sensor detects the fuel temperature in the injection pump and calibrates the injection amount change by the fuel temperature.

CAM RING POSITION SENSOR

The sensor detects the passing of the protrusion on the sensor wheel in the injection pump by the semiconductor magnetic resistance element sensor. The cam ring position sensor synchronizes with the cam ring, and detects the actual advance amount. The injection pump control unit measures the injection pump revolution by the signal of the cam ring position sensor.

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CONSULT-II Reference Value in Data Monitor Mode

Remarks: Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
FUEL TEMP SEN	● Engine: After warming up		More than 40°C (104°F)
SPILL/V	● Engine: After warming up		Approx. 13°CA
INJ TIMG C/V	● Engine: After warming up, idle the engine.		Approx. 50 - 70%
DECELER F/CUT	● Engine: After warming up	Idle	OFF
BARO SEN	● Ignition switch: ON		Altitude Approx. 0 m (0 ft): Approx. 100.62 kPa (1.0062 bar, 1.026 kg/cm^2, 14.59 psi) Approx. 1,000 m (3,281 ft): Approx. 88.95 kPa (0.8895 bar, 0.907 kg/cm^2, 12.90 psi) Approx. 1,500 m (4,992 ft): Approx. 83.16 kPa (0.8316 bar, 0.848 kg/cm^2, 12.06 psi) Approx. 2,000 m (6,562 ft): Approx. 78.36 kPa (0.7836 bar, 0.799 kg/cm^2, 11.36 psi)

ECM Terminals and Reference Value

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

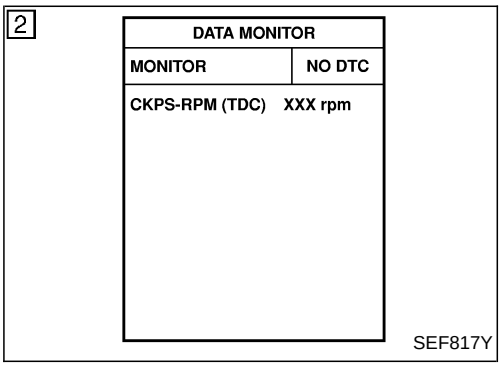
Do not use ECM ground terminals when measuring input/output voltage. Doing so may damage the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
33	G	Electronic control fuel injection pump	Engine is running. └ **Warm-up condition** Idle speed	Approximately 2.5V
40	R	Electronic control fuel injection pump	Engine is running. └ **Warm-up condition** Idle speed	Approximately 2.5V
52	Y	Electronic control fuel injection pump	Engine is running. └ Idle speed	Approximately 0.1V
53	OR	Electronic control fuel injection pump	Engine is running. └ Idle speed	Approximately 0.35V

On Board Diagnosis Logic

Malfunction is detected when	Check Items (Possible cause)
● An improper voltage signal from fuel temperature sensor (Built-into electronic control fuel injection pump) is sent to injection pump control unit.	● Harness or connectors (Electronic control fuel injection pump circuit is open or shorted.) ● Electronic control fuel injection pump

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DTC Confirmation Procedure

WITH CONSULT-II

1) Turn ignition switch “ON” and wait at least 2 seconds.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Start engine and run it for at least 2 seconds at idle speed. (If engine does not run, turn ignition switch to “START” for at least 2 seconds.)
4) If DTC is detected, go to “Diagnostic Procedure”, EC-128.

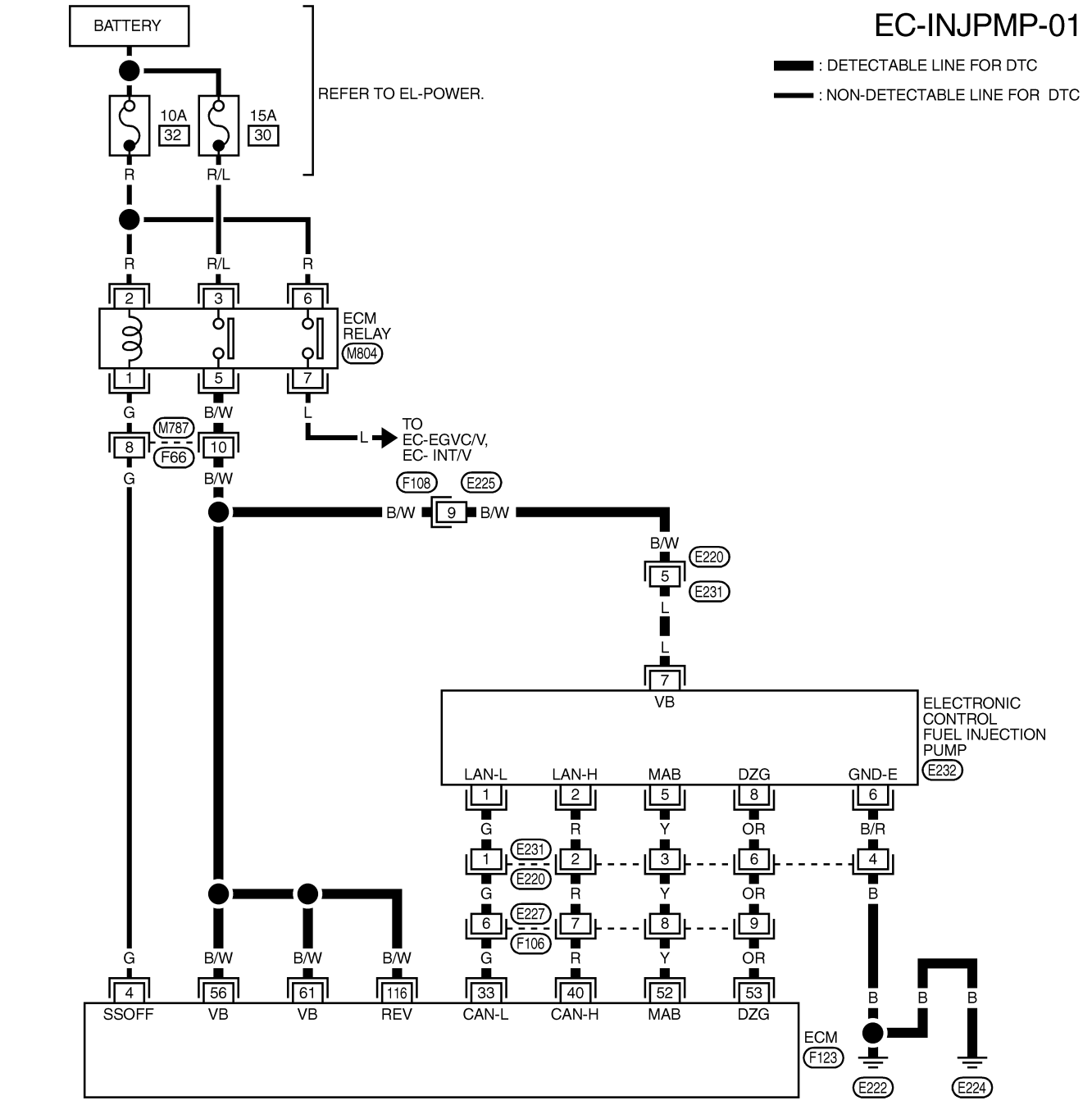
WITHOUT CONSULT-II

1) Turn ignition switch “ON” and wait at least 2 seconds.
2) Start engine and run it for at least 2 seconds at idle speed. (If engine does not run, turn ignition switch to “START” for at least 2 seconds.)
3) Turn ignition switch “OFF”, wait at least 5 seconds and then turn “ON”.
4) Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
5) If DTC is detected, go to “Diagnostic Procedure”, EC-128.

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Wiring Diagram

LHD MODELS

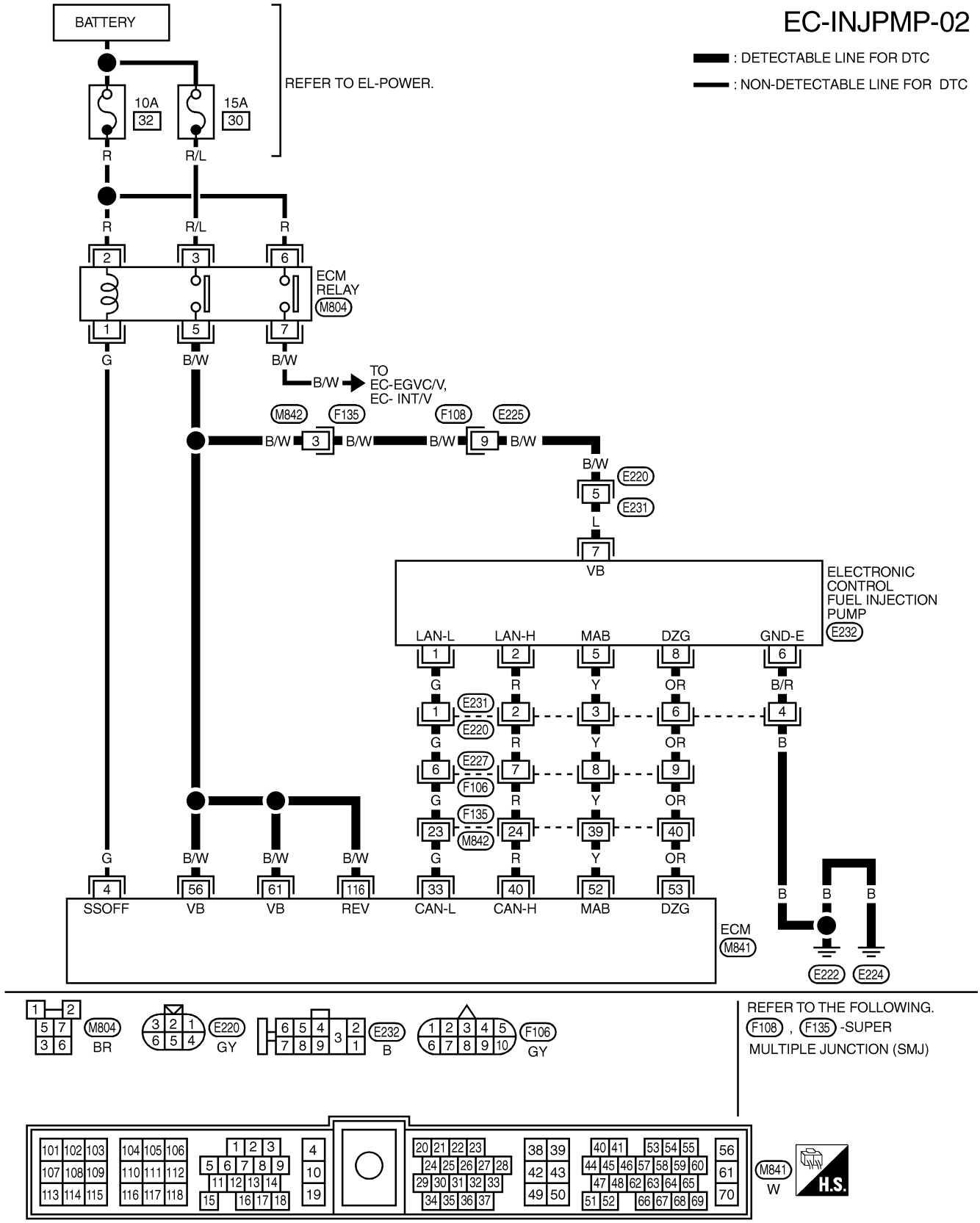


YEC181A

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Wiring Diagram (Cont'd)

RHD MODELS



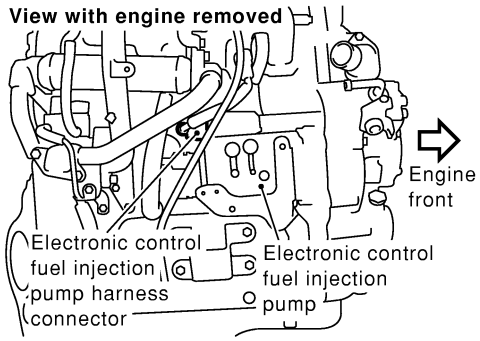
YEC182A

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Diagnostic Procedure

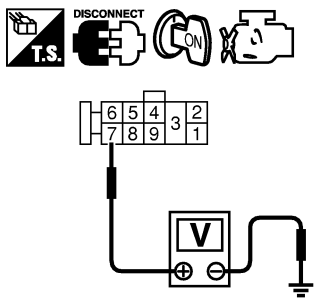
1	CHECK ELECTRONIC CONTROL FUEL INJECTION PUMP POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect electronic control fuel injection pump harness connector.



MEC025E

3. Turn ignition switch “ON”.
4. Check voltage between electronic control fuel injection pump terminal 7 and ground.



MEC977D

Voltage: Battery voltage

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M787, F66 (LHD models)
- Harness connectors F108, E225
- Harness connectors E220, E231
- Harness connectors M842, F135 (RHD models)
- Harness for open or short between electronic control fuel injection pump and ECM
- Harness for open or short between electronic control fuel injection pump and ECM relay

	▶	Repair open circuit or short to ground or short to power in harness or connectors.

3	CHECK ELECTRONIC CONTROL FUEL INJECTION PUMP GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between electronic control fuel injection pump terminal 6 and ground. Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 4.

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Diagnostic Procedure (Cont'd)

4	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E231, E220 ● Harness for open or short between electronic control fuel injection pump and engine ground	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

5	CHECK COMMUNICATION LINE FOR OPEN AND SHORT

1. Check continuity between the following terminals. Refer to Wiring Diagram.

Electronic control fuel injection pump	ECM
1	33
2	40
5	52
8	53

MTBL0444

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 7.
NG	▶	GO TO 6.

6	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E231, E220 ● Harness connectors E227, F106 ● Harness connectors F135, M842 (RHD models) ● Harness for open or short between electronic control fuel injection pump and ECM	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

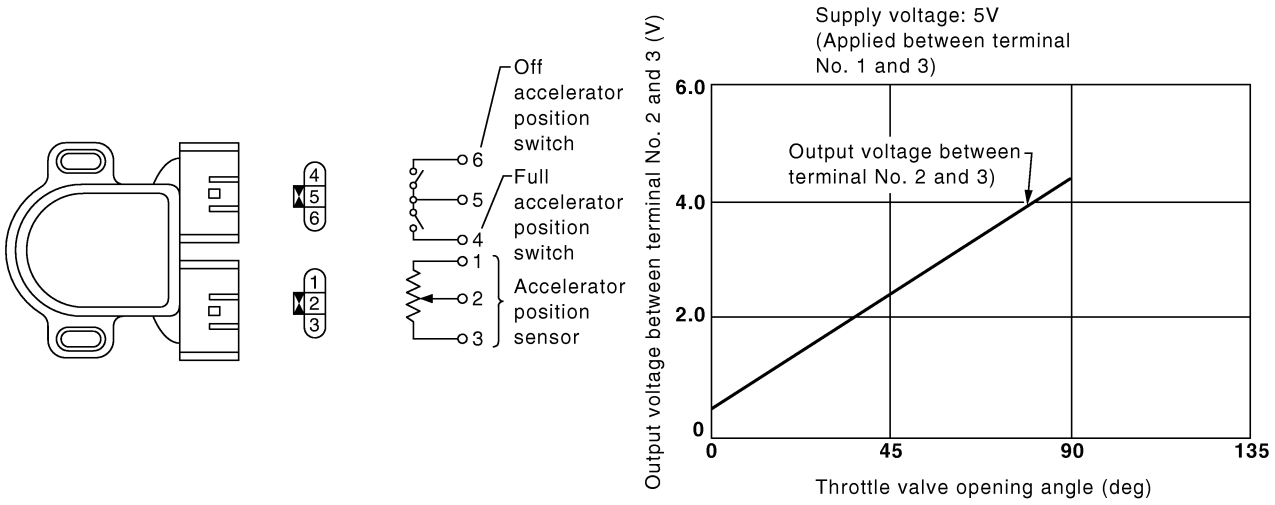
7	CHECK INTERMITTENT INCIDENT	
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-78.		
OK or NG		
OK	▶	Replace electronic control fuel injection pump.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

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Description

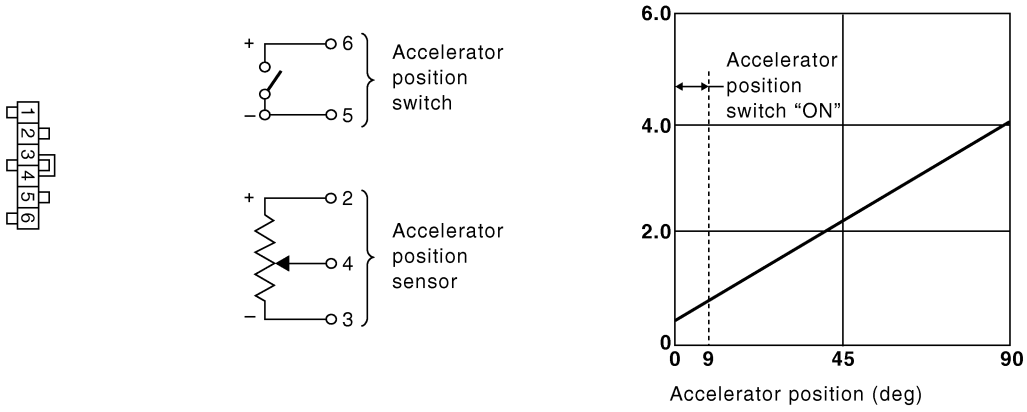
The accelerator position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM. The ECM uses the signal to determine the amount of fuel to be injected.
The accelerator position switch detects Off-accelerator switch signal and Full-accelerator switch signal (A/T models only) and send these signals to the ECM. The ECM will then determine engine idle conditions. These signals are also used for diagnosing the accelerator position sensor.

A/T models



SEF861SB

M/T models



YEC703A

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CONSULT-II Reference Value in Data Monitor Mode

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
ACCEL POS SEN	● Ignition switch: ON (Engine stopped)	Accelerator pedal: released	0.40 - 0.60V
		Accelerator pedal: depressed	Approx. 4.5V
FULL ACCEL SW	● Ignition switch: ON (Engine stopped)	Accelerator pedal: fully depressed	ON
		Except above	OFF
OFF ACCEL SW	● Ignition switch: ON (Engine stopped)	Accelerator pedal: fully released	ON
		Accelerator pedal: slightly open	OFF

ECM Terminals and Reference Value

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

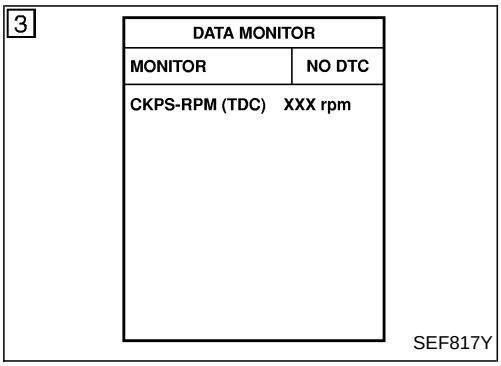
Do not use ECM ground terminals when measuring input/output voltage. Doing so may damage the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
23	G	Accelerator position sensor	Ignition switch "ON" └ Accelerator pedal fully released	0.4 - 0.6V
			Ignition switch "ON" └ Accelerator pedal fully depressed	Approximately 4.5V
31	L/Y	Accelerator position switch (Idle)	Ignition switch "ON" └ Accelerator pedal fully released	BATTERY VOLTAGE (11 - 14V)
			Ignition switch "ON" └ Accelerator pedal depressed	Approximately 0V
32	R/L	Accelerator position switch (Full)	Ignition switch "ON" └ Accelerator pedal released	Approximately 0V
			Ignition switch "ON" └ Accelerator pedal fully depressed	BATTERY VOLTAGE (11 - 14V)
48	R/B	Accelerator position sensor power supply	Ignition switch "ON"	Approximately 5V
51	B/W	Accelerator position sensor ground	Engine is running. └ **Warm-up condition** Idle speed	Approximately 0V

http://vnx.su/

On Board Diagnosis Logic

Malfunction is detected when ...	Check Items (Possible Cause)
● The relation between sensor and switch signal is not in the normal range during the specified accelerator position.	● Harness or connectors (The sensor circuit is open or shorted.) ● Accelerator position sensor ● Accelerator position switch ● Accelerator switch (F/C)



DTC Confirmation Procedure

WITH CONSULT-II

1) Turn ignition switch “ON”.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Depress and release fully accelerator pedal slowly.
4) If DTC is detected, go to “Diagnostic Procedure”, EC-144.

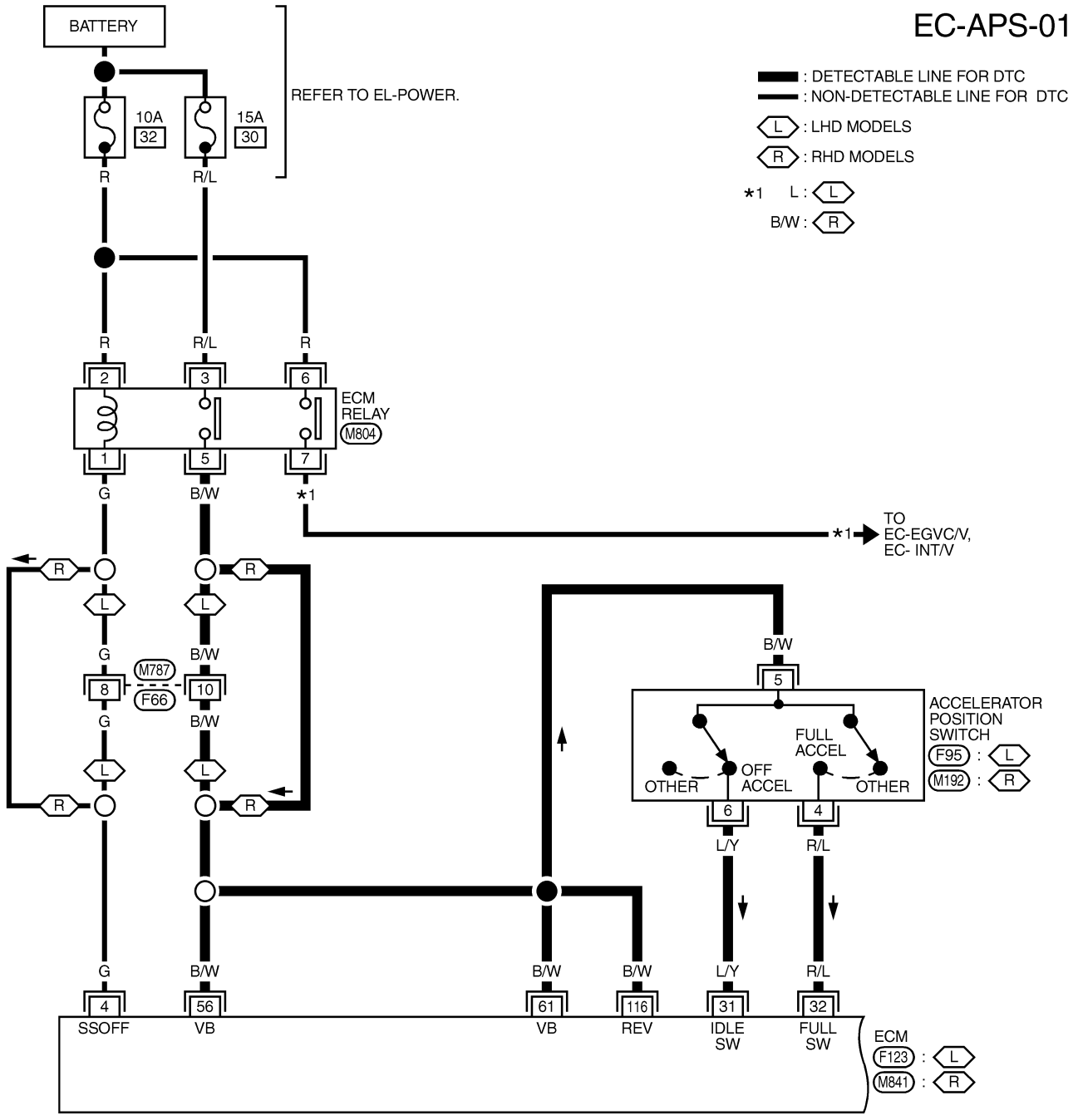
WITHOUT CONSULT-II

1) Turn ignition switch “ON”.
2) Depress and release fully accelerator pedal slowly.
3) Turn ignition switch “OFF”, wait at least 5 seconds and then turn “ON”.
4) Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
5) If DTC is detected, go to “Diagnostic Procedure”, EC-144.

http://vnx.su/

Wiring Diagram

A/T MODELS

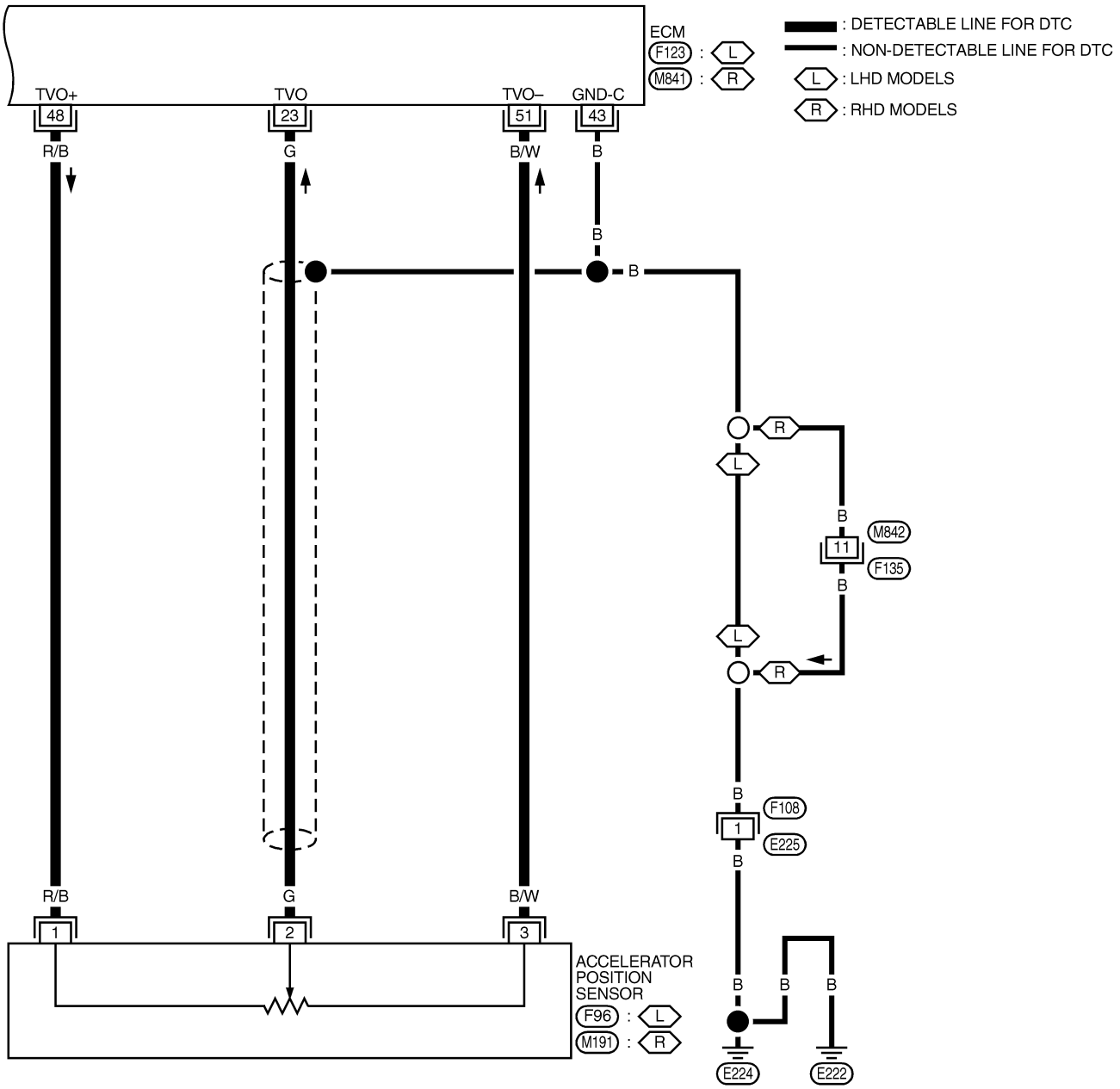


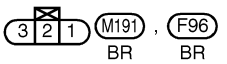
YEC689A

http://vnx.su/

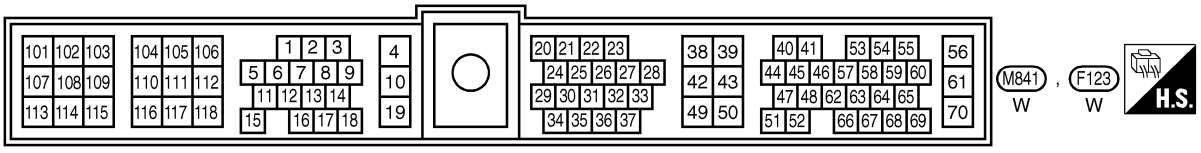
Wiring Diagram (Cont'd)

EC-APS-02





REFER TO THE FOLLOWING.
F108 , F135 -SUPER MULTIPLE JUNCTION (SMJ)

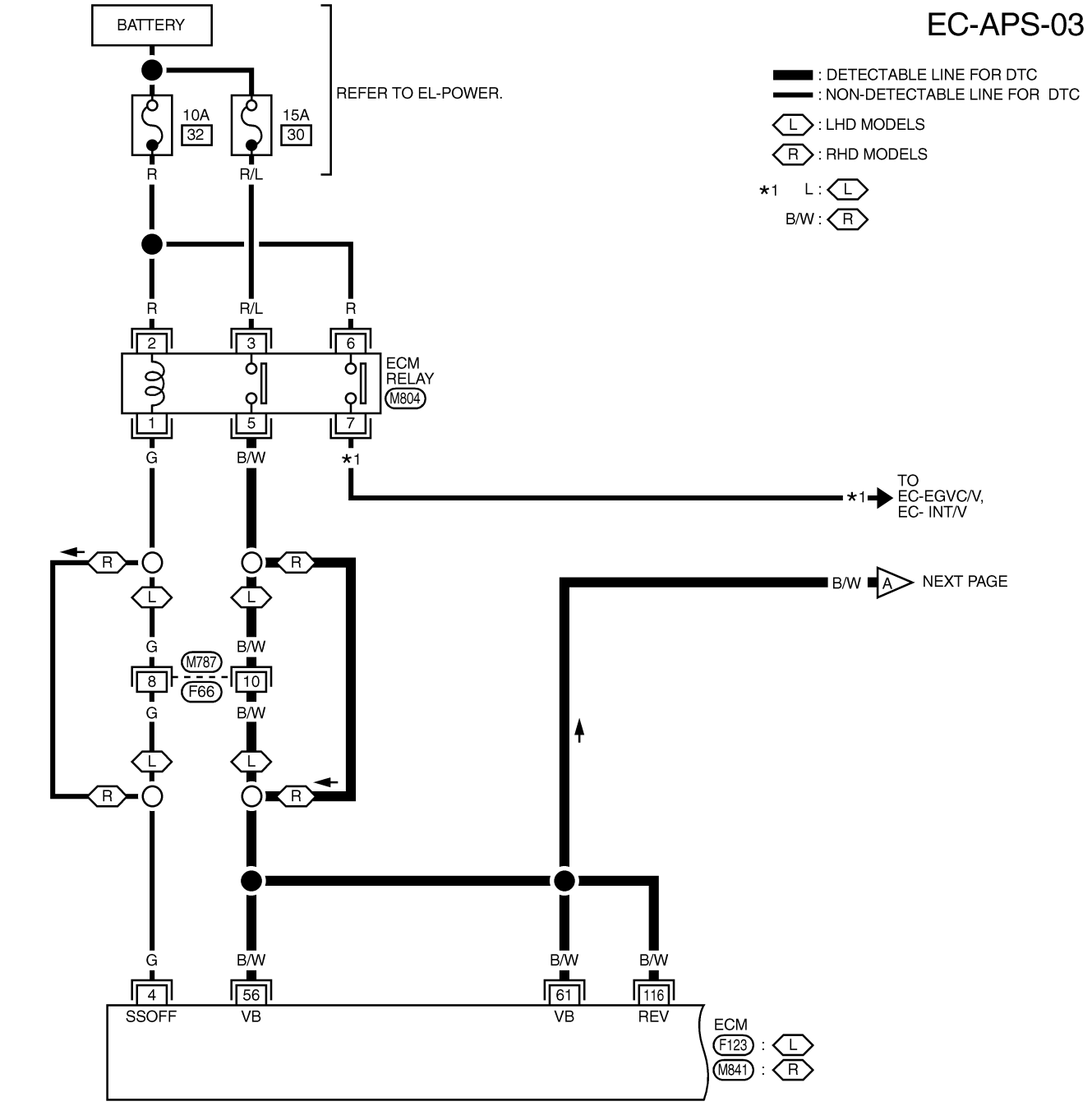


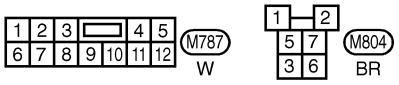
YEC663A

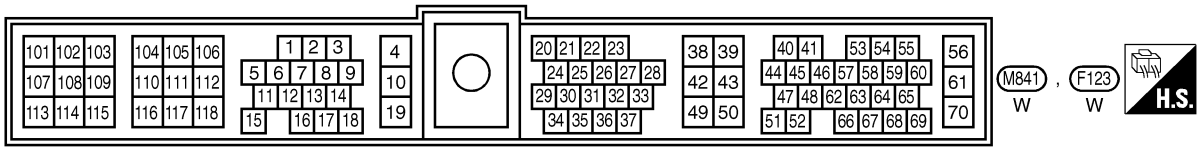
http://vnx.su/

Wiring Diagram (Cont'd)

M/T MODELS







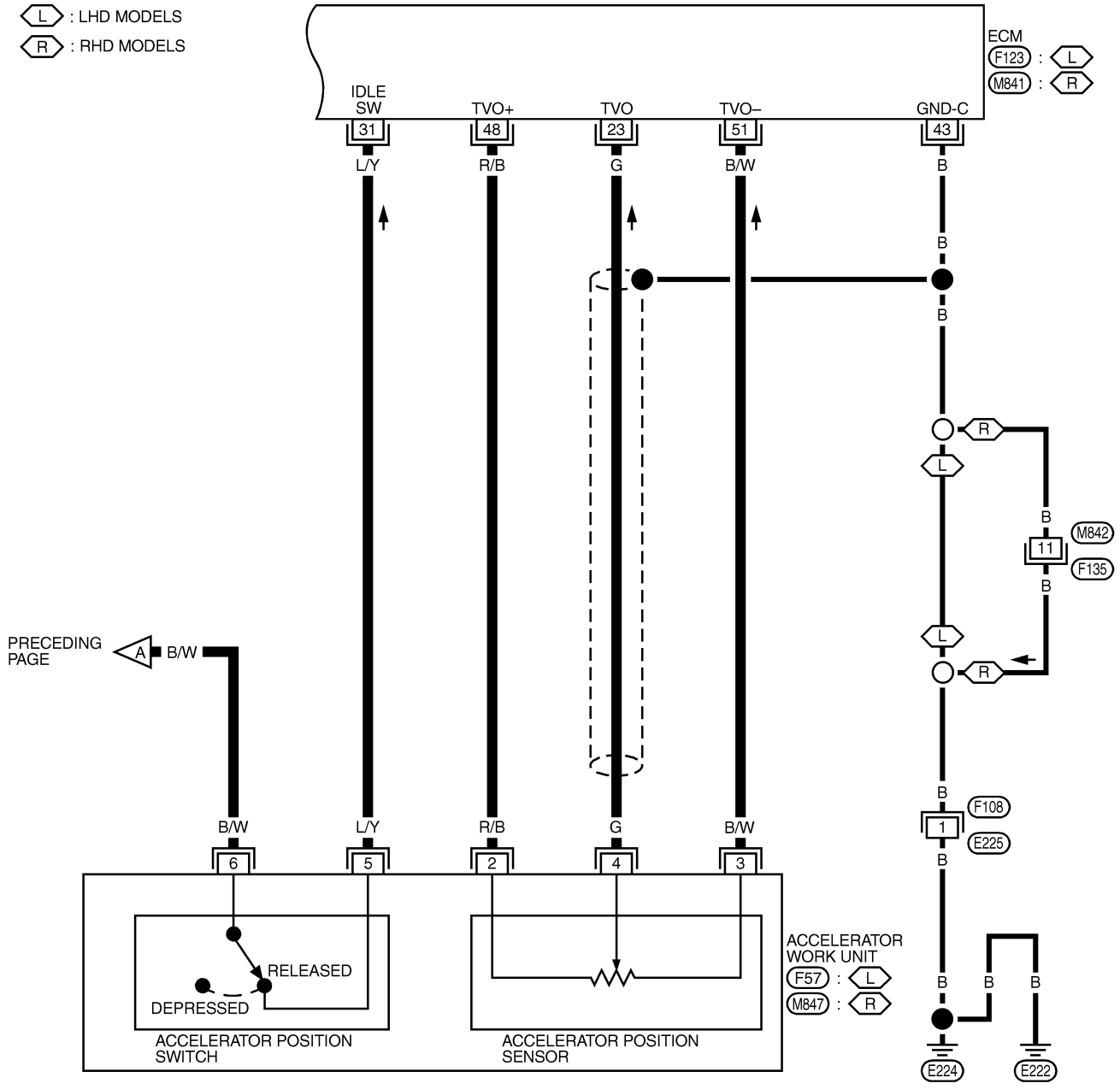
YEC690A

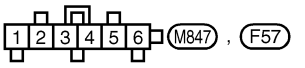
http://vnx.su/

Wiring Diagram (Cont'd)

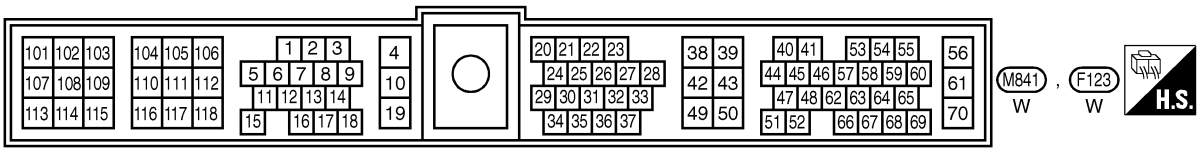
EC-APS-04

: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC
L : LHD MODELS
R : RHD MODELS





REFER TO THE FOLLOWING.
F108 , F135 -SUPER MULTIPLE JUNCTION (SMJ)



YEC691A

http://vnx.su/

Diagnostic Procedure

A/T MODELS

1	CHECK OVERALL FUNCTION-I

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “ACCEL POS SEN” in “DATA MONITOR” mode with CONSULT-II.
3. Check “ACCEL POS SEN” signal under the following conditions.

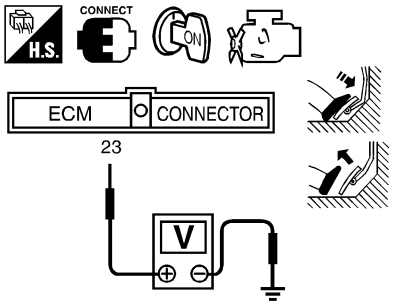
DATA MONITOR	
MONITOR	NO DTC
ACCEL POS SEN	XXXV

Conditions	ACCEL POS SEN
Accelerator pedal fully depressed	Approx. 4.5V
Accelerator pedal fully released	0.40 - 0.60V

SEF278Z

Without CONSULT-II

1. Turn ignition switch “ON”.
2. Check voltage between ECM terminal 23 and ground under the following conditions.



Conditions	Voltage
Accelerator pedal fully depressed	Approx. 4.5V
Accelerator pedal fully released	0.4 - 0.6V

SEF279Z

OK or NG

OK	▶	GO TO 2.
NG	▶	GO TO 3.

http://vnx.su/

Diagnostic Procedure (Cont'd)

2	CHECK OVERALL FUNCTION-II

With CONSULT-II

1. Turn ignition switch "ON".
2. Select "FULL ACCEL SW" and "OFF ACCEL SW" in "DATA MONITOR" mode with CONSULT-II.
3. Check "FULL ACCEL SW" and "OFF ACCEL SW" signal under the following conditions.

DATA MONITOR	
MONITOR	NO DTC
FULL ACCEL SW	OFF
OFF ACCEL SW	ON

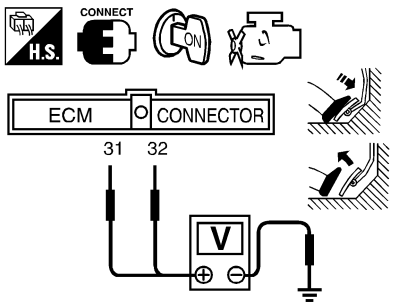
Conditions	FULL ACCEL SW
Accelerator pedal fully depressed	ON
Except above	OFF

Conditions	OFF ACCEL SW
Accelerator pedal fully released	ON
Accelerator pedal depressed	OFF

SEF416Y

Without CONSULT-II

1. Turn ignition switch "ON".
2. Check voltage between ECM terminals 31, 32 and ground under the following conditions.



Conditions	Voltage (ECM terminal 32)
Accelerator pedal fully depressed	Battery voltage
Except above	Approx. 0V

Conditions	Voltage (ECM terminal 31)
Accelerator pedal fully released	Battery voltage
Accelerator pedal depressed	Approx. 0V

SEF417Y

OK or NG

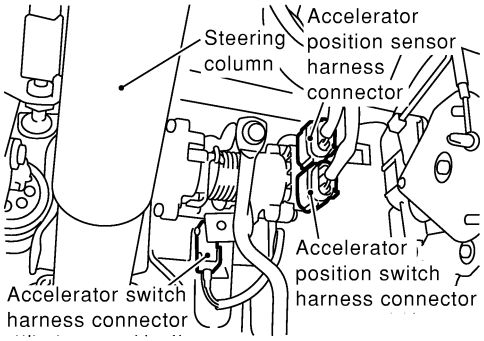
OK	▶	**INSPECTION END**
NG	▶	GO TO 11.

http://vnx.su/

Diagnostic Procedure (Cont'd)

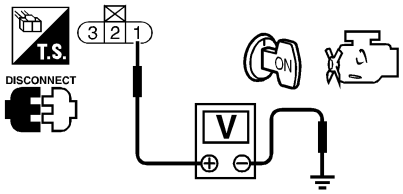
3	CHECK ACCELERATOR POSITION SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect accelerator position sensor harness connector.



MEC995D

3. Turn ignition switch "ON".
4. Check voltage between accelerator position sensor terminal 1 and ground with CONSULT-II or tester.



Voltage: Approximately 5V

SEF816Y

OK or NG

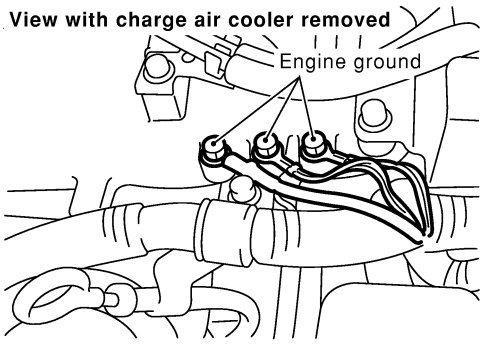
OK	▶	GO TO 4.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

http://vnx.su/

Diagnostic Procedure (Cont'd)

4	CHECK ACCELERATOR POSITION SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screw.



MEC994D

3. Check harness continuity between accelerator position sensor terminal 3 and engine ground. Refer to Wiring Diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 5.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

5	CHECK ACCELERATOR POSITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 23 and accelerator position sensor terminal 2. Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to ground and short to power.

OK or NG

OK (with CONSULT-II)	▶	GO TO 6.
OK (without CONSULT-II)	▶	GO TO 7.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

http://vnx.su/

Diagnostic Procedure (Cont'd)

6	CHECK ACCELERATOR POSITION SENSOR

With CONSULT-II

1. Reconnect all disconnected harness connectors.
2. Turn ignition switch "ON".
3. Select "DATA MONITOR" mode with CONSULT-II.
4. Check the indication of "ACCEL POS SEN" under the following conditions.

DATA MONITOR	
MONITOR	NO DTC
CKPS-RPM (TDC)	XXX rpm
ACCEL POS SEN	XXX V

Throttle valve conditions	ACCEL POS SEN
Completely closed (a)	0.4 - 0.6V
Partially open	Between (a) and (b)
Completely open (b)	Approx. 4.5V

SEF818Y

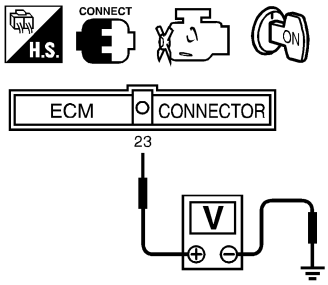
OK or NG

OK	▶	GO TO 8.
NG	▶	Replace accelerator pedal assembly.

7	CHECK ACCELERATOR POSITION SENSOR

Without CONSULT-II

1. Reconnect all disconnected harness connectors.
2. Turn ignition switch "ON".
3. Check voltage between ECM terminal 23 and ground under the following conditions.



Throttle valve conditions	Voltage
Completely closed (a)	0.4 - 0.6V
Partially open	Between (a) and (b)
Completely open (b)	Approx. 4.5V

SEF407Y

OK or NG

OK	▶	GO TO 9.
NG	▶	Replace accelerator pedal assembly.

8	RESET ACCELERATOR POSITION SENSOR IDLE POSITION MEMORY

With CONSULT-II

1. Turn ignition switch "ON".
2. Select "OFF ACCEL PO SIG" in "ACTIVE TEST" mode with CONSULT-II.
3. Touch "CLEAR".

	▶	GO TO 10.

http://vnx.su/

Diagnostic Procedure (Cont'd)

9	RESET ACCELERATOR POSITION SENSOR IDLE POSITION MEMORY

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Let engine idle for 10 minutes.

▶	GO TO 10.

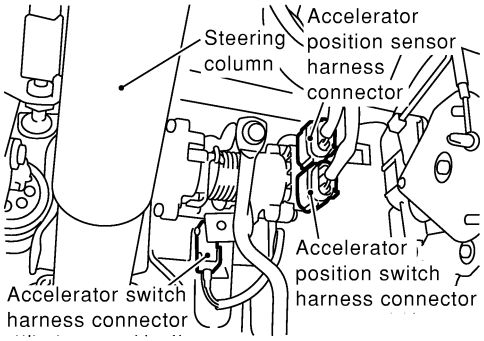
10	CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-78.

▶	**INSPECTION END**

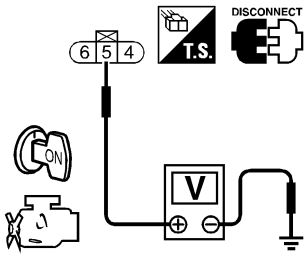
11	CHECK ACCELERATOR POSITION SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect accelerator position switch harness connector.



MEC995D

3. Turn ignition switch "ON".
4. Check voltage between accelerator position switch terminal 5 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF346X

OK or NG

OK	▶	GO TO 13.
NG	▶	GO TO 12.

12	DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M787, F6 (LHD models)
- Harness for open or short between accelerator position switch and ECM relay
- Harness for open or short between accelerator position switch and ECM

▶	Repair harness or connectors.

http://vnx.su/

Diagnostic Procedure (Cont'd)

13	CHECK ACCELERATOR POSITION SWITCH INPUT SIGNAL CIRCUIT-I FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between accelerator position switch terminal 6 and ECM terminal 31. Refer to Wiring Diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 14.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

14	CHECK ACCELERATOR POSITION SWITCH INPUT SIGNAL CIRCUIT-II FOR OPEN AND SHORT

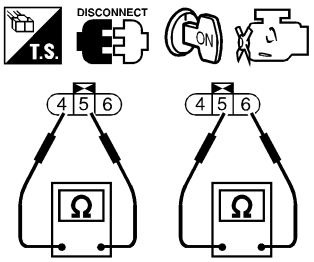
1. Check harness continuity between accelerator position switch terminal 4 and ECM terminal 32. Refer to Wiring Diagram.
   Continuity should exist.
2. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 15.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

15	CHECK ACCELERATOR POSITION SWITCH

Check continuity between accelerator position switch terminals 4 and 5, 5 and 6 under the following conditions.



Between terminals 4 and 5

Conditions	Continuity
Accelerator pedal fully depressed	Should exist.
Except above	Should not exist.

Between terminals 5 and 6

Conditions	Continuity
Accelerator pedal fully released	Should exist.
Accelerator pedal depressed	Should not exist.

SEF418Y

OK or NG

OK (With CONSULT-II)	▶	GO TO 16.
OK (Without CONSULT-II)	▶	GO TO 17.
NG	▶	Replace accelerator pedal assembly.

16	RESET ACCELERATOR POSITION SENSOR IDLE POSITION MEMORY

With CONSULT-II
1. Turn ignition switch "ON".
2. Select "OFF ACCEL PO SIG" in "ACTIVE TEST" mode with CONSULT-II.
3. Touch "CLEAR".

	▶	GO TO 18.

17	RESET ACCELERATOR POSITION SENSOR IDLE POSITION MEMORY

Without CONSULT-II
1. Start engine and warm it up to normal operating temperature.
2. Let engine idle for 10 minutes.

	▶	GO TO 18.

http://vnx.su/

Diagnostic Procedure (Cont'd)

18	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-78.	
▶	INSPECTION END

M/T MODELS

1	CHECK OVERALL FUNCTION-I

With CONSULT-II

1. Turn ignition switch "ON".
2. Select "ACCEL POS SEN" in "DATA MONITOR" mode with CONSULT-II.
3. Check "ACCEL POS SEN" signal under the following conditions.

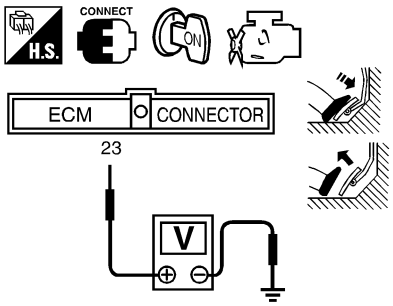
DATA MONITOR	
MONITOR	NO DTC
ACCEL POS SEN	XXXV

Conditions	ACCEL POS SEN
Accelerator pedal fully depressed	Approx. 4.5V
Accelerator pedal fully released	0.40 - 0.60V

SEF278Z

Without CONSULT-II

1. Turn ignition switch "ON".
2. Check voltage between ECM terminal 23 and ground under the following conditions.



Conditions	Voltage
Accelerator pedal fully depressed	Approx. 4.5V
Accelerator pedal fully released	0.4 - 0.6V

SEF279Z

OK or NG

OK	▶	GO TO 2.
NG	▶	GO TO 3.

http://vnx.su/

Diagnostic Procedure (Cont'd)

2	CHECK OVERALL FUNCTION-II

With CONSULT-II

1. Turn ignition switch "ON".
2. Select "FULL ACCEL SW" and "OFF ACCEL SW" in "DATA MONITOR" mode with CONSULT-II.
3. Check "FULL ACCEL SW" and "OFF ACCEL SW" signal under the following conditions.

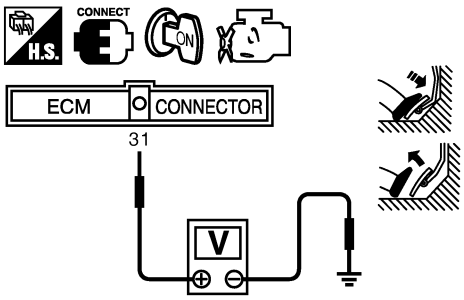
DATA MONITOR	
MONITOR	NO DTC
OFF ACCEL SW	ON

Conditions	OFF ACCEL SW
Accelerator pedal fully released	ON
Accelerator pedal depressed	OFF

YEC704A

Without CONSULT-II

1. Turn ignition switch "ON".
2. Check voltage between ECM terminal 31 and ground under the following conditions.



Conditions	Voltage (ECM terminal 31)
Accelerator pedal fully released	Battery voltage
Accelerator pedal depressed	Approx. 0V

YEC705A

OK or NG

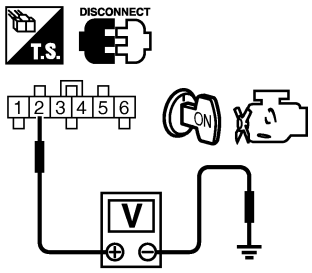
OK	▶	**INSPECTION END**
NG	▶	GO TO 11.

http://vnx.su/

Diagnostic Procedure (Cont'd)

3	CHECK ACCELERATOR POSITION SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect accelerator work unit harness connector.
3. Turn ignition switch "ON".
4. Check voltage between accelerator work unit terminal 2 and ground with CONSULT-II or tester.



Voltage: Approximately 5V

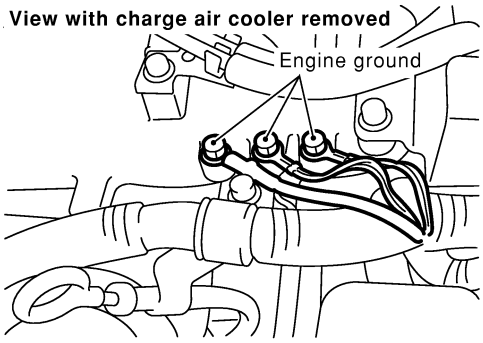
YEC706A

OK or NG

OK	▶	GO TO 4.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

4	CHECK ACCELERATOR POSITION SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screw.



MEC994D

3. Check harness continuity between accelerator work unit terminal 3 and engine ground. Refer to Wiring Diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 5.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

http://vnx.su/

Diagnostic Procedure (Cont'd)

5	CHECK ACCELERATOR POSITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 23 and accelerator work unit terminal 4. Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to ground and short to power.

OK or NG

OK (with CONSULT-II)	▶	GO TO 6.
OK (without CONSULT-II)	▶	GO TO 7.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

6	CHECK ACCELERATOR POSITION SENSOR

With CONSULT-II

1. Reconnect all disconnected harness connectors.
2. Turn ignition switch "ON".
3. Select "DATA MONITOR" mode with CONSULT-II.
4. Check the indication of "ACCEL POS SEN" under the following conditions.

DATA MONITOR	
MONITOR	NO DTC
CKPS-RPM (TDC)	XXX rpm
ACCEL POS SEN	XXX V

Throttle valve conditions	ACCEL POS SEN
Completely closed (a)	0.4 - 0.6V
Partially open	Between (a) and (b)
Completely open (b)	Approx. 4.5V

SEF818Y

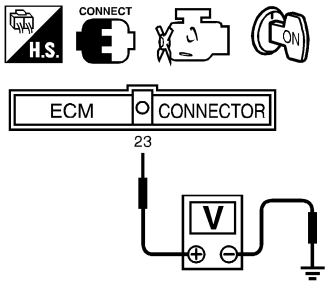
OK or NG

OK	▶	GO TO 8.
NG	▶	Replace accelerator pedal assembly.

7	CHECK ACCELERATOR POSITION SENSOR

Without CONSULT-II

1. Reconnect all disconnected harness connectors.
2. Turn ignition switch "ON".
3. Check voltage between ECM terminal 23 and ground under the following conditions.



Throttle valve conditions	Voltage
Completely closed (a)	0.4 - 0.6V
Partially open	Between (a) and (b)
Completely open (b)	Approx. 4.5V

SEF407Y

OK or NG

OK	▶	GO TO 9.
NG	▶	Replace accelerator pedal assembly.

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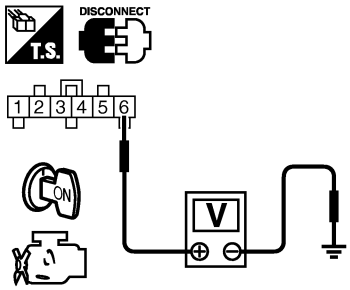
Diagnostic Procedure (Cont'd)

8	RESET ACCELERATOR POSITION SENSOR IDLE POSITION MEMORY
With CONSULT-II 1. Turn ignition switch "ON". 2. Select "OFF ACCEL PO SIG" in "ACTIVE TEST" mode with CONSULT-II. 3. Touch "CLEAR".	
▶	GO TO 10.

9	RESET ACCELERATOR POSITION SENSOR IDLE POSITION MEMORY
Without CONSULT-II 1. Start engine and warm it up to normal operating temperature. 2. Let engine idle for 10 minutes.	
▶	GO TO 10.

10	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-78.	
▶	**INSPECTION END**

11	CHECK ACCELERATOR POSITION SWITCH POWER SUPPLY CIRCUIT
1. Turn ignition switch "OFF". 2. Disconnect accelerator work unit harness connector. 3. Turn ignition switch "ON". 4. Check voltage between accelerator work unit terminal 6 and ground with CONSULT-II or tester.	



Voltage: Battery voltage

YEC707A

OK or NG

OK	▶	GO TO 13.
NG	▶	GO TO 12.

12	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors M787, F6 (LHD models) ● Harness for open or short between accelerator work unit and ECM relay ● Harness for open or short between accelerator work unit and ECM	
▶	Repair harness or connectors.

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Diagnostic Procedure (Cont'd)

13	CHECK ACCELERATOR POSITION SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

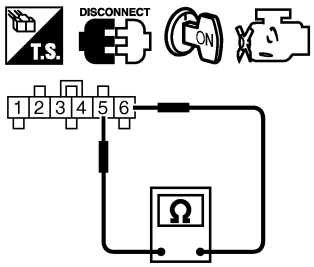
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between accelerator work unit terminal 5 and ECM terminal 31. Refer to Wiring Diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 14.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

14	CHECK ACCELERATOR POSITION SWITCH

Check continuity between accelerator work unit terminals 5 and 6 under the following conditions.



Between terminals 5 and 6

Conditions	Continuity
Accelerator pedal fully released	Should exist.
Accelerator pedal depressed	Should not exist.

YEC708A

OK or NG

OK (With CONSULT-II)	▶	GO TO 15.
OK (Without CONSULT-II)	▶	GO TO 16.
NG	▶	Replace accelerator pedal assembly.

15	RESET ACCELERATOR POSITION SENSOR IDLE POSITION MEMORY

With CONSULT-II
1. Turn ignition switch "ON".
2. Select "OFF ACCEL PO SIG" in "ACTIVE TEST" mode with CONSULT-II.
3. Touch "CLEAR".

	▶	GO TO 18.

16	RESET ACCELERATOR POSITION SENSOR IDLE POSITION MEMORY

Without CONSULT-II
1. Start engine and warm it up to normal operating temperature.
2. Let engine idle for 10 minutes.

	▶	GO TO 18.

17	CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-78.

	▶	**INSPECTION END**

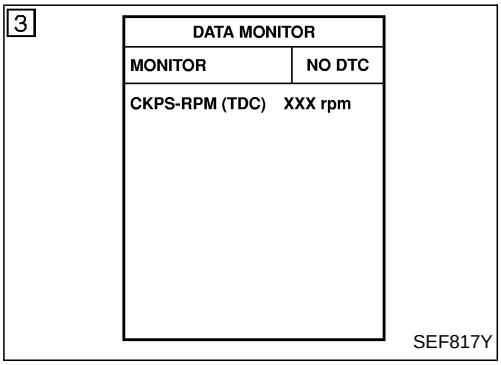
http://vnx.su/

On Board Diagnosis Logic

Malfunction is detected when ...	Check Items (Possible Cause)
● An excessively high voltage from the mass air flow sensor is sent to ECM when engine is running.	● Air duct ● Charge air cooler ● Variable nozzle turbocharger control system ● Variable nozzle turbocharger ● Mass air flow sensor ● Harness or connectors (The mass air flow sensor circuit is shorted.)

DTC Confirmation Procedure

NOTE:
If DTC 0406 “INT AIR VOL” displayed with DTC 0102 “MASS AIR FLOW SEN”, perform trouble diagnosis for DTC 0102 “MASS AIR FLOW SEN” first. (See EC-88.)



WITH CONSULT-II

1) Turn ignition switch “ON”.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Start engine and warm it up to normal operating temperature.
4) Drive vehicle.
5) Maintain the engine speed more than 4,000 rpm for at least 10 seconds.
6) If DTC is detected, go to “Diagnostic Procedure”, EC-151.

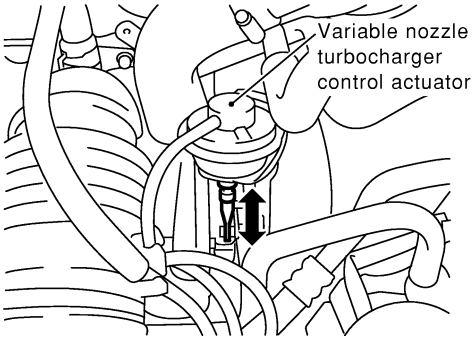
WITHOUT CONSULT-II

1) Start engine and warm it up to normal operating temperature.
2) Drive vehicle.
3) Maintain the engine speed more than 4,000 rpm for at least 10 seconds.
4) Stop vehicle.
5) Turn ignition switch “OFF”, wait at least 5 seconds and then turn “ON”.
6) Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
7) If DTC is detected, go to “Diagnostic Procedure”, EC-151.

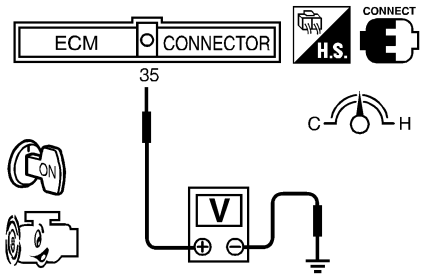
http://vnx.su/

Diagnostic Procedure

1	CHECK INTAKE AIR LEAK
Listen for an intake air leak after the mass air flow sensor.	
OK or NG	
OK ▶	GO TO 2.
NG ▶	Repair or replace.

2	CHECK VARIABLE NOZZLE TURBOCHARGER OVERALL FUNCTION
1. Start engine and let it idle. 2. Make sure that variable nozzle turbocharger control actuator rod moves when revving engine up to 3,000 rpm and returning to idle.	
 MEC015E	
OK or NG	
OK ▶	GO TO 3.
NG ▶	Go to “Diagnostic Procedure” in “VARIABLE NOZZLE TURBOCHARGER CONTROL SOLENOID VALVE”, EC-292.

3	CHECK MASS AIR FLOW SENSOR
1. Start engine and warm it up to normal operating temperature. 2. Check voltage between ECM terminal 35 (Mass air flow sensor signal) and ground.	



Condition	Voltage V
Ignition switch “ON” (Engine stopped.)	Approx. 1.0
Idle (Engine is warmed-up to normal operating temperature.)	1.6 - 2.0
Idle to about 4,000 rpm*	1.6 - 2.0 to Approx. 4.0

*: Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

SEF400Y

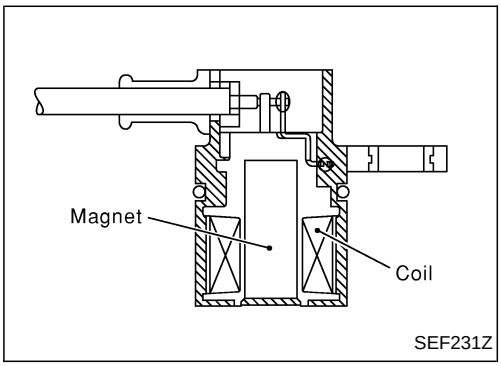
3. If the voltage is out of specification, disconnect MAFS harness connector and connect it again. Then repeat above check.

OK or NG

OK ▶	GO TO 4.
NG ▶	Replace mass air flow sensor.

4	CHECK INTERMIT INCIDENT
Refer to “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-78.	
▶	**INSPECTION END**

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Description

The crankshaft position sensor (TDC) monitors engine speed by means of signals from the sensing plate (with three protrusions) installed to the crankshaft pulley. The data signal output is detected at ATDC 70° and sent to the ECM. The sensor signal is used for fuel injection control and fuel injection timing control.

CONSULT-II Reference Value in Data Monitor Mode

Specification data are reference values.

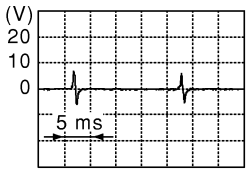
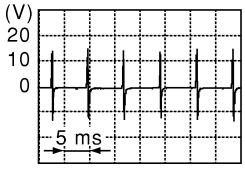
MONITOR ITEM	CONDITION	SPECIFICATION
CKPS·RPM (TDC)	● Tachometer: Connect ● Run engine and compare the CONSULT-II value with tachometer indication.	Almost the same speed as the tachometer indication.

ECM Terminals and Reference Value

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may damage the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
44	L/G	Crankshaft position sensor (TDC)	Engine is running. └ **Warm-up condition** Idle speed	Approximately 0V  SEF333Y
			Engine is running. └ **Warm-up condition** Engine speed is 2,000 rpm	Approximately 0V  SEF334Y
47	L/R	Crankshaft position sensor (TDC) ground	Engine is running. └ **Warm-up condition** Idle speed	Approximately 0V

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On Board Diagnosis Logic

Malfunction is detected when ...	Check Items (Possible Cause)
• An improper signal from the sensor is sent to ECM during engine running and cranking.	• Harness or connectors (The sensor circuit is open.) • Crankshaft position sensor (TDC)

3

DATA MONITOR	
MONITOR	NO DTC
CKPS-RPM (TDC)	XXX rpm

SEF817Y

DTC Confirmation Procedure

Before performing the following procedure, confirm that battery voltage is more than 10V.

WITH CONSULT-II

1) Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2) Crank engine for at least 1 second.
3) Start engine and run it for at least 2 seconds at idle speed.
4) If DTC is detected, go to “Diagnostic Procedure”, EC-156.

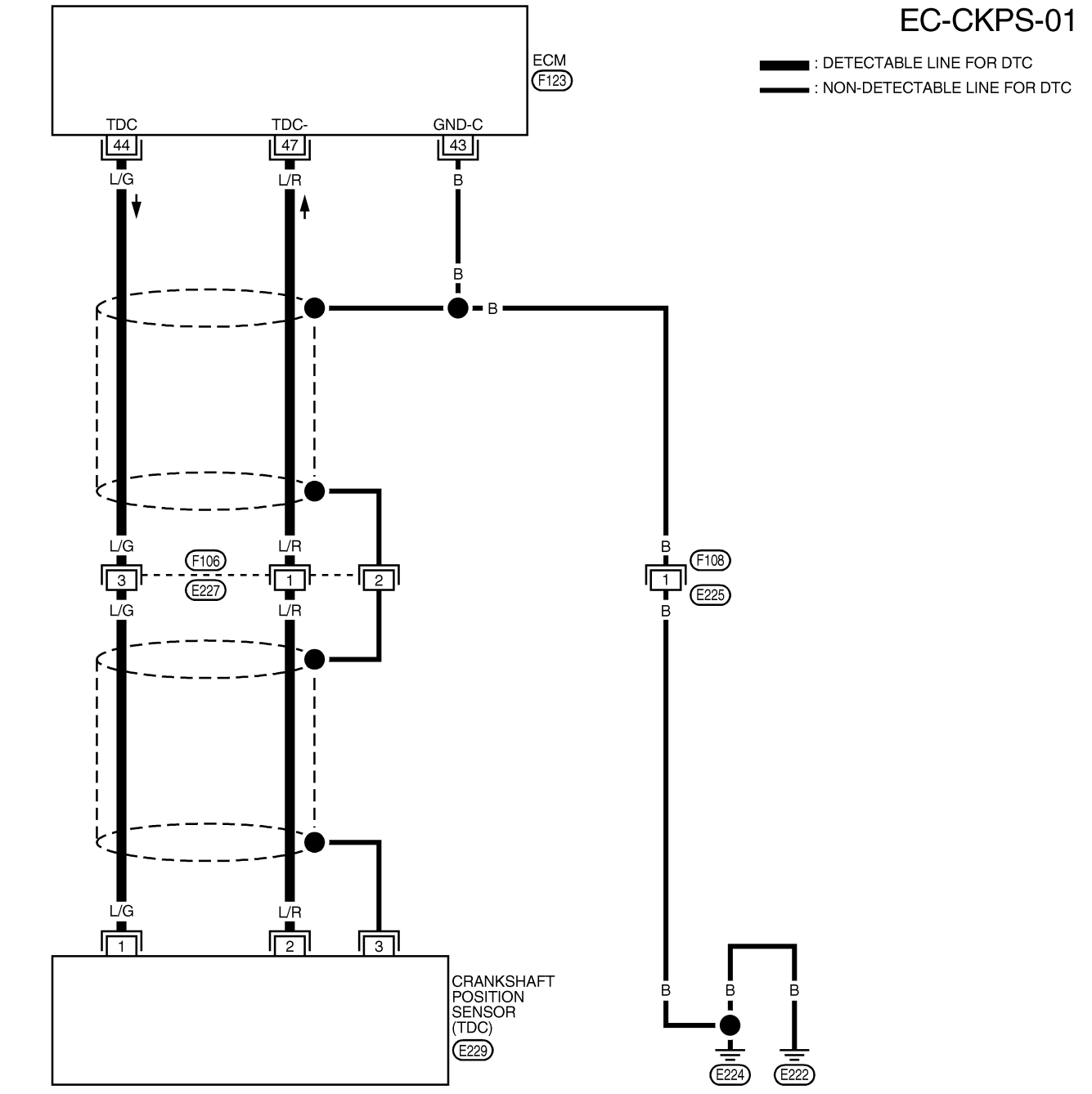
WITHOUT CONSULT-II

1) Crank engine for at least 1 second.
2) Start engine and run it for at least 2 seconds at idle speed.
3) Turn ignition switch “OFF”, wait at least 5 seconds and then turn “ON”.
4) Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
5) If DTC is detected, go to “Diagnostic Procedure”, EC-156.

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Wiring Diagram

LHD MODELS

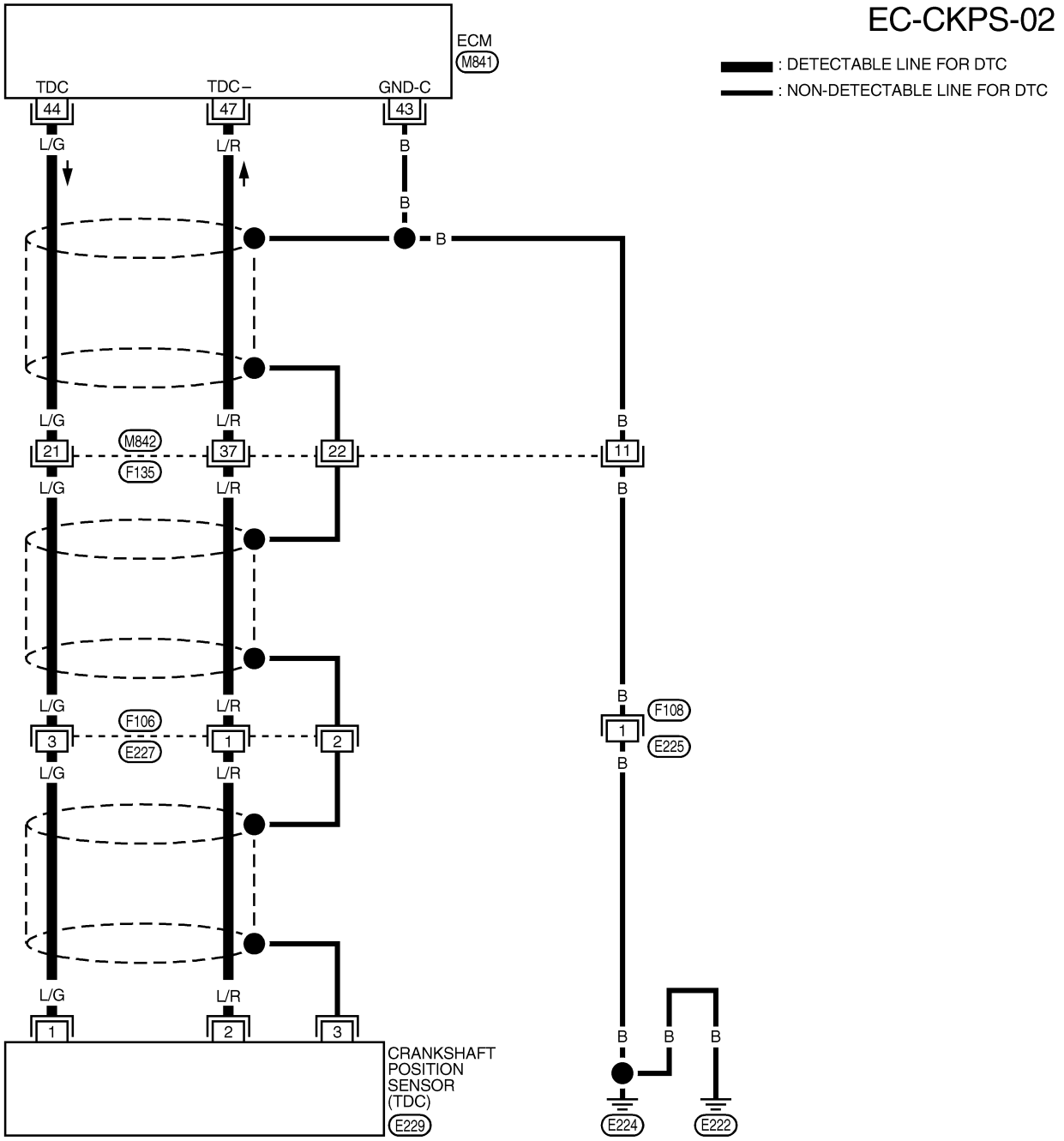


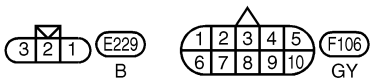
YEC185A

http://vnx.su/

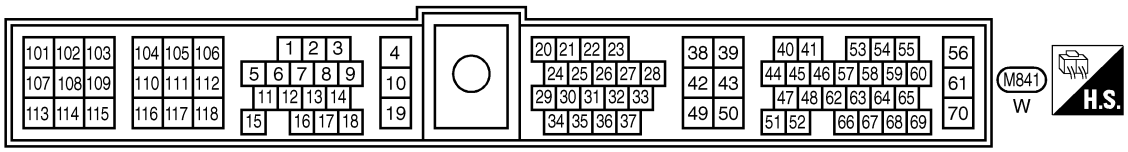
Wiring Diagram (Cont'd)

RHD MODELS





REFER TO THE FOLLOWING.
F108 , F135 -SUPER MULTIPLE JUNCTION (SMJ)



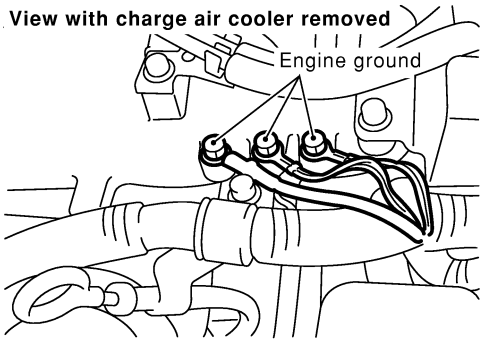
YEC664A

http://vnx.su/

Diagnostic Procedure

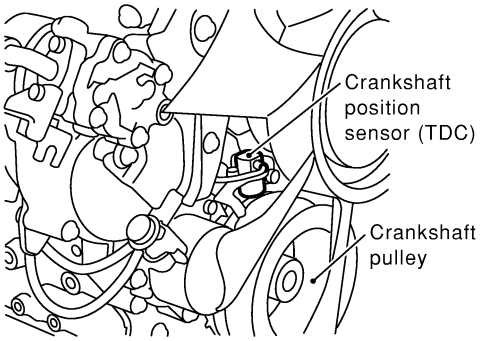
1	CHECK CRANKSHAFT POSITION SENSOR (TDC) GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

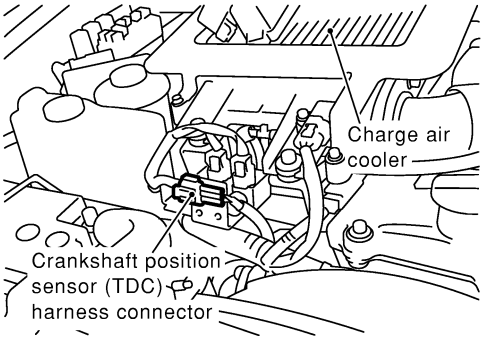


MEC994D

3. Disconnect crankshaft position sensor (TDC) harness connector and ECM harness connector.



MEC998D



MEC018E

4. Check harness continuity between ECM terminal 47 and terminal 2. Refer to Wiring Diagram.
   Continuity should exist.
5. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

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Diagnostic Procedure (Cont'd)

2	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors F106, E227 ● Harness connectors M842, F135 (RHD models) ● Harness for open or short between crankshaft position sensor (TDC) and ECM	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

3	CHECK CRANKSHAFT POSITION SENSOR (TDC) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT
1. Check harness continuity between terminal 1 and ECM terminal 44. Refer to Wiring Diagram. **Continuity should exist.** 2. Also check harness for short to ground and short to power.	
OK or NG	
OK ▶	GO TO 5.
NG ▶	GO TO 4.

4	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors F106, E227 ● Harness connectors M842, F135 (RHD models) ● Harness for open or short between crankshaft position sensor (TDC) and ECM	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

5	CHECK CRANKSHAFT POSITION SENSOR SHIELD CIRCUIT
1. Check harness continuity between crankshaft position sensor (TDC) terminal 3 and engine ground. Refer to Wiring Diagram. **Continuity should exist.** 2. Also check harness for short to ground and short to power.	
OK or NG	
OK ▶	GO TO 7.
NG ▶	GO TO 6.

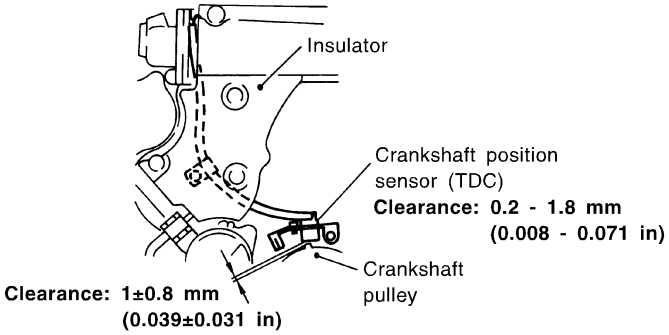
6	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors F106, E227 ● Harness connectors F108, E225 ● Harness connectors M842, F135 (RHD models) ● Harness for open or short between crankshaft position sensor (TDC) and engine ground	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

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Diagnostic Procedure (Cont'd)

7	CHECK CRANKSHAFT POSITION SENSOR (TDC) INSTALLATION

Check the clearance between crankshaft position sensor (TDC) and protrusion on the crankshaft pulley.



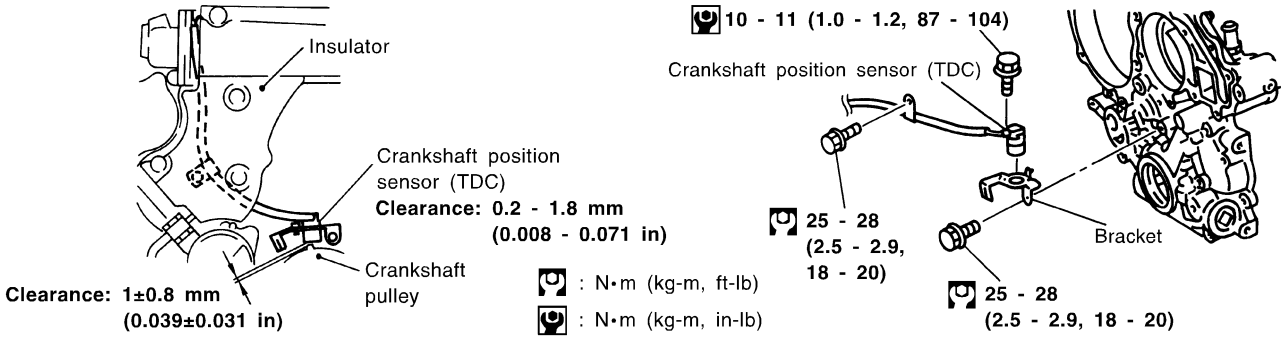
JEF293Z

OK or NG

OK	▶	GO TO 8.
NG	▶	GO TO 9.

8	REINSTALL CRANKSHAFT POSITION SENSOR (TDC)

1. Remove crankshaft position sensor (TDC).
2. Install crankshaft position sensor (TDC) properly.



JEF294Z

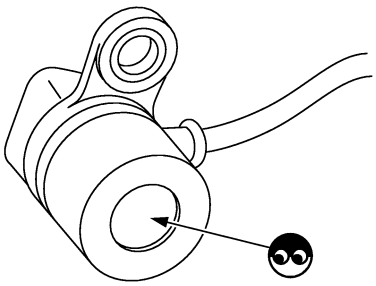
	▶	INSPECTION END

http://vnx.su/

Diagnostic Procedure (Cont'd)

9	CHECK CRANKSHAFT POSITION SENSOR (TDC)-I

1. Loosen the fixing bolt and remove the crankshaft position sensor (TDC).
2. Visually check the sensor for chipping.



SEF232Z

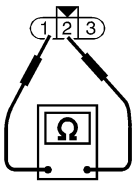
OK or NG

OK	▶	GO TO 10.
NG	▶	Replace crankshaft position sensor (TDC).

10	CHECK CRANKSHAFT POSITION SENSOR (TDC)-II

1. Disconnect crankshaft position sensor (TDC) harness connector.
2. Check resistance between crankshaft position sensor (TDC) terminals 1 and 2.





Resistance: 1,287 - 1,573Ω [at 20°C (68°F)]

SEF295Z

OK or NG

OK	▶	GO TO 11.
NG	▶	Replace crankshaft position sensor (TDC).

11	CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-78.

▶ **INSPECTION END**

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System Description

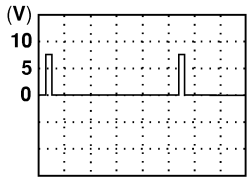
These circuit lines are used to control the smooth shifting up and down of A/T during the hard acceleration/deceleration.
Voltage signals are exchanged between ECM and TCM (Transmission control module).

ECM Terminals and Reference Value

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

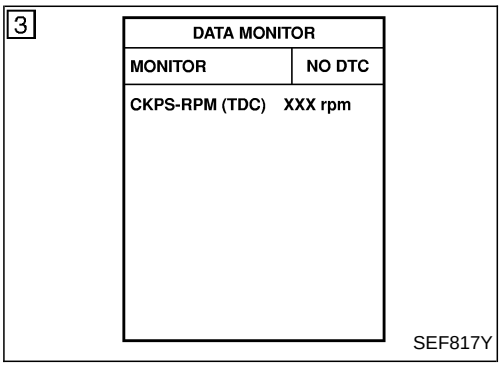
Do not use ECM ground terminals when measuring input/output voltage. Doing so may damage the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
24 37 58	G/Y LG/R R/B	A/T signal No. 1 A/T signal No. 2 A/T signal No. 4	Engine is running. └ **Warm-up condition** Idle speed	Voltage goes high up once in a few seconds  SEF448Z
30	LG/Y	A/T signal No. 3	Engine is running. └ **Warm-up condition** Idle speed	Approximately 0V
			Engine is running. └ **Warm-up condition** Engine speed is 2,000 rpm	Approximately 7.7V

On Board Diagnosis Logic

Malfunction is detected when ...	Check Items (Possible Cause)
• ECM receives incorrect voltage from TCM (Transmission control module) continuously.	• Harness or connectors [The circuit between ECM and TCM (Transmission control module) is open or shorted.]

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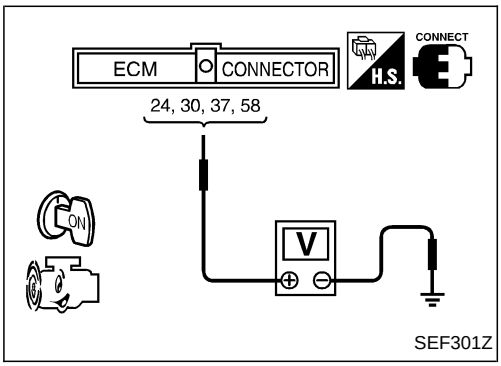


DTC Confirmation Procedure

NOTE:
If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

With CONSULT-II

1) Start engine.
2) Select "DATA MONITOR" mode with CONSULT-II.
3) Set selector lever to "D" position.
4) Accelerate up to 60 km/h (37 MPH) gradually on the accelerator pedal.
   Do not accelerate with shift down.
5) Stop the vehicle with engine running.
6) If DTC is detected, go to "Diagnostic Procedure", EC-164.



Overall Function Check

Use this procedure to check the overall function of the A/T control circuit. During this check, a DTC might not be confirmed.

Without CONSULT-II

1) Start engine.
2) Read the voltage signal between ECM terminals 24, 30, 37, 58 and ground with an oscilloscope.
3) Verify that the oscilloscope screen shows the signal wave as shown under "ECM Terminals and Reference Value" on the previous page.
4) If NG, go to "Diagnostic Procedure", EC-164.

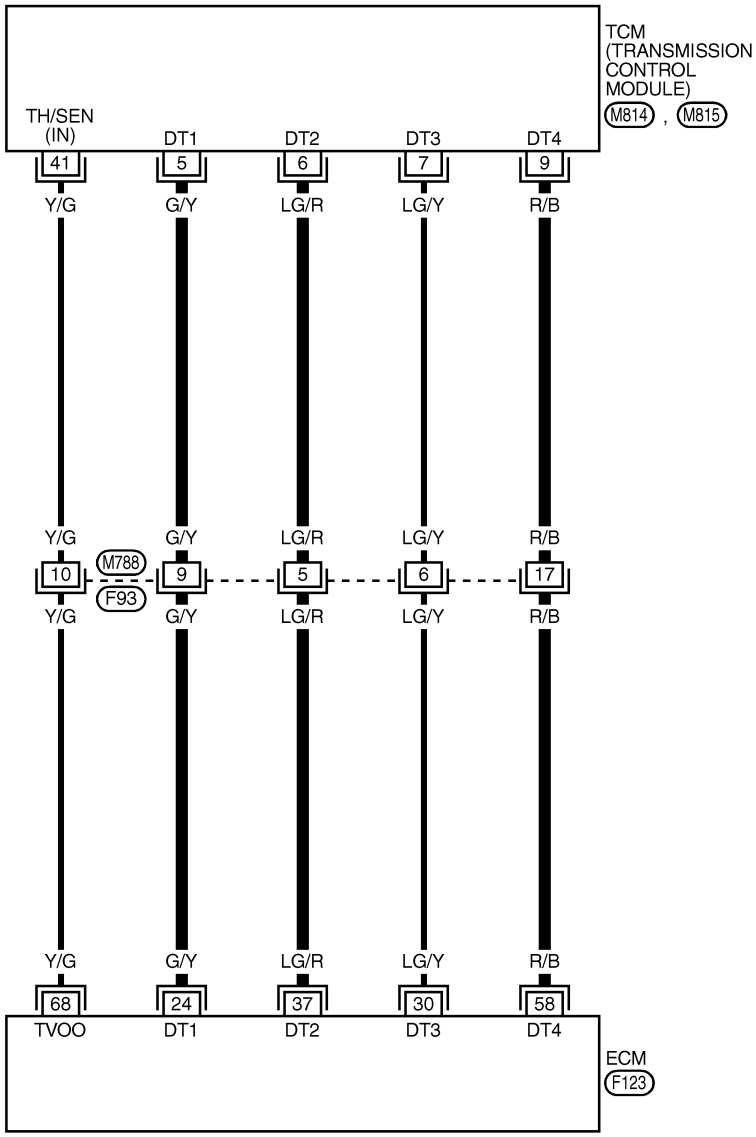
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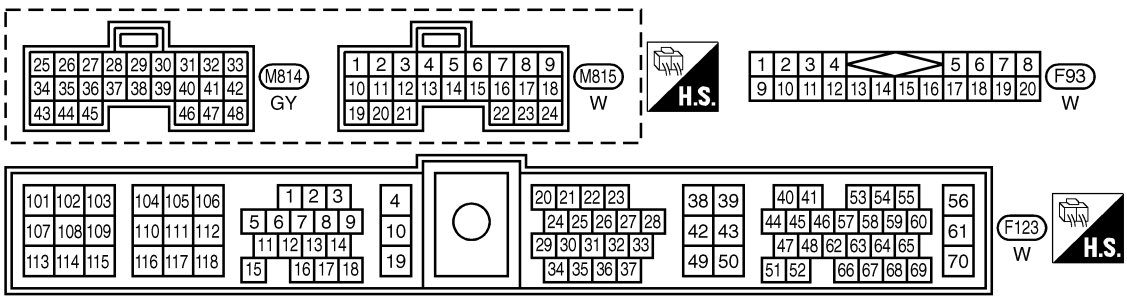
Wiring Diagram

LHD MODELS

EC-AT/C-01

: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC





YEC187A

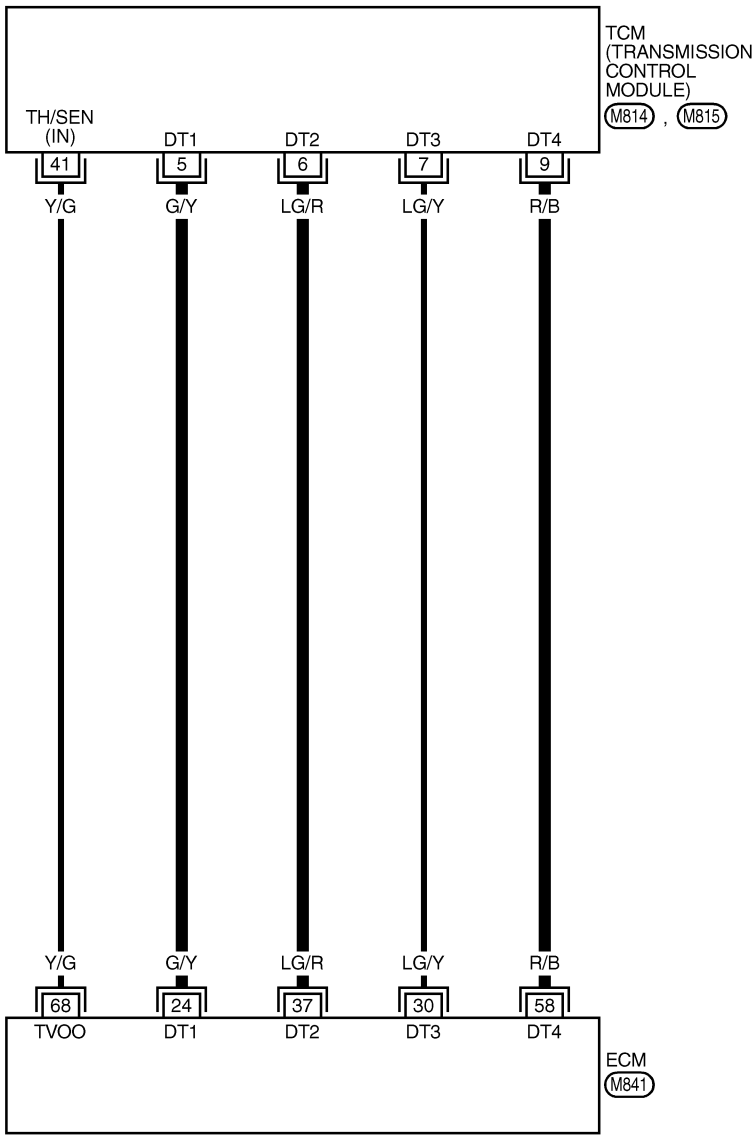
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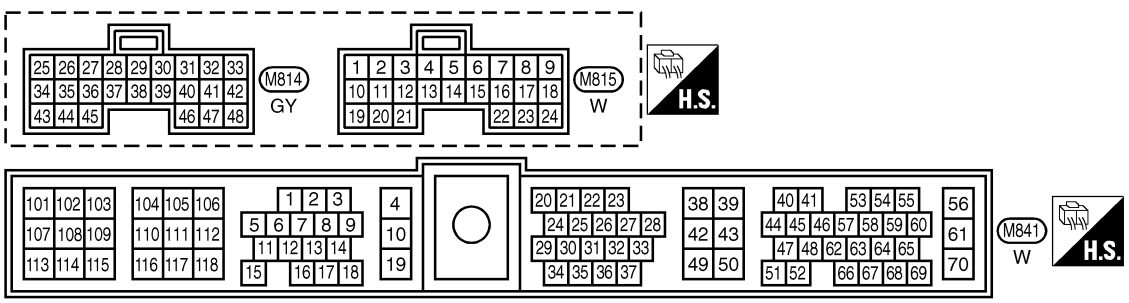
Wiring Diagram (Cont'd)

RHD MODELS

EC-AT/C-02

: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC





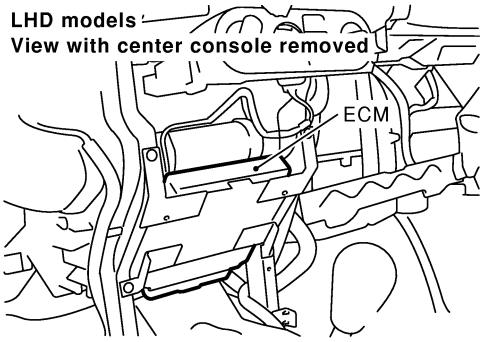
YEC188A

http://vnx.su/

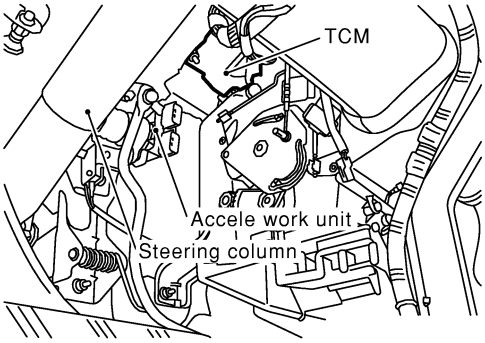
Diagnostic Procedure

1	CHECK INPUT SIGNAL CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector and TCM (Transmission control module) harness connector.



MEC020E



MEC026E

3. Check harness continuity between the following terminals. Refer to Wiring Diagram.

ECM	TCM
24	5
30	7
37	6
58	9

MTBL0532

Continuity should exist.

OK or NG

OK ▶	GO TO 3.
NG ▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M788, F93 (LHD models)
- Harness for open or short between ECM and TCM (Transmission control module)

▶	Repair harness or connectors.

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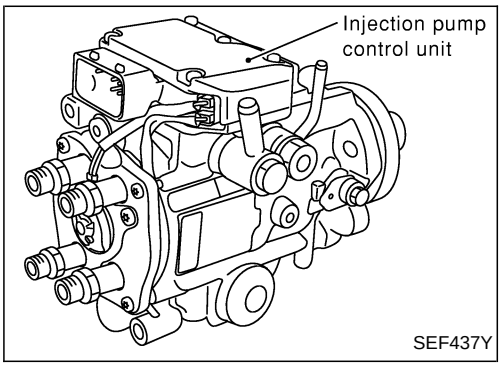
Diagnostic Procedure (Cont'd)

3	CHECK INPUT SIGNAL CIRCUIT
1. Check harness continuity between ECM terminal 24 and ground, ECM terminal 30 and ground, ECM terminal 37 and ground, ECM terminal 58 and ground. Refer to Wiring Diagram. **Continuity should not exist.** 2. Also check harness for short to ground and short to power. **OK or NG**	
OK ▶	GO TO 5.
NG ▶	GO TO 4.

4	DETECT MALFUNCTIONING PART
Check the harness for open or short between ECM and TCM (Transmission control module).	
▶	Repair open circuit short to ground or short to power in harness.

5	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-78.	
▶	**INSPECTION END**

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Description

SYSTEM DESCRIPTION

The ECM and the electronic control fuel injection pump control unit (abbreviated as the injection pump control unit) perform the real time communication (signal exchange).
The ECM transmits the signals of the target fuel injection amount, target fuel injection timing, and engine speed, etc., and receives the signals of the pump speed and fuel temperature, etc. from the injection pump control unit.
By those signals, the injection pump controls the optimum fuel injection amount and injection timing of the spill valve and timing control valve.
Injection pump control unit has an on board diagnostic system, which detects malfunctions related to sensors or actuators built-into electronic control fuel injection pump. These malfunction information are transferred through the line (circuit) from injection pump control unit to ECM.

FUEL INJECTION AMOUNT CONTROL

In accordance with the target fuel injection amount signal from the ECM, the injection amount is controlled by controlling the spill valve in the injection pump and by changing the needle opening time.

FUEL INJECTION TIMING CONTROL

Based on the target fuel injection timing signal from the ECM, the injection timing is controlled in accordance with the timer spring by performing the duty control of the timing control valve in the injection pump and by adjusting the pressure of the timer piston high pressure chamber.

FUEL TEMPERATURE SENSOR

The sensor detects the fuel temperature in the injection pump and calibrates the injection amount change by the fuel temperature.

CAM RING POSITION SENSOR

The sensor detects the passing of the protrusion on the sensor wheel in the injection pump by the semiconductor magnetic resistance element sensor. The cam ring position sensor synchronizes with the cam ring, and detects the actual advance amount. The injection pump control unit measures the injection pump revolution by the signal of the cam ring position sensor.

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CONSULT-II Reference Value in Data Monitor Mode

Remarks: Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
FUEL TEMP SEN	● Engine: After warming up		More than 40°C (104°F)
SPILL/V	● Engine: After warming up		Approx. 13°CA
INJ TIMG C/V	● Engine: After warming up, idle the engine.		Approx. 50 - 70%
DECELER F/CUT	● Engine: After warming up	Idle	OFF
BARO SEN	● Ignition switch: ON		Altitude Approx. 0 m (0 ft): Approx. 100.62 kPa (1.0062 bar, 1.026 kg/cm^2, 14.59 psi) Approx. 1,000 m (3,281 ft): Approx. 88.95 kPa (0.8895 bar, 0.907 kg/cm^2, 12.90 psi) Approx. 1,500 m (4,992 ft): Approx. 83.16 kPa (0.8316 bar, 0.848 kg/cm^2, 12.06 psi) Approx. 2,000 m (6,562 ft): Approx. 78.36 kPa (0.7836 bar, 0.799 kg/cm^2, 11.36 psi)

ECM Terminals and Reference Value

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

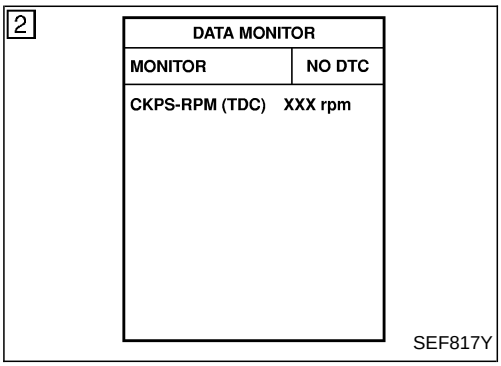
Do not use ECM ground terminals when measuring input/output voltage. Doing so may damage the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
33	G	Electronic control fuel injection pump	Engine is running. └ **Warm-up condition** Idle speed	Approximately 2.5V
40	R	Electronic control fuel injection pump	Engine is running. └ **Warm-up condition** Idle speed	Approximately 2.5V
52	Y	Electronic control fuel injection pump	Engine is running. └ Idle speed	Approximately 0.1V
53	O/R	Electronic control fuel injection pump	Engine is running. └ Idle speed	Approximately 0.35V

On Board Diagnosis Logic

Malfunction is detected when	Check Items (Possible cause)
● An improper voltage signal from cam position sensor (Built-into electronic control fuel injection pump) is sent to injection pump control unit.	● Harness or connectors (Electronic control fuel injection pump circuit is open or shorted.) ● Electronic control fuel injection pump

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DTC Confirmation Procedure

WITH CONSULT-II

1) Turn ignition switch “ON” and wait at least 2 seconds.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Start engine and run it for at least 2 seconds at idle speed. (If engine does not run, turn ignition switch to “START” for at least 2 seconds.)
4) If DTC is detected, go to “Diagnostic Procedure”, EC-171.

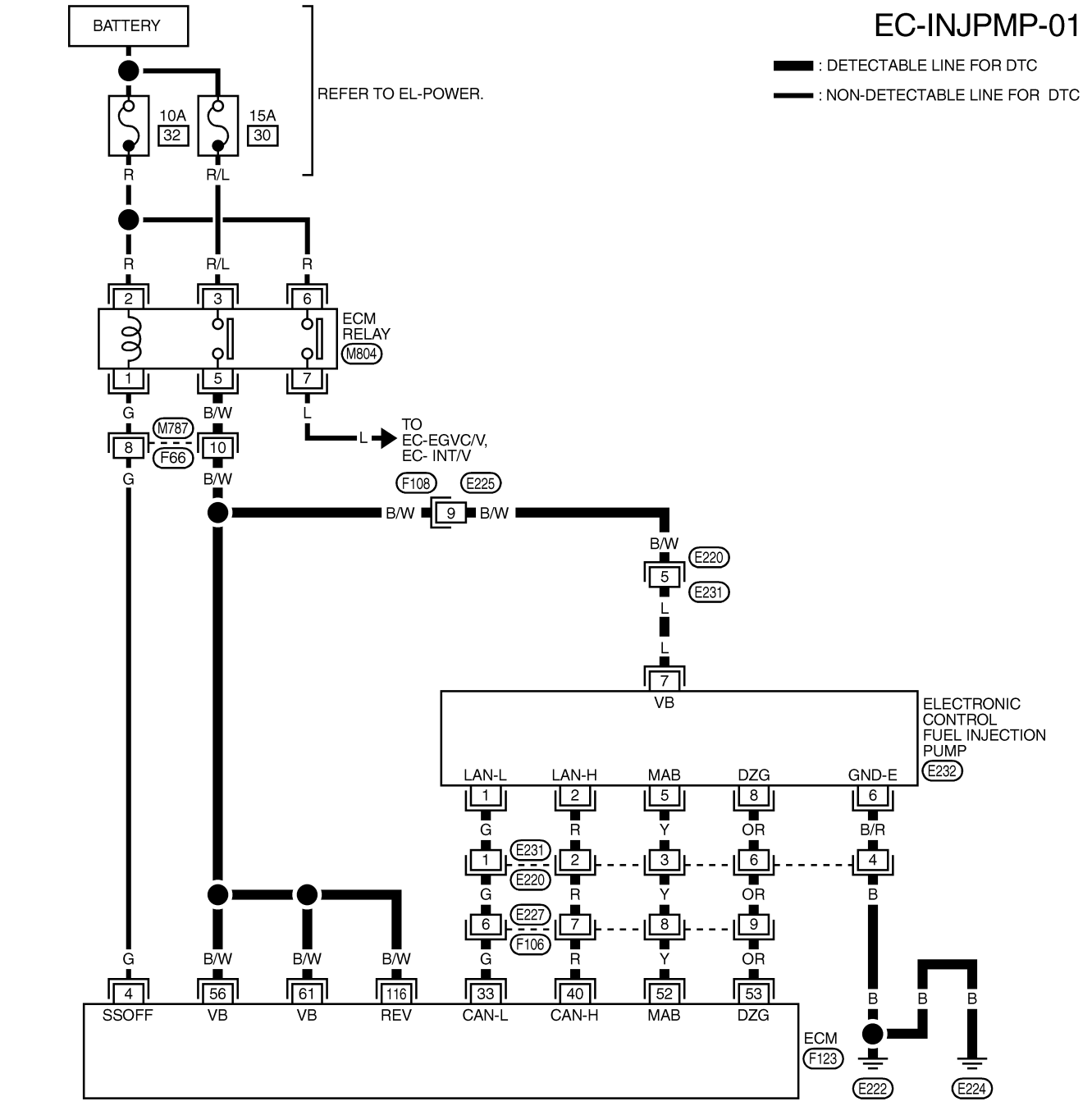
WITHOUT CONSULT-II

1) Turn ignition switch “ON” and wait at least 2 seconds.
2) Start engine and run it for at least 2 seconds at idle speed. (If engine does not run, turn ignition switch to “START” for at least 2 seconds.)
3) Turn ignition switch “OFF”, wait at least 5 seconds and then turn “ON”.
4) Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
5) If DTC is detected, go to “Diagnostic Procedure”, EC-171.

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Wiring Diagram

LHD MODELS

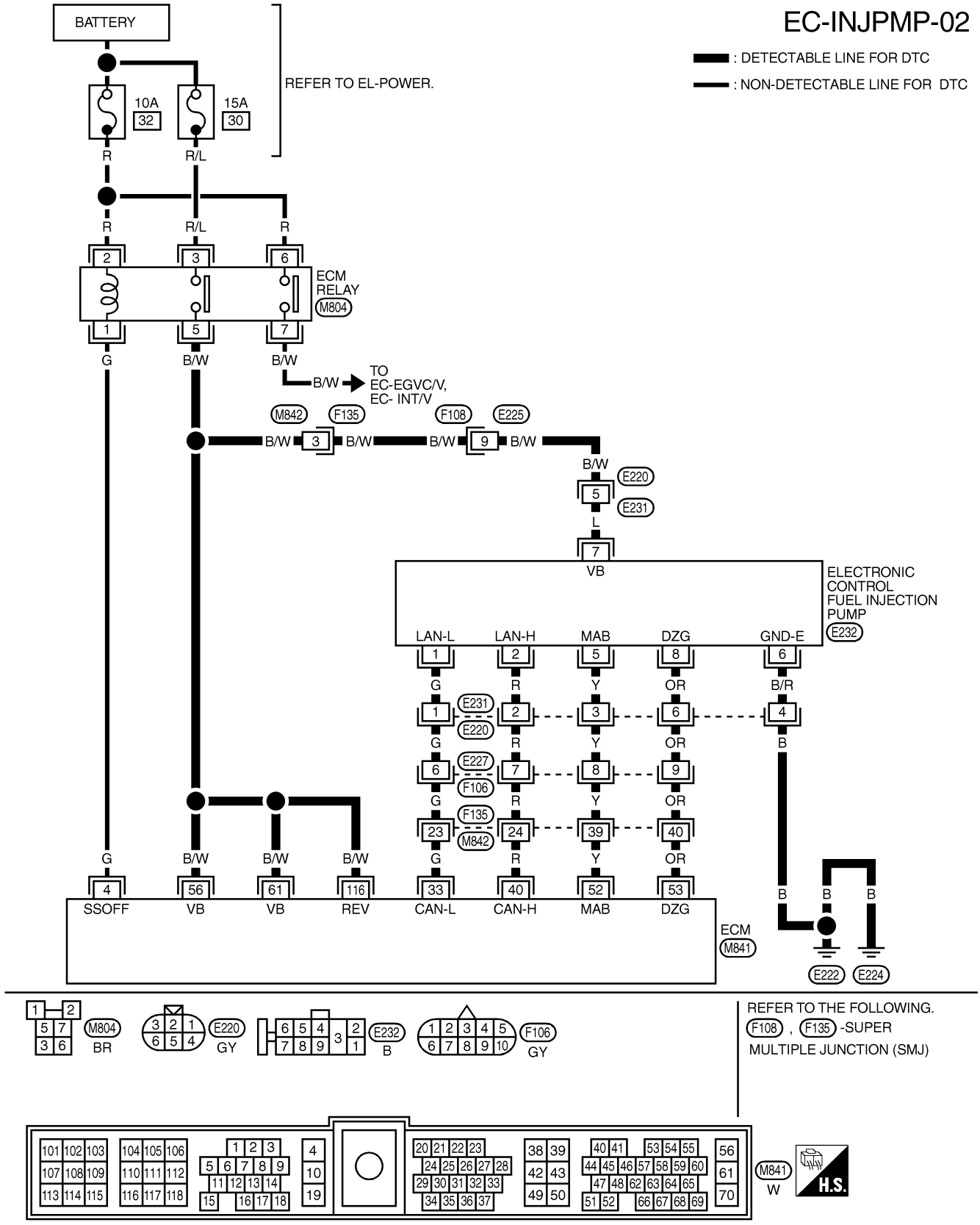


YEC181A

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Wiring Diagram (Cont'd)

RHD MODELS



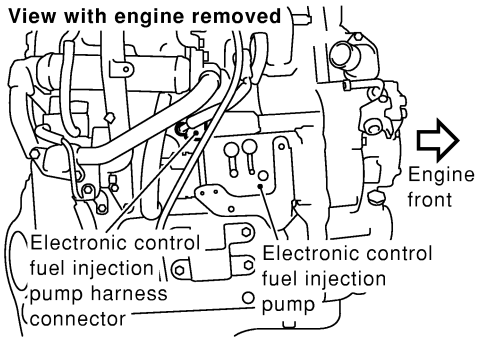
YEC182A

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Diagnostic Procedure

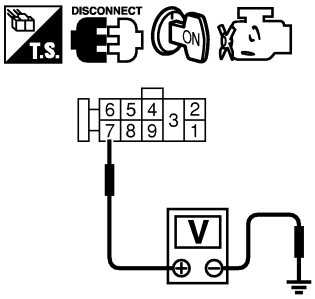
1	CHECK ELECTRONIC CONTROL FUEL INJECTION PUMP POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect electronic control fuel injection pump harness connector.



MEC025E

3. Turn ignition switch “ON”.
4. Check voltage between electronic control fuel injection pump terminal 7 and ground.



MEC977D

Voltage: Battery voltage

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M787, F66
- Harness connectors F108, E225
- Harness connectors E220, E231
- Harness connectors M842, F135 (RHD models)
- Harness for open or short between electronic control fuel injection pump and ECM
- Harness for open or short between electronic control fuel injection pump and ECM relay

	▶	Repair open circuit or short to ground or short to power in harness or connectors.

3	CHECK ELECTRONIC CONTROL FUEL INJECTION PUMP GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between electronic control fuel injection pump terminal 6 and ground. Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 4.

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Diagnostic Procedure (Cont'd)

4	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E231, E220 ● Harness for open or short between electronic control fuel injection pump and engine ground	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

5	CHECK COMMUNICATION LINE FOR OPEN AND SHORT

1. Check continuity between the following terminals. Refer to Wiring Diagram.

Electronic control fuel injection pump	ECM
1	33
2	40
5	52
8	53

MTBL0444

Continuity should exist.

2. Also check harness for short to ground and short to power.

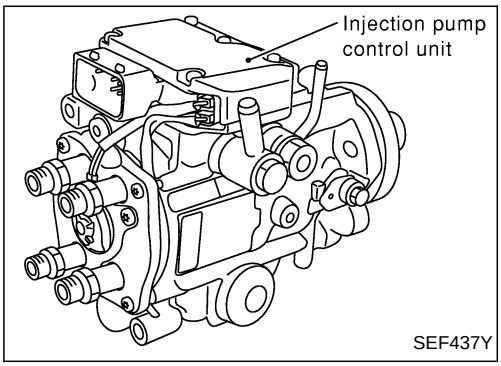
OK or NG

OK ▶	GO TO 7.
NG ▶	GO TO 6.

6	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E231, E220 ● Harness connectors E227, F106 ● Harness connectors F135, M842 (RHD models) ● Harness for open or short between electronic control fuel injection pump and ECM	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

7	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-78.	
OK or NG	
OK ▶	Replace electronic control fuel injection pump.
NG ▶	Repair open circuit or short to ground or short to power in harness or connectors.

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Description

SYSTEM DESCRIPTION

The ECM and the electronic control fuel injection pump control unit (abbreviated as the injection pump control unit) perform the real time communication (signal exchange).
The ECM transmits the signals of the target fuel injection amount, target fuel injection timing, and engine speed, etc., and receives the signals of the pump speed and fuel temperature, etc. from the injection pump control unit.
By those signals, the injection pump controls the optimum fuel injection amount and injection timing of the spill valve and timing control valve.
Injection pump control unit has an on board diagnostic system, which detects malfunctions related to sensors or actuators built-into electronic control fuel injection pump. These malfunction information are transferred through the line (circuit) from injection pump control unit to ECM.

FUEL INJECTION AMOUNT CONTROL

In accordance with the target fuel injection amount signal from the ECM, the injection amount is controlled by controlling the spill valve in the injection pump and by changing the needle opening time.

FUEL INJECTION TIMING CONTROL

Based on the target fuel injection timing signal from the ECM, the injection timing is controlled in accordance with the timer spring by performing the duty control of the timing control valve in the injection pump and by adjusting the pressure of the timer piston high pressure chamber.

FUEL TEMPERATURE SENSOR

The sensor detects the fuel temperature in the injection pump and calibrates the injection amount change by the fuel temperature.

CAM RING POSITION SENSOR

The sensor detects the passing of the protrusion on the sensor wheel in the injection pump by the semiconductor magnetic resistance element sensor. The cam ring position sensor synchronizes with the cam ring, and detects the actual advance amount. The injection pump control unit measures the injection pump revolution by the signal of the cam ring position sensor.

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CONSULT-II Reference Value in Data Monitor Mode

Remarks: Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
FUEL TEMP SEN	● Engine: After warming up		More than 40°C (104°F)
SPILL/V	● Engine: After warming up		Approx. 13°CA
INJ TIMG C/V	● Engine: After warming up, idle the engine.		Approx. 50 - 70%
DECELER F/CUT	● Engine: After warming up	Idle	OFF
BARO SEN	● Ignition switch: ON		Altitude Approx. 0 m (0 ft): Approx. 100.62 kPa (1.0062 bar, 1.026 kg/cm^2, 14.59 psi) Approx. 1,000 m (3,281 ft): Approx. 88.95 kPa (0.8895 bar, 0.907 kg/cm^2, 12.90 psi) Approx. 1,500 m (4,992 ft): Approx. 83.16 kPa (0.8316 bar, 0.848 kg/cm^2, 12.06 psi) Approx. 2,000 m (6,562 ft): Approx. 78.36 kPa (0.7836 bar, 0.799 kg/cm^2, 11.36 psi)

ECM Terminals and Reference Value

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

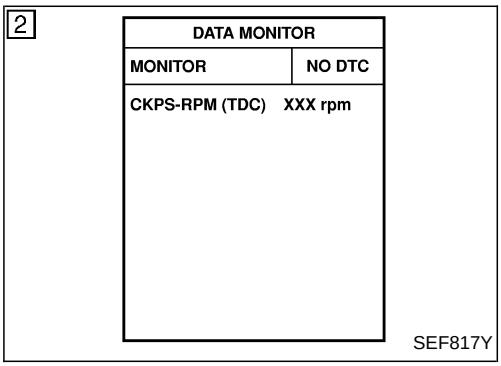
Do not use ECM ground terminals when measuring input/output voltage. Doing so may damage the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
33	G	Electronic control fuel injection pump	Engine is running. └ **Warm-up condition** Idle speed	Approximately 2.5V
40	R	Electronic control fuel injection pump	Engine is running. └ **Warm-up condition** Idle speed	Approximately 2.5V
52	Y	Electronic control fuel injection pump	Engine is running. └ Idle speed	Approximately 0.1V
53	OR	Electronic control fuel injection pump	Engine is running. └ Idle speed	Approximately 0.35V

On Board Diagnosis Logic

Malfunction is detected when	Check Items (Possible cause)
● Injection pump control unit input signal [Crankshaft position sensor (TDC) signal] processing function is malfunctioning.	● Harness or connectors (Electronic control fuel injection pump circuit is open or shorted.) ● Electronic control fuel injection pump

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DTC Confirmation Procedure

WITH CONSULT-II

1) Turn ignition switch “ON” and wait at least 2 seconds.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Start engine and run it for at least 2 seconds at idle speed. (If engine does not run, turn ignition switch to “START” for at least 2 seconds.)
4) If DTC 0407 is detected, go to “Diagnostic procedure”, EC-156. If DTC 0702 is detected, go to “Diagnostic Procedure”, EC-178.

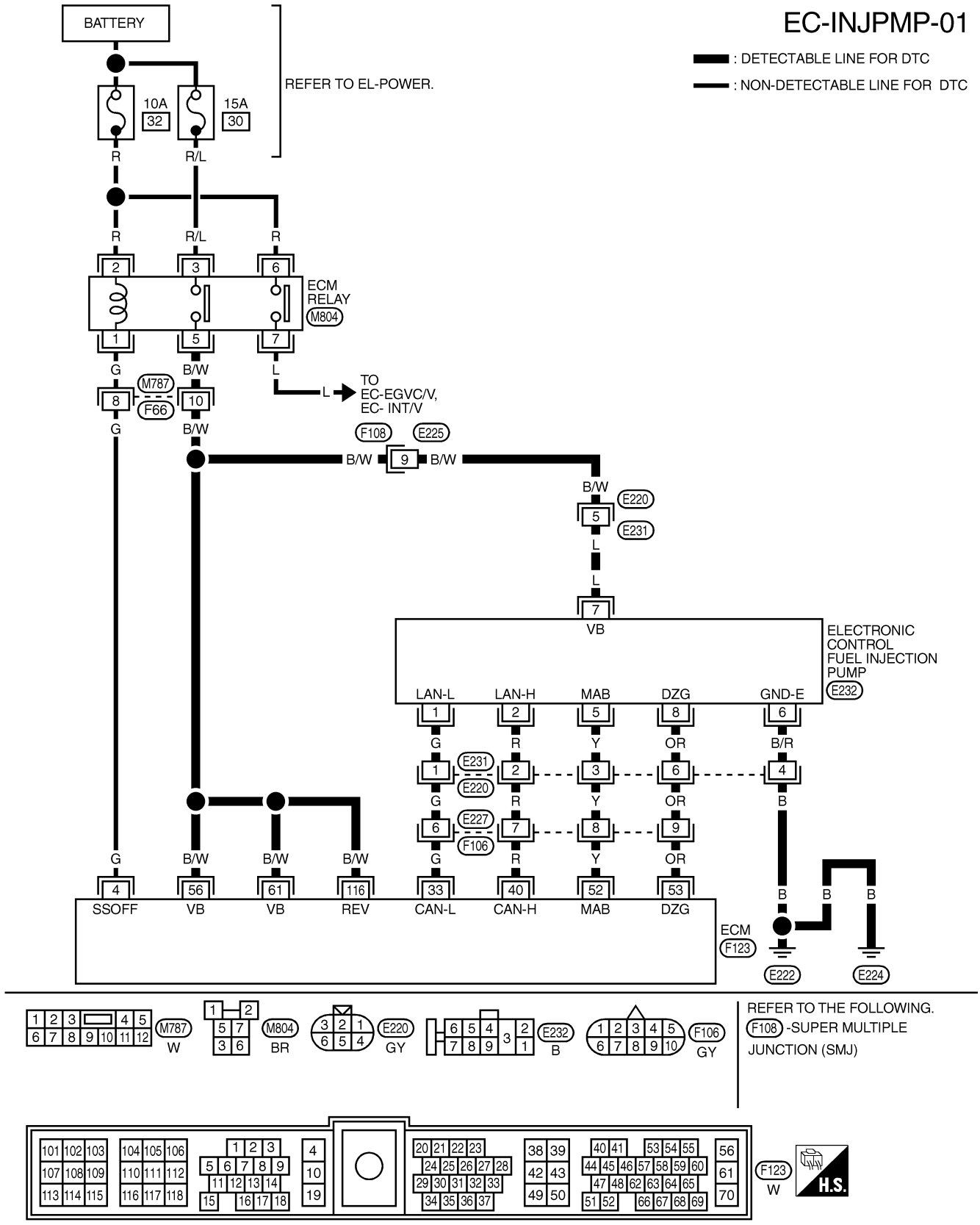
WITHOUT CONSULT-II

1) Turn ignition switch “ON” and wait at least 2 seconds.
2) Start engine and run it for at least 2 seconds at idle speed. (If engine does not run, turn ignition switch to “START” for at least 2 seconds.)
3) Turn ignition switch “OFF”, wait at least 5 seconds and then turn “ON”.
4) Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
5) If DTC 0407 is detected, go to “Diagnostic Procedure”, EC-156. If DTC 0702 is detected, go to “Diagnostic Procedure”, EC-178.

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Wiring Diagram

LHD MODELS

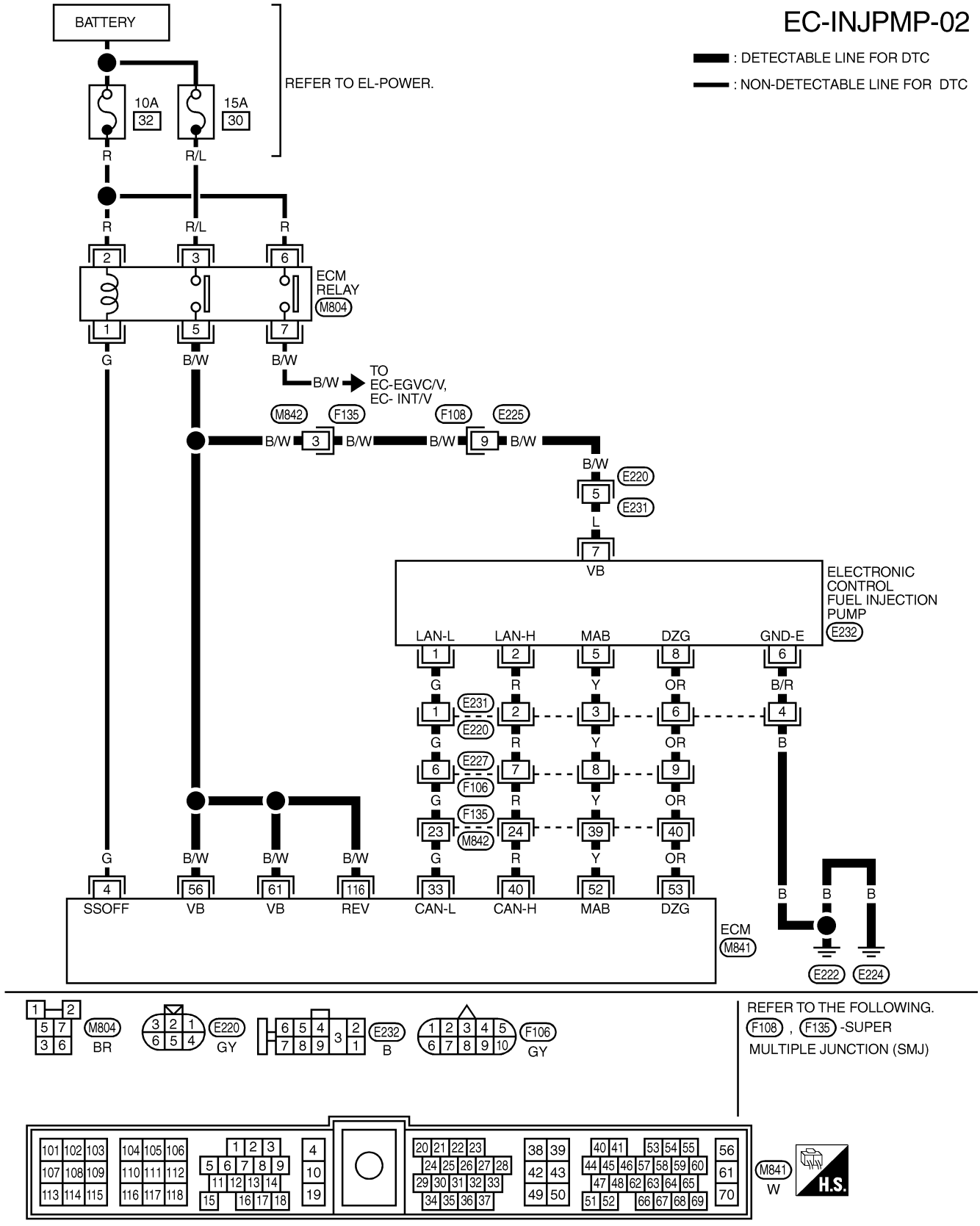


YEC181A

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Wiring Diagram (Cont'd)

RHD MODELS



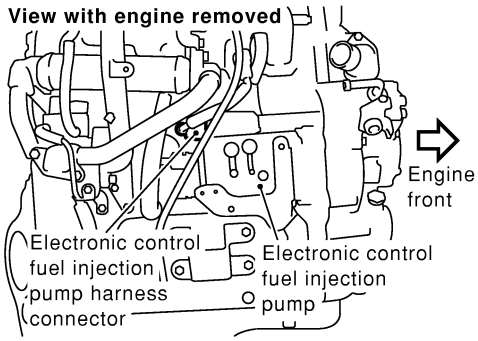
YEC182A

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Diagnostic Procedure

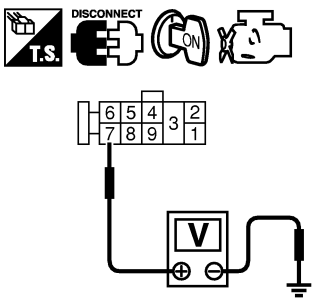
1	CHECK ELECTRONIC CONTROL FUEL INJECTION PUMP POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect electronic control fuel injection pump harness connector.



MEC025E

3. Turn ignition switch “ON”.
4. Check voltage between electronic control fuel injection pump terminal 7 and ground.



MEC977D

Voltage: Battery voltage

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M787, F66 (LHD models)
- Harness connectors F108, E225
- Harness connectors E220, E231
- Harness connectors M842, F135 (RHD models)
- Harness for open or short between electronic control fuel injection pump and ECM
- Harness for open or short between electronic control fuel injection pump and ECM relay

	▶	Repair open circuit or short to ground or short to power in harness or connectors.

3	CHECK ELECTRONIC CONTROL FUEL INJECTION PUMP GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between electronic control fuel injection pump terminal 6 and ground. Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 4.

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Diagnostic Procedure (Cont'd)

4	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E231, E220 ● Harness for open or short between electronic control fuel injection pump and engine ground	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

5	CHECK COMMUNICATION LINE FOR OPEN AND SHORT

1. Check continuity between the following terminals. Refer to Wiring Diagram.

Electronic control fuel injection pump	ECM
1	33
2	40
5	52
8	53

MTBL0444

Continuity should exist.

2. Also check harness for short to ground and short to power.

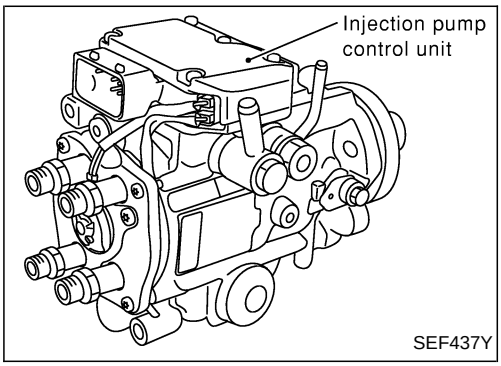
OK or NG

OK ▶	GO TO 7.
NG ▶	GO TO 6.

6	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E231, E220 ● Harness connectors E227, F106 ● Harness connectors F135, M842 (RHD models) ● Harness for open or short between electronic control fuel injection pump and ECM	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

7	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-78.	
OK or NG	
OK ▶	Replace electronic control fuel injection pump.
NG ▶	Repair open circuit or short to ground or short to power in harness or connectors.

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Description

SYSTEM DESCRIPTION

The ECM and the electronic control fuel injection pump control unit (abbreviated as the injection pump control unit) perform the real time communication (signal exchange).
The ECM transmits the signals of the target fuel injection amount, target fuel injection timing, and engine speed, etc., and receives the signals of the pump speed and fuel temperature, etc. from the injection pump control unit.
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Injection pump control unit has an on board diagnostic system, which detects malfunctions related to sensors or actuators built-into electronic control fuel injection pump. These malfunction information are transferred through the line (circuit) from injection pump control unit to ECM.

FUEL INJECTION AMOUNT CONTROL

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FUEL TEMPERATURE SENSOR

The sensor detects the fuel temperature in the injection pump and calibrates the injection amount change by the fuel temperature.

CAM RING POSITION SENSOR

The sensor detects the passing of the protrusion on the sensor wheel in the injection pump by the semiconductor magnetic resistance element sensor. The cam ring position sensor synchronizes with the cam ring, and detects the actual advance amount. The injection pump control unit measures the injection pump revolution by the signal of the cam ring position sensor.

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CONSULT-II Reference Value in Data Monitor Mode

Remarks: Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
FUEL TEMP SEN	● Engine: After warming up		More than 40°C (104°F)
SPILL/V	● Engine: After warming up		Approx. 13°CA
INJ TIMG C/V	● Engine: After warming up, idle the engine.		Approx. 50 - 70%
DECELER F/CUT	● Engine: After warming up	Idle	OFF
BARO SEN	● Ignition switch: ON		Altitude Approx. 0 m (0 ft): Approx. 100.62 kPa (1.0062 bar, 1.026 kg/cm^2, 14.59 psi) Approx. 1,000 m (3,281 ft): Approx. 88.95 kPa (0.8895 bar, 0.907 kg/cm^2, 12.90 psi) Approx. 1,500 m (4,992 ft): Approx. 83.16 kPa (0.8316 bar, 0.848 kg/cm^2, 12.06 psi) Approx. 2,000 m (6,562 ft): Approx. 78.36 kPa (0.7836 bar, 0.799 kg/cm^2, 11.36 psi)

ECM Terminals and Reference Value

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

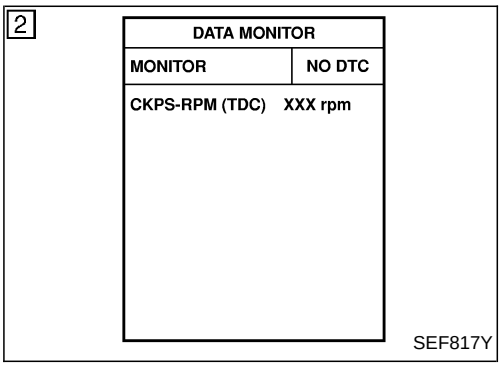
Do not use ECM ground terminals when measuring input/output voltage. Doing so may damage the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
33	G	Electronic control fuel injection pump	Engine is running. └ **Warm-up condition** Idle speed	Approximately 2.5V
40	R	Electronic control fuel injection pump	Engine is running. └ **Warm-up condition** Idle speed	Approximately 2.5V
52	Y	Electronic control fuel injection pump	Engine is running. └ Idle speed	Approximately 0.1V
53	OR	Electronic control fuel injection pump	Engine is running. └ Idle speed	Approximately 0.35V

On Board Diagnosis Logic

Malfunction is detected when	Check Items (Possible cause)
● Injection pump control unit receives incorrect voltage signal from ECM continuously.	● Harness or connectors (Electronic control fuel injection pump circuit is open or shorted.) ● Electronic control fuel injection pump

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DTC Confirmation Procedure

WITH CONSULT-II

1) Turn ignition switch “ON” and wait at least 2 seconds.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Start engine and run it for at least 2 seconds at idle speed. (If engine does not run, turn ignition switch to “START” for at least 2 seconds.)
4) If DTC is detected, go to “Diagnostic Procedure”, EC-185.

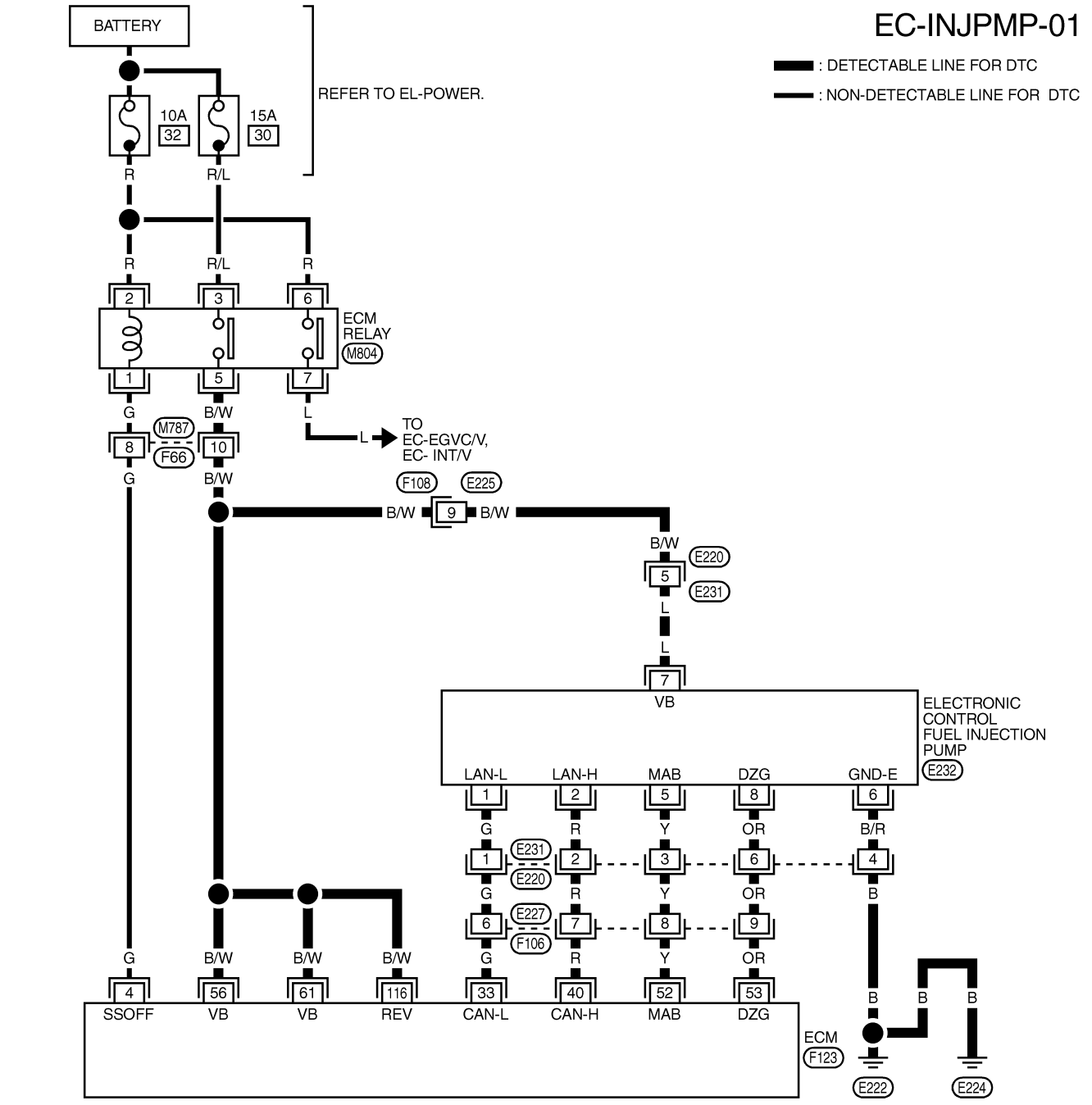
WITHOUT CONSULT-II

1) Turn ignition switch “ON” and wait at least 2 seconds.
2) Start engine and run it for at least 2 seconds at idle speed. (If engine does not run, turn ignition switch to “START” for at least 2 seconds.)
3) Turn ignition switch “OFF”, wait at least 5 seconds and then turn “ON”.
4) Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
5) If DTC is detected, go to “Diagnostic Procedure”, EC-185.

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Wiring Diagram

LHD MODELS

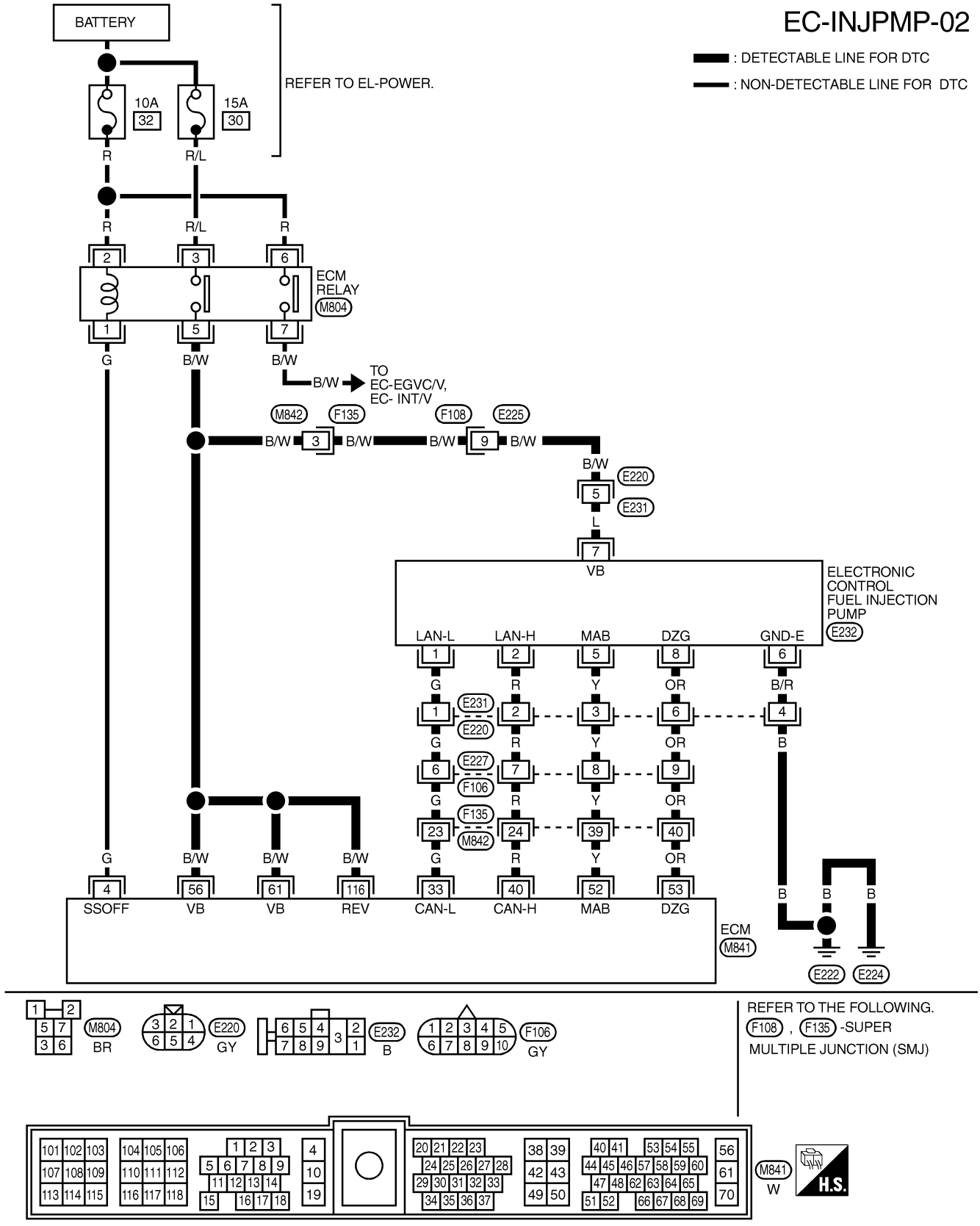


YEC181A

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Wiring Diagram (Cont'd)

RHD MODELS



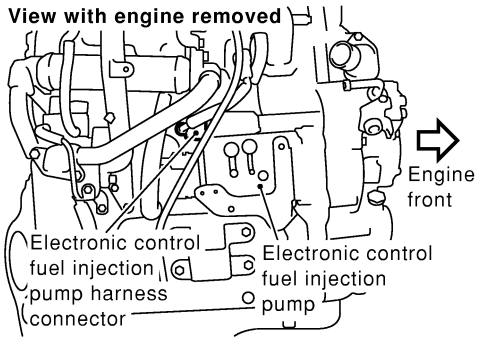
YEC182A

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Diagnostic Procedure

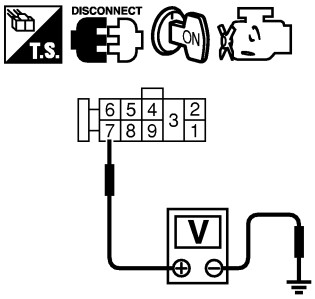
1	CHECK ELECTRONIC CONTROL FUEL INJECTION PUMP POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect electronic control fuel injection pump harness connector.



MEC025E

3. Turn ignition switch “ON”.
4. Check voltage between electronic control fuel injection pump terminal 7 and ground.



MEC977D

Voltage: Battery voltage

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M787, F66 (LHD models)
- Harness connectors F108, E225
- Harness connectors E220, E231
- Harness connectors M842, F135 (RHD models)
- Harness for open or short between electronic control fuel injection pump and ECM
- Harness for open or short between electronic control fuel injection pump and ECM relay

	▶	Repair open circuit or short to ground or short to power in harness or connectors.

3	CHECK ELECTRONIC CONTROL FUEL INJECTION PUMP GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between electronic control fuel injection pump terminal 6 and ground. Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 4.

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Diagnostic Procedure (Cont'd)

4	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E231, E220 ● Harness for open or short between electronic control fuel injection pump and engine ground	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

5	CHECK COMMUNICATION LINE FOR OPEN AND SHORT

1. Check continuity between the following terminals. Refer to Wiring Diagram.

Electronic control fuel injection pump	ECM
1	33
2	40
5	52
8	53

MTBL0444

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK ▶	GO TO 7.
NG ▶	GO TO 6.

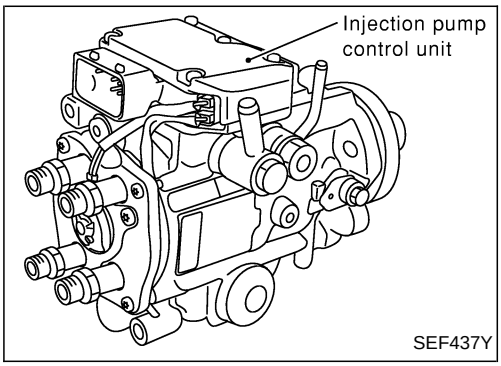
6	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E227, F106 ● Harness connectors E231, E220 ● Harness connectors F135, M842 (RHD models) ● Harness for open or short between electronic control fuel injection pump and ECM	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

7	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-78.	

OK or NG

OK ▶	Replace electronic control fuel injection pump.
NG ▶	Repair open circuit or short to ground or short to power in harness or connectors.

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Description

SYSTEM DESCRIPTION

The ECM and the electronic control fuel injection pump control unit (abbreviated as the injection pump control unit) perform the real time communication (signal exchange).
The ECM transmits the signals of the target fuel injection amount, target fuel injection timing, and engine speed, etc., and receives the signals of the pump speed and fuel temperature, etc. from the injection pump control unit.
By those signals, the injection pump controls the optimum fuel injection amount and injection timing of the spill valve and timing control valve.
Injection pump control unit has an on board diagnostic system, which detects malfunctions related to sensors or actuators built-into electronic control fuel injection pump. These malfunction information are transferred through the line (circuit) from injection pump control unit to ECM.

FUEL INJECTION AMOUNT CONTROL

In accordance with the target fuel injection amount signal from the ECM, the injection amount is controlled by controlling the spill valve in the injection pump and by changing the needle opening time.

FUEL INJECTION TIMING CONTROL

Based on the target fuel injection timing signal from the ECM, the injection timing is controlled in accordance with the timer spring by performing the duty control of the timing control valve in the injection pump and by adjusting the pressure of the timer piston high pressure chamber.

FUEL TEMPERATURE SENSOR

The sensor detects the fuel temperature in the injection pump and calibrates the injection amount change by the fuel temperature.

CAM RING POSITION SENSOR

The sensor detects the passing of the protrusion on the sensor wheel in the injection pump by the semiconductor magnetic resistance element sensor. The cam ring position sensor synchronizes with the cam ring, and detects the actual advance amount. The injection pump control unit measures the injection pump revolution by the signal of the cam ring position sensor.

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CONSULT-II Reference Value in Data Monitor Mode

Remarks: Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
FUEL TEMP SEN	● Engine: After warming up		More than 40°C (104°F)
SPILL/V	● Engine: After warming up		Approx. 13°CA
INJ TIMG C/V	● Engine: After warming up, idle the engine.		Approx. 50 - 70%
DECELER F/CUT	● Engine: After warming up	Idle	OFF
BARO SEN	● Ignition switch: ON		Altitude Approx. 0 m (0 ft): Approx. 100.62 kPa (1.0062 bar, 1.026 kg/cm^2, 14.59 psi) Approx. 1,000 m (3,281 ft): Approx. 88.95 kPa (0.8895 bar, 0.907 kg/cm^2, 12.90 psi) Approx. 1,500 m (4,992 ft): Approx. 83.16 kPa (0.8316 bar, 0.848 kg/cm^2, 12.06 psi) Approx. 2,000 m (6,562 ft): Approx. 78.36 kPa (0.7836 bar, 0.799 kg/cm^2, 11.36 psi)

ECM Terminals and Reference Value

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

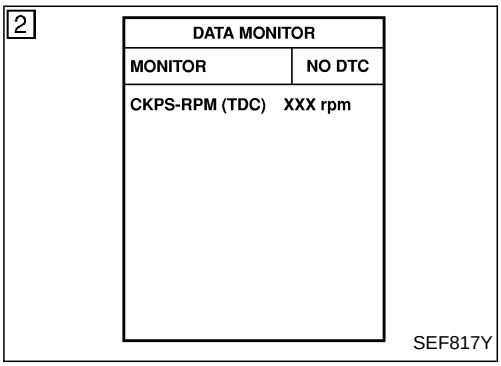
Do not use ECM ground terminals when measuring input/output voltage. Doing so may damage the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
33	G	Electronic control fuel injection pump	Engine is running. └ **Warm-up condition** Idle speed	Approximately 2.5V
40	R	Electronic control fuel injection pump	Engine is running. └ **Warm-up condition** Idle speed	Approximately 2.5V
52	Y	Electronic control fuel injection pump	Engine is running. └ Idle speed	Approximately 0.1V
53	OR	Electronic control fuel injection pump	Engine is running. └ Idle speed	Approximately 0.35V

On Board Diagnosis Logic

Malfunction is detected when	Check Items (Possible cause)
● Spill valve (Built-into electronic control fuel injection pump) does not function properly.	● Harness or connectors (Electronic control fuel injection pump circuit is open or shorted.) ● Electronic control fuel injection pump

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DTC Confirmation Procedure

WITH CONSULT-II

1) Turn ignition switch “ON” and wait at least 2 seconds.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Start engine and run it for at least 2 seconds at idle speed. (If engine does not run, turn ignition switch to “START” for at least 2 seconds.)
4) If DTC is detected, go to “Diagnostic Procedure”, EC-192.

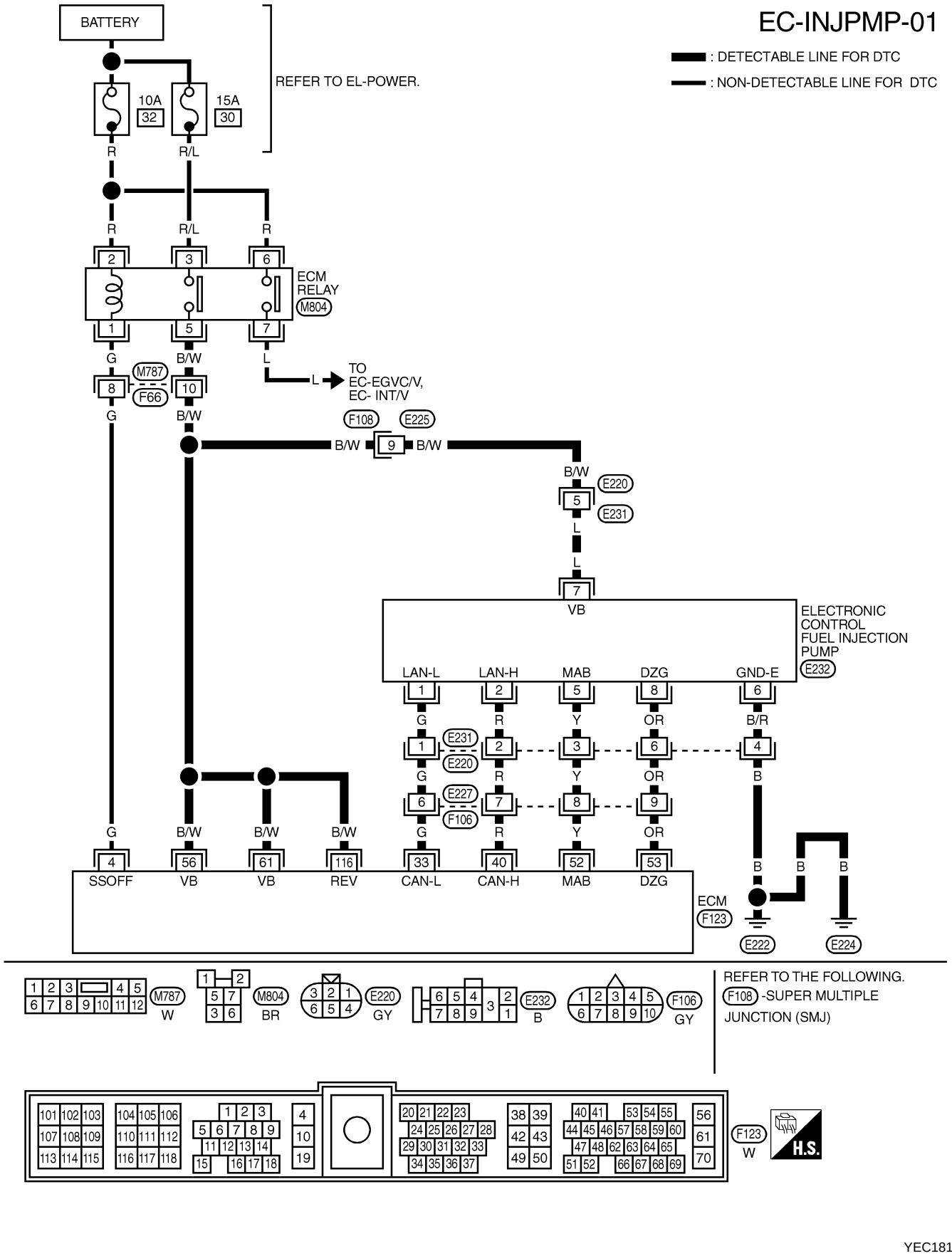
WITHOUT CONSULT-II

1) Turn ignition switch “ON” and wait at least 2 seconds.
2) Start engine and run it for at least 2 seconds at idle speed. (If engine does not run, turn ignition switch to “START” for at least 2 seconds.)
3) Turn ignition switch “OFF”, wait at least 5 seconds and then turn “ON”.
4) Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
5) If DTC is detected, go to “Diagnostic Procedure”, EC-192.

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Wiring Diagram

LHD MODELS

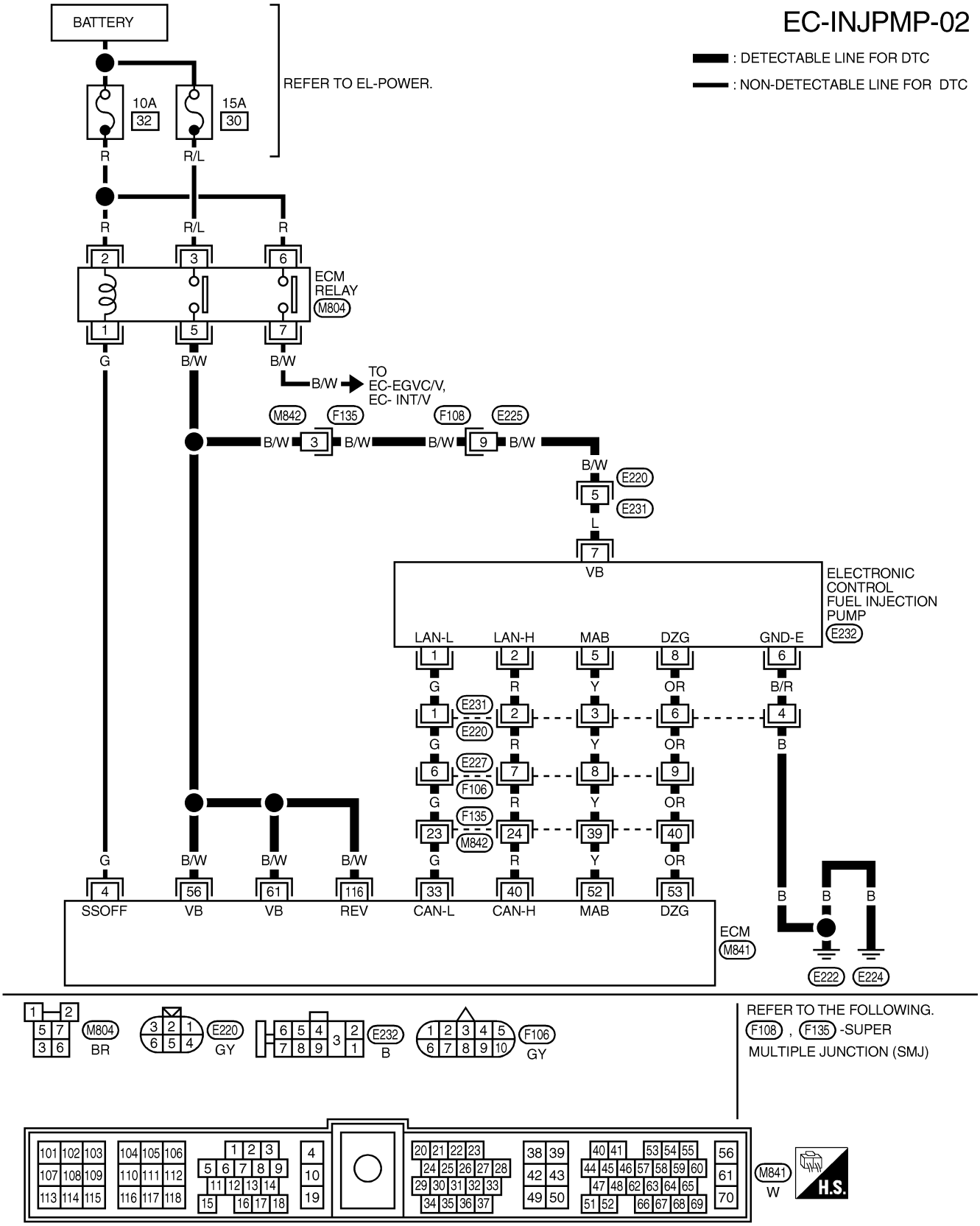


YEC181A

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Wiring Diagram (Cont'd)

RHD MODELS



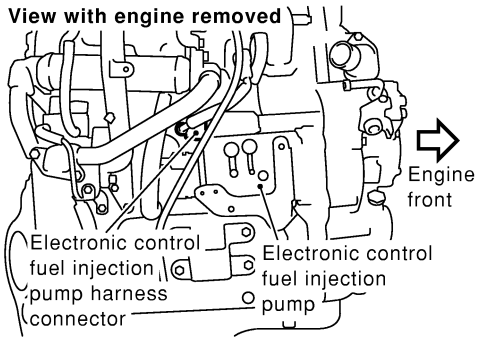
YEC182A

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Diagnostic Procedure

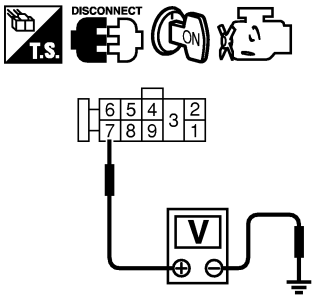
1	CHECK ELECTRONIC CONTROL FUEL INJECTION PUMP POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect electronic control fuel injection pump harness connector.



MEC025E

3. Turn ignition switch “ON”.
4. Check voltage between electronic control fuel injection pump terminal 7 and ground.



MEC977D

Voltage: Battery voltage

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M787, F66 (LHD models)
- Harness connectors F108, E225
- Harness connectors E220, E231
- Harness connectors M842, F135 (RHD models)
- Harness for open or short between electronic control fuel injection pump and ECM
- Harness for open or short between electronic control fuel injection pump and ECM relay

	▶	Repair open circuit or short to ground or short to power in harness or connectors.

3	CHECK ELECTRONIC CONTROL FUEL INJECTION PUMP GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between electronic control fuel injection pump terminal 6 and ground. Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 4.

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Diagnostic Procedure (Cont'd)

4	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E231, E220 ● Harness for open or short between electronic control fuel injection pump and engine ground	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

5	CHECK COMMUNICATION LINE FOR OPEN AND SHORT

1. Check continuity between the following terminals. Refer to Wiring Diagram.

Electronic control fuel injection pump	ECM
1	33
2	40
5	52
8	53

MTBL0444

Continuity should exist.

2. Also check harness for short to ground and short to power.

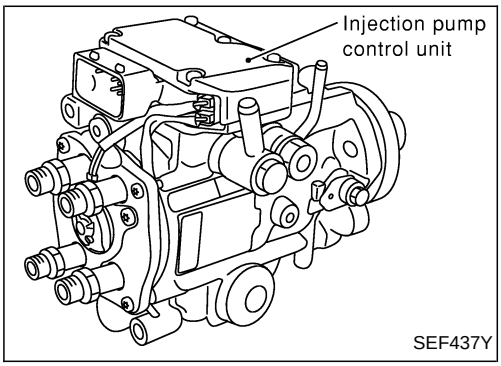
OK or NG

OK ▶	GO TO 7.
NG ▶	GO TO 6.

6	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E231, E220 ● Harness connectors E227, F106 ● Harness connectors F135, M842 (RHD models) ● Harness for open or short between electronic control fuel injection pump and ECM	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

7	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-78. **OK or NG**	
OK ▶	Replace electronic control fuel injection pump.
NG ▶	Repair open circuit or short to ground or short to power in harness or connectors.

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Description

SYSTEM DESCRIPTION

The ECM and the electronic control fuel injection pump control unit (abbreviated as the injection pump control unit) perform the real time communication (signal exchange).
The ECM transmits the signals of the target fuel injection amount, target fuel injection timing, and engine speed, etc., and receives the signals of the pump speed and fuel temperature, etc. from the injection pump control unit.
By those signals, the injection pump controls the optimum fuel injection amount and injection timing of the spill valve and timing control valve.
Injection pump control unit has an on board diagnostic system, which detects malfunctions related to sensors or actuators built-into electronic control fuel injection pump. These malfunction information are transferred through the line (circuit) from injection pump control unit to ECM.

FUEL INJECTION AMOUNT CONTROL

In accordance with the target fuel injection amount signal from the ECM, the injection amount is controlled by controlling the spill valve in the injection pump and by changing the needle opening time.

FUEL INJECTION TIMING CONTROL

Based on the target fuel injection timing signal from the ECM, the injection timing is controlled in accordance with the timer spring by performing the duty control of the timing control valve in the injection pump and by adjusting the pressure of the timer piston high pressure chamber.

FUEL TEMPERATURE SENSOR

The sensor detects the fuel temperature in the injection pump and calibrates the injection amount change by the fuel temperature.

CAM RING POSITION SENSOR

The sensor detects the passing of the protrusion on the sensor wheel in the injection pump by the semiconductor magnetic resistance element sensor. The cam ring position sensor synchronizes with the cam ring, and detects the actual advance amount. The injection pump control unit measures the injection pump revolution by the signal of the cam ring position sensor.

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CONSULT-II Reference Value in Data Monitor Mode

Remarks: Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
FUEL TEMP SEN	● Engine: After warming up		More than 40°C (104°F)
SPILL/V	● Engine: After warming up		Approx. 13°CA
INJ TIMG C/V	● Engine: After warming up, idle the engine.		Approx. 50 - 70%
DECELER F/CUT	● Engine: After warming up	Idle	OFF
BARO SEN	● Ignition switch: ON		Altitude Approx. 0 m (0 ft): Approx. 100.62 kPa (1.0062 bar, 1.026 kg/cm^2, 14.59 psi) Approx. 1,000 m (3,281 ft): Approx. 88.95 kPa (0.8895 bar, 0.907 kg/cm^2, 12.90 psi) Approx. 1,500 m (4,992 ft): Approx. 83.16 kPa (0.8316 bar, 0.848 kg/cm^2, 12.06 psi) Approx. 2,000 m (6,562 ft): Approx. 78.36 kPa (0.7836 bar, 0.799 kg/cm^2, 11.36 psi)

ECM Terminals and Reference Value

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

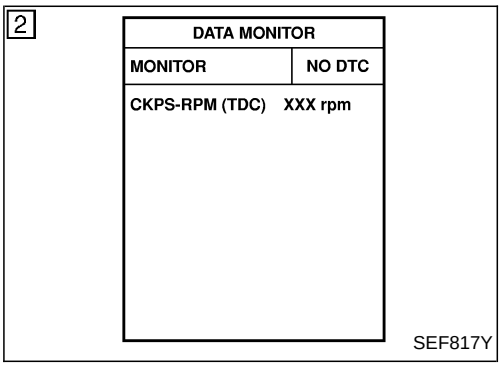
Do not use ECM ground terminals when measuring input/output voltage. Doing so may damage the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
33	G	Electronic control fuel injection pump	Engine is running. └ **Warm-up condition** Idle speed	Approximately 2.5V
40	R	Electronic control fuel injection pump	Engine is running. └ **Warm-up condition** Idle speed	Approximately 2.5V
52	Y	Electronic control fuel injection pump	Engine is running. └ Idle speed	Approximately 0.1V
53	OR	Electronic control fuel injection pump	Engine is running. └ Idle speed	Approximately 0.35V

On Board Diagnosis Logic

Malfunction is detected when	Check Items (Possible cause)
● Injection pump control unit does not function properly.	● Electronic control fuel injection pump

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DTC Confirmation Procedure

WITH CONSULT-II

1) Turn ignition switch “ON” and wait at least 2 seconds.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Start engine and run it for at least 2 seconds at idle speed. (If engine does not run, turn ignition switch to “START” for at least 2 seconds.)
4) If DTC is detected, go to “Diagnostic Procedure”, EC-196.

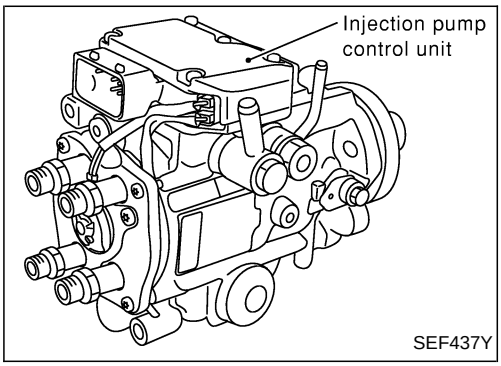
WITHOUT CONSULT-II

1) Turn ignition switch “ON” and wait at least 2 seconds.
2) Start engine and run it for at least 2 seconds at idle speed. (If engine does not run, turn ignition switch to “START” for at least 2 seconds.)
3) Turn ignition switch “OFF”, wait at least 5 seconds and then turn “ON”.
4) Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
5) If DTC is detected, go to “Diagnostic Procedure”, EC-196.

Diagnostic Procedure

1	INSPECTION START
With CONSULT-II 1. Turn ignition switch “ON”. 2. Select “SELF DIAG RESULTS” mode with CONSULT-II. 3. Touch “ERASE”. 4. Perform “DTC Confirmation Procedure”, EC-196, again. 5. Is the malfunction displayed again?	
Without CONSULT-II 1. Turn ignition switch “ON”. 2. Erase the Diagnostic Test Mode II (Self-diagnostic results) memory. 3. Perform “DTC Confirmation Procedure”, EC-196, again. 4. Perform “Diagnostic Test Mode II (Self-diagnostic results)”. 5. Is the DTC 0705 displayed again?	
Yes or No	
Yes ▶	Replace electronic control fuel injection pump.
No ▶	**INSPECTION END**

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Description

SYSTEM DESCRIPTION

The ECM and the electronic control fuel injection pump control unit (abbreviated as the injection pump control unit) perform the real time communication (signal exchange).
The ECM transmits the signals of the target fuel injection amount, target fuel injection timing, and engine speed, etc., and receives the signals of the pump speed and fuel temperature, etc. from the injection pump control unit.
By those signals, the injection pump controls the optimum fuel injection amount and injection timing of the spill valve and timing control valve.
Injection pump control unit has an on board diagnostic system, which detects malfunctions related to sensors or actuators built-into electronic control fuel injection pump. These malfunction information are transferred through the line (circuit) from injection pump control unit to ECM.

FUEL INJECTION AMOUNT CONTROL

In accordance with the target fuel injection amount signal from the ECM, the injection amount is controlled by controlling the spill valve in the injection pump and by changing the needle opening time.

FUEL INJECTION TIMING CONTROL

Based on the target fuel injection timing signal from the ECM, the injection timing is controlled in accordance with the timer spring by performing the duty control of the timing control valve in the injection pump and by adjusting the pressure of the timer piston high pressure chamber.

FUEL TEMPERATURE SENSOR

The sensor detects the fuel temperature in the injection pump and calibrates the injection amount change by the fuel temperature.

CAM RING POSITION SENSOR

The sensor detects the passing of the protrusion on the sensor wheel in the injection pump by the semiconductor magnetic resistance element sensor. The cam ring position sensor synchronizes with the cam ring, and detects the actual advance amount. The injection pump control unit measures the injection pump revolution by the signal of the cam ring position sensor.

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CONSULT-II Reference Value in Data Monitor Mode

Remarks: Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
FUEL TEMP SEN	● Engine: After warming up		More than 40°C (104°F)
SPILL/V	● Engine: After warming up		Approx. 13°CA
INJ TIMG C/V	● Engine: After warming up, idle the engine.		Approx. 50 - 70%
DECELER F/CUT	● Engine: After warming up	Idle	OFF
BARO SEN	● Ignition switch: ON		Altitude Approx. 0 m (0 ft): Approx. 100.62 kPa (1.0062 bar, 1.026 kg/cm^2, 14.59 psi) Approx. 1,000 m (3,281 ft): Approx. 88.95 kPa (0.8895 bar, 0.907 kg/cm^2, 12.90 psi) Approx. 1,500 m (4,992 ft): Approx. 83.16 kPa (0.8316 bar, 0.848 kg/cm^2, 12.06 psi) Approx. 2,000 m (6,562 ft): Approx. 78.36 kPa (0.7836 bar, 0.799 kg/cm^2, 11.36 psi)

ECM Terminals and Reference Value

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may damage the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

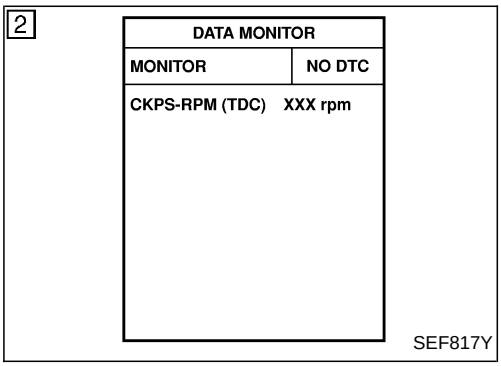
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
33	G	Electronic control fuel injection pump	Engine is running. └ **Warm-up condition** Idle speed	Approximately 2.5V
40	R	Electronic control fuel injection pump	Engine is running. └ **Warm-up condition** Idle speed	Approximately 2.5V
52	Y	Electronic control fuel injection pump	Engine is running. └ Idle speed	Approximately 0.1V
53	OR	Electronic control fuel injection pump	Engine is running. └ Idle speed	Approximately 0.35V

On Board Diagnosis Logic

Malfunction is detected when	Check Items (Possible cause)
● Fuel injection timing control system does not function properly.	● Harness or connectors (Electronic control fuel injection pump circuit is open or shorted.) ● Electronic control fuel injection pump ● Improper fuel quality ● "INJ TIMING" in "ACTIVE TEST" mode with CONSULT-II.*

*: When using this item, DTC may be detected. If so, erase it because it is not a malfunction.

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DTC Confirmation Procedure

WITH CONSULT-II

1) Turn ignition switch “ON” and wait at least 2 seconds.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Start engine and run it for at least 2 seconds at idle speed. (If engine does not run, turn ignition switch to “START” for at least 2 seconds.)
4) Keep engine speed at more than 2,000 rpm for at least 10 seconds.
5) If DTC is detected, go to “Diagnostic Procedure”, EC-202.

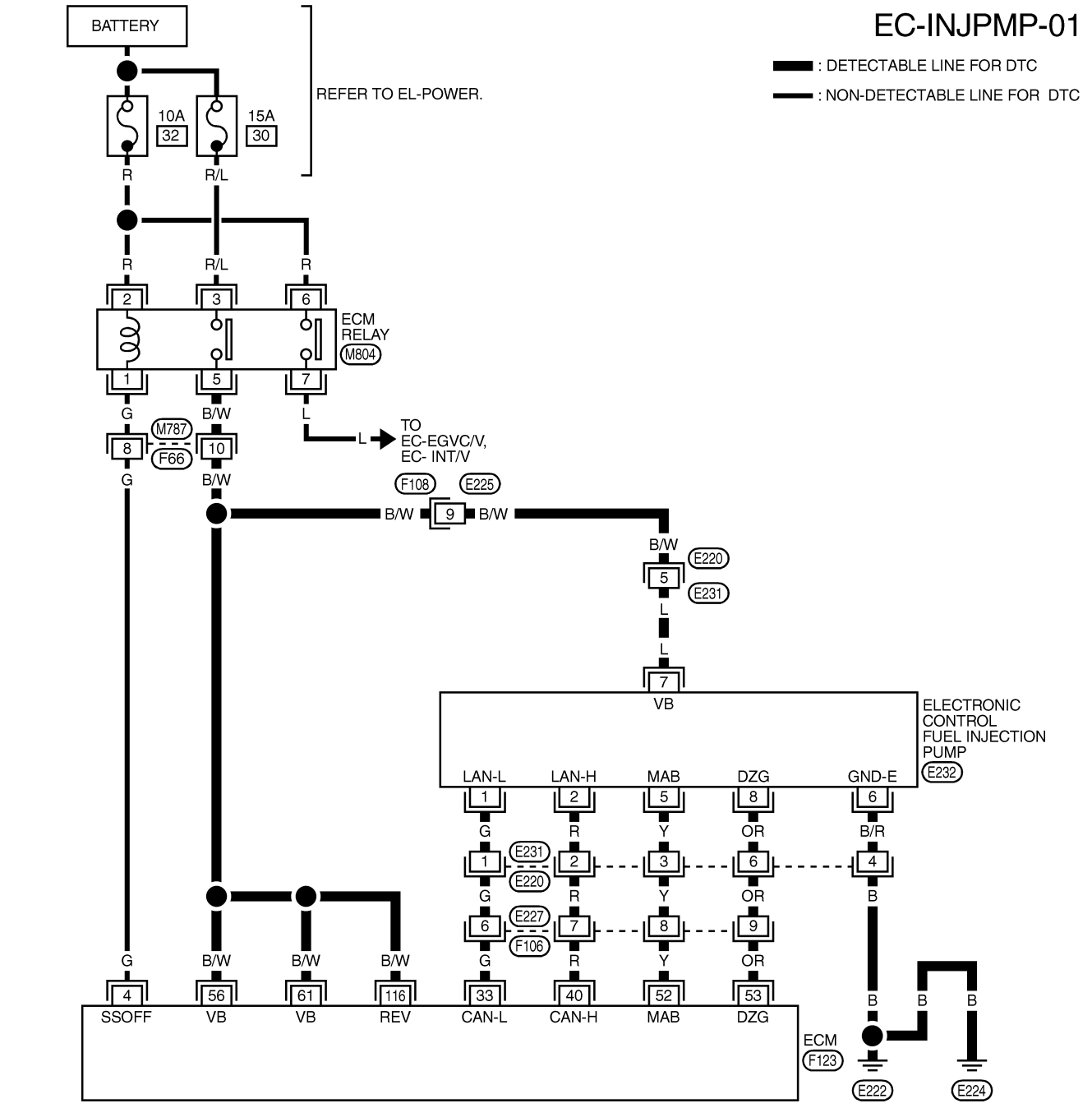
WITHOUT CONSULT-II

1) Turn ignition switch “ON” and wait at least 2 seconds.
2) Start engine and run it for at least 2 seconds at idle speed. (If engine does not run, turn ignition switch to “START” for at least 2 seconds.)
3) Keep engine speed at more than 2,000 rpm for at least 10 seconds.
4) Turn ignition switch “OFF”, wait at least 5 seconds and then turn “ON”.
5) Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
6) If DTC is detected, go to “Diagnostic Procedure”, EC-202.

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Wiring Diagram

LHD MODELS

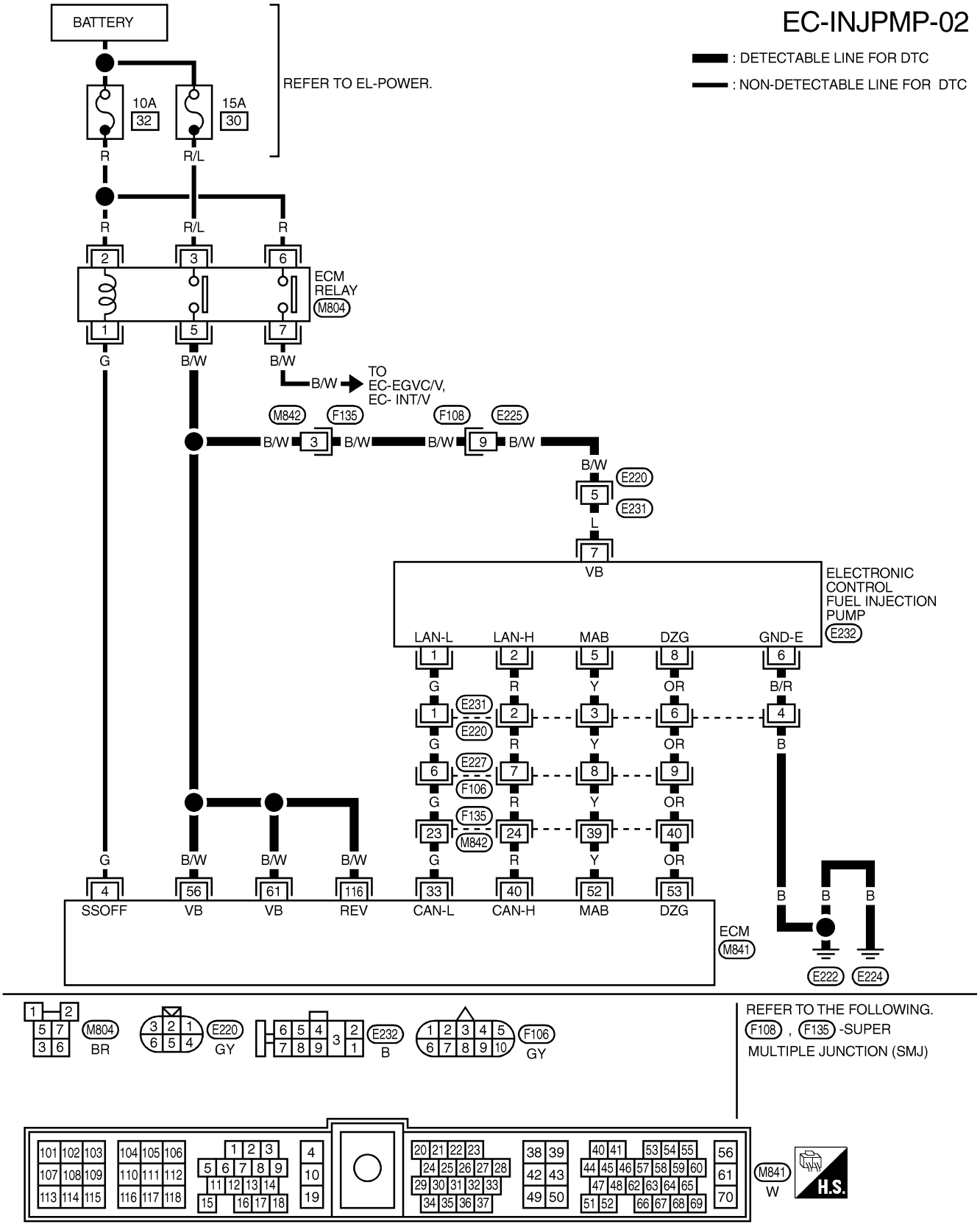


YEC181A

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Wiring Diagram (Cont'd)

RHD MODELS



YEC182A

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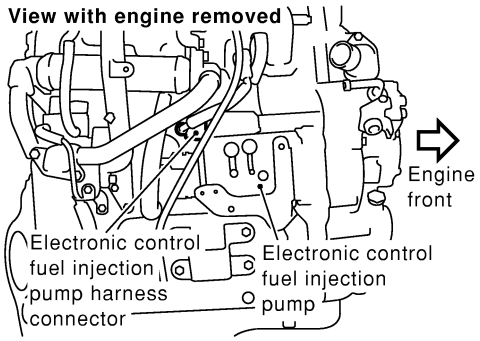
Diagnostic Procedure

1	INSPECTION START
1. Turn ignition switch “OFF”. 2. Perform “Air Bleeding”, EC-32, and “DRAINING WATER” in MA section.	
▶	GO TO 2.

2	PERFORM DTC CONFIRMATION PROCEDURE AGAIN
Perform “DTC Confirmation Procedure”, EC-199 again.	
OK or NG	
OK ▶	**INSPECTION END**
NG ▶	GO TO 3.

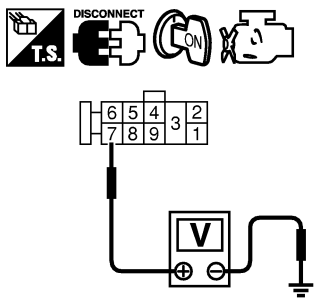
3	CHECK ELECTRONIC CONTROL FUEL INJECTION PUMP POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect electronic control fuel injection pump harness connector.



MEC025E

3. Turn ignition switch “ON”.
4. Check voltage between electronic control fuel injection pump terminal 7 and ground.



MEC977D

Voltage: Battery voltage

OK or NG

OK ▶	GO TO 5.
NG ▶	GO TO 4.

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Diagnostic Procedure (Cont'd)

4	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors M787, F66 (LHD models) ● Harness connectors F108, E225 ● Harness connectors E220, E231 ● Harness connectors M842, F135 (RHD models) ● Harness for open or short between electronic control fuel injection pump and ECM ● Harness for open or short between electronic control fuel injection pump and ECM relay	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

5	CHECK ELECTRONIC CONTROL FUEL INJECTION PUMP GROUND CIRCUIT FOR OPEN AND SHORT
1. Turn ignition switch "OFF". 2. Check harness continuity between electronic control fuel injection pump terminal 6 and ground. Refer to Wiring Diagram. **Continuity should exist.** 3. Also check harness for short to ground and short to power. **OK or NG**	
OK ▶	GO TO 7.
NG ▶	GO TO 6.

6	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E231, E220 ● Harness for open or short between electronic control fuel injection pump and engine ground	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

7	CHECK COMMUNICATION LINE FOR OPEN AND SHORT

1. Check continuity between the following terminals. Refer to Wiring Diagram.

Electronic control fuel injection pump	ECM
1	33
2	40
5	52
8	53

MTBL0444

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK ▶	GO TO 9.
NG ▶	GO TO 8.

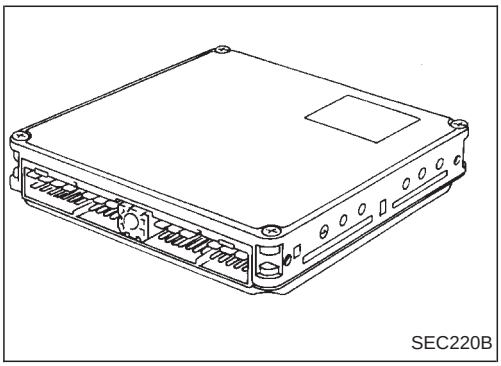
8	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E231, E220 ● Harness connectors E227, F106 ● Harness connectors F135, M842 (RHD models) ● Harness for open or short between electronic control fuel injection pump and ECM	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

http://vnx.su/

Diagnostic Procedure (Cont'd)

9	CHECK INTERMITTENT INCIDENT	
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-78. **OK or NG**		
OK	▶	Replace electronic control fuel injection pump.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

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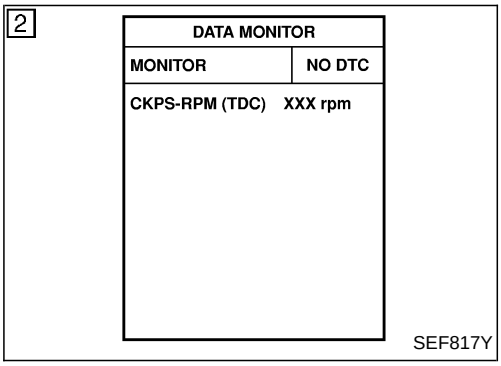

SEC220B

Description

The ECM consists of a microcomputer and connectors for signal input and output and for power supply. The unit controls the engine.

On Board Diagnosis Logic

Malfunction is detected when ...	Check Items (Possible Cause)
• An excessively high or low voltage from the absolute pressure sensor (built-into ECM) is sent to ECM.	• ECM



SEF817Y

DTC Confirmation Procedure

WITH CONSULT-II

1) Turn ignition switch “ON”.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Start engine and wait at least 2 seconds.
4) If DTC is detected, go to “Diagnostic Procedure”, EC-206.

WITHOUT CONSULT-II

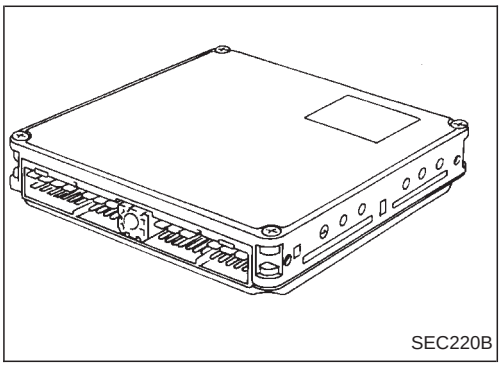
1) Turn ignition switch “ON” and wait at least 2 seconds.
2) Start engine and wait at least 2 seconds.
3) Turn ignition switch “OFF”, wait at least 5 seconds and then turn “ON”.
4) Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
5) If DTC is detected, go to “Diagnostic Procedure”, EC-206.

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Diagnostic Procedure

1	INSPECTION START
With CONSULT-II 1. Turn ignition switch “ON”. 2. Select “SELF DIAG RESULTS” mode with CONSULT-II. 3. Touch “ERASE”. 4. Perform “DTC Confirmation Procedure”, EC-205, again. 5. Is the malfunction displayed again?	
Without CONSULT-II 1. Turn ignition switch “ON”. 2. Erase the Diagnostic Test Mode II (Self-diagnostic results) memory. 3. Perform “DTC Confirmation Procedure”, EC-205, again. 4. Perform “Diagnostic Test Mode II (Self-diagnostic results)”. 5. Is the DTC 0802 displayed again?	
Yes or No	
Yes ▶	Replace ECM.
No ▶	**INSPECTION END**

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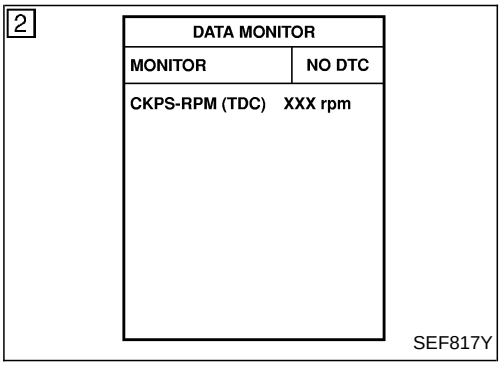

SEC220B

Description

The ECM consists of a microcomputer and connectors for signal input and output and for power supply. The unit controls the engine.

On Board Diagnosis Logic

Malfunction is detected when ...	Check Items (Possible Cause)
• ECM input signal processing function is malfunctioning.	• ECM



SEF817Y

DTC Confirmation Procedure

WITH CONSULT-II

1) Turn ignition switch “ON”.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Wait at least 1 second.
4) If DTC is detected, go to “Diagnostic Procedure”, EC-208.

WITHOUT CONSULT-II

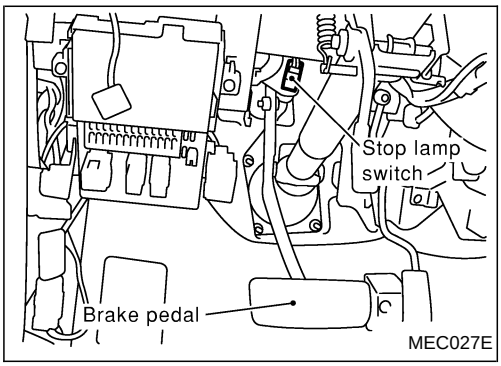
1) Turn ignition switch “ON” and wait at least 1 second.
2) Turn ignition switch “OFF”, wait at least 5 seconds and then turn “ON”.
3) Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
4) If DTC is detected, go to “Diagnostic Procedure”, EC-208.

http://vnx.su/

Diagnostic Procedure

1	**INSPECTION START**
With CONSULT-II 1. Turn ignition switch “ON”. 2. Select “SELF DIAG RESULTS” mode with CONSULT-II. 3. Touch “ERASE”. 4. Perform “DTC Confirmation Procedure”, EC-207, again. 5. Is the malfunction displayed again?	
Without CONSULT-II 1. Turn ignition switch “ON”. 2. Erase the Diagnostic Test Mode II (Self-diagnostic results) memory. 3. Perform “DTC Confirmation Procedure”, EC-207, again. 4. Perform “Diagnostic Test Mode II (Self-diagnostic results)”. 5. Is the DTC 0802 displayed again?	
Yes or No	
Yes ▶	Replace ECM.
No ▶	**INSPECTION END**

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Description

The stop lamp switch is installed to brake pedal bracket. The switch senses brake pedal position and sends an ON-OFF signal to the ECM. The ECM uses the signal to control the fuel injection control system.

ECM Terminals and Reference Value

Specification data are reference values and are measured between each terminal and ground.

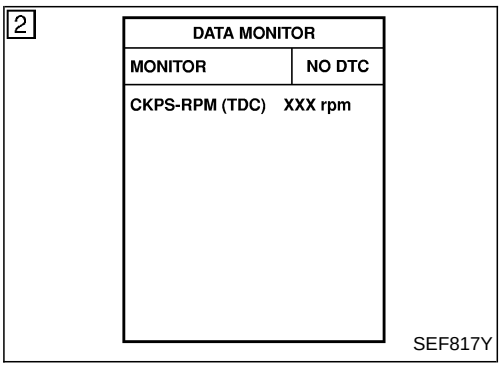
CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may damage the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
17	G/Y	Stop lamp switch	Ignition switch "ON" └ Brake pedal fully released	Approximately 0V
			Ignition switch "ON" └ Brake pedal depressed	BATTERY VOLTAGE (11 - 14V)

On Board Diagnosis Logic

Malfunction is detected when ...	Check Items (Possible Cause)
● An irregular voltage signal from the switch is sent to ECM.	● Harness or connectors (The stop lamp switch circuit is open or shorted.) ● Stop lamp switch



DTC Confirmation Procedure

WITH CONSULT-II

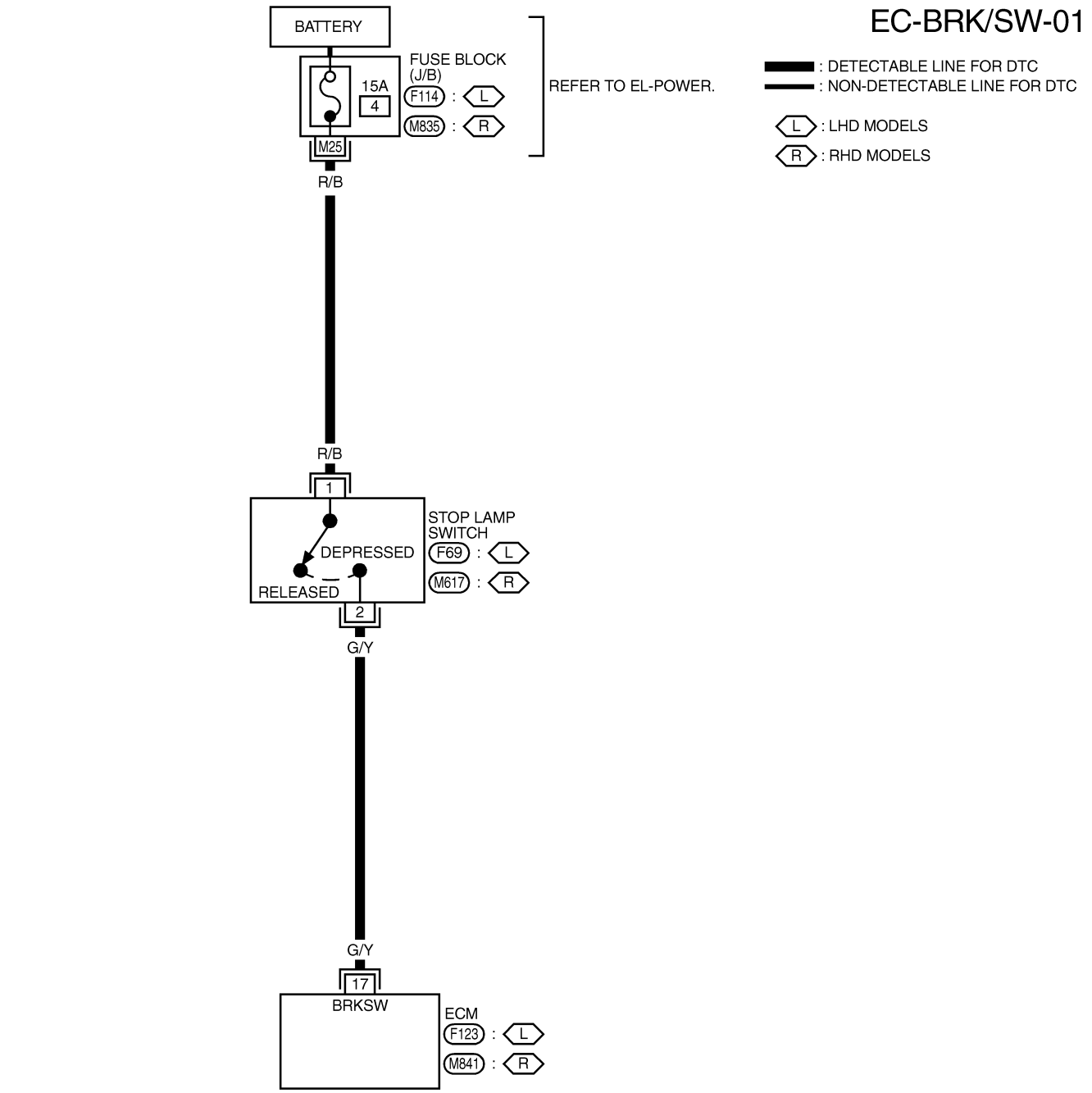
1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT-II.
3) Depress and release brake pedal more than 10 times.
4) If DTC is detected, go to "Diagnostic Procedure", EC-211.

WITHOUT CONSULT-II

1) Turn ignition switch "ON".
2) Depress and release brake pedal more than 10 times.
3) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
4) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
5) If DTC is detected, go to "Diagnostic Procedure", EC-211.

http://vnx.su/

Wiring Diagram



YEC189A

http://vnx.su/

Diagnostic Procedure

1	CHECK STOP LAMP SWITCH CIRCUIT

1. Turn ignition switch “ON”.
2. Check the stop lamp when depressing and releasing the stop lamp switch.

Stop lamp switch	Stop lamp
Fully released	Not illuminated
Depressed	Illuminated

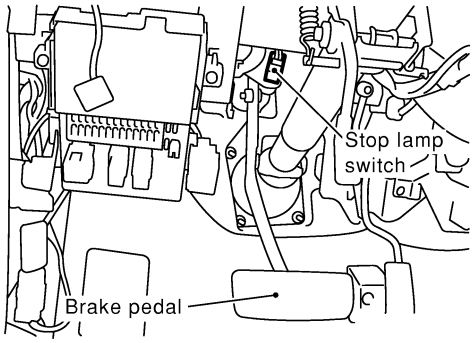
MTBL0443

OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO 2.

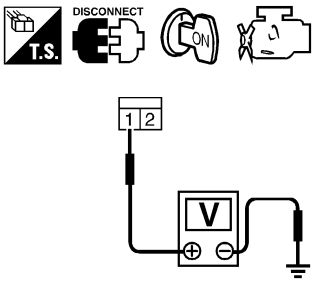
2	CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect stop lamp switch harness connector.



MEC027E

3. Turn ignition switch “ON”.
4. Check voltage between stop lamp switch terminal 1 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF435Y

OK or NG

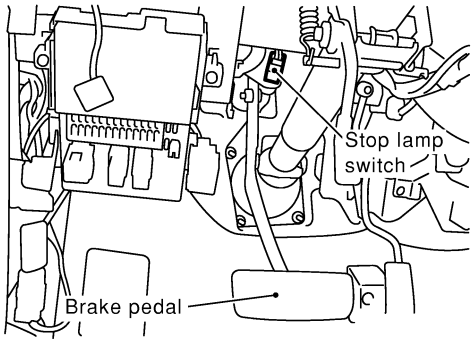
OK	▶	GO TO 4.
NG	▶	GO TO 3.

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Diagnostic Procedure (Cont'd)

3	DETECT MALFUNCTIONING PART
Check the following. ● Fuse block (J/B) connector F114 (LHD models), M835 (RHD models) ● 15A fuse ● Harness for open and short between stop lamp switch and fuse	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

4	CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT
1. Turn ignition switch "OFF". 2. Disconnect ECM harness connector. 3. Disconnect stop lamp switch harness connector.	



MEC027E

4. Check harness continuity between ECM terminal 17 and stop lamp switch terminal 2. Refer to Wiring Diagram.
Continuity should exist.
5. Also check harness for short to ground and short to power.

OK or NG

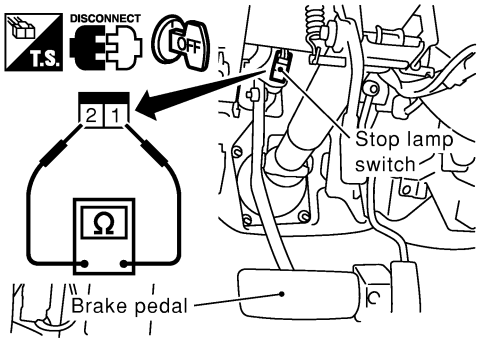
OK ▶	GO TO 5.
NG ▶	Repair open circuit or short to ground or short to power in harness or connectors.

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Diagnostic Procedure (Cont'd)

5	CHECK STOP LAMP SWITCH

1. Disconnect stop lamp switch harness connectors.
2. Check continuity between stop lamp switch terminals 1 and 2 under the following conditions.



MEC028E

Conditions	Continuity
Brake pedal fully released	Should not exist.
Brake pedal depressed	Should exist.

MTBL1324

OK or NG

OK	▶	GO TO 6.
NG	▶	Replace stop lamp switch.

6	CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-78.

▶ **INSPECTION END**

http://vnx.su/

ECM Terminals and Reference Value

Specification data are reference values and are measured between each terminal and ground.

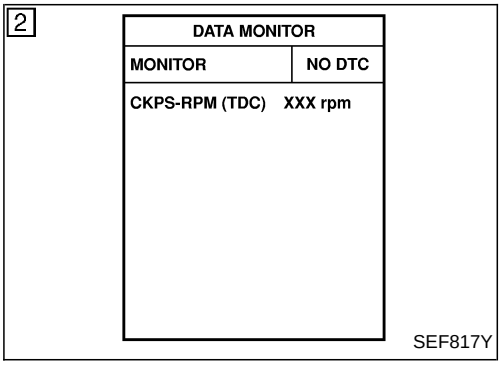
CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may damage the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
4	G	ECM relay (Self-shutoff)	Ignition switch "ON"	Approximately 0.25V
			Ignition switch "OFF" └ For a few seconds after turning ignition switch "OFF"	
			Ignition switch "OFF" └ More than a few seconds after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
38	B/W	Ignition switch	Ignition switch "OFF"	0V
			Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
56 61 116	B/W B/W B/W	Power supply for ECM	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)

On Board Diagnosis Logic

Malfunction is detected when	Check Items (Possible Cause)
• An irregular voltage signal from the ECM relay is sent to ECM.	• Harness or connectors (ECM relay circuit is open or shorted.) • ECM relay



DTC Confirmation Procedure

WITH CONSULT-II

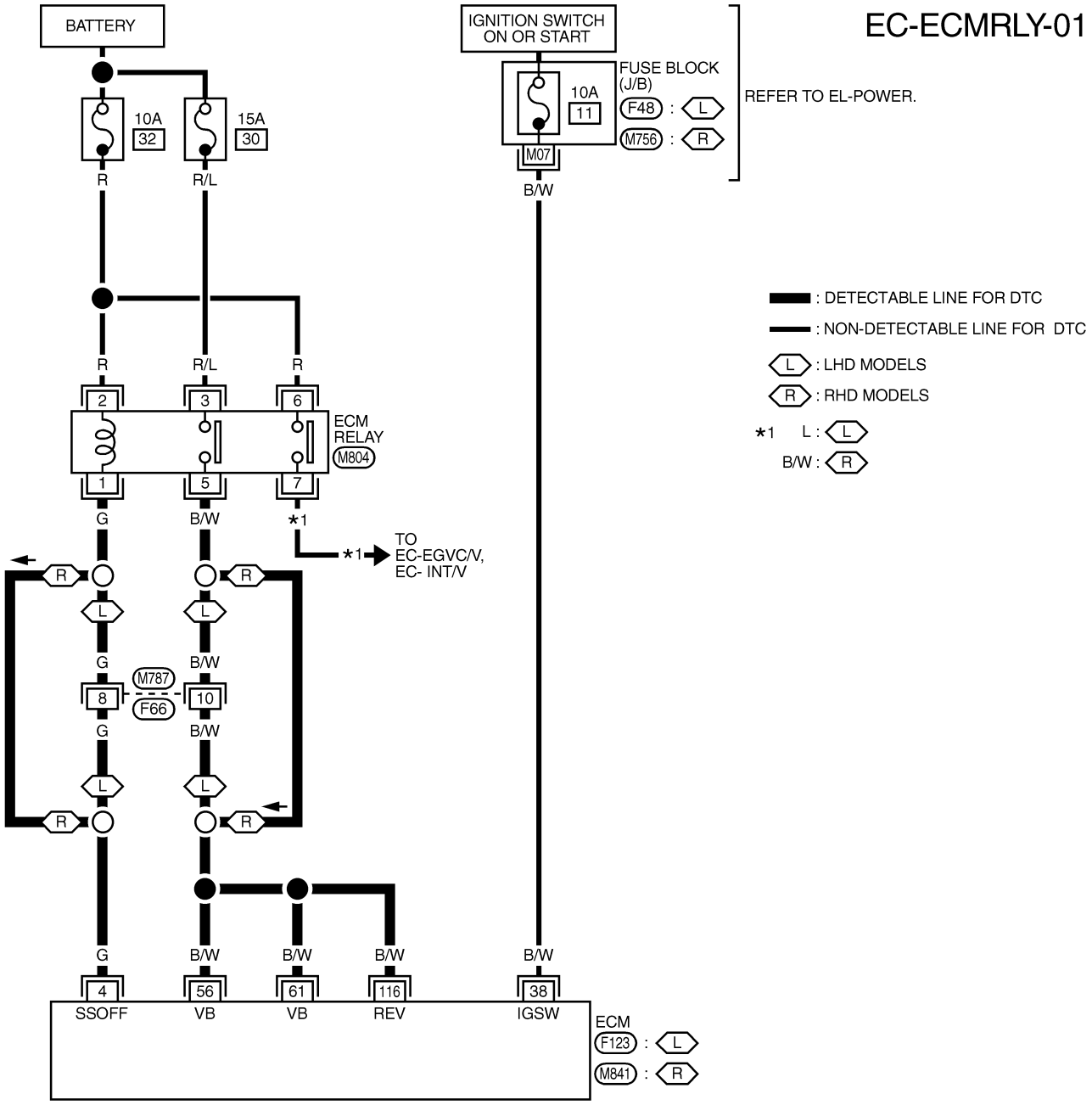
1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT-II.
3) Turn ignition switch "OFF", wait at least 20 seconds and then turn "ON".
4) If DTC is detected, go to "Diagnostic Procedure", EC-216.

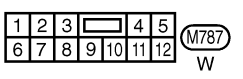
WITHOUT CONSULT-II

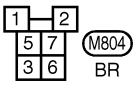
1) Turn ignition switch "ON".
2) Turn ignition switch "OFF", wait at least 20 seconds and then turn "ON".
3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
4) If DTC is detected, go to "Diagnostic Procedure", EC-216.

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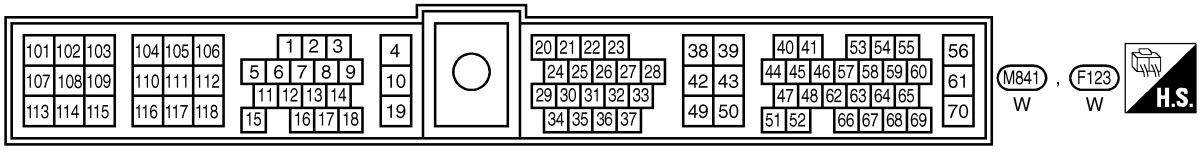
Wiring Diagram







REFER TO THE FOLLOWING.
M756 , F48 -FUSE BLOCK-JUNCTION BOX (J/B)



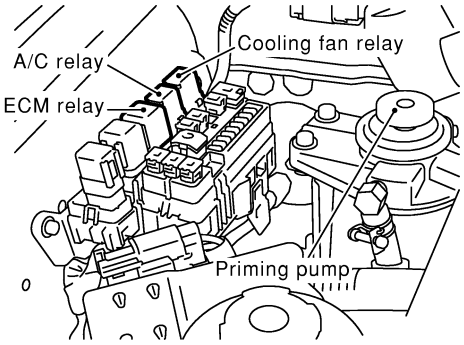
YEC190A

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Diagnostic Procedure

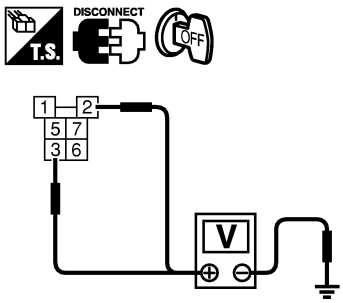
1	CHECK ECM POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect ECM relay.



MEC021E

3. Check voltage between ECM relay terminals 2, 3 and ground with CONSULT-II or tester.



MEC978D

Voltage: Battery voltage

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- 10A fuse
- 15A fuse
- Harness for open and short between ECM relay and battery

	▶	Repair open circuit or short to ground or short to power in harness or connectors.

3	CHECK ECM INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminals 56, 61, 116 and ECM relay terminal 5. Refer to Wiring Diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 4.

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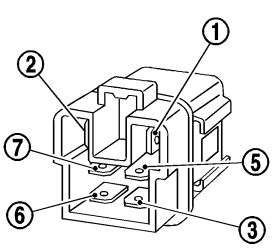
Diagnostic Procedure (Cont'd)

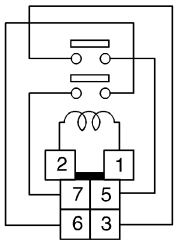
4	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors M787, F66 (LHD models) ● Harness for open or short between ECM and ECM relay	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

5	CHECK ECM OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT
1. Check harness continuity between ECM terminal 4 and ECM relay terminal 1. Refer to Wiring Diagram. **Continuity should exist.** 2. Also check harness for short to ground and short to power. **OK or NG**	
OK ▶	GO TO 7.
NG ▶	GO TO 6.

6	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors M787, F66 (LHD models) ● Harness for open or short between ECM and ECM relay	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

7	CHECK ECM RELAY
1. Apply 12V direct current between ECM relay terminals 1 and 2. 2. Check continuity between ECM relay terminals 3 and 5, 6 and 7.	





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

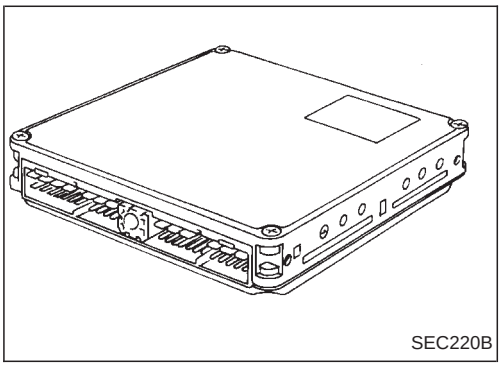
SEF296X

OK or NG

OK ▶	GO TO 8.
NG ▶	Replace ECM relay.

8	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-78.	
▶	**INSPECTION END**

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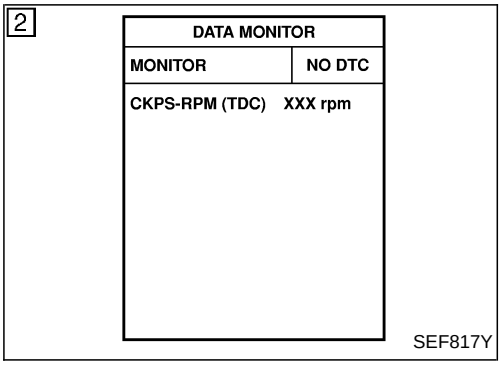

SEC220B

Description

The ECM consists of a microcomputer and connectors for signal input and output and for power supply. The unit controls the engine.

On Board Diagnosis Logic

Malfunction is detected when ...	Check Items (Possible Cause)
• ECM input signal processing function is malfunctioning.	• ECM



SEF817Y

DTC Confirmation Procedure

WITH CONSULT-II

1) Turn ignition switch “ON”.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Turn ignition switch “OFF”, wait at least 20 seconds and then turn “ON”.
4) If DTC is detected, go to “Diagnostic Procedure”, EC-219.

WITHOUT CONSULT-II

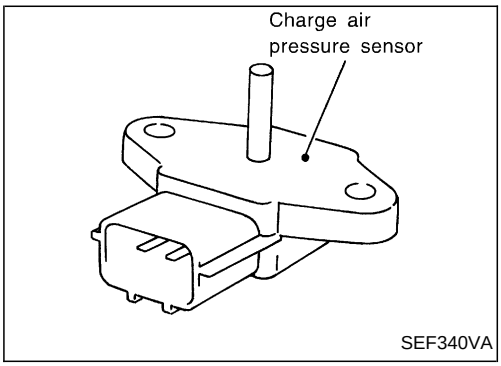
1) Turn ignition switch “ON” and wait at least 2 seconds.
2) Turn ignition switch “OFF”, wait at least 20 seconds and then turn “ON”.
3) Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
4) If DTC is detected, go to “Diagnostic Procedure”, EC-219.

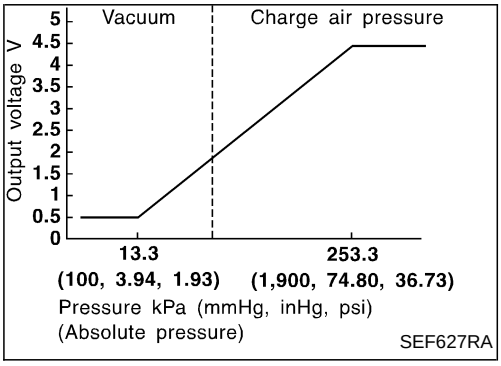
http://vnx.su/

Diagnostic Procedure

1	INSPECTION START
With CONSULT-II 1. Turn ignition switch “ON”. 2. Select “SELF DIAG RESULTS” mode with CONSULT-II. 3. Touch “ERASE”. 4. Perform “DTC Confirmation Procedure”, EC-218, again. 5. Is the malfunction displayed again?	
Without CONSULT-II 1. Turn ignition switch “ON”. 2. Erase the Diagnostic Test Mode II (Self-diagnostic results) memory. 3. Perform “DTC Confirmation Procedure”, EC-218, again. 4. Perform “Diagnostic Test Mode II (Self-diagnostic results)”. 5. Is the DTC 0903 displayed again?	
Yes or No	
Yes ▶	Replace ECM.
No ▶	**INSPECTION END**

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Component Description

The charge air pressure sensor detects pressure in the exit side of the charge air cooler. The sensor output voltage to the ECM increases as pressure increases. The charge air pressure sensor is not used to control the engine system under normal conditions.

ECM Terminals and Reference Value

Specification data are reference values, and are measured between each terminal and ground.

CAUTION:

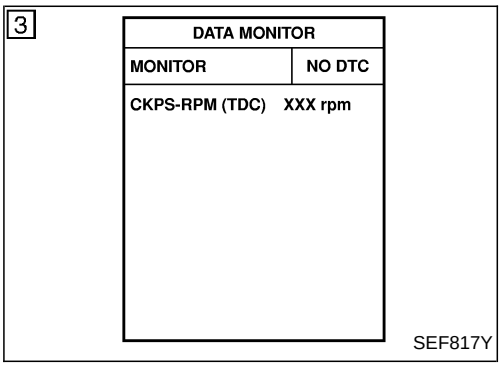
Do not use ECM ground terminals when measuring input/output voltage. Doing so may damage the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
46	G	Charge air pressure sensor	Engine is running. └ **Warm-up condition** Idle speed	Approximately 2.0V

On Board Diagnosis Logic

Malfunction is detected when ...	Check Items (Possible Cause)
• An excessively high or low voltage from the sensor is sent to ECM.	• Harness or connectors (The sensor circuit is open or shorted.) • Charge air pressure sensor

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DTC Confirmation Procedure

WITH CONSULT-II

1) Turn ignition switch “ON”.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Wait at least 1 second.
4) If DTC is detected, go to “Diagnostic Procedure”, EC-224.

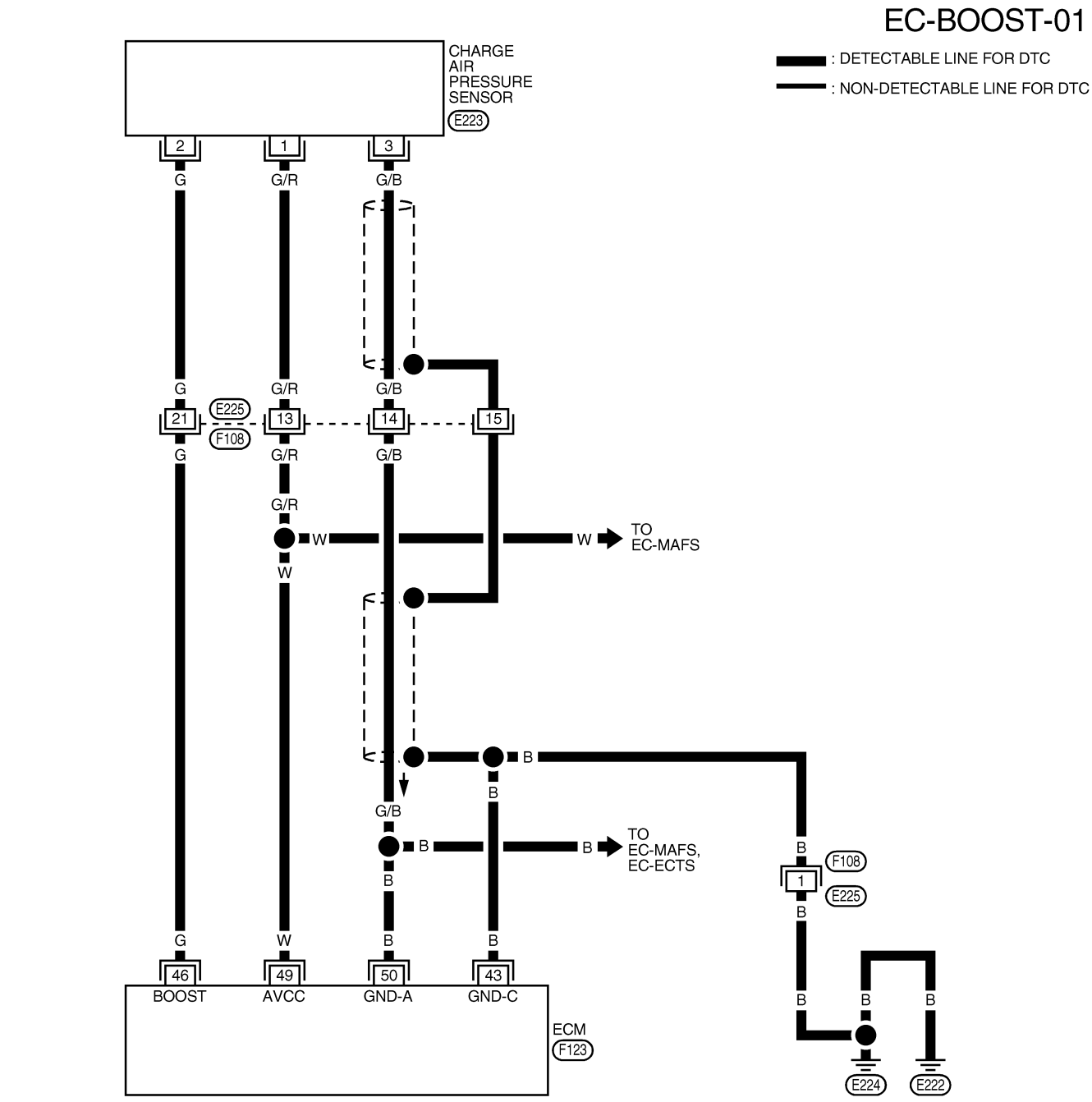
WITHOUT CONSULT-II

1) Turn ignition switch “ON” and wait at least 1 second.
2) Turn ignition switch “OFF”, wait at least 5 seconds and then turn “ON”.
3) Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
4) If DTC is detected, go to “Diagnostic Procedure”, EC-224.

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Wiring Diagram

LHD MODELS

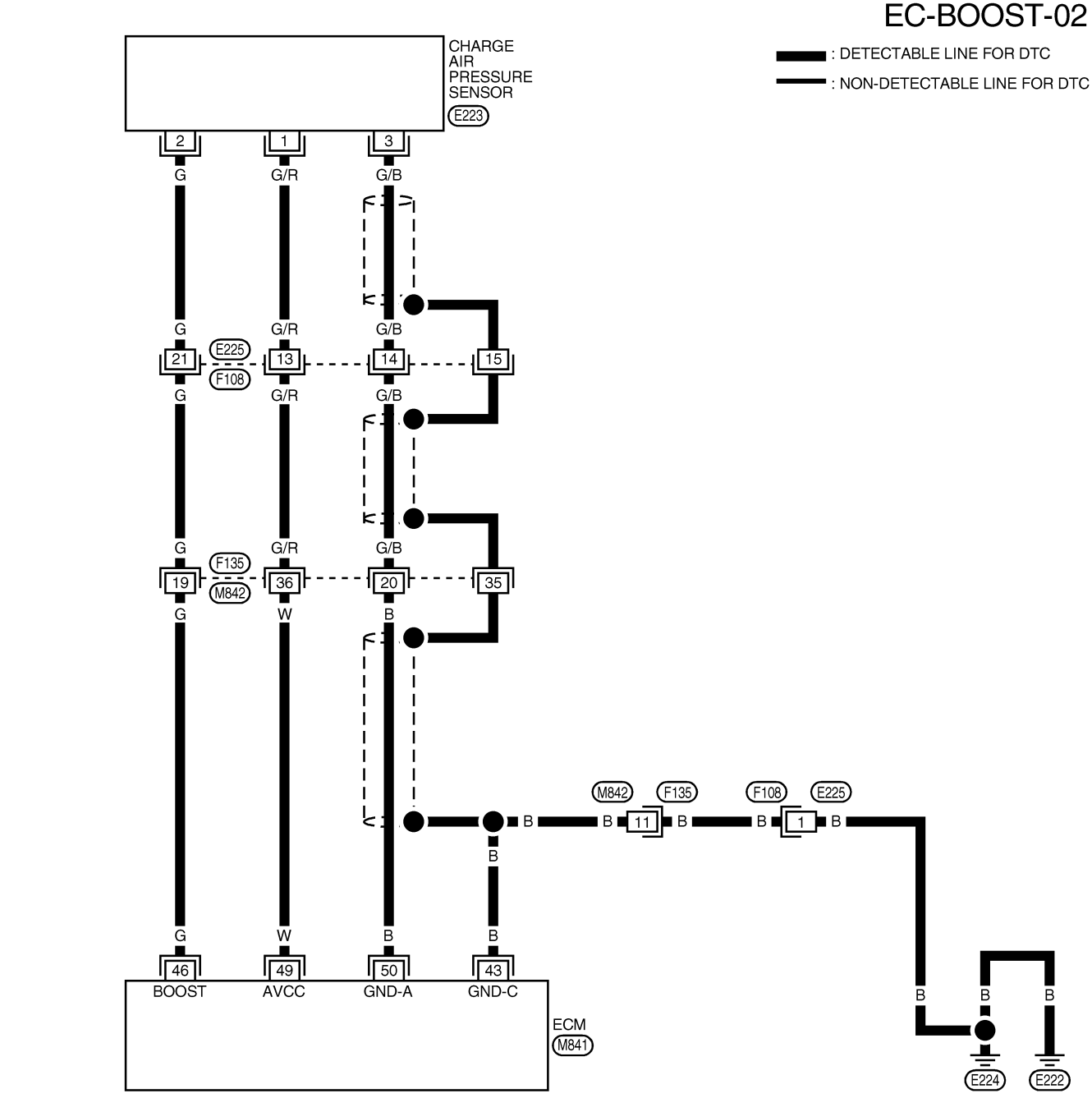


YEC191A

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Wiring Diagram (Cont'd)

RHD MODELS



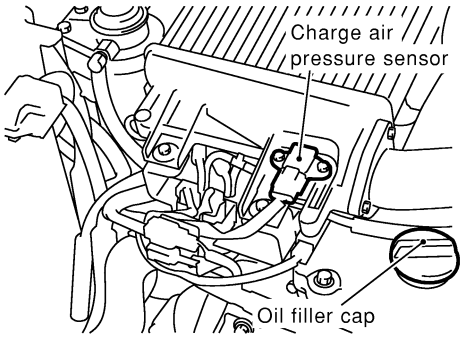
YEC192A

http://vnx.su/

Diagnostic Procedure

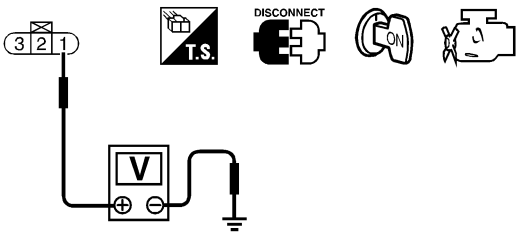
1	CHECK CHARGE AIR PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Stop engine.
2. Disconnect charge air pressure sensor harness connector.



SEF283Z

3. Turn ignition switch “ON”.
4. Check voltage between charge air pressure sensor terminal 1 and ground with CONSULT-II or tester.



Voltage: Approximately 5V

SEF306Z

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E225, F108
- Harness connectors F135, M842 (RHD models)
- Harness for open or short between charge air pressure sensor and ECM

	▶	Repair open circuit or short to ground or short to power in harness or connectors.

3	CHECK CHARGE AIR PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between charge air pressure sensor terminal 3 and engine ground. Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 4.

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Diagnostic Procedure (Cont'd)

4	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E225, F108 ● Harness connectors F135, M852 (RHD models) ● Harness for open or short between ECM and charge air pressure sensor	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

5	CHECK CHARGE AIR PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT
1. Disconnect ECM harness connector. 2. Check harness continuity between ECM terminal 46 and charge air pressure sensor terminal 2. Refer to Wiring Diagram. **Continuity should exist.** 3. Also check harness for short to ground and short to power. **OK or NG**	
OK ▶	GO TO 7.
NG ▶	GO TO 6.

6	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E225, F108 ● Harness connectors F135, M842 (RHD models) ● Harness for open or short between charge air pressure sensor and ECM	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

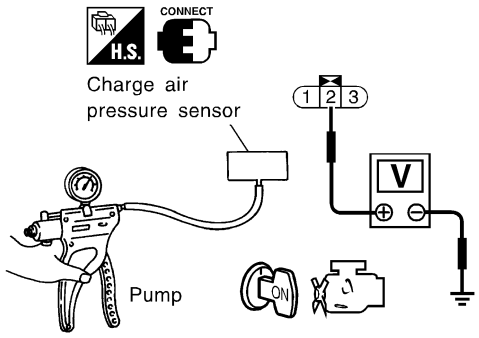
7	CHECK CHARGE AIR PRESSURE SENSOR

1. Remove charge air pressure sensor with its harness connector connected.
2. Turn ignition switch "ON".
3. Use pump to apply pressure to charge air pressure sensor as shown in the figure.

CAUTION:

- **Always calibrate the pressure pump gauge when using it.**
- **Inspection should be done at room temperature [10 - 30°C (50 - 86°F)].**

4. Check the output voltage between charge air pressure sensor terminal 2 and engine ground.



Pressure (Relative to atmospheric pressure)	Voltage V
0 kPa (0 mbar, 0 mmHg, 0 inHg)	1.9 - 3.0
+40 kPa (400 mbar, 300 mmHg, 11.81 inHg)	The voltage should be 0.6 to 1.0V higher than the value measured above.

SEF449Z

OK or NG

OK ▶	GO TO 8.
NG ▶	Replace charge air pressure sensor.

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Diagnostic Procedure (Cont'd)

8	CHECK SHIELD CIRCUIT

1. Disconnect charge air pressure sensor sub-harness connectors E225, F108 and ECM harness connector.
2. Check continuity between boost sensor sub-harness connector terminal 15 and ground.
   Continuity should exist.
3. Check continuity between ECM terminal 43 and ground.
   Continuity should exist.
4. Also check harness for short to power.

OK or NG

OK	▶	GO TO 10.
NG	▶	GO TO 9.

9	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E225, F108
- Harness connectors F135, M842 (RHD models)
- Harness for open or short between charge air pressure sensor and ground
- Harness for open or short between ECM and ground

	▶	

10	CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-78.

	▶	**INSPECTION END**

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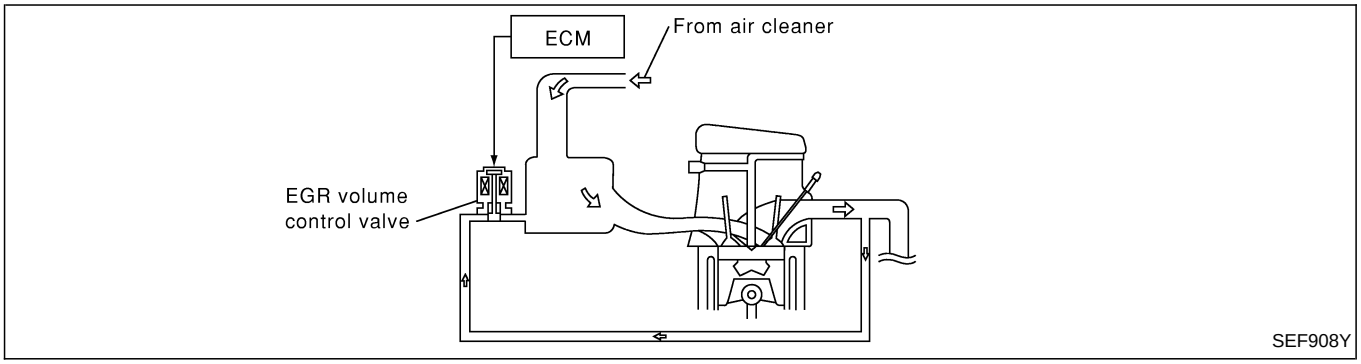
Description

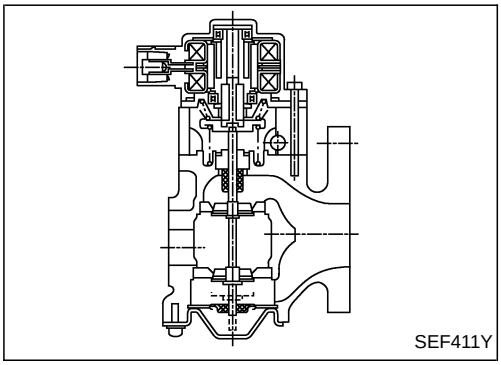
SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM Function	Actuator
Electronic controlled fuel injection pump	Fuel injection signal	EGR volume control	EGR volume control valve
Crankshaft position sensor (TDC)	Engine speed		
Vehicle speed sensor	Vehicle speed		
Engine coolant temperature sensor	Engine coolant temperature		
Ignition switch	Start signal		
Throttle position sensor	Throttle position		
Battery	Battery voltage		
Mass air flow sensor	Amount of intake air		
Air conditioner switch	Air conditioner operation		
Electrical load	Electrical load signal		
PNP switch	Park/Neutral position signal		

This system controls flow rate of EGR led from exhaust manifold to intake manifold. The opening of the EGR by-pass passage in the EGR volume control valve changes to control the flow rate. A built-in step motor moves the valve in steps corresponding to the ECM output pulses. The opening of the valve varies for optimum engine control. The optimum value stored in the ECM is determined by considering various engine conditions.
The EGR volume control valve remains close under the following conditions.

- Engine stopped
- Engine starting
- Low engine coolant temperature
- Excessively high engine coolant temperature
- High engine speed
- Wide open throttle
- Low battery voltage





COMPONENT DESCRIPTION

EGR volume control valve

The EGR volume control valve uses a step motor to control the flow rate of EGR from exhaust manifold. This motor has four winding phases. It operates according to the output pulse signal of the ECM. Two windings are turned ON and OFF in sequence. Each time an ON pulse is issued, the valve opens or closes, changing the flow rate. When no change in the flow rate is needed, the ECM does not issue the pulse signal. A certain voltage signal is issued so that the valve remains at that particular opening.

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CONSULT-II Reference Value in Data Monitor Mode

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
EGR VOL CON/V	● Engine: After warming up ● Air conditioner switch: “OFF” ● Shift lever: Neutral position ● No-load	After 1 minute at idle	More than 10 steps
		Revving engine up to 3,200 rpm quickly	0 step

ECM Terminals and Reference Value

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

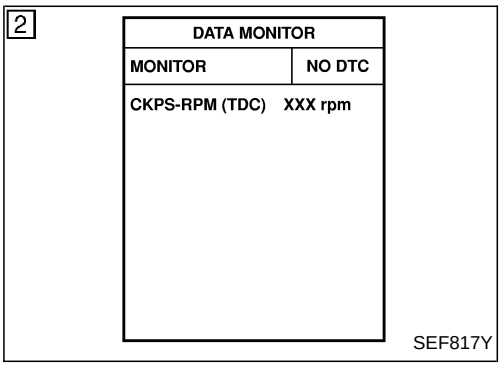
Do not use ECM ground terminals when measuring input/output voltage. Doing so may damage the ECM’s transistor. Use a ground other than ECM terminals, such as the ground.

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
103	R/Y (LHD models) L/R (RHD models)	EGR volume control valve	Engine is running. └ **Warm-up condition** Idle speed	0.1 - 14V
105	G/Y			
109	Y/B			
115	R/L			

On Board Diagnosis Logic

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
1003	● An excessively low voltage signal is sent to ECM.	● Harness or connectors (The EGR volume control valve circuit is open or shorted.) ● EGR volume control valve

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DTC Confirmation Procedure

WITH CONSULT-II

1) Start engine and warm it up to normal operating temperature.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Turn ignition switch “OFF”, and immediately turn “ON” within 1 second.
4) Start engine and let it idle.
5) If DTC is detected, go to “Diagnostic Procedure”, EC-232.

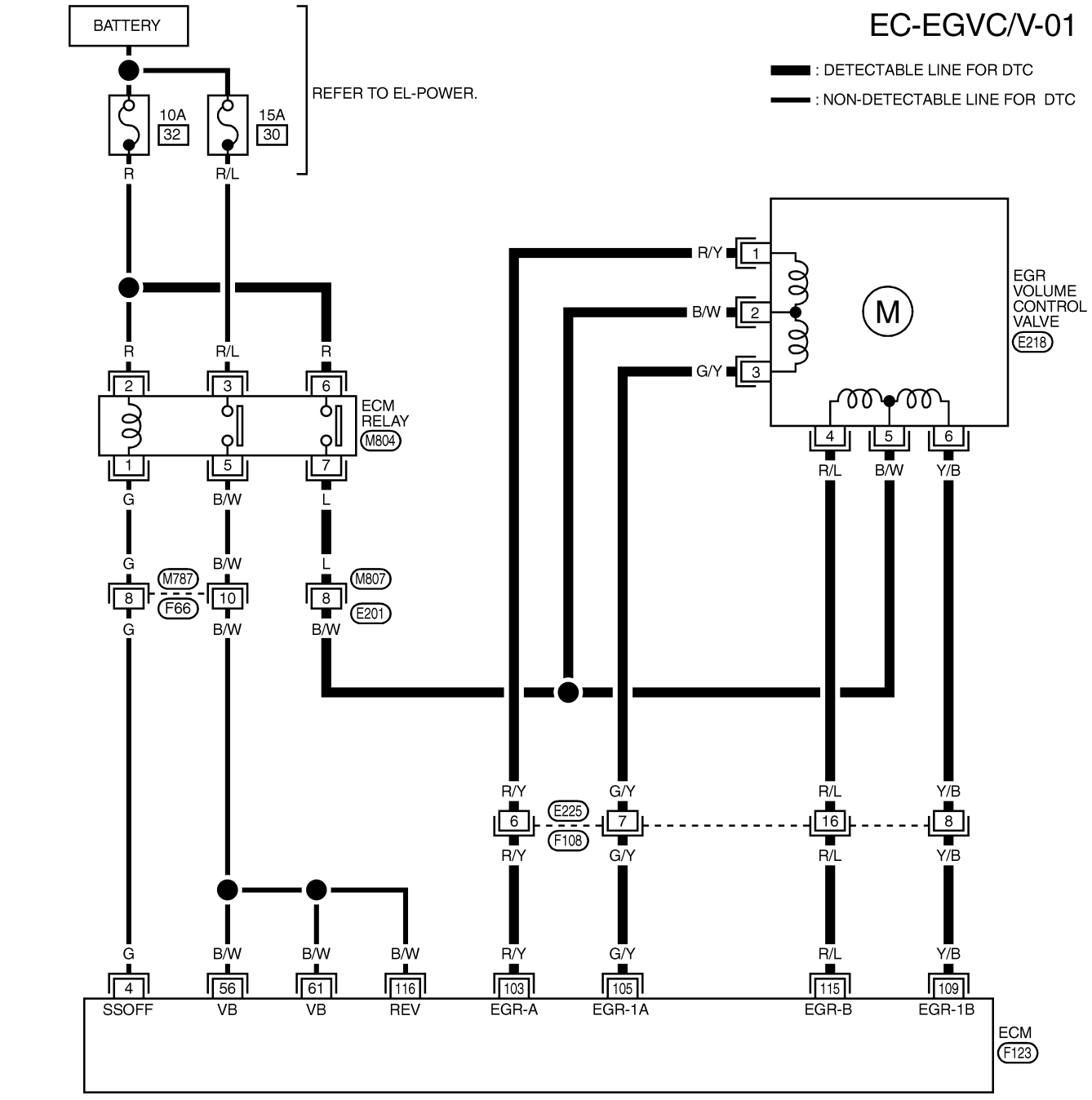
WITHOUT CONSULT-II

1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch “OFF”, and immediately turn “ON” within 1 second.
3) Start engine and let it idle.
4) Turn ignition switch “OFF”, wait at least 5 seconds and then turn “ON”.
5) Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
6) If DTC is detected, go to “Diagnostic Procedure”, EC-232.

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Wiring Diagram

LHD MODELS

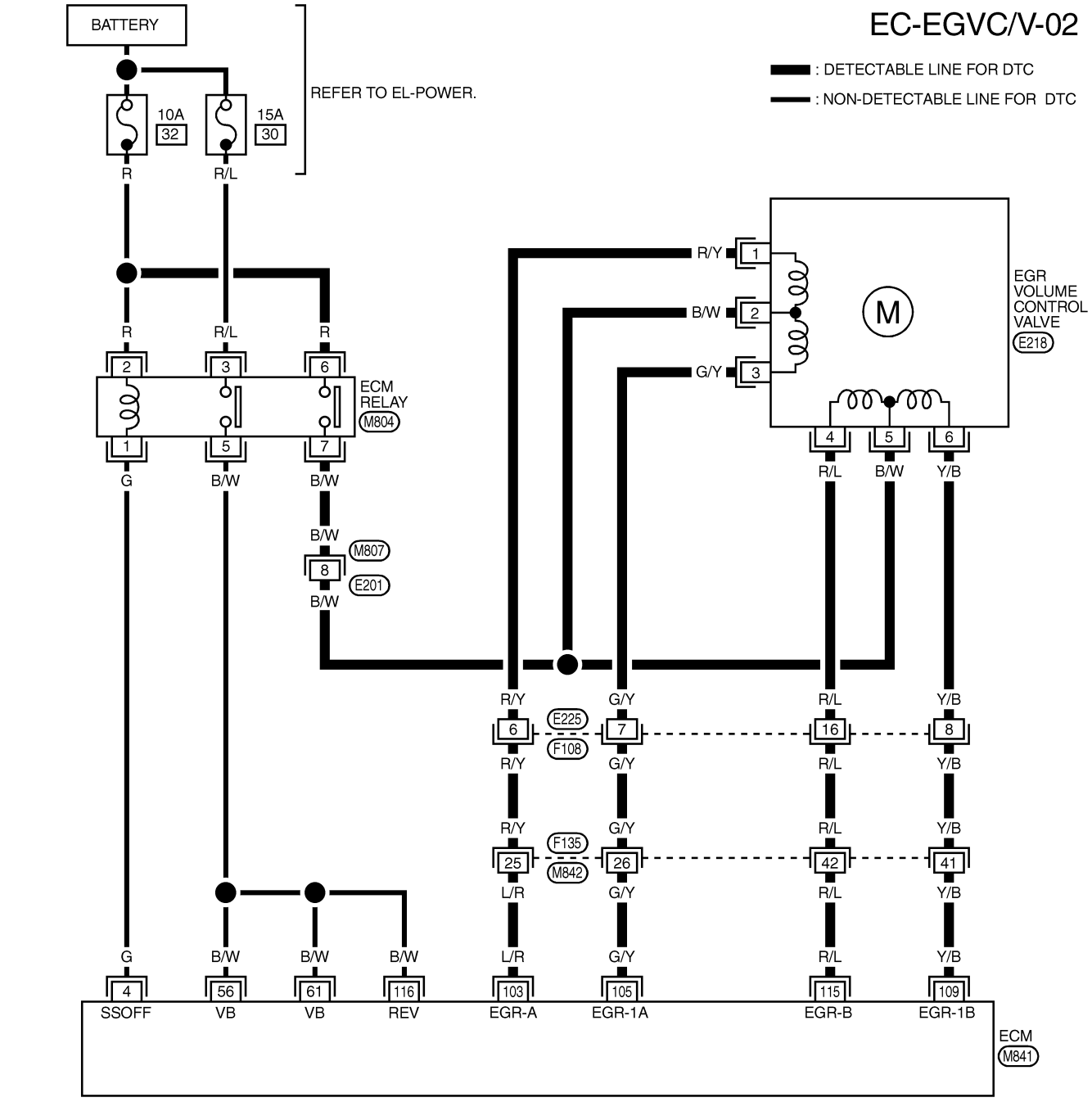


YEC193A

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Wiring Diagram (Cont'd)

RHD MODELS



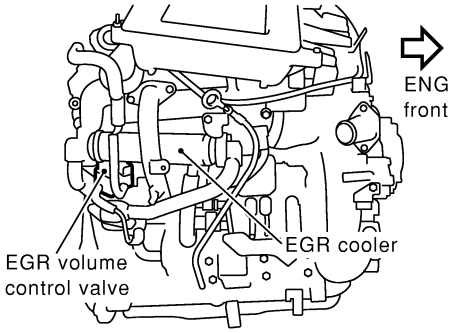
YEC194A

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Diagnostic Procedure

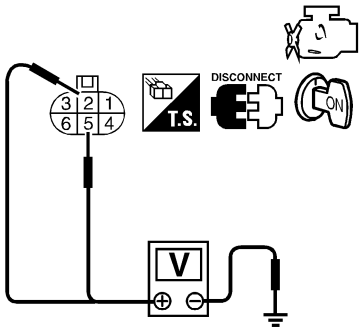
1	CHECK EGR VOLUME CONTROL VALVE POWER SUPPLY CIRCUIT-I

1. Turn ignition switch “OFF”.
2. Disconnect EGR volume control valve harness connector.



MEC019E

3. Turn ignition switch “ON”.
4. Check voltage between EGR volume control valve terminals 2, 5 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF412Y

OK or NG

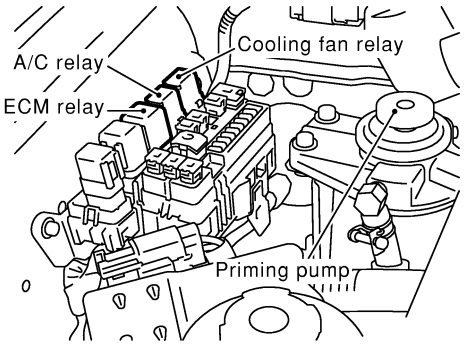
OK	▶	GO TO 7.
NG	▶	GO TO 2.

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Diagnostic Procedure (Cont'd)

2	CHECK EGR VOLUME CONTROL VALVE POWER SUPPLY CIRCUIT-II

1. Turn ignition switch "OFF".
2. Disconnect ECM relay.



MEC021E

3. Check harness continuity between ECM relay terminal 7 and EGR volume control valve terminals 2 and 5. Refer to Wiring Diagram.
   Continuity should exist.

OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO 3.

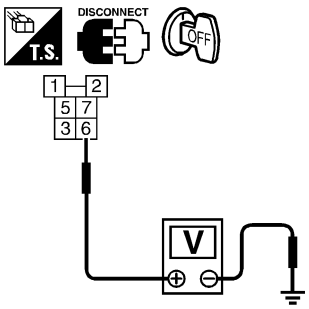
3	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M807, E201
- Harness for open or short between EGR volume control valve and ECM relay

	▶	Repair open circuit or short to ground or short to power in harness or connectors.

4	CHECK EGR VOLUME CONTROL VALVE POWER SUPPLY CIRCUIT-III

Check voltage between ECM relay terminal 6 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF297Z

OK or NG

OK	▶	GO TO 6.
NG	▶	GO TO 5.

5	DETECT MALFUNCTIONING PART

Check the following.
- 10A fuse
- Harness for open or short between ECM relay and battery

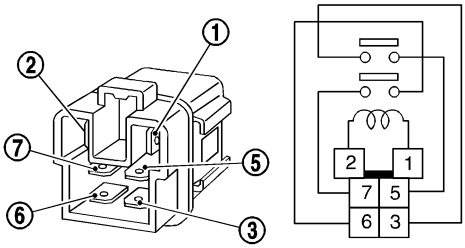
	▶	Repair open circuit or short to ground or short to power in harness or connectors.

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Diagnostic Procedure (Cont'd)

6	CHECK ECM RELAY

1. Apply 12V direct current between ECM relay terminals 1 and 2.
2. Check continuity between ECM relay terminals 3 and 5, 6 and 7.



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

SEF296X

OK or NG

OK	▶	GO TO 7.
NG	▶	Replace ECM relay.

7	CHECK EGR VOLUME CONTROL VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminals and EGR volume control valve terminals as follows. Refer to Wiring Diagram.

ECM terminal	EGR volume control valve
103	1
105	3
109	6
115	4

MTBL0442

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 9.
NG	▶	GO TO 8.

8	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E225, F108
- Harness connectors F135, M842 (RHD models)
- Harness for open or short between EGR volume control valve and ECM

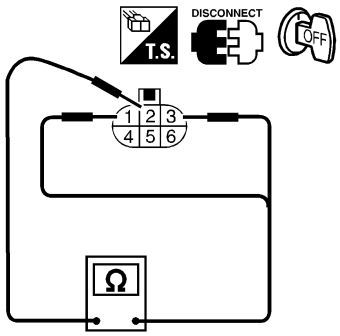
	▶	Repair open circuit or short to ground or short to power in harness or connectors.

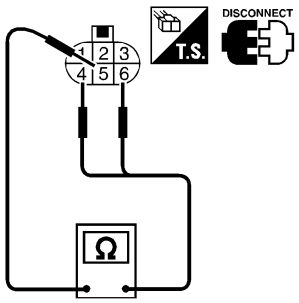
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Diagnostic Procedure (Cont'd)

9	CHECK EGR VOLUME CONTROL VALVE-I

Check resistance between EGR volume control valve terminal 2 and terminals 1, 3, terminal 5 and terminals 4, 6.





Resistance:
13 - 17Ω [At 20°C (68°F)]

SEF414Y

OK or NG

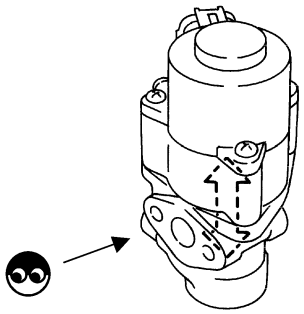
OK (With CONSULT-II)	▶	GO TO 9.
OK (Without CONSULT-II)	▶	GO TO 10.
NG	▶	Replace EGR volume control valve.

10	CHECK EGR VOLUME CONTROL VALVE-II

With CONSULT-II

1. Remove EGR volume control valve.
2. Reconnect ECM harness connector and EGR volume control valve harness connector.
3. Turn ignition switch "ON".
4. Perform "EGR VOL CONT/V" in "ACTIVE TEST" mode with CONSULT-II.
5. Check that EGR volume control valve shaft moves smoothly forward and backward according to the valve opening steps.

ACTIVE TEST	
EGR VOL CONT/V	20 step
MONITOR	
CKPS-RPM (TDC)	XXX rpm



SEF819Y

OK or NG

OK	▶	GO TO 11.
NG	▶	Replace EGR volume control valve.

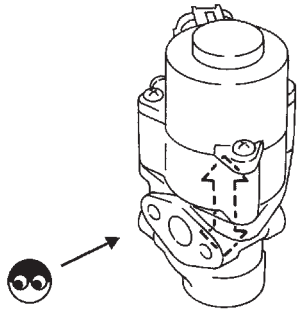
http://vnx.su/

Diagnostic Procedure (Cont'd)

11	CHECK EGR VOLUME CONTROL VALVE-II

Without CONSULT-II

1. Remove EGR volume control valve.
2. Reconnect ECM harness connector and EGR volume control valve harness connector.
3. Turn ignition switch "ON" and "OFF".
4. Check that EGR volume control valve shaft moves smoothly forward and backward according to the ignition switch position.



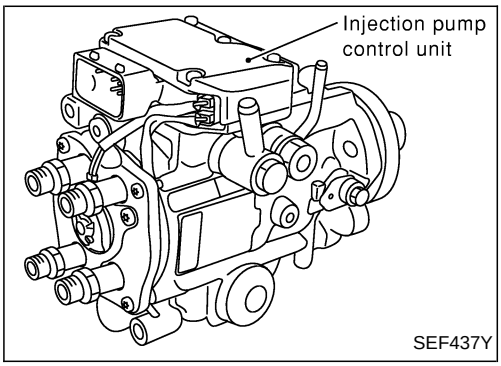
SEF560W

OK or NG

OK	▶	GO TO 11.
NG	▶	Replace EGR volume control valve.

12	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-78.	
▶	**INSPECTION END**

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Description

SYSTEM DESCRIPTION

The ECM and the electronic control fuel injection pump control unit (abbreviated as the injection pump control unit) perform the real time communication (signal exchange).
The ECM transmits the signals of the target fuel injection amount, target fuel injection timing, and engine speed, etc., and receives the signals of the pump speed and fuel temperature, etc. from the injection pump control unit.
By those signals, the injection pump controls the optimum fuel injection amount and injection timing of the spill valve and timing control valve.
Injection pump control unit has an on board diagnostic system, which detects malfunctions related to sensors or actuators built-into electronic control fuel injection pump. These malfunction information are transferred through the line (circuit) from injection pump control unit to ECM.

FUEL INJECTION AMOUNT CONTROL

In accordance with the target fuel injection amount signal from the ECM, the injection amount is controlled by controlling the spill valve in the injection pump and by changing the needle opening time.

FUEL INJECTION TIMING CONTROL

Based on the target fuel injection timing signal from the ECM, the injection timing is controlled in accordance with the timer spring by performing the duty control of the timing control valve in the injection pump and by adjusting the pressure of the timer piston high pressure chamber.

FUEL TEMPERATURE SENSOR

The sensor detects the fuel temperature in the injection pump and calibrates the injection amount change by the fuel temperature.

CAM RING POSITION SENSOR

The sensor detects the passing of the protrusion on the sensor wheel in the injection pump by the semiconductor magnetic resistance element sensor. The cam ring position sensor synchronizes with the cam ring, and detects the actual advance amount. The injection pump control unit measures the injection pump revolution by the signal of the cam ring position sensor.

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CONSULT-II Reference Value in Data Monitor Mode

Remarks: Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
FUEL TEMP SEN	● Engine: After warming up		More than 40°C (104°F)
SPILL/V	● Engine: After warming up		Approx. 13°CA
INJ TIMG C/V	● Engine: After warming up, idle the engine.		Approx. 50 - 70%
DECELER F/CUT	● Engine: After warming up	Idle	OFF
BARO SEN	● Ignition switch: ON		Altitude Approx. 0 m (0 ft): Approx. 100.62 kPa (1.0062 bar, 1.026 kg/cm^2, 14.59 psi) Approx. 1,000 m (3,281 ft): Approx. 88.95 kPa (0.8895 bar, 0.907 kg/cm^2, 12.90 psi) Approx. 1,500 m (4,992 ft): Approx. 83.16 kPa (0.8316 bar, 0.848 kg/cm^2, 12.06 psi) Approx. 2,000 m (6,562 ft): Approx. 78.36 kPa (0.7836 bar, 0.799 kg/cm^2, 11.36 psi)

ECM Terminals and Reference Value

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

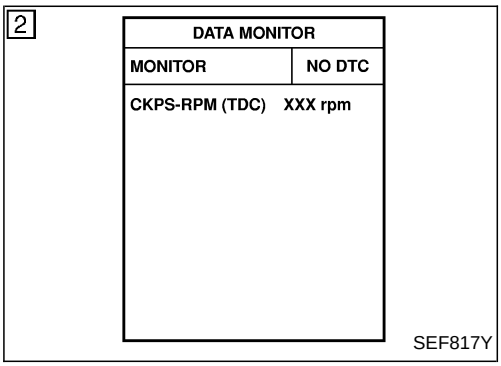
Do not use ECM ground terminals when measuring input/output voltage. Doing so may damage the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
33	G	Electronic control fuel injection pump	Engine is running. └ **Warm-up condition** Idle speed	Approximately 2.5V
40	R	Electronic control fuel injection pump	Engine is running. └ **Warm-up condition** Idle speed	Approximately 2.5V
52	Y	Electronic control fuel injection pump	Engine is running. └ Idle speed	Approximately 0.1V
53	OR	Electronic control fuel injection pump	Engine is running. └ Idle speed	Approximately 0.35V

On Board Diagnosis Logic

Malfunction is detected when	Check Items (Possible cause)
● Fuel cut control system does not function properly.	● Harness or connectors (Electronic control fuel circuit is open or shorted.) ● Electronic control fuel

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DTC Confirmation Procedure

WITH CONSULT-II

1) Turn ignition switch “ON” and wait at least 2 seconds.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Start engine and run it for at least 2 seconds at idle speed. (If engine does not run, turn ignition switch to “START” for at least 2 seconds.)
4) Turn ignition switch “OFF”, wait at least 5 seconds and then turn “ON”.
5) If DTC is detected, go to “Diagnostic Procedure”, EC-242.

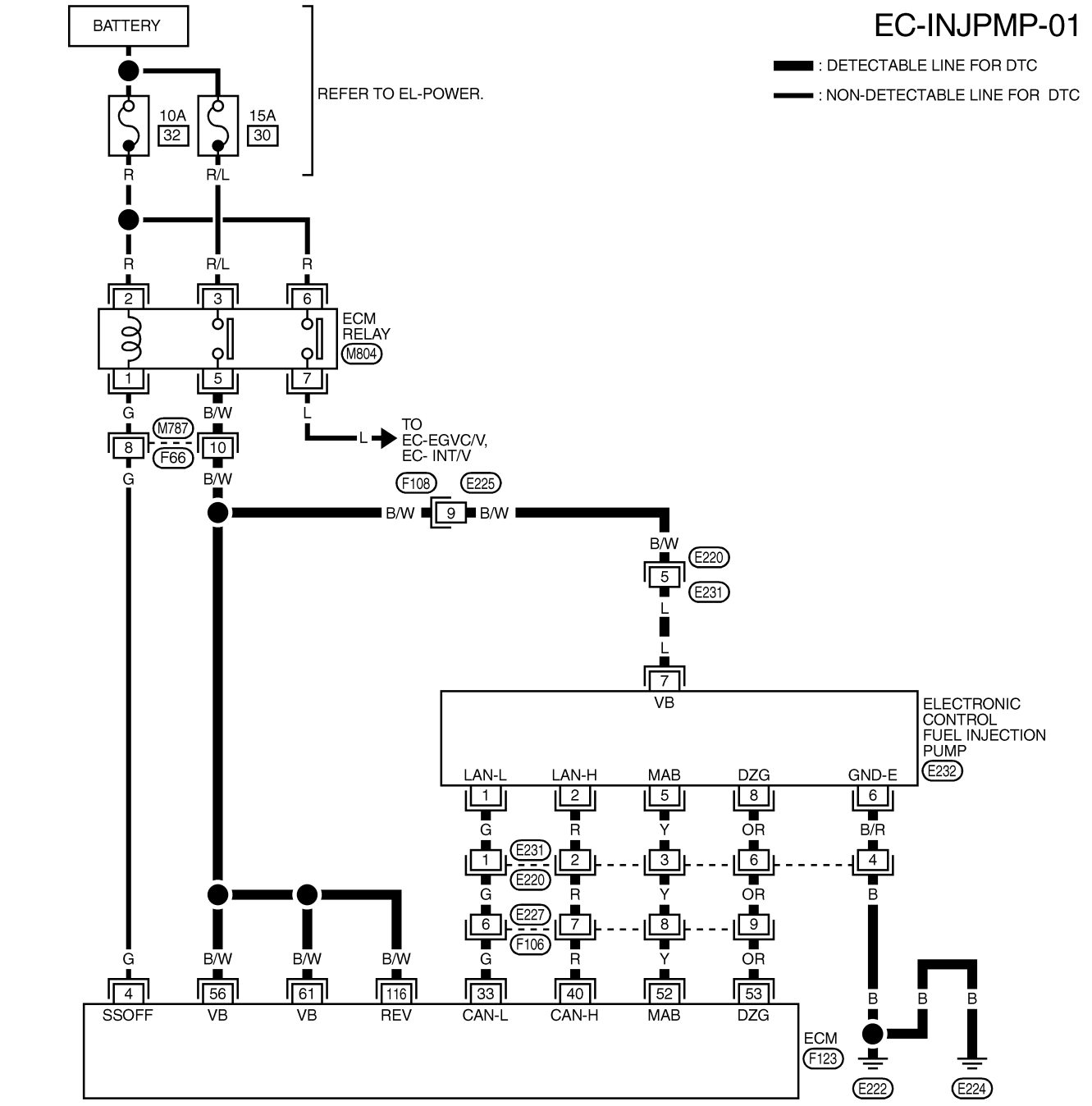
WITHOUT CONSULT-II

1) Turn ignition switch “ON” and wait at least 2 seconds.
2) Start engine and run it for at least 2 seconds at idle speed. (If engine does not run, turn ignition switch to “START” for at least 2 seconds.)
3) Turn ignition switch “OFF”, wait at least 5 seconds and then turn “ON”.
4) Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
5) If DTC is detected, go to “Diagnostic Procedure”, EC-242.

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Wiring Diagram

LHD MODELS

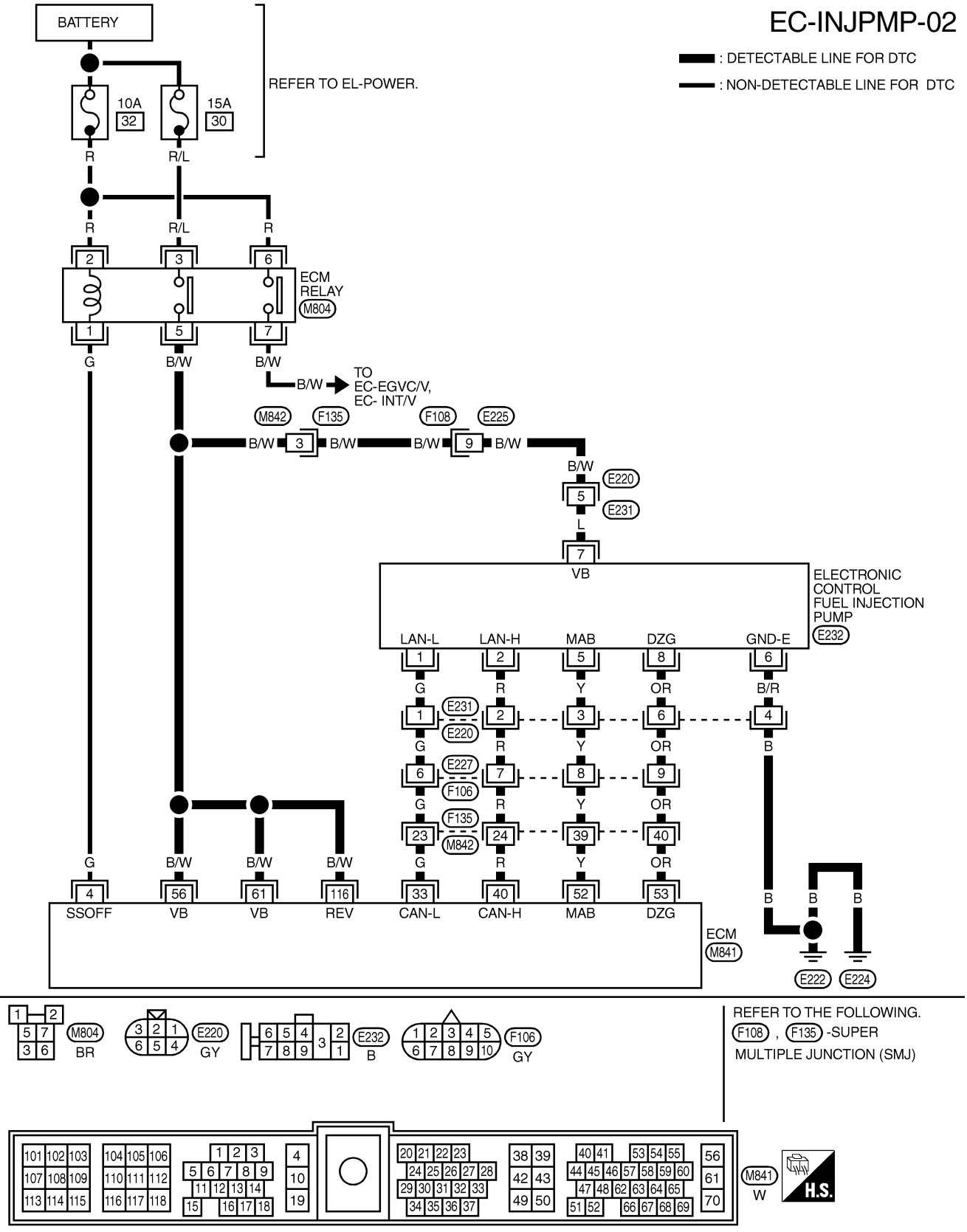


YEC181A

http://vnx.su/

Wiring Diagram (Cont'd)

RHD MODELS



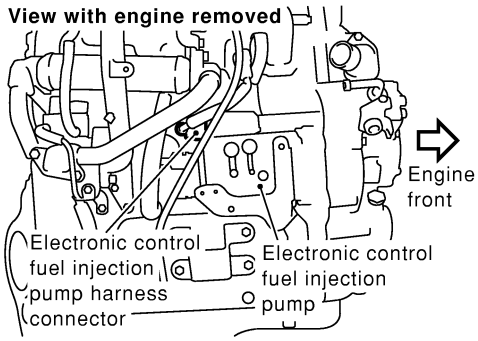
YEC182A

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Diagnostic Procedure

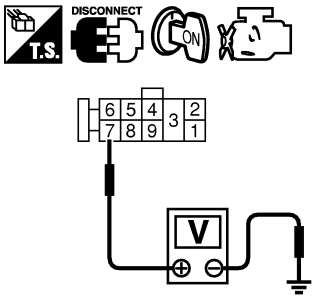
1	CHECK ELECTRONIC CONTROL FUEL INJECTION PUMP POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect electronic control fuel injection pump harness connector.



MEC025E

3. Turn ignition switch “ON”.
4. Check voltage between electronic control fuel injection pump terminal 7 and ground.



MEC977D

Voltage: Battery voltage

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M787, F66 (LHD models)
- Harness connectors F108, E225
- Harness connectors E220, E231 (LHD models)
- Harness connectors M842, F135 (RHD models)
- Harness for open or short between electronic control fuel injection pump and ECM
- Harness for open or short between electronic control fuel injection pump and ECM relay

	▶	Repair open circuit or short to ground or short to power in harness or connectors.

3	CHECK ELECTRONIC CONTROL FUEL INJECTION PUMP GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between electronic control fuel injection pump terminal 6 and ground. Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 4.

http://vnx.su/

Diagnostic Procedure (Cont'd)

4	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E231, E220 ● Harness for open or short between electronic control fuel injection pump and engine ground	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

5	CHECK COMMUNICATION LINE FOR OPEN AND SHORT

1. Check continuity between the following terminals. Refer to Wiring Diagram.

Electronic control fuel injection pump	ECM
1	33
2	40
5	52
8	53

MTBL0444

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK ▶	GO TO 7.
NG ▶	GO TO 6.

6	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E227, F106 ● Harness connectors E231, E220 ● Harness connectors F135, M842 (RHD models) ● Harness for open or short between electronic control fuel injection pump and ECM	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

7	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-78.	
OK or NG	
OK ▶	Replace electronic control fuel injection pump.
NG ▶	Repair open circuit or short to ground or short to power in harness or connectors.

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Description

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM Function	Actuator
Crankshaft position sensor (TDC)	Engine speed	Glow control	Glow lamp, Glow relay ↓ Glow plugs
Engine coolant temperature sensor	Engine coolant temperature		

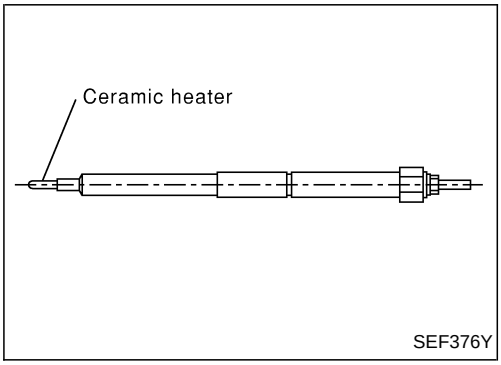
When engine coolant temperature is more than approximately 75°C (167°F), the glow relay turns off, inactivating the quick-glow control until coolant temperature drops below approximately 55°C (131°F).
When coolant temperature is lower than approximately 75°C (167°F):

- Ignition switch ON
  After ignition switch has turned to ON, the glow relay turns ON for a certain period of time in relation to engine coolant temperature, allowing current to flow through glow plug.
- Cranking
  The glow relay turns ON, allowing current to flow through glow plug.
- Starting
  After engine has started, current continues to flow through glow plug (after-glow mode) for a certain period in relation to engine coolant temperature.
  When engine speed exceeds approximately 4,800 rpm, current flow through glow plug is interrupted.

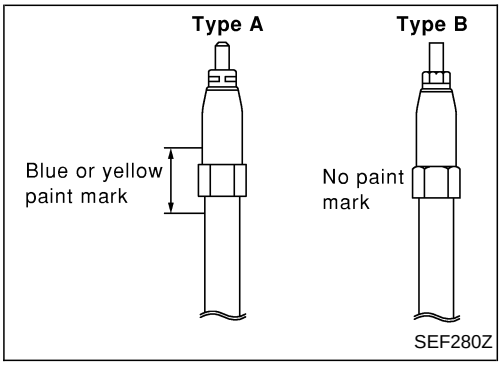
The glow indicator lamp turns ON for a certain period of time in relation to engine coolant temperature at the time glow relay is turned ON.

COMPONENT DESCRIPTION

Glow plug



- The glow plug is provided with a ceramic heating element to obtain a high-temperature resistance. It glows in response to a signal sent from the ECM, allowing current to flow through the glow plug via the glow relay.



- This engine uses two types of glow plugs.
  Type A has a blue or yellow paint mark.
  Type B has no paint mark.
  The location of the paint mark is shown in the figure.

WARNING:
Do not use two types of glow plugs at the same time.

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ECM Terminals and Reference Value

Specification data are reference values and are measured between each terminal and ground.

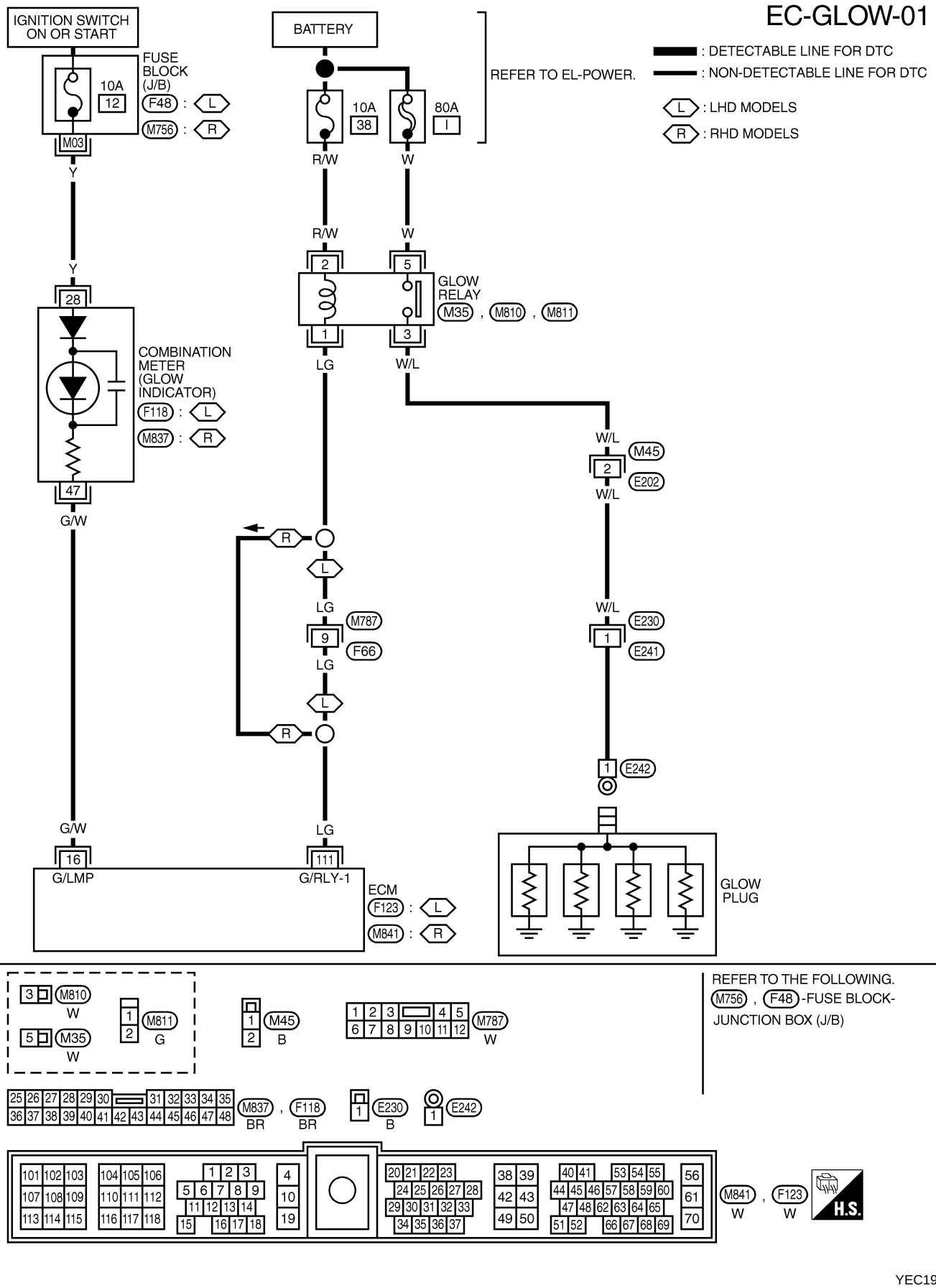
CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may damage the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
16	G/W	Glow indicator lamp	Ignition switch "ON" └ Glow indicator lamp is "ON"	Approximately 1V
			Ignition switch "ON" └ Glow indicator lamp is "OFF"	BATTERY VOLTAGE (11 - 14V)
111	LG	Glow relay	Refer to "SYSTEM DESCRIPTION", EC-244.	

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Wiring Diagram



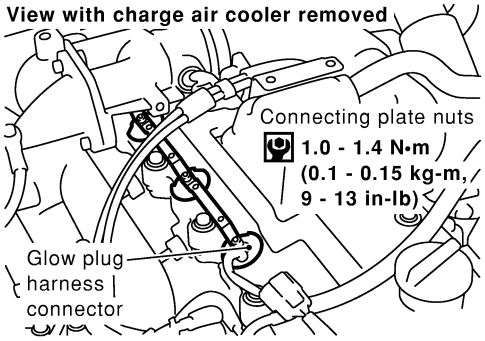
YEC195A

http://vnx.su/

Diagnostic Procedure

1	INSPECTION START
Check fuel level, fuel supplying system, starter motor, etc.	
OK or NG	
OK ▶	GO TO 2.
NG ▶	Correct.

2	CHECK INSTALLATION
Check that all glow plug connecting plate nuts are installed properly.	



MEC002E

OK or NG	
OK (With CONSULT-II) ▶	GO TO 3.
OK (Without CONSULT-II) ▶	GO TO 4.
NG ▶	Install properly.

3	CHECK GLOW INDICATOR LAMP OPERATION

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “COOLAN TEMP/S” in “DATA MONITOR” mode with CONSULT-II.
3. Confirm that “COOLAN TEMP/S” indicates below 75°C (167°F). If it indicates above 75°C (167°F), cool down engine.

DATA MONITOR	
MONITOR	NO DTC
COOLAN TEMP/S	XXX ˚C

SEF013Y

4. Turn ignition switch “OFF”, wait at least 5 seconds and then turn “ON”.
5. Make sure that glow indicator lamp is turned “ON” for 1.5 seconds or more after turning ignition switch “ON”, and then turned “OFF”.

OK or NG	
OK ▶	GO TO 5.
NG ▶	GO TO 6.

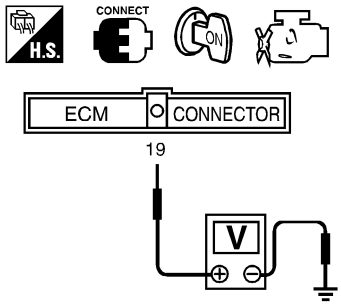
http://vnx.su/

Diagnostic Procedure (Cont'd)

4	CHECK GLOW INDICATOR LAMP OPERATION

Without CONSULT-II

1. Turn ignition switch "ON".
2. Confirm that the voltage between ECM terminal 19 and ground is above 1.36V. If it is below 1.36V, cool down engine.



Voltage: More than 1.36V

SEF430Y

3. Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
4. Make sure that glow indicator lamp is turned "ON" for 1.5 seconds or more after turning ignition switch "ON", and then turned "OFF".

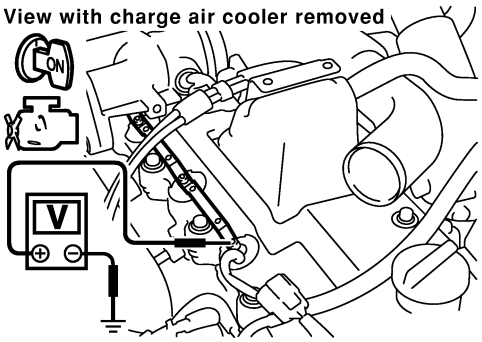
OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 6.

5	CHECK GLOW CONTROL SYSTEM OVERALL FUNCTION

1. Turn ignition switch "OFF".
2. Set voltmeter probe between glow plug and engine body.
3. Turn ignition switch "ON".
4. Check the voltage between glow plug and engine body under the following conditions.

View with charge air cooler removed



MEC003E

Conditions	Voltage
For 20 seconds after turning ignition switch ON	Battery voltage
More than 20 seconds after turning ignition switch ON	Approx. 0V

MTBL1325

OK or NG

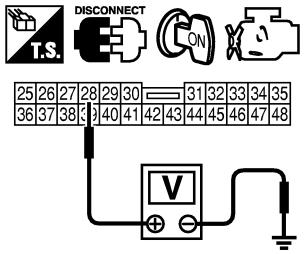
OK	▶	**INSPECTION END**
NG	▶	GO TO 10.

http://vnx.su/

Diagnostic Procedure (Cont'd)

6	CHECK GLOW INDICATOR LAMP POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect combination meter harness connector F118 (LHD models) or M837 (RHD models).
3. Turn ignition switch "ON".
4. Check voltage between combination meter terminal 28 and ground with CONSULT-II or tester.



MEC979D

Voltage: Battery voltage

OK or NG

OK	▶	GO TO 8.
NG	▶	GO TO 7.

7	DETECT MALFUNCTIONING PART

Check the following.
1. Fuse block (J/B) connector F48 (LHD models), M756 (RHD models)
2. 10A fuse
3. Harness for open or short between combination meter and fuse

	▶	Repair open circuit or short to ground or short to power in harness or connectors.

8	CHECK GLOW INDICATOR LAMP OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Disconnect combination meter harness connector F118 (LHD models) or M837 (RHD models).
4. Check harness continuity between ECM terminal 16 and combination meter terminal 47. Refer to Wiring Diagram.
   Continuity should exist.
5. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 9.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

9	CHECK COMBINATION METER

Check combination meter and glow indicator lamp. Refer to EL section ("METER AND GAUGES").

OK or NG

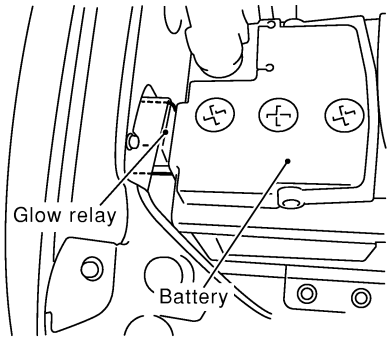
OK	▶	GO TO 17.
NG	▶	Repair or replace combination meter or glow indicator lamp.

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Diagnostic Procedure (Cont'd)

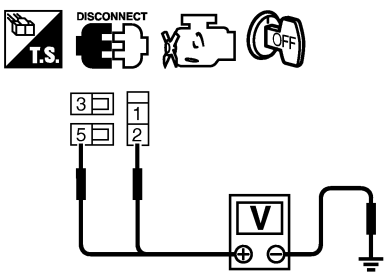
10	CHECK GLOW RELAY POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect glow relay.



MEC004E

3. Check voltage between glow relay terminals 2, 5 and ground with CONSULT-II or tester.



YEC709A

Voltage: Battery voltage

OK or NG

OK	▶	GO TO 12.
NG	▶	GO TO 11.

11	DETECT MALFUNCTIONING PART

Check the following.
- 80A fusible link
- 10A fuse
- Harness for open or short between glow relay and battery

	▶	Repair harness or connectors.

12	CHECK GLOW RELAY OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 111 and glow relay terminal 1. Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 14.
NG	▶	GO TO 13.

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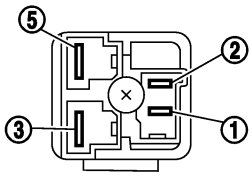
Diagnostic Procedure (Cont'd)

13	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors M787, F66 (LHD models) ● Harness for open or short between glow relay and ECM	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

14	CHECK HARNESS CONTINUITY BETWEEN GLOW RELAY AND GLOW PLUG FOR OPEN AND SHORT
1. Disconnect glow plug harness connector. 2. Check harness continuity between glow relay terminal 3 and glow plug harness connector. Refer to Wiring Diagram. **Continuity should exist.** 3. Also check harness for short to ground and short to power. **OK or NG**	
OK ▶	GO TO 16.
NG ▶	GO TO 15.

15	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors M45, E202 ● Harness connectors E230, E241 ● Harness for open or short between glow relay and glow plug	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

16	CHECK GLOW RELAY
Check continuity between glow relay terminals 3 and 5 under the following conditions.	



Conditions	Continuity
12V direct current supply between terminals 1 and 2	Yes
No current supply	No

Operation takes less than 1 second.

SEF433Y

OK or NG

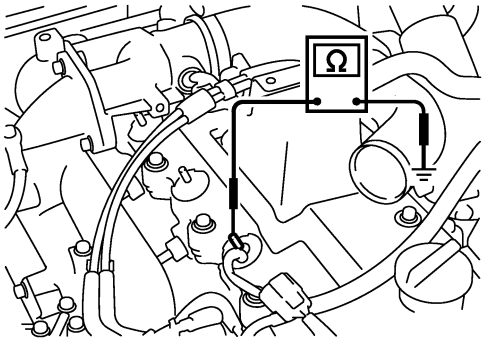
OK ▶	GO TO 17.
NG ▶	Replace glow relay.

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Diagnostic Procedure (Cont'd)

17	CHECK GLOW PLUG

1. Remove glow plug connecting plate.
2. Check glow plug resistance.



MEC005E

Resistance: Approx. 0.5Ω [at 20°C (68°F)]

NOTE:
- **Do not bump glow plug heating element. If it is bumped, replace glow plug with a new one.**
- **If glow plug is dropped from a height of 10 cm (3.94 in) or higher, replace with a new one.**
- **If glow plug installation hole is contaminated with carbon, remove it with a reamer or suitable tool.**
- **Hand-tighten glow plug by turning it two or three times, then tighten using a tool to specified torque.**
  : 15 - 20 N·m (1.5 - 2.1 kg-m, 11 - 15 ft-lb)

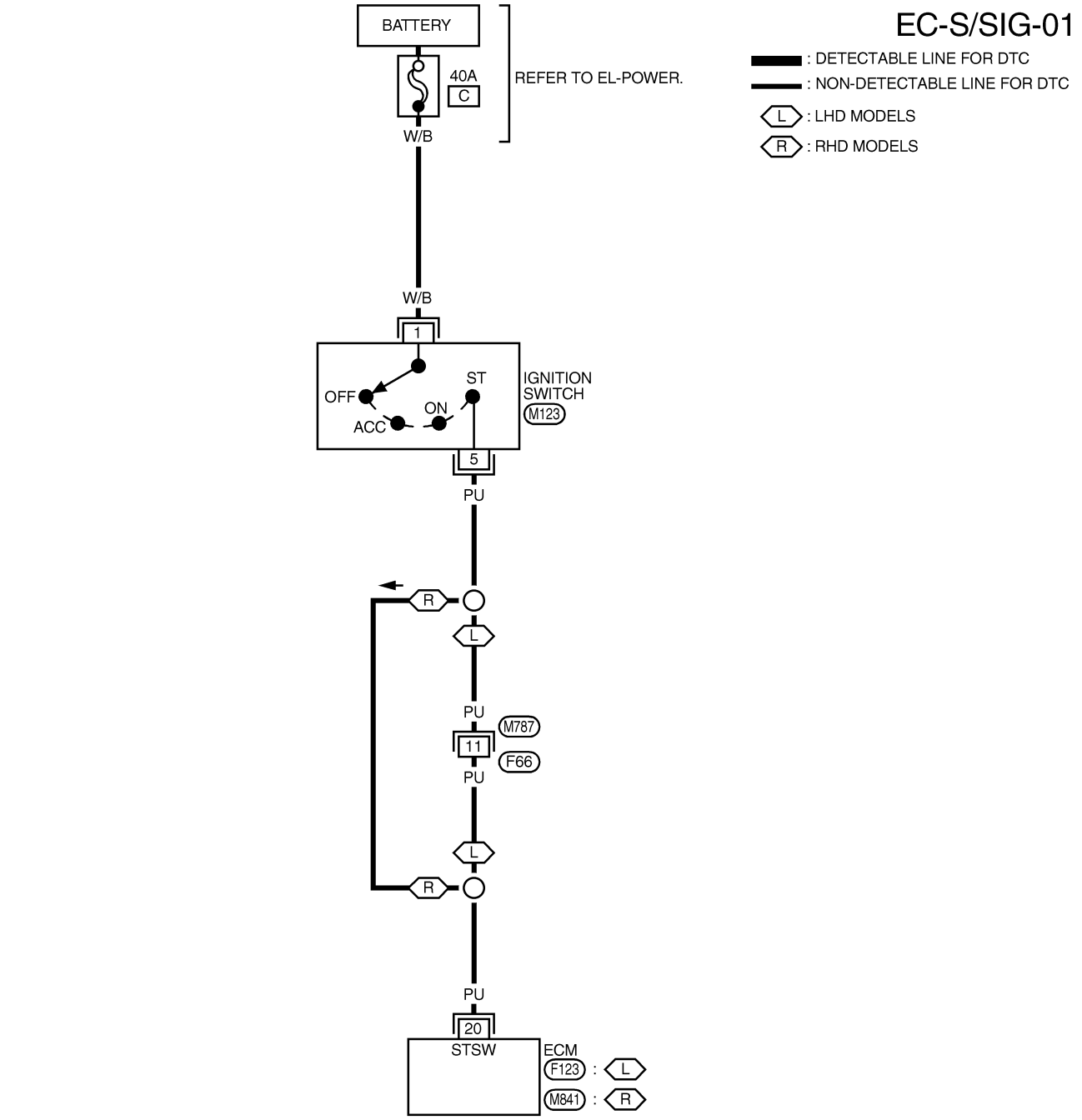
OK or NG

OK	▶	GO TO 18.
NG	▶	Replace glow plug.

18	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-78.	
▶	**INSPECTION END**

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Wiring Diagram



YEC196A

http://vnx.su/

Diagnostic Procedure

1	CHECK START SIGNAL OVERALL FUNCTION

With CONSULT-II

1. Turn ignition switch “ON”.
2. Check “START SIGNAL” in “DATA MONITOR” mode with CONSULT-II under the following conditions.

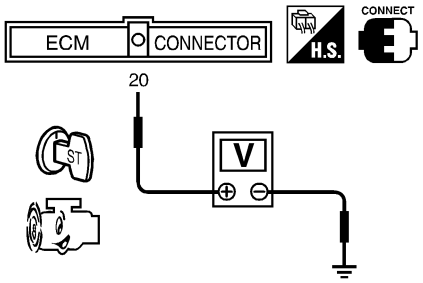
DATA MONITOR	
MONITORING	NO FAIL
START SIGNAL	OFF
CLSD TH/P SW	ON
AIR COND SIG	OFF
P/N POSI SW	ON

Condition	“START SIGNAL”
Ignition switch “ON”	OFF
Ignition switch “START”	ON

SEF604X

Without CONSULT-II

Check voltage between ECM terminal 20 and ground under the following conditions.



Condition	Voltage
Ignition switch “START”	Battery voltage
Other positions	Approximately 0V

SEF415Y

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 2.

2	CHECK START SIGNAL INPUT SIGNAL CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector and ignition switch harness connector.
3. Check harness continuity between ECM terminal 20 and ignition switch terminal 5. Refer to Wiring Diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO 3.

3	DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M787, F66 (LHD models)
- Harness for open or short between ECM and ignition switch

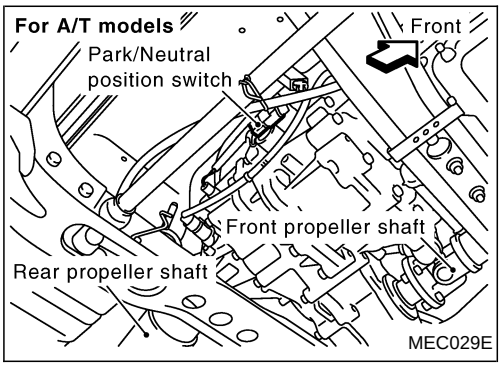
	▶	Repair open circuit or short to ground or short to power in harness or connectors.

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Diagnostic Procedure (Cont'd)

4	**CHECK INTERMITTENT INCIDENT**
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-78.	
▶	**INSPECTION END**

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Description

When the gear position is in “Neutral”, neutral position is “ON”. ECM detects the position because the continuity of the line (the “ON” signal) exists.

CONSULT-II Reference Value in Data Monitor Mode

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
P/N POSI SW	• Ignition switch: ON	Shift lever: Park/Neutral	ON
		Except above	OFF

ECM Terminals and Reference Value

Specification data are reference values and are measured between each terminal and ground.

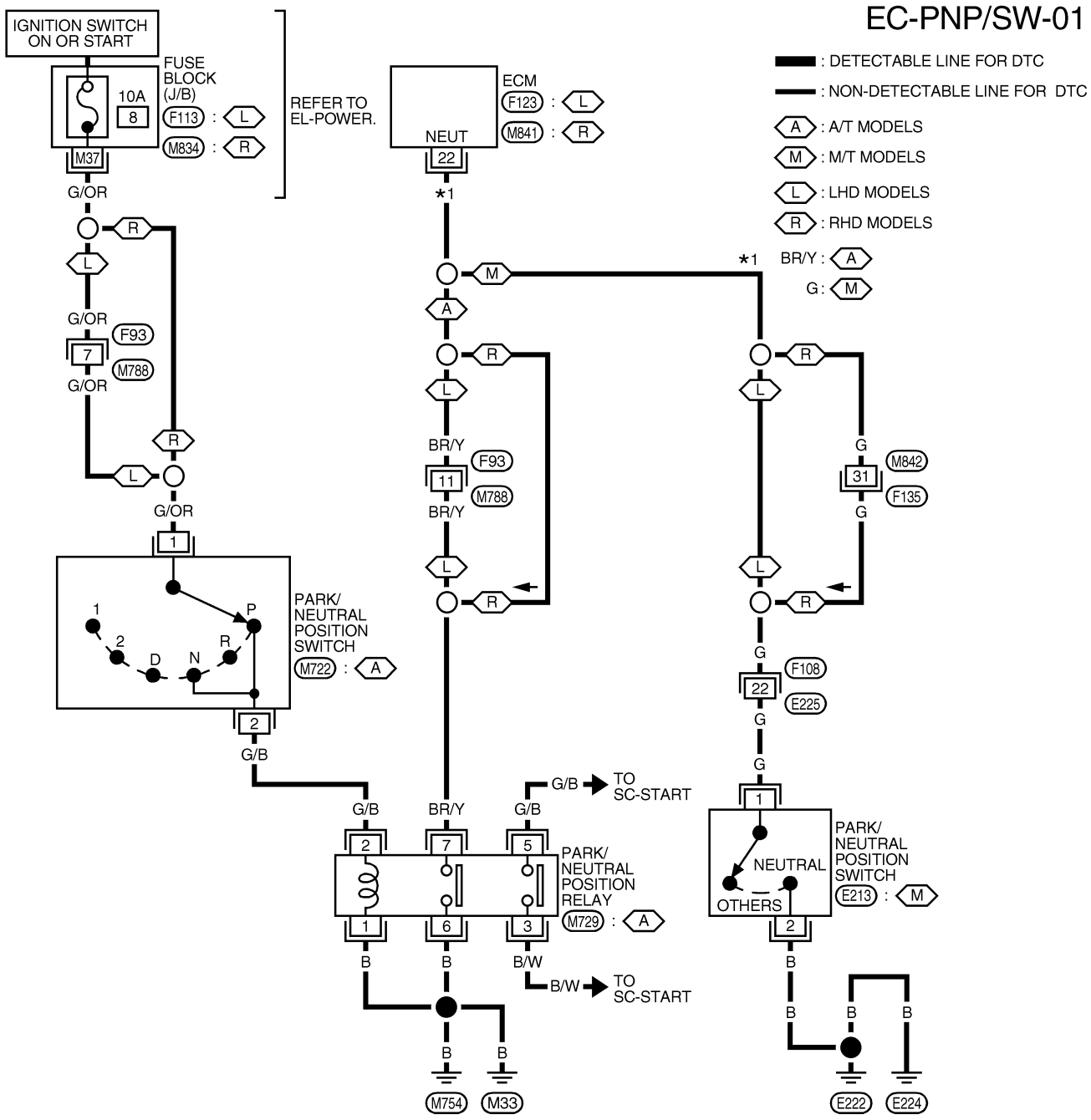
CAUTION:

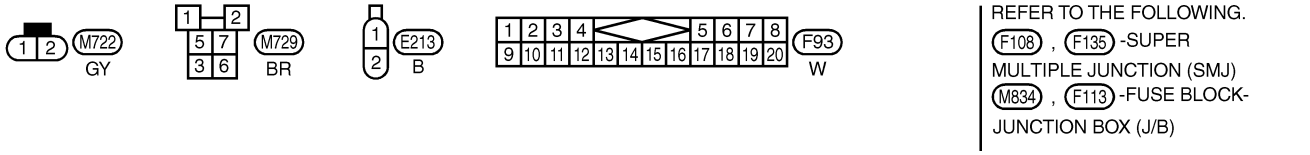
Do not use ECM ground terminals when measuring input/output voltage. Doing so may damage the ECM’s transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
22	BR/Y (A/T models) G (M/T models)	Park/Neutral position switch	Ignition switch “ON” └ Gear position is “Neutral” (M/T models) Gear position is “P” or “N” (A/T models)	Approximately 0V
			Ignition switch “ON” └ Except the above gear position	BATTERY VOLTAGE (11 - 14V)

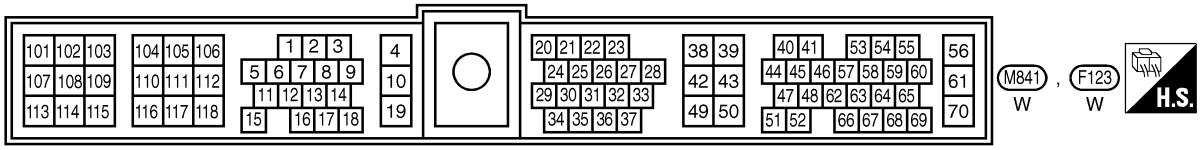
http://vnx.su/

Wiring Diagram





REFER TO THE FOLLOWING.
F108 , F135 -SUPER MULTIPLE JUNCTION (SMJ)
M834 , F113 -FUSE BLOCK-JUNCTION BOX (J/B)



YEC197A

http://vnx.su/

Diagnostic Procedure

FOR M/T MODELS

1	CHECK OVERALL FUNCTION

With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “P/N POSI SW” in “DATA MONITOR” mode with CONSULT-II.
3. Check “P/N POSI SW” signal under the following conditions.

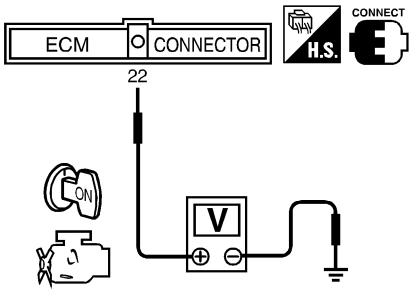
DATA MONITOR	
MONITOR	NO DTC
P/N POSI SW	ON

Shift lever position	P/N POSI SW
Neutral position	ON
Except the above position	OFF

SEF049Y

Without CONSULT-II

1. Turn ignition switch “ON”.
2. Check voltage between ECM terminal 22 and ground under the following conditions.



Condition (Gear position)	Voltage V
Neutral position	Approx. 0V
Except the above position	Battery voltage

SEF419Y

OK or NG

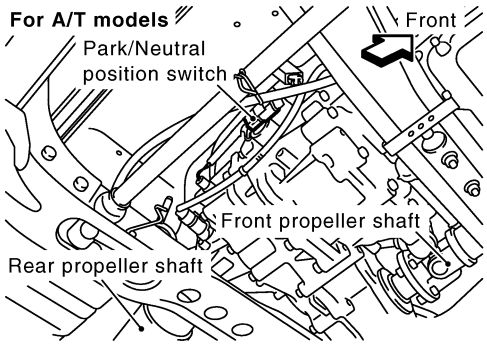
OK	▶	**INSPECTION END**
NG	▶	GO TO 2.

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Diagnostic Procedure (Cont'd)

2	CHECK PNP SWITCH GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Disconnect park/neutral position (PNP) switch harness connector.



MEC029E

3. Check harness continuity between PNP switch terminal 2 and body ground. Refer to Wiring Diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 3.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

3	CHECK PNP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 22 and PNP switch terminal 1. Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 4.

4	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M842, F135 (RHD models)
- Harness connectors F108, E225
- Harness for open or short between PNP switch and ECM

	▶	Repair open circuit or short to ground or short to power in harness or connectors.

5	CHECK PARK/NEUTRAL POSITION SWITCH

Refer to MT section ("POSITION SWITCH CHECK").

OK or NG

OK	▶	GO TO 6.
NG	▶	Replace park/neutral position switch.

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Diagnostic Procedure (Cont'd)

6	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-78.	
▶	INSPECTION END

FOR A/T MODELS

1	CHECK OVERALL FUNCTION

With CONSULT-II

1. Turn ignition switch "ON".
2. Select "P/N POSI SW" in "DATA MONITOR" mode with CONSULT-II.
3. Check "P/N POSI SW" signal under the following conditions.

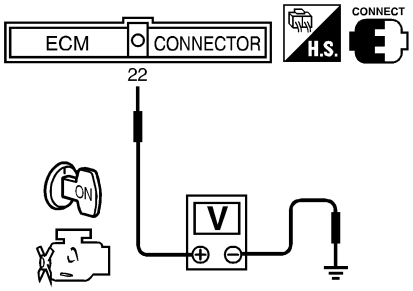
DATA MONITOR	
MONITOR	NO DTC
P/N POSI SW	ON

Shift lever position	P/N POSI SW
Neutral position	ON
Except the above position	OFF

SEF049Y

Without CONSULT-II

1. Turn ignition switch "ON".
2. Check voltage between ECM terminal 22 and ground under the following conditions.



Condition (Gear position)	Voltage V
Neutral position	Approx. 0V
Except the above position	Battery voltage

SEF419Y

OK or NG

OK	▶	INSPECTION END
NG	▶	GO TO 2.

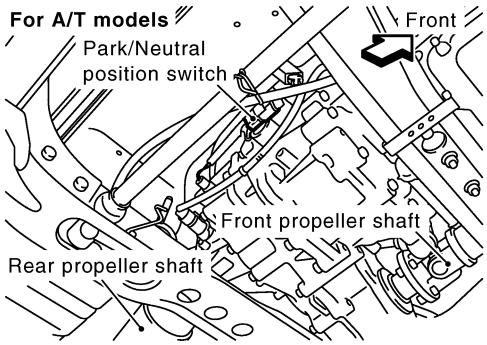
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Diagnostic Procedure (Cont'd)

2	CHECK PARK/NEUTRAL POSITION RELAY POWER SUPPLY CIRCUIT

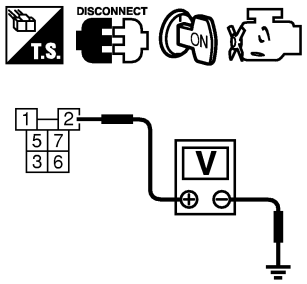
Without CONSULT-II

1. Turn ignition switch "OFF".
2. Disconnect park/neutral position (PNP) relay harness connector.



MEC029E

3. Turn ignition switch "ON".
4. Check voltage between PNP relay terminal 2 and ground under the following conditions.



MEC981D

Conditions (Gear position)	Voltage
"P" or "N" position	Battery voltage
Except above positions	Approx. 0V

MTBL1320

OK or NG

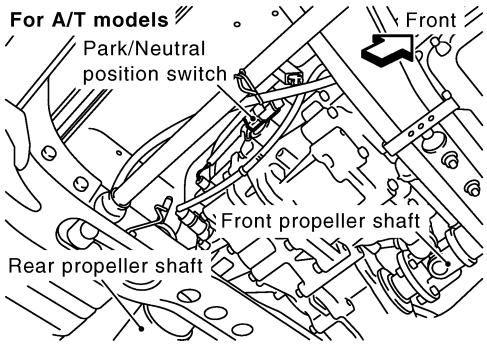
OK	▶	GO TO 7.
NG	▶	GO TO 3.

http://vnx.su/

Diagnostic Procedure (Cont'd)

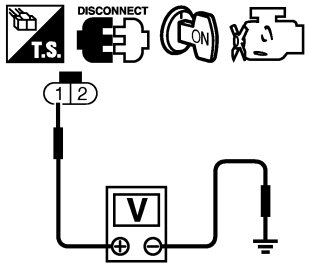
3	CHECK PARK/NEUTRAL POSITION SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect park/neutral position (PNP) switch harness connector.



MEC029E

3. Check voltage between PNP switch terminal 1 and ground.



YEC710A

Voltage: Battery voltage

OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 4.

4	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F93, M788 (LHD models)
- Fuse block (J/B) connector F113 (LHD models)
- Fuse block (J/B) connector M834 (RHD models)
- 10A fuse
- Harness for open or short between PNP switch and fuse

	▶	Repair harness or connectors.

5	CHECK PNP SWITCH GROUND CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between PNP switch terminal 2 and PNP relay terminal 2.
   Refer to Wiring Diagram.
   Continuity should exist.
2. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 6.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

http://vnx.su/

Diagnostic Procedure (Cont'd)

6	CHECK PARK/NEUTRAL POSITION SWITCH
Refer to AT section, "Park/neutral position switch".	
OK or NG	
OK ▶	GO TO 11.
NG ▶	Replace PNP switch.

7	CHECK PNP RELAY GROUND CIRCUIT FOR OPEN AND SHORT
1. Turn ignition switch "OFF". 2. Check harness continuity between PNP relay terminals 1, 6 and engine ground. Refer to Wiring Diagram. **Continuity should exist.** 3. Also check harness for short to power.	
OK or NG	
OK ▶	GO TO 8.
NG ▶	Repair open circuit or short to power in harness or connectors.

8	CHECK PNP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT
1. Disconnect ECM harness connector. 2. Check harness continuity between ECM terminal 22 and PNP relay terminal 7. Refer to Wiring Diagram. **Continuity should exist.** 3. Also check harness for short to ground or short to power.	
OK or NG	
OK ▶	GO TO 10.
NG ▶	GO TO 9.

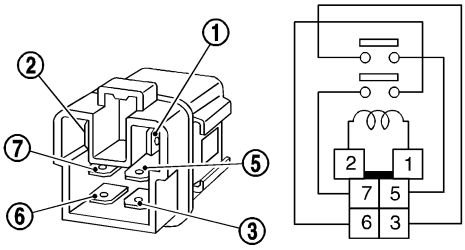
9	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors F93, M788 (LHD models) ● Harness for open or short between ECM and PNP relay	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

http://vnx.su/

Diagnostic Procedure (Cont'd)

10	CHECK PNP RELAY

1. Apply 12V direct current between PNP relay terminals 1 and 2.
2. Check continuity between PNP relay terminals 3 and 5, 6 and 7.



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

SEF296X

OK or NG

OK	▶	GO TO 11.
NG	▶	Replace PNP relay.

11	CHECK INTERMITTENT INCIDENT
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-78.	
▶	**INSPECTION END**

http://vnx.su/

Component Description

The heat up switch is located on the lower side of the instrument panel. This switch is used to speed up the heater's operation when the engine is cold.
When the ECM received the heat up switch "ON" signal, the ECM increases the engine idle speed to 1,100 to 1,200 rpm to warm up engine quickly.
This system works when all conditions listed below are met.

Heat up switch	ON
Engine coolant temperature	Below 105°C (221°F)
Shift lever	"P" or "N"
Accelerator pedal	Fully released

CONSULT-II Reference Value in Data Monitor Mode

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
WARM UP SW	• Ignition switch: ON	Heat up switch: ON	ON
		Heat up switch: OFF	OFF

ECM Terminals and Reference Value

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

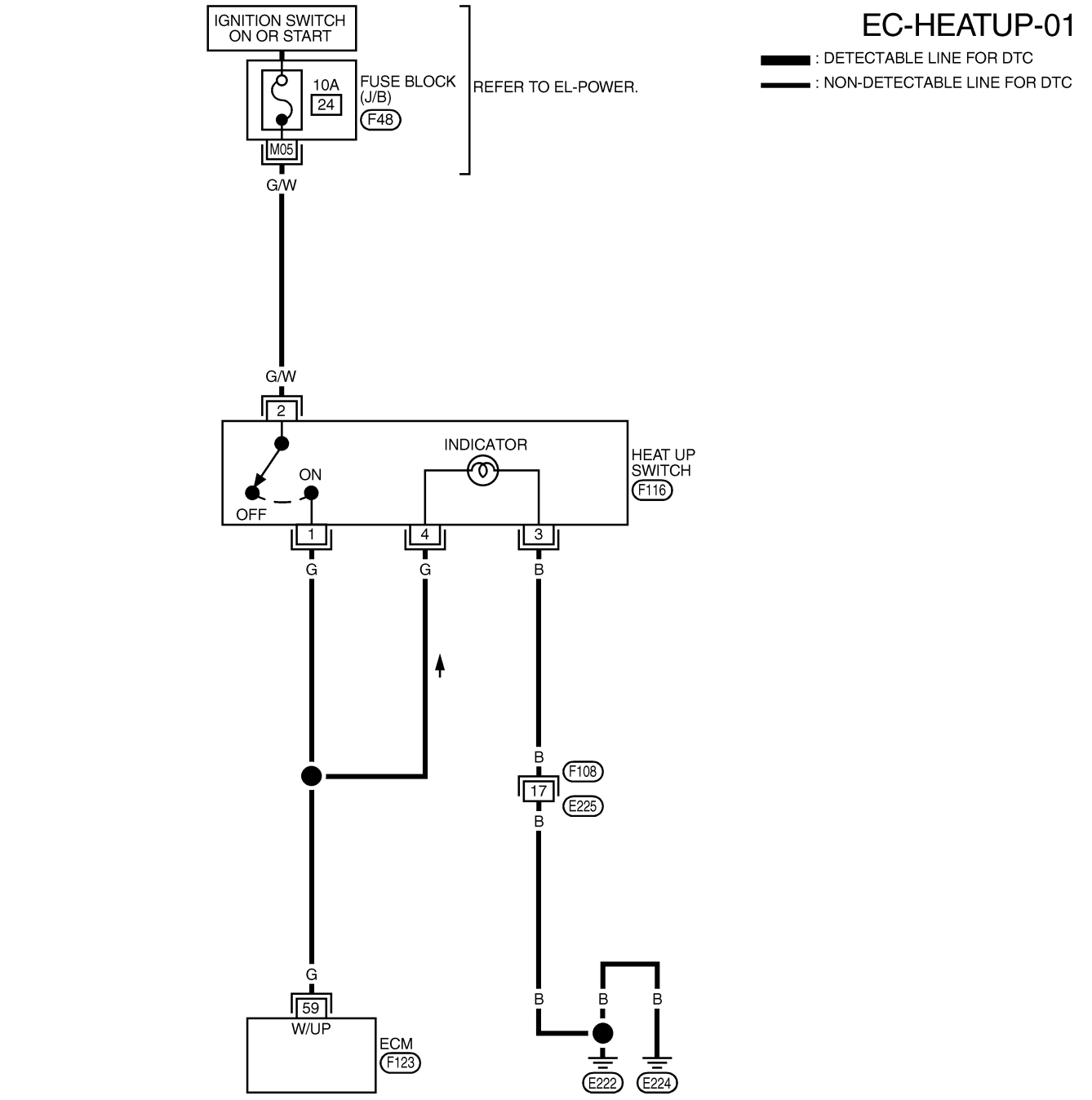
Do not use ECM ground terminals when measuring input/output voltage. Doing so may damage the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
59	G	Heat up switch	Ignition switch "ON" └ Heat up switch is "OFF".	0V
			Ignition switch "ON" └ Heat up switch is "ON".	BATTERY VOLTAGE (11 - 14V)

http://vnx.su/

Wiring Diagram

LHD MODELS



YEC198A

http://vnx.su/

Diagnostic Procedure

1	INSPECTION START
Do you have CONSULT-II? **Yes or No**	
Yes ▶	GO TO 2.
No ▶	GO TO 3.

2	CHECK OVERALL FUNCTION-I

With CONSULT-II

1. Turn ignition switch “ON”.
2. Check “WARM UP SW” in “DATA MONITOR” mode with CONSULT-II under the following conditions.

DATA MONITOR	
MONITOR	NO DTC
WARM UP SW	OFF

Conditions	WARM UP SW
Heat-up switch is “OFF”.	OFF
Heat-up switch is “ON”.	ON

SEF302Z

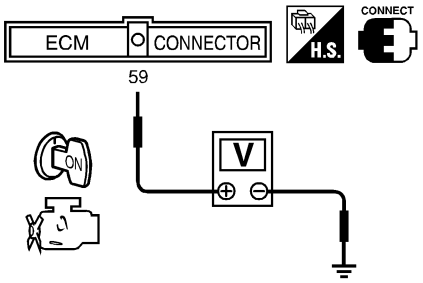
OK or NG

OK ▶	GO TO 4.
NG ▶	GO TO 5.

3	CHECK OVERALL FUNCTION-I

Without CONSULT-II

1. Turn ignition switch “ON”.
2. Check voltage between ECM terminal 59 and ground under the following conditions.



Conditions	Voltage
Heat-up switch is “OFF”.	Approximately 0V
Heat-up switch is “ON”.	Battery voltage

SEF303Z

OK or NG

OK ▶	GO TO 4.
NG ▶	GO TO 5.

http://vnx.su/

Diagnostic Procedure (Cont'd)

4	CHECK OVERALL FUNCTION-II

Check heat up switch indicator in the heat up switch under the following conditions.

CONDITION	INDICATOR
Heat up switch: ON	Illuminated
Heat up switch: OFF	Not illuminated

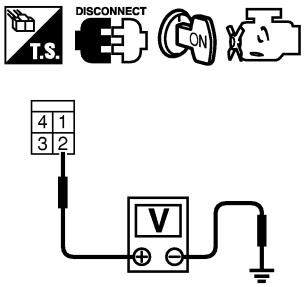
MTBL1846

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 9.

5	CHECK HEAT UP SWITCH POWER SUPPLY CIRCUIT

1. Turn heat up switch "OFF".
2. Turn ignition switch "OFF".
3. Disconnect heat up switch harness connector.
4. Turn ignition switch "ON".
5. Check voltage between heat up switch terminal 2 and ground with CONSULT-II or tester.



MEC983D

Voltage: Battery voltage

OK or NG

OK	▶	GO TO 7.
NG	▶	GO TO 6.

6	DETECT MALFUNCTIONING PART

Check the following.
- Fuse block (J/B) connector F48
- 10A fuse
- Harness for open or short between heat up switch and fuse

	▶	Repair open circuit or short to ground or short to power in harness or connectors.

7	CHECK HEAT UP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 59 and heat up switch terminal 1. Refer to Wiring Diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

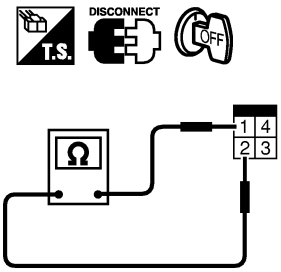
OK	▶	GO TO 7.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

http://vnx.su/

Diagnostic Procedure (Cont'd)

8	CHECK HEAT UP SWITCH

Check continuity between heat up switch terminals 1 and 2 under the following conditions.



MEC984D

Conditions	Continuity
Heat-up switch is "OFF".	Should not exist.
Heat-up switch is "ON".	Should exist.

MTBL1321

OK or NG

OK	▶	GO TO 12.
NG	▶	Replace heat up switch.

9	CHECK HEAT UP SWITCH INDICATOR CIRCUIT FOR OPEN AND SHORT

1. Turn heat up switch "OFF".
2. Turn ignition switch "OFF".
3. Disconnect heat up switch harness connector.
4. Check harness continuity between heat up switch terminals 1 and 4, heat up switch terminal 3 and body ground. Refer to Wiring Diagram.
   Continuity should exist.
5. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 11.
NG	▶	GO TO 10.

10	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F108, E225
- Harness for open and short between heat up switch and heat up switch
- Harness for open and short between heat up switch and body ground

	▶	Repair open circuit or short to ground or short to power in harness or connectors.

11	CHECK HEAT UP SWITCH INDICATOR

Check continuity between heat up switch terminals 3 and 4.
Refer to Wiring Diagram.
Continuity should exist.

OK or NG

OK	▶	GO TO 12.
NG	▶	Replace heat up switch.

http://vnx.su/

Diagnostic Procedure (Cont'd)

12	**CHECK INTERMITTENT INCIDENT**
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-78.	
▶	**INSPECTION END**

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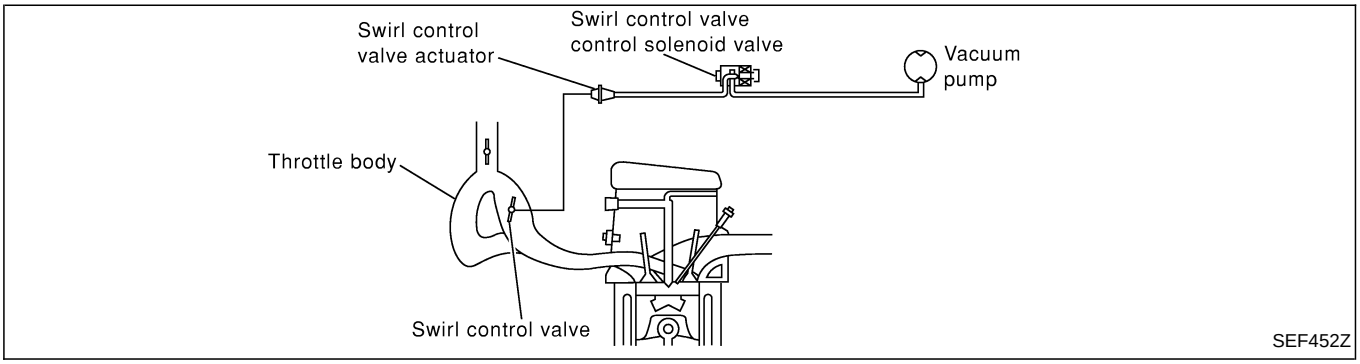
Description

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM Function	Actuator
Ignition switch	Start signal	Swirl control valve control	Swirl control valve control solenoid valve ↓ Vacuum signal Swirl control valve actuator ↓ Swirl control valve
Crankshaft position sensor (TDC)	Engine speed		
PNP switch	Park/Neutral position signal		
Engine coolant temperature sensor	Engine coolant temperature		

This system has a swirl control valve in the throttle body.
While idling and during low engine speed operation, the swirl control valve closes. Thus the velocity of the air in the intake passage increases, promoting the vaporization of the fuel and producing a swirl in the combustion chamber.
Because of this operation, this system tends to increase the burning speed of the gas mixture, improve fuel consumption, and increase the stability in running conditions.
Also, except when idling and during low engine speed operation, this system opens the swirl control valve. In this condition, this system tends to increase power by improving intake efficiency via reduction of intake flow resistance, intake flow.
The solenoid valve controls swirl control valve's shut/open condition. This solenoid valve is operated by the ECM.

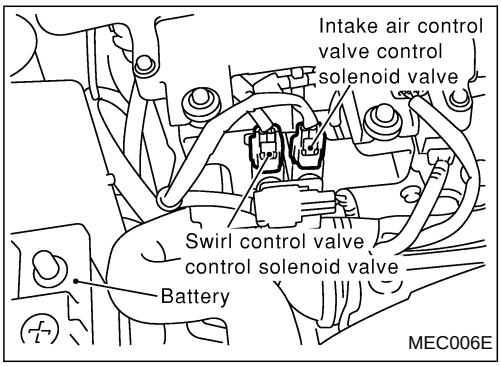
PNP switch	Engine speed	Engine coolant temperature	Swirl control valve control solenoid valve	Swirl control valve
OFF	Less than 1,250 rpm	Less than 50°C (122°F)	OFF	Open
		More than 50°C (122°F)	ON	Closed
	More than 1,250 rpm	Less than 50°C (122°F)	OFF	Open
		More than 50°C (122°F)	OFF	Open
ON	—	—	OFF	Open



http://vnx.su/

Description (Cont'd)

COMPONENT DESCRIPTION



Swirl control valve control solenoid valve

The swirl control valve control solenoid valve responds to signals from the ECM. When the ECM sends an ON (ground) signal, the solenoid valve is bypassed to apply vacuum pump vacuum to the swirl control valve actuator. This operation closes the swirl control valve. When the ECM sends an OFF signal, the vacuum signal is cut and the swirl control valve opens.

CONSULT-II Reference Value in Data Monitor Mode

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
SWRL CONT S/V	● Lift up the vehicle ● Engine: After warming up, let it idle for more than 1 second. ● Air conditioner switch: OFF ● No-load	Shift lever: Except "P" and "Neutral" position	ON
		Shift lever: "Neutral" position	OFF

ECM Terminals and Reference Value

Specification data are reference values and are measured between each terminal and ground.

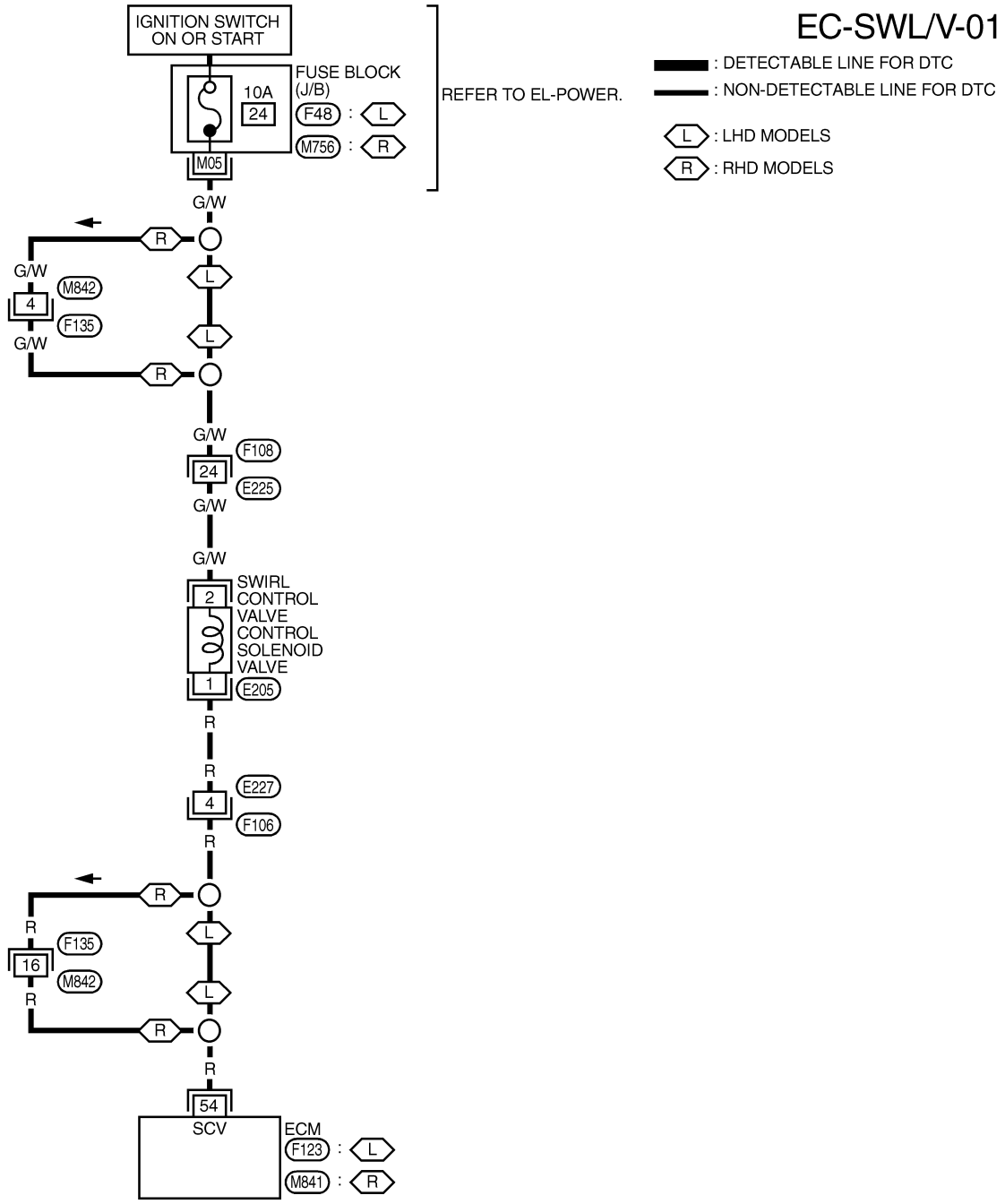
CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may damage the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
54	R	Swirl control valve control solenoid valve	Engine is running. └ **Warm-up condition** At idle speed for more than 1 second. Lift up the vehicle Gear position is except "P" and "Neutral"	Approximately 0.1V
			Engine is running. └ Idle speed Lift up the vehicle Gear position is "P" or "Neutral"	BATTERY VOLTAGE (11 - 14V)

http://vnx.su/

Wiring Diagram



YEC199A

http://vnx.su/

Diagnostic Procedure

1	INSPECTION START
Do you have CONSULT-II? **Yes or No**	
Yes ▶	GO TO 2.
No ▶	GO TO 3.

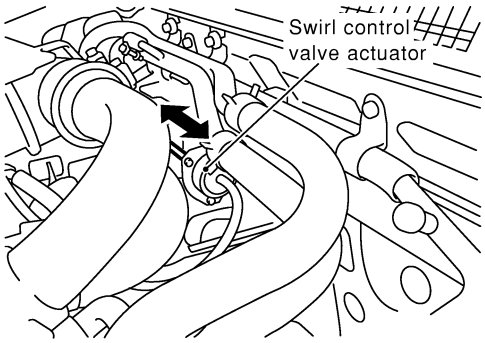
2	CHECK OVERALL FUNCTION

With CONSULT-II

1. Start engine and let it idle.
2. Select “SWIRL CONT S/V 1” in “ACTIVE TEST” mode with CONSULT-II.
3. Touch “ON” and “OFF” alternately on CONSULT-II screen.
4. Make sure that swirl control valve actuator rod moves according to “SWIRL CONT S/V 1” indication.

ACTIVE TEST	
SWIRL CONT S/V 1	ON
MONITOR	
CKPS-RPM (TDC)	750 rpm
SWRL CON S/V 1	ON

MEC007E



MEC008E

OK or NG

OK ▶	**INSPECTION END**
NG ▶	GO TO 4.

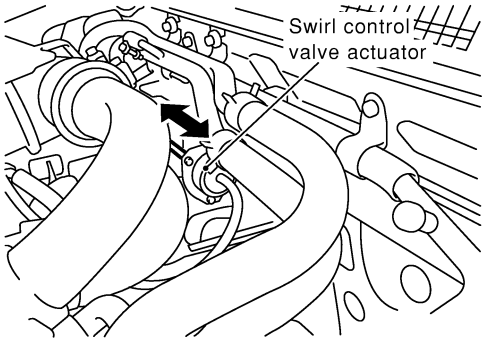
http://vnx.su/

Diagnostic Procedure (Cont'd)

3	CHECK OVERALL FUNCTION

Without CONSULT-II

1. Lift up the vehicle.
2. Start engine and warm it up to normal operating temperature.
3. Run engine at idle speed.
4. Make sure that swirl control valve actuator rod moves when shifting the shift lever to "P" or "Neutral" position and then to positions other than "P" and "Neutral".



MEC008E

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 5.

http://vnx.su/

Diagnostic Procedure (Cont'd)

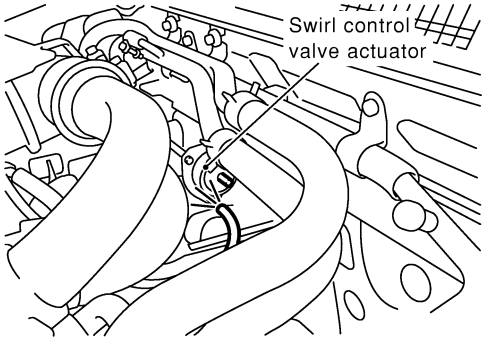
4	CHECK VACUUM SOURCE

With CONSULT-II

1. Turn ignition switch "OFF".
2. Disconnect vacuum hose connected to swirl control valve actuator.
3. Start engine and let it idle.
4. Select "SWIRL CONT S/V 1" in "ACTIVE TEST" mode with CONSULT-II.
5. Touch "ON" and "OFF" alternately on CONSULT-II screen.
6. Check vacuum hose for vacuum existence under the following conditions.

ACTIVE TEST	
SWIRL CONT S/V 1	ON
MONITOR	
CKPS-RPM (TDC)	750 rpm
SWRL CON S/V 1	ON

MEC007E



MEC009E

SWIRL CONT S/V 1	Vacuum
ON	Should exist.
OFF	Should not exist.

MTBL1326

OK or NG

OK	▶	GO TO 7.
NG	▶	GO TO 6.

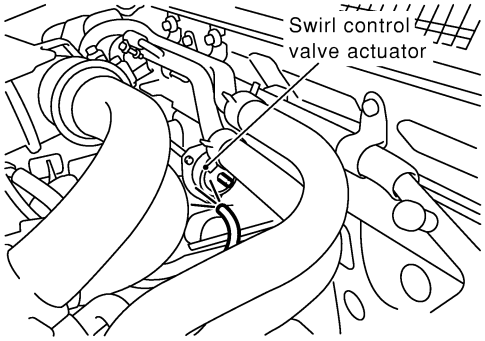
http://vnx.su/

Diagnostic Procedure (Cont'd)

5	CHECK VACUUM SOURCE

Without CONSULT-II

1. Turn ignition switch "OFF".
2. Disconnect vacuum hose connected to swirl control valve actuator.
3. Lift up the vehicle.
4. Start engine and warm it up to normal operating temperature.
5. Run engine at idle speed
6. Check vacuum hose for vacuum existence under the following conditions.



MEC009E

Conditions	Vacuum
Shift lever is in positions other than "P" and "Newtral".	Should exist.
Shift lever is in "P" or "Newtral" position.	Should not exist.

MTBL1327

OK or NG

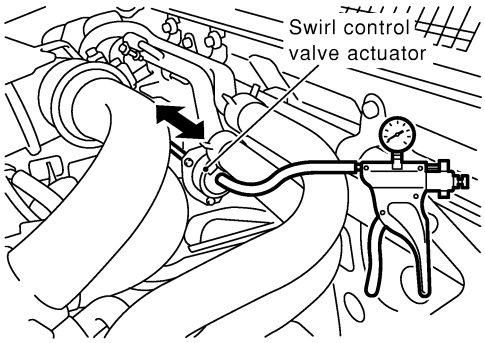
OK ▶	GO TO 7.
NG ▶	GO TO 6.

http://vnx.su/

Diagnostic Procedure (Cont'd)

6	CHECK SWIRL CONTROL VALVE ACTUATOR

1. Turn ignition switch "OFF".
2. Install a vacuum pump to swirl control valve actuator.
3. Make sure that the swirl control valve actuator rod moves smoothly when applying vacuum of −93.3 kPa (−933 mbar, −700 mmHg, −27.6 inHg) and releasing it.



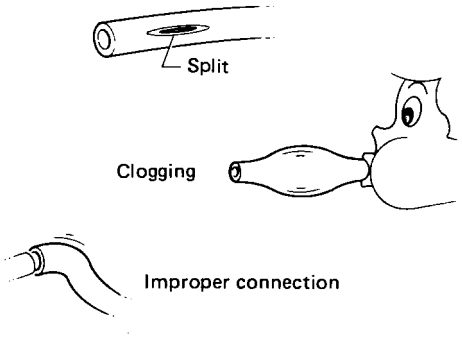
MEC010E

OK or NG

OK	▶	Repair or replace vacuum hoses and vacuum gallery.
NG	▶	Replace swirl control valve actuator.

7	CHECK VACUUM HOSE

1. Turn ignition switch "OFF".
2. Check vacuum hoses and vacuum gallery for clogging, cracks or improper connection.



SEF109L

OK or NG

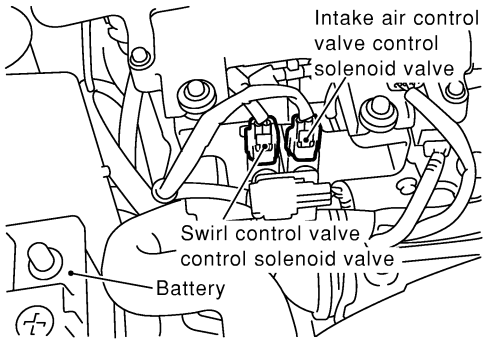
OK	▶	GO TO 8.
NG	▶	Repair or replace vacuum hoses and vacuum gallery.

http://vnx.su/

Diagnostic Procedure (Cont'd)

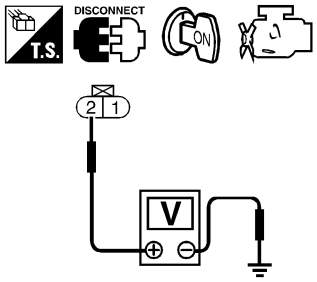
8	CHECK SWIRL CONTROL VALVE CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect swirl control valve control solenoid valve harness connector.



MEC006E

3. Turn ignition switch "ON".
4. Check voltage between swirl control valve control solenoid valve terminal 2 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF312Z

OK or NG

OK	▶	GO TO 10.
NG	▶	GO TO 9.

9	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F108, E225
- Harness connectors M842, F135
- Fuse block (J/B) connector F48 (LHD models), M756 (RHD models)
- 10A fuse
- Harness for open or short between swirl control valve control solenoid valve and fuse

	▶	Repair open circuit or short to ground or short to power in harness or connectors.

10	CHECK SWIRL CONTROL VALVE CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN OR SHORT

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 54 and swirl control valve control solenoid valve terminal 1. Refer to Wiring Diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 12.
NG	▶	GO TO 11.

http://vnx.su/

Diagnostic Procedure (Cont'd)

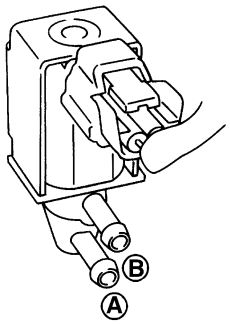
11	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E227, F106 ● Harness connectors F135, M842 (RHD models) ● Harness for open or short between swirl control valve control solenoid valve and ECM	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

12	CHECK SWIRL CONTROL VALVE CONTROL SOLENOID VALVE

With CONSULT-II

1. Reconnect all disconnected harness connectors.
2. Turn ignition switch "ON".
3. Select "SWIRL CONT S/V 1" in "ACTIVE TEST" mode with CONSULT-II.
4. Check air passage continuity of swirl control valve control solenoid valve under the following conditions.

ACTIVE TEST	
SWIRL CONT S/V 1	ON
MONITOR	
CKPS-RPM (TDC)	750 rpm
SWRL CON S/V 1	ON

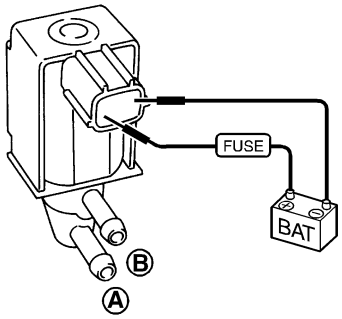


SWIRL CONT S/V 1	Air passage continuity between A and B
ON	Yes
OFF	No

SEF313Z

Without CONSULT-II

1. Apply 12V direct current between swirl control valve control solenoid valve terminals.
2. Check air passage continuity of swirl control valve control solenoid valve under the following conditions.



Condition	Air passage continuity between A and B
12V direct current supply between terminals 1 and 2	Yes
No supply	No

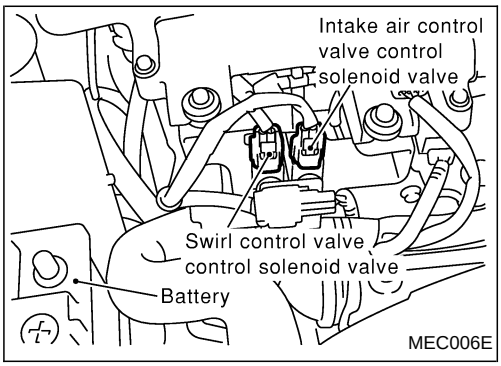
SEF335X

OK or NG

OK	▶	GO TO 13.
NG	▶	Replace swirl control valve control solenoid valve.

13	CHECK INTERMITTENT INCIDENT
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-78.	
▶	INSPECTION END

http://vnx.su/



Description

Vibration when stopping the engine can be controlled by cutting intake air just before the fuel is cut. The intake air control valve control solenoid valve controls the ON-OFF load of the intake air control valve actuator. As a result, the intake air control valve control solenoid valve will be turned ON when the ignition switch is turned OFF with the engine running and when the engine stalls. After the engine has stopped, the intake air control valve control solenoid valve will return to fully open.

Operation

Sensor	Input Signal to ECM	ECM Function	Actuator
Ignition switch	OFF	Intake air control valve control	Intake air control valve control solenoid valve ↓ Intake air control valve actuator
Crankshaft position sensor (TDC)	Engine stall		

ECM Terminals and Reference Value

Specification data are reference values, and are measured between each terminal and ground.

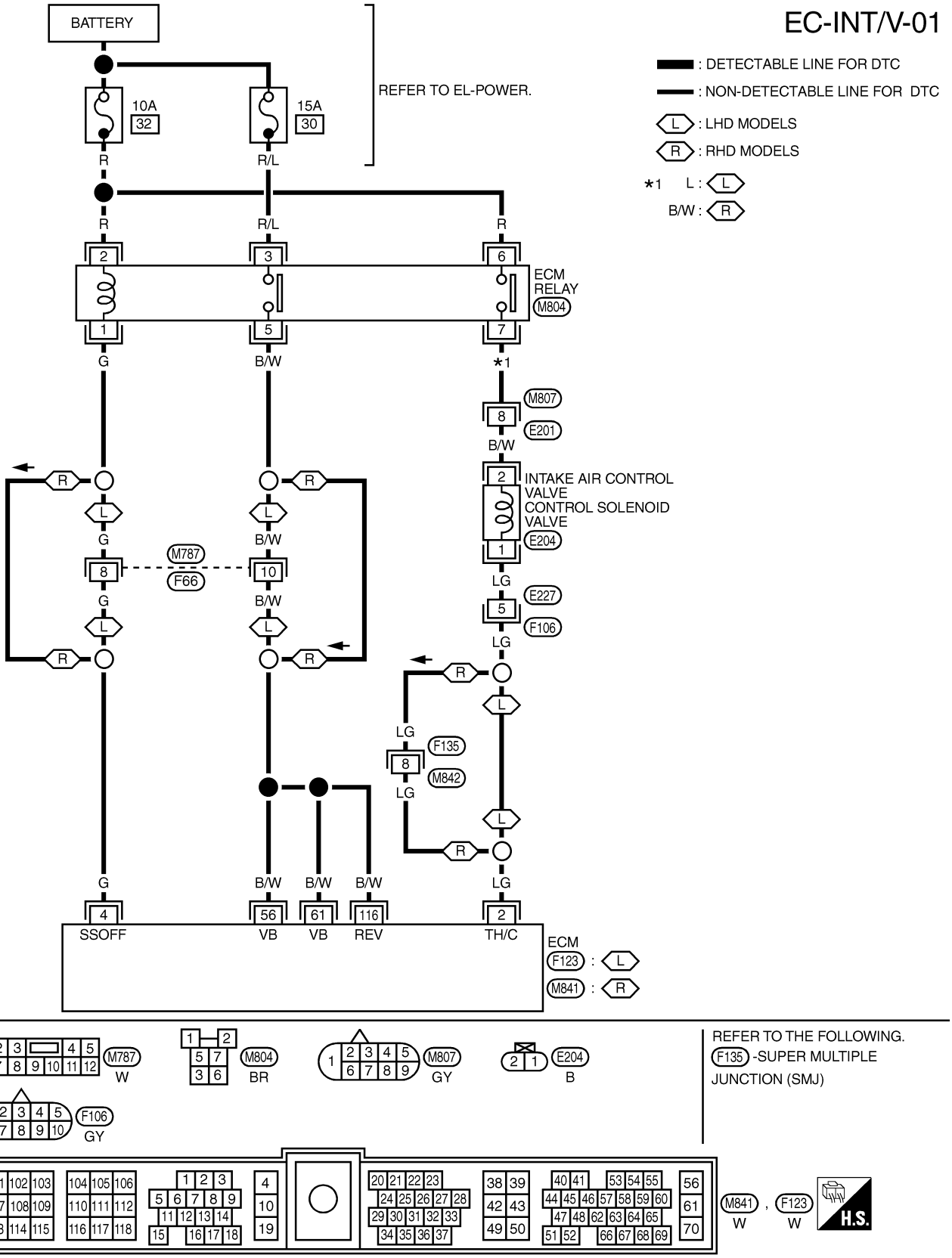
CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may damage the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
2	LG	Intake air control valve control solenoid valve	Engine is running.	BATTERY VOLTAGE (11 - 14V)
			Ignition switch "OFF" └ For a few seconds after engine stops	Approximately 0.1V

http://vnx.su/

Wiring Diagram



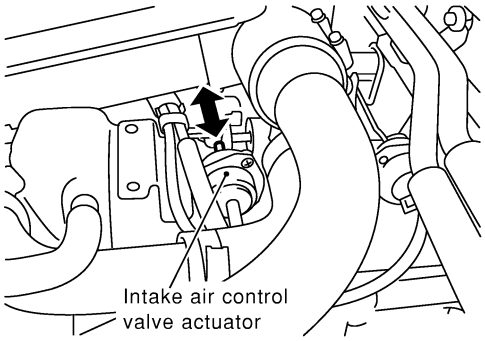
YEC200A

http://vnx.su/

Diagnostic Procedure

1	CHECK OVERALL FUNCTION

1. Start engine and let it idle.
2. Make sure that intake air control valve actuator rod moves when turning ignition switch “OFF”.



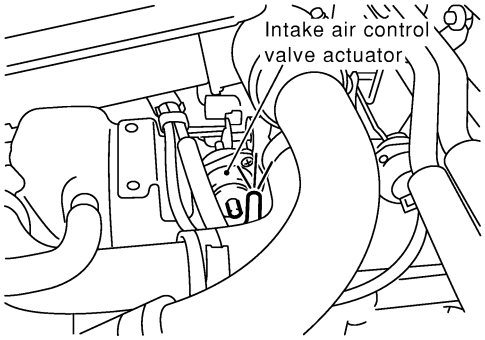
MEC011E

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 2.

2	CHECK VACUUM SOURCE

1. Turn ignition switch “OFF”.
2. Disconnect vacuum hose connected to intake air control valve actuator.
3. Start engine and let it idle.
4. Check vacuum hose for vacuum existence under the following conditions.



MEC012E

Conditions	Vacuum
For a few seconds after turning ignition switch OFF	Should exist.
Except above.	Should not exist.

MTBL1328

OK or NG

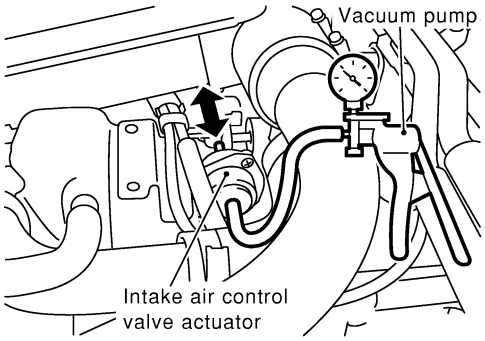
OK	▶	GO TO 3.
NG	▶	GO TO 4.

http://vnx.su/

Diagnostic Procedure (Cont'd)

3	CHECK INTAKE AIR CONTROL VALVE ACTUATOR

4. Turn ignition switch "OFF".
5. Install a vacuum pump to intake air control valve actuator.
6. Make sure that the intake air control valve actuator rod moves smoothly when applying vacuum of −93.3 kPa (−933 mbar, −700 mmHg, −27.56 psi) and releasing it.



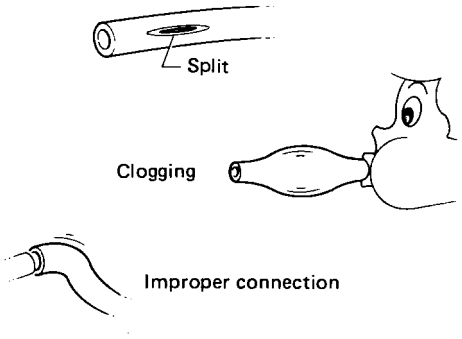
MEC013E

OK or NG

OK	▶	Repair or replace vacuum hoses and vacuum gallery.
NG	▶	Replace intake air control valve actuator.

4	CHECK VACUUM HOSE

3. Turn ignition switch "OFF".
4. Check vacuum hoses and vacuum gallery for clogging, cracks or improper connection.



SEF109L

OK or NG

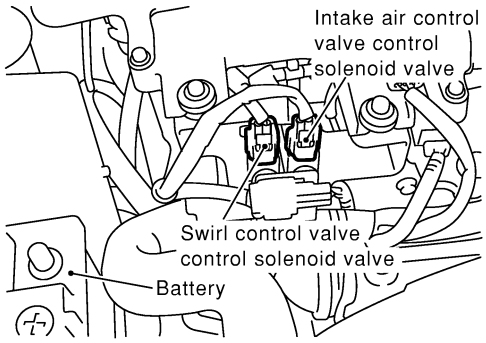
OK	▶	GO TO 5.
NG	▶	Repair or replace vacuum hoses and vacuum gallery.

http://vnx.su/

Diagnostic Procedure (Cont'd)

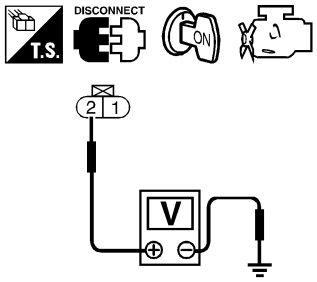
5	CHECK INTAKE AIR CONTROL VALVE CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT-I

1. Turn ignition switch "OFF".
2. Disconnect intake air control valve control solenoid valve harness connector.



MEC006E

3. Turn ignition switch "ON".
4. Check voltage between intake air control valve control solenoid valve terminal 2 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF312Z

OK or NG

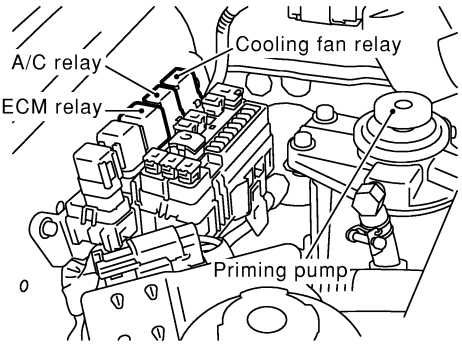
OK	▶	GO TO 11.
NG	▶	GO TO 6.

http://vnx.su/

Diagnostic Procedure (Cont'd)

6	CHECK INTAKE AIR CONTROL VALVE CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT-II

1. Turn ignition switch "OFF".
2. Disconnect ECM relay.



MEC021E

3. Check harness continuity between intake air control valve control solenoid valve terminal 2 and ECM relay terminal 7. Refer to Wiring Diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 8.
NG	▶	GO TO 7.

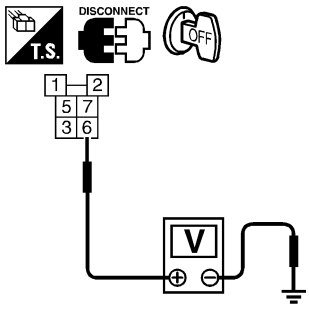
7	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M807, E201
- Harness for open or short between intake air control valve control solenoid valve and ECM relay

	▶	Repair open circuit or short to ground or short to power in harness or connectors.

8	CHECK INTAKE AIR CONTROL VALVE CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT-III

Check voltage between ECM relay terminal 6 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF297Z

OK or NG

OK	▶	GO TO 10.
NG	▶	GO TO 9.

9	DETECT MALFUNCTIONING PART

Check the following.
- 10A fuse
- Harness for open or short between ECM relay and battery

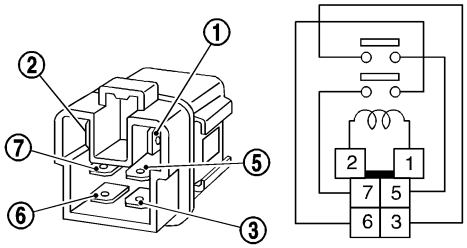
	▶	Repair open circuit or short to ground or short to power in harness or connectors.

http://vnx.su/

Diagnostic Procedure (Cont'd)

10	CHECK ECM RELAY

1. Apply 12V direct current between ECM relay terminals 1 and 2.
2. Check continuity between ECM relay terminals 3 and 5, 6 and 7.



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

SEF296X

OK or NG

OK	▶	GO TO 13.
NG	▶	Replace ECM relay.

11	CHECK INTAKE AIR CONTROL VALVE CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN OR SHORT

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 2 and intake air control valve control solenoid valve terminal 1. Refer to Wiring Diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 13.
NG	▶	GO TO 12.

12	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E227, F106
- Harness connectors F135, M842 (RHD models)
- Harness for open or short between swirl control valve control solenoid valve and ECM

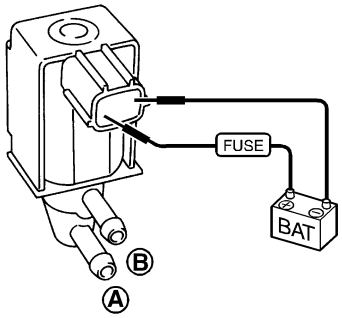
	▶	Repair open circuit or short to ground or short to power in harness or connectors.

http://vnx.su/

Diagnostic Procedure (Cont'd)

13	CHECK INTAKE AIR CONTROL VALVE CONTROL SOLENOID VALVE

1. Apply 12V direct current between intake air control valve control solenoid valve terminals.
2. Check air passage continuity of intake air control valve control solenoid valve under the following conditions.



Condition	Air passage continuity between A and B
12V direct current supply between terminals 1 and 2	Yes
No supply	No

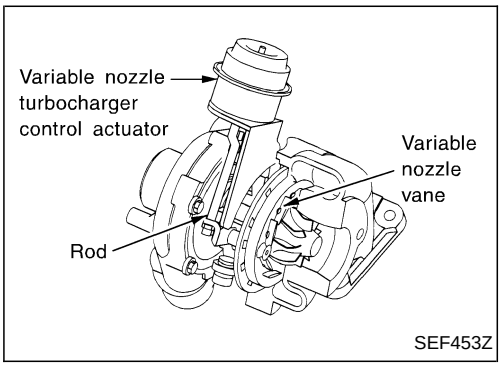
SEF335X

OK or NG

OK	▶	GO TO 14.
NG	▶	Replace intake control valve control solenoid valve.

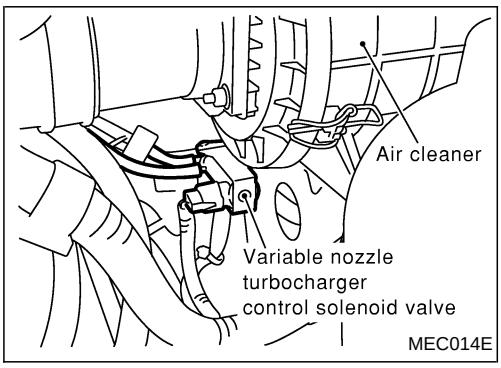
14	CHECK INTERMITTENT INCIDENT
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-78.	
▶	**INSPECTION END**

http://vnx.su/



Description

The load from the variable nozzle turbocharger control solenoid valve controls the actuator. By changing the variable nozzle vane opening through the rods, the intake air volume is adjusted.



The variable nozzle turbocharger control solenoid valve is moved by ON/OFF pulse from the ECM. The longer the ON pulse, the charge air pressure rises.

CONSULT-II Reference Value in Data Monitor Mode

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
VNT S/V 1	• Engine: After warming up • Air conditioner switch: “OFF” • Shift lever: Neutral position • No-load	Idle	Approx. 56%
		2,000 rpm	Approx. 20%

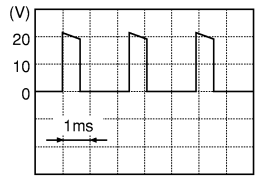
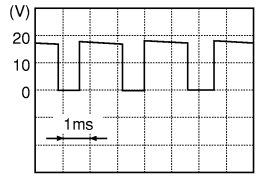
http://vnx.su/

ECM Terminals and Reference Value

Specification data are reference values, and are measured between each terminal and ground.

CAUTION:

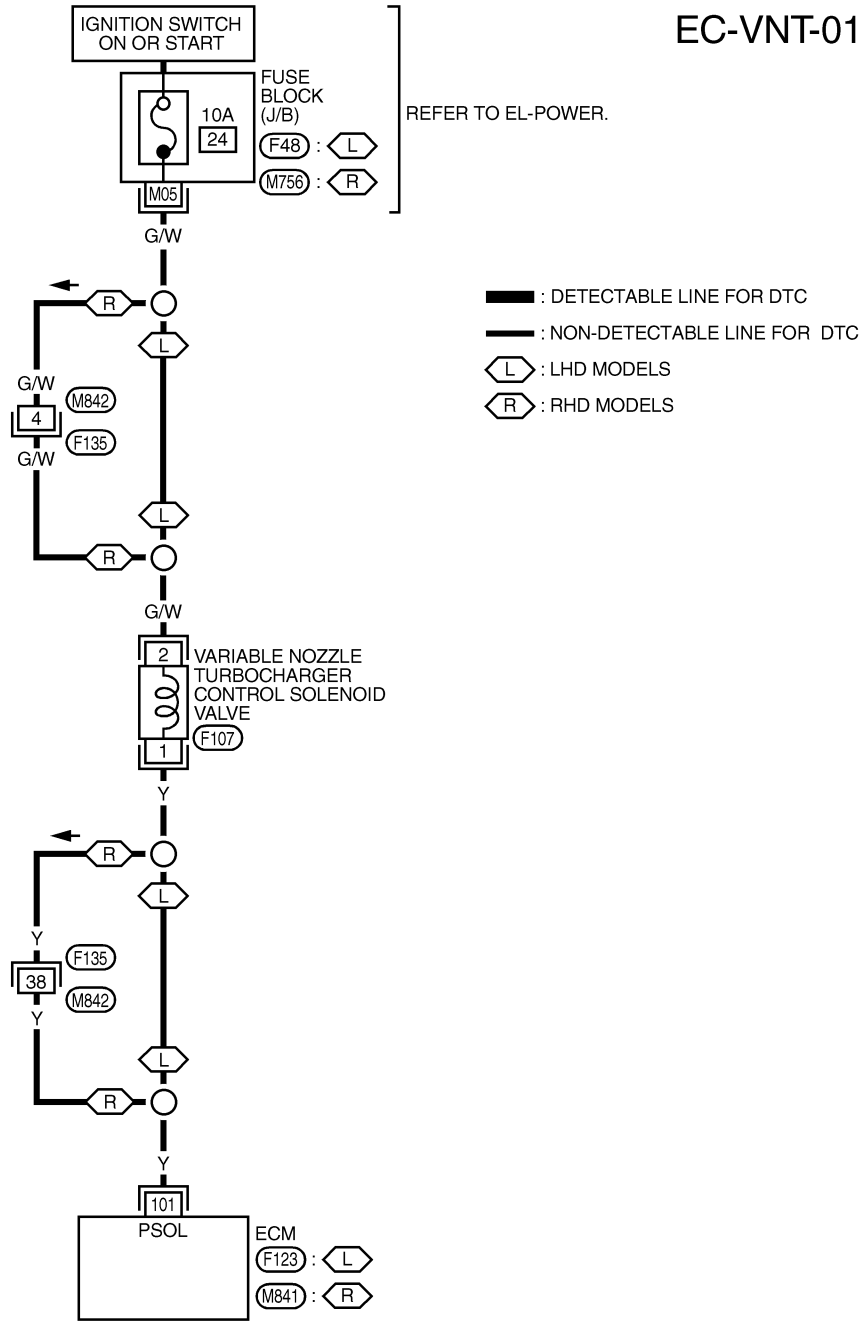
Do not use ECM ground terminals when measuring input/output voltage. Doing so may damage the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
101	Y	Variable nozzle turbo-charger control solenoid valve	Engine is running. └ **Warm-up condition** Idle speed	Approximately 6.8V  SEF253Z
			Engine is running. └ **Warm-up condition** Engine speed is 2,000 rpm	Approximately 11V  SEF254Z

http://vnx.su/

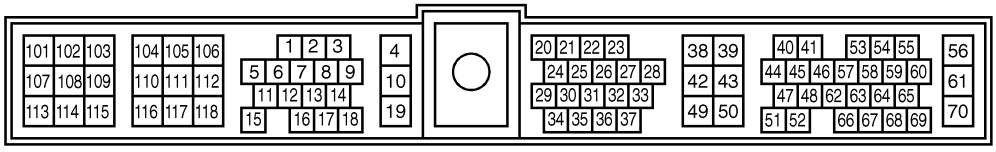
Wiring Diagram

EC-VNT-01



2 1 F107

REFER TO THE FOLLOWING.
F135 -SUPER MULTIPLE JUNCTION (SMJ)
M756 , F48 -FUSE BLOCK-JUNCTION BOX (J/B)



M841 W , F123 W

H.S.

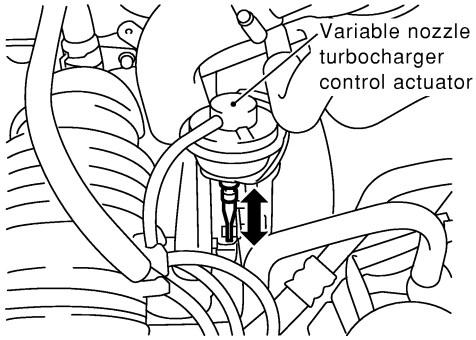
YEC201A

http://vnx.su/

Diagnostic Procedure

1	CHECK OVERALL FUNCTION

1. Start engine and let it idle.
2. Make sure that variable nozzle turbocharger control actuator rod moves when revving engine up to 3,000 rpm and returning to idle.



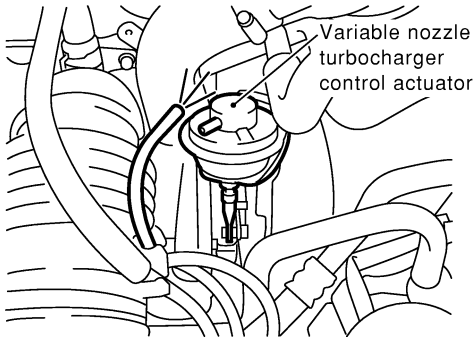
MEC015E

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 2.

2	CHECK VACUUM SOURCE

1. Turn ignition switch “OFF”.
2. Disconnect vacuum hose connected to variable nozzle turbocharger control actuator.
3. Start engine and let it idle.
4. Check vacuum hose for vacuum existence.



MEC016E

Vacuum should exist.

OK or NG

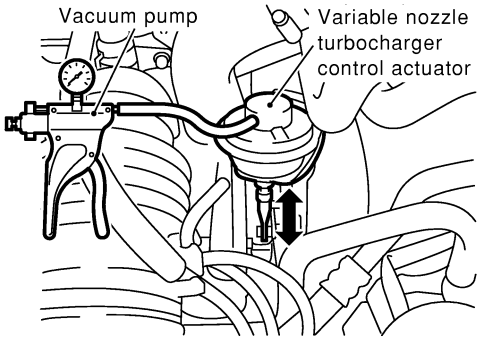
OK	▶	GO TO 3.
NG	▶	GO TO 5.

http://vnx.su/

Diagnostic Procedure (Cont'd)

3	CHECK VARIABLE NOZZLE TURBOCHARGER CONTROL ACTUATOR

1. Turn ignition switch "OFF".
2. Install a vacuum pump to variable nozzle turbocharger control actuator.
3. Make sure that the variable nozzle turbocharger control actuator rod moves smoothly when applying vacuum of −53.3 kPa (−533 mbar, −400 mmHg, −15.75 inHg) and releasing it.



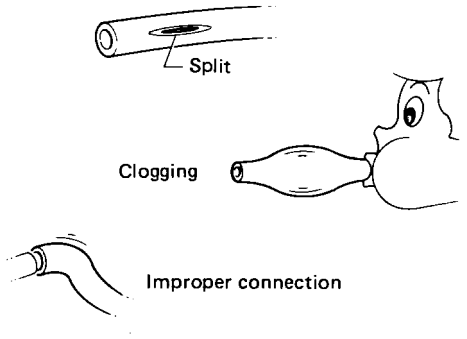
MEC017E

OK or NG

OK	▶	GO TO 4.
NG	▶	Replace turbocharger assembly.

4	CHECK VACUUM HOSE

1. Turn ignition switch "OFF".
2. Check vacuum hoses and vacuum gallery for clogging, cracks or improper connection.



SEF109L

OK or NG

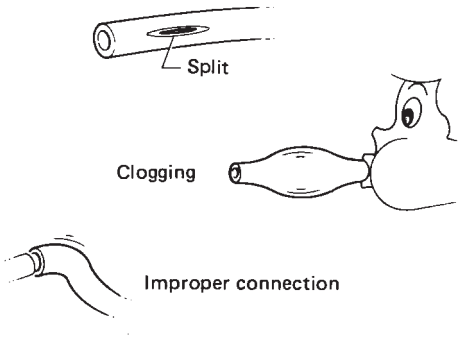
OK	▶	GO TO 9.
NG	▶	Repair or replace vacuum hoses and vacuum gallery.

http://vnx.su/

Diagnostic Procedure (Cont'd)

5	CHECK VACUUM HOSE

1. Turn ignition switch "OFF".
2. Check vacuum hoses and vacuum gallery for clogging, cracks or improper connection.



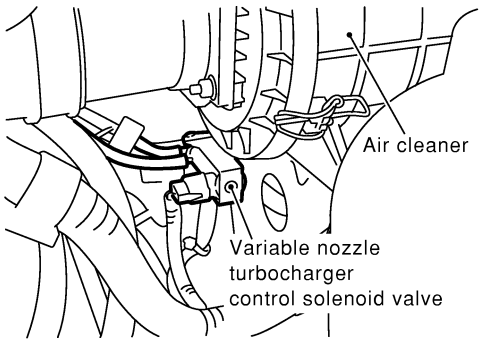
SEF109L

OK or NG

OK	▶	GO TO 6.
NG	▶	Repair or replace vacuum hoses and vacuum gallery.

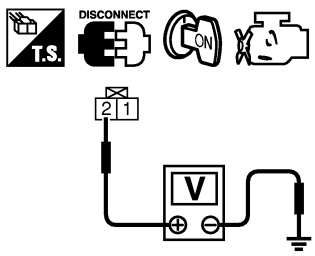
6	CHECK VARIABLE NOZZLE TURBOCHARGER CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect variable nozzle turbocharger control solenoid valve harness connector.



MEC014E

3. Turn ignition switch "ON".
4. Check voltage between variable nozzle turbocharger control solenoid valve terminal 2 and ground with CONSULT-II or tester.



MEC985D

Voltage: Battery voltage

OK or NG

OK	▶	GO TO 8.
NG	▶	GO TO 7.

http://vnx.su/

Diagnostic Procedure (Cont'd)

7	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors M842, F135 (RHD models) ● Fuse block (J/B) connector F48 (LHD models), M756 (RHD models) ● 10A fuse ● Harness for open or short between variable nozzle turbocharger control solenoid valve and fuse	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

8	CHECK VARIABLE NOZZLE TURBOCHARGER CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN OR SHORT
1. Turn ignition switch "OFF". 2. Disconnect ECM harness connector. 3. Check harness continuity between ECM terminal 101 and variable nozzle turbocharger control solenoid valve terminal 1. Refer to Wiring Diagram. **Continuity should exist.** 4. Also check harness for short to ground and short to power.	
OK or NG	
OK ▶	GO TO 10.
NG ▶	GO TO 9.

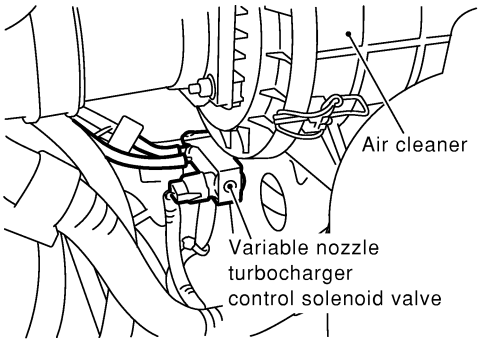
9	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors F135, M842 (RHD models) ● Harness for open or short between variable nozzle turbocharger control solenoid valve and ECM	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

http://vnx.su/

Diagnostic Procedure (Cont'd)

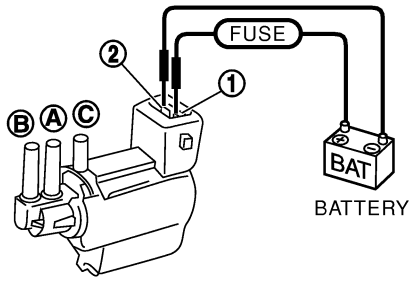
10	CHECK VARIABLE NOZZLE TURBOCHARGER CONTROL SOLENOID VALVE

1. Disconnect variable nozzle turbocharger control solenoid valve harness connector.



MEC014E

2. Apply 12V direct current between variable nozzle turbocharger control solenoid valve terminals.
3. Check air passage continuity of variable nozzle turbocharger control solenoid valve under the following conditions.



Conditions	Air passage continuity between Ⓐ and Ⓑ	Air passage continuity between Ⓐ and Ⓒ
12V direct current supply between terminals ① and ②	Yes	No
No supply	No	Yes

Operation takes less than 1 second.

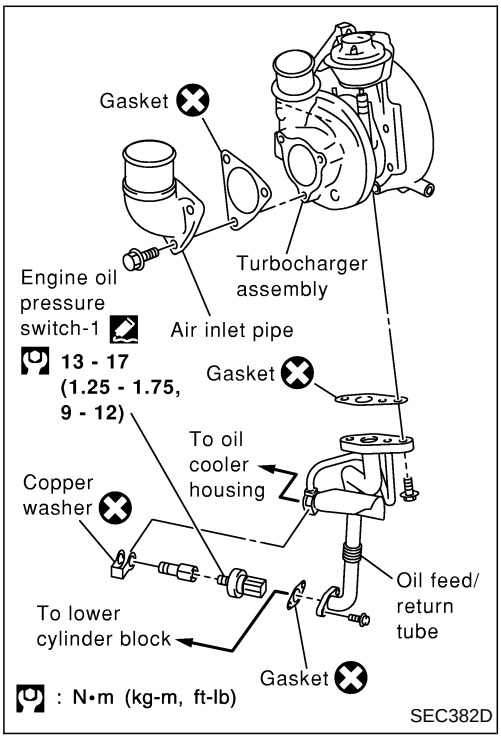
SEF454Z

OK or NG

OK	▶	GO TO 11.
NG	▶	Replace variable nozzle turbocharger control solenoid valve.

11	CHECK INTERMITTENT INCIDENT
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-78.	
▶	**INSPECTION END**

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Component Description

Engine oil pressure switches that monitor oil pressure at high engine speed (switch-2) and oil pressure at low engine speed (switch-1) are located on oil passage.
For detection of oil pressure at low engine speed, engine oil pressure switch-1 turns oil pressure warning lamp ON if oil pressure drops too low under normal engine running speed (below specified pressure of engine oil pressure switch-1 at low engine speed).
For detection of oil pressure at high engine speed, engine oil pressure switch-2 sends an ON signal to the ECM if oil pressure drops lower than specified value when engine is running at high speed or under high loading. Then the ECM turns oil pressure warning lamp ON.

System Description

	Malfunction is detected when...	Condition	Oil pressure warning lamp
Engine oil pressure switch-1	Engine oil amount is too low.	• Engine is running.	ON
	Except above condition		OFF
Engine oil pressure switch-2	An excessively high voltage is sent to the ECM.	• Ignition switch: ON (Engine stopped) • Engine is running	ON
	Engine oil amount is below low level for running engine at high speed.	More than 5 seconds when the following conditions are met • Engine: After warming-up [Below 95°C (203°F)] • Engine speed: 3,600 - 4,200 rpm • Engine oil pressure switch-2: ON	ON
	Except above condition		OFF

NOTE:
Oil pressure warning lamp is not turned OFF until ignition switch is turned OFF when turning ON during engine running.
If the test is performed again, always perform the test after turning ignition switch OFF.

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ECM Terminals and Reference Value

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

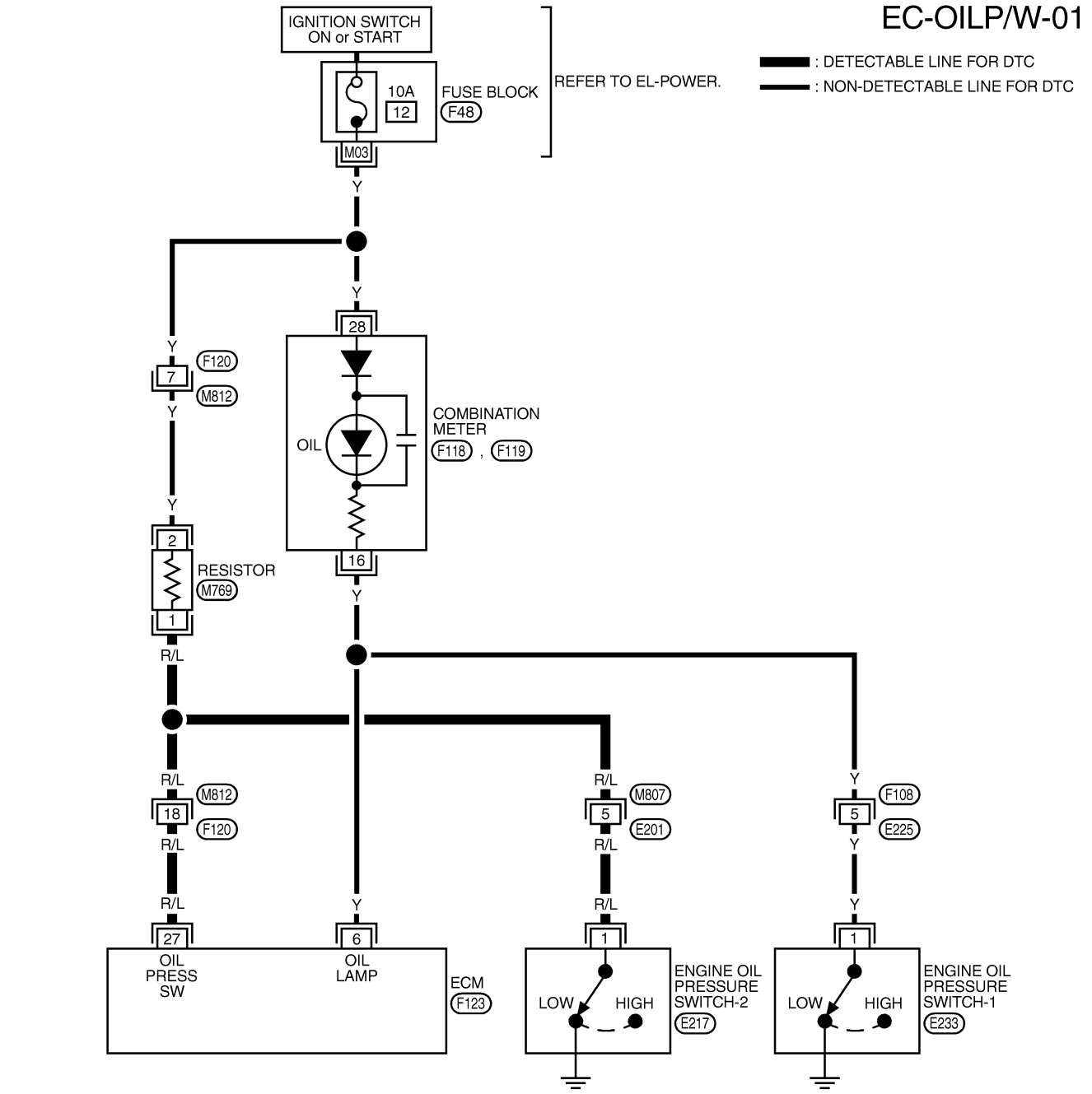
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
6	Y	Oil pressure warning lamp	[Ignition switch "ON"] ● Oil pressure warning lamp is illuminated	Approximately 0V
			[Engine is running] ● Oil pressure warning lamp is not illuminated	Battery voltage (12 - 14V)
27	R/L	Engine oil pressure switch-2	[Ignition switch "ON"]	Approximately 0V
			[Engine is running] ● Engine speed is 3,600 rpm	Battery voltage (12 - 14V)

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Wiring Diagram

LHD MODELS

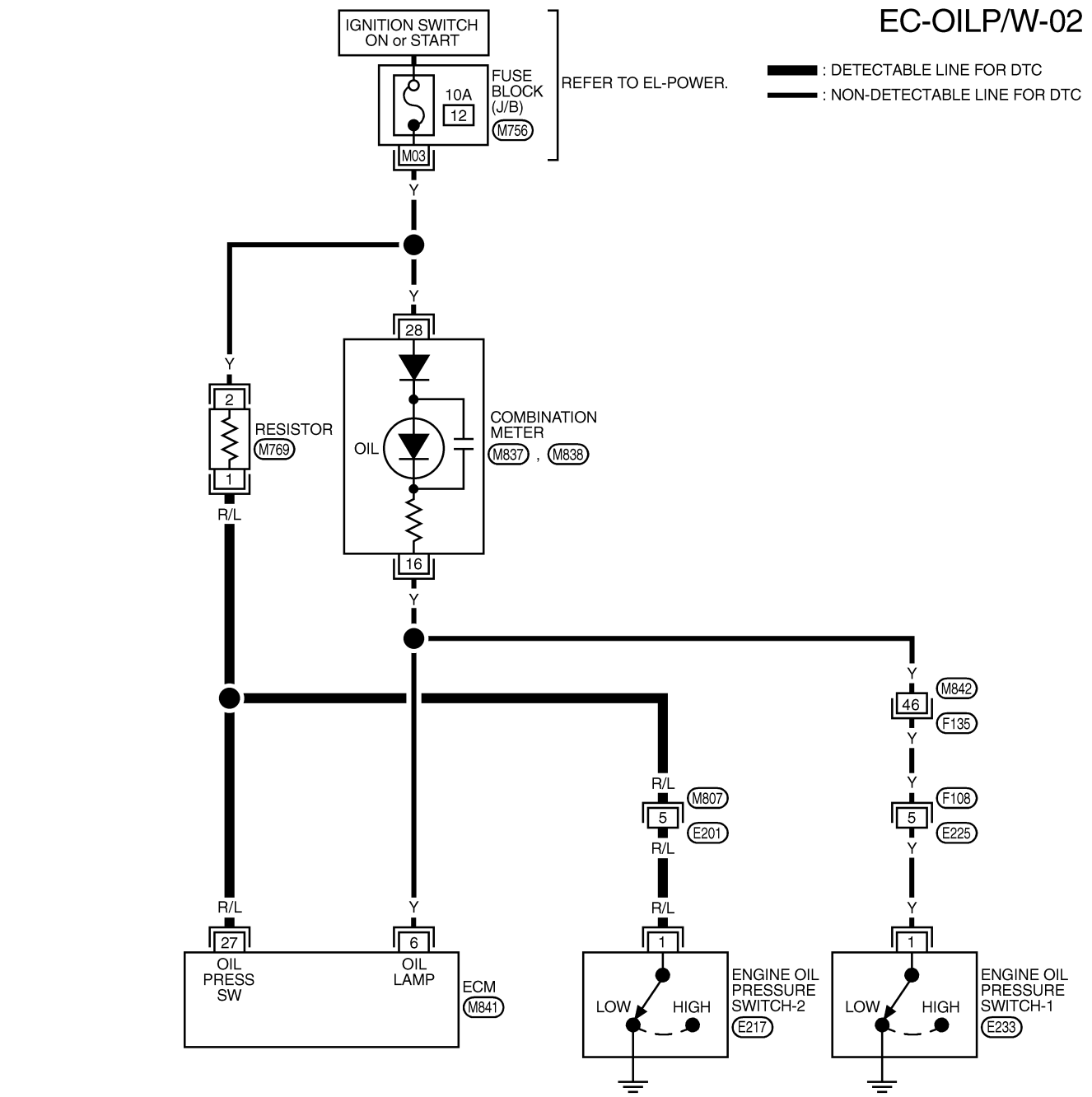


YEC667A

http://vnx.su/

Wiring Diagram (Cont'd)

RHD MODELS



YEC668A

http://vnx.su/

Diagnostic Procedure

1	OVERALL FUNCTION CHECK-I

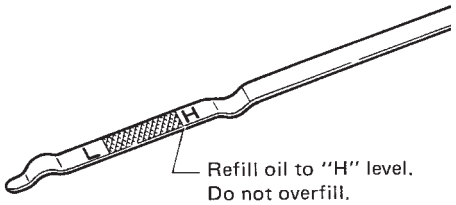
1. Turn ignition switch “ON”.
2. Check oil pressure warning lamp in combination meter illumination.
   Oil pressure warning lamp should illuminate after turning ignition switch “ON” immediately.

OK or NG

OK	▶	GO TO 2.
NG	▶	GO TO 8.

2	CHECK ENGINE OIL LEVEL

1. Turn ignition switch “OFF”.
2. Check engine oil level.



SMA885B

Engine oil level: Between L and H

OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO 3.

3	DETECT MALFUNCTIONING PART

Check the following.
- Check area around drain plug and oil filter for oil leakage.
- Check area around cylinder block oil gallery.

	▶	If NG, repair or replace. Refer to EM and LC sections.

4	OVERALL FUNCTION CHECK-II

1. Turn ignition switch “ON” and wait at least 3 seconds.
2. Start engine and let it idle.
3. Check oil pressure warning lamp illumination.
   Oil pressure warning lamp should go off.

OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 14.

5	OVERALL FUNCTION CHECK-III

1. Warm up engine to the normal operating temperature.
2. Keep engine speed between 3,600 to 4,200 rpm at least 30 seconds.
3. Check oil pressure warning lamp illumination.
   Oil pressure warning lamp should not illuminate.

OK or NG

OK	▶	GO TO 6.
NG	▶	GO TO 24.

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Diagnostic Procedure (Cont'd)

6	CHECK ECM OUTPUT SIGNAL CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Disconnect combination meter harness connector.
4. Check harness continuity between ECM terminal 6 and combination meter terminal 16.
   Refer to Wiring Diagram.
   Continuity should exist.
5. Also check harness for short to ground or short to power.

OK or NG

OK	▶	INSPECTION END
NG	▶	GO TO 7.

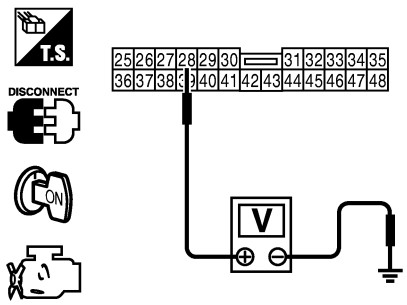
7	DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between ECM and combination meter

	▶	Repair open circuit or short to ground or short to power in harness or connectors.

8	CHECK COMBINATION METER POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect combination meter harness connector.
3. Turn ignition switch "ON".
4. Check voltage between combination meter terminal 28 and ground.



YEC701A

Voltage: Battery voltage

OK or NG

OK	▶	GO TO 10.
NG	▶	GO TO 9.

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Diagnostic Procedure (Cont'd)

9	DETECT MALFUNCTIONING PART
Check the following. ● 10A fuse ● Fuse block (J/B) connector F48 (LHD models) ● Fuse block (J/B) connector M756 (RHD models) ● Harness for open or short between combination meter and fuse block	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

10	CHECK ENGINE OIL PRESSURE SWITCH-1 INPUT SIGNAL CIRCUIT
1. Turn ignition switch "OFF". 2. Disconnect engine oil pressure switch-1 harness connector. 3. Check harness continuity between combination meter terminal 16 and engine oil pressure switch-1 terminal 1. Refer to Wiring Diagram. **Continuity should exist.** 4. Also check harness for short to power. **OK or NG**	
OK ▶	GO TO 12.
NG ▶	GO TO 11.

11	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors F108, E225 ● Harness connectors M842, F135 (RHD models) ● Harness for open or short between combination meter and engine oil pressure switch-1	
▶	Repair open circuit or short to power in harness or connectors.

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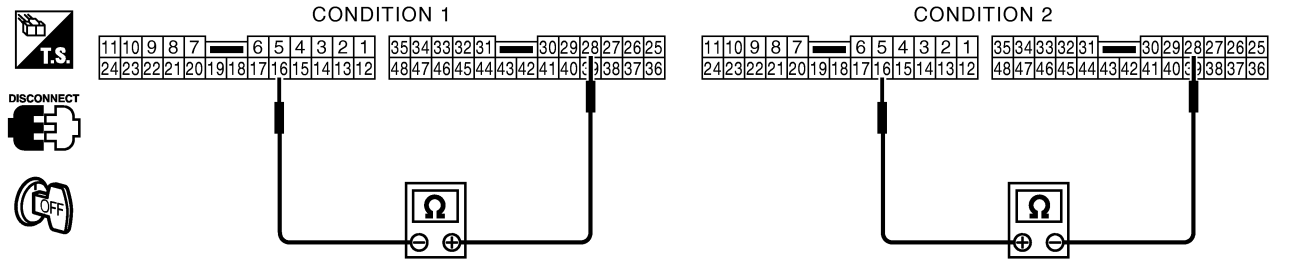
Diagnostic Procedure (Cont'd)

12	CHECK COMBINATION METER

Check combination meter continuity between the following terminals. Refer to Wiring Diagram.

	Combination meter terminal (Polarity)	Continuity
Condition 1	28 (+) - 16 (–)	Should not exist.
Condition 2	16 (+) - 28 (–)	Should exist.

MTBL1798



YEC702A

OK or NG

OK	▶	GO TO 13.
NG	▶	Repair or replace combination meter. Refer to EL section.

13	CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-78.

OK	▶	Replace engine oil pressure switch-1.
NG	▶	Repair harness or connectors.

14	OVERALL FUNCTION CHECK-IV

1. Turn ignition switch "OFF".
2. Disconnect engine oil pressure switch-1 harness connector.
3. Turn ignition switch "ON" and wait at least 3 seconds.
4. Start engine and let it idle.
5. Check oil pressure warning lamp illumination.
   Oil pressure warning lamp should go off.

OK or NG

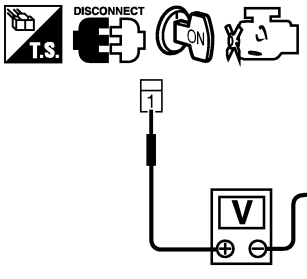
OK	▶	Replace engine oil pressure switch-1.
NG	▶	GO TO 15.

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Diagnostic Procedure (Cont'd)

15	CHECK ENGINE OIL PRESSURE SWITCH-1 INPUT SIGNAL CIRCUIT

1. Turn ignition switch "OFF" and then "ON".
2. Check voltage between engine oil pressure switch-1 terminal 1 and ground with CONSULT-II or tester.



SEC976D

Voltage: Battery voltage

OK or NG

OK	▶	GO TO 17.
NG	▶	GO TO 16.

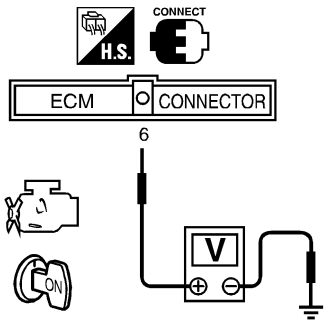
16	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F108, E225
- Harness connectors M842, F135 (RHD models)
- Harness for short between combination meter and engine oil pressure switch-1

	▶	Repair harness or connectors.

17	CHECK ECM OUTPUT SIGNAL CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Turn ignition switch "ON".
4. Check voltage between ECM terminal 6 and ground with CONSULT-II or tester.



SEC977D

Voltage: Battery voltage

OK or NG

OK	▶	GO TO 19.
NG	▶	GO TO 18.

18	DETECT MALFUNCTIONING PART

Check the following.
- Harness for short between combination meter and ECM

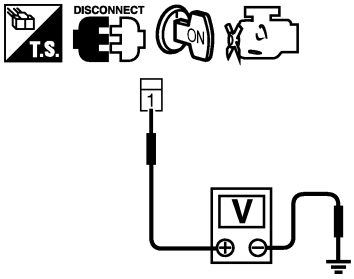
	▶	Repair harness or connectors.

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Diagnostic Procedure (Cont'd)

19	CHECK ENGINE OIL PRESSURE SWITCH-2 INPUT SIGNAL CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect engine oil pressure switch-2 harness connector.
3. Turn ignition switch "ON".
4. Check voltage between engine oil pressure switch-2 terminal 1 and ground with CONSULT-II or tester.



SEC976D

Voltage: Battery voltage

OK or NG

OK	▶	GO TO 21.
NG	▶	GO TO 20.

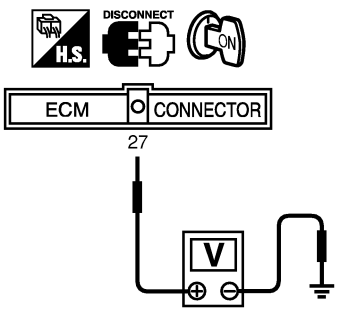
20	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M807, E201
- Harness connectors F120, M812 (LHD models)
- Resistor
- 10A fuse
- Fuse block (J/B) connector F48 (LHD models)
- Fuse block (J/B) connector M756 (RHD models)
- Harness for open between engine oil pressure switch-2 and fuse

	▶	Repair harness or connectors.

21	CHECK ECM INPUT SIGNAL CIRCUIT-I

Check voltage between ECM terminal 27 and ground with CONSULT-II or tester.



SEC388D

Voltage: Battery voltage

OK or NG

OK	▶	GO TO 23.
NG	▶	GO TO 22.

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Diagnostic Procedure (Cont'd)

22	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors F120, M812 (LHD models) ● Fuse block (J/B) connector F48 (LHD models) ● Fuse block (J/B) connector M756 (RHD models) ● 10A fuse ● Resistor ● Harness for open or short between ECM and fuse	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

23	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT" EC-78.	
OK or NG	
OK ▶	Replace engine oil pressure switch-2.
NG ▶	Repair harness or connectors.

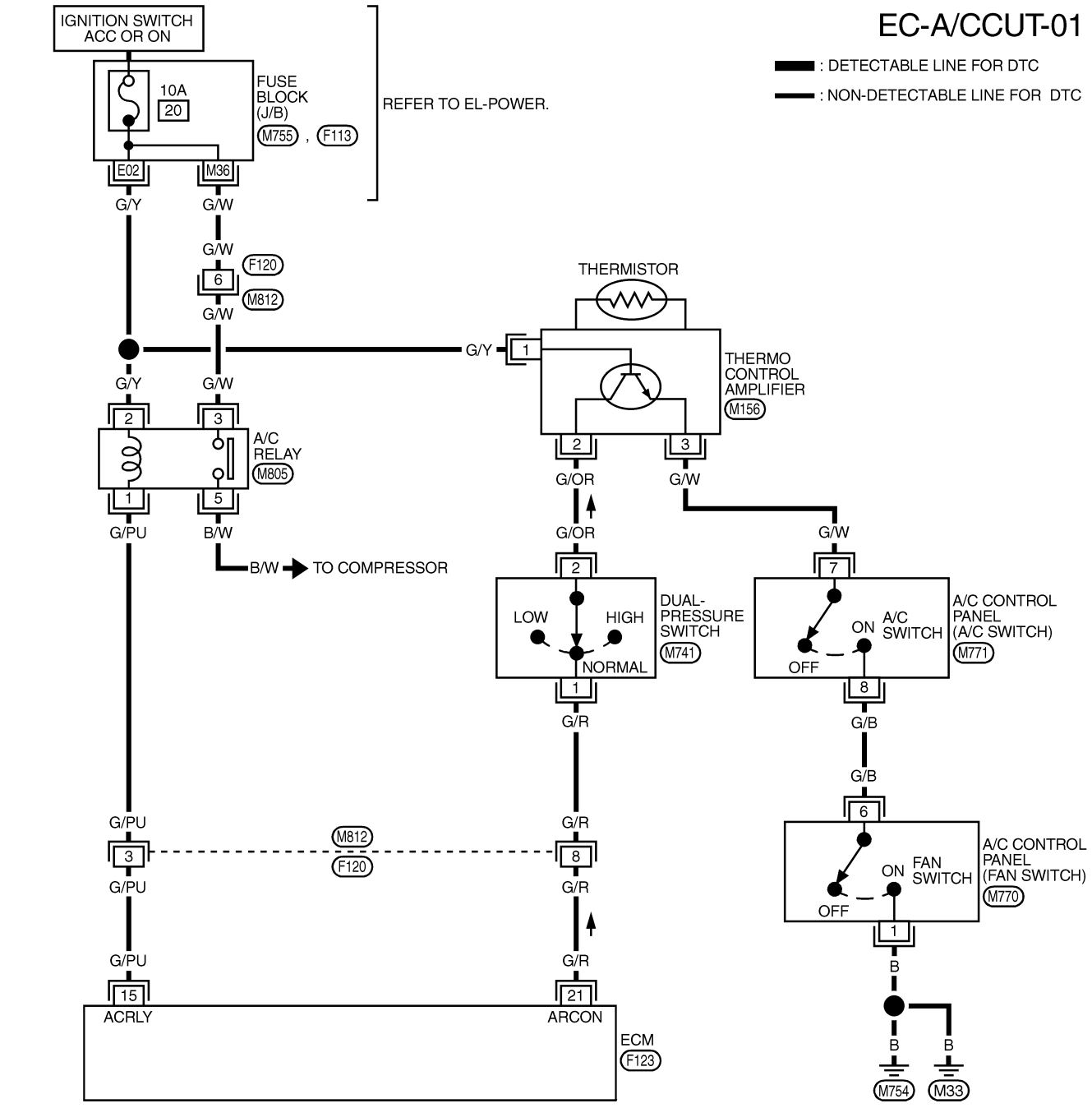
24	OVERALL FUNCTION CHECK-V
1. Turn ignition switch "OFF". 2. Disconnect engine oil pressure switch-2 harness connector. 3. Start engine and warm it up to normal operating temperature. 4. Keep engine speed between 3,600 to 4,200 rpm at least 30 seconds. 5. Check oil pressure warning lamp illumination. **Oil pressure warning lamp should not illuminate.**	
OK or NG	
OK ▶	GO TO 25.
NG ▶	Replace oil pressure switch-2.

25	DETECT MALFUNCTIONING PART
Check the following. ● Harness for short to ground between ECM and engine oil pressure switch-2 ● Harness for short to ground between ECM and fuse block	
▶	Repair short to ground in harness or connectors.

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Wiring Diagram

LHD MODELS

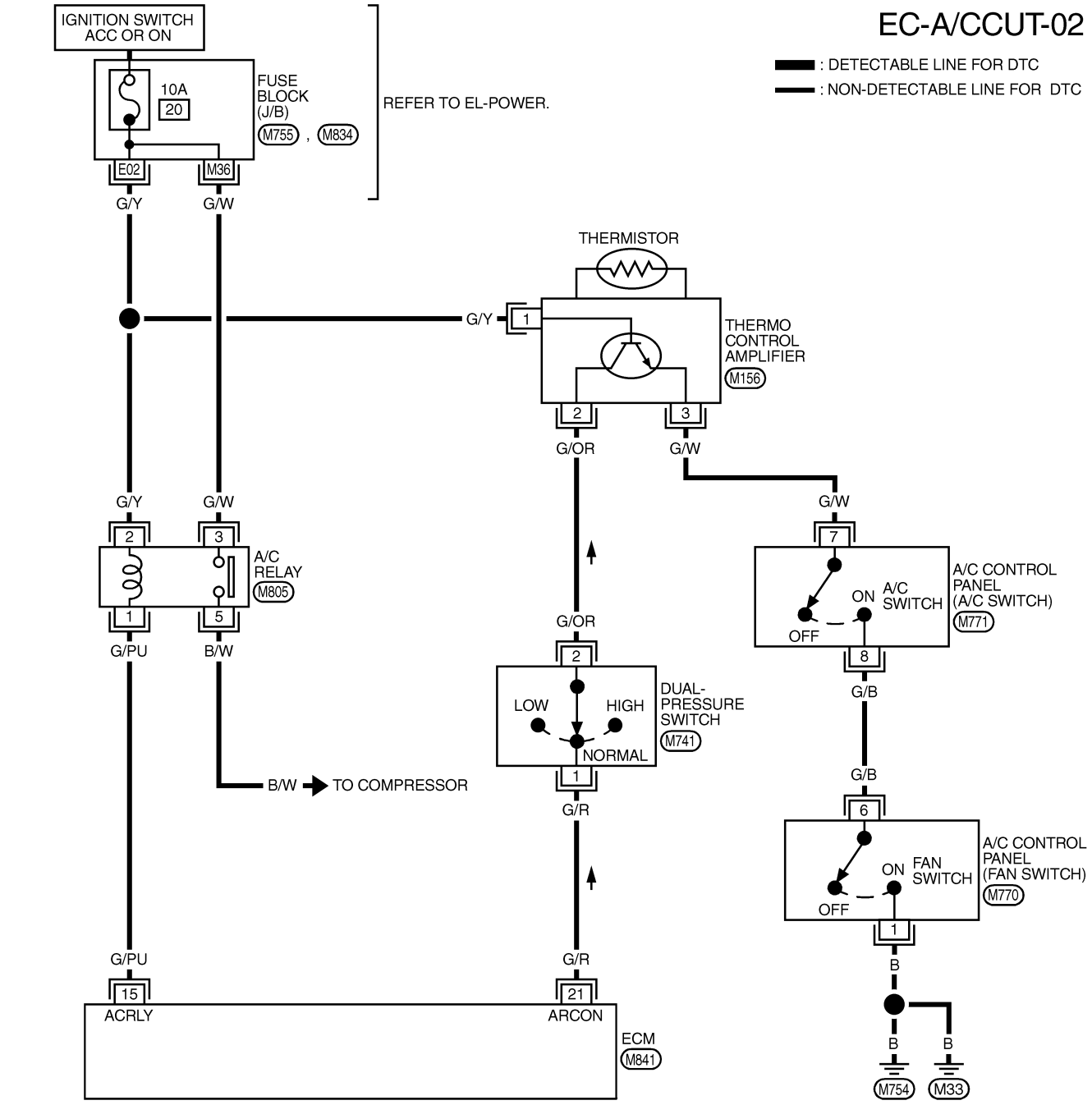


YEC665A

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Wiring Diagram (Cont'd)

RHD MODELS

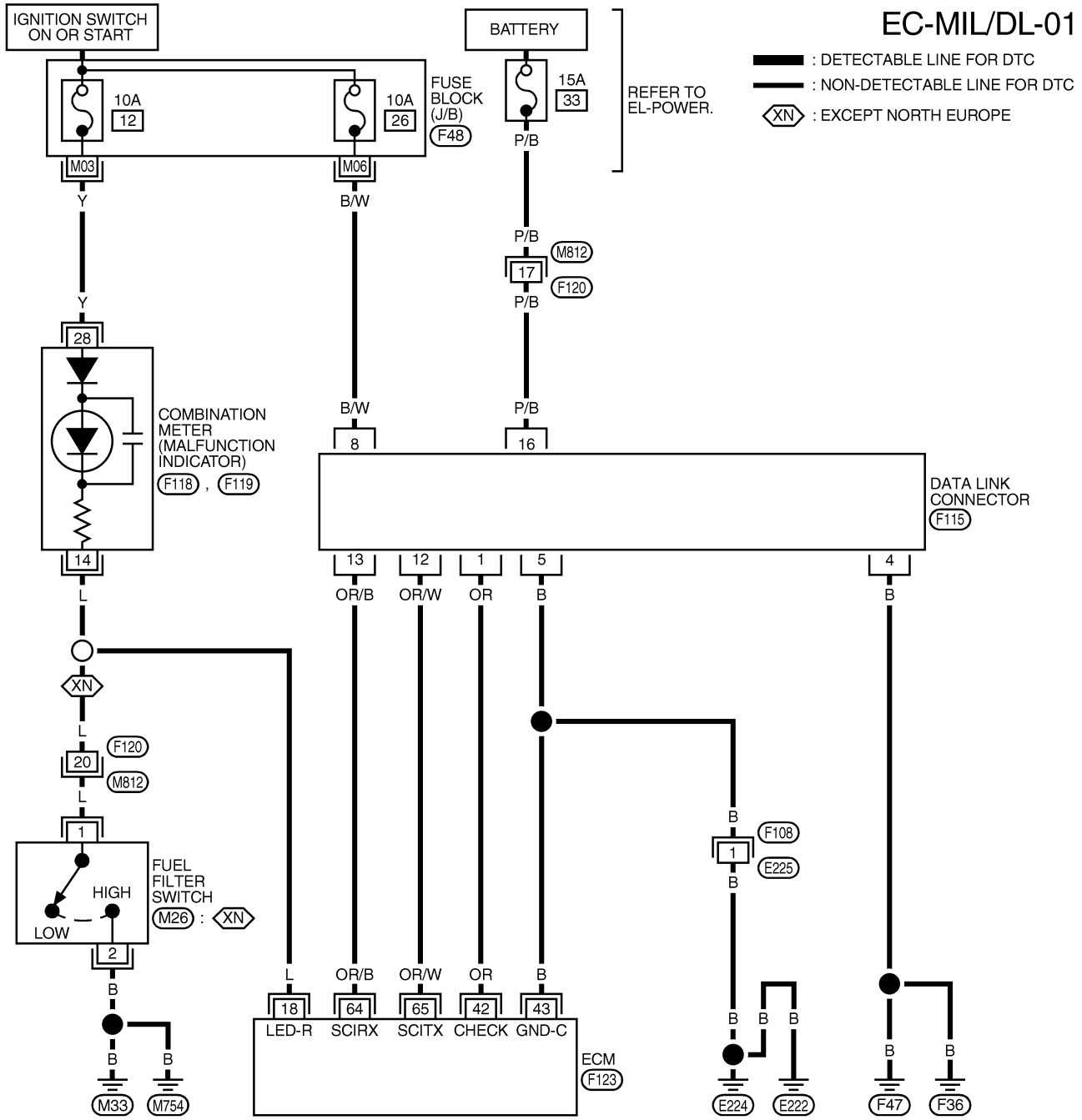


YEC666A

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Wiring Diagram

LHD MODESL

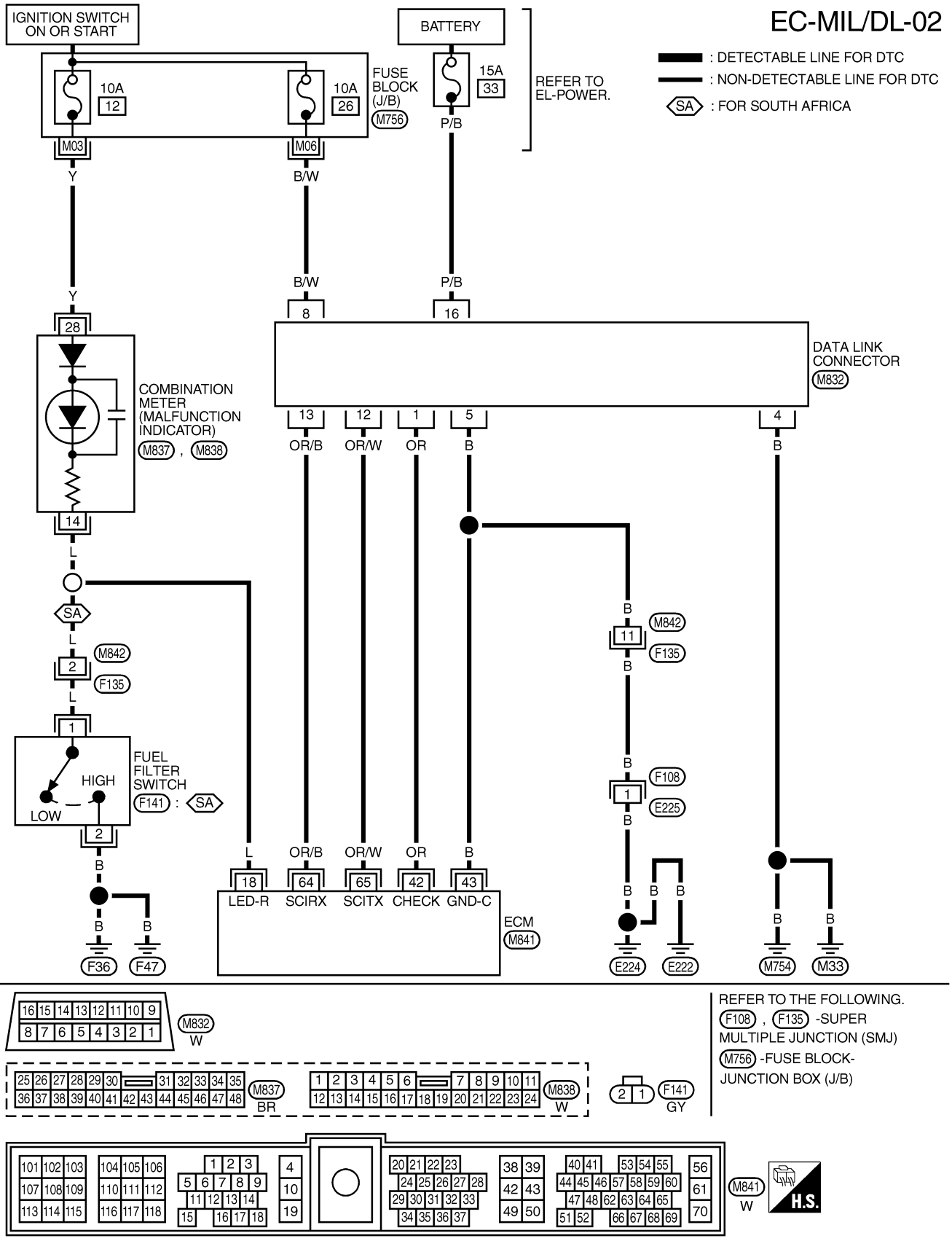


YEC669A

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Wiring Diagram (Cont'd)

RHD MODELS



YEC670A

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General Specifications

Unit: rpm

Engine	ZD30DDTi
Idle speed	750±25
Maximum engine speed	4,300

Injection Pump Numbers

Engine	Part number	Pump assembly number
ZD30DDTi	16700 VG100	109342-4023

Injection Nozzle

Unit: kPa (bar, kg/cm^2, psi)

Initial injection pressure	Used	19,026 (190.3, 194, 2,759)
	New	19,516 - 20,497 (195.2 - 205.0, 199 - 209, 2,830 - 2,972)
	Limit	16,182 (161.8, 165, 2,346)

Engine Coolant Temperature Sensor

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.00
90 (194)	0.236 - 0.260

Crankshaft Position Sensor (TDC)

Resistance [at 20°C (68°F)] Ω	1,287 - 1,573

Glow Plug

Resistance [at 20°C (68°F)] Ω	Approximately 0.5

Accelerator Position Sensor

Throttle valve conditions	Resistance between terminals 2 and 3 kΩ [at 25°C (77°F)]
Completely closed	Approximately 0.5
Partially open	0.5 - 4
Completely open	Approximately 4

EGR Volume Control Valve

Resistance [at 25°C (77°F)] Ω	13 - 17

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Alphabetical & Numerical Index for DTC

ALPHABETICAL INDEX FOR DTC

X: Applicable —: Not applicable

Items (CONSULT-II screen terms)	DTC		MI illumination	Reference page
	CONSULT-II GST*1	ECM*2		
ACCEL POS SENSOR	P0120	0403	X	EC-388
AIR CONDITIONR RLY	P1530	0805	X	EC-463
BRAKE SW	P0571	0807	X	EC-423
CONT SLEEV POS SEN	P1207	0105	X	EC-437
COOLANT TEMP SEN	P0115	0103	X	EC-384
CRANK POS SEN (TDC)	P0335	0407	X	EC-408
ECM RLY	P1620	0902	X	EC-469
ECM 2	P1607	0301	X	EC-467
ECM 10	P1107	0802	—	EC-430
ECM 12	P1603	0901	X	EC-467
EGR SOL/V A	P1404	0806	—	EC-454
EGR SOL/V B	P1405	0808	—	EC-454
F/INJ F/B 2	P1206	0108	X	EC-432
F/INJ TIMG F/B	P1246	0201	X	EC-403
FUEL CUT S/V 1	P0215	0306	X	EC-399
FUEL TEMP SENSOR	P0180	0402	X	EC-395
GLOW LAMP	P0381	0908	—	EC-412
GLOW RELAY	P0380	0803	—	EC-412
INJ TIMING CONT/V	P0216	0904	X	EC-403
MAS AIR FLOW SEN	P0100	0102	X	EC-379
MI	P0650	0907	—	EC-427
NEEDL LIFT SE (RPM)	P1242	0906	X	EC-450
NEEDLE LIFT SEN	P1240	0304	X	EC-450
NO SELF DIAGNOSTIC FAILURE INDICATED	P0000	0505	—	—
OVER HEAT	P1217	0208	X	EC-441
THROTTLE SOLENOID VALVE	P1407	0808	—	EC-454
VEHICLE SPEED SEN	P0500	0104	—	EC-420

*1: These numbers are prescribed by ISO 15031-6.
*2: In Diagnostic Test Mode II (Self-diagnostic results). These numbers are controlled by NISSAN.

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Alphabetical & Numerical Index for DTC (Cont'd)

NUMERICAL INDEX FOR DTC

X: Applicable —: Not applicable

DTC		Items (CONSULT-II screen terms)	MI illumination	Reference page
CONSULT-II GST*1	ECM*2			
P0000	0505	NO SELF DIAGNOSTIC FAILURE INDICATED	—	—
P0100	0102	MAS AIR FLOW SEN	X	EC-379
P0115	0103	COOLANT TEMP SEN	X	EC-384
P0120	0403	ACCEL POS SENSOR	X	EC-388
P0180	0402	FUEL TEMP SENSOR	X	EC-395
P0215	0306	FUEL CUT S/V 1	X	EC-399
P0216	0904	INJ TIMING CONT/V	X	EC-403
P0335	0407	CRANK POS SEN (TDC)	X	EC-408
P0380	0803	GLOW RELAY	—	EC-412
P0381	0908	GLOW LAMP	—	EC-412
P0500	0104	VEHICLE SPEED SEN	—	EC-420
P0571	0807	BRAKE SW	X	EC-423
P0650	0907	MI	—	EC-427
P1107	0802	ECM 10	—	EC-430
P1206	0108	F/INJ F/B 2	X	EC-432
P1207	0105	CONT SLEEV POS SEN	X	EC-437
P1217	0208	OVER HEAT	X	EC-441
P1240	0304	NEEDLE LIFT SEN	X	EC-450
P1242	0906	NEEDL LIFT SE(RPM)	X	EC-450
P1246	0201	F/INJ TIMG F/B	X	EC-403
P1404	0806	EGR SOL/V A	—	EC-454
P1405	0808	EGR SOL/V B	—	EC-454
P1407	0808	THROTTLE SOLENOID VALVE	—	EC-454
P1530	0805	AIR CONDITIONR RLY	X	EC-463
P1603	0901	ECM 12	X	EC-467
P1607	0301	ECM 2	X	EC-467
P1620	0902	ECM RLY	X	EC-469

*1: These numbers are prescribed by ISO 15031-6.
*2: In Diagnostic Test Mode II (Self-diagnostic results). These numbers are controlled by NISSAN.

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Precautions

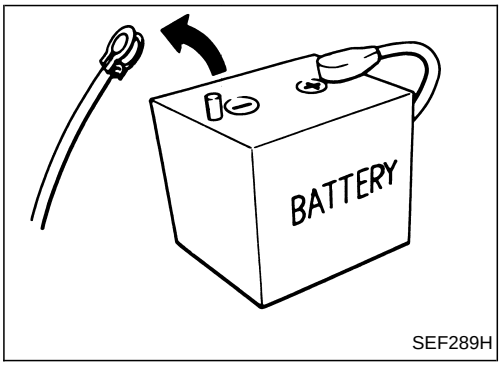
SUPPLEMENTAL RESTRAINT SYSTEM (SRS) “AIR BAG” AND “SEAT BELT PRE-TENSIONER”

The Supplemental Restraint System such as “AIR BAG” and “SEAT BELT PRE-TENSIONER” used along with a seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. The SRS composition which is available to NISSAN MODEL R20 is as follows (The composition varies according to the destination and optional equipment.):

- For a frontal collision
  The Supplemental Restraint System consists of driver air bag module (located in the center of the steering wheel), front passenger air bag module (located on the instrument panel on passenger side), front seat belt pre-tensioners, a diagnosis sensor unit, warning lamp, wiring harness and spiral cable.
- For a side collision
  The Supplemental Restraint System consists of front side air bag module (located in the outer side of front seat), side air bag (satellite) sensor, diagnosis sensor unit (one of components of air bags for a frontal collision), wiring harness, warning lamp (one of components of air bags for a frontal collision).

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 should be performed by an authorized NISSAN dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. Spiral cable and wiring harnesses covered with yellow insulation tape either just before the harness connectors or for the complete harness are related to the SRS.**



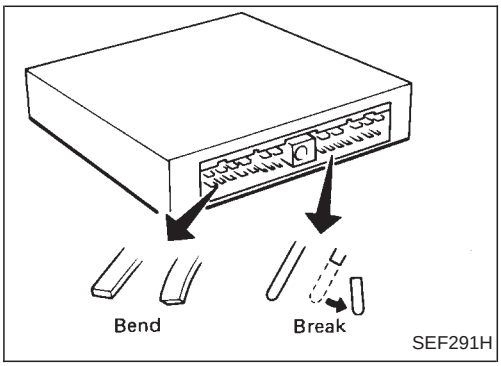
SEF289H

PRECAUTIONS

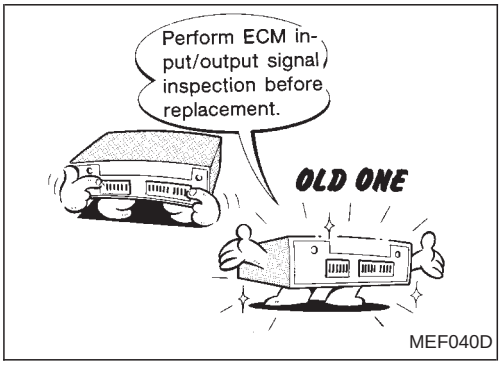
- **Before connecting or disconnecting the ECM harness connector, turn ignition switch OFF and disconnect negative battery terminal. Failure to do so may damage the ECM because battery voltage is applied to ECM even if ignition switch is turned off.**
- **Do not disassemble ECM.**

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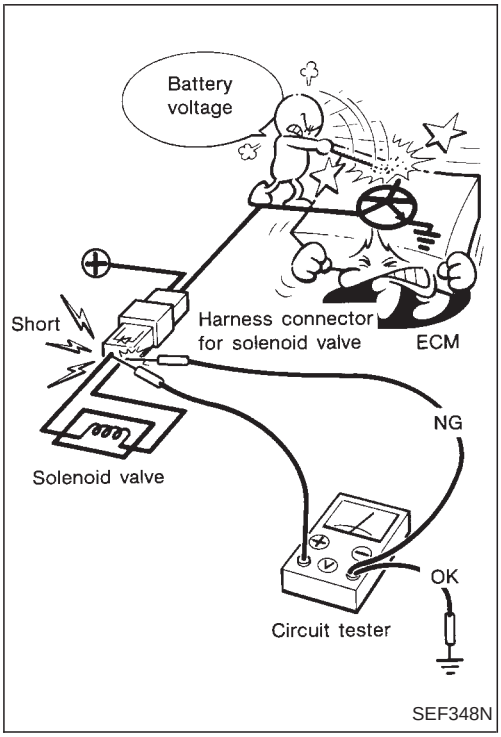
Precautions (Cont'd)



- When connecting or disconnecting pin connectors into or from ECM, take care not to damage pin terminals (bend or break).
  Make sure that there are not any bends or breaks on ECM pin terminal, when connecting pin connectors.
- Securely connect ECM harness connectors.
  A poor connection can cause an extremely high (surge) voltage to develop in coil and condenser, thus resulting in damage to IC's.
- Keep engine control system harness at least 10cm (4 in) away from adjacent harness, to prevent engine control system malfunctions due to receiving external noise, degraded operation of IC's, etc.
- Keep engine control system parts and harness dry.



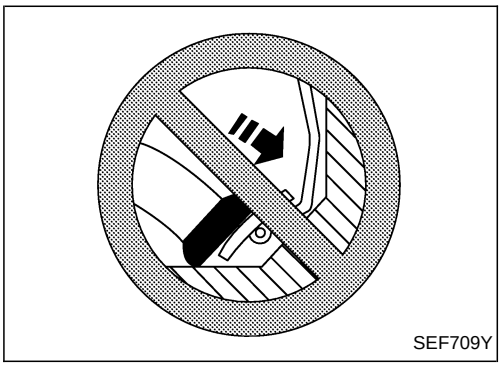
- Before replacing ECM, perform Terminals and Reference Value inspection and make sure ECM functions properly.
- After performing each TROUBLE DIAGNOSIS, perform "DTC Confirmation Procedure" or "Overall Function Check".
  The DTC should not be displayed in the "DTC Confirmation Procedure" if the repair is completed. The "Overall Function Check" should be a good result if the repair is completed.



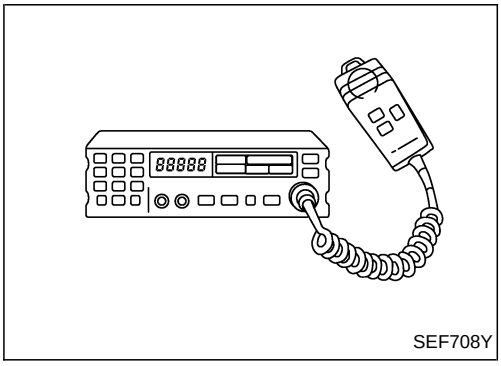
- When measuring ECM signals with a circuit tester, never allow the two tester probes to contact.
  Accidental contact of probes will cause a short circuit and damage the ECM power transistor.
- Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.
- Do not disconnect supply pump harness connector with engine running.
- Do not disassemble fuel pump.
  If NG, take proper action.
- Do not disassemble fuel injector.
  If NG, replace fuel injector.
- Even a slight leak in the air intake system can cause serious problems.
- Do not shock or jar the crankshaft position sensor and the camshaft position sensor.

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Precautions (Cont'd)


SEF709Y

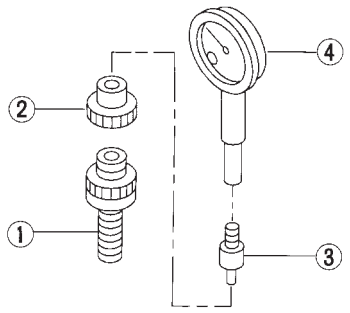
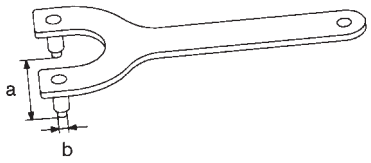
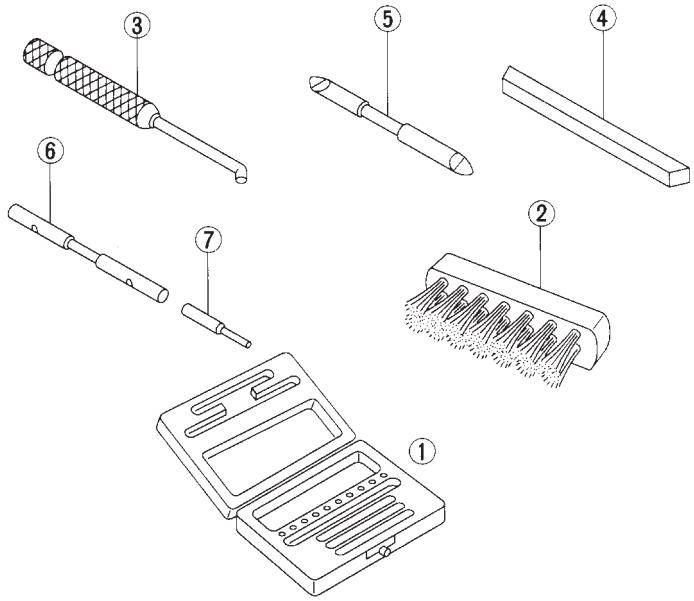
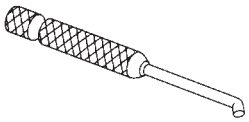
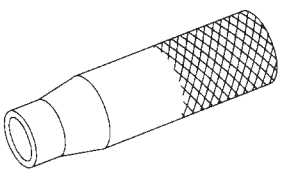
- Do not depress accelerator pedal when staring.
- Immediately after staring, do not rev up engine unnecessarily.
- Do not rev up engine just prior to shutdown.


SEF708Y

- When installing C.B. ham radio or a mobile phone, be sure to observe the following as it may adversely affect electronic control systems depending on installation location.
- Keep the antenna as far as possible from the electronic control units.
- Keep the antenna feeder line more than 20 cm (8 in) away from the harness of electronic controls.
  Do not let them run parallel for a long distance.
- Adjust the antenna and feeder line so that the standing-wave radio can be kept smaller.
- Be sure to ground the radio to vehicle body.

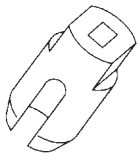
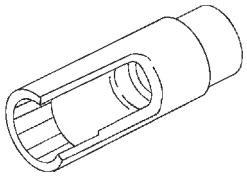
http://vnx.su/

Special Service Tools

Tool number Tool name	Description
KV11229352 Measuring device ① KV11229350 Holder ② KV11229360 Nut ③ KV11229370 Pin ④ KV11254410 Dial gauge	Measuring set length of plunger spring  NT570
ST16540000 Pulley holder	Removing injection pump drive gear **a: 68 mm (2.68 in)** **b: 8 mm (0.31 in)**  NT628
KV11289004 Nozzle cleaning kit ① KV11290012 Box ② KV11290110 Brush ③ KV11290122 Nozzle oil sump scraper ④ KV11290140 Nozzle needle tip cleaner ⑤ KV11290150 Nozzle seat scraper ⑥ KV11290210 Nozzle holder ⑦ KV11290220 Nozzle hole cleaning needle	 NT296
KV11290632 Nozzle oil sump scraper	 NT294
KV11292010 Nozzle centering device	 NT293

http://vnx.su/

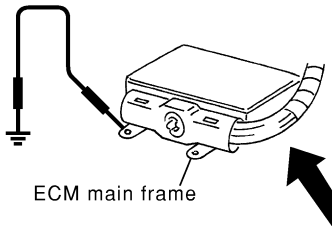
Special Service Tools (Cont'd)

Tool number Tool name	Description
KV11100300 Nozzle holder socket No. 2-4 injection nozzle holder socket	 NT563
KV111-05700 No. 1 injection nozzle holder socket	 NT648

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Engine Fuel & Emission Control System

ECM
- Do not disassemble ECM.
- If a battery terminal is disconnected, the memory will return to the ECM value. The ECM will now start to self-control at its initial value. Engine operation can vary slightly when the terminal is disconnected. However, this is not an indication of a problem. Do not replace parts because of a slight variation.
- When ECM is removed for inspection, make sure to ground the ECM main frame.

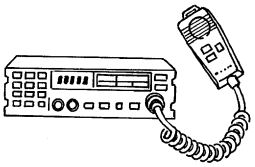


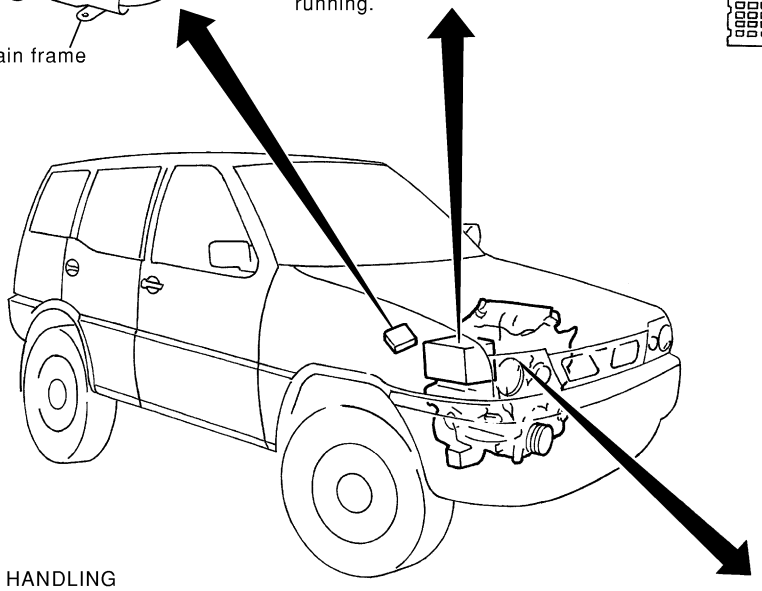
ECM main frame

BATTERY
- Always use a 12 volt battery as power source.
- Do not attempt to disconnect battery cables while engine is running.

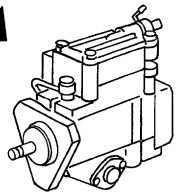
WIRELESS EQUIPMENT
- When installing C.B. ham radio or a mobile phone, be sure to observe the following as it may adversely affect electronic control systems depending on its installation location.

1) Keep the antenna as far away as possible from the ECM.
2) Keep the antenna feeder line more than 20 cm (7.9 in) away from the harnesses of electronic controls. Do not let harnesses and antenna feeder line run parallel for a long distance.
3) Adjust the antenna and feeder line so that the standing-wave ratio can be kept small.
4) Be sure to ground the radio to vehicle body.





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



ELECTRONIC FUEL INJECTION PUMP
- Do not disconnect pump harness connectors with engine running.
- Do not disassemble electronic fuel injection pump, except for the following parts;
  Camshaft position sensor (pump).
  Injection timing control valve.
  Fuel cut solenoid valve.

ECM PARTS HANDLING
- Handle mass air flow sensor carefully to avoid damage.
- Do not disassemble mass air flow sensor.
- Do not clean mass air flow sensor with any type of detergent.
- Do not disassemble No. 1 injection nozzle (built-in needle lift sensor).
- Even a slight leak in the air intake system can cause serious problems.
- Do not shock or jar the camshaft position sensor.



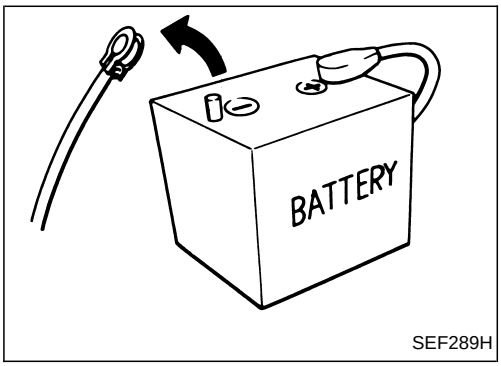
WHEN STARTING
- Do not depress accelerator pedal when starting.
- Immediately after starting, do not rev up engine unnecessarily.
- Do not rev up engine just prior to shutdown.

MEC031E

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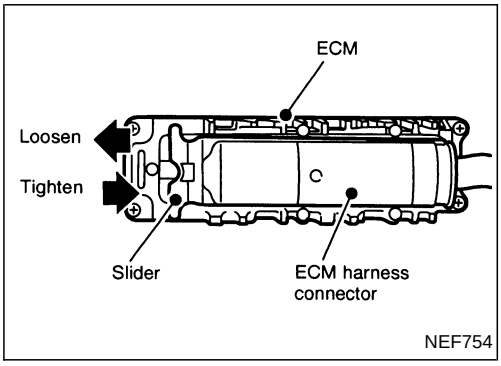
Engine Fuel & Emission Control System (Cont'd)

PRECAUTIONS



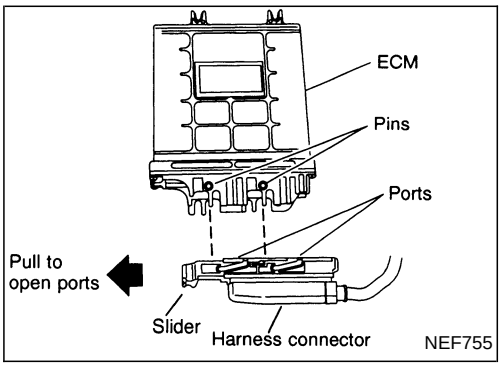
SEF289H

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



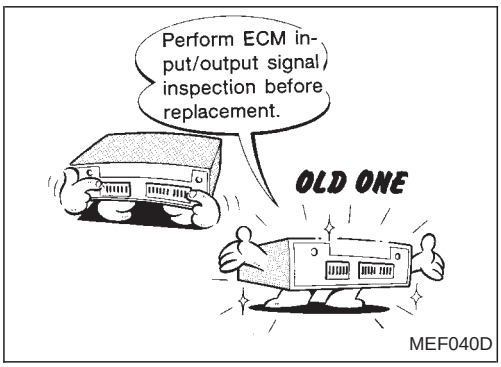
NEF754

- **When connecting ECM harness connector, open the ports on harness connector then meet the ports with the pins on ECM as shown. Push slider on harness connector until it stops.**

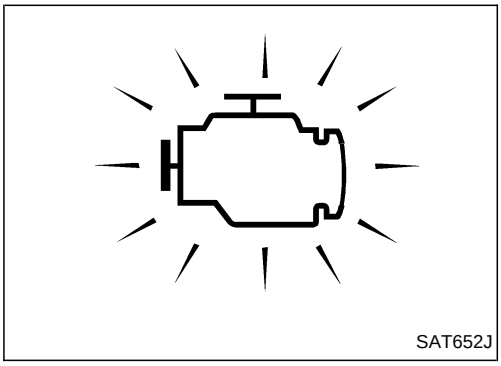


NEF755

- **Before replacing ECM, perform Terminals and Reference Value inspection and make sure ECM functions properly. Refer to EC-369.**



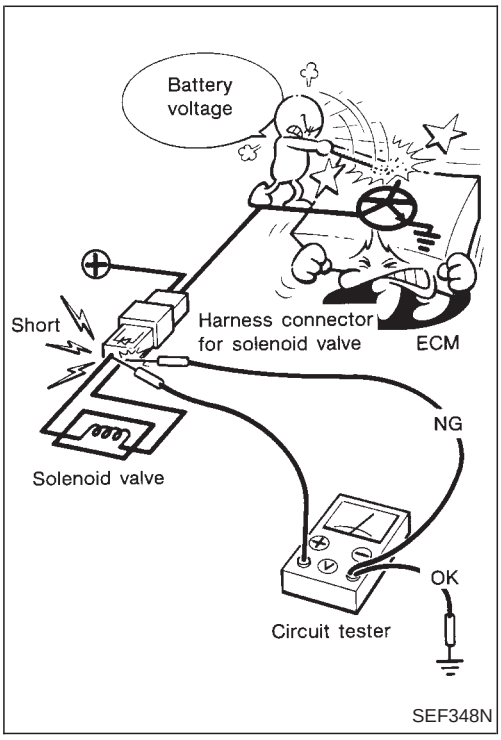
MEF040D


SAT652J

- **If MI illuminates or flashes irregularly while the engine is running, water may have accumulated in fuel filter. Drain water from fuel filter. If this does not correct the problem, perform specified trouble diagnostic procedures.**
- **After performing each TROUBLE DIAGNOSIS, perform "OVERALL FUNCTION CHECK" or "DTC (Diagnostic Trouble Code) CONFIRMATION PROCEDURE".**
  The DTC should not be displayed in the "DTC CONFIRMATION PROCEDURE" if the repair is successful. The "OVERALL FUNCTION CHECK" should indicate a good result if the repair is completed successfully.

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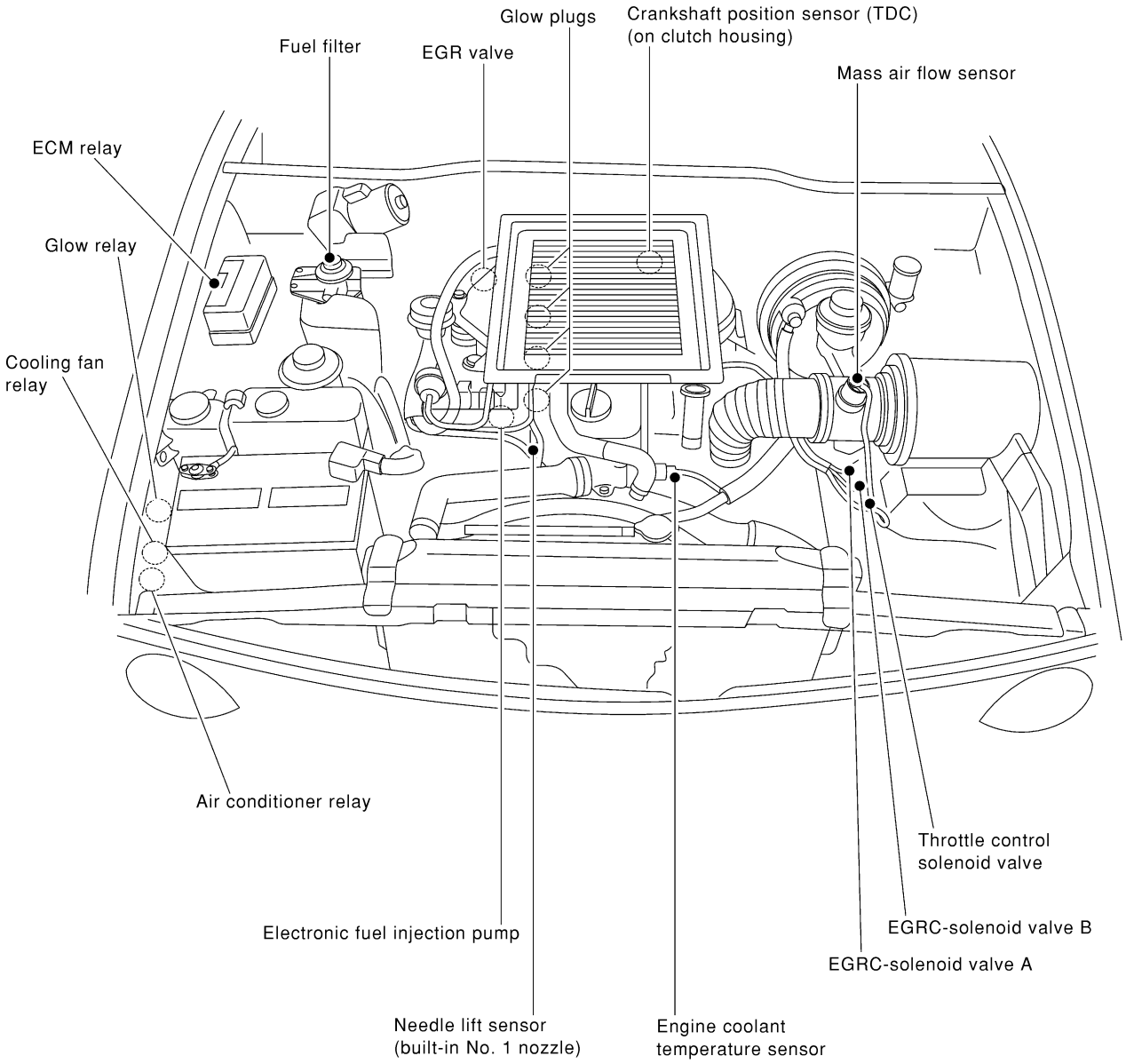
Engine Fuel & Emission Control System (Cont'd)



- **When measuring ECM signals with a circuit tester, never allow the two tester probes to contact.**
  Accidental contact of probes will cause a short circuit and damage the ECM power transistor.

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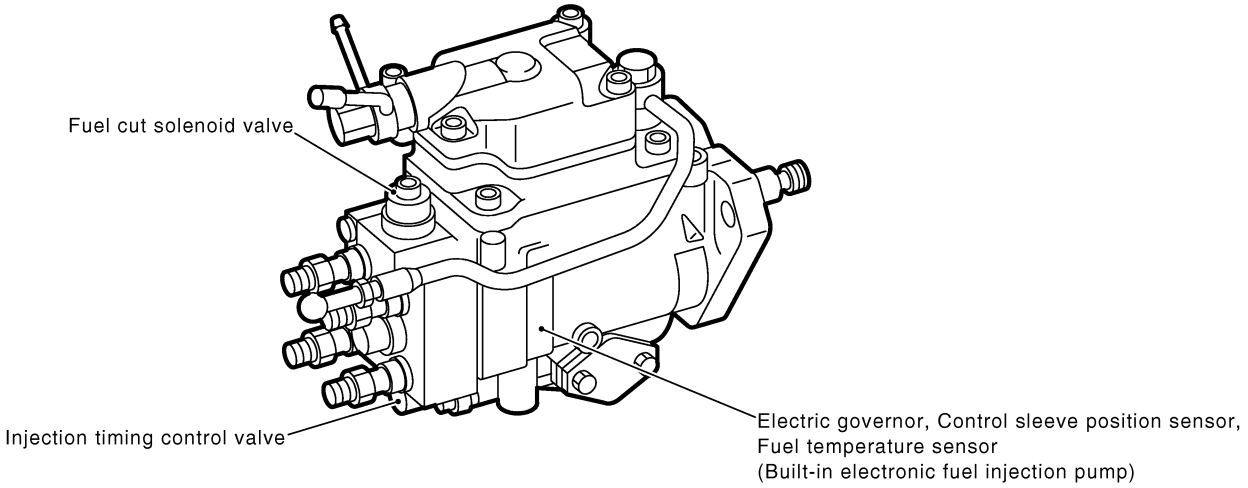
Engine Control Component Parts Location

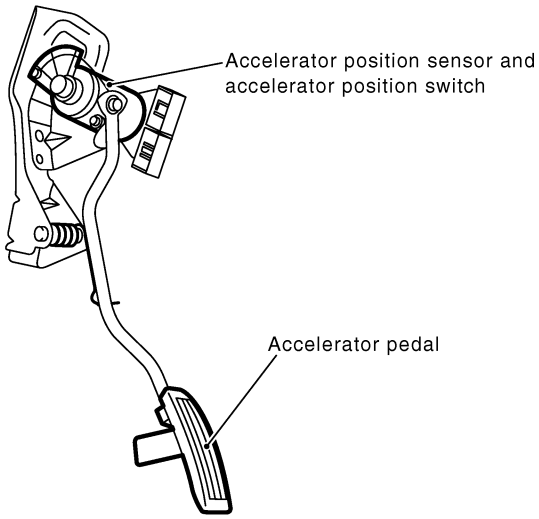


YEC234A

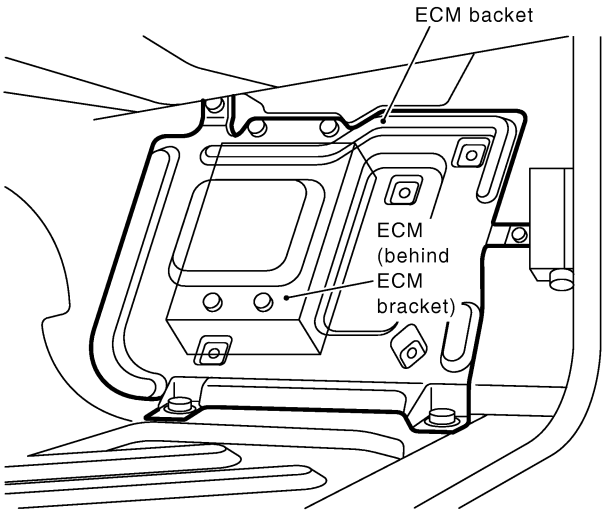
http://vnx.su/

Engine Control Component Parts Location (Cont'd)

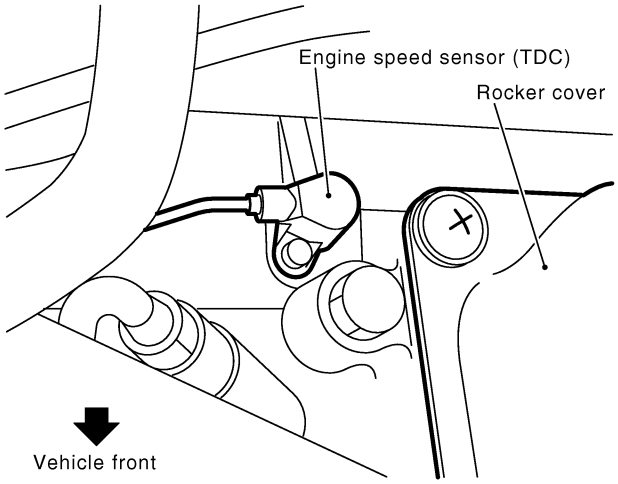




Removing carpet of front passenger leg room



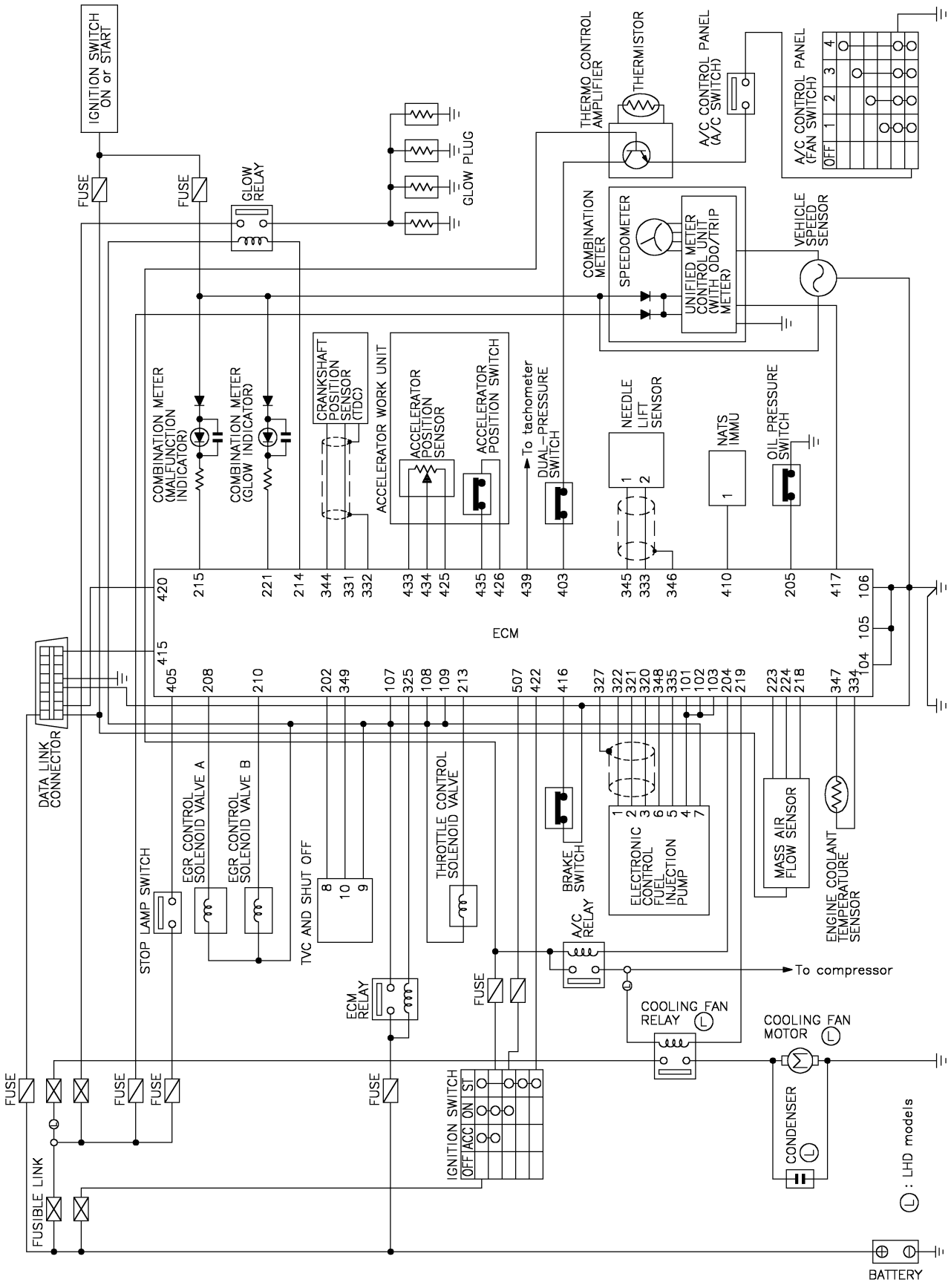
On clutch housing



YEC694A

http://vnx.su/

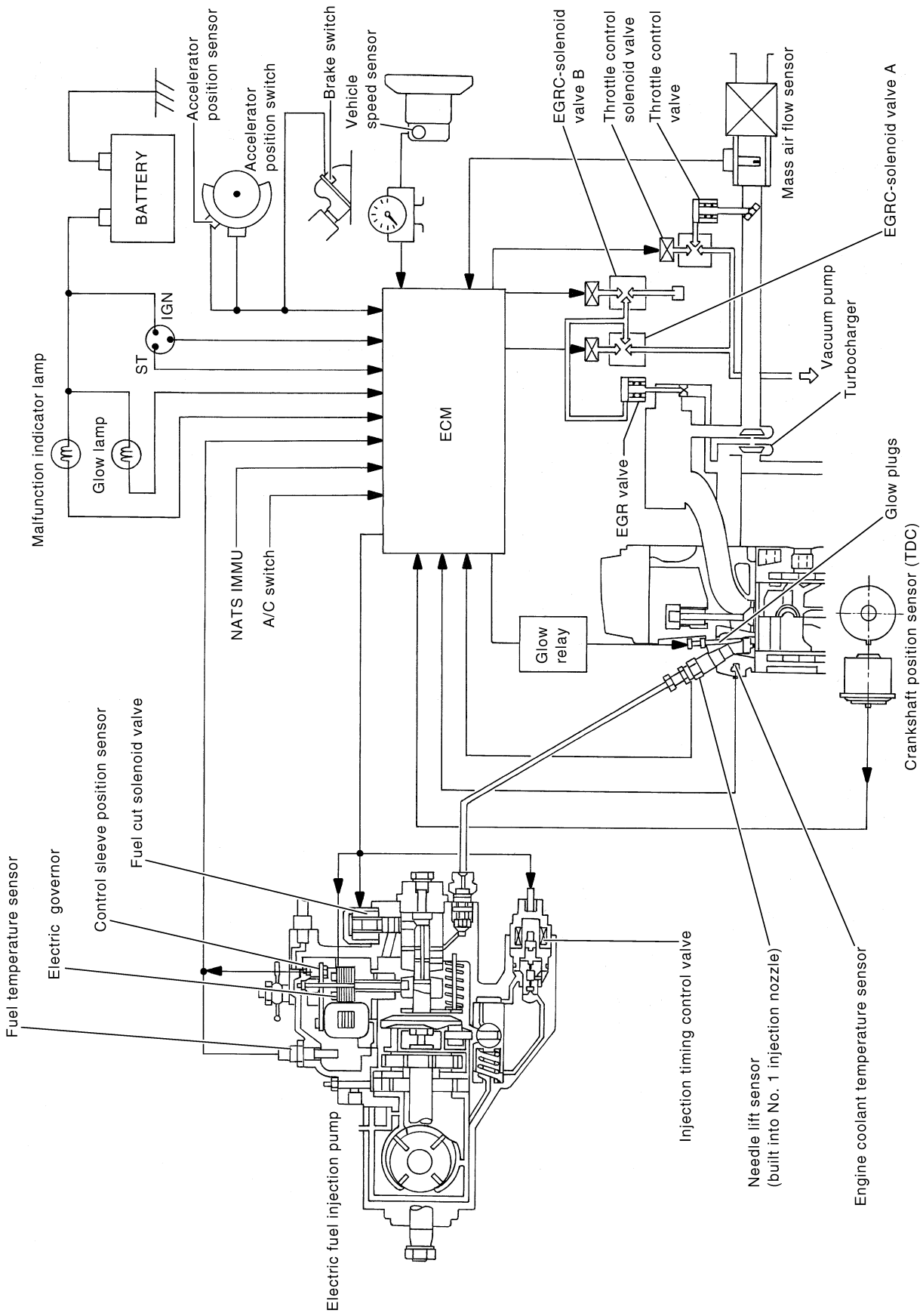
Circuit Diagram



YEC671A

http://vnx.su/

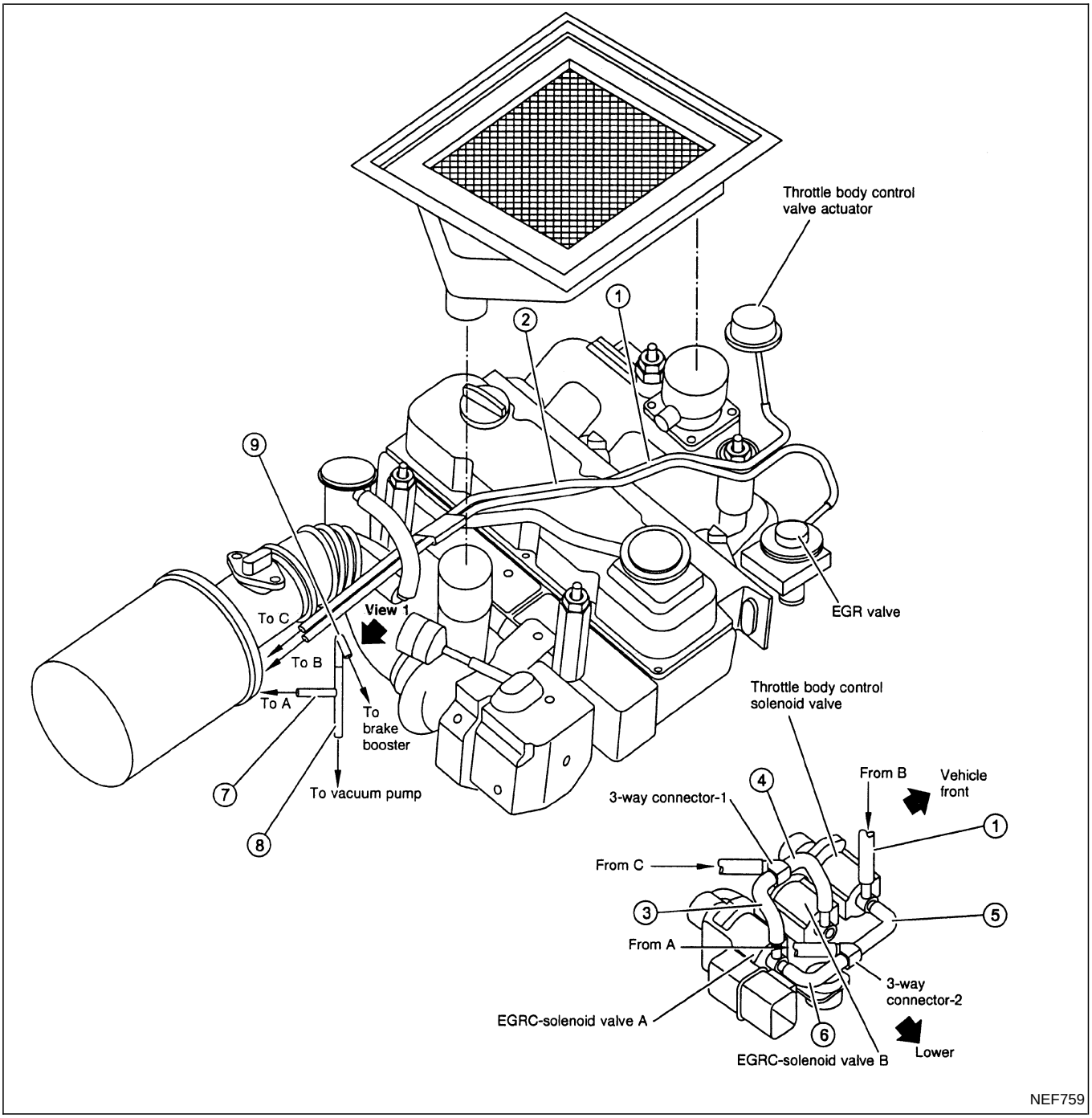
System Diagram



YEC695A

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Vacuum Hose Drawing

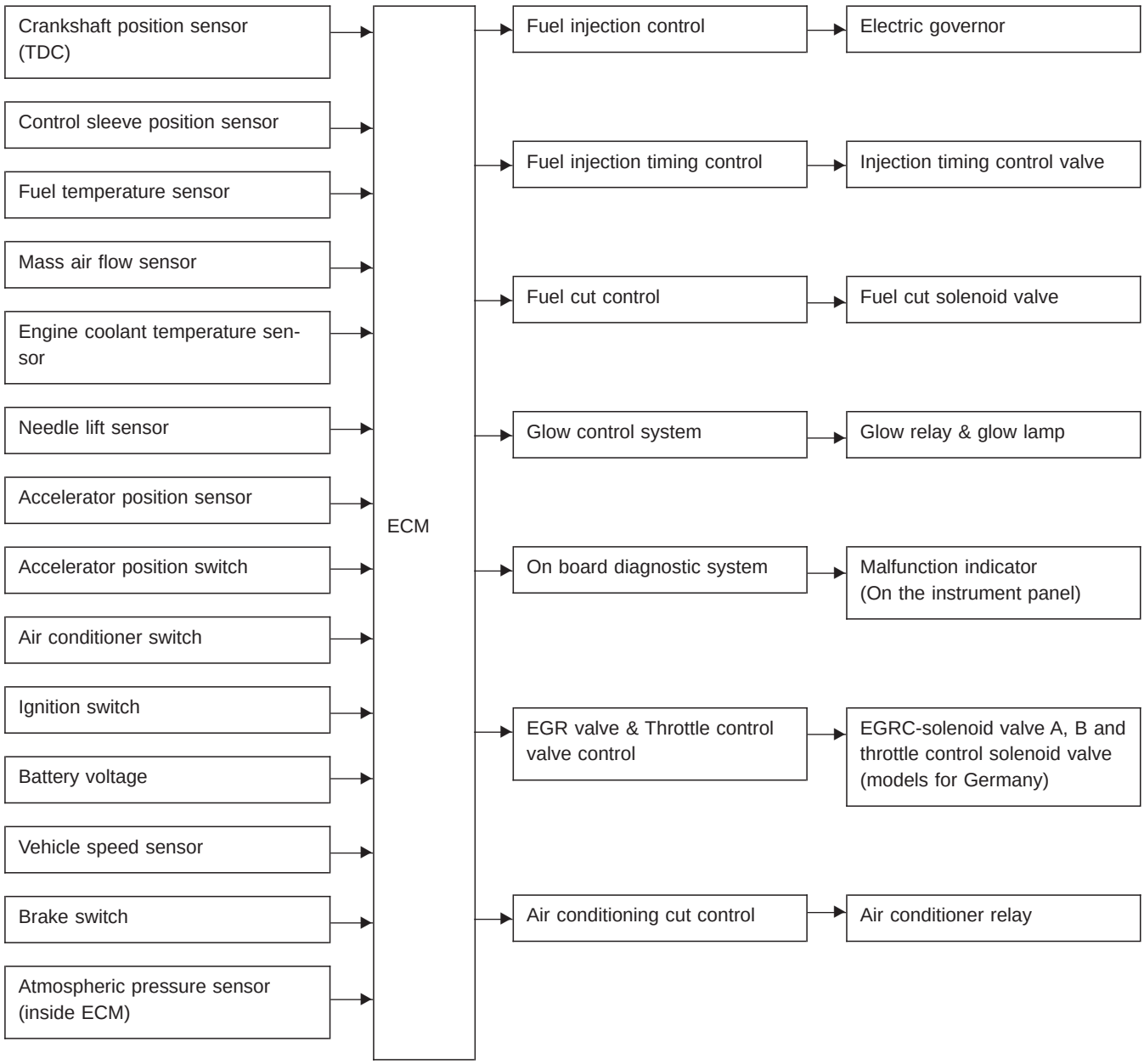


① Throttle body control valve actuator to throttle body control solenoid valve
② EGR valve to 3-way connector
③ EGRC-solenoid valve A to 3-way connector-1
④ EGRC-solenoid valve B to 3-way connector-1
⑤ Throttle body control solenoid valve to 2-way connector-2
⑥ EGRC-solenoid valve A to 3-way connector-2
⑦ Tube to 3-way connector-2
⑧ Tube to vacuum pump
⑨ Tube to brake booster

Refer to “System Diagram”, on previous page for vacuum control system

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System Chart



http://vnx.su/

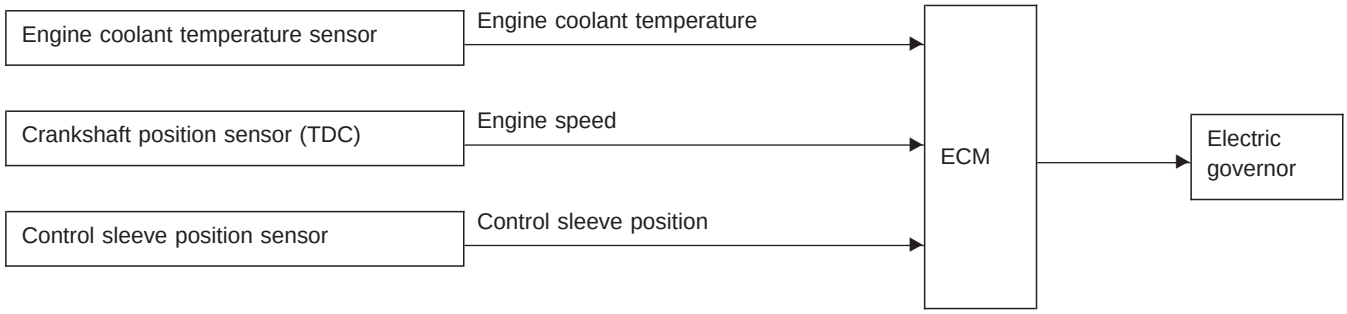
Fuel Injection System

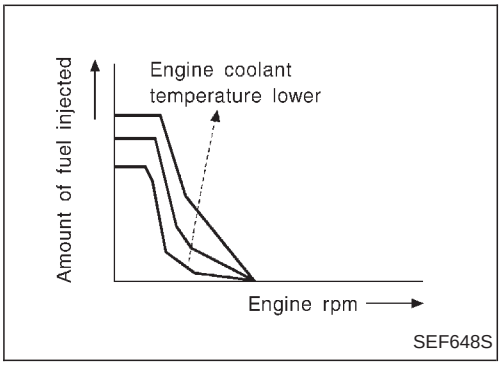
SYSTEM DESCRIPTION

Three types of fuel injection control are provided to accommodate engine operating conditions; normal control, idle control and start control. The ECM determines the appropriate fuel injection control. Under each control, the amount of fuel injected is compensated to improve engine performance. The ECM performs duty cycle control on the electric governor (built into the fuel injection pump) according to sensor signals to compensate the amount of fuel injected to the preset value.

START CONTROL

Input/output signal line





When the ECM receives a start signal from the ignition switch, the ECM adapts the fuel injection system for the start control. The amount of fuel injected at engine starting is a preset program value in the ECM. The program is determined by the engine speed and engine coolant temperature.

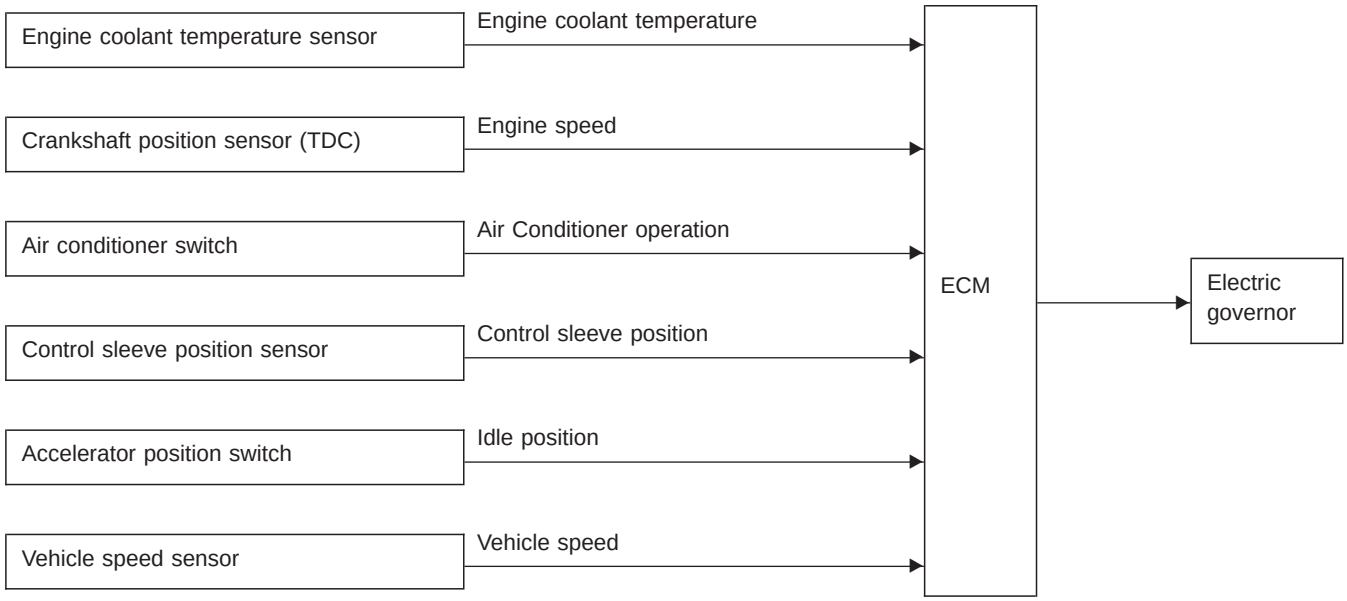
For better startability under cool engine conditions, the lower the coolant temperature becomes, the greater the amount of fuel injected. The ECM ends the start control when the engine speed reaches a value between 800 rpm and 1,200 rpm, which is determined by the engine coolant temperature and shifts the control to the normal or idle control.

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Fuel Injection System (Cont'd)

IDLE CONTROL

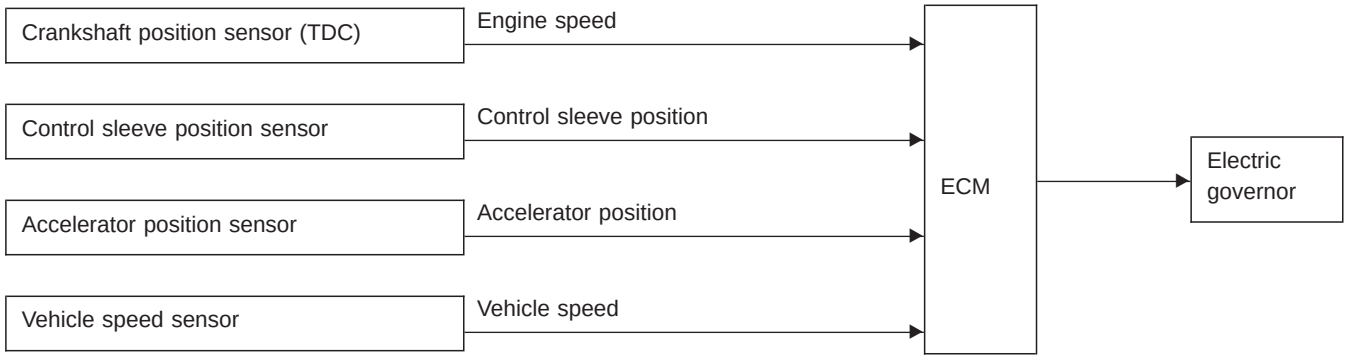
Input/output signal line

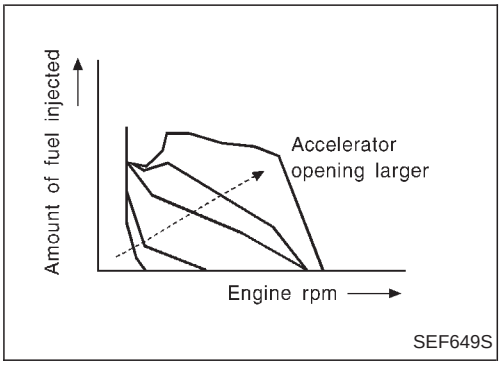


When the ECM determines that the engine speed is at idle, the fuel injection system is adapted for the idle control. The ECM regulates the amount of fuel injected corresponding to changes in load applied to the engine to keep engine speed constant. The ECM also provides the system with a fast idle control in response to the engine coolant temperature.

NORMAL CONTROL

Input/output signal line





The amount of fuel injected under normal driving conditions is determined according to sensor signals. The crankshaft position sensor (TDC) detects engine speed and the accelerator position sensor detects accelerator position. These sensors send signals to the ECM.

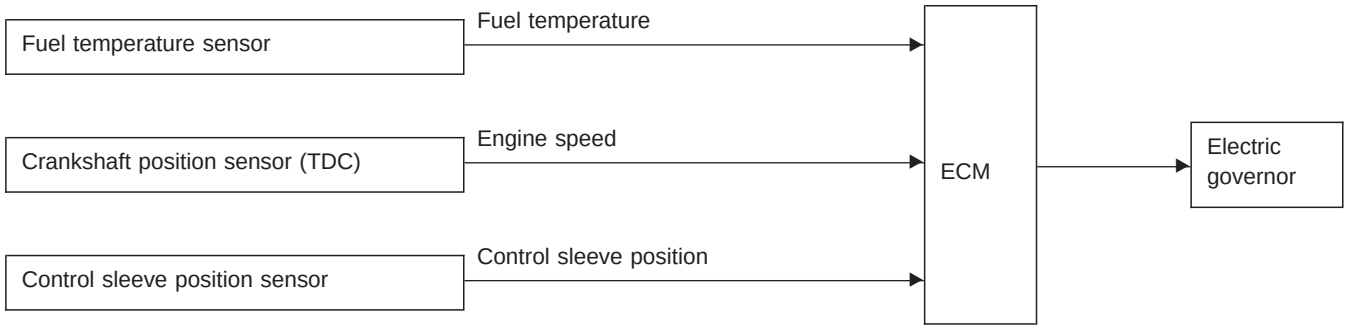
The fuel injection data, predetermined by correlation between various engine speeds and accelerator positions, are stored in the ECM memory, forming a map. The ECM determines the optimal amount of fuel to be injected using the sensor signals in comparison with the map.

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Fuel Injection System (Cont'd)

FUEL TEMPERATURE COMPENSATION

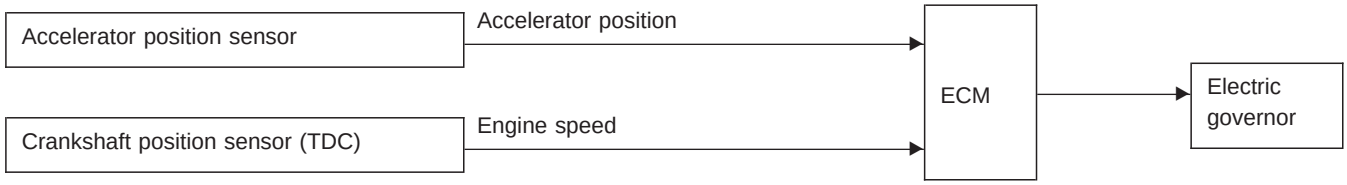
Input/output signal line



The amount of fuel leaking at or around high-pressure parts inside the fuel injection pump varies with the fuel temperature and engine speed. This will result in a difference between the target amount of fuel injected and the actual amount. The ECM compensates for the actual amount depending on the signal obtained from the fuel temperature sensor.

DECELERATION CONTROL

Input/output signal line



The ECM cuts power supply delivery to the electric governor during deceleration for better fuel efficiency. The ECM determines the time of deceleration according to signals from the accelerator position sensor and crankshaft position sensor (TDC).

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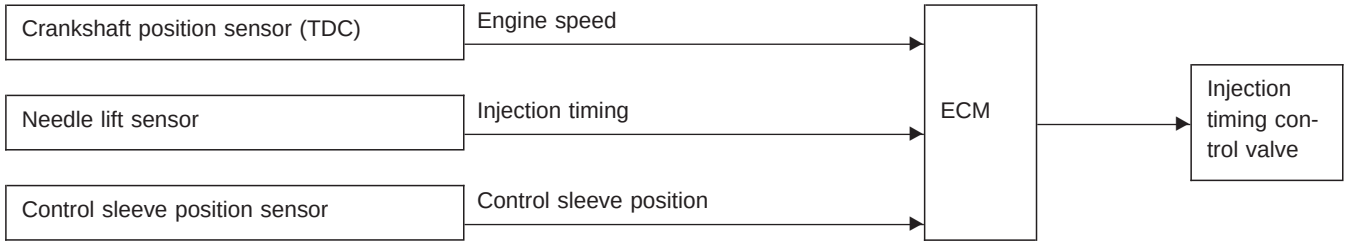
Fuel Injection Timing System

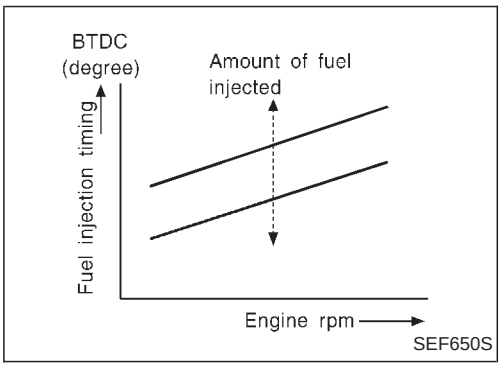
SYSTEM DESCRIPTION

The fuel injection timing system determines the optimal fuel injection timing, based on engine speed, injection quantity, engine coolant temperature and atmospheric pressure. The timing is formed by a basic value (Basic Control) and two correction values. By performing a duty cycle signal on the timing control valve, the ECM allows the valve to provide optimal injection timing. The ECM also performs feedback control on the timing control valve using the signal from the needle lift sensor which detects the actual fuel injection timing.

BASIC CONTROL

Input/output signal line

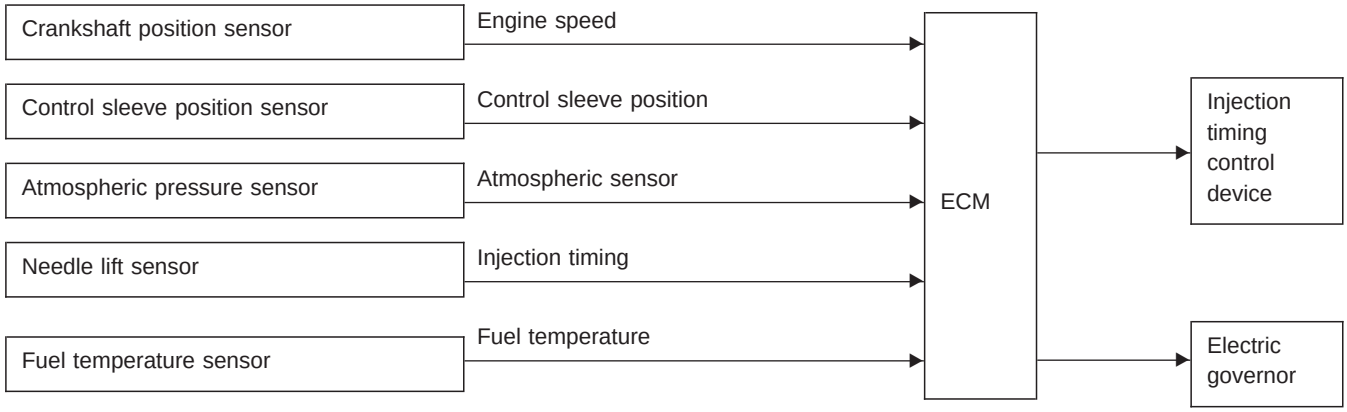




The optimal fuel injection timing data, predetermined in proportion to engine speeds and amount of fuel injected, are stored in the ECM memory. The ECM uses the data to control the fuel injection timing.

HIGH ALTITUDE COMPENSATION

Input/output signal line



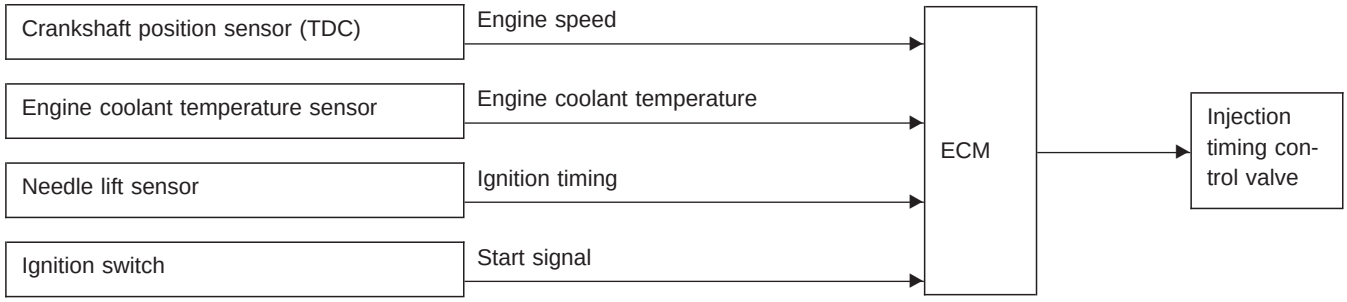
For better drivability in high altitude areas, the fuel injection timing is advanced and the fuel quantity is reduced according to the atmospheric pressure.

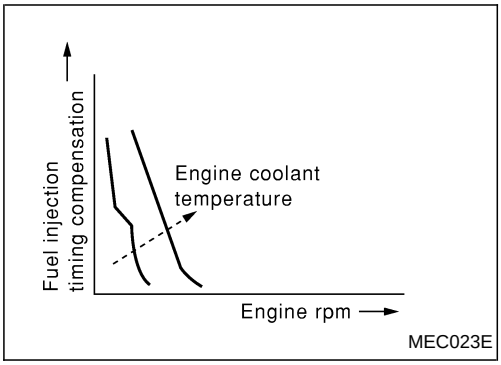
http://vnx.su/

Fuel Injection Timing System (Cont'd)

ENGINE COOLANT TEMPERATURE COMPENSATION (When starting)

Input/output signal line

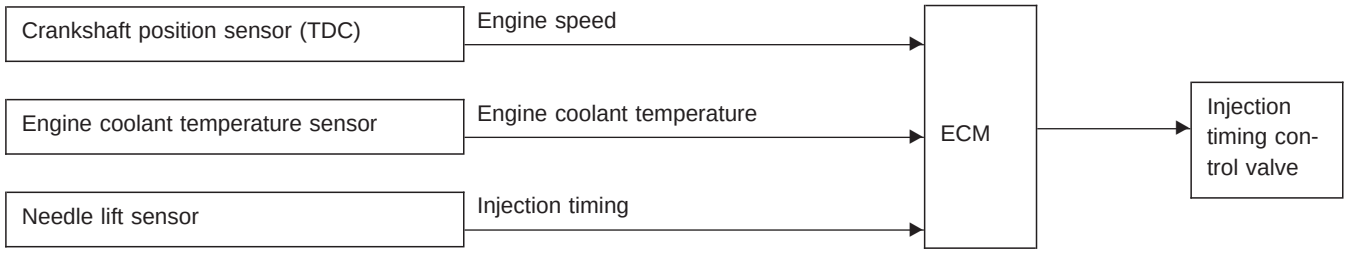


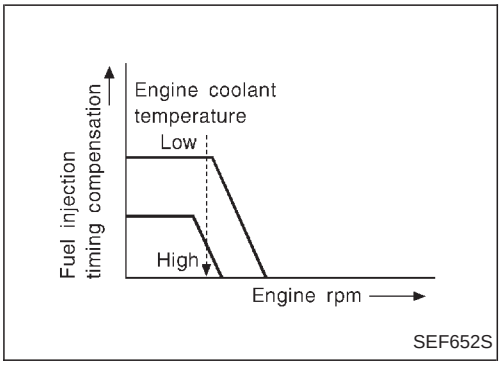


For better startability under cool engine conditions, the fuel injection timing is compensated according to the engine coolant temperature.

ENGINE COOLANT TEMPERATURE COMPENSATION (During driving)

Input/output signal line



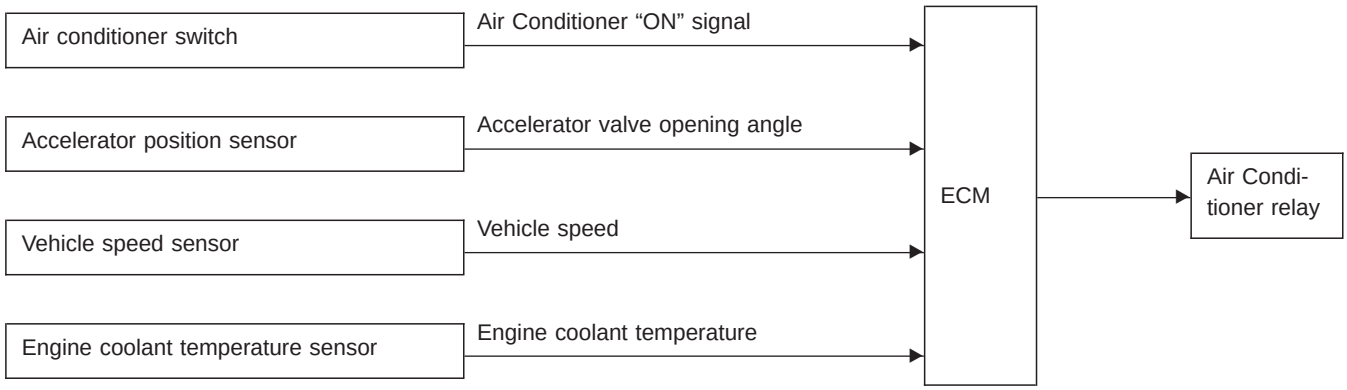


For better exhaust efficiency under cool engine conditions, the fuel injection timing is controlled within a compensation range depending on the engine speed, engine coolant temperature and amount of fuel injected.

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Air Conditioning Cut Control

INPUT/OUTPUT SIGNAL LINE



SYSTEM DESCRIPTION

This system improves acceleration when the air conditioner is used.
When the accelerator pedal is fully depressed, the air conditioner is turned off for a few seconds. When engine coolant temperature becomes excessively high, the air conditioner is turned off. This continues until the coolant temperature returns to normal.

Fuel Cut Control (at high engine speed)

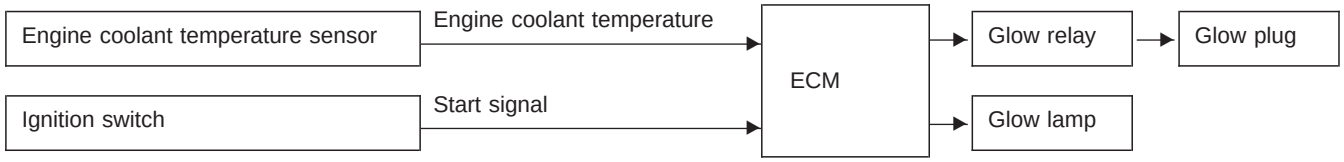
INPUT/OUTPUT SIGNAL LINE



If the engine speed is above 5,500 rpm fuel will be cut off to keep engine within its working range.
NOTE:
This function is different from deceleration control and fuel cut solenoid valve control.

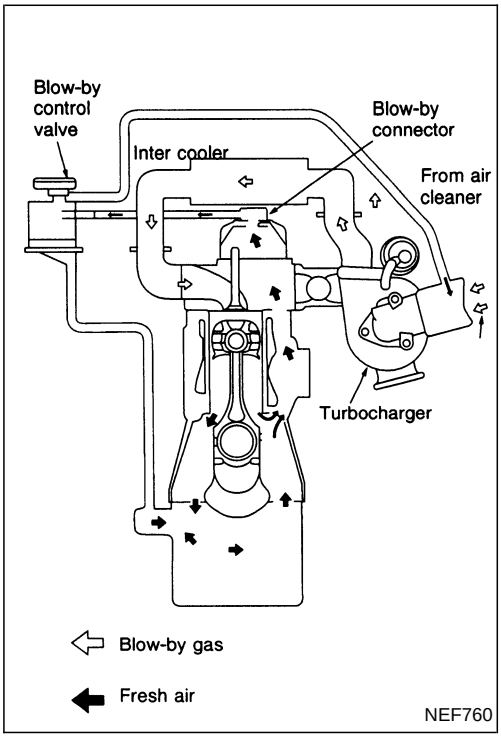
Glow Control

INPUT/OUTPUT SIGNAL LINE



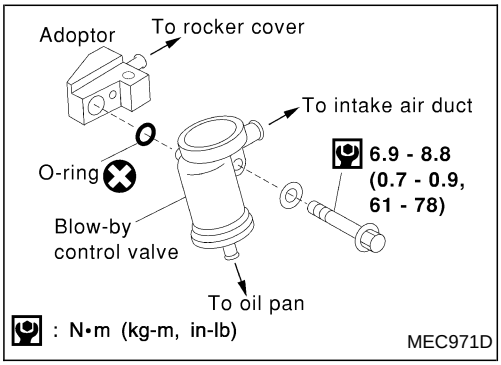
Glow plug is heated in three-stage that is pre-glow, intermediate-glow and after-glow. Glow time changes depending on engine coolant temperature.

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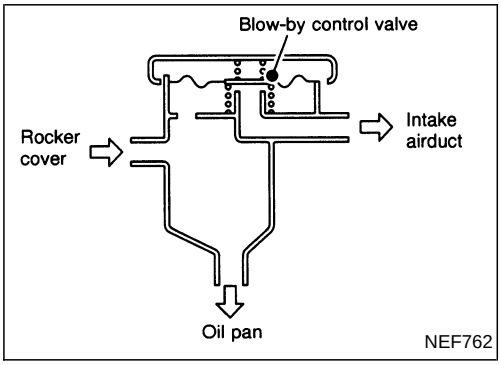
Description

- In this system blow-by gas is sucked into the air inlet pipe through the control valve after oil separation by oil separator.



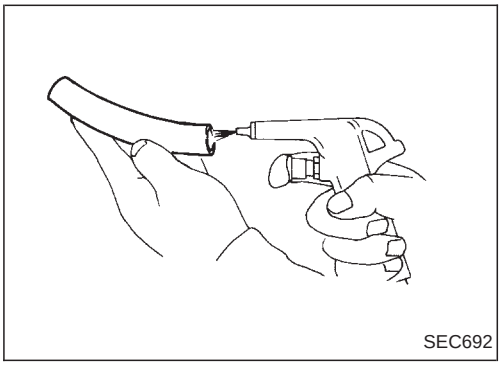
Blow-by Control Valve

- Check control valve for clogging and abnormalities.

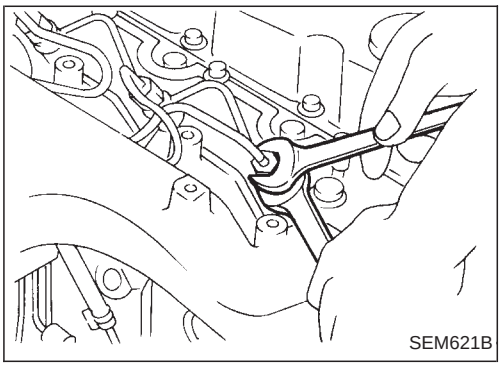


Ventilation Hose

1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air. If any hose cannot be freed of obstructions, replace.



http://vnx.su/

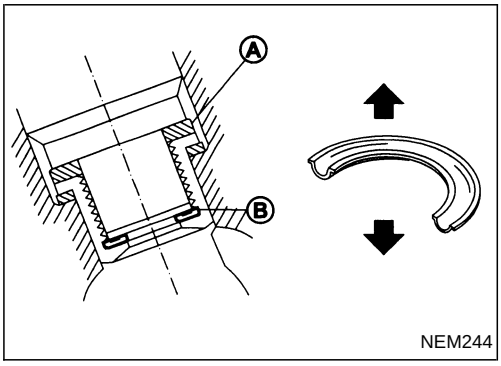

SEM621B

CAUTION:

- **Do not disassemble No. 1 nozzle (with needle lift sensor). Entrust disassembly or adjustment to BOSCH service shop.**

Plug flare nut with a cap or rag so that no dust enters the nozzle. Cover nozzle tip for protection of needle.

Removal and Installation



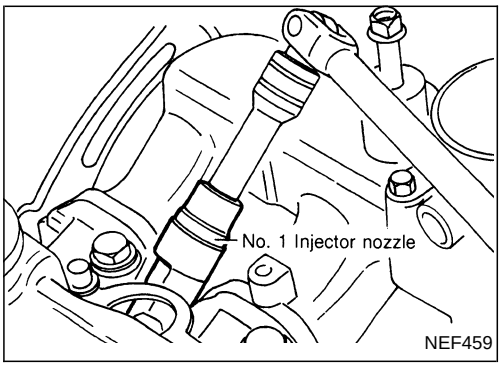
NEM244

1. Remove fuel injection tube and spill tube.
2. Remove injection nozzle assembly.

Also remove washers from nozzle end.

3. Install injection nozzle in the reverse order of removal.

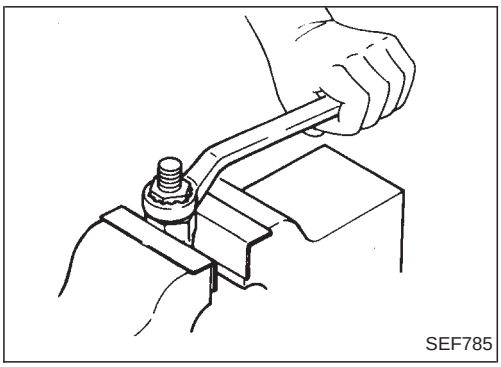
Injection nozzle to engine:
: 54 - 64 N·m (5.5 - 6.5 kg-m, 40 - 47 ft-lb)
Injection nozzle to tube:
: 20 - 25 N·m (2.0 - 2.5 kg-m, 14 - 18 ft-lb)



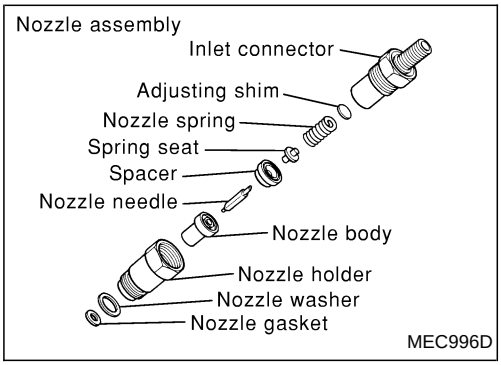
NEF459

a. Always clean the nozzle holes.
b. Always use new injection nozzle gasket.
c. Note that small washer should be installed in specified direction.
d. Bleed air from fuel system.

Disassembly (No. 2 - 4 nozzle)


SEF785

1. Loosen nozzle nut while preventing nozzle top from turning.



MEC996D

2. Arrange all disassembled parts in the order shown at left.

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Inspection (No. 2 - 4 nozzle)

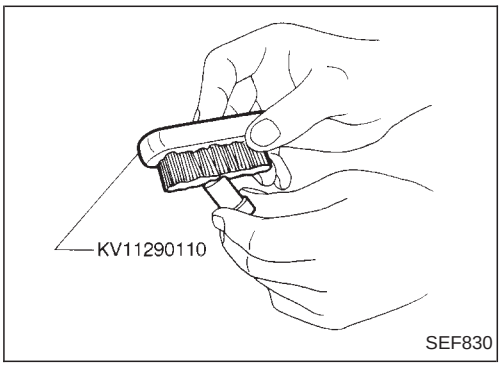
Thoroughly clean all disassembled parts with fresh kerosene or solvent.

- If nozzle needle is damaged or fused, replace nozzle assembly with a new one.
- If end of nozzle needle is seized or excessively discolored, replace nozzle assembly.
- Check nozzle body and distance piece for proper contact. If excessively worn or damaged, replace nozzle assembly or distance piece.
- Check nozzle spring for excessive wear or damage. If excessively worn or damaged, replace it with a new spring.
- Check distance piece and nozzle holder for proper contact. If excessively worn or damaged, replace nozzle holder assembly.

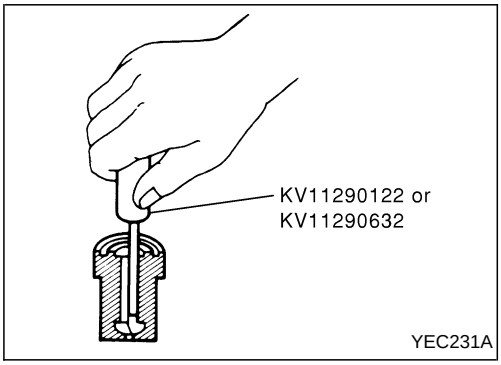
Cleaning (No. 2 - 4 nozzle)

a. Do not touch the nozzle mating surface with your fingers.
b. To wash the nozzles, use a wooden stick and brass brush with clean diesel fuel.

1. Remove any carbon from exterior of nozzle body (except wrapping angle portion) by using Tool.

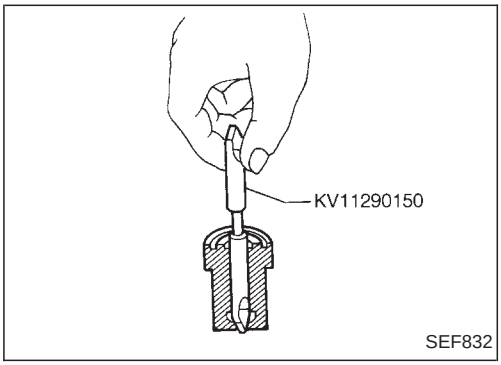


2. Clean oil sump of nozzle body using Tool.



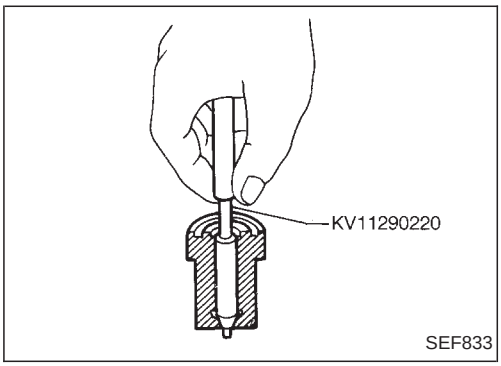
3. Clean nozzle seat by using Tool.

Take extra precautions when performing this job, since nozzle efficiency depends greatly on a good nozzle seat.



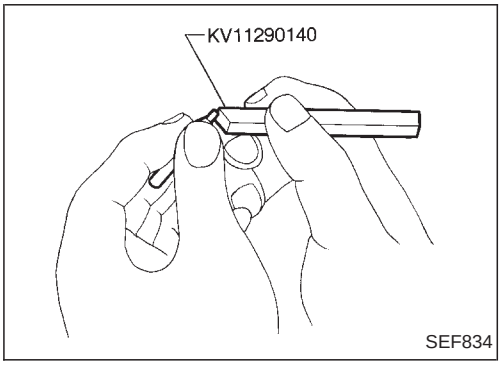
http://vnx.su/

Cleaning (No. 2 - 4 nozzle) (Cont'd)

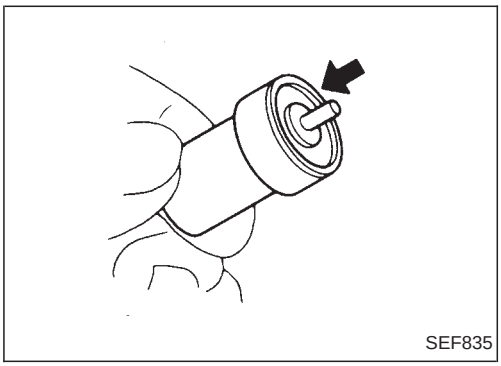


4. Clean spray hole of nozzle body by using Tool.

To prevent spray hole from canting, always clean it by starting with inner side and working towards the outside.



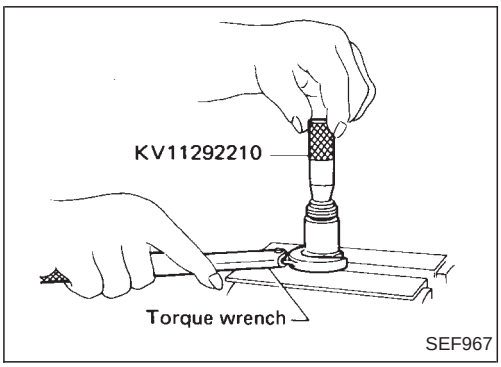
5. Decarbonate nozzle needle tip by using Tool.



6. Check needle sink.
(1) Pull needle about halfway out from body and then release it.
(2) Needle should sink into body very smoothly from just its own weight.
(3) Repeat this test and rotate needle slightly each time.

If needle fails to sink smoothly from any position, replace both needle and body as a unit.

Assembly (No. 2 - 4 nozzle)



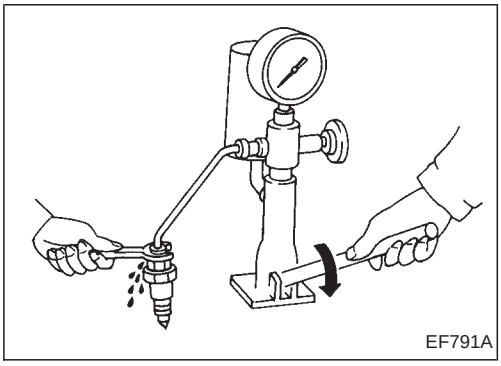
Assembly is in the reverse order of disassembly.

Holder to nozzle nut:
: 29 - 49 N·m (3.0 - 5.0 kg-m, 22 - 36 ft-lb)

http://vnx.su/

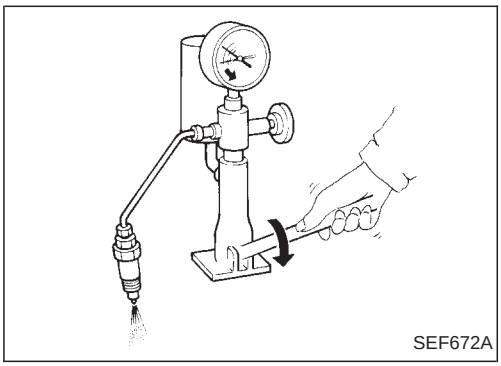
Test and Adjustment

WARNING:
When using nozzle tester, be careful not to allow diesel fuel sprayed from nozzle to contact your hands or body, and make sure your eyes are properly protected with goggles.


EF791A

INJECTION PRESSURE TEST

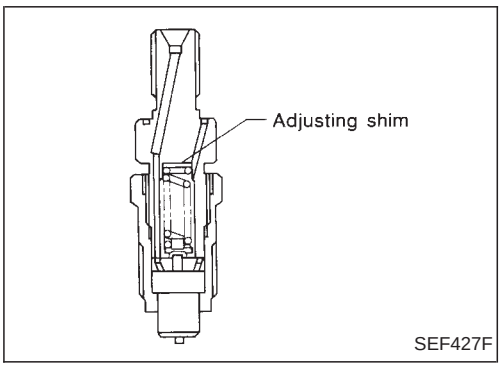
1. Install nozzle to injection nozzle tester and bleed air from flare nut.


SEF672A

2. Pump the tester handle slowly (once per second) and watch the pressure gauge.
3. Read the pressure gauge when the injection pressure just starts dropping.

Initial injection pressure:
Used
12,259 - 12,749 kPa (122.6 - 127.5 bar, 120 - 130 kg/cm^2, 1,706 - 1,849 psi)
New
12,749 - 13,730 kPa (127.5 - 137.3 bar, 130 - 140 kg/cm^2, 1,849 - 1,991 psi)

Always check initial injection pressure using a new nozzle.



SEF427F

4. To adjust injection pressure, change adjusting shims. (No. 2 - 4 nozzle)

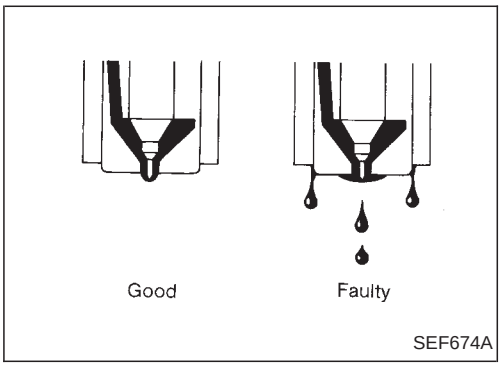
a. Increasing the thickness of adjusting shims increases initial injection pressure. Decreasing thickness reduces initial pressure.
b. A shim thickness of 0.04 mm (0.0016 in) corresponds approximately to a difference of 471 kPa (4.71 bar, 4.8 kg/cm^2, 68 psi) in initial injection pressure.

Refer to SDS for adjusting shim.

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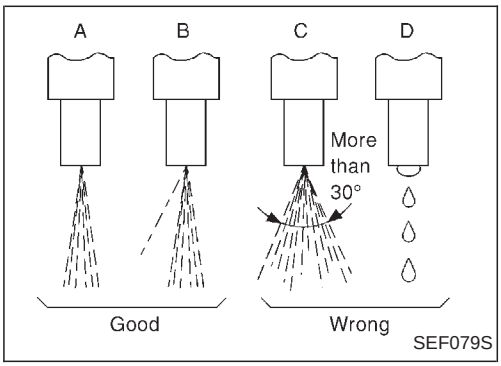
Test and Adjustment (Cont'd)

LEAKAGE TEST



1. Maintain the pressure at about 981 to 1,961 kPa (9.8 to 19.6 bar, 10 to 20 kg/cm^2, 142 to 284 psi) below initial injection pressure.
2. Check that there is no dripping from the nozzle tip or around the body.
3. If there is leakage, replace nozzle assembly.

SPRAY PATTERN TEST



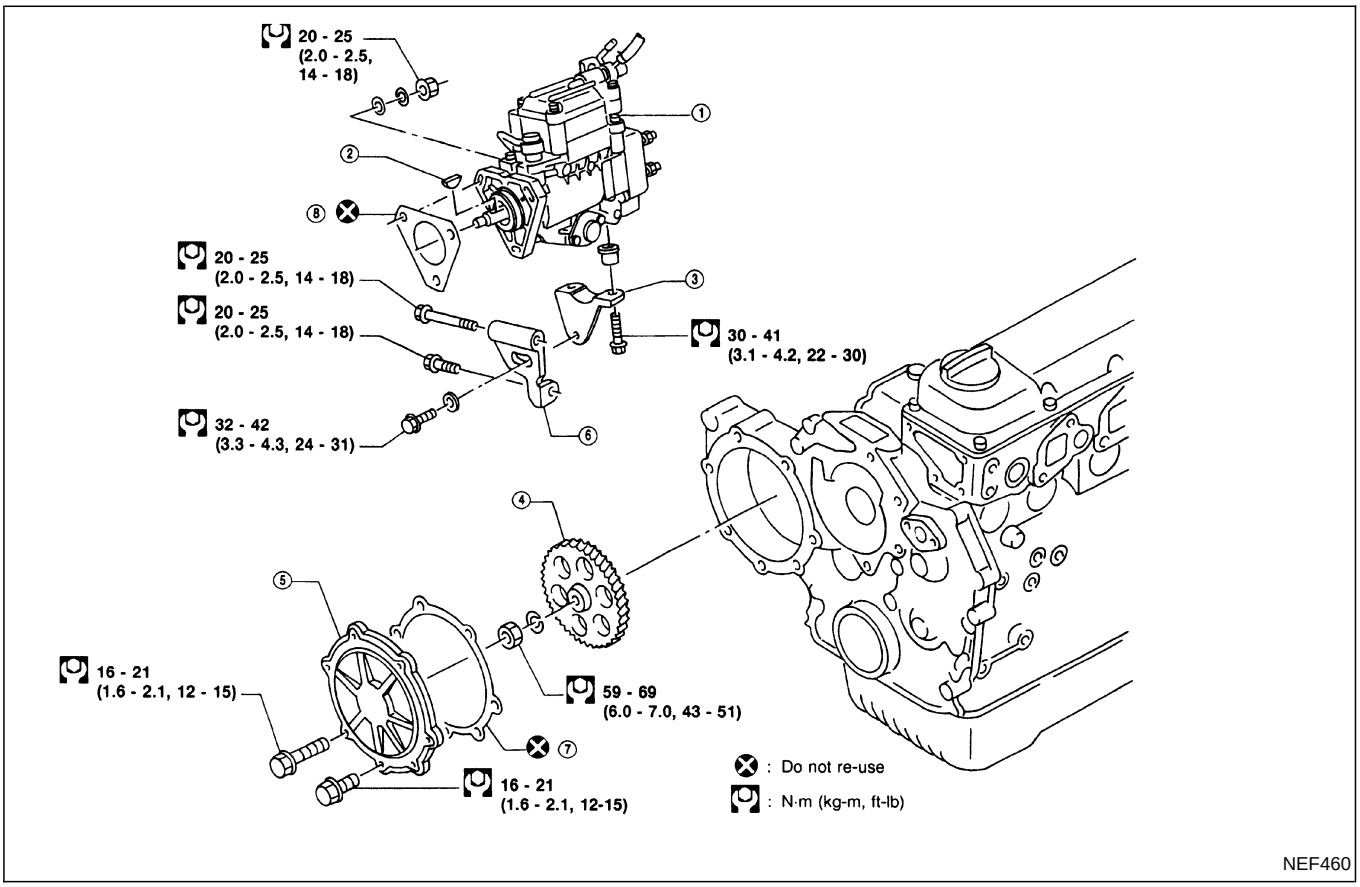
1. Check spray pattern by pumping tester handle one full stroke per second.

a. If main spray angle is within 30 degrees as shown, injection nozzle is good.

b. It is still normal even if a thin stream of spray deviates from the main spray (pattern B).

2. If the spray pattern is not correct, disassemble and clean nozzle.
3. Test again and if spray pattern is not corrected, replace nozzle.

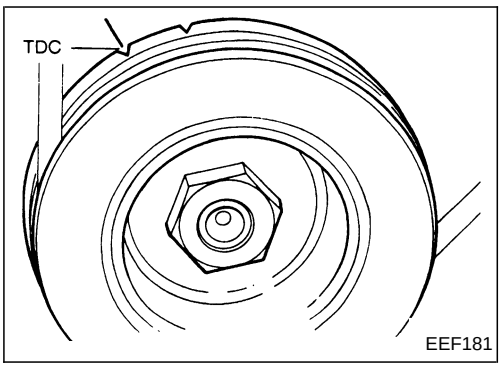
http://vnx.su/



① Electric fuel injection pump
② Key
③ Bracket
④ Injection pump drive gear
⑤ Dust cover
⑥ Bracket
⑦ Gasket
⑧ Gasket

Removal

1. Remove battery.
   Disconnect electronic injection pump harness connectors.

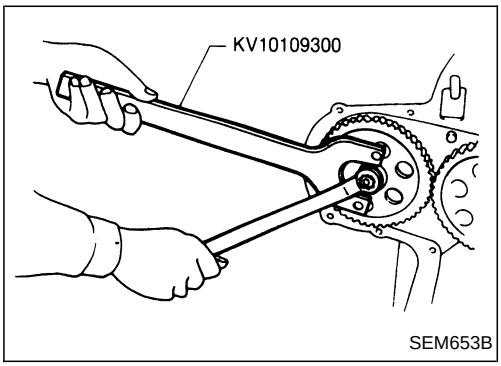


2. Set No. 1 piston at TDC on its compression stroke.

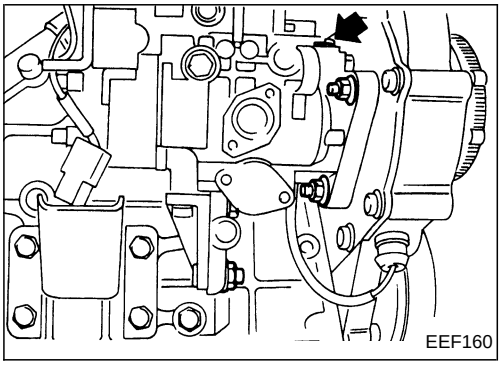
3. Remove fuel hoses (supply, return and spill) and injection tubes.

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Removal (Cont'd)



4. Remove dust cover and injection pump gear.
   Refer to EM section.



5. Remove fixing nuts and bolts. Then remove injection pump.

Installation

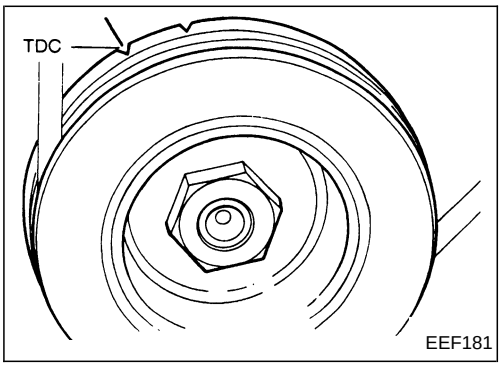
Install injection pump assembly in the reverse order of removal, observing the following:

1. Confirm that No. 1 cylinder is set at TDC on its compression stroke.
2. Install injection pump (Refer to EM section).

(1) Temporarily set injection pump so that the flange of the pump is aligned with aligning mark on front cover.

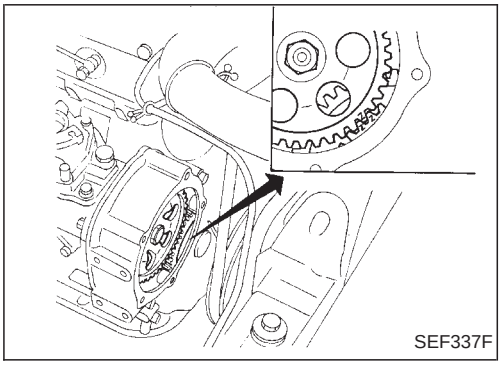
(2) Install injection pump gear.

: 59 - 69 N·m (6 - 7 kg-m, 43 - 51 ft-lb)



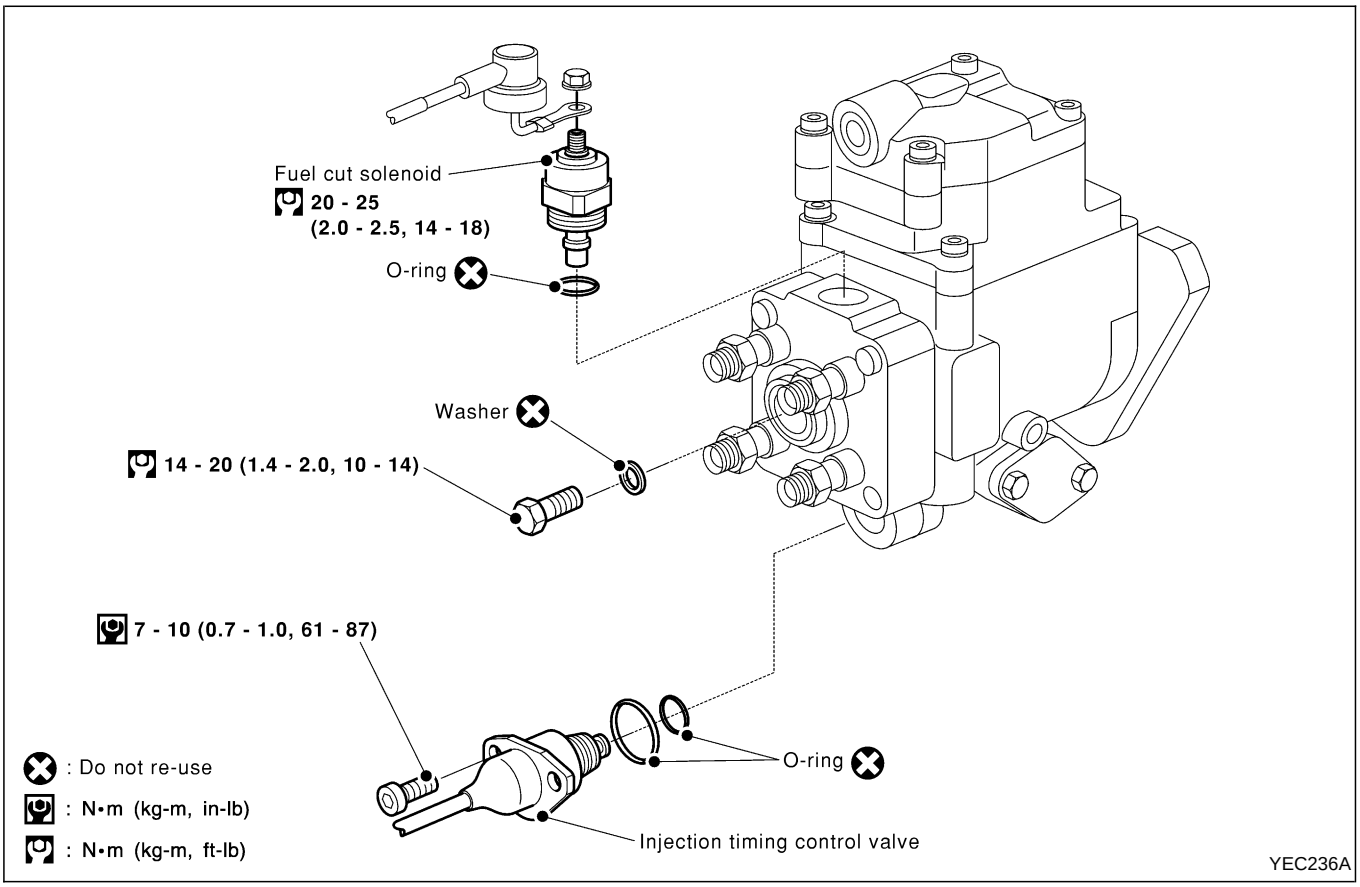
Make sure that the key does not fall into the front cover.
Make sure that "Z" marks are aligned.

(3) Apply liquid gasket to mating surface of injection pump gear cover and install it.



3. Adjust injection timing.
   Refer to "Basic Inspection", EC-361.
4. Install all parts removed.

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Disassembly and Assembly

CAUTION:

- **Do not disassemble the parts not shown in the illustration above.**
- **Before installing injection timing control valve, smear a coat of diesel fuel to O-ring and its mating area. Insert injection timing control valve straight into bore in fuel pump body. After positioning the injection timing control valve correctly, visually check that the fuel does not leak.**
- **After re-assembling the parts, erase Diagnostic Trouble Code (DTC), and perform DTC CONFIRMATION PROCEDURE (or OVERALL FUNCTION CHECK).**

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DTC and MI Detection Logic

When a malfunction is detected for the first time, the malfunction (DTC) is stored in the ECM memory.
The MI will light up each time the ECM detects a malfunction. However, if the same malfunction is experienced in two consecutive driving patterns and the engine is still running, the MI will stay lit up. For a description of diagnostic items causing the MI to light up, refer to “TROUBLE DIAGNOSIS — INDEX”, EC-313.

Diagnostic Trouble Code (DTC)

HOW TO READ DTC

The DTC can be read by the following methods.

Without CONSULT-II

ECM displays the DTC by a set of four digit numbers with MI illumination in the diagnostic test mode II (Self-diagnostic results). Example: 0102, 0103, 0104, etc.

With CONSULT-II

CONSULT-II displays the DTC in “SELF-DIAG RESULTS” mode. Examples: P0100, P0115, P0500, etc.
These DTCs are prescribed by ISO15031-6.
(CONSULT-II also displays the malfunctioning component or system.)

- **Output of the trouble code means that the indicated circuit has a malfunction. However, in the Mode II it does not indicate whether the malfunction is still occurring or occurred in the past and returned to normal.**
  CONSULT-II can identify them. Therefore, using CONSULT-II (if available) is recommended.

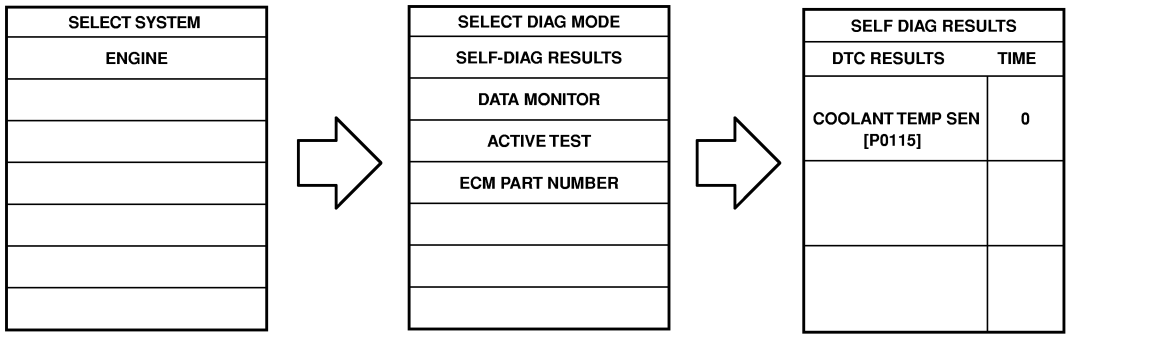
HOW TO ERASE DTC

How to Erase DTC (With CONSULT-II)

1. If the ignition switch stays “ON” after repair work, be sure to turn ignition switch “OFF” once. Wait at least 5 seconds and then turn it “ON” (engine stopped) again.
2. Touch “ENGINE”.
3. Touch “SELF-DIAG RESULTS”.
4. Touch “ERASE”. (The DTC in the ECM will be erased.)

How to erase DTC (With CONSULT-II)

1. If the ignition switch stays “ON” after repair work, be sure to turn ignition switch “OFF” once. Wait at least 5 seconds and then turn it “ON” again.



2. Turn CONSULT-II “ON” and touch “ENGINE”.
3. Touch “SELF-DIAG RESULTS”.
4. Touch “ERASE”. (The DTC in the ECM will be erased.)

SEF246Z

The emission related diagnostic information in the ECM can be erased by selecting “ERASE” in the “SELF-DIAG RESULTS” mode with CONSULT-II.

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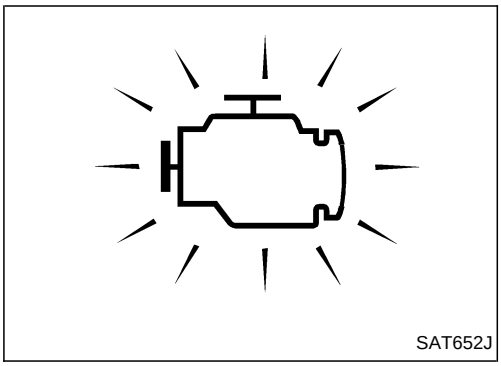
Diagnostic Trouble Code (DTC) (Cont'd)

How to Erase DTC (⊗ Without CONSULT-II)

1. If the ignition switch stays "ON" after repair work, be sure to turn ignition switch "OFF" once. Wait at least 5 seconds and then turn it "ON" (engine stopped) again.
2. Change the diagnostic test mode from Mode II to Mode I by using the data link connector. (See EC-346.)

The emission related diagnostic information in the ECM can be erased by changing the diagnostic test mode.

- **If the battery is disconnected, the emission-related diagnostic information will be lost after approx. 24 hours.**
- **Erasing the emission-related diagnostic information using CONSULT-II is easier and quicker than switching the diagnostic test mode using the data link connector.**


SAT652J

Malfunction Indicator (MI)

1. The malfunction indicator will light up when the ignition switch is turned ON without the engine running. This is a bulb check.
- If the malfunction indicator does not light up, refer to EL section ("WARNING LAMPS/WIRING DIAGRAM") or see MI & DATA LINK CONNECTORS.

2. When the engine is started, the malfunction indicator should go off.
   If the lamp remains on, the on board diagnostic system has detected an engine system malfunction.

If MI illuminates or flashes irregularly after starting engine, water may have accumulated in fuel filter. Drain water from fuel filter.

ON BOARD DIAGNOSTIC SYSTEM FUNCTION

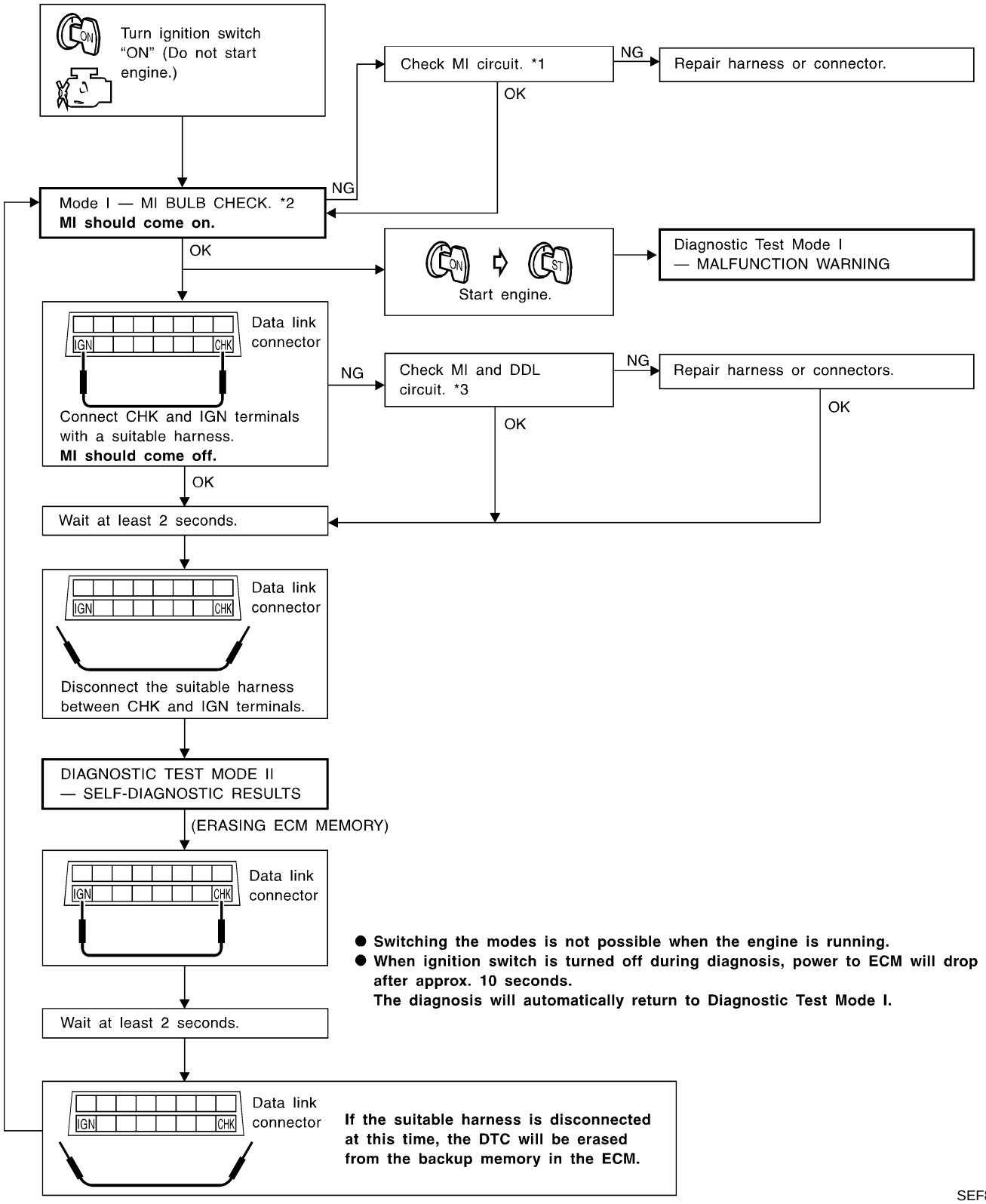
The on board diagnostic system has the following three functions.

Diagnostic Test Mode	KEY and ENG. Status	Function	Explanation of Function
Mode I	Ignition switch in ON position  Engine stopped 	BULB CHECK	This function checks the MI bulb for damage (blown, open circuit, etc.). If the MI does not come on, check MI circuit. (See EC-475.)
	Engine running 	MALFUNCTION WARNING	This is a usual driving condition. When ECM detects a malfunction, the MI will light up to inform the driver that a malfunction has been detected.
Mode II	Ignition switch in ON position  Engine stopped 	SELF-DIAGNOSTIC RESULTS	This function allows DTCs to be read.

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Malfunction Indicator (MI) (Cont'd)

HOW TO SWITCH DIAGNOSTIC TEST MODES



- **Switching the modes is not possible when the engine is running.**
- **When ignition switch is turned off during diagnosis, power to ECM will drop after approx. 10 seconds.**
  The diagnosis will automatically return to Diagnostic Test Mode I.

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*1: EC-475 *2: EC-345 *3: EC-475

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Malfunction Indicator (MI) (Cont'd)

DIAGNOSTIC TEST MODE I—BULB CHECK

In this mode, the MALFUNCTION INDICATOR on the instrument panel should stay ON. If it remains OFF, check the bulb. Refer to EL section ("WARNING LAMPS/WIRING DIAGRAM") or see EC-475.

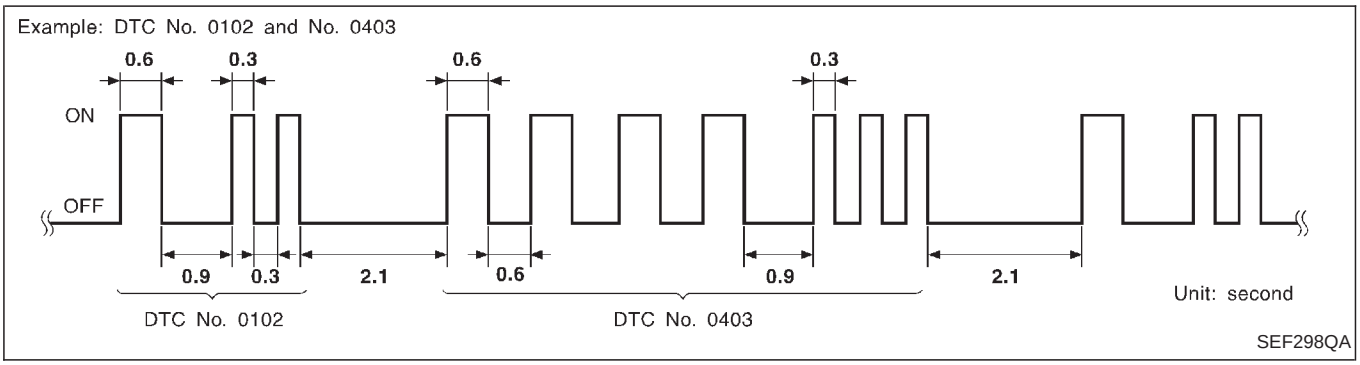
DIAGNOSTIC TEST MODE I—MALFUNCTION WARNING

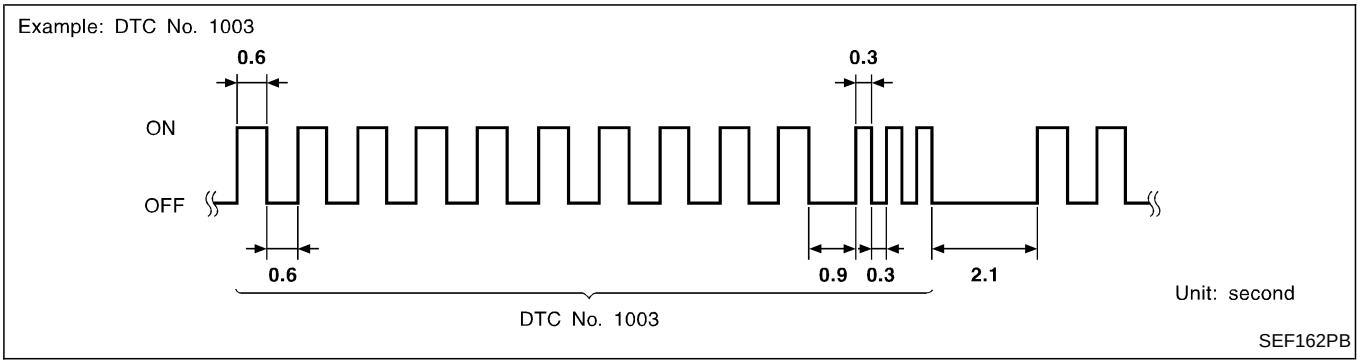
MI	Condition
ON	When a malfunction is detected or the ECM's CPU is malfunctioning.
OFF	No malfunction.

- These Diagnostic Trouble Code Numbers are clarified in Diagnostic Test Mode II (SELF-DIAGNOSTIC RESULTS).

DIAGNOSTIC TEST MODE II—SELF-DIAGNOSTIC RESULTS

In this mode, DTC is indicated by the number of blinks of the MI as shown below.





Long (0.6 second) blinking indicates the two LH digits of number and short (0.3 second) blinking indicates the two RH digits of number. For example, the MI blinks 10 times for 6 seconds (0.6 sec x 10 times) and then it blinks three times for about 1 second (0.3 sec x 3 times). This indicates the DTC "1003".
In this way, all the detected malfunctions are classified by their DTC numbers. The DTC "0505" refers to no malfunction. (See TROUBLE DIAGNOSIS — INDEX, EC-313.)

HOW TO ERASE DIAGNOSTIC TEST MODE II (Self-diagnostic results)

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

- **If the battery terminal is disconnected, the diagnostic trouble code will be lost from the backup memory within 24 hours.**
- **Be careful not to erase the stored memory before starting trouble diagnoses.**
- **If the MI flashes or "NATS MALFUNCTION" is displayed on "SELF-DIAG RESULTS" screen, perform self-diagnostic results mode with CONSULT-II using NATS program card (NATS-E940). Refer to EL section.**
- **Confirm no self-diagnostic results of NATS is displayed before touching "ERASE" in "SELF-DIAG RESULTS" mode with CONSULT-II.**
- **When replacing ECM, initialisation of NATS system and registration of all NATS ignition key IDs must be carried out with CONSULT-II using NATS program card (NATS-E940).**
  Therefore, be sure to receive all keys from vehicle owner.

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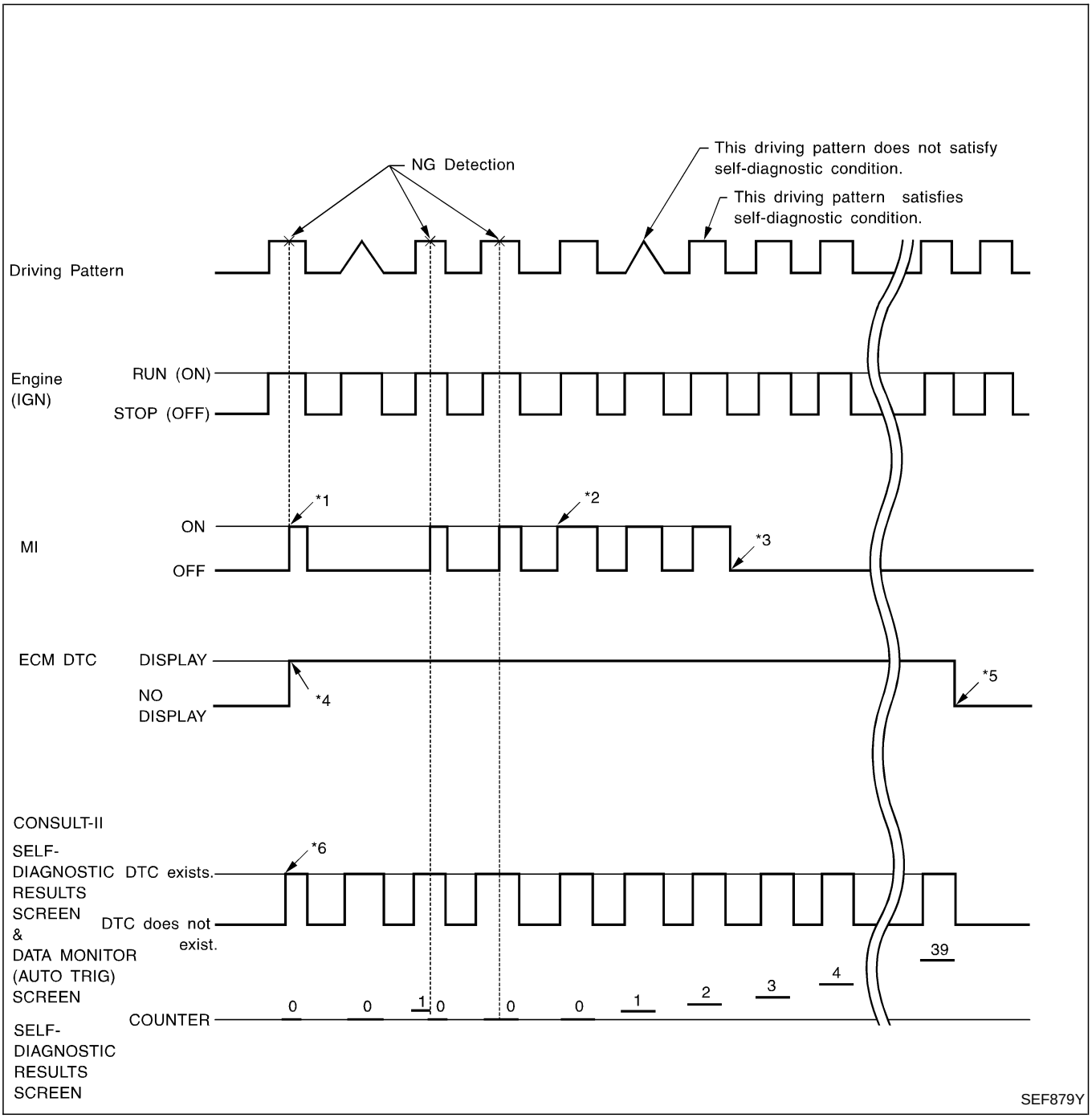
Malfunction Indicator (MI) (Cont'd)

Regarding the procedures of NATS initialisation and NATS ignition key ID registration, refer to CONSULT-II operation manual, NATS.

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Malfunction Indicator (MI) (Cont'd)

RELATIONSHIP BETWEEN MI, DTC, CONSULT-II AND DRIVING PATTERNS



*1: When a malfunction is detected, MI will light up.

*2: When the same malfunction is detected in two consecutive driving patterns, MI will stay lit up.

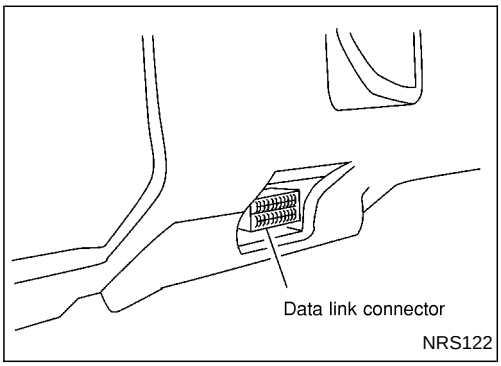
*3: MI will go off after vehicle is driven three times without any malfunctions.

*4: When a malfunction is detected for the first time, the DTC will be stored in ECM.

*5: The DTC will not be displayed any longer after vehicle is driven 40 times without the same malfunction. (The DTC still remain in ECM.)

*6: Other screens except SELF-DIAGNOSTIC RESULTS & DATA MONITOR (AUTO TRIG) cannot display the malfunction. DATA MONITOR (AUTO TRIG) can display the malfunction at the moment it is detected.

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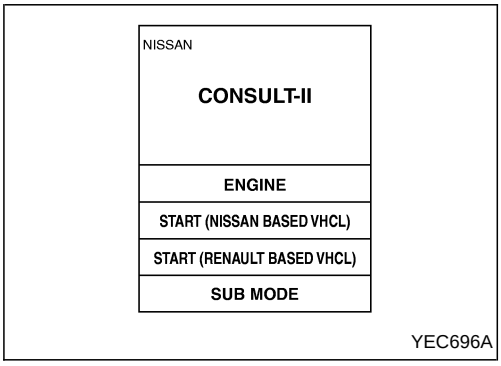


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CONSULT-II

CONSULT-II INSPECTION PROCEDURE

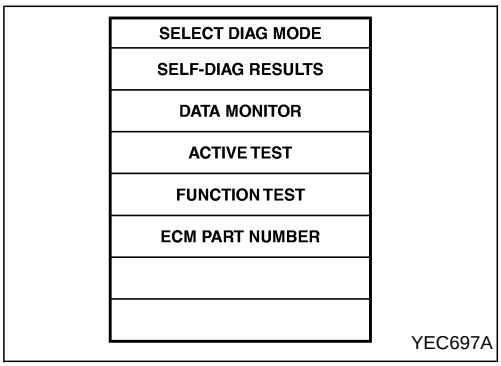
1. Turn off ignition switch.
2. Connect “CONSULT-II” to data link connector for CONSULT-II. (Data link connector for CONSULT-II is located behind the fuse box cover.)



YEC696A

3. Turn on ignition switch.
4. Touch “START”.
5. Touch “ENGINE”.
6. Perform each diagnostic test mode according to each service procedure.

For further information, see the CONSULT-II Operation Manual.



YEC697A

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CONSULT-II (Cont'd)

ENGINE CONTROL COMPONENT PARTS/CONTROL SYSTEMS APPLICATION

Item			DIAGNOSTIC TEST MODE		
			SELF-DIAG-NOSTIC RESULTS	DATA MONITOR	ACTIVE TEST
ENGINE CONTROL COMPONENT PARTS	INPUT	Camshaft position sensor (PUMP) *1	X *2	X	
		Mass air flow sensor	X	X	
		Engine coolant temperature sensor	X	X	
		Control sleeve position sensor	X	X	X
		Fuel temperature sensor	X	X	
		Vehicle speed sensor	X	X	
		Accelerator position sensor	X	X	
		Accelerator position switch		X	
		Crankshaft position sensor (TDC)	X	X	
		Needle lift sensor	X	X	
		Ignition switch (start signal)		X	
		Ignition switch (ON signal)	X	X	
		Air conditioner switch		X	
		Stop lamp switch	X	X	
		Brake switch 2	X	X	
		Battery voltage		X	
	OUTPUT	Injection timing control valve	X	X	X
		Fuel cut solenoid valve	X	X	X
		Air conditioner relay	X *2	X	
		Glow relay	X	X	X
		EGRC-solenoid valve A	X	X	X
		EGRC-solenoid valve B	X	X	X
		Throttle control solenoid valve	X	X	X

X: Applicable
*1 Imaginary sensor, which produces secondary engine revolution signal using needle lift sensor pulse.
*2 CONSULT-II may not display, but self-diagnostic results are available with MI.

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CONSULT-II (Cont'd)

SELF-DIAGNOSTIC MODE

Regarding items detected in "SELF-DIAG RESULTS" mode, refer to "TROUBLE DIAGNOSIS — INDEX", EC-313.

DATA MONITOR MODE

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
CKPS·RPM (TDC) [rpm]	○	○	• The engine speed computed from the crankshaft position sensor (TDC) signal is displayed.	
CMPS·RPM - PUMP [rpm]	○	○	• The engine speed computed from the needle lift sensor signal is displayed.	
COOLAN TEMP/S [°C] or [°F]	○	○	• The engine coolant temperature (determined by the signal voltage of the engine coolant temperature sensor) is displayed.	• When the engine coolant temperature sensor is open or short-circuited, ECM enters fail-safe mode. The same data as the fuel temperature is displayed.
VHCL SPEED SE [km/h] or [mph]	○	○	• The vehicle speed computed from the vehicle speed sensor signal is displayed.	
FUEL TEMP SEN [°C] or [°F]	○	○	• The fuel temperature (determined by the signal voltage of the fuel temperature sensor) is displayed.	
ACCEL POS SEN [V]	○	○	• The accelerator position sensor signal voltage is displayed.	
OFF ACCEL POS [ON/OFF]	○	○	• Indicates [ON/OFF] condition from the accelerator position switch signal.	• Signal at approximately 9° opened.
C/SLEEV POS/S [V]	○	○	• The control sleeve position sensor signal voltage is displayed.	
BATTERY VOLT [V]	○	○	• The power supply voltage of ECM is displayed.	
START SIGNAL [ON/OFF]	○	○	• Indicates [ON/OFF] condition from the starter signal.	• After starting the engine, [OFF] is displayed regardless of the starter signal.
AIR COND SIG [ON/OFF]	○	○	• Indicates [ON/OFF] condition of the air conditioner switch as determined by the air conditioner signal.	
BRAKE SW [ON/OFF]	○		• Indicates [ON/OFF] condition of the stop lamp switch.	
BRAKE SW2 [ON/OFF]	○		• Indicates [ON/OFF] condition of the brake switch 2.	
IGN SW [ON/OFF]	○	○	• Indicates [ON/OFF] condition from ignition switch.	
MAS AIR/FL SE [V]	○	○	• The signal voltage of the mass air flow sensor is displayed.	• When the engine is stopped, a certain value is indicated.
ACT INJ TIMG [°]	○		• The actual injection timing angle determined by the ECM (an approximate average angle between injection start and end from TDC) is displayed.	
TARGET F/INJ [mm^3/stroke]		○	• The target fuel injection quantity (determined by the ECM according to the input signal) is indicated.	

NOTE:
Any monitored item that does not match the vehicle being diagnosed is deleted from the display automatically.

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CONSULT-II (Cont'd)

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
FUEL CUT S/V [ON/OFF]			• The control condition of the fuel cut solenoid valve (determined by ECM according to the input signal) is indicated. • OFF ... Fuel cut solenoid valve is not operating. ON ... Fuel cut solenoid valve is operating.	• When the fuel cut solenoid valve is not operating, fuel supply is shut off.
AIR COND RLY [ON/OFF]		○	• The air conditioner relay control condition (determined by ECM according to the input signal) is indicated.	
GLOW RLY [ON/OFF]		○	• The glow relay control condition (determined by ECM according to the input signal) is displayed.	
EGRC SOL/V A [ON/OFF]			• The control condition of the EGRC-solenoid valve A (determined by ECM according to the input signal) is indicated. • OFF ... EGRC-solenoid valve A is not operating. ON ... EGRC-solenoid valve A is operating.	
EGRC SOL/V B [ON/OFF]			• The control condition of the EGRC-solenoid valve B (determined by ECM according to the input signal) is indicated. • OFF ... EGRC solenoid valve B is not operating. ON ... EGRC-solenoid valve B is operating.	
THROT RLY [ON/OFF]			• The control condition of the throttle control solenoid valve (determined by ECM according to the input signal) is indicated. • OFF ... Throttle control solenoid valve is not operating. ON ... Throttle control solenoid valve is operating.	

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CONSULT-II (Cont'd)

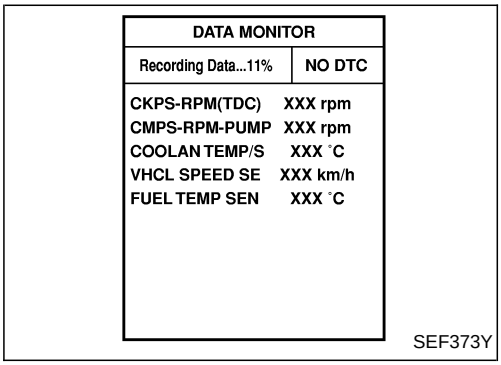
ACTIVE TEST MODE

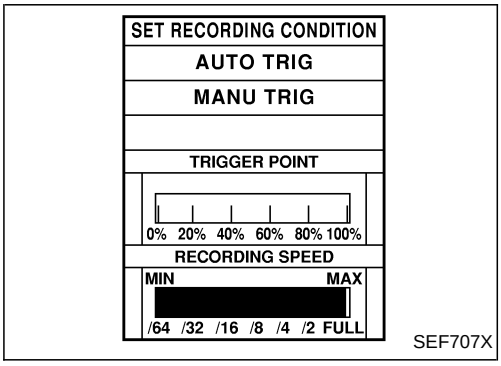
TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
TARGET F/INJ	• Engine: Return to the original trouble condition. • Fix the target injection quantity using CONSULT-II.	If trouble symptom disappears, see CHECK ITEM	• Control sleeve position sensor.
FUEL CUT SOL/V	• Ignition switch: ON • Turn solenoid valve "ON" and "OFF" with the CONSULT-II and listen to operating sound.	Solenoid valve makes an operating sound.	• Harness and connector • Solenoid valve
EGRC SOL/V A	• Ignition switch: ON • Turn solenoid valve "ON" and "OFF" with the CONSULT-II and listen to operating sound.	Solenoid valve makes an operating sound.	• Harness and connector • Solenoid valve
EGRC SOL/V B	• Ignition switch: ON • Turn solenoid valve "ON" and "OFF" with the CONSULT-II and listen to operating sound.	Solenoid valve makes an operating sound.	• Harness and connector • Solenoid valve
THROT CONT SOL/V	• Ignition switch: ON • Turn solenoid valve "ON" and "OFF" with the CONSULT-II and listen to operating sound.	Solenoid valve makes an operating sound.	• Harness and connector • Solenoid valve
GLOW RLY	• Ignition switch: ON (Engine stopped) • Turn the glow relay "ON" and "OFF" using CONSULT-II and listen to operating sound.	Glow relay makes the operating sound.	• Harness and connector • Glow relay
INJ TIMING	• Engine: Return to the original trouble condition • Retard the injection timing using CONSULT-II.	If trouble symptom disappears, see CHECK ITEM.	• Adjust initial injection timing

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CONSULT-II (Cont'd)

REAL TIME DIAGNOSIS IN DATA MONITOR MODE





CONSULT-II has two kinds of triggers and they can be selected by touching "SETTING" in "DATA MONITOR" mode.

1) "AUTO TRIG" (Automatic trigger):

- The malfunction will be identified on the CONSULT-II screen in real time.
  In other words, DTC will be displayed if the malfunction is detected by ECM.
  At the moment a malfunction is detected by ECM, "MONITOR" in "DATA MONITOR" screen is changed to "Recording Data ... xx%" as shown at left, and the data after the malfunction detection is recorded. Then when the percentage reached 100%, "REAL-TIME DIAG" screen is displayed. If "STOP" is touched on the screen during " Recording Data ... xx%", "REAL-TIME DIAG" screen is also displayed.
  The recording time after the malfunction detection and the recording speed can be changed by "TRIGGER POINT" and "Recording Speed". Refer to CONSULT-II OPERATION MANUAL.

2) "MANU TRIG" (Manual trigger):

- DTC will not be displayed automatically on CONSULT-II screen even though a malfunction is detected by ECM.
  DATA MONITOR can be performed continuously even though a malfunction is detected.

Use these triggers as follows:

1) "AUTO TRIG"

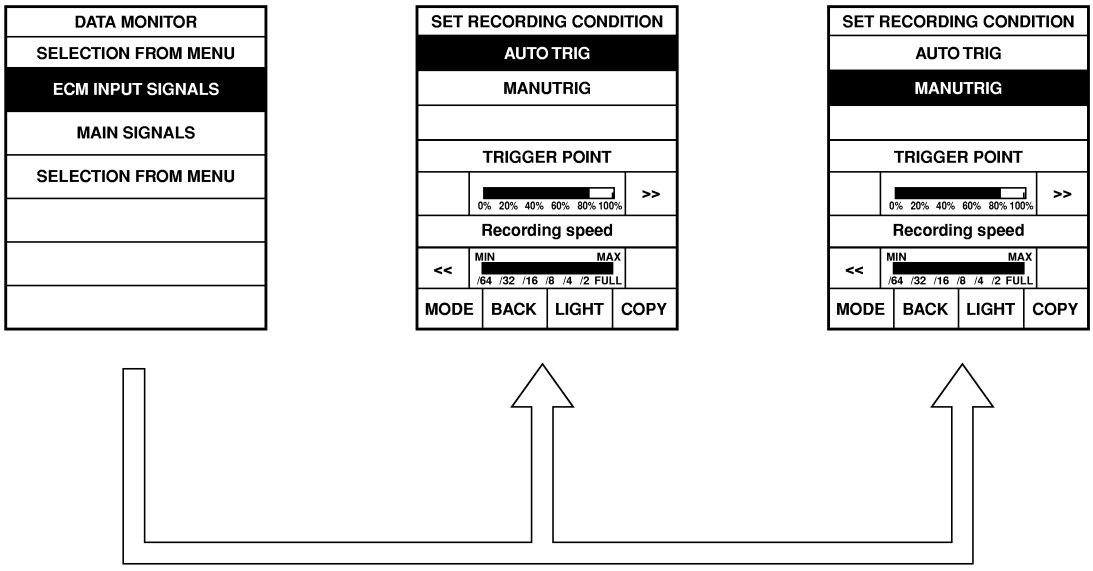
- While trying to detect the DTC by performing the "DTC Confirmation Procedure", be sure to select to "DATA MONITOR (AUTO TRIG)" mode. You can confirm the malfunction at the moment it is detected.
- While narrowing down the possible causes, CONSULT-II should be set in "DATA MONITOR (AUTO TRIG)" mode, especially in case the incident is intermittent.
  When you are inspecting the circuit by gently shaking (or twisting) the suspicious connectors, components and harness in the "DTC Confirmation Procedure", the moment a malfunction is found the DTC will be displayed. Refer to GI-22, "Incident Simulation Tests".

2) "MANU TRIG"

- If the malfunction is displayed as soon as "DATA MONITOR" is selected, reset CONSULT-II to "MANU TRIG". By selecting "MANU TRIG" you can monitor and store the data. The data can be utilized for further diagnosis, such as a comparison with the value for the normal operating condition.

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CONSULT-II (Cont'd)



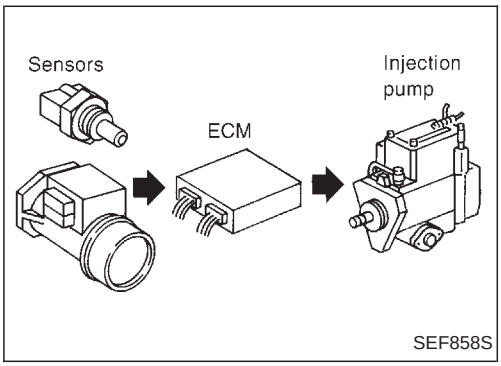
"SETTING"

"AUTO TRIG"
A malfunction can be displayed on "DATA MONITOR" screen automatically if detected.

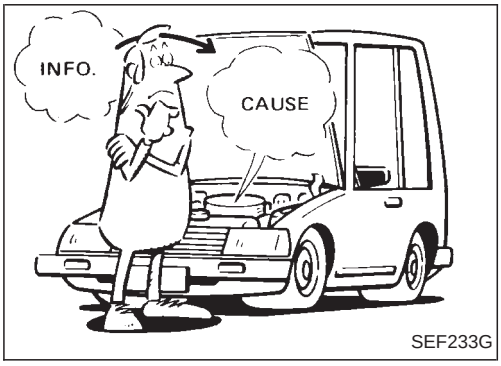
"MANU TRIG"
A malfunction can not be displayed on "DATA MONITOR" screen automatically even if detected.

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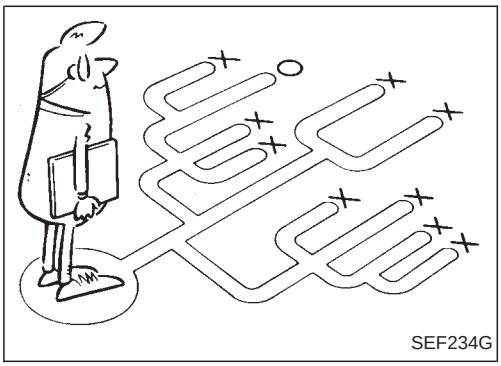
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SEF858S



SEF233G


SEF234G

Introduction

The engine has an ECM to control major systems such as fuel injection control, fuel injection timing control, glow control system, etc. The ECM accepts input signals from sensors and instantly drives electronic fuel injection pump. It is essential that both input and output signals are correct and stable. It is also important that there are no problems such as vacuum leaks, with the engine.

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

A visual check may not be sufficient to determine the cause of the problems. An active road test with CONSULT-II or a circuit tester connected should be performed. Follow the “Work Flow” on the next page.

Before undertaking actual checks, take a few minutes to talk with a customer who approaches with a driveability complaint. The customer can supply important information about such problems, especially intermittent ones. Find out what symptoms are present and under what conditions they occur. A “Diagnostic Worksheet” like the example on the next page should be used.

Start your diagnosis by looking for “conventional” problems first. This will help troubleshoot driveability problems on a vehicle with an electronically controlled engine.

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KEY POINTS

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

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Diagnostic Worksheet

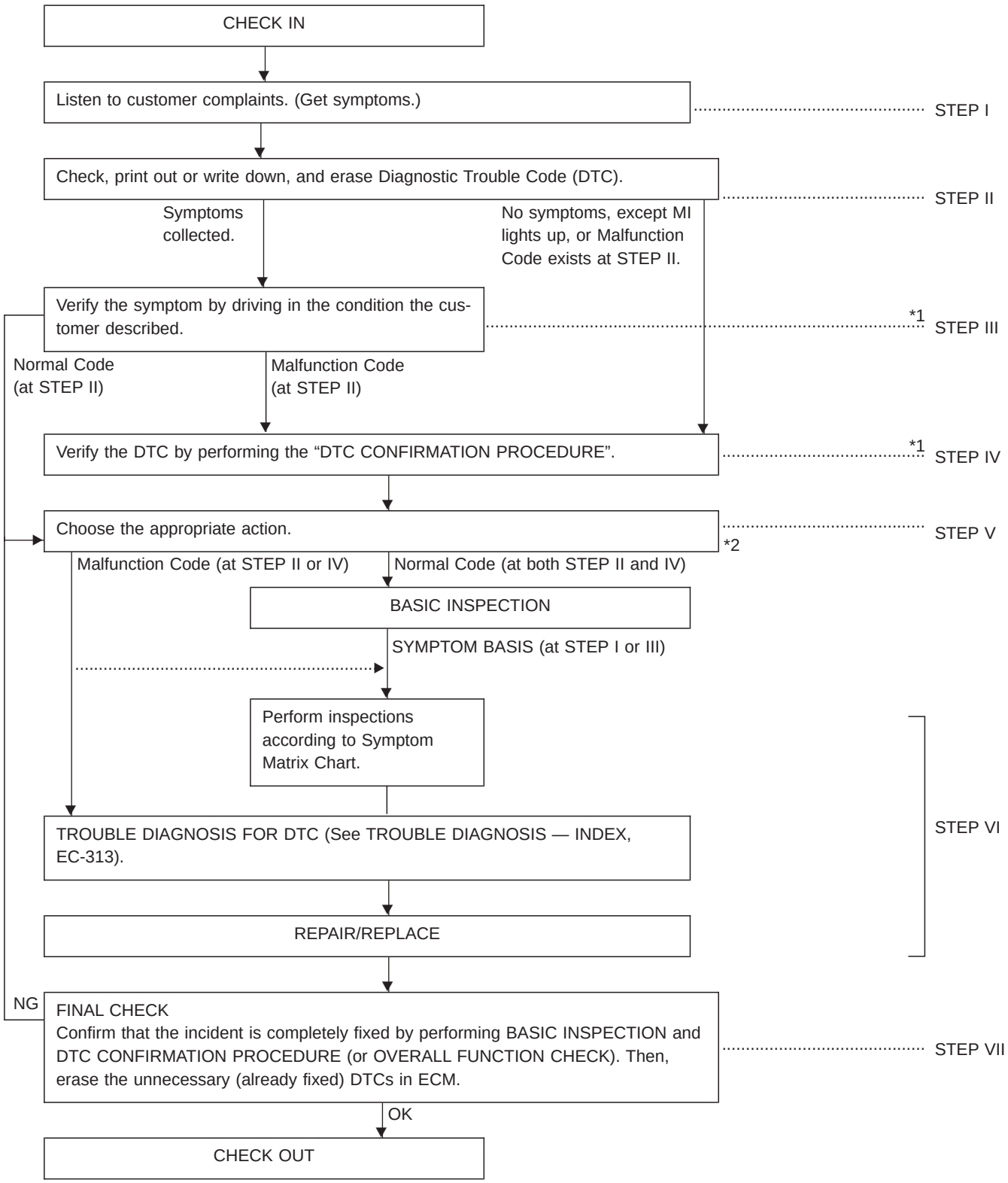
There are many operating conditions that lead to the malfunction of engine components. A good understanding of such conditions can make troubleshooting easier and more accurate.
In general, each customer feels differently about a problem. It is important to fully understand the symptoms or conditions for a customer complaint.
Utilize a diagnostic worksheet like the one shown below in order to organize all the information for troubleshooting.

WORKSHEET SAMPLE

Customer name MR/MS		Model & Year	VIN
Engine #		Trans.	Mileage
Incident Date		Manuf. Date	In Service Date
Symptoms	☐ Startability	☐ Impossible to start ☐ No combustion ☐ Partial combustion ☐ Partial combustion when warming-up engine ☐ Partial combustion when cooling down engine ☐ Possible but hard to start ☐ Others [ ]	
	☐ Idling	☐ No fast idle ☐ Unstable ☐ High idle ☐ Low idle ☐ Others [ ]	
	☐ Driveability	☐ Stumble ☐ Surge ☐ Knock ☐ Lack of power ☐ Others [ ]	
	☐ Engine stall	☐ At the time of start ☐ While idling ☐ While accelerating ☐ While decelerating ☐ Just after stopping ☐ While loading	
Incident occurrence		☐ Just after delivery ☐ Recently ☐ In the morning ☐ At night ☐ In the daytime	
Frequency		☐ All the time ☐ Under certain conditions ☐ Sometimes	
Weather conditions		☐ Not affected	
	Weather	☐ Fine ☐ Raining ☐ Snowing ☐ Others [ ]	
	Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold ☐ Humid °F	
Engine conditions		☐ Cold ☐ During warm-up ☐ After warm-up Engine speed 0 2,000 4,000 6,000 8,000 rpm	
Road conditions		☐ In town ☐ In suburbs ☐ Highway ☐ Off road (up/down)	
Driving conditions		☐ Not affected ☐ At starting ☐ While idling ☐ At racing ☐ While accelerating ☐ While cruising ☐ While decelerating ☐ While turning (RH/LH) Vehicle speed 0 10 20 30 40 50 60 70 80 90 100 mph	
Malfunction indicator lamp		☐ Turned on ☐ Not turned on	

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Work Flow



***1: If the incident cannot be duplicated, refer to GI section.**
***2: If the on board diagnostic system cannot be performed, check main power supply and ground circuit. Refer to “TROUBLE DIAGNOSIS FOR POWER SUPPLY”, EC-375.**

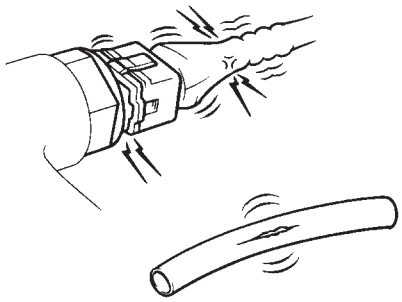
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Description for Work Flow

STEP	DESCRIPTION
STEP I	Get detailed information about the conditions and the environment when the incident/symptom occurred using the “DIAGNOSTIC WORKSHEET” as shown on the next page.
STEP II	Before confirming the concern, check and write down (print out using CONSULT-II) the Diagnostic Trouble Code (DTC), then erase the code. (Refer to EC-344). The DTC can be used when duplicating the incident at STEP III & IV. Study the relationship between the cause, specified by DTC, and the symptom described by the customer. (The “Symptom Matrix Chart” will be useful. Refer to EC-363.)
STEP III	Try to confirm the symptom and under what conditions the incident occurs. The “DIAGNOSTIC WORK SHEET” is useful to verify the incident. Connect CONSULT-II to the vehicle in DATA MONITOR (AUTO TRIG) mode and check real time diagnosis results. If the malfunction code is detected, skip STEP IV and perform STEP V.
STEP IV	Try to detect the Diagnostic Trouble Code (DTC) by driving in (or performing) the “DTC CONFIRMATION PROCEDURE”. Check and read the DTC by using CONSULT-II. During the DTC verification, be sure to connect CONSULT-II to the vehicle in DATA MONITOR (AUTO TRIG) mode and check real time diagnosis results. In case the “DTC CONFIRMATION PROCEDURE” is not available, perform the “OVERALL FUNCTION CHECK” instead. The DTC cannot be displayed by this check, however, this simplified “check” is an effective alternative. The “NG” result of the “OVERALL FUNCTION CHECK” is the same as the DTC detection.
STEP V	Take the appropriate action based on the results of STEP I through IV. If the malfunction code is indicated, proceed to TROUBLE DIAGNOSIS FOR DTC. If the normal code is indicated, proceed to the BASIC INSPECTION. Refer to EC-361. Then perform inspections according to the Symptom Matrix Chart. Refer to EC-363.
STEP VI	Identify where to begin diagnosis based on the relationship study between symptom and possible causes. Inspect the system for mechanical binding, loose connectors or wiring damage using (tracing) “Harness Layouts”. Gently shake the related connectors, components or wiring harness with CONSULT-II set in “DATA MONITOR (AUTO TRIG)” mode. Check the voltage of the related ECM terminals or monitor the output data from the related sensors with CONSULT-II. Refer to EC-369. The “DIAGNOSTIC PROCEDURE” in EC section contains a description based on open circuit inspection. A short circuit inspection is also required for the circuit check in the DIAGNOSTIC PROCEDURE. Repair or replace the malfunctioning parts.
STEP VII	Once you have repaired the circuit or replaced a component, you need to run the engine in the same conditions and circumstances which resulted in the customer’s initial complaint. Perform the “DTC CONFIRMATION PROCEDURE” and confirm the normal code (Diagnostic trouble code No. 55) is detected. If the incident is still detected in the final check, perform STEP VI by using a different method from the previous one. Before returning the vehicle to the customer, be sure to erase the unnecessary (already fixed) DTC in ECM. (Refer to EC-344.)

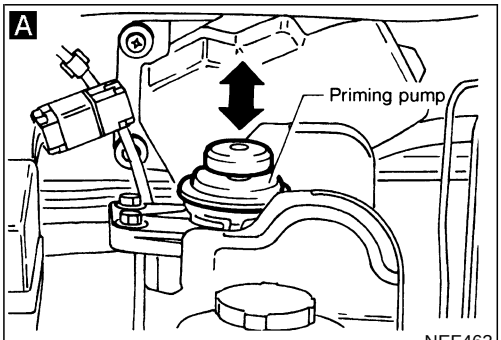
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A



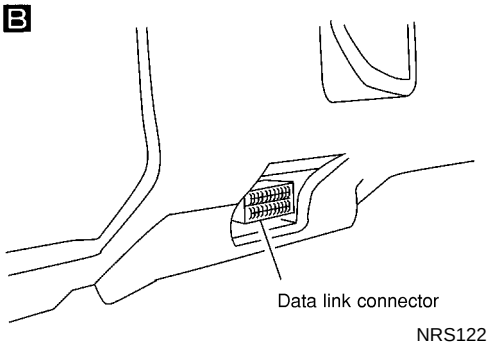
SEF142I

A



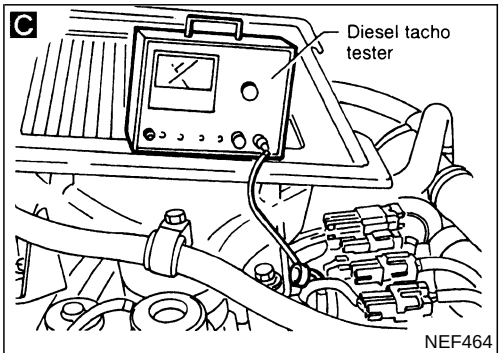
NEF463

B



NRS122

C



NEF464

C

DATA MONITOR	
MONITOR	NO DTC
CKPS-RPM (TDC)	XXX rpm

SEF817Y

Basic Inspection

Precaution:
Perform Basic Inspection without electrical or mechanical loads applied;

- **Headlamp switch is OFF,**
- **Air conditioner switch is OFF,**
- **Rear defogger switch is OFF,**
- **Steering wheel is in the straight-ahead position, etc.**

A

BEFORE STARTING

1. Check service records for any recent repairs that may indicate a related problem, or the current need for scheduled maintenance.
2. Open engine hood and check the following:
   - Harness connectors for improper connections
   - Vacuum hoses for splits, kinks, or improper connections
   - Wiring for improper connections, pinches, or cuts
3. Using priming pump, bleed air from fuel system. Refer to “Fuel Filter Check” in MA section.

B

CONNECT CONSULT-II TO THE VEHICLE.
Connect “CONSULT-II” to the data link connector for CONSULT-II and select “ENGINE” from the menu.

DOES ENGINE START?

No → Turn ignition switch to “LOCK” position, wait 5 seconds and then start engine. If engine fails to start, check diagnostic trouble code (DTC).

Yes

Run engine for 10 minutes.

C

CHECK IDLE SPEED.

Read engine idle speed in “DATA MONITOR” mode with CONSULT-II.
725 rpm ± 50 (in N position)

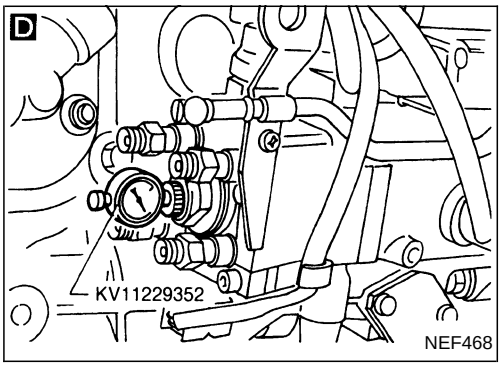
OR

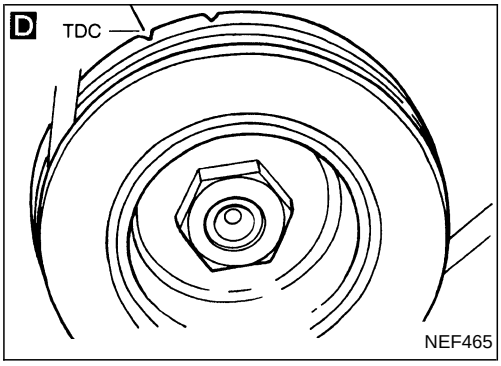
Check idle speed using tachometer tester.
725 rpm ± 50 (in N position)

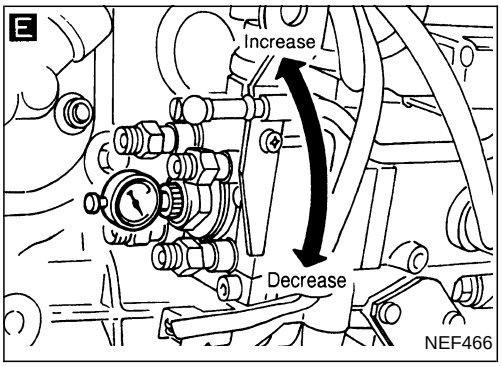
(Go to Ⓐ on next page.)

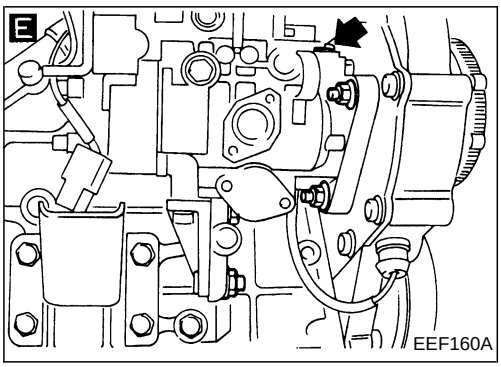
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Basic Inspection (Cont'd)









Ⓐ

D

CHECK INJECTION TIMING.

1. Set No. 1 piston at TDC on its compression stroke.
2. Remove injection tubes and air bleeder on the back of injection pump.
3. Set dial gauge so its indicator points to somewhere between 1.0 and 2.0 mm (0.039 and 0.079 in) on the scale.
4. Turn crankshaft two turns clockwise and check that dial gauge indicates the same value again.
5. Turn crankshaft counterclockwise about 100 degrees, then turn crankshaft clockwise slowly, and set dial gauge indicator to 0 mm at the position it stops.
6. Turn crankshaft clockwise and set it at TDC using the mark on the crankshaft pulley.
7. Read plunger lift.
   Plunger lift:
   0.36 ± 0.02 mm (0.0142 ± 0.0008 in) at TDC

- **When repeating the checking, start with step 5.**

OK → Bleed air from fuel system. After this inspection, unnecessary diagnostic trouble code No. might be displayed. Erase the stored memory in ECM. Refer to "HOW TO ERASE DTC" (EC-344).

OK → INSPECTION END

NG

E

Adjusting

1. If plunger lift is not within the specified value, adjust by turning injection pump.

- **If indication is smaller than the specified value, turn pump body away from engine.**
- **If indication is larger than the specified value, turn pump body towards engine.**

2. Tighten injection pump securing bolts and nuts.
   Nut:
   : 20 - 25 N·m (2.0 - 2.5 kg-m, 14 - 18 ft-lb)
   Bolt:
   : 32 - 42 N·m (3.3 - 4.3 kg-m, 24 - 31 ft-lb)
3. Remove dial gauge and install air bleeder with new washer.
4. Install injection tubes.
   Flare nut:
   : 20 - 25 N·m (2.0 - 2.5 kg-m, 14 - 18 ft-lb)
5. Bleed air from fuel system.
   Refer to "DRAINING SYSTEM" of "ENGINE MAINTENANCE" in MA section.

→ Go to A.

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Symptom Matrix Chart

SYSTEM — Basic engine control system		SYMPTOM: HARD/NO START/RESTART (EXCP. HA)				SYMPTOM: ENGINE STALL			SYMPTOM																						Reference page	Feature of symptom, Check point
		NO START (with first firing)	NO START (without first firing)	HARD TO START WHEN ENGINE IS COLD	HARD TO START WHEN ENGINE IS HOT	AT IDLE	DURING DRIVING	WHEN DECELERATING	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER	POOR ACCELERATION	HI IDLE	LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEAT/HIGH ENGINE COOLANT TEMPERATURE	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	ABNORMAL SMOKE COLOR: BLACK SMOKE	ABNORMAL SMOKE COLOR: WHITE SMOKE	DEAD BATTERY (UNDER CHARGE)	Malfunction indicator lamp illuminates.	Can be detected by CONSULT-II?	Fuel cut					
New CT/CS		AA				AB			AC	AD	AE		AF		AG	AH	AJ	AK	AL	AM	AP		HA								
Injection timing	Advanced	○	○	●	●			○		●					○	○					●				○		EC-361	
	Retarded	○	○	●	●			○			●				○	○						●			○		EC-361	
Electric injection pump mainframe		●	●	●	●	○	○	○	○	○	●	○	○	○	●	●	○		○		●	○		○	○	○	—	*1
Injection nozzle		○	○	○	○	○	○	○		●	○	○		○	●	●					●						EC-336	*2
Glow system		○	○	●	●					●												●					EC-412	
Engine body		○	○	●	●	○	○	○		●	○	○		○	●	●		○	○	○		●					EM-section	*3
EGR system											●	●									●						EC-454	
Air cleaner and ducts											●	●									●				○		MA-section	*4

● ; High Possibility Item
○ ; Low Possibility Item
*1: Insufficient or excess amount. Governor malfunction may be the cause.
*2: Depends on open-valve pressure and spray pattern.
*3: Caused mainly by insufficient compression pressure.
*4: Symptom varies depending on off-position of air duct, etc.

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Symptom Matrix Chart (Cont'd)

SYSTEM — Engine control system		New CT/CS	Mass air flow sensor circuit		Engine coolant temperature sensor circuit	Vehicle speed sensor circuit	Control sleeve position sensor circuit	Injection timing control valve circuit		Accelerator switch (F/C) circuit		Needle lift sensor circuit	Fuel cut solenoid valve circuit		Fuel temperature sensor circuit	Accelerator position sensor circuit	Crankshaft position sensor (TDC) circuit	
Malfunction			open, ground short	short	open, short	open, short	open, short	open, short	ground short	open, short	ground short	open, short	open, ground short	short	open, short	open, short	open, short	noise
Feature of symptom / Check point					Compensation according to engine coolant temperature does not function.			Injection timing cannot be controlled.					Engine runs on after turning ignition switch OFF.		Compensation for amount of fuel injected according to fuel temperature does not function.			
Reference page			EC-379		EC-384	EC-420	EC-437	EC-403		EC-388		EC-450	EC-399		EC-395	EC-388	EC-408	
Fuel cut							○						○	○				
Can be detected by CONSULT-II?			○	○	○	○	○	○	○	○	○	○		○	○	○	○	○
Malfunction indicator lamp illuminates.					○		○			○	○			○		○	○	○
SYMPTOM: DEAD BATTERY (UNDER CHARGE)		HA																
ABNORMAL SMOKE COLOR	WHITE SMOKE	AP						○				○						
	BLACK SMOKE			○					○									
EXCESSIVE OIL CONSUMPTION		AM																
EXCESSIVE FUEL CONSUMPTION		AL																
OVERHEAT/HIGH ENGINE COOLANT TEMPERATURE		AK																
SLOW/NO RETURN TO IDLE		AJ																
IDLING VIBRATION		AH			○										○		○	
ROUGH IDLE/HUNTING		AG			○										○		○	
LOW IDLE		AF			○										○			
HI IDLE																		
POOR ACCELERATION		AE	○			○									○	○		
LACK OF POWER			○												○	○		
SPARK KNOCK/DETONATION		AD						○				○						
HESITATION/SURGING/FLAT SPOT		AC	○	○						○					○	○		
ENGINE STALL	WHEN DECELERATING	AB			○		○						○		○			○
	DURING DRIVING						○						○					○
	AT IDLE				○		○						○		○			○
HARD/NO START/ RESTART (EXCP. HA)	HARD TO START WHEN ENGINE IS HOT	AA													○			
	HARD TO START WHEN ENGINE IS COLD				○													
	NO START (without first firing)												○					
	NO START (with first firing)																	

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Symptom Matrix Chart (Cont'd)

SYMPTOM				Feature of symptom / Check point	Reference page	Malfunction	SYSTEM — Engine control system
						New CT/CS	
				Start control does not function.	EC-472	Start signal circuit	open, short
				Air Conditioner does not stop operating.	EC-463	Air conditioner switch circuit	open, ground short
				Air Conditioner does not work.			short
				Engine does not stop.	EC-472	Ignition switch circuit	open
							short
					EC-375	Power supply for ECM circuit	open
							short
				Does not operate.	EC-458	Throttle control solenoid valve circuit	open, short
				Does not stop operating.			ground short
				Does not stop operating.	EC-454	EGRC-solenoid valve A, B circuit	open, short
							ground short
				Glow lamp does not turn on.	EC-412	Glow relay circuit	open
				Glow lamp does not turn off.			short
				Ground short makes engine unable to stop.	EC-469	ECM relay (Self-shut off) circuit	open
							short
				Air conditioner does not operate.	EC-463	Air conditioner relay circuit	open
				Air conditioner does not stop operating.			short
					EC-369, 475	ECM, Connector circuit	open, short
	Fuel cut						○
	Can be detected by CONSULT-II?						○
	Malfunction indicator lamp illuminates.						○
	DEAD BATTERY (UNDER CHARGE)		HA				○
	ABNORMAL SMOKE COLOR	WHITE SMOKE	AP				○
		BLACK SMOKE					○
	EXCESSIVE OIL CONSUMPTION		AM				○
	EXCESSIVE FUEL CONSUMPTION		AL				○
	OVERHEAT/HIGH ENGINE COOLANT TEMPERATURE		AK				○
	SLOW/NO RETURN TO IDLE		AJ				○
	IDLING VIBRATION		AH				○
	ROUGH IDLE/HUNTING		AG				○
	LOW IDLE		AF				○
	HI IDLE						○
	POOR ACCELERATION		AE				○
	LACK OF POWER						○
	SPARK KNOCK/DETONATION		AD				○
	HESITATION/SURGING/FLAT SPOT		AC				○
	ENGINE STALL	WHEN DECELERATING	AB				○
		DURING DRIVING					○
		AT IDLE					○
	HARD/NO START/ RESTART (EXCP. HA)	HARD TO START WHEN ENGINE IS HOT	AA	○			○
		HARD TO START WHEN ENGINE IS COLD		○			○
		NO START (without first firing)					○
		NO START (with first firing)					○

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CONSULT-II Reference Value in Data Monitor Mode

Remarks:
- Specification data are reference values.
- Specification data are output/input values which are detected or supplied by the ECM at the connector.
  * Specification data may not be directly related to their components signals/values/operations.

MONITOR ITEM	CONDITION		SPECIFICATION
CKPS·RPM (TDC)	• Tachometer: Connect • Run engine and compare tachometer indication with the CONSULT-II value.		Almost the same speed as the CONSULT-II value.
CKPS·RPM (REF)			
CMPS·RPM-PUMP			
COOLAN TEMP/S	• Engine: After warming up		More than 70°C (158°F)
VHCL SPEED SE	• Turn drive wheels and compare speedometer indication with the CONSULT-II value		Almost the same speed as the CONSULT-II value
FUEL TEMP SEN	• Engine: After warming up		More than 40°C (104°F)
ACCEL POS SEN	• Ignition switch: ON (Engine stopped)	Accelerator pedal: release	0.40 - 0.60V
		Accelerator pedal: depress	Approx. 4.0V
FULL ACCEL SW	• Ignition switch: ON (Engine stopped)	Accelerator pedal: depress	ON
		Except above	OFF
ACCEL SW (FC)	• Ignition switch: ON (Engine stopped)	Accelerator pedal: release	CLOSE
		Accelerator pedal: slightly open	OPEN
OFF ACCEL SW	• Ignition switch: ON (Engine stopped)	Accelerator pedal: release	ON
		Accelerator pedal: slightly open	OFF
C/SLEEV POS/S	• Engine: After warming up, idle the engine		1.0 - 3.5V
BATTERY VOLT	• Ignition switch: ON (Engine stopped)		11 - 14V
P/N POSI SW	• Ignition switch: ON	Shift lever: Neutral	ON
		Except above	OFF
START SIGNAL	• Ignition switch: ON → START → ON		OFF → ON → OFF
AIR COND SIG	• Engine: After warming up, idle the engine	Air Conditioner switch: “OFF”	OFF
		Air Conditioner switch: “ON” (Compressor operates.)	ON
IGN SW	• Ignition switch: ON → OFF		ON → OFF
MAS AIR/FL SE	• Engine: After warming up • Air Conditioner switch: “OFF” • Shift lever: “N” • No-load	Idle	1.5 - 2.1V
		2,000 rpm	2.3 - 2.9V
ACT INJ TIMG	• Engine: After warming up • Air Conditioner switch: “OFF” • Shift lever: “N” • No-load	Idle	−5.0° to −9.0°
		2,000 rpm	−5.0° to −18.0°
DECELER F/CUT	• Engine: After warming up	Idle	OFF
		When accelerator pedal is released quickly with engine speed at 3,000 rpm or more.	ON
FUEL CUT S/V	• Ignition switch: ON → OFF		ON → OFF
AIR COND RLY	• Air Conditioner switch: OFF → ON		OFF → ON
GLOW RLY	• Refer to EC-412.		

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CONSULT-II Reference Value in Data Monitor Mode (Cont'd)

MONITOR ITEM	CONDITION		SPECIFICATION
EGRC SOL/V A	• Engine: After warming up • Air Conditioner switch: "OFF" • Shift lever: "N" • No-load	Idle	ON
		3,200 rpm	OFF
EGRC SOL/V B	• Engine: After warming up • Air Conditioner switch: "OFF" • Shift lever: "N" • No-load	Idle	ON
		3,000 rpm	OFF
THROT RLY	• Engine: After warming up • Air Conditioner switch: "OFF" • Shift lever: "N" • No-load	Idle	ON
		3,000 rpm	OFF

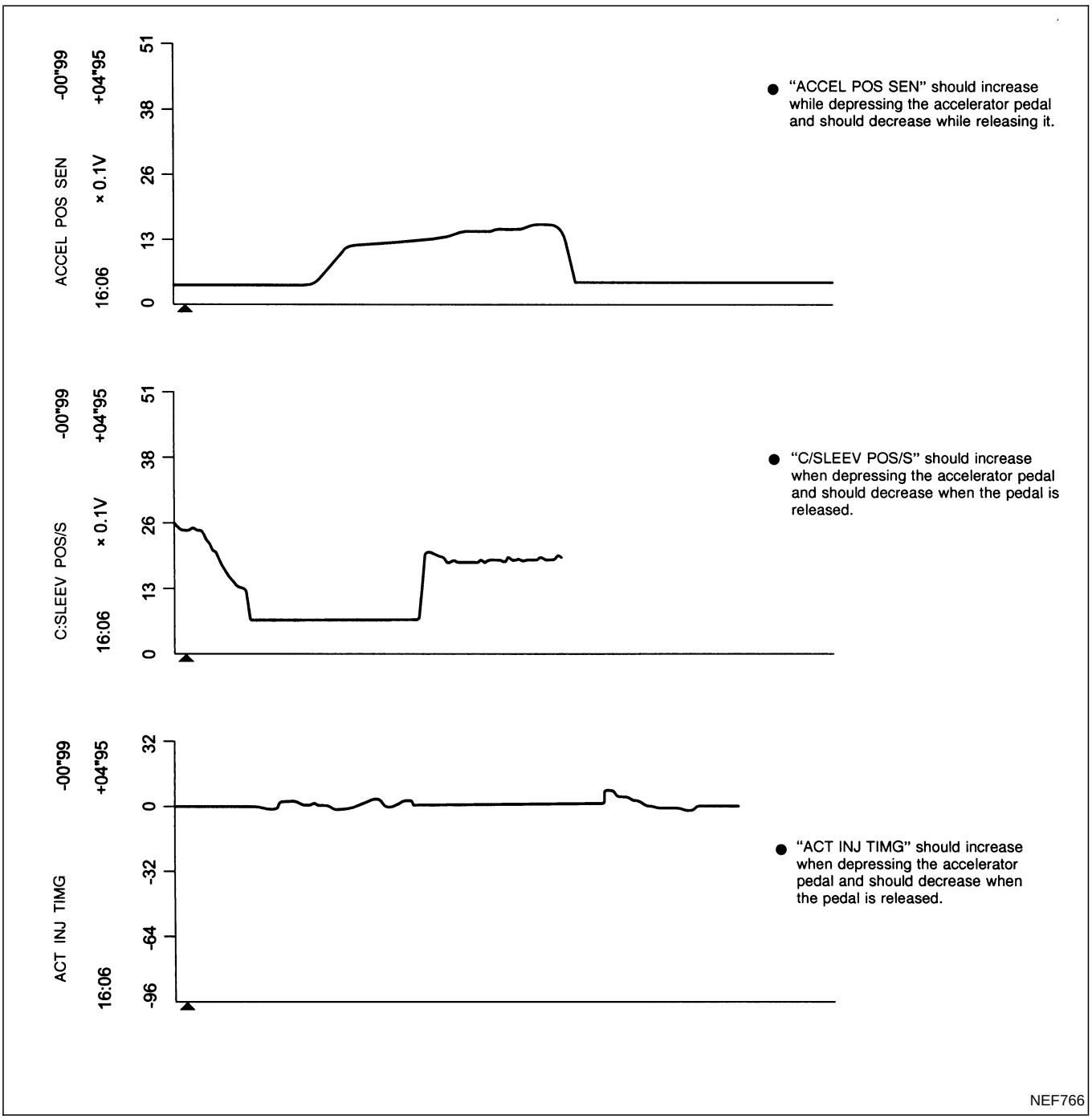
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Major Sensor Reference Graph in Data Monitor Mode

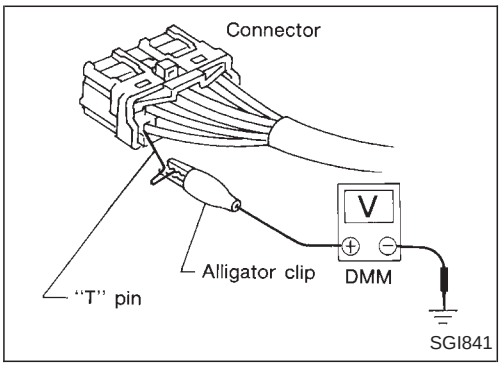
The following are the major sensor reference graphs in “DATA MONITOR” mode.
(Select “HI SPEED” in “DATA MONITOR” with CONSULT-II.)

ACCEL POS SEN, C/SLEEV POS/S, ACT INJ TIMG

Below is the data for “ACCEL POS SEN”, “C/SLEEV POS/S” and “ACT INJ TIMG” when revving engine quickly up to 3,000 rpm under no load after warming up engine sufficiently.
Each value is for reference, the exact value may vary.



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ECM Terminals and Reference Value

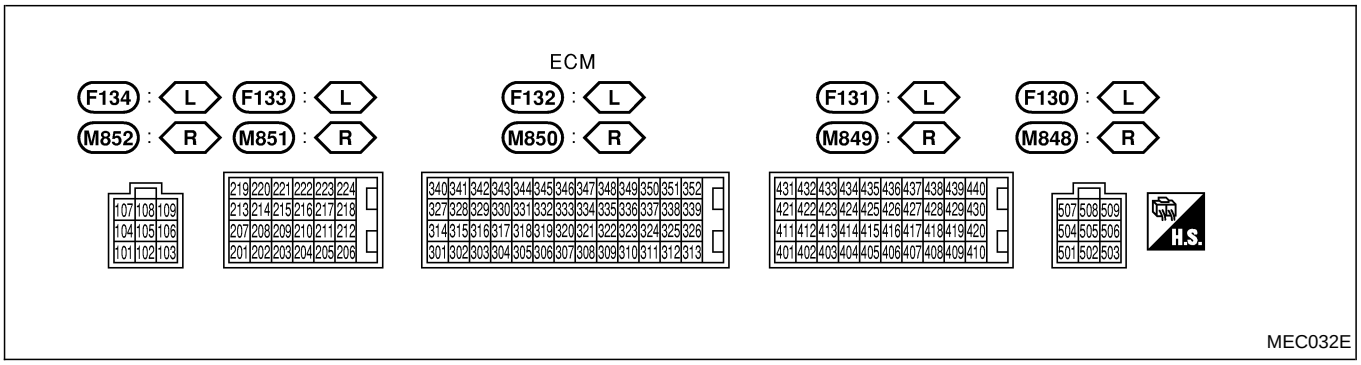
PREPARATION

Perform all voltage measurements with all the connectors connected. Measure ECM terminal voltage at the nearest connector to the sensors or actuators to be measured as accessing ECM terminals from outside is impossible.

- Use extreme care not to touch 2 pins at the same time.
- Data is for comparison and may not be exact.
- Use care not to enlarge the opening to keep the seal in good condition.

Be sure ECM unit is properly grounded before checking.

ECM HARNESS CONNECTOR TERMINAL LAYOUT



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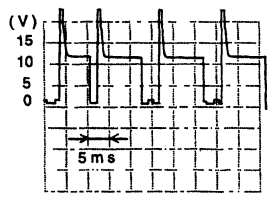
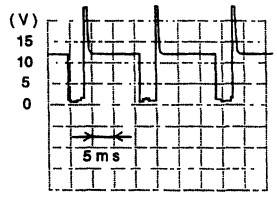
ECM Terminals and Reference Value (Cont'd)

ECM INSPECTION TABLE

Remarks: Specification data are reference values and are measured between each terminal and ground.

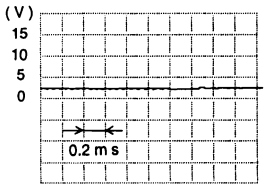
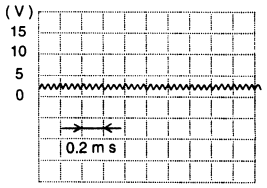
CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
101 102 103	G/R	Fuel cut solenoid valve	**[Ignition switch "OFF"]**	Approximately 0V
			[Ignition switch "ON"]	BATTERY VOLTAGE (11 - 14V)
104 105 106	B	ECM ground	**[Engine is running]** ● Idle speed	Approximately 0V
107 108 109	Y	Power supply for ECM	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
202	Y/R	Injection timing control valve	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 10 - 12V  NEF480
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	Approximately 9 - 14 V  NEF481
204	G/PU	Air conditioner relay	**[Engine is running]** ● Air conditioner switch is "OFF"	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● Both air conditioner switch and blower fan switch are "ON" (Compressor is operating)	Approximately 0.1V
205	Y/PU	Oil pressure switch	**[Ignition switch "ON"]**	Approximately 0V
			[Engine is running] ● Idle speed	Voltages
208	R/Y	EGRC-solenoid valve A	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0.7V
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,800 rpm	BATTERY VOLTAGE (11 - 14V)

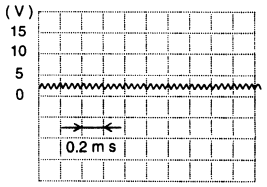
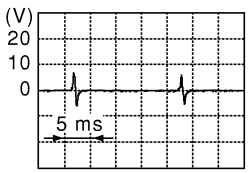
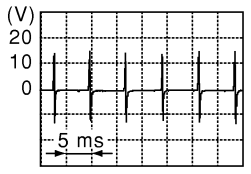
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ECM Terminals and Reference Value (Cont'd)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
210	Y/B	EGRC-solenoid valve B	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0.4V
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,500 rpm	BATTERY VOLTAGE (11 - 14V)
213	G/Y	Throttle control solenoid valve	**[Engine is running]** ● Warm-up condition ● Low load	Approximately 0V
			Except above condition	Battery voltage (12 - 14V)
214	LG	Glow relay	Refer to "Glow Control System", EC-412.	
215	L	Malfunction indicator (MI)	**[Ignition switch "ON"]**	Approximately 1.0V
			[Engine is running] ● Idle speed	BATTERY VOLTAGE (11 - 14V)
218	G/R	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
219	LG/R	Cooling fan relay	**[Engine is running]** ● Cooling fan is not operating	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● Cooling fan is operating	Approximately 0.1V
221	G/W	Glow lamp	**[Ignition switch "ON"]** ● Glow lamp is "ON"	Approximately 1V
			[Ignition switch "ON"] ● Glow lamp is "OFF"	BATTERY VOLTAGE (11 - 14V)
223	R/L	Mass air flow sensor power supply	**[Ignition switch "ON"]**	Approximately 5V
224	L/W	Mass air flow sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.5 - 2.0V
320	W	Control sleeve position sensor	**[Engine is running]** ● Idle speed	Approximately 2.6V  NEF477
321	R	Control sleeve position sensor power supply	**[Engine is running]** ● Idle speed	Approximately 2.6V  NEF476

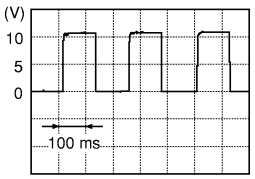
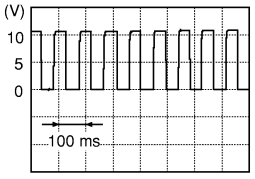
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ECM Terminals and Reference Value (Cont'd)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
322	B	Control sleeve position sensor ground	**[Engine is running]** ● Idle speed	Approximately 2.6V  NEF476
325	L	ECM relay (Self-shutoff)	**[Ignition switch "ON"]** **[Ignition switch "OFF"]** ● For a few seconds after turning ignition switch "OFF"	Approximately 1.4V
			[Ignition switch "OFF"] ● A few seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
331	L/R	Crankshaft position sensor (TDC) ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
333	R	Needle lift sensor ground	**[Ignition switch "ON"]**	Approximately 0V
334	G/R	Engine coolant temperature sensor ground	**[Ignition switch "ON"]**	Approximately 0V
335	G/R	Fuel temperature sensor ground	**[Engine is running]**	Approximately 0V
344	L/G	Crankshaft position sensor (TDC)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V  SEF333Y
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	Approximately 0V  SEF334Y
345	G	Needle lift sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 3.5V
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	Approximately 3.5V

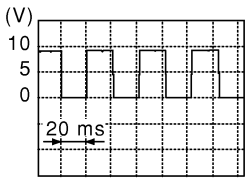
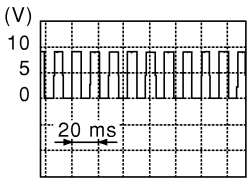
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ECM Terminals and Reference Value (Cont'd)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
347	LG/W	Engine coolant temperature sensor	**[Engine is running]**	Approximately 0 - 4.8V Output voltage varies with engine coolant temperature
348	Y/B	Fuel temperature sensor	**[Engine is running]**	0.6 - 5V Output voltage varies with fuel temperature.
349	G/R	Injection timing control valve ground	**[Ignition switch "ON"]**	Approximately 0V
403	G/R	Air conditioner switch	**[Engine is running]** ● Air conditioner switch is "OFF"	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● Both air conditioner switch and blower fan switch are "ON" (Compressor is operating)	Approximately 0.1V
405	G/Y	Stop lamp switch	**[Ignition switch "ON"]** ● Brake pedal fully released	Approximately 0V
			[Ignition switch "ON"] ● Brake pedal depressed	BATTERY VOLTAGE (11 - 14V)
416	Y/R	Brake pedal position switch	**[Ignition switch "ON"]** ● Brake pedal fully released	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"] ● Brake pedal depressed	Approximately 0V
415	OR	Data link connector for CONSULT-II	**[Engine is running]** ● Idle speed (CONSULT-II is connected and turned on)	Approximately 0V
420	R			BATTERY VOLTAGE (11 - 14V)
417	Y/B	Vehicle speed sensor	**[Engine is running]** ● Lift up the vehicle ● In 1st gear position ● Vehicle speed is 10 km/h (6 MPH)	0 - Approximately 8V  SEF891Y
			[Engine is running] ● Lift up the vehicle ● In 2nd gear position ● Vehicle speed is 30 km/h (19 MPH)	Approximately 6V  SEF892Y
422	PU	Start signal	**[Ignition switch "ON"]**	Approximately 0V
			[Ignition switch "START"]	BATTERY VOLTAGE (11 - 14V)
425	R/B	Accelerator position sensor ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V

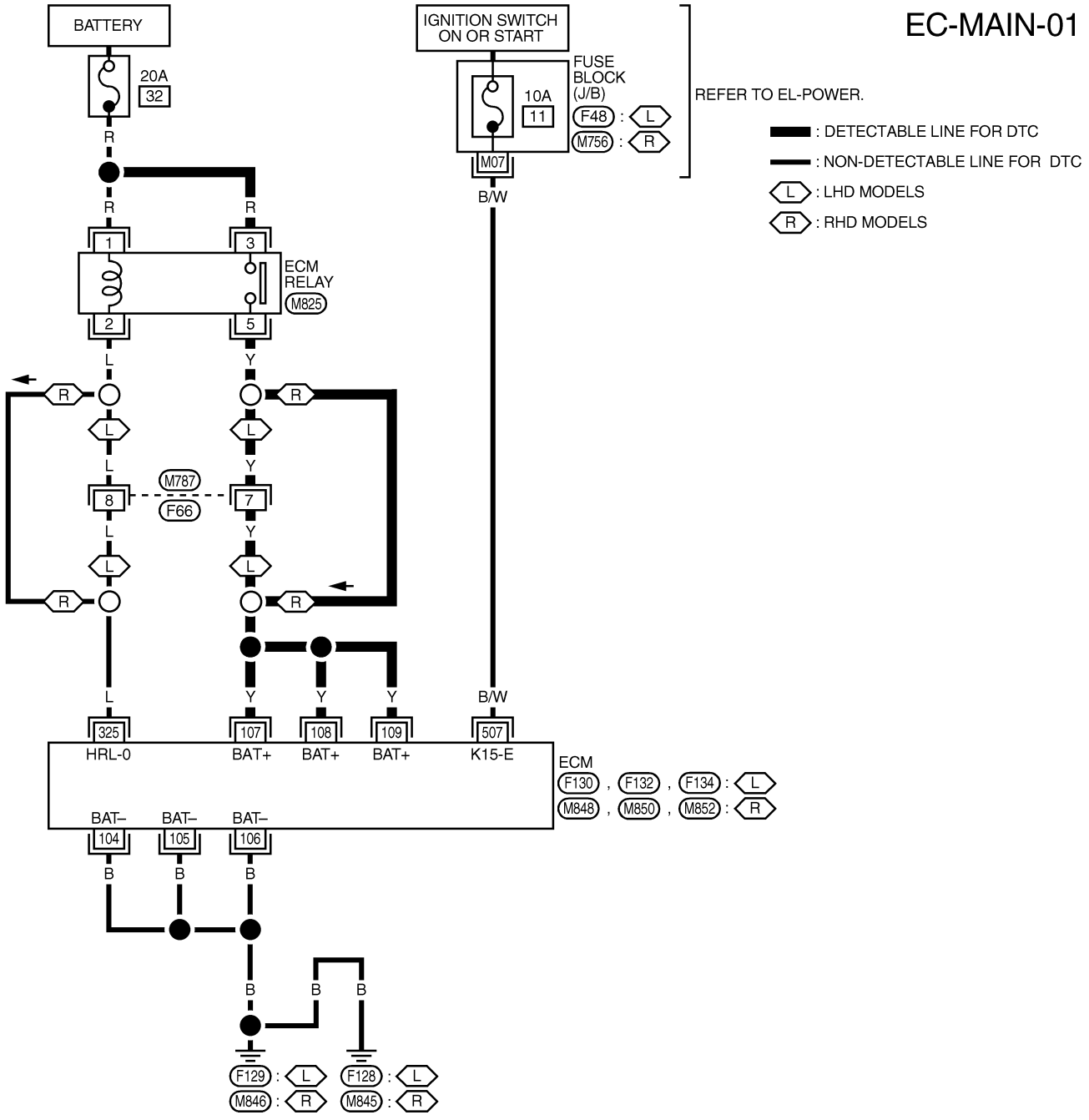
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ECM Terminals and Reference Value (Cont'd)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage and Pulse Signal)
426	B	Accelerator position switch (Idle) ground	**[Ignition switch "ON"]**	Approximately 0V
433	R/W	Accelerator position sensor power supply	**[Ignition switch "ON"]**	Approximately 5V
434	G	Accelerator position sensor	**[Ignition switch "ON"]** ● Accelerator pedal fully released	0.30 - 0.50V
			[Ignition switch "ON"] ● Accelerator pedal fully depressed	3.0 - 4.3V
435	L/Y	Accelerator position switch (Idle)	**[Ignition switch "ON"]** ● Accelerator pedal fully released	Approximately 0V
			[Ignition switch "ON"] ● Accelerator pedal depressed	BATTERY VOLTAGE (11 - 14V)
439	L/B	Tachometer	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 3.0V  SEF325Y
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	Approximately 3.0V  SEF326Y
507	B/W	Ignition switch	**[Ignition switch "OFF"]**	0V
			[Ignition switch "ON"]	BATTERY VOLTAGE (11 - 14V)

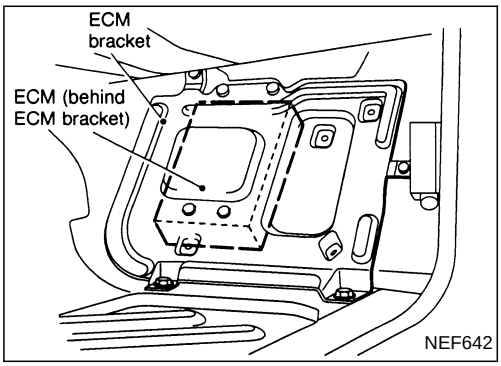
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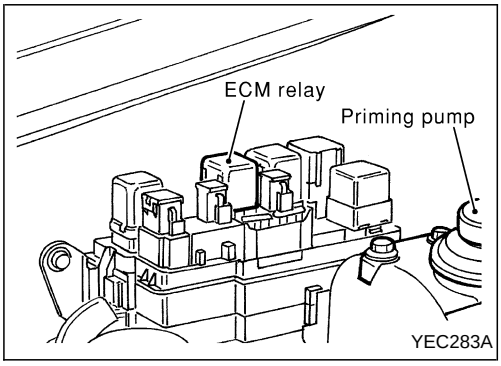
Wiring Diagram

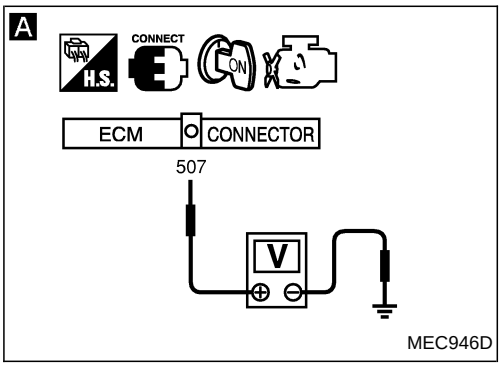


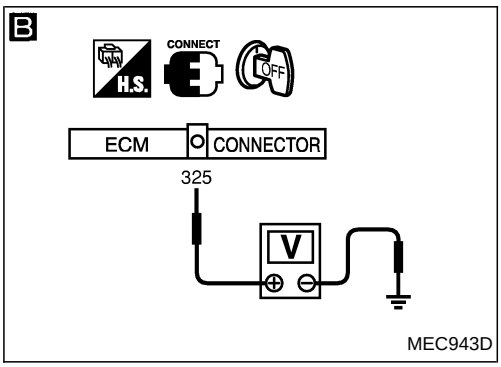
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Diagnostic Procedure

INSPECTION START

Start engine.
Is engine running?

No → A

A

CHECK POWER SUPPLY-I.
1. Turn ignition switch to “ON” position.
2. Check voltage between ECM connector terminal (507) and engine ground with CONSULT-II or voltage tester.
   Voltage: Battery voltage

If NG, check the following:
- 10A fuse
- Harness for open or short-circuit between ECM and ignition switch

If NG, replace 10A fuse or repair harness or connectors.

OK

Go to Ⓑ “CHECK GROUND CIRCUIT”.

Yes

B

CHECK POWER SUPPLY-II.
1. Stop engine.
2. Check voltage between ECM connector terminal (325) and engine ground with CONSULT-II or voltage tester.
   Voltage: Battery voltage

NG

Check the following:
- ECM relay
- 20A fuse
- Harness for open or short-circuit between ECM and battery
- Harness connectors M787, F66 (LHD models)
- Battery connection and charge

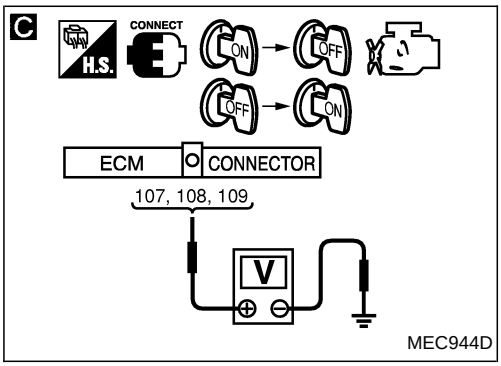
If NG, replace fuse or charge battery or repair harness or connectors.

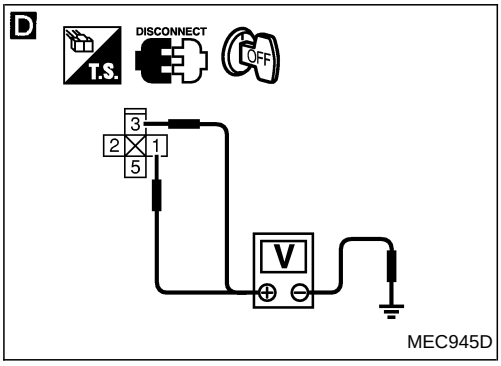
OK

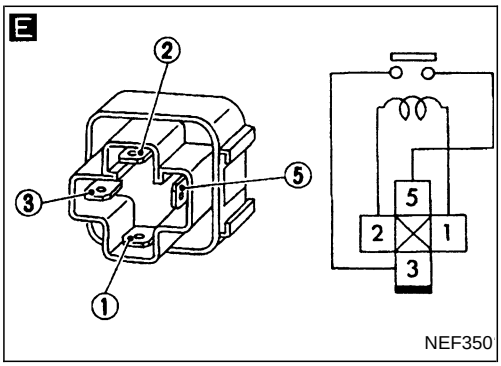
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Diagnostic Procedure (Cont'd)







Ⓐ

C

CHECK POWER SUPPLY-III.
1. Turn ignition switch to "ON" position and then to "LOCK" position.
2. Check voltage between ECM connector terminals (107), (108), (109) and engine ground with CONSULT-II or tester.

Voltage:
After turning ignition switch to "LOCK" position, battery voltage will exist for a few seconds, then drop to approximately 0V.

OK → Go to Ⓑ "CHECK GROUND CIRCUIT".

Case-1: Battery voltage does not exist.
Case-2: Battery voltage exists for more than a few seconds.

NG

Case-1 → Go to **E** "CHECK ECM RELAY".

Case-2 →

CHECK HARNESS CONTINUITY BETWEEN ECM RELAY AND ECM.
1. Disconnect ECM harness connector.
2. Disconnect ECM relay harness connector.
3. Check harness continuity between ECM connector terminals (325) and ECM relay connector terminal ②, and ECM connector terminals (107), (108), (109) and ECM relay connector terminal ⑤. Refer to wiring diagram.

Continuity should exist.
If OK, check harness for short-circuit.

NG → Check the following:
- Harness connectors (M787), (F66) (LHD models)
- Harness for open or short-circuit between ECM relay connector and ECM connector.

If NG, repair harness or connectors.

OK

D

CHECK VOLTAGE BETWEEN ECCS RELAY AND ENGINE GROUND.
Check voltage between ECM relay connector terminals ①, ③ and engine ground with CONSULT-II or tester.
Voltage: Battery voltage

NG → Check the following:
- 20A fuse
- Fuse box and battery connections
- Harness for open or short-circuit between ECM relay and battery

If NG, replace fuse or repair harness or connectors.

OK

E

CHECK ECM RELAY.
1. Remove ECM relay.
2. Apply 12V direct current between relay terminals ① and ②.
3. Check continuity between relay terminals ③ and ⑤.

12V (① - ②) applied:
Continuity exists.
No voltage applied:
No continuity

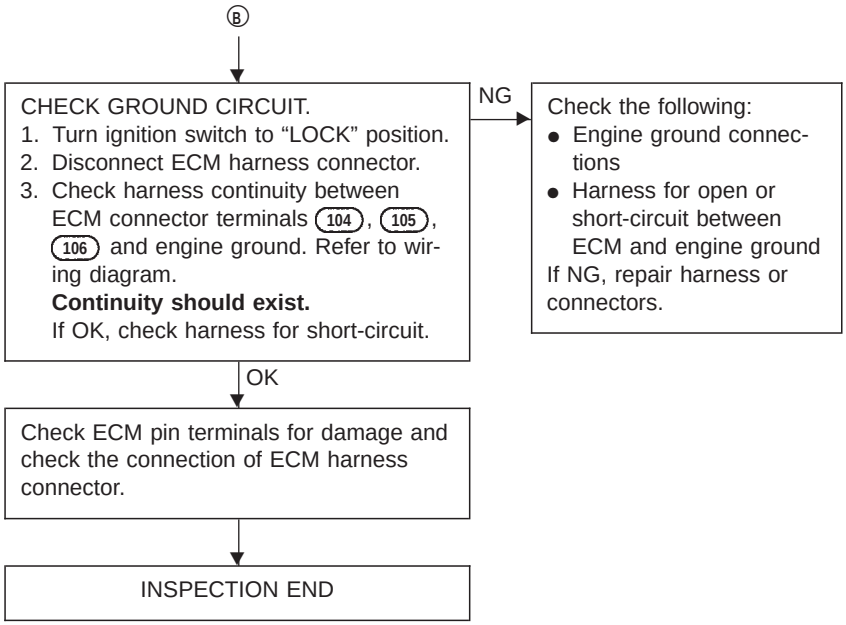
NG → Replace ECM relay.

OK

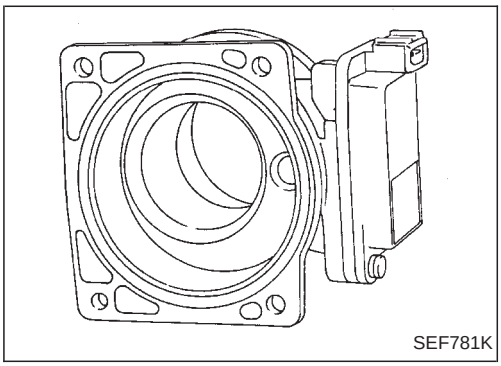
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Diagnostic Procedure (Cont'd)



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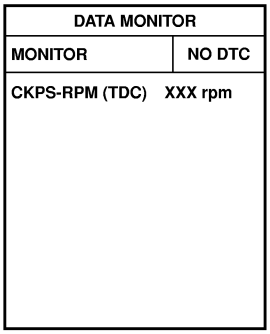
Component Description

MASS AIR FLOW SENSOR (MAFS)

The mass air flow sensor measures the intake air flow rate by monitoring a part of the entire flow. Measurements are made by the ECM which receives electrical signals from the mass air flow sensor which is proportional to the amount of heat emitted from the hot wire placed in the stream of the intake air.
When intake air flows into the intake manifold through a route around the hot wire, the heat generated by the hot wire is carried away by the air flow. The amount of heat detected depends on the volume of air flow. The temperature of the hot wire is automatically controlled to maintain it within a finite range regardless of the air flow rate by regulating the current supplied to the hot wire.
The ECM monitors the air flow by means of the corresponding electric change.

On Board Diagnosis Logic

DTC	Malfunction is detected when . . .	Check Items (Possible Cause)
P0100 0102	• An excessively high or low voltage from the sensor is entered to ECM.	• Harness or connectors (The sensor circuit is open or short-circuited.) • Mass air flow sensor



SEF817Y

DTC Confirmation Procedure

WITH CONSULT-II

1) Turn ignition switch to “ON” position.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Start engine and wait for at least 15 seconds.

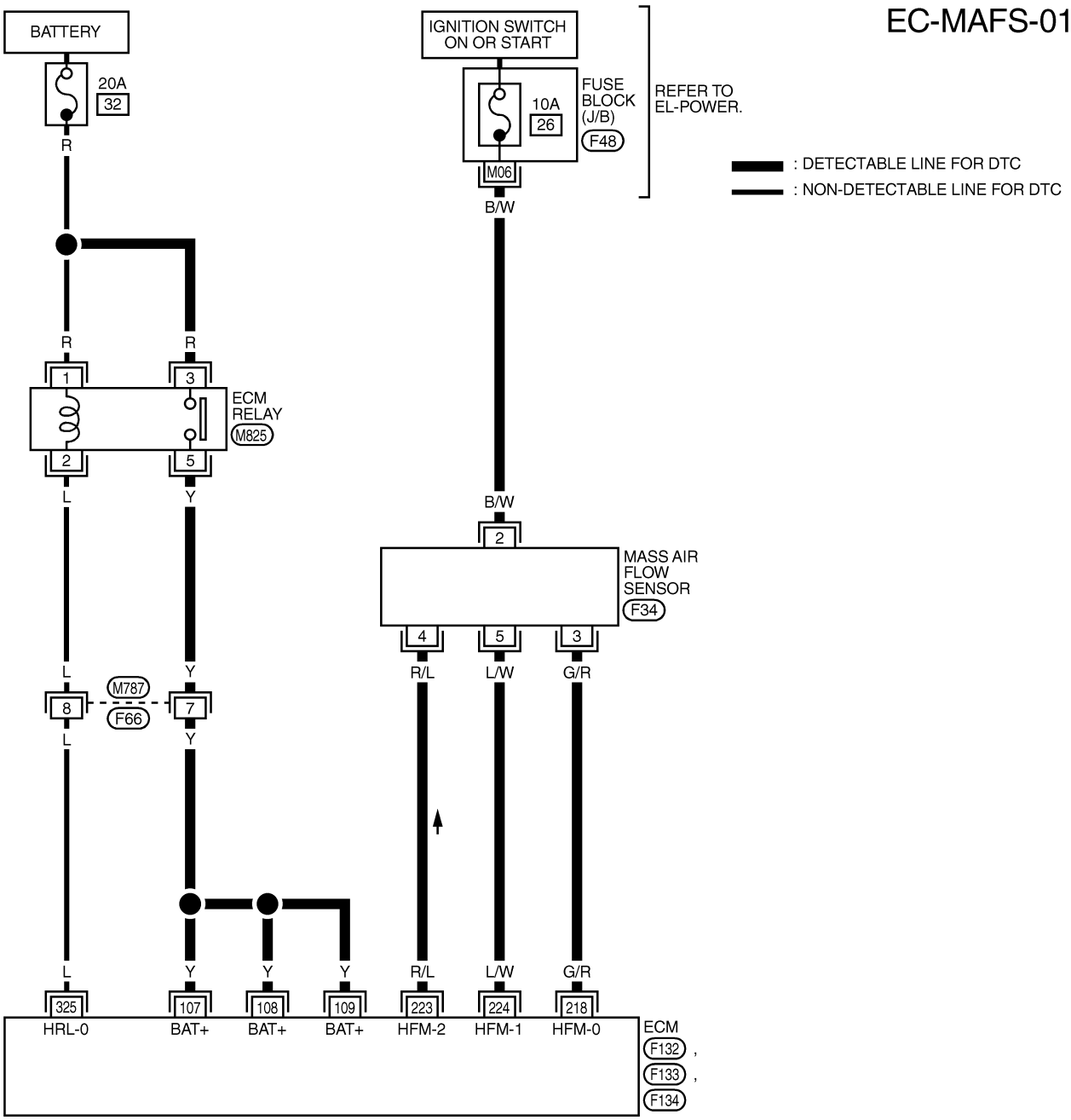
WITHOUT CONSULT-II

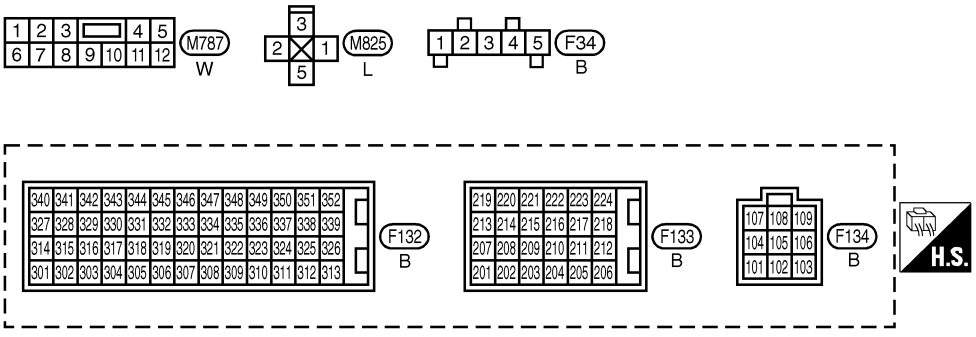
1) Start engine and wait for at least 15 seconds.
2) Turn ignition switch off, wait for at least 5 seconds and then turn on.
3) Perform “Diagnostic Test Mode II” (Self-diagnostic results).

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Wiring Diagram

LHD MODELS





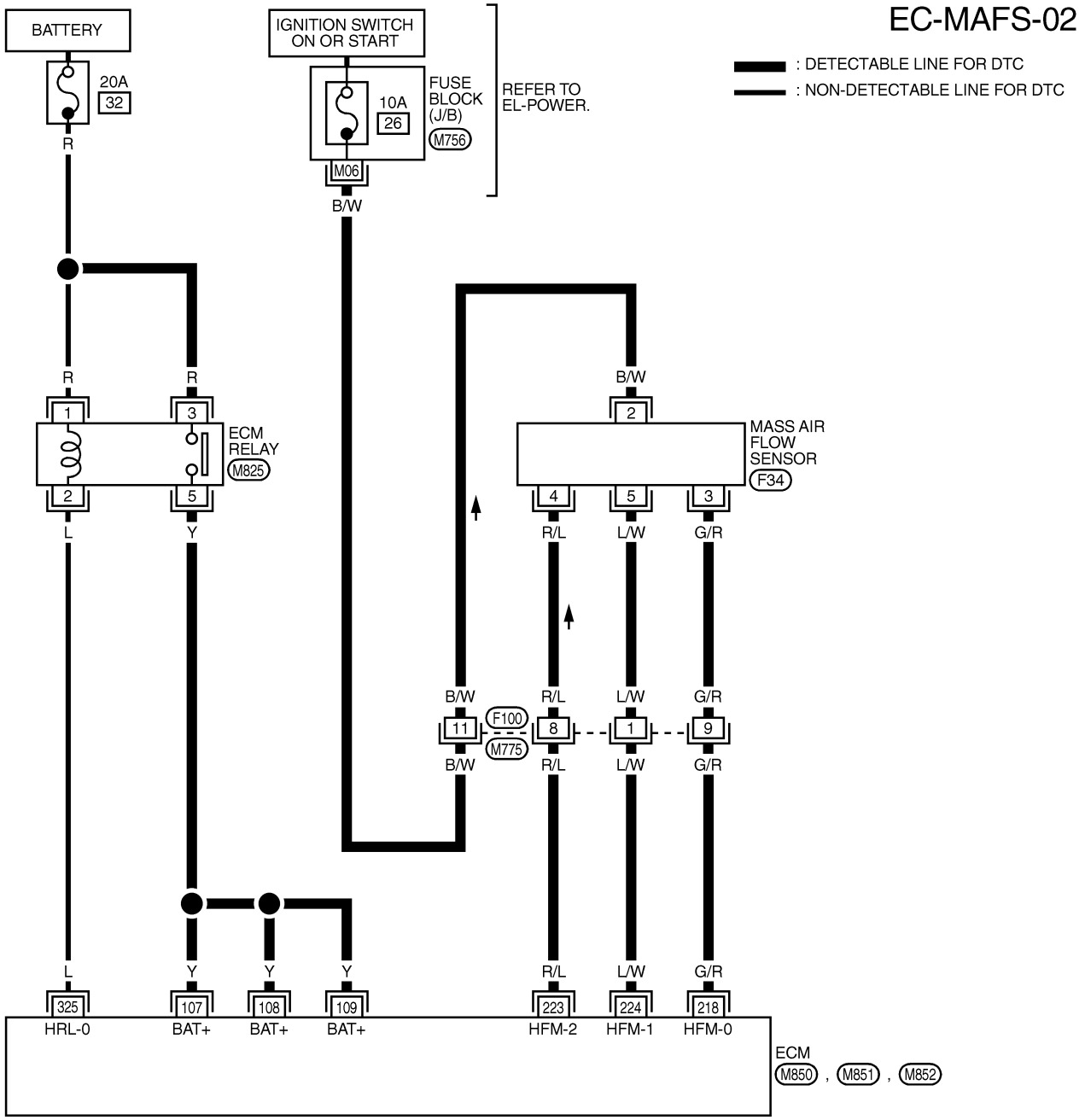
REFER TO THE FOLLOWING.
F48 -FUSE BLOCK-
JUNCTION BOX (J/B)

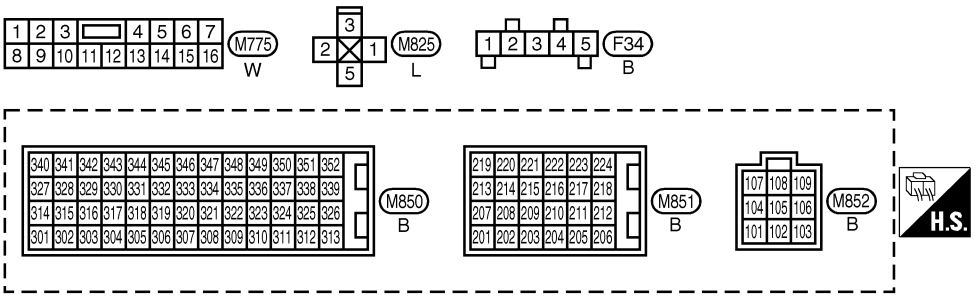
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Wiring Diagram (Cont'd)

RHD MODELS

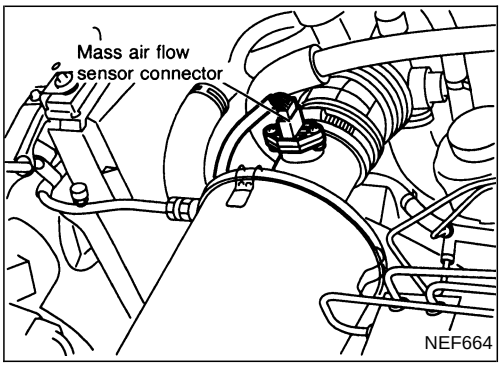


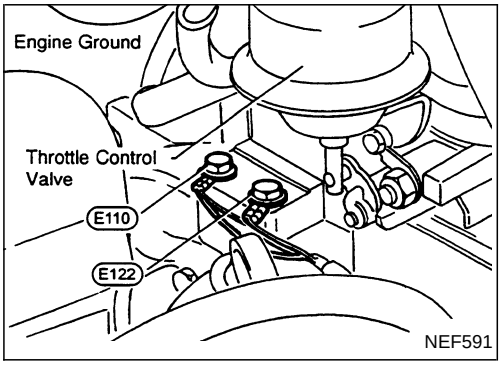


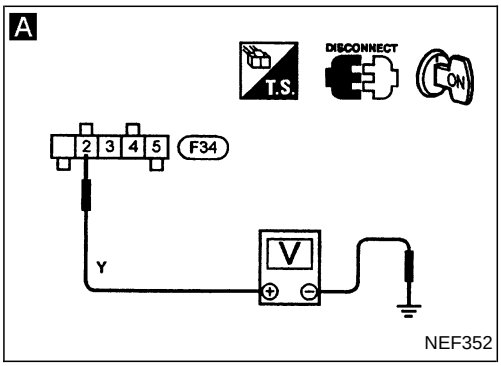
REFER TO THE FOLLOWING.
F756 -FUSE BLOCK-
JUNCTION BOX (J/B)

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Diagnostic Procedure

INSPECTION START

A

CHECK POWER SUPPLY.
1. Turn ignition switch to “LOCK” position.
2. Disconnect mass air flow sensor harness connector.
3. Turn ignition switch to “ON” position.
4. Check voltage between mass air flow sensor connector terminal ② and engine ground with CONSULT-II or tester.
   Voltage: Battery positive voltage

NG → Check the following:
- 10A fuse
- Harness continuity between ECM relay (coil and load side) connector and battery supply
- Harness connectors F100, M775 (RHD models)
- Harness continuity between ECM relay connector and Mass Air Flow Sensor Connector.

If NG, replace 10A fuse or repair or replace harness or connectors.

OK ↓

CHECK GROUND CIRCUIT.
1. Turn ignition switch to “LOCK” position.
2. Disconnect ECM harness connector.
3. Loosen and retighten engine ground screws.
4. Check harness continuity between mass air flow sensor harness connector terminal ③ and ECM connector terminal 218. Refer to wiring diagram.
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Check the following.
- Harness connectors F100, M775 (RHD models)
- Harness continuity between mass air flow sensor and ECM

If NG, repair or replace harness or connectors.

OK ↓

CHECK INPUT SIGNAL CIRCUIT.
Check harness continuity between mass air flow sensor connector terminal ④ and ECM connector terminal 223. Refer to wiring diagram.
Continuity should exist.
If OK, check harness for short-circuit.

NG → Check the following.
- Harness connectors F100, M775 (RHD models)
- Harness continuity between mass air flow sensor and ECM

If NG, repair or replace harness or connectors.

OK ↓

CHECK INPUT SIGNAL CIRCUIT.
Check harness continuity between mass air flow sensor connector terminal ⑤ and ECM connector terminal 224. Refer to wiring diagram.
Continuity should exist.
If OK, check harness for short-circuit.

NG → Check the following.
- Harness connectors F100, M775 (RHD models)
- Harness continuity between mass air flow sensor and ECM

If NG, repair or replace harness or connectors.

OK ↓

CHECK COMPONENT
(Mass air flow sensor).
Refer to “COMPONENT INSPECTION”, EC-383.

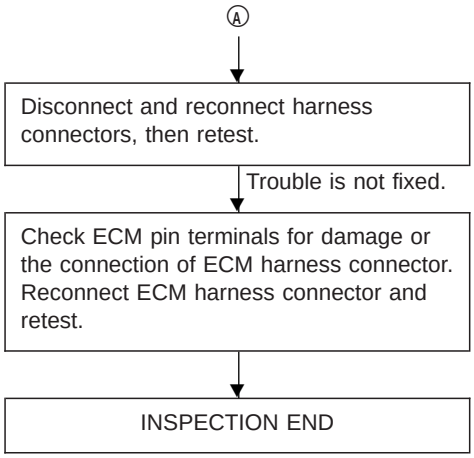
NG → Replace mass air flow sensor.

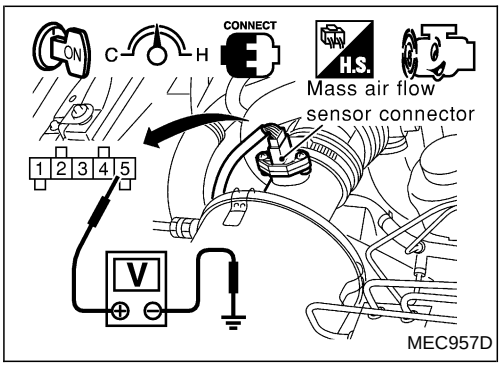
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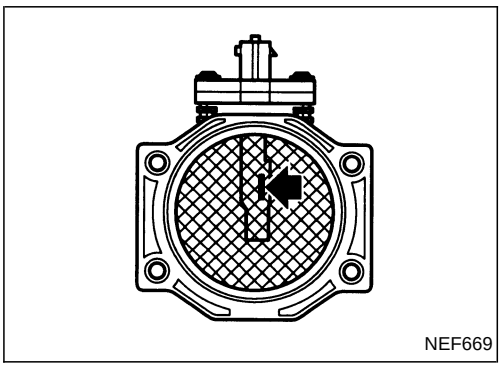
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Diagnostic Procedure (Cont'd)







Component Inspection

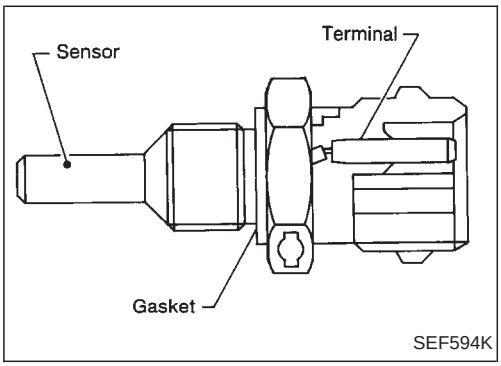
MASS AIR FLOW SENSOR

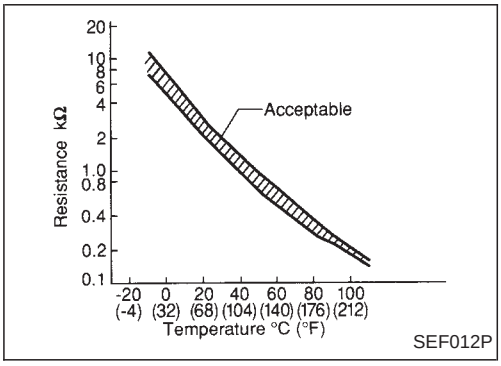
1. Turn ignition switch to "ON" position.
2. Start engine and warm it up sufficiently.
3. Check voltage between mass air flow sensor connector terminal ⑤ and engine ground.

Condition	Voltage V
Ignition switch "ON" position (Engine stopped.)	Approx. 1.0
Idle (Engine is warmed-up sufficiently.)	Approx. 2.2

4. If NG, remove mass air flow sensor from air duct. Check hot film for damage or dust.

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Component Description

ENGINE COOLANT TEMPERATURE (ECT) SENSOR

The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor comprises a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.

<Reference data>

Engine coolant temperature °C (°F)	Voltage (V)	Resistance (kΩ)
20 (68)	3.5	2.1 - 2.9
50 (122)	2.3	0.68 - 1.00
90 (194)	1.0	0.236 - 0.260

On Board Diagnosis Logic

DTC	Malfunction is detected when ...	Check Items (Possible Cause)
P0115 0103	• An excessively high or low voltage from the sensor is input to ECM.	• Harness or connectors (The sensor circuit is open or short-circuited.) • Engine coolant temperature sensor

DTC Confirmation Procedure

WITH CONSULT-II

1) Turn ignition switch to “ON” position.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Wait at least 5 seconds.

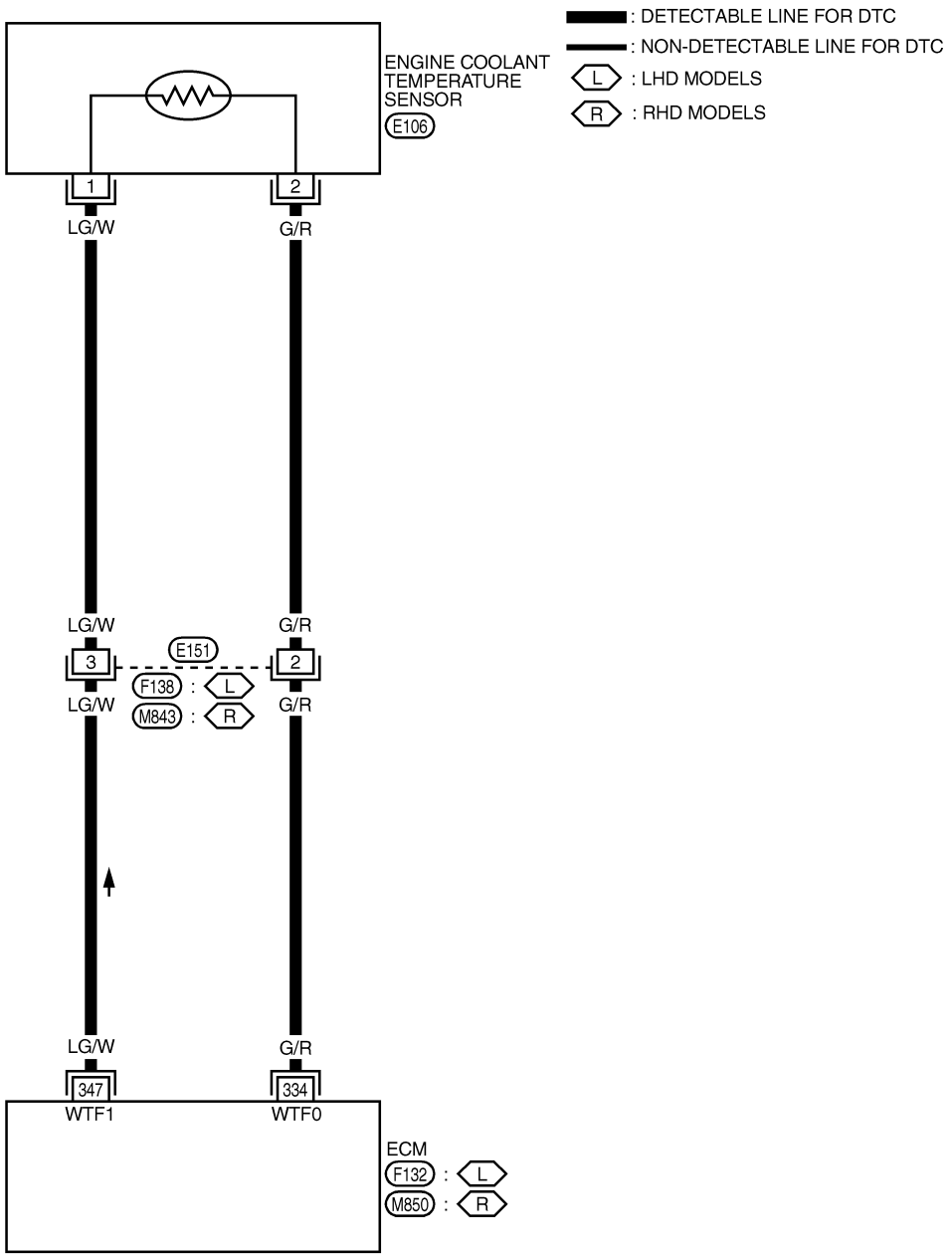
WITHOUT CONSULT-II

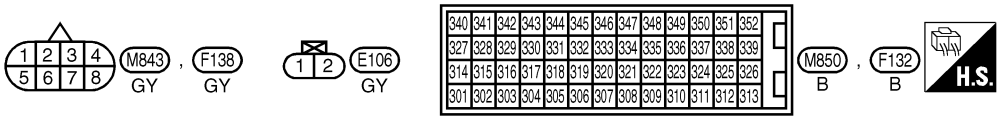
1) Turn ignition switch to “ON” position and wait at least 5 seconds.
2) Turn ignition switch to “LOCK” position, wait at least 5 seconds and then turn to “ON” position.
3) Perform diagnostic test mode II (Self-diagnostic results).

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Wiring Diagram

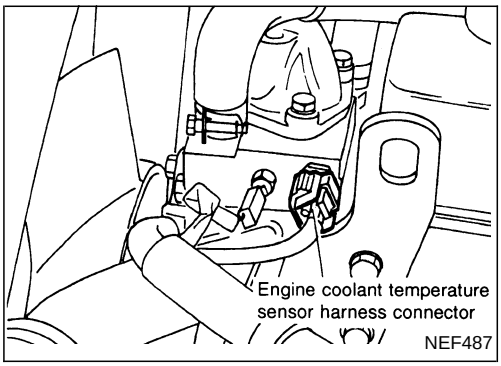
EC-ECTS-01

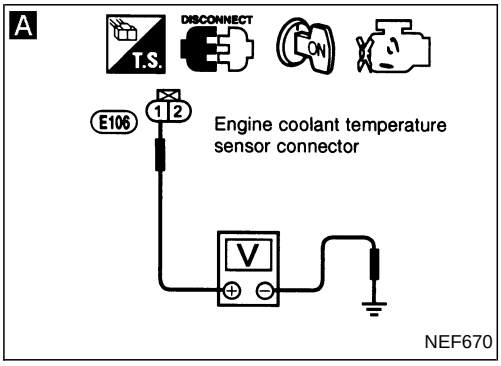




YEC675A

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Diagnostic Procedure

INSPECTION START

A

CHECK POWER SUPPLY.
1. Turn ignition switch to “LOCK” position.
2. Disconnect engine coolant temperature sensor harness connector.
3. Turn ignition switch to “ON” position.
4. Check voltage between engine coolant temperature sensor connector terminal ① and engine ground with CONSULT-II or tester.

Voltage:
Approximately 4.9V

NG → Check the following:
- Harness connectors E151, F138 (LHD model) E151, M843 (RHD model)
- Harness for open or short circuit between ECM and engine coolant temperature sensor.

If NG, repair harness or connectors.

OK

CHECK GROUND CIRCUIT.
1. Turn ignition switch to “LOCK” position.
2. Check harness continuity between engine coolant temperature sensor connector terminal ② and ECM terminal 334. Refer to wiring diagram.

Continuity should exist.
If OK, check harness for short-circuit.

NG → Check the following:
- Harness connectors E151, F138 (LHD model) E151, M843 (RHD model)
- Harness for open or short circuit between ECM and engine coolant temperature sensor.

If NG, repair harness or connectors.

OK

CHECK COMPONENT
(Engine coolant temperature sensor).
Refer to EC-387.

NG → Replace engine coolant temperature sensor.

OK

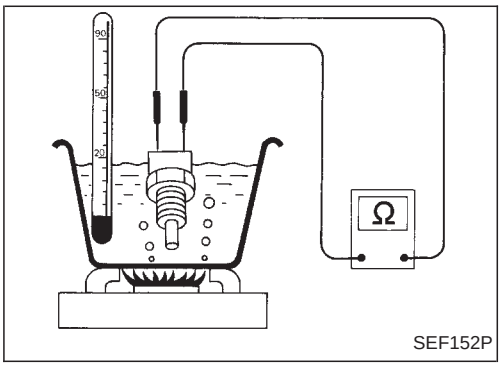
Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed.

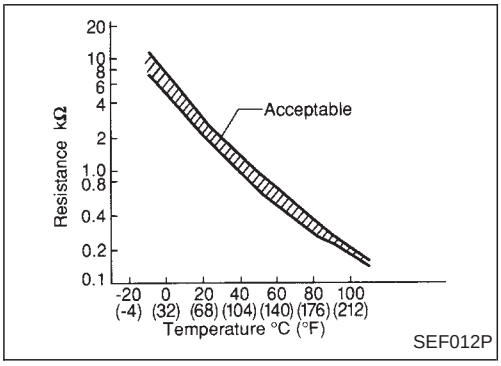
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END

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SEF152P



SEF012P

Component Inspection

ENGINE COOLANT TEMPERATURE SENSOR

Check resistance as shown in the figure.

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.0
90 (194)	0.236 - 0.260

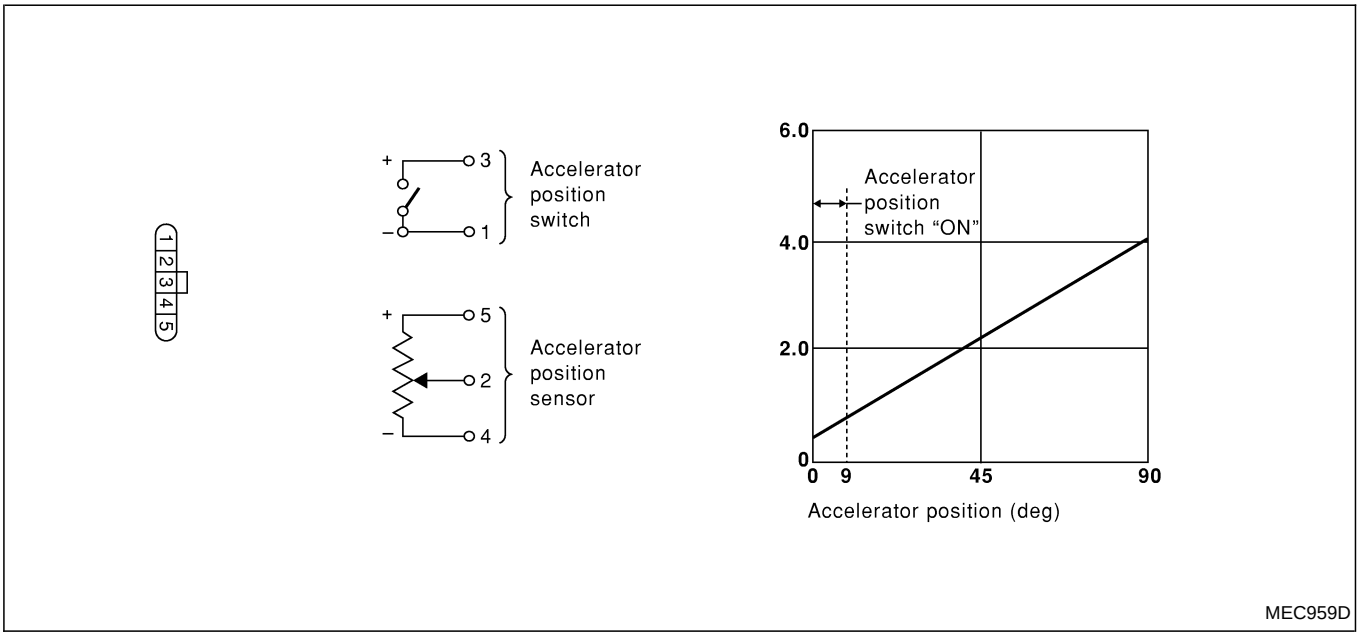
If NG, replace engine coolant temperature sensor.

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Component Description

ACCELERATOR WORK UNIT

The accelerator position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM. The ECM uses the signal to determine the amount of fuel to be injected.
The accelerator position switch is installed inside the accelerator position sensor. This switch is used for plausibility check of the accelerator position sensor.



On Board Diagnosis Logic

DTC	Malfunction is detected when ...	Check Items (Possible Cause)
P0120 0403	• An excessively low or high voltage from the sensor is detected by the ECM.	• Harness or connectors (The sensor or switch circuit is open or short-circuited.) • Accelerator position sensor • Accelerator position switch

DTC Confirmation Procedure A (For General Plausibility)

WITH CONSULT-II

1) Turn ignition switch to “ON” position.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Depress accelerator pedal fully and keep it for at least 1 second. Then release it and wait at least 5 seconds.

WITHOUT CONSULT-II

1) Turn ignition switch to “ON” position.
2) Depress accelerator pedal fully and keep it for at least 1 second. Then release it and wait at least 5 seconds.
3) Turn ignition switch to “LOCK” position, wait at least 5 seconds and then turn to “ON” position.
4) Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.

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DTC Confirmation Procedure B (For Accelerator Sticking)

If DTC P0571 is displayed same time, cure it at first.

WITH CONSULT-II

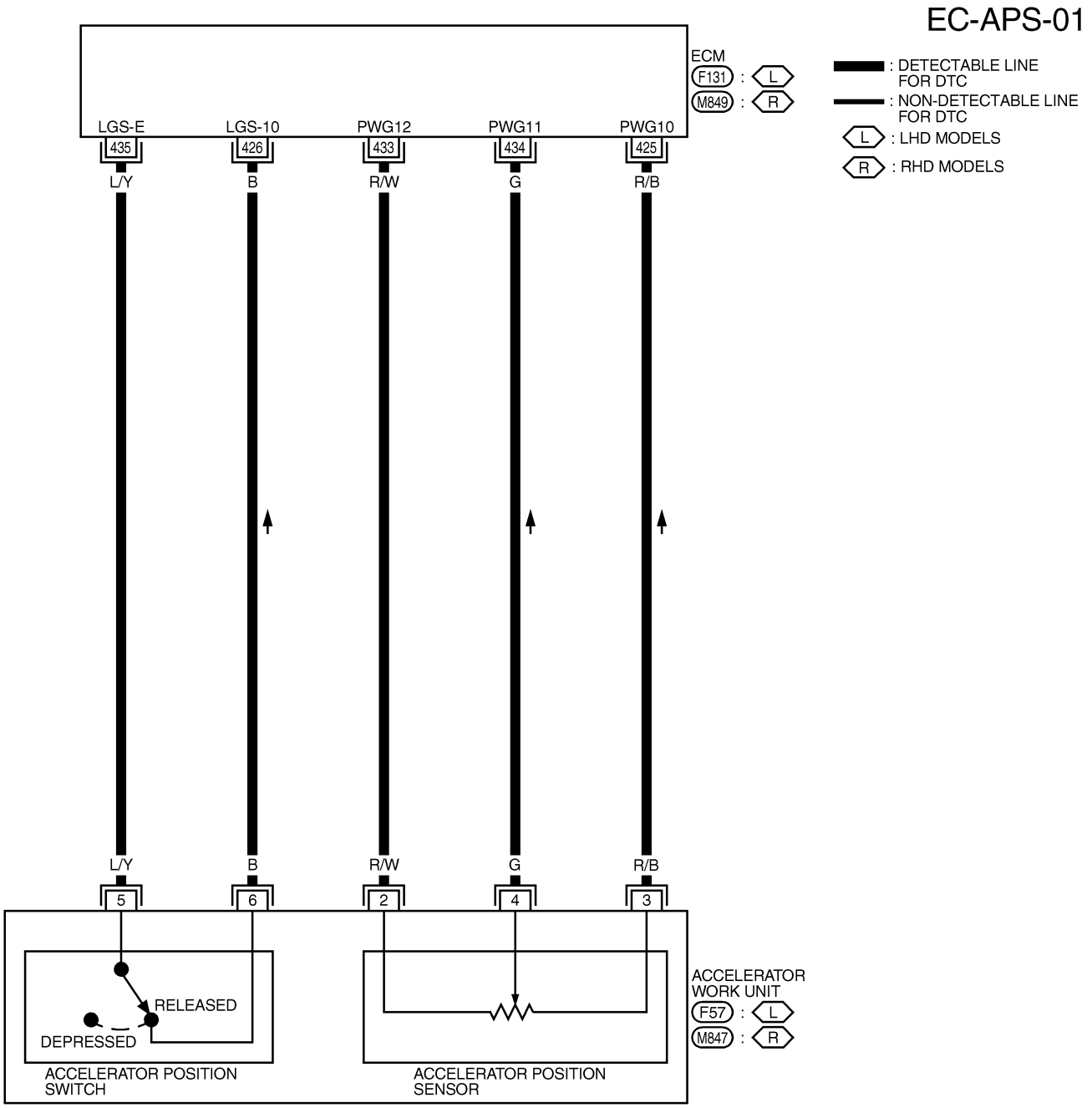
1) Turn ignition switch to “ON” position.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Start engine and rev it up to above 1,300 rpm.
4) Depress brake pedal immediately after releasing accelerator pedal and keep it at least 5 seconds.

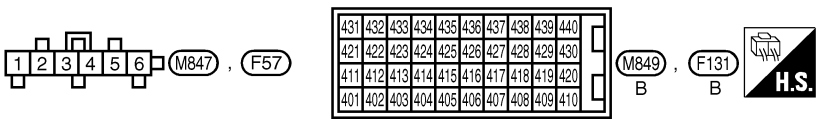
WITHOUT CONSULT-II

1) Start engine and rev it up to above 1,300 rpm.
2) Depress brake pedal immediately after releasing accelerator pedal and keep it at least 5 seconds.
3) Turn ignition switch to “LOCK” position, wait at least 5 seconds and then turn to “ON” position.
4) Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.

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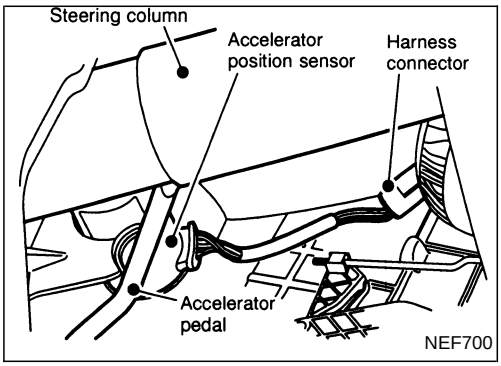
Wiring Diagram

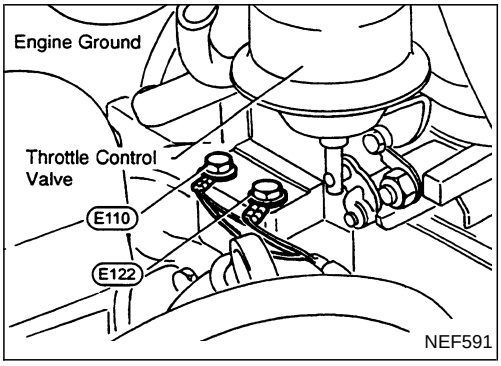


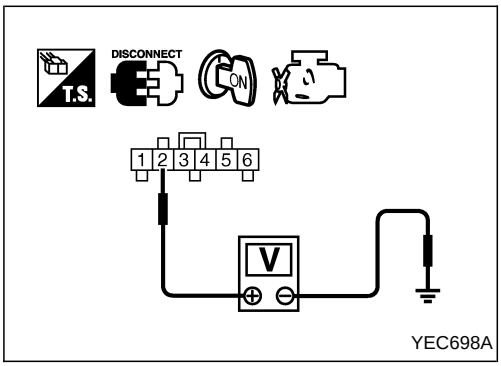


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Diagnostic Procedure

ACCELERATOR POSITION SENSOR

INSPECTION START

A

CHECK POWER SUPPLY.
1. Turn ignition switch to “LOCK” position.
2. Disconnect accelerator work unit harness connector.
3. Turn ignition switch to “ON” position.
4. Check voltage between accelerator work unit connector terminal ② and engine ground with CONSULT-II or tester.
   Voltage: Approximately 5V

NG → Check the following:
- Harness for open or short-circuit between ECM and accelerator work unit.

If NG, repair harness or connectors.

OK ↓

CHECK INPUT SIGNAL CIRCUIT.
1. Turn ignition switch to “LOCK” position.
2. Loosen and retighten engine ground screws.
3. Check harness continuity between accelerator work unit connector terminal ④ and ECM connector terminal (434). Refer to wiring diagram.
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Check the following:
- Harness for open-circuit between ECM and accelerator work unit

If NG, repair harness or connectors.

OK ↓

CHECK GROUND CIRCUIT.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal (425) and accelerator position sensor connector terminal ③. Refer to wiring diagram.
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK ↓

CHECK COMPONENT
(Accelerator position sensor).
Refer to “COMPONENT INSPECTION” on page EC-394.

NG → Replace accelerator pedal assembly.

OK ↓

Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed. ↓

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

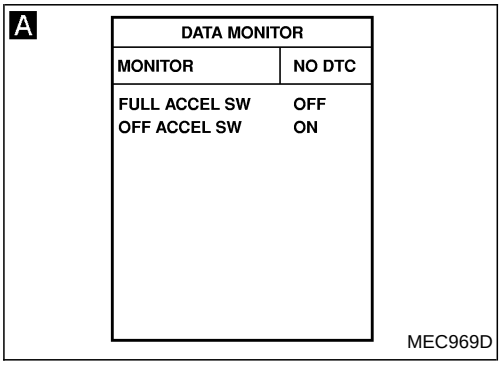
INSPECTION END

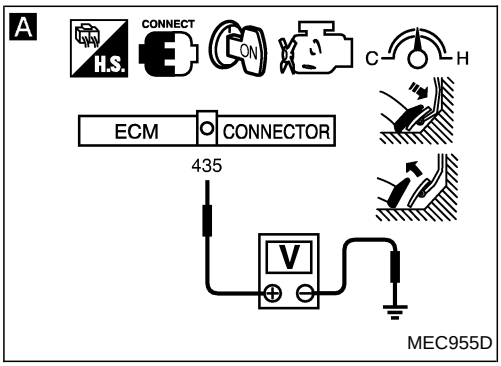
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Diagnostic Procedure (Cont'd)

ACCELERATOR POSITION SWITCH

The accelerator position switch detects OFF-accelerator switch signal and Full-accelerator switch signal and sends these signals to the ECM. The ECM will then determine engine idle conditions. These signals are also used for diagnosing the accelerator position sensor.





INSPECTION START

A

CHECK OVERALL FUNCTION.

With CONSULT-II

1. Turn ignition switch to "ON" position.
2. Select "FULL ACCELL SW" and "OFF ACCEL SW" in "DATA MONITOR" mode with CONSULT-II.
3. Check "FULL ACCEL SW" and "OFF ACCEL SW" signal under the following conditions.

OFF ACCEL SW:
Accelerator pedal released
— ON
Accelerator pedal depressed
— OFF

FULL ACCEL SW:
Accelerator pedal fully depressed
— ON

Without CONSULT-II

1. Turn ignition switch to "ON" position.
2. Check voltage between ECM terminal (435) and body ground under the following conditions:

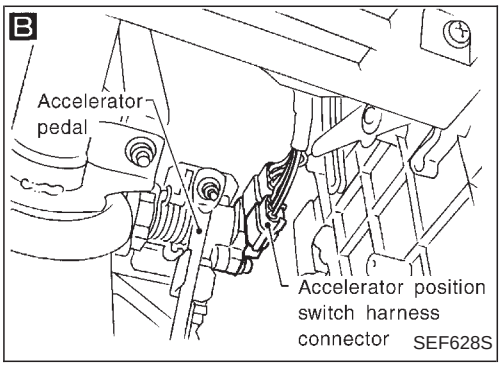
Voltage:
Accelerator pedal released
Approximately 0V
Accelerator pedal fully depressed
Approximately 5V

OK → INSPECTION END

NG → Ⓐ

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Diagnostic Procedure (Cont'd)



Ⓐ

B

CHECK INPUT SIGNAL CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Disconnect accelerator work unit harness connector and ECM harness connector.
3. Check harness continuity between accelerator work unit terminal ③ and ECM terminal (435). Refer to wiring diagram.
   Continuity should exist.
   Check harness for short-circuit.

NG → Check the following:
- 10A fuse in fuse box
- 75A fusible link in fusible link box
- Harness continuity between ECM relay and battery positive supply
- Harness for open or short-circuit between ECM relay and accelerator position switch.

If NG, repair harness or connectors.

OK ↓

CHECK GROUND CIRCUIT.
1. Turn ignition switch to "LOCK" position.
2. Disconnect ECM harness connector.
3. Check harness continuity between accelerator work unit connector terminal ① and ECM connector terminal (426). Refer to wiring diagram.
   Continuity should exist.
   If OK; check harness for short-circuit.
   If OK, re-connect harness connectors.

NG → Repair harness or connectors.

OK ↓

CHECK COMPONENT.
(Accelerator position switch.)
Refer to "COMPONENT INSPECTION" on page EC-394.

NG → Replace accelerator pedal.

OK ↓

Disconnect and reconnect harness connectors in the circuits. Then retest.

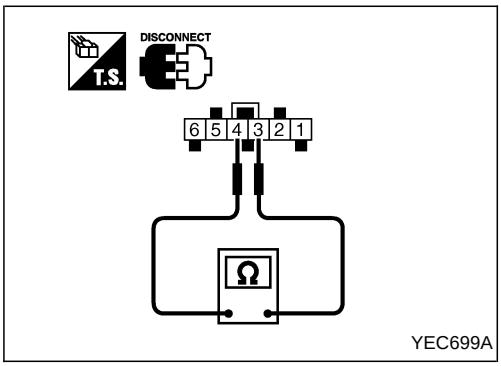
Trouble is not fixed ↓

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

INSPECTION END

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Component Inspection

ACCELERATOR POSITION SENSOR

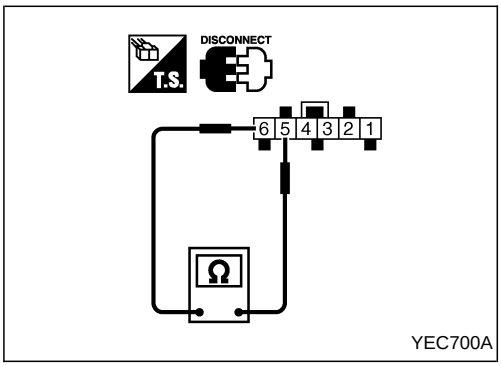
1. Disconnect accelerator work unit harness connector.
2. Make sure that resistance between terminals ③ and ④ changes when opening throttle valve manually.

Throttle valve conditions	Resistance [at 25°C (77°F)]
Completely closed	Approximately 1.2 kΩ
Partially open	1.2 - 1.9 kΩ
Completely open	Approximately 1.9 kΩ

If NG, replace accelerator pedal assembly.

CAUTION

- **Do not disassemble accelerator pedal assembly.**



ACCELERATOR POSITION SWITCH

1. Disconnect accelerator work unit harness connector.
2. Check continuity between terminals ⑤ and ⑥ .

Conditions	Continuity
Accelerator pedal released	No
Accelerator pedal depressed	Yes

If NG, replace accelerator pedal assembly.

CAUTION:

- **Do not disassemble accelerator pedal assembly.**

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Component Description

FUEL TEMPERATURE SENSOR (FTS)

The fuel temperature sensor is used to detect the fuel temperature in the injection pump. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the fuel temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.
The sensor is built into the inside electrical circuit of the injection pump.

On Board Diagnosis Logic

DTC	Malfunction is detected when ...	Check Items (Possible Cause)
P0180 0402	● An excessively high or low voltage from the sensor is detected by ECM.	● Harness or connectors (The sensor circuit is open or short-circuited.) ● Fuel temperature sensor

DTC Confirmation Procedure

WITH CONSULT-II

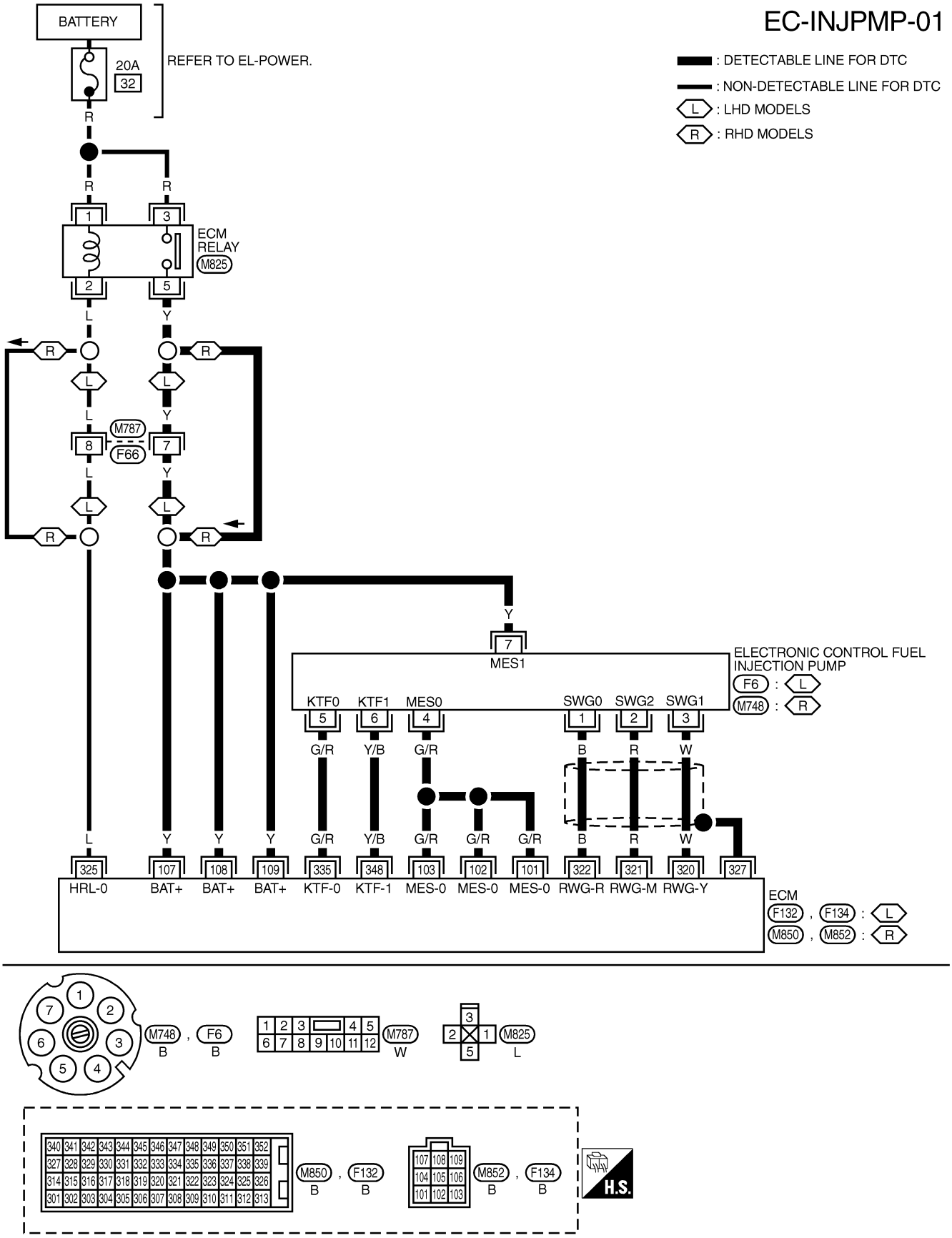
1) Turn ignition switch to “ON” position.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Wait at least 5 seconds.

WITHOUT CONSULT-II

1) Turn ignition switch to “ON” position and wait at least 5 seconds.
2) Turn ignition switch to “LOCK” position, wait at least 5 seconds and then turn to “ON” position.
3) Perform “Diagnostic Test Mode II” (Self-diagnostic results).

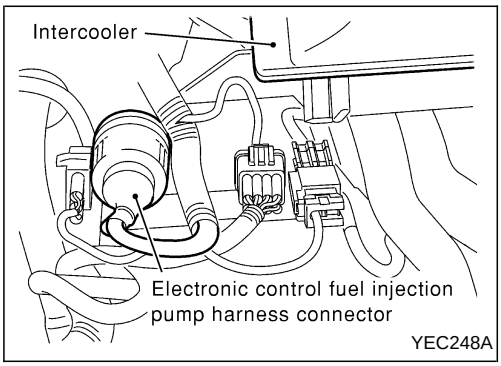
http://vnx.su/

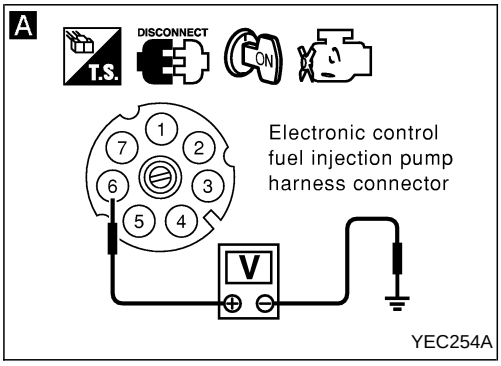
Wiring Diagram



YEC677A

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Diagnostic Procedure

INSPECTION START

A

CHECK POWER SUPPLY.
1. Turn ignition switch to “LOCK” position.
2. Disconnect electrical fuel injection pump harness connector.
3. Turn ignition switch to “ON” position.
4. Check voltage between electronic control fuel injection pump (Fuel temperature sensor) harness connector terminal ⑥ and engine ground with CONSULT-II or tester.

Voltage:
Approximately 4.9V

NG → Check the following:
- Harness for open or short-circuit between ECM and electronic control fuel injection pump (fuel temperature sensor)

If NG, repair harness or connectors.

OK ↓

CHECK GROUND CIRCUIT.
1. Turn ignition switch to “LOCK” position.
2. Check harness continuity between electronic control fuel injection pump (fuel temperature sensor) connector terminal ⑤ and ECM connector terminal (335). Refer to wiring diagram.

Continuity should exist.
If OK, check harness for short-circuit.

NG → Check the following:
- Harness for open or short-circuit between ECM and electronic control fuel injection pump (fuel temperature sensor).

If NG, repair harness or connectors.

OK ↓

CHECK COMPONENT
[Electronic control fuel injection pump (Fuel temperature sensor)].
Refer to “COMPONENT INSPECTION” on page EC-398.

NG → Have the injection pump assembly serviced by an authorised service representative.

OK ↓

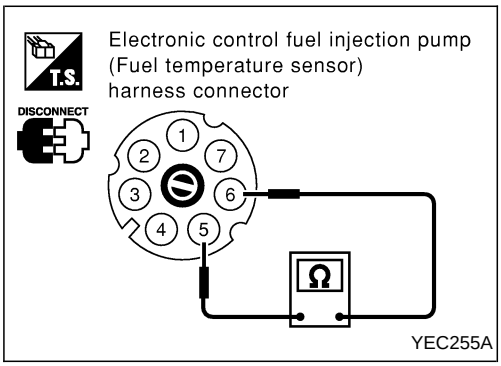
Disconnect and reconnect harness connectors in the circuits. Then retest.

Trouble is not fixed. ↓

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END

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Component Inspection

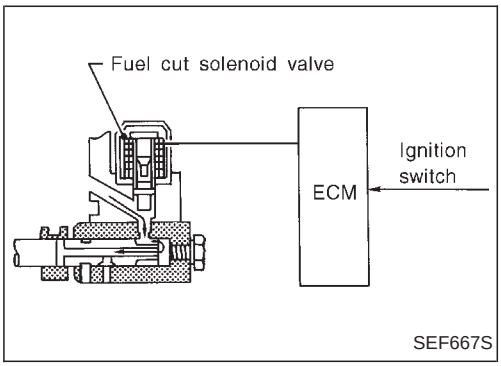
ELECTRONIC CONTROL FUEL INJECTION PUMP (FUEL TEMPERATURE SENSOR)

Wait until fuel temperature sensor reaches room temperature.
Check resistance between electronic control fuel injection pump (fuel temperature sensor) terminals ⑤ and ⑥.

Temperature °C (°F)	Resistance kΩ
25 (77)	Approximately 1.9

If NG, have the injection pump assembly serviced by an authorised service representative.

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Component Description

FUEL CUT SOLENOID VALVE

When the ignition switch is off, the ECM turns the fuel cut solenoid valve OFF (under this condition, no current flows through the fuel cut solenoid valve), shutting off fuel supply.
When the engine is not operating due to trouble, the fuel cut solenoid valve may or may not be OFF even when the ignition switch is ON.

On Board Diagnosis Logic

DTC	Malfunction is detected when ...	Check Items (Possible Cause)
P0125 0306	● Fuel cut solenoid valve circuit is malfunctioning.	● Harness or connectors (The solenoid valve circuit is open or shorted.) ● Fuel cut solenoid valve

DTC Confirmation Procedure

NOTE:
If DTC P0115 or P0335 is displayed same time, perform trouble diagnosis for P0115 or P0335 first.

WITH CONSULT-II

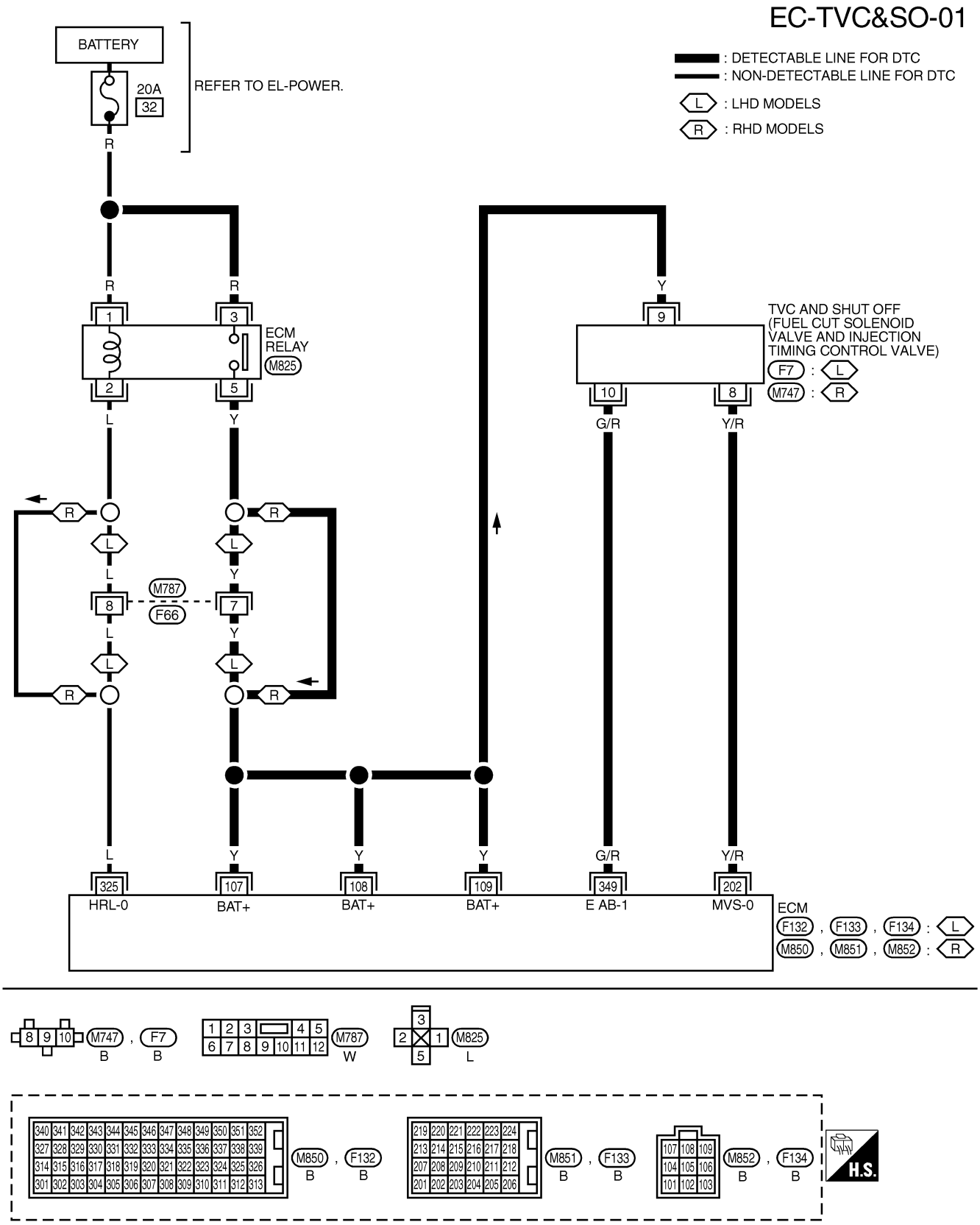
1) Turn ignition switch to “ON” position.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Start engine. (If no start, circuit is open.)
4) Warm it up sufficiently.
5) Turn ignition switch to “LOCK” position, wait at least 5 seconds.
6) Start engine and rev it up to above 1,300 rpm. Release pedal and wait at least 3 seconds.

WITHOUT CONSULT-II

1) Start engine. (If no start, circuit is open.)
2) Warm it up sufficiently.
3) Turn ignition switch to “LOCK” position, wait at least 5 seconds.
4) Start engine and rev it up to above 1,300 rpm. Release pedal and wait at least 3 seconds.
5) Turn ignition switch to “LOCK” position, wait at least 5 seconds and then turn to “ON” position.
6) Perform “Diagnostic Test Mode II” (Self-diagnostic results).

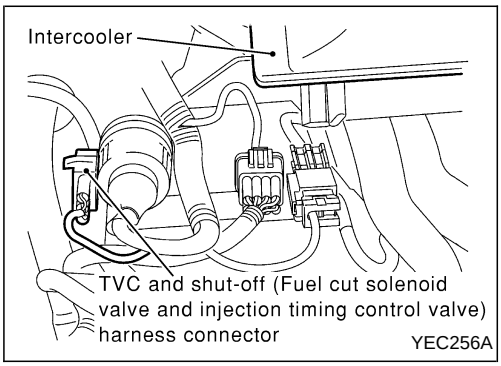
http://vnx.su/

Wiring Diagram



YEC678A

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Diagnostic Procedure

INSPECTION START

CHECK POWER SUPPLY.
Check power supply.

CHECK OUTPUT SIGNAL CIRCUIT.
With CONSULT-II
1. Turn ignition switch to “ON” position.
2. Select “FUEL CUT SOL/V” in “ACTIVE TEST” mode with CONSULT-II.
3. Touch “ON” and “OFF” alternately.
4. Check that operating sound is emitted.

Without CONSULT-II
1. Turn ignition switch to “LOCK” position.
2. Disconnect ECM harness connector and TVC and shut-off harness connector.
3. Check harness continuity between TVC and shut-off harness connector terminal ⑧ and ECM connector terminals (202), TVC and shut-off terminal ⑩ and ECM terminal (349). Refer to wiring diagram.
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK

CHECK COMPONENT
[TVC and shut-off (Fuel cut solenoid valve)].
Refer to “COMPONENT INSPECTION” on page EC-402.

NG → Replace [TVC and shut-off (fuel cut solenoid valve)].

OK

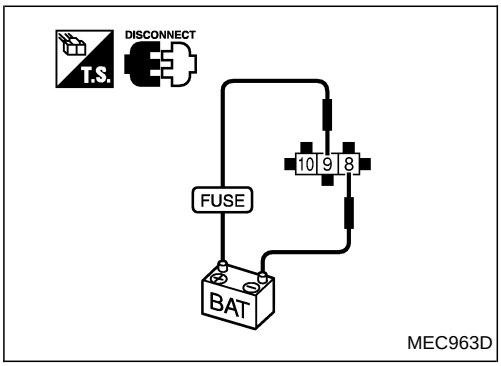
Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed.

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END

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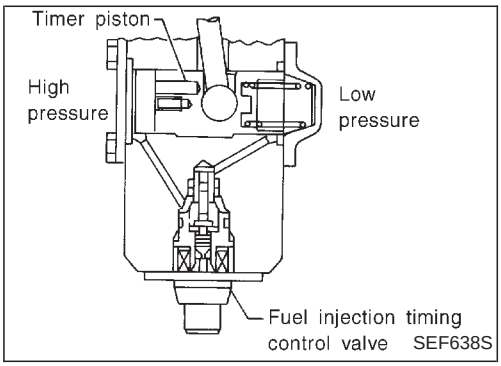
Component Inspection

[TVC AND SHUT OFF (FUEL CUT SOLENOID VALVE)]

1. Remove TVC and shut-off (fuel cut solenoid valve) harness connector.
2. Check that operating sound is emitted when applying 12V direct current to terminal ⑨ and ⑧.

If NG, replace TVC and shut-off (fuel cut solenoid valve).

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Component Description

INJECTION TIMING CONTROL VALVE

The injection timing control valve is built into the fuel injection pump. It controls the timer piston to change the fuel injection timing.
The timing control valve is a solenoid valve located in the line between high-pressure chamber and low-pressure chamber. It changes fuel pressure in the high-pressure chamber.
When current flows through the solenoid (the solenoid turns ON), the timing control valve opens, advancing fuel injection timing. When current does not flow through it, the timing control valve closes, retarding injection timing.
The ECM emits an ON-OFF duty signal. The longer the OFF-duration, the greater the advance angle. The longer the ON-duration, the greater the retard angle. This means that changing the ON-OFF duty ratio makes it possible to achieve an optimal advance angle and accurately control fuel injection timing.

On Board Diagnosis Logic

DTC	Malfunction is detected when	Check Items (Possible cause)
P0216 0904	• Injection timing control valve circuit is open or shorted.	• Harness or connectors (The injection timing control valve circuit is open or shorted) • Injection timing control valve
P1246 0201	• Injection timing feedback system does not operate properly. (This system consists essentially of ECM, injection timing control valve and needle lift sensor.)	• Harness or connectors [Injection timing control valve, needle lift sensor, crankshaft position sensor (TDC) circuits] • Injection timing control valve • Needle lift sensor • Crankshaft position sensor (TDC) • Air in fuel line

DTC P0216 Confirmation Procedure

WITH CONSULT-II

1) Turn ignition switch to “ON” position.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Wait at least 2 seconds.

WITHOUT CONSULT-II

1) Turn ignition switch to “ON” position.
2) Wait at least 2 seconds.
3) Turn ignition switch to “LOCK” position, wait at least 5 seconds and then turn to “ON” position.
4) Perform “Diagnostic Test Mode II” (Self-diagnostic results).

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DTC P1246 Confirmation Procedure

NOTE:
If both DTC P1246 and P1240 or P0335 are displayed, perform TROUBLE DIAGNOSIS FOR DTC P1240 or P0335. (See EC-450 or EC-408.)

WITH CONSULT-II

1) Turn ignition switch to “ON” position and select “DATA MONITOR” mode with CONSULT-II.
2) Start engine. Run it for 10 seconds at idle.

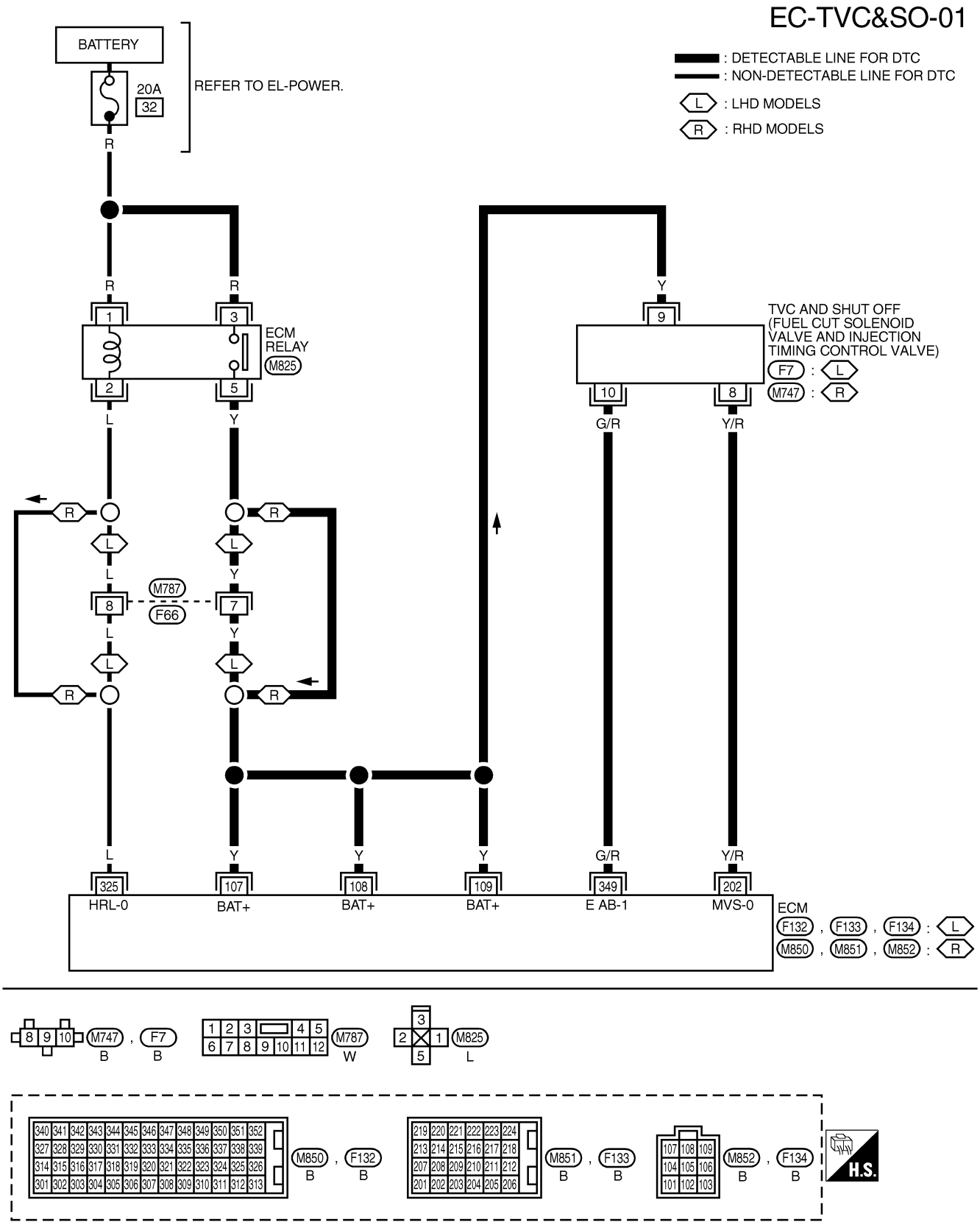
WITHOUT CONSULT-II

1) Start engine. Run it for 10 seconds at idle.
2) Turn ignition switch to “LOCK” position, wait at least 5 seconds and then turn to “ON” position.
3) Perform “Diagnostic Test Mode II” (Self-diagnostic results).

NOTE:
If a malfunction occurs intermittently, conduct suitable driving pattern for 10 minutes. This makes it possible to determine DTC.

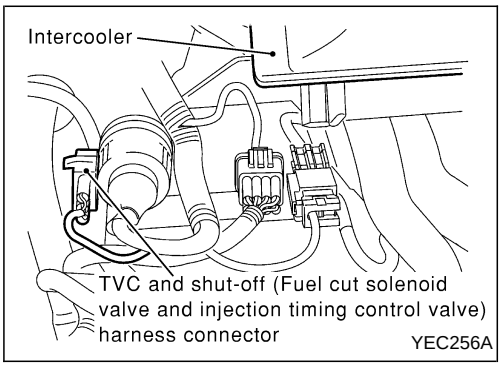
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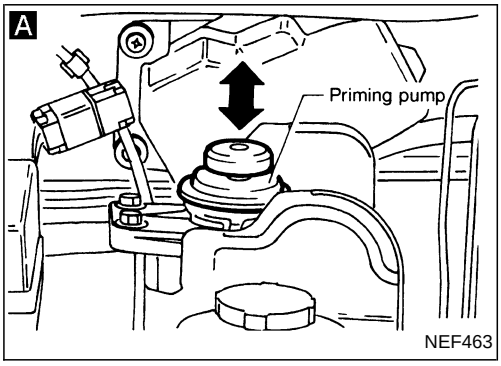
Wiring Diagram

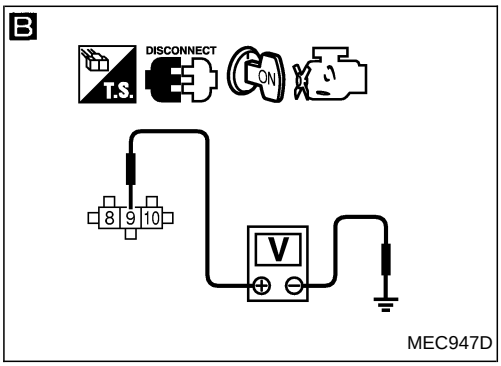


YEC678A

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Diagnostic Procedure

INSPECTION START

A

CHECK FOR AIR IN FUEL FILTER.
1. Move priming pump up and down to purge air from fuel filter.
2. Perform “DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE”.

B

CHECK POWER SUPPLY.
1. Turn ignition switch to “LOCK” position.
2. Disconnect TVC and shut-off (injection timing control valve) harness connector.
3. Turn ignition switch to “ON” position.
4. Check voltage between TVC and shut-off (injection timing control valve) connector terminal ⑨ and engine ground with CONSULT-II or tester.

Voltage: Battery voltage

NG →
Check the following:
- Harness connector (M787), (F66)
- 20A fuse
- ECM relay
- Harness for open or short-circuit between TVC and shut-off (injection timing control valve) harness connector and fuse box.

If NG, replace 20A fuse or ECM relay, harness or connectors.

OK ↓

CHECK OUTPUT SIGNAL CIRCUIT.
1. Turn ignition switch to “LOCK” position.
2. Disconnect ECM harness connector.
3. Check harness continuity between TVC and shut-off (injection timing control valve) connector terminal ⑧ and ECM terminals (202). Refer to wiring diagram.

Continuity should exist.

If OK, check harness for short-circuit.

NG →
Check the following:
- Harness for open or short-circuit between TVC and shut-off (injection timing control valve) and ECM

If NG, repair harness or connectors.

OK ↓

CHECK GROUND CIRCUIT.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM connector terminal (349) and TVC and shut-off (injection timing control valve) connector terminal ⑩. Refer to wiring diagram.

Continuity should exist.

If OK, check harness of short-circuit.

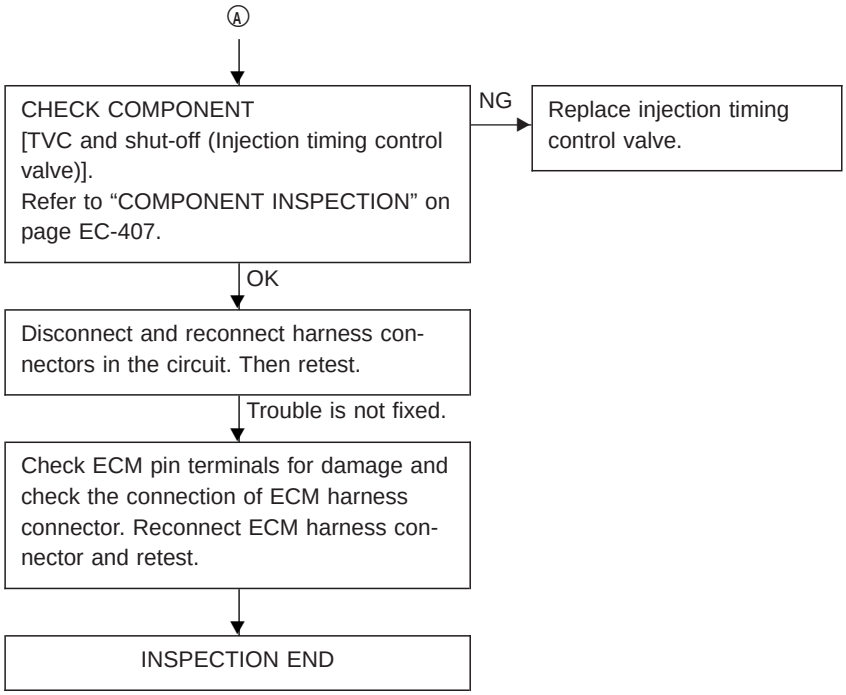
NG →
Repair harness or connectors

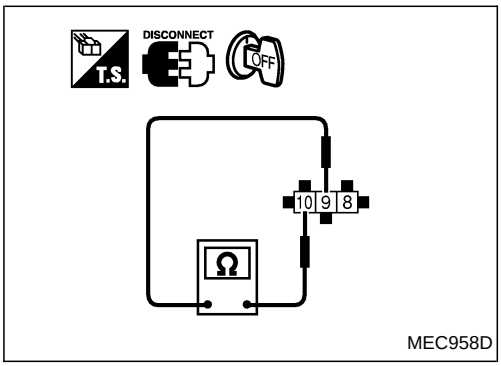
OK ↓

Ⓐ

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Diagnostic Procedure (Cont'd)



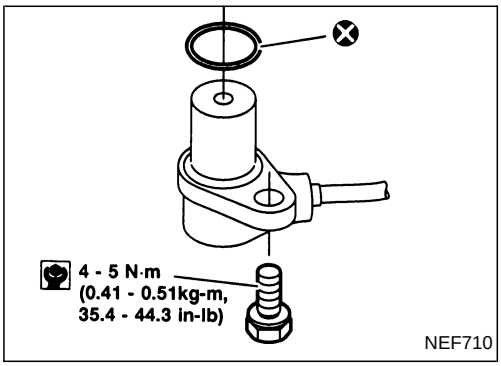


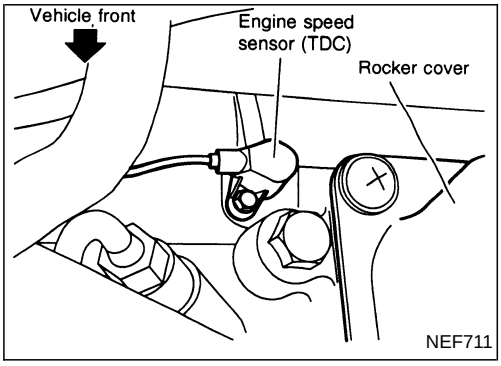
Component Inspection

[TVC AND SHUT-OFF (INJECTION TIMING CONTROL VALVE)]

1. Disconnect TVC and shut-off (injection timing control valve) harness connector.
2. Check resistance between terminals ⑨ and ⑩.
   Resistance: Approximately 15Ω [at 25°C (77°F)]
   If NG, replace injection timing control valve.

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Component Description

CRANKSHAFT POSITION SENSOR (TDC)

The crankshaft position sensor (TDC) monitors engine speed by means of signals from the sensing plate (with four protrusions) installed to the clutch housing. The datum signal output is detected at ATDC 30° and sent to the ECM. The sensor signal is used for fuel injection control and fuel injection timing control.

On Board Diagnosis Logic

DTC	Malfunction is detected when	Check Items (Possible cause)
P0335 0407	• An improper signal from the sensor is detected by ECM during engine running and cranking.	• Harness or connectors (The sensor circuit is open) • Crankshaft position sensor (TDC)

DTC Confirmation Procedure

- **If DTC P1240 is displayed same time, perform trouble diagnosis for DTC P1240 first.**
- **Before performing the following procedure, confirm that battery voltage is more than 9V.**

WITH CONSULT-II

1) Turn ignition switch to “ON” position and select “DATA MONITOR” mode with CONSULT-II.
2) Start engine and run it for at least 3 seconds at above 1,200 rpm.

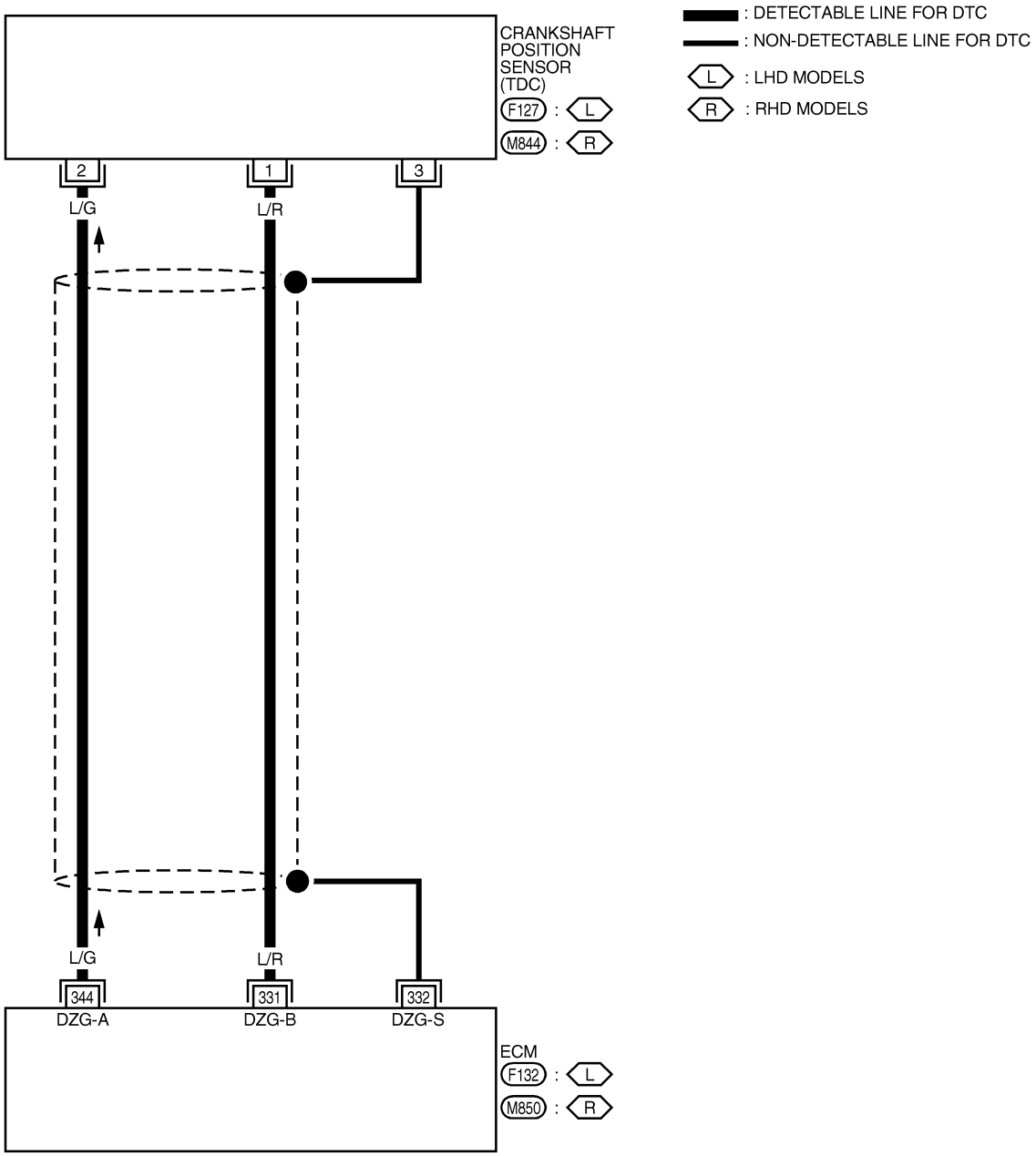
WITHOUT CONSULT-II

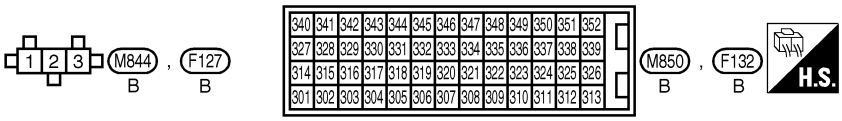
1) Start engine and run it for at least 3 seconds at above 1,200 rpm.
2) Turn ignition switch to “LOCK” position, wait at least 5 seconds and then turn to “ON” position.
3) Perform “Diagnostic Test Mode II” (Self-diagnostic results).

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Wiring Diagram

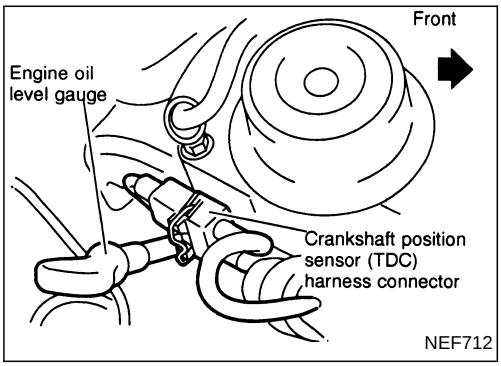
EC-CKPS-01

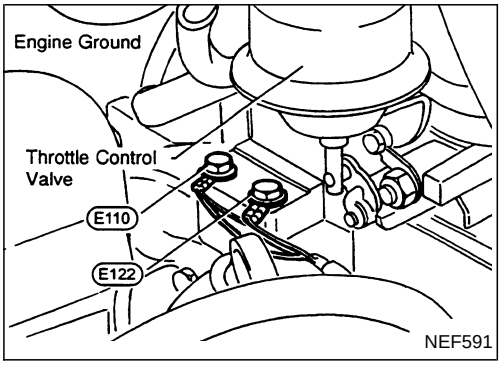




YEC146A

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Diagnostic Procedure

INSPECTION START

CHECK INPUT SIGNAL CIRCUIT.
1. Turn ignition switch to “LOCK” position.
2. Disconnect crankshaft position sensor (TDC) and ECM harness connectors.
3. Check continuity between ECM terminal (344) and crankshaft position sensor connector terminal ②. Refer to wiring diagram.

Continuity should exist.

If OK, check harness for short-circuit.

NG → Check the following:
- Harness for open-circuit between ECM and crankshaft position sensor (TDC).

If NG, repair harness or connectors.

OK ↓

CHECK GROUND CIRCUIT-I.
Check harness continuity between crankshaft position sensor connector terminal ① and ECM terminals (331). Refer to wiring diagram.

Continuity should exist.

If OK, check harness for short-circuit.

NG → Check the following:
- Harness for open-circuit between crankshaft position sensor (TDC) harness connector and ECM

If NG, repair harness or connectors.

OK ↓

CHECK GROUND CIRCUIT-II.
Check harness continuity between crankshaft position sensor connector terminal ③ and ECM terminal (332). Refer to wiring diagram.

Continuity should exist.

If OK, check harness for short-circuit.

NG → Check the following:
- Harness for open-circuit between crankshaft position sensor (TDC) and engine ground.

If NG, repair harness or connectors.

OK ↓

CHECK COMPONENT
[Crankshaft position sensor (TDC)].
Refer to “COMPONENT INSPECTION”, EC-411.

NG → Replace crankshaft position sensor (TDC).

OK ↓

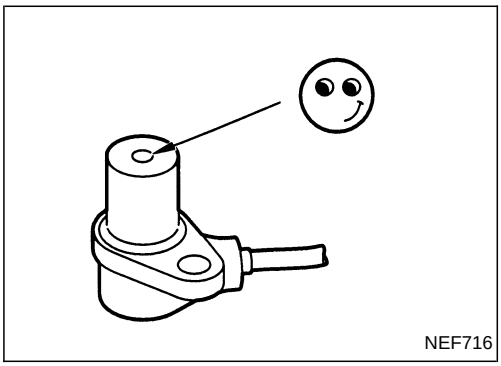
Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed. ↓

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END

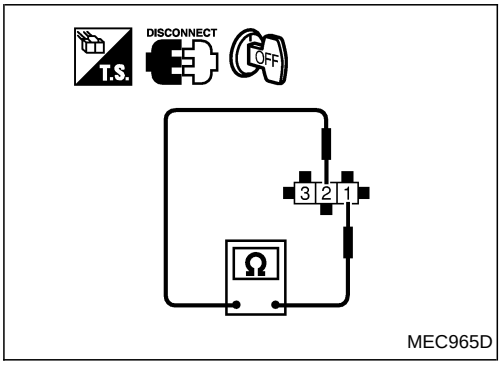
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NEF716

Component Inspection

CRANKSHAFT POSITION SENSOR (TDC)

1. Disconnect crankshaft position sensor (TDC) harness connector.
2. Loosen the fixing bolt of the sensor.
3. Remove the sensor.
4. Visually check the sensor for chipping.



MEC965D

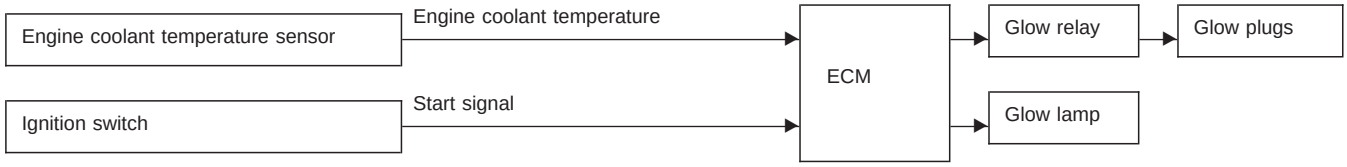
5. Check resistance between terminals ① and ② .
   Resistance: Approximately 900Ω
   [at 25°C (77°F)]
   If NG, replace crankshaft position sensor (TDC).

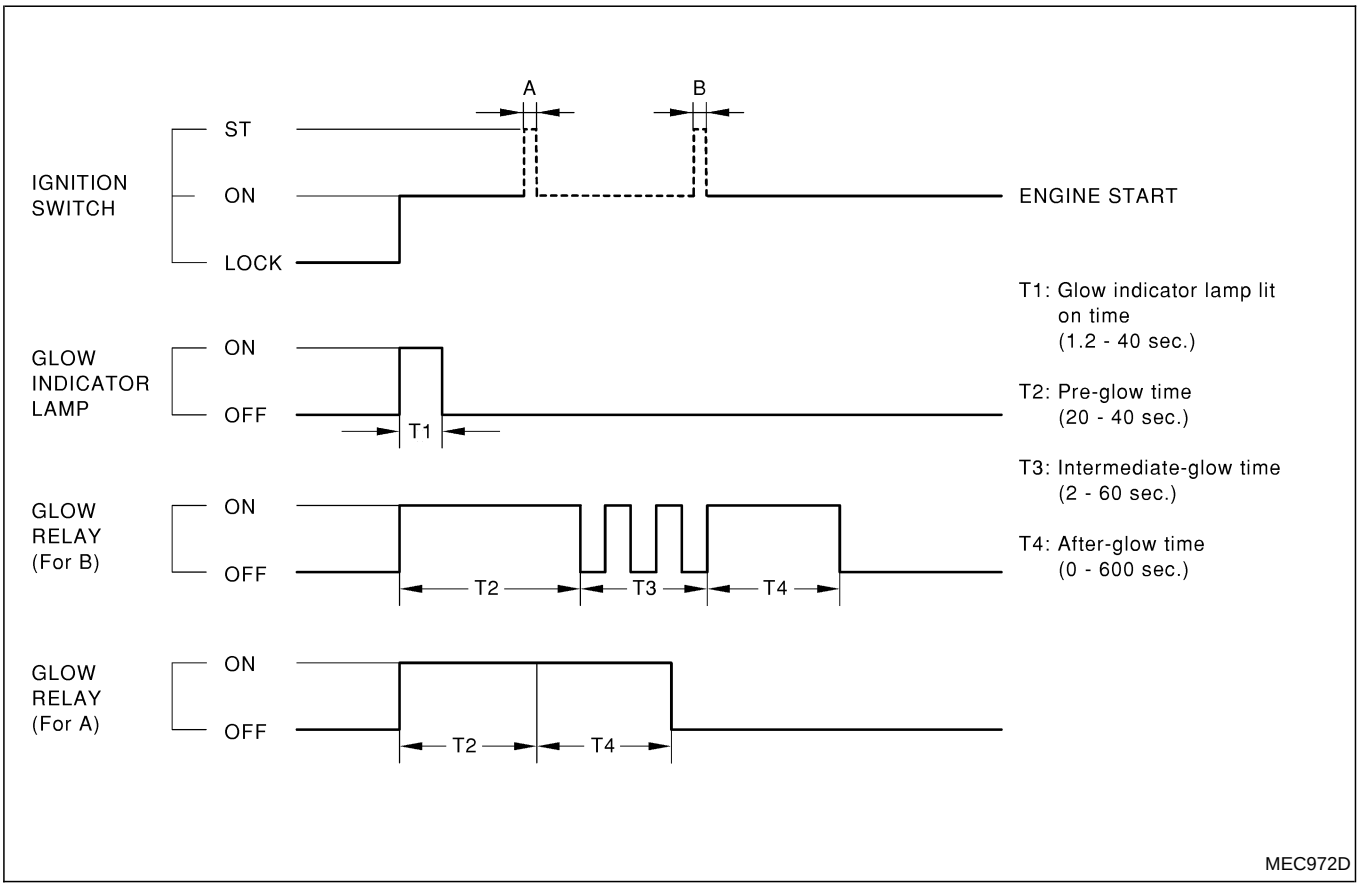
CAUTION
Do not use any crankshaft position sensor (TDC) that has been dropped or physically damaged.
Use only new one.

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System Description

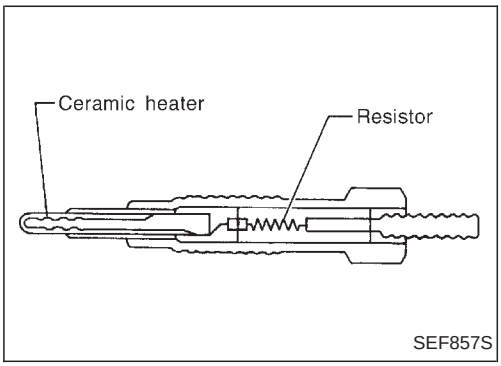
GLOW CONTROL





- Pre-glow
  When the ignition switch is turned on the ON position, the glow indicator lamp will turn ON and pre-glow starts.
  The glow relay is turned ON continuously. The ON time of both the glow indicator lamp and the glow relay is determined by the engine coolant temperature. Pre-glow ends when the pre-glow time elapses or when the engine is started.
- Intermediate glow
  Intermediate glow starts when the pre-glow time has elapsed and the engine has not been started. The glow relay is turned ON intermittently. Intermediate glow ends when the intermediate glow time has elapsed, or when the engine is started.
- After-glow
  After-glow starts as soon as the engine is running and the engine coolant temperature is below 50°C (122°F). The glow relay is turned on continuously. After-glow ends when the after-glow time elapses, or when the engine coolant temperature exceeds 50°C (122°F).

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Component Description

GLOW PLUG

The glow plug is provided with a ceramic heating element to obtain a high-temperature resistance. It glows in response to a signal sent from the ECM, allowing current to flow through the glow plug via the glow relay.

On Board Diagnosis Logic

DTC	Malfunction is detected when	Check Items (Possible cause)
P0380 0803	• Glow relay signal circuit is open or shorted.	• Harness or connectors (The glow relay signal circuit is open or shorted.) • Glow relay
P0381 0908	• Glow indicator lamp circuit is open or shorted.	• Harness or connectors (The glow indicator lamp circuit is open or shorted.) • Glow lamp

DTC Confirmation Procedure

WITH CONSULT-II

1) Turn ignition switch “ON” position.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Wait for at least 5 seconds.

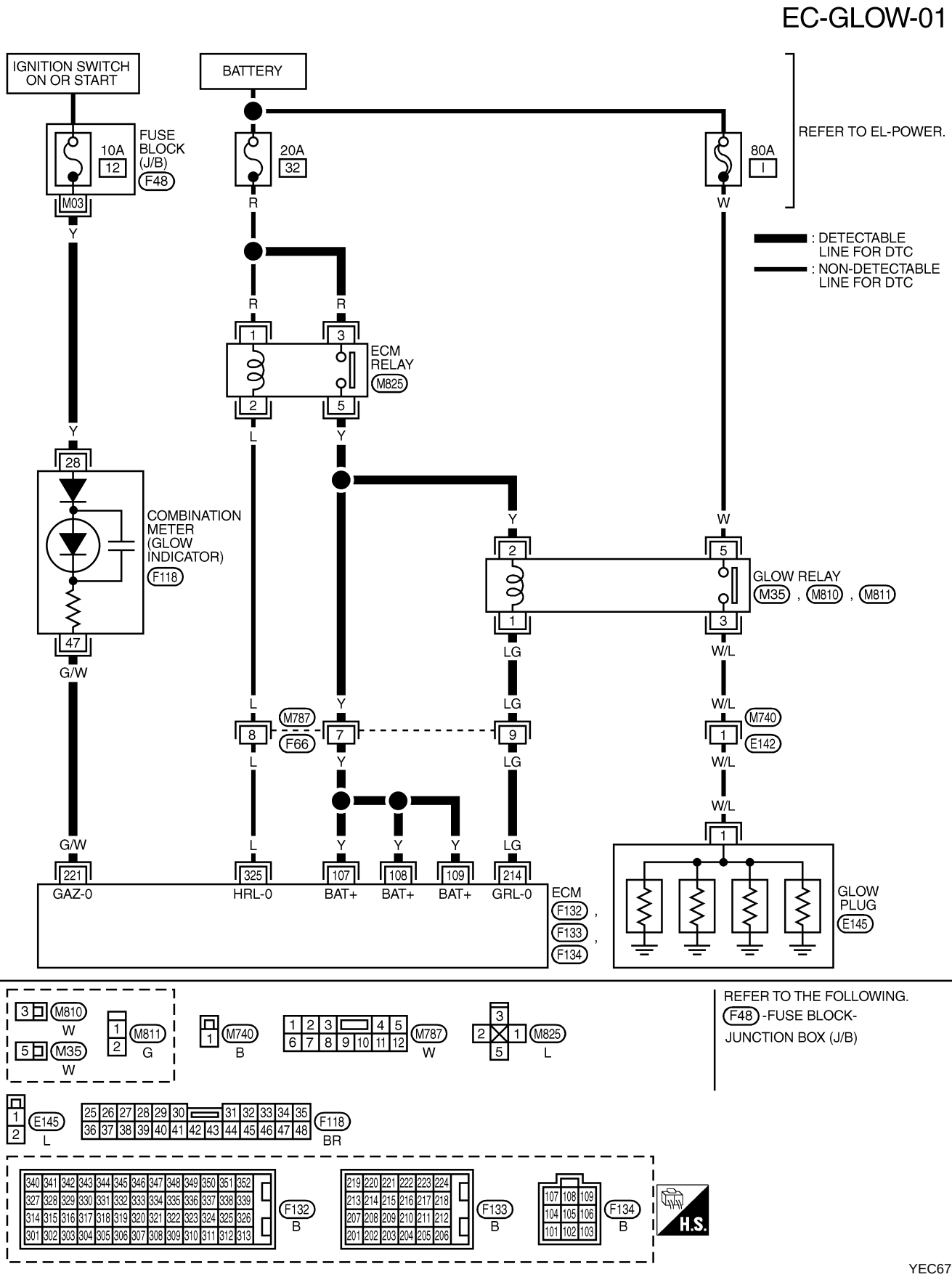
WITHOUT CONSULT-II

1) Turn ignition switch “ON” position and then wait for at least 5 seconds.
2) Turn ignition switch OFF, wait for at least 5 seconds and then turn on.
3) Perform “Diagnostic Test Mode II” (Self-diagnostic results).

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Wiring Diagram

LHD MODELS

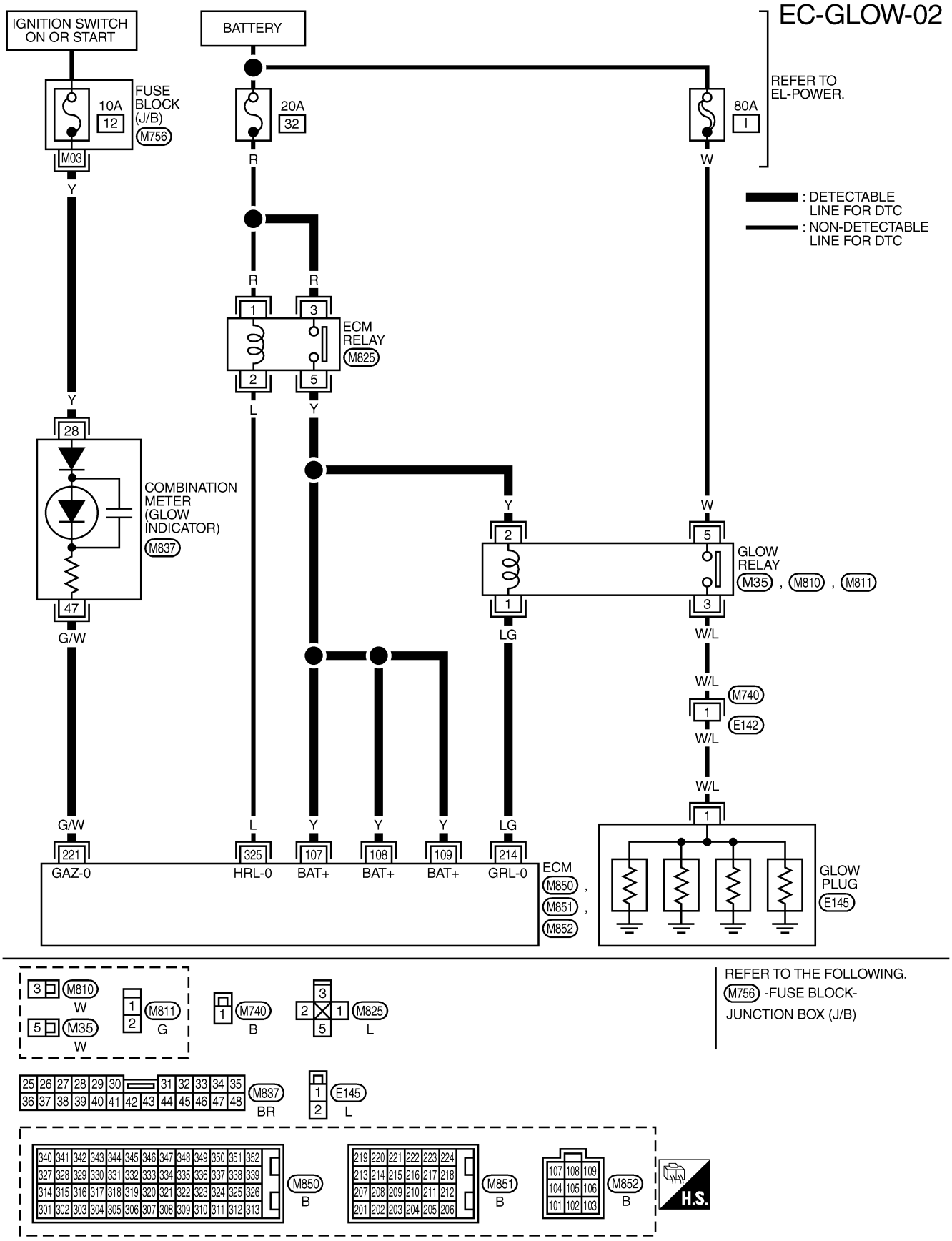


YEC679A

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Wiring Diagram (Cont'd)

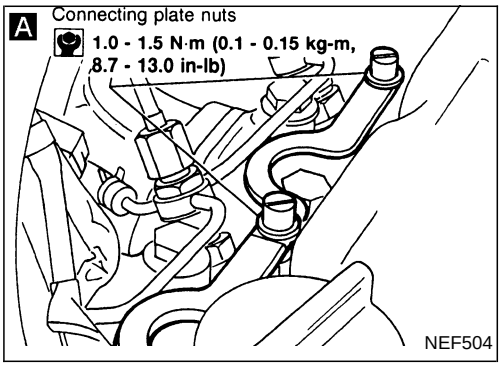
RHD MODELS



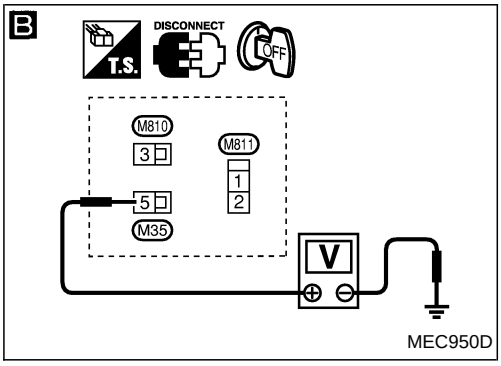
YEC680A

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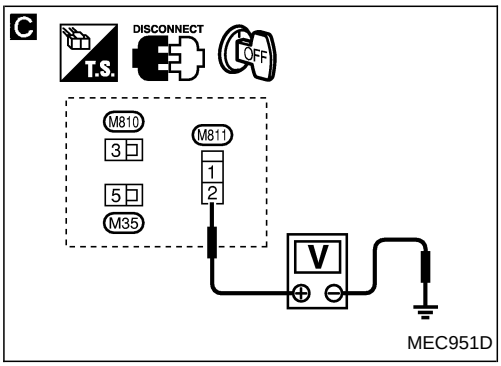
A



B



C



Diagnostic Procedure

INSPECTION START

Check fuel level, fuel supply system, starter motor, etc.
- NG → Repair or replace.
- OK ↓

A

Check that all glow plug connecting plate nuts are installed correctly.
- NG → Install correctly.
- OK ↓

CHECK OVERALL FUNCTION.
Check entire glow control system.
- OK → CHECK COMPONENT (Glow plug). Refer to EC-419.
- NG ↓

B

CHECK VOLTAGE BETWEEN GLOW RELAY AND GROUND.
1. Disconnect glow relay.
2. Check voltage between glow relay connector terminal ⑤ and engine ground with tester.

Voltage: Battery voltage
- NG → Check the following:
  - 80A fusible link in fusible link box
  - Harness continuity between glow relay and battery positive terminal.

  If NG, replace fuse or fusible link or repair harness or connectors.
- OK ↓

C

CHECK VOLTAGE BETWEEN GLOW RELAY AND GROUND.
1. Turn ignition switch to “ON” position.
2. Check voltage between glow relay connector terminals ② and engine ground with tester.

Voltage: Battery voltage
- NG → Check the following:
  - 20A fusible link in fusible link box
  - ECM relay
  - Harness continuity between glow relay and battery positive terminal.

  If NG, replace fuse or fusible link or repair harness or connectors.
- OK ↓

CHECK OUTPUT SIGNAL CIRCUIT.
1. Turn ignition switch to “LOCK” position.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM connector terminal (214) and glow relay connector terminal ①. Refer to wiring diagram.

Continuity should exist.

If OK, check harness for short-circuit.
- NG → Check the following.
  - Harness connectors (M787), (F66) (LHD models)
  - Harness continuity between glow relay and ECM

  If NG, repair harness or connectors.
- OK ↓

CHECK HARNESS CONTINUITY BETWEEN GLOW RELAY AND GLOW PLUG.
1. Disconnect glow plug connector.
2. Check harness continuity between glow relay connector terminal ③ and glow plug connector terminal ①. Refer to wiring diagram.

Continuity should exist.

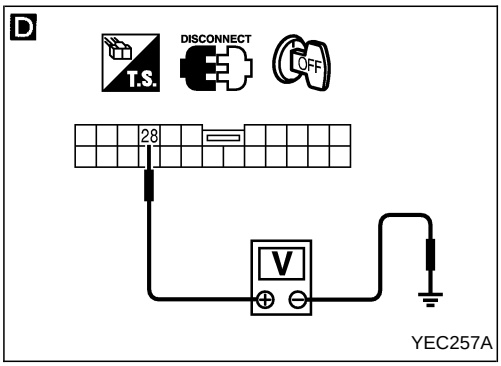
If OK, check harness for short-circuit.
- NG → Check the following.
  - Harness connectors (M740), (E142)
  - Harness continuity between glow relay and glow plug

  If NG, repair harness or connectors.
- OK ↓

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Diagnostic Procedure (Cont'd)



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D

CHECK VOLTAGE BETWEEN COMBINATION METER (GLOW INDICATOR) AND GROUND.
1. Turn ignition switch "OFF".
2. Disconnect combination meter harness connector.
3. Check voltage between combination meter terminal ㉘ and ground.

Voltage: Battery voltage

NG → Check the following.
- 10A fuse
- Harness continuity between combination meter and 10A fuse

If NG, replace fuse or repair harness or connectors.

OK ↓

CHECK HARNESS CONTINUITY BETWEEN COMBINATION METER AND ECM.
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between combination meter terminal ㊼ and ECM terminal (221). Refer to wiring diagram.

Continuity should exist.
If OK, check harness for short circuit.

NG → Repair harness or connectors.

OK ↓

CHECK COMPONENTS.
(Glow relay, Glow plug, Glow indicator).
Refer to "COMPONENT INSPECTION", EC-419.

NG → Replace malfunctioning component(s).

OK ↓

Disconnect and reconnect harness connectors in the circuit. Then retest.

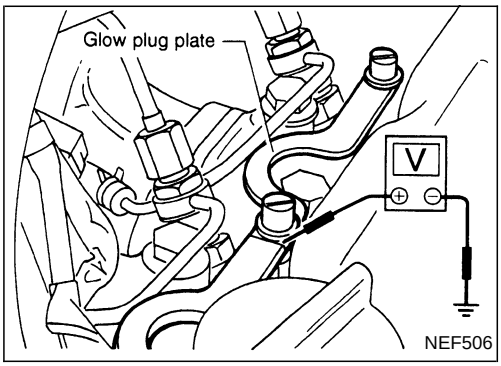
Trouble is not fixed. ↓

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

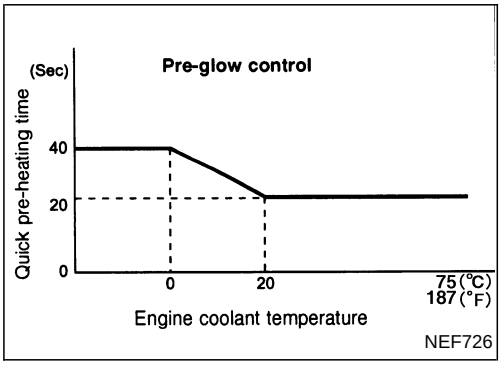
INSPECTION END

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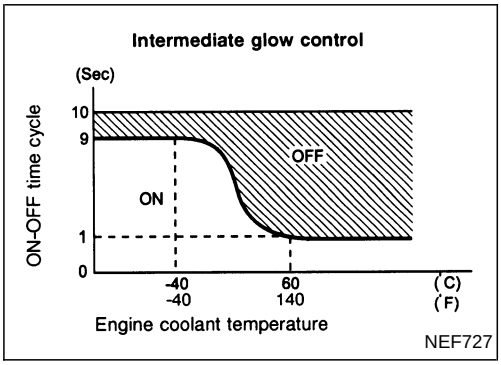


System Operation Check

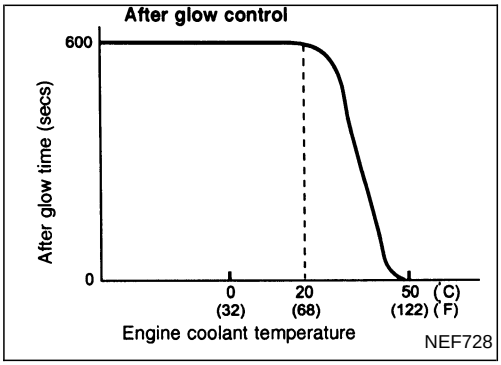
Set voltmeter between glow plug and engine body.



1. Pre-glow control
a. Turn ignition switch to “ON” position.
b. Read voltage and time.
Battery voltage will continuously appear for about 20* seconds after ignition switch is turned “ON”.
*** Engine coolant temperature is higher than 20°C (68°F).**
*** Repeatedly turning the ignition switch to “ON” position and then back to “LOCK” position may change the glow time.**
2. Intermediate-glow control
a. Turn ignition switch to “LOCK” position. Wait at least 5 seconds.
b. Turn ignition switch to “ON”.

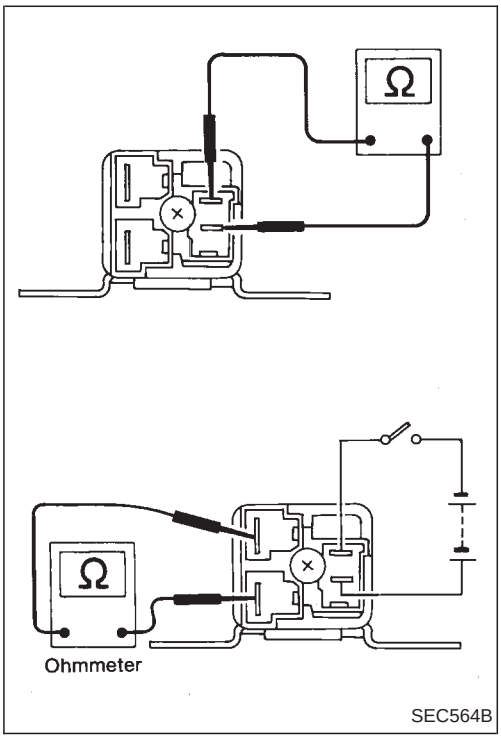


c. Read voltage.
Battery voltage will intermittently appear for about 60 seconds after pre-glow control time has elapsed.



3. After-glow control
Start engine and read voltage and time.
Battery voltage will appear for max. 10 minutes. When engine coolant temperature is lower than 50°C (122°F).

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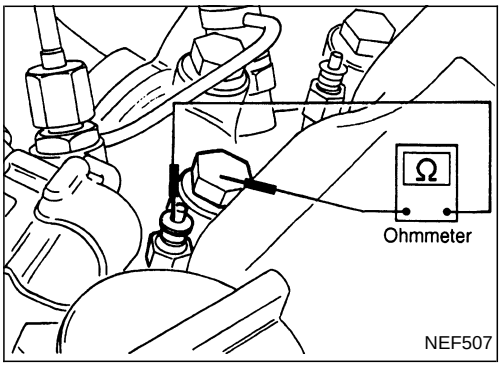


Component Inspection

GLOW RELAY

1. Check relay terminals ① and ② for coil continuity.
   Continuity should exist.
2. Check relay operation by applying battery voltage across relay coil terminals.

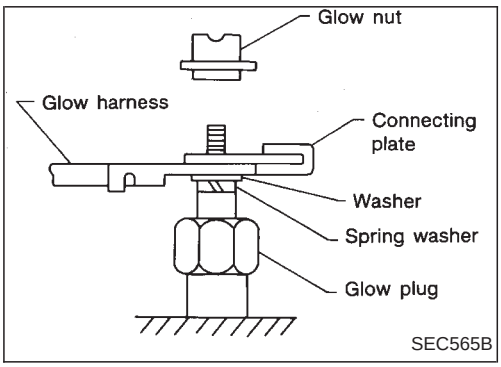
Coil voltage at relay terminals ① and ②	Continuity at relay terminals ⑤ and ③
0V	No
12V	Yes



GLOW PLUG

1. Remove glow plug connecting plate.
2. Check each glow plug for continuity.
   Continuity should exist:
   Approximately 0.5Ω [at 25°C (77°F)]

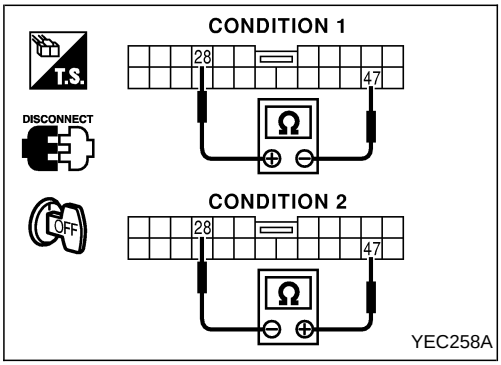
- If NG, replace glow plug.



3. Install glow plug connecting plate securely.

- **Do not bump glow plug heating element. If it is bumped, replace glow plug with new one. [If glow plug is dropped from a height above 10 cm (3.94 in), replace with new one.]**
- **If glow plug installation hole is contaminated with carbon, remove using a reamer or suitable tool.**
- **Hand-tighten glow plug by turning it 2 to 3 times, then tighten using a tool to specified torque.**

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



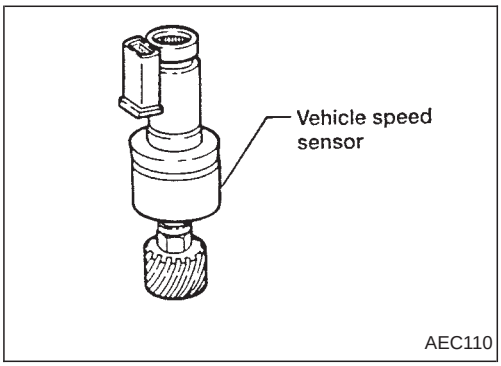
GLOW INDICATOR

1. Turn ignition switch “OFF”.
2. Disconnect combination meter harness connector.
3. Check continuity between terminals below.

Combination meter (Glow indicator)	CONDITION 1	+28 −47	Continuity should not exist.
	CONDITION 2	−28 +47	Continuity should exist.

IF NG, repair or replace combination meter (Glow indicator). Refer to EL section.

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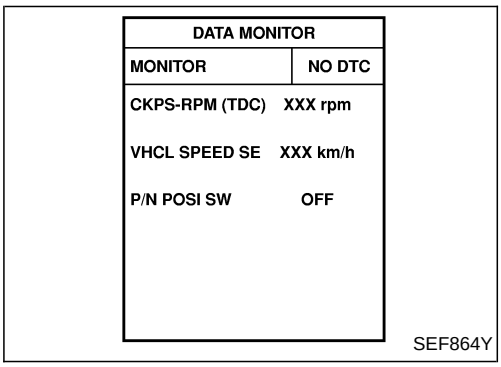
Component Description

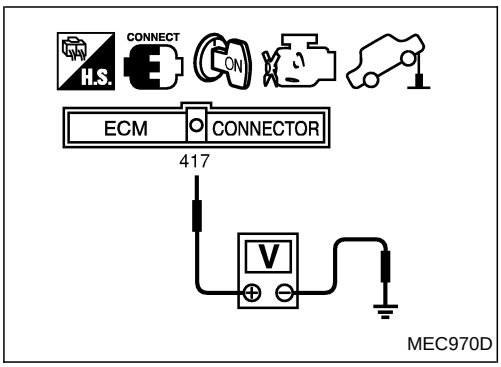
VEHICLE SPEED SENSOR (VSS)

The vehicle speed sensor is installed in the combination meter. It contains a pulse generator which provides a vehicle speed signal to the speedometer. The speedometer then sends a signal to the ECM.

On Board Diagnosis Logic

DTC	Malfunction is detected when	Check Items (Possible Cause)
P0500 0104	• The almost 0 km/h (0 mph) signal from vehicle speed sensor is sent to ECM even when vehicle is being driven.	• Harness or connector (The vehicle speed sensor circuit is open or short-circuited.) • Vehicle speed sensor





Overall Function Check

Use this procedure to check the overall function of the vehicle speed sensor circuit. During this check, a DTC might not be confirmed.

WITH CONSULT-II

1) Jack up drive wheels.
2) Start engine.
3) Read vehicle speed sensor signal in “DATA MONITOR” mode with CONSULT-II.

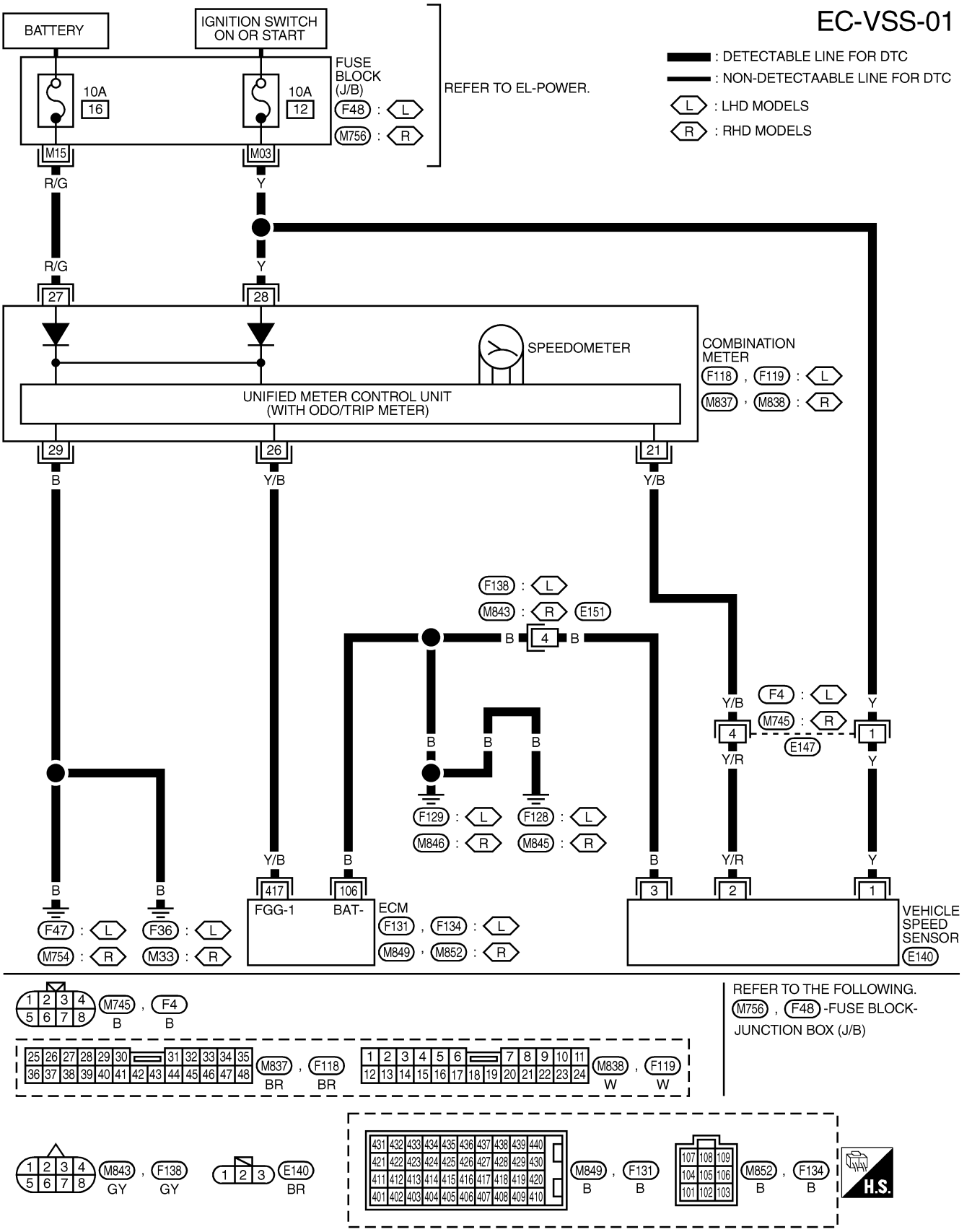
The vehicle speed on CONSULT-II should be able to exceed 10 km/h (6 mph) when rotating wheels with suitable gear position.

WITHOUT CONSULT-II

1) Jack up drive wheels.
2) Rotate drive wheel by hand.
3) Check voltage between ECM connector terminal (417) and body ground with tester.
   Voltage should vary between approx. 0 - Battery voltage.

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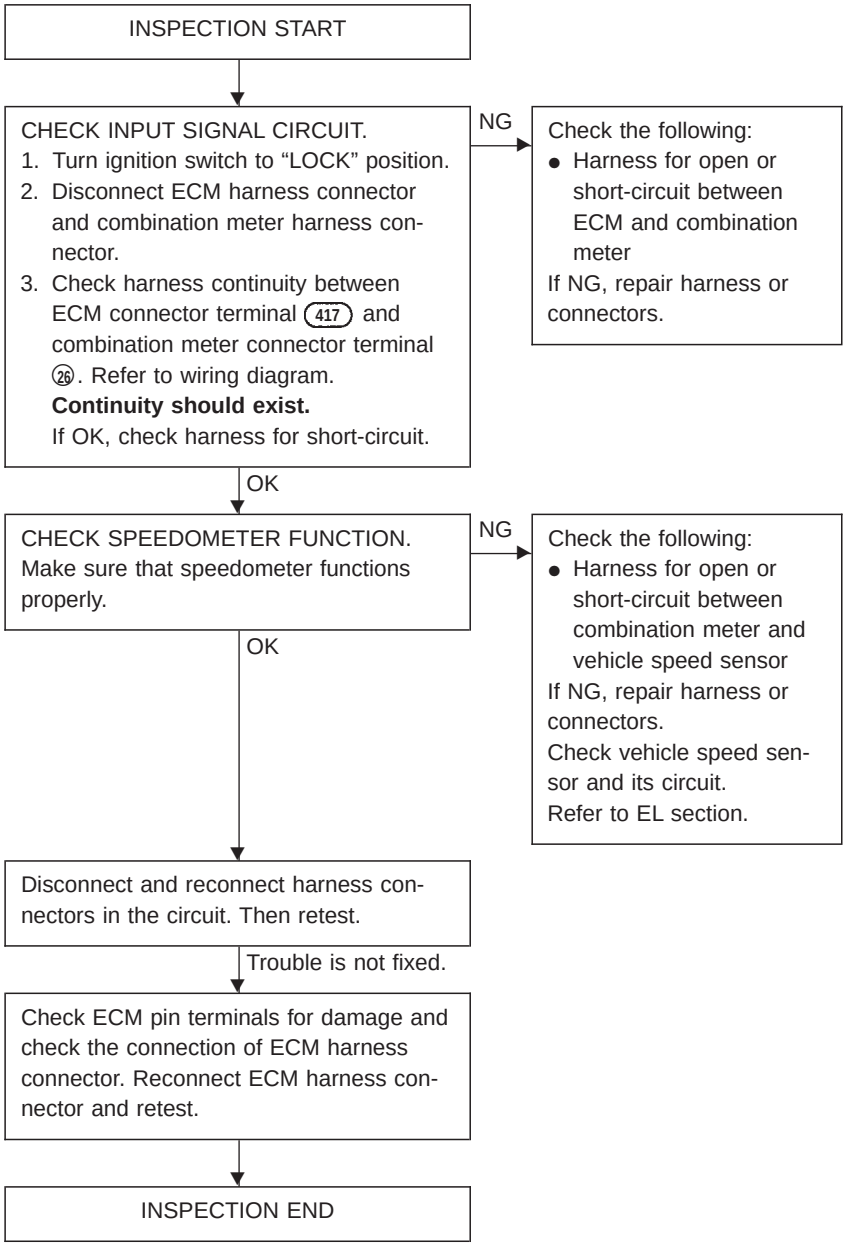
Wiring Diagram



YEC147A

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Diagnostic Procedure



http://vnx.su/

Component Description

BRAKE SWITCH

The ECM receives signals from two brake switches. One is a conventional brake lamp switch, the other is referred to as a redundant brake switch 2.
In case the accelerator pedal does not return to the idle position (pedal sticks), the driver will react by depressing the brake. In this (emergency) situation, the ECM will disregard the accelerator pedal signal and bring back the engine speed to 1,200 rpm.

On Board Diagnosis Logic

DTC	Malfunction is detected when ...	Check Items (Possible Cause)
P0571 0807	• Brake switch circuits are open or shorted.	• Harness or connectors (Brake switch circuits are open or shorted.) • Stop lamp switch • Brake switch 2

DTC Confirmation Procedure

WITH CONSULT-II

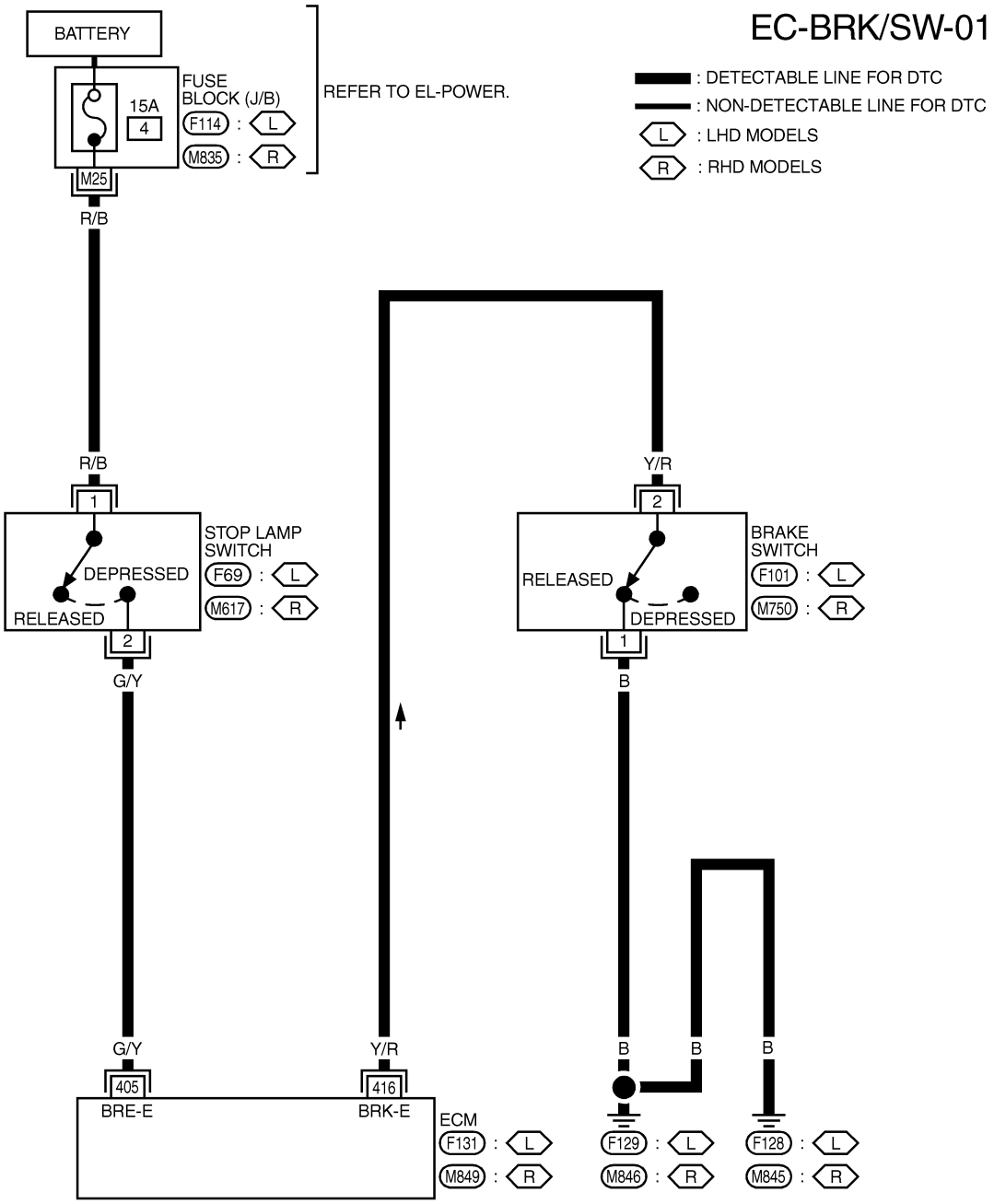
1) Turn ignition switch to “ON” position and select “DATA MONITOR” mode with CONSULT-II.
2) Depress brake pedal for at least 1 minute.

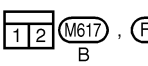
WITHOUT CONSULT-II

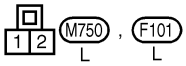
1) Turn ignition switch to “ON” position.
2) Depress brake pedal for at least 1 minute.
3) Turn ignition switch to “LOCK” position, wait at least 5 seconds and then turn to “ON” position.
4) Perform “Diagnostic Test Mode II” (Self-diagnostic results).

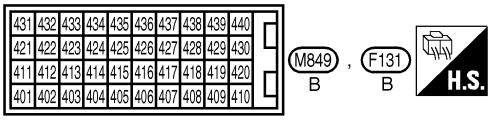
http://vnx.su/

Wiring Diagram





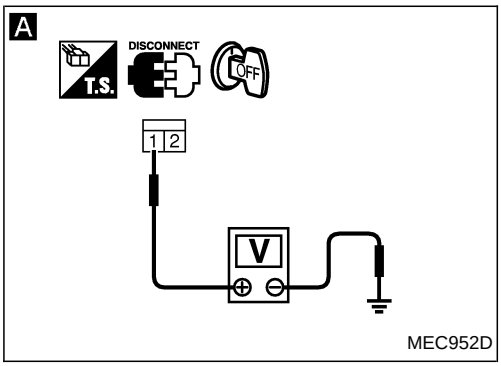




REFER TO THE FOLLOWING.
M835 , F114 -FUSE BLOCK-JUNCTION BOX (J/B)

YEC148A

http://vnx.su/



Diagnostic Procedure

INSPECTION START
(Stop lamp switch circuit)

A

CHECK POWER SUPPLY.
1. Turn ignition switch to “LOCK” position.
2. Disconnect stop lamp switch harness connector.
3. Check voltage between stop lamp switch harness connector terminal ① and engine ground.
   Voltage: Battery voltage

NG → Check the following:
- 15A fuse
- Harness for open or short-circuit between fuse block and stop lamp switch

If NG, repair harness or connectors.

OK ↓

CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM connector terminal (405) and stop lamp switch terminal ②. Refer to wiring diagram.
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK ↓

CHECK BRAKE SWITCH INPUT SIGNAL CIRCUIT.
1. Disconnect brake switch harness connector.
2. Check harness continuity between brake switch terminal ② and ECM terminal (416). Refer to wiring diagram.
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK ↓

CHECK GROUND CIRCUIT.
1. Check harness continuity between brake switch terminal ① and ground. Refer to wiring diagram.
   Continuity should exist.
   If OK, reconnect harness connectors.

NG → Repair harness or connectors.

OK ↓

CHECK COMPONENT.
(Stop lamp switch and brake switch)
Refer to “COMPONENT INSPECTION”, EC-426.

OK ↓

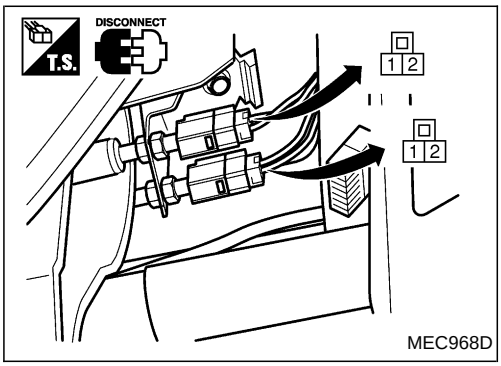
Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed ↓

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END

http://vnx.su/



Component Inspection

STOP LAMP SWITCH AND BRAKE SWITCH 2

1. Turn ignition switch to “LOCK” position.
2. Disconnect switch connectors.
3. Check continuity between terminals ① and ②.

Continuity:

Brake pedal	Stop lamp switch	Brake switch 2
Released	No	No
Depressed	Yes	Yes

If NG, replace stop lamp switch or brake switch.

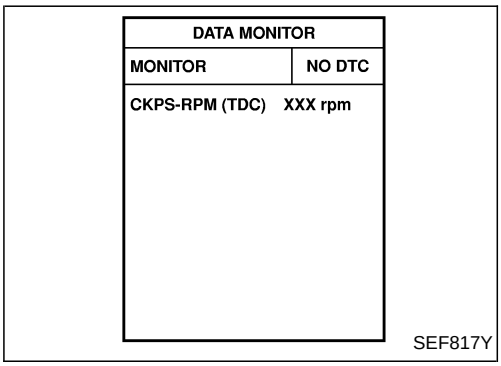
http://vnx.su/

Component Description

Malfunction Indicator (MI) is located on the instrument panel. When the ignition switch is turned ON without engine running, MI will light up. This is a bulb check. When the engine is started, MI should go off. If MI remains on, the on board diagnostic system has detected an engine system malfunction.

On Board Diagnosis Logic

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0650 0907	Malfunction indicator (MI) control circuit	• An excessively high voltage is sent to ECM through the MI circuit under the condition that calls for MI light up. • An excessively low voltage is sent to ECM through the MI circuit under the condition that calls for MI not to light up.	• Harness or connectors (MI circuit is open or shorted.) • MI



DTC Confirmation Procedure

NOTE:
If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

WITH CONSULT-II

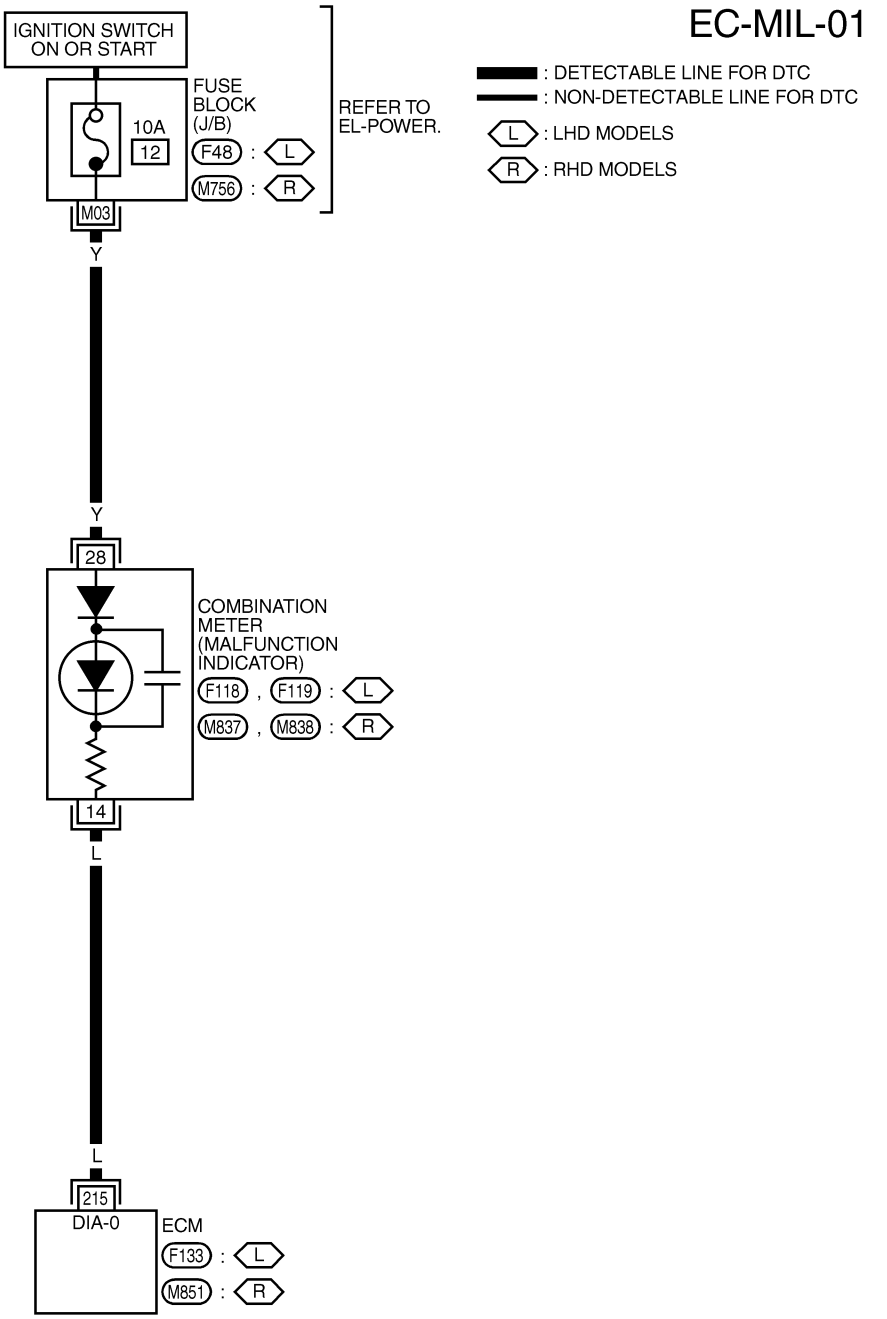
1. Turn ignition switch "ON".
2. Select "DATA MONITOR" mode with CONSULT-II.
3. Start engine and let it idle for 2 second.

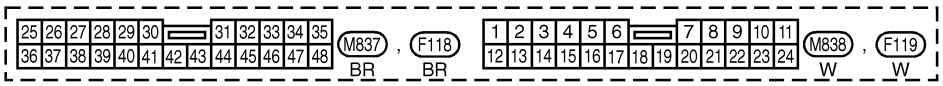
WITHOUT CONSULT-II

1. Turn ignition switch "ON".
2. Perform "Diagnostic Test Mode II" (Self-diagnostic results).
3. Start engine and let it idle for 2 second.
4. Perform "Diagnostic Test Mode II" (Self-diagnostic results).

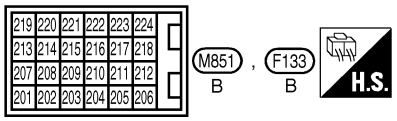
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Wiring Diagram





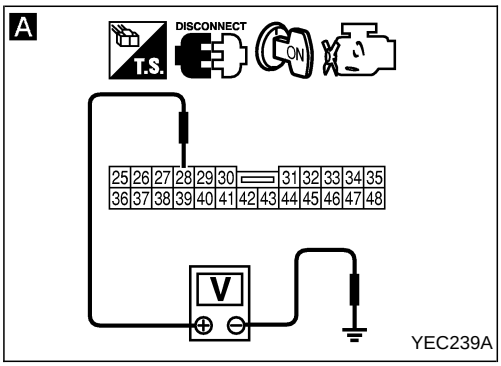
REFER TO THE FOLLOWING.
M756 , F48 -FUSE BLOCK-JUNCTION BOX (J/B)

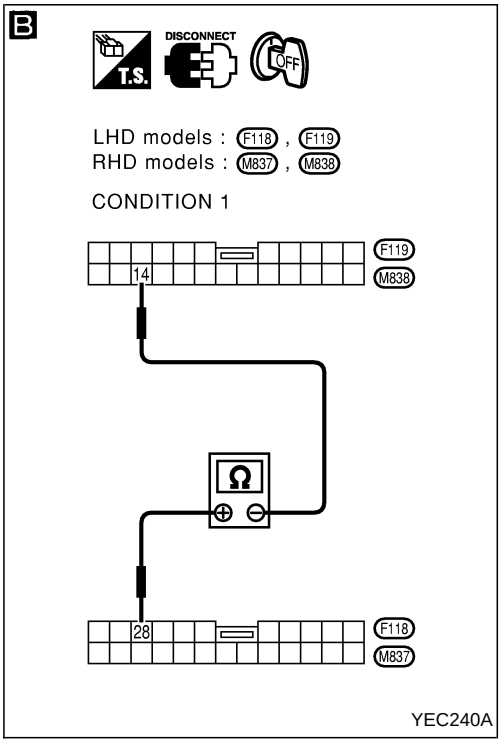


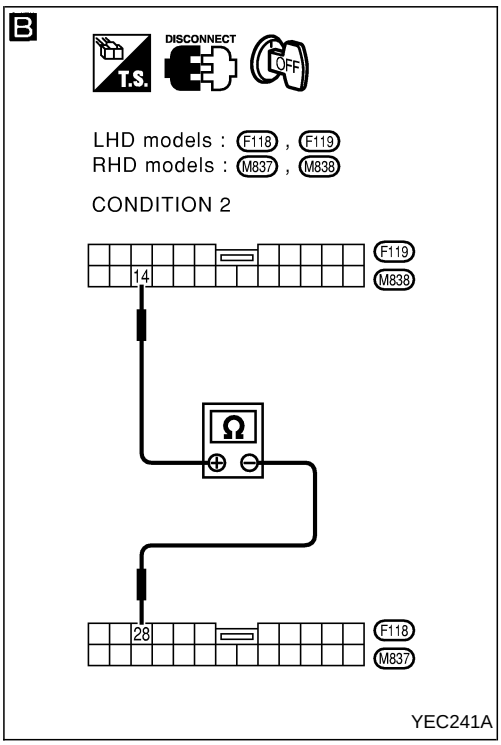
YEC249A

http://vnx.su/

Diagnostic Procedure







INSPECTION START

A

CHECK MI POWER SUPPLY.
1. Turn ignition switch “LOCK”.
2. Disconnect combination meter harness connector.
3. Turn ignition switch “ON”.
4. Check voltage between combination meter terminal (28) and ground with CONSULT-II or tester.

Voltage: Battery voltage

NG → Check the following.
- Fuse block (J/B) connector F48 (LHD models) M756 (RHD models)
- 10A fuse
- Harness for open or short between fuse block (J/B) and combination meter

If NG, repair harness or connectors.

OK ↓

CHECK MI OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT.
1. Turn ignition switch “LOCK”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminals 215 and combination meter terminal (14). Refer to Wiring Diagram.
4. Also check harness for short to ground and short to power.

Continuity should exist.

NG → Repair harness or connectors.

OK ↓

B

CHECK COMBINATION METER.
1. Turn ignition switch “LOCK”.
2. Disconnect combination meter harness connector.
3. Check continuity under the following conditions.

CONDITION	Terminal No. (Polarity)	Continuity
1	(28) (+) - (14) (−)	Should not exist.
2	(28) (−) - (14) (+)	Should exist.

NG → Replace combination meter. Refer to EL section.

OK ↓

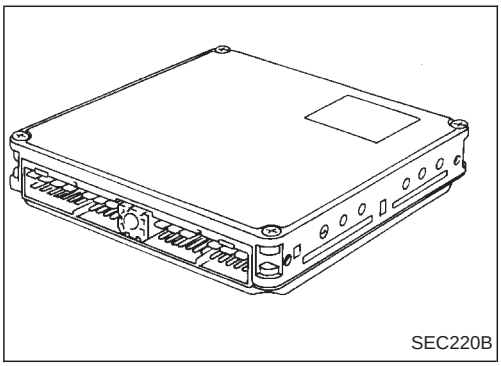
Disconnect and reconnect harness connectors in the circuits. Then retest.

Trouble is not fixed. ↓

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END

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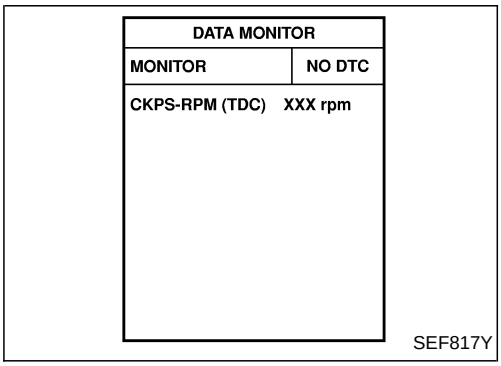

SEC220B

Description

The ECM consists of a microcomputer and connectors for signal input and output and for power supply. The unit controls the engine.

On Board Diagnosis Logic

DTC	Malfunction is detected when ...	Check Items (Possible Cause)
P1107 0802	• An excessively high or low voltage from the absolute pressure sensor (built-into ECM) is sent to ECM.	• ECM



SEF817Y

DTC Confirmation Procedure

WITH CONSULT-II

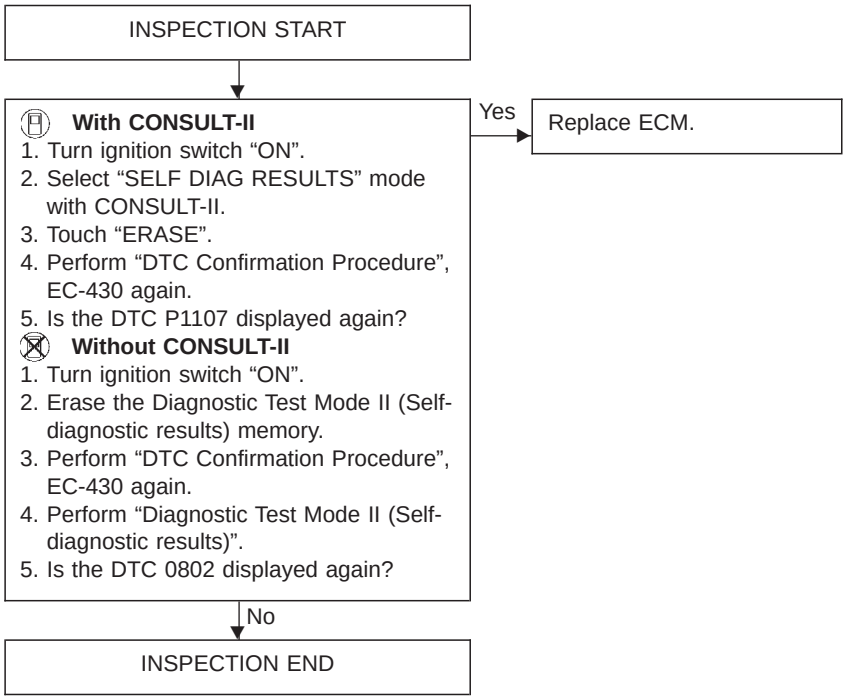
1) Turn ignition switch “ON”.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Start engine and wait at least 2 seconds.

WITHOUT CONSULT-II

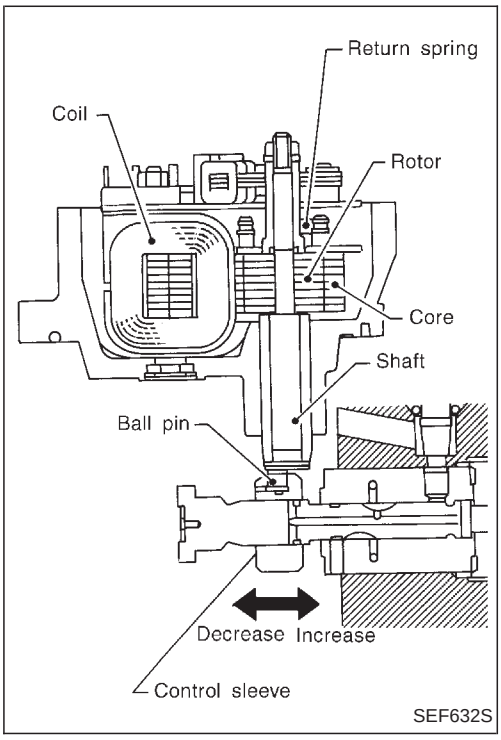
1) Turn ignition switch “ON” and wait at least 2 seconds.
2) Start engine and wait at least 2 seconds.
3) Turn ignition switch “OFF”, wait at least 5 seconds and then turn “ON”.
4) Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.

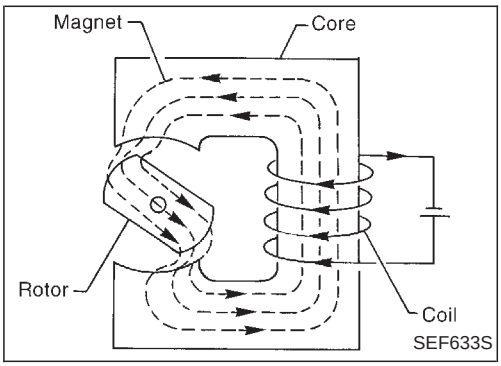
http://vnx.su/

Diagnostic Procedure



http://vnx.su/





Component Description

ELECTRIC GOVERNOR

The electric governor is built into the fuel injection pump. It moves the control sleeve to increase or decrease the amount of fuel injected.
When current flows through the coil, a magnetic force is produced, rotating the rotor. The rotor shaft is installed to the control sleeve via a ball pin which is eccentrically situated in relation to the rotor shaft. With this arrangement, the control sleeve can be moved in relation to rotor rotation.
The rotor's rotating angle is determined by a balanced condition of magnetic force (generated by current flow regulated by means of the ECM) and tension of return spring (installed to rotor). The larger the current flow through the coil, the greater the rotor's rotating angle. This means that the control sleeve moves to the right, increasing the amount of fuel injected.
The ECM regulates the current flow through the coil by changing the duty cycle ratio which controls the ON-OFF operation of the electric governor grounding circuit.

On Board Diagnosis Logic

DTC	Malfunction is detected when	Check Items (Possible cause)
P1206 0108	• Fuel injection feedback system does not operate properly. [This system consists essentially of ECM, electric governor and control sleeve position sensor.]	• Main power supply circuit • Harness or connectors (Electric governor and control sleeve position sensor circuit) • Electric governor • ECM

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DTC Confirmation Procedure

WITH CONSULT-II

1) Turn ignition switch to “ON” position and select “DATA MONITOR” mode with CONSULT-II.
2) Start engine above 1,200 rpm.
3) Run it for 2 seconds above 1,200 rpm. Return engine speed to idle.

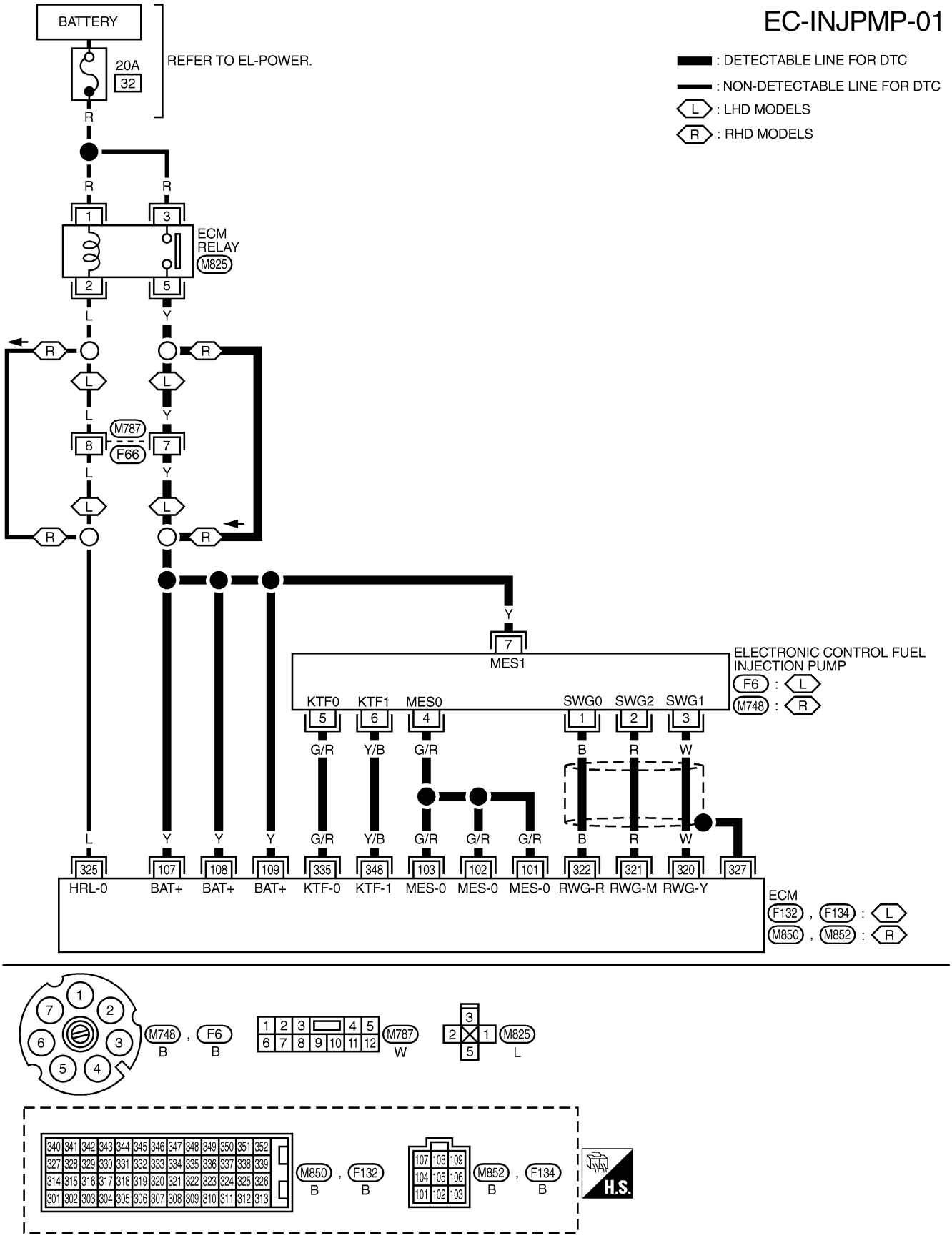
WITHOUT CONSULT-II

1) Start engine above 1,200 rpm.
2) Run engine for 2 seconds above 1,200 rpm. Return engine speed to idle.
3) Turn ignition switch to “LOCK” position, wait at least 5 seconds and then turn to “ON” position.
4) Perform “Diagnostic Test Mode II” (Self-diagnostic results).

NOTE:
If malfunction occurs intermittently, conduct suitable driving pattern for 10 minutes. This makes it possible to determine DTC.

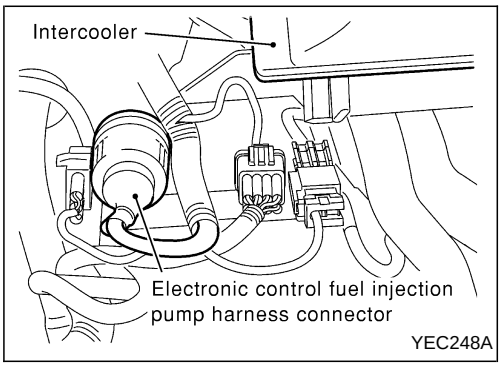
http://vnx.su/

Wiring Diagram



YEC677A

http://vnx.su/



Diagnostic Procedure

INSPECTION START

CHECK MAIN POWER SUPPLY.
Refer to EC-375.

CHECK POWER SUPPLY CIRCUIT.
1. Turn ignition switch to “LOCK” position.
2. Disconnect ECM harness connector and electronic injection pump harness connector.
3. Check harness continuity between injection pump connector terminal ⑦ and ECM connector terminals (107), (108), (109). Refer to wiring diagram.
Continuity should exist.
4. Check harness continuity between injection pump connector terminal ⑦ and ECM relay terminal ⑤.
Refer to wiring diagram.
Continuity should exist.
If OK, check harness for short-circuit.

NG → Check the following.
- Harness connector (M787), (F66) (LHD models)
- Harness for open or short between electronic control injection pump and ECM relay
- Harness for open or short between electronic control injection pump and ECM

If NG, repair harness or connectors.

OK ↓

CHECK GROUND CIRCUIT.
Check harness continuity between injection pump connector terminal ④ and ECM connector terminals (101), (102), (103). Refer to wiring diagram.
Continuity should exist.
If OK, check harness for short-circuit.

NG → Repair harness or connectors.

OK ↓

CHECK COMPONENT
(Electric governor).
Refer to “COMPONENT INSPECTION” on next page.

NG → Have the injection pump assembly serviced by an authorised service representative.

OK ↓

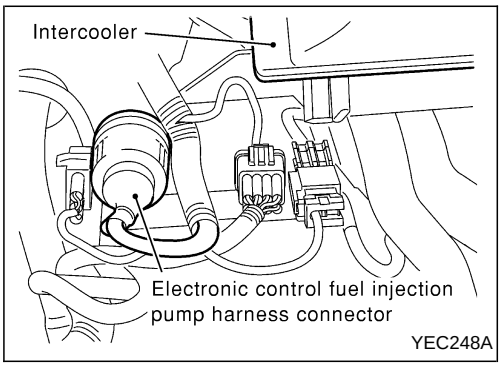
Disconnect and reconnect harness connectors in the circuit. Then retest.

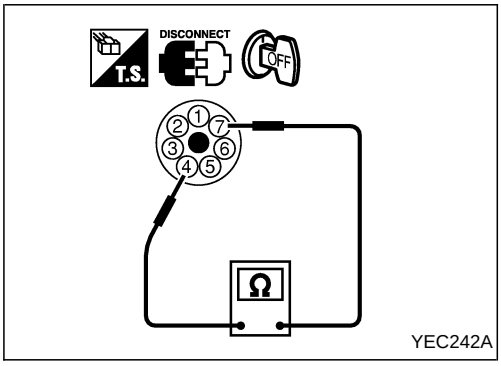
Trouble is not fixed. ↓

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END

http://vnx.su/



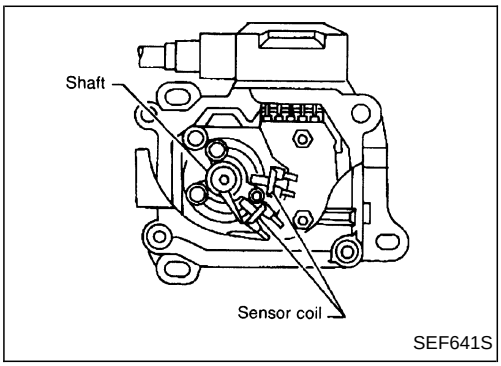


Component Inspection

ELECTRIC GOVERNOR

1. Disconnect electronic injection pump harness connector.
2. Check continuity between injection pump connector terminals ④ and ⑦.
   Resistance: Approximately 1.0Ω [at 25°C (77°F)]
   If NG, replace.

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Component Description

CONTROL SLEEVE POSITION SENSOR (CSPS)

The control sleeve position sensor is installed on the electric governor. It senses the position of control sleeve (rotor angle) while the control sleeve is being driven by the electric governor, and feeds it back to the ECM.

On Board Diagnosis Logic

DTC	Malfunction is detected when	Check Items (Possible cause)
P1207 0105	• An excessively high or low voltage from the sensor is detected by ECM. ..... • An improper voltage signal from the sensor is detected by ECM during engine running.	• Harness or connectors (The control sleeve position sensor circuit is open or short-circuited.) • Control sleeve position sensor

DTC Confirmation Procedure

WITH CONSULT-II

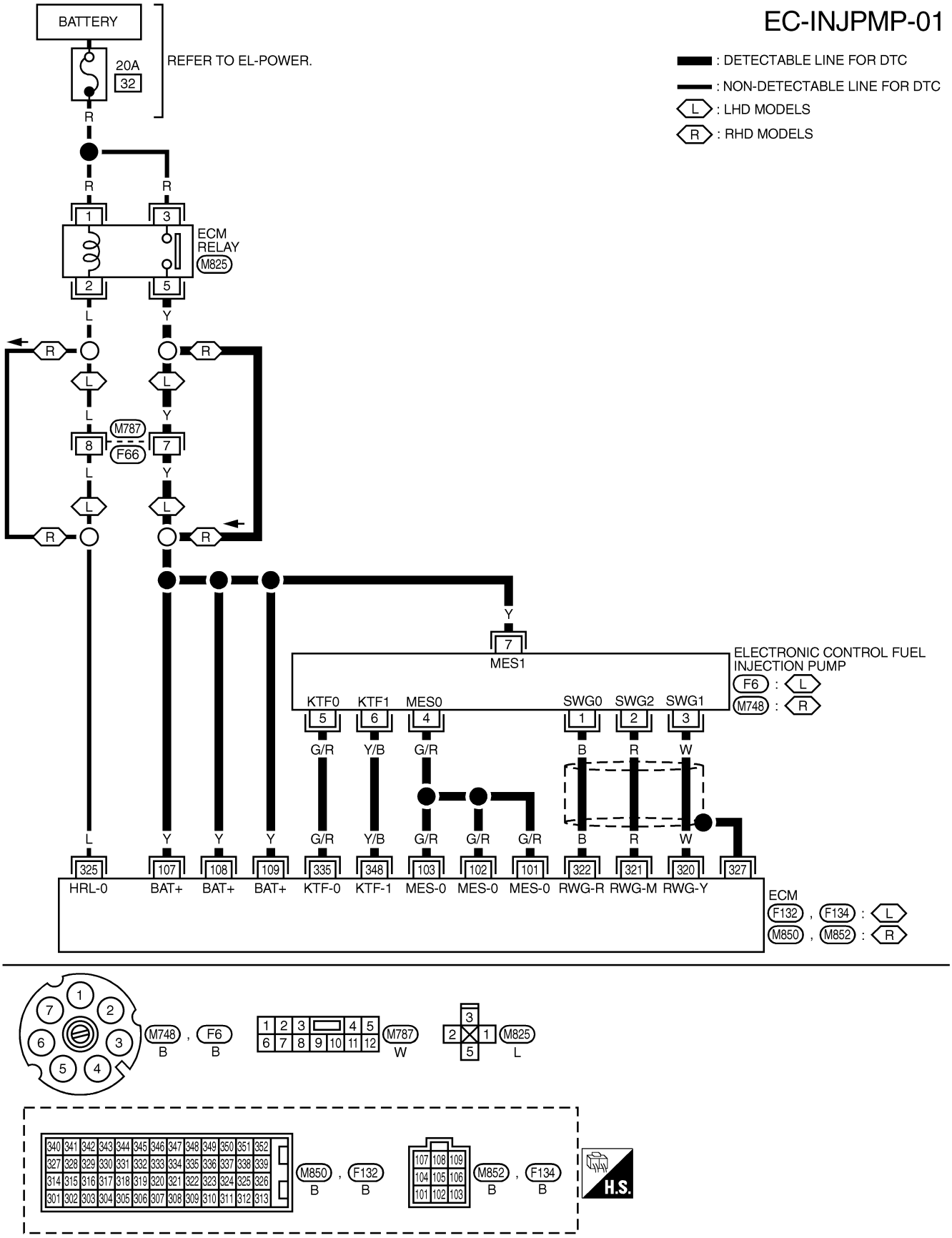
1) Turn ignition switch to “ON” position and select “DATA MONITOR” mode with CONSULT-II.
2) Start engine and run it for at least 2 seconds at idle speed.

WITHOUT CONSULT-II

1) Start engine and run it for at least 2 seconds at idle speed.
2) Turn ignition switch to “LOCK” position, wait at least 5 seconds and then to “ON” position.
3) Perform “Diagnostic Test Mode II (Self-diagnostic results)”.

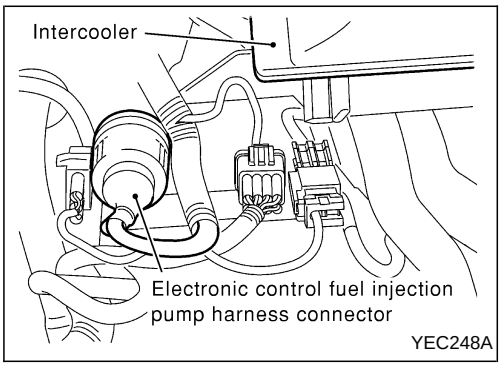
http://vnx.su/

Wiring Diagram



YEC677A

http://vnx.su/



Diagnostic Procedure

INSPECTION START

CHECK POWER SUPPLY CIRCUIT.
1. Turn ignition switch to “LOCK” position.
2. Disconnect ECM harness connector and electrical fuel injection pump harness connector.
3. Check harness continuity between electrical fuel injection pump terminal ② and ECM connector terminals (321). Refer to wiring diagram.
Continuity should exist.
If OK, check harness for short-circuit.

NG → Check the following:
- Harness for open or short-circuit between ECM and control sleeve position sensor.

If NG, repair harness or connectors.

OK

CHECK INPUT SIGNAL CIRCUIT.
1. Turn ignition switch to “LOCK” position.
2. Check harness continuity between control sleeve position sensor connector terminal ③ and ECM connector terminals (320). Refer to wiring diagram.
Continuity should exist.
If OK, check harness for short-circuit.

NG → Check the following:
- Harness for open or short-circuit between ECM and control sleeve position sensor.

If NG, repair harness or connectors.

OK

CHECK GROUND CIRCUIT-I.
Check harness continuity between electrical fuel injection pump connector terminals ① and ECM connector terminals (322). Refer to wiring diagram.
Continuity should exist.
If OK, check harness for short-circuit.

NG → Check the following:
- Harness for open or short-circuit between ECM and control sleeve position sensor.

If NG, repair harness or connectors.

OK

CHECK GROUND CIRCUIT-II.
Check harness continuity between ECM connector terminal (327) and engine ground. Refer to wiring diagram.
Continuity should exist.
If OK, check harness for short-circuit.

NG → Check the following:
- Harness for open or short-circuit.

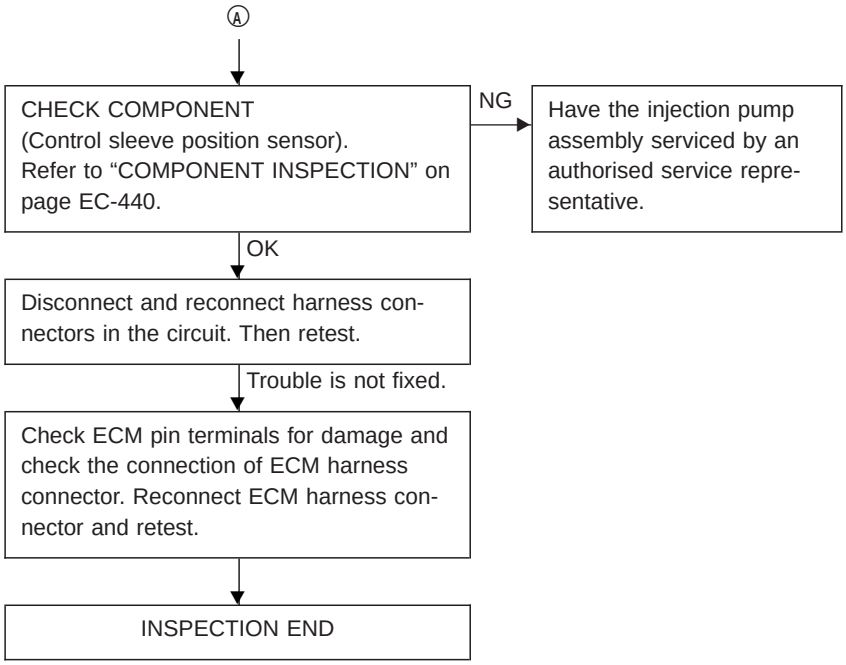
If NG, repair harness or connectors.

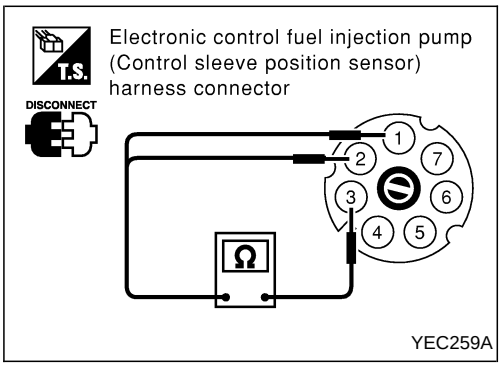
OK

Ⓐ

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Diagnostic Procedure (Cont'd)





Component Inspection

CONTROL SLEEVE POSITION SENSOR

1. Disconnect control sleeve position sensor & electric governor harness connector.
2. Check continuity between terminals ① and ③, ② and ③.
   Resistance: Approximately 6.1Ω [at 25°C (77°F)]
   If NG, take proper action.

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Description

SYSTEM DESCRIPTION

Sensor	Input signal to ECM	ECM function	Actuator
Engine coolant temperature sensor	Engine coolant temperature	Cooling fan control	Cooling fan relay
Air conditioner switch	Air conditioner “ON” signal		

The ECM controls the cooling fan corresponding to the vehicle speed, engine coolant temperature, air conditioner ON signal.

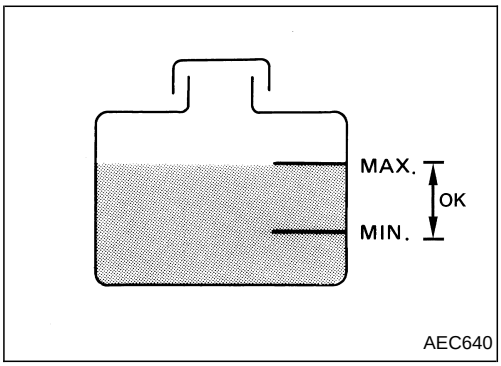
On Board Diagnosis Logic

This diagnosis continuously monitors the engine coolant temperature.
If the cooling fan or another component in the cooling system malfunctions, engine coolant temperature will rise.
When the engine coolant temperature reaches an abnormally high temperature condition, a malfunction is indicated.

DTC	Malfunction is detected when ...	Check Items (Possible Cause)
P1217 0208	• Cooling fan does not operate properly (Overheat). • Cooling fan system does not operate properly (Overheat). • Engine coolant was not added to the system using the proper filling method.	• Harness or connectors (The cooling fan circuit is open or shorted.) • Cooling fan • Radiator hose • Radiator • Radiator cap • Water pump • Thermostat • Engine coolant temperature sensor For more information, refer to “MAIN 12 CAUSES OF OVERHEATING”, EC-448.

CAUTION:
When a malfunction is indicated, be sure to replace the coolant following the procedure in the LC section, “Changing Engine Coolant”. Also, replace the engine oil.
1) Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute. Be sure to use coolant with the proper mixture ratio. Refer to MA section, “Engine Coolant Mixture Ratio”.
2) After refilling coolant, run engine to ensure that no water-flow noise is emitted.

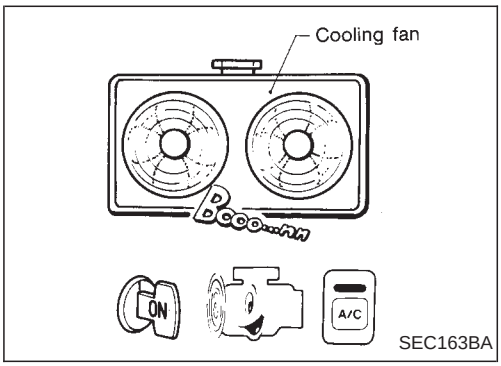
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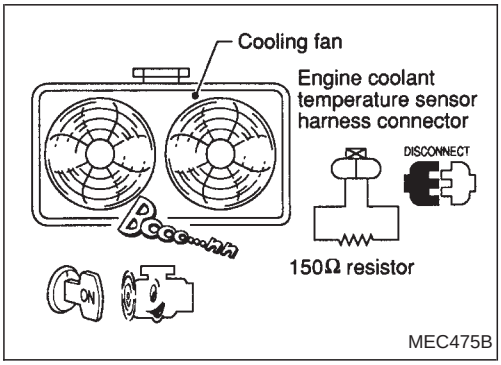
AEC640

ACTIVE TEST	
COOLING FAN	OFF
MONITOR	
COOLAN TEMP/S	XXX °C

SEF111X



SEC163BA



MEC475B

Overall Function Check

Use this procedure to check the overall function of the cooling fan. During this check, a DTC might not be confirmed.

WARNING:

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

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

WITH CONSULT-II

1) Check the coolant level in the reservoir tank and radiator.
   Allow engine to cool before checking coolant level.
   If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to “Diagnostic Procedure”, EC-444.
2) Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to “Diagnostic Procedure”, EC-444.
3) Turn ignition switch “ON”.
4) Perform “COOLING FAN” in “ACTIVE TEST” mode with CONSULT-II and make sure that cooling fans operate.
   If NG, go to “Diagnostic Procedure”, EC-444.

WITHOUT CONSULT-II

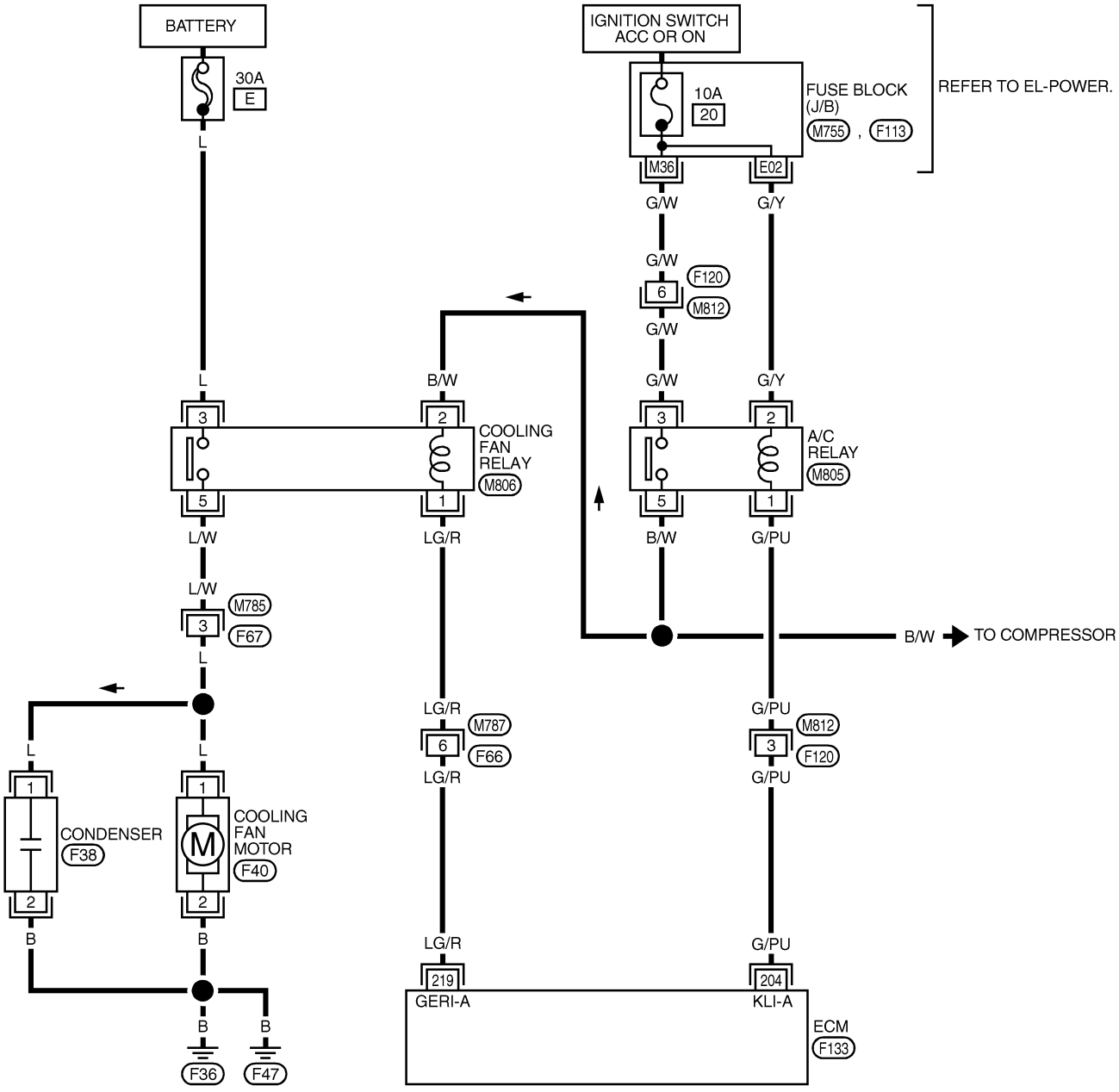
1) Check the coolant level in the reservoir tank and radiator.
   Allow engine to cool before checking coolant level.
   If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to “Diagnostic Procedure”, EC-444.
2) Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to “Diagnostic Procedure”, EC-444.
3) Start engine.
   Be careful not to overheat engine.
4) Set temperature control lever to full cold position.
5) Turn air conditioner switch “ON”.
6) Turn blower fan switch “ON”.
7) Run engine at idle for a few minutes with air conditioner operating.
   Be careful not to overheat engine.
8) Make sure that cooling fans operate at low speed.
9) Turn ignition switch “OFF”.
10) Turn air conditioner switch and blower fan switch “OFF”.
11) Disconnect engine coolant temperature sensor harness connector.
12) Connect 150Ω resistor to engine coolant temperature sensor harness connector.
13) Start engine and make sure that cooling fans operate at higher speed than low speed.
    Be careful not to overheat engine.
14) If NG, go to “Diagnostic Procedure”, EC-444.

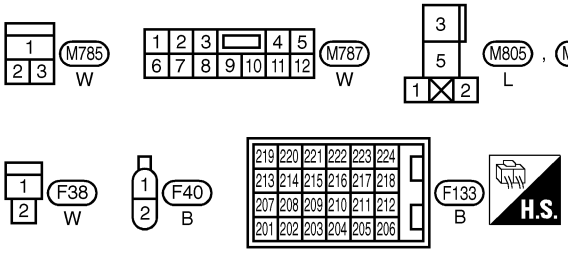
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Wiring Diagram

LHD MODELS

EC-COOL/F-01





REFER TO THE FOLLOWING.
M755 , F113 -FUSE BLOCK-
JUNCTION BOX (J/B)

YEC681A

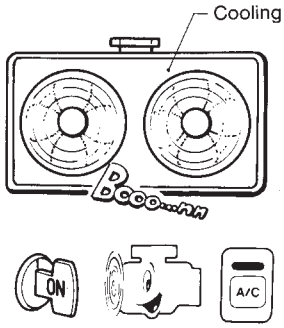
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A

ACTIVE TEST	
COOLING FAN	OFF
MONITOR	
COOLAN TEMP/S	XXX °C

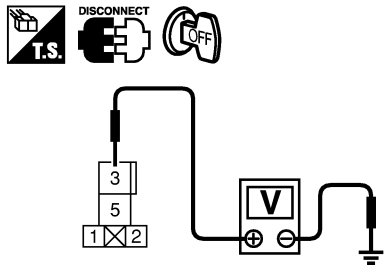
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A



SEC163BA

B



MEC940D

Diagnostic Procedure

INSPECTION START

A

CHECK OVERALL FUNCTION.

With CONSULT-II

1. Turn ignition switch “ON”.
2. Perform “COOLING FAN” in “ACTIVE TEST” mode with CONSULT-II.
3. Make sure that cooling fan operate.

Without CONSULT-II

1. Start engine and let it idle.
2. Set temperature lever at full cold position.
3. Turn air conditioner switch “ON”.
4. Turn blower fan switch “ON”.
5. Make sure that cooling fan operate.

OK → Go to “Ⓒ”, EC-447.

NG ↓

B

CHECK COOLING FAN RELAY POWER SUPPLY CIRCUIT.

1. Turn ignition switch “OFF”.
2. Disconnect cooling fan relay.
3. Check voltage between cooling fan relay terminal ③ and ground with CONSULT-II or tester.

Voltage: Battery voltage

NG → Check the following.
- 30A fuse
- Harness for open or short between cooling fan relay and battery

If NG, repair or replace harness or fuse.

OK ↓

CHECK COOLING FAN MOTOR AND CONDENSER CIRCUIT.

1. Disconnect cooling fan relay harness connector, cooling fan motor harness connector and condenser harness connector.
2. Check continuity as follows. Refer to wiring diagram.

Cooling fan relay terminal ⑤ and cooling fan motor terminal ①	Continuity should exist.
Cooling fan relay terminal ⑤ and condenser terminal ①	

NG → Check the following.
- Harness connectors (M785), (F67)
- Harness for open or short between cooling fan relay and cooling fan motor
- Harness for open or short between cooling fan relay and condenser

If NG, repair harness or connectors.

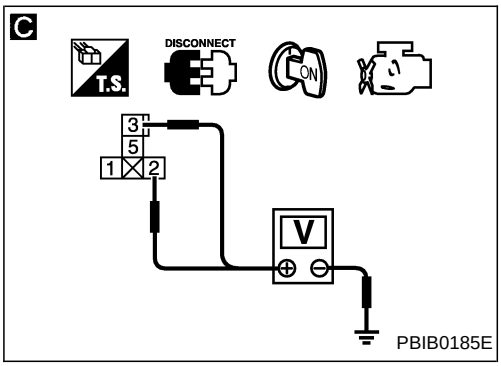
OK ↓

Ⓐ

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Diagnostic Procedure (Cont'd)

C



Ⓐ

CHECK COOLING FAN MOTOR AND CONDENSER GROUND CIRCUIT.
1. Check continuity between cooling fan motor terminal ② and ground. Refer to wiring diagram.
   Continuity should exist.
2. Check continuity between condenser terminal ② and ground. Refer to wiring diagram.
   Continuity should exist.

If OK, reconnect harness connectors.

NG → Repair harness or connectors.

OK ↓

CHECK COMPONENT
(Cooling fan relay).
Refer to "COMPONENT INSPECTION" on page EC-449.

OK ↓

C

CHECK A/C RELAY POWER SUPPLY CIRCUIT.
1. Disconnect A/C relay.
2. Check voltage between A/C relay terminal ② , ③ and ground.
   Voltage: Battery voltage

NG → Check the following.
- Harness connectors F120, M812
- 10A fuse
- Harness for open or short between A/C relay and fuse

If NG, repair or replace harness or fuse.

OK ↓

CHECK A/C RELAY AND COOLING FAN RELAY CIRCUIT.
1. Disconnect A/C relay and cooling fan relay.
2. Check continuity between A/C relay terminal ⑤ and cooling fan relay terminal ② . Refer to wiring diagram.
   Continuity should exist.

NG → Repair harness or connectors.

OK ↓

CHECK ECM INPUT SIGNAL CIRCUIT.
1. Disconnect ECM harness connector.
2. Check continuity as follows. Refer to wiring diagram.

ECM terminal 204 and A/C relay terminal ①	Continuity should exist.
ECM terminal 219 and cooling fan relay terminal ①	

NG → Check the following.
- Harness connectors M812, F120
- Harness connectors M787, F66
- Harness for open or short between A/C relay and ECM
- Harness for open or short between cooling fan relay and ECM

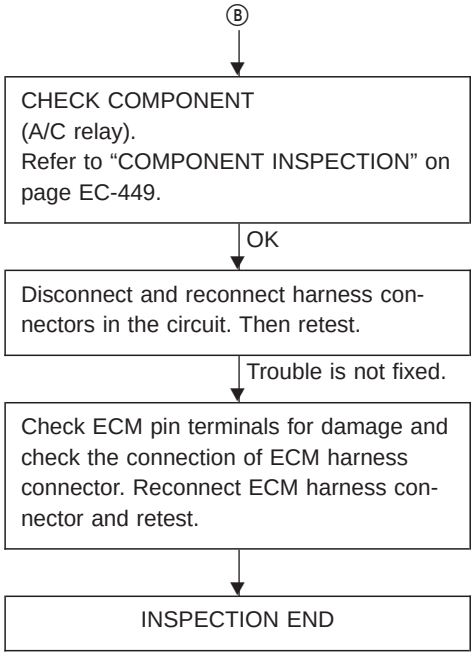
If NG, repair harness or connectors.

OK ↓

Ⓑ

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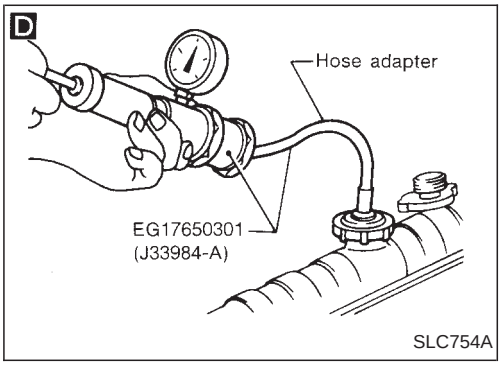
Diagnostic Procedure (Cont'd)



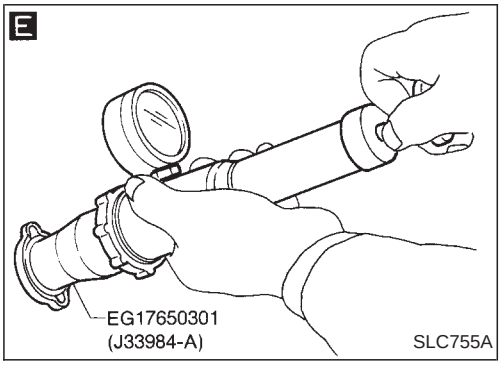
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Diagnostic Procedure (Cont'd)

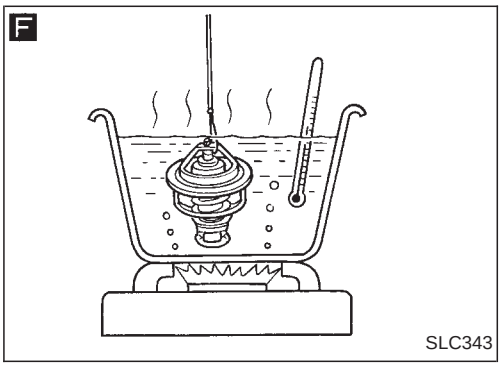
D



E



F



Ⓒ

D

CHECK COOLING SYSTEM FOR LEAK.
Apply pressure to the cooling system with a tester, and check if the pressure drops.
Testing pressure:
157 kPa (1.57 bar, 1.6 kg/cm^2, 23 psi)
Pressure should not drop.
CAUTION:
Higher than the specified pressure may cause radiator damage.

NG → Check the following for leak.
- Hose
- Radiator
- Water pump

Refer to LC section ("Water Pump").

OK ↓

E

CHECK RADIATOR CAP.
Apply pressure to cap with a tester.
Radiator cap relief pressure:
78 - 98 kPa (0.78 - 0.98 bar, 0.8 - 1.0 kg/cm^2, 11 - 14 psi)

NG → Replace radiator cap.

OK ↓

F

CHECK THERMOSTAT.
1. Check valve seating condition at normal room temperatures.
   It should seat tightly.
2. Check valve opening temperature and valve lift.
   Valve opening temperature:
   76.5°C (170°F) [standard]
   Valve lift:
   More than 10 mm/90°C (0.39 in/194°F)
3. Check if valve is closed at 5°C (9°F) below valve opening temperature.

For details, refer to LC section ("Thermostat").

NG → Replace thermostat

OK ↓

Check engine coolant temperature sensor. Refer to "COMPONENT INSPECTION", EC-449.

NG → Replace engine coolant temperature sensor.

OK ↓

If the cause can not be isolated, go to "MAIN 12 CAUSES OF OVERHEATING" on EC-448.

↓

INSPECTION END

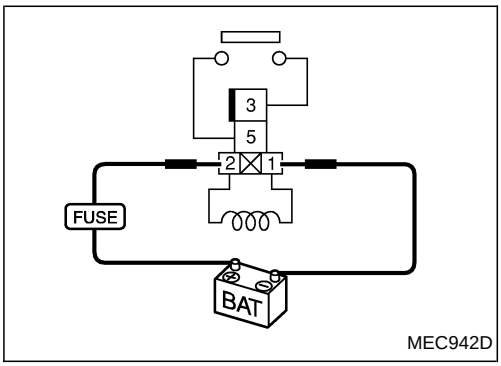
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Main 12 Causes of Overheating

Engine	Step	Inspection item	Equipment	Condition	Reference page
OFF	1	• Blocked radiator • Blocked radiator grille • Blocked bumper	• Visual	No blocking	—
	2	• Coolant mixture	• Coolant tester	50 - 50% coolant mixture	See MA section, “RECOMMENDED FLUIDS AND LUBRICANTS”.
	3	• Coolant level	• Visual	Coolant up to MAX level in reservoir tank and radiator filler neck	See LC section, “Changing Engine Coolant”.
	4	• Radiator cap	• Pressure tester	78 - 98 kPa (0.78 - 0.98 bar, 0.8 - 1.0 kg/cm^2, 11 - 14 psi)	See LC section, “System Check”.
ON*2	5	• Coolant leaks	• Visual	No leaks	See LC section, “System Check”.
ON*2	6	• Thermostat	• Touch the upper and lower radiator hoses	Both hoses should be hot	See LC section, “Thermostat” and “Radiator”.
ON*1	7	• Cooling fan	• CONSULT-II	Operating	See Trouble Diagnosis for DTC P1217, EC-441.
OFF	8	• Combustion gas leak	• Color checker chemical tester 4 Gas analyzer	Negative	—
ON*3	9	• Coolant temperature gauge	• Visual	Gauge less than 3/4 when driving	—
		• Coolant overflow to reservoir tank	• Visual	No overflow during driving and idling	See LC section, “Changing Engine Coolant”.
OFF*4	10	• Coolant return from reservoir tank to radiator	• Visual	Should be initial level in reservoir tank	See LC section, “REFILLING ENGINE COOLANT”.
OFF	11	• Cylinder head	• Straight gauge feeler gauge	0.1 mm (0.004 in) Maximum distortion (warping)	See EM section, “Inspection”.
	12	• Cylinder block and pistons	• Visual	No scuffing on cylinder walls or piston	See EM section, “Inspection”.

*1: Turn the ignition switch ON.
*2: Engine running at 3,000 rpm for 10 minutes.
*3: Drive at 90 km/h (55 MPH) for 30 minutes and then let idle for 10 minutes.
*4: After 60 minutes of cool down time.
For more information, refer to LC section, “OVERHEATING CAUSE ANALYSIS”.

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MEC942D

Component Inspection

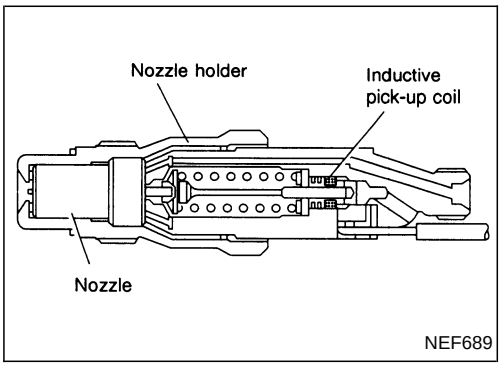
COOLING FAN RELAY AND A/C RELAY

1. Turn ignition switch OFF.
2. Disconnect cooling fan relay and A/C relay.
3. Check continuity between each relay terminal ③ and ⑤ under the following conditions.

Apply 12V direct current between relay terminals ① and ② .	Continuity should exist.
No voltage applied.	Continuity should not exist.

4. If NG, replace cooling fan relay or/and A/C relay(s).

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Component Description

NEEDLE LIFT SENSOR (NLS)

The needle lift sensor is built into the No. 1 nozzle. Its inductive pickup element senses fuel injection timing. It is sent as a pulse signal to the ECM for feed-back the actual fuel injection timing and calculating the secondary engine speed.

On Board Diagnosis Logic

DTC	Malfunction is detected when	Check Items (Possible Cause)
P1240 0304	• An incorrect signal from the sensor is sent to ECM.	• Harness or connectors (The sensor circuit is open or short-circuited.) • Needle lift sensor
P1242 0906		

DTC Confirmation Procedure

NOTE:
Before DTC confirmation, be sure to check battery voltage is above 9V.

WITH CONSULT-II

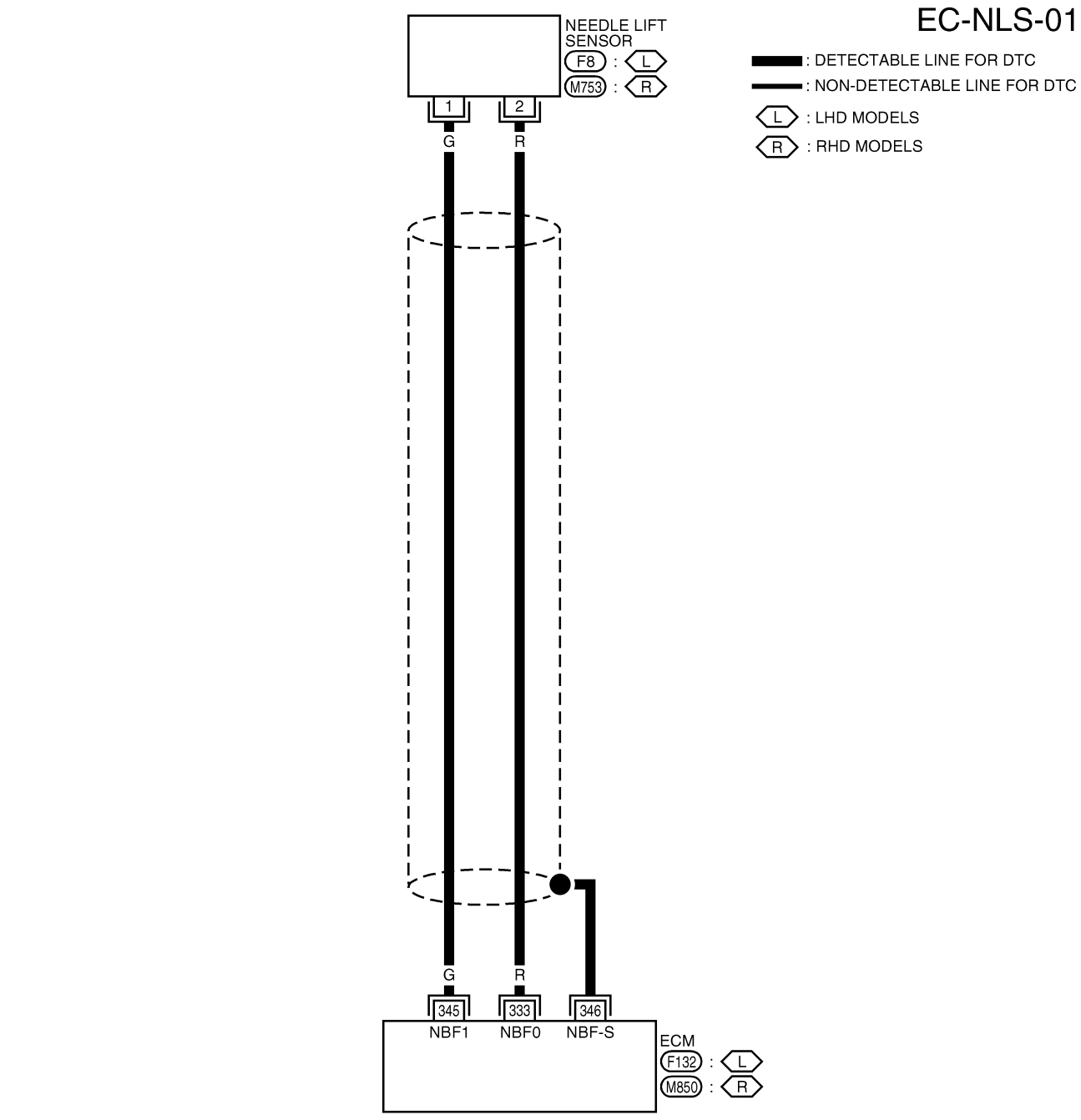
1) Turn ignition switch to “ON” position and select “DATA MONITOR” mode with CONSULT-II.
2) Start engine.
3) Run it for 2 seconds at above 1,200 rpm.

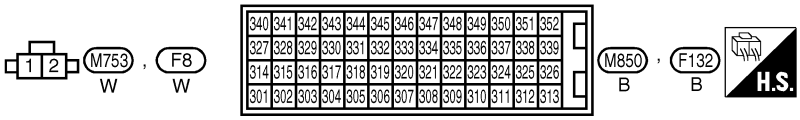
WITHOUT CONSULT-II

1) Start engine.
2) Run it for 2 seconds at above 1,200 rpm.
3) Turn ignition switch to “LOCK” position, wait at least 5 seconds and then turn to “ON” position.
4) Perform “Diagnostic Test Mode II” (Self-diagnostic results).

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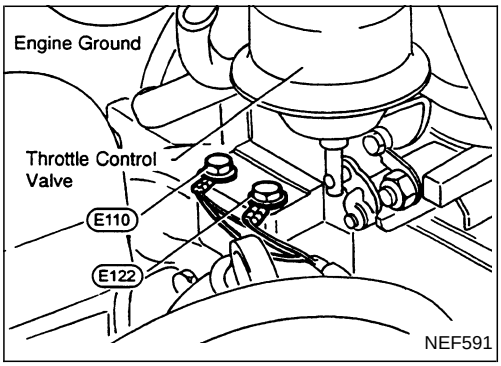
Wiring Diagram

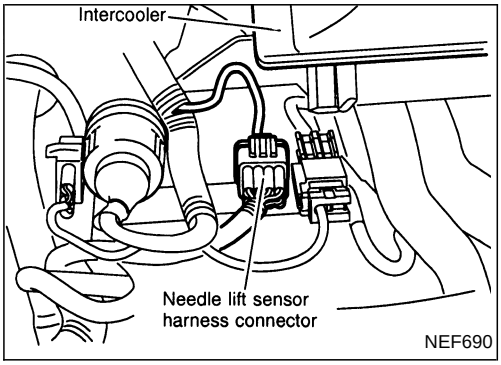


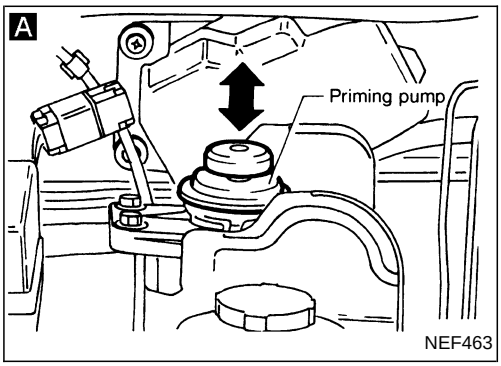


YEC682A

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Diagnostic Procedure

INSPECTION START

A

CHECK FOR AIR IN FUEL FILTER.
1. Move priming pump up and down to purge air from fuel filter.
2. Perform “DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE”.

CHECK INPUT SIGNAL CIRCUIT.
1. Turn ignition switch to “LOCK” position.
2. Disconnect ECM harness connector and needle lift sensor harness connector.
3. Check harness continuity between needle lift sensor connector terminal ① and ECM connector terminal (345). Refer to wiring diagram.
Continuity should exist.
If OK, check harness for short-circuit.

NG → Check the following:
- Harness for open circuit between needle lift sensor and ECM

If NG, repair harness or connectors.

OK

CHECK GROUND CIRCUIT-I.
Check harness continuity between needle lift sensor connector terminals ② and ECM connector terminals (333). Refer to wiring diagram.
Continuity should exist.
If OK, check harness for short-circuit.

NG → Check the following:
- Harness for open or short-circuit between ECM and needle lift sensor.

If NG, repair harness or connectors.

OK

CHECK GROUND CIRCUIT-II.
Check resistance between ECM connector terminal (346) and engine ground. Refer to wiring diagram.
Continuity should exist.
If OK, check harness for short-circuit.

NG → Check the following:
- Harness for open-circuit between ECM and engine ground

If NG, repair harness or connectors.

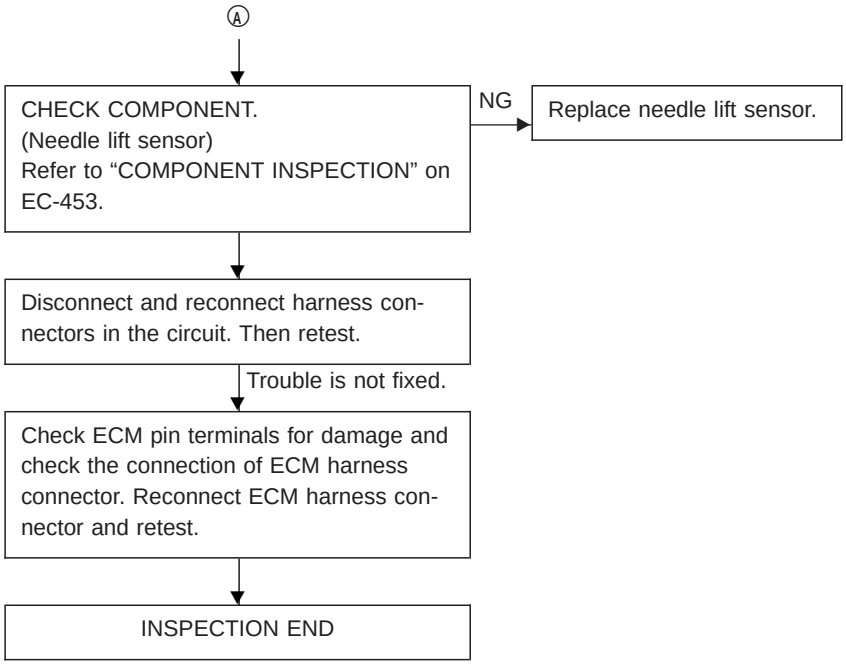
OK

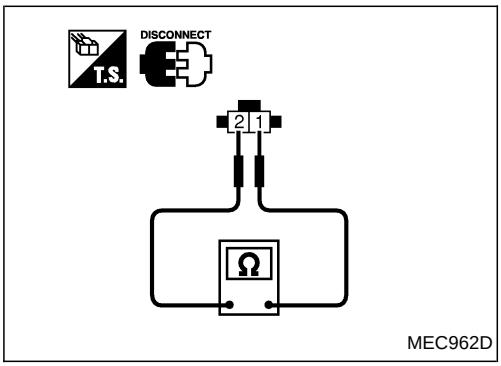
CHECK NO. 1 INJECTION NOZZLE FOR CLOGGING.
Refer to spray pattern test of “INJECTION NOZZLE”.
If NG, replace No. 1 injection nozzle.

Ⓐ

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Diagnostic Procedure (Cont'd)





Component Inspection

NEEDLE LIFT SENSOR

1. Disconnect needle lift sensor harness connector.
2. Check continuity between needle lift sensor terminals ① and ② .

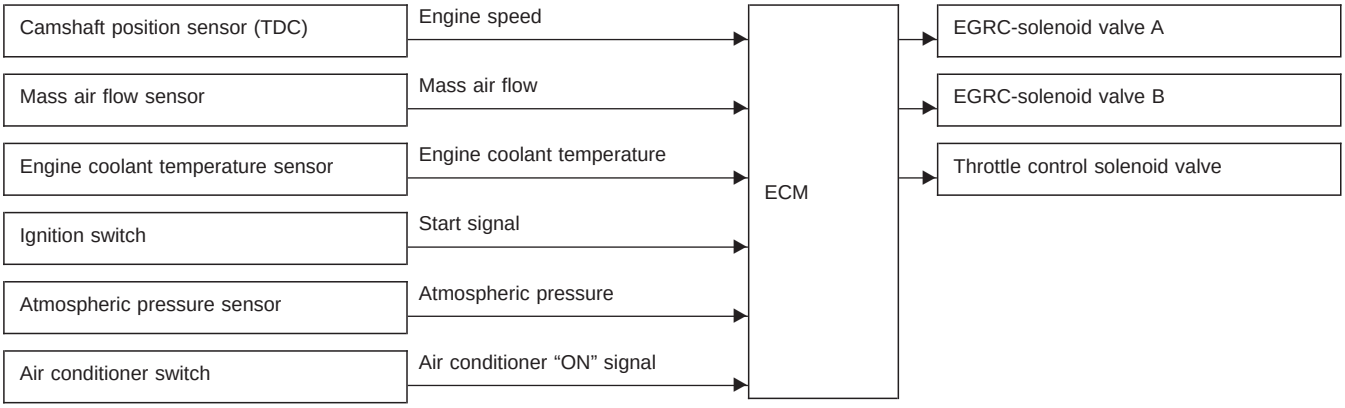
   Resistance: Approximately 105Ω [at 25°C (77°F)]

   If NG, replace needle lift sensor with injection nozzle holder.

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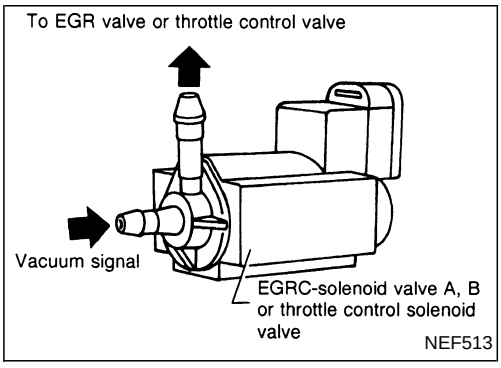
System Description

EGR CONTROL



The ECM receives signals sent from the engine coolant temperature sensor, crankshaft position sensor (TDC), ignition switch etc. to determine engine speed and operating conditions. Based on these signals, the ECM controls EGRC-solenoid valve (A and B) operation and throttle solenoid valve operation.
The EGR control stops when engine coolant temperature is below 45°C (113°F), at idling, at starting and when the system components and engine speed signals are disordered.

Engine coolant temperature °C (°F)	Load	EGRC-solenoid valve		Throttle control solenoid valve	EGR valve	Throttle control valve	Amount of EGR gas
		A	B				
Below 45 (113)	Any	OFF (Closed)	OFF (Closed)	OFF (Closed)	Fully closed	Fully open	—
Above 45 (113)	Low load	ON (Open)	ON (Open)	ON (Open)	Fully open	Closed	Large
	Medium load-1	ON (Open)	ON (Open)	OFF (Closed)	Fully open	Fully open	Medium
	Medium load-2	ON (Open)	OFF (Closed)	OFF (Closed)	Half open	Fully open	Small
	High load	OFF (Closed)	OFF (Closed)	OFF (Closed)	Fully closed	Fully open	—



Component Description

The EGRC-solenoid valves A and B, control vacuum pressure acting on the EGR valve. The EGR control valve will be fully opened, half-opened or fully closed, as required.
The throttle control solenoid valve controls vacuum pressure acting on the throttle control valve. Thus, intake air passages are opened or closed in relation to exhaust gas and intake air. Utilizing the relationship between exhaust gas pressure and intake air pressure control, the amount of EGR (exhaust gas recirculated) is regulated in three approximate measures — large, medium, small.

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On Board Diagnosis Logic

DTC	Malfunction is detected when	Check Items (Possible cause)
P1404 0806	• EGRC-solenoid valve A circuit is open or shorted.	• Harness or connectors (EGRC-solenoid valve A circuit is open or shorted.) • EGRC-solenoid valve A
P1405 0808	• EGRC-solenoid valve B circuit is open or shorted.	• Harness or connectors (EGRC-solenoid valve B circuit is open or shorted.) • EGRC-solenoid valve B
P1407 0808	• Throttle control solenoid valve circuit is open or shorted.	• Harness or connectors (Throttle control solenoid valve circuit is open or shorted.) • Throttle control solenoid valve

DTC Confirmation Procedure

WITH CONSULT-II

1) Turn ignition switch to “ON” position.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Wait at least 2 seconds.

WITHOUT CONSULT-II

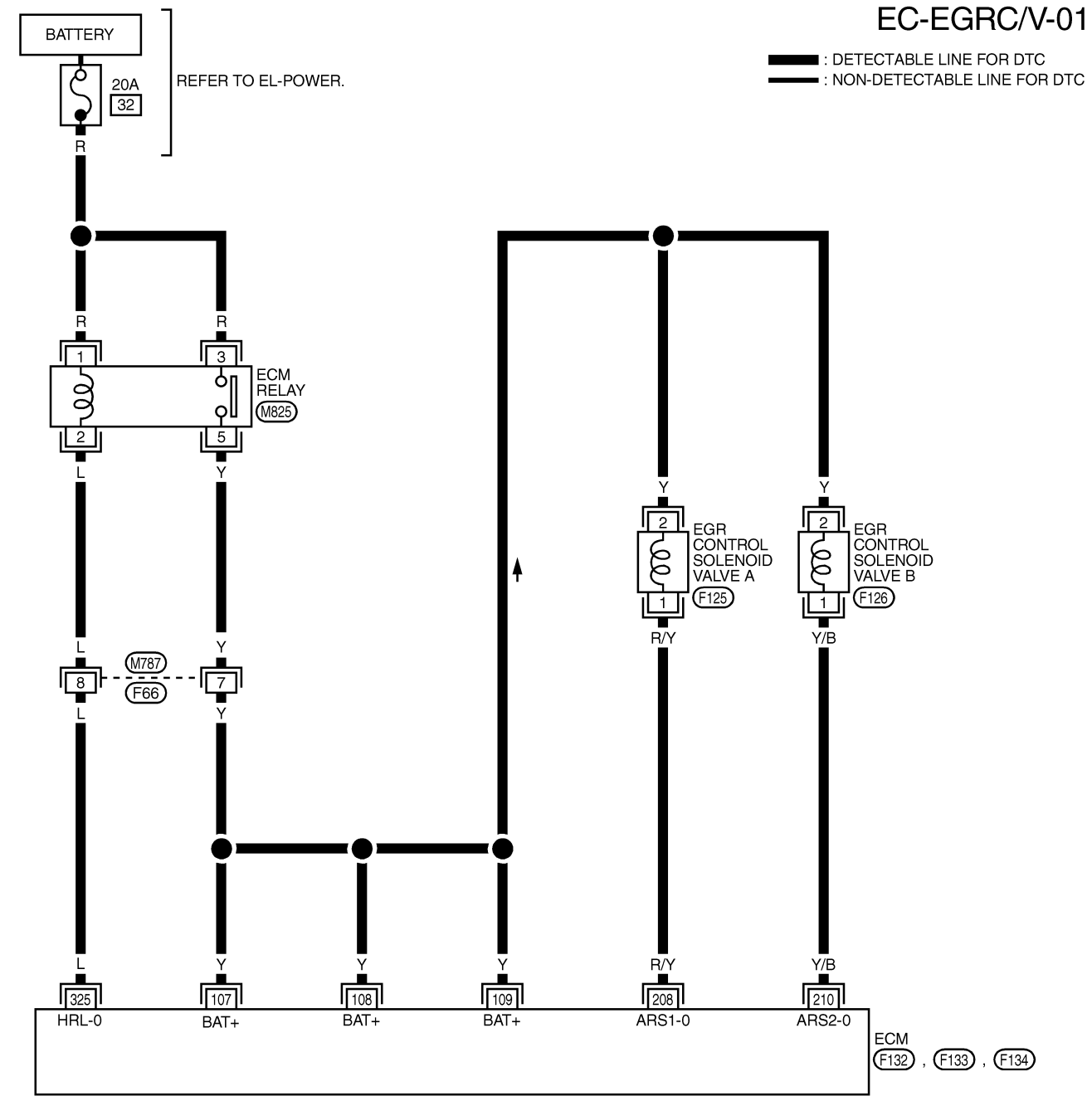
1) Turn ignition switch to “ON” position and wait at least 2 seconds.
2) Turn ignition switch to “LOCK” position, wait at least 5 seconds and then turn to “ON” position.
3) Perform “Diagnostic Test Mode II” (Self-diagnostic results).

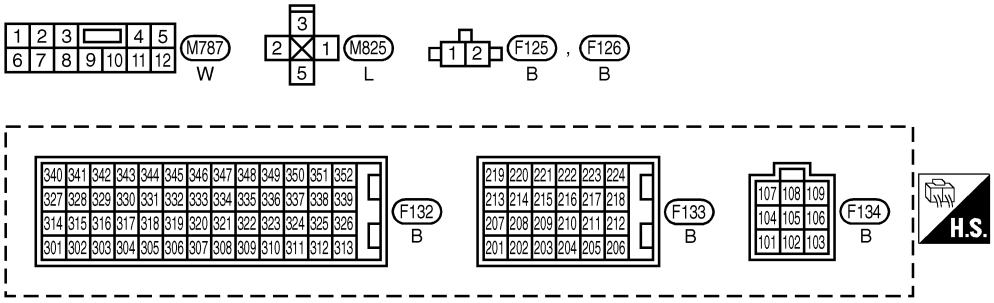
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Wiring Diagram

LHD MODELS

EGR control solenoid valve A and B





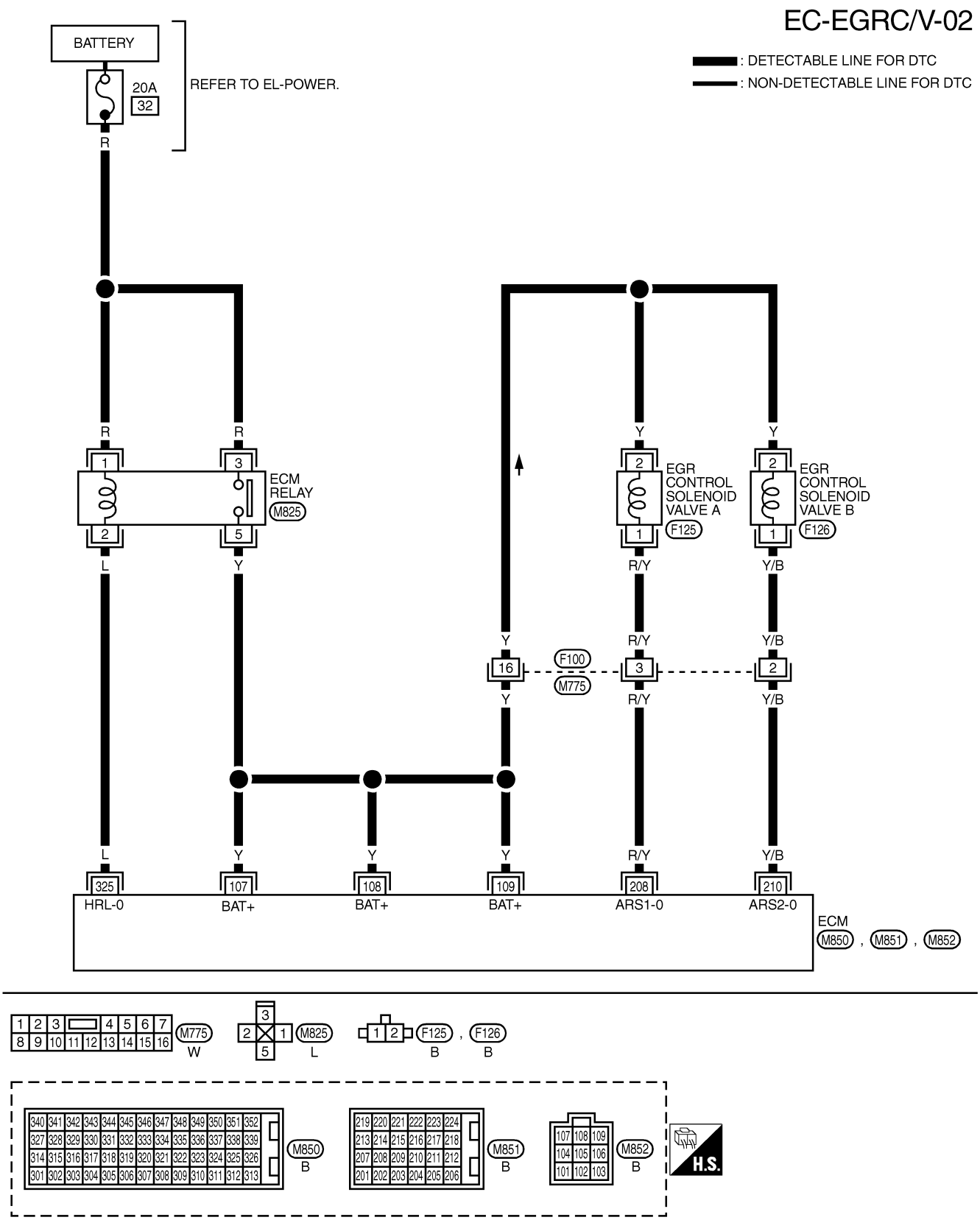
YEC683A

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Wiring Diagram (Cont'd)

RHD MODELS

EGR control solenoid valve A and B

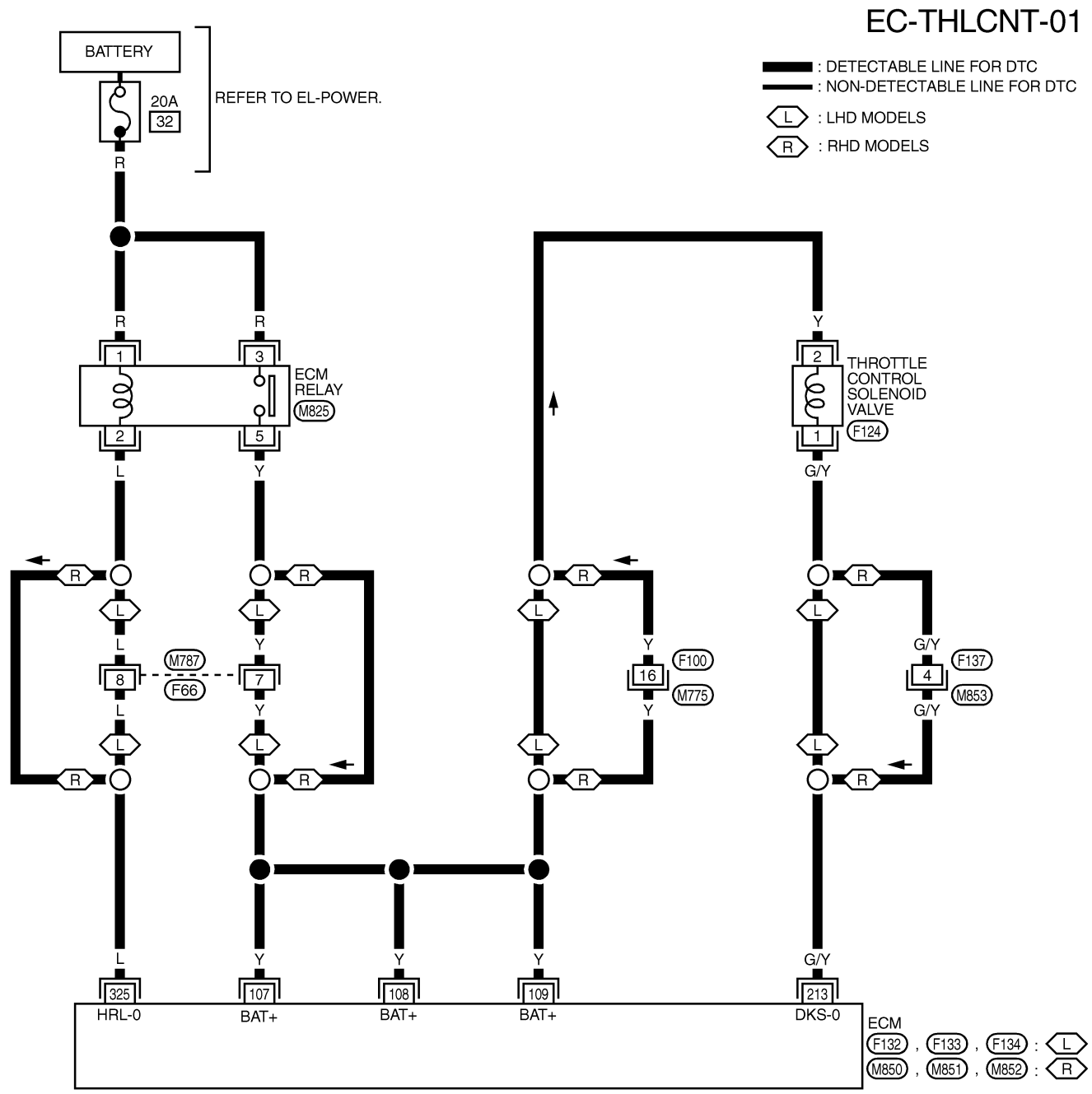


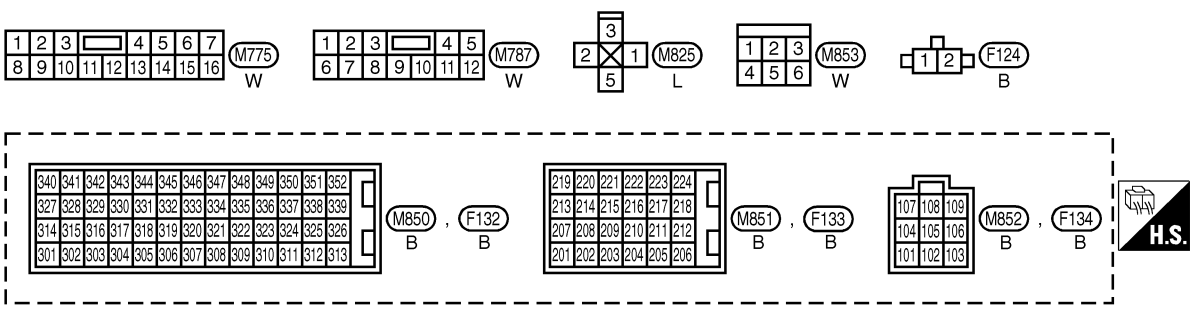
YEC684A

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Wiring Diagram (Cont'd)

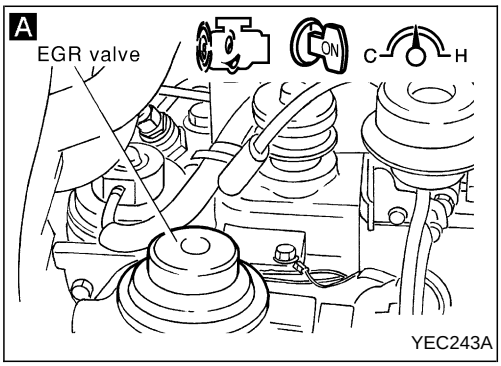
Throttle control solenoid valve

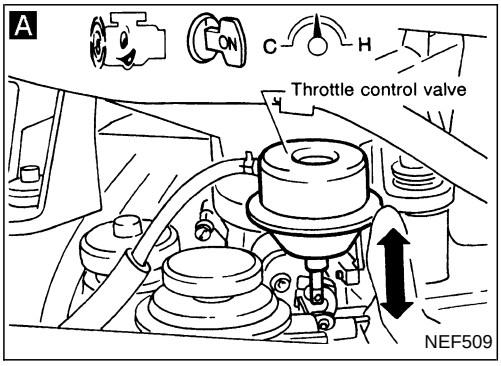


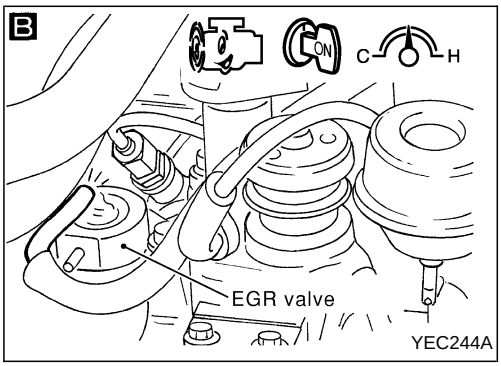


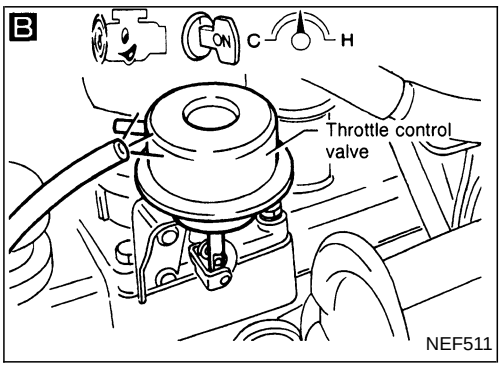
YEC685A

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Diagnostic Procedure

EGR CONTROL

INSPECTION START

A

CHECK OVERALL FUNCTION.
1. Start engine and warm it up sufficiently.
2. Perform diagnostic test mode II (Self-diagnostic results).
   Make sure that diagnostic trouble code P0000 (0505) is displayed.
3. Make sure that EGR valve spring moves up and down (Use your finger) under the following conditions.
   At idle:
   Spring does not move.
   Racing engine from idle to 3,000 rpm:
   Spring moves up and down.
4. Make sure that throttle control valve rod moves up and down under the following conditions.
   At idle:
   Rod does not move.
   Racing engine from idle to 3,000 rpm:
   Rod moves up and down.

OK → INSPECTION END

NG

B

CHECK VACUUM SOURCES TO EGR VALVE AND THROTTLE CONTROL VALVE.
1. Disconnect vacuum hoses to EGR valve and throttle control valve.
2. Make sure that vacuum exists under the following conditions.
   At idle:
   Vacuum should exist.
   Racing engine from idle to 3,000 rpm:
   Vacuum should not exist.

OK → CHECK COMPONENTS (EGR valve and throttle control valve). (See page EC-462.)

NG → Replace malfunctioning component(s).

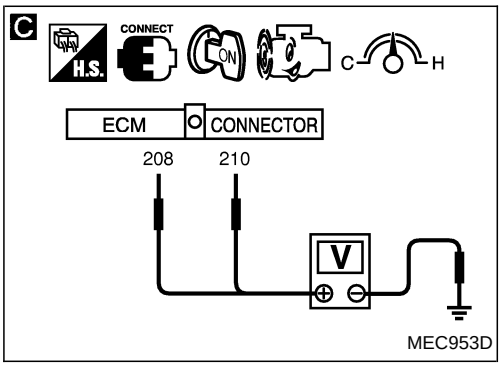
NG

Ⓐ

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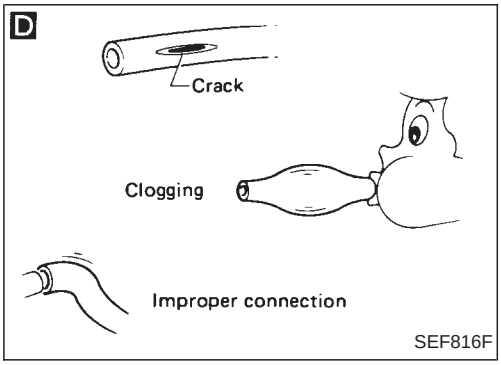
Diagnostic Procedure (Cont'd)

C



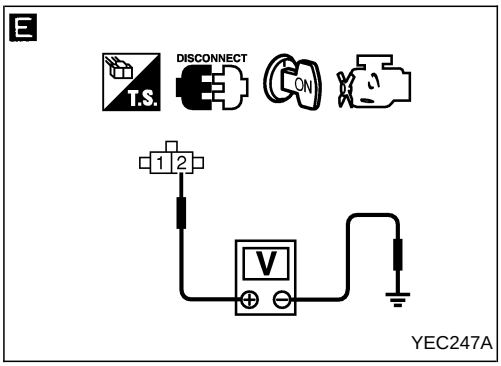
MEC953D

D



SEF816F

E



YEC247A

Ⓐ

C

CHECK CONTROL FUNCTION.

With CONSULT-II

1. Turn ignition switch to "ON" position.
2. Turn EGRC-solenoid valve A, B and throttle control solenoid valve to "ON" and to "OFF" in "ACTIVE TEST" mode with CONSULT and check operating sound.

Without CONSULT-II

1. Check voltage between ECM connector terminals (208), (210) and engine ground with tester under the following conditions.

Voltage:

At idle:

Approximately 0.4V

Engine speed is more than 3,000 rpm:

Battery voltage

2. Check voltage between ECM connector terminal ① and engine ground with tester under the following conditions.

Voltage:

At idle:

Approximately 0.4V

Engine speed is more than 2,400 rpm:

Battery voltage

OK → D

CHECK VACUUM HOSE.

Check vacuum hose for clogging, cracks or improper connection.

NG ↓

E

CHECK POWER SUPPLY-I.

1. Turn ignition switch to "LOCK" position.
2. Disconnect EGRC-solenoid valve A and B harness connector.
3. Turn ignition switch to "ON" position.
4. Check voltage between EGRC-solenoid valve A and B terminals ② and engine ground with CONSULT-II or tester.

Voltage: Battery voltage

NG →

Check the following:

- 20A fuse
- Condition and operation of ignition switch
- Harness connectors (M787), (F66) (LHD models)
- Harness connectors (F100), (M775) (RHD models)
- ECM relay
- Harness for open or short-circuit between EGRC-solenoid valve A, B and fuse.

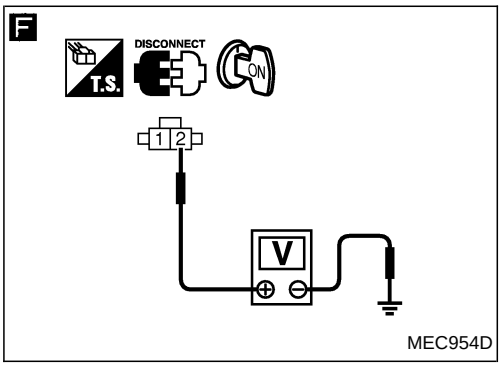
If NG, replace fuse or repair ignition switch, harness or connectors.

OK ↓

Ⓑ

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Diagnostic Procedure (Cont'd)



Ⓑ

F

CHECK POWER SUPPLY-II.
1. Turn ignition switch "OFF".
2. Disconnect throttle control solenoid valve harness connector.
3. Turn ignition switch "ON".
4. Check voltage between throttle solenoid valve connector terminal ② and engine ground with CONSULT-II or tester.
   Voltage: Battery voltage

NG → Check the following.
- 20A fuse
- ECM relay
- Harness connectors (M787), (F66) (LHD models)
- Harness connectors (F100), (M77) (RHD models)
- Harness for open or short circuit between throttle control solenoid valve and ECM relay.

If NG, repair or replace harness or connectors.

OK ↓

CHECK OUTPUT SIGNAL CIRCUIT-I.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM connector terminal (208) and EGR Control Solenoid Valve A connector terminal ①; ECM connector terminal (210) and EGR Control Solenoid Valve B connector terminal ①. Refer to wiring diagram.
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Check the following:
- Harness connectors (F100), (M775) (RHD models)
- Harness for open or short-circuit between EGRC-solenoid valve A, B and ECM

If NG, repair harness or connectors.

OK ↓

CHECK OUTPUT SIGNAL CIRCUIT-II.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM connector terminal (213) and throttle control solenoid valve terminal ①. Refer to wiring diagram.
   Continuity should exist.
   If OK, check harness for short circuit.

NG → Check the following:
- Harness connectors (F137), (M853) (RHD models)
- Harness for open or short circuit between throttle control solenoid valve and ECM

If NG, repair harness or connectors.

OK ↓

CHECK COMPONENTS
(EGRC-solenoid valve A and B).
(Throttle control valve)
Refer to EC-462.

NG → Replace malfunctioning component(s).

OK ↓

Disconnect and reconnect harness connectors in the circuit. Then retest.

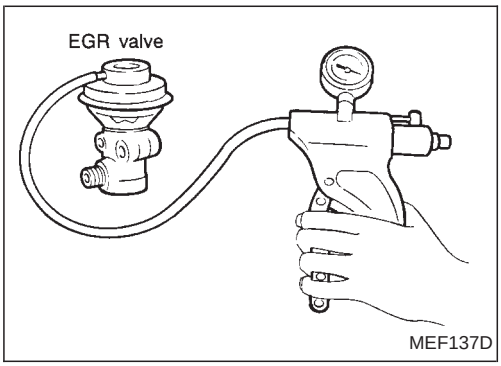
Trouble is not fixed. ↓

Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

INSPECTION END

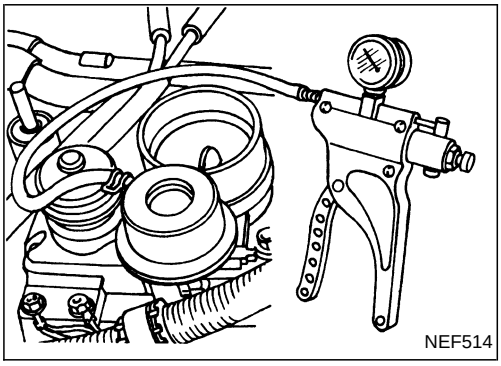
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Component Inspection

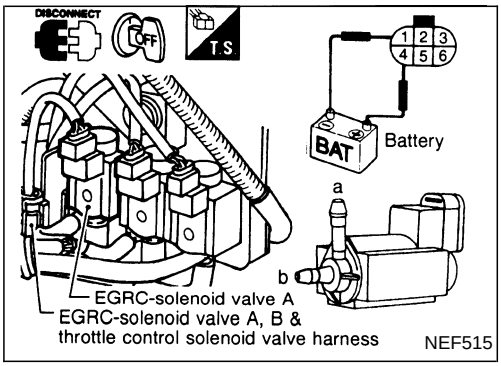
EGR VALVE

Apply vacuum to EGR vacuum port with a hand vacuum pump.
EGR valve diaphragm should lift.
If NG, replace EGR valve.



THROTTLE CONTROL VALVE

Apply vacuum to throttle control valve vacuum port with a hand vacuum pump.
Throttle control valve should close.
If NG, replace throttle control valve.

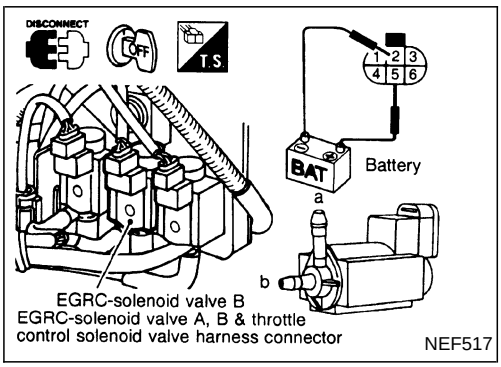


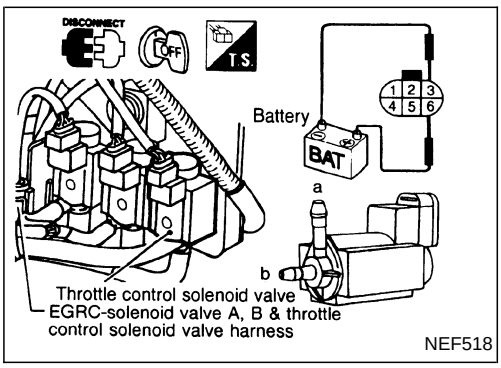
EGRC-SOLENOID VALVE A, B AND THROTTLE CONTROL SOLENOID VALVE

Check air passage continuity.

Component	Applied voltage	Air passage continuity between ports Ⓐ and Ⓑ
EGRC-solenoid valve A	12V dc between terminals ① & ④	YES
	No supply	NO
EGRC-solenoid valve B	12V dc between terminals ② & ⑤	YES
	No supply	NO
Throttle control solenoid valve A	12V dc between terminals ③ & ⑥	YES
	No supply	NO

If NG, replace EGRC-solenoid valve A, B and throttle control solenoid valve.





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Component Description

AIR CONDITIONER CUT CONTROL

Air conditioner is cut under the following conditions:

- Starting engine
- Quick acceleration from low speed
- Undershooting of idle speed
- High engine coolant temperature [above 107°C (225°F)]
- Malfunctioning of engine speed sensor, accelerator position sensor or vehicle speed sensor when engine speed is below 2,100 rpm.

On Board Diagnosis Logic

DTC	Malfunction is detected when	Check Items (Possible cause)
P1530 0805	• Air conditioner relay signal circuit is shorted.	• Harness or connectors (The air conditioner relay signal circuit is shorted.) • Air conditioner relay

DTC Confirmation Procedure

WITH CONSULT-II

1) Turn ignition switch and air conditioner switch to “ON” position.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Wait at least 2 seconds.

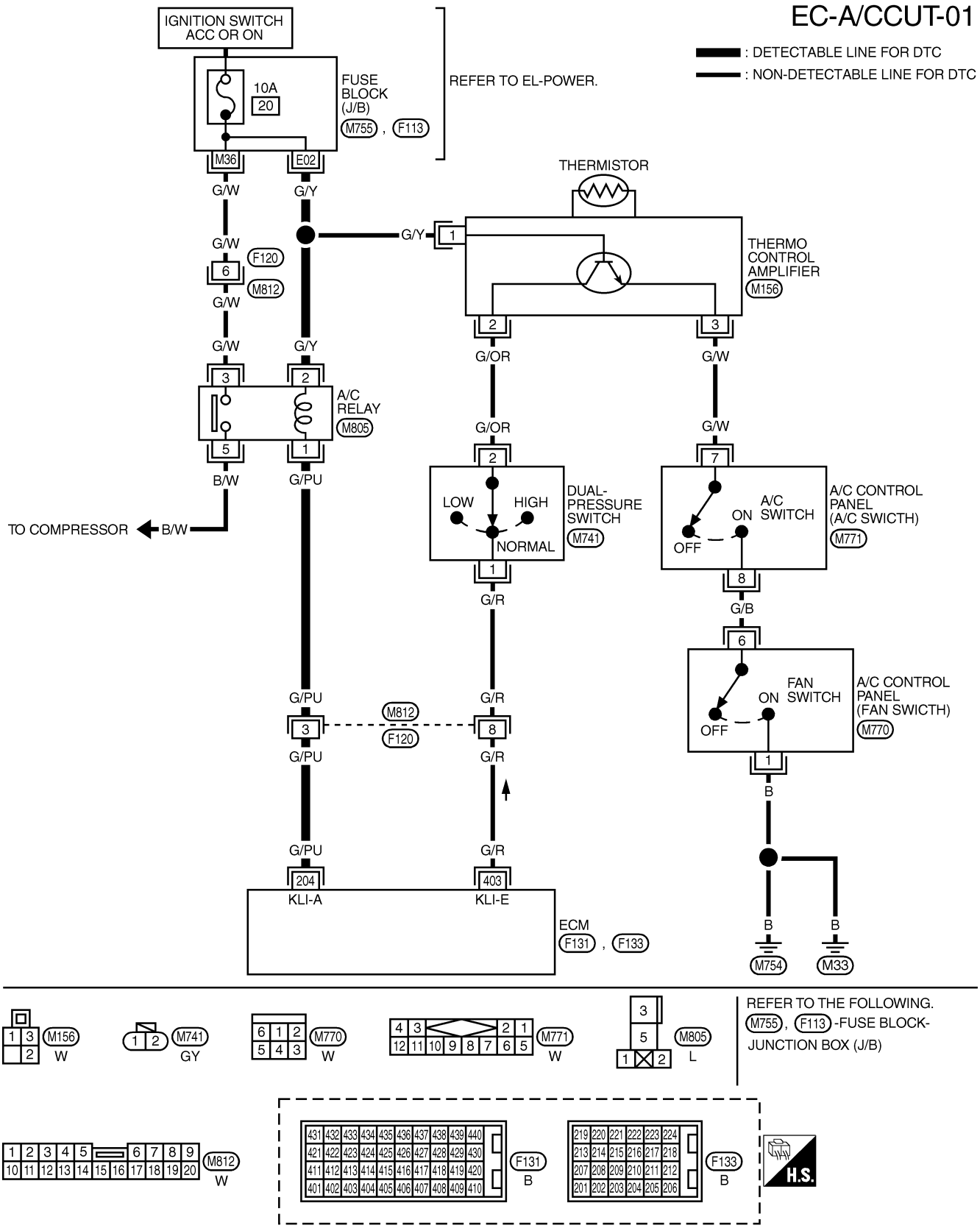
WITHOUT CONSULT-II

1) Turn ignition switch and air conditioner switch to “ON” position. Wait at least 2 seconds.
2) Turn ignition switch to “LOCK” position, wait at least 5 seconds and then turn to “ON” position.
3) Perform “Diagnostic Test Mode II” (Self-diagnostic results).

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Wiring Diagram

LHD MODELS

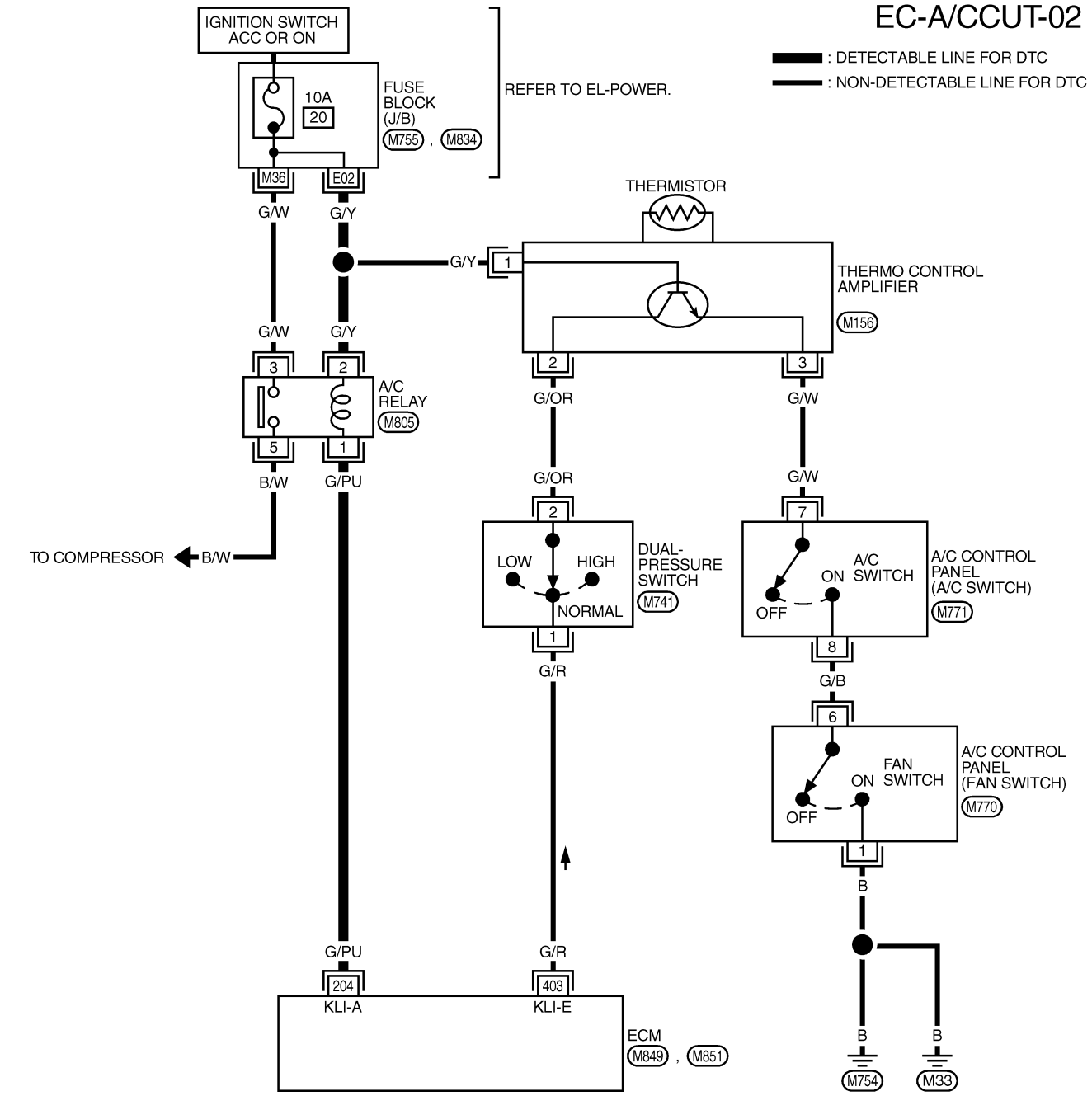


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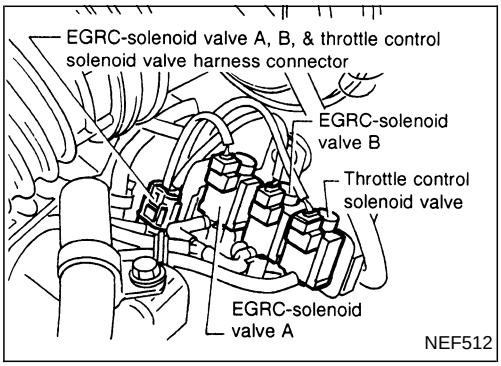
Wiring Diagram (Cont'd)

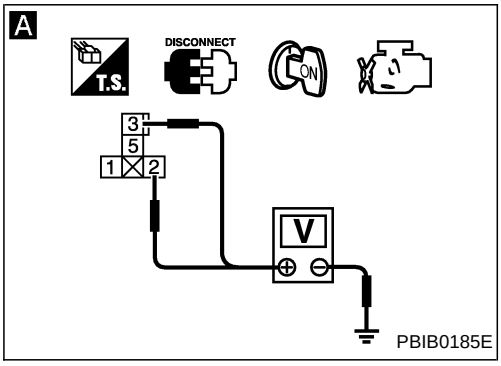
RHD MODELS



YEC686A

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Diagnostic Procedure

INSPECTION START
(Air conditioner relay signal circuit)

A

CHECK POWER SUPPLY.
1. Turn ignition switch to “LOCK” position.
2. Disconnect air conditioner relay harness connector.
3. Check voltage between air conditioner relay connector terminal ②, ③ and engine ground.
   Voltage: Battery voltage

NG → Check the following:
- 10A fuse
- Harness for open or short between fuse block and A/C relay

If NG, replace or repair the parts attached.

OK ↓

CHECK INPUT SIGNAL CIRCUIT.
1. Turn ignition switch to “LOCK” position.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM harness connector terminal (204) and air conditioner relay harness connector terminal ①. Refer to wiring diagram.
   Continuity should exist.
   If OK, check harness for short-circuit.

NG → Check the following:
- Harness connectors (M812), (F120) (LHD models)
- Harness for open or short-circuit between ECM and air conditioner relay.

If NG, repair harness or connectors.

OK ↓

CHECK AIR CONDITIONER RELAY.
Refer to HA section for inspection.

NG → Replace air conditioner relay.

OK ↓

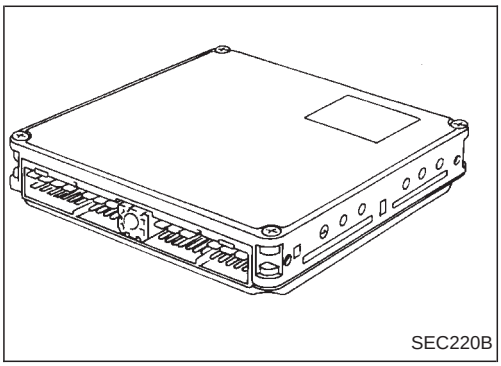
Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed ↓

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END

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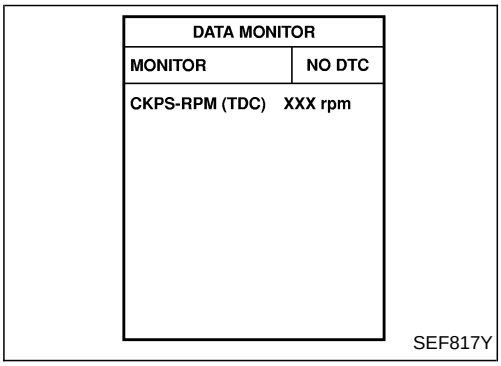

SEC220B

Description

The ECM consists of a microcomputer and connectors for signal input and output and for power supply. The unit controls the engine.

On Board Diagnosis Logic

DTC	Malfunction is detected when ...	Check Items (Possible Cause)
P1603 0901	● ECM calculation function is malfunctioning.	● ECM
P1607 0301		



SEF817Y

DTC Confirmation Procedure

WITH CONSULT-II

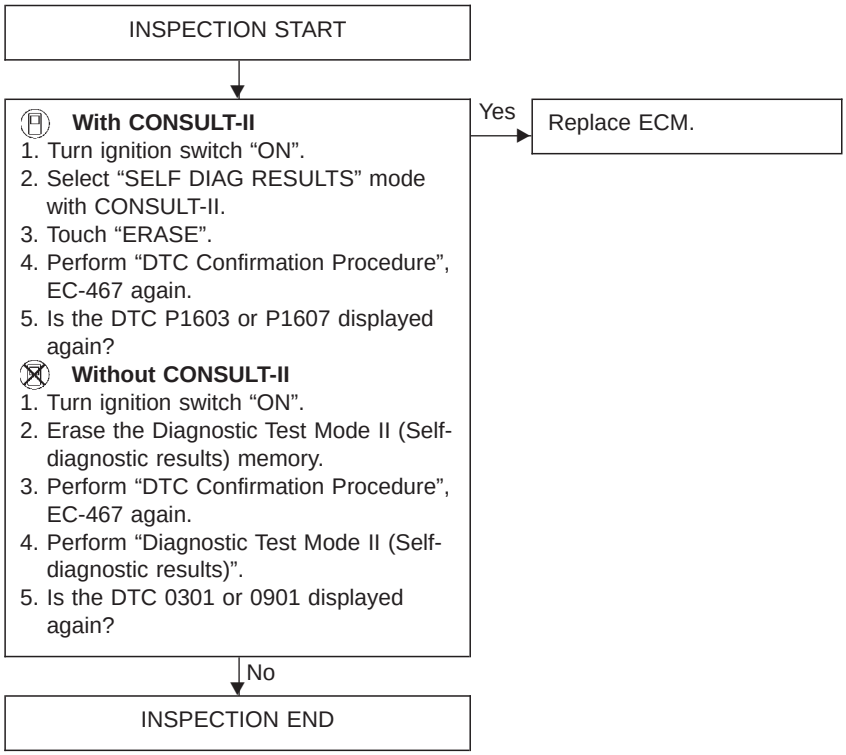
1) Turn ignition switch “ON”.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Start engine and wait at least 2 seconds.

WITHOUT CONSULT-II

1) Turn ignition switch “ON” and wait at least 2 seconds.
2) Start engine and wait at least 2 seconds.
3) Turn ignition switch “OFF”, wait at least 5 seconds and then turn “ON”.
4) Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.

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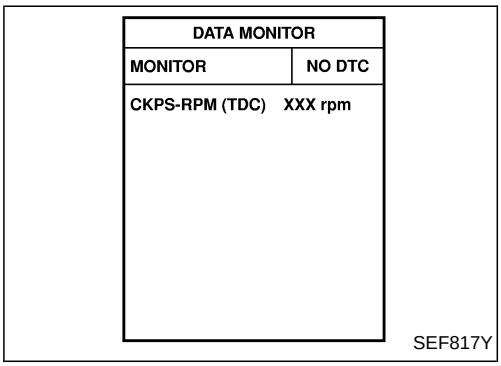
Diagnostic Procedure



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On Board Diagnosis Logic

DTC	Malfunction is detected when	Check Items (Possible Cause)
P1620 0902	• An irregular voltage signal from the ECM relay is sent to ECM.	• Harness or connectors (ECM relay circuit is open or shorted.) • ECM relay



DTC Confirmation Procedure

WITH CONSULT-II

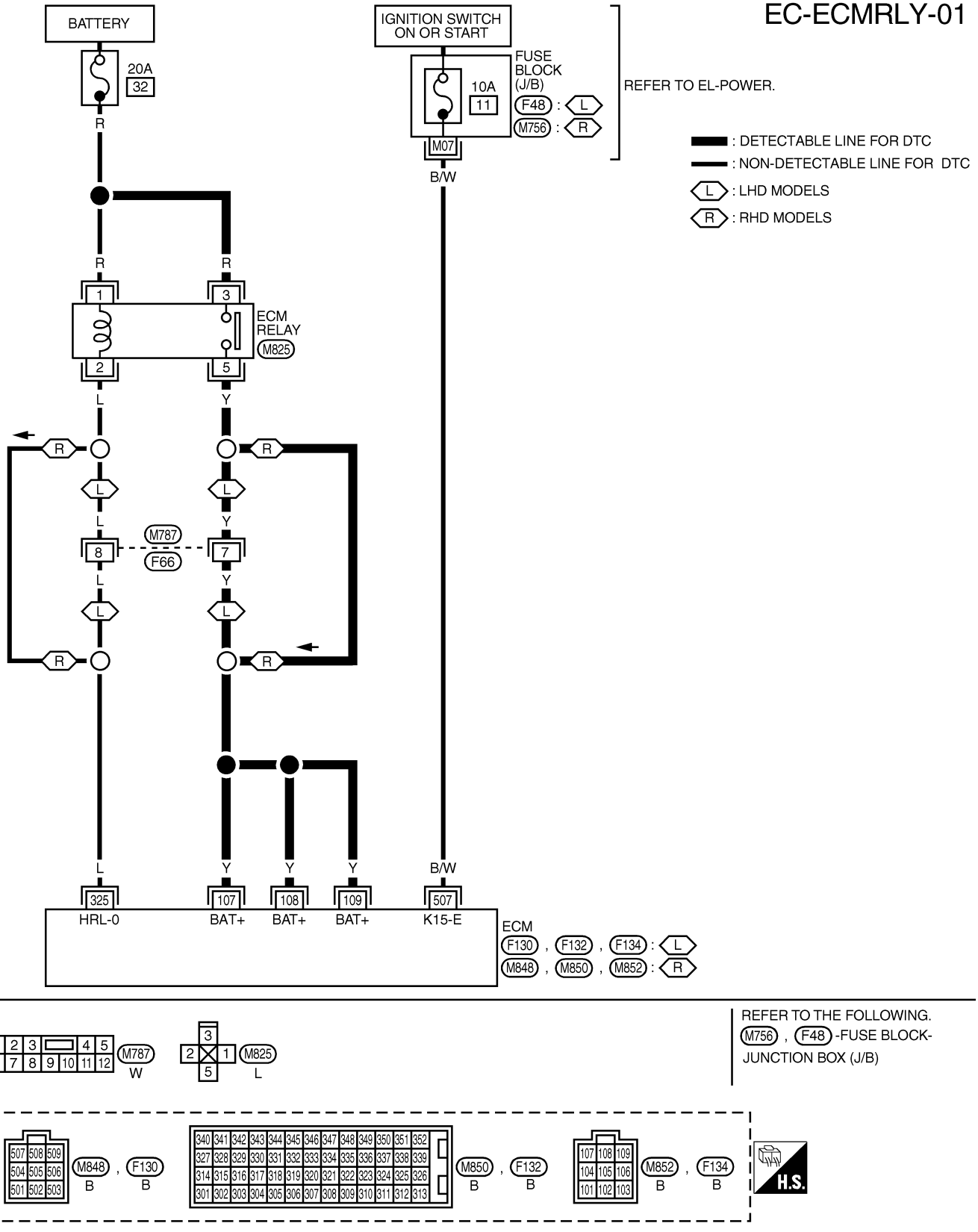
1) Turn ignition switch “ON”.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Turn ignition switch “OFF”, wait at least 20 seconds and then turn “ON”.

WITHOUT CONSULT-II

1) Turn ignition switch “ON”.
2) Turn ignition switch “OFF”, wait at least 20 seconds and then turn “ON”.
3) Perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.

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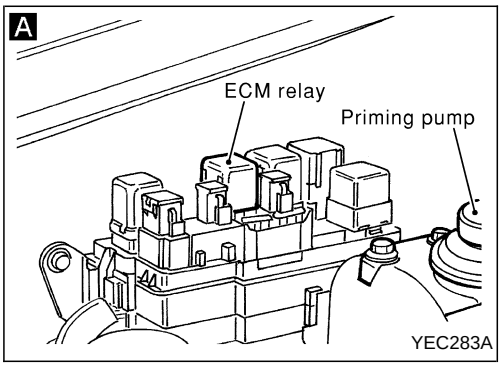
Wiring Diagram

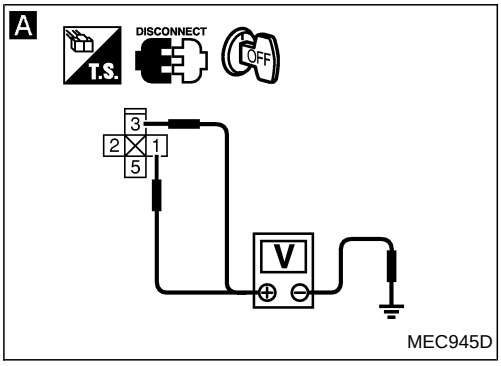


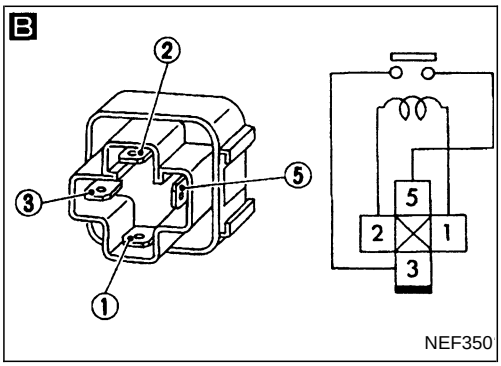
YEC687A

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Diagnostic Procedure







INSPECTION START

A

CHECK ECM POWER SUPPLY CIRCUIT.
1. Turn ignition switch “OFF”.
2. Disconnect ECM relay.
3. Check voltage between ECM terminals ①, ③ and ground with CONSULT-II or tester.

Voltage: Battery voltage

NG → Check the following.
- 20A fuse
- Harness for open and short between ECM relay and battery

If NG, repair open circuit or short to ground or short to power in harness or connectors.

OK ↓

CHECK ECM INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT
1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminals (107), (108), (109) and ECM relay terminal ⑤. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

NG → Check the following.
- Harness connectors (M787), (F66) (LHD models)
- Harness for open or short between ECM relay and ECM

If NG, repair harness or connectors.

OK ↓

CHECK ECM OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT.
1. Check harness continuity between ECM terminal (325) and ECM relay terminal ②. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

NG → Check the following.
- Harness connectors (M787), (F66) (LHD models)
- Harness for open or short between ECM relay and ECM

If NG, repair harness or connectors.

OK ↓

B

CHECK ECM RELAY
1. Apply 12V direct current between ECM relay terminals ① and ②.
2. Check continuity between ECM relay terminals ③ and ⑤.

12V (① - ②) applied: Continuity should exist

No voltage applied: No continuity

NG → Replace ECM relay.

OK ↓

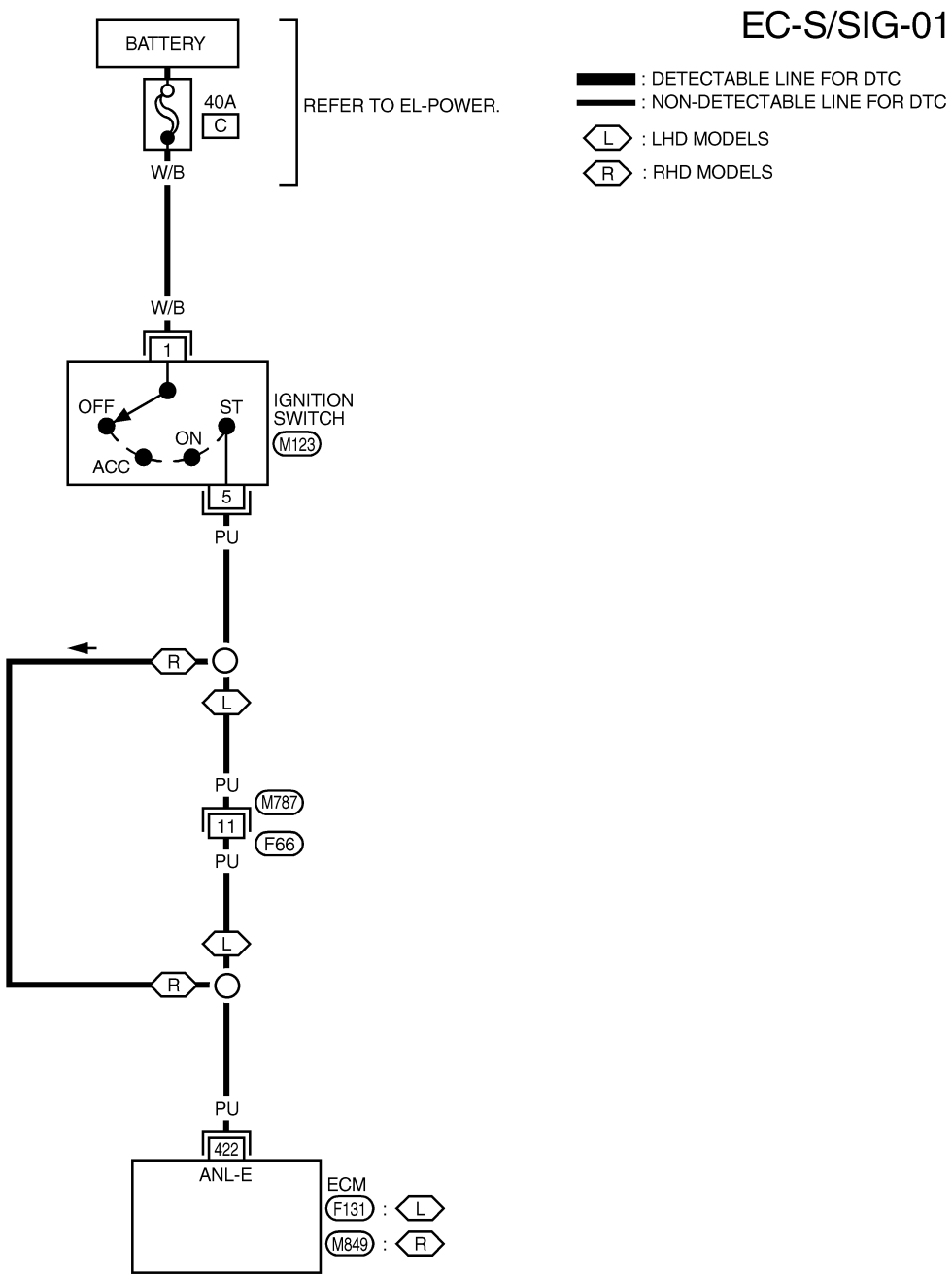
Check ECM pin terminals for damage and check the connection of ECM harness connector.

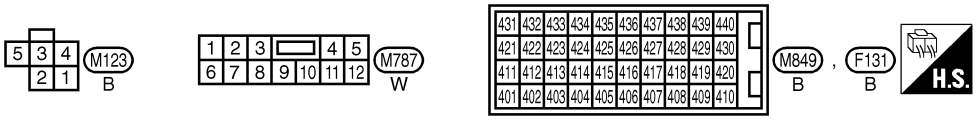
↓

INSPECTION END

http://vnx.su/

Wiring Diagram





YEC153A

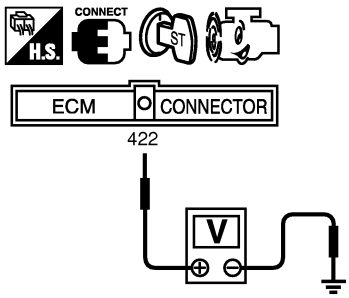
http://vnx.su/

A

DATA MONITOR	
MONITORING	NO FAIL
START SIGNAL	OFF
CLSD TH/P SW	ON
AIR COND SIG	OFF
P/N POSI SW	ON

PBIB0763E

A



MEC966D

Diagnostic Procedure

INSPECTION START

A

CHECK OVERALL FUNCTION.

1. Turn ignition switch to “ON” position.
2. Check “START SIGNAL” in “DATA MONITOR” mode with CONSULT-II.

IGN “ON”	OFF
IGN “START”	ON

OK → INSPECTION END

OR

1. Turn ignition switch to “START” position.
2. Check voltage between ECM connector terminal 422 and engine ground.

Voltage:

Ignition switch “START”:
Battery voltage

Except above:
Approximately 0V

NG

Check if 40A fusible link is OK.

NG → Replace 40A fusible link.

OK

B

CHECK INPUT SIGNAL CIRCUIT.

1. Turn ignition switch to “LOCK” position.
2. Disconnect ECM harness connector, ignition switch connector.
3. Check harness continuity between ECM connector terminal 422 and ignition switch connector terminal 5. Refer to wiring diagram.

Continuity should exist.

If OK, check harness for short circuit.

NG → Check the following:
- Harness connectors M787, F66 (LHD models)
- Condition and operations of ignition switch
- Harness for open or short-circuit between ECM and ignition switch

If NG, repair ignition switch, harness or connectors.

OK

Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed.

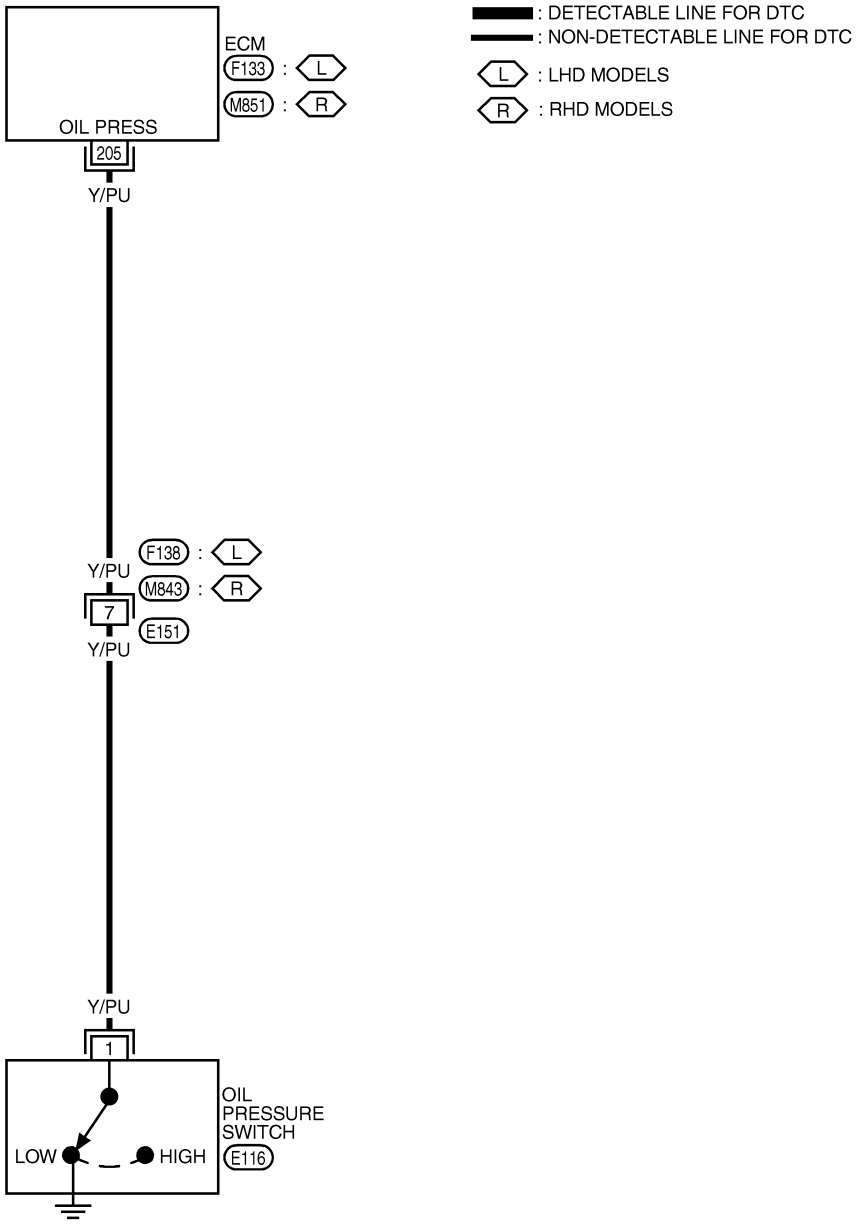
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END

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Wiring Diagram

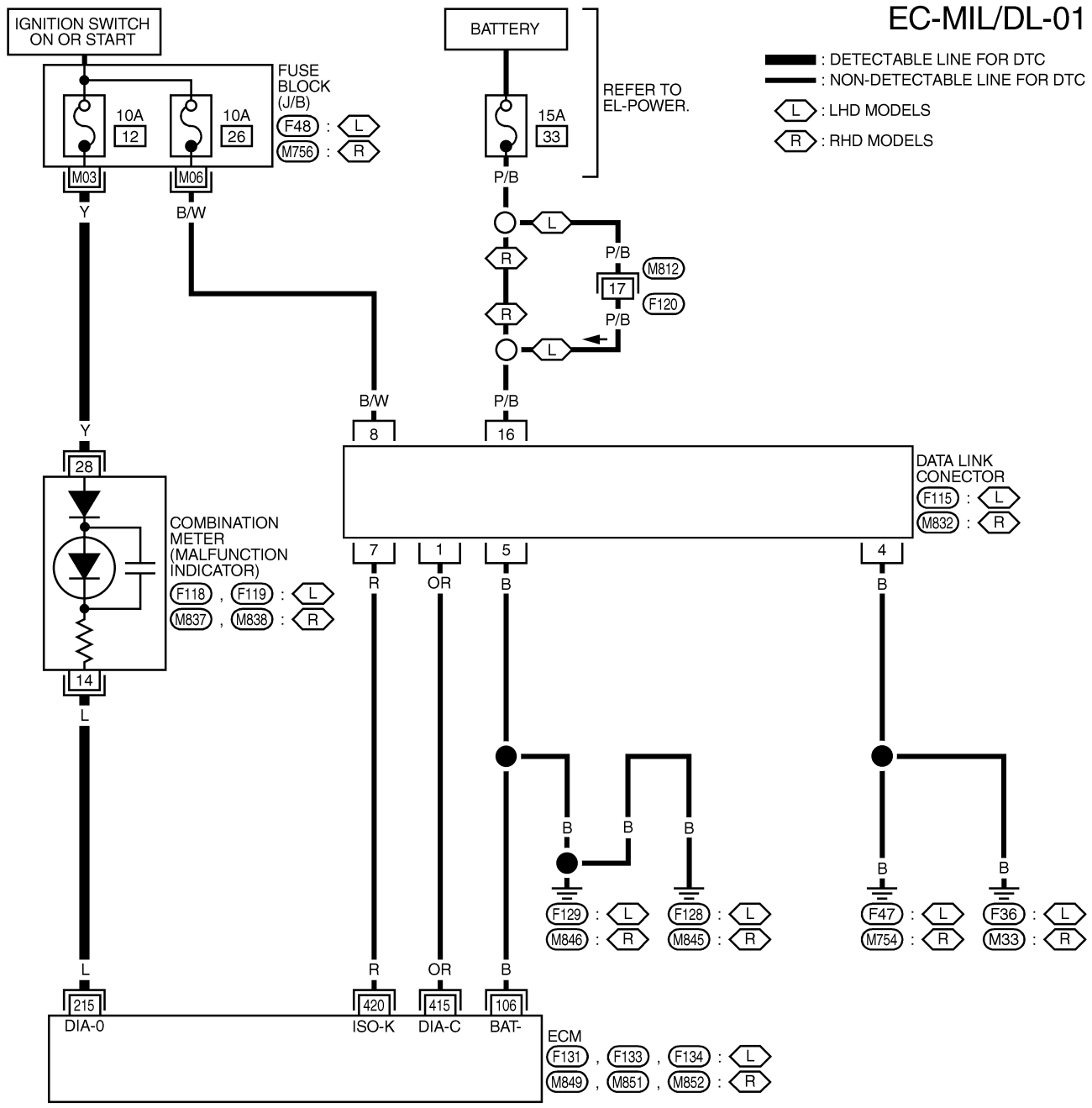
EC-OILPSW-01

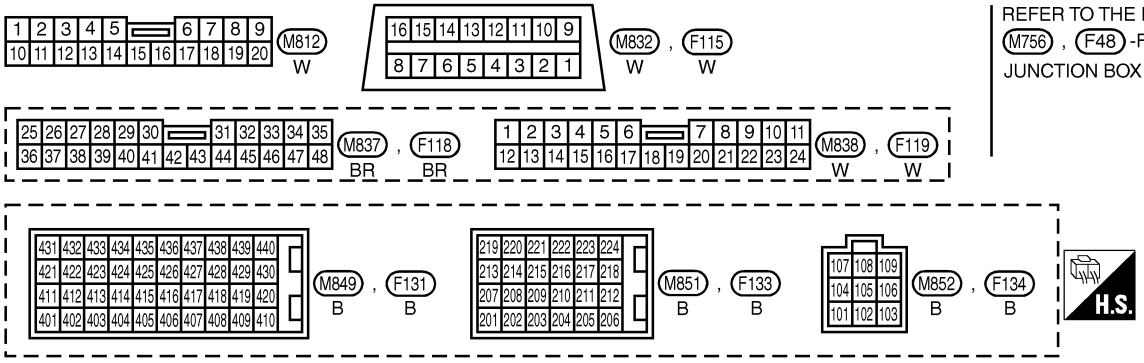


YEC162A

http://vnx.su/

Wiring Diagram





YEC688A

http://vnx.su/

General Specifications

Engine speed

Unit: rpm

Engine	TD27Ti
Idle speed A/C: ON	725 845
Maximum engine speed	5,500

Pump numbers

Engine	Part number	Pump assembly number
TD27Ti	16700 7F406	A 460 801 135

Pump data is not yet available.
Refer to CALIBRATION STANDARD published by BOSCH.

Injection Nozzle

INSPECTION AND ADJUSTMENT

Injection nozzle assembly

Unit: kPa (bar, kg/cm^2, psi)

Initial injection pressure	
New	12,749 - 13,730 (127.5 - 137.3, 130 - 140, 1,849 - 1,991)
Used	12,259 - 12,749 (122.6 - 127.5, 120 - 135, 1,706 - 1,849)

Inspection and Adjustment

Plunger lift at TDC	mm (in)	0.275 ± 0.02 (0.0108) ± (0.0008)
Idle speed (“N” or “P” position)	rpm	725 ± 25

MASS AIR FLOW SENSOR

Supply voltage	V	Approximately 5
Output voltage	V	1.5 - 2.7*

*: Engine is warmed up sufficiently and idling under no-load.

ENGINE COOLANT TEMPERATURE SENSOR

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.00
90 (194)	0.236 - 0.260

CONTROL SLEEVE POSITION SENSOR

Resistance [at 25°C (77°F)]	Ω	Approximately 6.1

INJECTION TIMING CONTROL VALVE

Resistance [at 25°C (77°F)]	Ω	Approximately 15

NEEDLE LIFT SENSOR

Resistance [at 25°C (77°F)]	Ω	Approximately 105

CRANKSHAFT POSITION SENSOR (TDC)

Resistance [at 25°C (77°F)]	Ω	Approximately 900

GLOW PLUG

Resistance [at 25°C (77°F)]	Ω	0.5

ACCELERATOR POSITION SENSOR

Throttle valve conditions	Resistance kΩ [at 25°C (77°F)]
Completely closed	Approximately 1.2
Partially open	1.2 - 1.9
Completely open	Approximately 1.9

FUEL TEMPERATURE SENSOR

Temperature °C (°F)	Resistance kΩ
25 (77)	Approximately 1.9

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ACCELERATOR CONTROL, FUEL & EXHAUST SYSTEM

SECTION FE

CONTENTS

ZD30DDTi

ACCELERATOR CONTROL SYSTEM 2
Removal and Installation 2
FUEL SYSTEM 3
EXHAUST SYSTEM 4

TD27Ti

ACCELERATOR CONTROL SYSTEM 5
Adjusting Accelerator Cable 5
FUEL SYSTEM 6
Fuel Pump and Gauge 7
EXHAUST SYSTEM 10

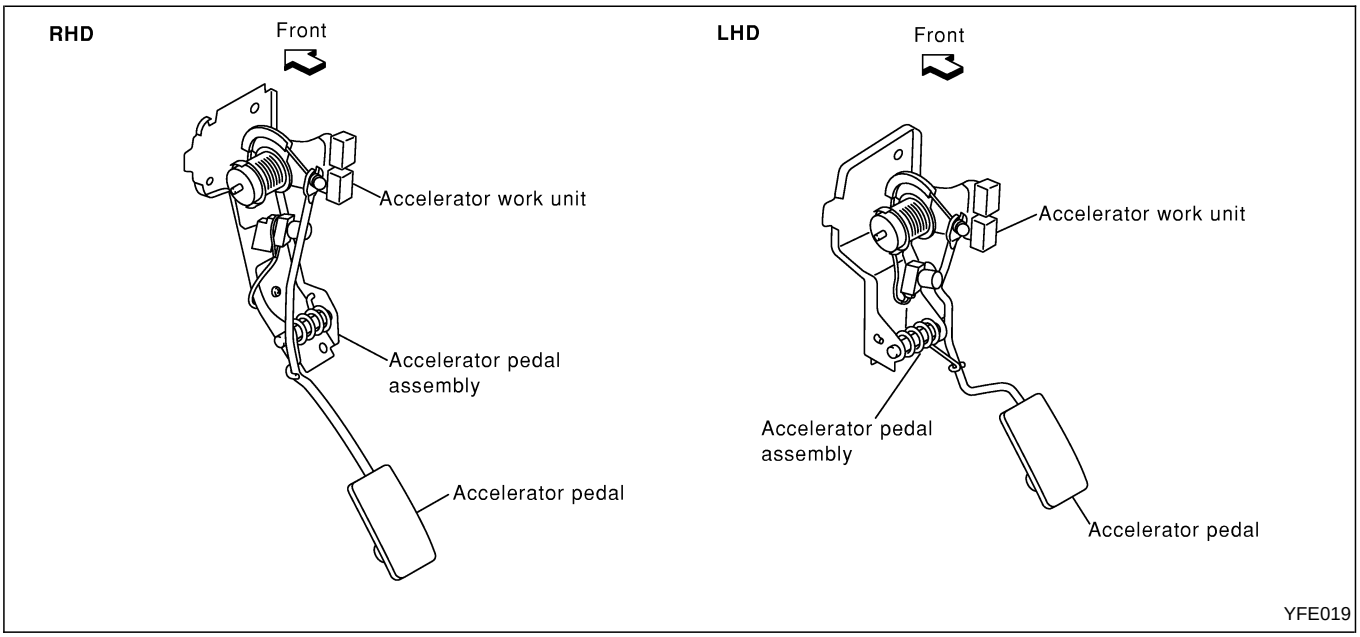
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Removal and Installation

CAUTION:

The accelerator wire should be adjusted when removing and replacing any parts of the accelerator control system, shown in the illustration.

a. Warm up engine to normal operating temperature. Then stop it.
b. Check to see if throttle valve fully opens when accelerator pedal is fully depressed and if it returns to idle position when released.
c. Adjust accelerator pedal free play by turning adjusting nut.
d. Check accelerator control parts for improper contact with any adjacent parts.
e. When connecting accelerator wire, be careful not to twist or scratch its inner wire.
f. Apply a light coat of recommended multi-purpose grease to all sliding or friction surfaces. Do not apply grease to wire.
g. For ASCD wire adjustment, refer to "ASCD Wire Adjustment" in EL section.

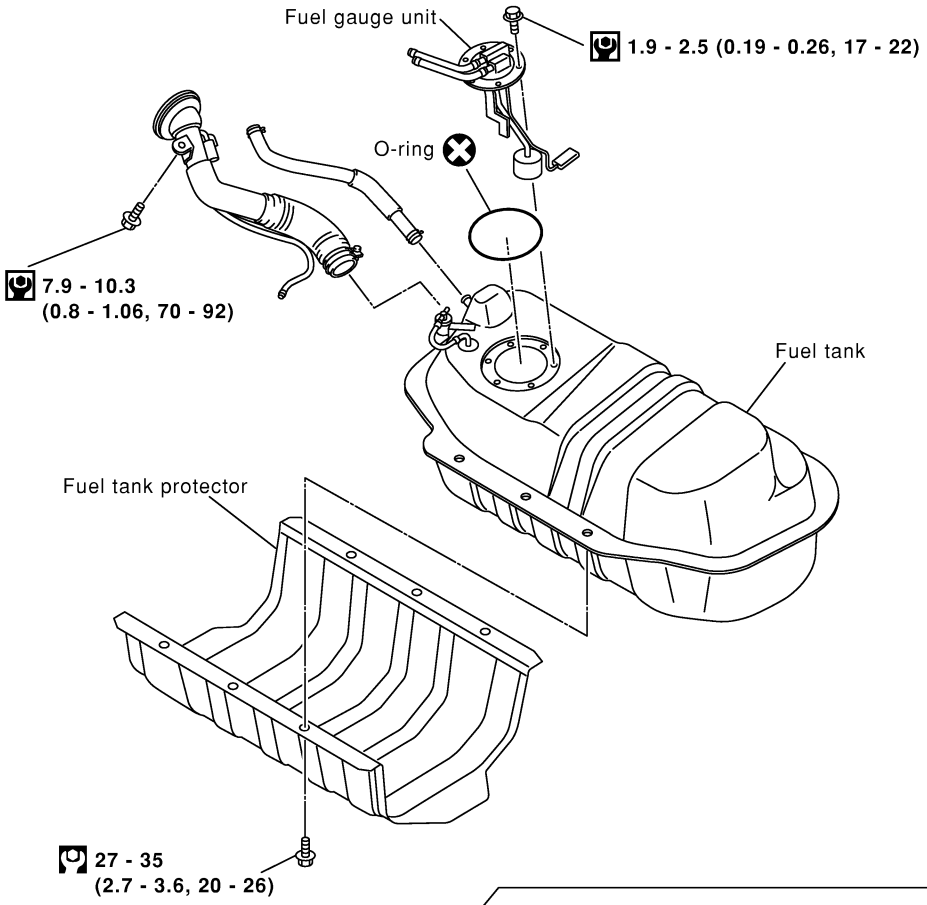


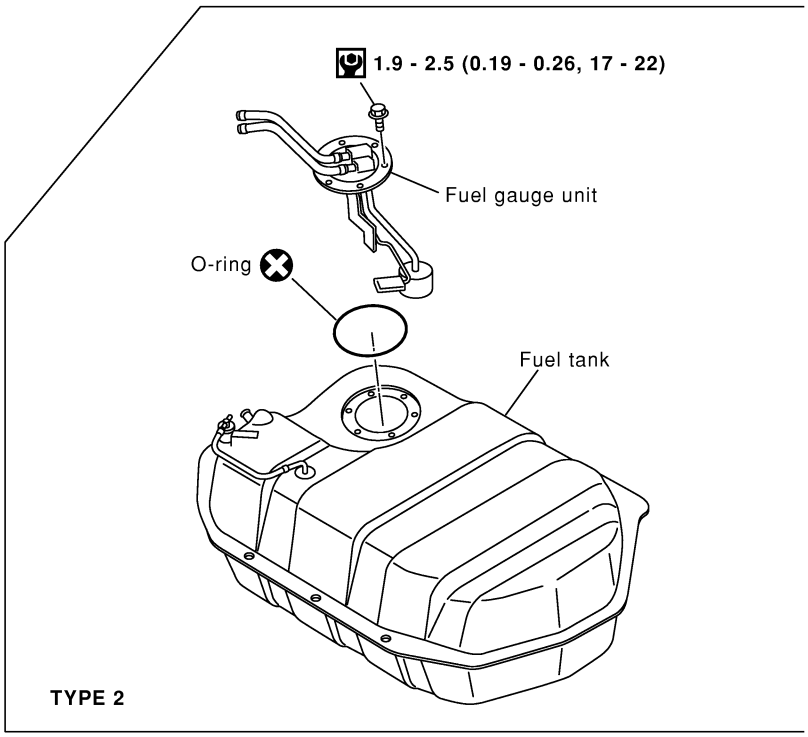
INSPECTION AFTER INSTALLATION

- Check if accelerator pedal moves smoothly within its range.
- Check if accelerator pedal returns securely to its original position.
- Perform "Accelerator Pedal Released Position Learning" when removing the accelerator pedal position sensor harness connector. Refer to "BASIC SERVICE PROCEDURE" in EC section for instructions.

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TYPE 1



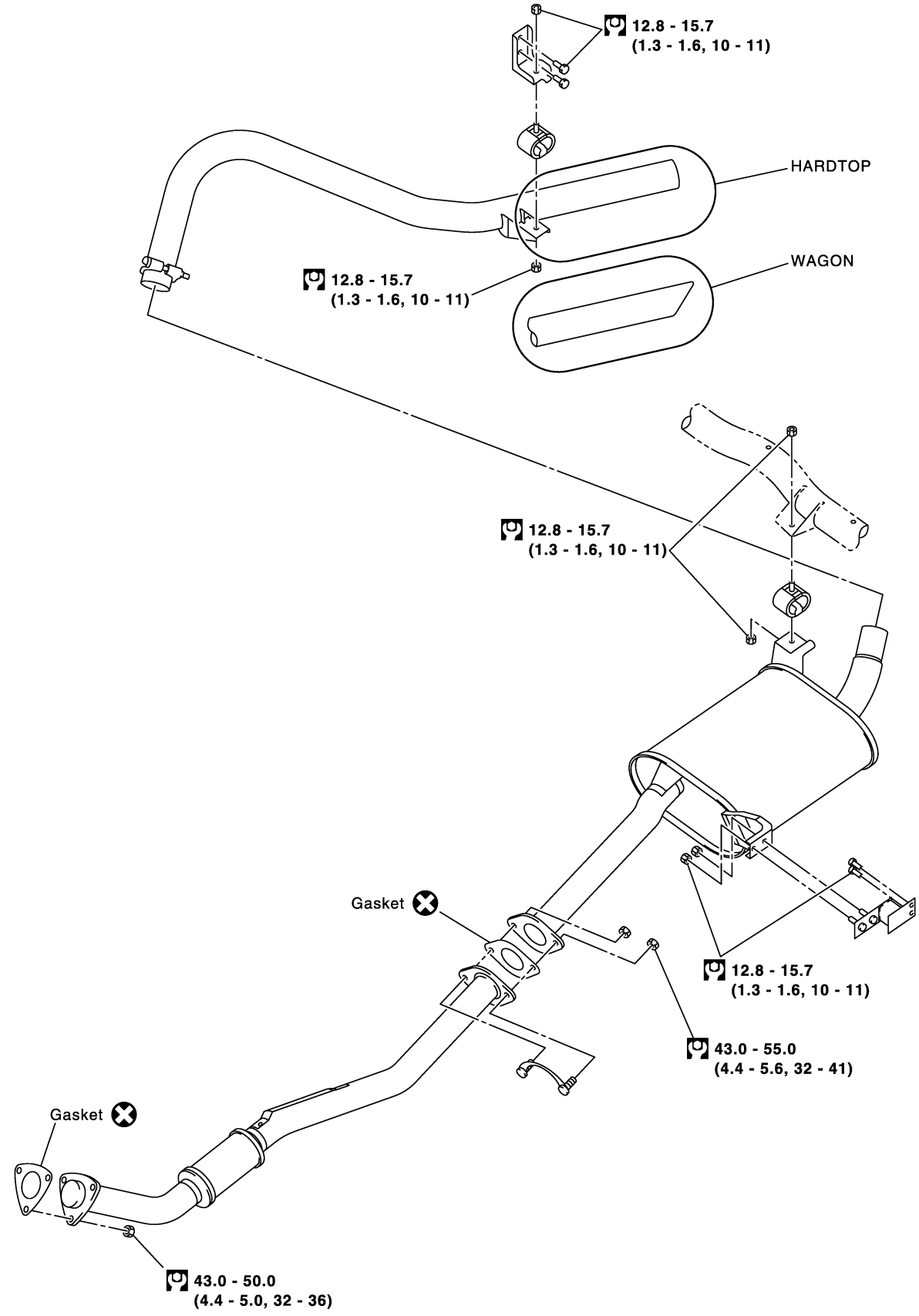


: N•m (kg-m, in-lb)

: N•m (kg-m, ft-lb)

YFE020

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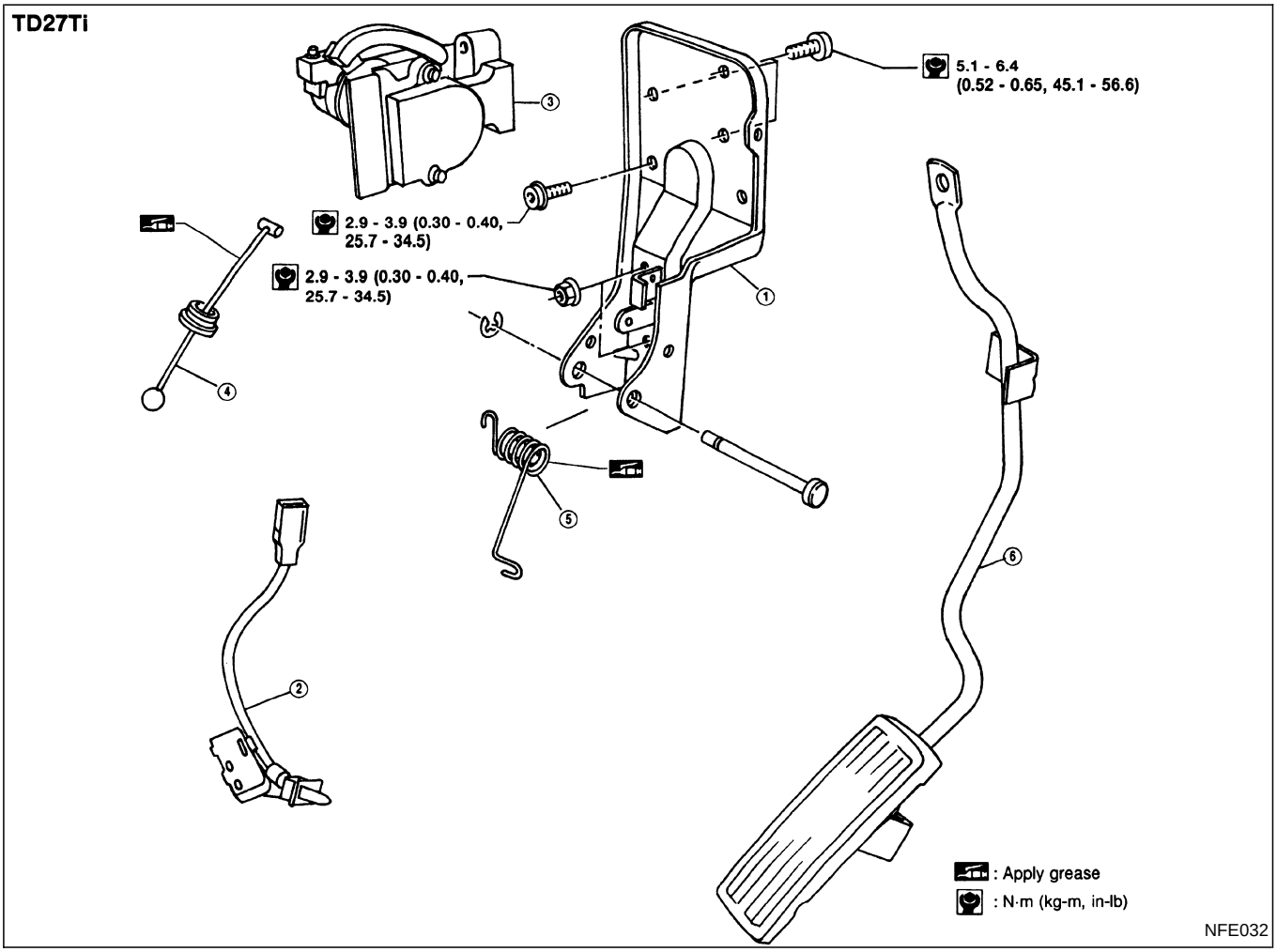


: N•m (kg-m, ft-lb)

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Adjusting Accelerator Cable



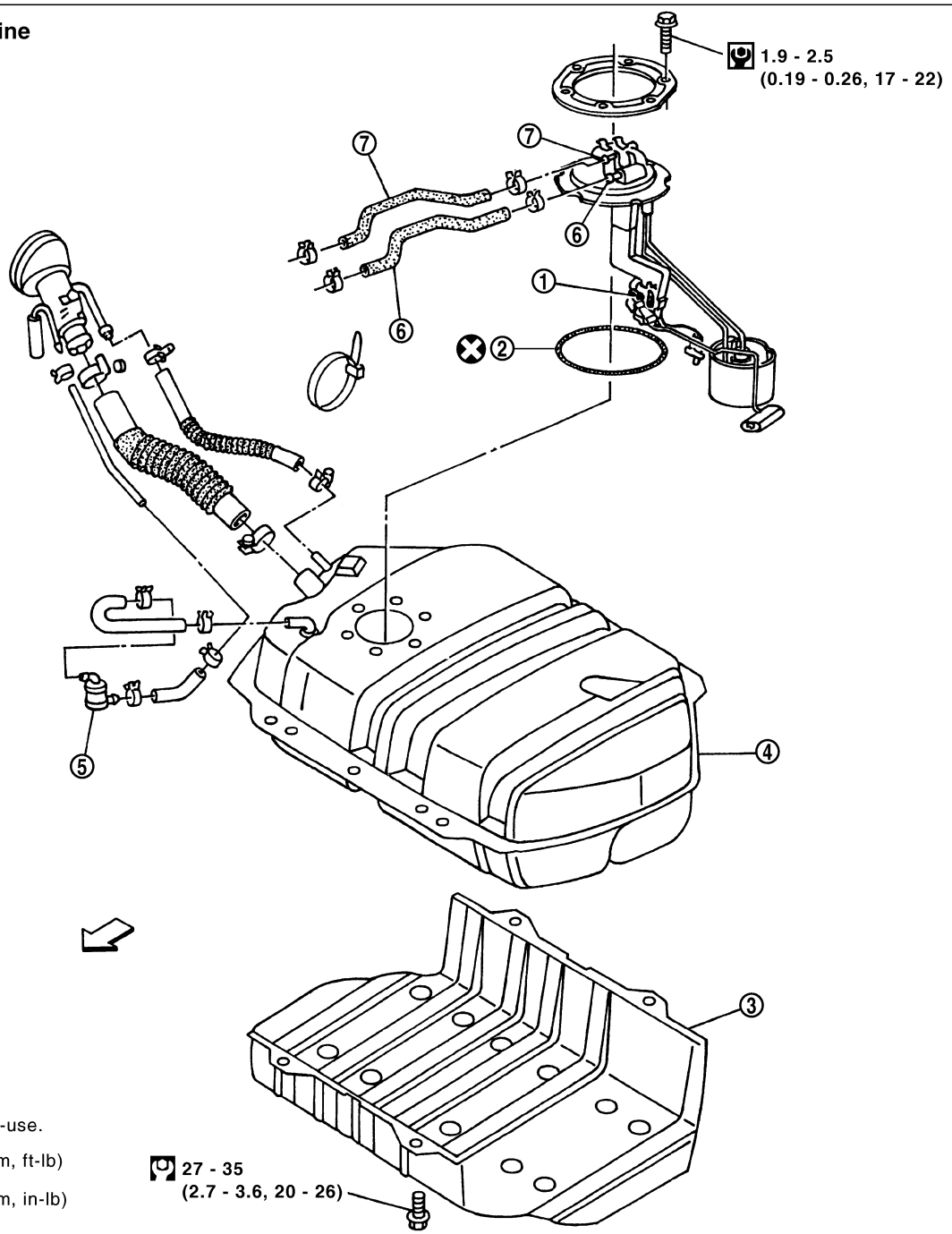
① Pedal bracket
② Accelerator switch
③ Accelerator position sensor
④ Accelerator cable
⑤ Return spring
⑥ Accelerator pedal

INSPECTION AFTER INSTALLATION

- Check if accelerator pedal moves smoothly within its range.
- Check if accelerator pedal returns securely to its original position.
- Perform “Accelerator Pedal Released Position Learning” when removing the accelerator pedal position sensor harness connector. Refer to “BASIC SERVICE PROCEDURE” in EC section for instructions.
- If MI illuminates after engine has started, refer to “ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION” in EC section for instructions.

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TD27Ti engine

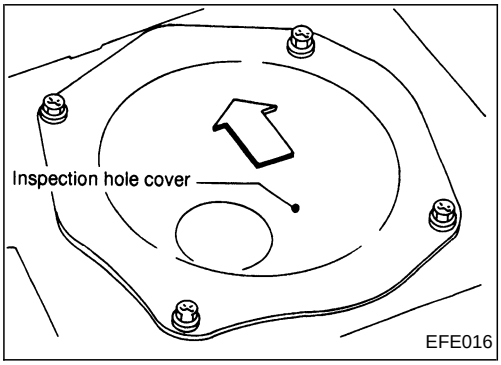


① Fuel gauge
② O-ring
③ Fuel tank protector
④ Fuel tank
⑤ Fuel check valve
⑥ Fuel return tube
⑦ Fuel feed tube

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WARNING:
When replacing fuel line parts, be sure to observe the following:
- **Display a "CAUTION: INFLAMMABLE" sign in workshop.**
- **Be sure to furnish workshop with a CO_2 fire extinguisher service.**
- **Do not smoke while servicing fuel system. Keep open flames and sparks away from work area.**
- **Be sure to disconnect battery ground cable before conducting operations.**
- **Pour drained fuel into an explosion-proof container, then ensure container lid is installed securely.**

CAUTION:
- **For ECM models, release fuel pressure from fuel line. Refer to EC section ("Fuel Pressure Release", "BASIC SERVICE PROCEDURE").**
- **Do not disconnect any fuel line unless absolutely necessary.**
- **Plug hose and pipe openings to prevent entry of dust or dirt.**
- **Always replace top lid seal and hose clamps with new ones.**
- **Do not kink or twist hoses and tubes during installation.**
- **Do not tighten hose clamps excessively because this could cause damage to the hose.**
- **Ensure fuel check valve is installed in the correct orientation.**
- **Refer to EC section ("FUEL CHECK VALVE", "EVAPORATIVE EMISSION SYSTEM").**
- **After installation, run engine and check for fuel leaks at connections.**

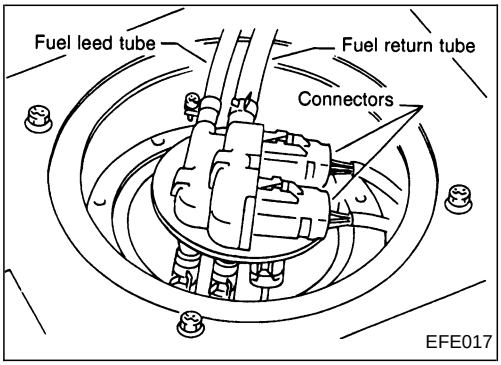


Fuel Pump and Gauge

REMOVAL

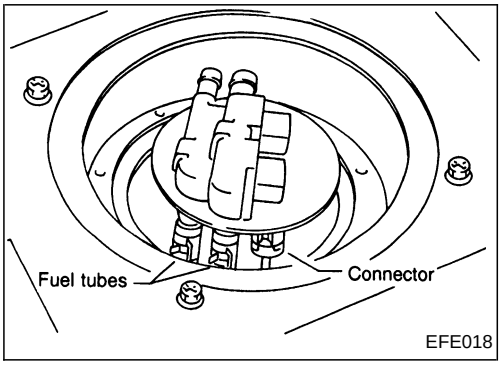
Petrol engine

1. Release fuel pressure from fuel line.
   Refer to EC section ("Fuel Pressure Release", "BASIC SERVICE PROCEDURE").
2. Remove inspection hole cover located under the luggage compartment carpet.



3. Remove fuel filler lid.
4. Disconnect fuel outlet, return tube and connectors.

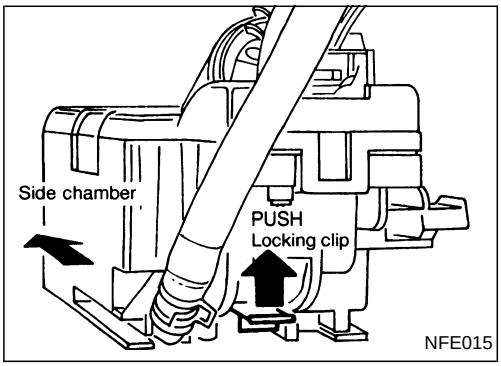
CAUTION:
Mark the fuel tubes to ensure correct position during installation.



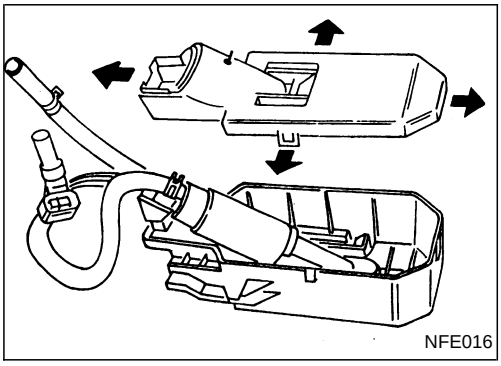
5. Remove the fuel gauge assembly and disconnect tubes and connector.

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Fuel Pump and Gauge (Cont'd)



6. Remove fuel pump with fuel tank chamber assy as follows:
a. Push the locking clip upwards and slide the pump chamber assy towards the rear of the vehicle.
b. Lift the pump chamber assy from the bracket.
c. Carefully remove the pump chamber assy and top plate from the tank.



7. Take off the fuel pump chamber lid by opening out the 4 clips. Remove the fuel pump from the fuel pump chamber.

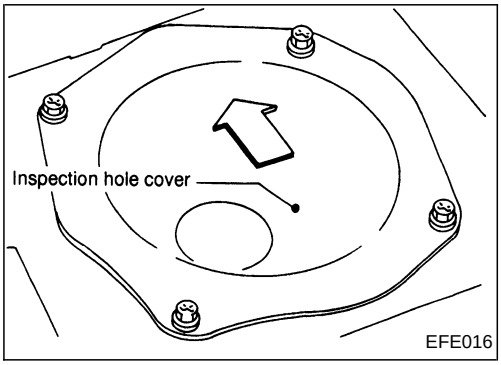
INSTALLATION

Installation is reverse procedure of removal.

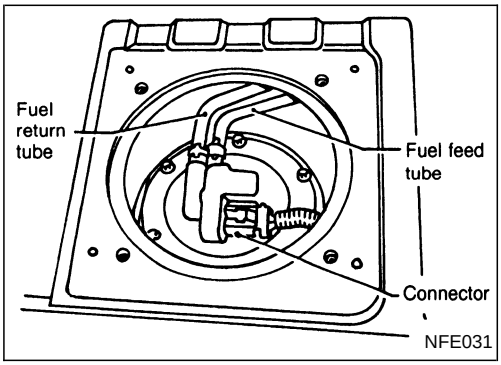
CAUTION:

- **Always use a new top plate seal.**
- **Tighten to specified torque.**

Diesel engine



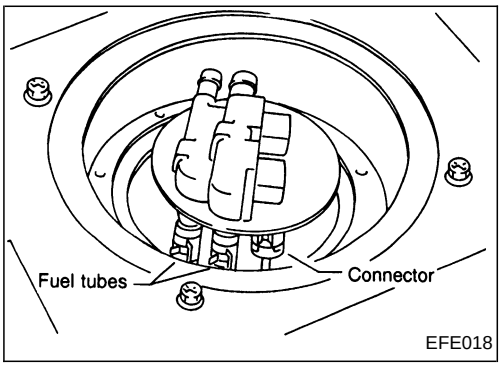
1. Remove inspection hole cover located under the luggage compartment carpet.



2. Disconnect fuel feed and return tubes and connector.
3. Remove the screws by which the fuel gauge is mounted to the fuel tank.

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Fuel Pump and Gauge (Cont'd)



4. Remove fuel gauge assembly.

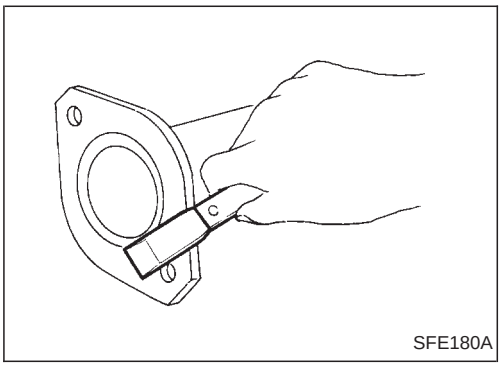
INSTALLATION

Installation procedure is the reverse order of removal.

CAUTION:

- **Tighten to specified torque.**
- **Always use a new top plate seal.**

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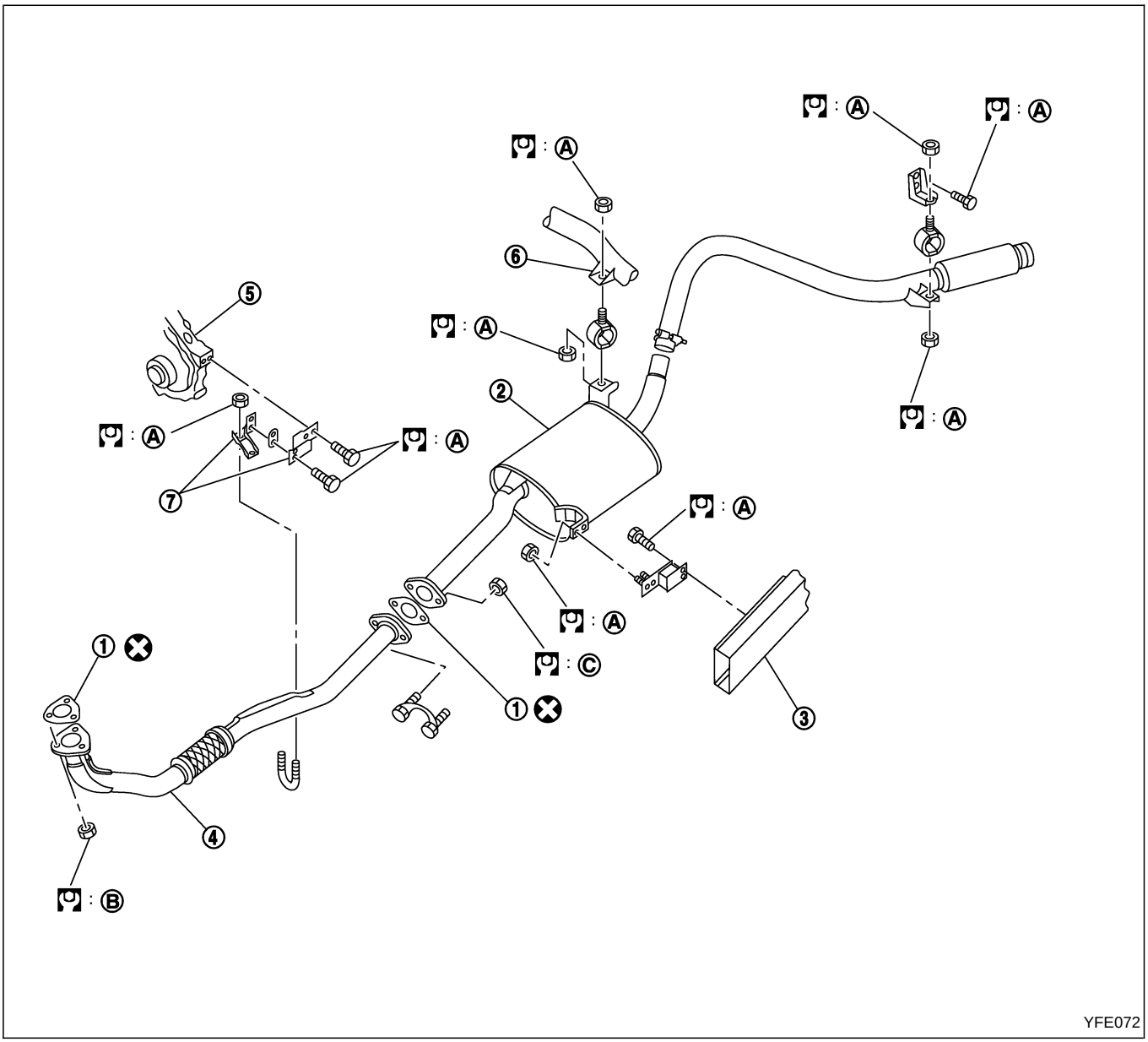


SFE180A

CAUTION:

- **Be careful not to drop or damage catalytic converter.**
- **Never wet catalytic converter with water, oil, etc.**
- **Always replace exhaust gaskets with new ones when reassembling.**
  If gasket is left on flange surface, scrape off complete as shown at left.
- **With engine running, check all tube connections for exhaust gas leaks, and entire system for unusual noises.**
- **After installation, but before fully tightening exhaust joints, check to ensure that mounting brackets and mounting insulators are free from undue stress. If any of the above parts are not installed properly, excessive noise or vibration may be transmitted to the vehicle body.**

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① Gasket
② Muffler assembly
③ Frame
④ Front tube
⑤ Transfer case
⑥ Crossmember
⑦ Support bracket (Wagon models only)
: Tightening torques
Ⓐ: 12.8 - 15.7 N·m (1.3 - 1.6 kg-m, 10 - 11 ft-lb)
Ⓑ: 43.0 - 50.0 N·m (4.4 - 5.0 kg-m, 32 - 36 ft-lb)
Ⓒ: 43.0 - 55.0 N·m (4.4 - 5.6 kg-m, 32 - 41 ft-lb)

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NOTES

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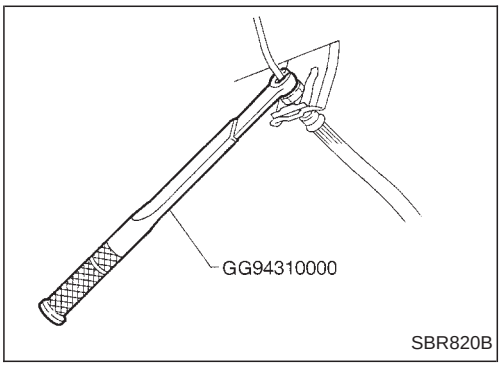
CLUTCH

SECTION CL

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Precautions

- **Recommended fluid is brake fluid “DOT 4”.**
- **Do not reuse drained brake fluid.**
- **Be careful not to splash brake fluid on painted areas.**
- **When removing and installing clutch piping, use Tool.**
- **To clean or wash all parts of master cylinder, operating cylinder and clutch damper, use clean brake fluid.**
- **Never use mineral oils such as gasoline or kerosene. It will ruin the rubber parts of the hydraulic system.**

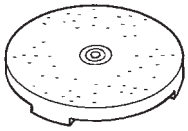
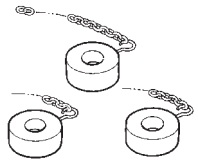
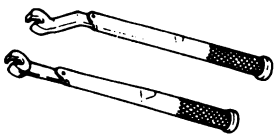
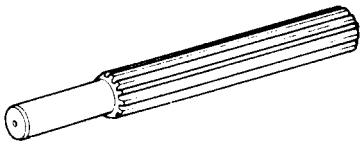
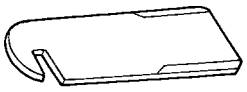
WARNING:

Remove all dust from clutch disc with a dust collector after cleaning with waste cloth.

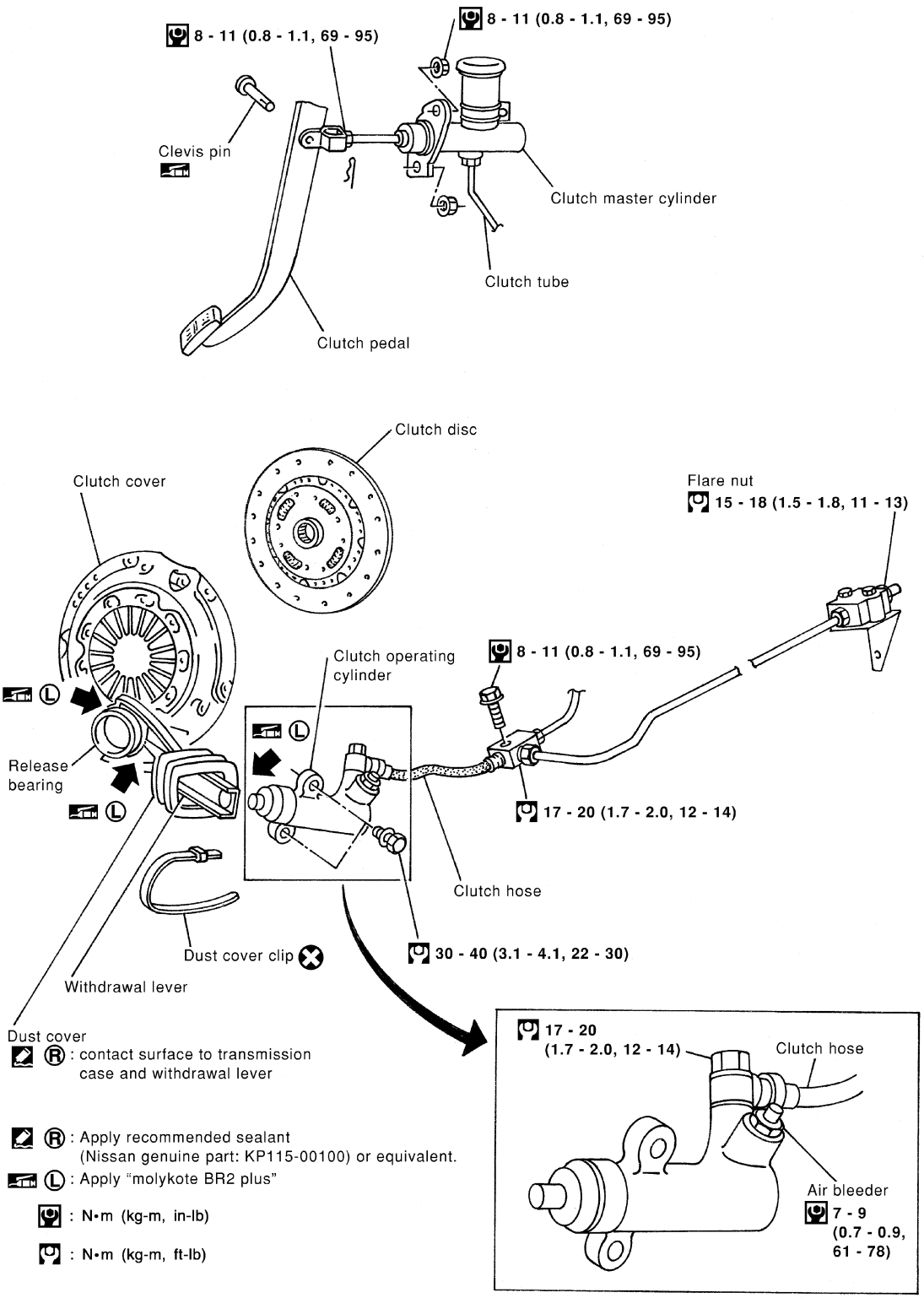
Preparation

SPECIAL SERVICE TOOLS

*: Special tool or commercial equivalent

Tool number Tool name	Description	
ST20050010 Base plate		Inspecting diaphragm spring of clutch cover
ST20050100 Distance piece		Inspecting diaphragm spring of clutch cover
GG94310000 Flare nut torque wrench		Removing and installing each clutch piping
KV30100100* Clutch aligning bar		Installing clutch cover and clutch disc
ST20050240* Diaphragm spring adjusting wrench		Adjusting unevenness of diaphragm spring of clutch cover

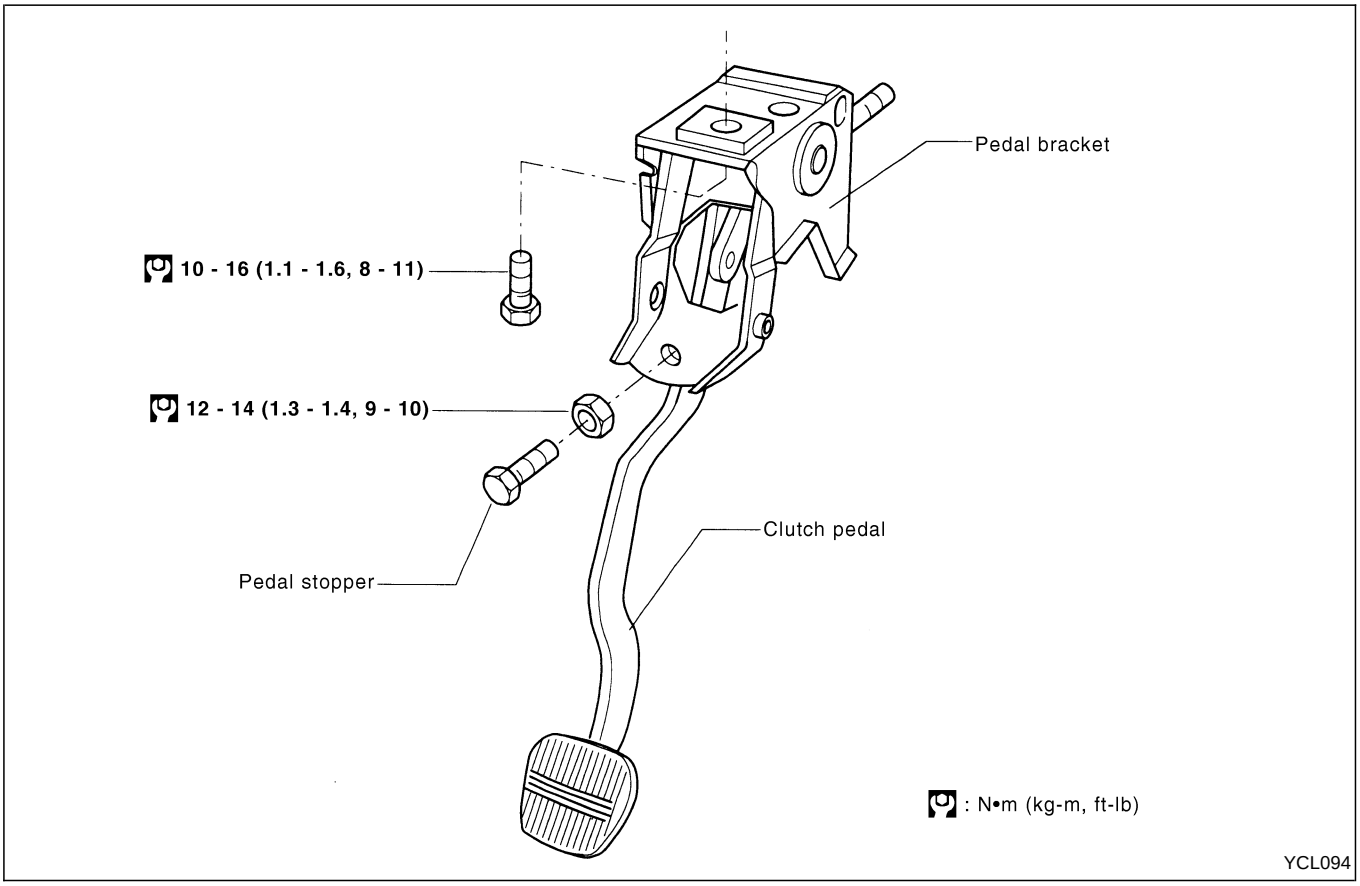
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Clutch Pedal

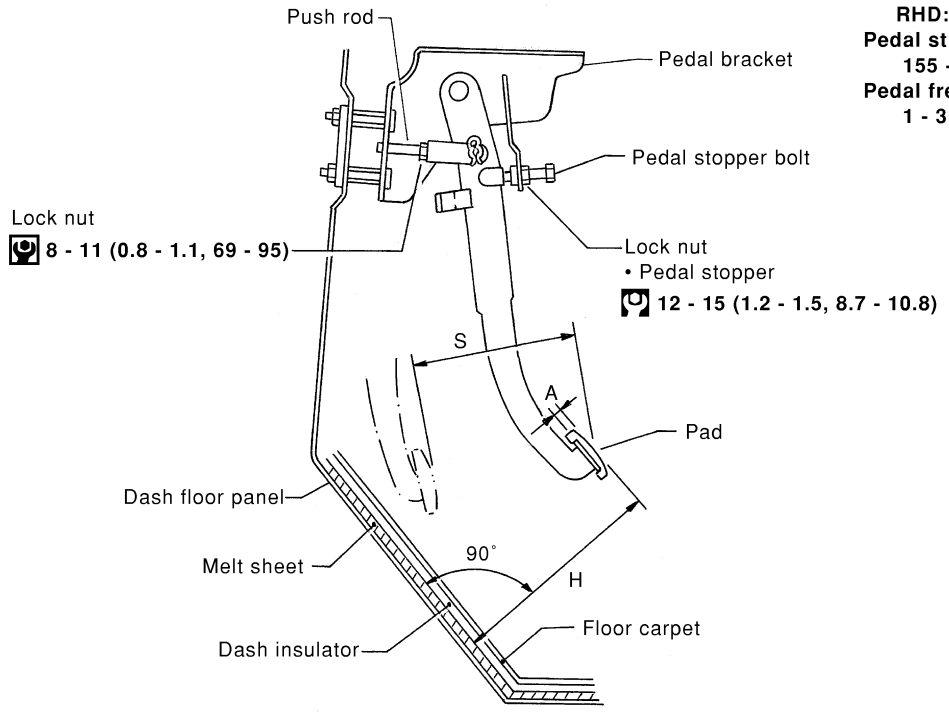


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Adjusting Clutch Pedal

1. Adjust pedal height with pedal stopper.
   Pedal height “H”:
   LHD: 227 - 237 mm (8.94 - 9.33 in)
   RHD: 210 - 220 mm (8.27 - 8.66 in)
2. Adjust pedal free play with master cylinder push rod. Then tighten lock nut.
   Pedal free play “A”:
   1.0 - 3.0 mm (0.039 - 0.118 in)

TD27Ti

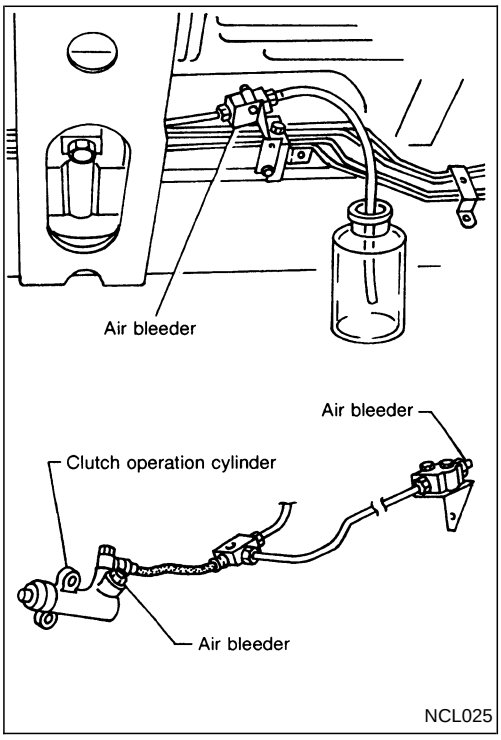


Pedal height “H”
(Measured from surface of melt sheet to panel pad):
LHD: 227 - 237 mm (8.94 - 9.33 in)
RHD: 210 - 220 mm (8.27 - 8.66 in)
Pedal stroke “S”
155 - 160 mm (6.10 - 6.30 in)
Pedal free play “A”:
1 - 3 mm (0.04 - 0.12 in)

: N•m (kg-m, in-lb)
: N•m (kg-m, ft-lb)

YCL009

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Bleeding Procedure

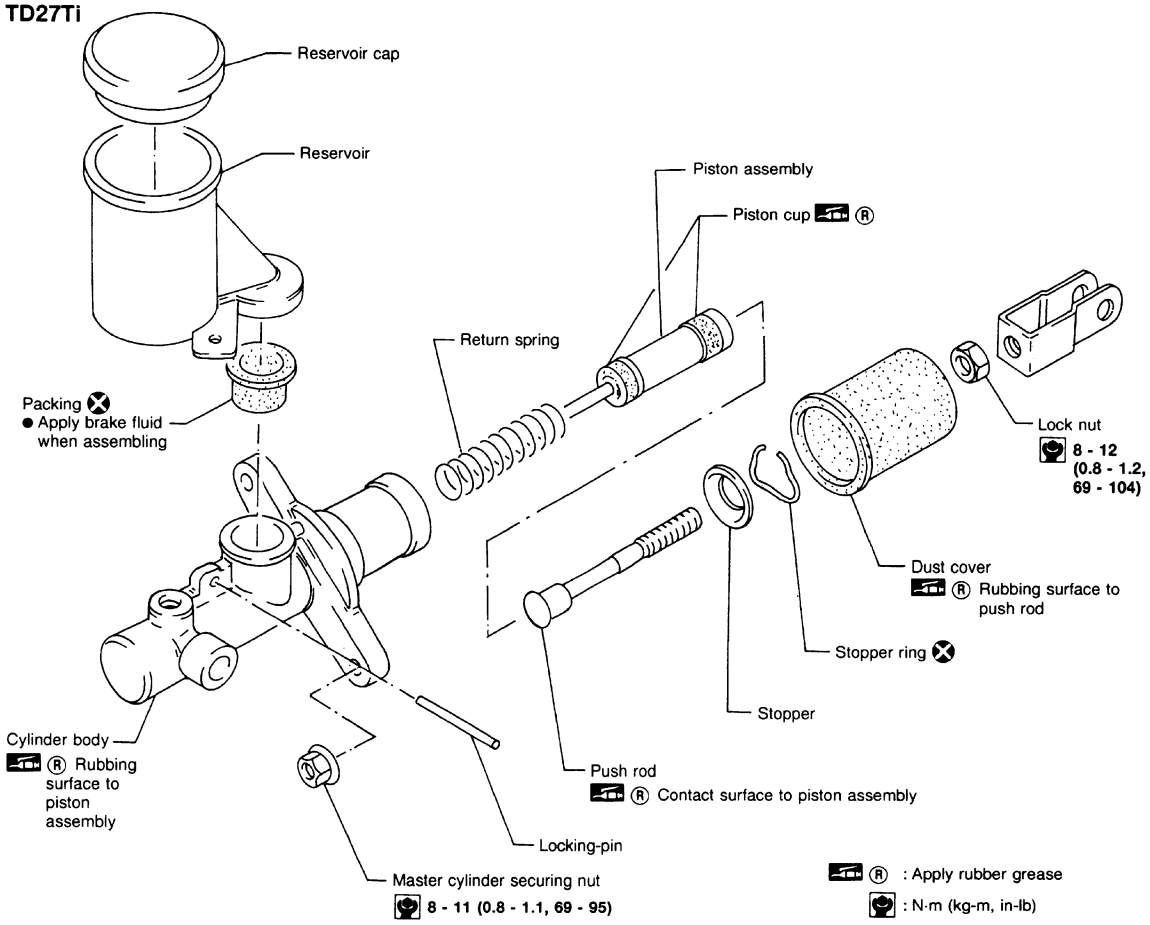
1. Bleed air from clutch operating cylinder according to the following procedure.

Carefully monitor fluid level at master cylinder during bleeding operation.

a. Top up reservoir with recommended brake fluid.
b. Connect a transparent vinyl tube to air bleeder valve of clutch damper.
c. Fully depress clutch pedal several times.
d. With clutch pedal depressed, open bleeder valve to release air.
e. Close bleeder valve.
f. Repeat steps (c) through (e) above until brake fluid flows from air bleeder valve without air bubbles.

2. Bleed air from clutch operating cylinder according to the above procedure.
3. Repeat the above bleeding procedures 1 and 2 several times.

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TD27Ti
Reservoir cap
Reservoir
Packing
● Apply brake fluid when assembling
Piston assembly
Piston cup R
Return spring
Lock nut
8 - 12 (0.8 - 1.2, 69 - 104)
Dust cover
R Rubbing surface to push rod
Stopper ring
Stopper
Cylinder body
R Rubbing surface to piston assembly
Push rod
R Contact surface to piston assembly
Locking-pin
Master cylinder securing nut
8 - 11 (0.8 - 1.1, 69 - 95)
R : Apply rubber grease
: N·m (kg-m, in-lb)
NCL028

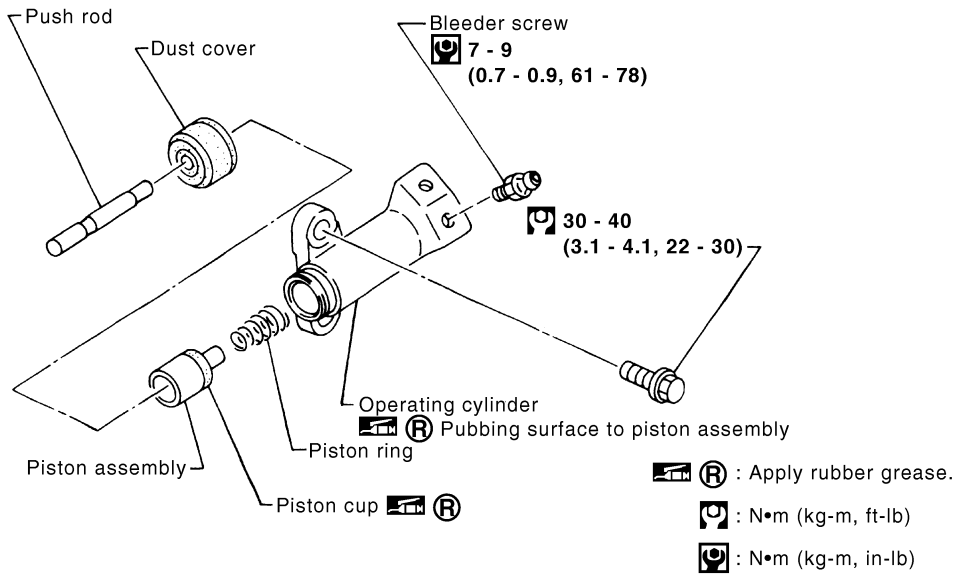
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Clutch Master Cylinder

INSPECTION

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

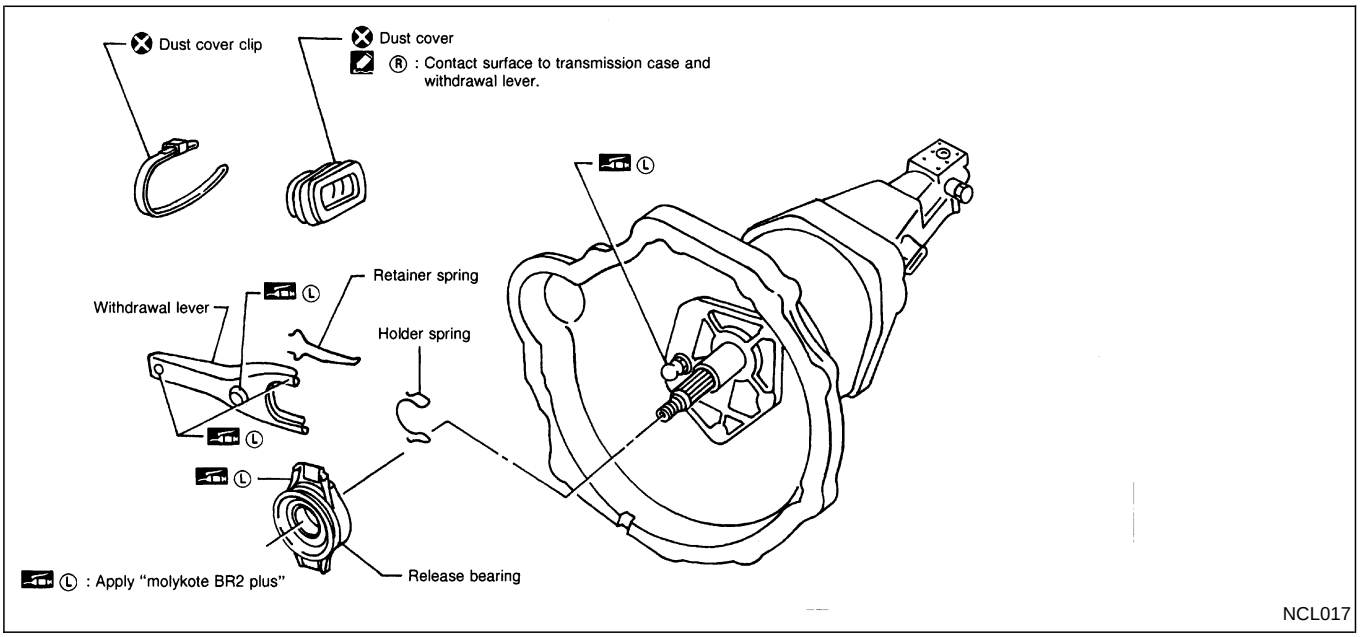
Clutch Operating Cylinder

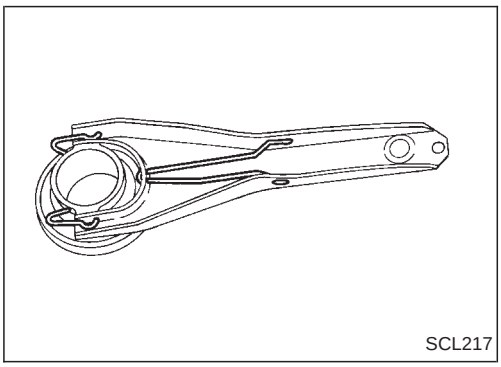


INSPECTION

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

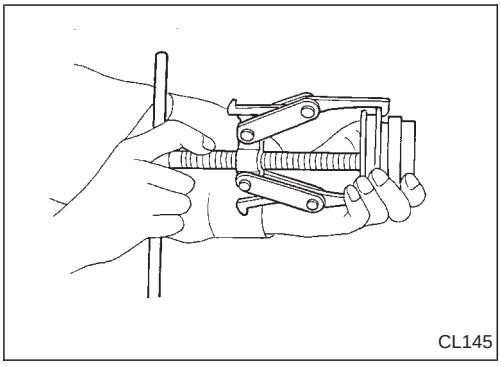
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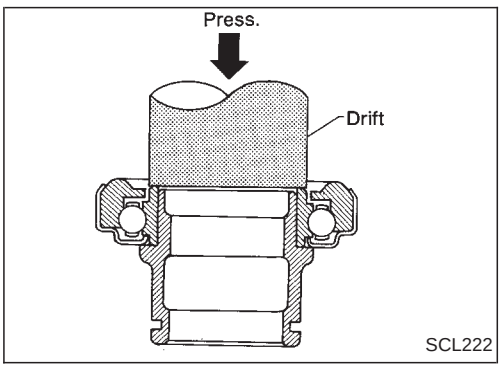


REMOVAL AND INSTALLATION

- Install retainer spring and holder spring.



- Remove release bearing.

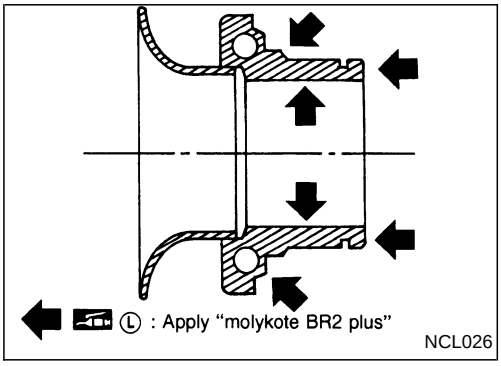


- Install release bearing with suitable drift.

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INSPECTION

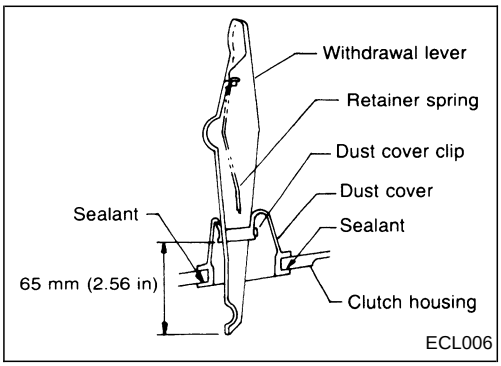
- Check release bearing to see that it rolls freely and is free from noise, cracks, pitting or wear. Replace if necessary.
- Check release sleeve and withdrawal lever rubbing surface for wear, rust or damage. Replace if necessary.



LUBRICATION

- Apply recommended grease to contact surface and rubbing surface.

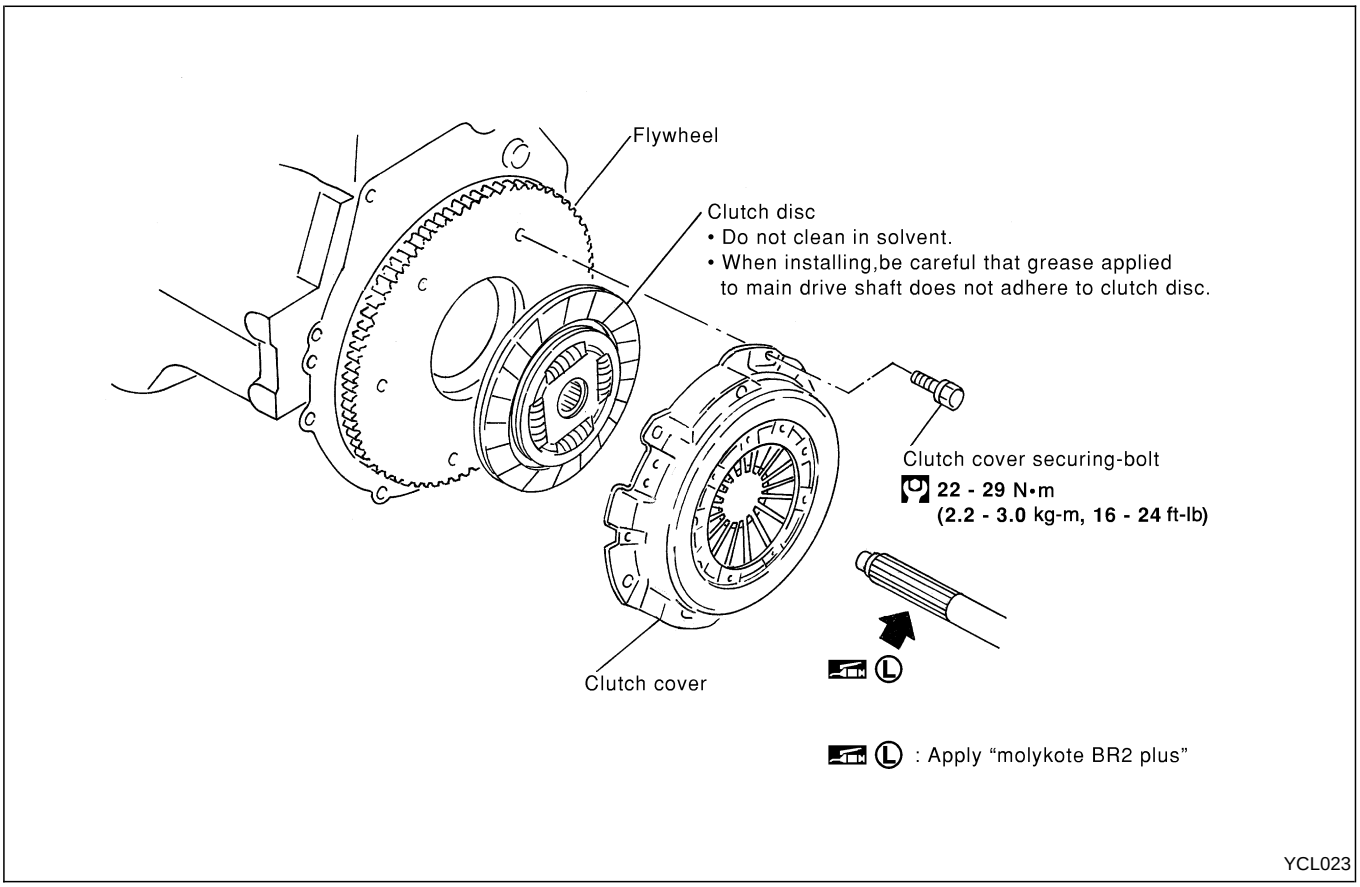
Too much lubricant might cause clutch disc facing damage.

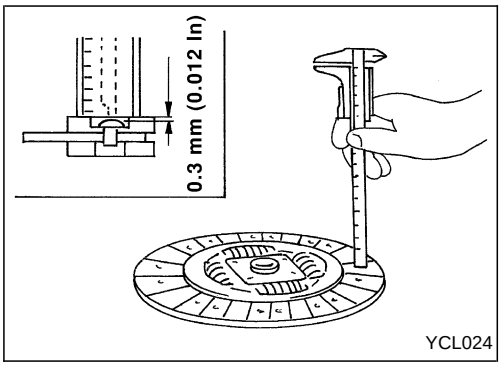


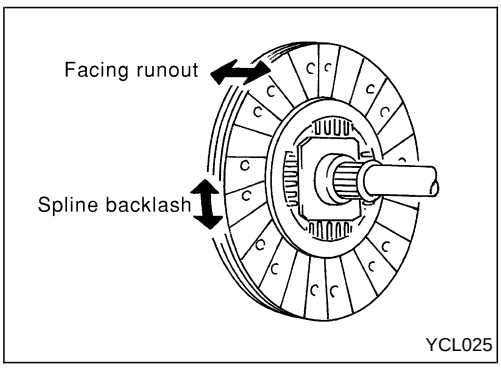
DUST COVER SEALING

- Apply recommended sealant to contact surface of dust cover to transmission case and withdrawal lever and then install dust cover clip.

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Clutch Disc

INSPECTION

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

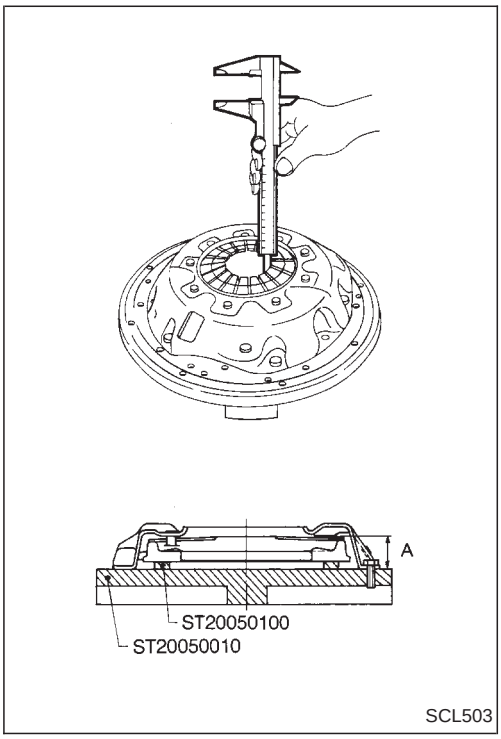
- Check clutch disc for spline backlash and facing runout.
  Maximum spline backlash (at outer edge of disc):
  1.0 mm (0.039 in)
  Runout limit:
  1.0 mm (0.039 in)
  Distance of runout check point (from hub center):
  120 mm (4.72 in)
- Check clutch disc for burns, discoloration or oil or grease leakage. Replace if necessary.

INSTALLATION

- Apply “molykote BR2 plus” grease to contact surface of splines to clutch disc hub.

Too much lubricant might damage clutch disc facing.

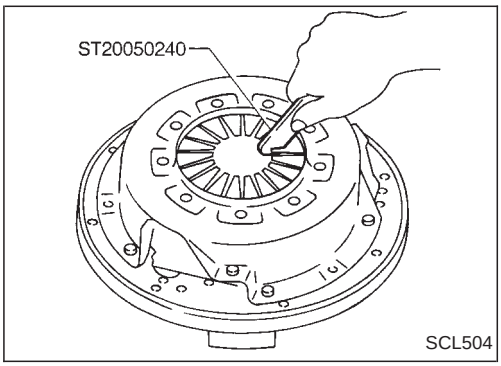
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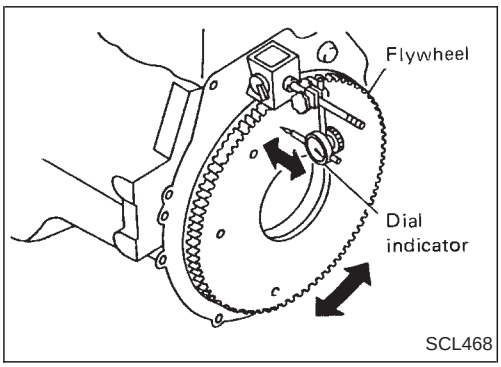
Clutch Cover and Flywheel

INSPECTION AND ADJUSTMENT

- Set Tools and check height and unevenness of diaphragm spring.
  Diaphragm spring height "A":
  36.5 - 38.5 mm (1.437 - 1.516 in)
- Check thrust rings for wear or damage by shaking cover assembly and listening for chattering noise, or lightly hammering on rivets for a slight cracking noise. Replace clutch cover assembly if necessary.
- Check pressure plate and clutch disc contact surface for slight burns or discoloration. Repair pressure plate with emery paper.
- Check pressure plate and clutch disc contact surface for deformation or damage. Replace if necessary.



- Adjust unevenness of diaphragm spring with Tool.
  Uneven limit:
  0.7 mm (0.028 in)

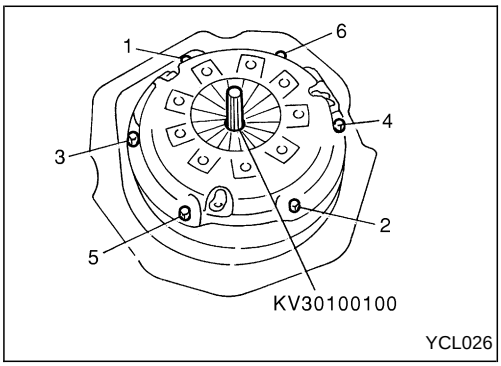


FLYWHEEL INSPECTION

- Check contact surface of flywheel for slight burns or discoloration. Repair flywheel with emery paper.
- Check flywheel runout.
  Runout (Total indicator reading):
  Refer to EM section. (Inspection — CYLINDER BLOCK)

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Clutch Cover and Flywheel (Cont'd)



INSTALLATION

- Insert Tool into clutch disc hub when installing clutch cover and disc.
- Tighten bolts in numerical order.
- **Be careful not to allow grease to contaminate clutch facing.**

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General Specifications

CLUTCH CONTROL SYSTEM

Type of clutch control	Hydraulic

CLUTCH MASTER CYLINDER

Inner diameter	mm (in)	15.87 (5/8)

CLUTCH OPERATING CYLINDER

Inner diameter	mm (in)	
LHD		17.46 (11/16)
RHD		19.05 (3/4)

CLUTCH DISC

Unit: mm (in)

Engine	TD27Ti	ZD30DDTi
Model	250	260
Facing size (Outer dia. x inner dia. x thickness)	250 x 160 x 3.7 (9.84 x 6.30 x 0.1457)	
Thickness of disc assembly under load	7.0 - 7.4 (0.276 - 0.291) Under a load of 5,884 N (600 kg, 1,323 lb)	

CLUTCH COVER

Engine		TD27Ti	ZD30DDTi
Model		250	260
Full load	N (kg, lb)	5,884 (600, 1,323)	6,760 (689, 1,520)

Inspection and Adjustment

CLUTCH PEDAL

Unit: mm (in)

Handle	LHD	RHD
Pedal height*	227 - 237 (8.94 - 9.33)	210 - 220 (8.27 - 8.66)
Pedal stroke	155 - 160 (6.10 - 6.30)	
Pedal free play (Backlash at clevis)	1.0 - 3.0 (0.039 - 0.118)	

*: Measured from surface of melt sheet to surface of pedal pad

CLUTCH DISC

Unit: mm (in)

Engine	TD27Ti	ZD30DDTi
Disc model	250	260
Rear limit of facing surface to rivet head	0.3 (0.012)	
Runout limit of facing	1 (0.04)	
Distance of runout check point (from the hub center)	120 (4.72)	
Maximum of spline backlash of spline (at outer edge of disc)	1.0 (0.039)	

CLUTCH COVER

Unit: mm (in)

Engine	TD27Ti	ZD30DDTi
Cover model	250	260
Diaphragm spring height	36.5 - 38.5 (1.437 - 1.516)	
Uneven limit of diaphragm spring toe height “A”	0.7 (0.028)	

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MANUAL TRANSMISSION

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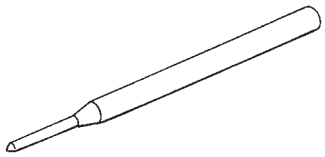
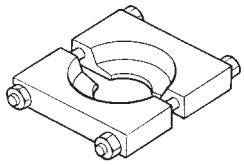
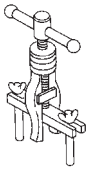
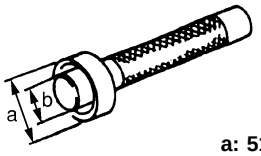
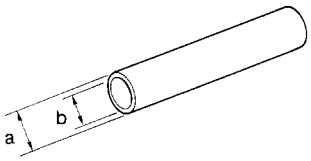
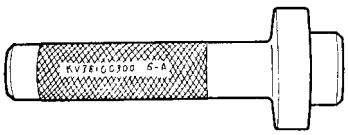
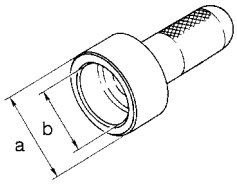
FS5R30A

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Special Service Tools

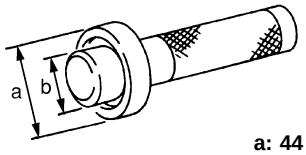
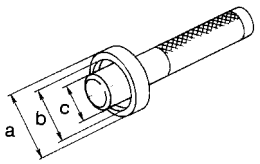
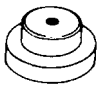
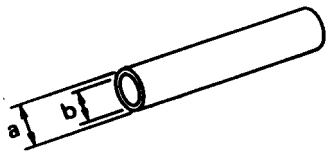
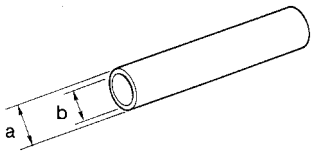
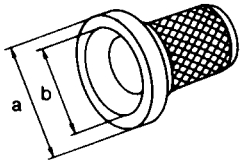
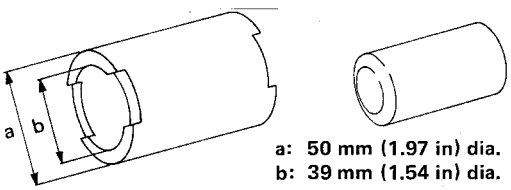
*: Special tool or commercial equivalent

Tool number Tool name	Description	
ST23540000* Pin punch		Removing and installing retaining pin
ST30031000* Puller		Removing 1st & 2nd synchronizer assembly Removing counter gear rear thrust bearing Removing main drive bearing
ST33290001* Puller		Removing rear oil seal
ST33230000* Drift	 **a: 51 mm (2.01 in) dia.** **b: 28.5 mm (1.122 in) dia.**	Removing mainshaft and counter gear
ST22350000* Drift	 **a: 34 mm (1.34 in) dia.** **b: 28 mm (1.10 in) dia.**	Removing counter gear front bearing (Use with KV38100300)
KV38100300* Drift	 **a: 54 mm (2.13 in) dia.** **b: 32 mm (1.26 in) dia.**	Removing counter gear front bearing (Use with ST22350000) Installing counter gear rear bearing
ST30720000* Drift	 **a: 77 mm (3.03 in) dia.** **b: 55.5 mm (2.185 in) dia.**	Removing mainshaft front bearing Installing mainshaft front bearing

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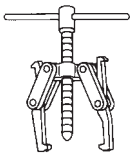
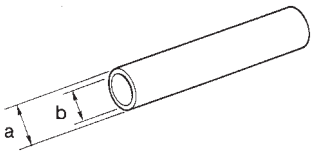
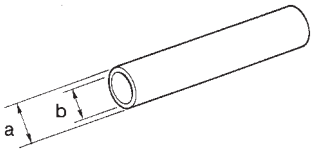
Special Service Tools (Cont'd)

*: Special tool or commercial equivalent

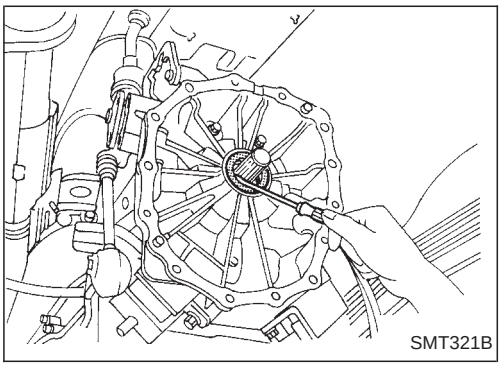
Tool number Tool name	Description	
ST33210000* Drift	 **a: 44 mm (1.73 in) dia.** **b: 24.5 mm (0.965 in) dia.**	Installing counter gear front bearing Installing front cover oil seal
ST33220000* Drift	 **a: 37 mm (1.46 in) dia.** **b: 22 mm (0.87 in) dia.**	Removing and installing counter gear rear end bearing
ST30613000* Drift	 **a: 72 mm (2.83 in) dia.** **b: 48 mm (1.89 in) dia.**	Installing main drive gear bearing
ST37750000* Drift	 **a: 40 mm (1.57 in) dia.** **b: 31 mm (1.22 in) dia.**	Removing counter gear rear bearing Installing OD gear bushing Installing reverse cone Installing reverse counter gear Installing counter gear rear end bearing
ST22452000* Drift	 **a: 40 mm (1.57 in) dia.** **b: 36 mm (1.42 in) dia.**	Installing reverse hub Installing mainshaft rear bearing
ST33400001* Drift	 **a: 60 mm (2.36 in) dia.** **b: 47 mm (1.85 in) dia.**	Installing rear oil seal
ST36730000* Drift	 a: 50 mm (1.97 in) dia. b: 39 mm (1.54 in) dia. **a: 50 mm (1.97 in) dia.** **b: 39 mm (1.54 in) dia.**	Installing sub-gear on reverse idler gear

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Commercial Service Tools

Tool name	Description	
Puller	 NT077	Removing counter gear rear end bearing Removing mainshaft rear bearing Removing reverse synchronizer hub Removing reverse counter gear
Drift	 **a: 44.5 mm (1.752 in) dia.** **b: 38.5 mm (1.516 in) dia.** ST22452000	Installing sub-gear snap ring
Drift	 **a: 44.5 mm (1.752 in) dia.** **b: 40.5 mm (1.594 in) dia.** ST22452000	Installing OD main gear Installing reverse gear bushing

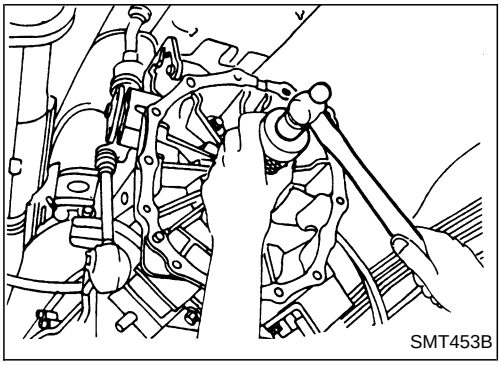
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SMT321B

Replacing the Rear Oil Seal

REMOVAL

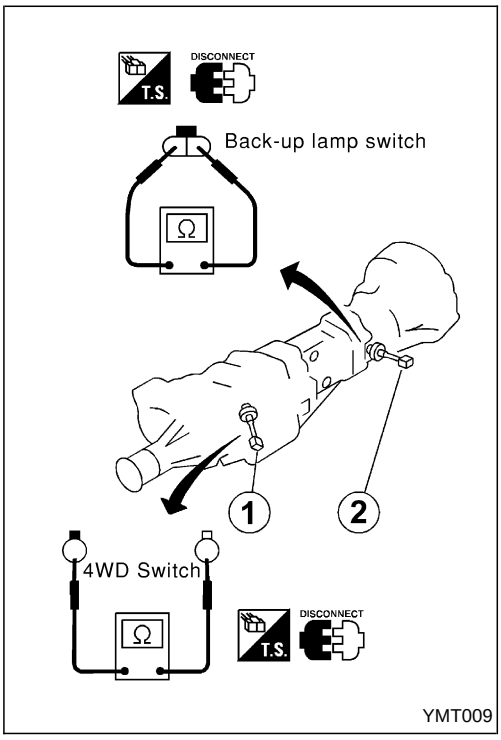
1. Remove transfer assembly. See Section TF.
2. Remove rear oil seal.


SMT453B

REPLACEMENT

1. Install rear oil seal.
   Before installation, apply multi-purpose grease to oil seal lip.
2. Install transfer assembly. See Section TF.

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Check of Position Switches

Switch			Gear position	Continuity
①	4WD*	Transfer case	4WD	Yes
			Except 4WD	No
②	Back-up lamp	Transmission case	Reverse	Yes
			Except reverse	No

*: Ensure both sides of 4WD 2-pole double-throw switch is operational, refer to “Warning lamps” wiring diagram in EL-Section.

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Removal

Transmission has to be removed as a unit together with transfer box.
Remove transmission assembly as follows:

- Disconnect negative battery terminal.
- Remove shift levers of transmission and transfer.
- Remove front and rear propeller shafts. — Refer to PD section.
- **Insert plug into rear oil seal after removing propeller shaft.**
- **Remove RPM-sensor from transmission upper side.**

CAUTION:
Be careful not to damage spline, sleeve yoke and rear oil seal, when removing propeller shaft.

- Remove torsion bar spring. — Refer to FA Section.
- Remove third crossmember (the one supporting front differential).
- Remove fifth crossmember (the one situated at the rear of transfer).
- Support transmission and transfer with a suitable transmission jack.

WARNING:
Support transmission and transfer with suitable jacks, while removing them.

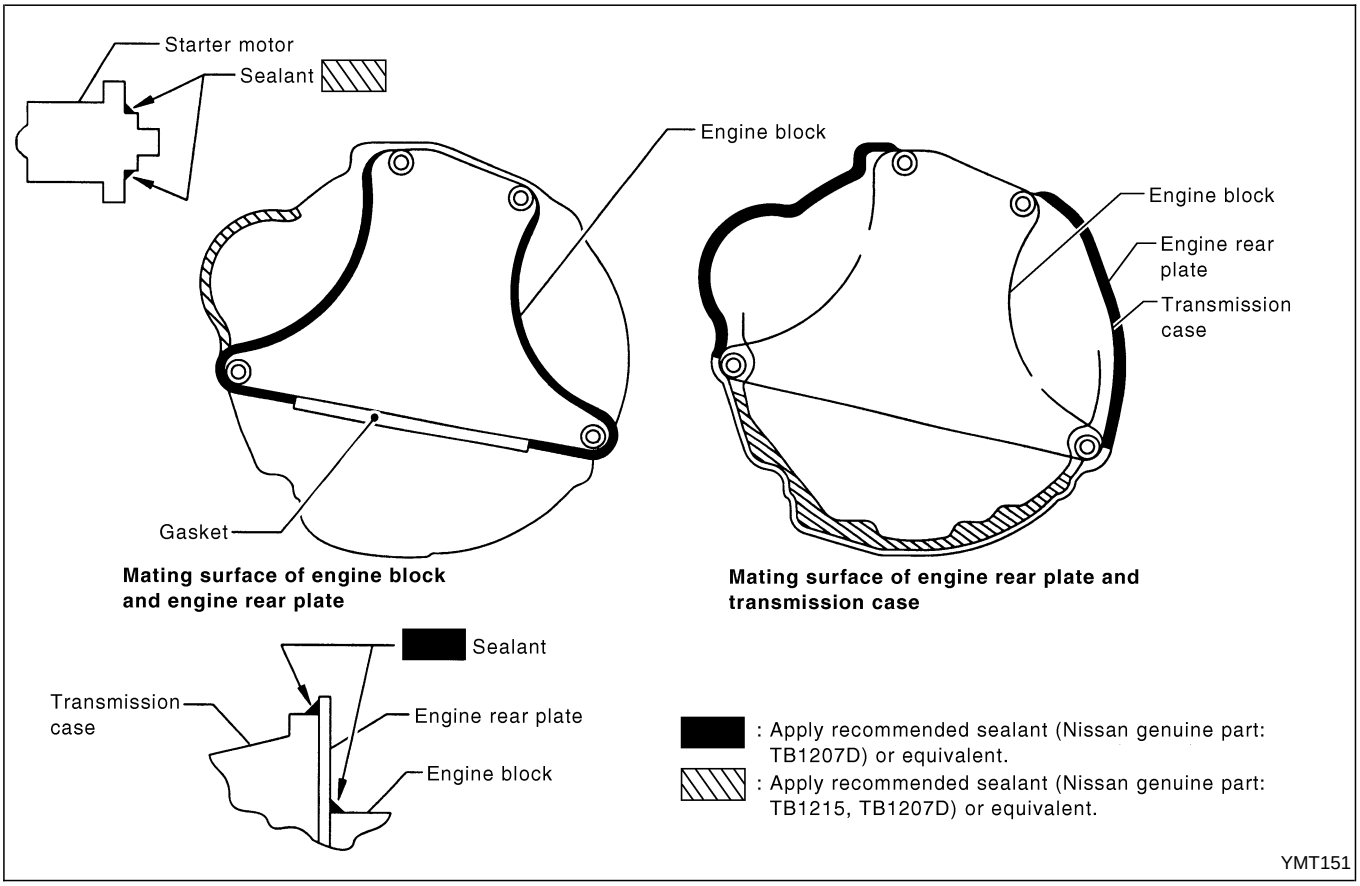
- Remove fourth crossmember (the one supporting transmission).
- Remove clutch operating cylinder.
- Remove starter motor.
- Remove exhaust tube bracket from transmission.
- Disconnect electrical connectors.
- Remove transmission from engine.

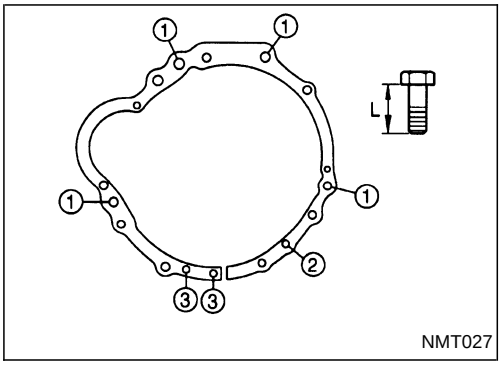
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Installation

Transmission has to be installed as a unit together with transfer box.
Install transmission assembly as follows:

- Apply sealant as below:



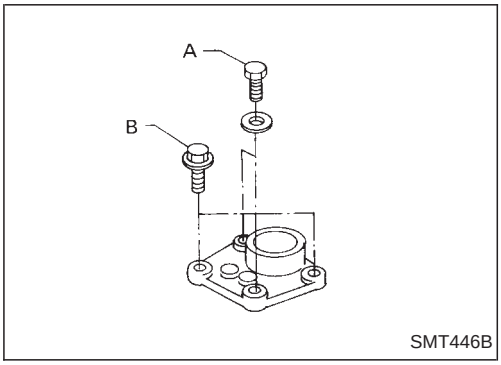


Bolt No.	Tightening torque N·m (kg-m, ft-lb)	Bolt length “L” - mm (in)
1	39 - 49 (4.0 - 5.0, 29 - 36)	57 (2.244)
2	18 - 22 (1.9 - 2.2, 14 - 16)	11 (0.433)
3	29 - 39 (3.0 - 4.0, 22 - 29)	100 (3.94)

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Installation (Cont'd)

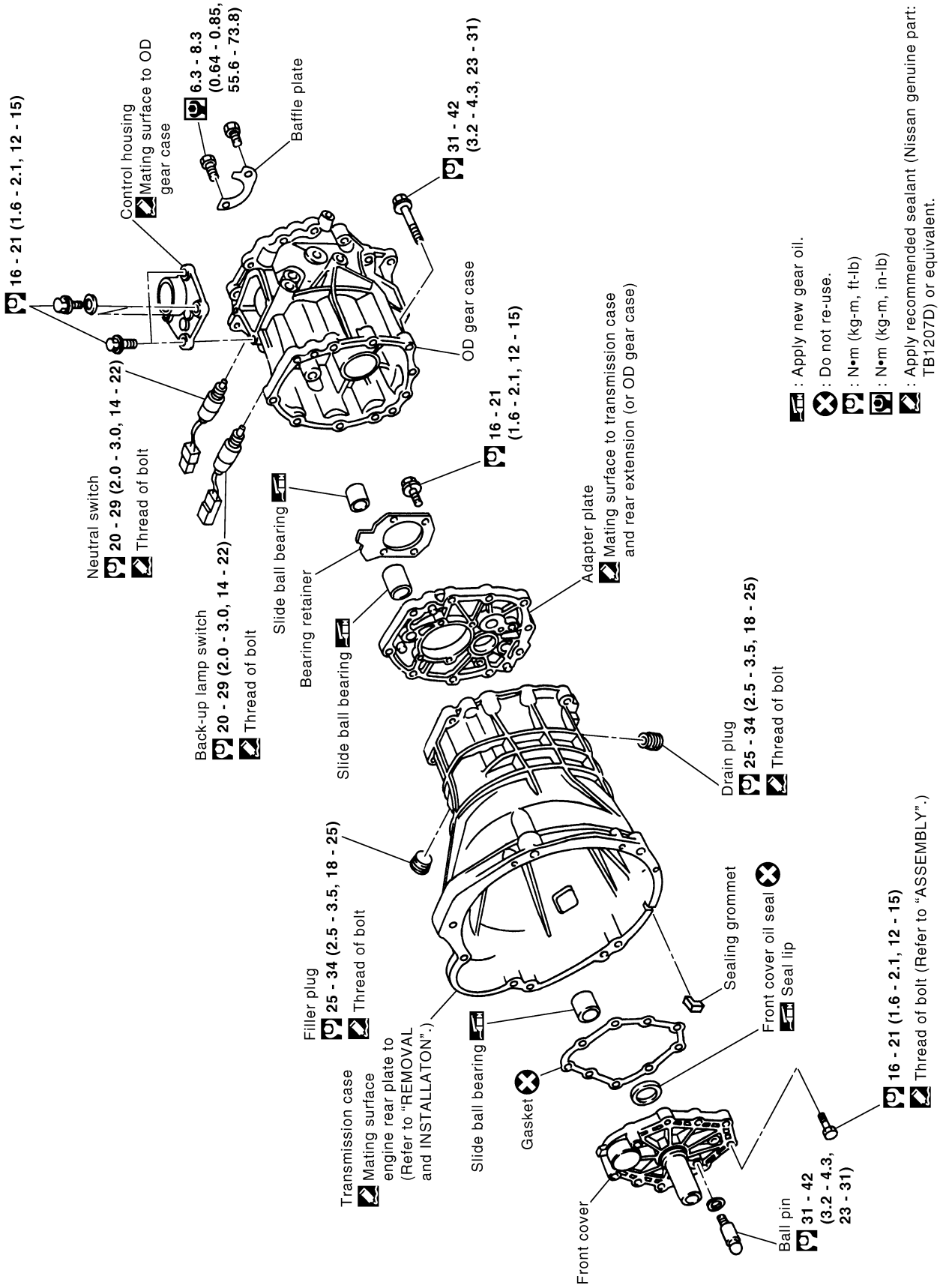
- Raise the unit with a hoist.
- Position the transmission assembly on a portable jack and secure it with a suitable tool.
  Lift the assembly until the gearbox input shaft faces its housing.
  Move the assembly towards the engine. The assembly must be rotated slightly so that the starter motor housing clears the projection on the companion floor. Insert input shaft into its housing (slightly raising the rear of the transfer box may facilitate the introduction of the shaft into its housing).
- Tighten the screws securing the gearbox to the engine.
  : 39 - 49 N·m (4.0 - 5.0 kg-m, 29 - 36 ft-lb)
- Connect the electrical wiring. Secure with the respective clips.
- Fit the RPM-sensor to the transmission upper side.
- Fit the exhaust pipe support bracket to the transfer box.
  : 13 - 16 N·m (1.3 - 1.6 kg-m, 9 - 12 ft-lb)
- Fit the starter motor. Secure the earth wire to the starter motor lower screw.
  : 31 - 41 N·m (3.2 - 4.2 kg-m, 23 - 30 ft-lb)
- Fit the clutch slave cylinder.
  : 30 - 40 N·m (3.1 - 4.1 kg-m, 22 - 30 ft-lb)
- Install fourth crossmember (Note the "front" mark).
  Crossmember fixing bolts to chassis:
  : 41 - 52 N·m (4.2 - 5.3 kg-m, 30 - 38 ft-lb)
  Crossmember fixing bolts to transmission:
  : 68 - 87 N·m (6.9 - 8.9 kg-m, 50 - 64 ft-lb)
- Take away the portable jack holding boxes assembly.
- Install fifth crossmember.
  : 59 - 78 N·m (6.0 - 8.0 kg-m, 43 - 58 ft-lb)
- Install third crossmember.
  : Screws: 41 - 52 N·m (4.2 - 5.3 kg-m, 30 - 38 ft-lb)
  Nuts: 68 - 87 N·m (6.9 - 8.9 kg-m, 50 - 64 ft-lb)
- Install torsion bar springs. — Refer to FA section.
- Install front and rear propeller shafts. — Refer to PD section.



- Install shift levers of transmission and transfer.
  : 14 - 18 N·m (1.4 - 1.8 kg-m, 10 - 13 ft-lb)
  Bolt head dimensions:
  Bolt A: 12 mm (0.472 in)
  Bolt B: 13 mm (0.512 in)
- Connect negative battery cable.

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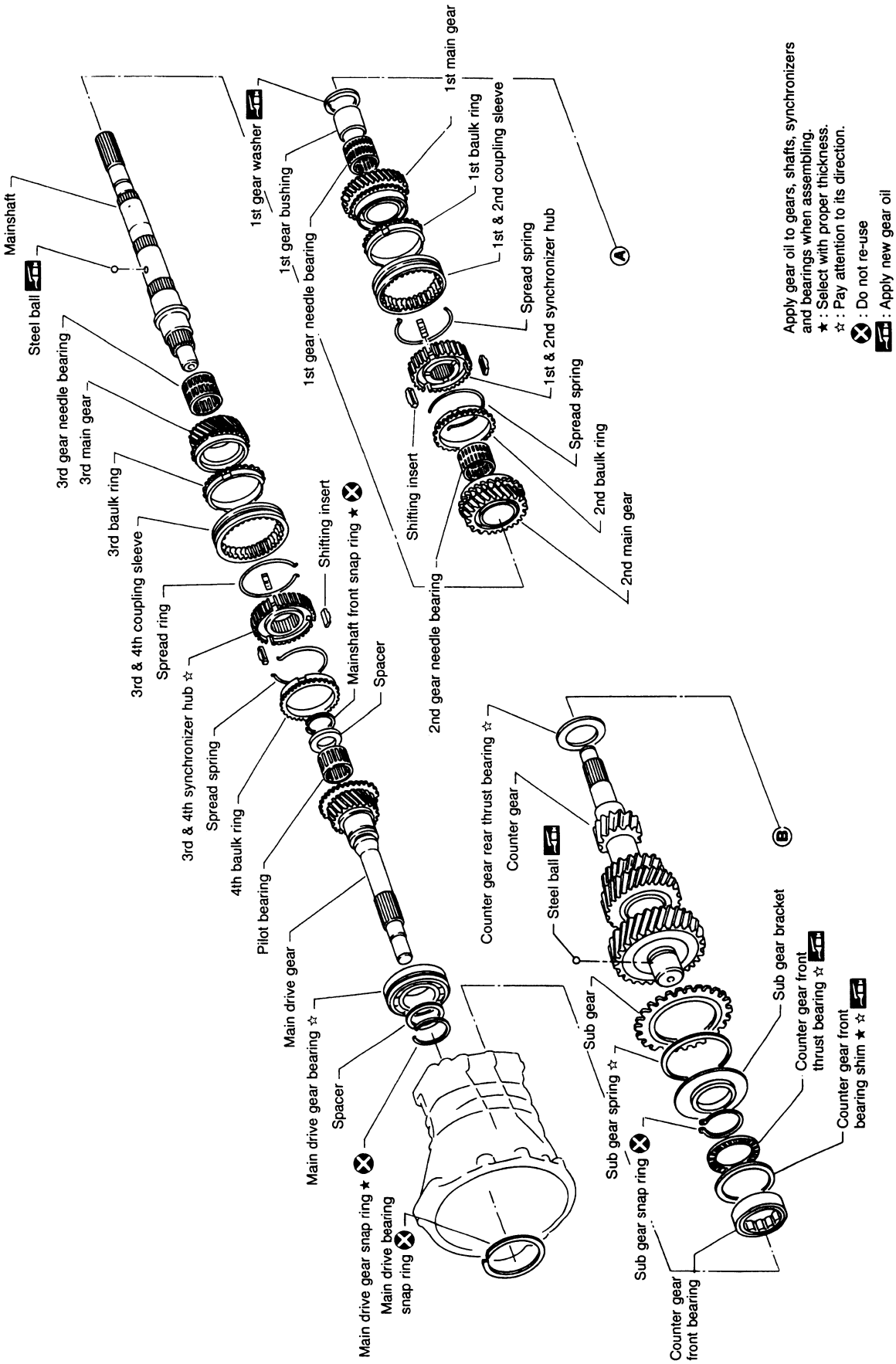
Case Components



YMT152

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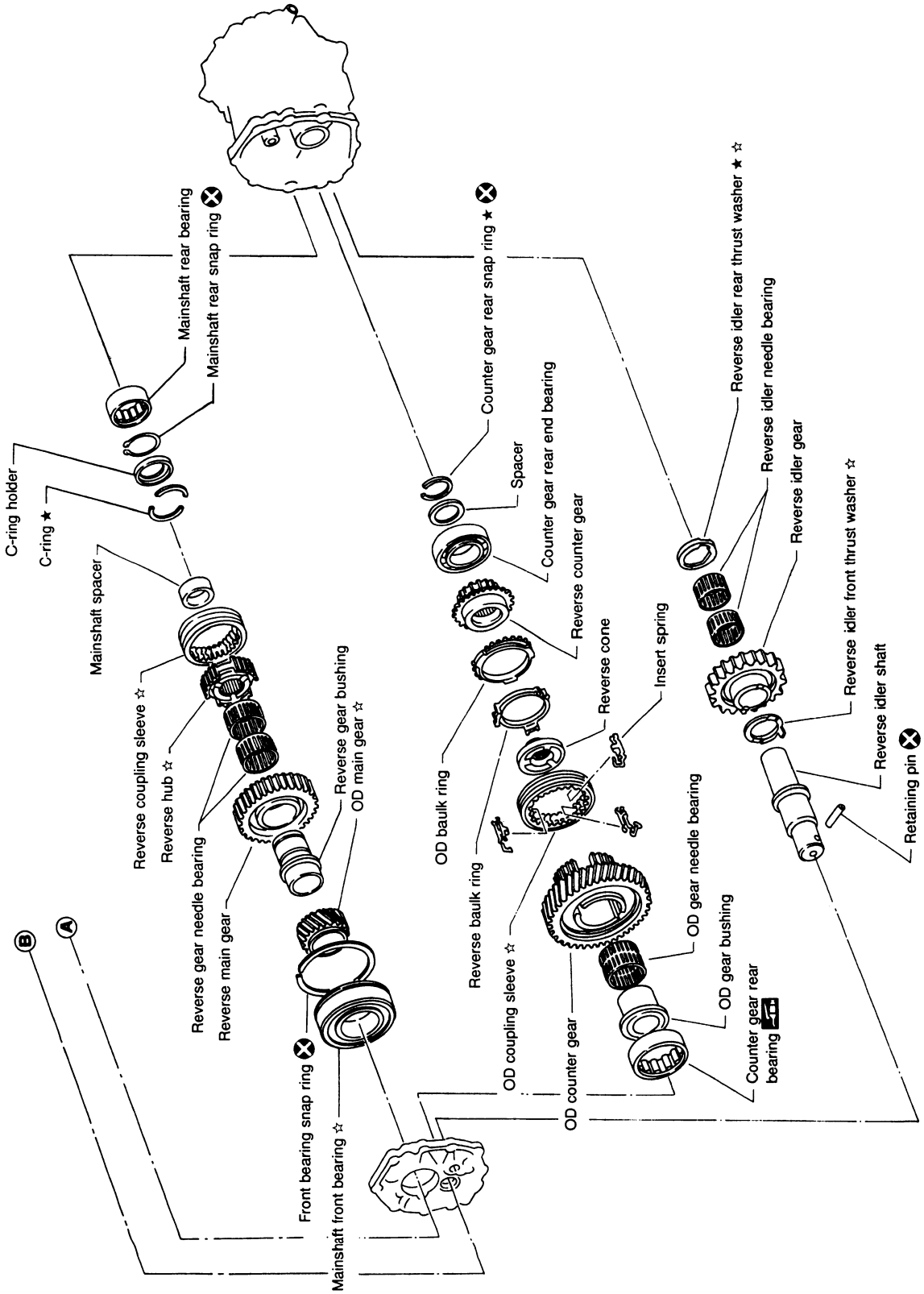
Gear Components



MT-3010

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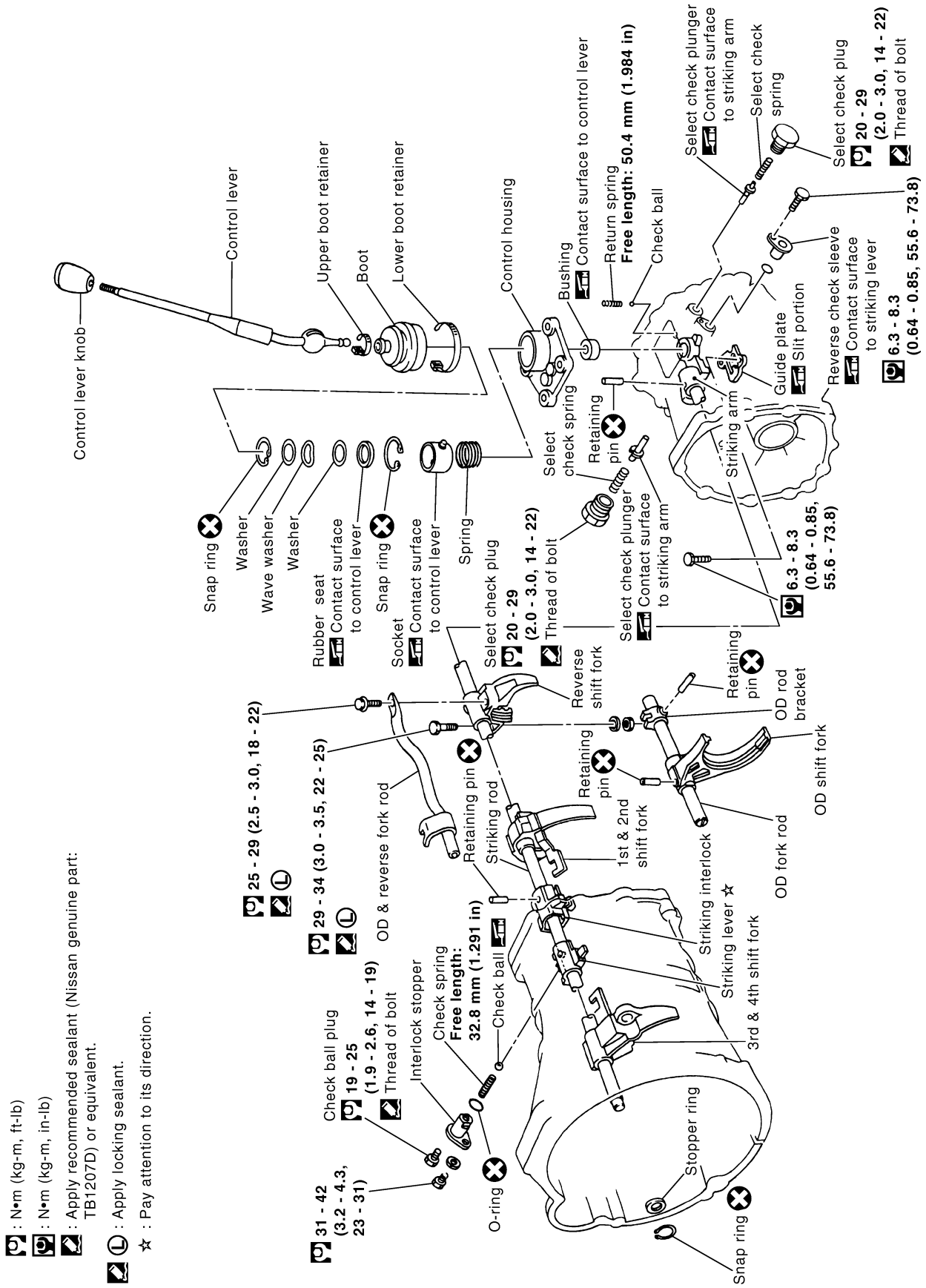
Gear Components (Cont'd)



NMT028

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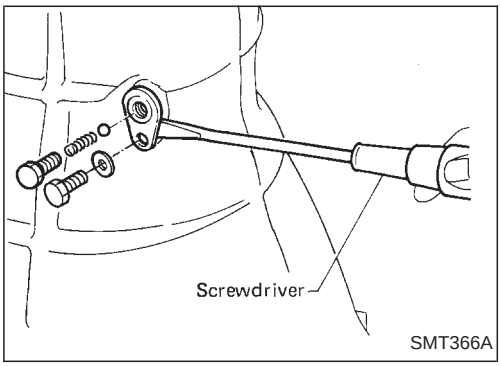
Shift Control Components



: N•m (kg-m, ft-lb)
: N•m (kg-m, in-lb)
: Apply recommended sealant (Nissan genuine part: TB1207D) or equivalent.
Ⓛ : Apply locking sealant.
☆ : Pay attention to its direction.

YMT153

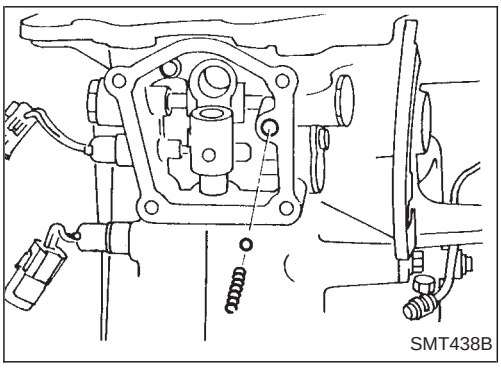
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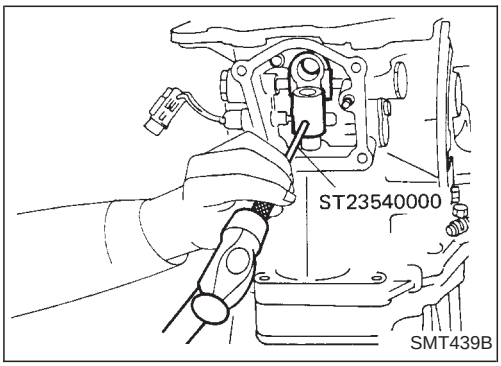
Case Components

1. Remove check ball plug, check spring and check ball. Then remove interlock stopper.

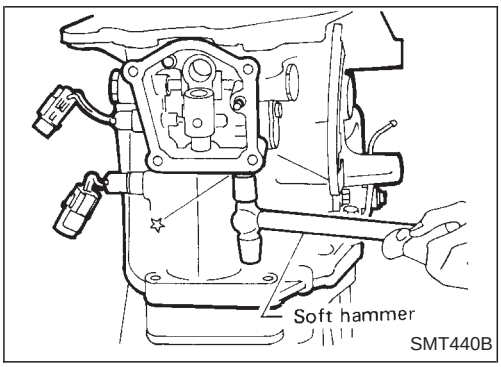
If interlock assembly is removed as a unit, the check ball can fall into transmission case.



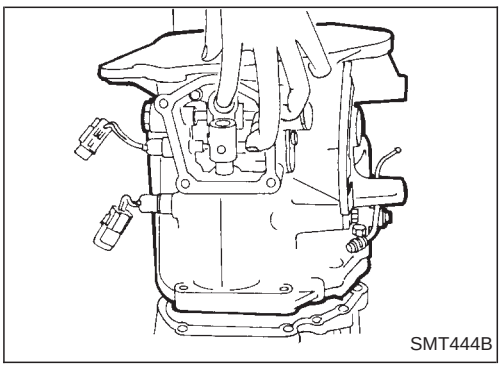
2. Remove control housing, return spring and check ball.



3. Drive out retaining pin from striking arm.

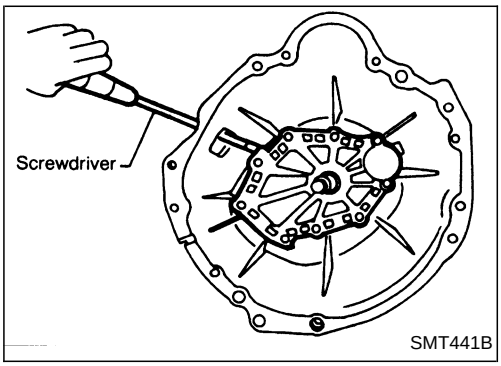


4. Remove OD gear case together with striking arm by tapping lightly.

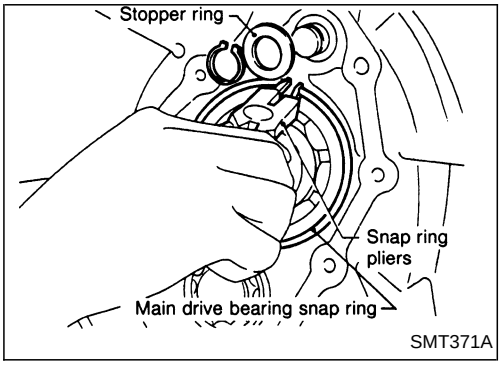


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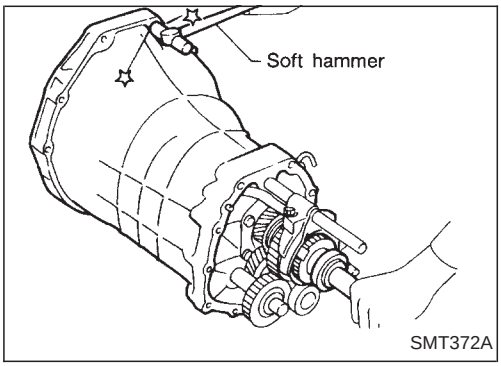
Case Components (Cont'd)



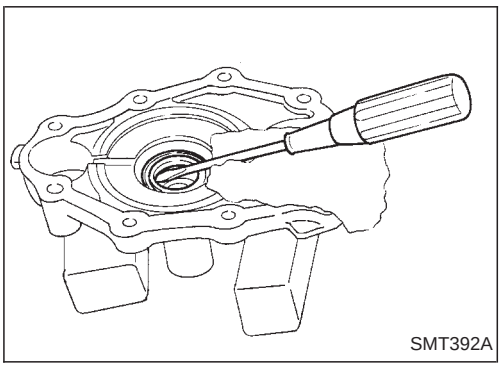
5. Remove front cover and gasket.



6. Remove stopper ring and main drive bearing snap ring.

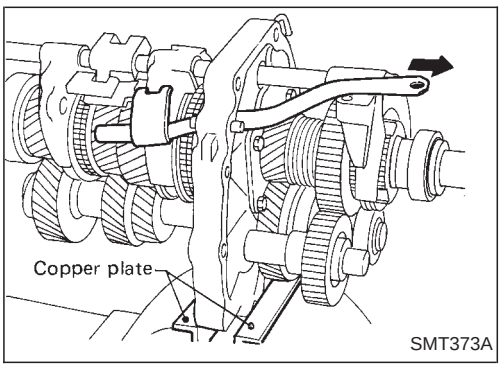


7. Remove transmission case by tapping lightly.



8. Remove front cover oil seal.

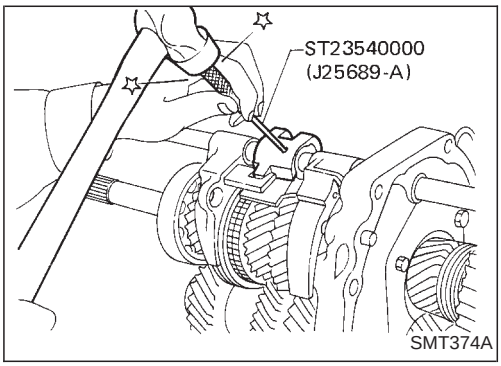
Shift Control Components



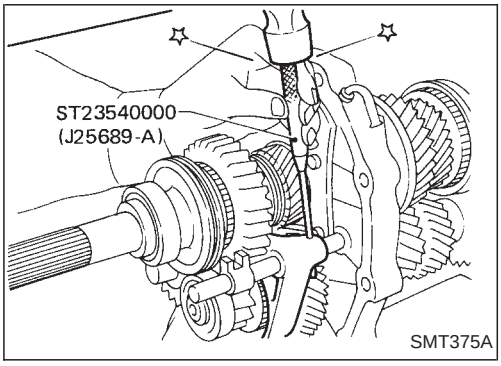
1. Mount adapter plate on vise.
2. Remove OD & reverse fork rod.

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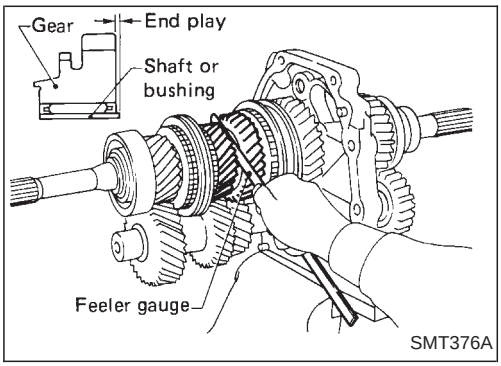
Shift Control Components (Cont'd)



3. Drive out retaining pin from striking lever.
4. While pulling out striking rod, remove striking lever and striking interlock. Then remove 1st & 2nd, 3rd & 4th and reverse shift fork.



5. Drive out retaining pin from OD shift fork.
6. Pull out OD fork rod and then remove OD shift fork.

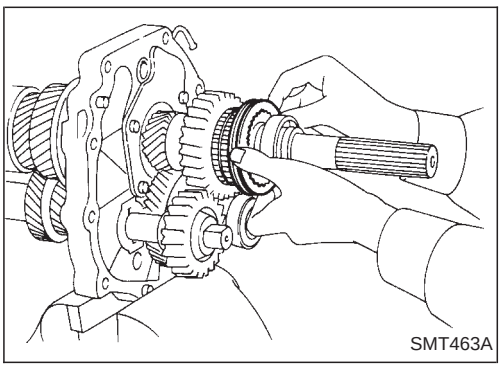


Gear Components

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

Gear	End play mm (in)
1st main gear	0.23 - 0.33 (0.0091 - 0.0130)
2nd main gear	0.23 - 0.33 (0.0091 - 0.0130)
3rd main gear	0.23 - 0.33 (0.0091 - 0.0130)
OD counter gear	0.23 - 0.33 (0.0091 - 0.0130)
Reverse main gear	0.33 - 0.43 (0.0130 - 0.0169)

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

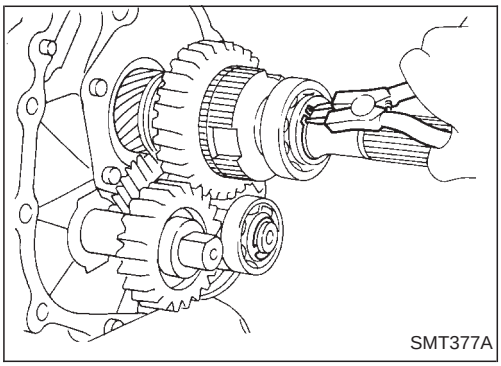


2. Remove rear side components on mainshaft and counter gear.

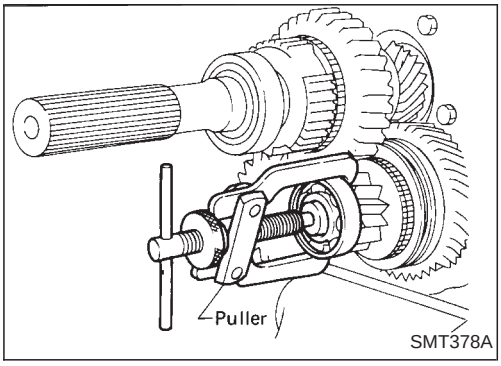
a. Remove reverse coupling sleeve.

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Gear Components (Cont'd)

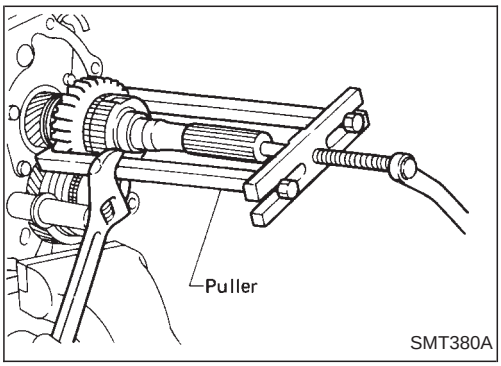

SMT377A

b. Remove mainshaft rear snap ring and counter gear snap ring.
c. Remove C-ring holder and mainshaft C-rings from mainshaft. Use punch and hammer to remove C-rings.



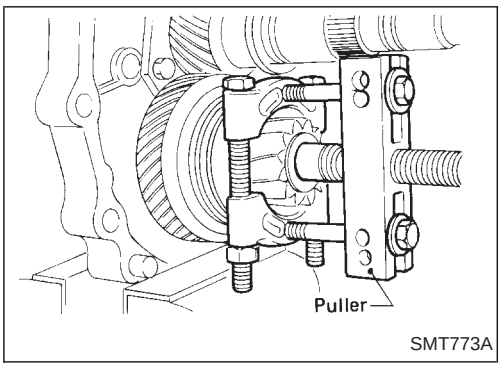
SMT378A

d. Pull out counter gear ring and bearing.
e. Remove reverse idler gear and reverse idler thrust washers.



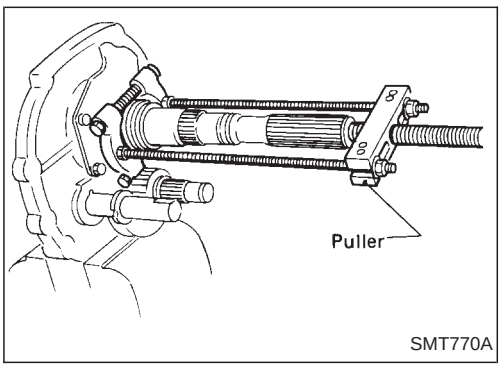
SMT380A

f. Pull out reverse main gear together with mainshaft spacer and reverse synchronizer hub. Then remove reverse gear needle bearings.



SMT773A

g. Pull out reverse counter gear.
h. Remove OD coupling sleeve together with OD baulk ring, reverse baulk ring and spring inserts.

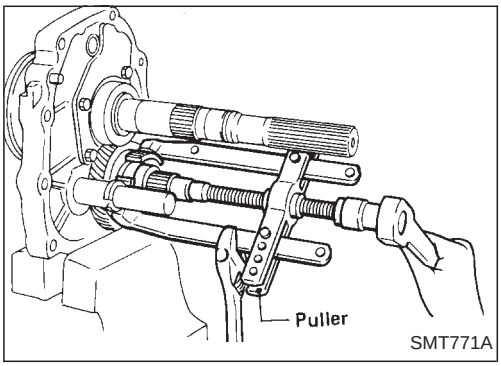


SMT770A

i. Pull out reverse gear bushing.

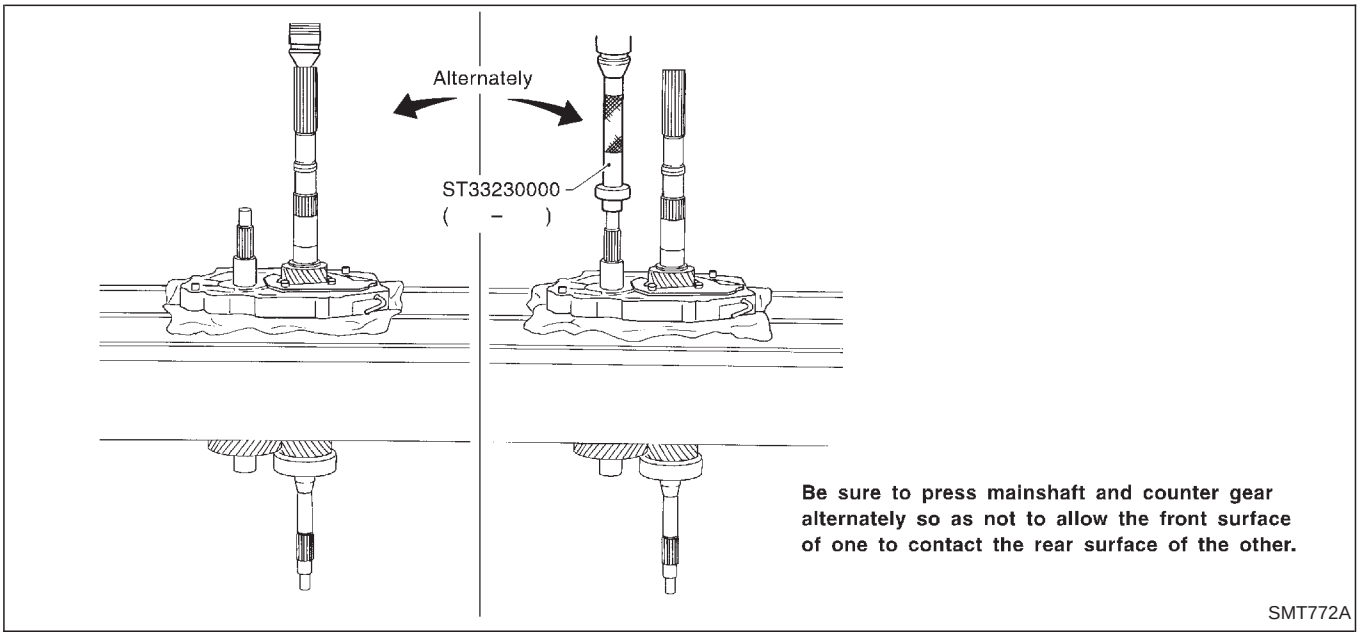
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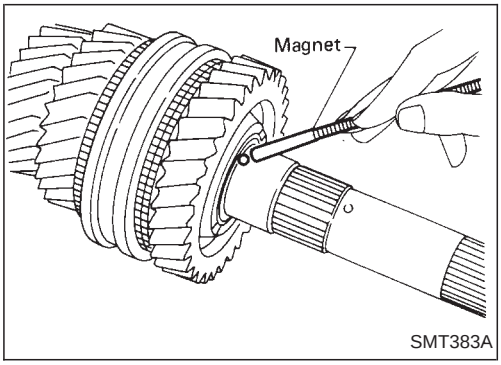
Gear Components (Cont'd)



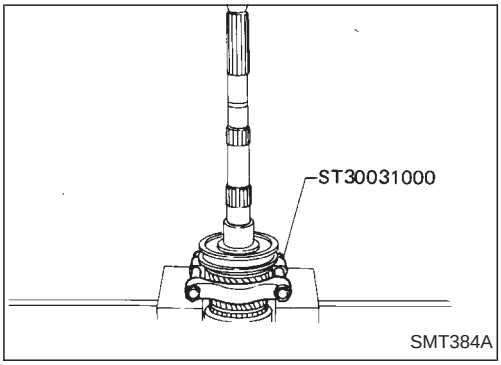
j. Pull out OD counter gear together with reverse cone.

3. Press out mainshaft and counter gear alternately.





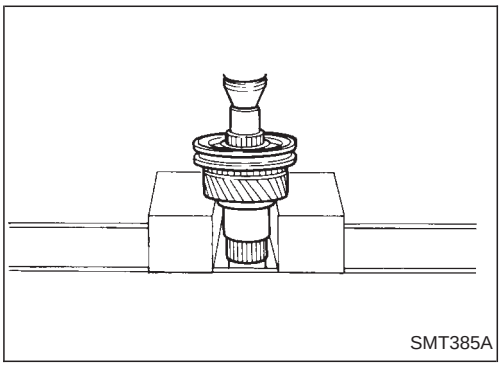
4. Remove front side components on mainshaft.
a. Remove 1st gear washer and steel ball.
b. Remove 1st main gear and 1st gear needle bearing.



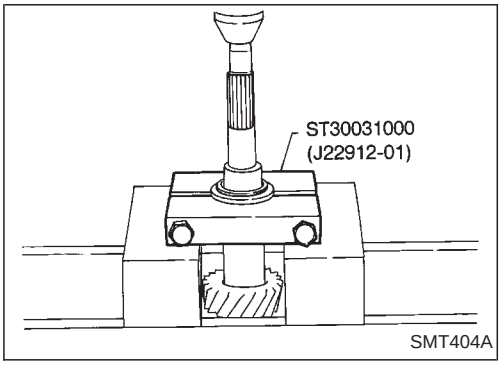
c. Press out 2nd main gear together with 1st gear bushing and 1st & 2nd synchronizer assembly.
d. Remove mainshaft front snap ring.

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Gear Components (Cont'd)

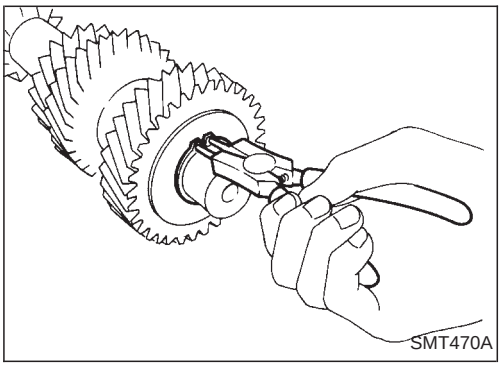

SMT385A

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

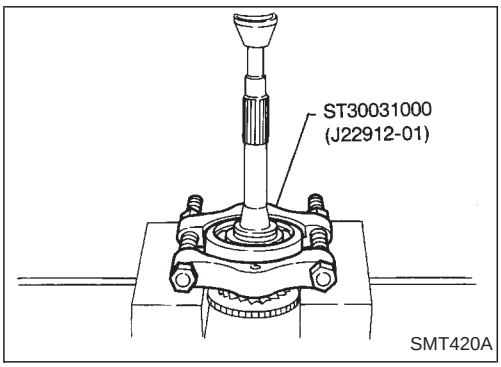


SMT404A

5. Remove front side components on counter gear.
a. Remove counter gear rear thrust bearing.


SMT470A

b. Remove sub-gear components.



SMT420A

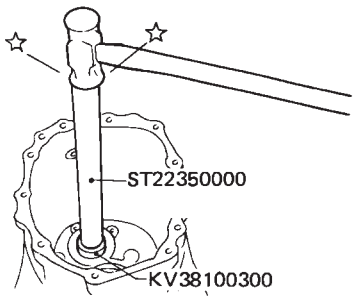
6. Remove main drive gear bearing.
a. Remove main drive gear snap ring and spacer.
b. Press out main drive gear bearing.

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Gear Components (Cont'd)

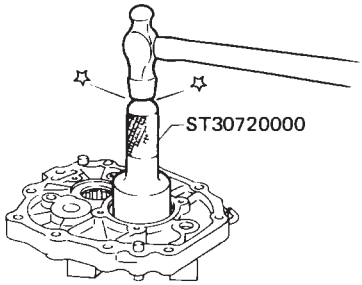
7. Remove bearings from case components.

Counter gear front bearing in transmission case



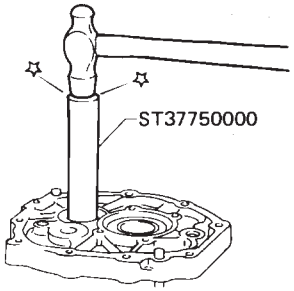
SMT388A

Mainshaft front bearing in adapter plate



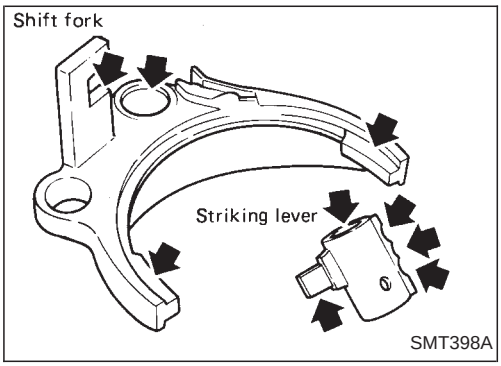
SMT396A

Counter gear rear bearing in adapter plate



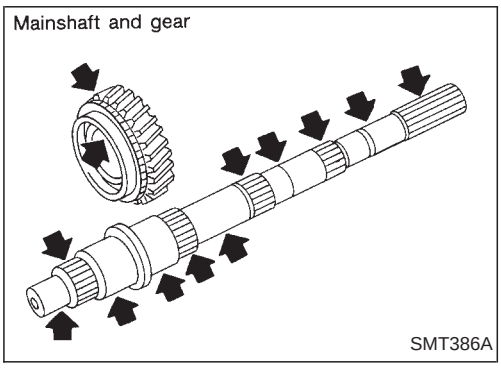
SMT394A

http://vnx.su/



Shift Control Components

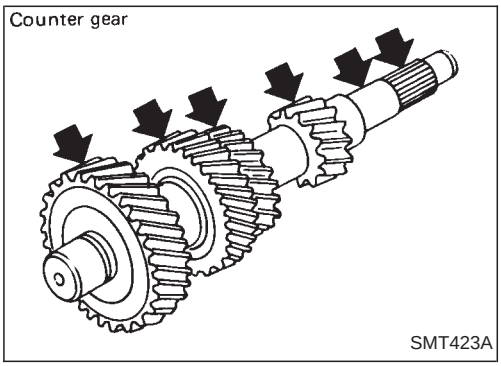
- Check contact surface and sliding surface for wear, scratches, projections or other damage.

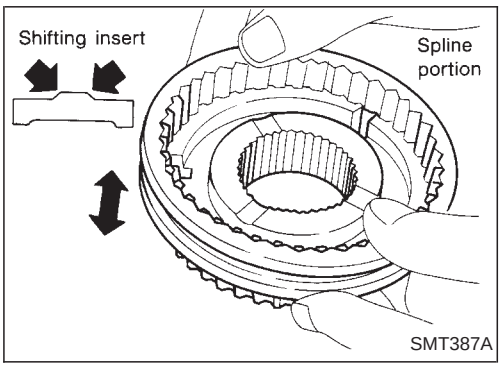


Gear Components

GEARS AND SHAFTS

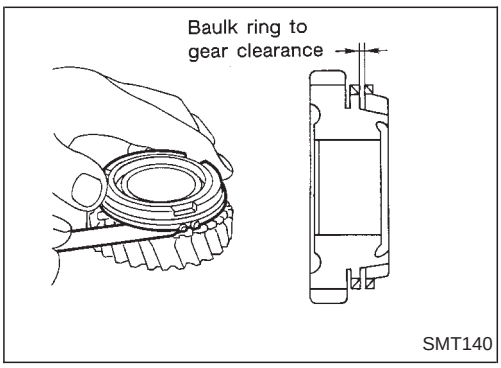
- Check shafts for cracks, wear or bending.
- Check gears for excessive wear, chips or cracks.





SYNCHRONIZERS

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



Clearance between baulk ring and gear

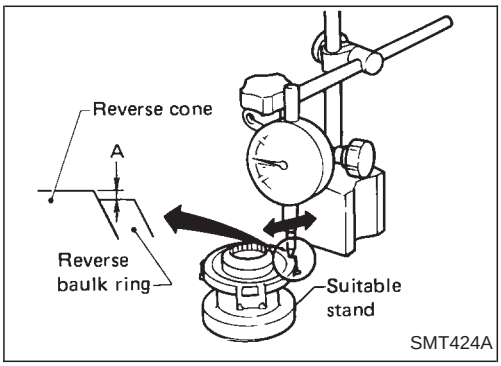
Unit: mm (in)

	Standard	Wear limit
1st & 2nd	1.05 - 1.3 (0.0413 - 0.0512)	0.7 (0.028)
3rd & main drive	1.05 - 1.3 (0.0413 - 0.0512)	0.7 (0.028)
OD	1.05 - 1.3 (0.0413 - 0.0512)	0.7 (0.028)

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

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Gear Components (Cont'd)



SMT424A

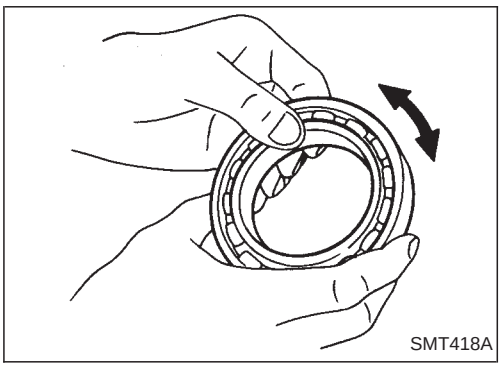
- Measure wear of reverse baulk ring.

a. Place baulk ring in position on reverse cone.
b. While holding baulk ring against reverse cone as far as it will go, measure dimension "A" with dial indicator.

Unit: mm (in)

	Standard	Wear limit
Dimension "A"	−0.1 to 0.35 (−0.0039 to 0.0138)	0.7 (0.028)

c. If dimension "A" is larger than the wear limit, replace baulk ring.


SMT418A

BEARINGS

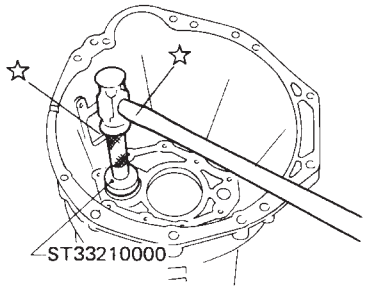
- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.

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Gear Components

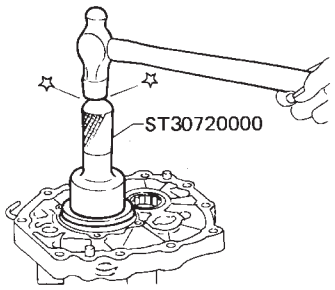
1. Install bearings into case components.

Counter gear front bearing in transmission case



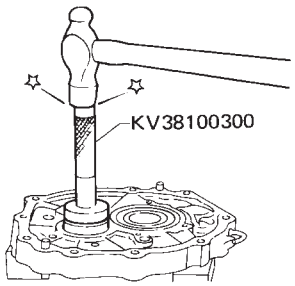
SMT389A

Mainshaft front bearing in adapter plate

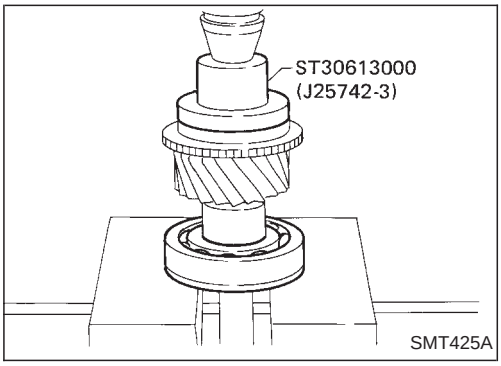


SMT397A

Counter gear rear bearing in adapter plate

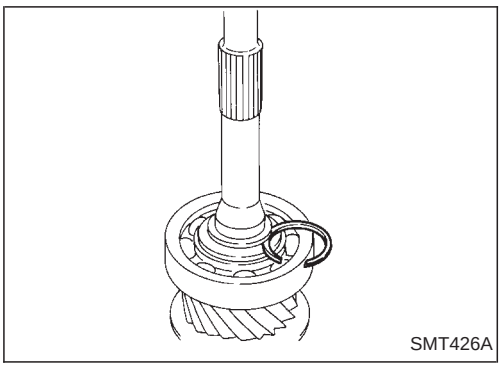


SMT395A



SMT425A

2. Install main drive gear bearing.
a. Press main drive gear bearing.
b. Install main drive gear spacer.



SMT426A

c. Select proper main drive gear snap ring to minimize clearance of groove.

Allowable clearance of groove:
0 - 0.1 mm (0 - 0.004 in)

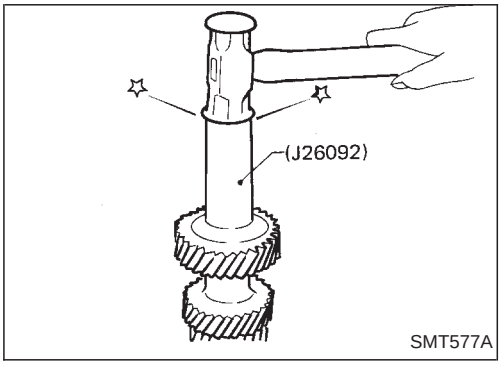
Main drive gear snap ring

Thickness mm (in)	Part number
1.89 (0.0744)	32204-01G00
1.98 (0.0780)	32204-01G01
2.05 (0.0807)	32204-01G02
2.12 (0.0835)	32204-01G03
2.19 (0.0862)	32204-01G04

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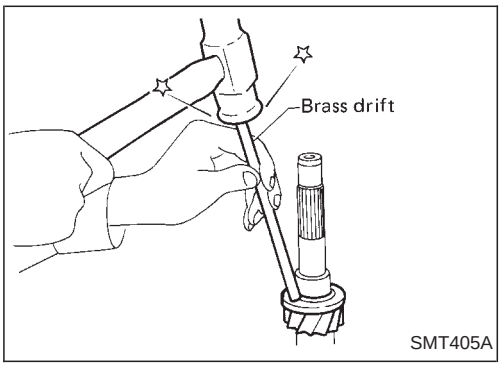
Gear Components (Cont'd)

d. Install selected snap ring on main drive gear.

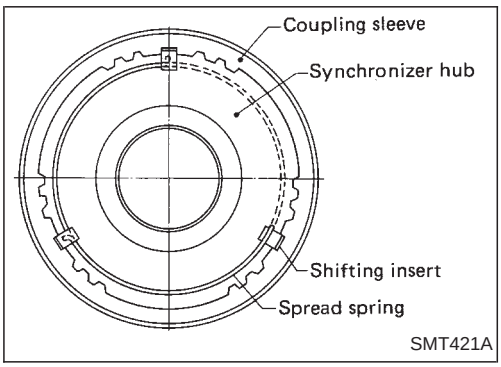


3. Install components on counter gear.
a. Install sub-gear components.

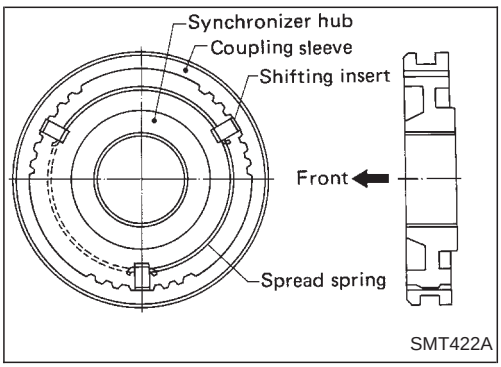
When installing sub-gear snap ring, tap sub-gear snap ring into position on counter gear.



b. Install counter gear rear thrust bearing.



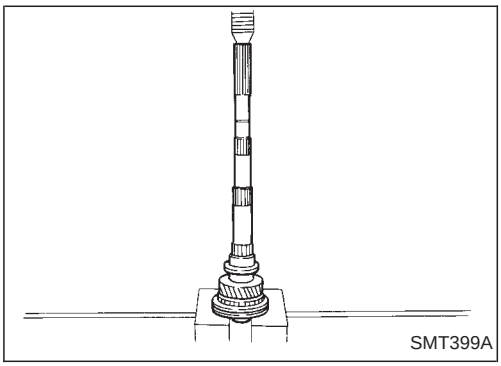
4. Install front side components on mainshaft.
a. Assemble 1st & 2nd synchronizer.



b. Assemble 3rd & 4th synchronizer.

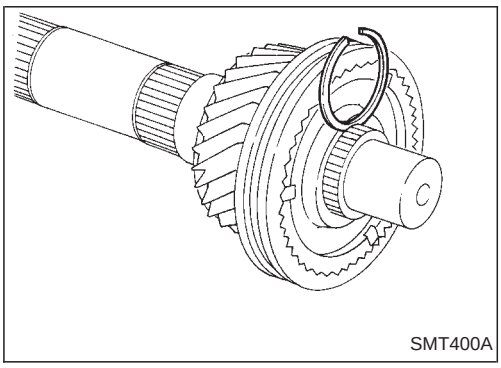
http://vnx.su/

Gear Components (Cont'd)


SMT399A

c. Press on 3rd & 4th synchronizer assembly together with 3rd main gear and 3rd gear needle bearing.

Pay attention to direction of synchronizer assembly.


SMT400A

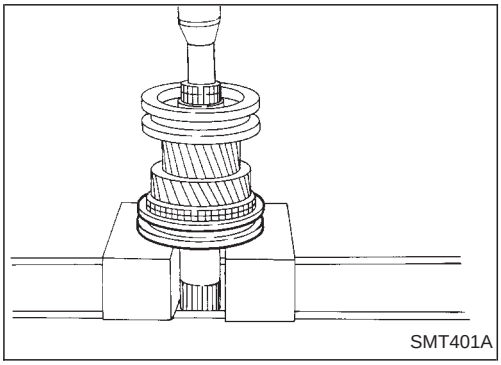
d. Select proper snap ring to minimize clearance of groove.

Allowable clearance of groove:
0 - 0.1 mm (0 - 0.004 in)

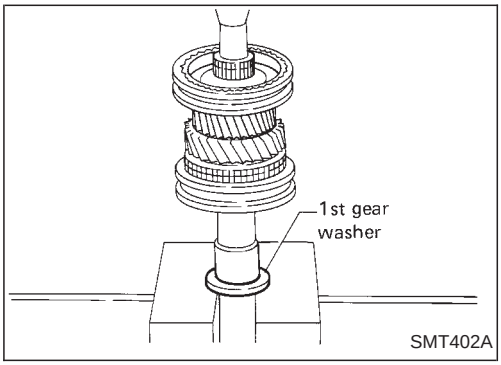
Mainshaft front snap ring

Thickness mm (in)	Part number
1.89 (0.0744)	32204-01G00
1.98 (0.0780)	32204-01G01
2.05 (0.0807)	32204-01G02
2.12 (0.0835)	32204-01G03
2.19 (0.0862)	32204-01G04

e. Install selected snap ring on mainshaft.


SMT401A

f. Press on 1st & 2nd synchronizer assembly together with 2nd main gear and 2nd gear needle bearing.

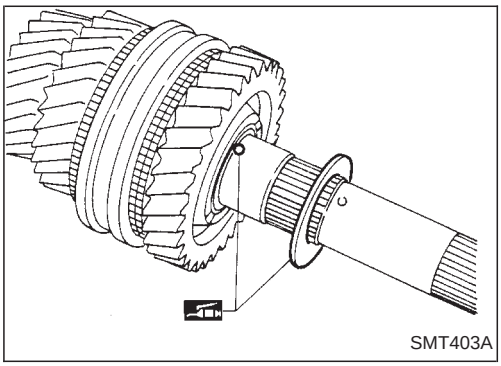


SMT402A

g. Press on 1st gear bushing using 1st gear washer.
h. Install 1st main gear and needle bearing.

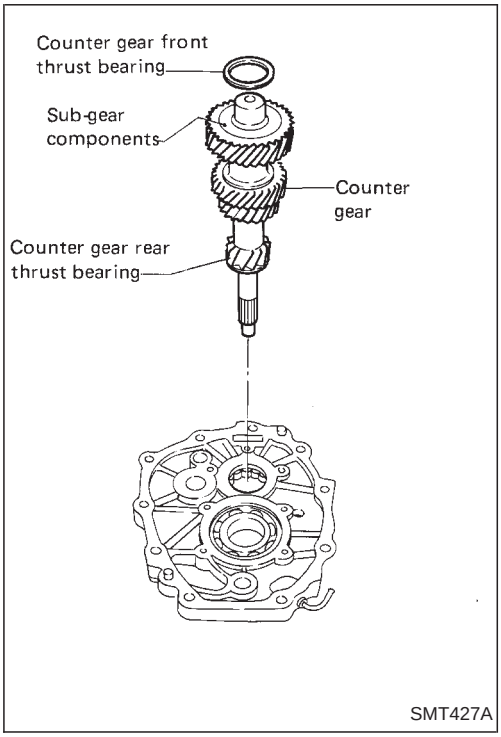
http://vnx.su/

Gear Components (Cont'd)


SMT403A

i. Install steel ball and 1st gear washer.

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



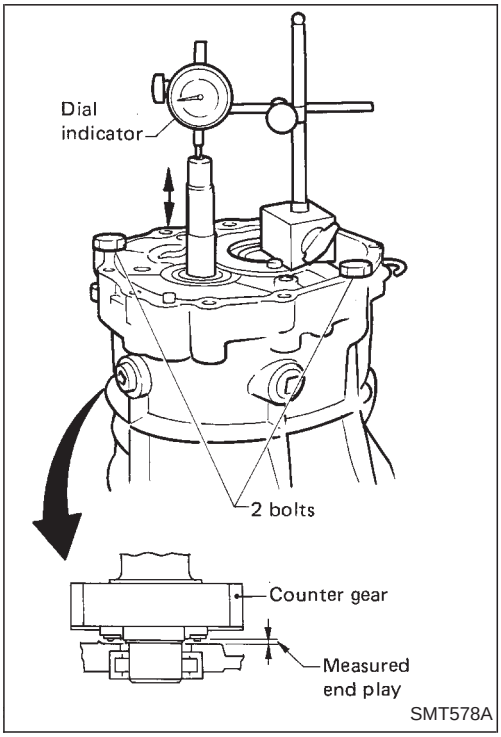
SMT427A

5. Select proper counter gear front bearing shim when replacing transmission case, counter gear, counter gear thrust bearing or sub-gear components.

a. Install counter gear with sub-gear components, counter gear front and rear thrust bearing on adapter plate.

b. Remove counter gear front bearing shim from transmission case.

c. Place adapter plate and counter gear assembly in transmission case (case inverted).



SMT578A

d. Tighten adapter plate to transmission case using 2 bolts.

e. Place dial indicator on rear end of counter gear.

f. Move counter gear up and down and measure dial indicator deflection.

g. Select proper shim using table below as a guide.

Counter gear end play:

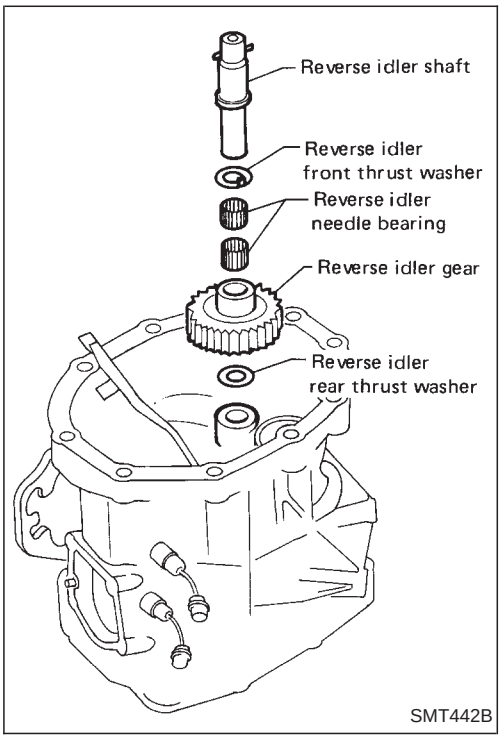
0.10 - 0.25 mm (0.0039 - 0.0098 in)

Table for selecting proper counter gear front bearing shim

Dial indicator deflection mm (in)	Thickness of proper washer mm (in)	Part number
0.93 - 1.02 (0.0366 - 0.0402)	0.88 (0.0346)	32216-01G11
1.03 - 1.12 (0.0406 - 0.0441)	0.96 (0.0378)	32216-01G12
1.13 - 1.22 (0.0445 - 0.0480)	1.04 (0.0409)	32216-01G13
1.23 - 1.32 (0.0484 - 0.0520)	1.12 (0.0441)	32216-01G14
1.33 - 1.42 (0.0524 - 0.0559)	1.28 (0.0504)	32216-01G15
1.43 - 1.52 (0.0563 - 0.0598)	1.36 (0.0535)	32216-01G16
1.53 - 1.62 (0.0602 - 0.0638)	1.44 (0.0567)	32216-01G17

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Gear Components (Cont'd)

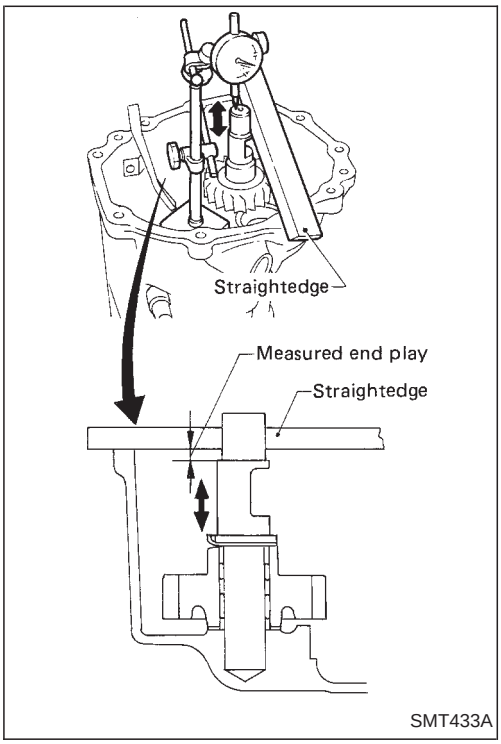


6. Select proper reverse idler rear trust washer when replacing OD gear case, reverse idler gear, reverse idler shaft or reverse idler thrust washer.

a. Install reverse idler gear, reverse idler needle bearings, reverse idler thrust washers and reverse idler shaft into OD gear case.

When replacing reverse idler rear washer, install either A or B.
Reverse idler rear thrust washer.

	Thickness mm (in)	Part number
A	1.97 (0.0776)	32284-01G10
B	2.07 (0.0815)	32284-01G11



b. Place dial indicator on front end of reverse idler shaft.

c. Put straightedge on front surface of OD gear case as a stopper for reverse idler shaft.

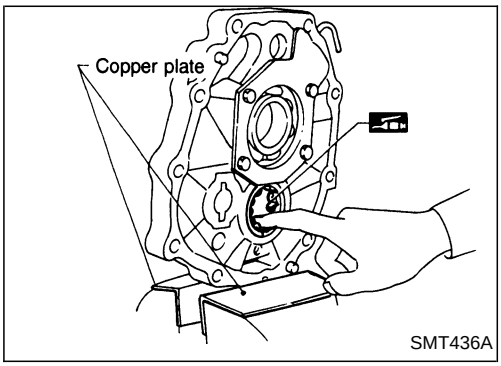
d. Move reverse idler shaft up and down and measure reverse idler gear end play.

Reverse idler gear end play:
0.30 - 0.53 mm (0.0118 - 0.0209 in)

e. If not within specification, replace reverse idler rear thrust washer with the other (A or B) and check again.

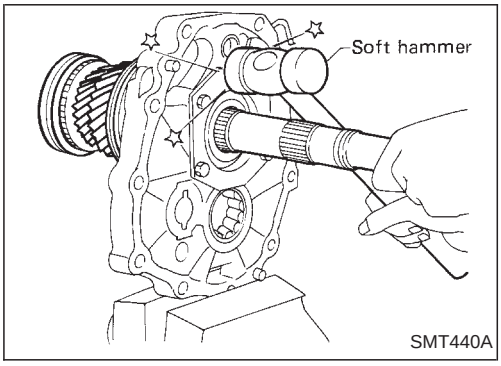
http://vnx.su/

Gear Components (Cont'd)



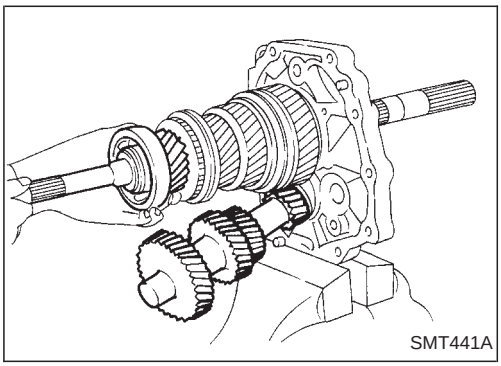
7. Install mainshaft and counter gear on adapter plate and main drive gear on mainshaft.

a. Mount adapter plate on vise and apply multi-purpose grease to counter gear rear bearing.

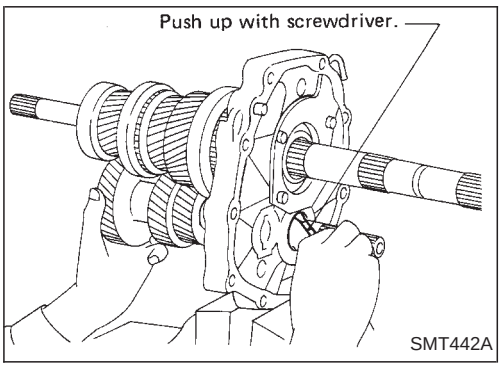


b. Install mainshaft a little on mainshaft front bearing.

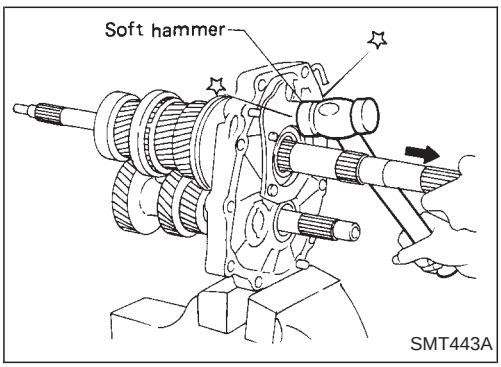
To allow for installation of counter gear, do not install mainshaft completely.



c. Install counter gear on counter gear rear bearing and install main drive gear, pilot bearing and spacer on mainshaft.



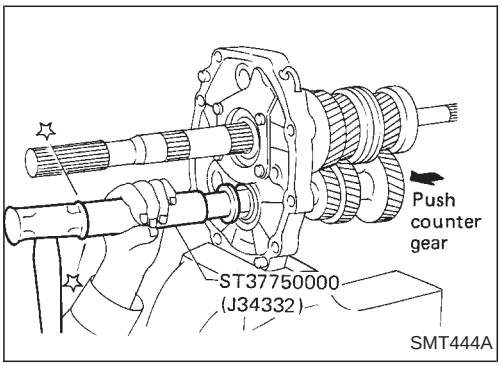
When installing counter gear into counter gear rear bearing, push up on upper roller of counter gear rear bearing with screwdriver.



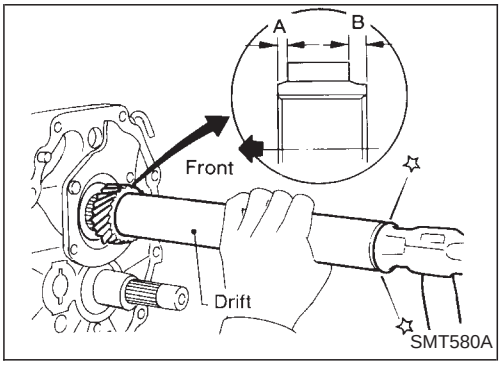
d. Install mainshaft and counter gear completely by tapping rear side of adapter plate and pulling mainshaft.

http://vnx.su/

Gear Components (Cont'd)



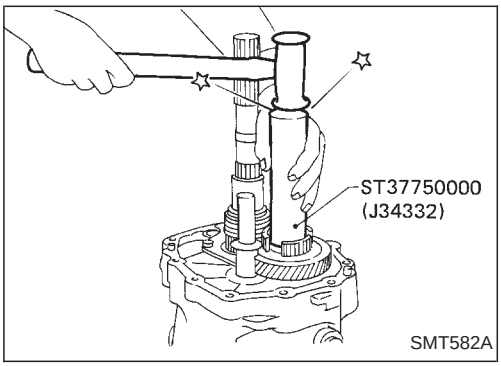
8. Install rear side components on mainshaft and counter gear.
a. Install OD gear bushing while pushing on the front of counter gear.



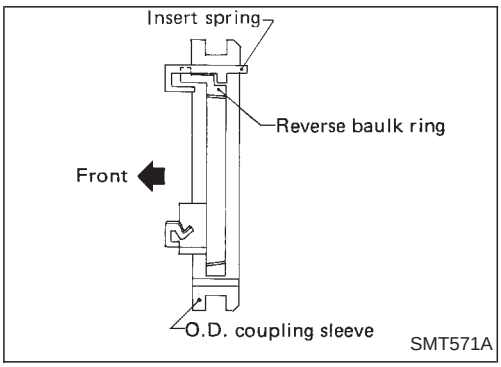
b. Install OD main gear.

Pay attention to direction of OD main gear. (B is wider than A as shown at left.)

c. Install adapter plate with gear assembly onto transmission case.
d. Install OD gear needle bearing and then install OD counter gear and reverse idler shaft.

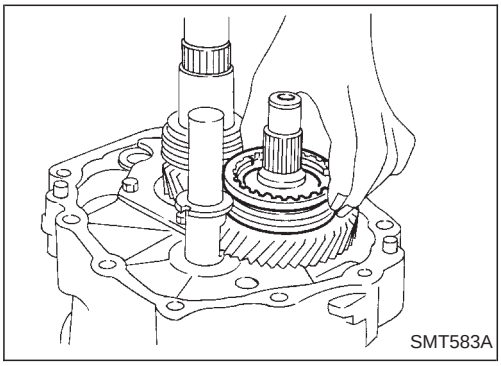


e. Install reverse cone.



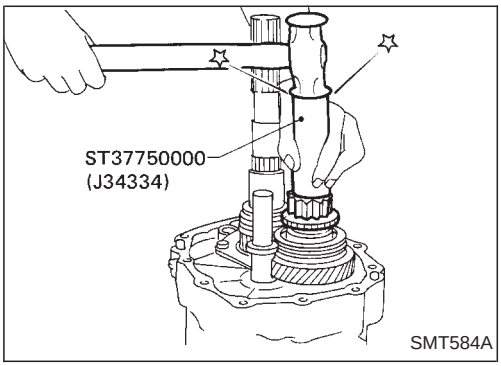
f. Install insert springs and reverse baulk ring on OD coupling sleeve. Then install them and OD baulk ring on OD counter gear.

Pay attention to direction of OD coupling sleeve.

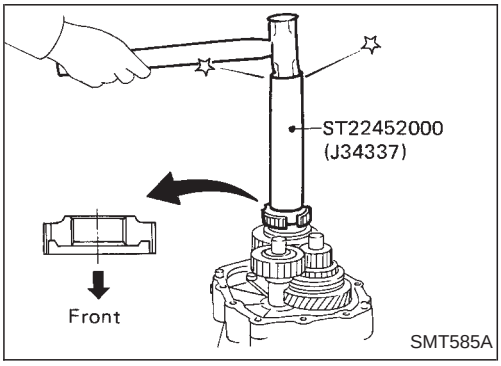


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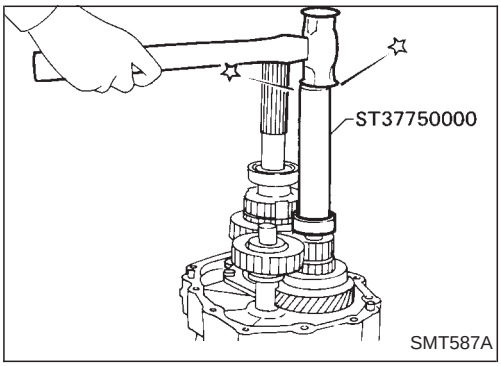
Gear Components (Cont'd)



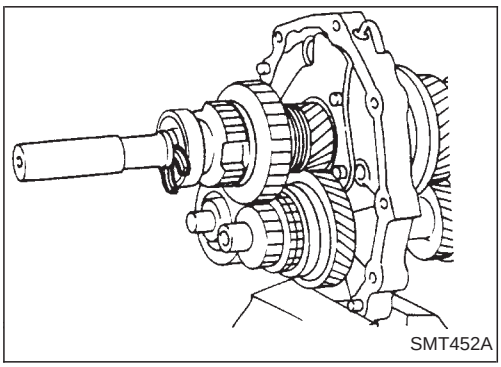
g. Install reverse counter gear.
h. Install reverse gear needle bearing and then install reverse main gear, reverse idler gear and reverse idler thrust washers.



i. Install reverse hub.
Pay attention to its direction.



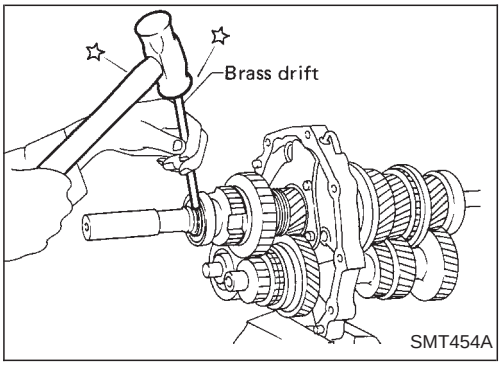
j. Install counter rear gear end bearing.
k. Separate adapter plate from transmission case and mount adapter plate on vice again.



l. Select proper mainshaft C-ring to minimize clearance of groove.
Allowable clearance of groove:
0 - 0.1 mm (0 - 0.004 in)

Mainshaft C-ring

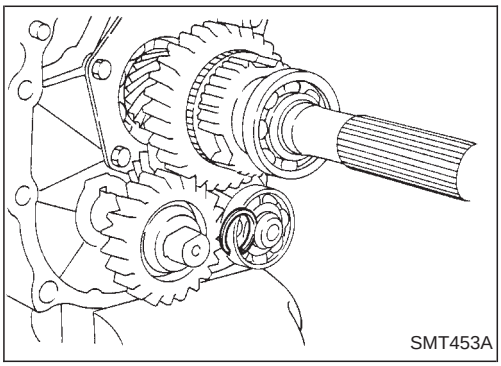
Thickness mm (in)	Part number	Thickness mm (in)	Part number
2.63 (0.1035)	32348-01G15	3.19 (0.1256)	32348-01G07
2.70 (0.1063)	32348-01G00	3.26 (0.1283)	32348-01G08
2.77 (0.1091)	32348-01G01	3.33 (0.1311)	32348-01G09
2.84 (0.1118)	32348-01G02	3.40 (0.1339)	32348-01G10
2.91 (0.1146)	32348-01G03	3.47 (0.1366)	32348-01G11
2.98 (0.1173)	32348-01G04	3.54 (0.1394)	32348-01G12
3.05 (0.1201)	32348-01G05	3.61 (0.1421)	32348-01G13
3.12 (0.1228)	32348-01G06	3.68 (0.1449)	32348-01G14



m. Install selected C-ring, C-ring holder and mainshaft rear snap ring.

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Gear Components (Cont'd)

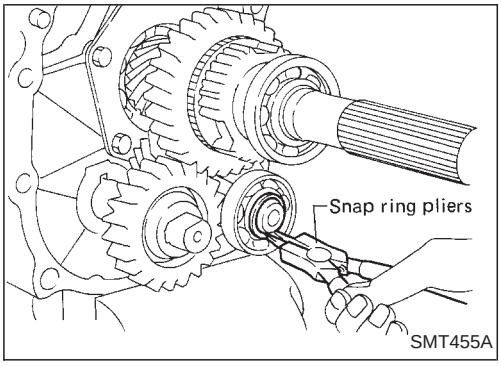

SMT453A

n. Install spacer and then select proper counter gear rear snap ring to minimize clearance of groove.

Allowable clearance of groove:
0 - 0.1 mm (0 - 0.004 in)

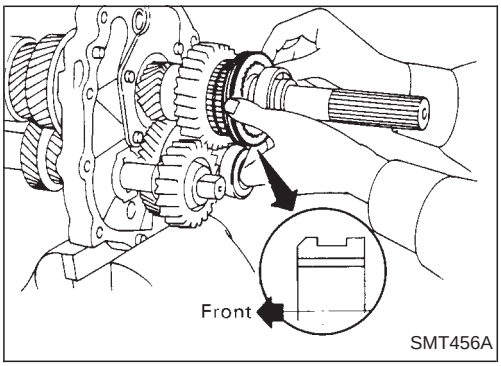
Counter gear rear snap ring

Thickness mm (in)	Part number
1.26 (0.0496)	32236-01G08
1.32 (0.0520)	32236-01G00
1.38 (0.0543)	32236-01G01
1.44 (0.0567)	32236-01G02
1.50 (0.0591)	32236-01G03
1.56 (0.0614)	32236-01G04
1.62 (0.0638)	32236-01G05
1.68 (0.0661)	32236-01G06
1.74 (0.0685)	32236-01G07



SMT455A

o. Install selected counter gear rear snap ring.



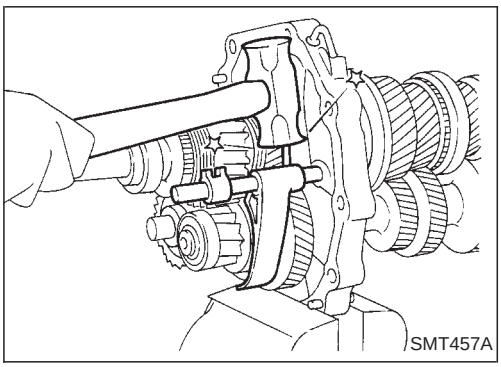
SMT456A

p. Install reverse coupling sleeve.

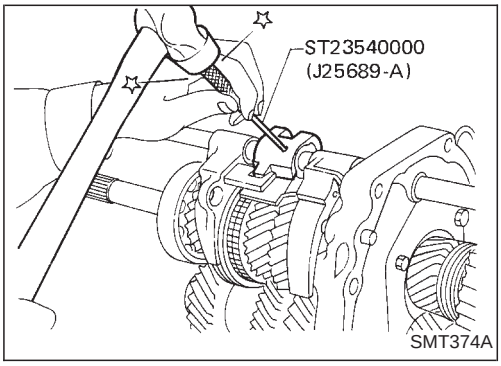
Pay attention to its direction.

q. Measure each gear end play as a final check. — Refer to "DISASSEMBLY", MT-14.

Shift Control Components


SMT457A

1. Install OD fork rod and OD shift fork. Then install retaining pin into OD shift fork.
2. Install 1st & 2nd, 3rd & 4th and reverse shift fork onto coupling sleeve.

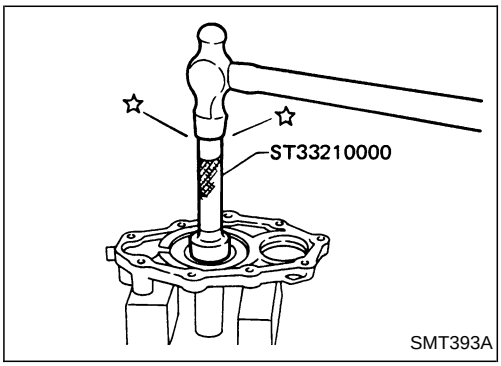


SMT374A

3. Install striking rod into hole of shift forks, striking lever and interlock and then install retaining pin into striking lever.

Make sure that striking rod moves smoothly.

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Case Components

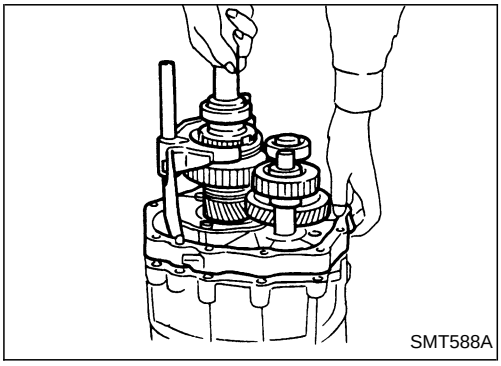
1. Install front cover oil seal.

Apply multi-purpose grease to seal lip.

2. Install selected counter gear front bearing shim onto transmission case.

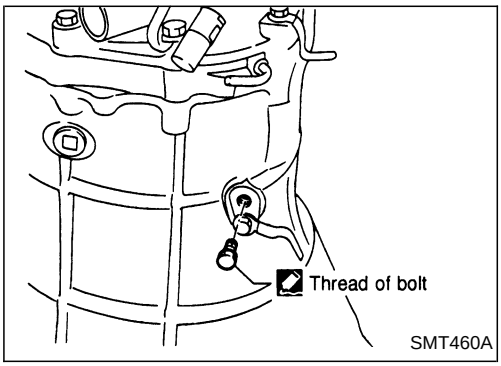
Apply multi-purpose grease.

3. Apply sealant to mating surface of transmission case.



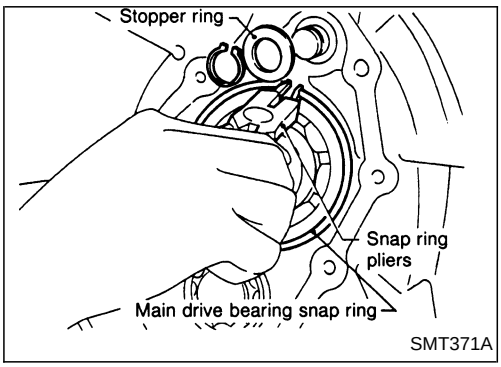
4. Install gear assembly onto transmission case.
5. Install check spring and check ball into interlock stopper.

Apply multi-purpose grease to check ball.

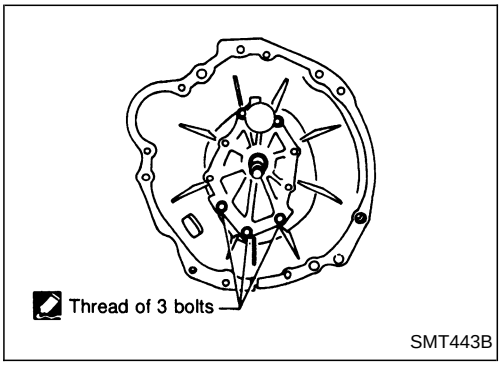


6. Install interlock stopper assembly and then tighten check ball plug.

Apply sealant to thread of check ball plug.



7. Install stopper ring and main drive bearing snap ring.



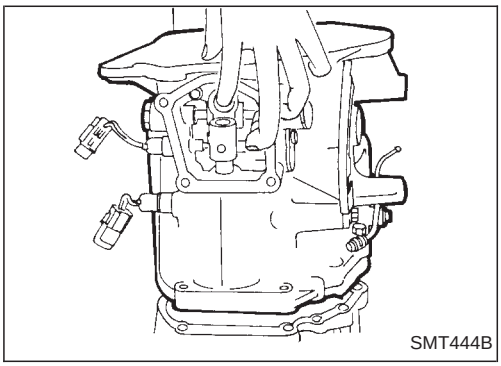
8. Install front cover and gasket.

Apply sealant to thread of 3 bolts shown left.

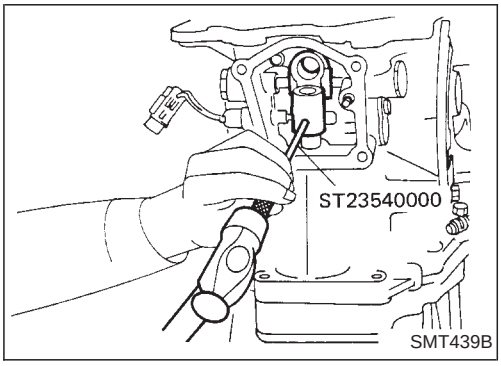
9. Apply sealant to mating surface of adapter plate.

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Case Components (Cont'd)

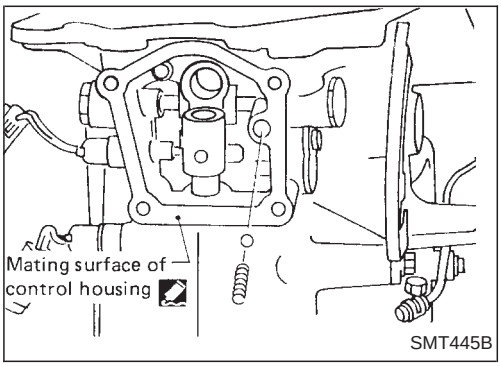

SMT444B

10. Install OD gear case together with striking arm.



SMT439B

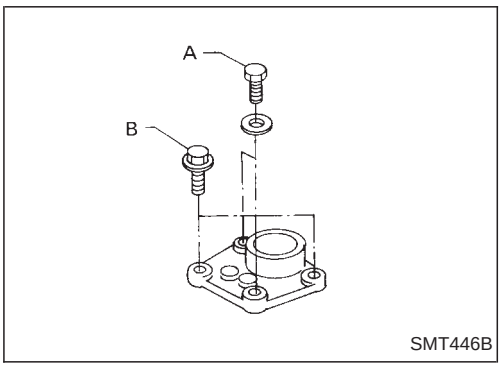
11. Install retaining pin into striking arm.



SMT445B

12. Install return spring and check ball and then install control housing.

Apply sealant to mating surface of OD gear case.



SMT446B

13. Tighten control housing bolts.

Bolt head size:

A bolts 12 mm

B bolts 13 mm

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General Specifications

Engine	TD27Ti and ZD30DDTi
Transmission model	FS5R30A
No. of speeds	5
Shift pattern	
Synchromesh type	Warner
Gear ratio	
1st	3.580
2nd	2.077
3rd	1.360
4th	1.000
OD	0.811
Reverse	3.631
No. of teeth	
Mainshaft	
drive	
1st	32
2nd	30
3rd	29
4th	22
OD	24
Reverse	30
Countershaft	
Drive	
1st	13
2nd	21
3rd	31
4th	32
OD	43
Reverse	12
Reverse idler gear	22
Oil capacity ℓ (Imp pt)	3.6 (6-3/8)

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Inspection and Adjustment

GEAR END PLAY

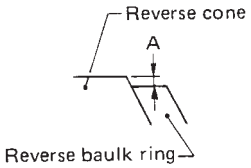
Gear	End play mm (in)
1st main gear	0.23 - 0.33 (0.0091 - 0.0130)
2nd main gear	0.23 - 0.33 (0.0091 - 0.0130)
3rd main gear	0.23 - 0.33 (0.0091 - 0.0130)
OD counter gear	0.23 - 0.33 (0.0091 - 0.0130)
Reverse main gear	0.33 - 0.43 (0.0130 - 0.0169)
Counter gear	0.10 - 0.25 (0.0039 - 0.0098)
Reverse idler gear	0.30 - 0.53 (0.0118 - 0.0209)

CLEARANCE BETWEEN BAULK RING AND GEAR

Unit: mm (in)

	Standard	Wear limit
1st & 2nd	1.05 - 1.3 (0.0413 - 0.0512)	0.7 (0.028)
3rd & main-drive	1.05 - 1.3 (0.0413 - 0.0512)	0.7 (0.028)
OD	1.05 - 1.3 (0.0413 - 0.0512)	0.7 (0.028)

DISTANCE BETWEEN REAR SURFACE OF REVERSE CONE AND REVERSE BAULK RING



Unit: mm (in)

	Standard	Wear limit
Dimension "A"	−0.1 to 0.36 (−0.0039 to 0.0142)	0.7 (0.028)

AVAILABLE SNAP RING

Main drive gear snap ring

Allowable clearance	0 - 0.1 mm (0 - 0.004 in)
Thickness mm (in)	Part number
1.89 (0.0744)	32204-01G00
1.98 (0.0780)	32204-01G01
2.05 (0.0807)	32204-01G02
2.12 (0.0835)	32204-01G03
2.19 (0.0862)	32204-01G04

Mainshaft front snap ring

Allowable clearance	0 - 0.1 mm (0 - 0.004 in)
Thickness mm (in)	Part number
1.89 (0.0744)	32204-01G00
1.98 (0.0780)	32204-01G01
2.05 (0.0807)	32204-01G02
2.12 (0.0835)	32204-01G03
2.19 (0.0862)	32204-01G04

Counter gear rear snap ring

Allowable clearance	0 - 0.1 mm (0 - 0.004 in)
Thickness mm (in)	Part number
1.26 (0.0496)	32236-01G08
1.32 (0.0520)	32236-01G00
1.38 (0.0543)	32236-01G01
1.44 (0.0567)	32236-01G02
1.50 (0.0591)	32236-01G03
1.56 (0.0614)	32236-01G04
1.62 (0.0638)	32236-01G05
1.68 (0.0661)	32236-01G06
1.74 (0.0685)	32236-01G07

AVAILABLE C-RING

Mainshaft C-ring

Allowable clearance		0 - 0.1 mm (0 - 0.004 in)	
Thickness mm(in)	Part number	Thickness mm (in)	Part number
2.63 (0.1035)	32348-01G15	3.19 (0.1256)	32348-01G07
2.70 (0.1063)	32348-01G00	3.26 (0.1283)	32348-01G08
2.77 (0.1091)	32348-01G01	3.33 (0.1311)	32348-01G09
2.84 (0.1118)	32348-01G02	3.40 (0.1339)	32348-01G10
2.91 (0.1146)	32348-01G03	3.47 (0.1366)	32348-01G11
2.98 (0.1173)	32348-01G04	3.54 (0.1394)	32348-01G12
3.05 (0.1201)	32348-01G05	3.61 (0.1421)	32348-01G13
3.12 (0.1228)	32348-01G06	3.68 (0.1449)	32348-01G14

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Inspection and Adjustment (Cont'd)

AVAILABLE SHIM AND WASHER

Table for selecting proper counter gear front bearing shim

Dial indicator deflection mm (in)	Thickness of proper washer mm (in)	Part number
0.93 - 1.02 (0.0366 - 0.0402)	0.88 (0.0346)	32218-01G11
1.03 - 1.12 (0.0406 - 0.0441)	0.96 (0.0378)	32218-01G12
1.13 - 1.22 (0.0445 - 0.0480)	1.04 (0.0409)	32218-01G13
1.23 - 1.32 (0.0484 - 0.0520)	1.12 (0.0441)	32218-01G14
1.33 - 1.42 (0.0524 - 0.0559)	1.28 (0.0504)	32218-01G15
1.43 - 1.52 (0.0563 - 0.0598)	1.36 (0.0535)	32218-01G16
1.53 - 1.62 (0.0602 - 0.0638)	1.44 (0.0567)	32218-01G17

Reverse idler rear thrust washer

Thickness mm (in)	Part number
1.97 (0.0776)	32284-01G10
2.07 (0.0815)	32284-01G11

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AUTOMATIC TRANSMISSION

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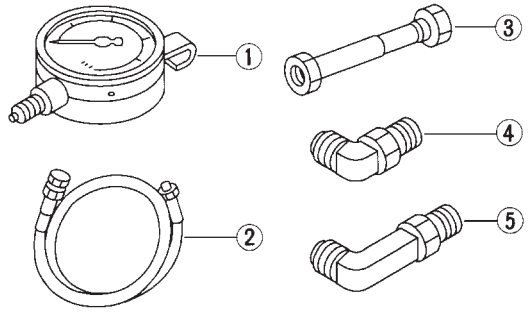
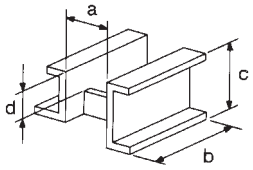
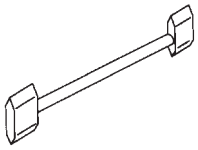
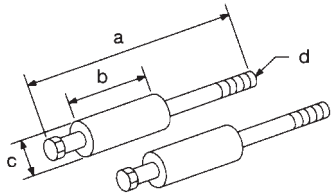
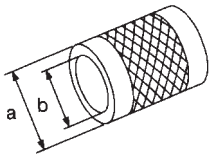
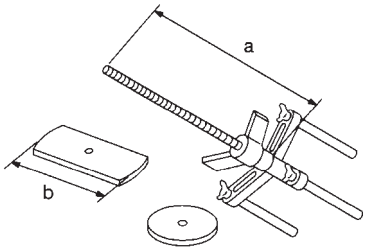
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When you read wiring diagrams:
- **Read GI section, "HOW TO READ WIRING DIAGRAMS".**
- **See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.**

When you perform trouble diagnoses, read GI section, "HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES" and "HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT".

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Special Service Tools

Tool number Tool name	Description	
ST2505S001 Oil pressure gauge set ① ST25051001 Oil pressure gauge ② ST25052000 Hose ③ ST25053000 Joint pipe ④ ST25054000 Adapter ⑤ ST25055000 Adapter	 NT097	Measuring line pressure
ST07870000 Transmission case stand	 NT421	Disassembling and assembling A/T **a: 182 mm (7.17 in)** **b: 282 mm (11.10 in)** **c: 230 mm (9.06 in)** **d: 100 mm (3.94 in)**
KV31102100 Torque converter one-way clutch check tool	 NT098	Checking one-way clutch in torque converter
ST25850000 Sliding hammer	 NT422	Removing oil pump assembly **a: 179 mm (7.05 in)** **b: 70 mm (2.76 in)** **c: 40 mm (1.57 in) dia.** **d: M12 x 1.75P**
ST33200000 Drift	 NT091	Installing oil pump housing oil seal Installing rear oil seal **a: 60 mm (2.36 in) dia.** **b: 44.5 mm (1.752 in) dia.**
KV31102400 Clutch spring compressor	 NT423	Removing and installing clutch return springs **a: 320 mm (12.60 in)** **b: 174 mm (6.85 in)**

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

The Supplemental Restraint System such as “AIR BAG” and “SEAT BELT PRE-TENSIONER” used along with a seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. The SRS composition which is available to NISSAN MODEL R20 is as follows (The composition varies according to the destination and optional equipment.):

- For a frontal collision
  The Supplemental Restraint System consists of driver air bag module (located in the center of the steering wheel), front passenger air bag module (located on the instrument panel on passenger side), front seat belt pre-tensioners, a diagnosis sensor unit, warning lamp, wiring harness and spiral cable.
- For a side collision
  The Supplemental Restraint System consists of front side air bag module (located in the outer side of front seat), side air bag (satellite) sensor, diagnosis sensor unit (one of components of air bags for a frontal collision), wiring harness, warning lamp (one of components of air bags for a frontal collision).

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 should be performed by an authorized NISSAN dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. Spiral cable and wiring harnesses covered with yellow insulation tape either just before the harness connectors or for the complete harness are related to the SRS.**

Precautions for SRS “AIR BAG” and “SEAT BELT PRE-TENSIONER” Service

- Do not use electrical test equipment to check SRS circuits unless instructed to in this Service Manual.
- Before servicing the SRS, turn ignition switch “OFF”, disconnect both battery cables and wait at least 3 minutes.
  For approximately 3 minutes after the cables are removed, it is still possible for the air bag and seat belt pre-tensioner to deploy. Therefore, do not work on any SRS connectors or wires until at least 3 minutes have passed.
- Diagnosis sensor unit must always be installed with their arrow marks “←” pointing towards the front of the vehicle for proper operation. Also check diagnosis sensor unit for cracks, deformities or rust before installation and replace as required.
- The spiral cable must be aligned with the neutral position since its rotations are limited. Do not attempt to turn steering wheel or column after removal of steering gear.
- Handle air bag module carefully. Always place driver and front passenger air bag modules with the pad side facing upward and place front side air bag module (built-in type) standing with stud bolt side setting bottom.
- Conduct self-diagnosis to check entire SRS for proper function after replacing any components.
- After air bag inflates, the front instrument panel assembly should be replaced if damaged.

Precautions

- Before proceeding with disassembly, thoroughly clean the outside of the transmission. It is important to prevent the internal parts from becoming contaminated by dirt or other foreign matter.
- Disassembly should be done in a clean work area.
- Use lint-free cloth or towels for wiping parts clean. Common shop rags can leave fibers that could interfere with the operation of the transmission.
- Place disassembled parts in order for easier and proper assembly.
- All parts should be carefully cleaned with a general purpose, non-flammable solvent before inspection or reassembly.
- Gaskets, seals and O-rings should be replaced any time the transmission is disassembled.
- It is very important to perform functional tests whenever they are indicated.
- The valve body contains precision parts and requires extreme care when parts are removed and serviced. Place removed parts in a parts rack in order to replace them in correct positions and sequences. Care will also prevent springs and small parts from becoming scattered or lost.
- Properly installed valves, sleeves, plugs, etc. will slide along bores in valve body under their own weight.

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Precautions (Cont'd)

- Before assembly, apply a coat of recommended ATF to all parts. Apply petroleum jelly to protect O-rings and seals, and to hold bearings and washers in place during assembly. Do not use grease.
- Extreme care should be taken to avoid damage to O-rings, seals and gaskets when assembling.
- After overhaul, refill the transmission with new ATF.
- When the A/T drain plug is removed, only some of the fluid is drained. Old A/T fluid will remain in torque converter and ATF cooling system.
  Always follow the procedures under "Changing A/T Fluid" in the MA section when changing A/T fluid.

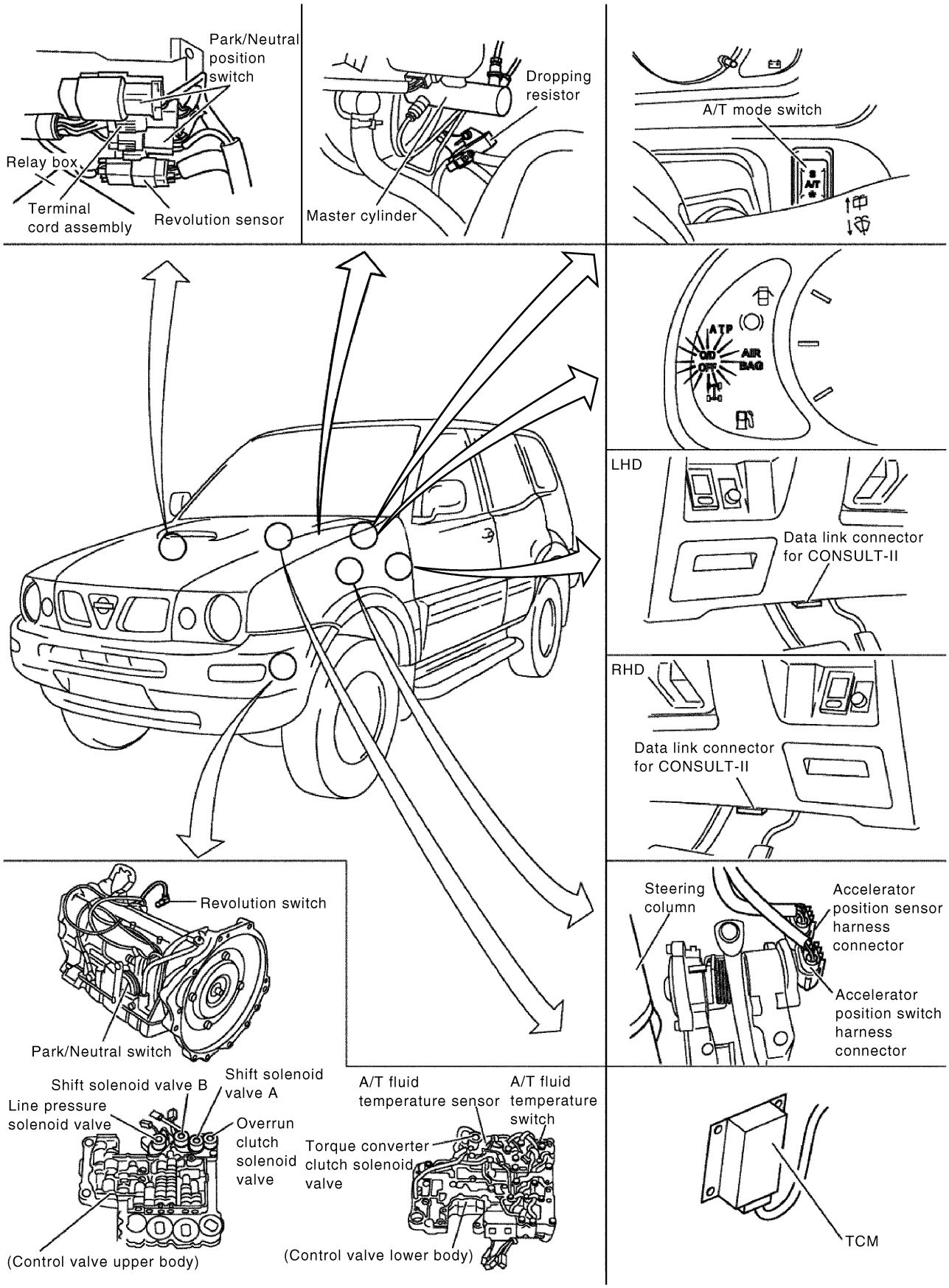
Service Notice or Precautions

FAIL-SAFE

The TCM has an electronic Fail-Safe (limp home mode). This allows the vehicle to be driven even if a major electrical input/output device circuit is damaged.
Under Fail-Safe, the vehicle always runs in third gear even with a shift lever position of "1", "2" or "D". Customer may complain of "sluggish or poor acceleration".
When the Fail-Safe operation occurs the next time the key is turned to the "ON" position, the SPORT indicator lamp will blink for about 8 seconds. (For diagnosis, refer to AT-33.)
Fail-Safe may activate without electrical circuit damages if the vehicle is driven under extreme conditions (such as excessive wheel spins and emergency braking immediately afterwards). In this case, turn the ignition key "OFF" for 5 seconds and then "ON" to recover normal shift pattern.
The blinking of the SPORT indicator lamp for about 8 seconds will appear only once and be cleared. The customer may resume normal driving conditions by chance.
Always follow the "WORK FLOW" (Refer to AT-26).
The SELF-DIAGNOSIS results will be as follows:
The first SELF-DIAGNOSIS will indicate the damage of the vehicle speed sensor or the revolution sensor.
During the next SELF-DIAGNOSIS performed after checking the sensor, no damages will be indicated.

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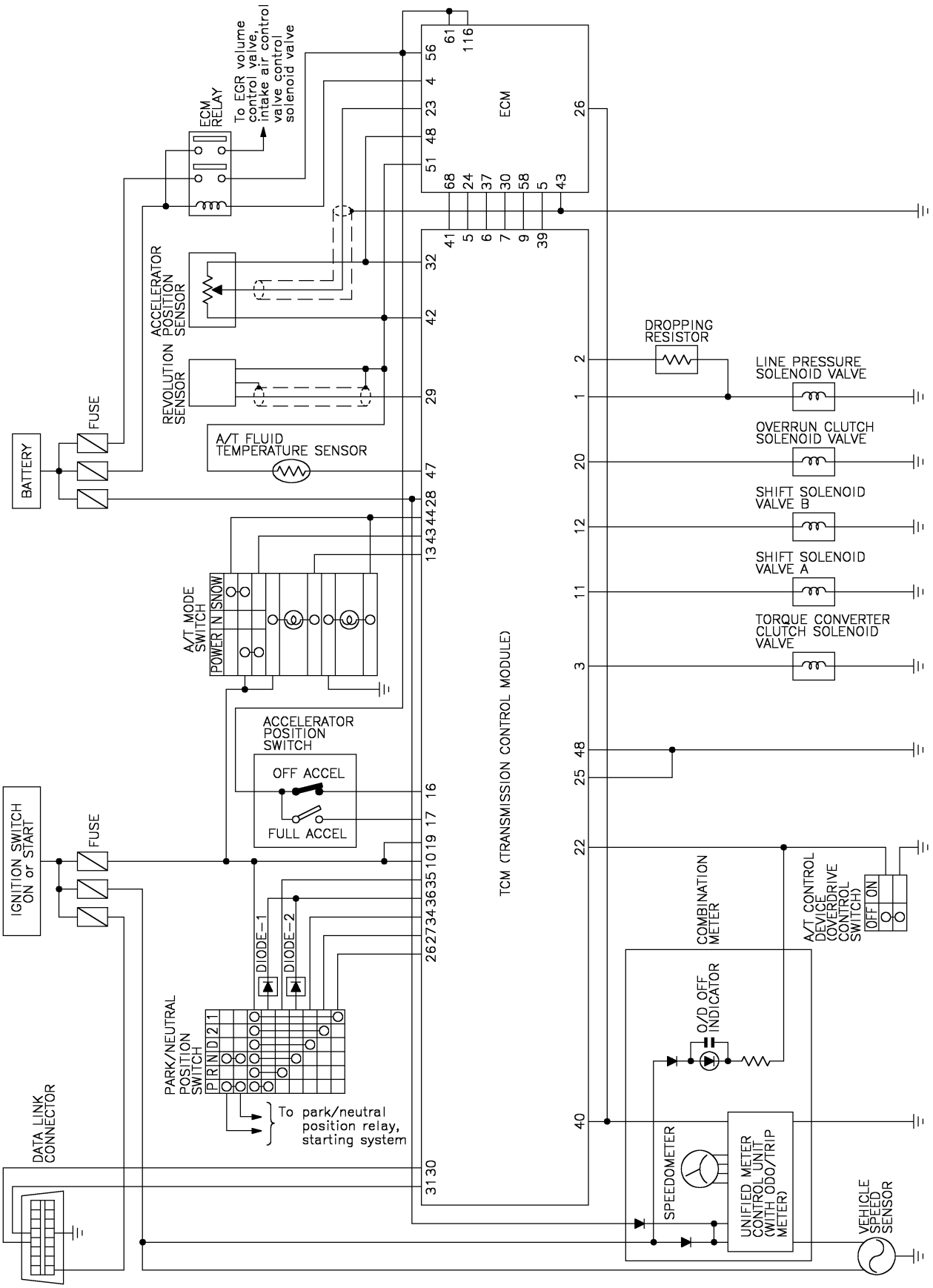
A/T Electrical Parts Location



YAT410

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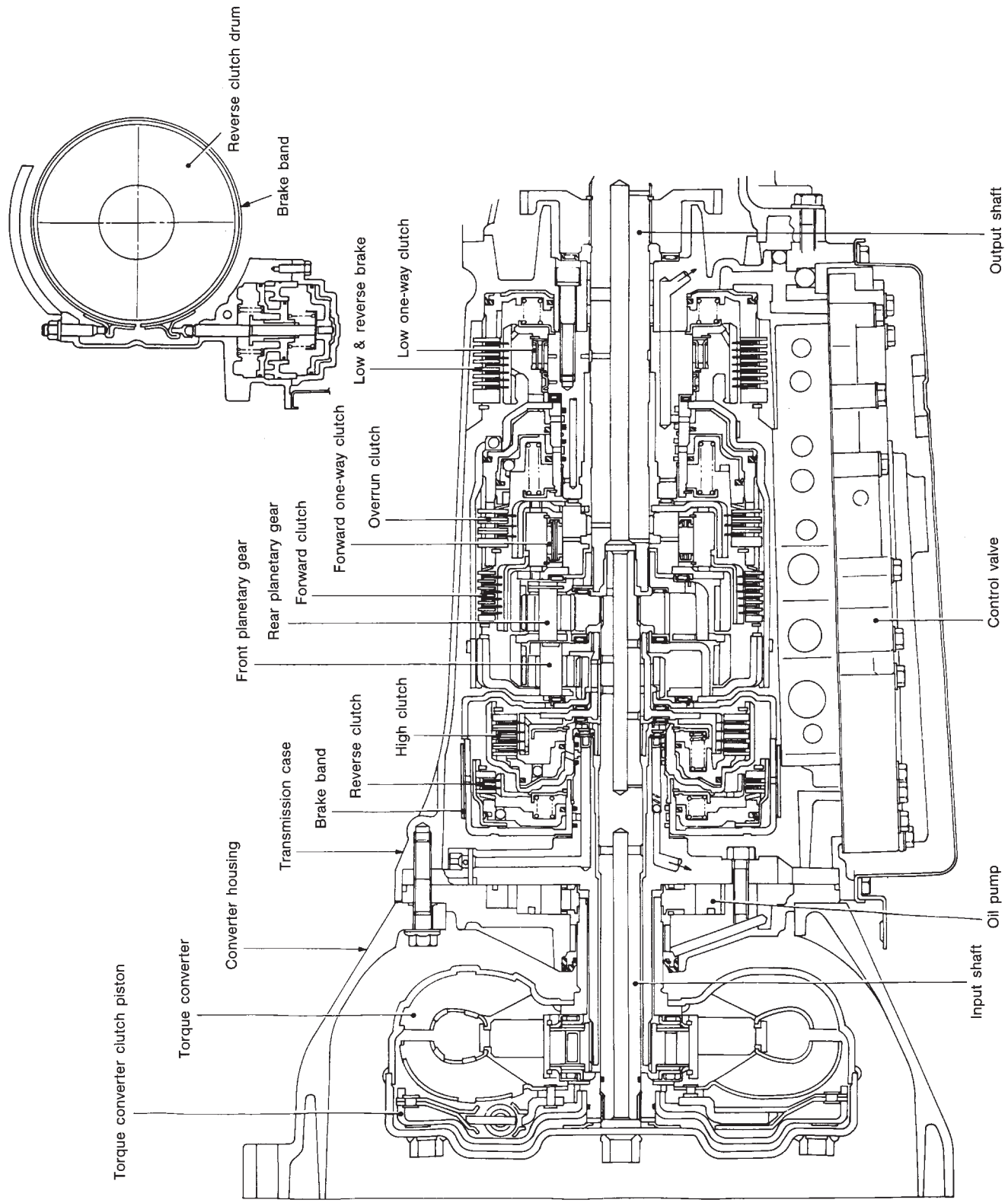
Wiring Diagram — A/T —



YAT399

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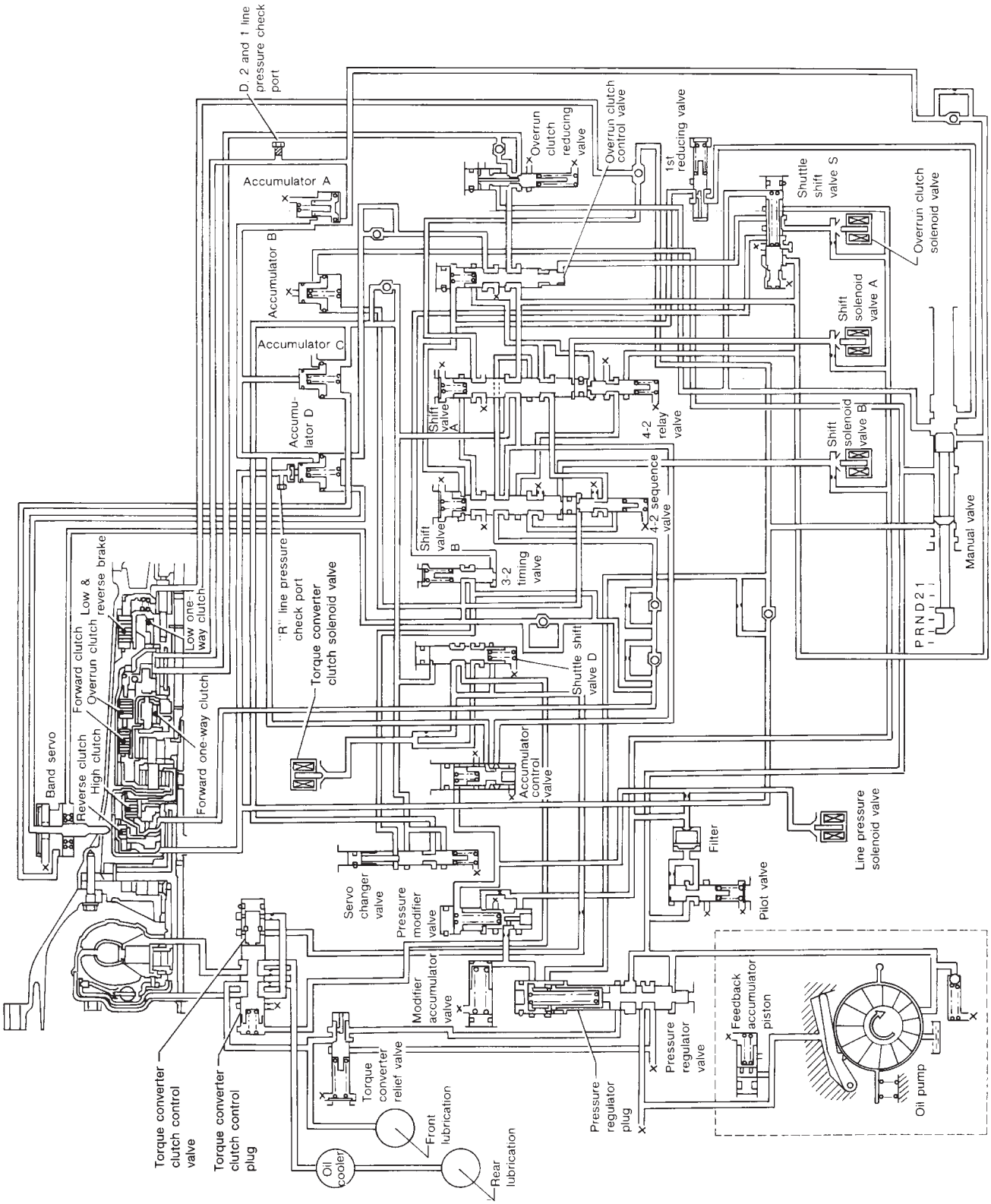
Cross-sectional View



SAT125BA

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Hydraulic Control Circuits



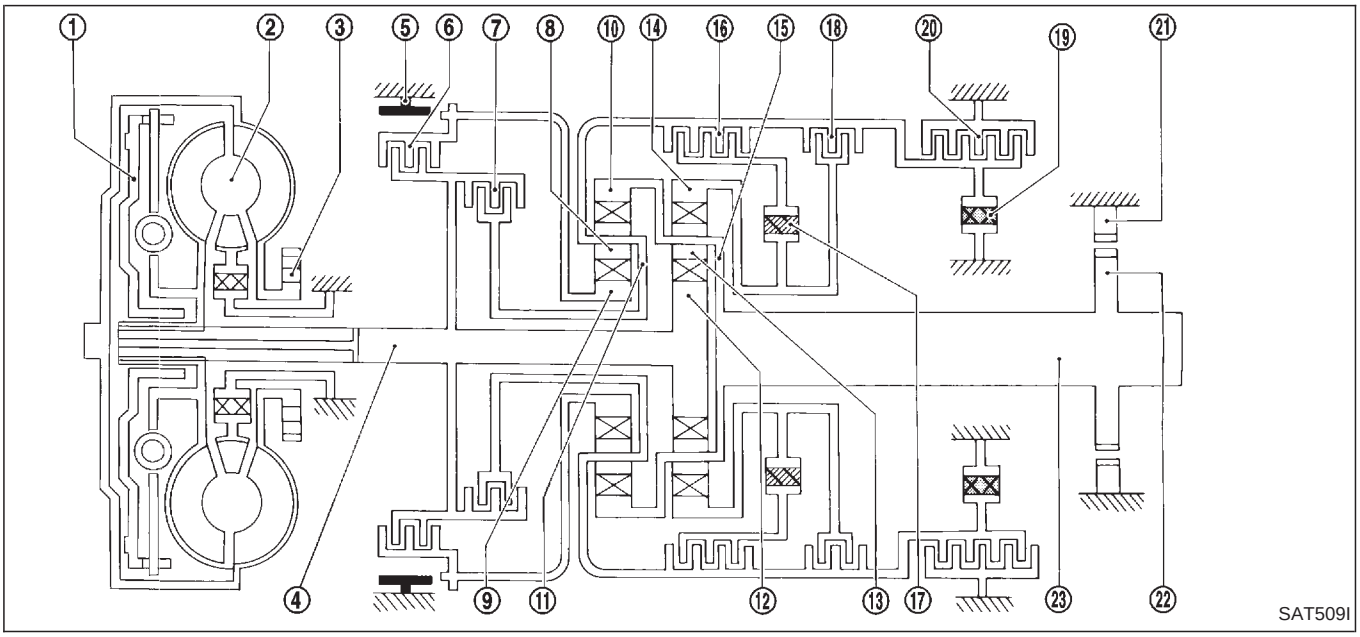
SAT624GA

http://vnx.su/

Shift Mechanism

The automatic transmission uses compact, dual planetary gear systems to improve power-transmission efficiency, simplify construction and reduce weight.
It also employs an optimum shift control and superwide gear ratios. They improve starting performance and acceleration during medium and high-speed operation.
Two one-way clutches are also employed: one is used for the forward clutch and the other for the low clutch. These one-way clutches, combined with four accumulators, reduce shifting shock to a minimum.

CONSTRUCTION



① Torque converter clutch piston
② Torque converter
③ Oil pump
④ Input shaft
⑤ Brake band
⑥ Reverse clutch
⑦ High clutch
⑧ Front pinion gear
⑨ Front sun gear
⑩ Front internal gear
⑪ Front planetary carrier
⑫ Rear sun gear
⑬ Rear pinion gear
⑭ Rear internal gear
⑮ Rear planetary carrier
⑯ Forward clutch
⑰ Forward one-way clutch
⑱ Overrun clutch
⑲ Low one-way clutch
⑳ Low & reverse brake
㉑ Parking pawl
㉒ Parking gear
㉓ Output shaft

FUNCTION OF CLUTCH AND BRAKE

Control members	Abbr.	Function
⑥ Reverse clutch	R/C	To transmit input power to front sun gear ⑨.
⑦ High clutch	H/C	To transmit input power to front planetary carrier ⑪.
⑯ Forward clutch	F/C	To connect front planetary carrier ⑪ with forward one-way clutch ⑰.
⑱ Overrun clutch	O/C	To connect front planetary carrier ⑪ with rear internal gear ⑭.
⑤ Brake band	B/B	To lock front sun gear ⑨.
⑰ Forward one-way clutch	F/O.C	When forward clutch is engaged, to stop rear internal gear ⑭ from rotating in opposite direction.
⑲ Low one-way clutch	L/O.C	At D_1 position, to prevent rear internal gear ⑭ from rotating in opposite direction.
⑳ Low & reverse brake	L & R/B	To lock rear internal gear ⑭ (2, 1_2 and 1_1), to lock front planetary carrier ⑪ (R position).

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Shift Mechanism (Cont'd)

CLUTCH AND BAND CHART

Shift position		⑥ Reverse clutch	⑦ High clutch	⑯ Forward clutch	⑱ Overrun clutch	Band servo			⑰ Forward one-way clutch	⑲ Low one-way clutch	⑳ Low & reverse brake	Lock-up	Remarks
						2nd apply	3rd release	4th apply					
P													PARK POSITION
R		○									○		REVERSE POSITION
N													NEUTRAL POSITION
D*4	1st			○	*1⊗				●	●			Automatic shift 1 ↔ 2 ↔ 3 ↔ 4
	2nd			○	*1◎	○			●				
	3rd		○	○	*1◎	*2⊗	⊗		●				
	4th		○	⊗		*3⊗	⊗	○				○	
2	1st			○	⊗				●	●			Automatic shift 1 ↔ 2
	2nd			○	◎	○			●				
1	1st			○	○				●		○		Locks (held stationary) in 1st speed 1 ← 2
	2nd			○	○	○			●				

*1: Operates when overdrive control or A/T mode switch is being set in "OFF" or "SPORT" position.
*2: Oil pressure is applied to both 2nd "apply" side and 3rd "release" side of band servo piston. However, brake band does not contract because oil pressure area on the "release" side is greater than that on the "apply" side.
*3: Oil pressure is applied to 4th "apply" side in condition *2 above, and brake band contracts.
*4: A/T will not shift to 4th when overdrive control or A/T mode switch is set in "OFF" or "SPORT" position.

○ : Operates.
◎ : Operates when throttle opening is less than 3/16, activating engine brake.
● : Operates during "progressive" acceleration.
⊗ : Operates but does not affect power transmission.
⊗ : Operates when throttle opening is less than 3/16, but does not affect engine brake.

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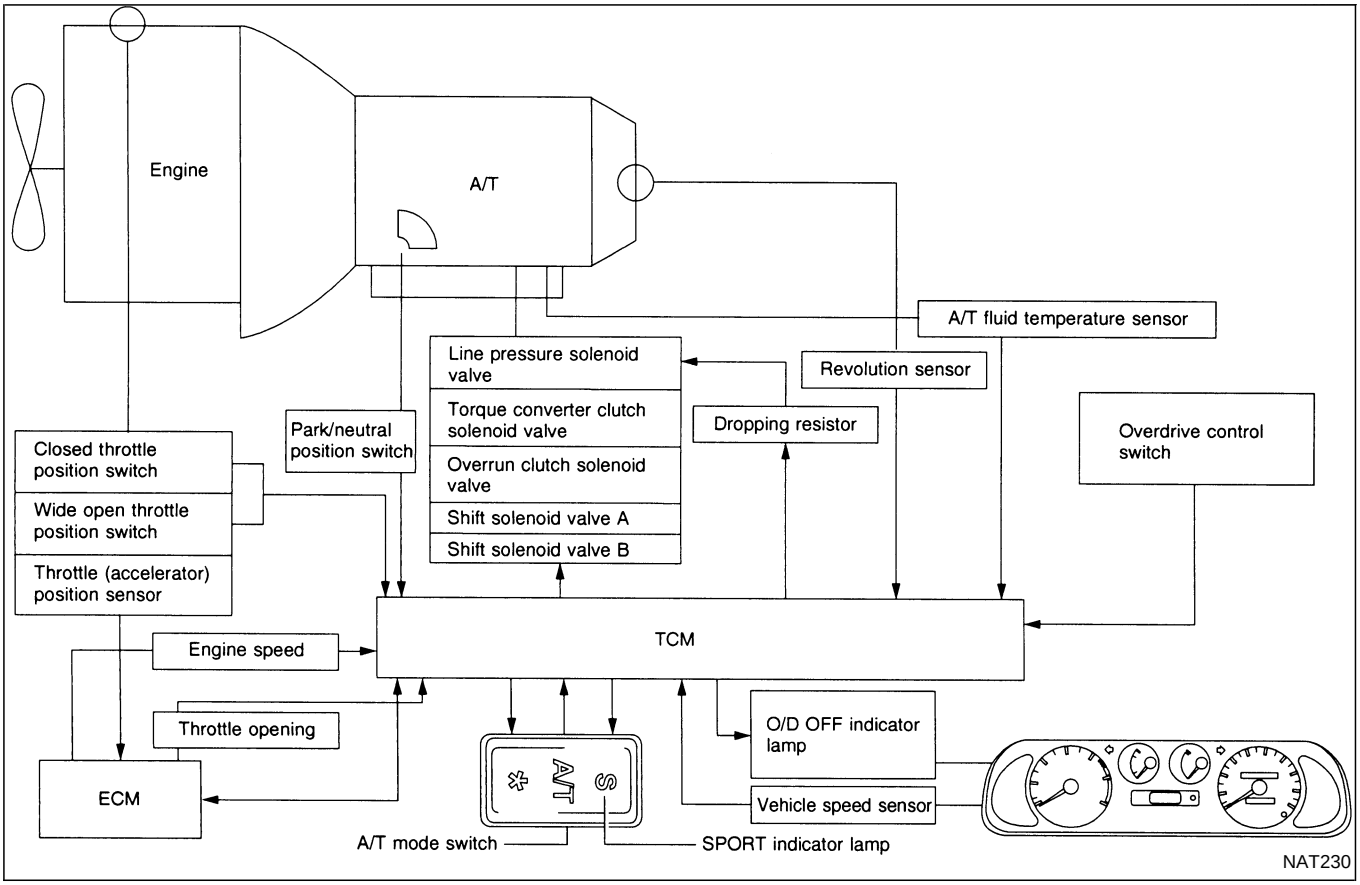
Control System

OUTLINE

The automatic transmission senses vehicle operating conditions through various sensors. It always controls the optimum shaft position and reduces shifting and lock-up shocks.

SENSORS	TCM	ACTUATORS
Park/neutral position switch Throttle (accelerator) position sensor Closed throttle position switch Wide open throttle position switch Engine speed signal A/T fluid temperature sensor Revolution sensor Vehicle speed sensor Overdrive control switch A/T mode switch	Shift control Line pressure control Lock-up control Overrun clutch control Timing control Fail-safe control Self-diagnosis Duet-EU control CONSULT-II communication line control	Shift solenoid valve A Shift solenoid valve B Overrun clutch solenoid valve Torque converter clutch solenoid valve Line pressure solenoid valve O/D OFF or SPORT indicator lamp

CONTROL SYSTEM



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Control System (Cont'd)

TCM FUNCTION

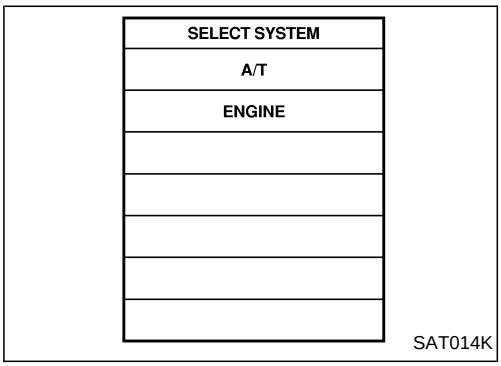
The function of the TCM is to:

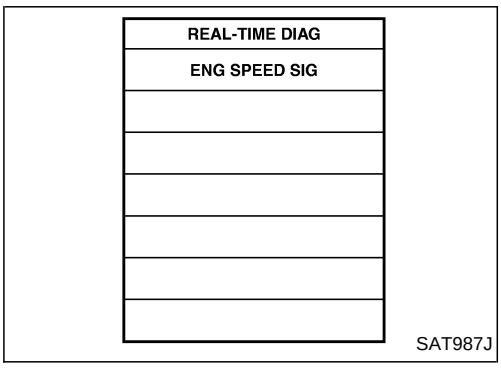
- Receive input signals sent from various switches and sensors.
- Determine required line pressure, shifting point, lock-up operation, and engine brake operation.
- Send required output signals to the respective solenoids.

INPUT/OUTPUT SIGNAL OF TCM

	Sensors and solenoid valves	Function
Input	Park/neutral position switch	Detects select lever position and sends a signal to TCM.
	Throttle (accelerator) position sensor	Detects throttle valve position and sends a signal to TCM.
	Closed throttle position switch	Detects throttle valve's fully-closed position and sends a signal to TCM.
	Wide open throttle position switch	Detects a throttle valve position of greater than 1/2 of full throttle and sends a signal to TCM.
	Engine speed signal	From ECM.
	A/T fluid temperature sensor	Detects transmission fluid temperature and sends a signal to TCM.
	Revolution sensor	Detects output shaft rpm and sends a signal to TCM.
	Vehicle speed sensor	Used as an auxiliary vehicle speed sensor. Sends a signal when revolution sensor (installed on transmission) malfunctions.
	Overdrive control switch A/T mode switch	Sends a signal, which prohibits a shift to "D_4" (overdrive) position, to the TCM.
Output	Shift solenoid valve A/B	Selects shifting point suited to driving conditions in relation to a signal sent from TCM.
	Line pressure solenoid valve	Regulates (or decreases) line pressure suited to driving conditions in relation to a signal sent from TCM.
	Torque converter clutch solenoid valve	Regulates (or decreases) lock-up pressure suited to driving conditions in relation to a signal sent from TCM.
	Overrun clutch solenoid valve	Controls an "engine brake" effect suited to driving conditions in relation to a signal sent from TCM.
	O/D OFF indicator lamp SPORT indicator lamp	Shows TCM malfunctions, when A/T control components malfunction.

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Self-diagnosis

After performing this procedure, place check marks for results on the "DIAGNOSTIC WORKSHEET", AT-24. Reference pages are provided following the items.

SELF-DIAGNOSTIC PROCEDURE (With CONSULT-II)

1. Turn on CONSULT-II and touch "A/T".
   If A/T is not displayed, check TCM power supply and ground circuit. Refer to AT-46. If result is NG, refer to EL section ("POWER SUPPLY ROUTING").

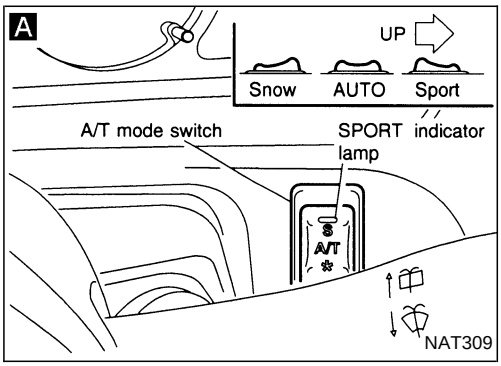
2. Touch "SELF-DIAG RESULTS".
   Display shows malfunction experienced since the last erasing operation.
   CONSULT-II performs REAL-TIME SELF-DIAGNOSIS.
   Also, any malfunction detected while in this mode will be displayed at real time.

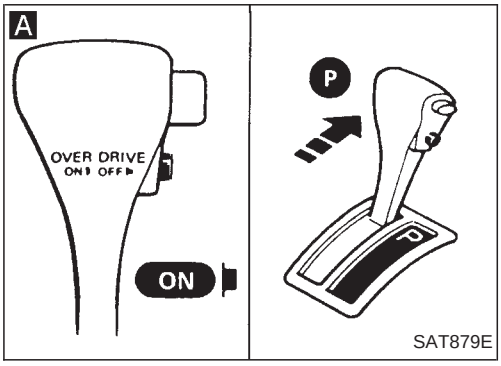
Item	Display	Description	Remarks
No failure	****NO FAILURE****	● No failure has been detected.	
Initial start	*INITIAL START*	● This is NOT a malfunction message. [Whenever shutting off a power supply to the TCM, this message appears on the screen.]	
Vehicle speed sensor·A/T (Revolution sensor)	VHCL SPEED SEN·A/T	● No signal input from vehicle speed sensor·A/T (revolution sensor) during traveling due to disconnection, or input of abnormal signal.	
Vehicle speed sensor·MTR (Meter)	VHCL SPEED SEN·MTR	● No signal input from vehicle speed sensor·MTR during traveling due to disconnection, or input of abnormal signal.	
Throttle (accelerator) position sensor	THROTTLE POSI SEN	● Throttle (accelerator) position sensor signal voltage is abnormally high. ● Throttle (accelerator) position sensor signal voltage is abnormally low with closed throttle position switch "OFF" or wide open throttle position switch "ON".	
Shift solenoid valve A	SHIFT SOLENOID/V A	● Specified voltage is not applied to solenoid valve due to disconnection or shortcircuit.	
Shift solenoid valve B	SHIFT SOLENOID/V B	● Specified voltage is not applied to solenoid valve due to disconnection or shortcircuit.	
Overrun clutch solenoid valve	OVERRUN CLUTCH S/V	● Specified voltage is not applied to solenoid valve due to disconnection or shortcircuit.	
T/C clutch solenoid valve	T/C CLUTCH SOL/V	● Specified voltage is not applied to solenoid valve due to disconnection or shortcircuit.	
A/T fluid temperature sensor/TCM power source	BATT/FLUID TEMP SEN	● Supply voltage to TCM is abnormally low during traveling. ● Fluid temperature signal voltage is abnormally high (fluid temperature is low) during traveling.	To be displayed in case of abnormality and no recording is made
Engine speed signal	ENGINE SPEED SIG	● Engine RPM is abnormally low during traveling.	
Line pressure solenoid valve	LINE PRESSURE S/V	● Specified voltage is not applied to solenoid valve due to disconnection or shortcircuit.	
TCM (ROM)	CONTROL UNIT (ROM)	● TCM memory (ROM) is malfunctioning.	
TCM (RAM)	CONTROL UNIT (RAM)	● TCM memory (RAM) is malfunctioning.	

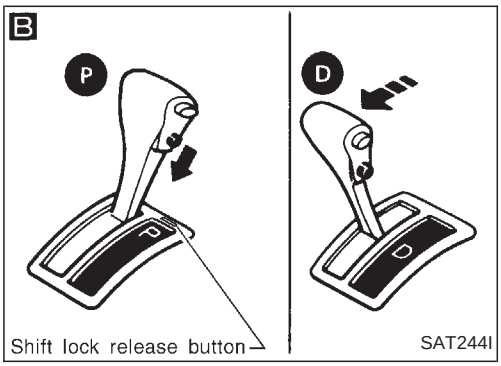
http://vnx.su/

Self-diagnosis (Cont'd)

SELF-DIAGNOSTIC PROCEDURE (Without CONSULT-II)







DIAGNOSIS START

1. Start engine and warm it up to normal engine operating temperature.
2. Turn ignition switch to "OFF" position. Wait at least 5 seconds.

A

1. Set A/T mode switch to "AUTO" position.
2. Set overdrive control switch in "ON" position.
3. Move selector lever to "P" position.
4. Turn ignition switch to "ON" position. (Do not start engine.)
5. Does SPORT indicator lamp come on for about 2 seconds?

No → Go to 1. SPORT Indicator Lamp Does Not Come On, AT-97.

Yes

B

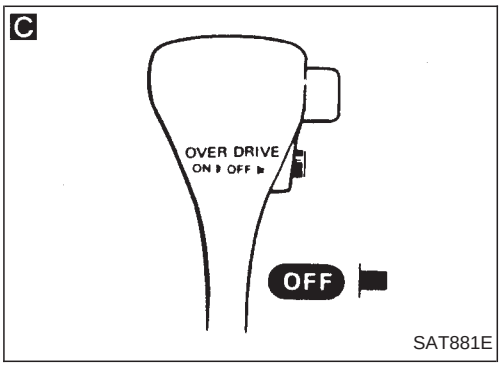
1. Turn ignition switch to "ACC" position.
2. Move selector lever to "D" position.

Ⓐ

http://vnx.su/

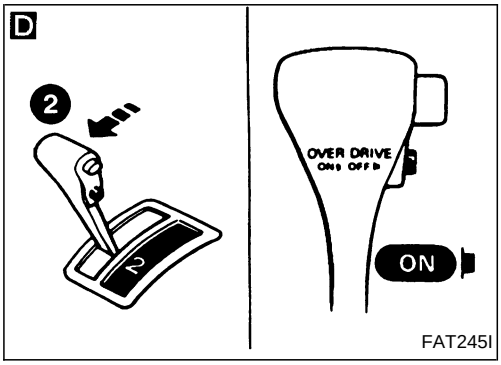
Self-diagnosis (Cont'd)

C



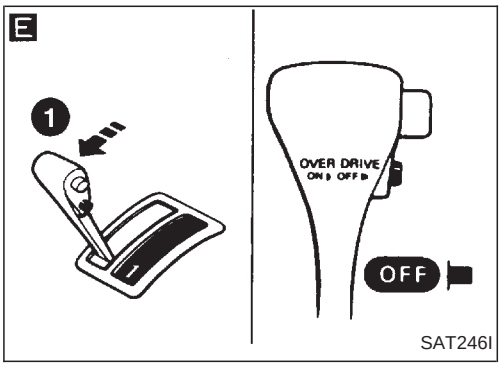
SAT881E

D



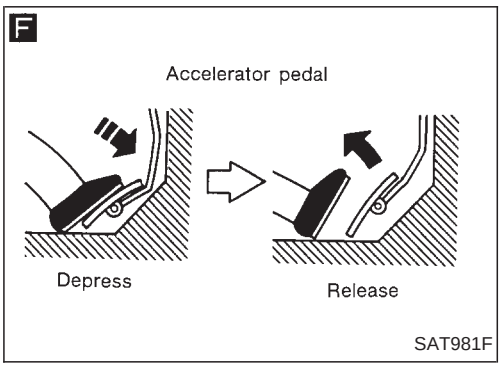
FAT245I

E



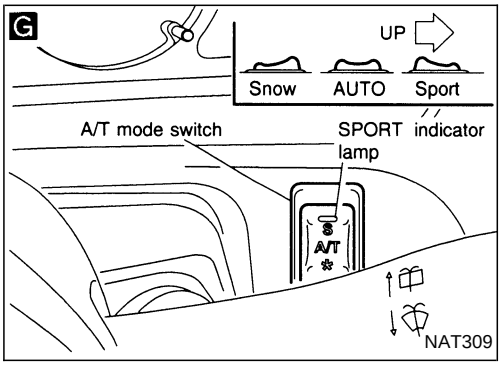
SAT246I

F



SAT981F

G



NAT309

Ⓐ

C

1. Set overdrive control switch in "OFF" position.
2. Depress accelerator pedal fully and release it.
3. Turn ignition switch "ON". (Do not start engine.)

D

1. Move selector lever to "2" position.
2. Set overdrive control switch in "ON" position.

E

1. Move selector lever to "1" position.
2. Set overdrive control switch in "OFF" position.

F

Depress accelerator pedal fully and release it.

G

Check SPORT indicator lamp. Refer to JUDGEMENT OF SELF-DIAGNOSIS CODE, AT-17.

DIAGNOSIS END

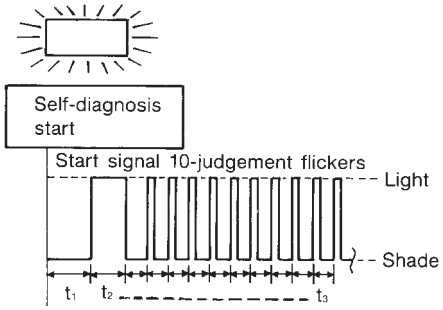
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Self-diagnosis (Cont'd)

JUDGEMENT OF SELF-DIAGNOSIS CODE

SPORT indicator lamps

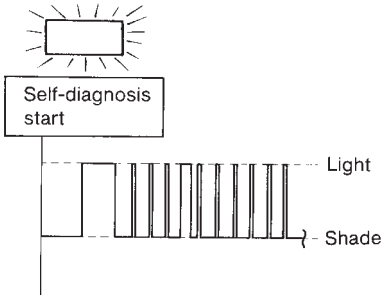
All judgement flickers are same.



SAT819H

All circuits that can be confirmed by self-diagnosis are OK.

4th judgement flicker is longer than others.

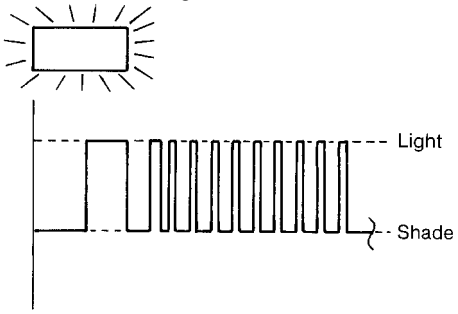


SAT797H

Shift solenoid valve A circuit is short-circuited or disconnected.

➡ **Go to SHIFT SOLENOID VALVE A, AT-65.**

1st judgement flicker is longer than others.

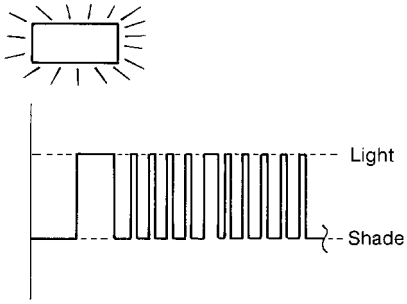


SAT794H

Revolution sensor circuit is short-circuited or disconnected.

➡ **Go to VEHICLE SPEED SENSOR·A/T (REVOLUTION SENSOR), AT-52.**

5th judgement flicker is longer than others.

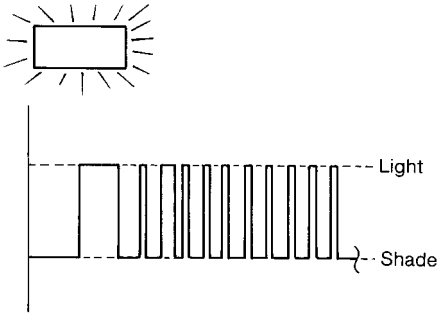


SAT798H

Shift solenoid valve B circuit is short-circuited or disconnected.

➡ **Go to SHIFT SOLENOID VALVE B, AT-68.**

2nd judgement flicker is longer than others.

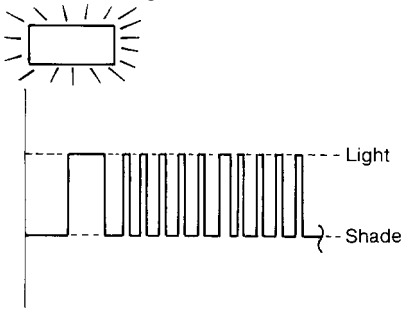


SAT795H

Vehicle speed sensor circuit is short-circuited or disconnected.

➡ **Go to VEHICLE SPEED SENSOR·MTR, AT-56.**

6th judgement flicker is longer than others.

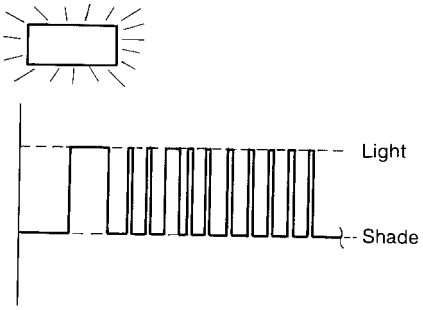


SAT799H

Overrun clutch solenoid valve circuit is short-circuited or disconnected.

➡ **Go to OVERRUN CLUTCH SOLENOID VALVE, AT-71.**

3rd judgement flicker is longer than others.

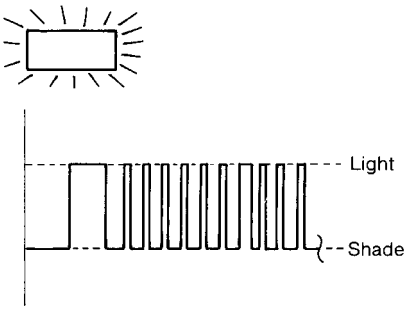


SAT796H

Throttle (accelerator) position sensor circuit is short-circuited or disconnected.

➡ **Go to THROTTLE (ACCELERATOR) POSITION SENSOR, AT-62.**

7th judgement flicker is longer than others.



SAT800H

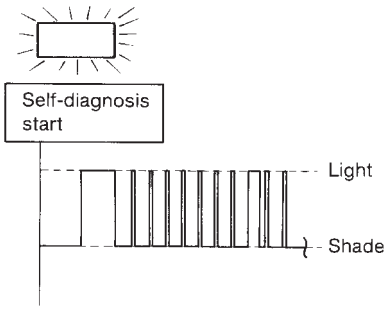
Torque converter clutch solenoid valve circuit is short-circuited or disconnected.

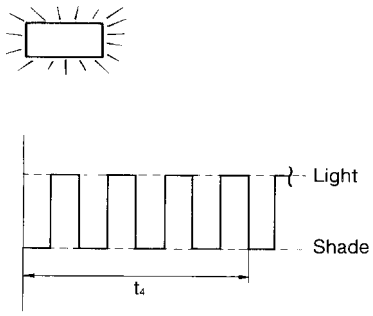
➡ **Go to TORQUE CONVERTER CLUTCH SOLENOID VALVE, AT-74.**

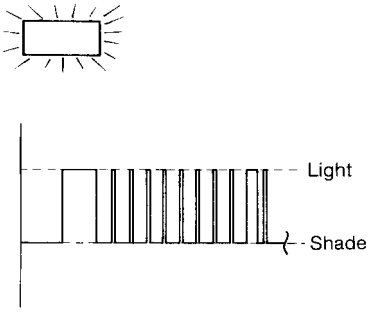
t_1 = 2.5 seconds t_2 = 2.0 seconds t_3 = 1.0 second

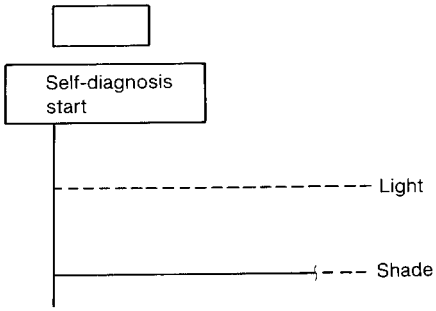
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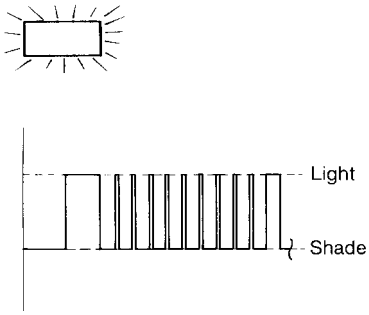
Self-diagnosis (Cont'd)

<table>
<tr><th colspan="2">SPORT indicator lamps</th></tr>
<tr><td>8th judgement flicker is longer than others.
 

SAT801H
A/T fluid temperature sensor is disconnected or TCM power source circuit is damaged.
➡ Go to A/T FLUID TEMPERATURE SENSOR AND TCM POWER SOURCE, AT-78.</td><td>Flickers as shown below.
 

SAT804H
Battery power is low.
Battery has been disconnected for a long time.
Battery is connected conversely.
(When reconnecting TCM connectors. — This is not a problem.)</td></tr>
<tr><td>9th judgement flicker is longer than others.
 

SAT802H
Engine speed signal circuit is short-circuited or disconnected.
➡ Go to ENGINE SPEED SIGNAL, AT-82.</td><td>Does not come on.
 

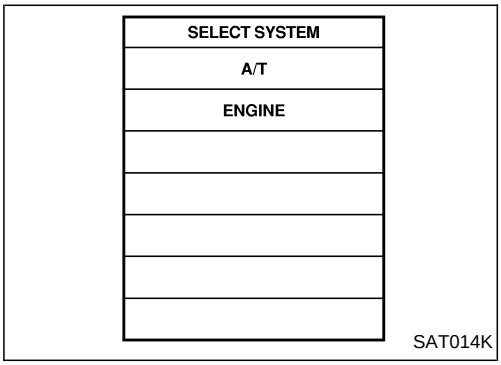
SAT805H
Park/neutral position, overdrive control or throttle (accelerator) position switches circuit is disconnected or TCM is damaged.
➡ Go to PARK/NEUTRAL POSITION, OVERDRIVE CONTROL AND THROTTLE (ACCELERATOR) POSITION SWITCHES, AT-93.</td></tr>
<tr><td>10th judgement flicker is longer than others.
 

SAT803H
Line pressure solenoid valve circuit is short-circuited or disconnected.
➡ Go to LINE PRESSURE SOLENOID VALVE, AT-86.</td><td></td></tr>
</table>

t_4 = 1.0 second

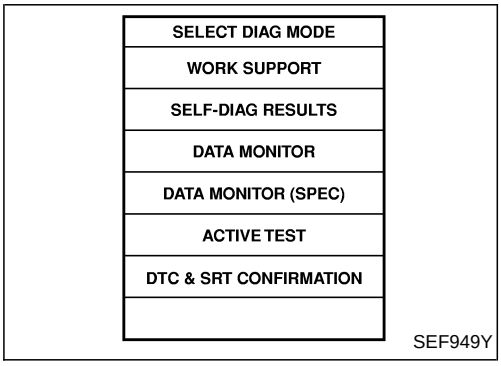
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Self-diagnosis (Cont'd)

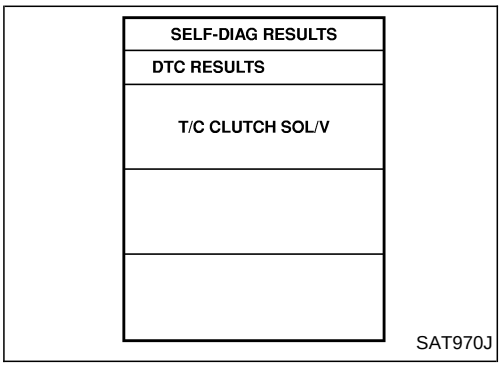


HOW TO ERASE SELF-DIAGNOSTIC RESULTS (With CONSULT-II)

1. If the ignition switch stays "ON" after repair work, be sure to turn ignition switch "OFF" once. Wait for at least 5 seconds and then turn it "ON" again.
2. Turn CONSULT-II "ON", and touch "A/T".



3. Touch "SELF-DIAG RESULTS".



4. Touch "ERASE". (The self-diagnostic results will be erased.)

HOW TO ERASE SELF-DIAGNOSTIC RESULTS (Without CONSULT-II)

1. If the ignition switch stays "ON" after repair work, be sure to turn ignition switch "OFF" once. Wait for at least 5 seconds and then turn it "ON" again.
2. Perform "SELF-DIAGNOSTIC PROCEDURE (Without CONSULT-II)". Refer to AT-15.
3. Turn ignition switch "OFF". (The self-diagnostic results will be erased.)

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Diagnosis by CONSULT-II

NOTICE

1. The CONSULT-II electrically displays shift timing and lock-up timing (that is, operation timing of each solenoid).
   Check for time difference between actual shift timing and the CONSULT-II display. If the difference is noticeable, mechanical parts (except solenoids, sensors, etc.) may be malfunctioning. Check mechanical parts using applicable diagnostic procedures.
2. Shift schedule (which implies gear position) displayed on CONSULT-II and that indicated in Service Manual may differ slightly. This occurs because of the following reasons:
   - Actual shift schedule has more or less tolerance or allowance,
   - Shift schedule indicated in Service Manual refers to the point where shifts start. Gear position displayed on CONSULT-II indicates the point where shifts are completed.
3. Shift solenoid valve “A” or “B” is displayed on CONSULT-II at the start of shifting. Gear position is displayed upon completion of shifting (which is computed by TCM).
4. Additional CONSULT-II information can be found in the Operation Manual supplied with the CONSULT-II unit.

SELF-DIAGNOSTIC RESULT TEST MODE

Refer to AT-14.

DATA MONITOR DIAGNOSTIC TEST MODE

Item	Display	Monitor item		Description	Remarks
		ECU input signals	Main signals		
Vehicle speed sensor 1 (A/T) (Revolution sensor)	VHCL/S SE·A/T [km/h] or [mph]	X	—	• Vehicle speed computed from signal of revolution sensor is displayed.	When racing engine in “N” or “P” position with vehicle stationary, CONSULT-II data may not indicate 0 km/h (0 MPH).
Vehicle speed sensor 2 (Meter)	VHCL/S SE·MTR [km/h] or [mph]	X	—	• Vehicle speed computed from signal of vehicle speed sensor is displayed.	Vehicle speed display may not be accurate under approx. 10 km/h (6 MPH). It may not indicate 0 km/h (0 MPH) when vehicle is stationary.
Throttle (accelerator) position sensor	THRTL POS SEN [V]	X	—	• Throttle (accelerator) position sensor signal voltage is displayed.	
A/T fluid temperature sensor	FLUID TEMP SE [V]	X	—	• A/T fluid temperature sensor signal voltage is displayed. • Signal voltage lowers as fluid temperature rises.	
Battery voltage	BATTERY VOLT [V]	X	—	• Source voltage of TCM is displayed.	
Engine speed	ENGINE SPEED [rpm]	X	X	• Engine speed, computed from engine speed signal, is displayed.	Engine speed display may not be accurate under approx. 800 rpm. It may not indicate 0 rpm even when engine is not running.
Overdrive control switch	OVERDRIVE SW [ON/OFF]	X	—	• ON/OFF state computed from signal of overdrive control SW is displayed.	
P/N position switch	P/N POSI SW [ON/OFF]	X	—	• ON/OFF state computed from signal of P/N position SW is displayed.	
R position switch	R POSITION SW [ON/OFF]	X	—	• ON/OFF state computed from signal of R position SW is displayed.	
D position switch	D POSITION SW [ON/OFF]	X	—	• ON/OFF state computed from signal of D position SW is displayed.	
2 position switch	2 POSITION SW [ON/OFF]	X	—	• ON/OFF status, computed from signal of 2 position SW, is displayed.	
1 position switch	1 POSITION SW [ON/OFF]	X	—	• ON/OFF status, computed from signal of 1 position SW, is displayed.	
ASCD-cruise signal	ASCD·CRUISE [ON/OFF]	X	—	• Status of ASCD cruise signal is displayed. ON ... Cruising state OFF ... Normal running state	• This is displayed even when no ASCD is mounted.

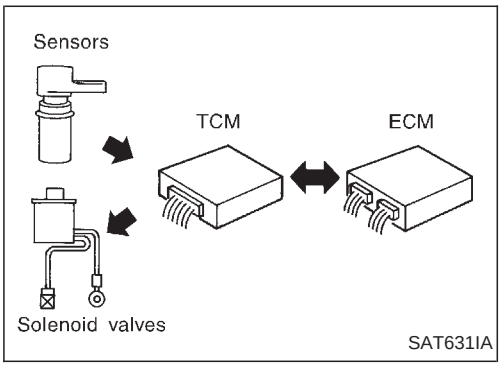
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Diagnosis by CONSULT-II (Cont'd)

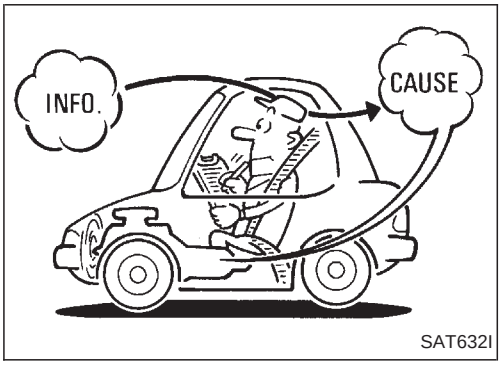
Item	Display	Monitor item		Description	Remarks
		ECU input signals	Main signals		
ASCD-OD cut signal	ASCD·OD CUT [ON/OFF]	X	—	• Status of ASCD·OD release signal is displayed. ON ... OD released OFF ... OD not released	• This is displayed even when no ASCD is mounted.
Kickdown switch	KICKDOWN SW [ON/OFF]	X	—	• ON/OFF status, computed from signal of kickdown SW, is displayed.	• This is displayed even when no kickdown switch is equipped.
A/T mode switch	POWER SHIFT SW [ON/OFF]	X	—	• ON/OFF state computed from signal of SPORT shift SW is displayed.	
Closed throttle position switch	CLOSED THL/SW [ON/OFF]	X	—	• ON/OFF status, computed from signal of closed throttle (accelerator) position SW, is displayed.	
Wide open throttle position switch	W/O THRL/P-SW [ON/OFF]	X	—	• ON/OFF status, computed from signal of wide open throttle (accelerator) position SW, is displayed.	
A/T mode switch	HOLD SW [ON/OFF]	X	—	• ON/OFF status, computed from signal of SNOW shift SW, is displayed.	
Gear position	GEAR	—	X	• Gear position data used for computation by TCM, is displayed.	
Selector lever position	SLCT LVR POSI	—	X	• Selector lever position data, used for computation by TCM, is displayed.	• A specific value used for control is displayed if fail-safe is activated due to error.
Vehicle speed	VEHICLE SPEED [km/h] or [mph]	—	X	• Vehicle speed data, used for computation by TCM, is displayed.	
Throttle (accelerator) position	THROTTLE POSI [/8]	—	X	• Throttle (accelerator) position data, used for computation by TCM, is displayed.	• A specific value used for control is displayed if fail-safe is activated due to error.
Line pressure duty	LINE PRES DTY [%]	—	X	• Control value of line pressure solenoid valve, computed by TCM from each input signal, is displayed.	
Torque converter clutch solenoid valve duty	TCC S/V DUTY [%]	—	X	• Control value of torque converter clutch solenoid valve, computed by TCM from each input signal, is displayed.	
Shift solenoid valve A	SHIFT S/V A [ON/OFF]	—	X	• Control value of shift solenoid valve A, computed by TCM from each input signal, is displayed.	Control value of solenoid is displayed even if solenoid circuit is disconnected. The "OFF" signal is displayed if solenoid circuit is shorted.
Shift solenoid valve B	SHIFT S/V B [ON/OFF]	—	X	• Control value of shift solenoid valve B, computed by TCM from each input signal, is displayed.	
Overrun clutch solenoid valve	OVERRUN/C S/V [ON/OFF]	—	X	• Control value of overrun clutch solenoid valve computed by TCM from each input signal is displayed.	
Self-diagnosis display lamp (SPORT indicator lamp)	SELF-D DP LMP [ON/OFF]	—	X	• Control status of SPORT indicator lamp is displayed.	

X: Applicable
—: Not applicable

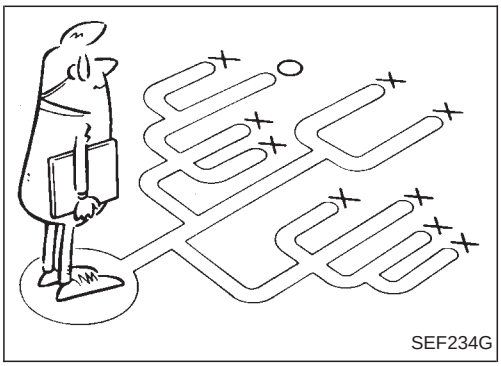
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SAT631IA



SAT632I


SEF234G

Introduction

The TCM receives a signal from the vehicle-speed sensor, throttle (accelerator) position sensor or park/neutral position switch and provides shift control or lock-up control via solenoid valves.

Input and output signals must always be correct and stable in the operation of the A/T system. The A/T system must be in good operating condition and be free of valve seizure, solenoid valve malfunction, etc.

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

A visual check only may not find the cause of the incidents. A road test with CONSULT-II or a circuit tester connected should be performed. Follow the “Work Flow”. Refer to AT-26.

Before undertaking actual checks, take a few minutes to talk with a customer who approaches with a driveability complaint. The customer can supply good information about such incidents, especially intermittent ones. Find out what symptoms are present and under what conditions they occur. A “Diagnostic Worksheet” like the example (AT-24) should be used.

Start your diagnosis by looking for “conventional” incidents first. This will help troubleshoot driveability incidents on an electronically controlled engine vehicle.

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Diagnostic Worksheet

INFORMATION FROM CUSTOMER

KEY POINTS

WHAT ..... Vehicle & A/T model
WHEN ..... Date, Frequencies
WHERE ..... Road conditions
HOW ..... Operating conditions, Symptoms

Customer name MR/MS	Model & Year	VIN
Trans. model	Engine	Mileage
Incident Date	Manuf. Date	In Service Date
Frequency	☐ Continuous ☐ Intermittent (times a day)	
Symptoms	☐ Vehicle does not move. (☐ Any position ☐ Particular position)	
	☐ No up-shift (☐ 1st → 2nd ☐ 2nd → 3rd ☐ 3rd → O/D)	
	☐ No down-shift (☐ O/D → 3rd ☐ 3rd → 2nd ☐ 2nd → 1st)	
	☐ Lockup malfunction	
	☐ Shift point too high or too low.	
	☐ Shift shock or slip (☐ N → D ☐ Lockup ☐ Any drive position)	
	☐ Noise or vibration	
	☐ No kickdown	
	☐ No pattern select	
	☐ Others ( )	
SPORT indicator lamp	Blinks for about 8 seconds.	
	☐ Continuously lit	☐ Not lit
Malfunction indicator lamp (MIL)	☐ Continuously lit	☐ Not lit

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Diagnostic Worksheet (Cont'd)

DIAGNOSTIC WORKSHEET

1.	☐ Read the Fail-safe and listen to customer complaints.	AT-5
2.	☐ A/T FLUID CHECK ☐ Leakage (Follow specified procedure) ☐ Fluid condition ☐ Fluid level	AT-27
3.	☐ Perform STALL TEST and LINE PRESSURE TEST. ☐ Stall test — Mark possible damaged components/others. ☐ Torque converter one-way clutch ☐ Reverse clutch ☐ Forward clutch ☐ Overrun clutch ☐ Forward one-way clutch ☐ Low & reverse brake ☐ Low one-way clutch ☐ Engine ☐ Line pressure is low ☐ Clutches and brakes except high clutch and brake band are OK ☐ Line pressure test — Suspected parts:	AT-27, AT-30
4.	☐ Perform all ROAD TEST and mark required procedures.	AT-32
	4-1. Check before engine is started. ☐ SELF-DIAGNOSTIC PROCEDURE — Mark detected items. ☐ Vehicle speed sensor·A/T (Revolution sensor), AT-52. ☐ Vehicle speed sensor·MTR, AT-56. ☐ Throttle (accelerator) position sensor, AT-62. ☐ Shift solenoid valve A, AT-65. ☐ Shift solenoid valve B, AT-68. ☐ Overrun clutch solenoid valve, AT-71. ☐ Torque converter clutch solenoid valve, AT-93. ☐ A/T fluid temperature sensor and TCM power source, AT-78. ☐ Engine speed signal, AT-82. ☐ Line pressure solenoid valve, AT-86. ☐ Park/neutral position, overdrive control, A/T check and throttle (accelerator) position switches, AT-93. ☐ Battery ☐ Others	AT-33
	4-2. Check at idle ☐ 1. SPORT Indicator Lamp Does Not Come On, AT-97. ☐ 2. SPORT or SNOW Indicator Lamp Does Not Come On, AT-100. ☐ 3. O/D OFF Indicator Lamp Does Not Come On, AT-100. ☐ 4. SPORT Indicator Lamp Does Not Come On, AT-101. ☐ 5. Engine Cannot Be Started In "P" And "N" Position, AT-102. ☐ 6. In "P" Position, Vehicle Moves Forward Or Backward When Pushed, AT-102. ☐ 7. In "N" Position, Vehicle Moves, AT-103. ☐ 8. Large Shock. "N" → "R" Position, AT-104. ☐ 9. Vehicle Does Not Creep Backward In "R" Position, AT-105. ☐ 10. Vehicle Does Not Creep Forward In "D", "2" Or "1" Position, AT-106.	AT-35
	4-3. Cruise test Part-1 ☐ 11. Vehicle Cannot Be Started From D_1, AT-107. ☐ 12. A/T Does Not Shift: $D_1 \rightarrow D_2$ Or Does Not Kickdown: $D_4 \rightarrow D_2$, AT-108. ☐ 13. A/T Does Not Shift: $D_2 \rightarrow D_3$, AT-109. ☐ 14. A/T Does Not Shift: $D_3 \rightarrow D_4$, AT-110. ☐ 15. A/T Does Not Perform Lock-up, AT-111. ☐ 16. A/T Does Not Hold Lock-up Condition, AT-112. ☐ 17. Lock-up Is Not Released, AT-112. ☐ 18. Engine Speed Does Not Return To Idle (Light Braking $D_4 \rightarrow D_3$), AT-113.	AT-36, AT-39

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Diagnostic Worksheet (Cont'd)

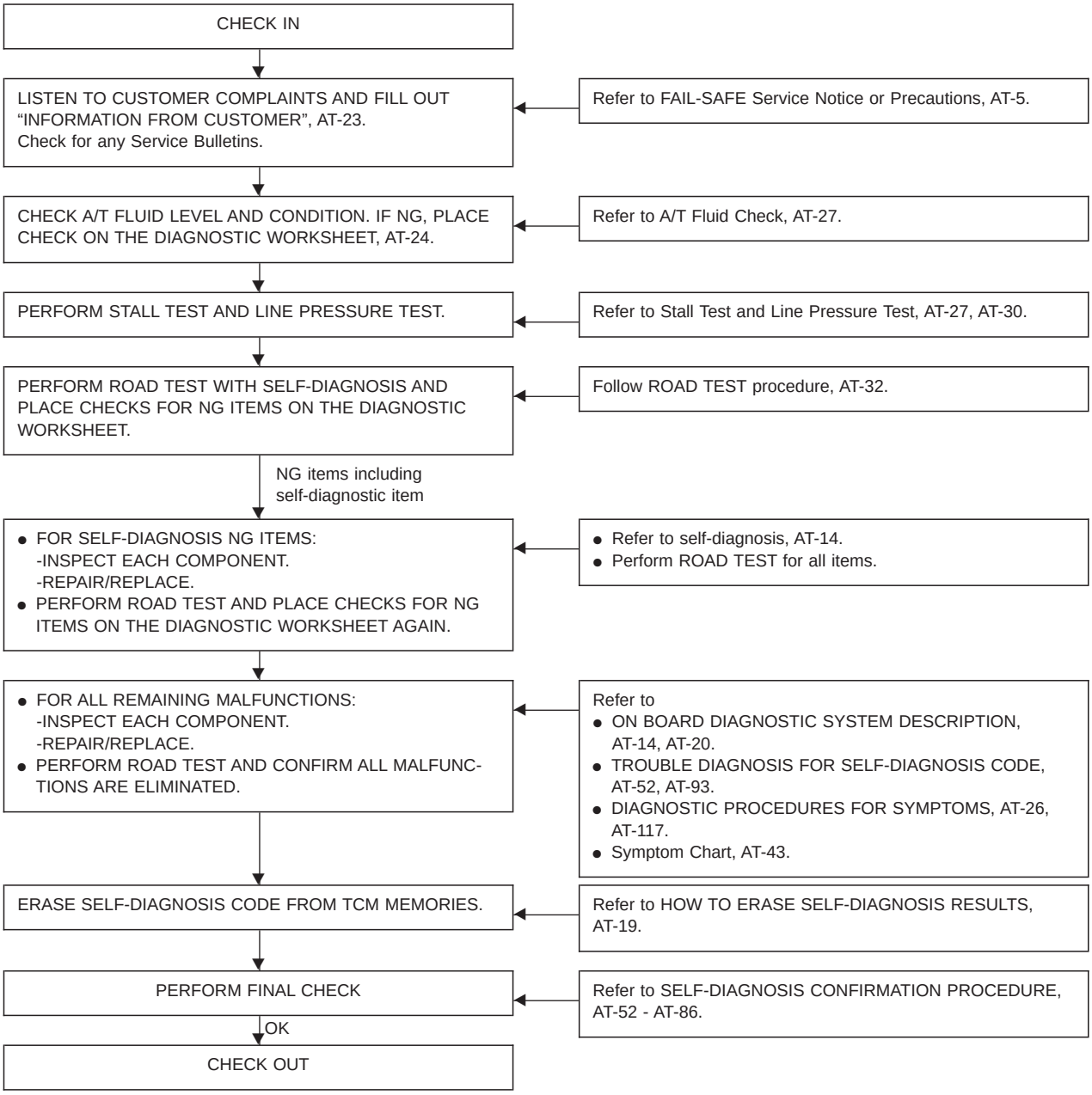
4.	Part-2 ☐ 19. Vehicle Does Not Start From D_1, AT-114. ☐ 12. A/T Does Not Shift: $D_1 \rightarrow D_2$ Or Does Not Kickdown: $D_4 \rightarrow D_2$, AT-108. ☐ 13. A/T Does Not Shift: $D_2 \rightarrow D_3$, AT-109. ☐ 14. A/T Does Not Shift: $D_3 \rightarrow D_4$, AT-110.	AT-41
	Part-3 ☐ 20. A/T Does Not Shift: $D_2 \rightarrow D_1$ When Depressing Accelerator Pedal, AT-5. ☐ 21. A/T Does Not Shift: $D_4 \rightarrow D_3$ When Overdrive Control Switch "ON" → "OFF", AT-116. ☐ 18. Engine Speed Does Not Return To Idle (Engine Brake In D_3), AT-113. ☐ 22. A/T Does Not Shift: $D_3 \rightarrow 2_2$, When Selector Lever "D" → "2" Position, AT-116. ☐ 18. Engine Speed Does Not Return To Idle (Engine Brake In 2_2), AT-113. ☐ 23. A/T Does Not Shift: $2_2 \rightarrow 1_1$, When Selector Lever "2" → "1" Position, AT-5. ☐ 24. Vehicle Does Not Decelerate By Engine Brake, AT-117. ☐ SELF-DIAGNOSTIC PROCEDURE — Mark detected items. ☐ Vehicle speed sensor·A/T (Revolution sensor), AT-52. ☐ Vehicle speed sensor·MTR, AT-56. ☐ Throttle (accelerator) position sensor, AT-62. ☐ Shift solenoid valve A, AT-65. ☐ Shift solenoid valve B, AT-68. ☐ Overrun clutch solenoid valve, AT-71. ☐ Torque converter clutch solenoid valve, AT-71. ☐ A/T fluid temperature sensor and TCM power source, AT-78. ☐ Engine speed signal, AT-82. ☐ Line pressure solenoid valve, AT-86. ☐ Park/neutral position, overdrive control, A/T check and throttle (accelerator) position switches, AT-93. ☐ Battery ☐ Others	AT-42
5.	☐ For self-diagnosis NG items, inspect each component. Repair or replace the damaged parts.	AT-14
6.	☐ Perform all ROAD TEST and re-mark required procedures.	AT-32
7.	☐ Perform the Diagnostic Procedures for all remaining items marked NG. Repair or replace the damaged parts. Refer to the Symptom Chart when you perform the procedures. (The chart also shows some other possible symptoms and the component inspection orders.)	AT-46 AT-43
8.	☐ Erase self-diagnosis code from TCM memories.	AT-19

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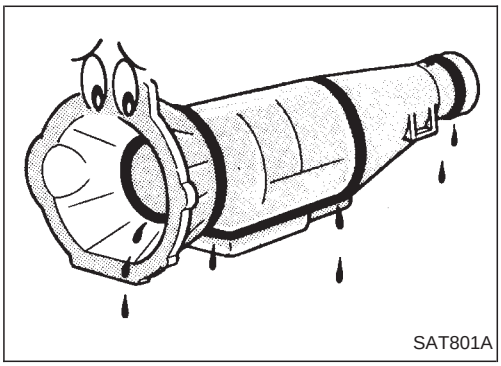
Work Flow

HOW TO PERFORM TROUBLE DIAGNOSES FOR QUICK AND ACCURATE REPAIR

A good understanding of the malfunction conditions can make troubleshooting faster and more accurate.
In general, each customer feels differently about a malfunction. It is important to fully understand the symptoms or conditions for a customer complaint.
Make good use of the two sheets provided, “INFORMATION FROM CUSTOMER” and “DIAGNOSTIC WORKSHEET”, to perform the best troubleshooting possible.



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SAT801A

A/T Fluid Check

FLUID LEAKAGE CHECK

1. Clean area suspected of leaking. — for example, mating surface of converter housing and transmission case.
2. Start engine, apply foot brake, place selector lever in “D” position and wait a few minutes.
3. Stop engine.
4. Check for fresh leakage.

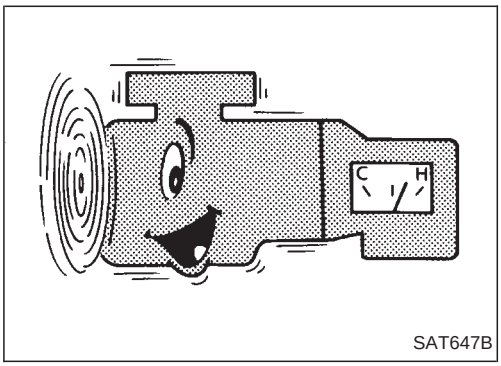

SAT638A

FLUID CONDITION CHECK

Fluid color	Suspected cause
Dark or black with burned odor	Wear of frictional material
Milky pink	Water contamination — Road water entering through filler tube or breather
Varnished fluid, light to dark brown and tacky	Oxidation — Over or under filling, — Overheating

FLUID LEVEL CHECK

Refer to MA section (“Checking A/T Fluid”, “CHASSIS AND BODY MAINTENANCE”).



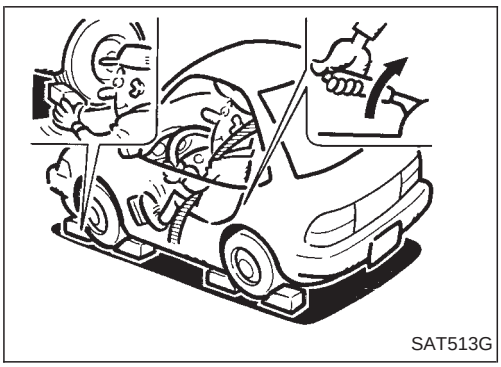
SAT647B

Stall Test

STALL TEST PROCEDURE

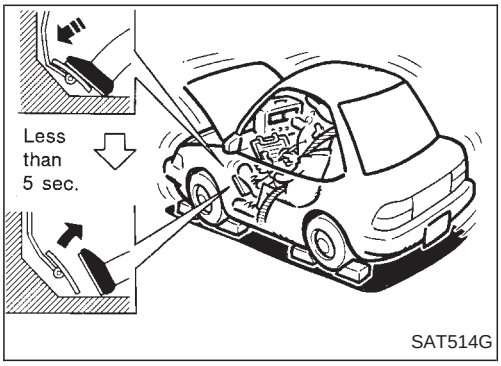
1. Check A/T and engine fluid levels. If necessary, add.
2. Drive vehicle for approx. 10 minutes or until engine oil and ATF reach operating temperature.

ATF operating temperature:
50 - 80°C (122 - 176°F)


SAT513G

3. Set parking brake and block wheels.
4. Install a tachometer where it can be seen by driver during test.

- **It is good practice to put a mark on point of specified engine rpm on indicator.**



SAT514G

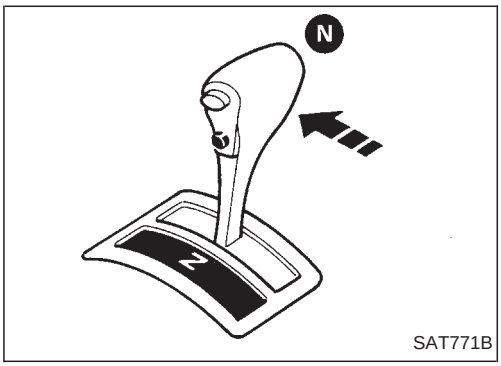
5. Start engine, apply foot brake, and place selector lever in “D” position.
6. Accelerate to wide open throttle gradually while applying foot brake.
7. Quickly note the engine stall revolution and immediately release throttle.

- **During test, never hold throttle wide open for more than 5 seconds.**

Stall revolution:
2,450 - 2,700 rpm

http://vnx.su/

Stall Test (Cont'd)



8. Move selector lever to "N" position.
9. Cool off ATF.
   - **Run engine at idle for at least one minute.**
10. Repeat steps 5 through 9 with selector lever in "2", "1" and "R" positions.

JUDGEMENT OF STALL TEST

The test result and possible damaged components relating to each result are shown in the illustration.
In order to pinpoint the possible damaged components, follow the WORK FLOW as shown in AT-26.

Note

Stall revolution is too high in "D" or "2" position:

- Slippage occurs in 1st gear but not in 2nd and 3rd gears. ..... Low one-way clutch slippage
- Slippage occurs at the following gears:
  1st through 3rd gears in "D" position and engine brake functions.
  1st and 2nd gears in "2" position and engine brake functions with accelerator pedal released (fully closed throttle). ..... Forward clutch or forward one-way clutch slippage

Stall revolution is too high in "R" position:

- Engine brake does not function in "1" position. ..... Low & reverse brake slippage
- Engine brake functions in "1" position. ..... Reverse clutch slippage

Stall revolution within specifications:

- Vehicle does not achieve speed of more than 80 km/h (50 MPH). ..... One-way clutch seizure in torque converter housing

  CAUTION:
  Be careful since automatic fluid temperature increases abnormally.
- Slippage occurs in 3rd and 4th gears in "D" position. ..... High clutch slippage
- Slippage occurs in 2nd and 4th gears in "D" position. ..... Brake band slippage

Stall revolution less than specifications:

- Poor acceleration during starts. ..... One-way clutch seizure in torque converter

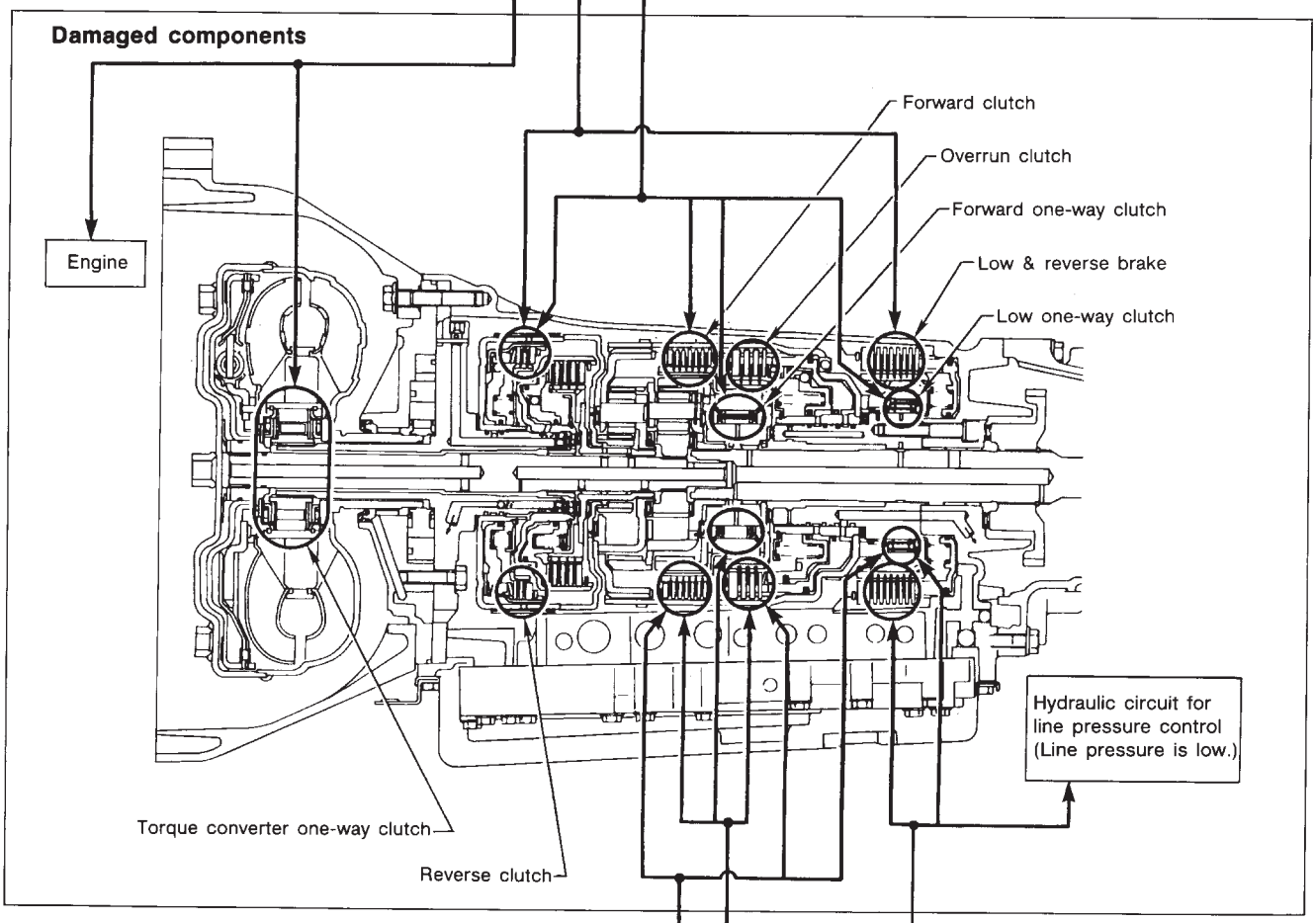
http://vnx.su/

Stall Test (Cont'd)

JUDGEMENT OF STALL TEST

Selector lever position	Judgement		
D	L	O	H
2	L	O	H
1	L	O	O
R	L	H	H

O : Stall revolution is normal.
H : Stall revolution is higher than specified.
L : Stall revolution is lower than specified.

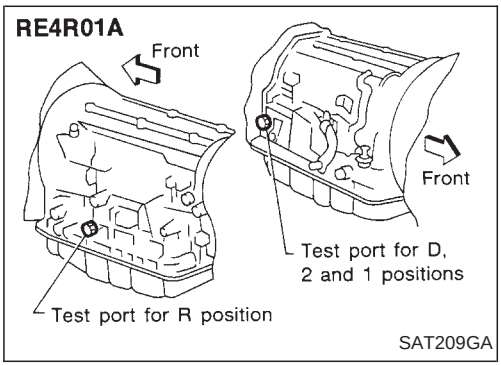


Clutches and brakes except high clutch and brake band are OK. (Condition of high clutch and brake band cannot be confirmed by stall test.)

Selector lever position	Judgement			
D	H	H	H	O
2	H	H	H	O
1	O	H	H	O
R	O	O	H	O

SAT392H

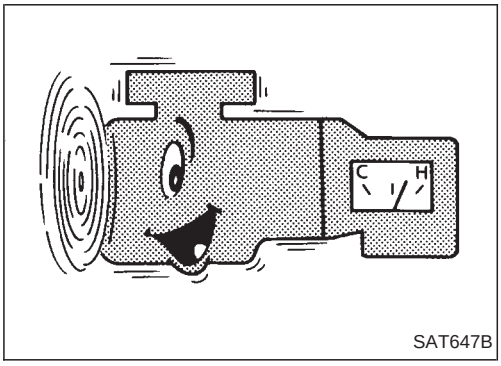
http://vnx.su/



Line Pressure Test

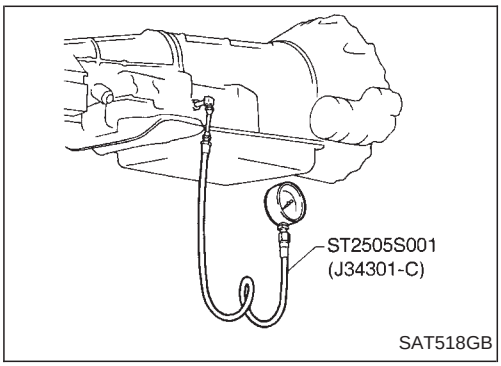
LINE PRESSURE TEST PORTS

- Location of line pressure test ports.
- **Always replace line pressure plugs as they are self-sealing bolts.**

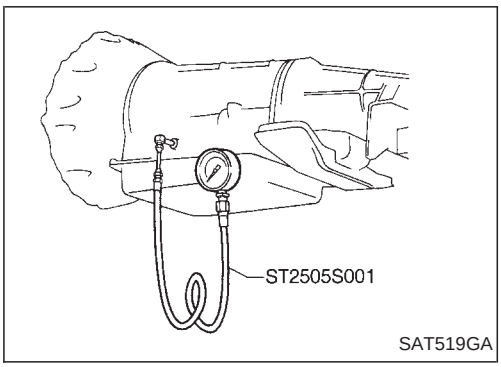


LINE PRESSURE TEST PROCEDURE

1. Check A/T and engine fluid levels. If necessary, add fluid.
2. Drive vehicle for approx. 10 minutes or until engine oil and ATF reach operating temperature.
   ATF operating temperature:
   50 - 80°C (122 - 176°F)

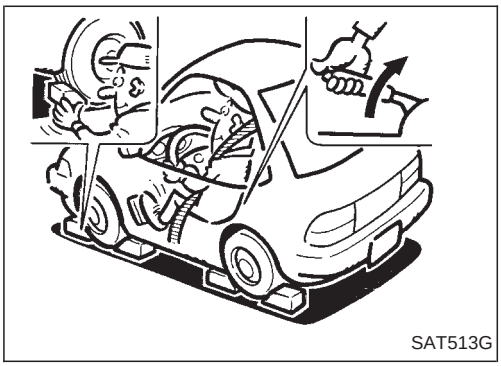


3. Install pressure gauge to corresponding line pressure port.

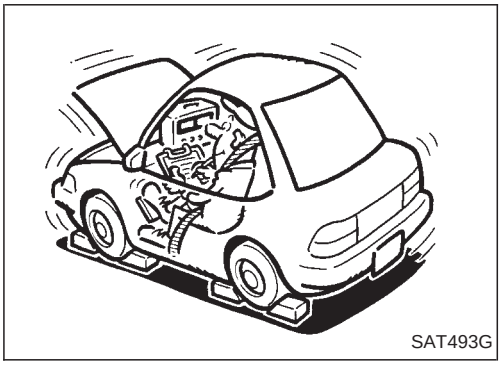


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Line Pressure Test (Cont'd)


SAT513G

4. Set parking brake and block wheels.
- **Continue to depress brake pedal fully while line pressure test is being performed at stall speed.**


SAT493G

5. Start engine and measure line pressure at idle and stall speed.
- **When measuring line pressure at stall speed, follow the stall test procedure.**

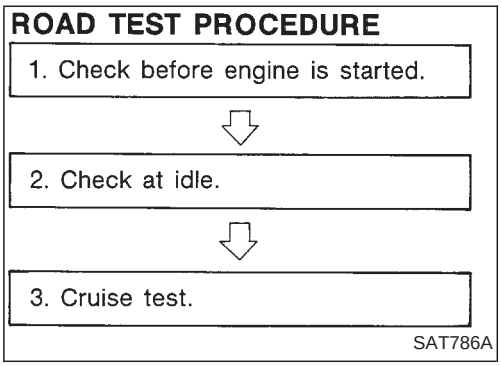
Line pressure:

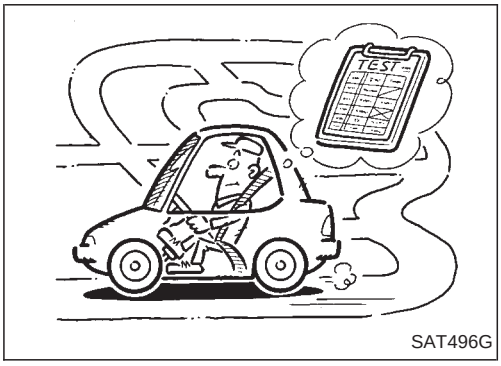
Refer to SDS, AT-201.

JUDGEMENT OF LINE PRESSURE TEST

Judgement		Suspected parts
At idle	Line pressure is low in all positions.	• Oil pump wear • Control piston damage • Pressure regulator valve or plug sticking • Spring for pressure regulator valve damaged • A/T fluid pressure leakage between oil strainer and pressure regulator valve • Clogged strainer
	Line pressure is low in particular position.	• Fluid pressure leakage between manual valve and particular clutch • For example, line pressure is: — Low in "R" and "1" positions, — Normal in "D" and "2" positions. Then, fluid leakage exists at or around low and reverse brake circuit. Refer to "CLUTCH AND BAND CHART", AT-11.
	Line pressure is high.	• Mal-adjustment of throttle position sensor • A/T fluid temperature sensor damaged • Line pressure solenoid valve sticking • Short circuit of line pressure solenoid valve circuit • Pressure modifier valve sticking • Pressure regulator valve or plug sticking • Open in dropping resistor circuit
At stall speed	Line pressure is low.	• Mal-adjustment of throttle position sensor • Line pressure solenoid valve sticking • Short circuit of line pressure solenoid valve circuit • Pressure regulator valve or plug sticking • Pressure modifier valve sticking • Pilot valve sticking

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Road Test

DESCRIPTION

- The purpose of the test is to determine overall performance of A/T and analyze causes of malfunctions.
- The road test consists of the following three parts:

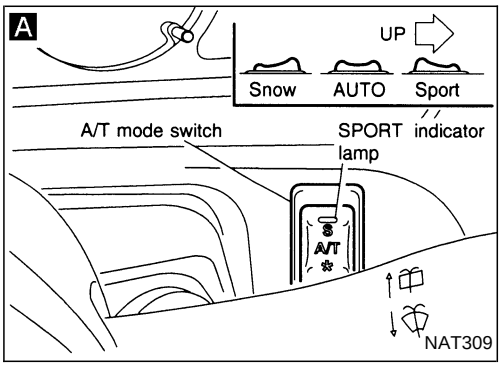
1. Check before engine is started
2. Check at idle
3. Cruise test

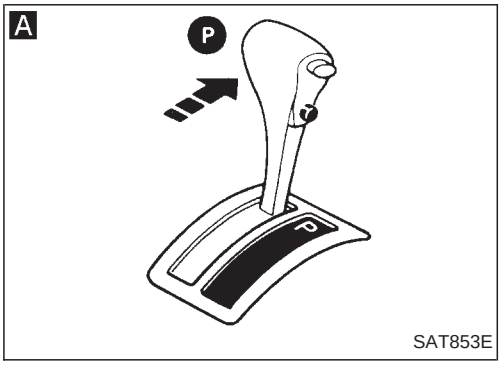
- Before road test, familiarize yourself with all test procedures and items to check.
- Conduct tests on all items until specified symptom is found. Troubleshoot items which check out No Good after road test. Refer to “ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION” and “DIAGNOSTIC PROCEDURES FOR SYMPTOMS”, AT-14 - AT-20 and AT-97 - AT-117.

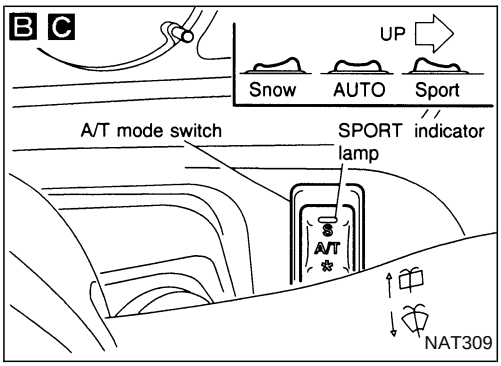
http://vnx.su/

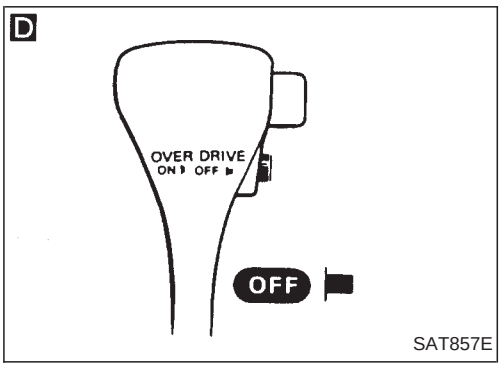
Road Test (Cont'd)

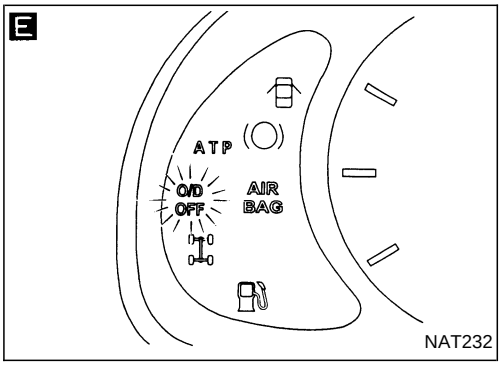
1. CHECK BEFORE ENGINE IS STARTED











1. Park vehicle on flat surface.
2. Turn ignition switch to "OFF" position.

↓

A

1. Set A/T mode switch to "AUTO" position.
2. Move selector lever to "P" position.
3. Turn ignition switch to "ON" position. (Do not start engine.)
4. Does SPORT indicator lamp come on for about 2 seconds?

No → Go to 1. SPORT Indicator Lamp Does Not Come On, AT-97.

↓ Yes

B

Does SPORT indicator lamp flicker for about 8 seconds?

Yes → Perform self-diagnosis. Refer to SELF-DIAGNOSIS PROCEDURE, AT-14.

↓ No

C

1. Set A/T mode switch to "SPORT" position.
2. Does SPORT indicator lamp come on?

No → Go to 2. SPORT or SNOW (*) Indicator Lamp Does Not Come On, AT-100.

↓ Yes

D

Set overdrive control switch to "OFF" position.

↓

E

Does O/D OFF indicator lamp come on?

No → Go to 3. O/D OFF Indicator Lamp Does Not Come On, AT-100.

↓ Yes

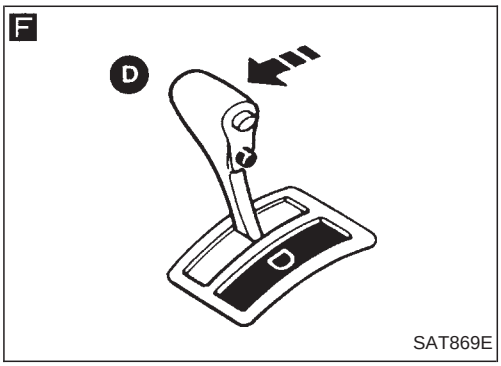
Ⓐ

(Go to next page.)

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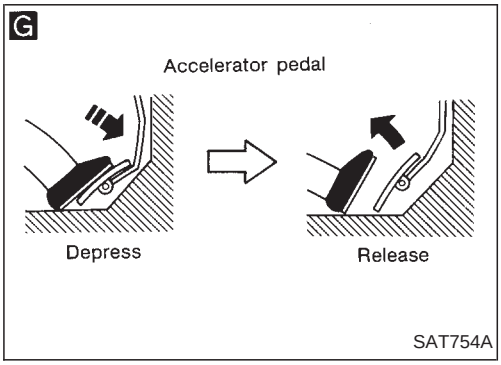
Road Test (Cont'd)

F



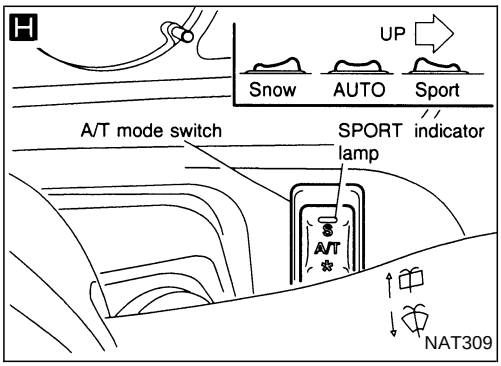
SAT869E

G



SAT754A

H



NAT309

Ⓐ

F

Depress brake pedal and move selector lever to "D" position.

G

1. Set A/T mode switch to "AUTO" position.
2. Depress and release accelerator pedal quickly.

H

Does SPORT indicator lamp come on for about 3 seconds after accelerator pedal is depressed?

No → Go to 4. SPORT Indicator Lamp Does Not Come On, AT-101.

Yes

Turn ignition switch to "OFF" position.

Perform self-diagnosis and note NG items:
Refer to SELF-DIAGNOSIS PROCEDURE, AT-14.

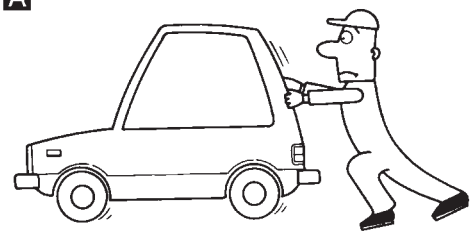
Go to "2. Check at idle", AT-35.

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Road Test (Cont'd)

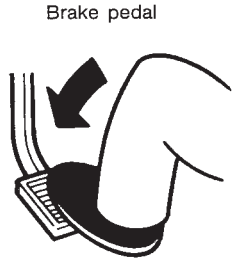
2. CHECK AT IDLE

A



SAT796A

B



SAT797A

1. Park vehicle on flat surface.
2. Turn ignition switch to "OFF" position.
3. Move selector lever to "P" or "N" position.
4. Turn ignition switch to start position.
5. Is engine started?

No → Go to "5. Engine Cannot Be Started In "P" and "N" Position", AT-102.

Yes ↓

1. Turn ignition switch to "OFF" position.
2. Move selector lever to "D", "1", "2" or "R" position.
3. Turn ignition switch to start position.
4. Is engine started?

Yes → Go to "5. Engine Cannot Be Started In "P" and "N" Position", AT-102.

No ↓

A

1. Turn ignition switch to "OFF" position.
2. Move selector lever to "P" position.
3. Release parking brake.
4. Push vehicle forward or backward.
5. Does vehicle move when it is pushed forward or backward?

Yes → Go to "6. In "P" Position, Vehicle Moves Forward Or Backward When Pushed", AT-117.

No ↓

1. Apply parking brake.
2. Move selector lever to "N" position.
3. Turn ignition switch to "START" position and start engine.
4. Release parking brake.
5. Does vehicle move forward or backward?

Yes → Go to "7. In "N" Position, Vehicle Moves", AT-103.

No ↓

B

1. Apply foot brake.
2. Move selector lever to "R" position.
3. Is there large shock when changing from "N" to "R" position?

Yes → Go to "8. Large Shock. "N" → "R" Position", AT-104.

No ↓

1. Release foot brake for several seconds.
2. Does vehicle creep backward when foot brake is released?

No → Go to "9. Vehicle Does Not Creep Backward In "R" Position", AT-105.

Yes ↓

1. Move selector lever to "D", "1" and "2" position and check if vehicle creeps forward.
2. Does vehicle creep forward in all three positions?

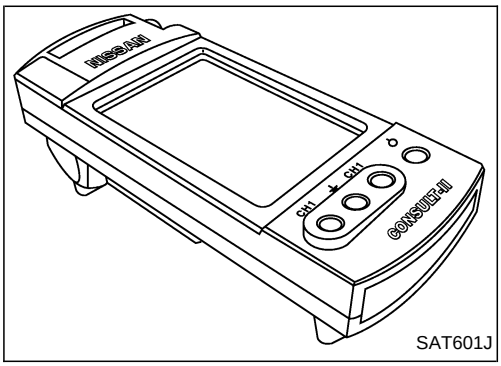
No → Go to "10. Vehicle Does Not Creep Forward In "D", "2" Or "1" Position", AT-106.

Yes ↓

Go to "3. Cruise test", AT-36.

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Road Test (Cont'd)

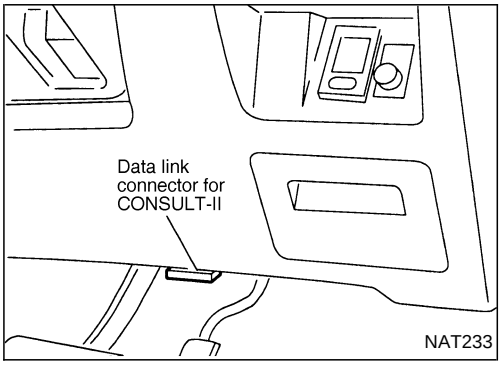


3. CRUISE TEST

- Check all items listed in Parts 1 through 3.

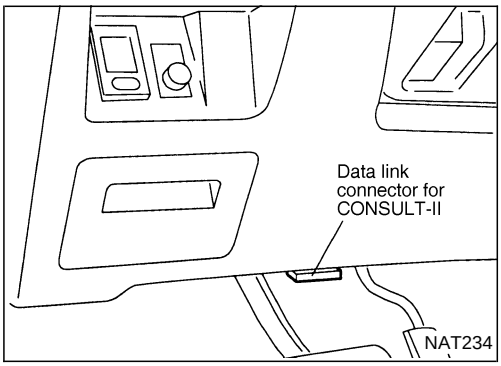
With CONSULT-II

- Using CONSULT-II, conduct a cruise test and record the result.
- Print the result and ensure that shifts and lock-ups take place as per "Shift Schedule".

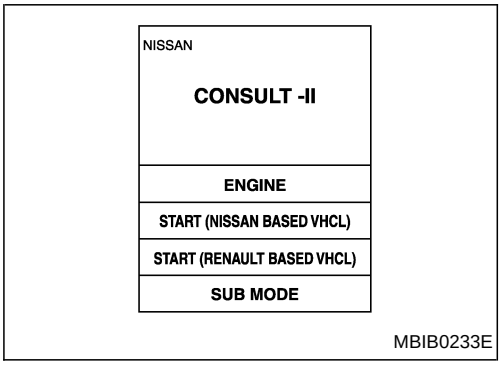


CONSULT-II setting procedure

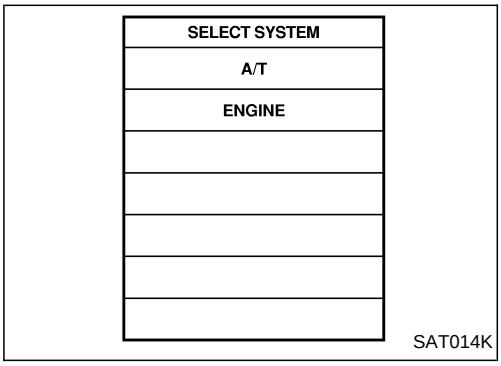
1. Turn off ignition switch.
2. Connect "CONSULT-II" to Data link connector for CONSULT-II. Data link connector for CONSULT-II is located in instrument lower panel on driver side.



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

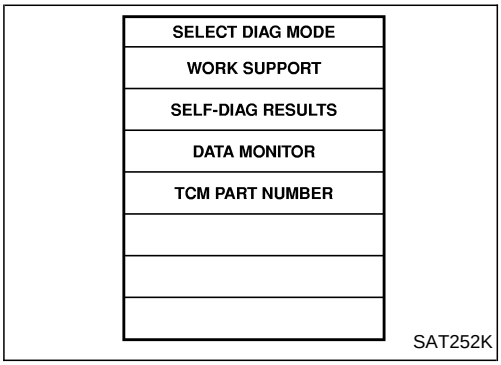


5. Touch "A/T".

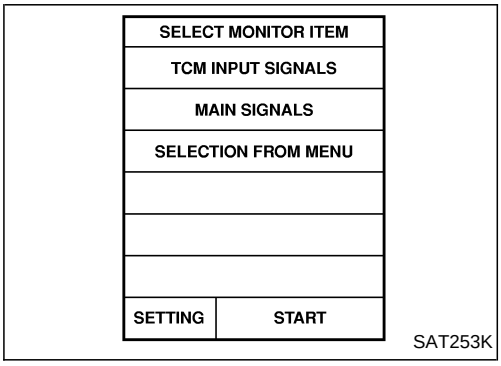


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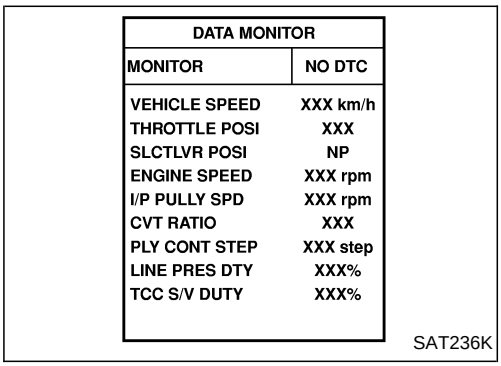
Road Test (Cont'd)



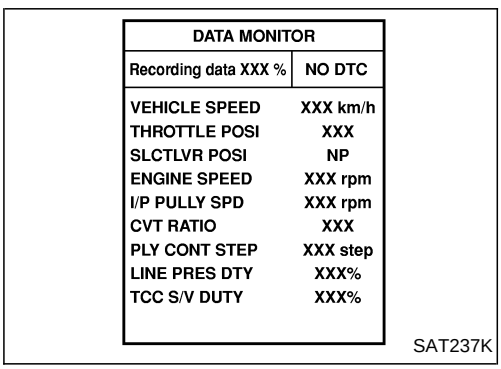
6. Touch "DATA MONITOR".



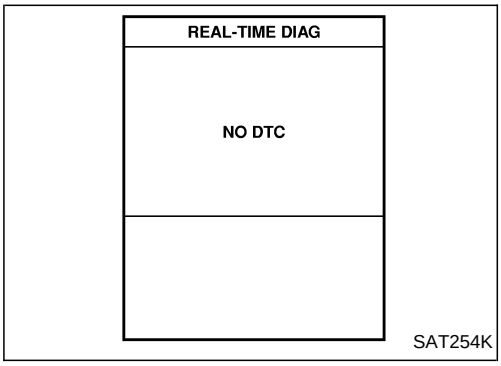
7. Touch "MAIN SIGNALS" to set recording condition.
8. See "Numerical Display", "Barchart Display" or "Line Graph Display".
9. Touch "START".



10. When performing cruise test, touch "Store Data".



11. After finishing cruise test part 1, touch "STOP".



12. Touch "STORE".

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Road Test (Cont'd)

SAVE DATA	
NOT FOUND SAVE REC DATA	
A/T	1999/1/30 19:59:18
A/T	1999/1/30 19:59:42
A/T	1999/1/30 20:01:04

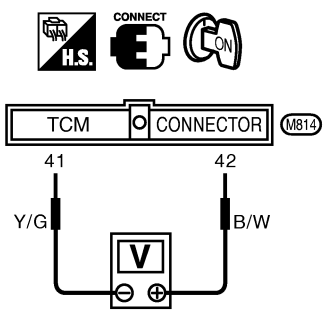
SAT608J

13. Touch "DISPLAY".

STORE	
SYSTEM	SAVE REC DATA
ENGINE	04/15/1999, 10:34:29
ENGINE	07/15/1999, 15:10:33

SAT238K

14. Touch "PRINT".
15. Check the monitor data printed out.
16. Continue cruise test part 2 and 3.



YAT411

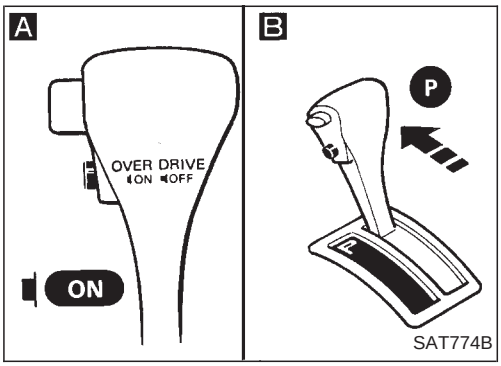
Without CONSULT-II

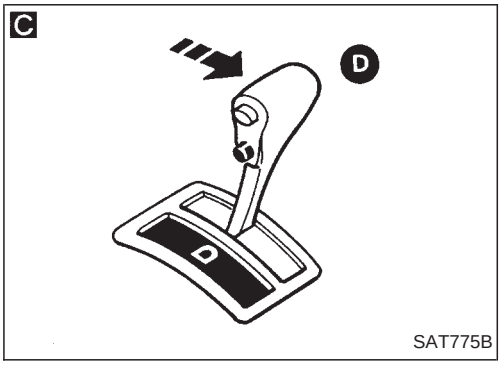
- Throttle (accelerator) position can be checked by voltage across terminals ㊶ and ㊷ of TCM.

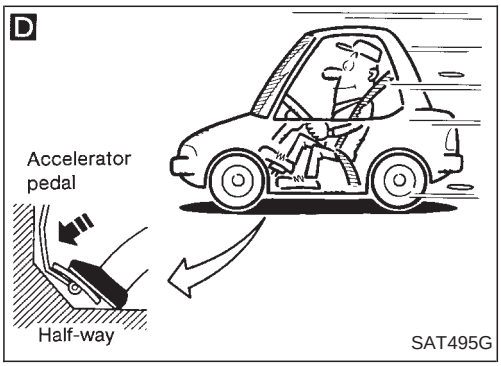
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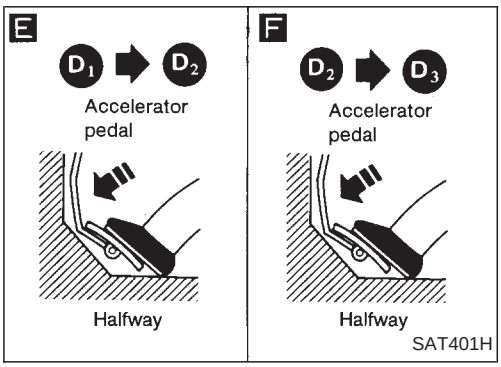
Road Test (Cont'd)

CRUISE TEST — Part 1









Drive vehicle for approx. 10 minutes to warm engine oil and ATF up to operating temperature.

ATF operating temperature:
50 - 80°C (122 - 176°F)

A B

1. Park vehicle on flat surface.
2. Set overdrive control switch to "ON" position.
3. Move selector lever to "P" position.
4. Start engine.

C

Move selector lever to "D" position.

D

Accelerate vehicle by constantly depressing accelerator pedal halfway.

Does vehicle start from D_1?

Read gear position.

No → Go to "11. Vehicle Cannot Be Started From D_1", AT-107.

Yes

E

Does A/T shift from D_1 to D_2 at the specified speed?

Read gear position, throttle opening and vehicle speed.

Specified speed when shifting from D_1 to D_2:
Refer to Shift schedule, AT-201.

No → Go to "12. A/T Does Not Shift: $D_1 \rightarrow D_2$ Or Does Not Kickdown: $D_4 \rightarrow D_2$", AT-201.

Yes

F

Does A/T shift from D_2 to D_3 at the specified speed?

Read gear position, throttle position and vehicle speed.

Specified speed when shifting from D_2 to D_3:
Refer to Shift schedule, AT-109.

No → Go to "13. A/T Does Not Shift: $D_2 \rightarrow D_3$", AT-109.

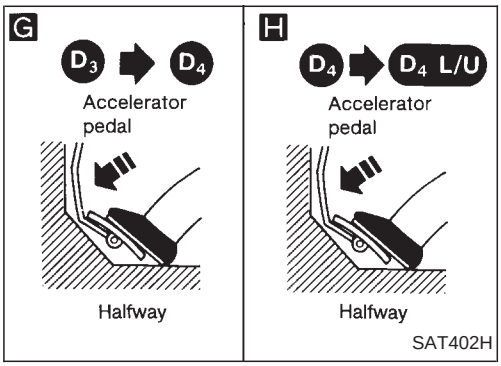
Yes

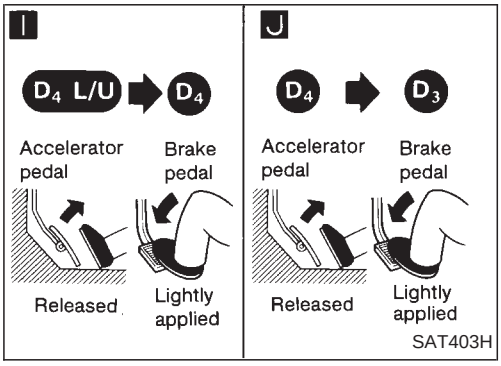
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(Go to next page.)

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Road Test (Cont'd)





Ⓐ

G

Does A/T shift from D_3 to D_4 at the specified speed?

Read gear position, throttle position and vehicle speed.

Specified speed when shifting from D_3 to D_4:

Refer to Shift schedule, AT-201.

No → Go to "14. A/T Does Not Shift: $D_3 \rightarrow D_4$", AT-110.

Yes ↓

H

Does A/T perform lock-up at the specified speed?

Read vehicle speed, throttle position when lock-up duty becomes 94%.

Specified speed when lock-up occurs:

Refer to Shift schedule, AT-201.

No → Go to "15. A/T Does Not Perform Lock-up", AT-111.

Yes ↓

Does A/T hold lock-up condition for more than 30 seconds?

No → Go to "16. A/T Does Not Hold Lock-up Condition", AT-112.

Yes ↓

I

1. Release accelerator pedal.
2. Is lock-up released when accelerator pedal is released?

No → Go to "17. Lock-up Is Not Released", AT-112.

Yes ↓

J

1. Decelerate vehicle by applying foot brake lightly.
2. Does engine speed return to idle smoothly when A/T is shifted from D_4 to D_3?

Read gear position and engine speed.

No → Go to "18. Engine Speed Does Not Return To Idle (Light Braking $D_4 \rightarrow D_3$)", AT-113.

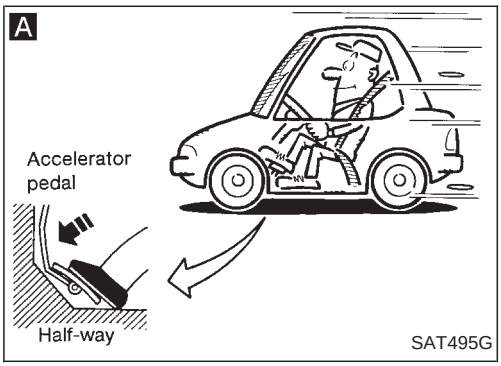
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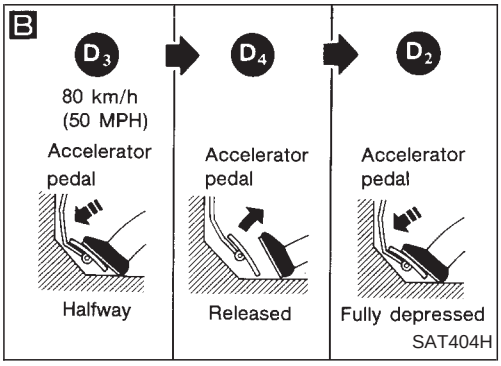
1. Stop vehicle.
2. Go to "Cruise test — Part 2", AT-41.

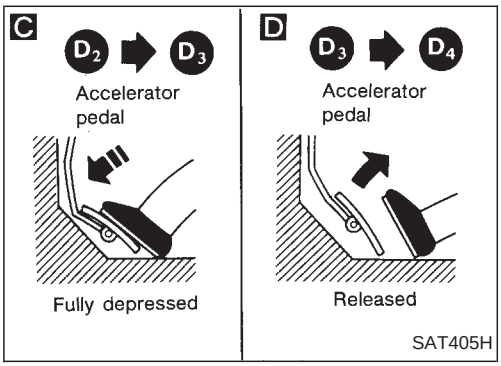
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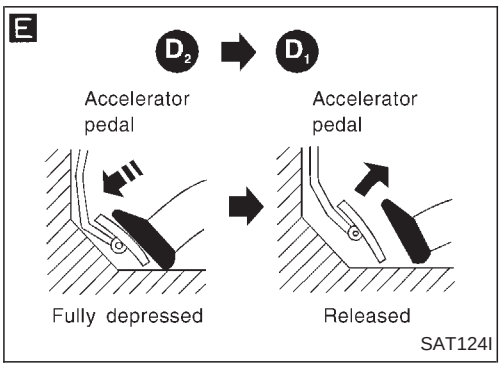
Road Test (Cont'd)

CRUISE TEST — Part 2









A

1. Confirm overdrive control switch is in "ON" position.
2. Confirm selector lever is in "D" position.
3. Accelerate vehicle by half throttle again.
4. Does vehicle start from D_1?

Read gear position.

No → Go to "19. Vehicle Does Not Start From D_1", AT-114.

Yes ↓

B

1. Accelerate vehicle to 80 km/h (50 MPH) as shown in illustration.
2. Release accelerator pedal and then quickly depress it fully.
3. Does A/T shift from D_4 to D_2 as soon as accelerator pedal is depressed fully?

Read gear position and throttle position.

No → Go to "12. A/T Does Not Shift: $D_1 \rightarrow D_2$ Or Does Not Kickdown: $D_4 \rightarrow D_2$", AT-108.

Yes ↓

C

Does A/T shift from D_2 to D_3 at the specified speed?

Read gear position, throttle position and vehicle speed.

Specified speed when shifting from D_2 to D_3:

Refer to Shift schedule, AT-201.

No → Go to "13. A/T Does Not Shift: $D_2 \rightarrow D_3$", AT-109.

Yes ↓

D

1. Release accelerator pedal after shifting from D_2 to D_3.
2. Does A/T shift from D_3 to D_4 and does vehicle decelerate by engine brake?

Read gear position, throttle position and vehicle speed.

No → Go to "14. A/T Does Not Shift: $D_3 \rightarrow D_4$", AT-110.

Yes ↓

E

1. Decelerate to 10 km/h (6 MPH) with accelerator pedal released and then quickly depress it fully.
2. Does A/T shift from D_2 to D_1 as soon as accelerator pedal is depressed fully?

No → Go to "20. A/T Does Not Shift: $D_2 \rightarrow D_1$ When Depressing Accelerator Pedal", AT-115.

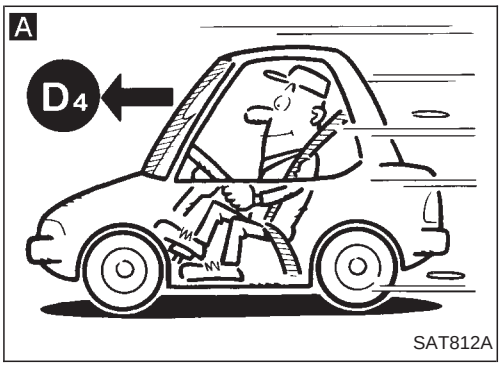
Yes ↓

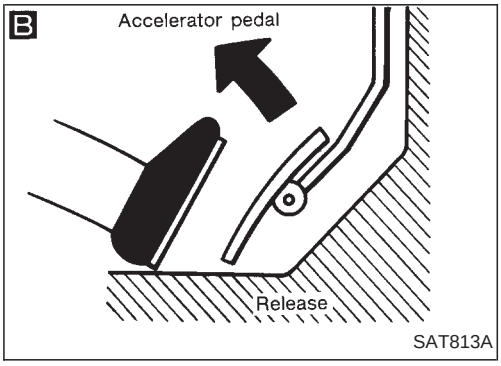
1. Stop vehicle.
2. Go to "Cruise test — Part 3", AT-42.

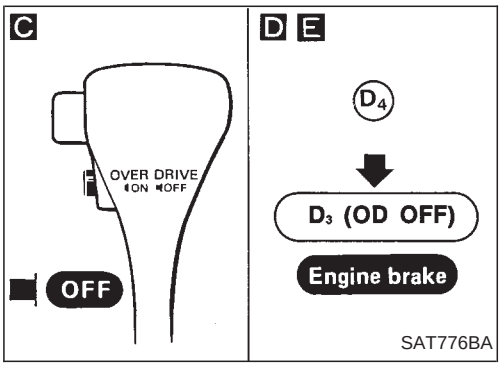
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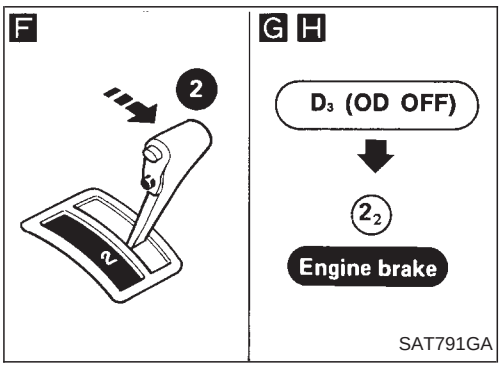
Road Test (Cont'd)

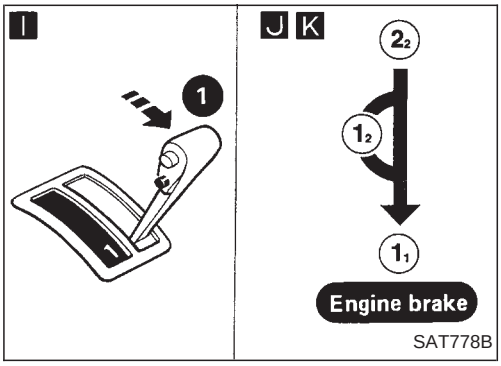
CRUISE TEST — Part 3











1. Confirm overdrive control switch is in "ON" position.
2. Confirm selector lever is in "D" position.

A

Accelerate vehicle using half-throttle to D_4.

B

Release accelerator pedal.

C

Set overdrive control switch to "OFF" position while driving in D_4.

D

Does A/T shift from D_4 to D_3 (O/D OFF)?
Read gear position and vehicle speed.

No → Go to "21. A/T Does Not Shift: $D_4 \rightarrow D_3$, When Overdrive Control Switch "ON" → "OFF"", AT-116.

Yes

E

Does vehicle decelerate by engine brake?

No → Go to "18. Engine Speed Does Not Return To Idle (Light Braking $D_4 \rightarrow D_3$)", AT-113.

Yes

F

Move selector lever from "D" to "2" position while driving in D_3 (O/D OFF).

G

Does A/T shift from D_3 (O/D OFF) to 2_2?
Read gear position.

No → Go to "22. A/T Does Not Shift: $D_3 \rightarrow 2_2$, When Selector Lever "D" → "2" Position", AT-116.

Yes

H

Does vehicle decelerate by engine brake?

No → Go to "18. Engine Speed Does Not Return To Idle (Light Braking $D_4 \rightarrow D_3$)", AT-113.

Yes

I J

1. Move selector lever from "2" to "1" position while driving in 2_2.
2. Does A/T shift from 2_2 to 1_1 position?
Read gear position.

No → Go to "23. A/T Does Not Shift: $2_2 \rightarrow 1_1$, When Selector Lever "2" → "1" Position", AT-117.

Yes

K

Does vehicle decelerate by engine brake?

No → Go to "24. Vehicle Does Not Decelerate By Engine Brake", AT-117.

Yes

1. Stop vehicle.
2. Perform self-diagnosis. Refer to SELF-DIAGNOSTIC PROCEDURE, AT-14.

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Symptom Chart

	ON vehicle										OFF vehicle					
Reference page (AT-)	27, 120	119	56, 62, 82	30	65, 144	68, 86	71, 74	78, 118	118	118	71, 128	156, 160	162	162, 170	166, 176	180
Numbers are arranged in order of probability. Perform inspections starting with number one and work up. Circled numbers indicate that the transmission must be removed from the vehicle.	Fluid level Control linkage	Park/neutral position switch Throttle (accelerator) position sensor (Adjustment)	Revolution sensor and vehicle speed sensor Engine speed signal	Engine idling speed Line pressure	Control valve assembly Shift solenoid valve A	Shift solenoid valve B Line pressure solenoid valve	Torque converter clutch solenoid valve Overrun clutch solenoid valve	A/T fluid temperature sensor Accumulator N-D	Accumulator 1-2 Accumulator 2-3	Accumulator 3-4 (N-R) Ignition switch and starter	Torque converter Oil pump	Reverse clutch High clutch	Forward clutch Forward one-way clutch	Overrun clutch Low one-way clutch	Low & reverse brake Brake band	Parking pawl components
Engine does not start in “N”, “P” positions.	2	3								1						
Engine starts in position other than “N” and “P”.	1	2														
Transmission noise in “P” and “N” positions.	1	3	4 5	2							⑦ ⑥					
Vehicle moves when changing into “P” position or parking gear does not disengage when shifted out of “P” position.	1															②
Vehicle runs in “N” position.	1									2		④	③	⑤		
Vehicle will not run in “R” position (but runs in “D”, “2” and “1” positions). Clutch slips. Very poor acceleration.	1			2	4	3						⑤ ⑥	⑦	⑧	⑨	
Vehicle braked when shifting into “R” position.	1 2			3	5	4						⑥	⑧	⑨	⑦	
Sharp shock in shifting from “N” to “D” position.	2	5	1 3	7	6		4 8						⑩			
Vehicle will not run in “D” and “2” positions (but runs in “1” and “R” position).	1													②		
Vehicle will not run in “D”, “1” and “2” positions (but runs in “R” position). Clutch slips. Very poor acceleration.	1			2	4	3		5				⑥ ⑦	⑧ ⑨	⑩		
Clutches or brakes slip somewhat in starting.	1 2	3		4	6	5		7		8	⑬ ⑫	⑩	⑨		⑪	
Excessive creep.				1												
No creep at all.	1			2	3						⑥ ⑤		④			
Failure to change gear from “D_1” to “D_2”.	2	1	5		4 3										⑥	
Failure to change gear from “D_2” to “D_3”.	2	1	5		4	3						⑥			⑦	
Failure to change gear from “D_3” to “D_4”.	2	1	4	3				5							⑥	
Too high a gear change point from “D_1” to “D_2”, from “D_2” to “D_3”, from “D_3” to “D_4”.		1	2		3	4										
Gear change directly from “D_1” to “D_3” occurs.	1								2						③	
Engine stops when shifting lever into “R”, “D”, “2” and “1”.				1	3		2				④					
Too sharp a shock in change from “D_1” to “D_2”.		1		2	4			5	3						⑥	
Too sharp a shock in change from “D_2” to “D_3”.		1		2	4				3			⑤			⑥	

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Symptom Chart (Cont'd)

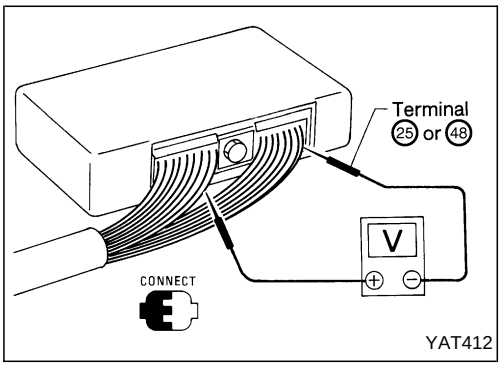
	ON vehicle										OFF vehicle					
Reference page (AT-)	27, 120	119	56, 62, 82	30	65, 144	68, 86	71, 74	78, 118	118	118	71, 128	156, 160	162	162, 170	166, 176	180
Numbers are arranged in order of probability. Perform inspections starting with number one and work up. Circled numbers indicate that the transmission must be removed from the vehicle.	Fluid level Control linkage	Park/neutral position switch Throttle (accelerator) position sensor (Adjustment)	Revolution sensor and vehicle speed sensor Engine speed signal	Engine idling speed Line pressure	Control valve assembly Shift solenoid valve A	Shift solenoid valve B Line pressure solenoid valve	Torque converter clutch solenoid valve Overrun clutch solenoid valve	A/T fluid temperature sensor Accumulator N-D	Accumulator 1-2 Accumulator 2-3	Accumulator 3-4 (N-R) Ignition switch and starter	Torque converter Oil pump	Reverse clutch High clutch	Forward clutch Forward one-way clutch	Overrun clutch Low one-way clutch	Low & reverse brake Brake band	Parking pawl components
Too sharp a shock in change from "D_3" to "D_4".		1		2	4					3				⑥	⑤	
Almost no shock or clutches slipping in change from "D_1" to "D_2".	1	2		3	5				4						⑥	
Almost no shock or slipping in change from "D_2" to "D_3".	1	2		3	5				4			⑥			⑦	
Almost no shock or slipping in change from "D_3" to "D_4".	1	2		3	5					4		⑥			⑦	
Vehicle braked by gear change from "D_1" to "D_2".	1											② ④		⑤	③	
Vehicle braked by gear change from "D_2" to "D_3".	1														②	
Vehicle braked by gear change from "D_3" to "D_4".	1											④	③	②		
Maximum speed not attained. Acceleration poor.	1	2			5 3	4					⑪ ⑩	⑥ ⑦			⑨ ⑧	
Failure to change gear from "D_4" to "D_3".	1	2			6 4	5	3							⑧	⑦	
Failure to change gear from "D_3" to "D_2" or from "D_4" to "D_2".	1	2			5 3	4						⑥			⑦	
Failure to change gear from "D_2" to "D_1" or from "D_3" to "D_1".	1	2			5 3	4						⑦		⑥	⑧	
Gear change shock felt during deceleration by releasing accelerator pedal.		1		2	4		3									
Too high a change point from "D_4" to "D_3", from "D_3" to "D_2", from "D_2" to "D_1".		1	2													
Kickdown does not operate when depressing pedal in "D_4" within kickdown vehicle speed.		1	2		3	4										
Kickdown operates or engine overruns when depressing pedal in "D_4" beyond kickdown vehicle speed limit.		2	1		3	4										
Races extremely fast or slips in changing from "D_4" to "D_3" when depressing pedal.	1	2		3	5	4						⑥	⑦			
Races extremely fast or slips in changing from "D_4" to "D_2" when depressing pedal.	1	2		3	6 5	4							⑧		⑦	
Races extremely fast or slips in changing from "D_3" to "D_2" when depressing pedal.	1	2		3	5	4		6	7			⑩	⑨		⑧	
Races extremely fast or slips in changing from "D_4" or "D_3" to "D_1" when depressing pedal.	1	2		3	5	4							⑥ ⑦	⑧		
Vehicle will not run in any position.	1 2			3		4					⑨ ⑤	⑥			⑧ ⑦	⑩
Transmission noise in "D", "2", "1" and "R" positions.	1										②					

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Symptom Chart (Cont'd)

	ON vehicle										OFF vehicle					
Reference page (AT-)	27, 120	119	56, 62, 82	30	65, 144	68, 86	71, 74	78, 118	118	118	144, 128	156, 160	162	162, 170	166, 176	180
Numbers are arranged in order of probability. Perform inspections starting with number one and work up. Circled numbers indicate that the transmission must be removed from the vehicle.	Fluid level Control linkage	Park/neutral position switch Throttle (accelerator) position sensor (Adjustment)	Revolution sensor and vehicle speed sensor Engine speed signal	Engine idling speed Line pressure	Control valve assembly Shift solenoid valve A	Shift solenoid valve B Line pressure solenoid valve	Torque converter clutch solenoid valve Overrun clutch solenoid valve	A/T fluid temperature sensor Accumulator N-D	Accumulator 1-2 Accumulator 2-3	Accumulator 3-4 (N-R) Ignition switch and starter	Torque converter Oil pump	Reverse clutch High clutch	Forward clutch Forward one-way clutch	Overrun clutch Low one-way clutch	Low & reverse brake Brake band	Parking pawl components
Failure to change from "D_3" to "2" when changing lever into "2" position.	7	1 2			6 5	4	3							⑨	⑧	
Gear change from "2_1" to "2_2" in "2" position.		1														
Engine brake does not operate in "1" position.	2	1 3	4		6 5		7							⑧	⑨	
Gear change from "1_1" to "1_2" in "1" position.	2	1														
Does not change from "1_2" to "1_1" in "1" position.		1	2		4 3		5							⑥	⑦	
Large shock changing from "1_2" to "1_1" in "1" position.					1										②	
Transmission overheats.	1	3		2 4	6	5					⑭ ⑦	⑧ ⑨	⑪	⑫	⑬ ⑩	
ATF shoots out during operation. White smoke emitted from exhaust pipe during operation.	1											② ③	⑤	⑥	⑦ ④	
Offensive smell at fluid charging pipe.	1										② ③	④ ⑤	⑦	⑧	⑨ ⑥	
Torque converter is not locked up.		3 1	2 4	6	8		7	5			⑨					
Torque converter clutch piston slip	1	2		3	6	5	4				⑦					
Lock-up point is extremely high or low.		1	2		4		3									
A/T does not shift to "D_4" when driving with overdrive control switch "ON".		2 1	3	8	6 4		5	7						⑩	⑨	
Engine is stopped at "R", "D", "2" and "1" positions.	1				5 4	3	2									

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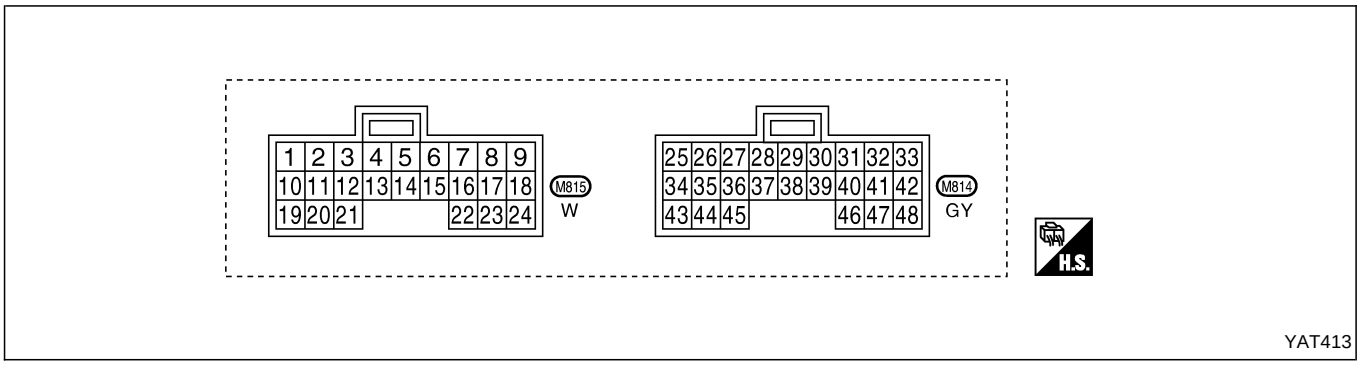


TCM Terminals and Reference Value

PREPARATION

- Measure voltage between each terminal and terminal 25 or 48 by following “TCM INSPECTION TABLE”.

TCM HARNESS CONNECTOR TERMINAL LAYOUT



TCM INSPECTION TABLE

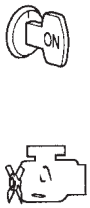
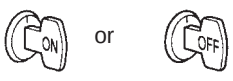
(Data are reference values.)

Terminal No.	Item	Condition		Judgement standard
1	Line pressure solenoid valve		When releasing accelerator pedal after warming up engine.	1.5 - 3.0V
			When depressing accelerator pedal fully after warming up engine.	0.5V or less
2	Line pressure solenoid valve (with dropping resistor)		When releasing accelerator pedal after warming up engine.	4 - 14V
			When depressing accelerator pedal fully after warming up engine.	0.5V or less
3	Torque converter clutch solenoid valve		When A/T performs lock-up.	8 - 15V
			When A/T does not perform lock- up.	Approximately 0V
5*	DT1		—	—
6*	DT2		—	—
7*	DT3		—	—
9*	DT4		—	—
			—	—

*: These terminals are connected to the ECM.

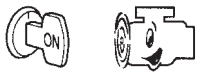
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TCM Terminals and Reference Value (Cont'd)

Terminal No.	Item	Condition		Judgement standard
10	Power source		When turning ignition switch to "ON".	Battery voltage
			When turning ignition switch to "OFF".	Approximately 0V
11	Shift solenoid valve A		When shift solenoid valve A operates. (When driving in "D_1" or "D_4".)	Battery voltage
			When shift solenoid valve A does not operate. (When driving in "D_2" or "D_3".)	Approximately 0V
12	Shift solenoid valve B		When shift solenoid valve B operates. (When driving in "D_1" or "D_2".)	Battery voltage
			When shift solenoid valve B does not operate. (When driving in "D_3" or "D_4".)	Approximately 0V
13	"SPORT" indicator lamp		When setting A/T mode switch in "SPORT" position.	Approximately 0V
			When setting A/T mode switch in other position.	Battery voltage
16	Closed throttle position switch [in throttle (accelerator) position switch]		When releasing accelerator pedal after warming up engine.	Battery voltage
			When depressing accelerator pedal after warming up engine.	Approximately 0V
17	Wide open throttle position switch [in throttle (accelerator) position switch]		When depressing accelerator pedal more than half-way after warming up engine.	Battery voltage
			When releasing accelerator pedal after warming up engine.	Approximately 0V
19	Power source		Same as No. 104	
20	Overrun clutch solenoid valve		When overrun clutch solenoid valve operates.	Battery voltage
			When overrun clutch solenoid valve does not operate.	Approximately 0V
22	Overdrive control switch		When setting overdrive control switch in "ON" position	Battery voltage
			When setting overdrive control switch in "OFF" position	1V or less
25	Ground		—	—
26	Park/neutral "1" position switch		When setting selector lever to "1" position.	Battery voltage
			When setting selector lever to other positions.	Approximately 0V
27	Park/neutral "2" position switch		When setting selector lever to "2" position.	Battery voltage
			When setting selector lever to other positions.	Approximately 0V
28	Power source (Back-up)		When turning ignition switch to "OFF".	Battery voltage
			When turning ignition switch to "ON".	Battery voltage

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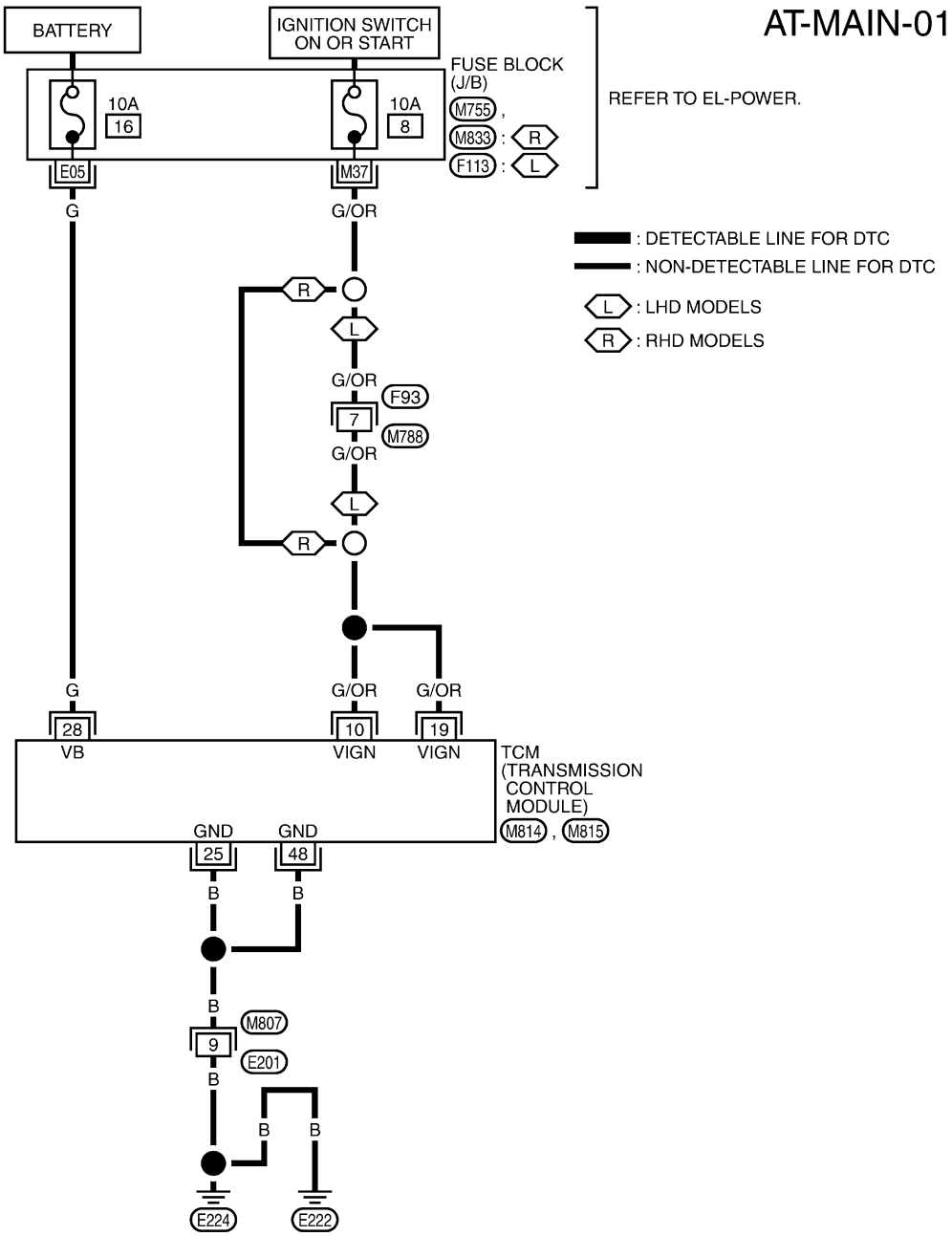
TCM Terminals and Reference Value (Cont'd)

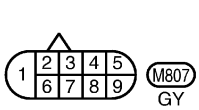
Terminal No.	Item	Condition		Judgement standard
29	Revolution sensor (Measure in AC rang)		When vehicle cruises at 30 km/h (19 MPH).	1V or more Voltage rises gradually in response to vehicle speed.
			When vehicle parks.	0V
30**	Data link connector		—	—
31**	Data link connector		—	—
32	Throttle (accelerator) position sensor (Power source)		Ignition switch ON	4.5 - 5.5V
			Ignition switch OFF	0.5 or less
34	Park/neutral "D" position switch		When setting selector lever to "D" position.	Battery voltage
			When setting selector lever to other positions.	Approximately 0V
35	Park/neutral "R" position switch		When setting selector lever to "R" position.	Battery voltage
			When setting selector lever to other positions.	Approximately 0V
36	Park/neutral "N" or "P" position switch		When setting selector lever to "N" or "P" position.	Battery voltage
			When setting selector lever to other positions.	Approximately 0V
39	Engine speed signal		When engine runs at idle speed.	0.8V
			When engine runs at 2,000 rpm.	Approximately 2.2V
40	Vehicle speed sensor		When moving vehicle at 2 to 3 km/h (1 to 2 MPH) for 1 m (3 ft) or more.	Voltage varies between less than 1V and more than 4.5V
41	Throttle (accelerator) position sensor		When depressing accelerator pedal slowly after warming up engine. (Voltage rises gradually in response to throttle position.)	4.5 - 5.5V
42	Throttle (accelerator) position sensor (Ground)		—	—
43	SPORT indicator lamp		When setting A/T mode switch in "SPORT" position.	Approximately 0V
			When setting A/T mode switch in other position.	Battery voltage
44	A/T mode switch "SPORT"		When setting A/T mode switch in "SPORT" position.	Battery voltage
			When setting A/T mode switch in other position.	Approximately 0V
47	A/T fluid temperature sensor		When ATF temperature is 20°C (68°F).	Approximately 1.5V
			When ATF temperature is 80°C (176°F).	Approximately 0.5V
48	Ground		—	—

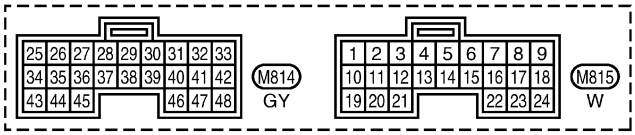
**: These terminals are connected to the data link connector.

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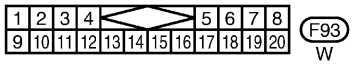
Wiring Diagram — AT — MAIN











REFER TO THE FOLLOWING.
M755 , M833 , F113 -FUSE BLOCK-JUNCTION BOX (J/B)

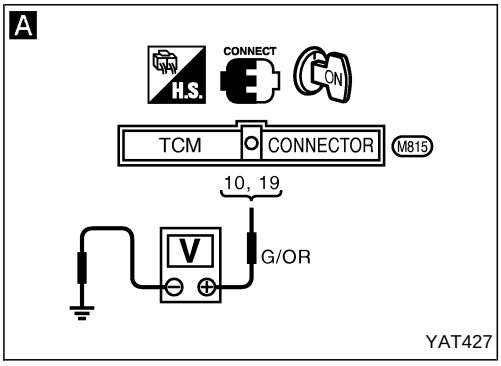
YAT405

http://vnx.su/

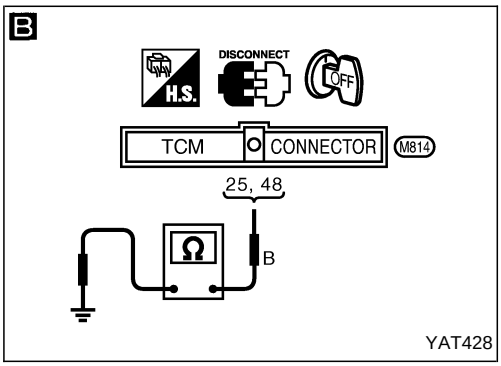
TCM Power Supply Circuit

DIAGNOSTIC PROCEDURE

A



B



A

CHECK TCM POWER SOURCE.
1. Turn ignition switch to “ON” position. (Do not start engine.)
2. Check voltage between TCM terminals ⑩, ⑲ and ground.
   Battery voltage should exist.

NG → Check the following items:
- Harness for short or open between ignition switch and TCM (Main harness)
- Ignition switch and fuse Refer to EL section (“POWER SUPPLY ROUTING”).

OK ↓

B

CHECK TCM GROUND CIRCUIT.
1. Turn ignition switch to “OFF” position.
2. Disconnect TCM harness connector.
3. Check resistance between TCM terminals ㉕, ㊽ and ground.
   Resistance:
   Approximately 0Ω
   If OK, check harness for short to ground and short to power.

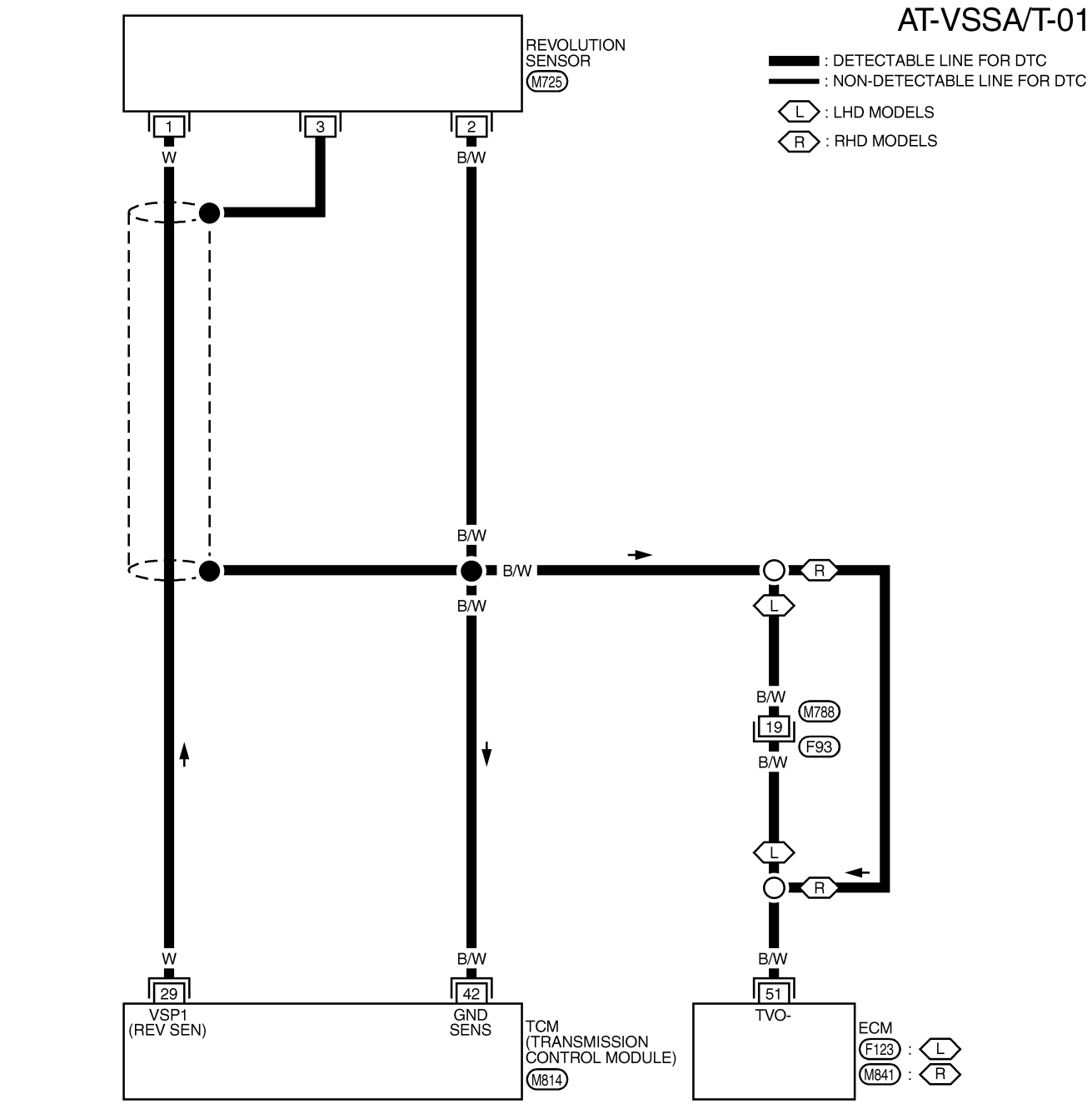
NG → Repair open circuit or short to ground or short to power in harness or connector.

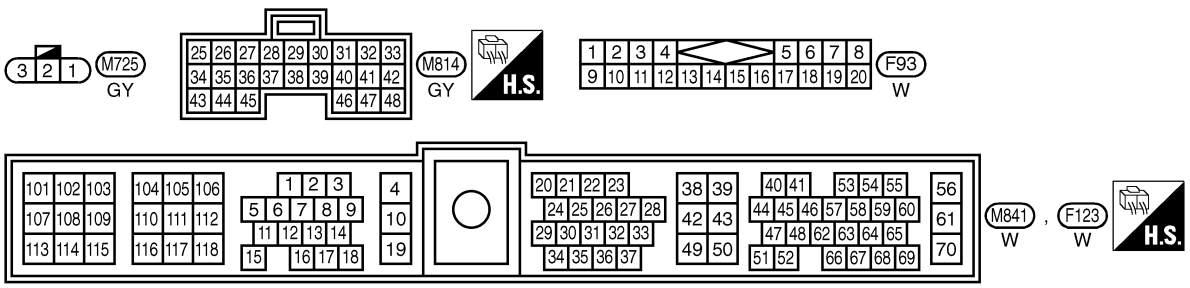
OK ↓

INSPECTION END

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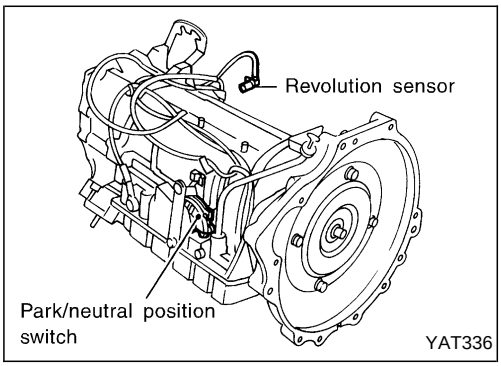
Wiring Diagram — AT — VSSA/T





YAT400

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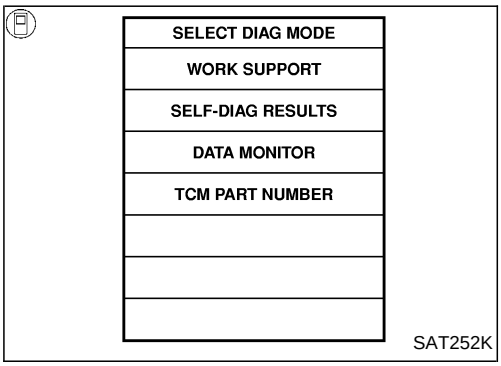
Vehicle Speed Sensor·A/T (Revolution sensor)

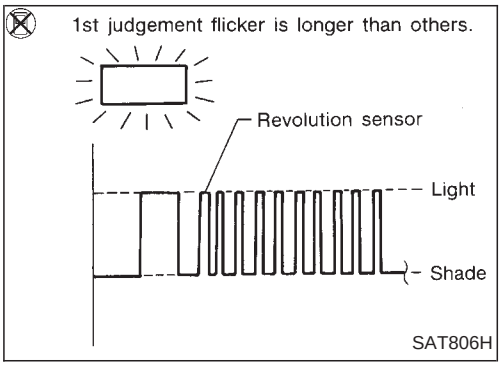
DESCRIPTION

The revolution sensor detects the revolution of the out put shaft parking pawl lock gear and emits a pulse signal. The pulse signal is sent to the TCM which converts it into vehicle speed.

ON BOARD DIAGNOSIS LOGIC

Diagnostic trouble code	Malfunction is detected when ...	Check items (Possible cause)
: VHCL SPEED SEN·A/T : 1st judgement flicker	TCM does not receive the proper voltage signal from the sensor.	● Harness or connectors (The sensor circuit is open or shorted.) ● Revolution sensor





SELF-DIAGNOSIS CODE CONFIRMATION PROCEDURE

After the repair, perform the following procedure to confirm the malfunction is eliminated.

1) Start engine.
2) Select “SELF-DIAG RESULTS” mode with CONSULT-II.
3) Drive vehicle under the following conditions:
   Selector lever in “D” position, vehicle speed higher than 30 km/h (19 MPH), throttle opening greater than 1/8 of the full throttle position and driving for more than 5 seconds.

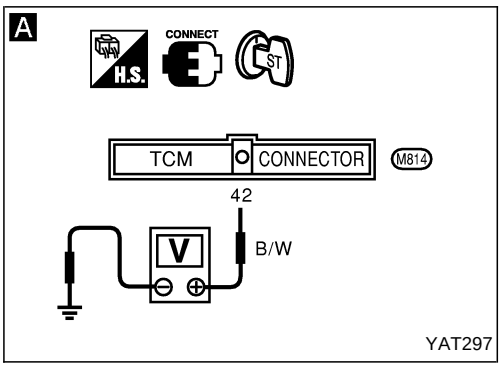
OR

1) Start engine.
2) Drive vehicle under the following conditions:
   Selector lever in “D” position, vehicle speed higher than 30 km/h (19 MPH), throttle opening greater than 1/8 of the full throttle position and driving for more than 5 seconds.
3) Perform self-diagnosis.
   Refer to SELF-DIAGNOSTIC PROCEDURE (Without CONSULT-II), AT-15.

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Vehicle Speed Sensor·A/T (Revolution sensor) (Cont'd)

DIAGNOSTIC PROCEDURE



CHECK REVOLUTION SENSOR.
Refer to "COMPONENT INSPECTION" below.

NG → Repair or replace revolution sensor.

OK ↓

A

CHECK INPUT SIGNAL.

1. Start engine.
2. Select "ECU INPUT SIGNALS" in Data Monitor.
3. Read out the value of "VHCL/S SE·A/T" while driving.
   Check the value changes according to driving speed.

OR

1. Start engine.
2. Check voltage between TCM terminal ㊷ and ground while driving. (Measure in AC range.)
   Voltage:
   At 0 km/h (0 MPH):
   0V
   At 30 km/h (19 MPH):
   1V or more
   (Voltage rises gradually in response to vehicle speed.)

NG → Check the following items:
- Harness for short or open between TCM and revolution sensor (Main harness)
- Harness for short or open between revolution sensor and ECM (Main harness)
- Ground circuit for ECM
  Refer to EC section ("TROUBLE DIAGNOSIS FOR POWER SUPPLY").

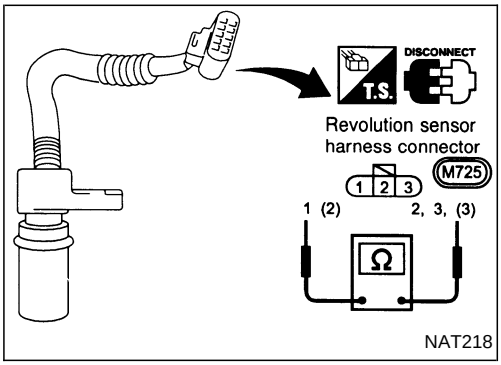
OK ↓

Perform "SELF-DIAGNOSIS CODE CONFIRMATION PROCEDURE".

NG → 1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK ↓

INSPECTION END



COMPONENT INSPECTION

Revolution sensor

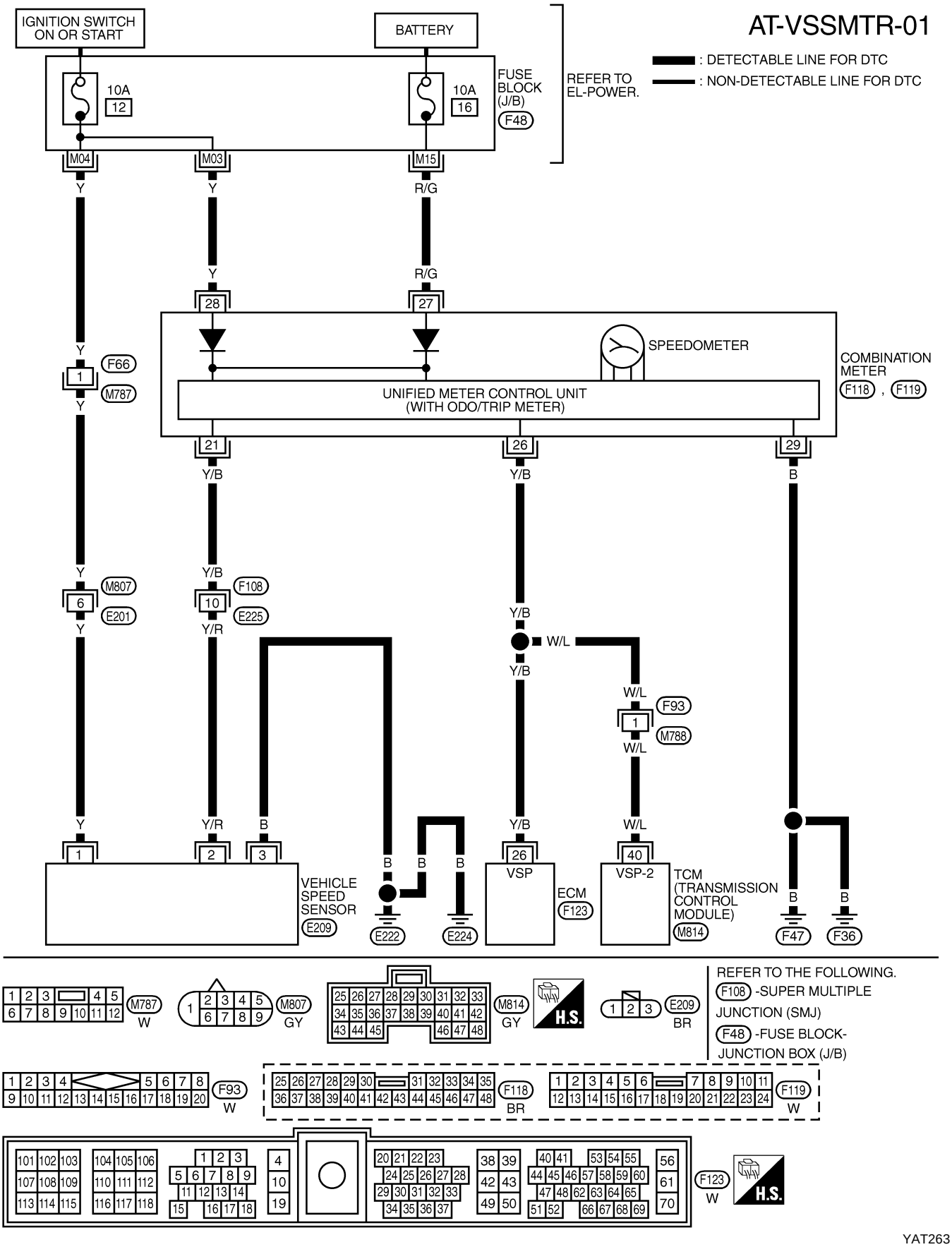
- For removal, refer to AT-119.
- Check resistance between terminals ①, ② and ③.

Terminal No.		Resistance
①	②	500 - 650Ω
②	③	No continuity
①	③	No continuity

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Wiring Diagram — AT — VSSMTR

LHD MODELS

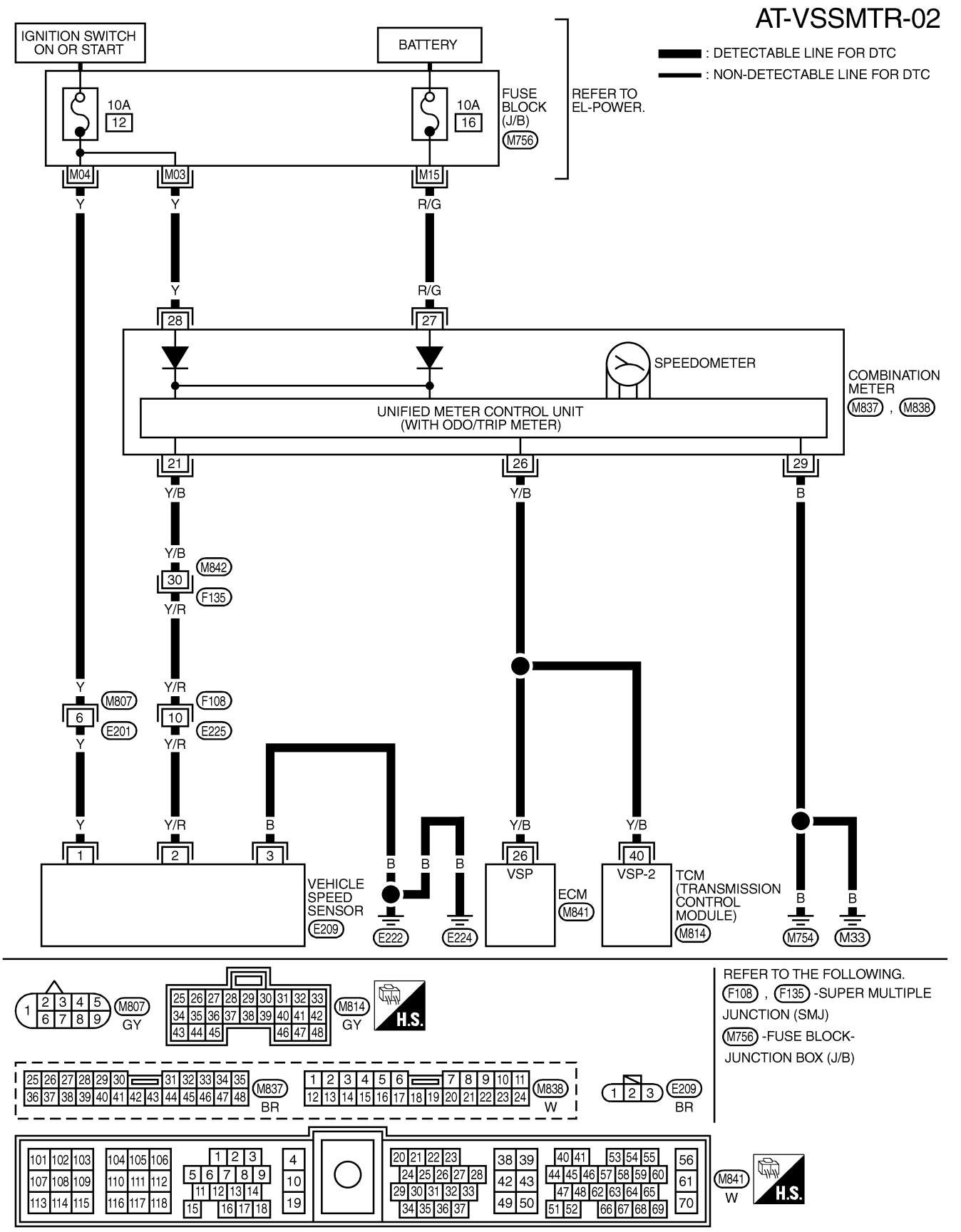


YAT263

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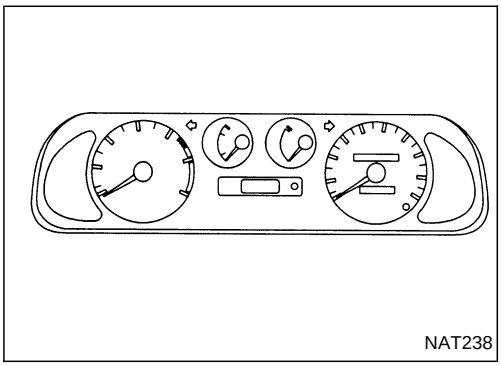
Wiring Diagram — AT — VSSMTR (Cont'd)

RHD MODELS



YAT264

http://vnx.su/


NAT238

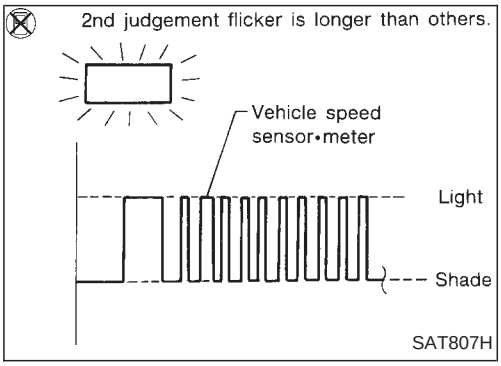
Vehicle Speed Sensor·MTR

DESCRIPTION

The vehicle speed sensor·MTR is built into the speedometer assembly. The sensor functions as an auxiliary device to the revolution sensor when it is malfunctioning. The TCM will then use a signal sent from the vehicle speed sensor·MTR.

ON BOARD DIAGNOSIS LOGIC

Diagnostic trouble code	Malfunction is detected when ...	Check items (Possible cause)
: VHCL SPEED SEN·MTR : 2nd judgement flicker	TCM does not receive the proper voltage signal from the sensor.	● Harness or connectors (The sensor circuit is open or shorted.) ● Vehicle speed sensor



SELF-DIAGNOSIS CODE CONFIRMATION PROCEDURE

After the repair, perform the following procedure to confirm the malfunction is eliminated.

1) Start engine.
2) Select “SELF-DIAG RESULTS” mode with CONSULT-II.
3) Drive vehicle under the following conditions:
   Selector lever in “D” position and vehicle speed higher than 20 km/h (12 MPH).

OR

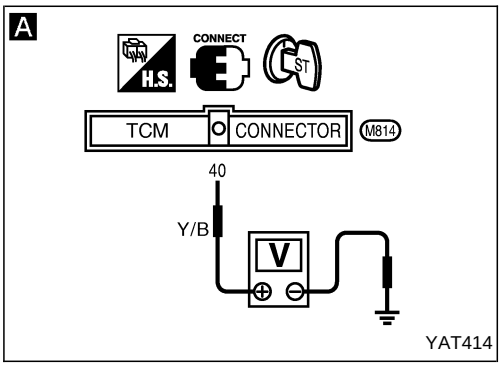
1) Start engine.
2) Drive vehicle under the following conditions:
   Selector lever in “D” position and vehicle speed higher than 20 km/h (12 MPH).
3) Perform self-diagnosis.
   Refer to SELF-DIAGNOSTIC PROCEDURE (Without CONSULT-II), AT-15.

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Vehicle Speed Sensor·MTR (Cont'd)

DIAGNOSTIC PROCEDURE

A



CHECK INPUT SIGNAL.

1. Start engine.
2. Select "ECU INPUT SIGNALS" in Data Monitor.
3. Read out the value of "VHCL/S SE·MTR" while driving.
   Check the value changes according to driving speed.

OR

1. Start engine.
2. Check voltage between TCM terminal (40) and ground while driving at 2 to 3 km/h (1 to 2 MPH) for 1 m (3 ft) or more.
   Voltage:
   Voltage varies between less than 1V and more than 4.5V.

NG → Check the following items:
- Vehicle speed sensor and ground circuit for vehicle speed sensor Refer to EL section ("METERS AND GAUGES").
- Harness for short or open between TCM and vehicle speed sensor (Main harness)

OK ↓

Perform "SELF-DIAGNOSIS CODE CONFIRMATION PROCEDURE", AT-56.

NG → 1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

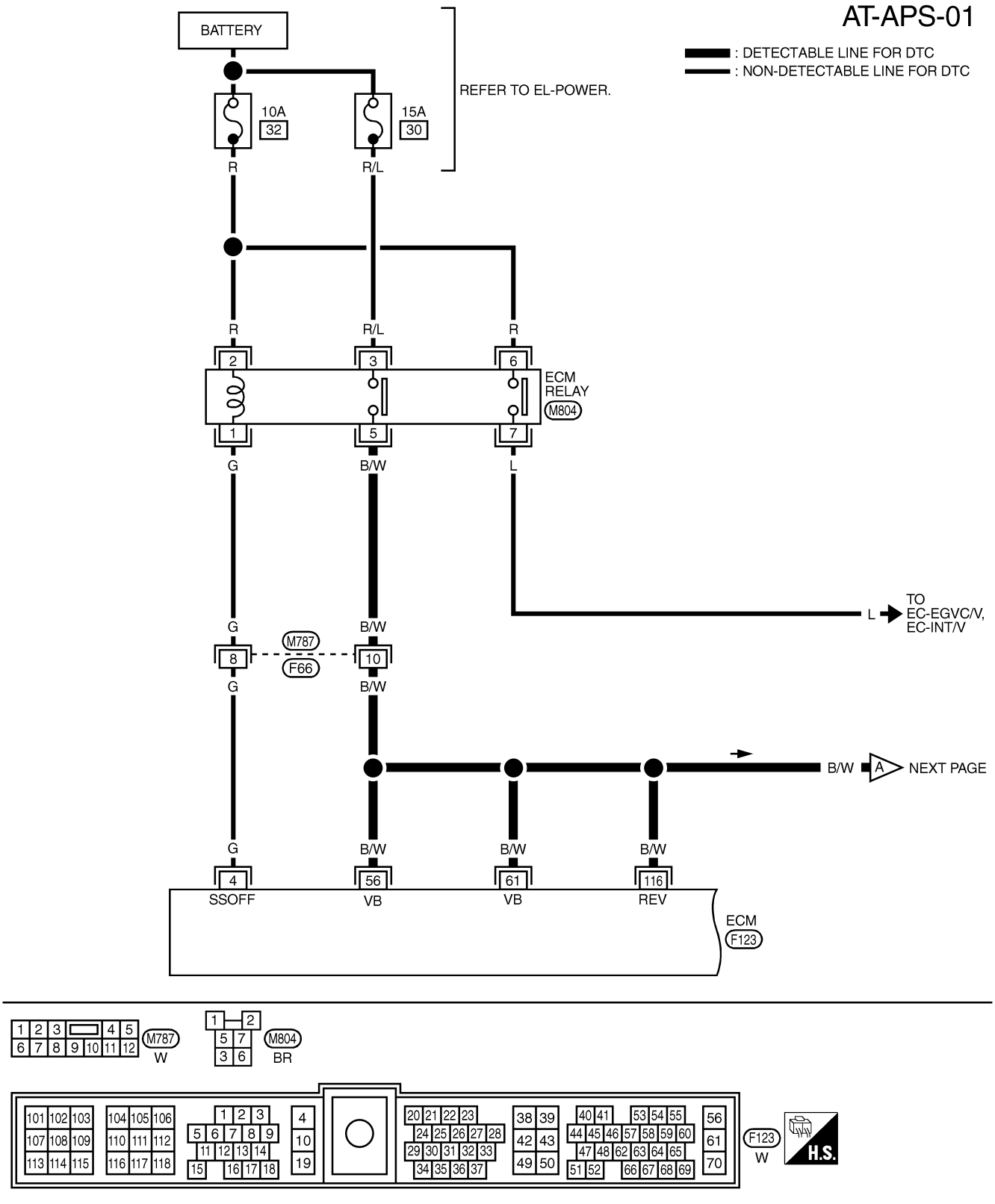
OK ↓

INSPECTION END

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Wiring Diagram — AT — TPS

LHD MODELS

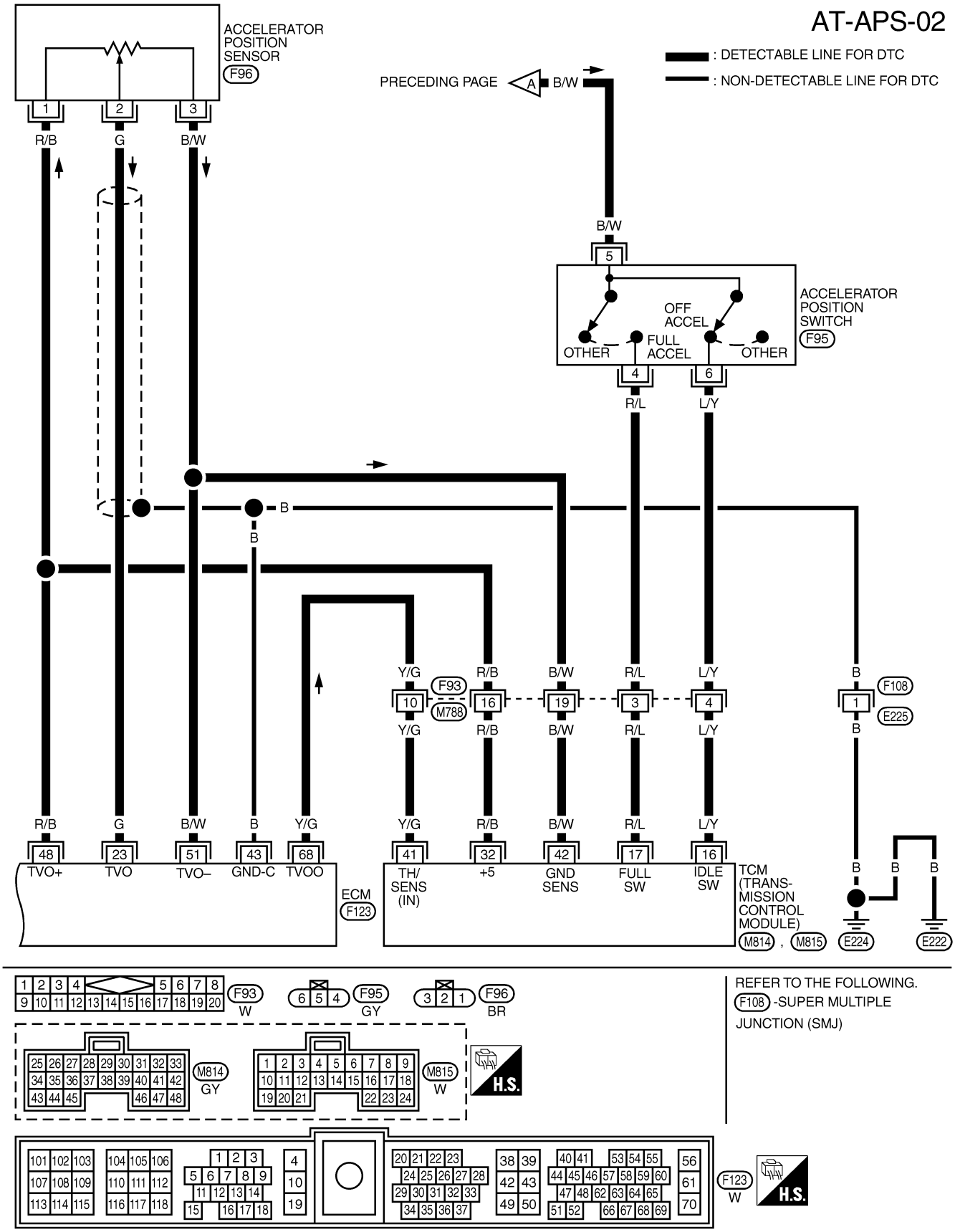


YAT265

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Wiring Diagram — AT — TPS (Cont'd)

LHD MODELS

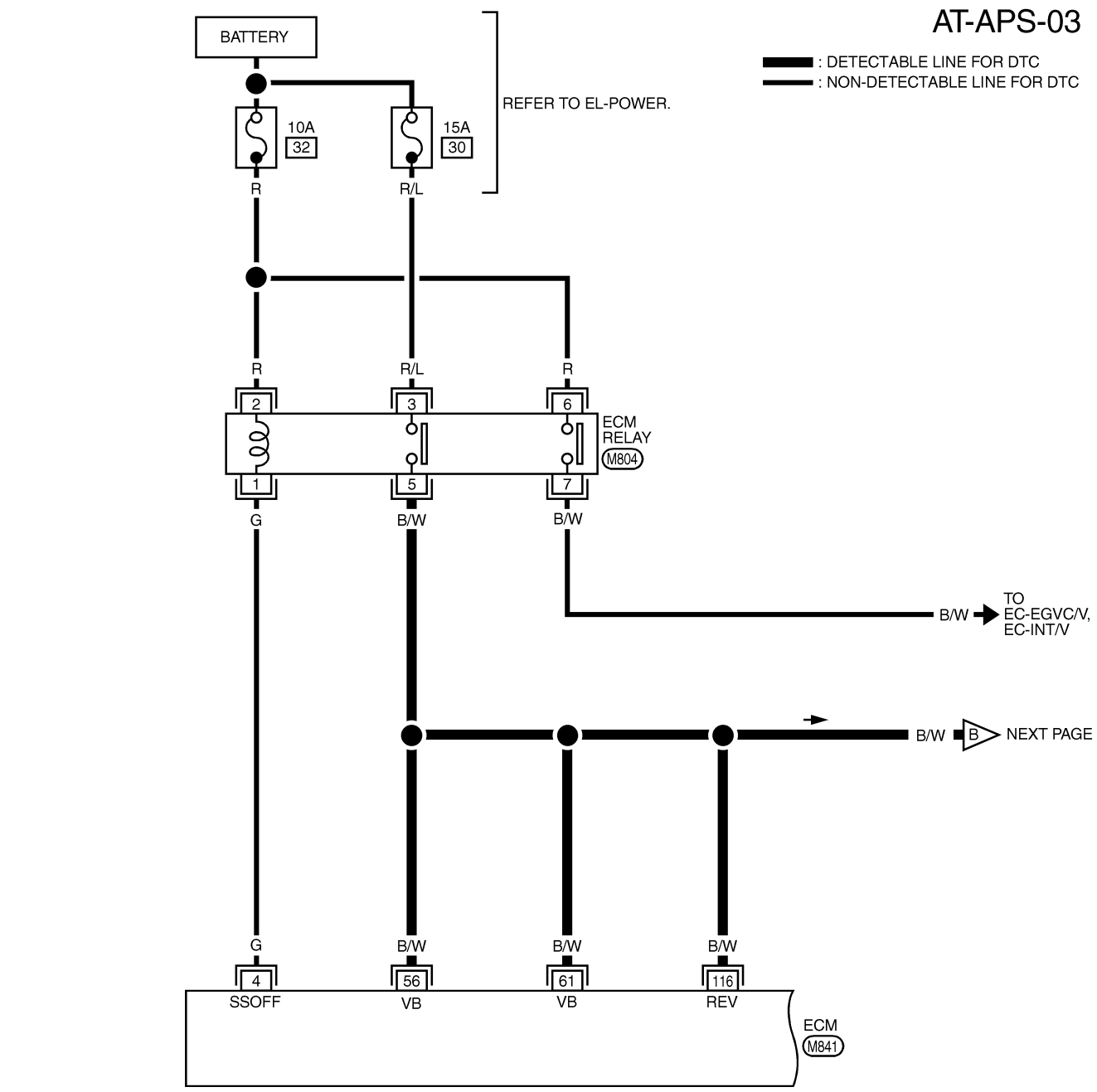


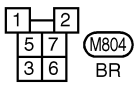
YAT401

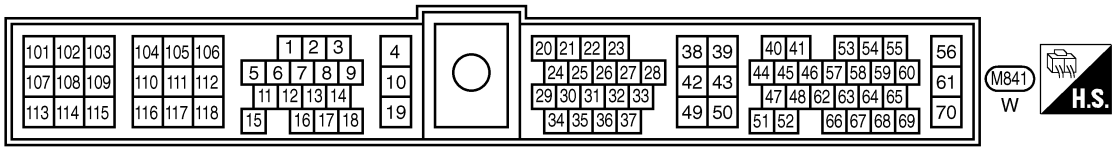
http://vnx.su/

Wiring Diagram — AT — TPS (Cont'd)

RHD MODELS





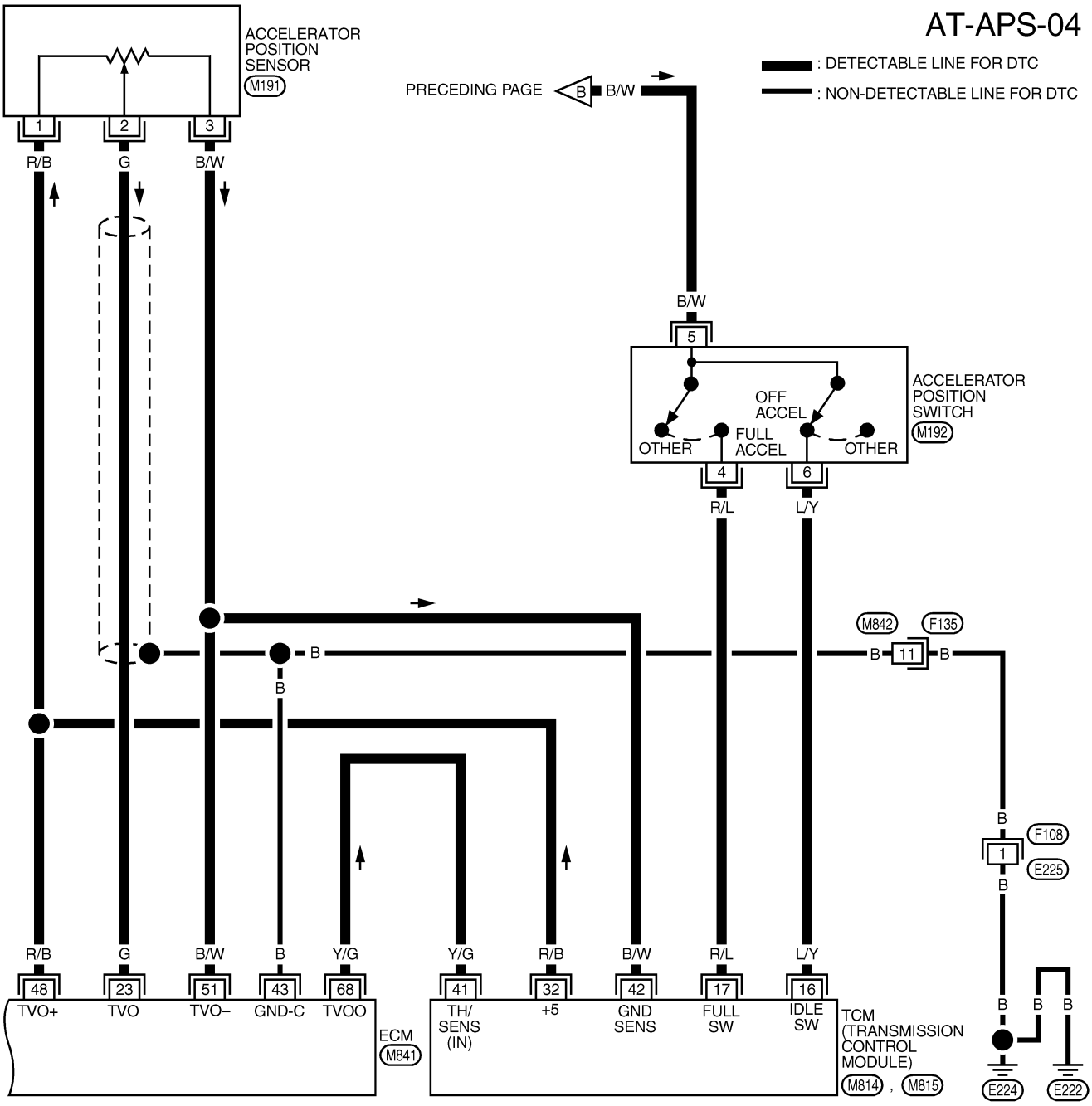


YAT267

http://vnx.su/

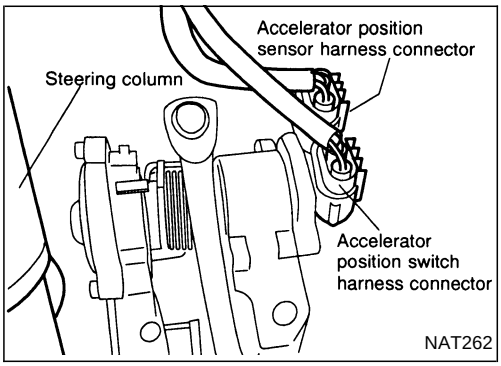
Wiring Diagram — AT — TPS (Cont'd)

RHD MODELS



YAT402

http://vnx.su/



Throttle (Accelerator) Position Sensor

DESCRIPTION

The throttle (accelerator) position sensor detects the throttle valve position and sends a signal to the TCM.

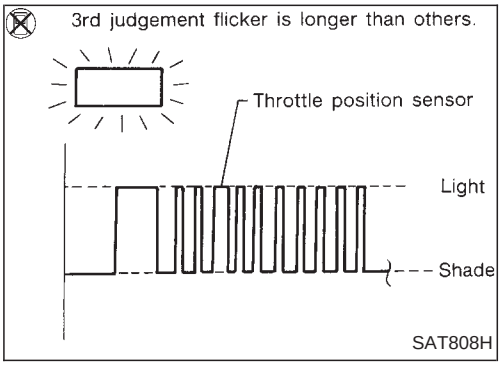
ON BOARD DIAGNOSIS LOGIC

Diagnostic trouble code	Malfunction is detected when ...	Check items (Possible cause)
: THROTTLE POSI SEN : 3rd judgement flicker	TCM receives an excessively low or high voltage from the sensor.	● Harness or connectors (The sensor circuit is open or shorted.) ● Throttle (accelerator) position sensor

CONSULT-II REFERENCE VALUE IN DATA MONITOR MODE

Remarks: Specification data are reference values.

Monitor item	Condition	Specification
Throttle (accelerator) position sensor	Fully-closed throttle	Approximately 0.5V
	Fully-open throttle	Approximately 4V



SELF-DIAGNOSIS CODE CONFIRMATION PROCEDURE

After the repair, perform the following procedure to confirm the malfunction is eliminated.

1) Start engine.
2) Select “SELF-DIAG RESULTS” mode with CONSULT-II.
3) Drive vehicle under the following conditions:
Selector lever in “D” position, vehicle speed higher than 10 km/h (6 MPH), throttle opening greater than 1/2 of the full throttle position and driving for more than 3 seconds.

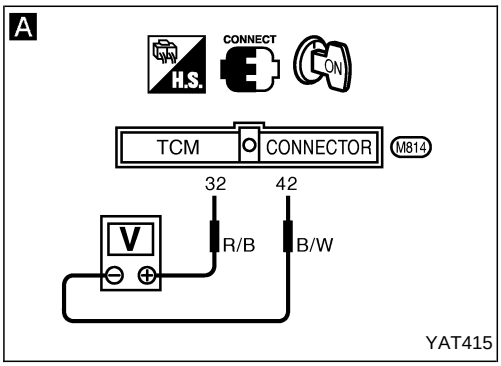
OR

1) Start engine.
2) Drive vehicle under the following conditions:
Selector lever in “D” position, vehicle speed higher than 10 km/h (6 MPH), throttle opening greater than 1/2 of the full throttle position and driving for more than 3 seconds.
3) Perform self-diagnosis.
Refer to SELF-DIAGNOSTIC PROCEDURE (Without CONSULT-II), AT-15.

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Throttle (Accelerator) Position Sensor (Cont'd)

DIAGNOSTIC PROCEDURE



Perform diagnostic test mode II (self-diagnostic results) for engine control. Refer to EC section ["Malfunction Indicator Lamp (MIL)", "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION"].

NG → Check throttle (accelerator) position sensor circuit for engine control. Refer to EC section ["TROUBLE DIAGNOSIS FOR "THRTL (ACCEL) POSI SEN"].

OK ↓

A

CHECK INPUT SIGNAL.

1. Turn ignition switch to "ON" position. (Do not start engine.)
2. Select "ECU INPUT SIGNALS" in Data Monitor.
3. Read out the value of "THRTL POS SEN".

Voltage:

Fully-closed throttle:
Approximately 0.5V

Fully-open throttle:
Approximately 4V

OR

1. Turn ignition switch to "ON" position. (Do not start engine.)
2. Check voltage between TCM terminals 32 and 42 while accelerator pedal is depressed slowly.

Voltage:

Fully-closed throttle valve:
Approximately 0.4V

Fully-open throttle valve:
Approximately 4V

(Voltage rises gradually in response to throttle position)

NG → Check harness for short or open between ECM and TCM regarding throttle (accelerator) position sensor circuit. (Main harness)

OK ↓

CHECK THROTTLE (ACCELERATOR) POSITION SWITCH.
Refer to "CHECK THROTTLE (ACCELERATOR) POSITION SWITCH", AT-93.

NG → Repair or replace damaged parts.

OK ↓

Perform "SELF-DIAGNOSIS CODE CONFIRMATION PROCEDURE", AT-62.

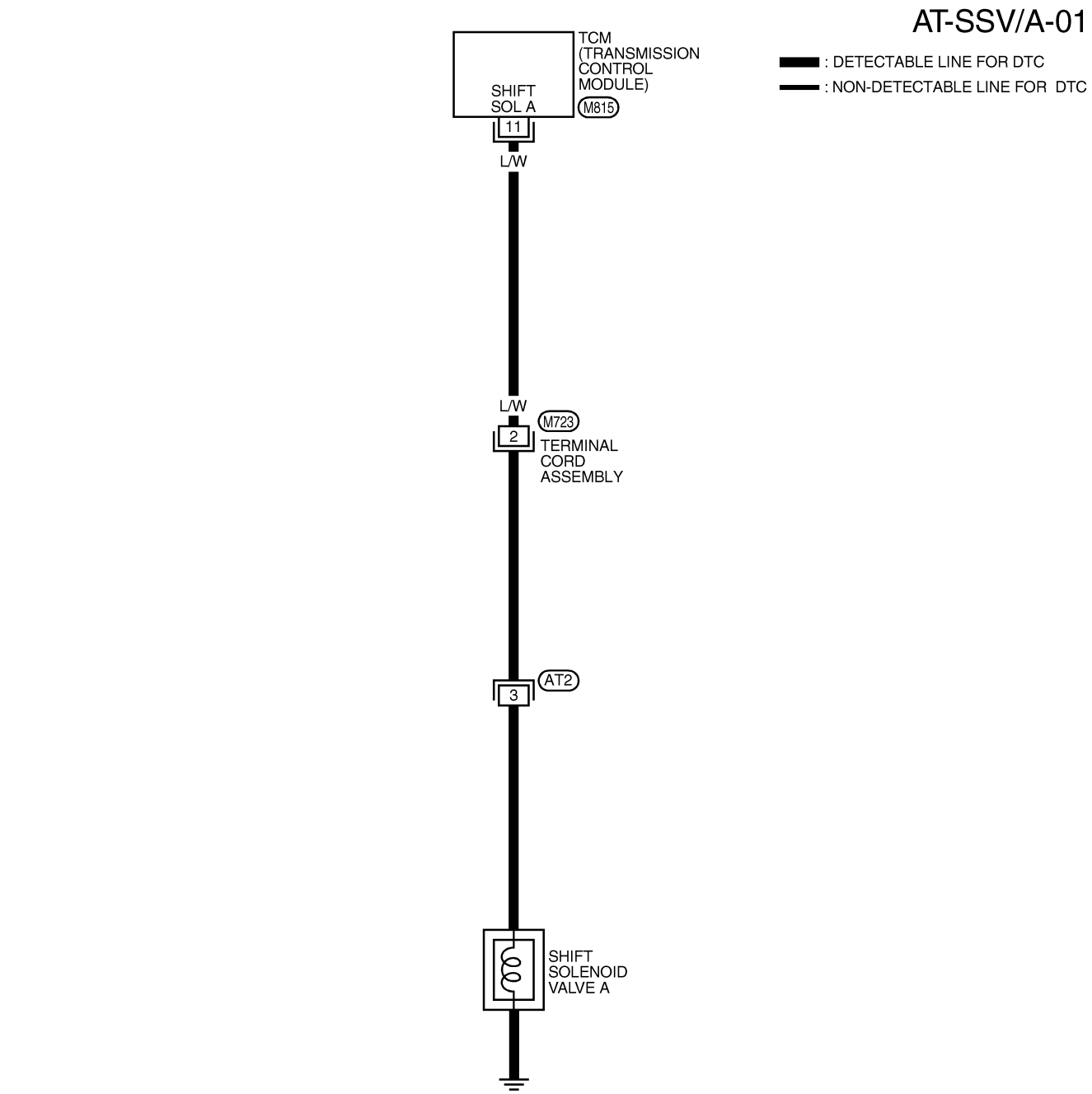
NG →
1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK ↓

INSPECTION END

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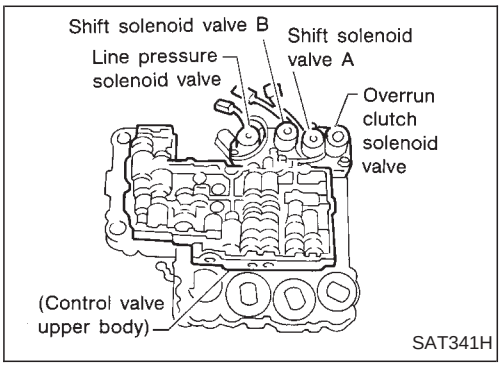
Wiring Diagram — AT — SSV/A



*: THIS CONNECTOR IS NOT SHOWN IN “HARNESS LAYOUT”, EL SECTION.

YAT280

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Shift Solenoid Valve A

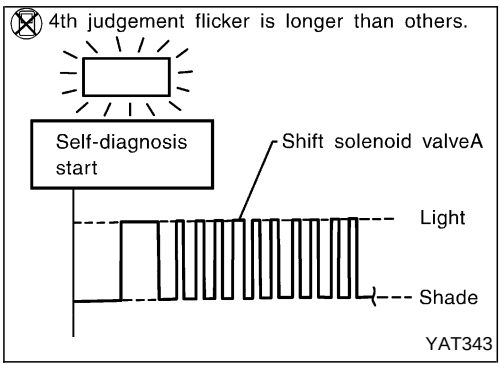
DESCRIPTION

Shift solenoid valves A and B are turned “ON” or “OFF” by the TCM in response to signals sent from the park/neutral position switch, vehicle speed and throttle position sensors. Gears will then be shifted to the optimum position.

Gear position	1	2	3	4
Shift solenoid valve A	ON	OFF	OFF	ON
Shift solenoid valve B	ON	ON	OFF	OFF

ON BOARD DIAGNOSIS LOGIC

Diagnostic trouble code	Malfunction is detected when ...	Check items (Possible cause)
: SHIFT SOLENOID/V A : 4th judgement flicker	TCM detects an improper voltage drop when it tries to operate the solenoid valve.	• Harness or connectors (The solenoid circuit is open or shorted.) • Shift solenoid valve A



SELF-DIAGNOSIS CODE CONFIRMATION PROCEDURE

After the repair, perform the following procedure to confirm the malfunction is eliminated.

1) Start engine.
2) Select “SELF-DIAG RESULTS” mode with CONSULT-II.
3) Drive vehicle in $D_1 \rightarrow D_2$ position.

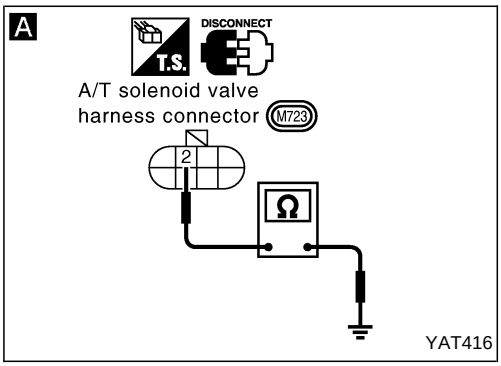
OR

1) Start engine.
2) Drive vehicle in $D_1 \rightarrow D_2$ position.
3) Perform self-diagnosis.
   Refer to SELF-DIAGNOSTIC PROCEDURE (Without CONSULT-II), AT-15.

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Shift Solenoid Valve A (Cont'd)

DIAGNOSTIC PROCEDURE

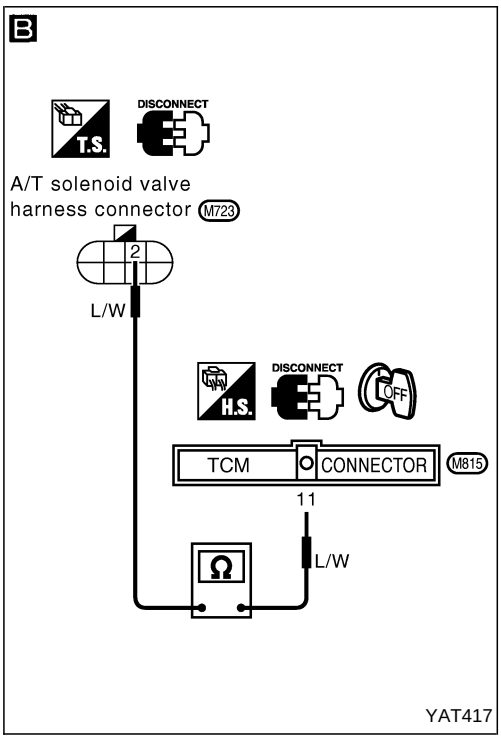


A

CHECK GROUND CIRCUIT.
1. Turn ignition switch to "OFF" position.
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal ② and ground.
   Resistance: 20 - 40Ω

NG →
1. Remove control valve assembly. Refer to AT-118.
2. Check the following items:
- Shift solenoid valve A
  Refer to "COMPONENT INSPECTION" below.
- Harness of terminal cord assembly for short or open

OK ↓



B

CHECK POWER SOURCE CIRCUIT.
1. Turn ignition switch to "OFF" position.
2. Disconnect TCM harness connector.
3. Check resistance between terminal ② and TCM harness connector terminal ⑪.
   Resistance:
   Approximately 0Ω
   If OK, check harness for short to ground and short to power.
4. Reinstall any part removed.

NG → Repair open circuit or short to ground or short to power in harness or connector.

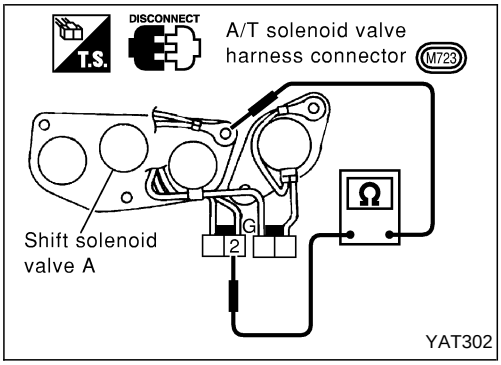
OK ↓

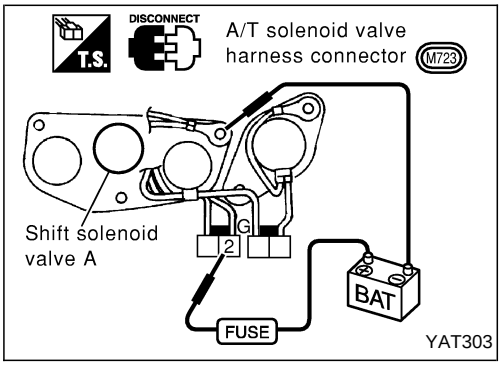
Perform "SELF-DIAGNOSIS CODE CONFIRMATION PROCEDURE", AT-65.

NG →
1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK ↓

INSPECTION END





COMPONENT INSPECTION

Shift solenoid valve A

- For removal, refer to AT-144.

Resistance check

- Check resistance between terminal ② and ground.

Solenoid valve	Terminal No.		Resistance (Approx.)
Shift solenoid valve A	②	Ground	20 - 40Ω

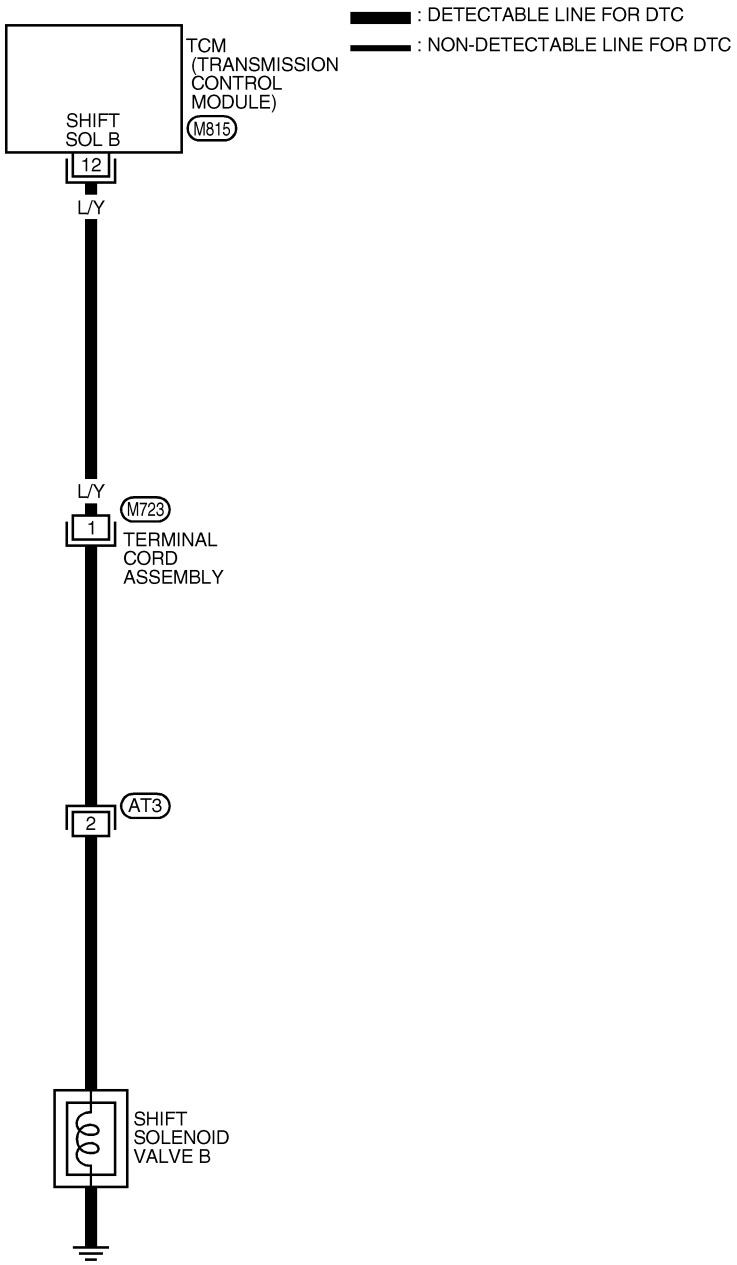
Operation check

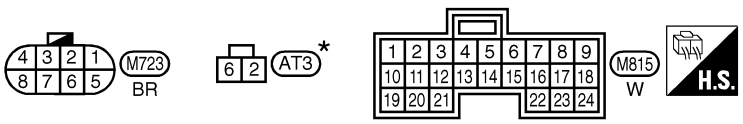
- Check solenoid valve by listening for its operating sound while applying battery voltage to the terminal ② and ground.

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Wiring Diagram — AT — SSV/B

AT-SSV/B-01

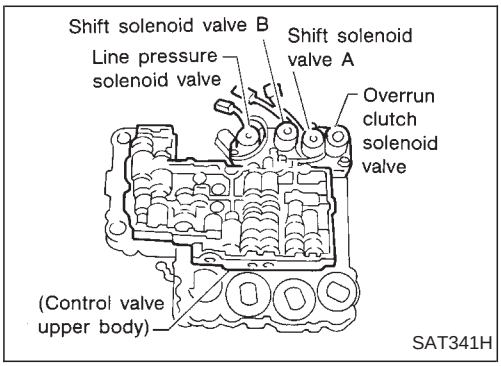




*: THIS CONNECTOR IS NOT SHOWN IN “HARNESS LAYOUT”, EL SECTION.

YAT281

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Shift Solenoid Valve B

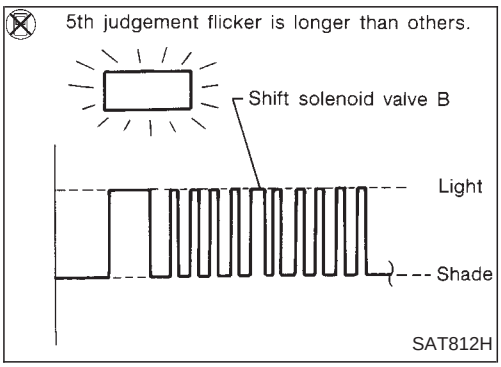
DESCRIPTION

Shift solenoid valves A and B are turned “ON” or “OFF” by the TCM in response to signals sent from the park/neutral position switch, vehicle speed and throttle (accelerator) position sensors. Gears will then be shifted to the optimum position.

Gear position	1	2	3	4
Shift solenoid valve A	ON	OFF	OFF	ON
Shift solenoid valve B	ON	ON	OFF	OFF

ON BOARD DIAGNOSIS LOGIC

Diagnostic trouble code	Malfunction is detected when ...	Check items (Possible cause)
: SHIFT SOLENOID/V B : 5th judgement flicker	TCM detects an improper voltage drop when it tries to operate the solenoid valve.	• Harness or connectors (The solenoid circuit is open or shorted.) • Shift solenoid valve B



SELF-DIAGNOSIS CODE CONFIRMATION PROCEDURE

After the repair, perform the following procedure to confirm the malfunction is eliminated.

1) Start engine.
2) Select “SELF-DIAG RESULTS” mode with CONSULT-II.
3) Drive vehicle in $D_1 \rightarrow D_2 \rightarrow D_3$ position.

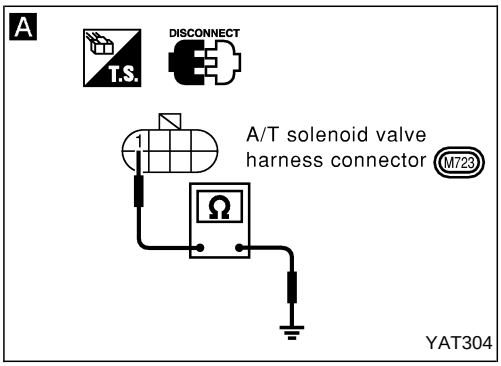
OR

1) Start engine.
2) Drive vehicle in $D_1 \rightarrow D_2 \rightarrow D_3$ position.
3) Perform self-diagnosis.
   Refer to SELF-DIAGNOSTIC PROCEDURE (Without CONSULT-II), AT-15.

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Shift Solenoid Valve B (Cont'd)

DIAGNOSTIC PROCEDURE

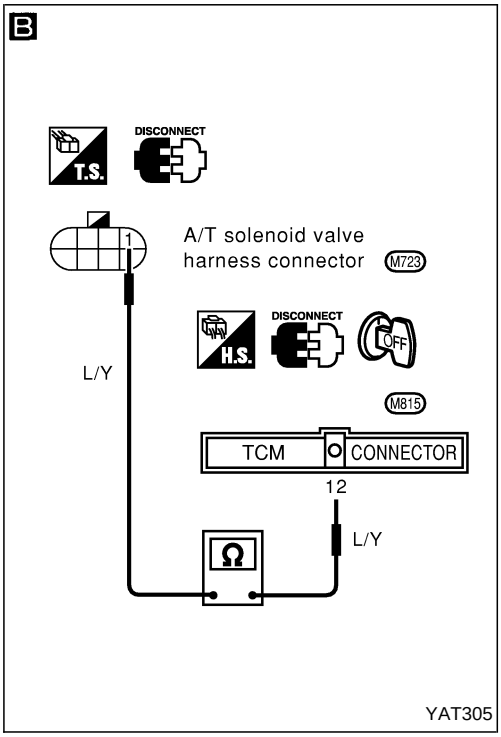


A

CHECK GROUND CIRCUIT.
1. Turn ignition switch to "OFF" position.
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal ① and ground.
   Resistance: 20 - 40Ω

NG →
1. Remove control valve assembly. Refer to AT-144.
2. Check the following items:
- Shift solenoid valve B
  Refer to "COMPONENT INSPECTION" below.
- Harness of terminal cord assembly for short or open

OK ↓



B

CHECK POWER SOURCE CIRCUIT.
1. Turn ignition switch to "OFF" position.
2. Disconnect TCM harness connector.
3. Check resistance between terminal ① and TCM harness connector terminal ⑫.
   Resistance:
   Approximately 0Ω
   If OK, check harness for short to ground and short to power.
4. Reinstall any part removed.

NG → Repair open circuit or short to ground or short to power in harness or connector.

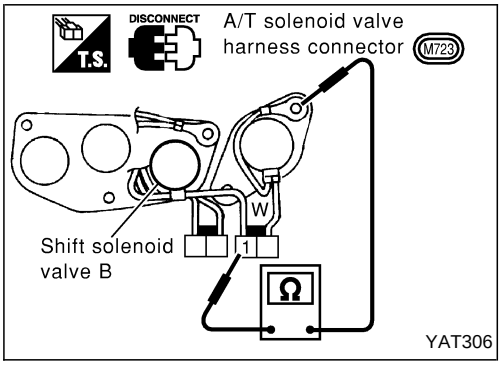
OK ↓

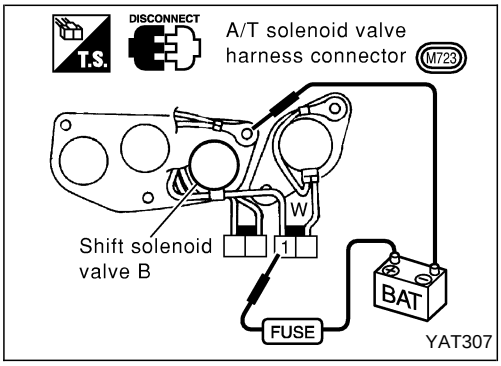
Perform "SELF-DIAGNOSIS CODE CONFIRMATION PROCEDURE", AT-68.

NG →
1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK ↓

INSPECTION END





COMPONENT INSPECTION

Shift solenoid valve B

- For removal, refer to AT-144.

Resistance check

- Check resistance between terminal ① and ground.

Solenoid valve	Terminal No.		Resistance (Approx.)
Shift solenoid valve B	①	Ground	20 - 40Ω

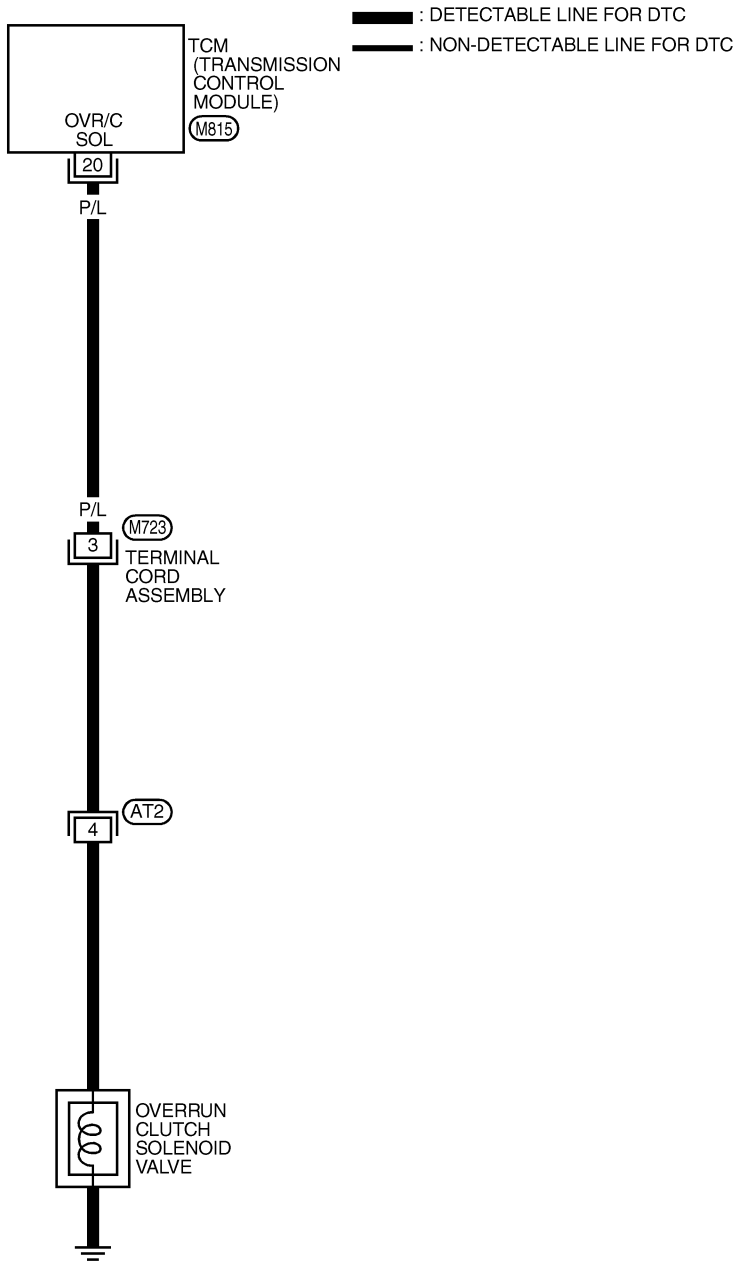
Operation check

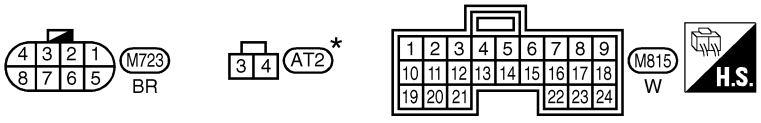
- Check solenoid valve by listening for its operating sound while applying battery voltage to the terminal ① and ground.

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Wiring Diagram — AT — OVRCSV

AT-OVRCSV-01

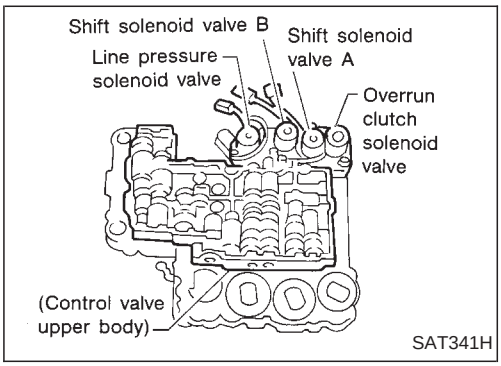




*: THIS CONNECTOR IS NOT SHOWN IN “HARNESS LAYOUT”, EL SECTION.

YAT282

http://vnx.su/



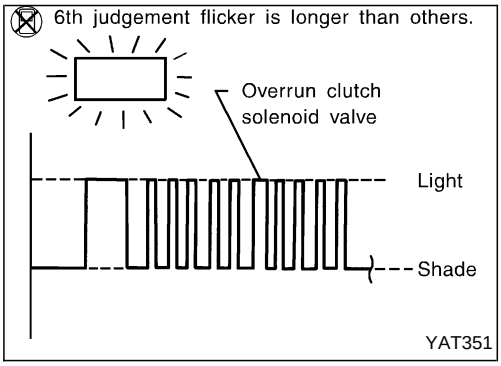
Overrun Clutch Solenoid Valve

DESCRIPTION

The overrun clutch solenoid valve is activated by the TCM in response to signals sent from the park/neutral position switch, overdrive control switch, vehicle speed and throttle (accelerator) position sensors. The overrun clutch operation will then be controlled.

ON BOARD DIAGNOSIS LOGIC

Diagnostic trouble code	Malfunction is detected when ...	Check items (Possible cause)
: OVERRUN CLUTCH S/V : 6th judgement flicker	TCM detects an improper voltage drop when it tries to operate the solenoid valve.	● Harness or connectors (The solenoid circuit is open or shorted.) ● Overrun clutch solenoid valve



SELF-DIAGNOSIS CODE CONFIRMATION PROCEDURE

After the repair, perform the following procedure to confirm the malfunction is eliminated.

1) Start engine.
2) Select “SELF-DIAG RESULTS” mode with CONSULT-II.
3) Drive vehicle under the following conditions:
   Selector lever in “D” position, overdrive control switch in “OFF” position and vehicle speed higher than 10 km/h (6 MPH).

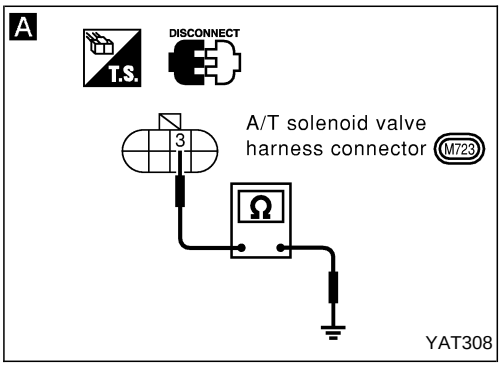
OR

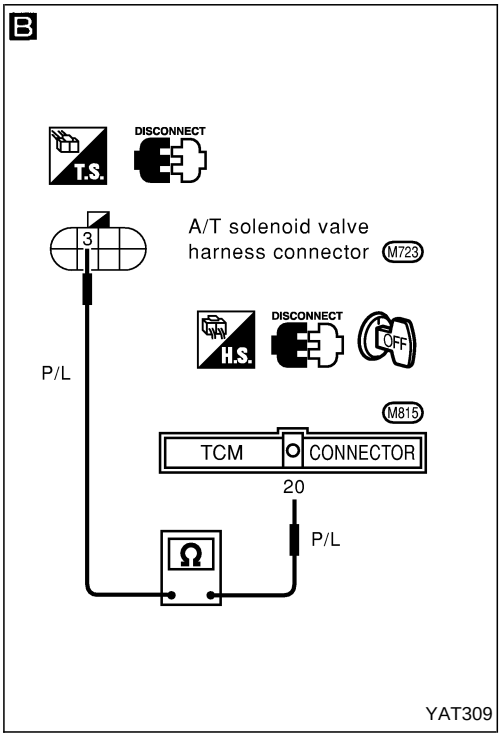
1) Start engine.
2) Drive vehicle under the following conditions:
   Selector lever in “D” position, overdrive control switch in “OFF” position and vehicle speed higher than 10 km/h (6 MPH).
3) Perform self-diagnosis.
   Refer to SELF-DIAGNOSTIC PROCEDURE (Without CONSULT-II), AT-15.

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Overrun Clutch Solenoid Valve (Cont'd)

DIAGNOSTIC PROCEDURE





A

CHECK GROUND CIRCUIT.
1. Turn ignition switch to "OFF" position.
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal ③ and ground.
   Resistance: 20 - 40Ω

NG →
1. Remove control valve assembly. Refer to AT-118.
2. Check the following items:
- Overrun clutch solenoid valve
  Refer to "COMPONENT INSPECTION" below.
- Harness of terminal cord assembly for short or open

OK ↓

B

CHECK POWER SOURCE CIRCUIT.
1. Turn ignition switch to "OFF" position.
2. Disconnect TCM harness connector.
3. Check resistance between terminal ③ and TCM harness connector terminal ⑳.
   Resistance:
   Approximately 0Ω
   If OK, check harness for short to ground and short to power.
4. Reinstall any part removed.

NG →
Repair open circuit or short to ground or short to power in harness or connector.

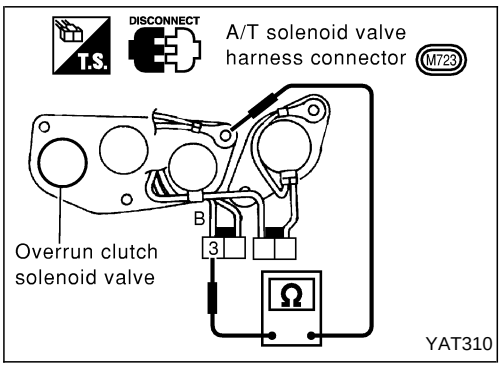
OK ↓

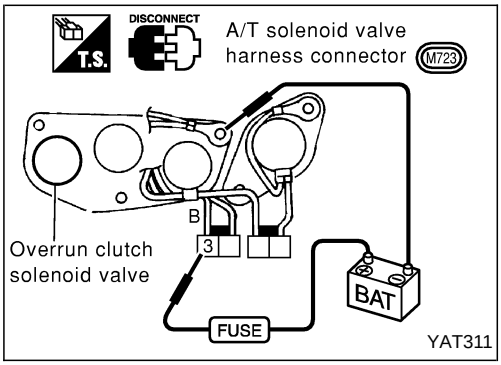
Perform "SELF-DIAGNOSIS CODE CONFIRMATION PROCEDURE", AT-71.

NG →
1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK ↓

INSPECTION END





COMPONENT INSPECTION

Overrun clutch solenoid valve

- For removal, refer to AT-118.

Resistance check

- Check resistance between terminal ③ and ground.

Solenoid valve	Terminal No.		Resistance (Approx.)
Overrun clutch solenoid valve	③	Ground	20 - 40Ω

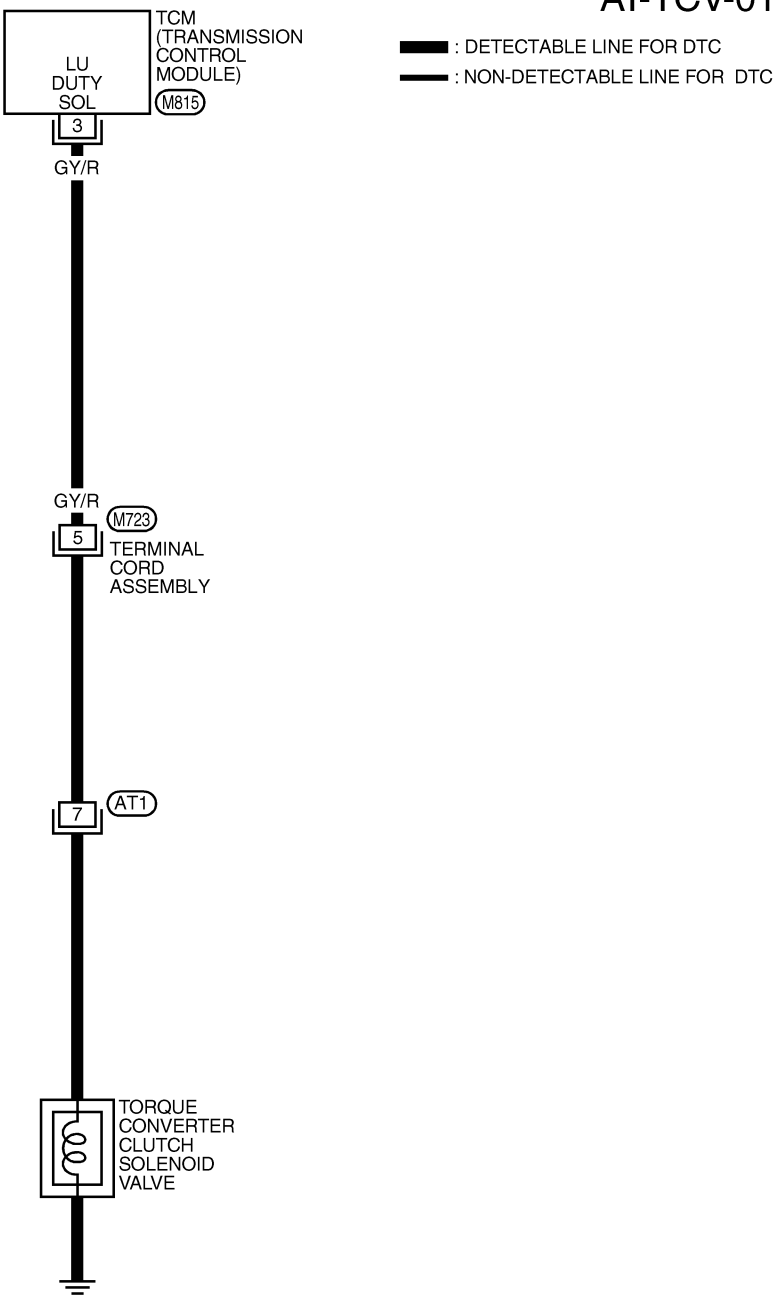
Operation check

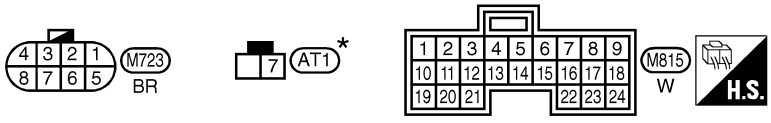
- Check solenoid valve by listening for its operating sound while applying battery voltage to the terminal ③ and ground.

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Wiring Diagram — AT — TCV

AT-TCV-01

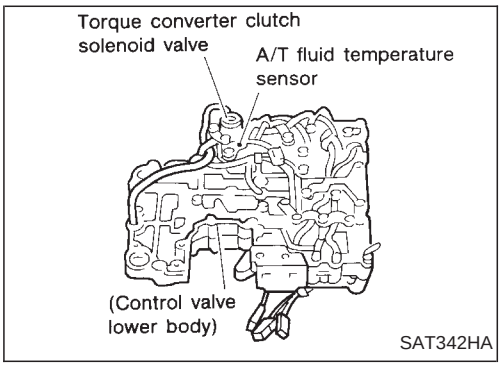




*: THIS CONNECTOR IS NOT SHOWN IN "HARNESS LAYOUT", EL SECTION.

YAT277

http://vnx.su/



Torque Converter Clutch Solenoid Valve

DESCRIPTION

The torque converter clutch solenoid valve is activated, with the gear in D_4, by the TCM in response to signals sent from the vehicle speed and throttle (accelerator) position sensors. Torque converter clutch piston operation will then be controlled.
Lock-up operation, however, is prohibited when A/T fluid temperature is too low.

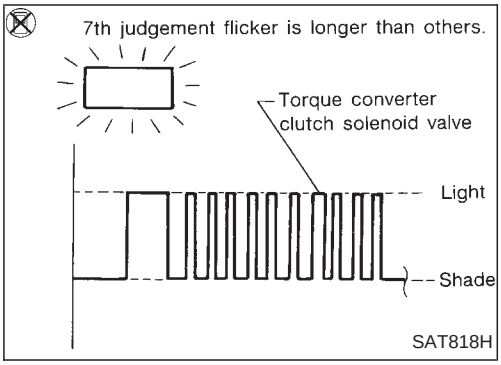
ON BOARD DIAGNOSIS LOGIC

Diagnostic trouble code	Malfunction is detected when ...	Check items (Possible cause)
: T/C CLUTCH SOL/V : 7th judgement flicker	TCM detects an improper voltage drop when it tries to operate the solenoid valve.	● Harness or connectors (The solenoid circuit is open or shorted.) ● T/C clutch solenoid valve

CONSULT-II REFERENCE VALUE IN DATA MONITOR MODE

Remarks: Specification data are reference values.

Monitor item	Condition	Specification
Torque converter clutch solenoid valve duty	Lock-up “OFF” ↓ Lock-up “ON”	Approximately 4% ↓ Approximately 94%



SELF-DIAGNOSIS CODE CONFIRMATION PROCEDURE

After the repair, perform the following procedure to confirm the malfunction is eliminated.

1) Start engine.
2) Select “SELF-DIAG RESULTS” mode with CONSULT-II.
3) Drive vehicle in $D_1 \rightarrow D_2 \rightarrow D_3 \rightarrow D_4 \rightarrow D_4$ lock-up position.

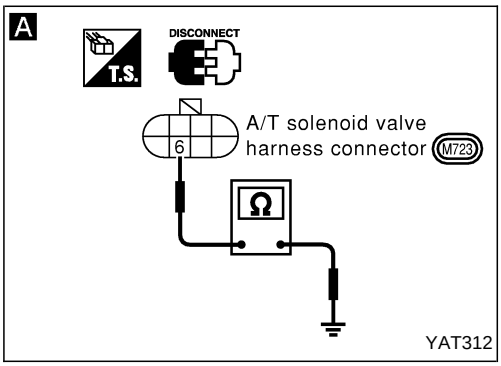
OR

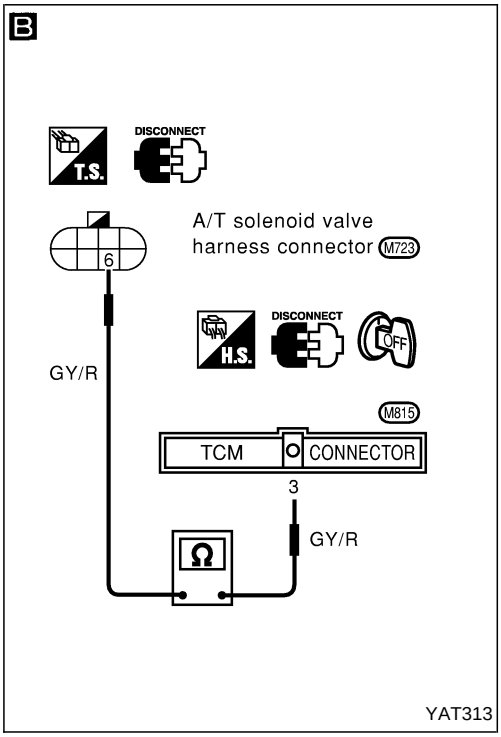
1) Start engine.
2) Drive vehicle in $D_1 \rightarrow D_2 \rightarrow D_3 \rightarrow D_4 \rightarrow D_4$ lock-up position.
3) Perform self-diagnosis.
   Refer to SELF-DIAGNOSTIC PROCEDURE (Without CONSULT-II), AT-15.

http://vnx.su/

Torque Converter Clutch Solenoid Valve (Cont'd)

DIAGNOSTIC PROCEDURE





A

CHECK GROUND CIRCUIT.
1. Turn ignition switch to "OFF" position.
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal ⑥ and ground.
   Resistance: 10 - 20Ω

NG →
1. Remove oil pan. Refer to AT-128.
2. Check the following items:
- Torque converter clutch solenoid valve
  Refer to "COMPONENT INSPECTION" on next page.
- Harness of terminal cord assembly for short or open

OK ↓

B

CHECK POWER SOURCE CIRCUIT.
1. Turn ignition switch to "OFF" position.
2. Disconnect TCM harness connector.
3. Check resistance between terminal ⑥ and TCM harness connector terminal ③ .
   Resistance:
   Approximately 0Ω
   If OK, check harness for short to ground and short to power.
4. Reinstall any part removed.

NG →
Repair open circuit or short to ground or short to power in harness or connector.

OK ↓

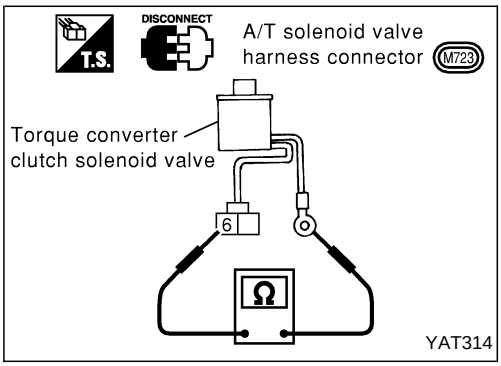
Perform "SELF-DIAGNOSIS CODE CONFIRMATION PROCEDURE", AT-74.

NG →
1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK ↓

INSPECTION END

http://vnx.su/



Torque Converter Clutch Solenoid Valve (Cont'd)

COMPONENT INSPECTION

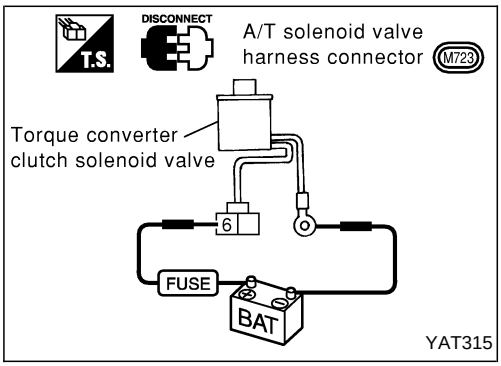
Torque converter clutch solenoid valve

- For removal, refer to AT-144.

Resistance check

- Check resistance between terminal ⑥ and ground.

Solenoid valve	Terminal No.		Resistance (Approx.)
Torque converter clutch solenoid valve	⑥	Ground	10 - 20Ω

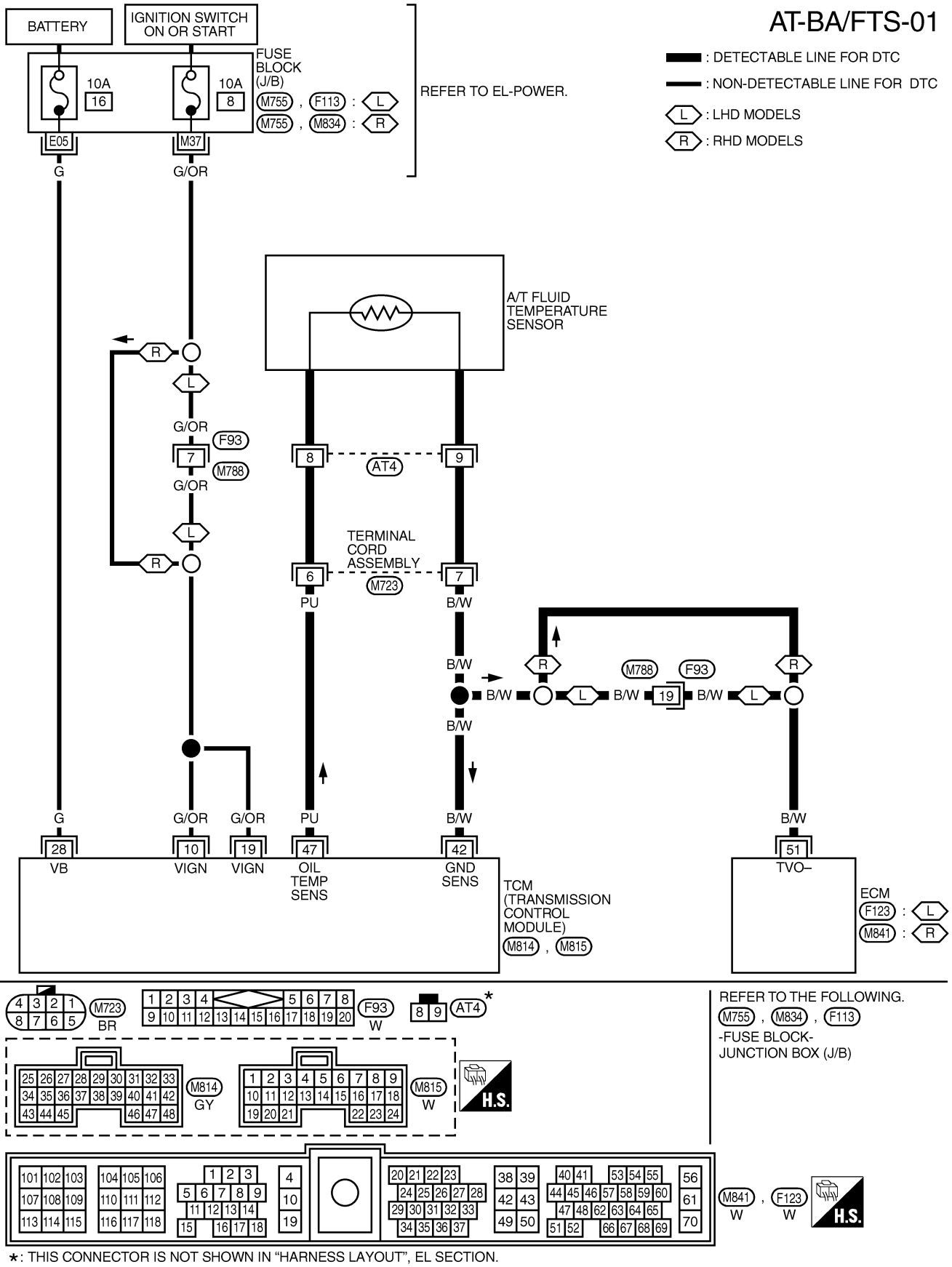


Operation check

- Check solenoid valve by listening for its operating sound while applying battery voltage to the terminal ⑥ and ground.

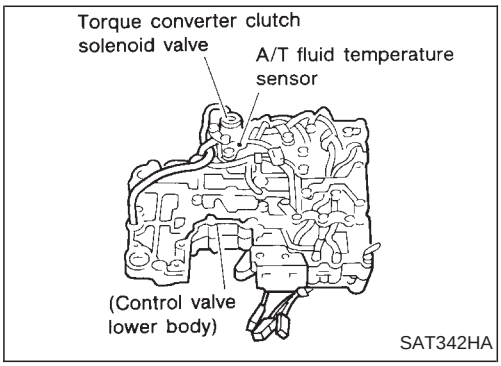
http://vnx.su/

Wiring Diagram — AT — BA/FTS



YAT403

http://vnx.su/



A/T Fluid Temperature Sensor and TCM Power Source

DESCRIPTION

The A/T fluid temperature sensor detects the A/T fluid temperature and sends a signal to the TCM.

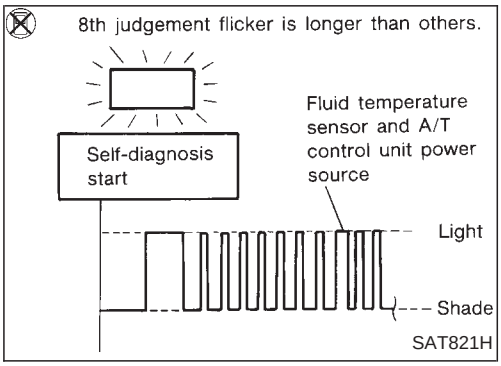
ON BOARD DIAGNOSIS LOGIC

Diagnostic trouble code	Malfunction is detected when ...	Check items (Possible cause)
: BATT/FLUID TEMP SEN : 8th judgement flicker	TCM receives an excessively low or high voltage from the sensor.	● Harness or connectors (The sensor circuit is open or shorted.) ● A/T fluid temperature sensor

CONSULT-II REFERENCE VALUE IN DATA MONITOR MODE

Remarks: Specification data are reference values.

Monitor item	Condition	Specification
A/T fluid temperature sensor	Cold [20°C (68°F)] ↓ Hot [80°C (176°F)]	Approximately 1.5V ↓ Approximately 0.5V



SELF-DIAGNOSIS CODE CONFIRMATION PROCEDURE

After the repair, perform the following procedure to confirm the malfunction is eliminated.

1) Start engine.
2) Select “SELF-DIAG RESULTS” mode with CONSULT-II.
3) Drive vehicle under the following conditions:
Selector lever in “D” position, vehicle speed higher than 10 km/h (6 MPH), throttle opening greater than 1/8 of the full open position, engine speed higher than 450 rpm and driving for more than 10 minutes.

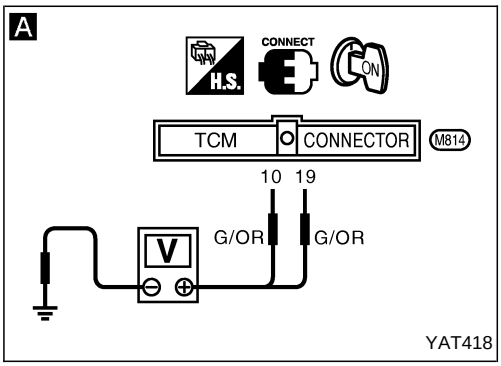
OR

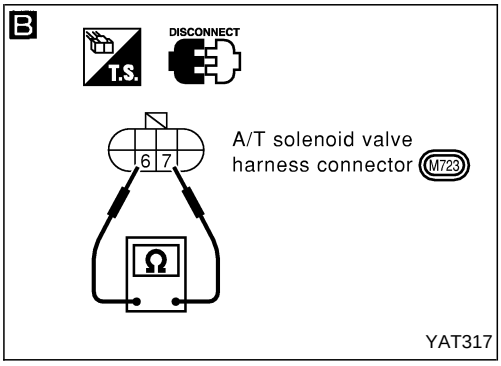
1) Start engine.
2) Drive vehicle under the following conditions:
Selector lever in “D” position, vehicle speed higher than 10 km/h (6 MPH), throttle opening greater than 1/8 of the full open position, engine speed higher than 450 rpm and driving for more than 10 minutes.
3) Perform self-diagnosis.
Refer to SELF-DIAGNOSTIC PROCEDURE (Without CONSULT-II), AT-15.

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A/T Fluid Temperature Sensor and TCM Power Source (Cont'd)

DIAGNOSTIC PROCEDURE





A

CHECK TCM POWER SOURCE.

1. Turn ignition switch to "ON" position. (Do not start engine.)
2. Check voltage between TCM terminals ⑩, ⑲ and ground.
   Battery voltage should exist.

NG → Check the following items:
- Harness for short or open between ignition switch and TCM (Main harness)
- Ignition switch and fuse Refer to EL section ("POWER SUPPLY ROUTING").

OK ↓

B

CHECK A/T FLUID TEMPERATURE SENSOR WITH TERMINAL CORD ASSEMBLY.

1. Turn ignition switch to "OFF" position.
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminals ⑥ and ⑦ when A/T is cold.
   Resistance:
   Cold [20°C (68°F)]
   Approximately 2.5 kΩ
4. Reinstall any part removed.

NG →
1. Remove oil pan.
2. Check the following items:
- A/T fluid temperature sensor Refer to "COMPONENT INSPECTION" on next page.
- Harness of terminal cord assembly for short or open

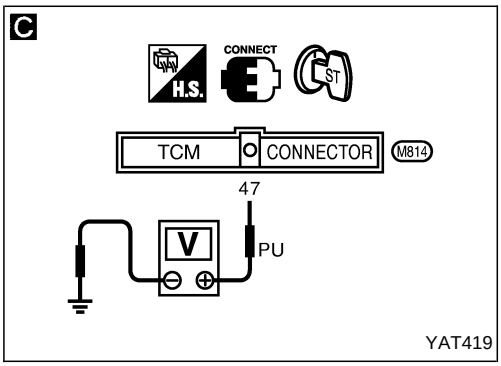
OK ↓

Ⓐ

(Go to next page.)

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A/T Fluid Temperature Sensor and TCM Power Source (Cont'd)



Ⓐ

C

CHECK INPUT SIGNAL OF A/T FLUID TEMPERATURE SENSOR.

With CONSULT-II

1. Start engine.
2. Select "ECU INPUT SIGNALS" in Data Monitor.
3. Read out the value of "FLUID TEMP SE".

Voltage:
Cold [20°C (68°F)] → Hot [80°C (176°F)]:
Approximately 1.5V → 0.5V

OR

Without CONSULT-II

1. Start engine.
2. Check voltage between TCM terminal ㊼ and ground while warming up A/T.

Voltage:
Cold [20°C (68°F)] → Hot [80°C (176°F)]:
Approximately 1.5V → 0.5V

NG → Check the following item:
- Harness for short or open between TCM and terminal cord assembly (Main harness)

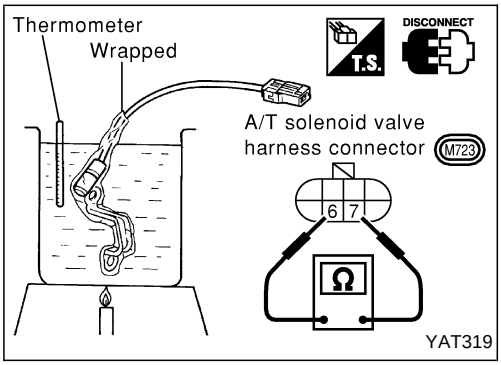
OK ↓

Perform "SELF-DIAGNOSIS CODE CONFIRMATION PROCEDURE", AT-78.

NG → 1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK ↓

INSPECTION END



COMPONENT INSPECTION

A/T fluid temperature sensor

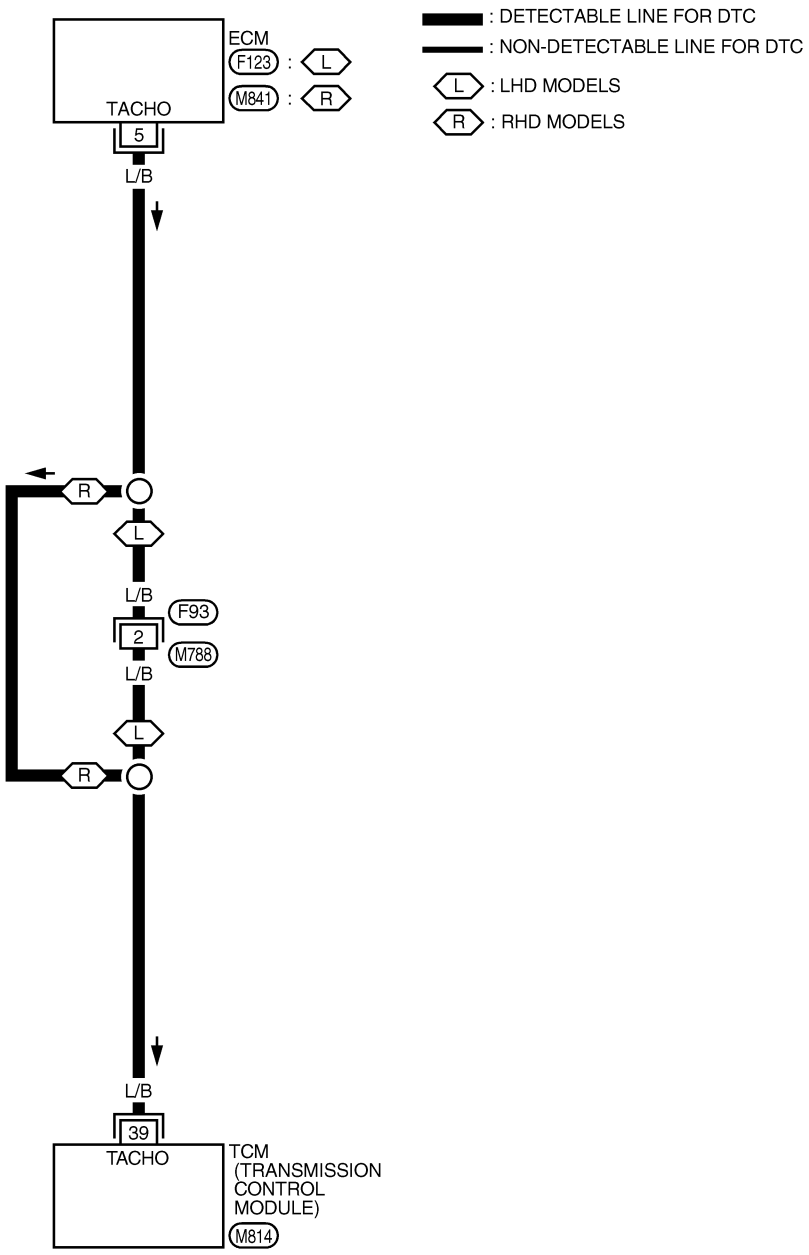
- For removal, refer to AT-118.
- Check resistance between terminals ⑥ and ⑦ while changing temperature as shown at left.

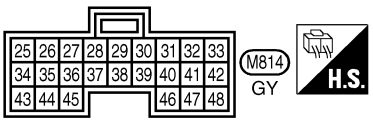
Temperature °C (°F)	Resistance
20 (68)	Approximately 2.5 kΩ
80 (176)	Approximately 0.3 kΩ

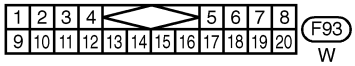
http://vnx.su/

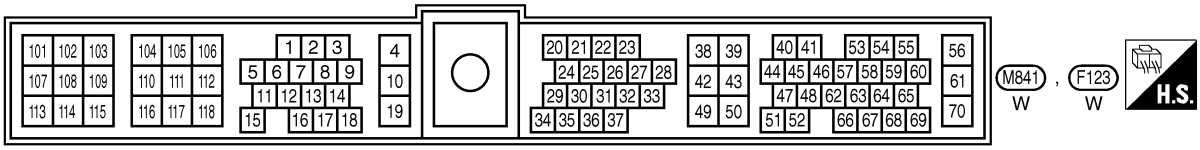
Wiring Diagram — AT — ENGSS

AT-ENGSS-01









YAT271

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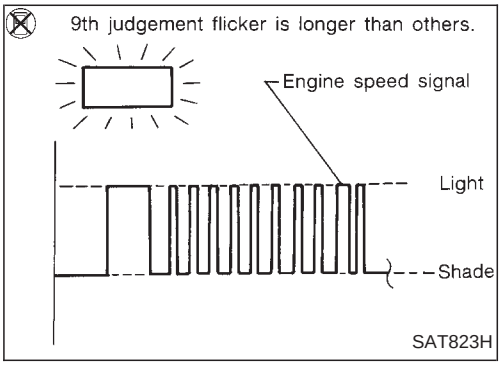
Engine Speed Signal

DESCRIPTION

The engine speed signal is sent from the ECM to the TCM.

ON BOARD DIAGNOSIS LOGIC

Diagnostic trouble code	Malfunction is detected when ...	Check items (Possible cause)
: ENGINE SPEED SIG : 9th judgement flicker	TCM does not receive the proper voltage signal from ECM.	● Harness or connectors (The sensor circuit is open or shorted.)



SELF-DIAGNOSIS CODE CONFIRMATION PROCEDURE

After the repair, perform the following procedure to confirm the malfunction is eliminated.

1) Start engine.
2) Select “SELF-DIAG RESULTS” mode with CONSULT-II.
3) Drive vehicle under the following conditions:
   Selector lever in “D” position, vehicle speed higher than 10 km/h (6 MPH), throttle opening greater than 1/8 of the full throttle position and driving for more than 10 seconds.

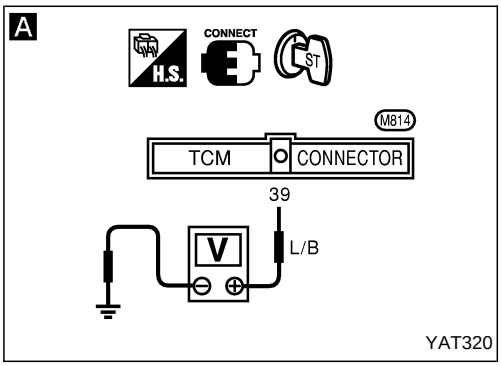
OR

1) Start engine.
2) Drive vehicle under the following conditions:
   Selector lever in “D” position, vehicle speed higher than 10 km/h (6 MPH), throttle opening greater than 1/8 of the full throttle position and driving for more than 10 seconds.
3) Perform self-diagnosis.
   Refer to SELF-DIAGNOSTIC PROCEDURE (Without CONSULT-II), AT-15.

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Engine Speed Signal (Cont'd)

DIAGNOSTIC PROCEDURE



Perform diagnostic test mode II (self-diagnostic results) for engine control. Check ignition signal circuit condition.

NG → Check ignition signal circuit for engine control. Refer to EC section [TROUBLE DIAGNOSIS FOR "IGN SIGNAL-PRIMARY" (DTC 21)].

OK ↓

A

CHECK INPUT SIGNAL.

1. Start engine.
2. Select "ECU INPUT SIGNALS" in Data Monitor.
3. Read out the value of "ENGINE SPEED".
   Check engine speed changes according to throttle position.

OR

1. Start engine.
2. Check voltage between TCM terminal ㊴ and ground.
   Voltage (Idle speed):
   Approximately 0.8V
   Voltage (2,000 rpm):
   Approximately 2.2V

NG → Check the following items:
- Harness for short or open between TCM and ECM
- Resistor

Refer to EC section [TROUBLE DIAGNOSIS FOR "IGN SIGNAL-PRIMARY" (DTC 21)].

OK ↓

Perform "SELF-DIAGNOSIS CODE CONFIRMATION PROCEDURE", AT-82.

NG → 1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

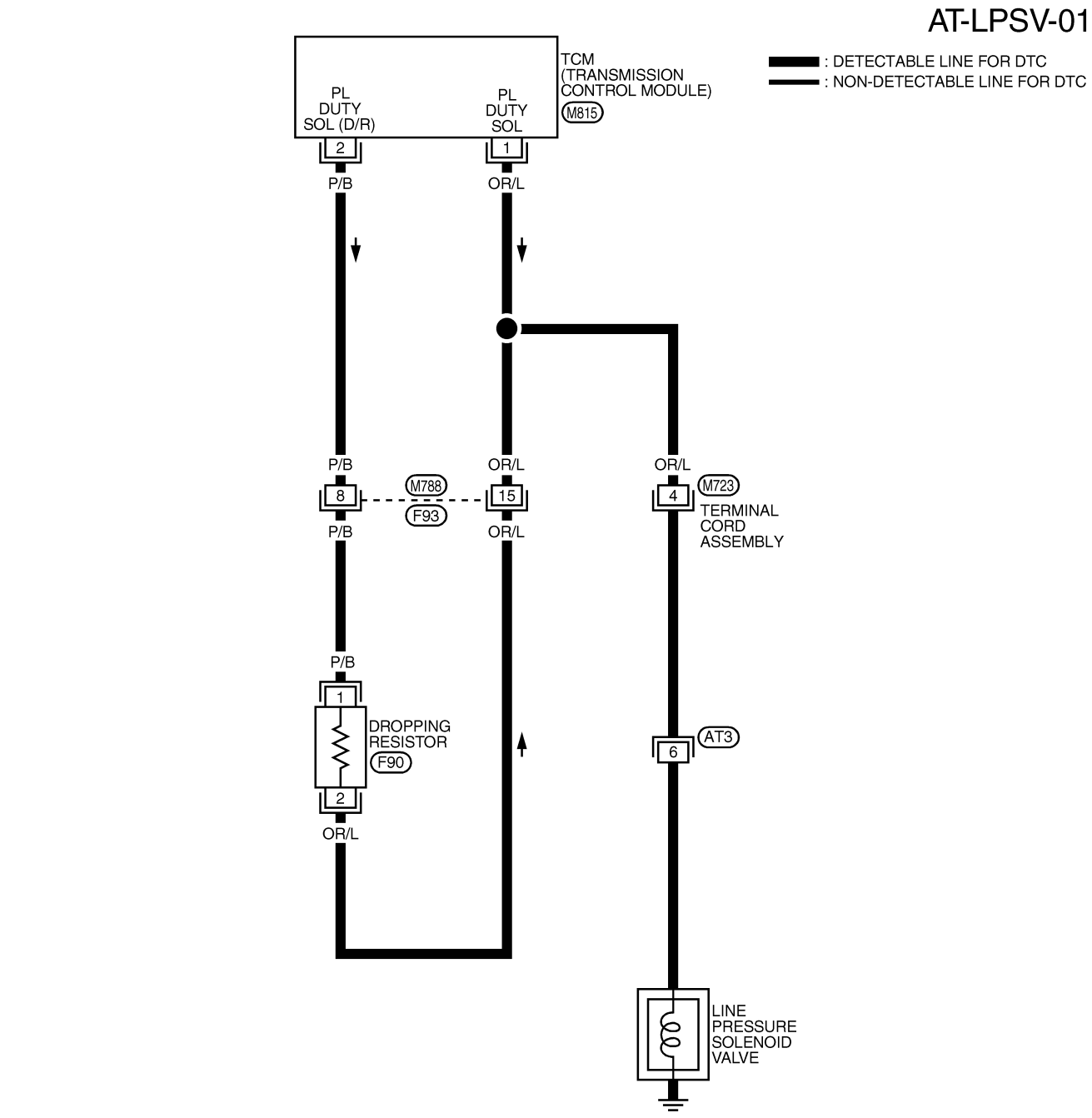
OK ↓

INSPECTION END

http://vnx.su/

Wiring Diagram — AT — LPSV

LHD MODELS



*: THIS CONNECTOR IS NOT SHOWN IN "HARNESS LAYOUT", EL SECTION.

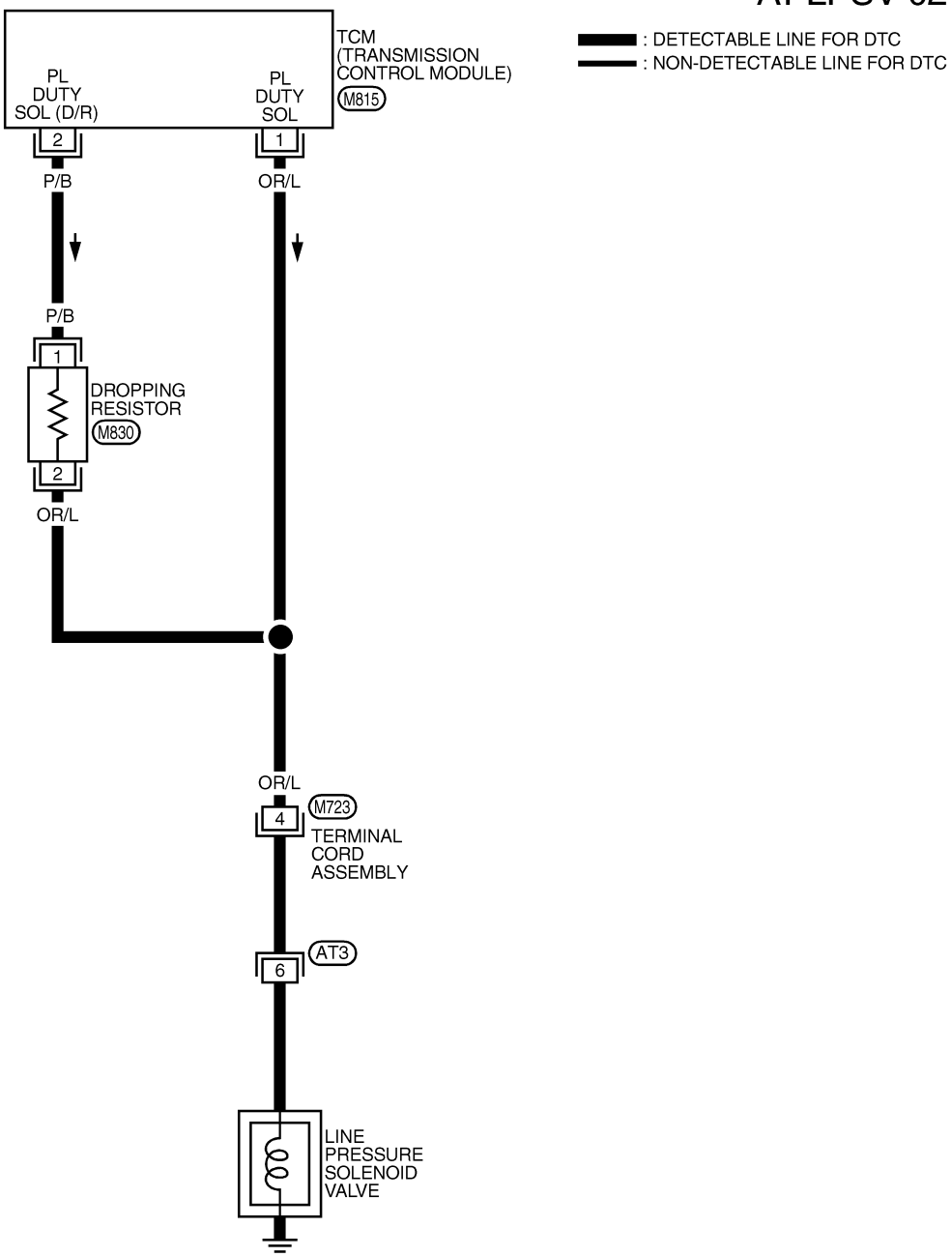
YAT278

http://vnx.su/

Wiring Diagram — AT — LPSV (Cont'd)

RHD MODELS

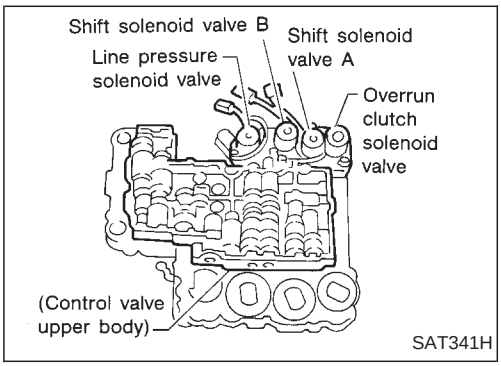
AT-LPSV-02



*: THIS CONNECTOR IS NOT SHOWN IN "HARNESS LAYOUT", EL SECTION.

YAT279

http://vnx.su/



Line Pressure Solenoid Valve

DESCRIPTION

The line pressure solenoid valve regulates the oil pump discharge pressure to suit the driving condition in response to a signal sent from the TCM.

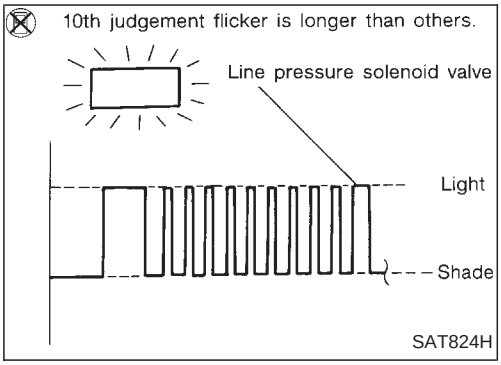
ON BOARD DIAGNOSIS LOGIC

Diagnostic trouble code	Malfunction is detected when ...	Check items (Possible cause)
(H) : LINE PRESSURE S/V (X) : 10th judgement flicker	TCM detects an improper voltage drop when it tries to operate the solenoid valve.	● Harness or connectors (The solenoid circuit is open or shorted.) ● Line pressure solenoid valve

CONSULT-II REFERENCE VALUE IN DATA MONITOR MODE

Remarks: Specification data are reference values.

Monitor item	Condition	Specification
Line pressure solenoid valve duty	Low line-pressure (Small throttle opening) ↓ High line-pressure (Large throttle opening)	Approximately 29% ↓ Approximately 94%



SELF-DIAGNOSIS CODE CONFIRMATION PROCEDURE

After the repair, perform the following procedure to confirm the malfunction is eliminated.

(H)
1) Start engine.
2) Select “SELF-DIAG RESULTS” mode with CONSULT-II.
3) With brake pedal depressed, shift the lever from “P” → “N” → “D” → “N” → “P” positions.

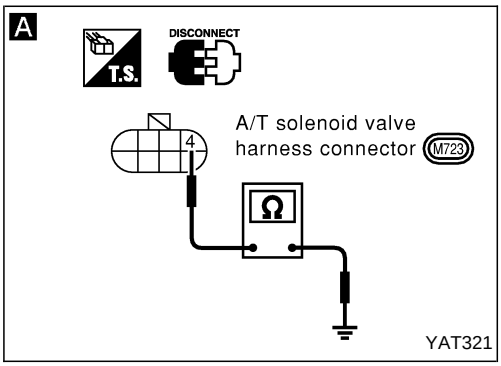
OR

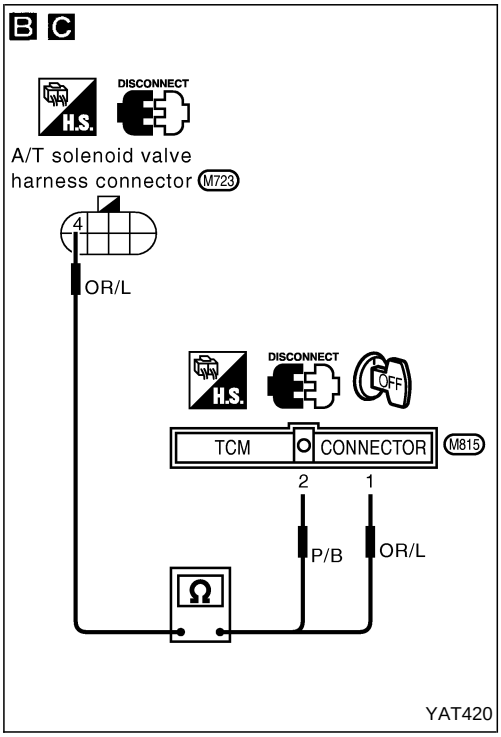
(X)
1) Start engine.
2) With brake pedal depressed, shift the lever from “P” → “N” → “D” → “N” → “P” positions.
3) Perform self-diagnosis.
Refer to SELF-DIAGNOSTIC PROCEDURE (Without CONSULT-II), AT-15.

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Line Pressure Solenoid Valve (Cont'd)

DIAGNOSTIC PROCEDURE





A

CHECK GROUND CIRCUIT.
1. Turn ignition switch to "OFF" position.
2. Disconnect terminal cord assembly connector in engine compartment.
3. Check resistance between terminal ④ and ground.
   Resistance: 2.5 - 5Ω

NG →
1. Remove control valve assembly. Refer to AT-118.
2. Check the following items:
   - Line pressure solenoid valve
     Refer to "COMPONENT INSPECTION" on next page.
   - Harness of terminal cord assembly for short or open

OK ↓

B

CHECK POWER SOURCE CIRCUIT.
1. Turn ignition switch to "OFF" position.
2. Disconnect TCM harness connector.
3. Check resistance between terminal ④ and TCM harness connector terminal ② .
   Resistance: 11.2 - 12.8Ω

NG →
Check the following items:
- Dropping resistor
  Refer to "COMPONENT INSPECTION" on next page.
- Harness for short or open between TCM terminal ② and terminal cord assembly (Main harness)

OK ↓

C

CHECK POWER SOURCE CIRCUIT.
1. Turn ignition switch to "OFF" position.
2. Check resistance between terminal ④ and TCM harness connector terminal ① .
   Resistance:
   Approximately 0Ω
   If OK, check harness for short to ground and short to power.
3. Reinstall any part removed.

NG →
Repair open circuit or short to ground or short to power in harness or connector.

OK ↓

Perform "SELF-DIAGNOSIS CODE CONFIRMATION PROCEDURE", AT-86.

NG →
1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK ↓

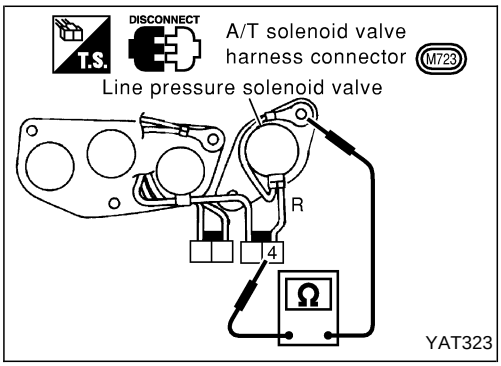
INSPECTION END

http://vnx.su/

Line Pressure Solenoid Valve (Cont'd)

COMPONENT INSPECTION

Line pressure solenoid valve

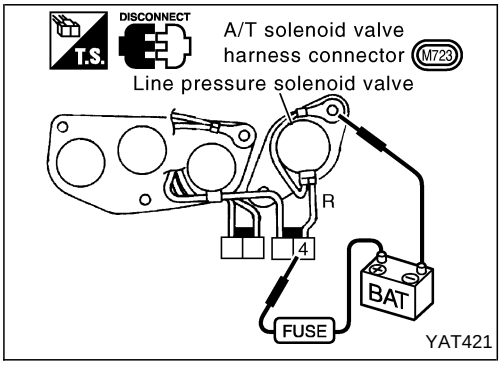


- For removal, refer to AT-118.

Resistance check

- Check resistance between terminal ④ and ground.

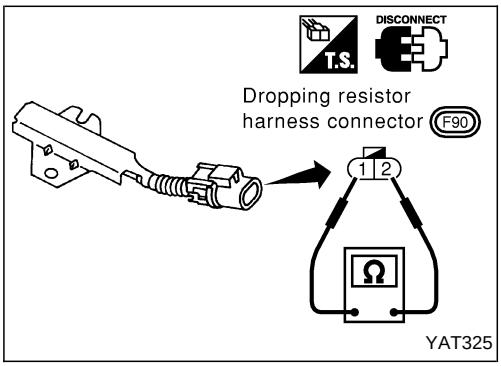
Solenoid valve	Terminal No.		Resistance (Approx.)
Line pressure solenoid valve	④	Ground	2.5 - 5Ω



Operation check

- Check solenoid valve by listening for its operating sound while applying battery voltage to the terminal ④ and ground.

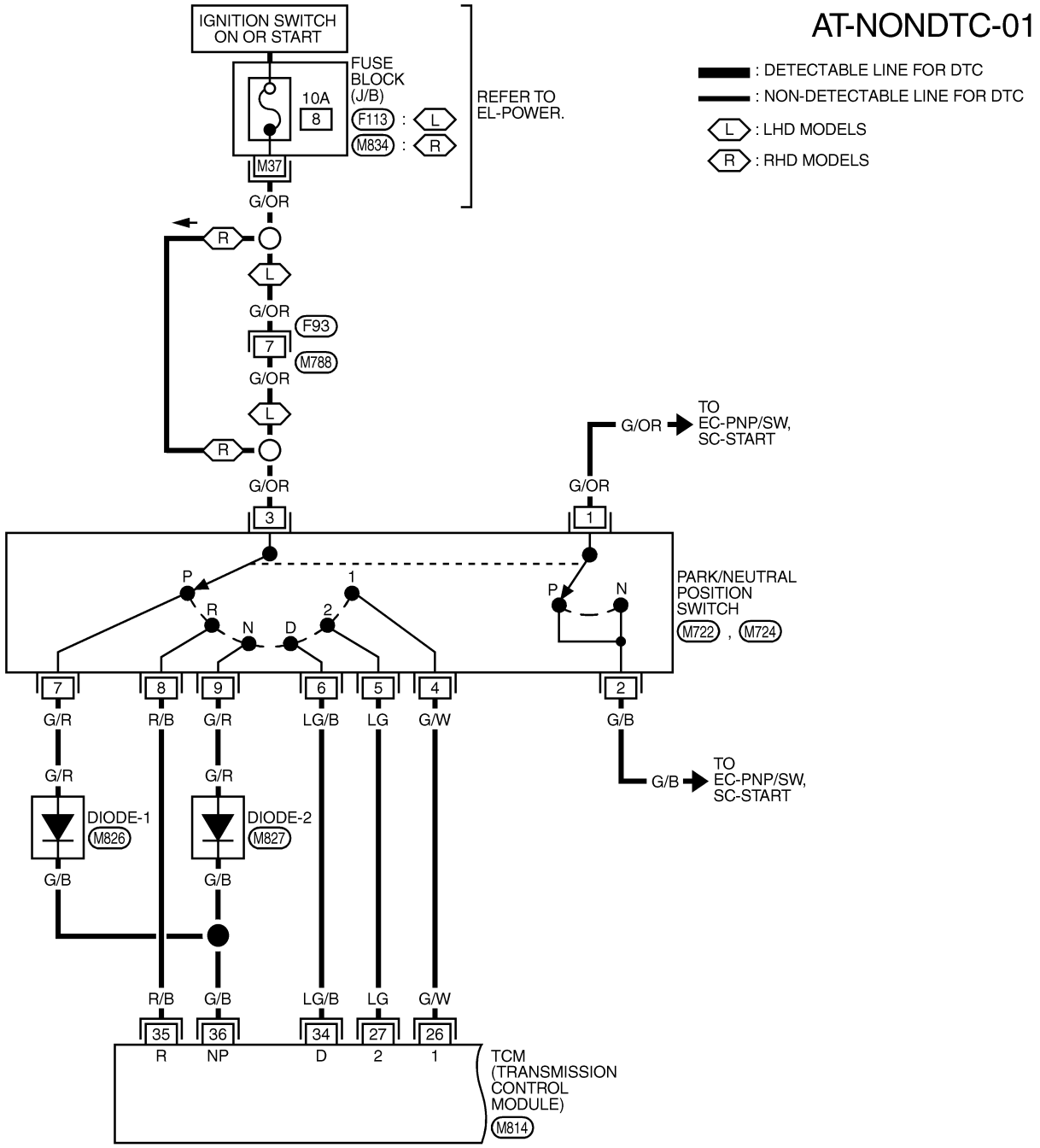
Dropping resistor

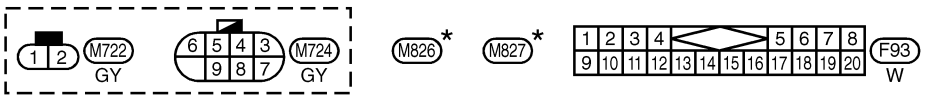


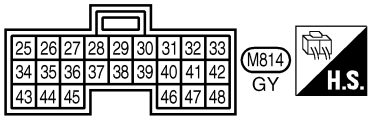
- Check resistance between terminals ① and ② .
  Resistance: 11.2 - 12.8 Ω

http://vnx.su/

Wiring Diagram — AT — PNP/SW







*: THIS DIODE IS BUILT IN HARNESS

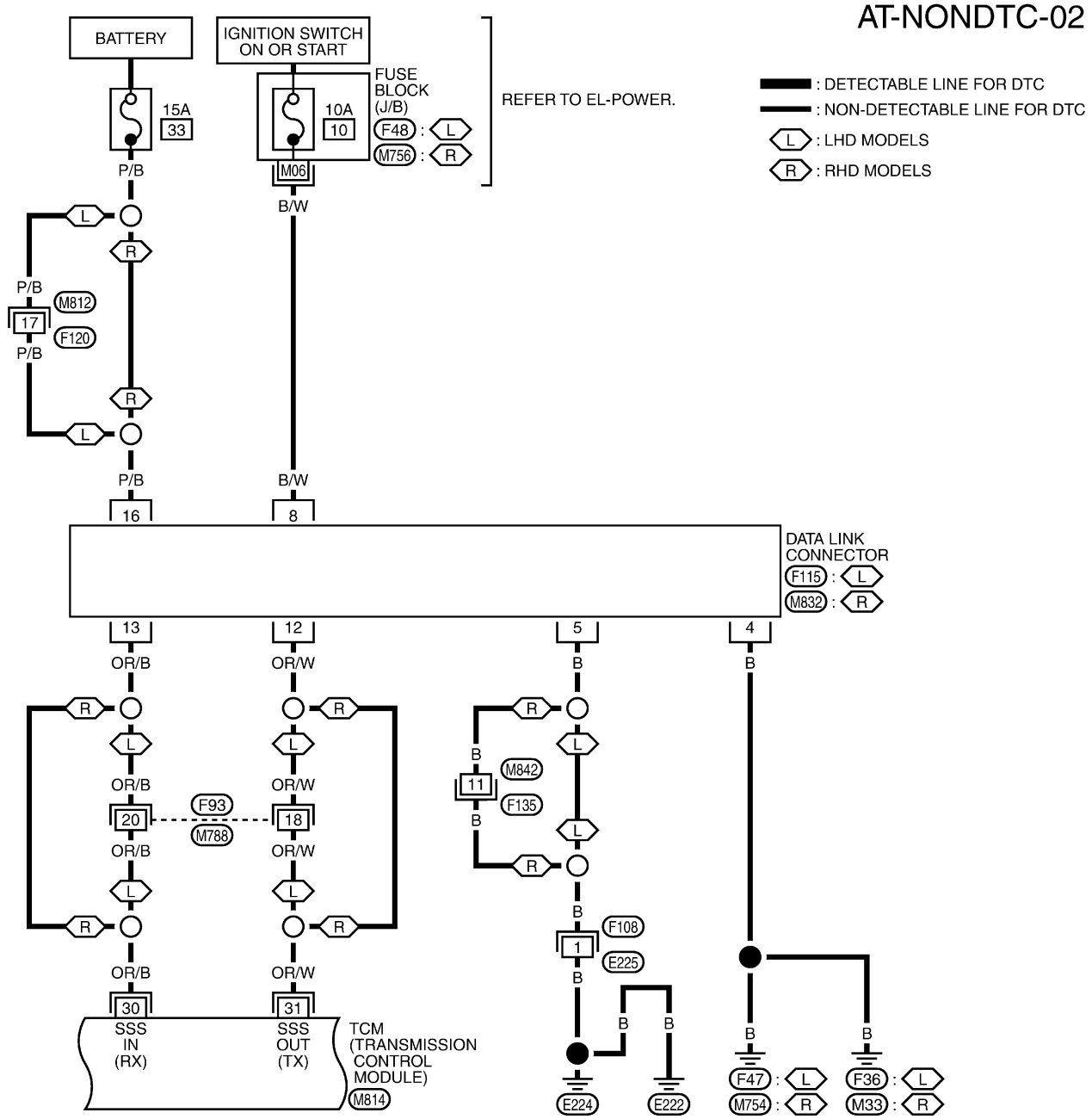
REFER TO THE FOLLOWING.
M834 , F113 -FUSE BLOCK-JUNCTION BOX (J/B)

YAT406

http://vnx.su/

Wiring Diagram — AT — PNP/SW (Cont'd)

AT-NONDTC-02

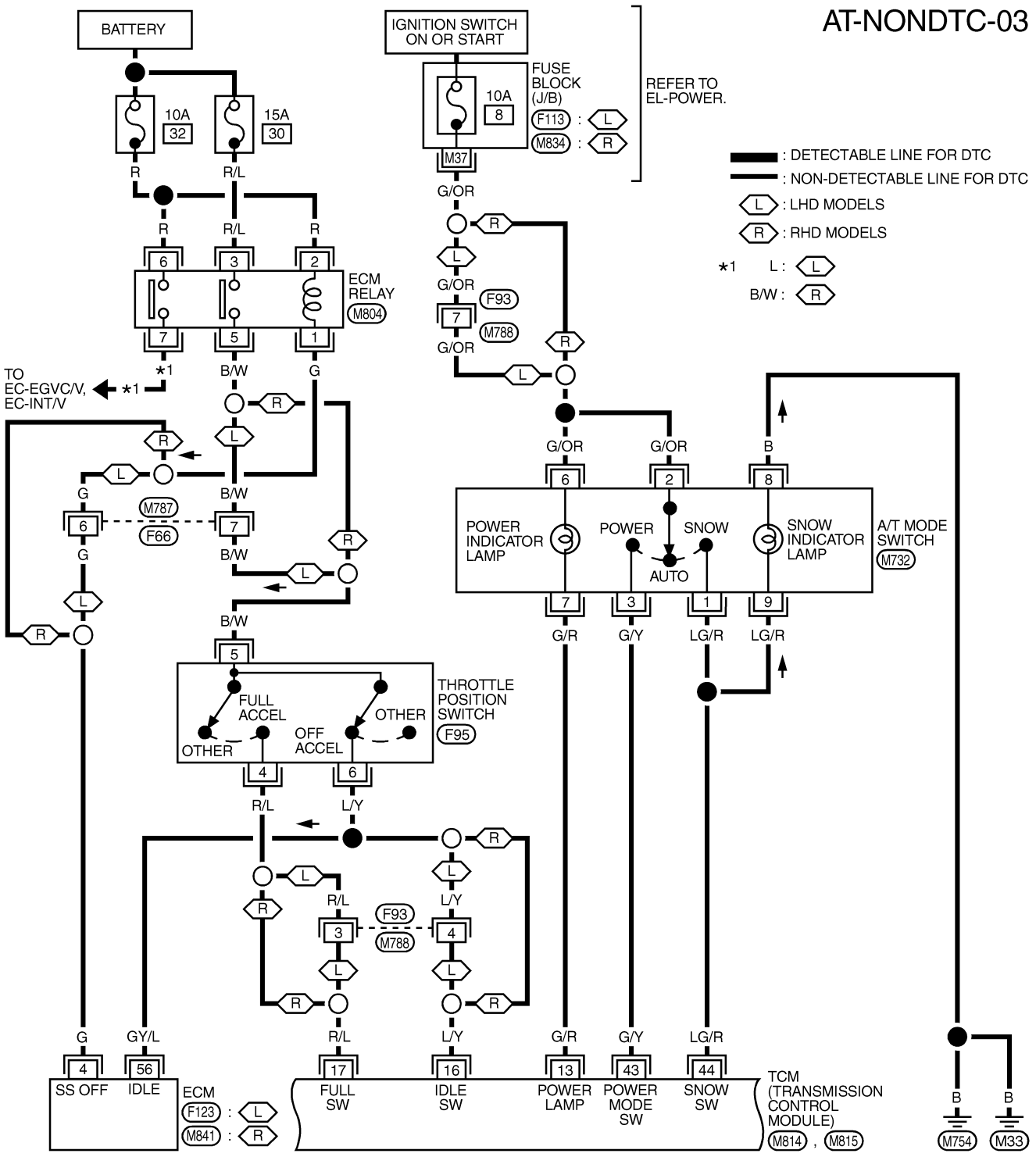


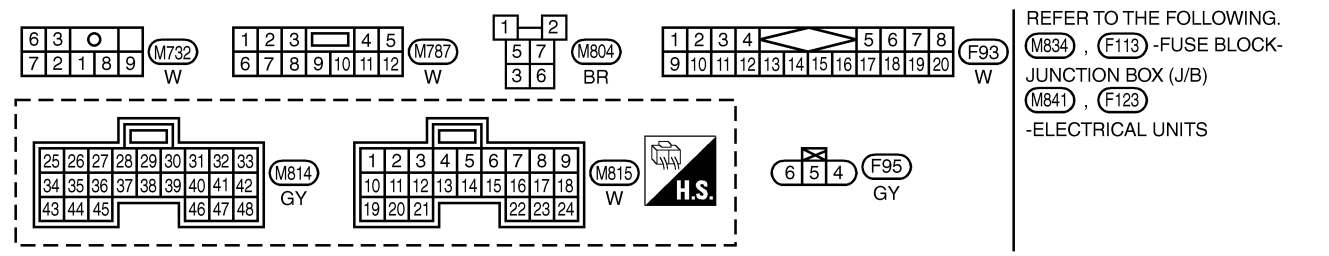
YAT407

http://vnx.su/

Wiring Diagram — AT — PNP/SW (Cont'd)

AT-NONDTC-03





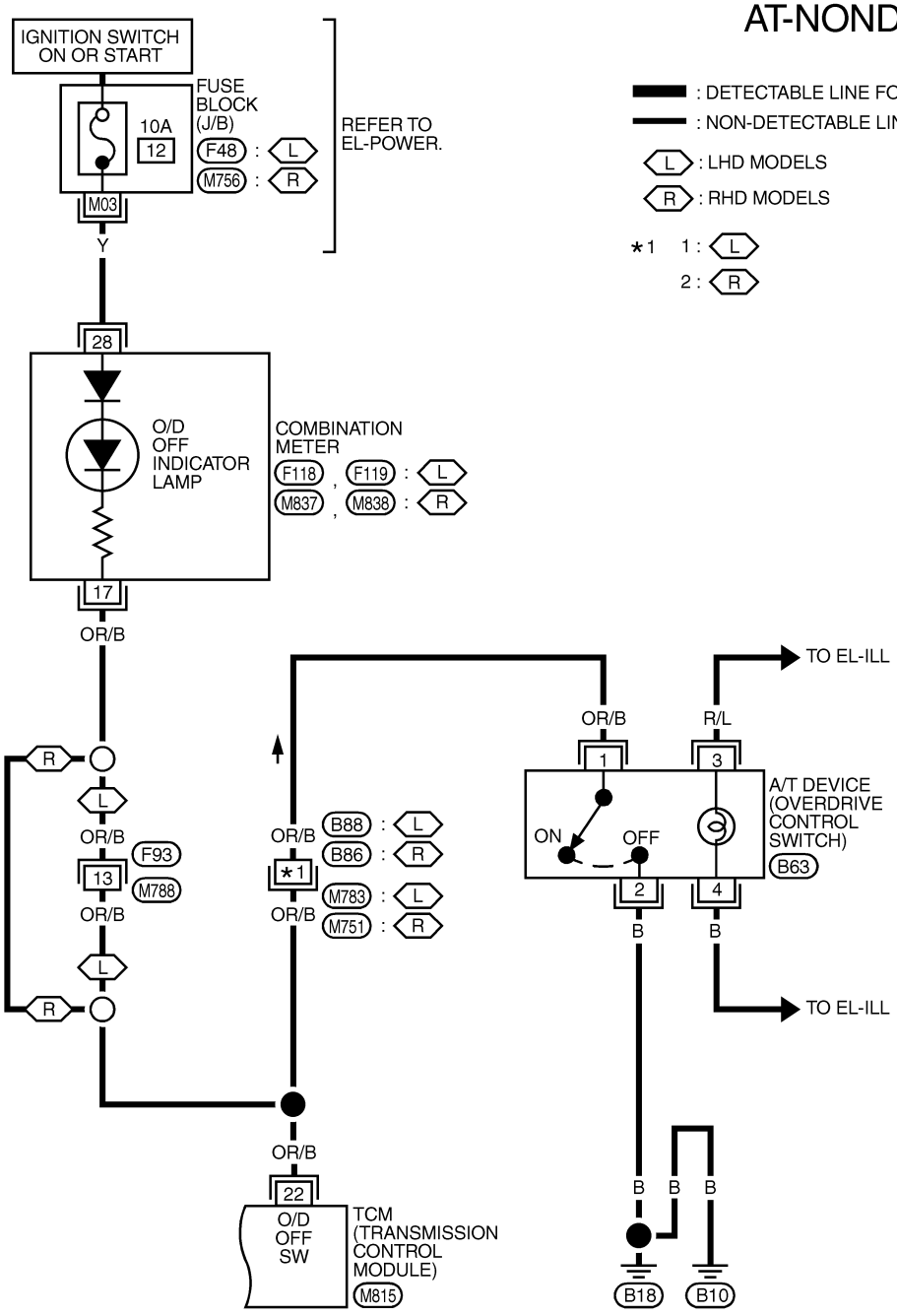
REFER TO THE FOLLOWING.
M834 , F113 -FUSE BLOCK-JUNCTION BOX (J/B)
M841 , F123
-ELECTRICAL UNITS

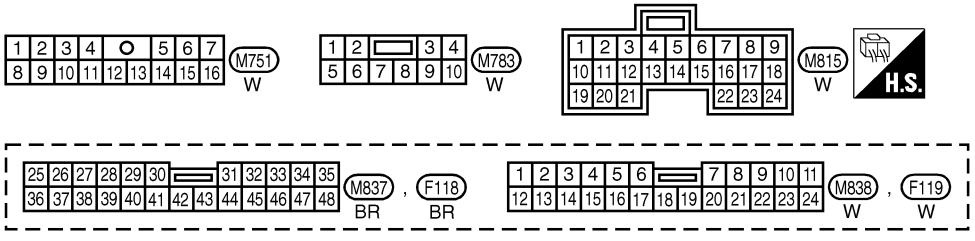
YAT408

http://vnx.su/

Wiring Diagram — AT — PNP/SW (Cont'd)

AT-NONDTC-04

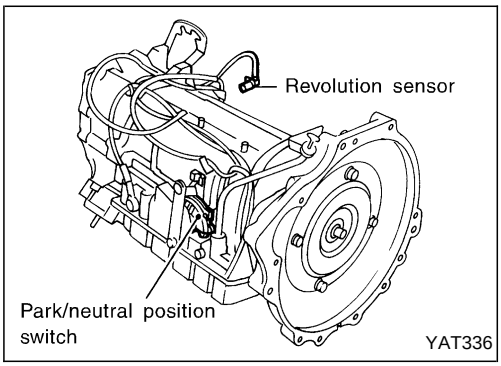


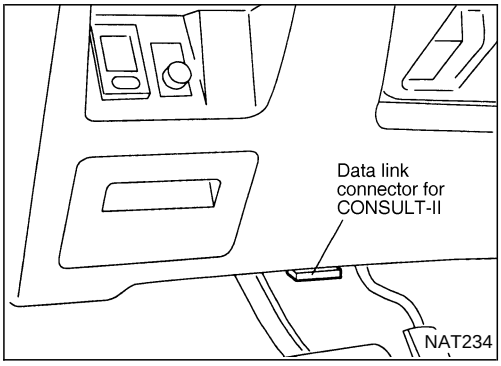


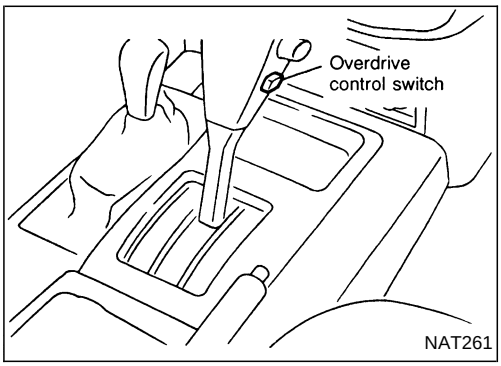
REFER TO THE FOLLOWING.
M756 , F48 -FUSE BLOCK-JUNCTION BOX (J/B)

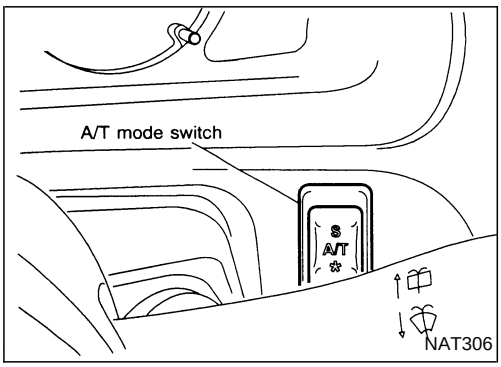
YAT409

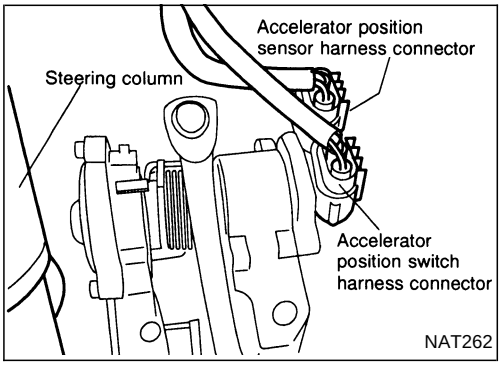
http://vnx.su/











Park/neutral Position, Overdrive Control or Throttle (Accelerator) Position Switches

DESCRIPTION

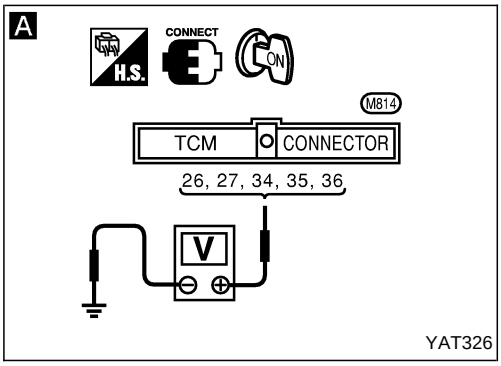
- Park/neutral position switch
  Detects the selector lever position and sends a signal to the TCM.
- Overdrive control switch
  Detects the overdrive control switch position (ON or OFF) and sends a signal to the TCM.
- Throttle (accelerator) position switch
  Consists of a wide open throttle position switch and a closed throttle (accelerator) position switch.
  The wide open throttle position switch sends a signal to the TCM when the throttle valve is open at least 1/2 of the full throttle position. The closed throttle position switch sends a signal to the TCM when the throttle valve is fully closed.

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Park/neutral Position, Overdrive Control or Throttle (Accelerator) Position Switches (Cont'd)

DIAGNOSTIC PROCEDURE

A



CHECK PARK/NEUTRAL POSITION SWITCH CIRCUIT.

1. Turn ignition switch to "ON" position. (Do not start engine.)
2. Select "ECU INPUT SIGNALS" in Data Monitor.
3. Read out "R, N, D, 2 and 1 position switches" moving selector lever to each position. Check the signal of the selector lever position is indicated properly.

OR

1. Turn ignition switch to "ON" position. (Do not start engine.)
2. Check voltage between TCM terminals ㉖, ㉗, ㉞, ㉟, ㊱ and ground while moving selector lever through each position.

Voltage:

B: Battery voltage

0: 0V

Lever position	Terminal No.				
	㊱	㉟	㉞	㉗	㉖
P, N	**B**	0	0	0	0
R	0	**B**	0	0	0
D	0	0	**B**	0	0
2	0	0	0	**B**	0
1	0	0	0	0	**B**

NG → Check the following items:
- Park/neutral position switch
  Refer to "COMPONENT INSPECTION", AT-119.
- Harness for short or open between ignition switch and park/neutral position switch (Main harness)
- Harness for short or open between park/neutral position switch and TCM (Main harness)
- Diode

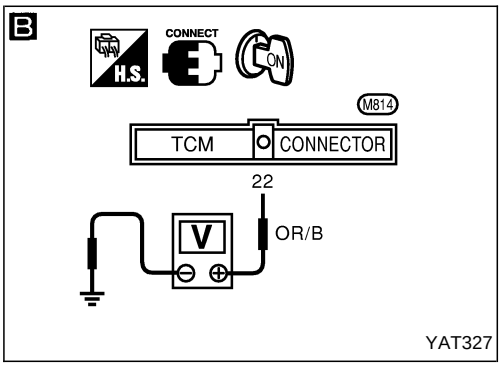
OK ↓

Ⓐ

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Park/neutral Position, Overdrive Control or Throttle (Accelerator) Position Switches (Cont'd)



Ⓐ

B

CHECK OVERDRIVE CONTROL SWITCH CIRCUIT.

With CONSULT-II

1. Turn ignition switch to "ON" position. (Do not start engine.)
2. Select "ECU INPUT SIGNALS" in Data Monitor.
3. Read out "OVERDRIVE SWITCH". Check the signal of the overdrive control switch is indicated properly. (Overdrive control switch "ON" displayed on CONSULT-II means overdrive "OFF".)

OR

Without CONSULT-II

1. Turn ignition switch to "ON" position. (Do not start engine.)
2. Check voltage between TCM terminal ㉒ and ground when overdrive control switch is "ON" and "OFF".

Switch position	Voltage
ON	Battery voltage
OFF	1V or less

NG → Check the following items.
- Overdrive control switch Refer to "COMPONENT INSPECTION", AT-119.
- Harness for short or open between TCM and overdrive control switch (Main harness)
- Harness for short or open of ground circuit for overdrive control switch (Main harness)

OK

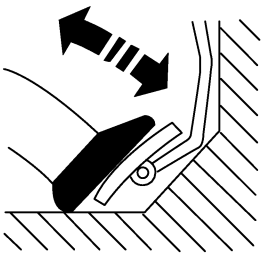
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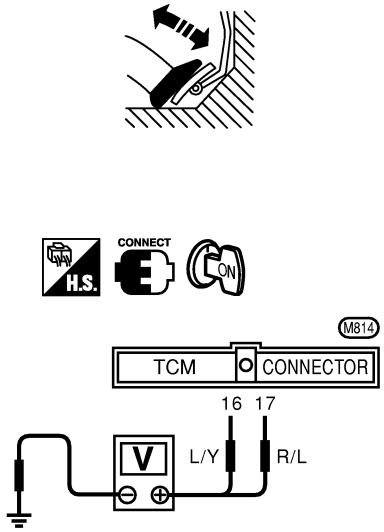
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Park/neutral Position, Overdrive Control or Throttle (Accelerator) Position Switches (Cont'd)

C



YAT328



YAT329

Ⓑ

C

CHECK THROTTLE (ACCELERATOR) POSITION SWITCH CIRCUIT.

1. Turn ignition switch to "ON" position. (Do not start engine.)
2. Select "ECU INPUT SIGNALS" in Data Monitor.
3. Read out "CLOSED THL/SW" and "W/O THRL/P-SW" depressing and releasing accelerator pedal. Check the signal of throttle (accelerator) position switch is indicated properly.

Accelerator pedal condition	Data monitor	
	CLOSED THL/SW	W/O THRL/P-SW
Released	ON	OFF
Fully depressed	OFF	ON

OR

1. Turn ignition switch to "ON" position. (Do not start engine.)
2. Check voltage between TCM terminals ⑯, ⑰ and ground while depressing, and releasing accelerator pedal slowly. (after warming up engine)

Accelerator pedal condition	Voltage	
	Terminal No. ⑯	Terminal No. ⑰
Released	Battery voltage	1V or less
Fully depressed	1V or less	Battery voltage

NG → Check the following items:
- Throttle (accelerator) position switch Refer to "COMPONENT INSPECTION", AT-119.
- Harness for short or open between ignition switch and throttle (accelerator) position switch (Main harness)
- Harness for short or open between throttle (accelerator) position switch and TCM (Main harness)

OK ↓

Perform "DIAGNOSTIC PROCEDURE", AT-94.

NG → 1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

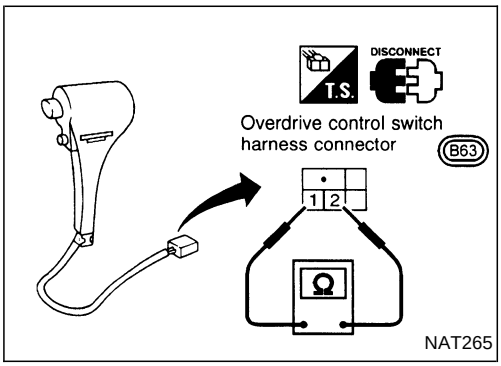
OK ↓

INSPECTION END

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Park/neutral Position, Overdrive Control or Throttle (Accelerator) Position Switches (Cont'd)

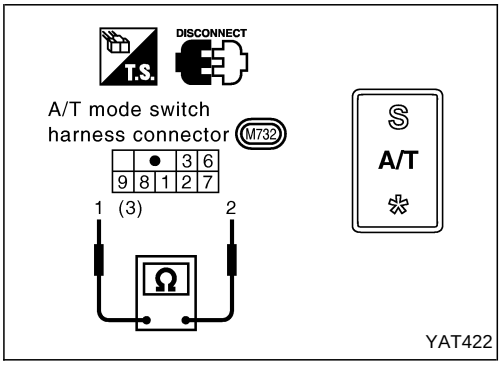
COMPONENT INSPECTION



Overdrive control switch

- Check continuity between terminals ① and ② .

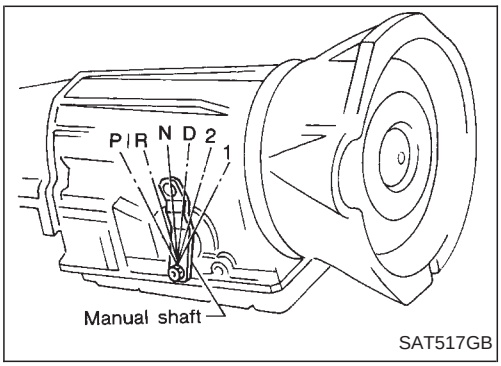
Switch position	Continuity
ON	No
OFF	Yes



A/T mode switch

- Check continuity between terminals ① , (③) and ② .

Switch position		Terminal No.	Continuity
S	ON	② — ③	Yes
	OFF		No
*	ON	① — ②	Yes
	OFF		No

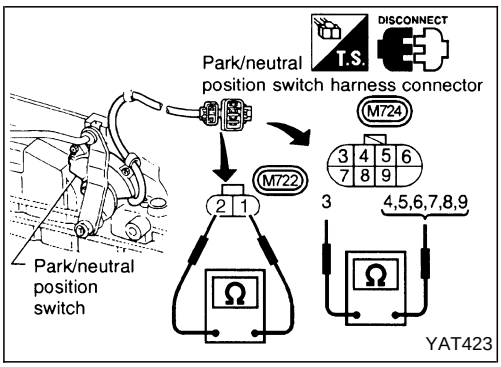


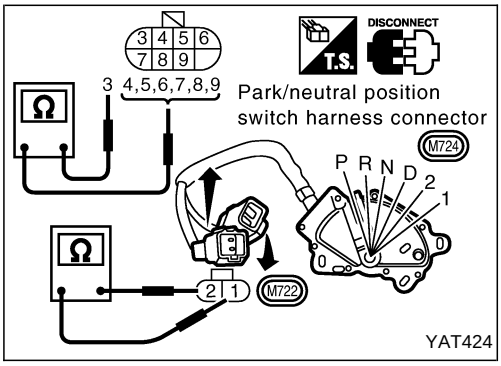
Park/neutral position switch

1. Check continuity between terminals ① and ② and between terminals ③ and ④ , ⑤ , ⑥ , ⑦ , ⑧ , ⑨ while moving manual shaft through each position.

Lever position	Terminal No.	
P	① — ②	③ — ⑦
R	③ — ⑧	
N	① — ②	③ — ⑨
D	③ — ⑥	
2	③ — ⑤	
1	③ — ④	

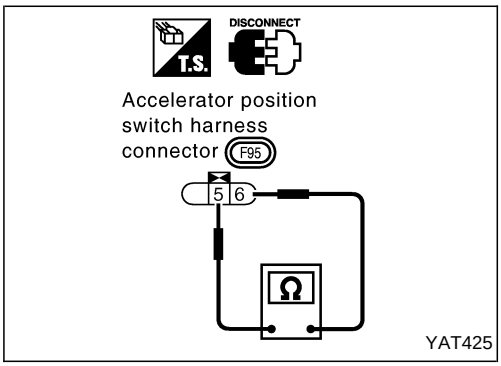
2. If NG, check again with manual control linkage disconnected from manual shaft of A/T assembly. Refer to step 1.
3. If OK on step 2, adjust manual control linkage. Refer to AT-117.





4. If NG on step 2, remove park/neutral position switch from A/T and check continuity of park/neutral position switch terminals. Refer to step 1.
5. If OK on step 4, adjust park/neutral position switch. Refer to AT-119.
6. If NG on step 4, replace park/neutral position switch.

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Park/neutral Position, Overdrive Control or Throttle (Accelerator) Position Switches (Cont'd)

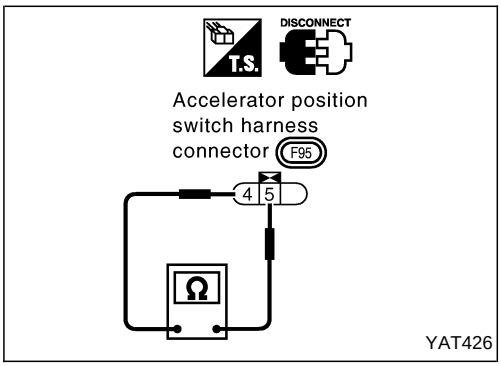
Throttle (accelerator) position switch

Closed throttle position switch (idle position)

- Check continuity between terminals ⑤ and ⑥.

Accelerator pedal condition	Continuity
Released	Yes
Depressed	No

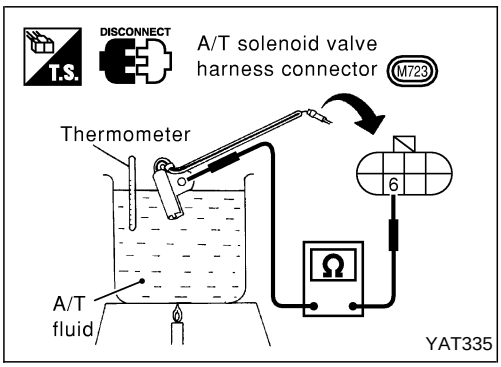
- To adjust closed throttle (accelerator) position switch, refer to EC section ("Basic Inspection", "TROUBLE DIAGNOSIS — Basic Inspection").



Wide open throttle position switch

- Check continuity between terminals ④ and ⑤.

Accelerator pedal condition	Continuity
Released	No
Depressed	Yes



A/T fluid temperature switch

1. Make sure the A/T fluid warning lamp lights when the key is inserted and turned to "ON".
2. Make sure the A/T fluid warning lamp goes off when turning the ignition switch to "ON".
3. For removal, refer to AT-118.
4. Check resistance between terminal ⑥ and ground while changing temperature as shown at left.

Temperature °C (°F)	Continuity
140 (284) or more	Yes
140 (284) or less	No

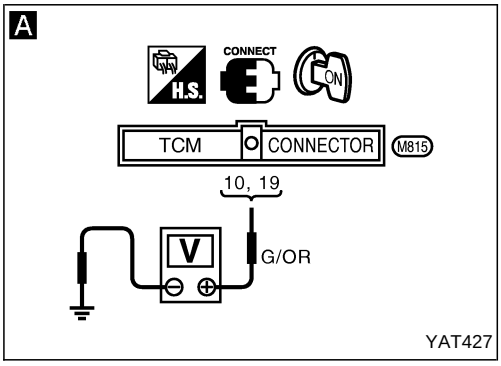
http://vnx.su/

1. SPORT Indicator Lamp Does Not Come On

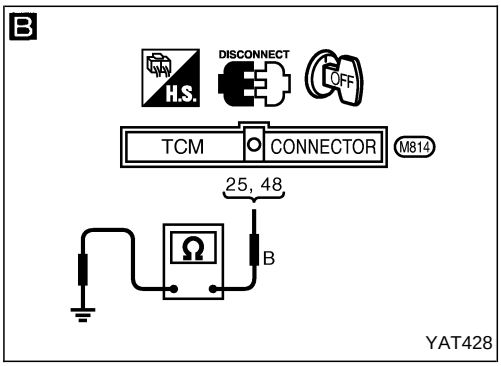
SYMPTOM:

POWER indicator lamp does not come on for about 2 seconds when turning ignition switch to “ON”.

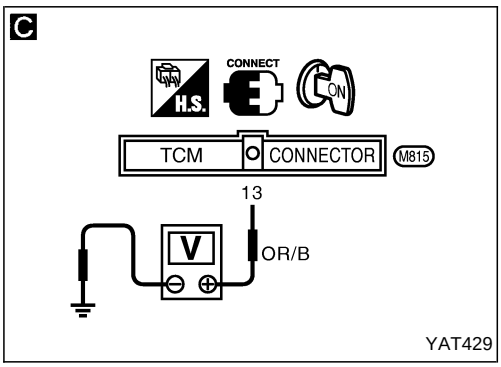
A



B



C



A

CHECK TCM POWER SOURCE.
1. Turn ignition switch to “ON” position. (Do not start engine.)
2. Check voltage between TCM terminals ⑩, ⑲ and ground.
   Battery voltage should exist.

NG → Check the following items:
- Harness for short or open between ignition switch and TCM (Main harness)
- Ignition switch and fuse Refer to EL section (“POWER SUPPLY ROUTING”).

OK ↓

B

CHECK TCM GROUND CIRCUIT.
1. Turn ignition switch to “OFF” position.
2. Disconnect TCM harness connector.
3. Check resistance between TCM terminals ㉕, ㊽ and ground.
   Resistance:
   Approximately 0Ω

   If OK, check harness for short to ground and short to power.

NG → Repair open circuit or short to ground or short to power in harness or connector.

OK ↓

C

CHECK LAMP CIRCUIT.
1. Turn ignition switch to “ON” position.
2. Set overdrive control, A/T check or power switch to “ON” position.
3. Check voltage between TCM terminal ⑬ and ground.
   Voltage: Battery voltage
4. Reinstall any part removed.

NG → Check the following items:
- Fuse (7.5A)
- SPORT indicator lamp Refer to EL section (“WARNING LAMPS”).
- Harness for short or open between ignition switch and SPORT indicator lamp (Main harness) Refer to EL section (“POWER SUPPLY ROUTING”).
- Harness for short or open between SPORT indicator lamp and TCM

OK ↓

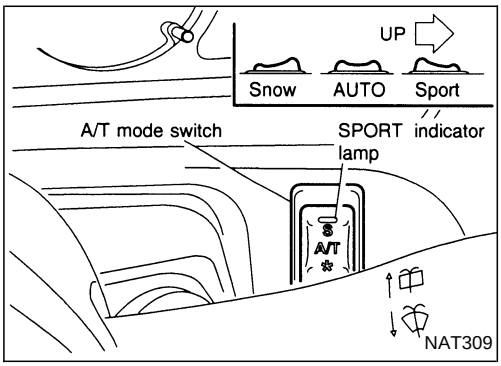
Check again.

NG → 1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK ↓

INSPECTION END

http://vnx.su/



2. SPORT or SNOW Indicator Lamp Does Not Come On

SYMPTOM:

SPORT or SNOW indicator lamp does not come on when turning A/T mode switch to the appropriate position.

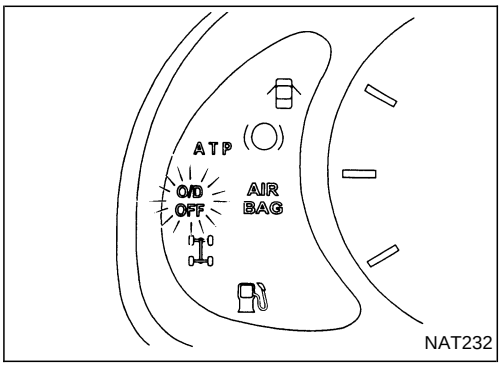
Is 1. O/D OFF, SPORT or A/T CHECK Indicator Lamp Does Not Come On OK?

No → Go to 1. SPORT Indicator Lamp Does Not Come On, AT-97.

Yes ↓

Check the following items:
- A/T mode switch
  Refer to AT-97.
- SNOW indicator lamp
- Harness continuity between ignition switch and A/T mode switch
- Harness continuity between A/T mode switch and TCM

NG → Repair or replace damaged parts.



3. O/D OFF Indicator Lamp Does Not Come On

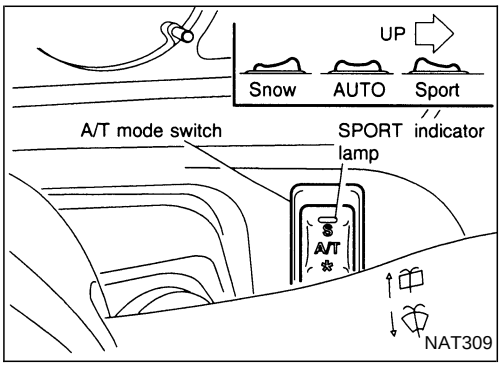
SYMPTOM:

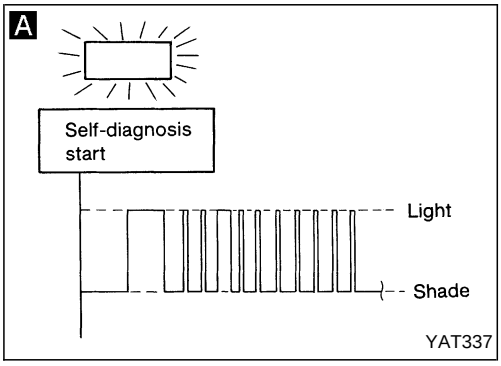
O/D OFF indicator lamp does not come on when setting overdrive control switch to “OFF” position.

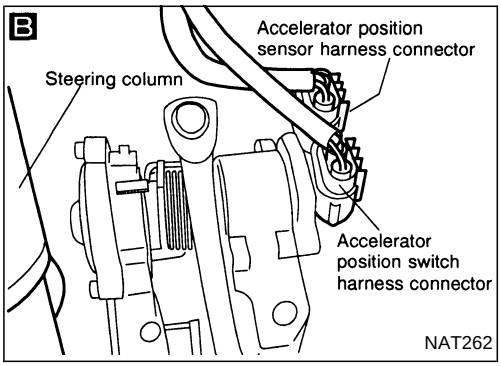
Check the following items:
- Overdrive control switch
- O/D OFF indicator lamp
- Harness continuity between ignition switch and O/D OFF indicator lamp

NG → Repair or replace damaged parts.

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4. SPORT Indicator Lamp Does Not Come On

SYMPTOM:

SPORT indicator lamp does not come on for about 3 seconds when depressing and releasing accelerator pedal fully.

A

Does self-diagnosis show damage to throttle (accelerator) position sensor circuit?

No → Check throttle (accelerator) position sensor. Refer to AT-62.

Yes ↓

B

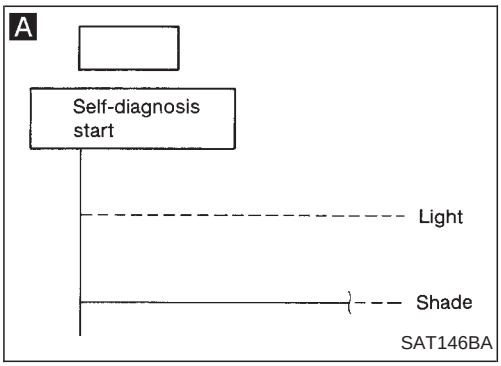
Check throttle (accelerator) position sensor. — Refer to EC section [TROUBLE DIAGNOSIS FOR “THROTTLE (ACCEL) POSI SEN” (DTC 43)].

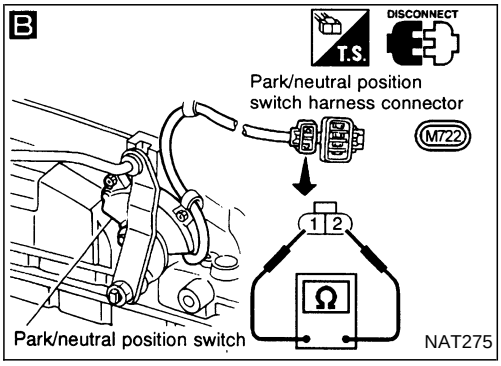
NG → Repair or replace throttle (accelerator) position sensor.

OK ↓

1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

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5. Engine Cannot Be Started In “P” and “N” Position

SYMPTOM:

- **Engine cannot be started with selector lever in “P” or “N” position.**
- **Engine can be started with selector lever in “D”, “2”, “1” or “R” position.**

Does “ECU INPUT SIGNALS” in Data Monitor show damage to park/neutral position switch circuit? → Yes → Check park/neutral position switch. Refer to AT-93.

OR

A

Does self-diagnosis show damage to park/neutral position switch circuit?

No

B

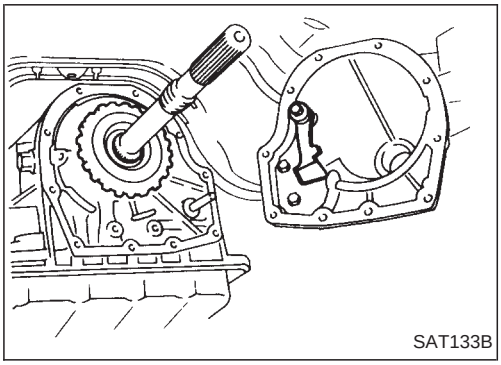
Check for short or open of park/neutral position switch 2-pin connector. Refer to AT-93. → NG → Repair or replace park/neutral position switch.

OK

Check starting system. Refer to EL section (“System Description”, “STARTING SYSTEM”). → NG → Repair or replace damaged parts.

OK

INSPECTION END



6. In “P” Position, Vehicle Moves Forward Or Backward When Pushed

SYMPTOM:

Vehicle moves when it is pushed forward or backward with selector lever in “P” position.

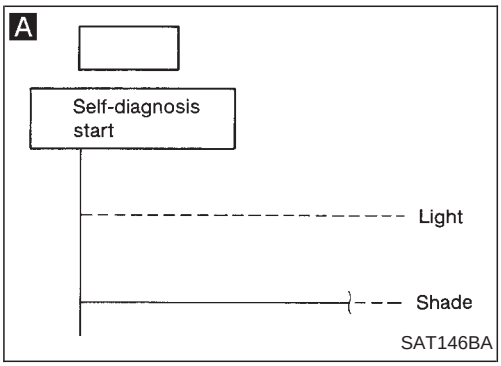
Check parking pawl components. Refer to AT-180. → NG → Repair or replace damaged parts.

OK

INSPECTION END

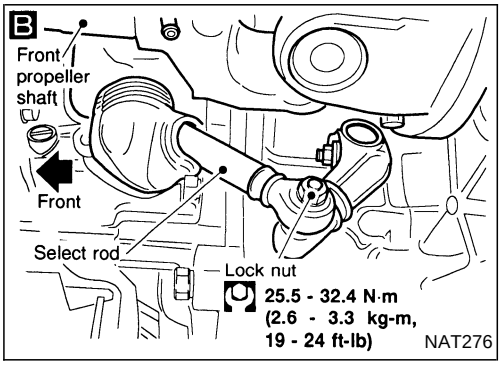
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A



SAT146BA

B



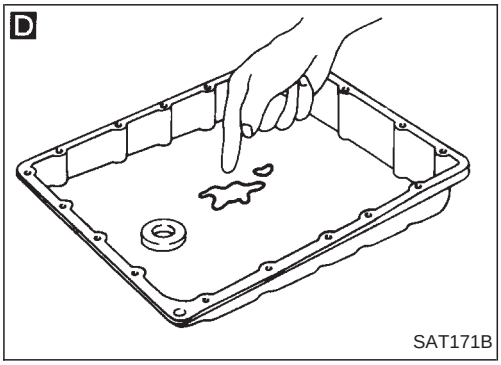
NAT276

C



SAT638A

D



SAT171B

7. In “N” Position, Vehicle Moves

SYMPTOM:

Vehicle moves forward or backward when selecting “N” position.

Does “ECU INPUT SIGNALS” in Data Monitor show damage to park/neutral position switch circuit?

Yes → Check park/neutral position switch. Refer to AT-97.

OR

A

Does self-diagnosis show damage to park/neutral position switch circuit?

No ↓

Check control linkage. Refer to AT-120.

NG → B Adjust control linkage. Refer to AT-120.

OK ↓

C

Check A/T fluid level again.

NG → Refill ATF.

OK ↓

D

1. Remove oil pan.
2. Check A/T fluid condition.

NG →
1. Disassemble A/T.
2. Check the following items:
   - Forward clutch assembly
   - Overrun clutch assembly
   - Reverse clutch assembly

OK ↓

Check again.

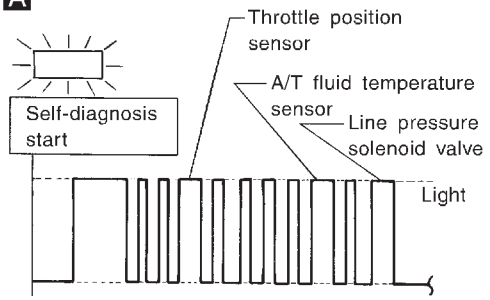
NG →
1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK ↓

INSPECTION END

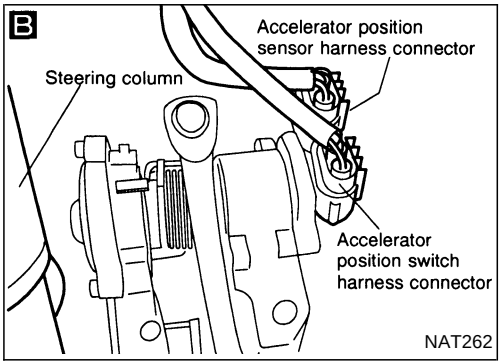
http://vnx.su/

A



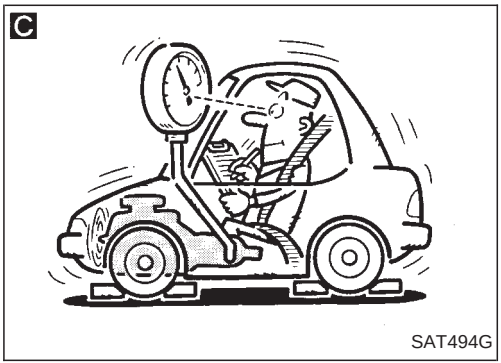
SAT831HA

B



NAT262

C



SAT494G

8. Large Shock. “N” → “R” Position

SYMPTOM:

There is large shock when changing from “N” to “R” position.

A

Does self-diagnosis show damage to line pressure solenoid valve or throttle (accelerator) position sensor, A/T fluid temperature sensor circuit?

Yes → Check damaged circuit. Refer to AT-62, AT-78 or AT-86.

No

B

Check throttle (accelerator) position sensor. Refer to EC section [TROUBLE DIAGNOSIS FOR “THROTTLE (ACCEL) POSI SEN” (DTC 43)].

NG → Repair or replace throttle (accelerator) position sensor.

OK

C

Check line pressure at idle with selector lever in “D” position. Refer to “Line Pressure Test”, AT-30.

NG →
1. Remove control valve assembly. Refer to AT-118.
2. Check the following items:
- Valves to control line pressure (Pressure regulator valve, pressure modifier valve, pilot valve and pilot filter)
- Line pressure solenoid valve

OK

Check again.

NG →
1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK

INSPECTION END

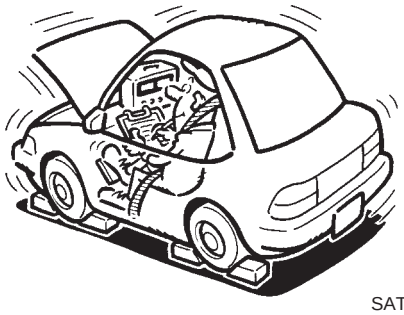
http://vnx.su/

A



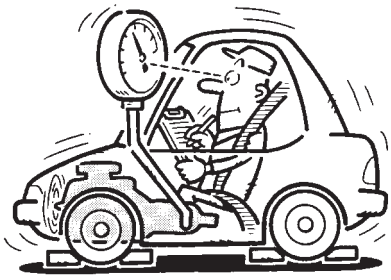
SAT638A

B



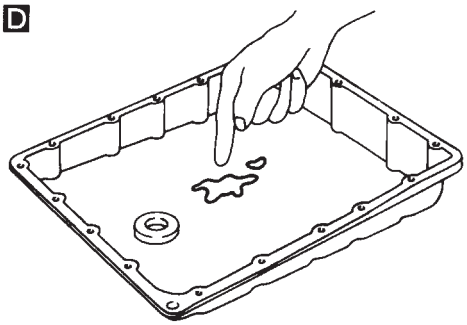
SAT493G

C



SAT494G

D



SAT171B

9. Vehicle Does Not Creep Backward In “R” Position

SYMPTOM:

Vehicle does not creep backward when selecting “R” position.

A

Check A/T fluid level again.

NG → Refill ATF.

OK ↓

B

Check stall revolution with selector lever in “1” and “R” positions.

NG in both “1” and “R” positions → Ⓐ

1. Remove control valve assembly. Refer to AT-118.
2. Check the following items:
- Valves to control line pressure (Pressure regulator valve, pressure modifier valve, pilot valve and pilot filter)
- Line pressure solenoid valve
3. Disassemble A/T.
4. Check the following items:
- Oil pump assembly
- Torque converter
- Reverse clutch assembly
- High clutch assembly
- Low & reverse brake assembly
- Low one-way clutch

OK ↓

OK in “1” position
NG in “R” position →

1. Remove control valve assembly. Refer to AT-118.
2. Check the following items:
- Valves to control line pressure (Pressure regulator valve, pressure modifier valve, pilot valve and pilot filter)
- Line pressure solenoid valve
3. Disassemble A/T.
4. Check the following items:
- Oil pump assembly
- Torque converter
- Reverse clutch assembly
- High clutch assembly

C

Check line pressure at idle with selector lever in “R” position. Refer to “Line Pressure Test”, AT-30.

NG →

1. Remove control valve assembly. Refer to AT-118.
2. Check the following items:
- Valves to control line pressure (Pressure regulator valve, pressure modifier valve, pilot valve and pilot filter)
- Line pressure solenoid valve
3. Disassemble A/T.
4. Check the following item:
- Oil pump assembly

OK ↓

D

1. Remove oil pan.
2. Check A/T fluid condition.

NG → Ⓐ

OK ↓

Check again.

NG →

1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK ↓

INSPECTION END

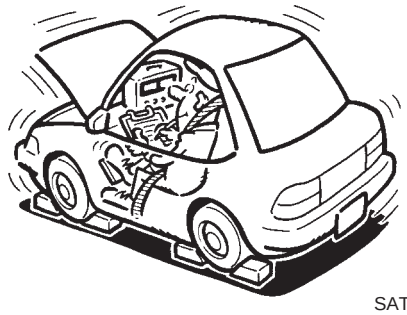
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A



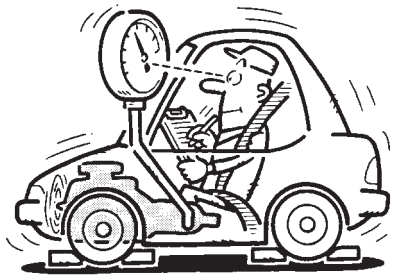
SAT638A

B



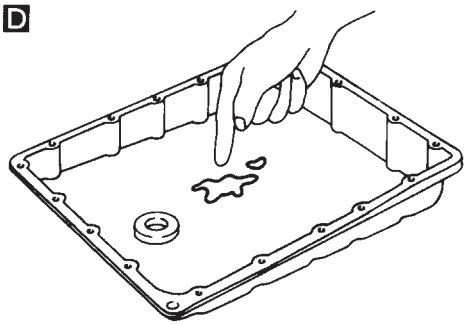
SAT493G

C



SAT494G

D



SAT171B

10. Vehicle Does Not Creep Forward In “D”, “2” Or “1” Position

SYMPTOM:

Vehicle does not creep forward when selecting “D”, “2” or “1” position.

A

Check A/T fluid level again.

NG → Refill ATF.

OK ↓

B

Check stall revolution with selector lever in “D” position. Refer to “STALL TEST”, AT-27.

NG → 1. Remove control valve assembly. Refer to AT-118.
2. Check the following items:
- Valves to control line pressure (Pressure regulator valve, pressure modifier valve, pilot valve and pilot filter)
- Line pressure solenoid valve

3. Disassemble A/T.
4. Check the following items:
- Oil pump assembly
- Forward clutch assembly
- Forward one-way clutch
- Low one-way clutch
- Low & reverse brake assembly
- Torque converter

OK ↓

C

Check line pressure at idle with selector lever in “D” position. Refer to “Line Pressure Test”, AT-30.

OK ↓

NG → 1. Remove control valve assembly. Refer to AT-118.
2. Check the following items:
- Valves to control line pressure (Pressure regulator valve, pressure modifier valve, pilot valve and pilot filter)
- Line pressure solenoid valve

3. Disassemble A/T.
4. Check the following item:
- Oil pump assembly

D

1. Remove oil pan.
2. Check A/T fluid condition.

NG → Ⓐ

OK ↓

Check again.

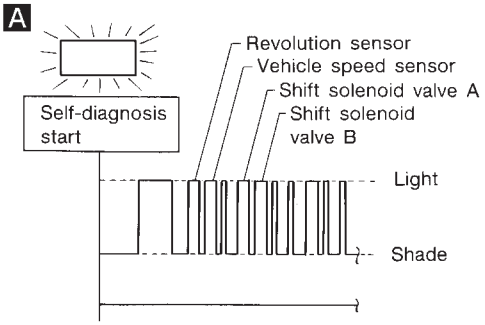
NG → 1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK ↓

INSPECTION END

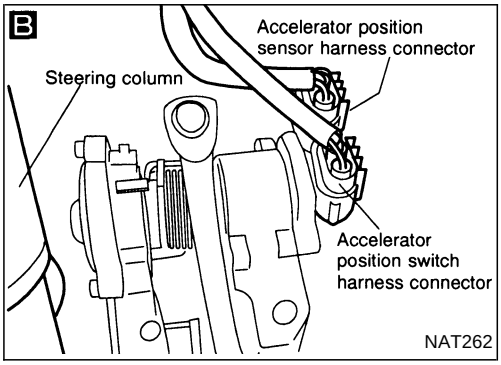
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A



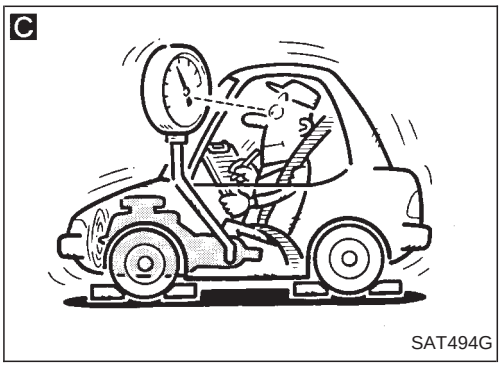
SAT832H

B



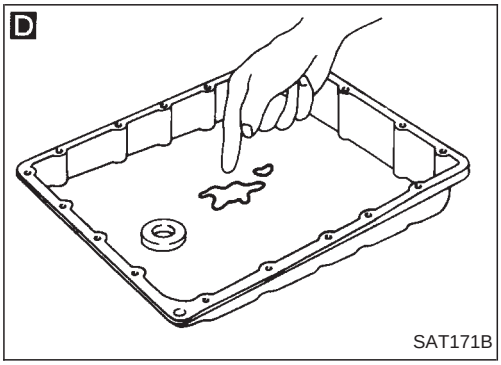
NAT262

C



SAT494G

D



SAT171B

11. Vehicle Cannot Be Started From D_1

SYMPTOM:

Vehicle cannot be started from D_1 on Cruise test — Part 1.

Is 9. Vehicle Does Not Creep Backward In "R" Position OK?

No → Go to 9. Vehicle Does Not Creep Backward In "R" Position, AT-105.

Yes ↓

A

Does self-diagnosis show damage to vehicle speed sensor·A/T (revolution sensor), shift solenoid valve A, B or vehicle speed sensor·MTR after cruise test?

Yes → Check damaged circuit. Refer to AT-52, AT-56, AT-65 or AT-68.

No ↓

B

Check throttle (accelerator) position sensor. Refer to EC section [TROUBLE DIAGNOSIS FOR "THROTTLE (ACCEL) POSI SEN"].

NG → Repair or replace throttle (accelerator) position sensor.

OK ↓

C

Check line pressure at stall point with selector lever in "D" position. Refer to "Line Pressure Test", AT-30.

NG →
1. Remove control valve assembly. Refer to AT-118.
2. Check the following items:
- Shift valve A
- Shift valve B
- Shift solenoid valve A
- Shift solenoid valve B
- Pilot valve
- Pilot filter
3. Disassemble A/T.
4. Check the following items:
- Forward clutch assembly
- Forward one-way clutch
- Low one-way clutch
- High clutch assembly
- Torque converter
- Oil pump assembly

OK ↓

D

1. Remove oil pan.
2. Check A/T fluid condition.

NG → (same items as above)

OK ↓

1. Remove control valve assembly. Refer to AT-118.
2. Check the following items:
- Shift valve A
- Shift valve B
- Shift solenoid valve A
- Shift solenoid valve B
- Pilot valve
- Pilot filter

OK ↓

OK → (same items as above)

Check again.

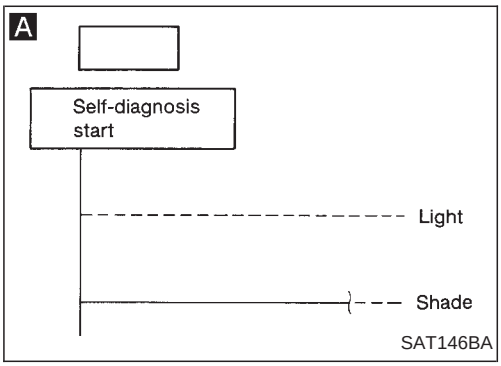
NG →
1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK ↓

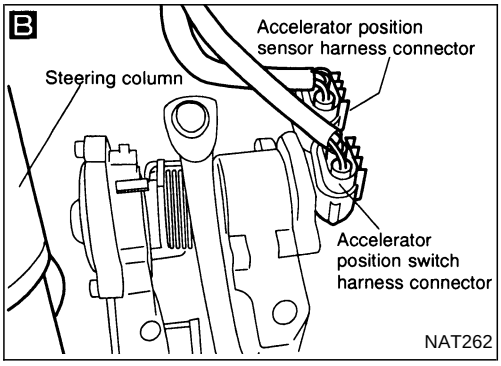
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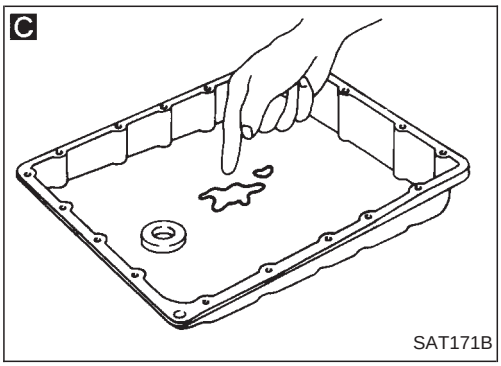
A



B



C



12. A/T Does Not Shift: $D_1 \rightarrow D_2$ Or Does Not Kickdown: $D_4 \rightarrow D_2$

SYMPTOM:

A/T does not shift from D_1 to D_2 at the specified speed.
A/T does not shift from D_4 to D_2 when depressing accelerator pedal fully at the specified speed.

Are 10. Vehicle Does Not Creep Forward In “D”, “2” Or “1” Position and 11. Vehicle Cannot Be Started From D_1 OK?

No → Go to 10. Vehicle Does Not Creep Forward In “D”, “2” Or “1” Position and 11. Vehicle Cannot Be Started From D_1, AT-106, AT-107.

Yes ↓

Does “ECU INPUT SIGNALS” in Data Monitor show damage to park/neutral position switch circuit?

Yes → Check park/neutral position switch. Refer to AT-97.

OR

A

Does self-diagnosis show damage to park/neutral position switch circuit?

No ↓

Check vehicle speed sensor·A/T (revolution sensor) and vehicle speed sensor·MTR. Refer to AT-52, AT-56.

NG → Repair or replace vehicle speed sensor·A/T (revolution sensor) and vehicle speed sensor·MTR. Refer to AT-52, AT-56.

OK ↓

B

Check throttle (accelerator) position sensor. Refer to EC section [TROUBLE DIAGNOSIS FOR “THROTTLE (ACCEL) POSI SEN” (DTC 43)].

NG → Repair or replace throttle (accelerator) position sensor.

OK ↓

C

1. Remove oil pan.
2. Check A/T fluid condition.

NG → 1. Remove control valve. Refer to AT-118.
2. Check the following items:
- Shift valve A
- Shift solenoid valve A
- Pilot valve
- Pilot filter
3. Disassemble A/T.
4. Check the following items:
- Servo piston assembly
- Brake band
- Oil pump assembly

OK ↓

1. Remove control valve. Refer to AT-118.
2. Check the following items:
- Shift valve A
- Shift solenoid valve A
- Pilot valve
- Pilot filter

OK ↓

OK ←

Check again.

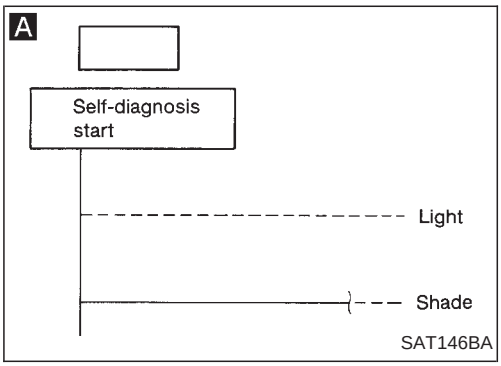
NG → 1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK ↓

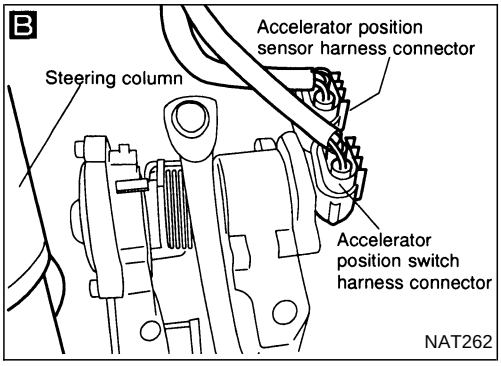
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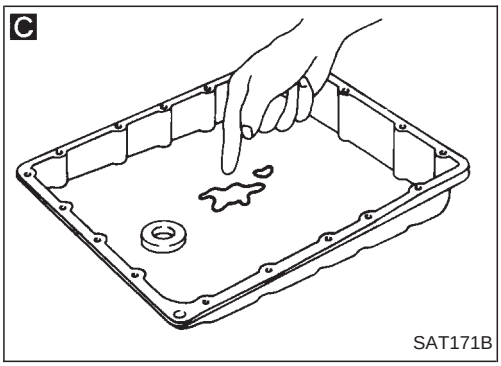
A



B



C



13. A/T Does Not Shift: $D_2 \rightarrow D_3$

SYMPTOM:

A/T does not shift from D_2 to D_3 at the specified speed.

Are 10. Vehicle Does Not Creep Forward In “D”, “2” Or “1” Position and 11. Vehicle Cannot Be Started From D_1 OK?

No → Go to 10. Vehicle Does Not Creep Forward In “D”, “2” Or “1” Position and 11. Vehicle Cannot Be Started From D_1, AT-106, AT-107.

Yes ↓

Does “ECU INPUT SIGNALS” in Data Monitor show damage to park/neutral position switch circuit?

Yes → Check park/neutral position switch. Refer to AT-97.

OR

A

Does self-diagnosis show damage to park/neutral position switch circuit?

No ↓

B

Check throttle (accelerator) position sensor. Refer to EC section [TROUBLE DIAGNOSIS FOR “THROTTLE (ACCEL) POSI SEN”].

NG → Repair or replace throttle (accelerator) position sensor.

OK ↓

C

1. Remove oil pan.
2. Check A/T fluid condition.

NG → 1. Remove control valve assembly. Refer to AT-118.
2. Check the following items:
- Shift valve B
- Shift solenoid valve B
- Pilot valve
- Pilot filter
3. Disassemble A/T.
4. Check the following items:
- Servo piston assembly
- High clutch assembly
- Oil pump assembly

OK ↓

1. Remove control valve assembly. Refer to AT-118.
2. Check the following items:
- Shift valve B
- Shift solenoid valve B
- Pilot valve
- Pilot filter

OK ↓

OK ←

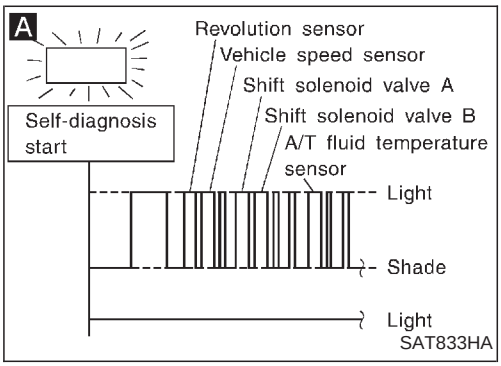
Check again.

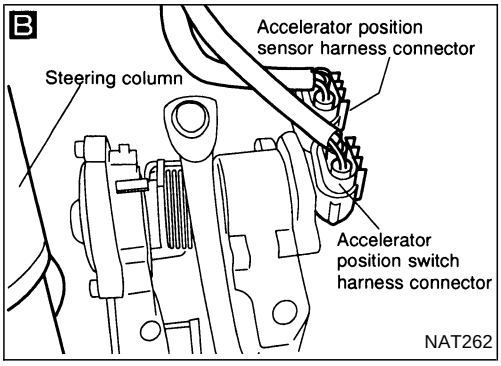
NG → 1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

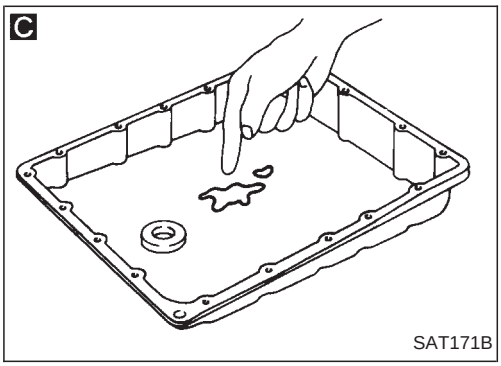
OK ↓

INSPECTION END

http://vnx.su/







14. A/T Does Not Shift: $D_3 \rightarrow D_4$

SYMPTOM:

- **A/T does not shift from D_3 to D_4 at the specified speed.**
- **A/T must be warm before D_3 to D_4 shift will occur.**

Are 10. Vehicle Does Not Creep Forward In “D”, “2” Or “1” Position and 11. Vehicle Cannot Be Started From D_1 OK?

No → Go to 10. Vehicle Does Not Creep Forward In “D”, “2” Or “1” Position and 11. Vehicle Cannot Be Started From D_1, AT-106, AT-107.

Yes ↓

A

Does self-diagnosis, after cruise test, show damage to any of the following circuits?
- Park/neutral position switch
- Overdrive control switch
- A/T fluid temperature sensor
- Vehicle speed sensor·A/T (Revolution sensor)
- Shift solenoid valve A or B
- Vehicle speed sensor·MTR

Yes → Check damaged circuit. Refer to AT-52, AT-56, AT-65, AT-68 or AT-93.

No ↓

B

Check throttle (accelerator) position sensor. Refer to EC section [TROUBLE DIAGNOSIS FOR “THROTTLE (ACCEL) POSI SEN”].

NG → Repair or replace throttle (accelerator) position sensor.

OK ↓

C

1. Remove oil pan.
2. Check A/T fluid condition.

NG → 1. Remove control valve assembly. Refer to AT-118.
2. Check the following items:
- Shift valve B
- Overrun clutch control valve
- Shift solenoid valve B
- Pilot valve
- Pilot filter
3. Disassemble A/T.
4. Check the following items:
- Servo piston assembly
- Brake band
- Torque converter
- Oil pump assembly

OK ↓

1. Remove control valve assembly. Refer to AT-118.
2. Check the following items:
- Shift valve B
- Overrun clutch control valve
- Shift solenoid valve B
- Pilot valve
- Pilot filter

OK ↓

OK ← (from 1. Remove control valve assembly. Refer to AT-118.)

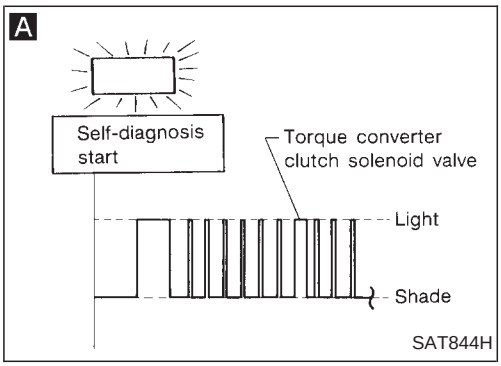
Check again.

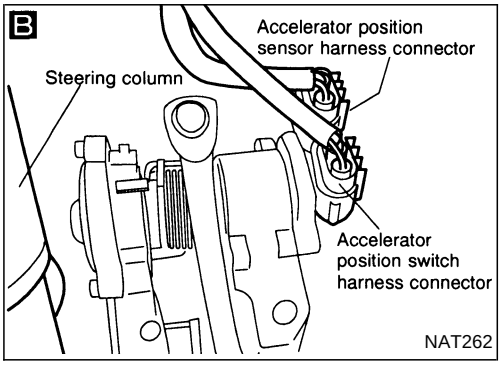
NG → 1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK ↓

INSPECTION END

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15. A/T Does Not Perform Lock-up

SYMPTOM:

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

A

Does self-diagnosis show damage to torque converter clutch solenoid valve after cruise test?

Yes → Check torque converter clutch solenoid valve. Refer to AT-74.

No

B

Check throttle (accelerator) position sensor. Refer to EC section [TROUBLE DIAGNOSIS FOR “THROTTLE (ACCEL) POSI SEN”].

NG → Repair or replace throttle (accelerator) position sensor.

OK

1. Remove control valve. Refer to AT-118.
2. Check following items:
   - Torque converter clutch control valve
   - Torque converter relief valve
   - Torque converter clutch solenoid valve
   - Pilot valve
   - Pilot filter

NG → Repair or replace damaged parts.

OK

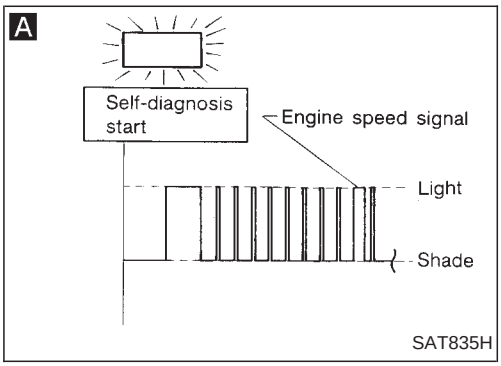
Check again.

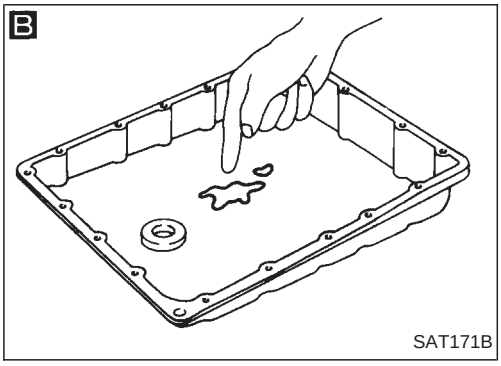
NG → 1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK

INSPECTION END

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16. A/T Does Not Hold Lock-up Condition

SYMPTOM:

A/T does not hold lock-up condition for more than 36 seconds.

A

Does self-diagnosis show damage to engine speed signal circuit after cruise test? — Yes → Check engine speed signal. Refer to AT-82.

No ↓

B

1. Remove oil pan.
2. Check A/T fluid condition.

NG → 1. Remove control valve assembly. Refer to AT-118. 2. Check the following items: ● Torque converter clutch control valve ● Pilot valve ● Pilot filter 3. Disassemble A/T. 4. Check torque converter and oil pump assembly.

OK ↓

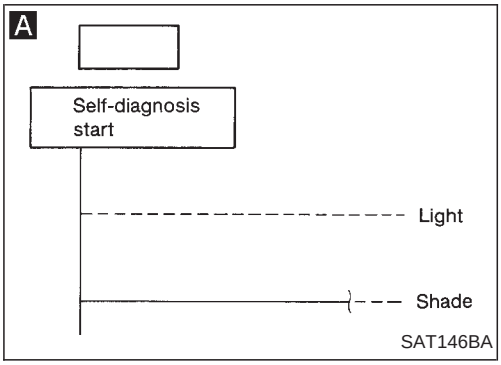
1. Remove control valve assembly. Refer to AT-118.
2. Check the following items:
- Torque converter clutch control valve
- Pilot valve
- Pilot filter

OK → (OK)

Check again. — NG → 1. Perform TCM input/output signal inspection. 2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK ↓

INSPECTION END



17. Lock-up Is Not Released

SYMPTOM:

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

Does “ECU INPUT SIGNALS” in Data Monitor show damage to closed throttle position switch circuit? — Yes → Check closed throttle position switch. Refer to AT-93.

OR

A

Does self-diagnosis show damage to closed throttle position switch circuit?

No ↓

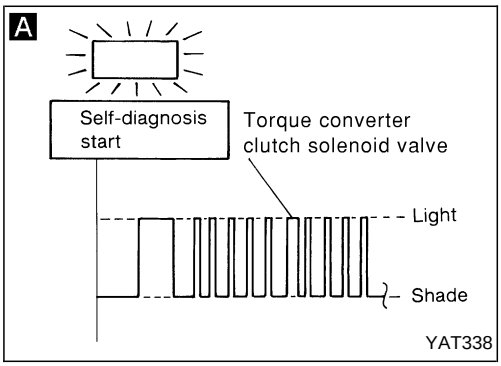
Check again. — NG → 1. Perform TCM input/output signal inspection. 2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK ↓

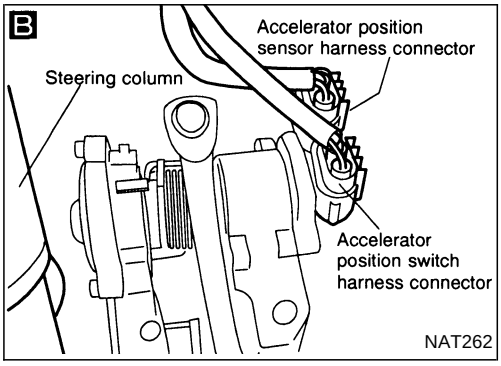
INSPECTION END

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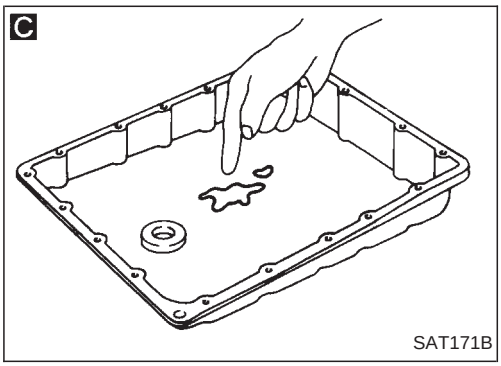
A



B



C



18. Engine Speed Does Not Return To Idle (Light Braking $D_4 \rightarrow D_3$)

SYMPTOM:

- **Engine speed does not smoothly return to idle when A/T shifts from D_4 to D_3.**
- **Vehicle does not decelerate by engine brake when turning overdrive control switch OFF.**
- **Vehicle does not decelerate by engine brake when shifting A/T from “D” to “2” position.**

A

Does self-diagnosis show damage to overrun clutch solenoid valve circuit after cruise test?

Yes → Check overrun clutch solenoid valve. Refer to AT-71.

No

B

Check throttle (accelerator) position sensor. Refer to EC section [TROUBLE DIAGNOSIS FOR “THROTTLE (ACCEL) POSI SEN”].

NG → Repair or replace throttle (accelerator) position sensor.

OK

C

1. Remove oil pan.
2. Check A/T fluid condition.

NG → 1. Remove control valve assembly. Refer to AT-118.
2. Check the following items:
- Overrun clutch control valve
- Overrun clutch reducing valve
- Overrun clutch solenoid valve
3. Disassemble A/T.
4. Check the following items:
- Overrun clutch assembly
- Oil pump assembly

OK

1. Remove control valve assembly. Refer to AT-118.
2. Check the following items:
- Overrun clutch control valve
- Overrun clutch reducing valve
- Overrun clutch solenoid valve

OK

OK

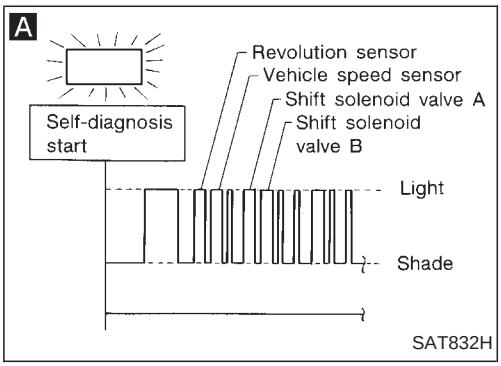
Check again.

NG → 1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK

INSPECTION END

http://vnx.su/



19. Vehicle Does Not Start From D_1

SYMPTOM:

Vehicle does not start from D_1 on Cruise test — Part 2.

A

Does self-diagnosis show damage to vehicle speed sensor·A/T (revolution sensor), shift solenoid valve A, B or vehicle speed sensor·MTR after cruise test?

Yes → Check damaged circuit. Refer to AT-52, AT-56, AT-65 or AT-68.

No ↓

Check again.

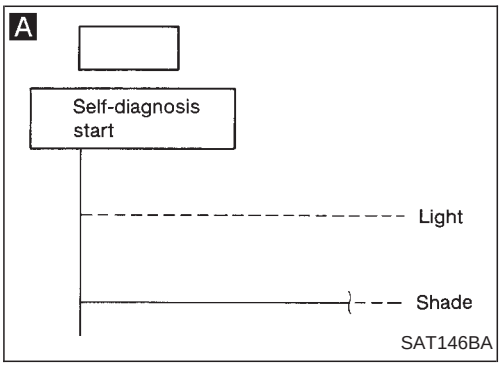
NG → 1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK ↓

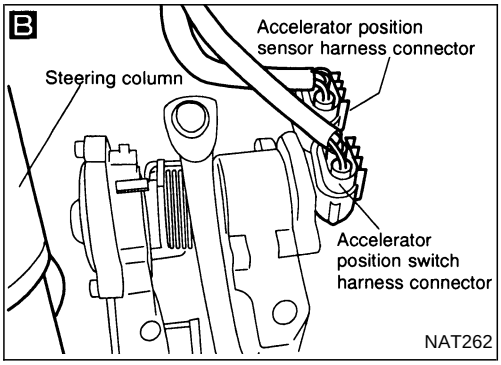
Go to 11. Vehicle Cannot Be Started From D_1, AT-107.

http://vnx.su/

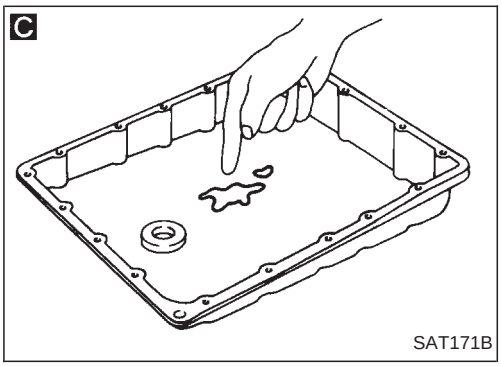
A



B



C



20. A/T Does Not Shift: $D_2 \rightarrow D_1$ When Depressing Accelerator Pedal

SYMPTOM:

A/T does not shift from D_2 to D_1 when depressing accelerator pedal fully at the specified speed.

Are 9. Vehicle Does Not Creep Backward In “R” Position and 10. Vehicle Does Not Creep Forward In “D”, “2” Or “1” Position OK?

No → Go to 9. Vehicle Does Not Creep Backward In “R” Position and 10. Vehicle Does Not Creep Forward In “D”, “2” Or “1” Position, AT-105, AT-106.

Yes ↓

Does “ECU INPUT SIGNAL” show damage to park/neutral position switch circuit?

OR

A

Does self-diagnosis show damage to park/neutral position switch circuit?

Yes → Check park/neutral position switch. Refer to AT-93.

No ↓

Check vehicle speed sensor·A/T (revolution sensor) and vehicle speed sensor·MTR. Refer to AT-52, AT-56.

NG → Repair or replace vehicle speed sensor·A/T (revolution sensor) and vehicle speed sensor·MTR.

OK ↓

B

Check throttle (accelerator) position sensor. Refer to EC section [TROUBLE DIAGNOSIS FOR “THROTTLE (ACCEL) POSI SEN” (DTC 43)].

NG → Repair or replace throttle (accelerator) position sensor.

OK ↓

C

1. Remove oil pan.
2. Check A/T fluid condition.

NG → 1. Remove control valve. Refer to AT-118.
2. Check the following items:
- Shift valve A
- Shift solenoid valve A
- Pilot valve
- Pilot filter
3. Disassemble A/T.
4. Check the following items:
- Servo piston assembly
- Brake band
- Oil pump assembly

OK ↓

1. Remove control valve. Refer to AT-118.
2. Check the following items:
- Shift valve A
- Shift solenoid valve A
- Pilot valve
- Pilot filter

OK ↓

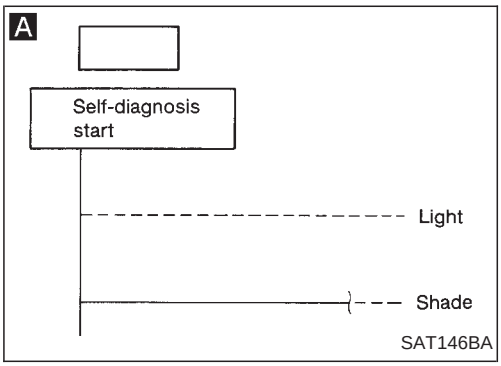
Check again.

NG → 1. Perform TCM input/output signal inspection.
2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK ↓

INSPECTION END

http://vnx.su/



21. A/T Does Not Shift: $D_4 \rightarrow D_3$, When Overdrive Control Switch "ON" $\rightarrow$ "OFF"

SYMPTOM:

A/T does not shift from D_4 to D_3 when changing overdrive control switch to "OFF" position.

Does "ECU INPUT SIGNALS" in Data Monitor show damage to overdrive control switch circuit?

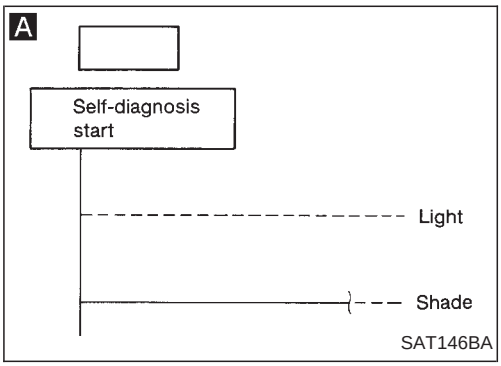
OR

A

Does self-diagnosis show damage to overdrive control switch circuit?

Yes → Check overdrive control switch circuit. Refer to AT-97.

No → Go to 13. A/T Does Not Shift: $D_2 \rightarrow D_3$, AT-109.



22. A/T Does Not Shift: $D_3 \rightarrow 2_2$, When Selector Lever "D" $\rightarrow$ "2" Position

SYMPTOM:

A/T does not shift from D_3 to 2_2 when changing selector lever from "D" to "2" position.

Does "ECU INPUT SIGNALS" in Data Monitor show damage to park/neutral position switch circuit?

OR

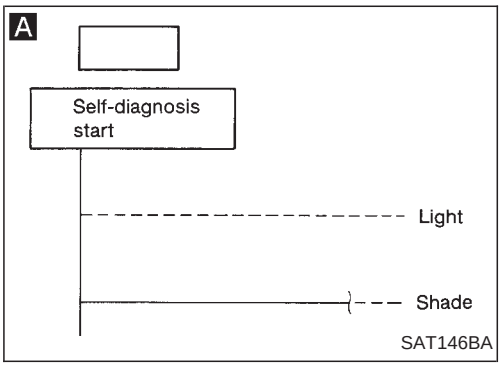
A

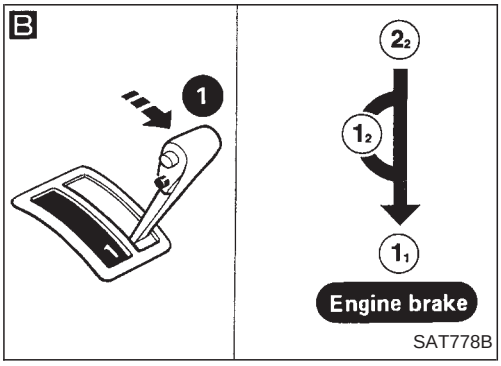
Does self-diagnosis show damage to park/neutral position switch circuit?

Yes → Check park/neutral position switch circuit. Refer to AT-97.

No → Go to 12. A/T Does Not Shift: $D_1 \rightarrow D_2$ Or Does Not Kickdown: $D_4 \rightarrow D_2$, AT-108.

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23. A/T Does Not Shift: $2_2 \rightarrow 1_1$, When Selector Lever "2" $\rightarrow$ "1" Position

SYMPTOM:

A/T does not shift from 2_2 to 1_1 when changing selector lever from "2" to "1" position.

Does "ECU INPUT SIGNALS" in Data Monitor show damage to park/neutral position switch circuit? — Yes → Check park/neutral position switch circuit. Refer to AT-97.

OR

A

Does self-diagnosis show damage to park/neutral position switch circuit? — Yes → Check park/neutral position switch circuit. Refer to AT-97.

No

B

Check again. — NG → 1. Perform TCM input/output signal inspection. 2. If NG, recheck TCM pin terminals for damage or loose connection with harness connector.

OK

INSPECTION END

24. Vehicle Does Not Decelerate By Engine Brake

SYMPTOM:

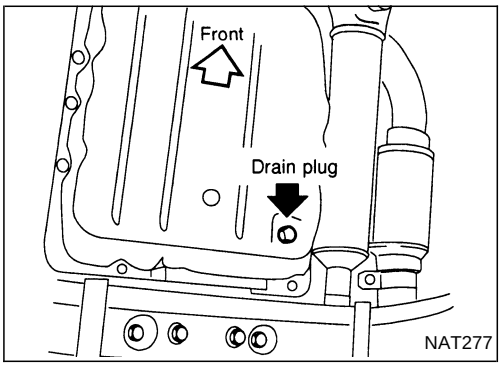
Vehicle does not decelerate by engine brake when shifting from 2_2 (1_2) to 1_1.

Is 9. Vehicle Does Not Creep Backward In "R" Position OK? — No → Go to 9. Vehicle Does Not Creep Backward In "R" Position, AT-105.

Yes

Go to 18. Engine Speed Does Not Return To Idle (Light Braking $D_4 \rightarrow D_3$), AT-113.

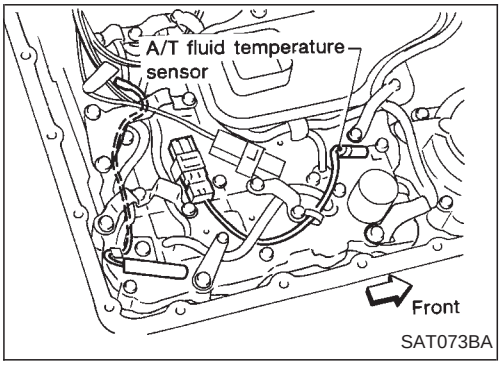
http://vnx.su/



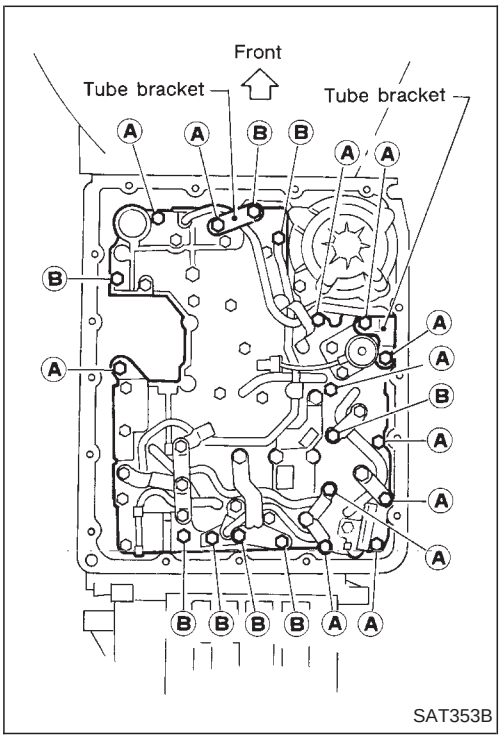
Control Valve Assembly and Accumulators

REMOVAL

1. Remove exhaust front tube.
2. Remove oil pan and gasket and drain ATF.



3. Remove A/T fluid temperature sensor if necessary.
4. Remove oil strainer.

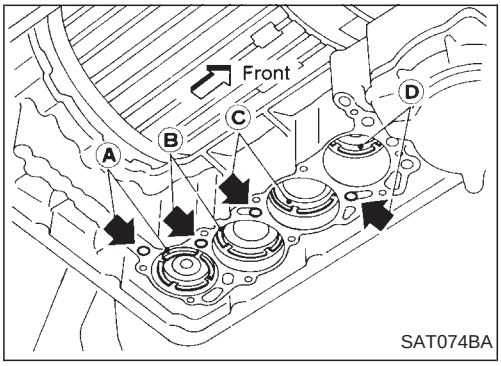


5. Remove control valve assembly by removing fixing bolts and disconnecting harness connector.

Bolt length and location

Bolt symbol	ℓ mm (in)
Ⓐ	33 (1.30)
Ⓑ	45 (1.77)

6. Remove solenoids and valves from valve body if necessary.
7. Remove terminal cord assembly if necessary.



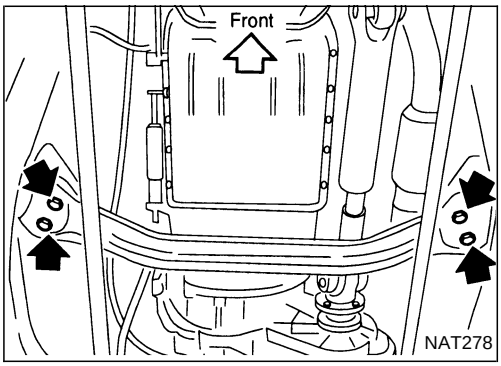
8. Remove accumulator Ⓐ, Ⓑ, Ⓒ and Ⓓ by applying compressed air if necessary.

- **Hold each piston with rag.**

9. Reinstall any part removed.

- **Always use new sealing parts.**

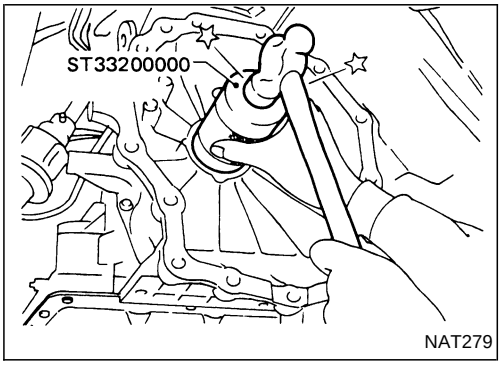
http://vnx.su/



Revolution Sensor Replacement

1. Remove rear engine mounting member from side member while supporting A/T with transfer case with jack. Tighten rear engine mounting member to the specified torque. Refer to EM section (“ENGINE REMOVAL”).
2. Lower A/T with transfer case as much as possible.
3. Remove revolution sensor from A/T.
4. Reinstall any part removed.

- **Always use new sealing parts.**

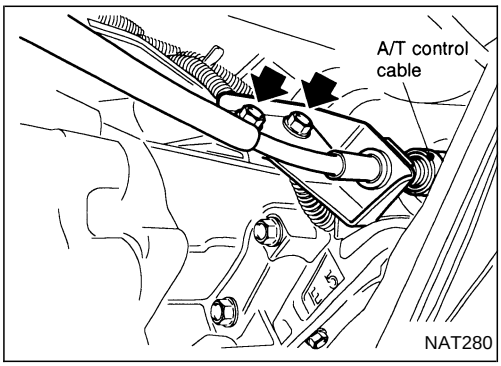


Rear Oil Seal Replacement

1. Remove transfer case from vehicle. Refer to TF section (“Removal”, “REMOVAL AND INSTALLATION”).
2. Remove rear oil seal.
3. Install rear oil seal.

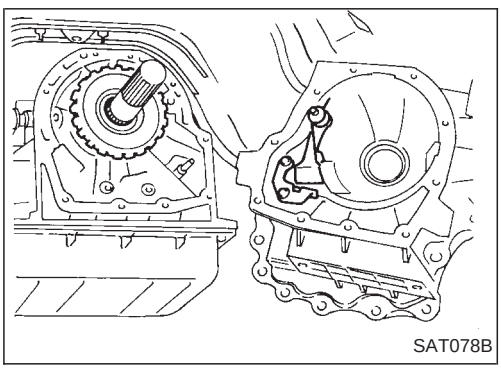
- **Apply ATF before installing.**

4. Reinstall any part removed.



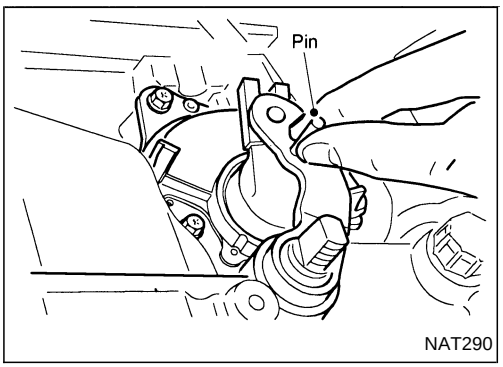
Parking Components Inspection

1. Remove propeller shaft. Refer to PD section (“Removal”, “PROPELLER SHAFT”).
2. Remove transfer case from vehicle. Refer to TF section (“Removal”, “REMOVAL AND INSTALLATION”).
3. Remove manual control linkage bracket from adapter case.



4. Support A/T assembly with a jack.
5. Remove adapter case from transmission case.
6. Replace parking components if necessary.
7. Reinstall any part removed.

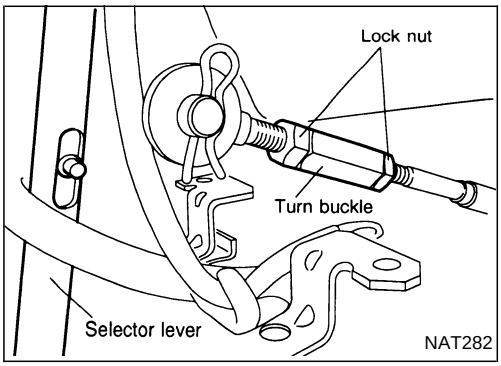
- **Always use new sealing parts.**



Park/neutral Position Switch Adjustment

1. Remove manual control linkage from manual shaft of A/T assembly.
2. Set manual shaft of A/T assembly in “N” position.
3. Loosen park/neutral position switch fixing bolts.
4. Insert pin into adjustment holes in both park/neutral position switch and manual shaft of A/T assembly as near vertical as possible.
5. Reinstall any part removed.
6. Check continuity of park/neutral position switch. Refer to “Components Inspection”, AT-97.

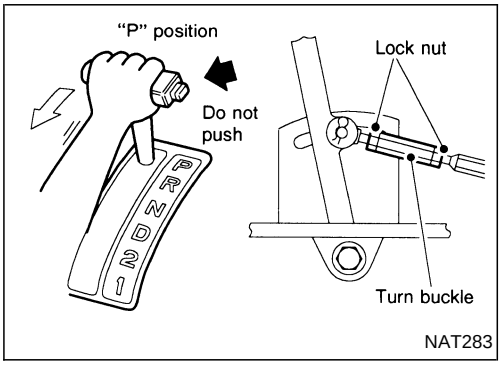
http://vnx.su/



Manual Control Linkage Adjustment

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

1. Place selector lever in “P” position.
2. Loosen lock nuts.



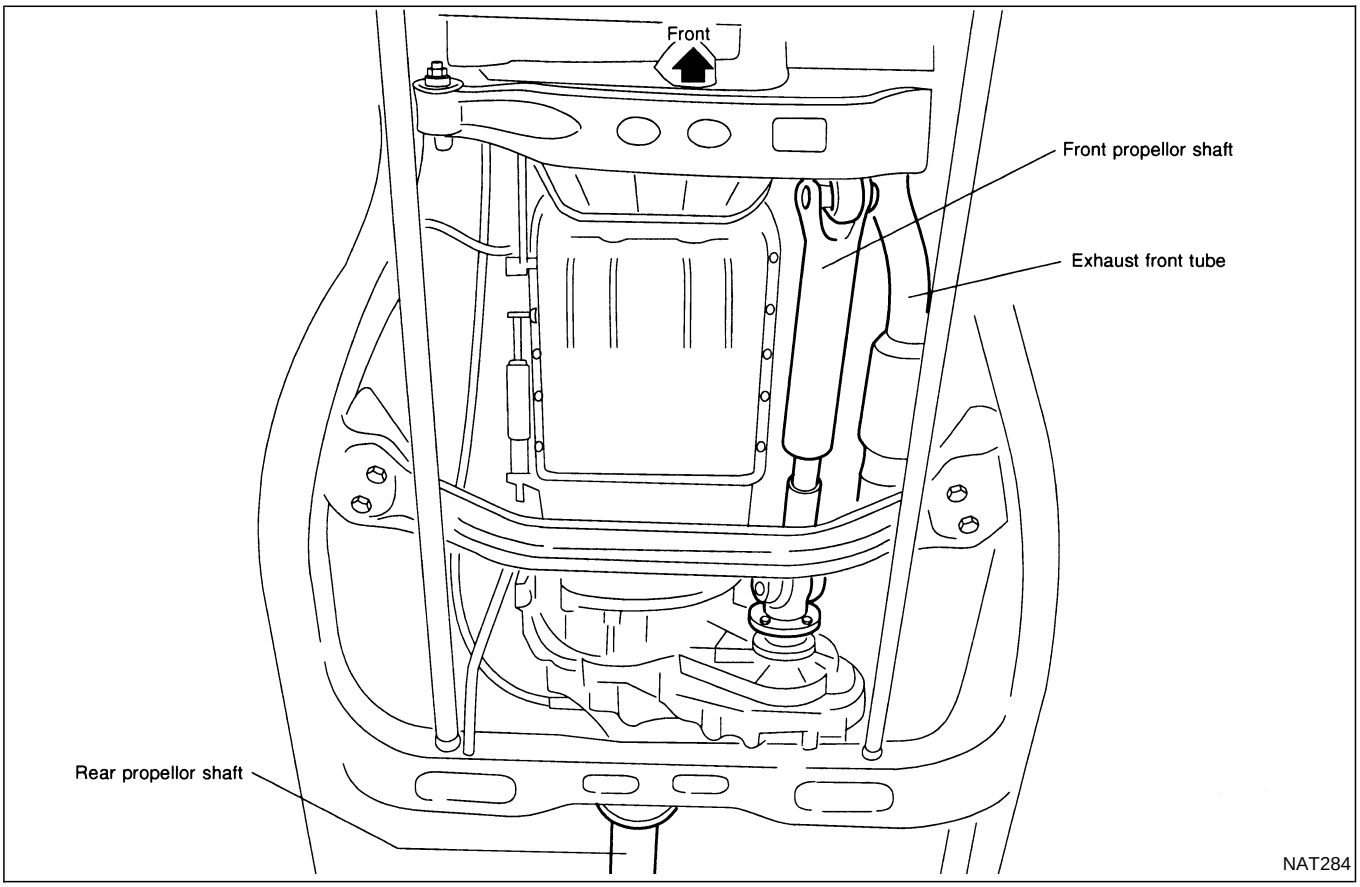
3. Tighten turn buckle until aligns with inner cable, pulling selector lever toward “R” position side without pushing button.
4. Back off turn buckle 1 turn and tighten lock nuts to the specified torque.

   Lock nut

   : 4.4 - 5.9 N·m

   (0.45 - 0.60 kg-m, 39.1 - 52.1 in-lb)
5. Move selector lever from “P” position to “1” position. Make sure that selector lever can move smoothly.

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Removal

CAUTION:

When removing the A/T assembly from engine, first remove the crankshaft position sensor (OBD) from the A/T assembly upper side.

Be careful not to damage sensor edge.

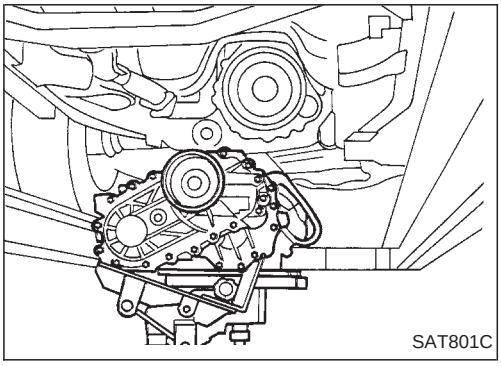
1. Remove battery negative terminal.
2. Remove exhaust front tube.
3. Remove fluid charging pipe from A/T assembly.
4. Remove oil cooler pipe from A/T assembly.
5. Plug up openings such as the fluid charging pipe hole, etc.
6. Remove propeller shaft. Refer to PD section (“Removal”, “PROPELLER SHAFT”).
7. Remove transfer control linkage from transfer. Refer to TF section (“Removal”, “REMOVAL AND INSTALLATION”).
8. Remove A/T control cable from A/T assembly.
9. Disconnect A/T and speedometer sensor harness connectors.

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Removal (Cont'd)

10. Remove starter motor.
11. Remove gusset and rear plate cover securing engine to A/T assembly.
12. Remove bolts securing torque converter to drive plate.

- **Remove the bolts by turning crankshaft.**


SAT801C

13. Support A/T and transfer assembly with a jack.
14. Remove rear engine mounting member from body and A/T assembly. Tighten rear engine mounting member to the specified torque. Refer to EM section ("ENGINE REMOVAL").
15. Remove bolts securing A/T assembly to engine.

- **Secure torque converter to prevent it from dropping.**
- **Secure A/T assembly with transfer to a jack.**

16. Lower A/T assembly with transfer.

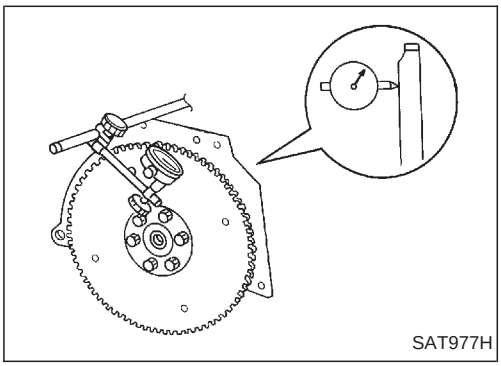
Installation

- Drive plate runout

Do not allow any magnetic materials to contact the ring gear teeth.

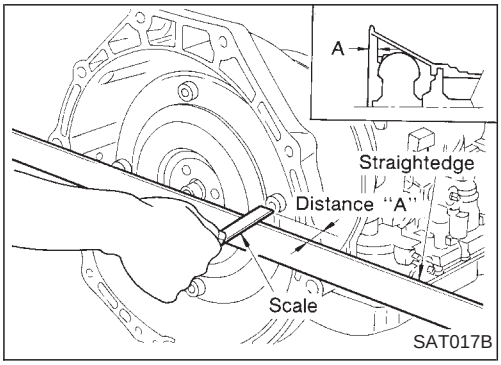
Maximum allowable runout:
Refer to EM section ("Inspection", CYLINDER BLOCK).

If this runout is out of specification, replace drive plate with ring gear.


SAT977H

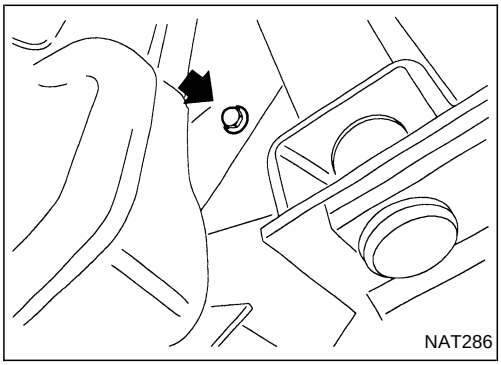
- When connecting torque converter to transmission, measure distance "A" to be certain that they are correctly assembled.

Distance "A":
26.0 mm (1.024 in) or more



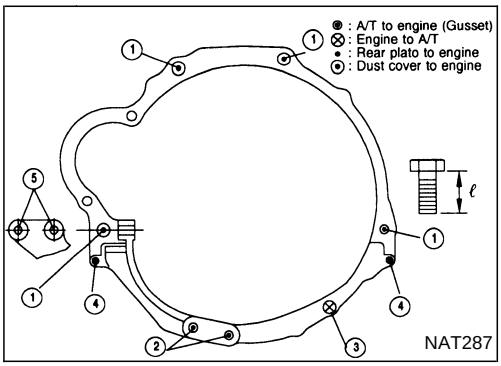
SAT017B

- Install converter to drive plate.
- **After converter is installed to drive plate, rotate crankshaft several turns and check to be sure that transmission rotates freely without binding.**


NAT286

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Installation (Cont'd)





- Tighten bolts securing transmission.

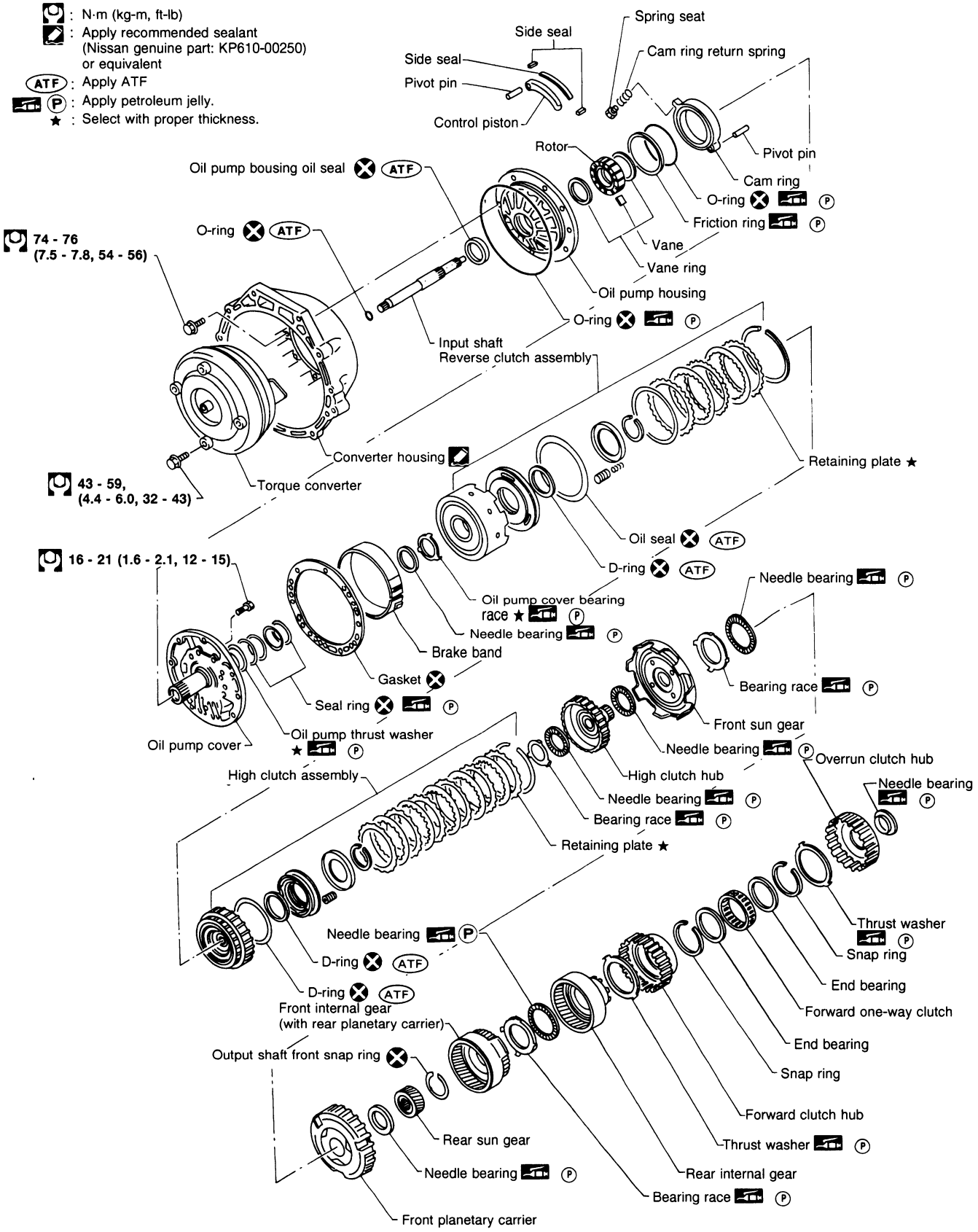
Bolt No.	Tightening torque N·m (kg-m, ft-lb)	Bolt length "ℓ" mm (in)
①	39 - 49 (4.0 - 5.0, 29 - 36)	58.0 (2.28)
②	29 - 39 (3.0 - 4.0, 22 - 29)	90.0 (3.54)
③	18 - 22 (1.8 - 2.2, 13 - 16)	16.0 (0.63)
④	3 - 4 (0.3 - 0.4, 2.2 - 2.9)	12.0 (0.47)
⑤	29 - 39 (3.0 - 4.0, 22 - 29)	35.0 (1.38)

- Reinstall any part removed.
- Check fluid level in transmission.
- Move selector lever through all positions to be sure that transmission operates correctly.
  With parking brake applied, rotate engine at idling. Move selector lever through "N" to "D", to "2", to "1" and to "R" positions. A slight shock should be felt by hand gripping selector each time transmission is shifted.
- Perform road test. Refer to "ROAD TEST", AT-32.

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SEC. 311•313•315

: N·m (kg-m, ft-lb)
: Apply recommended sealant (Nissan genuine part: KP610-00250) or equivalent
ATF : Apply ATF
P : Apply petroleum jelly.
★ : Select with proper thickness.

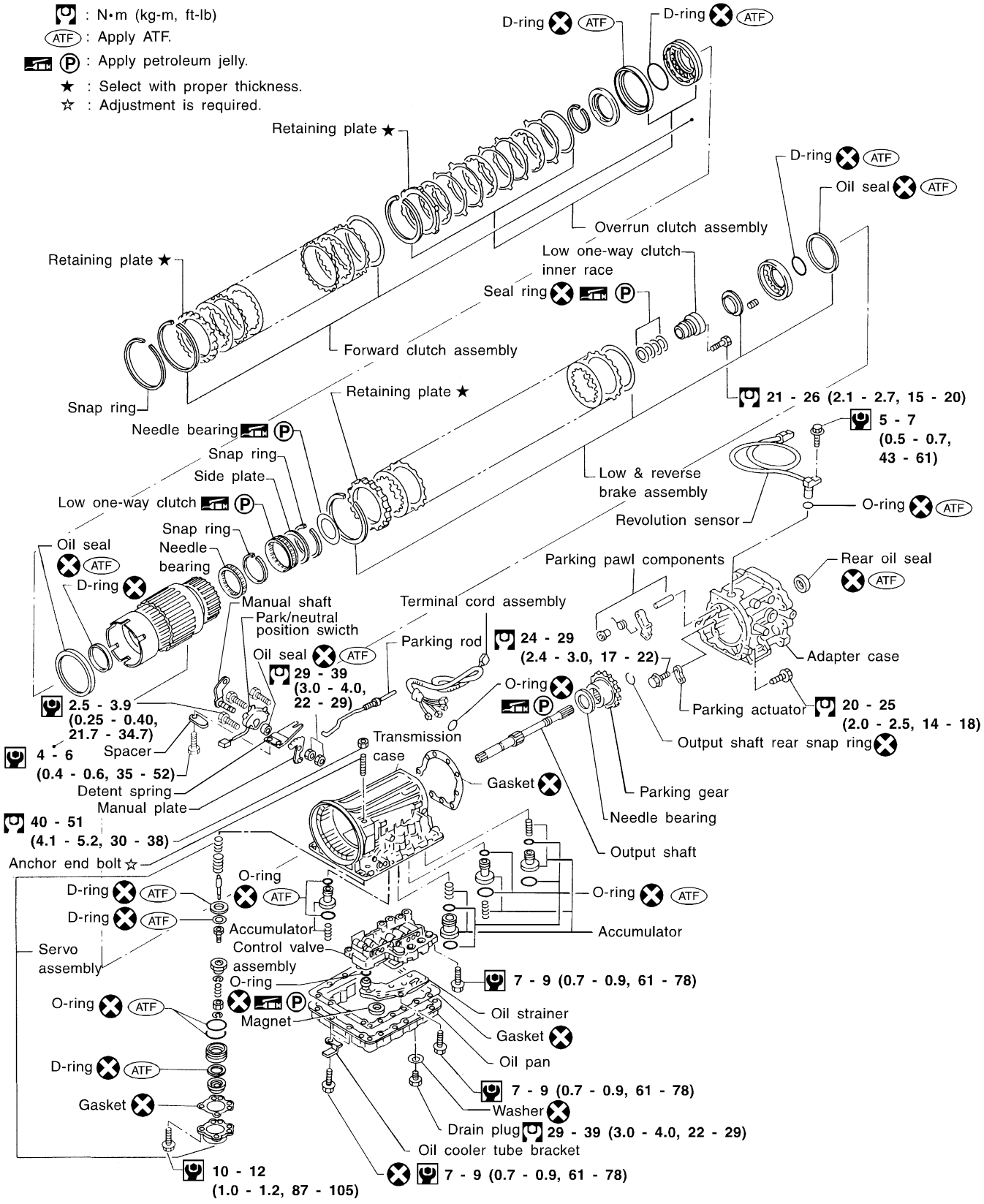


NAT223

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SEC. 311•315•317

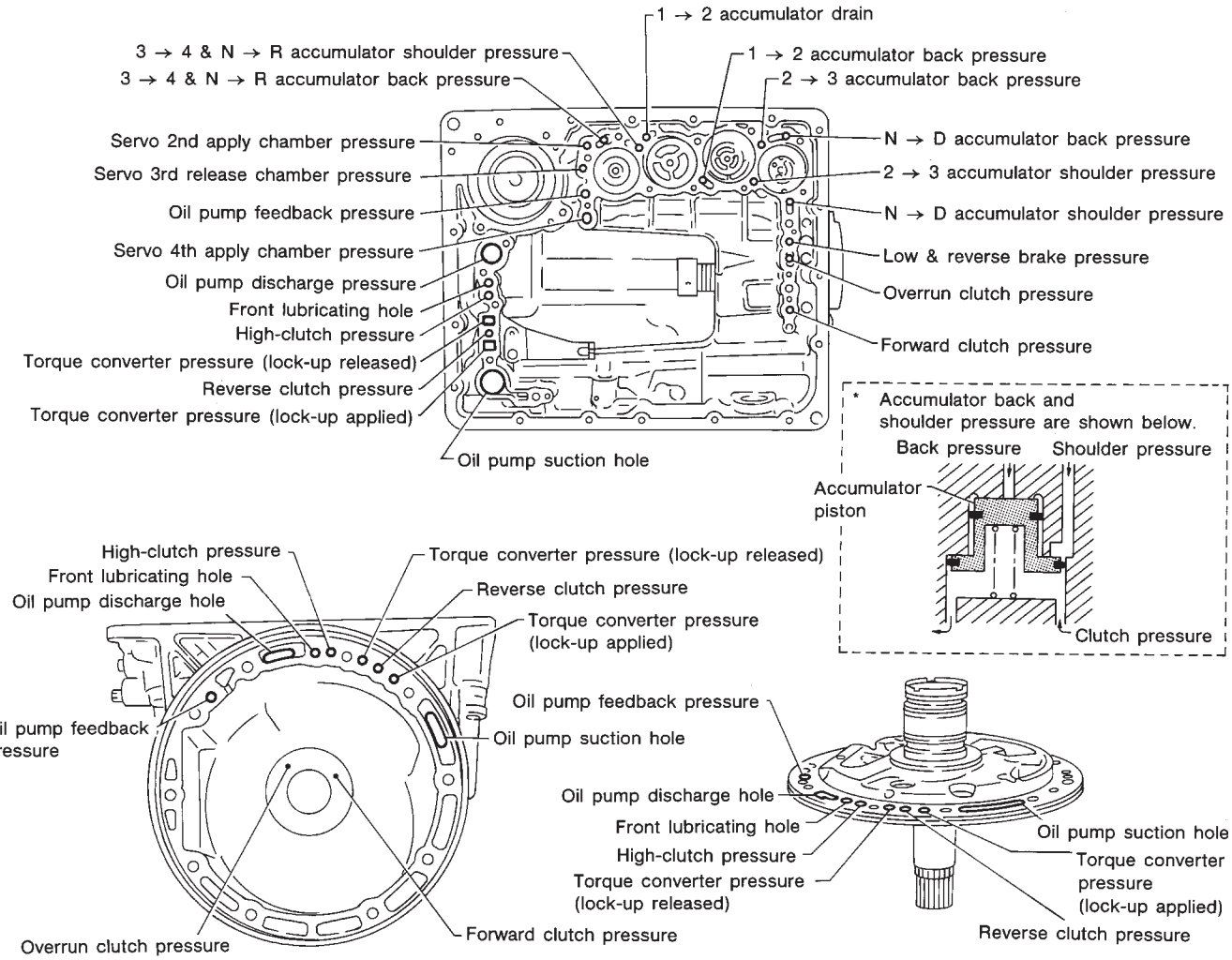
: N•m (kg-m, in-lb)
: N•m (kg-m, ft-lb)
ATF : Apply ATF.
: Apply petroleum jelly.
★ : Select with proper thickness.
☆ : Adjustment is required.

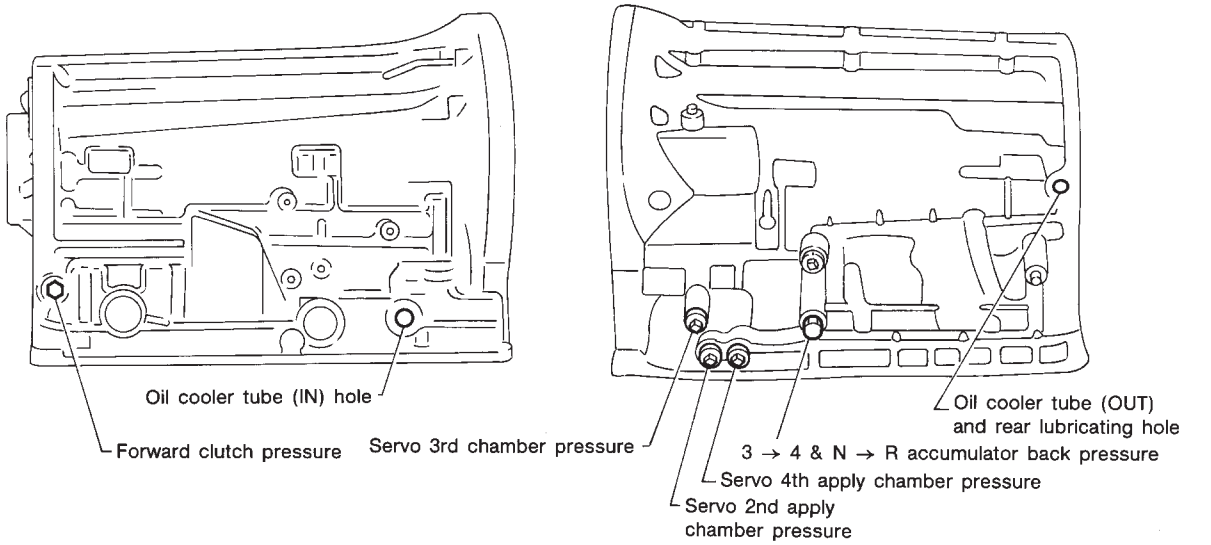


YAT342

http://vnx.su/

Oil Channel





SAT185B

http://vnx.su/

Locations of Needle Bearings, Thrust Washers and Snap Rings

Outer diameter of snap rings

Item number	Outer diameter mm (in)
②	161.0 (6.34)
③	140.1 (5.52)
④	156.4 (6.16)
⑥	142.0 (5.59)
⑦	159.2 (6.27)

Thrust washers

Item number	Color
①	Black
⑤	White

Outer diameter of needle bearings

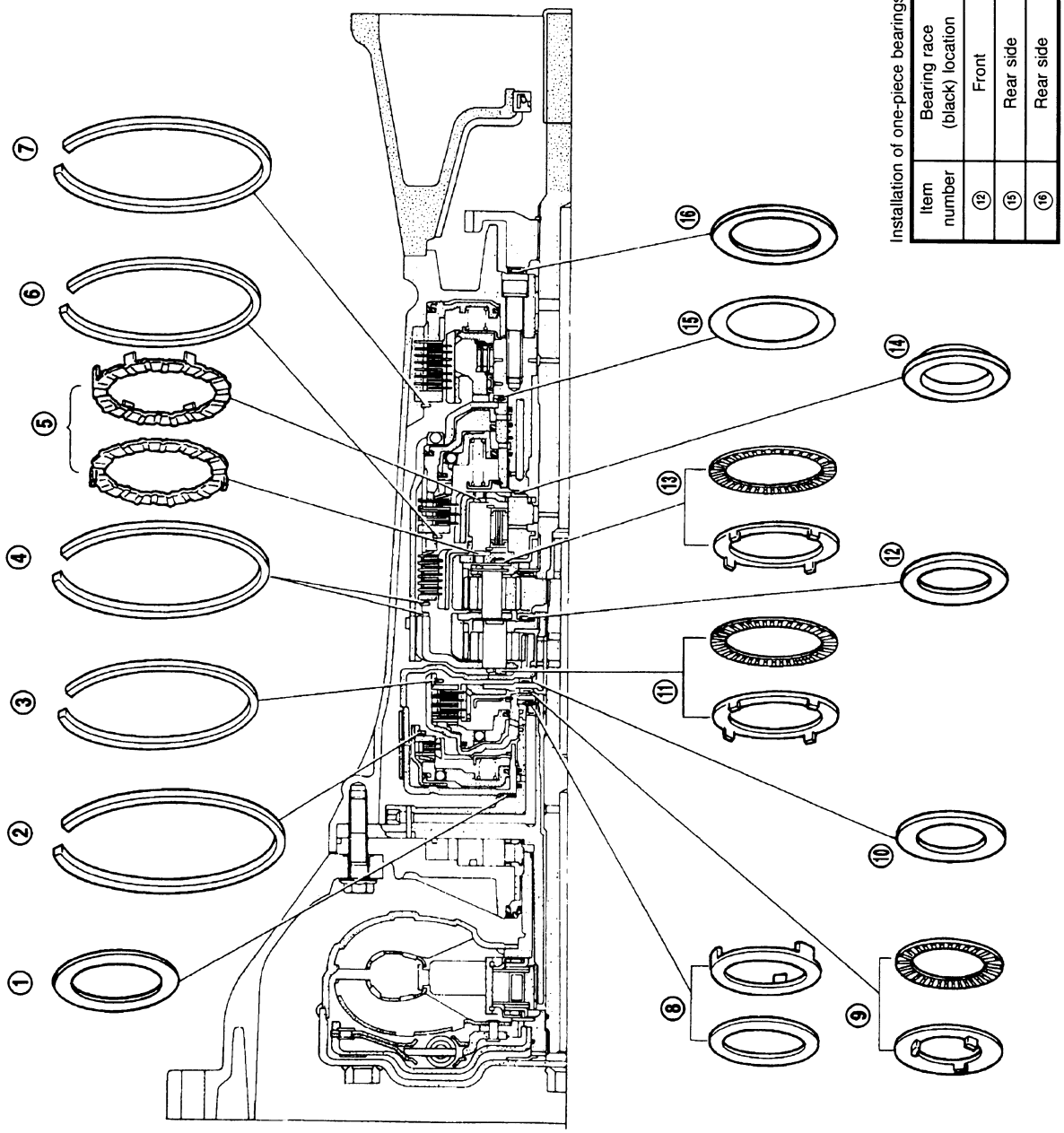
Item number	Outer diameter mm (in)
⑧	47 (1.85)
⑨	53 (2.09)
⑩	53 (2.09)
⑪	78 (3.07)
⑫	53 (2.09)
⑬	78 (3.07)
⑭	57 (2.24)
⑮	78.1 (3.075)
⑯	64 (2.52)

Outer diameter of bearing races

Item number	Outer diameter mm (in)
⑪	58 (2.28)
⑬	58.8 (2.315)

Installation of one-piece bearings

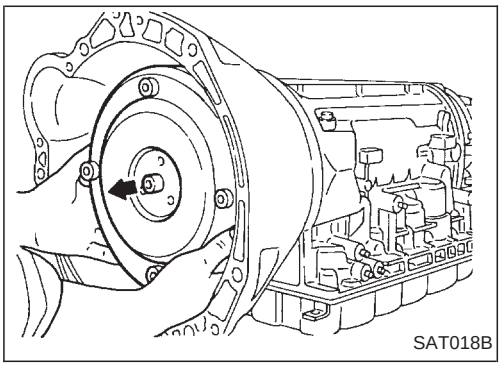
Item number	Bearing race (black) location
⑫	Front
⑮	Rear side
⑯	Rear side



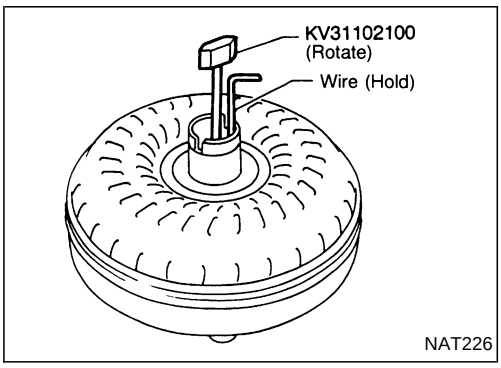
NAT225

http://vnx.su/

Disassembly

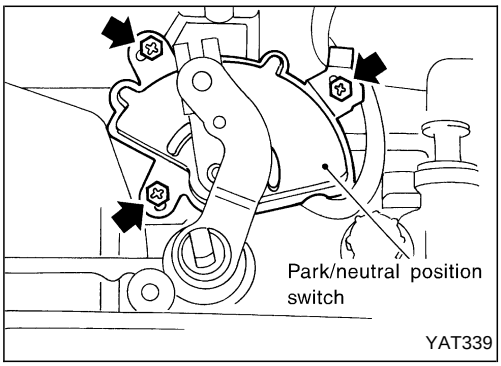

SAT018B

1. Drain ATF through drain plug.
2. Remove torque converter by holding it firmly and turning while pulling straight out.



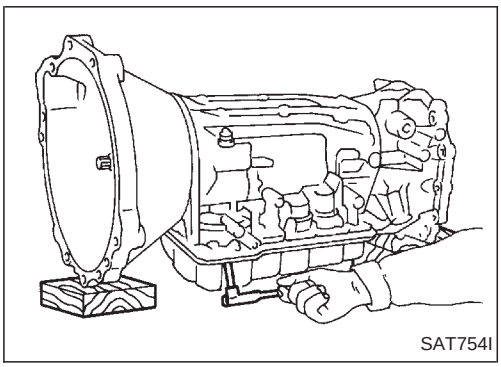
NAT226

3. Check torque converter one-way clutch.
a. Insert Tool into spline of one-way clutch inner race.
b. Hook bearing support unitized with one-way clutch outer race with suitable wire.
c. Check that one-way clutch inner race rotates only clockwise with Tool while holding bearing support with wire.

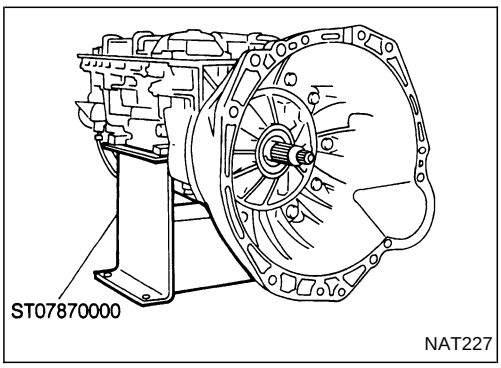


YAT339

4. Remove park/neutral position switch from transmission case.


SAT754I

5. Remove oil pan.
- **Always place oil pan straight down so that foreign particles inside will not move.**

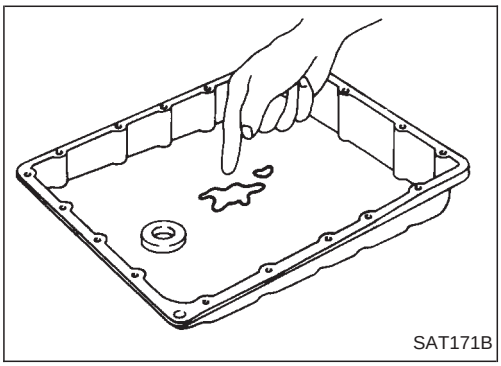


NAT227

6. Place transmission into Tool with the control valve facing up.

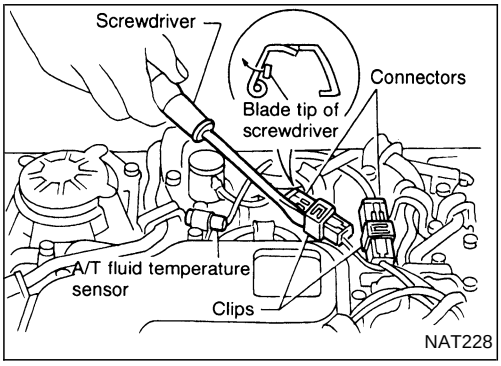
http://vnx.su/

Disassembly (Cont'd)


SAT171B

7. Check foreign materials in oil pan to help determine cause of malfunction. If the fluid is very dark, smells burned, or contains foreign particles, the frictional material (clutches, band) may need replacement. A tacky film that will not wipe clean indicates varnish build up. Varnish can cause valves, servo, and clutches to stick and may inhibit pump pressure.

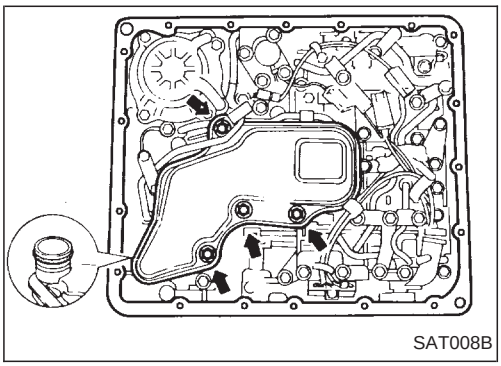
- **If frictional material is detected, replace radiator after repair of A/T. Refer to LC section ("Radiator", "ENGINE COOLING SYSTEM").**



NAT228

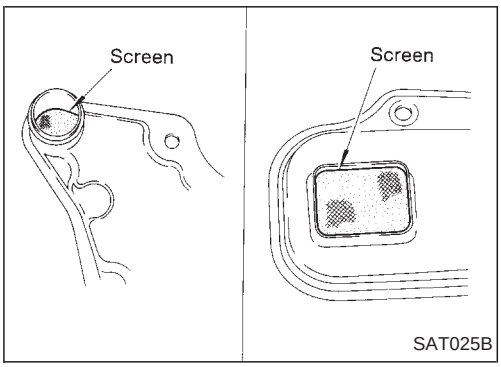
8. Remove torque converter clutch solenoid valve and A/T fluid temperature sensor connectors.

- **Be careful not to damage connector.**


SAT008B

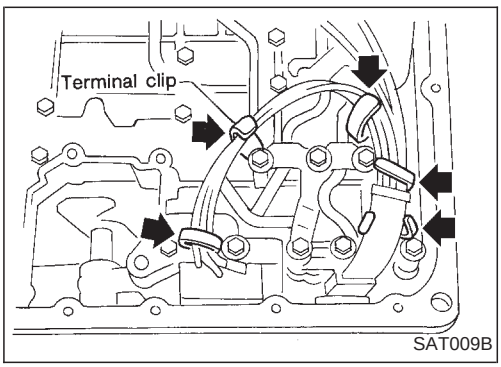
9. Remove oil strainer.

a. Remove oil strainer from control valve assembly then remove O-ring from oil strainer.



SAT025B

b. Check oil strainer screen for damage.



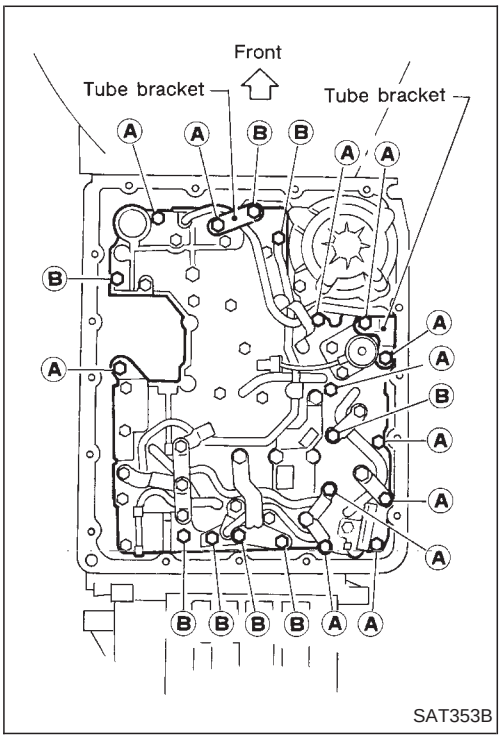
SAT009B

10. Remove control valve assembly.

a. Straighten terminal clips to free terminal cords then remove terminal clips.

http://vnx.su/

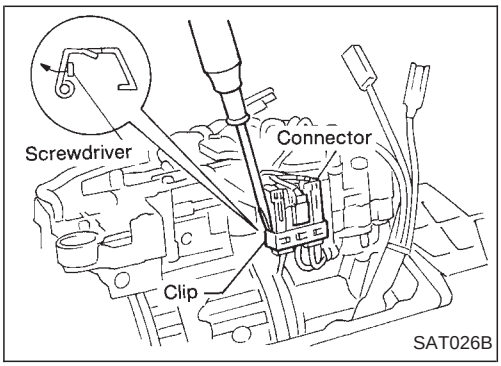
Disassembly (Cont'd)



SAT353B

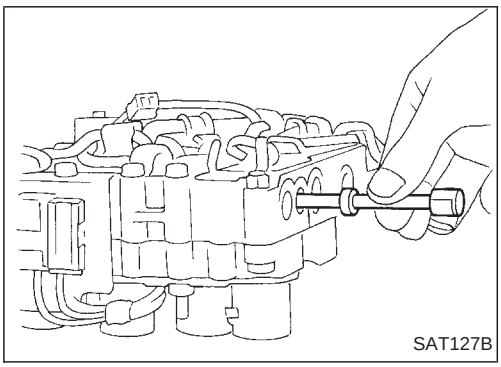
b. Remove bolts Ⓐ and Ⓑ, and remove control valve assembly from transmission.

Bolt symbol	Length mm (in)
Ⓐ	33 (1.30)
Ⓑ	45 (1.77)

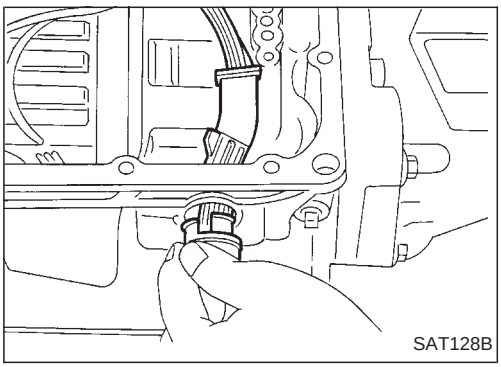


SAT026B

c. Remove solenoid connector.
- **Be careful not to damage connector.**


SAT127B

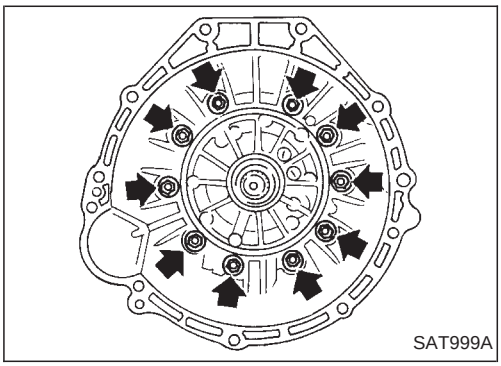
d. Remove manual valve from control valve assembly.


SAT128B

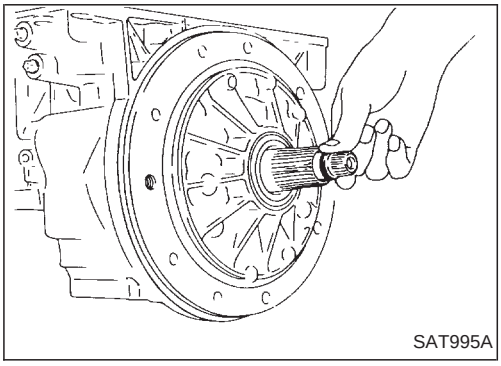
11. Remove terminal cord assembly from transmission case while pushing on stopper.
- **Be careful not to damage cord.**
- **Do not remove terminal cord assembly unless it is damaged.**

http://vnx.su/

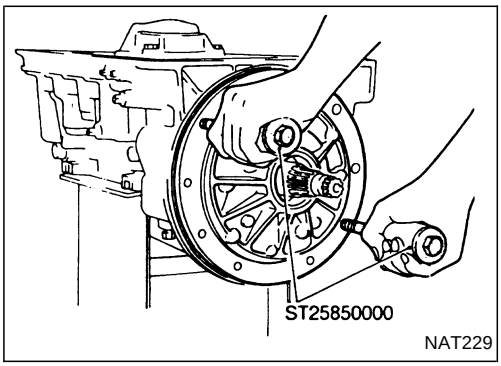
Disassembly (Cont'd)


SAT999A

12. Remove converter housing from transmission case.
- **Be careful not to scratch converter housing.**

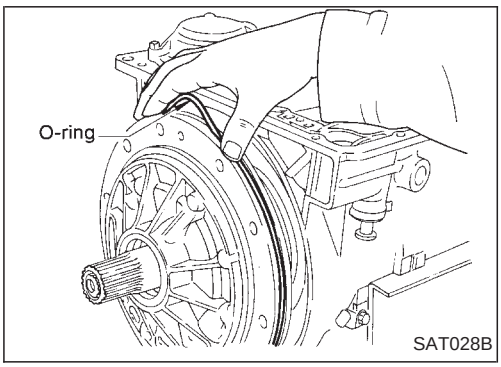

SAT995A

13. Remove O-ring from input shaft.



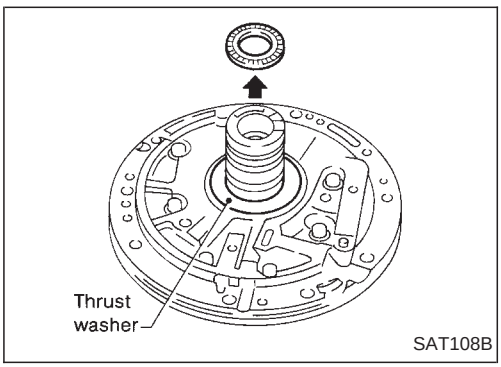
NAT229

14. Remove oil pump assembly.
a. Attach Tool to oil pump assembly and extract it evenly from transmission case.



SAT028B

b. Remove O-ring from oil pump assembly.
c. Remove traces of sealant from oil pump housing.
- **Be careful not to scratch pump housing.**

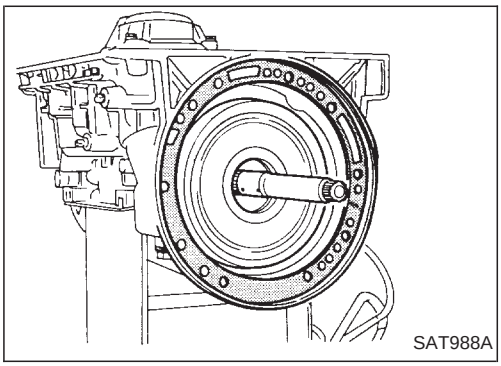


SAT108B

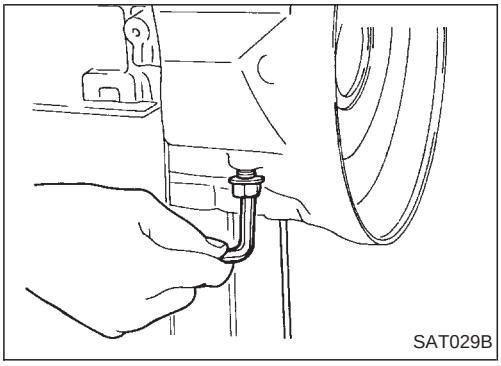
d. Remove needle bearing and thrust washer from oil pump assembly.

http://vnx.su/

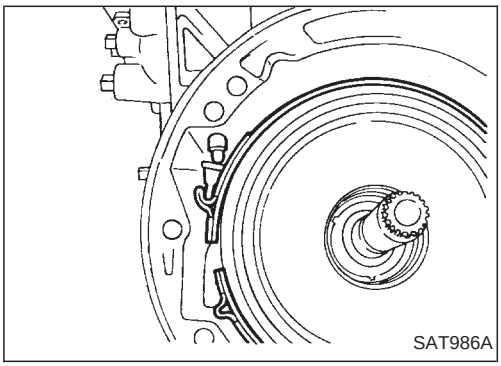
Disassembly (Cont'd)


SAT988A

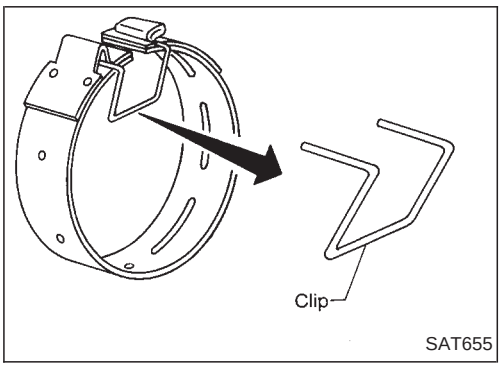
15. Remove input shaft and oil pump gasket.


SAT029B

16. Remove brake band and band strut.
a. Loosen lock nut and remove band servo anchor end pin from transmission case.

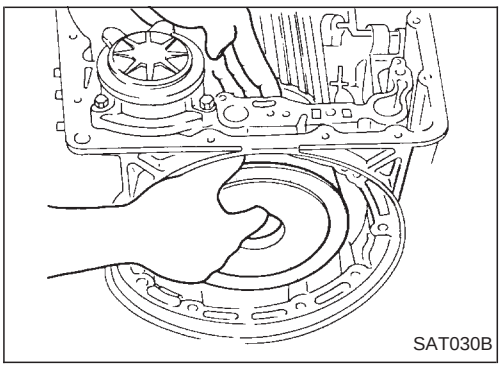

SAT986A

b. Remove brake band and band strut from transmission case.



SAT655

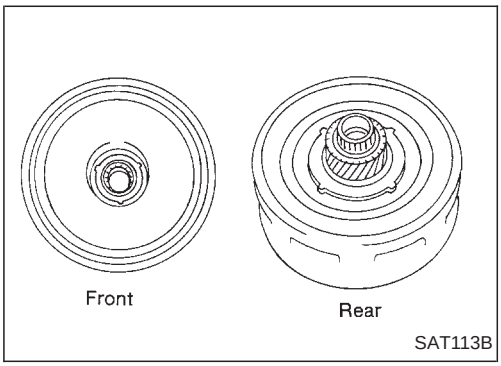
c. Hold brake band in a circular shape with clip.


SAT030B

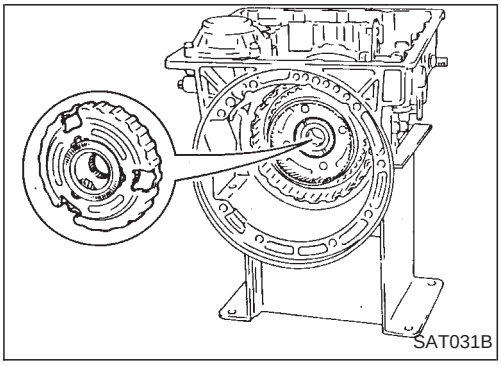
17. Remove front side clutch and gear components.
a. Remove clutch pack (reverse clutch, high clutch and front sun gear) from transmission case.

http://vnx.su/

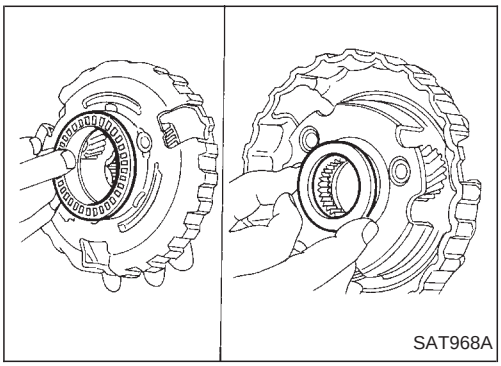
Disassembly (Cont'd)



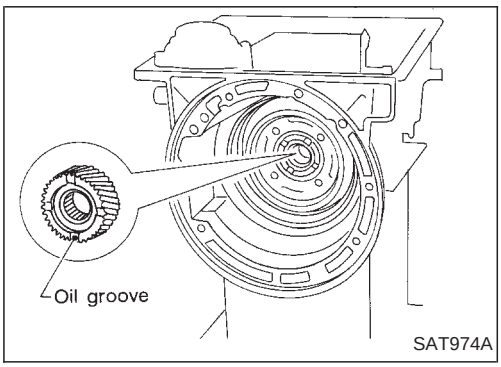
b. Remove front bearing race from clutch pack.
c. Remove rear bearing race from clutch pack.



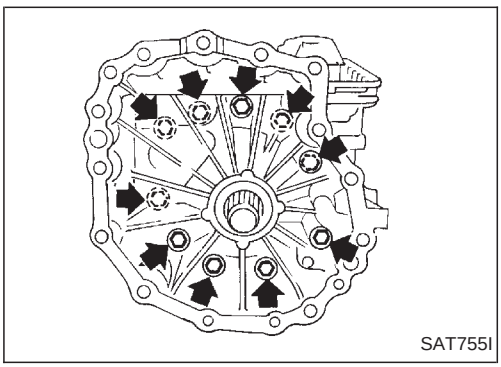
d. Remove front planetary carrier from transmission case.



e. Remove front needle bearing from front planetary carrier.
f. Remove rear bearing from front planetary carrier.



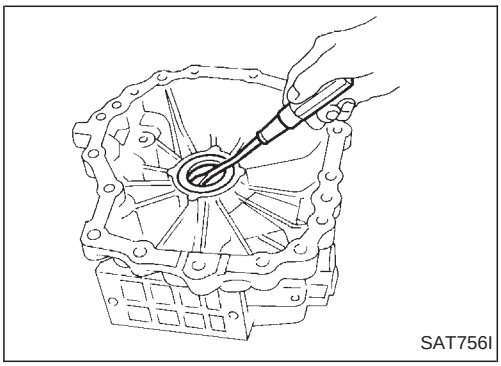
g. Remove rear sun gear from transmission case.



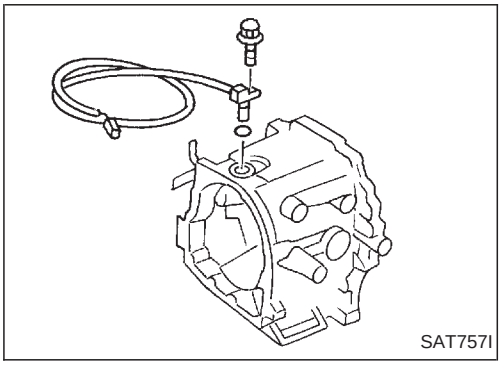
18. Remove adapter case.
a. Remove adapter case from transmission case.
b. Remove adapter case gasket from transmission case.

http://vnx.su/

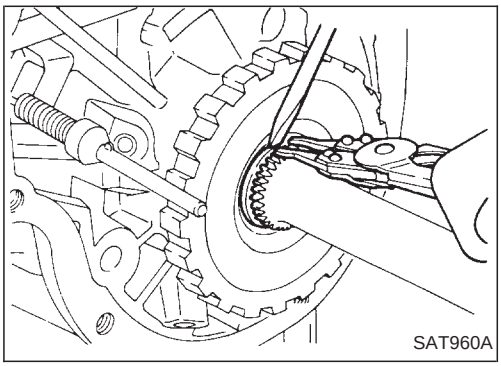
Disassembly (Cont'd)


SAT756I

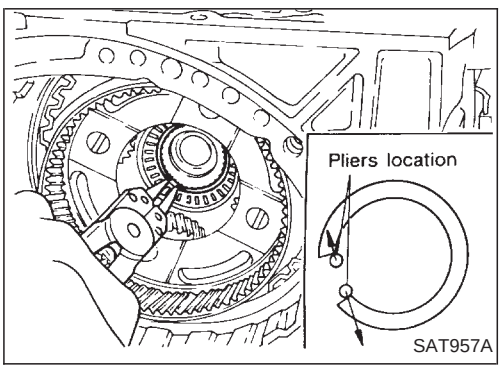
c. Remove oil seal from adapter case.
- **Do not remove oil seal unless it is to be replaced.**


SAT757I

d. Remove revolution sensor from adapter case.
e. Remove O-ring from revolution sensor.


SAT960A

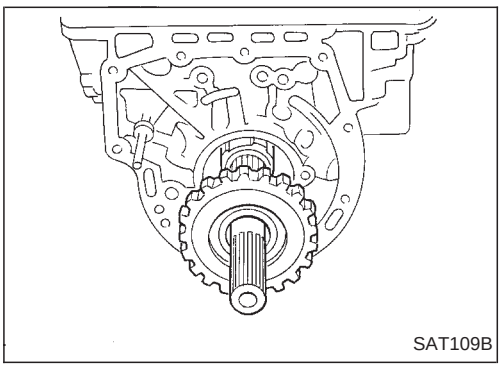
19. Remove output shaft and parking gear.
a. Remove rear snap ring from output shaft.



SAT957A

b. Slowly push output shaft all the way forward.
- **Do not use excessive force.**

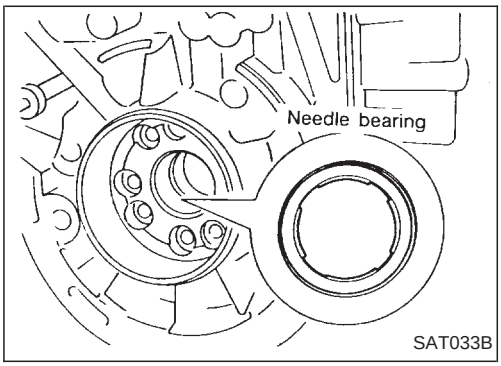
c. Remove snap ring from output shaft.


SAT109B

d. Remove output shaft and parking gear as a unit from transmission case.
e. Remove parking gear from output shaft.

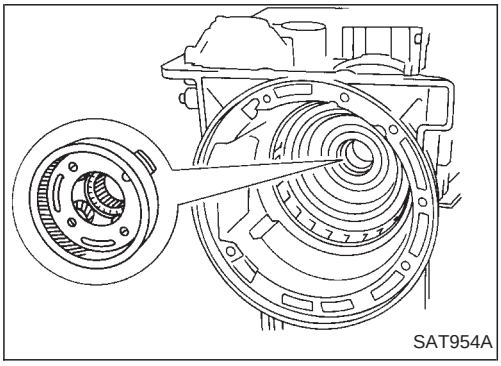
http://vnx.su/

Disassembly (Cont'd)

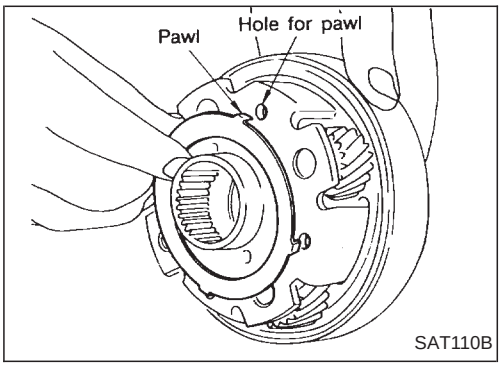


SAT033B

f. Remove needle bearing from transmission case.

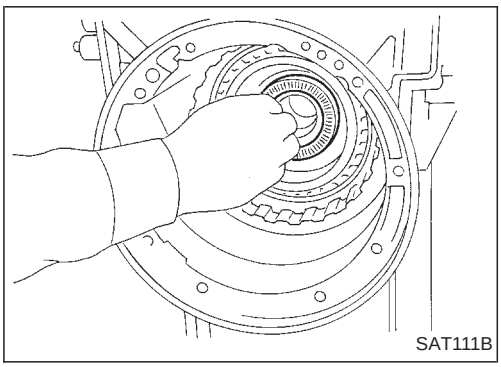

SAT954A

20. Remove rear side clutch and gear components.
a. Remove front internal gear.

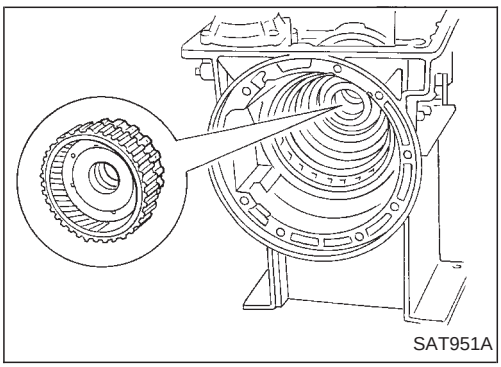


SAT110B

b. Remove bearing race from front internal gear.


SAT111B

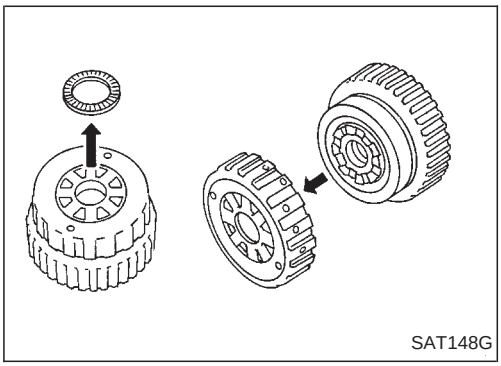
c. Remove needle bearing from rear internal gear.


SAT951A

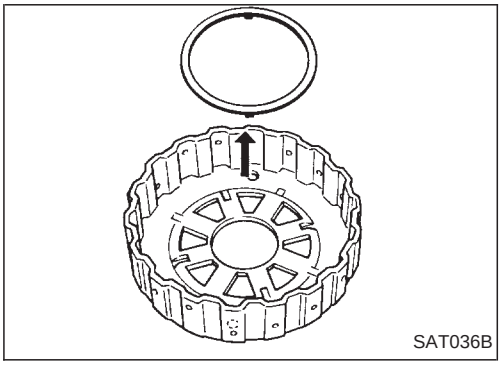
d. Remove rear internal gear, forward clutch hub and overrun clutch hub as a set from transmission case.

http://vnx.su/

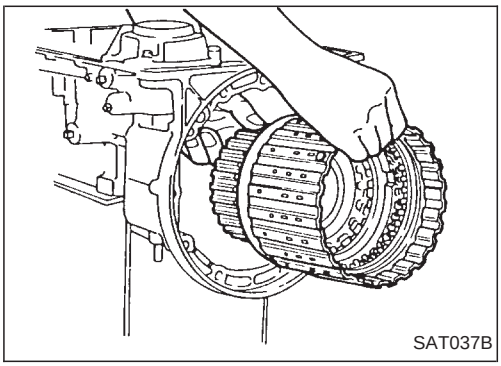
Disassembly (Cont'd)


SAT148G

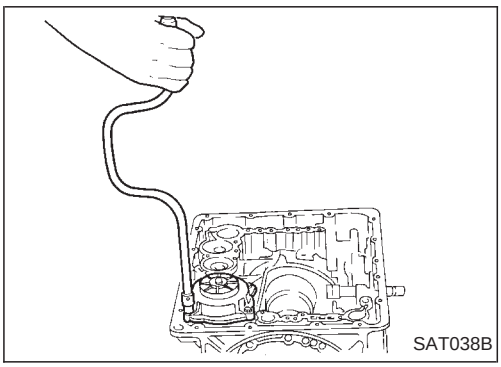
e. Remove needle bearing from overrun clutch hub.
f. Remove overrun clutch hub from rear internal gear and forward clutch hub.


SAT036B

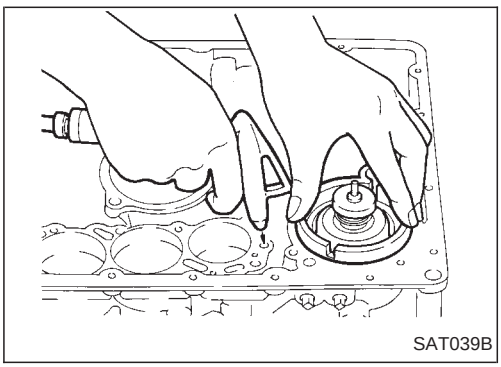
g. Remove thrust washer from overrun clutch hub.


SAT037B

h. Remove forward clutch assembly from transmission case.


SAT038B

21. Remove band servo and accumulator components.
a. Remove band servo retainer from transmission case.

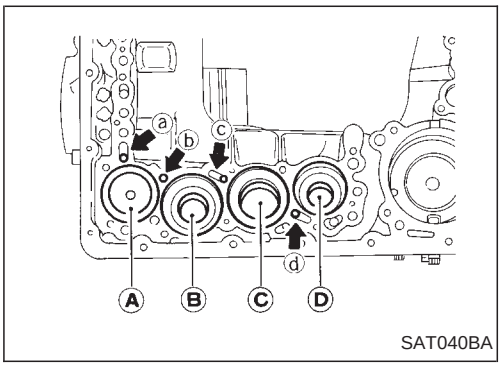

SAT039B

b. Apply compressed air to oil hole until band servo piston comes out of transmission case.
- **Hold piston with a rag and gradually direct air to oil hole.**

c. Remove return springs.

http://vnx.su/

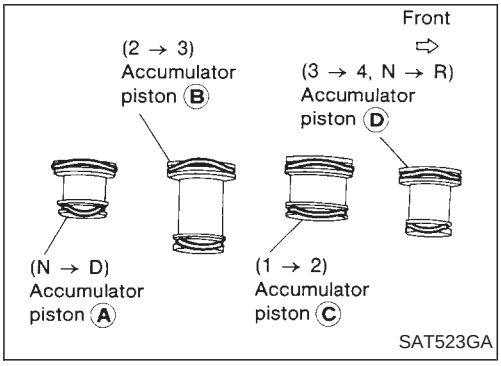
Disassembly (Cont'd)



SAT040BA

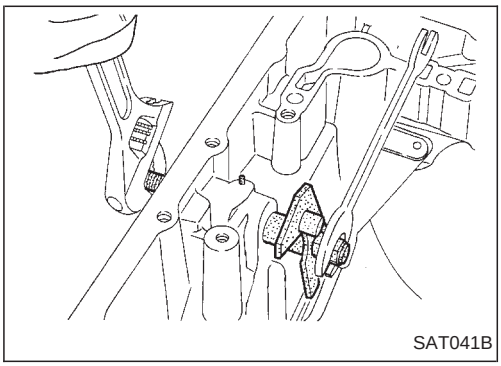
d. Remove springs from accumulator pistons Ⓑ, Ⓒ and Ⓓ.
e. Apply compressed air to each oil hole until piston comes out.
- **Hold piston with a rag and gradually direct air to oil hole.**

Identification of accumulator pistons	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Identification of oil holes	ⓐ	ⓑ	ⓒ	ⓓ

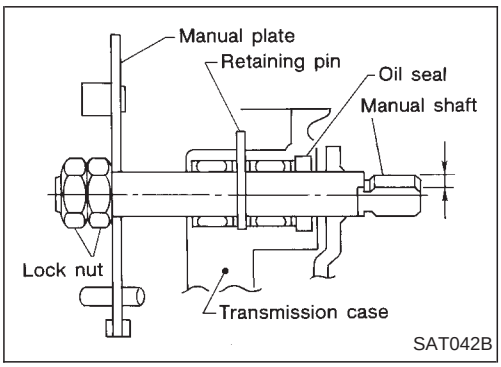


SAT523GA

f. Remove O-ring from each piston.

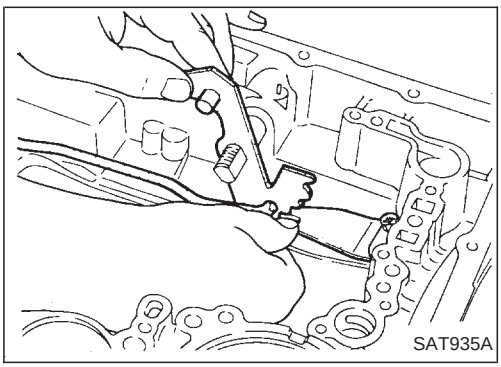

SAT041B

22. Remove manual shaft components, if necessary.
a. Hold width across flats of manual shaft (outside the transmission case) and remove lock nut from shaft.



SAT042B

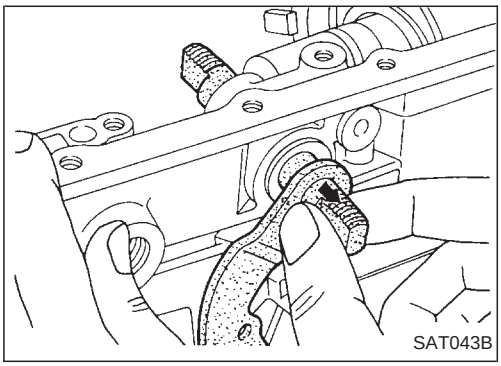
b. Remove retaining pin from transmission case.


SAT935A

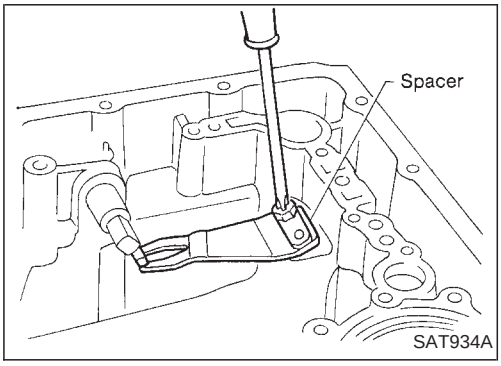
c. While pushing detent spring down, remove manual plate and parking rod from transmission case.

http://vnx.su/

Disassembly (Cont'd)

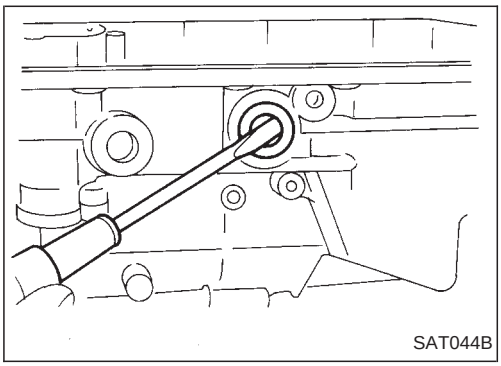

SAT043B

d. Remove manual shaft from transmission case.



SAT934A

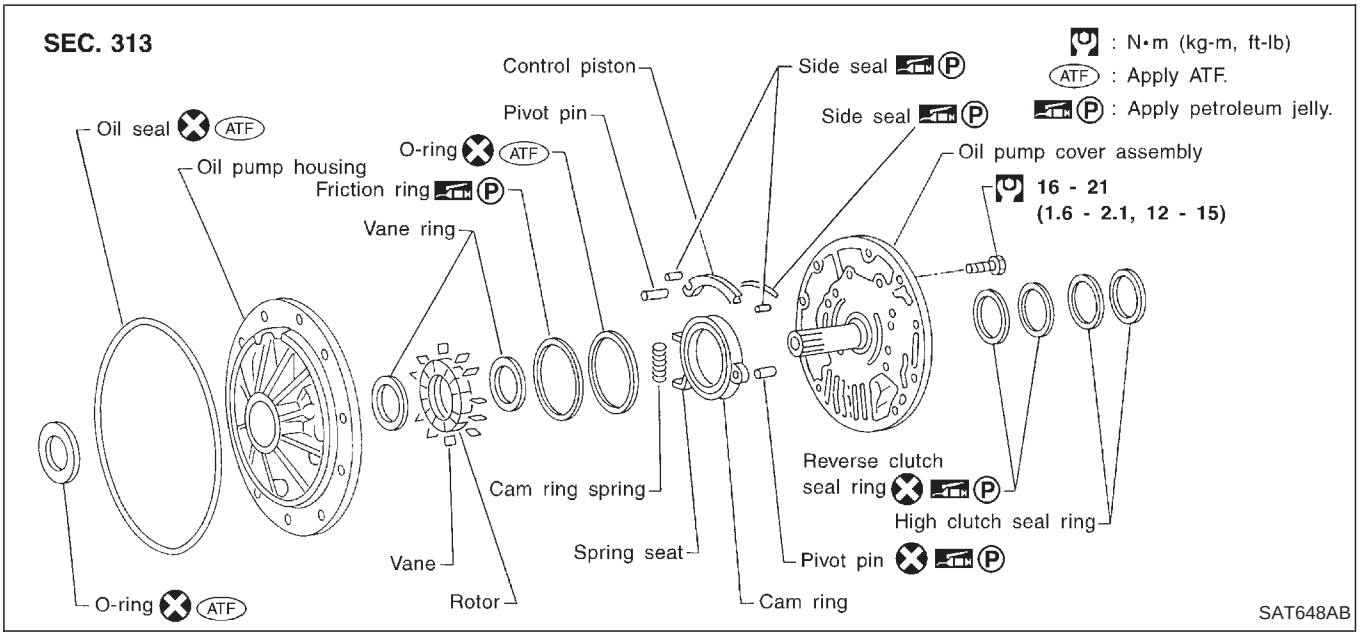
e. Remove spacer and detent spring from transmission case.

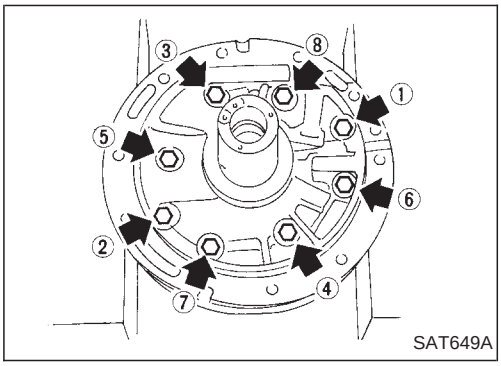

SAT044B

f. Remove oil seal from transmission case.

http://vnx.su/

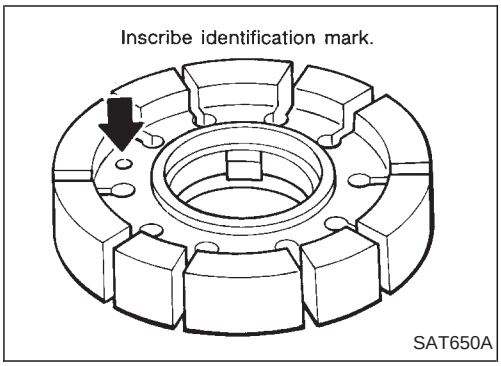
Oil Pump



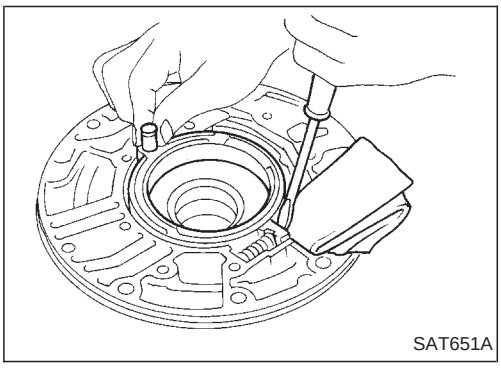


DISASSEMBLY

1. Loosen bolts in numerical order and remove oil pump cover.



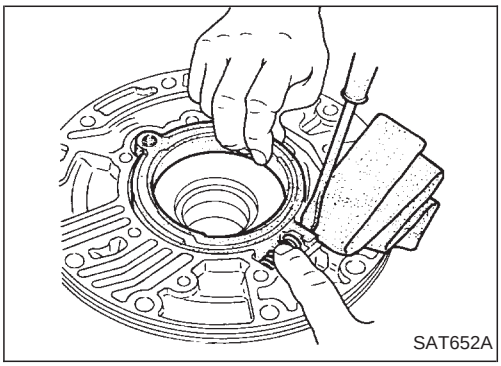
2. Remove rotor, vane rings and vanes.
- **Inscribe a mark on back of rotor for identification of fore-aft direction when reassembling rotor. Then remove rotor.**



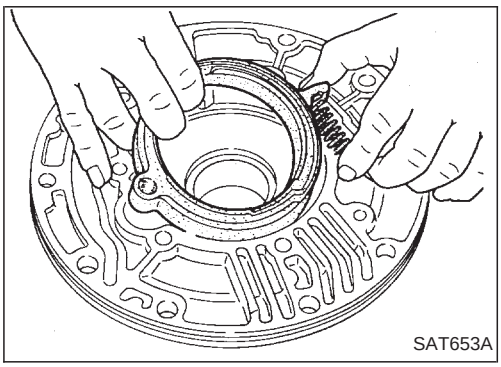
3. While pushing on cam ring remove pivot pin.
- **Be careful not to scratch oil pump housing.**

http://vnx.su/

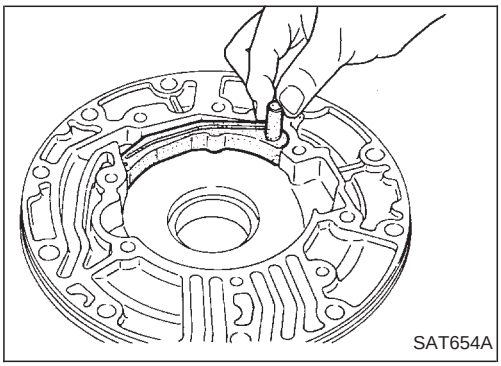
Oil Pump (Cont'd)


SAT652A

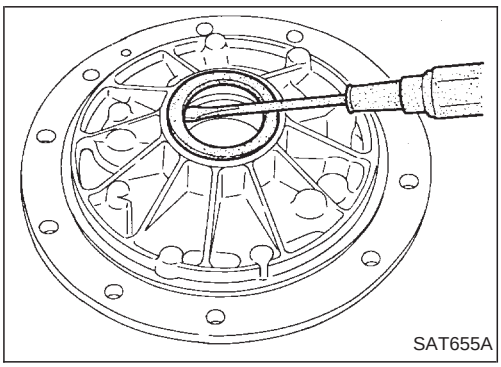
4. While holding cam ring and spring lift out cam ring spring.
- **Be careful not to damage oil pump housing.**
- **Hold cam ring spring to prevent it from jumping.**


SAT653A

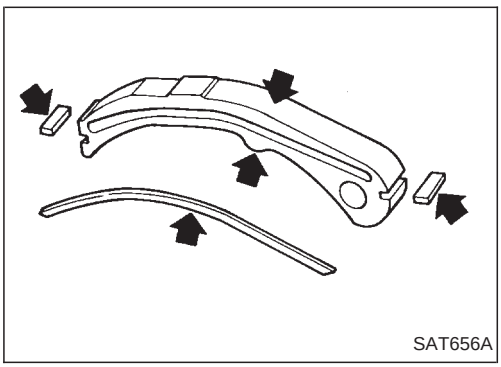
5. Remove cam ring and cam ring spring from oil pump housing.


SAT654A

6. Remove pivot pin from control piston and remove control piston assembly.


SAT655A

7. Remove oil seal from oil pump housing.
- **Be careful not to scratch oil pump housing.**


SAT656A

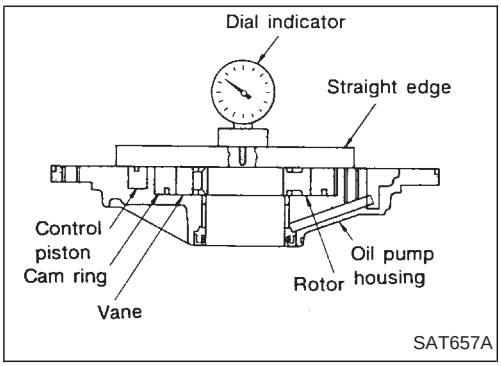
INSPECTION

Oil pump cover, rotor, vanes, control piston, side seals, cam ring and friction ring

- Check for wear or damage.

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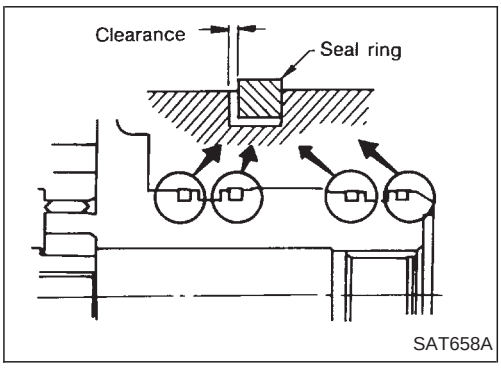
Oil Pump (Cont'd)



SAT657A

Side clearances

- Measure side clearances between end of oil pump housing and cam ring, rotor, vanes and control piston. Measure in at least four places along their circumferences. Maximum measured values should be within specified positions.
- **Before measurement, check that friction rings, O-ring, control piston side seals and cam ring spring are removed.**
  Standard clearance (Cam ring, rotor, vanes and control piston):
  Refer to SDS, AT-204.
- If not within standard clearance, replace oil pump assembly except oil pump cover assembly.



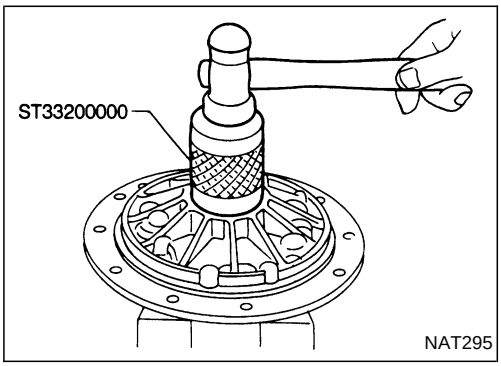
SAT658A

Seal ring clearance

- Measure clearance between seal ring and ring groove.
  Standard clearance:
  0.10 - 0.25 mm (0.0039 - 0.0098 in)
  Wear limit:
  0.25 mm (0.0098 in)
- If not within wear limit, replace oil pump cover assembly.

ASSEMBLY

1. Drive oil seal into oil pump housing.
- **Apply ATF to outer periphery and lip surface.**

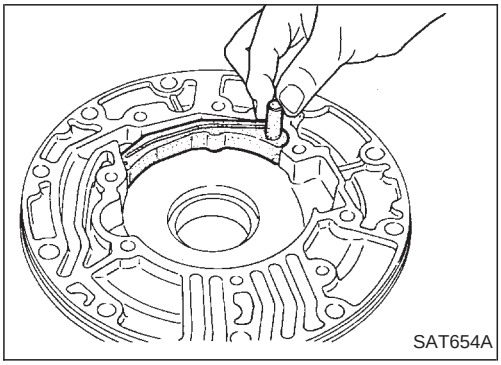


NAT295

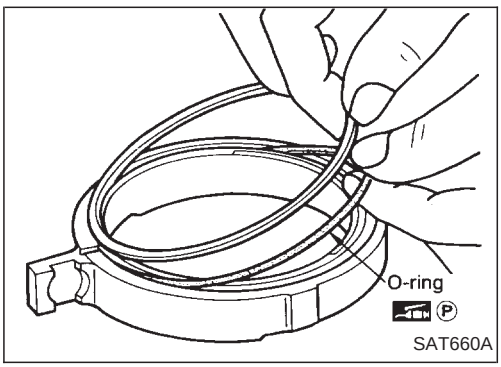
2. Install cam ring in oil pump housing by the following steps.

a. Install side seal on control piston.
- **Pay attention to its direction — Black surface goes toward control piston.**
- **Apply petroleum jelly to side seal.**

b. Install control piston on oil pump.


SAT654A

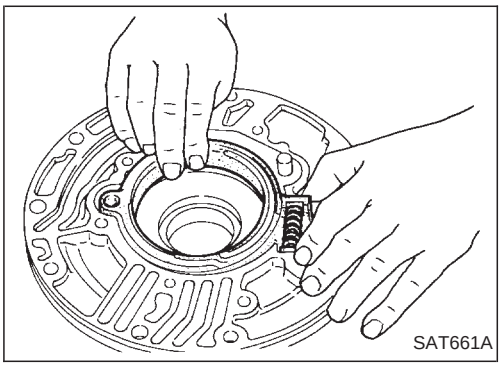
c. Install O-ring and friction ring on cam ring.
- **Apply petroleum jelly to O-ring.**



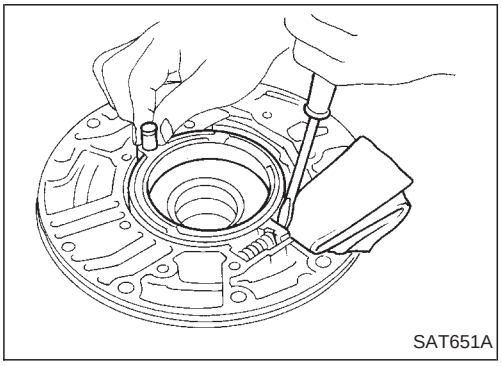
SAT660A

http://vnx.su/

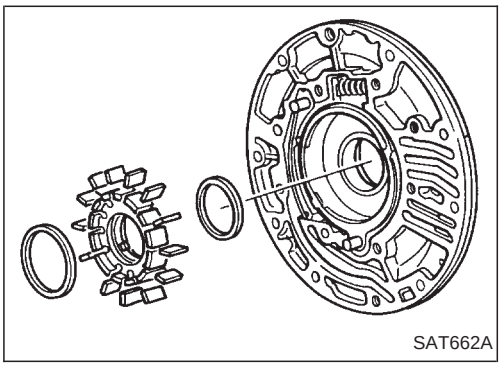
Oil Pump (Cont'd)


SAT661A

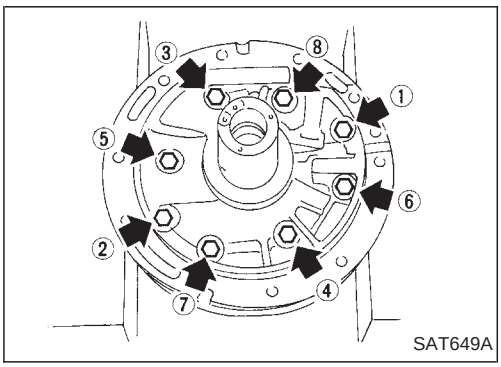
d. Assemble cam ring, cam ring spring and spring seat. Install spring by pushing it against pump housing.


SAT651A

e. While pushing on cam ring install pivot pin.

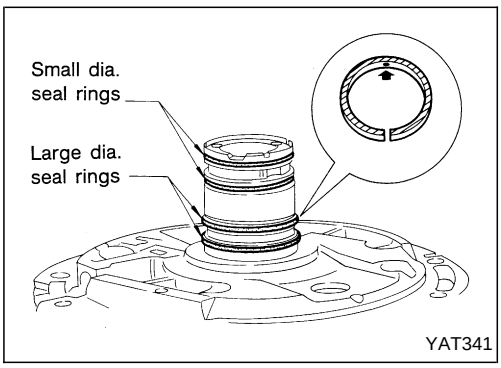

SAT662A

3. Install rotor, vanes and vane rings.
- **Pay attention to direction of rotor.**



SAT649A

4. Install oil pump housing and oil pump cover.
a. Wrap masking tape around splines of oil pump cover assembly to protect seal. Position oil pump cover assembly in oil pump housing assembly, then remove masking tape.
b. Tighten bolts in a criss-cross pattern.



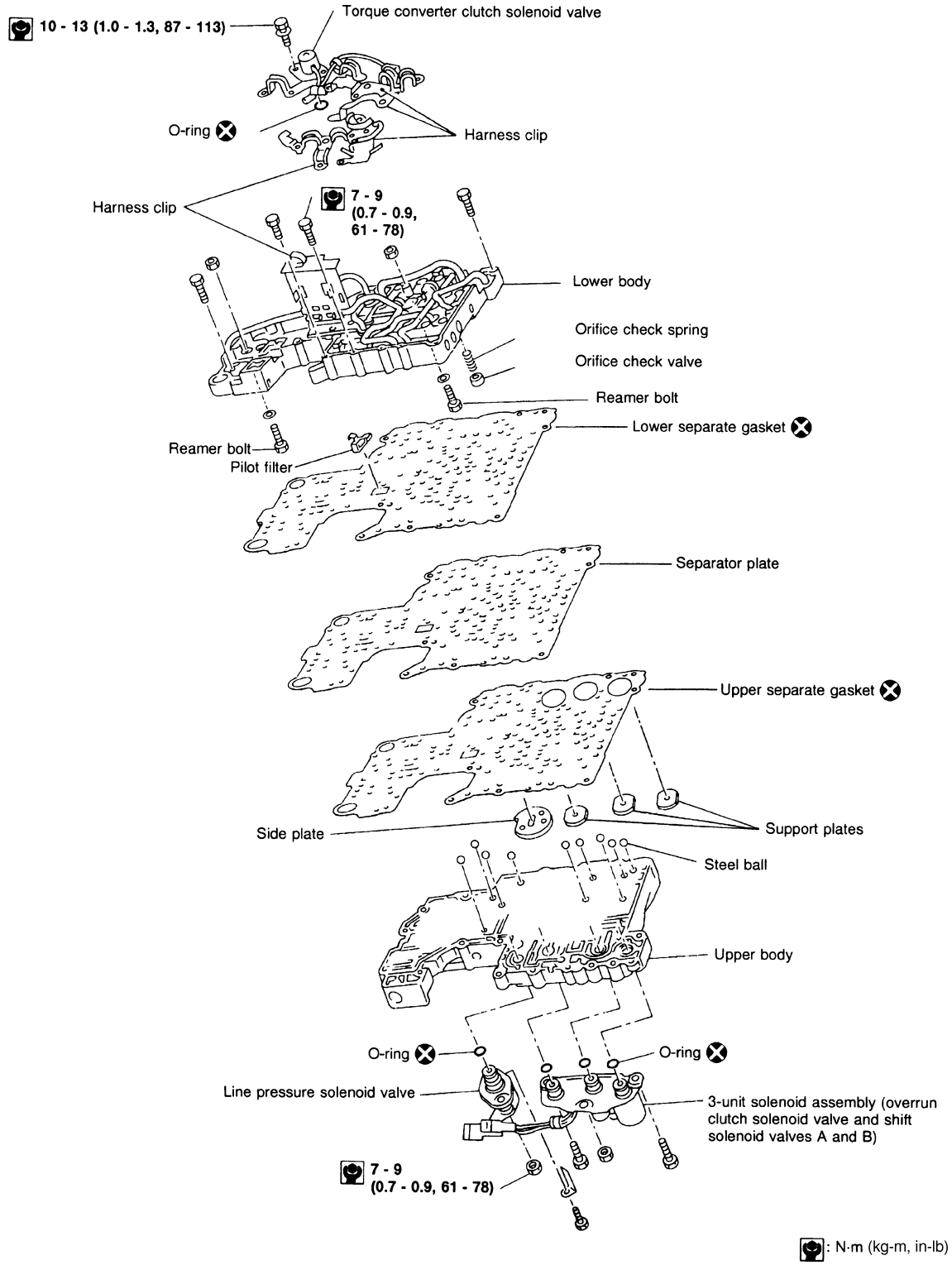
YAT341

5. Install new seal rings carefully after packing ring grooves with petroleum jelly. Press rings down into jelly to a close fit.
- **Seal rings come in two different diameters. Check fit carefully in each groove.**
  Small dia. seal ring:
  No mark
  Large dia. seal ring:
  Yellow mark in area shown by arrow
- **Do not spread gap of seal ring excessively while installing. It may deform ring.**

http://vnx.su/

Control Valve Assembly

SEC. 317

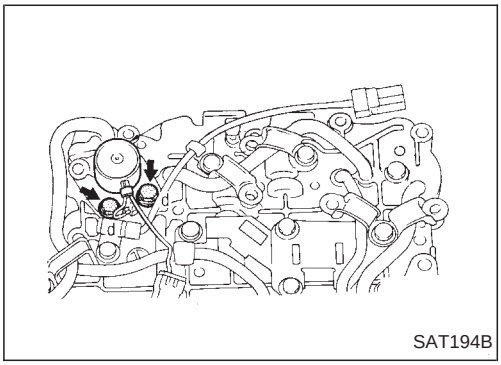


NAT294

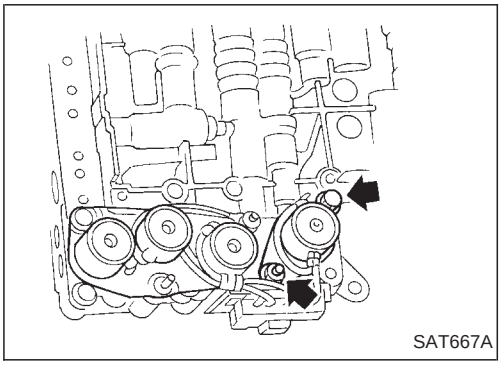
http://vnx.su/

Control Valve Assembly (Cont'd)

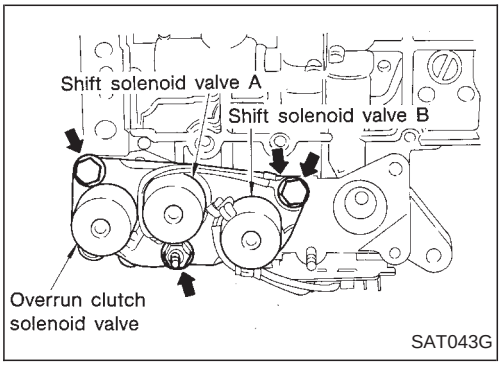
DISASSEMBLY


SAT194B

1. Remove solenoids.
a. Remove torque converter clutch solenoid valve and side plate from lower body.
b. Remove O-ring from solenoid.

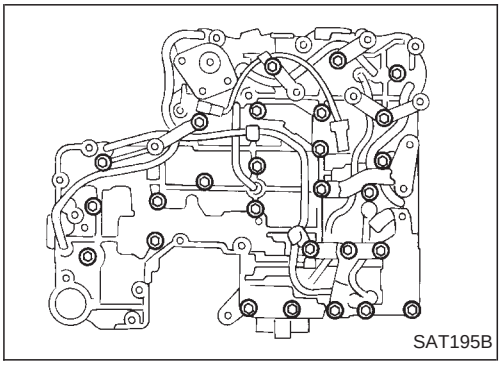

SAT667A

c. Remove line pressure solenoid valve from upper body.
d. Remove O-ring from solenoid.



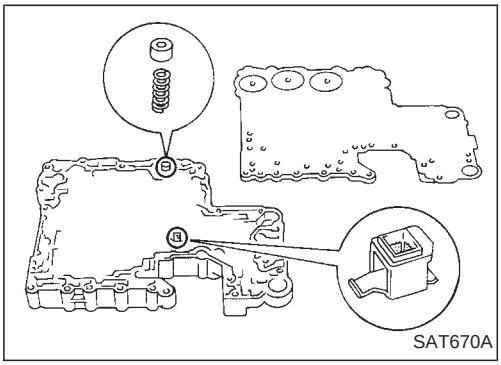
SAT043G

e. Remove 3-unit solenoid assembly from upper body.
f. Remove O-rings from solenoids.


SAT195B

2. Disassemble upper and lower bodies.
a. Place upper body facedown, and remove bolts, reamer bolts and support plates.
b. Remove lower body, separator plate and separate gasket as a unit from upper body.

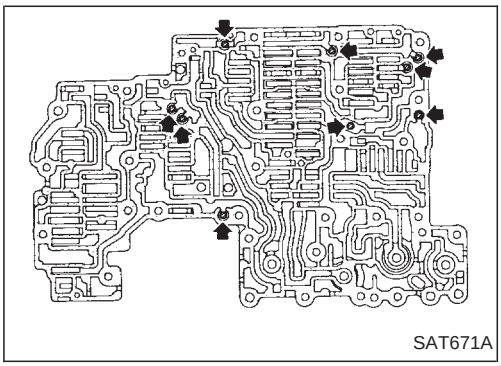
- **Be careful not to drop pilot filter, orience check valve, spring and steel balls.**


SAT670A

c. Place lower body facedown, and remove separate gasket and separator plate.
d. Remove pilot filter, orifice check valve and orifice check spring.

http://vnx.su/

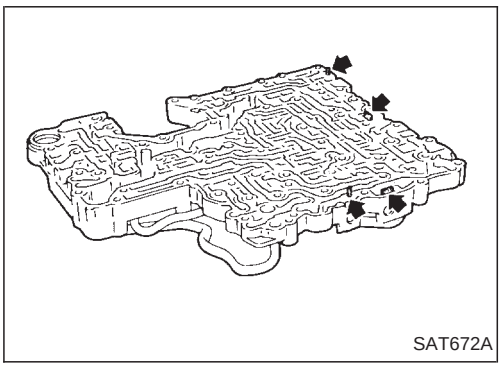
Control Valve Assembly (Cont'd)


SAT671A

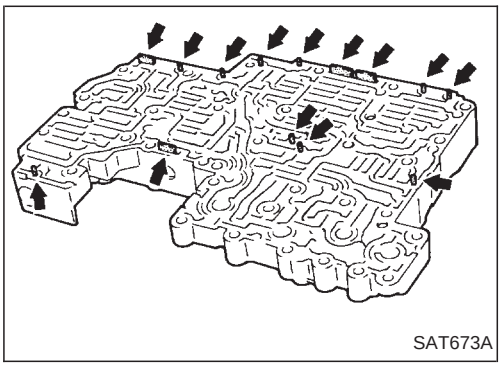
e. Check to see that steel balls are properly positioned in upper body. Then remove them from upper body.

INSPECTION

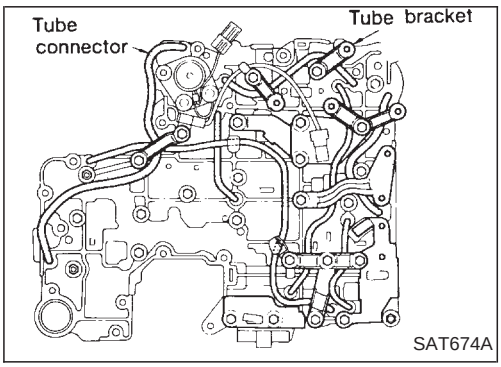
Lower and upper bodies


SAT672A

- Check to see that there are pins and retainer plates in lower body.


SAT673A

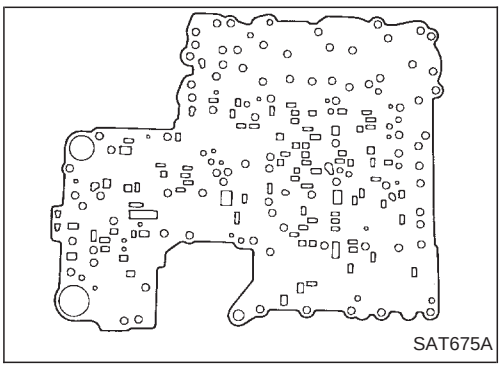
- Check to see that there are pins and retainer plates in upper body.
- **Be careful not to lose these parts.**



SAT674A

- Check to make sure that oil circuits are clean and free from damage.
- Check tube brackets and tube connectors for damage.

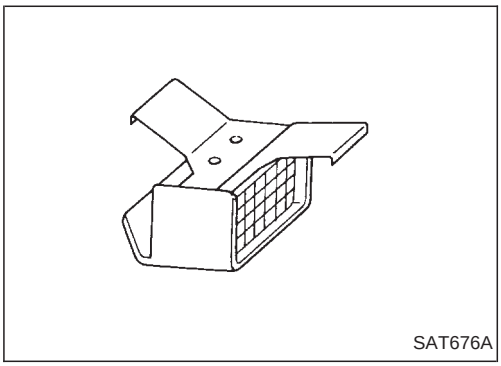
Separator plates


SAT675A

- Make sure that separator plate is free of damage and not deformed and oil holes are clean.

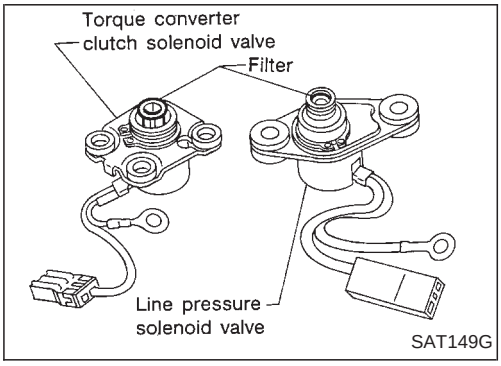
http://vnx.su/

Control Valve Assembly (Cont'd)


SAT676A

Pilot filter

- Check to make sure that filter is not clogged or damaged.



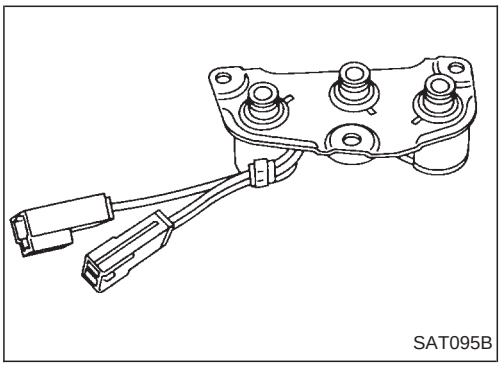
SAT149G

Torque converter clutch solenoid valve

- Check that filter is not clogged or damaged.
- Measure resistance. Refer to "Component Inspection", AT-86.

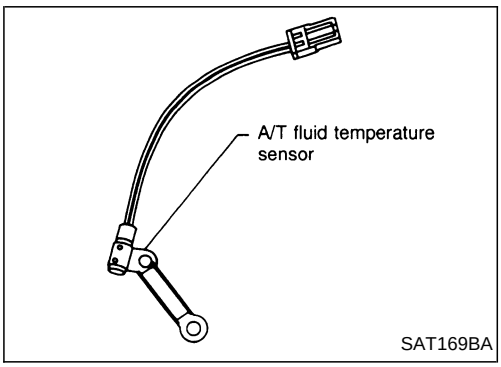
Line pressure solenoid valve

- Check that filter is not clogged or damaged.
- Measure resistance. Refer to "Component Inspection", AT-88.


SAT095B

3-unit solenoid assembly (Overrun clutch solenoid valve and shift solenoid valves A and B)

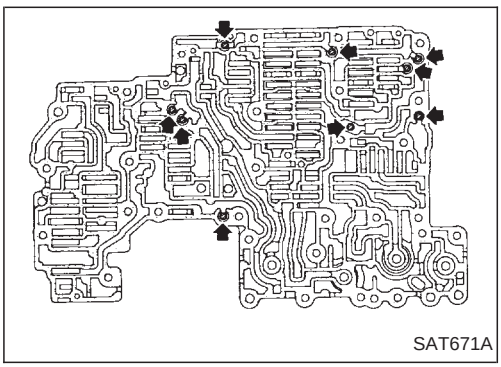
- Measure resistance of each solenoid. Refer to "Component Inspection", AT-66, AT-69, AT-72.



SAT169BA

A/T fluid temperature sensor

- Measure resistance. Refer to "Component Inspection", AT-80.


SAT671A

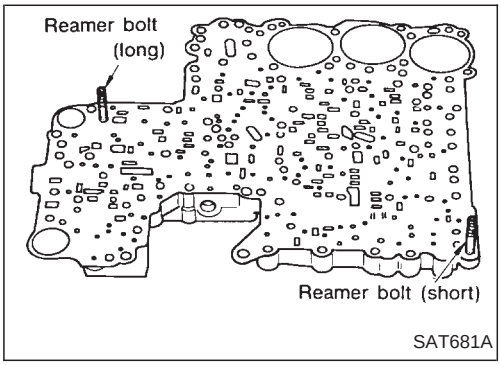
ASSEMBLY

1. Install upper and lower bodies.

a. Place oil circuit of upper body face up. Install steel balls in their proper positions.

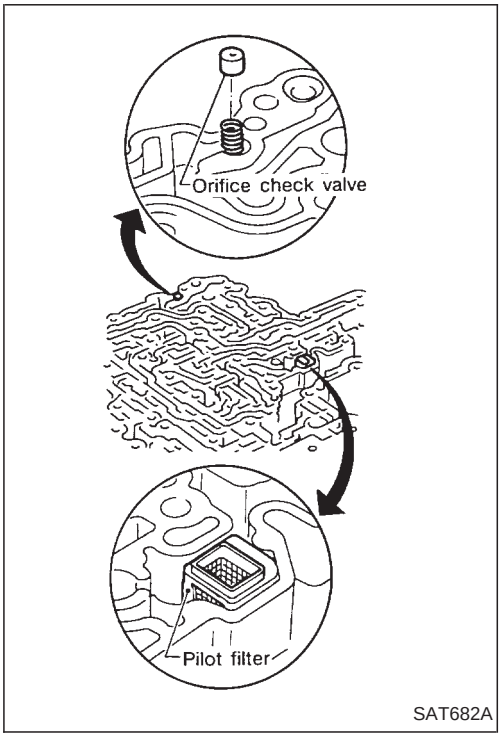
http://vnx.su/

Control Valve Assembly (Cont'd)



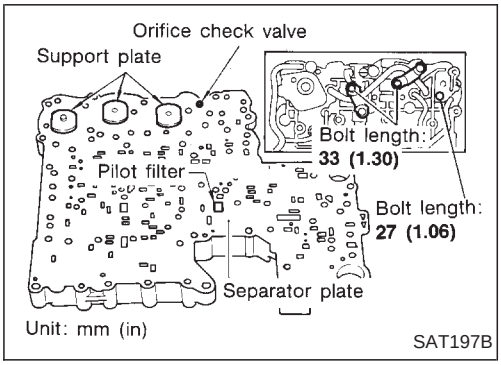
SAT681A

b. Install reamer bolts from bottom of upper body and install separate gaskets.



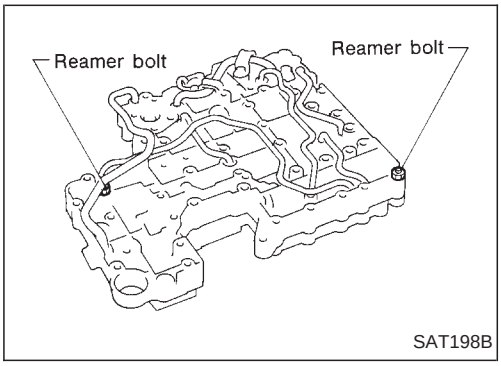
SAT682A

c. Place oil circuit of lower body face up. Install orifice check spring, orifice check valve and pilot filter.



SAT197B

d. Install lower separate gaskets and separator plates on lower body.
e. Install and temporarily tighten support plates, fluid temperature sensor and tube brackets.



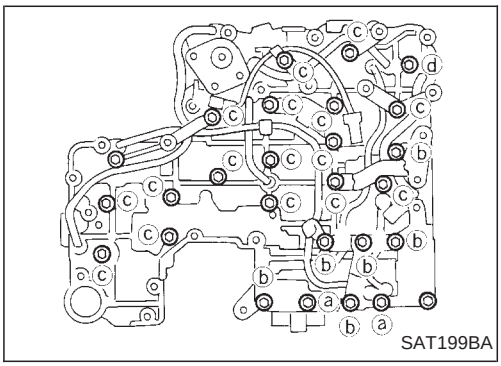
SAT198B

f. Temporarily assemble lower and upper bodies, using reamer bolt as a guide.

- **Be careful not to dislocate or drop steel balls, orifice check spring, orifice check valve and pilot filter.**

http://vnx.su/

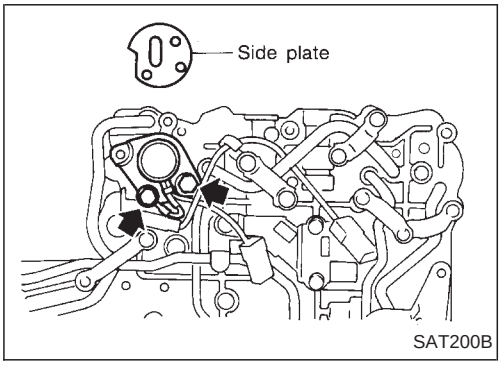
Control Valve Assembly (Cont'd)



g. Install and temporarily tighten bolts and tube brackets in their proper locations.

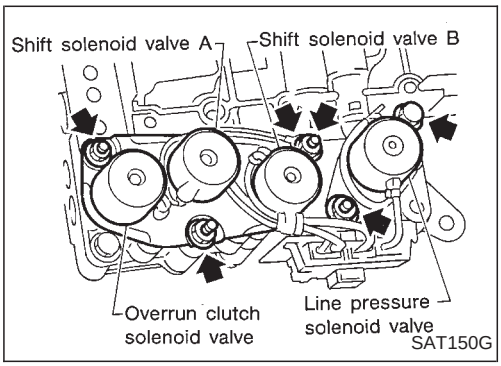
Bolt length and location:

Bolt symbol		ⓐ	ⓑ	ⓒ	ⓓ
Bolt length	mm (in)	70 (2.76)	50 (1.97)	33 (1.30)	27 (1.06)



2. Install solenoids.

a. Attach O-ring and install torque converter clutch solenoid valve and side plates onto lower body.



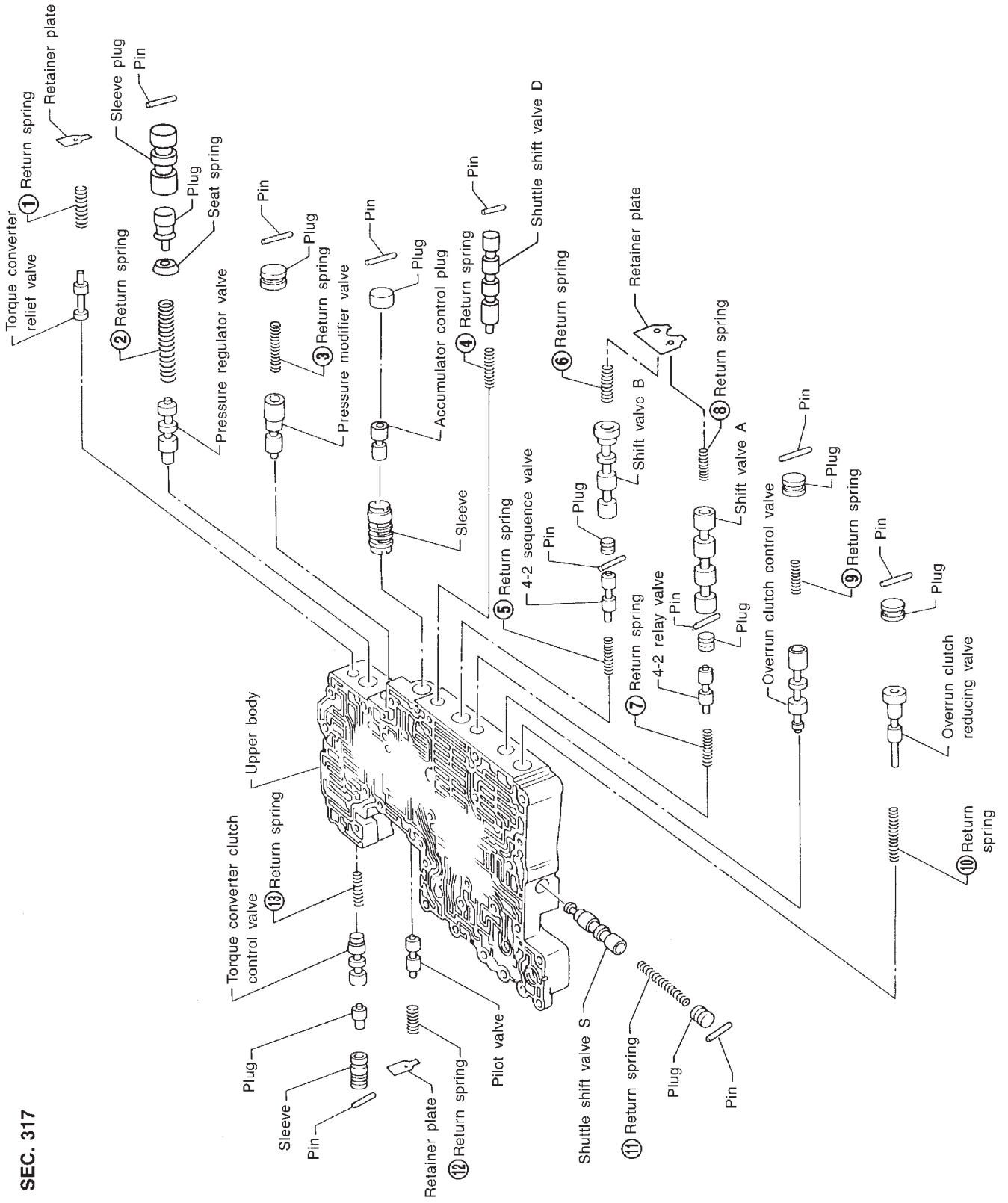
b. Attach O-rings and install 3-unit solenoids assembly onto upper body.

c. Attach O-ring and install line pressure solenoid valve onto upper body.

3. Tighten all bolts.

http://vnx.su/

Control Valve Upper Body



Apply ATF to all components before their installation.

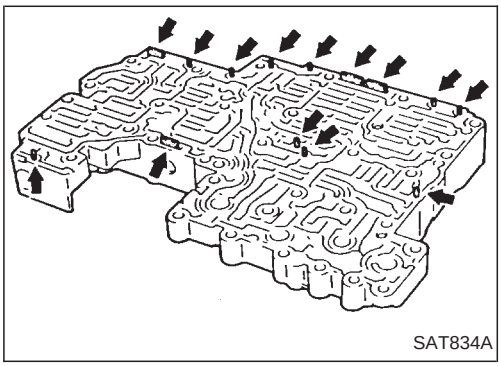
SAT665I

Numbers preceding valve springs correspond with those shown in SDS on page AT-202.

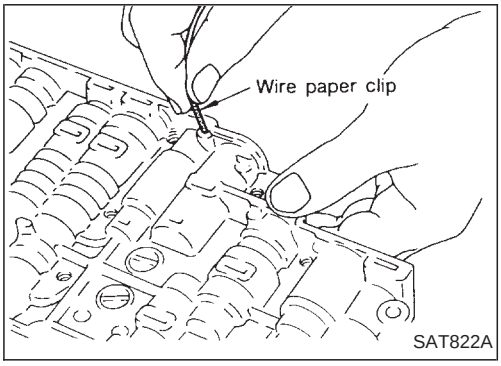
http://vnx.su/

Control Valve Upper Body (Cont'd)

DISASSEMBLY

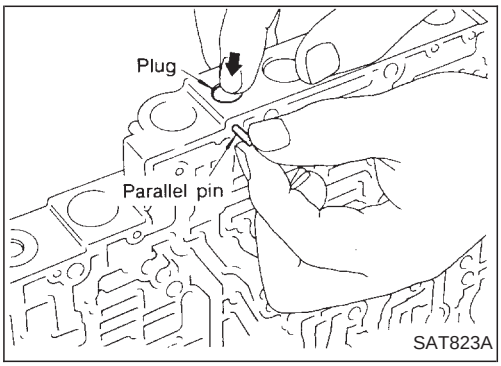

SAT834A

1. Remove valves at parallel pins.
- **Do not use a magnetic hand.**



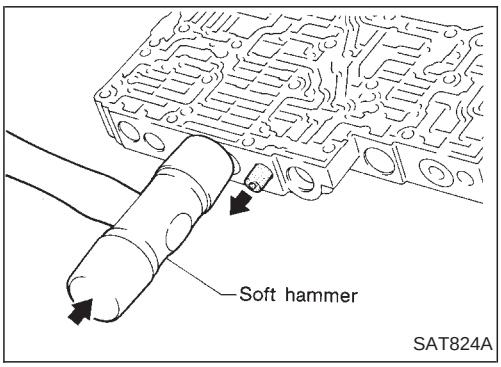
SAT822A

a. Use a wire paper clip to push out parallel pins.



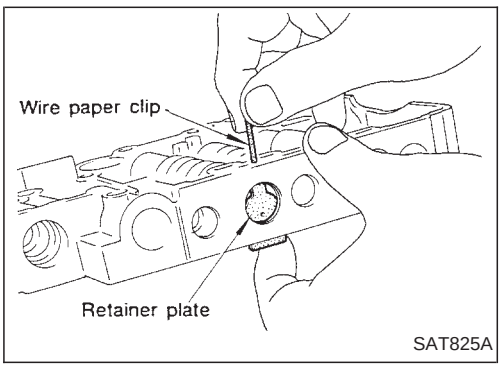
SAT823A

b. Remove parallel pins while pressing their corresponding plugs and sleeves.
- **Remove plug slowly to prevent internal parts from jumping out.**



SAT824A

c. Place mating surface of valve facedown, and remove internal parts.
- **If a valve is hard to remove, place valve body facedown and lightly tap it with a soft hammer.**
- **Be careful not to drop or damage valves and sleeves.**

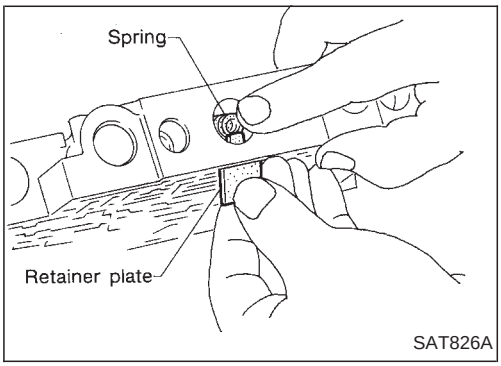


SAT825A

2. Remove valves at retainer plates.
a. Pry out retainer plate with wire paper clip.

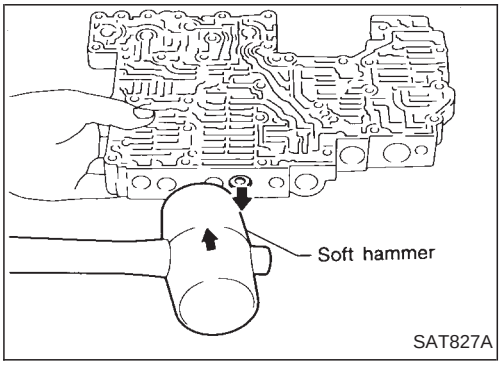
http://vnx.su/

Control Valve Upper Body (Cont'd)



SAT826A

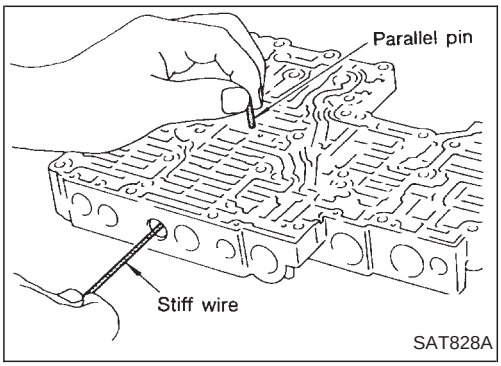
b. Remove retainer plates while holding spring.



SAT827A

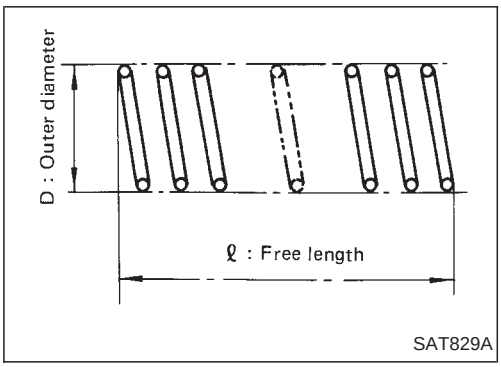
c. Place mating surface of valve facedown, and remove internal parts.

- **If a valve is hard to remove, lightly tap valve body with a soft hammer.**
- **Be careful not to drop or damage valves, sleeves, etc.**



SAT828A

- 4-2 sequence valve and relay valve are located far back in upper body. If they are hard to remove, carefully push them out using stiff wire.
- **Be careful not to scratch sliding surface of valve with wire.**



SAT829A

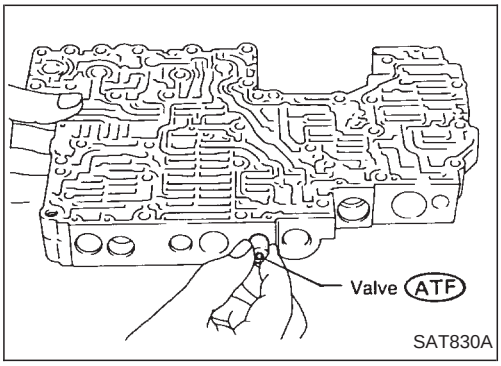
INSPECTION

Valve springs

- Measure free length and outer diameter of each valve spring. Also check for damage or deformation.
  Inspection standard:
  Refer to SDS, AT-202.
- Replace valve springs if deformed or fatigued.

Control valves

- Check sliding surfaces of valves, sleeves and plugs.



SAT830A

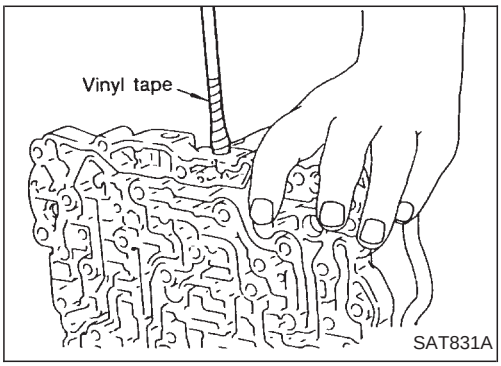
ASSEMBLY

1. Lubricate the control valve body and all valves with ATF. Install control valves by sliding them carefully into their bores.

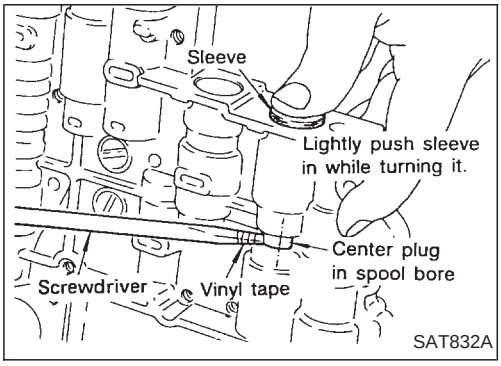
- **Be careful not to scratch or damage valve body.**

http://vnx.su/

Control Valve Upper Body (Cont'd)

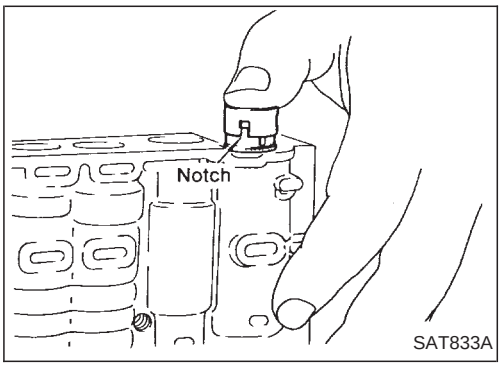


- Wrap a small screwdriver with vinyl tape and use it to insert the valves into proper position.



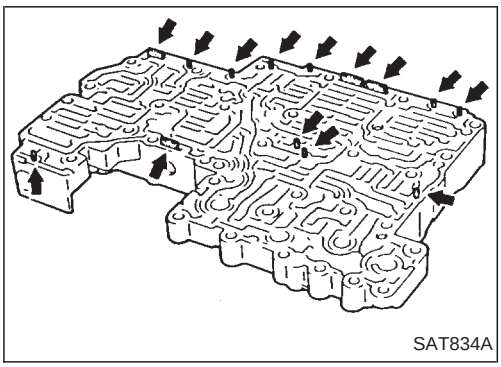
Pressure regulator valve

- If pressure regulator plug is not centered properly, sleeve cannot be inserted into bore in upper body.
  If this happens, use vinyl tape wrapped screwdriver to center sleeve until it can be inserted.
- Turn sleeve slightly while installing.

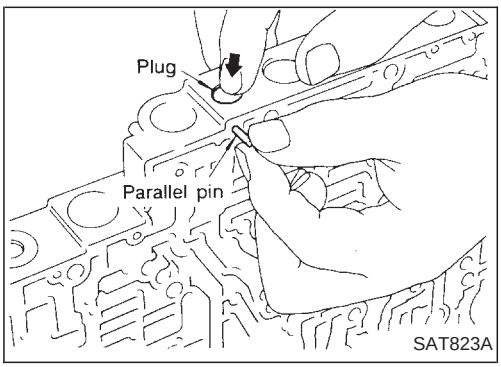


Accumulator control plug

- Align protrusion of accumulator control sleeve with notch in plug.
- Align parallel pin groove in plug with parallel pin, and install accumulator control valve.



2. Install parallel pins and retainer plates.

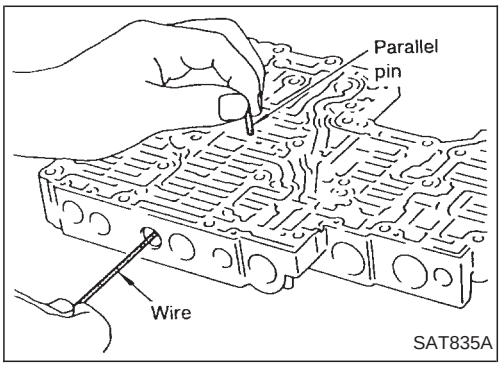


- **While pushing plug, install parallel pin.**

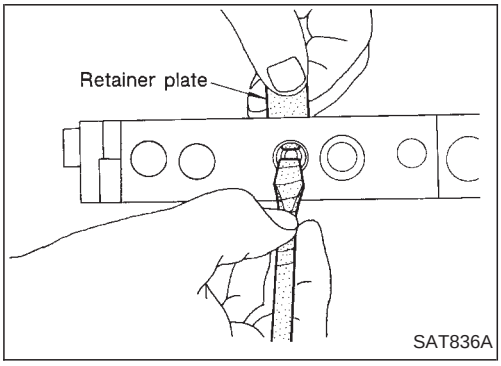
http://vnx.su/

Control Valve Upper Body (Cont'd)

4-2 sequence valve and relay valve



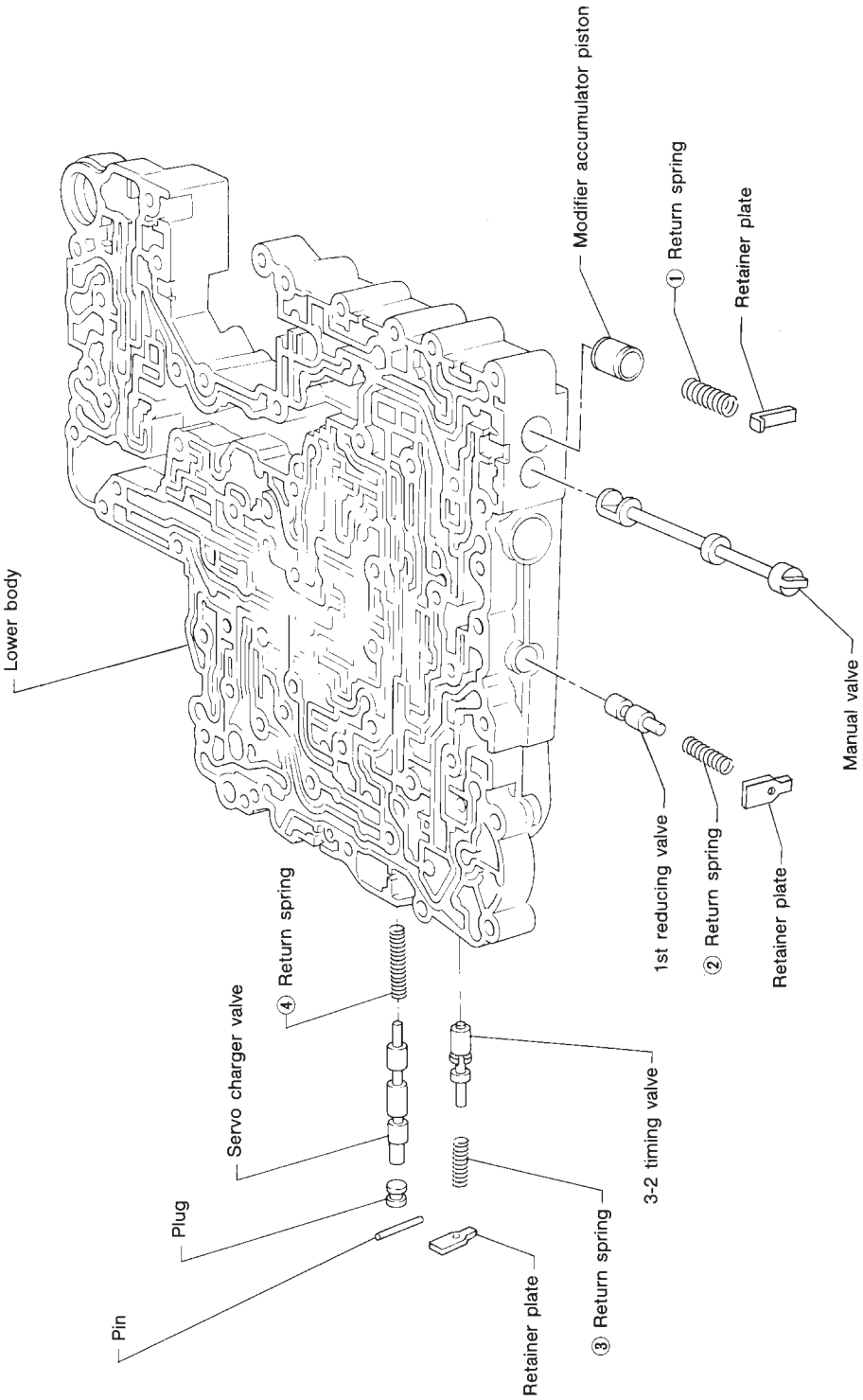
- Push 4-2 sequence valve and relay valve with wire wrapped in vinyl tape to prevent scratching valve body. Install parallel pins.



- Insert retainer plate while pushing spring.

http://vnx.su/

Control Valve Lower Body



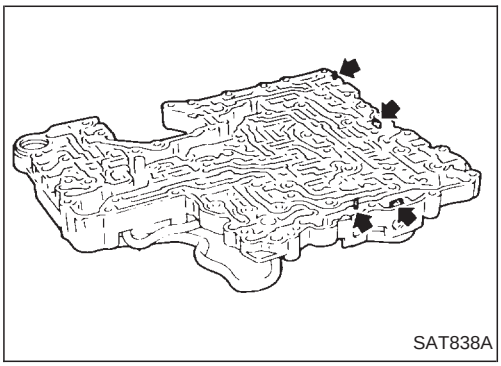
SEC. 317

SAT112GA

Apply ATF to all components before their installation.
Numbers preceding valve springs correspond with those shown in SDS on page AT-202.

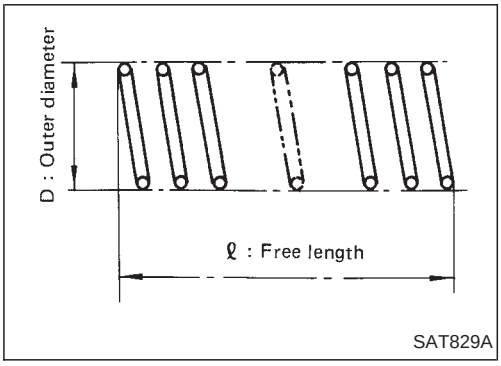
http://vnx.su/

Control Valve Lower Body (Cont'd)


SAT838A

DISASSEMBLY

1. Remove valves at parallel pins.
2. Remove valves at retainer plates.
   For removal procedures, refer to "DISASSEMBLY" of Control Valve Upper Body.



SAT829A

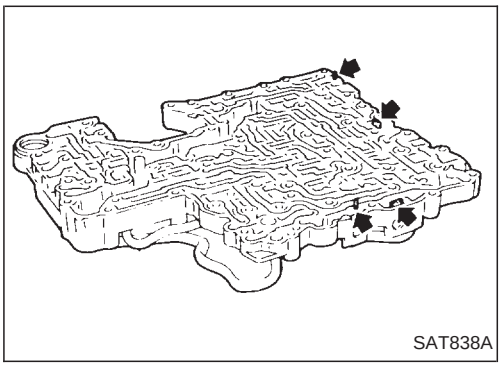
INSPECTION

Valve springs

- Check each valve spring for damage or deformation. Also measure free length and outer diameter.
  Inspection standard:
  Refer to SDS, AT-202.
- Replace valve springs if deformed or fatigued.

Control valves

- Check sliding surfaces of control valves, sleeves and plugs for damage.

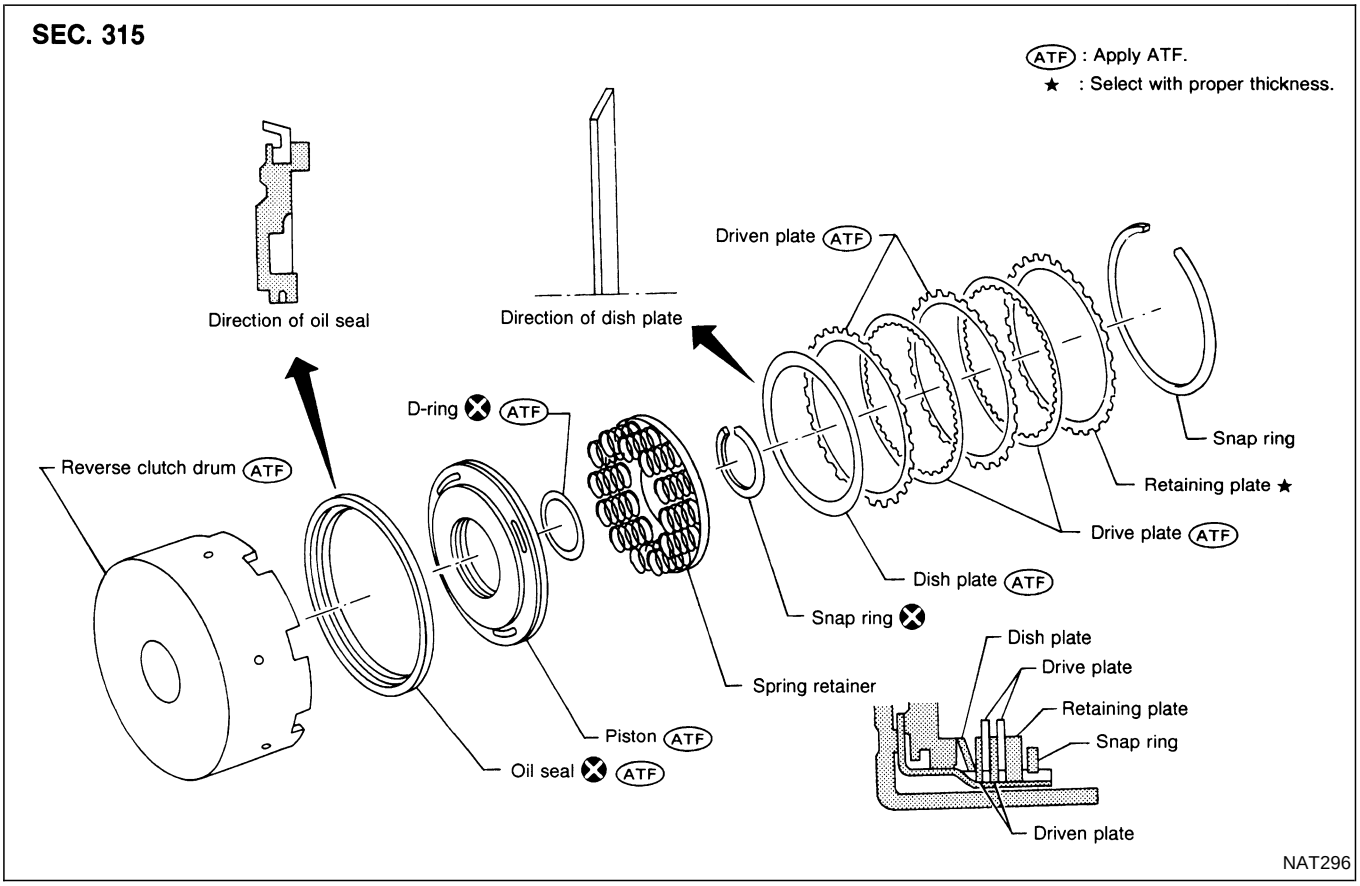

SAT838A

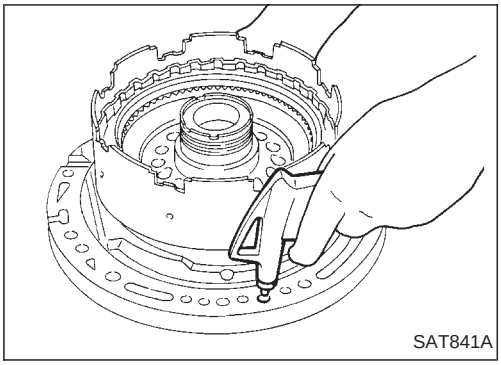
ASSEMBLY

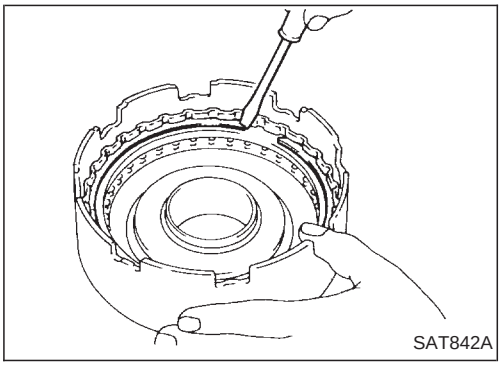
- Install control valves.
  For installation procedures, refer to "ASSEMBLY" of Control Valve Upper Body, AT-151.

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Reverse Clutch




SAT841A


SAT842A

DISASSEMBLY

1. Check operation of reverse clutch.

a. Install seal ring onto oil pump cover and install reverse clutch. Apply compressed air to oil hole.

b. Check to see that retaining plate moves to snap ring.

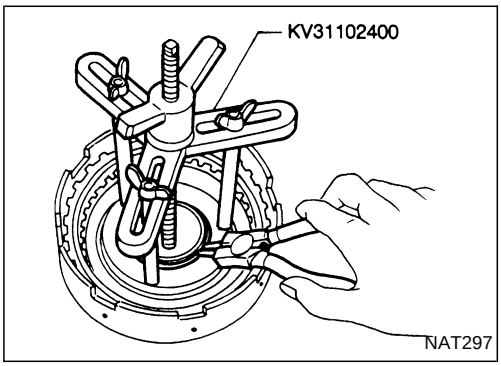
c. If retaining plate does not contact snap ring,

- D-ring might be damaged.
- Oil seal might be damaged.
- Fluid might be leaking past piston check ball.

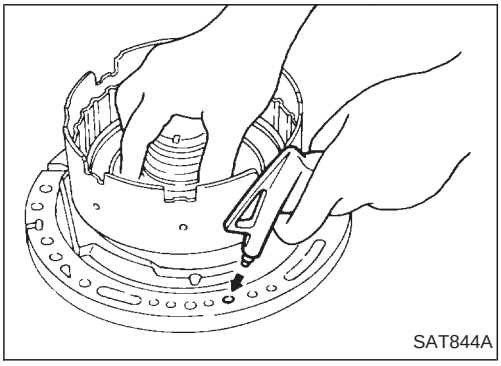
2. Remove drive plates, driven plates, retaining plate, dish plate and snap ring.

http://vnx.su/

Reverse Clutch (Cont'd)



3. Remove snap ring from clutch drum while compressing clutch springs.
- **Do not expand snap ring excessively.**
4. Remove spring retainer and return spring.

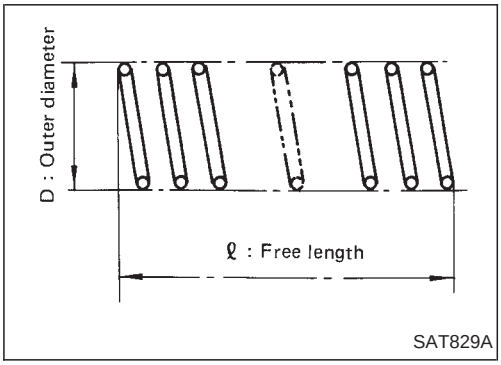


5. Install seal ring onto oil pump cover and install reverse clutch drum. While holding piston, gradually apply compressed air to oil hole until piston is removed.
- **Do not apply compressed air abruptly.**
6. Remove D-ring and oil seal from piston.

INSPECTION

Reverse clutch snap ring and spring retainer

- Check for deformation, fatigue or damage.

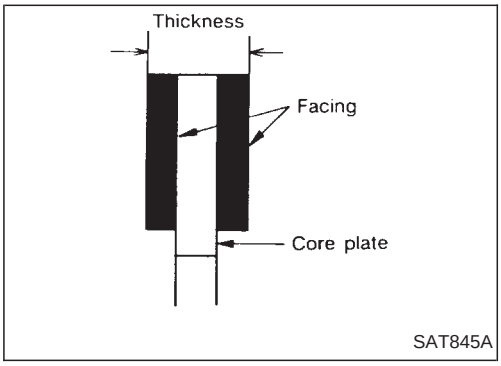


Reverse clutch return springs

- Check for deformation or damage. Also measure free length and outside diameter.

Inspection standard:

Refer to SDS, AT-202.



Reverse clutch drive plates

- Check facing for burns, cracks or damage.
- Measure thickness of facing.

Thickness of drive plate:

Standard value: 1.90 - 2.05 mm (0.0748 - 0.0807 in)

Wear limit: 1.80 mm (0.0709 in)

- If not within wear limit, replace.

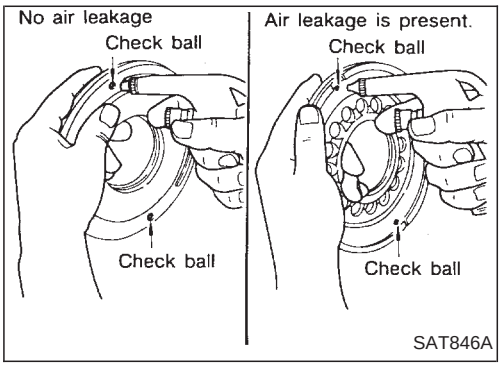
Reverse clutch dish plate

- Check for deformation or damage.

http://vnx.su/

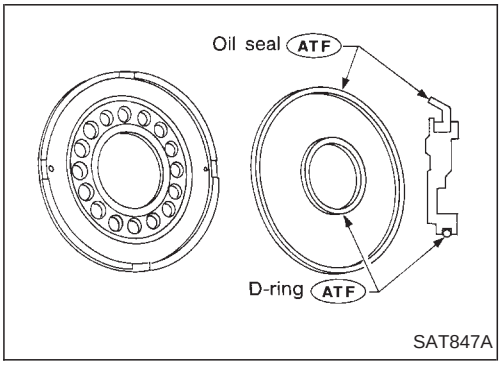
Reverse Clutch (Cont'd)

Reverse clutch piston

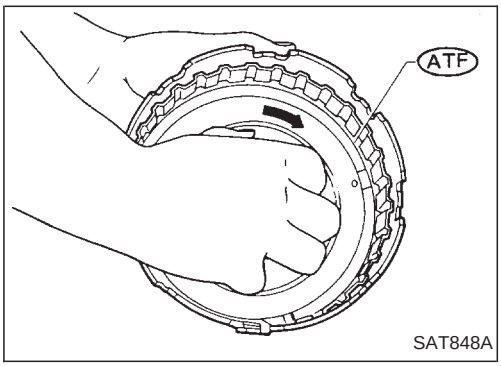


- Shake piston to assure that balls are not seized.
- Apply compressed air to check ball oil hole opposite the return spring. Make sure there is no air leakage.
- Also apply compressed air to oil hole on return spring side to assure that air leaks past ball.

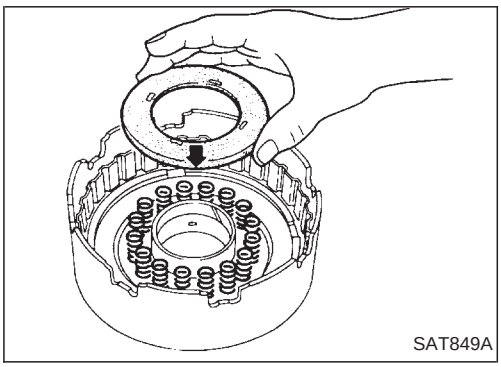
ASSEMBLY



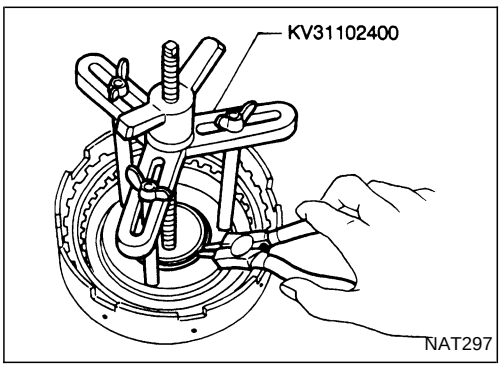
1. Install D-ring and oil seal on piston.
- **Apply ATF to both parts.**



2. Install piston assembly by turning it slowly and evenly.
- **Apply ATF to inner surface of drum.**



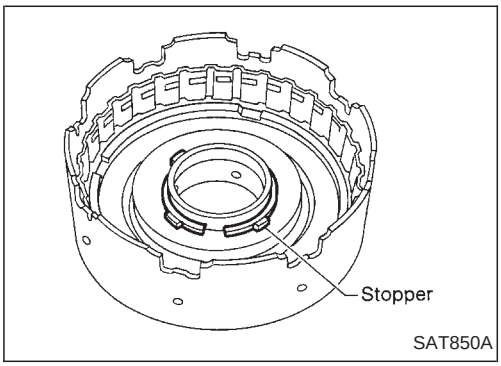
3. Install return springs and spring retainer.



4. Install snap ring while compressing clutch springs.

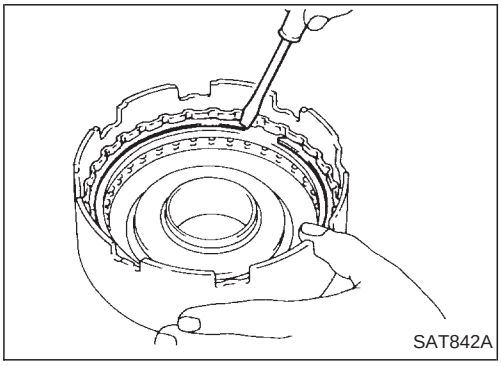
http://vnx.su/

Reverse Clutch (Cont'd)

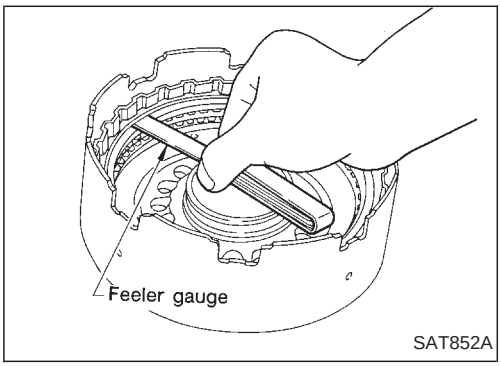


SAT850A

- **Do not align snap ring gap with spring retainer stopper.**

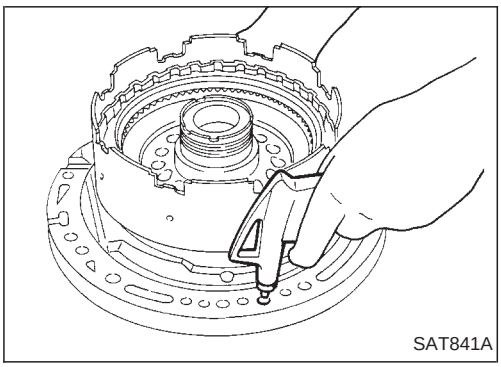

SAT842A

5. Install drive plates, driven plates, retaining plate and dish plate.
6. Install snap ring.



SAT852A

7. Measure clearance between retaining plate and snap ring. If not within allowable limit, select proper retaining plate.
   Specified clearance:
   Standard
   0.5 - 0.8 mm (0.020 - 0.031 in)
   Allowable limit
   1.2 mm (0.047 in)
   Retaining plate:
   Refer to SDS, AT-203.


SAT841A

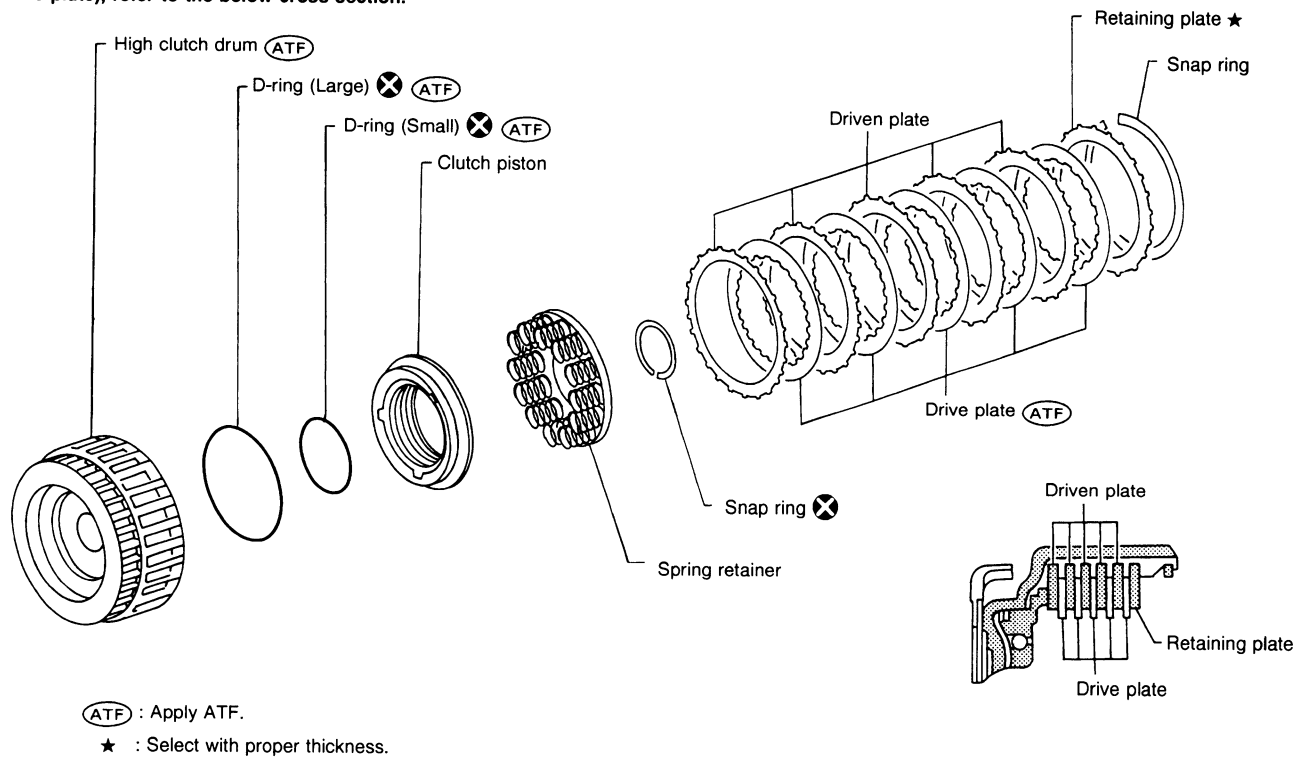
8. Check operation of reverse clutch.
   Refer to "DISASSEMBLY" of Reverse Clutch, AT-156.

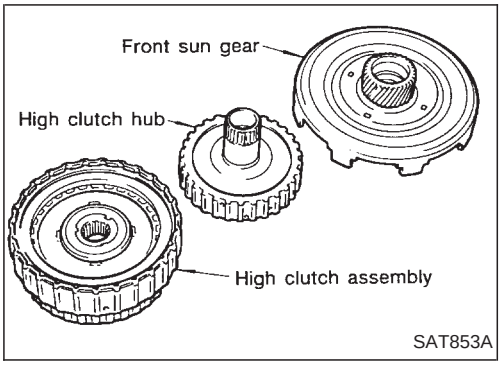
http://vnx.su/

High Clutch

SEC. 315

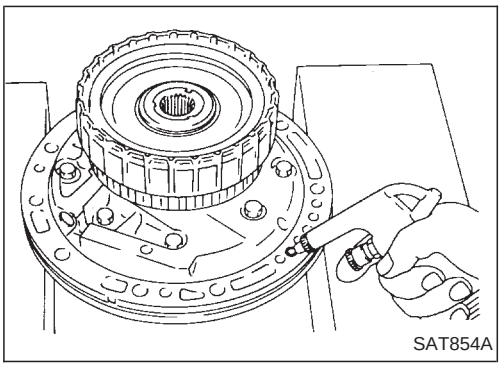
For the number of clutch sheets (drive plate and drive plate), refer to the below cross-section.





DISASSEMBLY AND ASSEMBLY

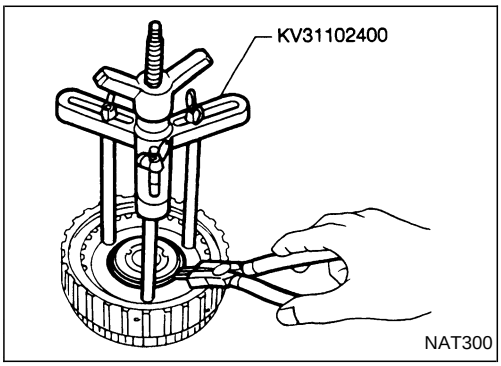
Service procedures for high clutch are essentially the same as those for reverse clutch, with the following exception:



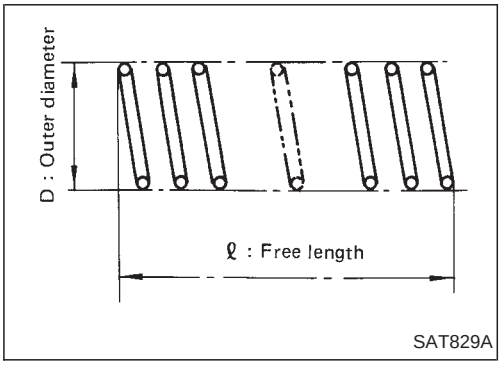
- Check of high clutch operation

http://vnx.su/

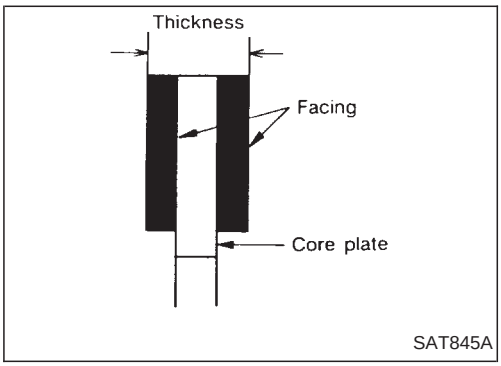
High Clutch (Cont'd)



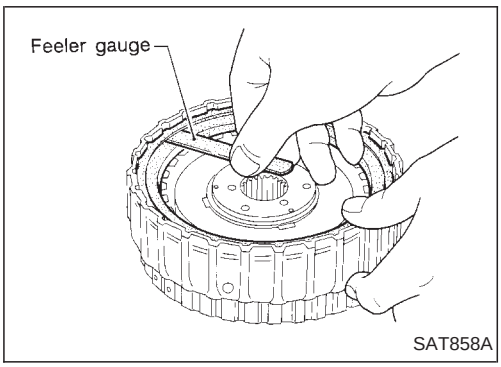
- Removal and installation of return spring



- Inspection of high clutch return springs
  Inspection standard:
  Refer to SDS, AT-202.



- Inspection of high clutch drive plate
  Thickness of drive plate:
  Standard
  1.52 - 1.67 mm (0.0598 - 0.0657 in)
  Wear limit
  1.40 mm (0.0551 in)

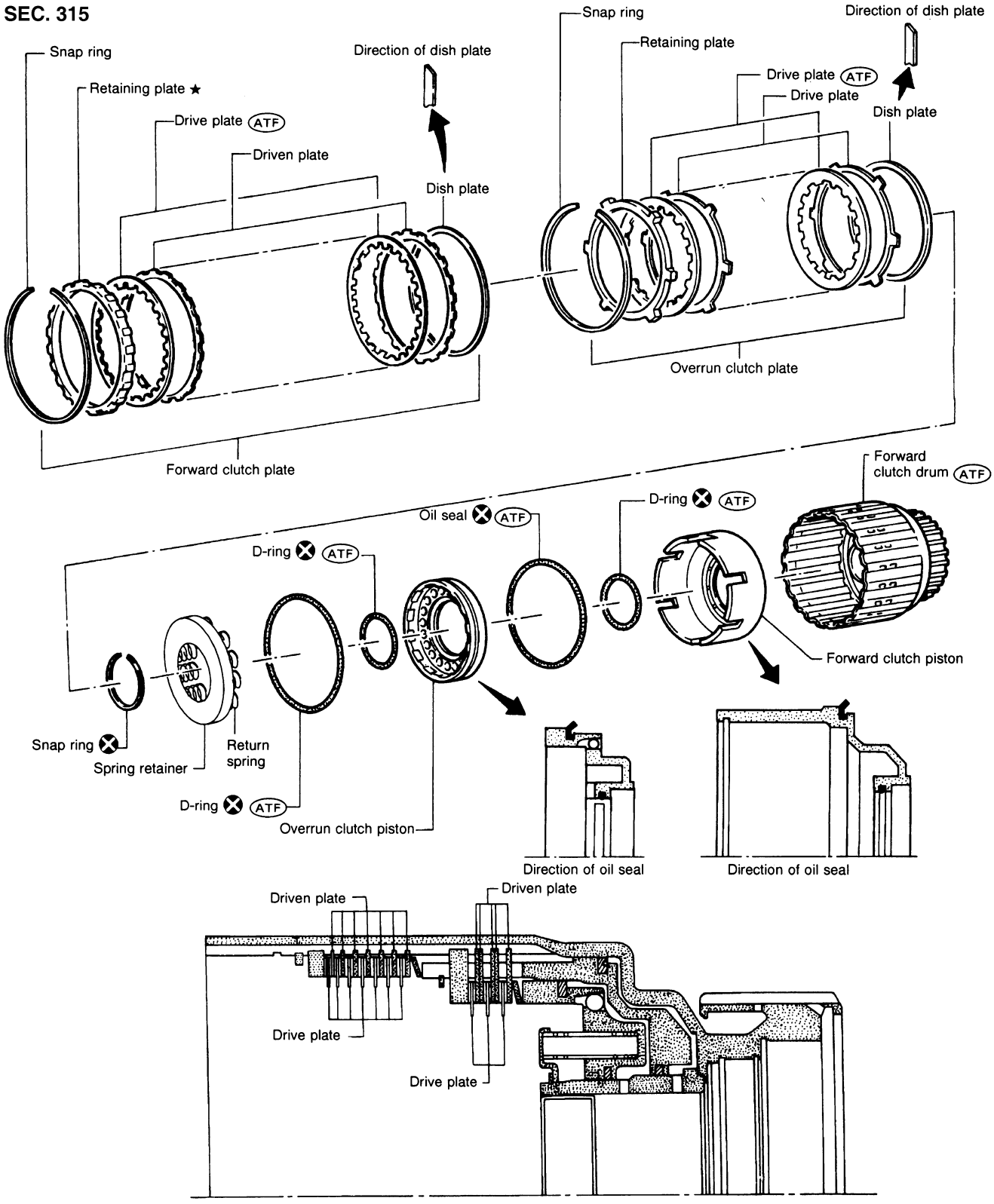


- Measurement of clearance between retaining plate and snap ring
  Specified clearance:
  Standard
  1.8 - 2.2 mm (0.071 - 0.087 in)
  Allowable limit
  3.2 mm (0.126 in)
  Retaining plate:
  Refer to SDS, AT-203.

http://vnx.su/

Forward and Overrun Clutches

SEC. 315



NAT301

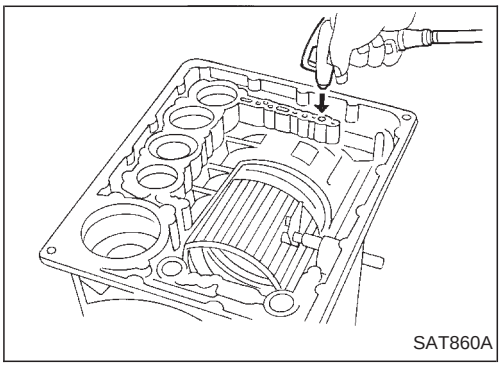
http://vnx.su/

Forward and Overrun Clutches (Cont'd)

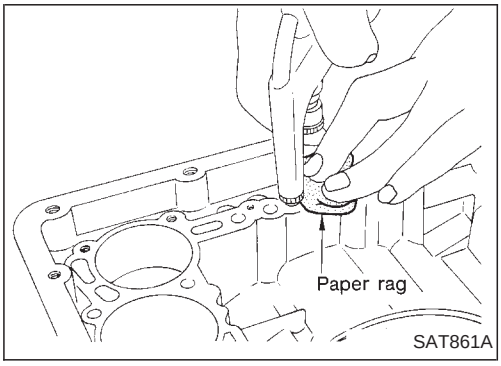
DISASSEMBLY AND ASSEMBLY

Forward and overrun clutches are serviced essentially the same way as reverse clutch is serviced. However, note the following exceptions.

- Check of forward clutch operation.


SAT860A

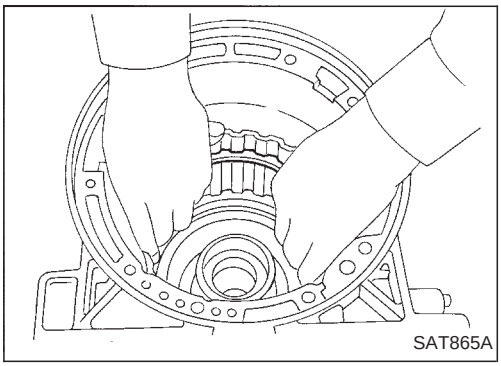
- Check of overrun clutch operation.



SAT861A

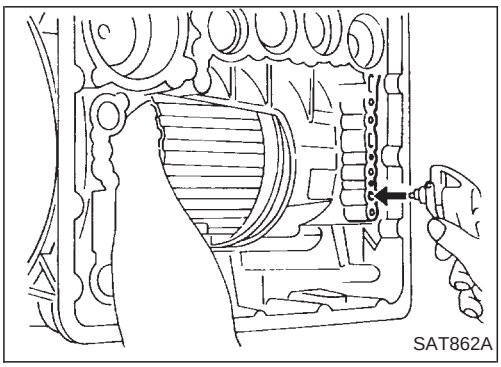
- Removal of forward clutch drum

  Remove forward clutch drum from transmission case by holding snap ring.

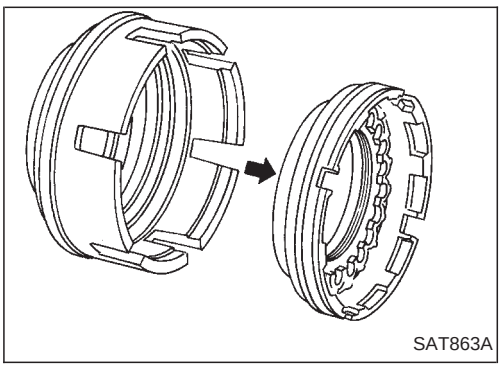

SAT865A

- Removal of forward clutch and overrun clutch pistons

1. While holding overrun clutch piston, gradually apply compressed air to oil hole.

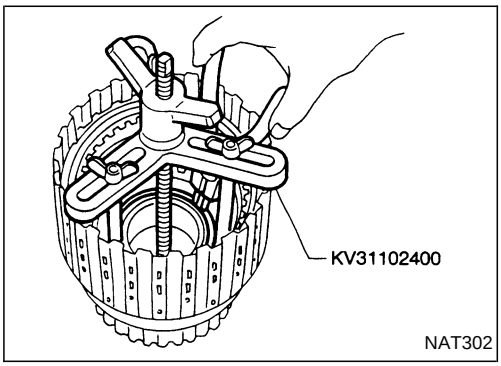

SAT862A

2. Remove overrun clutch from forward clutch.

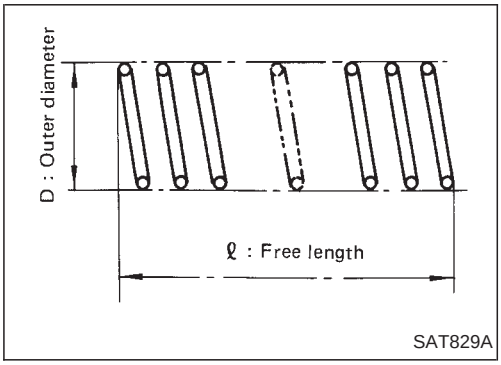

SAT863A

http://vnx.su/

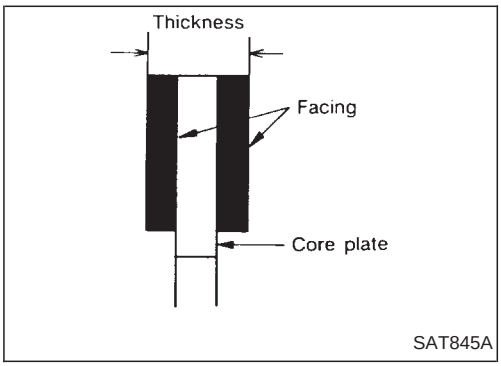
Forward and Overrun Clutches (Cont'd)



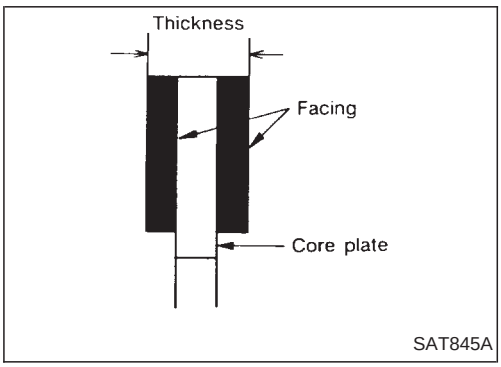
- Removal and installation of return springs



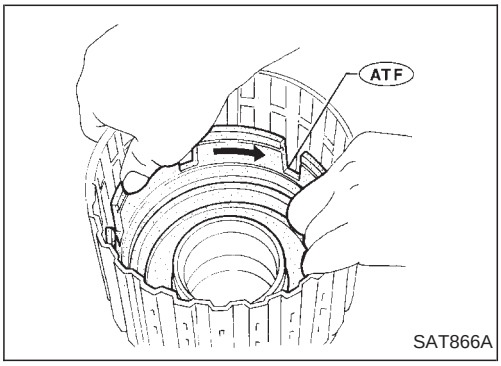
- Inspection of forward clutch and overrun clutch return springs
  Inspection standard:
  Refer to SDS, AT-202.



- Inspection of forward clutch drive plates
  Thickness of drive plate:
  Standard
  1.52 - 1.67 mm (0.0598 - 0.0657 in)
  Wear limit
  1.40 mm (0.0551 in)



- Inspection of overrun clutch drive plates
  Thickness of drive plate:
  Standard
  1.90 - 2.05 mm (0.0748 - 0.0807 in)
  Wear limit
  1.80 mm (0.0709 in)



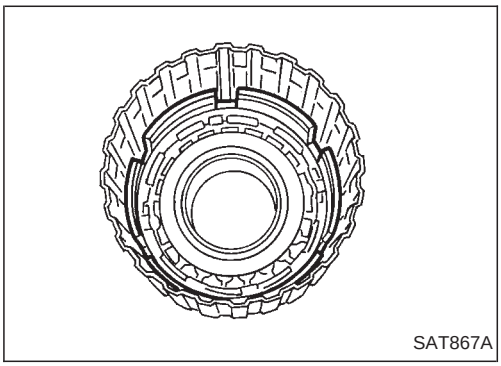
- Installation of forward clutch piston and overrun clutch piston

1. Install forward clutch piston by turning it slowly and evenly.

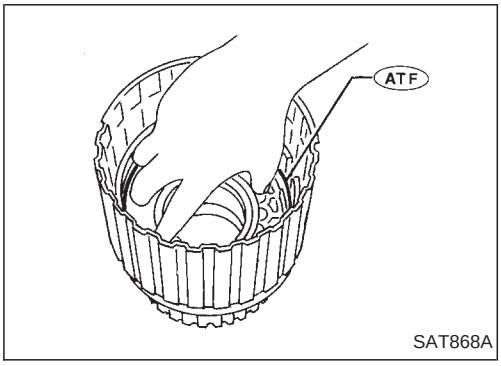
- **Apply ATF to inner surface of clutch drum.**

http://vnx.su/

Forward and Overrun Clutches (Cont'd)

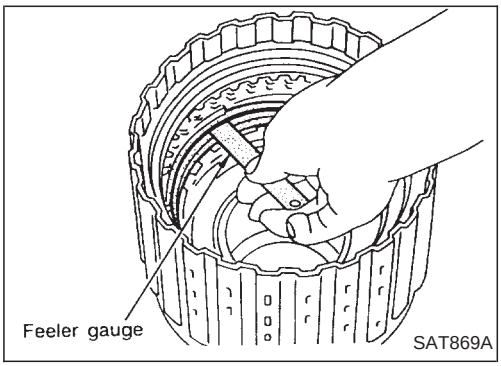

SAT867A

- **Align notch in forward clutch piston with groove in forward clutch drum.**



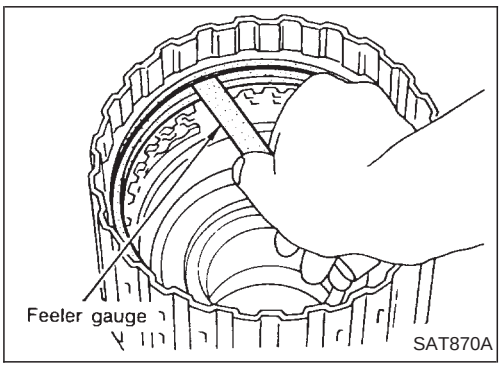
SAT868A

2. Install overrun clutch by turning it slowly and evenly.
- **Apply ATF to inner surface of forward clutch piston.**



SAT869A

- Measurement of clearance between retaining plate and snap ring of overrun clutch
  Specified clearance:
  Standard
  1.0 - 1.4 mm (0.039 - 0.055 in)
  Allowable limit
  2.0 mm (0.079 in)
  Retaining plate:
  Refer to SDS, AT-203.

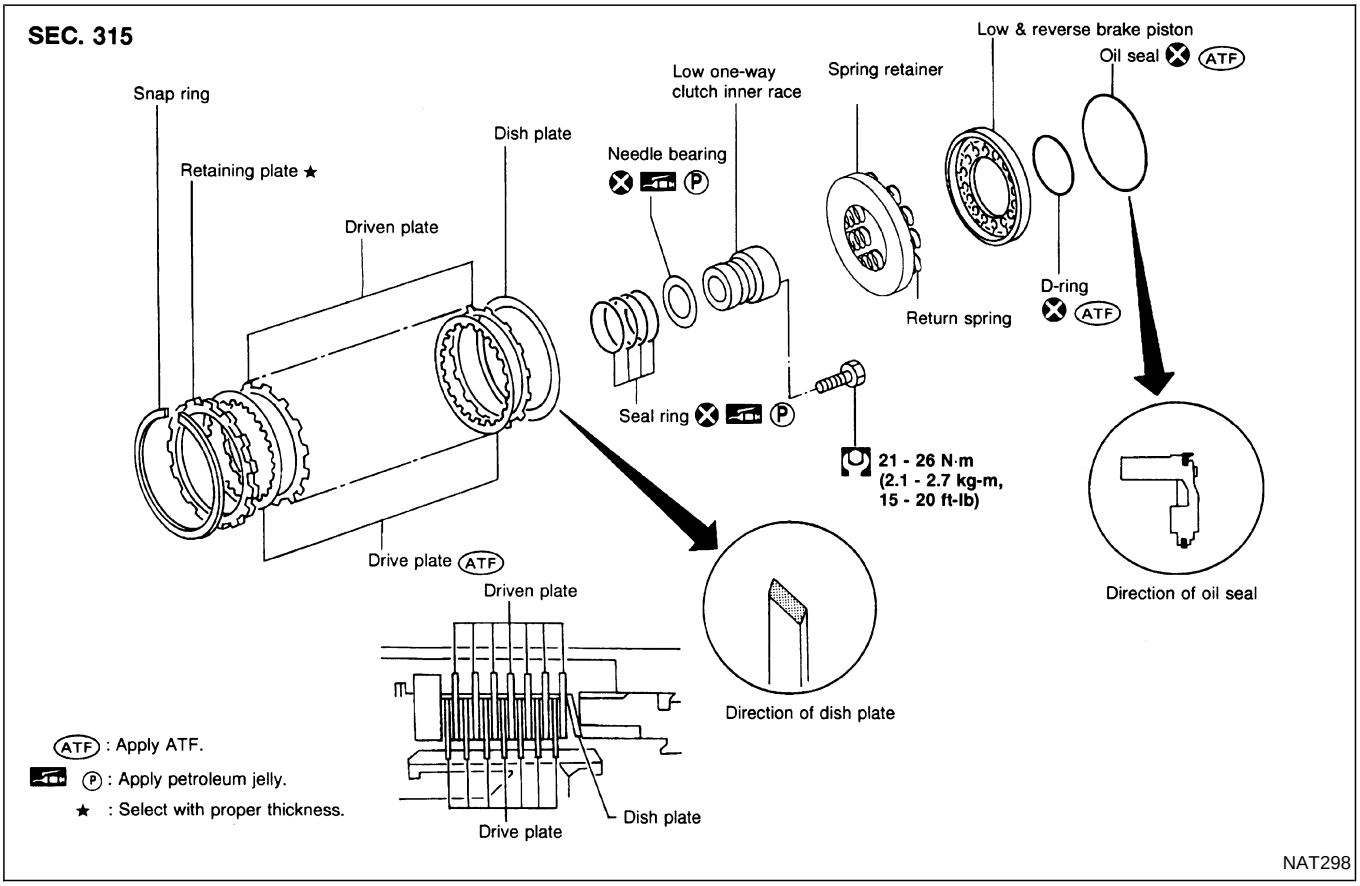


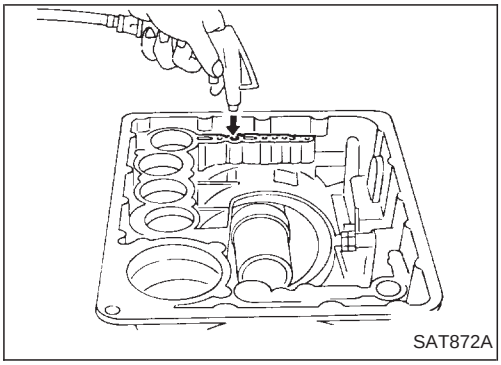
SAT870A

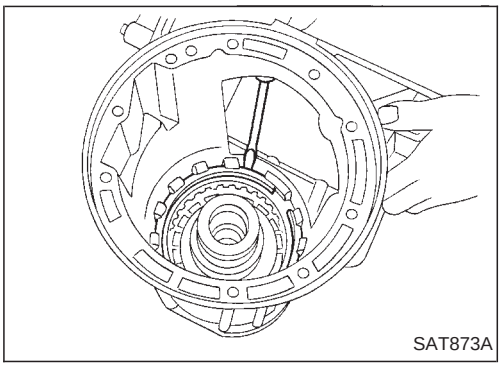
- Measurement of clearance between retaining plate and snap ring of forward clutch
  Specified clearance:
  Standard
  0.45 - 0.75 mm (0.0138 - 0.0295 in)
  Allowable limit
  2.15 mm (0.0846 in)
  Retaining plate:
  Refer to SDS, AT-203.

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Low & Reverse Brake







DISASSEMBLY

1. Check operation of low and reverse brake.

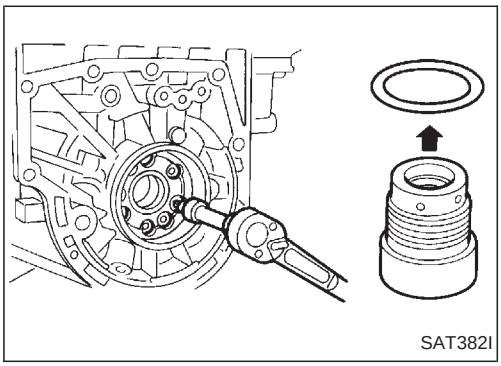
a. Install seal ring onto oil pump cover and install reverse clutch. Apply compressed air to oil hole.
b. Check to see that retaining plate moves to snap ring.
c. If retaining plate does not contact snap ring,

- D-ring might be damaged.
- Oil seal might be damaged.
- Fluid might be leaking past piston check ball.

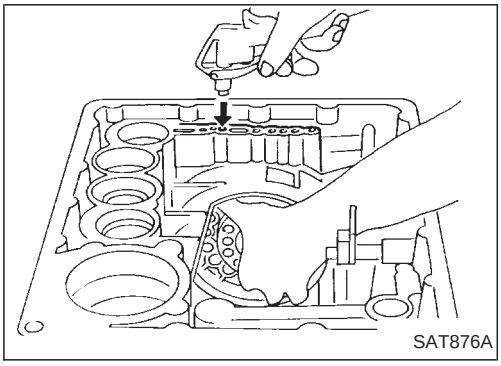
2. Remove snap ring, low and reverse brake drive plates, driven plates and dish plate.

http://vnx.su/

Low & Reverse Brake (Cont'd)


SAT382I

3. Remove low one-way clutch inner race, spring retainer and return spring from transmission case.
4. Remove seal rings from low one-way clutch inner race.
5. Remove needle bearing from low one-way clutch inner race.

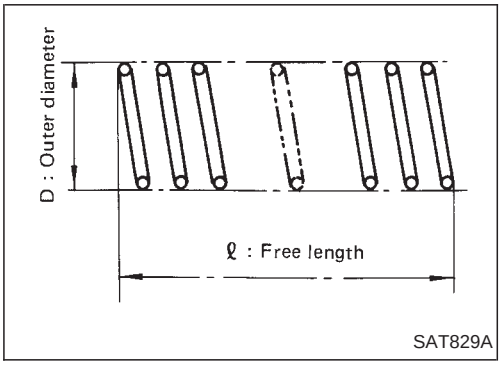

SAT876A

6. Remove low and reverse brake piston using compressed air.
7. Remove oil seal and D-ring from piston.

INSPECTION

Low and reverse brake snap ring and spring retainer

- Check for deformation, or damage.



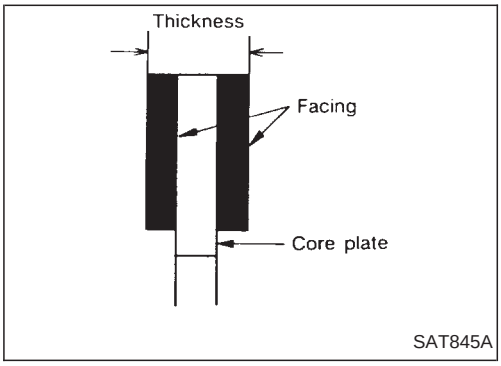
SAT829A

Low and reverse brake return springs

- Check for deformation or damage. Also measure free length and outside diameter.

  Inspection standard:

  Refer to SDS, AT-202.



SAT845A

Low and reverse brake drive plates

- Check facing for burns, cracks or damage.
- Measure thickness of facing.

  Thickness of drive plate:

  Standard value

  1.52 - 1.67 mm (0.0598 - 0.0657 in)

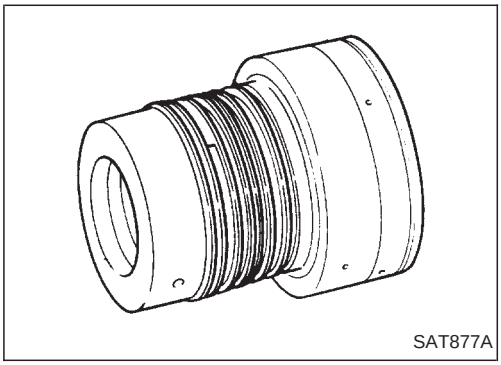
  Wear limit

  1.4 mm (0.055 in)
- If not within wear limit, replace.

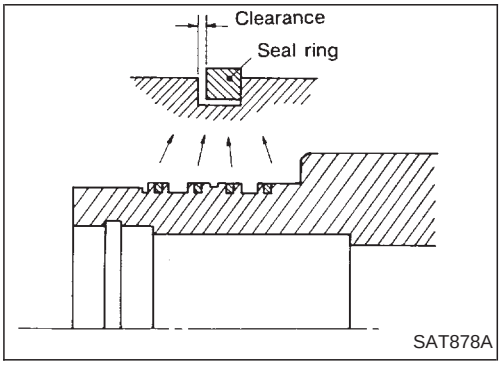
http://vnx.su/

Low & Reverse Brake (Cont'd)

Low one-way clutch inner race


SAT877A

- Check frictional surface of inner race for wear or damage.



SAT878A

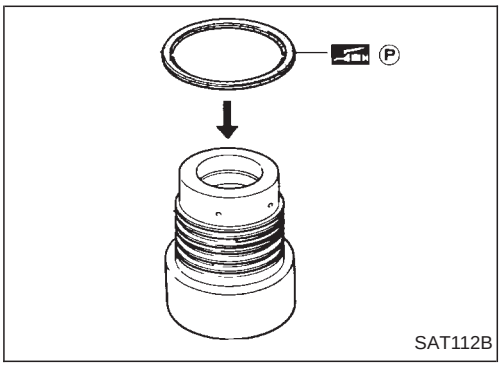
- Install a new seal rings onto low one-way clutch inner race.
- **Be careful not to expand seal ring gap excessively.**
- Measure seal ring-to-groove clearance.

  Inspection standard:

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

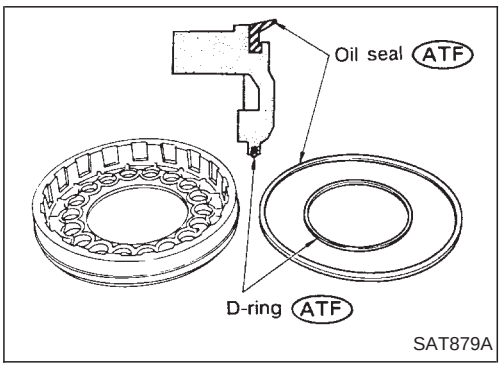
  Allowable limit: 0.25 mm (0.0098 in)
- If not within allowable limit, replace low one-way clutch inner race.

ASSEMBLY



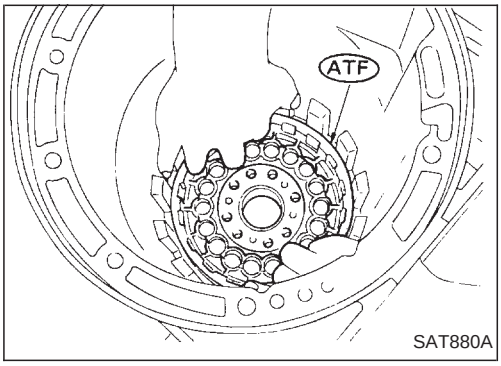
SAT112B

1. Install needle bearing onto one-way clutch inner race.
- **Pay attention to its direction — Black surface goes to rear side.**
- **Apply petroleum jelly to needle bearing.**



SAT879A

2. Install oil seal and D-ring onto piston.
- **Apply ATF to oil seal and D-ring.**

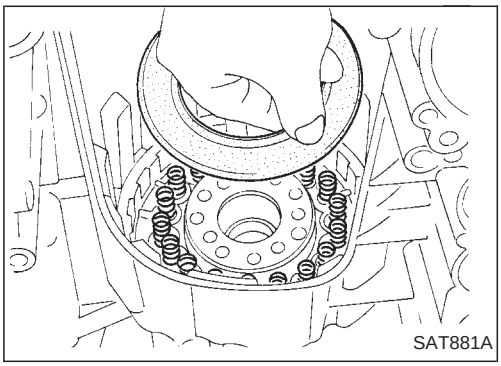


SAT880A

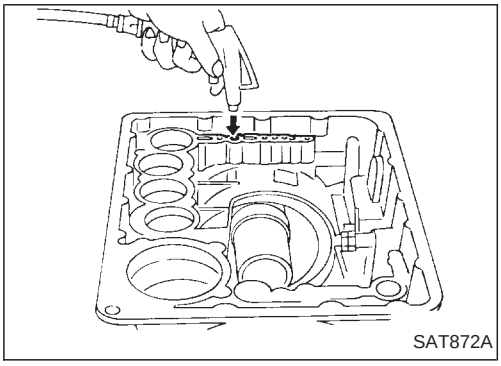
3. Install piston by rotating it slowly and evenly.
- **Apply ATF to inner surface of transmission case.**

http://vnx.su/

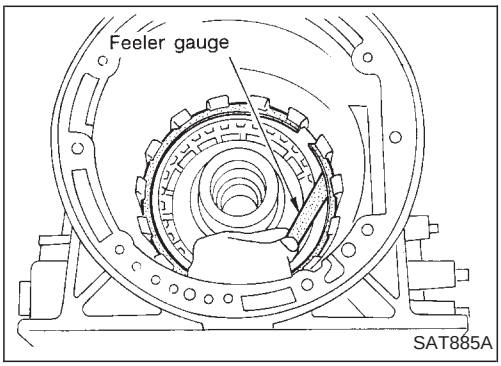
Low & Reverse Brake (Cont'd)


SAT881A

4. Install return springs, spring retainer and low one-way clutch inner race onto transmission case.
5. Install dish plate, low and reverse brake drive plates, driven plates and retaining plate.
6. Install snap ring on transmission case.

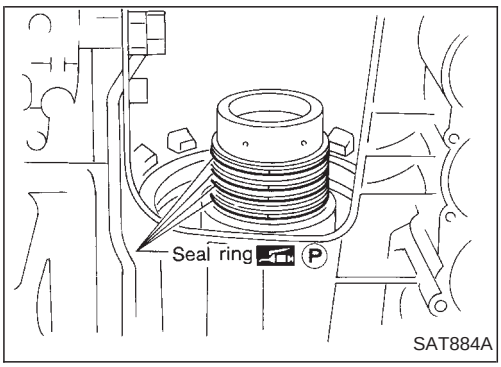

SAT872A

7. Check operation of low and reverse brake clutch piston. Refer to "DISASSEMBLY", AT-166.



SAT885A

8. Measure clearance between retaining plate and snap ring. If not within allowable limit, select proper retaining plate.
   Specified clearance:
   Standard
   0.8 - 1.1 mm (0.031 - 0.043 in)
   Allowable limit
   2.5 mm (0.098 in)
   Retaining plate:
   Refer to SDS, AT-203.

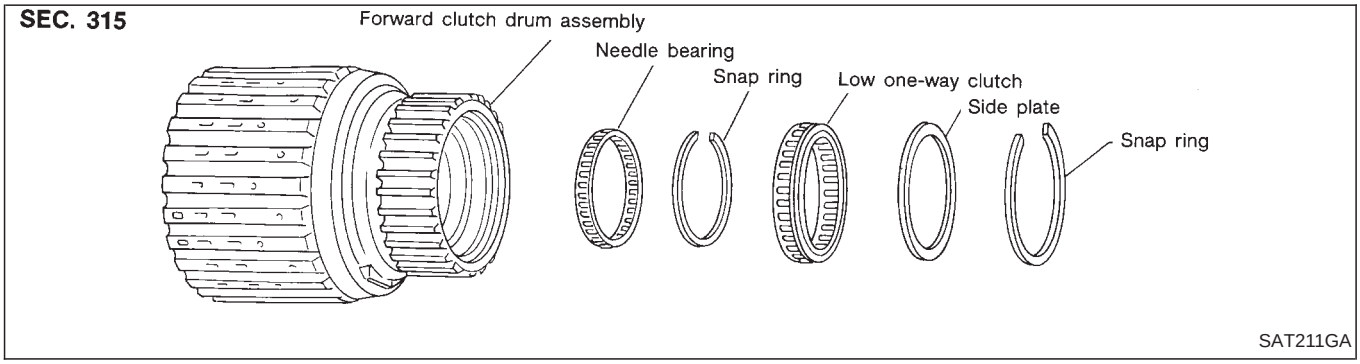


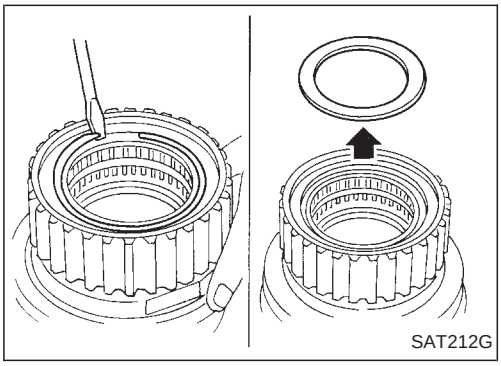
SAT884A

9. Install low one-way clutch inner race seal ring.
- **Apply petroleum jelly to seal ring.**
- **Make sure seal rings are pressed firmly into place and held by petroleum jelly.**

http://vnx.su/

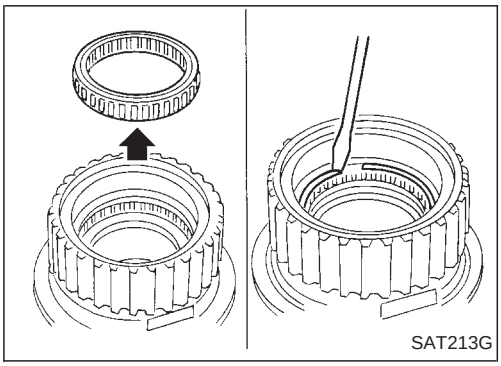
Forward Clutch Drum Assembly



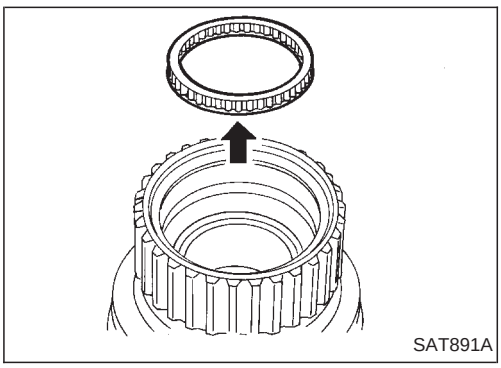


DISASSEMBLY

1. Remove snap ring from forward clutch drum.
2. Remove side plate from forward clutch drum.



3. Remove low one-way clutch from forward clutch drum.
4. Remove snap ring from forward clutch drum.

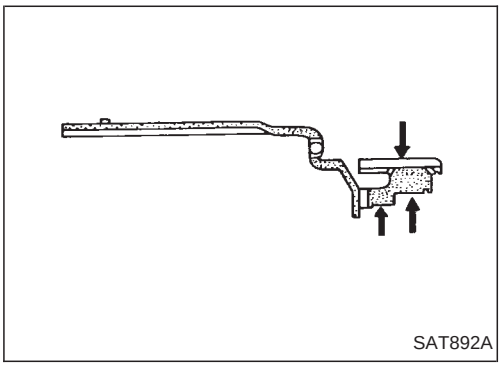


5. Remove needle bearing from forward clutch drum.

http://vnx.su/

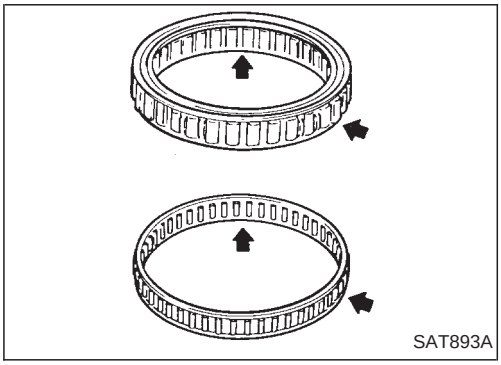
Forward Clutch Drum Assembly (Cont'd)

INSPECTION


SAT892A

Forward clutch drum

- Check spline portion for wear or damage.
- Check frictional surfaces of low one-way clutch and needle bearing for wear or damage.

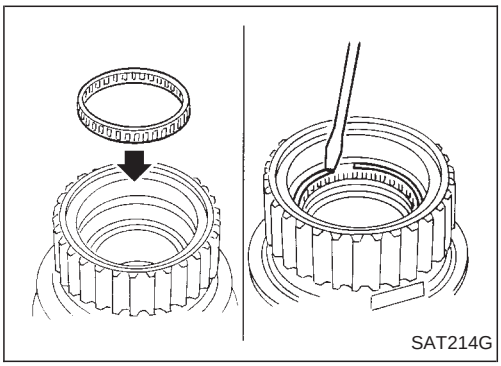

SAT893A

Needle bearing and low one-way clutch

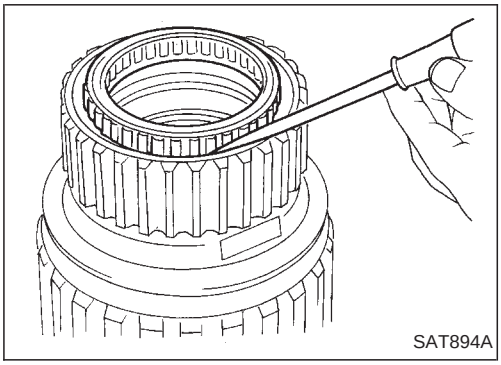
- Check frictional surface for wear or damage.

ASSEMBLY

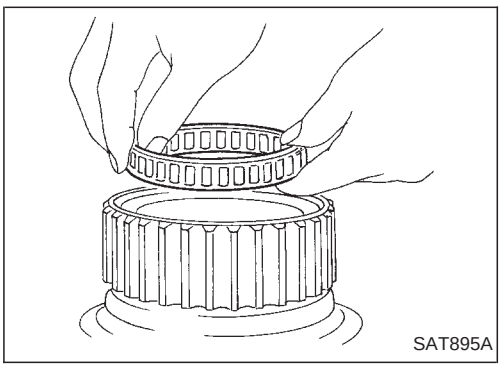
1. Install needle bearing in forward clutch drum.
2. Install snap ring onto forward clutch drum.


SAT214G

3. Install low one-way clutch onto forward clutch drum by pushing the roller in evenly.

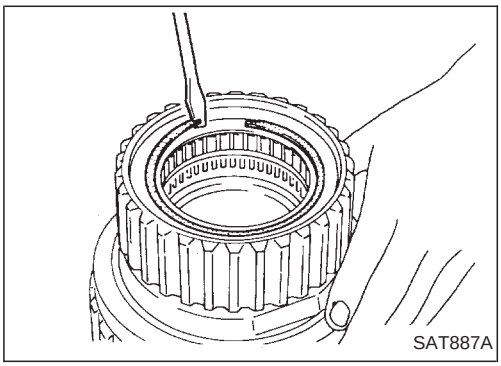

SAT894A

- **Install low one-way clutch with flange facing rearward.**


SAT895A

http://vnx.su/

Forward Clutch Drum Assembly (Cont'd)

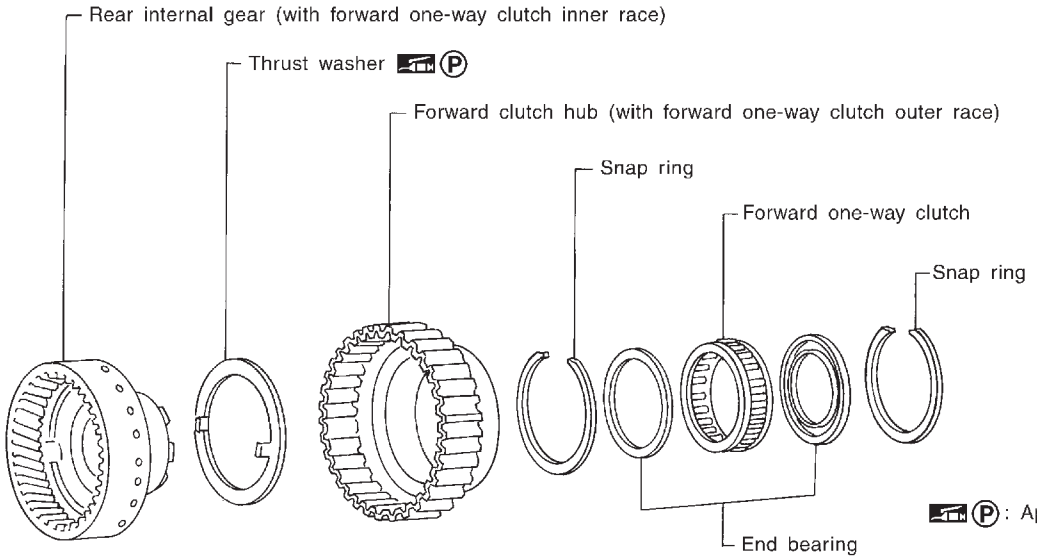

SAT887A

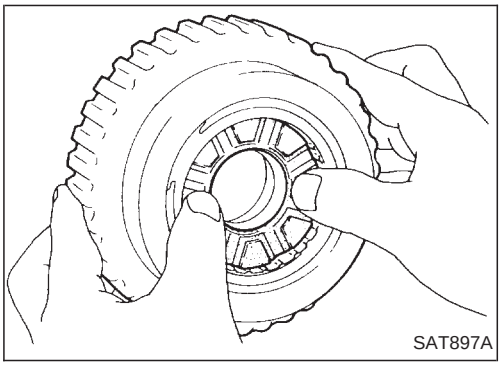
4. Install side plate onto forward clutch drum.
5. Install snap ring onto forward clutch drum.

http://vnx.su/

Rear Internal Gear and Forward Clutch Hub

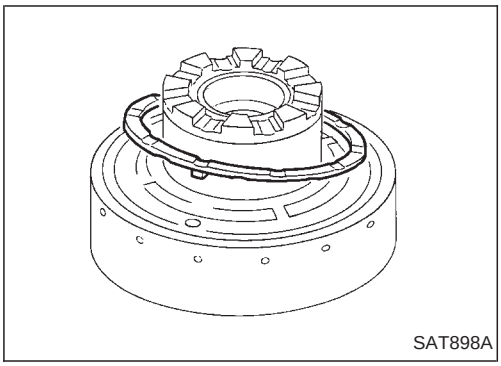
SEC. 315



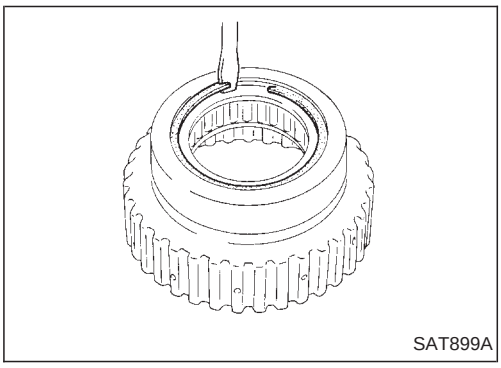


DISASSEMBLY

1. Remove rear internal gear by pushing forward clutch hub forward.



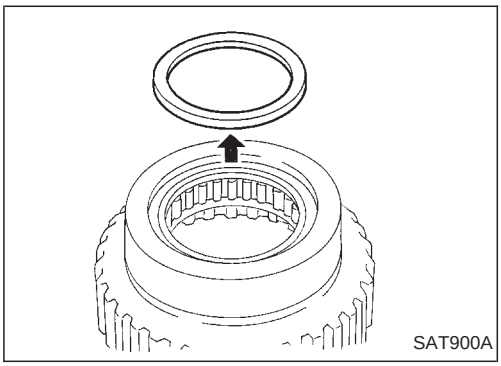
2. Remove thrust washer from rear internal gear.



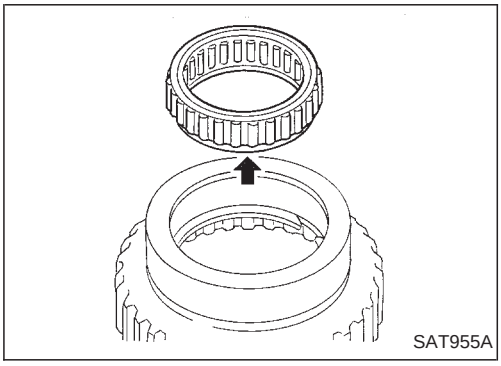
3. Remove snap ring from forward clutch hub.

http://vnx.su/

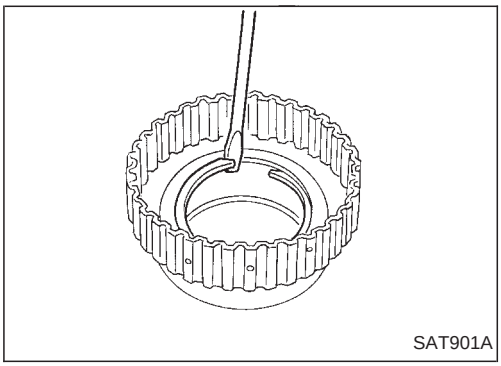
Rear Internal Gear and Forward Clutch Hub (Cont'd)


SAT900A

4. Remove end bearing.


SAT955A

5. Remove forward one-way clutch and end bearing as a unit from forward clutch hub.

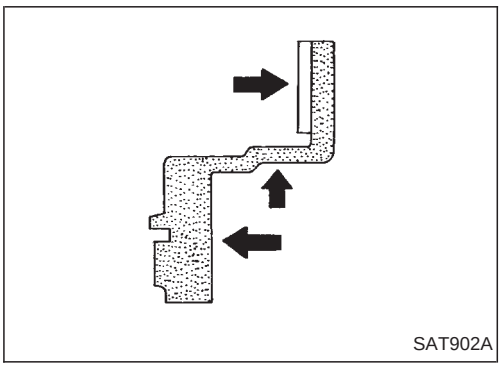

SAT901A

6. Remove snap ring from forward clutch hub.

INSPECTION

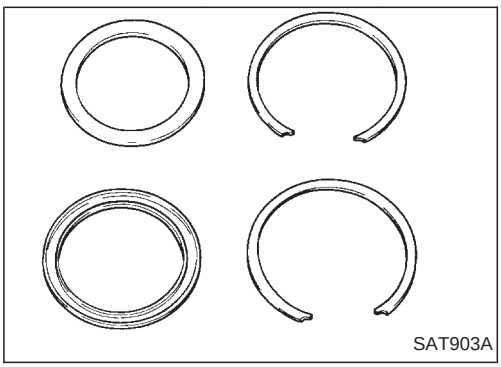
Rear internal gear and forward clutch hub

- Check gear for excessive wear, chips or cracks.
- Check frictional surfaces of forward one-way clutch and thrust washer for wear or damage.
- Check spline for wear or damage.


SAT902A

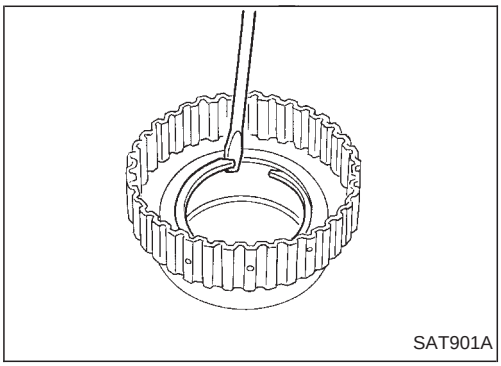
Snap ring and end bearing

- Check for deformation or damage.


SAT903A

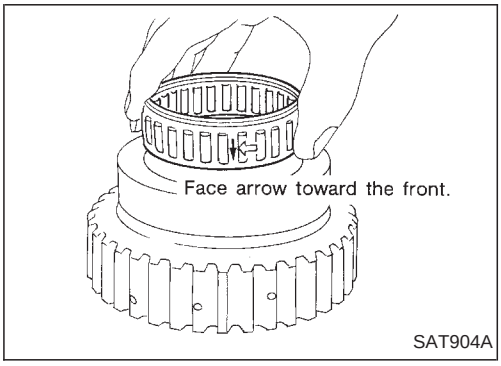
http://vnx.su/

Rear Internal Gear and Forward Clutch Hub (Cont'd)


SAT901A

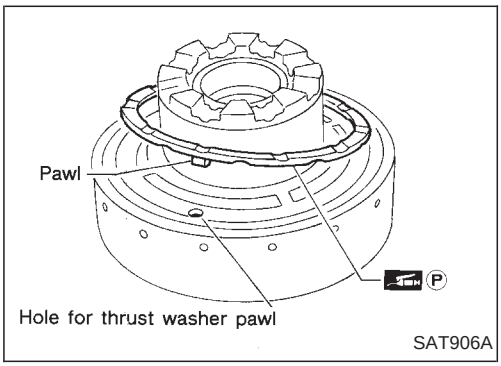
ASSEMBLY

1. Install snap ring onto forward clutch hub.
2. Install end bearing.



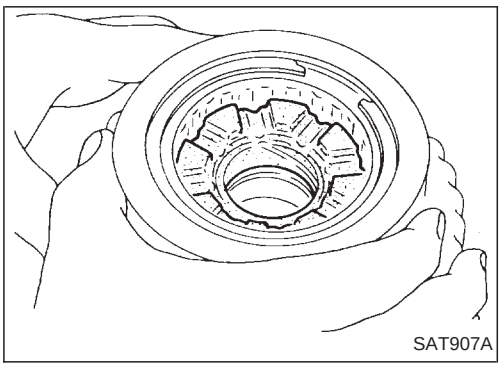
SAT904A

3. Install forward one-way clutch onto clutch hub.
- **Install forward one-way clutch with flange facing rearward.**
4. Install end bearing.
5. Install snap ring onto forward clutch hub.

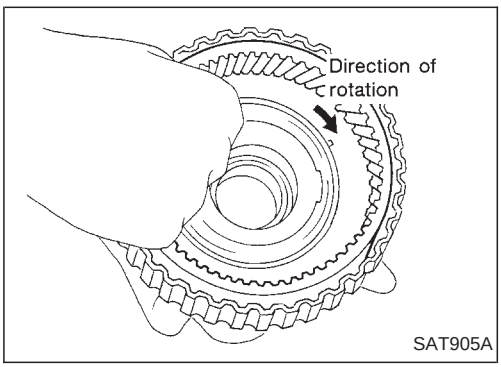


SAT906A

6. Install thrust washer onto rear internal gear.
- **Apply petroleum jelly to thrust washer.**
- **Securely insert pawls of thrust washer into holes in rear internal gear.**


SAT907A

7. Position forward clutch hub in rear internal gear.

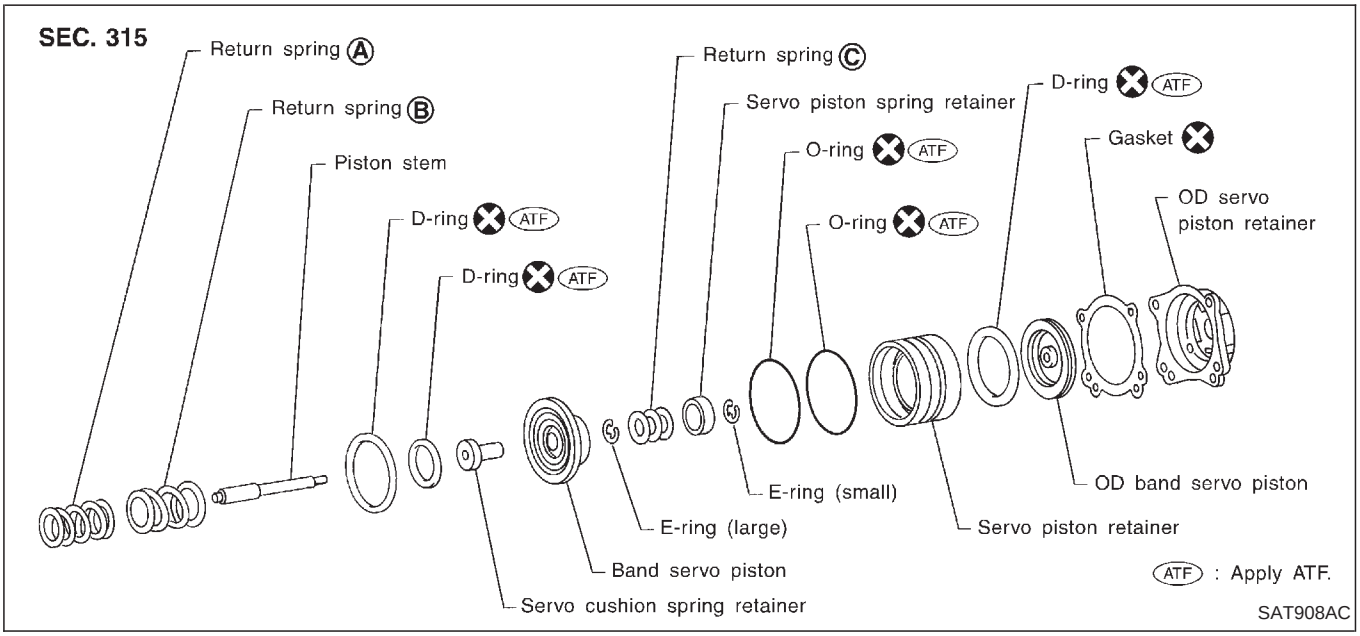


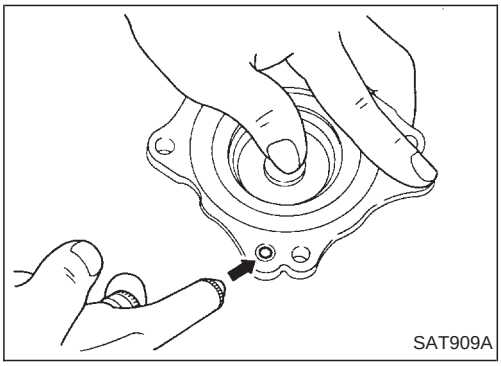
SAT905A

8. After installing, check to assure that forward clutch hub rotates clockwise.

http://vnx.su/

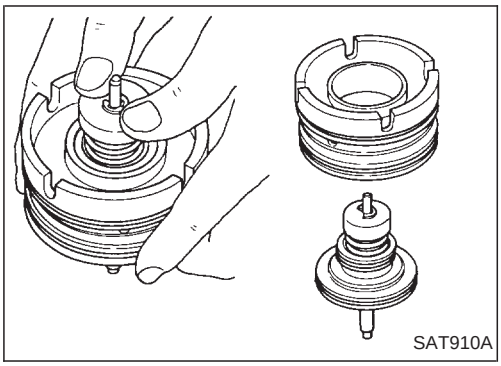
Band Servo Piston Assembly



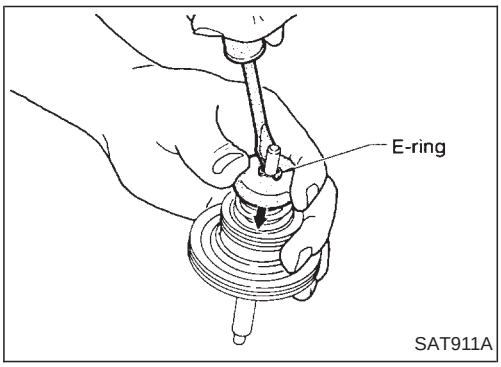


DISASSEMBLY

1. Block one oil hole in OD servo piston retainer and the center hole in OD band servo piston.
2. Apply compressed air to the other oil hole in piston retainer to remove OD band servo piston from retainer.
3. Remove D-ring from OD band servo piston.



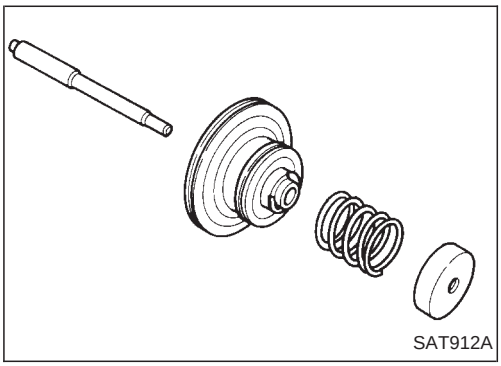
4. Remove band servo piston assembly from servo piston retainer by pushing it forward.



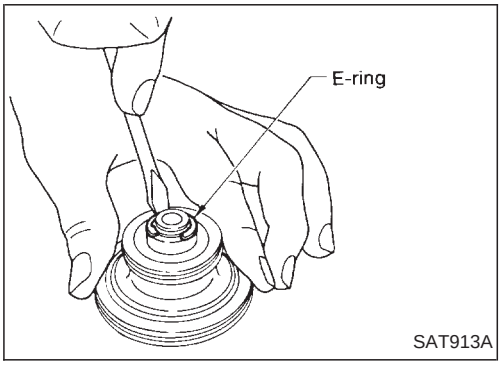
5. Place piston stem end on a wooden block. While pushing servo piston spring retainer down, remove E-ring.

http://vnx.su/

Band Servo Piston Assembly (Cont'd)

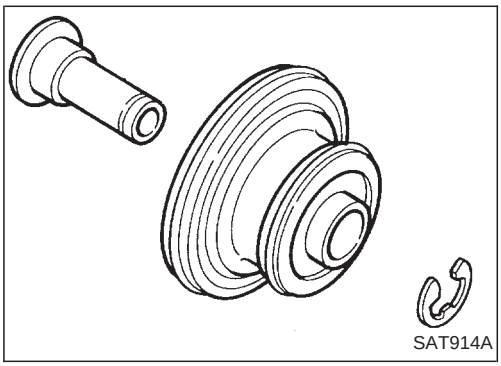

SAT912A

6. Remove servo piston spring retainer, return spring C and piston stem from band servo piston.

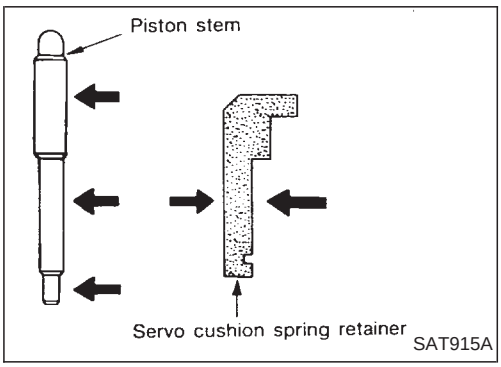


SAT913A

7. Remove E-ring from band servo piston.


SAT914A

8. Remove servo cushion spring retainer from band servo piston.
9. Remove D-rings from band servo piston.
10. Remove O-rings from servo piston retainer.

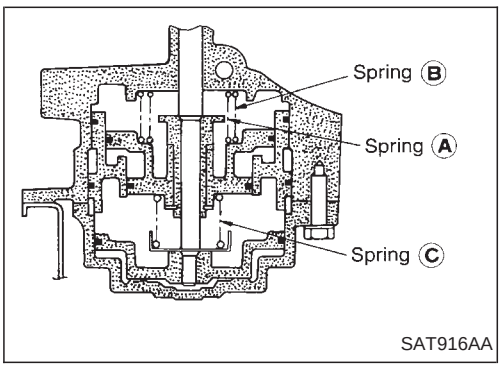


SAT915A

INSPECTION

Pistons, retainers and piston stem

- Check frictional surfaces for abnormal wear or damage.



SAT916AA

Return springs

- Check for deformation or damage. Measure free length and outer diameter.

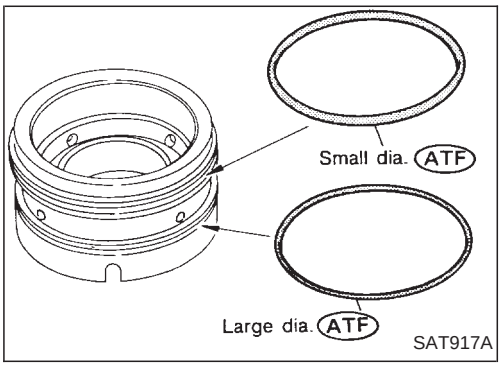
  Inspection standard:

  Refer to SDS, AT-203.

http://vnx.su/

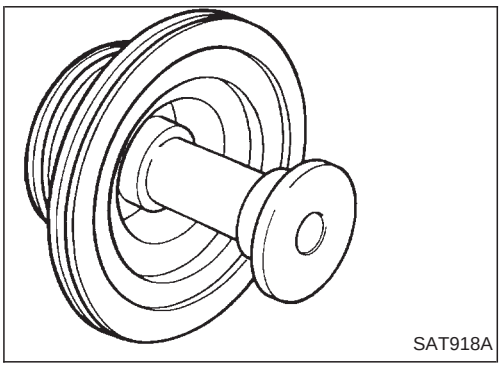
Band Servo Piston Assembly (Cont'd)

ASSEMBLY

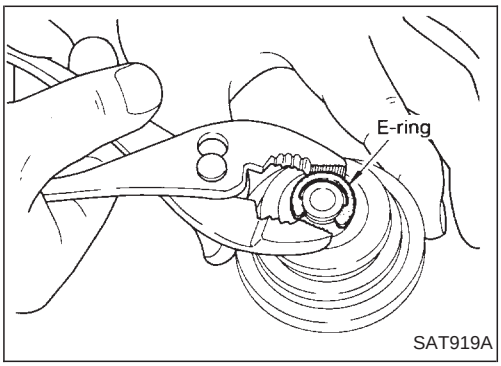


SAT917A

1. Install O-rings onto servo piston retainer.
- **Apply ATF to O-rings.**
- **Pay attention to position of each O-ring.**

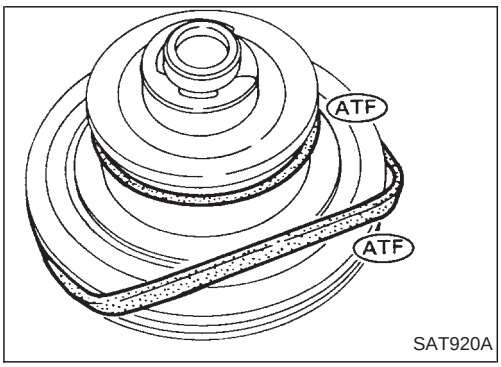

SAT918A

2. Install servo cushion spring retainer onto band servo piston.



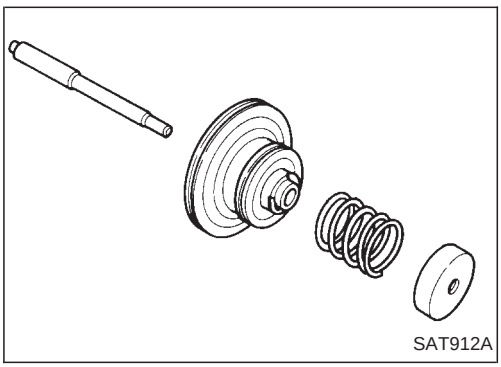
SAT919A

3. Install E-ring onto servo cushion spring retainer.



SAT920A

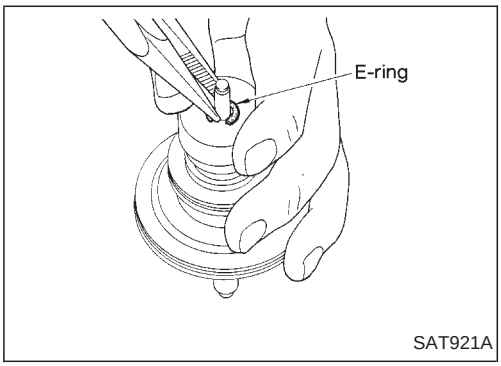
4. Install D-rings onto band servo piston.
- **Apply ATF to D-rings.**


SAT912A

5. Install servo piston spring retainer, return spring C and piston stem onto band servo piston.

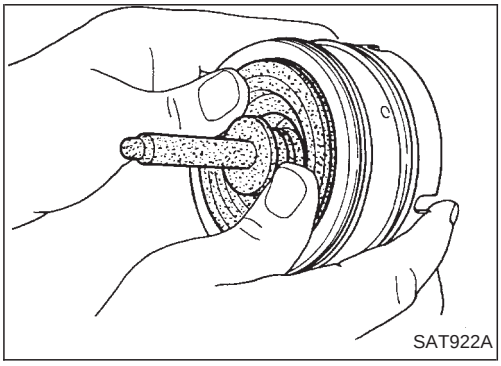
http://vnx.su/

Band Servo Piston Assembly (Cont'd)

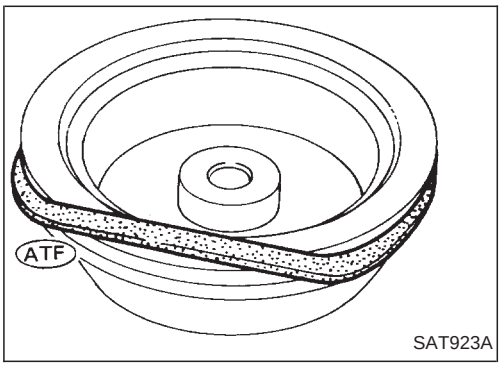


SAT921A

6. Place piston stem end on a wooden block. While pushing servo piston spring retainer down, install E-ring.

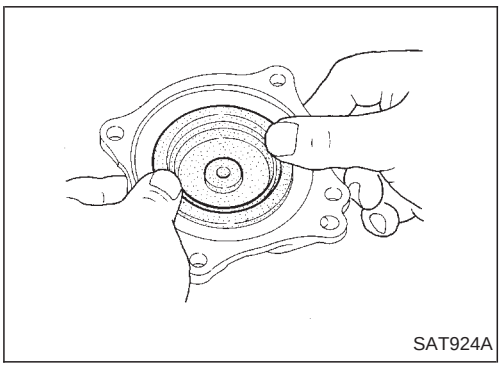

SAT922A

7. Install band servo piston assembly onto servo piston retainer by pushing it inward.



SAT923A

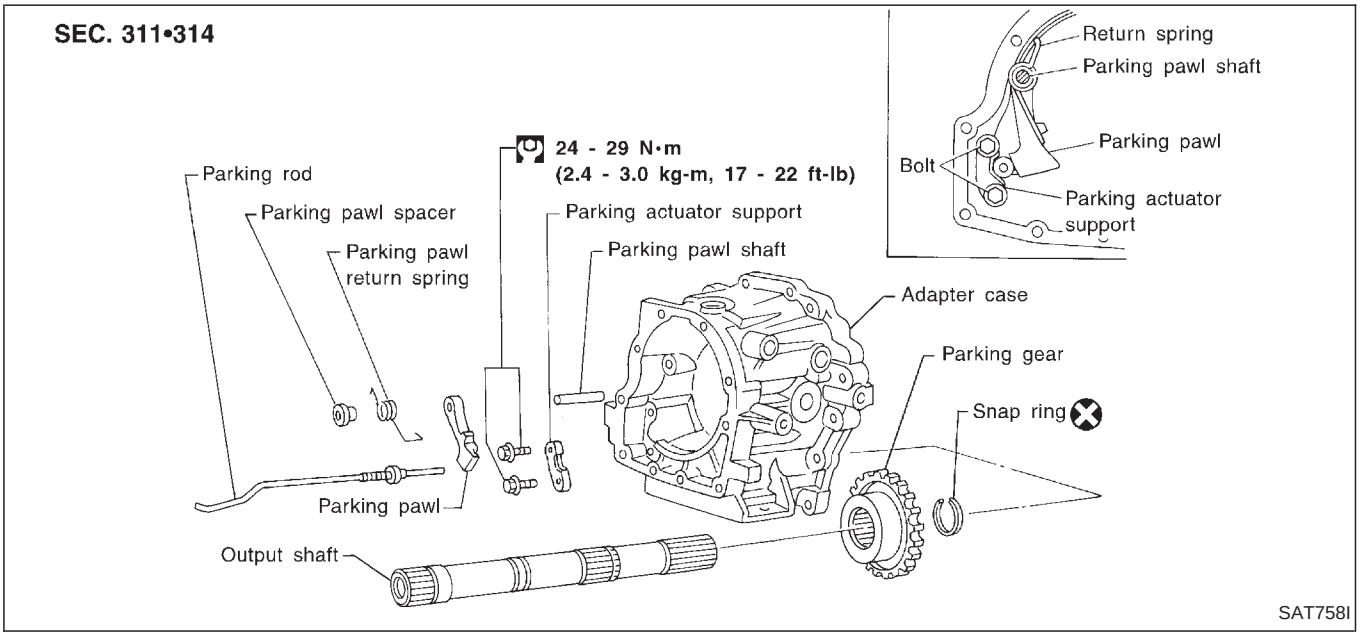
8. Install D-ring on OD band servo piston.
- **Apply ATF to D-ring.**

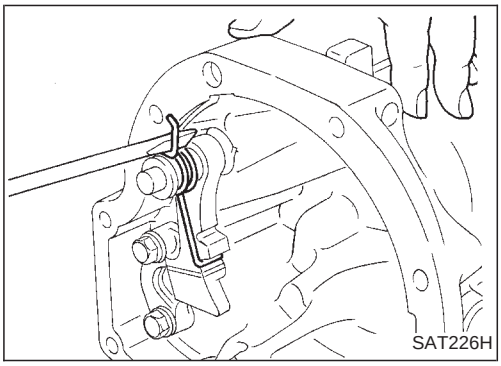

SAT924A

9. Install OD band servo piston onto servo piston retainer by pushing it inward.

http://vnx.su/

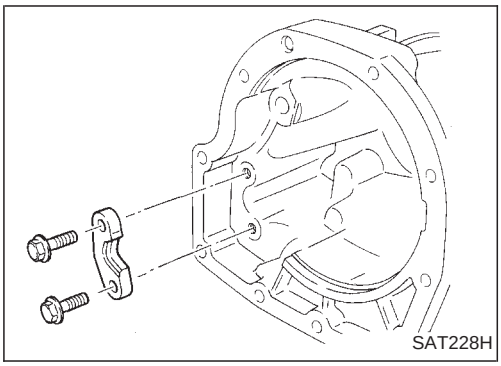
Parking Pawl Components



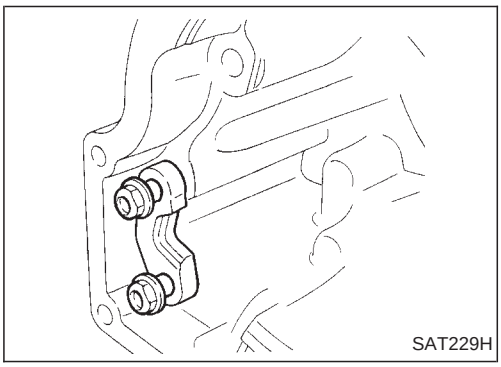


DISASSEMBLY

1. Slide return spring to the front of rear extension case flange or adapter case flange.
2. Remove return spring, pawl spacer and parking pawl from rear extension or adapter case.
3. Remove parking pawl shaft from rear extension or adapter case.



4. Remove parking actuator support from rear extension or adapter case.

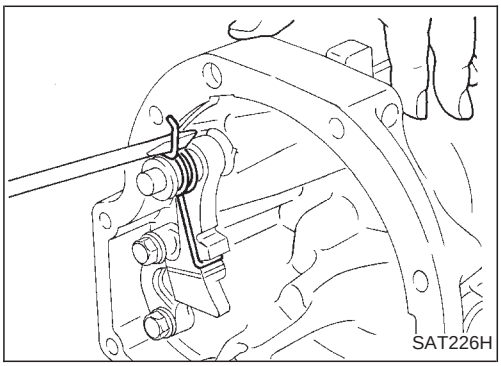


ASSEMBLY

1. Install parking actuator support onto rear extension or adapter case.
2. Insert parking pawl shaft into rear extension or adapter case.
3. Install return spring, pawl spacer and parking pawl onto parking pawl shaft.

http://vnx.su/

Parking Pawl Components (Cont'd)


SAT226H

4. Bend return spring upward and install it onto rear extension or adapter case.

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Assembly (1)

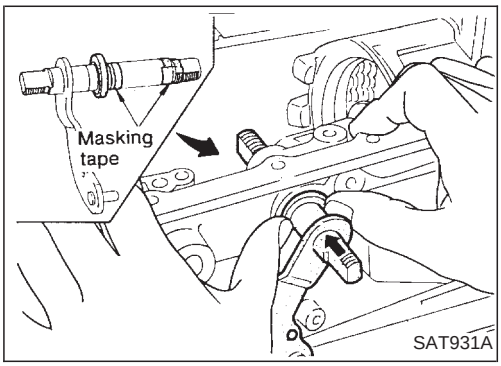
1. Install manual shaft components.

a. Install oil seal onto manual shaft.

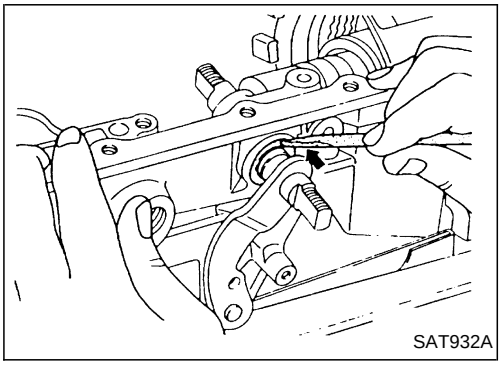
- **Apply ATF to oil seal.**
- **Wrap threads of manual shaft with masking tape.**

b. Insert manual shaft and oil seal as a unit into transmission case.

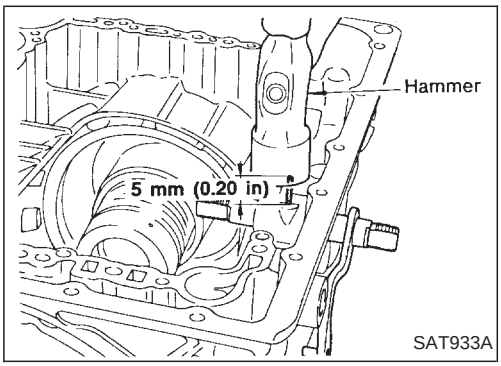
c. Remove masking tape.



d. Push oil seal evenly and install it onto transmission case.

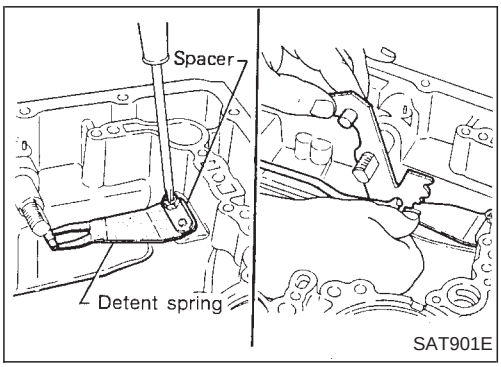


e. Align groove in shaft with drive pin hole, then drive pin into position as shown in figure at left.

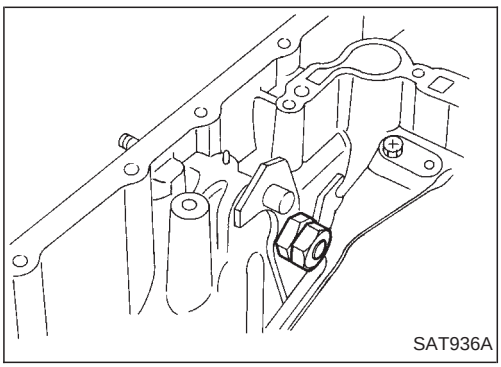


f. Install detent spring and spacer.

g. While pushing detent spring down, install manual plate onto manual shaft.

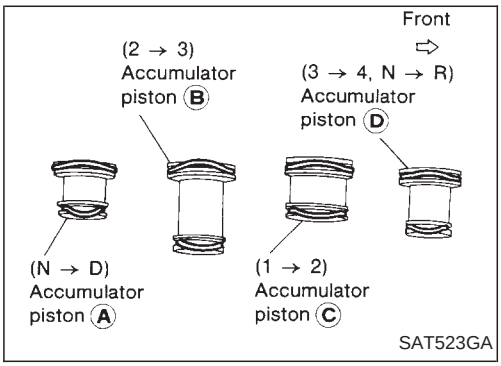


h. Install lock nuts onto manual shaft.



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Assembly (1) (Cont'd)

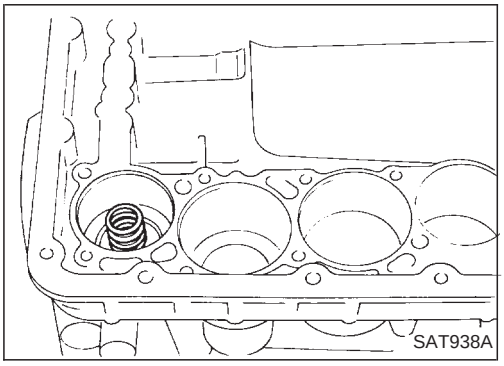


2. Install accumulator piston.
a. Install O-rings onto accumulator piston.
- **Apply ATF to O-rings.**

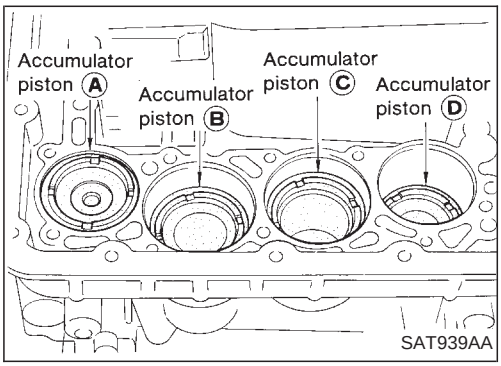
Accumulator piston O-rings

Unit: mm (in)

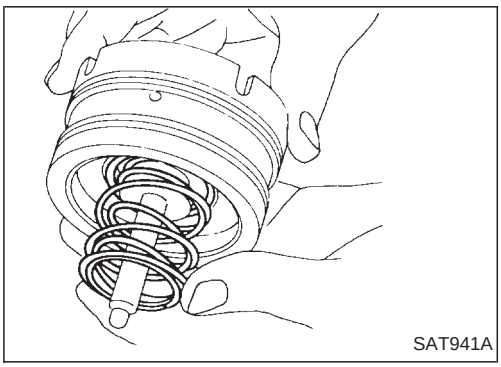
Accumulator	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Small diameter end	29 (1.14)	32 (1.26)	45 (1.77)	29 (1.14)
Large diameter end	45 (1.77)	50 (1.97)	50 (1.97)	45 (1.77)



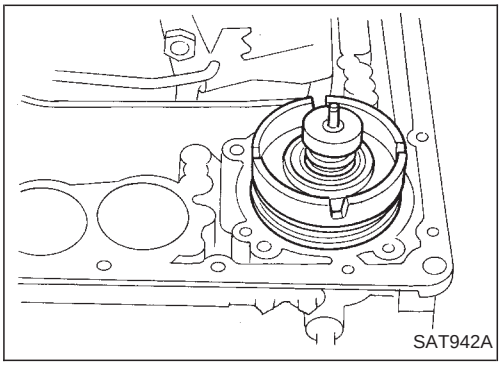
b. Install return spring for accumulator A onto transmission case.
Free length of return spring:
Refer to SDS, AT-202.



c. Install accumulator pistons Ⓐ, Ⓑ, Ⓒ and Ⓓ.
- **Apply ATF to transmission case.**



3. Install band servo piston.
a. Install return springs onto servo piston.

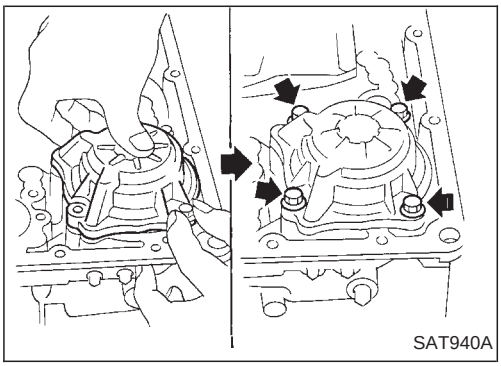


b. Install band servo piston onto transmission case.
- **Apply ATF to O-ring of band servo piston and transmission case.**

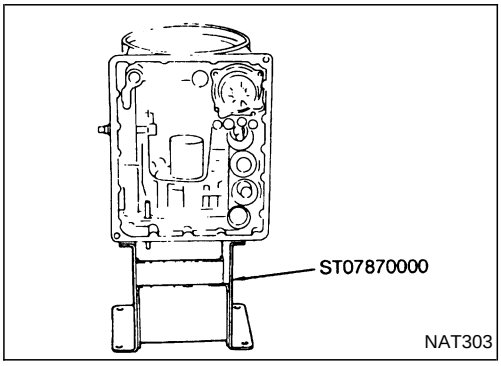
c. Install gasket for band servo onto transmission case.

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Assembly (1) (Cont'd)

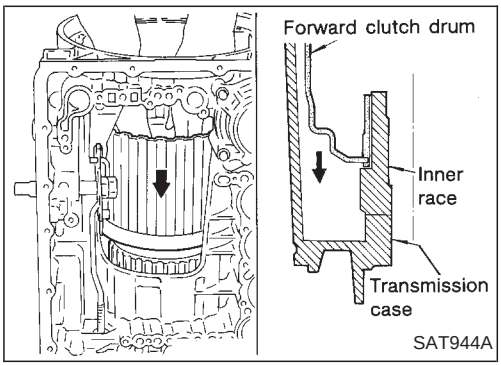

SAT940A

d. Install band servo retainer onto transmission case.



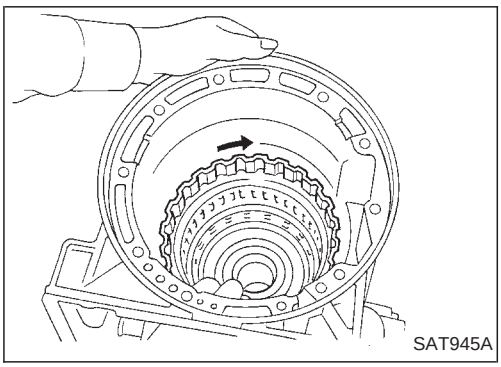
NAT303

4. Install rear side clutch and gear components.
a. Place transmission case in vertical position.

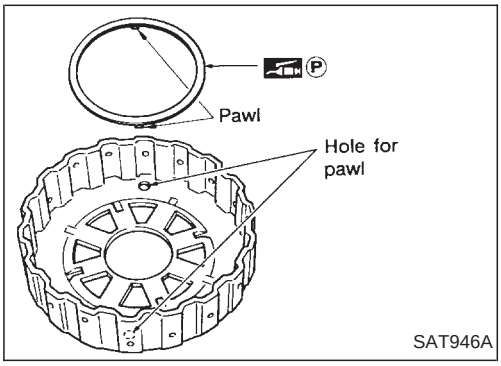


SAT944A

b. Slightly lift forward clutch drum assembly. Then slowly rotate it clockwise until its hub passes fully over clutch inner race inside transmission case.


SAT945A

c. Check to be sure that rotation direction of forward clutch assembly is correct.

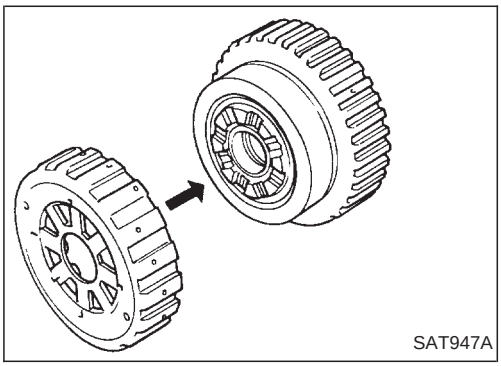


SAT946A

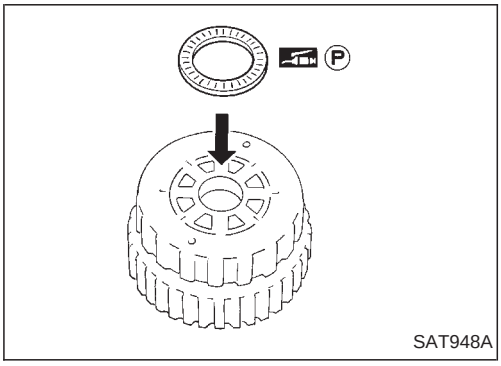
d. Install thrust washer onto front of overrun clutch hub.
- **Apply petroleum jelly to the thrust washer.**
- **Insert pawls of thrust washer securely into holes in overrun clutch hub.**

http://vnx.su/

Assembly (1) (Cont'd)

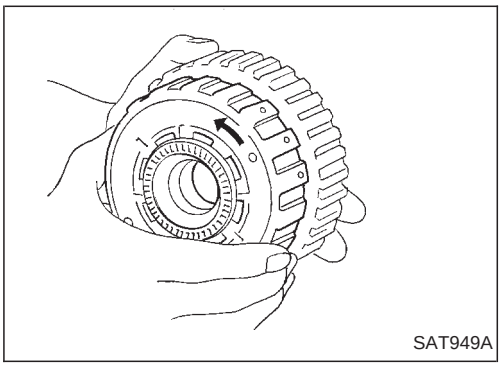

SAT947A

e. Install overrun clutch hub onto rear internal gear assembly.

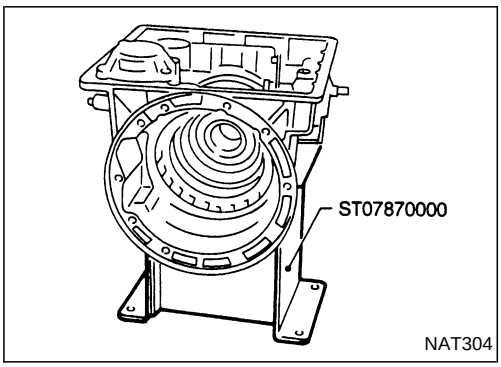


SAT948A

f. Install needle bearing onto rear of overrun clutch hub.
- **Apply petroleum jelly to needle bearing.**

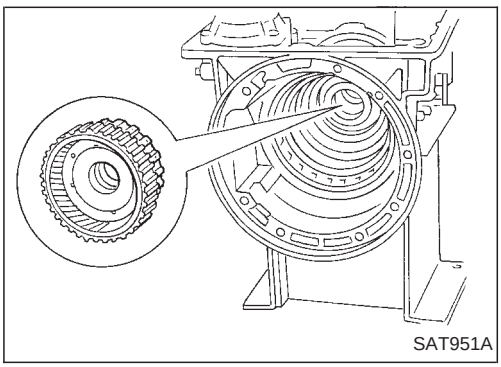

SAT949A

g. Check that overrun clutch hub rotates as shown while holding forward clutch hub.



NAT304

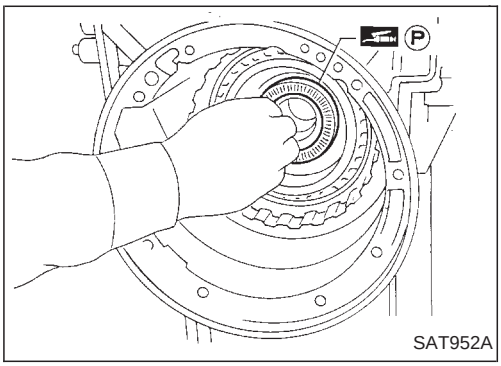
h. Place transmission case into horizontal position.


SAT951A

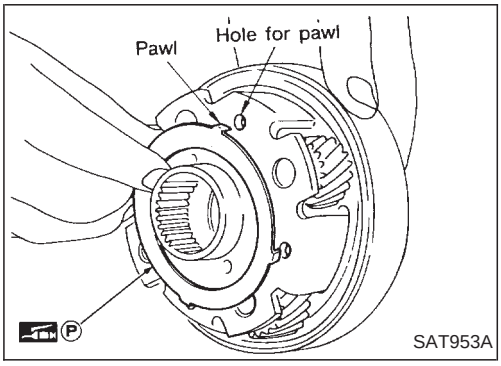
i. Install rear internal gear, forward clutch hub and overrun clutch hub as a unit onto transmission case.

http://vnx.su/

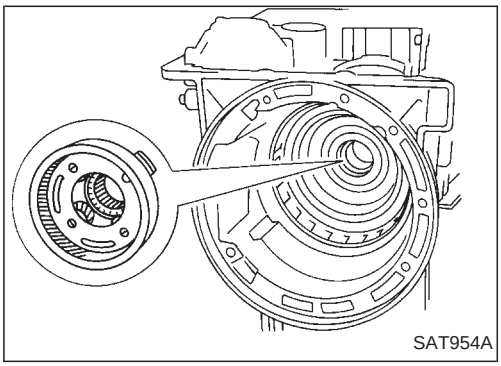
Assembly (1) (Cont'd)



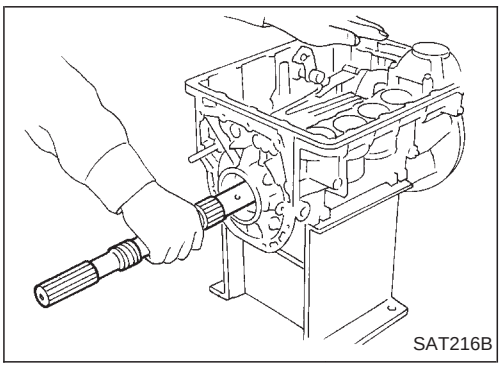
j. Install needle bearing onto rear internal gear.
- **Apply petroleum jelly to needle bearing.**



k. Install bearing race onto rear of front internal gear.
- **Apply petroleum jelly to bearing race.**
- **Securely engage pawls of bearing race with holes in front internal gear.**

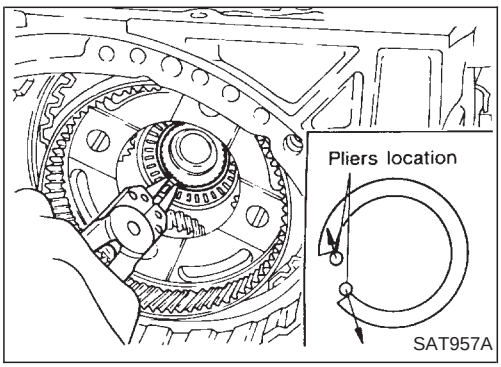


l. Install front internal gear on transmission case.



5. Install output shaft and parking gear.

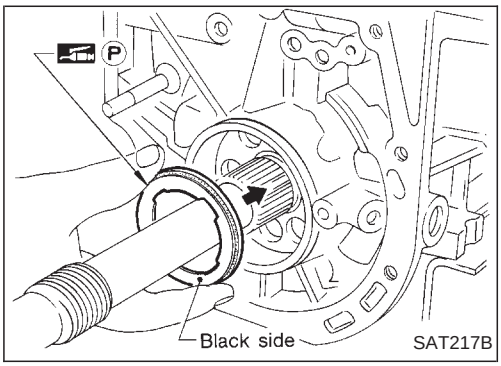
a. Insert output shaft from rear of transmission case while slightly lifting front internal gear.
- **Do not force output shaft against front of transmission case.**



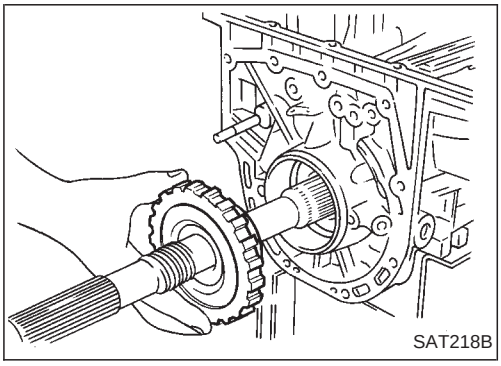
b. Carefully push output shaft against front of transmission case. Install snap ring on front of output shaft.
- **Check to be sure output shaft cannot be removed in rear direction.**

http://vnx.su/

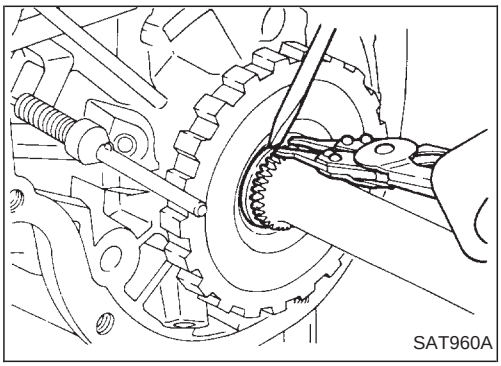
Assembly (1) (Cont'd)



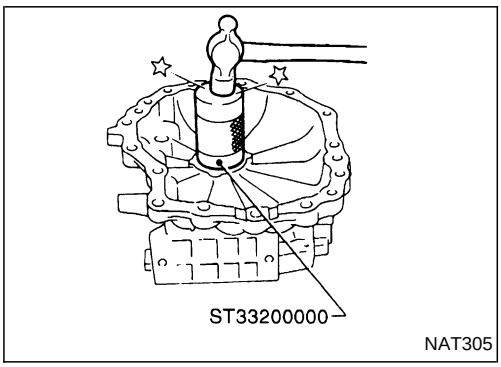
c. Install needle bearing on transmission case.
- **Pay attention to its direction — Black side goes to rear.**
- **Apply petroleum jelly to needle bearing.**



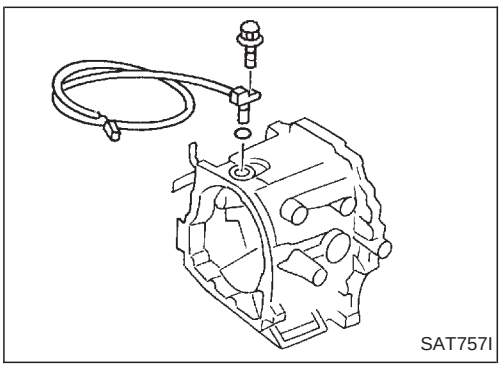
d. Install parking gear on transmission case.



e. Install snap ring on rear of output shaft.
- **Check to be sure output shaft cannot be removed in forward direction.**



6. Install adapter case.
a. Install oil seal on adapter case.
- **Apply ATF to oil seal.**

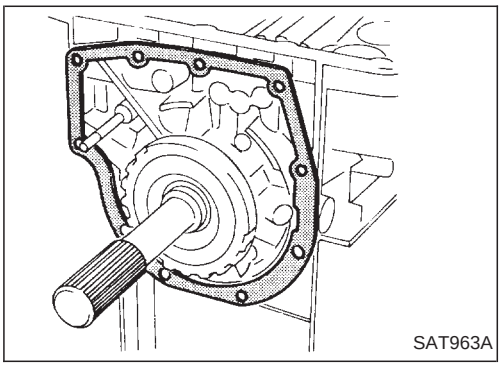


b. Install O-ring on revolution sensor.
- **Apply ATF to O-ring.**

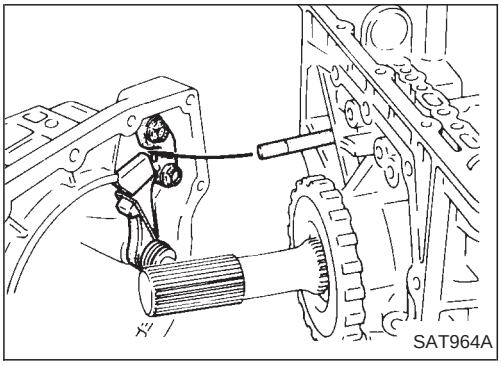
c. Install revolution sensor on adapter case.

http://vnx.su/

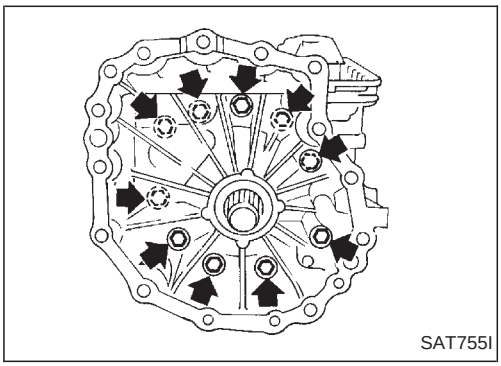
Assembly (1) (Cont'd)


SAT963A

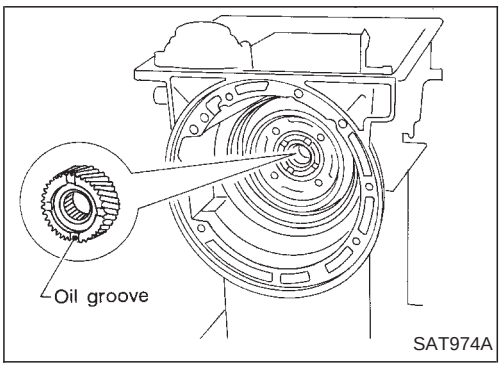
d. Install adapter case gasket on transmission case.


SAT964A

e. Install parking rod on transmission case.

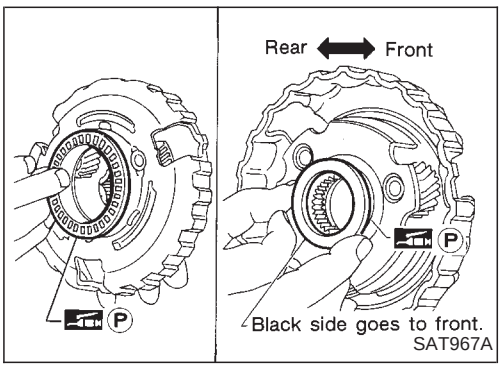

SAT755I

f. Install adapter case on transmission case.



SAT974A

7. Install front side clutch and gear components.
a. Install rear sun gear on transmission case.
- **Pay attention to its direction.**



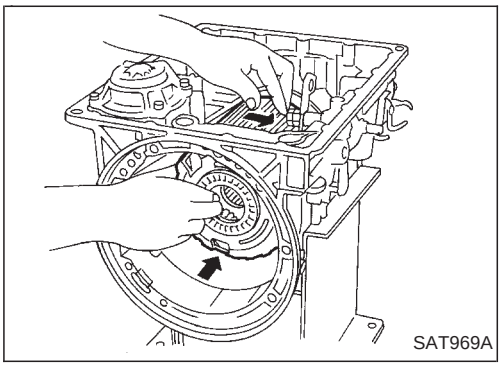
SAT967A

b. Make sure needle bearing is on front of front planetary carrier.
- **Apply petroleum jelly to needle bearing.**

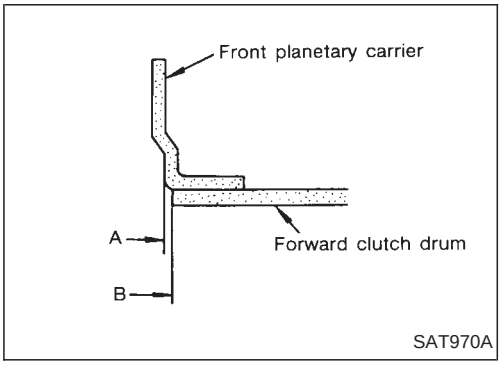
c. Make sure needle bearing is on rear of front planetary carrier.
- **Apply petroleum jelly to bearing.**
- **Pay attention to its direction — Black side goes to front.**

http://vnx.su/

Assembly (1) (Cont'd)

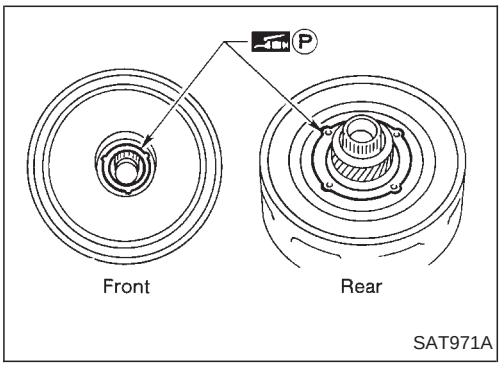

SAT969A

d. While rotating forward clutch drum clockwise, install front planetary carrier on forward clutch drum.



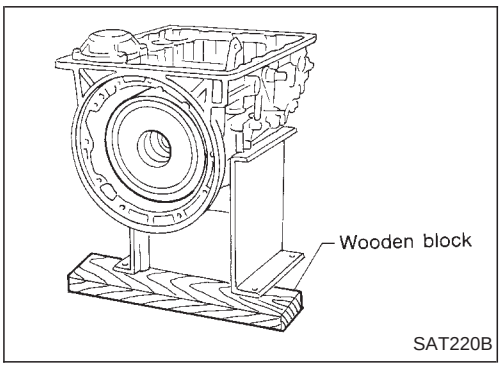
SAT970A

- **Check that portion A of front planetary carrier protrudes approximately 2 mm (0.08 in) beyond portion B of forward clutch assembly.**



SAT971A

e. Make sure bearing races are on front and rear of clutch pack.
- **Apply petroleum jelly to bearing races.**
- **Securely engage pawls of bearing races with holes in clutch pack.**



SAT220B

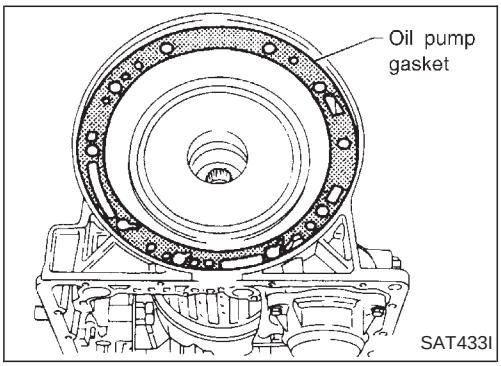
f. Install clutch pack into transmission case.

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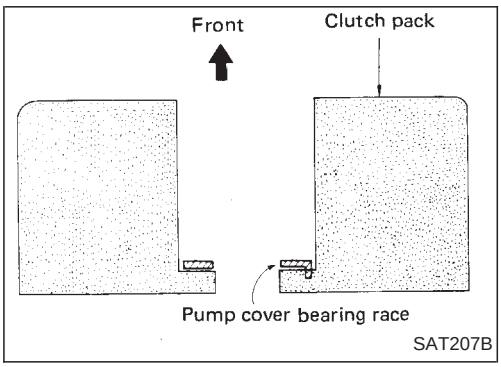
Adjustment

When any parts listed in the following table are replaced, total end play or reverse clutch end play must be adjusted.

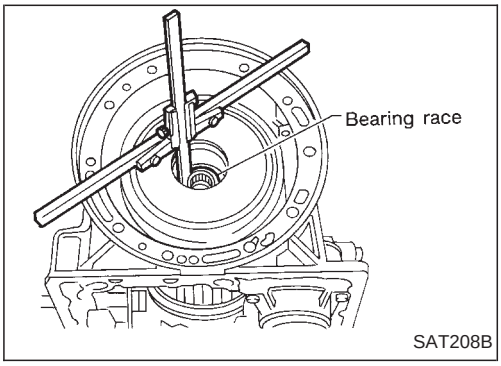
Part name	Total end play	Reverse clutch end play
Transmission case	●	●
Low one-way clutch inner race	●	●
Overrun clutch hub	●	●
Rear internal gear	●	●
Rear planetary carrier	●	●
Rear sun gear	●	●
Front planetary carrier	●	●
Front sun gear	●	●
High clutch hub	●	●
High clutch drum	●	●
Oil pump cover	●	●
Reverse clutch drum	—	●



1. Adjust total end play.
a. Install new oil pump gasket on transmission case.



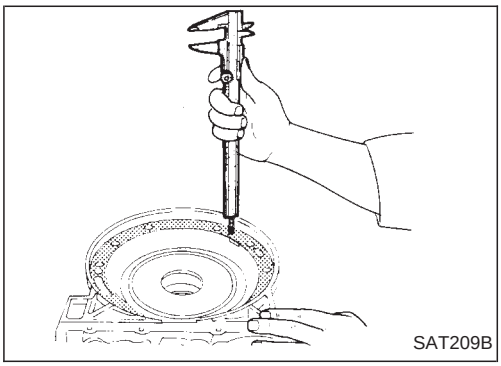
b. Install pump cover bearing race on clutch pack.



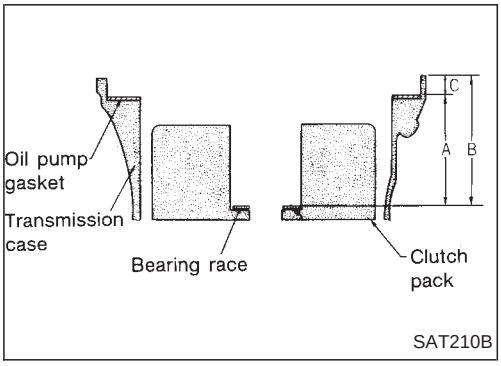
c. Measure distance “B” between front end of transmission case and oil pump cover bearing race.

http://vnx.su/

Adjustment (Cont'd)

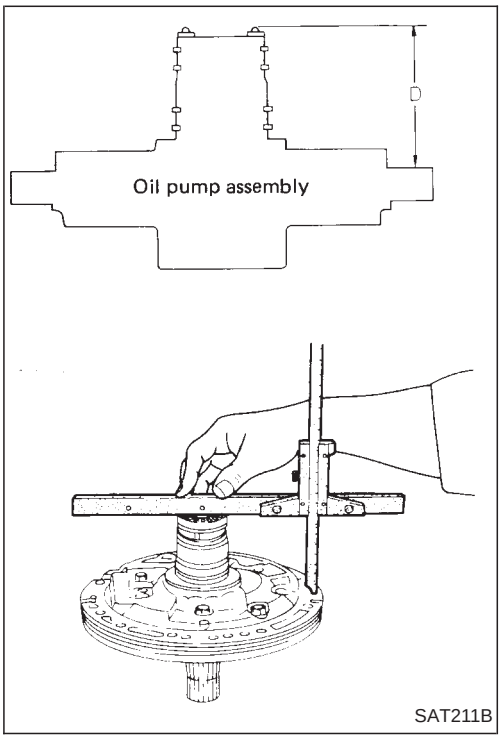

SAT209B

d. Measure distance "C" between front end of transmission case and oil pump cover gasket.



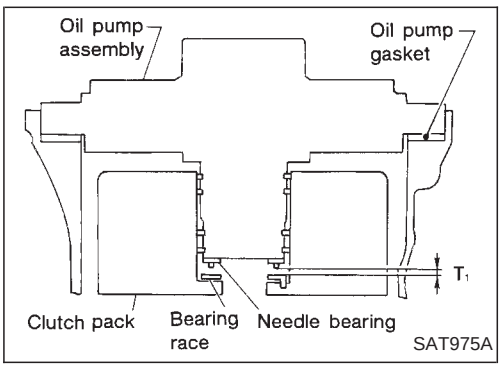
SAT210B

e. Determine dimension "A" by using the following equation.
A = B − C



SAT211B

f. Install needle bearing on oil pump assembly.
g. Measure distance "D" between needle bearing and machined surface of oil pump cover assembly.



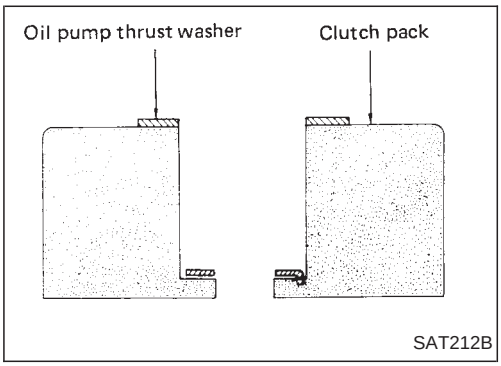
SAT975A

h. Determine total end play "T_1" by using the following equation.
T_1 = A − D − 0.1
Total end play "T_1":
0.25 - 0.55 mm (0.0098 - 0.0217 in)

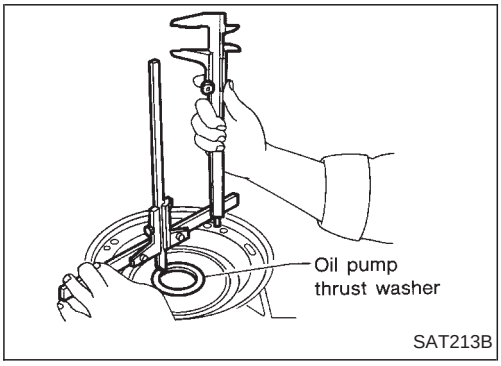
- If end play is out of specification, decrease or increase thickness of oil pump cover bearing race as necessary.
Available oil pump cover bearing race:
Refer to SDS, AT-204.

http://vnx.su/

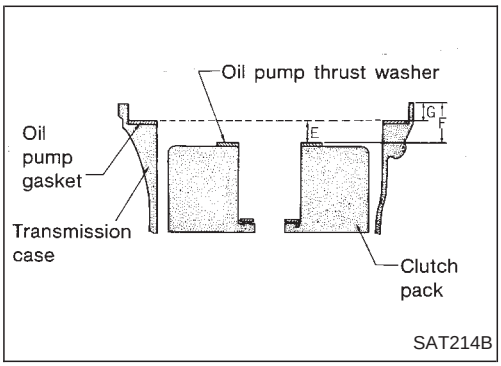
Adjustment (Cont'd)



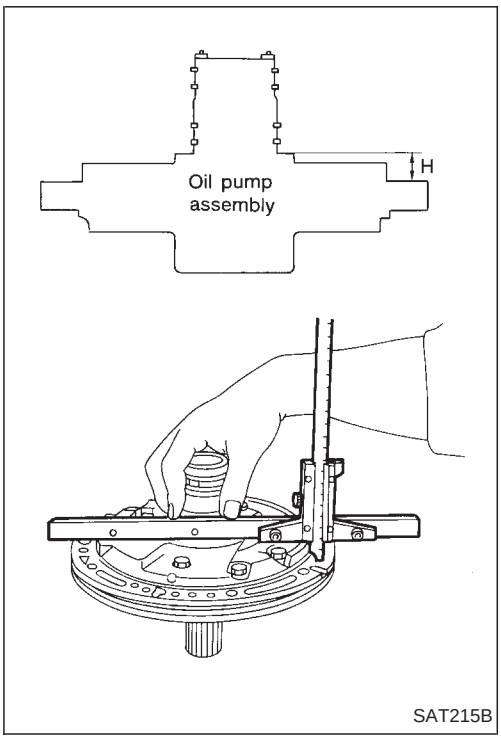
2. Adjust reverse clutch drum end play.
a. Install oil pump thrust washer on clutch pack.



b. Measure distance "F" between front end of transmission case and oil pump thrust washer.
c. Measure distance "G" between front end of transmission case and gasket.



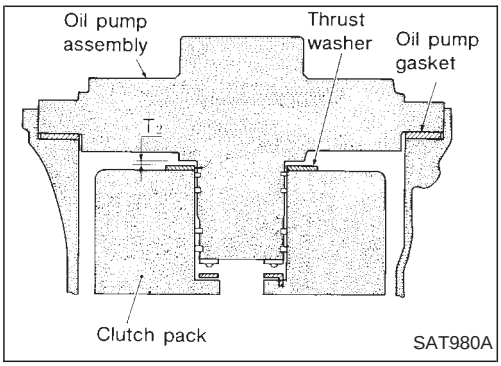
d. Determine dimension "E" by using the following equation.
E = F − G



e. Measure distance "H".

http://vnx.su/

Adjustment (Cont'd)



f. Determine reverse clutch drum end play "T_2" by using the following equation.

T_2 = E − H − 0.1

Reverse clutch drum end play "T_2":

0.55 - 0.90 mm (0.0217 - 0.0354 in)

- If end play is out of specification, decrease or increase thickness of oil pump thrust washer as necessary.

Available oil pump thrust washer:

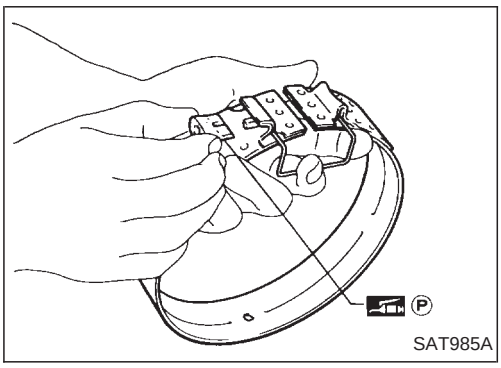
Refer to SDS, AT-204.

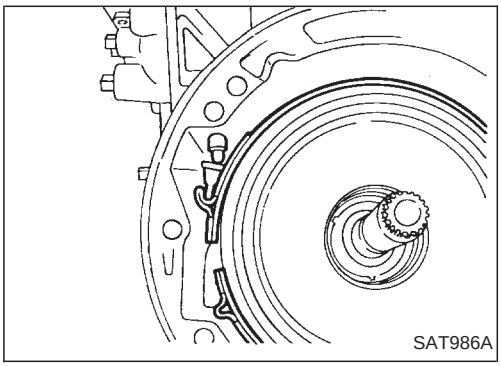
Assembly (2)

1. Install brake band and band strut.

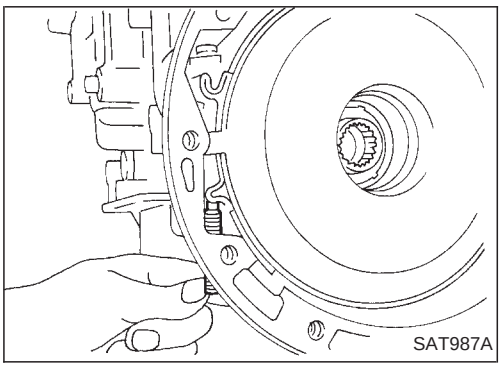
a. Install band strut on brake band.

- **Apply petroleum jelly to band strut.**

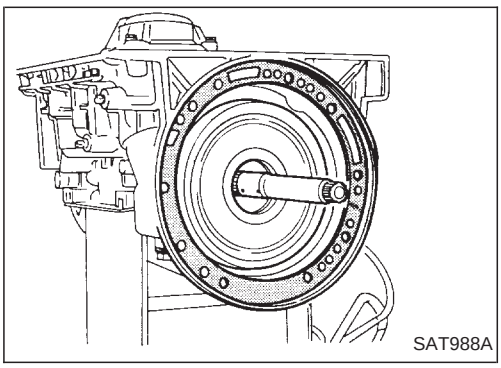




b. Place brake band on periphery of reverse clutch drum, and insert band strut into end of band servo piston stem.



c. Install anchor end bolt on transmission case. Then, tighten anchor end bolt just enough so that reverse clutch drum (clutch pack) will not tilt forward.



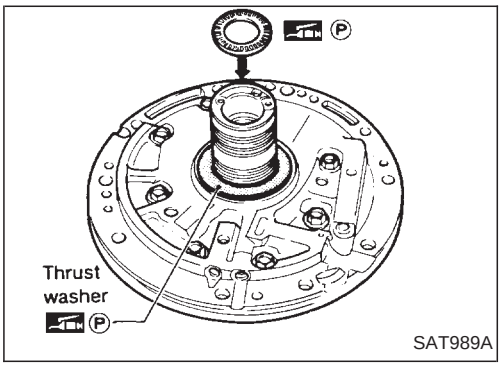
2. Install input shaft on transmission case.

- **Pay attention to its direction — O-ring groove side is front.**

3. Install gasket on transmission case.

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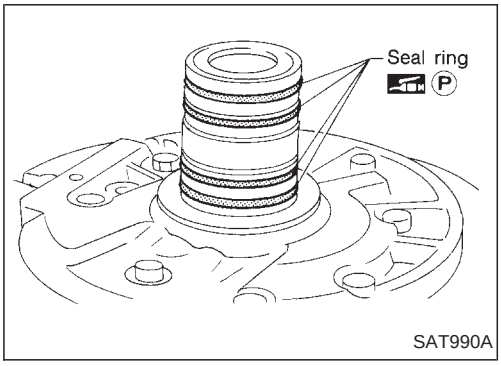
Assembly (2) (Cont'd)



SAT989A

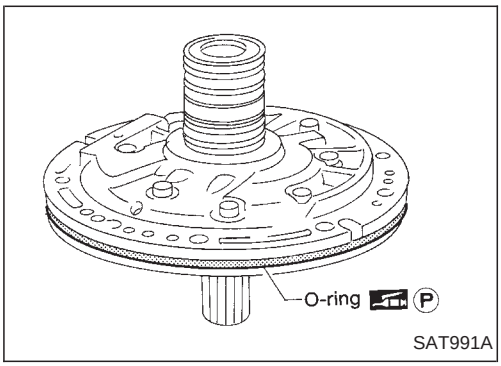
4. Install oil pump assembly.
a. Install needle bearing on oil pump assembly.
- **Apply petroleum jelly to the needle bearing.**

b. Install selected thrust washer on oil pump assembly.
- **Apply petroleum jelly to thrust washer.**



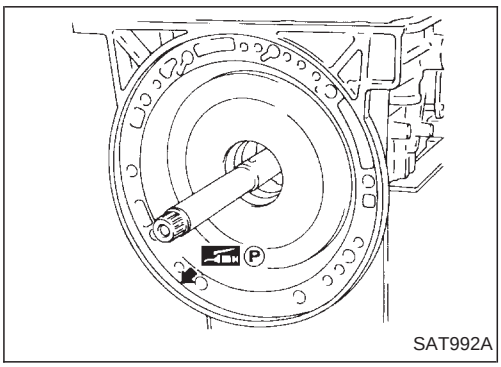
SAT990A

c. Carefully install seal rings into grooves and press them into the petroleum jelly so that they are a tight fit.



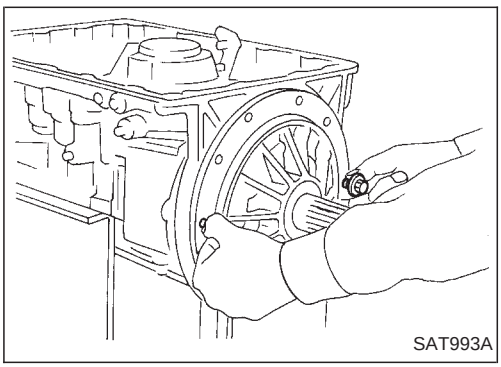
SAT991A

d. Install O-ring on oil pump assembly.
- **Apply petroleum jelly to O-ring.**



SAT992A

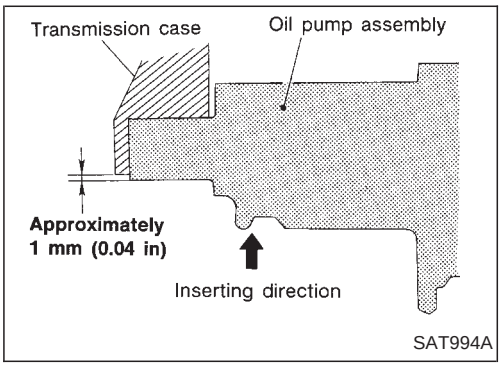
e. Apply petroleum jelly to mating surface of transmission case and oil pump assembly.


SAT993A

f. Install oil pump assembly.
- **Install two converter housing securing bolts in bolt holes in oil pump assembly as guides.**

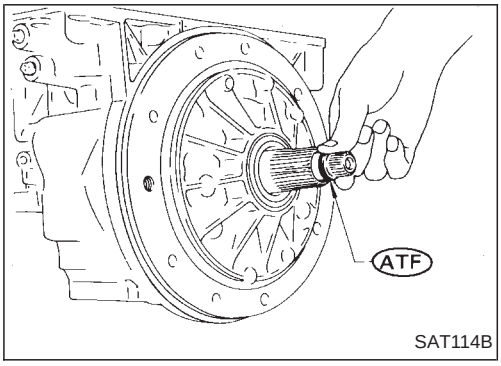
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Assembly (2) (Cont'd)



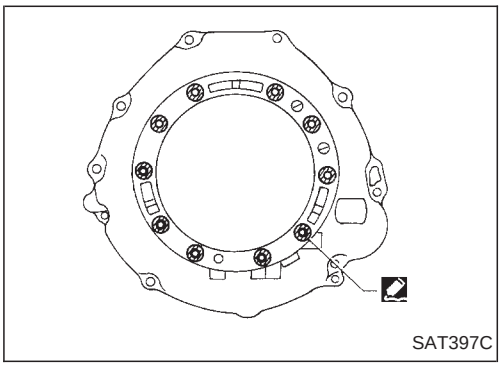
SAT994A

- **Insert oil pump assembly to the specified position in transmission, as shown at left.**

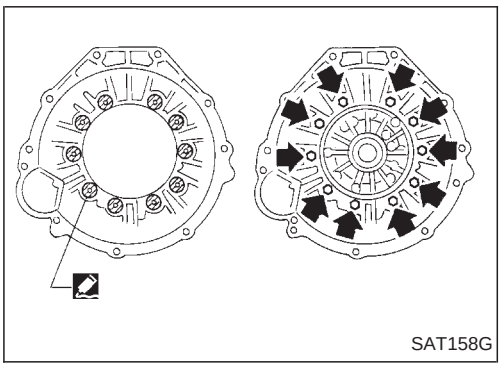


SAT114B

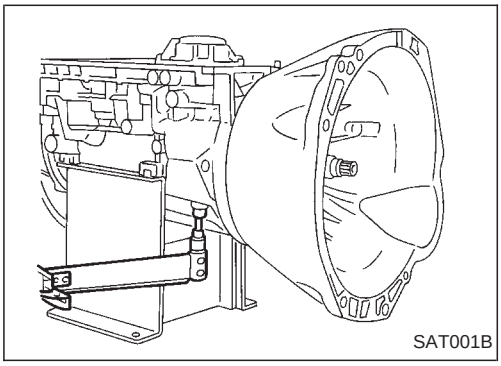
5. Install O-ring on input shaft.
- **Apply ATF to O-rings.**


SAT397C

6. Install converter housing.
a. Apply recommended sealant (Nissan genuine part: KP610-00250 or equivalent) to outer periphery of bolt holes in converter housing.
- **Do not apply too much sealant.**


SAT158G

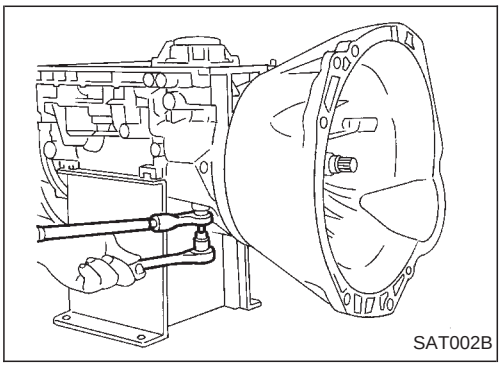
b. Apply recommended sealant (Nissan genuine part: KP610-00250 or equivalent) to seating surfaces of bolts that secure front of converter housing.
c. Install converter housing on transmission case.


SAT001B

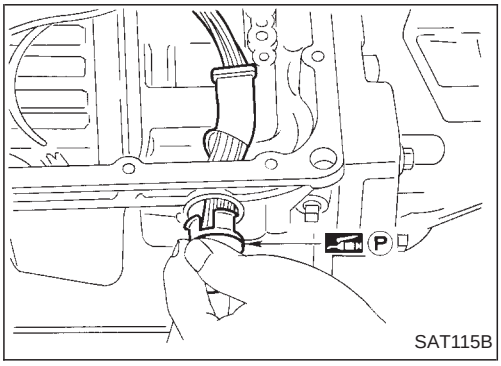
7. Adjust brake band.
a. Tighten anchor end bolt to specified torque.
Anchor end bolt:
: 4 - 6 N·m
(0.4 - 0.6 kg-m, 35 - 52 in-lb)
b. Back off anchor end bolt two and a half turns.

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Assembly (2) (Cont'd)


SAT002B

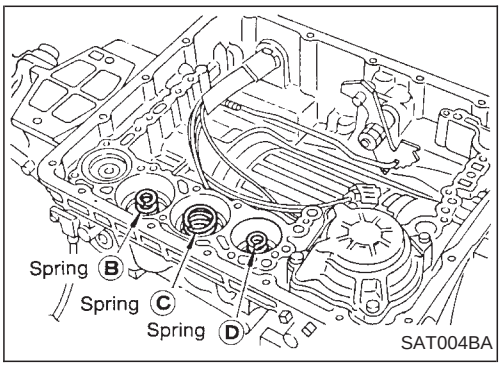
c. While holding anchor end pin, tighten lock nut.



SAT115B

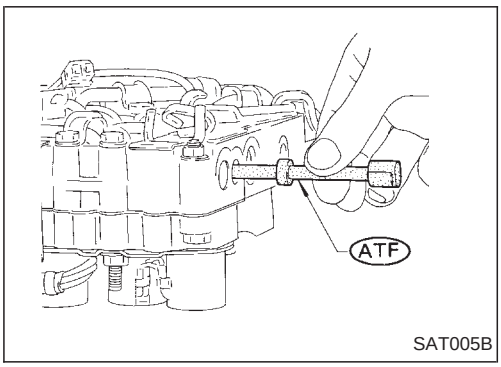
8. Install terminal cord assembly.
a. Install O-ring on terminal cord assembly.
- **Apply petroleum jelly to O-ring.**

b. Compress terminal cord assembly stopper and install terminal cord assembly on transmission case.



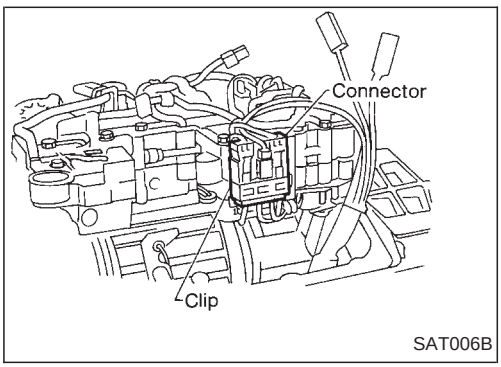
SAT004BA

9. Install control valve assembly.
a. Install accumulator piston return springs Ⓑ, Ⓒ and Ⓓ.
Free length of return springs:
Refer to SDS, AT-202.



SAT005B

b. Install manual valve on control valve.
- **Apply ATF to manual valve.**

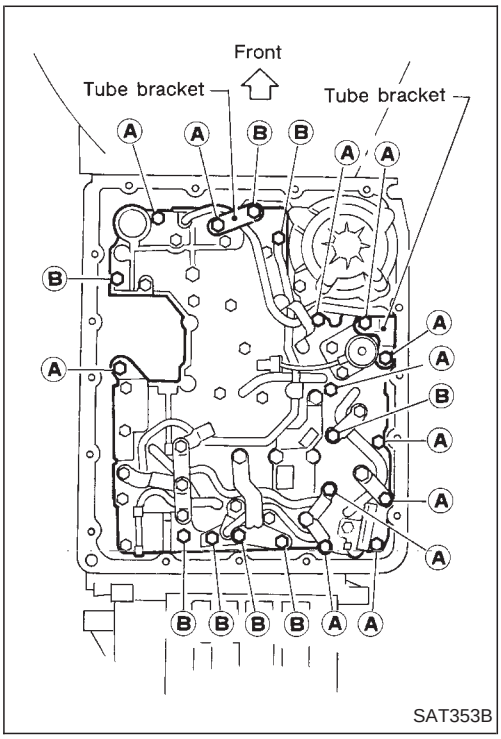


SAT006B

c. Place control valve assembly on transmission case. Connect solenoid connector for upper body.
d. Install connector clip.

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Assembly (2) (Cont'd)

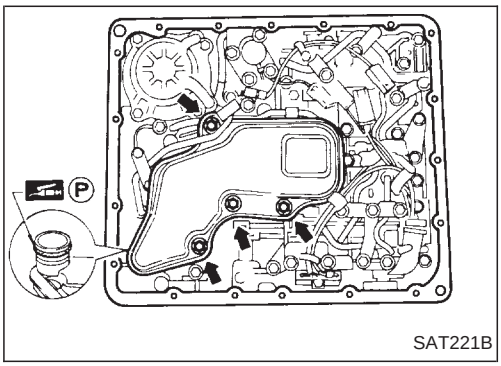


SAT353B

e. Install control valve assembly on transmission case.
f. Install connector tube brackets and tighten bolts Ⓐ and Ⓑ.

- **Check that terminal assembly does not catch.**

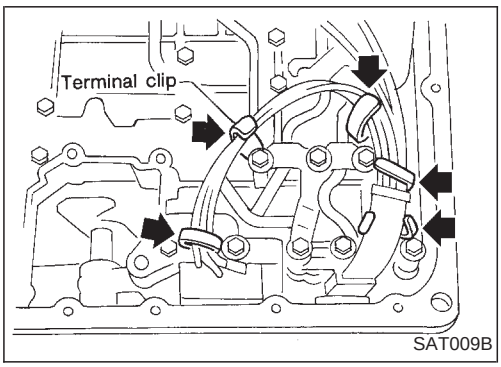
Bolt symbol	ℓ mm (in)
Ⓐ	33 (1.30)
Ⓑ	45 (1.77)



SAT221B

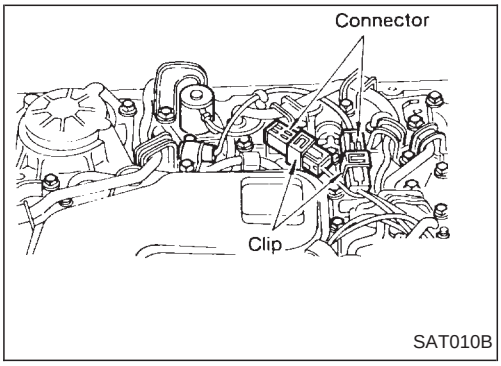
g. Install O-ring on oil strainer.
- **Apply petroleum jelly to O-ring.**

h. Install oil strainer on control valve.



SAT009B

i. Securely fasten terminal harness with clips.

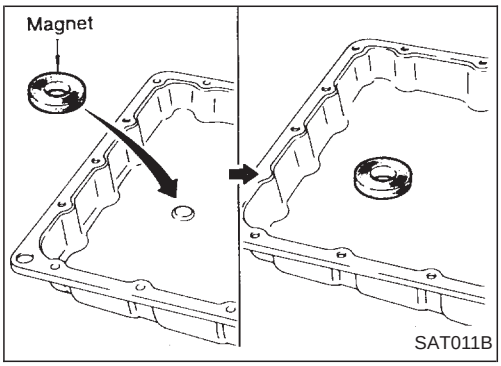


SAT010B

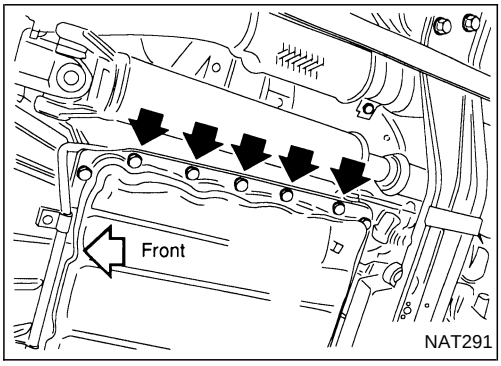
j. Install torque converter clutch solenoid valve and fluid temperature sensor connectors.

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Assembly (2) (Cont'd)

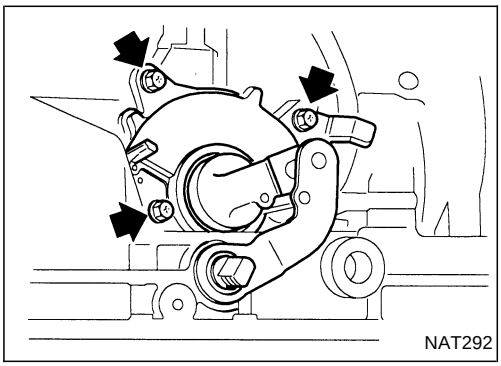


10. Install oil pan.
a. Attach a magnet to oil pan.

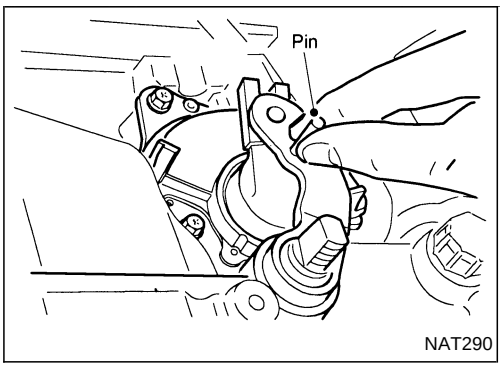


b. Install new oil pan gasket on transmission case.
c. Install oil pan and bracket on transmission case.
- **Always replace oil pan bolts as they are self-sealing bolts.**
- **Before installing bolts, remove traces of sealant and oil from mating surface and thread holes.**
- **Tighten four bolts in a criss-cross pattern to prevent dislocation of gasket.**

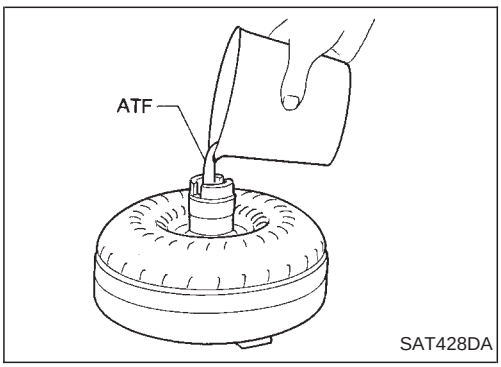
d. Tighten drain plug.



11. Install park/neutral position switch.
a. Check that manual shaft is in "1" position.
b. Temporarily install park/neutral position switch on manual shaft.
c. Move manual shaft to "N".



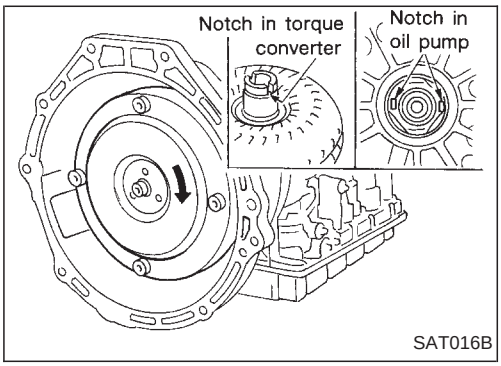
d. Tighten bolts while inserting 4.0 mm (0.157 in) dia. pin vertically into locating holes in park/neutral position switch and manual shaft.



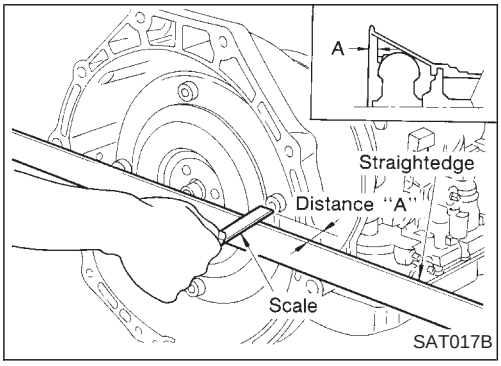
12. Install torque converter.
a. Pour ATF into torque converter.
- **Approximately 2 liters (1-3/4 Imp qt) of fluid are required for a new torque converter.**
- **When reusing old torque converter, add the same amount of fluid as was drained.**

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Assembly (2) (Cont'd)



b. Install torque converter while aligning notches and oil pump.



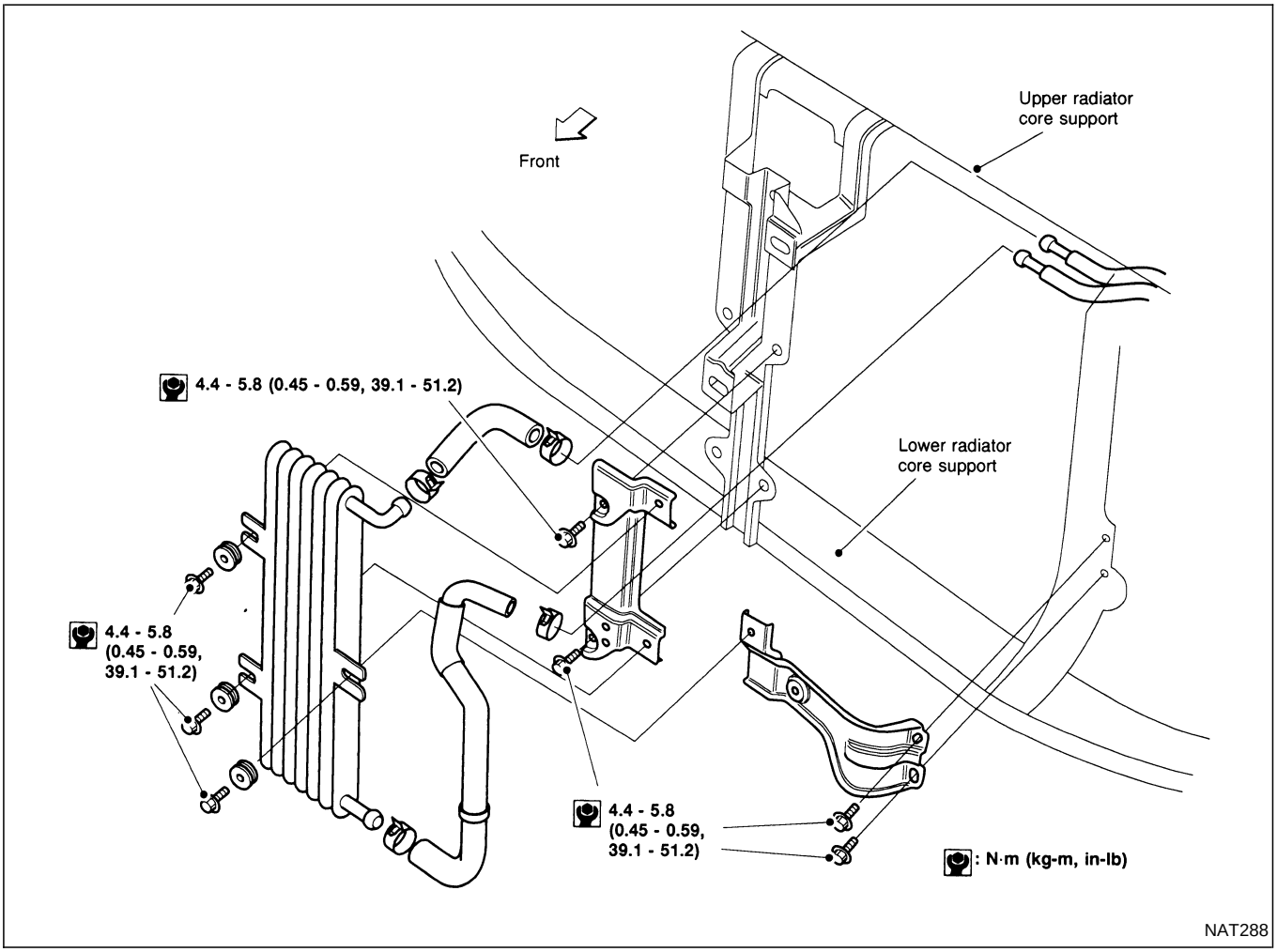
c. Measure distance A to check that torque converter is in proper position.

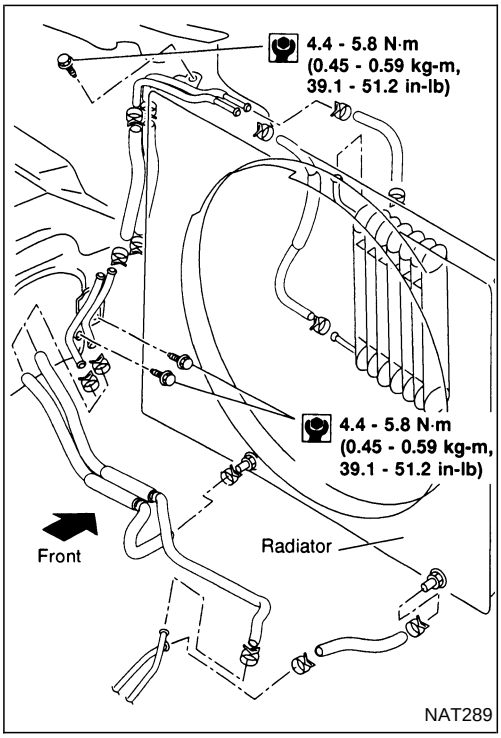
Distance "A":

26.0 mm (1.024 in) or more

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A/T Fluid Cooler





REMOVAL AND INSTALLATION

1. Remove front radiator grill. Refer to BT section (“BODY END”).
2. Disconnect fluid hoses from fluid cooler unit.
3. Remove fluid cooler unit.
4. Remove fluid cooler bracket.
5. Remove clips securing fluid hose (cooler unit to radiator) and loosen hose clamps, then remove the fluid hose.
6. Loosen clamps securing fluid hose (A/T assembly to fluid cooler), then remove the fluid hose.
7. Remove bolts securing fluid cooler tube bracket.
8. Remove fluid hose with bracket.

Reverse the removal procedure to install the A/T fluid cooler unit. Refer to the component drawing and specified tightening torque.

Check A/T fluid level and refill if necessary. Refer to MA section (“CHASSIS AND BODY MAINTENANCE”).

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General Specifications

Applied model	TD27ETi engine
Automatic transmission model	RE4R01A
Transmission model code number	4GX07
Stall torque ratio	2.0 : 1
Transmission gear ratio	
1st	2.785
2nd	1.545
Top	1.000
OD	0.694
Reverse	2.272
Recommended fluid	Genuine Nissan ATF or equivalent*1
Fluid capacity ℓ (Imp qt)	8.5 (7-1/2)

*1: Refer to MA section (“Fluids and Lubricants”, “RECOMMENDED FLUIDS AND LUBRICANTS”).

Specifications and Adjustment

SHIFT SCHEDULE

Vehicle speed when shifting gears

Throttle position	Vehicle speed km/h (MPH)						
	$D_1 \rightarrow D_2$	$D_2 \rightarrow D_3$	$D_3 \rightarrow D_4$	$D_4 \rightarrow D_3$	$D_3 \rightarrow D_2$	$D_2 \rightarrow D_1$	$1_2 \rightarrow 1_1$
Full throttle	32 - 36 (20 - 23)	66 - 74 (41 - 46)	108 - 118 (68 - 74)	103 - 113 (64 - 71)	61 - 69 (38 - 43)	27 - 31 (17 - 19)	43 - 47 (27 - 29)
Half throttle	30 - 34 (19 - 21)	62 - 68 (39 - 43)	82 - 92 (51 - 58)	67 - 75 (42 - 47)	26 - 32 (16 - 20)	7 - 11 (4 - 7)	43 - 47 (27 - 29)

Vehicle speed when performing and releasing lock-up

Throttle position	Overdrive control switch [Shift position]	Vehicle speed km/h (MPH)	
		Lock-up “ON”	Lock-up “OFF”
Full throttle	ON [D_4]	121 - 129 (76 - 81)	116 - 124 (73 - 78)
	OFF [D_3]	74 - 82 (46 - 51)	74 - 82 (46 - 51)
Half throttle	ON [D_4]	104 - 112 (65 - 70)	93 - 101 (58 - 63)
	OFF [D_3]	74 - 82 (46 - 51)	74 - 82 (46 - 51)

STALL REVOLUTION

Stall revolution	rpm	2,450 - 2,700

LINE PRESSURE

Engine speed rpm	Line pressure kPa (bar, kg/cm^2, psi)	
	D, 2 and 1 positions	R position
Idle	422 - 461 (4.22 - 4.61, 4.3 - 4.7, 61 - 67)	589 - 627 (5.89 - 6.27, 6.01 - 6.40, 85.4 - 90.9)
Stall	1,020 - 1,098 (10.20 - 10.98, 10.4 - 11.2, 148 - 159)	1,422 - 1,500 (14.22 - 15.00, 14.5 - 15.3, 206 - 218)

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Specifications and Adjustment (Cont'd)

RETURN SPRINGS

Unit: mm (in)

Parts				Item		
				Part No.	Free length	Outer diameter
Control valve	Upper body	Torque converter relief valve spring	①	31742-41X23	38.0 (1.496)	9.0 (0.354)
		Pressure regulator valve spring	②	31742-41X24	44.02 (1.7331)	14.0 (0.551)
		Pressure modifier valve spring	③	31742-41X19	31.95 (1.2579)	6.8 (0.268)
		Accumulator control valve spring	—	—	—	—
		Shuttle shift valve D spring	④	31762-41X01	25.0 (0.984)	7.0 (0.276)
		4-2 sequence valve spring	⑤	31756-41X00	29.1 (1.146)	6.95 (0.2736)
		Shift valve B spring	⑥	31762-41X01	25.0 (0.984)	7.0 (0.276)
		4-2 relay valve spring	⑦	31756-41X00	29.1 (1.146)	6.95 (0.2736)
		Shift valve A spring	⑧	31762-41X01	25.0 (0.984)	7.0 (0.276)
		Overrun clutch control valve spring	⑨	31762-41X03	23.6 (0.929)	7.0 (0.276)
		Overrun clutch reducing valve spring	⑩	31742-41X20	32.5 (1.280)	7.0 (0.276)
		Shuttle shift valve S spring	⑪	31762-41X04	51.0 (2.008)	5.65 (0.2224)
		Pilot valve spring	⑫	31742-41X13	25.7 (1.012)	9.0 (0.354)
		Torque converter clutch control valve spring	⑬	31742-41X22	18.5 (0.728)	13.0 (0.512)
	Lower body	Modifier accumulator piston spring	①	31742-27X70	31.4 (1.236)	9.8 (0.386)
		1st reducing valve spring	②	31756-41X05	25.4 (1.000)	6.75 (0.2657)
		3-2 timing valve spring	③	31742-41X06	23.0 (0.906)	6.7 (0.264)
		Servo charger valve spring	④	31742-41X06	23.0 (0.906)	6.7 (0.264)
Reverse clutch		16 pcs		31521-41X02 (Assembly)	19.69 (0.7752)	11.6 (0.457)
High clutch		10 pcs		31521-41X03 (Assembly)	24.2 (0.953)	11.6 (0.457)
Forward clutch (Overrun clutch)		20 pcs		32521-41X00 (Assembly)	35.77 (1.4083)	9.7 (0.382)
Low & reverse brake		18 pcs		31655-41X00 (Assembly)	22.3 (0.878)	11.2 (0.441)
Band servo		Spring Ⓐ		31605-41X05	45.6 (1.795)	34.3 (1.350)
		Spring Ⓑ		31605-41X00	53.8 (2.118)	40.3 (1.587)
		Spring Ⓒ		31605-41X01	29.7 (1.169)	27.6 (1.087)
Accumulator		Accumulator Ⓐ		31605-41X02	43.0 (1.693)	18.0 (0.709)
		Accumulator Ⓑ		31605-41X10	66.0 (2.598)	20.0 (0.787)
		Accumulator Ⓒ		31605-41X09	45.0 (1.772)	29.3 (1.154)
		Accumulator Ⓓ		31605-41X06	58.4 (2.299)	17.3 (0.681)

ACCUMULATOR O-RING

Accumulator	Diameter mm (in)			
	Ⓐ	Ⓑ	Ⓒ	Ⓓ
Small diameter end	29 (1.14)	32 (1.26)	45 (1.77)	29 (1.14)
Large diameter end	45 (1.77)	50 (1.97)	50 (1.97)	45 (1.77)

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Specifications and Adjustment (Cont'd)

CLUTCHES AND BRAKES

Code number		4GX07	
Reverse clutch			
Number of drive plates		2	
Number of driven plates		2	
Thickness of drive plate mm (in)	Standard	1.90 - 2.05 (0.0748 - 0.0807)	
	Wear limit	1.80 (0.0709)	
Clearance mm (in)	Standard	0.5 - 0.8 (0.020 - 0.031)	
	Allowable limit	1.2 (0.047)	
Thickness of retaining plate		Thickness mm (in)	Part number
		4.8 (0.189)	31537-42X02
		5.0 (0.197)	31537-42X03
		5.2 (0.205)	31537-42X04
		5.4 (0.213)	31537-42X05
		5.6 (0.220)	31537-42X06
High clutch			
Number of drive plates		5	
Number of driven plates		5	
Thickness of drive plate mm (in)	Standard	1.52 - 1.67 (0.0598 - 0.0657)	
	Wear limit	1.40 (0.0551)	
Clearance mm (in)	Standard	1.8 - 2.2 (0.071 - 0.087)	
	Allowable limit	3.2 (0.126)	
Thickness of retaining plate		Thickness mm (in)	Part number
		3.4 (0.134)	31537-41X71
		3.6 (0.142)	31537-41X61
		3.8 (0.150)	31537-41X62
		4.0 (0.157)	31537-41X63
		4.2 (0.165)	31537-41X64
		4.4 (0.173)	31537-41X65
		4.6 (0.181)	31537-41X66
		4.8 (0.189)	31537-41X67
Forward clutch			
Number of drive plates		7	
Number of driven plates		7	
Thickness of drive plate mm (in)	Standard	1.52 - 1.67 (0.0598 - 0.0657)	
	Wear limit	1.40 (0.0551)	
Clearance mm (in)	Standard	0.35 - 0.75 (0.0138 - 0.0295)	
	Allowable limit	2.15 (0.0846)	
Thickness of retaining plate		Thickness mm (in)	Part number
		4.6 (0.181)	31537-42X13
		4.8 (0.189)	31537-42X14
		5.0 (0.197)	31537-42X15
		5.2 (0.205)	31537-4AX00
		5.4 (0.213)	31537-4AX01
		5.6 (0.220)	31537-4AX02

Code number		4GX07	
Overrun clutch			
Number of drive plates		3	
Number of driven plates		5	
Thickness of drive plate mm (in)	Standard	1.90 - 2.05 (0.0748 - 0.0807)	
	Wear limit	1.80 (0.0709)	
Clearance mm (in)	Standard	1.0 - 1.4 (0.039 - 0.055)	
	Allowable limit	2.0 (0.079)	
Thickness of retaining plate		Thickness mm (in)	Part number
		4.2 (0.165)	31537-41X80
		4.4 (0.173)	31537-41X81
		4.6 (0.181)	31537-41X82
		4.8 (0.189)	31537-41X83
		5.0 (0.197)	31537-41X84
Low & reverse brake			
Number of drive plates		7	
Number of driven plates		7	
Thickness of drive plate mm (in)	Standard	1.52 - 1.67 (0.0598 - 0.0657)	
	Wear limit	1.4 (0.055)	
Clearance mm (in)	Standard	0.8 - 1.1 (0.031 - 0.043)	
	Allowable limit	2.5 (0.098)	
Thickness of retaining plate		Thickness mm (in)	Part number
		6.6 (0.260)	31667-41X17
		6.8 (0.268)	31667-41X11
		7.0 (0.276)	31667-41X12
		7.2 (0.283)	31667-41X13
		7.4 (0.291)	31667-41X14
		7.6 (0.299)	31667-41X07
		7.8 (0.307)	31667-41X08
		8.0 (0.315)	31667-41X00
		8.2 (0.323)	31667-41X01
		8.4 (0.331)	31667-41X02
		8.6 (0.339)	31667-41X03
		8.8 (0.346)	31667-41X04
		9.0 (0.354)	31667-41X05
Brake band			
Anchor end bolt tightening torque N·m (kg-m, in-lb)		4 - 6 (0.4 - 0.6, 35 - 52)	
Number of returning revolution for anchor end bolt		2.5	

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Specifications and Adjustment (Cont'd)

OIL PUMP AND LOW ONE-WAY CLUTCH

Oil pump clearance mm (in)	
Cam ring — oil pump housing	
Standard	0.01 - 0.024 (0.0004 - 0.0009)
Rotor, vanes and control piston — oil pump housing	
Standard	0.03 - 0.044 (0.0012 - 0.0017)
Seal ring clearance mm (in)	
Standard	0.10 - 0.25 (0.0039 - 0.0098)
Allowable limit	0.25 (0.0098)

TOTAL END PLAY

Total end play "T_1"	0.25 - 0.55 mm (0.0098 - 0.0217 in)	
	Thickness mm (in)	Part number
Thickness of oil pump cover bearing race	0.8 (0.031)	31435-41X01
	1.0 (0.039)	31435-41X02
	1.2 (0.047)	31435-41X03
	1.4 (0.055)	31435-41X04
	1.6 (0.063)	31435-41X05
	1.8 (0.071)	31435-41X06
	2.0 (0.079)	31435-41X07

REVERSE CLUTCH DRUM END PLAY

Reverse clutch drum end play "T_2"	0.55 - 0.90 mm (0.0217 - 0.0354 in)	
	Thickness mm (in)	Part number
Thickness of oil pump thrust washer	0.9 (0.035)	31528-21X01
	1.1 (0.043)	31528-21X02
	1.3 (0.051)	31528-21X03
	1.5 (0.059)	31528-21X04
	1.7 (0.067)	31528-21X05
	1.9 (0.075)	31528-21X06

REMOVAL AND INSTALLATION

Manual control linkage	
Number of returning revolutions for lock nut	2
Lock nut tightening torque N·m (kg-m, in-lb)	4.4 - 5.9 (0.45 - 0.60, 39.1 - 52.1)
Distance between end of converter housing and torque converter mm (in)	26.0 (1.024) or more

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TRANSFER

SECTION TF

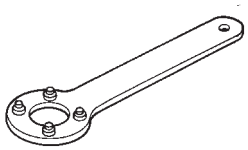
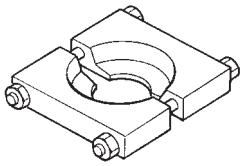
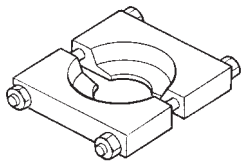
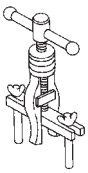
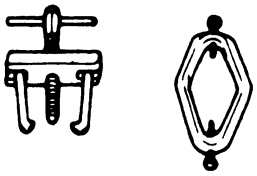
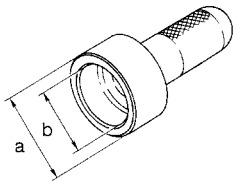
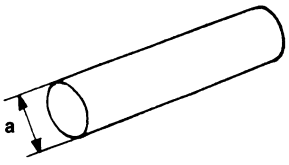
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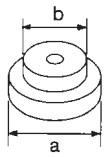
SPECIAL SERVICE TOOLS

*: Special tool or commercial equivalent

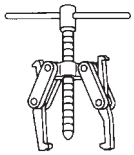
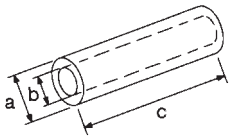
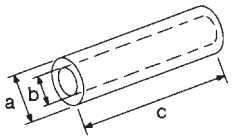
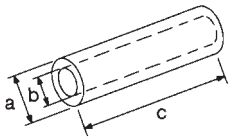
Tool number Tool name	Description	
ST38060002* Flange wrench		Removing companion flange nut Installing companion flange nut
ST30021000* Puller		Removing counter gear front bearing (Use with ST36710010)
ST30031000* Puller		Removing counter gear rear bearing (Use with ST36710010)
ST33290001* Puller		Removing center case oil seal Removing rear oil seal
ST33051001* Puller		Removing companion flange
ST30720000* Drift		Installing center case oil seal Installing rear oil seal **a: 77 mm (3.03 in) dia.** **b: 55.5 mm (2.185 in) dia.**
ST36710010* Drift		Removing counter gear front bearing (Use with ST30021000) Removing counter gear rear bearing (Use with ST30031000) **a: 34.5 mm (1.358 in) dia.**
ST33061000* Drift		Removing main gear bearing **a: 28.5 mm (1.122 in) dia.** **b: 38 mm (1.50 in) dia.**

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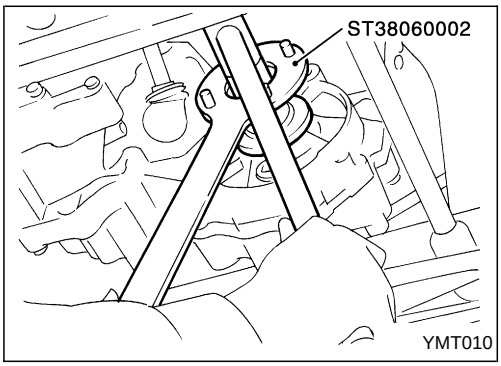
*: Special tool or commercial equivalent

Tool number Tool name	Description	
ST30613000* Drift		Installing main gear bearing Installing cover oil seal **a: 72 mm (2.83 in) dia.** **b: 48 mm (1.89 in) dia.**

COMMERCIAL SERVICE TOOLS

Tool name	Description	
Puller		Removing front drive shaft front bearing Removing front drive shaft rear bearing Removing main gear bearing
Drift		Installing shift shaft oil seal **a: 26 mm (1.02 in) dia.** **b: 20 mm (0.79 in) dia.** **c: 150 mm (5.91 in)**
Drift		Installing mainshaft rear bearing **a: 50 mm (1.97 in) dia.** **b: 42 mm (1.65 in) dia.** **c: 180 mm (7.09 in)**
Drift		Installing L & H hub **a: 60 mm (2.36 in) dia.** **b: 50 mm (1.97 in) dia.** **c: 60 mm (2.36 in)**

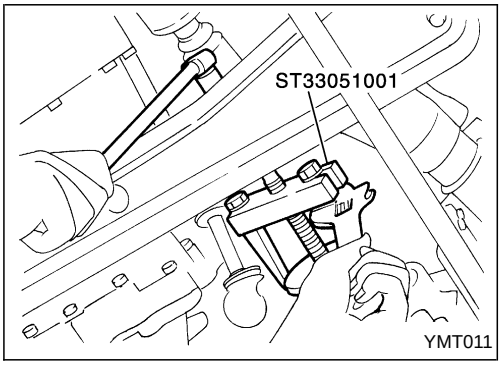
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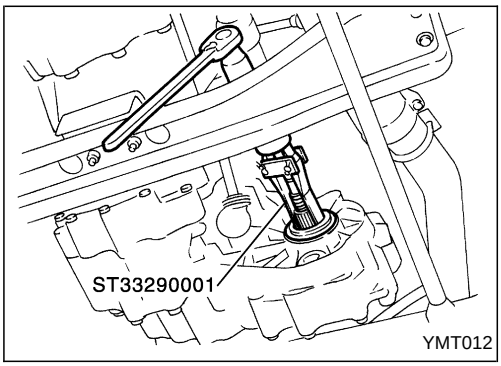
Replacing Oil Seal

CENTER CASE OIL SEAL

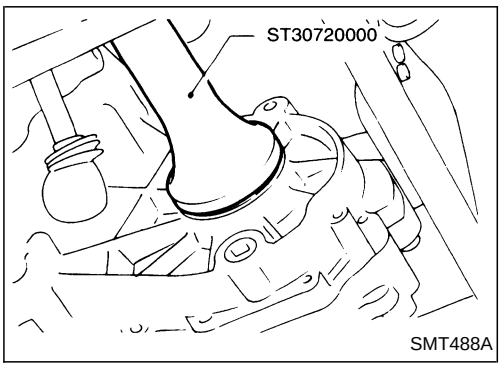
1. Remove front propeller shaft — Refer to PD section.
2. Remove companion flange nut.



3. Remove companion flange.



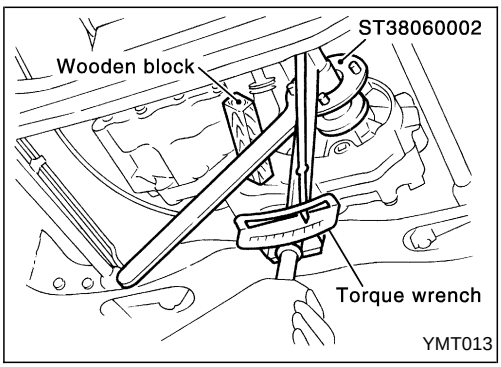
4. Remove center case oil seal.



5. Install center case oil seal.

Before installing, apply multi-purpose grease to seal lip.

6. Install companion flange.



7. Tighten nut to the specified torque.

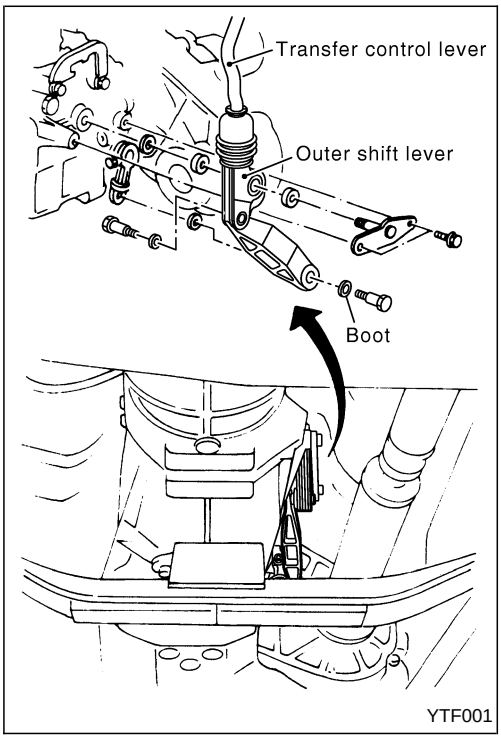
: 226 - 324 N·m (23 - 33 kg-m, 166 - 239 ft-lb)

8. Install front propeller shaft.

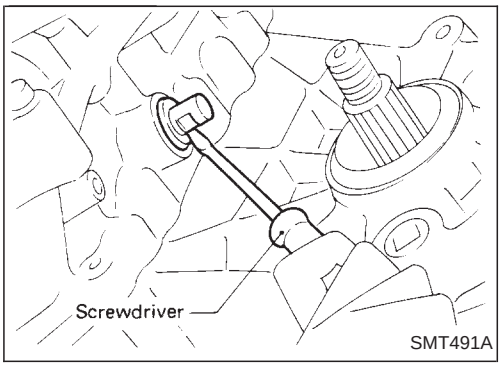
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Replacing Oil Seal (Cont'd)

SHIFT SHAFT OIL SEAL

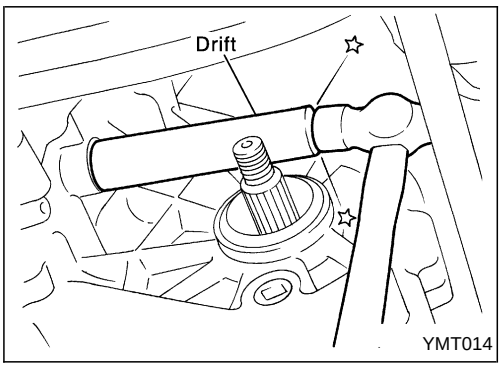


1. Remove front propeller shaft — Refer to PD section.
2. Install companion flange — Refer to "CENTER CASE OIL SEAL", TF-4.
3. Remove transfer control lever from transfer outer shift lever. Then remove outer shift lever.



4. Remove shift shaft oil seal.

Be careful not do damage cross shaft.

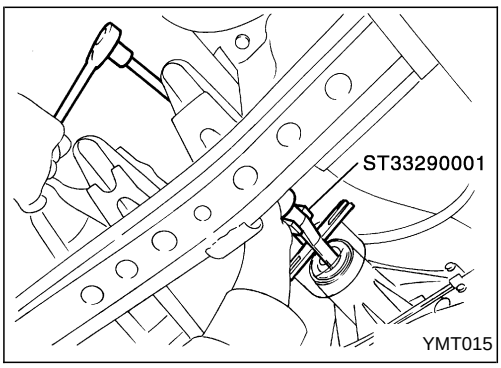


5. Install shift shaft oil seal.

Before installing, apply multi-purpose grease to seal lip.

6. Install transfer control linkage.
7. Install companion flange — Refer to "CENTER CASE OIL SEAL", TF-4.
8. Install front propeller shaft.

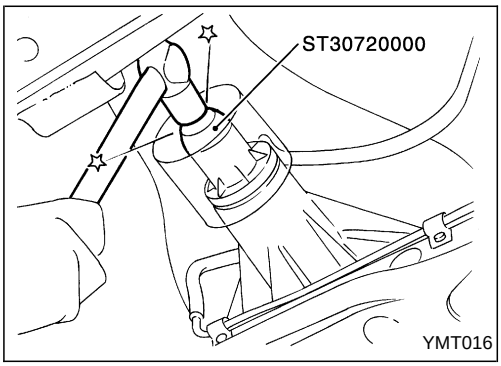
REAR OIL SEAL



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

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Replacing Oil Seal (Cont'd)

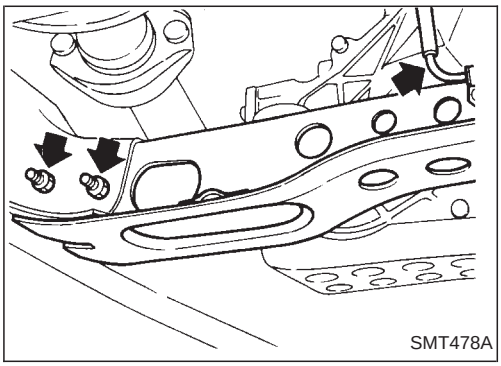


3. Install rear oil seal.

Before installing apply multi-purpose grease to seal lip.

4. Install rear propeller shaft.

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SMT478A

Removal

- Drain oil from transfer and transmission.
- Remove front and rear propeller shafts — Refer to PD section.
- Insert plug into oil seal after removing propeller shaft.

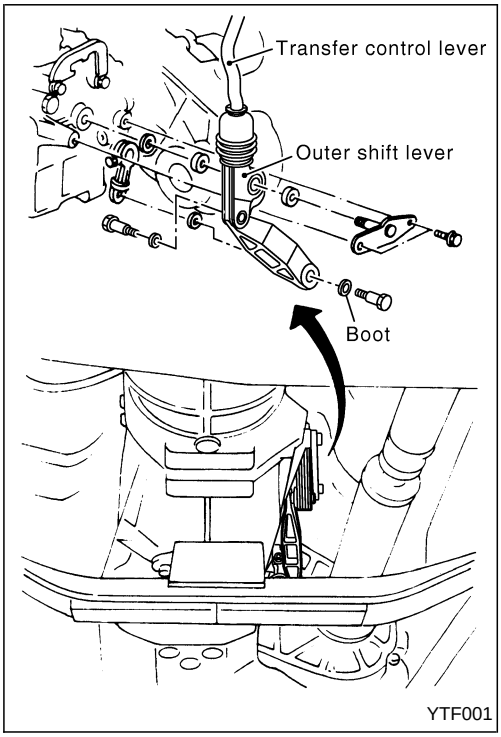
CAUTION:

Be careful not to damage spline, sleeve yoke and rear oil seal, when removing propeller shaft.

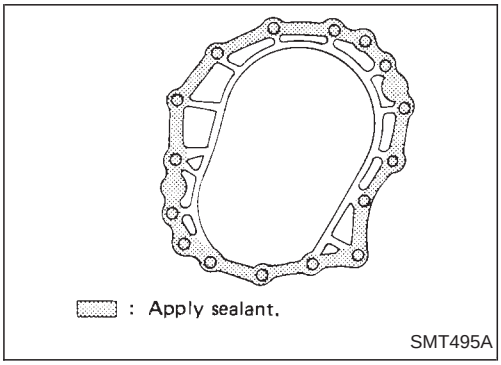
- Remove torsion bar spring — Refer to removal and installation of lower link in FA section. Then remove fifth crossmember.
- Remove transfer control lever from transfer outer shift lever.
- Remove transfer from transmission.

WARNING:

Support transfer while removing it.



YTF001



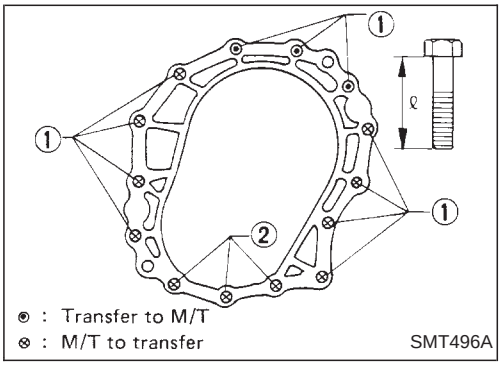
SMT495A

Installation

- Apply recommended sealant to mating surface to transmission.

Recommended sealant:

Nissan genuine part (KP610-00250) or equivalent

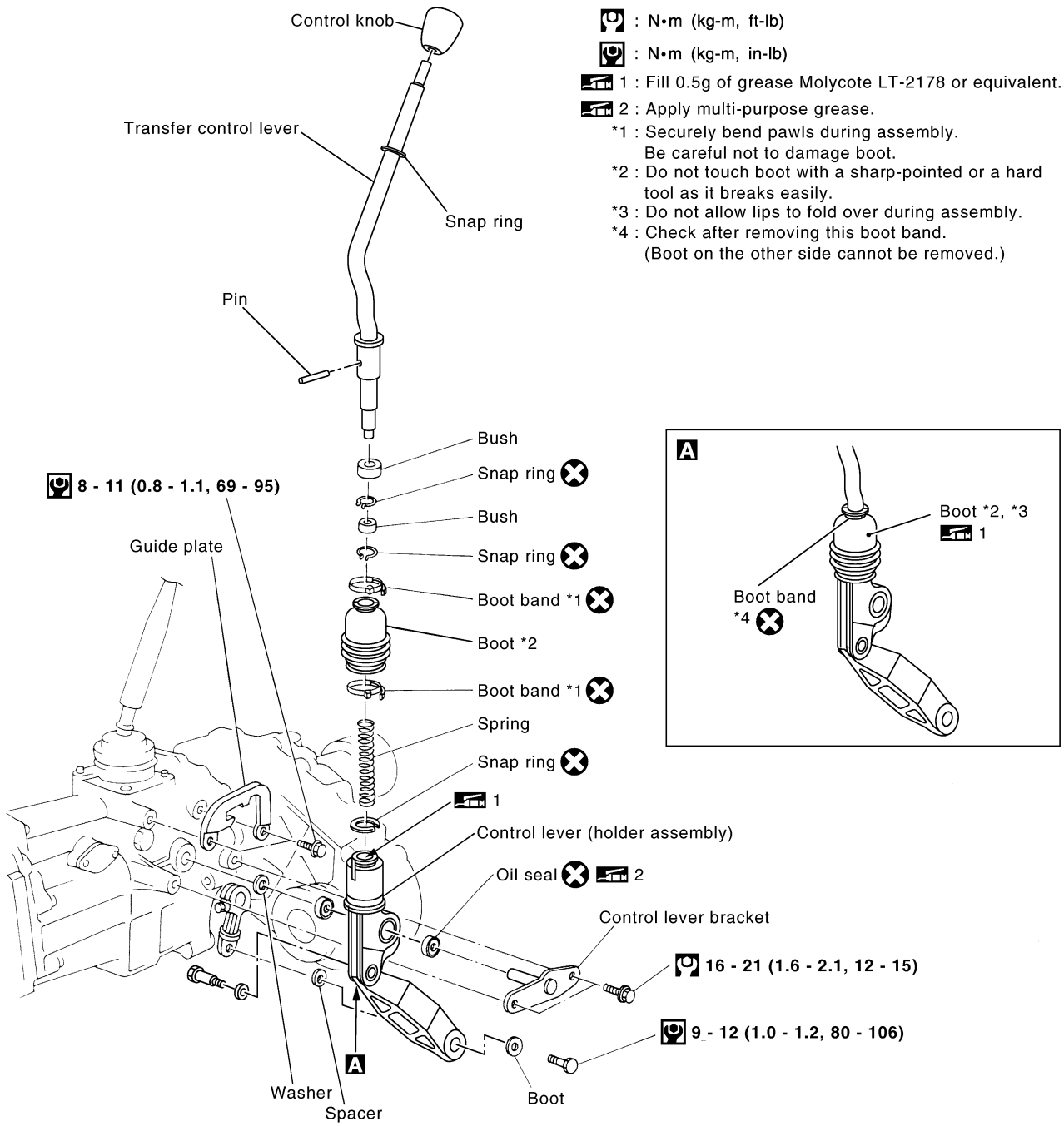


SMT496A

- Tighten bolts securing transfer.

Bolt No.	Tightening torque N·m (kg-m, ft-lb)	ℓ mm (in)
①	27 - 36 (2.8 - 3.6, 20 - 26)	45 (1.77)
②	27 - 36 (2.8 - 3.6, 20 - 26)	60 (2.36)

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: N•m (kg-m, ft-lb)

: N•m (kg-m, in-lb)

1 : Fill 0.5g of grease Molycote LT-2178 or equivalent.

2 : Apply multi-purpose grease.

*1 : Securely bend pawls during assembly.
Be careful not to damage boot.

*2 : Do not touch boot with a sharp-pointed or a hard tool as it breaks easily.

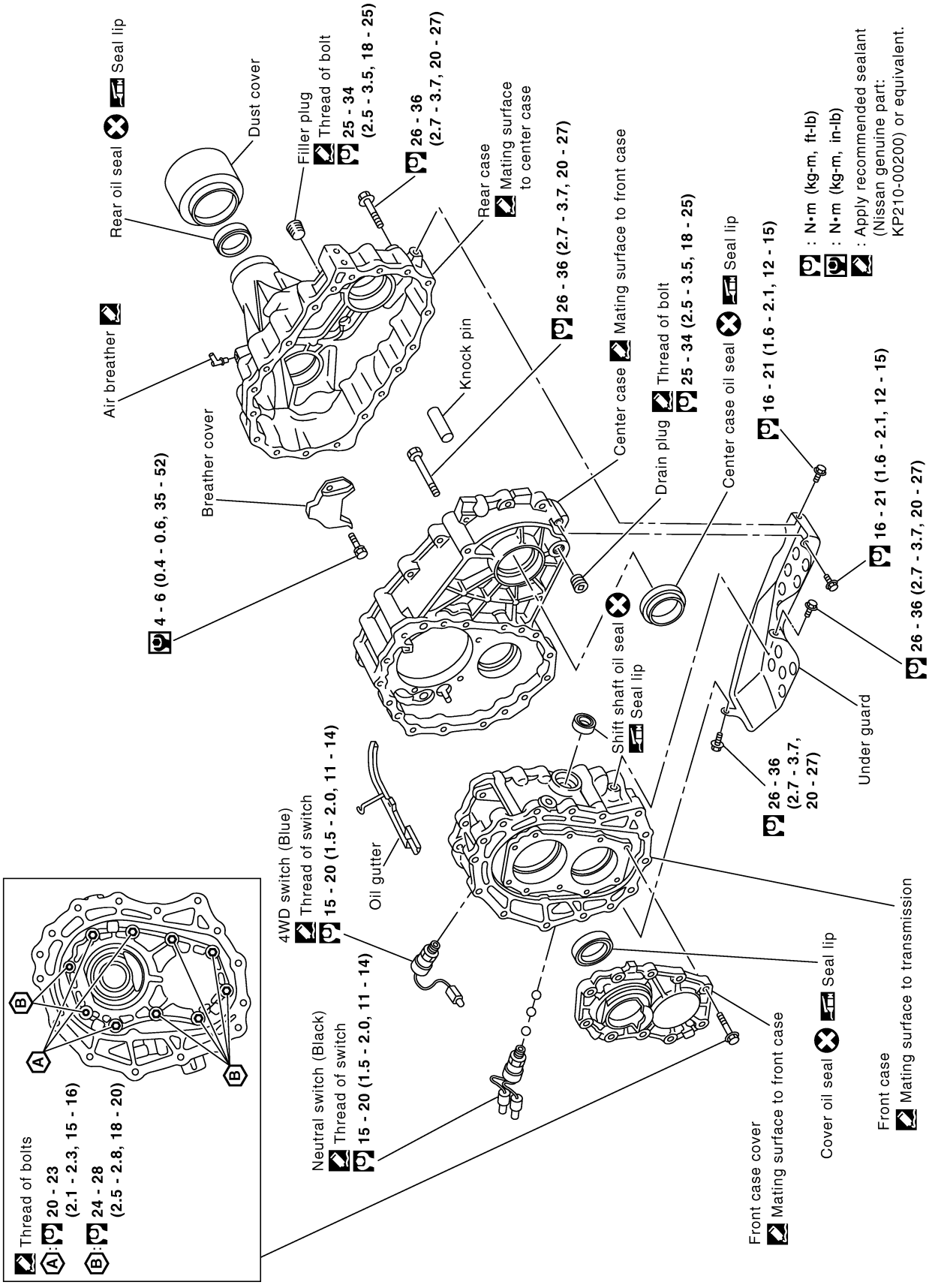
*3 : Do not allow lips to fold over during assembly.

*4 : Check after removing this boot band.
(Boot on the other side cannot be removed.)

YTF002

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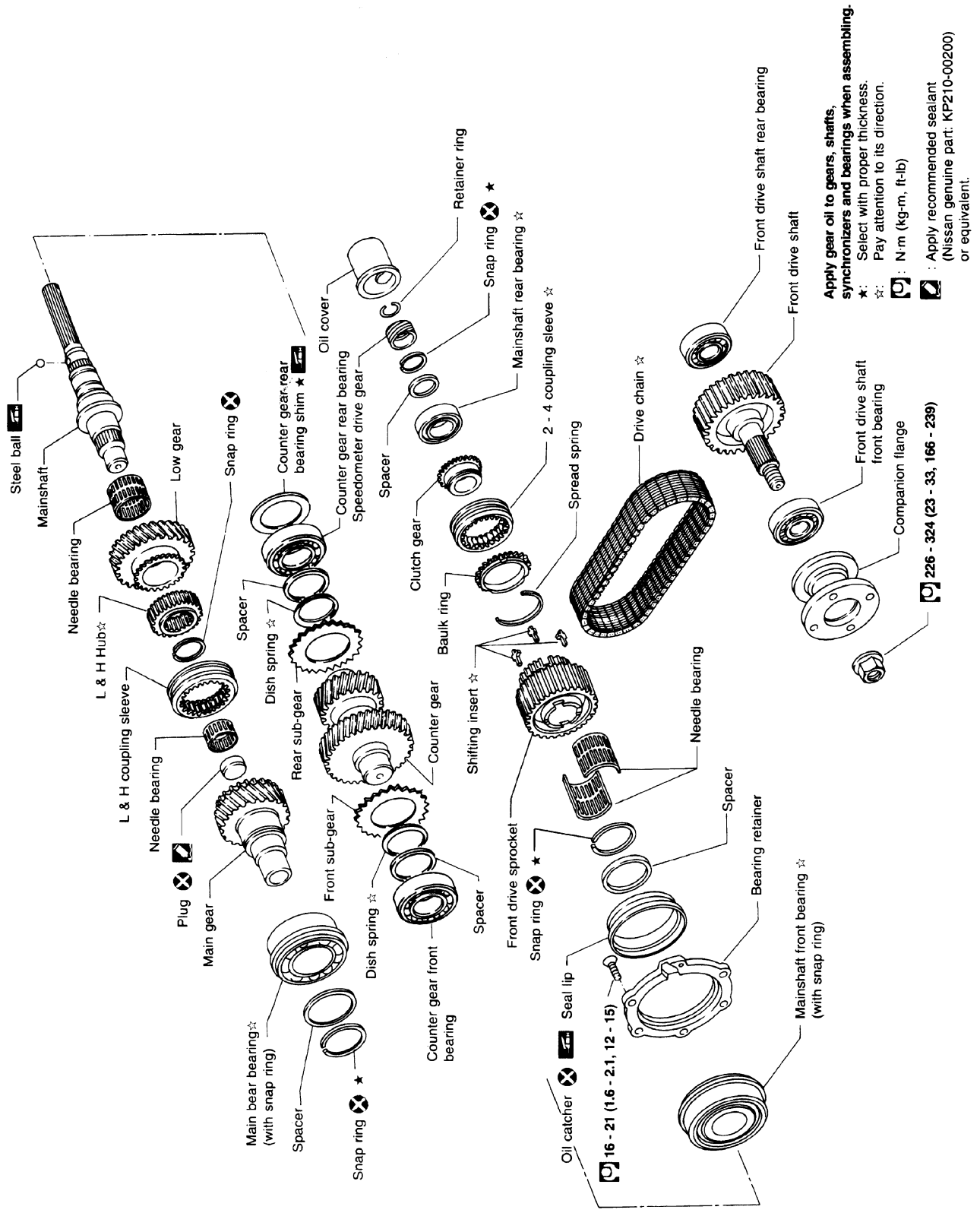
Case Components



YTF003

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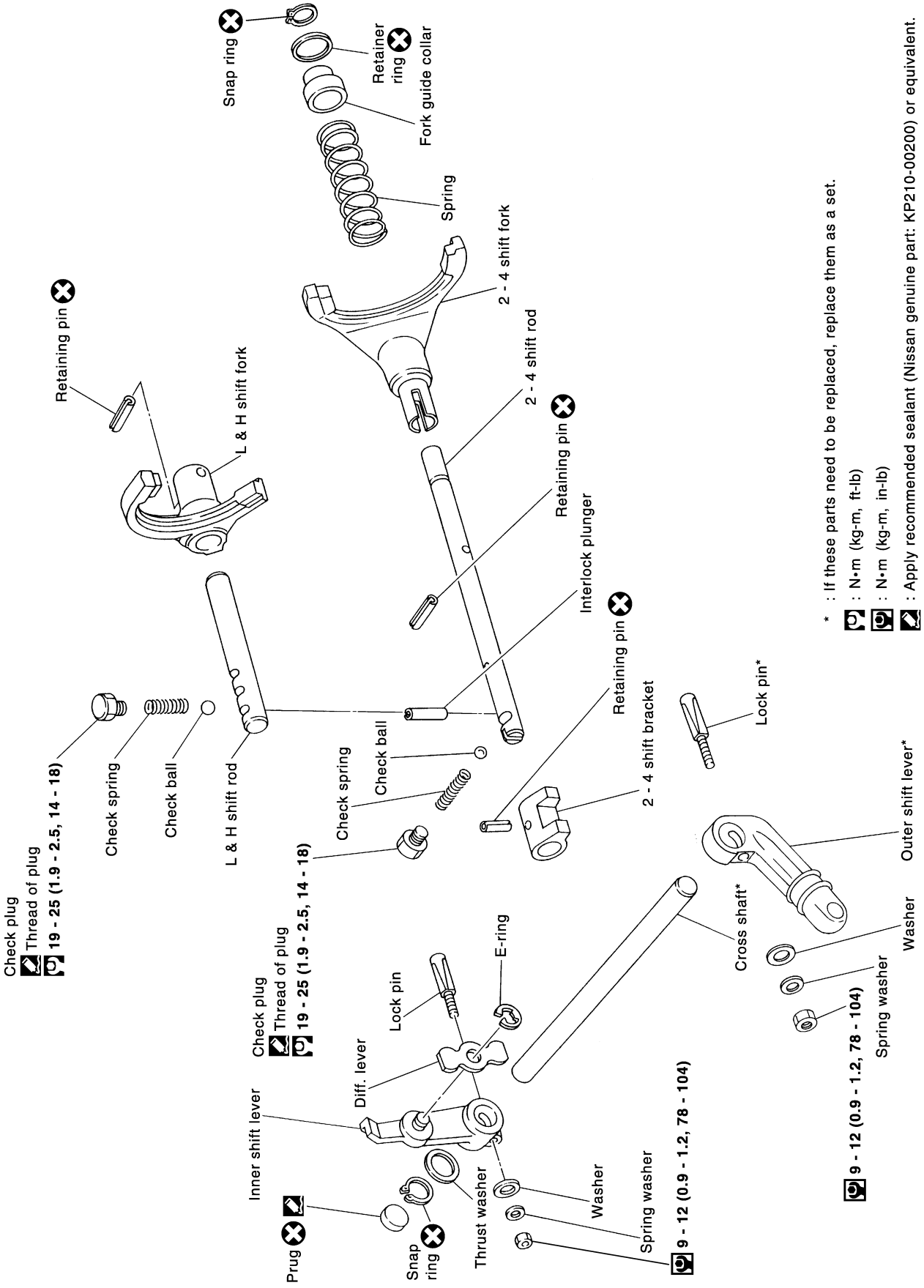
Gear Components



SMT212B

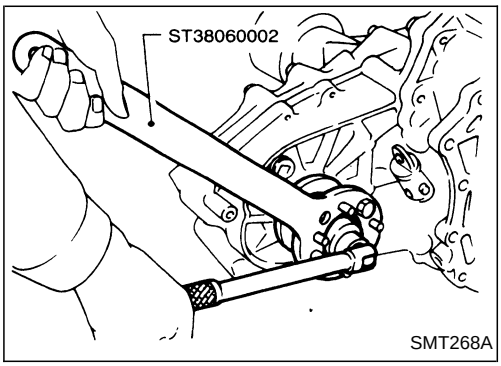
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Shift Control Components

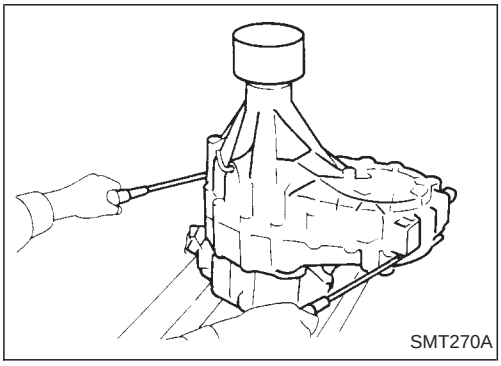


YMT008

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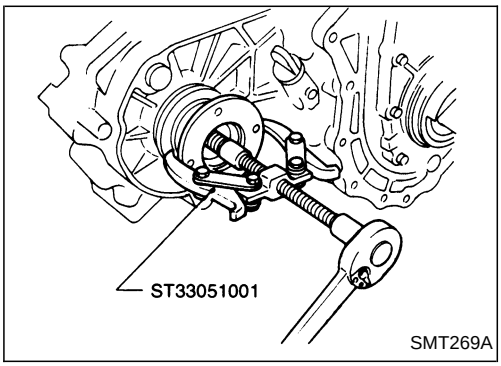


1. Remove nut of companion flange.

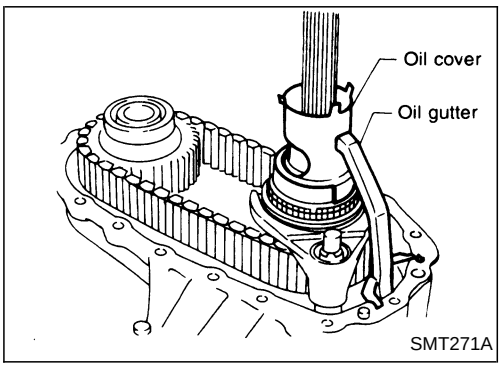


2. Remove rear case.

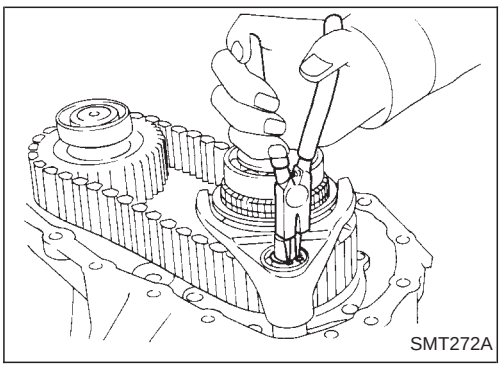
Be careful not to damage the mating surface.



3. Remove companion flange.

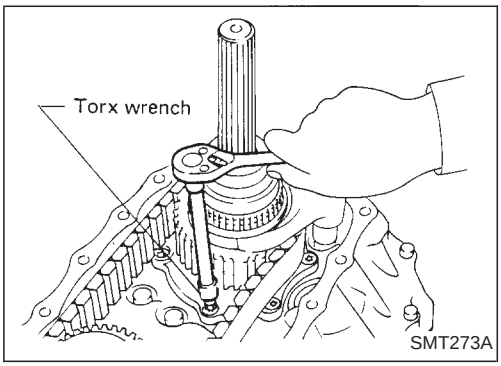


4. Remove oil cover and oil gutter.



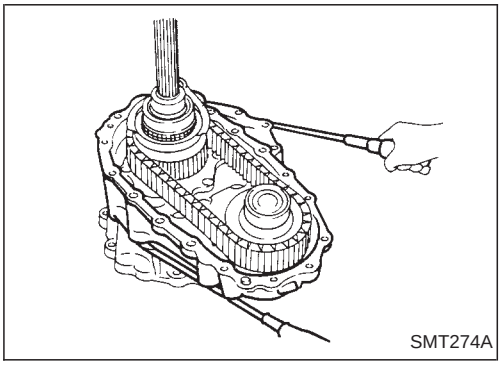
5. Remove snap ring from 2-4 shift rod.

http://vnx.su/

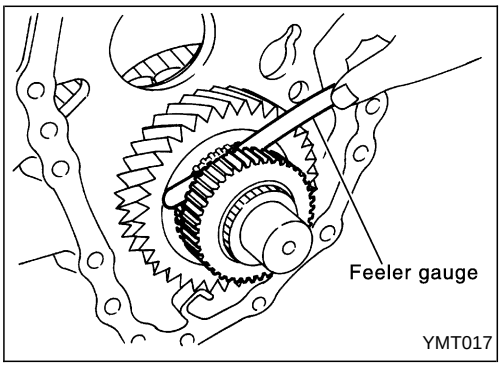


6. Remove bolts securing bearing retainer.

This step is necessary to remove mainshaft from center case.



7. Remove bolts securing center case to front case and then separate center case and front case.

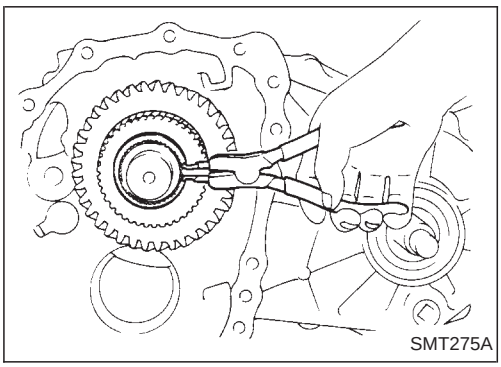


8. Measure end play of low gear.

Standard:

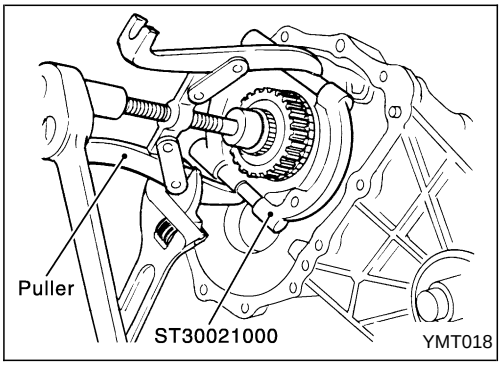
0 - 0.15 mm (0 - 0.0059 in)

If end play is beyond the maximum value, check low gear and L & H hub for wear.



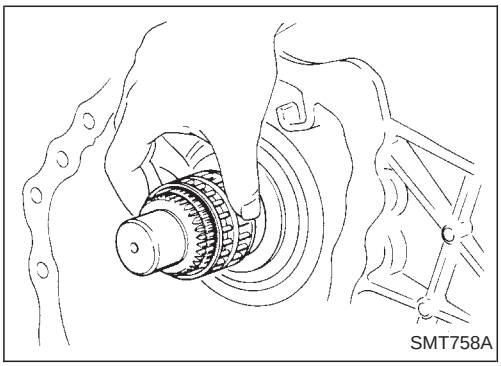
9. Disassemble center case assembly.

a. Remove snap ring from mainshaft.

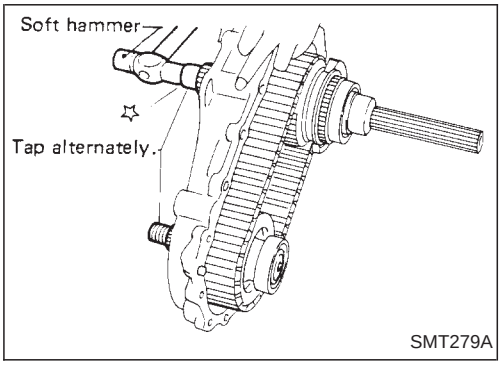


b. Pull out low gear with L & H hub.

http://vnx.su/

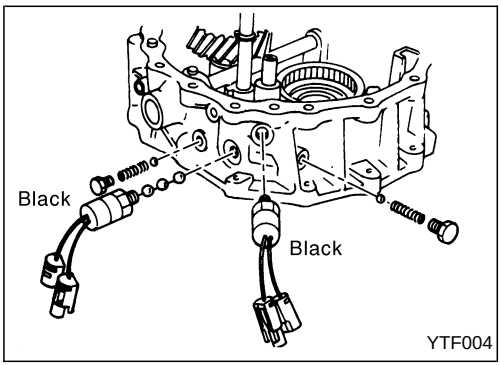

SMT758A

c. Remove needle bearing of low gear.



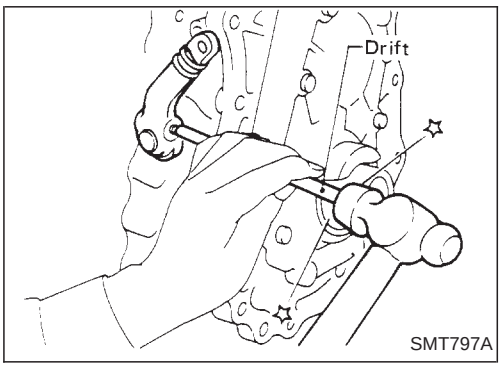
SMT279A

d. Remove mainshaft, front drive and drive chain as a set by tapping front end of mainshaft and front drive shaft alternately.
Be careful not to bend drive chain.



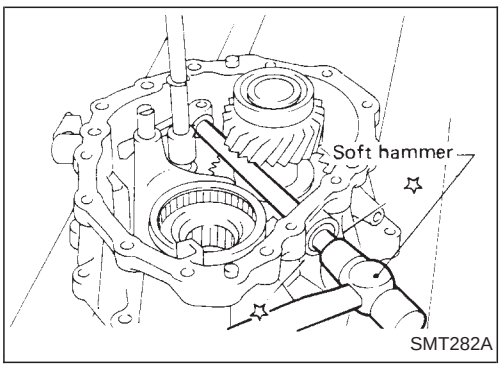
YTF004

10. Disassemble front case assembly.
a. Remove switches, check plugs, check springs and check balls.



SMT797A

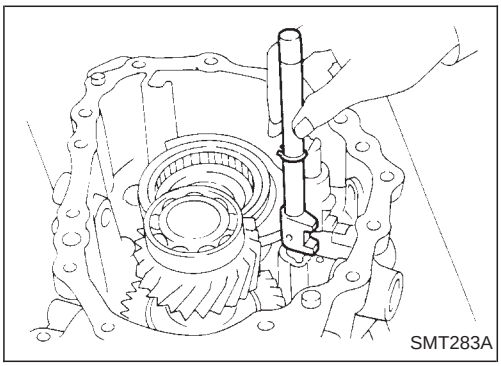
b. Remove outer shift lever.



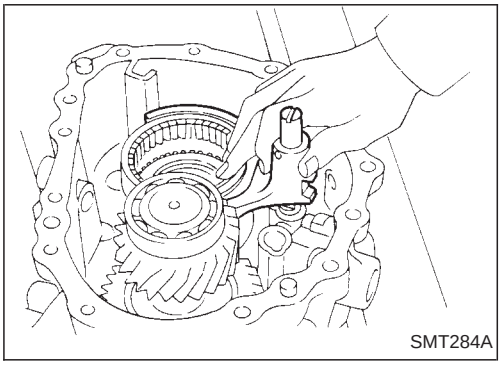
SMT282A

c. Remove lock pin of inner shift lever and drive out cross shaft with plug.

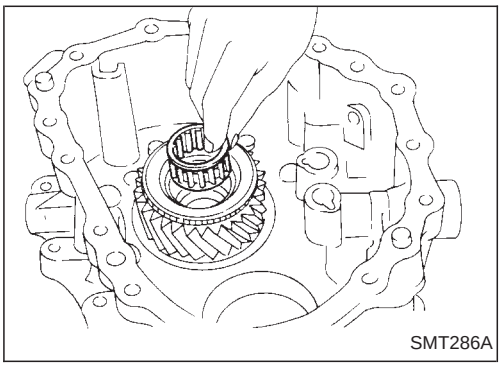
http://vnx.su/


SMT283A

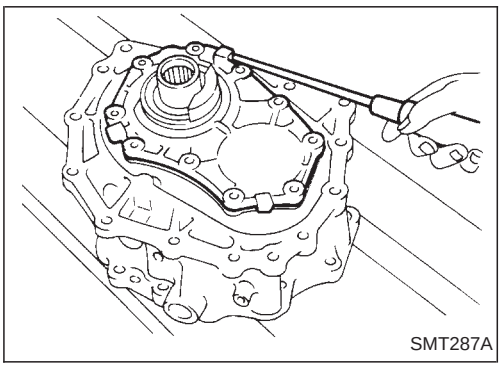
d. Remove 2-4 shift rod.


SMT284A

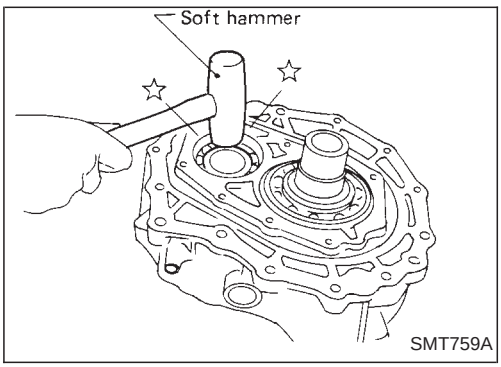
e. Remove L & H shift rod and fork assembly with coupling sleeve.


SMT286A

f. Remove needle bearing from main gear.


SMT287A

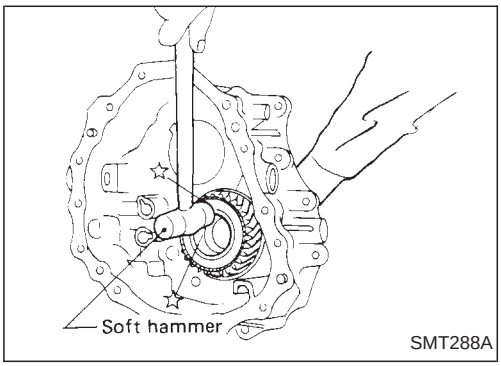
g. Remove bolts securing front case cover and then remove case.



SMT759A

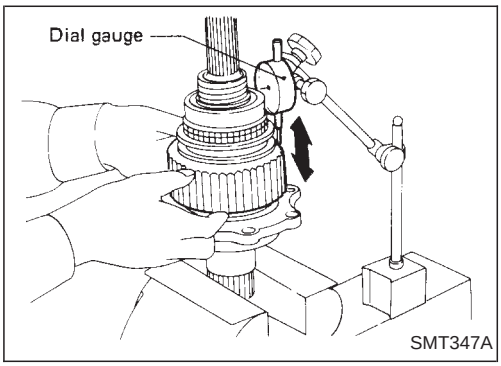
h. Remove counter gear by tapping lightly.

http://vnx.su/



i. Remove main gear by tapping lightly.

http://vnx.su/

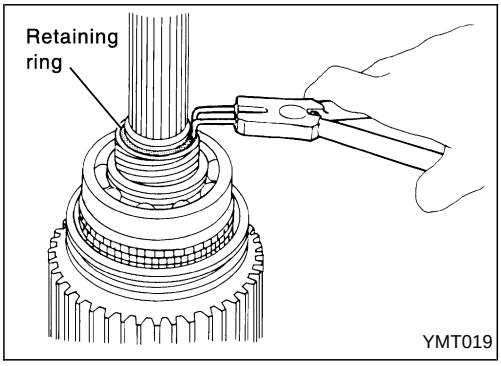


Mainshaft

DISASSEMBLY

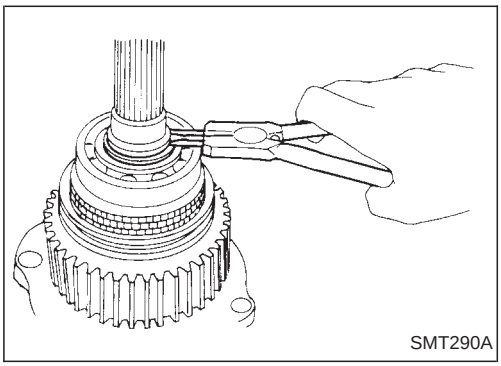
1. Check end play of front drive sprocket.
   Standard:
   0 - 0.15 mm (0 - 0.0059 in)

If end play is beyond the maximum value, check front drive sprocket and clutch gear for wear.

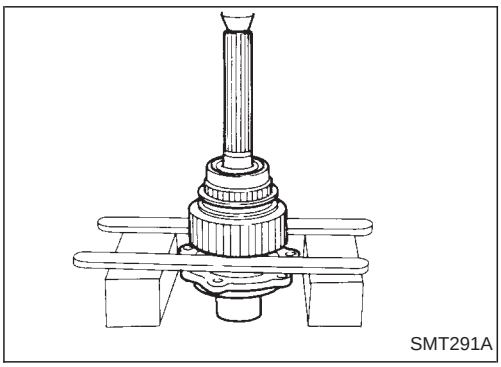


2. Remove retaining ring, speedometer drive gear and steel ball.

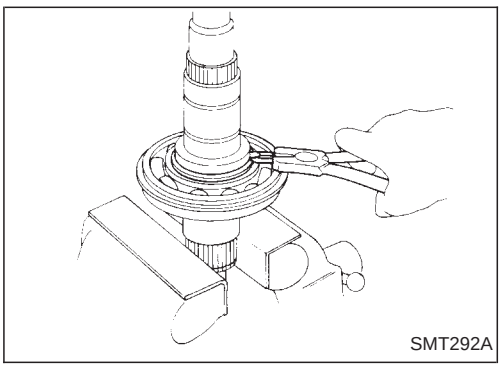
Be careful not to lose the steel ball.



3. Remove snap ring and spacer.



4. Press out front drive sprocket with mainshaft rear bearing and clutch gear together.
5. Remove needle bearing.

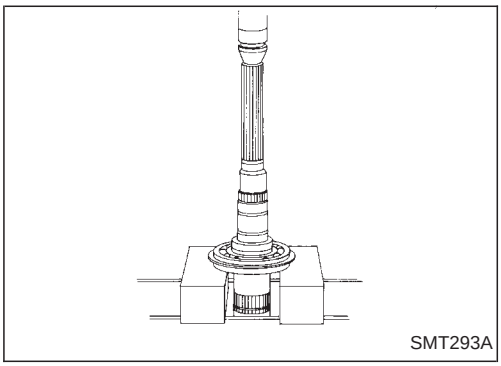


6. Remove bearing retainer and then remove snap ring and spacer.

http://vnx.su/

Mainshaft (Cont'd)

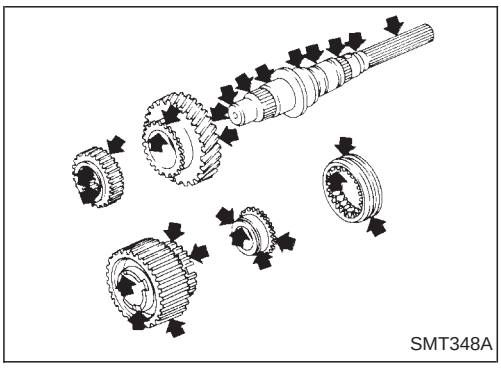
7. Press out mainshaft front bearing from mainshaft.


SMT293A

INSPECTION

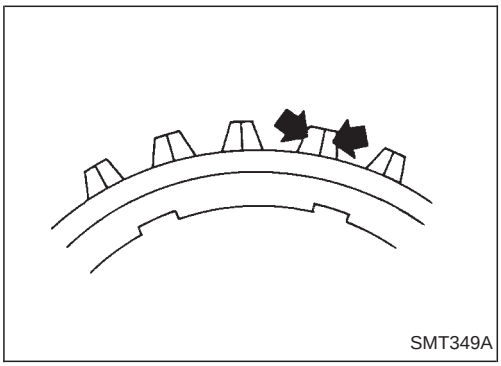
Gear and shaft

- Check gears for excessive wear, chips or cracks.
- Check shaft for cracks, wear of bending.
- Check coupling sleeve for wear or damage.


SMT348A

Baulk ring

- Check baulk ring for cracks or deformation.

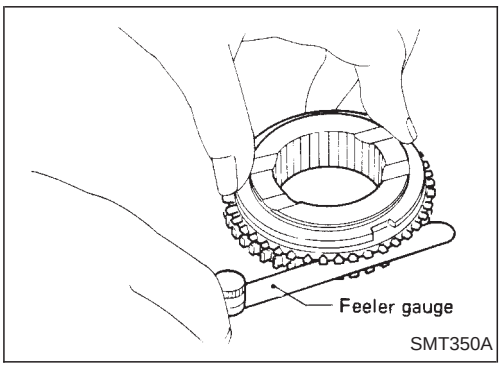

SMT349A

- Measure clearance between baulk ring and gear.

Baulk ring to gear clearance:

Unit: mm (in)

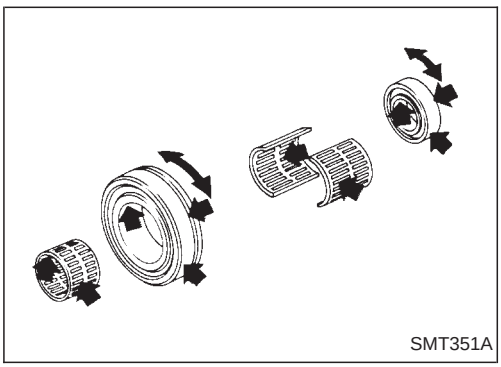
Standard	Wear limit
1.0 - 1.5 (0.039 - 0.059)	0.5 (0.020)



SMT350A

Bearing

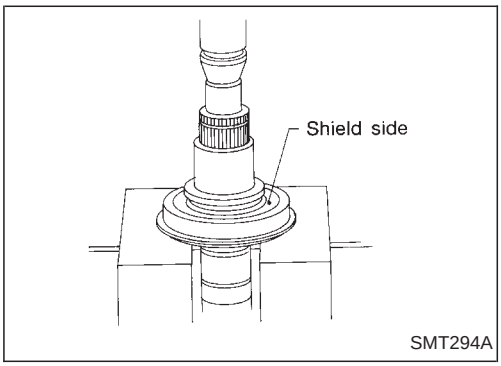
- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.


SMT351A

http://vnx.su/

Mainshaft (Cont'd)

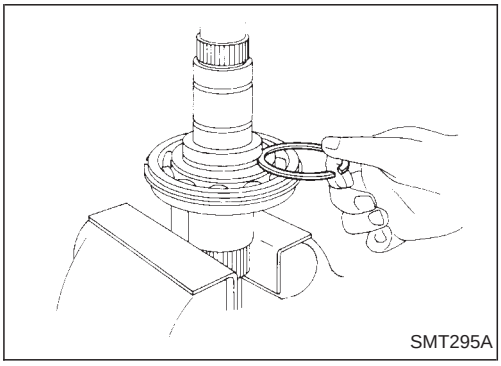
ASSEMBLY



SMT294A

1. Press mainshaft front bearing onto mainshaft.

Pay special attention to its direction.


SMT295A

2. Install spacer.
3. Select snap ring with proper thickness and install it.

Allowable clearance between snap ring and groove:
0 - 0.15 mm (0 - 0.0059 in)

Available snap ring

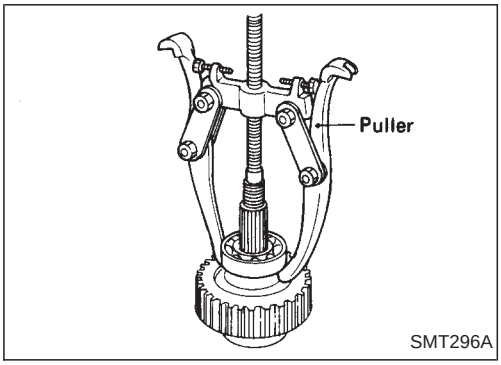
Thickness mm (in)	Part number
3.1 (0.122)	33138-73P10
3.2 (0.126)	33138-73P11
3.3 (0.130)	33138-73P12

4. Regarding further procedures, refer to "ASSEMBLY" above.

Front Drive Shaft

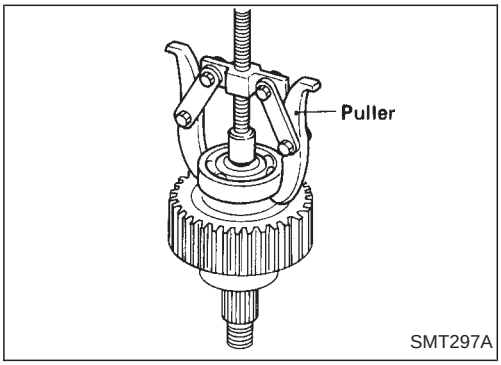
DISASSEMBLY

- Front drive shaft front bearing



SMT296A

- Front drive shaft rear bearing

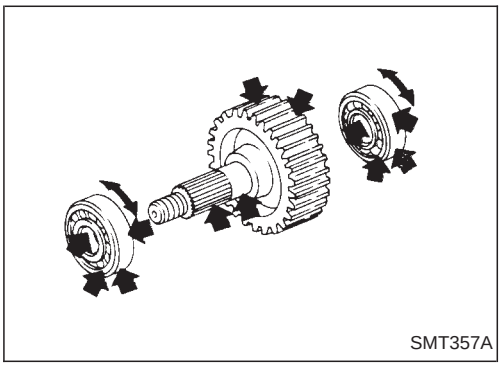


SMT297A

http://vnx.su/

Front Drive Shaft (Cont'd)

INSPECTION


SMT357A

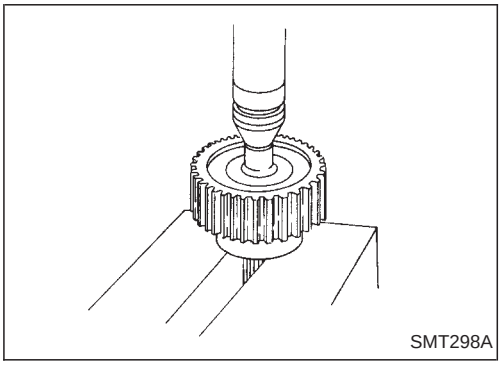
Sprocket and shaft

- Check sprocket for excessive wear, chips or cracks.
- Check shaft for cracks or wear.

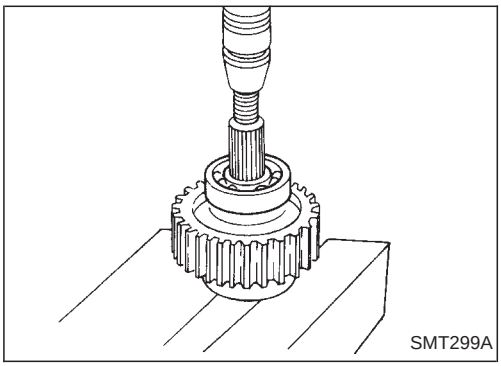
Bearing

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

ASSEMBLY


SMT298A

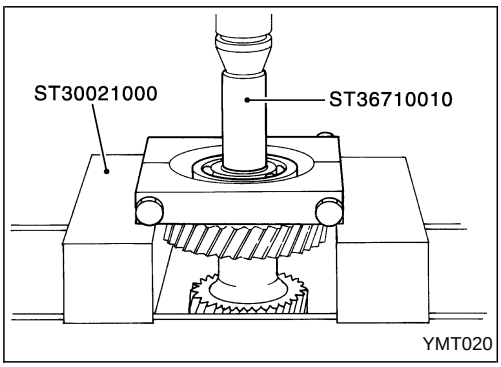
- Front drive shaft front bearing


SMT299A

- Rear drive shaft rear bearing

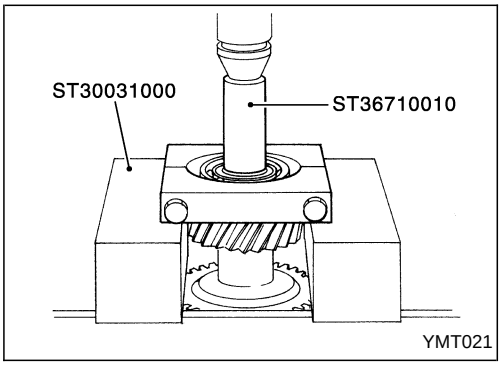
Counter Gear

DISASSEMBLY



YMT020

1. Press out counter gear front bearing and then remove front sub-gear, spacer and dish spring.

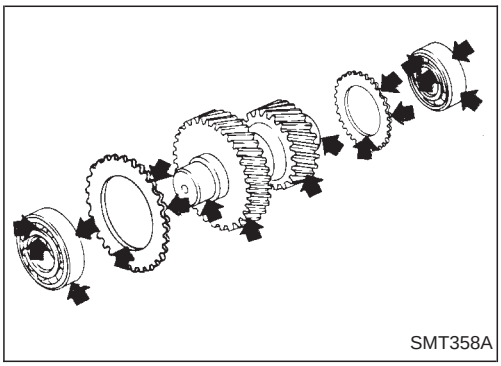


YMT021

2. Press out counter gear rear bearing and then remove rear sub-gear, spacer and dish spring.

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Counter Gear (Cont'd)


SMT358A

INSPECTION

Gear and shaft

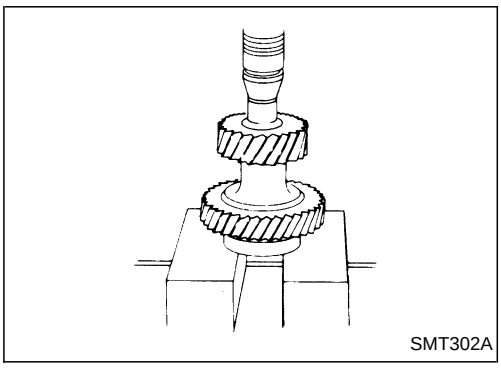
- Check gears for excessive wear, chips or cracks.
- Check shaft for cracks of wear.

Bearing

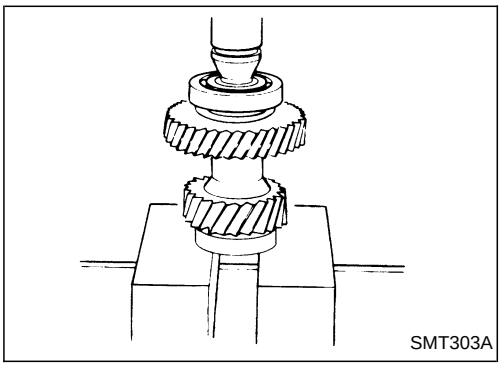
- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.

ASSEMBLY

1. Install front sub-gear, dish spring and spacer, and then press on counter gear front bearing.


SMT302A

2. Install rear sub-gear, dish spring and spacer, and then press on counter gear rear bearing.

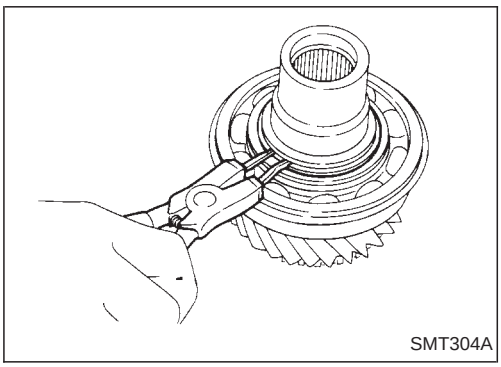

SMT303A

Main Gear

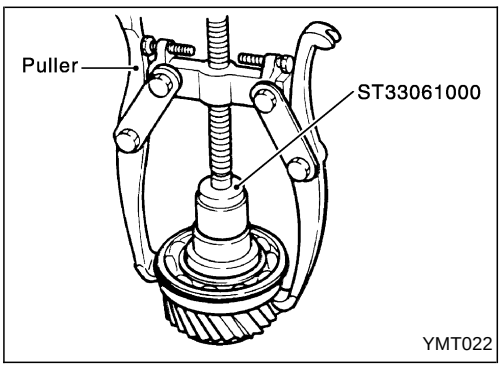
DISASSEMBLY

Main gear bearing

1. Remove snap ring and spacer.


SMT304A

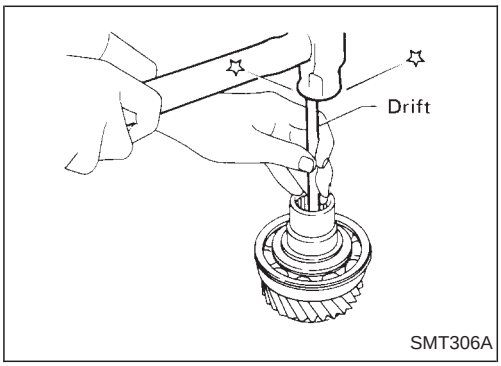
2. Pull out main gear bearing.



YMT022

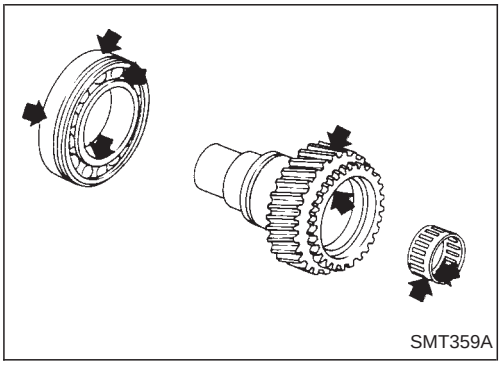
http://vnx.su/

Main Gear (Cont'd)



Plug

Always replace it with new one whenever it is removed.



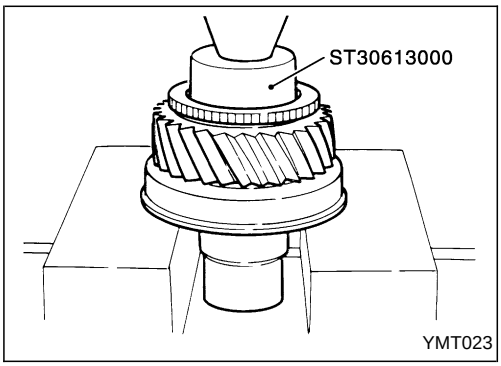
INSPECTION

Gear and shaft

- Check gears for excessive wear, chips or cracks.
- Check shaft for cracks or wear.

Bearing

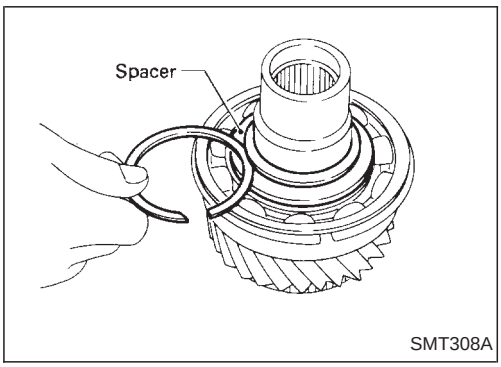
- Make sure bearings roll freely and are free from noise, cracks, pitting or wear.



ASSEMBLY

Main gear bearing

1. Press on main gear bearing.
2. Install spacer.

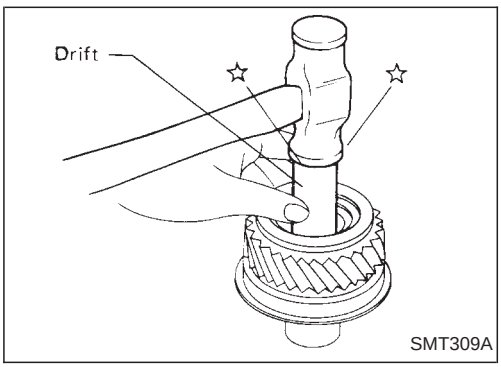


3. Select snap ring with proper thickness and install it.

Allowable clearance between snap ring and groove:
0 - 0.15 mm (0 - 0.0059 in)

Available snap ring

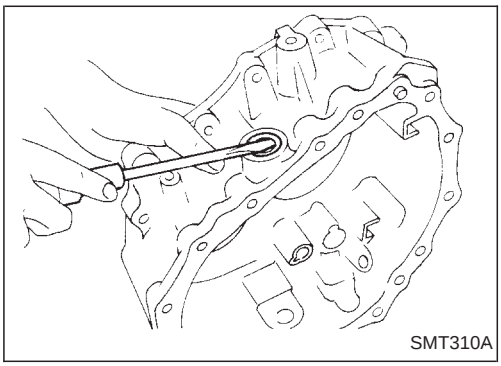
Thickness mm (in)	Part number
2.6 (0.102)	33114-73P00
2.7 (0.106)	33114-73P01
2.8 (0.110)	33114-73P02



Plug

Apply sealant to plug and install it.

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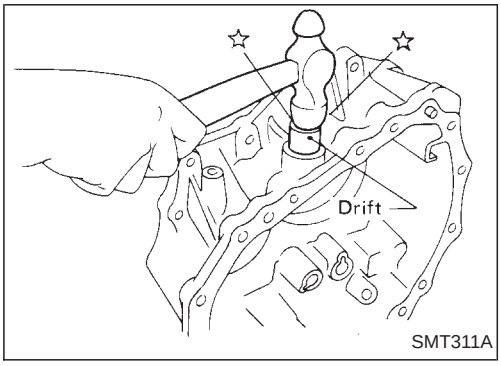

SMT310A

Front Case

SHIFT SHAFT OIL SEAL

Removal

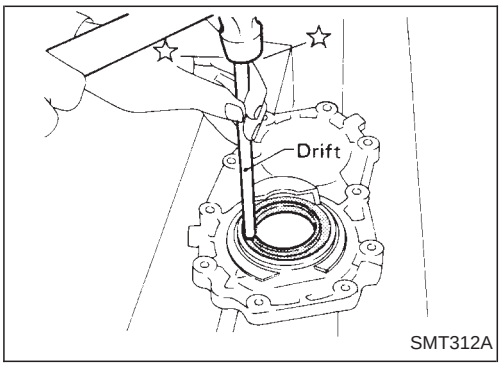
Remove the oil seal. Be careful not to damage its housing. Always replace after every disassembly.



SMT311A

Installation

Install a new oil seal, using a suitable tool.



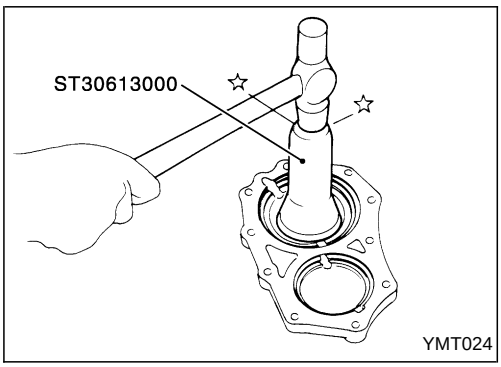
SMT312A

Front Case Cover

COVER OIL SEAL

Removal

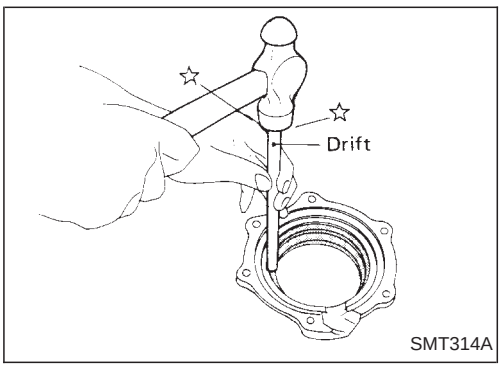
Remove the oil seal. Be careful not to damage its housing. Always replace after every disassembly.



YMT024

Installation

Install a new oil seal, using the Special Tool.



SMT314A

Bearing Retainer

OIL CATCHER

Removal

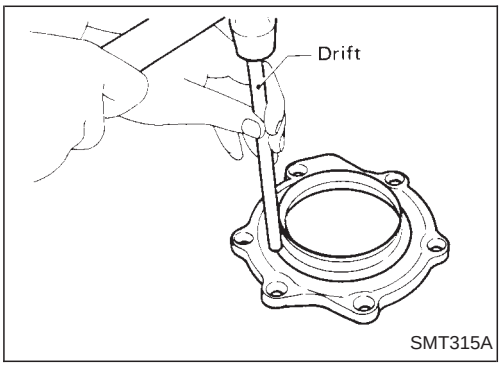
Remove the oil seal. Be careful not to damage its housing. Always replace after every disassembly.

http://vnx.su/

Bearing Retainer (Cont'd)

Installation

Install a new oil seal, using a suitable tool.

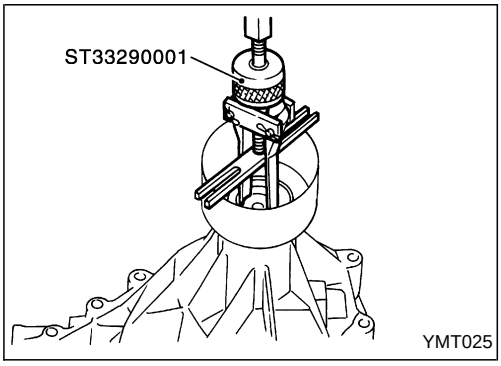


Rear Case

REAR OIL SEAL

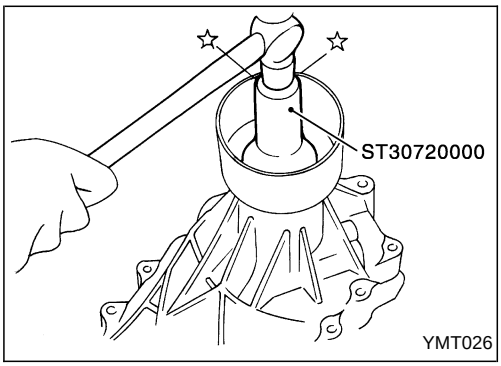
Removal

Remove the oil seal. Be careful not to damage its housing. Always replace after every disassembly.



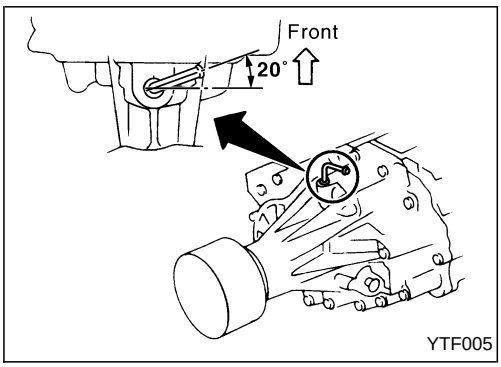
Installation

Install a new oil seal, using the Special Tool.



AIR BREATHER

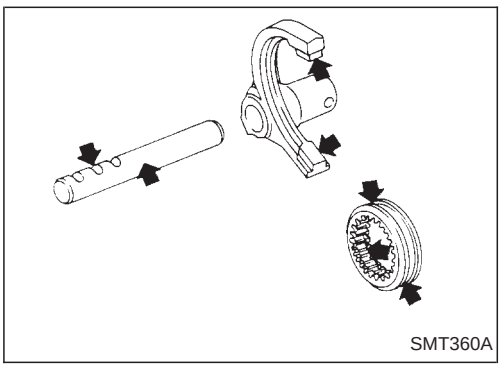
Install as shown in the illustration.



Shift Control Components

INSPECTION

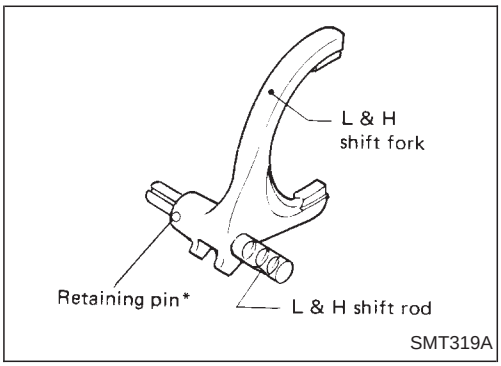
- Check contact surface and sliding surface for wear, scratches, projections or other faulty conditions.



http://vnx.su/

Shift Control Components (Cont'd)

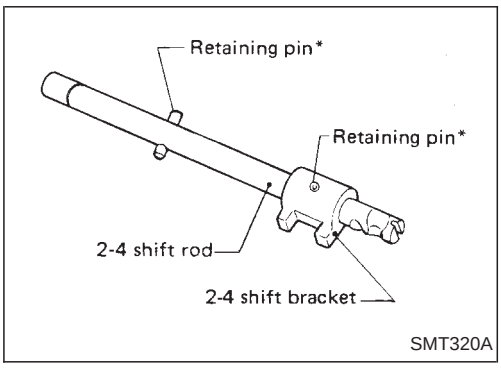
L & H SHIFT ROD & FORK



Assemble as shown in the illustration.

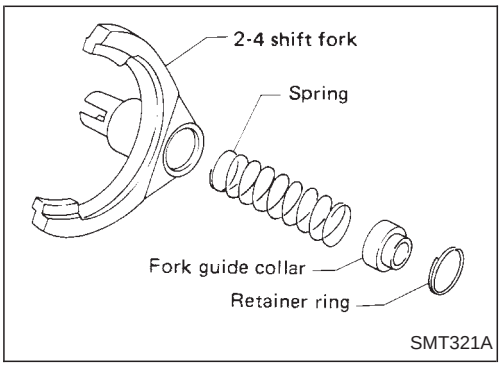
* This pin is the same size as the one for 2-4 shift rod.

2-4 SHIFT ROD & FORK



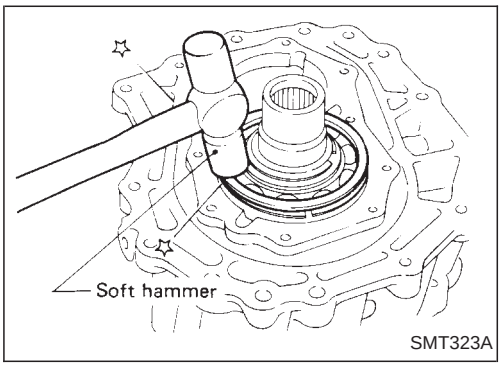
Assemble as shown in the illustration.

* These pins are the same size.

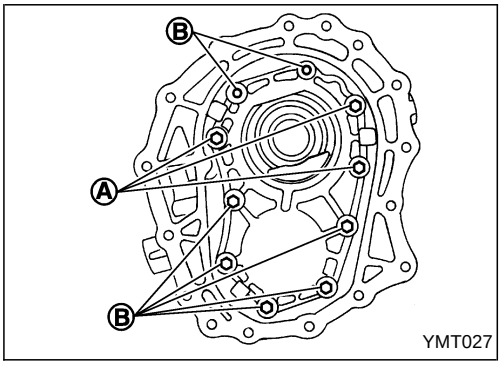


Pay special attention to the direction of fork guide collar.

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1. Assemble front case.
a. Install main gear assembly by tapping lightly.

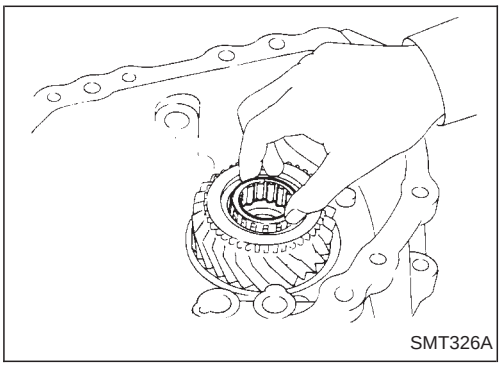


b. Apply sealant to the mating surface and bolts of front case cover and install it on front case.

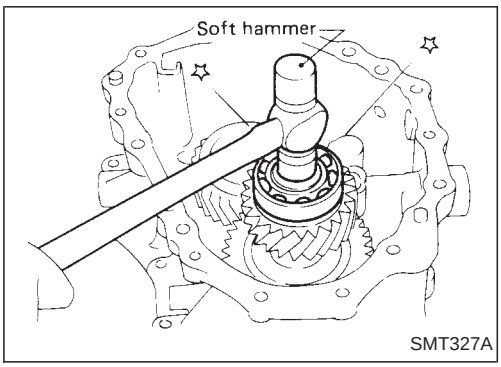
- **These ten bolts should be coated with sealant.**

Tightening torque

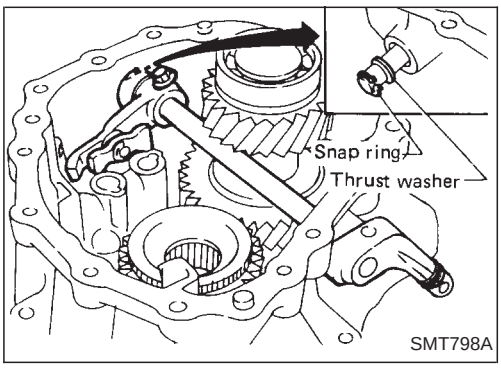
Ⓐ: 20 - 23 N·m
(2.1 - 2.3 kg-m, 15 - 16 ft-lb)
Ⓑ: 24 - 28 N·m
(2.5 - 2.8 kg-m, 18 - 20 ft-lb)



c. Apply gear oil to needle bearing and install it into main gear.



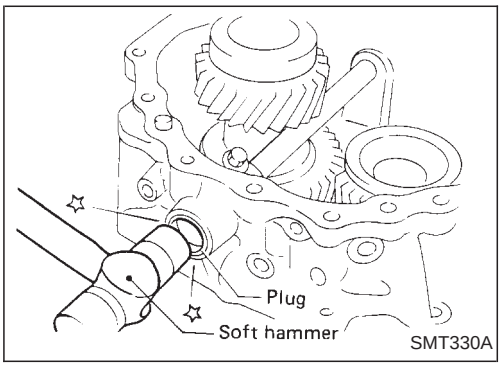
d. Install counter gear assembly by tapping lightly.



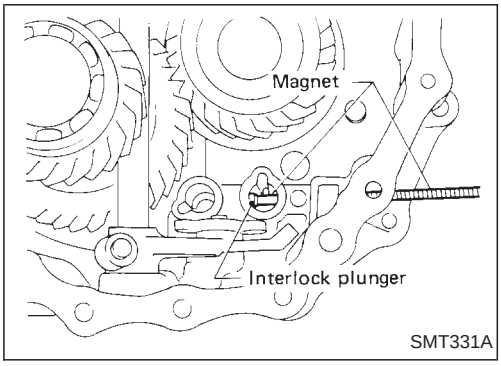
e. Install cross shaft and inner shift lever.

When replacing cross shaft, outer shift lever of lock pin of outer shift lever, replace them as a set.

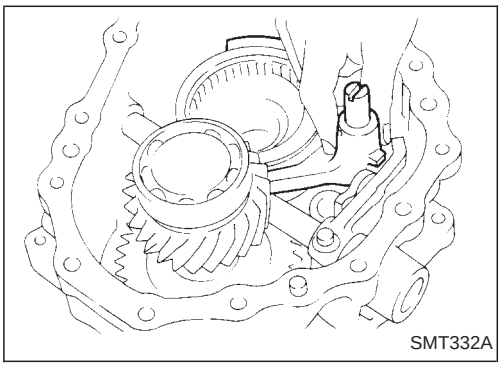
http://vnx.su/



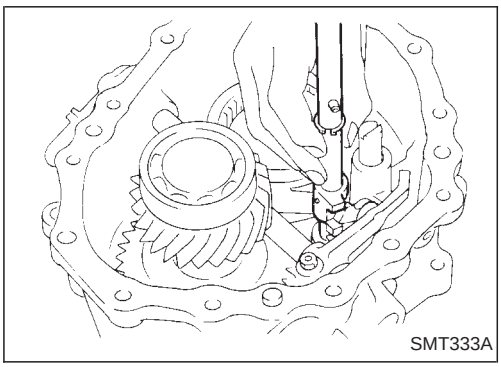
f. Apply sealant to plug and install it into front case.



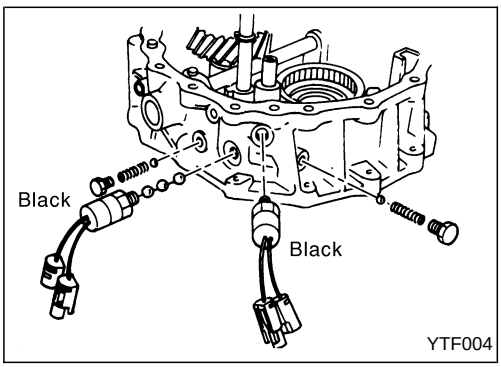
g. Insert interlock plunger into front case.



h. Install L & H shift rod and fork assembly with coupling sleeve.

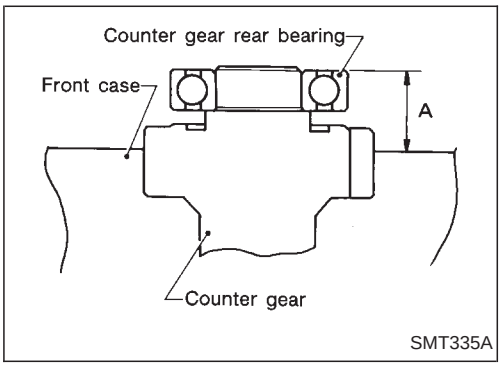


i. Install 2-4 shift rod.



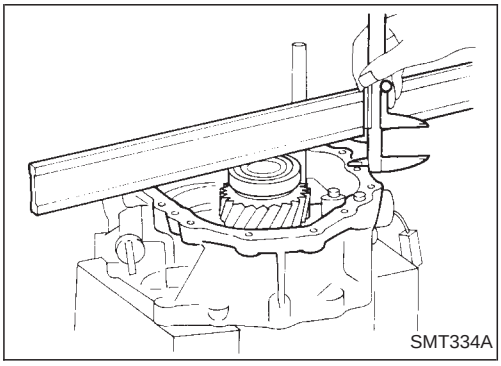
j. Install switches, check balls, check springs and plugs.
Apply sealant to switches and plugs.

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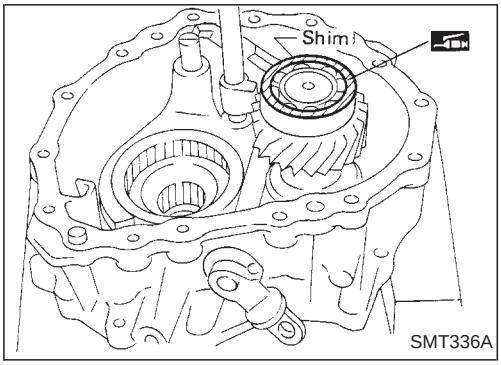
2. Select counter gear rear bearing shim.
Counter gear end play:
0 - 0.2 mm (0 - 0.008 in)

a. Measure distance “A” between upper surface of counter gear rear bearing and mating surface of front case.

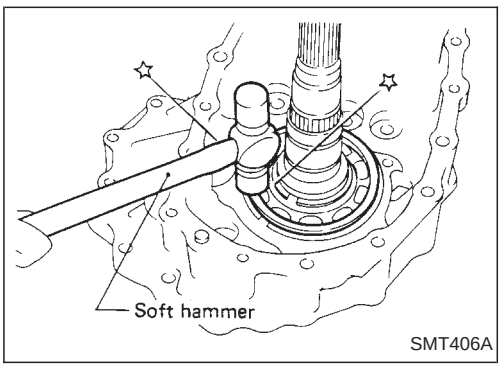


b. Select suitable shim using chart below.

Distance “A” mm (in)	Suitable shim	
	Thickness mm (in)	Part number
32.65 - 32.55 (1.2854 - 1.2815)	Not necessary	
32.55 - 32.45 (1.2815 - 1.2776)	0.1 (0.004)	33112-C6900
32.45 - 32.35 (1.2776 - 1.2736)	0.2 (0.008)	33112-C6901
32.35 - 32.25 (1.2736 - 1.2697)	0.3 (0.012)	33112-C6902
32.25 - 32.15 (1.2697 - 1.2657)	0.4 (0.016)	33112-C6903
32.15 - 32.05 (1.2657 - 1.2618)	0.5 (0.020)	33112-33G00
32.05 - 31.95 (1.2618 - 1.2579)	0.6 (0.024)	33112-33G01



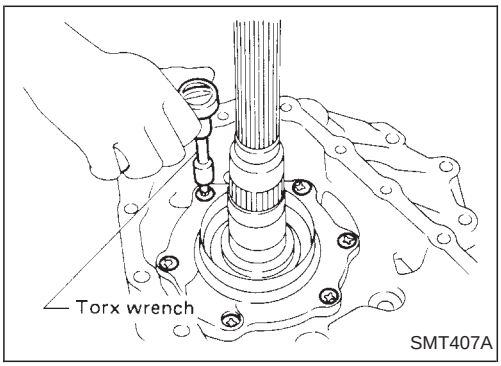
3. Place suitable shim on counter gear rear bearing with grease.
4. Apply gear oil to each part in front case.



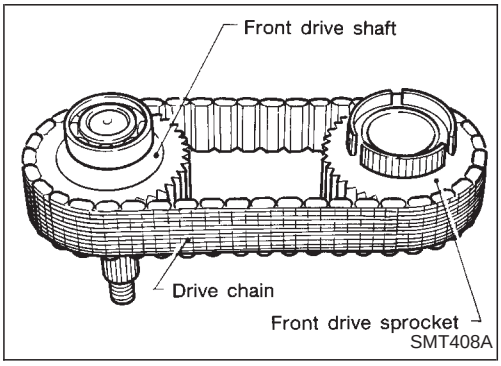
5. Assemble center case assembly.

a. Install mainshaft on center case by tapping lightly.
Apply gear oil to mainshaft front bearing.

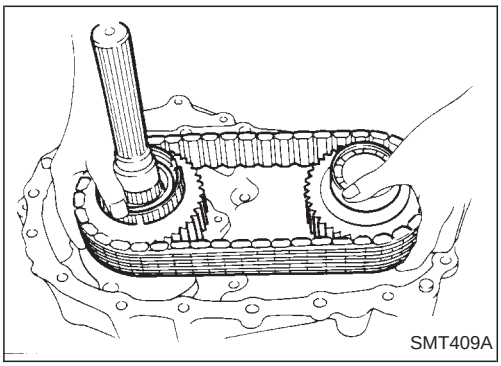
http://vnx.su/

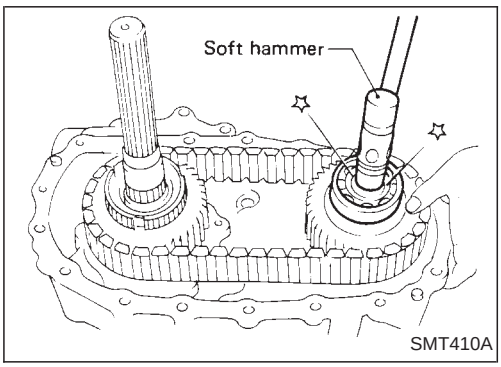


b. Install bearing retainer.

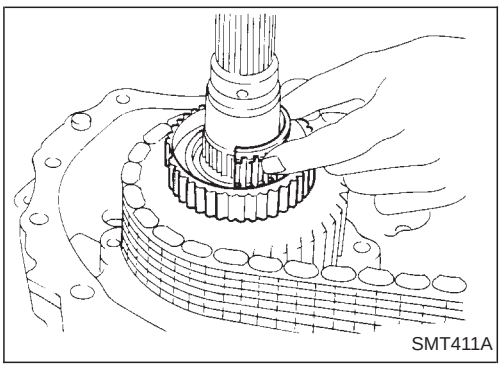


c. Put drive chain onto the front drive sprocket and front drive shaft, and then put them in center case.





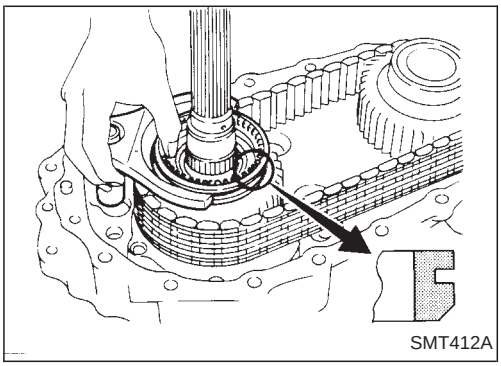
d. Install front drive shaft by tapping lightly.



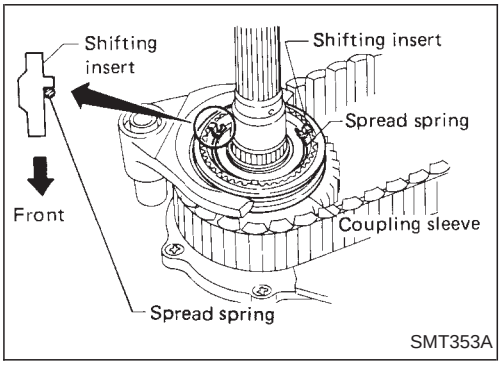
e. Apply gear oil to needle bearings and install them into front drive sprocket.

These needle bearings will be installed more easily if front drive sprocket is rotated while installing them.

http://vnx.su/

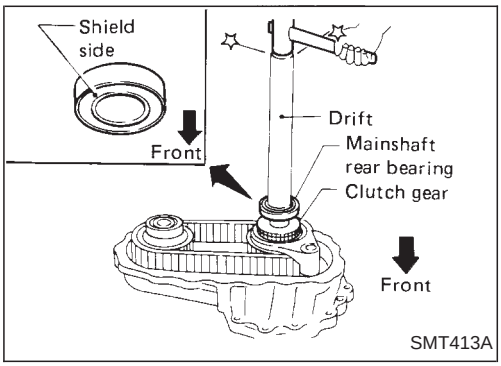

SMT412A

f. Install 2-4 coupling sleeve with 2-4 shift fork.
Pay special attention to direction of coupling sleeve.



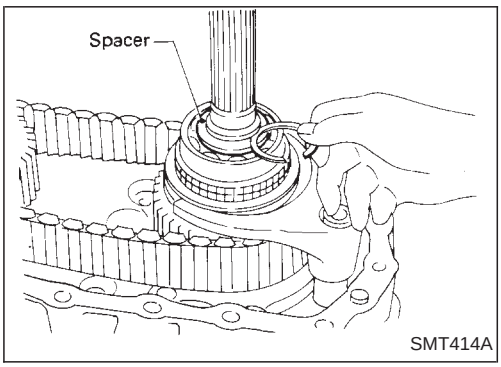
SMT353A

g. Install shifting inserts and spread spring.
Pay special attention to direction of shifting inserts.



SMT413A

h. Install baulk ring and then install clutch gear and mainshaft rear bearing.
Place wooden block under mainshaft in order to protect mainshaft front bearing.



SMT414A

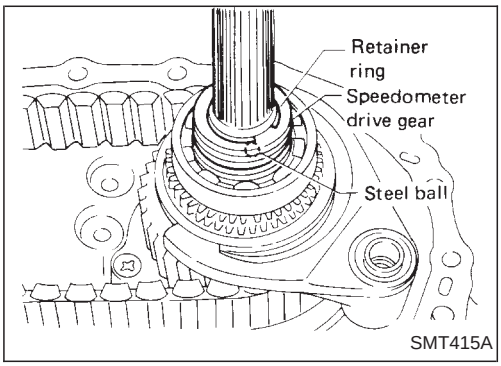
i. Install spacer.
j. Select snap ring with proper thickness and install it.

Allowable clearance between snap ring and groove:
0 - 0.15 mm (0 - 0.0059 in)

Available snap ring

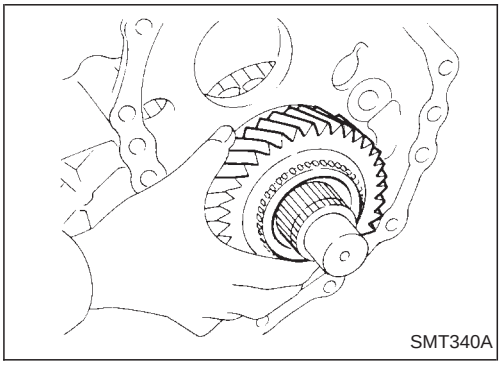
Thickness mm (in)	Part number
1.8 (0.071)	33138-73P20
1.9 (0.075)	33138-73P21
2.0 (0.079)	33138-73P22
2.1 (0.083)	33138-73P23
2.2 (0.087)	33138-73P24

http://vnx.su/

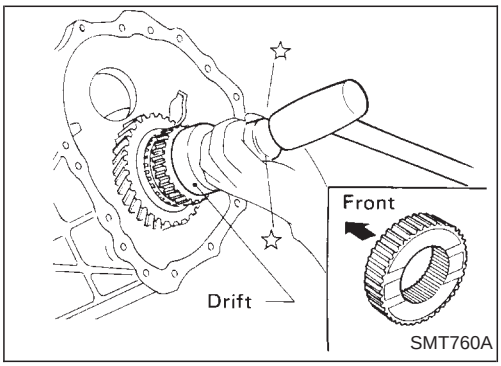


SMT415A

k. Install steel ball, speedometer drive gear and retainer ring.
Steel ball is the smallest of check balls for this unit.

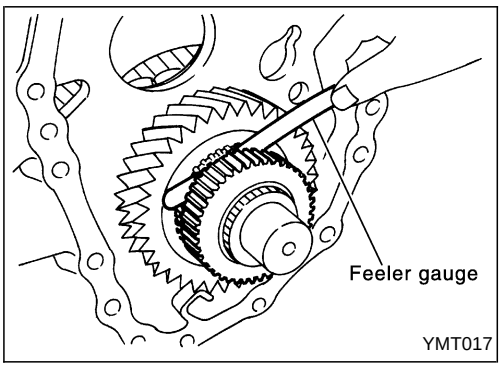

SMT340A

l. Install low gear and its bearing to mainshaft.
Apply gear oil to needle bearing.



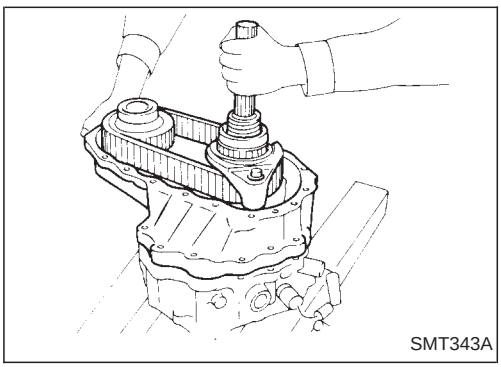
SMT760A

m. Install L & H hub and snap ring to mainshaft.
Pay special attention to direction of L & H hub.



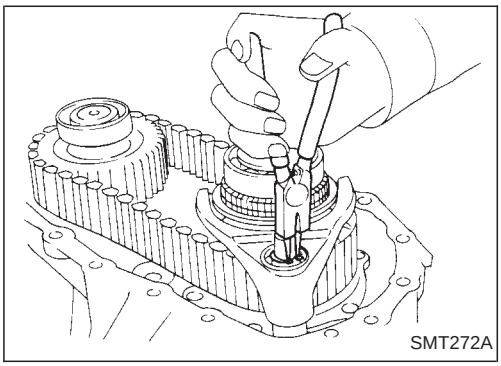
YMT017

n. Measure end play of low gear.
Standard:
0 - 0.15 mm (0 - 0.0059 in)

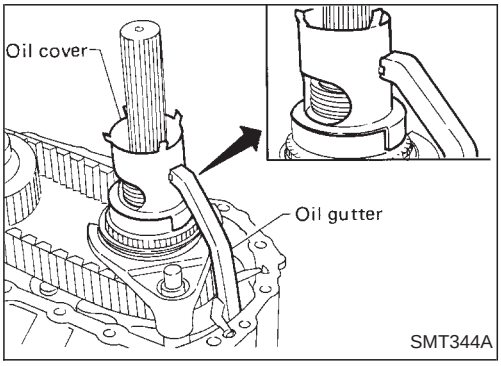

SMT343A

6. Apply sealant to mating surface and put center case assembly onto front case and tighten bolts.

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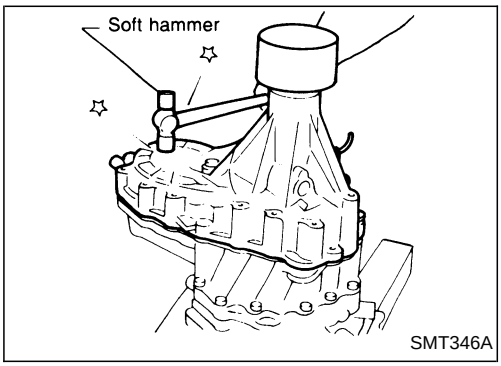

SMT272A

7. Install snap ring to 2-4 shift rod.



SMT344A

8. Install oil gutter and oil cover.
9. Apply gear oil to each part in center case.



SMT346A

10. Apply sealant to mating surface and install rear case on center case.

http://vnx.su/

General Specifications

Transfer model			TX12
Gear ratio	High		1.000
	Low		2.020
Number of teeth	Main gear		29
	Low gear		37
	Counter gear	High	38
		Low	24
	Front drive sprocket		41
	Front drive shaft		41
Oil capacity		ℓ (Imp qt)	2.3 (2)

Inspection and Adjustment

GEAR END PLAY

Unit: mm (in)

Front drive sprocket	0 - 0.15 (0 - 0.0059)
Low gear	0 - 0.15 (0 - 0.0059)
Counter gear	0 - 0.2 (0 - 0.008)

CLEARANCE BETWEEN BAULK RING AND CLUTCH GEAR

Unit: mm (in)

Standard	Wear limit
1.0 - 1.5 (0.039 - 0.059)	0.5 (0.020)

AVAILABLE SNAP RING

Mainshaft front bearing

Allowable clearance	0 - 0.15 mm (0 - 0.0059 in)
Thickness mm (in)	Part number
3.1 (0.122)	33138-73P10
3.2 (0.126)	33138-73P11
3.3 (0.130)	33138-73P12

Mainshaft rear bearing

Allowable clearance	0 - 0.15 mm (0 - 0.0059 in)
Thickness mm (in)	Part number
1.8 (0.071)	33138-73P20
1.9 (0.075)	33138-73P21
2.0 (0.079)	33138-73P22
2.1 (0.083)	33138-73P23
2.2 (0.087)	33138-73P24

Main gear bearing

Allowable clearance	0 - 0.15 mm (0.0059 in)
Thickness mm (in)	Part number
2.6 (0.102)	33114-73P00
2.7 (0.106)	33114-73P01
2.8 (0.110)	33114-73P02

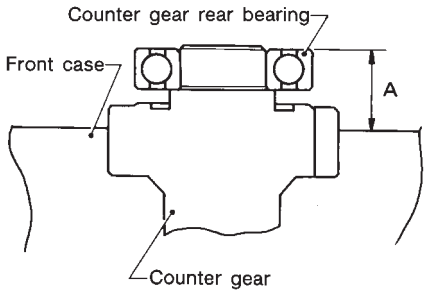
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Inspection and Adjustment (Cont'd)

AVAILABLE SHIM

Counter gear rear bearing

Distance "A" mm (in)	Shim(s)	
	Thickness mm (in)	Part number
32.65 - 32.55 (1.2854 - 1.2815)	Not necessary	
32.55 - 32.45 (1.2815 - 1.2776)	0.1 (0.004)	33112-C6900
32.45 - 32.35 (1.2776 - 1.2736)	0.2 (0.008)	33112-C6901
32.35 - 32.25 (1.2736 - 1.2697)	0.3 (0.012)	33112-C6902
32.25 - 32.15 (1.2697 - 1.2657)	0.4 (0.016)	33112-C6903
32.15 - 32.05 (1.2657 - 1.2618)	0.5 (0.020)	33112-33G00
32.05 - 31.95 (1.2618 - 1.2579)	0.6 (0.024)	33112-33G01



SMT335A

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PROPELLER SHAFT & DIFFERENTIAL CARRIER

SECTION PD

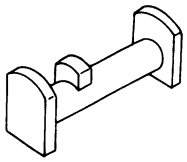
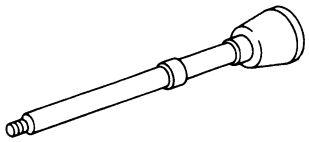
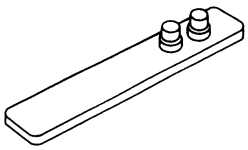
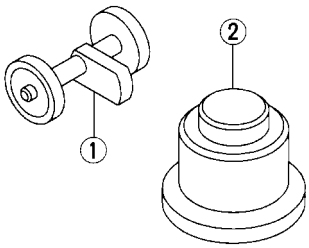
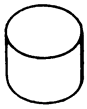
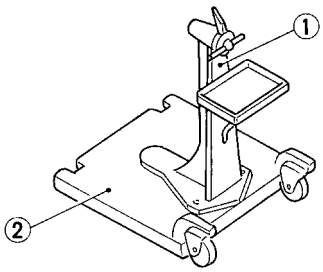
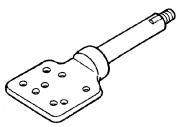
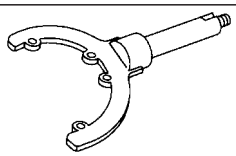
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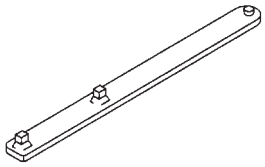
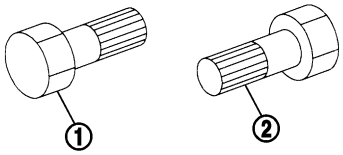
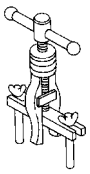
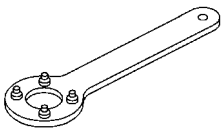
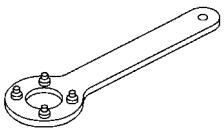
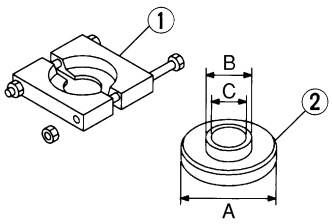
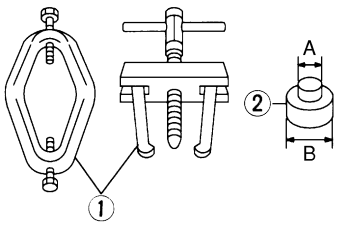
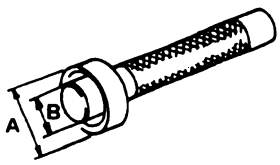
SPECIAL SERVICE TOOLS

*: Special tool or commercial equivalent

Tool number Tool name	Description		Unit application	
			R180A	H233B
ST31211000 Height gauge		Selecting pinion height adjusting washer	X	—
ST31212000 Dummy shaft		Selecting pinion height adjusting washer	X	—
ST31852000 Stopper		Selecting pinion height adjusting washer	X	—
ST3125S000 Drive pinion height setting gauge set ① ST31251000 Drive pinion height gauge ② ST31181001 Dummy shaft		Selecting pinion height adjusting washer	—	X
ST32501000 Weight block		Selecting side bearing adjusting shim	X	—
KV38101900 Master gauge [20.0 mm (0.787 in)]		Selecting side bearing adjusting shim	X	—
ST0501S000 Engine stand ① ST05011000 Engine stand ② ST05012000 Base		Mounting differential attachment	X	X
KV38100800 Differential attachment		Mounting final drive	X	—
ST06340000 Differential attachment		Mounting final drive	—	X

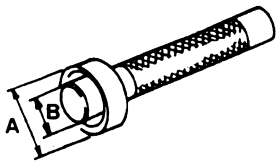
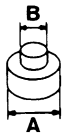
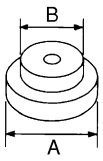
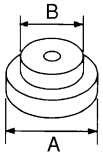
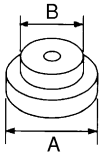
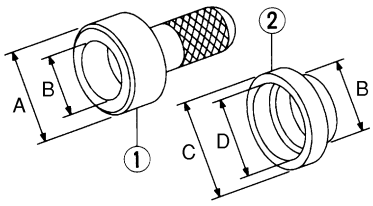
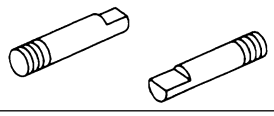
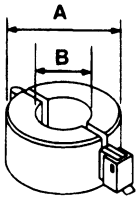
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*: Special tool or commercial equivalent

Tool number Tool name	Description		Unit application	
			R180A	H233B
ST32580000 Diff. side bearing adjusting nut wrench		Adjusting side bearing preload and backlash (ring gear drive pinion)	—	X
KV381052S0 Rear axle shaft dummy ① KV38105210 Torque wrench side ② KV38105220 Vice side		Checking differential torque on limited slip differential	—	X
ST33290001* Side bearing outer race puller		Removing side bearing outer race and side oil seal	X	—
ST38060002* Drive pinion flange wrench		Removing and installing propeller shaft lock nut, and drive pinion lock nut	X	—
KV38104700* Drive pinion flange wrench		Removing and installing propeller shaft lock nut, and drive pinion lock nut	—	X
ST3090S000* Drive pinion rear inner race puller set ① ST30031000 Puller ② ST30901000* Base		Removing and installing drive pinion rear inner cone **A: 79 mm (3.11 in) dia.** **B: 45 mm (1.77 in) dia.** **C: 35 mm (1.38 in) dia.**	X	X
ST3306S001 Diff. side bearing puller set ① ST33051001* Body ② ST33061000* Adapter		Removing and installing differential side bearing inner cone **A: 28.5 mm (1.122 in) dia.** **B: 38 mm (1.50 in) dia.**	X	X
ST33230000* Diff. side bearing drift		Installing side bearing inner cone **A: 51 mm (2.01 in) dia.** **B: 28.5 mm (1.122 in) dia.**	X	—

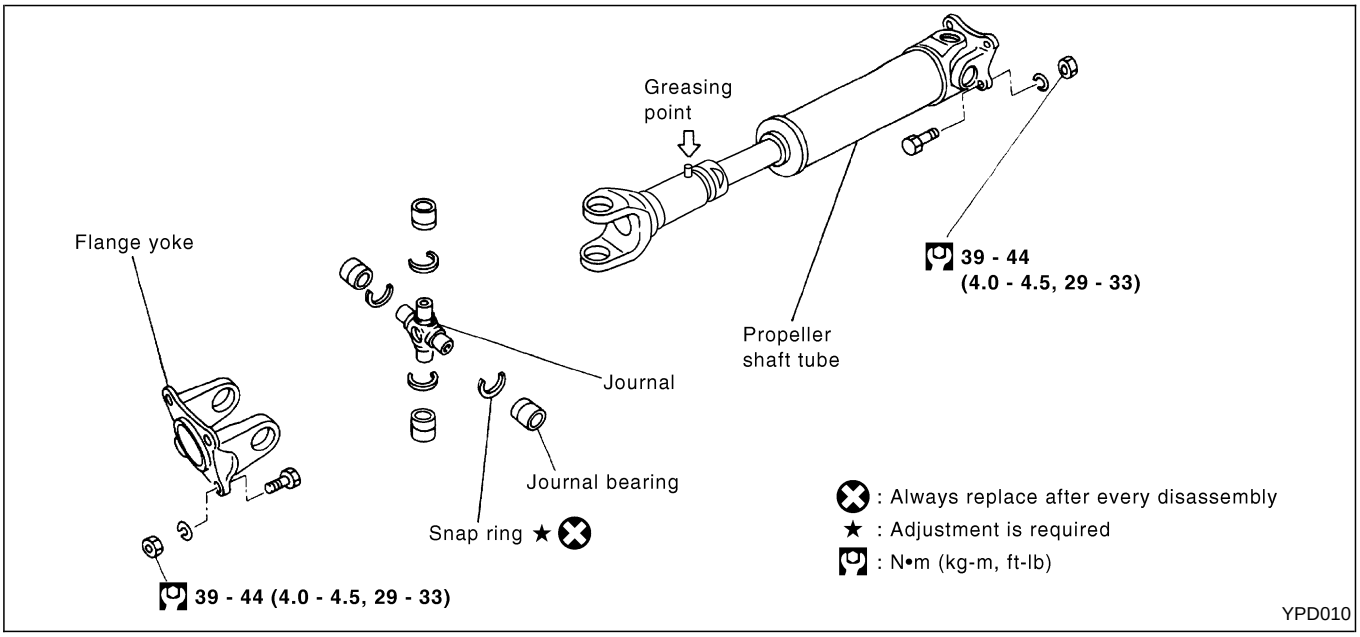
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*: Special tool or commercial equivalent

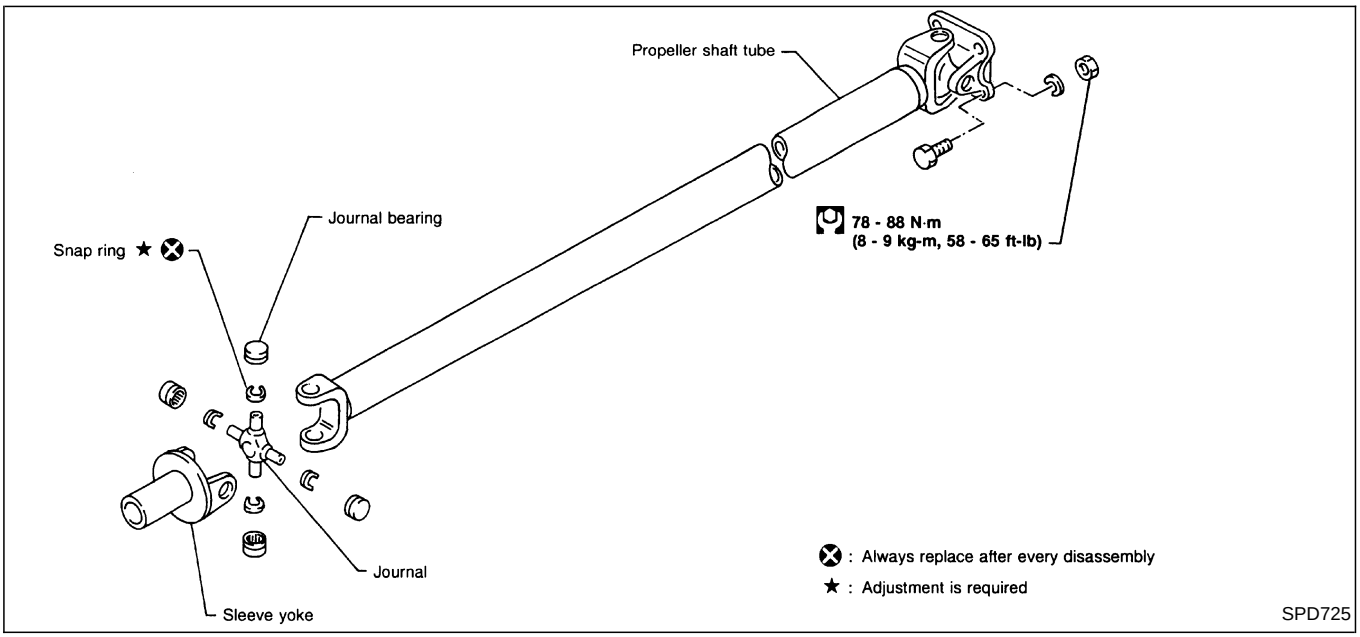
Tool number Tool name	Description		Unit application	
			R180A	H233B
ST33190000* Diff. side bearing drift		Installing side bearing inner cone **A: 52 mm (2.05 in) dia.** **B: 34 mm (1.34 in) dia.**	—	X
ST33081000* Side bearing puller adapter		Installing side bearing inner cone **A: 43 mm (1.69 in) dia.** **B: 33.5 mm (1.319 in) dia.**	—	X
ST30611000* Drift		Installing pinion rear bearing outer race	X	X
ST30621000* Drift		Installing pinion rear bearing outer race **A: 79 mm (3.11 in) dia.** **B: 59 mm (2.32 in) dia.**	X	X
ST30701000* Drift		Installing pinion front bearing outer race **A: 61.5 mm (2.421 in) dia.** **B: 41 mm (1.61 in) dia.**	X	—
ST30613000* Drift		Installing pinion front bearing outer race **A: 71.5 mm (2.815 in) dia.** **B: 47.5 mm (1.870 in) dia.**	—	X
KV381025S0* Oil seal fitting tool ① ST30720000 Drift bar ② KV38102510 Drift		Installing front oil seal **A: 77 mm (3.03 in) dia.** **B: 55 mm (2.17 in) dia.** **C: 71 mm (2.80 in) dia.** **D: 65 mm (2.56 in) dia.**	X	X
ST33720000 Diff. side retainer guide		Installing side retainer	X	—
ST33270000 Side oil seal drift		Installing side oil seal **A: 62 mm (2.44 in) dia.** **B: 28 mm (1.10 in) dia.**	X	—

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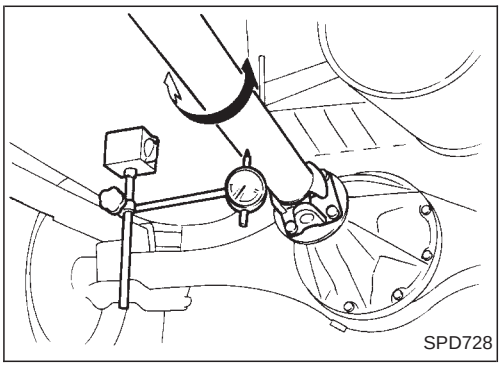
Front propeller shaft (Model 0F71H)



Rear propeller shaft (Model 2S80B)



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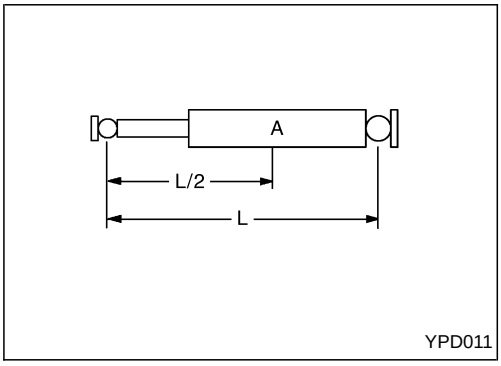

SPD728

On-Vehicle Service

PROPELLER SHAFT VIBRATION

If vibration is present at high speed, inspect propeller shaft runout first.

1. Raise rear wheels.
2. Measure propeller shaft runout at center of propeller shaft, between two yokes, by rotating final drive companion flange by hand.

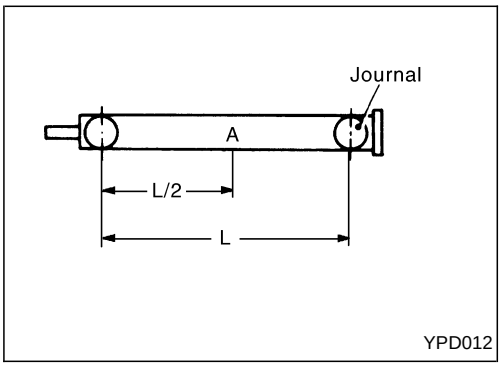


YPD011

Front propeller shaft

Unit: mm (in)

Propeller shaft model	0F71H
Measuring point A	L/2

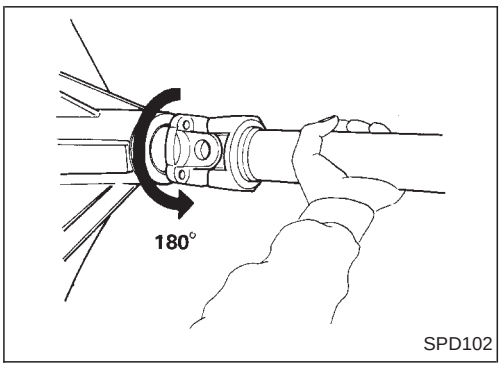


YPD012

Rear propeller shaft

Unit: mm (in)

Propeller shaft model	2S80B
Measuring point A	L/2



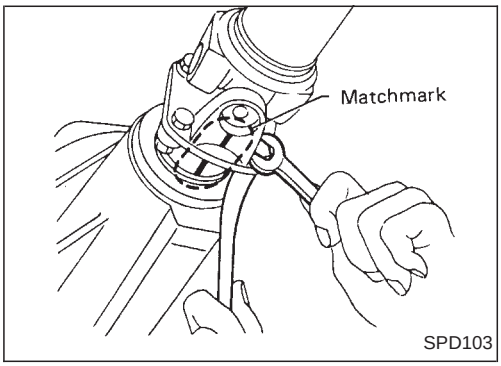
SPD102

3. If runout exceeds specifications, disconnect propeller shaft at final drive companion flange; then rotate companion flange 180 degrees and reconnect propeller shaft.
   Runout limit: 0.6 mm (0.024 in)
4. Check runout again. If runout still exceeds specifications, replace propeller shaft assembly.
5. Perform road test.

APPEARANCE CHECKING

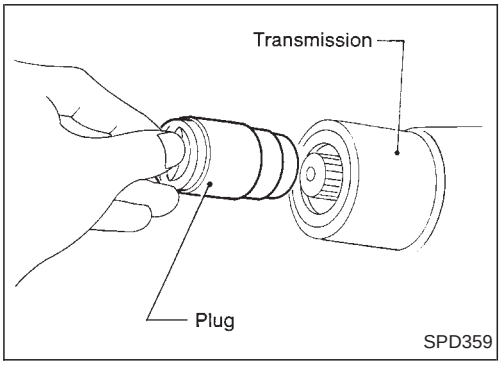
- Inspect propeller shaft tube surface for dents or cracks. If damaged, replace shaft assembly.
- If center is noisy or damaged, replace center bearing.

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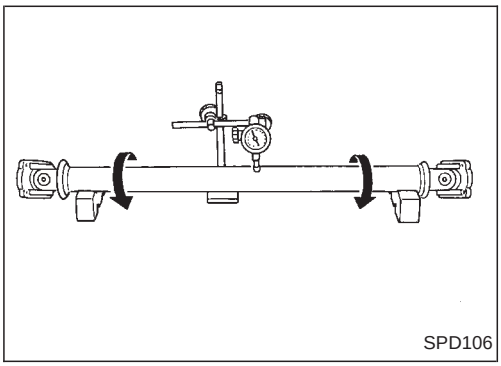


Removal and Installation

- Put match marks on flanges and separate propeller shaft from final drive.

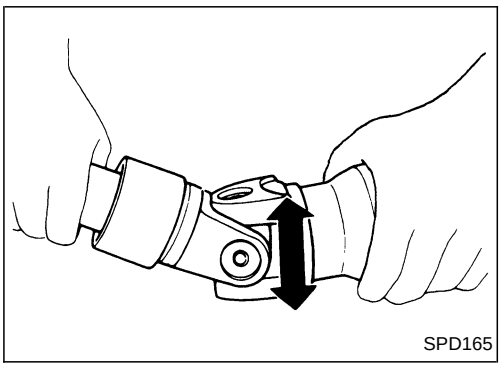


- Draw out propeller shaft from transmission and plug up rear end of transmission rear extension housing.

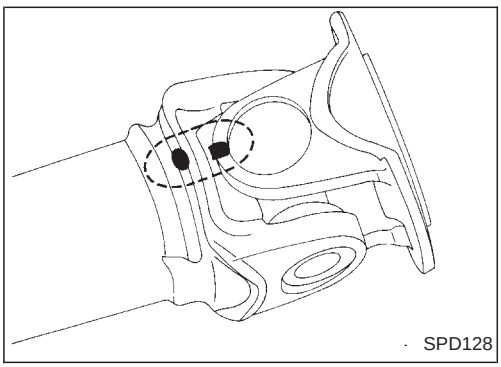


Inspection

- Inspect propeller shaft runout. If runout exceeds specifications, replace propeller shaft assembly.
  Runout limit:
  0.6 mm (0.024 in)



- Inspect journal axial play. If the play exceeds specifications, replace propeller shaft assembly.
  Journal axial play:
  0.2 mm (0.008 in) or less



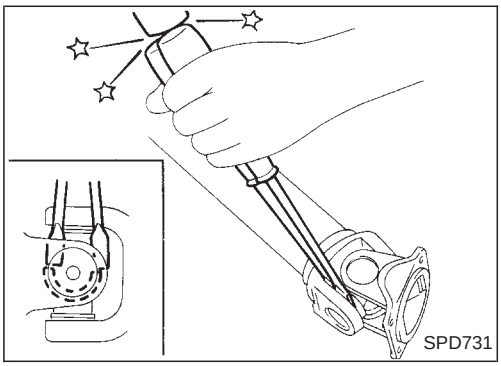
Disassembly

JOURNAL

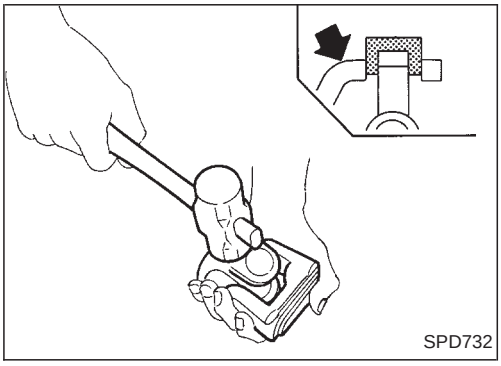
1. Put match marks on shaft and flange or yoke.

http://vnx.su/

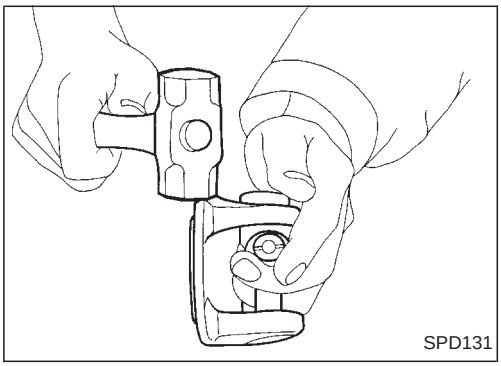
Disassembly (Cont'd)


SPD731

2. Remove snap ring.


SPD732

3. Remove pushed out journal bearing by lightly tapping yoke with a hammer, taking care not to damage journal and yoke hole.

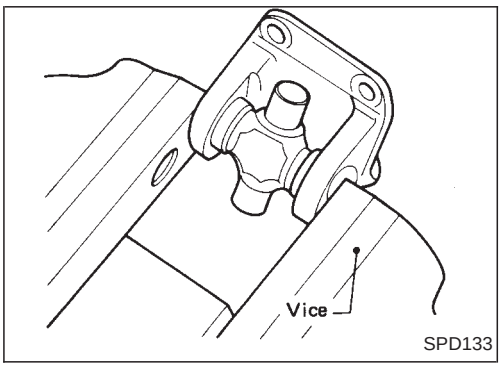

SPD131

4. Remove bearing at opposite side in above operation.

Put marks on disassembled parts so that they can be reinstalled in their original positions from which they were removed.

Assembly

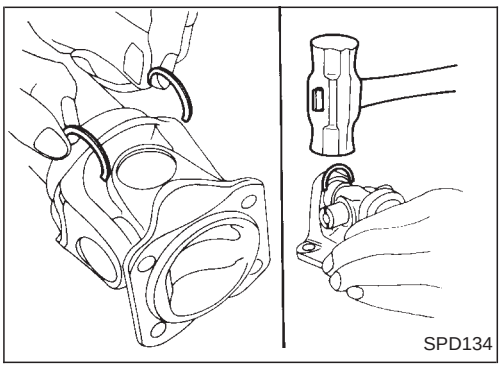
JOURNAL



SPD133

1. Assemble journal bearing. Apply recommended multi-purpose grease on bearing inner surface.

When assembling, be careful that needle bearing does not fall down.

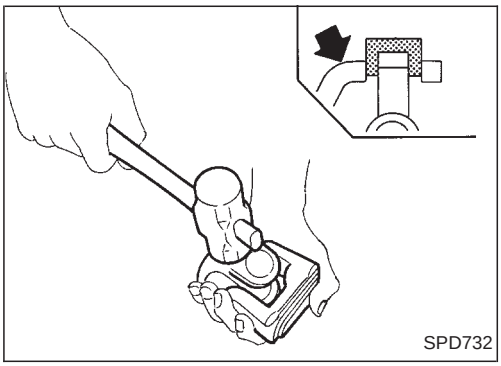

SPD134

2. Select snap rings that will provide specified play in axial direction of journal, and install them. (Refer to PD-57.)

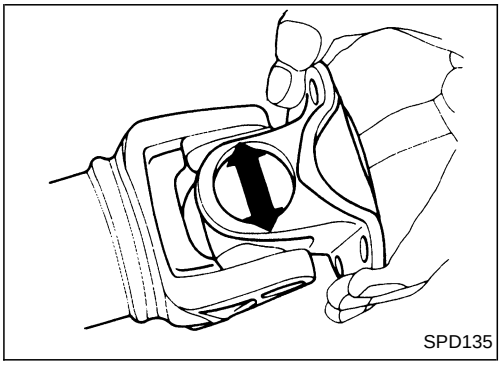
Select snap rings with a difference in thickness at both sides within 0.06 mm (0.0024 in).

http://vnx.su/

Assembly (Cont'd)

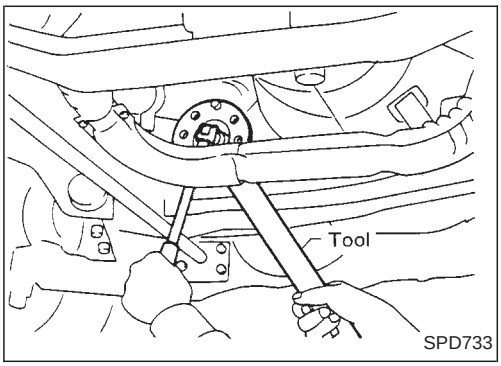

SPD732

3. Adjust thrust clearance between bearing and snap ring to zero by tapping yoke.


SPD135

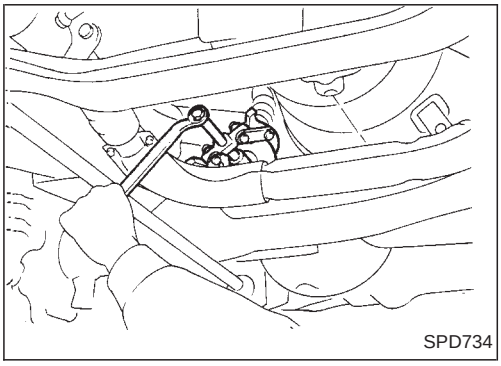
4. Check to see that journal moves smoothly and check for axial play.
   Axial play: Less than 0.02 mm (0.0008 in)

http://vnx.su/

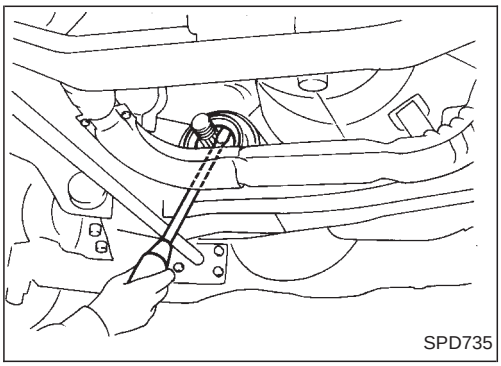


Front Oil Seal Replacement (Front final drive: R180A)

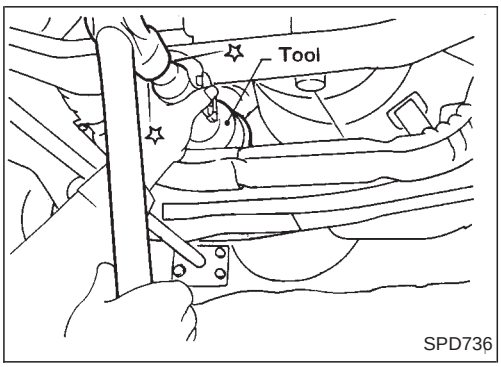
1. Remove front propeller shaft.
2. Loosen drive pinion nut.
   Tool number: ST38060002



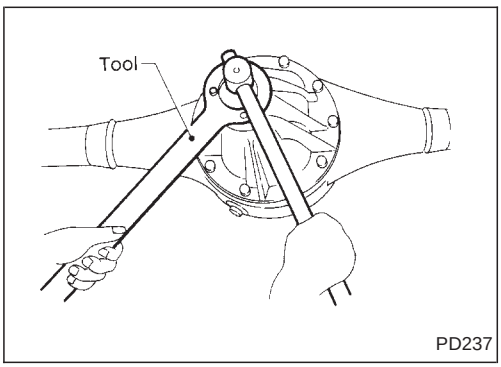
3. Remove companion flange.



4. Remove front oil seal.



5. Apply multi-purpose grease to cavity at sealing lips of oil seal. Press front oil seal into carrier.
6. Install companion flange and drive pinion nut.
7. Install propeller shaft.
   Tool number:
   ST30720000

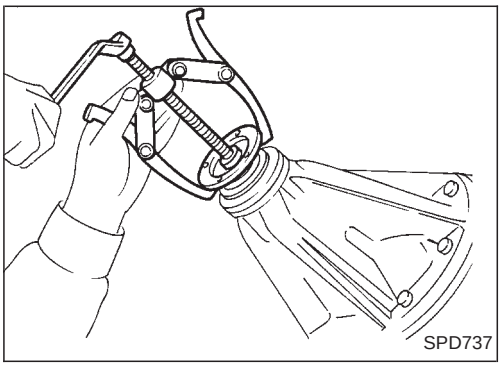


Front Oil Seal Replacement (Rear final drive: C200)

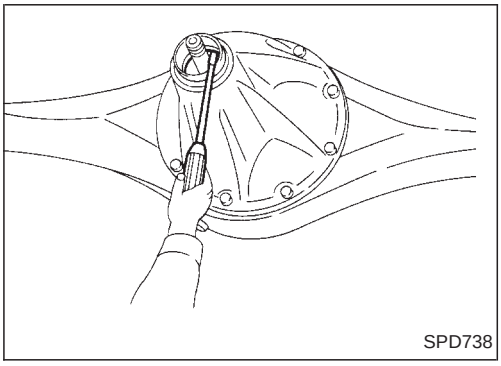
1. Remove rear propeller shaft.
2. Loosen drive pinion nut.
   Tool number:
   KV38104700

http://vnx.su/

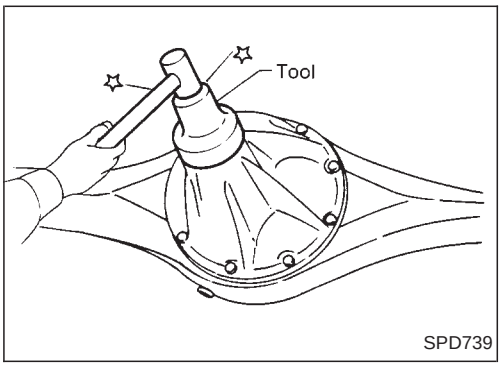
Front Oil Seal Replacement (Rear final drive: C200) (Cont'd)


SPD737

3. Remove companion flange.


SPD738

4. Remove front oil seal.

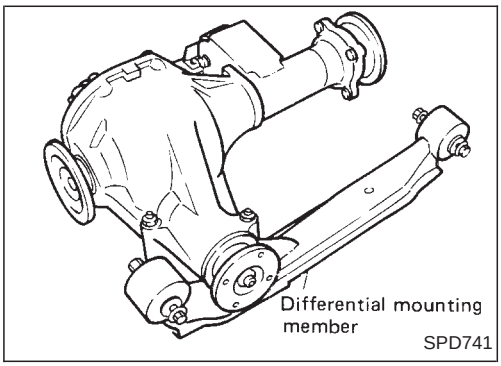


SPD739

5. Apply multi-purpose grease to cavity at sealing lips of oil seal. Press front oil seal into carrier.
6. Install companion flange and drive pinion nut in.
7. Install rear propeller shaft.

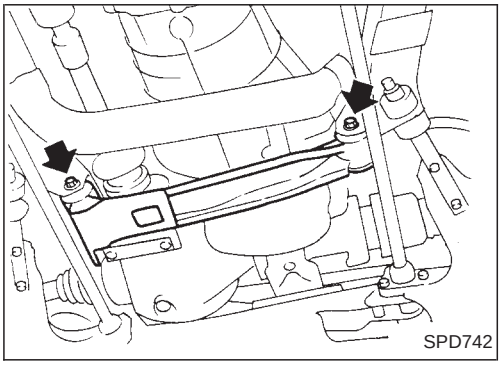
Tool number:
KV381025S0

http://vnx.su/



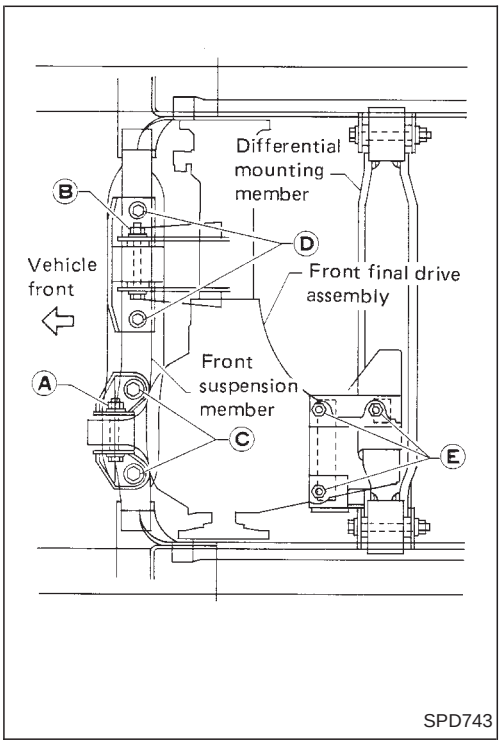
Removal

1. Remove front propeller shaft.
2. Remove drive shaft. Refer to FA section.
3. Remove engine mounting bolts and raise up engine.
4. Remove front final drive together with differential mounting member.



Installation

1. Install front final drive assembly together with differential mounting member.



2. Tighten the front final drive securing bolts and nuts following the procedures below to prevent drive train vibration.
(1) Temporarily tighten nut Ⓐ.
(2) Temporarily tighten nut Ⓑ.
(3) Tighten bolts Ⓒ to the torque of 68 to 87 N·m (6.9 to 8.9 kg-m, 50 to 64 ft-lb).
(4) Tighten bolts Ⓓ to the torque of 68 to 87 N·m (6.9 to 8.9 kg-m, 50 to 64 ft-lb).
(5) Tighten nut Ⓐ to the torque of 68 to 87 N·m (6.9 to 8.9 kg-m, 50 to 64 ft-lb).
(6) Tighten nut Ⓑ to the torque of 68 to 87 N·m (6.9 to 8.9 kg-m, 50 to 64 ft-lb).
(7) Tighten nuts Ⓔ to the torque of 68 to 87 N·m (6.9 to 8.9 kg-m, 50 to 64 ft-lb).

3. Install drive shaft. Refer to FA section.
4. Install front propeller shaft.

http://vnx.su/

Removal

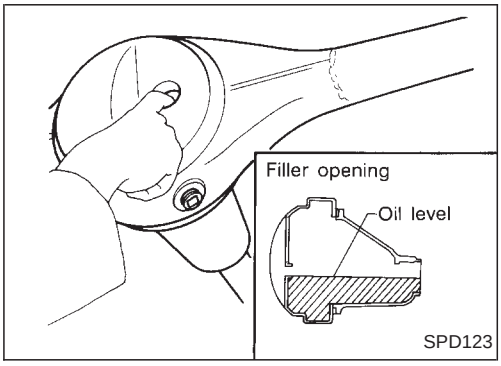
- Remove propeller shaft.

Insert plug into transfer or transmission after removing propeller shaft.

- Remove axle shaft. Refer to RA section.

CAUTION:

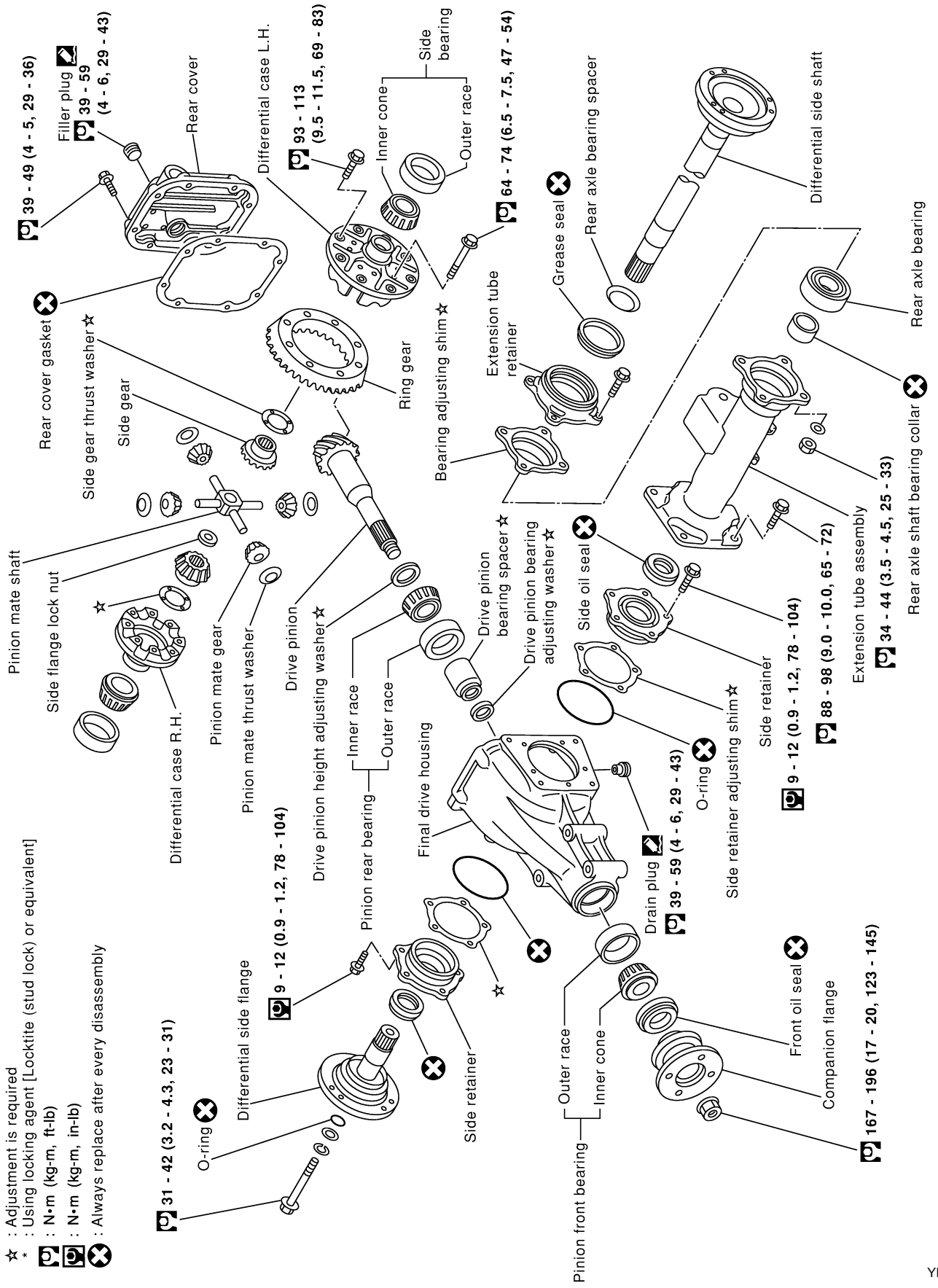
- **Be careful not to damage spline, sleeve yoke and front oil seal when removing propeller shaft.**



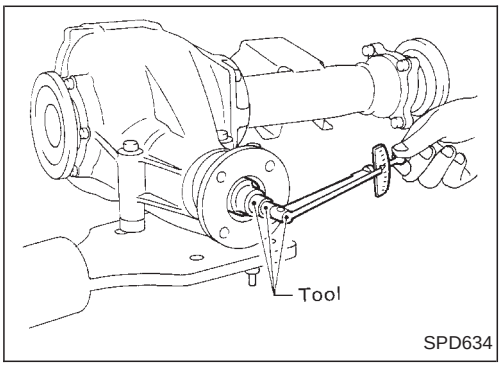
Installation

- Fill final drive with recommended gear oil.

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☆ : Adjustment is required
☆* : Using locking agent [Locktite (stud lock) or equivalent]
: N•m (kg-m, ft-lb)
: N•m (kg-m, in-lb)
: Always replace after every disassembly
39 - 49 (4 - 5, 29 - 36)
Filler plug
39 - 59 (4 - 6, 29 - 43)
Rear cover
Differential case L.H.
93 - 113 (9.5 - 11.5, 69 - 83)
Inner cone
Side bearing
Outer race
64 - 74 (6.5 - 7.5, 47 - 54)
Rear cover gasket
Side gear thrust washer☆
Side gear
Ring gear
Bearing adjusting shim☆
Extension tube retainer
Grease seal
Rear axle bearing spacer
Differential side shaft
Pinion mate shaft
Side flange lock nut
Differential case R.H.
Pinion mate gear
Pinion mate thrust washer
Drive pinion
Drive pinion height adjusting washer☆
Inner race
Outer race
Drive pinion bearing spacer☆
Drive pinion bearing adjusting washer☆
Side oil seal
Rear axle bearing
Pinion rear bearing
Final drive housing
Side retainer adjusting shim☆
Side retainer
9 - 12 (0.9 - 1.2, 78 - 104)
88 - 98 (9.0 - 10.0, 65 - 72)
Extension tube assembly
34 - 44 (3.5 - 4.5, 25 - 33)
Rear axle shaft bearing collar
O-ring
Drain plug
39 - 59 (4 - 6, 29 - 43)
Differential side flange
31 - 42 (3.2 - 4.3, 23 - 31)
Pinion front bearing
Front oil seal
Companion flange
167 - 196 (17 - 20, 123 - 145)
YPD003

http://vnx.su/

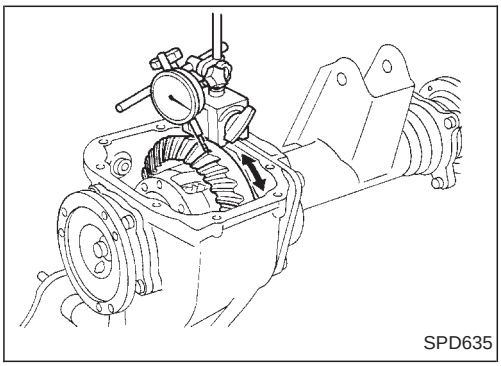


Pre-inspection

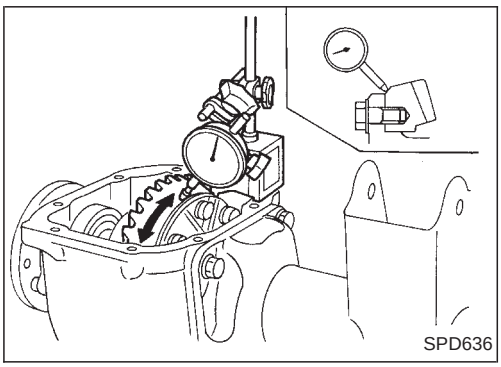
Before disassembling final drive, perform the following inspection.

- Total preload
- Remove the extension tube and the side flange. This measurement must be performed with the extension tube and the differential flange removed.

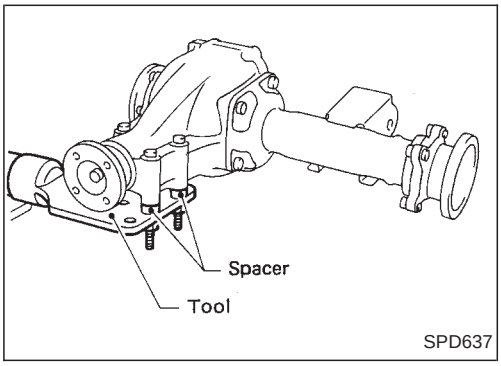
1) Turn drive pinion in both directions several times to set bearing rollers.
2) Check total preload with Tool.
   Tool number:
   ST3127S000
   Total preload:
   1.3 - 2.2 N·m (13 - 22 kg-cm, 11 - 19 in-lb)



- Ring gear to drive pinion backlash
  Check backlash of ring gear with a dial indicator at several points.
  Ring gear-to-drive pinion backlash:
  0.13 - 0.18 mm (0.0051 - 0.0071 in)



- Ring gear runout
  Check runout of ring gear with a dial indicator.
  Runout limit:
  0.05 mm (0.0020 in)
- Tooth contact
  Check tooth contact (Refer to Adjustment).

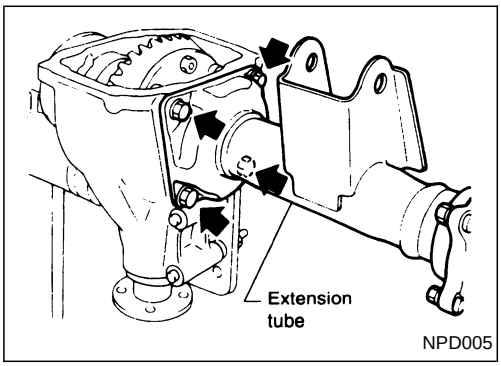


Final Drive Housing

1. Using three spacers [20 mm (0.79 in)], mount final drive assembly on Tool.
   Tool number:
   KV38100800

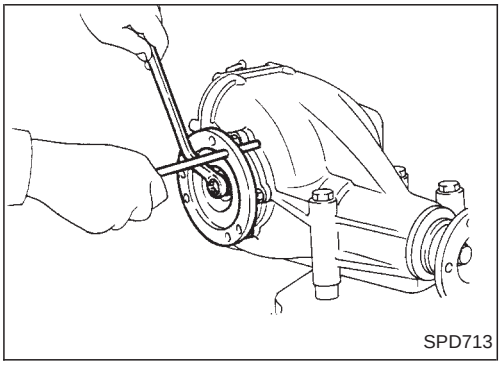
http://vnx.su/

Final Drive Housing (Cont'd)

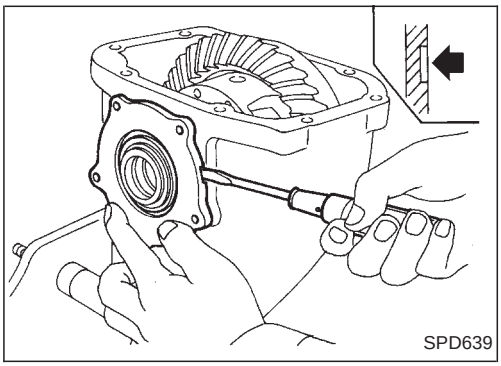


NPD005

2. Remove extension tube and differential side shaft assembly.

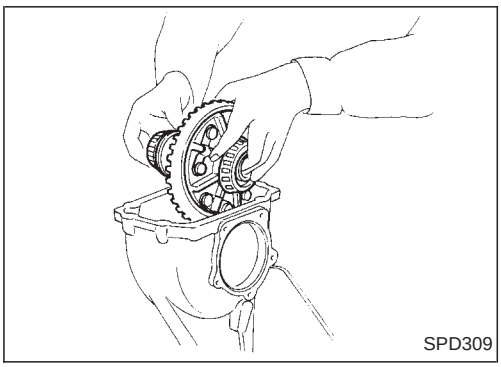

SPD713

3. Remove differential side flange.

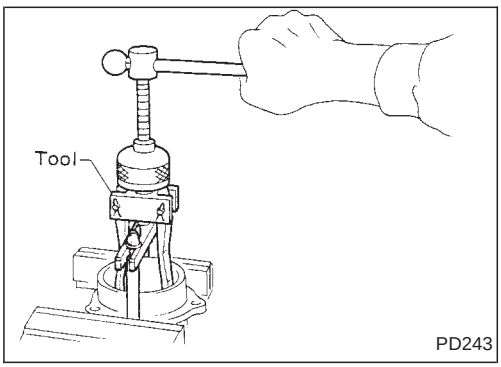

SPD639

4. Mark side retainers for identification. Remove side retainers.

Be careful not to confuse right and left side retainers and shims.


SPD309

5. Extract differential case from final drive housing.



PD243

6. Remove side outer races.

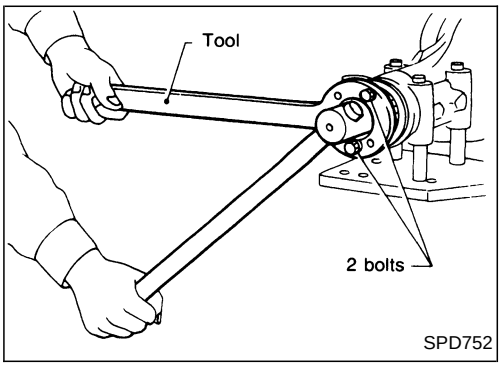
Tool number:
ST33290001

Be careful to keep the side bearing outer races together with their respective inner cones — do not mix them up.

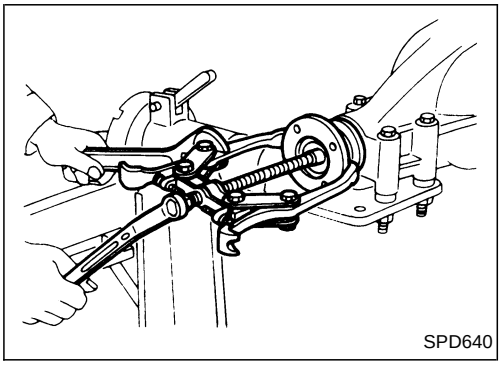
7. Remove side oil seal.

http://vnx.su/

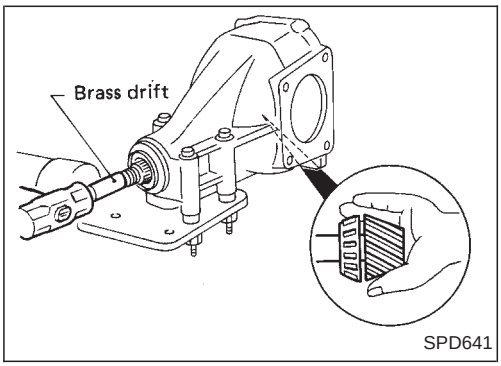
Final Drive Housing (Cont'd)



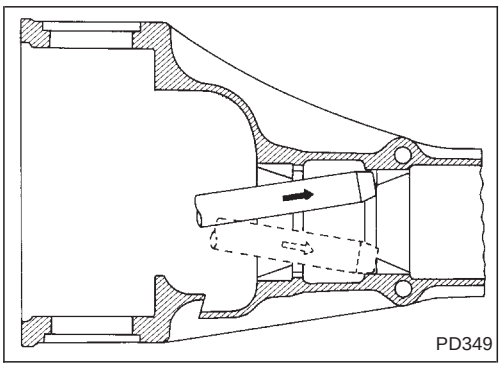
8. Loosen drive pinion nut.
   Tool number:
   ST38060002



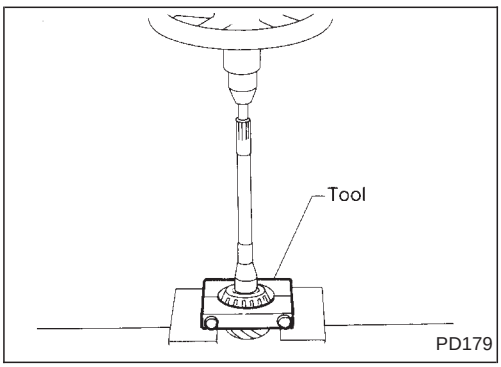
9. Remove companion flange with puller.



10. Take out drive pinion together with pinion rear bearing inner cone, drive pinion bearing spacer and pinion bearing adjusting washer.
11. Remove front oil seal and pinion front bearing inner cone.



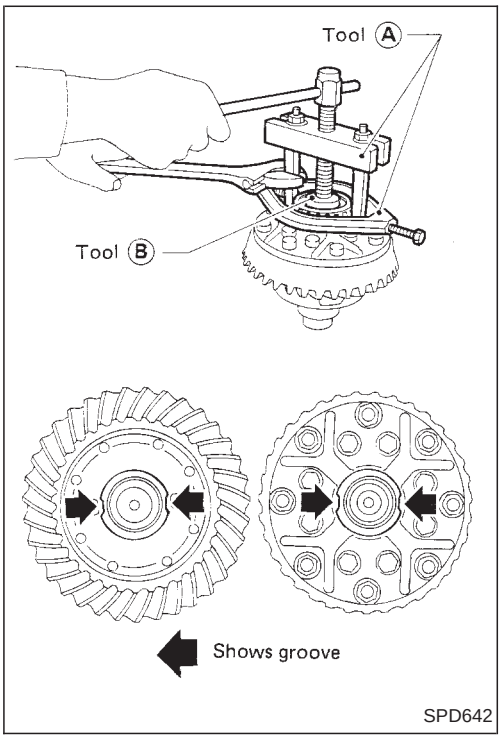
12. Remove pinion front and rear bearing outer races with brass drift.



13. Remove pinion rear bearing inner cone and drive pinion adjusting washer.
    Assembly:
    ST30905000
    Tool number:
    ST30031000

http://vnx.su/

Differential Case

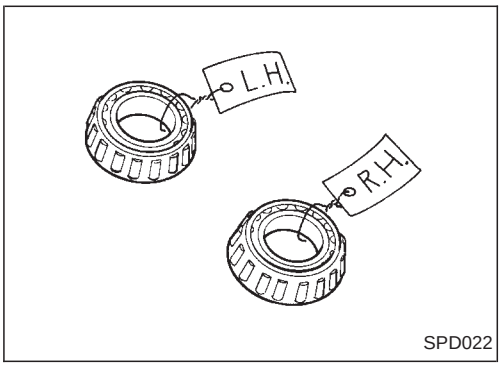


1. Remove side bearing inner cones.

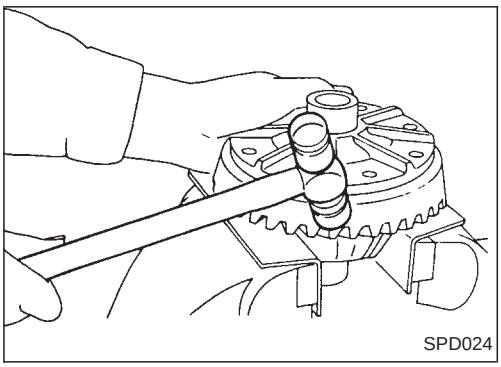
To prevent damage to bearing, engage puller jaws in grooves.

Assembly:
ST33065001

Tool number:
Ⓐ ST33051001
Ⓑ ST33061000

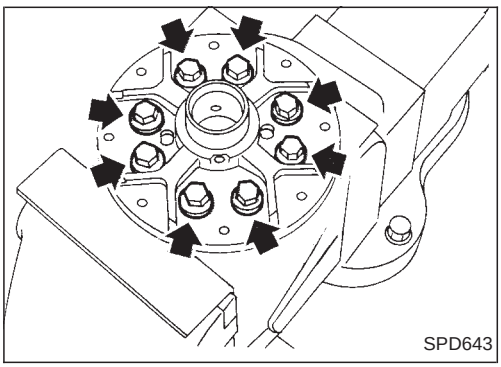


Be careful not to confuse the right and left hand parts.



2. Loosen ring gear bolts in a criss-cross fashion.
3. Tap ring gear off differential case with a soft hammer.

Tap evenly all around to keep ring gear from binding.

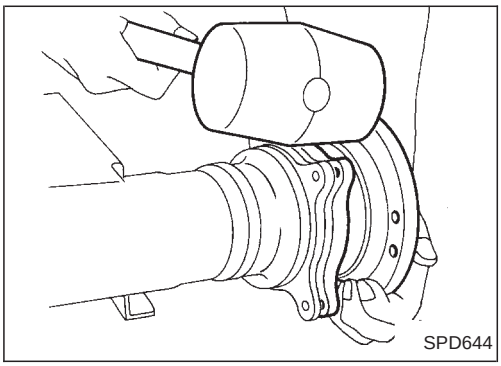


4. Separate L.H. and R.H. differential cases.

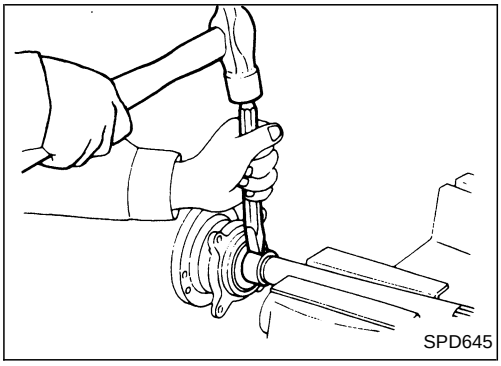
Put match marks on both L.H. and R.H. differential cases.

http://vnx.su/

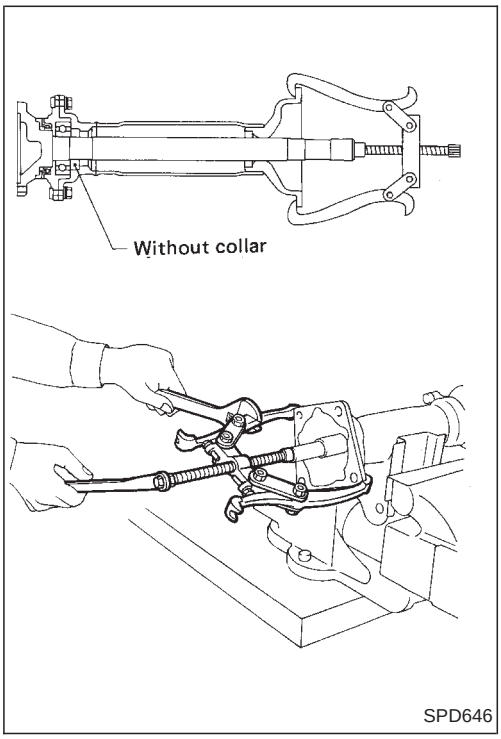
Extension Tube and Differential Side Shaft


SPD644

1. Remove differential side shaft assembly from extension tube.

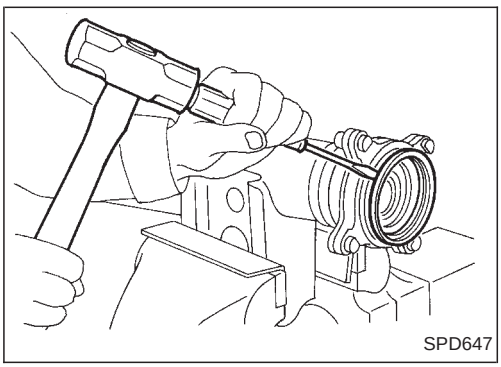

SPD645

2. Cut rear axle bearing collar with cold chisel. Be careful not to damage differential side shaft.



SPD646

3. Install differential side shaft into extension tube and secure with bolts. Remove extension tube retainer from differential side shaft.

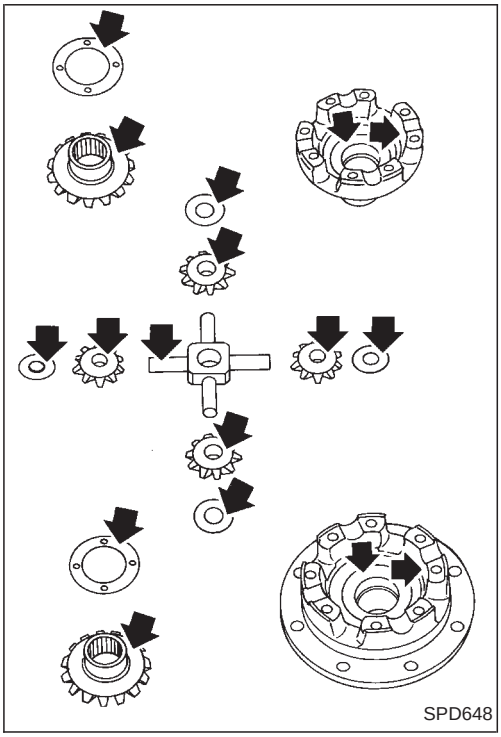

SPD647

4. Remove grease seal.

http://vnx.su/

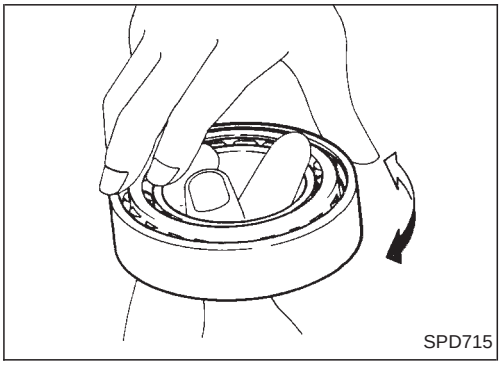
Ring Gear and Drive Pinion

Check gear teeth for scoring, cracking or chipping.
If any damaged part is evident, replace ring gear and drive pinion as a set (hypoid gear set).


SPD648

Differential Case Assembly

Check mating surfaces of differential case, side gears, pinion mate gears, pinion mate shaft and thrust washers.

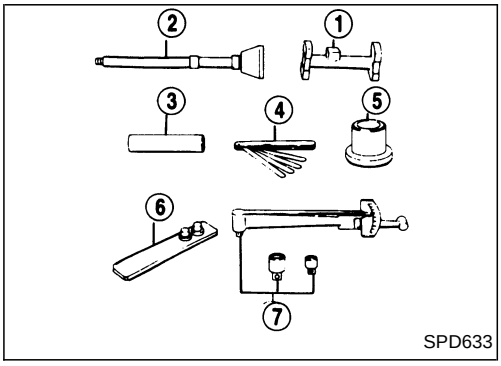

SPD715

Bearing

1. Thoroughly clean bearing.
2. Check bearings for wear, scratches, pitting or flaking.
   Check tapered roller bearing for smooth rotation. If damaged, replace outer race and inner cone as a set.

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To avoid confusion while calculating bearing shims, it is absolutely necessary to stay with the metric system. If you measure anything in inches, the results MUST be converted to the metric system.

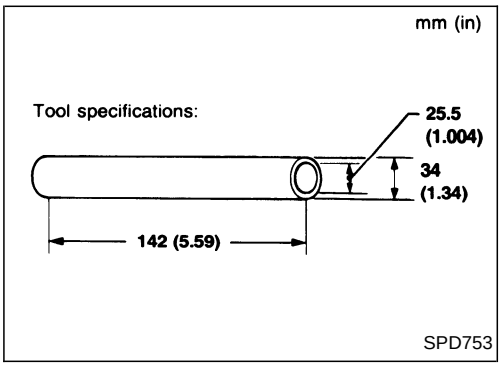


SPD633

Drive Pinion Height

1. First prepare Tools for pinion height adjustment.

① Height gauge (ST31211000)
② Dummy shaft (ST31212000)
③ Collar
④ Feeler gauge
⑤ Dummy shaft spacer (ST31851000)
⑥ Stopper (ST31852000)
⑦ Preload gauge (ST3127S000)

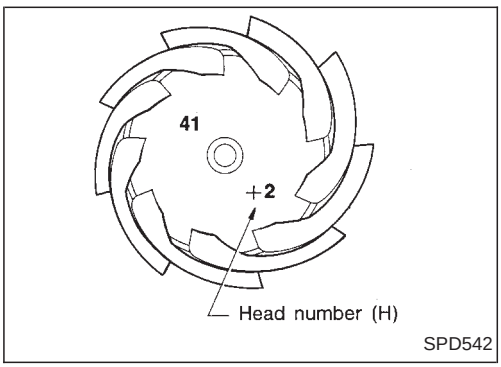


SPD753

- Use a collar which has the specifications shown at left.

2. To simplify the job, make a chart, like the one below, to organize your calculations.

LETTERS	HUNDREDTHS OF A MILLIMETER
H: Head number	
D′: Figure marked on dummy shaft	
S: Figure marked on height gauge	
N: Measuring clearance	

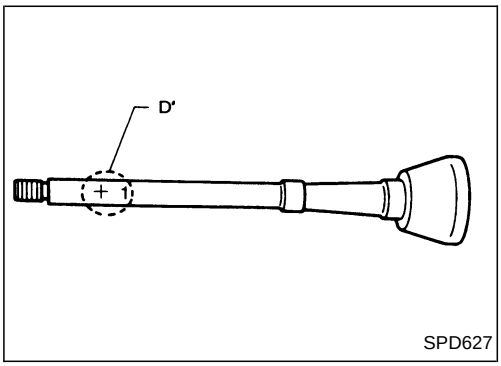


SPD542

3. Write the following numbers down in the chart.
H: Head number

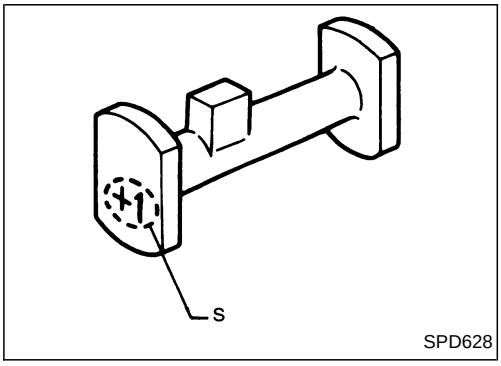
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Drive Pinion Height (Cont'd)



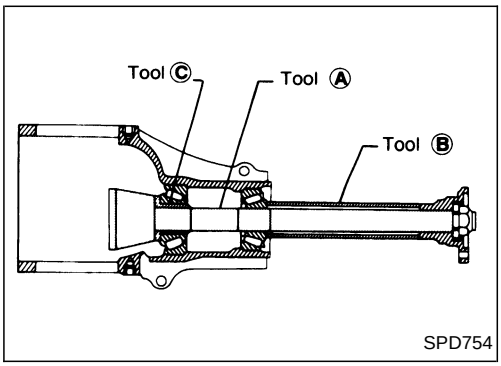
SPD627

D′: Figure marked on dummy shaft.



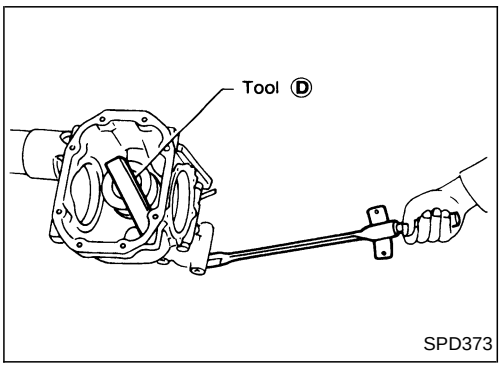
SPD628

S: Figure marked on height gauge.
W: Thickness of drive pinion height adjusting washer which is 3.09 mm (0.1217 in).

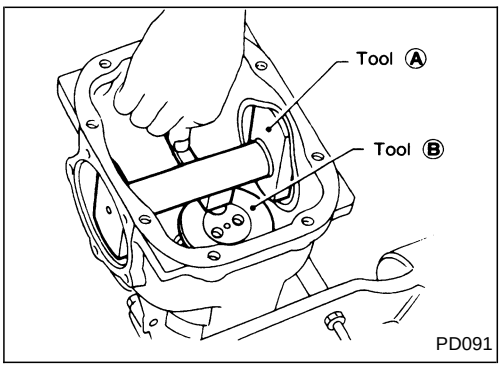


SPD754

4. Set Tool (dummy shaft) as shown at left and tighten drive pinion nut carefully to correct preload of 1.0 to 1.3 N·m (10 to 13 kg-cm, 8.7 to 11.3 in-lb).
   Tool number:
   - Ⓐ **Dummy shaft (ST31212000)**
   - Ⓑ **Collar**
   - Ⓒ **Dummy shaft spacer (ST31851000)**
   - Ⓓ **Stopper (ST31852000)**



SPD373



PD091

5. Attach Tool (height gauge) to gear carrier, and measure the clearance between the height gauge and the dummy shaft face.
   Tool number
   - Ⓐ **Height gauge (ST31211000)**
   - Ⓑ **Dummy shaft (ST31212000)**

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Drive Pinion Height (Cont'd)

6. Substitute these values into the equation to calculate the thickness of the washer.

If values signifying H, D′ and S are not given, regard them as zero and calculate.

T (Thickness of washer)
= W + N − [(H − D′ − S) x 0.01] − 0.20

Example:

W = 3.09
N = 0.33
H = +2
D′ = −1
S = 0

T = W + N − [(H − D′ − S) x 0.01] − 0.20

(1)	H	2
	−D′	−(−1)
		+3
(2)	−S	−0
		+3
(3)		+3
		x0.01
		+0.03
(4)	W	3.09
	+N	+0.33
		3.42
(5)		−[+0.03]
		3.39
(6)		−0.20
		3.19

7. Select the proper washer. (Refer to PD-57.)

If you cannot find the desired thickness of washer, use washer with thickness closest to the calculated value.

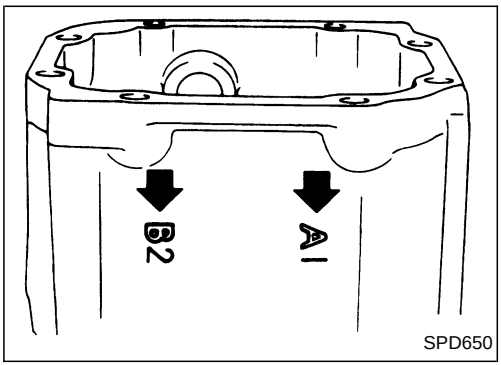
Example:
Calculated value ... T = 3.19 mm
Used washer ... T = 3.18 mm

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Side Bearing Preload

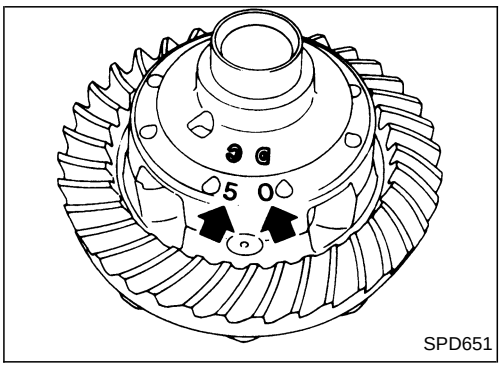
1. To simplify the job, make a chart like the one below to organize your calculations.

LETTERS	HUNDREDTHS OF A MILLIMETER
A − Left housing	
B − Right housing	
C − Differential case	
D − Differential case	
E − Left side bearing	
F − Right side bearing	
G_1 − Left side retainer	
G_2 − Right side retainer	



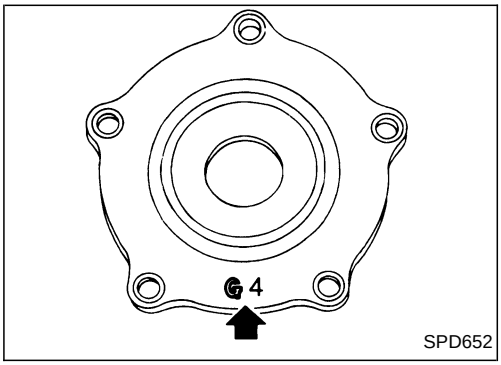
SPD650

2. Write the following numbers down in the chart.
   A & B: Figures marked on final drive housing.



SPD651

C & D: Figures marked on differential case.

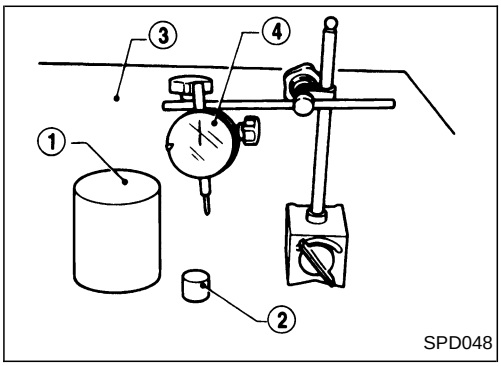


SPD652

G_1 & G_2: Figures marked on side retainer.

http://vnx.su/

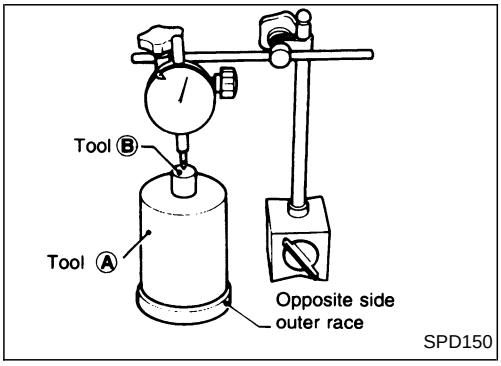
Side Bearing Preload (Cont'd)



SPD048

3. Measure how far under the standard thickness [20 mm (0.79 in)] the side bearings are.
   It will require tools shown below.

① Weight Block (ST32501000)
② Master Gauge (KV38101900)
③ Base Plate
④ Dial Indicator

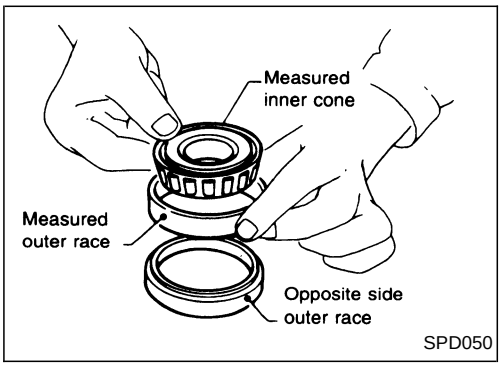


SPD150

4. Place the outer race of the opposite side bearing to the measured.
5. Place a weight block on the outer race, and a master gauge on the block.

Tool number:

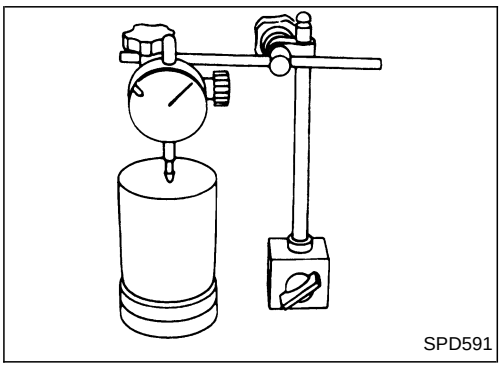
Ⓐ ST32501000
Ⓑ KV38101900



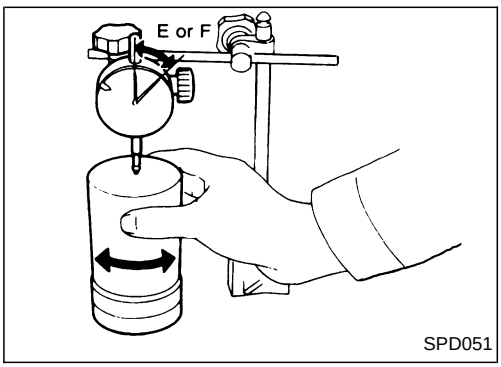
SPD050

6. Adjust dial indicator scale to zero.
7. Carefully slide master gauge and weight block out from under dial indicator.
8. Lubricate side bearing and place the bearing outer race and inner cone to be measured on the opposite side outer race.

If the bearing assembly is placed on the base plate, the bearing width cannot be accurately determined due to its cage being in contact with the base plate.


SPD591

9. Place weight block (ST32501000) on side bearing.
10. Slide dial indicator on weight block.



SPD051

11. Turn weight block a few times to ensure that bearing is properly seated.
12. Read dial indicator.

- Normal indication:
  0.10 - 0.30 mm (0.0039 - 0.0118 in)
- If the needle fluctuates erratically then bearing is either dirty or defective and should be cleaned or replaced.

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Side Bearing Preload (Cont'd)

13. Measure both bearing in the same way and write the left side bearing measurement next to "E" and the right side bearing measurement next to "F".
14. Substitute these values into the equation to calculate the thickness of the shim.

If values signifying A, B, C, D, G_1 and G_2 are not given, regard them as zero and calculate.

Left side:

$$T_1 = (A + C + G_1 - D) \times 0.01 + 0.76 - E$$

Right side:

$$T_2 = (B + D + G_2) \times 0.01 + 0.76 - F$$

Example

A = 5	E = 0.11
B = 5	F = 0.15
C = 3	G_1 = 4
D = 3	G_2 = 1

Left side:

T_1 = (A + C + G_1 − D) x 0.01 + 0.76 − E
= (5 + 3 + 4 − 3) x 0.01 + 0.76 − 0.11

(1)	A	5
	+ C	+3
		8
	+ G_1	+4
		12
	− D	−3
		9
(2)		9
		x0.01
		0.09
(3)		0.09
		+0.76
		0.85
(4)		0.85
	− E	−0.11
		0.74

$\therefore T_1$ = 0.74 mm

Right side:

T_2 = (B + D + G_2) x 0.01 + 0.76 − F
= (5 + 3 + 1) x 0.01 + 0.76 − 0.15

(1)	B	5
	+ D	+3
		8
	+ G_2	+1
		9
(2)		9
		x0.01
		0.09
(3)		0.09
		+0.76
		0.85
(4)		0.85
		−0.15
		0.70

$\therefore T_2$ = 0.70 mm

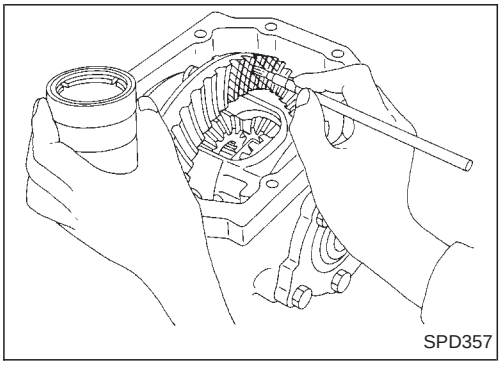
15. Select the proper shims. (Refer to PD-57.)

If you cannot find the desired thickness of shims, use shims with the total thickness closest to the calculated value.

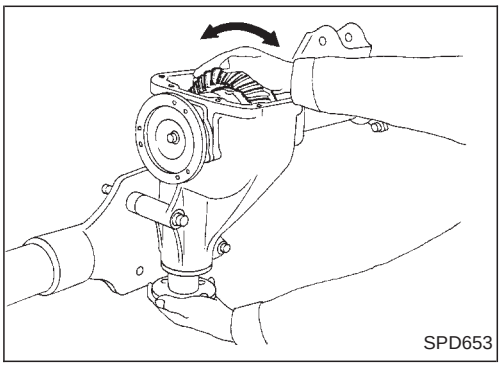
http://vnx.su/

Tooth Contact

Gear tooth contact pattern check is necessary to verify correct relationship between ring gear and drive pinion.
Hypoid gear sets which are not positioned properly in relation to one another may be noisy, or have short life span or both. With a pattern check, the most desirable contact for low noise level and long life can be assured.

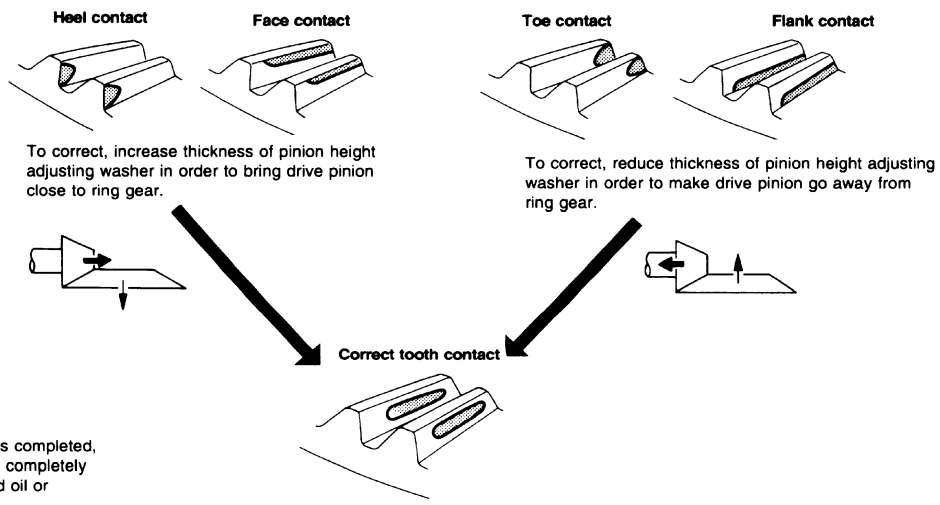

SPD357

1. Thoroughly clean ring gear and drive pinion teeth.
2. Sparingly apply a mixture of powdered ferric oxide and oil or equivalent to 3 or 4 teeth of ring gear drive side.


SPD653

3. Hold companion flange steady by hand and rotate the ring gear in both directions.

Usually the pattern will be correct if you have calculated the shims correctly and the backlash is correct.
However, in rare cases you may have to use trial-and-error processes until you get a good tooth contact pattern.
Tho tooth pattern is the best indication of how well a differential has been set up.

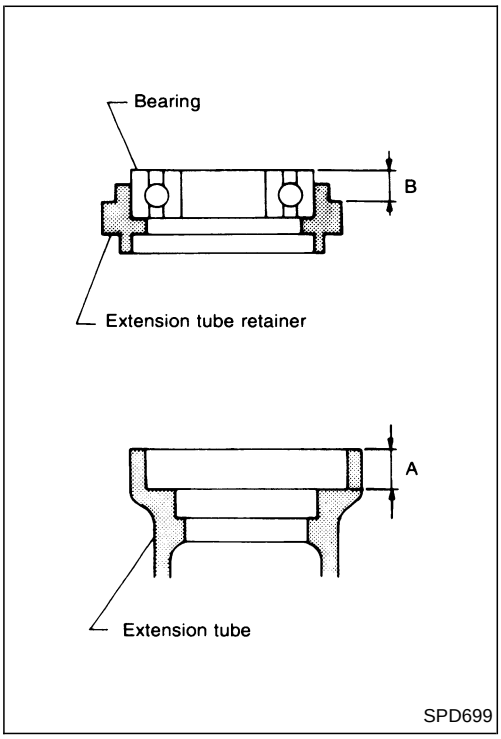


When adjustment is completed, be sure to wipe off completely the ferric oxide and oil or their equivalent.

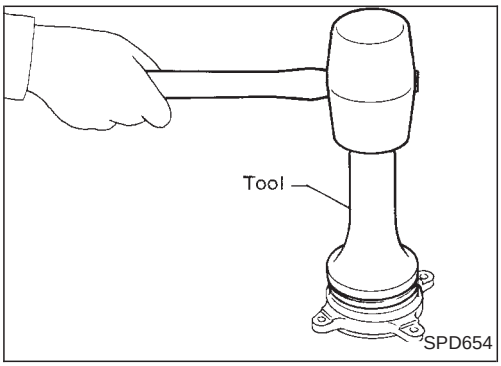
NPD003

http://vnx.su/

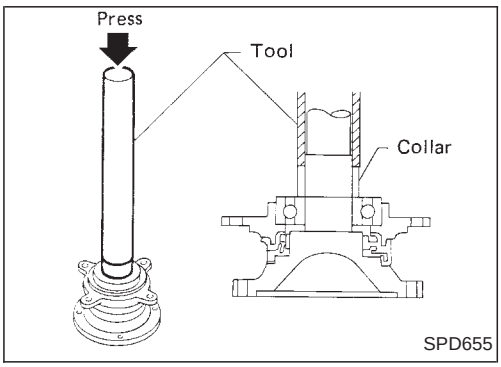
Extension Tube and Differential Side Shaft



1. Measure rear axle bearing end play.
   Rear axle bearing end play (A − B):
   0.1 mm (0.0039 in) or less
   The end play can be adjusted with bearing adjusting shim. (Refer to PD-57.)

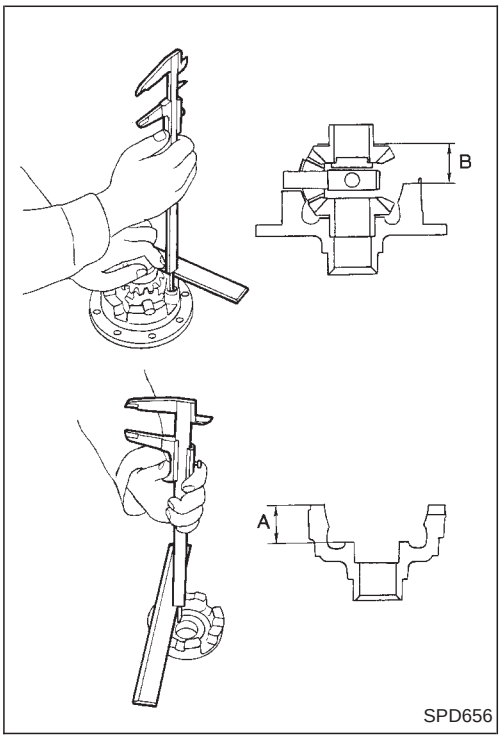


2. Install oil seal.



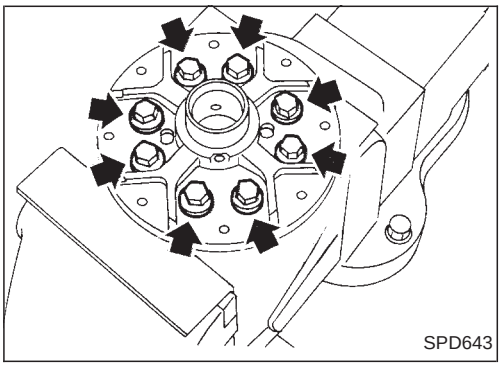
3. Install the spacer, grease seal, extension tube retainer, adjusting shim, shim and shim collar onto the differential side shaft.
4. Install differential side shaft assembly into extension tube.

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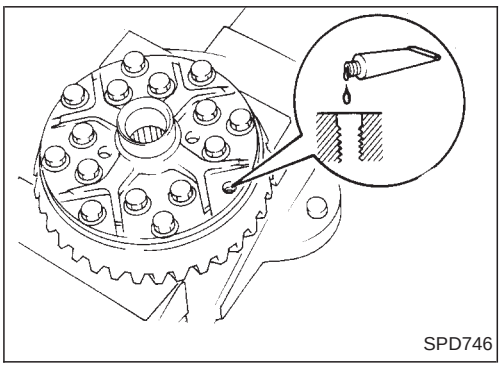


Differential Case

1. Measure clearance between side gear thrust washer and differential case.
   Clearance between side gear thrust washer and differential case (A − B):
   0.10 - 0.20 mm (0.0039 - 0.0079 in)
   The clearance can be adjusted with side gear thrust washer. (Refer to PD-57.)
2. Apply gear oil to gear tooth surfaces and thrust surfaces and check to see the turn properly.

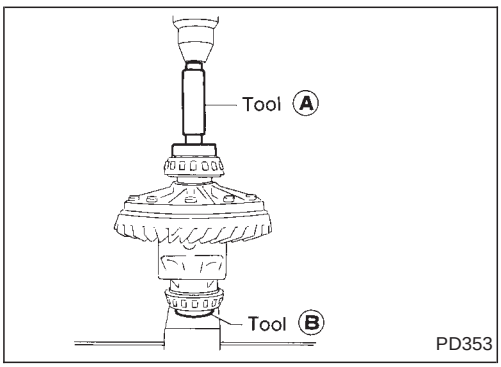


3. Install L.H. and R.H. differential cases.



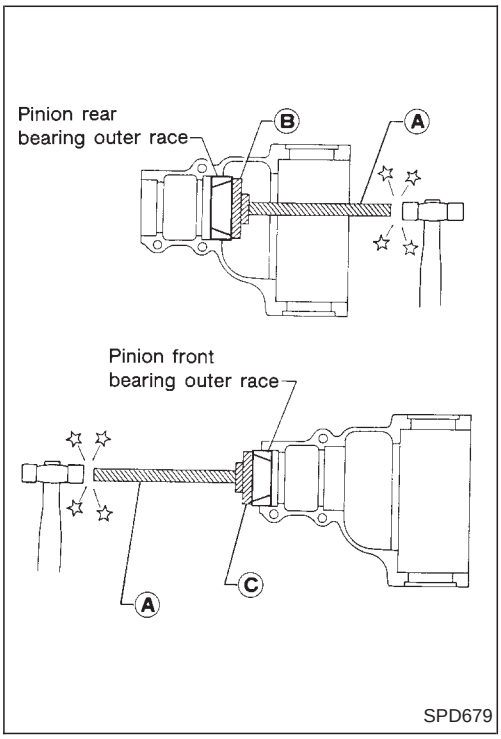
4. Place differential case on ring gear.
5. Apply locking agent [Locktite (stud lock) or equivalent] to ring gear bolts, and install them.

Tighten bolts in a criss-cross fashion, lightly tapping bolt head with a hammer.



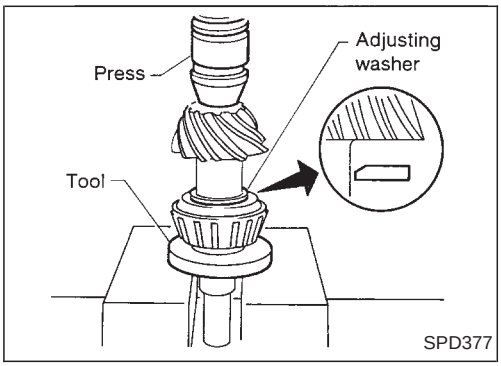
6. Press-fit side bearing inner cones on differential case with Tool.
   Tool number:
   Ⓐ ST33230000
   Ⓑ ST33061000

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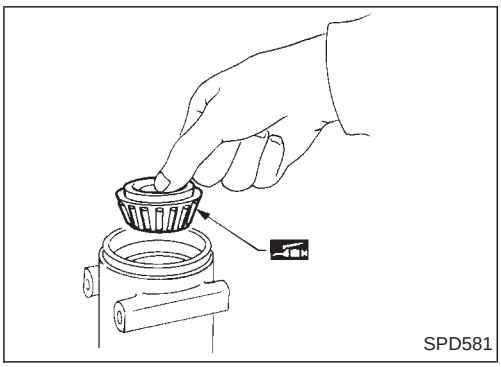


Final Drive Housing

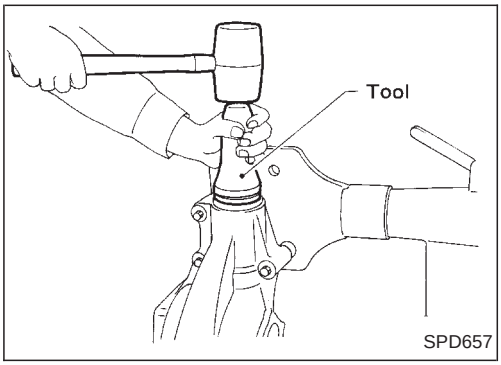
1. Press-fit front and rear bearing outer races with Tools.
   Tool number:
   - Ⓐ **ST30611000**
   - Ⓑ **ST30621000**
   - Ⓒ **ST30701000**
2. Select pinion bearing adjusting washer and drive pinion bearing spacer, referring to Adjustment.



3. Install drive pinion height adjusting washer in drive pinion, and press-fit rear bearing inner cone in it, using press and Tool.
   Assembly:
   ST30905000
   Tool number:
   ST30901000



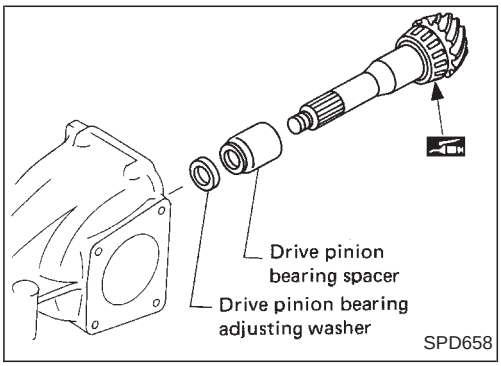
4. Place pinion front bearing inner cone in final drive housing.



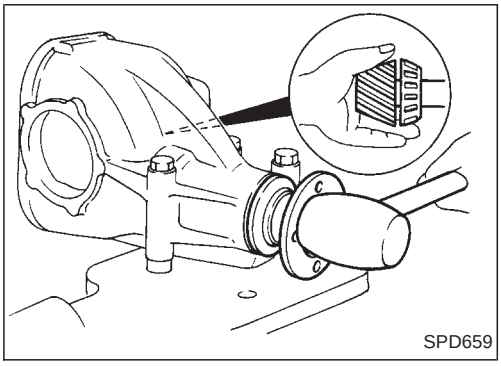
5. Apply multi-purpose grease to cavity at sealing lips of oil seal. Install front oil seal.
   Tool number:
   ST30720000

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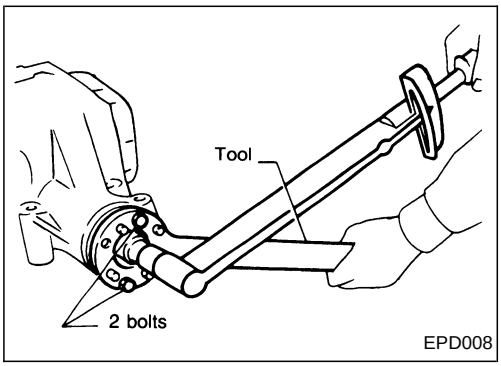
Final Drive Housing (Cont'd)



6. Place drive pinion bearing spacer, pinion bearing adjusting washer and drive in final drive housing.



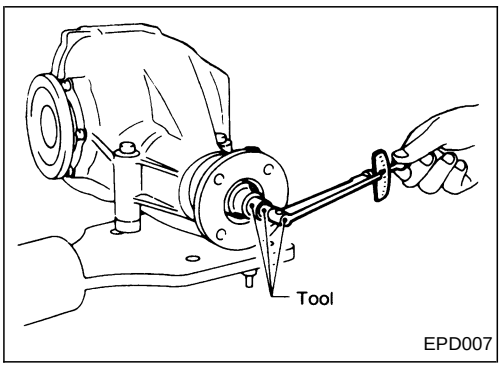
7. Insert companion flange into drive pinion by tapping the companion flange with a soft hammer.



8. Tighten pinion nut to the specified torque.

The threaded portion of drive pinion and pinion nut should be free from oil or grease.

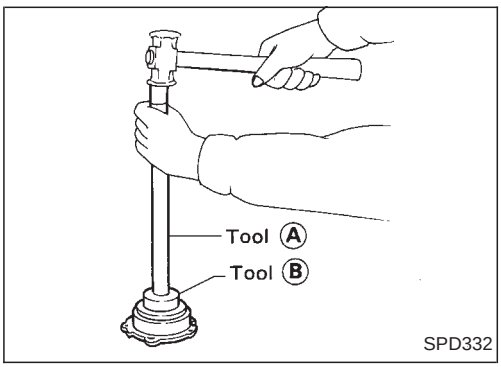
Tool number:
ST38060002



9. Turn drive pinion in both directions several revolutions, and measure pinion bearing preload.

Tool number:
ST3127S000
Pinion bearing preload:
1.2 - 1.6 N·m (12 - 16 kg-cm, 10 - 14 in-lb)

When pinion bearing preload is outside the specifications, replace pinion bearing adjusting washer and spacer with a different thickness.

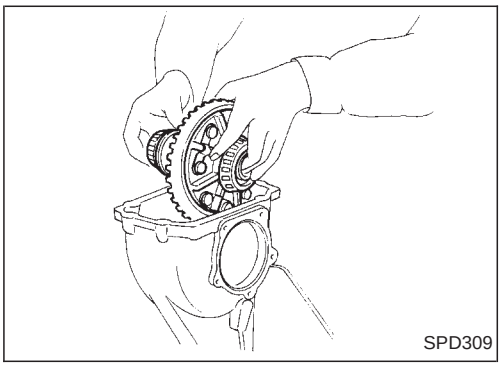


10. Select side retainer adjusting washer.
    Refer to Adjustment.
11. Press-fit side bearing outer race into side retainer.

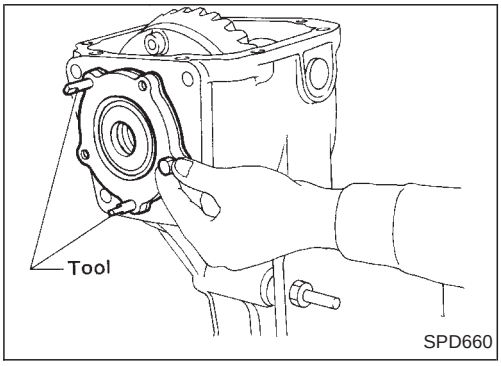
Tool number:
Ⓐ ST30611000
Ⓑ ST30621000

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Final Drive Housing (Cont'd)

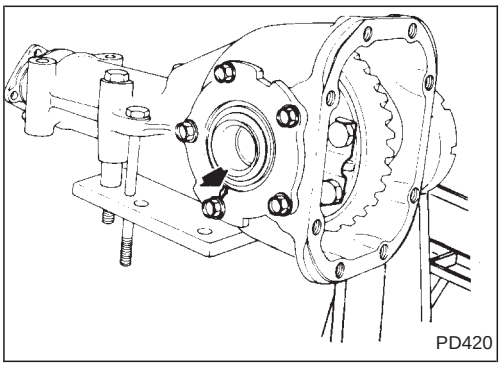

SPD309

12. Place the differential case assembly in its housing.

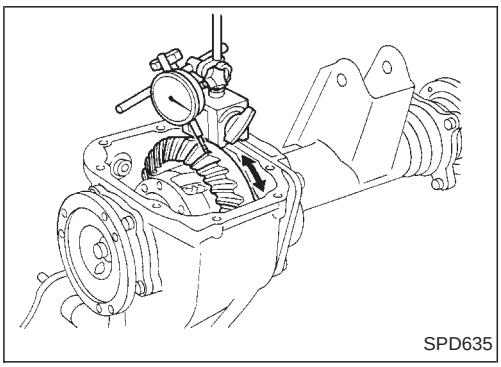


SPD660

13. Install side oil seal.
14. Place side retainer adjusting shims and O-ring on side retainer, and install them in final drive housing.
    Tool number:
    ST33720000


PD420

- Align arrows stamped on side retainer and final drive housing.


SPD635

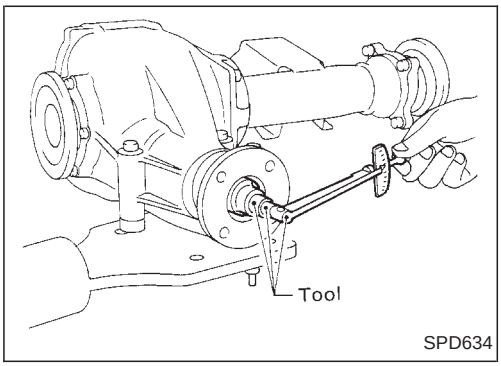
15. Measure ring gear-to-drive pinion backlash with a dial indicator.
    Ring gear-to-drive pinion backlash:
    0.13 - 0.18 mm (0.0051 - 0.0071 in)

- If backlash is too small, decrease thickness of right shim and increase thickness of left shim by the same amount.
  If backlash is too great, reverse the above procedure.

Never change the total amount of shims as it will change the bearing preload.

http://vnx.su/

Final Drive Housing (Cont'd)



SPD634

16. Check total preload with Tool.

When checking preload, turn drive pinion in both directions several times to set bearing rollers.

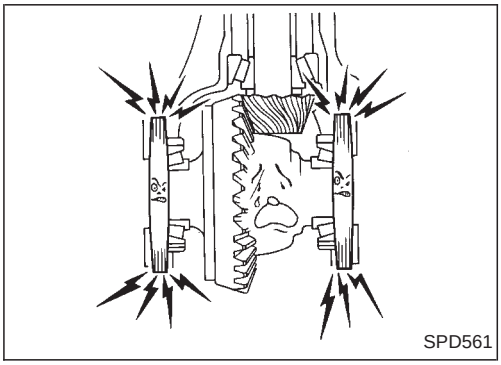
The total pinion bearing preload value with the differential case assembly should be in accordance with the same value measured without the differential case assembly. (See point 9.)

The relationship between both is:

Pinion bearing preload

With differential case assembly		Without differential case assembly	
kg-cm	N·m	kg-cm	N·m
11	1.1	12 - 17	1.2 - 1.7
12	1.2	13 - 18	1.3 - 1.8
13	1.3	14 - 19	1.4 - 1.9
14	1.4	15 - 20	1.5 - 2.0
15	1.5	16 - 21	1.6 - 2.1
16	1.6	17 - 22	1.7 - 2.2
17	1.7	18 - 23	1.8 - 2.3

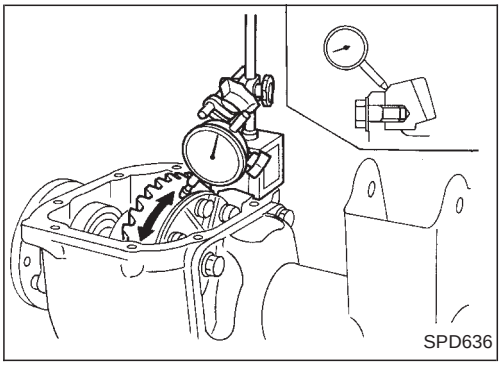
Tool number:
ST3127S000
Total preload:
1.0 - 2.3 N·m (10 - 23 kg-cm, 8.7 - 20.0 in-lb)


SPD561

- If preload is too great, remove the same amount of shim from each side.
- If preload is too small, add the same amount of shim to each side.

Never add or remove a different number of shims for each side as it will change ring gear-to-drive pinion backlash.

17. Recheck ring gear-to-drive pinion backlash because increase or decrease in thickness of shims will cause change of ring gear-to-pinion backlash.

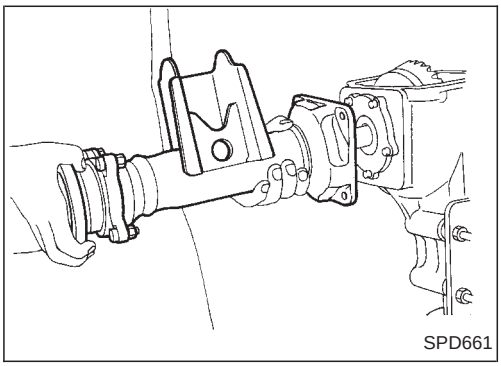

SPD636

18. Check runout of ring gear with a dial indicator.
    Runout limit:
    0.05 mm (0.0020 in)

- If backlash varies excessively in different places, the variance may have resulted from foreign matter caught between the ring gear and the differential case.
- If the backlash varies greatly when the runout of the ring gear is within a specified range, the hypoid gear set or differential case should be replaced.

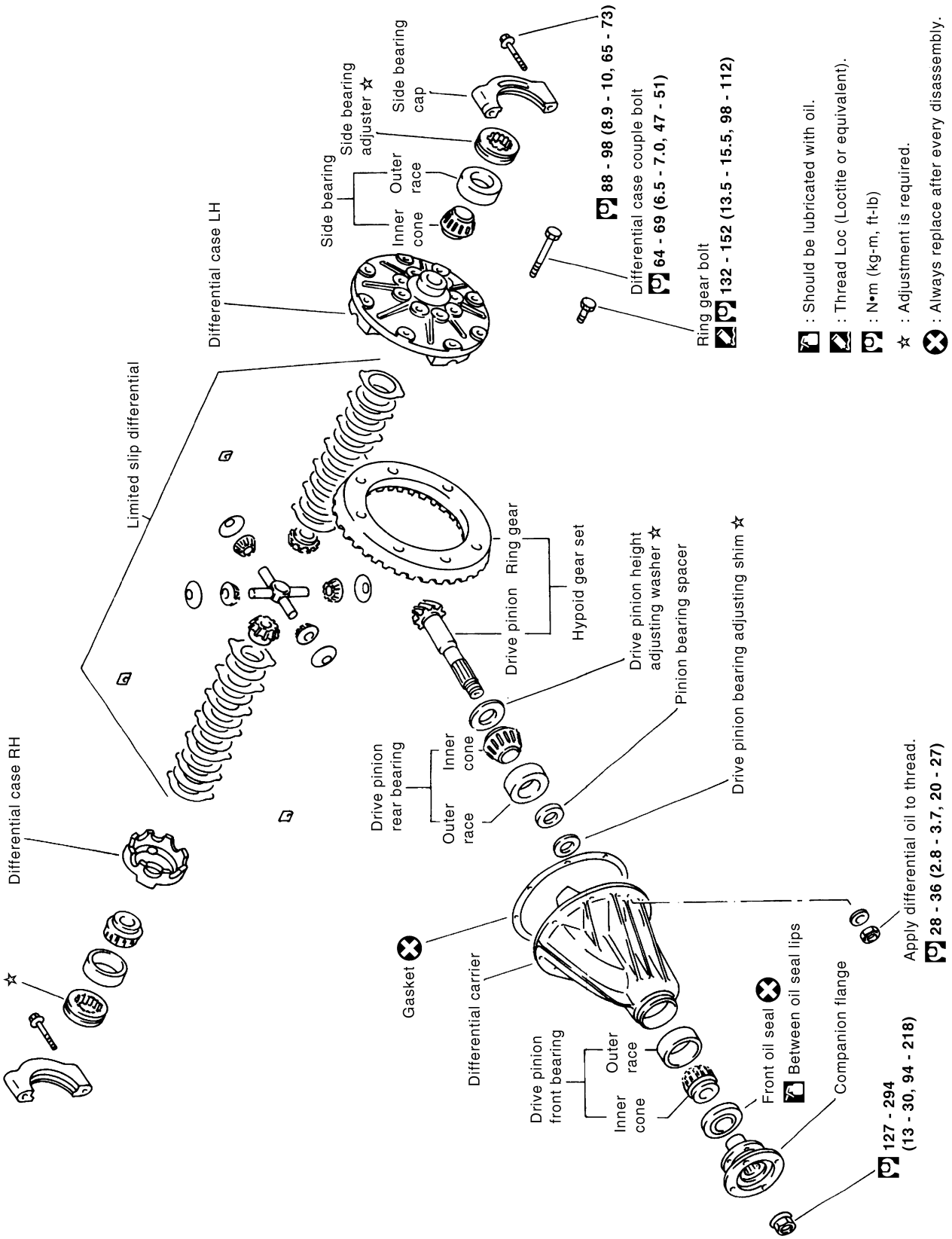
http://vnx.su/

Final Drive Housing (Cont'd)


SPD661

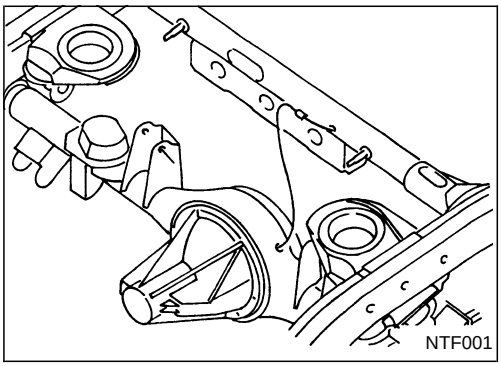
19. Check tooth contact.
    Refer to Adjustment.
20. Install rear cover and gasket.
21. Install extension tube and differential side shaft assembly.

http://vnx.su/



YPD013

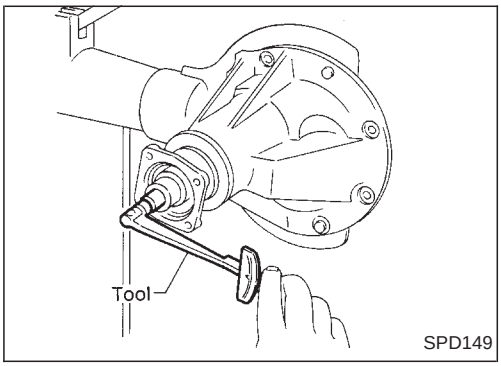
http://vnx.su/



Air Breather

Make sure air breather hose is situated as shown in the illustration.

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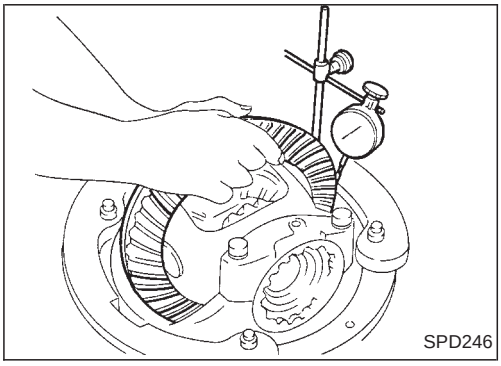
Pre-inspection

Before disassembling final drive, perform the following inspection.

- Total preload

1) Turn drive pinion in both directions several times to seat bearing rollers correctly.
2) Check total preload with Tool.

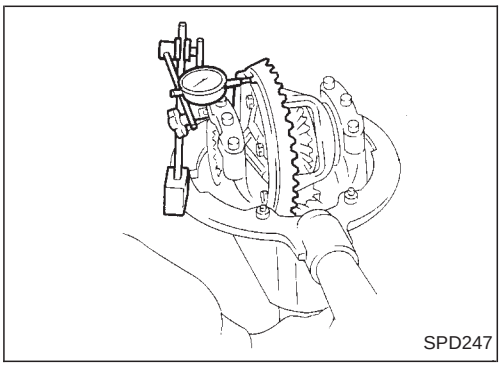
Total preload:
1.5 - 2.9 N·m (15 - 30 kg-cm, 13 - 26 in-lb)
Tool number:
ST3127S000



- Ring gear to drive pinion backlash

Check backlash of ring gear with a dial indicator at several points.

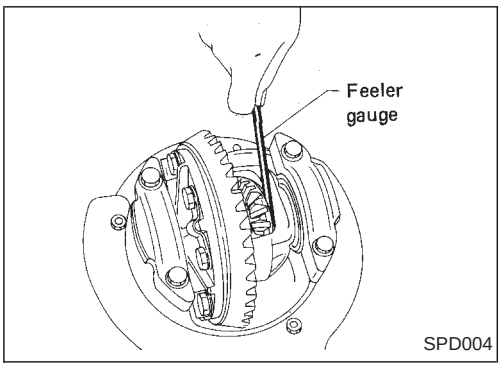
Ring gear-to-drive pinion backlash:
0.10 - 0.20 mm (0.0039 - 0.0079 in)



- Ring gear runout

Check runout of ring gear with a dial indicator.

Runout limit:
0.08 mm (0.0031 in)



- Tooth contact

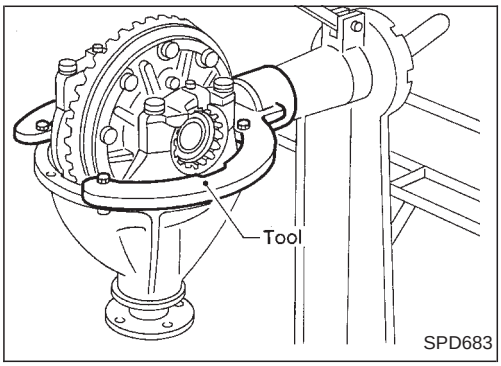
Check tooth contact, referring to Adjustment.

- Side gear to pinion mate gear backlash

Measure clearance between side gear thrust washer and differential case with a feeler gauge.

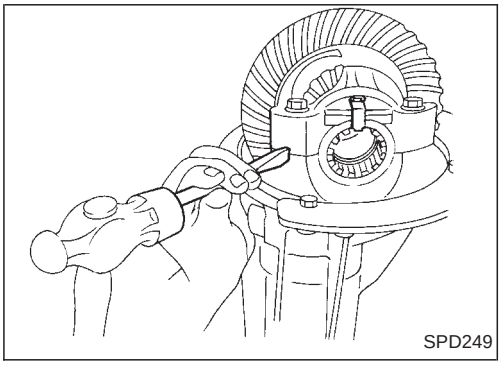
Clearance between side gear thrust washer and differential case:
0.10 - 0.20 mm (0.0039 - 0.0079 in)

http://vnx.su/



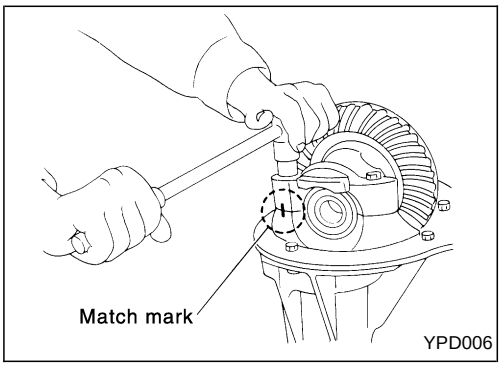
Differential Carrier

1. Mount final drive assembly on Tool.
   Tool number:
   ST06340000

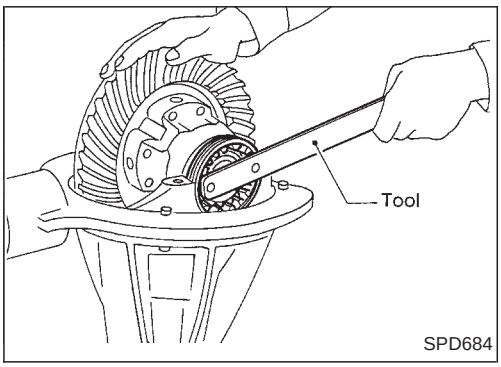


2. Put match marks on one side bearing cap with paint or punch to ensure that it is replaced in proper position during reassembly.

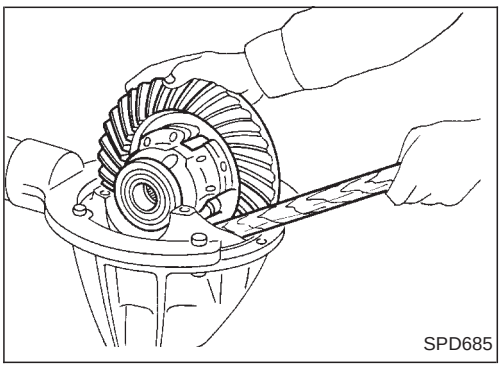
Bearing caps are line-bored during manufacture and should be put back in their original places.



3. Remove side lock fingers and side bearing caps.



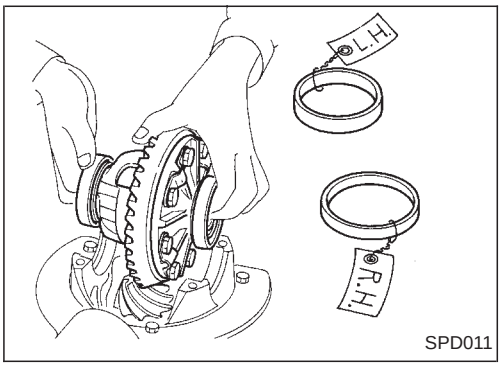
4. Remove side bearing adjuster with Tool.
   Tool number:
   ST32580000



5. Remove differential case assembly with a pry bar.

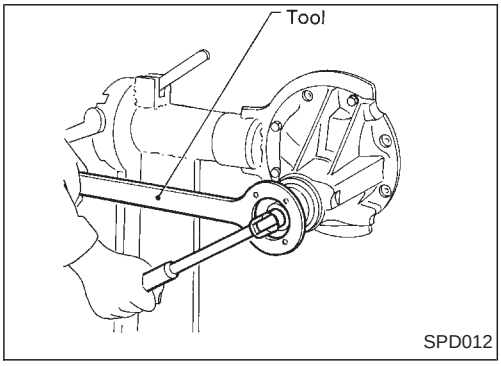
http://vnx.su/

Differential Carrier (Cont'd)



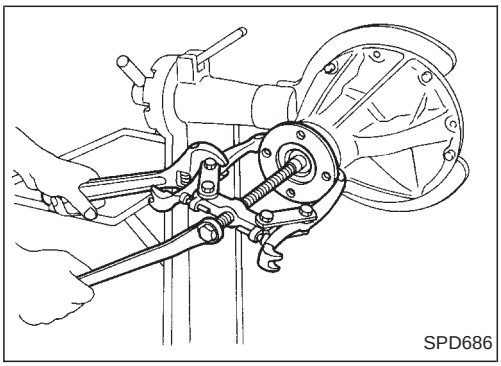
SPD011

Be careful to keep the side bearing outer races together with their respective inner cones — do not mix them up.

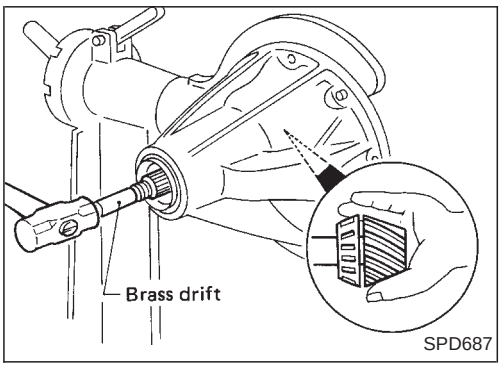


SPD012

6. Remove drive pinion nut with Tool.
   Tool number: KV38104700

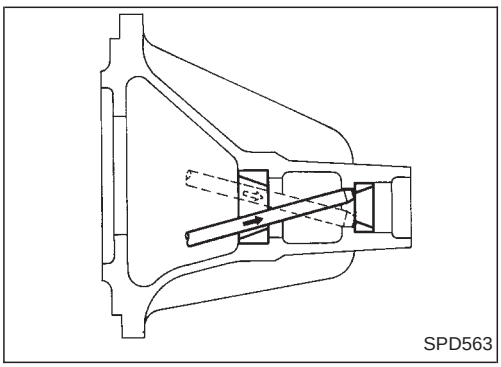

SPD686

7. Remove companion flange with puller.



SPD687

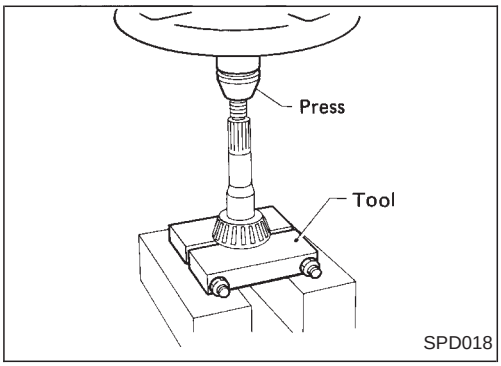
8. Take out drive pinion together with pinion rear bearing inner cone, drive pinion bearing spacer and pinion bearing adjusting shim.


SPD563

9. Remove front oil seal and pinion front bearing inner cone.
10. Remove pinion bearing outer races with a brass drift.

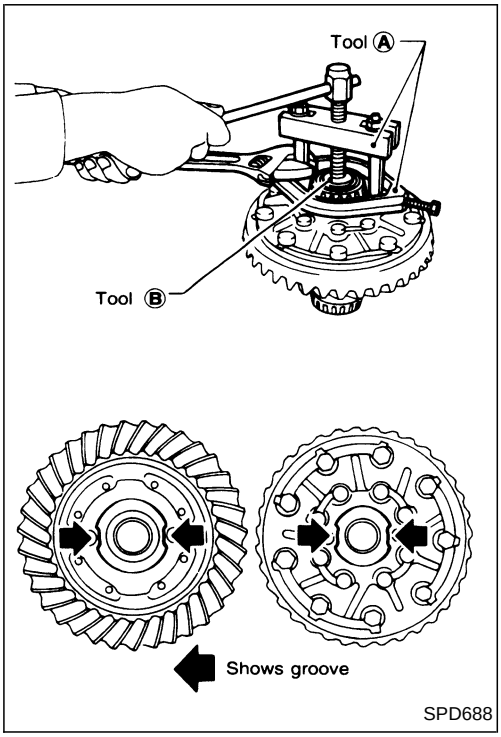
http://vnx.su/

Differential Carrier (Cont'd)



11. Remove pinion rear bearing inner cone and drive pinion adjusting washer.
    Tool number:
    ST30031000

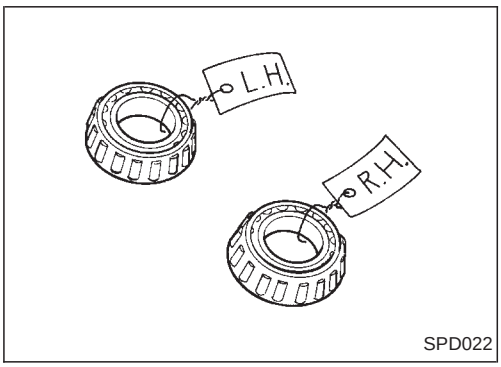
Differential Case



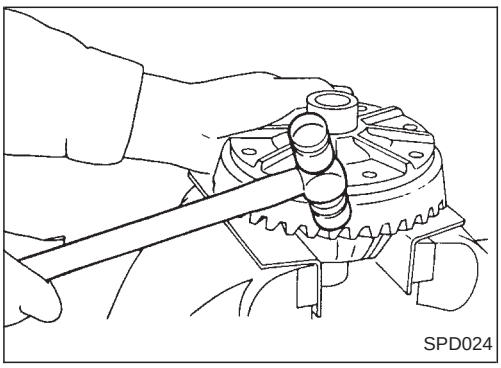
1. Remove side bearing inner cones.

To prevent damage to bearing, engage puller jaws in groove.

Tool number:
Ⓐ ST33051001
Ⓑ ST33061000



Be careful not to confuse left and right hand parts.

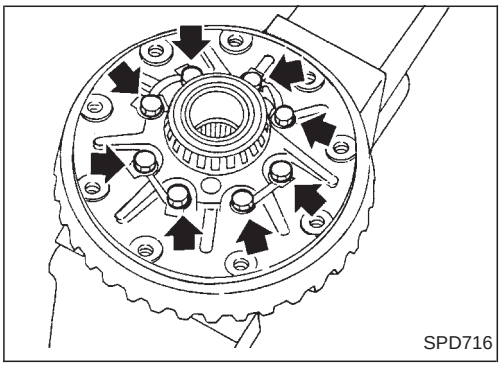


2. Loosen ring gear bolts in a criss-cross fashion.
3. Tap ring gear off differential case with a soft hammer.

Tap evenly all around to keep ring gear from binding.

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Differential Case (Cont'd)


SPD716

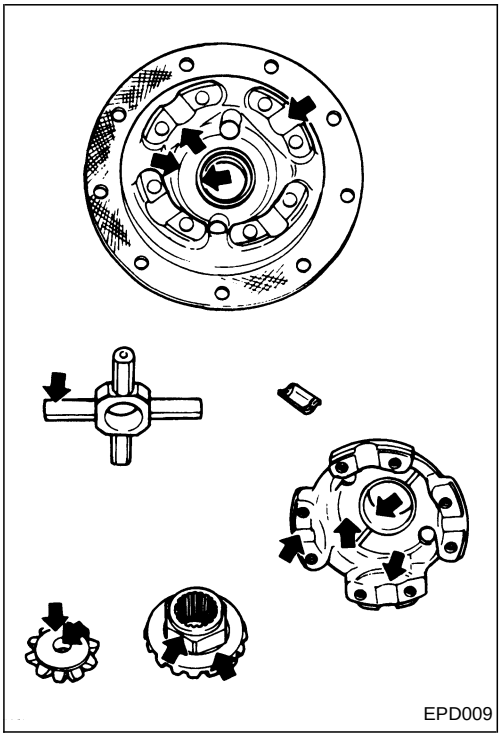
4. Separate differential case.

Put match marks on both L.H. and R.H. differential cases.

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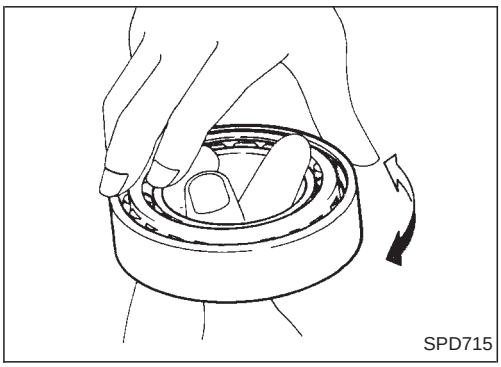
Ring Gear and Drive Pinion

Check gear teeth for scoring, cracking or chipping.
If any damaged part is evident, replace ring gear and drive pinion as a set (hypoid gear set).


EPD009

Differential Case Assembly

Check mating surfaces of differential case, side gears, pinion mate gears, pinion mate shaft, and thrust washers.


SPD715

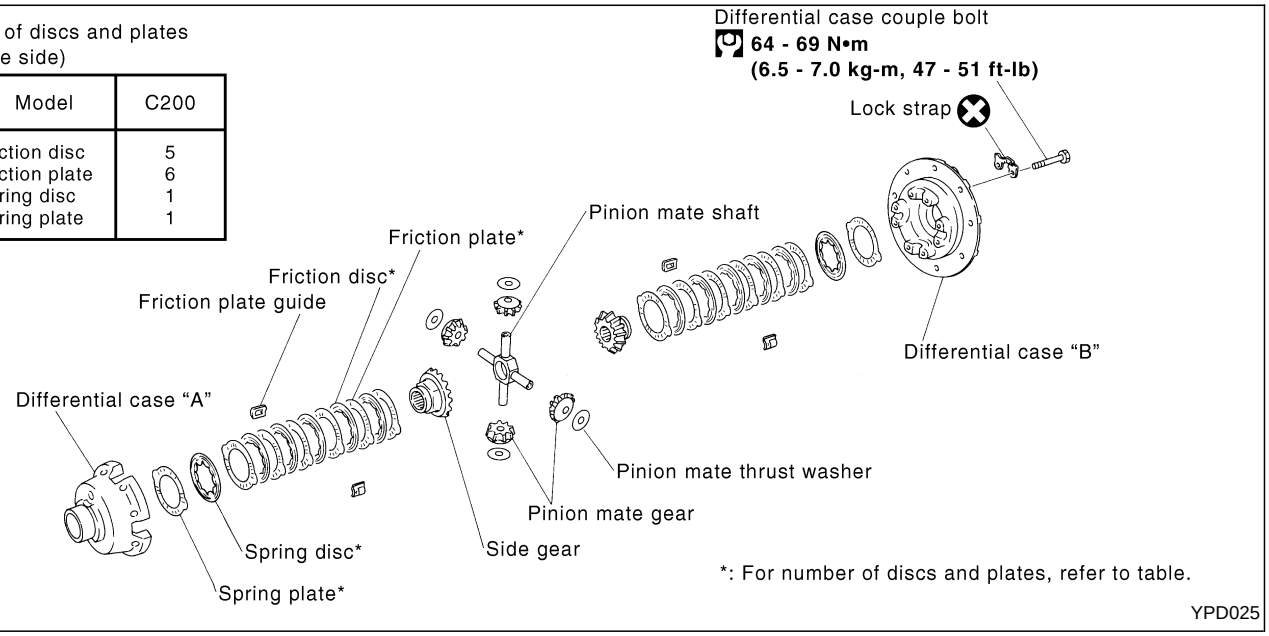
Bearing

1. Thoroughly clean bearing.
2. Check bearings for wear, scratches, pitting or flaking.
   Check tapered roller bearing for smooth rotation. If damaged, replace outer race and inner cone as a set.

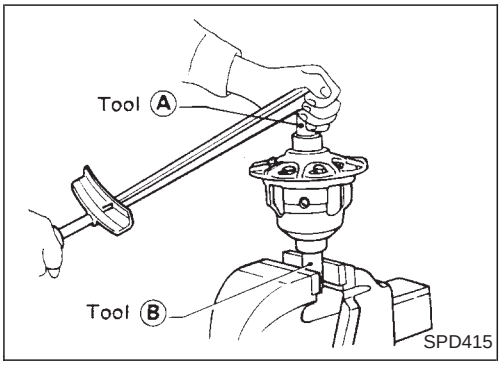
http://vnx.su/

No. of discs and plates
(One side)

Model	C200
Friction disc	5
Friction plate	6
Spring disc	1
Spring plate	1



CAUTION:
Do not run engine when one rear wheel is off the ground.



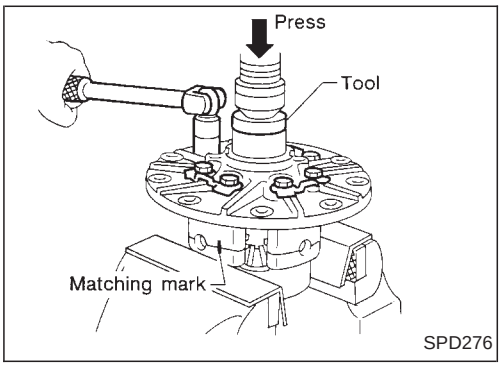
Preparation for Disassembly

CHECKING DIFFERENTIAL TORQUE

Measure differential torque with Tool.
If it is not within the specifications, inspect components of limited slip differential.

Differential torque:
353 - 392 N·m (36 - 40 kg-m, 260 - 289 ft-lb)
Assembly:
KV38105250
Tool number:
Ⓐ KV38105210
Ⓑ KV38105220

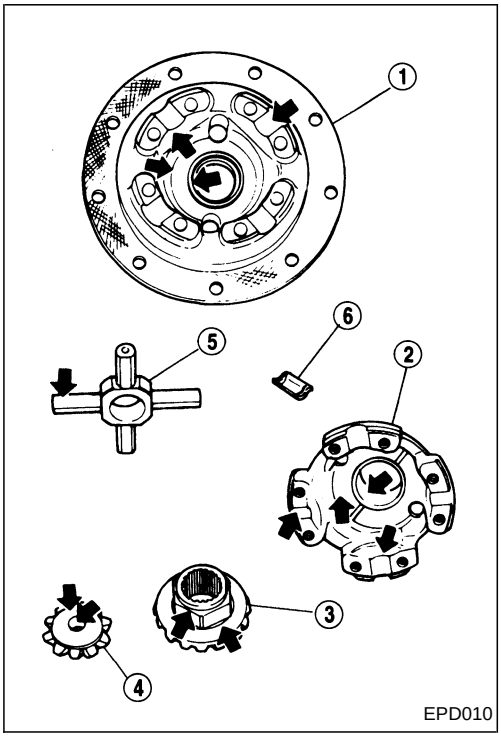
http://vnx.su/



Disassembly

1. Spread out lock straps.
2. Remove couple bolts using a press.
   Tool number: ST33081000
3. Separate differential case A and B.
   Draw out component parts (discs and plates, etc.)

Put marks on gears and pressure rings so that they can be reinstalled in their original positions from which they were removed.



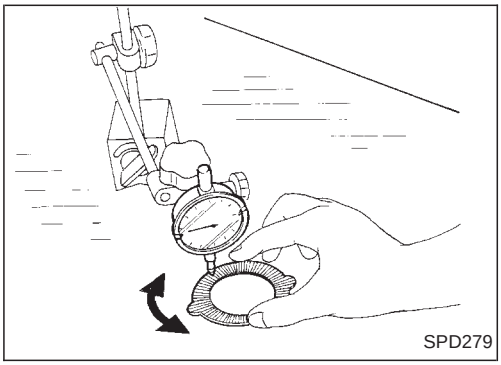
Inspection

CONTACT SURFACES

1. Clean the disassembled parts in suitable solvent and blow dry with compressed air.
2. If following surfaces are found with burrs or scratches, smooth with oil stone.
   ① Differential case B
   ② Differential case A
   ③ Side gear
   ④ Pinion mate gear
   ⑤ Pinion mate shaft
   ⑥ Friction plate guide

DISC AND PLATE

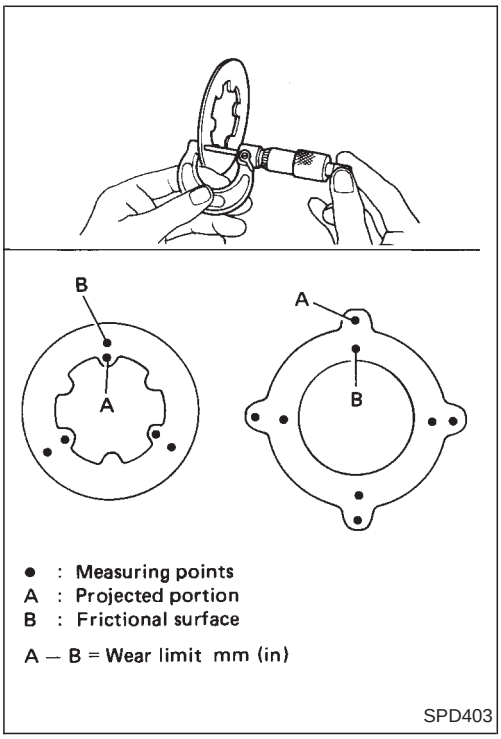
1. Clean the discs and plates in suitable solvent and blow dry with compressed air.
2. Inspect discs and plates for wear, nicks and burrs.



3. To make sure that friction disc or plate is not distorted, place it on a surface plate and rotate it by hand with indicating finger of dial gauge resting against disc or plate surface. Check the warpage.
   Allowable warpage:
   0.05 - 0.15 mm (0.0020 - 0.0059 in)
   If it exceeds limit, replace with a new plate to eliminate possibility of clutch slippage or sticking.

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Inspection (Cont'd)

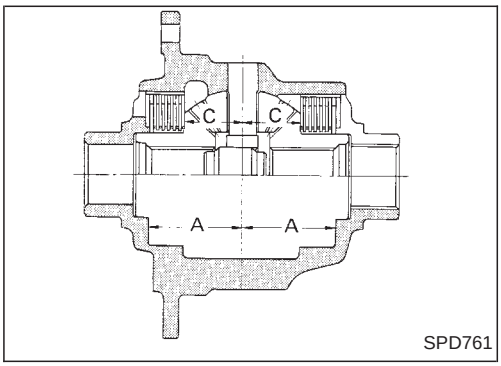


4. Measure frictional surfaces and projected portions of friction disc, friction plate and spring plate.

If any part has worn beyond the wear limit, replace it with a new one that is the same thickness as the projected portion.

Wear limit:

0.1 mm (0.004 in) or less



Adjustment

FRICTION DISC AND FRICTION PLATE END PLAY

End play of friction disc and friction plate can be calculated by using the following equation and should be adjusted within the following range.

Adjustment can be made by selecting friction disc having two different thicknesses.

End play E:

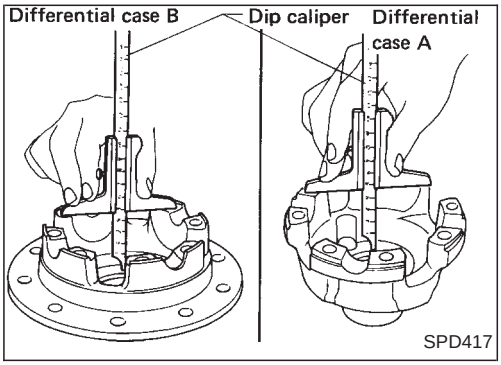
0.05 - 0.15 mm (0.0020 - 0.0059 in)

E = A − (B + C)

A: Length of differential case contact surface to differential case inner bottom.

B: Total thickness of friction discs, friction plates, spring disc and spring plate in differential case on one side.

C: Length of differential case contact surface to back side of side gear.



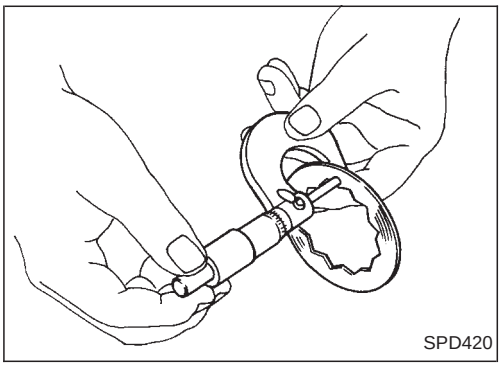
1. Measure values of "A".

Standard length A:

49.50 - 49.55 mm (1.9488 - 1.9508 in)

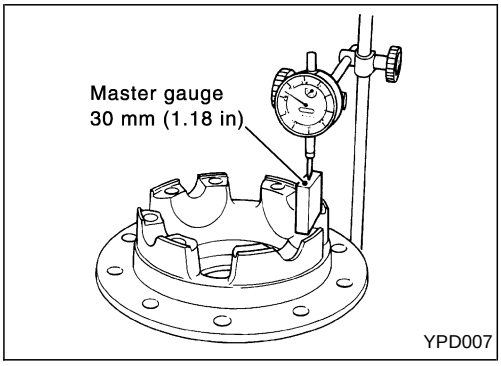
http://vnx.su/

Adjustment (Cont'd)


SPD420

2. Measure thickness of each disc and plate.
   Total thickness "B":
   19.24 - 20.26 mm (0.7575 - 0.7976 in)
   No. of discs and plates (One side):

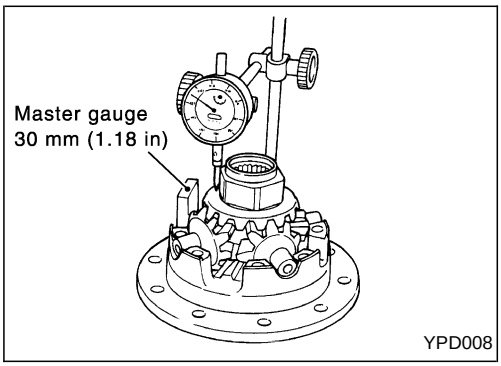
Friction disc	**5**
Friction plate	**6**
Spring disc	**1**
Spring plate	**1**



YPD007

3. Measure values of "C".
(1) Attach a dial indicator to the base plate.
(2) Place differential case B on the base plate, and install a master gauge on case B.

Then adjust the dial indicator scale to zero with its tip on the master gauge.



YPD008

(3) Install pinion mate gears, side gears and pinion mate shaft in differential case B.
(4) Set dial indicator's tip on the side gear, and read the indication.

Example:

E = A − D
= A − (B + C)
= 0.05 to 0.15 mm → Specified range
A = 49.52 mm
B = 19.45 mm
C = 29.7 mm
D = B + C

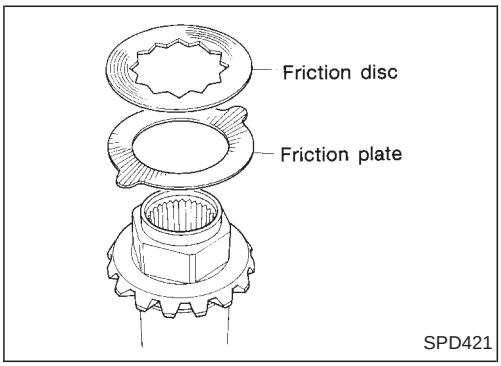
B	19.45
+ C	29.7
	49.15

E = A − D

A	49.52
− D	49.15
	0.37

From the above equation, end play of 0.37 mm exceeds the specified range of 0.05 to 0.15 mm.
Select suitable discs and plates to adjust correctly. (Refer to PD-57.)

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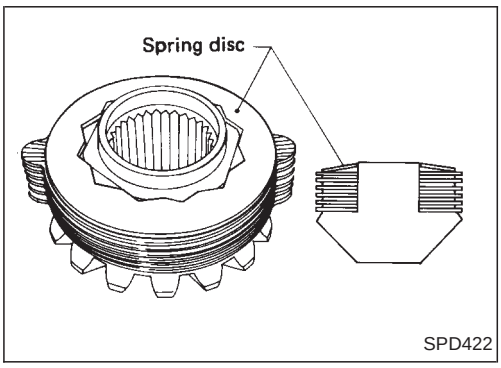


Assembly

Prior to assembling discs and plates, properly lubricate them by dipping them in limited slip differential oil.

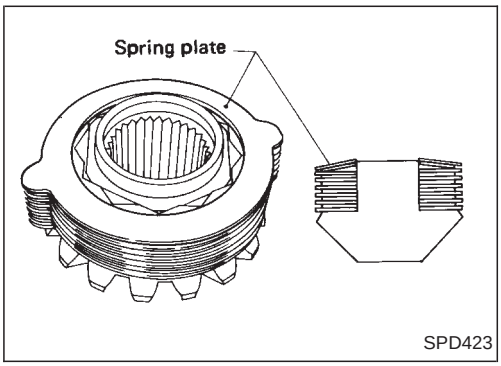
1. Alternately position specified number of friction plates and friction discs on rear of side gear.

Always position a friction plate first on rear of side gear.

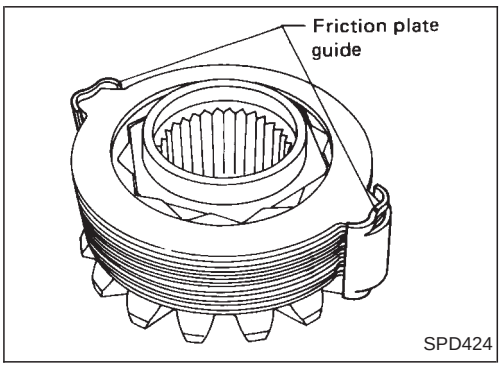


2. Install spring disc.

Align the twelve angular holes in spring disc with the hexagonal area of the side gear.

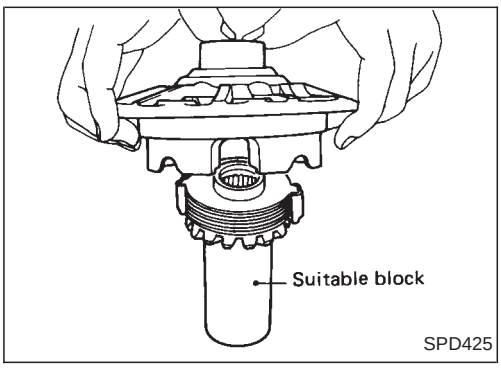


3. Install spring plate.



4. Install friction plate guides.

Correctly align the raised portions of friction plates, and apply grease to inner surfaces of friction plate guides to prevent them from falling.

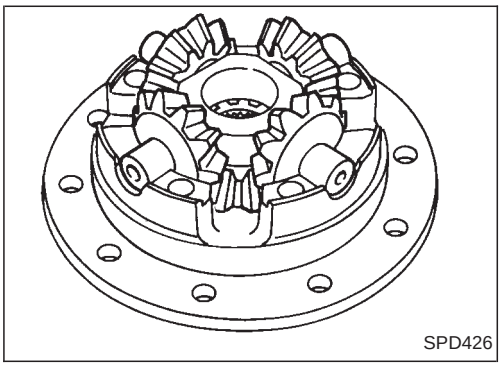


5. Install differential case B over side gear, discs, plates and friction plate guide assembly.

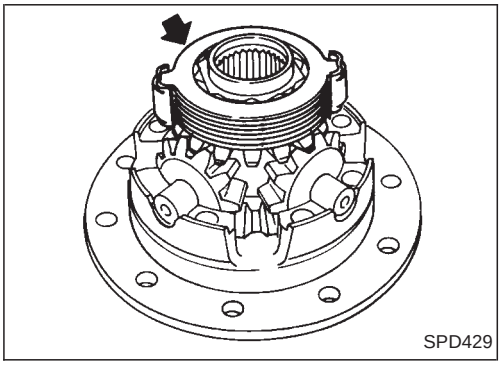
- **Install differential case B while supporting friction plate guides with your middle finger inserted through oil hole in differential case.**
- **Be careful not to detach spring disc from the hexagonal part of the side gear.**

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Assembly (Cont'd)

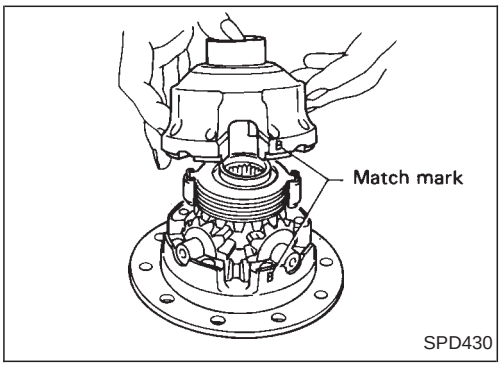

SPD426

6. Install pinion mate gears and pinion shaft to differential case B.


SPD429

7. Install side gear to pinion mate gears.
8. Install each disc and plate.

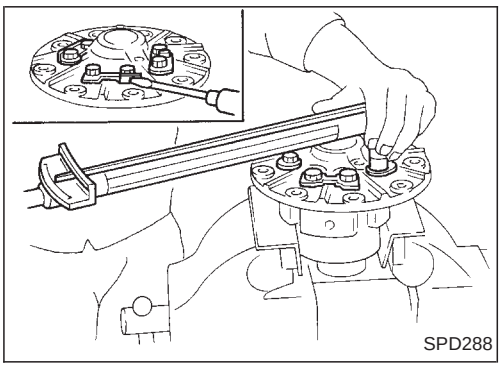
Use same procedures as outlined in steps 1. through 4. above.



SPD430

9. Install differential case A.

Position differential cases A and B by correctly aligning marks stamped on cases.


SPD288

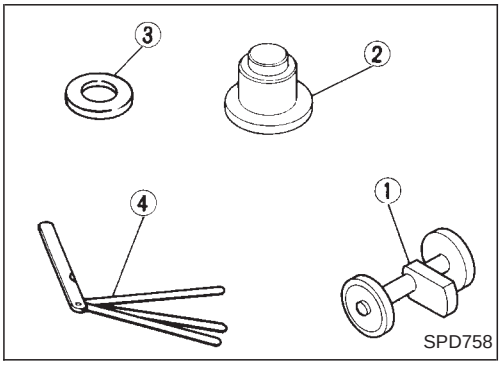
10. Tighten differential case bolts.
    : 64 - 69 N·m (6.5 - 7.0 kg-m, 47 - 51 ft-lb)
11. Place ring gear on differential case and install new lock straps and bolts.

Tighten bolts in a criss-cross fashion, lightly tapping bolt head with a hammer.
Then bend up lock straps to lock the bolts in place.

12. Install side bearing inner cone.
13. Check differential torque.

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To avoid confusion while calculating bearing shims, it is absolutely necessary to stay with the metric system. If you measure anything in inches, the results MUST be converted to the metric system.

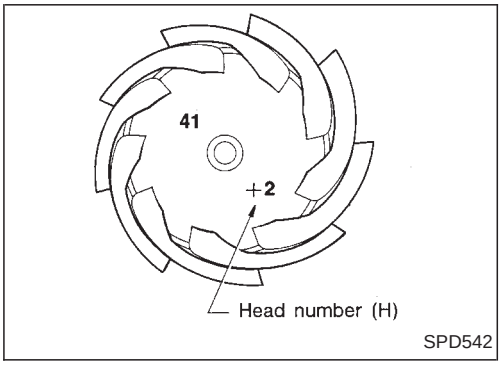


SPD758

Drive Pinion Height

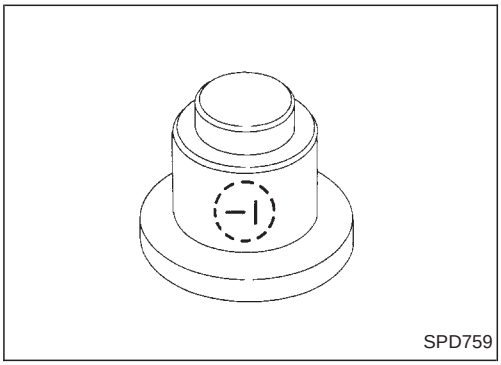
1. First prepare Tools for pinion height adjustment.
   Assembly ① ② :
   ST3125500
   ① Height Gauge (ST31251000)
   ② Dummy Shaft (ST31181001)
   ③ Spacer [thickness: 2.50 mm (0.0984 in)]
   ④ Feeler Gauge
2. To simplify the job, make a chart, like the one below, to organize your calculations.

LETTERS	HUNDREDTHS OF A MILLIMETER
H: Head number	
D′: Figure marked on dummy shaft	
S: Figure marked on height gauge	
N: Measuring clearance	



SPD542

3. Write the following numbers down in the chart.
   H: Head number

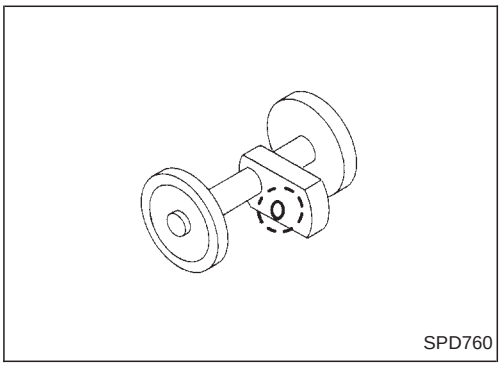


SPD759

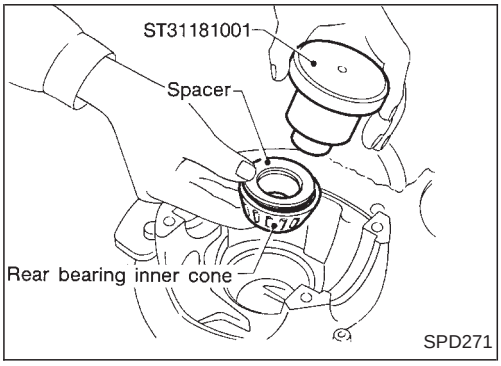
D′: Figure marked on dummy shaft

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Drive Pinion Height (Cont'd)

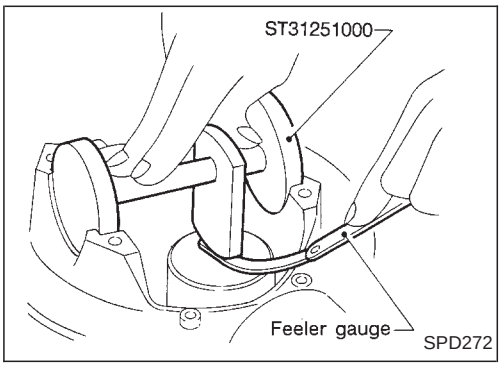

SPD760

S: Figure marked on height gauge



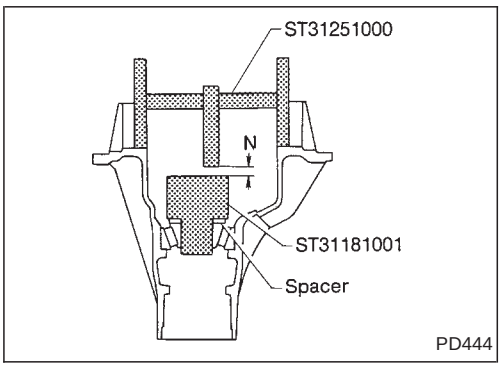
SPD271

4. Place pinion rear bearing inner race and Tools on gear carrier.



SPD272

5. Attach Tool (Height gauge) to gear carrier, and measure the clearance between the height gauge tip and the dummy shaft face.



PD444

http://vnx.su/

Drive Pinion Height (Cont'd)

6. Substitute these values into the equation to calculate the thickness of the washer.

If values signifying H, D′ and S are not given, regard them as zero and calculate.

T (Thickness of washer) = N − [(H − D′− S) x 0.01] + 3.05

Example:

N = 0.30

H = 2

D′ = −1

S = 0

T=N − [(H − D′ − S) x 0.01] + 3.05
= 0.30 − [{2 − (−1) − 0} x 0.01] + 3.05

(1) H.....2
− D′.....−(−1)
3

− S.....−0
3

(2) 3
x 0.01
0.03

(3) N.....0.30
−0.03
0.27

(4) 0.27
+3.05
3.32

∴T = 3.32

7. Select the proper washer. (Refer to PD-57.)

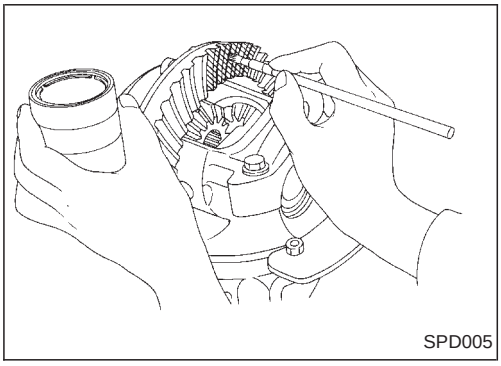
If you cannot find the desired thickness of washer, use washer with thickness closest to the calculated value.

Example:
Calculated value ... T = 3.32 mm
Used washer ... T = 3.33 mm

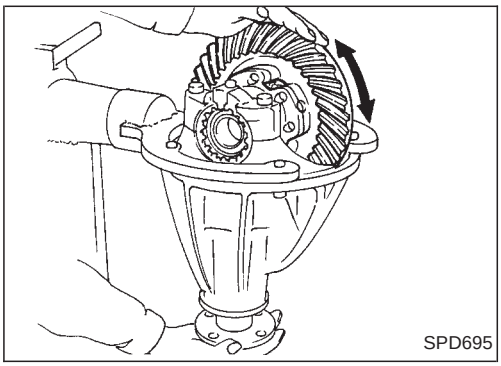
http://vnx.su/

Tooth Contact

Gear tooth contact pattern check is necessary to verify correct relationship between ring gear and drive pinion.
Hypoid gear sets which are not positioned properly in relation to one another may be noisy, or have short life span or both. With a pattern check, the most desirable contact for low noise level and long life can be assured.

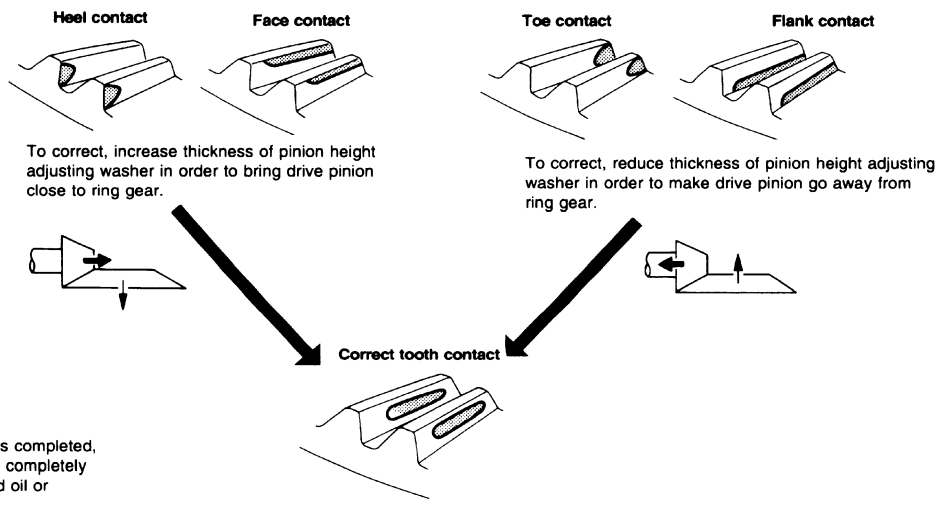

SPD005

1. Thoroughly clear ring gear and dive pinion teeth.
2. Sparingly apply a mixture of powdered ferric oxide and oil or equivalent to 3 or 4 teeth of ring gear drive side.


SPD695

3. Hold companion flange steady by hand and rotate the ring gear in both directions.

Usually the pattern will be correct if you have calculated the shims correctly and the backlash is correct.
However, in rare cases you may have to use trial-and-error processes until you get a good tooth contact pattern.
Tho tooth pattern is the best indication of how well a differential has been set up.

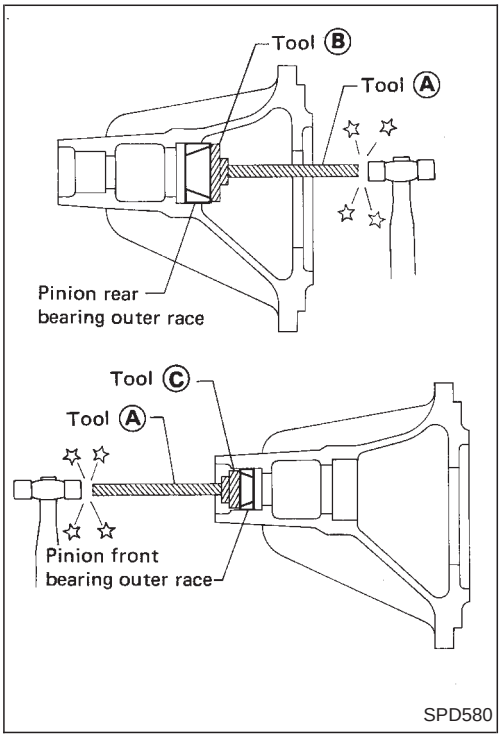


When adjustment is completed, be sure to wipe off completely the ferric oxide and oil or their equivalent.

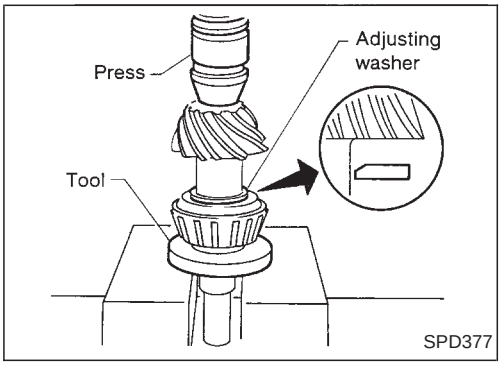
NPD003

http://vnx.su/

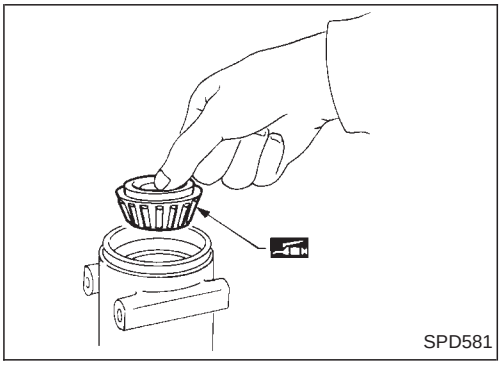
Differential Carrier



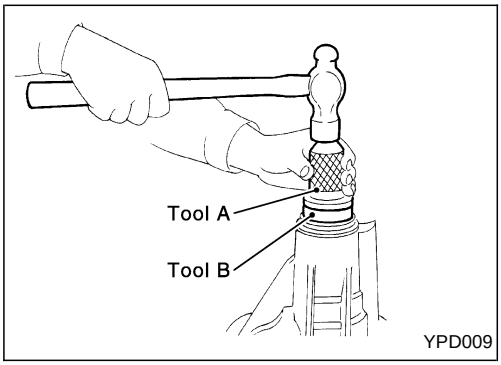
1. Press-fit front and rear bearing outer races with Tools.
   Tool number:
   - Ⓐ **ST30611000**
   - Ⓑ **ST30621000**
   - Ⓒ **ST30613000**



2. Select drive pinion height adjusting washer, referring to Adjustment.
3. Install drive pinion adjusting washer in drive pinion, and press-fit pinion rear bearing inner cone in it with press and Tool.
   Tool number:
   ST30901000



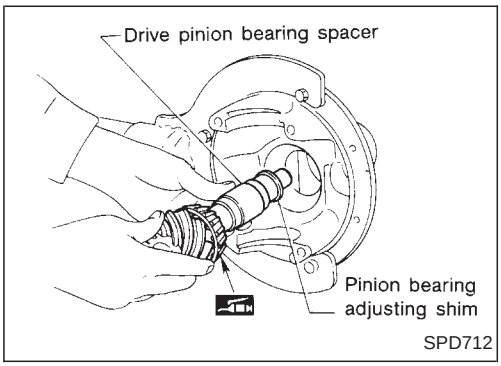
4. Place pinion front bearing inner cone in gear carrier.



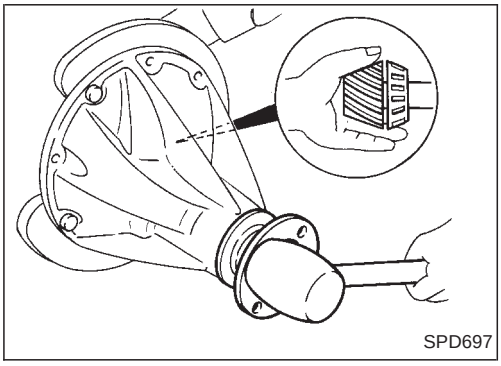
5. Apply multi-purpose grease to cavity at sealing lips of oil seal. Install front oil seal.
   Tool number:
   - Ⓐ **ST30720000**
   - Ⓑ **KV38102510**

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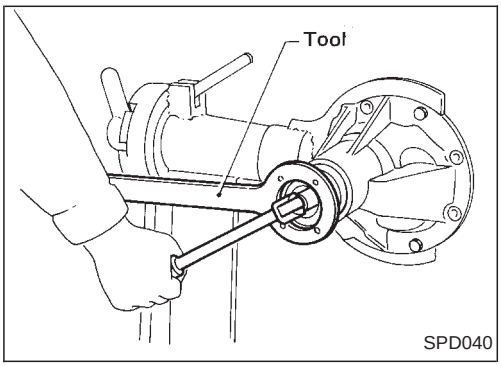
Differential Carrier (Cont'd)



6. Install drive pinion bearing spacer, pinion bearing adjusting shim and drive pinion in gear carrier.



7. Insert companion flange into drive pinion by tapping the companion flange with a soft hammer.

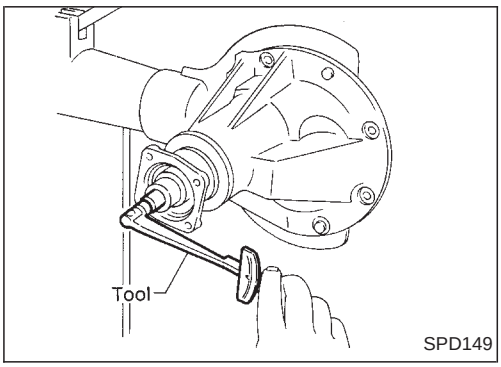


8. Tighten pinion nut to specified torque.

The threaded portion of drive pinion and pinion nut should be free from oil or grease.

Tool number:

KV38104700



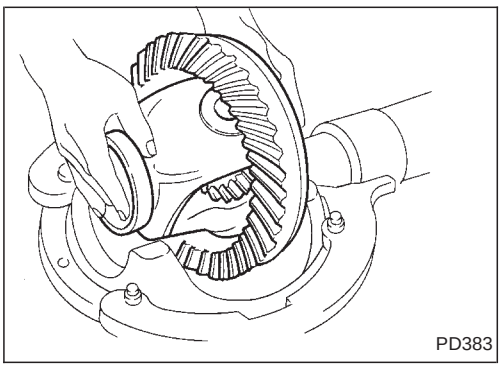
9. Turn drive pinion in both directions several times, and measure pinion bearing preload.

Tool number:

ST3127S000

Pinion bearing preload:

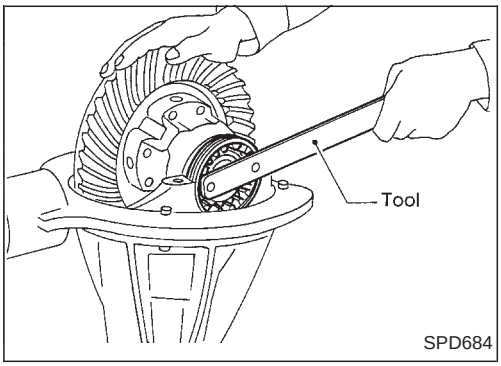
1.1 - 1.6 N·m (11.2 - 16.3 kg-cm, 9.7 - 14.1 in-lb)



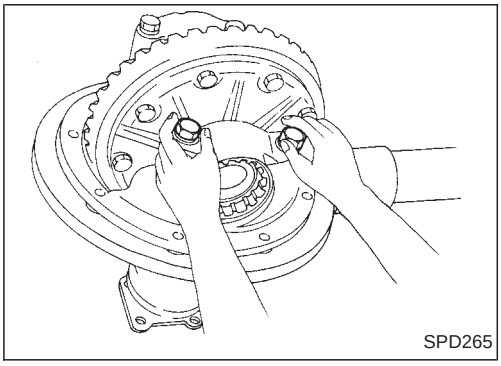
10. Install differential case assembly with side bearing outer races into gear carrier.

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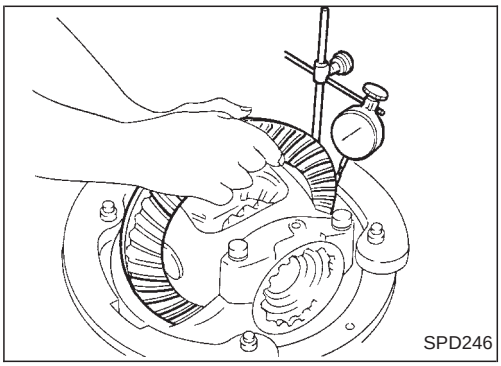
Differential Carrier (Cont'd)



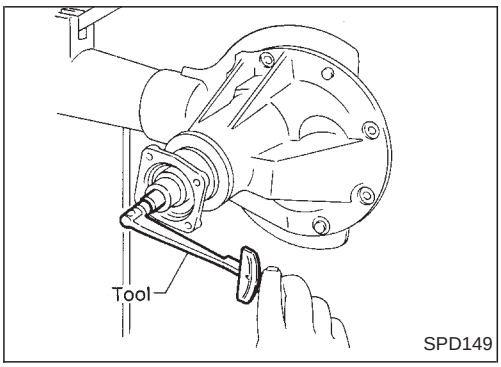
11. Position side bearing on gear carrier with threads properly engaged; screw in adjusters lightly at this stage of assembly.
    Tool number:
    ST32580000



12. Align mark on bearing cap with that on gear carrier and install bearing cap on gear carrier.
- Do not tighten at this point to allow further tightening of side bearing adjusters.



13. Tighten both right and left side bearing adjusters alternately and measure ring gear backlash and total preload at the same time. Adjust right and left side bearing adjusters by tightening them alternately so that proper ring gear backlash and total preload can be obtained.
    Ring gear-to-drive pinion backlash:
    0.10 - 0.20 mm (0.0039 - 0.0079 in)



- **When checking preload, turn drive pinion in both directions several times to set bearing rollers.**
  Tool number:
  ST3127S000

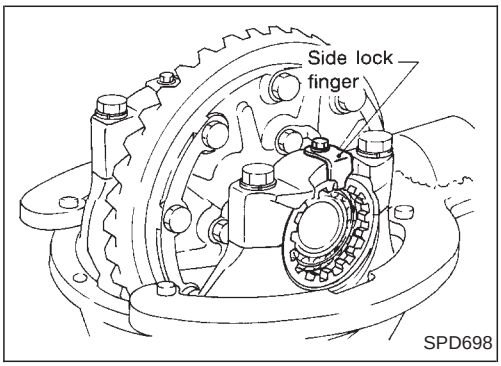
The total pinion bearing preload value with the differential case assembly should be in accordance with the same value measured without the differential case assembly. (See point 9.)
The relationship between both is:

Pinion bearing preload

With differential case assembly		Without differential case assembly	
kg-cm	N·m	kg-cm	N·m
14	1.4	17 - 23	1.7 - 2.3
15	1.5	18 - 24	1.8 - 2.4
16	1.6	19 - 25	1.9 - 2.5
17	1.7	20 - 26	2.0 - 2.6

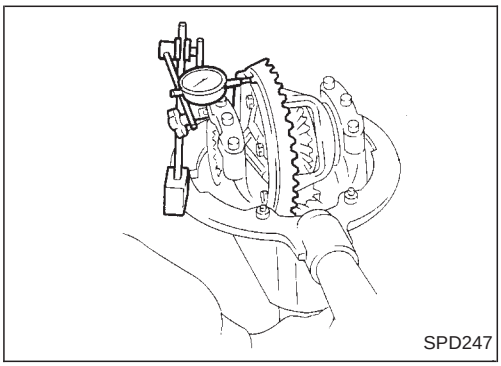
http://vnx.su/

Differential Carrier (Cont'd)



14. Tighten side bearing cap bolts.
    : 88 - 98 N·m (9.0 - 9.9 kg-m, 65 - 72 ft-lb)

15. Install side lock finger in place to prevent rotation during operation.



16. Check runout of ring gear with a dial indicator.
    Runout limit:
    0.08 mm (0.0031 in)
    - If backlash varies excessively in different places, the variance may have resulted from foreign matter caught between the ring gear and the differential case.
    - If the backlash varies greatly when the runout of the ring gear is within a specified range, the hypoid gear set or differential case should be replaced.
17. Check tooth contact. (Refer to PD-49.)

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Propeller Shaft

GENERAL SPECIFICATIONS

Unit: mm (in)

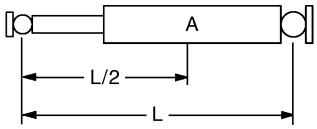
MODEL	ALL	H/T	WAGON
Portion	Front	Rear	
Propeller shaft model	0F71H	2S80B	
Number of joints	2		
Coupling method with transmission	Flange type	Sleeve type	
Types of journal bearings	Solid type (disassembly type)	Solid type	
Shaft length (Spider to spider) mm (in)	569 (22.40)	750 (29.53)	950 (37.40)
Shaft outer diameter mm (in)	65 (2.56)	65 (2.56)	

INSPECTION AND ADJUSTMENT

Front propeller shaft

Unit: mm (in)

Propeller shaft model	0F71H
Journal axial play limit	0.02 (0.0008)
Propeller shaft runout limit	0.6 (0.024)
Measuring point A	L/2

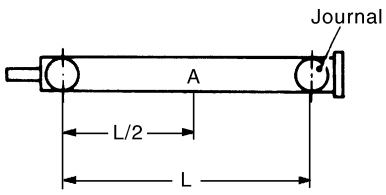


YPD011

Rear propeller shaft

Unit: mm (in)

Propeller shaft model	2S80B
Journal axial play limit	0.02 (0.0008)
Propeller shaft runout limit	0.6 (0.024)
Measuring point A	L/2



YPD012

Available snap rings

0F71H models

Unit: mm (in)

Thickness mm (in)	Part number
1.25 (0.0492)	37150-2X800
1.30 (0.0512)	37149-2X800
1.35 (0.0531)	37148-2X800
1.40 (0.0551)	37147-2X800
1.45 (0.0571)	37146-2X800

2S80B models

Thickness mm (in)	Part number
1.45 (0.0571)	37146-7F000
1.50 (0.0591)	37147-7F000
1.55 (0.0610)	37148-7F000
1.60 (0.0630)	37149-7F000
1.65 (0.0650)	37150-7F000
1.70 (0.0669)	37151-7F000
1.75 (0.0689)	37152-7F000

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Final Drive

GENERAL SPECIFICATIONS

Front final drive	R180A	
	4-pinion	
Oil capacity (Approx.) ℓ (Imp pt)	1.3 (2-1/4)	
Rear final drive	H233B	
	LSD* 4-pinion	
Oil capacity (Approx.) ℓ (Imp pt)	2.8 (4-7/8)	
Model	TD27Ti	ZD30DDTi
Gear ratio	4.375	4.111
Number of teeth		
Ring gear	35	37
Drive pinion	8	9

* Limited Slip Differential

INSPECTION AND ADJUSTMENT (R180A)

Ring gear runout

Ring gear runout limit mm (in)	0.05 (0.0020)

Axle bearing adjustment

Axle bearing end play mm (in)	0 - 0.1 (0 - 0.004)

Available axle bearing adjusting shims

Thickness mm (in)	Part number
0.10 (0.0039)	38233-01G11
0.20 (0.0079)	38233-01G12
0.30 (0.0118)	38233-01G13
0.40 (0.0157)	38233-01G14

Side gear adjustment

Side gear backlash (Clearance between side gear to differential case) mm (in)	0.10 - 0.20 (0.0039 - 0.0079)

Available side gear thrust washers

Thickness mm (in)	Part number
0.75 (0.0295)	38424-W2010
0.78 (0.0307)	38424-W2011
0.81 (0.0319)	38424-W2012
0.84 (0.0331)	38424-W2013
0.87 (0.0343)	38424-W2014
0.90 (0.0354)	38424-W2015
0.93 (0.0366)	38424-W2016
0.96 (0.0378)	38424-W2017

Drive pinion height adjustment

Available pinion height adjusting washers

Thickness mm (in)	Part number
3.09 (0.1217)	38154-G2317
3.12 (0.1228)	38154-G2318
3.15 (0.1240)	38154-G2319
3.18 (0.1252)	38154-G2320
3.21 (0.1264)	38154-G2321
3.24 (0.1276)	38154-G2322
3.27 (0.1287)	38154-G2323
3.30 (0.1299)	38154-G2324
3.33 (0.1311)	38154-G2360
3.36 (0.1323)	38154-G2361
3.39 (0.1335)	38154-G2362
3.42 (0.1346)	38154-G2363
3.45 (0.1358)	38154-G2364
3.48 (0.1370)	38154-G2365
3.51 (0.1382)	38154-G2366
3.54 (0.1394)	38154-G2367
3.57 (0.1406)	38154-G2368
3.60 (0.1417)	38154-G2369
3.63 (0.1429)	38154-G2370
3.66 (0.1441)	38154-G2371

Drive pinion preload adjustment

Drive pinion bearing preload adjusting method	Adjusting washer and spacer
Drive pinion preload N·m (kg-cm, in-lb)	
With front oil seal	1.2 - 1.6 (12 - 16, 10 - 14)

Available drive pinion preload adjusting washers

Thickness mm (in)	Part number
6.59 (0.2594)	38127-01G00
6.57 (0.2587)	38127-01G01
6.55 (0.2579)	38127-01G02
6.53 (0.2571)	38127-01G03
6.51 (0.2563)	38127-01G04
6.49 (0.2555)	38127-01G05
6.47 (0.2547)	38127-01G06
6.45 (0.2539)	38127-01G07
6.43 (0.2531)	38127-01G08
6.41 (0.2524)	38127-01G09
6.39 (0.2516)	38127-01G10
6.37 (0.2508)	38127-01G11
6.35 (0.2500)	38127-01G12
6.33 (0.2492)	38127-01G13
6.31 (0.2484)	38127-01G14

Available drive pinion preload adjusting spacers

Length mm (in)	Part number
52.20 (2.0551)	38130-G2300
52.40 (2.0630)	38131-G2301
52.60 (2.0709)	38132-G2302
52.80 (2.0787)	38133-G2303
53.00 (2.0866)	38134-G2304
53.20 (2.0945)	38135-G2305

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Final Drive (Cont'd)

Side bearing adjustment

Differential carrier assembly turning resistance N (kg, lb)	34.3 - 39.2 (3.5 - 4.0, 7.7 - 8.8)
Side bearing adjusting method	Adjusting shim

Available side retainer adjusting shims

Thickness mm (in)	Part number
0.20 (0.0079)	38453-01G00
0.25 (0.0098)	38453-01G01
0.30 (0.0118)	38453-01G02
0.40 (0.0157)	38453-01G03
0.50 (0.0197)	38453-01G04

Total preload adjustment

Total preload N·m (kg-cm, in-lb)	1.3 - 2.2 (13 - 22, 11 - 19)
Ring gear backlash mm (in)	0.13 - 0.18 (0.0051 - 0.0071)

INSPECTION AND ADJUSTMENT (C200)

Ring gear runout

Ring gear runout limit mm (in)	0.08 (0.0031)

Differential torque adjustment

Differential torque N·m (kg-m, ft-lb)	353 - 392 (36 - 40, 260 - 289)
Number of discs and plates	
Friction disc	5
Friction plate	6
Spring disc	1
Spring plate	1
Wear limit of plate and disc mm (in)	0.1 (0.004)
Allowable warpage of friction disc and plate mm (in)	0.05 - 0.15 (0.0020 - 0.0059)

Available discs and plates

Part name	Thickness mm (in)	Part number
Friction disc	1.48 - 1.52 (0.0583 - 0.0598)	38433-C6000
	1.58 - 1.62 (0.0622 - 0.0638)	38433-C6001
Friction plate	1.48 - 1.52 (0.0583 - 0.0598)	38432-C6000
Spring disc	1.48 - 1.52 (0.0583 - 0.0598)	38436-C6000
Spring plate	1.48 - 1.52 (0.0583 - 0.0598)	38435-C6010

Drive pinion height adjustment

Available pinion height adjusting washers

Thickness mm (in)	Part number
2.58 (0.1016)	38151-01J00
2.61 (0.1028)	38151-01J01
2.64 (0.1039)	38151-01J02
2.67 (0.1051)	38151-01J03
2.70 (0.1063)	38151-01J04
2.73 (0.1075)	38151-01J05
2.76 (0.1087)	38151-01J06
2.79 (0.1098)	38151-01J07
2.82 (0.1110)	38151-01J08
2.85 (0.1122)	38151-01J09
2.88 (0.1134)	38151-01J10
2.91 (0.1146)	38151-01J11
2.94 (0.1157)	38151-01J12
2.97 (0.1169)	38151-01J13
3.00 (0.1181)	38151-01J14
3.03 (0.1193)	38151-01J15
3.06 (0.1205)	38151-01J16
3.09 (0.1217)	38151-01J17
3.12 (0.1228)	38151-01J18
3.15 (0.1240)	38151-01J19
3.18 (0.1252)	38151-01J60
3.21 (0.1264)	38151-01J61
3.24 (0.1276)	38151-01J62
3.27 (0.1287)	38151-01J63
3.30 (0.1299)	38151-01J64
3.33 (0.1311)	38151-01J65
3.36 (0.1323)	38151-01J66
3.39 (0.1335)	38151-01J67
3.42 (0.1346)	38151-01J68
3.45 (0.1358)	38151-01J69
3.48 (0.1370)	38151-01J70
3.51 (0.1382)	38151-01J71
3.54 (0.1394)	38151-01J72
3.57 (0.1406)	38151-01J73
3.60 (0.1417)	38151-01J74
3.63 (0.1429)	38151-01J75
3.66 (0.1441)	38151-01J76

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Final Drive (Cont'd)

Drive pinion preload adjustment

Drive pinion bearing preload adjusting method	Adjusting shim and spacer
Drive pinion preload N·m (kg-cm, in-lb)	1.2 - 2.0 (12 - 16, 10 - 14)
Without front oil seal	0.8 - 1.3 (8 - 13, 6.9 - 11.3)

Available drive pinion preload adjusting shims

Thickness mm (in)	Part number
2.31 (0.0909)	38125-82100
2.33 (0.0917)	38126-82100
2.35 (0.0925)	38127-82100
2.37 (0.0933)	38128-82100
2.39 (0.0941)	38129-82100
2.41 (0.0949)	38130-82100
2.43 (0.0957)	38131-82100
2.45 (0.0965)	38132-82100
2.47 (0.0972)	38133-82100
2.49 (0.0980)	38134-82100
2.51 (0.0988)	38135-82100
2.53 (0.0996)	38136-82100
2.55 (0.1004)	38137-82100
2.57 (0.1012)	38138-82100
2.59 (0.1020)	38139-82100

Available drive pinion preload adjusting spacers

Length mm (in)	Part number
4.50 (0.1772)	38165-76000
4.75 (0.1870)	38166-76000
5.00 (0.1969)	38167-76000
5.25 (0.2067)	38166-01J00
5.50 (0.2165)	38166-01J10

Total preload adjustment

Total preload N·m (kg-cm, in-lb)	1.5 - 2.9 (15 - 30, 13 - 26)
Ring gear backlash mm (in)	0.10 - 0.20 (0.0039 - 0.0079)
Side bearing adjusting method	Side adjuster

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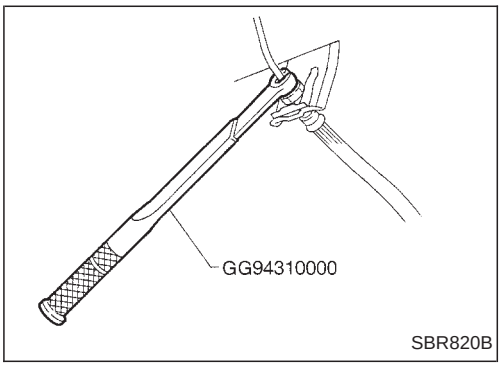
FRONT AXLE & FRONT SUSPENSION

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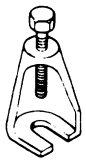
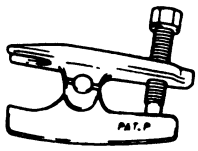
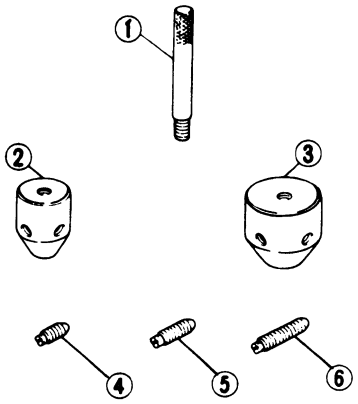
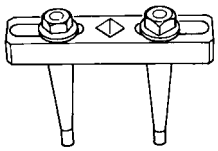
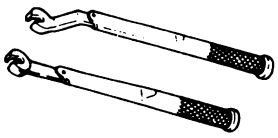


(1) When installing each rubber part, final tightening must be carried out under unladen condition * with tires on ground.
    * Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.
(2) When removing each suspension part, check wheel alignment and adjust if necessary.
(3) Use Tool when removing or installing brake tubes.

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SPECIAL SERVICE TOOLS

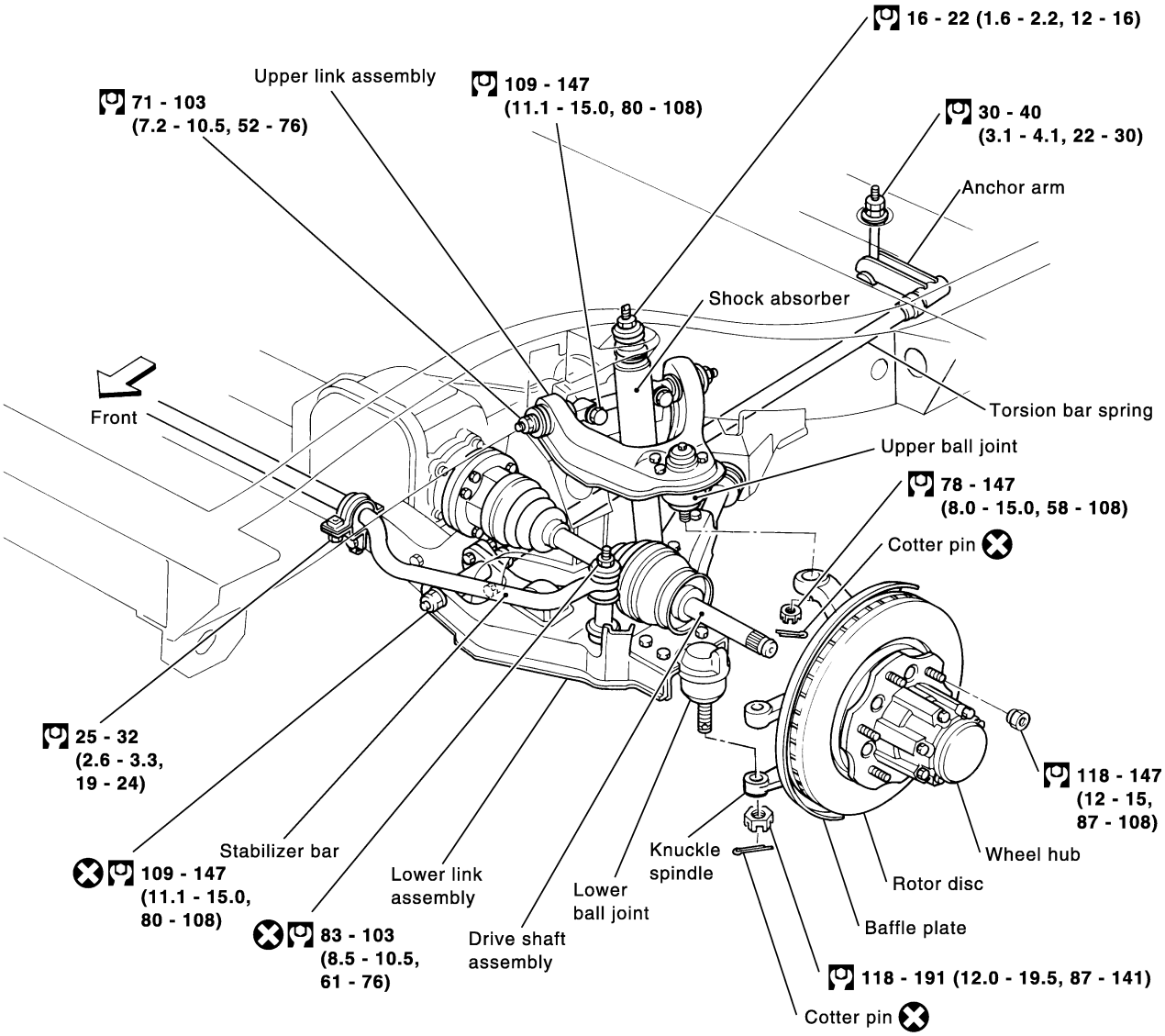
*: Special tool or commercial equivalent

Tool number Tool name	Description	
ST29020001* Gear arm puller		Removing ball joint for knuckle spindle
ST27850000 Ball joint remover		Removing tie-rod outer end
KV401021S0* Bearing outer race drift ① ST35325000* Drift bar ② KV40102110* Drift (A) ③ KV40102120* Drift (B) ④ KV40102130* Screw (A) ⑤ KV40102140* Screw (B) ⑥ KV40102150* Screw (C)		Installing wheel bearing outer race
KV40105400 Wheel bearing lock nut wrench		Removing or installing wheel bearing lock nut
GG94310000* Flare nut torque wrench		Removing and installing brake piping

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When installing each rubber part, final tightening must be carried out under unladen condition* with tires on ground.

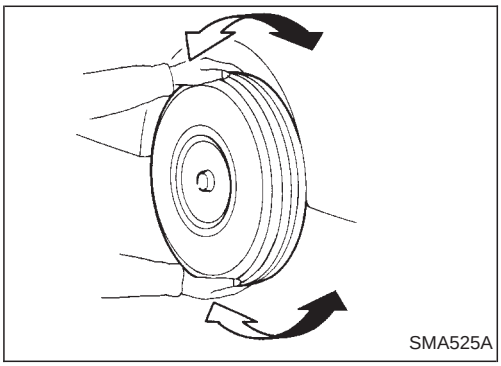
* Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.



: N•m (kg-m, ft-lb)

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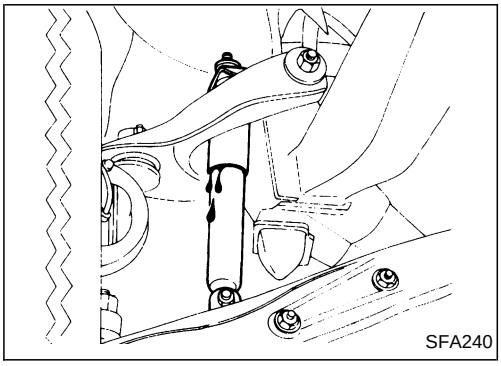
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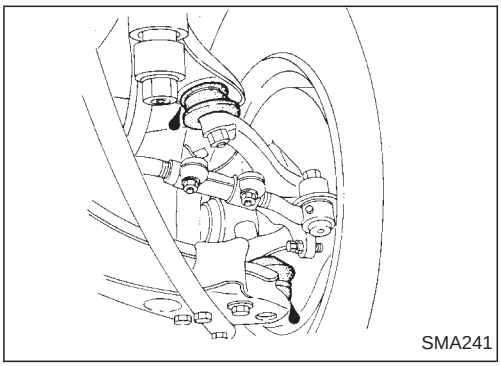
Front Axle and Front Suspension Parts

- Check front axle and front suspension parts for looseness, cracks, wear or other damage.

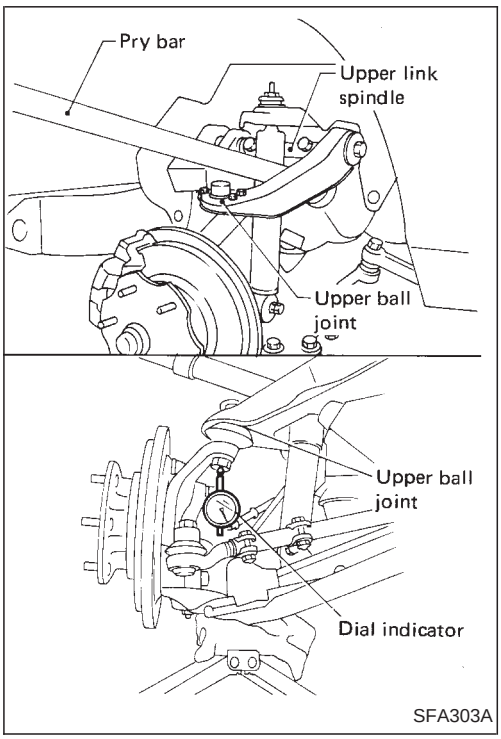
(1) Shake each front wheel.
(2) Make sure that cotter pin is inserted.
(3) Retighten all nuts and bolts to the specified torque.
: Refer to “FRONT SUSPENSION”, FA-29.
(4) Check front axle and front suspension parts for wear, cracks or other damage.


SFA240

- Check shock absorber for oil leakage or other damage.


SMA241

- Check suspension ball joints for grease leakage and dust covers for cracks or other damage.



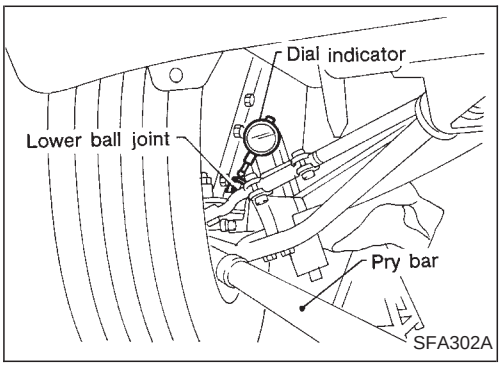
SFA303A

- Check ball joint for vertical end play.
Upper ball joint:
1.6 mm (0.063 in) or less

(1) Jack up front of vehicle and set the stands.
(2) Clamp dial indicator onto transverse link and place indicator tip on lower edge of brake caliper.
(3) Make sure front wheels are straight and brake pedal is depressed.
(4) Place a pry bar between transverse link and inner rim of road wheel.
(5) While pushing and releasing pry bar, observe maximum dial indicator value.
(6) If ball joint movement is beyond specifications, remove and recheck it.

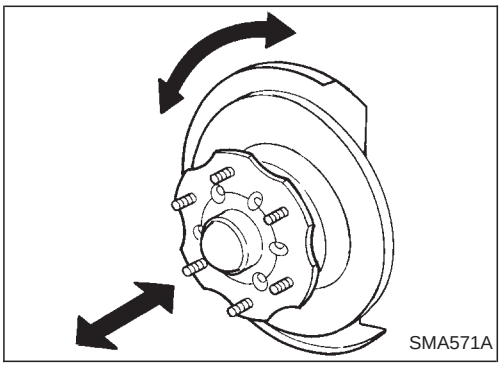
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Front Axle and Front Suspension Parts (Cont'd)



Lower ball joint:
0.5 mm (0.020 in) or less

(1) Jack up front of vehicle and set the stands.
(2) Remove road wheel.
(3) Clamp dial indicator onto upper link and place indicator tip on knuckle near ball joint.
(4) Jack up lower link [Approx. 20 mm (0.79 in)].
(5) Place a pry bar between upper link and upper link spindle.
(6) While pushing and releasing pry bar observe maximum dial indicator value.
(7) If ball joint movement is beyond specifications, remove and recheck it.



Front Wheel Bearing

- Check that wheel bearings operate smoothly.
- Check axial end play.

Axial end play: 0 mm (0 in)

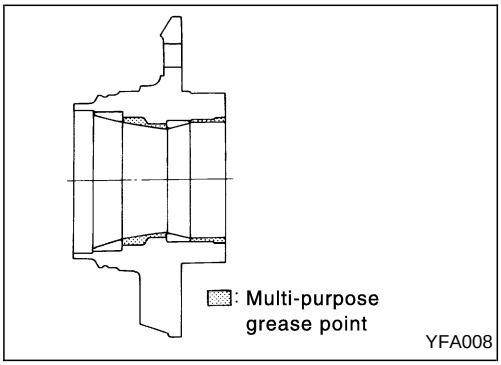
- Adjust wheel bearing preload if there is any axial end play or wheel bearing does not turn smoothly.

PRELOAD ADJUSTMENT

Adjust wheel bearing preload after wheel bearing has been replaced or front axle has been reassembled.

Adjust wheel bearing preload as follows:

1. Before adjustment, thoroughly clean all parts to prevent dirt entry.

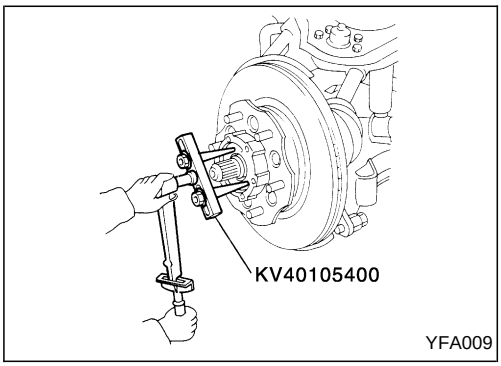


2. Apply multi-purpose grease sparingly to the following parts:

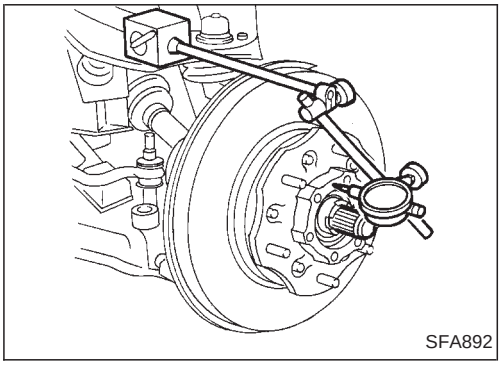
- Threaded portion of spindle
- Contact surface between wheel bearing washer and outer wheel bearing
- Grease seal lip
- Wheel hub (as shown at left)

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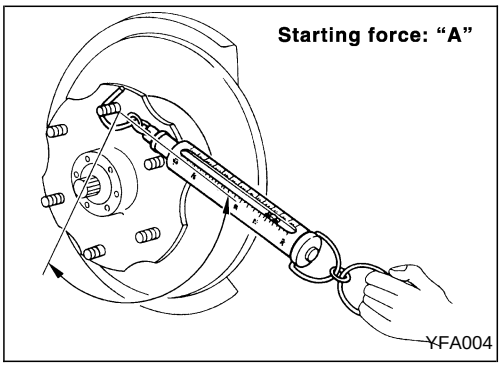
Front Wheel Bearing (Cont'd)



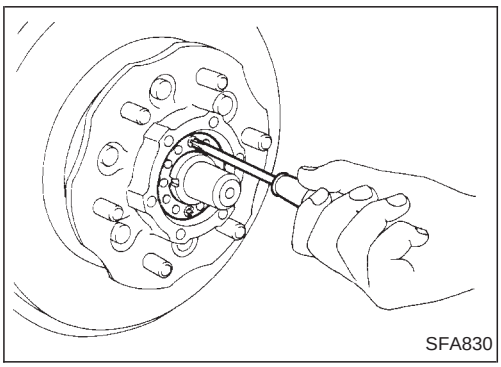
3. Tighten wheel bearing lock nut with Tool.
   : 78 - 98 N·m
   (8 - 10 kg-m, 58 - 72 ft-lb)
4. Turn wheel hub several times in both directions.
5. Loosen wheel bearing lock nut so that torque becomes 0 N·m (0 kg-m, 0 ft-lb).
6. Retighten wheel bearing lock nut with Tool.
   : 0.5 - 1.5 N·m
   (0.05 - 0.15 kg-m, 4 - 13 in-lb)



7. Turn wheel hub several times in both directions.
8. Retighten wheel bearing lock nut with Tool.
   : 0.5 - 1.5 N·m
   (0.05 - 0.15 kg-m, 4 - 13 in-lb)
9. Measure wheel bearing axial end play.
   Axial end play:
   0 mm (0 in)



10. Measure starting force "A" at wheel hub bolt when moving the hub by 90° as shown.



11. Install lock washer by tightening the lock nut within 15 to 30 degrees.
12. Turn wheel hub several times in both directions to seat wheel bearing correctly.
13. Measure starting force "B" at wheel hub bolt. Refer to procedure 10.
14. Wheel bearing preload "C" can be calculated as shown below.

    C = B − A

    Wheel bearing preload "C":
    7.06 - 20.99 N
    (0.72 - 2.14 kg, 1.59 - 4.72 lb)
15. Repeat above procedures until correct axial end play and wheel bearing preload are obtained.
16. Install free-running hub and brake pads.

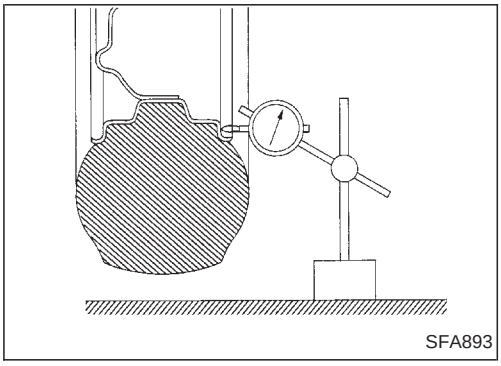
http://vnx.su/

Front Wheel Alignment

Before checking front wheel alignment, be sure to make a preliminary inspection.

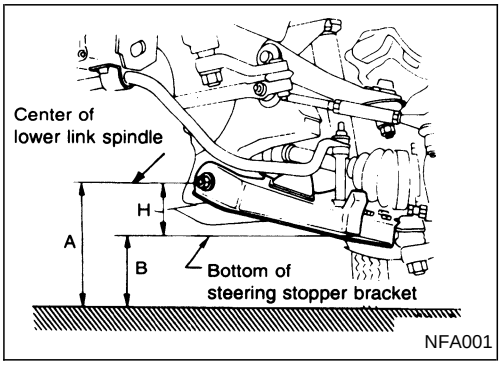
PRELIMINARY INSPECTION

1. Check the tires for wear and proper inflation.


SFA893

2. Check the wheel runout.
   Wheel runout:
   Refer to SDS, FA-39.
3. Check the front wheel bearings for looseness.
4. Check the front suspension for looseness.
5. Check the steering linkage for looseness.
6. Check that the front shock absorbers work properly by using the standard bounce test.
7. Measure vehicle height (Unladen): H = A − B mm (in)
   Refer to SDS, FA-39.

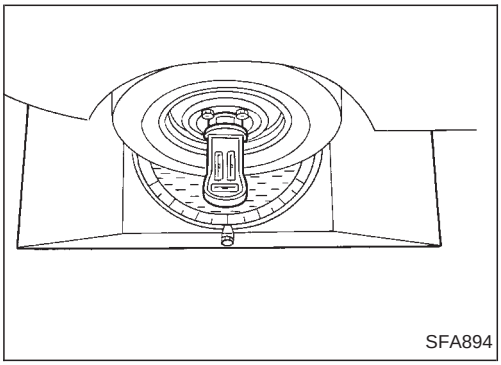
(1) Exercise the front suspension by bouncing the front of the vehicle 4 or 5 times to ensure that vehicle is in a neutral height attitude.
(2) Measure wheel alignment.
   Refer to SDS, FA-39.
(3) Measure vehicle posture ... Dimension “H”.
   Refer to SDS, FA-39.



NFA001

If “H” dimension is not within the specified value, readjust vehicle posture using anchor arm adjusting nut.
Refer to “INSTALLATION AND ADJUSTMENT”, “Torsion Bar Spring”, FA-31. Adjust wheel alignment if necessary.

(4) If wheel alignment is not as specified, but dimension “H” is correct, adjust wheel alignment.


SFA894

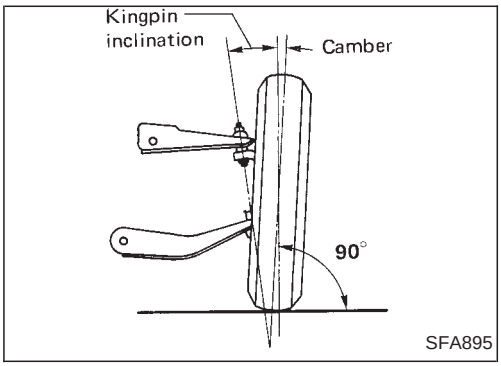
CAMBER, CASTER AND KINGPIN INCLINATION

Before checking camber, caster or kingpin inclination, move vehicle up and down on turning radius gauge to minimize friction. Ensure that vehicle is in correct posture (unladen vehicle).

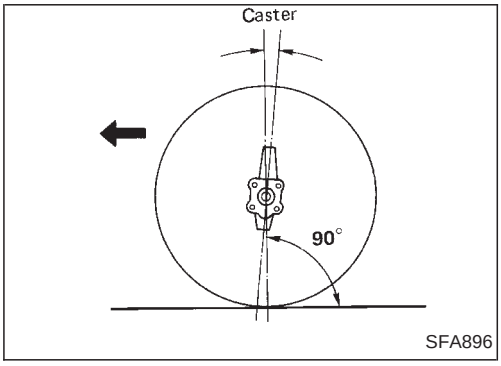
- **Measure camber, caster and kingpin inclination of both right and left wheels with a suitable alignment gauge and adjust in accordance with the following procedures.**

http://vnx.su/

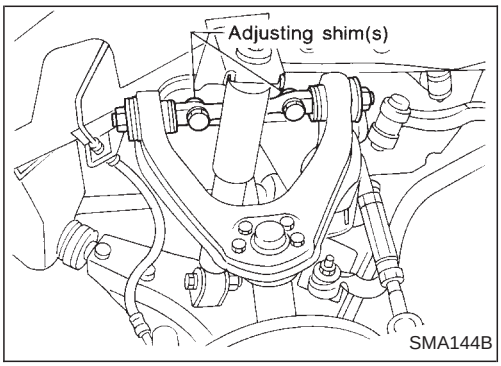
Front Wheel Alignment (Cont'd)



Camber (Unladen):
Refer to SDS, FA-39.
Kingpin inclination (Unladen):
Refer to SDS, FA-39.

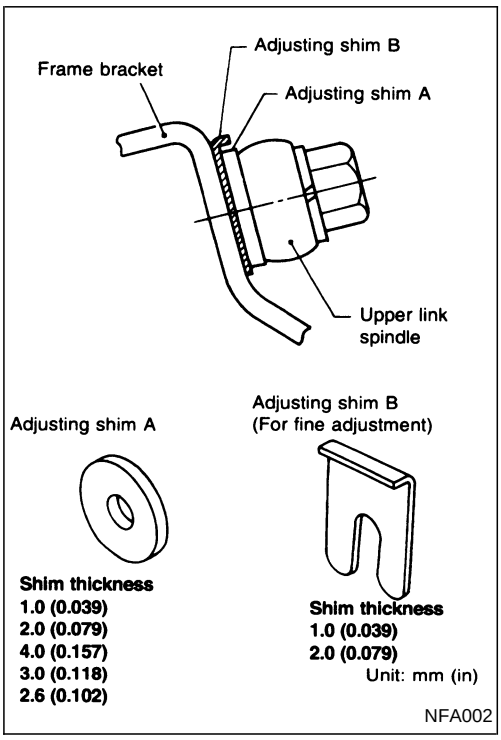


Caster (Unladen):
Refer to SDS, FA-39.



ADJUSTMENT

Both camber and caster angles are adjusted by increasing or decreasing the number of adjusting shims inserted between upper link spindle and frame.



Before removing or installing adjusting shim(s), be sure to place a jack under lower link.

Adjusting shim standard thickness:
4.0 mm (0.157 in)

- **Do not use three or more shims at one place.**
- **When installing shim B, always face the pawl towards spindle and insert them from bracket side. Use only one shim in a place.**
- **Total thickness of shims must be within 8.0 mm (0.315 in).**
- **Difference of total thickness of the front and rear must be within 3.0 mm (0.118 in). The caster angle between the opposite sides of the vehicle may not exceed 0°45′.**
- **Determine thickness and number of shims necessary for adjusting camber and caster, in accordance with the following graph.**

http://vnx.su/

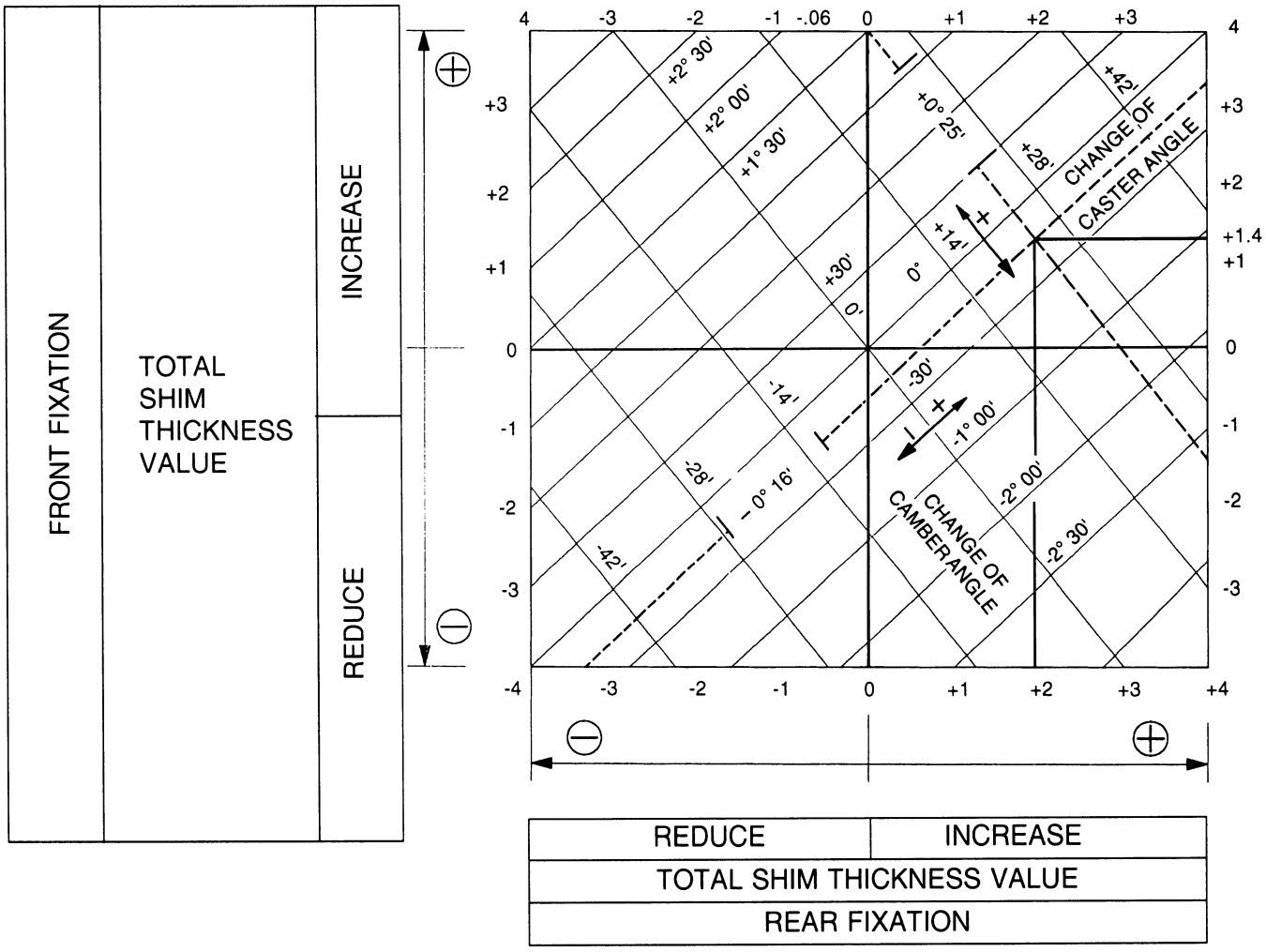
Front Wheel Alignment (Cont'd)

[Example]
(Measures taken at one side):
(1)

	Angle		
	Specified value	Measured	Change
Camber angle	0°30′	0°5′	+0°25′
Caster angle	1°54′	2°10′	−0°16′

The above values relate to the graph below:

Shim thickness selection graph



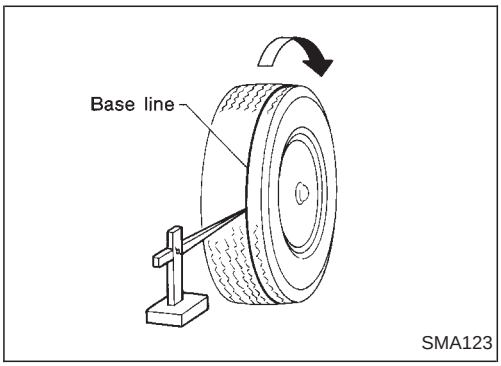
EFA015

(2) Obtain intersection point of lines in accordance with the graph.
Front: 1.4 mm
Rear: 2.0 mm
(3) Choose shims which are nearest to the values found in the graph:
Front: 1.6 mm
Rear: 2.0 mm
(4) If shim thicknesses as calculated appear not to be available, combinations of different shims should be used to meet the desired total thickness of the shims.

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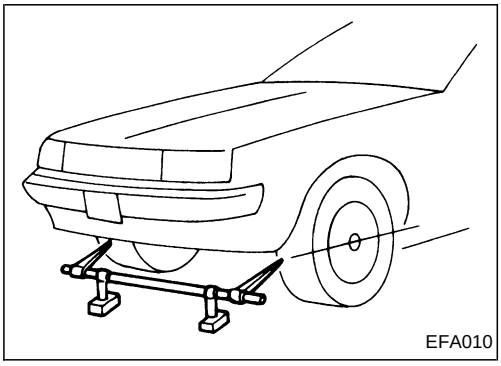
Front Wheel Alignment (Cont'd)

TOE-IN



1. Mark a base line across the tread.

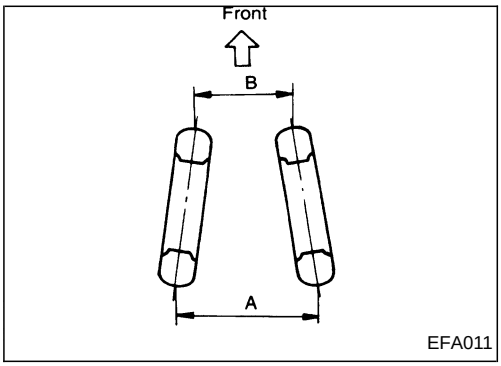
After lowering front of vehicle, move it up and down to eliminate friction, and set steering wheel in straight ahead position.

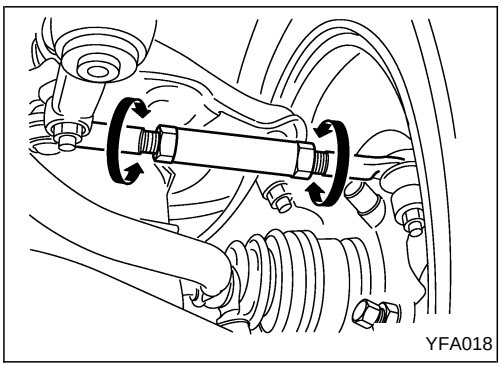


2. Measure toe-in.

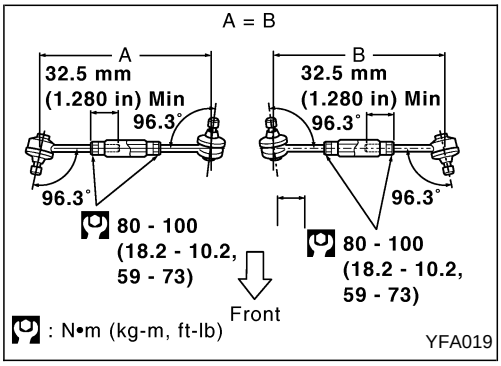
Measure distance "A" and "B" at the same height as hub center.

Toe-in (Unladen):
Refer to SDS, FA-39.
Toe-in = A − B





3. Adjust toe-in by varying the length of steering tie-rods.
(1) Loosen clamp bolts or lock nuts.
(2) Adjust toe-in by turning the left and right tie-rod tubes an equal amount.



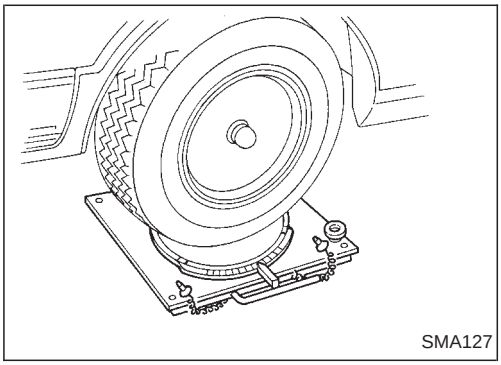
Make sure that the tie-rod bars are screwed into the tie-rod tube more than 32.5 mm (1.280 in).
Make sure that the tie-rods are the same length.
Standard length (A = B):
287 mm (11.30 in)

(3) Tighten clamp bolts or lock nuts, to the specified torque.

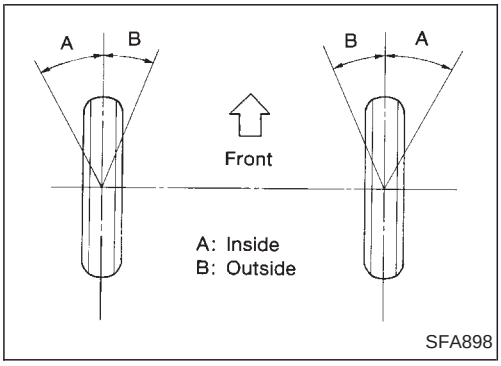
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Front Wheel Alignment (Cont'd)

FRONT WHEEL TURNING ANGLE

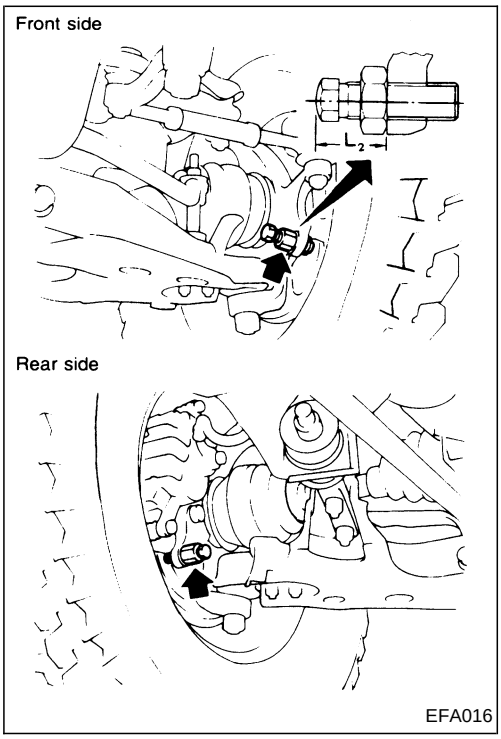

SMA127

1. Set wheels in straight ahead position and then move vehicle forward until front wheels rest on turning radius gauge properly.



SFA898

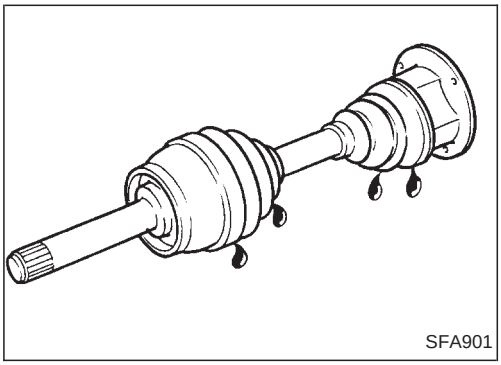
2. Rotate steering wheel all the way right and left; measure turning angle.
   Wheel turning angle:
   Refer to SDS, FA-39.



EFA016

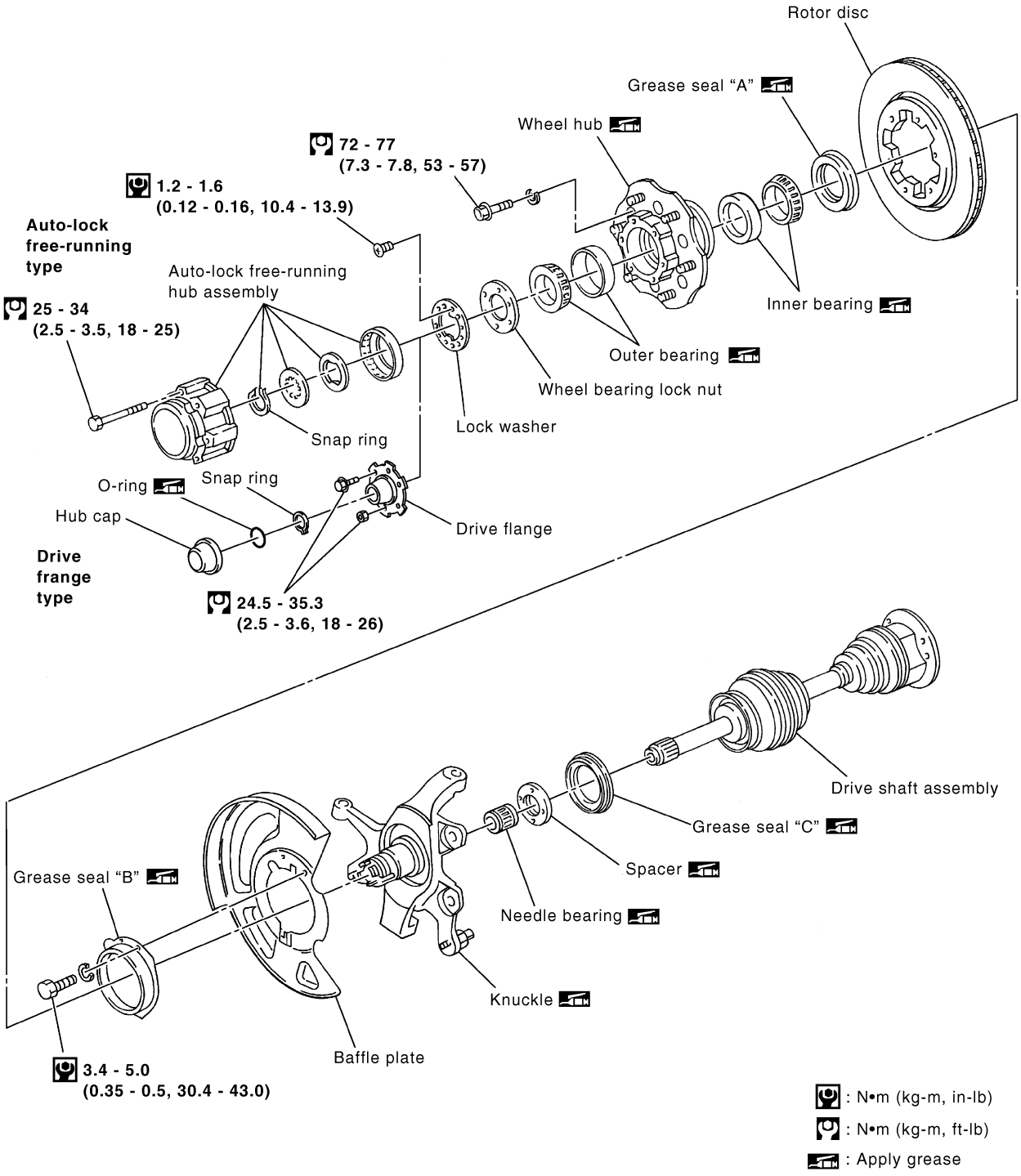
3. Adjust by stopper bolt if necessary.
   Standard length "L_2":
   26.5 mm (1.043 in)

Drive Shaft


SFA901

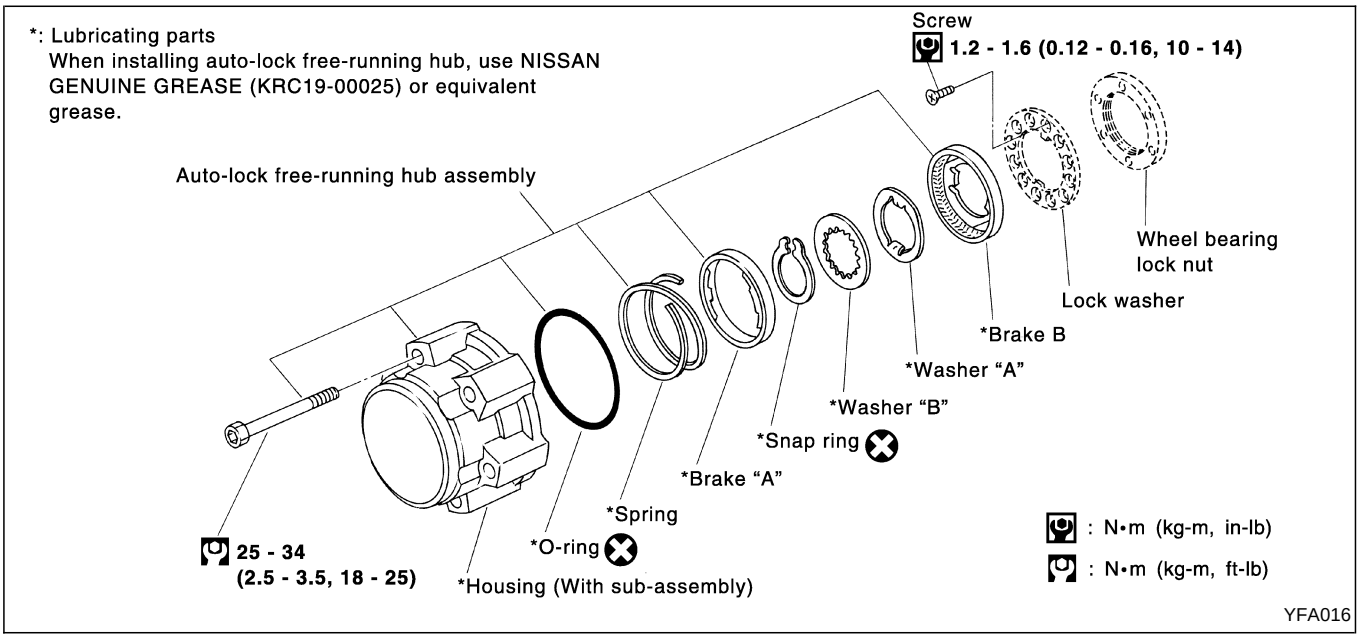
- Check for grease leakage or other damage.

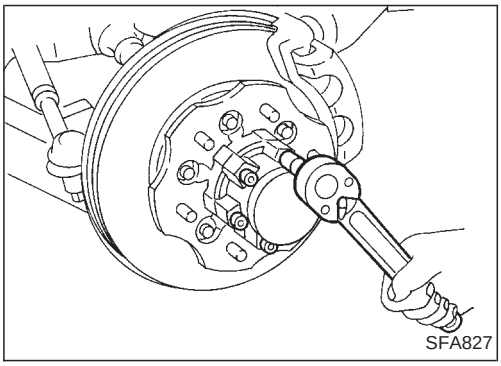
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YFA020

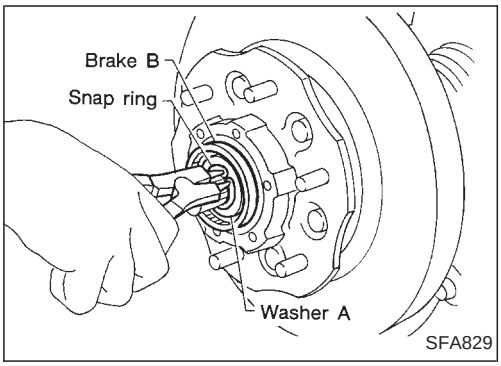
http://vnx.su/





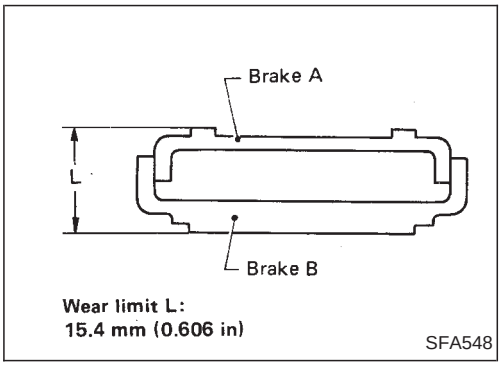
Removal and Installation

- Set the auto-lock free-running hub at the condition "Free".
- Remove auto-lock free-running hub with brake pedal depressed.



- Remove snap ring.
- Remove washer B, washer A and brake B.
- After installing auto-lock free-running hub, check operation.

When installing it, apply recommended grease to drive shaft end.



Inspection

Thoroughly clean parts and dry with compressed air.

Brake "A" and "B"

Measure the thickness "L" of brake "A" and "B".

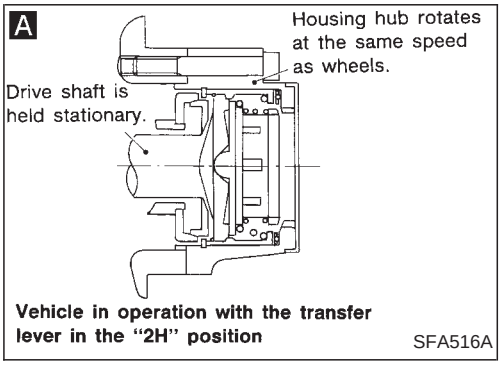
If thickness is less than the specified limit, replace brake "A" and "B" as a set.

Wear limit "L" = 15.4 mm (0.606 in)

http://vnx.su/

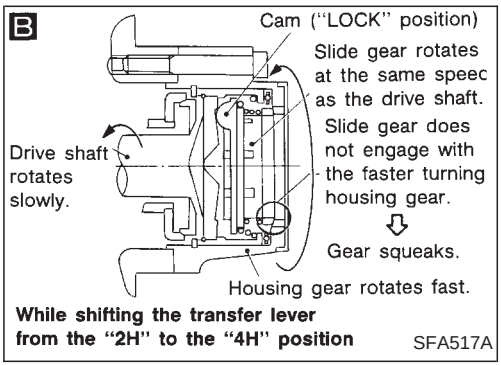
Trouble-shooting

Noise occurring in the auto hub under any of the conditions described is not indicative of a problem. Noise can be eliminated by properly operating the transfer lever of the vehicle.



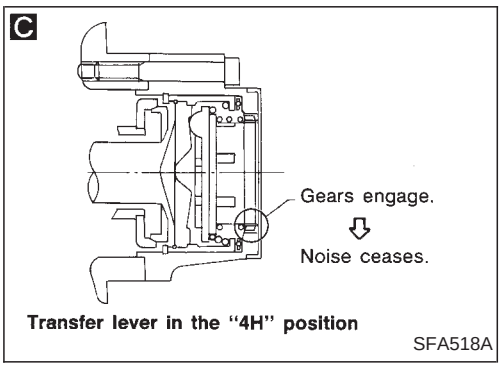
Vehicle in operation with the transfer lever in the "2H" position

SFA516A



While shifting the transfer lever from the "2H" to the "4H" position

SFA517A



Transfer lever in the "4H" position

SFA518A

Noise

Was the transfer lever shifted from the "2H" to the "4H" position while the vehicle was operated at a speed greater than 40 km/h (25 MPH)?

Yes → Shifting the transfer lever from the "2H" to the "4H" position in high-speed operation (Fig. A → Fig. B), is sometimes difficult. At this point, a clattering occurs in the auto hub. If shifting is stopped halfway, the drive shaft no longer rotates and the cam is held in the "LOCK" position (Fig. B). In this case, the noise will continue until the vehicle is stopped. When this occurs, decrease vehicle speed to less than 40 km/h (25 MPH), return the transfer lever to the "2H" position once and then reshift to the "4H" position. Gears will then be engaged and the noise will cease (Fig. C).

No

Was the transfer lever shifted from the "2H" to the "4H" position while the vehicle was operated at a speed less than 40 km/h (25 MPH)?

Yes → When noise occurs in the auto hub while shifting from the "2H" to the "4H" position (Fig. A → Fig. B), do not stop shifting halfway. When shifted to the "4H" position, the "4WD" pilot lamp will come on to indicate that the gears are engaged properly and that the vehicle is set in the 4WD mode. Noise will then cease (Fig. C). If shifting is stopped halfway, noise will continue.
In such a case, return the transfer lever to the "2H" position once and re-shift it to the "4H" position. Gears will then be engaged and the noise will cease (Fig. C). (If the lever is left in the "2H" position, the noise will continue until the vehicle is stopped.)

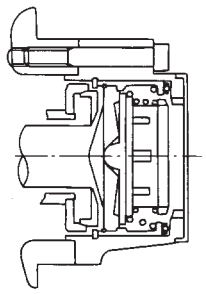
No

Ⓐ

http://vnx.su/

Trouble-shooting (Cont'd)

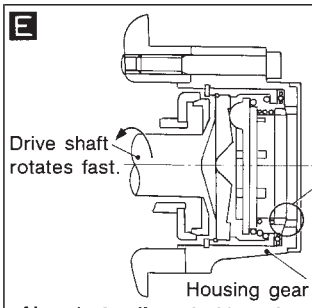
D



Vehicle stoppage

SFA519A

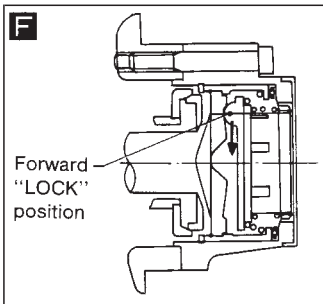
E



Abrupt standing start/acceleration while rear wheels are slipping

SFA520A

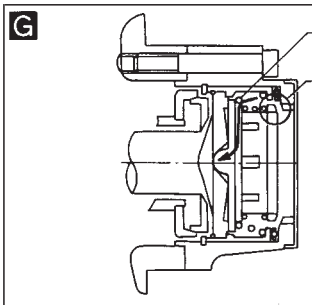
F



Vehicle starting to back up

SFA521A

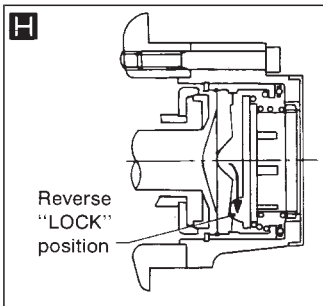
G



Gears in "unlocked" condition

SFA522A

H



Gears engaged in reverse

SFA523A

Ⓐ

Was the vehicle started after the transfer lever was shifted from the "2H" to the "4H" or "4L" position?

Yes → A clicking noise can sometimes occur in the auto hub when the gears are engaged. This is not a problem.
Noise can be encountered during rapid acceleration while rear wheels are slipping on snowy roads, muddy roads, slopes, etc. (Fig. D → Fig. E).
In such a case, release the accelerator pedal to reduce engine speed. Gears will then be engaged and the noise will cease (Fig. C).

No

Was the vehicle backed up when the transfer lever was in the "4H" or the "4L" position, or was the vehicle backed up while on a downgrade when the transfer lever was in the "4H" or the "4L" position?

Yes → When backing up the vehicle with the transfer in the "4H" or the "4L" position, auto-hub gears sometimes disengage but soon reengage (Fig. F → Fig. G → Fig. H) with a clicking noise. This is not a problem. Noise will also occur if the vehicle is accelerated rapidly while the gears are disengaged. In such a case, release the accelerator pedal once to decrease engine speed. Gears will then be engaged and the noise will cease (Fig. C).

No

Was the vehicle turned on a dry pavement, when the transfer lever was in the "4H" or the "4L" position?

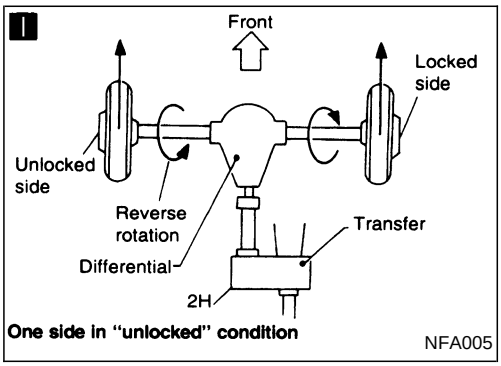
Yes → Under these conditions, noise occurs in tires (creaking) or in the power train (rattling) — not in the auto hub.
Avoid driving in the conditions described above as it may lead to tire wear.

No

Ⓑ

http://vnx.su/

Trouble-shooting (Cont'd)



One side in "unlocked" condition
NFA005

Ⓑ

Was the vehicle moved in one direction after the vehicle was driven in another direction when the transfer lever was in the "4H" or the "4L" position and then returned to the "2H" position?

Yes → Auto-hub gears will disengage with a resultant noise (clicking). If the distance the vehicle is moved in the opposite direction is short [less than 1 m (3 ft)] or if the rotation angle of the left and right wheels is not the same (as in rounding a corner), gears on one side will disengage (Fig. I). Under this condition, a noise (crushing, etc.) might occur while driving in the "2H" position. If only gears on one side are unlocked, the locked drive shaft rotates at the same speed as wheels; however, the unlocked drive shaft is made to rotate in the reverse direction by the differential. This forces by auto hub's slide gear to lock in the reverse direction. As a result, noise occurs.
If this happens, slowly move the vehicle straight back approximately 2 to 3 m (7 to 10 ft) with the transfer lever in the "2H" position to disengage the gears on the other side.

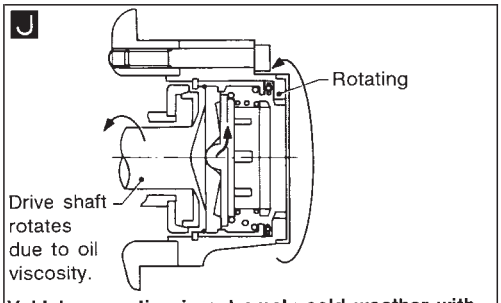
No ↓

Was the vehicle driven with the transfer lever in the "2H" position in extremely cold weather?

Yes → In extremely cold weather (areas), the viscosity of differential oil is greater than in moderate weather. When the auto hubs are unlocked with the transfer lever set to the "2H" position, one auto hub can sometimes remain locked.
This causes noise during operation. Noise can also occur in the auto hub when the front propeller shaft is rotated due to the viscosity resistance of the transfer fluid (Fig. J).
In such a case, drive in the "4H" position for approximately 10 minutes until the vehicle warms up, and return the transfer lever to the "2H" position to eliminate the noise.

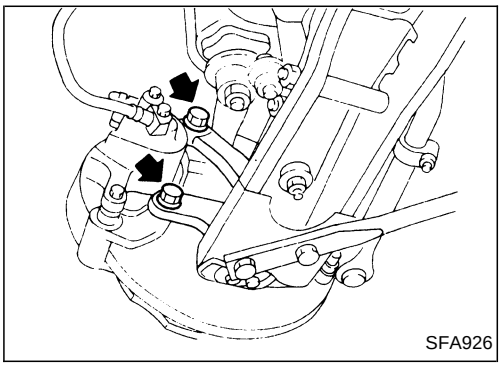
No ↓

Disassemble and check the auto hub.
(Refer to "Removal and Installation", FA-18.)



Vehicle operating in extremely cold weather with transfer lever in the "2H" position
SFA525A

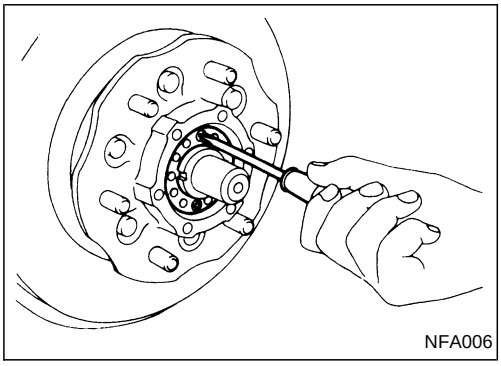
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SFA926

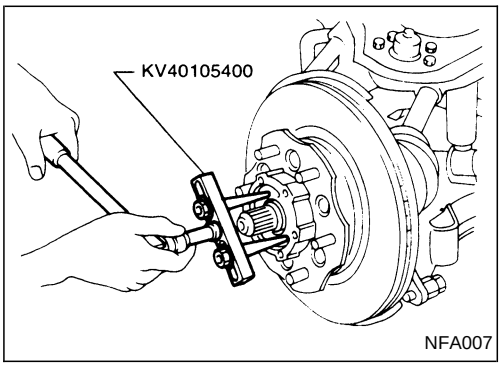
Removal and Installation

- Remove free-running hub assembly.
  Refer to “FRONT AXLE — Auto-Lock Free-running Hub”, FA-14.
- Remove brake caliper assembly.

Brake hose does not need to be disconnected from brake caliper.
Be careful not to depress brake pedal, or piston will pop out.
Make sure brake hose is not twisted.

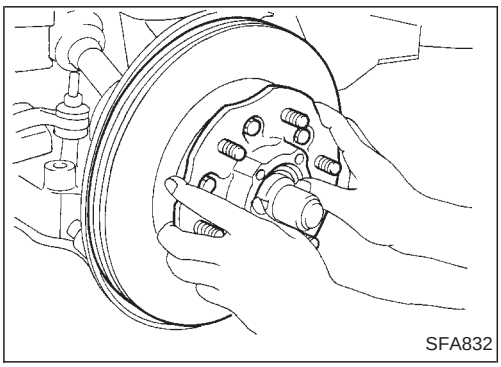

NFA006

- Remove lock washer.



NFA007

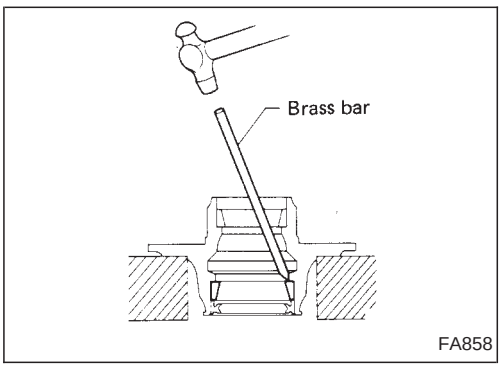
- Remove wheel bearing lock nut with Tool.
  Tool: KV40105400


SFA832

- Remove wheel hub and wheel bearing.

Be careful not to drop outer bearing.

- After installing wheel hub and wheel bearing, adjust wheel bearing preload.
  Refer to “PRELOAD ADJUSTMENT”, “Front Wheel Bearing”, FA-6.



FA858

Disassembly

- Drive bearing outer races with suitable brass bar.

http://vnx.su/

Inspection

Thoroughly clean wheel bearing and wheel hub.

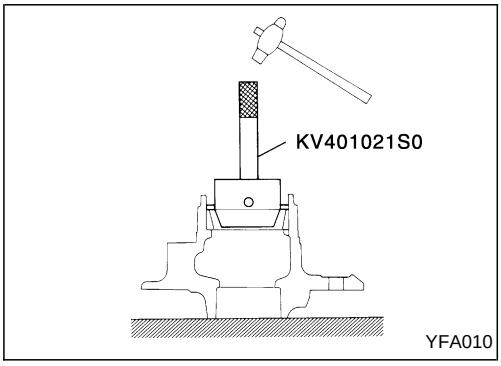
WHEEL BEARING

- Make sure wheel bearing rolls freely and is free from noise, crack, pitting or wear.

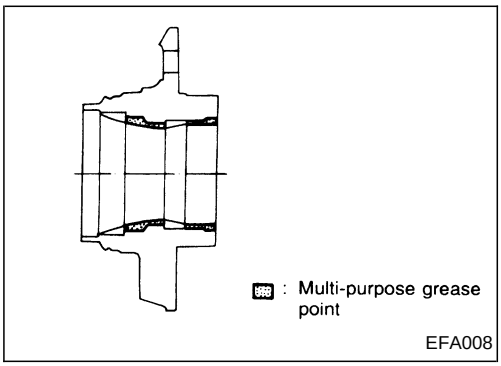
WHEEL HUB

- Check wheel hub for cracks by using a magnetic exploration or dyeing test.

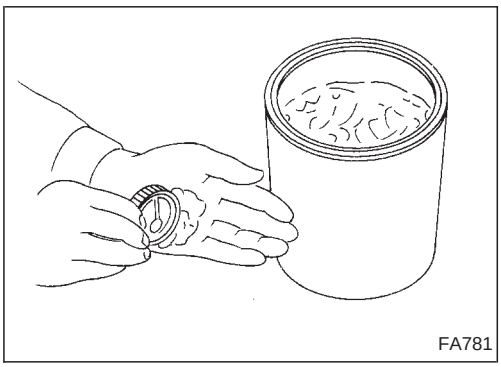
Assembly



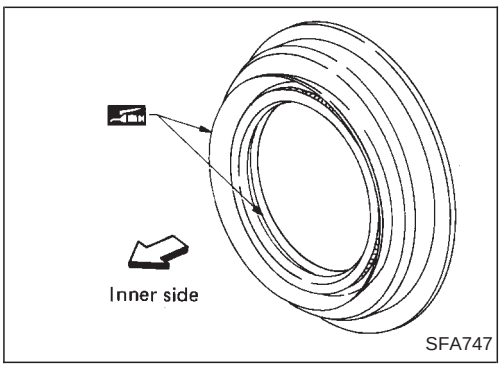
- Install bearing outer race with Tool until it seats in hub.



- Pack multi-purpose grease to hub and hub cap.

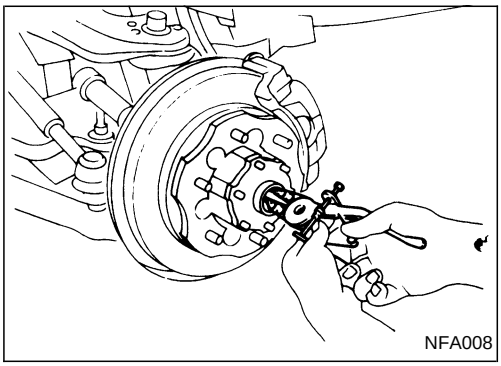


- Apply multi-purpose grease to each bearing cone.



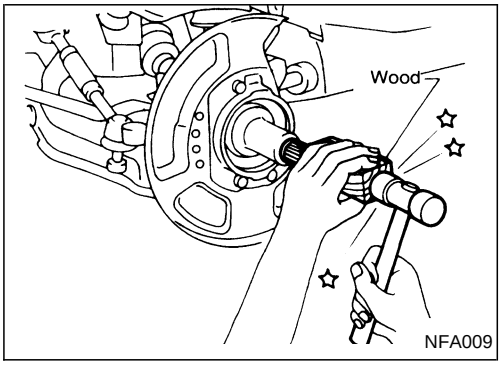
- Pack grease seal lip with multi-purpose grease, then install it into wheel hub with suitable drift.

http://vnx.su/


NFA008

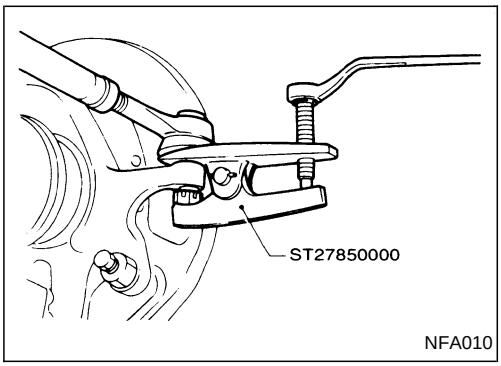
Removal

- Remove free-running hub assembly.
  Refer to “FRONT AXLE — Auto-lock Free-running Hub”, FA-14.



NFA009

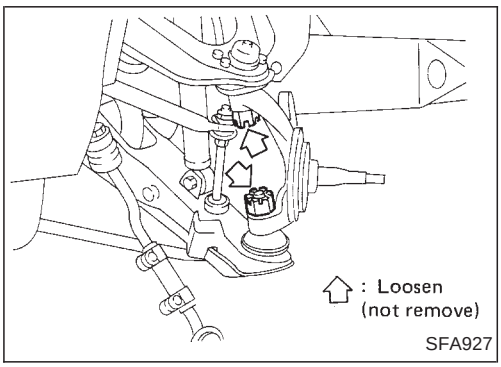
- Separate drive shaft from knuckle spindle by slightly tapping drive shaft end.



NFA010

- Separate tie-rod from knuckle spindle with Tool.

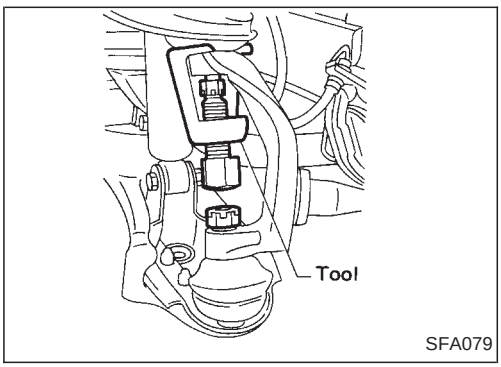
Install stud nut conversely on stud bolt so as not to damage stud bolt.



SFA927

- Separate knuckle spindle from ball joints.

(1) Loosen (not remove) upper and lower ball joint tightening nuts.



SFA079

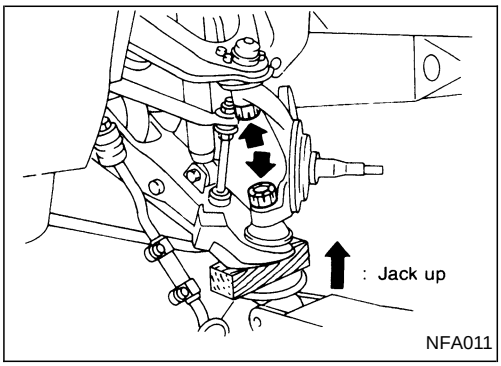
(2) Separate upper and lower ball joints to knuckle spindle with Tool.

During above operation, never remove ball joint nuts which are loosened in step (1) above.

Tool: HT72520000

http://vnx.su/

Removal (Cont'd)



(3) Remove ball joint tightening nuts.
Support lower link with jack.
(4) Separate knuckle spindle from upper and lower links.

Inspection

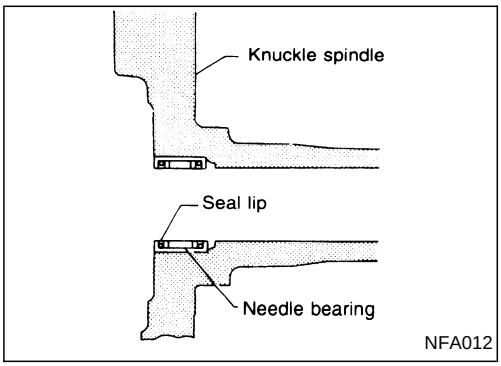
KNUCKLE SPINDLE

- Check knuckle spindle for deformation, cracks or other damage by using a magnetic exploration or dyeing test.

NEEDLE BEARING

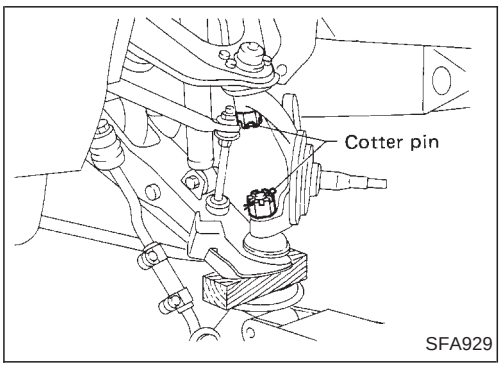
- Check needle bearing for wear, scratches, pitting, flaking and burn marks.

Installation



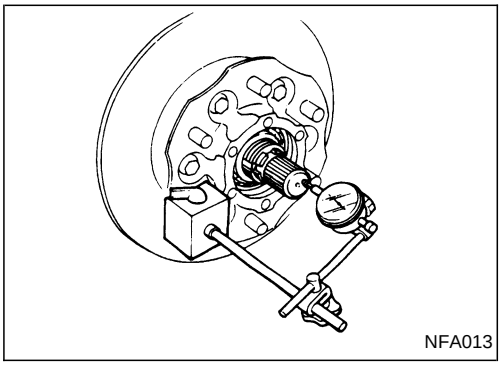
- Install needle bearing into knuckle spindle.

Make sure that needle bearing is facing in proper direction.
Apply multi-purpose grease.



- Install knuckle spindle to upper and lower ball joints with lower link jacked up.

CAUTION:
Make sure that oil or grease does not come into contact with tapered areas of ball joint and knuckle spindle and threads of ball joint.

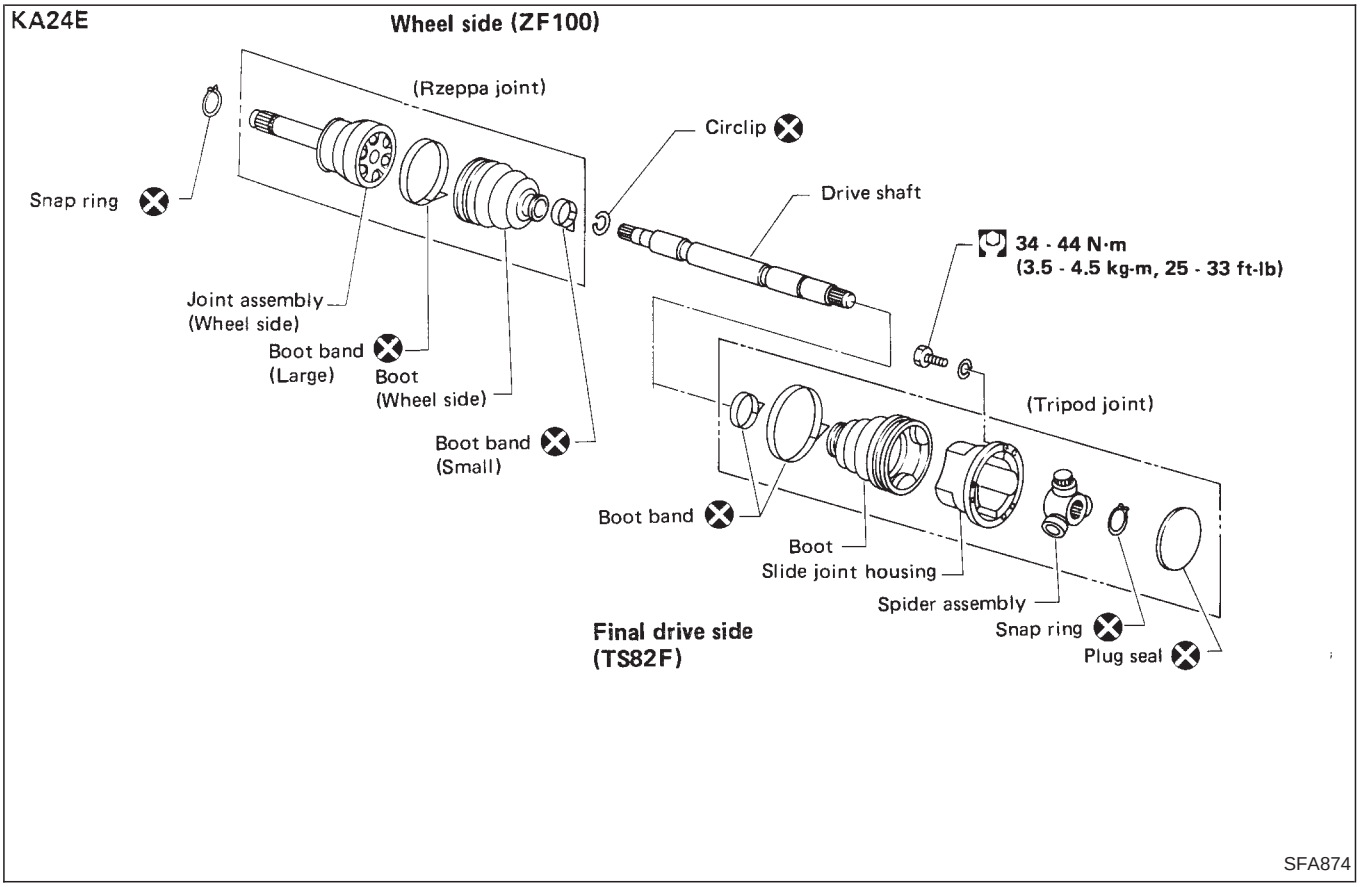


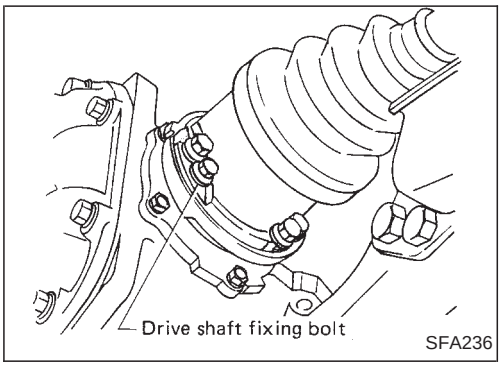
- After installing knuckle spindle, adjust wheel bearing preload. Refer to "PRELOAD ADJUSTMENT", "Front Wheel Bearing", FA-6.
- After installing drive shaft, check drive shaft axial end play.

Do not reuse snap ring once it has been removed.
Temporarily install snap ring at same thickness as it was installed before removal.
Refer to "FRONT AXLE — Drive Shaft", FA-22.

http://vnx.su/

Removal and Installation





Removal

1. Remove bolts fixing drive shaft to final drive.

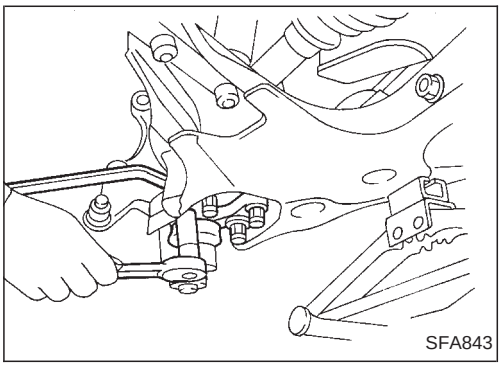
2. Remove free-running hub assembly with brake pedal depressed. Refer to “FRONT AXLE — Auto-lock Free-running Hub”, FA-14.
- Remove brake caliper assembly without disconnecting brake hydraulic line.

Make sure that brake hose is not twisted.

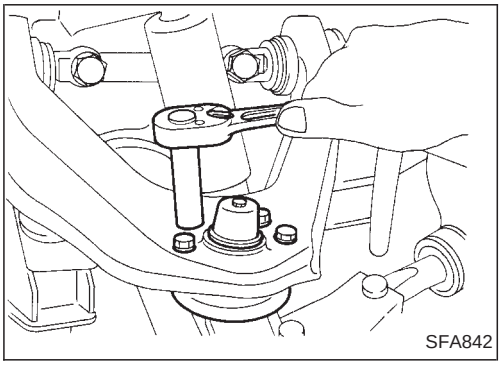
- Remove tie-rod ball joint. Refer to “FRONT AXLE — Knuckle Spindle”, FA-20.

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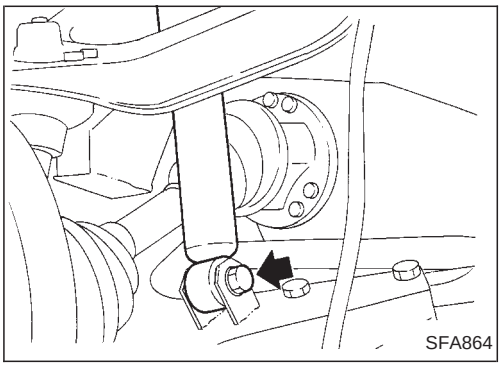
Removal (Cont'd)


SFA843

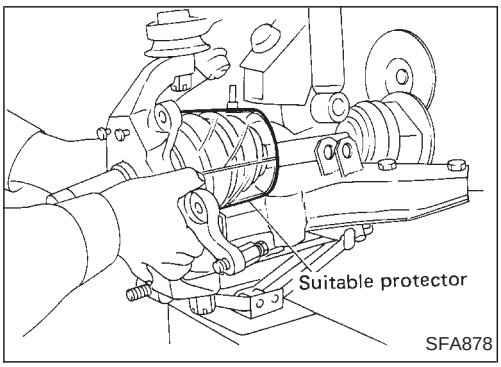
3. Remove nuts fixing lower ball joint on lower link.
Support lower link with jack.


SFA842

4. Remove upper ball joint fixing bolt.

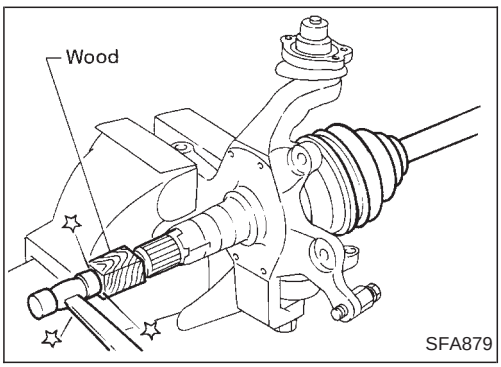

SFA864

5. Remove shock absorber lower bolt.



SFA878

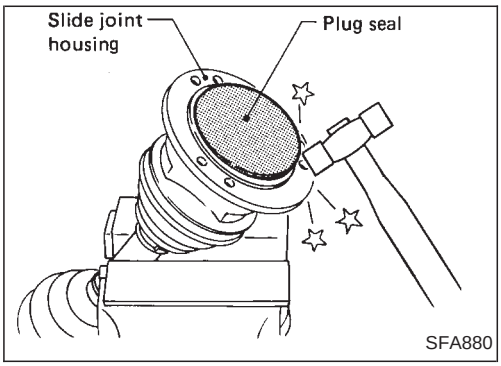
6. Remove drive shaft with knuckle.
Cover drive shaft boot with a suitable protector.



SFA879

7. Separate drive shaft from knuckle by slightly tapping it.

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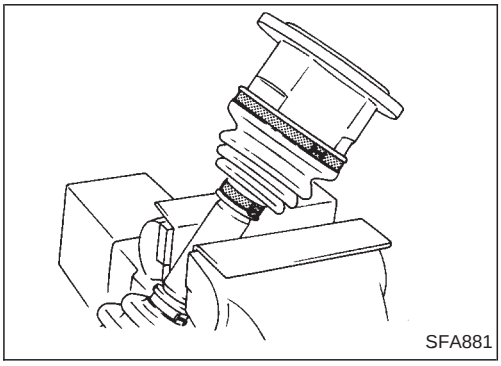


Disassembly

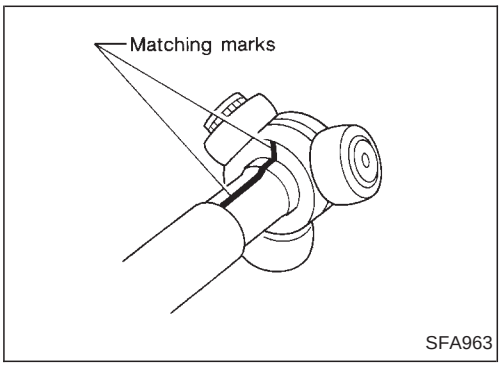
FINAL DRIVE SIDE

— TS82F type —

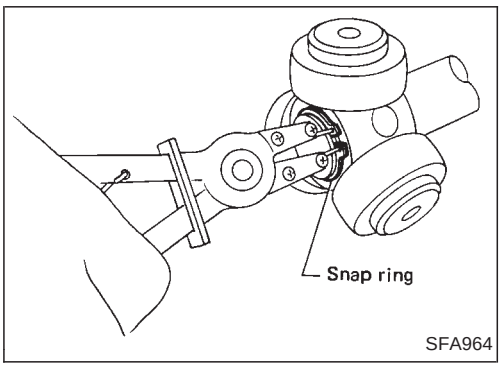
1. Remove plug seal from slide joint housing by lightly tapping around slide joint housing.



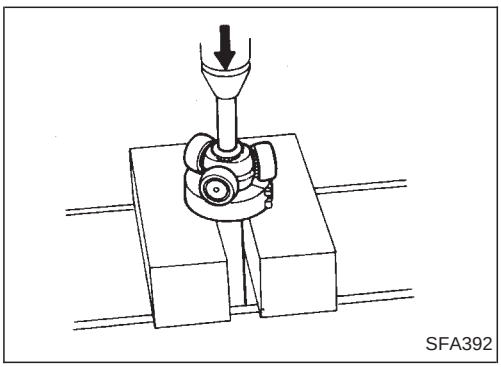
2. Remove boot bands.



3. Move boot and slide joint housing toward wheel side, and put matching marks.



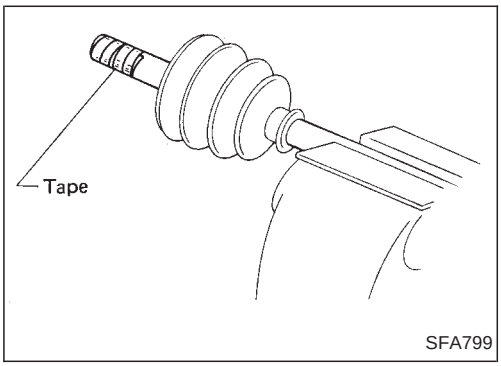
4. Pry off snap ring.



5. Detach spider assembly with press.

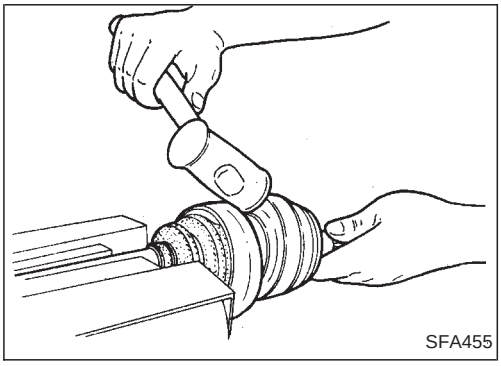
http://vnx.su/

Disassembly (Cont'd)



6. Draw out boot.

Cover drive shaft serration with tape so as not to damage the boot.



WHEEL SIDE (ZF100)

CAUTION:

This type of joint on the wheel side cannot be disassembled.

- Before separating joint assembly, put matching marks on drive shaft and joint assembly.
- Separate joint assembly with suitable tool.

Be careful not to damage threads on drive shaft.

- Remove boot bands.

Inspection

Thoroughly clean all parts, in cleaning solvent, and dry with compressed air. Check parts for evidence of deformation or other damage.

DRIVE SHAFT

Replace drive shaft if it is twisted or cracked.

BOOT

Check boot for fatigue, cracks, or wear. Replace boot with new boot bands.

JOINT ASSEMBLY (TS82F) (FINAL DRIVE SIDE)

- Replace any parts of double offset joint which show signs of scorching, rust, wear or excessive play.
- Check serration for deformation. Replace if necessary.
- Check slide joint housing for any damage. Replace if necessary.

JOINT ASSEMBLY (ZF100) (WHEEL SIDE)

Replace joint assembly if it is deformed or damaged.

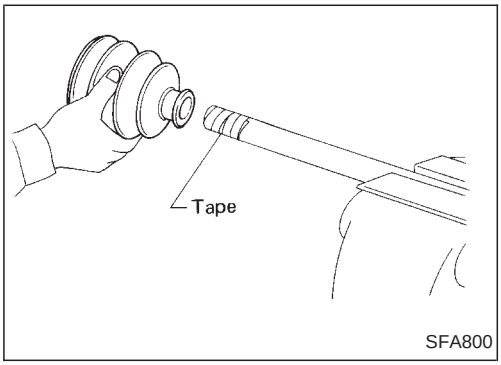
Assembly

- **After drive shaft has been assembled, ensure that it moves smoothly over its entire range without binding.**
- **Use NISSAN GENUINE GREASE or equivalent after every overhaul.**

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Assembly (Cont'd)

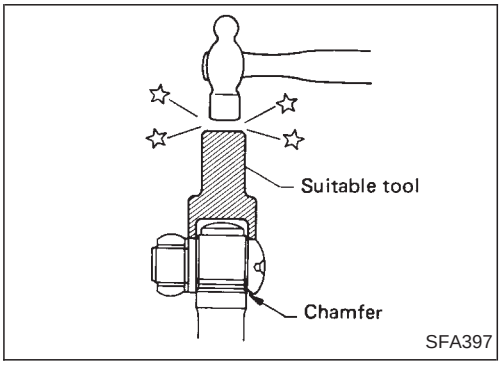
FINAL DRIVE SIDE



— TS82F type —

1. Install new small boot band, boot and side joint housing to drive shaft.

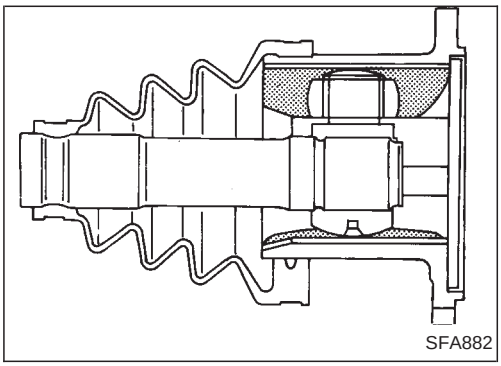
Cover drive shaft serration with tape so as not to damage boot during installation.



2. Install spider assembly securely, ensuring marks are properly aligned.

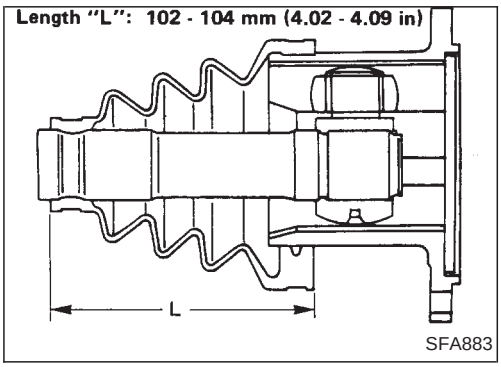
- **Press-fit with spider assembly serration chamfer facing shaft.**

3. Install new snap ring.



4. Pack with grease.

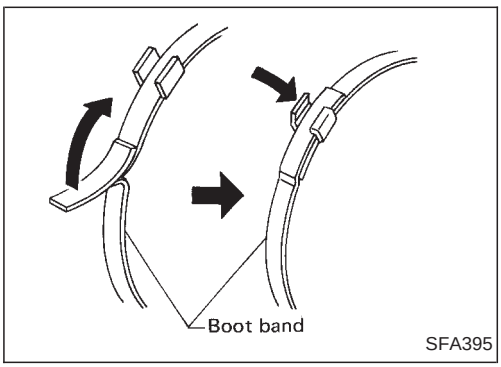
Specified amount of grease:
190 - 210 g (6.70 - 7.41 oz)



5. Set boot so that it does not swell and deform when its length is "L".

Length "L" = 102 - 104 mm (4.02 - 4.09 in)

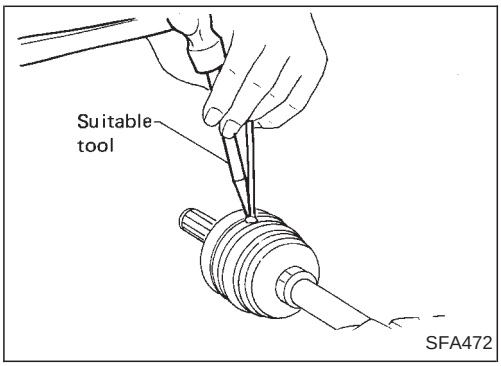
Make sure that boot is properly installed on the drive shaft groove.



6. The rubber cover comes with clamps on both ends. Firmly clinch the clamp to the end which is wider in diameter and repeat the procedure at the narrower end. Use the appropriate tool.

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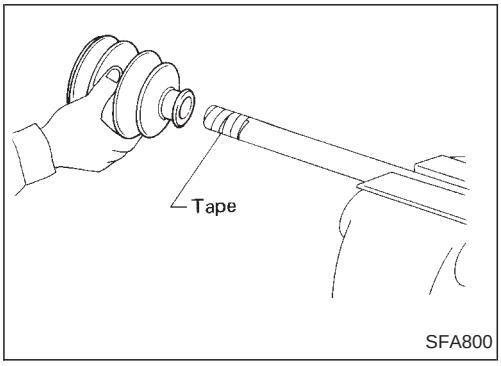
Assembly (Cont'd)



SFA472

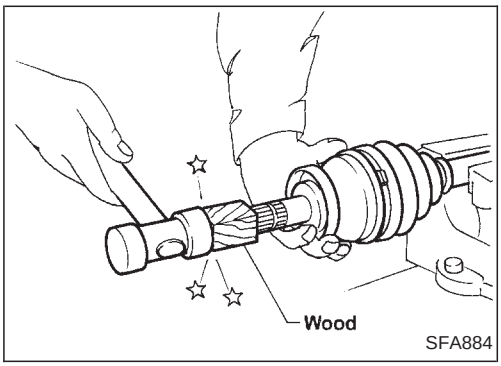
7. Install new plug seal to slide joint housing by lightly tapping it.
Apply sealant to mating surface of plug seal.

WHEEL SIDE (ZF100)



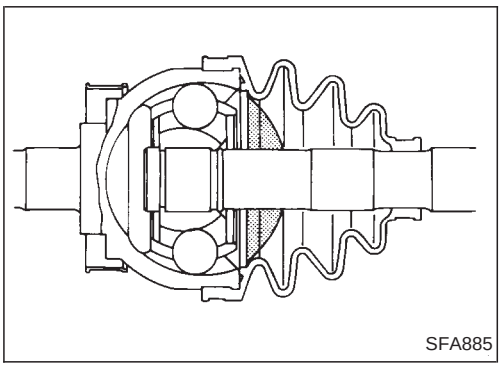
SFA800

1. Install new small boot band and boot on drive shaft.
Cover drive shaft serration with tape so as not to damage boot during installation.

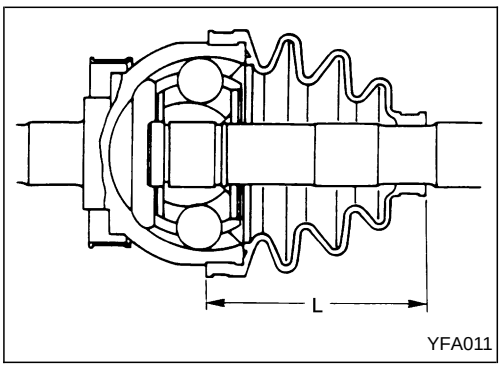


SFA884

2. Set joint assembly onto drive shaft by lightly tapping it.
Install joint assembly securely, ensuring marks which were made during disassembly are properly aligned.


SFA885

3. Pack drive shaft with specified amount of grease.
Specified amount of grease:
100 - 120 g (3.53 - 4.23 oz)

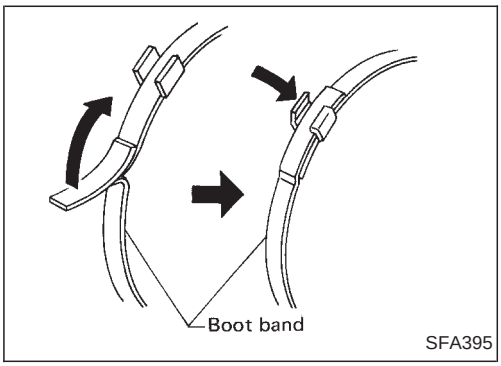


YFA011

4. Set boot so that is does not swell and deform when its length is "L".
Length "L" = 96 - 98 mm (3.78 - 3.86 in)
Make sure that boot is properly installed on the drive shaft groove.

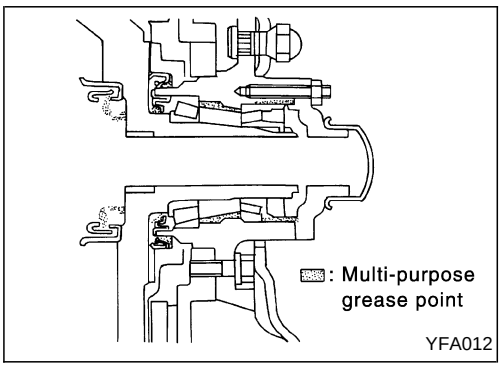
http://vnx.su/

Assembly (Cont'd)

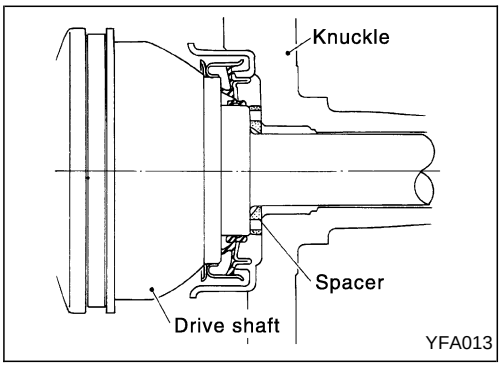


5. Lock new larger boot band securely with a suitable tool.

Installation

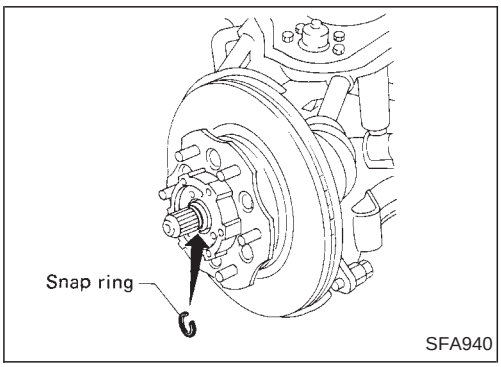


- Apply multi-purpose grease.



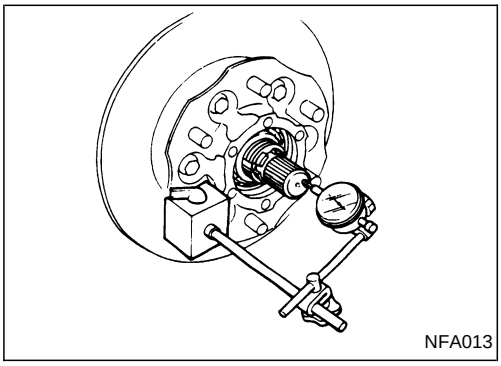
- Install bearing spacer onto drive shaft.

Make sure that bearing spacer is facing in proper direction.



- When installing drive shaft, adjust drive shaft axial end play by selecting a suitable snap ring.

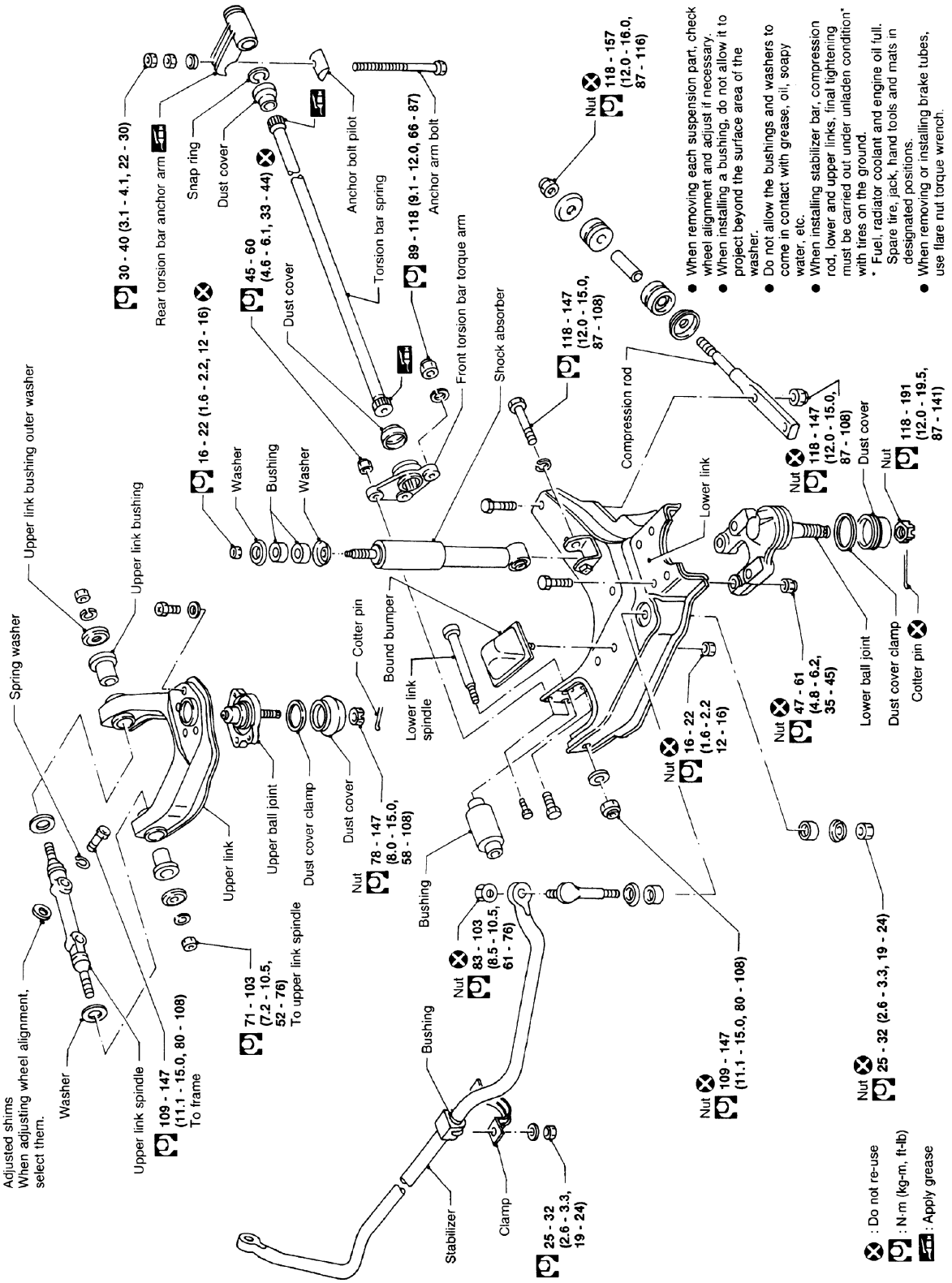
(1) Temporarily install new snap ring on drive shaft in the same thickness as it was installed before removal.



(2) Set dial gauge on drive shaft end.
(3) Measure axial end play of drive shaft.
Axial end play: 0.1 - 0.3 mm (0.004 - 0.012 in)
(4) If axial end play is not within the specified limit, select another snap ring.

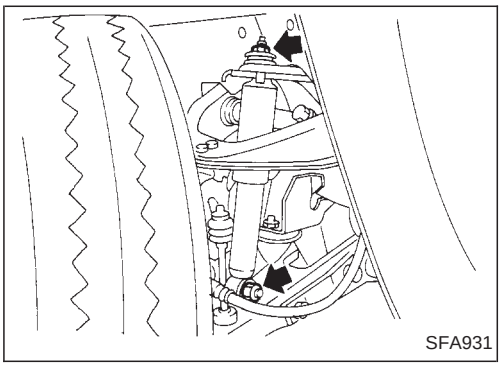
1.1 mm (0.043 in)	**1.3 mm (0.051 in)**
1.5 mm (0.059 in)	**1.7 mm (0.067 in)**
1.9 mm (0.075 in)	**2.1 mm (0.083 in)**
2.3 mm (0.091 in)	

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NFA038

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SFA931

Shock Absorber

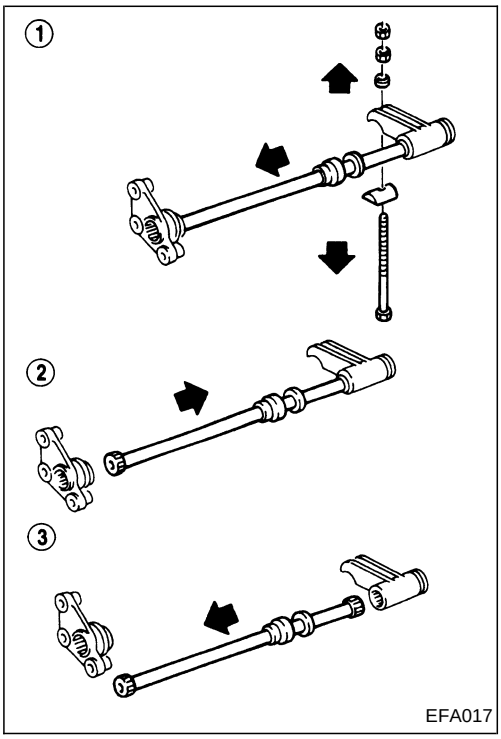
REMOVAL AND INSTALLATION

When removing and installing shock absorber, do not allow oil or grease to come into contact with rubber parts.

INSPECTION

Wash all parts, except for nonmetallic parts, with suitable solvent and dry with compressed air.
Blow dirt and dust off of nonmetallic parts with compressed air.

- Check for oil leakage and cracks. Replace if necessary.
- Check piston rod for smooth operation. Replace if necessary.
- Check rubber parts for wear, cracks, damage or deformation. Replace if necessary.



EFA017

Torsion Bar

REMOVAL

- Remove torsion bar as follows:

(1) Remove anchor arm bolt nuts and remove anchor arm bolt and pilot.
Remove snap ring and dust cover from rear torsion bar anchor arm.
(2) Withdraw torsion bar and remove torsion bar and torsion bar rear anchor arm as an assembly from front torsion bar torque arm.
(3) Remove torsion bar from rear torsion bar anchor arm.

INSPECTION

- Check torsion bar for wear, twist, bend and other damage.
- Check serrations of each part for cracks, wear, twist and other damage.
- Check dust cover for cracks.

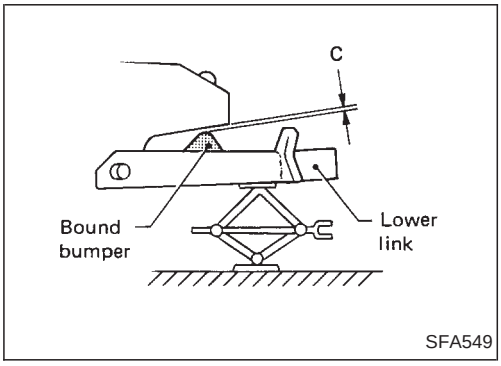
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Torsion Bar (Cont'd)

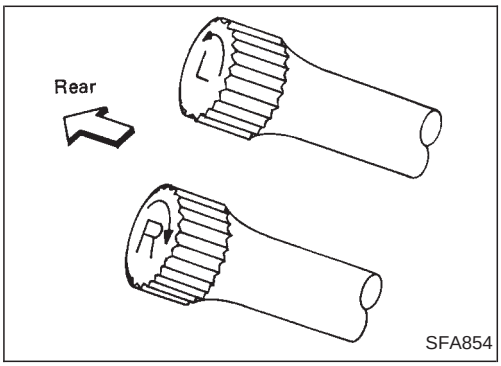
INSTALLATION AND ADJUSTMENT

Adjustment of anchor arm adjusting nut is in tightening direction only.
Do not adjust by loosening anchor arm adjusting nut.

1. Coat multi-purpose grease on the serration of torsion bar spring.

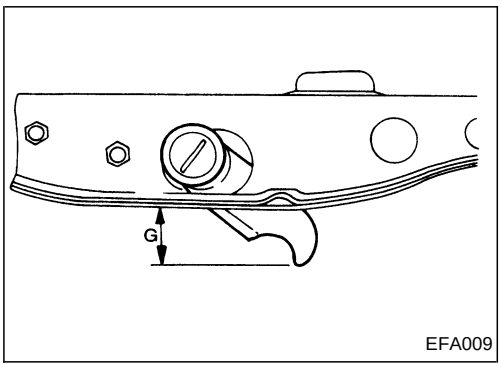


2. Place lower link in the position where bound buffer clearance "C" is 0.
   Clearance "C": 0 mm (0 in)



3. Install torsion bar spring with torque arm.

Be sure to install right and left torsion bar springs correctly.

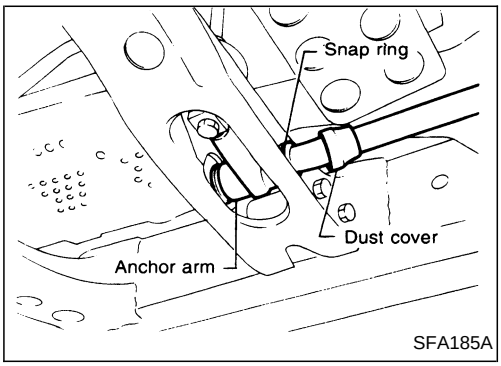


4. Set anchor arm.
   Standard length "G"
   TD27Ti engine:
   38 - 49 mm (1.50 - 1.93 in)
   ZD30DDTi engine:
   40 - 51 mm (1.57 - 2.01 in)

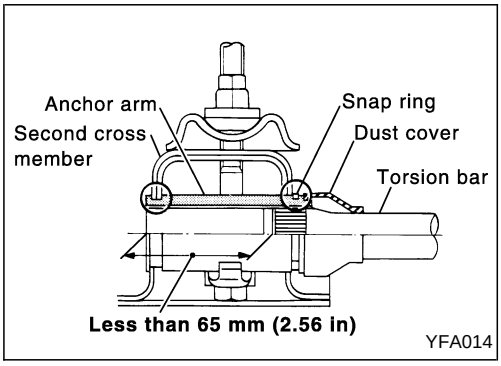
5. Install snap ring to anchor arm and dust cover.

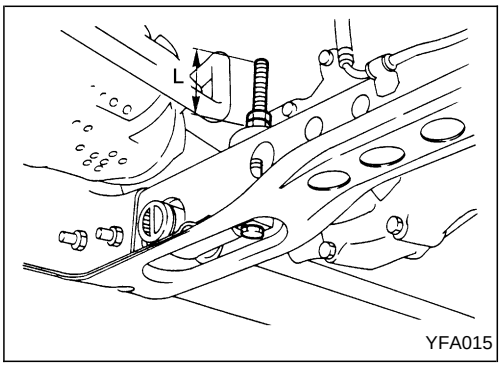
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Torsion Bar (Cont'd)

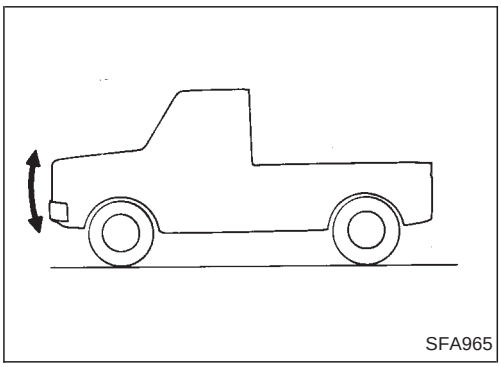


Make sure that snap ring and anchor arm are properly installed.

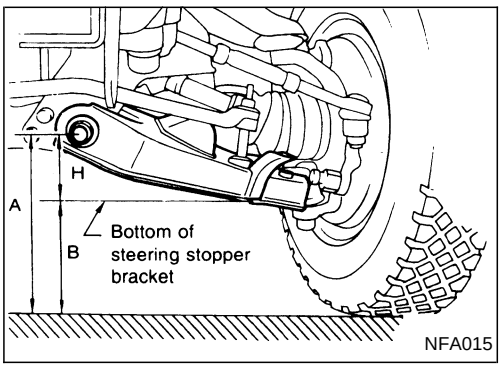




6. Tighten anchor arm adjusting nut to attain dimension "L".
   Standard length "L":
   77 mm (3.03 in)



7. Bounce vehicle with tires on ground (Unladen) to eliminate friction of suspension.

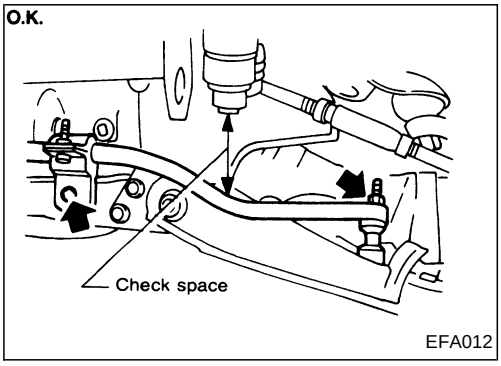


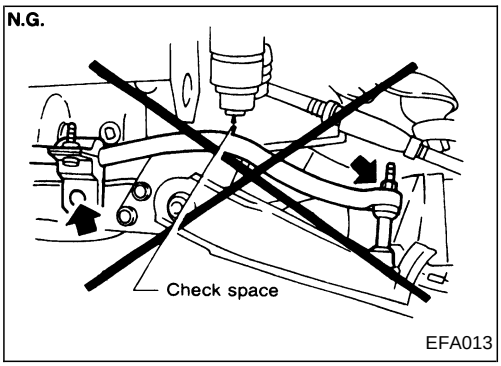
8. Measure vehicle posture "H".
   H = A − B mm (in) "Unladen"
   Refer to SDS, FA-39.
   (1) Exercise the front suspension by bouncing the front of the vehicle 4 or 5 times to ensure that the vehicle is in a neutral height attitude.
   (2) Measure vehicle posture ... Dimension "H".
   (Refer to SDS, FA-39.)

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Torsion Bar (Cont'd)

(3) If height of the vehicle is not as specified, adjust vehicle posture.
(Refer to SDS, FA-39.)
(4) Check wheel alignment if necessary.
(Refer to SDS, FA-39.)
9. If "H" dimension is not within the specified value, readjust vehicle posture using anchor arm adjusting nut.





Stabilizer Bar

REMOVAL

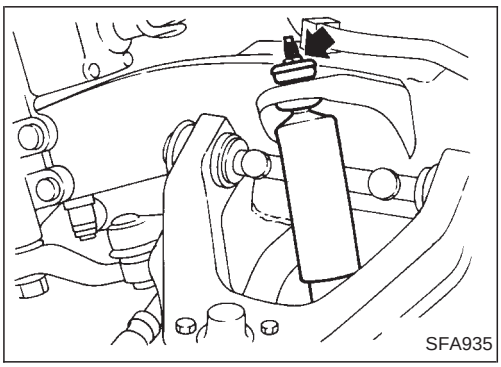
- Remove stabilizer bar ball joint nuts and clamp bolts.

INSPECTION

- Check stabilizer bar for twist and deformation.
  Replace if necessary.
- Check rubber bushing for cracks, wear or deterioration.
  Replace if necessary.

INSTALLATION

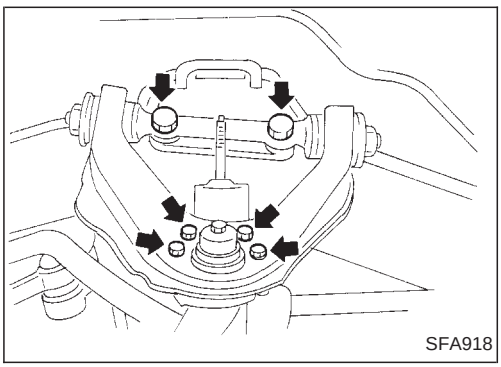
- Install bushing outside white mark painted on stabilizer facing the ground.
- Make sure stabilizer bar is properly installed. See figures.



Upper Link

REMOVAL

- Remove shock absorber upper fixing nut.



- Remove bolts fixing upper ball joint on upper link.

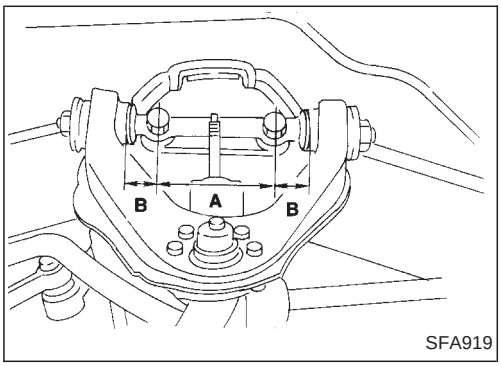
Support lower link with jack.

- Remove upper link spindle fixing bolts.

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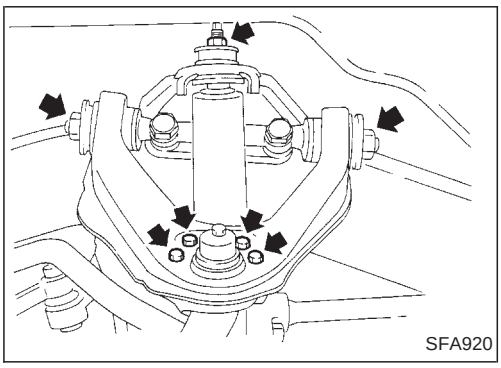
Upper Link (Cont'd)

INSTALLATION



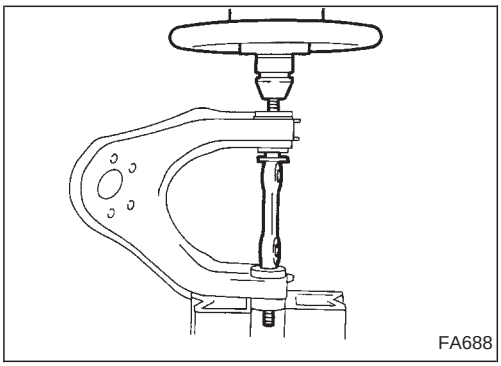
SFA919

- Tighten upper link spindle with camber adjusting shims.
- After fitting, check dimensions "A" and "B".
  A: 110 mm (4.33 in)
  B: 31.8 mm (1.252 in)


SFA920

- Install upper ball joint upper link.
- Install shock absorber upper fixing nut.
- Tighten upper link spindle lock nuts under unladen condition with tires on ground.
- After installing, check wheel alignment. Adjust if necessary. Refer to "Front Wheel Alignment", "CHECK AND ADJUSTMENT", FA-8.

DISASSEMBLY

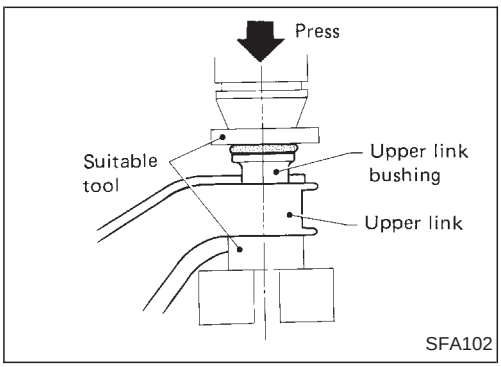

FA688

- Press out upper link spindle with bushings.

INSPECTION

- Check upper spindle and rubber bushings for damage. Replace if necessary.
- Check upper link for deformation or cracks. Replace if necessary.

ASSEMBLY



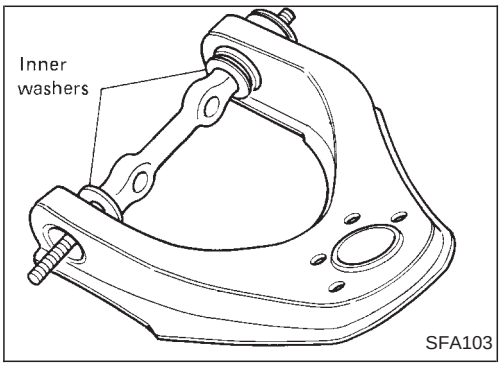
SFA102

- Apply soapsuds to rubber bushing.
- Press upper link bushing.

Press bushing so that flange of bushing securely contacts end surface of upper link collar.

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Upper Link (Cont'd)

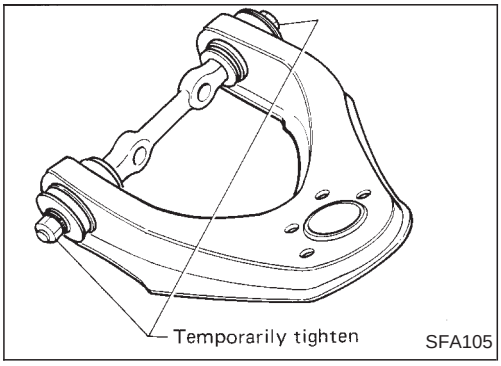


- Insert upper link spindle and inner washers.

Install inner washers with rounded edges facing inward.

- Press another bushing.

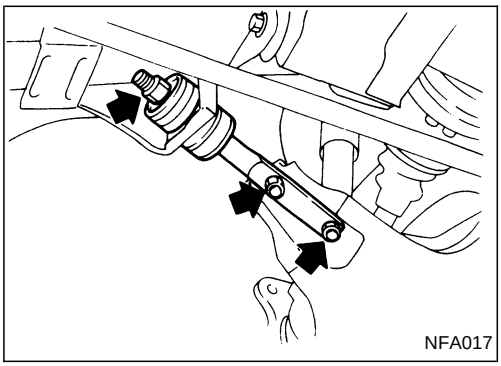
Press bushing so that flange of bushing securely contacts end surface of upper link collar.



- Temporarily tighten nuts.

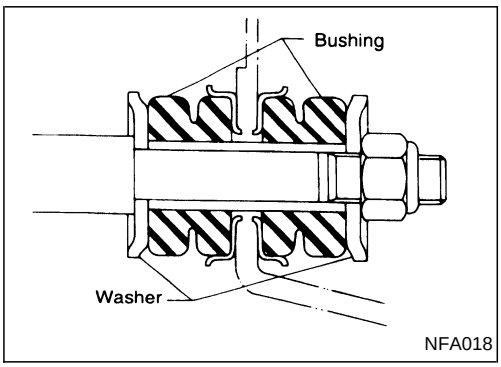
Compression Rod

REMOVAL AND INSTALLATION



- Remove fixing nuts on lower link and frame

Support lower link with jack.

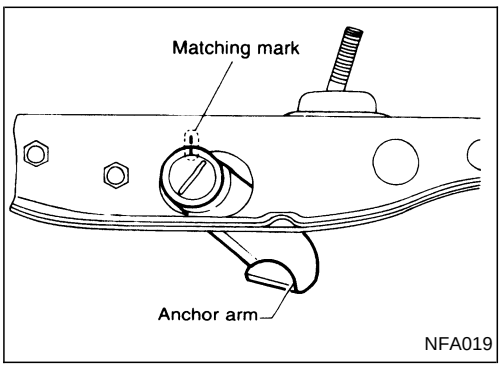


- Install compression rod.

Make sure that bushings and washers are installed correctly.

Lower Link

REMOVAL AND INSTALLATION

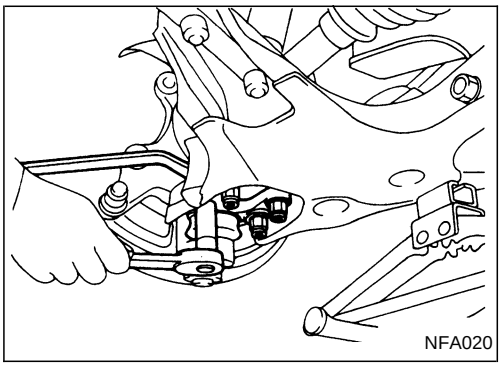


- Remove torsion bar. Refer to "REMOVAL", "Torsion Bar", FA-30.

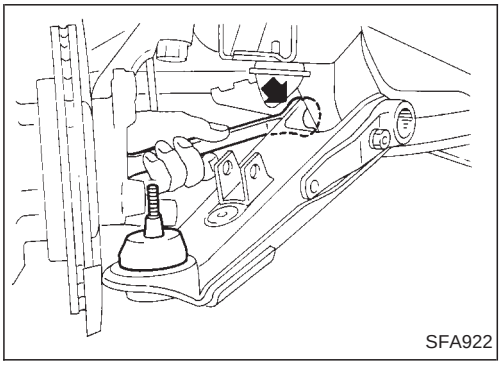
Make matching mark on anchor arm and crossmember when loosening adjusting nut until there is no tension on torsion bar.

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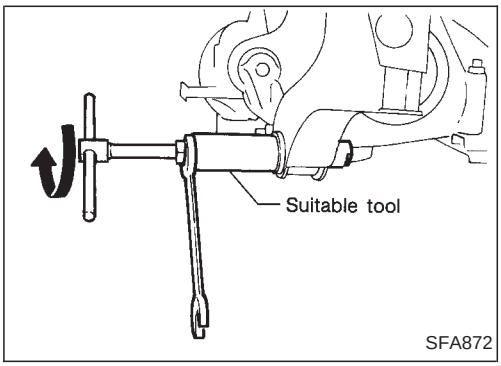
Lower Link (Cont'd)


NFA020

- Separate lower ball joint from lower link.


SFA922

- Remove front lower link fixing nut.



SFA872

- Remove bushing of lower link spindle from frame with suitable tool.
- When installing bushing, apply grease on bushing and remove excess after installation.
- After installing lower link, adjust wheel alignment and vehicle height. Refer to "Front Wheel Alignment", "CHECK AND ADJUSTMENT", FA-8.

INSPECTION

Lower link and lower link spindle

- Check lower link and lower link spindle for deformation or cracks. Replace if necessary.

Lower link bushing

- Check bushing for distortion or other damage. Replace if necessary.

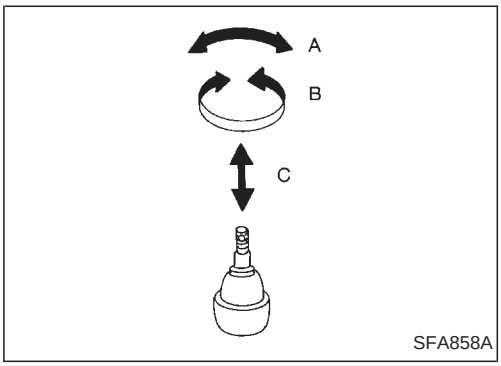
Upper Ball Joint and Lower Ball Joint

REMOVAL AND INSTALLATION

- Separate knuckle spindle from upper and lower link. Refer to "FRONT AXLE — Knuckle Spindle", FA-20.

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Upper Ball Joint and Lower Ball Joint (Cont'd)



INSPECTION

- Check ball joint for turning torque "A".
  Upper ball joint:
  31.87 - 199.38 N
  (3.25 - 20.33 kg, 7.17 - 44.83 lb)
  Lower ball joint:
  0 - 67.7 N
  (0 - 6.9 kg, 0 - 15.2 lb)
  If turning torque A is not within above specifications, replace ball joint assembly.

- Check ball joint for turning torque "B".
  Upper ball joint:
  1.0 - 4.9 N·m
  (10 - 50 kg-cm, 8.7 - 43.4 in-lb)
  Lower ball joint:
  0 - 4.9 N·m
  (0 - 50 kg-cm, 0 - 43 in-lb)
  If turning torque B is not within above specifications, replace ball joint assembly.

- Check ball joint for vertical end play "C".
  Upper ball joint:
  1.6 mm (0.063 in) or less
  Lower ball joint:
  0.5 mm (0.020 in) or less
  Replace ball joint if movement is beyond specifications.

- Check dust cover for damage.
  Replace dust cover and dust cover clamp if necessary.

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General Specifications

TORSION BAR SPRING

Applied model	Hardtop	Wagon
Spring diameter x length mm (in)	26.0 x 1,230 (1.024 x 48.43)	
Spring constant N/mm (kg/mm, lb/in)	25.3 (2.58, 144.5)	

SHOCK ABSORBER

Applied model	ABS models
Shock absorber type	Non-adjustable (hydraulic)
Damping force N (kg, lb) [at 0.3 m (1.0 ft)/sec.]	
Extension	2,265±314 (231.0±32.0, 509.2±70.6)
Compression	653±124 (66.6±12.6, 146.8±27.9)

STABILIZER BAR

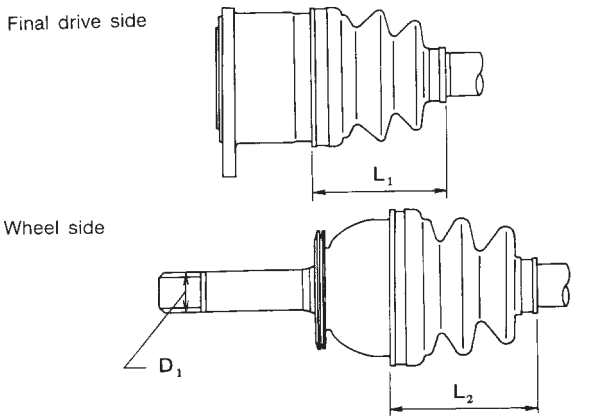
Applied model	All
Stabilizer bar diameter mm (in)	29 (1.14)

COMPRESSION ROD

Applied model	Hardtop	Wagon
Rod diameter mm (in)	23.5 (0.925)	

DRIVE SHAFT

Applied model	All
Drive shaft joint type	
Final drive side	TS82F
Wheel side	ZF100
Fixed joint axial end play limit mm (in)	1.0 (0.039)
Wheel side	
Pitch circle diameter serration mm (in)	27.0 (1.063)
Major diameter (D1) mm (in)	28.0 (1.102)
Grease	
Quality	Nissan genuine grease or equivalent
Capacity g (oz)	
Final drive side	190 - 210 (6.70 - 7.41)
Wheel side	100 - 120 (3.53 - 4.23)
Boot length mm (in)	
Final drive side (L_1)	97 - 99 (3.82 - 3.90)
Wheel side (L_2)	96 - 98 (3.78 - 3.86)



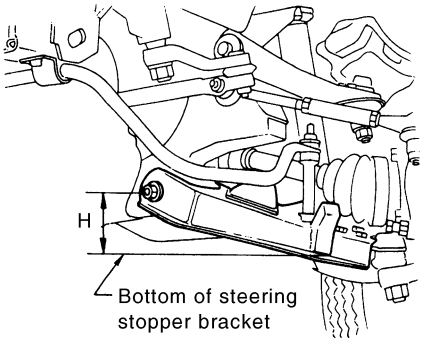
SFA877A

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Inspection and Adjustment

WHEEL ALIGNMENT (Unladen *1)

Applied model		Hardtop (short wheel-base)	Wagon (long wheel-base)
Camber	degree	0°30′±30′	0°29′±30′
Caster	degree	1°53′±30′	1°58′±30′
Kingpin inclination	degree	12°39′	
Total toe-in			
Radial tire	mm (in)	3.15 - 5.15 (0.1240 - 0.2028)	2.72 - 4.72 (0.1071 - 0.1858)
Front wheel turning angle			
Full turn			
inside		34°24′	34°22′
outside		33°35′	33°33′
Vehicle posture			
Lower arm pivot height (H)	mm (in)	33 (1.30)	31 (1.22)



NFA021

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

WHEEL BEARING

Axial end play limit	mm (in)	0 (0)
Lock nut		
Tightening torque	N·m (kg-m, ft-lb)	78 - 98 (8 - 10, 58 - 72)
Retightening torque	N·m (kg-m, ft-lb)	0.5 - 1.5 (0.05 - 0.15, 0.4 -1.1)
Turning resistance at wheel hub bolt		A
Tightening angle	degree	15° - 30°
Turning resistance at wheel hub bolt		B
Preload C = B − A	N (kg, lb)	7.06 - 20.99 (0.72 - 2.14, 1.59 - 4.72)

DRIVE SHAFT INSTALLATION

Axial end play	mm (in)	
At wheel hub		0.1 - 0.3 (0.004 -0.012)

Available drive shaft end snap rings

Thickness mm (in)	Part number	
1.1 (0.043)	39253-31G10	39253-88G10
1.3 (0.051)	39253-31G11	39253-88G11
1.5 (0.059)	39253-31G12	39253-88G12
1.7 (0.067)	39253-31G13	39253-88G13
1.9 (0.075)	39253-31G14	39253-88G14
2.1 (0.083)	39253-31G15	39253-88G15
2.3 (0.091)	39253-31G16	39253-88G16

UPPER BALL JOINT

Swinging force at cotter pin hole	N (kg, lb)	31.87 - 199.38 (3.25 - 20.33, 7.17 - 44.83)
Rotating torque	N·m (kg-cm, in-lb)	1.0 - 4.9 (10 - 50, 8.7 - 43.4)
Axial endplay limit	mm (in)	1.6 (0.063)

LOWER BALL JOINT

Swinging force at cotter pin hole	N (kg, lb)	0 - 67.7 (0 - 6.9, 0 - 15.2)
Rotating torque	N·m (kg-cm, in-lb)	0 - 4.9 (0 - 50, 0 - 43)
Axial end play limit	mm (in)	0.5 (0.020)

WHEEL RUNOUT

Wheel type		Steel
		(15″)
Radial runout limit	mm (in)	0.5 (0.02)
Lateral runout limit	mm (in)	0.8 (0.031)

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NOTES

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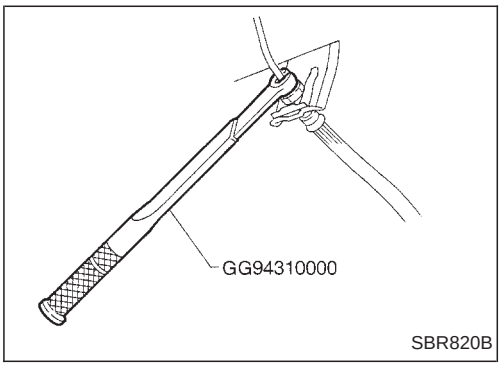
REAR AXLE & REAR SUSPENSION

SECTION RA

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Inspection and Adjustment....16

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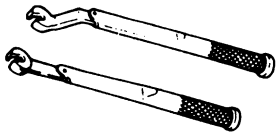
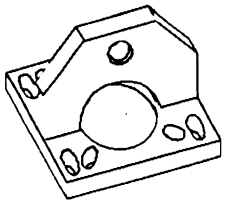
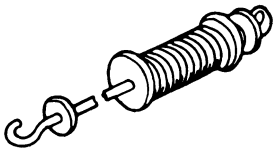
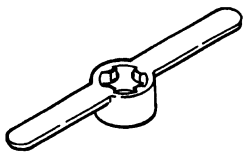
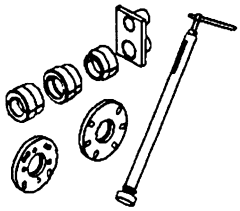
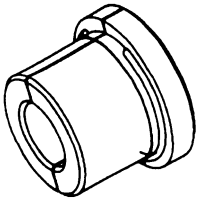
Precautions

- When installing each rubber part, final tightening must be carried out under unladen condition* with tires on ground.
  * Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.
- Use Tool when removing or installing brake tubes.
- If suspension or suspension parts are dismounted, check wheel alignment and adjust if necessary.
- Do not jack up vehicle at lower link.

Preparation

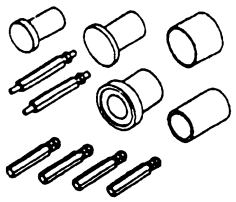
SPECIAL SERVICE TOOLS

*: Special tool or commercial equivalent

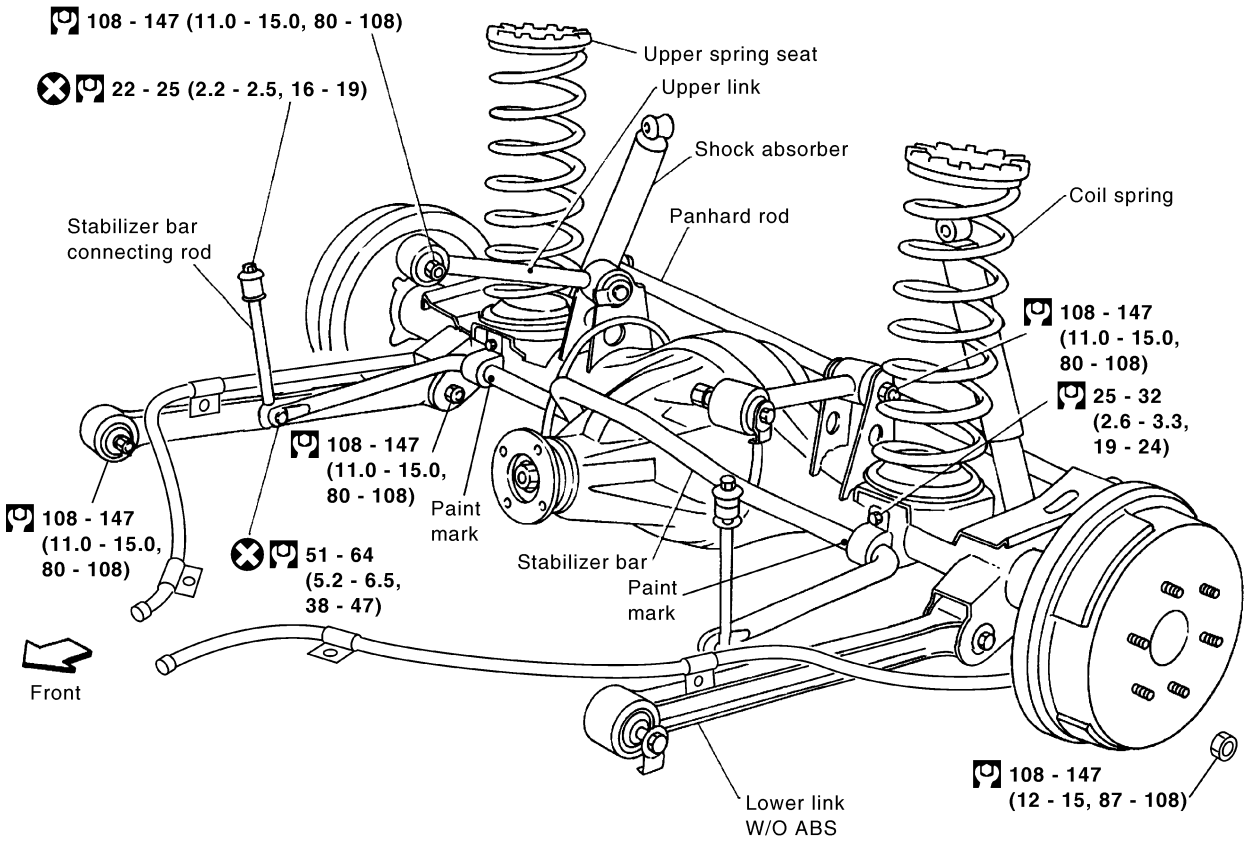
Tool number Tool name	Description	
GG94310000* Flare nut torque wrench		Removing or installing brake piping
KV40101000* Axle stand		Removing rear axle shaft
ST36230000* Sliding hammer		Removing rear axle shaft
ST38020000 Bearing lock nut wrench		Removing wheel bearing lock nut
KV401-06700-B Rear axle shaft bearing puller		Remove wheel bearing and ABS rotor
NI-110 Rear axle shaft guide		Installing rear axle shaft

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Preparation (Cont'd)

Tool number Tool name	Description	
NI-104 Rear axle bearing removal installation kit		Install and remove rear wheel bearing and shaft

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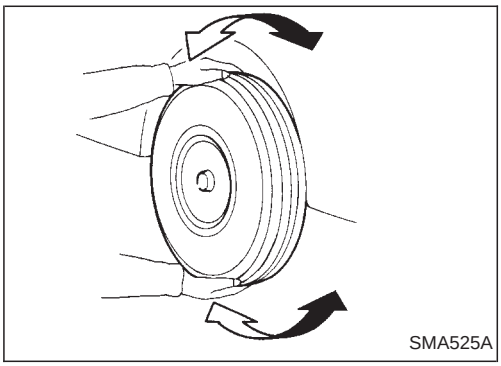
: N•m (kg-m, ft-lb)

When installing each rubber part, final tightening must be carried out under unladen condition* with tires on ground.

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

YRA008

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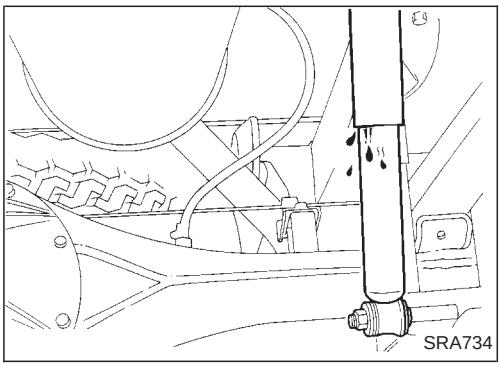

SMA525A

Rear Axle and Rear Suspension Parts

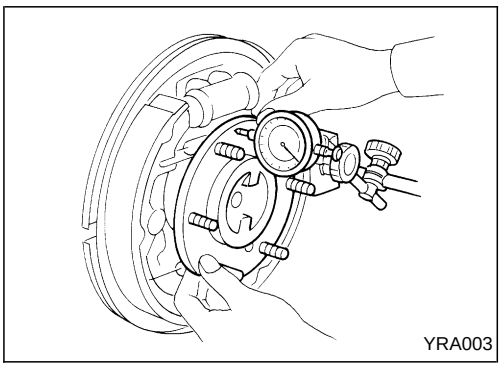
Check rear axle and rear suspension parts for looseness, wear or damage.

- Shake each rear wheel to check for excessive play.

- Retighten all nuts and bolts to the specified torque.
  Tightening torque: refer to REAR AXLE AND REAR SUSPENSION, RA-4.


SRA734

- Check shock absorber for oil leakage or other damage.

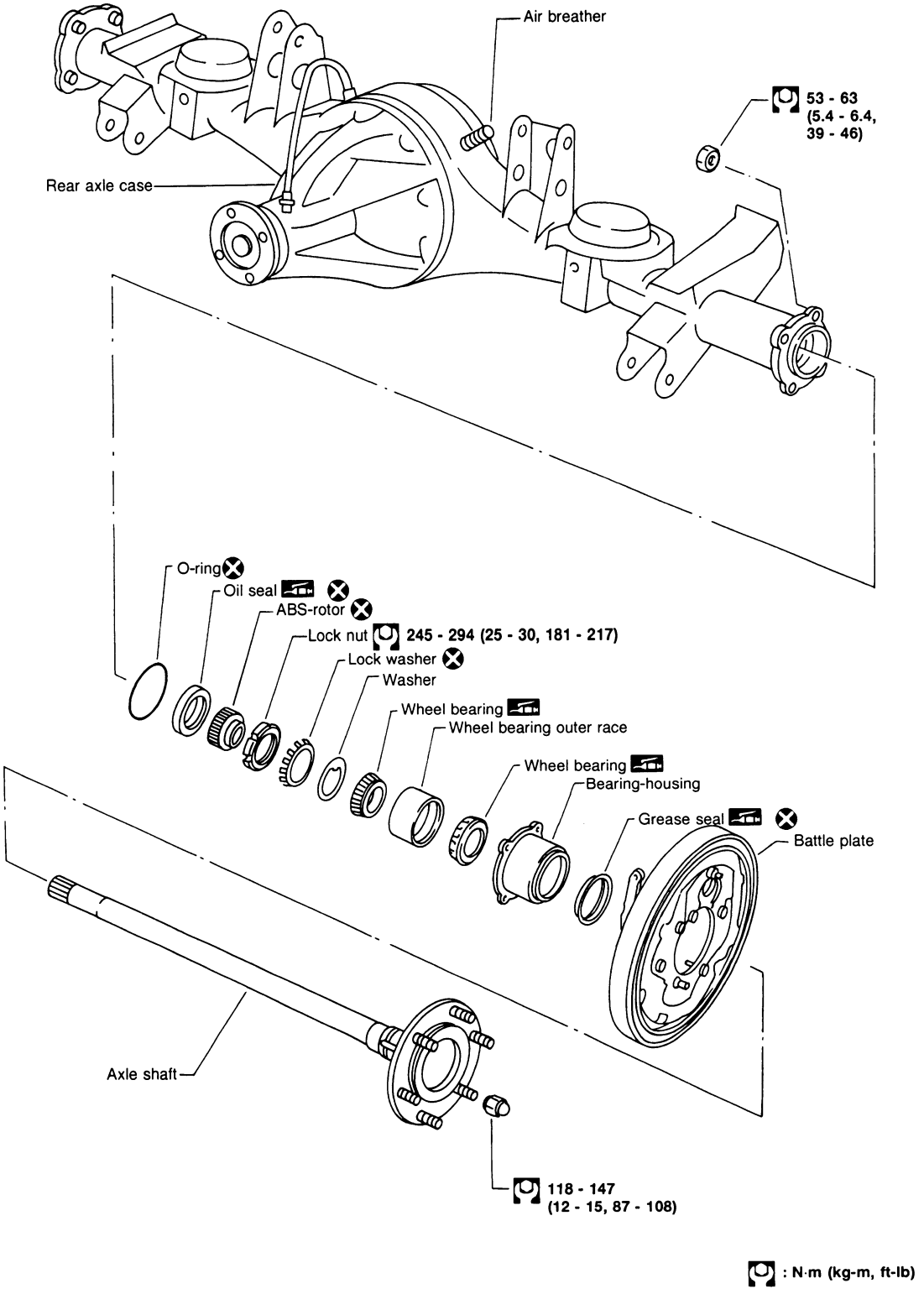

YRA003

Rear Wheel Bearing

- Check that wheel bearings operate smoothly.
- Check axial end play.
  Axial end play:
  Refer to SDS, RA-16.

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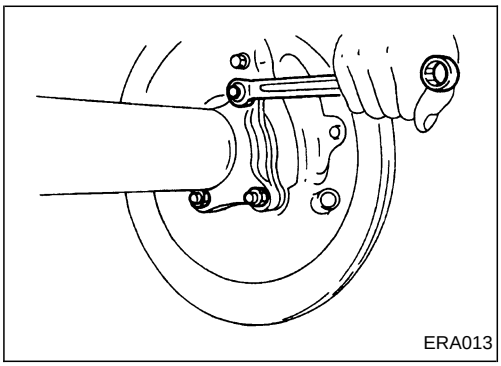
Components



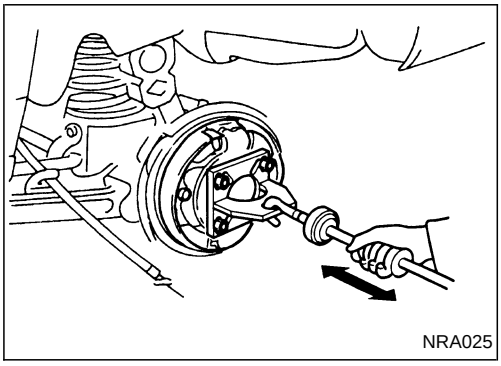
NRA026

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Removal

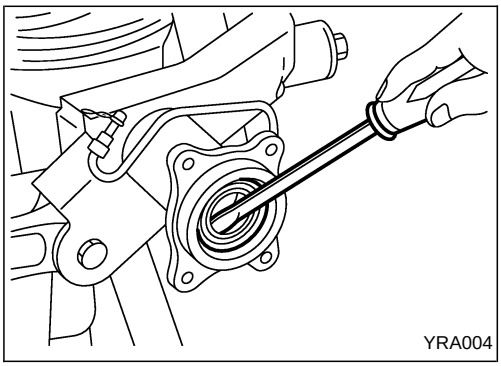


- Disconnect parking brake cable and brake tube.
- Remove nuts securing wheel bearing cage with baffle plate.
- Remove ABS sensor.



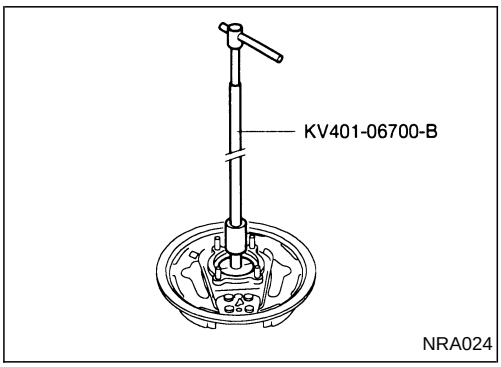
- Draw out axle shaft with Tool.

When drawing out axle shaft, be careful not to damage oil seal.

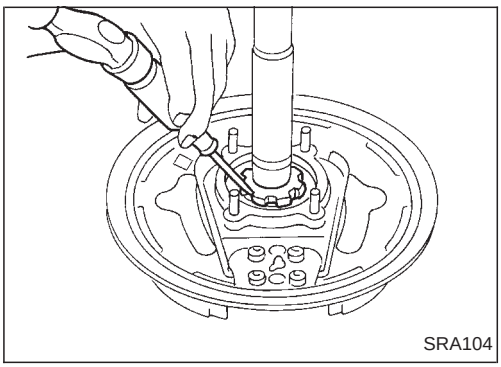


- Remove oil seal.

Do not reuse oil seal one it is removed.
Always install new one.



- Remove ABS-rotor using special tool.

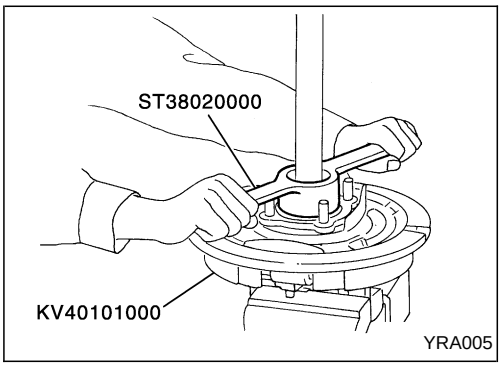


- Unbend lock washer with a screwdriver.

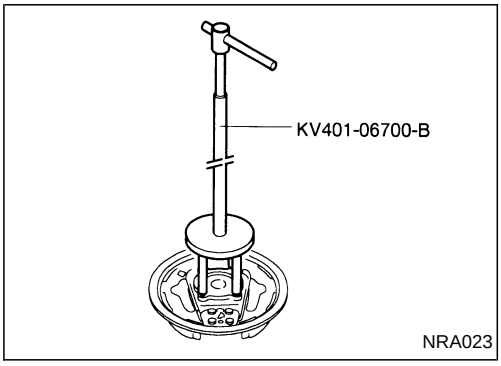
Do not reuse lock washer once it is removed.
Always install new one.

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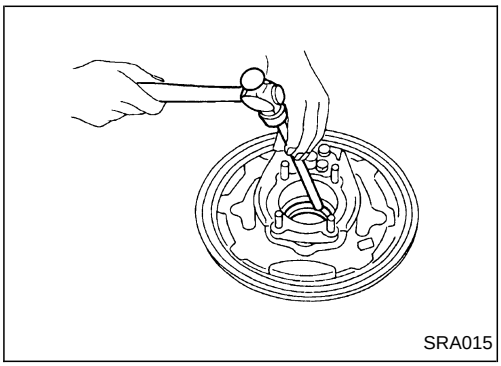
Removal (Cont'd)



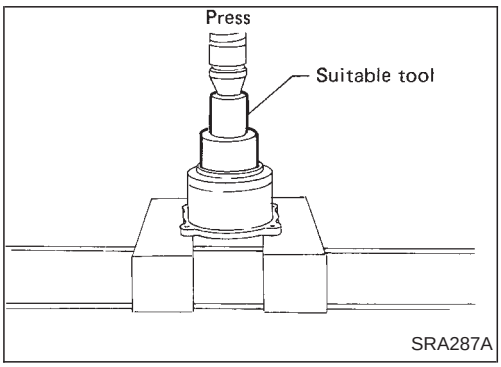
- Remove bearing lock nut with Tool.



- Remove rear axle shaft using special tool.



- Remove grease seal in bearing cage with suitable bar.



- Remove wheel bearing outer race.
  Suitable tool is included in Rear Axle Removal/Installation kit NI-104.

Inspection

AXLE SHAFT

- Check axle shaft for straightness, cracks, damage, wear or distortion. Replace if necessary.

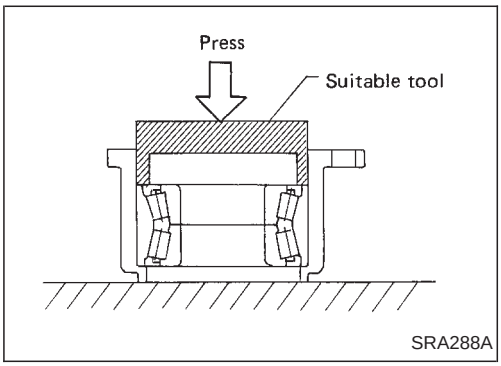
BEARING HOUSING

- Check bearing housing for deformation or cracks. Replace if necessary.

REAR AXLE HOUSING

- Check rear axle housing for yield, deformation or cracks. Replace if necessary.

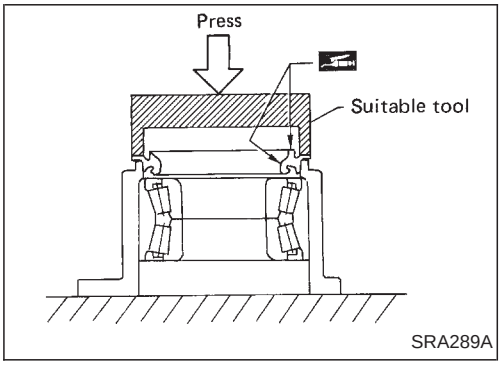
http://vnx.su/



Installation

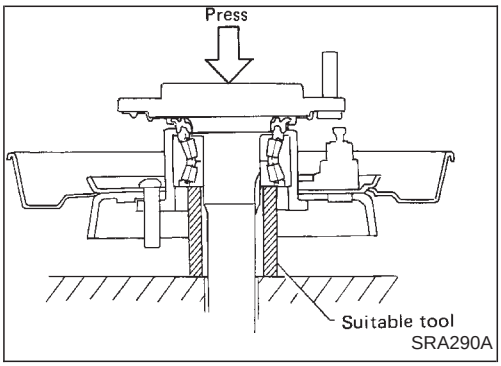
- Press new wheel bearing until it touches the bottom of the bearing housing.

Always press outer race of wheel bearing during installation.



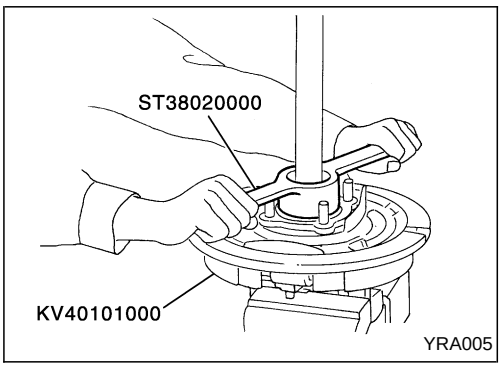
- Press new grease seal until it bottoms end face of bearing housing.

After installing new grease seal, coat sealing lip with multipurpose grease.



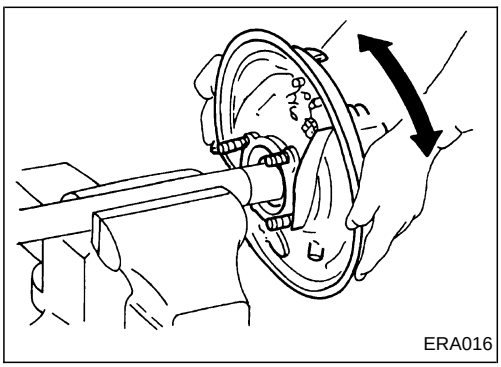
- Install baffle plate over bearing housing and press axle shaft into inner race of wheel bearing.

Be careful not to damage or deform grease seal.



- Install washer and lock washer.
- Before installing lock nut, apply a coat of wheel bearing grease to its seat. Tighten lock nut to specified torque.

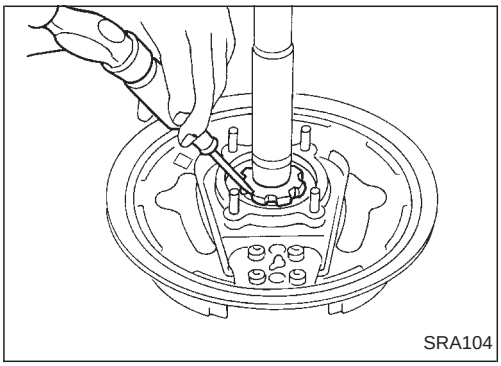
: 245 - 249 N·m
(25 - 30 kg-m, 181 - 217 ft-lb)



- Turn bearing housing (with respect to axle shaft) two or three times. It must turn smoothly.

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Installation (Cont'd)

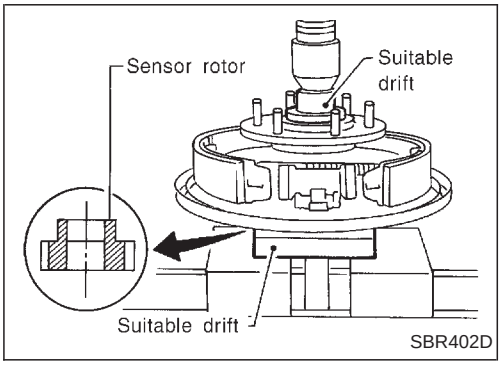


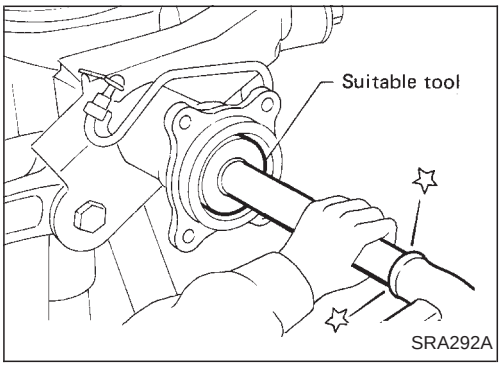
- Secure lock nut by bending one portion of lock washer.

Installation

Install the sensor rotor using suitable drift and press.

- Always replace sensor rotor with new one.
- Pay attention to the direction of front sensor rotor as shown in figure.



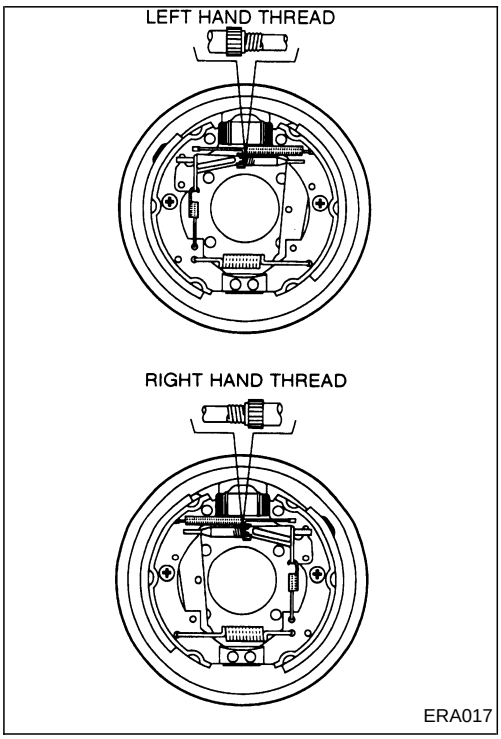


- Install new oil seal to rear axle housing using a suitable tool.

After installing new oil seal, coat sealing lip with multi-purpose grease.

- Position axle shafts in rear axle housing.

Be careful not to damage oil seal.



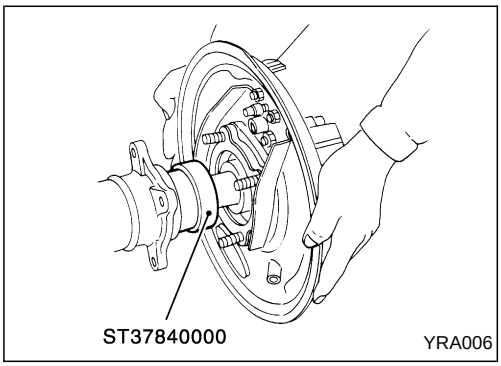
- When the ball-bearing holder and the brake are installed in the base of the axle, they need to be correctly positioned.

A quick way to determine on which side the holder should be located, is to look at the brake adjustment screw.

Left-hand thread:
Install the holder on the left side.
Right-hand thread (Normal)
Install the holder on the right side.

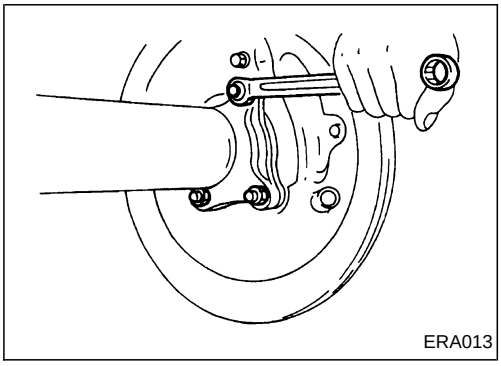
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Installation (Cont'd)

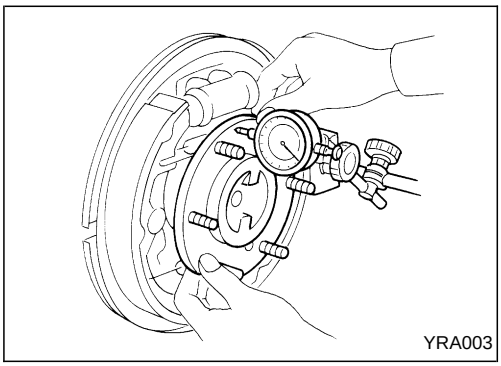


- Insert axle shaft with Tool as a guide.

When inserting axle shaft, be careful not to damage oil seal.



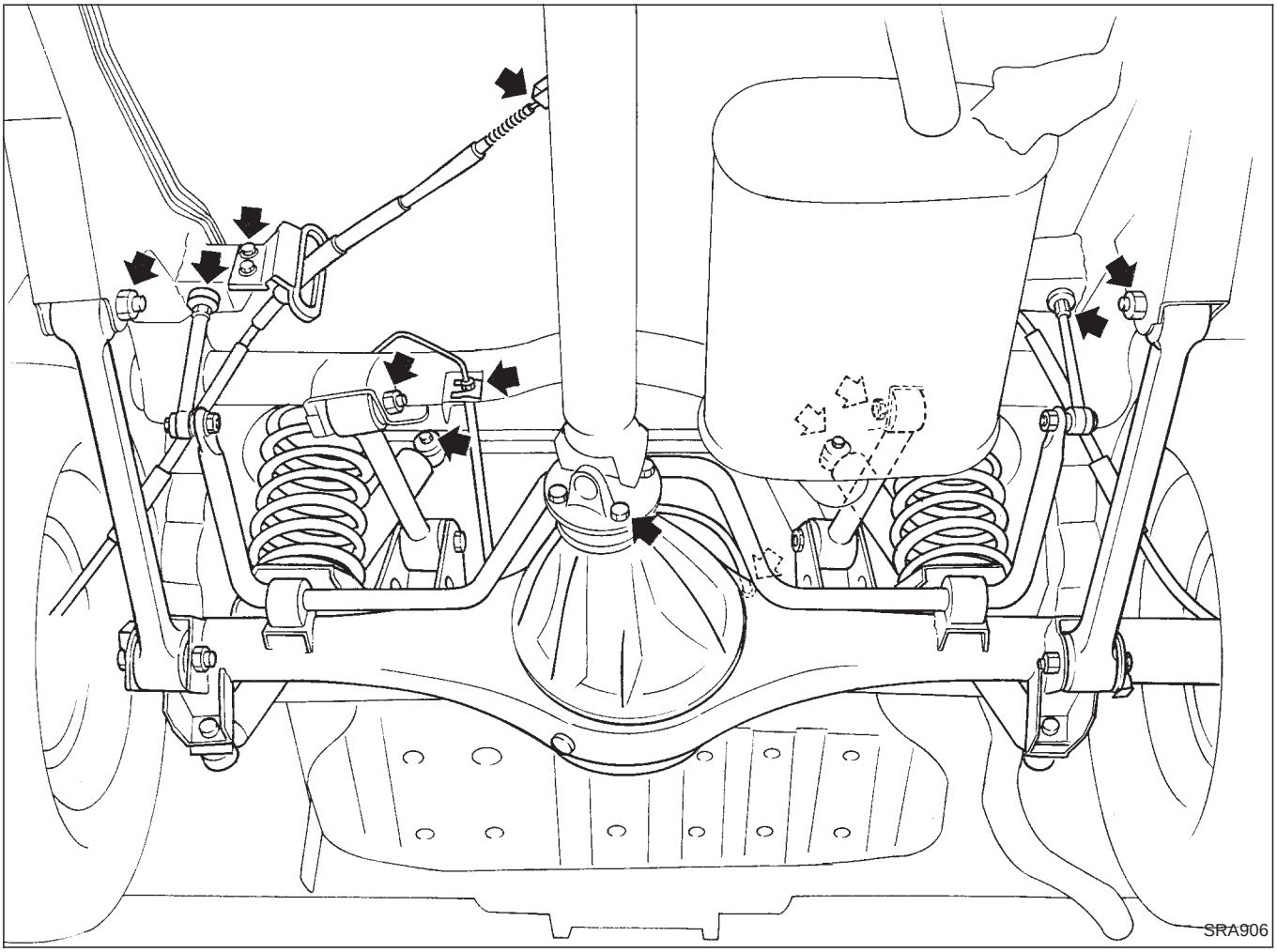
- Tighten nuts to the specified torque.
  : 53 - 63 N·m (5.4 - 6.4 kg-m, 39 - 46 ft-lb)
- Install ABS-sensor.

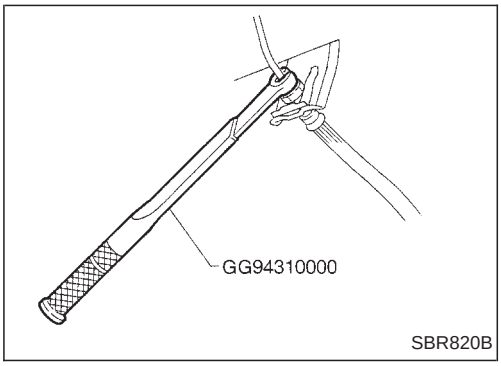


- Measure end play of axle shaft.
  Axial end play:
  0.0 mm (0.0000 in)

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Removal and Installation



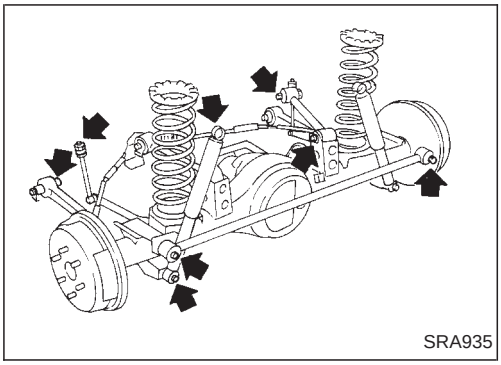


- Disconnect brake hydraulic line and parking brake cable.

CAUTION:

Use Tool when removing or installing brake tubes.

- Remove stabilizer bar from body
- Remove upper links and lower links from body.
- Remove panhard rod from body.
- Disconnect propeller shaft.
- Remove upper end nuts of shock absorber.

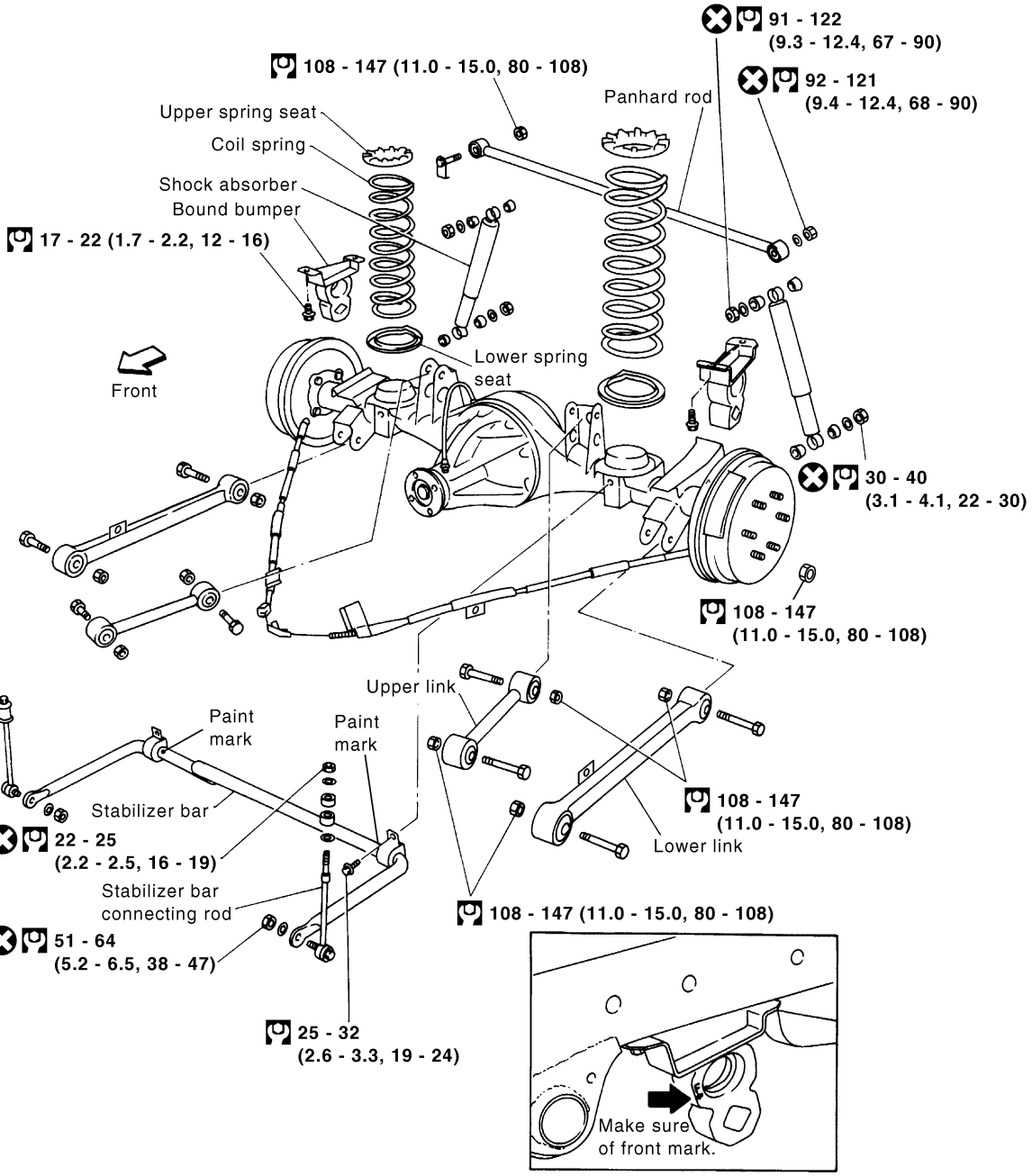


Final tightening for rubber parts requires to be carried out under unladen condition with tires on ground.

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Components

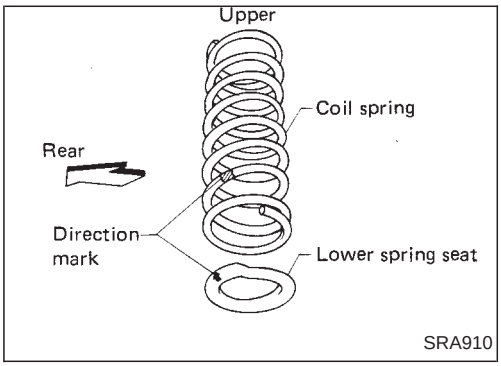
When installing each rubber part, final tightening must be carried out under unladen condition* with tires on ground.
* Fuel, radiator coolant and engine oil full. Spare tire, jack, hand tools and mats in designated positions.



: N•m (kg-m, ft-lb)

YRA009

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Coil Spring Shock Absorber

REMOVAL AND INSTALLATION

- Refer to Removal and Installation of REAR AXLE AND REAR SUSPENSION, RA-12.

When installing coil spring and lower spring seat, pay attention to its direction.
Be sure spring rubber seat is not twisted and has not slipped off when installing coil spring.

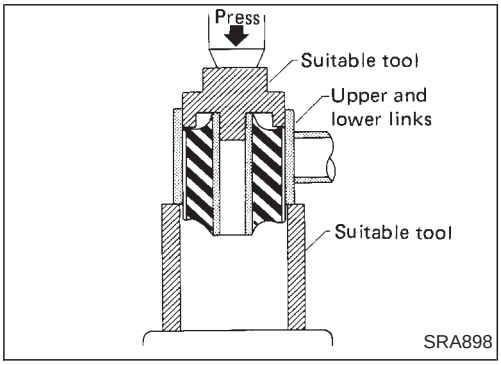
INSPECTION

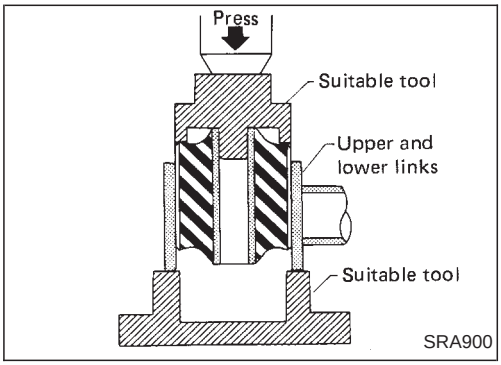
- Check coil spring for yield, deformation or cracks.
- Check coil spring specifications. Refer to SDS, RA-16.
- Check shock absorber for oil leakage, cracks or deformation.
- Check shock absorber specifications. Refer to SDS, RA-16.
- Check all rubber parts for wear, cracks or deformation. Replace if necessary.

Upper Link, Lower Link and Panhard Rod

INSPECTION

Check for cracks, distortion or other damage. Replace if necessary.





BUSHING REPLACEMENT

Check for cracks or other damage. Replace with suitable tool if necessary.

- Remove bushing with suitable tool.

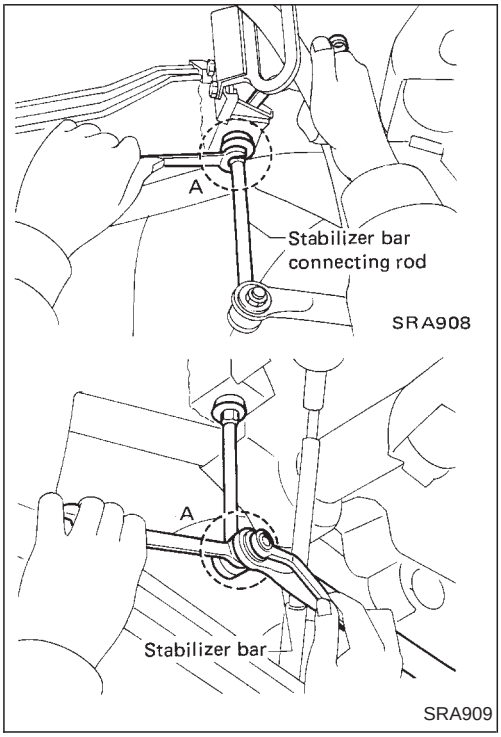
When installing bushing, apply a coating of 1% soap water to outer wall of bushing.
Always install new bushing.
Do not tap end face of bushing directly with a hammer.

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Upper Link, Lower Link and Panhard Rod (Cont'd)

INSTALLATION

When installing each link, pay attention to direction of bolts and nuts. Refer to REAR SUSPENSION - Components, RA-13. When installing each rubber part, final tightening must be carried out under unladen condition with tires on ground.



Stabilizer Bar

REMOVAL AND INSTALLATION

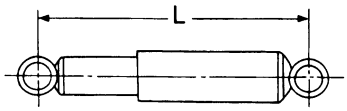
- When removing and installing stabilizer bar, fix portion A.

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General Specifications

COIL SPRING AND SHOCK ABSORBER

Model	Hardtop	Wagon
Coil spring		
Wire diameter mm (in)	13.0 (0.512)	13.5 (0.531)
Free length mm (in)	400 (15.75)	417 (16.42)
Spring constant N/mm (kg/mm, lb/in)	25.5 (2.6, 146)	29 (3.0, 168)
Shock absorber		
Shock absorber type	Non-adjustable (hydraulic)	
Maximum length mm (in)	586 (23.07)	596 (23.46)
Minimum length mm (in)	350 (13.78)	356 (14.02)
Damping force [at 0.3 m (1.0 ft)/sec.] N (kg, lb)		
Expansion	990 - 1,330 (101 - 136, 223 - 229)	1,169 - 1,563 (119 - 159, 223 - 351)
Compression	346 - 524 (35.3 - 53.4, 77.8 - 117.8)	301 - 461 (30.7 - 47.0, 67.7 - 103.6)



RA260

STABILIZER BAR

Model	Hardtop	Wagon
Diameter mm (in)	23 (0.91)	24 (0.94)
Spring constant N/mm (kg/mm, lb/in)	24.5 (2.5, 140)	29.0 (3.0, 166)

Inspection and Adjustment

WHEEL BEARING

Total end play	mm (in)	0 (0)

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BRAKE SYSTEM

SECTION BR

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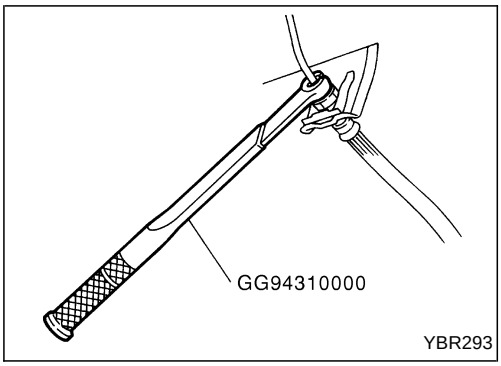
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Supplement Restraint System (SRS) “AIR BAG” and “SEAT BELT PRE-TENSIONER”

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

WARNING:

- **To avoid rendering the SRS inoperative (which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation), all maintenance must be performed by an authorized NISSAN dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses (except “SEAT BELT-TENSIONER” connector) can be identified with yellow harness connector and with yellow harness protector or yellow insulation tape before the harness connectors.**



Precautions

- **Use only “DOT 4” fluid from a sealed container.**
- **Never reuse drained brake fluid.**
- **Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately.**
- **To clean master cylinder parts, disc brake caliper parts or wheel cylinder parts, use clean brake fluid.**
- **Never use mineral oils such as Petrol or kerosene. They will ruin rubber parts of hydraulic system.**
- **Use flare nut wrench when removing and installing brake tubes.**
- **Always torque brake lines when installing.**
- **Burnish the brake contact surfaces after refinishing or replacing drums or rotors, after replacing pads or linings, or if a soft pedal occurs at very low speed. Refer to “Brake Burnishing Procedure”, “Check and Adjustment”, BR-5.**

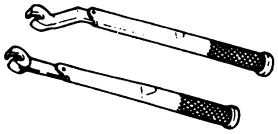
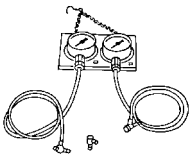
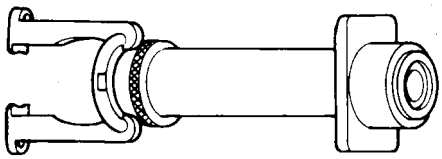
WARNING:

- **Clean brakes with a vacuum dust collector to minimize risk of health hazard from airborne materials.**
- **Avoid prolonged and repeated skin contact with brake fluid.**
- **Wear protective clothing, including impervious gloves.**
- **Where there is a risk of eye contact, eye protection should be worn — for example chemical goggles or face shield.**

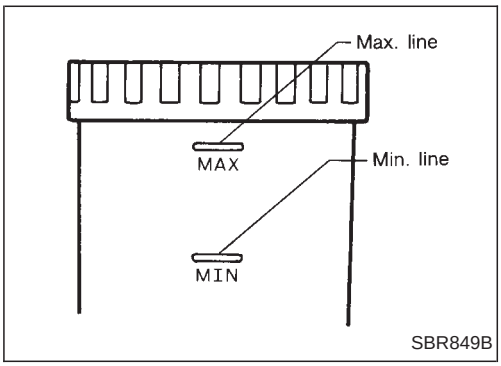
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Preparation

SPECIAL SERVICE TOOLS

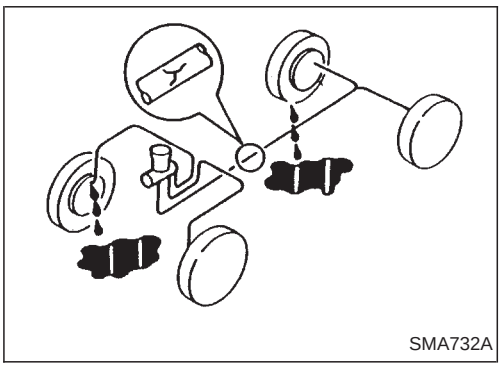
Tool number Tool name	Description	
GG94310000 Flare nut torque wrench		Removing and installing each brake piping
KV991V0010 Brake fluid pressure gauge		Measuring brake fluid pressure
HT72480000 Rear axle shaft bearing puller		Removing rear wheel sensor rotor

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Checking Brake Fluid Level

- Check fluid level in reservoir tank. It should be between Max. and Min. lines on reservoir tank.
- If fluid level is extremely low, check brake system for leaks.
- When brake warning lamp comes on even when parking brake lever is released, check brake system for leaks.

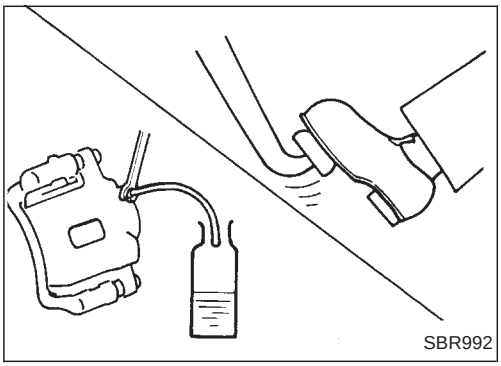


Checking Brake Line

CAUTION:

If leakage occurs around joints, retighten or, if necessary, replace damaged parts.

1. Check brake lines (tubes and hoses) for cracks, deterioration or other damage. Replace any damaged parts.
2. Check for oil leakage by fully depressing brake pedal while engine is running.



Changing Brake Fluid

CAUTION:

- **Refill with new brake fluid “DOT 4”.**
- **Never reuse drained brake fluid.**
- **Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately. DO NOT RUB IT OFF.**

1. Connect a vinyl tube to each air bleeder valve.
2. Drain brake fluid from each air bleeder valve by depressing brake pedal.
3. Refill until new brake fluid comes out of each air bleeder valve. Use same procedure as in bleeding hydraulic system to refill brake fluid. Refer to “Bleeding Brake System”, “BRAKE HYDRAULIC LINE”, BR-8.

Brake Burnishing Procedure

Burnish the brake contact surfaces according to the following procedure after refinishing or replacing rotors or drums, after replacing pads or linings, or if a soft pedal occurs at very low mileage.

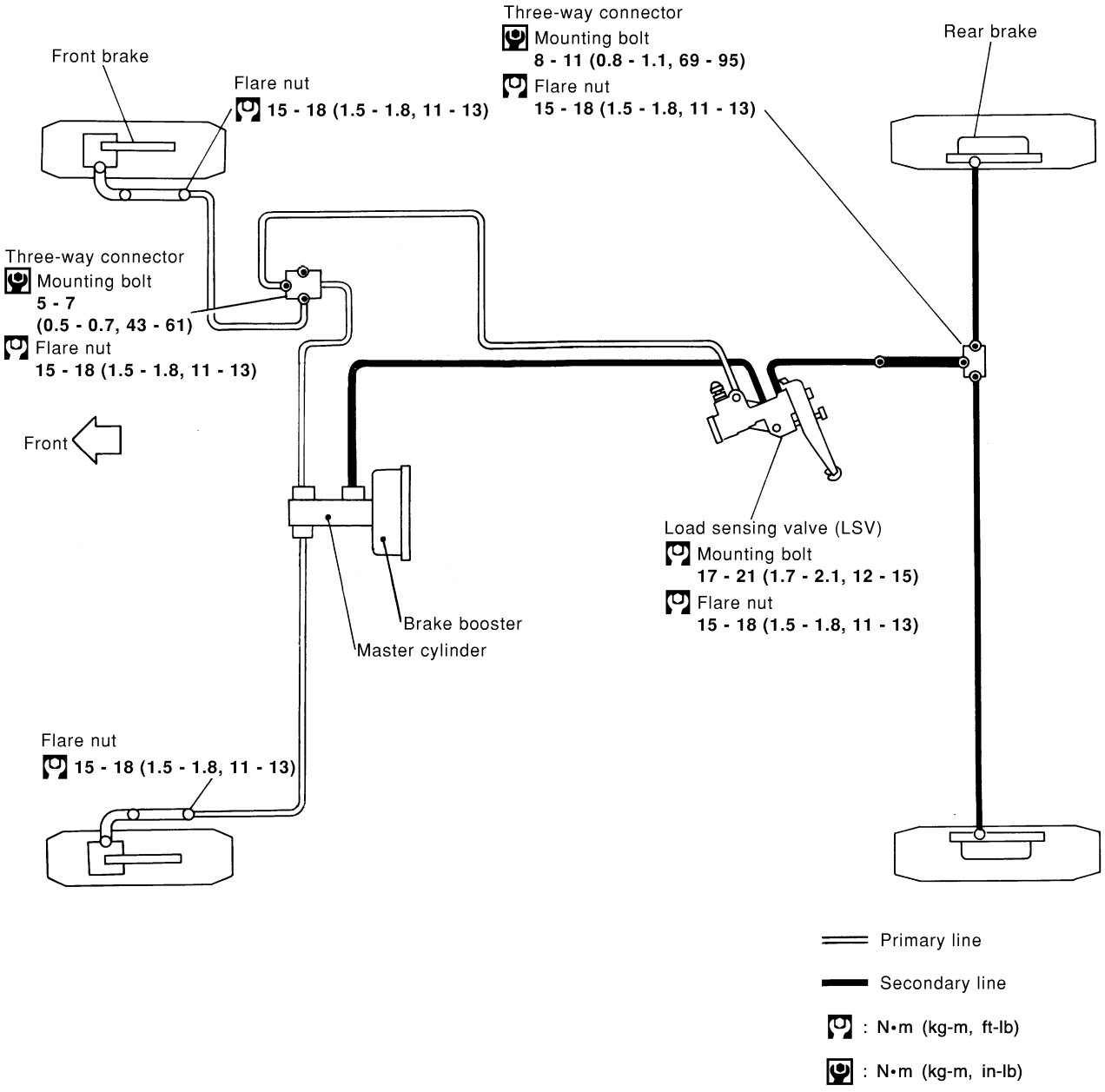
CAUTION:

Only perform this procedure under safe road and traffic conditions. Use extreme caution.

1. **Drive the vehicle on a straight smooth road at 50 km/h (31 MPH).**
2. **Use medium brake pedal/foot to bring the vehicle to a complete stop from 50 km/h (31 MPH). Adjust brake pedal/foot pressure such that vehicle stopping time equals 3 to 5 seconds.**
3. **To cool the brake system, drive the vehicle at 50 km/h (31 MPH) for 1 minute without stopping.**
4. **Repeat steps 1 to 3 for 10 times or more to complete the burnishing procedure.**

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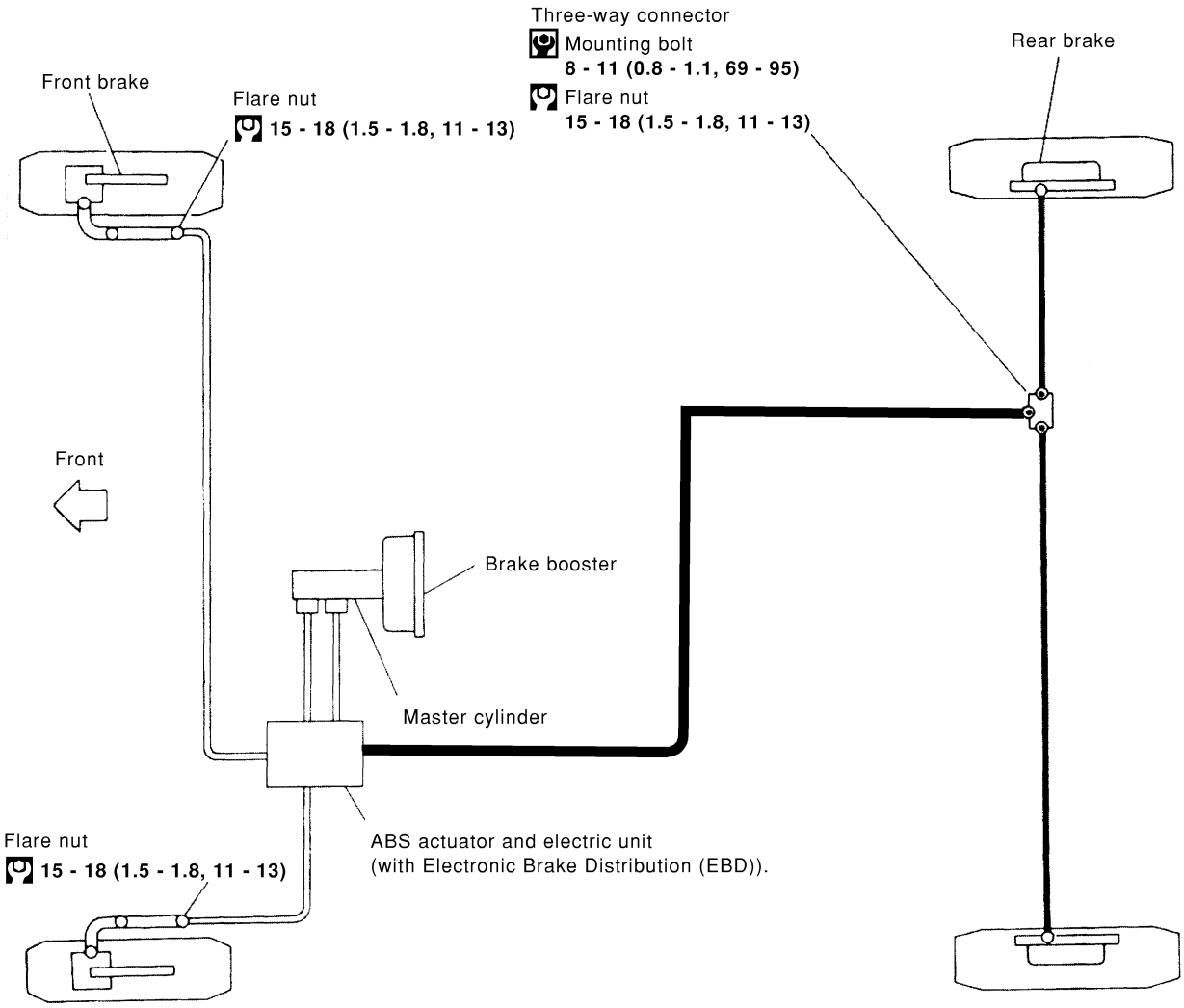
W/O ABS



YBR256

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WITH ABS



Note: without load sensing valve

CAUTION:
When Brake and ABS warning lights come on simultaneously with an audible sound, drive at low speed and brake smoothly to prevent rear wheel locking.

Primary line

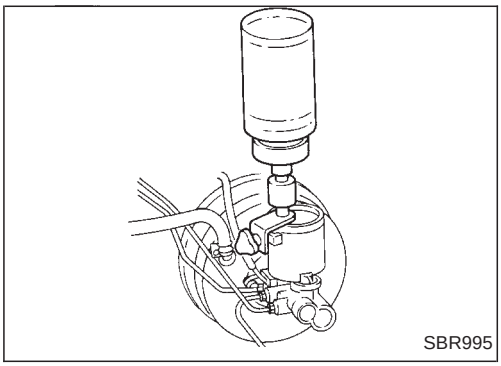
Secondary line

: N•m (kg-m, ft-lb)

: N•m (kg-m, in-lb)

YBR257

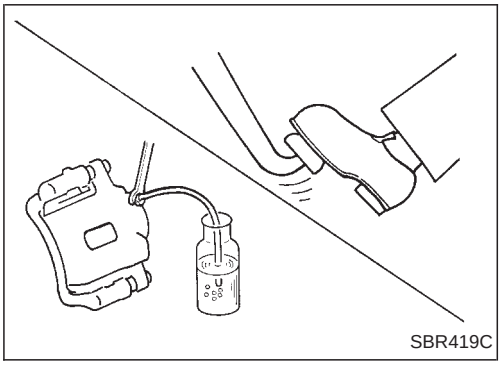
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SBR995

Bleeding Brake System

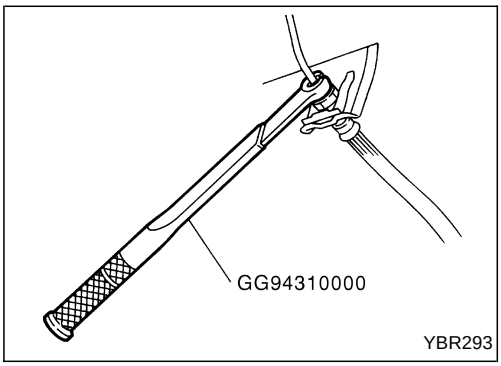
CAUTION:

- **Carefully monitor brake fluid level at master cylinder during bleeding operation.**
- **If master cylinder is suspected to have air inside, bleed air from master cylinder first. Refer to “Installation”, “MASTER CYLINDER”, BR-17.**
- **Fill reservoir with recommended brake fluid “DOT 4”. Make sure it is full at all the times while bleeding air out of system.**
- **Place a container under master cylinder to avoid spillage of brake fluid.**
- **For models with ABS, turn ignition switch to the OFF position and disconnect ABS fuse or battery cable.**
- **Bleed air in the following order:**
  Load Sensing Valve air bleeder (Models equipped with LSV)
  ↓
  Left rear brake
  ↓
  Right rear brake
  ↓
  Left front brake
  ↓
  Right front brake


SBR419C

1. Connect a transparent vinyl tube to air bleeder valve.
2. Fully depress brake pedal several times.
3. With brake pedal depressed, open air bleeder valve to release air.
4. Close air bleeder valve.
5. Release brake pedal slowly.
6. Repeat steps 2 through 5 until clear brake fluid comes out of air bleeder valve.
7. Tighten air bleeder valve
   : 7 - 9 N·m (0.7 - 0.9 kg-m, 61 - 78 in-lb)

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Removal

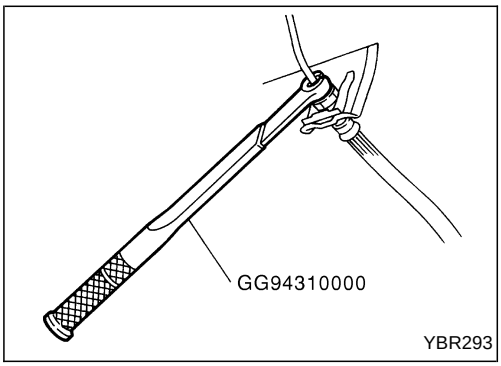
CAUTION:

- **Use suitable tool for assembly and disassembly of brake lines and hoses.**
- **Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately. DO NOT RUB IT OFF.**
- **All hoses must be free from excessive bending, twisting and pulling.**

1. Connect a vinyl tube to air bleeder valve.
2. Drain brake fluid from each air bleeder valve by depressing brake pedal.
3. Remove flare nut securing brake tube to hose, then withdraw lock spring.
4. Cover openings to prevent entrance of dirt whenever disconnecting hydraulic line.

Inspection

Check brake lines (tubes and hoses) for cracks, deterioration or other damage. Replace any damaged parts.



Installation

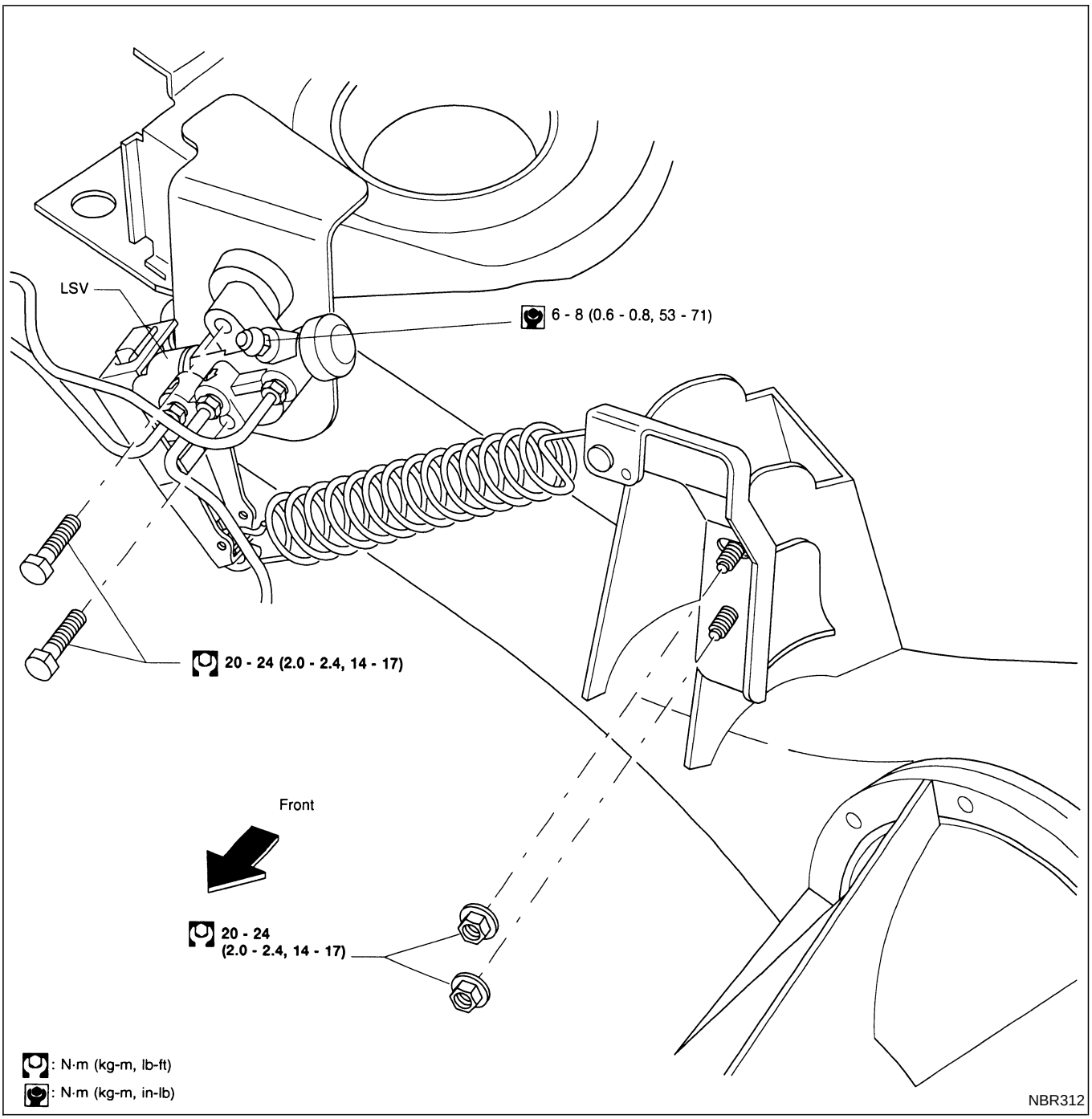
CAUTION:

- **Refill with new brake fluid “DOT 4”.**
- **Never reuse drained brake fluid.**

1. Tighten all flare nuts and connecting bolts.
   Flare nut:
   : 15 - 18 N·m (1.6 - 1.8 kg-m, 11 - 13 ft-lb)
   Connecting bolt:
   : 17 - 20 N·m (1.7 - 2.0 kg-m, 12 - 14 ft-lb)
2. Refill until new brake fluid comes out of each air bleeder valve.
3. Bleed air. Refer to “Bleeding Brake System”, BR-8.

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Removal and Installation

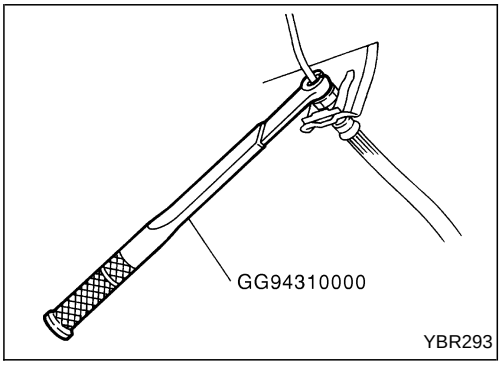


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Removal

CAUTION:

- **Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately. DO NOT RUB IT OFF.**
- Remove flare nuts and LSV bolts.



Installation

CAUTION:

- **Refill with new brake fluid “DOT 4”.**
- **Never reuse drained brake fluid.**
- **Check level in brake fluid reservoir.**

1. Tighten provisionally flare nuts.
2. Tighten LSV bolts.
   : 20 - 24 N·m (2.0 - 2.4 kg-m, 14 - 17 ft-lb)
3. Tighten flare nuts.
   : 15 - 18 N·m (1.5 - 1.8 kg-m, 11 - 13 ft-lb)
4. Bleed air. Refer to “Bleeding Brake System”, “BRAKE HYDRAULIC LINE”, BR-8.
5. Adjust load sensing valve (LSV). Refer to “Inspection and Adjustment”, “LOAD SENSING VALVE”, BR-12.

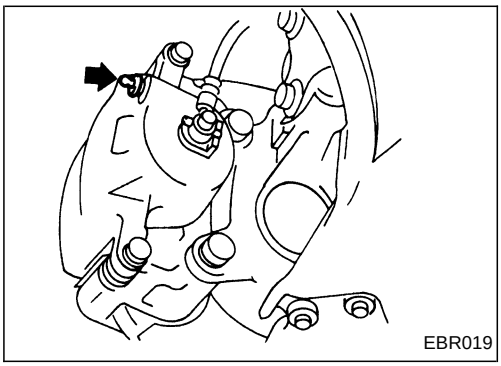
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Inspection and Adjustment

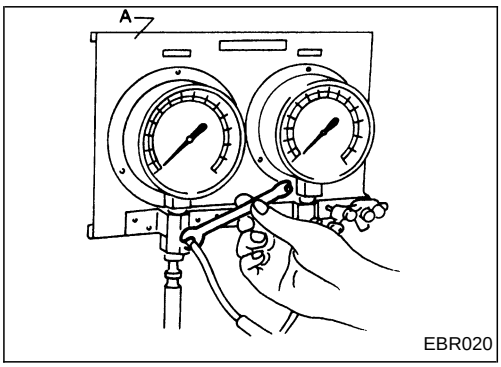
CAUTION:

- **Check level in brake fluid reservoir.**
- **Refill with recommended brake fluid “DOT 4”.**
- **Never reuse drained brake fluid.**
- **Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas wash it away with water immediately. DO NOT RUB IT OFF.**

1. Before adjusting load sensing valve spring length, check for proper installation and abnormal wear of brake pads and shoes.

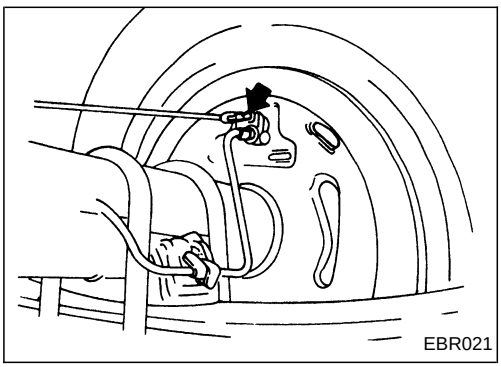

EBR019

2. Remove the air bleeder from the wheel caliper, and install a pressure gauge (A) to the bleed valve hole.



EBR020

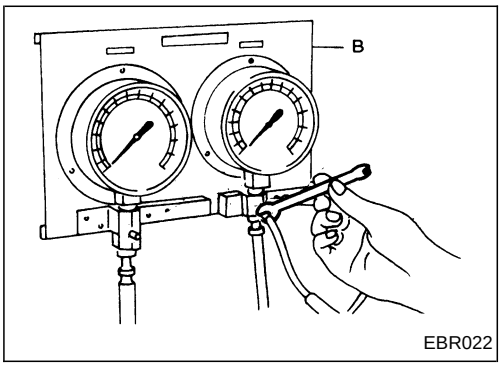
3. Bleed the air from the front brake piping.


EBR021

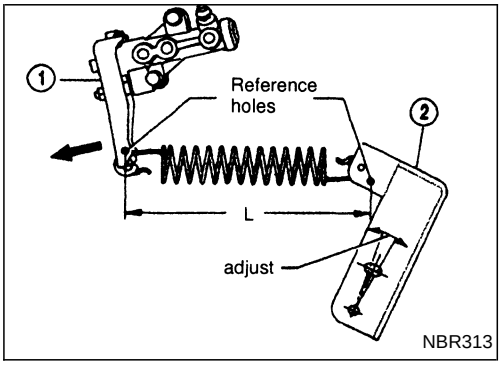
4. Remove the air bleed valve from the rear wheel cylinder, and install a pressure gauge (B) to the bleed valve hole.

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Inspection and Adjustment (Cont'd)



5. Bleed the air from the rear brake piping.

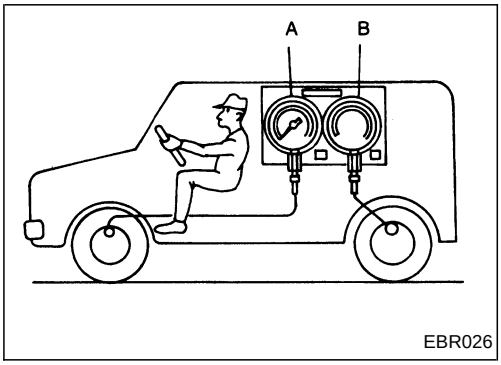


6. To adjust the LSV correctly, proceed as follows:

a. With unladen vehicle (12 liters of fuel, radiator coolant and engine oil are full). Spare tire, hand tools and mats in designated positions. Ensure all doors are closed and no one is inside of the car. Check the length of LSV spring "L".

b. If the spring length is different from that specified, move the regulation lever (2) until the specified value is obtained. Move the LSV lever (1) until it contacts the stopper bolt and recheck the spring length.

Sensor spring length "L"
Hardtop: 211 mm (8.31 in)
Wagon: 209 mm (8.23 in)
NOTE: Do not disturb stopper bolt.



c. Start the engine and run it at idling speed.

d. Slowly depress the brake pedal until an input pressure of 4,805 kPa (48.1 bar, 49 kg/cm^2, 697 psi) is obtained (at the front axle pressure gauge) and an output pressure of 1,736 - 2,501 kPa (18 - 26 bar, 17.7 - 25.5 kg/cm^2, 252 - 363 psi) is obtained (at the rear axle pressure gauge).

If the output pressure at the rear axle pressure gauge is not within the specified values, adjust LSV spring length as described under b) until the output pressure measured is within the specified range.

Unit: kPa (bar, kg/cm^2, psi)

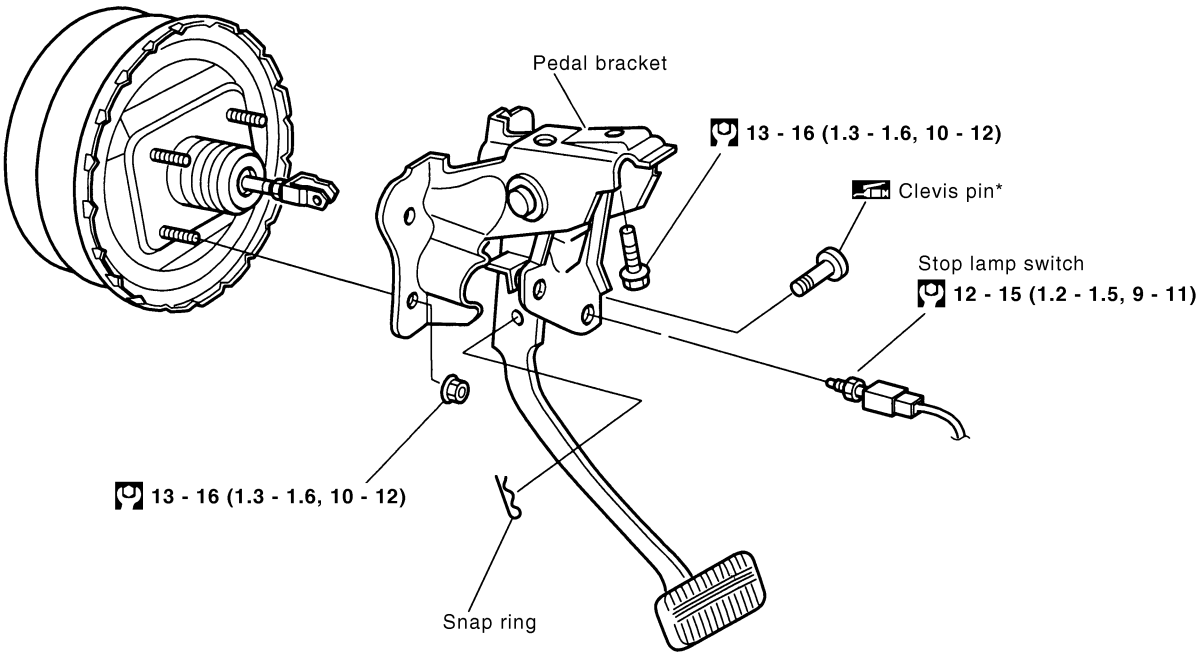
Front axle*	4,805 (48.1, 49.0, 697)
Rear axle*	1,736 - 2,501 (18 - 26, 17.7 - 25.5, 252 - 363)

* Load conditions as indicated under 6.a, driver seat occupied.

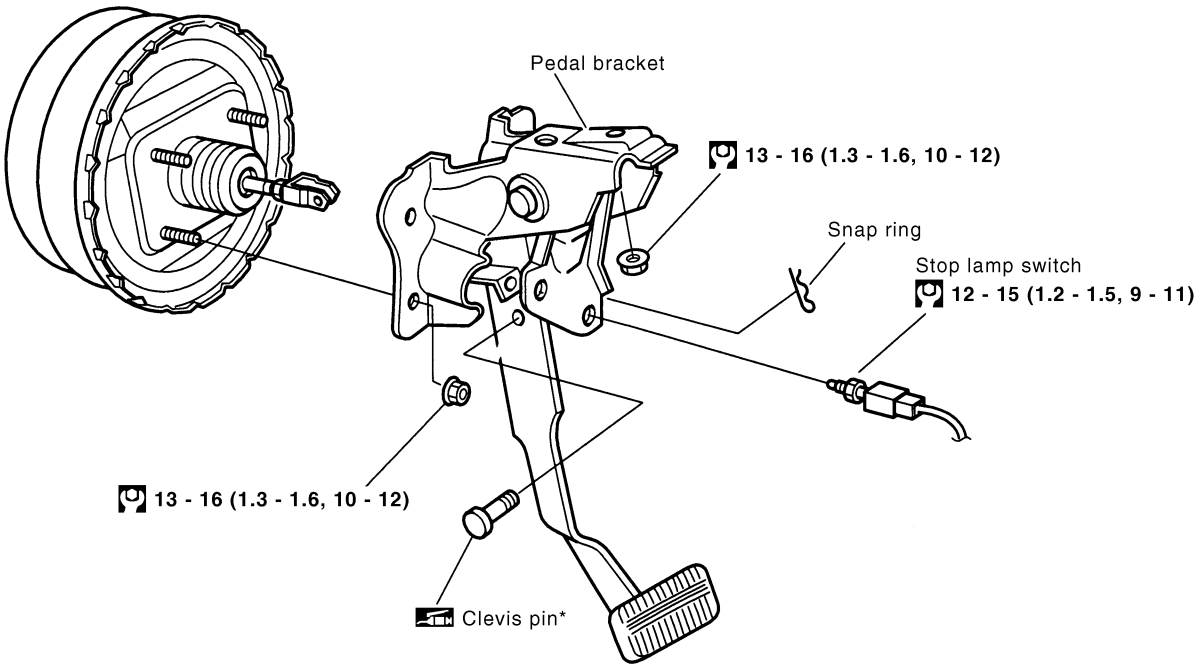
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Removal and Installation

LHD



RHD



: N•m (kg-m, ft-lb)

YBR446

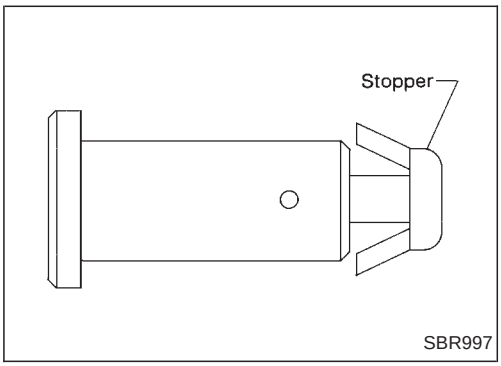
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Removal

1. Remove stop lamp switch connector and stop lamp switch.
2. Remove bolt for (LHD) or nut for (RHD) securing pedal bracket to the front panel.
3. Remove snap ring and pull clevis pin from the brake pedal.
4. Remove 4 mounting nuts securing pedal bracket to the brake booster.

Installation

Install pedal bracket in the reverse order of the removal.
NOTE:
Pay attention to the direction of the clevis pin for installation.

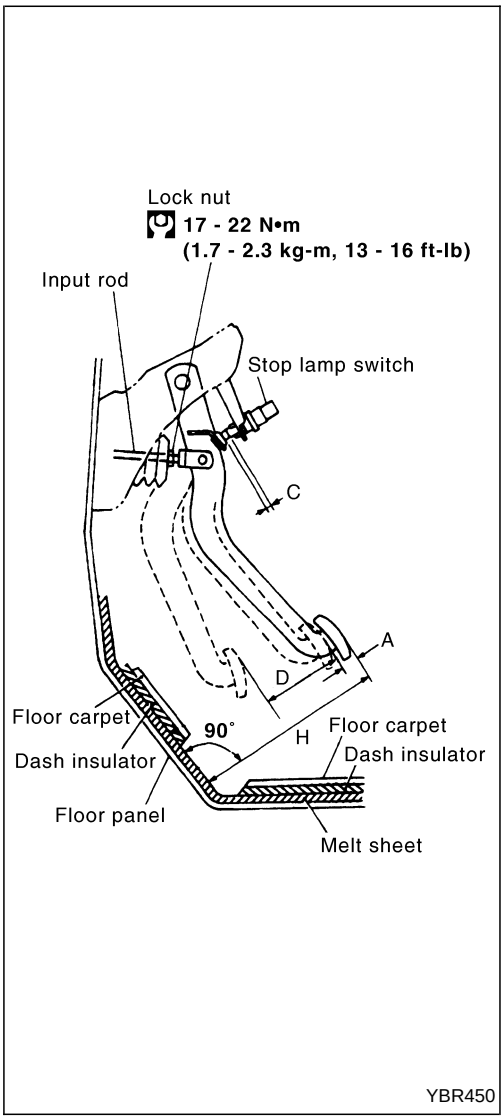


Inspection

Check brake pedal for following items:

- Brake pedal bend
- Clevis pin deformation
- Crack of any welded portion
- Crack or deformation of clevis pin stopper

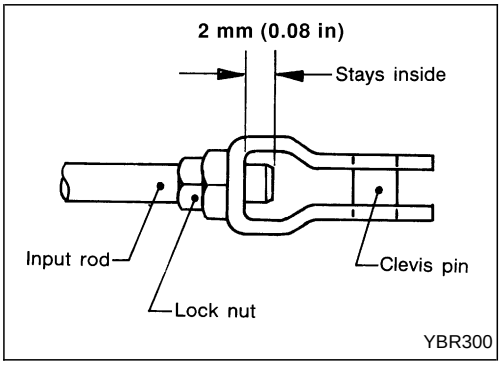
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Adjustment

Check brake pedal free height from dash reinforcement panel.

H: Free height
Refer to SDS, BR-86.
D: Full stroke
Refer to SDS, BR-86.
C: Clearance between pedal stopper and threaded end of stop lamp switch
0.3 - 1.0 mm (0.012 - 0.039 in)
A: Pedal free play
1.0 - 3.0 mm (0.039 - 0.118 in)



If necessary, adjust brake pedal free height.

1. Loosen lock nut and adjust pedal free height by turning brake booster input rod. Then tighten lock nut.

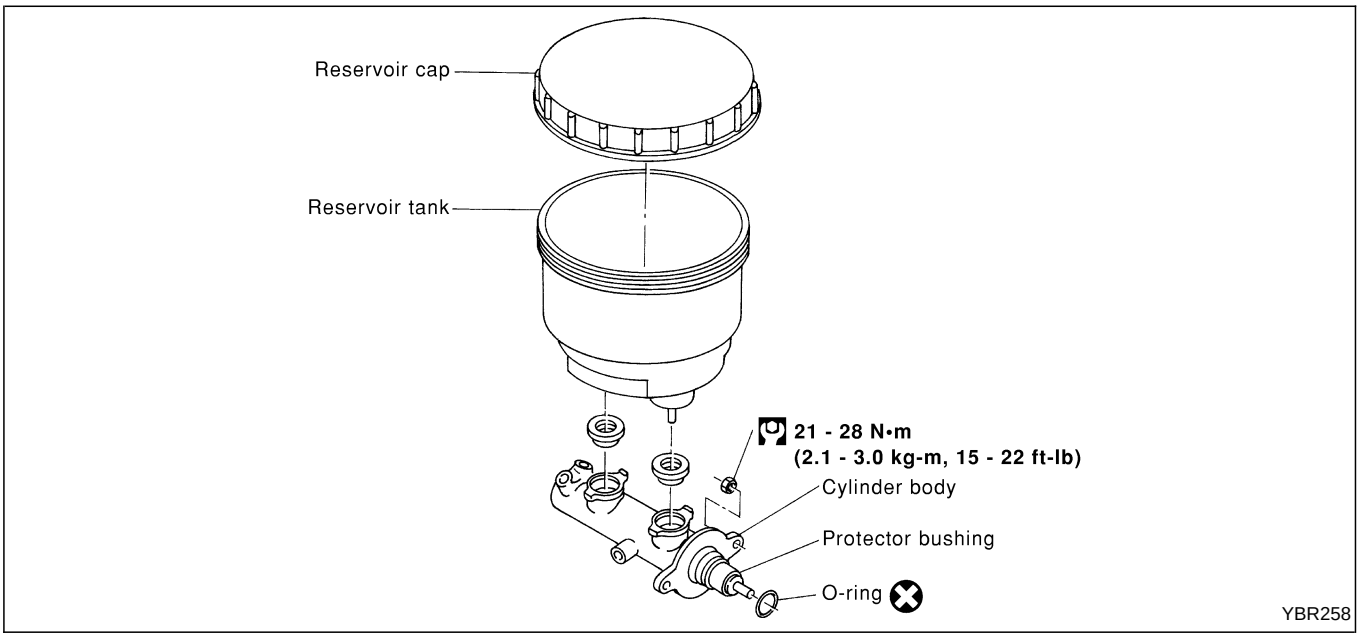
Make sure that tip of input rod stays inside of clevis as shown.

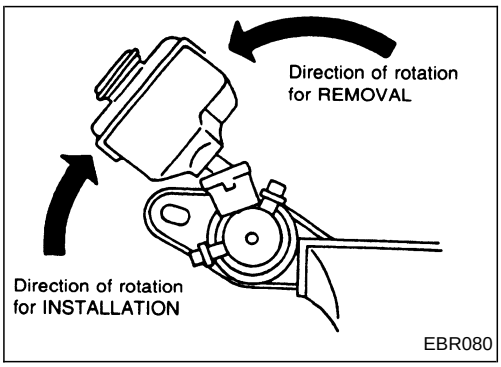
2. Loosen lock nut and adjust clearance “C” with stop lamp switch. Then tighten lock nuts.
3. Check pedal free play.

Make sure that stop lamps go off when pedal is released.

4. Check brake system for leaks, accumulation of air or any damage to components (master cylinder, etc.); then make necessary repairs.
5. After installation and adjustment, operate the brake pedal to full stroke several times to confirm that strange sound interference hitching or other do not arise working smoothly throughout the stroke.

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Removal

CAUTION:

Be careful not to splash brake fluid on painted areas; it may cause paint damage. If brake fluid is splashed on painted areas, wash it away with water immediately. DO NOT RUB.

1. Connect a vinyl tube to air bleeder valve.
2. Drain brake fluid from each air bleeder valve, depressing brake pedal to empty fluid from master cylinder.
3. Remove brake pipe flare nuts.
4. Remove master cylinder mounting nuts.
5. Remove protector of master cylinder, and avoid scratching the surface of master cylinder during removal.

CAUTION:

Do not disassemble master cylinder.

NOTE:

If it is necessary to change the brake fluid reservoir, remove it as shown in the illustration on the left, while holding the seals with one hand.

It is not necessary to replace the seals if they are in a good condition.

Installation

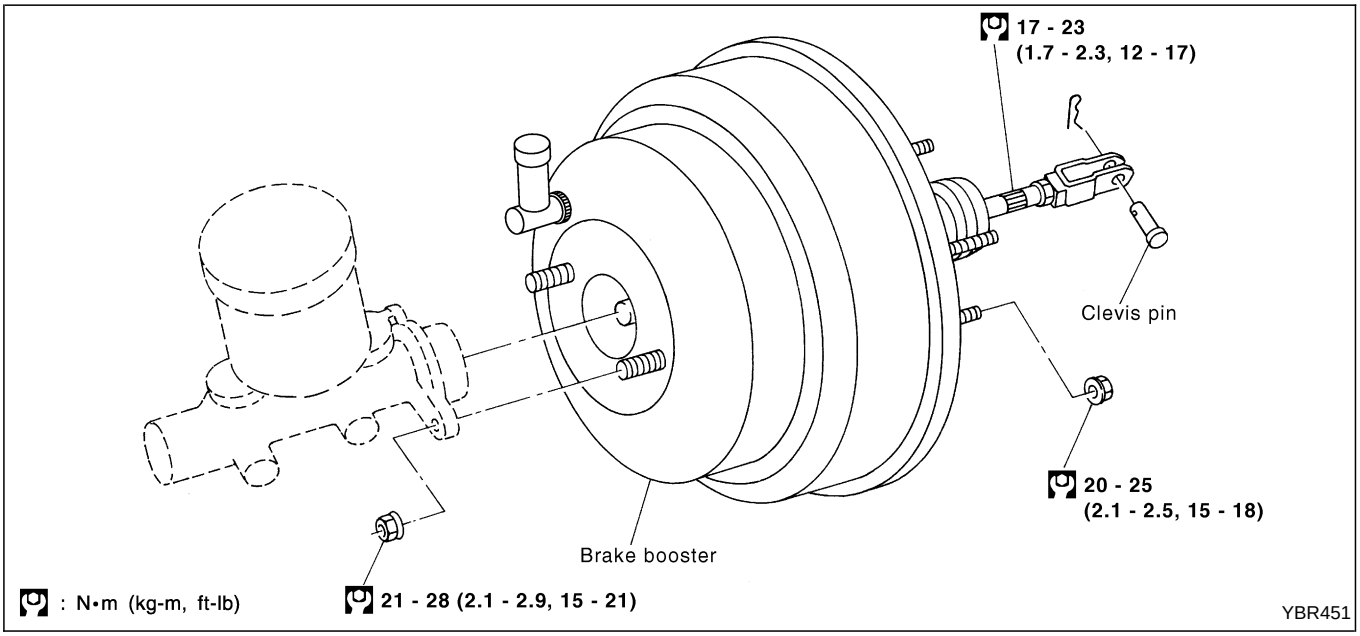
CAUTION:

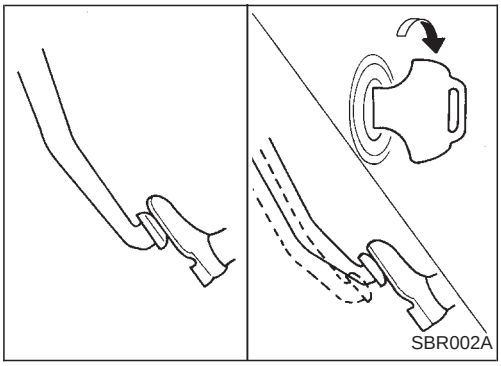
- **Refill with new brake fluid “DOT 4”.**
- **Never reuse drained brake fluid.**

1. Place master cylinder onto brake booster and secure mounting nuts lightly.
2. Fit flare nuts to master cylinder.
3. Tighten mounting nuts.
   : 21 - 29 N·m (2.1 - 3.0 kg-m, 15 - 22 ft-lb)
4. Tighten flare nuts.
   : 15 - 18 N·m (1.5 - 1.8 kg-m, 11 - 13 ft-lb)
5. Bleed air. Refer to “Bleeding Brake System”, “BRAKE HYDRAULIC LINE”, BR-8.

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Removal and Installation

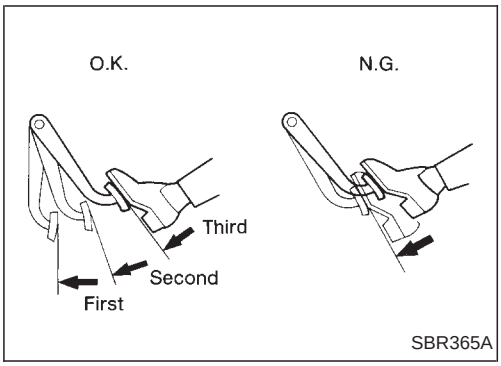




Inspection

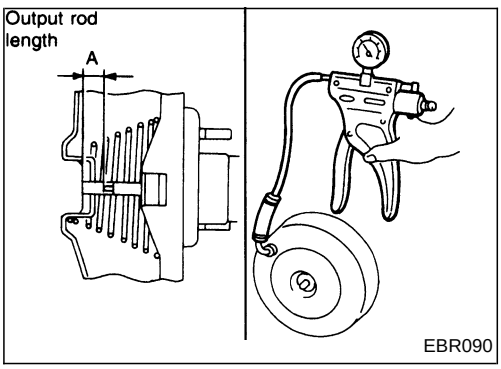
OPERATING CHECK

- Depress brake pedal several times with engine off, and check that there is no change in pedal stroke.
- Depress brake pedal, then start engine. If pedal goes down slightly, operation is normal.



AIRTIGHT CHECK

- Start engine, and stop it after one or two minutes. Depress brake pedal several times slowly. If pedal goes further down the first time and gradually rises after second or third time, booster is airtight.
- Depress brake pedal while engine is running, and stop engine with pedal depressed. If there is no change in pedal stroke after holding pedal down **30 seconds**, brake booster is airtight.

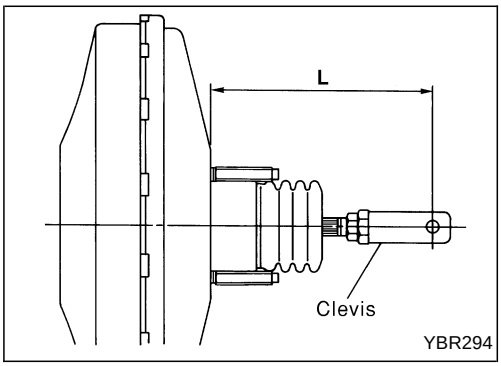


OUTPUT ROD LENGTH CHECK

1. Apply vacuum of −66.7 kPa (−667 mbar, −500 mmHg, −19.69 inHg) to brake booster with a manual vacuum pump and check output rod length “A”.
   Specified length “A”:
   22.15 - 22.45 mm (0.872 - 0.884 in)
   (The length “A” in this case is the distance from end of output rod to outside of brake booster, when the specified vacuum is applied.)

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Inspection (Cont'd)



2. Check output rod length "L" when brake booster doesn't work.
   Specified length "L":
   129.2 - 130.2 mm (5.09 - 5.13 in)

Installation

CAUTION:

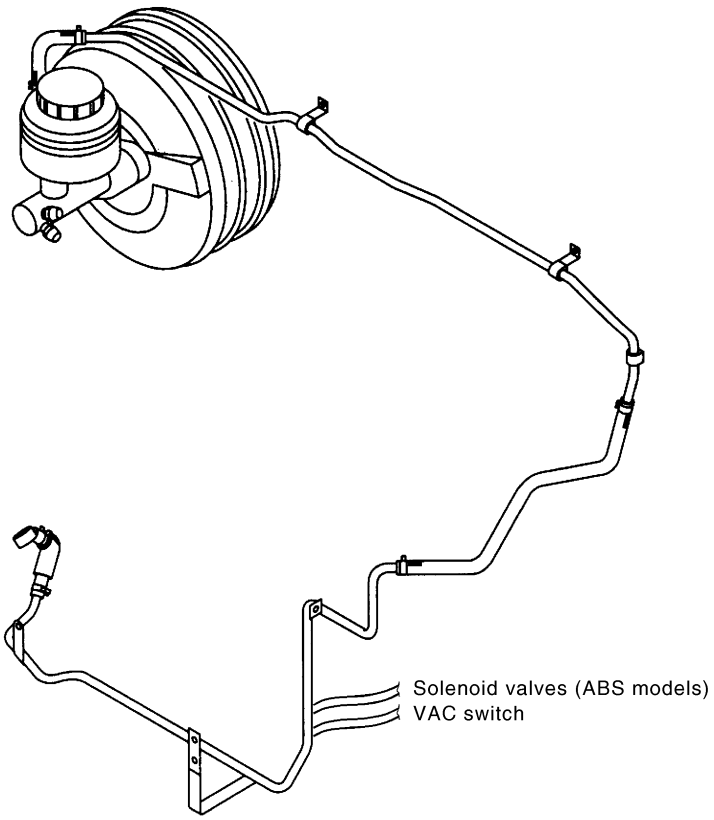
- **Be careful not to deform or bend brake pipes, during installation of booster.**
- **Replace clevis pin if damaged.**
- **Refill with new brake fluid "DOT 4".**
- **Never reuse drained brake fluid.**
- **Take care not to damage brake booster mounting bolt thread when installing. Due to the acute angle of installation, the threads can be damaged on the metal surrounding the dash panel holes.**

1. Before fitting booster, temporarily adjust clevis to dimension shown.
2. Fit booster, then secure mounting nuts (brake pedal bracket to brake booster) lightly. (Join brake booster and brake pedal bracket to the front end of the vehicle interior).
3. Connect brake pedal and booster input rod with clevis pin.
4. Secure mounting nuts.
   : 20 - 25 N·m (1.3 - 1.6 kg-m, 10 - 12 ft-lb)
5. Install master cylinder. Refer to "Installation", "MASTER CYLINDER", BR-17.
6. Bleed air. Refer to "Bleeding Brake System", "BRAKE HYDRAULIC LINE", BR-8.
7. Adjust brake height. Refer to "Adjustment", "BRAKE PEDAL AND BRACKET", BR-16.
8. Tighten brake booster lock nut.
   : 17 - 23 N·m (1.7 - 2.3 kg-m, 12 - 17 ft-lb)

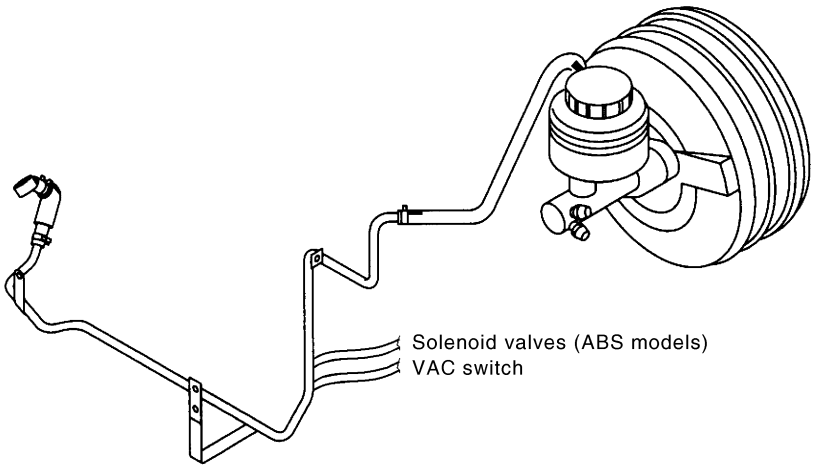
http://vnx.su/

Removal and Installation

TD27Ti Engine
RHD



LHD

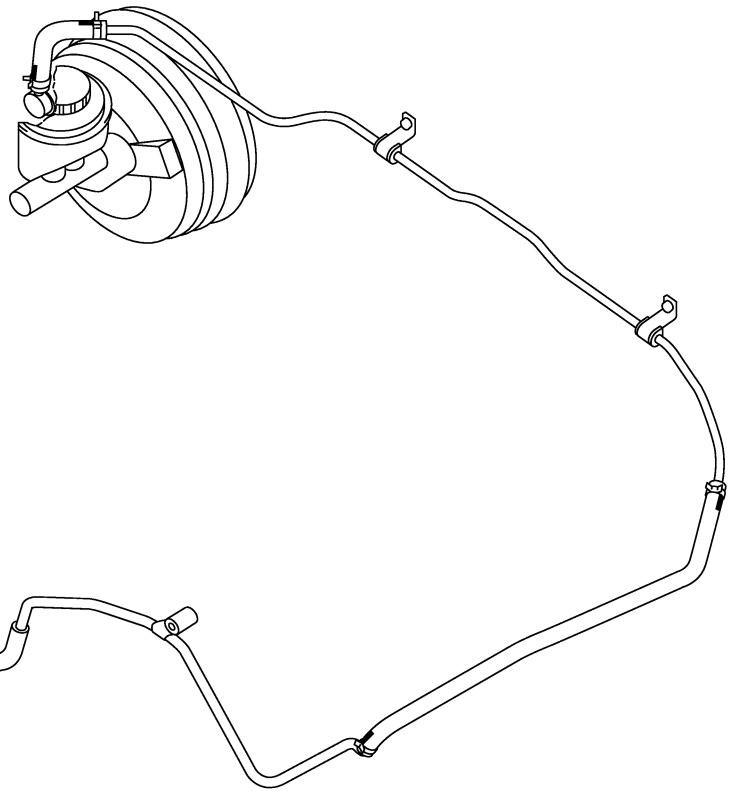


YBR453

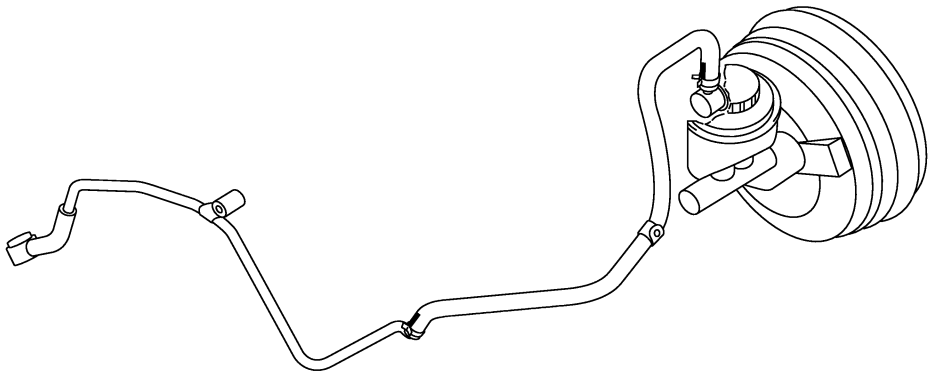
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Removal and Installation (Cont'd)

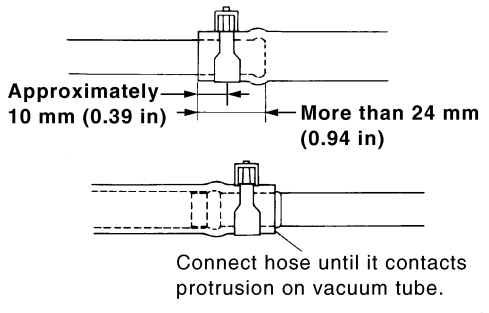
ZD30DDTi Engine
RHD



LHD



YBR454



YBR452

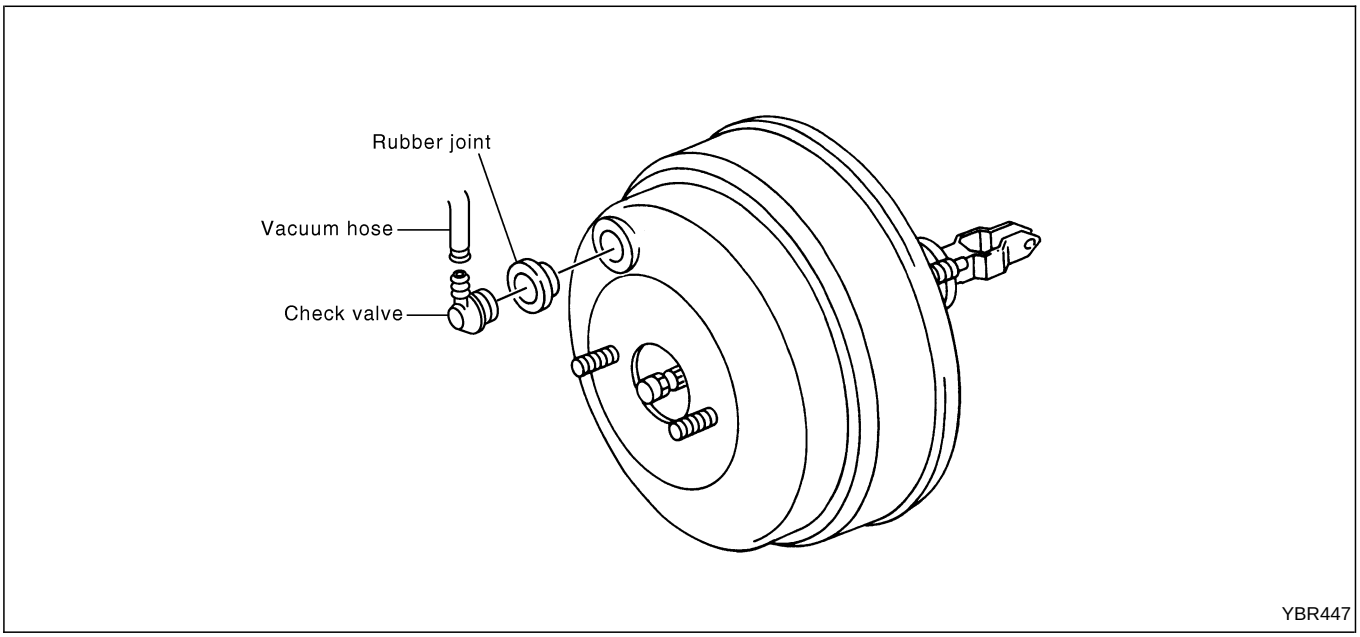
CAUTION:

When installing vacuum hoses, pay attention to the following points.

- **Do not apply any oil or lubricants to vacuum hose and check valve.**
- **Insert vacuum tube into vacuum hose over a length of min. 24 mm (0.94 in) as shown.**

Take care to main vacuum hoses in their original direction and position.

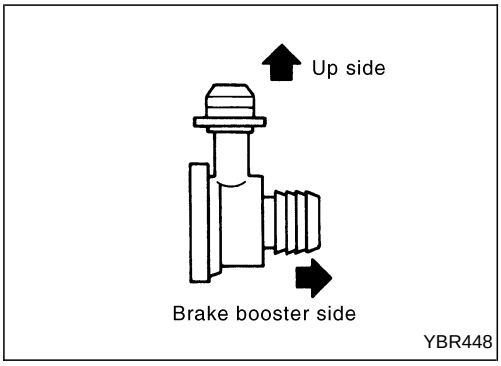
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Inspection

HOSES AND CONNECTORS

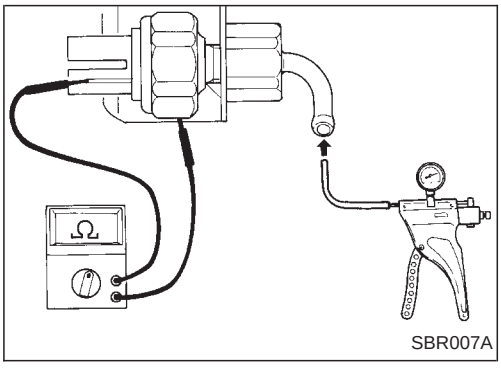
- Check condition of vacuum hoses and connectors.
- Check vacuum hoses and check valve for air tightness.



CHECK VALVE

- Check vacuum with a manual vacuum pump.

Connect to booster side	Vacuum should exist.
Connect to engine side	Vacuum should not exist.



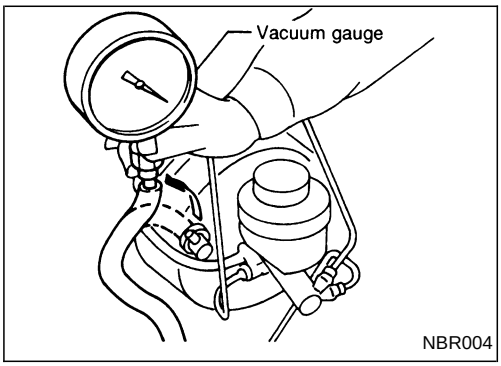
VACUUM WARNING SWITCH

Test continuity though vacuum warning switch with an ohmmeter and vacuum pump.

Vacuum	Less than 26.7 kPa (267 mbar, 200 mmHg, 7.87 inHg)	0Ω
	33.3 kPa (333 mbar, 250 mmHg, 9.84 inHg) or more	∞ Ω

http://vnx.su/

Inspection (Cont'd)



VACUUM PUMP (TD27Ti ENGINE)

1. Install vacuum gauge.
2. Run engine at 1,000 rpm or more.
3. Check vacuum.

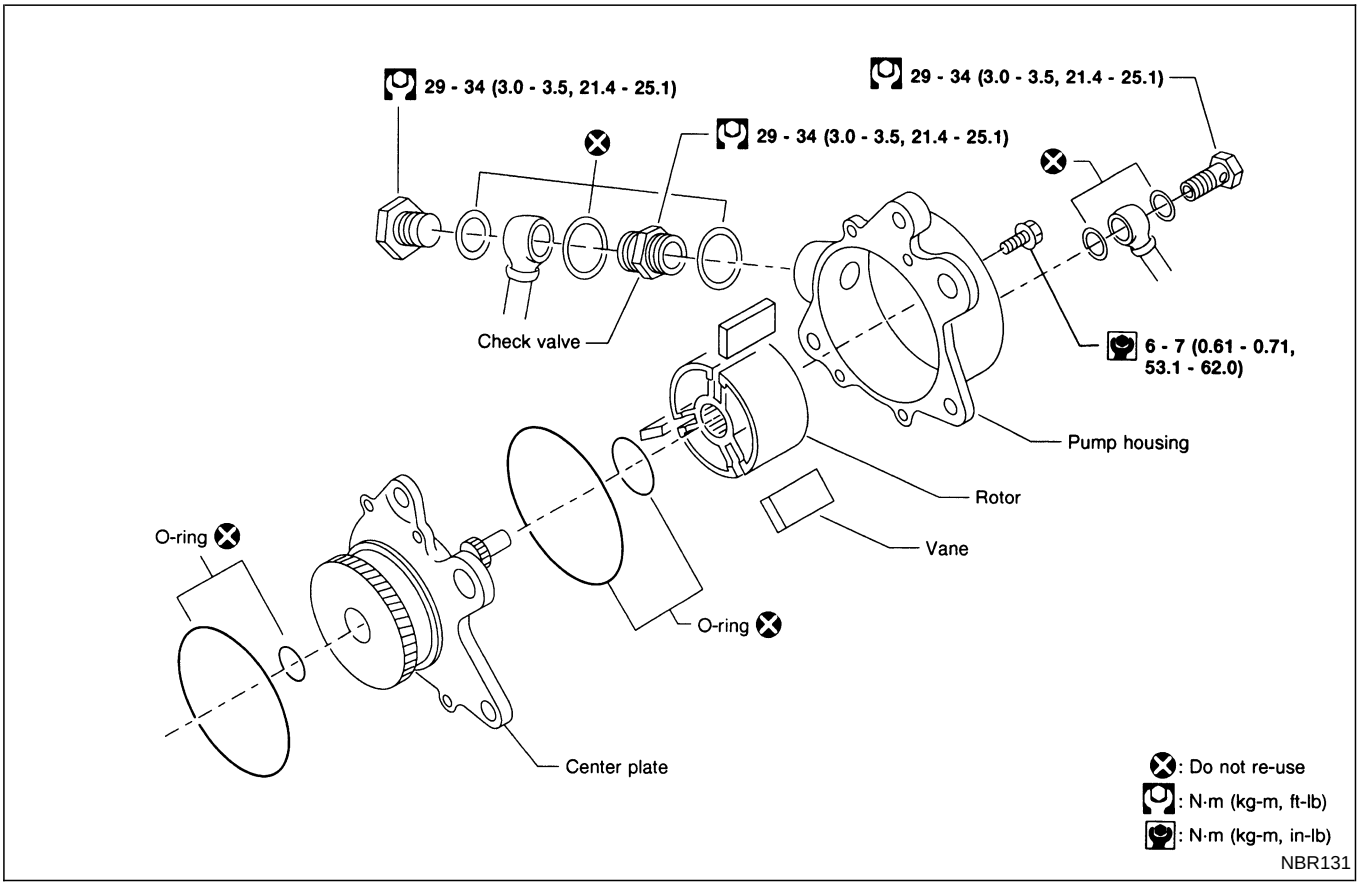
Specified vacuum:
93.3 kPa
(933 mbar, 700 mmHg, 27.56 inHg) or more

VACUUM PUMP (ZD30DDTi ENGINE)

Refer to EM section, "INSPECTION" in "VACUUM PUMP — Removal and Installation".

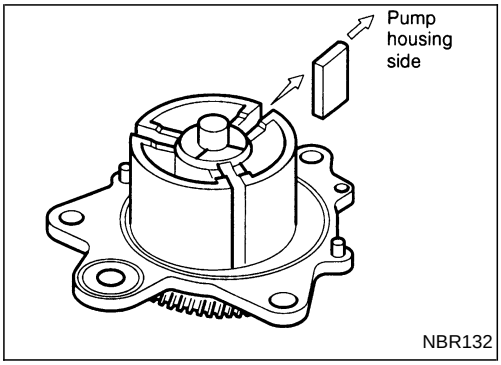
http://vnx.su/

Removal and Installation

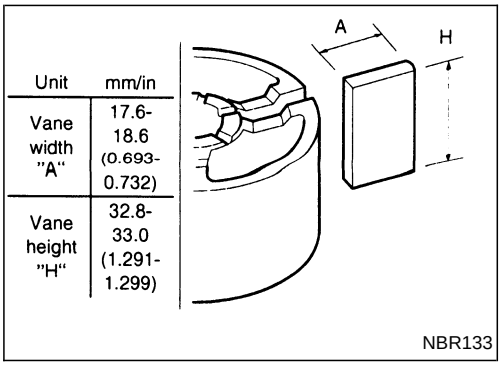


- Drain oil from vacuum pump before removal.

Manually rotate fan belt clockwise to discharge any oil which may have accumulated in vacuum pump.



- Install vane so that its round surface faces pump housing.
- After installing vacuum pump assembly, apply 5 mℓ (0.2 Imp fl oz) of engine oil into vacuum pump assembly. Then, make sure that pulley can be smoothly rotated by hand.



Unit	mm/in
Vane width "A"	17.6-18.6 (0.693-0.732)
Vane height "H"	32.8-33.0 (1.291-1.299)

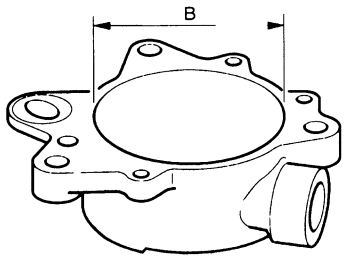
Inspection

Clean all parts and check them as follows:

- Check for wear or scratches on mating surfaces of rotor and vacuum pump housing and on rotor and center plate. If wear or scratches are noted, replace those parts.
- Check for wear or scratches on vanes. If necessary, replace.

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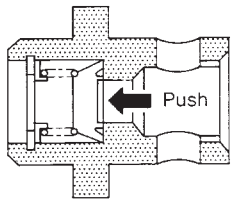
Inspection (Cont'd)



Inner diameter "B": mm (in)
69.5-69.8 (2.736-2.748)

NBR134

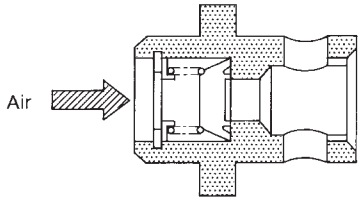
- Check inner wall of vacuum pump housing for wear. If necessary, replace.
- Check rotor shaft for wear. If necessary, replace.
- Check valve locations and copper washers for bends or deformation. If necessary, replace.



Checking valve operation

SBR194

- Check that valve operates smoothly when slightly pushed. Replace if necessary.



Checking air leakage of valve

SBR195

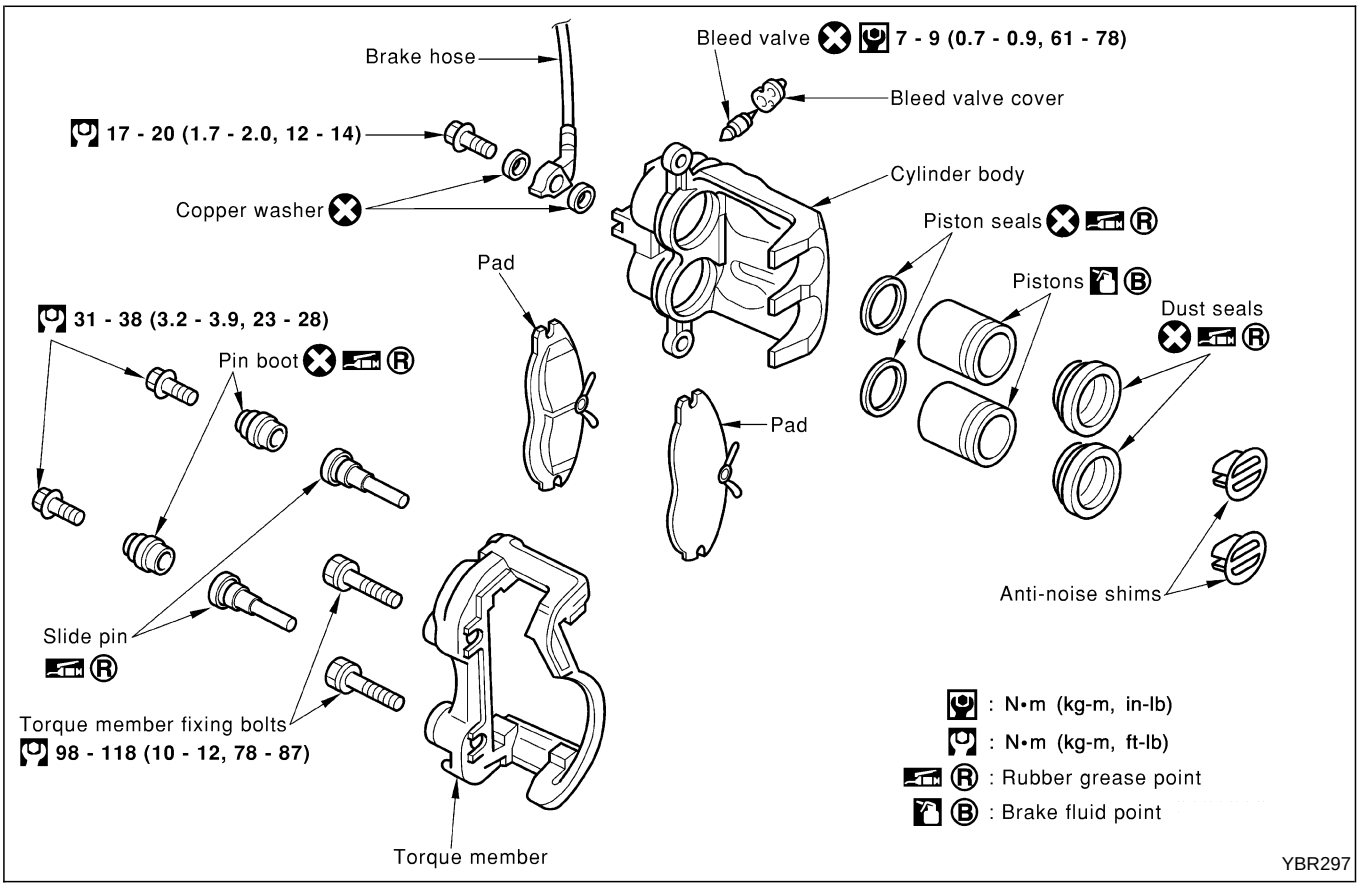
- Check for air leakage with 98 to 490 kPa (1.0 to 4.9 bar, 1 to 5 kg/cm^2, 14 to 71 psi) of air pressure.
  Replace if necessary.

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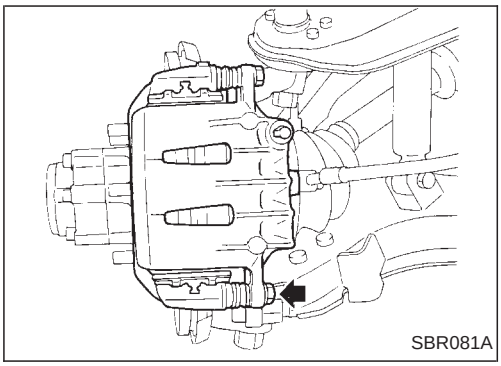
Removal and Installation

Refer to EM section, “VACUUM PUMP — Removal and Installation”.

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PRECAUTION:
Clean all brake assembly parts with a vacuum dust collector to prevent particles from spreading through work area.

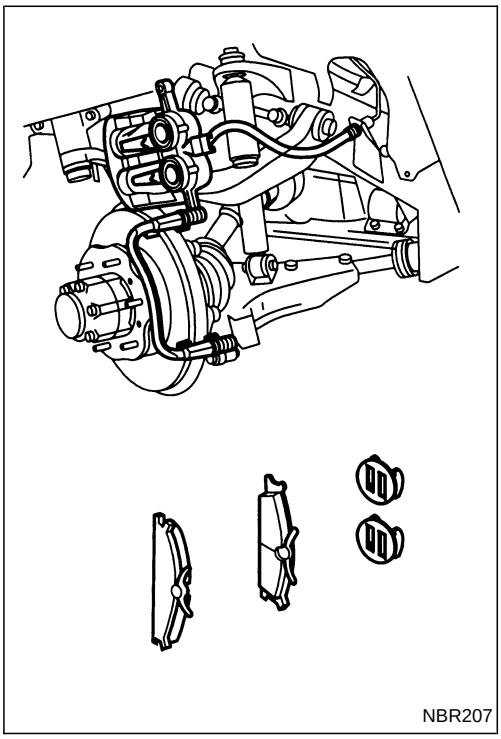


Pad Replacement

1. Loosen brake fluid reservoir cap.
2. Remove lower pin bolt.

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Pad Replacement (Cont'd)


NBR207

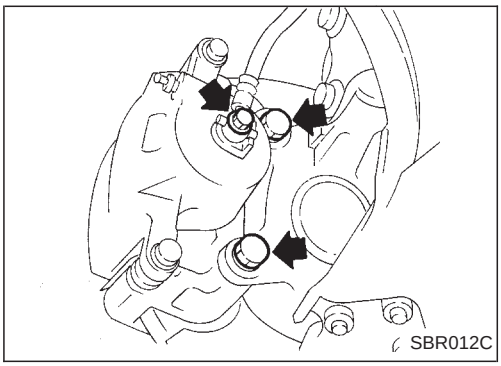
3. Swing cylinder body upward. Then remove pad and anti-noise shims.

CAUTION:

- **When cylinder body is swung up, do not depress brake pedal because piston will pop out.**
- **Ensure that brake fluid does not come into contact with dustcover and rotor.**
- **Be careful not to twist brake hoses.**

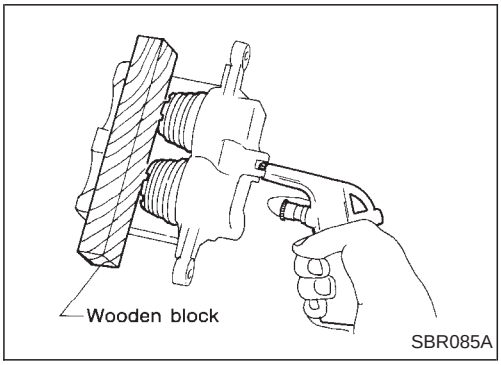
  Brake pad thickness (new):
  10 mm (0.39 in)
  Wear limit (min. thickness):
  2 mm (0.08 in)
- **After installing new brake pads, check brake fluid level at brake fluid reservoir.**

Removal


SBR012C

- Remove torque member fixing bolts and union bolt.

Disassembly



SBR085A

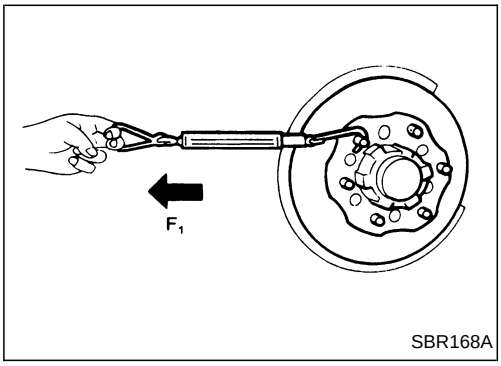
Push out piston with dust cover with compressed air.
Use a wooden block so that the 2 pistons come out evenly.

CAUTION:

- **Wear protecting clothes and safety goggles.**
- **Do not hold your fingers in front of the pistons.**
- **Be careful not to scratch piston and/or cylinder faces.**

Inspection

INSPECTION OF BRAKE DRAG FORCE



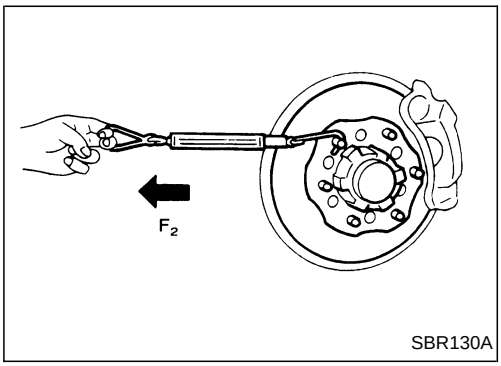
SBR168A

"Residual pair" describes the friction pressure of the disc brake shoes against the disc when the brake pedal is not applied.

1. Swing cylinder body upward.
2. Make sure that wheel bearing is adjusted properly. Refer to section FA.
3. Measure rotating force (F_1).

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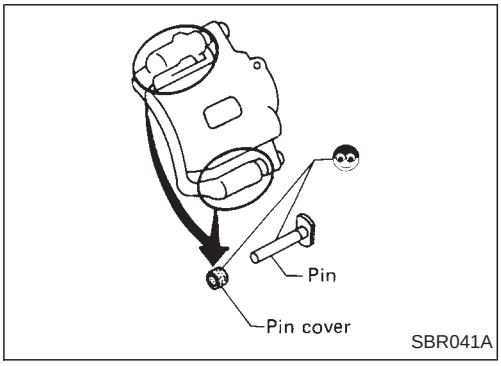
Inspection (Cont'd)



SBR130A

4. Install caliper with pads to the original position.
5. Depress brake pedal for 5 seconds.
6. Release brake pedal, rotate disc rotor 10 revolutions.
7. Measure rotating force (F_2).
8. Calculate brake drag force by subtracting F_1 from F_2.

Maximum brake drag force (F_2 — F_1):
103.0 N (10.5 kg, 23.2 lb)



SBR041A

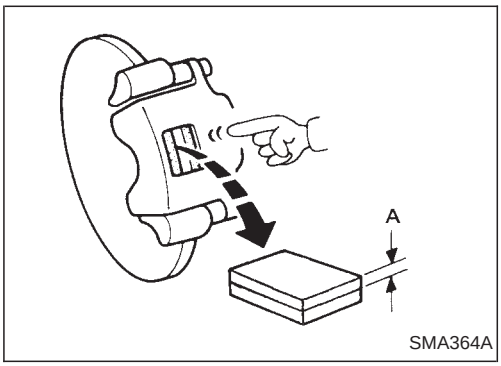
If it is not within specification, check pins and pin boots in caliper.

- **Make sure that wheel bearing is adjusted properly.**
- **Disc pads and disc rotor must be dry.**

DISC PAD

Check disc pad for wear or damage.

Pad wear limit (A):
2.0 mm (0.079 in)

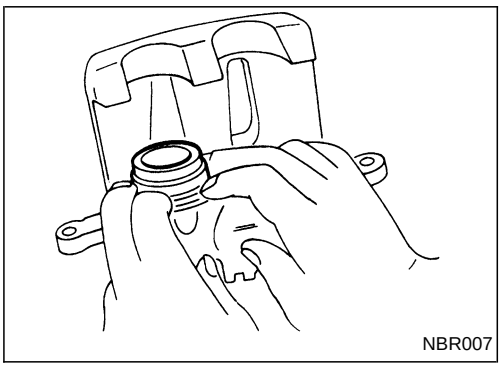


SMA364A

Assembly

Fit new piston seals.
Lightly apply clean brake fluid "DOT 4" to piston outer face.

1. Insert piston seal into groove on cylinder body.
2. Install piston into cylinder body.
3. Install piston boot and secure properly.

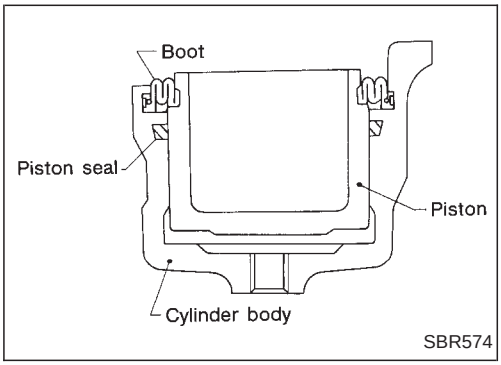

NBR007

Inspection

CYLINDER BODY

- Check inside surface of cylinder for score, rust, wear, damage or presence of foreign materials. If any of the above conditions are observed, replace cylinder body.
- Minor damage from rust or foreign materials may be eliminated by polishing the surface with a fine emery paper. Replace cylinder body if necessary.

CAUTION:
Use brake fluid to clean. Never use mineral oil.



SBR574

http://vnx.su/

Inspection (Cont'd)

PISTON

Check outside surface of piston for score, rust, wear, damage or presence of foreign materials. Replace if any of the above conditions are observed.

CAUTION:

Piston sliding surface is plated. Do not polish with emery paper even if rust or foreign materials are stuck to sliding surface.

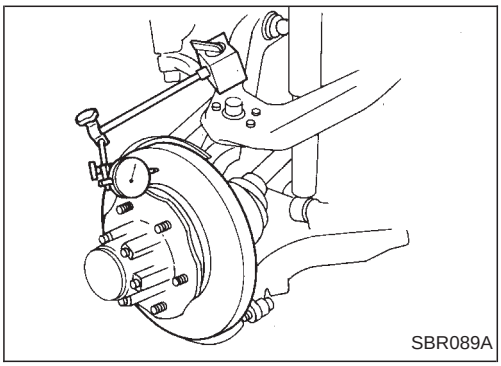
PIN, PIN BOLT AND PIN BOLT

Check for wear, cracks or other damage. Replace if any of the above conditions are observed.

ROTOR

Rubbing surface

Check rotor for roughness, cracks or chips.


SBR089A

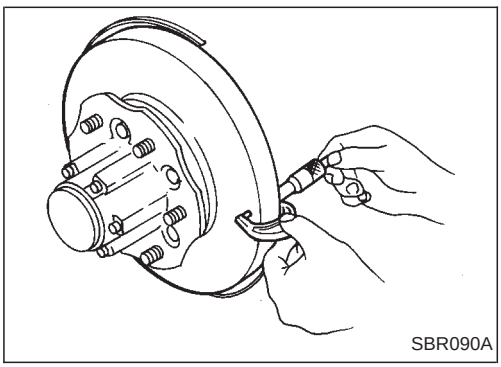
Runout

1. Secure rotor to wheel hub with at least two nuts.
2. Check runout using a dial indicator.

Make sure that wheel bearing axial end play is within the specifications before measuring. Refer to section FA.

Maximum runout:
0.07 mm (0.0028 in)

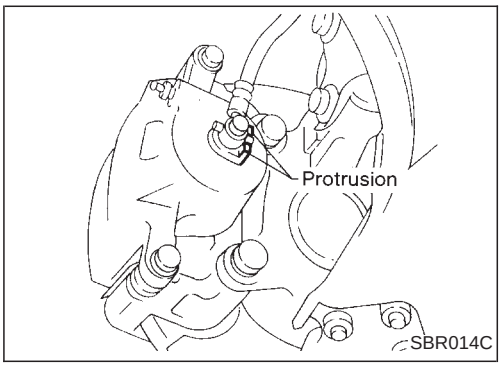
3. If the runout is out of specification, find minimum runout position as follows:
   a. Remove nuts and rotor from wheel hub.
   b. Shift the rotor one hole and secure rotor to wheel hub with nuts.
   c. Measure runout.
   d. Repeat steps a. to c. so that minimum runout position can be found.
4. If the runout is still out of specification, turn rotor with on-car brake lathe.


SBR090A

Thickness

Standard thickness:
26.0 mm (1.02 in)
Minimum thickness:
24.0 mm (0.94 in)

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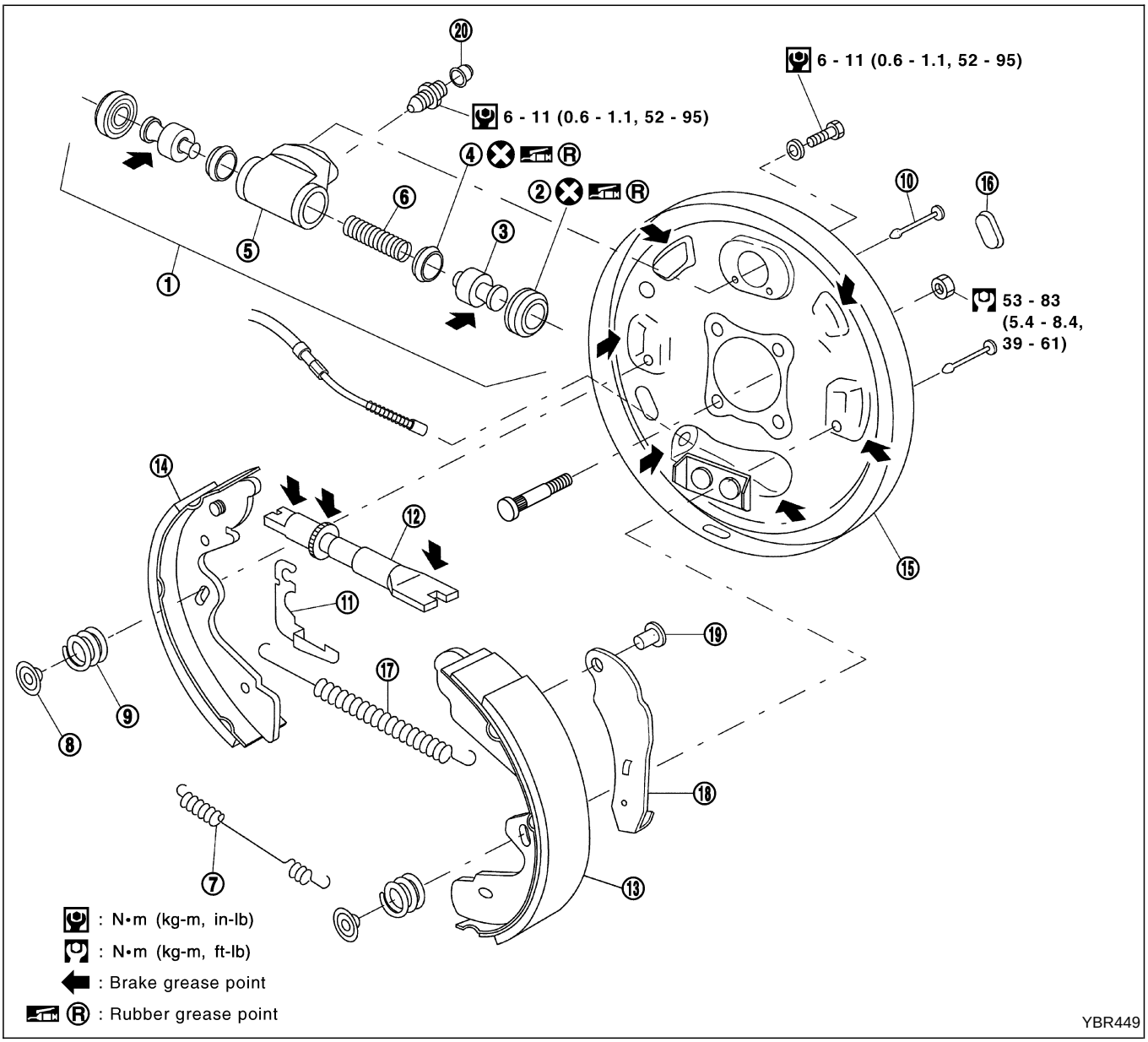
Installation

CAUTION:

- **Refill with new brake fluid “DOT 4”.**
- **Never reuse drained brake fluid.**

1. Install caliper assembly.
2. Install brake hose to caliper securely taking care that brake hose is not trapped between any suspension part and that hoses are not twisted.
3. Bleed air. Refer to “Bleeding Brake System”, “BRAKE HYDRAULIC LINE”, BR-8.

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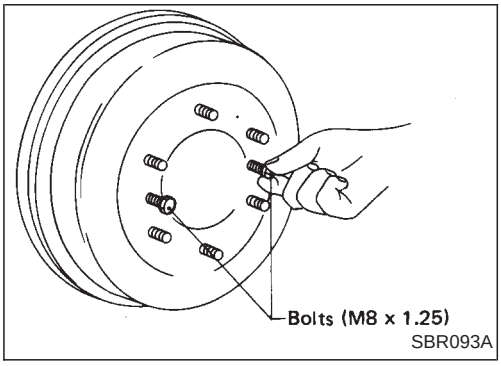


① Wheel cylinder assembly
② Boot
③ Piston
④ Piston cup
⑤ Cylinder body
⑥ Spring
⑦ Retaining shoe spring
⑧ Hold down retainer
⑨ Shoe hold-down spring
⑩ Shoe hold-down pin
⑪ Pawl
⑫ Adjuster assembly
⑬ Trailing shoe
⑭ Leading shoe
⑮ Back plate
⑯ Plug
⑰ Shoe return spring
⑱ Toggle lever
⑲ Pin
⑳ Dust cap

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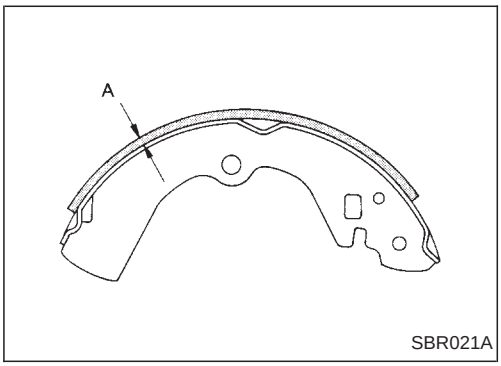
Removal

WARNING:
Clean brake lining with a vacuum dust collector.
CAUTION:
Make sure parking brake lever is released completely.



1. Release parking brake lever fully, then remove drum.
If drum is hard to remove, screw two bolts in the provided holes of the drum and tighten them gradually.
If the drum cannot be removed after carrying out this operation, refer to “Inspection”, “PARKING BRAKE CONTROL”, BR-36.

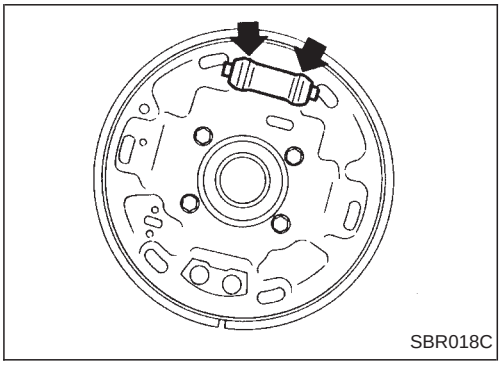
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Shoe Replacement

When installing new shoes, springs should be changed as well. Check lining thickness.

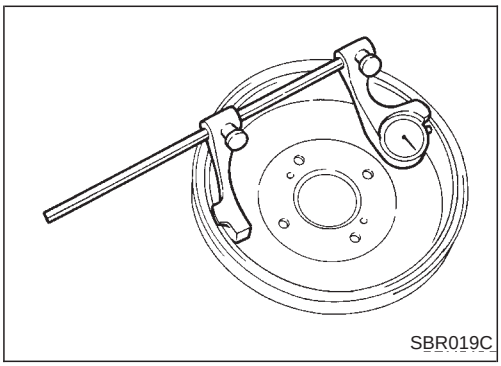
Standard lining thickness:
Trailing: 3.95 mm (0.156 in)
Leading: 8.95 mm (0.352 in)
Lining wear limit (A):
1.52 mm (0.0598 in)



Inspection

WHEEL CYLINDER

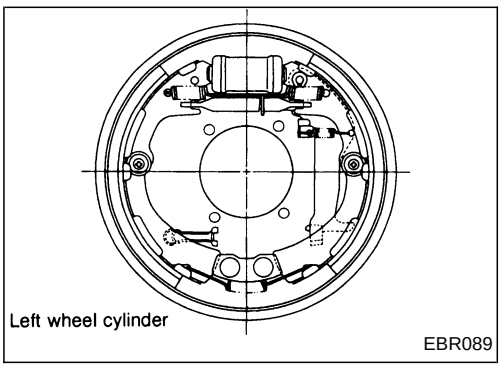
- Check wheel cylinder for leakage.
- Check for wear, damage and loose conditions. Replace if any such condition exists.



DRUM

Maximum inner diameter:
282 mm (11.10 in)
Out of roundness:
0.05 mm (0.019 in) or less

- Contact surface should be fine finished with No. 120 to 150 emery paper.
- If any scratches or wear are detected, adjust the alignment of the drum.
- After brake drum has been completely reconditioned or replaced, check drum and shoes for proper contact pattern.



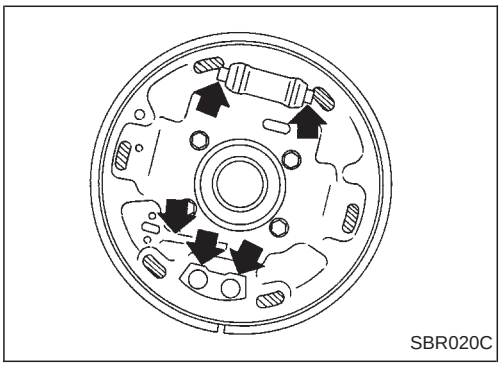
Installation

Always perform shoe clearance adjustment. Refer to “Adjustment”, “PARKING BRAKE CONTROL”, BR-36.

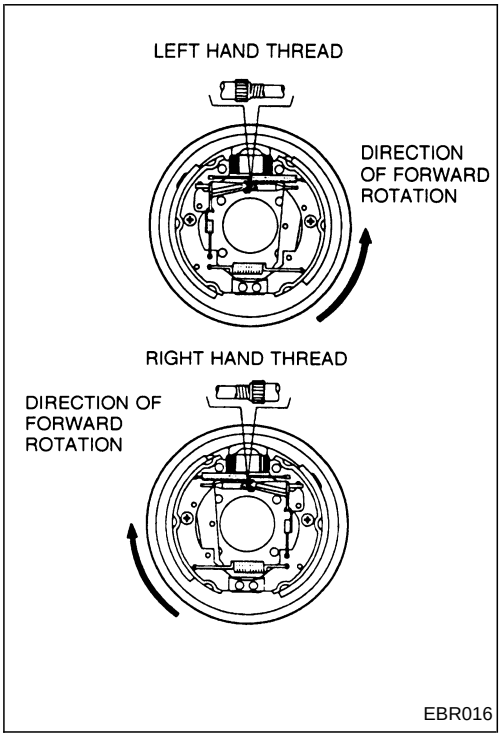
1. Fit adjuster assembly.

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Installation (Cont'd)


SBR020C

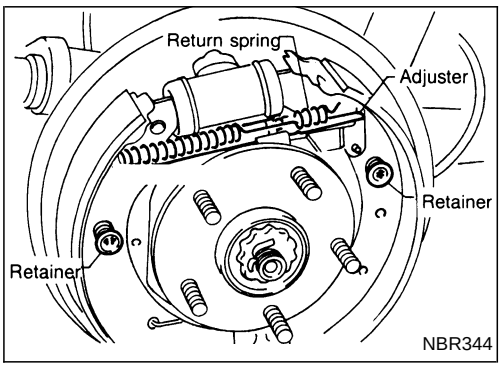
2. Apply brake grease to the contact areas shown at left.



EBR016

3. Shorten adjuster by rotating it, so that shoe outer diameter is 279 - 279.5 mm (10.98 - 11 in).

- **Pay attention to direction of adjuster assembly.**



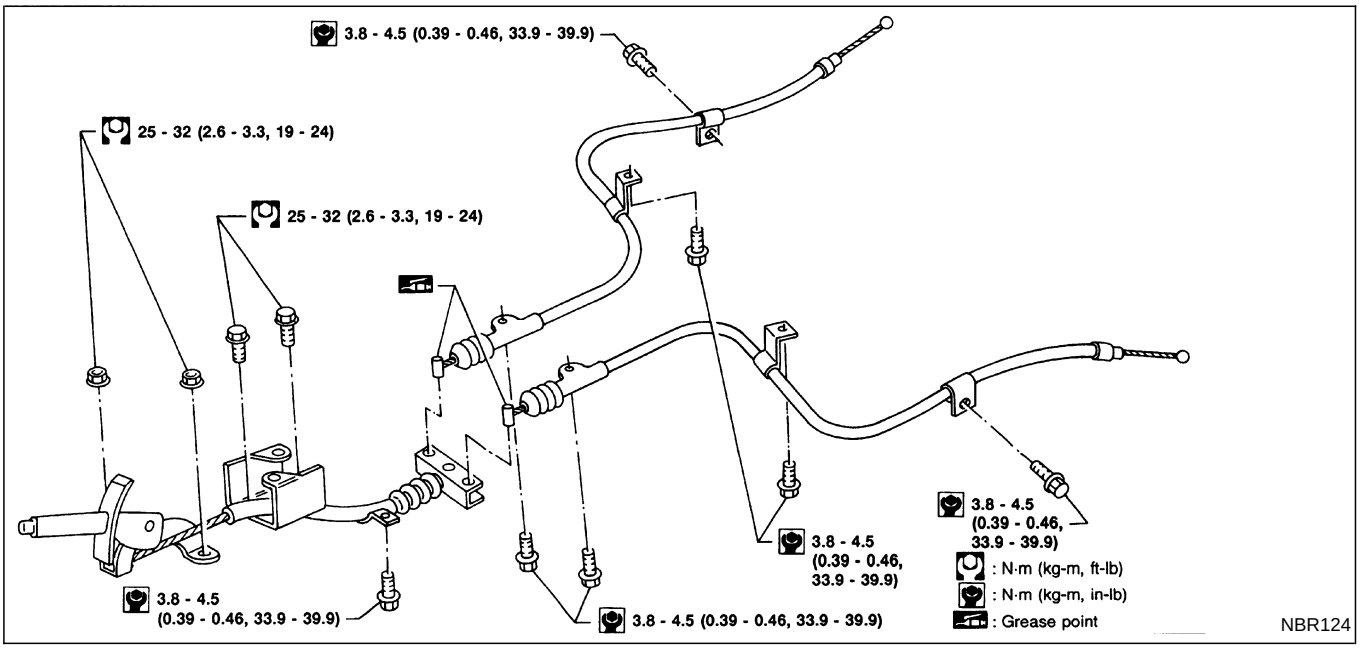
NBR344

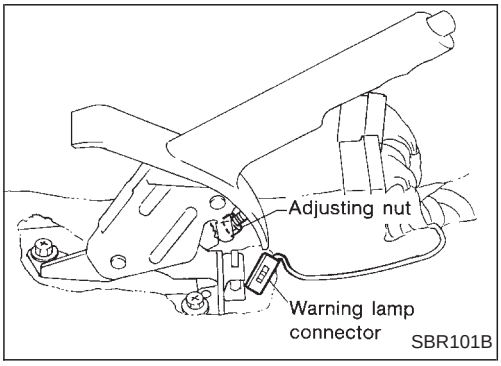
4. Connect parking brake cable to toggle lever.
5. Install all parts.
6. Check all parts are installed properly.

Pay attention to direction of adjuster assembly.

7. Install brake drum.
8. When installing new wheel cylinder or overhauling wheel cylinder, bleed air. Refer to "Bleeding Brake System", "BRAKE HYDRAULIC LINE", BR-8.
9. At completion, apply brake pressure by pressing the brake pedal approximately 20 times at half stroke.

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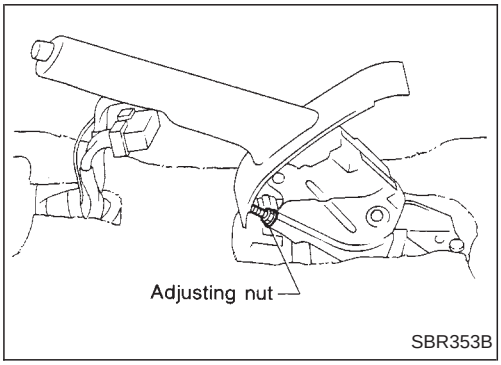


Removal and Installation

1. To remove parking brake cable, first remove center console.
2. Disconnect warning lamp connector.
3. Remove bolts, slacken off and remove adjusting nut.

Inspection

1. Check control lever for wear or other damage. Replace if necessary.
2. Check wires for discontinuity or deterioration. Replace if necessary.
3. Check warning lamp and switch. Replace if necessary.
4. Check parts at each connecting portion and, if deformed or damaged, replace.



Adjustment

1. Adjust clearance between shoe and drum as follows:

a. Release parking brake lever and loosen adjusting nut.

b. Depress brake pedal fully at least 10 times with engine switched off.

2. Apply the handbrake, allowing the handbrake grip to move 6 notches. You can adjust the handbrake travel by using the adjusting nut. To complete this adjustment, you will need a dynamo meter to check the amount of load required to move from 9 to 10 notches. If the load exceeds 20 kg, the cable will have to be loosened with the help of the adjusting nut.

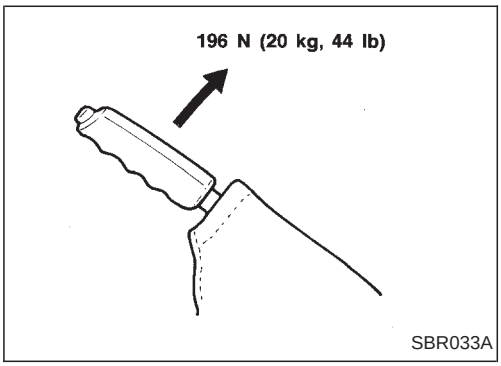
Number of notches:

9 - 10

If the load is less than 20 kg, the cable should be tightened.

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Adjustment (Cont'd)



3. Apply the handbrake, using the specified pressure. Check the travel to see that the handbrake is working smoothly.

4. Bend parking brake warning lamp switch plate so that brake warning lamp comes on when parking brake lever is pulled "A" notches.

   Number of "A" notches: 1 or less

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Purpose

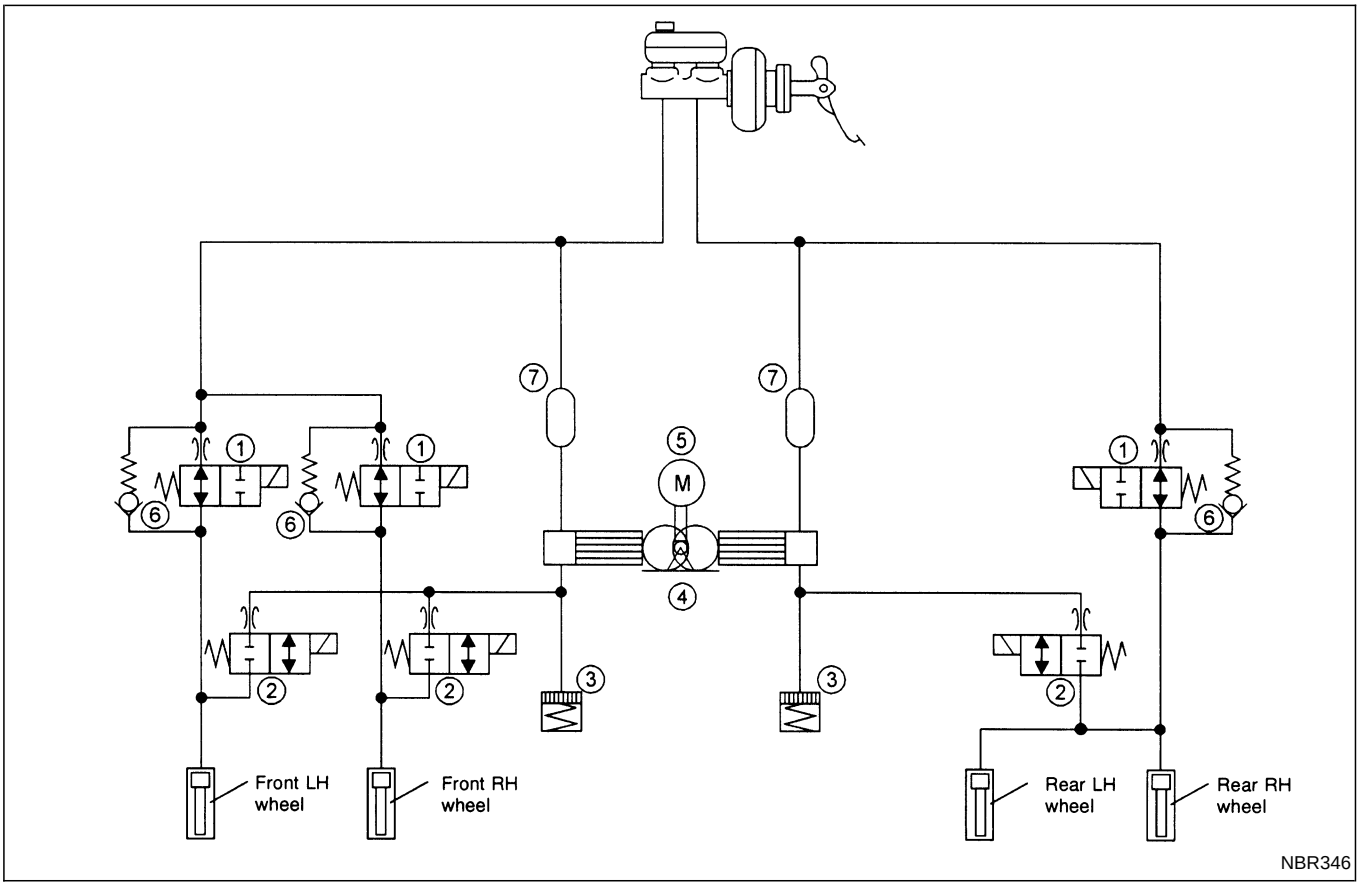
The Anti-lock Brake System (ABS) with an integrated Electronic Brake force Distribution (EBD) system consists of electronic and hydraulic components. It allows you to control the braking force so that wheel lock can be avoided during braking.

The advantages of ABS with EBD
1) Better tracking performance through improved steering wheel control.
2) Improved maneuverability and safer vehicle control.
3) Improved vehicle stability by preventing flat spins.
4) Shorter stopping distance and optimal utilisation of the rear brakes under many different circumstances.

Operation

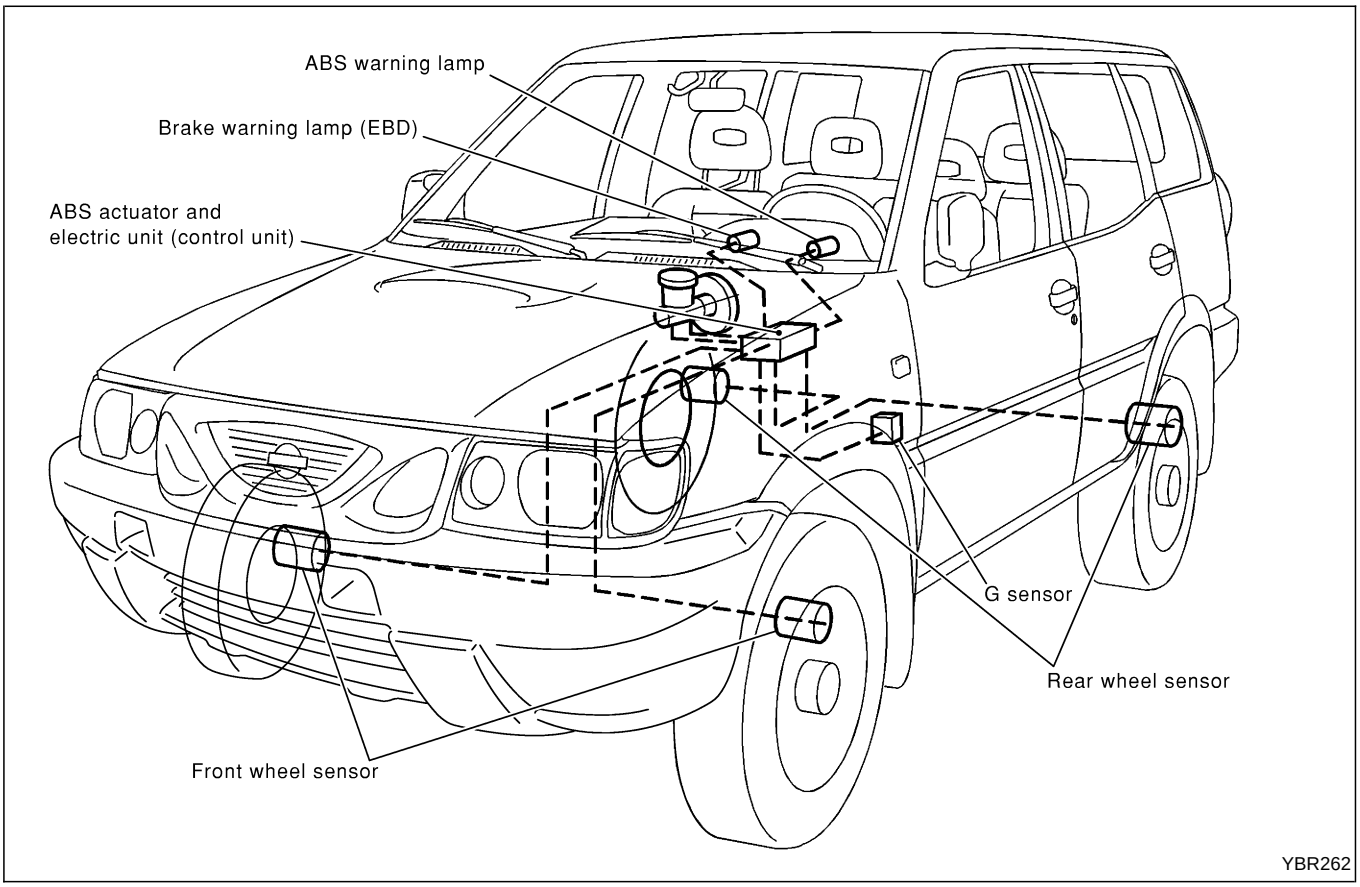
- ABS with EBD has self-test capabilities. The ABS warning lamp is illuminated for 1 second each time the ignition switch is turned “ON”. After the engine is started, the ABS warning lamp turns off. An ABS self-test is performed the first time the vehicle reaches 6 km/h (4 MPH) to ensure the system is operational. A mechanical noise may be heard as the ABS performs this self-test and is a normal part of the self-test feature. If a malfunction is detected during this check, the ABS warning lamp will stay on.
  During the self-test, it also performs a EBD check when it detects a failure the ABS warning light will go on simultaneously with the brake warning light and an audible sound will sound constantly.
- EBD system will only operate when the ABS is not in active status and it uses the inlet valves of ABS control unit to limit the pressure to the rear wheels when they tend to go into slip.
- When the vehicle speed is less than 10 km/h (6 MPH) the ABS system does not operate.
- While driving, a mechanical noise may be heard during ABS operation, this is a normal system condition.

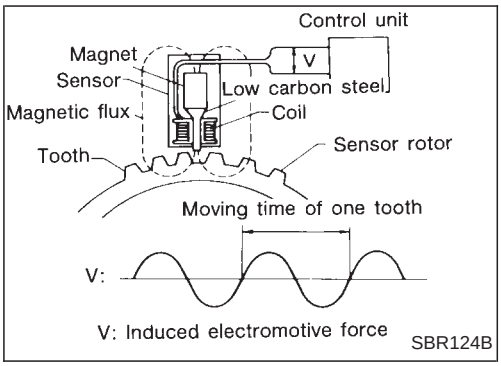
ABS Hydraulic Circuit

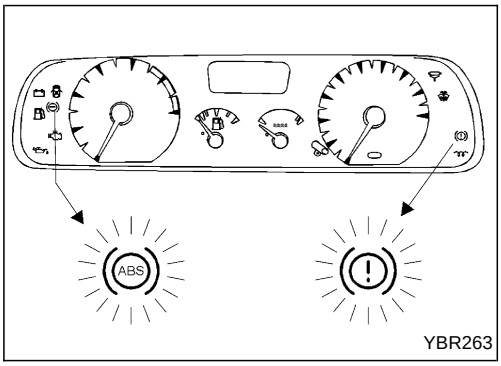


① Inlet solenoid valve
② Outlet solenoid valve
③ Reservoir
④ Pump
⑤ Motor
⑥ By pass check valve
⑦ Damper

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System Description

Sensor

The sensor unit consists of a gear-shaped sensor rotor and a sensor element. The element contains a bar magnet around which a coil is wound. The sensor is installed on the back of the brake rotor and the rear brake drum.
As the wheel rotates, the sensor generates a sine-wave pattern. The frequency and voltage increase(s) as the rotating speed increases.

Control unit

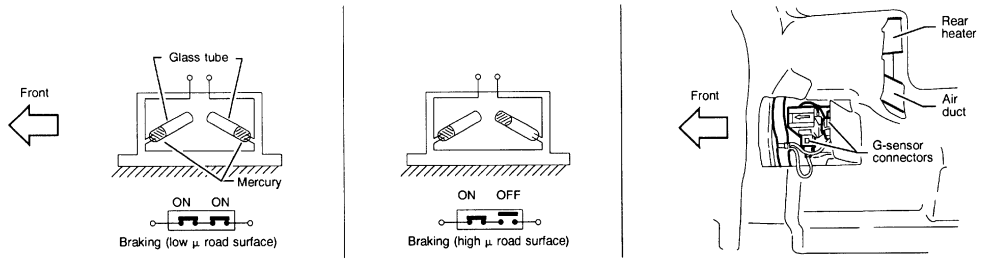
The control unit computes the wheel rotating speed by the signal current sent from the sensor. Then it supplies a DC current to the actuator solenoid valve. It also controls ON-OFF operation of the valve relay and rotor relay. If any electrical malfunction should be detected in the ABS or EBD system, the control unit causes the warning lamp(s) to light up, combined with an audible sound.
In this condition, the ABS or EBD will be deactivated by the control unit, and the vehicle's brake system reverts to normal operation. (Fail-safe mode)

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System Description (Cont'd)

G SENSOR

The G sensor analyses deceleration during braking to determine whether the vehicle is being driven on a road with low surface resistance (μ) (snow-covered road, etc.). The ABS control unit uses the signal from the deceleration sensor to compensate for road surface conditions when controlling the braking operation.

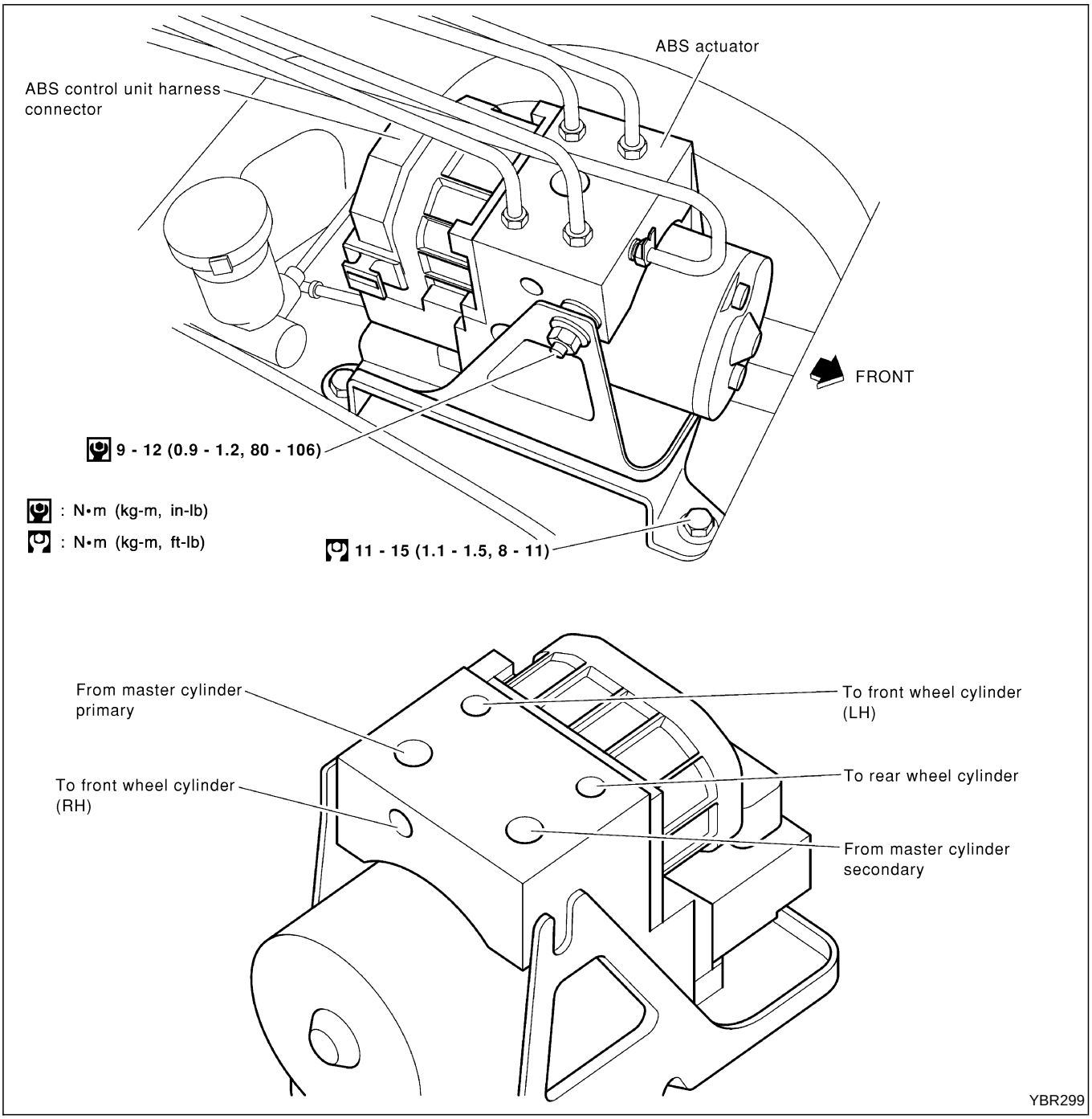


NBR136

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System Description (Cont'd)

ACTUATOR AND ELECTRIC UNIT



The actuator and electric unit contains:

- An electric motor and pump
- Two relays
- Six solenoid valves, each inlet and outlet for
  - — LH front
  - — RH front
  - — Rear
- ABS control unit

These components control the hydraulic circuit. The ABS control unit directs the actuator to increase, hold or decrease hydraulic pressure to all or individual wheels. The ABS actuator and electric unit cannot be disassembled and has to be serviced as an assembly.

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System Description (Cont'd)

ABS actuator operation

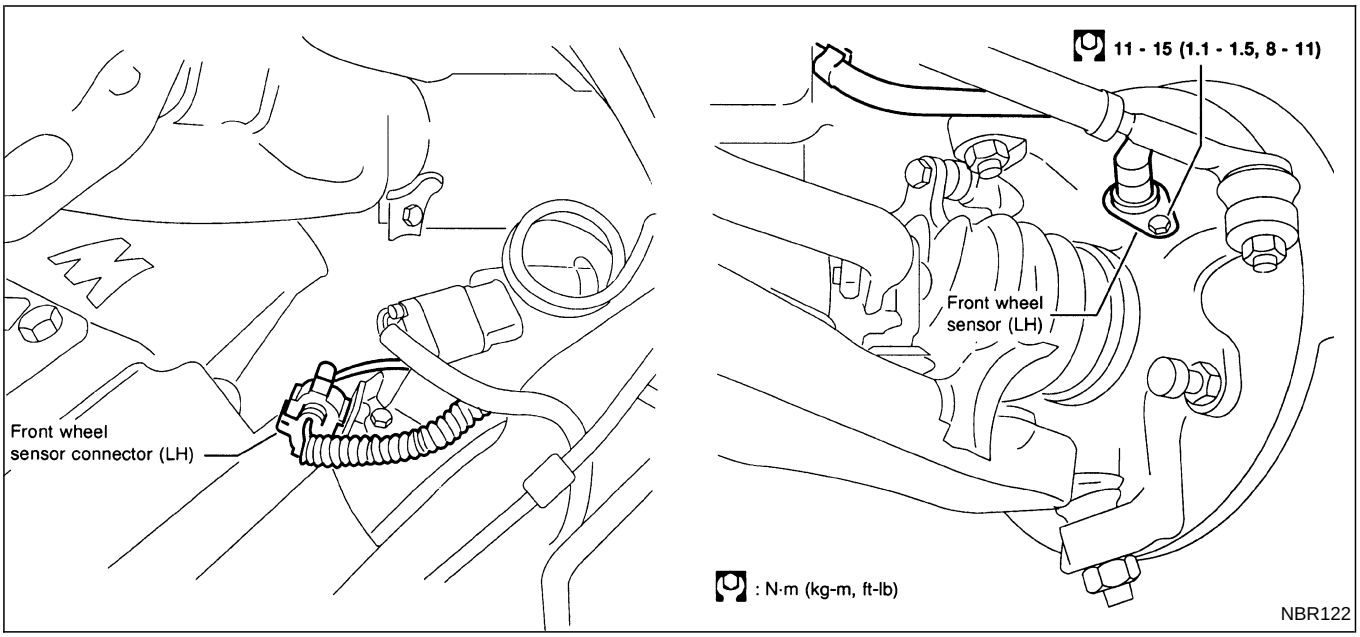
		Inlet solenoid valve	Outlet solenoid valve	
Normal brake operation		OFF (Open)	OFF (Closed)	Master cylinder brake fluid pressure is directly transmitted to caliper via the inlet solenoid valve.
ABS operation	Pressure hold	ON (Closed)	OFF (Closed)	Hydraulic circuit is shut off to hold the caliper brake fluid pressure.
	Pressure decrease	ON (Closed)	ON (Open)	Caliper brake fluid is sent to reservoir via the outlet solenoid valve. Then it is pushed up to the master cylinder by pump.
	Pressure increase	OFF (Open)	OFF (Closed)	Master cylinder brake fluid pressure is transmitted to caliper.

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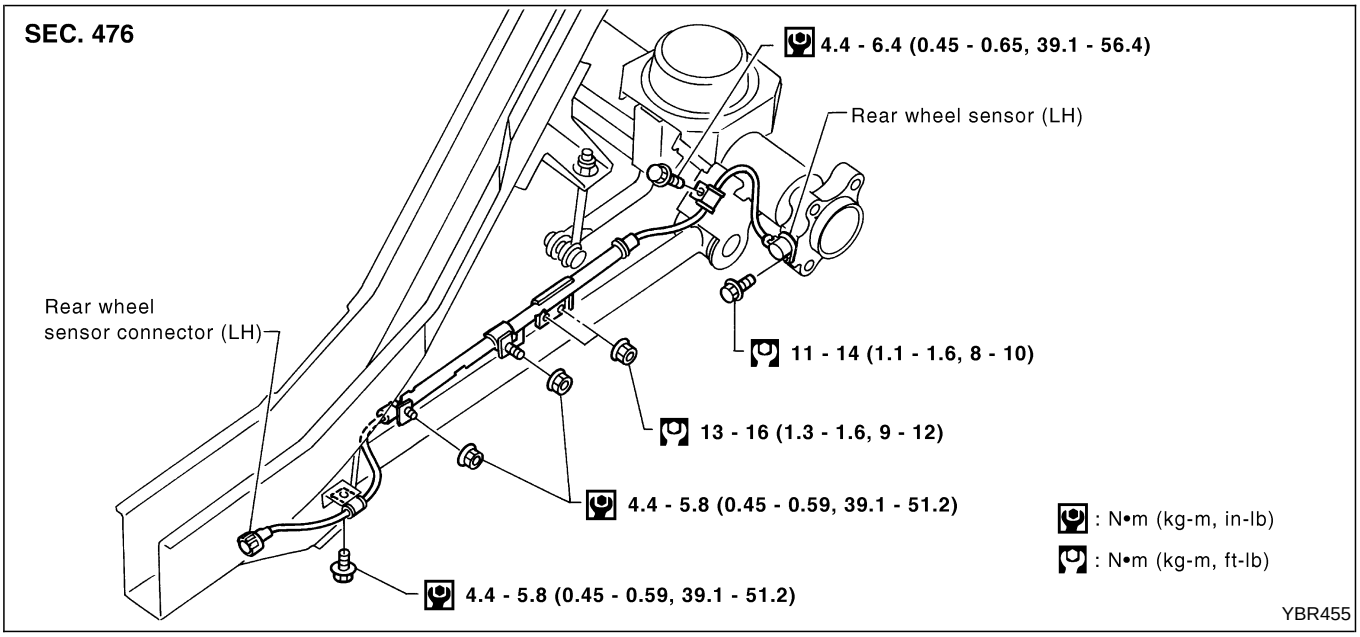
Removal and Installation

CAUTION:
Be careful not to damage sensor edge and sensor rotor teeth. When removing the front or rear wheel hub assembly, disconnect the ABS wheel sensor from the assembly and move it away.

FRONT WHEEL SENSOR



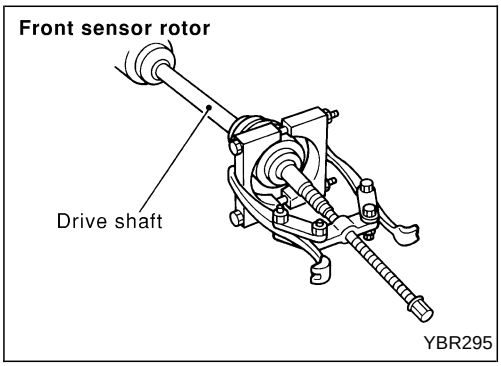
REAR WHEEL SENSOR



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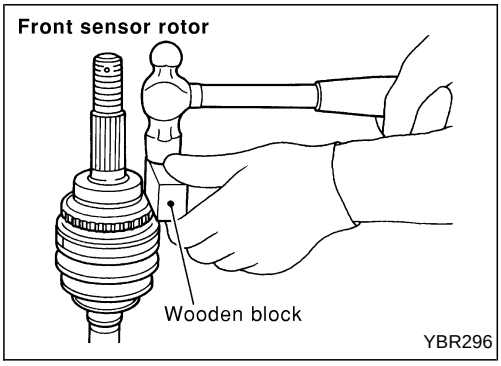
Removal and Installation (Cont'd)

FRONT SENSOR ROTOR



Removal

1. Remove the drive shaft and rear wheel hub. Refer to "Front axle — drive shaft" in FA section and "Rear axle" in RA section.
2. Remove the sensor rotor using suitable puller, drift and bearing replacer.



Installation

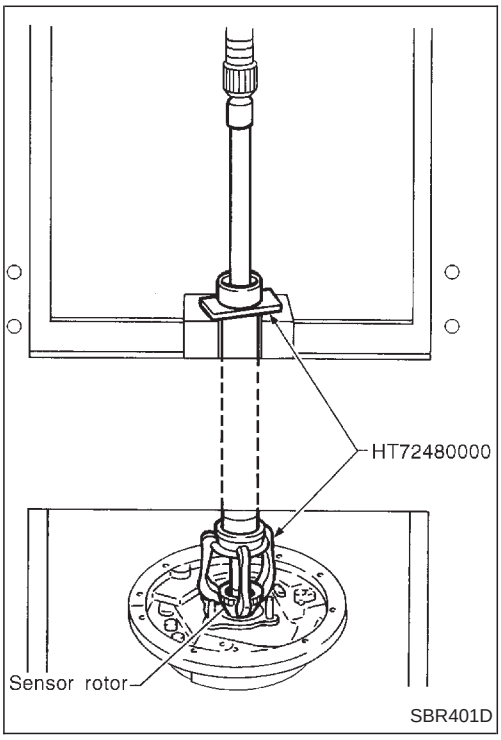
Install the sensor rotor. For front sensor rotor, use hammer and wooden block. For rear sensor rotor, use suitable drift and press.

- Always replace sensor rotor with new one.

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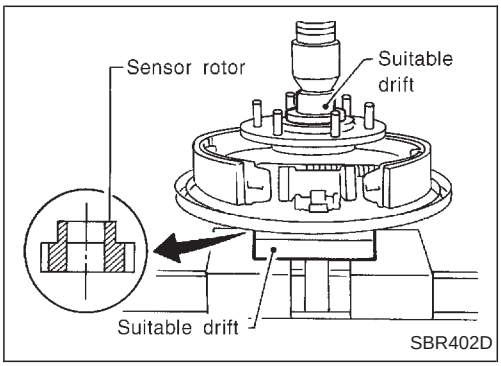
Removal and Installation (Cont'd)

REAR SENSOR ROTOR



Removal

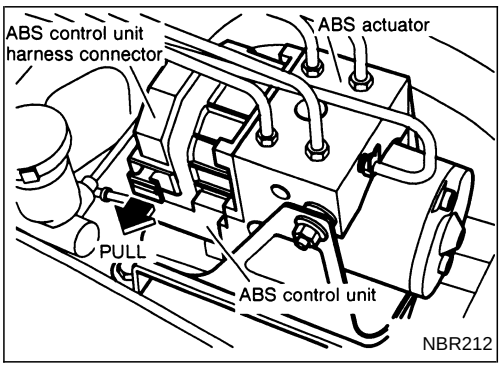
- Remove the sensor rotor using Tool.



Installation

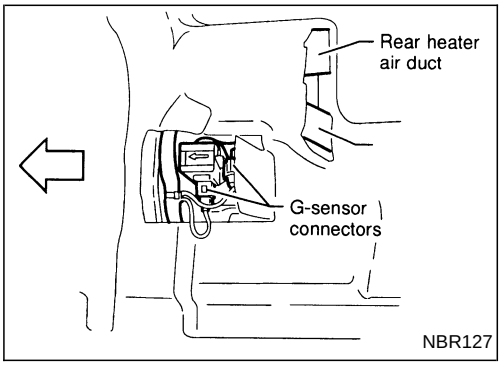
Install the sensor rotor using suitable drift and press.

- Always replace sensor rotor with new one.
- Pay attention to the direction of front sensor rotor as shown in figure.



CONTROL UNIT

Location: Built-in ABS actuator.
When disconnecting the harness connector, pull the lever as shown in figure.



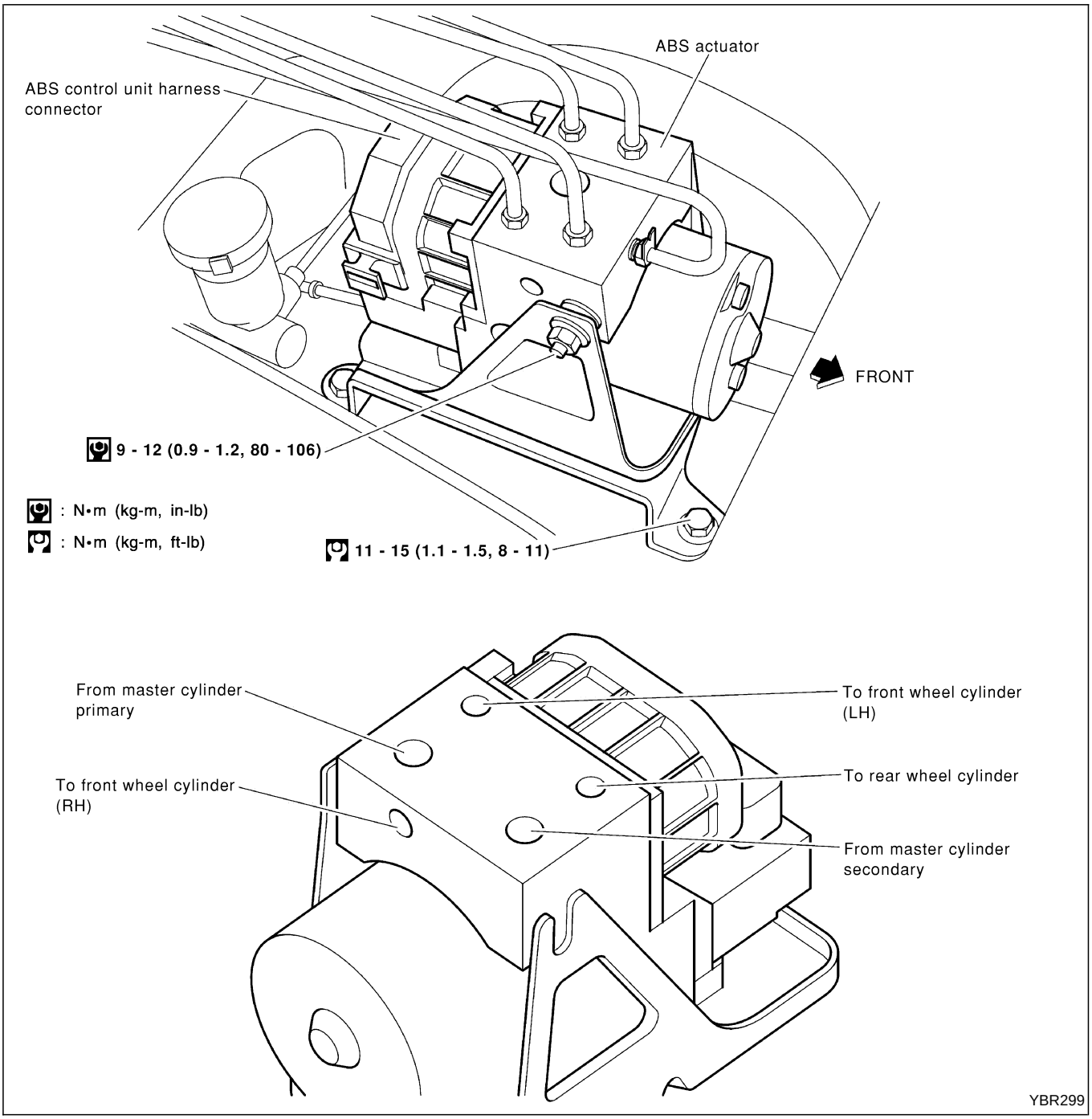
G SENSOR

Always replace G sensor if bumped or dropped. Otherwise, performance characteristics of G sensor will be changed, which in turn alters ABS control performance characteristics.

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Removal and Installation (Cont'd)

ACTUATOR



Removal

1. Disconnect battery cable.
2. Drain brake fluid. Refer to BR-5.
3. Unlock the slider then disconnect the electrical harness connectors from ABS control unit.
4. Identify each brake pipe with corresponding actuator port hole and mark them accordingly.
5. Disconnect brake pipes and move them away from actuator. Do not force brake pipes so as to kink them or bend them excessively.
   Ensure that brake fluid does not come into contact with any parts.

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Removal and Installation (Cont'd)

6. Loosen/remove mounting nuts between actuator and bracket.

Installation

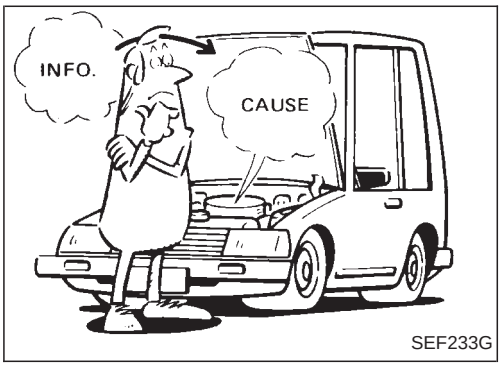
CAUTION:

After installation, pay attention to the following points:

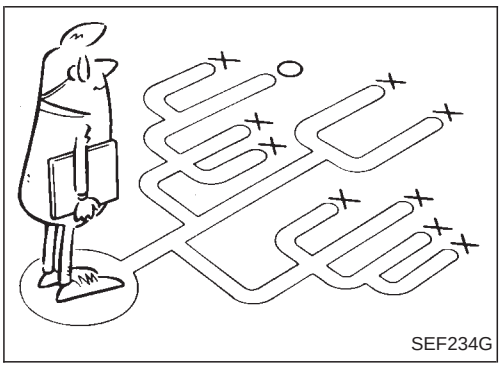
- **Refill brake fluid and bleed air. Refer to "CHECK AND ADJUSTMENT", BR-5 and "Bleeding Brake System", "BRAKE HYDRAULIC LINE", BR-8, respectively.**

1. Install actuator on bracket without tightening fixings.
2. Assemble brake tubes to actuator without tightening tube nuts. Ensure that correct tubes are connected to each port.
3. Fully tighten actuator and bracket fixings to specified torque.
4. Fully tighten flare nuts to specified torque, BR-9.
5. Secure ABS control unit harness connector and battery cable.

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SEF233G


SEF234G

How to Perform Trouble Diagnoses for Quick and Accurate Repair

INTRODUCTION

The ABS system has an electronic control unit to control major functions. The control unit accepts input signals from sensors and uses this data to compute control characteristics to instantly drive the actuators. It is essential that both kinds of signal are accurate and stable. It is also important to check for conventional brake system incidents: such as air leaks in booster lines, lack of brake fluid, or other incidents with the brake system.

It is much more difficult to diagnose an incident that occurs intermittently rather than catastrophically. Most intermittent incidents are caused by poor electric connections or improper wiring. In this case, careful checking of suspicious circuits may help prevent the replacement of good parts.

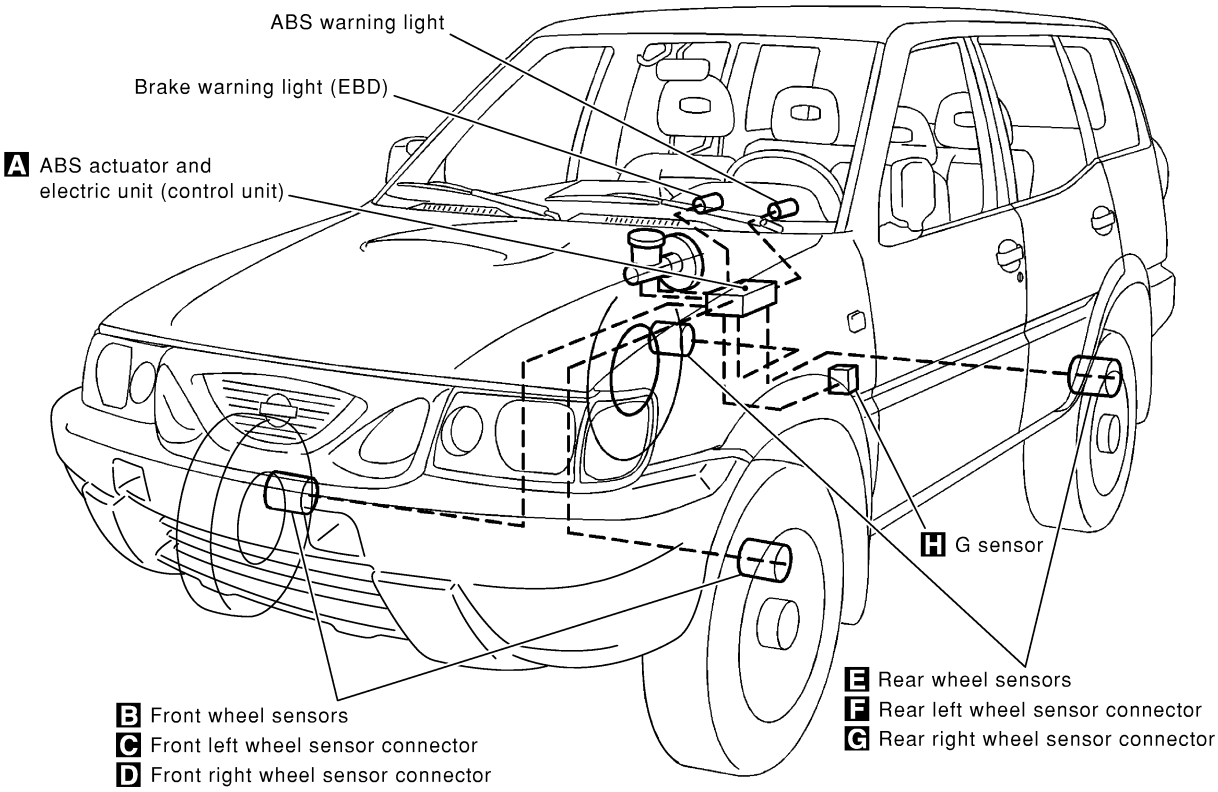
A visual check may not be sufficient to determine the cause of the incidents, so a road test should also be conducted.

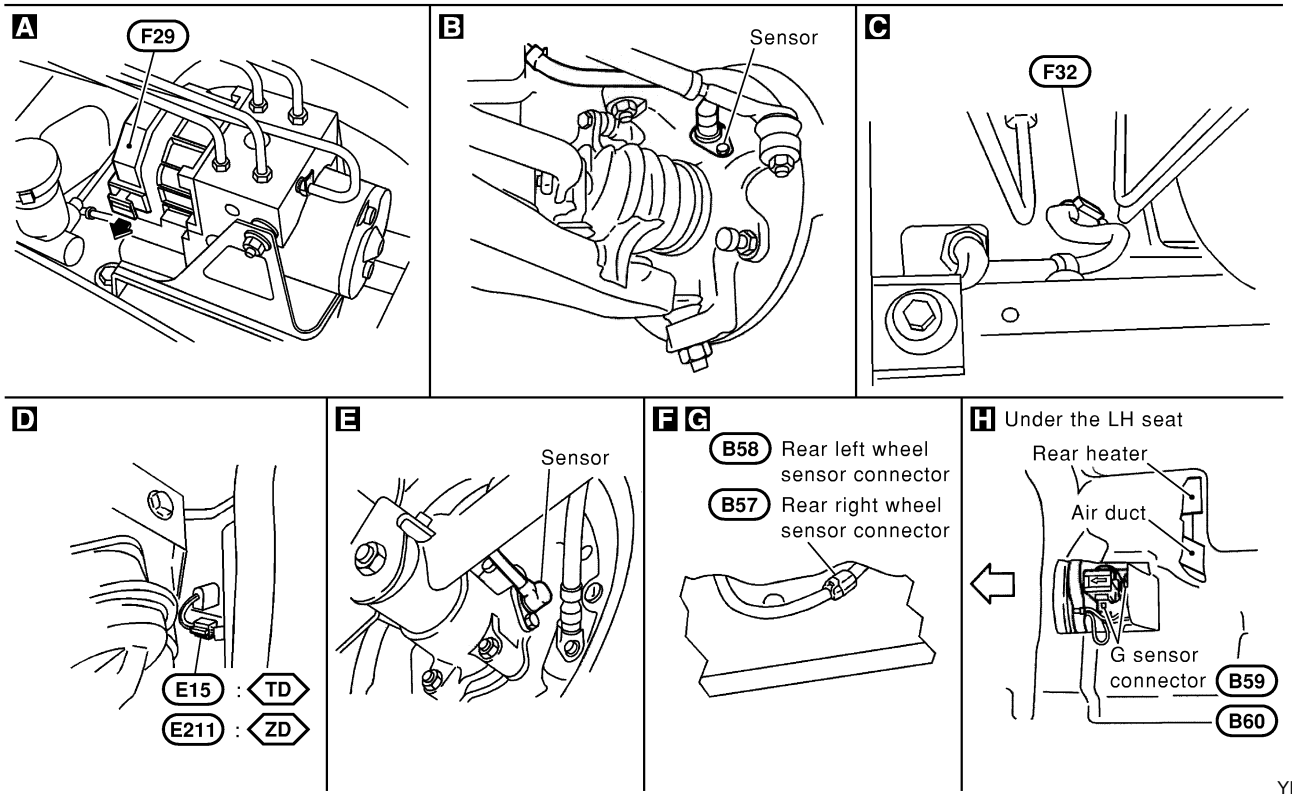
Before undertaking actual checks, take a few minutes to talk with a customer who approaches with an ABS complaint. The customer is a very good source of information on such incidents; especially intermittent ones. Through the talks with the customer, find out what symptoms are present and under what conditions they occur.

Start your diagnosis by looking for “conventional” incidents first. This is one of the best ways to troubleshoot brake incidents on an ABS controlled vehicle.

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Component Parts and Harness Connector Location

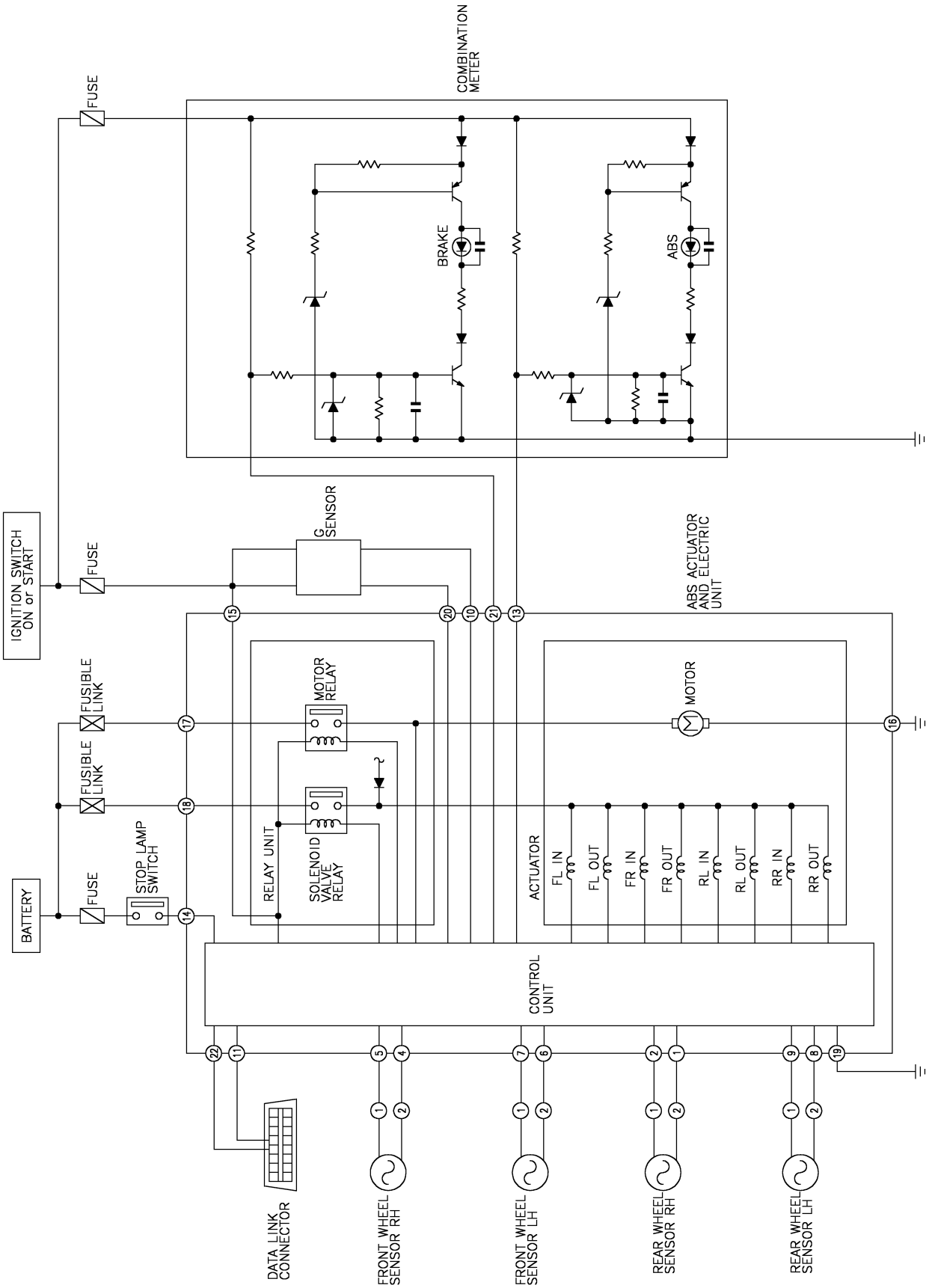




YBR264

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Circuit Diagram for Quick Pinpoint Check

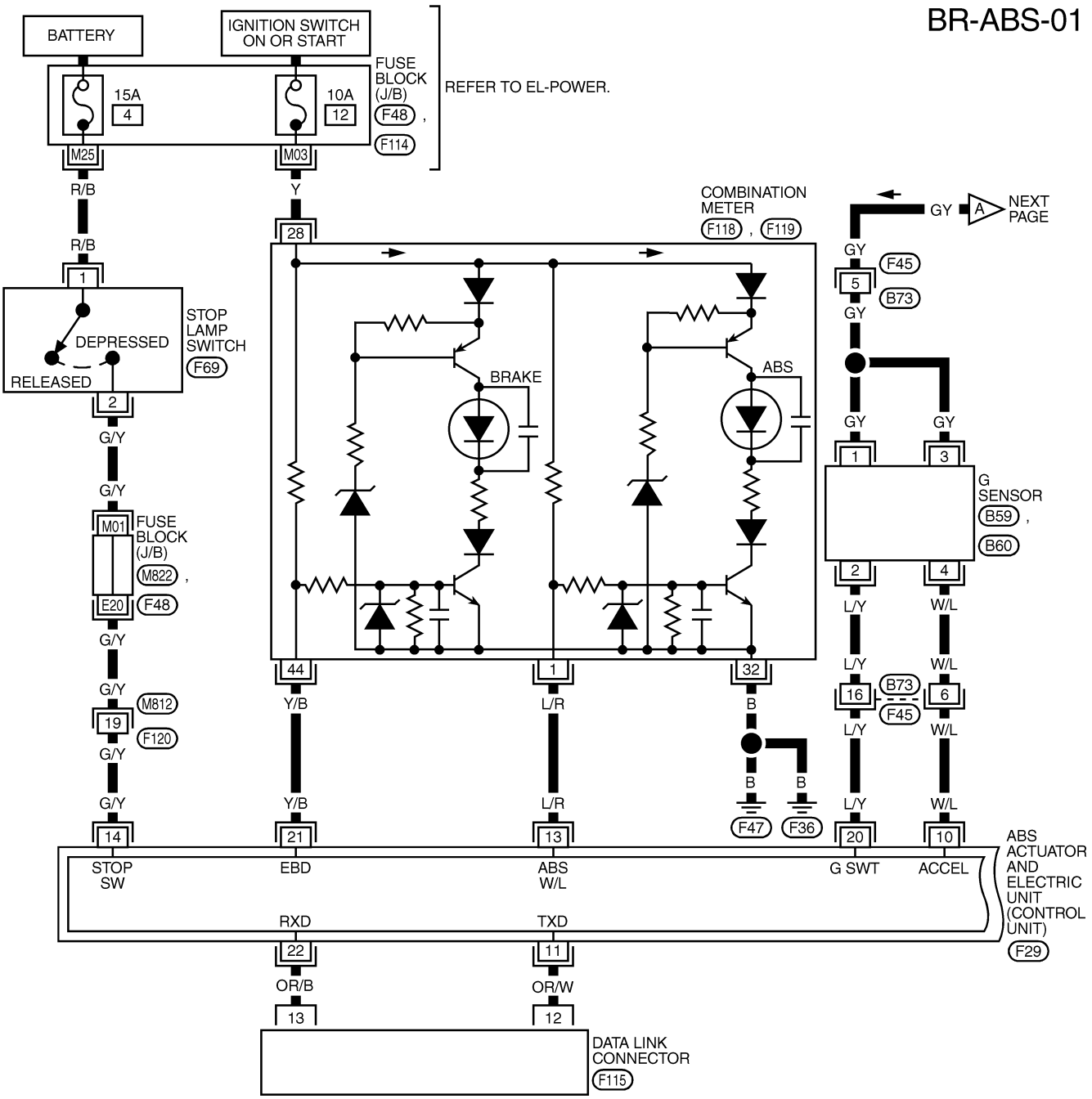


YBR244

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Wiring Diagram — ABS —

LHD MODELS

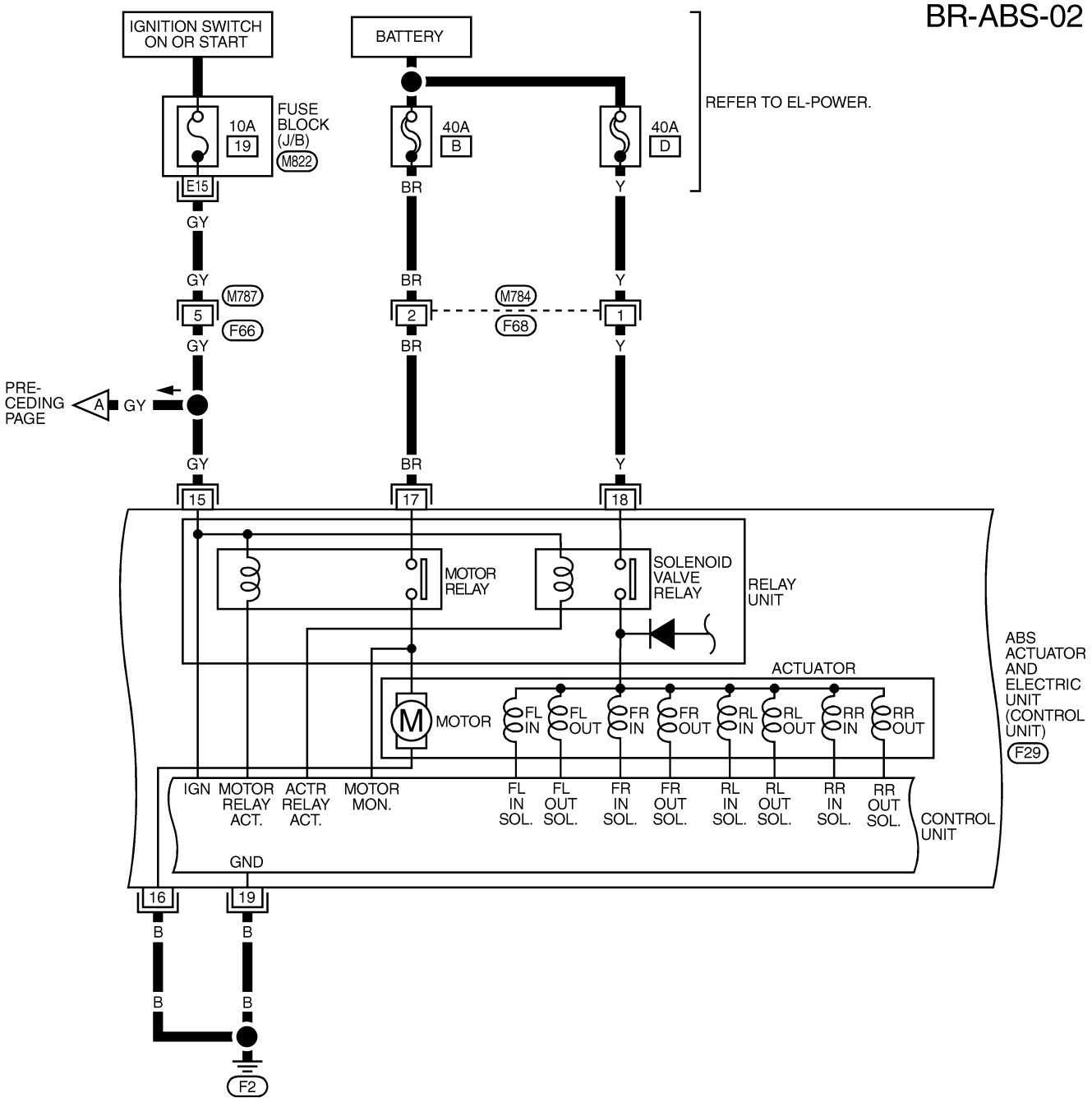


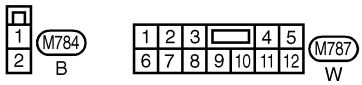
YBR245

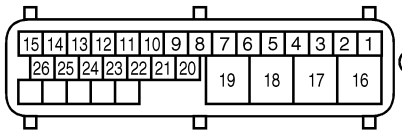
http://vnx.su/

Wiring Diagram — ABS — (Cont'd)

BR-ABS-02







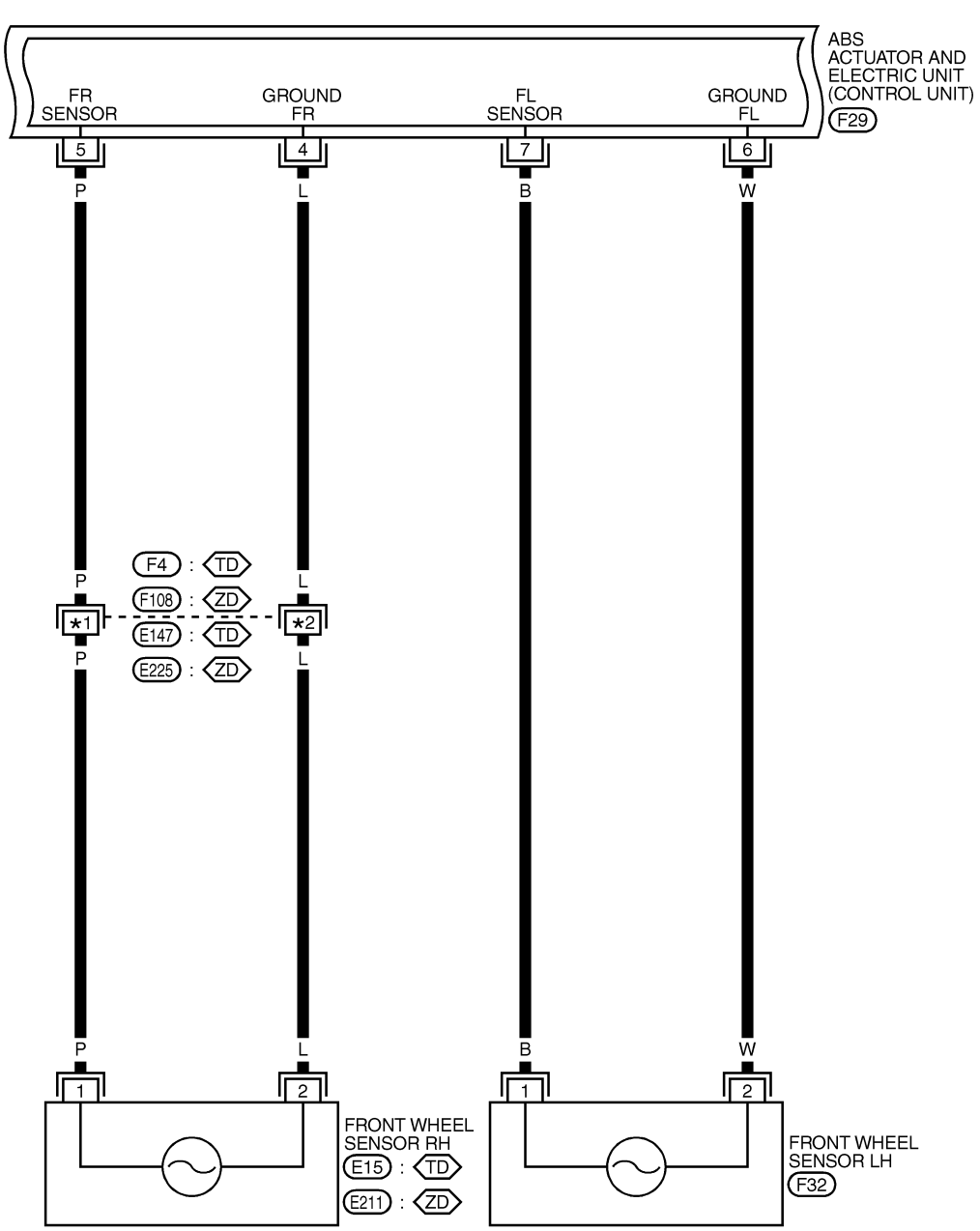
REFER TO THE FOLLOWING.
M822 -FUSE BLOCK-JUNCTION BOX (J/B)

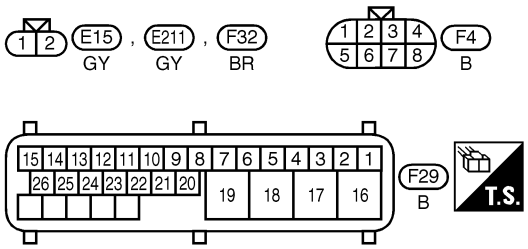
YBR246

http://vnx.su/

Wiring Diagram — ABS — (Cont'd)

BR-ABS-03





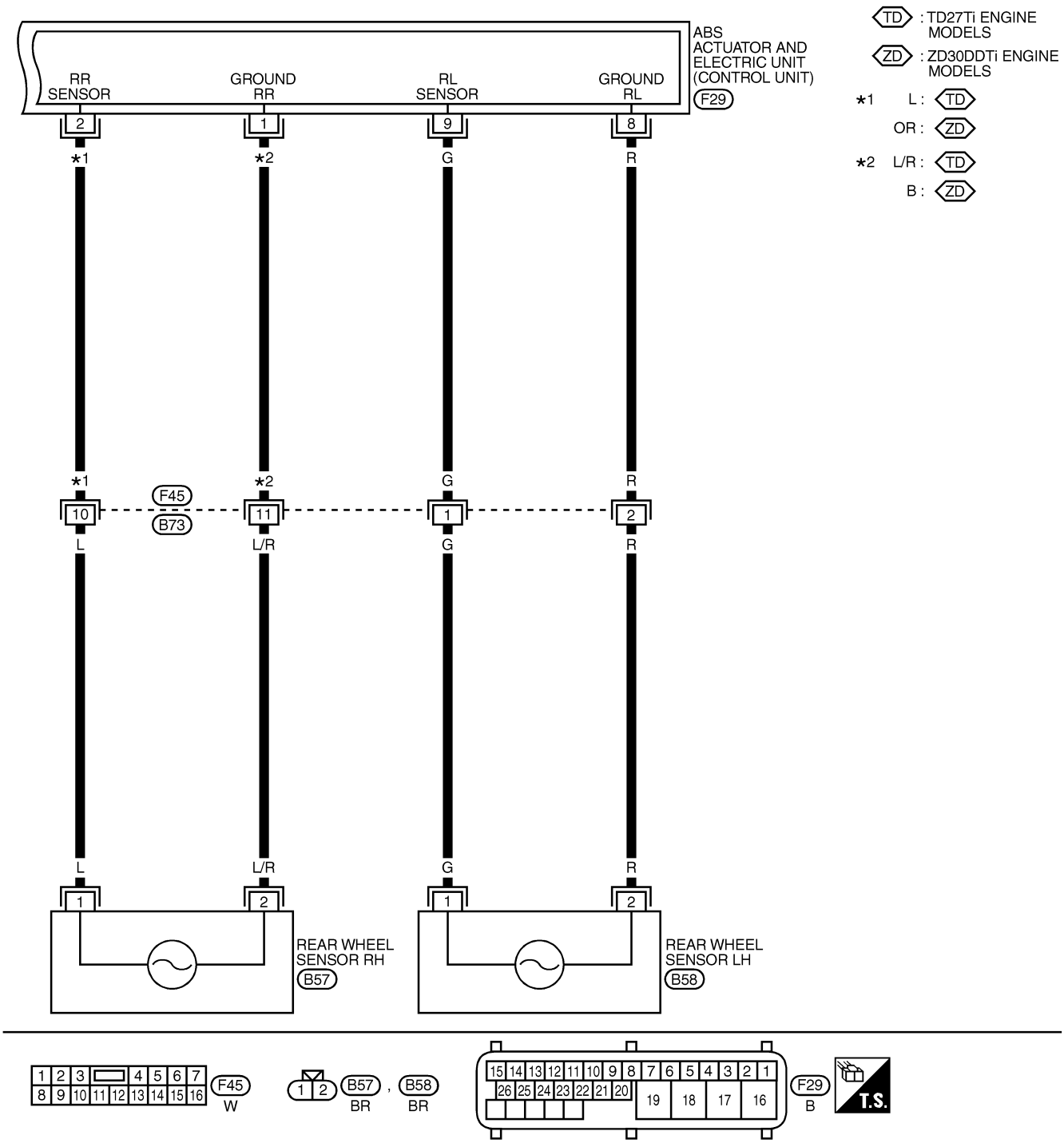
REFER TO THE FOLLOWING.
F108 -SUPER MULTIPLE JUNCTION (SMJ)

YBR247

http://vnx.su/

Wiring Diagram — ABS — (Cont'd)

BR-ABS-04

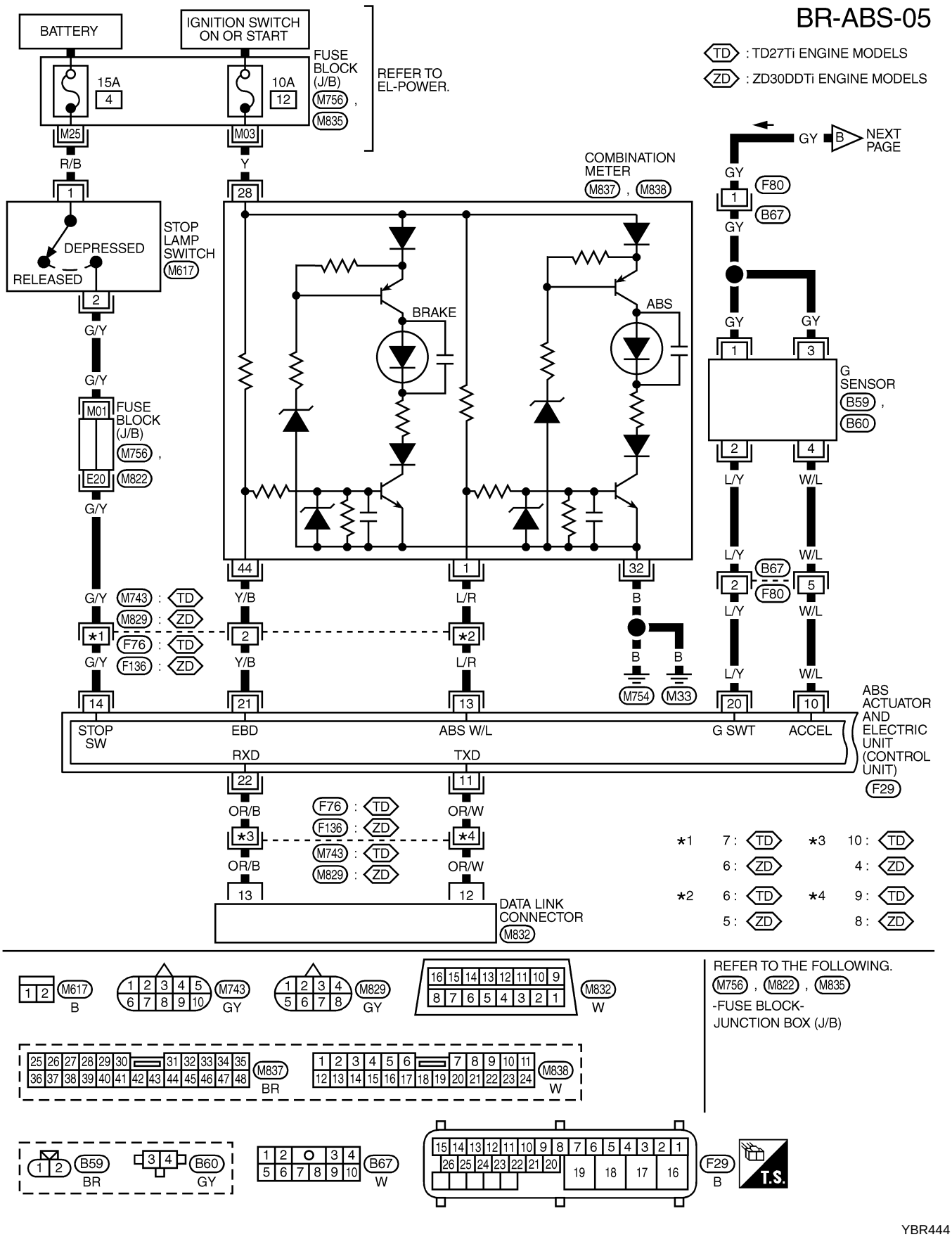


YBR248

http://vnx.su/

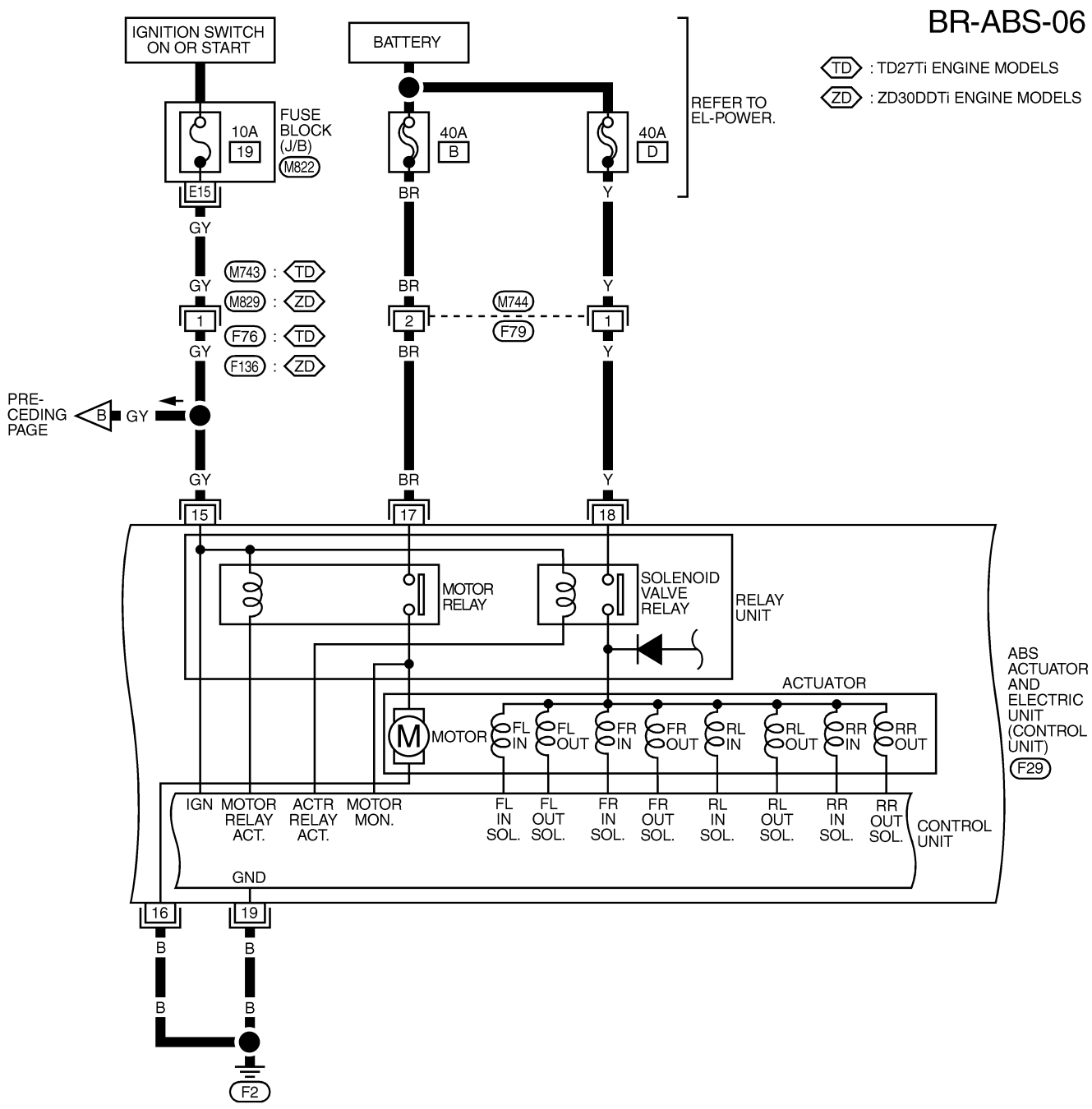
Wiring Diagram — ABS — (Cont'd)

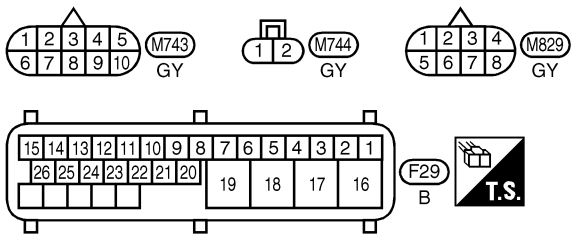
RHD MODELS



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Wiring Diagram — ABS — (Cont'd)





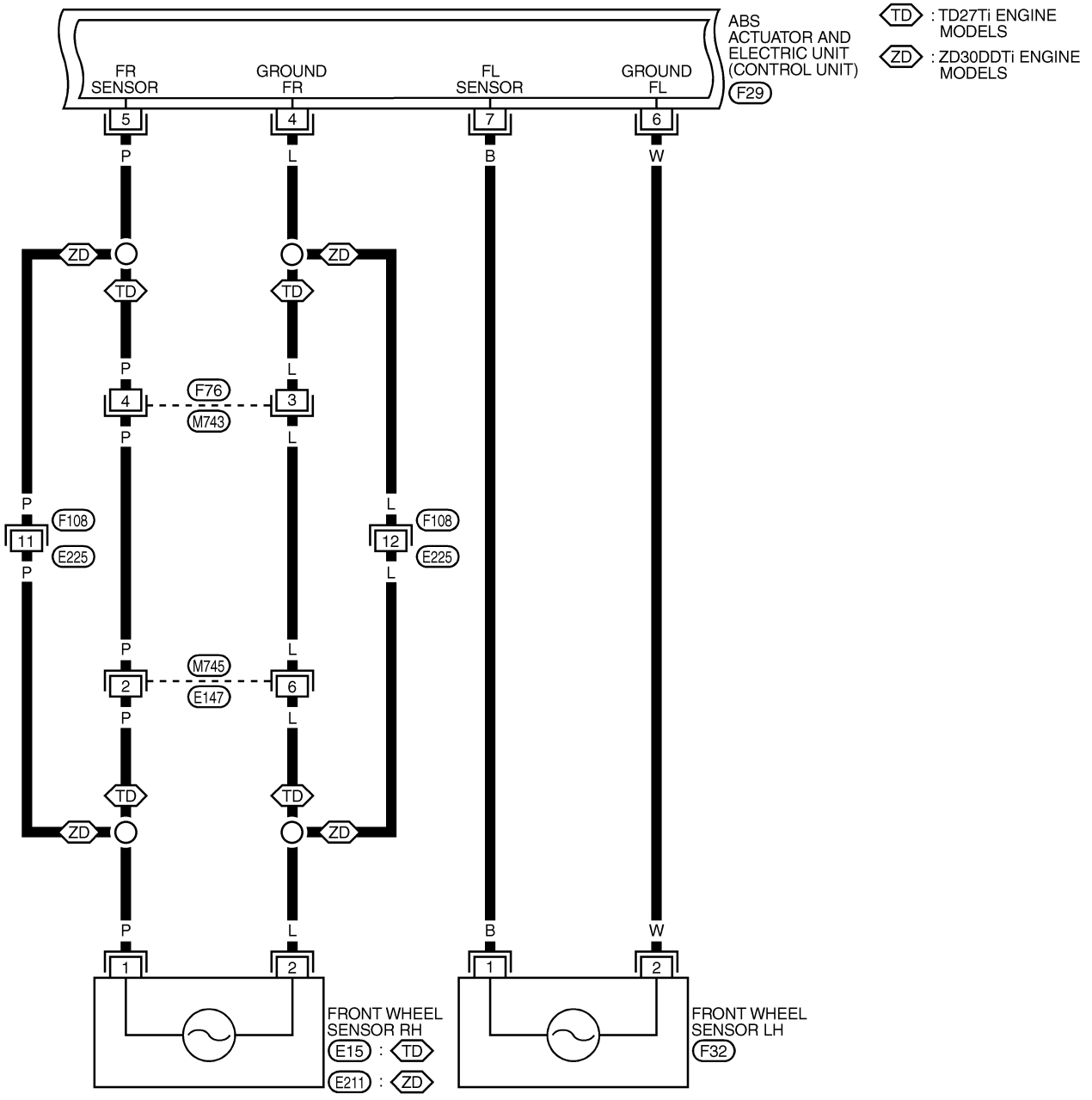
REFER TO THE FOLLOWING.
M822 -FUSE BLOCK-
JUNCTION BOX (J/B)

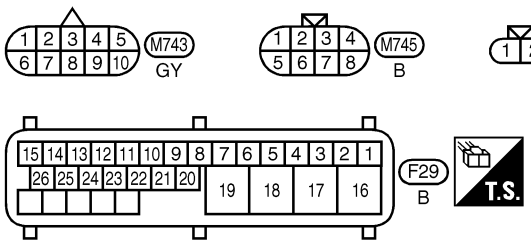
YBR250

http://vnx.su/

Wiring Diagram — ABS — (Cont'd)

BR-ABS-07





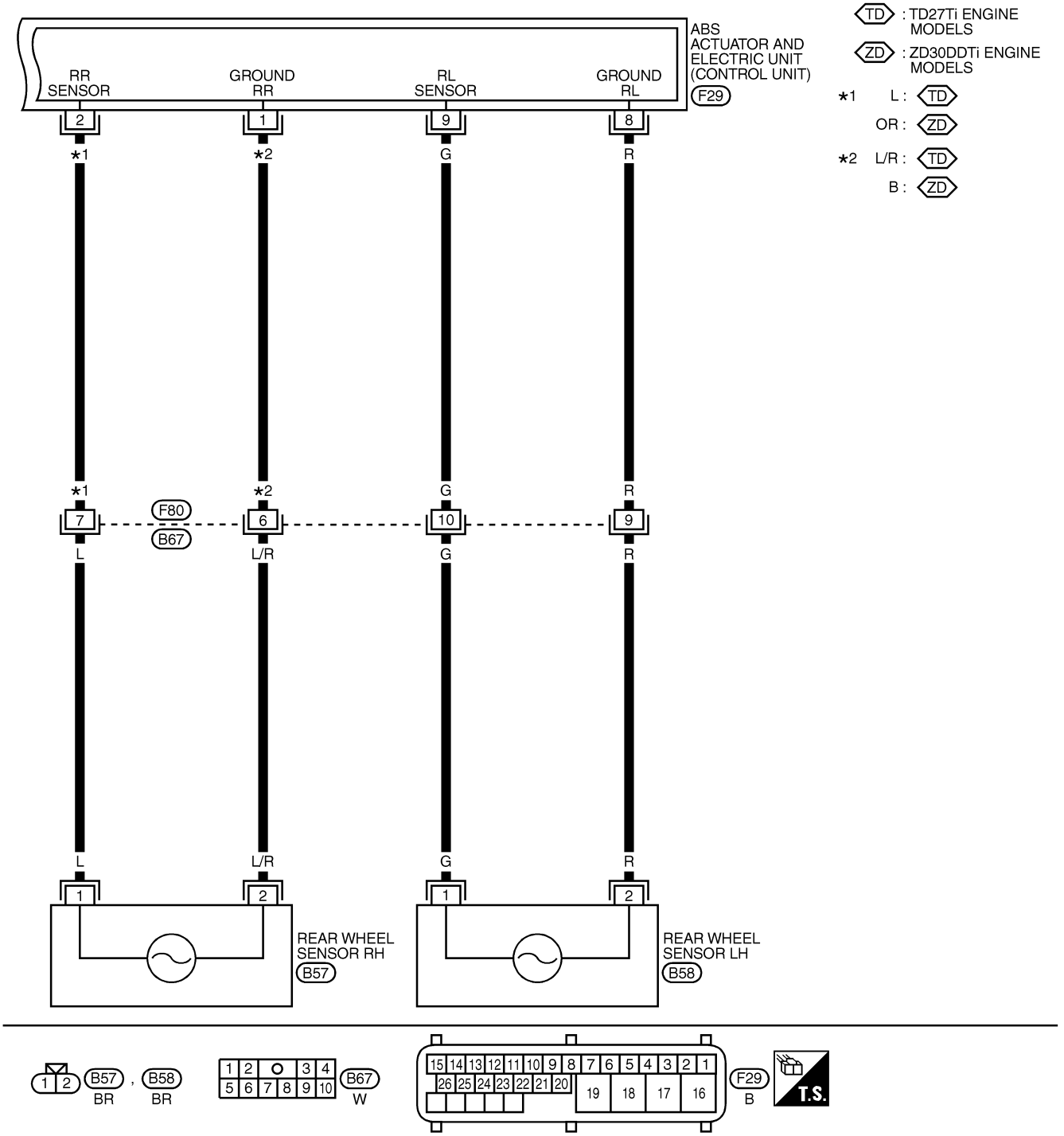
REFER TO THE FOLLOWING.
F108 -SUPER MULTIPLE JUNCTION (SMJ)

YBR251

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Wiring Diagram — ABS — (Cont'd)

BR-ABS-08



YBR252

http://vnx.su/

CONSULT-II

CONSULT-II APPLICATION TO ABS

ITEM	SELF-DIAGNOSTIC RESULTS	DATA MONITOR	ACTIVE TEST
Front right wheel sensor	X	X	—
Front left wheel sensor	X	X	—
Rear right wheel sensor	X	X	—
Rear left wheel sensor	X	X	—
G switch (G sensor)	X	X	X
Stop lamp switch	—	X	—
Front right inlet solenoid valve	X	X	X
Front right outlet solenoid valve	X	X	X
Front left inlet solenoid valve	X	X	X
Front left outlet solenoid valve	X	X	X
Rear inlet solenoid valve	X	X	X
Rear outlet solenoid valve	X	X	X
Actuator solenoid valve relay	X	X	—
Actuator motor relay (ABS MOTOR is shown on the Data Monitor screen.)	X	X	X
ABS warning lamp	—	X	—
Brake warning lamp	—	X	—
Battery voltage	X	X	—
ABS Operating Signal	—	—	—

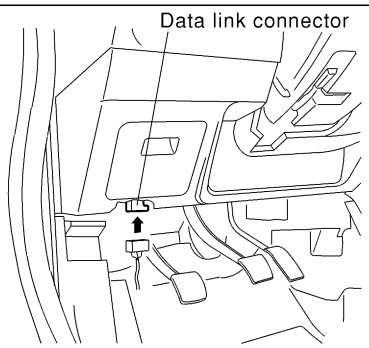
X: Applicable
—: Not applicable

ECU (ABS control unit) part number mode

Ignore the ECU part number displayed in the ECU PART NUMBER MODE. Refer to parts catalog to order the ECU.

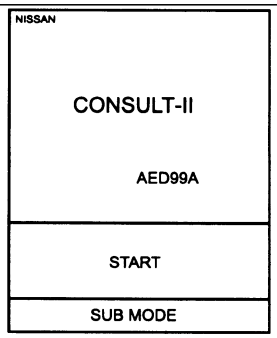
http://vnx.su/

A



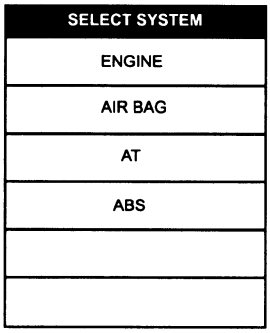
YBR265

B



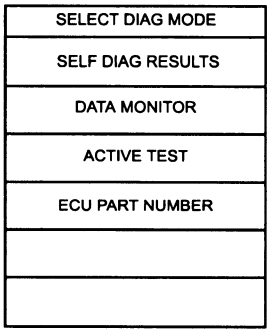
C2NCS01

C



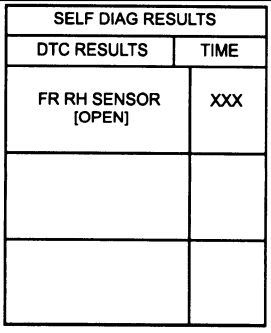
C2SSE01

D



C2SDM01

E



C2SDR01

CONSULT-II Inspection Procedure

SELF-DIAGNOSIS PROCEDURE

A

1) Turn ignition switch to OFF position.
2) Connect CONSULT-II to Data Link Connector.

↓

1) Start engine.
2) Drive vehicle over 30 km/h (19 MPH) for at least one minute.

↓

B 1) Stop vehicle with engine running and touch “START” on CONSULT-II screen.
C 2) Touch “ABS”.
D 3) Touch “SELF-DIAG RESULTS”.
- The screen shows the detected malfunction and how many times the ignition switch has been turned since the malfunction.

↓

Make the necessary repairs following the diagnostic procedures.

↓

E

After the malfunctions are repaired, erase the self-diagnostic results stored in the control unit by touching “ERASE”.

↓

Check warning lamp(s) for deactivation after driving vehicle over 30 km/h (19 MPH) for at least one minute.

↓

Test the ABS system in a safe area to verify that it functions properly.

↓

END

Note: “SELF-DIAG RESULTS” screen shows the detected malfunction and how many times the ignition switch has been turned since the malfunction.

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CONSULT-II Inspection Procedure (Cont'd)

SELF-DIAGNOSTIC RESULTS MODE

Diagnostic item	Diagnostic item is detected when . . .	Diagnostic procedure
FR RH SENSOR★ [OPEN]	● Circuit for front right wheel sensor is open. (An abnormally high input voltage is entered.)	4
FR LH SENSOR★ [OPEN]	● Circuit for front left wheel sensor is open. (An abnormally high input voltage is entered.)	4
RR RH SENSOR★ [OPEN]	● Circuit for rear right sensor is open. (An abnormally high input voltage is entered.)	4
RR LH SENSOR★ [OPEN]	● Circuit for rear left sensor is open. (An abnormally high input voltage is entered.)	4
FR RH SENSOR★ [SHORT]	● Circuit for front right wheel sensor is shorted. (An abnormally low input voltage is entered.)	4
FR LH SENSOR★ [SHORT]	● Circuit for front left wheel sensor is shorted. (An abnormally low input voltage is entered.)	4
RR RH SENSOR★ [SHORT]	● Circuit for rear right sensor is shorted. (An abnormally low input voltage is entered.)	4
RR LH SENSOR★ [SHORT]	● Circuit for rear left sensor is shorted. (An abnormally low input voltage is entered.)	4
ABS SENSOR★ [ABNORMAL SIGNAL]	● Teeth damage on sensor rotor or misalignment of wheel sensor. (Abnormal wheel sensor signal is entered.)	4
FR RH IN ABS SOL [OPEN, SHORT]	● Circuit for front right inlet solenoid valve is open or shorted. (An abnormally low output voltage is entered.)	3
FR LH IN ABS SOL [OPEN, SHORT]	● Circuit for front left inlet solenoid valve is open or shorted. (An abnormally low output voltage is entered.)	3
FR RH OUT ABS SOL [OPEN, SHORT]	● Circuit for front right outlet solenoid valve is open or shorted. (An abnormally low output voltage is entered.)	3
FR LH OUT ABS SOL [OPEN, SHORT]	● Circuit for front left outlet solenoid valve is open or shorted. (An abnormally low output voltage is entered.)	3
RR IN ABS SOL [OPEN, SHORT]	● Circuit for rear right outlet solenoid valve is open or shorted. (An abnormally high output voltage is entered.)	3
RR OUT ABS SOL [OPEN, SHORT]	● Circuit for rear left outlet solenoid valve is open or shorted. (An abnormally high output voltage is entered.)	3
ABS ACTUATOR RELAY [ABNORMAL]	● Actuator solenoid valve relay is ON, even if control unit sends OFF signal. ● Actuator solenoid valve relay is OFF, even if control unit sends ON signal.	6
ABS MOTOR RELAY [ABNORMAL]	● Circuit for ABS motor relay is open or shorted. ● Circuit for actuator motor is open or shorted. ● Actuator motor relay is stuck.	5
BATTERY VOLT [VB-LOW]	● Power source voltage supplied to ABS control unit is abnormally low.	7
CONTROL UNIT	● Function of calculation in ABS control unit has failed.	9
G-SENSOR [ABNORMAL]	● G sensor is open.	8

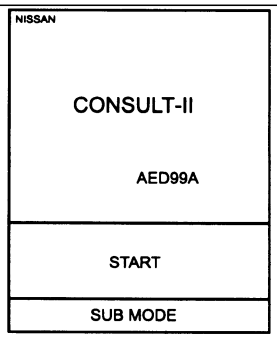
★ If a tire slips on rough roads for more than 10 seconds, the ABS warning lamp may come on. In this case, the malfunctioning code regarding the wheel sensors may be memorized. Turn off the ignition switch, restart the engine and drive the vehicle at speeds above 30 km/h (19 MPH).

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CONSULT-II Inspection Procedure (Cont'd)

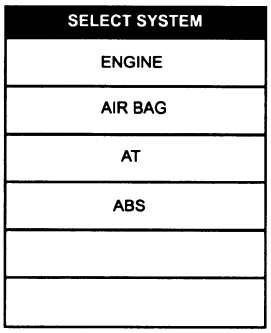
DATA MONITOR PROCEDURE

A



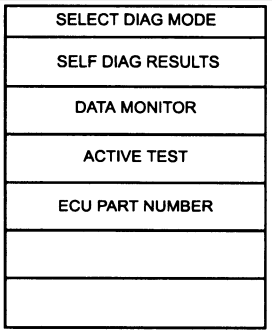
C2NCS01

B



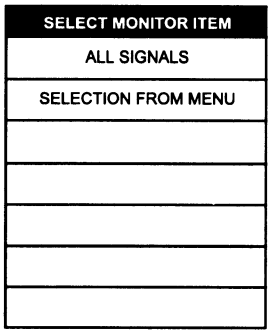
C2SSE01

C



C2SDM01

D



C2SMI01

1) Turn ignition switch to the OFF position.
2) Connect CONSULT-II to Data Link Connector.
3) Turn ignition switch to the ON position.

↓

A 1) Touch "START" on CONSULT-II screen.
B 2) Touch "ABS".
C 3) Touch "DATA MONITOR".

↓

D 1) Select "SELECT MONITOR ITEM".

↓

Carry out the monitor test under the condition as described in page BR-63.

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CONSULT-II Inspection Procedure (Cont'd)

DATA MONITOR MODE

MONITOR ITEM	CONDITION	SPECIFICATION
FR RH SENSOR FR LH SENSOR REAR RH SENSOR REAR LH SENSOR	Drive vehicle. (Each wheel is rotating.)	Wheel speed signal Almost the same speed as speedometer.
STOP LAMP SW	Brake is depressed.	Depress the pedal: ON Release the pedal: OFF
G-SWITCH	Vehicle is driven. Vehicle is stopped. Brake is applied.	When driving or stopping vehicle with a force of less than 0.3G: ON When driving or stopping vehicle with a force of 0.3G or more: OFF
FR RH IN SOL FR RH OUT SOL FR LH IN SOL FR LH OUT SOL RR IN SOL RR OUT SOL	1. Drive vehicle at speeds over 30 km/h (19 MPH) for at least one minute. 2. Engine is running.	Operating conditions for each solenoid valve are indicated. ABS is not operating: OFF
MOTOR RELAY		ABS is not operating: OFF ABS is operating: ON
ACTUATOR RELAY	Ignition switch is set to the "ON" position or engine is running.	Ignition switch in the "ON" position (Engine stops): OFF Engine running: ON
WARNING LAMP		Warning lamp is turned on: ON Warning lamp is turned off: OFF
BATTERY VOLT		Power supply voltage for control unit

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CONSULT-II Inspection Procedure (Cont'd)

ACTIVE TEST PROCEDURE

- When conducting Active test, vehicle must be stationary.
- When ABS warning lamp stays on, never conduct Active test.

1) Turn ignition switch to the "LOCK" position.
2) Connect CONSULT-II to Data Link Connector.
3) Start engine.

↓

A 1) Touch "START" on CONSULT-II screen.
B 2) Touch "ABS".
C 3) Touch "ACTIVE TEST".

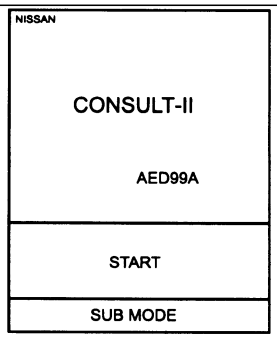
↓

D 1) Select active test item by touching screen.
E 2) Touch "START".

↓

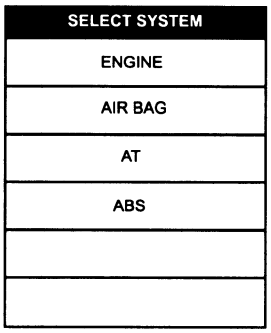
Carry out the active test by touching screen key.

A



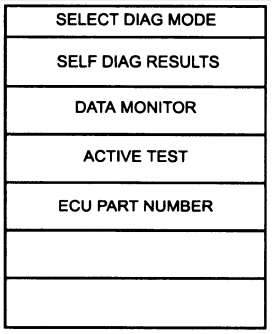
C2NCS01

B



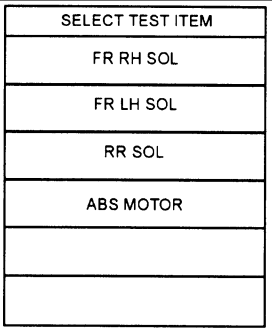
C2SSE01

C



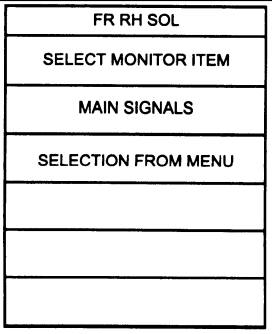
C2SDM01

D



C2STI01

E



C2FRS01

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CONSULT-II Inspection Procedure (Cont'd)

ACTIVE TEST MODE

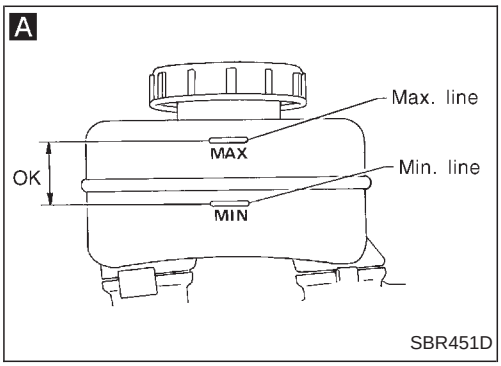
TEST ITEM	CONDITION	JUDGEMENT
FR RH SOLENOID FR LH SOLENOID RR SOLENOID	Engine is running.	Brake fluid pressure control operation IN SOL / OUT SOL UP (Increase): OFF / OFF KEEP (Hold): ON / OFF DOWN (Decrease): ON / ON
ABS MOTOR		ABS actuator motor ON: Motor runs (ABS motor relay ON) OFF: Motor stops (ABS motor relay OFF)
G-SWITCH	Ignition switch is ON or engine is running.	Check G-switch circuit OFF: G-switch OFF ON: G-switch ON

Note: Active test will automatically stop ten seconds after the test starts. (LIMIT SIGNAL monitor shows ON.)

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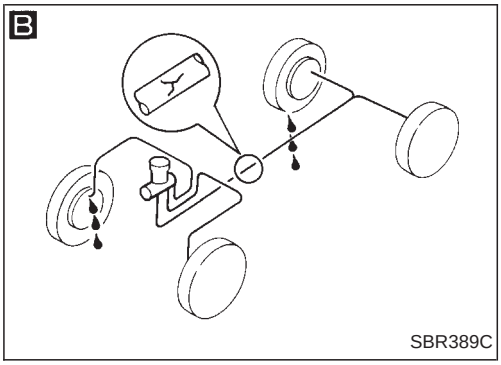
Preliminary Check

A

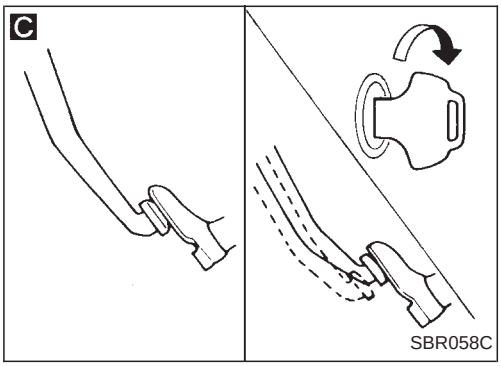


SBR451D

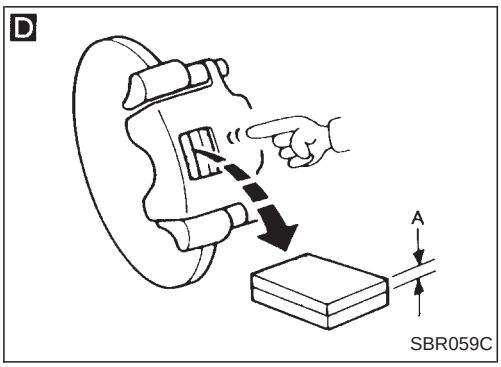
B


SBR389C

C

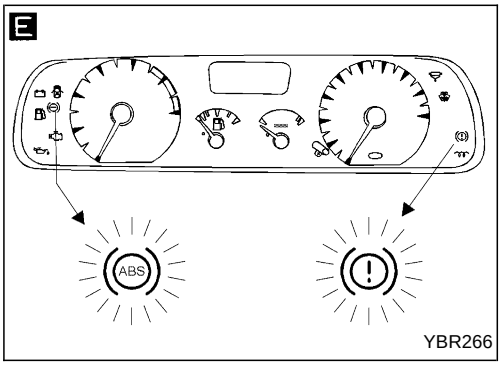

SBR058C

D



SBR059C

E



YBR266

A

Check brake fluid level in reservoir tank.

Low fluid level may indicate brake pad wear or leakage from brake line.

B

Check brake line for leakage. — NG → Repair.

OK

C

Check brake booster for operation and air tightness. Refer to BR-19. — NG → Replace.

OK

D

Check brake pads, rotor and drums. — NG → Replace.

OK

A

Check brake fluid level in reservoir tank. — NG → Fill up brake fluid.

OK

E

Check warning lamp(s) or warning sound activation.
When ignition switch is turned on, warning lamp(s) turn(s) on. — NG → Check fuse, warning lamp bulb and warning lamp circuit.

OK

Check warning lamp(s) for deactivation after engine is started. — NG → Go to Self-diagnosis, BR-60.

OK

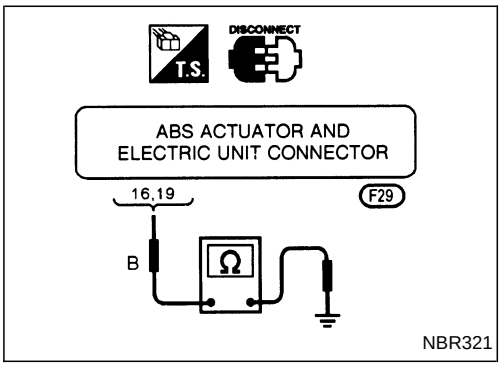
Drive vehicle at speeds over 30 km/h (19 MPH) for at least one minute.

Ensure warning lamp(s) remain(s) off while driving. — NG → Go to Self-diagnosis, BR-60.

OK

END

http://vnx.su/

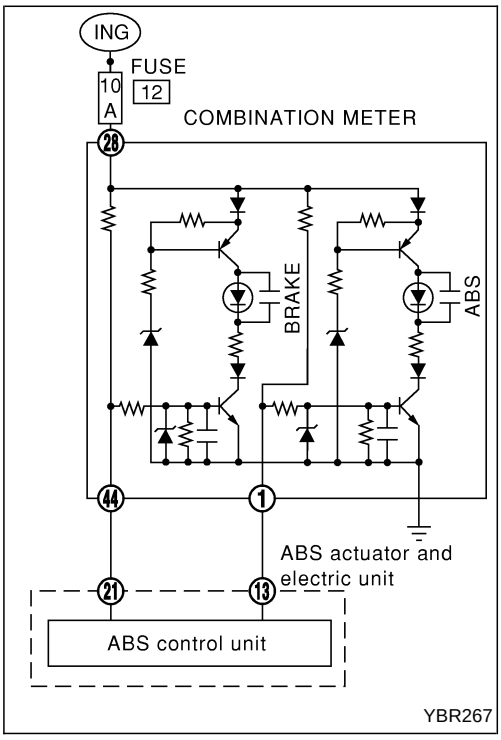


Ground Circuit Check

ABS CONTROL UNIT GROUND

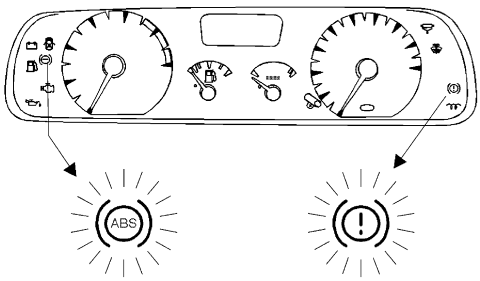
- Check resistance between ABS actuator and electric unit connector terminals and ground.
  Resistance: approximately 0Ω

http://vnx.su/



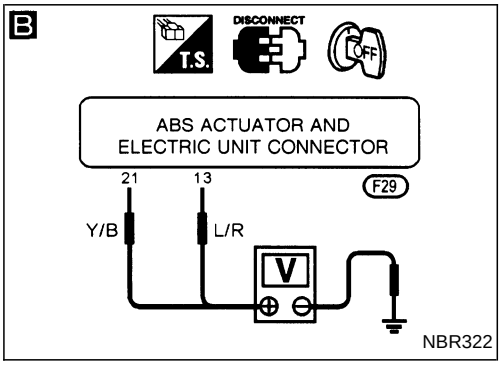
YBR267

A



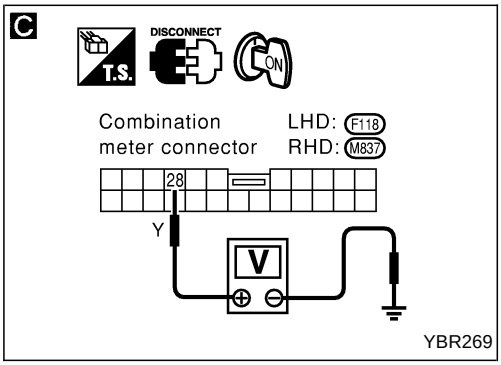
YBR268

B



NBR322

C



YBR269

Diagnostic Procedure 1 (Not self-diagnostic item)

Warning lamp does not come on when ignition switch is turned ON.

CHECK FUSE.
Check 10A fuse 12 . For fuse layout, refer to POWER SUPPLY ROUTING EL section.
NG → Replace fuse.
OK ↓

A

CHECK IF ABS (and BRAKE) WARNING LAMP(S) ACTIVATES.
Disconnect ABS actuator and electric unit connector.
Does the warning lamp(s) activate?
Yes → Ⓐ (Go to next page.)
No ↓

B

CHECK HARNESS FOR SHORT.
1. Disconnect ABS connector and electric unit connector.
2. Check voltage between ABS actuator and electric unit connector F29 (body side) terminals 21, 13 and ground.

Battery voltage should not exist.
NG → Repair harness or connector.
OK ↓

C

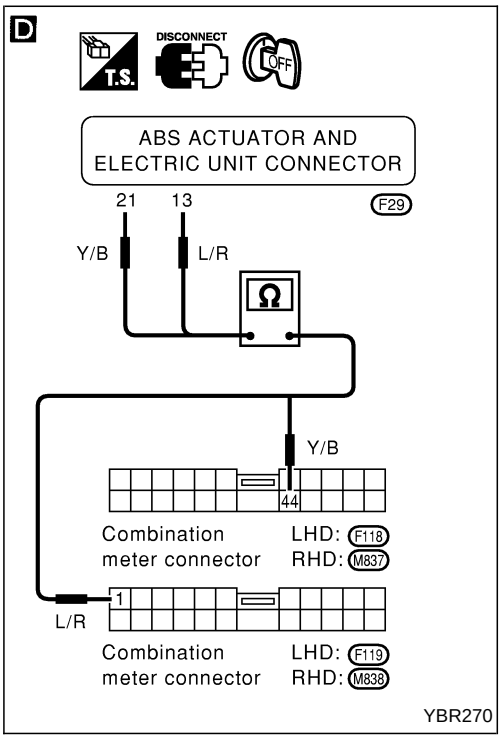
Check voltage between combination connector LHD: F118, RHD: M837 terminal 28 and ground.
Battery Voltage should exist.
NG → Replace harness or connector.
OK ↓

CHECK WARNING LAMP(S).
1. Turn ignition switch to “OFF” position.
2. Check ABS (and Brake) warning lamp(s).

NG → Replace bulb(s).
OK ↓
Ⓐ

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Diagnostic Procedure 1 (Not self-diagnostic item) (Cont'd)



Ⓐ

D

CHECK HARNESS FOR SHORT.

1. Disconnect combination meter connector LHD: F118 and F119, or RHD: M837 and M838.
2. Check continuity between ABS actuator and electric unit connector F29 and combination meter connector LHD: F118 and F119, or RHD: M837 and M838.

	F29	LHD: F119 RHD: M838	LHD: F118 RHD: M837	Continuity
Terminal	⑬	①	—	Yes
Terminal	㉑	—	㊹	Yes

NG → Replace harness or connector(s).

OK ↓

Check combination meter

NG ↓

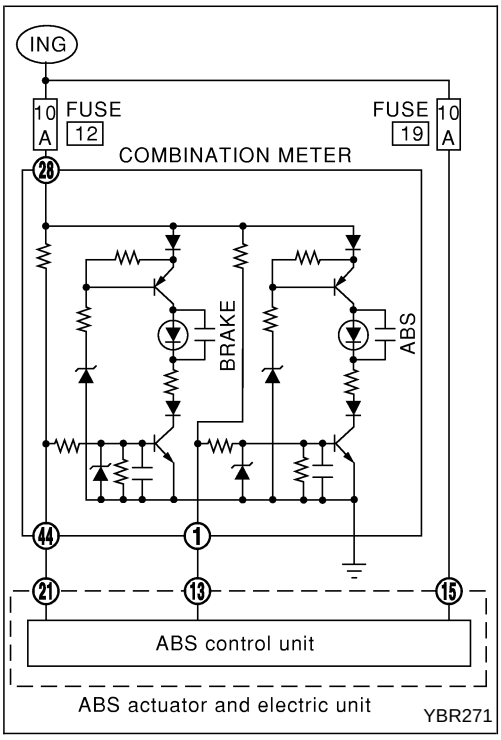
CHECK HARNESS CONNECTOR.
Check ABS actuator and electric unit pin terminals for damage or connection of ABS actuator and electric unit harness connector. Reconnect ABS actuator and electric unit harness connector. Then retest.

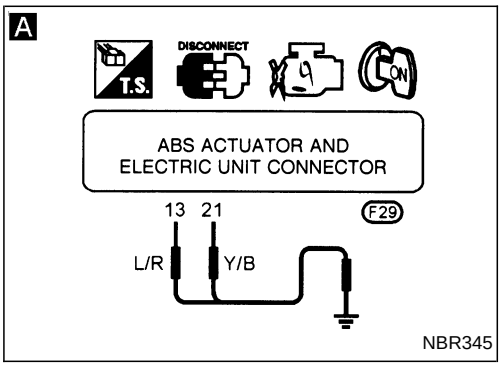
OK → Inspection end

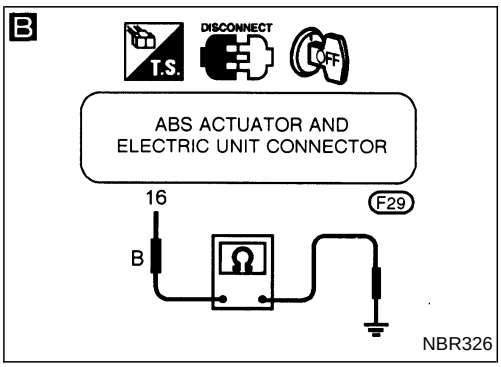
↓

REPLACE.
Replace ABS actuator and electric unit.

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Diagnostic Procedure 2 (Warning lamp stays on when ignition switch is turned ON)

CHECK FUSE.
Check 10A fuse 19 . For fuse layout, refer to POWER SUPPLY ROUTING in EL section.

NG → Ⓐ (Go to next page.)

OK ↓

A

CHECK WARNING LAMP.
1. Disconnect ABS actuator and electric unit connector.
2. Connect suitable wire between ABS actuator and electric unit harness connector F29 terminals 13, 21 and ground.
Warning lamp should not activate.

NG → Ⓑ (Go to next page.)

OK ↓

CHECK HARNESS CONNECTOR.
Check ABS actuator and electric unit pin terminals for damage or the connection of ABS actuator and electric unit harness connector. Reconnect ABS actuator and electric unit harness connector. Then retest.

OK → Inspection end

NG ↓

B

CHECK ABS MOTOR GROUND.
1. Turn ignition switch OFF.
2. Disconnect ABS actuator and electric unit connector.
3. Check continuity between ABS actuator and electric unit connector F29 (body side) terminal 16 and ground.
Continuity should exist.

NG → Check the following.
- Harness connector F29
- Harness for open or short between ABS actuator and electric unit and ground

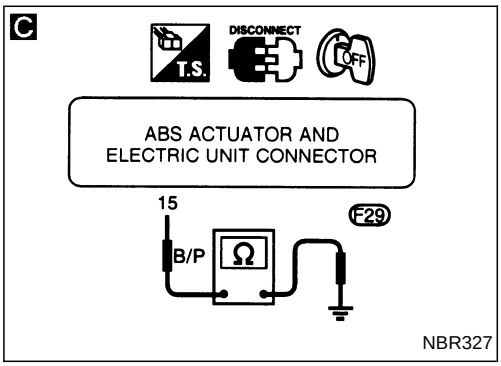
If NG, repair harness or connector.

OK ↓

REPLACE.
Replace ABS actuator and electric unit.

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Diagnostic Procedure 2 (Warning lamp stays on when ignition switch is turned ON) (Cont'd)



Ⓐ

REPLACE.
Replace fuse.
Does the fuse blow out when ignition switch is turned ON?

No → Inspection end

Yes ↓

C

CHECK ABS ACTUATOR AND ELECTRIC UNIT POWER SUPPLY CIRCUIT FOR SHORT.

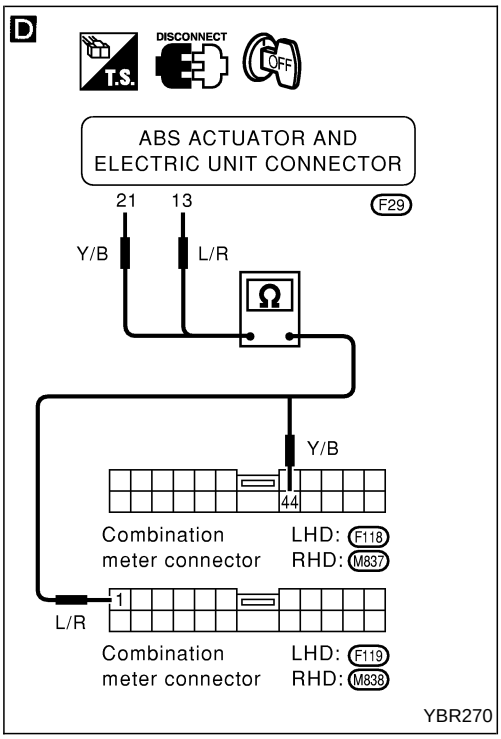
1. Disconnect battery cable and ABS actuator and electric unit connector (F29).
2. Check continuity between ABS actuator and electric unit connector (F29) body side terminal (15) and ground.
   Continuity should not exist.

NG →
Check the following.
- Harness connector (F29)
- Harness for open or short between ABS actuator and electric unit and fuse

If NG, repair harness or connector.

OK ↓

REPLACE.
Replace ABS actuator and electric unit.



Ⓑ

D

CHECK ABS WARNING LAMP CONTROL CIRCUIT.

1. Disconnect combination meter connector LHD: (F118) and (F119), or RHD: (M837) and (M838).
2. Check continuity between ABS actuator and electric unit connector (F29) (body side) terminal and combination meter connector LHD: (F118) and (F119), or RHD: (M837) and (M838).

	F29	LHD: (F119) RHD: (M838)	LHD: (F118) RHD: (M837)	Continuity
Terminal	(13)	(1)	—	Yes
Terminal	(21)	—	(44)	Yes

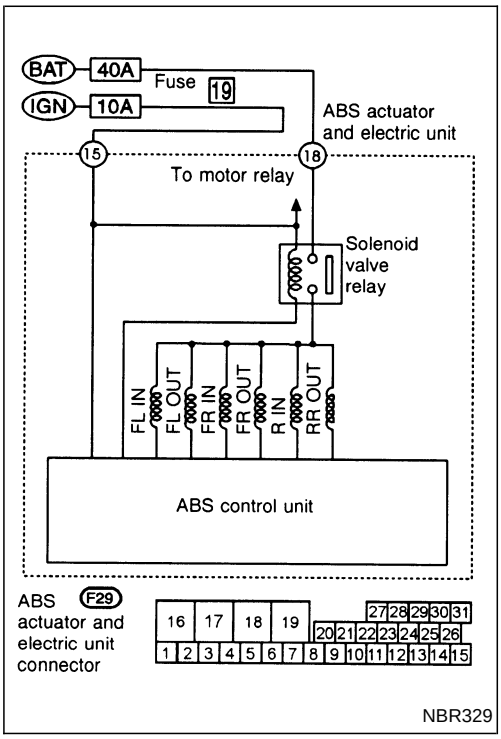
NG →
Check the following.
- Harness connectors LHD: (F118) and (F119), or RHD: (M837) and (M838) and (F29)
- Harness for open or short between ABS actuator and electric unit and combination meter

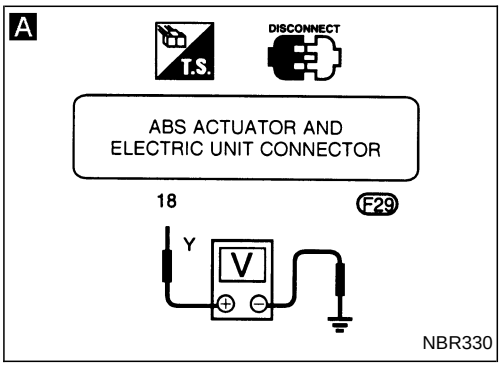
If NG, repair harness or connectors.

OK ↓

CHECK COMBINATION METER.
Check combination meter. Refer to WARNING LAMPS in EL section.

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Diagnostic Procedure 3 (ABS actuator solenoid valve and solenoid valve relay)

Malfunction code Nos. 41, 42, 45, 46, 55, 56, 63

CHECK FUSIBLE LINK.
Check 40A. For fusible link layout, refer to POWER SUPPLY ROUTING in EL section.

NG → Ⓐ (Go to next page.)

OK ↓

CHECK FUSE.
Check 10A fuse 19 . For fuse layout, refer to POWER SUPPLY ROUTING in EL section.

NG → Ⓑ (Go to next page.)

OK ↓

CHECK CONNECTOR.
1. Disconnect ABS actuator and electric unit connector. Check terminals for damage or loose connection. Then reconnect connector.
2. Carry out self-diagnosis again.
Does warning lamp activate again?

No → Inspection end

Yes ↓

CHECK ABS ACTUATOR AND ELECTRIC UNIT GROUND CIRCUIT.
Refer to ABS ACTUATOR AND ELECTRIC UNIT GROUND in Ground Circuit Check, BR-67.

NG → Repair harness and connector.

OK ↓

A

CHECK SOLENOID VALVE RELAY POWER SUPPLY CIRCUIT.
1. Disconnect ABS actuator and electric unit connector.
2. Check voltage between ABS actuator and electric unit connector F29 (body side) terminal 18 and ground.
Battery voltage should exist.

NG → Check the following.
- Harness connector F29, LHD: F68 and M784, or RHD: F79 and M744
- Harness for open or short between ABS actuator and electric unit and fusible link

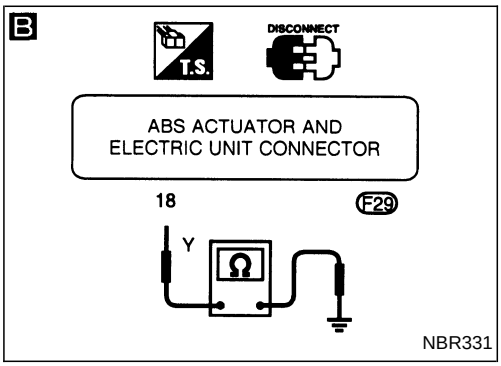
If NG, repair harness or connector.

OK ↓

REPLACE.
Replace ABS actuator and electric unit.

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Diagnostic Procedure 3 (ABS actuator solenoid valve and solenoid valve relay) (Cont'd)



Ⓐ

REPLACE.
Replace fusible link.
Does the fusible link blow out when ignition switch is turned ON?

No → Inspection end

Yes ↓

B

CHECK SOLENOID VALVE RELAY POWER SUPPLY CIRCUIT.

1. Disconnect battery cable and ABS actuator and electric unit connector.
2. Check continuity between ABS actuator and electric unit connector F29 (body side) terminal 18 and ground.
   Continuity should not exist.

NG →
Check the following
- Harness connector F29, LHD: F68 and M784, or RHD: F79 and M744
- Harness for open or short between ABS actuator and electric unit and fusible link

If NG, repair harness or connector.

OK ↓

REPLACE.
Replace ABS actuator and electric unit.

Ⓑ

REPLACE.
Replace fuse.
Does the fuse blow out when ignition switch is turned ON?

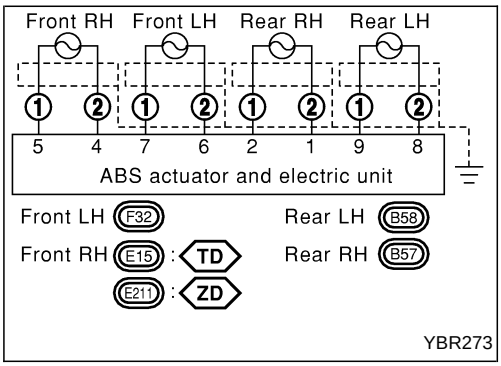
Yes →
Check the following.
- Harness connector F29, M822, LHD: F66 and M787, or RHD: F76: TD, F136: ZD, M743: TD and M829: ZD
- Harness for open or short between ABS actuator and electric unit and fuse

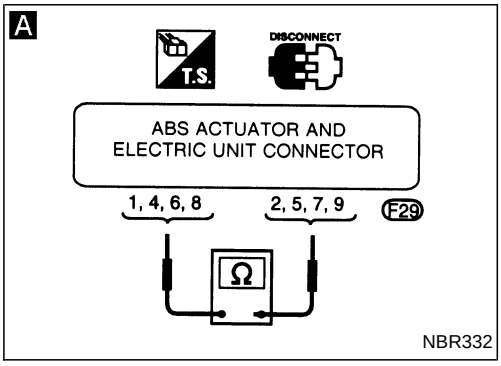
If NG, repair harness or connector.

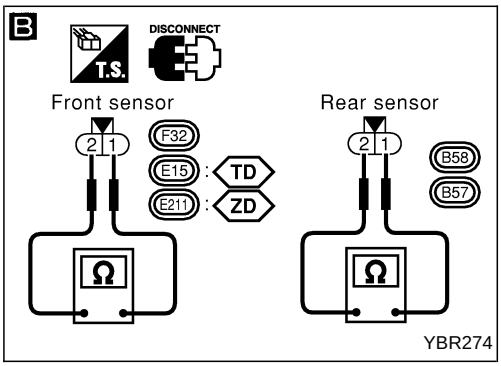
No ↓

END
Inspection end

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Diagnostic Procedure 4 (Wheel sensor or rotor)

Malfunction code No. 21, 22, 25, 26, 31, 32, 35, 36 or 18

INSPECTION START
1. Disconnect connectors from ABS actuator and electric unit and wheel sensor of malfunction code No. Check terminals for damage or loose connections. Then reconnect connectors.
2. Carry out self-diagnosis again.
Does warning lamp activate again?

No → Inspection end

Yes ↓

A

CHECK WHEEL SENSOR ELECTRICAL.
1. Disconnect ABS actuator and electric unit connector.
2. Check resistance between ABS actuator and electric unit connector F29 (body side) terminals.
Code No. 21 or 22 (Front RH wheel)
Terminals ⑤ and ④
Code No. 25 or 26 (Front LH wheel)
Terminals ⑦ and ⑥
Code No. 31 or 32 (Rear RH wheel)
Terminals ② and ①
Code No. 35 or 36 (Rear LH wheel)
Terminals ⑨ and ⑧
Resistance: Front 0.9 - 1.1 kΩ
Rear 1.44 - 1.76 kΩ

OK → Ⓐ (Go to next page.)

NG ↓

B

CHECK WHEEL SENSOR.
Check each sensor for resistance.
Resistance: Front 0.9 - 1.1 kΩ
Rear 1.44 - 1.76 kΩ

OK → Check the following.
- Harness connectors F29, B57, B58, E15 : TD, E211 : ZD and F32
- Harness for open or short between wheel sensor connectors and ABS actuator and electric unit

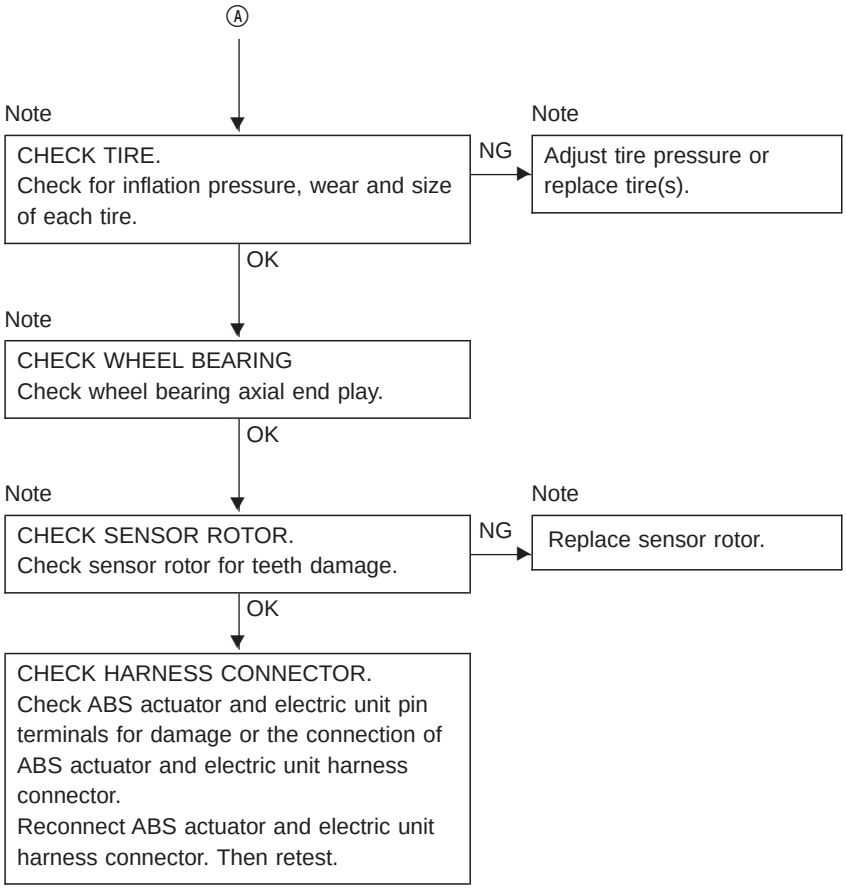
If NG, repair harness or connectors.

NG ↓

REPLACE.
Replace wheel sensor.

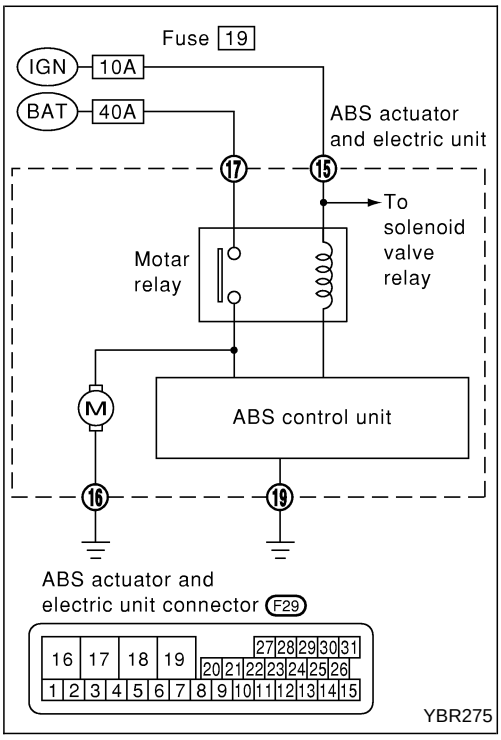
http://vnx.su/

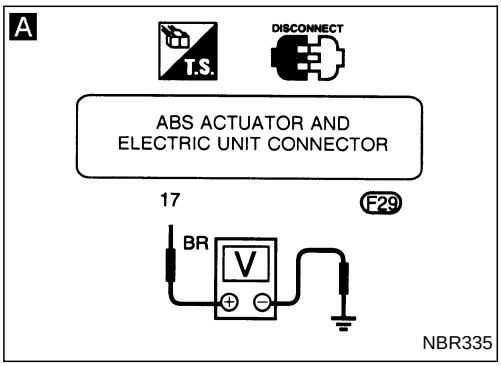
Diagnostic Procedure 4 (Wheel sensor or rotor) (Cont'd)



Note: Wheel position should be distinguished by code numbers except code No. 18 (sensor rotor).

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Diagnostic Procedure 5 (Motor Relay or motor)

Malfunction code No. 61

CHECK FUSIBLE LINK.
Check 40A. For fusible link layout, refer to POWER SUPPLY ROUTING in EL section.
NG → Ⓐ (Go to next page.)
OK ↓

CHECK CONNECTOR
1. Disconnect ABS actuator and electric unit connector. Check terminals for damage or loose connection. Then reconnect connector.
2. Carry out self-diagnosis again.
Does warning lamp activate again?

No → Inspection end
Yes ↓

A

CHECK MOTOR RELAY POWER SUPPLY CIRCUIT.
1. Disconnect ABS actuator and electric unit connector.
2. Check voltage between ABS actuator and electric unit connector F29 (body side) terminal ⑰ and ground.
Battery voltage should exist.

NG → Check the following.
- Harness connector F29, LHD: F68 and M784, or RHD: F79 and M744
- Harness for open or short between ABS actuator and electric unit and fusible link.

If NG, repair harness or connector.

OK ↓

CHECK ABS ACTUATOR AND ELECTRIC UNIT GROUND.
Refer to ABS ACTUATOR AND ELECTRIC UNIT GROUND in Ground Circuit Check, BR-67.

NG → Repair harness and terminals.

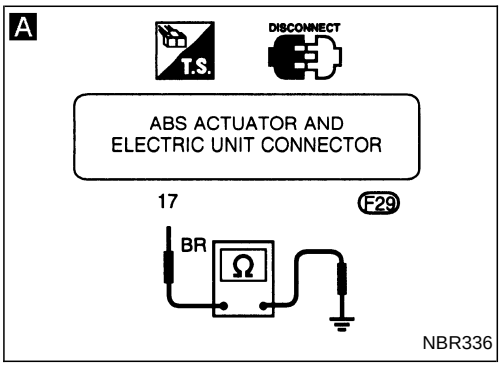
OK ↓

REPLACE.
Replace ABS actuator and electric unit.

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Diagnostic Procedure 5 (Motor Relay or motor) (Cont'd)

A



Ⓐ

REPLACE.
Replace fusible link.
Does the fusible link blow out when ignition switch is turned ON?

No → Inspection end

Yes

B

CHECK ABS ACTUATOR MOTOR POWER SUPPLY CIRCUIT.
1. Disconnect battery cable and ABS actuator and electric unit connector (F29).
2. Check continuity between ABS actuator and electric unit connector (F29) (body side) terminal ⑰ and ground.
   Continuity should not exist.

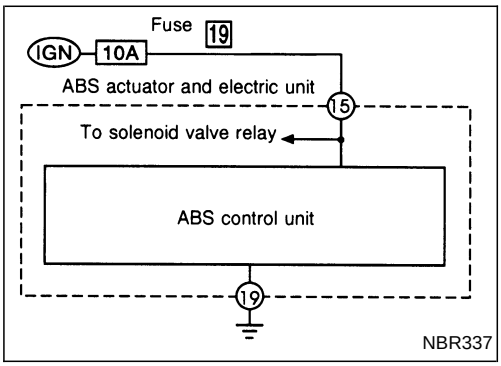
NG → Check the following
- Harness connector (F29), LHD: (F68) and (M784), or RHD: (F79) and (M744)
- Harness for open or short between ABS actuator and electric unit and fusible link

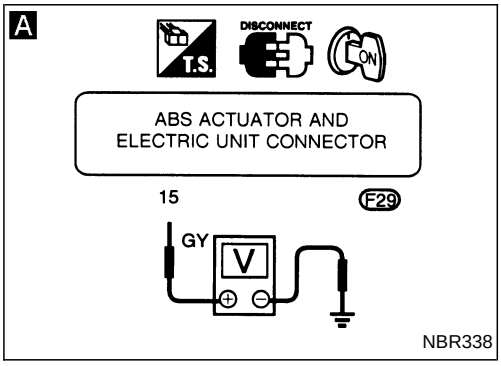
If NG, repair harness or connector.

OK

CHECK HARNESS CONNECTOR.
Check ABS actuator and electric unit pin terminals for damage or the connection of ABS actuator and electric unit harness connector.
Reconnect ABS actuator and electric unit harness connector. Then retest.

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Diagnostic Procedure 7 (Low voltage)

Malfunction code No. 57

CHECK CONNECTOR.
1. Disconnect ABS actuator and electric unit connector. Check terminals for damage or loose connections. Then reconnect connector.
2. Carry out self-diagnosis again.
Does warning lamp activate again?

No → Inspection end

Yes ↓

A

CHECK ABS CONTROL UNIT POWER SUPPLY CIRCUIT.
1. Disconnect ABS actuator and electric unit connector.
2. Check voltage between ABS actuator and electric unit connector F29 terminal 15 and ground.
Battery voltage should exist when ignition switch is turned ON.

NG → Ⓐ (See below.)

OK ↓

CHECK ABS CONTROL UNIT GROUND.
Refer to ABS ACTUATOR AND ELECTRIC UNIT GROUND in Ground Circuit Check, BR-67.

NG → Repair harness and connector.

OK ↓

CHECK HARNESS CONNECTOR.
Check ABS actuator and electric unit pin terminals for damage or the connection of ABS actuator and electric unit harness connector. Reconnect ABS actuator and electric unit harness connector. Then retest.

NG → Replace
Replace ABS actuator and electric unit

Ⓐ ↓

CHECK FUSE.
Check 10A fuse 19 . For fuse layout, refer to POWER SUPPLY ROUTING in EL section.

NG → Replace fuse.

OK ↓

CHECK ABS CONTROL UNIT POWER SUPPLY CIRCUIT.
Check continuity between fuse and ABS actuator and electric unit connector F29 (body side) terminal 15.

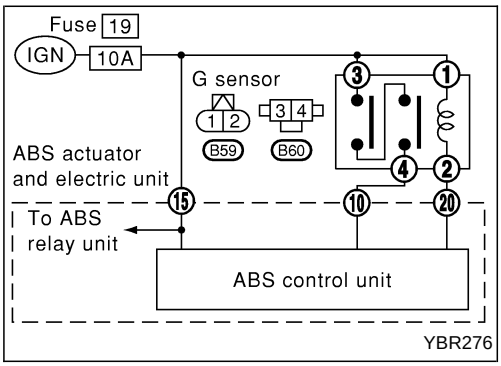
NG → Check the following:
- Harness connector F29, M822, LHD: F66 and M787, or RHD: F76: TD, F136: ZD, M743: ZD and M829: ZD
- Harness for open or short between ABS actuator and electric unit and fuse

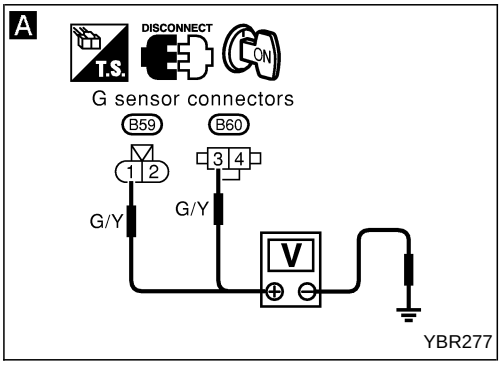
If NG, repair harness or connector.

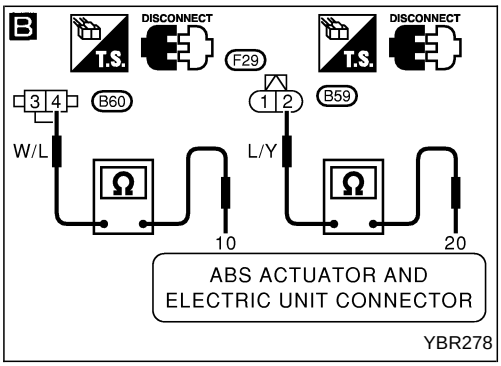
OK ↓

Check battery. Refer to BATTERY in EL section.

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Diagnostic Procedure 8 (G sensor)

Malfunction code No. 17

CHECK G SENSOR POWER SUPPLY CIRCUIT.
Check 10A fuse 19 . For fuse layout, refer to POWER SUPPLY ROUTING in EL section.

NG → Replace fuse.

OK ↓

CHECK CONNECTOR.
1. Disconnect ABS actuator and electric unit connector. Check terminals for damage or loose connection. Then reconnect connector.
2. Carry out self-diagnosis again.
Does warning lamp activate again?

No → Inspection end

Yes ↓

CHECK G SENSOR.
Refer to G SENSOR in Electrical Components Inspection, BR-84

NG → Replace G sensor.

OK ↓

A

CHECK G SENSOR POWER SUPPLY CIRCUIT.
1. Disconnect G sensor connectors.
2. Check voltage between G sensor connector terminals ① (B59), ③ (B60) and ground.
Battery voltage should exist.

NG → Check the following.
- Harness connectors B59, B60, LHD: B73, RHD: B67, LHD: F66, RHD: F76: TD, RHD: F136: ZD, LHD: M787, RHD: M743: TD, RHD: M829: ZD, LHD: F45, RHD: F80 and M822
- Harness for open or short between G sensor and ABS actuator and electric unit

If NG, repair harness or connectors.

OK ↓

B

CHECK G SENSOR GROUND.
1. Disconnect ABS actuator and electric unit connector and G sensor connectors.
2. Check continuity between ABS actuator and electric unit connector F29 (body side) terminals ⑳, ⑩ and G sensor connectors (body side) terminals ② (B59), ④ (B60).
Continuity should exist.

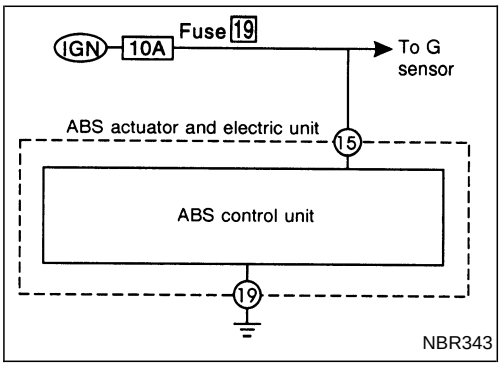
NG → Check the following.
- Harness connectors B59, B60, LHD: B73, RHD: B67, F29, LHD: F45 and RHD: F80
- Harness for open or short between G sensor and ABS actuator and electric unit

If NG, repair harness or connectors.

OK ↓

CHECK HARNESS CONNECTOR.
Check ABS actuator and electric unit pin terminals for damage or the connection of ABS actuator and electric unit harness connector. Reconnect ABS actuator and electric unit harness connector. Then retest.

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Diagnostic Procedure 9 (Control unit)

Malfunctioning code No. 71

CHECK CONNECTOR.
1. Disconnect ABS actuator and electric unit connector.
   Check terminals for damage or loose connections. Then reconnect connector.
2. Carry out self-diagnosis again.
   Does warning lamp activate again?

No → Inspection end

Yes ↓

CHECK ABS ACTUATOR AND ELECTRIC UNIT POWER SUPPLY CIRCUIT.
Check voltage. Refer to A in Diagnostic Procedure 7, BR-78.

↓

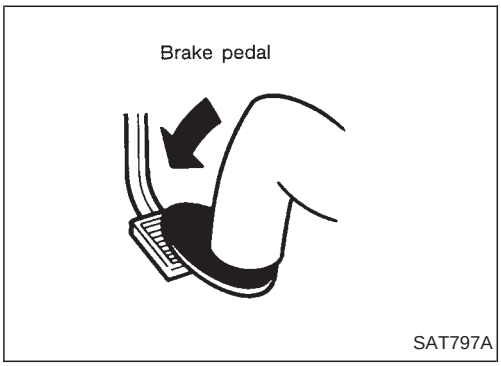
CHECK SELF-DIAGNOSTIC RESULTS.
Does warning lamp indicate code No. 71 again?

Yes → Replace ABS actuator and electric unit.

No ↓

INSPECTION
Inspect the system according to the code No.

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Diagnostic Procedure 10 (Pedal vibration and noise)

INSPECTION START
1. Apply brake.
2. Start engine.
3. Does the symptom appear only when engine is started?

Yes → Carry out self-diagnosis. Refer to BR-60.

No ↓

CHECK IF SYMPTOM APPEARS.
Does the symptom appear when electrical equipment switches (such as headlamp) are operated?

No → Go to B in Diagnostic Procedure 12, BR-82.

Yes ↓

CHECK WHEEL SENSOR.
Check wheel sensor shield ground. For location of shield ground, refer to wiring diagram and “HARNESS LAYOUT” in EL section.

NG → Repair wheel sensor.

OK ↓

CHECK HARNESS CONNECTOR.
Check ABS actuator and electric unit pin terminals for damage or the connection of ABS actuator and electric unit harness connector.
Reconnect ABS actuator and electric unit harness connector. Then retest.

Note: ABS may operate and cause vibration under any of the following conditions.

Diagnostic Procedure 11 (Long stopping distance)

CHECK ABS PERFORMANCE.
Disconnect ABS actuator and electric unit connector and check whether stopping distance is still long.

No → Go to B in Diagnostic Procedure 12, BR-82.

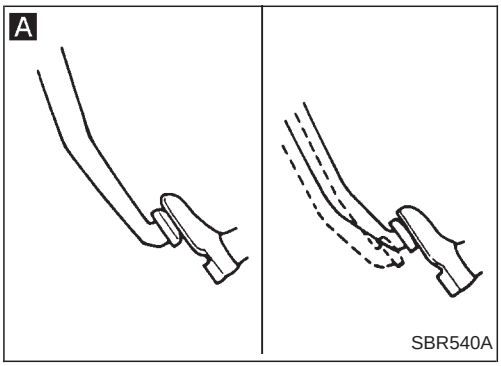
Yes ↓

Perform Preliminary Check and air bleeding.

Note: Stopping distance may be larger than vehicles without ABS when road condition is slippery.

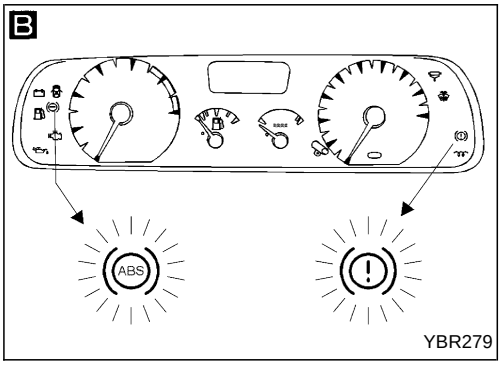
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A



SBR540A

B



YBR279

Diagnostic Procedure 12 (Unexpected pedal action)

A

CHECK BRAKE PEDAL STROKE.
Check brake pedal stroke. Is stroke excessively large?

Yes → Perform Preliminary Check. Refer to BR-66.

No ↓

CHECK BRAKE PERFORMANCE
Disconnect ABS actuator and electric unit connector and check whether brake is effective.

No → Perform Preliminary Check. Refer to BR-66.

Yes ↓

B

CHECK IF WARNING LAMP ACTIVATES.
Ensure warning lamp remains off while driving.

NG → Carry out self-diagnosis. Refer to BR-60.

OK ↓

CHECK WHEEL SENSOR.
1. Check wheel sensor connector for terminal damage or loose connection.
2. Perform wheel sensor mechanical check.
   Refer to Diagnostic Procedure 4, BR-74.

NG → Repair.

OK ↓

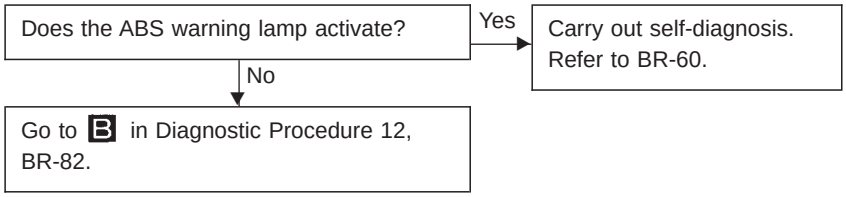
CHECK HARNESS CONNECTOR.
Check ABS actuator and electric unit pin terminals for damage or the connection of ABS actuator and electric unit harness connector.
Reconnect ABS actuator and electric unit harness connector. Then retest.

CAUTION: Drive at low speed and brake smoothly to prevent rear wheels locking.

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Diagnostic Procedure 13

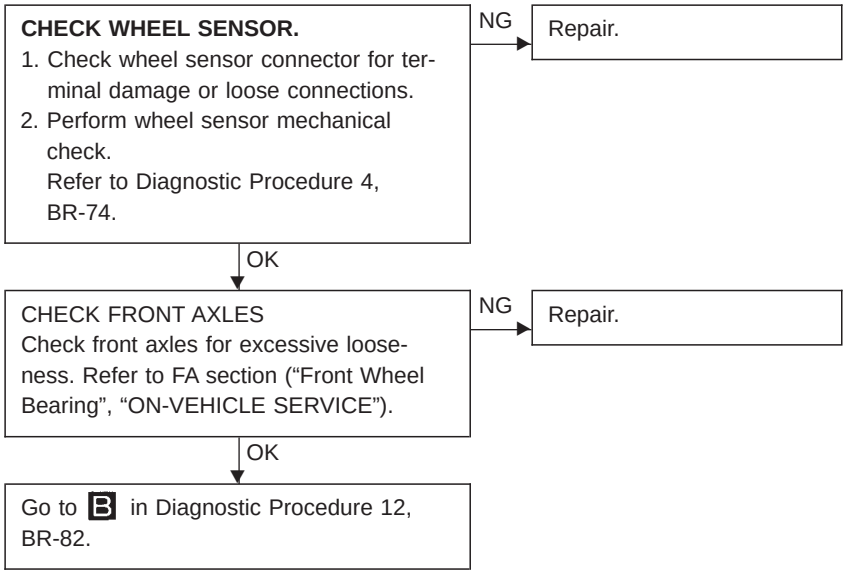
SYMPTOM: ABS does not work.



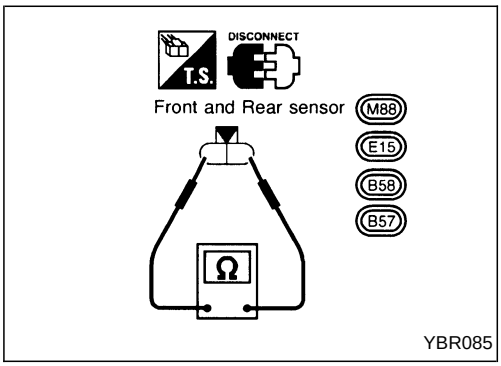
Note: ABS does not work when vehicle speed is under 10 km/h (6 MPH).

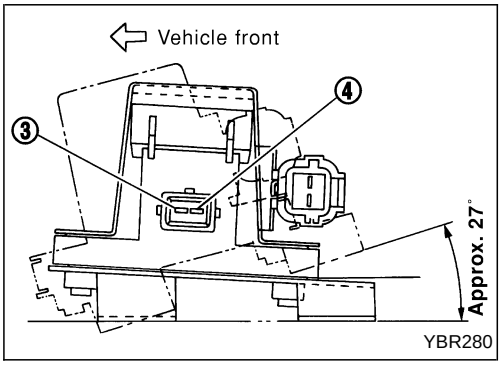
Diagnostic Procedure 14

SYMPTOM: ABS works frequently.



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Electrical Components Inspection

WHEEL SENSOR

Check resistance for each sensor.

Resistance:

Front 0.9 - 1.1 kΩ

Rear 1.44 - 1.76 kΩ

G SENSOR

Condition	Resistance between terminals ③ and ④	Continuity
Installed in vehicle	Approx. 1.5 kΩ	Yes
Tilted as shown in figure	Approx. 5.1 kΩ	No

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General Specifications

Applied model	Wagon (LWB)	Hard Top (SWB)	Wagon (LWB)	Hard Top (SWB)
	Without ABS		With ABS	
Front brake	LD28VA			
Brake model				
Cylinder bore diameter mm (in)	43 (1.69)			
Pad length x width x thickness mm (in)	144.85 x 48.5 x 15.5 (5.70 x 1.90 x 0.61)			
Rotor outer diameter x thickness mm (in)	276.7 x 26.1 (10.89 x 1.02)			
Drum brake	LT28			
Brake model				
Cylinder bore diameter mm (in)	23.8 (0.94)	22.0 (0.87)		20.6 (0.81)
Lining mm (in) Length x width x thickness Leading	111 x 55 x 8.95 (4.37 x 2.17 x 0.35)			
Trailing	114 x 55 x 3.95 (4.49 x 2.17 x 0.16)			
Drum inner mm (in)				
Diameter	280 (11.02)			
Master cylinder mm (in)				
Cylinder bore diameter	25.4 (1.0)			
Control valve				
Valve model	Load Sensing Valve		—	
Split point [kPa (bar, kg/cm^2, psi)] x reducing ratio	Variable x 0.23	Variable x 0.15	—	
Brake booster				
Booster model	Lucas LSC 115 (8″ + 9″)			
Diaphragm diameter mm (in)	Primary: 203.2 (8) Secondary: 228.6 (9)			
Specified brake fluid	DOT 4			

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Inspection and Adjustment

DISC BRAKE

Unit: mm (in)

Brake model	LD28VA
Pad wear limit	
Minimum thickness	2.0 (0.079)
Rotor repair limit	
Minimum thickness	24.0 (0.94)

DRUM BRAKE

Unit: mm (in)

Lining wear limit	
Minimum thickness	1.52 (0.06)
Drum repair limit	
Maximum inner diameter	280.5 (11.04)
Out-of-roundness	0.05 (0.0020) or less

BRAKE PEDAL

Unit: mm (in)

	RHD	LHD
Free pedal height (H)	196 - 206 (7.7 - 8.1)	210 - 220 (8.3 - 8.7)
Full stroke (D)	137.7 - 147.7 (5.42 - 5.81)	142.5 - 152.5 (5.61 - 6.0)
Clearance between pedal stopper and threaded end of stop lamp switch (C)	0.3 - 1.0 (0.012 - 0.039)	
Pedal free play at clevis (A)	1 - 3 (0.039 - 0.118)	

PARKING BRAKE

Item \ Control type	Center lever
Number of notches [under force of 196 N (20 kg, 44 lb)]	9 - 10
Number of notches (when warning switch comes on)	1

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STEERING SYSTEM

SECTION ST

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

The Supplemental Restraint System such as “AIR BAG” and “SEAT BELT PRE-TENSIONER” used along with a seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. The SRS composition which is available to NISSAN MODEL R20 is as follows (The composition varies according to the destination and optional equipment.):

- For a frontal collision
  The Supplemental Restraint System consists of driver air bag module (located in the center of the steering wheel), front passenger air bag module (located on the instrument panel on passenger side), front seat belt pre-tensioners, a diagnosis sensor unit, warning lamp, wiring harness and spiral cable.
- For a side collision
  The Supplemental Restraint System consists of front side air bag module (located in the outer side of front seat), side air bag (satellite) sensor, diagnosis sensor unit (one of components of air bags for a frontal collision), wiring harness, warning lamp (one of components of air bags for a frontal collision).

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 should be performed by an authorized NISSAN dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. Spiral cable and wiring harnesses covered with yellow insulation tape either just before the harness connectors or for the complete harness are related to the SRS.**

Precautions for SRS “AIR BAG” and “SEAT BELT PRE-TENSIONER” Service

- Do not use electrical test equipment to check SRS circuits unless instructed to in this Service Manual.
- Before servicing the SRS, turn ignition switch “OFF”, disconnect both battery cables and wait at least 3 minutes.
  For approximately 3 minutes after the cables are removed, it is still possible for the air bag and seat belt pre-tensioner to deploy. Therefore, do not work on any SRS connectors or wires until at least 3 minutes have passed.
- Diagnosis sensor unit must always be installed with their arrow marks “←” pointing towards the front of the vehicle for proper operation. Also check diagnosis sensor unit for cracks, deformities or rust before installation and replace as required.
- The spiral cable must be aligned with the neutral position since its rotations are limited. Do not attempt to turn steering wheel or column after removal of steering gear.
- Handle air bag module carefully. Always place driver and front passenger air bag modules with the pad side facing upward and place front side air bag module (built-in type) standing with stud bolt side setting bottom.
- Conduct self-diagnosis to check entire SRS for proper function after replacing any components.
- After air bag inflates, the front instrument panel assembly should be replaced if damaged.

Precautions for Steering System

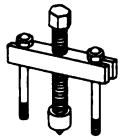
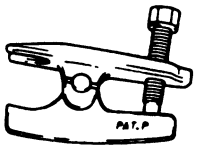
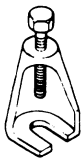
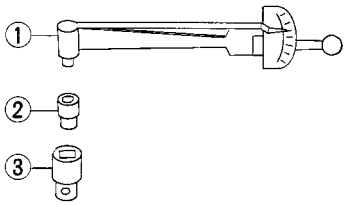
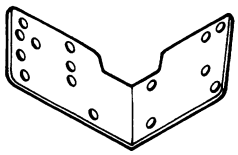
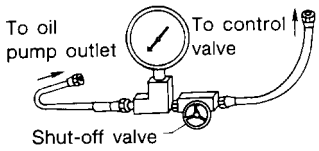
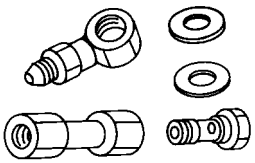
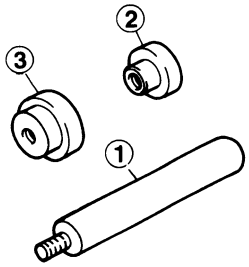
- **Before disassembly, thoroughly clean the outside of the unit.**
- **Disassembly should be done in a clean work area. It is important to prevent the internal parts from becoming contaminated by dirt or other foreign matter.**
- **When disassembling parts, be sure to place them in order on a part rack so they can be reinstalled in their proper positions.**
- **Use nylon cloths or paper towels to clean the parts; common shop rags can leave lint that might interfere with their operation.**
- **Before inspection or reassembly, carefully clean all parts with a general purpose, non-flammable solvent.**
- **Before assembly, apply a coat of recommended ATF* to hydraulic parts. Vaseline may be applied to O-rings and seals. Do not use any grease.**
- **Replace all gaskets, seals and O-rings. Avoid damaging O-rings, seals and gaskets during installation. Perform functional tests whenever designated.**

***: Automatic transmission fluid**

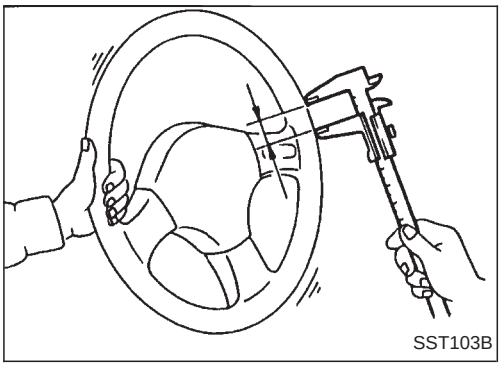
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Special Service Tools

*: Special tool or commercial equivalent

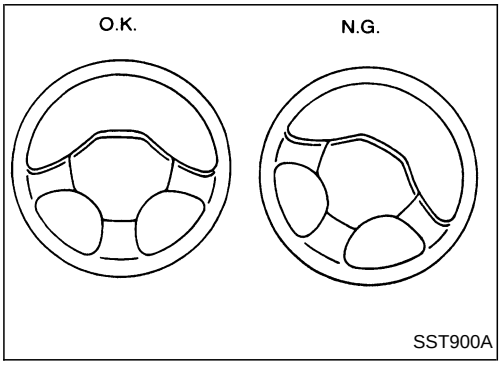
Tool number Tool name	Description	
KV48100700 Torque adapter		Measuring pinion rotating torque
ST27180001* Steering wheel puller		Removing and installing steering wheel
ST27850000 Ball joint remover		Removing ball joint
ST29020001* Steering gear arm puller		Removing and installing pitman arm
ST3127S000* ① GG91030000 Torque wrench ② HT62940000 Socket adapter ③ HT62900000 Socket adapter		Measuring turning torque
KV48100301* Strut & steering gearbox attachment		Steering gear is installed
KV48103500-A Pressure gauge		Measuring oil pressure
KV48102500 Pressure gauge adapter		Measuring oil pressure
KV481009S0 Oil seal drift set ① KV48100910 Drift ② KV48100920 Adapter ③ KV48100930 Adapter		Installing oil seal

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SST103B

Checking Steering Wheel Play

1. With wheels in a straight-ahead position, check steering wheel play.
   Steering wheel play:
   35 mm (1.38 in) or less
2. If it is not within specification, check steering gear assembly when front suspension and axle, steering gear assembly and steering column are mounted correctly.

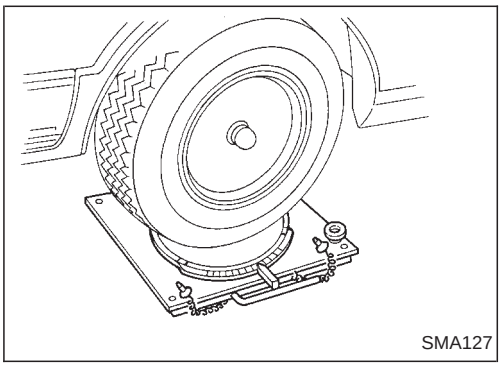


SST900A

Checking Neutral Position on Steering Wheel

CHECKING

1. Check that the steering wheel is in the neutral position when driving straight ahead.
2. If it is not in the neutral position, remove the steering wheel and reinstall it correctly.
3. If the neutral position is between two serrated teeth, loosen tie-rod lock nut and move tie-rod in the opposite direction by the same amount on both left and right sides to compensate for error in the neutral position.


SMA127

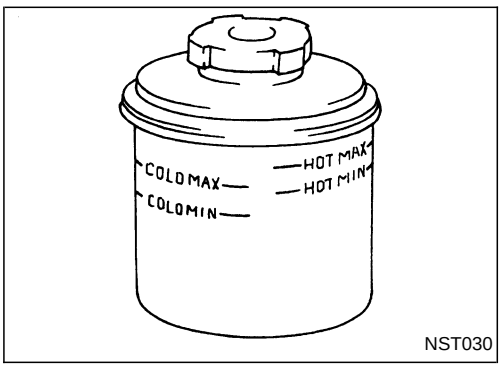
Front Wheel Turning Angle

Rotate steering wheel all the way right and left; measure turning angle.

Turning angle of full turns:
Refer to section FA for SDS.

Checking and Adjusting Drive Belts

Refer to section MA for Drive Belt Inspection.



NST030

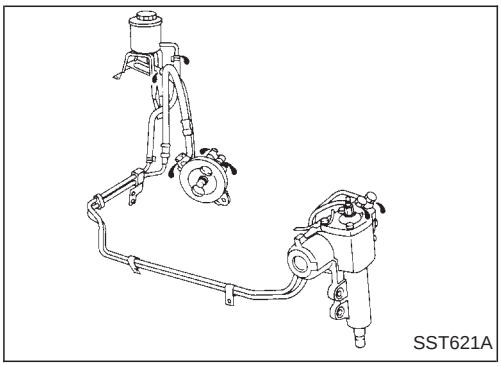
Checking Fluid Level

Check the fluid level in the reservoir when the engine is cold. If the fluid level is below the MIN line, and fluid up to the MAX line.

CAUTION:

- **Do not overfill the MAX level.**
- **Do not reuse any used power steering fluid.**
- **Use only "DEXRON™" or equivalent.**

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SST621A

Checking Fluid Leakage

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

1. Run engine between idle speed and 1,000 rpm.

Make sure temperature of fluid in oil tank rises to 50 to 80°C (122 to 176°F).

2. Turn steering wheel right-to-left several times.
3. Hold steering wheel at each “lock” position for five seconds and carefully check for fluid leakage.

CAUTION:

Do not hold the steering wheel in a locked position for more than 10 seconds (There is possibility that oil pump may be damaged.).

4. If fluid leakage at connectors is noticed, loosen flare nut and then retighten.

Do not overtighten connector as this can damage O-ring, washer and connector.

5. If fluid leakage at the connectors are noticed, then loosen the flare nut and retighten it.

Bleeding Hydraulic System

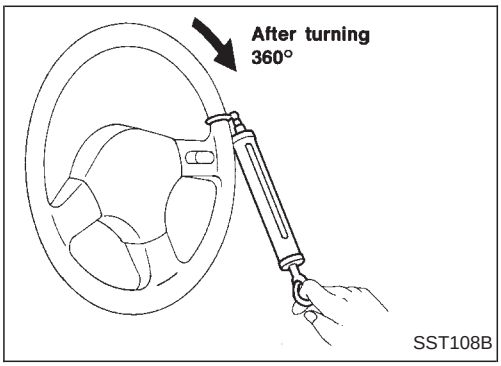
1. Raise front end of vehicle until wheels are clear of the ground.
2. Add fluid into oil tank to specified level. Meanwhile quickly turn steering wheel fully to right and left and lightly touch steering stoppers.
   Repeat steering wheel operation until fluid level no longer decreases.
3. Start engine.
   Repeat step 2 above.

- Incomplete air bleeding will cause the following to occur. When this happens, bleed air again.

a. Generation of air bubbles in reservoir tank
b. Generation of clicking noise in oil pump
c. Excessive buzzing in oil pump

While the vehicle is stationary or while moving the steering wheel slowly, fluid noise may occur in the valve or oil pump. This noise is inherent in this steering system, and it will not affect performance or durability of the system.

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Checking Steering Wheel Turning Force

1. Park vehicle on a level, dry surface and set parking brake.
2. Start engine.
3. Bring power steering fluid up to adequate operating temperature.

   Temperature:

   50° - 80°C (122 - 176°F)

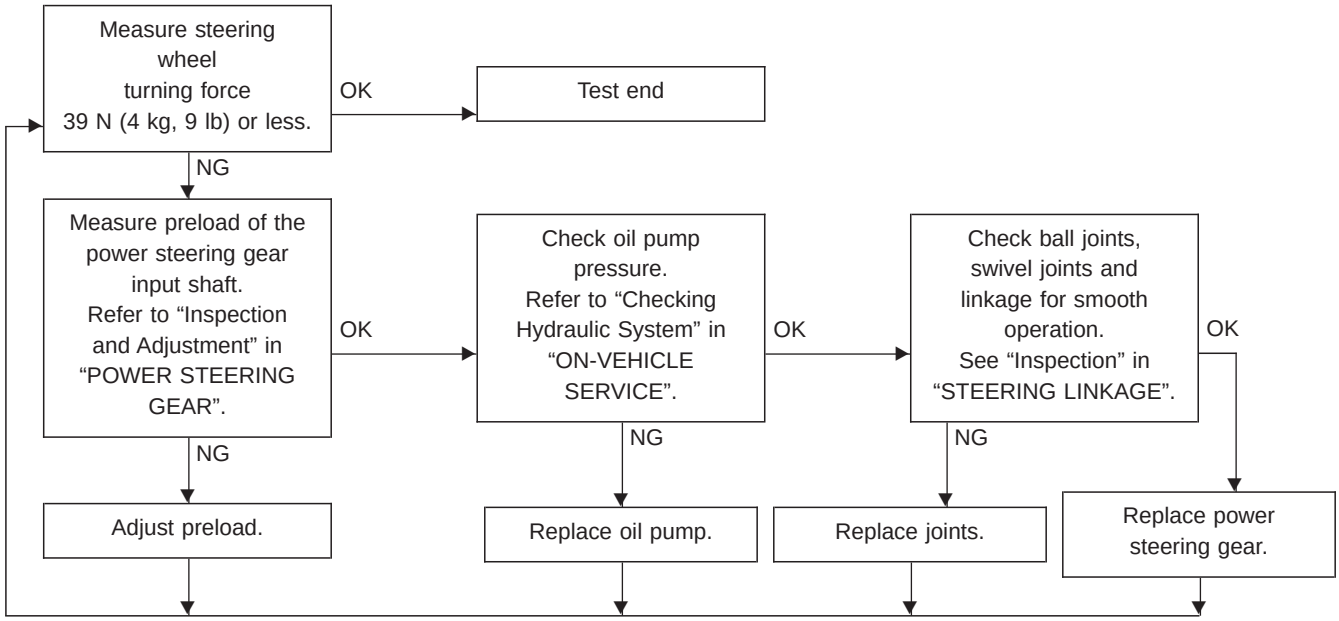
Tires need to be inflated to normal pressure.

4. Check steering wheel turning force when steering wheel has been turned 360° from neutral position.

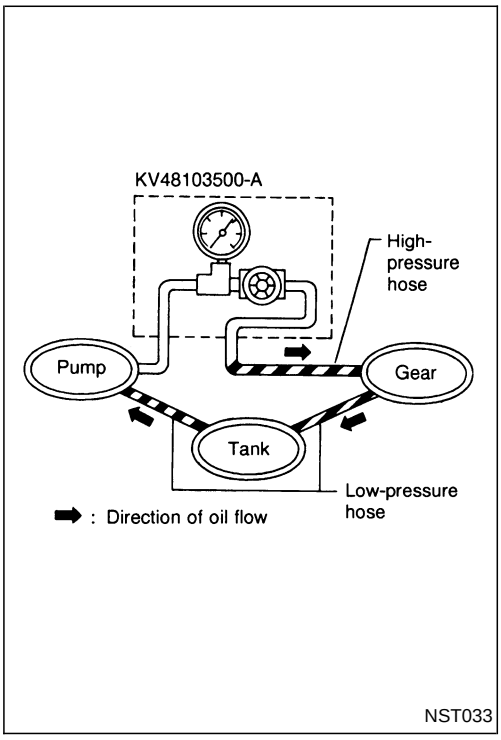
   Steering wheel turning force:

   39 N (4 kg, 9 lb) or less

   - If steering wheel turning force is not within specification, perform the following inspection procedure:



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Checking Hydraulic System

Before starting, check belt tension, driving pulley and tire pressure.

1. Set Tool. Open shut-off valve, then bleed air. (Refer to “Bleeding Hydraulic System”, ST-5.)
2. Run engine.

Make sure temperature of fluid in tank rises to 60 to 80°C (140 to 176°F).

WARNING:

Warm up engine with shut-off valve fully opened. If engine is started with shut-off valve closed, oil pressure in oil pump will increase to relief pressure, resulting in an abnormal rise in oil temperature.

3. Check pressure with steering wheel fully turned to left and right positions with engine idling at 1,000 rpm.

CAUTION:

Do not hold the steering wheel in a locked position for more than 15 seconds.

Oil pump maximum standard pressure:

TD27Ti engine

8,800 - 9,200 kPa (88 - 92 bar, 89 - 93 kg/cm^2, 1,276 - 1,334 psi)

ZD30DTi engine

9,800 - 10,500 kPa (98.0 - 105.0 bar, 99.96 - 107.10 kg/cm^2, 1,421 - 1,523 psi)

4. If oil pressure is below the maximum pressure, slowly close shut-off valve and check pressure.

- When pressure reaches maximum pressure, gear is damaged.
- When pressure remains below maximum pressure, pump is damaged.

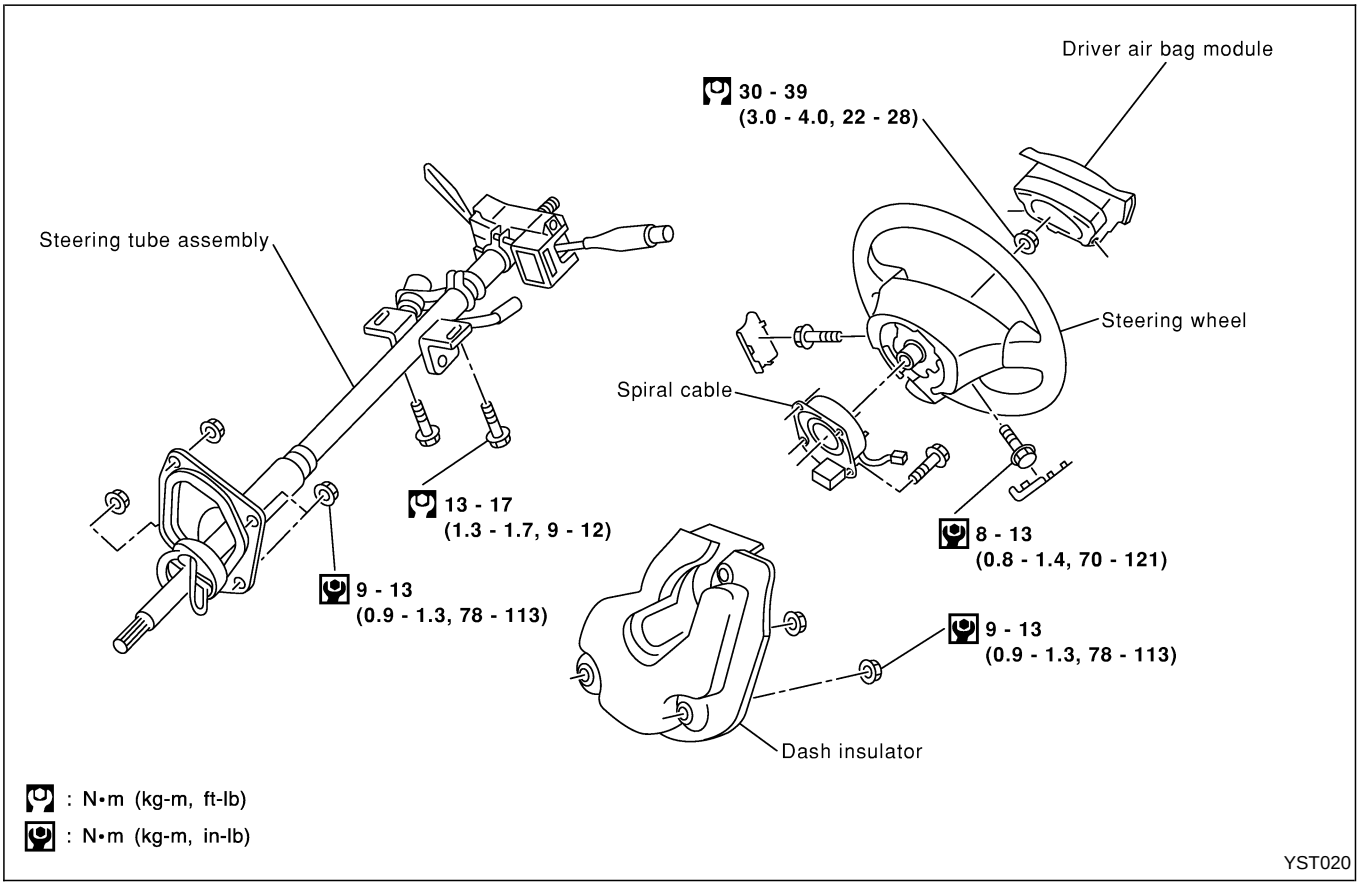
CAUTION:

Do not close shut-off valve for more than 15 seconds.

5. If oil pressure is higher than maximum pressure, check oil pump flow control valve.
6. After checking hydraulic system, remove Tool and add fluid if necessary, then completely bleed air out of system.

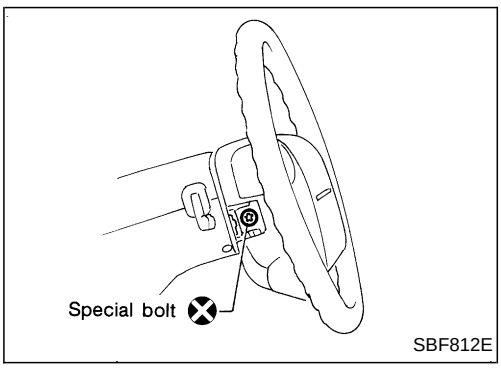
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Removal and Installation



CAUTION:

- **The rotation of the spiral cable (SRS "Air bag" component part) is limited. If the steering gear must be removed, set the front wheels in the straight-ahead direction. Do not rotate the steering column while the steering gear is removed.**
- **Remove the steering wheel before removing the steering lower joint to avoid damaging the SRS spiral cable.**

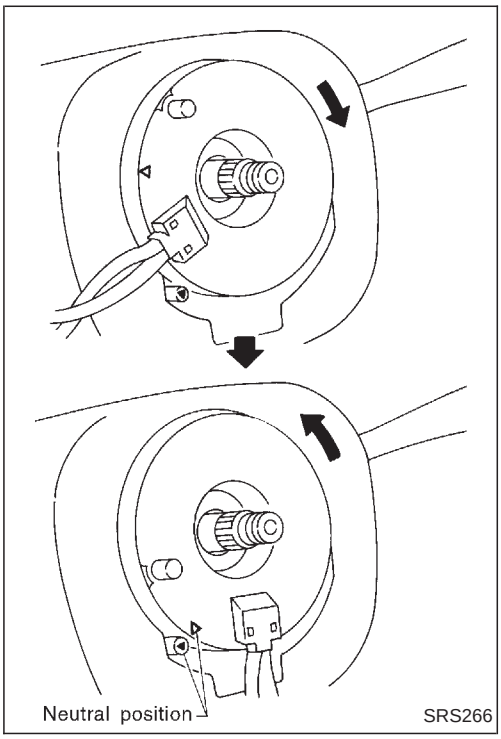


STEERING WHEEL

- Remove remote audio control (if applied).
- Remove air bag module and spiral cable.
  Refer to RS-28, "Removal — Air Bag Module and Spiral Cable".

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Removal and Installation (Cont'd)



- Align spiral cable correctly when installing steering wheel.

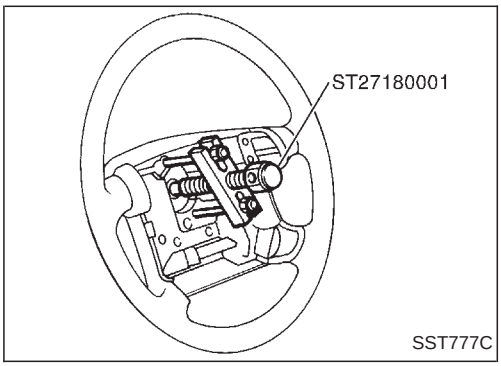
a) Set the front wheels in the straight-ahead position.

b) Make sure that the spiral cable is in the neutral position.
The neutral position is detected by turning left 2.5 revolutions from the right end position. Align the two marks (⧗).

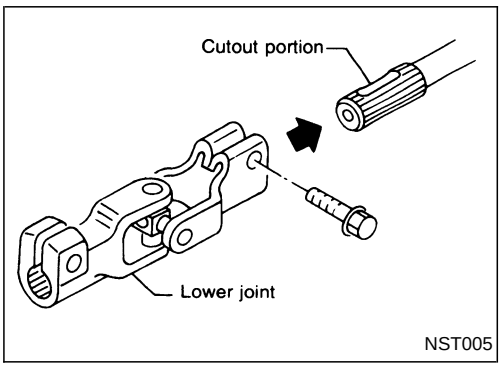
CAUTION:

The spiral cable may snap due to steering operation if the cable is installed in an improper position.

Also, with the steering linkage disconnected, the cable may snap by turning the steering wheel beyond the limited number of turns. (The spiral cable can be turned up to 2.5 turns from the neutral position to both the right and left.)



- Remove steering wheel with Tool.



STEERING COLUMN

- When installing steering column, fingertighten upper support bracket bolts and lower support bracket nuts; then tighten them to the specified torque. Do not apply undue stress to steering column.
- When attaching coupling joint, be sure tightening bolt faces cutout portion.
- When inserting coupling joint onto steering gear axle, make sure that it is positioned correctly.

CAUTION:

After installing steering column, turn steering wheel to make sure it moves smoothly and that the number of turns from the straight-ahead forward position to left and right locks are equal. Be sure that the steering wheel is in a neutral position when driving straight ahead.

Number of steering wheel turns from straight-ahead position:

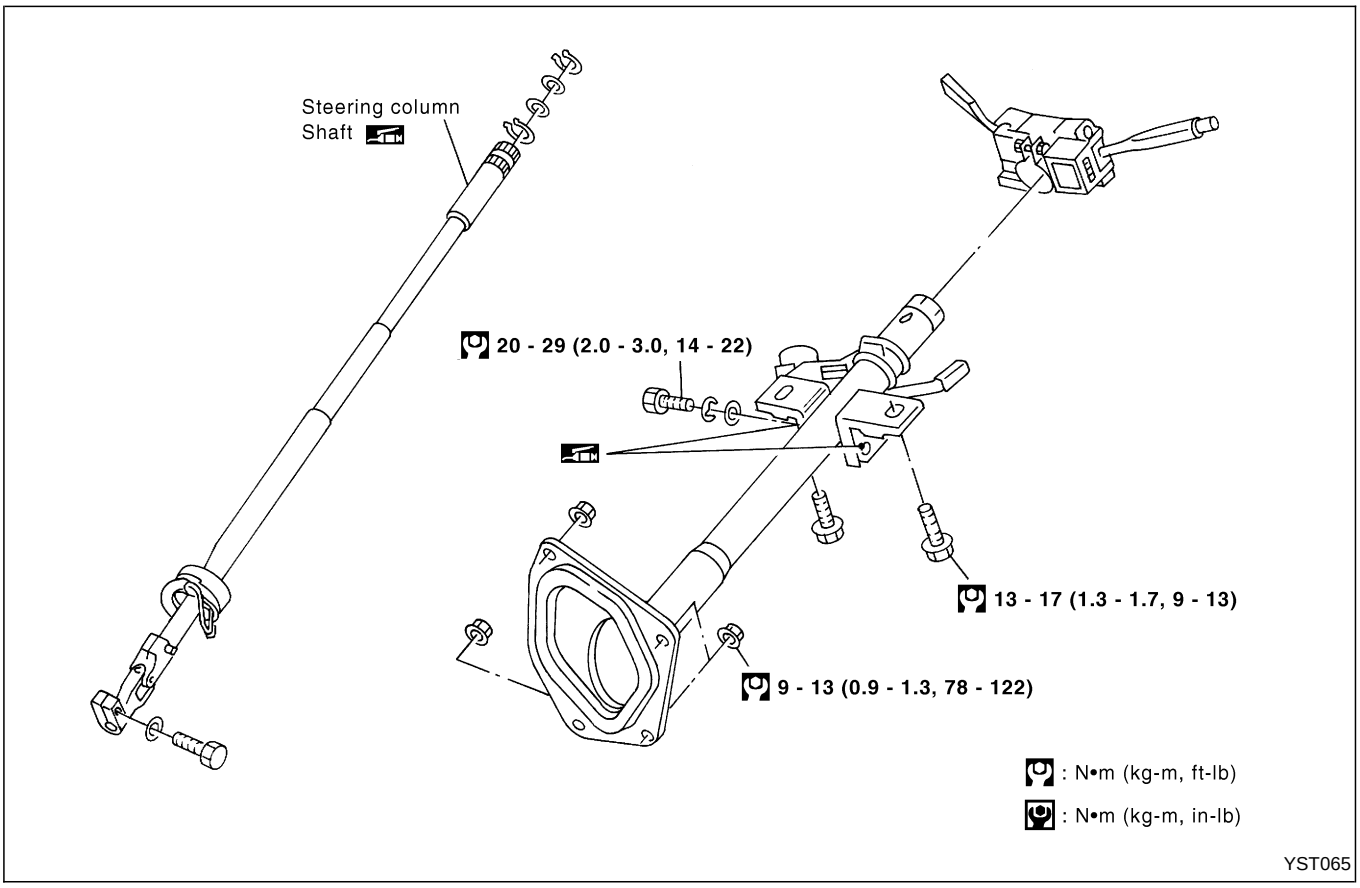
Right 1.93

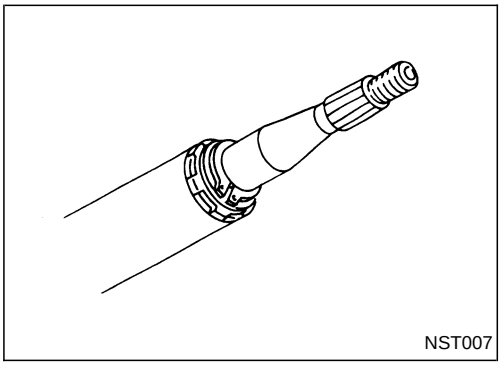
Left 1.93

http://vnx.su/

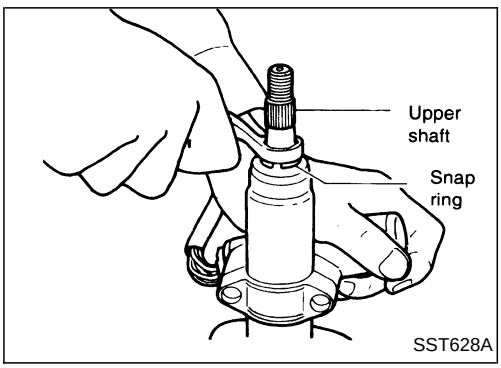
Disassembly and Assembly

L.H.D., R.H.D.





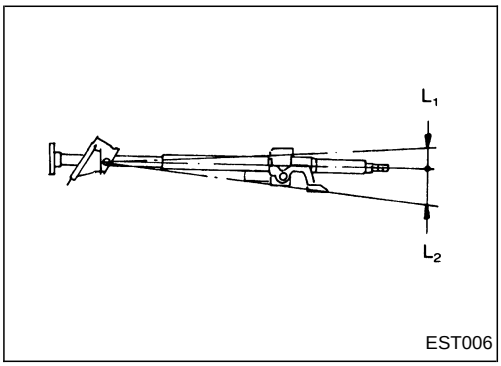
- When disassembling and assembling, unlock steering lock with key.



- Install snap ring on upper shaft with box wrench.

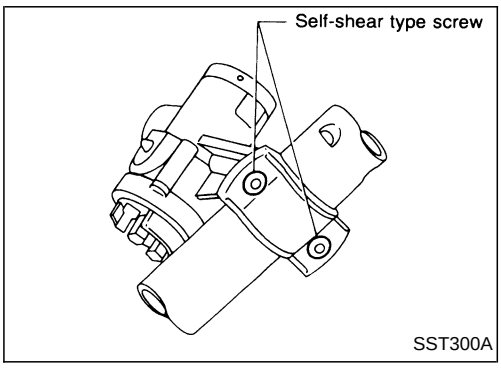
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Disassembly and Assembly (Cont'd)



EST006

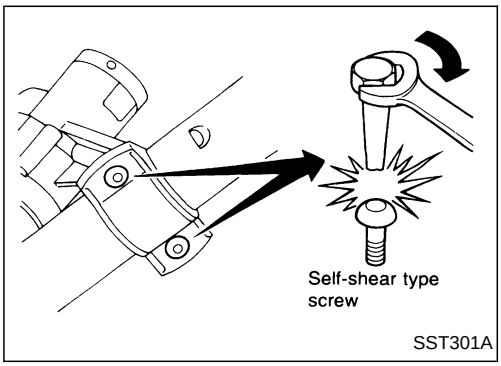
- After installing steering column, check tilt mechanism operation.
  L_1: 8 - 12 mm (0.32 - 0.47 in)
  L_2: 18 - 22 mm (0.71 - 0.87 in)



SST300A

- Steering lock

a. Break self-shear type screws with a drill or other appropriate tool.

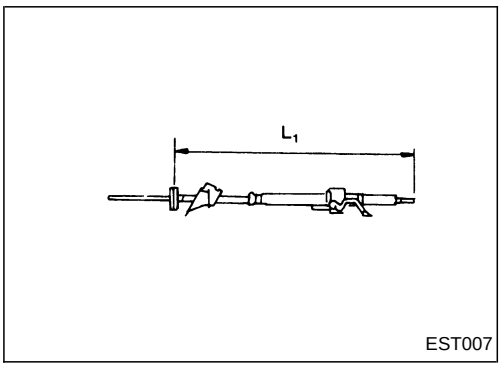


SST301A

b. Install self-shear type screws until self-shear type screw heads are cut off.

- When disassembling and assembling, unlock steering lock with key.
- Ensure that rounded surface of snap ring faces towards bearing when snap ring is installed.

Inspection



EST007

- When steering wheel can not be rotated smoothly, check the steering column for the following matters and replace damaged parts:

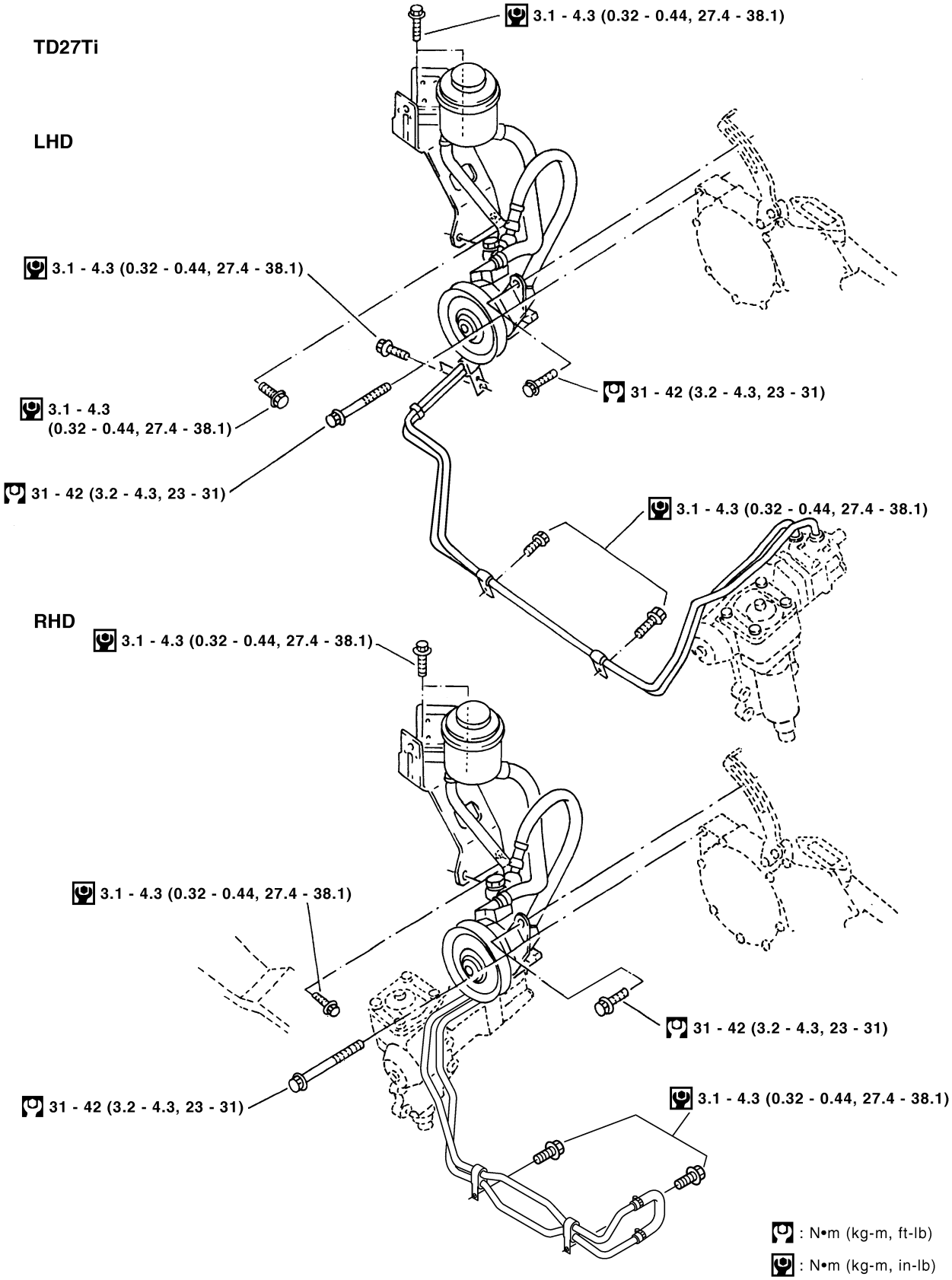
a. Check column bearings for damage or unevenness. Lubricate with recommended multi-purpose grease or replace steering column as an assembly, if necessary.

b. Check jacket tube for deformation or breakage. Replace if necessary.

- When the vehicle is involved in a light collision, check column length "L". If it is not within specifications, replace steering column assembly "L_1".
  Column length:
  "L_1": 830.5 - 832.7 mm (32.697 - 32.783 in)

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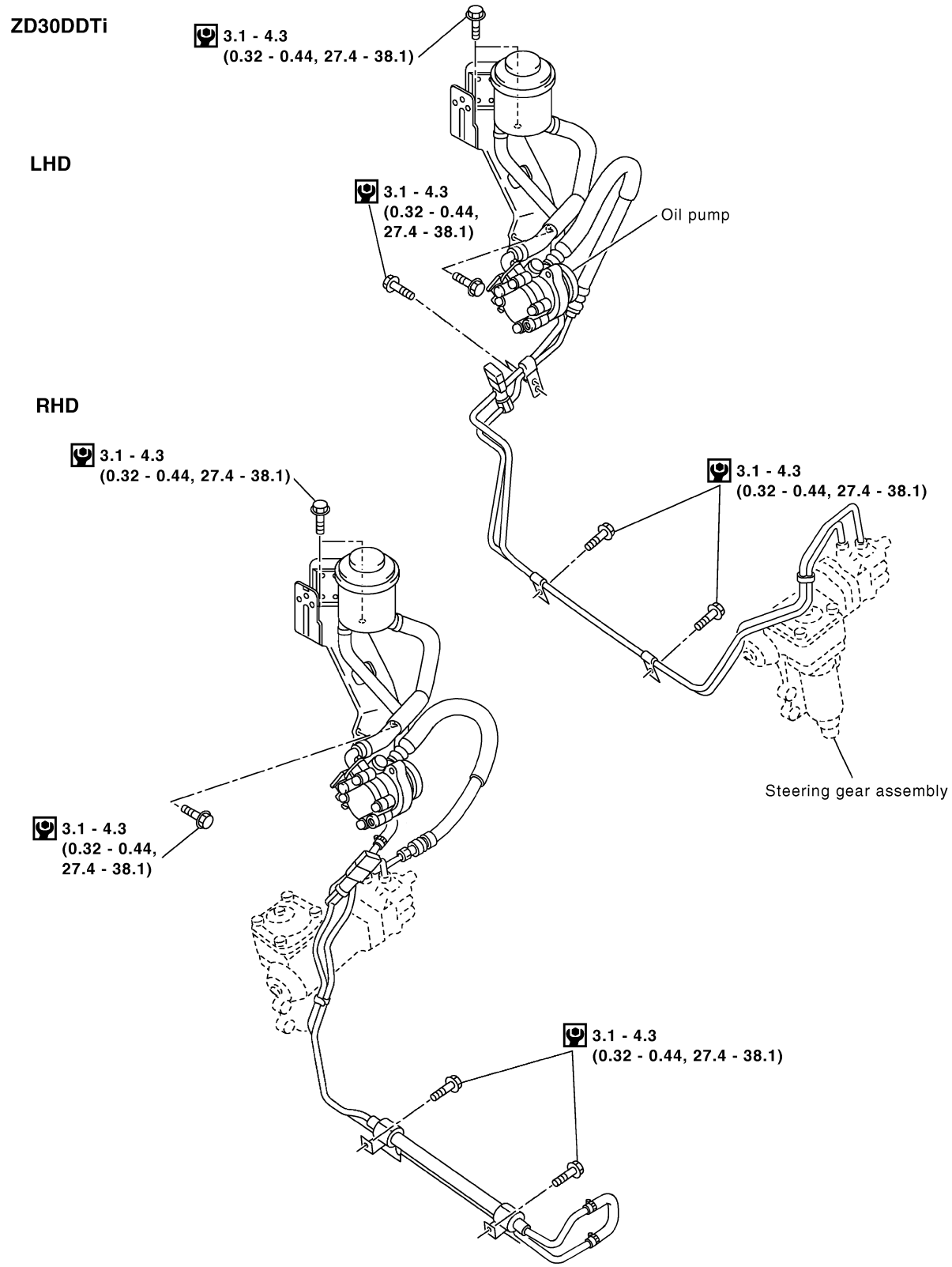
Description



YST060

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Description (Cont'd)



: N•m (kg-m, ft-lb)

: N•m (kg-m, in-lb)

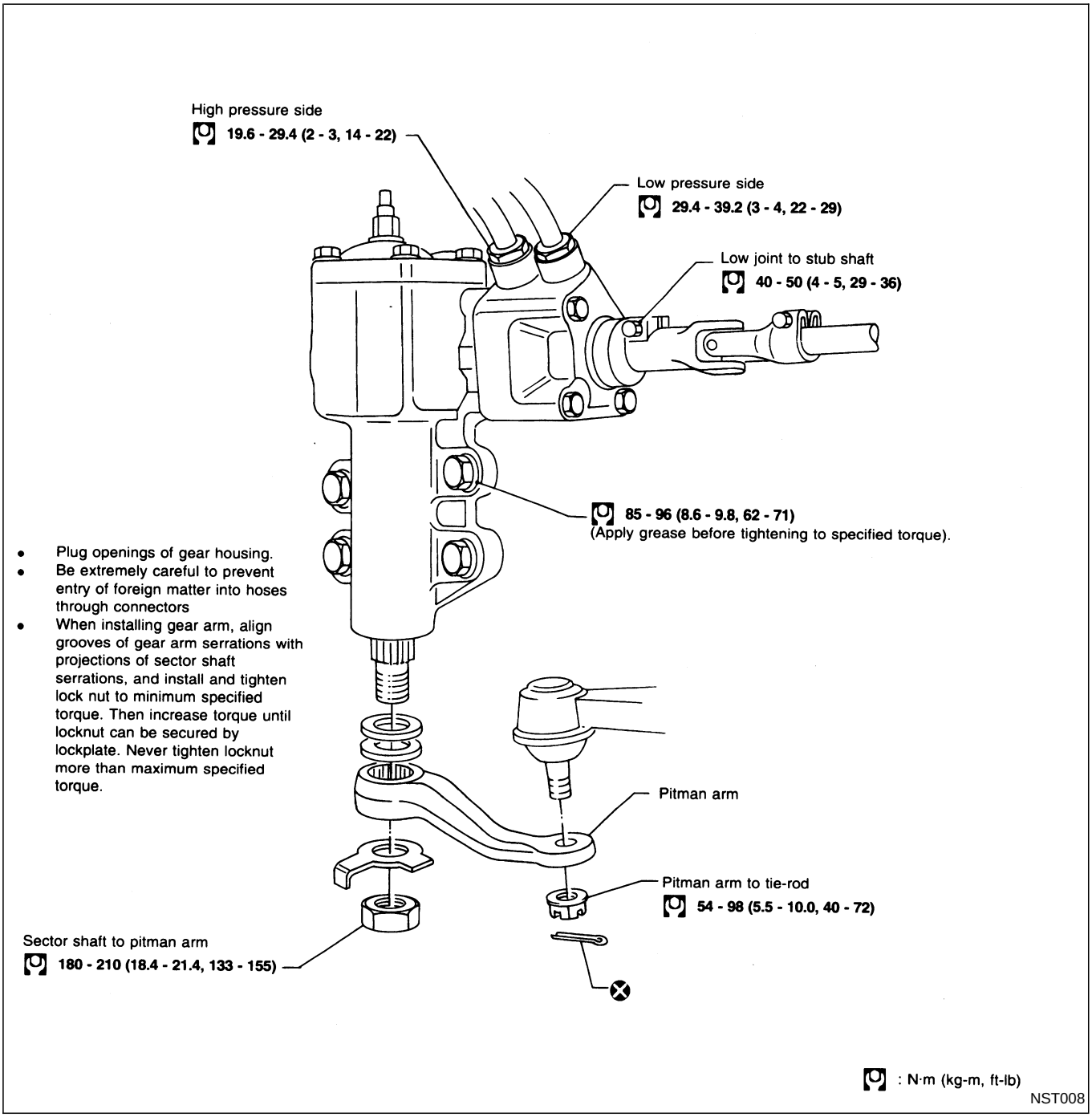
YST061

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Removal and Installation

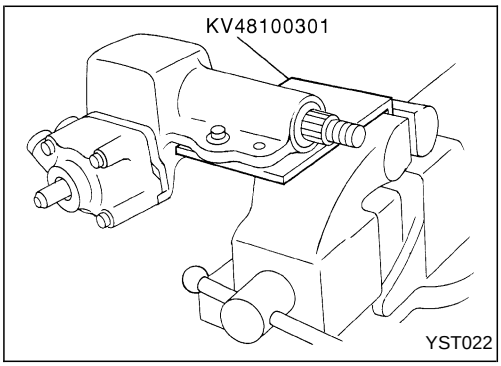
Before removing, clean exteriors of gear housing and oil pump with steam and dry with compressed air.

STEERING GEAR



- The steering gear must not be disassembled. Replace as an assembly.
- Remove only the parts shown in the illustration.

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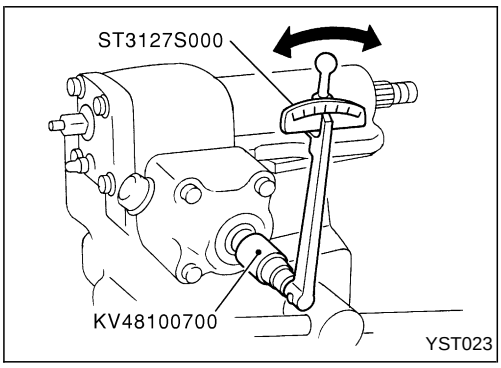


Inspection and Adjustment

STEERING GEAR PRELOAD

Measure preload in worm gear.

1. Mount steering gear to Tool (KV48100301) and place it in a vise, as shown in the illustration.
2. Turn worm gear several times by hand completely to the left and right (full lock to lock).



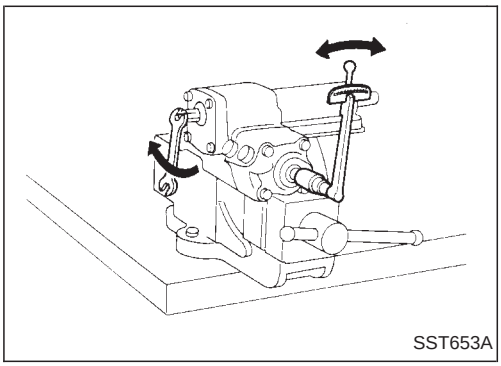
3. Measure preload at ±360° from straight-ahead position.

a. Turn worm gear counterclockwise until full lock position. Then turn clockwise more than two turns until the straight-ahead position.
Straight-ahead position is the position where the two mating marks are in line (approx. 765° from full lock position).

b. Turn worm gear one full turn (360°) clockwise and measure total preload at this position.

c. Turn worm gear two full turns (720°) counterclockwise and measure total preload.

Total preload at ±360° from straight-ahead position:
: 0.4 - 1.2 N·m (0.04 - 0.12 kg-m, in-lb)

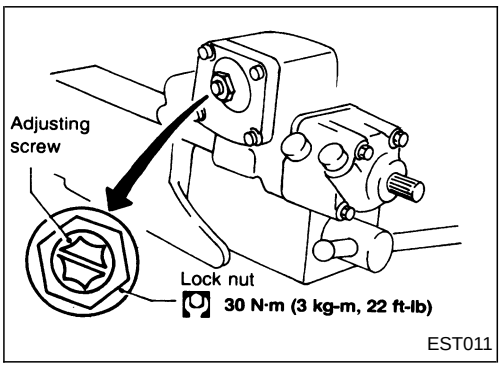


4. Measure total preload at straight-ahead position.

a. Place worm gear in straight-ahead position. See step 3.a.

b. Measure total preload in straight-ahead position.

Total preload at straight-ahead position:
: 0.6 - 1.6 N·m (0.06 - 0.16 kg-m, 5 - 14 in-lb)

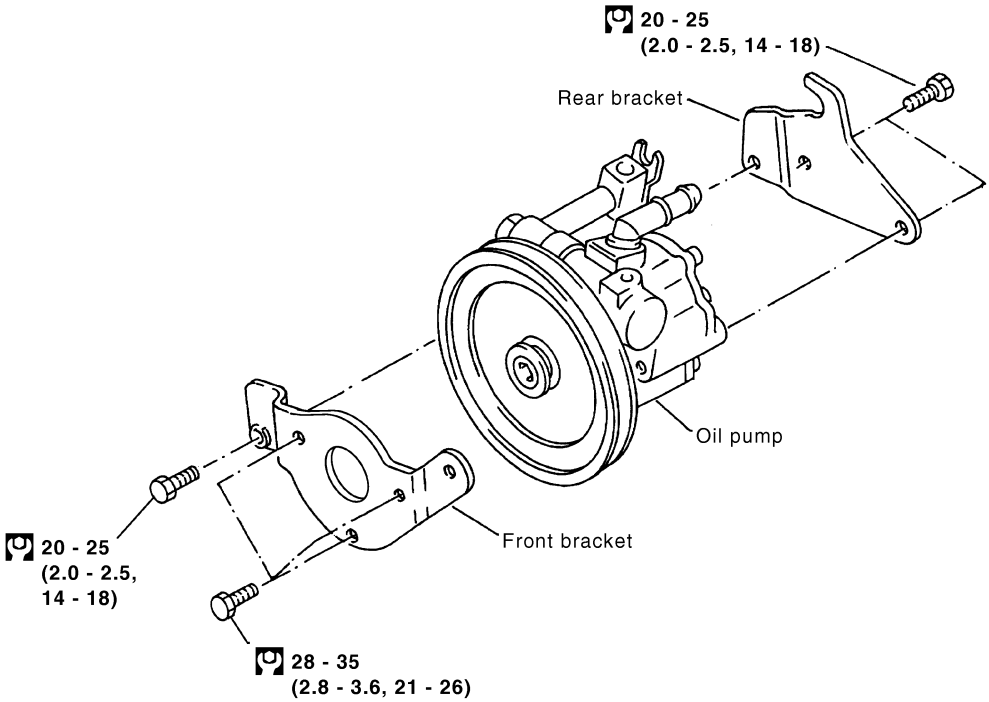


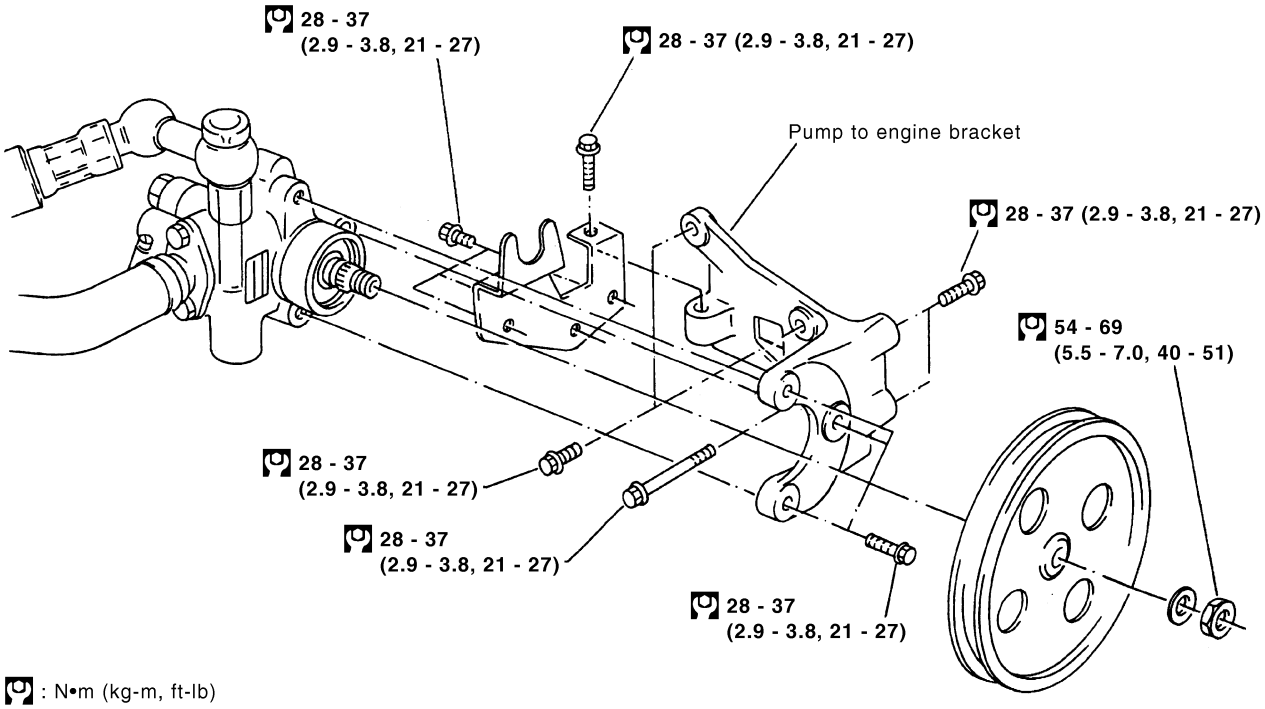
5. If either one of the above measured values are not within specifications, adjust total preload by turning sector shaft adjusting screw. Tighten adjusting screw lock nut with tools.

Lock nut:
: 30 N·m (3 kg-m, 22 ft-lb)

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Removal and Installation





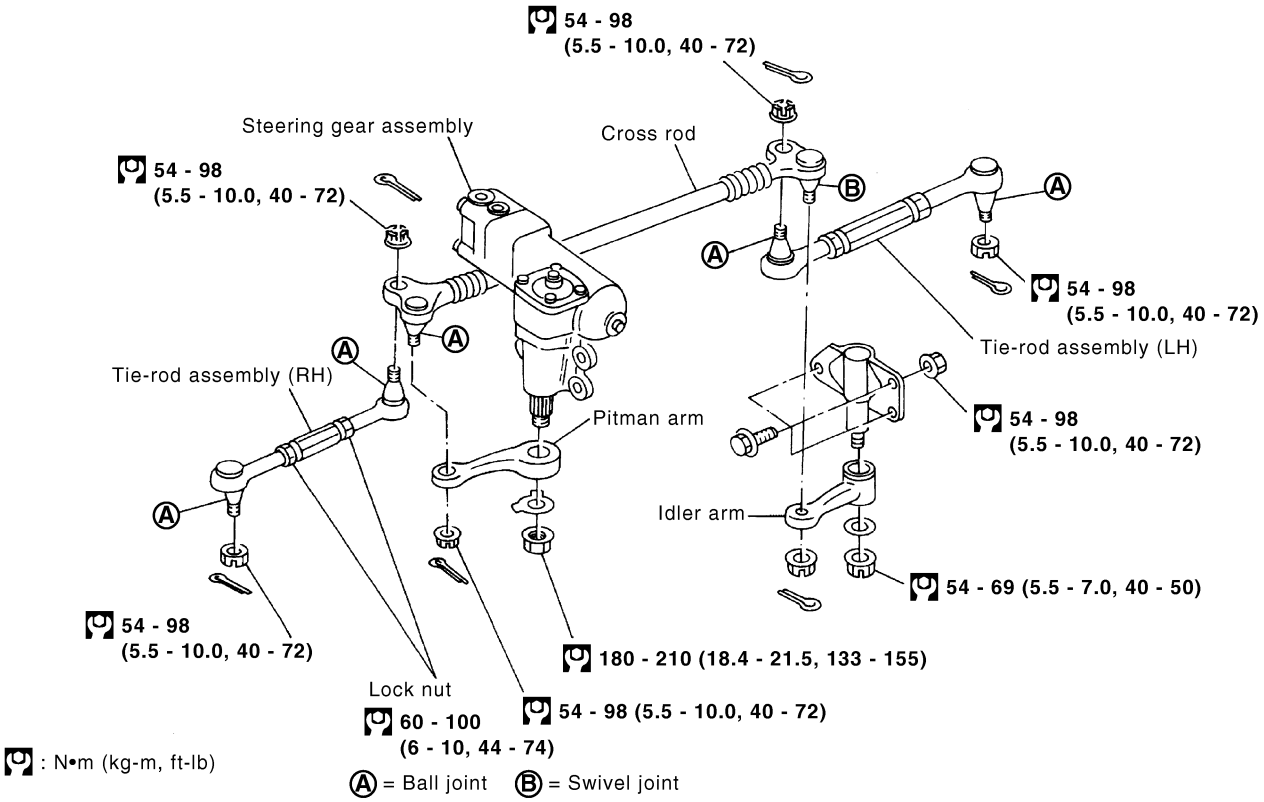
: N•m (kg-m, ft-lb)

YST062

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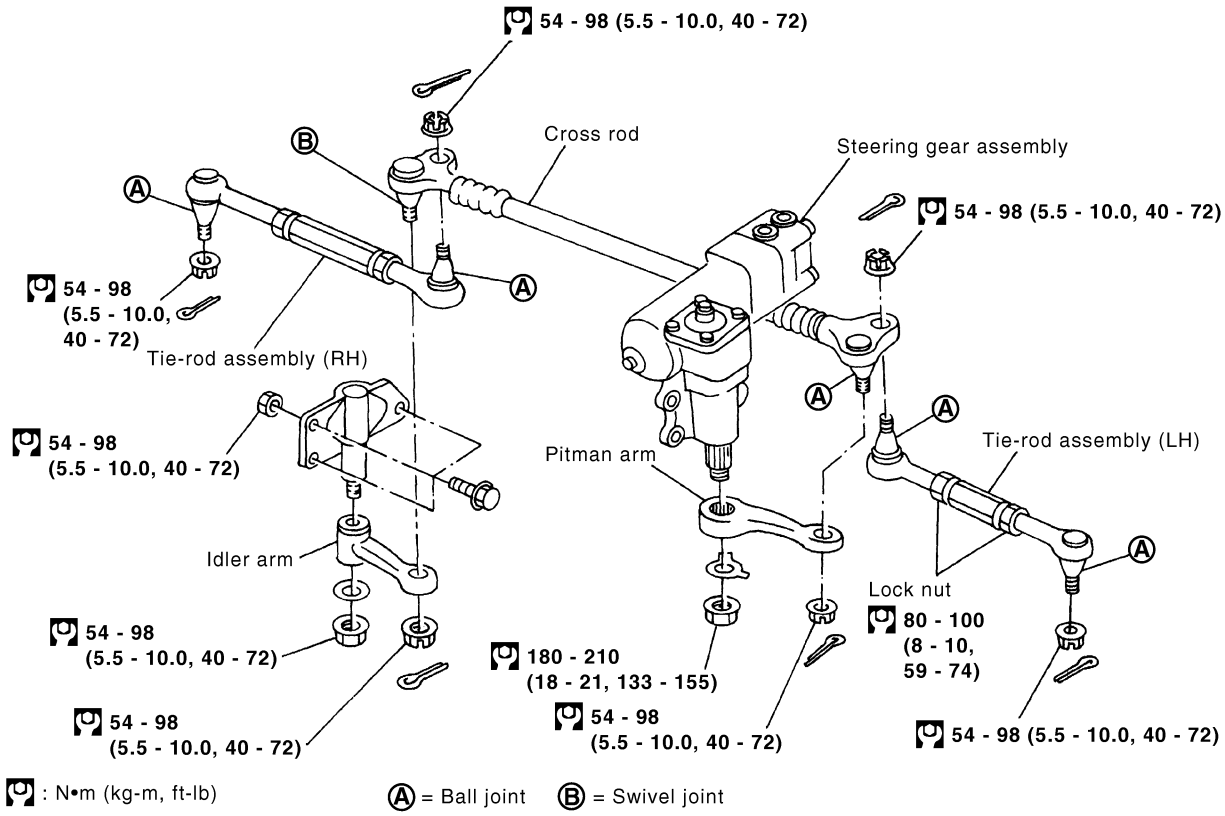
Removal and Installation

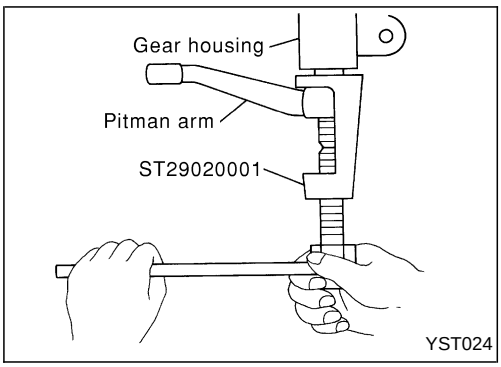
LHD



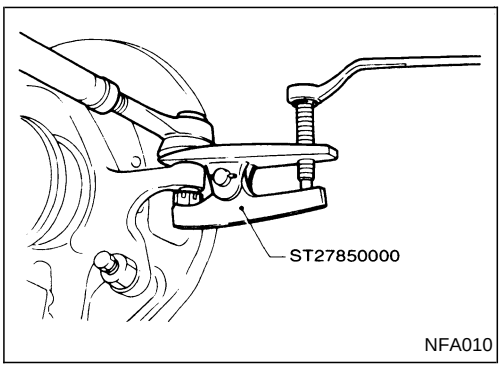
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Removal and Installation (Cont'd)



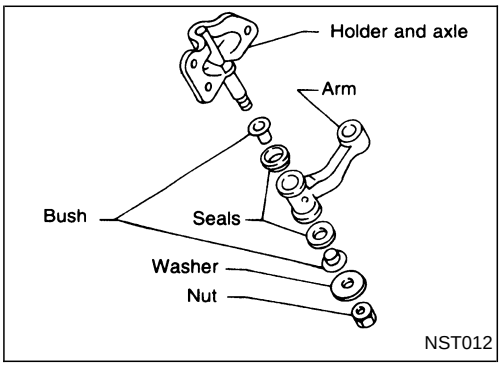


Remove gear arm with Tool.



Remove tie-rod from knuckle arm with Tool.

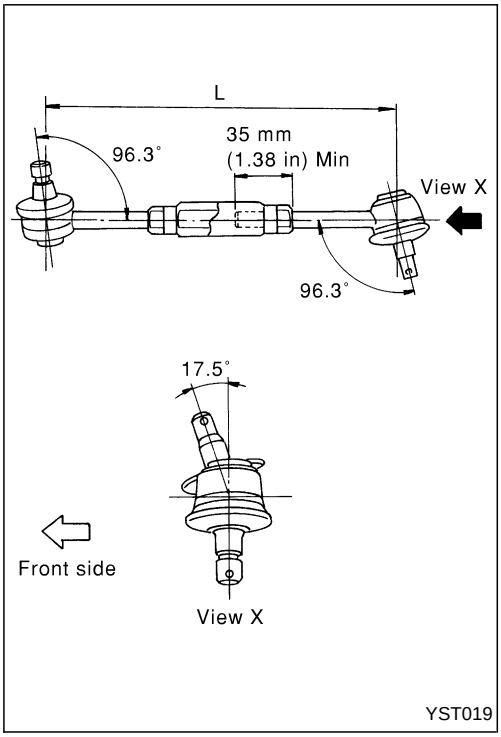
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Disassembly and Assembly

IDLER ARM ASSEMBLY

- Apply coat of multi-purpose grease to bushing.
- Press bushing into idler body, and insert shaft of idler bracket carefully until bushing protrudes.
  Tighten nut to the specified torque.
  : 54 - 69 N·m (5.5 - 7.0 kg-m, 40 - 50 ft-lb)



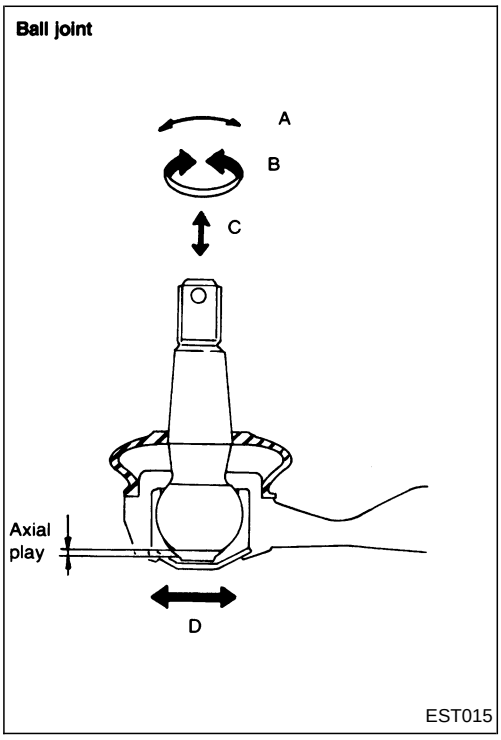
CROSS ROD AND TIE-ROD

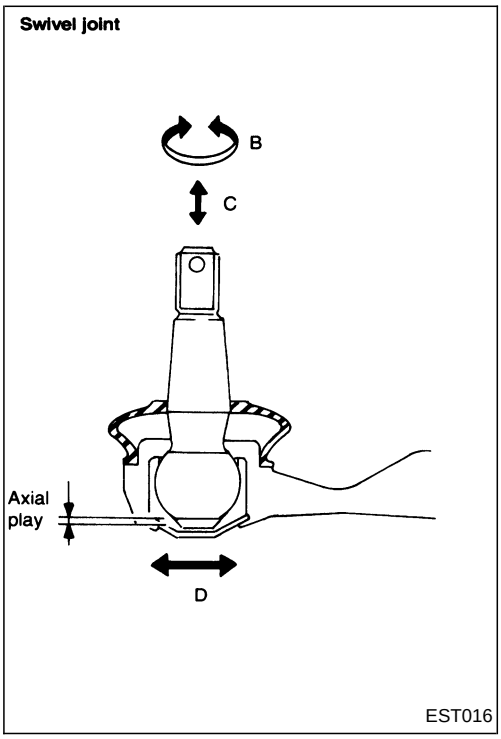
1. When tie-rod ball joints and tie-rod bar are separated, adjust tie-rod length correctly.
   Adjustment should be done between ball stud centers.
   L: Standard
   287 mm (11.30 in)
2. Lock tie-rod clamp nuts so that ball joint on outer ball stud is as follows with respect to that on inner ball stud.

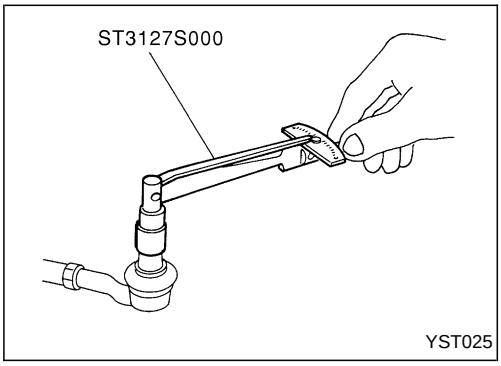
CAUTION:

Make sure that tie-rod bars are screwed into tie-rod tube more than 35 mm (1.38 in). Refer to illustration.

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Inspection

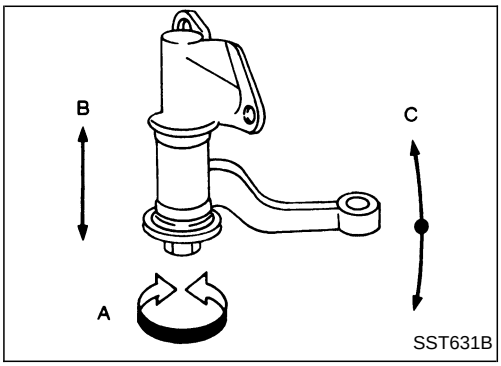
BALL JOINT AND SWIVEL JOINT

1. Check joints for play. If ball or swivel stud is worn and play in axial direction is excessive or joint is hard to swing or does not meet the specified values, replace as a complete unit.
   Swinging force (Measuring point: Cotter pin hole) “A”:
   The ball joint must rotate smoothly in all directions.
   Rotating torque “B”: (both)
   0.5 - 5.0 N·m (0.05 - 0.51 kg-m, 4 - 44 in-lb)
   Axial end play “C”: (both)
   0 - 0.2 mm (0 - 0.008 in)
   Radial play “D” (both)
   0 mm (0 in)
2. Check condition of dust cover. If it is cracked excessively, replace ball joint or swivel joint as an assembly.

- Check rotating torque “B”.

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Inspection (Cont'd)



IDLER ARM ASSEMBLY

- Check idler arm assembly for breakage, wear or play, and if necessary replace.

  Rotating force "A":
  1 - 6 N·m (0.1 - 0.6 kg-m, 9 - 52 in-lb)
  Axial end play "B":
  0 m (0 in)
  Deflection "C" (when load is applied to the end of arm):

Load	N (kg, lb)	1,569 (160, 353)	3,923 (400, 882)
Deflection	mm (in)		
Max.		3 (0.12)	5.5 (0.217)
Min.		0.7 (0.028)	1.0 (0.039)

- Lubricate idler arm assembly with recommended multipurpose grease.
  When lubricating, refer to section MA.

CROSS ROD AND TIE-ROD

Check tie-rod and cross rod for breakage, bend or cracks, and replace with a new one if necessary.

FIXING LOCATION

- Check fixing location (nuts and cotter pins) for looseness, play or breakage.
- When looseness or play is found, check for wear on tapered portion of joints, gear arm and idler arm.

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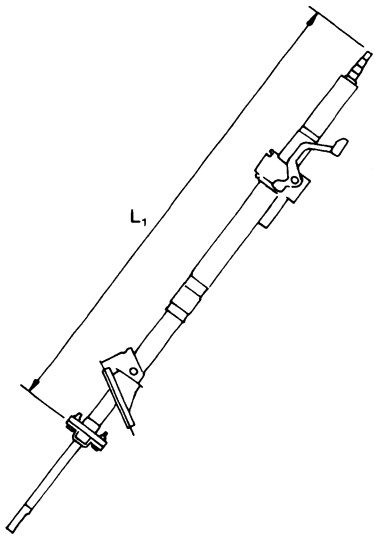
General Specifications

Models	All
Steering gear type	ZF 8054
Turns of steering wheel (Lock to lock)	3.86
Overall gear ratio	17.1 : 1
Steering column type	Collapsible, adjustable height

Inspection and Adjustment

STEERING WHEEL AND COLUMN

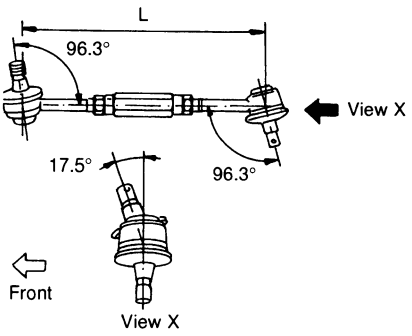
Applied model		AIR BAG
Steering wheel axial play	mm (in)	0 (0)
Steering wheel play	mm (in)	35 (1.38) or less
Steering column length “L”	mm (in)	830.5 - 832.7 (32.697 - 32.783)



EST018

STEERING GEAR AND LINKAGE

Ball joint and swivel joint		
Rotating torque “B”	N·m (kg-m, in-lb)	0.5 - 5.0 (0.05 - 0.51, 4 - 44)
Axial end play “C”	mm (in)	0 - 0.2 (0 - 0.008)
Radial play “D”	mm (in)	0 (0)
Length “L”	mm (in)	287 (11.30)



SST583B

OIL PUMP

Unit: kPa (bar, kg/cm^2, psi)

Engine	ZD30DDTi	TD27Ti
Make	UNISIA	
Max. pressure	9,800 - 10,500 (98.0 - 105.0, 99.96 - 107.10, 1,421 - 1,523)	8,800 - 9,200 (88 - 92, 89 - 93, 1,276 - 1,334)

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RESTRAINT SYSTEM

SECTION RS

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- Rear Seat Belt 6

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Precautions

SUPPLEMENTAL RESTRAINT SYSTEM (SRS) “AIR BAG” AND “SEAT BELT PRE-TENSIONER”

The Supplemental Restraint System such as “AIR BAG” and “SEAT BELT PRE-TENSIONER” used along with a seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. The SRS composition which is available to NISSAN MODEL R20 is as follows (The composition varies according to the destination and optional equipment.):

- For a frontal collision
  The Supplemental Restraint System consists of driver air bag module (located in the center of the steering wheel), front passenger air bag module (located on the instrument panel on passenger side), front seat belt pre-tensioners, a diagnosis sensor unit, warning lamp, wiring harness and spiral cable.
- For a side collision
  The Supplemental Restraint System consists of front side air bag module (located in the outer side of front seat), side air bag (satellite) sensor, diagnosis sensor unit (one of components of air bags for a frontal collision), wiring harness, warning lamp (one of components of air bags for a frontal collision).

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 should be performed by an authorized NISSAN dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. Spiral cable and wiring harnesses covered with yellow insulation tape either just before the harness connectors or for the complete harness are related to the SRS.**

Precaution for Seat Belt Service

CAUTION:

- **Before removing the seat belt pre-tensioner assembly, turn the ignition switch off, disconnect both battery cables and wait at least 3 minutes.**
- **Do not use electrical test equipment for seat belt pre-tensioner connector.**
- **After replacing or reinstalling seat belt pre-tensioner assembly, or reconnecting seat belt pre-tensioner connector, check the system function. Refer to “SRS Operation Check” for details. (RS-38)**
- **Do not disassemble buckle or seat belt assembly.**
- **Replace anchor bolts if they are deformed or worn out.**
- **Never oil tongue and buckle.**
- **If any component of seat belt assembly is questionable, do not repair. Replace the whole seat belt assembly.**
- **If webbing is cut, frayed, or damaged, replace seat belt assembly.**
- **When replacing seat belt assembly, use a genuine seat belt assembly.**

After A Collision

WARNING:

Inspect all seat belt assemblies including retractors and attaching hardware after any collision. NISSAN recommends that all seat belt assemblies in use during a collision be replaced unless the collision was minor and the belts show no damage and continue to operate properly. Failure to do so could result in serious personal injury in an accident. Seat belt assemblies not in use during a collision should also be replaced if either damage or improper operation is noted. Seat belt pre-tensioner should be replaced even if the seat belts are not in use during a frontal collision in which the air bags are deployed.

Replace any seat belt assembly if:

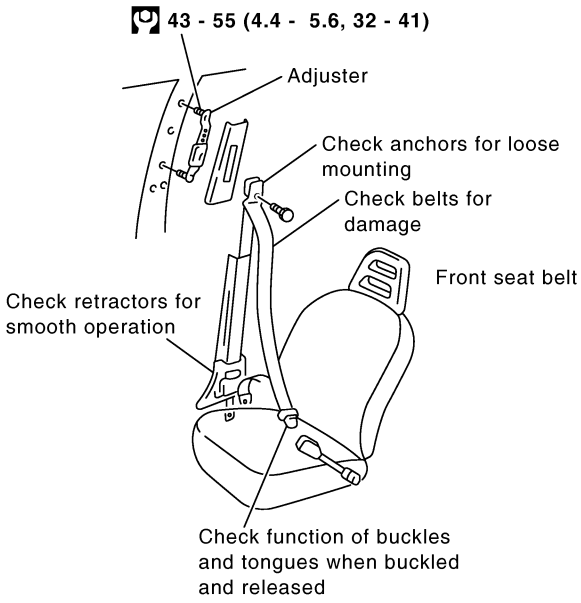
- The seat belt was in use at the time of a collision (except for minor collisions and the belts, retractors and buckles show no damage and continue to operate properly).
- The seat belt was damaged in an accident. (i.e. torn webbing, bent retractor or guide, etc.)
- The seat belt attaching point was damaged in an accident. Inspect the seat belt attaching area for damage or distortion and repair as necessary before installing a new seat belt assembly.
- Anchor bolts are deformed or worn out.

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Precautions (Cont'd)

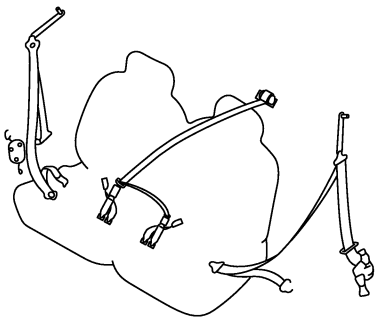
CAUTION:

- **After any collision ,inspect all seat belt assemblies, including retractors and other attached hardwares (i.e. anchor bolt, guide rail set). Nissan recommends to replace all seat belt assemblies in use during a collision, unless not damaged and properly operating after minor collision.**
  Replace the seat belt assembly if any damage or improper operation were found even if the belt had not been used during a collision.
  Also inspect seat belt assemblies not in use during a collision, and replace if damaged or improperly operating. Front seat belt pre-tensioner should be replaced even if the seat belt are not in use during a frontal collision where the driver and passenger air bags are deployed.
- **If any component of seat belt assembly is questionable, do not repair. Replace as seat belt assembly.**
- **If webbing is cut, frayed, or damaged, replace belt assembly.**
- **Do not spill drinks, oil etc. on inner lap belt buckle. Never oil tongue and buckle.**
- **Use a NISSAN genuine seat belt assembly.**

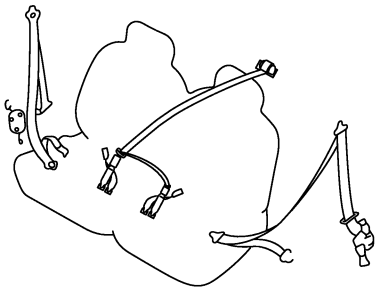


Anchor bolt
43.1 - 54.9 (4.4 - 5.6, 32 - 40)

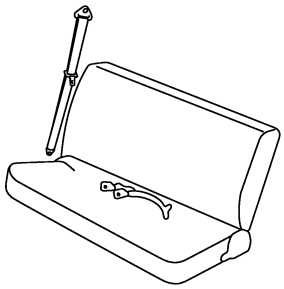
2nd seat belt
H/T



2nd seat belt
Wagon



3rd seat belt



: N•m (kg-m, ft-lb)

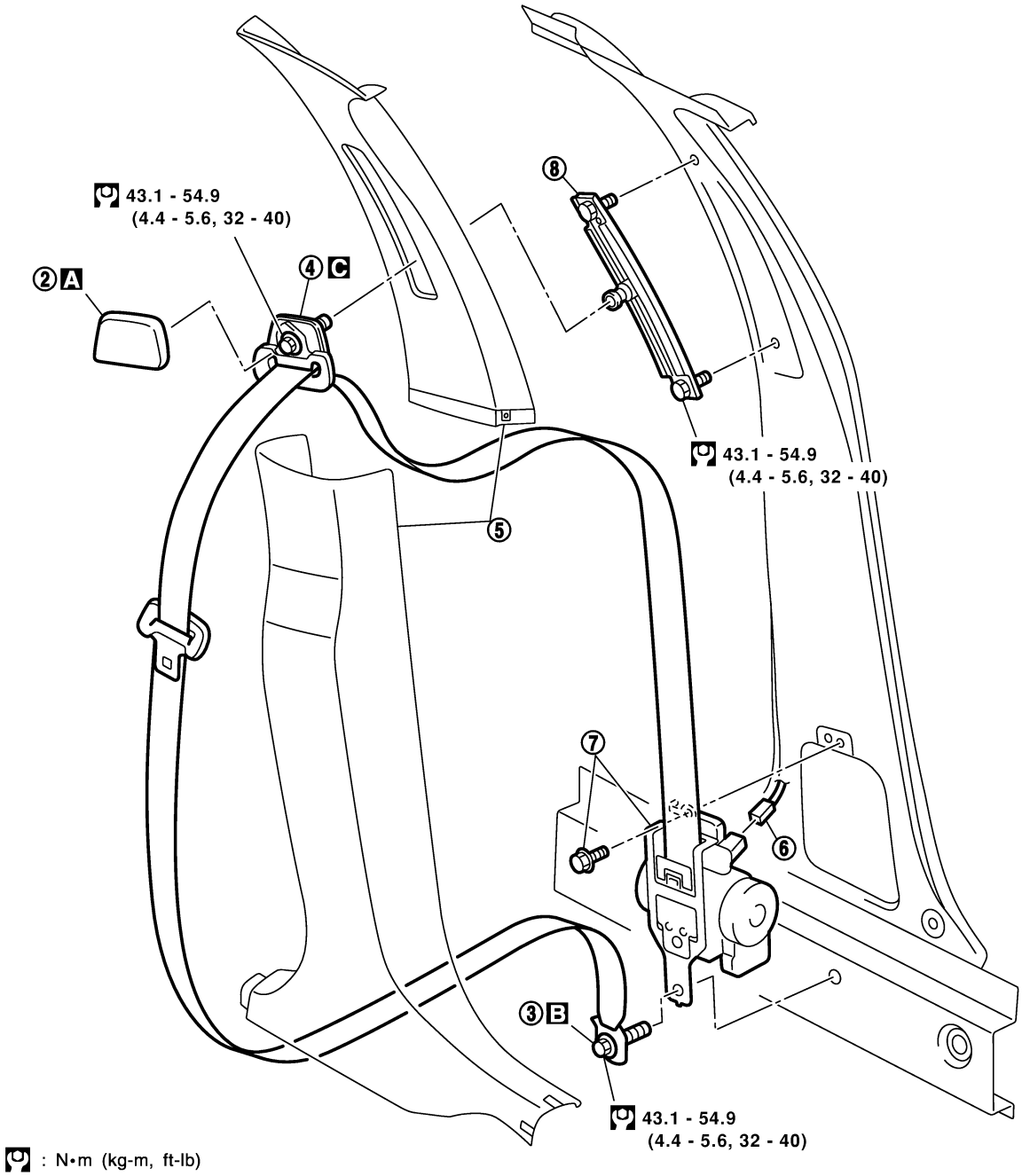
YRS137

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Front Seat Belt

REMOVAL AND INSTALLATION

1. Slide the seat all the way forward. Tilt the seatback toward the front and remove the rear floor boxes.
2. Remove adjuster cover. A
3. Remove floor anchor bolt. B
4. Remove shoulder anchor bolt. C
5. Remove front and rear kicking plate, then remove center pillar upper and lower garnish. Refer to BT-18, “SIDE AND FLOOR TRIM” for details.
6. Disconnect seat belt pre-tensioner connector.
7. Remove the screw securing seat belt pre-tensioner retractor, then remove seat belt and seat belt pre-tensioner retractor.
8. Remove bolts securing seat belt adjuster, then remove seat belt adjuster.

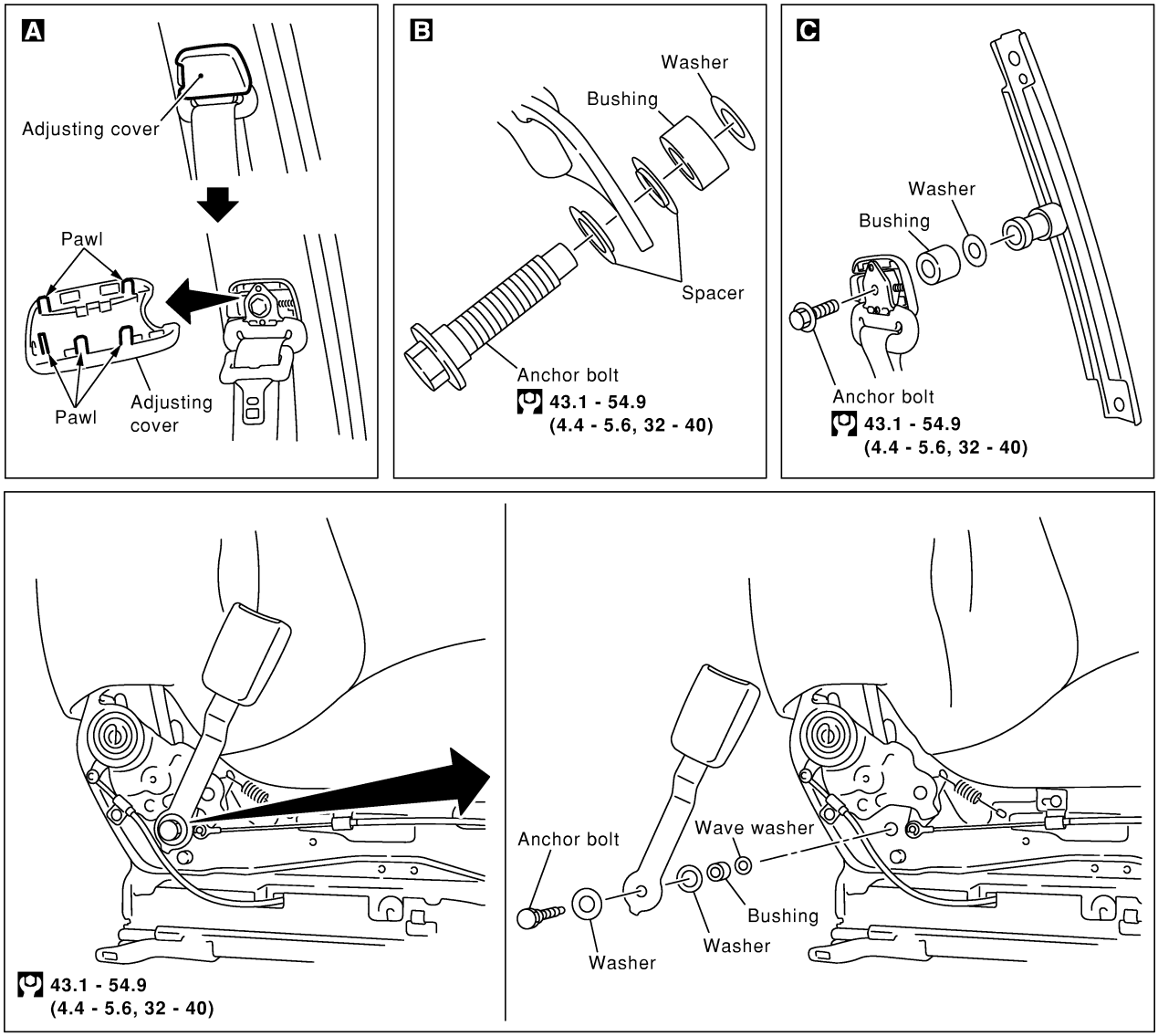


: N•m (kg-m, ft-lb)

YRS093

http://vnx.su/

Front Seat Belt (Cont'd)

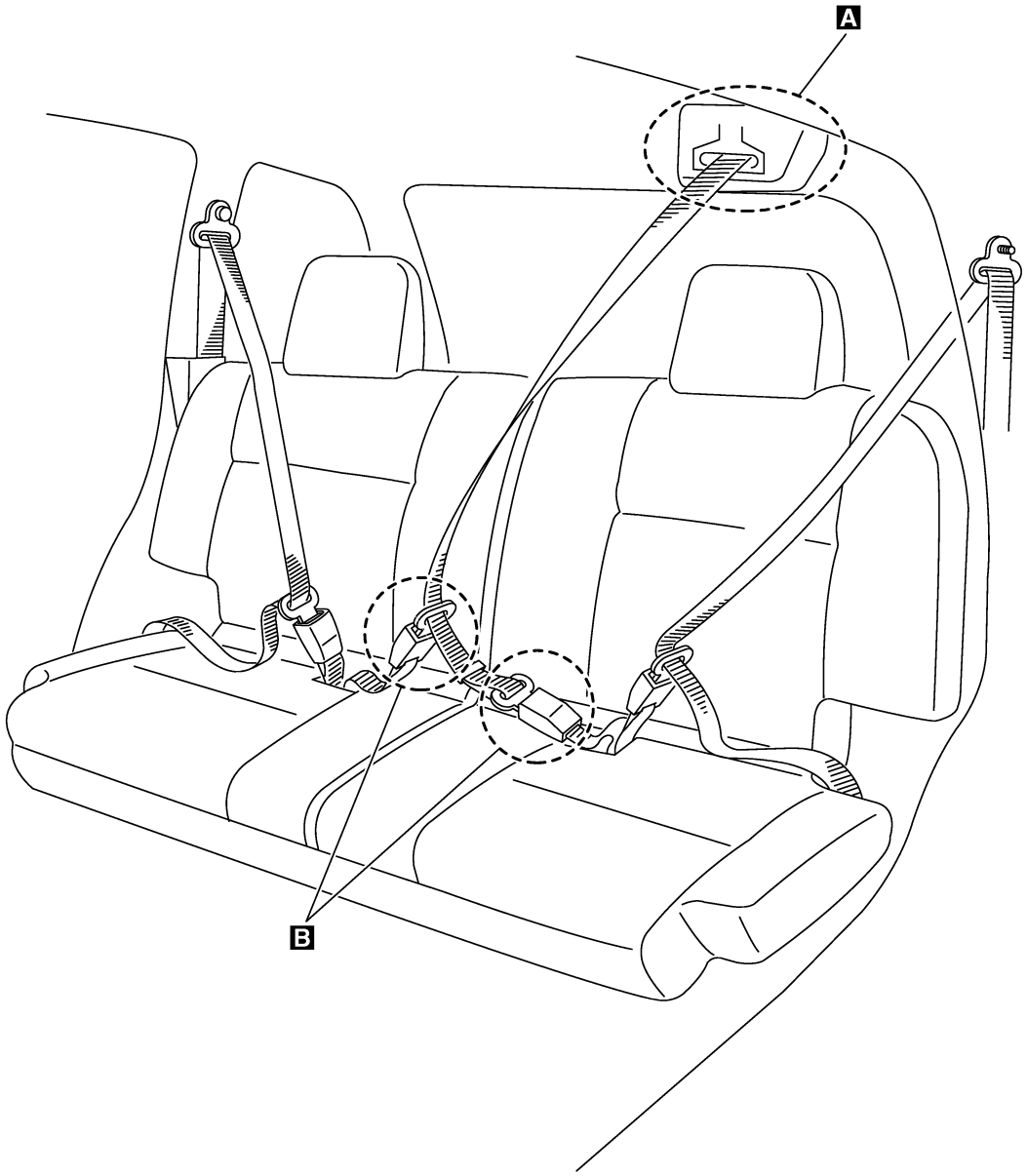


: N•m (kg-m, ft-lb)

YRS074

http://vnx.su/

Rear Seat Belt

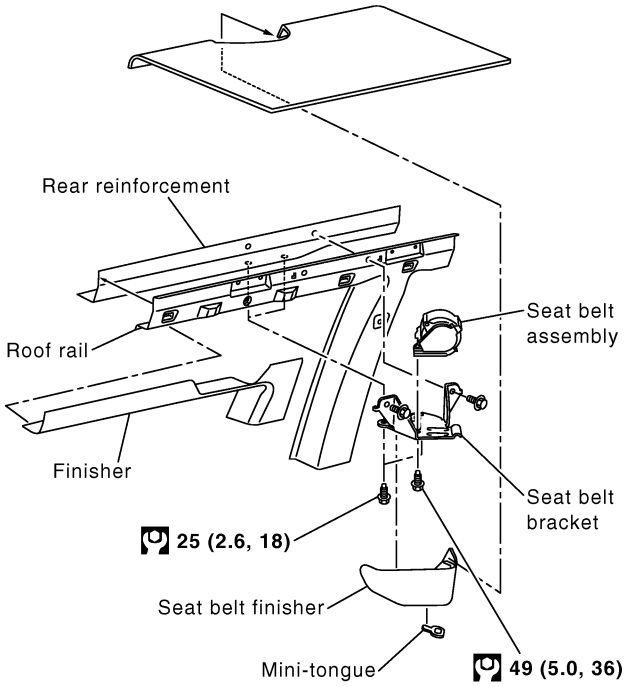


YRS133

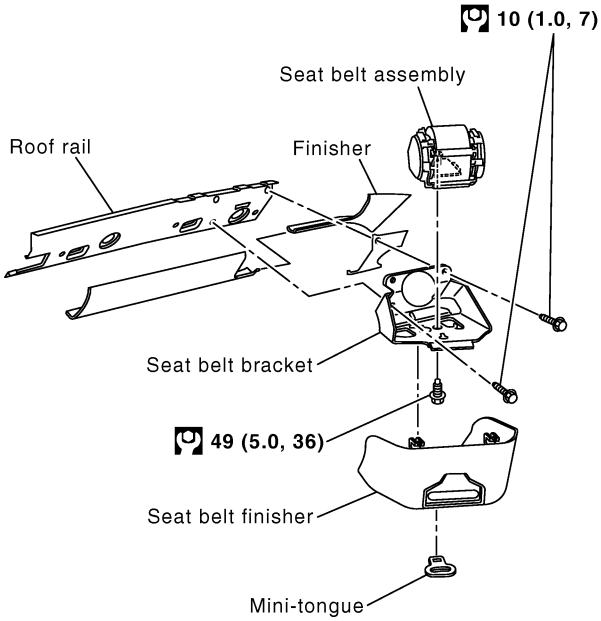
http://vnx.su/

Rear Seat Belt (Cont'd)

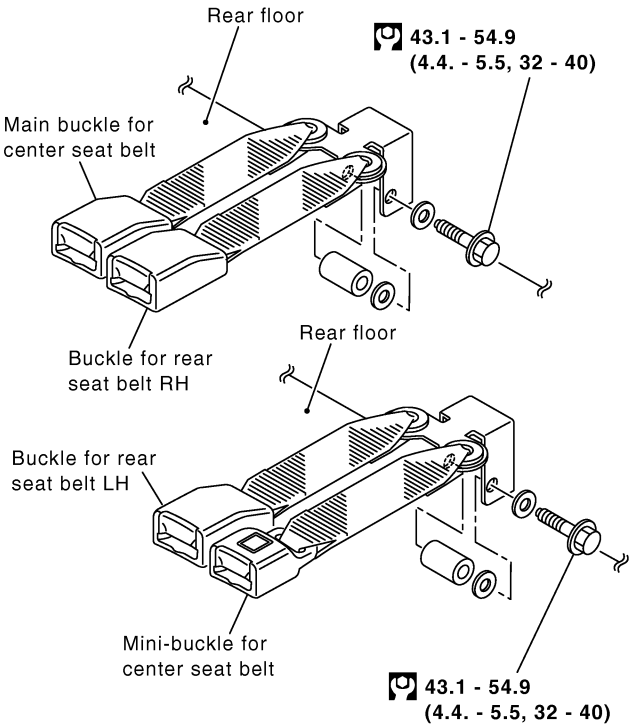
For Wagon 1



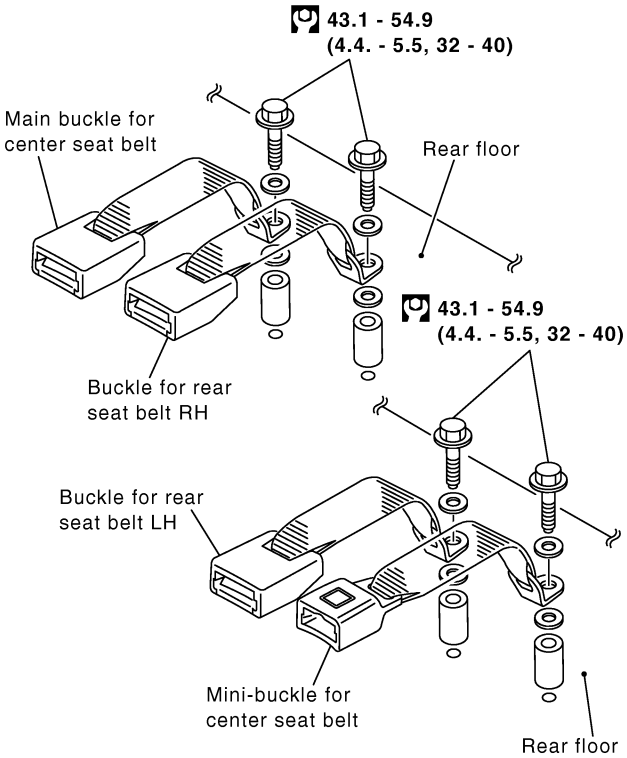
For Hardtop 1



For Wagon 2



For Hardtop 2



: N•m (kg-m, ft-lb)

YRS134

http://vnx.su/

Precautions

SUPPLEMENTAL RESTRAINT SYSTEM (SRS) “AIR BAG” AND “SEAT BELT PRE-TENSIONER”

The Supplemental Restraint System such as “AIR BAG” and “SEAT BELT PRE-TENSIONER” used along with a seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. The SRS composition which is available to NISSAN MODEL R20 is as follows (The composition varies according to the destination and optional equipment.):

- For a frontal collision
  The Supplemental Restraint System consists of driver air bag module (located in the center of the steering wheel), front passenger air bag module (located on the instrument panel on passenger side), front seat belt pre-tensioners, a diagnosis sensor unit, warning lamp, wiring harness and spiral cable.
- For a side collision
  The Supplemental Restraint System consists of front side air bag module (located in the outer side of front seat), side air bag (satellite) sensor, diagnosis sensor unit (one of components of air bags for a frontal collision), wiring harness, warning lamp (one of components of air bags for a frontal collision).

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 should be performed by an authorized NISSAN dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. Spiral cable and wiring harnesses covered with yellow insulation tape either just before the harness connectors or for the complete harness are related to the SRS.**

PRECAUTIONS FOR SRS “AIR BAG” AND “SEAT BELT PRE-TENSIONER” SERVICE

- Do not use electrical test equipment to check SRS circuits unless instructed to in this Service Manual.
- Before servicing the SRS, turn ignition switch “OFF”, disconnect both battery cables and wait at least 3 minutes.
  For approximately 3 minutes after the cables are removed, it is still possible for the air bag and seat belt pre-tensioner to deploy. Therefore, do not work on any SRS connectors or wires until at least 3 minutes have passed.
- Diagnosis sensor unit must always be installed with their arrow marks “←” pointing towards the front of the vehicle for proper operation. Also check diagnosis sensor unit for cracks, deformities or rust before installation and replace as required.
- The spiral cable must be aligned with the neutral position since its rotations are limited. Do not attempt to turn steering wheel or column after removal of steering gear.
- Handle air bag module carefully. Always place driver and front passenger air bag modules with the pad side facing upward and place front side air bag module (built-in type) standing with stud bolt side setting bottom.
- Conduct self-diagnosis to check entire SRS for proper function after replacing any components.
- After air bag inflates, the front instrument panel assembly should be replaced if damaged.

WIRING DIAGRAMS AND TROUBLE DIAGNOSIS

When you read wiring diagrams, refer to the following:

- GI-10, “HOW TO READ WIRING DIAGRAMS”
- EL-8, “POWER SUPPLY ROUTING” for power distribution circuit

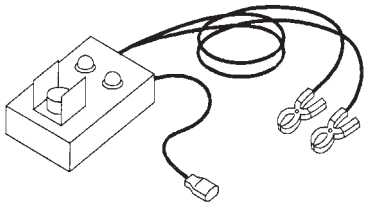
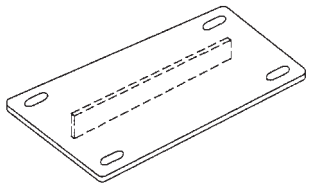
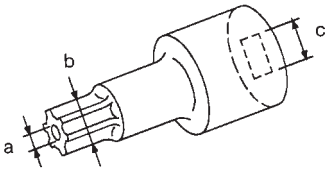
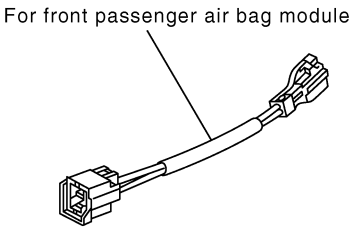
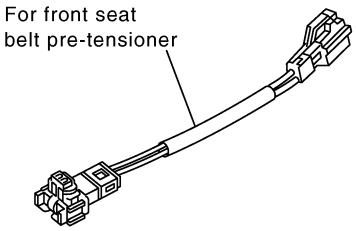
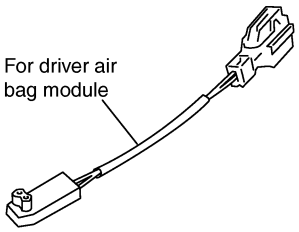
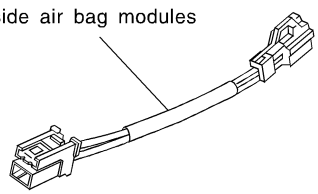
When you perform trouble diagnosis, refer to the following:

- GI-25, “HOW TO FOLLOW TEST GROUPS IN TROUBLE DIAGNOSIS”
- GI-22, “HOW TO PERFORM EFFICIENT DIAGNOSES FOR AN ELECTRICAL INCIDENT”

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Preparation

SPECIAL SERVICE TOOLS

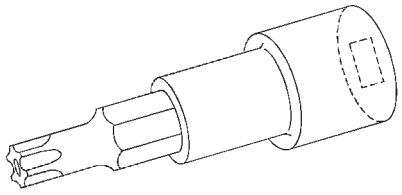
Tool number Tool name	Description	
KV99106400 Deployment tool	 NT357	Disposing of air bag module
KV99105300 Air bag module bracket	 NT354	Anchoring air bag module
HT61961000 and HT62152000 combined *Special torx bit	 NT361	Use for special bolts [TAMPER RESISTANT TORX (Size T50)] **a: 3.5 (0.138) dia.** **b: 8.5 - 8.6 (0.335 - 0.339) dia.** **c: approx. 10 (0.39) sq.** Unit: mm (in)
KV99108300 Deployment tool adapter for front passenger air bag module	 YRS101	
KV99108200 Deployment tool adapter for seat belt pre-tensioner	 YRS128	
KV99109800 Deployment tool adapter for driver air bag module	 YRS129	
KV99109000 Deployment tool adapter for front side air bag	 NT797	

*: Special tool or commercial equivalent

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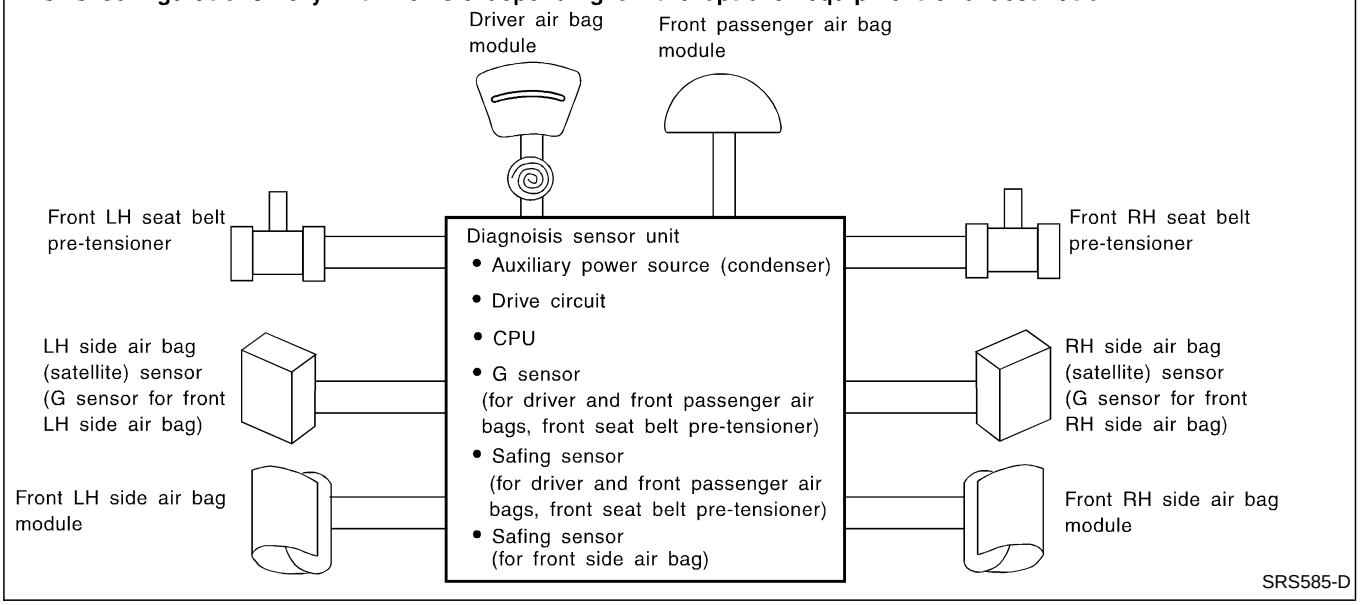
Preparation (Cont'd)

COMMERCIAL SERVICE TOOL

Tool name	Description
Tamper resistant torx socket	Size: T30  NT757

SRS Configuration

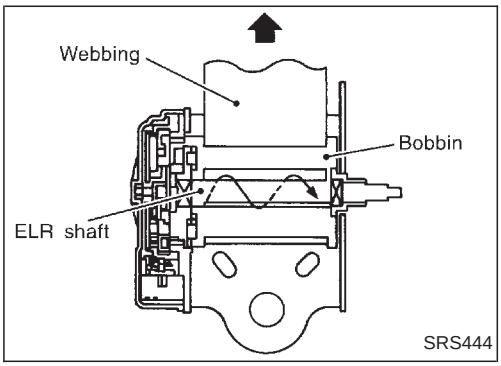
SRS configurations vary with vehicle depending on the optional equipment and destination.



The air bag deploys if the diagnosis sensor unit activates while the ignition switch is in the "ON" or "START" position.
The collision modes for which supplemental restraint systems are activated are different among the SRS systems. For example, the driver air bag module and front passenger air bag module are activated in a frontal collision but not in a side collision.
SRS configurations which are activated for some collision modes are as follows:

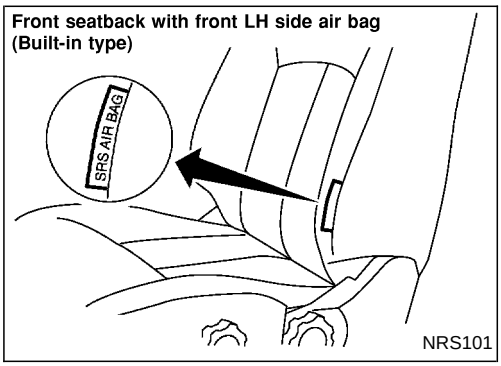
SRS configuration	Frontal collision	Left side collision	Right side collision
Driver air bag module	○	—	—
Front passenger air bag module	○	—	—
Front LH seat belt pre-tensioner	○	—	—
Front RH seat belt pre-tensioner	○	—	—
Front LH side air bag module	—	○	—
Front RH side air bag module	—	—	○

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Seat Belt Pre-tensioner with Load Limiter

The seat belt pre-tensioner system with load limiter is installed to both the driver's seat and the front passenger's seat. It operates simultaneously with the SRS air bag system in the event of a frontal collision with an impact exceeding a specified level.
When the frontal collision with an impact exceeding a specified level occurs, seat belt slack resulting from clothing or other factors is immediately taken up by the pre-tensioner. Vehicle passengers are securely restrained.
When passengers in a vehicle are thrown forward in a collision and the restraining force of the seat belt exceeds a specified level, the load limiter permits the specified extension of the seat belt by the twisting of the ELR shaft, and a relaxation of the chest-area seat belt web tension while maintaining force.



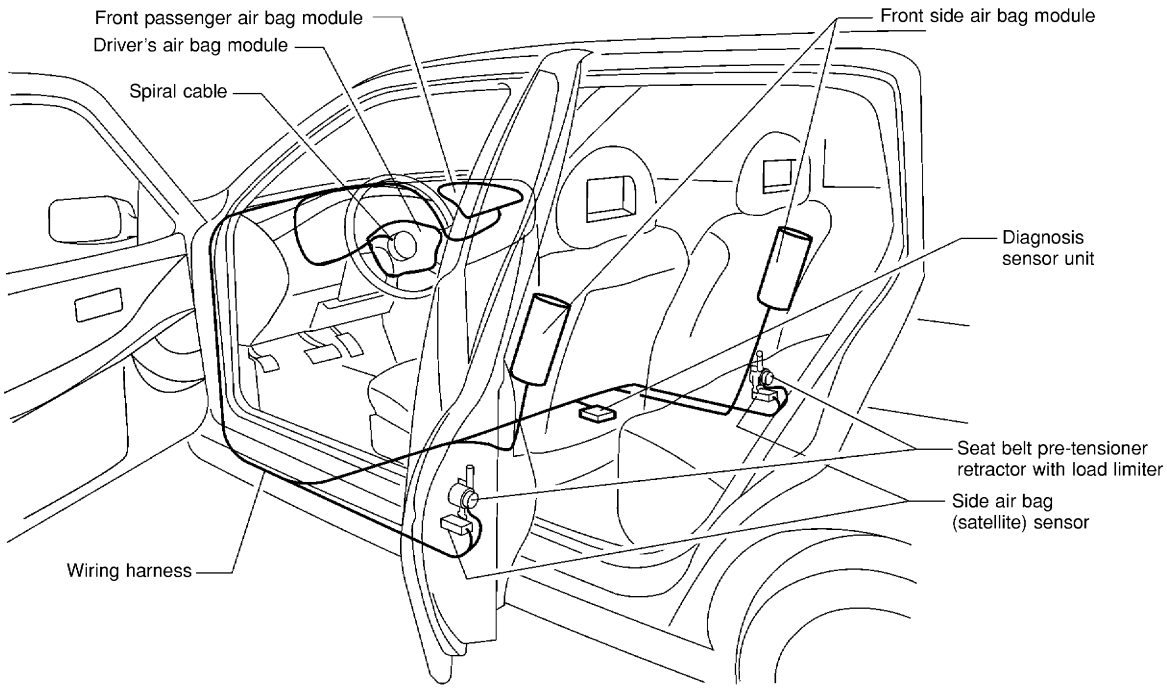
Built-in Type Side Air Bag

Front side air bag is built-in type.
The front seat backs with built-in type front side air bag have the labels shown in figure at left.

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SRS Component Parts Location

SEC. 240•251•253•480•868•870
SRS configurations vary with vehicle depending on the destination and optional equipment.



NRS102



SRS797-A

Maintenance Items

CAUTION:
Do not use electrical test equipment to check SRS circuit.

1. Check operation of "AIR BAG" warning lamp.
   After turning ignition key to "ON" position, "AIR BAG" warning lamp illuminates. The "AIR BAG" warning lamp will go off after about 7 seconds if no malfunction is detected. If any of the following "AIR BAG" warning lamp conditions occur, immediately check the air bag system. Refer to RS-38 for details.

- The "AIR BAG" warning lamp does not illuminate when the ignition switch is turned "ON".
- The "AIR BAG" warning lamp does not go off about 7 seconds after the ignition switch is turned "ON".
- The "AIR BAG" warning lamp blinks after about 7 seconds after the ignition switch is turned "ON".

2. Visually check SRS components.

1) Diagnosis sensor unit

- Check diagnosis sensor unit and bracket for dents, cracks and deformities.
- Check connectors for damage, and terminals for deformities.

2) Air bag module and steering wheel

- Remove air bag module from steering wheel, instrument panel or seatback. Check harness cover and connectors for damage, terminals for deformities, and harness for binding.

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Maintenance Items (Cont'd)

- Install driver air bag module to steering wheel to check fit or alignment with the wheel.
- Check steering wheel for excessive free play.
- Install front passenger air bag module to instrument panel to check fit or alignment with the instrument panel.
- Install front side air bag module to seatback to check fit and alignment with the seat.

3) Spiral cable
- Check spiral cable for dents, cracks, or deformities.
- Check connectors and protective tape for damage.
- Check steering wheel for noise, binding or heavy operation.

4) Main harness, body harness, side air bag module sub-harness
- Check connectors for poor connections, damage, and terminals for deformities.
- Check harnesses for binding, chafing or cut.

5) Front seat belt pre-tensioner
- Check harness cover and connectors for damage, terminals for deformities, and harness for binding.
- Check belts for damage and anchors for loose mounting.
- Check retractor for smooth operation.
- Perform self-diagnosis for seat belt pre-tensioner using "AIR BAG" warning lamp or CONSULT-II.
  Refer to "SRS Operation Check" for details. (RS-38)

6) Side air bag (satellite) sensor
- Check side air bag (satellite) sensor (including bracket portion) for dents, cracks or deformities.
- Check connectors for damage, and terminals for deformities.

CAUTION:

Replace previously used special bolts and ground bolt with new ones.

Diagnosis Sensor Unit

REMOVAL AND INSTALLATION

CAUTION:

- **Before servicing SRS, turn the ignition switch off, disconnect both battery cables and wait at least 3 minutes.**
- **The special bolts are coated with bonding agent while the other bolt is for ground. Do not use old bolts after removal; replace with new ones.**
- **Check diagnosis sensor unit for proper installation.**
- **Check diagnosis sensor unit to ensure it is free of deformities, dents, cracks or rust. If they show any visible signs of damage, replace them with new ones.**
- **Check diagnosis sensor unit brackets to ensure they are free of deformities or rust.**
- **Replace diagnosis sensor unit if it has been dropped or sustained an impact.**
- **After replacement of diagnosis sensor unit, perform self-diagnosis for SRS. Refer to "SRS Operation Check" for details. (RS-38)**

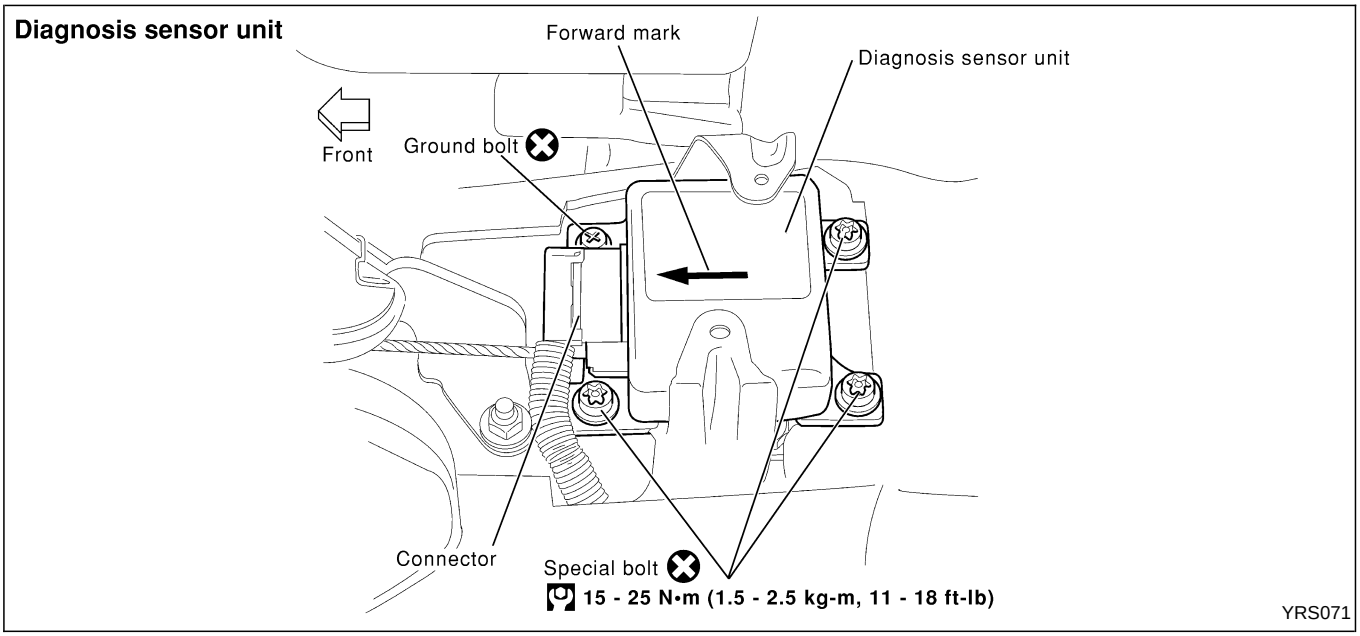
1. Disconnect driver, front passenger and front side air bag module connectors. Also, disconnect front seat belt pre-tensioner connector.
2. Remove console box. Refer to BT-22, "INSTRUMENT PANEL ASSEMBLY".
3. Disconnect diagnosis sensor unit connector.
4. Remove ground bolt and also remove special bolts using the TAMPER RESISTANT TORX (Size T50), from diagnosis sensor unit.
   Then remove the diagnosis sensor unit.

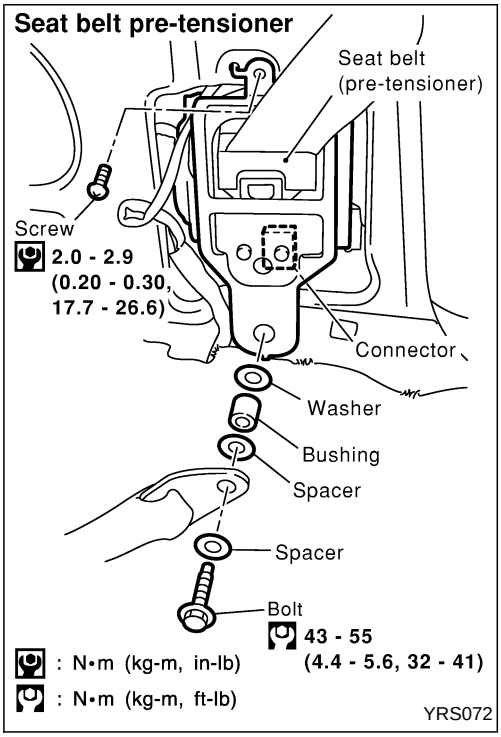
http://vnx.su/

Diagnosis Sensor Unit (Cont'd)

NOTE:

- **To install, reverse the removal procedure sequence.**





Front Seat Belt Pre-tensioner

REMOVAL AND INSTALLATION

CAUTION:

- **Before servicing SRS, turn the ignition switch off, disconnect both battery cables and wait at least 3 minutes.**
- **Check front seat front belt pre-tensioner with load limiter for proper installation.**
- **After replacement of front seat belt pre-tensioner, check SRS function and perform self-diagnosis for SRS.**
- **Refer to "SRS Operation Check" for details. (RS-38)**
- **Do not attempt to disassemble front seat belt pre-tensioner with load limiter.**
- **Replace front seat belt pre-tensioner if it has been dropped or sustained an impact.**
- **Do not expose front seat belt pre-tensioner to temperatures exceeding 80°C (176°F).**

For removal of front seat belt pre-tensioner, refer to "Front Seat Belt" for details. (RS-4)

NOTE:

- **To install, reverse the removal procedure sequence.**

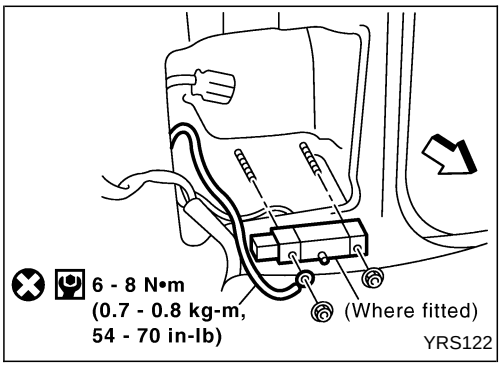
http://vnx.su/

Side Air Bag (Satellite) Sensor

REMOVAL AND INSTALLATION

CAUTION:

- **Before servicing SRS, turn the ignition switch off, disconnect both battery cables and wait at least 3 minutes.**
- **Do not use old bolts coated with bonding agent after removal; replace with new ones.**
- **Check side air bag (satellite) sensor for proper installation.**
- **Check side air bag (satellite) sensor to ensure they are free of deformities, dents, cracks or rust. If it shows any visible signs of damage, replace it with new one.**
- **After replacement of side air bag (satellite) sensor, check SRS function and perform self-diagnosis for SRS. Refer to "SRS Operation Check" for details. (RS-38)**
- **Do not attempt to disassemble side air bag (satellite) sensor.**
- **Replace side air bag (satellite) sensor if it has been dropped or sustained an impact.**



1. Remove front seat belt pre-tensioner. Refer to "Front Seat Belt" for details. (RS-4)
2. Disconnect side air bag (satellite) sensor connector.
3. Remove bolt and nuts from side air bag (satellite) sensor unit. Then remove the (satellite) sensor.

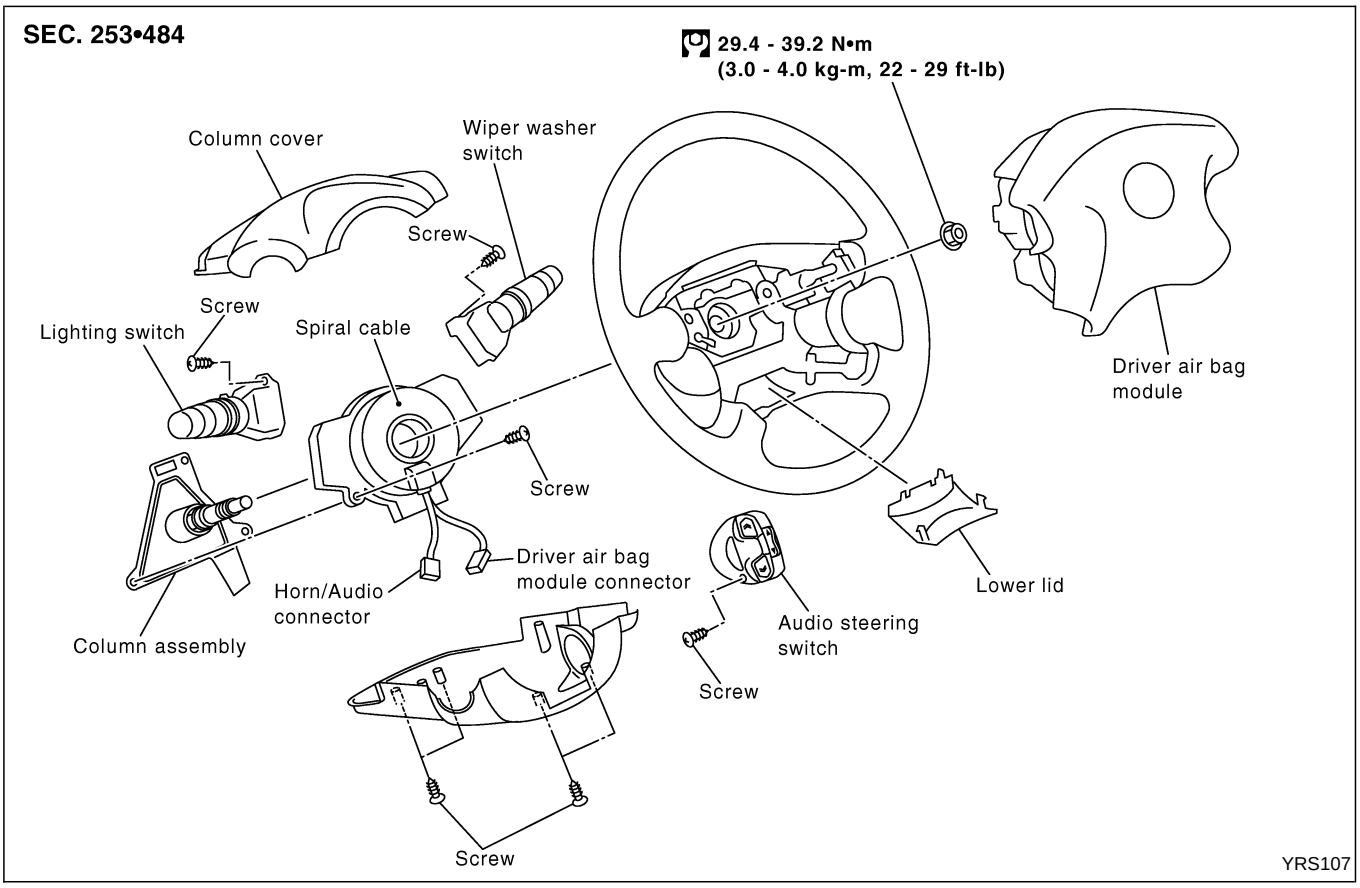
NOTE:

- **To install, reverse the removal procedure sequence.**
- **Face the connector rearward and the label upward.**

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Driver Air Bag Module and Spiral Cable

REMOVAL AND INSTALLATION



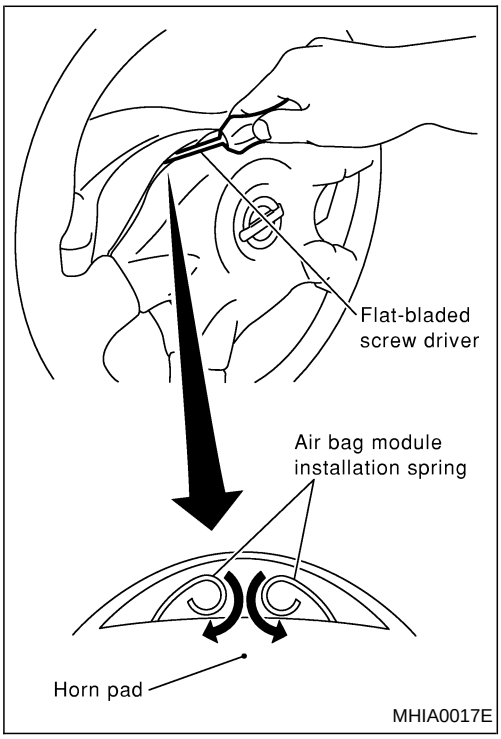
REMOVAL

CAUTION:

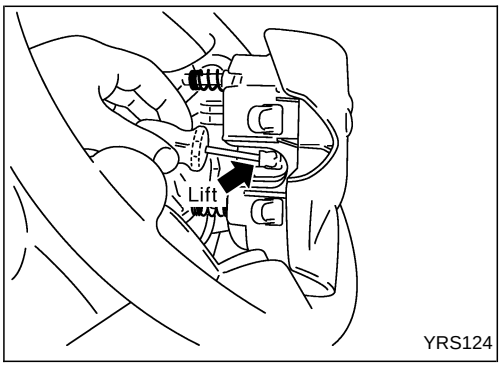
- **Before servicing SRS, turn the ignition switch off, disconnect both battery cables and wait at least 3 minutes.**
- **Always work from the side of driver air bag module.**

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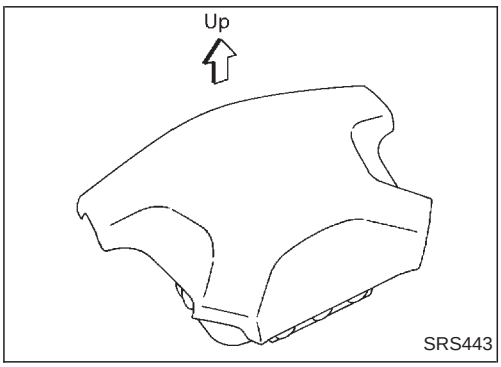
Driver Air Bag Module and Spiral Cable (Cont'd)



1. Push the top of horn pad downward.
2. Rotate the air bag module installation spring to inner direction with a flat-bladed screwdriver, and remove air bag module.



3. Lift the black locking clip with a flat-bladed screw driver and disconnect air bag module harness connector. Disconnect horn connector.



CAUTION:

- **Always place driver air bag module with pad side facing upward.**
- **Do not attempt to disassemble driver air bag module.**
- **The special bolts are coated with bonding agent. Do not use old bolts after removal; replace with new ones.**
- **Do not insert any foreign objects (screwdriver, etc.) into driver air bag module connector.**



- **Replace driver air bag module if it has been dropped or sustained an impact.**
- **Do not expose the driver air bag module to temperatures exceeding 90°C (194°F).**
- **Do not allow oil, grease or water to come in contact with the driver air bag module.**

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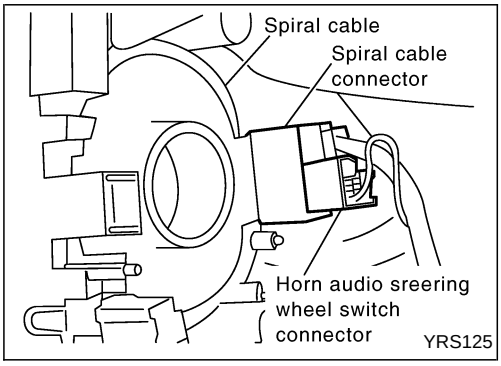
Driver Air Bag Module and Spiral Cable (Cont'd)

4. Set steering wheel in the neutral position.
5. Disconnect horn connector (or horn/audio connector) and remove nut.
6. Remove steering wheel.

CAUTION:

- **Do not tap or bump the steering wheel.**

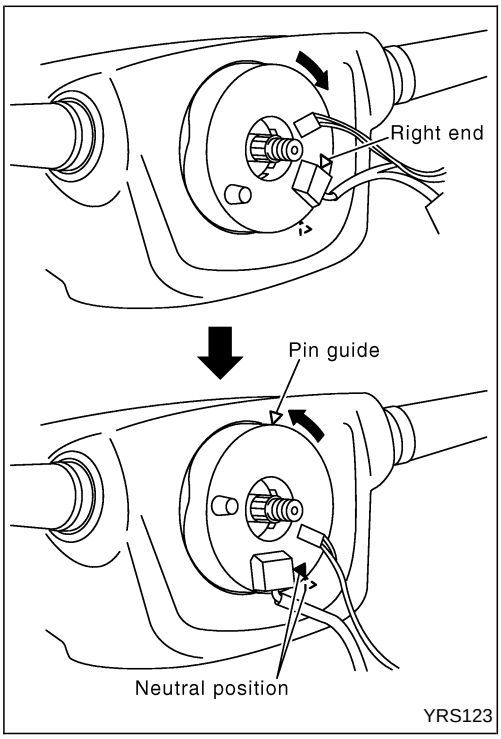
7. Remove steering column cover.



8. Disconnect in order the air bag module connector and the (horn/audio steering switch) connector behind the spiral cable.
9. Remove spiral cable securing screws, and while pushing the upper plastic tab, remove the spiral cable.

CAUTION:

- **Do not attempt to disassemble spiral cable.**
- **Do not apply lubricant to the spiral cable.**



INSTALLATION

1. Set the front wheels in the straight-ahead position.
2. Make sure that the spiral cable is in the neutral position.
   The neutral position is detected by turning left (counterclockwise) about 2.5 revolutions from the right end position. Align the two marks (⧗).

CAUTION:

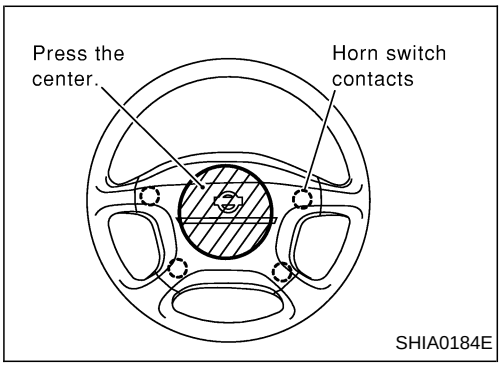
- **The spiral cable may snap due to steering operation if the cable is installed in an improper position.**
- **Also, with the steering linkage disconnected, the cable may snap by turning the steering wheel beyond the limited number of turns. The spiral cable can be turned up to about 2.5 turns from the neutral position to both the right and left.**

3. Connect spiral cable connector in the reverse order of disconnecting and tighten with screws.
4. Install steering column covers. And make sure the harness do not get caught between inner steering cover and steering column.
5. Install steering wheel, aligning with spiral cable pin guides, and pull spiral cable through.
6. Connect horn connector (or horn/audio steering switch connector) and engage spiral cable with pawls in steering wheel. Move driver air bag module connector away from steering wheel lower lid opening.
7. Tighten nut.

   : 30 - 40 N·m (3.1 - 4.1 kg-m, 22 - 30 ft-lb)

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Driver Air Bag Module and Spiral Cable (Cont'd)



8. Install steering switch.
9. Install the air bag module by pressing the center of the horn to make the contacts (RH, LH) ON.
10. Connect driver air bag module connector, and push the black locking clip to secure the connector to the air bag module.
11. Conduct self-diagnosis to ensure entire SRS operates properly. (Use CONSULT-II or warning lamp check.)
    Before performing self-diagnosis, connect both battery cables.
12. Turn steering wheel to the left end and then to the right end fully to make sure that spiral cable is set in the neutral position.
    If "AIR BAG" warning lamp blinks or stays ON (at the user mode), it shows the spiral cable may be snapped due to its improper position. Perform self-diagnosis again (use CONSULT-II or warning lamp). If a malfunction is detected, replace the spiral cable with a new one.
13. Perform self-diagnosis again to check that no malfunction is detected.

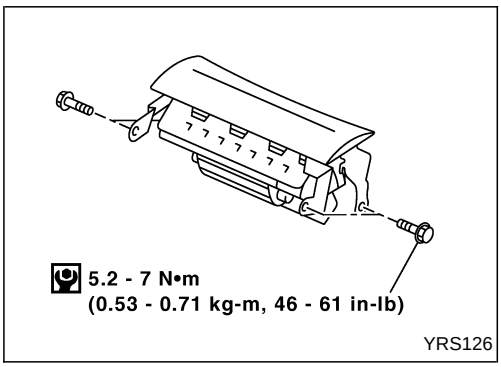
Front Passenger Air Bag Module

REMOVAL

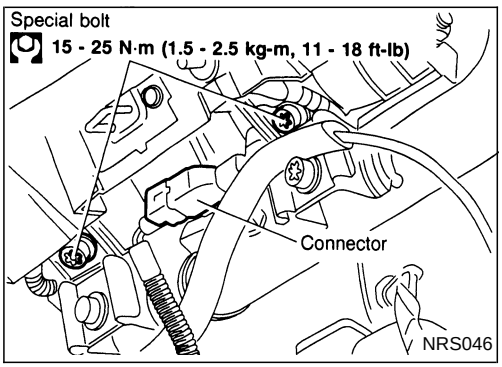
CAUTION:

Before servicing SRS, turn the ignition switch off, disconnect both battery cables and wait for at least 3 minutes.
Always work from the side of (or under) front passenger air bag module.

1. Remove glove box assembly. Refer to BT-16, "INSTRUMENT PANEL ASSEMBLY" for details.
2. Disconnect inflator connector.



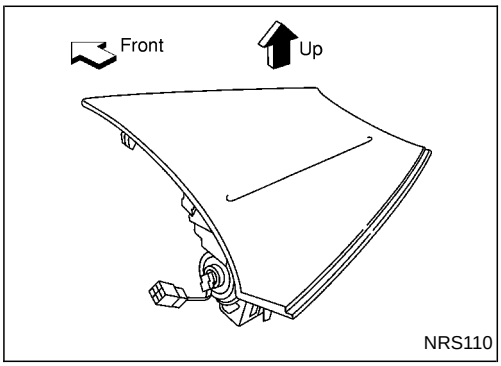
3. Remove bolts holding the passenger air bag module to the instrument panel.



4. Remove upper special bolts, as indicated.
5. Remove the passenger air bag module.

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Front Passenger Air Bag Module (Cont'd)



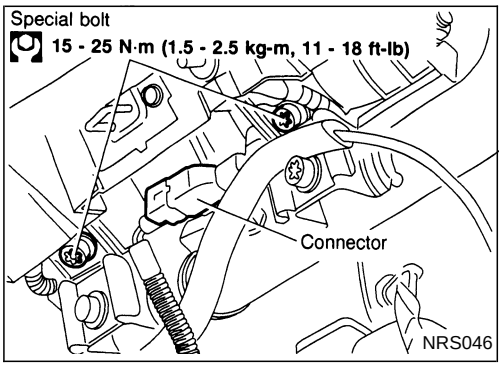
CAUTION:

- **Always place front passenger air bag module with pad side facing upward.**
- **Do not attempt to disassemble front passenger air bag module.**
- **The special bolts are coated with bonding agent. Do not use old bolts after removal; replace with new coated bolts.**
- **Do not insert any foreign objects (screwdriver, etc.) into front passenger air bag module connector.**



- **Replace front passenger air bag module if it has been dropped or sustained an impact.**
- **Do not expose the front passenger air bag module to temperatures exceeding 90°C (194°F).**
- **Do not allow oil, grease or water to come in contact with the front passenger air bag module.**
- **After front passenger air bag inflates, the front instrument panel assembly should be replaced if damaged.**

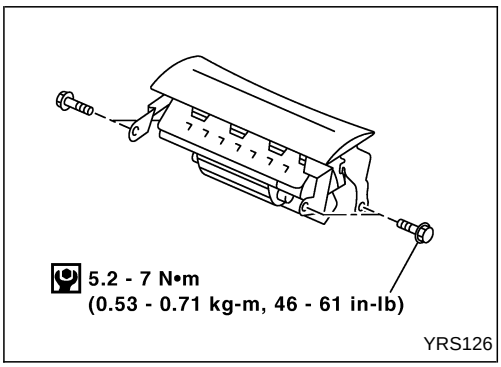
INSTALLATION



CAUTION:

- **Always work from the side of or under front passenger air bag module.**

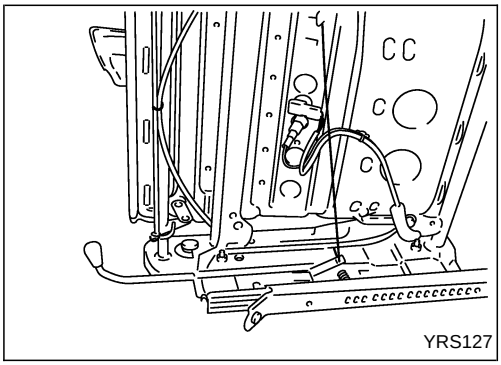
1. Install front passenger air bag module. Tighten special bolts and side mounting bolts to the specified torque as shown in the figure.
   - Ensure harness is not caught between rear of front passenger air bag module and steering member.



2. Connect the front passenger air bag module connector.
3. Install glove box.
4. Connect both battery cables.
5. Conduct self-diagnosis to ensure entire SRS operates properly. (Use CONSULT-II or warning lamp check.)

Front Side Air Bag Module

REMOVAL



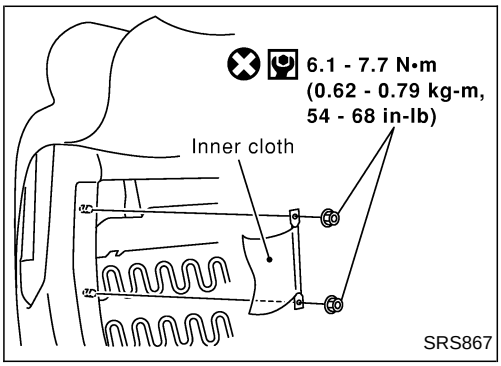
CAUTION:

- **Before servicing SRS, turn the ignition switch OFF, disconnect both battery cables and wait at least 3 minutes.**
- **Always work from the rear of the front side air bag module.**

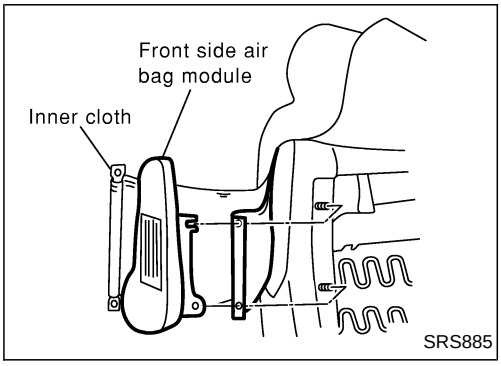
1. Disconnect front side air bag module connector under the seat.
2. Open the seatback zipper.

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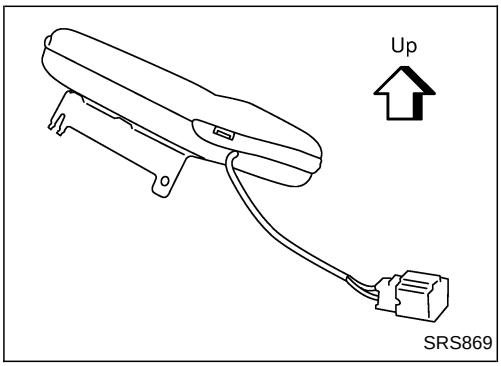
Front Side Air Bag Module (Cont'd)



3. Pull up the seatback trim.
4. Remove the nuts coated with bonding agent, securing front side air bag and the inner cloth with seatback frame.



5. Remove inner cloth.
6. Remove front side air bag connector. Front side air bag module can then be removed.



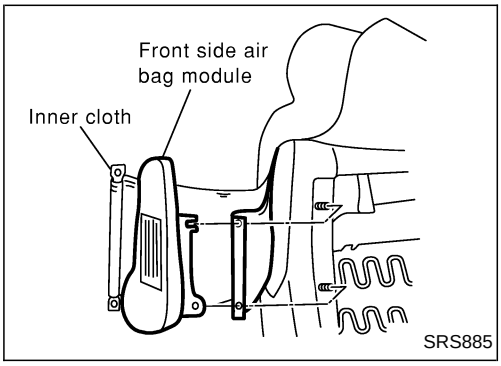
CAUTION:

- **Always place the front side air bag module standing with the stud bolt side setting bottom.**
- **Do not attempt to disassemble front side air bag module.**
- **Do not use old nuts after removal; replace with new nuts.**
- **Do not insert any foreign objects (screwdriver, etc.) into front side air bag module connector.**



- **Replace front side air bag module if it has been dropped or sustained an impact.**
- **Do not expose the front side air bag module to temperatures exceeding 90°C (194°F).**
- **Do not allow oil, grease or water to come in contact with the front side air bag module.**
- **After front side air bag inflates, all parts of front seatback (including front seatback frame) should be replaced.**

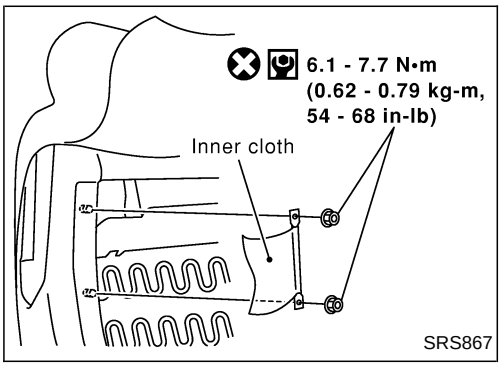
INSTALLATION



1. Install the seatback trim. Refer to BT-34, "Front Seat".
2. Install front side air bag module on seatback frame.
3. Install front side air bag connector.

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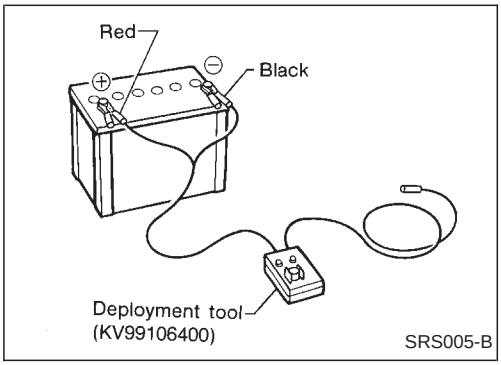
Front Side Air Bag Module (Cont'd)



4. Secure the inner cloth which covers the front side air bag module with new nuts.
5. Connect front side air bag module connector.
6. Close the seatback zipper.
7. Connect both battery cables.
8. Go to "SRS Operation Check", (RS-38) and perform self-diagnosis to ensure entire SRS operates properly. (Use CONSULT-II or "AIR BAG" warning lamp.)

Disposal of Air Bag Module and Seat Belt Pre-tensioner

- Before disposing of air bag module and seat belt pre-tensioner, or vehicles equipped with such systems, deploy the systems. If such systems have already been deployed due to an accident, dispose of them as indicated in "DISPOSING OF AIR BAG MODULE AND SEAT BELT PRE-TENSIONER" (RS-27).
- When deploying the air bag module and seat belt pre-tensioner, always use the Special Service Tool; Deployment tool KV99106400.
- When deploying the air bag module and seat belt pre-tensioner, stand at least 5 m (16 ft) away from the deployment component.
- When deploying air bag module and seat belt pre-tensioner, a fairly loud noise is made, followed by smoke being released. The smoke is not poisonous, however, be careful not to inhale smoke since it irritates the throat and can cause choking.
- Always activate one air bag module at a time.
- Due to heat, leave air bag module unattended for more than 30 minutes after deployment. Also leave seat belt pre-tensioner unattended for move than 10 minutes after deployment.
- Be sure to wear gloves when handling a deployed air bag module and seat belt pre-tensioner.
- Never apply water to the deployed air bag module and seat belt pre-tensioner.
- Wash your hands clean after finishing work.
- Place the vehicle outdoors with an open space of at least 6 m (20 ft) on all sides when deploying air bag module and seat belt pre-tensioner while mounted in vehicle.
- Use a voltmeter to make sure the vehicle battery is fully charged.
- Do not dispose of the air bag module and seat belt pre-tensioner un-deployed.



CHECKING DEPLOYMENT TOOL

Connecting to Battery

- Place the vehicle outdoors with an open space of at least 6 m (20 ft) on all sides.
- Use a voltmeter to make sure the vehicle battery is fully charged.

CAUTION:

The battery must show voltage of 9.6V or more.

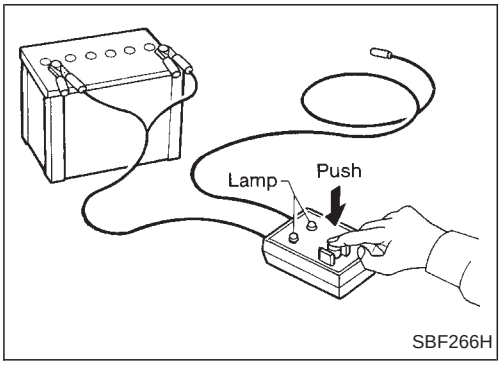
Remove the battery from the vehicle and place it on dry wood blocks approximately 5 m (16 ft) away from the vehicle.

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Disposal of Air Bag Module and Seat Belt Pre-tensioner (Cont'd)

- Wait 3 minutes after the vehicle battery is disconnected before proceeding.
- Connect red clip of deployment tool to battery positive terminal and black clip to negative terminal.

Make sure the polarity is correct. The right side lamp in the tool, marked "deployment tool power", should glow with a green light. If the right side lamp glows red, reverse the connections to the battery.



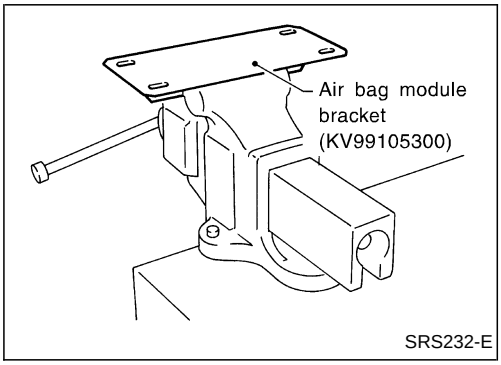
Deployment Tool Check

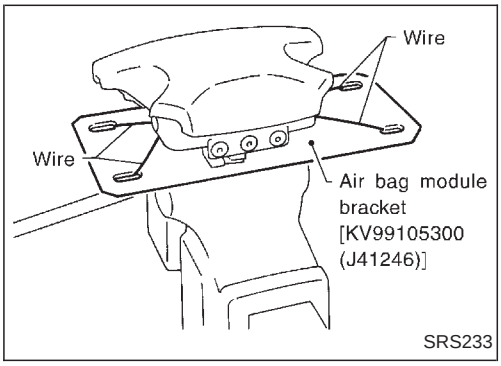
Press the deployment tool switch to the "ON" position. The left side lamp in the tool, marked "air bag connector voltage" should illuminate. If it does not illuminate, replace the tool.

Air Bag Deployment Tool Lamp Illumination Chart (Battery connected)

Switch operation	Left side lamp, green* "AIR BAG CONNECTOR VOLTAGE"	Right side lamp, green* "DEPLOYMENT TOOL POWER"
OFF	OFF	ON
ON	ON	ON

*: If this lamp glows red, the tool is connected to the battery incorrectly. Reverse the connections and make sure the lamp glows green.





DEPLOYMENT PROCEDURES FOR AIR BAG MODULE (OUTSIDE OF VEHICLE)

Unless the vehicle is being scrapped, deploying the air bag in the vehicle is not recommended. This may cause damage to the vehicle interior.

Anchor air bag module bracket (KV99105300) in a vise secured to a firm foundation during deployment.

Deployment of Driver Air Bag Module (Outside of vehicle)

1. Using wire, secure driver air bag module to air bag module bracket (SST: KV99105300) at two places.

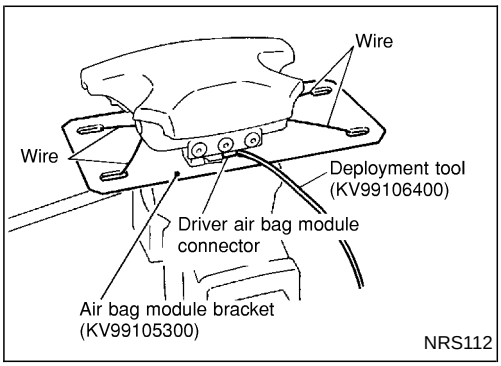
CAUTION:

Use wire of at least 1 mm (0.04 in) diameter.

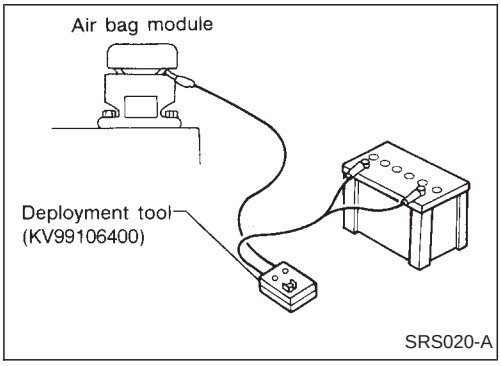
2. Firmly secure air bag module bracket (SST: KV99105300) with driver air bag module attached, in a vise.

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Disposal of Air Bag Module and Seat Belt Pre-tensioner (Cont'd)



3. Connect deployment tool adapter (SST: KV99109800) to deployment (SST: KV99106400) connector and driver air bag module connector.



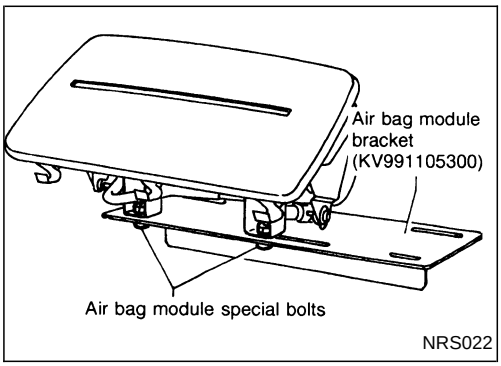
4. Connect red clip of deployment tool to battery positive terminal and black clip to negative terminal.
5. The lamp on the right side of the tool, marked "deployment tool power", should glow green, not red.
6. Press the button on the deployment tool. The left side lamp on the tool, marked "air bag connector voltage", will illuminate and the air bag module will deploy.

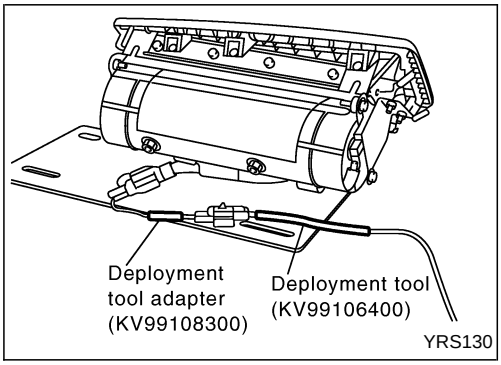
CAUTION:

When deploying the driver air bag module, stand at least 5 m (16 ft) away from the driver air bag module.

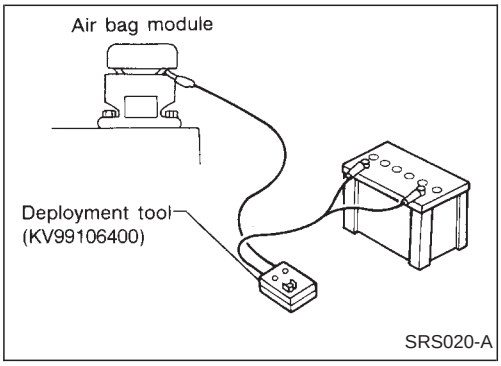
Deployment of Front Passenger Air Bag Module (Outside of vehicle)

1. Secure the passenger air bag module on the air bag module bracket (SST: KV99105300), using the modules special bolts.
2. Firmly anchor the air bag module bracket in a vise.





3. Connect deployment tool adapter (SST: KV99108300) to deployment tool (SST: KV99106400) connector and front passenger air bag module connector.
4. Connect red clip of deployment tool to battery positive terminal and black clip to negative terminal.
5. The lamp on the right side of the tool, marked "deployment tool power", should glow green, not red.
6. Press the button on the deployment tool. The left side lamp on the tool, marked "air bag connector voltage", will illuminate and the front passenger air bag module will deploy.

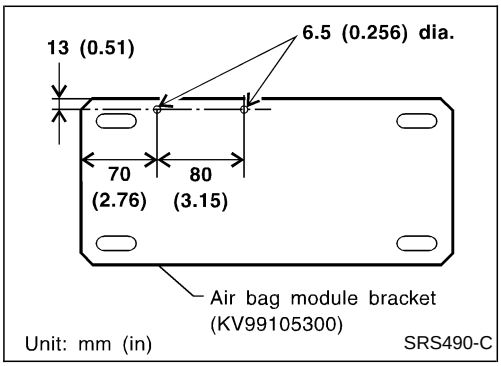


CAUTION:

- **When deploying the front passenger air bag module, do not stand on the deploying side.**
- **Stand at least 5 m (16 ft) away from the front passenger air bag module.**

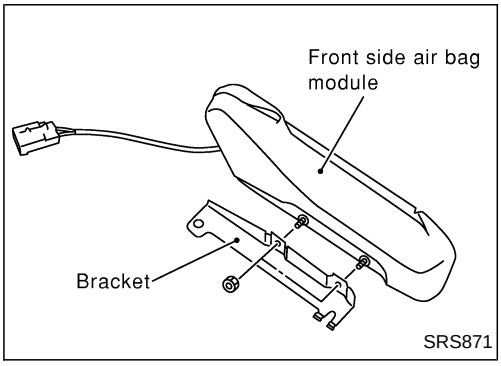
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Disposal of Air Bag Module and Seat Belt Pre-tensioner (Cont'd)

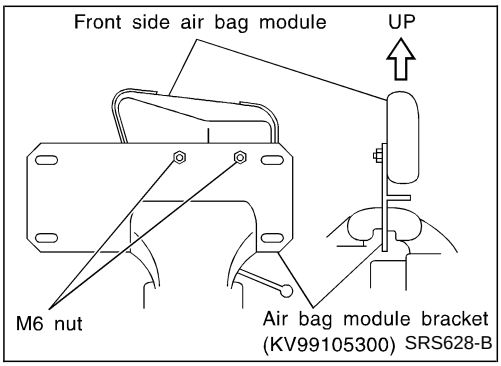


Deployment of Front Side Air Bag Module (Built-in type) (Outside of vehicle)

1. Make 6.5 mm (0.256 in) diameter holes in air bag module bracket (SST: KV99105300) at the position shown in figure at left.
2. Firmly secure air bag module bracket (SST: KV99105300) in a vise.



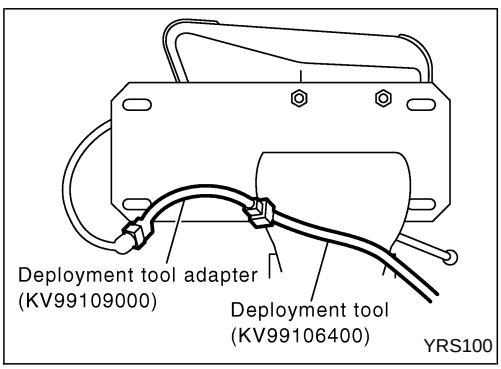
3. Remove nuts then remove the bracket from front side air bag module.



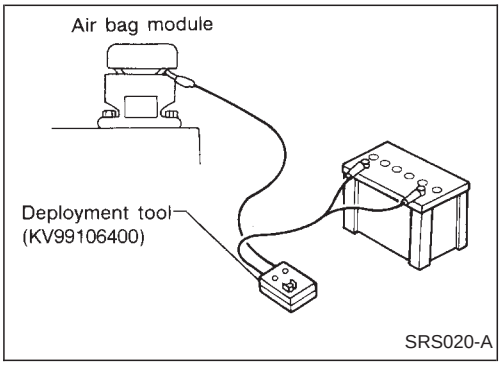
4. Insert the stud bolts of side air bag module into the two holes in air bag module bracket (held in vise) and fix them with two M6 nuts.

CAUTION:

Side air bag module should be secured to air bag module bracket (SST: KV99105300) in a vise with stud bolt side setting bottom.



5. Connect deployment tool adapter (SST: KV99109000) to deployment tool (SST: KV99106400) connector and connector on air bag module.



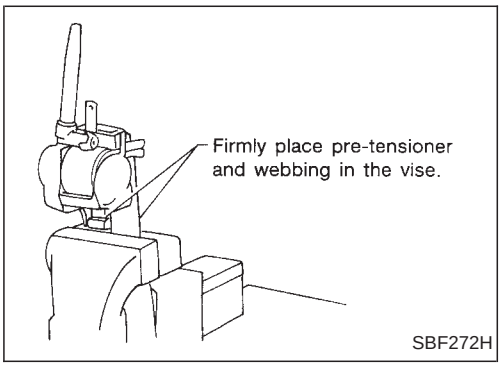
6. Connect red clip of deployment tool to battery positive terminal and black clip to negative terminal.
7. The lamp on the right side of the tool, marked "deployment tool power", should glow green, not red.
8. Press the button on the deployment tool. The left side lamp on the tool, marked "air bag connector voltage", will illuminate and the air bag module will deploy.

CAUTION:

When deploying the air bag module, stand at least 5 m (16 ft) away from the air bag module.

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Disposal of Air Bag Module and Seat Belt Pre-tensioner (Cont'd)

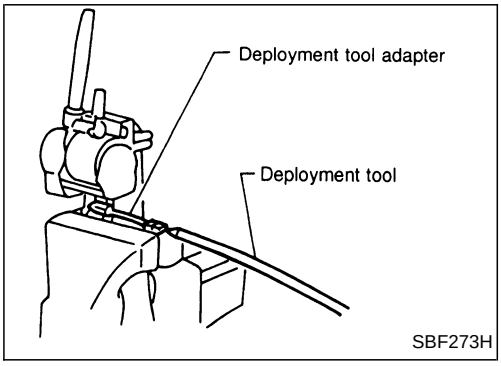


DEPLOYMENT PROCEDURES FOR SEAT BELT PRE-TENSIONER AS A UNIT (OUTSIDE OF VEHICLE)

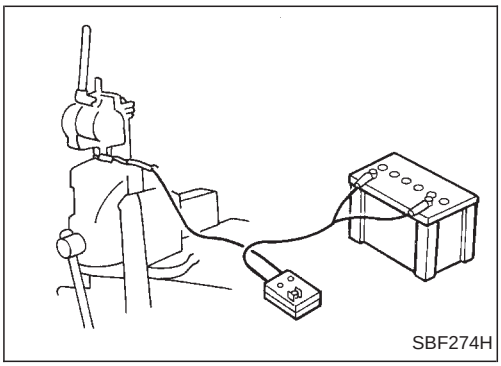
1. Firmly secure front seat belt pre-tensioner in a vise.

CAUTION:

Ensure bracket and webbing are placed in a vise.



2. Connect deployment tool adapter (SST: KV99109700) to deployment tool (SST: KV99106400) connector and front seat belt pre-tensioner connector.



3. Connect red clip of deployment tool to battery positive terminal and black clip to negative terminal.
4. The lamp on the right side of the tool, marked "deployment tool power", should glow green, not red.
5. Press the button on the deployment tool. The left side lamp on the tool, marked "seat belt pre-tensioner connector voltage", will illuminate and the front seat belt pre-tensioner will deploy.

CAUTION:

When deploying the front seat belt pre-tensioner, stand at least 5 m (16 ft) away from the front seat belt pre-tensioner.

DEPLOYMENT OF AIR BAG MODULE AND SEAT BELT PRE-TENSIONER WHILE MOUNTED IN VEHICLE

When disposing of a vehicle, deploy air bag module and seat belt pre-tensioner while they are mounted in vehicle.

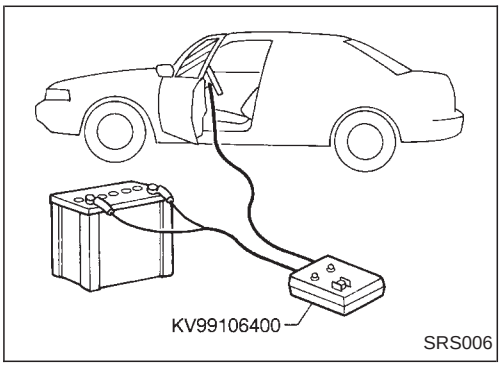
CAUTION:

When deploying air bag module or seat belt pre-tensioner, ensure vehicle is empty.

1. Disconnect both the vehicle battery cables and wait 10 minutes.
2. Disconnect air bag module and seat belt pre-tensioner connector.
3. Connect deployment tool (SST: KV99106400) to air bag module or seat belt pre-tensioner.
   For front passenger air bag module, attach deployment tool adapter (SST: KV99108300) to the tool connector. For front side air bag module (built-in type), attach deployment tool adapter (SST: KV99109000). For front seat belt pre-tensioner, attach deployment tool adapter (SST: KV99109700) to the tool connector.

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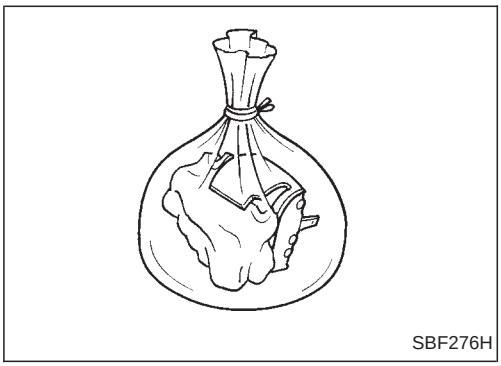
Disposal of Air Bag Module and Seat Belt Pre-tensioner (Cont'd)



4. Connect red clip of deployment tool to battery positive terminal and black clip to negative terminal.
5. The lamp on the right side of the tool, marked "deployment tool power", should glow green, not red.
6. Press the button on the deployment tool. The left side lamp on the tool, marked "air bag connector voltage", will illuminate and the air bag module or seat belt pre-tensioner will deploy.
7. After deployment, remove them from vehicle and seal them up in plastic bags, then dispose of them.

CAUTION:

Activate only one air bag module or seat belt pre-tensioner at a time.



DISPOSING OF AIR BAG MODULE AND SEAT BELT PRE-TENSIONER

Deployed air bag module and seat belt pre-tensioner are very hot. Before disposing of air bag module, and seat belt pre-tensioner wait at least 30 minutes, and 10 minutes, respectively. Seal them in a plastic bag before disposal.

CAUTION:

- **Never apply water to a deployed air bag module and seat belt pre-tensioner.**
- **Be sure to wear gloves when handling a deployed air bag module and seat belt pre-tensioner.**
- **No poisonous gas is produced upon air bag module deployment. However, be careful not to inhale gas since it irritates throat and can cause choking.**
- **Do not attempt to disassemble air bag module and seat belt pre-tensioner.**
- **Air bag module and seat belt pre-tensioner cannot be reused.**
- **Wash your hands clean after finishing work.**

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Trouble Diagnoses Introduction

CAUTION:

- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. Spiral cable and wiring harnesses covered with yellow insulation tape either just before the harness connectors or for the complete harness are related to the SRS.**
- **Do not attempt to repair, splice or modify the SRS wiring harness. If the harness is damaged, replace it with a new one.**
- **Keep ground portion clean.**

DIAGNOSIS FUNCTION

The SRS self-diagnosis results can be read by using “AIR BAG” warning lamp and/or CONSULT-II. The reading of these results is accomplished using one of two modes — “User mode” and “Diagnosis mode”.
The User mode is exclusively prepared for the customer (driver). This mode warns the driver of a system malfunction through the operation of the “AIR BAG” warning lamp.
The Diagnosis mode allows the technician to locate and inspect the malfunctioning part.
The mode applications for the “AIR BAG” warning lamp and CONSULT-II are as follows:

	User mode	Diagnosis mode	Display type
“AIR BAG” warning lamp	X	X	ON-OFF operation
CONSULT-II	—	X	Monitoring

NOTE:
Seat belt pre-tensioner malfunction is indicated by “AIR BAG” warning lamp.

DIAGNOSIS MODE FOR CONSULT-II

- “SELF-DIAG [CURRENT]”
  A current self-diagnosis result (also indicated by the number of warning lamp flashes in the Diagnosis mode) is displayed on the CONSULT-II screen in real time. This refers to a malfunctioning part requiring repairs.
- “SELF-DIAG [PAST]”
  Diagnosis results previously stored in the memory are displayed on the CONSULT-II screen. The stored results are not erased until memory erasing is executed.
- “TROUBLE DIAG RECORD”
  With TROUBLE DIAG RECORD, diagnosis results previously erased by a reset operation can be displayed on the CONSULT-II screen.
- “ECU DISCRIMINATED NO.”
  The diagnosis sensor unit for each vehicle model is assigned with its own, individual classification number (refer to the table below). This number will be displayed on the CONSULT-II screen. When replacing the diagnosis sensor unit, refer to the part number for the compatibility. After installation, replacement with a correct unit can be checked by confirming this classification number on the CONSULT-II screen.

For NISSAN MODEL R20, the diagnosis sensor unit classification numbers are as follows:

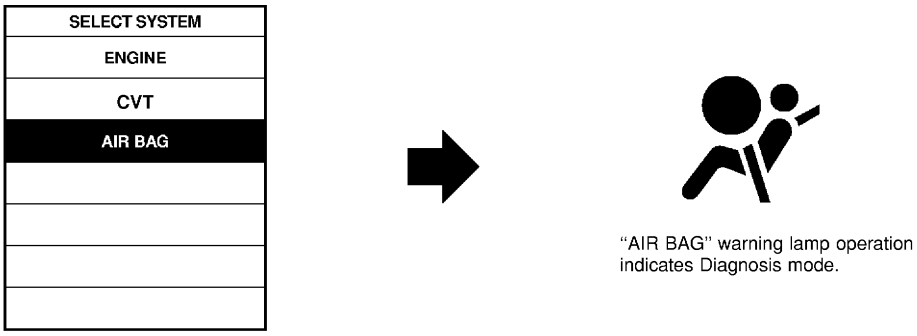
MODEL	ECU DISCRIMINATED NO.
Models with single air bag and seat belt pre-tensioner	A928
Models with dual air bags and seat belt pre-tensioner	A929
Models with dual air bags, side air bag and seat belt pre-tensioner	A930

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HOW TO CHANGE SELF-DIAGNOSIS MODE WITH CONSULT-II

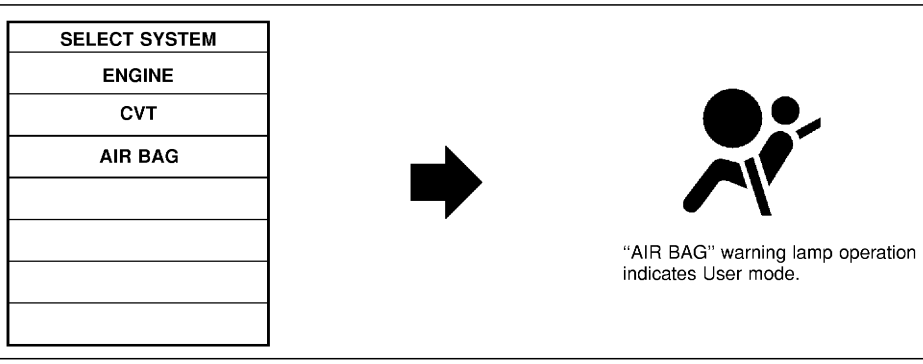
From User Mode to Diagnosis Mode

After selecting "AIR BAG" on the "SELECT SYSTEM" screen, User mode automatically changes to Diagnosis mode.



From Diagnosis Mode to User Mode

To return to User mode from Diagnosis mode, touch "BACK" key of CONSULT-II until "SELECT SYSTEM" appears, Diagnosis mode automatically changes to User mode.



HOW TO CHANGE SELF-DIAGNOSIS MODE WITHOUT CONSULT-II

From User Mode to Diagnosis Mode

When a malfunction is detected, activate the Diagnosis mode by turning the ignition switch as follows:
1) Turn ignition switch "ON".
2) After "AIR BAG" warning lamp lights for 7 seconds, turn ignition switch "OFF" within 1 second.
3) Wait more than 3 seconds.
4) Repeat steps 1 to 3 three times.
5) Turn ignition switch "ON".

SRS will not enter Diagnosis mode if no malfunction is detected.

From Diagnosis Mode to User Mode

After a malfunction is repaired, switch the ignition "OFF" for at least one second, then back "ON". Diagnosis mode is returned to User mode.
When a malfunction is detected, switch from Diagnosis mode to User mode by turning the ignition switch as follows:
1) Turn ignition switch "ON".
2) After "AIR BAG" warning lamp lights for 7 seconds, turn ignition switch "OFF" within 1 second.
3) Wait more than 3 seconds.
4) Repeat steps 1 to 3 three times.
5) Turn ignition switch "ON".

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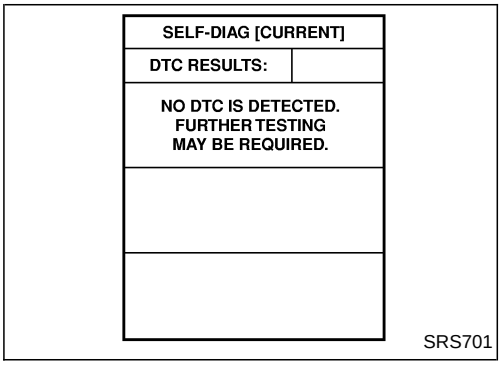
Trouble Diagnoses Introduction (Cont'd)

HOW TO ERASE SELF-DIAGNOSIS RESULTS

With CONSULT-II

- "SELF-DIAG [CURRENT]"
  A current self-diagnosis result is displayed on the CONSULT-II screen in real time.
  After the malfunction is repaired completely, no malfunction is detected on "SELF-DIAG [CURRENT]".
- "SELF-DIAG [PAST]"
  Return to the "SELF-DIAG [CURRENT]" CONSULT-II screen by pushing "BACK" key of CONSULT-II and select "SELF-DIAG [CURRENT]" in SELECT DIAG MODE. Touch "ERASE" in "SELF-DIAG [CURRENT]" mode.

NOTE:
If the memory of the malfunction in "SELF-DIAG [PAST]" is not erased, the User mode shows the system malfunction by the operation of the warning lamp even if the malfunction is repaired completely.



- "TROUBLE DIAG RECORD"
  The memory of "TROUBLE DIAG RECORD" cannot be erased.

Without CONSULT-II

After a malfunction is repaired, switch the ignition "OFF" for at least one second, then back "ON". Diagnosis mode returns to the User mode. At that time, the self-diagnostic result is cleared.

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How to Perform Trouble Diagnoses for Quick and Accurate Repair

A good understanding of the malfunction conditions can make troubleshooting faster and more accurate. In general, each customer feels differently about a malfunction. It is important to fully understand the symptoms or conditions for a customer complaint.

INFORMATION FROM CUSTOMER

WHAT ..... Vehicle model
WHEN ..... Date, Frequencies
WHERE ..... Road conditions
HOW ..... Operating conditions, Symptoms

PRELIMINARY CHECK

Check that the following parts are in good order.

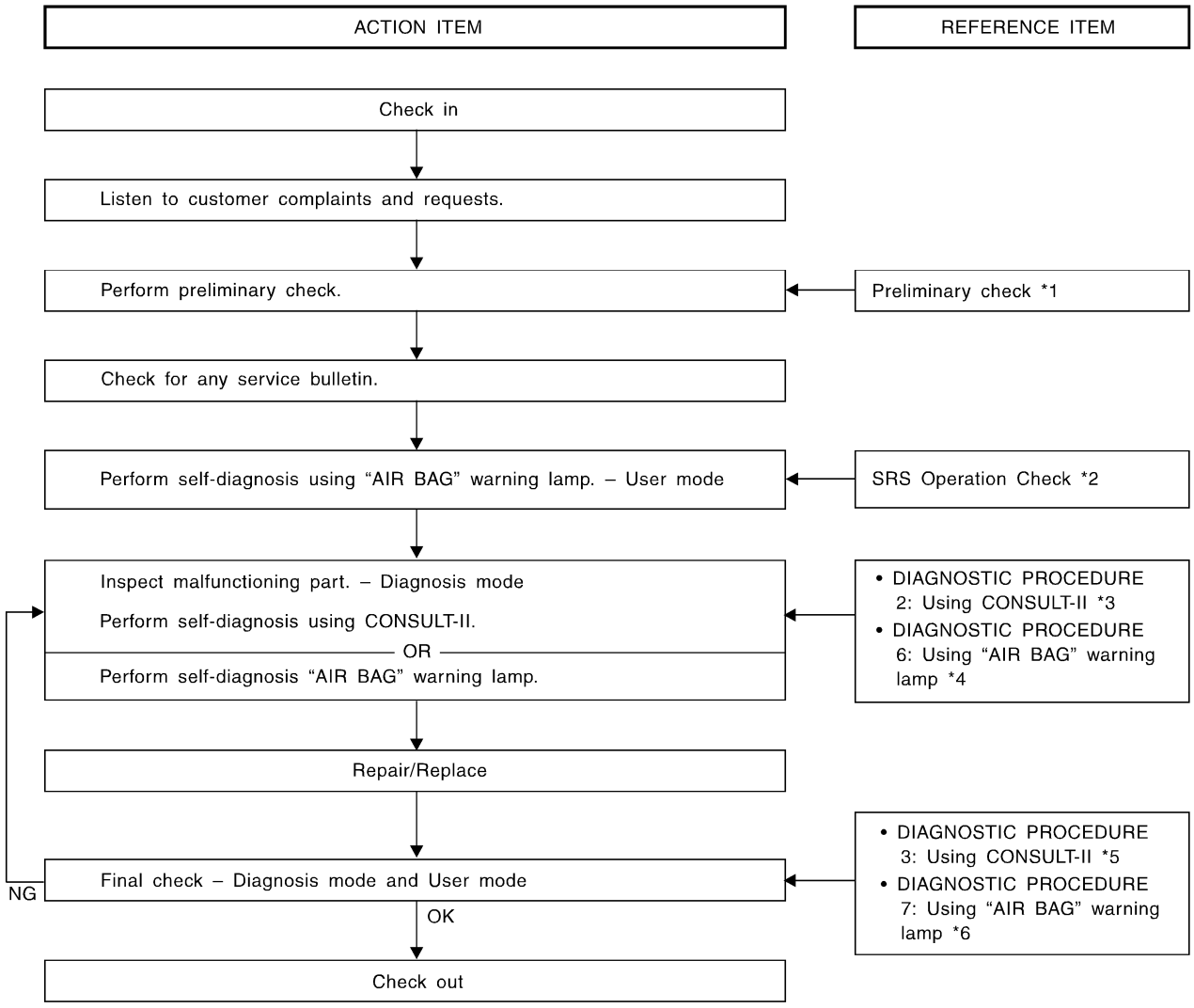
- Battery [Refer to SC-3, “BATTERY”.]
- Fuse [Refer to EL-12, “Fuse”, “POWER SUPPLY ROUTING”.]
- System component-to-harness connections

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

WORK FLOW

NOTE:
Seat belt pre-tensioner malfunction is indicated by "AIR BAG" warning lamp.

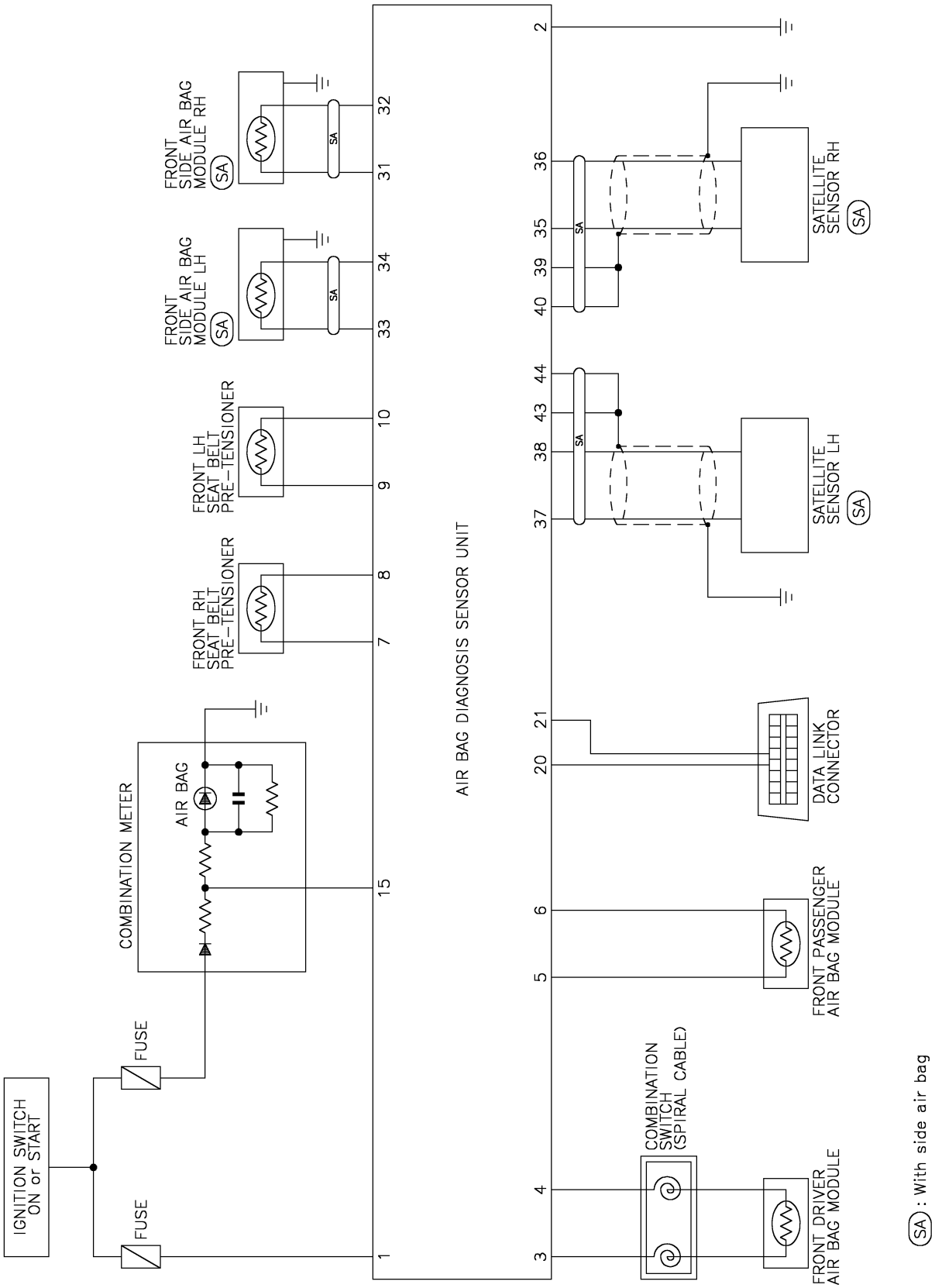


SRS799

*1: RS-31
*2: RS-38
*3: RS-39
*4: RS-48
*5: RS-42
*6: RS-53

http://vnx.su/

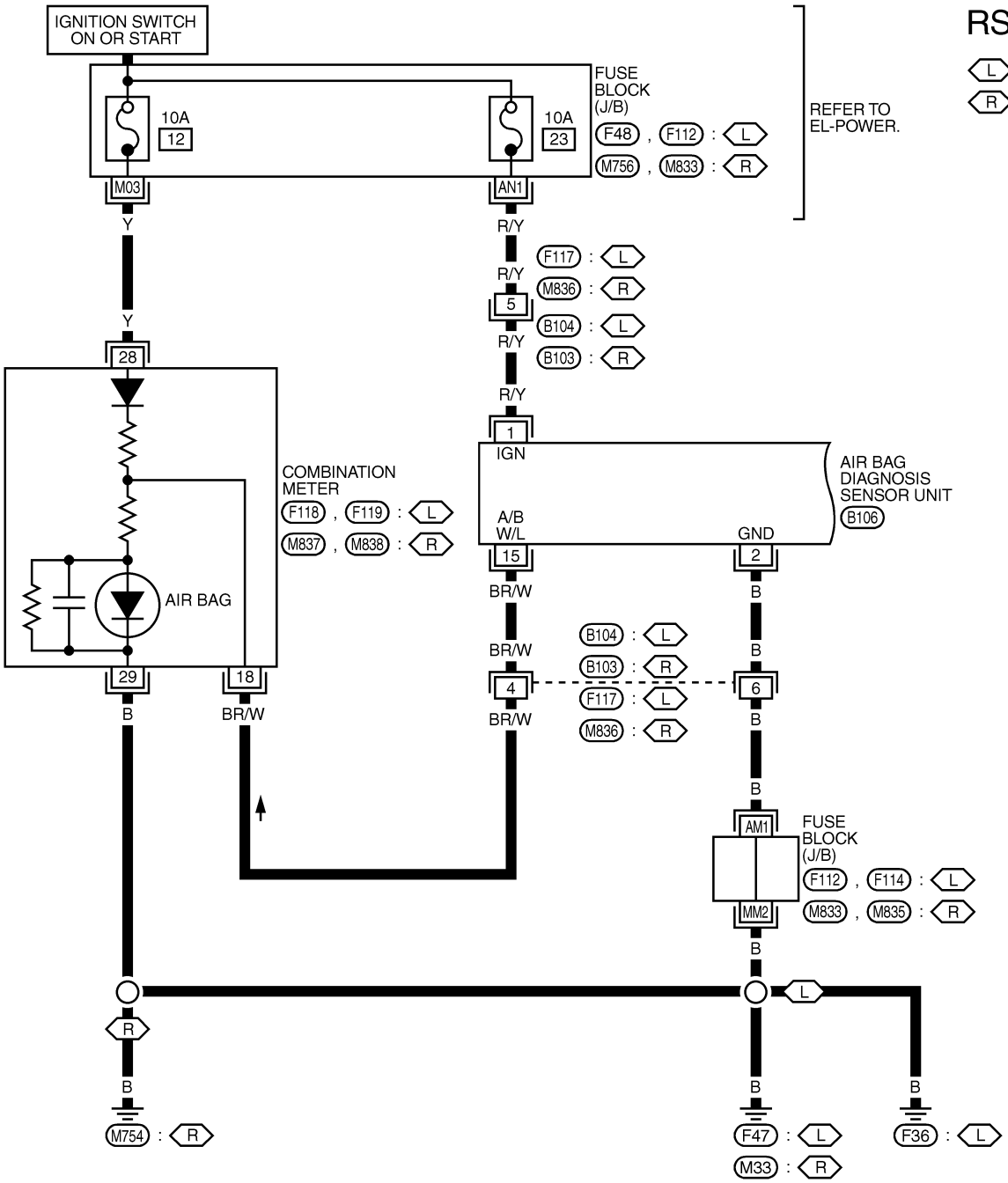
Schematic

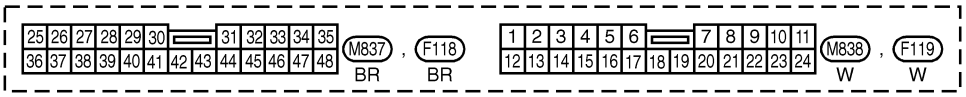


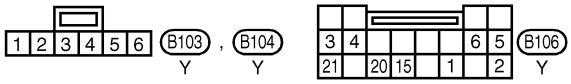
YRS064

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Wiring Diagram — SRS —







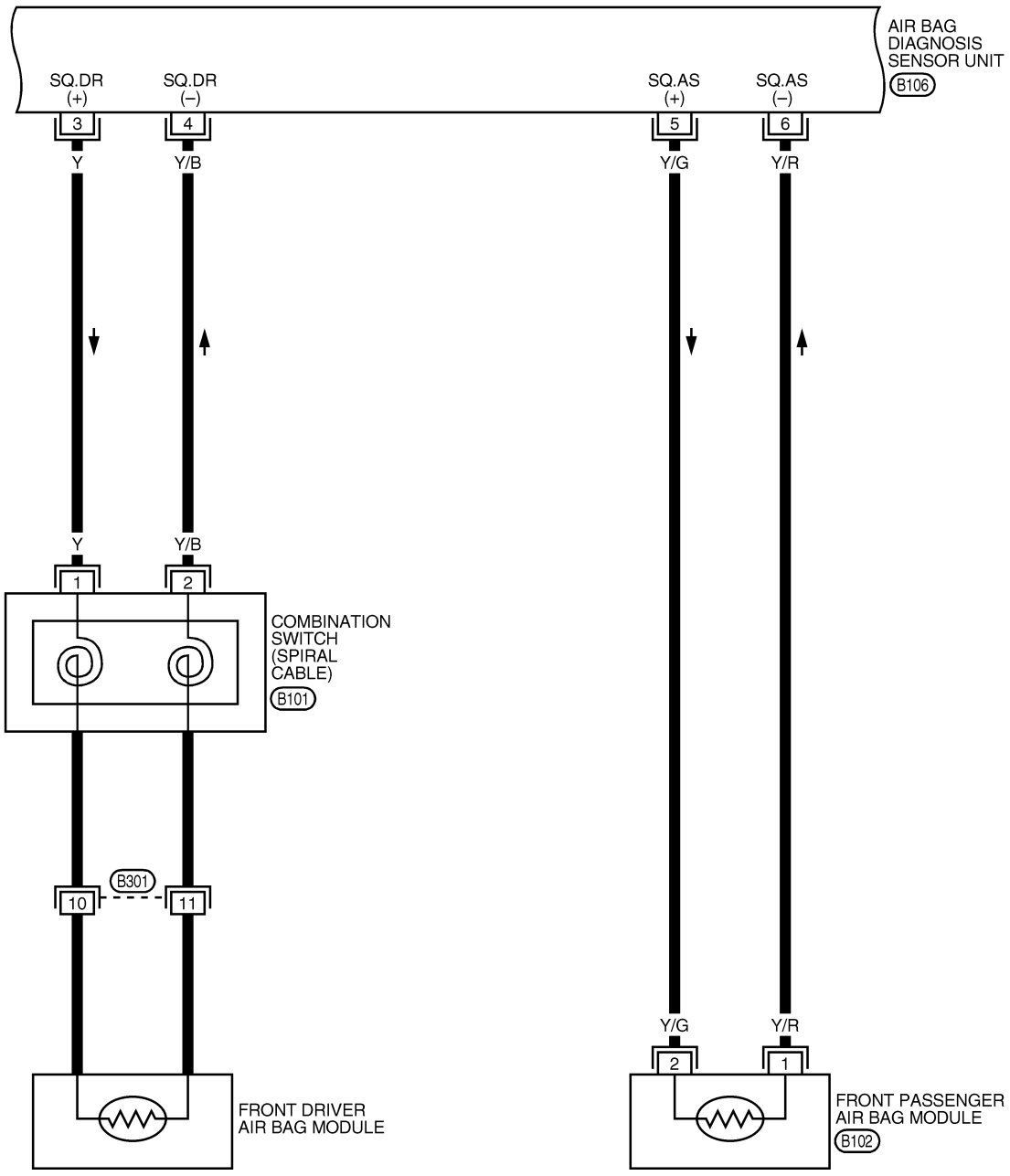
REFER TO THE FOLLOWING.
M756 , M833 , M835 , F48 , F112 , F114 -FUSE BLOCK-JUNCTION BOX (J/B)

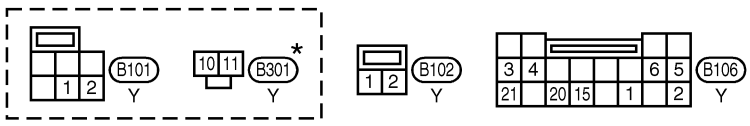
YRS119

http://vnx.su/

Wiring Diagram — SRS — (Cont'd)

RS-SRS-02





*: THIS CONNECTOR IS NOT SHOWN IN "HARNESS LAYOUT", EL SECTION.

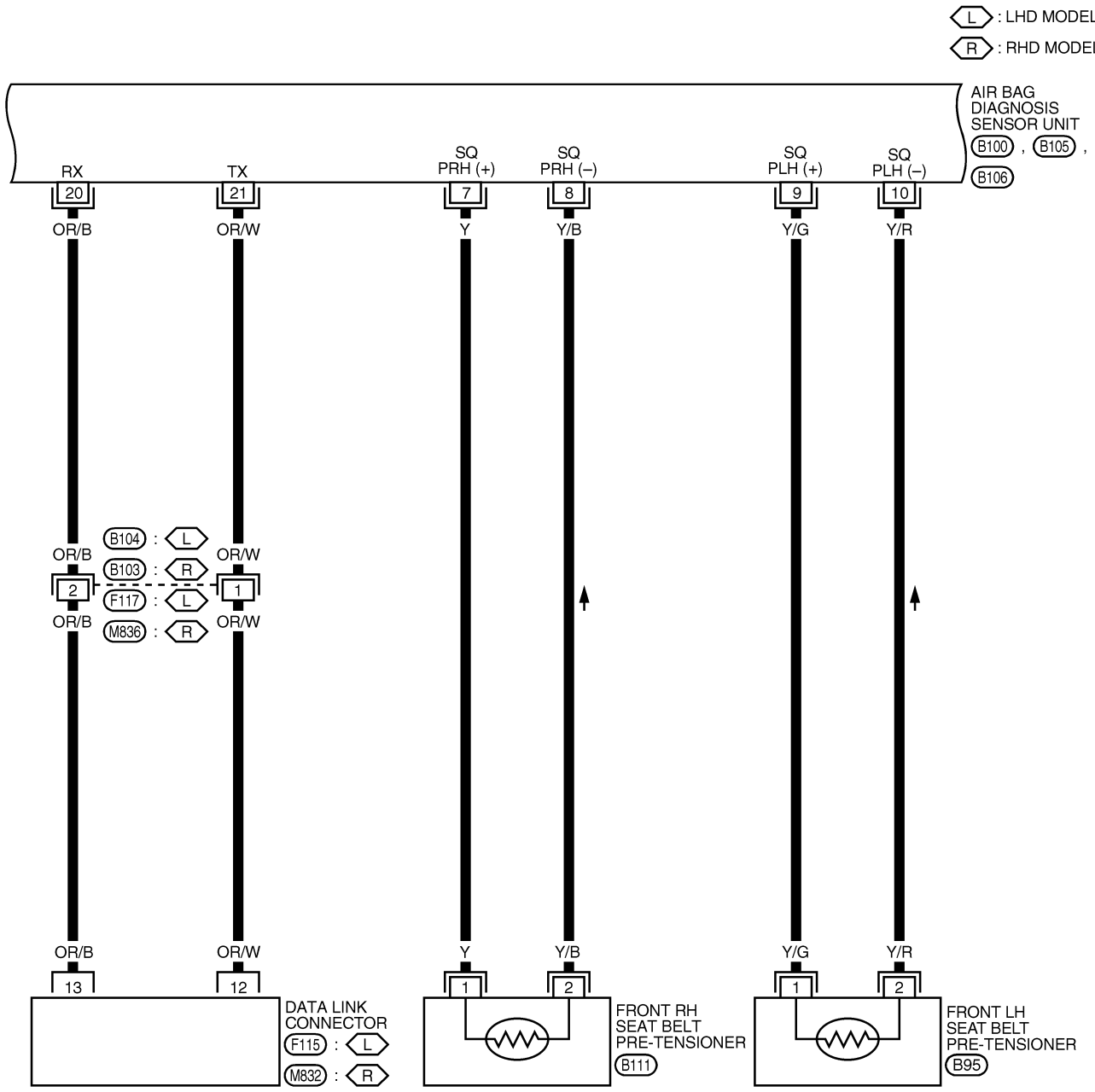
YRS066

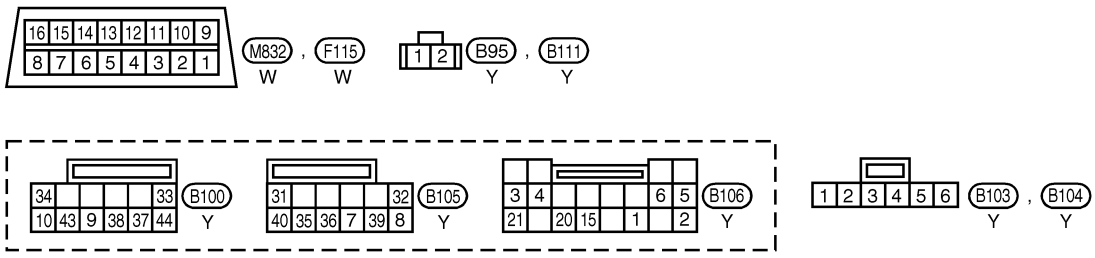
http://vnx.su/

Wiring Diagram — SRS — (Cont'd)

MODELS WITH FRONT SEAT BELT PRE-TENSIONER B52, B53

RS-SRS-03



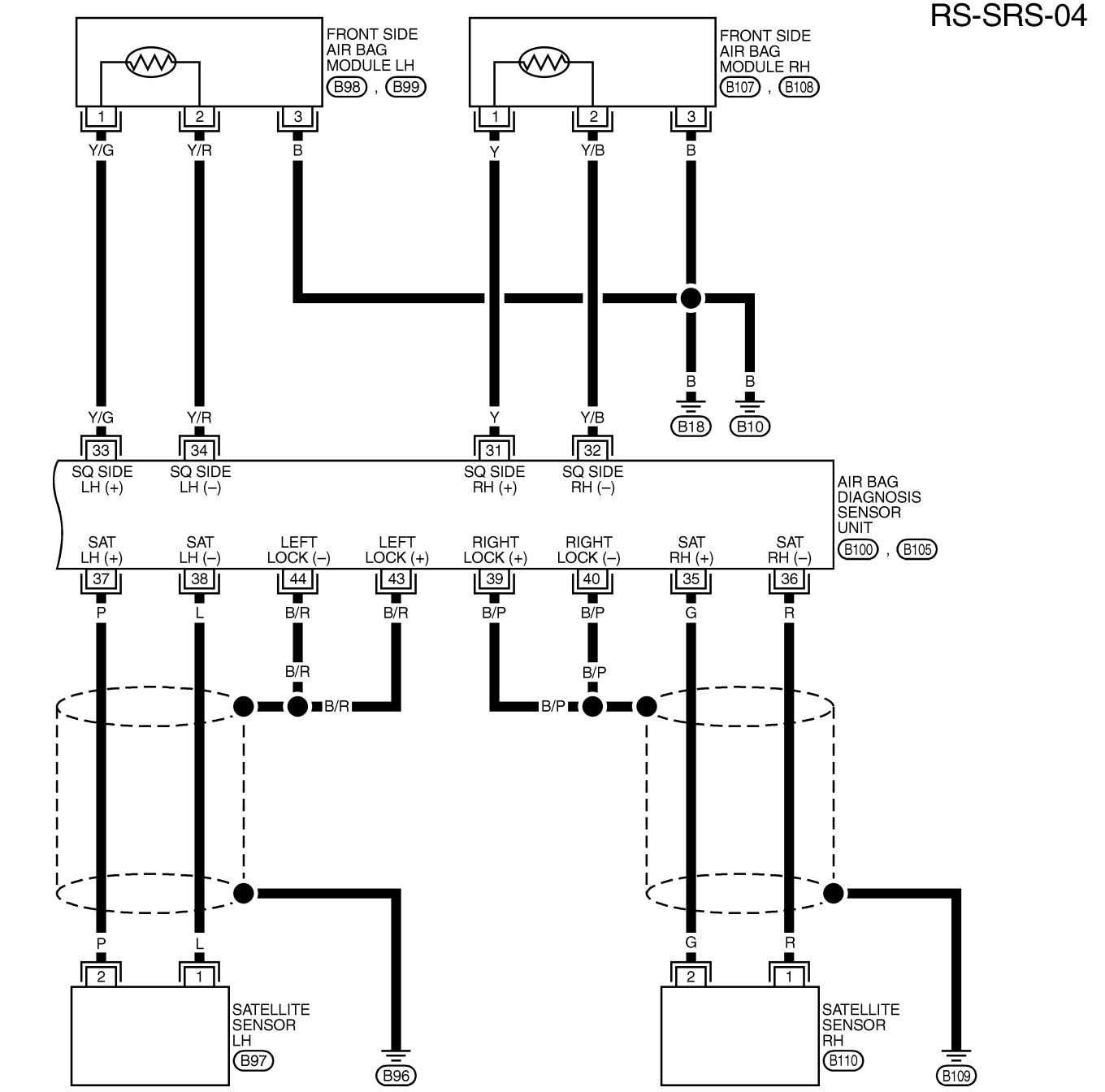


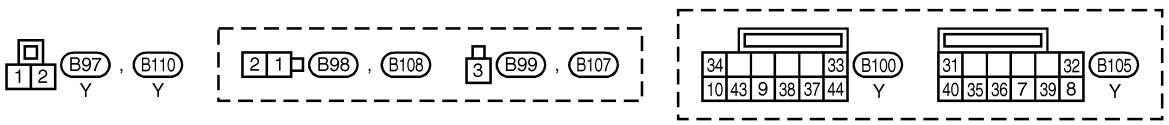
YRS120

http://vnx.su/

Wiring Diagram — SRS — (Cont'd)

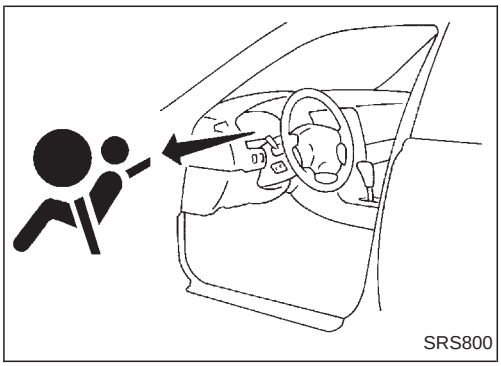
RS-SRS-04





YRS121

http://vnx.su/

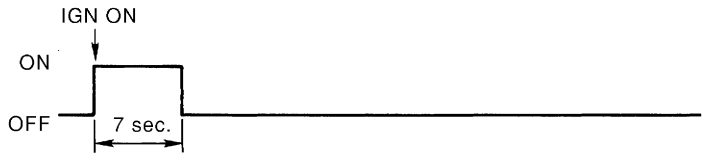
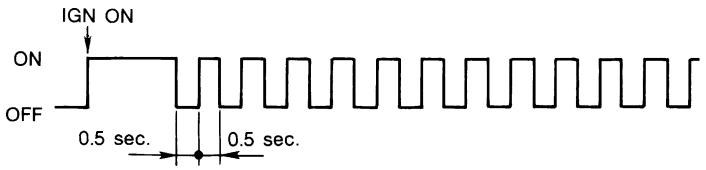

SRS800

SRS Operation Check

DIAGNOSTIC PROCEDURE 1

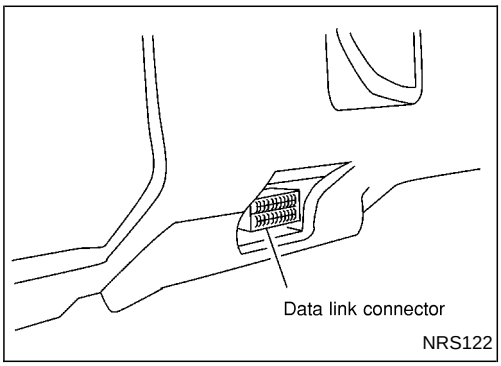
Checking Air Bag Operation by Using "AIR BAG" Warning Lamp — User Mode

1. After turning ignition switch from "OFF" to "ON", "AIR BAG" warning lamp operates.
2. Compare "AIR BAG" warning lamp operation to the chart below.

"AIR BAG" warning lamp operation — User mode —	SRS condition	Reference item
 MRS095A	No malfunction is detected. No further action is necessary.	—
 MRS096A	The system is malfunctioning and needs to be repaired as indicated.	Go to DIAGNOSTIC PROCEDURE 2 or 6 (RS-39 or RS-48).
 MRS097A	Air bag or/and seat belt pretensioner is deployed.	Go to COLLISION DIAGNOSIS (RS-59).
	Air bag fuse, diagnosis sensor unit or harness is malfunctioning and needs to be repaired.	Go to DIAGNOSTIC PROCEDURE 9 (RS-56).
 MRS098A	One of the following has occurred and needs to be repaired. ● Meter fuse is blown. "AIR BAG" warning lamp circuit has open or short. ● Diagnosis sensor unit is malfunctioning.	Go to DIAGNOSTIC PROCEDURE 10 (RS-58).

NOTE:
If "AIR BAG" warning lamp operates differently from the operations shown above, refer to "AIR BAG" warning lamp operation — Diagnosis mode —, DIAGNOSTIC PROCEDURE 6 (step 4), RS-48.

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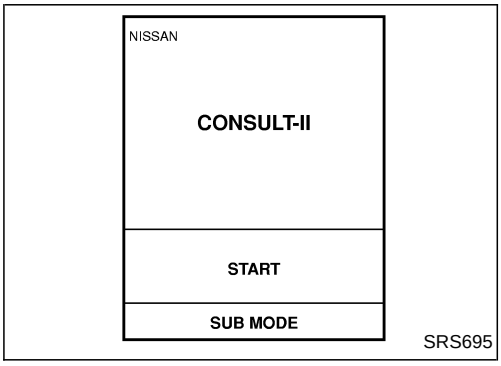
NRS122

Trouble Diagnoses with CONSULT-II

DIAGNOSTIC PROCEDURE 2

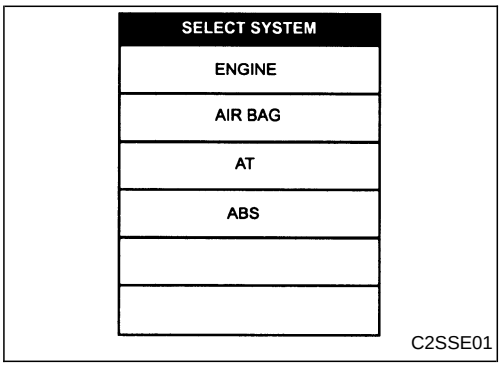
Inspecting SRS malfunctioning parts by using CONSULT-II — Diagnosis mode

1. Turn ignition switch “OFF”.
2. Connect CONSULT-II to data link connector.



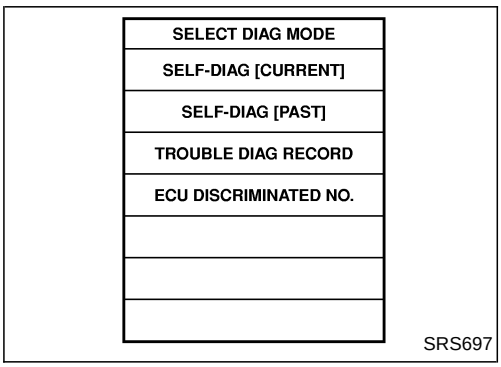
SRS695

3. Turn ignition switch “ON”.
4. Touch “START”.



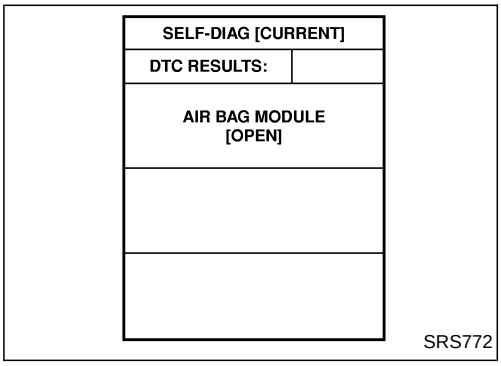
C2SSE01

5. Touch “AIR BAG”.



SRS697

6. Touch “SELF-DIAG [CURRENT]”.

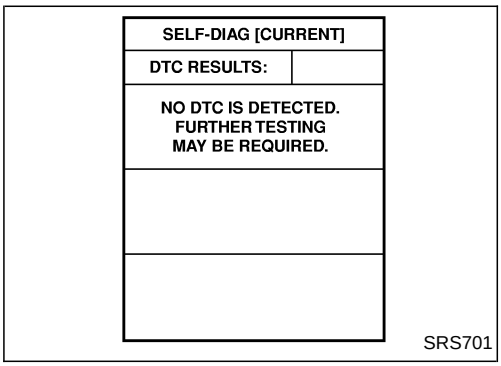


SRS772

7. Diagnostic codes are displayed on “SELF-DIAG [CURRENT]”.

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Trouble Diagnoses with CONSULT-II (Cont'd)



If no malfunction is detected on "SELF-DIAG [CURRENT]" but malfunction is indicated by the "AIR BAG" warning lamp, go to DIAGNOSTIC PROCEDURE 4, page RS-44, to diagnose the following situations:

- Self-diagnostic result "SELF-DIAG [PAST]" (previously stored in the memory) might not be erased after repair.
- The SRS system malfunctions intermittently.

8. Touch "PRINT".
9. Compare diagnostic codes to "CONSULT-II Diagnostic Code Chart", page RS-40.
10. Touch "BACK" key of CONSULT-II until "SELECT SYSTEM" appears in order to return to User mode from Diagnosis mode.
11. Turn ignition switch "OFF", then turn off and disconnect CONSULT-II, and disconnect both battery cables.
12. Repair the system as outlined by the "Repair order" in "CONSULT-II Diagnostic Code Chart", that corresponds to the self-diagnostic result. For replacement procedure of component parts, refer to RS-13.
13. After repairing the system, go to DIAGNOSTIC PROCEDURE 3, page RS-42 for final checking.

CONSULT-II DIAGNOSTIC CODE CHART ("SELF-DIAG [CURRENT]")

Diagnostic item	Explanation		Repair order **"Recheck SRS at each replacement."**
NO DTC IS DETECTED.	When malfunction is indicated by the "AIR BAG" warning lamp is user mode.	● Self-diagnostic result "SELF-DIAG [PAST]" (previously stored in the memory) might not be erased after repair. ● Intermittent malfunction has been detected in the past.	● Go to DIAGNOSTIC PROCEDURE 4 (RS-42) after charging battery.
	● No malfunction is detected.		● Go to DIAGNOSTIC PROCEDURE 3 (RS-42).
AIRBAG MODULE [OPEN]	● Driver air bag module circuit is open. (including the spiral cable)		1. Visually check the wiring harness connection. 2. Replace the harness if it has visible damage. 3. Replace the spiral cable. 4. Replace driver air bag module. (Before disposal, it must be deployed.) 5. Replace the diagnosis sensor unit. 6. Replace the related harness.
AIRBAG MODULE [VB-SHORT]	● Driver air bag module circuit is shorted to a power supply circuit. (including the spiral cable)		
AIRBAG MODULE [GND-SHORT]	● Driver air bag module circuit is shorted to ground. (including the spiral cable)		
AIRBAG MODULE [SHORT]	● Driver air bag module circuit is shorted between wires.		

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Trouble Diagnoses with CONSULT-II (Cont'd)

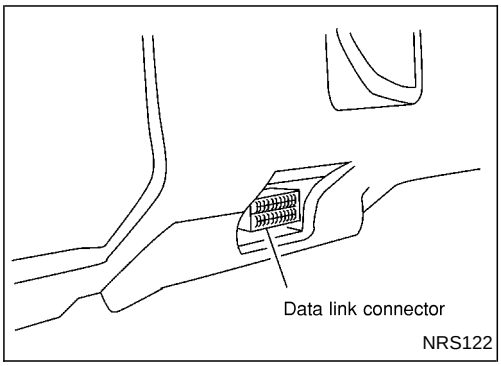
Diagnostic item	Explanation	Repair order **"Recheck SRS at each replacement."**
ASSIST A/B MODULE [VB-SHORT]	● Front passenger air bag module circuit is shorted to a power supply circuit.	1. Visually check the wiring harness connection. 2. Replace the harness if it has visible damage. 3. Replace front passenger air bag module. (Before disposal, it must be deployed.) 4. Replace the diagnosis sensor unit. 5. Replace the related harness.
ASSIST A/B MODULE [OPEN]	● Front passenger air bag module circuit is open.	
ASSIST A/B MODULE [GND-SHORT]	● Front passenger air bag module circuit is shorted to ground.	
ASSIST A/B MODULE [SHORT]	● Front passenger air bag module circuit is shorted between wires.	
SIDE MODULE LH [OPEN]	● Front LH side air bag module circuit is open.	1. Visually check the wiring harness connection. 2. Replace the harness if it has visible damage. 3. Replace front LH side air bag module. (Before disposal, it must be deployed.) 4. Replace the diagnosis sensor unit. 5. Replace the related harness.
SIDE MODULE LH [VB-SHORT]	● Front LH side air bag module circuit is shorted to a power supply circuit.	
SIDE MODULE LH [GND-SHORT]	● Front LH side air bag module circuit is shorted to ground.	
SIDE MODULE LH [SHORT]	● Front LH side air bag module circuit is shorted between wires.	
SIDE MODULE RH [OPEN]	● Front RH side air bag module circuit is open.	1. Visually check the wiring harness connection. 2. Replace the harness if it has visible damage. 3. Replace front RH side air bag module. (Before disposal, it must be deployed.) 4. Replace the diagnosis sensor unit. 5. Replace the related harness.
SIDE MODULE RH [VB-SHORT]	● Front RH side air bag module circuit is shorted to a power supply circuit.	
SIDE MODULE RH [GND-SHORT]	● Front RH side air bag module circuit is shorted to ground.	
SIDE MODULE RH [SHORT]	● Front RH side air bag module circuit is shorted between wires.	
SATELLITE SENS LH [UNIT FAIL] SATELLITE SENS LH [COMM FAIL]	● LH side air bag (satellite) sensor	1. Visually check the wiring harness connection. 2. Replace the harness if it has visible damage. 3. Replace the LH side air bag (satellite) sensor. 4. Replace the diagnosis sensor unit. 5. Replace the related harness.
SATELLITE SENS RH [UNIT FAIL] SATELLITE SENS RH [COMM FAIL]	● RH side air bag (satellite) sensor	1. Visually check the wiring harness connection. 2. Replace the harness if it has visible damage. 3. Replace the RH side air bag (satellite) sensor. 4. Replace the diagnosis sensor unit. 5. Replace the related harness.
PRE-TEN FRONT LH [OPEN/VB-SHORT]	● The circuit for front LH seat belt pre-tensioner is open or shorted to a power supply circuit.	1. Visually check the wiring harness connections. 2. Replace the harness if it has visible damage. 3. Replace front LH seat belt. (Before disposal, it must be deactivated.) 4. Replace the diagnosis sensor unit. 5. Replace the related harness.
PRE-TEN FRONT LH [GND-SHORT]	● The circuit for front LH seat belt pre-tensioner is shorted to ground.	

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Trouble Diagnoses with CONSULT-II (Cont'd)

Diagnostic item	Explanation	Repair order **"Recheck SRS at each replacement."**
PRE-TEN FRONT RH [OPEN/VB-SHORT]	• The circuit for front RH seat belt pre-tensioner is open or shorted to a power supply circuit.	1. Visually check the wiring harness connections. 2. Replace the harness if it has visible damage. 3. Replace front RH seat belt. (Before disposal, it must be deactivated.) 4. Replace the diagnosis sensor unit. 5. Replace the related harness.
PRE-TEN FRONT RH [GND-SHORT]	• The circuit for front RH seat belt pre-tensioner is shorted to ground.	
INDEFINITE FAILURES (AIR BAG)	• A problem which cannot be specified occurs because more than two parts are out of order.	1. Visually check wiring harness connections. 2. Replace diagnosis sensor unit. 3. Replace spiral cable and air bag modules. 4. Replace air bag and pre-tensioner harness. 5. Replace main harness.
INDEFINITE FAILURES (PRE-TENSIONER)	Driver's and front passenger seat belt pre-tensioners are out of order.	1. Visually check wiring harness connections. 2. Replace diagnosis sensor unit. 3. Replace spiral cable and air bag modules. 4. Replace air bag and pre-tensioner harness. 5. Replace main harness.
CONTROL UNIT	• Low battery voltage (Less than 9V)	• Go to DIAGNOSTIC PROCEDURE 3 (RS-42) after charging battery.
	• Diagnosis sensor unit is malfunctioning.	1. Visually check the wiring harness connection. 2. Replace the harness if it has visible damage. 3. Replace diagnosis sensor unit. 4. Replace the related harness.

*** Follow the procedures in numerical order when repairing malfunctioning parts. Confirm whether malfunction is eliminated using the air bag warning lamp or CONSULT-II each time repair is finished. If malfunction is still observed, proceed to the next step. When malfunction is eliminated, further repair work is not required.**



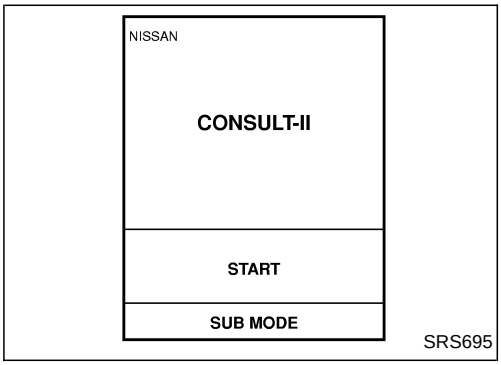
DIAGNOSTIC PROCEDURE 3

Final checking after repairing SRS by using CONSULT-II — Diagnosis mode

1. After repairing SRS, connect both battery cables.
2. Connect CONSULT-II to data link connector.
3. Turn ignition switch from "OFF" to "ON".

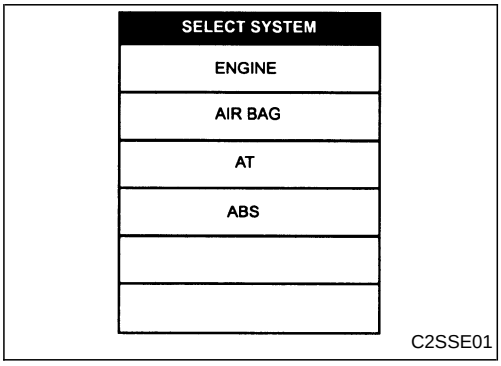
http://vnx.su/

Trouble Diagnoses with CONSULT-II (Cont'd)



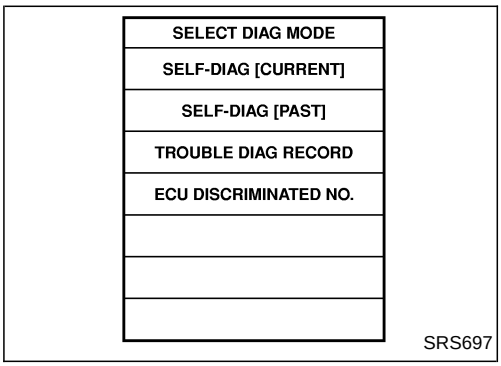
SRS695

4. Touch "START".



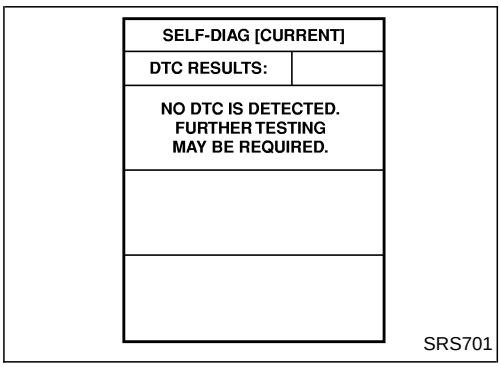
C2SSE01

5. Touch "AIR BAG".



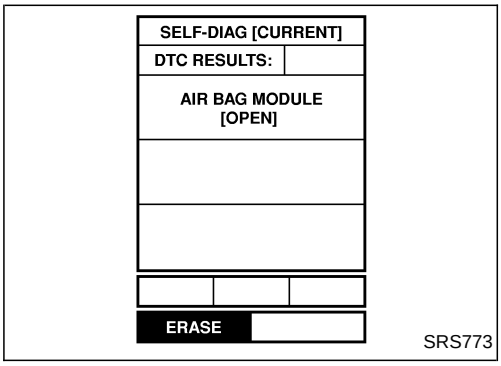
SRS697

6. Touch "SELF-DIAG [CURRENT]".



SRS701

7. If no malfunction is detected on "SELF-DIAG [CURRENT]", repair of SRS is completed. Go to step 8.
   If any malfunction is displayed on "SELF-DIAG [CURRENT]", the malfunctioning part is not repaired completely or another malfunctioning part is detected. Go to DIAGNOSTIC PROCEDURE 2, page RS-39, and repair malfunctioning part completely.



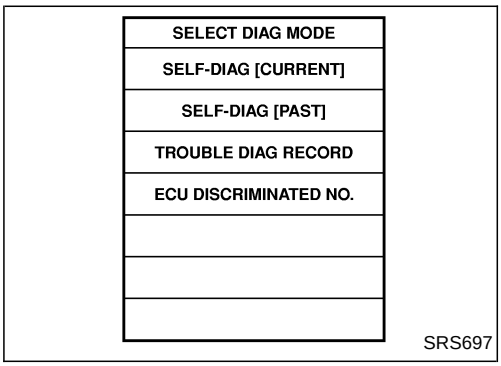
SRS773

8. Touch "ERASE".

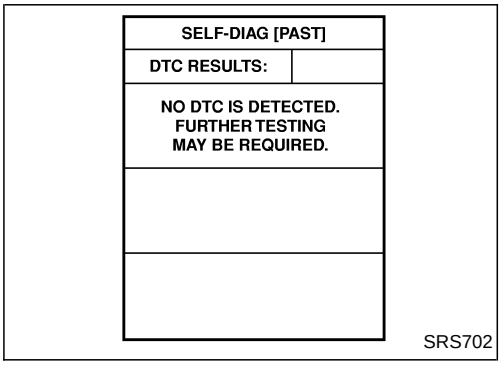
NOTE:
Touch "ERASE" to clear the memory of the malfunction ("SELF-DIAG [PAST]").
If the memory of the malfunction in "SELF-DIAG [PAST]" is not erased, the User mode shows the system malfunction by the operation of the warning lamp even if the malfunction is repaired completely.

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Trouble Diagnoses with CONSULT-II (Cont'd)



9. Touch "BACK" key of CONSULT-II to "SELECT SYSTEM" screen. Touch "SELF-DIAG [PAST]".

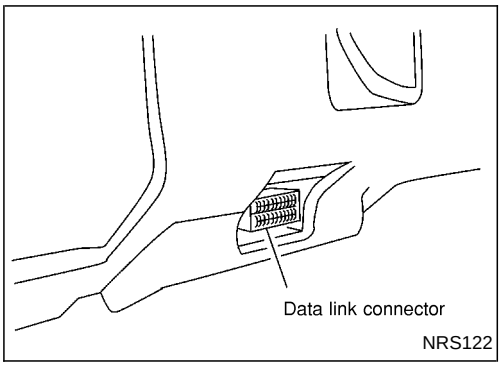


10. Check that no malfunction is detected on "SELF-DIAG [PAST]".
11. Touch "BACK" key of CONSULT-II until "SELECT SYSTEM" appears in order to return to User mode from Diagnosis mode.
12. Turn ignition switch "OFF", then turn off and disconnect CONSULT-II.
13. Go to "SRS Operation Check", page RS-38 to check SRS operation by using "AIR BAG" warning lamp with User mode.

DIAGNOSTIC PROCEDURE 4 (CONTINUED FROM DIAGNOSTIC PROCEDURE 2)

Inspecting SRS malfunctioning record

1	CONSIDER POSSIBILITY OF NOT ERASING SELF-DIAGNOSTIC RESULT AFTER REPAIRING	
Is it the first time for maintenance of SRS? **Yes or No**		
Yes	▶	Go to DIAGNOSTIC PROCEDURE 5 (RS-44).
No	▶	Self-diagnostic result "SELF-DIAG [PAST]" (previously stored in the memory) might not be erased after repair. Go to DIAGNOSTIC PROCEDURE 3, step 8 (RS-42).



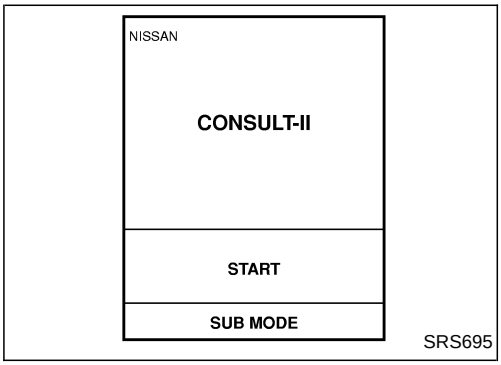
DIAGNOSTIC PROCEDURE 5

Inspecting SRS intermittent malfunction by using CONSULT-II — Diagnosis mode

1. Turn ignition switch "OFF".
2. Connect CONSULT-II to data link connector.

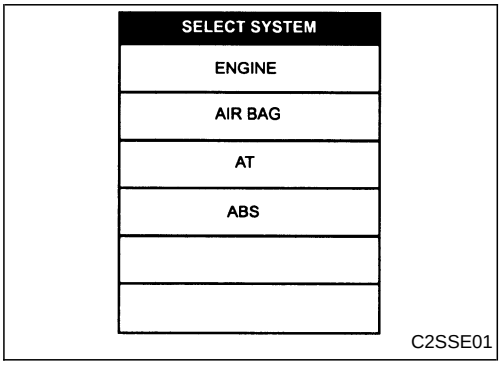
http://vnx.su/

Trouble Diagnoses with CONSULT-II (Cont'd)



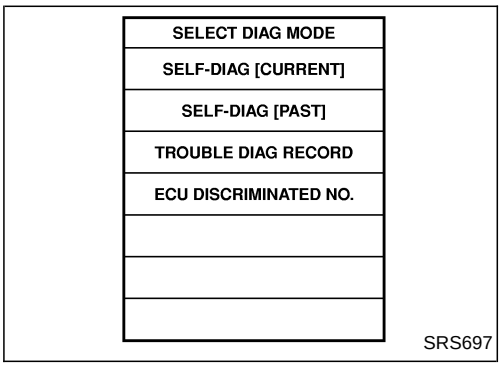
SRS695

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



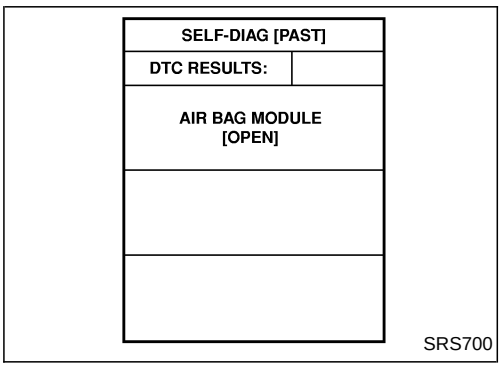
C2SSE01

5. Touch "AIR BAG".



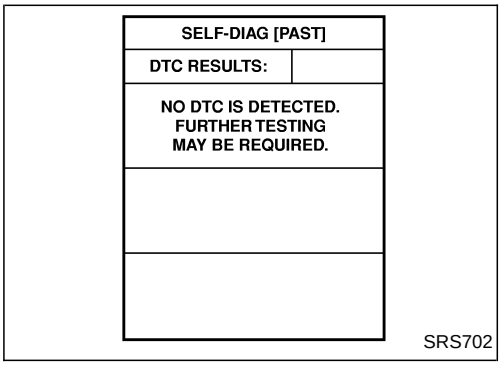
SRS697

6. Touch "SELF-DIAG [PAST]".



SRS700

7. If diagnostic codes are displayed on "SELF-DIAG [PAST]", go to step 10.

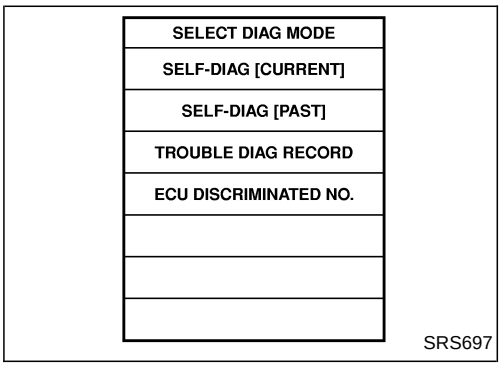


SRS702

If no malfunction is detected on "SELF-DIAG [PAST]", touch "BACK" and go back to "SELECT DIAG MODE".

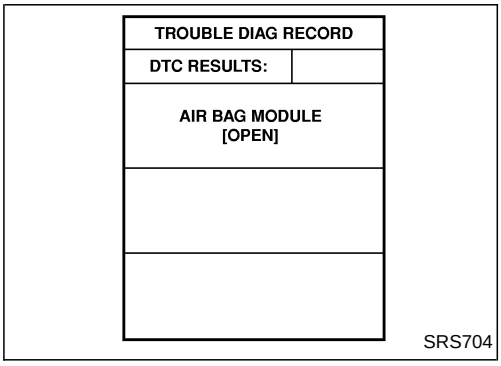
http://vnx.su/

Trouble Diagnoses with CONSULT-II (Cont'd)



8. Touch "TROUBLE DIAG RECORD".

NOTE:
With "TROUBLE DIAG RECORD", diagnosis results previously erased by a reset operation can be displayed.



9. Diagnostic code is displayed on "TROUBLE DIAG RECORD".
10. Touch "PRINT".
11. Compare diagnostic codes to "Intermittent Malfunction Diagnostic Code Chart", page RS-53.
12. Touch "BACK" key of CONSULT-II until "SELECT SYSTEM" appears.
13. Turn ignition switch "OFF", then turn off and disconnect CONSULT-II, and disconnect both battery cables.
14. Repair the system as outlined by the "Repair order" in "Intermittent Malfunction Diagnostic Code Chart", that corresponds to the self-diagnostic result. For replacement procedure of component parts, refer to RS-13.
15. Go to DIAGNOSTIC PROCEDURE 3, page RS-42, for final-checking.

INTERMITTENT MALFUNCTION DIAGNOSTIC CODE CHART ("SELF-DIAG [PAST] or TROUBLE DIAG RECORD")

Diagnostic item	Explanation	Repair order
NO DTC IS DETECTED.	● No malfunction is detected.	● Go to DIAGNOSTIC PROCEDURE 3 (RS-42).
AIRBAG MODULE [OPEN]	● Driver air bag module circuit is open. (including the spiral cable)	1. Visually check the wiring harness connection. 2. Replace the harness if it has visible damage. 3. If the harness check is OK, replace the spiral cable, diagnosis sensor unit and driver air bag module. (Before disposing of the driver air bag module, it must be deployed.)
AIRBAG MODULE [VB-SHORT]	● Driver air bag module circuit is shorted to a power supply circuit. (including the spiral cable)	
AIRBAG MODULE [GND-SHORT]	● Driver air bag module circuit is shorted to ground. (including the spiral cable)	
AIRBAG MODULE [SHORT]	● Driver air bag module circuit is shorted between wires.	

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Trouble Diagnoses with CONSULT-II (Cont'd)

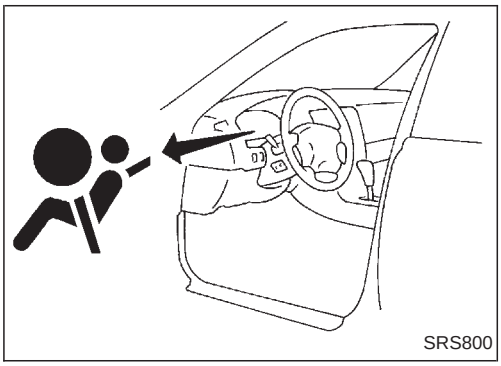
Diagnostic item	Explanation	Repair order
ASSIST A/B MODULE [VB-SHORT]	• Front passenger air bag module circuit is shorted to a power supply circuit.	1. Visually check the wiring harness connection. 2. Replace the harness if it has visible damage. 3. If the harness check is OK, replace the diagnosis sensor unit and passenger air bag module. (Before disposing of the passenger air bag module, it must be deployed.)
ASSIST A/B MODULE [OPEN]	• Front passenger air bag module circuit is open.	
ASSIST A/B MODULE [GND-SHORT]	• Front passenger air bag module circuit is shorted to ground.	
ASSIST A/B MODULE [SHORT]	• Front passenger air bag module circuit is shorted between wires.	
SIDE MODULE LH [OPEN]	• Front LH side air bag module circuit is open.	1. Visually check the wiring harness connection. 2. Replace the harness if it has visible damage. 3. If the harness check is OK, replace the diagnosis sensor unit and front LH side air bag module. (Before disposing of the front LH side air bag module, it must be deployed.)
SIDE MODULE LH [VB-SHORT]	• Front LH side air bag module circuit is shorted to a power supply circuit.	
SIDE MODULE LH [GND-SHORT]	• Front LH side air bag module circuit is shorted to ground.	
SIDE MODULE LH [SHORT]	• Front LH side air bag module circuit is shorted between wires.	
SIDE MODULE RH [OPEN]	• Front RH side air bag module circuit is open.	1. Visually check the wiring harness connection. 2. Replace the harness if it has visible damage. 3. If the harness check is OK, replace the diagnosis sensor unit and front RH side air bag module. (Before disposing of the front RH side air bag module, it must be deployed.)
SIDE MODULE RH [VB-SHORT]	• Front RH side air bag module circuit is shorted to a power supply circuit.	
SIDE MODULE RH [GND-SHORT]	• Front RH side air bag module circuit is shorted to ground.	
SIDE MODULE RH [SHORT]	• Front RH side air bag module circuit is shorted between wires.	
SATELLITE SENS LH [UNIT FAIL] SATELLITE SENS LH [COMM FAIL]	• LH side air bag (satellite) sensor	1. Visually check the wiring harness connection. 2. Replace the harness if it has visible damage. 3. If the harness check is OK, replace the diagnosis sensor unit and LH side air bag (satellite) sensor.
SATELLITE SENS RH [UNIT FAIL] SATELLITE SENS RH [COMM FAIL]	• RH side air bag (satellite) sensor	1. Visually check the wiring harness connection. 2. Replace the harness if it has visible damage. 3. If the harness check is OK, replace the diagnosis sensor unit and RH side air bag (satellite) sensor.
PRE-TEN FRONT LH [OPEN/VB-SHORT]	• The circuit for front LH seat belt pre-tensioner is open or shorted to a power supply circuit.	1. Visually check the wiring harness connections. 2. Replace the harness if it has visible damage. 3. If the harness check is OK, replace the diagnosis sensor unit and front LH seat belt. (Before disposing of the front LH seat belt pre-tensioner, if must be deployed.)
PRE-TEN FRONT LH [GND-SHORT]	• The circuit for front LH seat belt pre-tensioner is shorted to ground.	

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Trouble Diagnoses with CONSULT-II (Cont'd)

Diagnostic item	Explanation	Repair order
PRE-TEN FRONT RH [OPEN/VB-SHORT]	● The circuit for front RH seat belt pre-tensioner is open or shorted to a power supply circuit.	1. Visually check the wiring harness connections. 2. Replace the harness if it has visible damage. 3. If the harness check is OK, replace the diagnosis sensor unit and front RH seat belt. (Before disposing of the front RH seat belt pre-tensioner, if must be deployed.)
PRE-TEN FRONT RH [GND-SHORT]	● The circuit for front RH seat belt pre-tensioner is shorted to ground.	
CONTROL UNIT	● Diagnosis sensor unit is malfunctioning.	1. Visually check the wiring harness connection. 2. Replace the harness if it has visible damage. 3. If the harness check is OK, replace the diagnosis sensor unit.

* Follow the procedures in numerical order when repairing malfunctioning parts, then make the final system check.


SRS800

Trouble Diagnoses without CONSULT-II

DIAGNOSTIC PROCEDURE 6

Inspecting SRS malfunctioning parts by using "AIR BAG" warning lamp — Diagnosis mode

NOTE:

SRS will not enter Diagnosis mode if no malfunction is detected in User mode.

1. Turn ignition switch "ON".
2. After "AIR BAG" warning lamp lights for 7 seconds, turn ignition switch "OFF" within 1 second.
3. Wait more than 3 seconds.
4. Repeat steps 1 to 3 three times.
5. Turn ignition switch "ON".
   SRS is now in Diagnosis mode.
6. "AIR BAG" warning lamp operates in Diagnosis mode as follows:

NOTE:

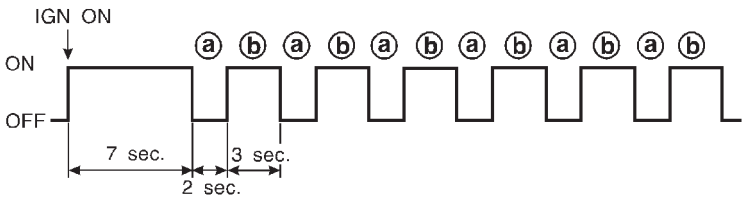
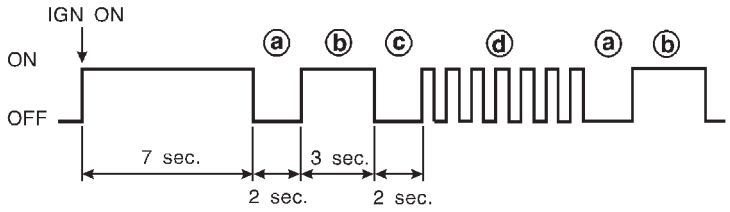
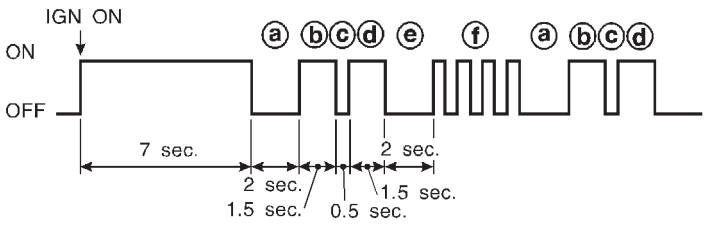
If SRS does not enter Diagnosis mode even though malfunction is detected in User mode, check the battery voltage.

If the battery voltage is less than 9V, charge the battery. Then go to DIAGNOSTIC PROCEDURE 7, page RS-53.

If the battery voltage is OK, replace the diagnosis sensor unit.

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⊗ Trouble Diagnoses without CONSULT-II (Cont'd)

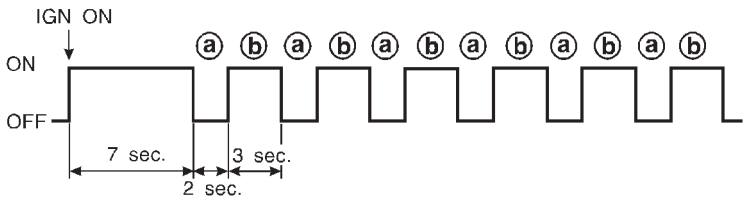
No.	"AIR BAG" warning lamp flash pattern — Diagnosis mode —		SRS condition
1	 SRS333	ⓐ through ⓑ are repeated.	• Diagnosis results (previously stored in the memory) might not be erased after repair. • Intermittent malfunction has been detected in the past. Go to DIAGNOSTIC PROCEDURE 8 (RS-56).
2	 SRS341	ⓐ through ⓓ are repeated. ⓑ — Driver and front passenger air bag and front seat belt pre-tensioner marker (For identifying driver air bag, front passenger air bag and/or front seat belt pre-tensioners malfunctioning) ⓓ — Indicates malfunctioning part. The number of flash varies with malfunctioning part (0.5 sec. ON and 0.5 sec. OFF is counted as one flash.)	The system is malfunctioning and needs to be repaired.
3	 SRS342-A	ⓐ through ⓕ are repeated. ⓑ, ⓒ, ⓓ — Front side air bag marker (For identifying front side air bag malfunctioning) ⓕ — Indicates malfunctioning part. The number of flash varies with malfunctioning part (0.5 sec. ON and 0.5 sec. OFF is counted as one flash.)	

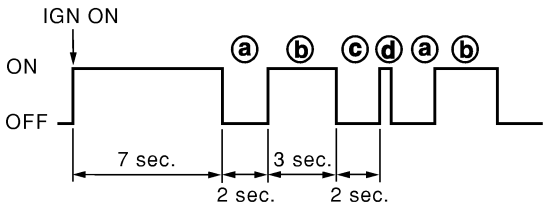
7. Malfunctioning part is indicated by the number of flashes (part ⓓ or ⓕ). Compare the number of flashes to "Air Bag Warning Lamp Flash Code Chart", page RS-50, and locate malfunctioning part.
8. Turn ignition switch "OFF", and disconnect both battery cables.
9. Repair the system as outlined by the "Repair order" in "Warning Lamp Flash Code Chart" that corresponds to the flash code. For replacement procedure of component parts, refer to RS-21.
10. After repairing the system, go to DIAGNOSTIC PROCEDURE 7, page RS-53.

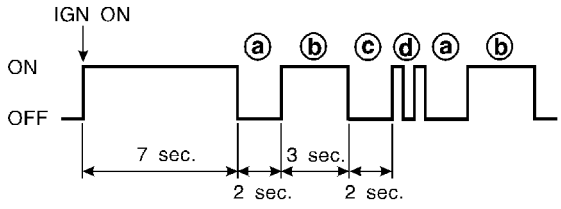
http://vnx.su/

⊠ Trouble Diagnoses without CONSULT-II (Cont'd)

Air Bag Warning Lamp Flash Code Chart (Diagnosis mode)

<table>
<tr><td rowspan="4">● Diagnosis results (previously stored in the memory) might not be erased after repair.
● Intermittent malfunction has been detected in the past.</td><td>Flash pattern</td></tr>
<tr><td> 

SRS333
ⓐ through ⓑ are repeated.</td></tr>
<tr><td>Repair order</td></tr>
<tr><td>● Go to DIAGNOSTIC PROCEDURE 8 (RS-56).</td></tr>
<tr><td rowspan="4">The front RH seat belt pre-tensioner circuit is malfunctioning.
(ⓓ: 1 flash)</td><td>Flash pattern</td></tr>
<tr><td> 

SRS801
ⓐ through ⓓ are repeated.
ⓓ — One flash indicates malfunctioning front RH seat belt pre-tensioner circuit.</td></tr>
<tr><td>Repair order (“Recheck SRS at each replacement”.)</td></tr>
<tr><td>1. Visually check the wiring harness connections.
2. Replace the harness if it has visible damage.
3. Replace front RH seat belt pre-tensioner.
(Before disposal, it must be deactivated.)
4. Replace the diagnosis sensor unit.
5. Replace the related harness.</td></tr>
<tr><td rowspan="4">The driver air bag module circuit is malfunctioning.
(ⓓ: 2 flashes)</td><td>Flash pattern</td></tr>
<tr><td> 

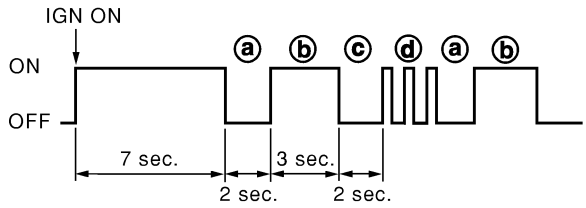
SRS334
ⓐ through ⓓ are repeated.
ⓓ — Two flashes indicate malfunctioning driver air bag module circuit.</td></tr>
<tr><td>Repair order (“Recheck SRS at each replacement.”)</td></tr>
<tr><td>1. Visually check the wiring harness connection.
2. Replace the harness if it has visible damage.
3. Replace the spiral cable.
4. Replace driver air bag module.
(Before disposal, it must be deployed.)
5. Replace the diagnosis sensor unit.
6. Replace the related harness.</td></tr>
</table>

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⊠ Trouble Diagnoses without CONSULT-II (Cont'd)

The front LH seat belt pre-tensioner circuit is malfunctioning. (ⓓ: 3 flashes)

Flash pattern



SRS802

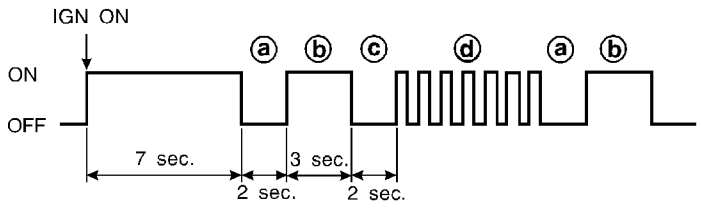
ⓐ through ⓓ are repeated.
ⓓ — Three flashes indicate malfunctioning front LH seat belt pre-tensioner circuit.

Repair order ("Recheck SRS at each replacement.")

1. Visually check the wiring harness connections.
2. Replace the harness if it has visible damage.
3. Replace front LH seat belt pre-tensioner.
   (Before disposal, it must be deactivated.)
4. Replace the diagnosis sensor unit.
5. Replace the related harness.

The diagnosis sensor unit is malfunctioning. (ⓓ: 7 flashes)

Flash pattern



SRS335

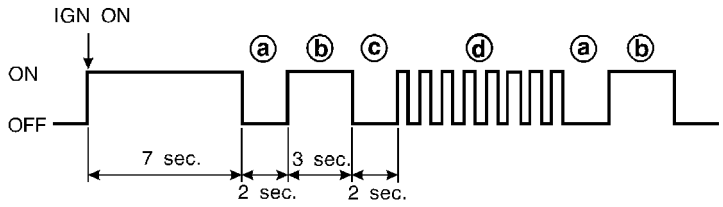
ⓐ through ⓓ are repeated.
ⓓ — Seven flashes indicate malfunctioning diagnosis sensor unit.

Repair order ("Recheck SRS at each replacement.")

1. Visually check the wiring harness connections.
2. Replace the harness if it has visible damage.
3. Replace the diagnosis sensor unit.
4. Replace the related harness.

The front passenger air bag module circuit is malfunctioning. (ⓓ: 8 flashes)

Flash pattern



SRS336

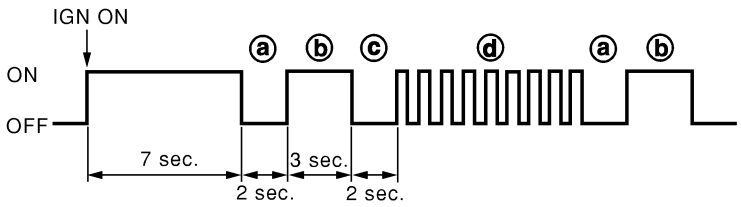
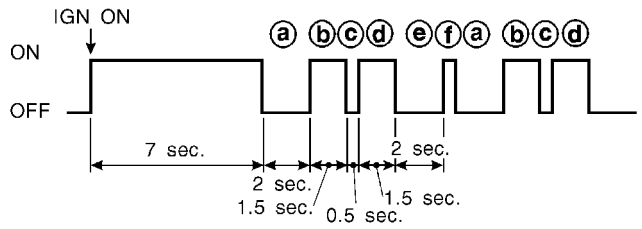
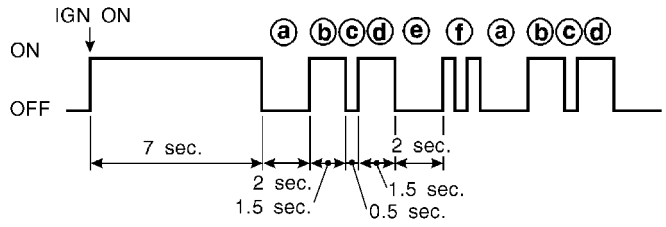
ⓐ through ⓓ are repeated.
ⓓ — Eight flashes indicate malfunctioning front passenger air bag module circuit.

Repair order ("Recheck SRS at each replacement.")

1. Visually check the wiring harness connection.
2. Replace the harness if it has visible damage.
3. Replace front passenger air bag module.
   (Before disposal, it must be deployed.)
4. Replace the diagnosis sensor unit.
5. Replace the related harness.

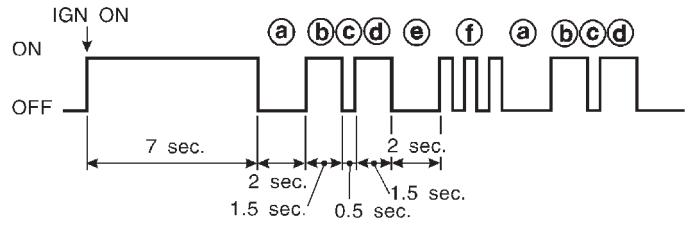
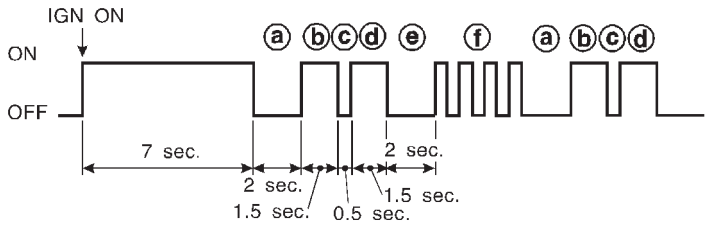
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⊠ Trouble Diagnoses without CONSULT-II (Cont'd)

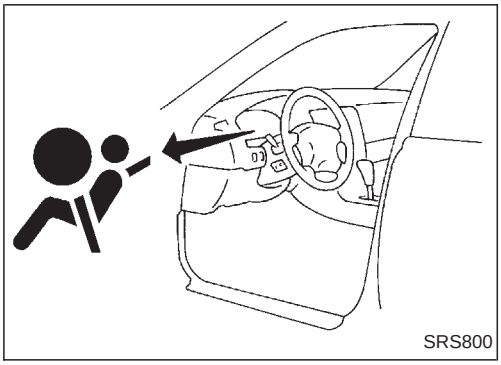
More than two parts groups are out of order. (ⓓ: 9 flashes)	Flash pattern  YRS073 ⓐ through ⓓ are repeated. ⓓ — Nine flashes indicate malfunctioning more than two parts groups. Repair order ("Recheck SRS at each replacement.") 1. Visually check the wiring harness connection. 2. Replace the harness if it has visible damage. 3. Replace spiral cable and air bag module. 4. Replace the diagnosis sensor unit. 5. Replace the related harness.
The front RH side air bag module circuit is malfunctioning. (ⓕ: 1 flash)	Flash pattern  SRS338 ⓐ through ⓕ are repeated. ⓕ — One flash indicates malfunctioning front RH side air bag module circuit. Repair order ("Recheck SRS at each replacement.") 1. Visually check the wiring harness connection. 2. Replace the harness if it has visible damage. 3. Replace front RH side air bag module. (Before disposal, it must be deployed.) 4. Replace the diagnosis sensor unit. 5. Replace the related harness.
The front LH side air bag module circuit is malfunctioning. (ⓕ: 2 flashes)	Flash pattern  SRS337 ⓐ through ⓕ are repeated. ⓕ — Two flashes indicate malfunctioning front LH side air bag module circuit. Repair order ("Recheck SRS at each replacement.") 1. Visually check the wiring harness connection. 2. Replace the harness if it has visible damage. 3. Replace front LH side air bag module. (Before disposal, it must be deployed.) 4. Replace the diagnosis sensor unit. 5. Replace the related harness.

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⊠ Trouble Diagnoses without CONSULT-II (Cont'd)

The RH side air bag (satellite) sensor is malfunctioning. (ⓕ: 3 flashes)	Flash pattern	
	 SRS340	ⓐ through ⓕ are repeated. ⓕ — Three flashes indicate malfunctioning RH side air bag (satellite) sensor circuit.
	Repair order ("Recheck SRS at each replacement.")	
	1. Visually check the wiring harness connection. 2. Replace the harness if it has visible damage. 3. Replace the RH side air bag (satellite) sensor. 4. Replace the diagnosis sensor unit. 5. Replace the related harness.	
The LH side air bag (satellite) sensor is malfunctioning. (ⓕ: 4 flashes)	Flash pattern	
	 SRS339-A	ⓐ through ⓕ are repeated. ⓕ — Four flashes indicate malfunctioning LH side air bag (satellite) sensor circuit.
	Repair order ("Recheck SRS at each replacement.")	
	1. Visually check the wiring harness connection. 2. Replace the harness if it has visible damage. 3. Replace the LH side air bag (satellite) sensor. 4. Replace the diagnosis sensor unit. 5. Replace the related harness.	

*** Follow the procedures in numerical order when repairing malfunctioning parts. Confirm whether malfunction is eliminated using the air bag warning lamp or CONSULT-II each time repair is finished. If malfunction is still observed, proceed to the next step. When malfunction is eliminated, further repair work is not required.**


SRS800

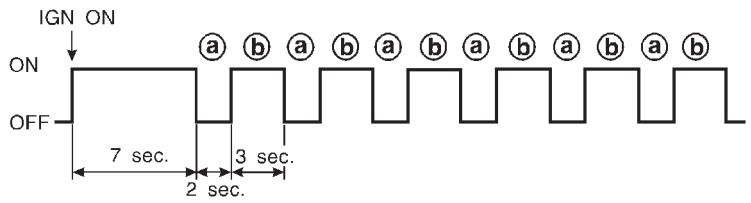
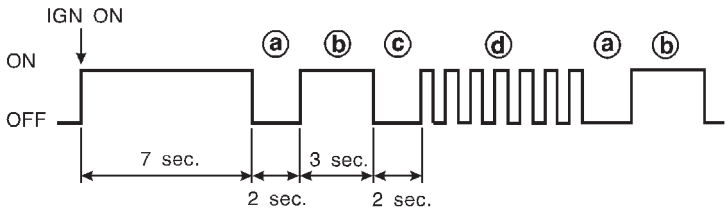
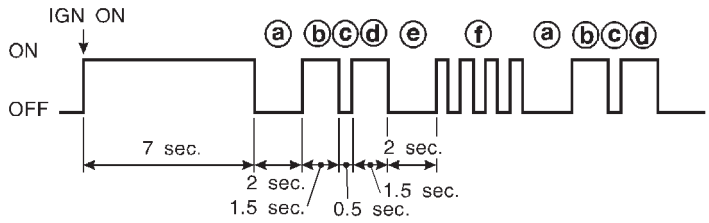
DIAGNOSTIC PROCEDURE 7

Final checking after repairing SRS by using "AIR BAG" warning lamp — Diagnosis mode and User mode

1. After repairing SRS connect both battery cables.
2. Open driver's door.
3. Turn ignition switch from "OFF" to "ON".
4. "AIR BAG" warning lamp operates in Diagnosis mode as follows:

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⊗ Trouble Diagnoses without CONSULT-II (Cont'd)

No.	"AIR BAG" warning lamp flash pattern — Diagnosis mode —		SRS condition
1	 SRS333	ⓐ through ⓑ are repeated.	No malfunction is detected or repair is completed. No further action is necessary.
2	 SRS341	ⓐ through ⓓ are repeated. ⓑ — Driver and front passenger air bag and front seat belt pre-tensioner marker (For identifying driver air bag, front passenger air bag and/or front seat belt pre-tensioners malfunctioning) ⓓ — Indicates malfunctioning part. The number of flashes varies with malfunctioning part (0.5 sec. ON and 0.5 sec. OFF is counted as one flash.)	The system is malfunctioning and needs to be repaired.
3	 SRS342-A	ⓐ through ⓕ are repeated. ⓑ, ⓒ, ⓓ — Front side air bag marker (For identifying front side air bag malfunctioning) ⓕ — Indicates malfunctioning part. The number of flashes varies with malfunctioning part (0.5 sec. ON and 0.5 sec. OFF is counted as one flash.)	

NOTE:
When diagnosis sensor unit is replaced with new one, "AIR BAG" warning lamp will operate in User mode. Checking "AIR BAG" warning lamp operation in Diagnosis mode is not required. Go to step 6.

5. If "AIR BAG" warning lamp operates as shown in No. 1 in chart above, turn ignition switch "OFF" to reset from Diagnosis mode to User mode and to erase the memory of the malfunction. Then go to step 6.
   If "AIR BAG" warning lamp operates as shown in No. 2 or No. 3 in chart above, the malfunctioning part is not repaired completely, or another malfunctioning part is detected. Go to DIAGNOSTIC PROCEDURE 6, page RS-48, and repair malfunctioning part completely.
6. Turn ignition switch "ON". "AIR BAG" warning lamp operates in User mode. Compare "AIR BAG" warning lamp operation to the chart on the next page.

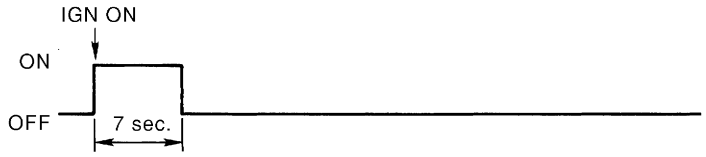
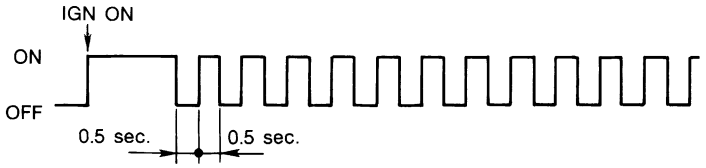
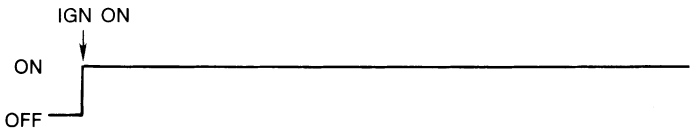
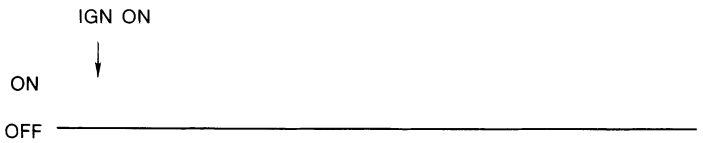
NOTE:
When a malfunction is detected, switch from Diagnosis mode to user mode by turning the ignition switch as follows:

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⊗ Trouble Diagnoses without CONSULT-II (Cont'd)

1) Turn ignition switch "ON".
2) After "AIR BAG" warning lamp lights for 7 seconds, turn ignition switch "OFF" within 1 second.
3) Wait more than 3 seconds.
4) Repeat steps 1 to 3 three times.
5) Turn ignition switch "ON".

SRS is now in User mode.

"AIR BAG" warning lamp operation — User mode —	SRS condition	Reference item
 MRS095A	No malfunction is detected. No further action is necessary.	—
 MRS096A	The system is malfunctioning and needs to be repaired as indicated.	Go to DIAGNOSTIC PROCEDURE 6 (RS-48).
 MRS097A	Air bag is deployed. Seat belt pre-tensioner is deployed.	Go to COLLISION DIAGNOSIS (RS-59).
	Air bag fuse, diagnosis sensor unit or harness is malfunctioning and needs to be repaired.	Go to DIAGNOSTIC PROCEDURE 9 (RS-56).
 MRS098A	One of the following has occurred and needs to be repaired. ● Meter fuse is blown. ● "AIR BAG" warning lamp circuit has open or short. ● Diagnosis sensor unit is malfunctioning.	Go to DIAGNOSTIC PROCEDURE 10 (RS-58).

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⊗ Trouble Diagnoses without CONSULT-II (Cont'd)

DIAGNOSTIC PROCEDURE 8 (CONTINUED FROM DIAGNOSTIC PROCEDURE 6)

Inspecting SRS malfunctioning record

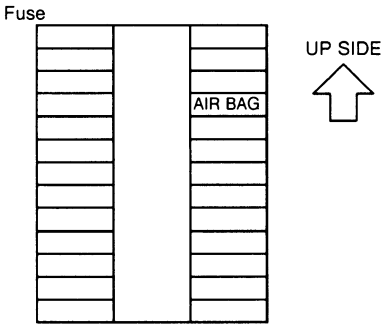
1	CONSIDER POSSIBILITY OF NOT ERASING SELF-DIAGNOSTIC RESULT AFTER REPAIRING
Is it the first time for maintenance of SRS? **Yes or No**	
Yes ▶	Go to DIAGNOSTIC PROCEDURE 5 (RS-44). (Further inspection cannot be performed without CONSULT-II.)
No ▶	Diagnosis results (previously stored in the memory) might not be erased after repair. Go to DIAGNOSTIC PROCEDURE 7, step 5 (RS-53).

Trouble Diagnoses: "AIR BAG" Warning Lamp Does Not Turn Off

DIAGNOSTIC PROCEDURE 9

1	SEE THE DEPLOYMENT OF AIR BAG MODULE
Is air bag module deployed? **Yes or No**	
Yes ▶	Refer to COLLISION DIAGNOSIS (RS-59).
No ▶	GO TO 2.

2	CHECK AIR BAG FUSE
Is SRS "Air Bag" fuse OK?	
OK ▶	GO TO 4.
NG ▶	GO TO 3.



OK or NG

3	CHECK AIR BAG FUSE AGAIN
Replace "AIR BAG" fuse and turn ignition switch ON. **Is "AIR BAG" fuse blown again?**	
Yes ▶	Repair main harness.
No ▶	**INSPECTION END**

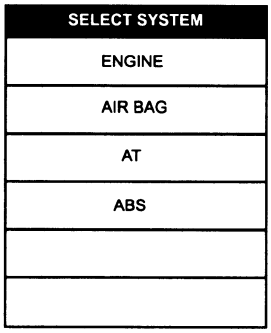
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Trouble Diagnoses: “AIR BAG” Warning Lamp Does Not Turn Off (Cont’d)

4	CHECK DIAGNOSIS SENSOR UNIT

Connect CONSULT-II and touch “START”.

- Is “AIR BAG” displayed on CONSULT-II?



C2SSE01

Yes or No

Yes	▶	GO TO 5.
No	▶	Visually check the wiring harness connection of diagnosis sensor unit. If the harness connection check result is OK, replace diagnosis sensor unit.

5	CHECK HARNESS CONNECTION

Is harness connection between warning lamp and diagnosis sensor unit OK?

OK or NG

OK	▶	Replace diagnosis sensor unit.
NG	▶	Connect “AIR BAG” warning lamp and diagnosis sensor unit connector properly. If “AIR BAG” warning lamp still does not go off, replace harness.

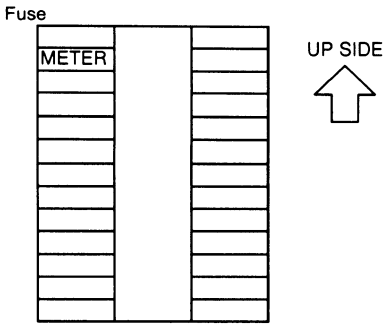
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Trouble Diagnoses: “AIR BAG” Warning Lamp Does Not Turn On

DIAGNOSTIC PROCEDURE 10

1	CHECK “METER” FUSE

Is meter fuse OK?



NRS092

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	CHECK “METER” FUSE AGAIN

Replace meter fuse and turn ignition switch ON.

Is meter fuse blown again?

Yes	▶	Repair main harness.
No	▶	**INSPECTION END**

3	CHECK “AIR BAG” WARNING LAMP LED

Is “AIR BAG” warning lamp LED OK?

OK or NG

OK	▶	GO TO 4.
NG	▶	Replace “AIR BAG” warning lamp LED.

4	CHECK HARNESS CONNECTION BETWEEN DIAGNOSIS SENSOR UNIT AND “AIR BAG” WARNING LAMP

Disconnect diagnosis sensor unit connector and turn ignition switch “ON”.
- Does “AIR BAG” warning lamp turn on?

Yes or No

Yes	▶	Replace diagnosis sensor unit.
No	▶	Check the ground circuit of “AIR BAG” warning lamp.

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Collision Diagnosis

FOR FRONTAL COLLISION

To repair the SRS, perform the following steps.

When SRS (except the side air bag modules) is activated in a collision:

1) Replace the diagnosis sensor unit.
2) Remove the air bag modules (except the side air bag modules) and front seat belt pre-tensioner assemblies.
3) Check the SRS components using the table shown below:

- Replace any SRS components showing visible signs of damage (dents, cracks and deformation).

4) Install new air bag modules (except the side air bag module) and front seat belt pre-tensioner assemblies.
5) Conduct self-diagnosis using CONSULT-II or “AIR BAG” warning lamp. Refer to “SRS Operation Check” for details (RS-38). Ensure entire SRS operation properly.

When SRS is not activated in a collision:

1) Check the SRS components using the table shown below:

- Replace any SRS components showing visible signs of damage (dents, cracks and deformation).

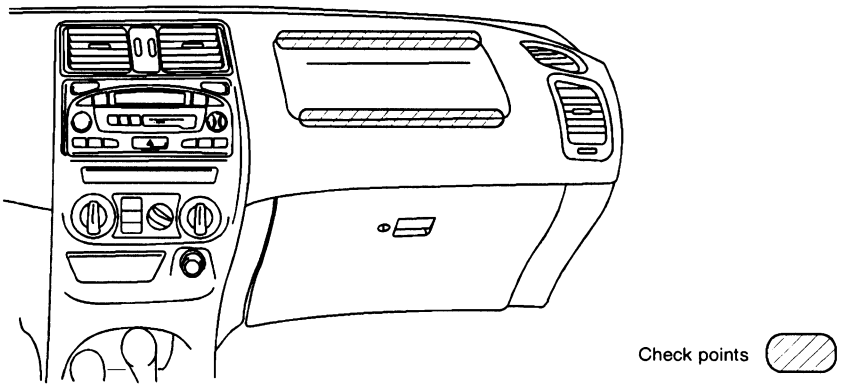
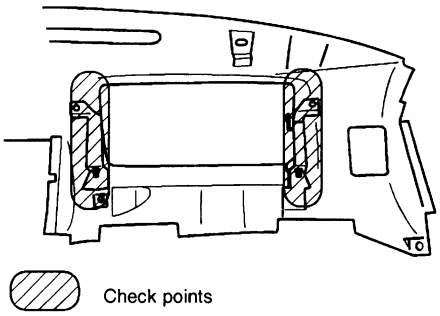
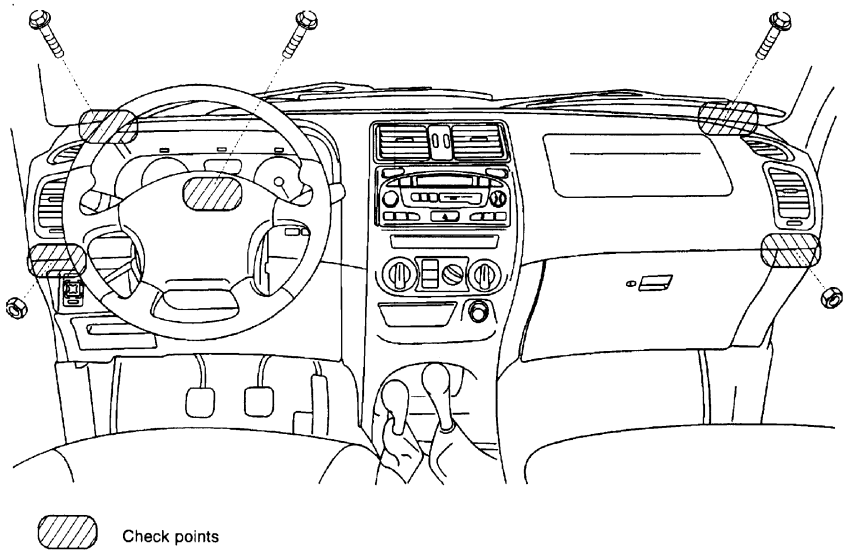
2) Conduct self-diagnosis using CONSULT-II or “AIR BAG” warning lamp. Refer to “SRS Operation Check” for details (RS-38). Ensure entire SRS operation properly.

SRS Inspection (For frontal collision)

Part	SRS is activated	SRS is NOT activated
Air bag module (driver and front passenger side)	REPLACE Install with new special bolts coated with bonding agent.	1. Remove air bag module. Check harness cover and connectors for damage, terminals for deformities, and harness for binding. 2. a. Install driver air bag module into the steering wheel to check fit and alignment with the wheel. b. Install front passenger air bag module into the instrument panel to check fit with the instrument panel. 3. No damage found, reinstall with new bolts coated with bonding agent. 4. If damaged—REPLACE. Install air bag modules with new special bolts coated with bonding agent. Air bag must be deployed before disposal.
Front seat belt pre-tensioner assembly	REPLACE Install seat belt pre-tensioner with new bolts.	1. Remove front seat belt pre-tensioners. Check harness cover and connectors for damage, terminals for deformities, and harness for binding. 2. Check belts for damage and anchors for loose mounting. 3. Check retractor for smooth operation. 4. If no damage is found, reinstall front seat belt pre-tensioner assembly. 5. If damaged—REPLACE. Install the front seat belt pre-tensioners with new bolts coated with bonding agent. Front seat belt pre-tensioners must be deployed before disposal.
Diagnosis sensor unit	REPLACE Install with new bolts coated with bonding agent.	1. Check case for dents, cracks or deformities. 2. Check connectors for damage, and terminals for deformities. 3. If no damage is found, reinstall with new special bolts and ground bolt coated with bonding agent. 4. If damaged—REPLACE. Install diagnosis sensor unit with new special bolts and ground bolt coated with bonding agent.
Steering wheel	1. Visually check steering wheel for deformities. 2. Check harness (built into steering wheel) and connectors for damage, and terminals for deformities. 3. Install driver air bag module to check fit or alignment with steering wheel. 4. Check steering wheel for excessive free play. 5. If no damage is found, reinstall with bolts. 6. If damaged—REPLACE.	
Spiral cable	1. Visually check spiral cable and combination switch for damage. 2. Check connectors and protective tape for damage. 3. Check steering wheel for noise, binding or heavy operation. 4. If no damage is found, reinstall with bolts. 5. If damaged—REPLACE.	

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Collision Diagnosis (Cont'd)

Part	SRS is activated	SRS is NOT activated
Harness and Connectors	1. Check connectors for poor connection, damage, and terminals for deformities. 2. Check harness for binding, chafing, cuts, or deformities. 3. If no damage is found, reinstall the harness and connectors. 4. Damaged—REPLACE damaged section of harness. Do not attempt to repair, splice or modify any SRS harness.	
Instrument panel	1. When passenger air bag inflates, check the following points for bending, deformities or cracks. ● Opening portion for front passenger air bag  NBF372 ● Front passenger air bag module brackets Back face of instrument panel  NBF373 ● The portions securing the instrument panel  NBF374 2. If no damage is found, reinstall the instrument panel. 3. If damaged—REPLACE the instrument panel with bolts.	

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Collision Diagnosis (Cont'd)

FOR SIDE COLLISION

To repair the SRS for a side collision, perform the following steps.

When the side air bag is activated in the side collision:

1) Replace the following component:
— All parts of front seatback (including front seatback frame) with side air bag module (on the side on which side air bag is activated)
— Diagnosis sensor unit
— Side air bag (satellite) sensor (on the side on which side air bag is activated)
2) Check the SRS components and the related parts using the table shown below.
● Replace any SRS components and the related parts showing visible signs of damage (dents, cracks, deformation).
3) Conduct self-diagnosis using CONSULT-II or "AIR BAG" warning lamp. Refer to "SRS Operation Check" for details (RS-38). Ensure entire SRS operation properly.

When SRS is not activated in the side collision:

1) Check the SRS components and the related parts using the table shown below.
● Replace any SRS components and the related parts showing visible signs of damage (dents, cracks, deformation).
2) Conduct self-diagnosis using CONSULT-II or "AIR BAG" warning lamp. Refer to "SRS Operation Check" for details (RS-38). Ensure entire SRS operation properly.

SRS Inspection (For side collision)

Part	Side air bag is activated	SRS is NOT activated
Front (LH or RH) side air bag modules	REPLACE all parts of front seatback with deployed front side air bag module.	1. Check for visible signs of damage (dents, tears, deformation) of the seat back on the collision side. 2. If damaged—REPLACE the damaged seat parts with new bolts and remove the front side air bag module. 3. Check for visible signs of damage (tears etc.) of the side air bag module. 4. Check harness and connectors for damage, and terminals for deformities. 5. If no damaged is found, reinstall the front side air bag module with new nuts. 6. If damaged—REPLACE the front side air bag module with new nuts. Air bag must be deployed before disposal.
(LH or RH) side air bag (satellite) sensor	REPLACE the side air bag (satellite) sensor on the collision side with new nuts coated with bonding agent. (Repair the center pillar inner, etc. before installing new one if damaged.)	1. Remove the satellite sensor on the collision side. Check harness connectors for damage, terminals for deformities, and harness for binding. 2. Check for visible signs of damage (dents, cracks, deformation) of the satellite sensor. 3. Install the side air bag (satellite) sensor to check fit. 4. If no damage is found, reinstall the side air bag (satellite)sensor with new nuts. 5. If damaged—REPLACE the side air bag sensor with new nuts coated with bonding agent.
Diagnosis sensor unit	REPLACE the diagnosis sensor unit with the new bolts.	1. Check case and bracket for dents, cracks or deformities. 2. Check connectors for damage, and terminals for deformities. 3. If no damage is found, reinstall the diagnosis sensor unit with new special bolts and ground bolt. 4. If damaged—REPLACE. Install the diagnosis sensor unit with new special bolts and ground bolt.
Front seat belt pre-tensioner assembly	1. Check if the seat belt can be extended smoothly. If the seat belt cannot be extended smoothly. — Check for deformities of the center pillar inner. — If the center pillar inner has no damage, REPLACE the front seat belt pre-tensioner assembly. 2. Remove the front seat belt pre-tensioner assembly on the collision side. Check harness cover and connectors for damage, terminals for deformities, and harness for binding. 3. Check for visible signs of damage (dents, cracks, deformation) of the front seat belt pre-tensioner assembly. 4. If no damage is found, reinstall the front seat belt pre-tensioner assembly. 5. If damaged—REPLACE the front seat belt pre-tensioner assembly with new bolts coated with bonding agent. The front seat belt pre-tensioner assembly must be deployed before disposal.	

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Collision Diagnosis (Cont'd)

Part	Side air bag is activated	SRS is NOT activated
Seat with built-in side air bag	REPLACE all parts of front seatback (including front seatback frame)	1. Visually check the seat on the collision side. 2. Remove the seat on the collision side and check the following for damage and deformities. ● Harness, connectors and terminals ● Frame and recliner (for front and rear seat), and also adjuster and slides (for front seat) 3. If no damage is found, reinstall the seat. 4. If damaged—REPLACE the damaged seat parts with new bolts.
Center pillar inner	1. Check the center pillar inner on the collision side for damage (dents, cracks, deformation). 2. If damaged—REPAIR the center pillar inner.	
Trim	1. Check for visible signs of damage (dents, cracks, deformation) of the interior trim on the collision side. 2. If damaged—REPLACE the damaged trim parts.	

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BODY & TRIM

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Service Notice

- When removing or installing various parts, place a cloth or padding onto the vehicle body to prevent scratches.
- Handle trim, molding, instruments, grille, etc. carefully during removing or installing. Be careful not to oil or damage them.
- Apply sealing compound where necessary when installing parts.
- When applying sealing compound, be careful that the sealing compound does not protrude from parts.
- When replacing any metal parts (for example body outer panel, members, etc.), be sure to take rust prevention measures.

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

The Supplemental Restraint System such as “AIR BAG” and “SEAT BELT PRE-TENSIONER” used along with a seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. The SRS system composition which is available to NISSAN MODEL R20 is as follows (The composition varies according to the destination and optional equipment.):

- For a frontal collision
  The Supplemental Restraint System consists of driver air bag module (located in the center of the steering wheel), front passenger air bag module (located on the instrument panel on passenger side), front seat belt pre-tensioners, a diagnosis sensor unit, warning lamp, wiring harness and spiral cable.
- For a side collision
  The Supplemental Restraint System consists of front side air bag module (located in the outer side of front seat), side air bag (satellite) sensor, diagnosis sensor unit (one of components of air bags for a frontal collision), wiring harness, warning lamp (one of components of air bags for a frontal collision).

Information necessary to service the system safely is included in the **RS** section of this Service Manual.

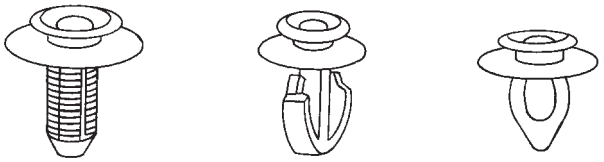
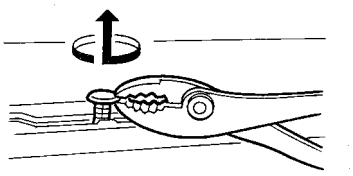
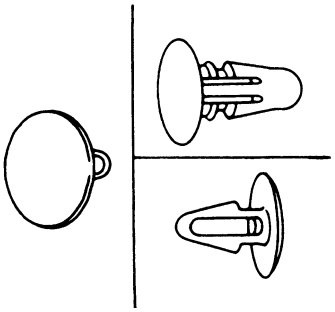
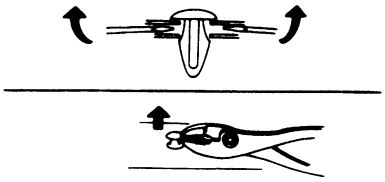
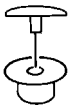
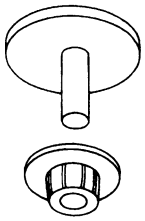
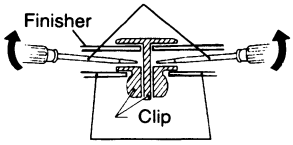
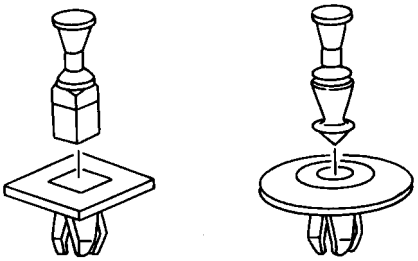
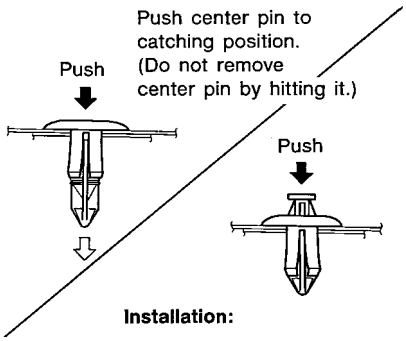
WARNING:

- **To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance should be performed by an authorized NISSAN dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see the RS section.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. Spiral cable and wiring harnesses covered with yellow insulation tape either just before the harness connectors or for the complete harness are related to the SRS.**

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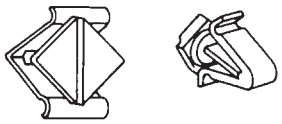
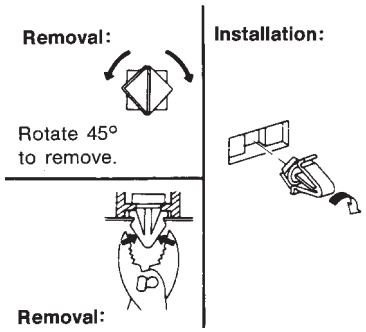
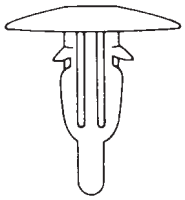
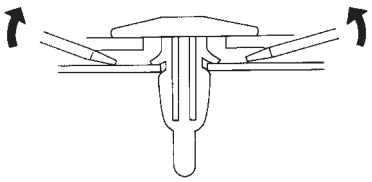
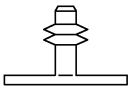
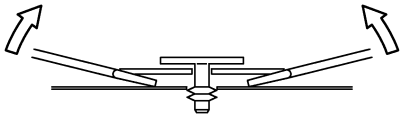
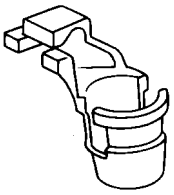
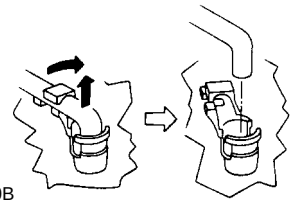
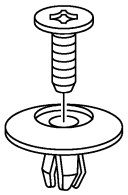
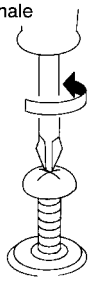
Description

- Clips and fasteners in BT section correspond to the following numbers and symbols.
- Replace any clips and/or fasteners which are damaged during removal or installation.

Symbol No.	Shapes	Removal & Installation
C101 	 SBF302H	**Removal:** Remove by bending up with flat-bladed screwdrivers or clip remover.  SBF367BA
C102 	 YBT081	 **Removal:** Pull up by rotating. SBF115B
C106 	 SBF090B	**Removal:** **Remove with flat-bladed screwdrivers or pliers.**  SBF091B
C201 	 SBF241B	**Removal:** **Flat-bladed screwdrivers**  Body panel SBF242B
C203 	 SBF258G	Push center pin to catching position. (Do not remove center pin by hitting it.)  **Installation:** SBF708E

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Description (Cont'd)

Symbol No.	Shapes	Removal & Installation
CG101 	 SBF145B	 SBF085B
CE117 	 SBF174D	**Removal:** Remove by bending up with a flat-bladed screwdriver or pliers.  SBF175DA
CE801 	 YBT091	Removal: remove with flat-bladed screwdriver  YBT092
CR103	 SBF768B	**Removal:** Holder portion of clip must be spread out to remove rod.  SBF770B
CS103 	 YBT094	**Removal:** 1. Screw out with a Phillips screwdriver. 2. Remove female portion with flat-bladed screwdriver.  SBF992G

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Checking Body Corrosion

Visually check the body sheet metal panel for corrosion, paint damage (scratches, chipping, rubbing, etc.) or damage to the anti-corrosion materials. In particular, check the following locations.

Hemmed portion

Hood front end, door lower end, back door rear end, etc.

Panel joint

Side sill of rear fender and center pillar, rear wheel housing of rear fender, around strut tower in engine compartment, etc.

Panel edge

Back door opening, sunroof opening, fender wheelarch flange, fuel filler lid flange, around holes in panel, etc.

Parts contact

Waist molding, windshield molding, bumper, etc.

Protectors

Damage or condition of mudguard, fender protector, chipping protector, etc.

Anti-corrosion materials

Damage or separation of anti-corrosion materials under the body.

Drain holes

Condition of drain holes at door and side sill.

When repairing corroded areas, refer to the Corrosion Repair Manual.

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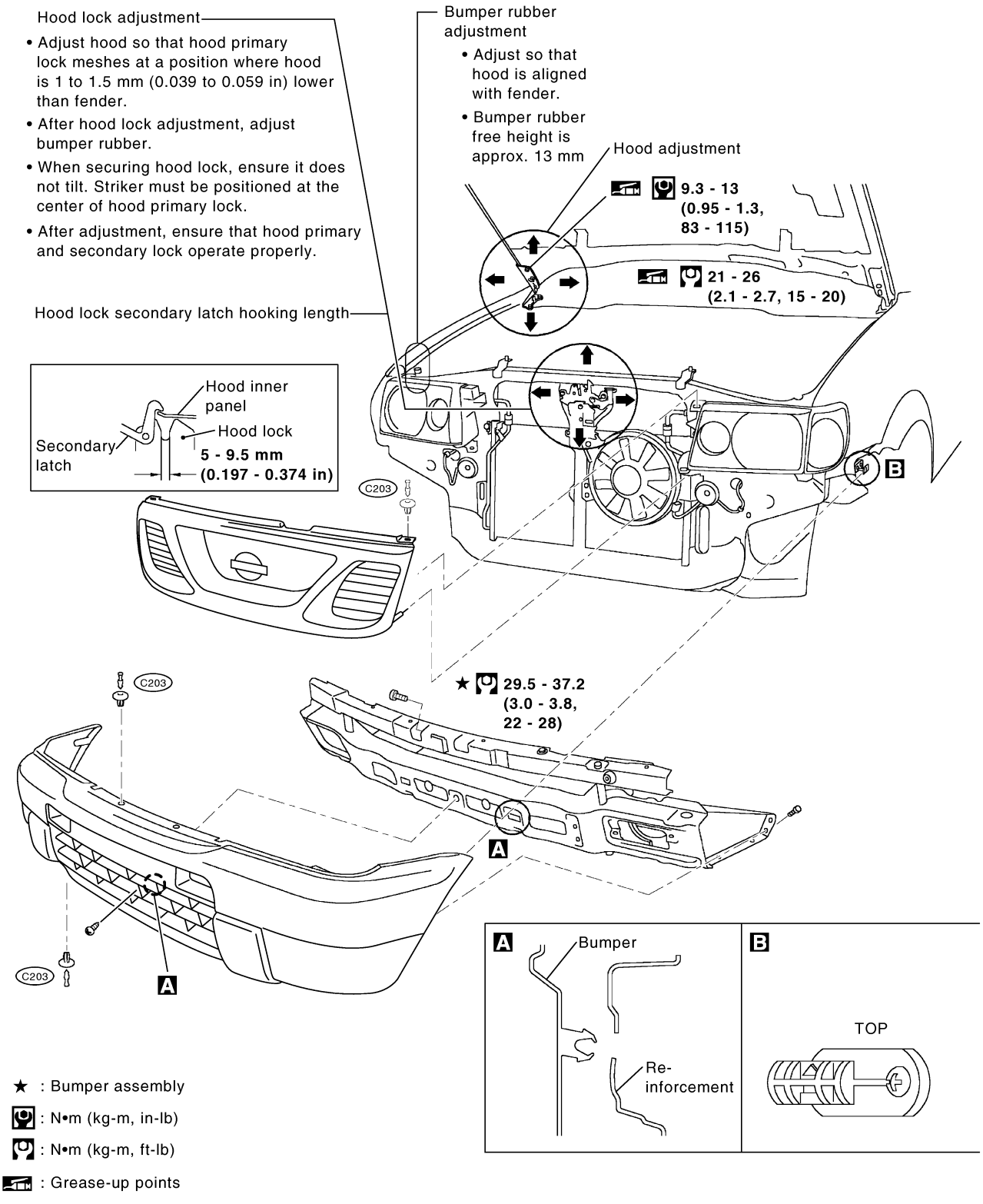
Removal and Installation

- When removing or installing hood, place a cloth or other padding on hood. This prevents vehicle body from being scratched.
- Bumper fascia is made of plastic. Do not use excessive force and be sure to keep oil away from it.
- Hood adjustment: Adjust at hinge portion.
- Hood lock adjustment: After adjusting, check hood lock control operation. Apply a coat of grease to hood locks engaging mechanism.
- Hood opener: Do not attempt to bend cable forcibly. Doing so increases effort required to unlock hood.

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Removal and Installation (Cont'd)

FRONT BUMPER ASSEMBLY



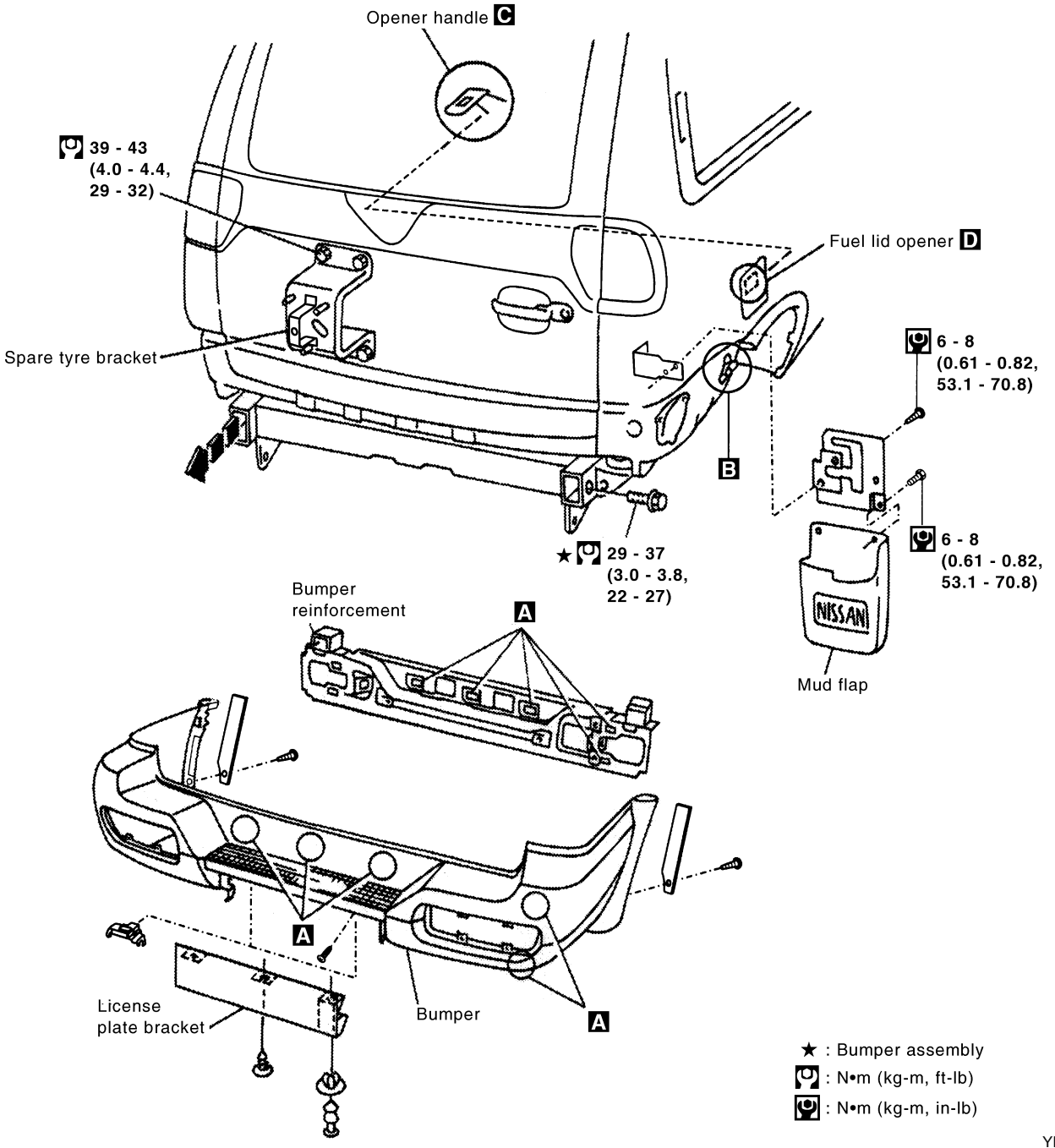
YBT116

http://vnx.su/

Removal and Installation

- When removing or installing back door, place a cloth or other padding on back door. This prevents vehicle body from being scratched.
- Bumper fascia is made of plastic. Do not use excessive force and be sure to keep oil away from it.
- Back door adjustment: Adjust at hinge-back door portion for proper back door fit.
- Back door lock system adjustment: Adjust striker so that it is in the center of the lock. After adjustment, check back door lock operation.
- After installation, make sure that back door and fuel filler lid open smoothly.

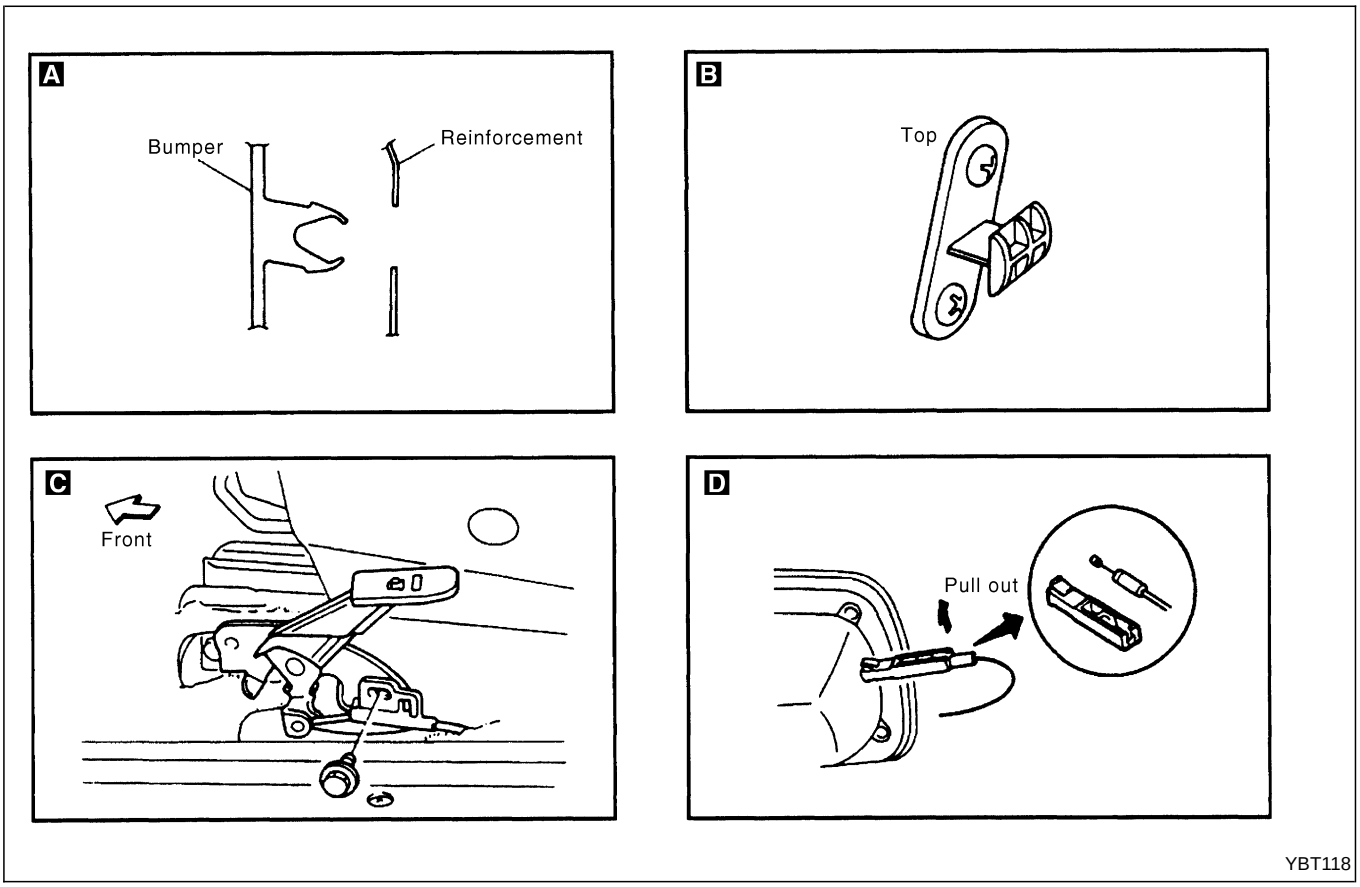
REAR BUMPER ASSEMBLY



YBT117

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Removal and Installation (Cont'd)

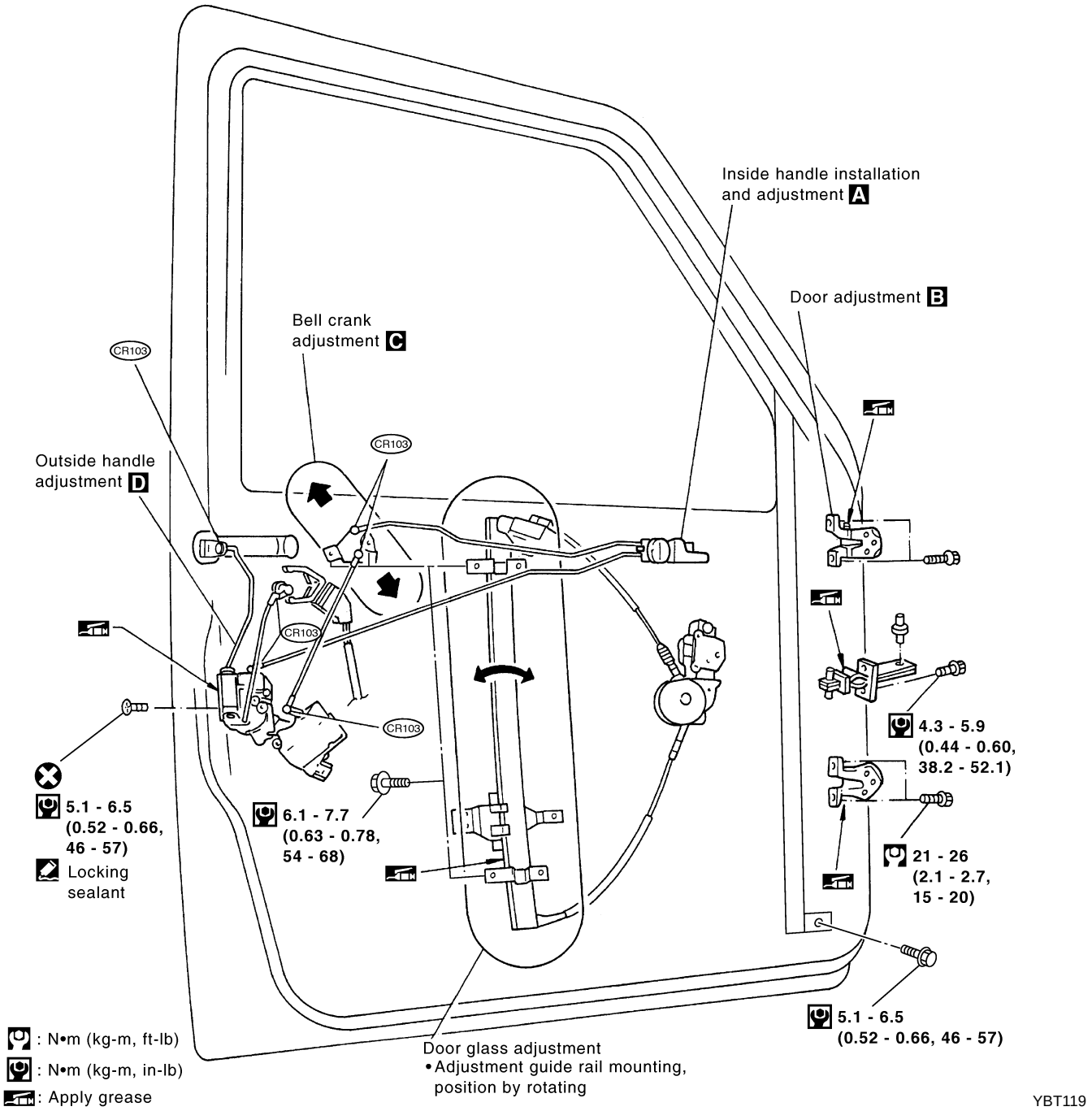


http://vnx.su/

Removal and Installation

FRONT DOOR

- For removal of front door finisher, refer to “DOOR TRIM”, BT-19.
- Remove sealing screen.
- After adjusting door or door lock, check door lock operation.

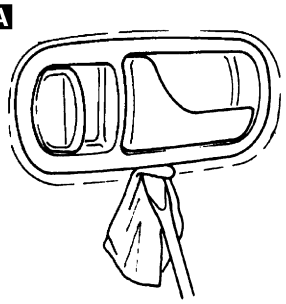


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Removal and Installation (Cont'd)

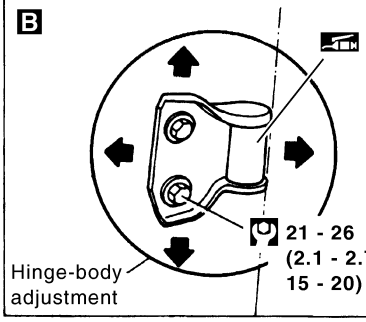
Inside handle installation

A

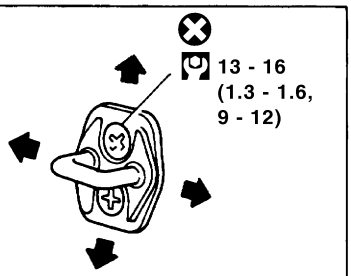


Door adjustment

B

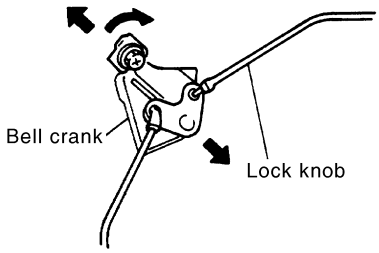


Striker adjustment



Bell crank adjustment

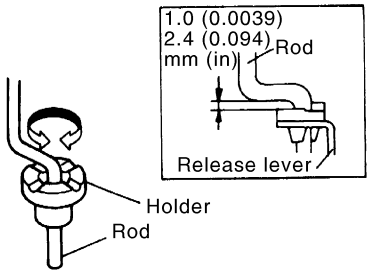
C



Bell crank adjustment:
Lock door after setting door lock assembly and inside handle in position.
Move bell crank in direction of arrow (shown in figure at left) to take up knob free play, and secure with bolts.

Outside handle adjustment

D



: N•m (kg-m, ft-lb)

YBT120

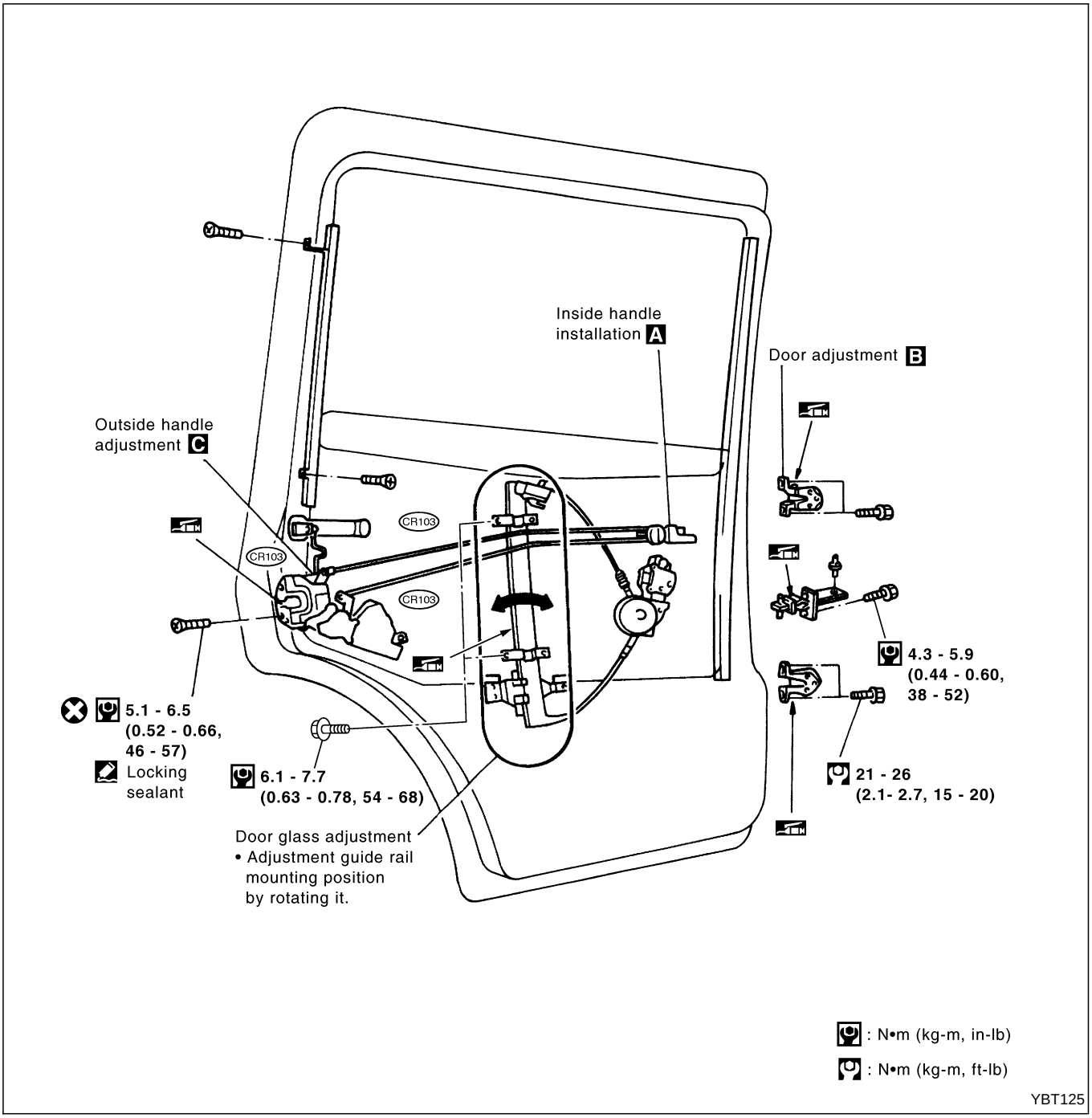
http://vnx.su/

Removal and Installation (Cont'd)

REAR DOOR

Wagon

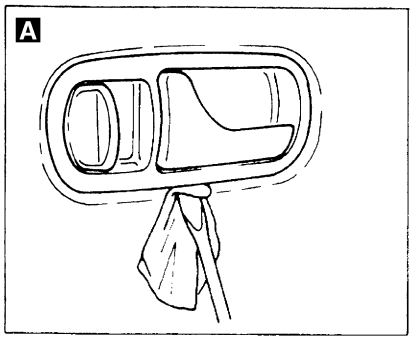
- For removal of rear door finisher, refer to "DOOR TRIM", BT-19.
- Remove sealing screen.
- After adjusting door or door lock, make sure door lock properly.



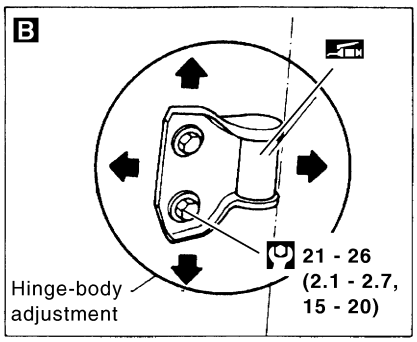
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Removal and Installation (Cont'd)

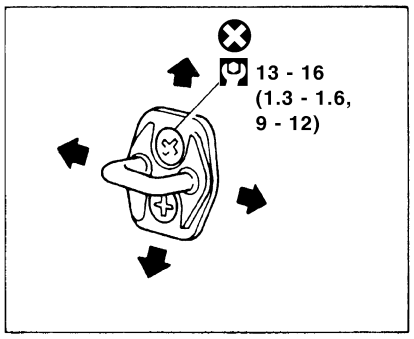
Inside handle installation



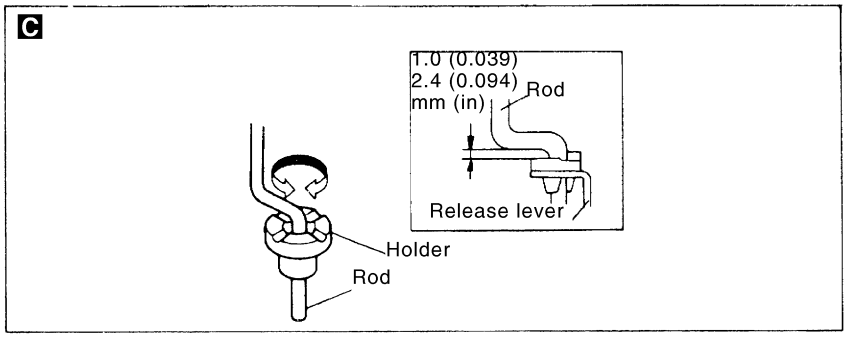
Door adjustment



Striker adjustment



Outline handle adjustment



: N•m (kg-m, ft-lb)

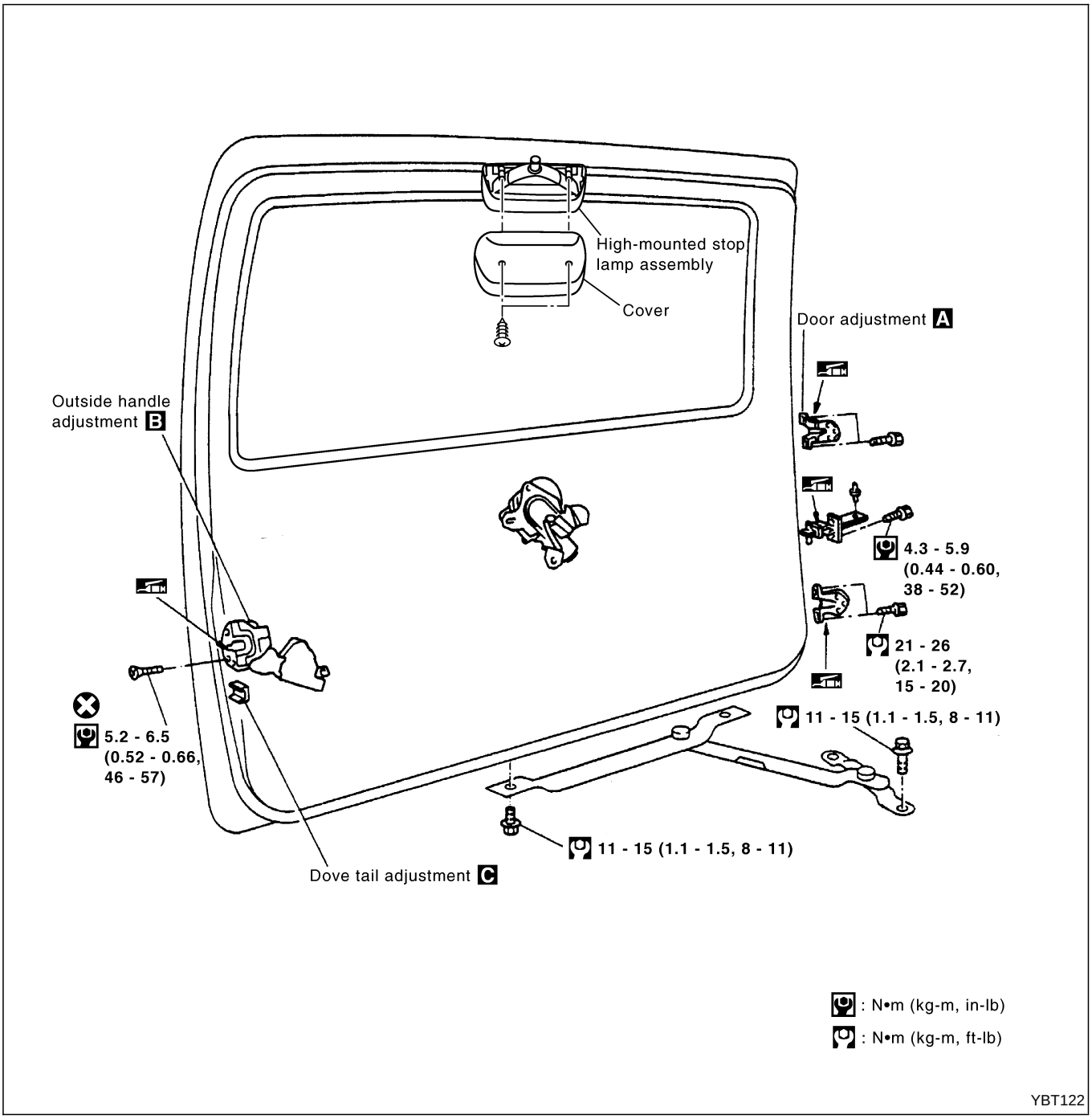
YBT121

http://vnx.su/

Removal and Installation (Cont'd)

- After adjusting door or door lock, make sure door locks properly.

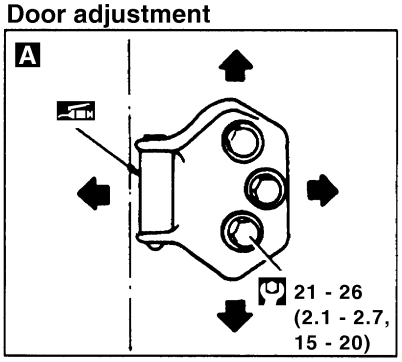
BACK DOOR



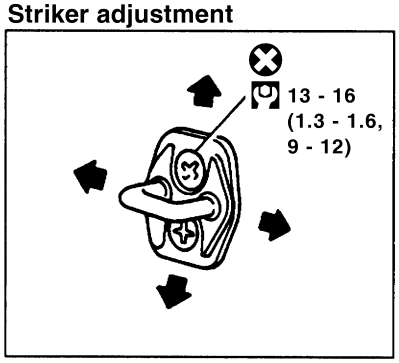
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Removal and Installation (Cont'd)

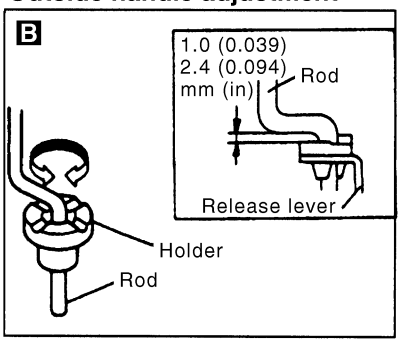
Door adjustment



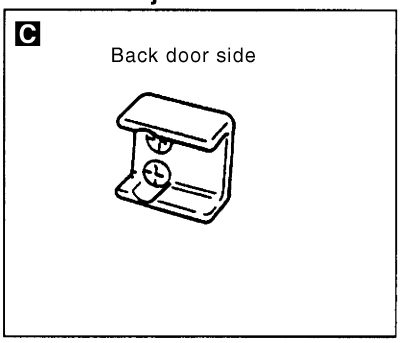
Striker adjustment

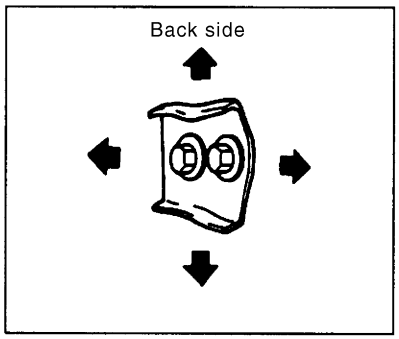


Outside handle adjustment



Dove tail adjustment





: N•m (kg-m, ft-lb)

YBT123

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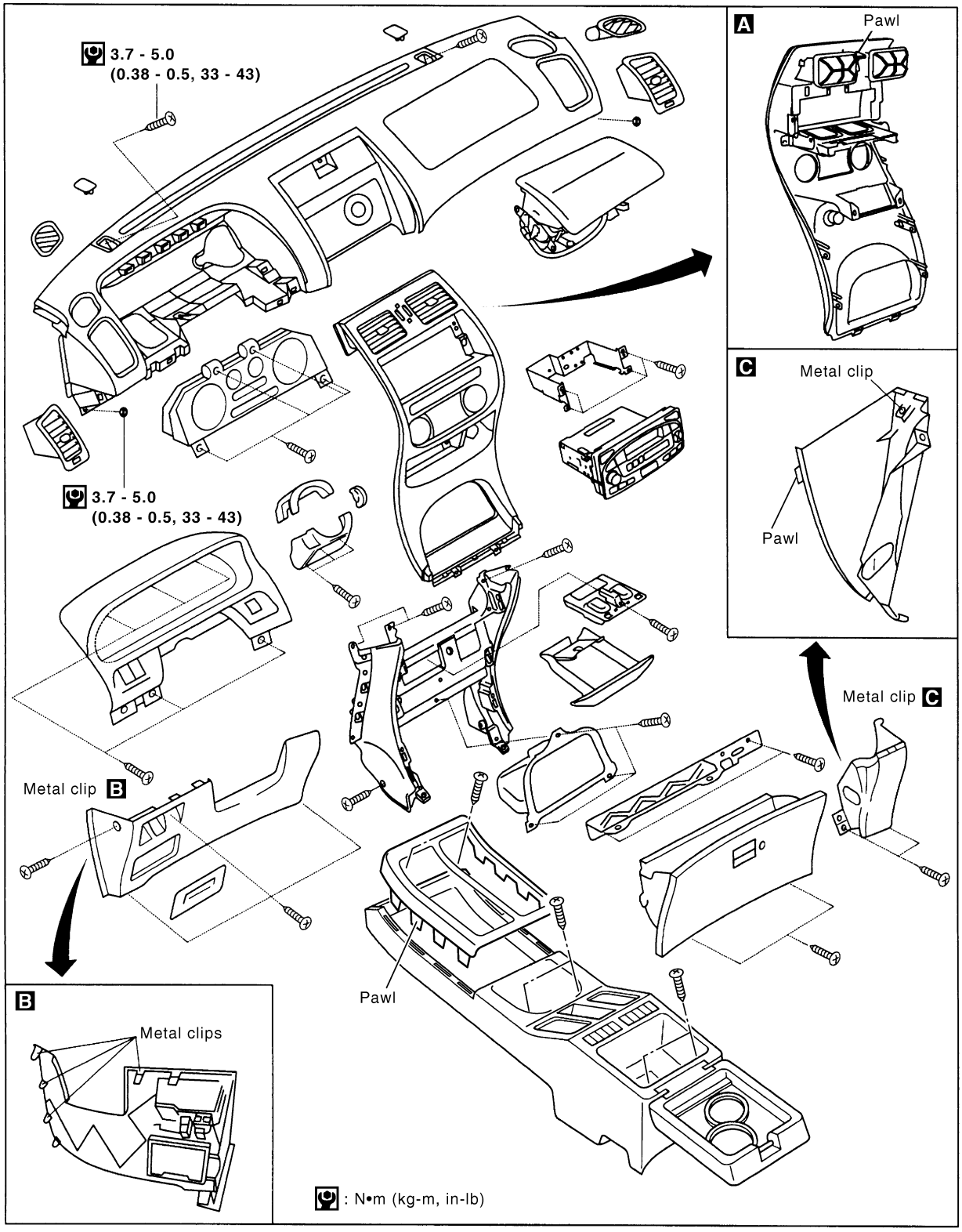
Removal and Installation

CAUTION:

- **Disconnect ground terminal from battery in advance.**
- **Disconnect air bag system line in advance.**
- **Never tamper with or force air bag lid open, as this may adversely affect air bag performance.**
- **Be careful not to scratch pad and other parts.**

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Removal and Installation (Cont'd)



YBT129

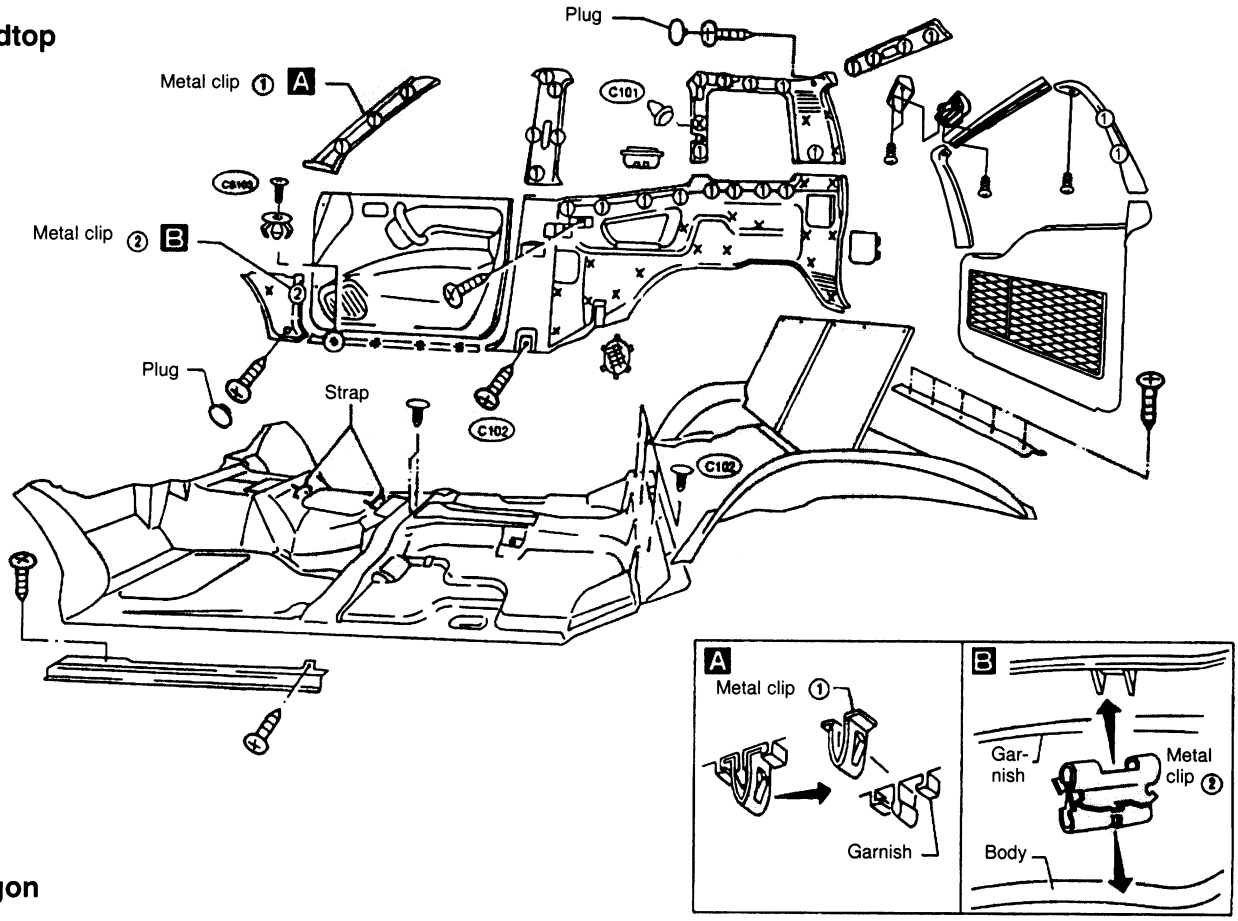
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Removal and Installation

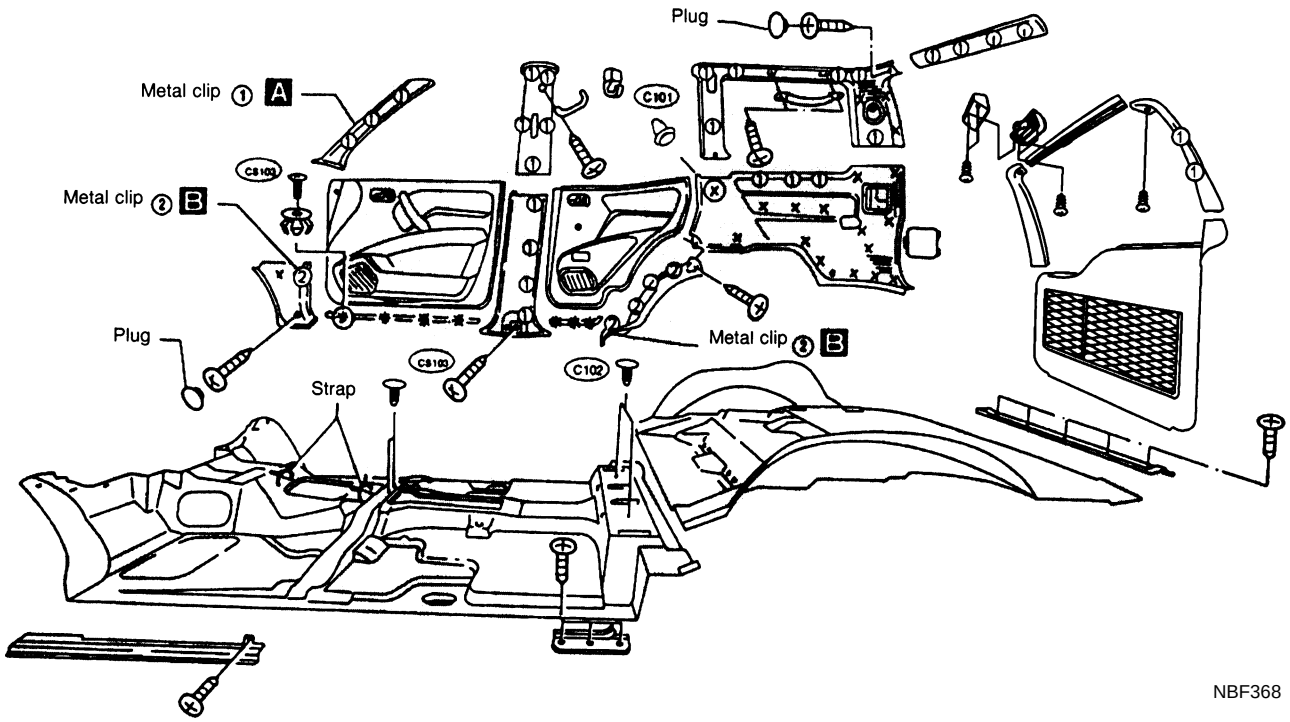
CAUTION:

- **Wrap the tip of flat-bladed screwdriver with a cloth when removing metal clips from garnishes.**

Hardtop



Wagon



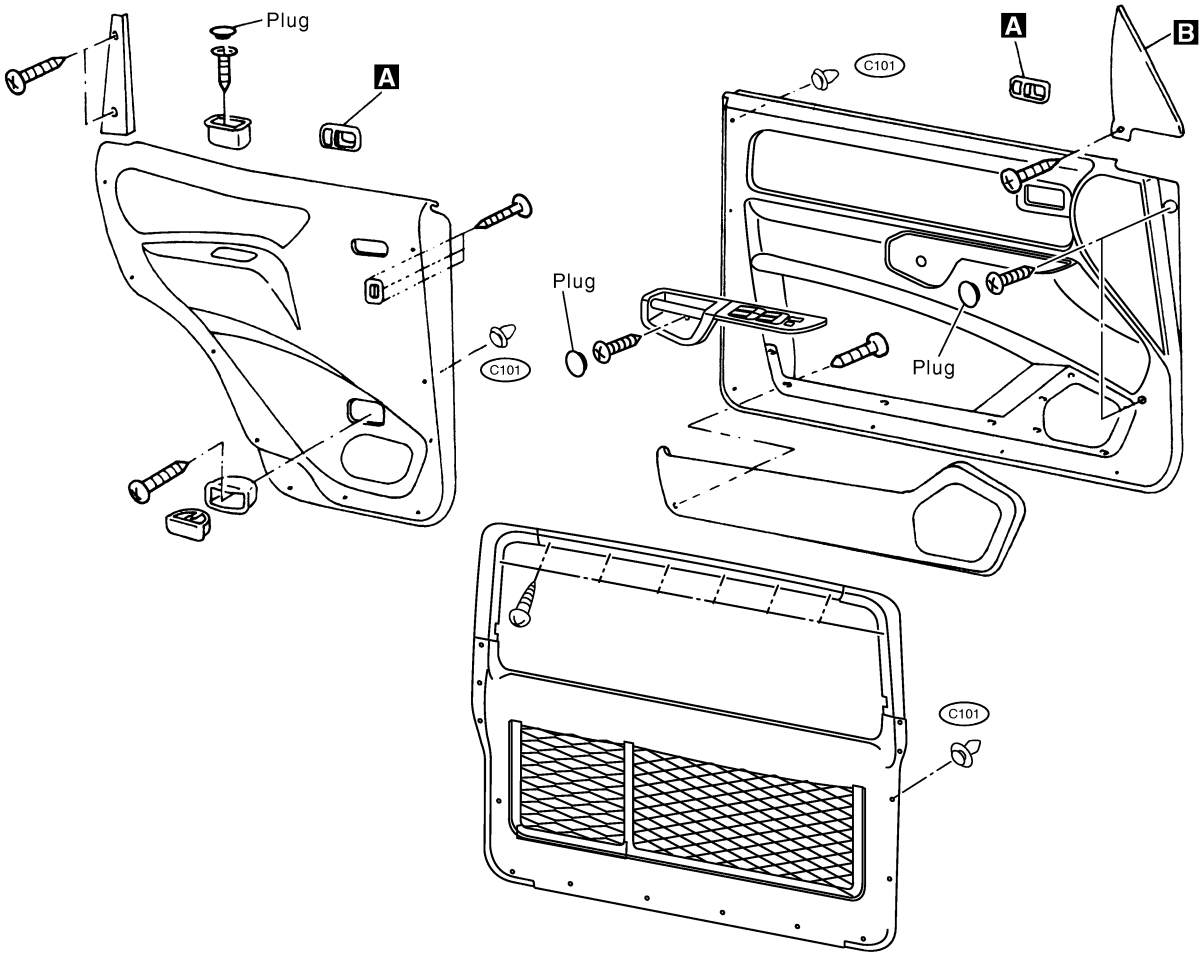
NBF368

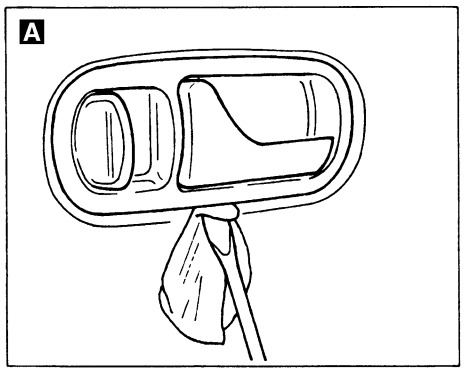
http://vnx.su/

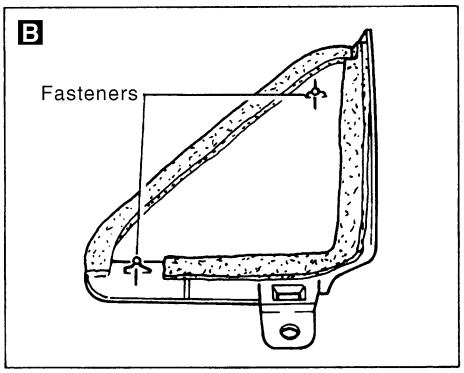
Removal and Installation

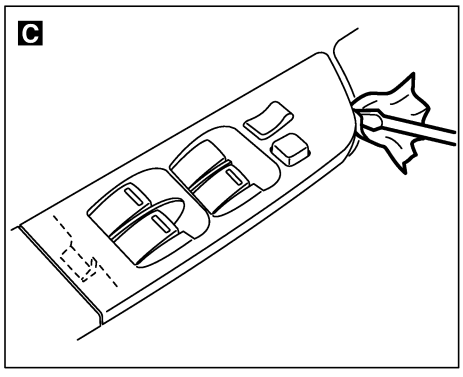
CAUTION:

- **When removing the outside mirror cover, situated at the inside of the door, pull the cover straight out to prevent the fasteners from breaking.**





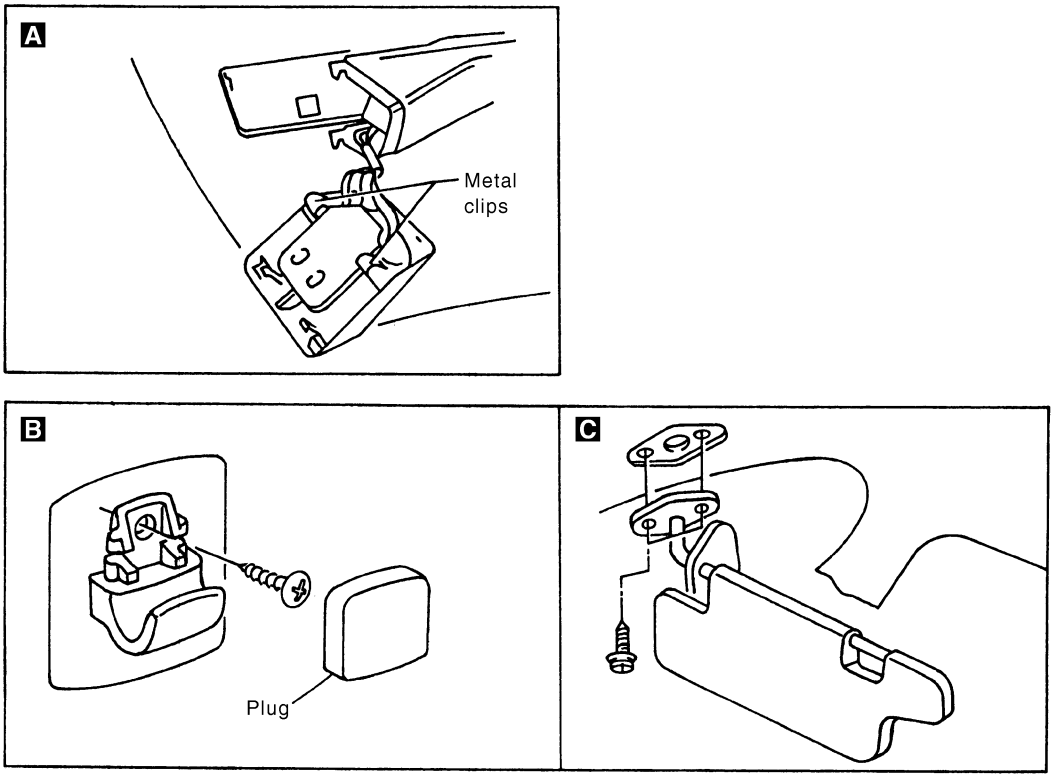


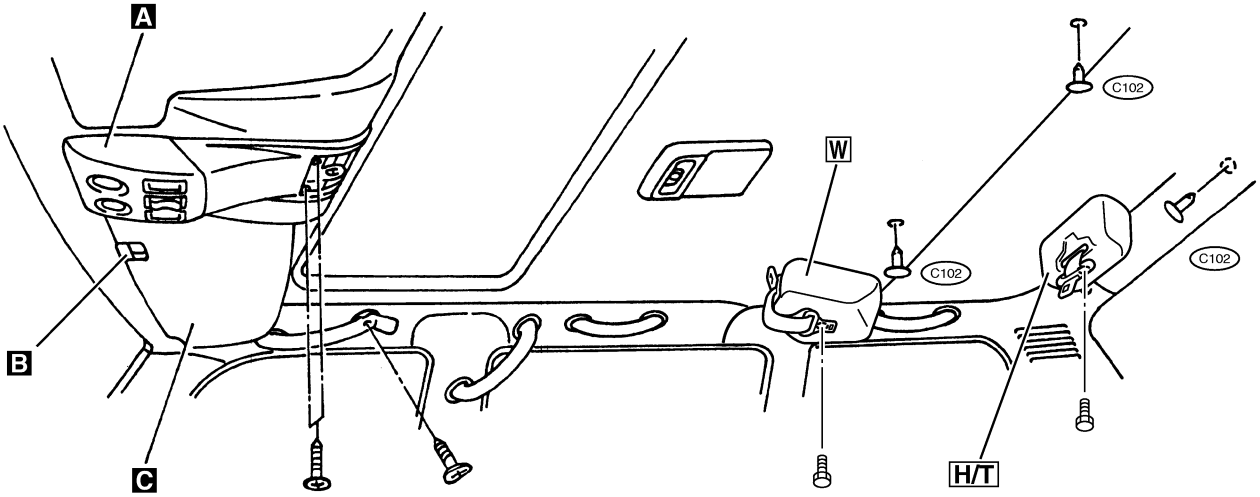


YBT124

http://vnx.su/

Removal and Installation

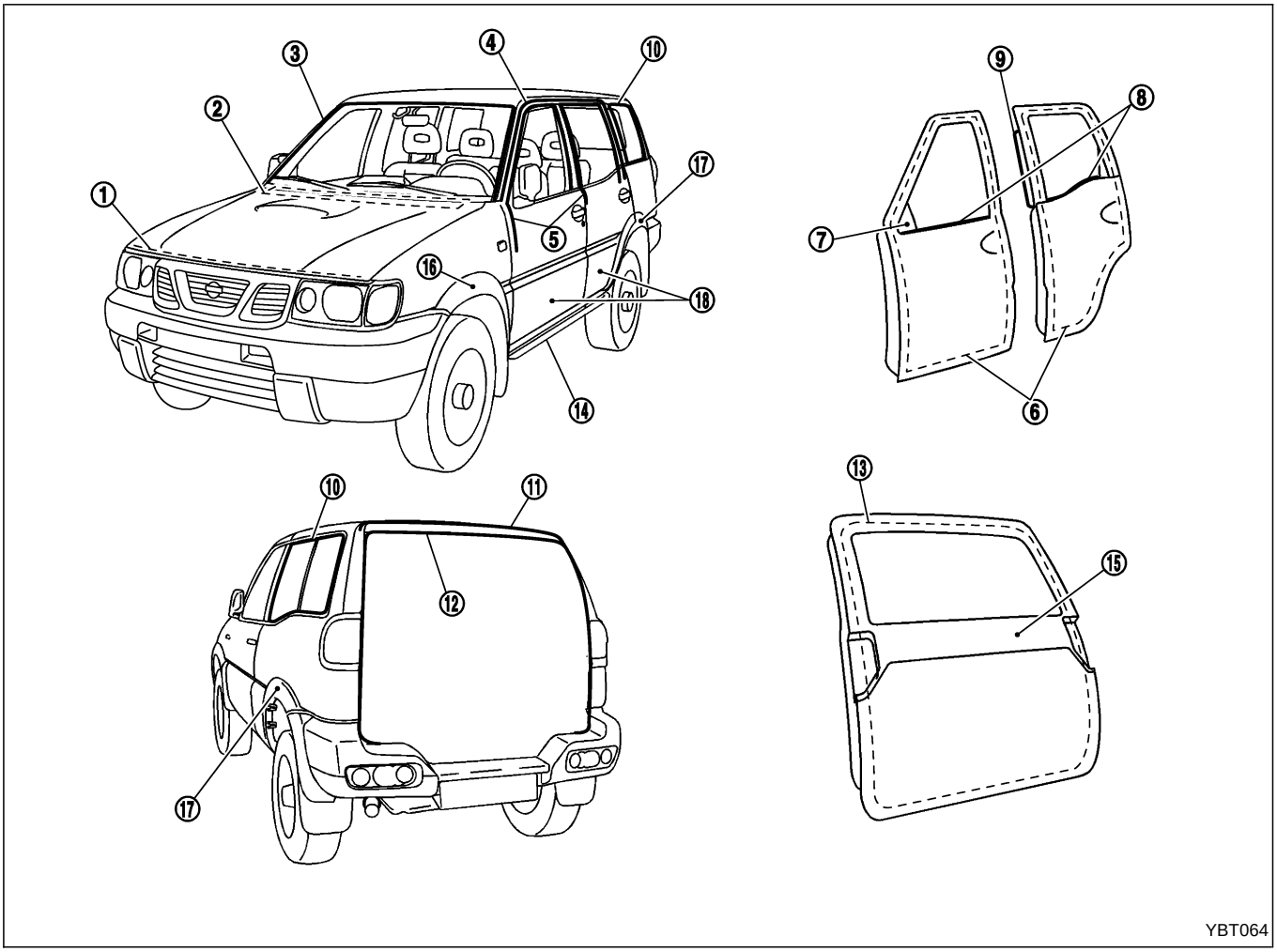




YBT130

http://vnx.su/

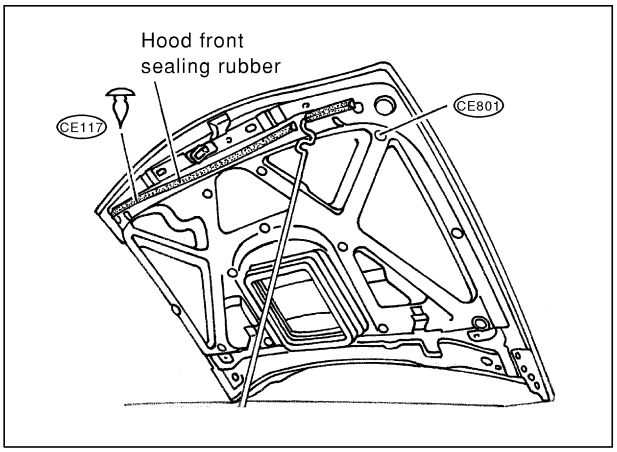
Removal and Installation



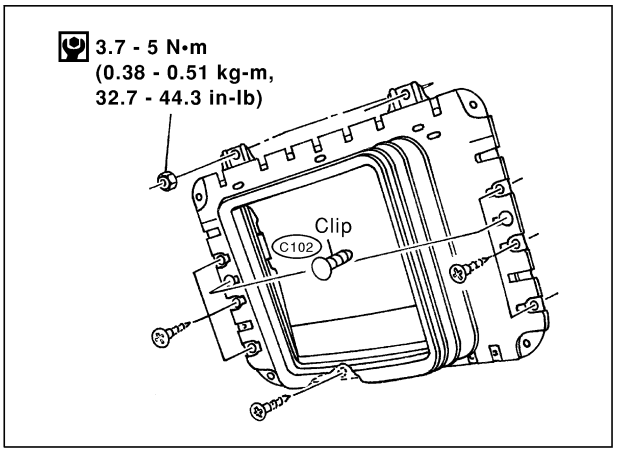
http://vnx.su/

Removal and Installation (Cont'd)

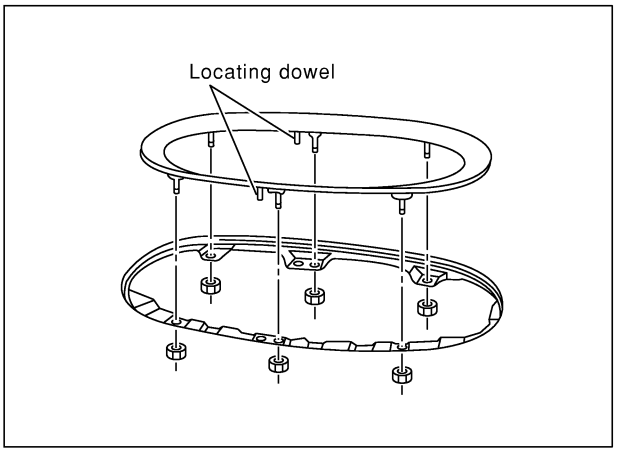
① Hood front seal



LOUVER HOOD/INTAKE AIR GROMMET



LOUVER HOOD/ INTAKE AIR

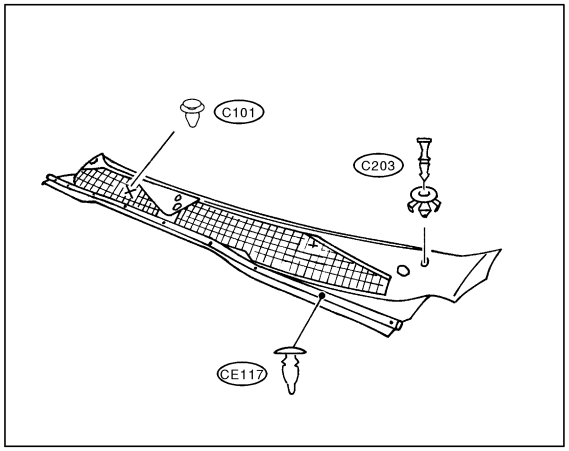


YBT065

http://vnx.su/

Removal and Installation (Cont'd)

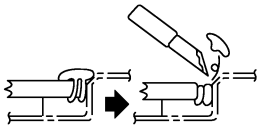
② Cowl top grille



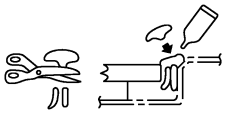
③ Windshield upper molding and side molding

Method 1

Cut off top portion of molding and clean glass and panel surfaces.



Apply sealant to top portion of molding.



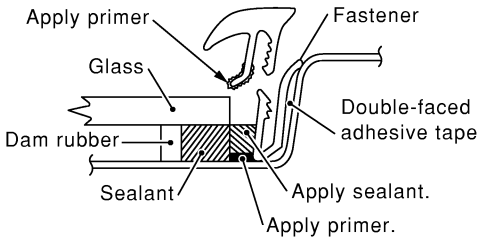
Cut off lower portion of new molding.



Finish well to give it a good appearance.

Method 2

1. Cut off sealant at glass end.
2. Clean the side on which panel was mounted.,
3. Set molding fastener and apply sealant to body panel, and apply primer to molding and body.



4. Install molding by aligning the molding mark located on center with vehicle center.
   Be sure to install tightly so that there is no gap around the corner.

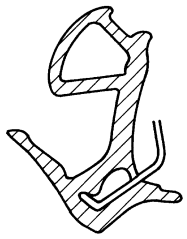
YBT066

http://vnx.su/

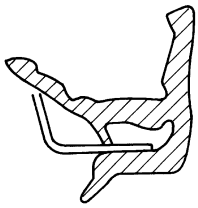
Removal and Installation (Cont'd)

④ **Roof weatherstrip**

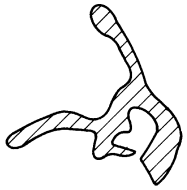
A-A

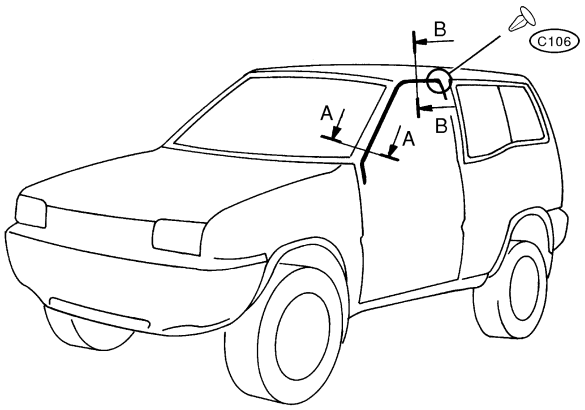


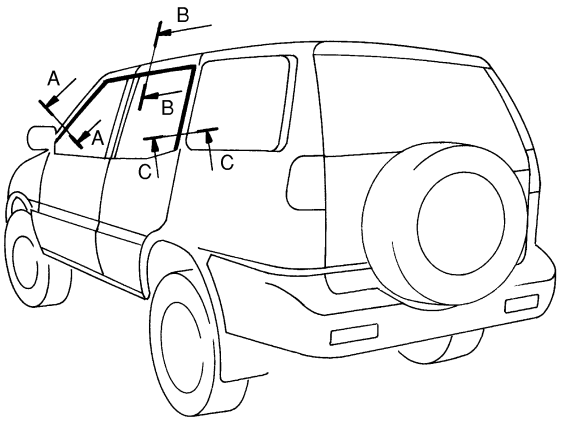
B-B



C-C





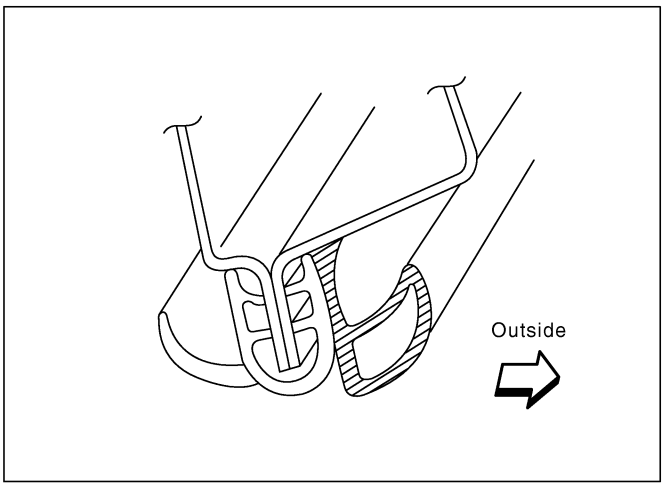


YBT067

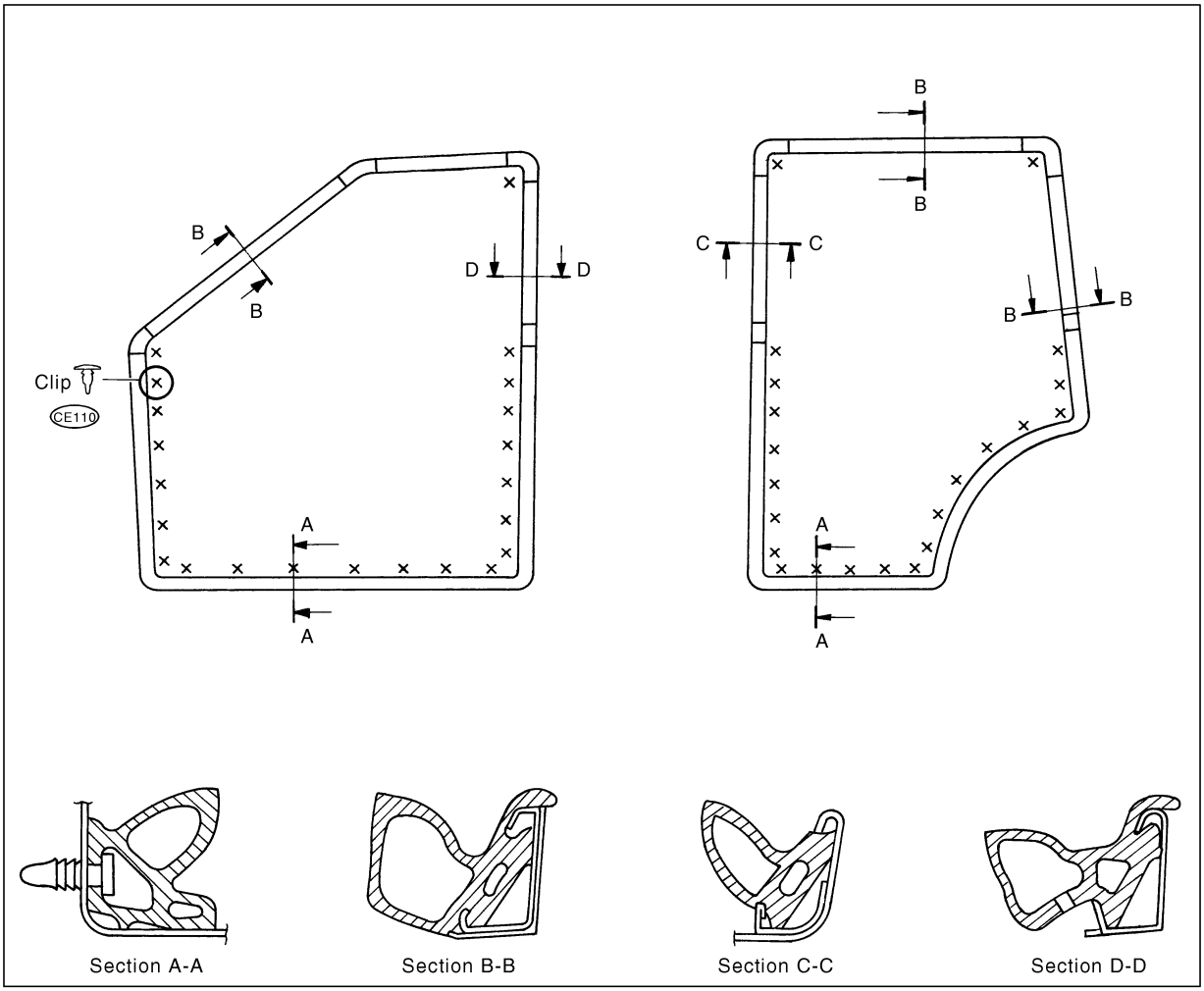
http://vnx.su/

Removal and Installation (Cont'd)

⑤ Drip weatherstrip



⑥ Door weatherstrip

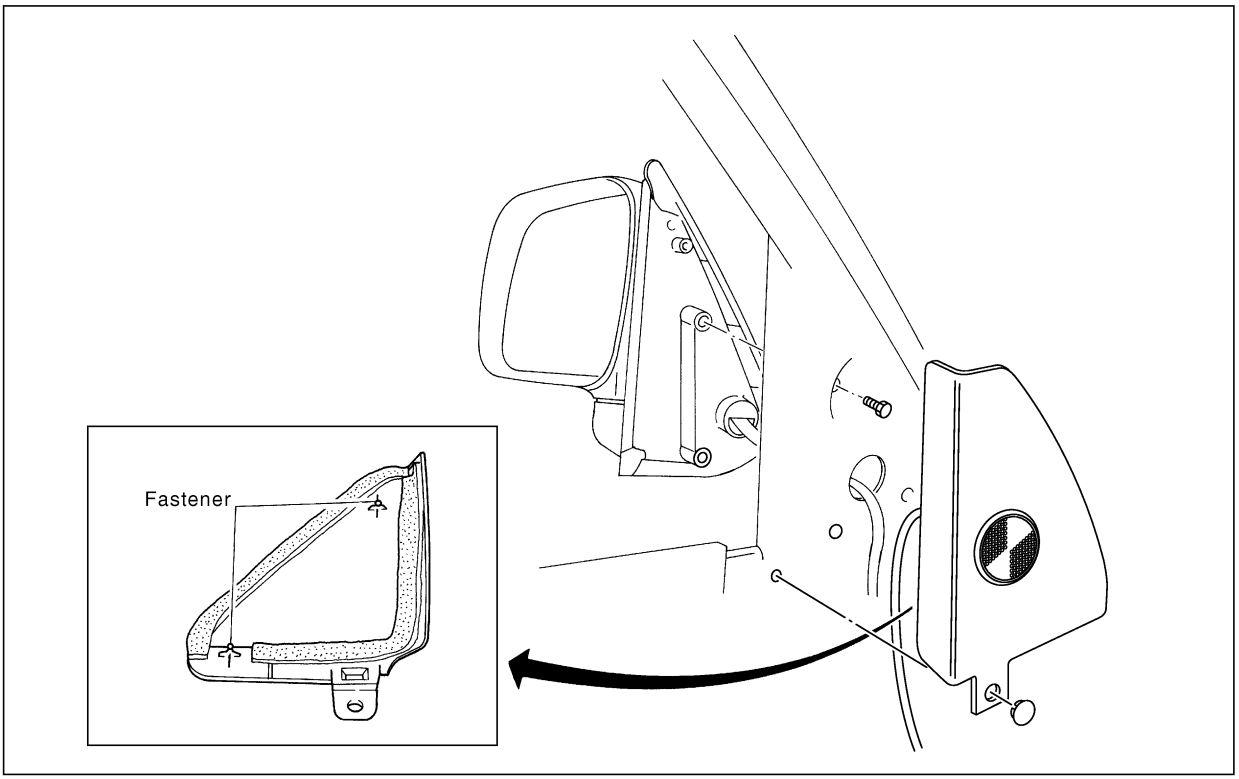


YBT134

http://vnx.su/

Removal and Installation (Cont'd)

⑦ **Door mirror**

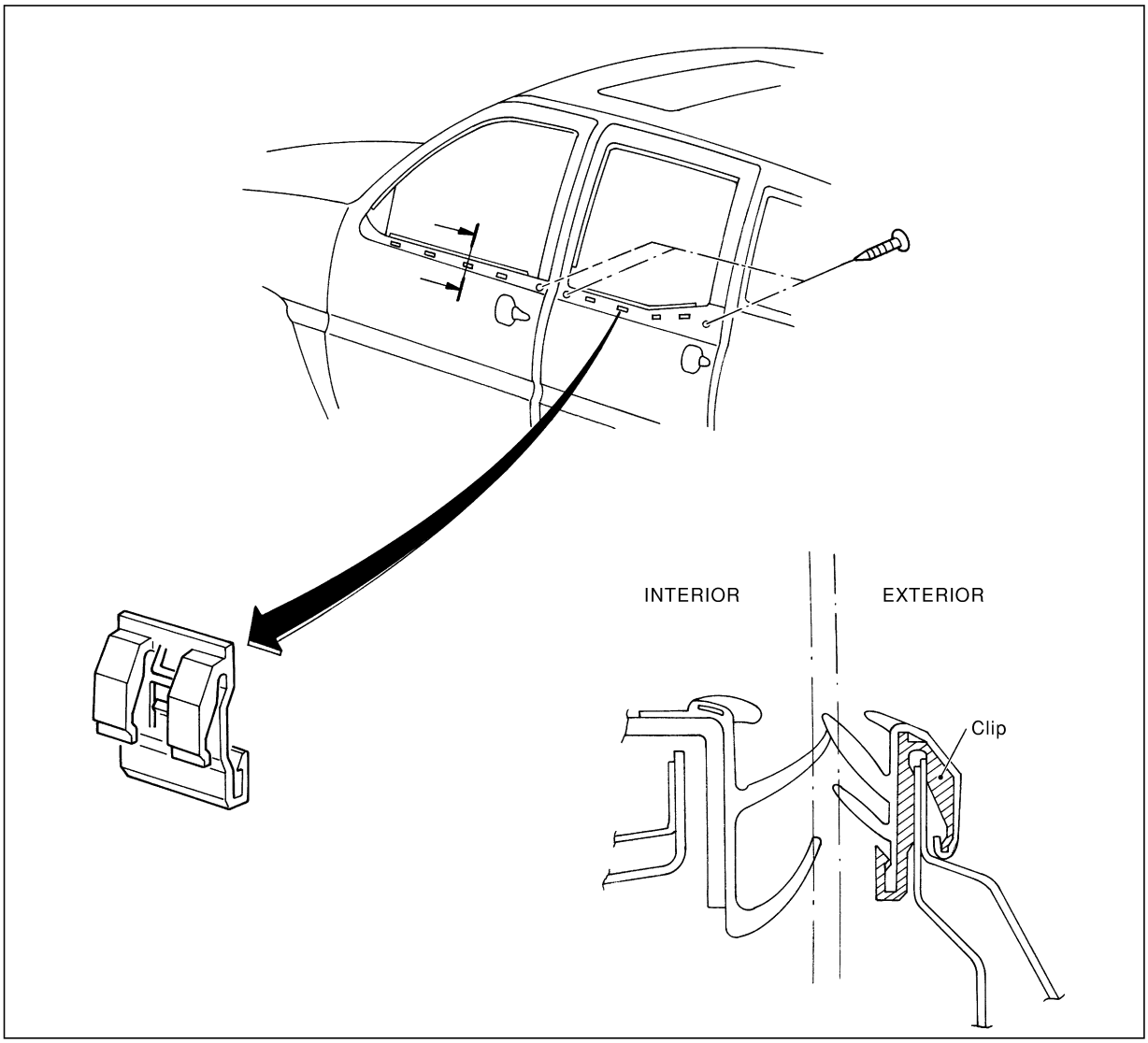


YBT136

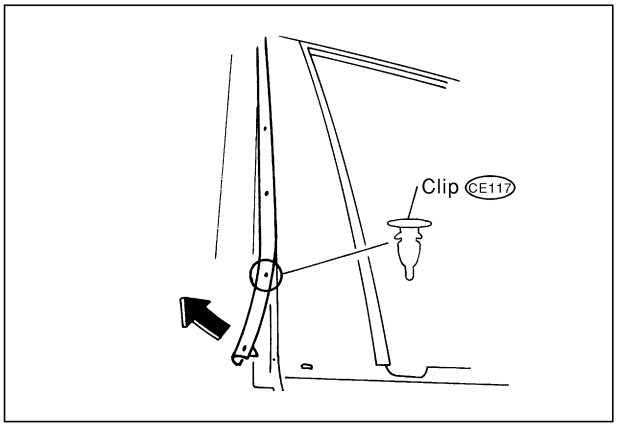
http://vnx.su/

Removal and Installation (Cont'd)

⑧ Door weatherstrip outer



⑨ Rear Door weatherstrip

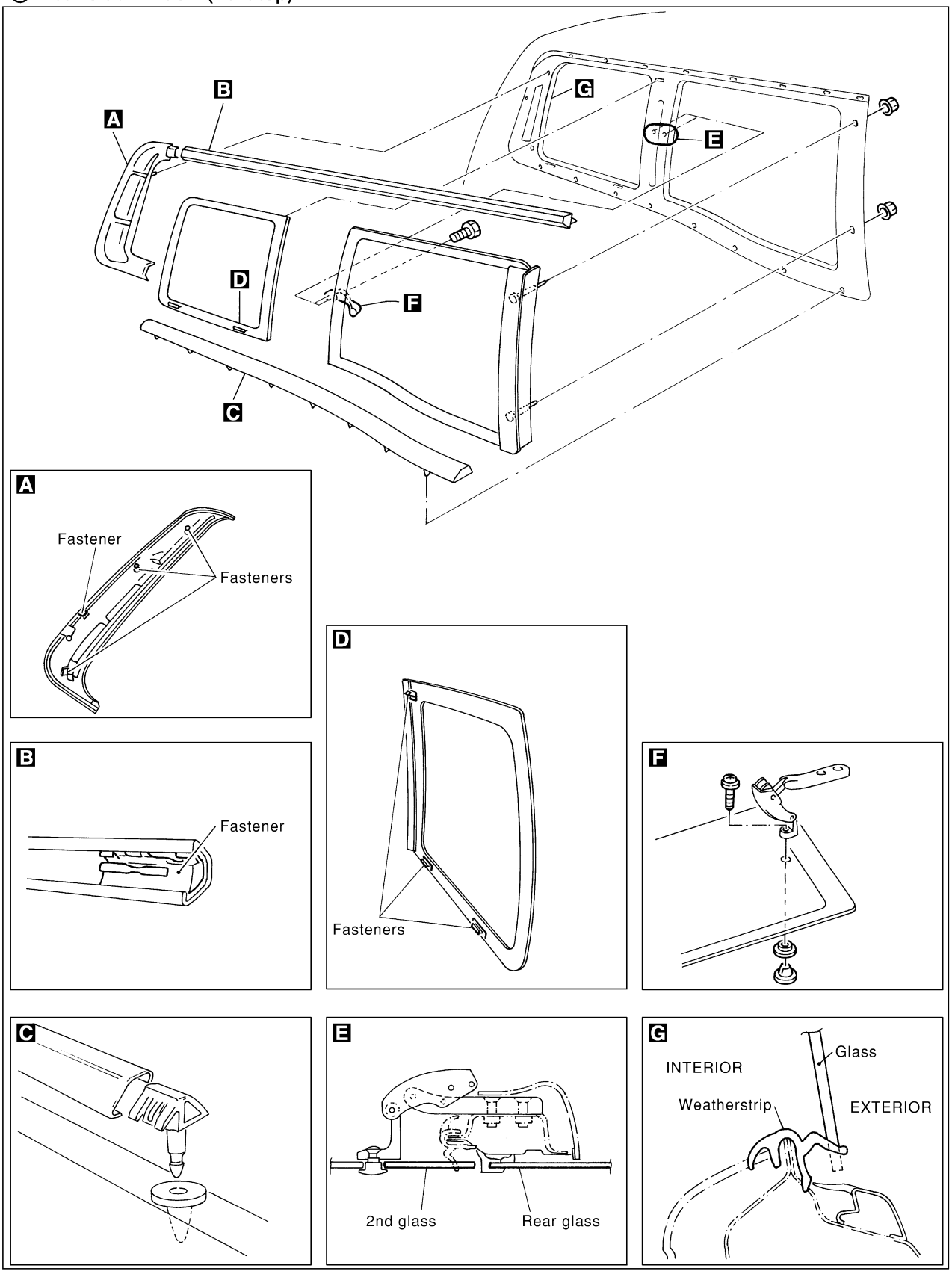


YBT070

http://vnx.su/

Removal and Installation (Cont'd)

⑧ Rear side window (Hardtop)

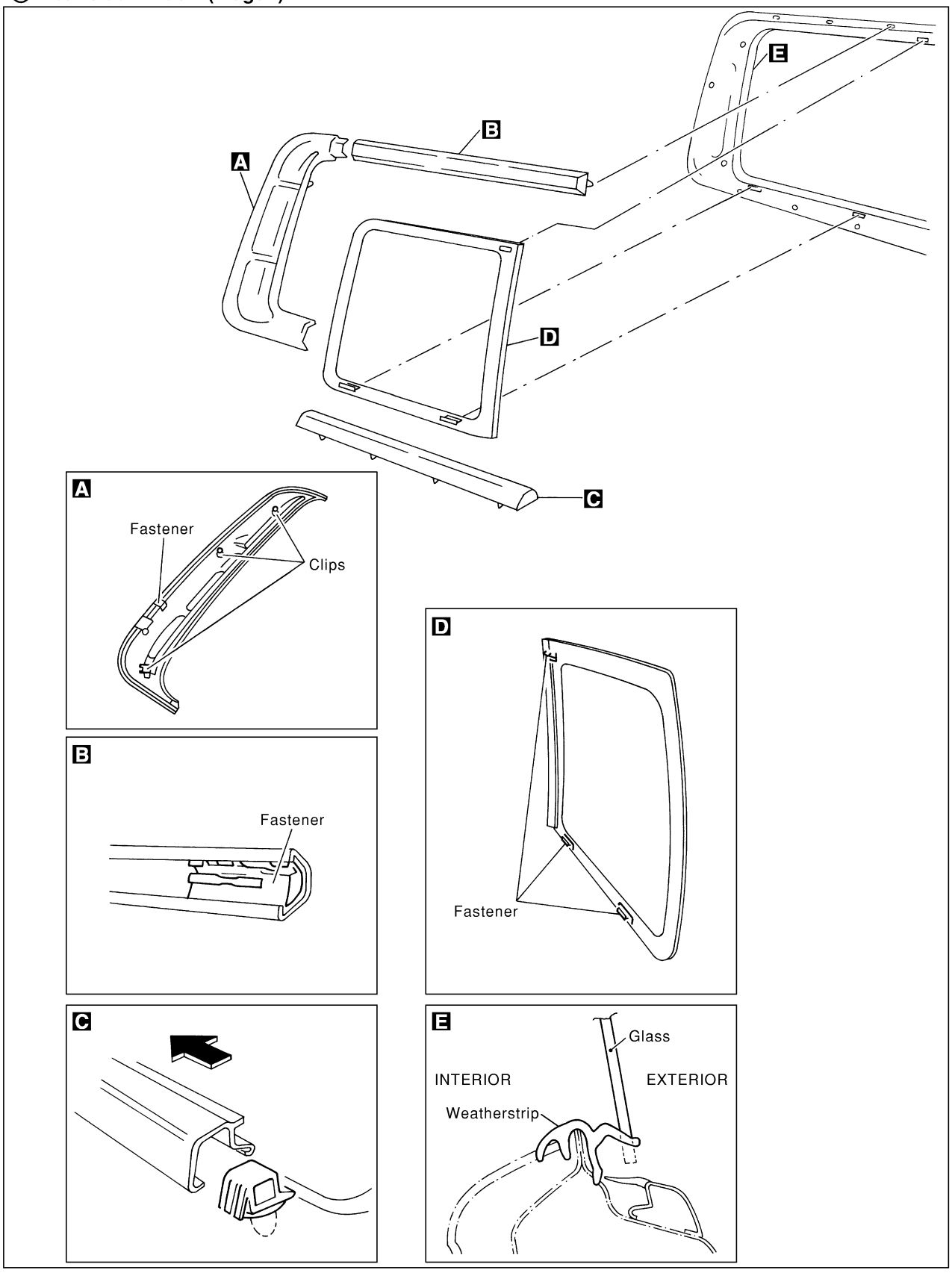


YBT071

http://vnx.su/

Removal and Installation (Cont'd)

⑧ Rear side window (Wagon)

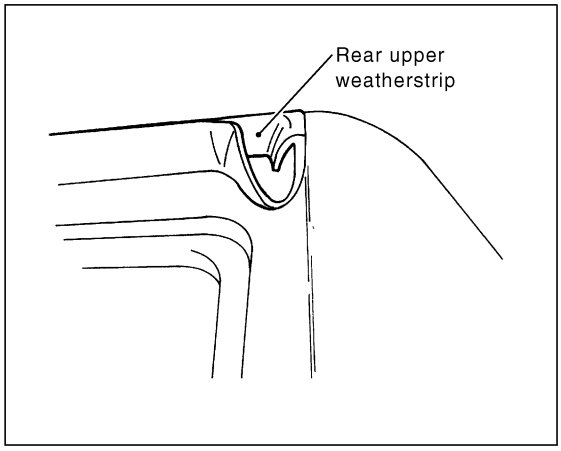


YBT072

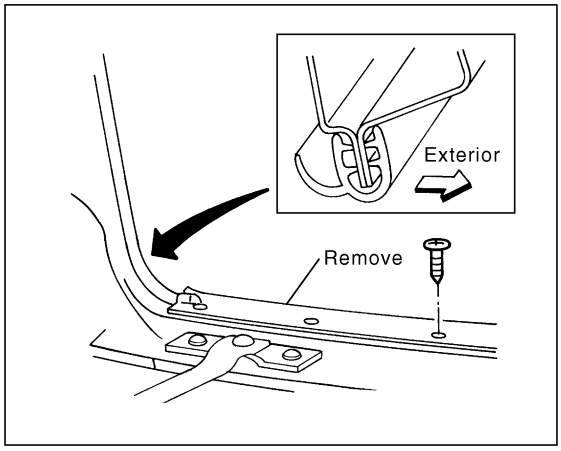
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Removal and Installation (Cont'd)

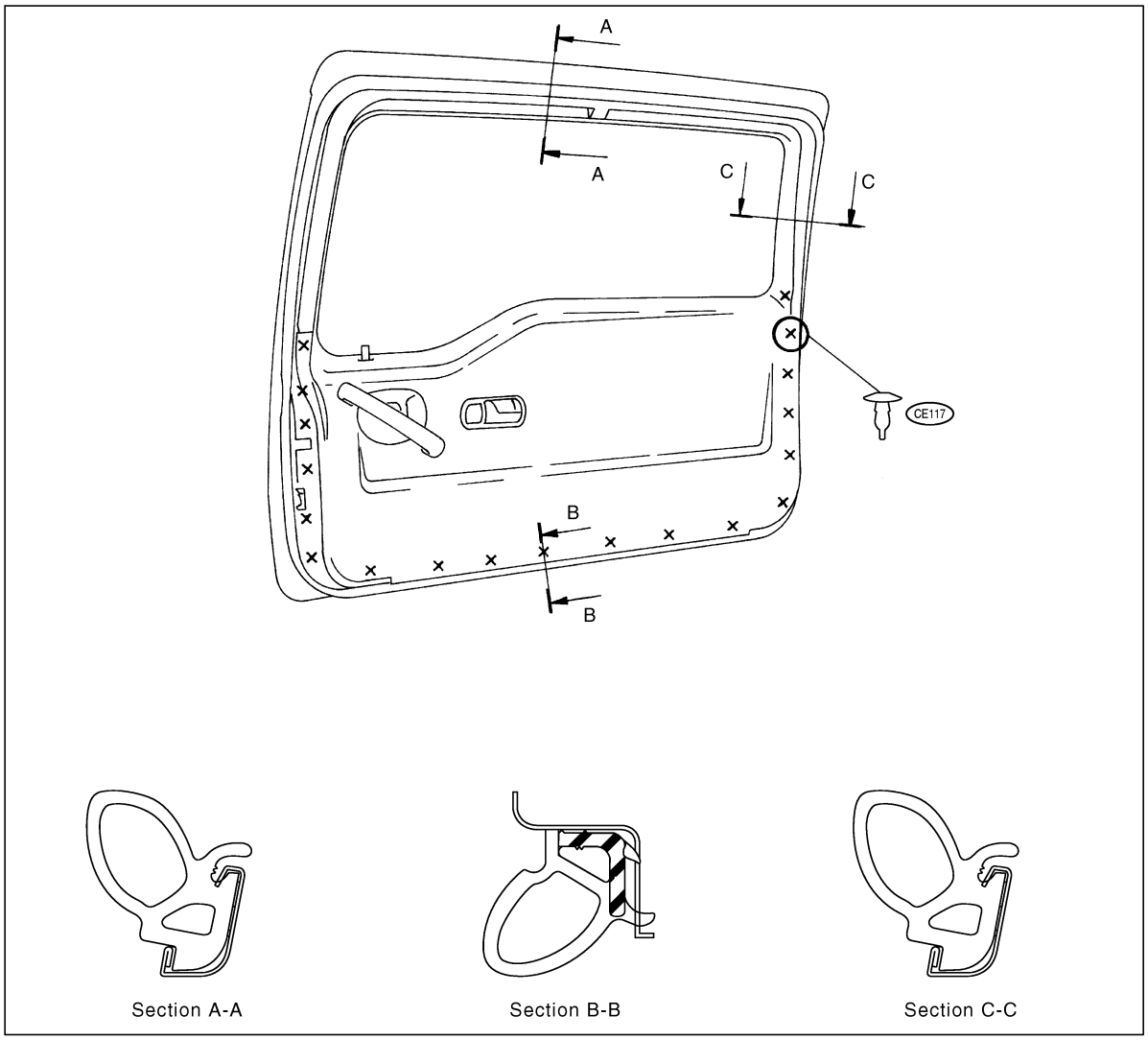
⑪ Rear upper weatherstrip



⑫ Rear lower weatherstrip



⑬ Back door weatherstrip

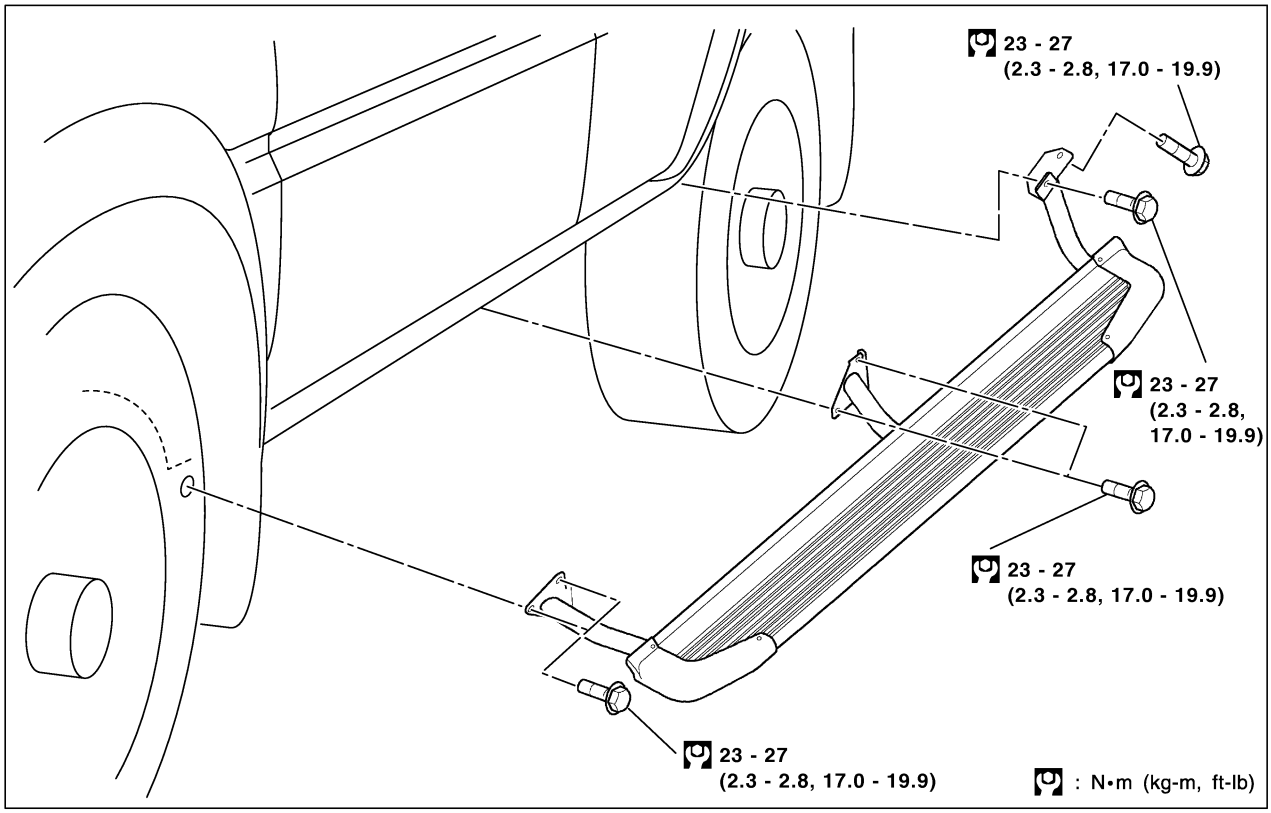


YBT128

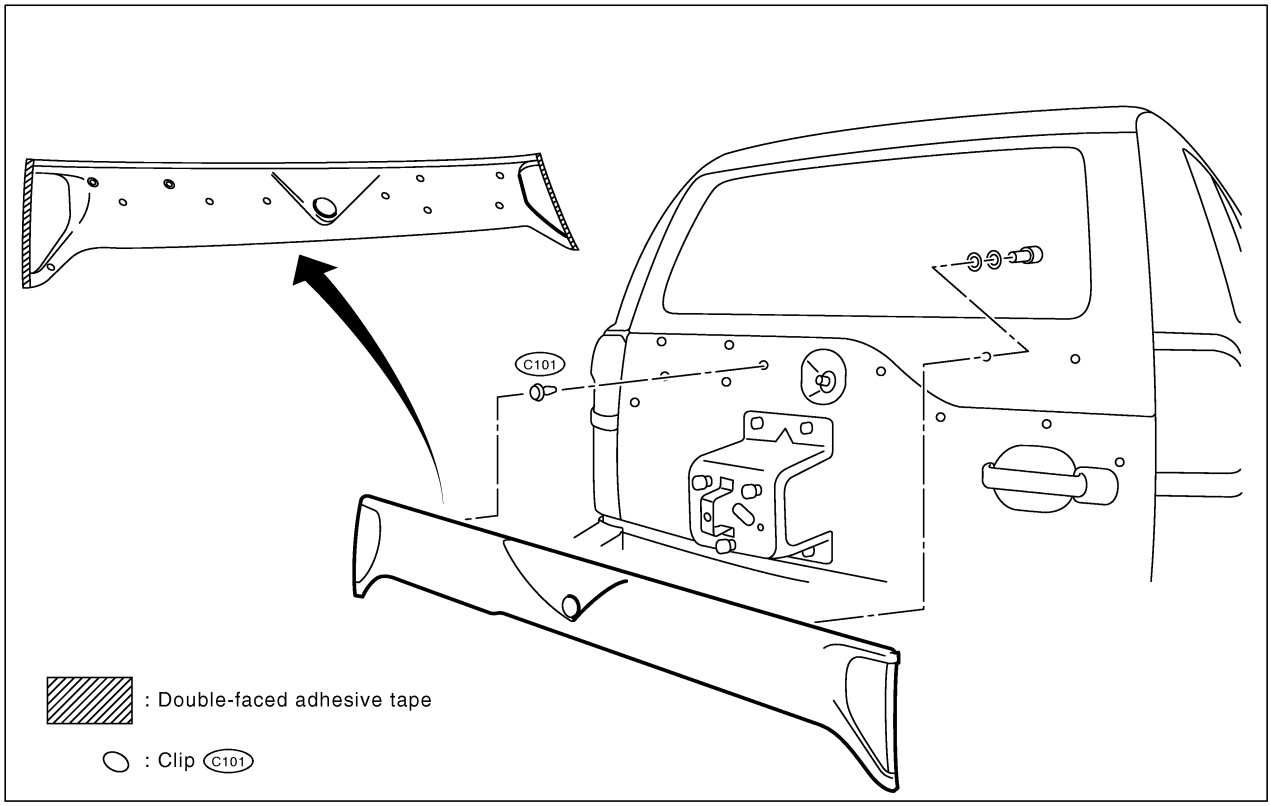
http://vnx.su/

Removal and Installation (Cont'd)

⑭ Side Step



⑮ Back Door Molding

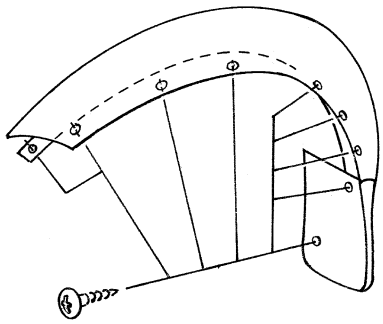


YBT131

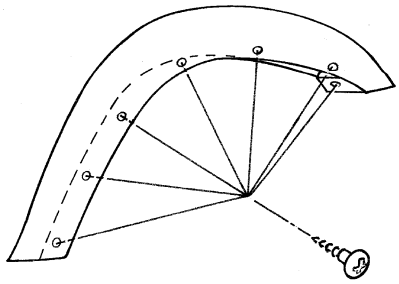
http://vnx.su/

Removal and Installation (Cont'd)

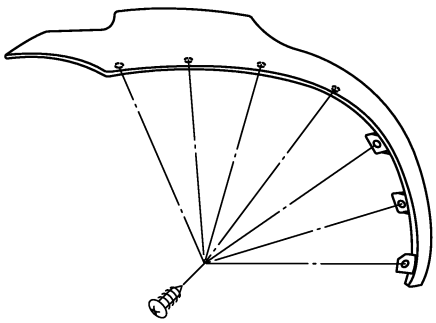
⑯



⑰ HARDTOP



⑰ WAGON

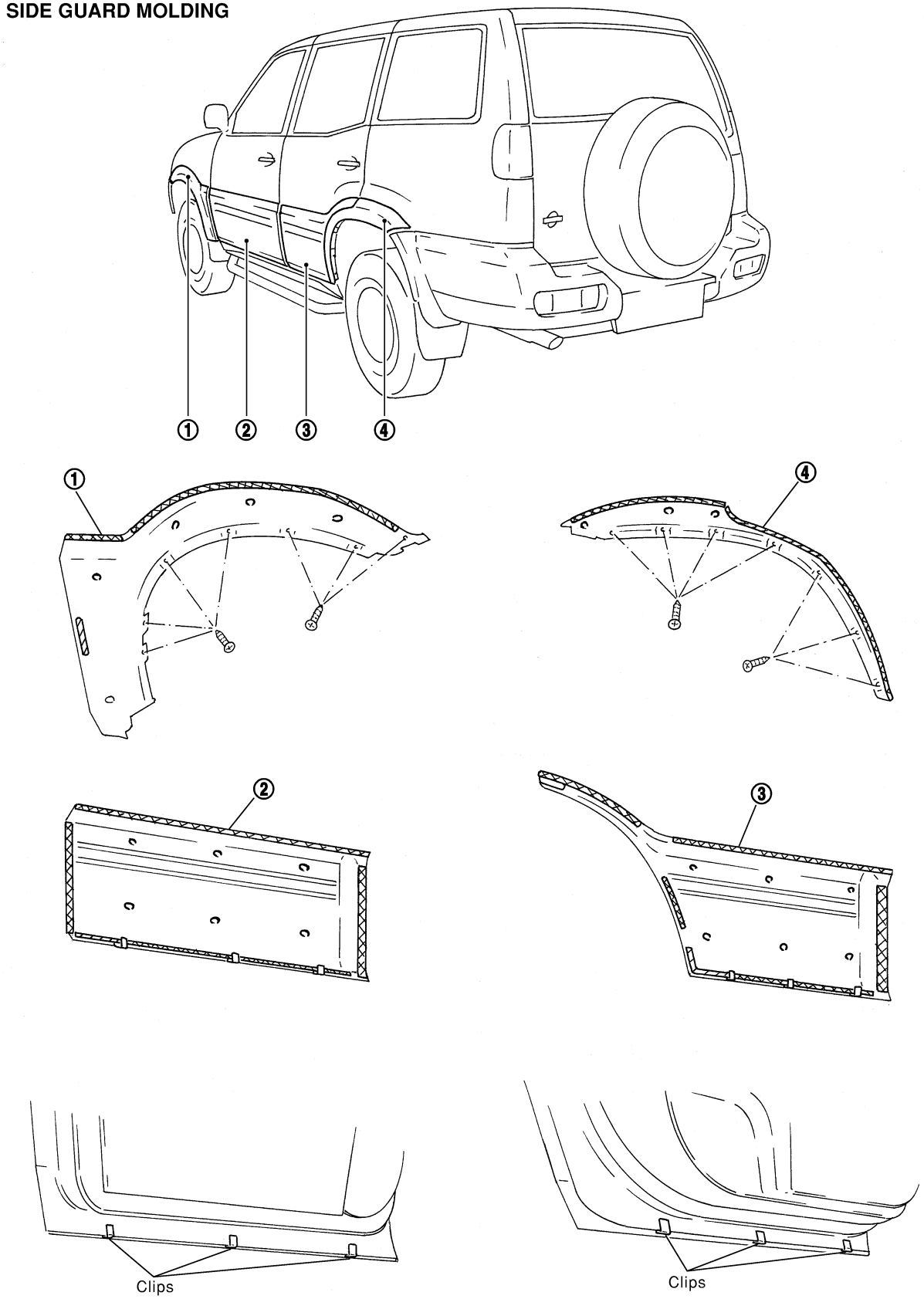


YBT132

http://vnx.su/

Removal and Installation (Cont'd)

⑱ SIDE GUARD MOLDING



▨ : Double-faced adhesive tape
O : Clip: COT

YBT075

http://vnx.su/

Removal and Installation

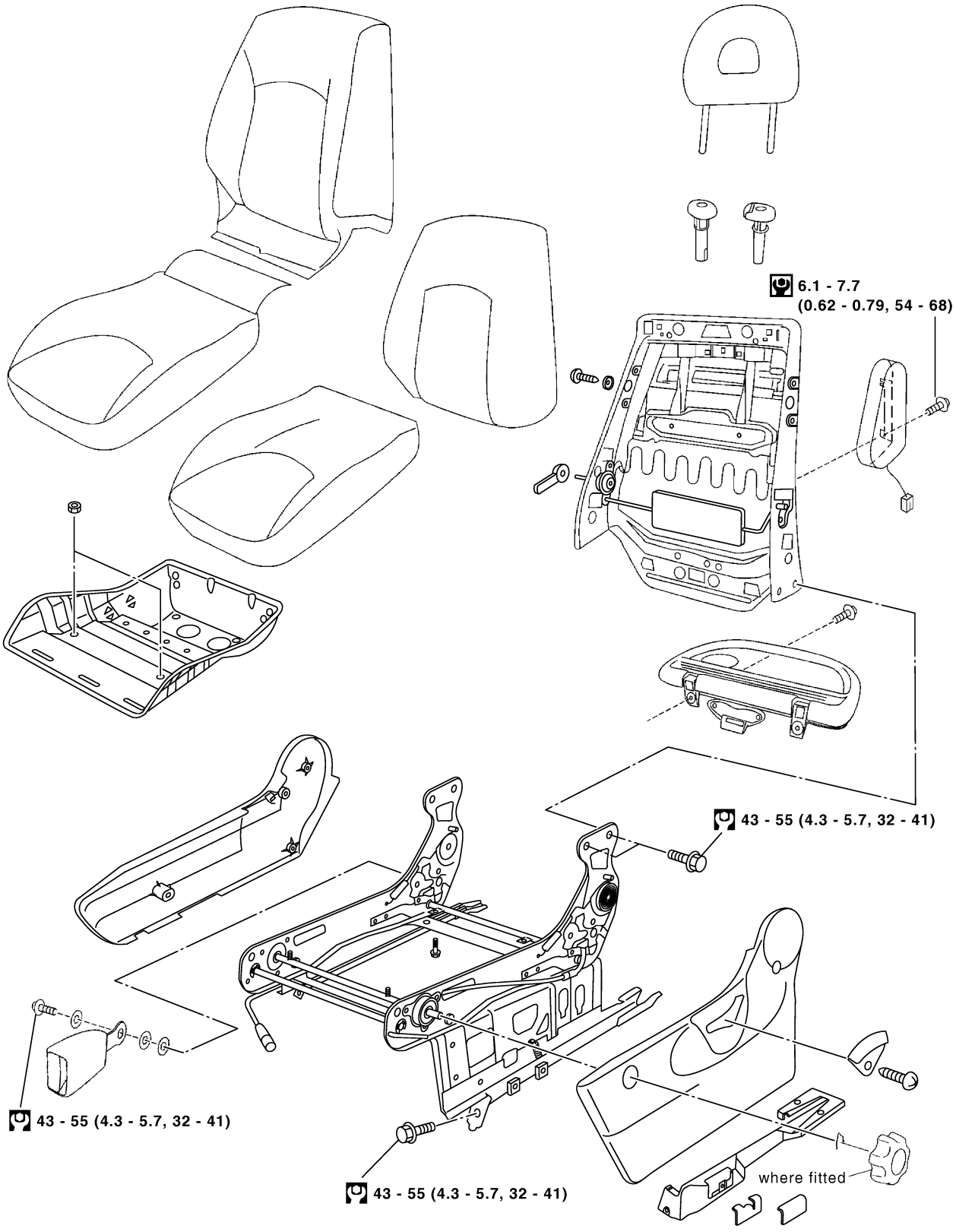
- When removing or installing the seat trim, carefully handle it to keep dirt out and avoid damage.

CAUTION:

- **Before removing the front seat, turn the ignition switch off, disconnect both battery cables and wait at least 3 minutes (models with side air bag).**
- **Do not drop, tilt, or bump the side air bag module installed in the seat. Always handle it with care.**
- **Disconnect the side air bag harness connector and heated seat harness connector from under the seat before removing the seat.**
- **Disconnect the side air bag harness connector before removing the seatback. Refer to RS-29, "Front Side Air Bag Module" for details.**

http://vnx.su/

Removal and Installation (Cont'd)



: N•m (kg-m, ft-lb)

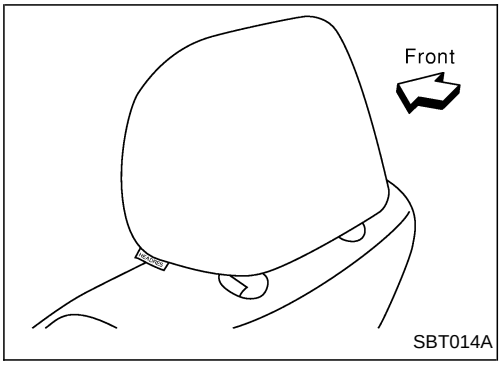
: N•m (kg-m, in-lb)

YBT133

http://vnx.su/

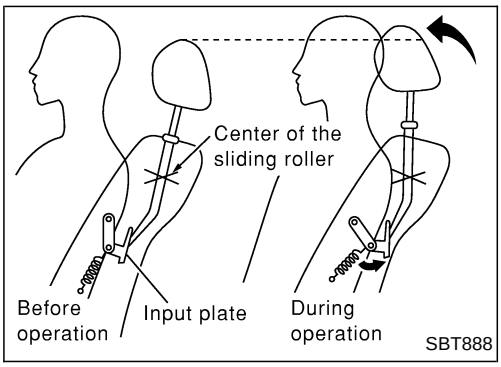
Heated Seat

★ **For Wiring Diagram, refer to EL-151, “HEATED SEAT” for details.**



Active Head Restraint

The active head restraint system is designed so that the headrest instantaneously moves towards the front upper direction by utilizing the force at the seatback during a rear-end collision.
As a result, the occupant’s head is protected from being overextended, reducing the chance for neck injury as much as possible.
Seat with active head restraint have the labels shown in figures at left.



OPERATION OUTLINE

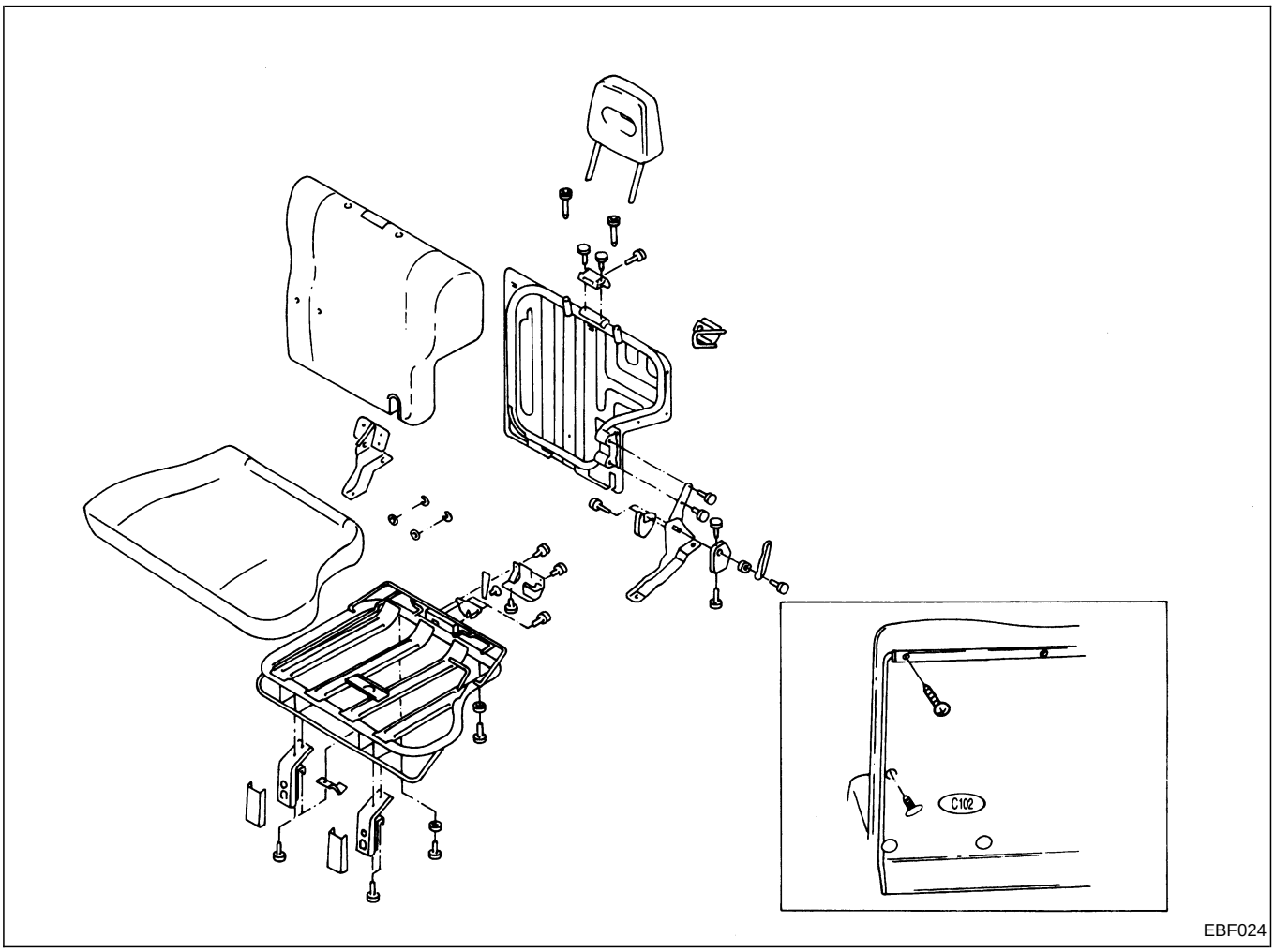
When the seatback receives a sharp backward force during a rear-end collision, the input plate moves with the link rotating center as a pivot. The headrest will then move towards the front upper direction with the center of the sliding roller as a pivot.
As the backward force on the seatback is eliminated, spring tension returns the headrest to its original position.

http://vnx.su/

Removal and Installation

- When removing or installing the seat trim, handle carefully to keep dirt out and avoid damage.

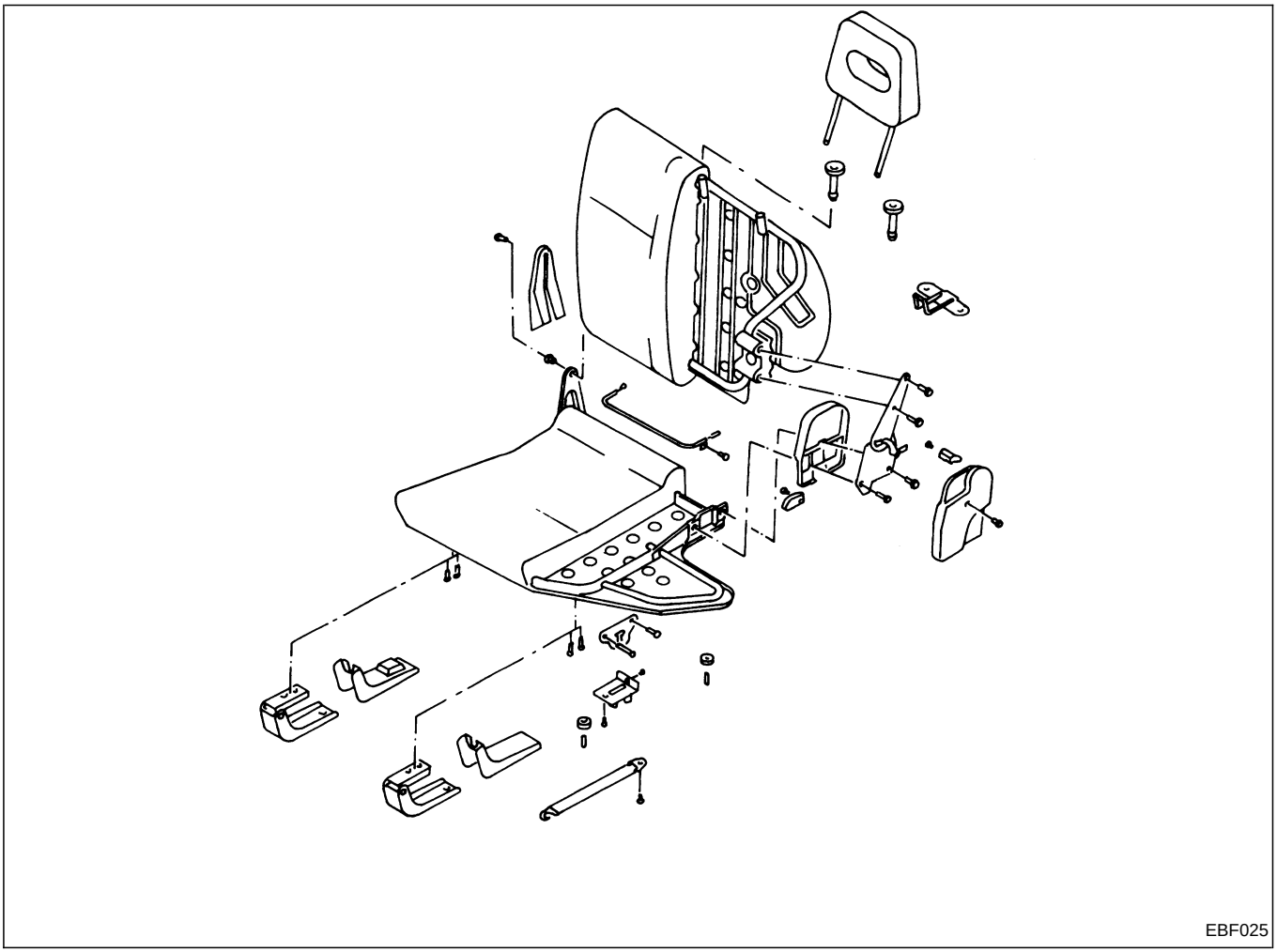
TYPE 1 (HARDTOP)



http://vnx.su/

Removal and Installation (Cont'd)

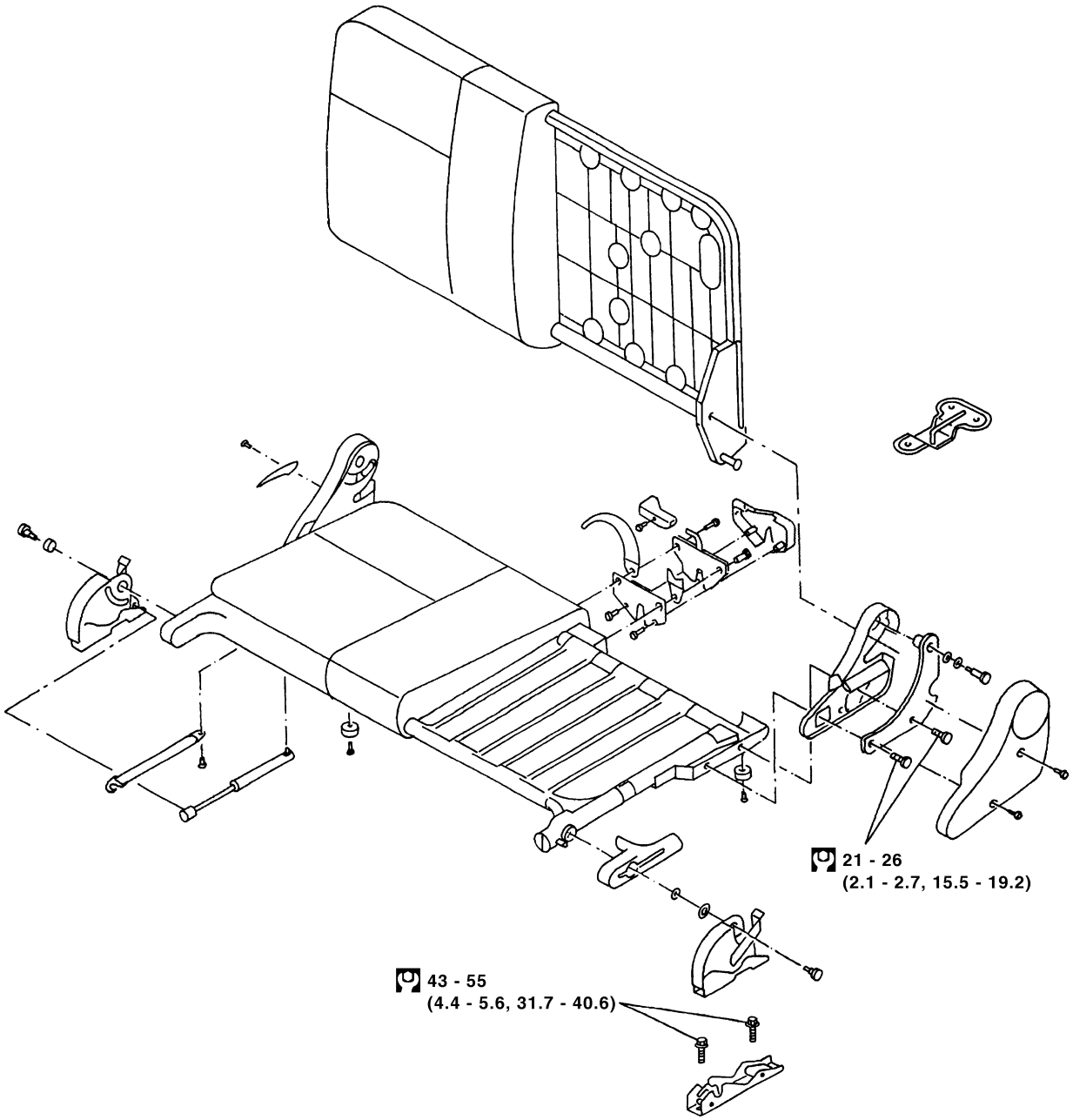
TYPE 2 (WAGON)



EBF025

http://vnx.su/

Removal and Installation



: N•m (kg-m, ft-lb)

YBT126

http://vnx.su/

Removal and Installation

- After any adjustment, check sunroof operation and lid alignment.
- Handle finisher plate and glass lid with care so not to cause damage.
- It is desirable for easy installation to mark each point before removal.

CAUTION:

- **Always work with a helper.**
- **Remove sunroof frame rear door opening.**

SUNROOF LID ASSEMBLY

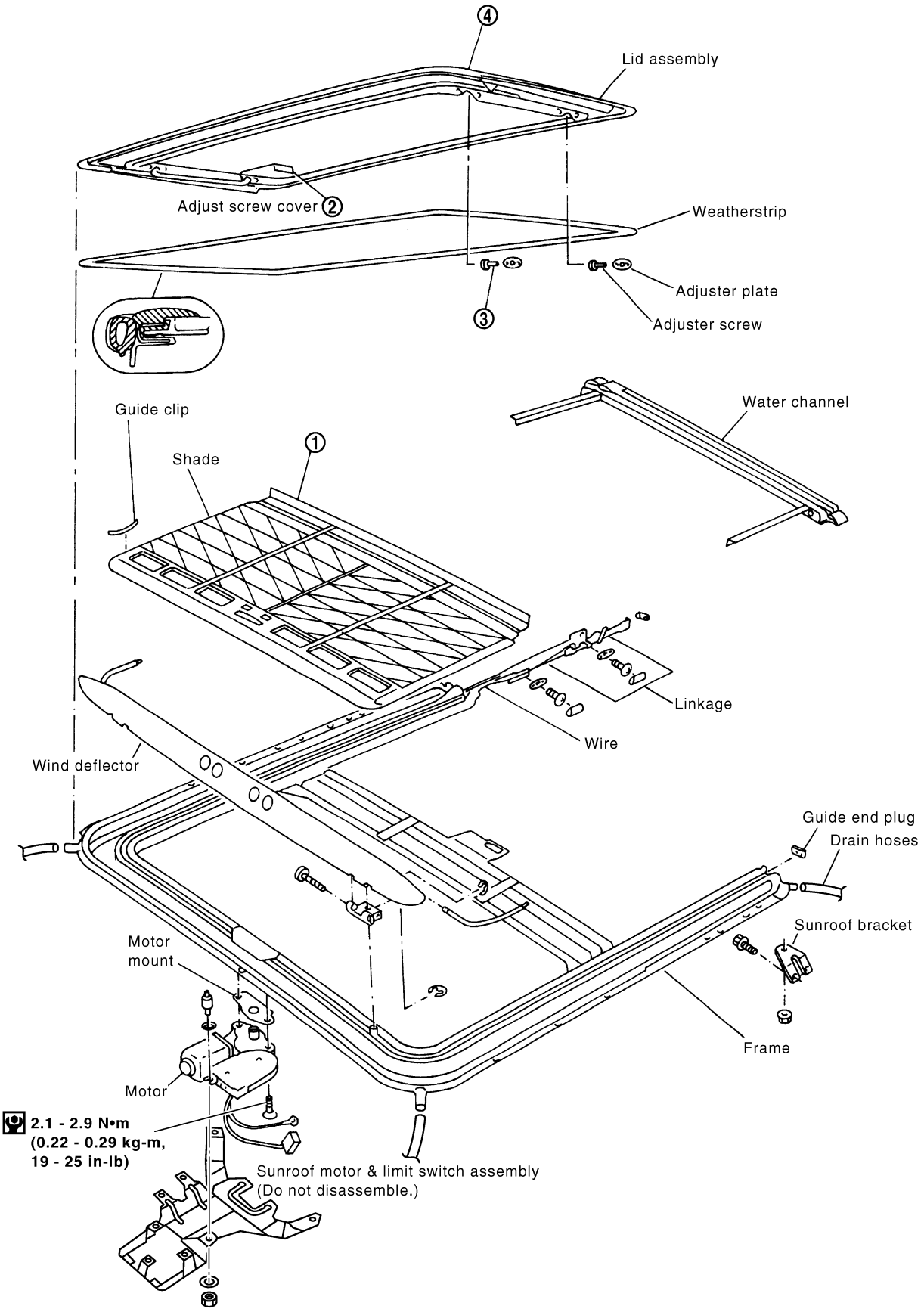
① Open sunroof shade.
② Close sunroof lid, and remove adjustment screw covers.
③ Remove the four adjuster screws
④ Remove sunroof lid assembly.

SUNROOF ASSEMBLY

1. Remove headlining. For details, refer to “ROOF TRIM”, BT-20.
2. Disconnect interior lamp harness.
3. Disconnect front and rear drain hoses.
4. Remove nuts and bolts securing sunroof frame and motor to roof.
5. Remove sunroof assembly.

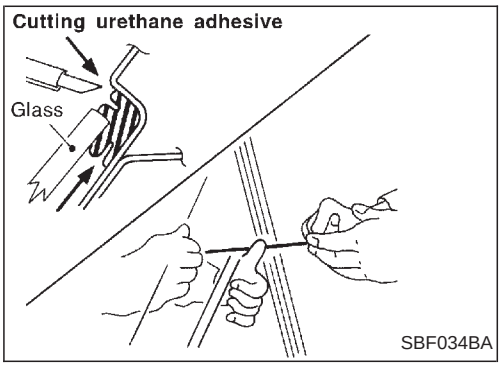
http://vnx.su/

Removal and Installation (Cont'd)



YBT127

http://vnx.su/



Removal and Installation

REMOVAL

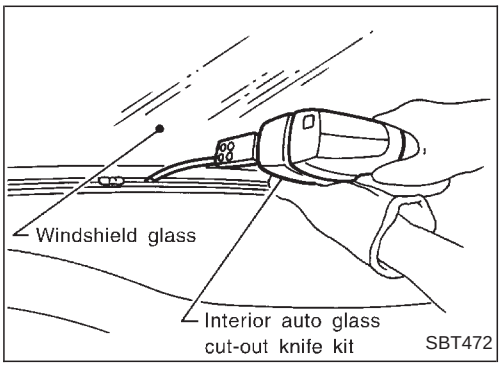
After removing moldings, remove glass using piano wire or power cutting tool and an inflatable pump bag.

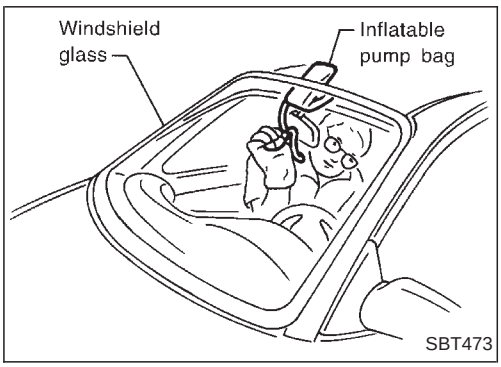
WARNING:

When cutting the glass from the vehicle, always wear safety glasses and heavy gloves to help prevent glass splinters from entering your eyes or cutting your hands.

CAUTION:

- **Be careful not to scratch the glass when removing.**
- **Do not set or stand the glass on its edge. Small chips may develop into cracks.**





INSTALLATION

- **Use a genuine Nissan Urethane Adhesive Kit or equivalent and follow the instructions furnished with it.**
- **While the urethane adhesive is curing, open a door window. This will prevent the glass from being forced out by passenger compartment air pressure when a door is closed.**
- **The molding must be installed securely so that it is in position and leaves no gap.**
- **Inform the customer that the vehicle should remain stationary until the urethane adhesive has completely cured (preferably 24 hours). Curing time varies with temperature and humidity.**

WARNING:

- **Keep heat and open flames away as primers and adhesive are flammable.**
- **The materials contained in the kit are harmful if swallowed, and may irritate skin and eyes. Avoid contact with the skin and eyes.**
- **Use in an open, well ventilated location. Avoid breathing the vapors. They can be harmful if inhaled. If affected by vapor inhalation, immediately move to an area with fresh air.**
- **Driving the vehicle before the urethane adhesive has completely cured may affect the performance of the windshield in case of an accident.**

CAUTION:

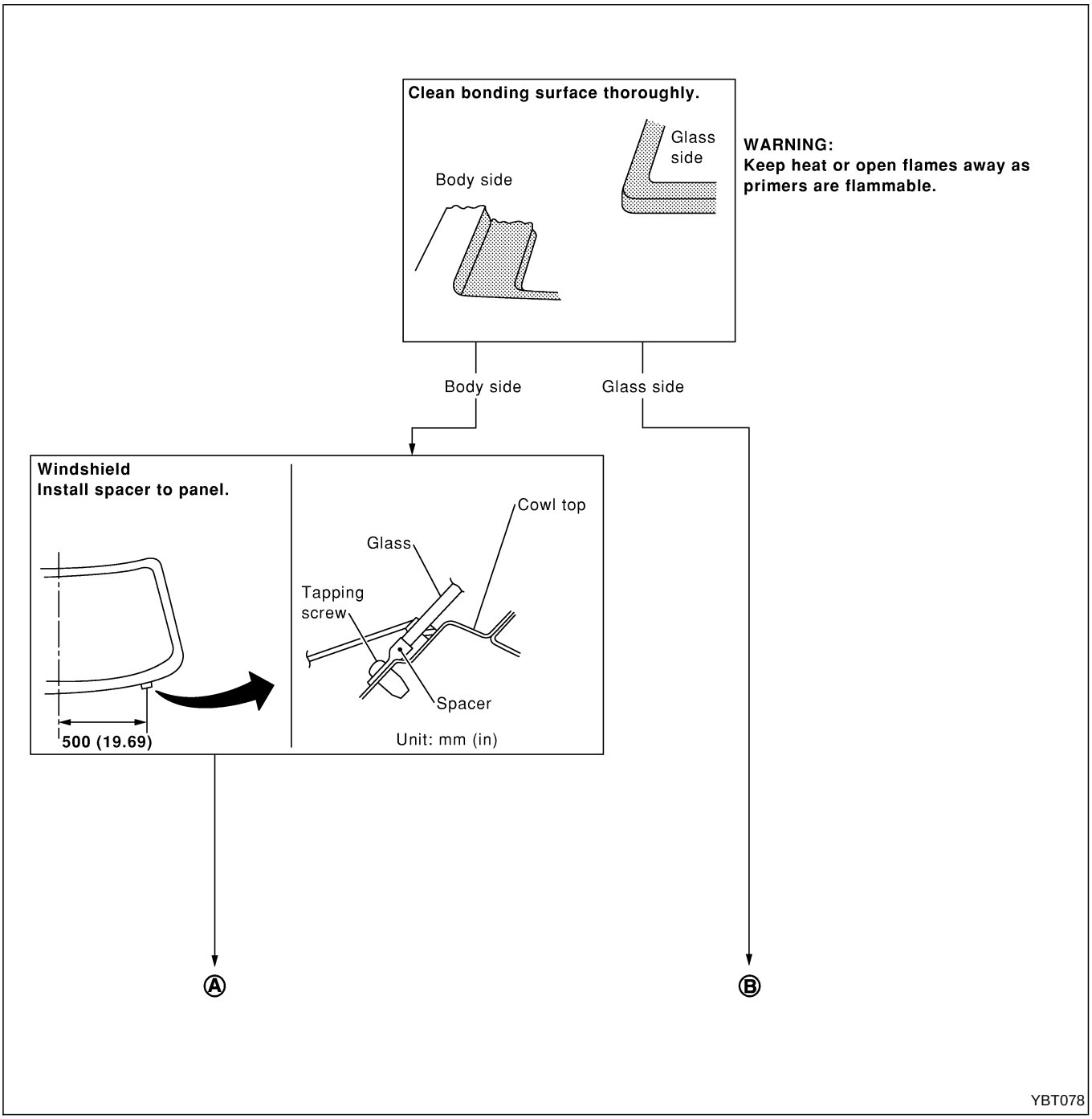
- **Do not use an adhesive which is past its usable term. Shelf life of this product is limited to six months after the date of manufacture. Carefully adhere to the expiration or manufacture date printed on the box.**
- **Keep primers and adhesive in a cool, dry place. Ideally, they should be stored in a refrigerator.**
- **Do not leave primers or adhesive cartridge unattended with their caps open or off.**
- **The vehicle should not be driven for at least 24 hours or**

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Removal and Installation (Cont'd)

until the urethane adhesive has completely cured. Curing time varies depending on temperature and humidities. The curing time will increase under higher temperatures and lower humidities.

WINDSHIELD, REAR SIDE WINDOW AND BACK DOOR WINDOW



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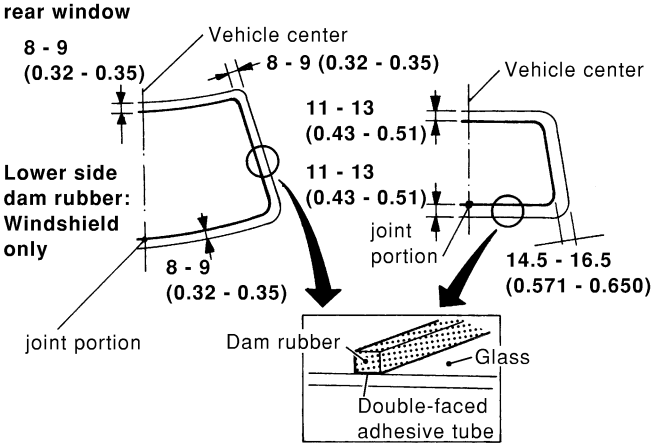
Removal and Installation (Cont'd)

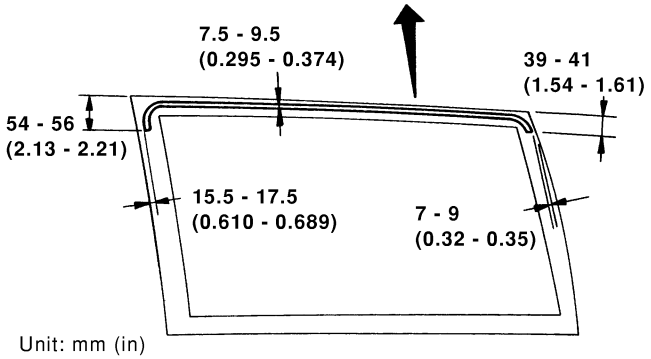
Ⓐ

Ⓑ

Install dam rubber.
Windshield and rear window

Back door window

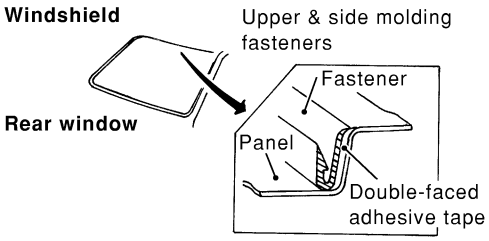




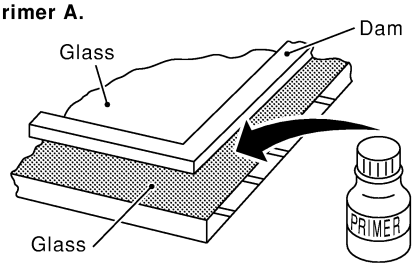
Unit: mm (in)

Install molding fastener.

When installing it, heat body panel and fastener to approx. 30 to 40°C (86 to 104°F).

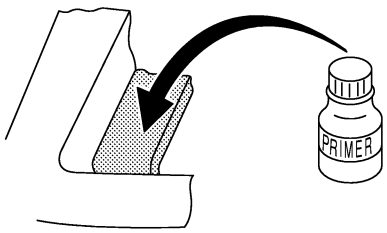


Apply primer A.

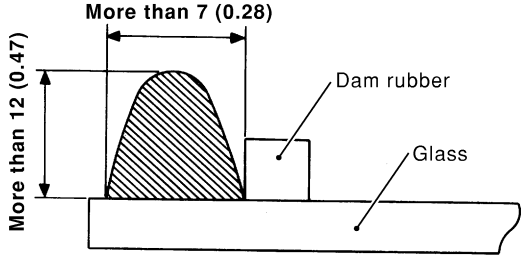


CAUTION:
Allow primers to dry for 10 to 15 minutes before proceeding to the next step.

Apply primer E.



Apply sealant evenly.



Unit: mm (in)

Ⓒ

YBT079

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Removal and Installation (Cont'd)

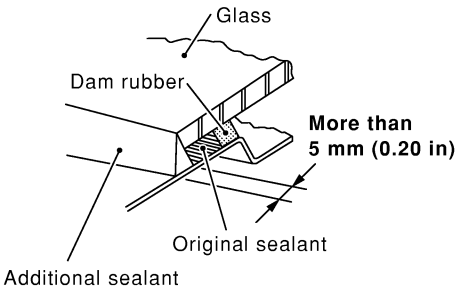
CAUTION:
Allow primers to dry for 10 to 15 minutes before proceeding to the next step.

Ⓒ

Set glass in position and press glass lightly and evenly.

CAUTION:
Windshield glass should be installed within 15 minutes of applying sealant: sealant starts to harden 15 minutes after it is applied.

Apply additional sealant uniformly to the lower portion of glass, as shown below:



Check for water leakage.

CAUTION:
For sealant drying period, refer to "Drying Time for Sealant". *1

Apply sealant to upper & side molding fixing portion.

Set upper and side moldings.

CAUTION:
Molding must be installed securely so that it is in position and leaves no gap.

For details of moldings, refer to "Exterior". *2

Install lower molding.

YBT080

*1 BT-46

*2 BT-21

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Removal and Installation (Cont'd)

DRYING TIME FOR SEALANT

- Reference: Time required for sealant to dry to desired hardness.

CAUTION:

Advise the user of the fact that vehicle should not be driven on rough roads or surfaces until sealant has properly vulcanized.

Unit: days

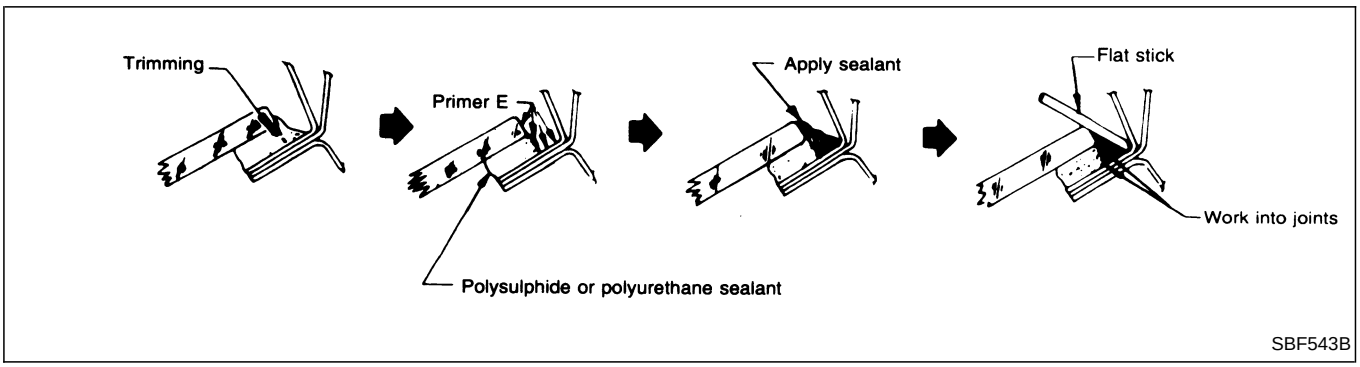
Relative humidity % / Temperature °C (°F)	Windshield and Rear window			Back door window		
	90	50	25	90	50	25
40 (104)	1.5	2.5	5.0	1.5	2.5	5.5
25 (77)	2.5	4.0	7.5	2.5	4.5	8.5
5 (41)	5.0	13.0	20.5	5.5	14.0	22.0

REPAIRING WATER LEAKS FOR WINDSHIELD

Leaks can be repaired without removing and reinstalling glass.

If water is leaking between the urethane adhesive material and body or glass, determine the extent of leakage. This can be done by applying water to the windshield area while pushing glass outward.

To stop the leak, apply primer (if necessary) and then urethane adhesive to the leak point.

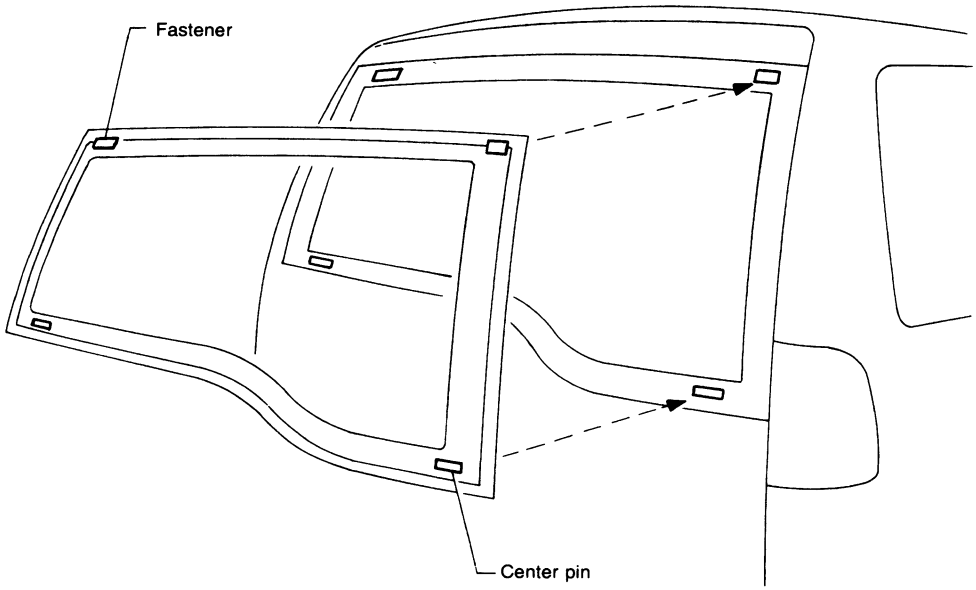


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Removal and Installation (Cont'd)

BACK DOOR WINDOW

- Window glass is held in place by weatherstrip. Refer to "EXTERIOR", BT-21.
- Apply sealer to clearances between vehicle body panel and weatherstrip as necessary.



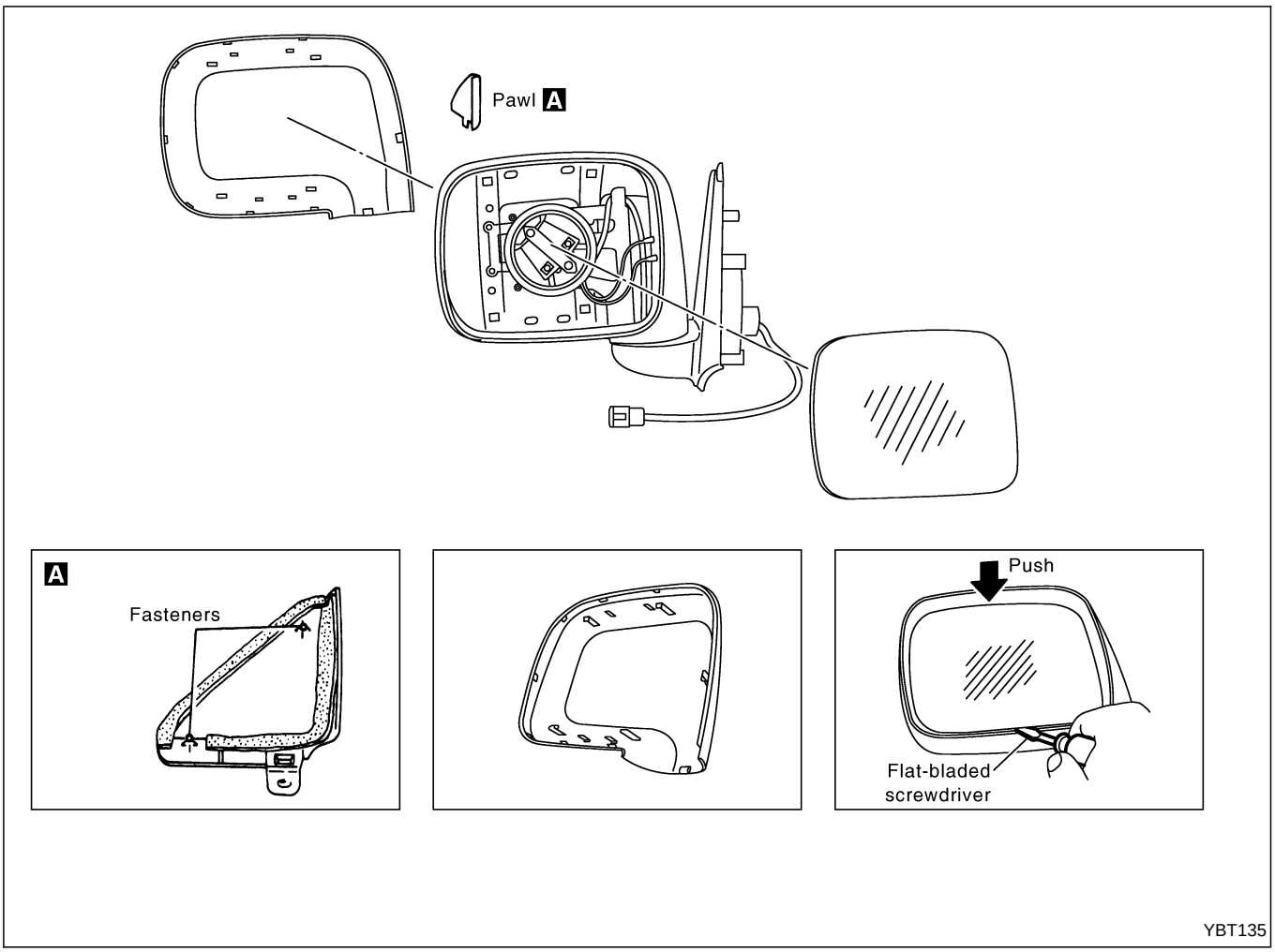
EBF030

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Removal and Installation

CAUTION:
Be careful not to scratch door rearview mirror body.
★ For Wiring Diagram, refer to EL-275, “DOOR MIRROR” for details.

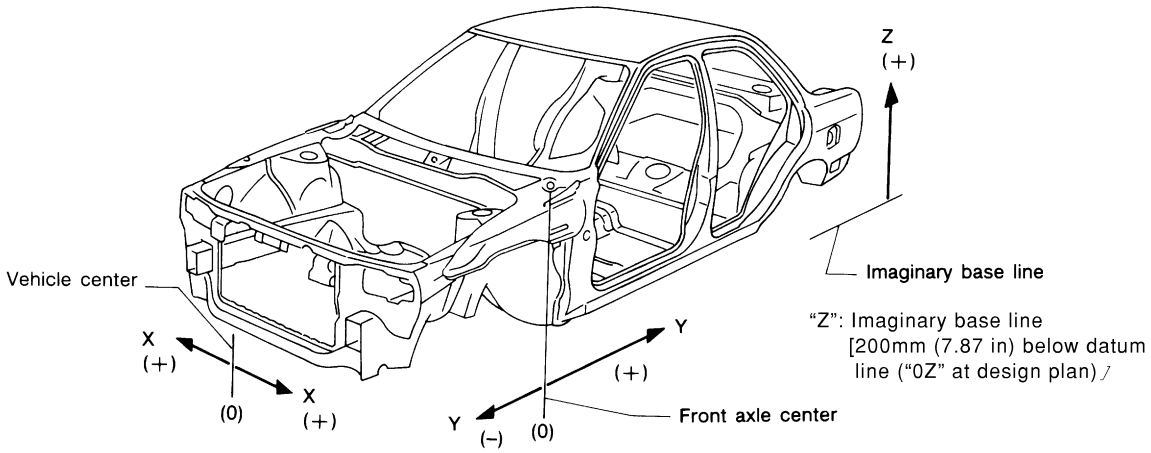
1. Remove door trim. Refer to “DOOR TRIM”, BT-19.
2. Remove inner cover front corner of door.
3. Disconnect door mirror harness connector.
4. Remove harness clips.
5. Remove bolts securing door mirror assembly.



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Alignment

- All dimensions indicated in figures are actual ones.
- When using a tracking gauge, adjust both pointers to equal length. Then check the pointers and gauge itself to make sure there is no free play.
- When a measuring tape is used, check to be sure there is no elongation, twisting or bending.
- Measurements should be taken at the center of the mounting holes.
- An asterisk (*) following the value at the measuring point indicates that the measuring point on the other side is symmetrically the same value.
- The coordinates of the measurement points are the distances measured from the standard line of “X”, “Y” and “Z”.



YBT089

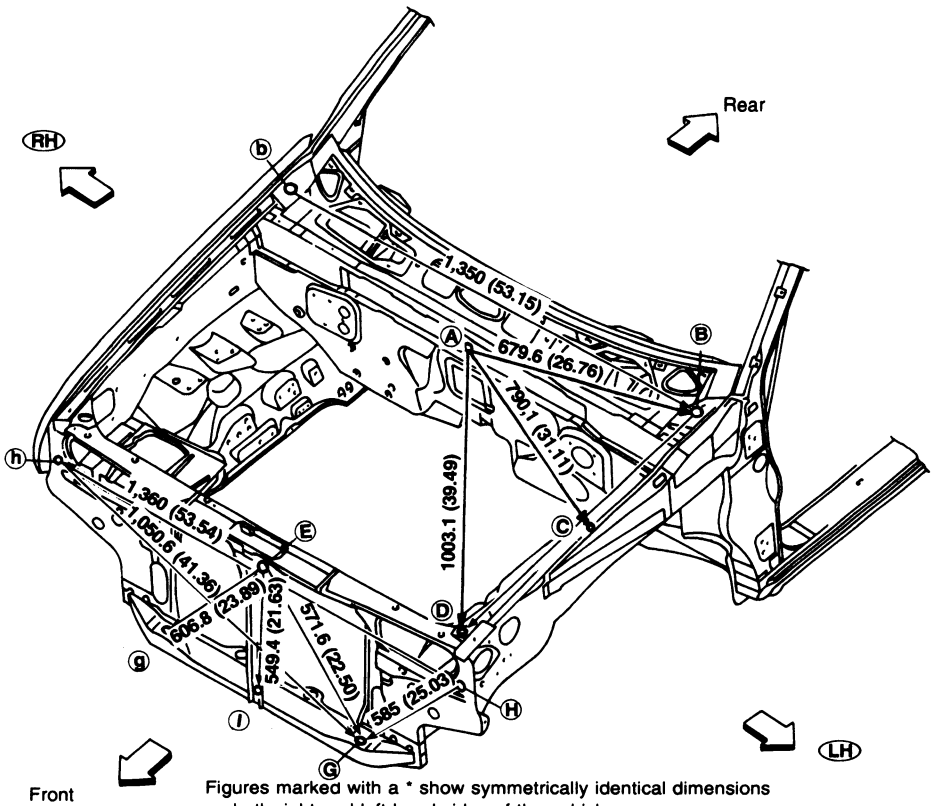
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Alignment (Cont'd)

ENGINE COMPARTMENT

Measurement

Unit: mm (in)



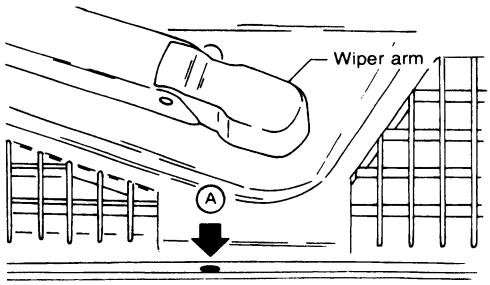
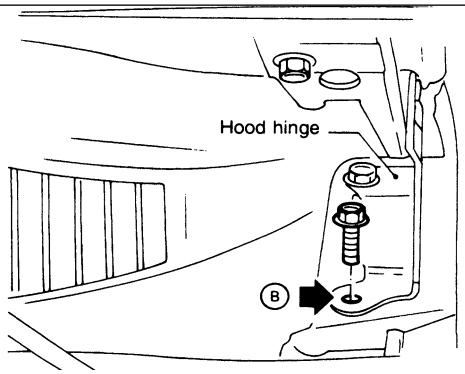
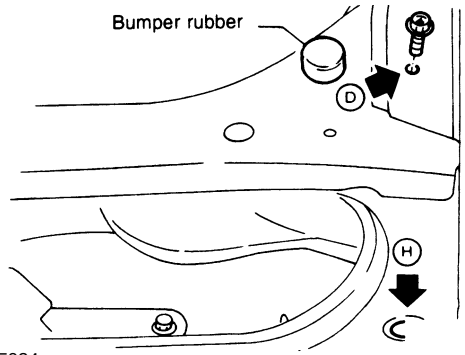
Figures marked with a * show symmetrically identical dimensions on both right and left hand sides of the vehicle.

NBF021

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Alignment (Cont'd)

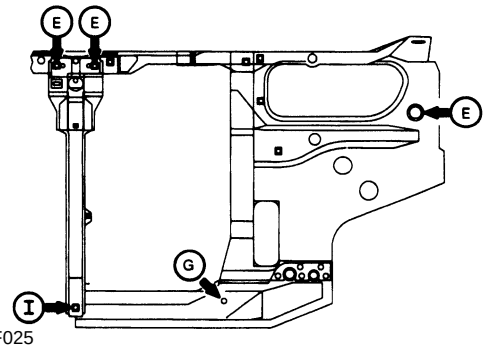
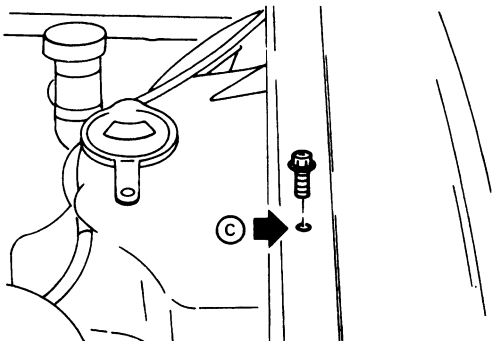
Detailed Measurement Points

Points	Hole dia. mm (in)	Detailed points		Coordinates mm (in)		
				"X"	"Y"	"Z"
Ⓐ	8 (0.32)	 NBF022	Cowl top hole at vehicle center	0.0 (0.00)	250.0 (9.84)	760.9 (29.96)
Ⓑ ⓑ	11 (0.43)	 NBF023	Cowl top side hole	698.5 (27.50)	−110.1 (−4.34)	624.7 (24.59)
Ⓓ ⓓ	8 (0.32)	 NBF024	Upper radiator core support location hole	691.0 (27.20)	−459.5 (−18.09)	548.0 (21.58)
Ⓗ ⓗ	16 (0.63)		Side radiator core support location hole	680.0 (26.77)	−551.7 (−21.72)	400.0 (15.75)

① : Coordinate indicated is (LH), (RH) coordinate is - (LH) coordinate.
E.g. if (LH) coordinate is: 698.5, (RH) coordinate is: −698.5.

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Alignment (Cont'd)

Points	Hole dia. mm (in)	Detailed points		Coordinates mm (in)		
				"X"	"Y"	"Z"
Ⓔ	9 (0.35)	 NBF025	Hood lock stay mounting hole on upper radiator core support	37.0 (1.46)	−589.0 (−23.19)	494.0 (19.45)
Ⓘ			Lower radiator core support mounting hole	0.0 (0.00)	−581.1 (−22.88)	−54.1 (−2.13)
Ⓖ ⓖ	12 (0.47)		Lower radiator core support location hole	280.0 (11.02)	−608.9 (−23.97)	−23.0 (−0.91)
Ⓒ ⓒ	7.2 (0.28)	 NBF027	Front fender mounting hole on hoodledge	698.5 (27.50)	−110.1 (−4.34)	624.7 (24.59)

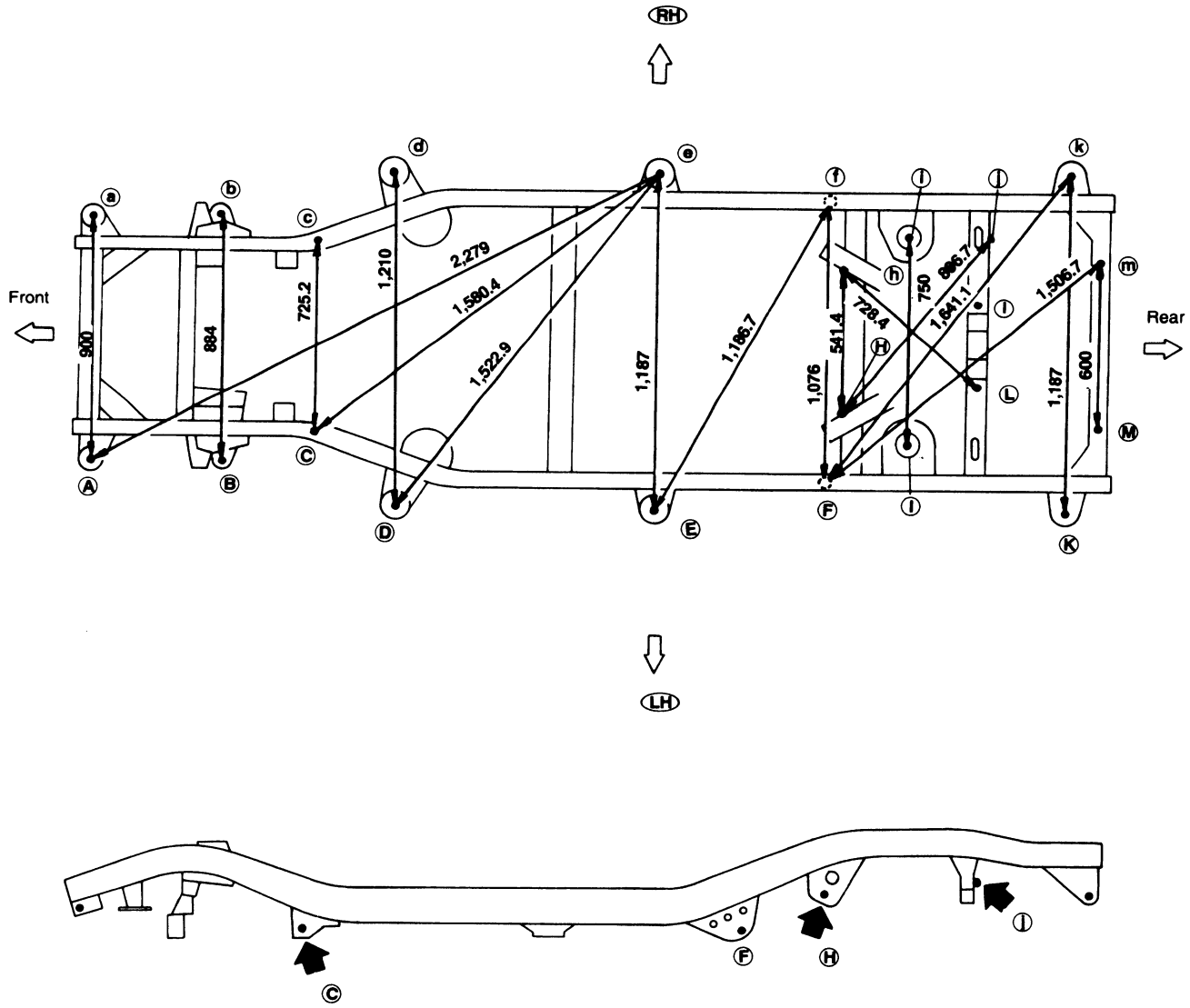
① : Coordinate indicated is (LH), (RH) coordinate is - (LH) coordinate.
E.g. if (LH) coordinate is: 698.5, (RH) coordinate is: −698.5.

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Alignment (Cont'd)

UNDERBODY

Measurement (Hardtop model)

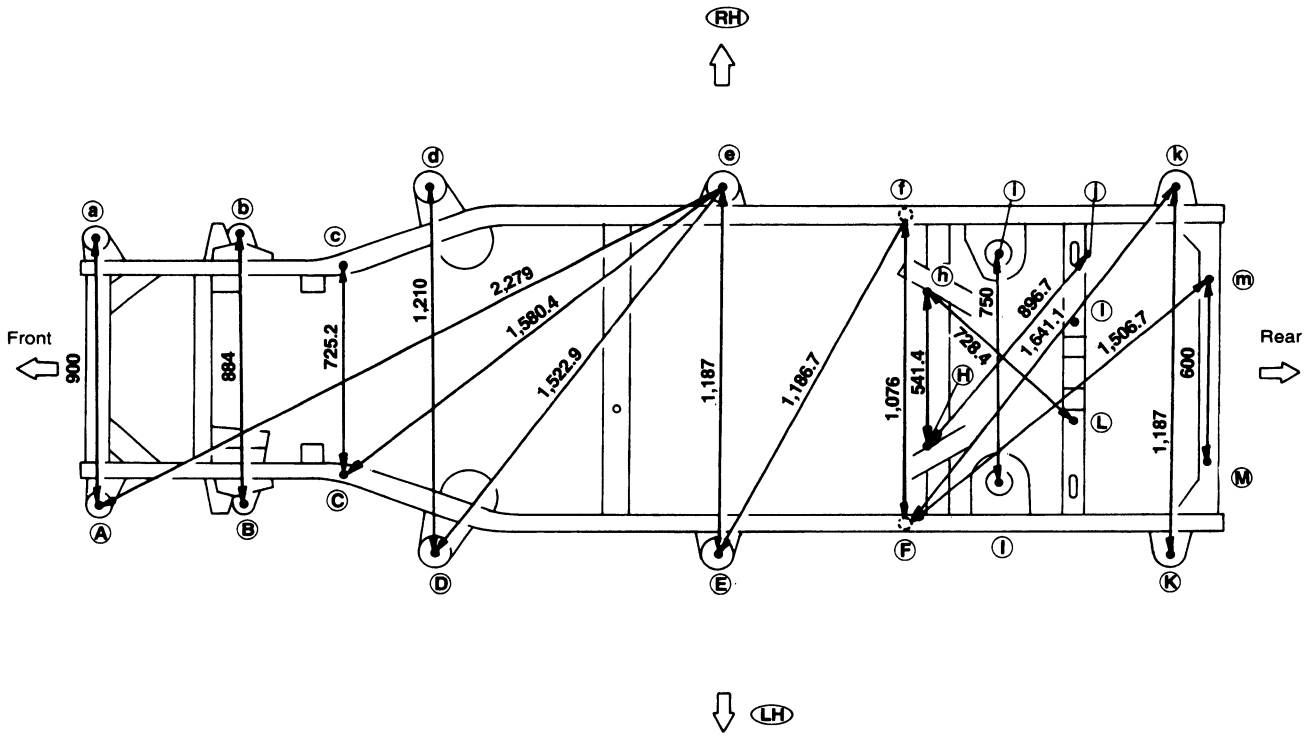


Unit: mm

NBF028

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Alignment (Cont'd)



Unit: mm

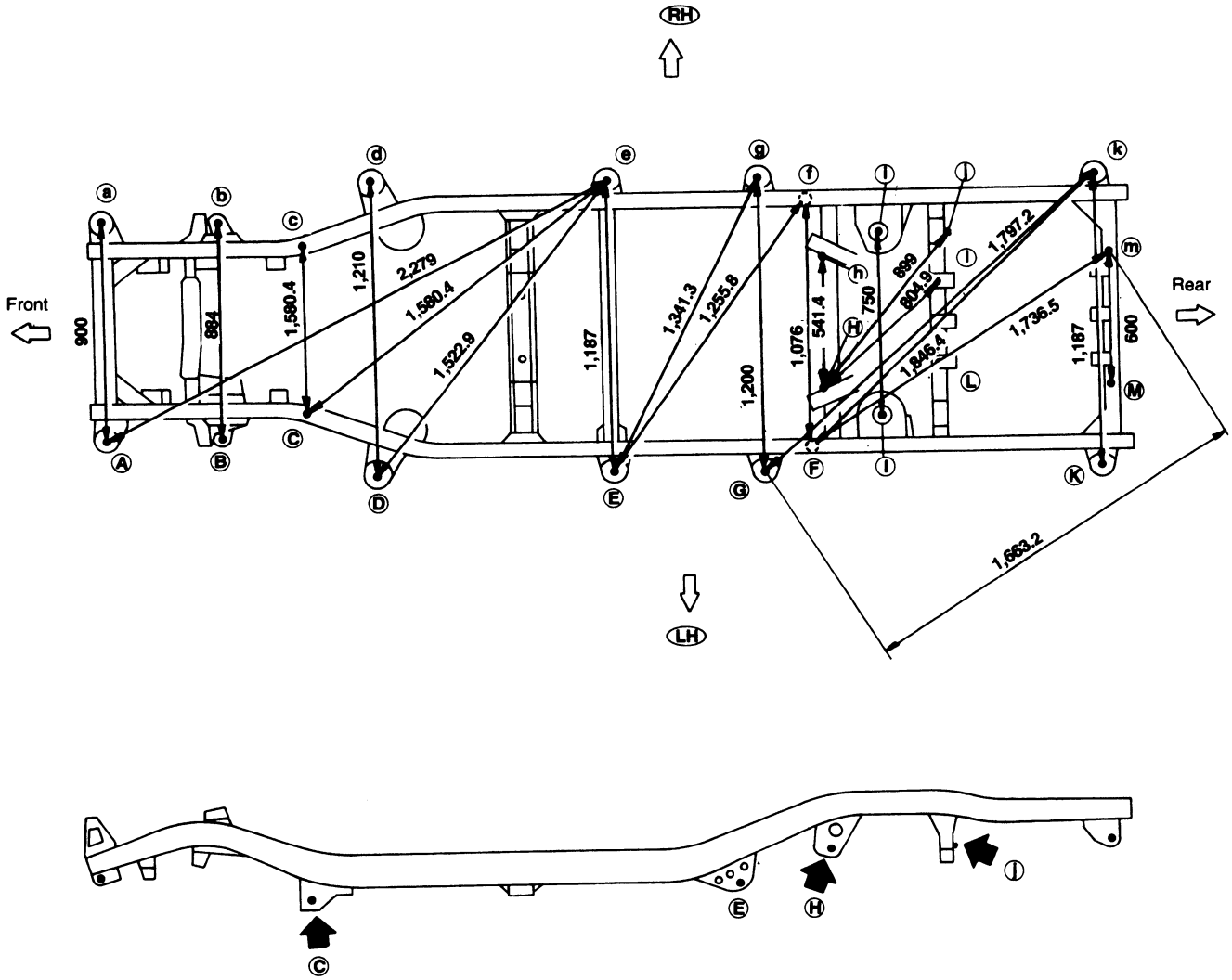
NBF029

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Alignment (Cont'd)

UNDERBODY

Measurement (Wagon model)

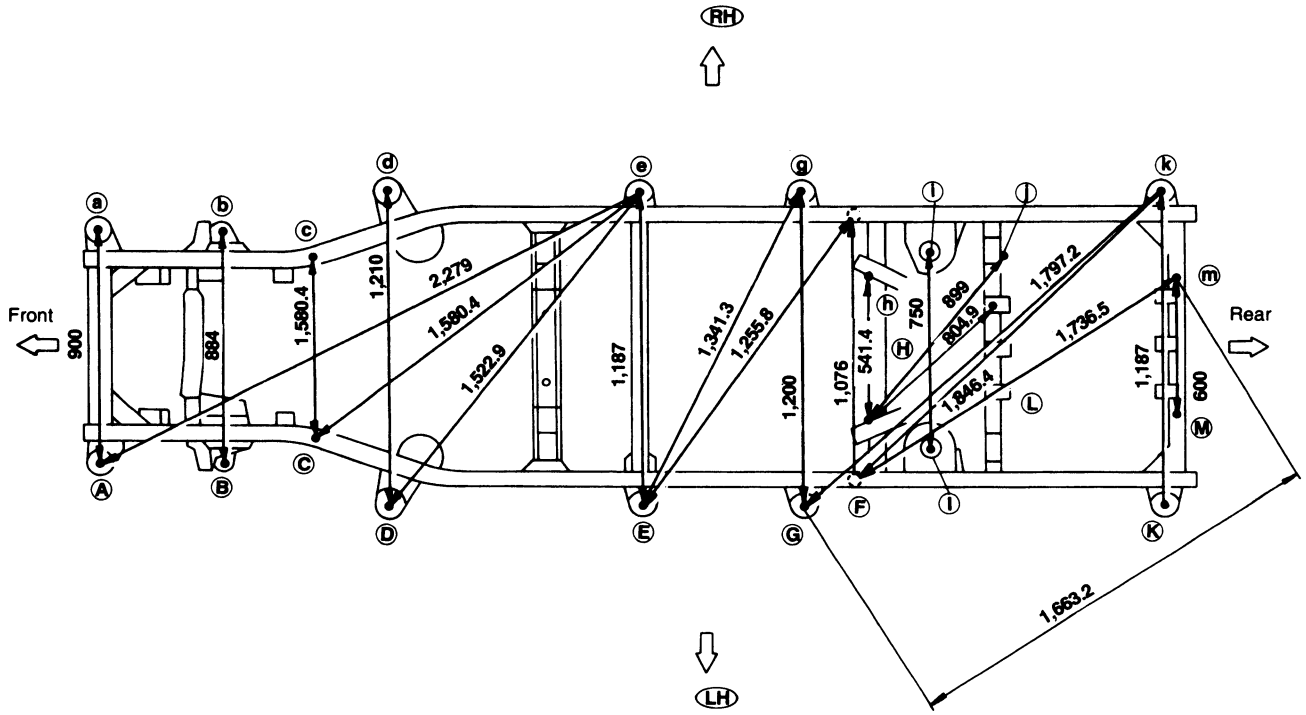


Unit: mm

NBF030

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Alignment (Cont'd)



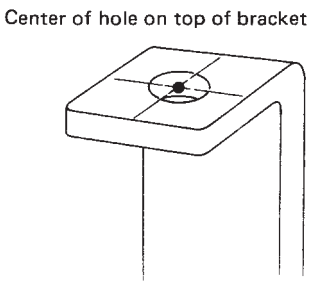
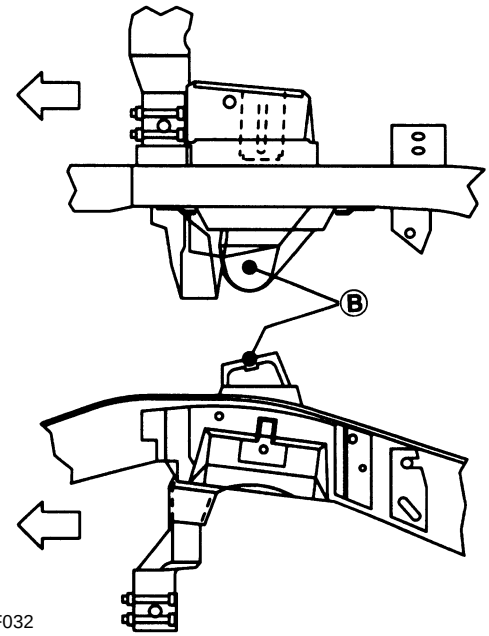
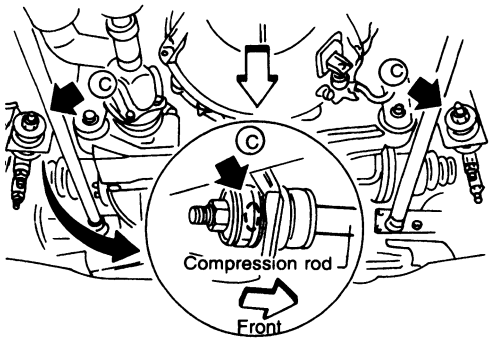
Unit: mm

NBF031

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Alignment (Cont'd)

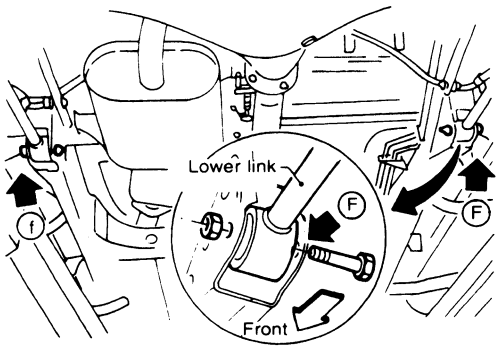
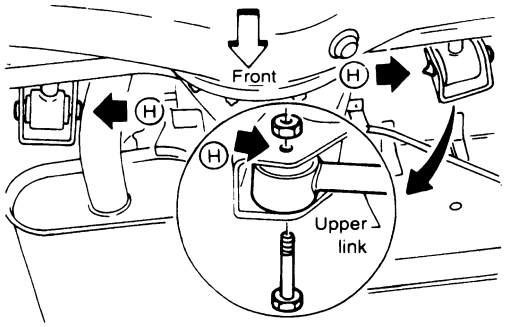
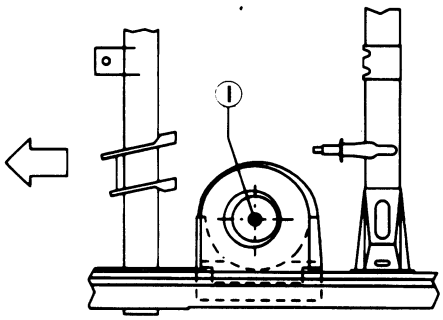
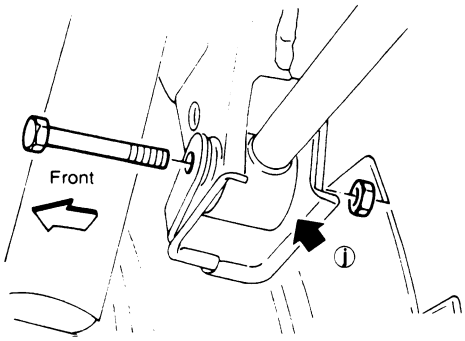
Detailed Measurement Points

Points	Detailed points		Coordinates mm (in) "X"	"Y"	"Z"
Ⓐ ⓐ	 SBF274B	Body mounting bracket hole	450.0 (17.72)	−488.5 (−19.23)	58.0 (2.28)
Ⓓ ⓓ			605.0 (23.82)	597.5 (23.52)	4.7 (0.18)
Ⓔ ⓔ			593.5 (23.37)	1,537.0 (60.51)	10.0 (0.39)
Ⓖ ⓖ			[W] : 600.0 (23.62)	[W] : 2,135.0 (84.06)	[W] : 140.2 (5.52)
Ⓚ ⓚ			593.5 (23.37)	[W] : 3,477.5 (136.91) [H] : 2,997.5 (118.01)	195.5 (7.70)
Ⓑ ⓑ	 NBF032	Front shock absorber bracket mounting hole	442.0 (17.40)	−16.0 (−0.63)	196.5 (7.74)
Ⓒ ⓒ	 NBF033	Compression rod mounting hole	362.6 (14.28)	290.0 (11.42)	−158.9 (−6.26)

① : Coordinate indicated is (LH), (RH) coordinate is - (LH) coordinate.
E.g. if (LH) coordinate is: 698.5, (RH) coordinate is: −698.5.

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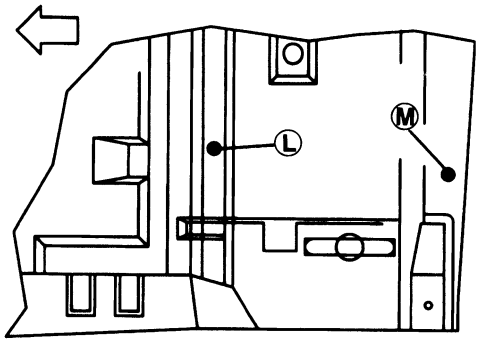
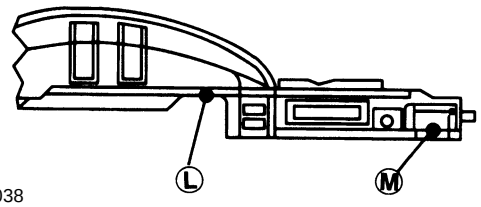
Alignment (Cont'd)

Points	Detailed points		Coordinates mm (in)		
			"X"	"Y"	"Z"
Ⓕ ⓕ	 NBF034	Lower link mounting bracket hole	538.0 (21.18)	W : 2,059.0 (81.06) H : 1,859.0 (73.19)	−146.0 (−5.75)
Ⓗ ⓗ	 NBF035	Upper link mounting bracket hole	270.7 (10.66)	W : 2,382.3 (93.79) H : 2,182.3 (85.92)	5.0 (0.20)
Ⓘ ⓘ	 NBF036	Rear spring mounting bracket hole	375.0 (14.76)	W : 2,610.0 (102.76) H : 2,410.0 (94.88)	210.0 (8.27)
ⓙ	 NBF037	Rear panhard rod mounting bracket hole	RH only −495.8 (−19.52)	W : 2,843.7 (111.96) H : 2,643.7 (104.08)	−55.0 (−2.16)

① : Coordinate indicated is LH, RH coordinate is - LH coordinate.
E.g. if LH coordinate is: 698.5, RH coordinate is: −698.5.

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Alignment (Cont'd)

Points	Detailed points		Coordinates mm (in)		
			"X"	"Y"	"Z"
Ⓛ Ⓘ		5th crossmember location hole	225.0 (8.86)	W : 2,961.0 (116.58) H : 2,637.0 (103.82)	W : 264.4 (10.41) H : 284.4 (11.20)
Ⓜ ⓜ	 NBF038	6th crossmember location hole	300.0 (11.81)	W : 3,530.0 (138.98) H : 3,050.0 (120.08)	240.6 (9.47)

① : Coordinate indicated is (LH), (RH) coordinate is - (LH) coordinate.
E.g. if (LH) coordinate is: 698.5, (RH) coordinate is: −698.5.

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NOTES

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HEATER & AIR CONDITIONER

SECTION HA

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When you read wiring diagrams:
- **Read GI section, “HOW TO READ WIRING DIAGRAMS”.**
- **See EL section, “POWER SUPPLY ROUTING” for power distribution circuit.**

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

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

The Supplemental Restraint System such as “AIR BAG” and “SEAT BELT PRE-TENSIONER” used along with a seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. The SRS composition which is available to NISSAN MODEL R20 is as follows (The composition varies according to the destination and optional equipment.):

- For a frontal collision
  The Supplemental Restraint System consists of driver air bag module (located in the center of the steering wheel), front passenger air bag module (located on the instrument panel on passenger side), front seat belt pre-tensioners, a diagnosis sensor unit, warning lamp, wiring harness and spiral cable.
- For a side collision
  The Supplemental Restraint System consists of front side air bag module (located in the outer side of front seat), side air bag (satellite) sensor, diagnosis sensor unit (one of components of air bags for a frontal collision), wiring harness, warning lamp (one of components of air bags for a frontal collision).

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 should be performed by an authorized NISSAN dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. Spiral cable and wiring harnesses covered with yellow insulation tape either just before the harness connectors or for the complete harness are related to the SRS.**

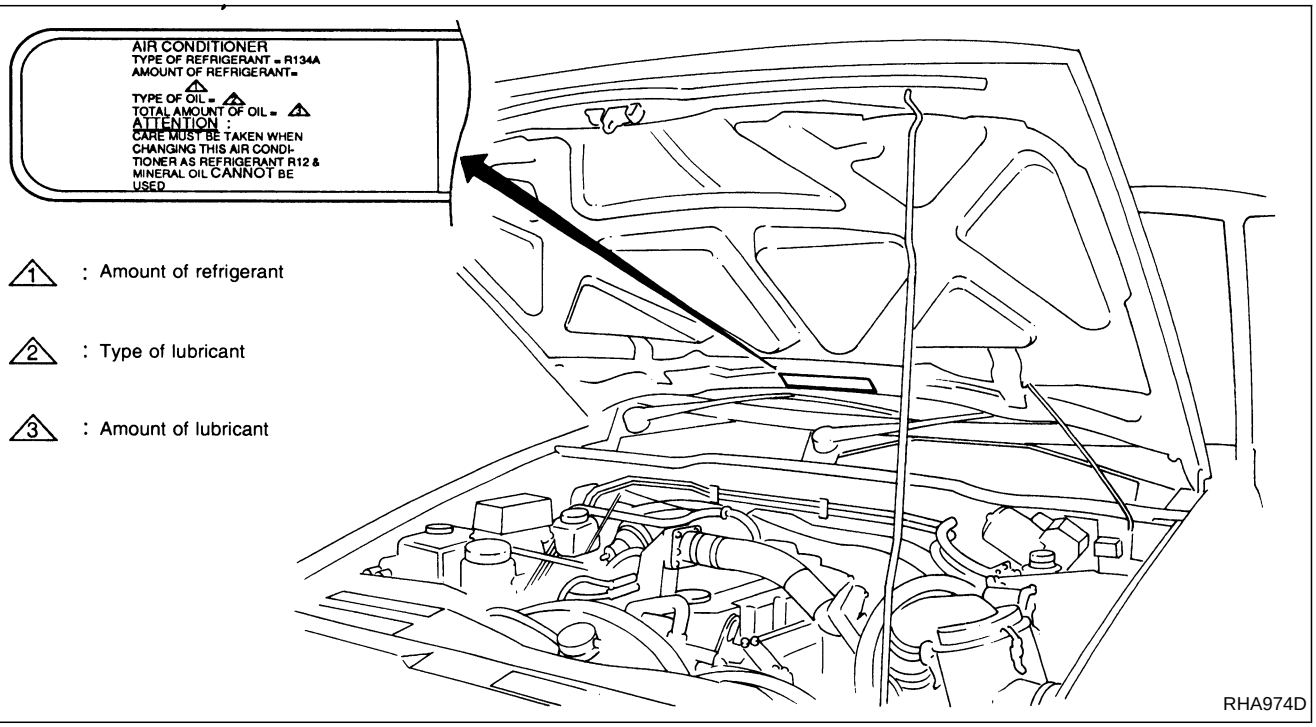
Introduction

To prevent the ozone layer from being destroyed, the HFC-134a (R-134a) refrigerant has replaced the previously used CFC-12 (R-12).
The new and previous service tools, refrigerant, lubricant, etc. are not interchangeable due to differences in their physical properties and characteristics.
Always service the HFC-134a (R-134a) air conditioning system using the specified tools, lubricant and refrigerant, observing the following precautions:

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Identification

IDENTIFICATION LABEL FOR VEHICLE

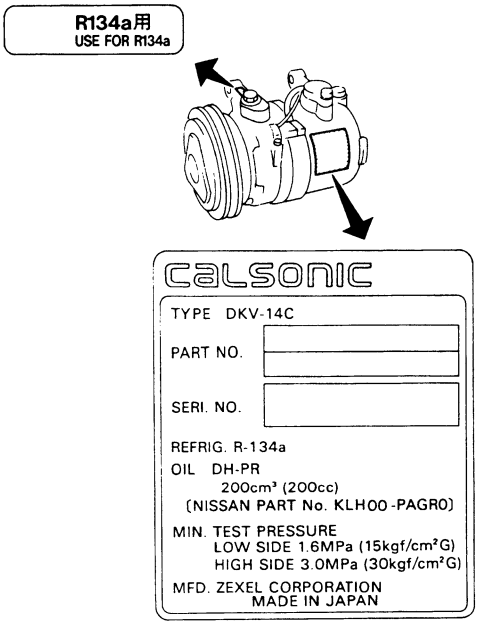


RHA974D

PARTS IDENTIFICATION

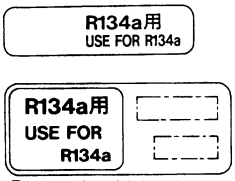
1. Compressor label

R134a label



2. Other component parts label

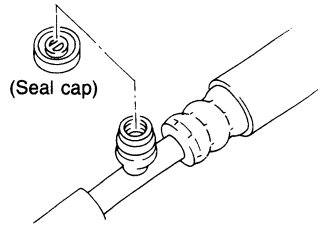
R134a label



Base color: Light blue

Part name	Identification
1. Compressor	R134a label or Compressor label
2. Cooling unit	R134a label
3. Expansion valve	Stamp
4. Condenser	R134a label
5. Liquid tank	R134a label
6. Hose or pipe	R134a label

3. Service valves (suction/discharge)



The service valves are specially designed for the HFC-134a (R-134a) system. Those for the CFC-12 (R-12) system are different in size and configuration. Refer to "PREPARATION".

RHA254D

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Precautions for Working with HFC-134a (R-134a)

WARNING:

- **CFC-12 (R-12) refrigerant and HFC-134a (R-134a) refrigerant must never be mixed, even in the smallest amounts, as they are incompatible with each other. If the refrigerants are mixed, compressor failure is likely to occur.**
- **Use only specified lubrication oil for the HFC-134a (R-134a) A/C system and HFC-134a (R-134a) components. If lubrication oil other than that specified is used, compressor failure is likely to occur.**
- **The specified HFC-134a (R-134a) lubrication oil absorbs moisture from the atmosphere at a rapid rate, therefore the following handling precautions must be observed:**
  - **a: When removing refrigerant components from a vehicle, immediately cap (seal) the component to minimize the entry of moisture from the atmosphere.**
  - **b: When installing refrigerant components to a vehicle, do not remove the caps (unseal) until just before connecting the components. Also, complete the connection of all refrigerant loop components as quickly as possible to minimize the entry of moisture into the system.**
  - **c: Use the specified lubrication oil from a sealed container only. Containers must be re-sealed immediately after dispensing the lubrication oil. Lubrication oil in containers which are not properly sealed will become moisture saturated, and such lubrication oil is no longer suitable for use and should be properly disposed of.**
  - **d: Avoid breathing A/C refrigerant and lubricant vapor or mist. Exposure may irritate eyes, nose and throat. Use only approved recovery/recycling equipment to discharge HFC-134a (R-134a) system. If accidental system discharge occurs, ventilate work area before resuming service. Additional health and safety information may be obtained from refrigerant and lubricant manufacturers.**
  - **e: Do not allow lubrication oil (Nissan A/C System Oil Type S or Type R) to come in contact with styrofoam parts. Damage may result.**

General Refrigerant Precautions

WARNING:

- **Do not release refrigerant into the air. Use approved recovery/recycling equipment to capture the refrigerant every time an air conditioning system is discharged.**
- **Always wear eye and hand protection (goggles and gloves) when working with any refrigerant or air conditioning system.**
- **Do not store or heat refrigerant containers above 52°C (125°F).**
- **Do not heat a refrigerant container with an open flame; if container warming is required, place the bottom of the container in a warm pail of water.**
- **Do not drop, puncture, or incinerate refrigerant containers.**
- **Keep refrigerant away from open flames: poisonous gas will be produced if refrigerant burns.**
- **Refrigerant will displace oxygen, therefore be certain to work in well ventilated areas to prevent suffocation.**
- **Do not introduce compressed air to any refrigerant container or refrigerant component.**

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Precautions for Refrigerant Connection

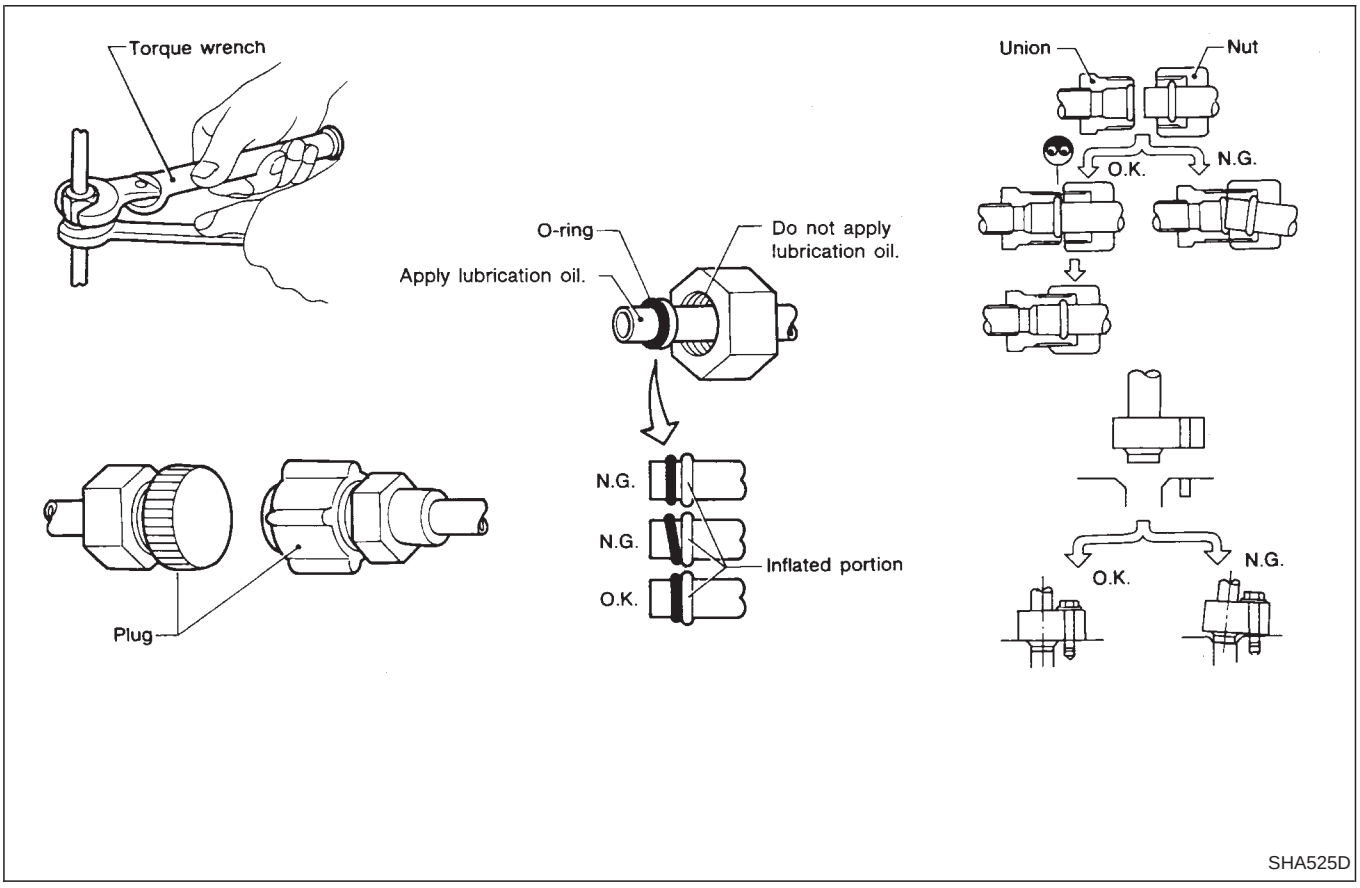
WARNING:

Make sure all refrigerant is discharged into the recycling equipment and the pressure in the system is less than atmospheric. Then gradually loosen the discharge side hose fitting and remove it.

CAUTION:

When replacing or cleaning refrigerant cycle components, observe the following.

- **Do not leave compressor on its side or upside down for more than 10 minutes, as compressor oil will enter low pressure chamber.**
- **When connecting tubes, always use a torque wrench and a back-up wrench.**
- **After disconnecting tubes, plug all openings immediately to prevent entrance of dirt and moisture.**
- **When installing an air conditioner in the vehicle, the pipes must be connected at the final stage of the operation. The seal caps of the pipes and other components must not be removed until their removal is required for connection.**
- **To prevent the condensation of moisture inside A/C components, components stored in cool areas should be allowed to warm to the working area temperature before removing the seal caps.**
- **Thoroughly remove moisture from the refrigeration system before charging the refrigerant.**
- **Always replace used O-rings.**
- **When connecting tube, apply lubrication oil to portions shown in illustration. Be careful not to apply oil to threaded portion.**
  Lubrication oil name: NISSAN A/C System Oil Type S
  Part number: KLH00-PAGS0
- **O-ring must be closely attached to inflated portion of tube.**
- **After inserting tube into union until O-ring is no longer visible, tighten nut to specified torque.**
- **After connecting line, conduct leak test and make sure that there is no leakage from connections. When the gas leaking point is found, disconnect that line and replace the O-ring. Then tighten connections of seal seat to the specified torque.**



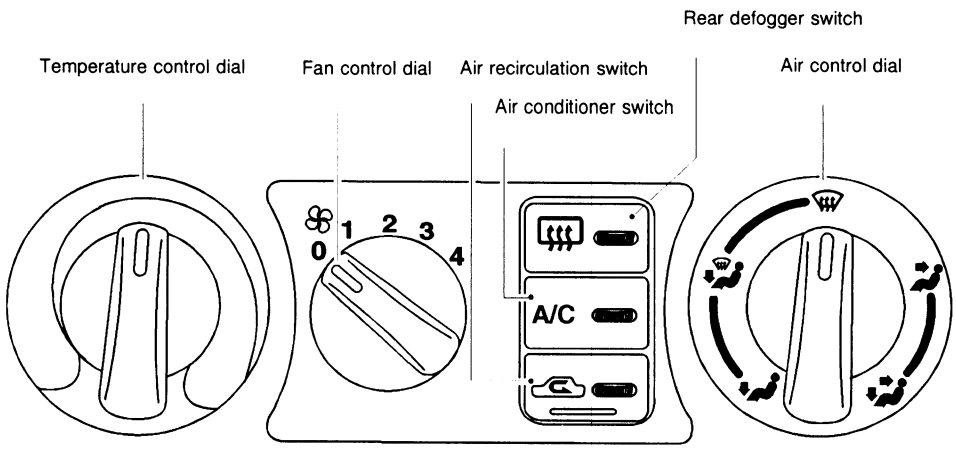
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Precautions for Servicing Compressor

- **Attach a blind plug to the suction port (low pressure) and discharge port (high pressure) of the compressor to prevent oil from leaking out and dust from getting inside.**
- **When the compressor is removed, store it under the same condition as it is when mounted on the car.**
- **When replacing or repairing compressor, be sure to remove oil from the compressor and check the oil quantity extracted.**
- **When replacing with a new compressor, be sure to remove oil from the new compressor so that the quantity of oil remaining in the new compressor is equal to the quantity collected from the removed compressor. See the section “LUBRICATION OIL”.**
- **Pay attention so as not to allow dirt and oil to attach on the friction surfaces between clutch and pulley. If the surface is contaminated, with oil, wipe it off by using a clean waste cloth moistened with thinner.**
- **After completing the compressor service operation, be sure to rotate the compressor shaft more than five turns in both directions by hand to equalize oil distribution inside the compressor, then run the compressor for about one hour by idling the engine.**
- **When the compressor magnet clutch has been replaced, be sure to check the magnet clutch for normal operation by applying voltage to the clutch.**

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Control Operation



NHA331

FAN CONTROL DIAL

This DIAL turns the fan ON and OFF, and controls fan speed.

AIR CONTROL DIAL

This DIAL allows outlet air to flow.

TEMPERATURE CONTROL DIAL

This DIAL allows the temperature of the outlet air to be adjusted.

AIR RECIRCULATION SWITCH

OFF position:
Outside air is drawn into the passenger compartment.
ON position (Indicator light ON):
Interior air is recirculated inside the vehicle.

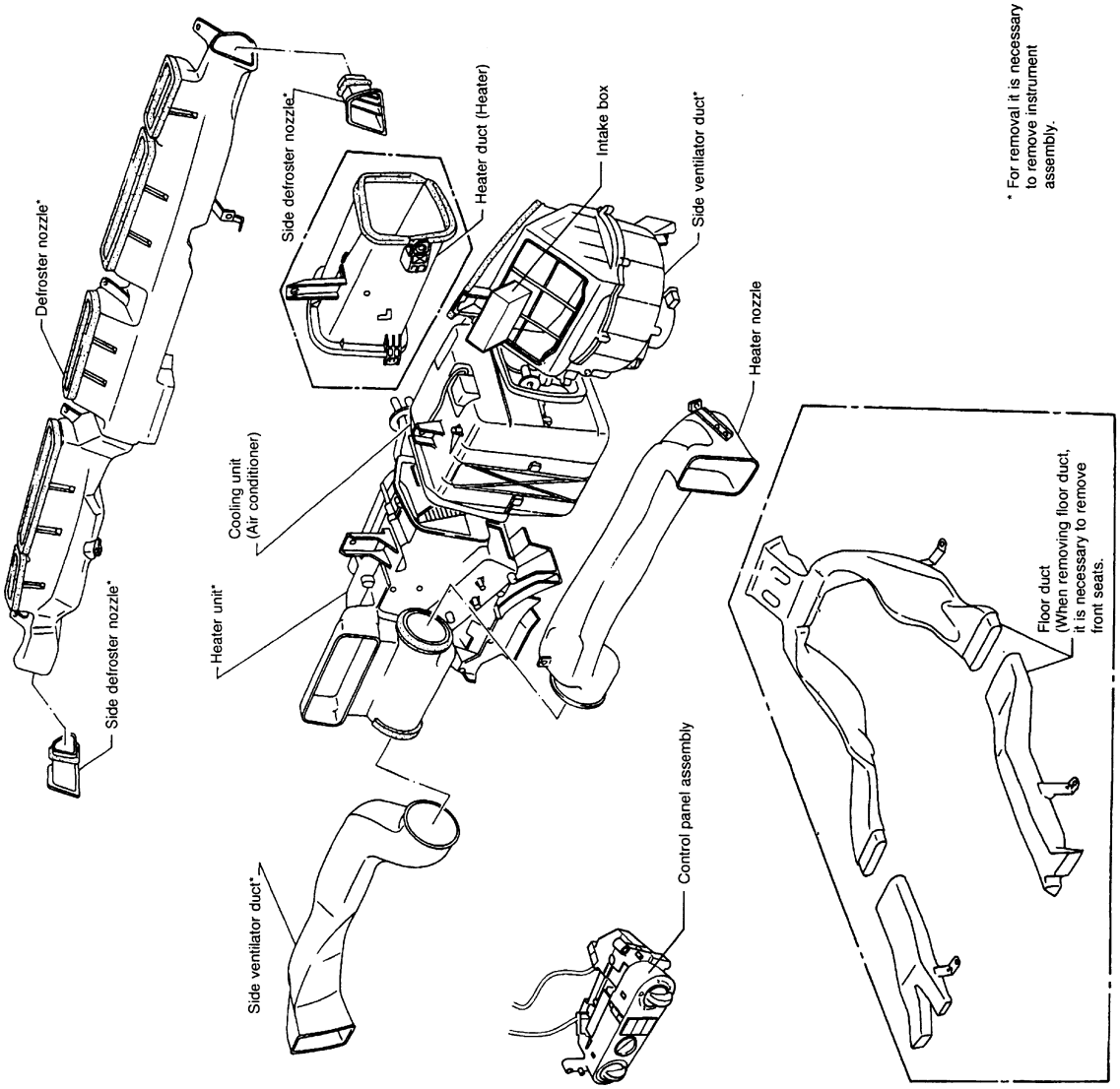
AIR CONDITIONER SWITCH

Start the engine, turn the fan control dial to the desired (1 to 4) position and press the air conditioner switch to turn ON the air conditioner. The indicator light will come on when the air conditioner is ON. To stop the air conditioner, push the switch again to return it to the original position.

The air conditioner cooling function operates only when the engine is running.

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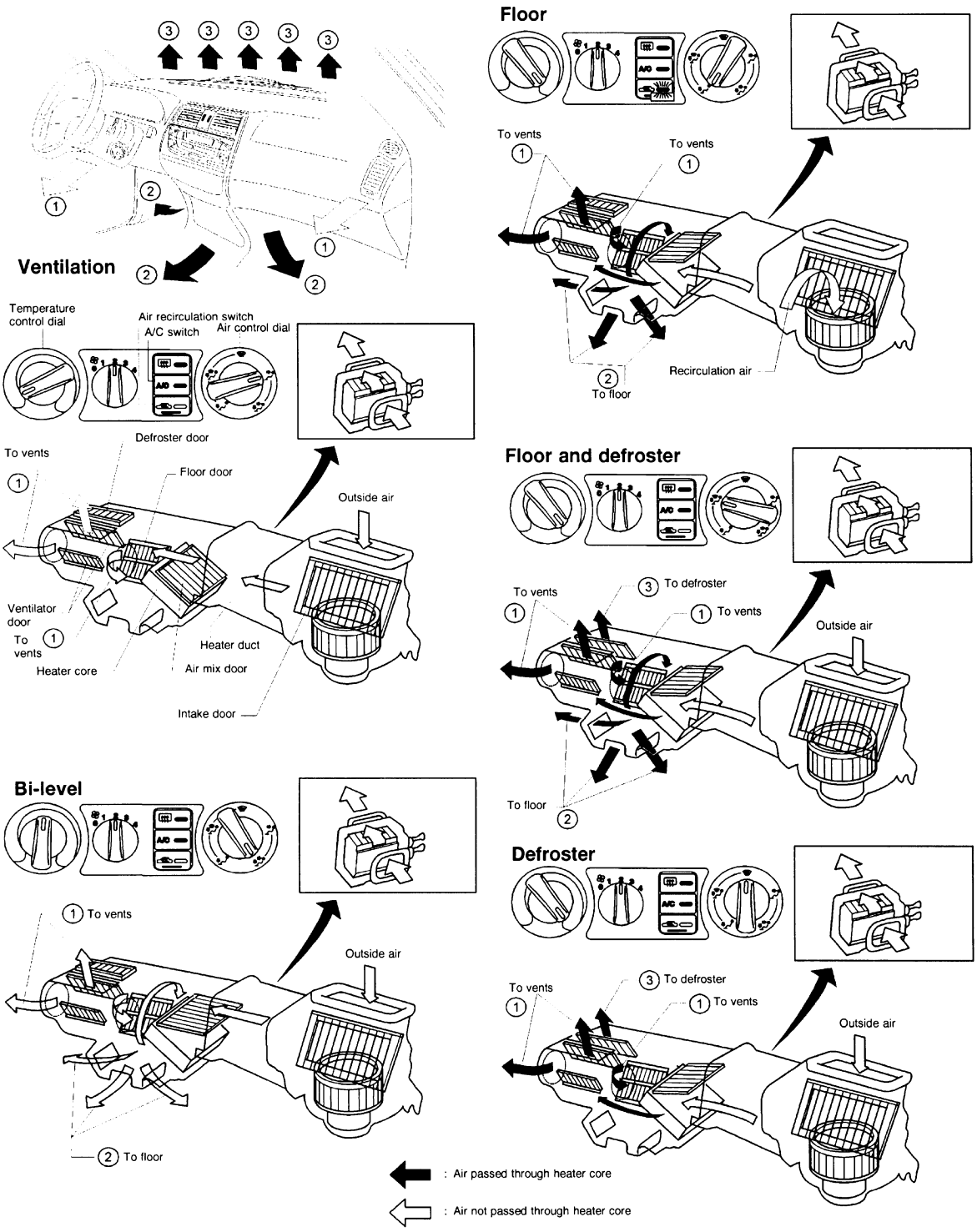
Component Layout



NHA339

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Air Flow



NHA332

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Refrigeration Cycle

REFRIGERANT FLOW

The refrigerant flows in the standard pattern, that is, through the compressor, the condenser, the liquid tank, through the evaporator, and back to the compressor.
The refrigerant evaporation through the evaporator coil is controlled by an externally equalized expansion valve, located inside the evaporator case.

FREEZE PROTECTION

The compressor cycles on and off to maintain the evaporator temperature within a specified range. When the evaporator coil temperature falls below a specified point, the thermo control amplifier interrupts the compressor operation. When the evaporator coil temperature rises above the specification, the thermo control amplifier allows compressor operation.

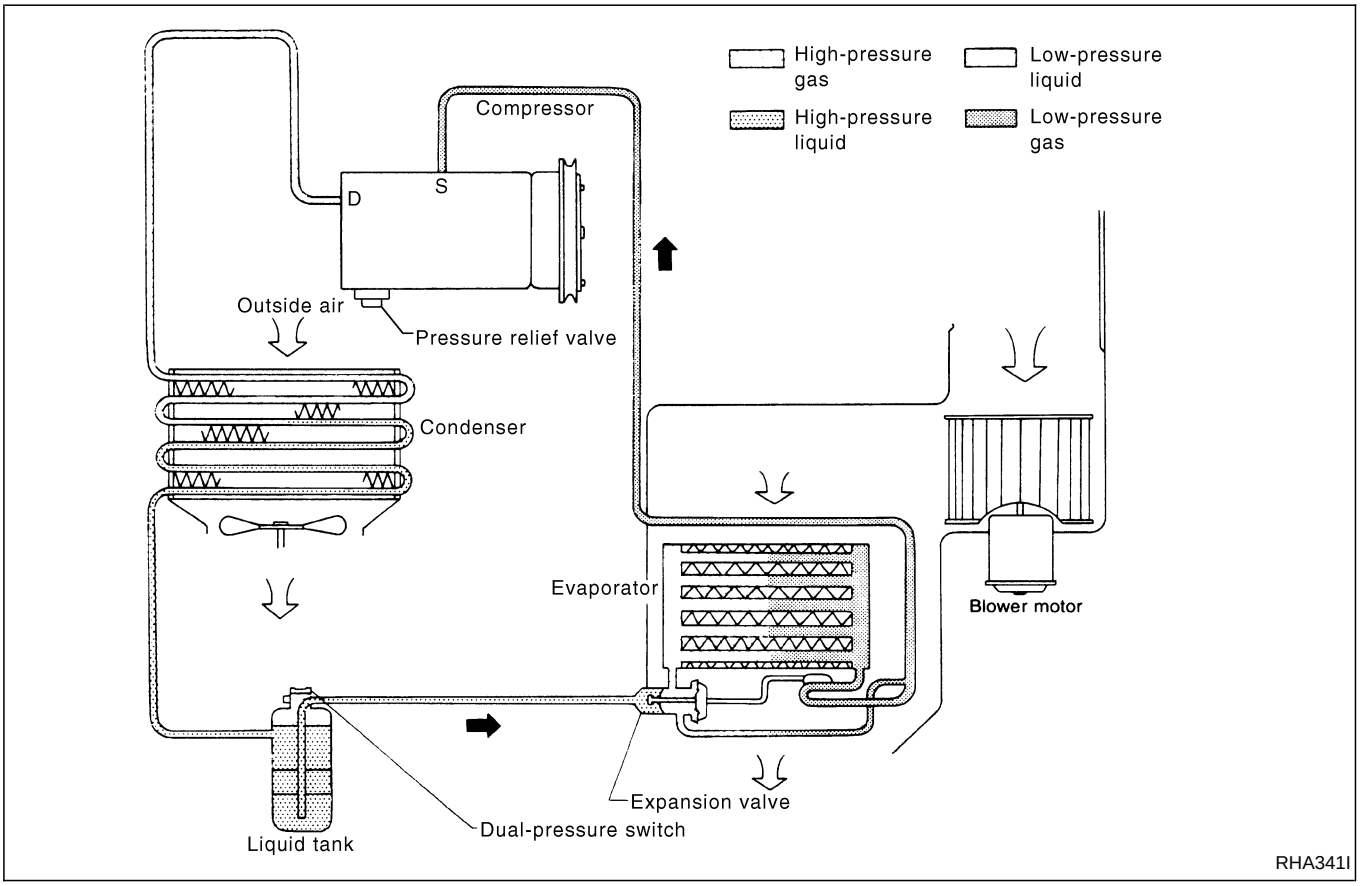
REFRIGERANT SYSTEM PROTECTION

Dual-pressure switch

The refrigerant system is protected against excessively high or low pressures by the dual-pressure switch, located on the liquid tank. If the system pressure rises above, or falls below the specifications, the dual-pressure switch opens to interrupt the compressor operation.

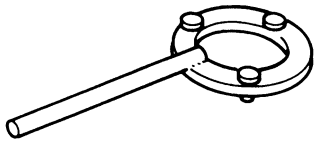
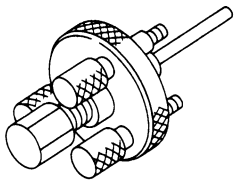
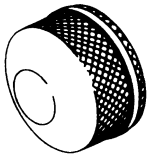
Pressure relief valve

The refrigerant system is also protected by a pressure relief valve, located in the rear head of the compressor. When the pressure of refrigerant in the system increases to an unusual level [more than 3,700 kPa (37.0 bar, 37.7 kg/cm^2, 537 psi)], the release port on the pressure relief valve automatically opens and releases refrigerant into the atmosphere.



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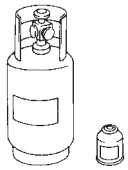
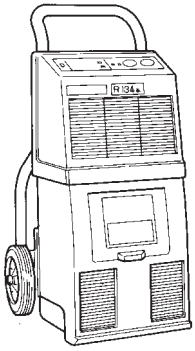
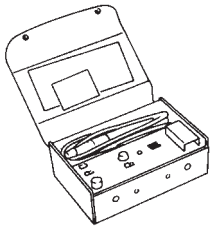
Special Service Tools

Tool number Tool name	Description	
KV99231260 Clutch disc wrench		Removing shaft nut and clutch disc
KV992T0001 Clutch disc puller		Removing clutch disc
KV992T0002 Pulley installer		Installing pulley

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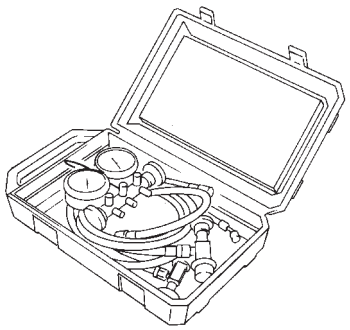
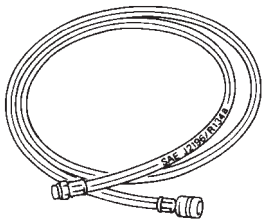
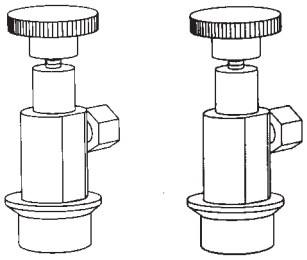
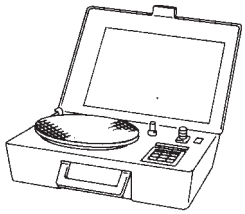
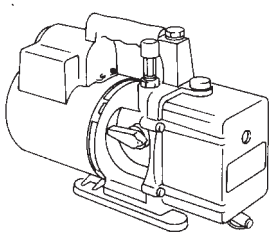
HFC-134a (R-134a) Service Tools and Equipment

It is important to understand that HFC-134a (R-134a) refrigerant, and the specified lubricant which must be used with HFC-134a (R-134a), must never be mixed with CFC-12 (R-12) refrigerant and/or the CFC-12 (R-12) lubricant.
This means that separate and non-interchangeable service equipment must be used for handling each type of refrigerant/lubricant.
To prevent the mixing of refrigerants/lubricants, refrigerant container fittings, service hose fittings, and service equipment fittings (equipment which handles refrigerant and/or lubricant) are different between CFC-12 (R-12) and HFC-134a (R-134a).
Adaptors to convert from one size of fitting to another must never be used: refrigerant/lubricant contamination will occur and compressor failure will result.

Tool number (Kent-Moore No.) Tool name	Description	Note
HFC-134a (R-134a) refrigerant		Container color: Light blue Container marking: HFC-134a (R-134a) Fitting size: Thread size ● Large container 1/2″-16 ACME
KLH00-PAGS0 (—) Nissan A/C System Oil Type S (DH-PS)		Type: Poly alkyline glycol oil (PAG), type S Application: HFC-134a (R-134a) swash plate compressors (Nissan only) Lubricity: 40 mℓ (1.4 Imp fl oz)
(J-39500-NI) (115V) (J-39635) (220V) Recovery/Recycling/ Recharging equipment (ACR4)		Function: Refrigerant Recovery and Recycling and Recharging
(J-39400) Electrical leak detector		Power supply: ● DC 12V (Cigarette lighter)

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HFC-134a (R-134a) Service Tools and Equipment (Cont'd)

Tool number (Kent-Moore No.) Tool name	Description	Note
(J-39183) Manifold gauge set (with hoses and couplers)		Identification: ● The gauge face indicates R-134a. Fitting size: Thread size ● 1/2″-16 ACME
Service hoses ● High side hose (J-39501-72) ● Low side hose (J-39502-72) ● Utility hose (J-39476-72)		Hose color: ● Low hose: Blue with black stripe ● High hose: Red with black stripe ● Utility hose: Yellow with black stripe or green with black stripe Hose fitting to gauge: ● 1/2″-16 ACME
Service couplers ● High side coupler (J-39500-20) ● Low side coupler (J-39500-24)		Hose fitting to service hose: ● M14 x 1.5 fitting (optional) or permanently attached
(J-39650) (115V) (J-39656) (220V) Refrigerant weight scale		For measuring of refrigerant Fitting size: Thread size ● 1/2″-16 ACME
(J-39649) (115V) (J-39655) (220V) Vacuum pump (Including the isolator valve)		Capacity: ● Air displacement: 4 CFM ● Micron rating: 20 microns ● Oil capacity: 482 g (17 oz) Fitting size: Thread size ● 1/2″-16 ACME

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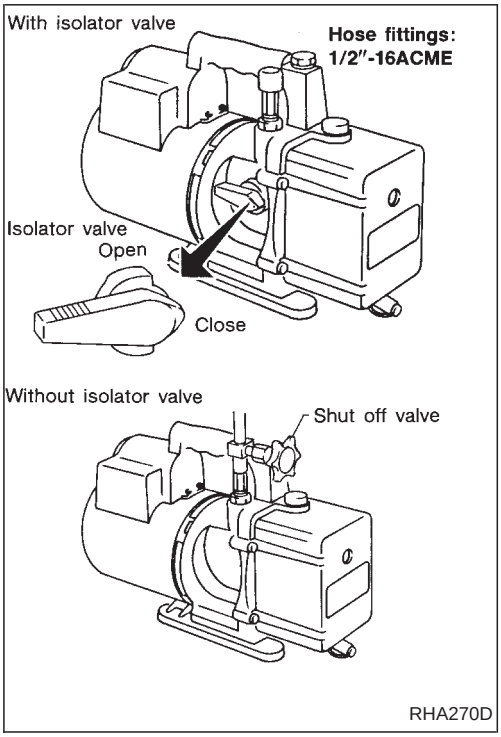
Precautions for Service Equipment

RECOVERY/RECYCLING/RECHARGING EQUIPMENT

Be certain to follow the manufacturers instructions for machine operation and machine maintenance. Never introduce any refrigerant other than that specified into the machine.

ELECTRONIC LEAK DETECTOR

Be certain to follow the manufactures instructions for tester operation and tester maintenance.



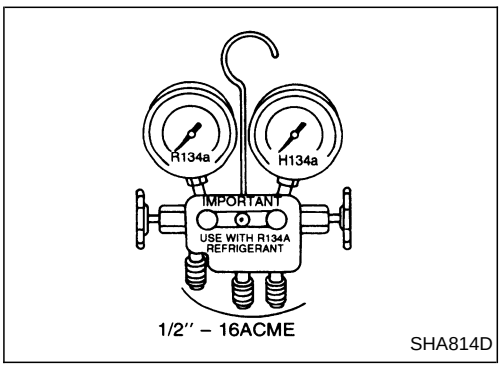
VACUUM PUMP

The lubricant contained inside the vacuum pump is not compatible with the specified lubricant for HFC-134a (R-134a) A/C systems. Since the vent side of the vacuum pump is exposed to atmospheric pressure, it is possible for the vacuum pump lubricant to migrate out of the pump into the service hose if the pump is switched off after evacuation (vacuuming) and the service hose is not isolated from the vacuum pump.

To prevent the migration of vacuum pump lubricant into service hoses, it is necessary to use a valve (which can be manually opened or closed) near the connection of the service hose to the pump.

- On a vacuum pump which is equipped with an isolator valve (usually part of the vacuum pump), closing this valve will isolate the service hose from the pump.
- For pumps without an isolator valve, be certain that the service hose is equipped with a manual shut off valve near the pump end of the hose.
- Hoses which contain an automatic shut off valve at the end of the service hose must be disconnected from the vacuum pump to prevent the migration of lubricant: as long as the hose is connected, the valve is open and lubricant may migrate.

One-way valves which open when vacuum is applied and close under a no vacuum condition are not recommended, because this valve may restrict the pump's ability to pull a deep vacuum.

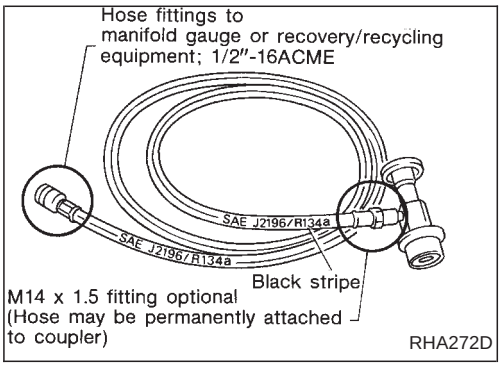


MANIFOLD GAUGE SET

Be certain that the gauge face indicates R-134a or 134a. Be certain that the manifold gauge set has the 1/2″-16 ACME threaded connections for service hoses, and that no refrigerants other than HFC-134a (R-134a) (along with only specified lubricants) have been used with the manifold gauge set.

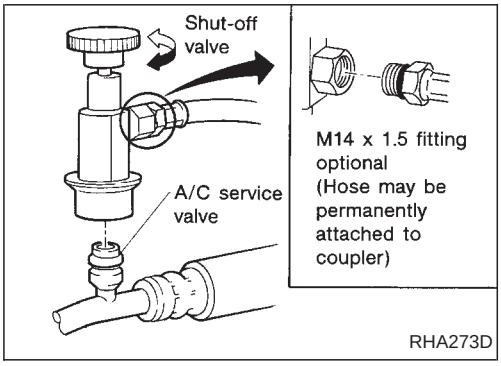
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Precautions for Service Equipment (Cont'd)



SERVICE HOSES

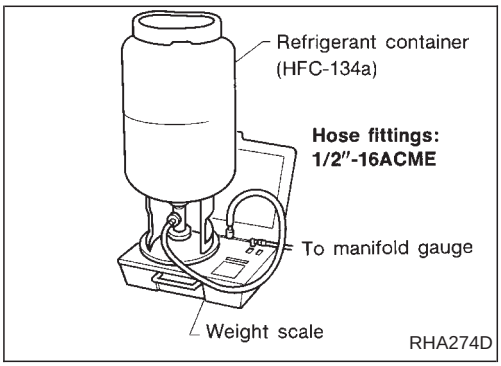
Be certain that the service hoses display the markings described (colored hose with black stripe). Be certain that all hoses include positive shut off devices (either manual or automatic) near the end of the hoses opposite the manifold gauge.



SERVICE COUPLERS

Never attempt to connect HFC-134a (R-134a) service couplers to an CFC-12 (R-12) A/C system. Although the HFC-134a (R-134a) couplers will not secure on to the CFC-12 (R-12) system, CFC-12 (R-12) refrigerant and lubricant will be discharged into the HFC-134a (R-134a) coupler, causing contamination.

Shut off valve rotation	A/C service valve
Clockwise	Open
Counterclockwise	Close



REFRIGERANT WEIGHT SCALE

If the scale allows electronic control of the flow of refrigerant through the scale, be certain that the hose fitting size is 1/2″-16 ACME, and that no refrigerant other than HFC-134a (R-134a) (along with only specified lubricant) has been used with the scale.

CHARGING CYLINDER

The charging cylinder is not recommended because refrigerant may be vented into the air from the top valve of the cylinder when filling the cylinder with refrigerant. Additionally, the accuracy of the cylinder is generally less than that of an electronic scale or of quality recycle/recharge equipment.

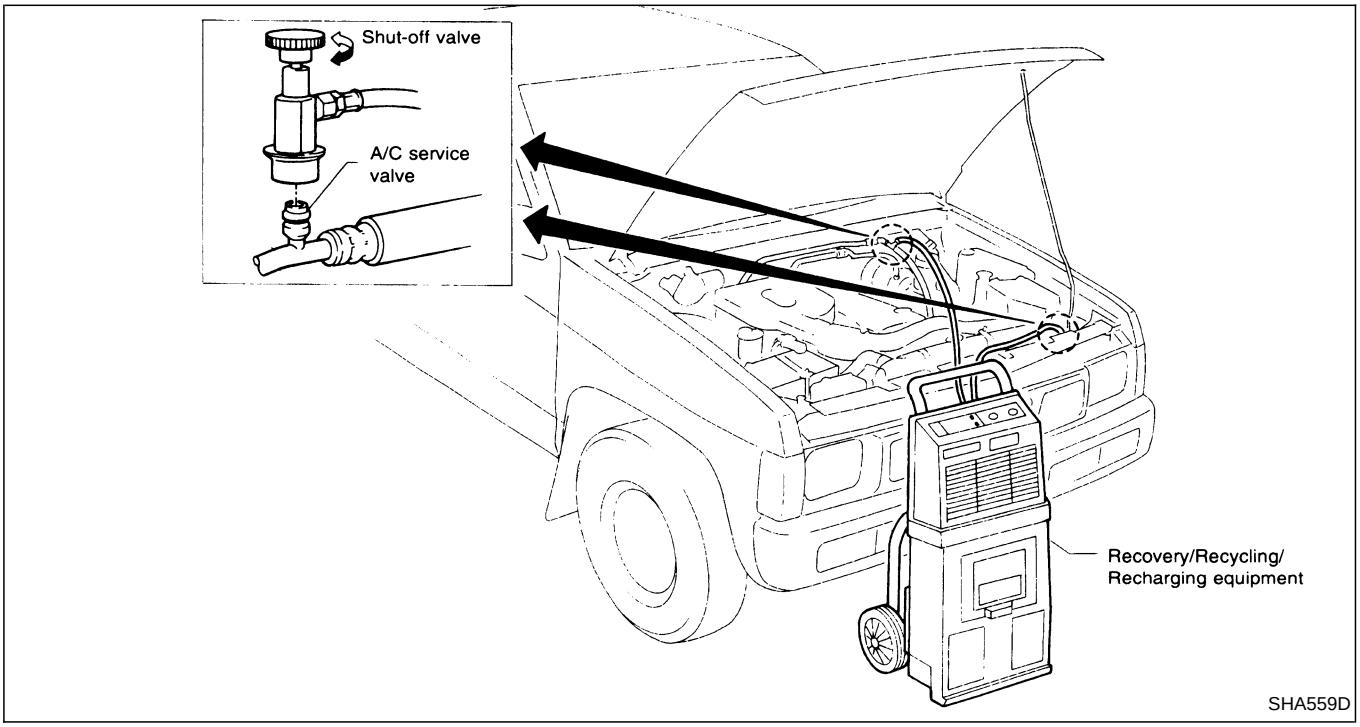
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HFC-134a (R-134a) Service Procedure

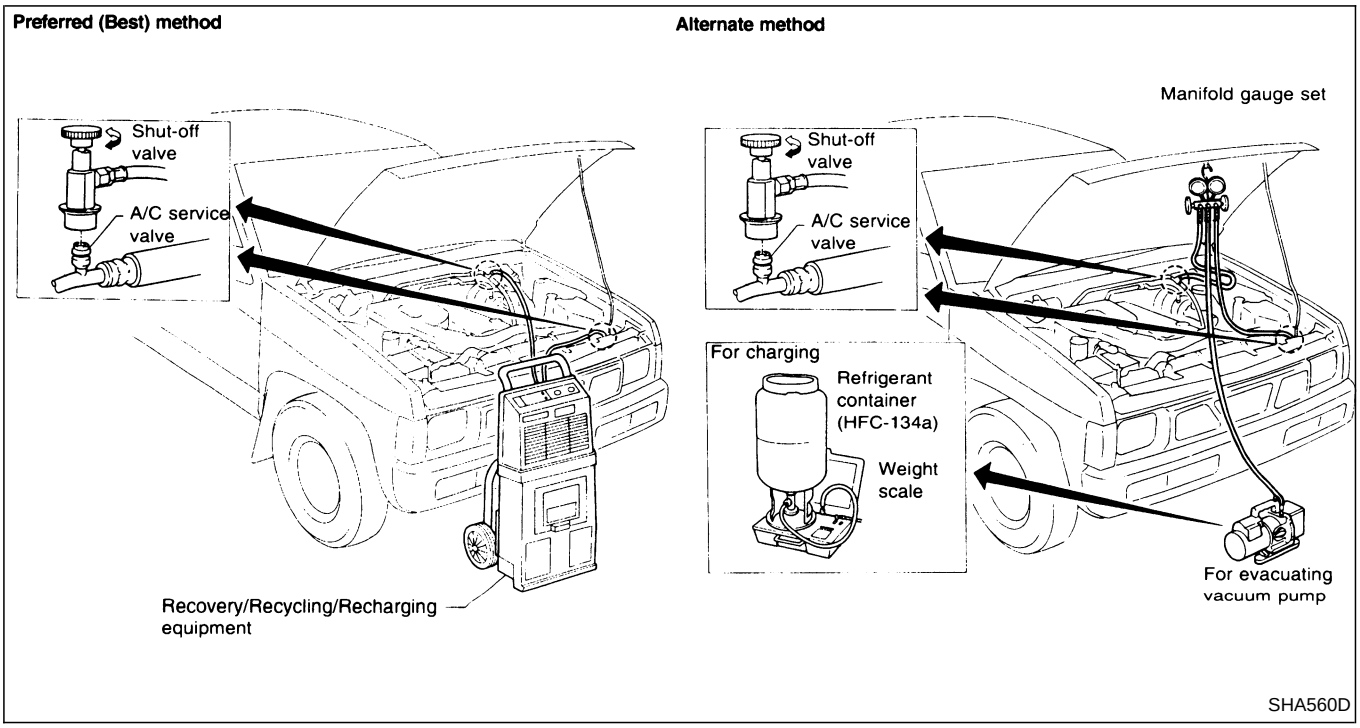
DISCHARGING REFRIGERANT

WARNING:

Avoid breathing A/C refrigerant and lubricant vapor or mist. Exposure may irritate eyes, nose and throat. To remove HFC-134a (R-134a) from the A/C system, use service equipment certified to meet the requirements of HFC-134a (R-134a) recycling equipment or HFC-134a (R-134a) recovery equipment. If accidental system discharge occurs, ventilate work area before resuming service. Additional health and safety information may be obtained from refrigerant and lubricant manufacturers.

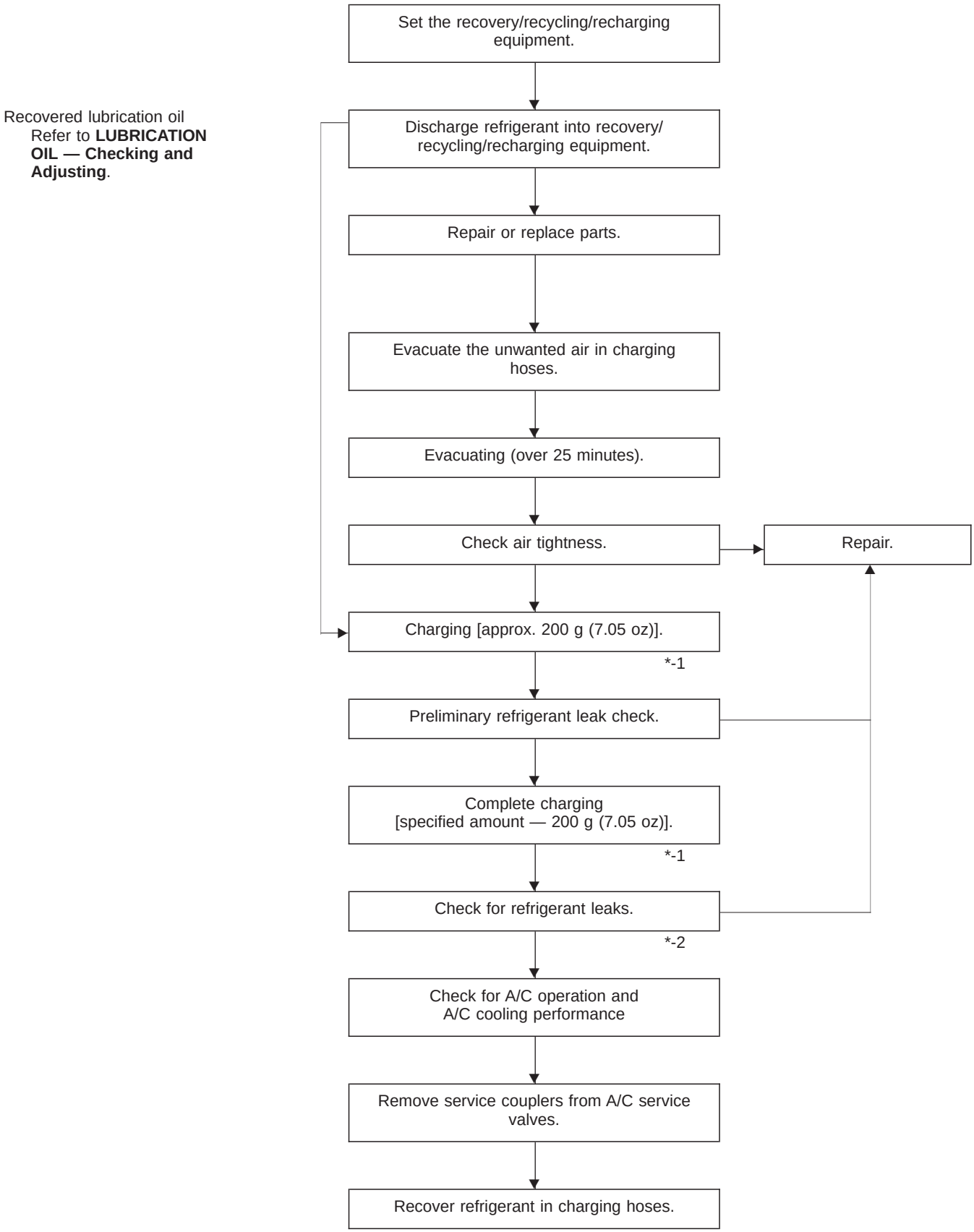


EVACUATING SYSTEM AND CHARGING REFRIGERANT



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HFC-134a (R-134a) Service Procedure (Cont'd)

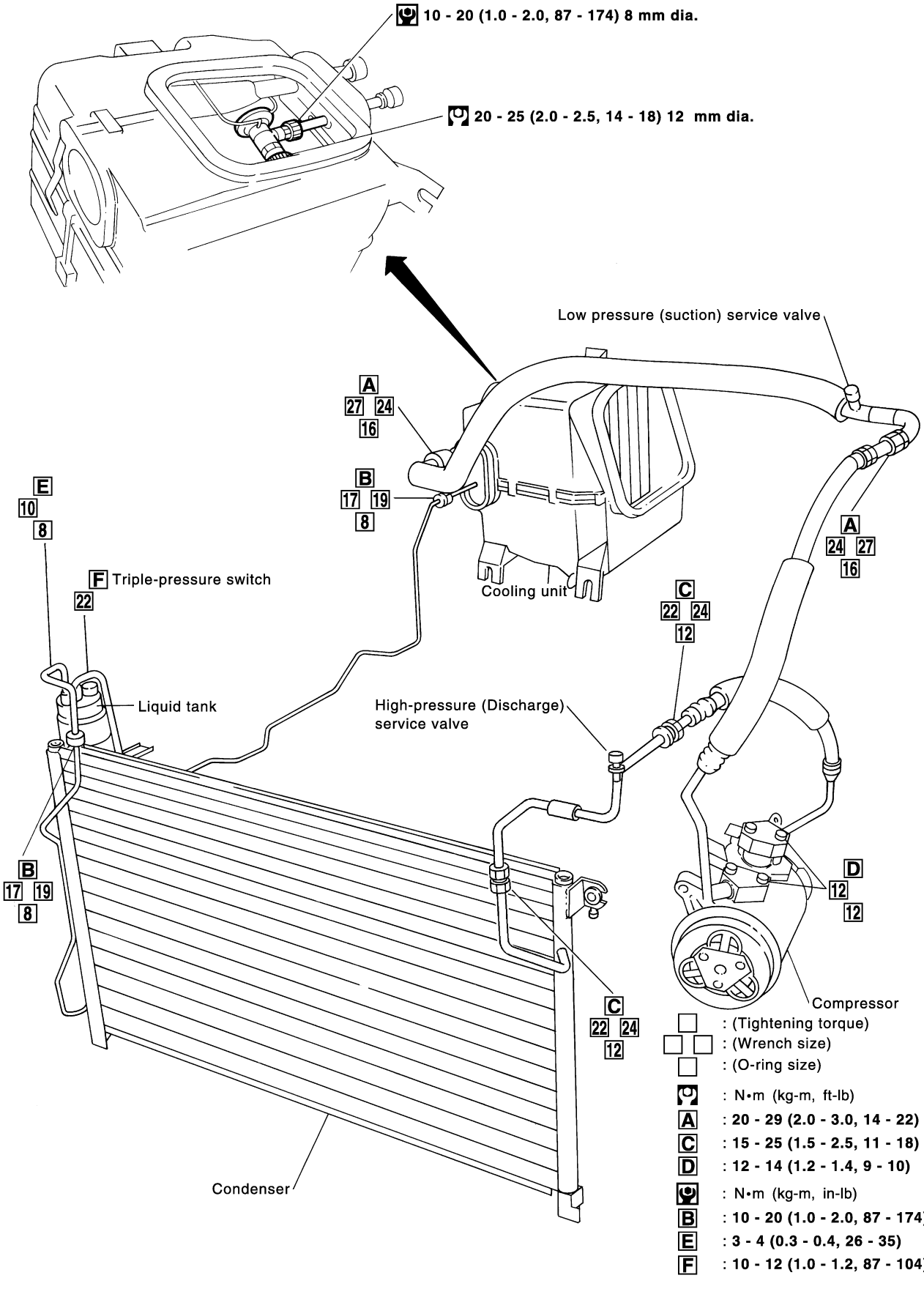


Note: *-1 Before charging refrigerant, ensure engine is off.
*-2 Before checking for leaks, start engine to activate air conditioning system then turn it off. Service valve caps must be attached to valves (to prevent leak).

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Refrigerant Lines

TD ENGINE LHD MODELS

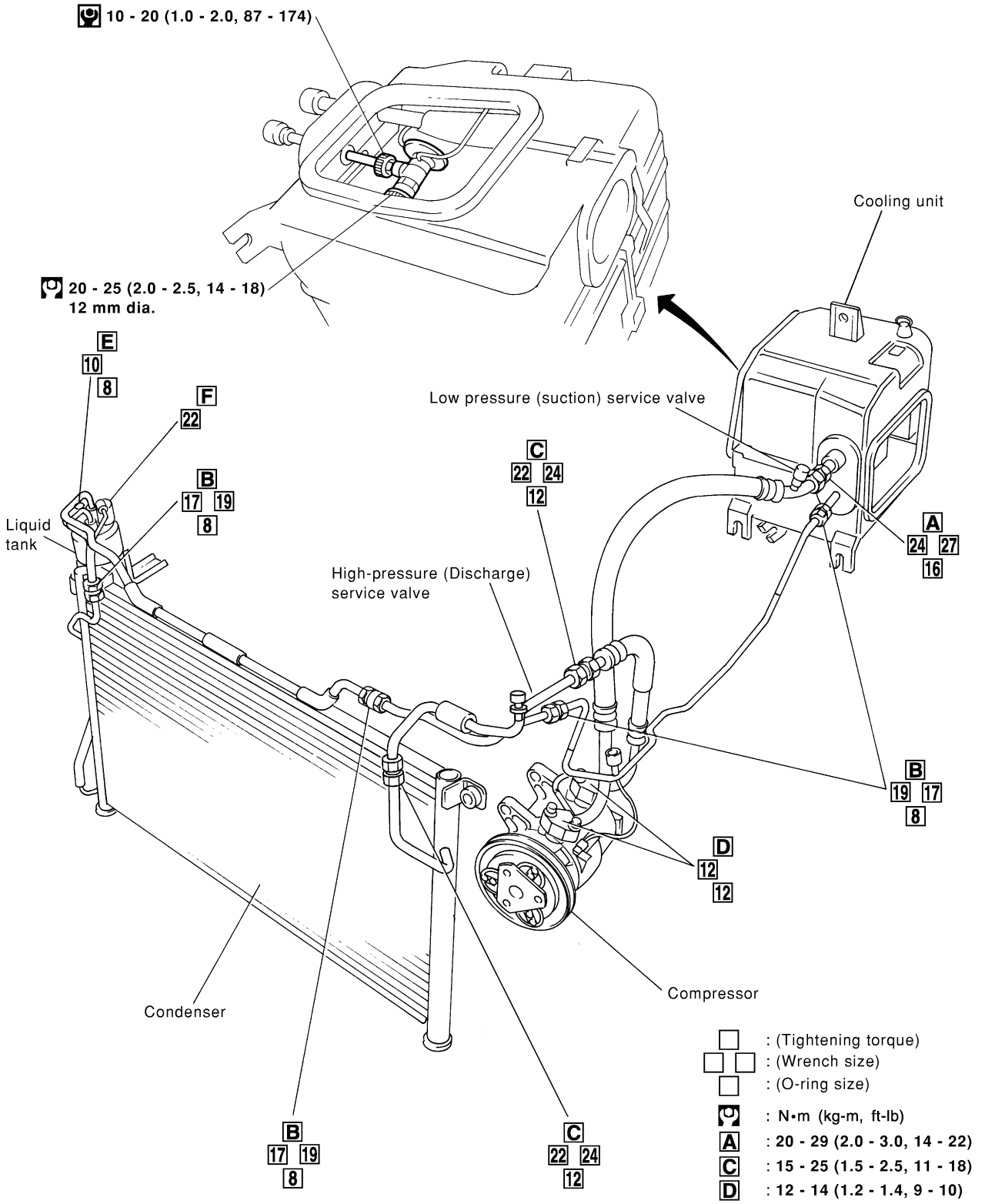


YHA448

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Refrigerant Lines (Cont'd)

TD ENGINE RHD MODELS

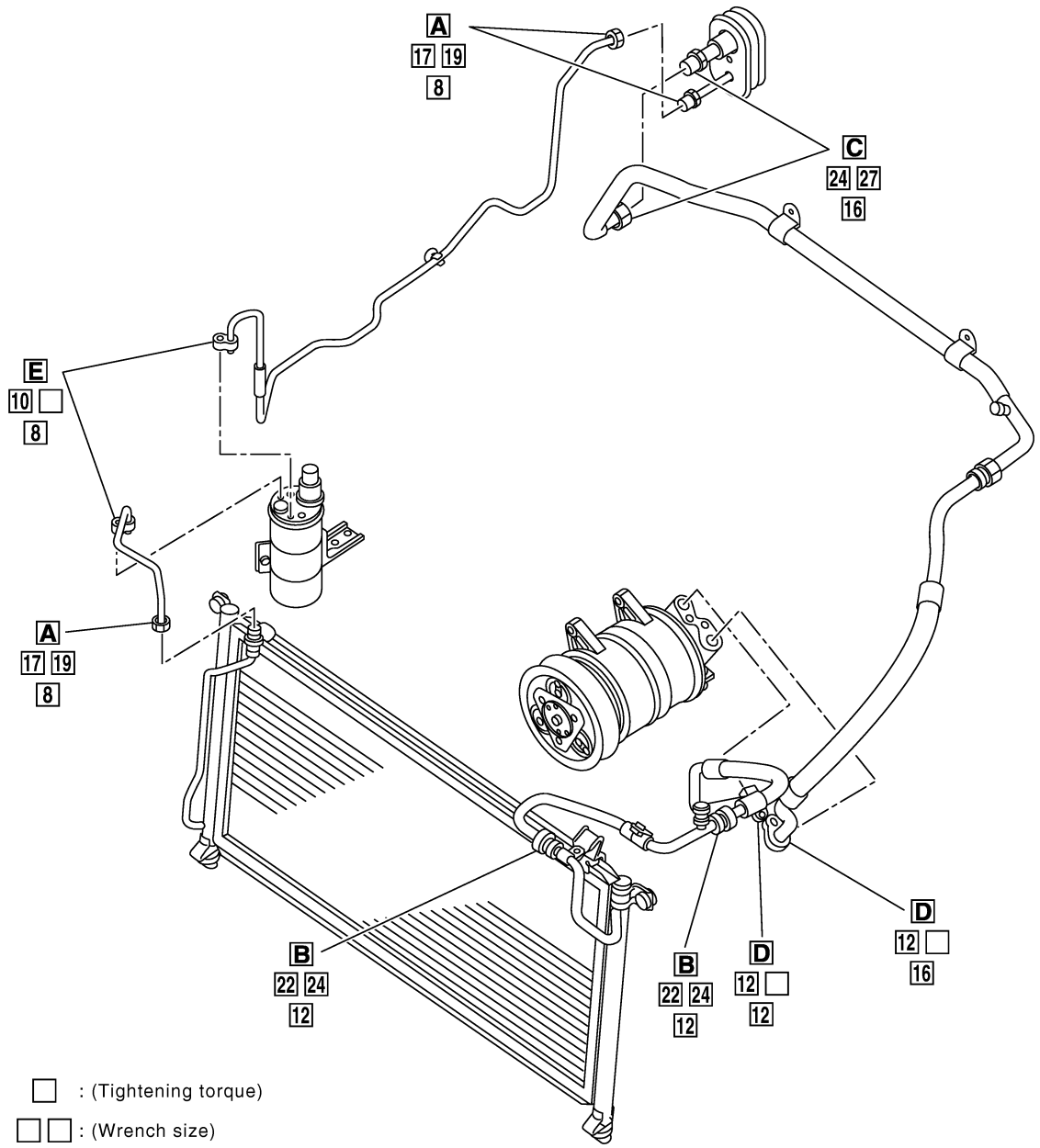


YHA449

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Refrigerant Lines (Cont'd)

ZD ENGINE LHD MODELS



: (Tightening torque)

: (Wrench size)

: (O-ring size)

: N•m (kg-m, ft-lb)

A : 10 - 20 (1.1 - 2.0, 8 - 14)

B : 15 - 25 (1.6 - 2.5, 11 - 18)

C : 20 - 30 (2.1 - 3.0, 15 - 22)

: N•m (kg-m, in-lb)

D : 8 - 11 (0.9 - 1.1, 71 - 97)

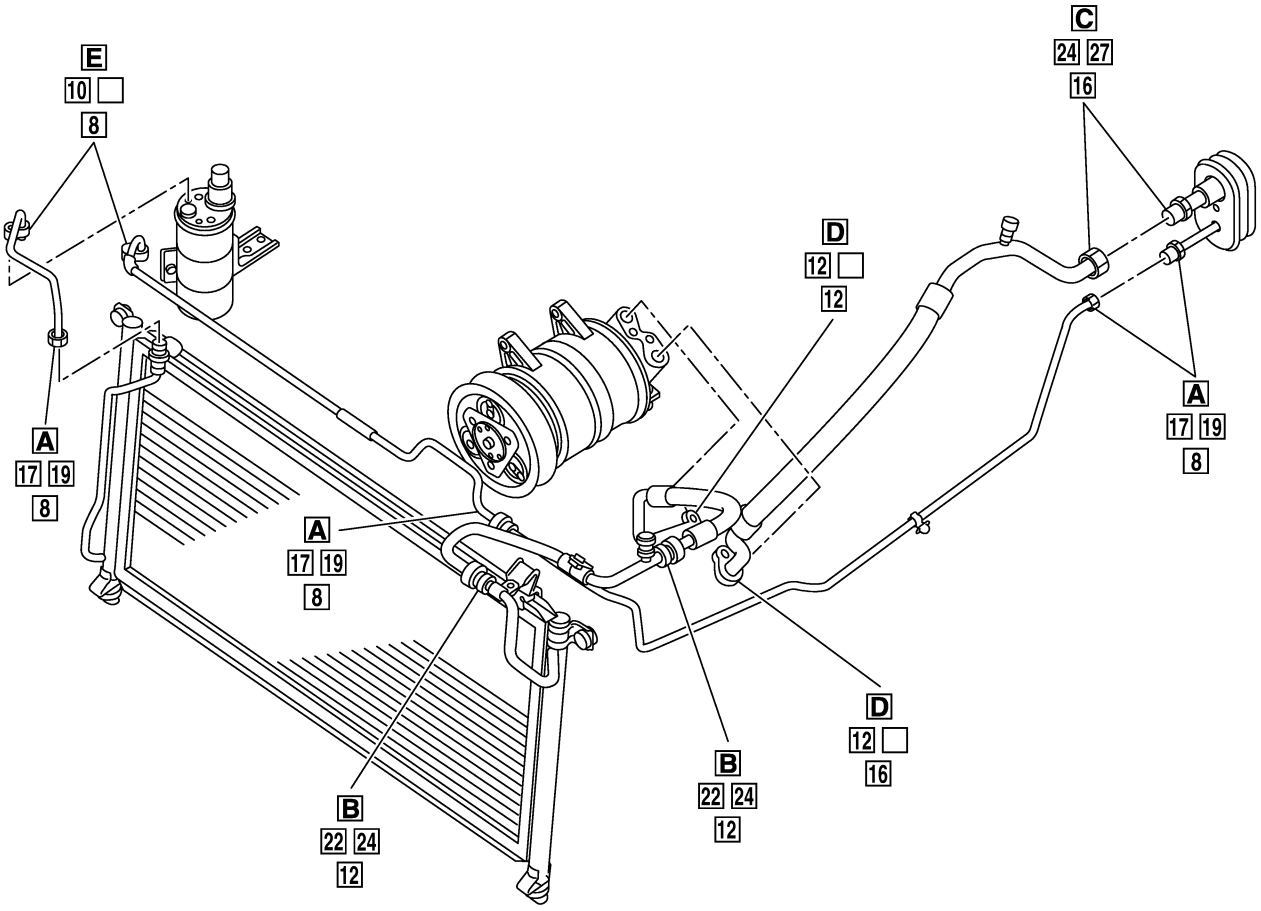
E : 3.2 - 3.6 (0.33 - 0.36, 29 - 31)

RHA368I

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Refrigerant Lines (Cont'd)

ZD ENGINE RHD MODELS



□ : (Tightening torque)

□□ : (Wrench size)

□ : (O-ring size)

: N•m (kg-m, ft-lb)

A : 10 - 20 (1.1 - 2.0, 8 - 14)

B : 15 - 25 (1.6 - 2.5, 11 - 18)

C : 20 - 30 (2.1 - 3.0, 15 - 22)

: N•m (kg-m, in-lb)

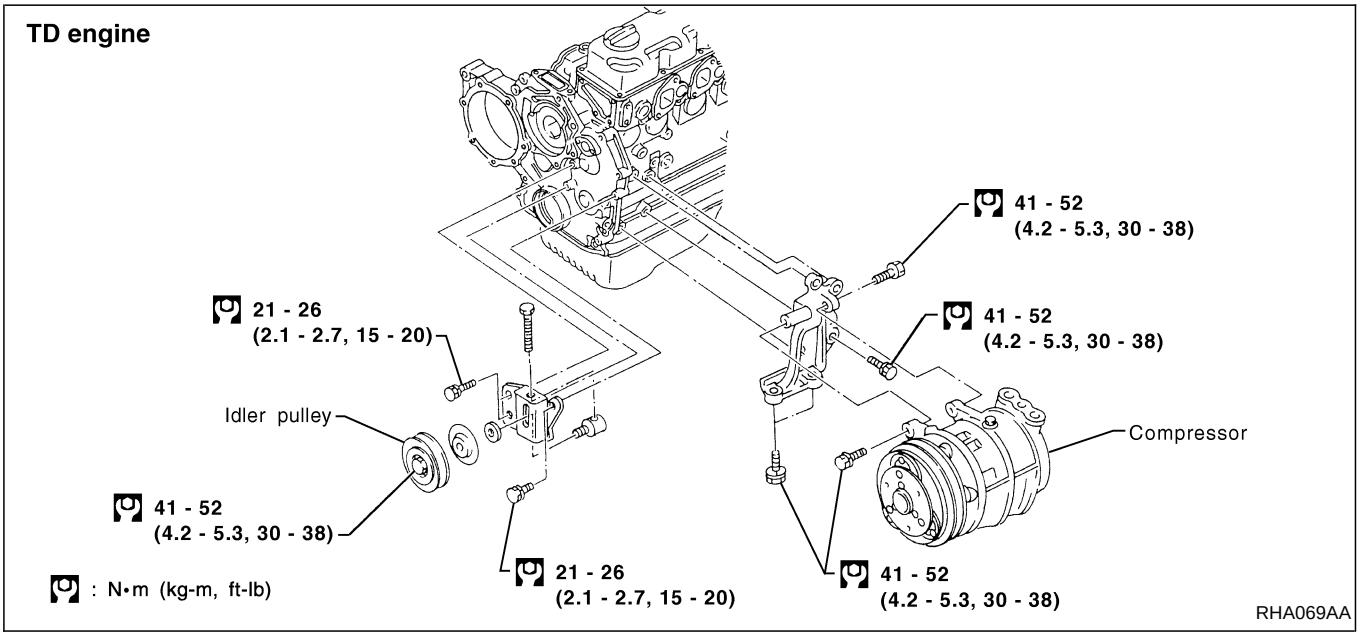
D : 8 - 11 (0.9 - 1.1, 71 - 97)

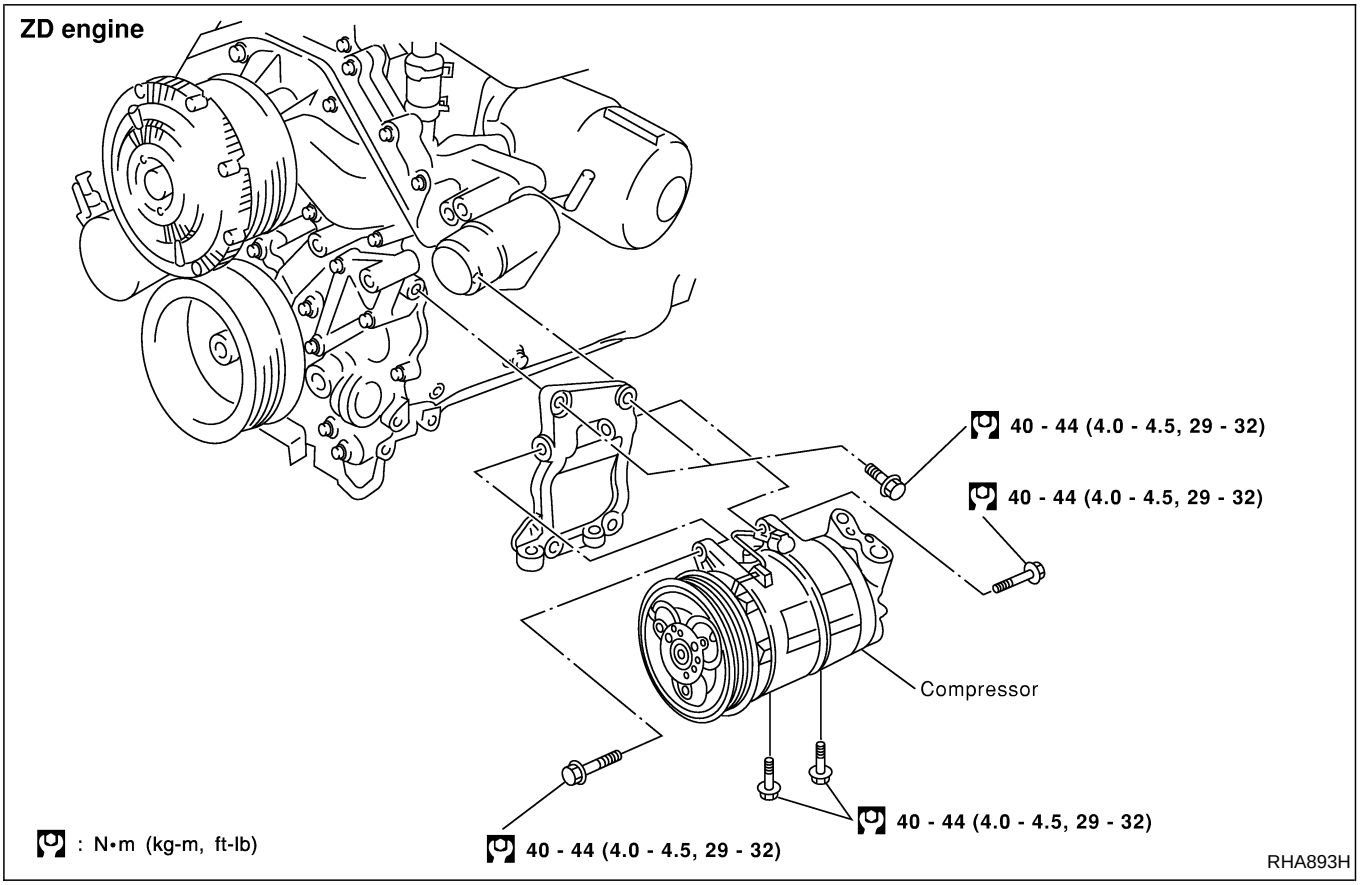
E : 3.2 - 3.6 (0.33 - 0.36, 29 - 31)

RHA369I

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Compressor Mounting





Belt Tension

- Refer to MA section.

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Lubrication Oil

Name: Nissan A/C System Oil Type S
Part number: KLH00-PAGS0

Maintenance of Oil Quantity in Compressor

The oil used to lubricate the compressor circulates through the system with the refrigerant. Whenever any component of the system is replaced or a large amount of gas leakage occurs, add oil to the compressor to maintain the specified amount.
If oil quantity is not maintained properly, the following malfunctions may result:

- Lack of oil: May lead to a seized compressor
- Excessive oil: Inadequate cooling (thermal exchange impeded)

Checking and Adjusting

Adjust the oil quantity according to the flowchart shown below.

START

Can oil return operation be performed?
- A/C system works properly.
- There is no evidence of a large amount of oil leakage.

Yes → Perform oil return operation, proceeding as follows:

1. Start engine, and set the following conditions:
- **Test condition**
  Engine speed: Idling to 1,200 rpm
  A/C or AUTO switch: ON
  Blower speed: Max. position
  Temp. control: Optional [Set so that intake air temperature is 25 to 30°C (77 to 86°F).]
2. Perform oil return operating for about 10 minutes.
3. Stop engine.

CAUTION:
If excessive oil leakage is noted, do not perform the oil return operation.

No

Should the compressor be replaced?

No

Yes

Ⓐ (Go to next page.)

Is there any part to be replaced? (Evaporator, condenser, liquid tank or in case there is evidence of a large amount of oil leakage.)

Yes → After replacing any of the following major components of the system, be sure to add the correct amount of oil to the system.

Amount of oil to be added

Part replaced	Oil to be added to system Amount of oil mℓ (Imp fl oz)	Remarks
Evaporator	75 (2.6)	—
Condenser	75 (2.6)	—
Liquid tank	5 (0.2)	Add if compressor is not replaced. *1
In case of refrigerant leak	30 (1.1)	Large leak
	—	Small leak *2

*1: If compressor is replaced, addition of oil is included in the flow chart.
*2: If refrigerant leak is small, no addition of oil is needed. “Ratio” in this table indicates the ratio of added oil to the overall amount of oil needed in the system.

No

Carry out the A/C performance test.

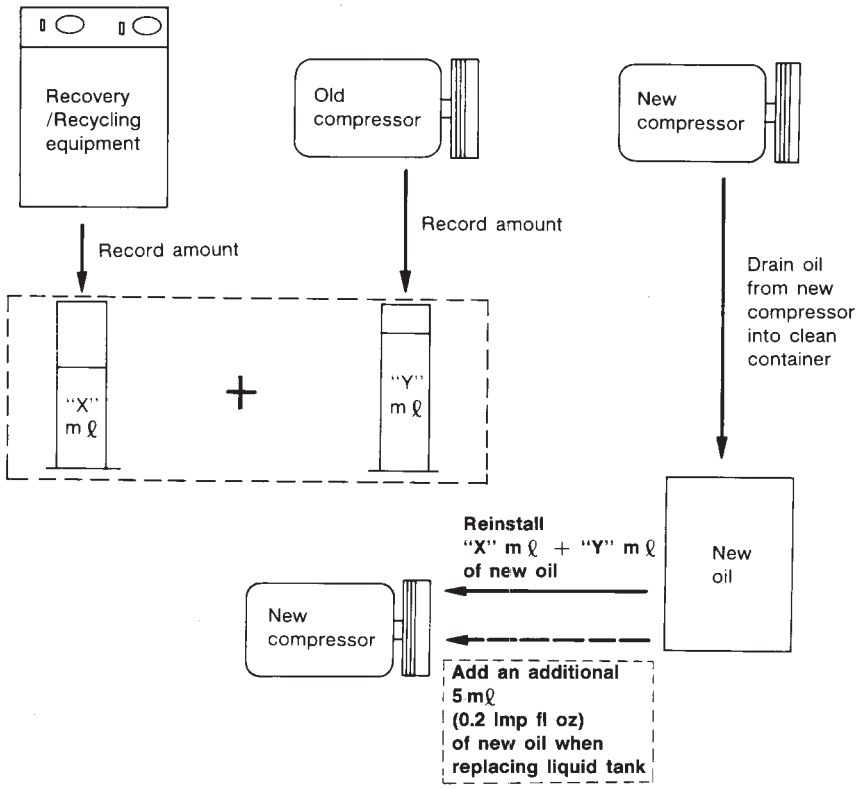
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Checking and Adjusting (Cont'd)

Ⓐ

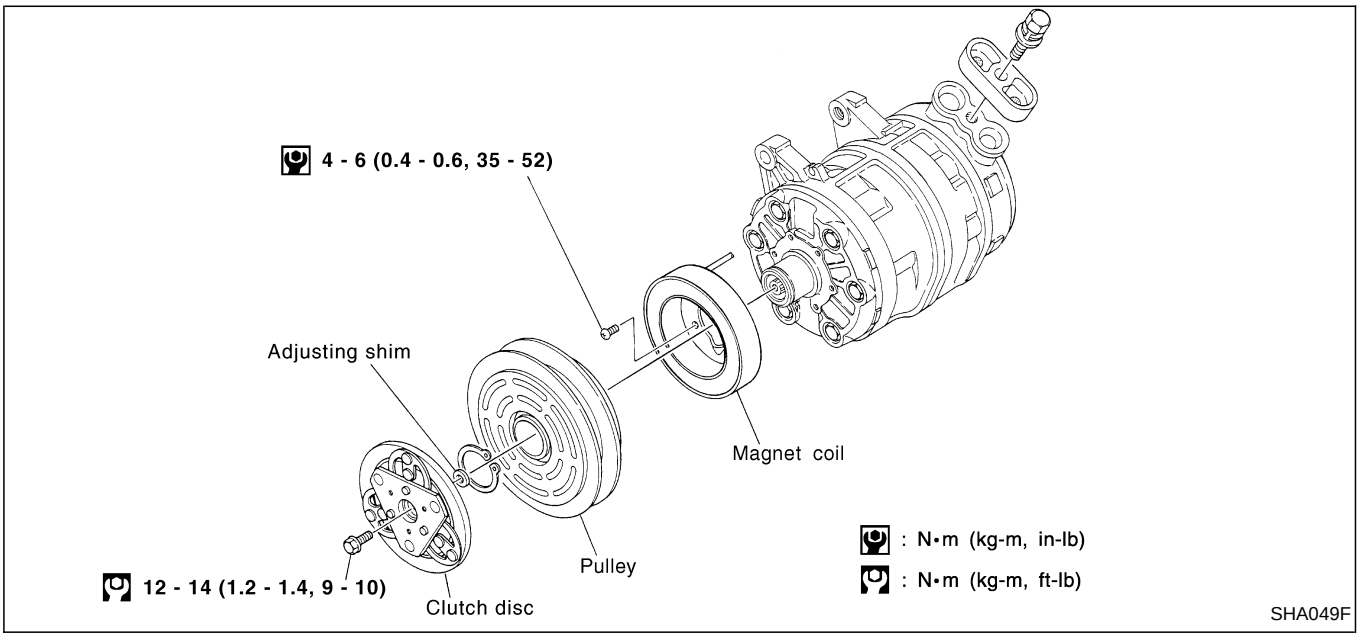
1. Discharge refrigerant into the refrigerant recovery/recycling equipment. Measure oil discharged into the recovery/recycling equipment.
2. Drain the oil from the "old" (removed) compressor into a graduated container, and record the amount of oil drained.
3. Drain the oil from the "new" compressor into a separate, clean container.
4. Measure an amount of the new oil equivalent to that drained from the "old" compressor, and add this oil to the "new" compressor through the drain plug or suction port opening.
5. Measure an amount of the "new" oil equivalent to that recovered during discharging, and add this oil to the "new" compressor through the drain plug or suction port opening.
6. If the liquid tank also needs to be replaced, add an additional 5 mℓ (0.2 Imp fl oz) of oil at this time.
   Do not add this 5 mℓ (0.2 Imp fl oz) of oil if only replacing the compressor.

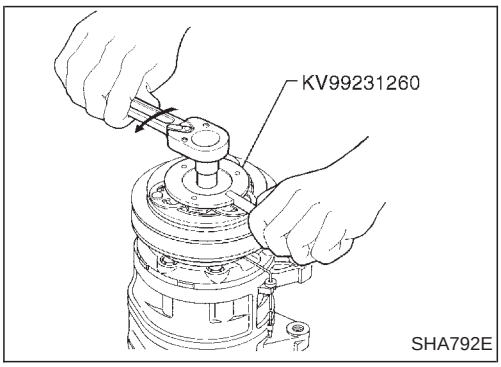
Oil adjusting procedure for compressor replacement



SHA563D

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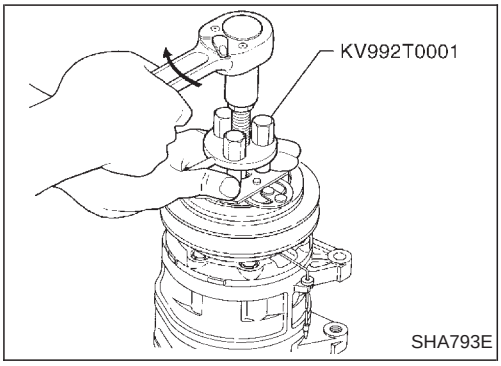




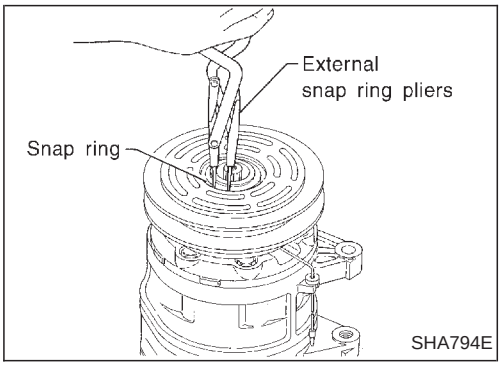
Compressor Clutch

REMOVAL

- When removing center bolt, hold clutch disc with clutch disc wrench.



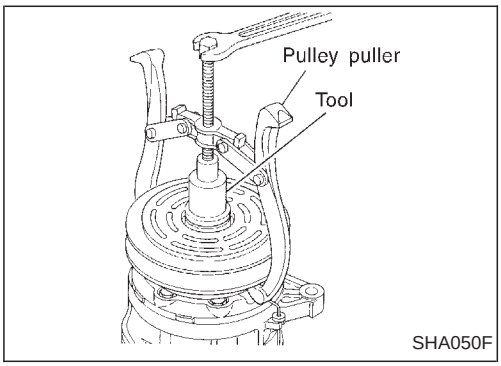
- Remove the drive plate using Tool.
  Insert holder's three pins into the drive plate. Rotate the holder clockwise to hook it onto the plate. Then, tighten the center bolt to remove the drive plate.
  After removing the drive plate, remove the shims from either the drive shaft or the drive plate.



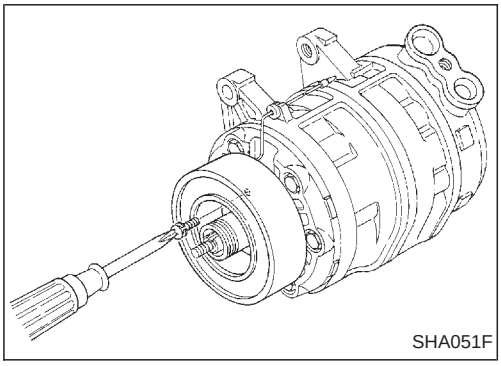
- Remove the snap ring using external snap ring pliers.

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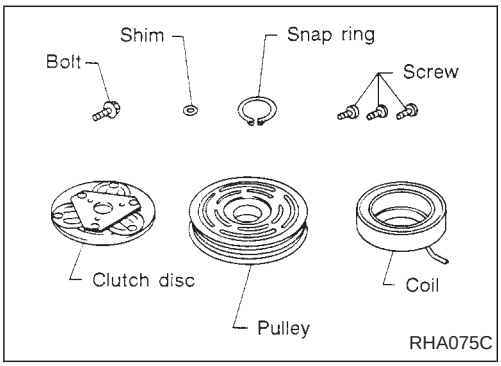
Compressor Clutch (Cont'd)



- Pulley removal
  Use any commercially available pulley puller and tool. Position the center of it on the end of the tool, and remove the pulley assembly.
  For pressed pulleys
  To prevent deformation of the pulley groove, the puller claws should be hooked under the pulley (not into the groove). For machine latched pulleys
  Align the pulley puller groove with the pulley groove, and then remove the pulley assembly.

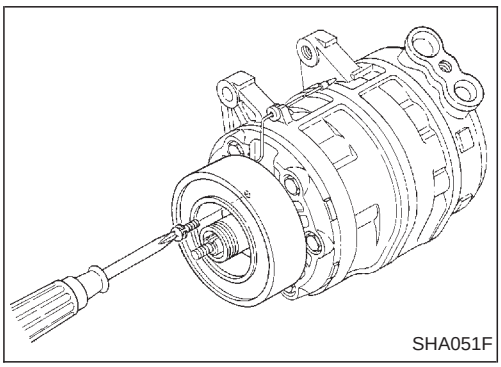


- Remove the three field coil fixing screws and remove the field coil.



INSPECTION

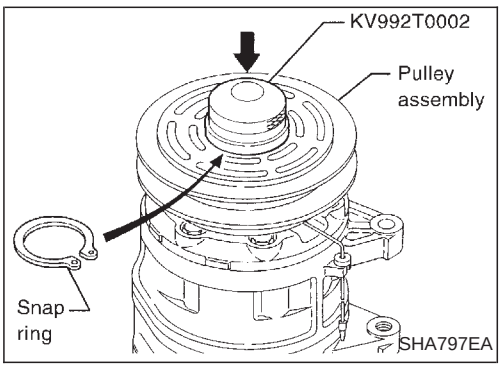
Clutch disc: If the contact surface shows signs of damage due to excessive heat, replace clutch disc and pulley.
Pulley: Check the appearance of the pulley assembly. Check the contact surface of the pulley for any sign of excessive grooving due to slippage. If any sign is found, replace both the pulley and clutch disc. The contact surfaces of the pulley assembly should be cleaned with a suitable solvent before reinstallation.
Coil: Check coil for loose connection or cracked insulation.



INSTALLATION

- Install the field coil.

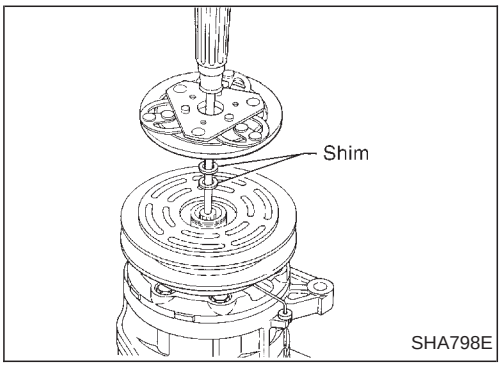
Be sure to align the coil's pin with the hole in the compressor's front head.



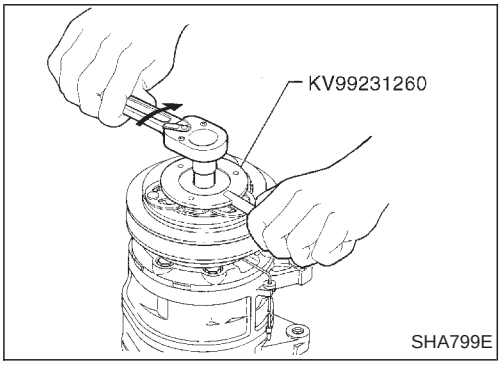
- Install the pulley assembly using the installer and a hand press, and then install the snap ring using snap ring pliers.

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Compressor Clutch (Cont'd)

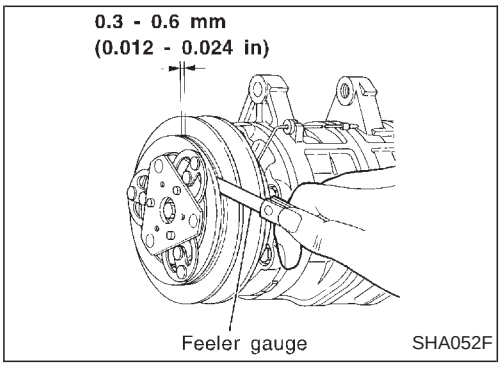


- Install the drive plate on the drive shaft, together with the original shim(s). Press the drive plate down by hand.



- Using the holder to prevent drive plate rotation, tighten the bolt to 12 to 14 N·m (1.2 to 1.4 kg-m, 9 to 10 ft-lb) torque.

After tightening the bolt, check that the pulley rotates smoothly.



- Check clearance around the entire periphery of clutch disc.

  Disc-to-pulley clearance:

  0.3 - 0.6 mm (0.012 - 0.024 in)

  If the specified clearance is not obtained, replace adjusting shim and readjust.

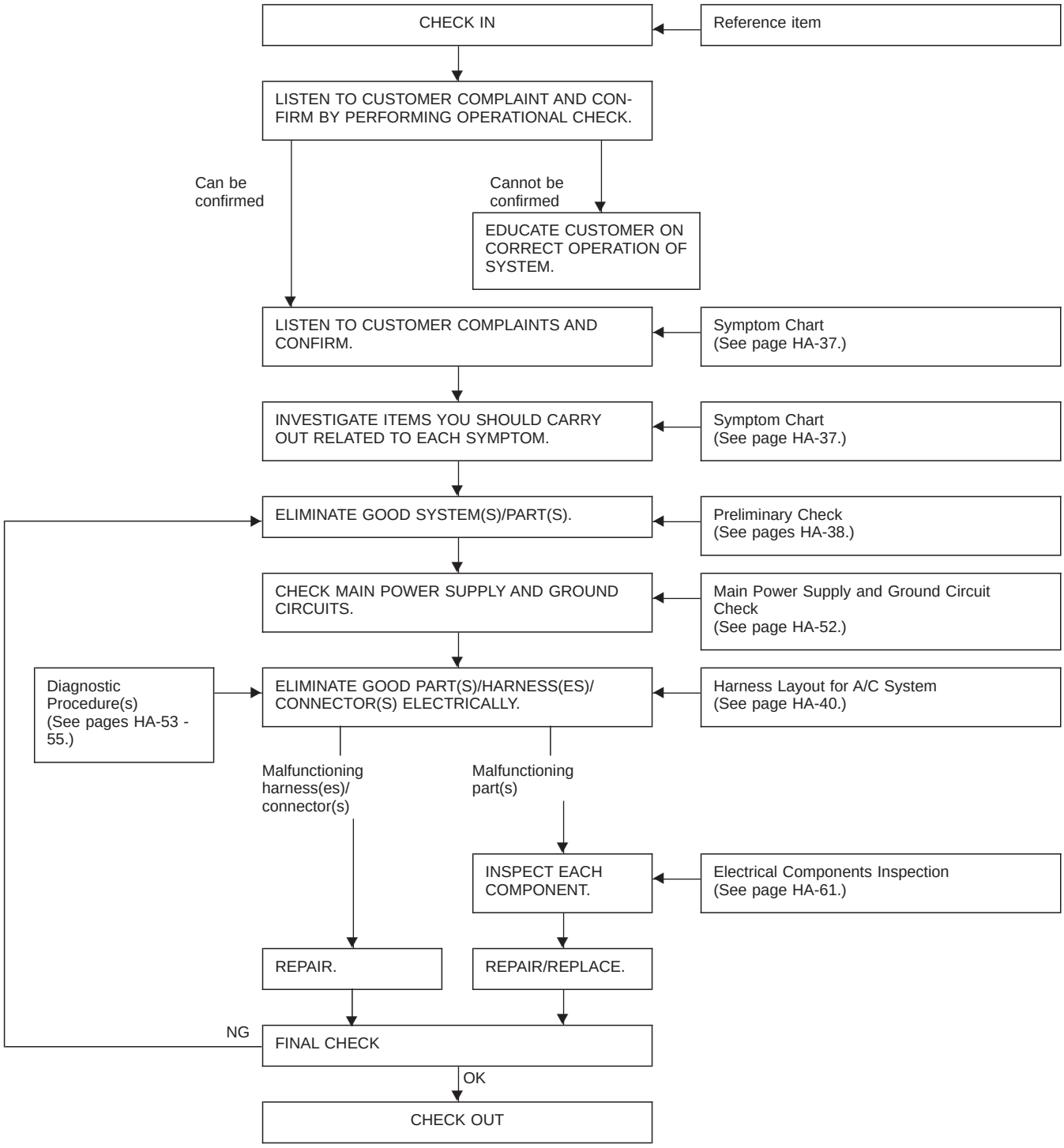
BREAK-IN OPERATION

When replacing compressor clutch assembly, always conduct the break-in operation. This is done by engaging and disengaging the clutch about thirty times. Break-in operation raises the level of transmitted torque.

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How to Perform Trouble Diagnoses for Quick and Accurate Repair

WORK FLOW



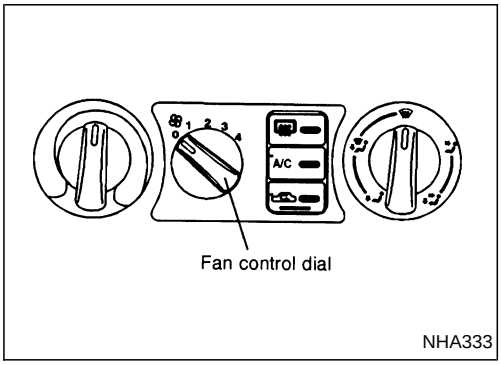
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Operation Check

The purpose of the operational check is to confirm that the system is as it should be. The systems which will be checked are the blower, mode (discharge air), intake air, temperature decrease, temperature increase and A/C switch system.

CONDITIONS:

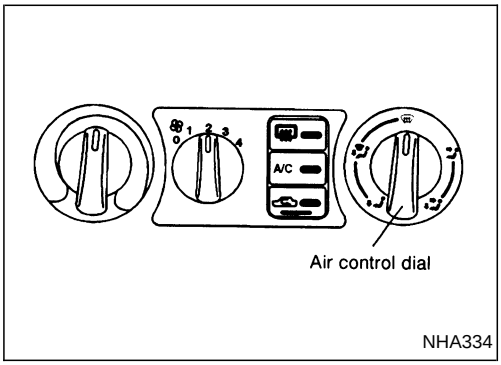
Engine running and at normal operating temperature.



PROCEDURE:

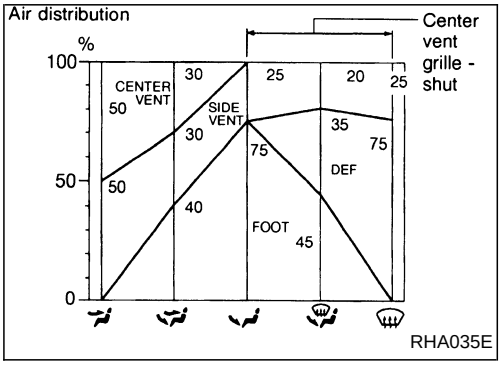
1. Check blower

1) Turn FAN CONTROL DIAL to 1.
   Blower should operate at speed 1.
2) Then turn the DIAL to speed 2.
3) Continue checking blower speed until all speeds are checked.
4) Leave blower on speed 4.



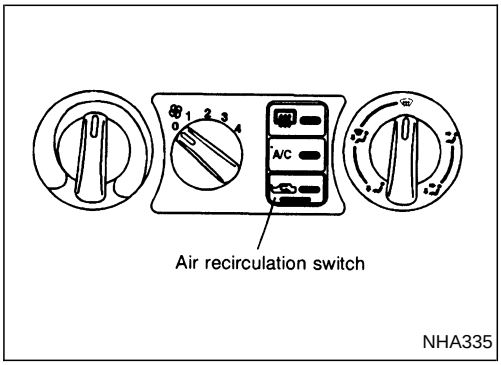
2. Check discharge air

1) Turn AIR CONTROL DIAL to position.
2) Confirm that all discharge air comes out of face vents.
3) Turn AIR CONTROL DIAL to position.
4) Confirm that discharge air comes out of face vents and foot vents.
5) Turn AIR CONTROL DIAL to position.
6) Confirm that discharge air comes out of foot vents, with some air from face vents.
7) Turn AIR CONTROL DIAL to position.
8) Confirm that discharge air comes out of foot vents with some air from defroster vents.
9) Turn AIR CONTROL DIAL to position.
10) Confirm that all discharge air comes out of defroster vents, with some air from face vents.



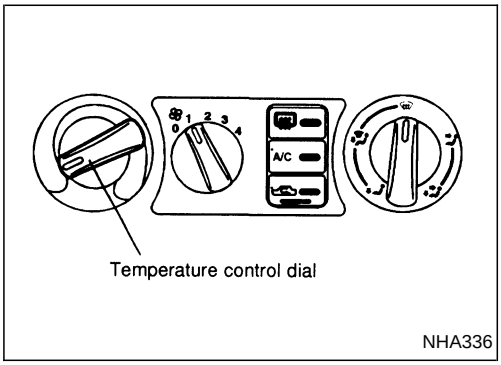
3. Check recirculation

1) Switch AIR RECIRCULATION SWITCH to ON position (Indicator light ON).
2) Listen for intake door position change (you should hear sound change slightly).



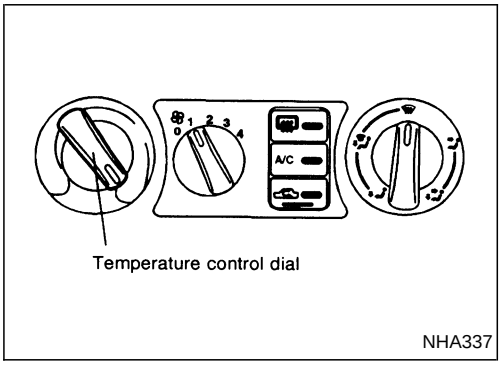
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Operation Check (Cont'd)



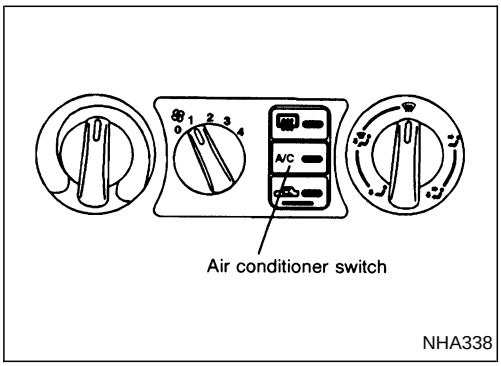
4. Check temperature decrease

1) Turn TEMPERATURE CONTROL DIAL to full cold (counter-clockwise).
2) Check for cold air at discharge air outlets.



5. Check temperature increase

1) Turn TEMPERATURE CONTROL DIAL to full hot (clockwise).
2) Check for hot air at discharge air outlets.



6. Check A/C switch

Turn FAN CONTROL DIAL to the desired position (1 to 4) and switch AIR CONDITIONER SWITCH to turn ON air conditioner. Indicator light will come on when air conditioner is ON.

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Performance Chart

TEST CONDITION

Testing must be performed as follows:

Vehicle location:	Indoors or in the shade (in a well-ventilated place)
Doors:	Closed
Door window:	Open (Front driver side only)
Hood:	Open
TEMP. control dial position:	Max. COLD
AIR control dial position:	(Ventilation)
Air recirculation switch position:	(Recirculation)
Fan control dial position:	4
Engine speed:	1,500 rpm
Time required before starting testing after air conditioner starts operating:	More than 10 minutes

TEST READING

Recirculating-to-discharge air temperature table

Inside air (Recirculating air) at blower assembly inlet		Discharge air temperature at center ventilator °C (°F)
Relative humidity %	Air temperature °C (°F)	
40 - 60	25 (77)	9.8 - 11.5 (50 - 53)
	30 (86)	13.8 - 15.9 (57 - 61)
	35 (95)	17.9 - 20.3 (64 - 69)
60 - 80	25 (77)	11.5 - 13.3 (53 - 56)
	30 (86)	15.9 - 18.0 (61 - 64)
	35 (95)	20.3 - 22.7 (69 - 73)

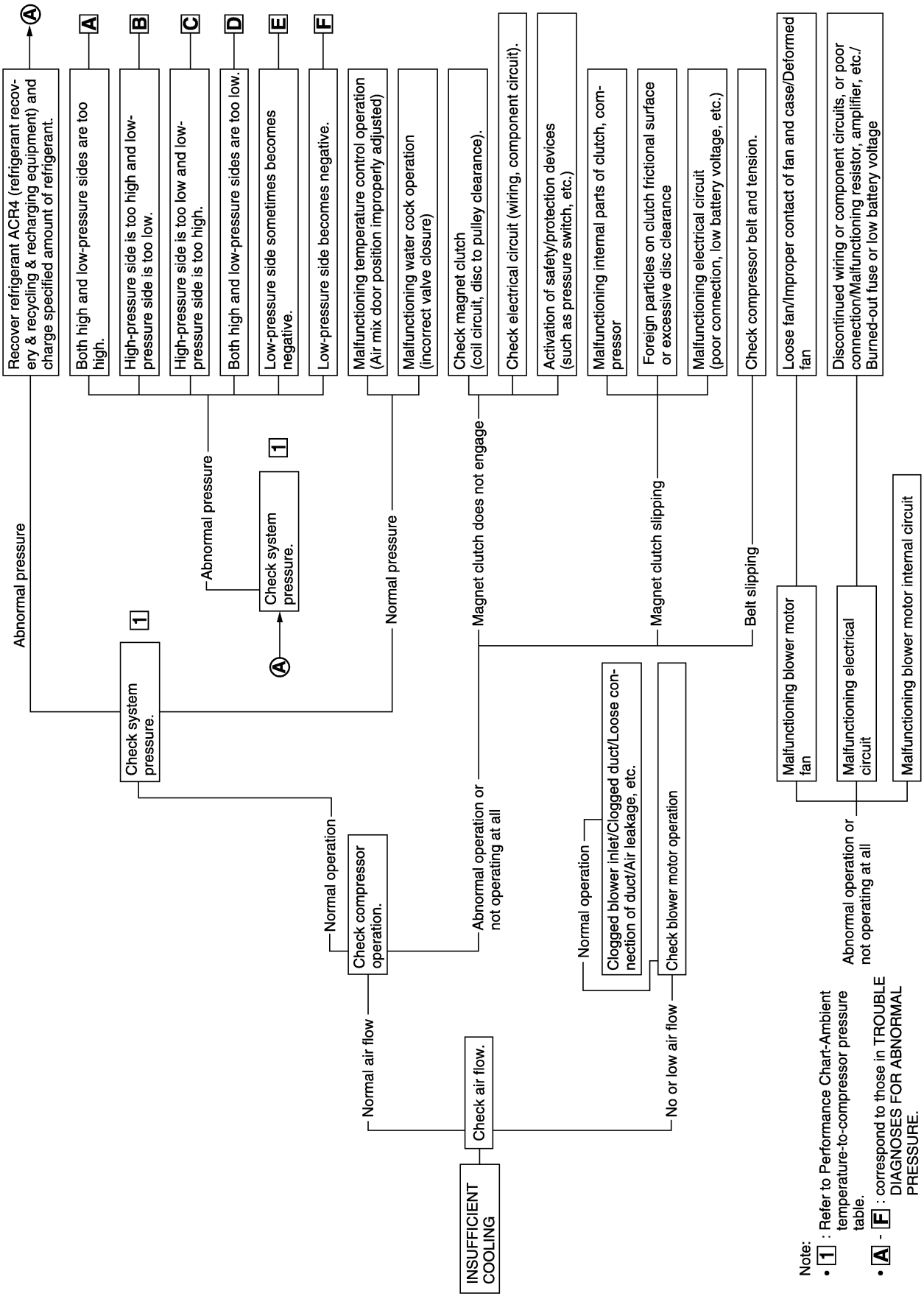
Ambient air temperature-to-compressor pressure table

Ambient air		High-pressure (Discharge side) kPa (bar, kg/cm^2, psi)	Low-pressure (Suction side) kPa (bar, kg/cm^2, psi)
Relative humidity %	Air temperature °C (°F)		
40 - 80	25 (77)	1,451 - 1,608 (14.51 - 16.08, 14.8 - 16.4, 210 - 233)	157 - 186 (1.57 - 1.86, 1.6 - 1.9, 23 - 27)
	30 (86)	1,569 - 1,804 (15.69 - 18.04, 16.0 - 18.4, 228 - 262)	176 - 235 (1.76 - 2.35, 1.8 - 2.4, 26 - 34)
	35 (95)	1,834 - 2,138 (18.34 - 21.38, 18.7 - 21.8, 266 - 310)	226 - 304 (2.26 - 3.04, 2.3 - 3.1, 33 - 44)

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Performance Test Diagnoses

INSUFFICIENT COOLING



Note:
- 1 : Refer to Performance Chart-Ambient temperature-to-compressor pressure table.
- A - F : correspond to those in TROUBLE DIAGNOSES FOR ABNORMAL PRESSURE.

(Go to next page)

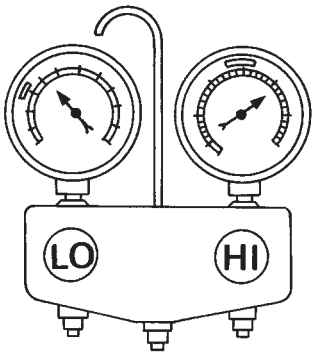
MHA176B

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Performance Test Diagnoses (Cont'd)

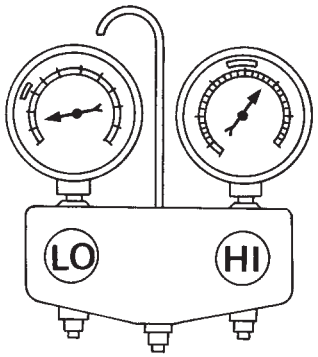
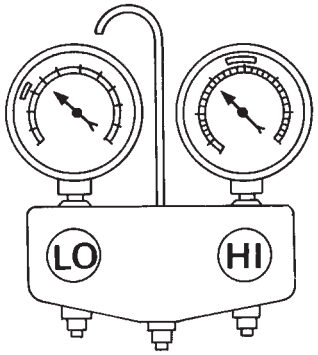
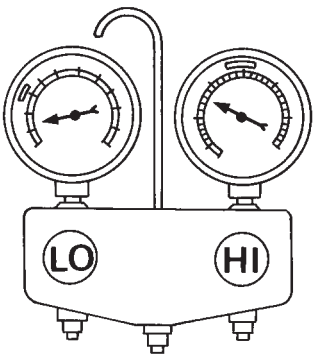
TROUBLE DIAGNOSES FOR ABNORMAL PRESSURE

Whenever abnormal pressure of high and/or low sides of the system is noted, diagnosis must be conducted by using a manifold gauge. The large-line zone on the gauge scale (see illustrations.) shown in the following table refers to the standard (normal) pressure range for the corresponding pressure side (high or low). Since the standard (normal) pressure, however, differs from vehicle to vehicle, refer to the "Ambient air temperature-to-compressor pressure table".

Gauge indication	Refrigerant cycle	Probable cause	Corrective action
Both high- and low-pressure sides are too high. A  AC359A	● Pressure is reduced soon after water is splashed on condenser.	Excessive refrigerant charge in refrigeration cycle	Reduce refrigerant until specified pressure is obtained.
	Air suction by radiator or condenser fan is insufficient.	Insufficient condenser cooling performance ↓ ① Condenser fins are clogged. ② Improper rotation of radiator fan or condenser fan	● Clean condenser. ● Check and repair radiator or condenser fan as necessary.
	● Low-pressure pipe is not cold. ● When compressor is stopped high-pressure value quickly drops by approximately 196 kPa (2 kg/cm^2, 28 psi). It then decreases gradually thereafter.	Poor heat exchange in condenser (After compressor operation stops, high pressure decreases too slowly.) ↓ Air in refrigeration cycle	Evacuate repeatedly and recharge system.
	Engine tends to overheat.	Engine cooling systems malfunction.	Check and repair each engine cooling system.
	● Areas near low-pressure pipe connection and service valves are considerably cold compared with areas near expansion valve outlet or evaporator. ● Plates are sometimes covered with frost.	● Excessive liquid refrigerant on low-pressure side ● Excessive refrigerant discharge flow ● Expansion valve is open a little compared with the specification. ↓ ① Improper expansion valve installation ② Improper expansion valve adjustment	Replace expansion valve.

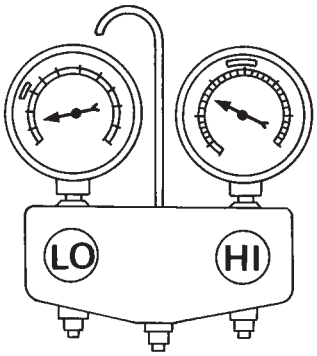
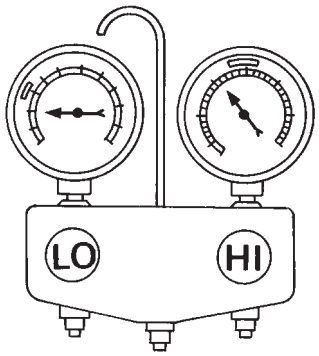
http://vnx.su/

Performance Test Diagnoses (Cont'd)

Gauge indication	Refrigerant cycle	Probable cause	Corrective action
High-pressure side is too high and low-pressure side is too low. B  AC360A	Upper side of condenser and high-pressure side are hot, however, liquid tank is not so hot.	High-pressure tube or parts located between compressor and condenser are clogged or crushed.	● Check and repair or replace malfunctioning parts. ● Check compressor oil for contamination.
High-pressure side is too low and low-pressure side is too high. C  AC356A	High- and low-pressure sides become equal soon after compressor operation stops.	Compressor pressure operation is improper. ↓ Damages inside compressor packings	Replace compressor.
	No temperature difference between high- and low-pressure sides	Compressor discharge capacity does not change. (Compressor stroke is set at maximum.)	Replace compressor.
Both high- and low-pressure sides are too low. D  AC353A	● There is a big temperature difference between liquid tank outlet and inlet. Outlet temperature is extremely low. ● Liquid tank inlet and expansion valve are frosted.	Liquid tank inside is clogged a little.	● Replace liquid tank ● Check compressor oil for contamination.
	● Temperature of expansion valve inlet is extremely low as compared with areas near liquid tank. ● Expansion valve inlet may be frosted. ● Temperature difference occurs somewhere in high-pressure side	High-pressure pipe located between liquid tank and expansion valve is clogged.	● Check and repair malfunctioning parts. ● Check compressor oil for contamination.

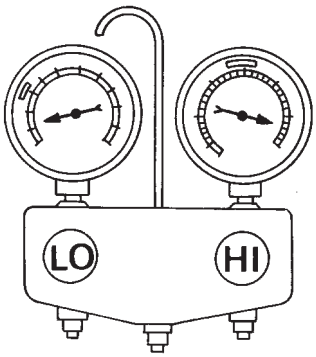
http://vnx.su/

Performance Test Diagnoses (Cont'd)

Gauge indication	Refrigerant cycle	Probable cause	Corrective action
Both high- and low-pressure sides are too low. D  AC353A	There is a big temperature difference between expansion valve inlet and outlet while the valve itself is frosted.	Expansion valve closes a little compared with the specification. ↓ ① Improper expansion valve adjustment ② Malfunctioning expansion valve ③ Outlet and inlet may be clogged.	● Remove foreign particles by using compressed air. ● Check compressor oil for contamination. ● Replace expansion valve.
	Areas near low-pressure pipe connection and service valve are extremely cold as compared with areas near expansion valve outlet and evaporator.	Low-pressure pipe is clogged or crushed.	● Check and repair malfunctioning parts. ● Check compressor oil for contamination.
	Air flow volume is not enough or is too low.	Evaporator is frozen. ↓ Compressor discharge capacity does not change. (Compressor stroke is set at maximum length.)	Replace compressor.
Low-pressure side sometimes becomes negative. E  AC354A	● Air conditioning system does not function and does not cyclically cool the compartment air. ● The system constantly functions for a certain period of time after compressor is stopped and restarted.	Refrigerant does not discharge cyclically. ↓ Moisture is frozen at expansion valve outlet and inlet. ↓ Water is mixed with refrigerant.	● Drain water from refrigerant or replace refrigerant. ● Replace liquid tank.

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Performance Test Diagnoses (Cont'd)

Gauge indication	Refrigerant cycle	Probable cause	Corrective action
Low-pressure side becomes negative. F  AC362A	Liquid tank or front/rear side of expansion valve's pipe is frosted or dewed.	High-pressure side is closed and refrigerant does not flow. ↓ Expansion valve or liquid tank is frosted.	After the system is left at rest, start it again in order to confirm whether or not problem is caused by water or foreign particles. ● If the problem is due to water, drain water from refrigerant or replace refrigerant. ● If it is due to foreign particles, remove expansion valve and remove them with dry and compressed air. ● If either of the above methods cannot correct the problem, replace expansion valve. ● Replace liquid tank. ● Check compressor oil for contamination.

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Symptom Chart

DIAGNOSTIC TABLE

PROCEDURE	Preliminary Check		Diagnostic Procedure			Main Power Supply and Ground Circuit Check			Electrical Components Inspection								
SYMPTOM	Preliminary check 1	Preliminary check 2	Diagnostic procedure 1	Diagnostic procedure 2	Diagnostic procedure 3	15A Fuses	10A Fuse	15A Fuse	Blower motor	Intake door motor	Resistor	A/C switch	Fan switch	A/C relay	Dual-pressure switch	Compressor: Magnet clutch	Harness
A/C does not blow cold air.	❶		○			○	○	○	○		○	○	○	○	○	○	○
Blower motor does not rotate.	❶		❷			○		○	○		○		○				○
Magnet clutch does not engage when A/C switch and fan switch are ON.	❶			❷			○	○				○	○	○	○	○	○
Noise		❶															
Intake door does not change.					❶		○			○							○

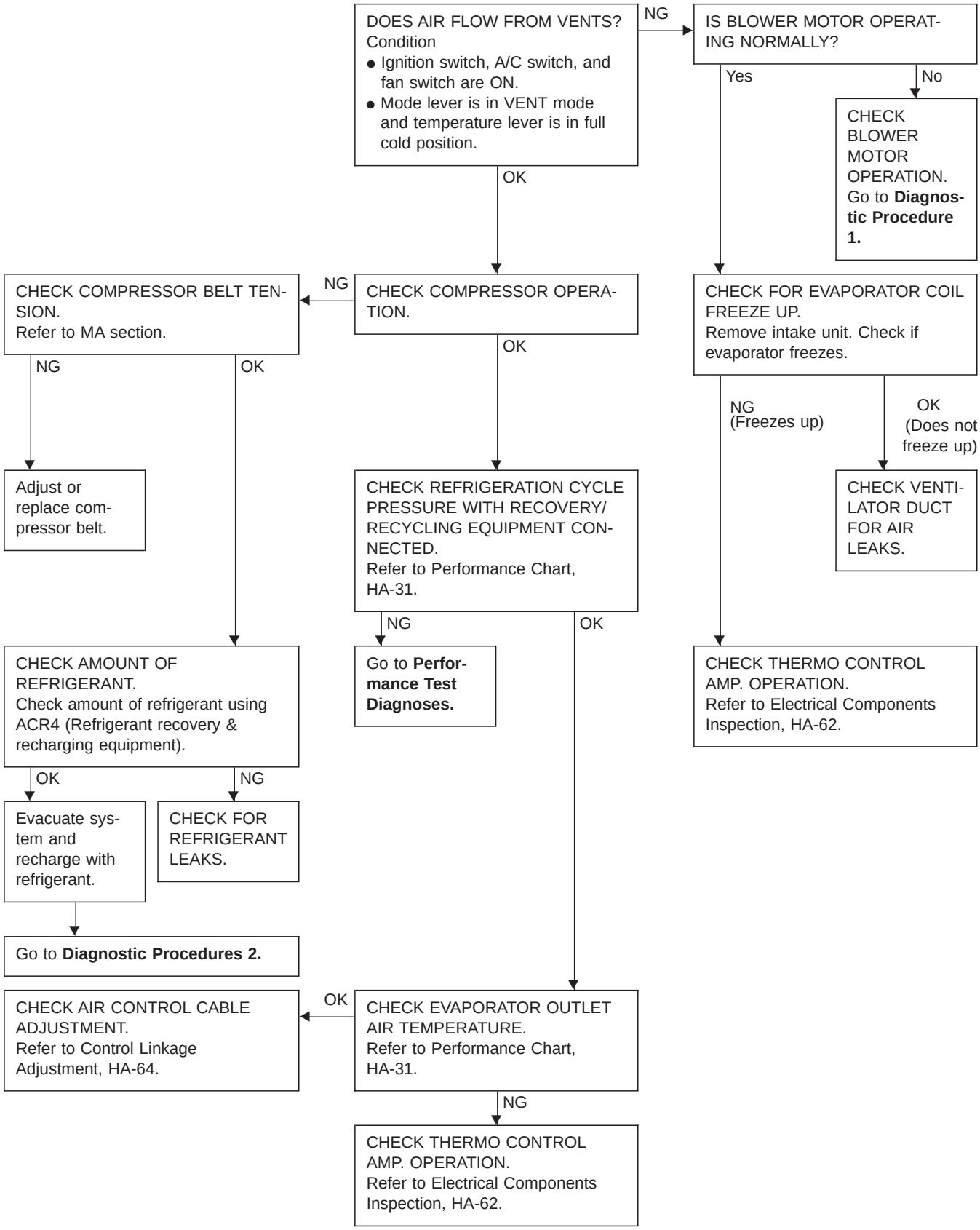
❶, ❷: The number indicates checking order.
○: Refer to each flow chart for checking order. (It depends on malfunctioning portion.)

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Preliminary Check

PRELIMINARY CHECK 1

A/C does not blow cold air.

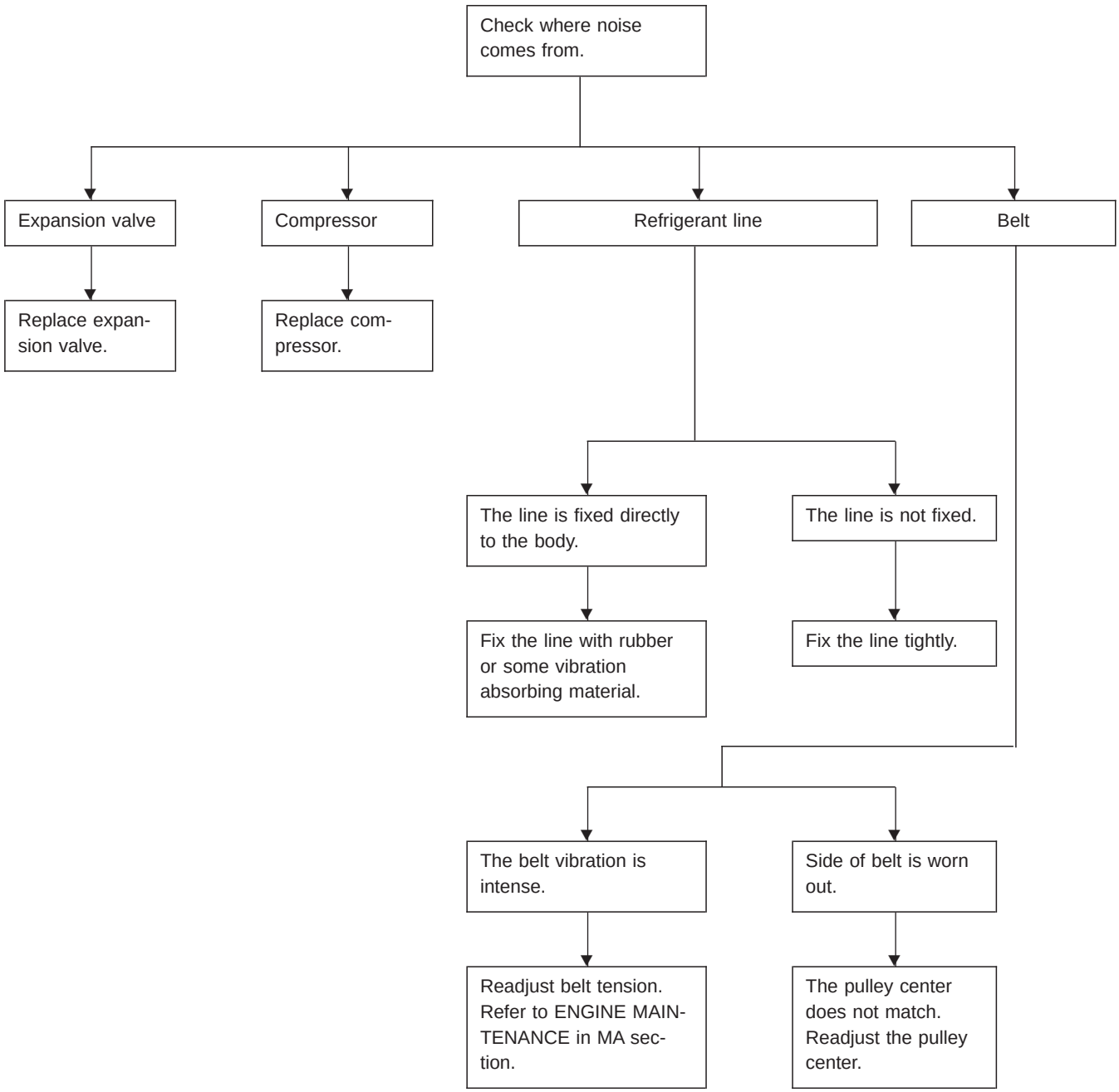


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Preliminary Check (Cont'd)

PRELIMINARY CHECK 2

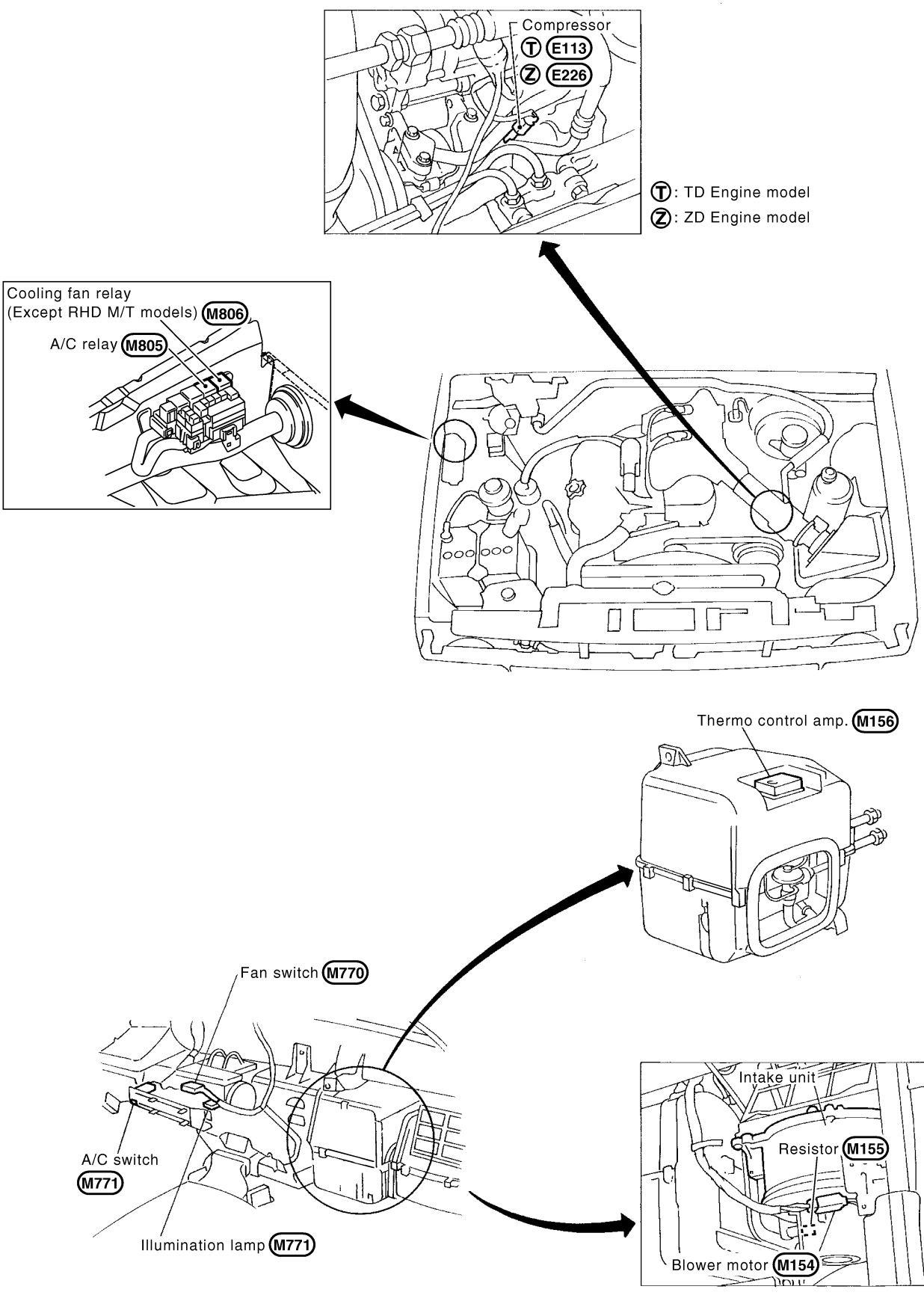
Noise



http://vnx.su/

Harness Layout for A/C System

LH DRIVE MODELS

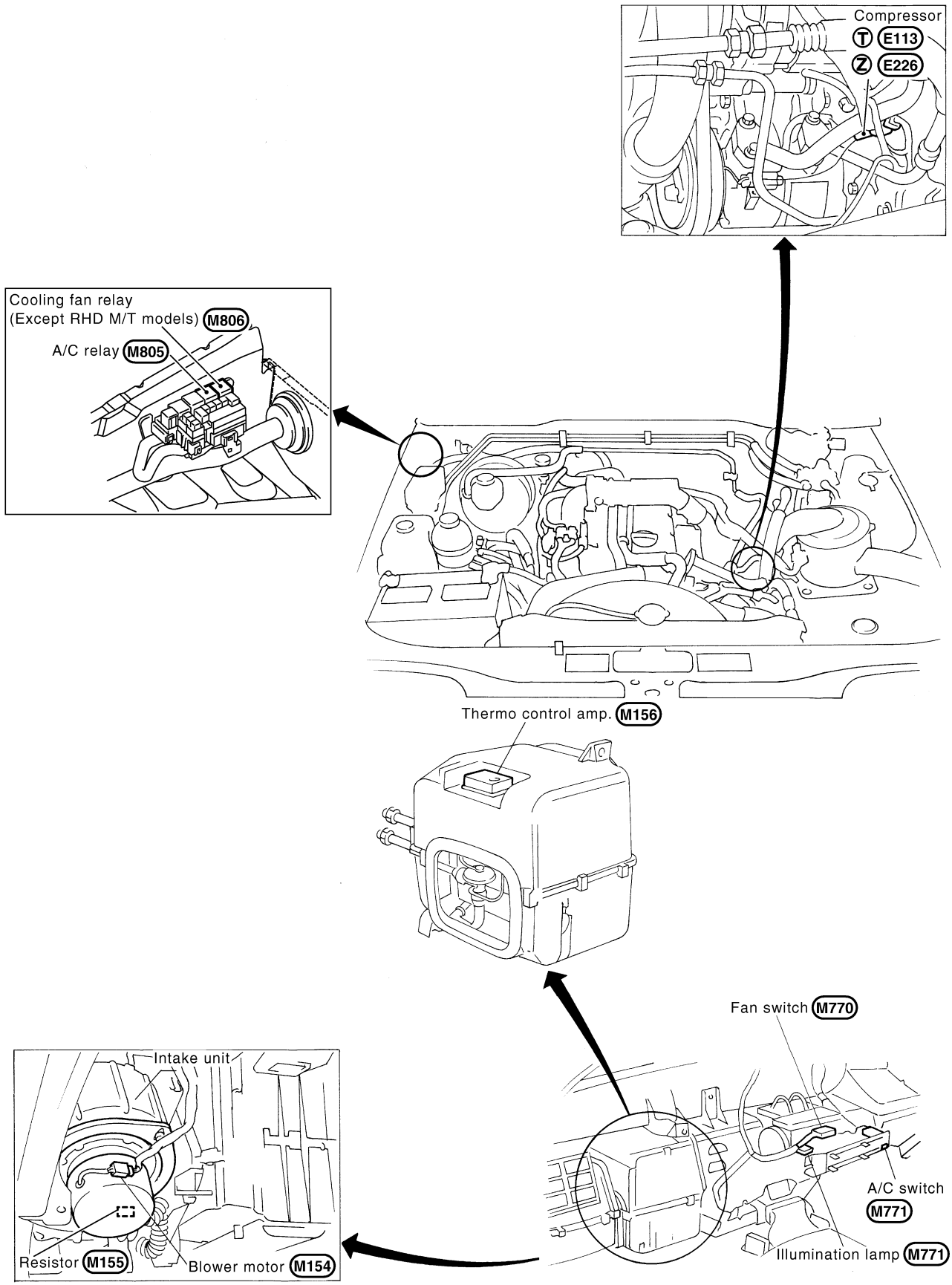


RHA342I

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Harness Layout for A/C System (Cont'd)

RH DRIVE MODELS

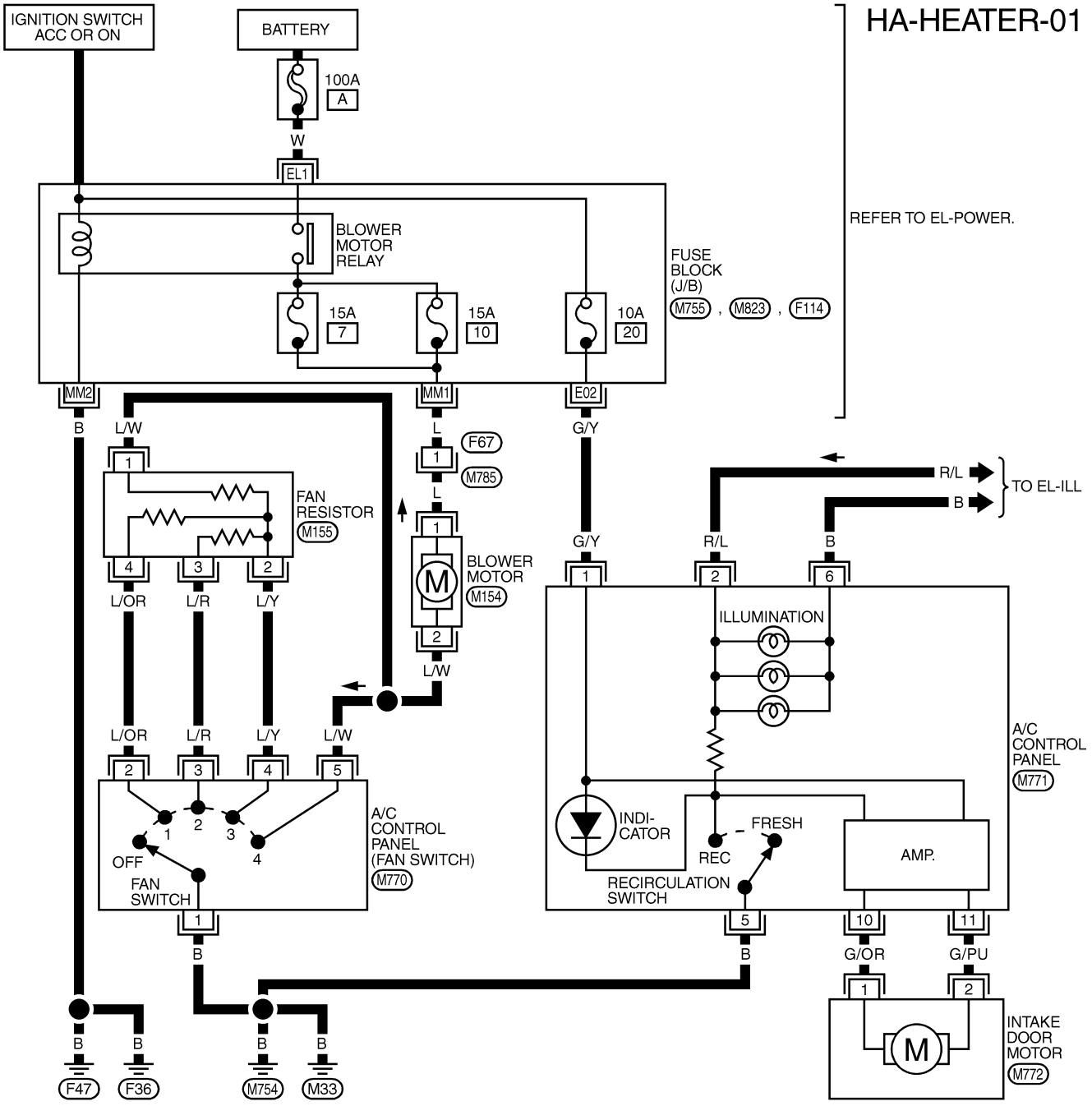


RHA343I

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Wiring Diagram — Heater

LHD MODELS

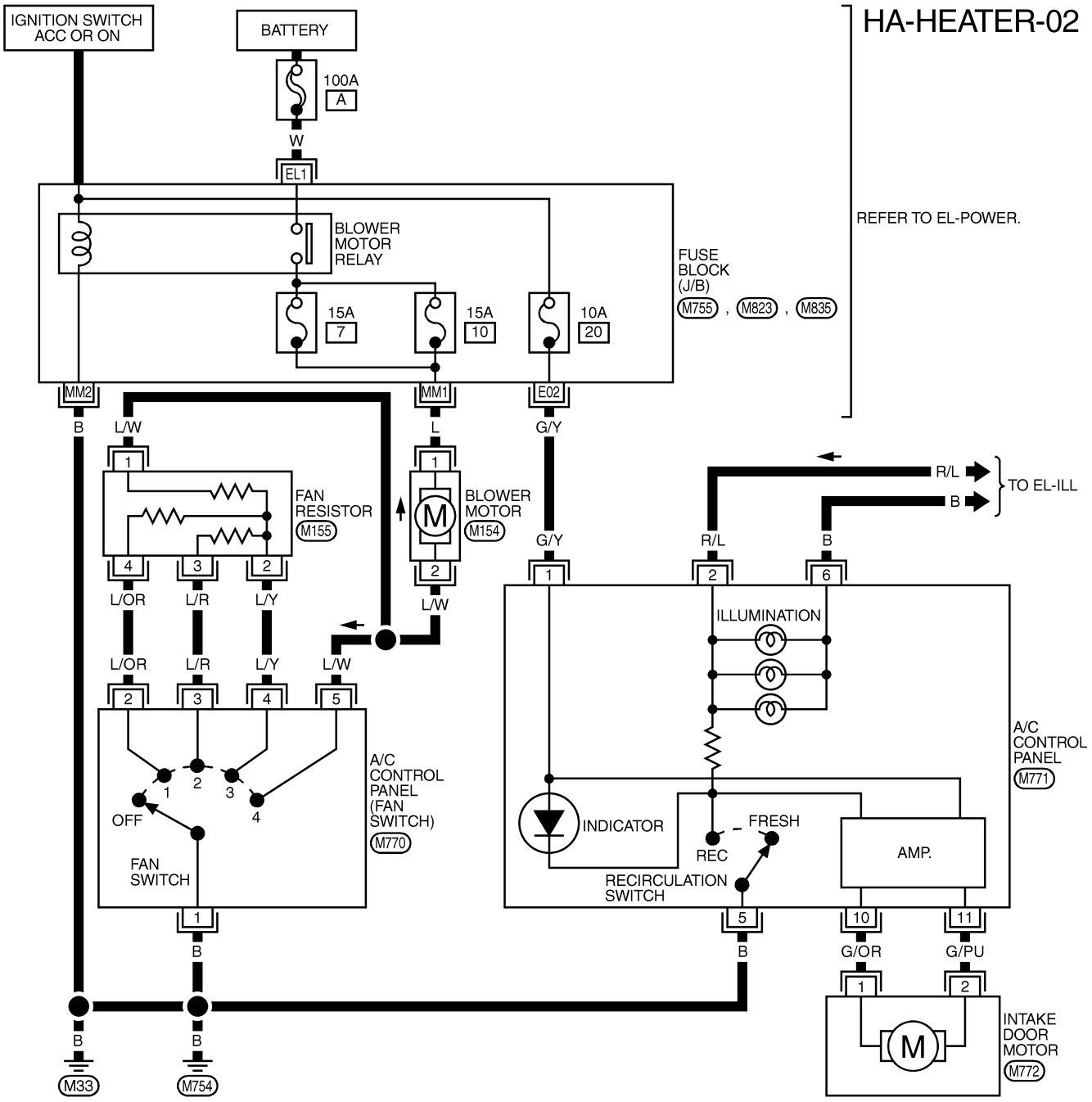


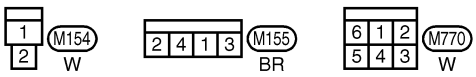
YHA400

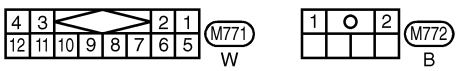
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Wiring Diagram — Heater (Cont'd)

RHD MODELS







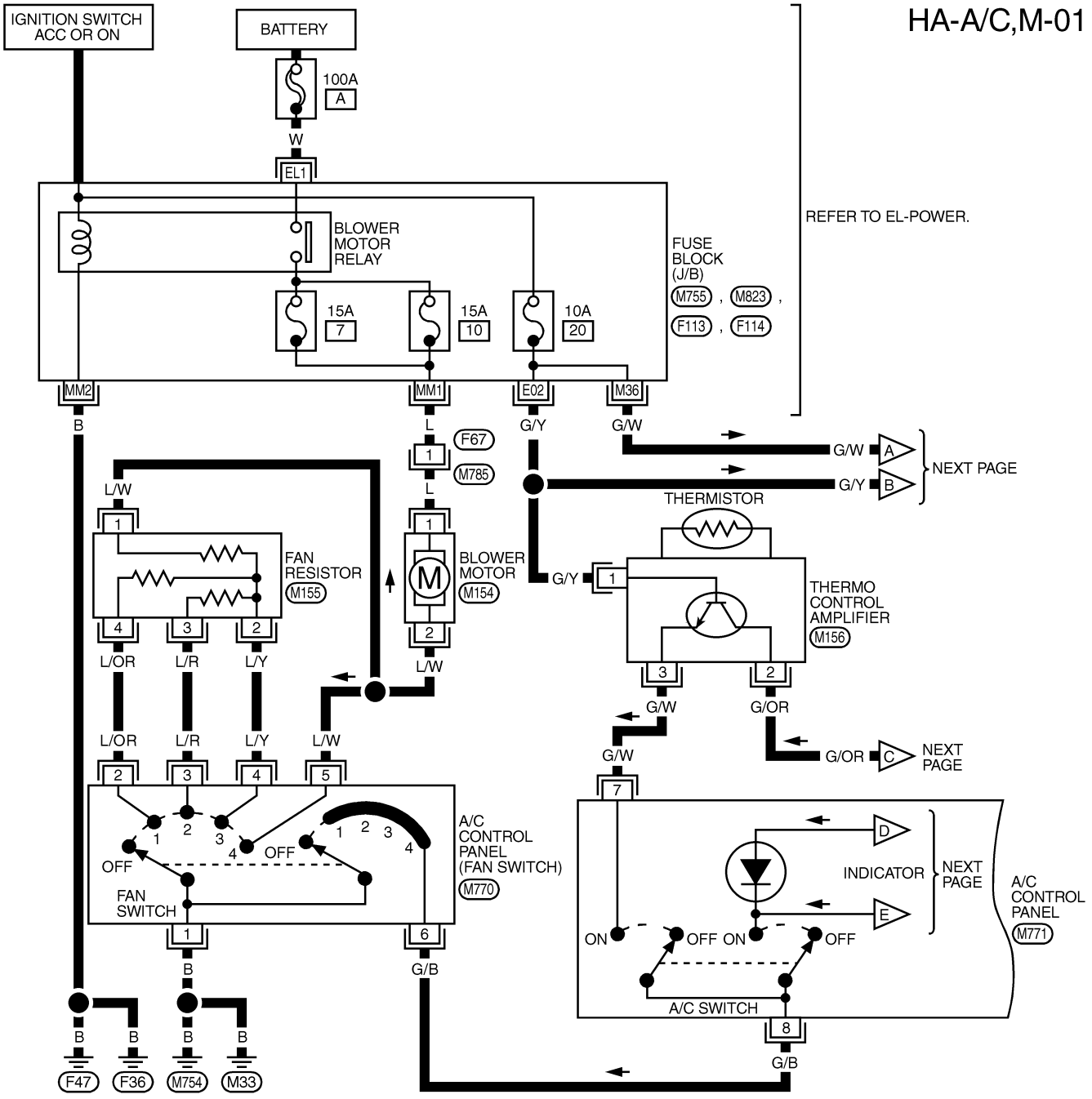
REFER TO THE FOLLOWING.
M755 , M823 , M835
-FUSE BLOCK-
JUNCTION BOX (J/B)

YHA401

http://vnx.su/

Wiring Diagram

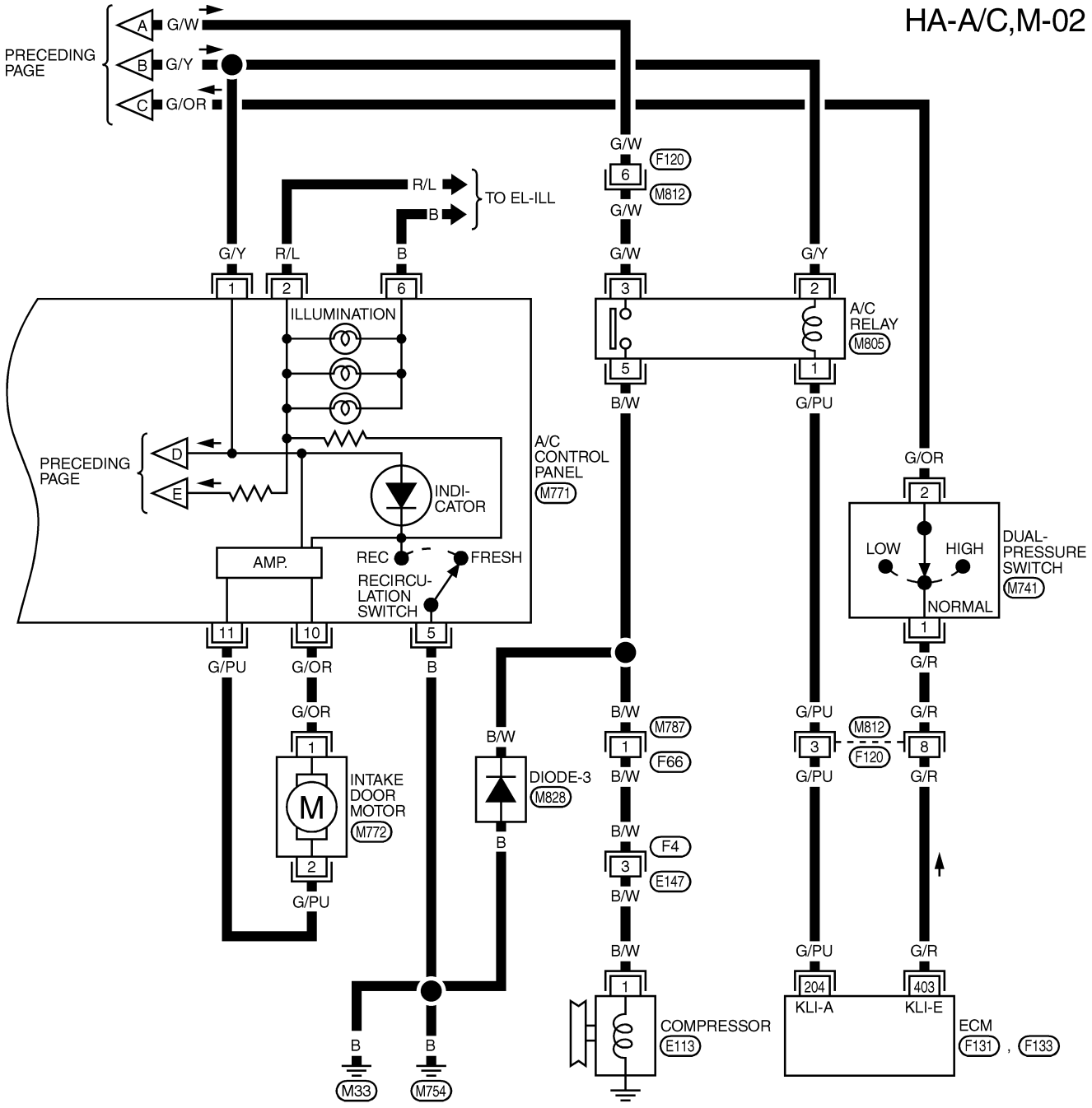
LHD TD27Ti ENGINE MODELS

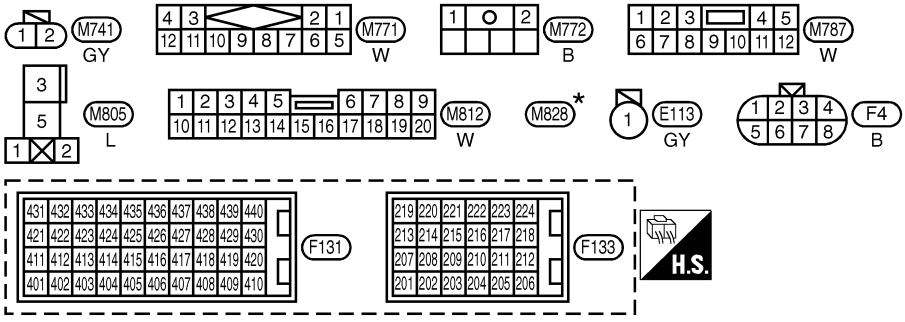


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Wiring Diagram (Cont'd)

HA-A/C,M-02





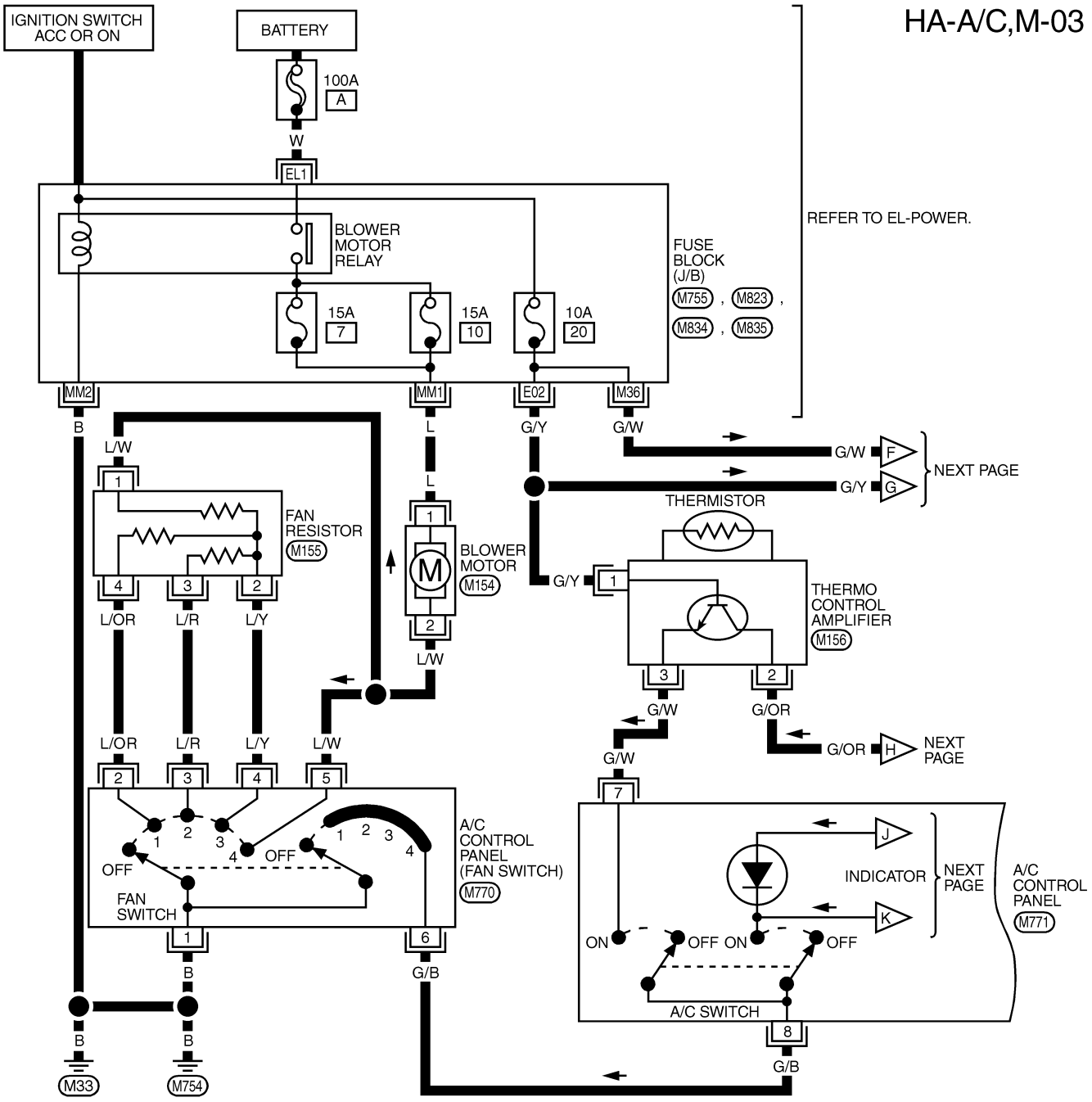
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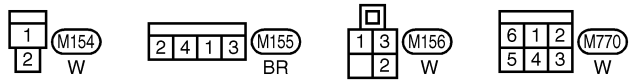
YHA393

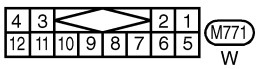
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Wiring Diagram (Cont'd)

RHD TD27Ti ENGINE MODELS





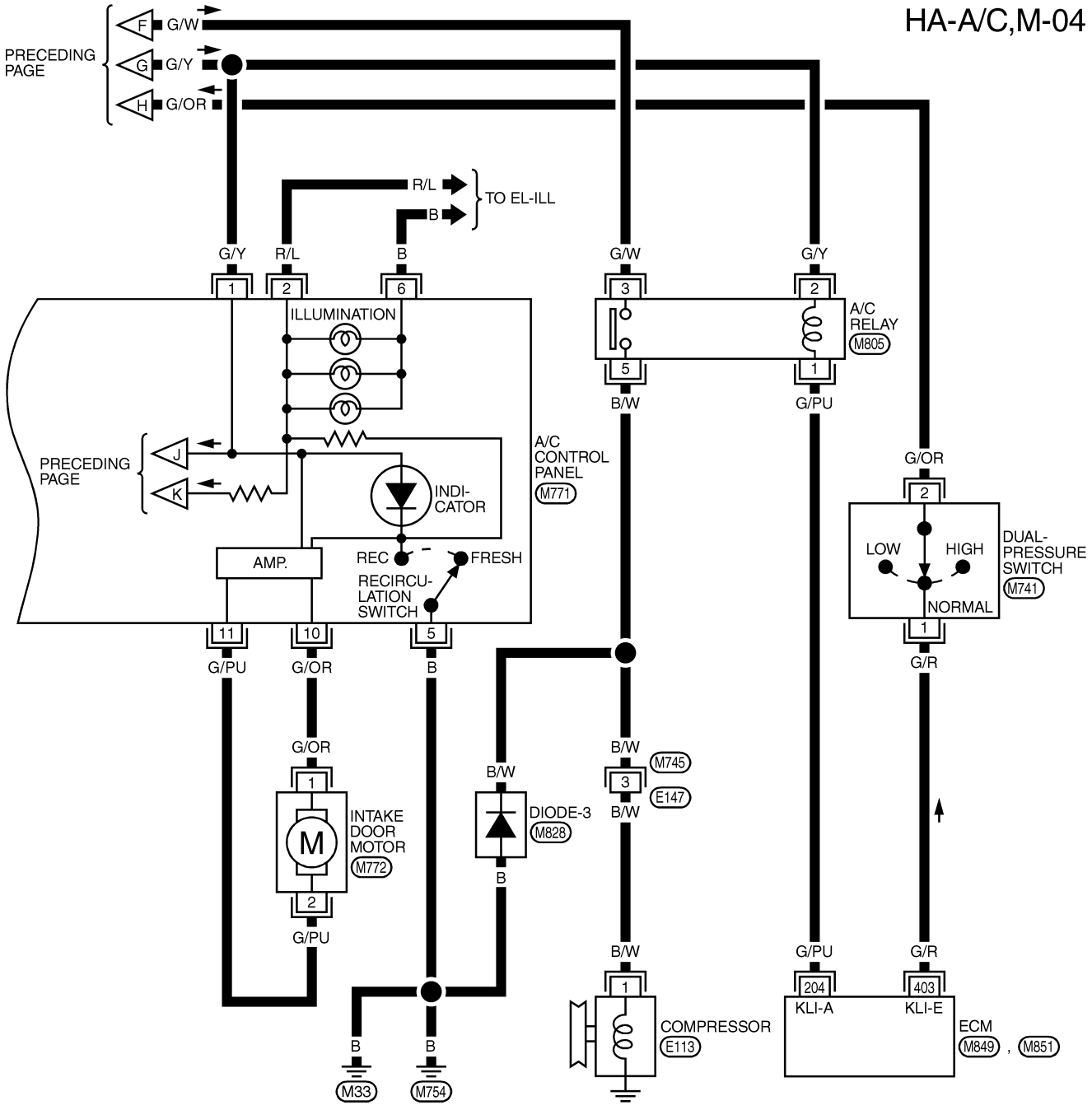


REFER TO THE FOLLOWING.
M755 , M823 , M834 , M835
-FUSE BLOCK-
JUNCTION BOX (J/B)

YHA394

http://vnx.su/

Wiring Diagram (Cont'd)



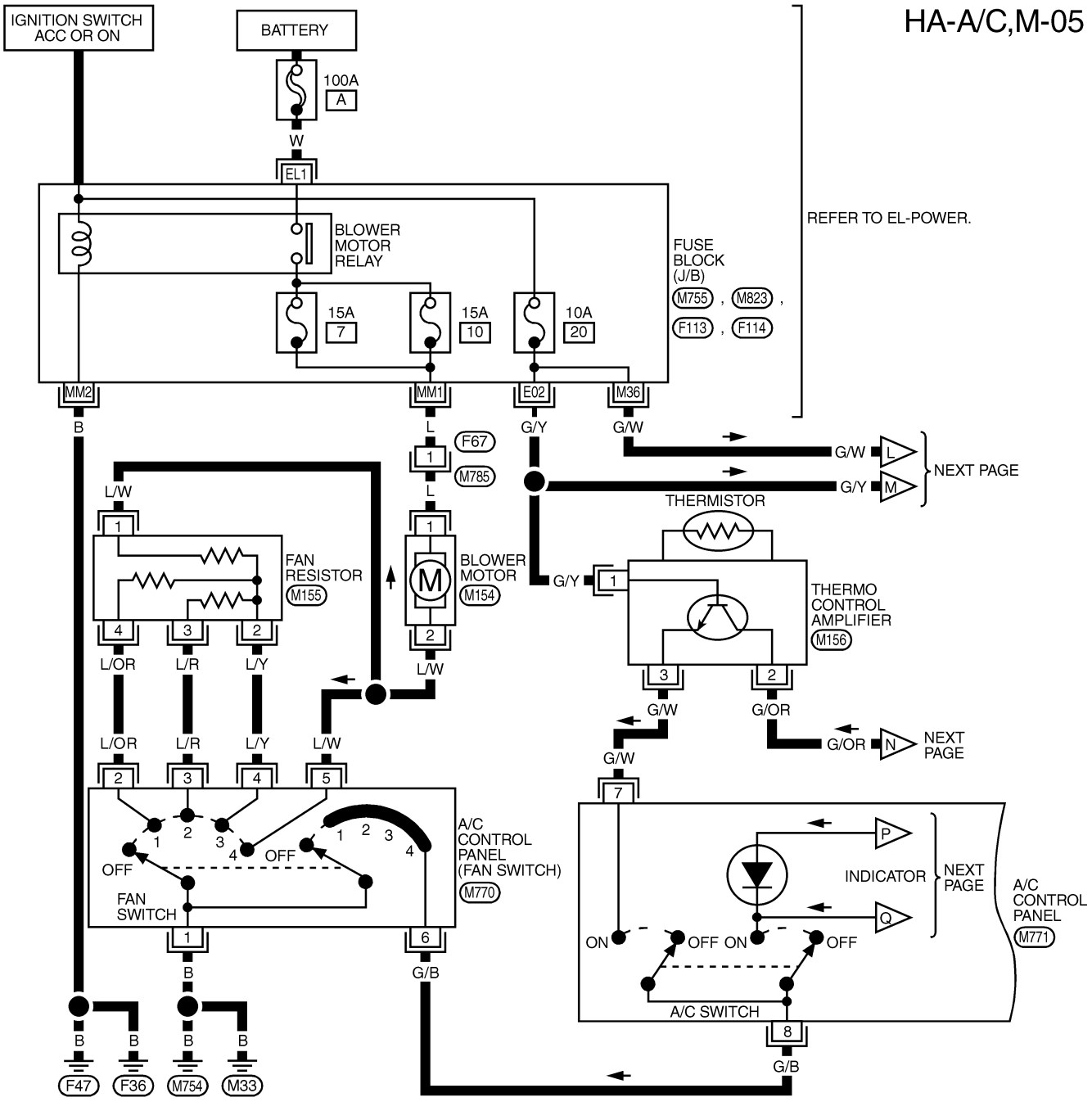
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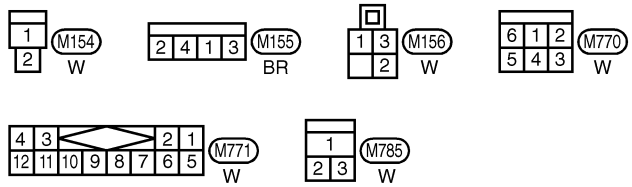
YHA395

http://vnx.su/

Wiring Diagram (Cont'd)

LHD ZD30DDTi ENGINE MODELS





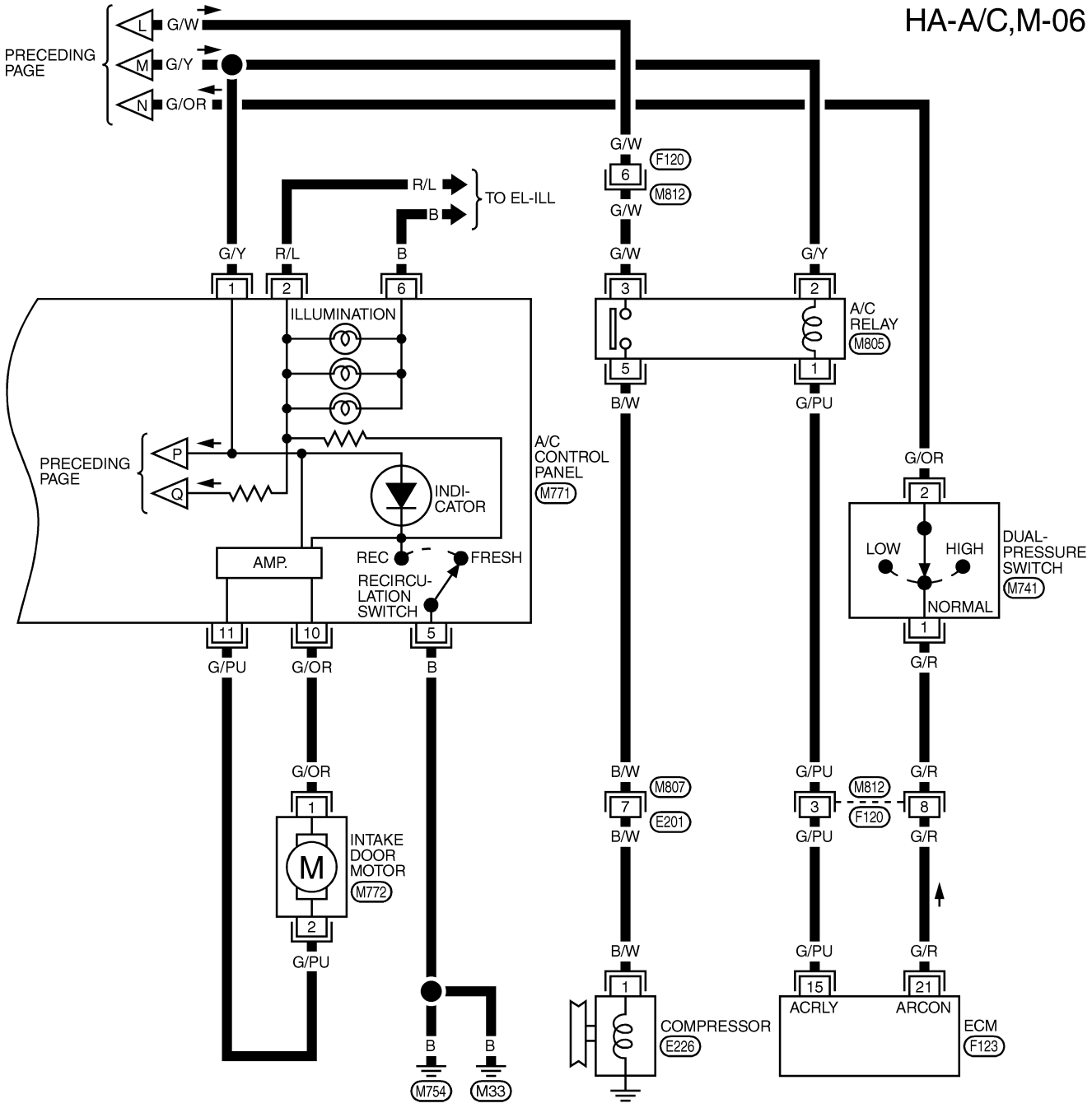
REFER TO THE FOLLOWING.
M755 , M823 , F113 , F114
-FUSE BLOCK-
JUNCTION BOX (J/B)

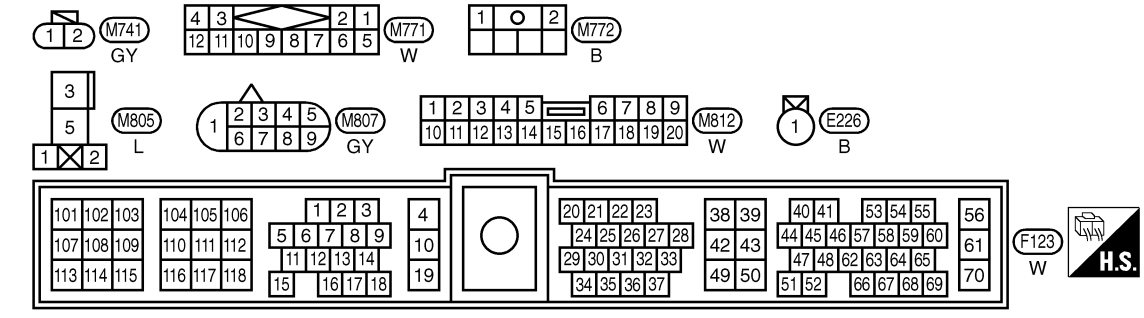
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Wiring Diagram (Cont'd)

HA-A/C,M-06



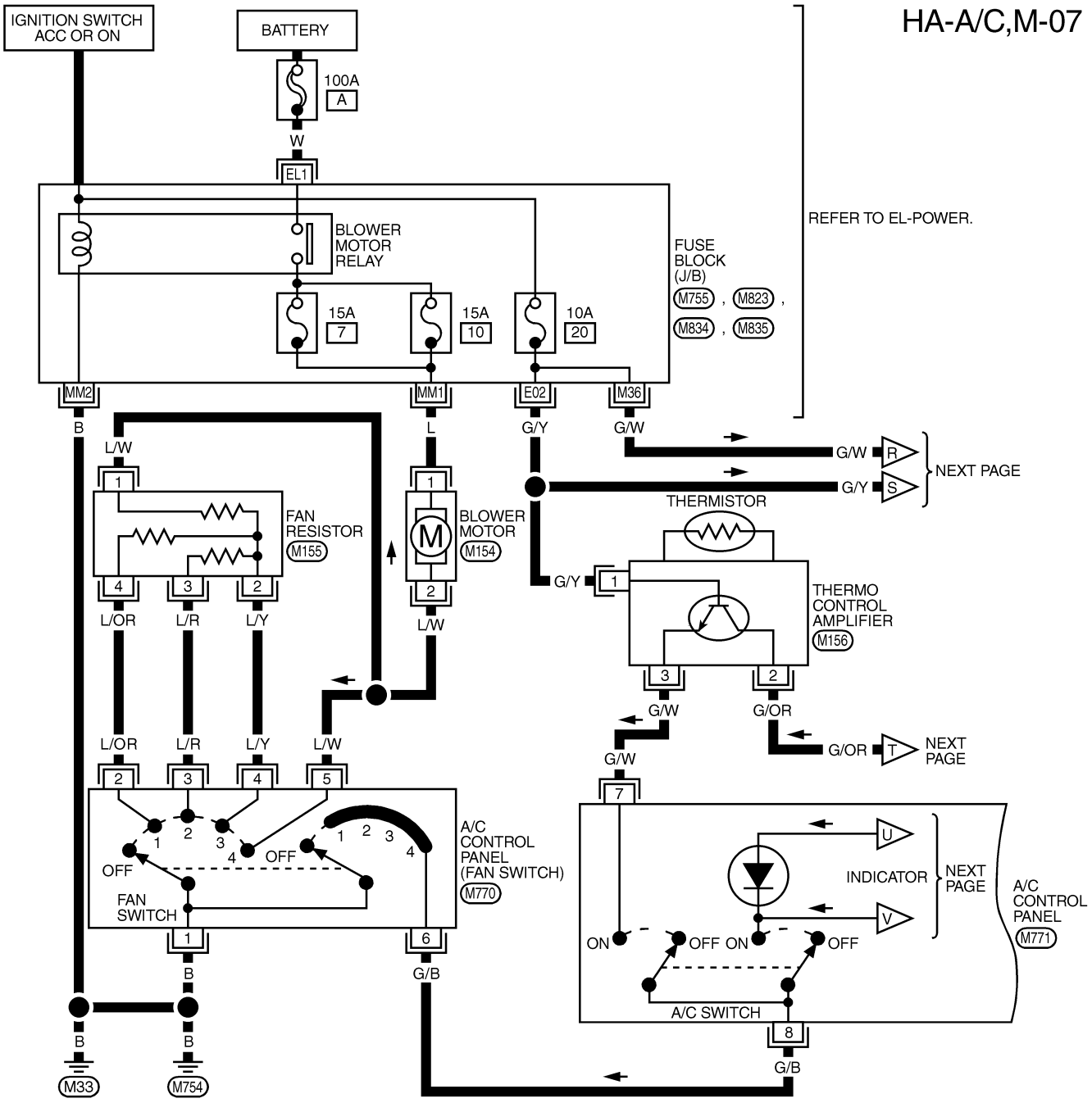


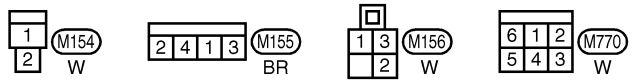
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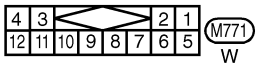
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Wiring Diagram (Cont'd)

RHD ZD30DDTi ENGINE MODELS







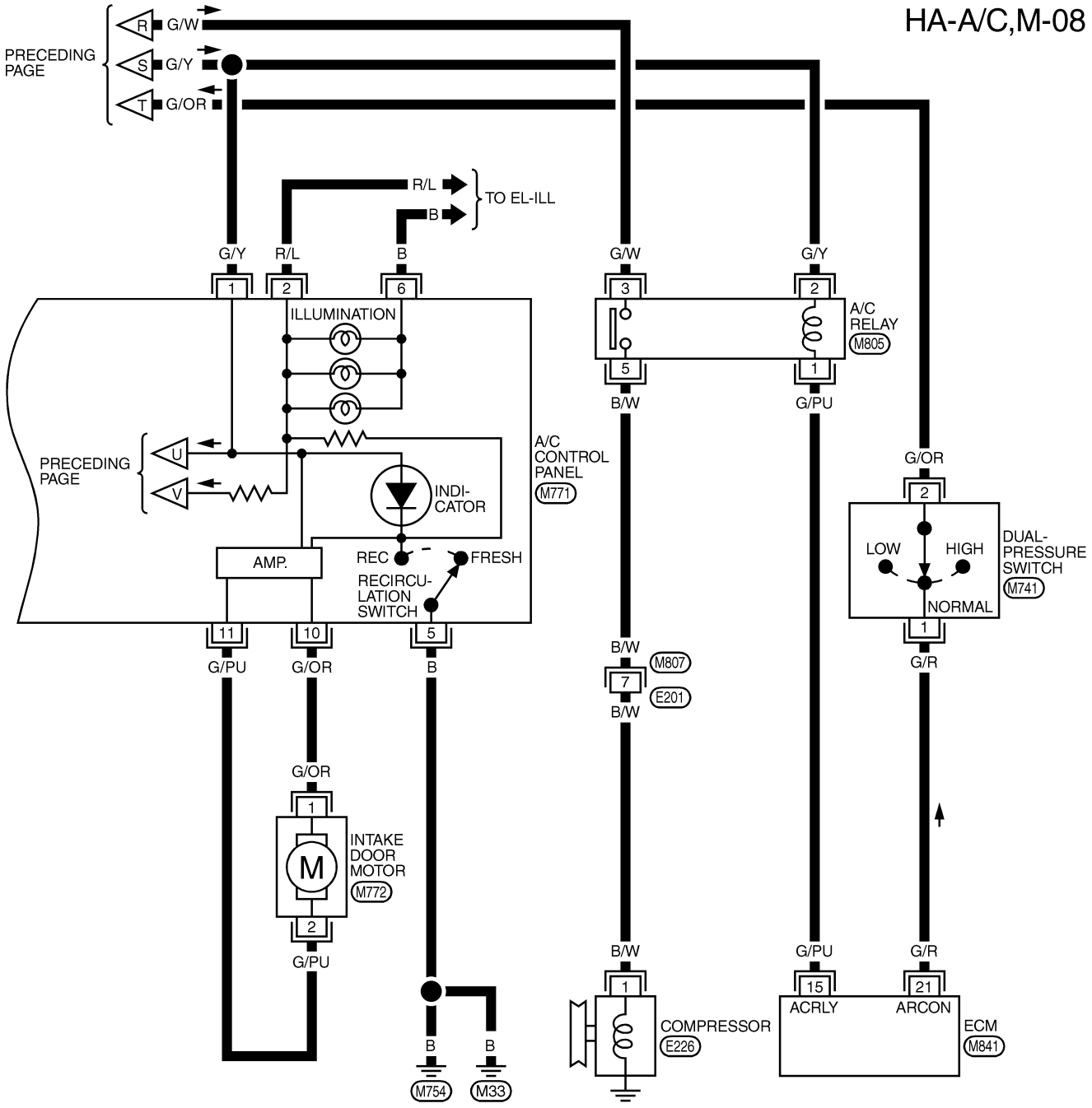
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-FUSE BLOCK-
JUNCTION BOX (J/B)

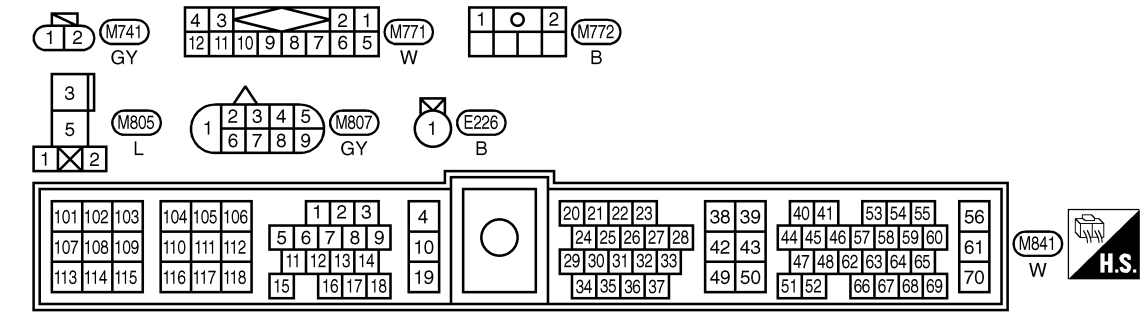
YHA398

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Wiring Diagram (Cont'd)

HA-A/C,M-08





YHA399

http://vnx.su/

Main Power Supply and Ground Circuit Check

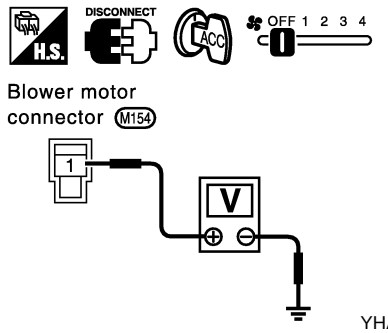
POWER SUPPLY CIRCUIT CHECK FOR A/C SYSTEM

Check power supply circuit for air conditioning system.
Refer to “POWER SUPPLY ROUTING” in EL section and “Wiring Diagram”.

http://vnx.su/

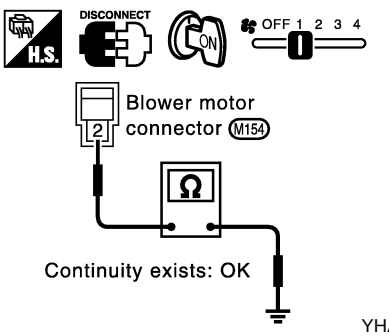
	INCIDENT	Flow chart No.
1	Fan fails to rotate.	1
2	Fan does not rotate at 1-speed.	2
3	Fan does not rotate at 2-speed.	3
4	Fan does not rotate at 3-speed.	4
5	Fan does not rotate at 4-speed.	5

A



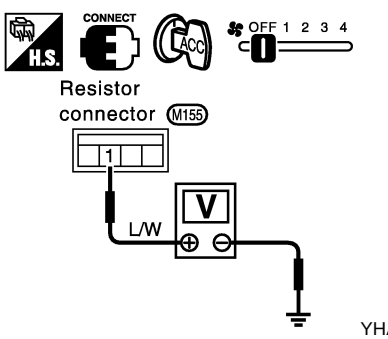
YHA408

B



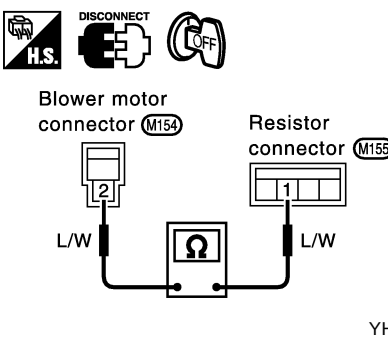
YHA409

C



YHA410

D



YHA411

Diagnostic Procedure 1

SYMPTOM: Blower motor does not rotate.

- **Perform PRELIMINARY CHECK 2 before referring to the following flow chart.**

Check if blower motor rotates properly at each fan speed.
Conduct check as per flow chart at left.
→ 2 3 4 → Ⓑ
→ 5 → Ⓒ
(Go to next page.)

↓ 1

A

CHECK POWER SUPPLY FOR BLOWER MOTOR.
- Disconnect blower motor harness connector.
- Turn ignition switch to ACC or ON position.

Do approx. 12 volts exist between blower motor harness terminal No. ① and body ground?

NG → Check 15A fuses at fuse block. (Refer to “POWER SUPPLY ROUTING” in EL section and “Wiring Diagram”.)

OK ↓

B

- Put fan switch to ON position.

Check circuit continuity between blower motor harness terminal No. ② and body ground.

NG → Reconnect blower motor harness connector.

OK ↓

CHECK BLOWER MOTOR. (Refer to Electrical Components Inspection, HA-61.)

NG ↓

Replace blower motor.

C

CHECK BLOWER MOTOR CIRCUIT BETWEEN BLOWER MOTOR AND RESISTOR.
- Put fan switch to OFF position.

Do approx. 12 volts exist between resistor harness terminal No. ① and body ground?

NG → Disconnect blower motor and resistor harness connectors.

D Note
- Turn ignition switch OFF. Check circuit continuity between blower motor harness terminal No. ② and resistor harness terminal No. ① .

OK ↓

Ⓐ

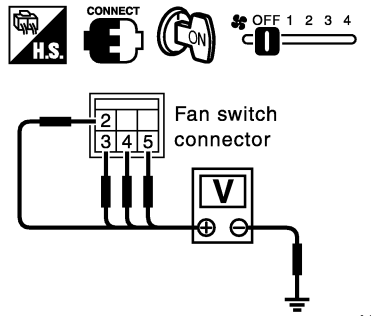
(Go to next page.)

Note:
If the result is NG after checking circuit continuity, repair harness or connector.

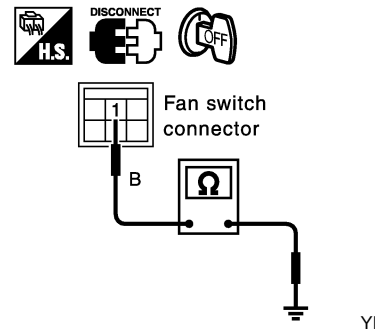
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Diagnostic Procedure 1 (Cont'd)

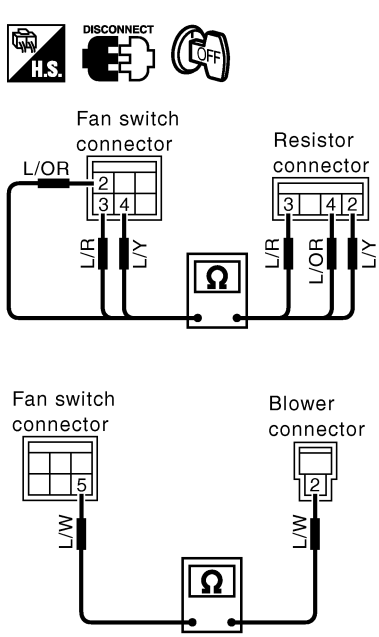
E



F



G



Ⓐ 1 — Ⓑ 2 3 4 — Ⓒ 5

CHECK RESISTOR AFTER DISCONNECTING IT.
(Refer to Electrical Components Inspection, HA-61.)

- OK → Reconnect resistor harness connector.
- NG → Replace resistor. → Reconnect resistor harness connector.

1 — 2 3 4

E

CHECK FAN SWITCH CIRCUIT.
Do approx. 12 volts exist between each fan switch harness terminal and body ground?

Flow chart No.	Terminal No. ⊕	Terminal No. ⊖	Voltage
2	②	Body ground	Approx. 12V
3	③		
4	④		
5	⑤		

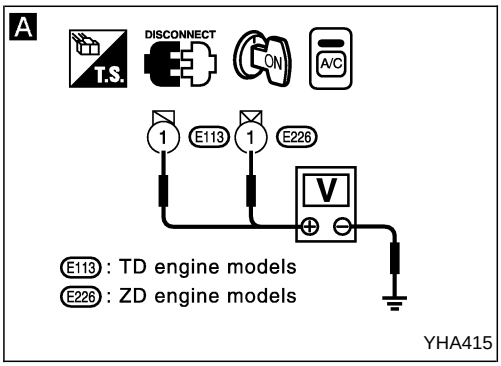
- OK → 2 3 4 5
- NG → **G** Note: Check circuit continuity between fan switch and resistor (or blower motor).

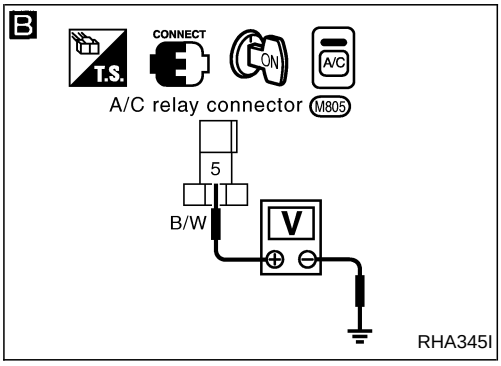
CHECK FAN SWITCH AFTER DISCONNECTING IT.
(Refer to Electrical Components Inspection, HA-61.)

- NG → Replace fan switch.
- OK → **F** Note: Check circuit continuity between fan switch harness terminal No. ① and body ground.
  - OK → Replace blower motor.

Note:
If the result is NG after checking circuit continuity, repair harness or connector.

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Diagnostic Procedure 2

SYMPTOM: Magnet clutch does not engage when A/C switch and fan switch are ON.

- **Perform PRELIMINARY CHECK 1 before referring to the following flow chart.**

A

CHECK POWER SUPPLY FOR COMPRESSOR.
Disconnect compressor harness connector.
- Turn ignition switch ON and A/C switch ON.

Do approx. 12 volts exist between compressor harness terminal No. ① and body ground?

NG → B

B

CHECK A/C RELAY OPERATION.
Do approx. 12 volts exist between A/C relay harness terminal No. ⑤ and body ground.

OK → Ⓐ
NG → Ⓑ

OK ↓

Check magnet clutch coil.

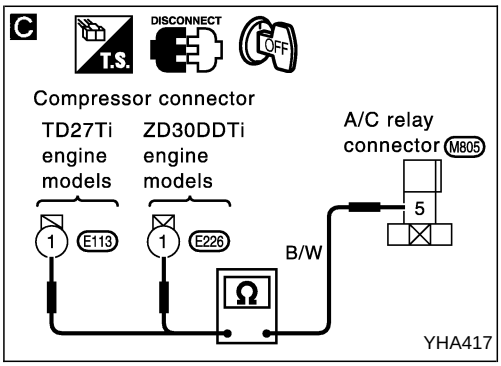
OK ↓

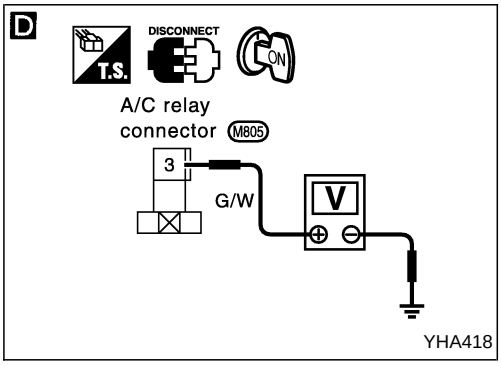
Replace magnet clutch.
Refer to COMPRESSOR — Model DKS-17CH (ZEXEL make).

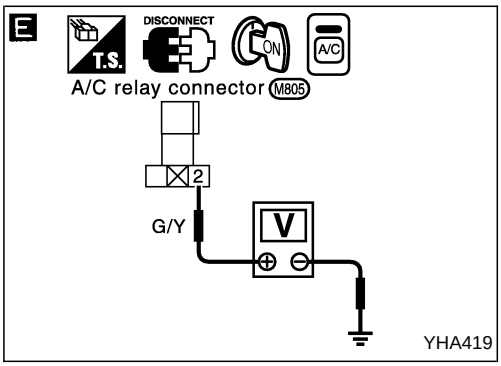
Note:
If the result is NG after checking circuit continuity, repair harness or connector.

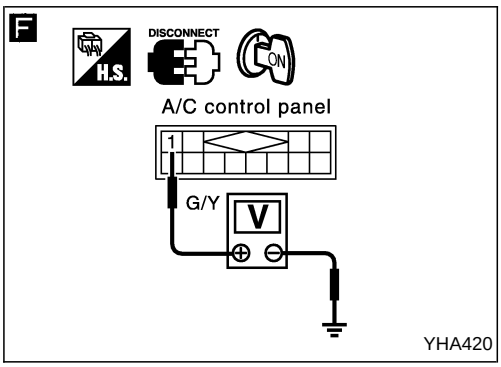
http://vnx.su/

Diagnostic Procedure 2 (Cont'd)









Ⓐ

● Turn ignition switch OFF.
Disconnect A/C relay harness connector.

C

Check circuit continuity between A/C relay harness connector terminal No. ⑤ and compressor harness connector terminal No. ① .
If NG, check harness connectors.

Note

E

● Turn ignition switch ON.
CHECK POWER SUPPLY FOR A/C RELAY (Coil side).
Do approx. 12 volts exist between A/C relay harness connector terminal No. ② and body ground?

NG → **F**

CHECK POWER SUPPLY FOR A/C CONTROL PANEL.
Disconnect A/C control panel harness connector.
Do approx. 12 volts exist between A/C control panel harness connector terminal No. ① and body ground?

OK → Ⓒ (Go to next page.)

NG → CHECK POWER SUPPLY CIRCUIT AND 10A FUSE AT FUSE BLOCK.
(Refer to "POWER SUPPLY ROUTING" in EL section and Wiring Diagram.)

Ⓑ

D

CHECK POWER SUPPLY FOR A/C RELAY.
Disconnect A/C relay.
Do approx. 12 volts exist between A/C relay harness connector terminal No. ③ and body ground?

OK → **E**

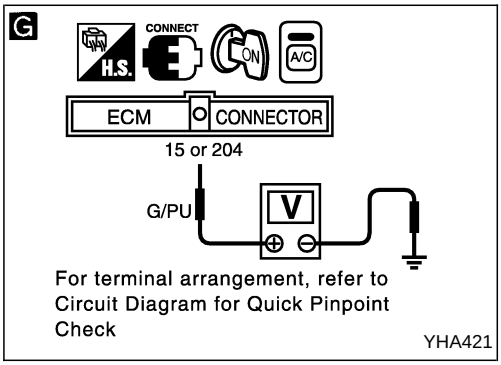
NG → CHECK POWER SUPPLY CIRCUIT AND 10A FUSE AT FUSE BLOCK.
(Refer to "POWER SUPPLY ROUTING" in EL section and Wiring Diagram.)

Note:
If the result is NG after checking circuit continuity, repair harness or connector.

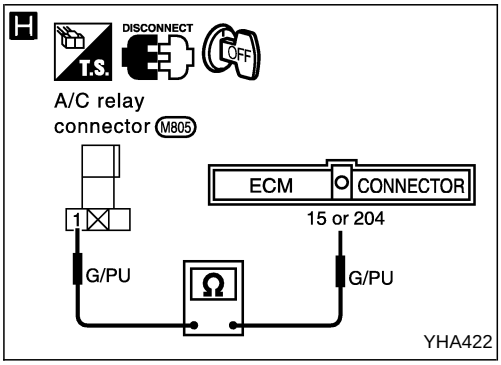
http://vnx.su/

Diagnostic Procedure 2 (Cont'd)

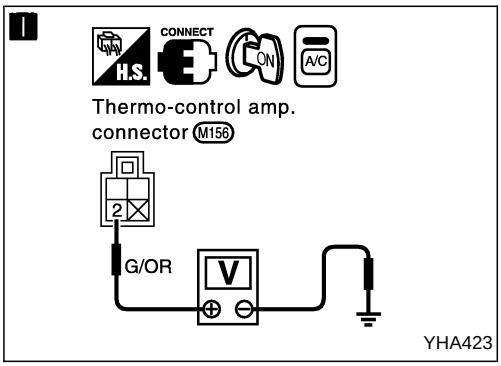
G



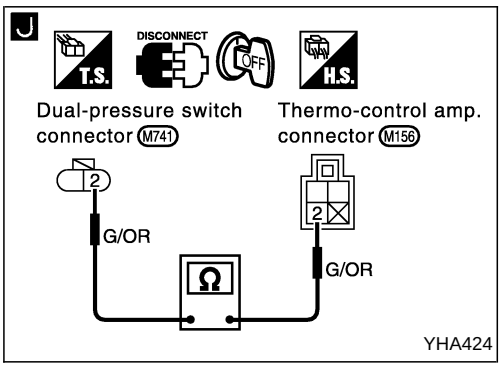
H



I



J



Ⓒ

CHECK A/C RELAY AFTER DISCONNECTING IT.
(Refer to Electrical Components Inspection, HA-62.)

NG → Replace A/C relay.

OK

Reconnect A/C relay.

G

CHECK COIL SIDE CIRCUIT OF A/C RELAY.
Do approx. 12 volts exist between ECM harness connector terminal No. 204 (TD27Ti models) or 15 (ZD30DDTi models) and body ground?

NG → H

H — Note

● Turn ignition switch OFF. Check circuit continuity between A/C relay harness terminal No. 1 and ECM harness connector terminal No. 204 (TD27Ti models) or 15 (ZD30DDTi models).

OK

I

CHECK VOLTAGE FOR THERMO CONTROL AMP.
Do more than 8 volts exist between thermo-control amp. harness connector terminal No. 2 and body ground?

NG → J

J

● Turn ignition switch OFF. Check circuit continuity between thermo-control amp. harness connector terminal No. 2 and dual-pressure switch connector terminal No. 2 .

OK

CHECK DUAL-PRESSURE SWITCH.
(Refer to Electrical Components Inspection, HA-62.)

OK → Ⓔ (Go to page HA-59.)

NG → Replace dual-pressure switch.

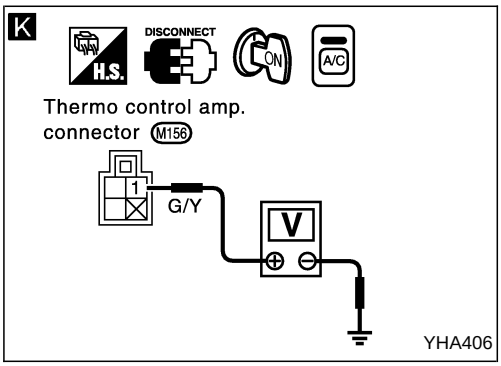
OK

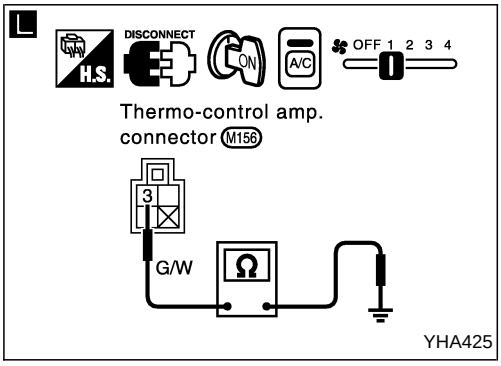
Ⓓ (Go to next page.)

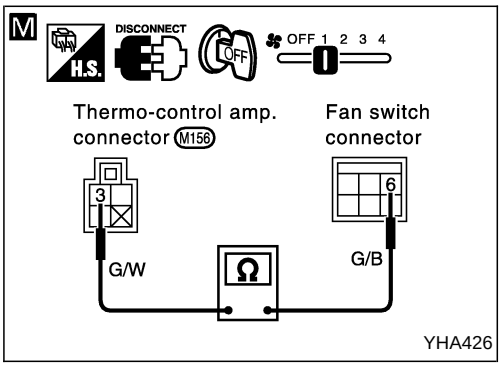
Note:
If the result is NG after checking circuit continuity, repair harness or connector.

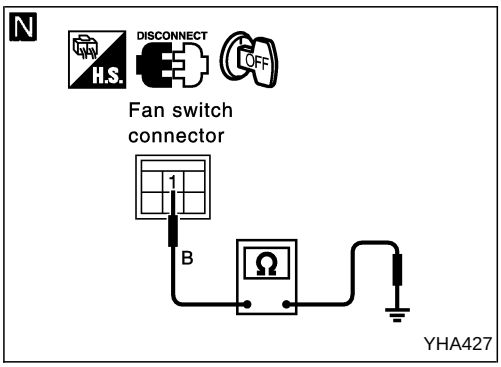
http://vnx.su/

Diagnostic Procedure 2 (Cont'd)









Ⓓ

K

CHECK POWER SUPPLY FOR THERMO-CONTROL AMP.
Disconnect thermo-control amp. connector.
Do approx. 12 volts exist between thermo-control amp. harness connector terminal No. ① and body ground?

NG → CHECK POWER SUPPLY CIRCUIT AND 10A FUSE AT FUSE BLOCK.
(Refer to "POWER SUPPLY ROUTING" in EL section and Wiring Diagram.)

OK ↓

L

● Turn ignition switch OFF.
CHECK BODY GROUND CIRCUIT FOR THERMO-CONTROL AMP.
Disconnect thermo-control amp. harness connector.
Ensure A/C switch is in ON position.
Ensure fan switch is in ON position (1 to 4).
Does continuity exist between thermo control amp. harness connector terminal No. ③ and body ground?

NG → Disconnect fan switch harness connector.
Ensure A/C switch is in ON position.

OK ↓

Replace thermo-control amp.

M Note

Check circuit continuity between thermo-control amp. harness connector terminal No. ③ and fan switch harness connector terminal No. ⑥ .

OK → (to N)

NG → Check A/C switch (Refer to Electrical Components Inspection, HA-61.)

OK → Repair harness or connectors.

N Note

CHECK BODY GROUND CIRCUIT FOR FAN SWITCH.
Does continuity exist between fan switch harness connector terminal No. ① and body ground?

OK ↓

CHECK FAN SWITCH.
(Refer to Electrical Components Inspection, HA-61.)

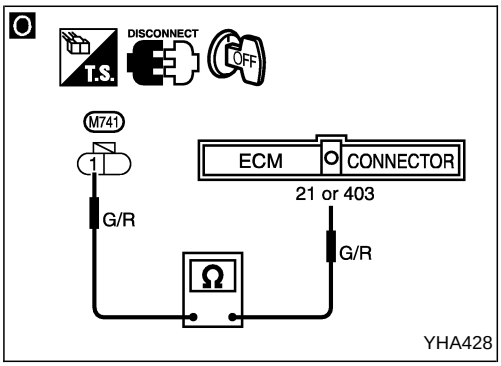
NG ↓

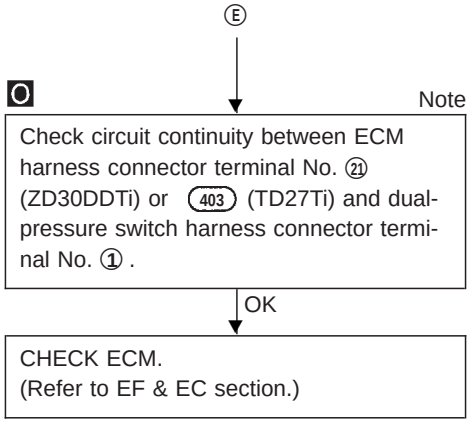
Replace fan switch.

Note:
If the result is NG after checking circuit continuity, repair harness or connector.

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Diagnostic Procedure 2 (Cont'd)

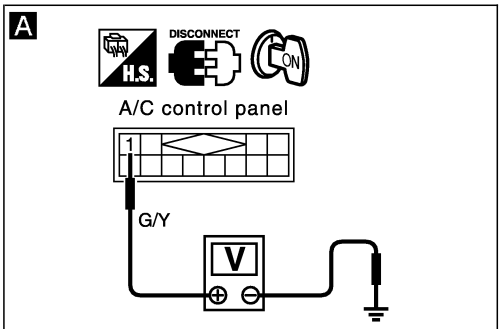




Note:
If the result is NG after checking circuit continuity, repair harness or connector.

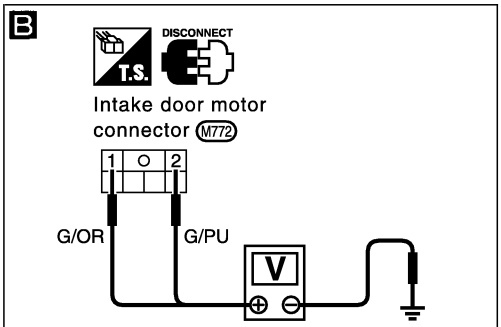
http://vnx.su/

A



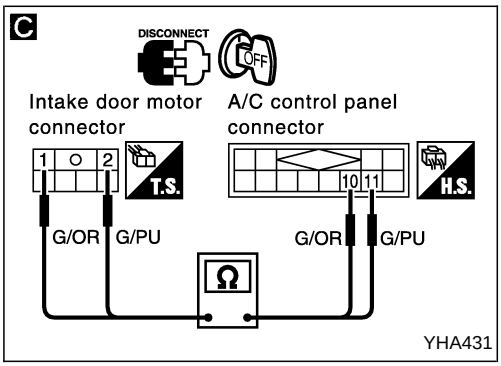
YHA429

B



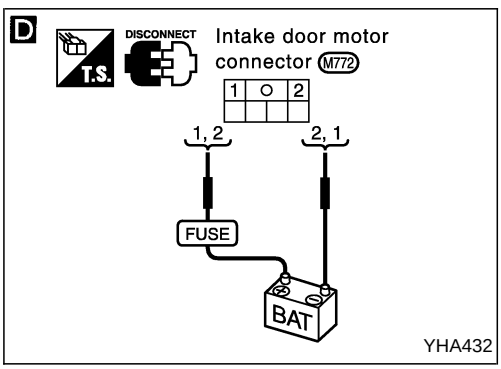
YHA430

C



YHA431

D



YHA432

Diagnostic Procedure 3

SYMPTOM: Intake door does not change.

CHECK OPERATION
Does intake door motor (recirculation system) operate, correctly?

OK → Intake door motor (recirculation system) is OK.

NG ↓

A

CHECK POWER SUPPLY A/C CONTROL PANEL
Disconnect A/C control panel harness connector.
Do approx. 12 volts exist between A/C panel harness connector terminal ① and body ground?

NG → CHECK POWER SUPPLY CIRCUIT AND 10A FUSE.
(Refer to "POWER SUPPLY ROUTING" in EL section and Wiring Diagram).

OK ↓

B

CHECK POWER SUPPLY FOR INTAKE DOOR MOTOR
- Turn ignition switch ON.

Check voltage between intake door motor terminal ① and ground, a few seconds after air recirculation switch is switched ON.
Do approx. 12 volts exist?
Check voltage between intake door motor terminal ② and ground, a few seconds after air recirculation switch is switched OFF.
Do approx. 12 volts exist?

NG → C

Check continuity between intake door motor terminal ① (②) and A/C control panel terminal ⑩ (⑪).
If NG, repair harness or connector.

OK → Replace A/C control panel.

OK ↓

D

CHECK INTAKE DOOR MOTOR
Apply approx. 12 volts between intake door motor terminals ① (②) and ② (①).
Does intake door motor operate, correctly?

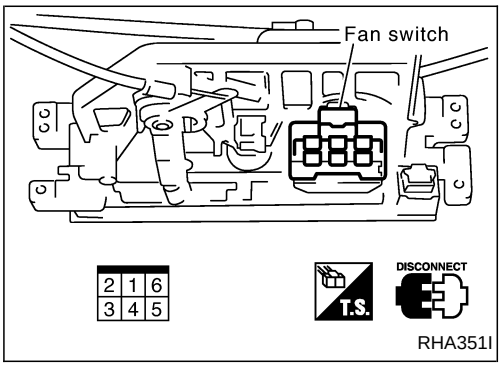
NG → Replace intake door motor.

OK ↓

CHECK INTAKE DOOR LINKAGE
(Refer to "Control Linkage Adjustment, HA-64.)
If OK, intake door is OK.

NG → Repair intake door linkage.

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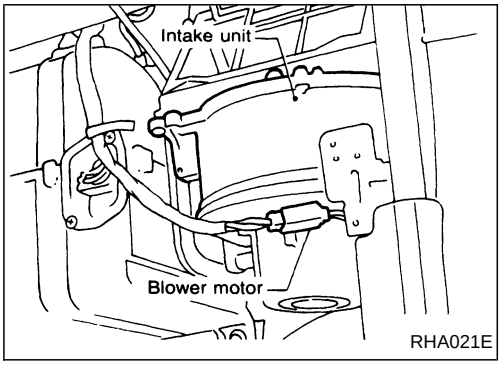


Electrical Components Inspection

FAN SWITCH

Check continuity between terminals at each switch position.

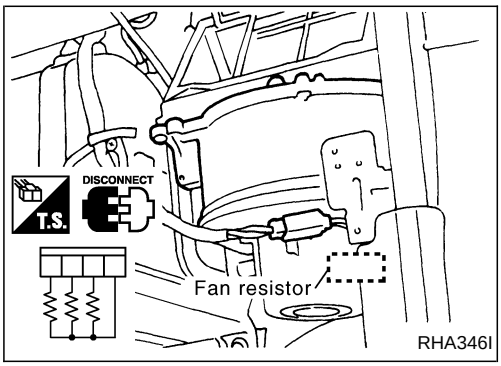
TERMINAL	LEVER POSITION	OFF	1	2	3	4
5						o
2			o			o
3			o	o		
4					o	
1			o	o	o	o
6			o	o	o	o



BLOWER MOTOR

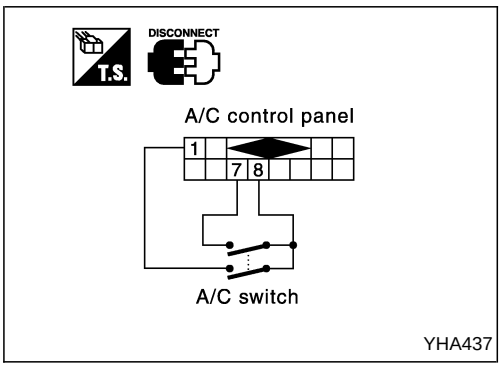
Confirm smooth rotation of the blower motor.

- Ensure that there are no foreign particles inside the intake unit.



BLOWER RESISTOR

Check continuity between terminals.



A/C SWITCH

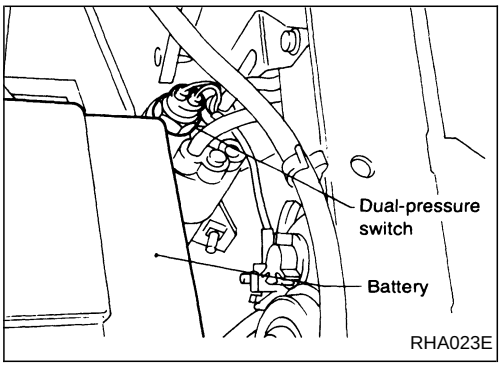
Check continuity between component terminals.

A/C control panel connector terminal No.	A/C switch condition	Continuity
① — ⑦	ON	YES
	OFF	NO
① — ⑧	ON	YES
	OFF	NO
⑦ — ⑧	ON	YES
	OFF	NO

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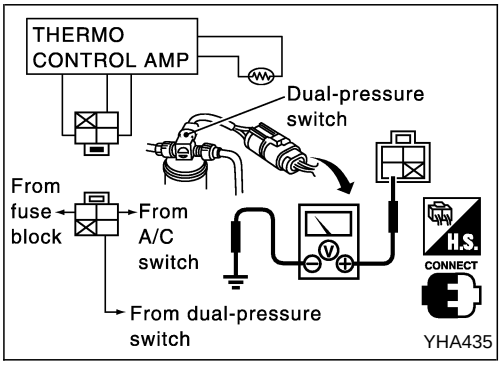
Electrical Components Inspection (Cont'd)

DUAL-PRESSURE SWITCH



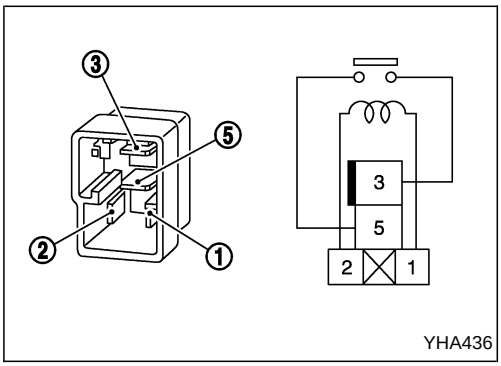
High-pressure side line pressure kPa (bar, kg/cm^2, psi)	Operation	Continuity
Decreasing to 157 - 216 (1.6 - 2.2, 1.6 - 2.2, 23 - 31) Increasing to 2,452 - 2,844 (24.5 - 28.4, 25 - 29, 356 - 412)	Turn OFF	Does not exist
Increasing to 157 - 235 (1.6 - 2.4, 1.6 - 2.4, 23 - 34) Decreasing to 1,863 - 2,256 (18.6 - 22.6, 19 - 23, 270 - 327)	Turn ON	Exists

THERMO CONTROL AMP.



Evaporator outlet air temperature °C (°F)	Thermo amp. operation	Tester
Decreasing to 0.1 - 0.9 (32 - 34)	Turn OFF	Approx. 12V
Increasing to 2.5 - 3.5 (37 - 38)	Turn ON	Approx. 0V

A/C RELAY, COOLING FAN RELAY



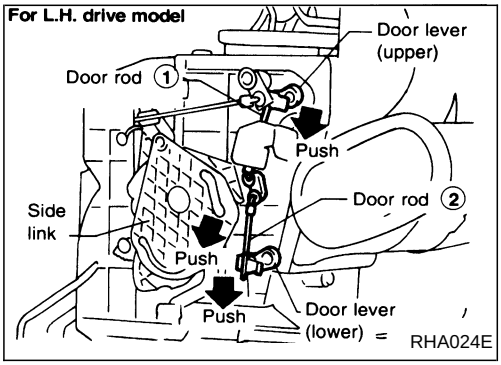
Check circuit continuity between terminals by supplying 12 volts to coil side terminals of relay.
Apply 12V to terminals ① and ② and check continuity between terminals ③ and ⑤.

Conditions	Continuity
12V direct current supply between terminals ① and ②	YES
No current supply	NO

If NG, replace relay.
Refer to EL section for Description.

Control Linkage Adjustment

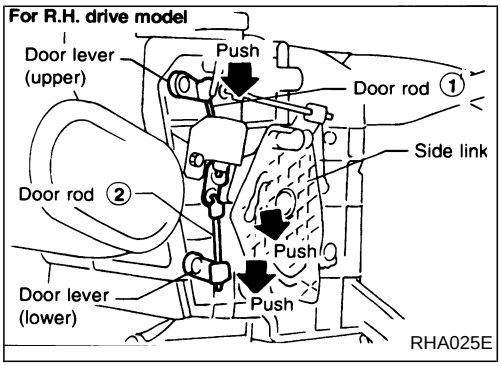
VENTILATOR DOOR CONTROL ROD

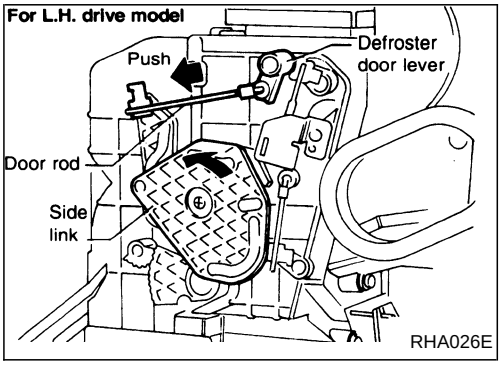


1. Move side link in direction of arrow.
2. With upper and lower ventilator door levers held in the direction of the arrow, connect rods ① and ② to their corresponding ventilator door levers in that order.

http://vnx.su/

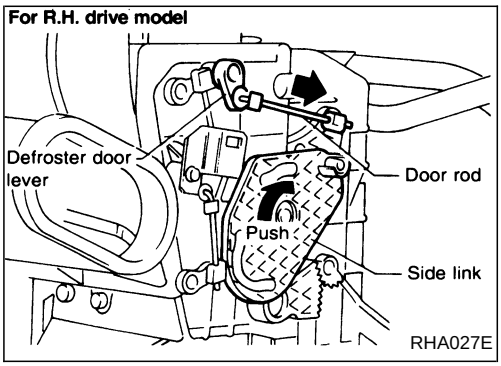
Control Linkage Adjustment (Cont'd)





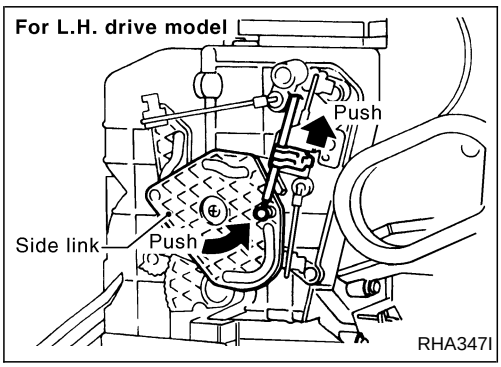
DEFROSTER DOOR CONTROL ROD

1. Move side link in direction of arrow.
2. Connect rod to side link while pushing defroster door lever in direction of arrow.



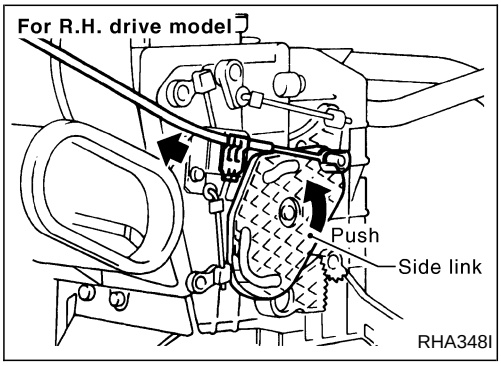
AIR CONTROL CABLE

For L.H. drive model



- Move air control lever to position.
  Set side link in VENT mode.
  Pull outer cable in direction of arrow and then clamp it.

For R.H. drive model

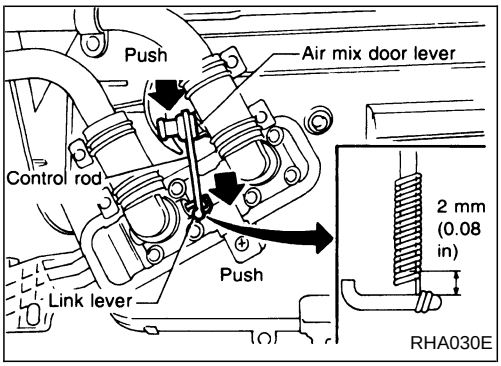


- Move air control lever to position.
  Set side link in DEF mode.
  Pull outer cable in direction of arrow and then clamp it.

After positioning control cable, check that it operates properly.

http://vnx.su/

Control Linkage Adjustment (Cont'd)

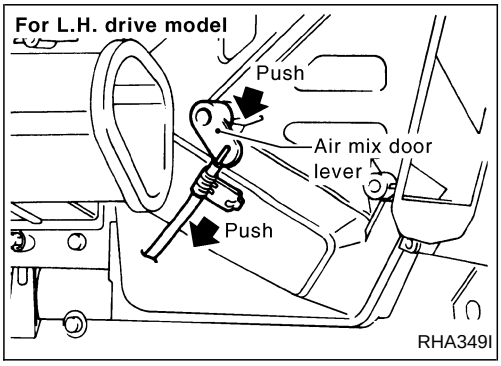


WATER COCK CONTROL ROD

- **When adjusting water cock control rod, first disconnect temperature control cable from air mix door lever and then adjust control rod. Reconnect temperature control cable and readjust it. (Refer to next item.)**

1. Push air mix door lever in direction of arrow.
2. Pull control rod of water cock in direction of arrow so as to make clearance of about 2 mm (0.08 in) between ends of rod and link lever and connect the rod to door lever.

After connecting control rod, check that it operates properly.

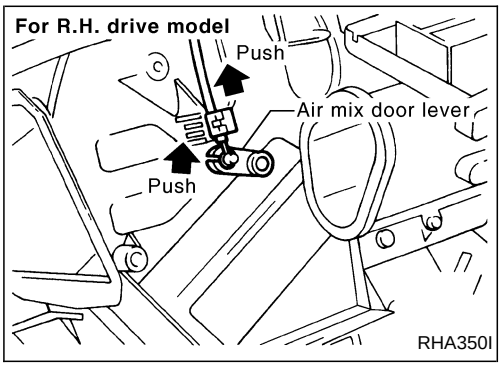


TEMPERATURE CONTROL CABLE

- **When adjusting ventilator door rod and defroster door rod, first disconnect air control cable from side link. Reconnect and readjust air control cable.**

For L.H. drive model

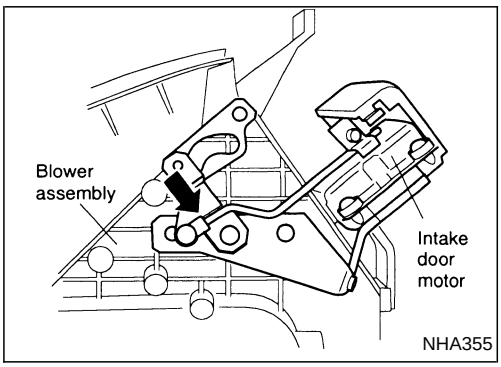
- Move temperature control lever to max. COLD position. Set air mix door lever in full cold mode. Pull outer cable in direction of arrow and then clamp it.



For R.H. drive model

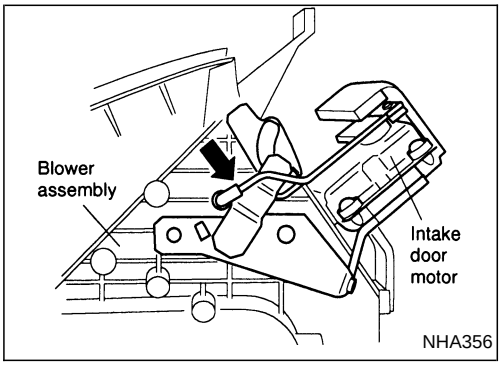
- Move temperature control lever to max. HOT position. Set air mix door lever in full hot mode. Pull outer cable in direction of arrow and then clamp it.

After positioning control cable, check it operates properly.



INTAKE DOOR CONTROL LINKAGE

- Adjust the portion of connecting rod where indicated with arrow as shown in figure.



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General Specifications

COMPRESSOR

Model	DKS-17CH
Type	Swash plate
Displacement cm^3 (cu in)/Rev	168 (10.25)
Direction of rotation	Clockwise (Viewed from drive end)
Drive belt	A type

LUBRICATION OIL

Model	ZEXEL make DKS-17CH
Name	Nissan A/C System Oil Type S
Part number	KLH00-PAGS0
Capacity mℓ (Imp fl oz)	
Total in system	TD ENGINE: 250 (8.8) ZD ENGINE: 200 (7.0)
Compressor (Service parts) charging amount	TD ENGINE: 250 (8.8) ZD ENGINE: 200 (7.0)

REFRIGERANT

Type	R134a
Capacity kg (lb)	0.60 - 0.70 (1.32 - 1.54)

Inspection and Adjustment

ENGINE IDLING SPEED

When A/C is ON
Refer to EF & EC section.

BELT TENSION

Refer to Checking Drive Belts (MA section).

COMPRESSOR

Model	DKS-17CH
Clutch disc-to-pulley clearance mm (in)	0.3 - 0.6 (0.012 - 0.024)

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NOTES

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STARTING & CHARGING SYSTEMS

SECTION SC

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

The Supplemental Restraint System such as “AIR BAG” and “SEAT BELT PRE-TENSIONER” used along with a seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. The SRS system composition which is available to NISSAN MODEL R20 is as follows (The composition varies according to the destination and optional equipment.):

- For a frontal collision
  The Supplemental Restraint System consists of driver air bag module (located in the center of the steering wheel), front passenger air bag module (located on the instrument panel on passenger side), front seat belt pre-tensioners, a diagnosis sensor unit, warning lamp, wiring harness and spiral cable.
- For a side collision
  The Supplemental Restraint System consists of front side air bag module (located in the outer side of front seat), side air bag (satellite) sensor, diagnosis sensor unit (one of components of air bags for a frontal collision), wiring harness, warning lamp (one of components of air bags for a frontal collision).

Information necessary to service the system safely is included in the **RS section** of this Service Manual.

WARNING:

- **To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance should be performed by an authorized NISSAN dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see the RS 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 harness connector.**

Wiring Diagrams and Trouble Diagnoses

When you read wiring diagrams, refer to the following:

- GI section, “HOW TO READ WIRING DIAGRAMS”
- EL section, “POWER SUPPLY ROUTING” for power distribution circuit

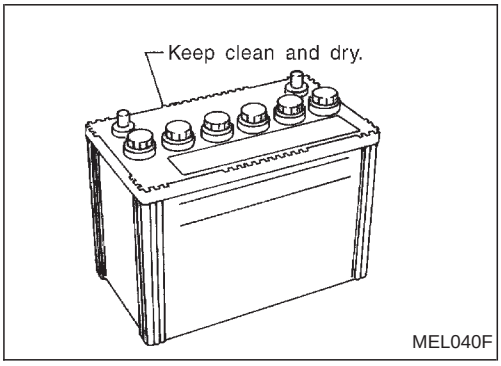
When you perform trouble diagnoses, refer to the following:

- GI section, “HOW TO FOLLOW TEST GROUPS IN TROUBLE DIAGNOSES”
- GI section, “HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT”

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How to Handle Battery

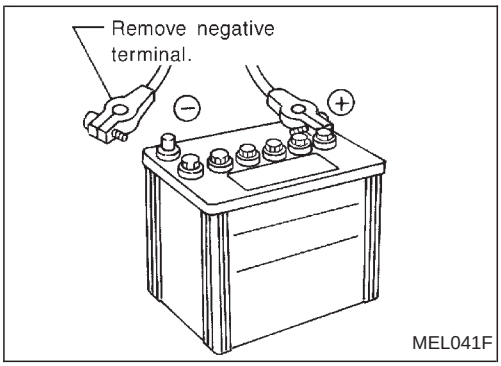
CAUTION:
If it becomes necessary to start the engine with a booster battery and jumper cables,
1) Use a 12-volt booster battery.
2) After connecting battery cables, ensure that they are tightly clamped to battery terminals for good contact.



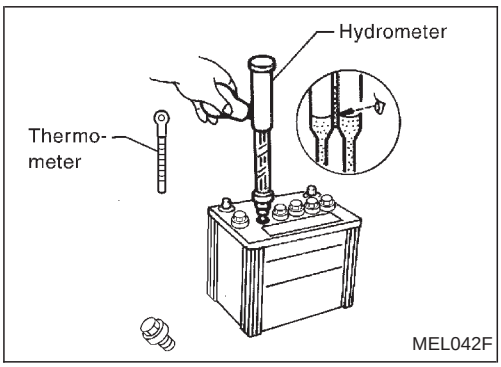
METHODS OF PREVENTING OVER-DISCHARGE

The following precautions must be taken to prevent over-discharging a battery.

- The battery surface (particularly its top) should always be kept clean and dry.
- The terminal connections should be clean and tight.
- At every routine maintenance, check the electrolyte level. This also applies to batteries designated as “low maintenance” and “maintenance-free”.



- When the vehicle is not going to be used over a long period of time, disconnect the negative battery terminal.



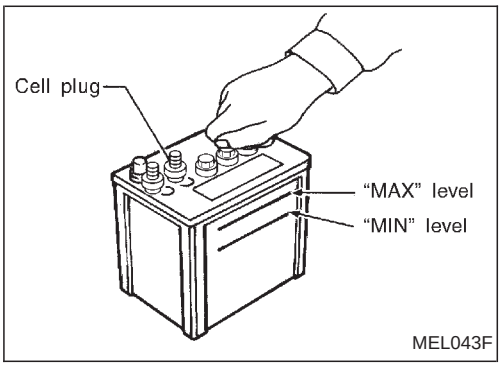
- Check the charge condition of the battery.
  Periodically check the specific gravity of the electrolyte. Keep a close check on charge condition to prevent over-discharge.

CHECKING ELECTROLYTE LEVEL

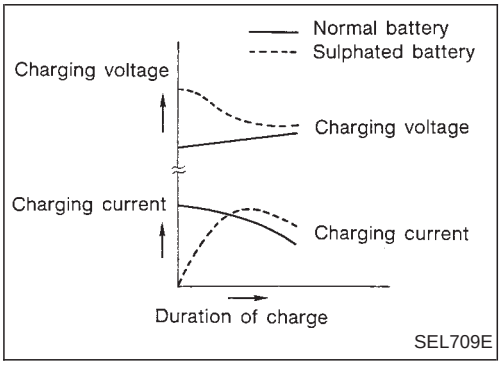
WARNING:
Do not allow battery fluid to come in contact with skin, eyes, fabrics, or painted surfaces. After touching a battery, do not touch or rub your eyes until you have thoroughly washed your hands. If acid contacts eyes, skin or clothing, immediately flush with water for 15 minutes and seek medical attention.

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How to Handle Battery (Cont'd)

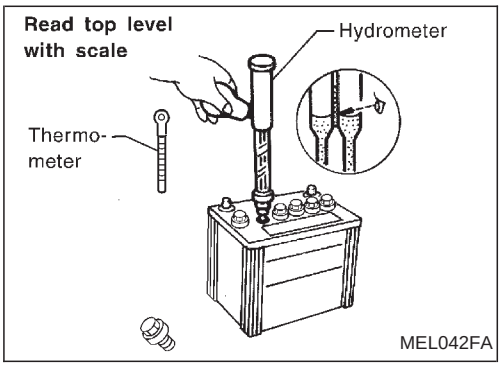


- Remove the cell plug using a suitable tool.
- Add distilled water up to the MAX level.



Sulphation

A battery will be completely discharged if it is left unattended for a long time and the specific gravity will become less than 1.100. This may result in sulphation on the cell plates.
To determine if a battery has been "sulphated", note its voltage and current when charging it. As shown in the figure, less current and higher voltage are observed in the initial stage of charging sulphated batteries.
A sulphated battery may sometimes be brought back into service by means of a long, slow charge, 12 hours or more, followed by a battery capacity test.



SPECIFIC GRAVITY CHECK

1. Read hydrometer and thermometer indications at eye level.

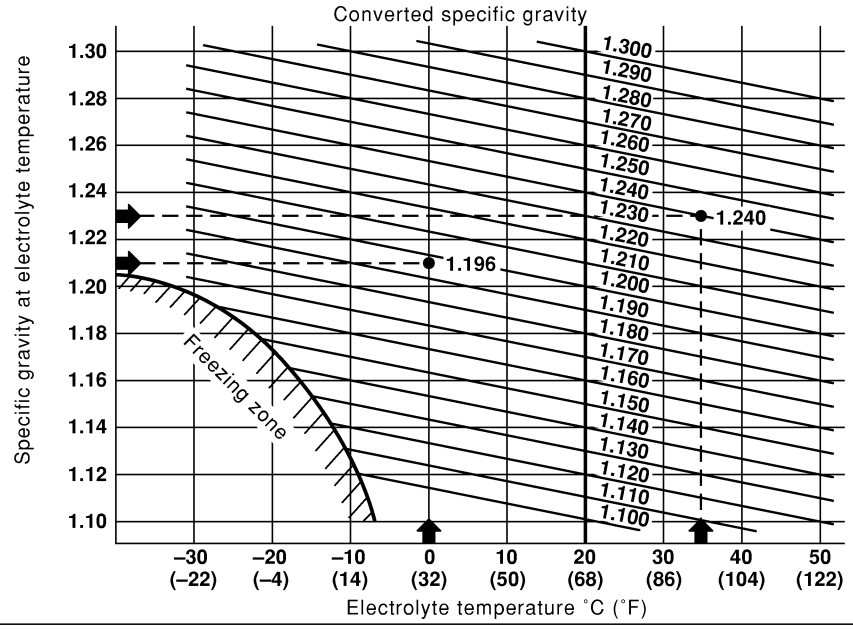
2. Convert into specific gravity at 20°C (68°F).

Example:

- When electrolyte temperature is 35°C (95°F) and specific gravity of electrolyte is 1.230, converted specific gravity at 20°C (68°F) is 1.240.
- When electrolyte temperature is 0°C (32°F) and specific gravity of electrolyte is 1.210, converted specific gravity at 20°C (68°F) is 1.196.

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How to Handle Battery (Cont'd)

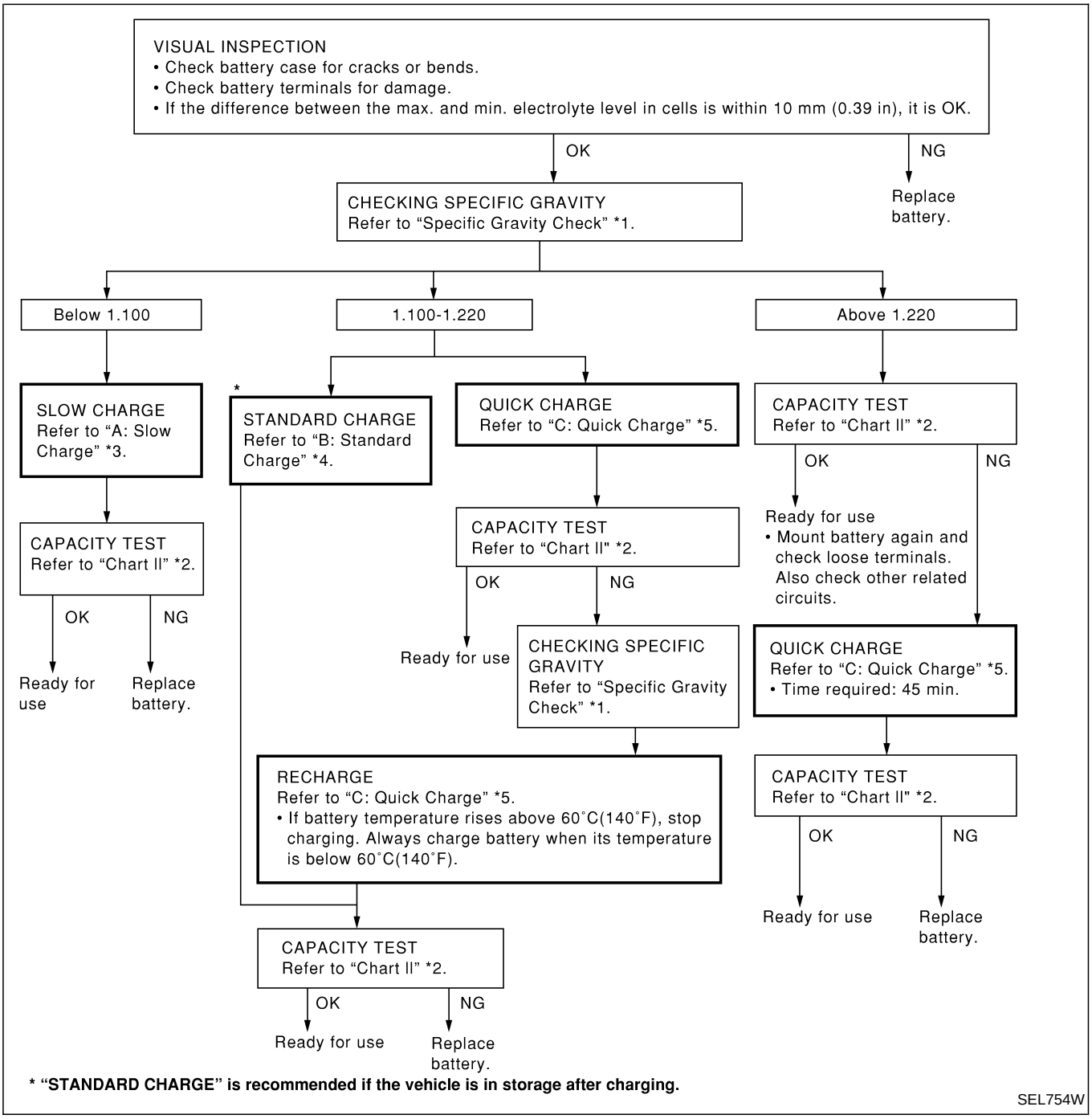


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Battery Test and Charging Chart

CHART I



*** "STANDARD CHARGE" is recommended if the vehicle is in storage after charging.**

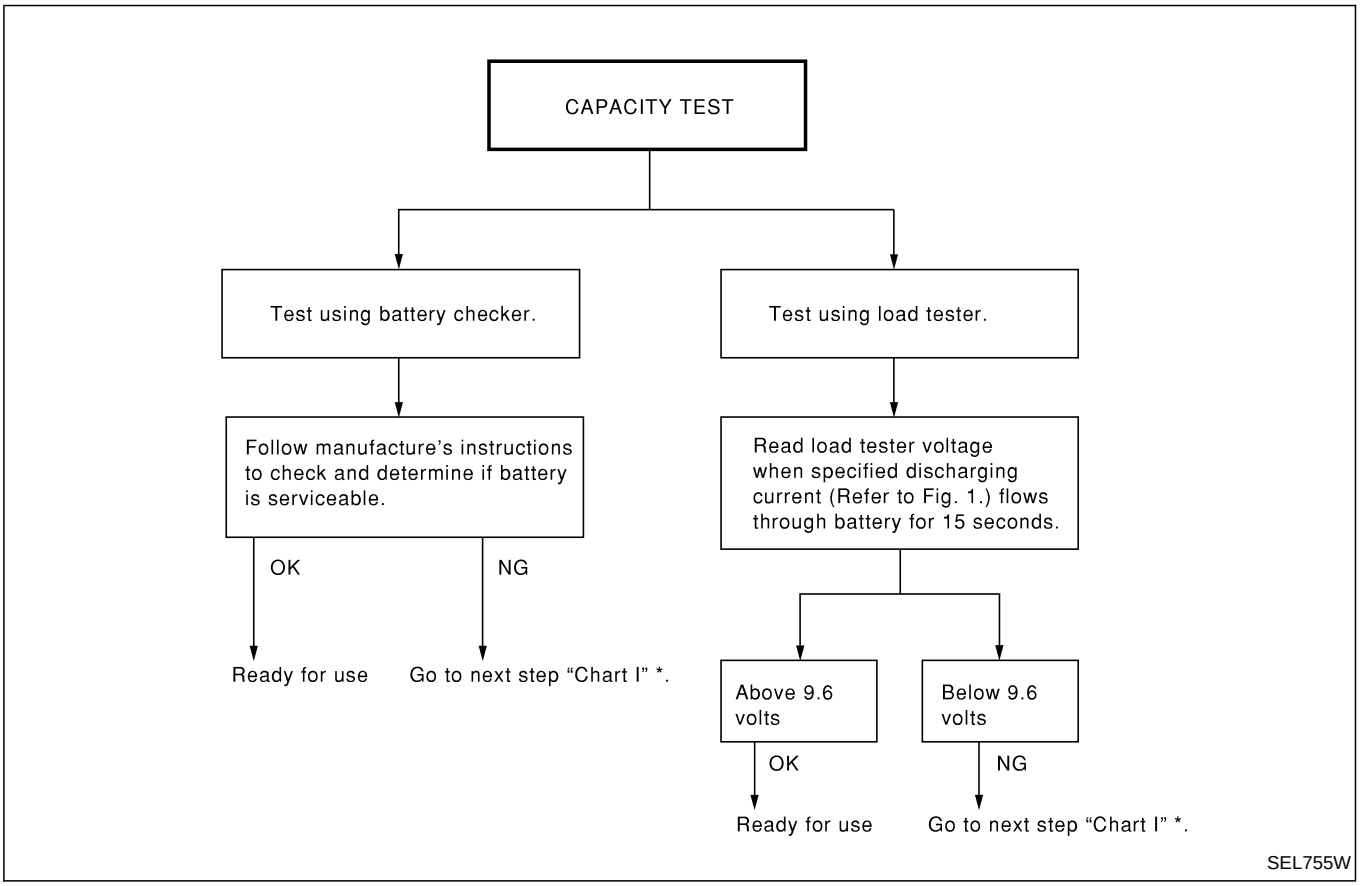
SEL754W

*1: SC-4
*2: SC-7
*3: SC-8
*4: SC-10
*5: SC-11

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Battery Test and Charging Chart (Cont'd)

CHART II



*: SC-6

- Check battery type and determine the specified current using the following table.

Fig. 1 DISCHARGING CURRENT (Load Tester)

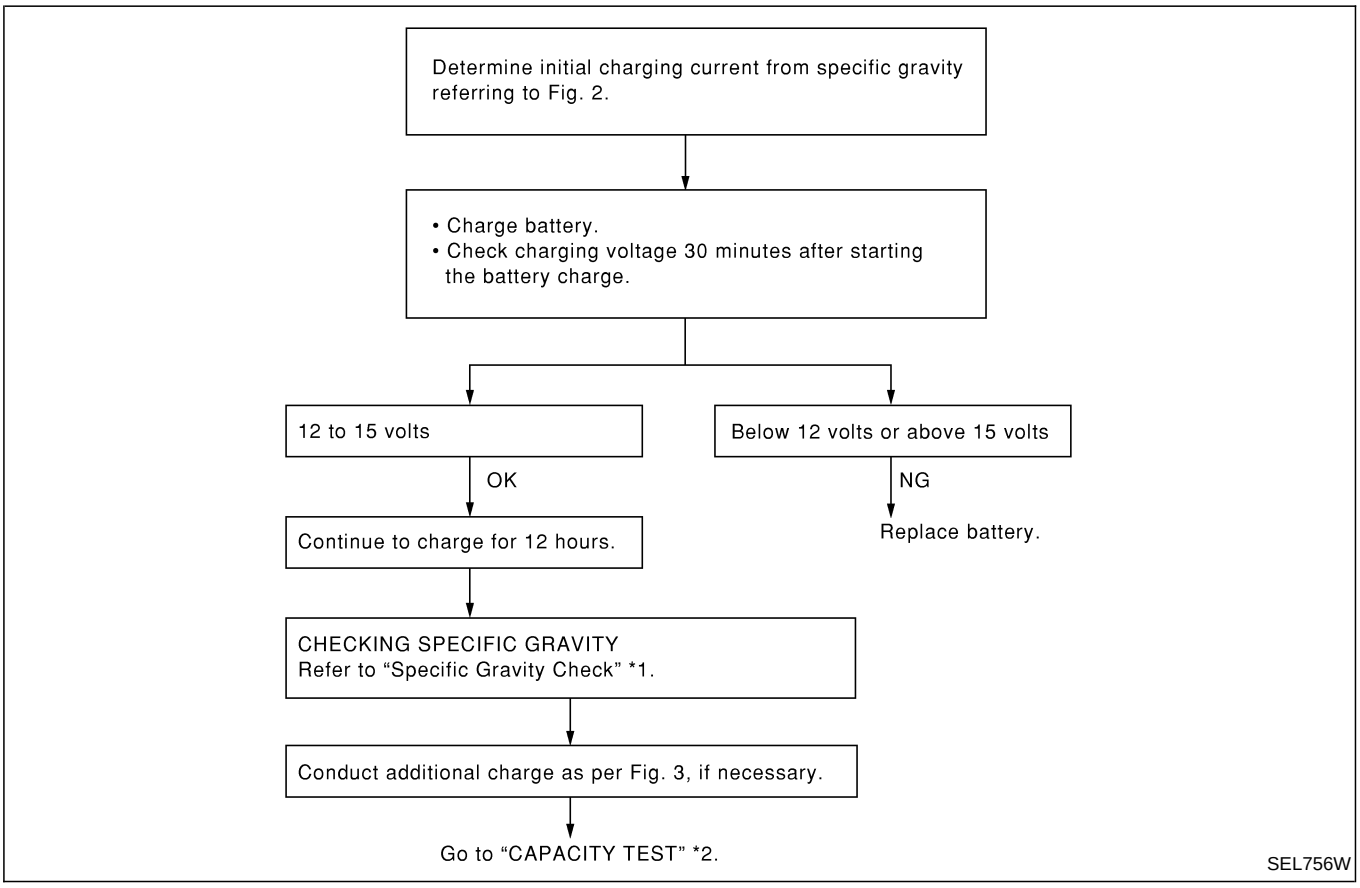
Type	Current (A)
28B19R(L)	90
34B19R(L)	99
46B24R(L)	135
55B24R(L)	135
50D23R(L)	150
55D23R(L)	180
65D26R(L)	195
L2-580 R/L (65 Ah)	195
80D26R(L)	195
75D31R(L)	210
063 [YUASA type code]	210
L3-760 R/L (75 Ah)	225
95D31R(L)	240
115D31R(L)	240
025 [YUASA type code]	240
065 [YUASA type code]	255
027 [YUASA type code]	285

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Battery Test and Charging Chart (Cont'd)

Type	Current (A)
075 [YUASA type code]	300
110D26R(L)	300
95E41R(L)	300
067 [YUASA type code]	325
130E41R(L)	330
096 [YUASA type code]	375
096L [YUASA type code]	375
010S [YUASA type code]	360

A: SLOW CHARGE



*1: SC-4 *2: SC-7

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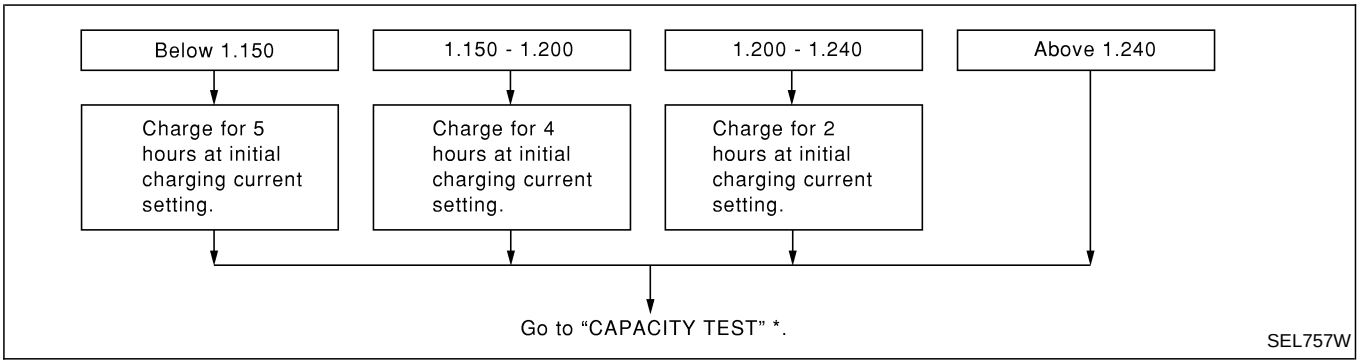
Battery Test and Charging Chart (Cont'd)

Fig. 2 INITIAL CHARGING CURRENT SETTING (Slow charge)

CONVERTED SPECIFIC GRAVITY	BATTERY TYPE																							
	28B19R(L)	34B19R(L)	46B24R(L)	55B24R(L)	50D23R(L)	55D23R(L)	025 [YUASA type code]	027 [YUASA type code]	65D26R(L)	80D26R(L)	L2-580 R/L (65 Ah)	063 [YUASA type code]	067 [YUASA type code]	096 [YUASA type code]	75D31R(L)	L3-760 R/L (75 Ah)	95D31R(L)	115D31R(L)	110D26R(L)	95E41R(L)	065 [YUASA type code]	075 [YUASA type code]	096L [YUASA type code]	010S [YUASA type code]	130E41R(L)
Below 1.100	4.0 (A)		5.0 (A)		7.0 (A)				8.0 (A)					8.5 (A)	9.0 (A)		10.0 (A)						11.0 (A)		14.0 (A)

- Check battery type and determine the specified current using the table shown above.
- After starting charging, adjustment of charging current is not necessary.

Fig. 3 ADDITIONAL CHARGE (Slow charge)



*: SC-7

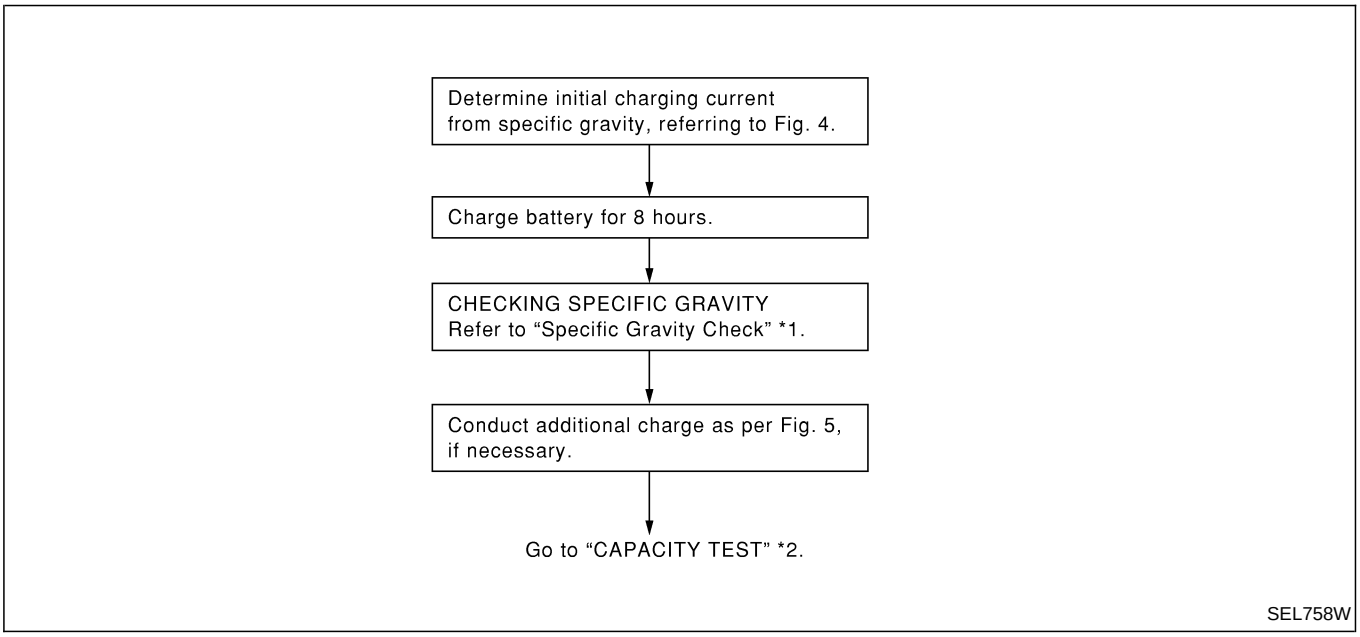
CAUTION:

- **Set charging current to value specified in Fig. 2. If charger is not capable of producing specified current value, set its charging current as close to that value as possible.**
- **Keep battery away from open flame while it is being charged.**
- **When connecting charger, connect leads first, then turn on charger. Do not turn on charger first, as this may cause a spark.**
- **If battery temperature rises above 60°C (140°F), stop charging. Always charge battery when its temperature is below 60°C (140°F).**

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Battery Test and Charging Chart (Cont'd)

B: STANDARD CHARGE



*1: SC-4 *2: SC-7

Fig. 4 INITIAL CHARGING CURRENT SETTING (Standard charge)

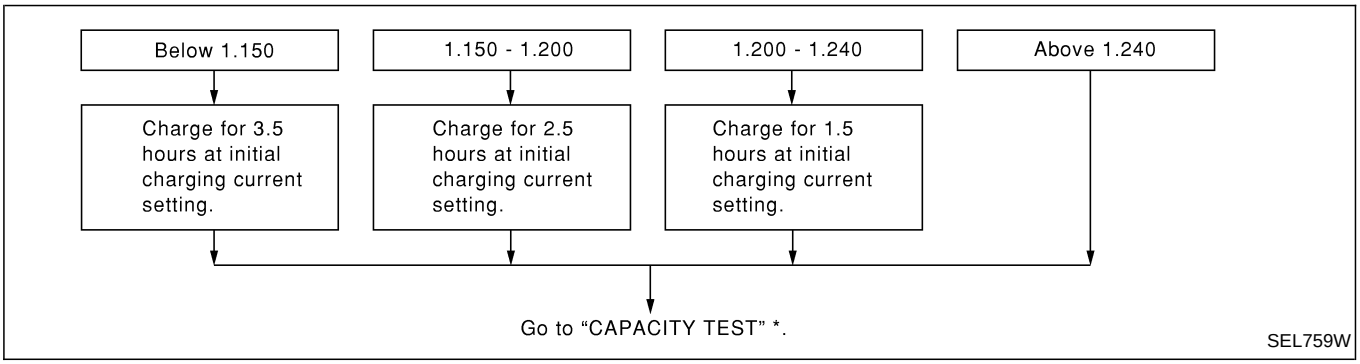
CONVERTED SPECIFIC GRAVITY	BATTERY TYPE																						
	28B19R(L)	34B19R(L)	46B24R(L)	55B24R(L)	50D23R(L)	55D23R(L)	025 [YUASA type code]	027 [YUASA type code]	65D26R(L)	L2-580 R/L (65 Ah)	80D26R(L)	063 [YUASA type code]	067 [YUASA type code]	096 [YUASA type code]	75D31R(L)	L3-760 R/L (75 Ah)	95D31R(L)	115D31R(L)	110D26R(L)	95E41R(L)	065 [YUASA type code]	075 [YUASA type code]	096L [YUASA type code]	010S [YUASA type code]	130E41R(L)
1.100 - 1.130	4.0 (A)		5.0 (A)		6.0 (A)				7.0 (A)						8.0 (A)		9.0 (A)						10.0 (A)		13.0 (A)
1.130 - 1.160	3.0 (A)		4.0 (A)		5.0 (A)				6.0 (A)						7.0 (A)		8.0 (A)						9.0 (A)		11.0 (A)
1.160 - 1.190	2.0 (A)		3.0 (A)		4.0 (A)				5.0 (A)						6.0 (A)		7.0 (A)						8.0 (A)		9.0 (A)
1.190 - 1.220	2.0 (A)		2.0 (A)		3.0 (A)				4.0 (A)						5.0 (A)		5.0 (A)						6.0 (A)		7.0 (A)

- Check battery type and determine the specified current using the table shown above.
- After starting charging, adjustment of charging current is not necessary.

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Battery Test and Charging Chart (Cont'd)

Fig. 5 ADDITIONAL CHARGE (Standard charge)

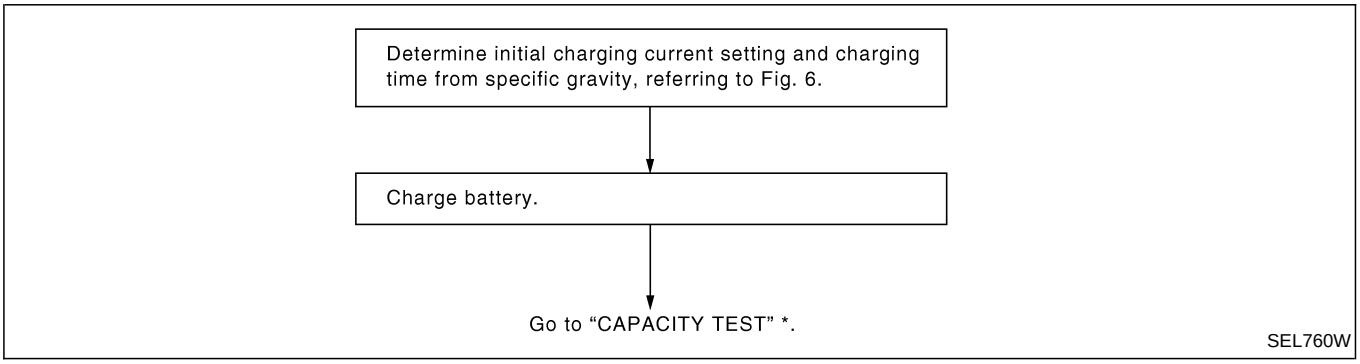


*: SC-7

CAUTION:

- **Do not use standard charge method on a battery whose specific gravity is less than 1.100.**
- **Set charging current to value specified in Fig. 4. If charger is not capable of producing specified current value, set its charging current as close to that value as possible.**
- **Keep battery away from open flame while it is being charged.**
- **When connecting charger, connect leads first, then turn on charger. Do not turn on charger first, as this may cause a spark.**
- **If battery temperature rises above 60°C (140°F), stop charging. Always charge battery when its temperature is below 60°C (140°F).**

C: QUICK CHARGE



*: SC-7

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Battery Test and Charging Chart (Cont'd)

Fig. 6 INITIAL CHARGING CURRENT SETTING AND CHARGING TIME (Quick charge)

BATTERY TYPE		28B19R(L)	34B19R(L)	46B24R(L)	55B24R(L)	50D23R(L)	55D23R(L)	65D26R(L)	L2-580 R/L (65 Ah)	80D26R(L)	025 [YUASA type code]	027 [YUASA type code]	063 [YUASA type code]	067 [YUASA type code]	096 [YUASA type code]	065 [YUASA type code]	075 [YUASA type code]	096L [YUASA type code]	010S [YUASA type code]	75D31R(L)	L3-760 R/L (75 Ah)	95D31R(L)	115D31R(L)	110D26R(L)	95E41R(L)	130E41R(L)
CURRENT [A]		10 (A)		15 (A)			20 (A)							25 (A)				30 (A)								40 (A)
CONVERTED SPECIFIC GRAVITY	1.100 - 1.130	2.5 hours																								
	1.130 - 1.160	2.0 hours																								
	1.160 - 1.190	1.5 hours																								
	1.190 - 1.220	1.0 hours																								
	Above 1.220	0.75 hours (45 min.)																								

- Check battery type and determine the specified current using the table shown above.
- After starting charging, adjustment of charging current is not necessary.

CAUTION:

- **Do not use quick charge method on a battery whose specific gravity is less than 1.100.**
- **Set initial charging current to value specified in Fig. 6. If charger is not capable of producing specified current value, set its charging current as close to that value as possible.**
- **Keep battery away from open flame while it is being charged.**
- **When connecting charger, connect leads first, then turn on charger. Do not turn on charger first, as this may cause a spark.**
- **Be careful of a rise in battery temperature because a large current flow is required during quick-charge operation.**
  If battery temperature rises above 60°C (140°F), stop charging. Always charge battery when its temperature is below 60°C (140°F).
- **Do not exceed the charging time specified in Fig. 6, because charging battery over the charging time can cause deterioration of the battery.**

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System Description

M/T MODELS

Power is supplied at all times
- through 40A fusible link (letter **C**, located in the fuse and fusible link box)
- to ignition switch terminal 1.

With the ignition switch in START position, power is supplied
- from ignition switch terminal 4
- to starter motor harness connector terminal 1.

The starter motor plunger closes and provides a closed circuit between the battery and starter motor. The starter motor is grounded to the engine block. With power and ground supplied, cranking occurs and the engine starts.

A/T MODELS

Power is supplied at all times
- through 40A fusible link (letter **C**, located in the fuse and fusible link box)
- to ignition switch terminal 1.

With the ignition switch in the START position, power is supplied
- from ignition switch terminal 4
- to park/neutral position relay terminal 5.

With the ignition switch ON or START position, power is supplied
- through 10A fuse [No. 8, located in the fuse block (J/B)]
- to park/neutral position (PNP) switch terminal 1.

With the selector lever in the P or N position, ground is supplied
- to park/neutral position switch terminal 2 through the park/neutral position relay terminals 2 and 1
- from body grounds M754 and M33.

Then park/neutral position relay is energized and power is supplied
- from park/neutral position relay terminal 3
- to starter motor harness connector terminal 1.

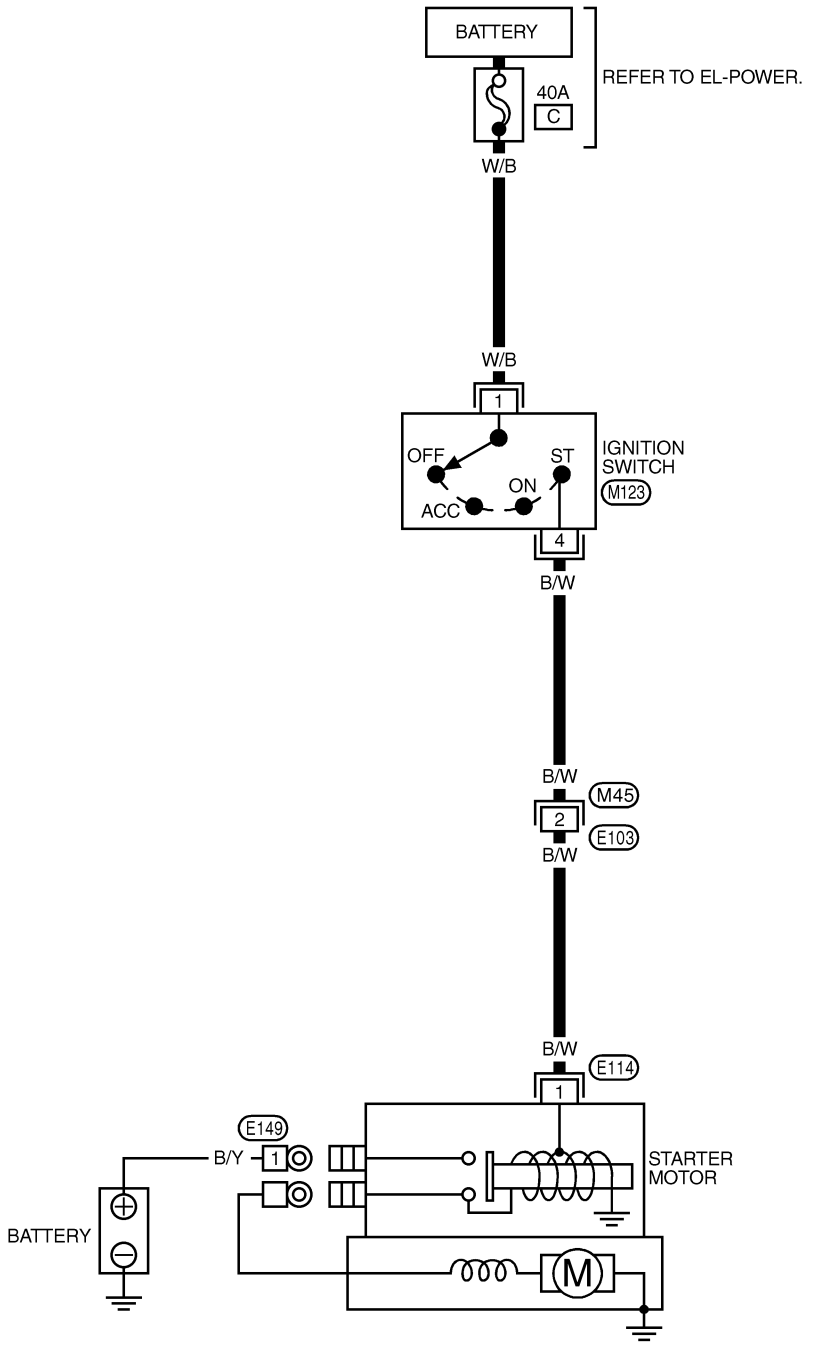
The starter motor plunger closes and provides a closed circuit between the battery and starter motor. The starter motor is grounded to the engine block. With power and ground supplied, cranking occurs and the engine starts.

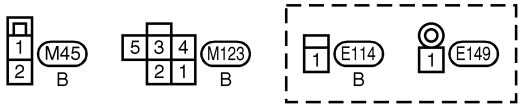
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Wiring Diagram — START —

TD27Ti ENGINE MODELS

SC-START-01



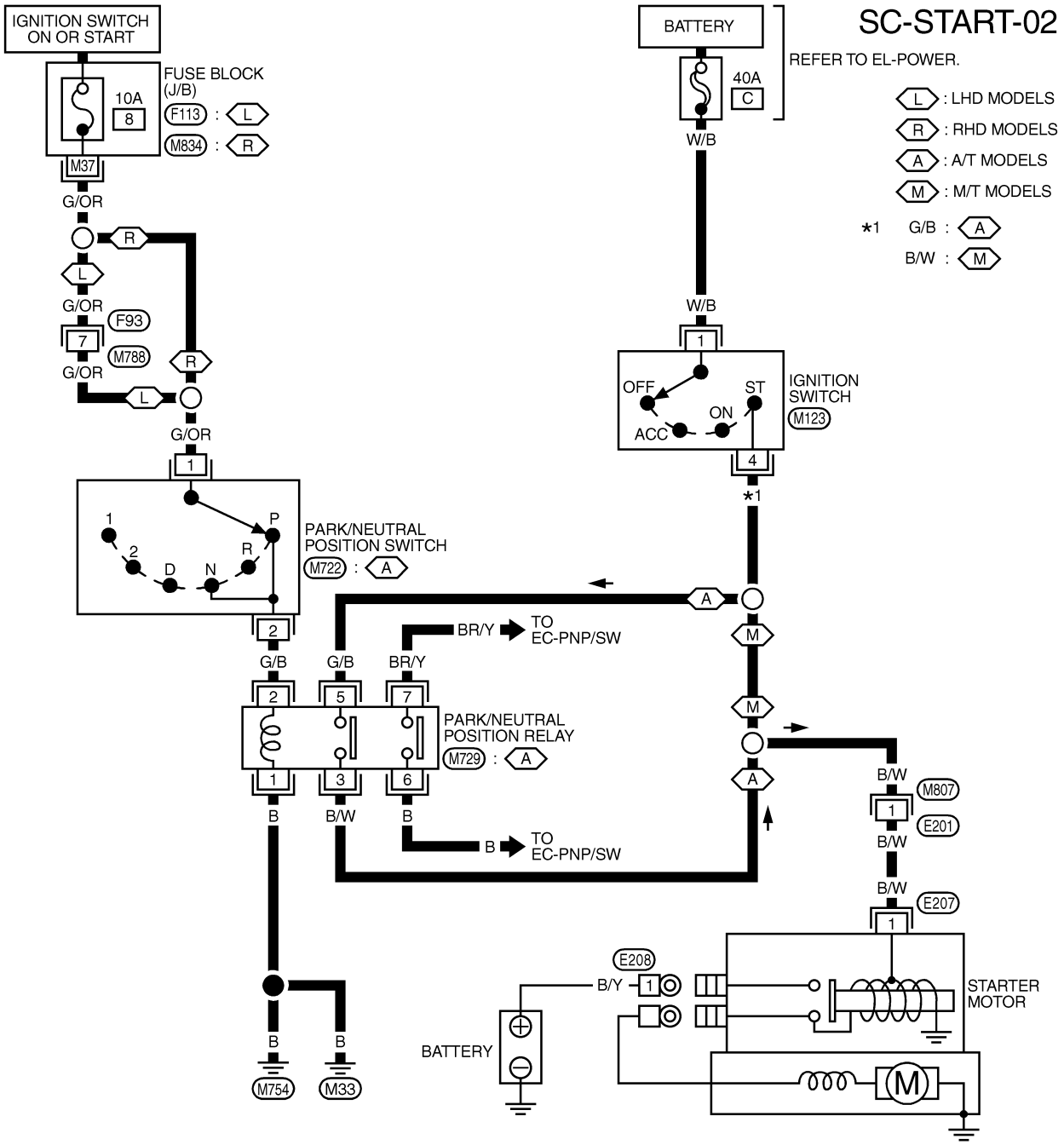


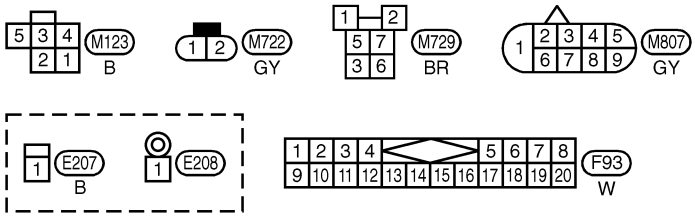
YEL053D

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Wiring Diagram — START — (Cont'd)

ZD30DDTi ENGINE MODELS





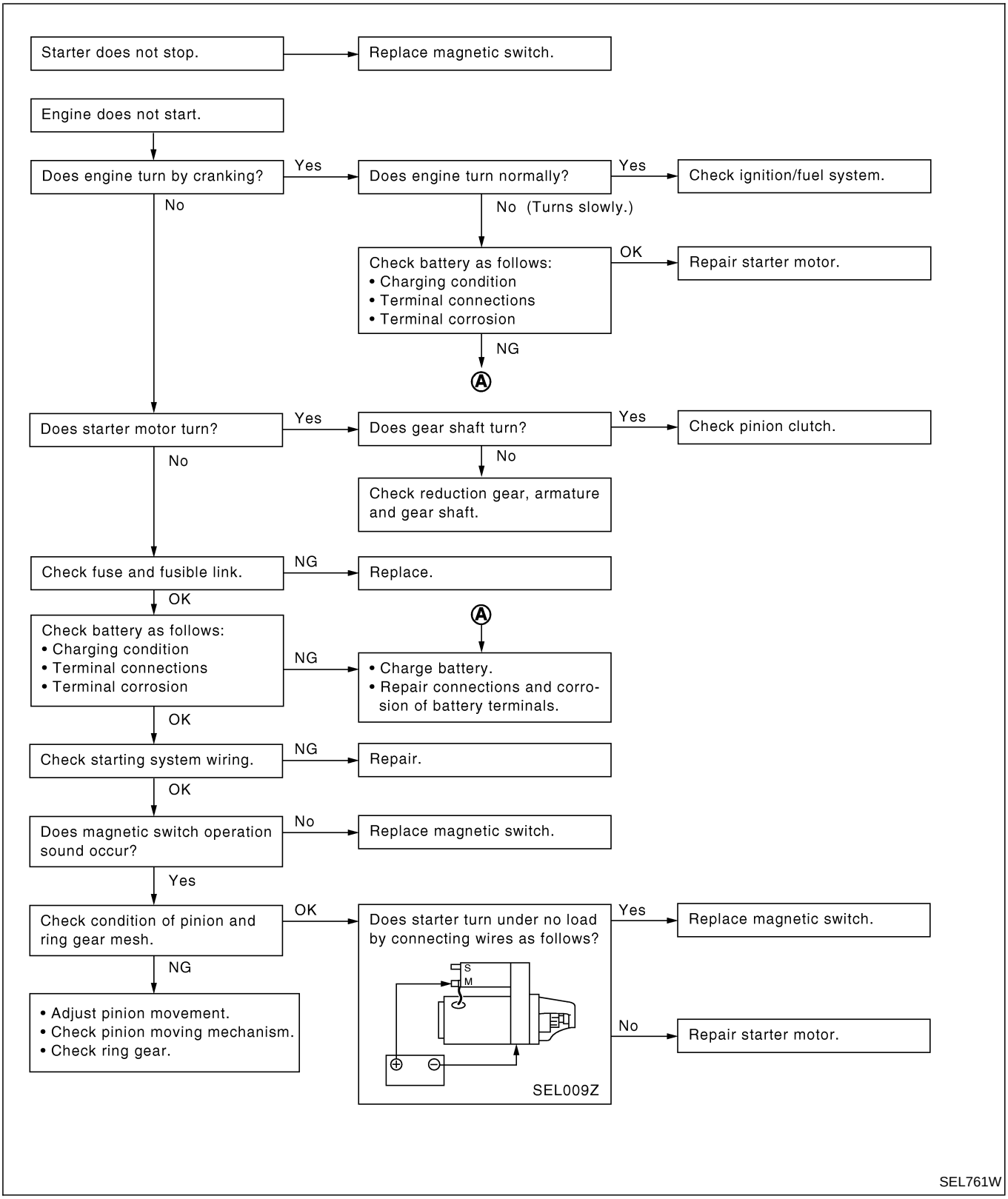
REFER TO THE FOLLOWING.
M834 , F113 -FUSE BLOCK-JUNCTION BOX (J/B)

YEL054D

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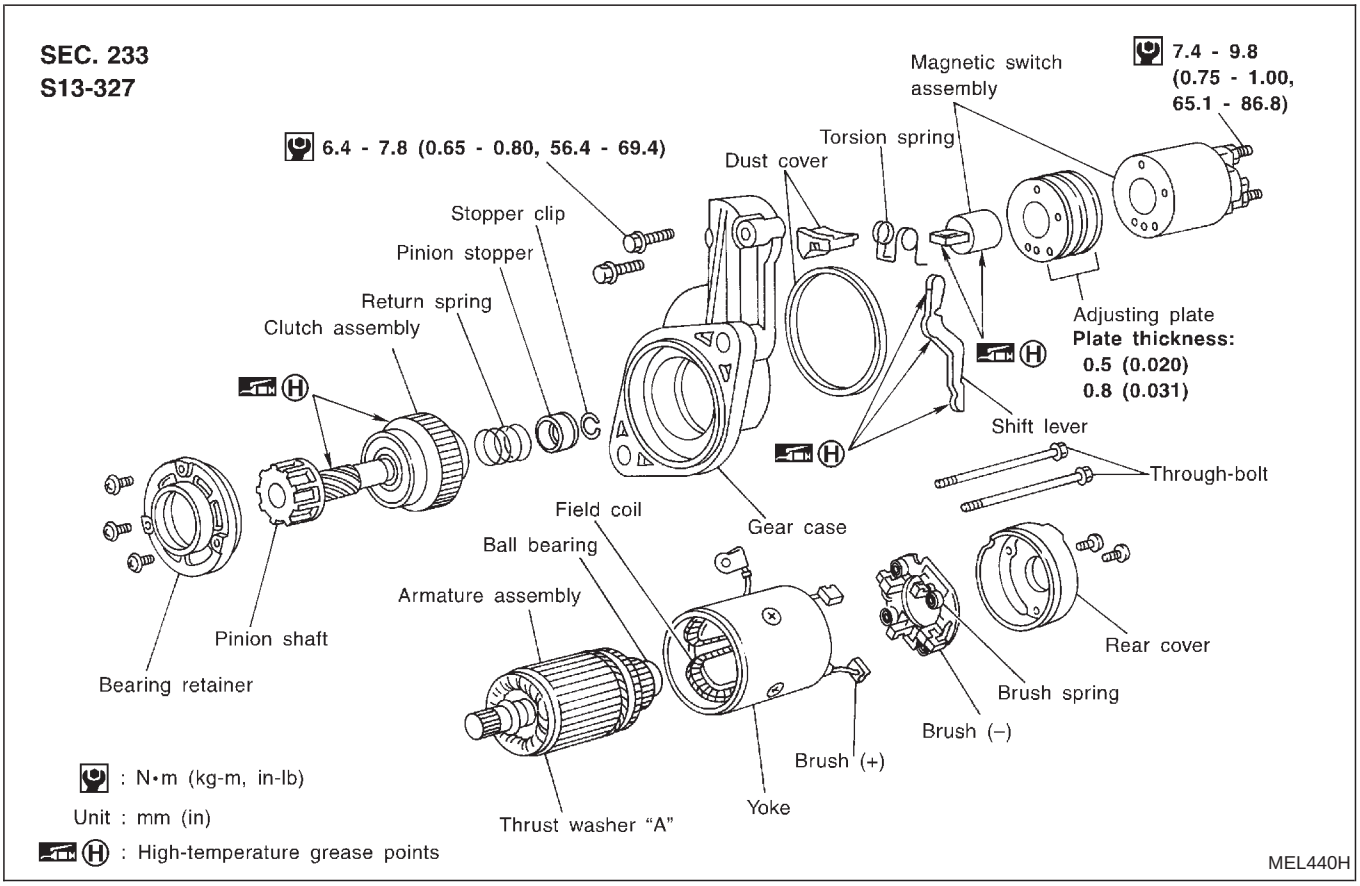
Trouble Diagnoses

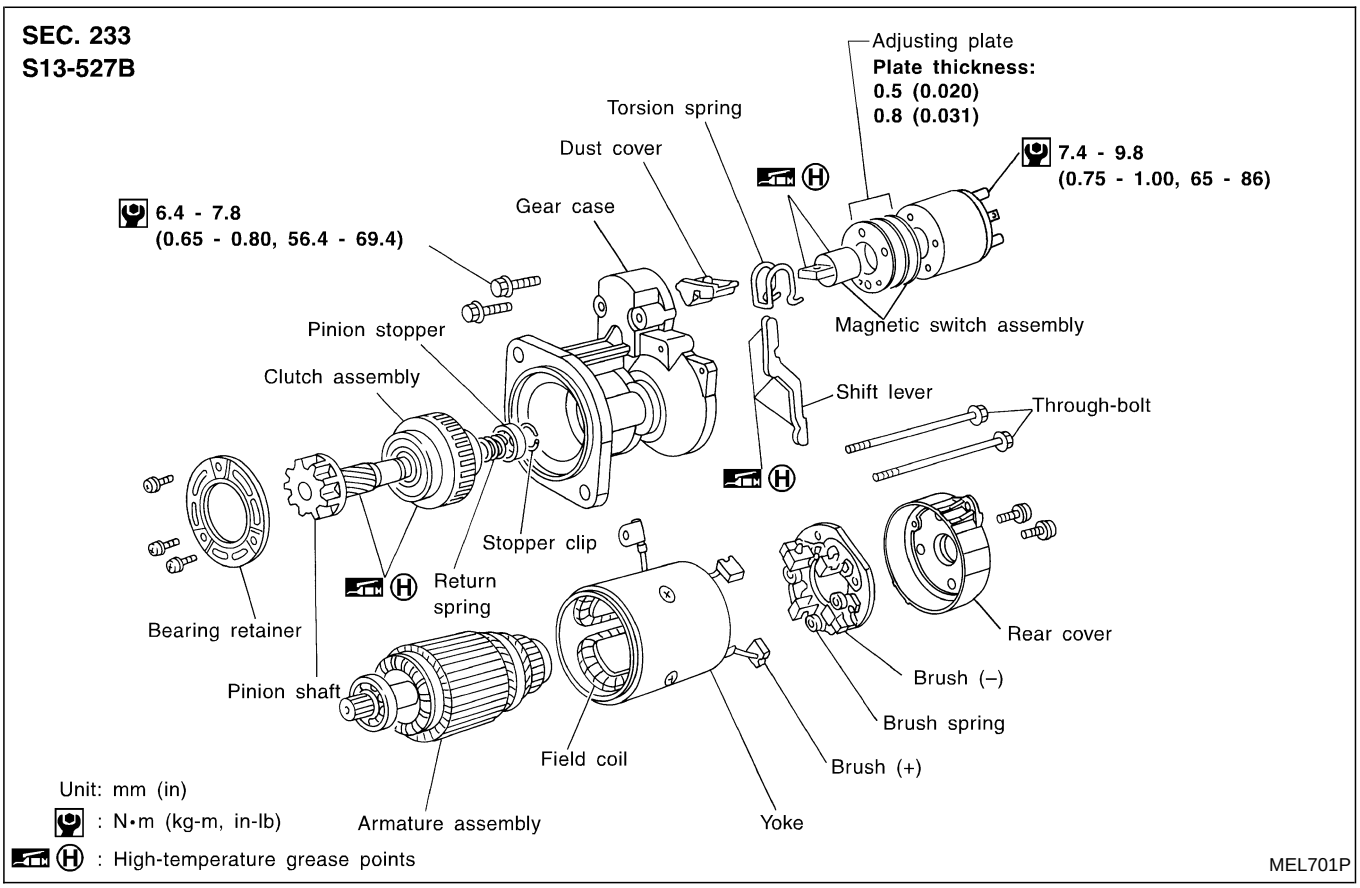
If any malfunction is found, immediately disconnect ground battery cable.



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Construction

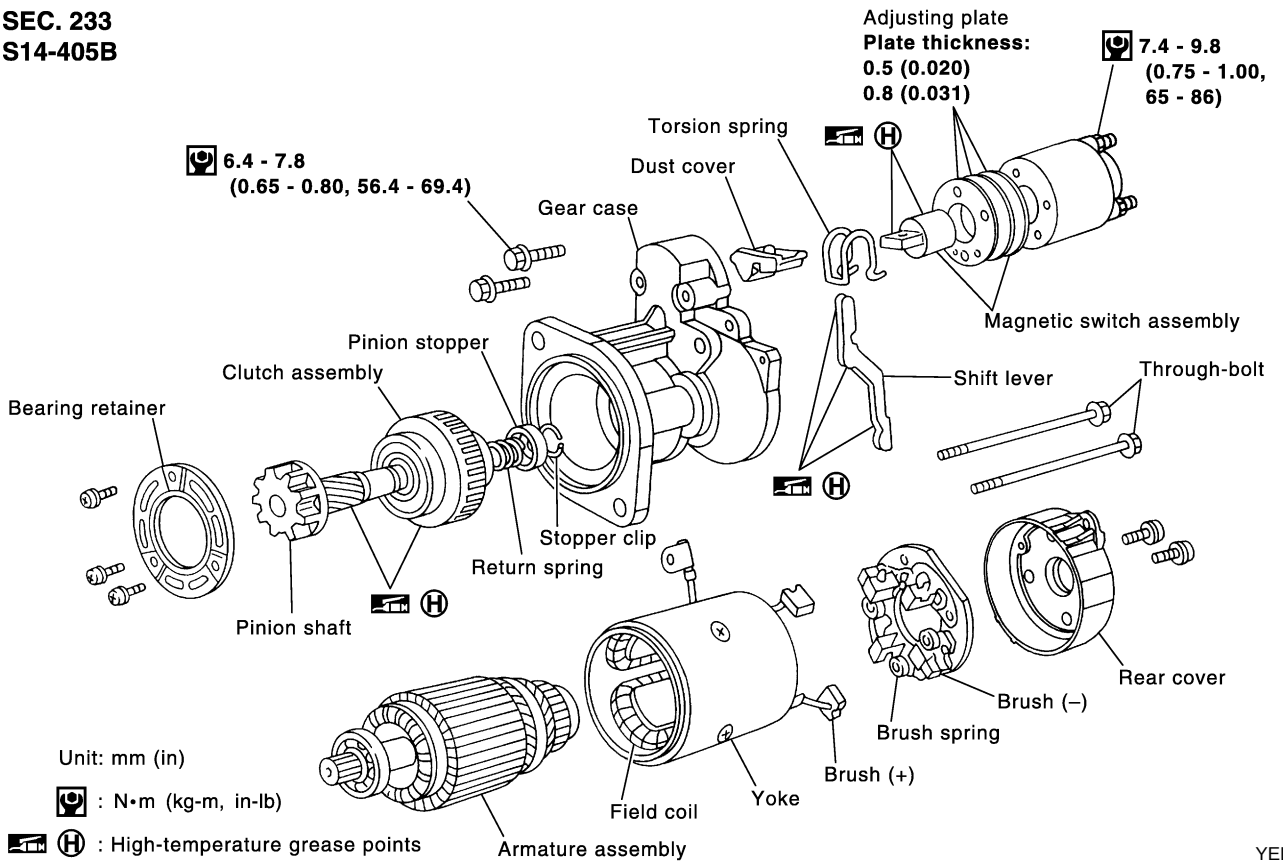




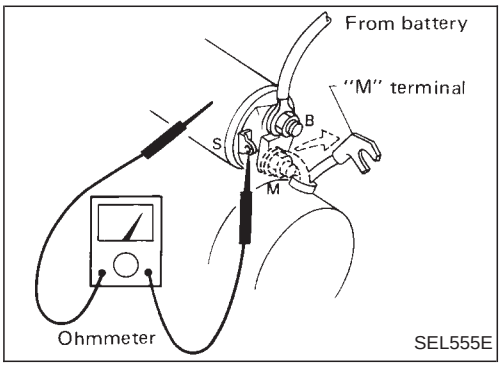
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Construction (Cont'd)

SEC. 233
S14-405B



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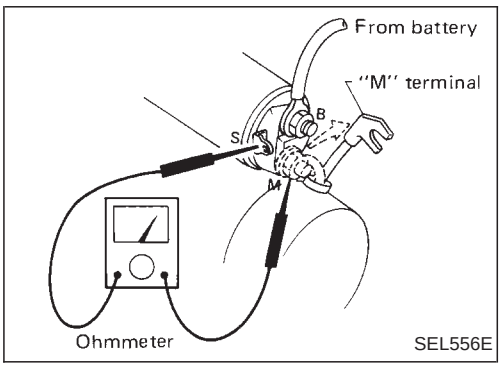


Magnetic Switch Check

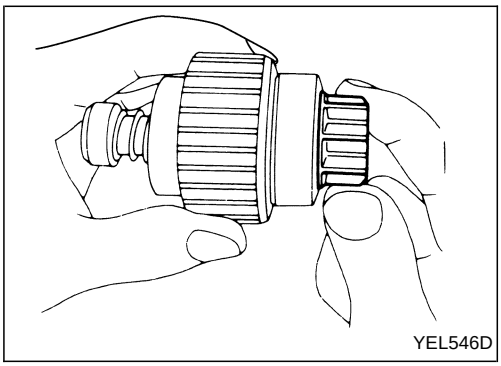
Magnetic Switch Check

- Before starting to check, disconnect battery ground cable.
- Disconnect "M" terminal of starter motor.

1. Continuity test (between "S" terminal and switch body).
   - No continuity ... Replace.

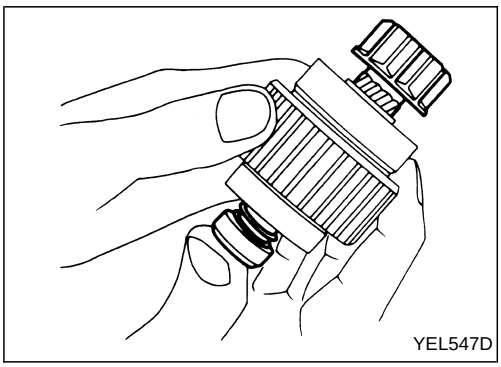


2. Continuity test (between "S" terminal and "M" terminal).
   - No continuity ... Replace.

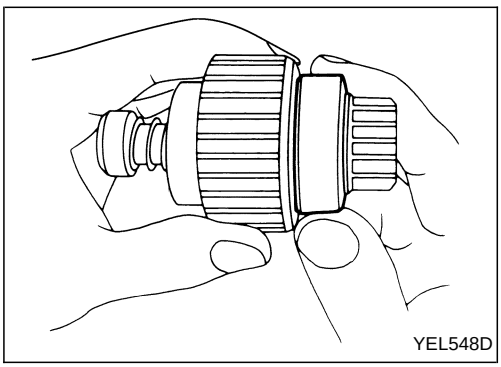


Pinion/Clutch Check

1. Check to see if pinion locks in one direction and rotates smoothly in the opposite direction.
   - If it does not lock (or locks) in either direction or unusual resistance is evident ... Replace.



2. Check pinion movement
   - If it is hard to move, apply grease or, if necessary, replace.

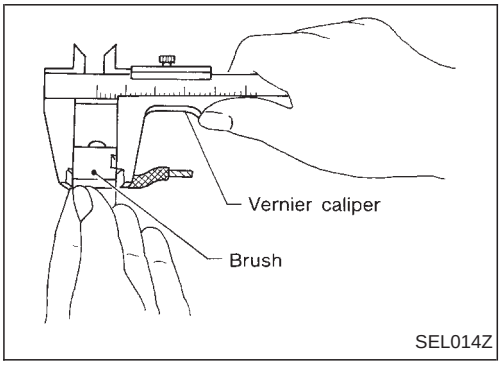


3. Check ball bearing.
   Spin outer race of ball bearing to ensure that it turns smoothly without binding.
   - Abnormal resistance ... Replace.

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Pinion/Clutch Check (Cont'd)

4. Inspect pinion teeth.
   - Replace pinion if teeth are worn or damaged. (Also check condition of ring gear teeth.)
5. Inspect reduction gear teeth.
   - Replace reduction gear if teeth are worn of damaged. (Also check condition of armature shaft gear teeth.)



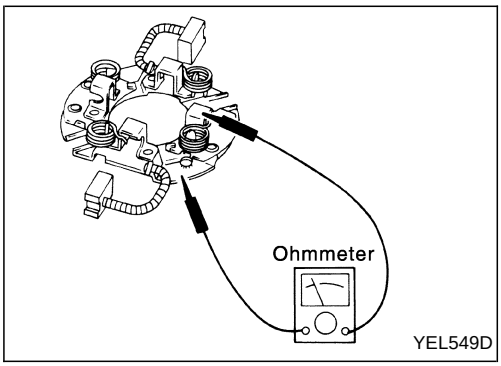
Brush Check

BRUSH

Check wear of brush.

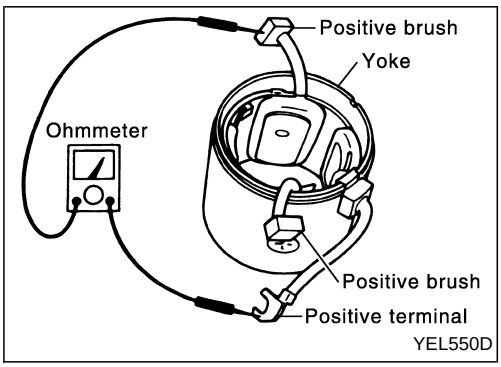
Wear limit length:
Refer to SDS (SC-30).

- Excessive wear ... Replace.



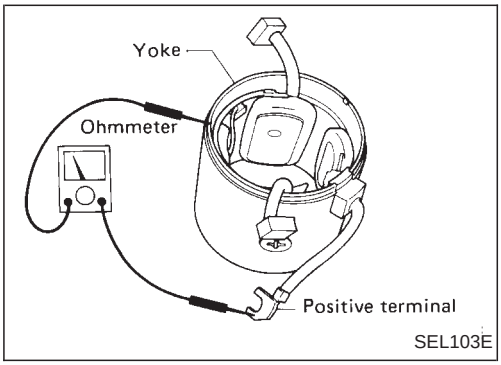
BRUSH HOLDER

1. Perform insulation test between brush holder (positive side) and its base (negative side).
   - Continuity exists ... Replace.
2. Check brush to see if it moves smoothly.
   - If brush holder is bent, replace it; if sliding surface is dirty, clean.



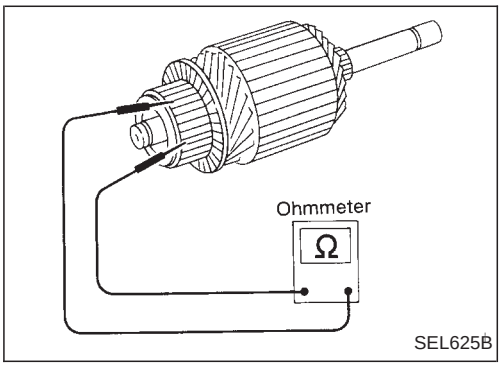
Field Coil Check

1. Continuity test (between field coil positive terminal and positive brushes).
   - No continuity ... Replace field coil.



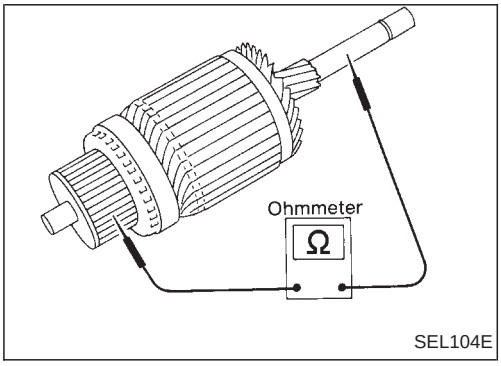
2. Insulation test (between field coil positive terminal and yoke).
   - Continuity exists ... Replace field coil.

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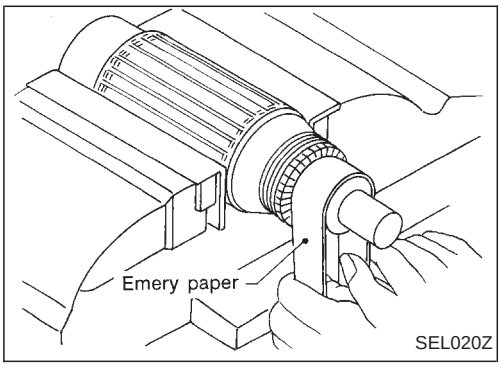


Armature Check

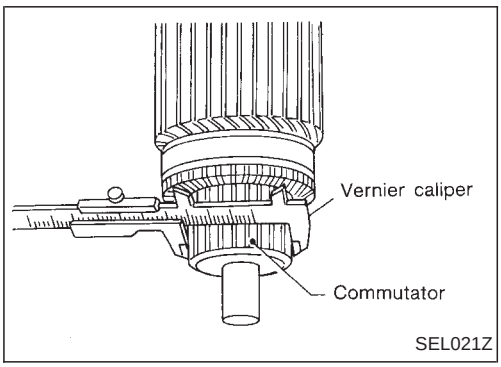
1. Continuity test (between two segments side by side).
   - No continuity ... Replace.



2. Insulation test (between each commutator bar and shaft).
   - Continuity exists ... Replace.



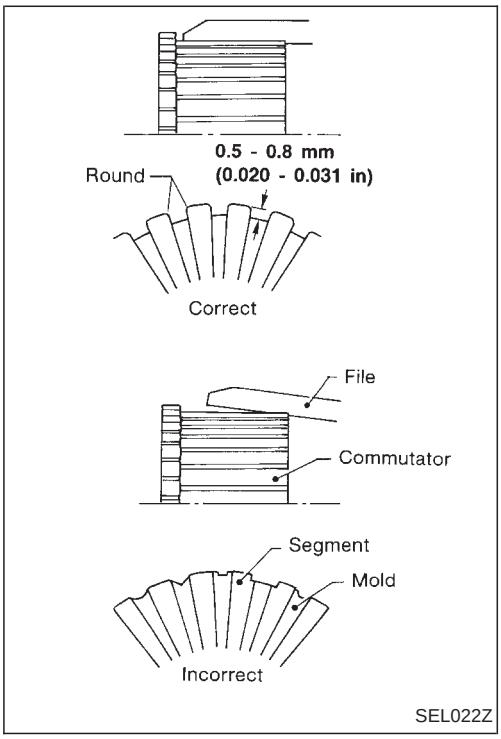
3. Check commutator surface.
   - Rough ... Sand lightly with No. 500-600 emery paper.



4. Check diameter of commutator.
   Commutator minimum diameter:
   Refer to SDS (SC-30).
   - Less than specified value ... Replace.

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Armature Check (Cont'd)



5. Check depth of insulating mold from commutator surface.
   - Less than 0.2 mm (0.008 in) ... Undercut to 0.5 - 0.8 mm (0.020 - 0.031 in)

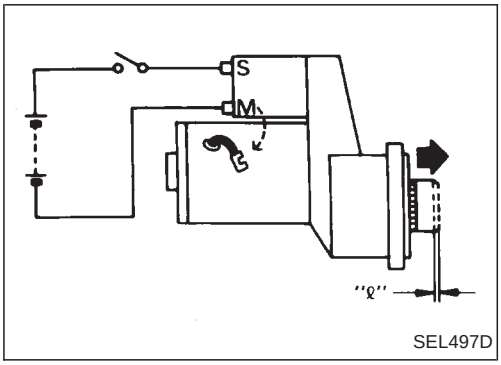
Assembly

Carefully observe the following instructions.

GREASE POINT

- Rear cover metal
- Gear case metal
- Center bracket metal
- Frictional surface of pinion
- Moving portion of shift lever
- Plunger of magnetic switch
- Reduction gear

PINION PROTRUSION LENGTH ADJUSTMENT

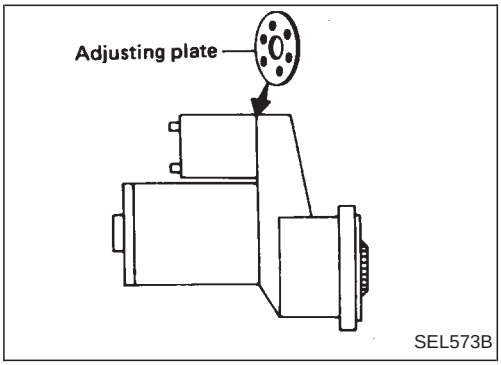


Reduction gear type

Compare movement "ℓ" in height of pinion when it is pushed out with magnetic switch energized and when it is pulled out by hand until it touches stopper.

Movement "ℓ":

Refer to SDS (SC-30).



- Not in the specified value ... Adjust by adjusting plate.

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System Description

The alternator provides DC voltage to operate the vehicle's electrical system and to keep the battery charged. The voltage output is controlled by the IC regulator.
Power is supplied at all times to alternator terminal 4 (S) (ZD30DDTi engine models) through:

- 10A fuse (No. 31, located in the fuse and fusible link box).

Terminal B supplies power to charge the battery and operate the vehicle's electrical system. Output voltage is controlled by the IC regulator at terminal 4 (S) detecting the input voltage (ZD30DDTi engine models). The charging circuit is protected by the 100A fusible link.
The alternator is grounded to the engine block.
With the ignition switch in the ON or START position, power is supplied

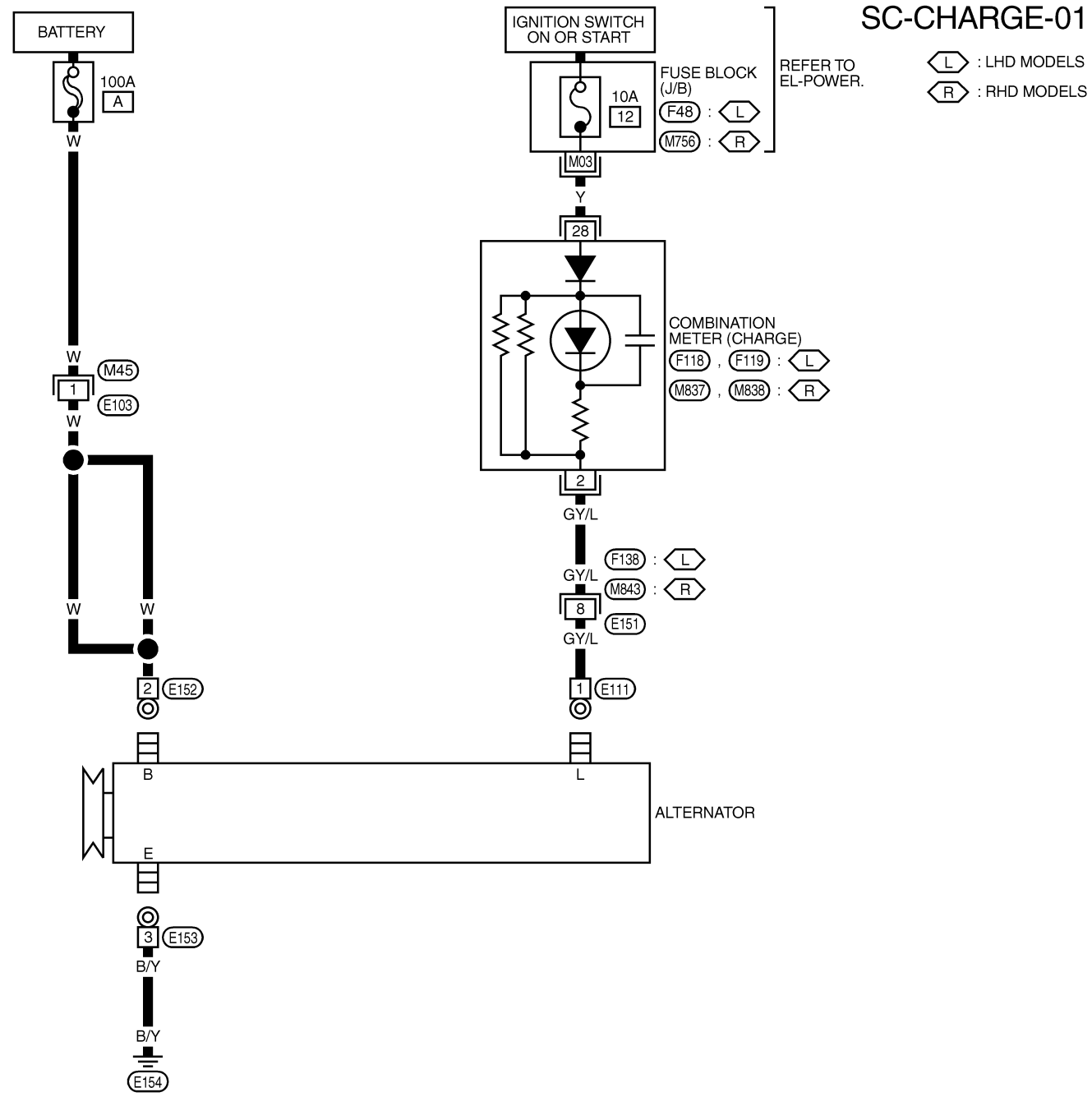
- through 10A fuse [No. 12, located in the fuse block (J/B)]
- to combination meter terminal 28 for the charge warning lamp.

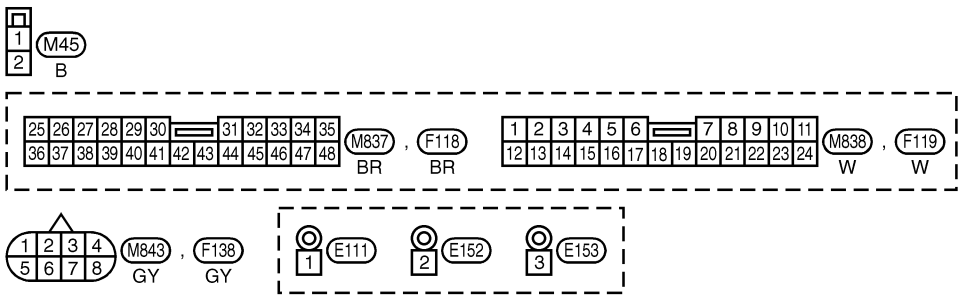
Ground is supplied to terminal 2 of the combination meter through terminal 1(L) (TD27Ti engine models) or 3(L) (ZD30DDTi engine models) of the alternator. With power and ground supplied, the charge warning lamp will illuminate. When the alternator is providing sufficient voltage with the engine running, the ground is opened and the charge warning lamp will go off.
If the charge warning lamp illuminates with the engine running, a malfunction is indicated.

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Wiring Diagram — CHARGE —

TD27Ti ENGINE MODELS





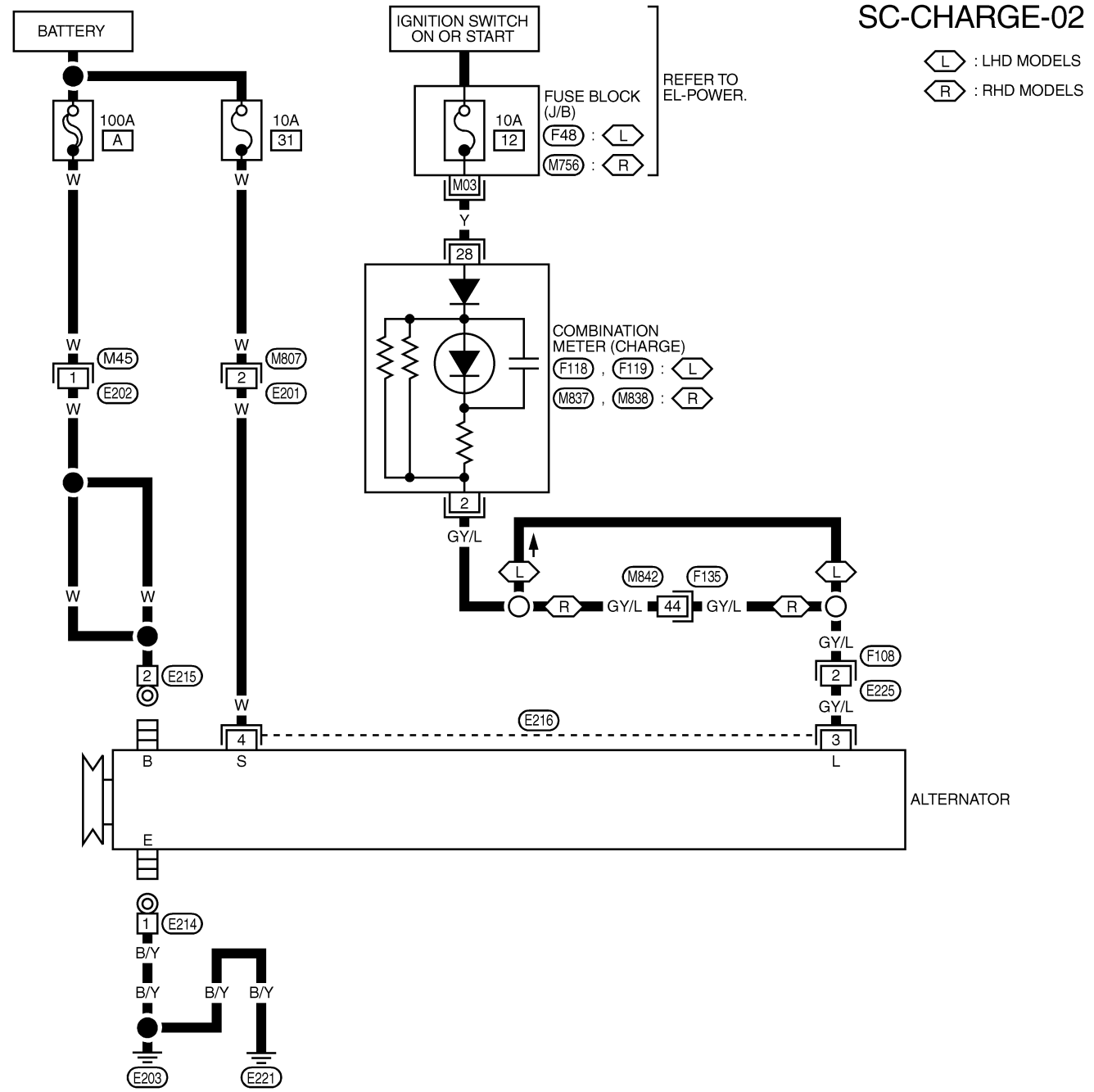
REFER TO THE FOLLOWING.
M756 , F48 -FUSE BLOCK-JUNCTION BOX (J/B)

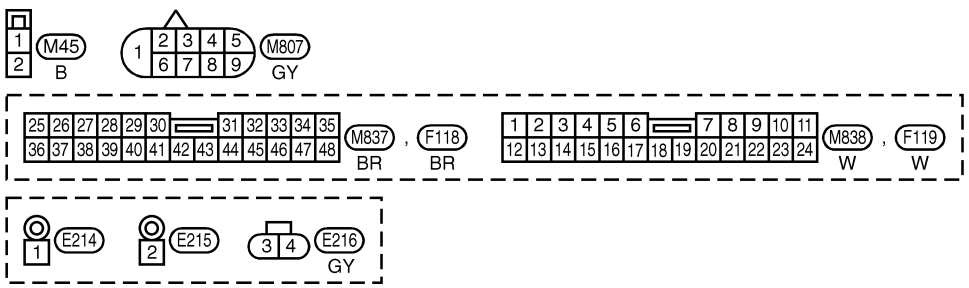
YEL055D

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Wiring Diagram — CHARGE — (Cont'd)

ZD30DDTi ENGINE MODELS





REFER TO THE FOLLOWING.
F108 , F135 -SUPER MULTIPLE JUNCTION BOX (SMJ)
M756 , F48 -FUSE BLOCK-JUNCTION BOX (J/B)

YEL056D

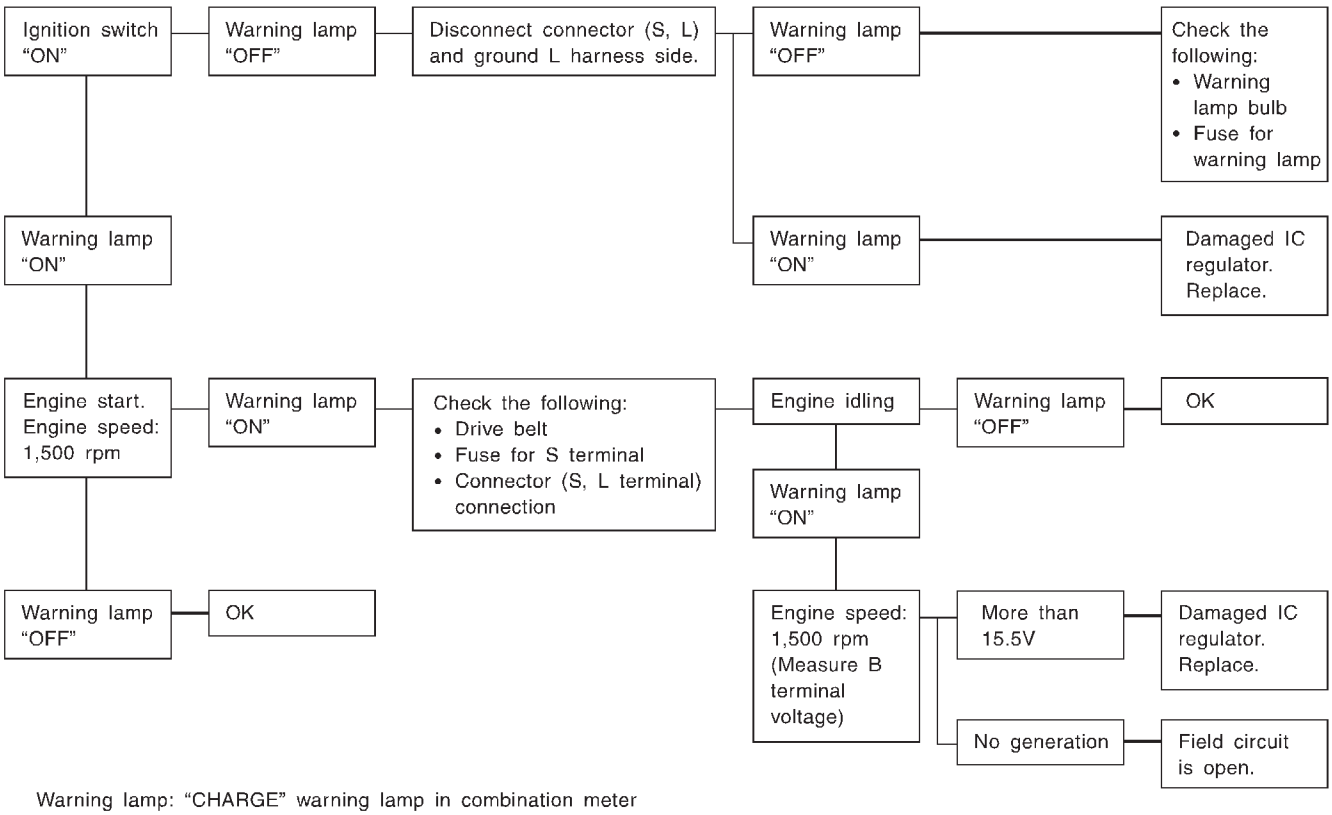
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Trouble Diagnoses

Before conducting an alternator test, make sure that the battery is fully charged. A 30-volt voltmeter and suitable test probes are necessary for the test. The alternator can be checked easily by referring to the Inspection Table.

- **Before starting, inspect the fusible link.**
- **Use fully charged battery.**

WITH IC REGULATOR



Warning lamp: "CHARGE" warning lamp in combination meter

SEL338V

NOTE:

- If the inspection result is OK even though the charging system is malfunctioning, check the B terminal connection. (Check the tightening torque.)
- When field circuit is open, check condition of rotor coil, rotor slip ring and brush. If necessary, replace faulty parts with new ones.

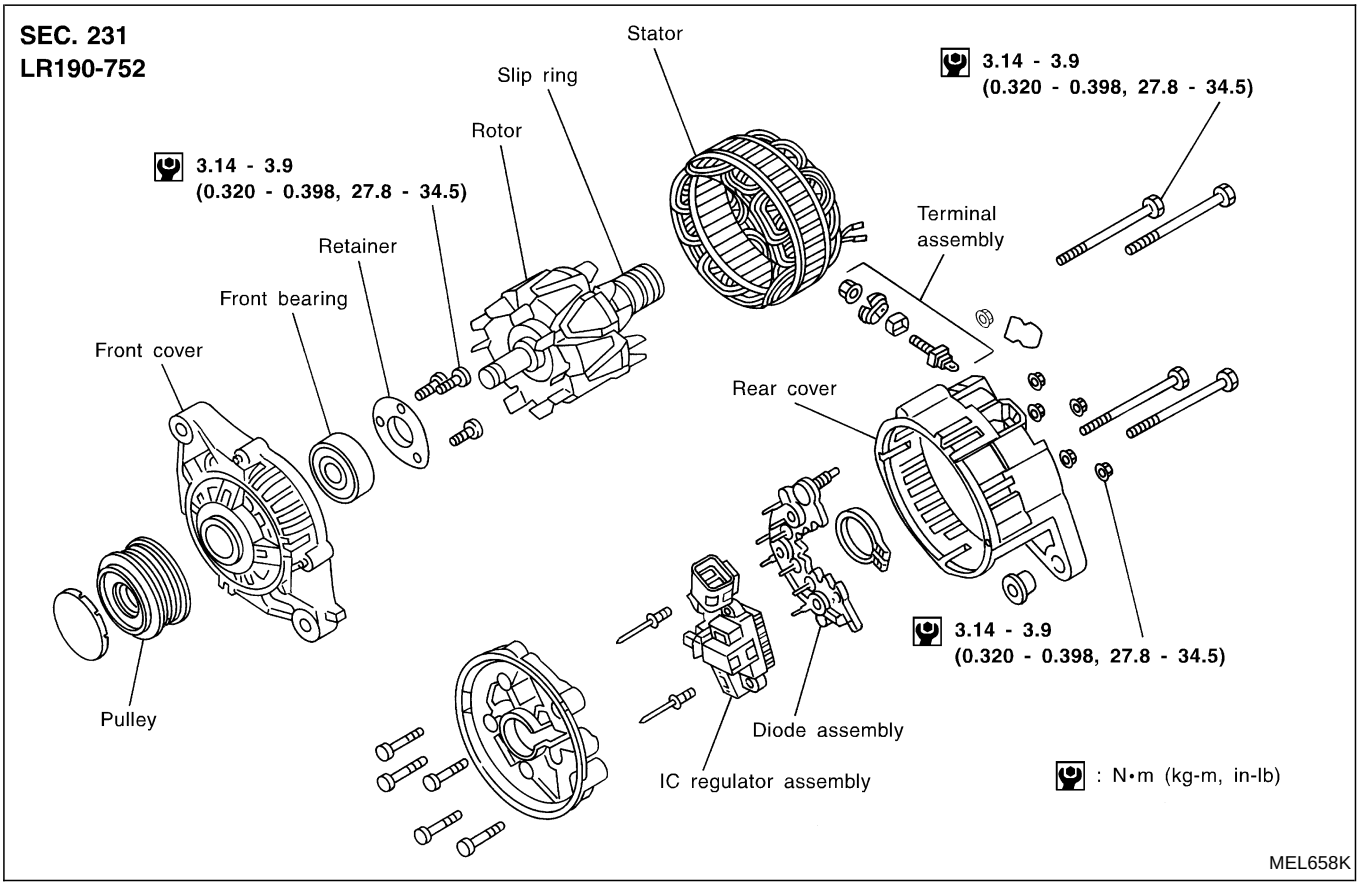
MALFUNCTION INDICATOR

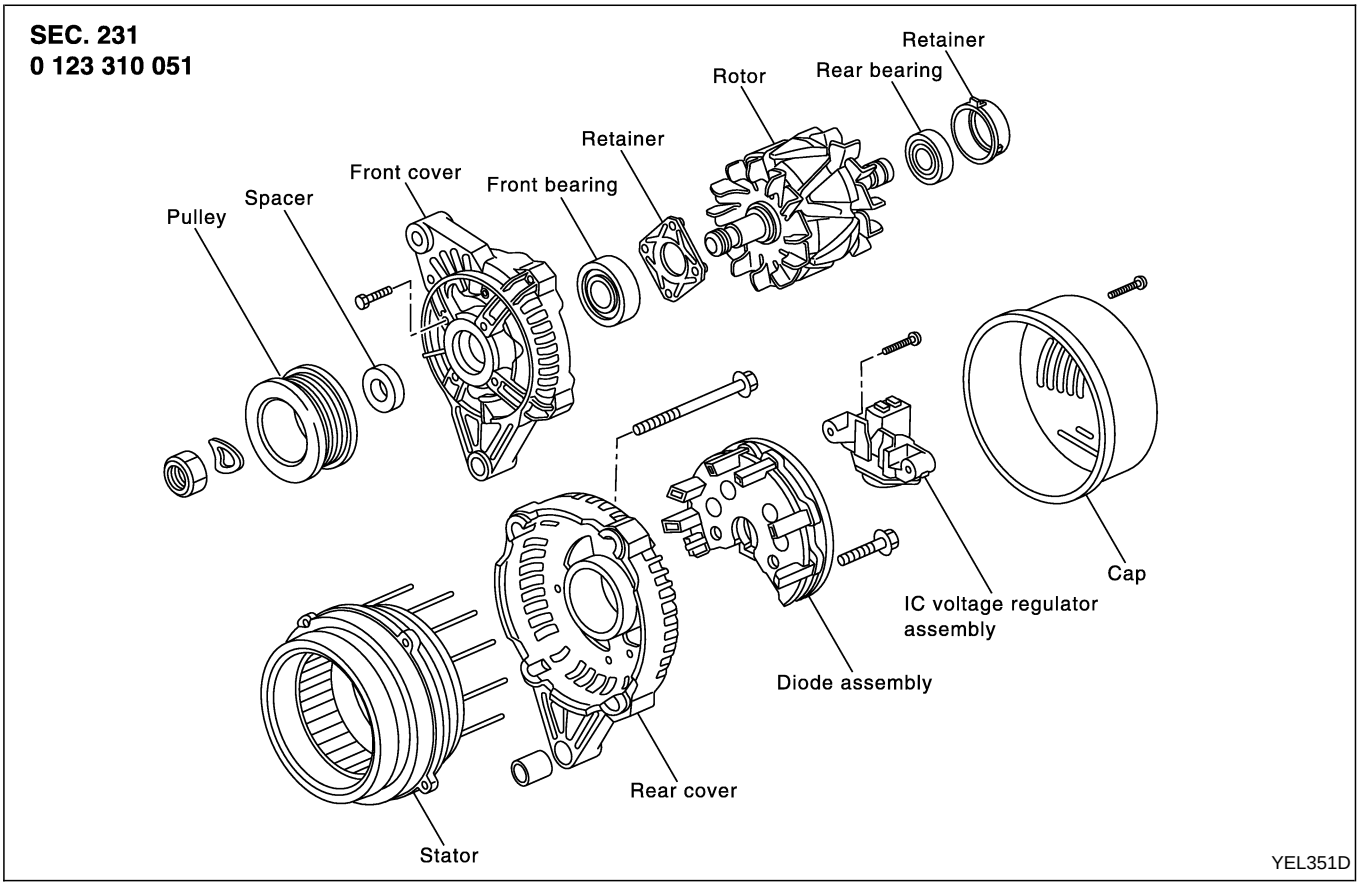
The IC regulator warning function activates to illuminate "CHARGE" warning lamp, if any of the following symptoms occur while alternator is operating:

- Excessive voltage is produced.
- No voltage is produced.

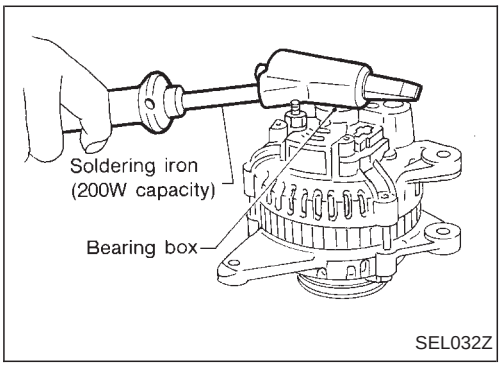
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Construction





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Disassembly

REAR COVER

CAUTION:

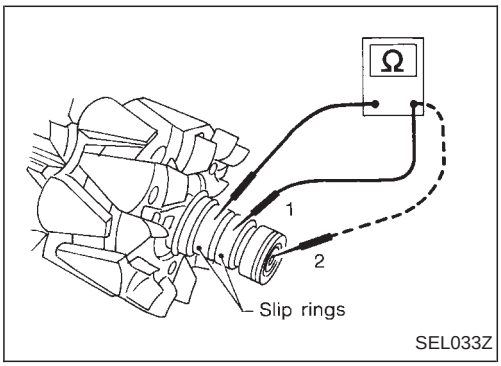
Rear cover may be hard to remove because a ring is used to lock outer race of rear bearing. To facilitate removal of rear cover, heat just bearing box section with a 200W soldering iron.

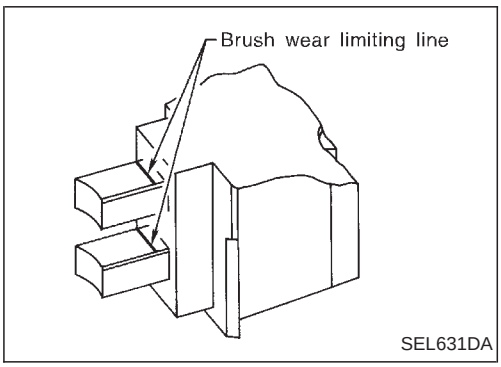
Do not use a heat gun, as it can damage diode assembly.

REAR BEARING

CAUTION:

- **Do not reuse rear bearing after removal. Replace with a new one.**
- **Do not lubricate rear bearing outer race.**





Inspection

ROTOR CHECK

1. Resistance test

   Resistance: Refer to SDS (SC-30).

- Not within the specified values ... Replace rotor.

2. Insulator test

- Continuity exists ... Replace rotor.

3. Check slip ring for wear.

   Slip ring minimum outer diameter:
   Refer to SDS (SC-30).

- Not within the specified values ... Replace rotor.

BRUSH CHECK

1. Check smooth movement of brush.

- Not smooth ... Check brush holder and clean.

2. Check brush for wear.

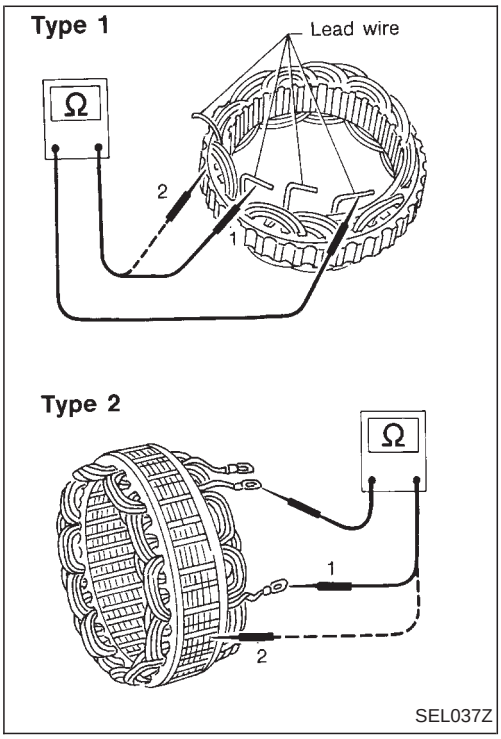
- Replace brush if it is worn down to the limit line.

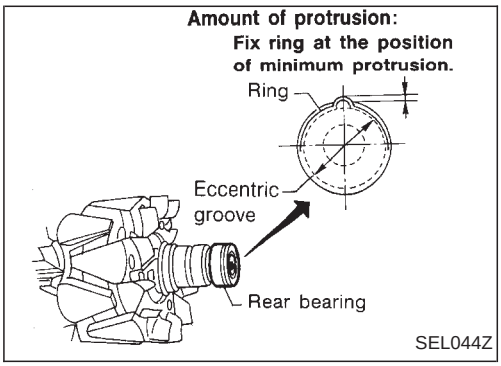
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Inspection (Cont'd)

STATOR CHECK

1. Continuity test
- No continuity ... Replace stator.
2. Ground test
- Continuity exists ... Replace stator.





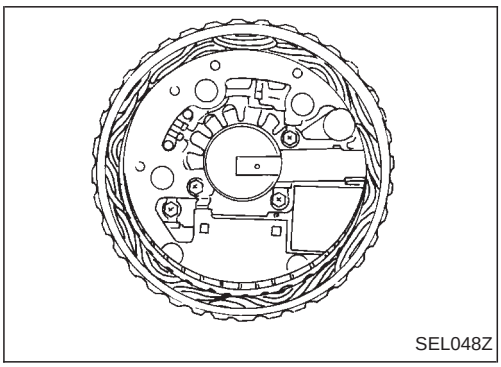
Assembly

RING FITTING IN REAR BEARING

- Fix ring into groove in rear bearing so that it is as close to the adjacent area as possible.

CAUTION:

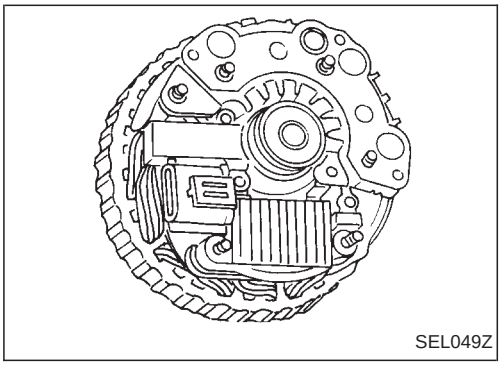
Do not reuse rear bearing after removal.



REAR COVER INSTALLATION

1. Fit brush assembly, diode assembly, regulator assembly and stator.
2. Push brushes up with fingers and install them to rotor.

Take care not to damage slip ring sliding surface.



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Battery

Applied model	TD27Ti		ZD30DDTi	
Type	L2-580 R (65 Ah)	L2-580 L (65 Ah)	L3-760 R (75 Ah)	L3-760 L (75 Ah)
Capacity V-AH	12-55		12-64	

Starter

Type			S13-327	S13-527B	S14-405B
			HITACHI make		
Applied model			TD27Ti	ZD30DDTi	
System voltage		V	12		
No-load	Terminal voltage	V	11.0		
	Current	A	Less than 160		
	Revolution	rpm	More than 4,000	More than 3,300	More than 3,400
Minimum diameter of commutator		mm (in)	35.5 (1.398)		35.5 (1.398)
Minimum length of brush		mm (in)	9.0 (0.354)	11.0 (0.433)	11.0 (0.433)
Brush spring tension		N (kg, lb)	—	28.4 - 34.3 (2.9 - 3.5, 6.4 - 7.7)	28.4 - 34.3 (2.9 - 3.5, 6.4 - 7.7)
Clearance between bearing metal and armature shaft		mm (in)	—	—	—
Clearance "ℓ" between pinion front edge and pinion stopper		mm (in)	—	—	—
Movement "ℓ" in height of pinion assembly		mm (in)	0.3 - 1.5 (0.012 - 0.059)	0.3 - 2.0 (0.012 - 0.079)	0.3 - 2.0 (0.012 - 0.079)

Alternator

Type		LR190-752	0 123 310 051
		HITACHI make	BOSCH make
Applied model		ZD30DDTi	TD27Ti
Nominal rating	V-A	12-90	12-70
Ground polarity		Negative	
Minimum revolutions under no-load (When 13.5V is applied)	rpm	Less than 1,000	Less than 1,000
Hot output current (When 13.5V is applied)	A/rpm	More than 23/1,300 More than 65/2,500 More than 87/5,000	More than 26/1,300 More than 58/2,500 More than 72/5,000
Regulated output voltage	V	14.1 - 14.7	
Minimum length of brush	mm (in)	More than 6.0 (0.237)	2 (0.08)
Brush spring pressure	N (g, oz)	1.00 - 3.43 (102 - 350, 3.60 - 12.34)	1.80 - 2.40 (184.6 - 244.8, 6.47 - 8.63)
Slip ring minimum diameter	mm (in)	More than 26.0 (1.024)	13.8 (0.543)
Rotor coil resistance at 20° (68°F)	Ω	2.67	2.47 - 2.73

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ELECTRICAL SYSTEM

SECTION EL

When you read wiring diagrams:
● Read GI section, “HOW TO READ WIRING DIAGRAMS”.

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CONTENTS (Cont'd)

WIRING DIAGRAM REFERENCE CHART

ENGINE CONTROL SYSTEM, IGNITION SYSTEM ..... EC SECTION
RESTRAINT SYSTEM (AIR BAG) ..... RS SECTION
HEATER AND AIR CONDITIONER ..... HA SECTION

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

The Supplemental Restraint System such as “AIR BAG” and “SEAT BELT PRE-TENSIONER” used along with a seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. The SRS system composition which is available to NISSAN MODEL R20 is as follows (The composition varies according to the destination and optional equipment.):

- For a frontal collision
  The Supplemental Restraint System consists of driver air bag module (located in the center of the steering wheel), front passenger air bag module (located on the instrument panel on passenger side), front seat belt pre-tensioners, a diagnosis sensor unit, warning lamp, wiring harness and spiral cable.
- For a side collision
  The Supplemental Restraint System consists of front side air bag module (located in the outer side of front seat), side air bag (satellite) sensor, diagnosis sensor unit (one of components of air bags for a frontal collision), wiring harness, warning lamp (one of components of air bags for a frontal collision).

Information necessary to service the system safely is included in the **RS section** of this Service Manual.

WARNING:

- **To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance should be performed by an authorized NISSAN dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see the RS 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 harness connector.**

Wiring Diagrams and Trouble Diagnoses

When you read wiring diagrams, refer to the following:

- GI section, “HOW TO READ WIRING DIAGRAMS”
- EL section, “POWER SUPPLY ROUTING” for power distribution circuit

When you perform trouble diagnoses, refer to the following:

- GI section, “HOW TO FOLLOW TEST GROUPS IN TROUBLE DIAGNOSES”
- GI section, “HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT”

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Description

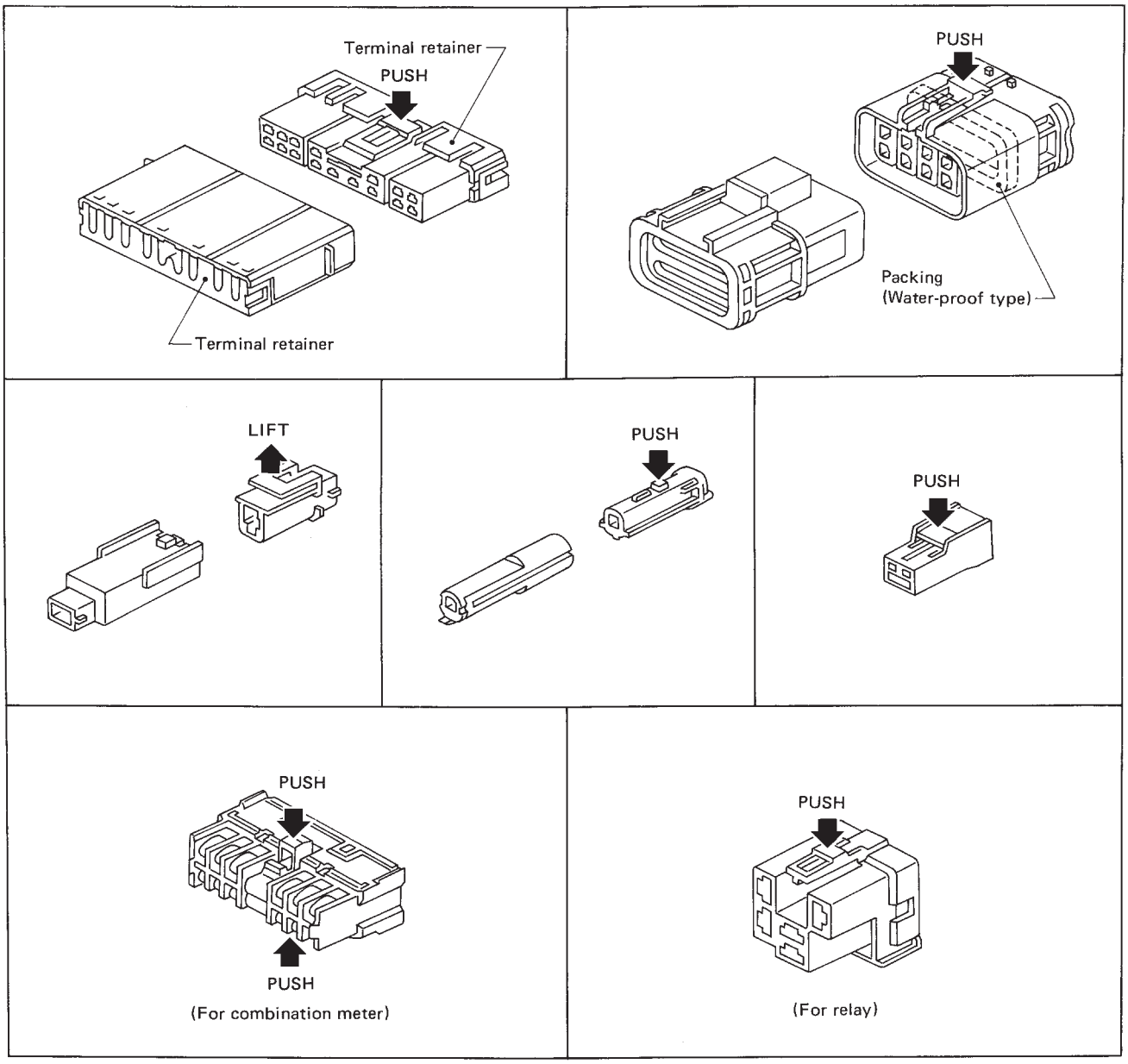
HARNESS CONNECTOR

- All harness connectors have been modified to prevent accidental looseness or disconnection.
- The connectors can be disconnected by pushing or lifting the locking section.

CAUTION:

Do not pull the harness when disconnecting the connector.

[Example]



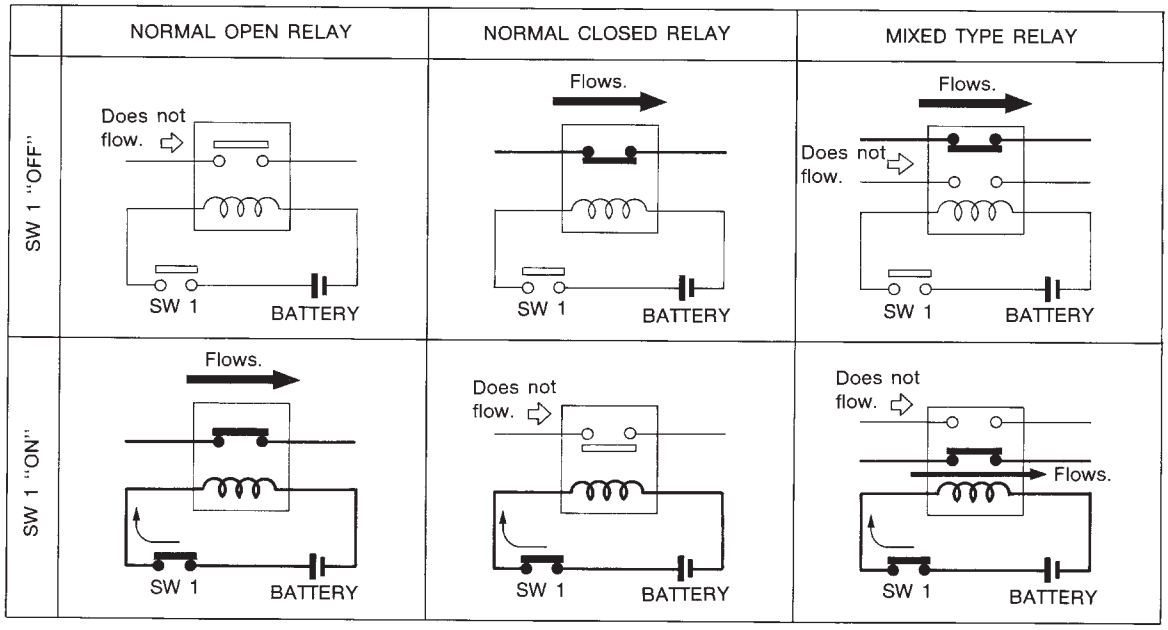
SEL769D

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Description

NORMAL OPEN, NORMAL CLOSED AND MIXED TYPE RELAYS

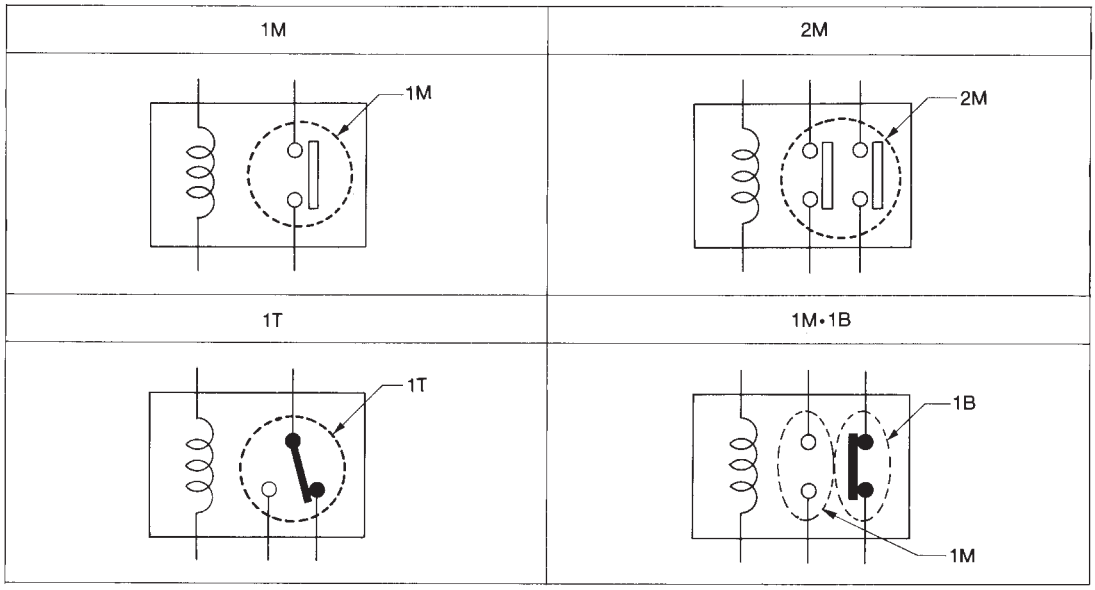
Relays can mainly be divided into three types: normal open, normal closed and mixed type relays.



SEL881H

TYPE OF STANDARDIZED RELAYS

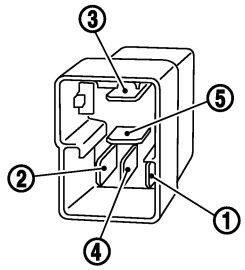
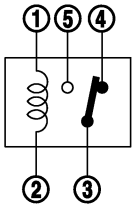
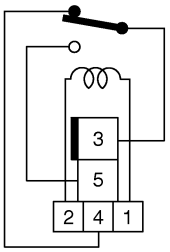
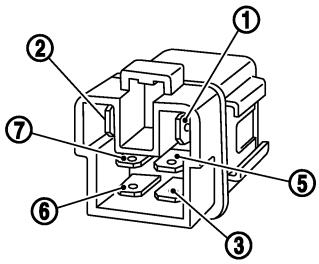
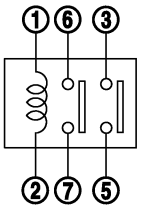
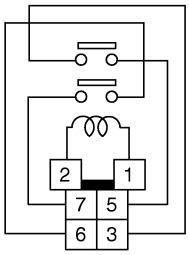
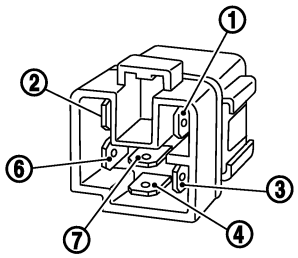
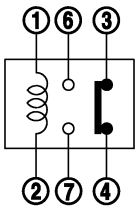
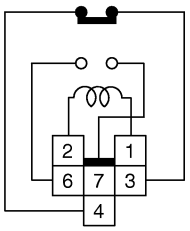
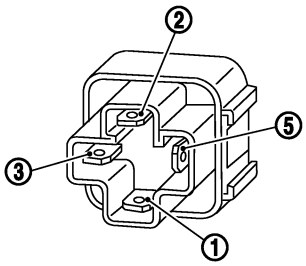
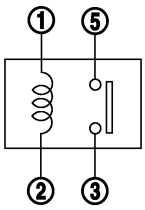
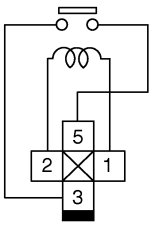
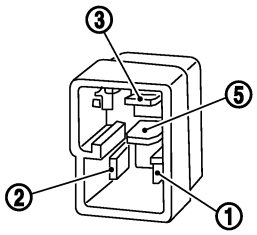
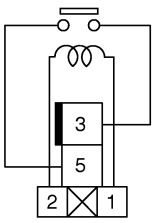
1M	..... 1 Make	2M	..... 2 Make
1T	..... 1 Transfer	1M·1B	..... 1 Make 1 Break



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Description (Cont'd)

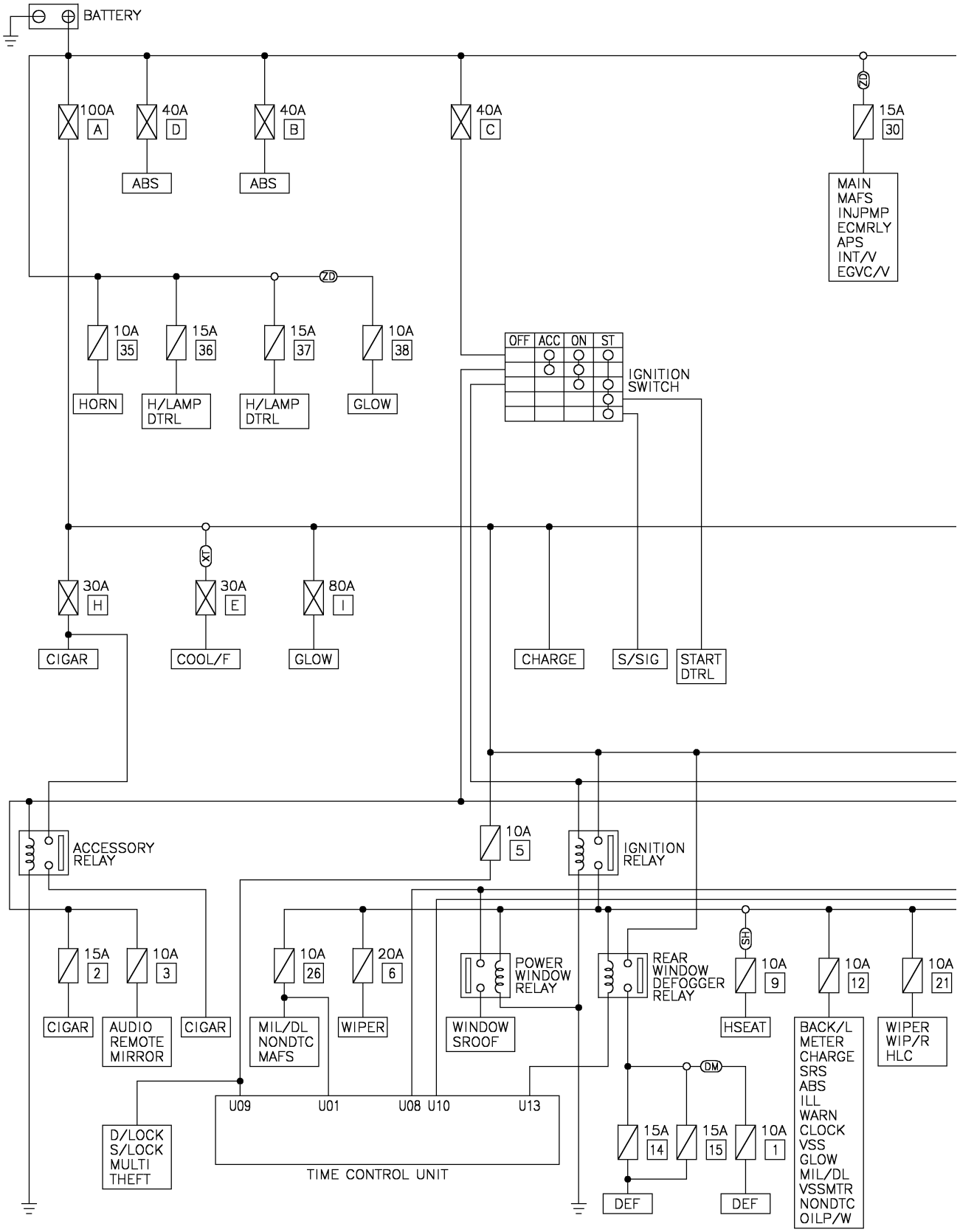
Type	Outer view	Circuit	Connector symbol and connector	Case color
1T				BLACK
2M				BROWN
1M•1B				GRAY
1M				BLUE
				

The arrangement of terminal numbers on the actual relays may differ from those shown above.

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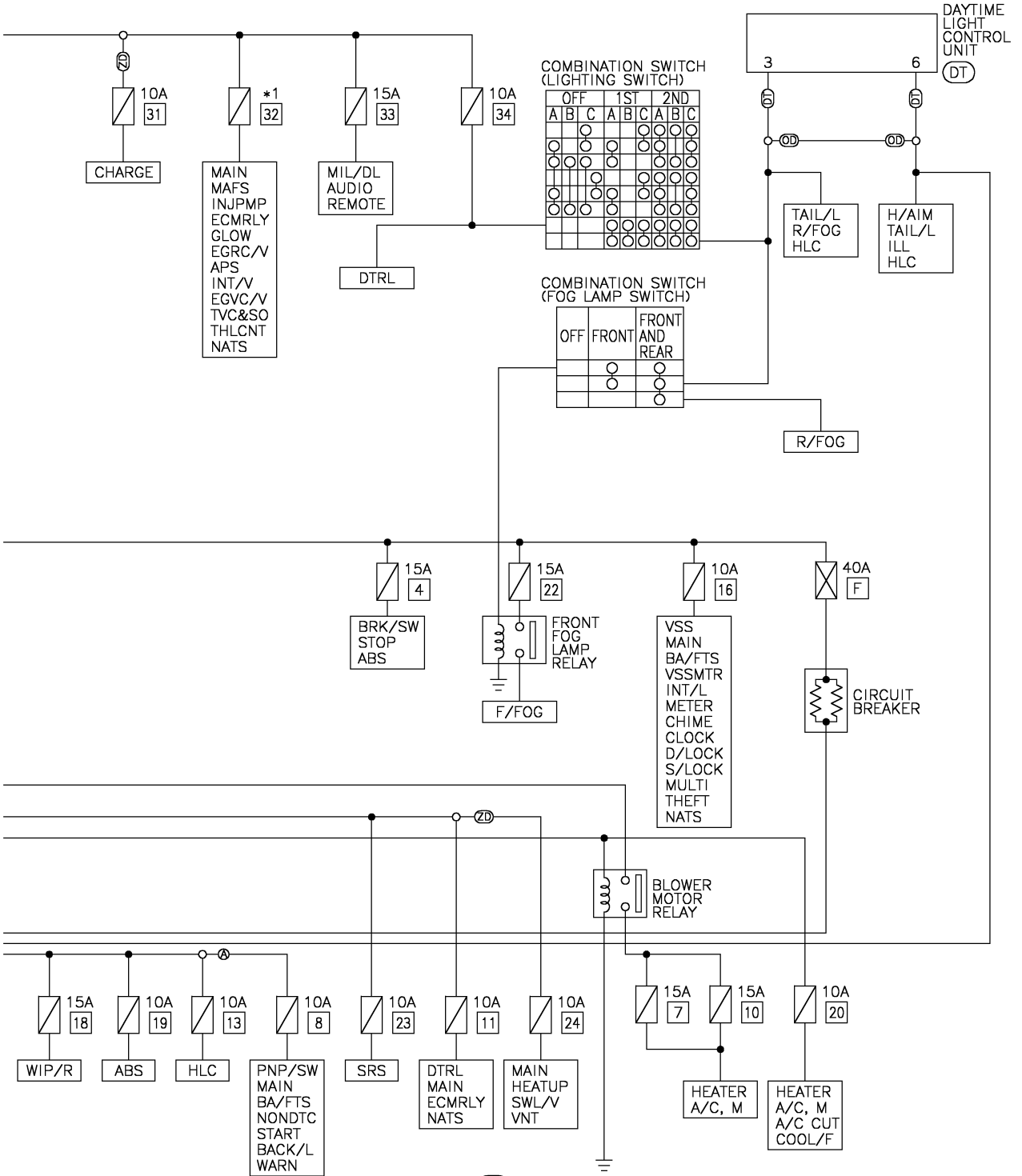
Schematic



YEL833E

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Schematic (Cont'd)

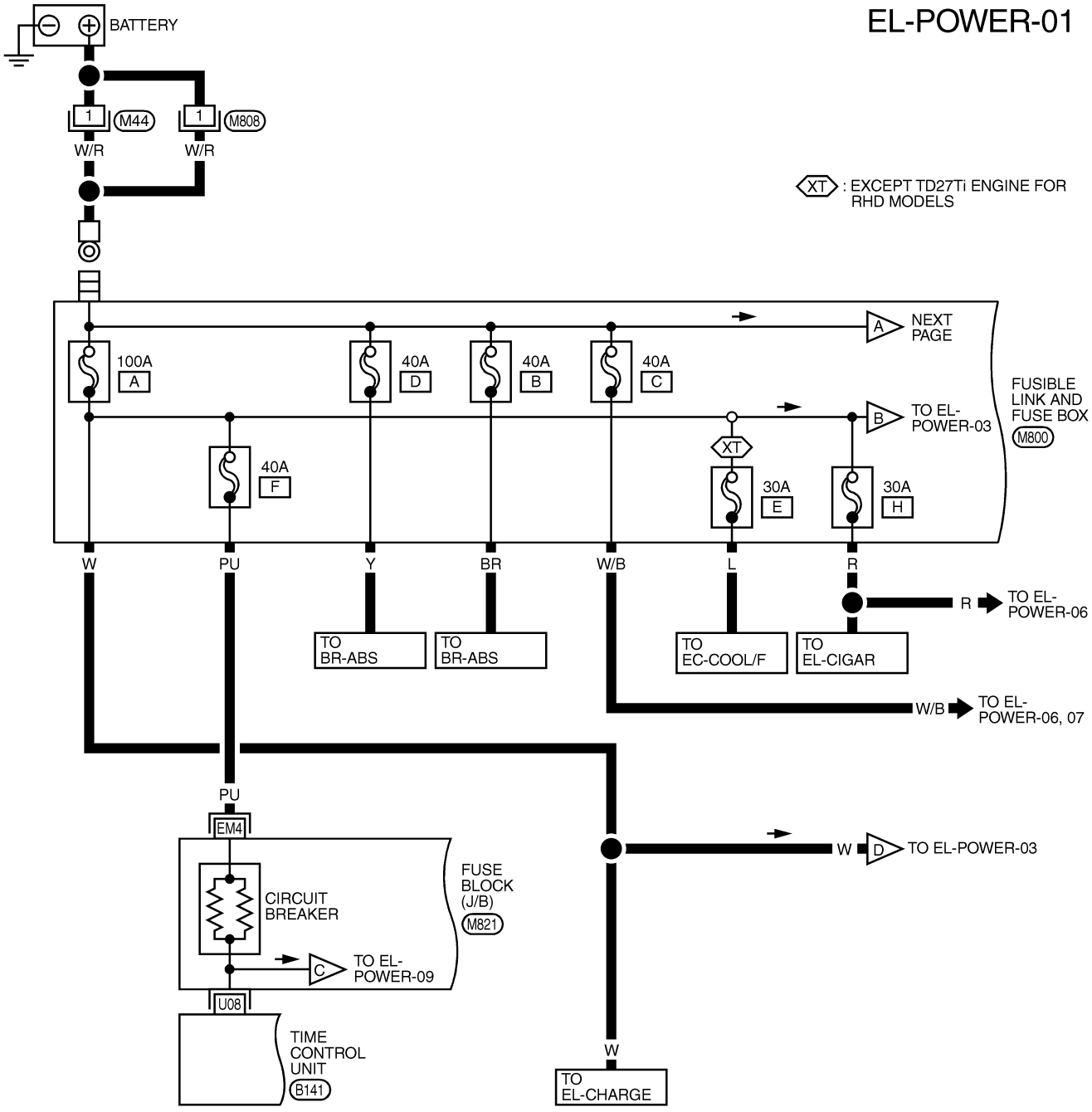


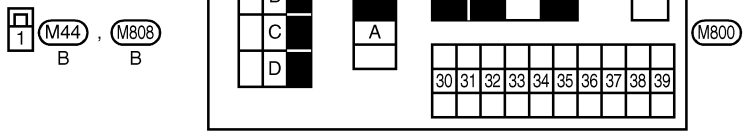
YEL834E

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Wiring Diagram — POWER —

EL-POWER-01







∗ : THIS CONNECTOR IS NOT SHOWN IN "HARNESS LAYOUT", EL SECTION.

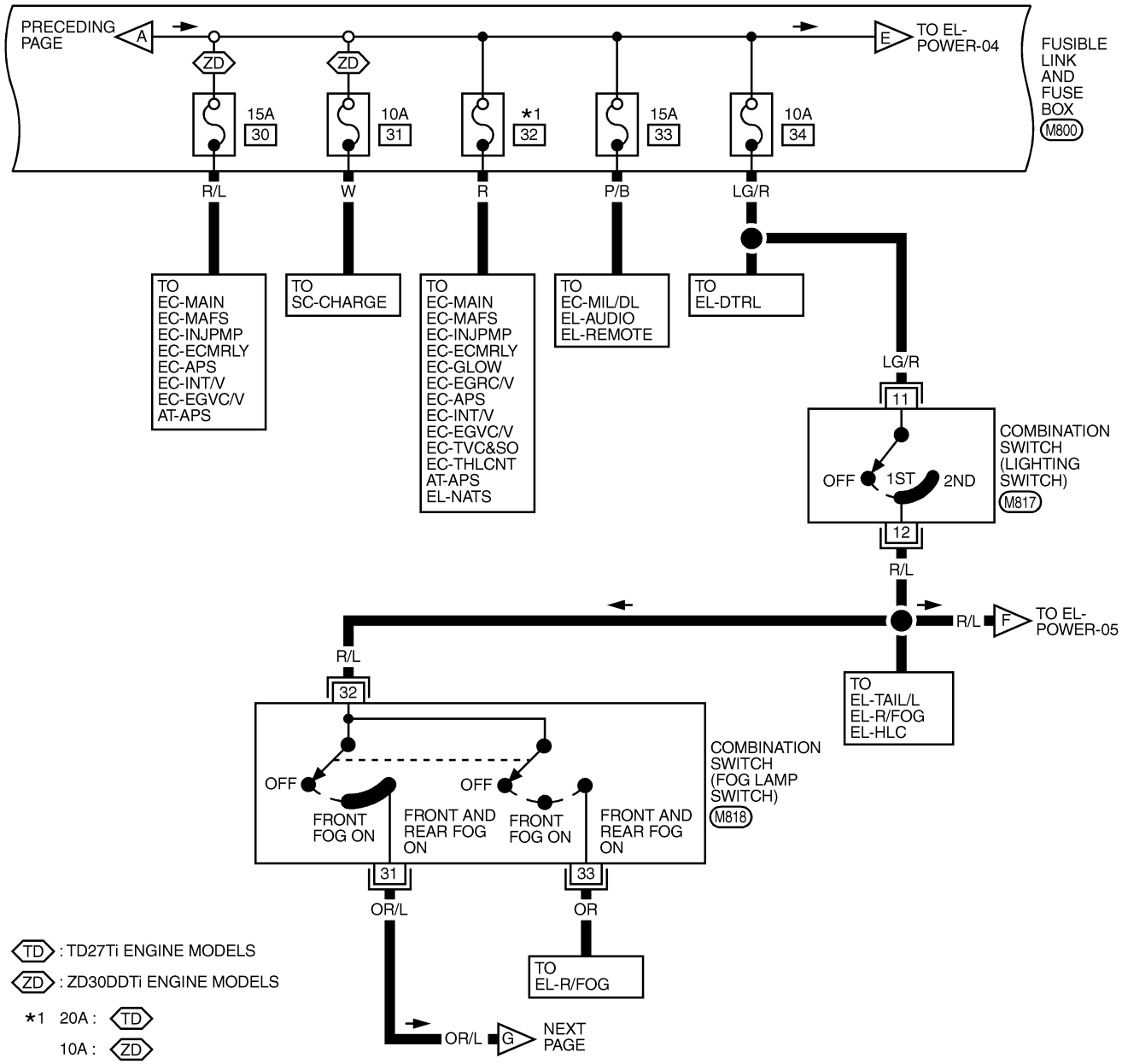
REFER TO THE FOLLOWING.
M821 -FUSE BLOCK- JUNCTION BOX (J/B)

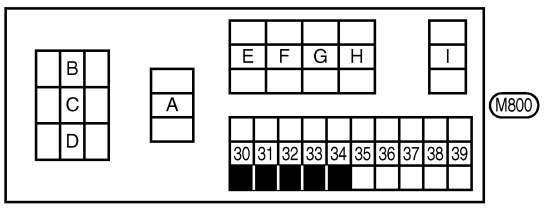
YEL201D

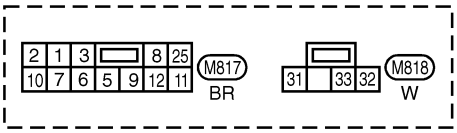
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Wiring Diagram — POWER — (Cont'd)

EL-POWER-02





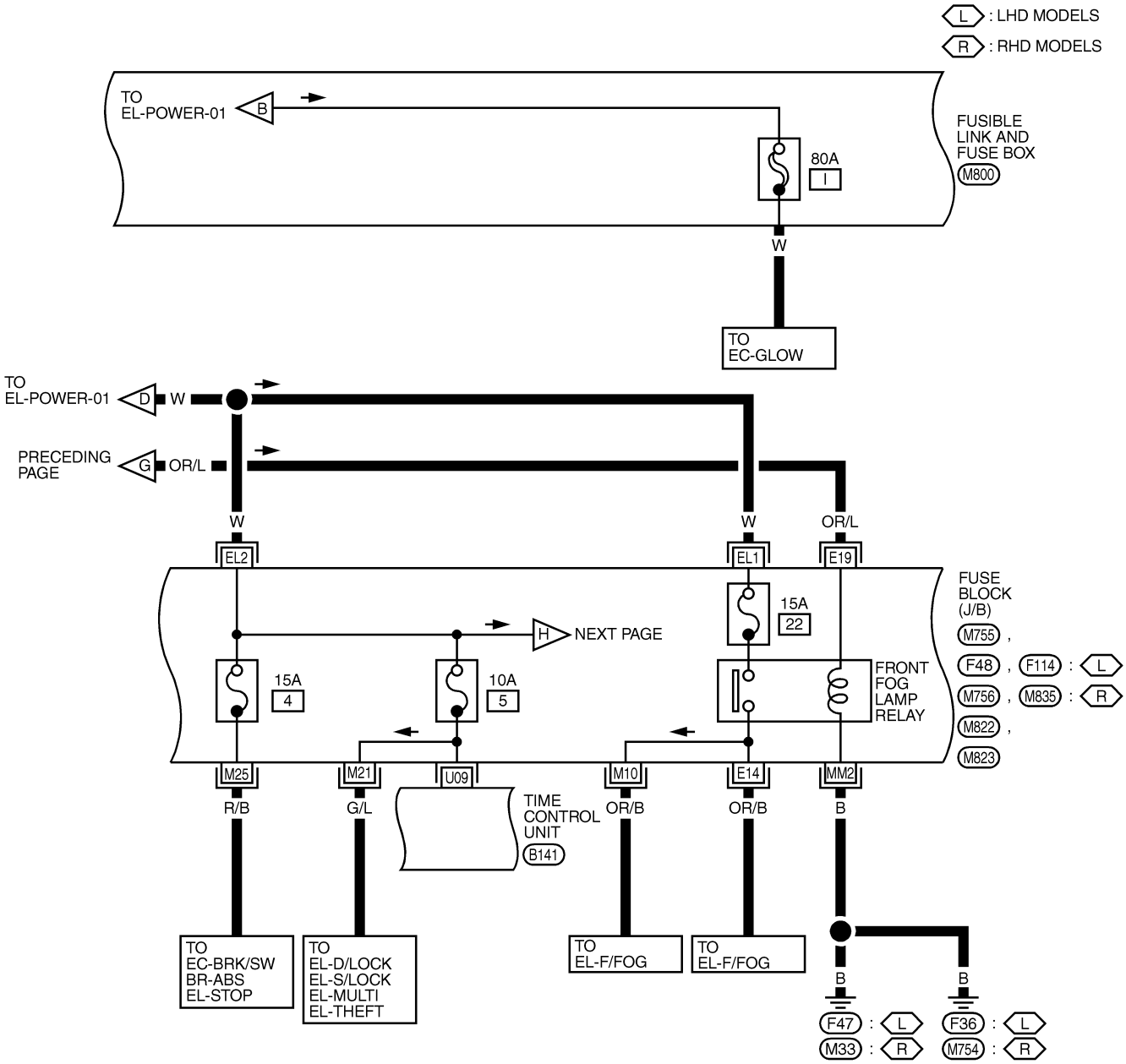


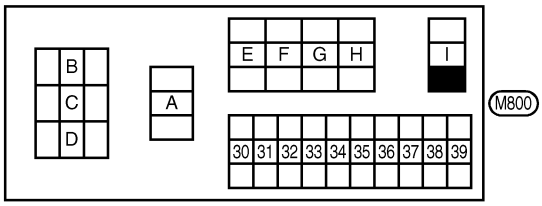
YEL849E

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Wiring Diagram — POWER — (Cont'd)

EL-POWER-03







* : THIS CONNECTOR IS NOT SHOWN IN "HARNESS LAYOUT", EL SECTION.

REFER TO THE FOLLOWING.

M755 , M756 , M822 , M823 , M835 , F48 , F114

-FUSE BLOCK-
JUNCTION BOX (J/B)

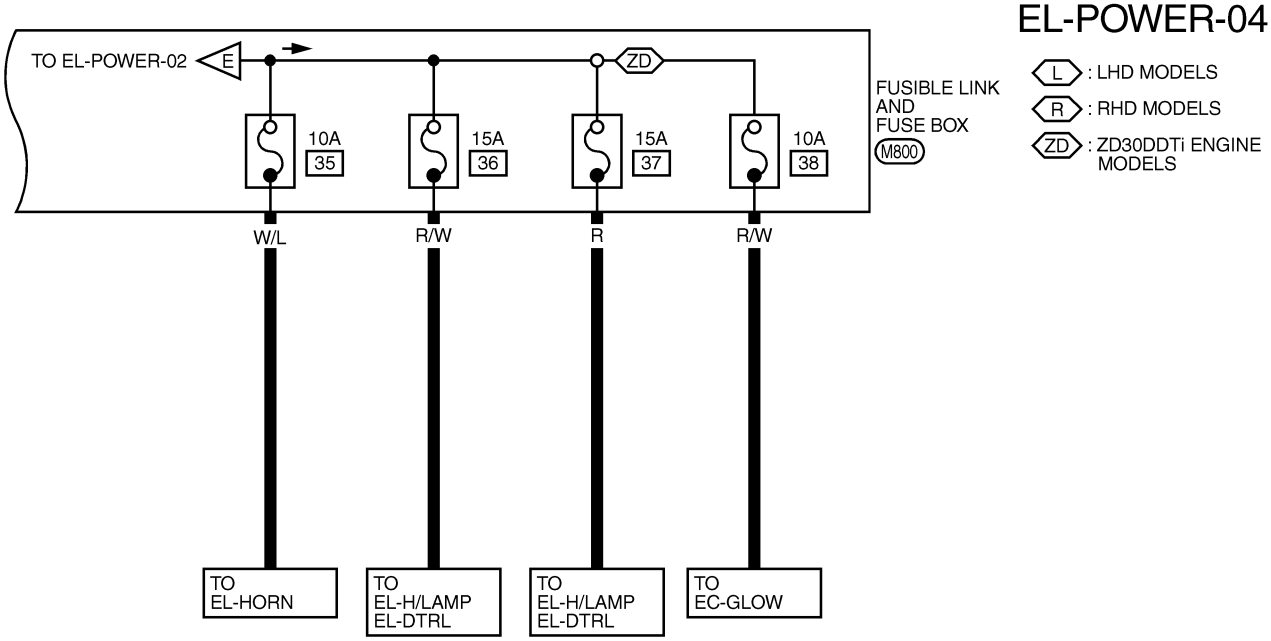
1	2	3	4	5	6	7	8	9	10	11	12	13
14	15	16		18	19	20	21	22	23	24		26

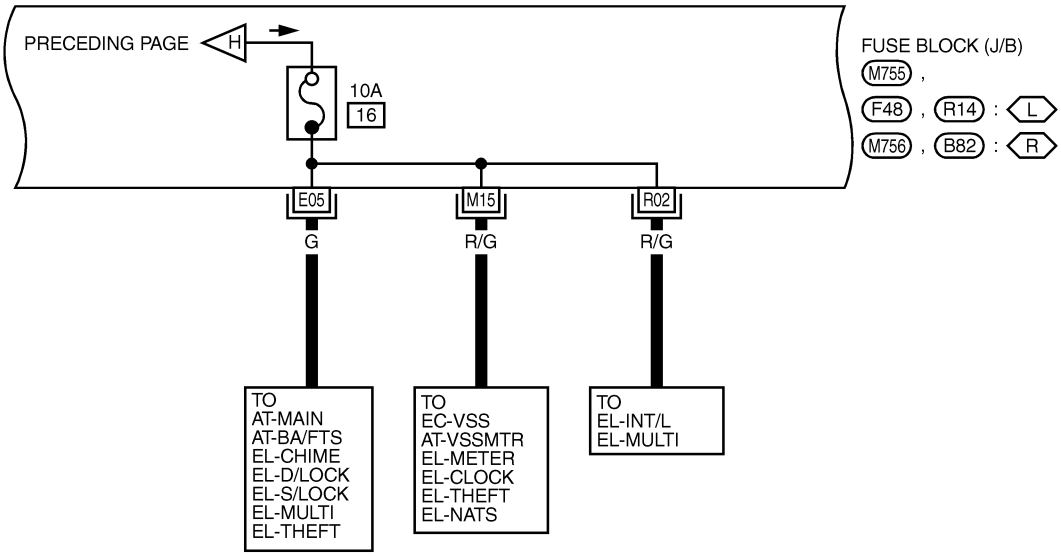
YEL203D

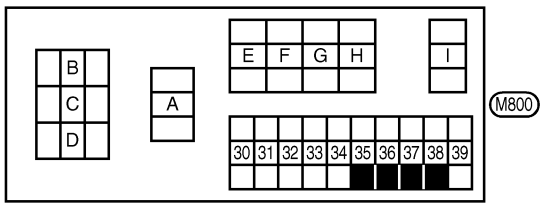
http://vnx.su/

Wiring Diagram — POWER — (Cont'd)

EL-POWER-04







REFER TO THE FOLLOWING.

M755 , M756 , F48 , B82 ,
R14 -FUSE BLOCK-
JUNCTION BOX (J/B)

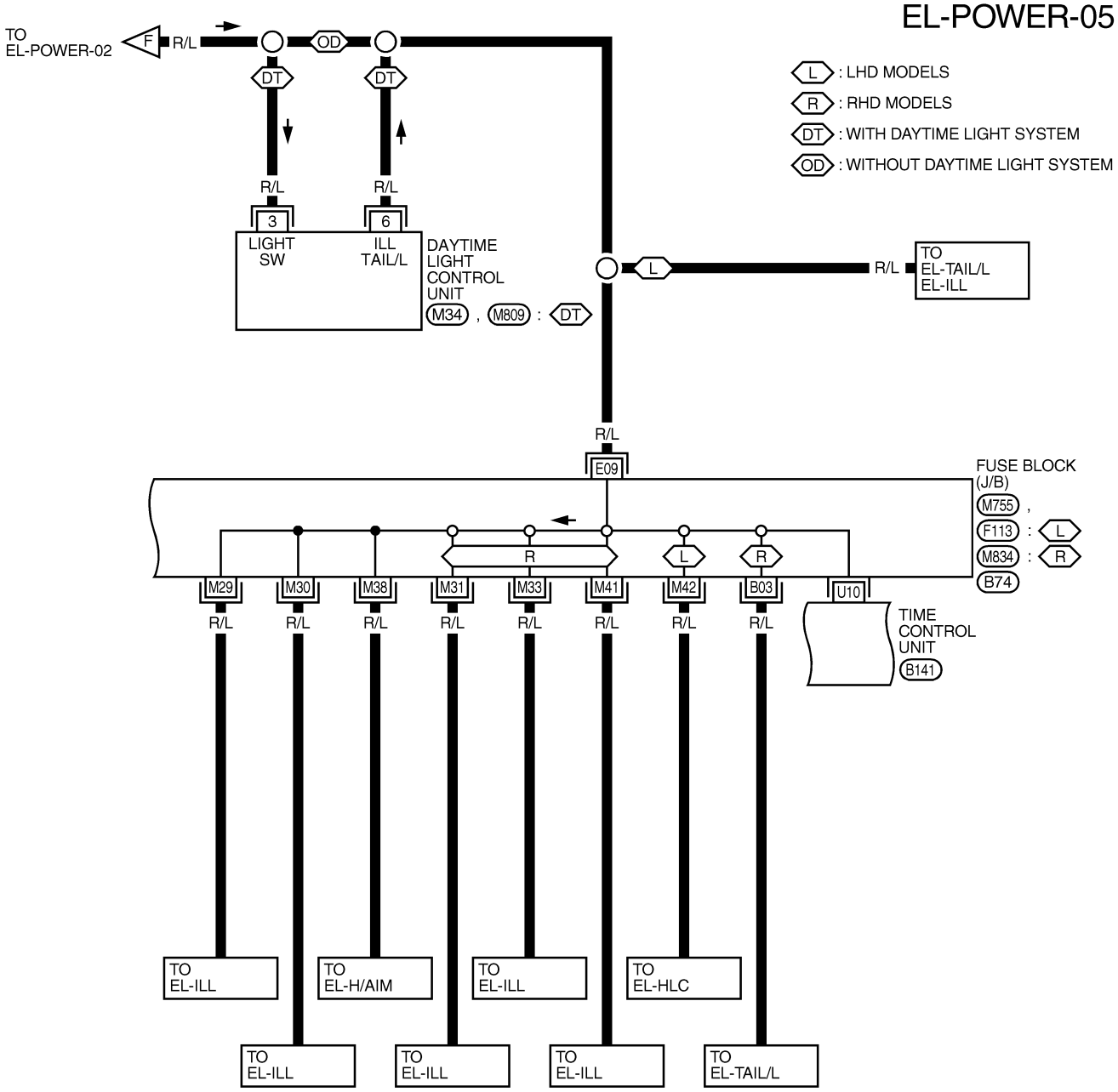
1	2	3	4	5	6	7	8	9	10	11	12	13
14	15	16		18	19	20	21	22	23	24		26

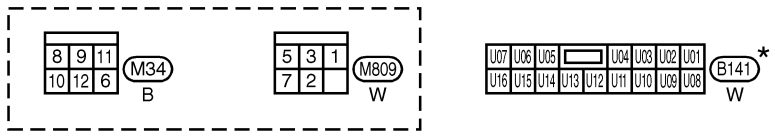
YEL204D

http://vnx.su/

Wiring Diagram — POWER — (Cont'd)

EL-POWER-05





*: THIS CONNECTOR IS NOT SHOWN IN "HARNESS LAYOUT", EL SECTION.

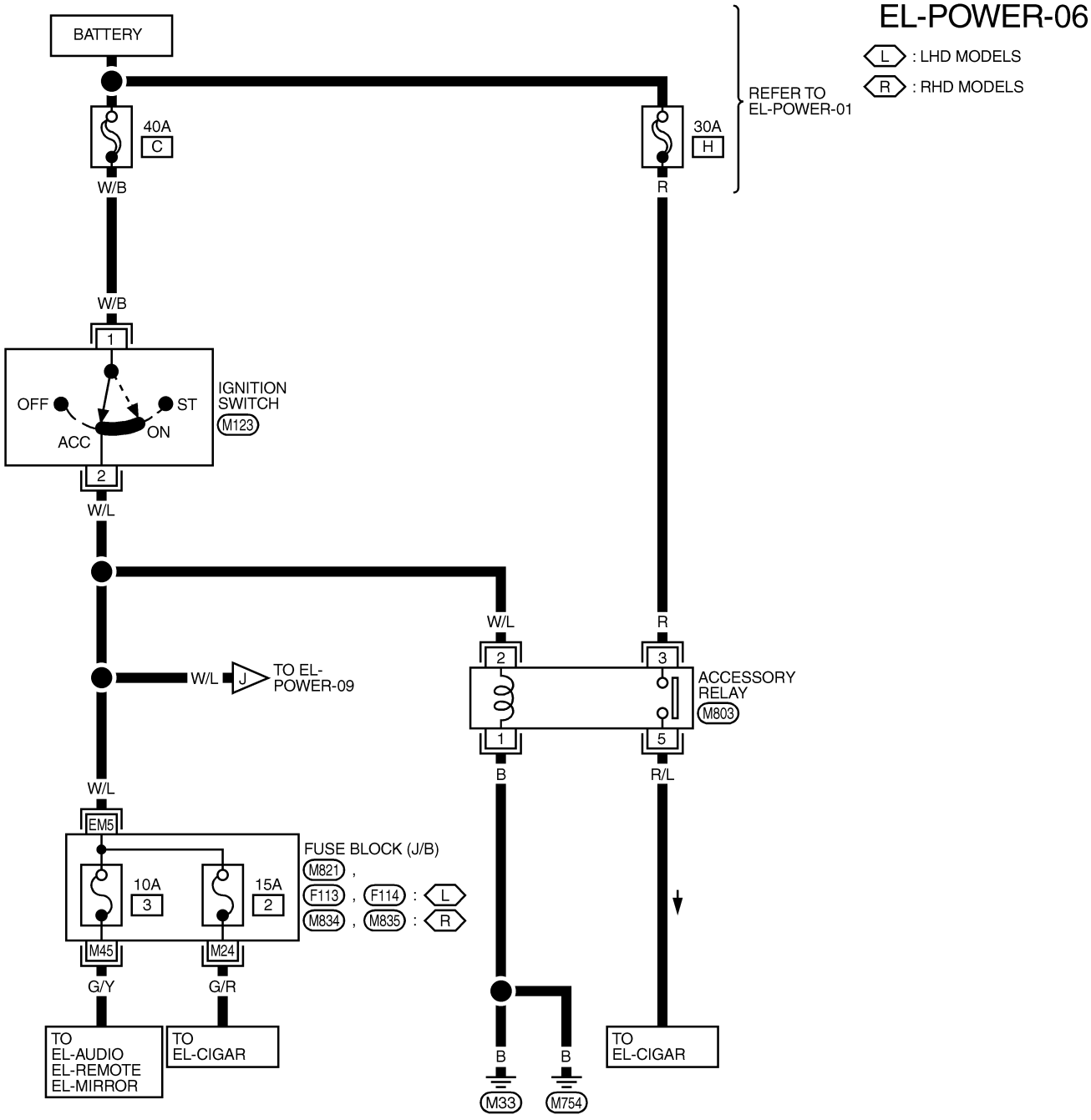
REFER TO THE FOLLOWING.
M755 , M834 , F113 , B74
-FUSE BLOCK-
JUNCTION BOX (J/B)

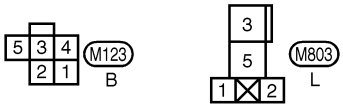
YEL835E

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Wiring Diagram — POWER — (Cont'd)

EL-POWER-06





REFER TO THE FOLLOWING.

M821 , M834 , M835 , F113 ,
F114 -FUSE BLOCK-
JUNCTION BOX (J/B)

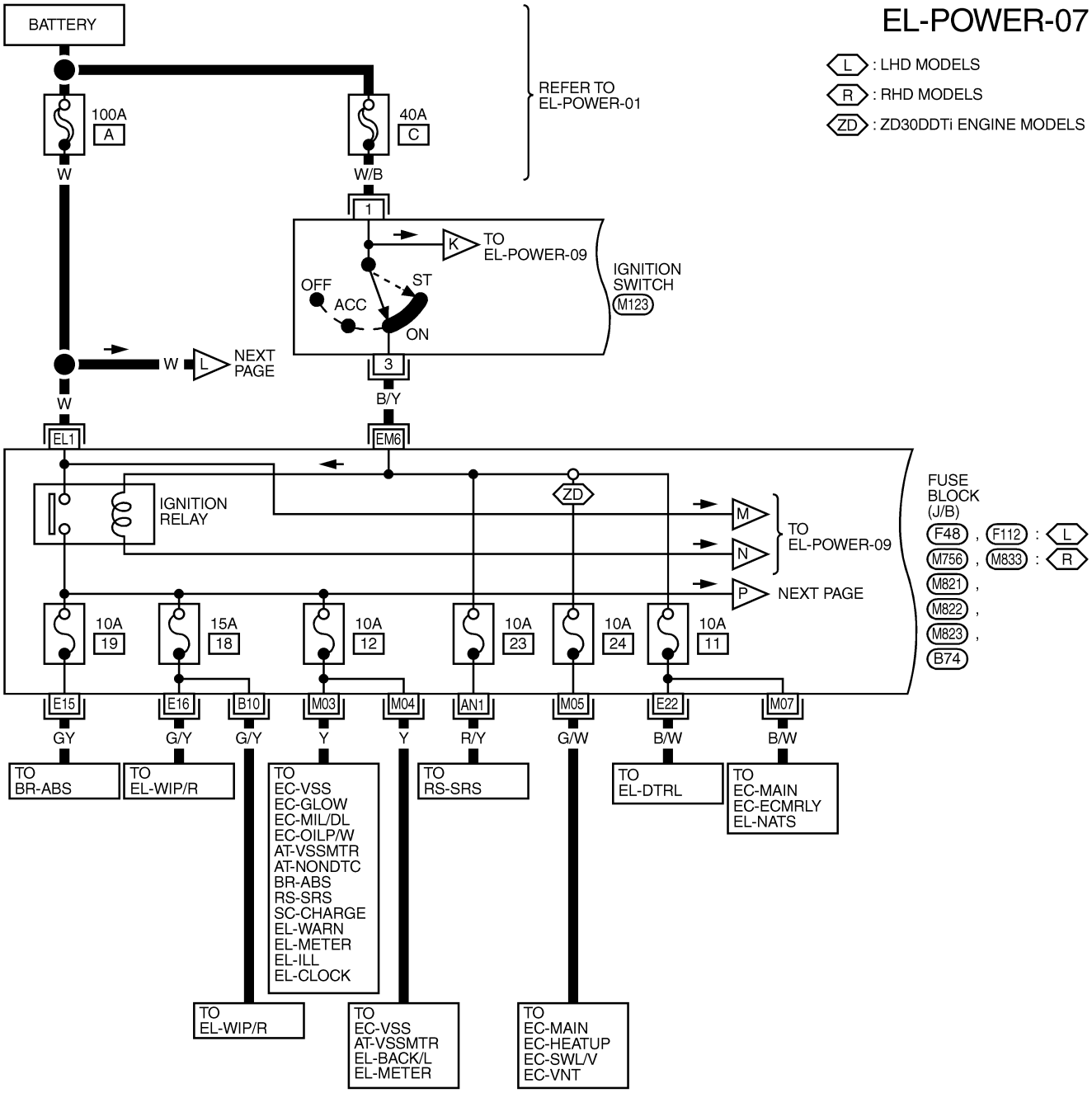
1	2	3	4	5	6	7	8	9	10	11	12	13
14	15	16		18	19	20	21	22	23	24		26

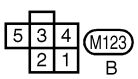
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Wiring Diagram — POWER — (Cont'd)

EL-POWER-07





REFER TO THE FOLLOWING.

M756 , M821 , M822 , M823 , M833 , F48 , F112 , B74

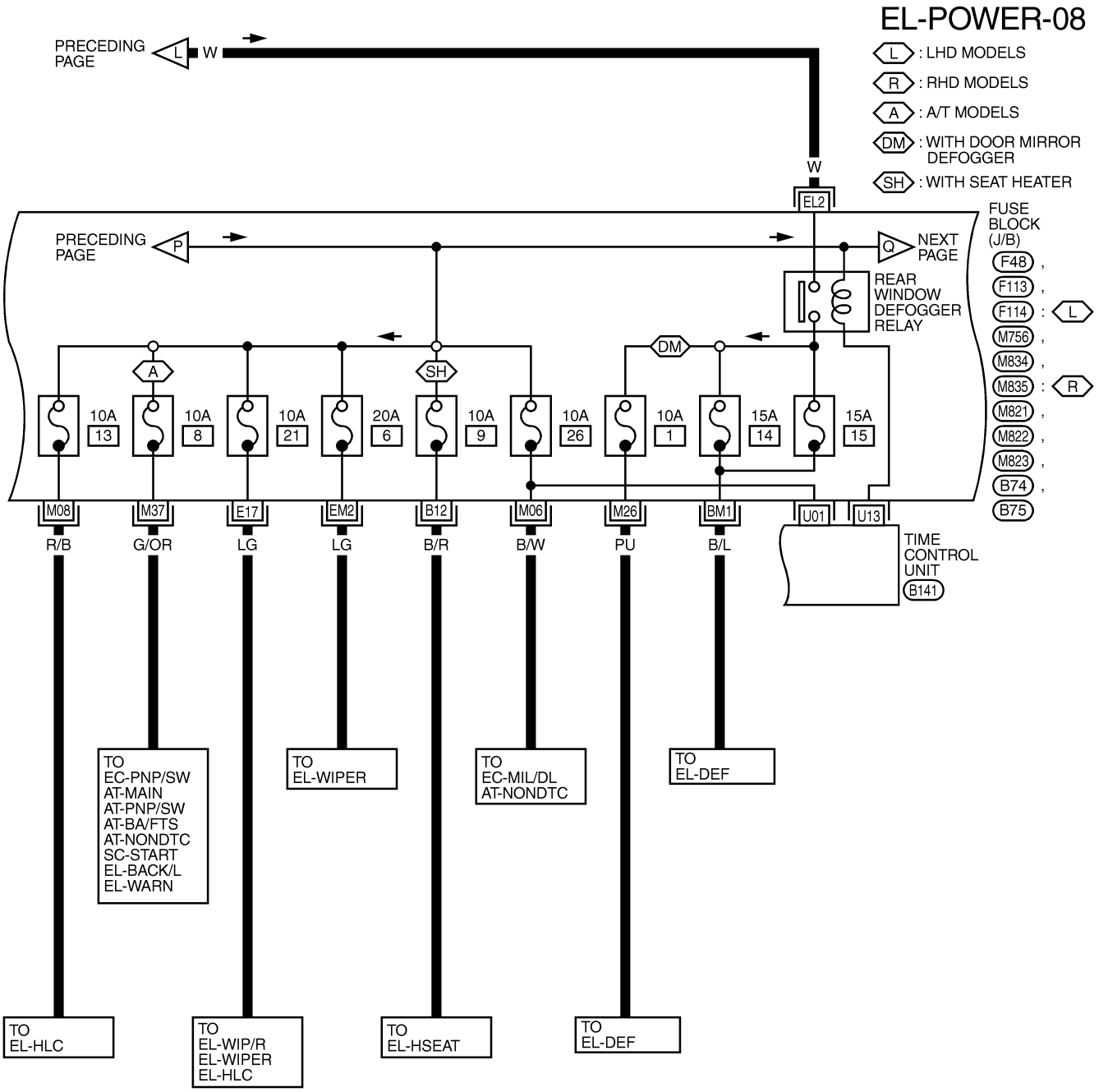
-FUSE BLOCK- JUNCTION BOX (J/B)

1	2	3	4	5	6	7	8	9	10	11	12	13
14	15	16		18	19	20	21	22	23	24		26

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Wiring Diagram — POWER — (Cont'd)





* : THIS CONNECTOR IS NOT SHOWN IN "HARNESS LAYOUT", EL SECTION.

REFER TO THE FOLLOWING.

M756 , M821 , M822 , M823 , M834 , M835 , F48 , F113 , F114 , B74 , B75

-FUSE BLOCK- JUNCTION BOX (J/B)

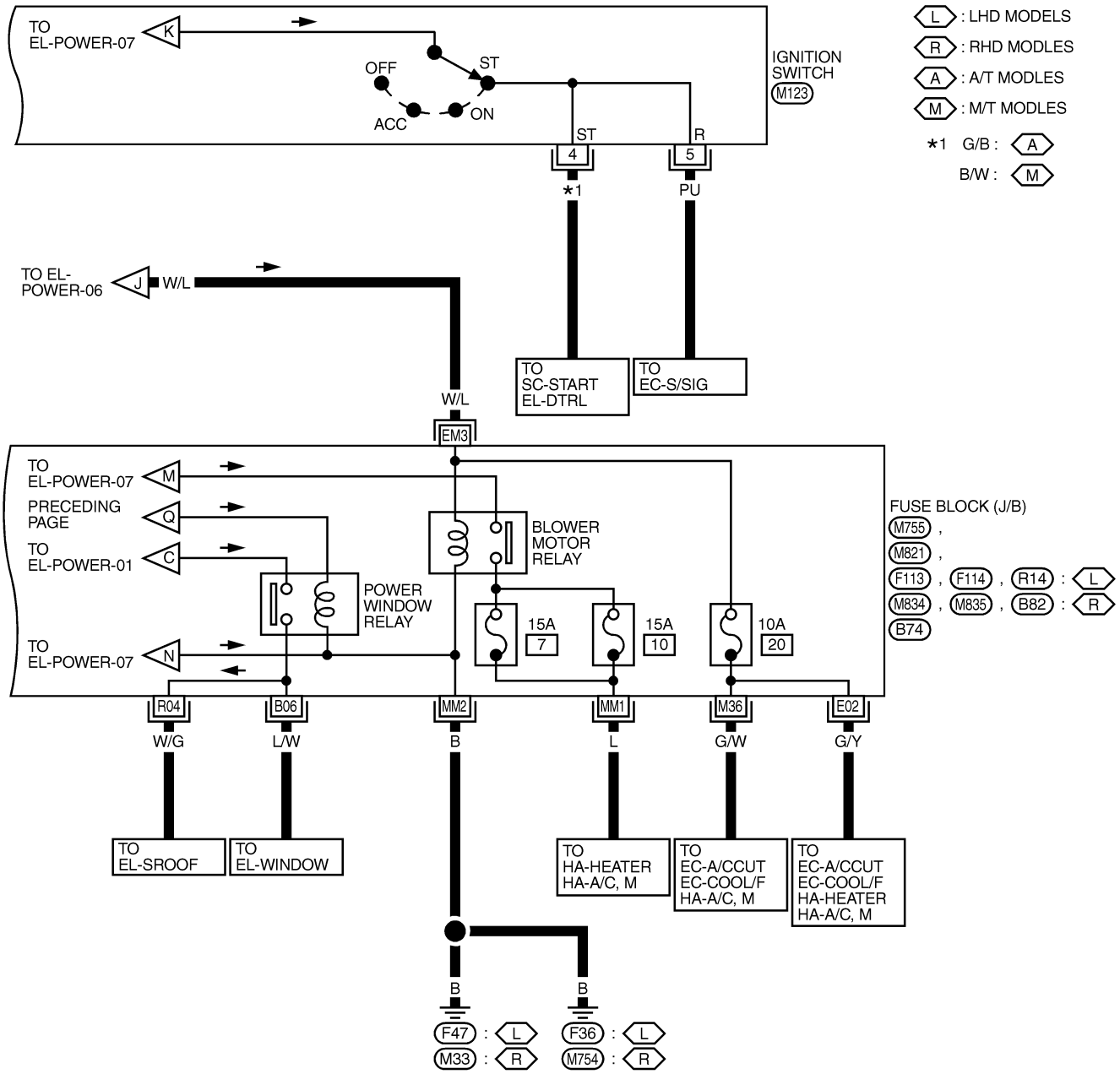
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14	15	16		18	19	20	21	22	23	24		26

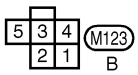
YEL838E

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Wiring Diagram — POWER — (Cont'd)

EL-POWER-09





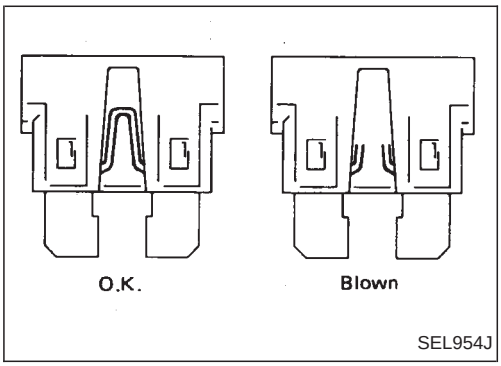
REFER TO THE FOLLOWING.

M755 , M821 , M834 , M835 ,
F113 , F114 , B74 , B82 ,
R14 -FUSE BLOCK- JUNCTION BOX (J/B)

1	2	3	4	5	6	7	8	9	10	11	12	13
14	15	16		18	19	20	21	22	23	24		26

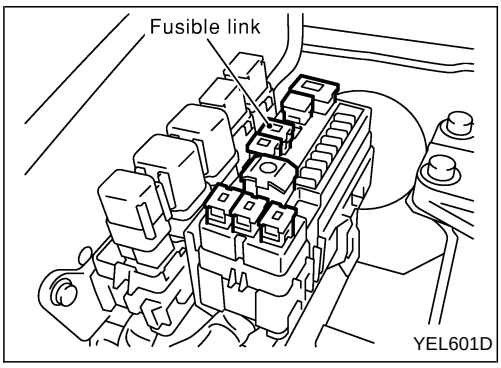
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Fuse

a. If fuse is blown, be sure to eliminate cause of problem before installing new fuse.
b. Use fuse of specified rating. Never use fuse of more than specified rating.
c. Do not install fuse in oblique direction; always insert it into fuse holder properly.
d. Remove fuse for clock if vehicle is not used for a long period of time.

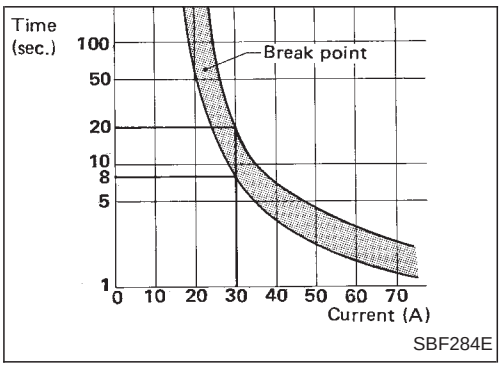


Fusible Link

A melted fusible link can be detected by visual inspection. If its condition is questionable, use circuit tester or test lamp.

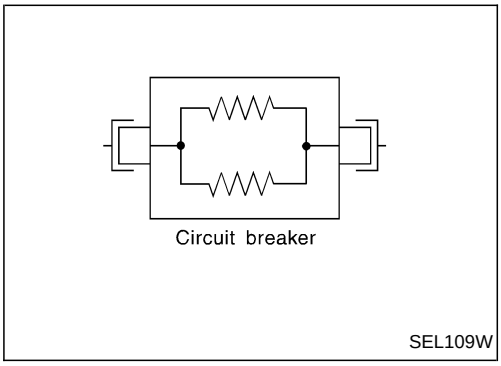
CAUTION:

- **If fusible link should melt, it is possible that critical circuit (power supply or large current carrying circuit) is shorted. In such a case, carefully check and eliminate cause of problem.**
- **Never wrap periphery of fusible link with vinyl tape. Extreme care should be taken with this link to ensure that it does not come into contact with any other wiring harness or vinyl or rubber parts.**



Circuit Breaker Inspection

For example, when current is 30A, the circuit is broken within 8 to 20 seconds.



CIRCUIT BREAKER (PTC THERMISTOR TYPE)

The PTC thermistor generates heat in response to current flow. The temperature (and resistance) of the thermistor element varies with current flow. Excessive current flow will cause the element's temperature to rise. When the temperature reaches a specified level, the electrical resistance will rise sharply to control the circuit current.

Reduced current flow will cause the element to cool. Resistance falls accordingly and normal circuit current flow is allowed to resume.

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EFC HARNESS LHD MODELS

GROUND	CONNECT TO	CONN. NO.	CELL CODE
F129/F128	4WD SWITCH (TD27Ti)	E150	EL-WARN
	BRAKE SWITCH	F101	EC-BRK/SW
	DATA LINK CONNECTOR	F115	EC-MIL/DL
	ECM	F134	EC-MAIN, EC-VSS, EC-BRK/SW, EC-MIL/DL
	NATS IMMU (TD27Ti)	F58	EL-NATS
	VEHICLE SPEED SENSOR	E140	EC-VSS, EL-METER
F47/F36	AIR BAG DIAGNOSIS SENSOR UNIT	B106	RS-SRS
	BRAKE FLUID LEVEL SWITCH	F3	EL-WARN
	COMBINATION METER	F118	EC-VSS, AT-VSSMTR, EL-H/LAMP, EL-DTRL, EL-F/FOG, EL-R/FOG, EL-ILL, EL-TURN, EL-METER, EL-WARN, EL-CLOCK, BR-ABS, RS-SRS
	COOLING FAN MOTOR	F40	EC-COOL/F
	DATA LINK CONNECTOR	F115	EC-MIL/DL, AT-NONDTC
	FRONT FOG LAMP LH	F44	EL-F/FOG
	FRONT TURN SIGNAL LAMP LH	F37	EL-TURN, EL-THEFT
	FUSE BLOCK (J/B)	F114	EL-F/FOG, EL-INT/L, EL-TURN, EL-CHIME, EL-DEF, EL-SROOF, EL-WINDOW, EL-D/LOCK, EL-S/LOCK, EL-MULTI, EL-THEFT, HA-A/C, M, HA-HEATER
	HAZARD SWITCH (TYPE 1)	F140	EL-TURN, EL-ILL
	HAZARD SWITCH (TYPE 2)	F152	EL-TURN, EL-ILL
	HEADLAMP AIMING MOTOR LH	F43	EL-H/AIM
	HEADLAMP CLEANER MOTOR	F103	EL-HLC
	HEADLAMP LH	F42	EL-H/LAMP, EL-DTRL
	PARKING LAMP LH	F41	EL-TAIL/L
	SIDE TURN SIGNAL LAMP LH	F104	EL-TURN, EL-THEFT
F53	AUDIO UNIT (TYPE 1)	F139	EL-ILL, EL-AUDIO
	AUDIO UNIT (TYPE 2)	F153	EL-ILL, EL-AUDIO, EL-REMOTE
	CD AUDIO CHANGER	F155	EL-AUDIO
F2	ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT)	F29	BR-ABS

EFC HARNESS RHD MODELS

GROUND	CONNECT TO	CONN. NO.	CELL CODE
F47/F36	FRONT FOG LAMP LH	F44	EL-F/FOG
	FRONT TURN SIGNAL LAMP LH	F37	EL-TURN, EL-THEFT
	HEADLAMP AIMING MOTOR LH	F43	EL-H/AIM
	HEADLAMP CLEANER MOTOR	F103	EL-HLC
	HEADLAMP LH	F42	EL-H/LAMP
	PARKING LAMP LH	F41	EL-TAIL/L
	SIDE TURN SIGNAL LAMP LH	F104	EL-TURN, EL-THEFT
	FUEL FILTER SWITCH	F141	EL-WARN
F2	ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT)	F29	BR-ABS

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MAIN HARNESS LHD MODELS

GROUND	CONNECT TO	CONN. NO.	CELL CODE
M754/M33	A/C CONTROL PANEL (FAN SWITCH)	M770	EC-A/CCUT, HA-A/C, M, HA-HEATER
	A/C CONTROL PANEL	M771	EL-ILL, EL-DEF, HA-A/C, M, HA-HEATER
	A/T MODE SWITCH	M732	AT-NONDTC
	ACCESSORY RELAY	M803	EL-CIGAR
	ASHTRAY ILLUMINATION	M137	EL-ILL
	CIGARETTE LIGHTER SOCKET	M141	EL-CIGAR
	COMBINATION SWITCH (TURN SIGNAL SWITCH)	M817	EL-TURN
	COMBINATION SWITCH (WIPER AND WASHER SWITCH)	M816	EL-WIPER, EL-WIP/R, EL-HLC
	COOLING FAN MOTOR	M19	EC-COOL/F
	DAYTIME LIGHT CONTROL UNIT	M34	EL-DTRL
	FRONT FOG LAMP RH	M38	EL-F/FOG
	FRONT WIPER MOTOR	M27	EL-WIPER
	FRONT TURN SIGNAL LAMP RH	M39	EL-TURN, EL-THEFT
	FUEL FILTER SWITCH	M26	EC-MIL/DL, EL-WARN
	GLOVE BOX LAMP SWITCH	M143	EL-ILL
	HEADLAMP AIMING MOTOR RH	M41	EL-H/AIM
	HEADLAMP RH	M42	EL-H/LAMP, EL-DTRL
	HOOD SWITCH	M84	EL-THEFT
	PARK/NEUTRAL POSITION RELAY	M729	EC-PNP/SW, SC-START
	PARKING LAMP RH	M43	EL-TAIL/L
	REAR FOG LAMP RELAY	M820	EL-R/FOG
	SIDE TURN SIGNAL LAMP RH	M801	EL-TURN, EL-THEFT

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MAIN HARNESS RHD MODELS

GROUND	CONNECT TO	CONN. NO.	CELL CODE
M846/M845	4WD SWITCH (TD27Ti)	E150	EL-WARN
	BRAKE SWITCH	M750	EC-BRK/SW
	DATA LINK CONNECTOR	M832	EC-MIL/DL
	DONGLE CONTROL UNIT (TD27Ti)	M720	EL-AUDIO, EL-NATS
	ECM	M852	EC-MAIN, EC-VSS, EC-BRK/SW, EC-MIL/DL
	NATS IMMU (TD27Ti)	M831	EL-NATS
	VEHICLE SPEED SENSOR	E140	EC-VSS, EL-METER
M754/M33	A/C CONTROL PANEL (FAN SWITCH)	M770	EC-A/CCUT, HA-A/C, M, HA-HEATER
	A/C CONTROL PANEL	M771	EL-ILL, EL-DEF, HA-A/C, M, HA-HEATER
	A/T MODE SWITCH	M732	AT-NONDTC
	ACCESSORY RELAY	M803	EL-CIGAR
	AIR BAG DIAGNOSIS SENSOR UNIT	B106	RS-SRS
	ASHTRAY ILLUMINATION	M137	EL-ILL
	BRAKE FLUID LEVEL SWITCH	M507	EL-WARN
	CIGARETTE LIGHTER SOCKET	M141	EL-CIGAR
	COMBINATION METER	M837	EC-VSS, AT-VSSMTR, EL-H/LAMP, EL-F/FOG, EL-R/FOG, EL-ILL, EL-TURN, EL-METER, EL-WARN, EL-CLOCK, BR-ABS, RS-SRS
	COMBINATION SWITCH (TURN SIGNAL SWITCH)	M817	EL-TURN
	COMBINATION SWITCH (WIPER AND WASHER SWITCH)	M816	EL-WIPER, EL-WIP/R, EL-HLC
	COOLING FAN MOTOR	M19	EC-COOL/F
	DATA LINK CONNECTOR	M832	EC-MIL/DL, AT-NONDTC
	FRONT FOG LAMP RH	M38	EL-F/FOG
	FRONT TURN SIGNAL LAMP RH	M39	EL-TURN, EL-THEFT
	FRONT WIPER MOTOR	M502	EL-WIPER
	FUSE BLOCK (J/B)	M835	EL-F/FOG, EL-INT/L, EL-TURN, EL-CHIME, EL-DEF, EL-SROOF, EL-WINDOW, EL-S/LOCK, EL-MULTI, EL-THEFT, HA-A/C, M, HA-A/C, M, HA-HEATER
	GLOVE BOX LAMP SWITCH	M143	EL-ILL
	HAZARD SWITCH (TYPE 1)	M855	EL-TURN
	HAZARD SWITCH (TYPE 2)	M873	EL-TURN
	HEADLAMP AIMING MOTOR RH	M41	EL-H/AIM
	HEADLAMP RH	M42	EL-H/LAMP
	HOOD SWITCH	M84	EL-THEFT
	PARK/NEUTRAL POSITION RELAY	M729	EC-PNP/SW, SC-START
	PARKING LAMP RH	M43	EL-TAIL/L
	REAR FOG LAMP RELAY	M820	EL-R/FOG
	SIDE TURN SIGNAL LAMP RH	M801	EL-TURN, EL-THEFT
	ULTRASONIC CANCEL SWITCH	M117	EL-THEFT
M761	AUDIO UNIT (TYPE 1)	M854	EL-ILL, EL-AUDIO
	AUDIO UNIT (TYPE 2)	M874	EL-ILL, EL-AUDIO, EL-REMOTE
	CD AUTO CHANGER	M876	EL-AUDIO

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ENGINE ROOM HARNESS LHD MODELS

GROUND	CONNECT TO	CONN. NO.	CELL CODE
E222/E224	4WD SWITCH (ZD30DDTi)	E212	EL-WARN
	ACCELERATOR SWITCH	F94	EC-AAC/SW
	DATA LINK CONNECTOR	F115	EC-MIL/DL
	ECM	F123	EC-MAIN, EC-MAFS, EC-VSS, EC-APS, EC-CKPS, EC-MIL/DL
	ELECTRONIC CONTROL FUEL INJECTION	E232	EC-INJPMP
	HEAT UP SWITCH	F116	EC-HEATUP
	SHIELD WIRE (MASS AIR FLOW SENSOR)	F91	EC-MAFS
	NATS IMMU (ZD30DDTi)	F58	EL-NATS
	PARK/NEUTRAL POSITION SWITCH	E213	EC-PNP/SW
	SHIELD WIRE (ACCELERATOR POSITION SENSOR)	F96	EC-APS, AT-TPS
	SHIELD WIRE (CHARGE AIR PRESSURE SENSOR)	E223	EC-BOOST
	SHIELD WIRE [CRANKSHAFT POSITION SENSOR (TDC)]	E229	EC-CKPS
	TCM (TRANSMISSION CONTROL MODULE)	M814	AT-MAIN
	TRANSFER NEUTRAL POSITION SWITCH	E213	EL-WARN
	VEHICLE SPEED SENSOR	E209	EC-VSS, AT-VSSMTR, EL-METER
E154	ALTERNATOR (TD27Ti)	E153	SC-CHARGE
E203/E221	ALTERNATOR (ZD30DDTi)	E214	SC-CHARGE

ENGINE ROOM HARNESS RHD MODELS

GROUND	CONNECT TO	CONN. NO.	CELL CODE
E222/E224	4WD SWITCH (ZD30DDTi)	E212	EL-WARN
	ACCELERATOR SWITCH	M193	EC-AAC/SW
	DATA LINK CONNECTOR	M832	EC-MIL/DL
	DONGLE CONTROL UNIT (ZD30DDTi)	M720	EL-AUDIO, EL-NATS
	ECM	M841	EC-MAIN, EC-MAFS, EC-VSS, EC-APS, EC-CKPS, EC-MIL/DL
	ELECTRONIC CONTROL FUEL INJECTION PUMP	E232	EC-INJPMP
	SHIELD WIRE (MASS AIR FLOW SENSOR)	F91	EC-MAFS
	NATS IMMU (ZD30DDTi)	M831	EL-NATS
	PARK/NEUTRAL POSITION SWITCH	E213	EC-PNP/SW
	SHIELD WIRE (ACCELERATOR POSITION SENSOR)	M191	EC-APS, AT-TPS
	SHIELD WIRE (CHARGE AIR PRESSURE SENSOR)	E223	EC-BOOST
	SHIELD WIRE [CRANKSHAFT POSITION SENSOR (TDC)]	E229	EC-CKPS
	TCM (TRANSMISSION CONTROL MODULE)	M814	AT-MAIN
	TRANSFER NEUTRAL POSITION SWITCH	E213	EL-WARN
	VEHICLE SPEED SENSOR	E209	EC-VSS, AT-VSSMTR, EL-METER
E154	ALTERNATOR (TD27Ti)	E153	SC-CHARGE
E203/E221	ALTERNATOR (ZD30DDTi)	E214	SC-CHARGE

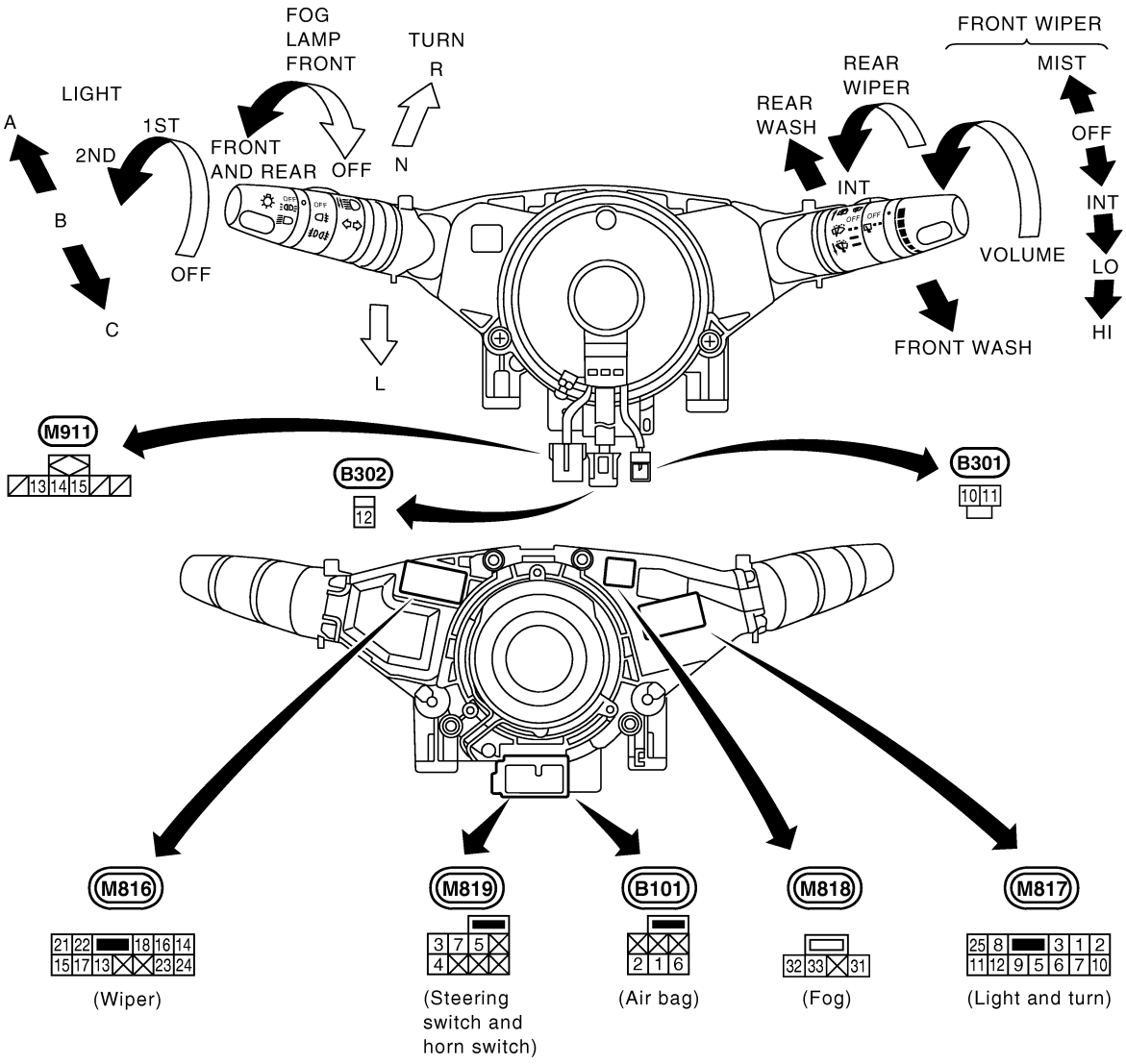
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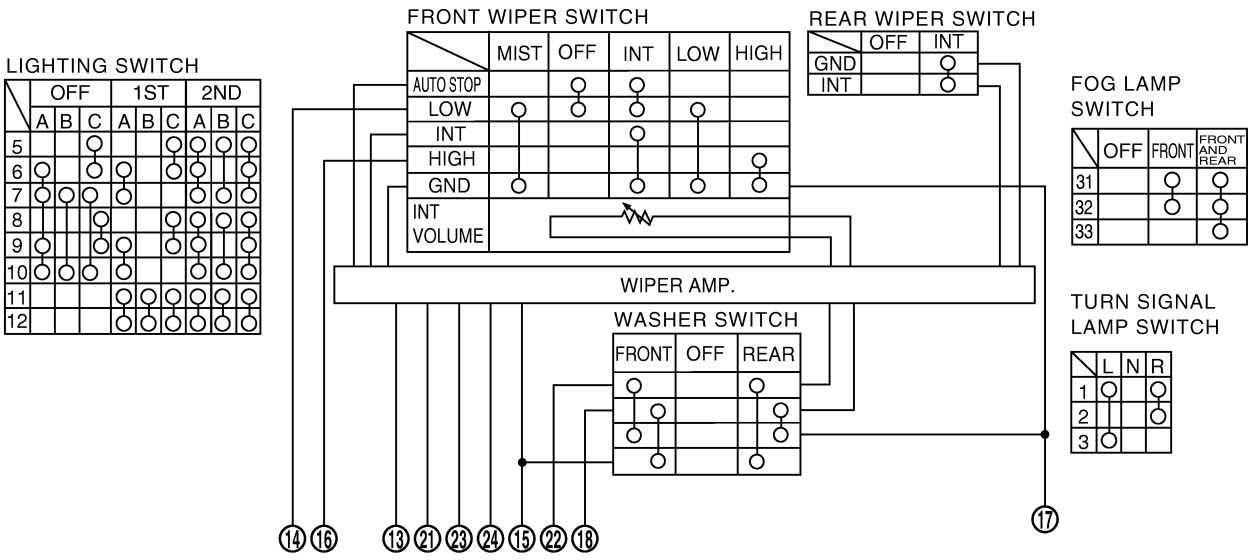
BODY HARNESS

GROUND	CONNECT TO	CONN. NO.	CELL CODE
B10/B18	A/T CONTROL DEVICE	B63	AT-NONDTC, EL-ILL
	DOOR MIRROR SWITCH	B78	EL-MIRROR
	DOOR MIRROR LH	D39	EL-DEF
	DOOR MIRROR RH	D68	EL-DEF
	FRONT DOOR LOCK ACTUATOR LH	D42	EL-D/LOCK, EL-THEFT
	FRONT DOOR LOCK ACTUATOR LH	D36	EL-S/LOCK, EL-MULTI, EL-THEFT
	FRONT DOOR LOCK ACTUATOR RH	D80	EL-D/LOCK, EL-THEFT
	FRONT DOOR LOCK ACTUATOR RH	D41	EL-S/LOCK, EL-MULTI, EL-THEFT
	FRONT POWER SOCKET	B65	EL-CIGER
	FRONT SIDE AIR BAG MODULE LH	B99	RS-SRS
	FRONT SIDE AIR BAG MODULE RH	B107	RS-SRS
	FUEL LEVEL SENSOR UNIT (TD27Ti)	C9	EL-METER, EL-WARN
	FUEL LEVEL SENSOR UNIT (ZD30DDTi)	C11	EL-METER, EL-WARN
	HEATED SEAT LH	B17	EL-HSEAT
	HEATED SEAT RH	B24	EL-HSEAT
	HEATED SEAT SWITCH LH	B19	EL-HSEAT
	HEATED SEAT SWITCH RH	B22	EL-HSEAT
	HIGH-MOUNTED STOP LAMP	T8	EL-STOP/L
	KEY CYLINDER SWITCH LH	D8	EL-S/LOCK, EL-THEFT
	KEY CYLINDER SWITCH RH	D61	EL-S/LOCK, EL-THEFT
	LICENSE PLATE LAMP LH	C5	EL-TAIL/L
	LICENSE PLATE LAMP RH	C6	EL-TAIL/L
	POWER WINDOW MAIN SWITCH (LHD MODELS)	D40	EL-WINDOW, EL-D/LOCK, EL-S/LOCK, EL-MULTI, EL-THEFT
	POWER WINDOW MAIN SWITCH (RHD MODELS)	D69	EL-WINDOW, EL-S/LOCK, EL-MULTI, EL-THEFT
	REAR COMBINATION LAMP LH	C4	EL-TAIL/L, EL-BACK/L, EL-R/FOG, EL-TURN, EL-THEFT
	REAR COMBINATION LAMP RH	C7	EL-TAIL/L, EL-BACK/L, EL-R/FOG, EL-TURN, EL-THEFT
	REAR DOOR LOCK ACTUATOR LH	D56	EL-S/LOCK, EL-MULTI, EL-THEFT
	REAR DOOR LOCK ACTUATOR RH	D76	EL-S/LOCK, EL-MULTI, EL-THEFT
	REAR POWER SOCKET	B66	EL-CIGER
	REAR WINDOW DEFOGGER	T6	EL-DEF
	REAR WIPER MOTOR	T4	EL-WIP/R
	STOP LAMP LH	B14	EL-STOP/L
	STOP LAMP RH	B30	EL-STOP/L
	THEFT WARNING HORN	B112	EL-THEFT
	ULTRASONIC CANCEL SWITCH	B77	EL-THEFT
B96	SHIELD WIRE (AIR BAG DIAGNOSIS SENSOR UNIT)	B100	RS-SRS
B109	SHIELD WIRE (AIR BAG DIAGNOSIS SENSOR UNIT)	B105	RS-SRS

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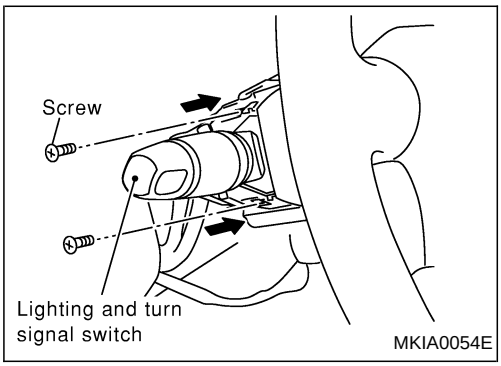
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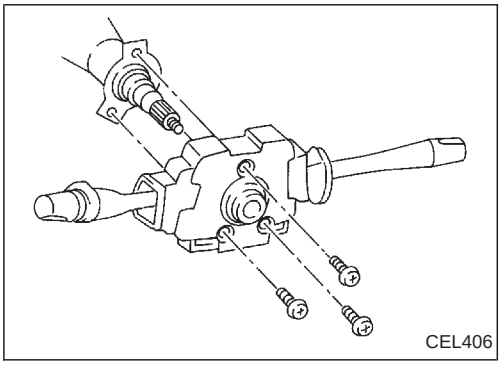
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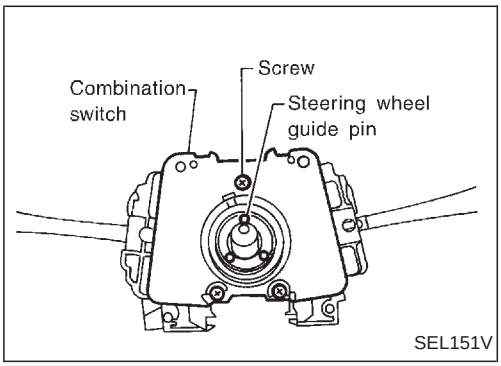
Replacement

For removal and installation of spiral cable, refer to RS section, “Installation — Air Bag Module and Spiral Cable”.

- Each switch can be replaced without removing combination switch base.



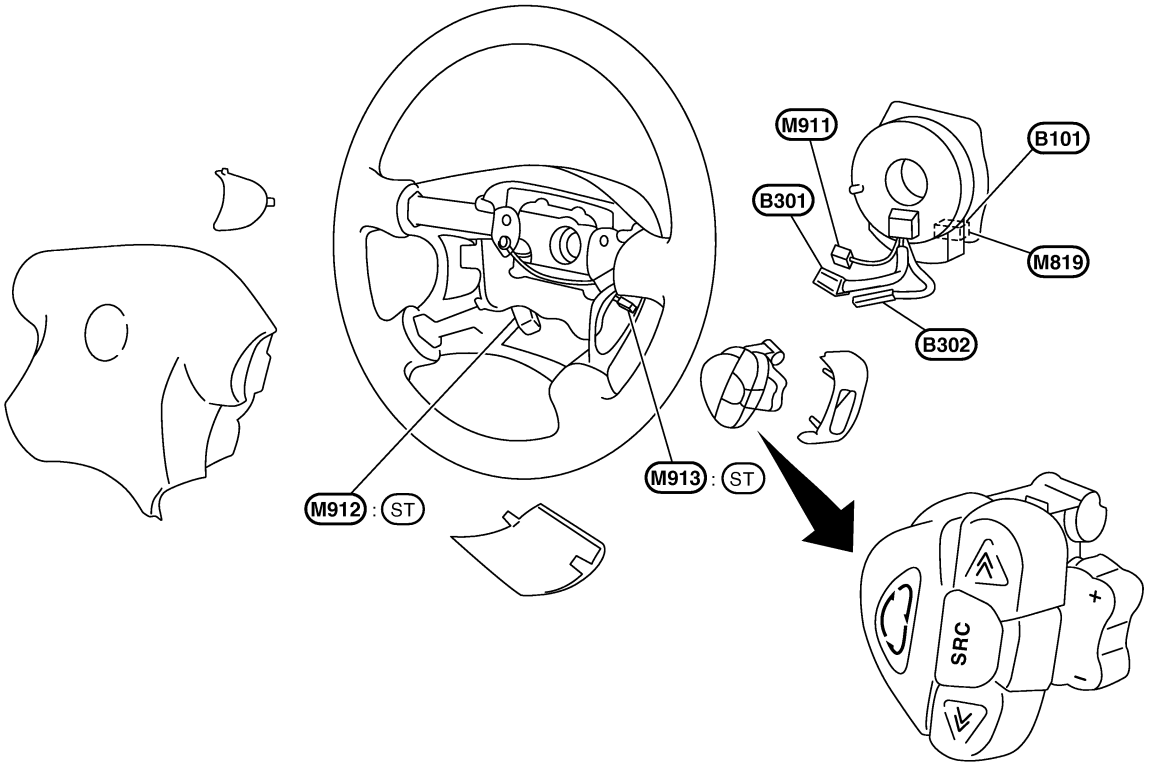
- To remove combination switch base, remove base attaching screw.

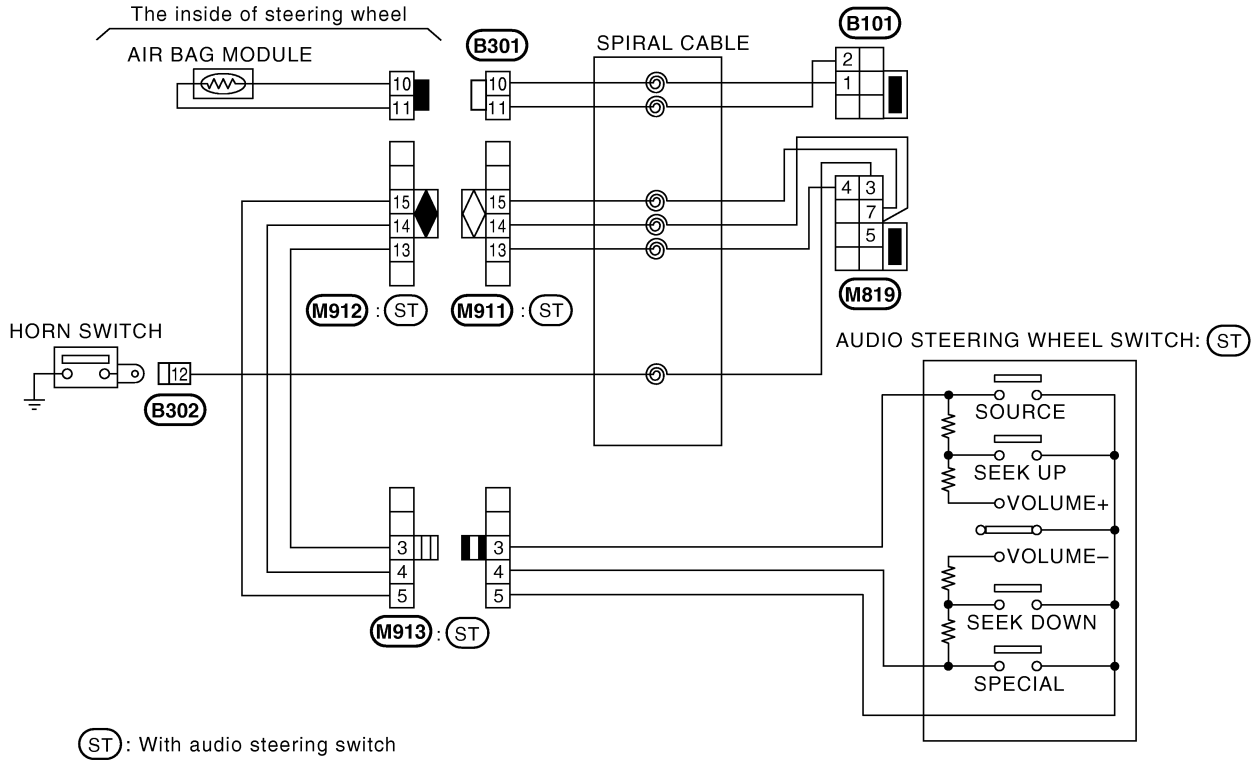


- Before installing the steering wheel, align the steering wheel guide pins with the screws which secure the combination switch as shown in the left figure.

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Check



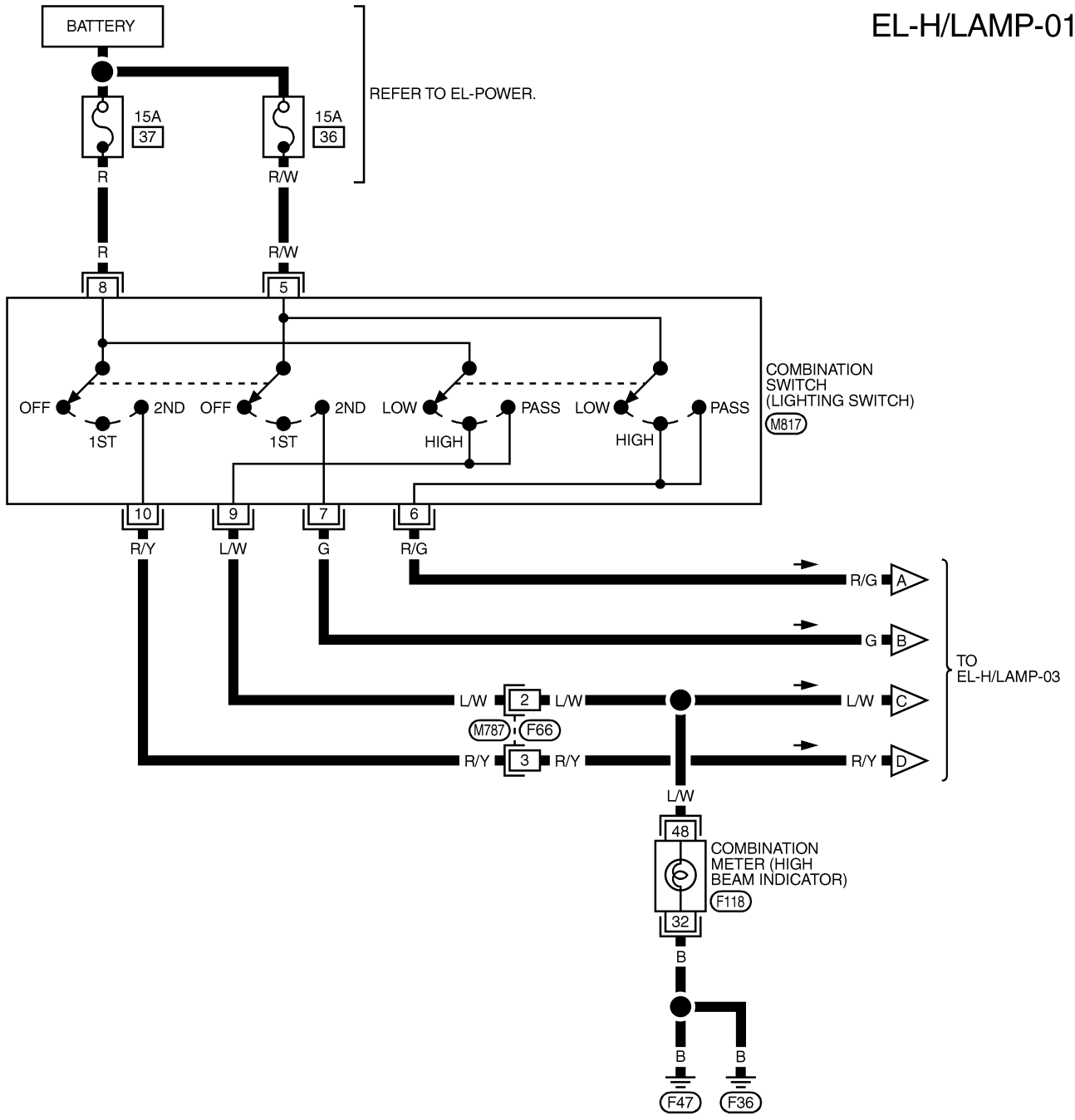


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Wiring Diagram — H/LAMP —

LHD MODELS



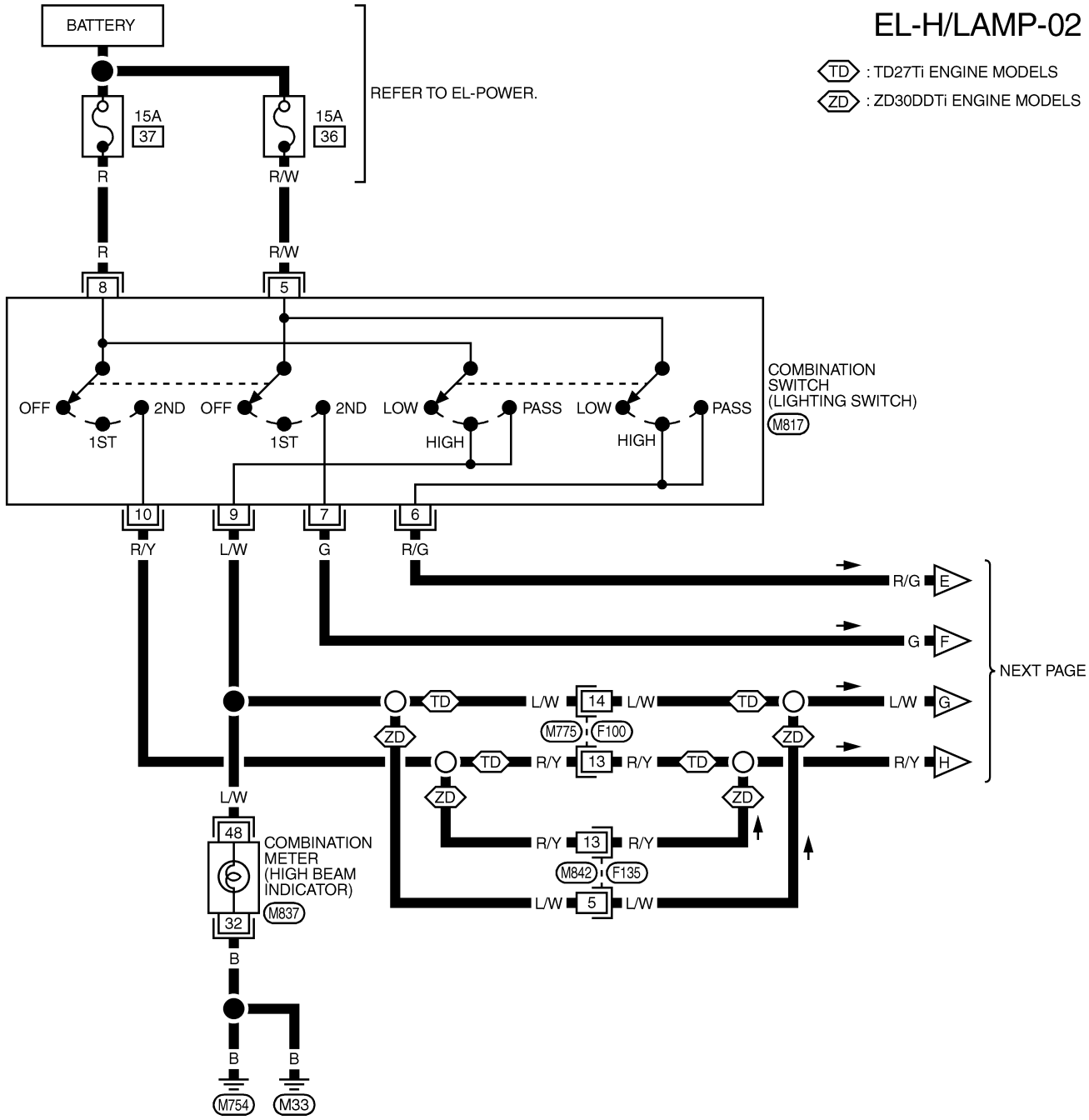


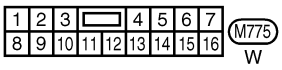
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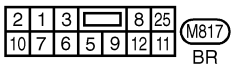
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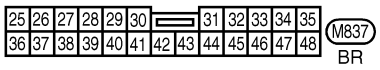
Wiring Diagram — H/LAMP — (Cont'd)

RHD MODELS









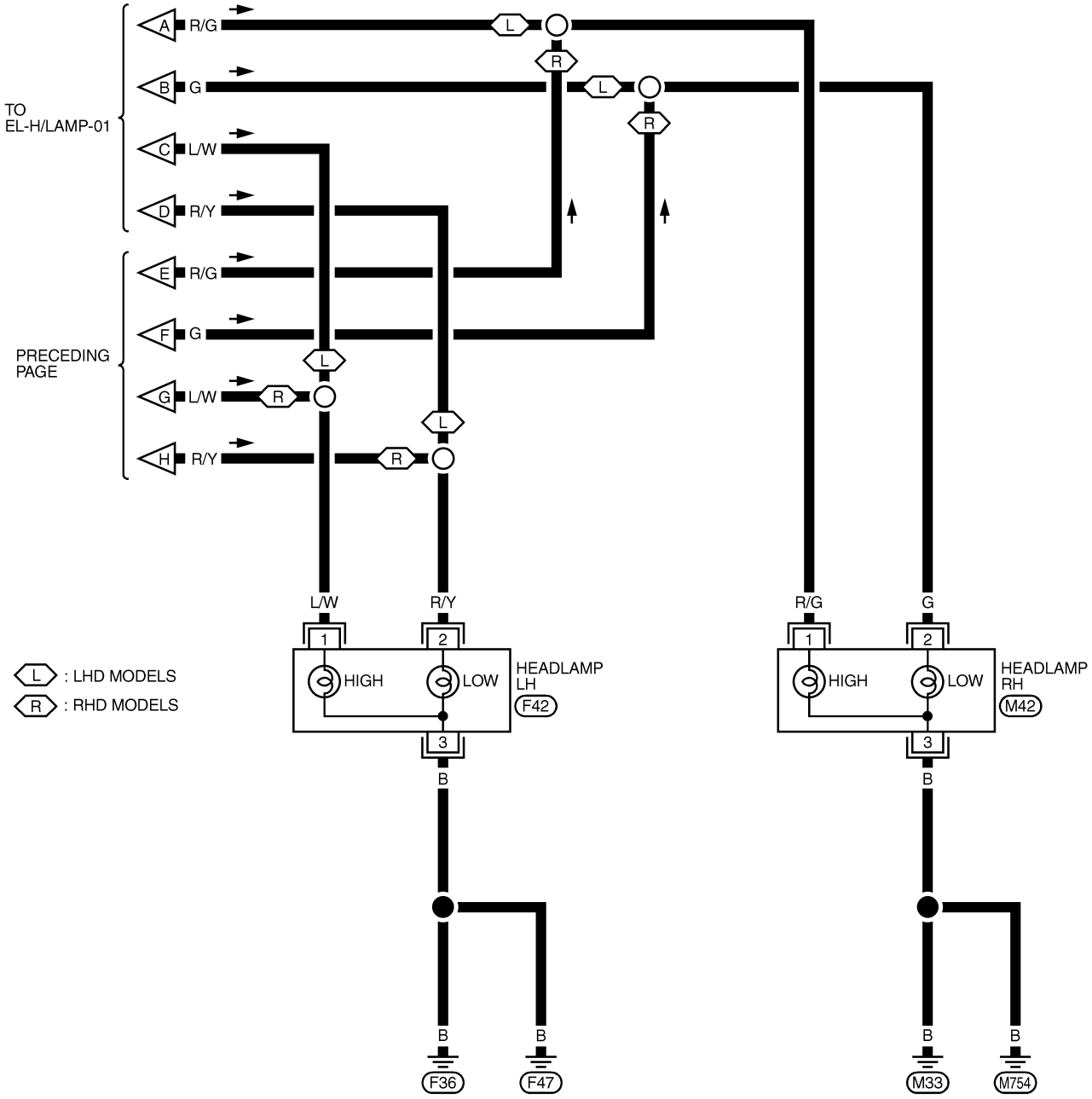
REFER TO THE FOLLOWING.
F135 -SUPER MULTIPLE JUNCTION (SMJ)

YEL059D

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Wiring Diagram — H/LAMP — (Cont'd)

EL-H/LAMP-03



2 / 1 3 M42 B , F42 B

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Trouble Diagnoses

Symptom	Possible cause	Repair order
Neither headlamp operates.	1. Lighting switch	1. Check lighting switch.
LH headlamp (low and high beam) does not operate, but RH headlamp (low and high beam) operates.	1. 15A fuse (No. 37) 2. Headlamp LH ground circuit 3. Lighting switch	1. Check 15A fuse. Verify battery positive voltage is present at lighting switch terminal 8. 2. Check headlamp LH ground circuit. 3. Check lighting switch.
RH headlamp (low and high beam) does not operate, but LH headlamp (low and high beam) does operate.	1. 15A fuse (No. 36) 2. Headlamp RH ground circuit 3. Lighting switch	1. Check 15A fuse. Verify battery positive voltage is present at lighting switch terminal 5. 2. Check headlamp RH ground circuit. 3. Check lighting switch.
LH high beam does not operate, but LH low beam does operate.	1. Bulb 2. Open in LH high beam circuit 3. Lighting switch	1. Check bulb. 2. Check the harness between lighting switch and LH high beam for an open circuit. 3. Check lighting switch.
LH low beam does not operate, but LH high beam does operate.	1. Bulb 2. Open in LH low beam circuit 3. Lighting switch	1. Check bulb. 2. Check the harness between lighting switch and LH low beam for an open circuit. 3. Check lighting switch.
RH high beam does not operate, but RH low beam does operate.	1. Bulb 2. Open in RH high beam circuit 3. Lighting switch	1. Check bulb. 2. Check the harness between lighting switch and RH high beam for an open circuit. 3. Check lighting switch.
RH low beam does not operate, but RH high beam does operate.	1. Bulb 2. Open in RH low beam circuit 3. Lighting switch	1. Check bulb. 2. Check the harness between lighting switch and RH low beam for an open circuit. 3. Check lighting switch.
High beam indicator does not work.	1. Bulb 2. Ground circuit 3. Open in high beam circuit	1. Check bulb in combination meter. 2. Check harness between high beam indicator and ground. 3. Check the harness between lighting switch and combination meter for an open circuit.

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Operation

After starting the engine with the lighting switch in the “OFF” position, the headlamp low beam and parking, tail, license and illumination lamps automatically turn on. Lighting switch operations other than the above are the same as conventional light systems.

Engine		With engine stopped									With engine running								
Lighting switch		OFF			1ST			2ND			OFF			1ST			2ND		
		A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
Headlamp	High beam	X	X	◯	X	X	◯	◯	X	◯	X	X	◯	X	X	◯	◯	X	◯
	Low beam	X	X	X	X	X	X	X	◯	X	◯	◯	◯	X	X	X	X	◯	X
Parking and tail lamp		X	X	X	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯
License and illumination lamp		X	X	X	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯

◯: Lamp “ON”
X: Lamp “OFF”
□: Added functions

System Description

The headlamp system on vehicles for North Europe contains a daytime light control unit. The unit activates the following whenever the engine is running with the lighting switch in the OFF position:

- Low beam headlamps
- Parking, license, tail and illumination lamps

Power is supplied at all times

- through 10A fuse (No. 34, located in the fuse and fusible link box)
- to daytime light control unit terminal 1 and
- through 40A fusible link (No. C, located in the fusible link and fuse box)
- to ignition switch terminal 1.

Power is also supplied at all times

- through 15A fuse (No. 36, located in the fusible link and fuse box)
- to daytime light control unit terminal 5 and
- to lighting switch terminal 5.

Power is also supplied at all times

- through 15A fuse (No. 37, located in the fusible link and fuse box)
- to daytime light control unit terminal 7 and
- to lighting switch terminal 8.

With the ignition switch in the ON or START position, power is supplied

- through 10A fuse [No. 11, located in the fuse block (J/B)]
- to daytime light control unit terminal 12.

With the ignition switch in the START position, power is supplied

- to daytime light control unit terminal 8.

Ground is supplied to daytime light control unit terminal 10 through body grounds M33 and M754.

HEADLAMP OPERATION (DAYTIME LIGHT CANCEL OPERATION)

When the lighting switch is turned to the 1st or 2nd position, power is supplied

- through lighting switch terminal 12,
- to daytime light control unit terminal 3.

Then daytime light will be canceled. And the lighting system operation will be the same as no daytime light system.

DAYTIME LIGHT OPERATION

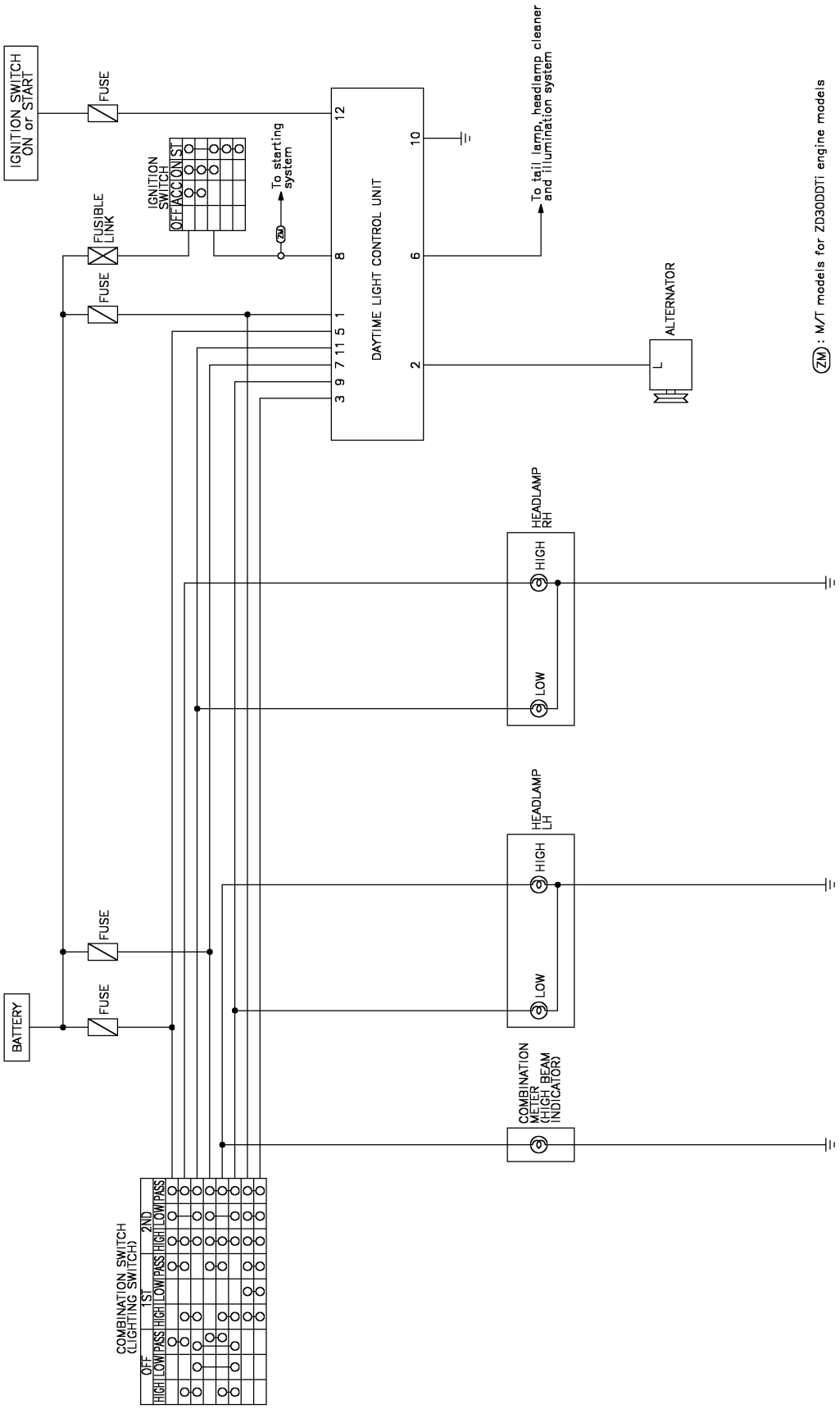
With the engine running and the lighting switch in the OFF position, power is supplied

- from alternator terminal 1
- to daytime light control unit terminal 2,
- through daytime light control unit terminal 9
- to terminal 2 of headlamp LH,
- through daytime light control unit terminal 11
- to terminal 2 of headlamp RH and
- through daytime light control unit terminal 6
- to tail lamp and illumination.

Ground is supplied to terminal 3 of each headlamp through body grounds F36, F47 (LH) and M33, M754 (RH).

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Schematic

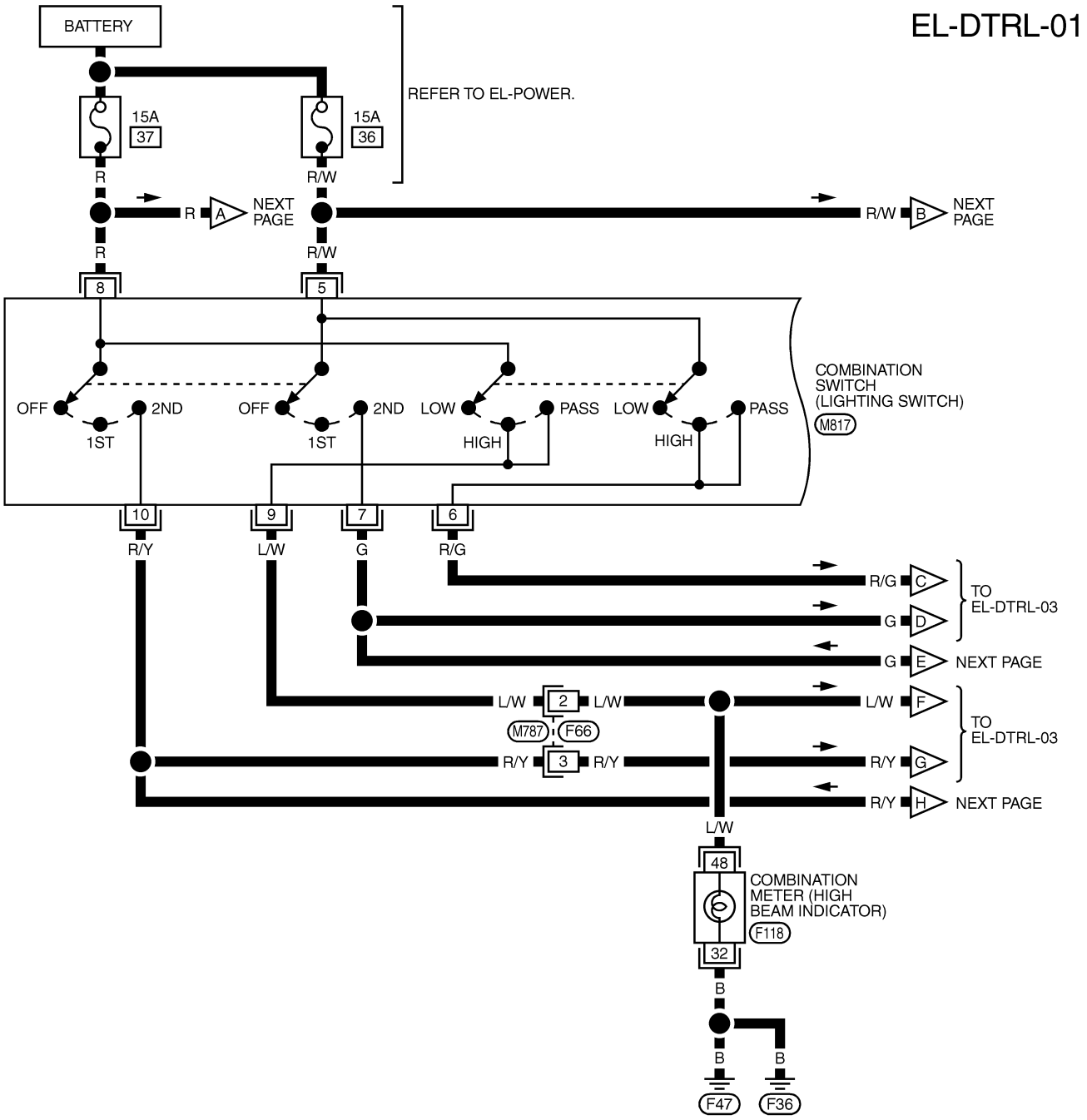


YEL730E

http://vnx.su/

Wiring Diagram — DTRL —

TD27Ti ENGINE MODELS





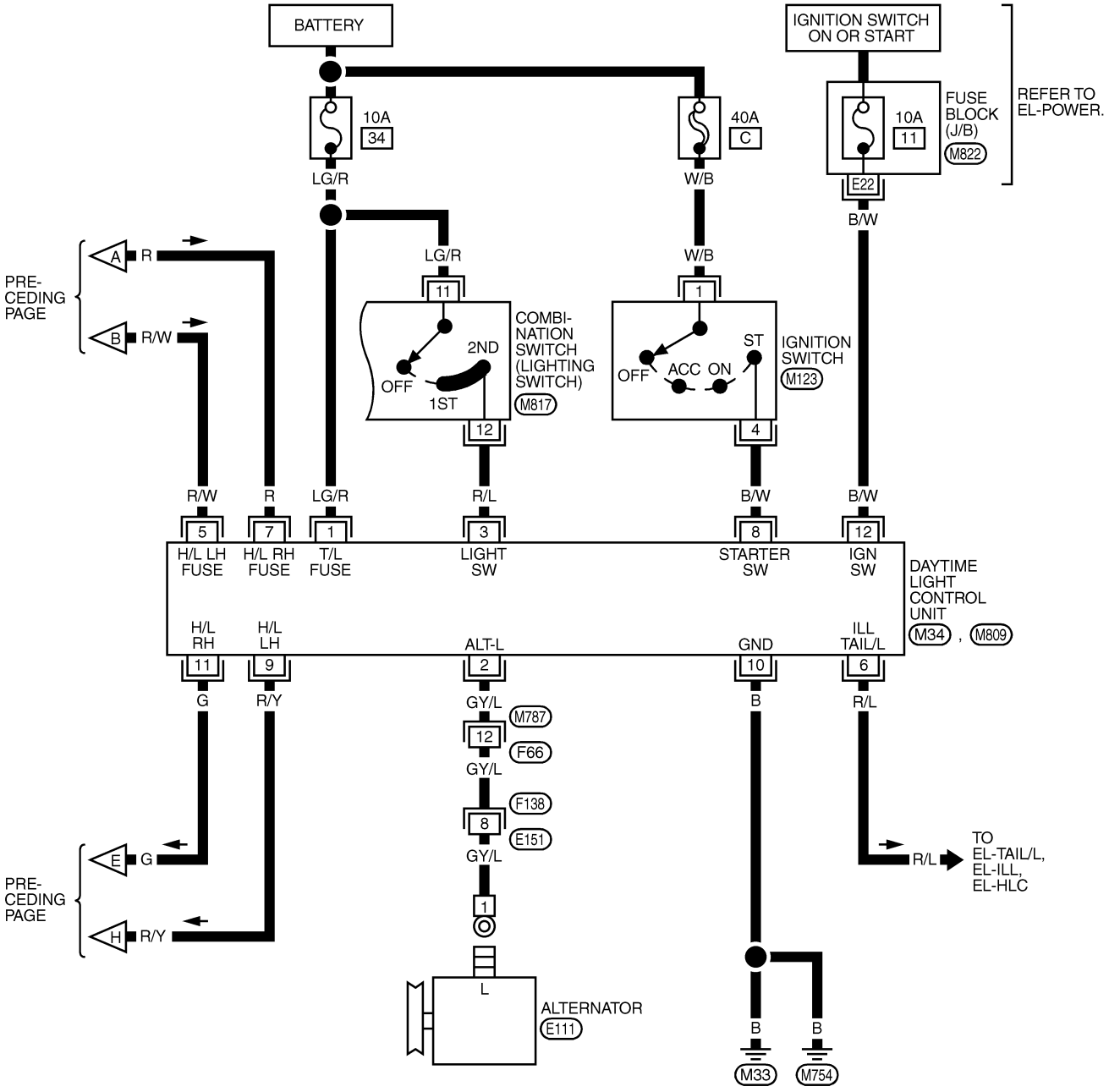
YEL980E

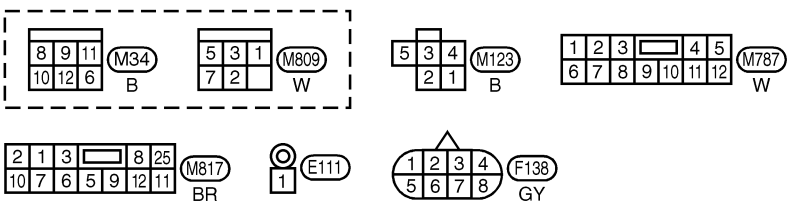
http://vnx.su/

Wiring Diagram — DTRL — (Cont'd)

TD27Ti ENGINE MODELS

EL-DTRL-02





REFER TO THE FOLLOWING.
M822 -FUSE BLOCK-
JUNCTION BOX (J/B)

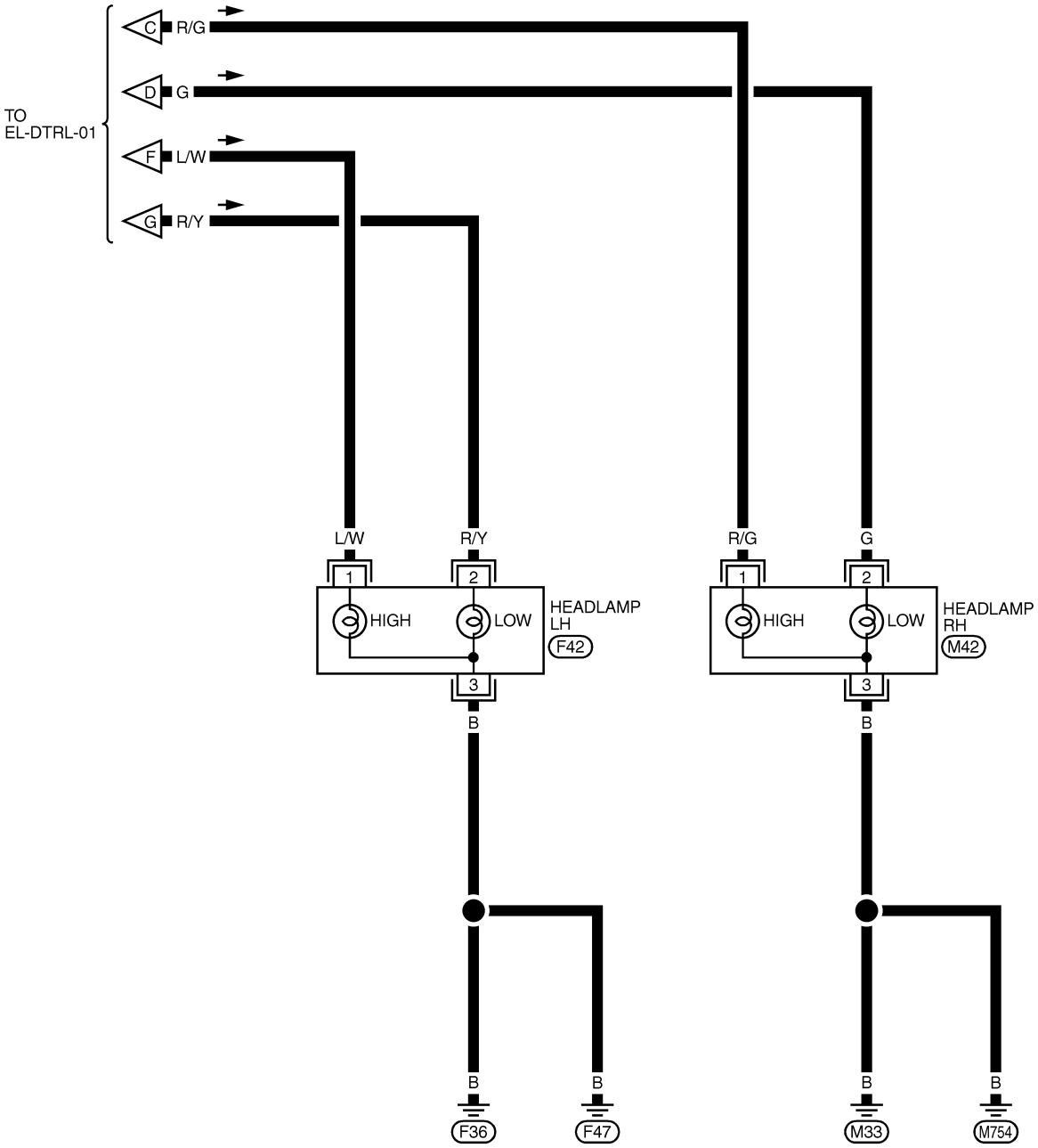
YEL731E

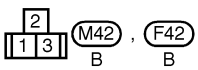
http://vnx.su/

Wiring Diagram — DTRL — (Cont'd)

TD27Ti ENGINE MODELS

EL-DTRL-03



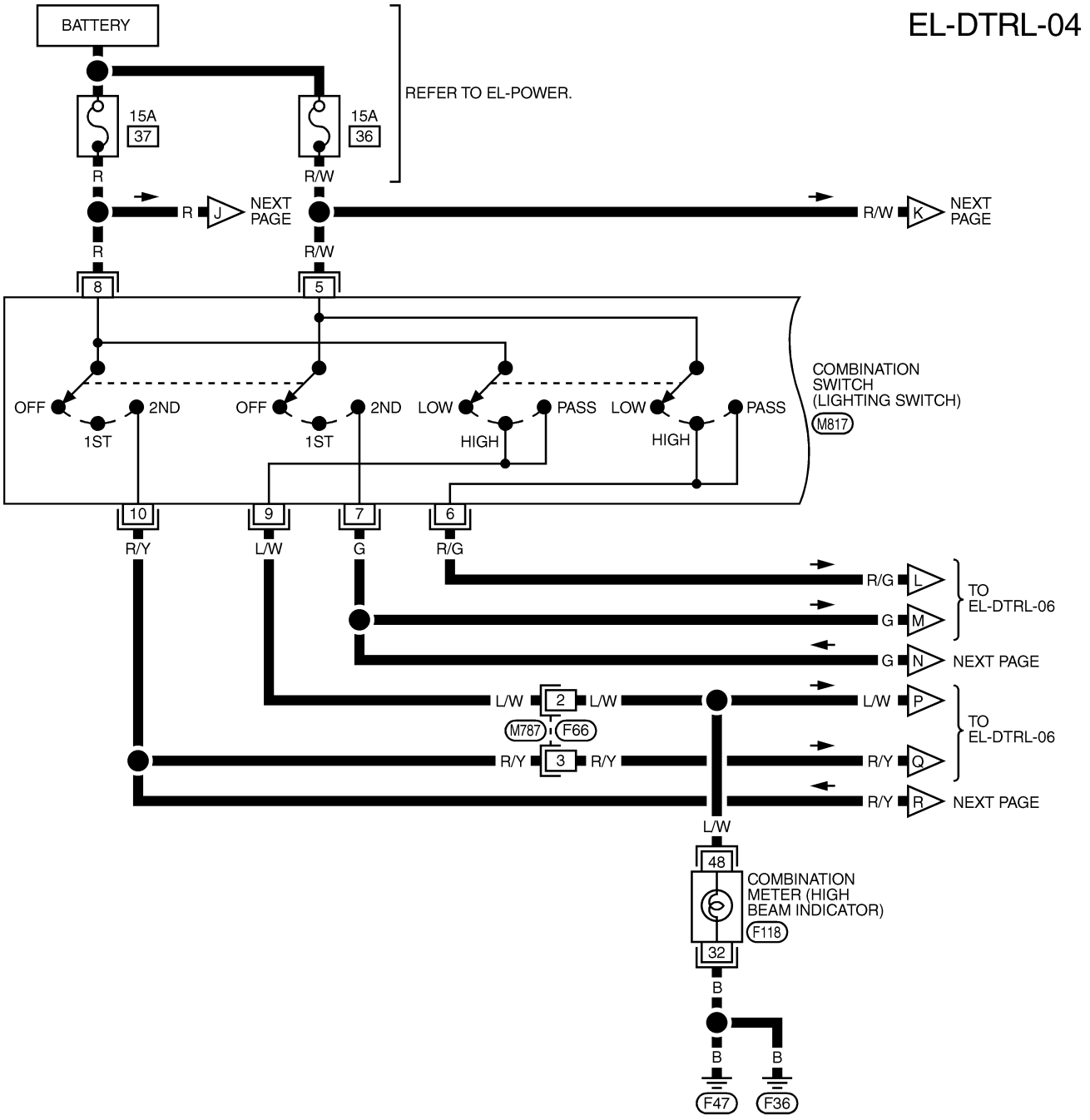


YEL732E

http://vnx.su/

Wiring Diagram — DTRL — (Cont'd)

ZD30DDTi ENGINE MODELS



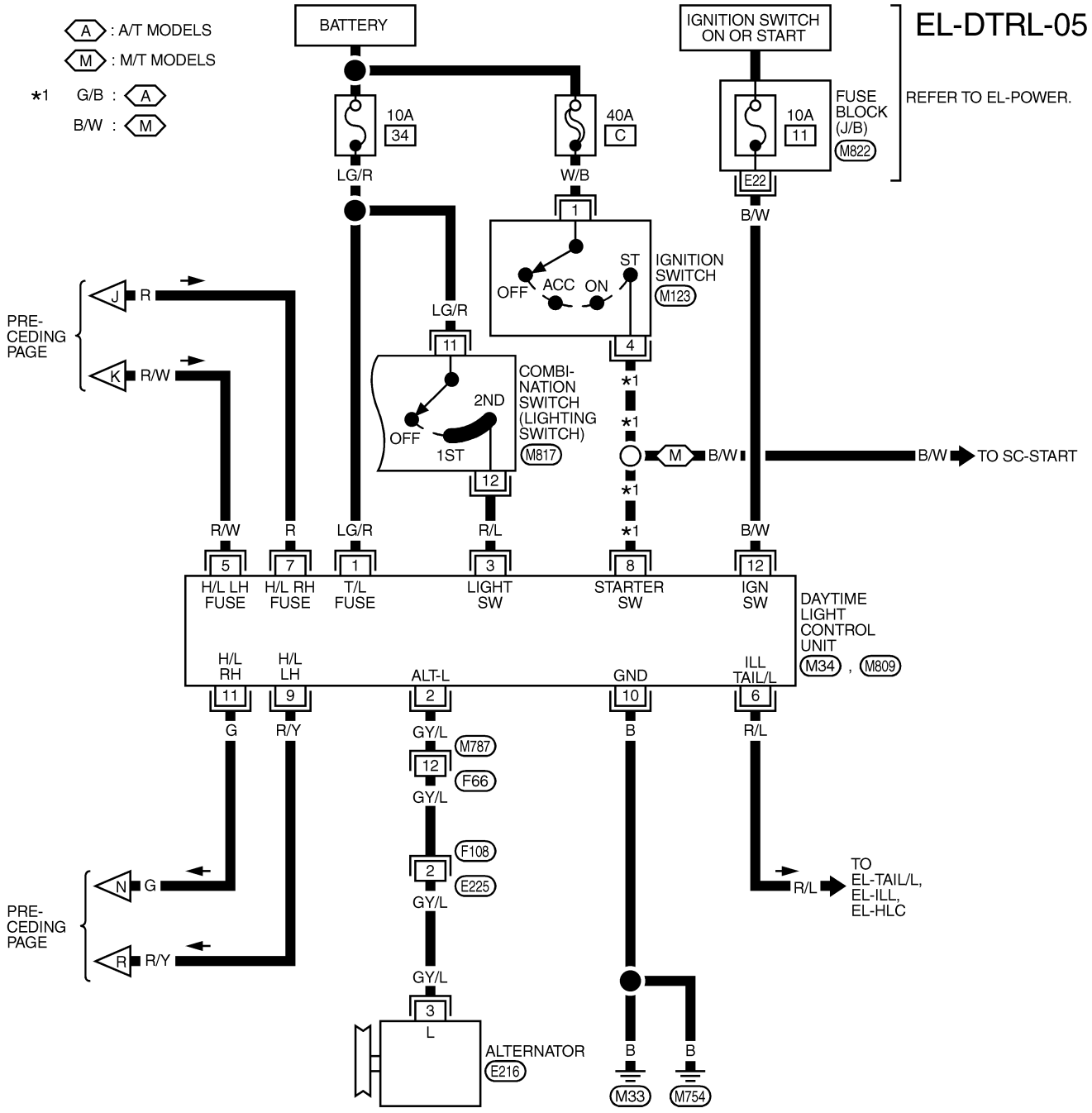


YEL981E

http://vnx.su/

Wiring Diagram — DTRL — (Cont'd)

ZD30DDTi ENGINE MODELS



REFER TO THE FOLLOWING.
F108 -SUPER MULTIPLE JUNCTION (SMJ)
M822 -FUSE BLOCK-JUNCTION BOX (J/B)

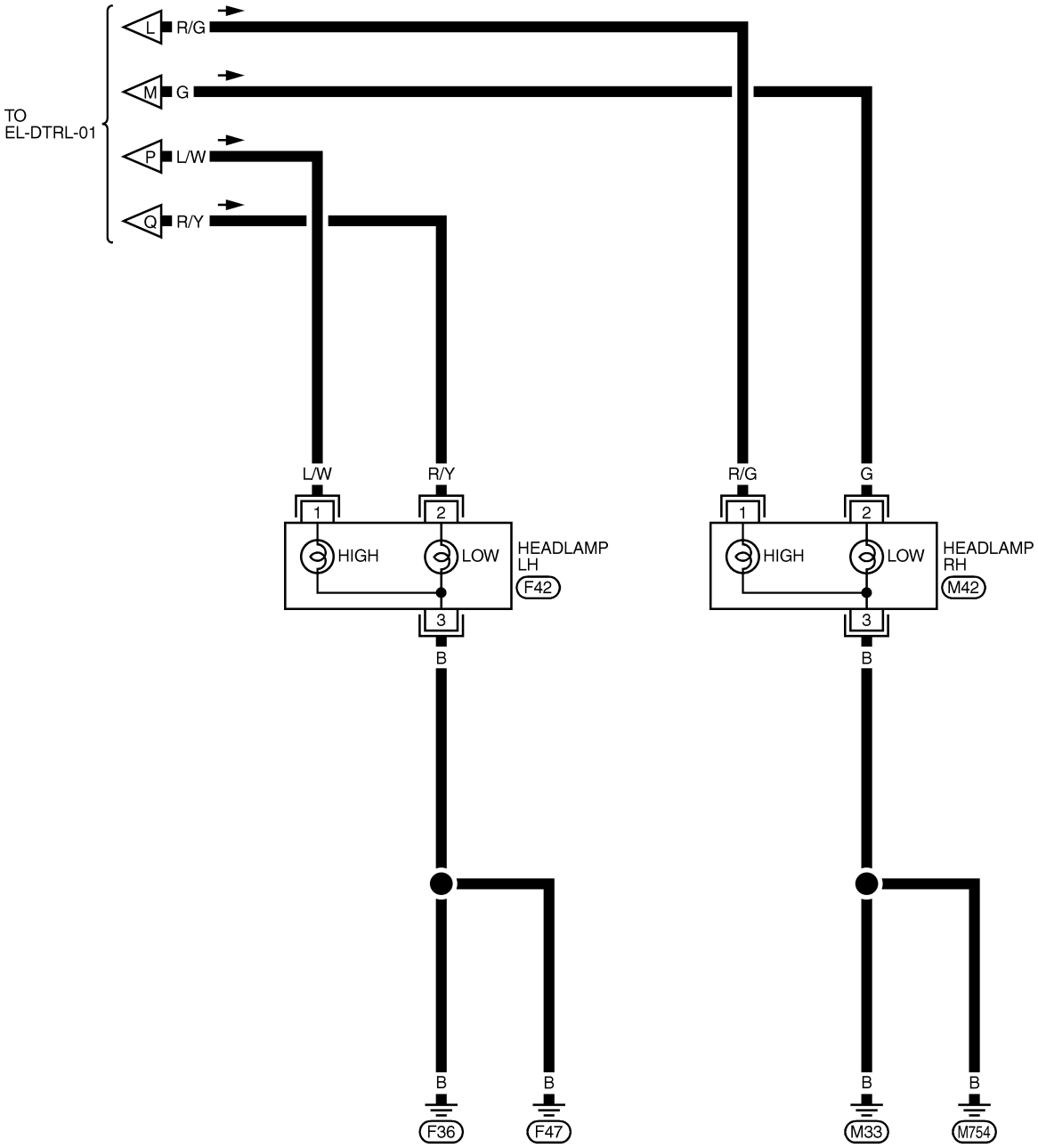
YEL733E

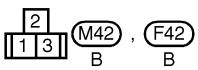
http://vnx.su/

Wiring Diagram — DTRL — (Cont'd)

ZD30DDTi ENGINE MODELS

EL-DTRL-06





YEL734E

http://vnx.su/

Trouble Diagnoses

DAYTIME LIGHT UNIT INSPECTION TABLE

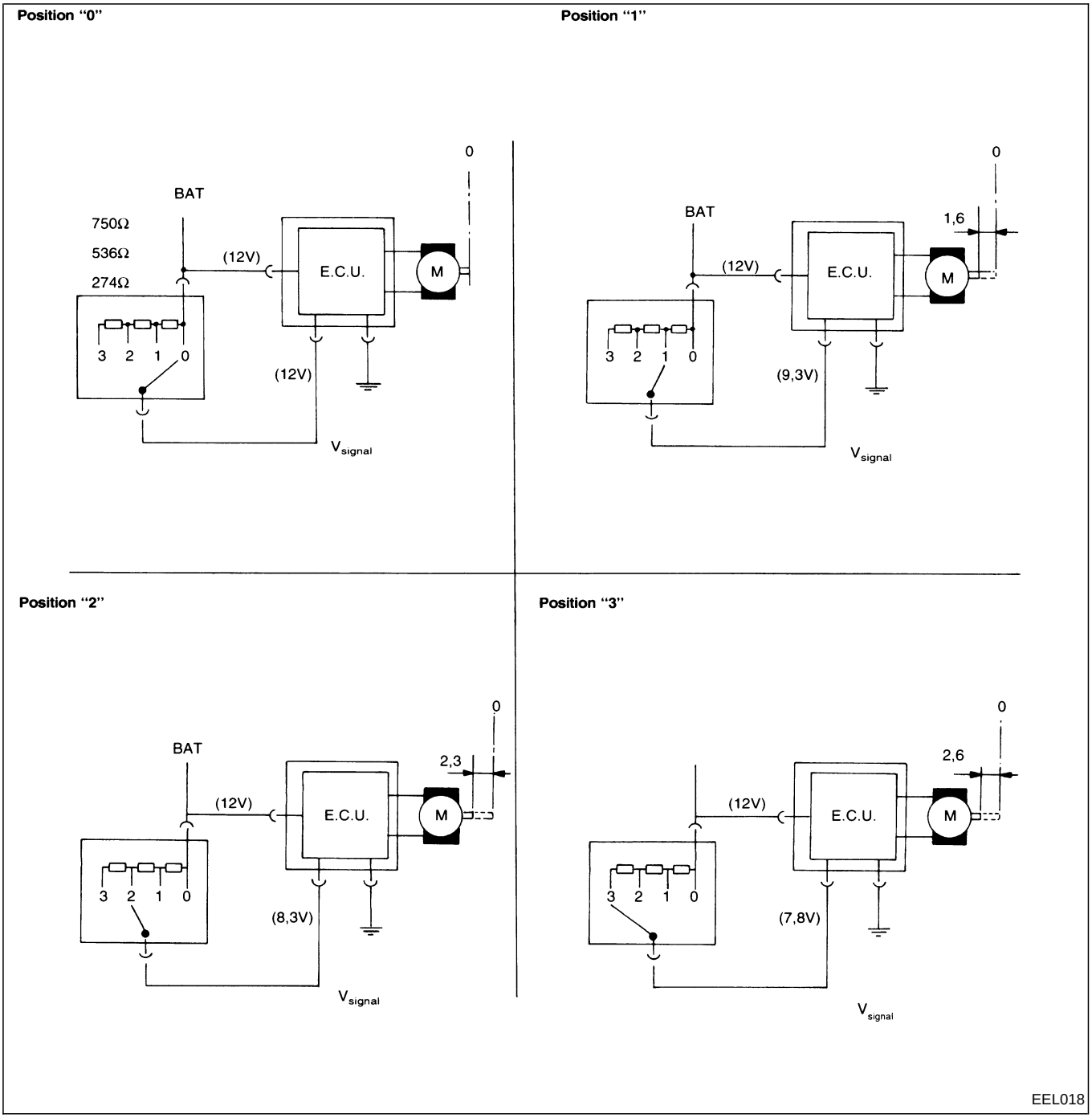
Terminal No.	Wire color	Connections	Operated condition		Voltage (V) (Approximate values)
1	LG/R	Power source for illumination & tail lamp	—		12
2	GY/L	Alternator “L” terminal	Engine	Running	12
				Stopped	0
3	R/L	Lighting switch	1ST·2ND position		12
			OFF		0
5	GY/L	Power source for headlamp LH	—		12
6	R/L	Illumination & tail lamp	ON (daytime light operating*)		12
			OFF		0
7	R	Power source for headlamp RH	—		12
8	B/W	Start signal	Ignition switch	START	12
				ON, ACC or OFF	0
9	R/Y	Headlamp LH	ON (daytime light operating*)		12
			OFF		0
10	B	Ground	—		0
11	G	Headlamp RH	ON (daytime light operating*)		12
			OFF		0
12	B/W	Power source	Ignition switch	ON or START	12
				ACC or OFF	0

*: Daytime light operating: Lighting switch in “OFF” position with engine running.

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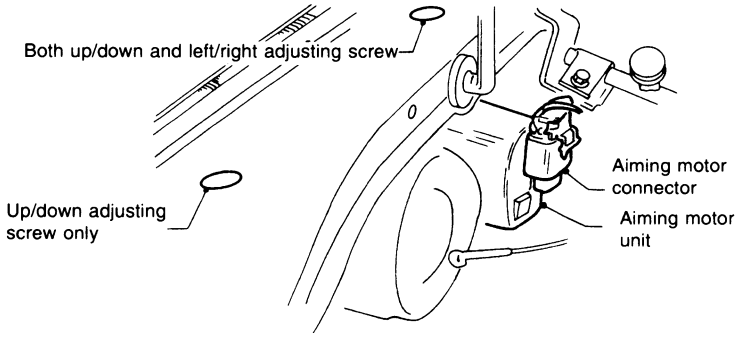
Description

- The vertical direction of the headlamp projection can be adjusted from inside the vehicle to prevent the headlamp beam axis from facing upward due to a change in the number of occupants and load conditions in the vehicle.
- A little Electronic Control Unit (ECU) is incorporated in each actuator (one for each headlamp), which compares a signal voltage (V_{signal}), coming from the headlamp aiming switch, with battery voltage (12V). The signal voltage varies with the position of the switch.
  Related to the difference in voltage the actuator rod will move more or less and adjust the headlamp beam angle accordingly.

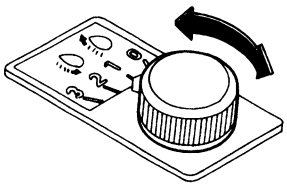


http://vnx.su/

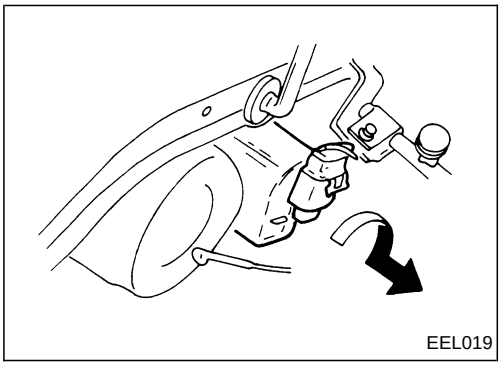
Description (Cont'd)



Aiming motor unit can not be disassembled



EEL017



EEL019

Replacing Headlamp Aiming Actuator

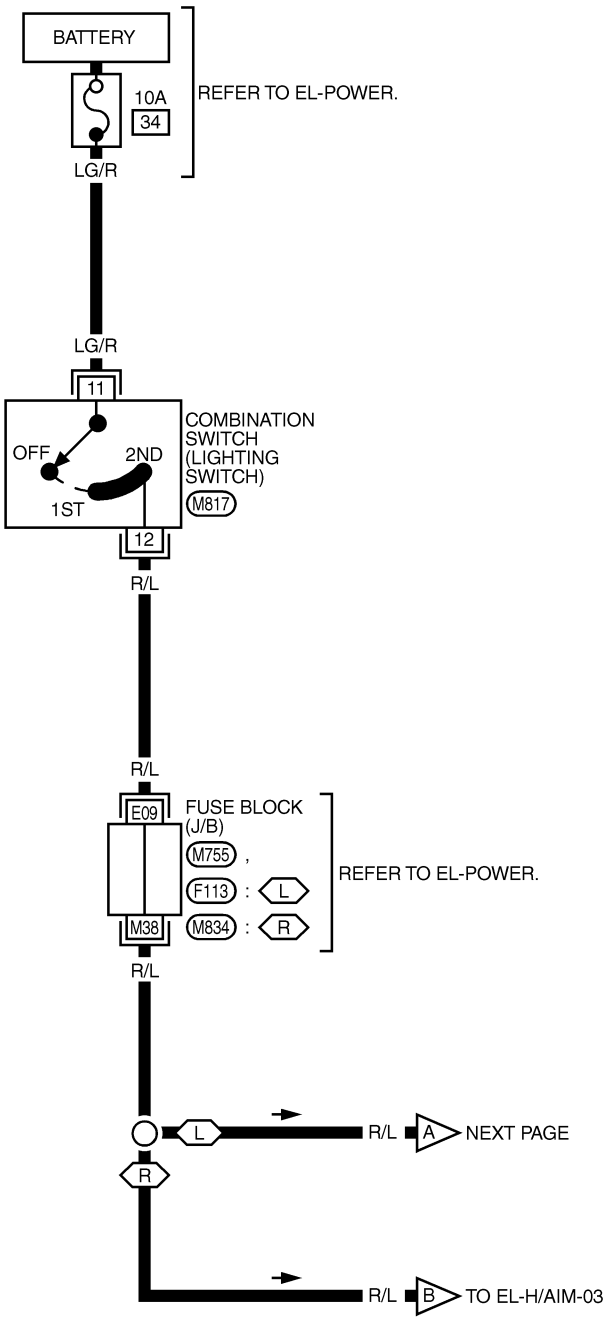
Headlamp aiming actuator can not be disassembled.
To remove aiming actuator, turn it 90° to the center of the vehicle (left and right symmetrical) and pull outward.

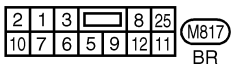
http://vnx.su/

Wiring Diagram — H/AIM —

EL-H/AIM-01

L : LHD MODELS
R : RHD MODELS





REFER TO THE FOLLOWING.
M755 , M834 , F113
-FUSE BLOCK-
JUNCTION BOX (J/B)

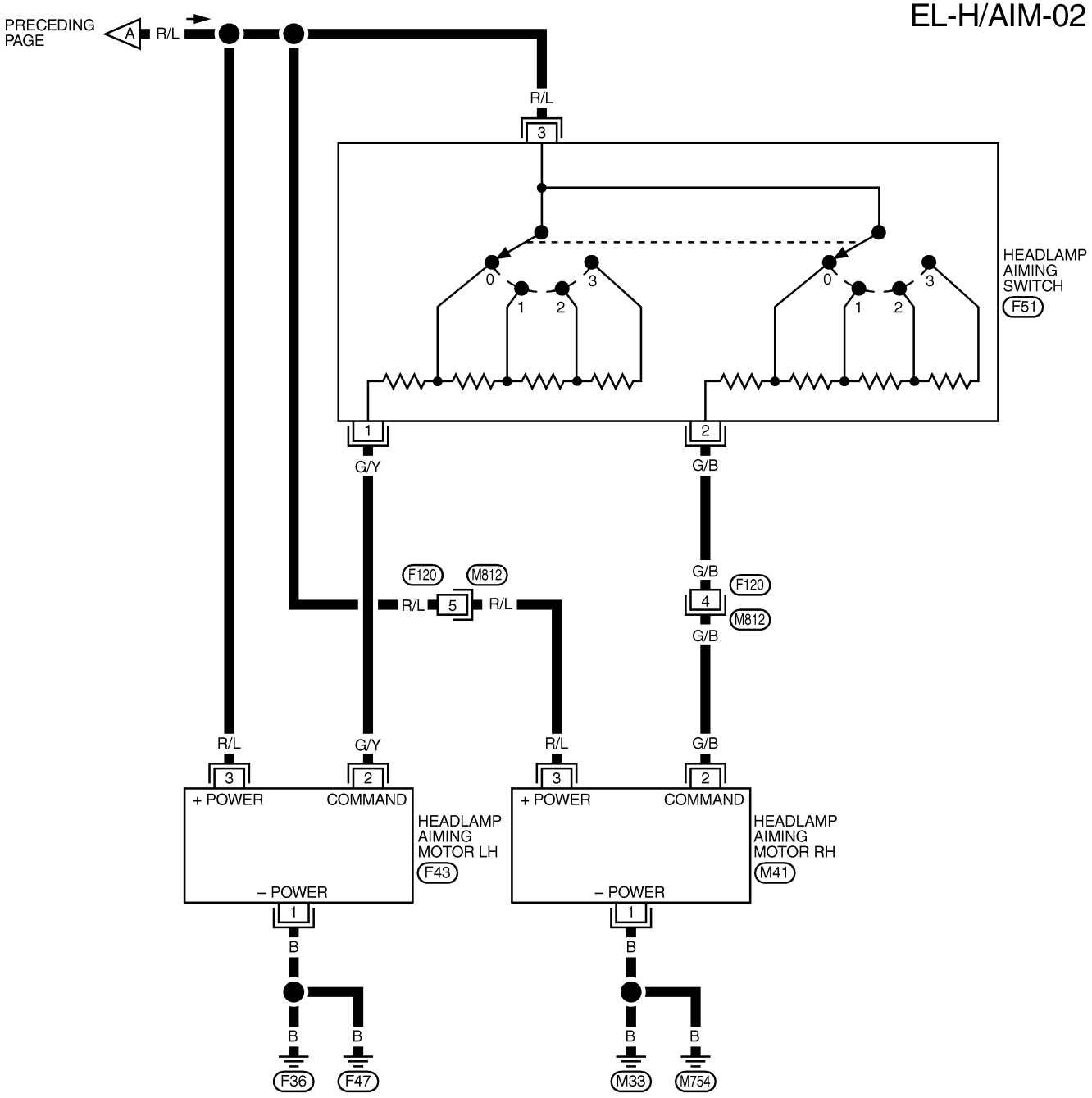
YEL068D

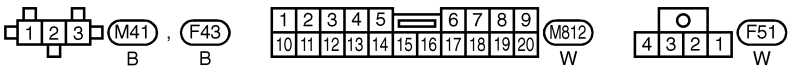
http://vnx.su/

Wiring Diagram — H/AIM — (Cont'd)

LHD MODELS

EL-H/AIM-02



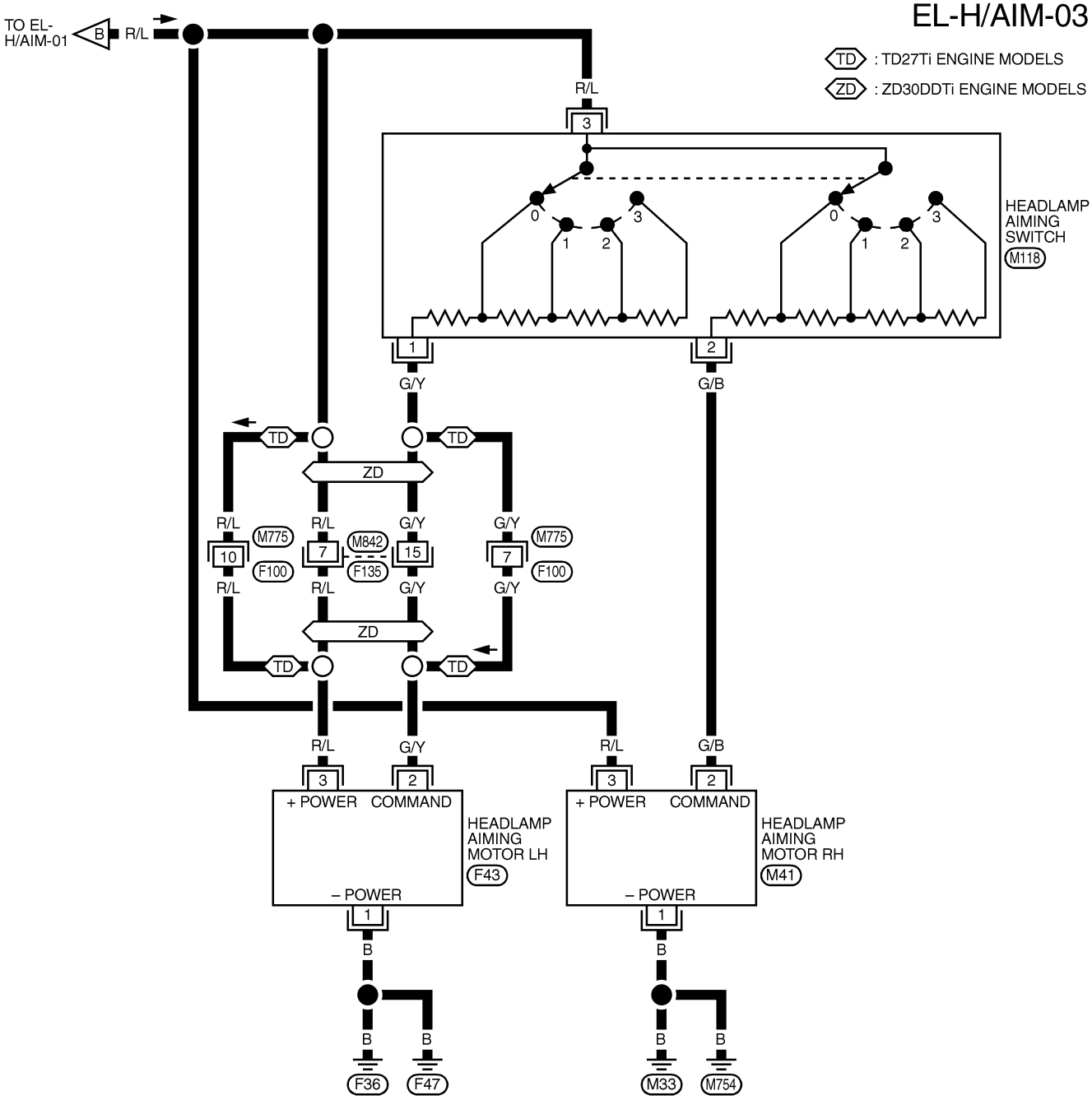


YEL069D

http://vnx.su/

Wiring Diagram — H/AIM — (Cont'd)

RHD MODELS



M41 B , F43 B

M118 W

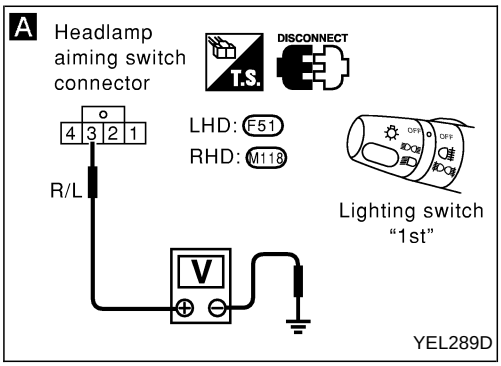
M775 W

REFER TO THE FOLLOWING.
F135 -SUPER MULTIPLE JUNCTION (SMJ)

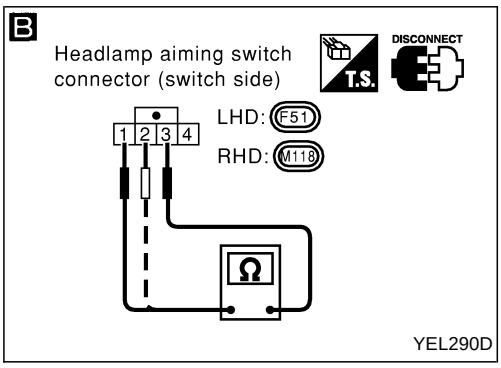
YEL070D

http://vnx.su/

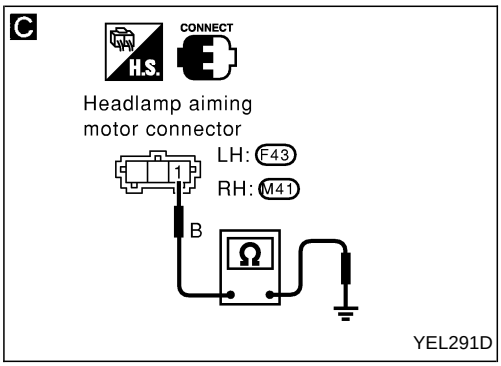
A



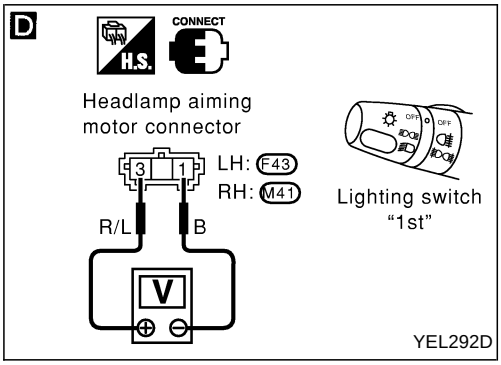
B



C



D



Trouble Diagnoses

SYMPTOM: Headlamp aiming does not operate.

A

POWER SUPPLY CIRCUIT CHECK
(For aiming switch)
- Disconnect headlamp aiming switch connector.
- Turn lighting switch to 1st. position.

Check voltage between headlamp aiming switch connector terminal ③ and body ground.

Voltmeter terminals		Voltage (V)
(+)	(−)	
③	Ground	Approx. 12

NG → Check the following:
- Harness and connector between headlamp aiming switch and fuse
- 10A fuse (No. 34) in fuse block (Refer to "POWER SUPPLY ROUTING", EL-8).
- Condition and operation of ignition switch.
- Battery charge condition.

If NG, replace 10A fuse, recharge battery or repair ignition switch.

OK ↓

B

AIMING SWITCH CHECK
Check resistance between headlamp aiming switch connector (switch side) terminals ①/② and ③ at each switch position.

Switch position	Ohmmeter terminals	
	①	③
	②	
0	0Ω	
1	750Ω	
2	536Ω	
3	274Ω	

NG → Replace headlamp aiming switch

OK ↓

C

GROUND CIRCUIT CHECK FOR AIMING MOTOR
- Connect headlamp aiming switch connector.

Check continuity between headlamp aiming motor connector terminal ① and body ground.

Continuity exists ... OK

NG → Repair harness or connectors between aiming motor and body ground.

OK ↓

D

POWER SUPPLY CIRCUIT CHECK
(For aiming motor unit)
- Turn lighting switch to 1st. position

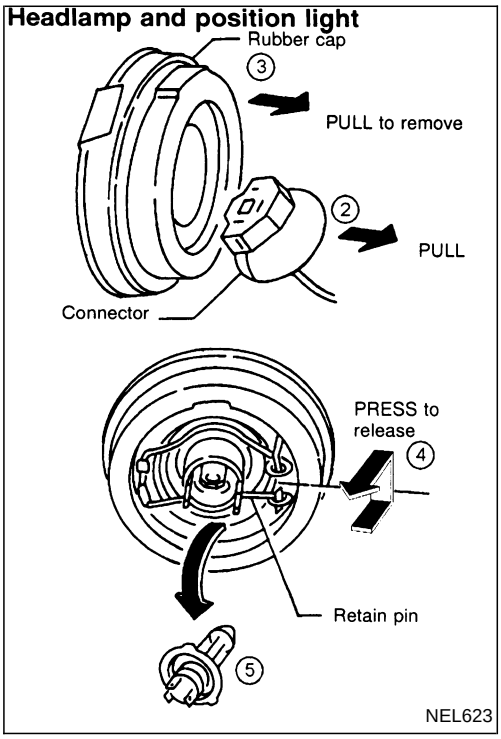
Check if battery voltage exist between headlamp aiming motor connector terminals ① and ③.

NG → Check harness between headlamp aiming switch and aiming motor unit.

OK ↓

Replace aiming motor unit.

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Bulb Replacement

The headlamp is a semi-sealed beam type which uses a replacable halogen bulb. The bulb can be replaced from the engine compartment side without removing the headlamp body.

- **Grasp only the plastic base when handling the bulb. Never touch the glass envelope.**

1. Disconnect the battery cable.
2. Disconnect the harness connector from the back side of the bulb.
3. Pull off the rubber cap.
4. Press end of the retaining pin together to release bulb.
5. Remove the headlamp bulb. Do not shake or rotate the bulb when removing it.
6. Install the new bulb in reverse order of removal.

CAUTION:

- **Do not leave headlamp reflector without bulb for a long period of time as dust, moisture, smoke, etc. may enter the headlamp body and affect the performance of the headlamp. Thus, the headlamp bulb should not be removed from the headlamp reflector until just before a replacement bulb is to be installed.**

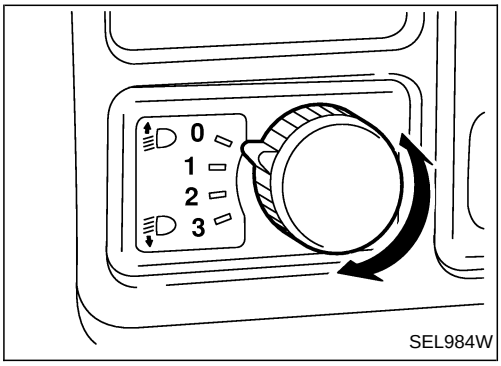
Aiming Adjustment

When performing headlamp aiming adjustment, use an aiming machine, aiming wall screen or headlamp tester. For operating instructions, of any aimer, it should be in good repair, calibrated and used according to respective operation manuals supplied with the unit.

For details, refer to the regulations in your own country.

Before performing aiming adjustment, check the following:

a. Keep all tires inflated to correct pressures.
b. Place vehicle and tester on one and same flat surface.
c. See that there is noload in vehicle other than coolant, engine oil filled up to correct level, full fuel tank and the driver (or equivalent weight placed in driver's position).

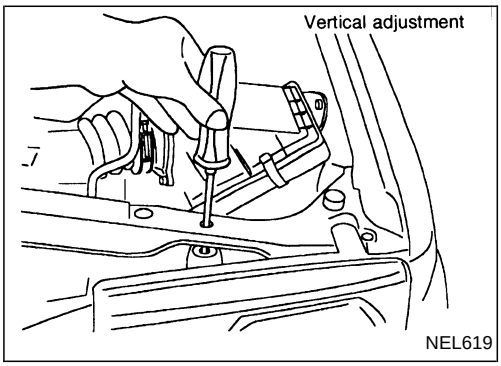


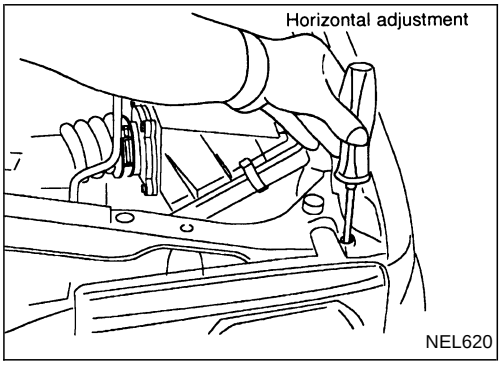
CAUTION:

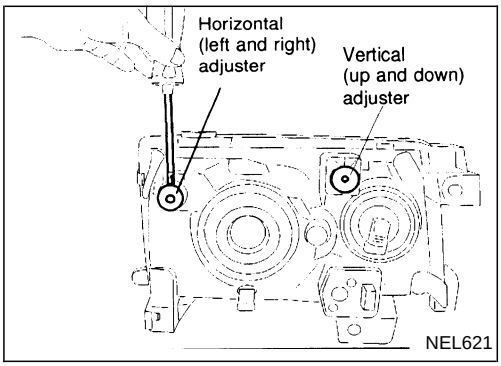
Be sure aiming switch is set to "0" when performing aiming adjustment on vehicles equipped with headlamp aiming control.

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Aiming Adjustment (Cont'd)



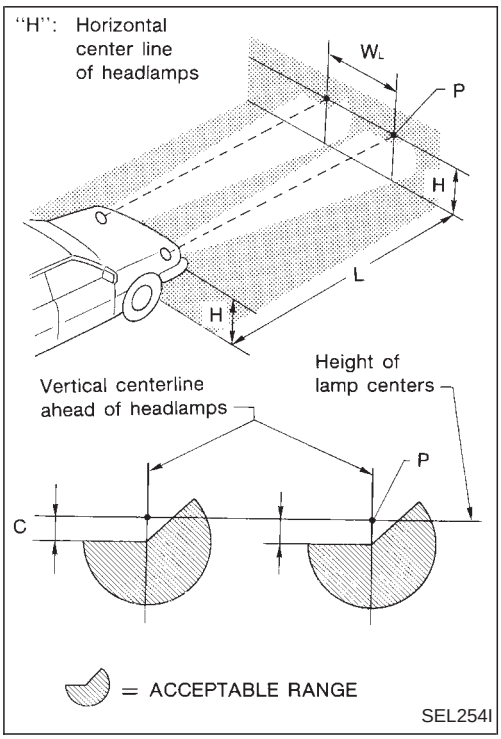




LOW BEAM

1. Turn headlamp low beam on.
2. Use aiming adjusters to perform aiming adjustment with screw driver ⊕ as shown in figures.

- **First tighten the adjusting screws all the way and then make adjustment by loosening the screws.**

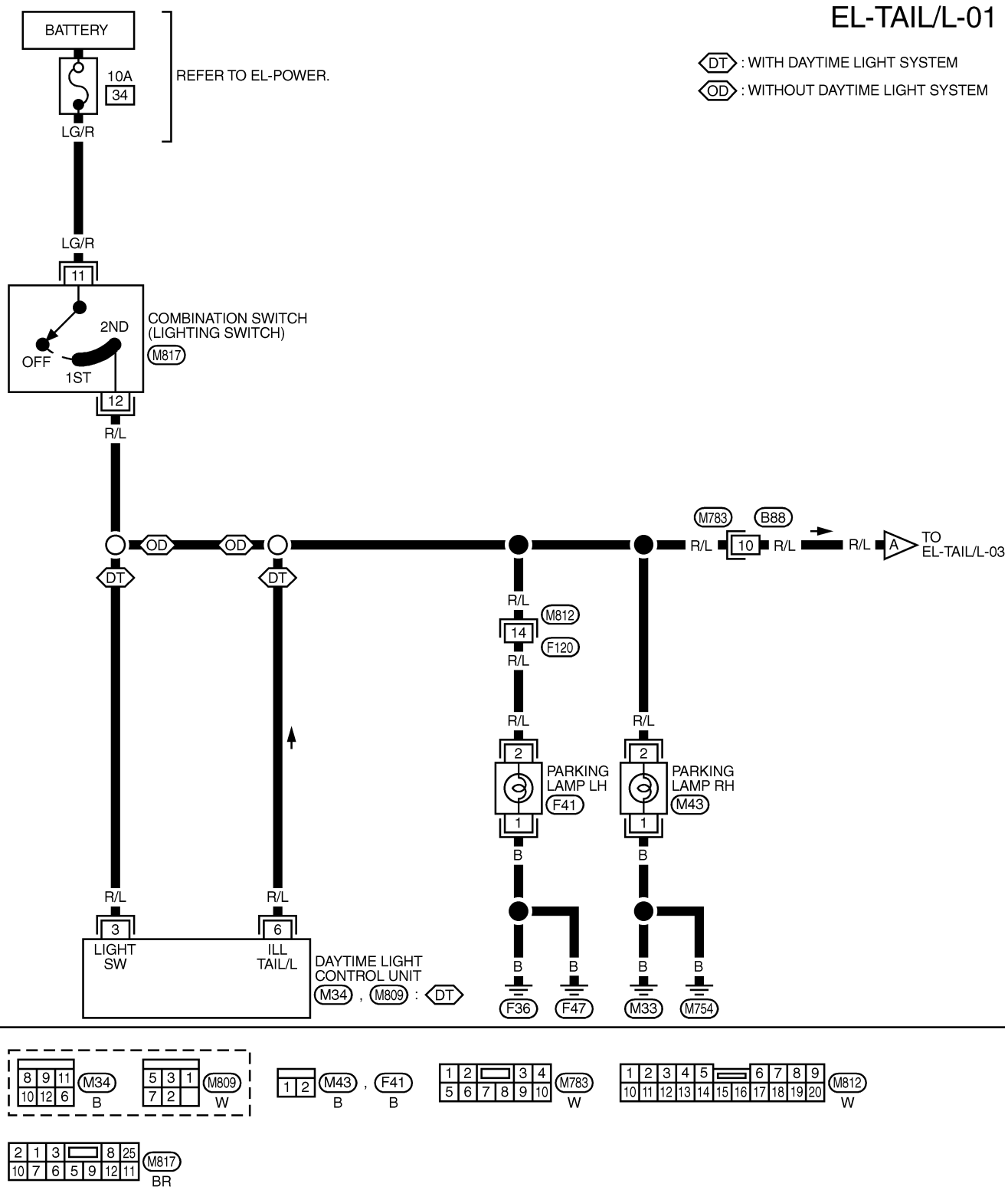


- **Adjust headlamps so that main axis of light is parallel to center line of body and is aligned with point P shown in illustration.**
- **Figure to the left shows headlamp aiming pattern for driving on right side of road; for driving on left side of road, aiming pattern is reversed.**
- **Dotted lines to point P in illustration show center of headlamp.**
  "H": Horizontal center line of headlamps
  "W_L": Distance between each headlamp center
  "L": 5,000 mm (196.85 in)
  "C": 65 mm (2.56 in)

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Wiring Diagram — TAIL/L —

LHD MODELS

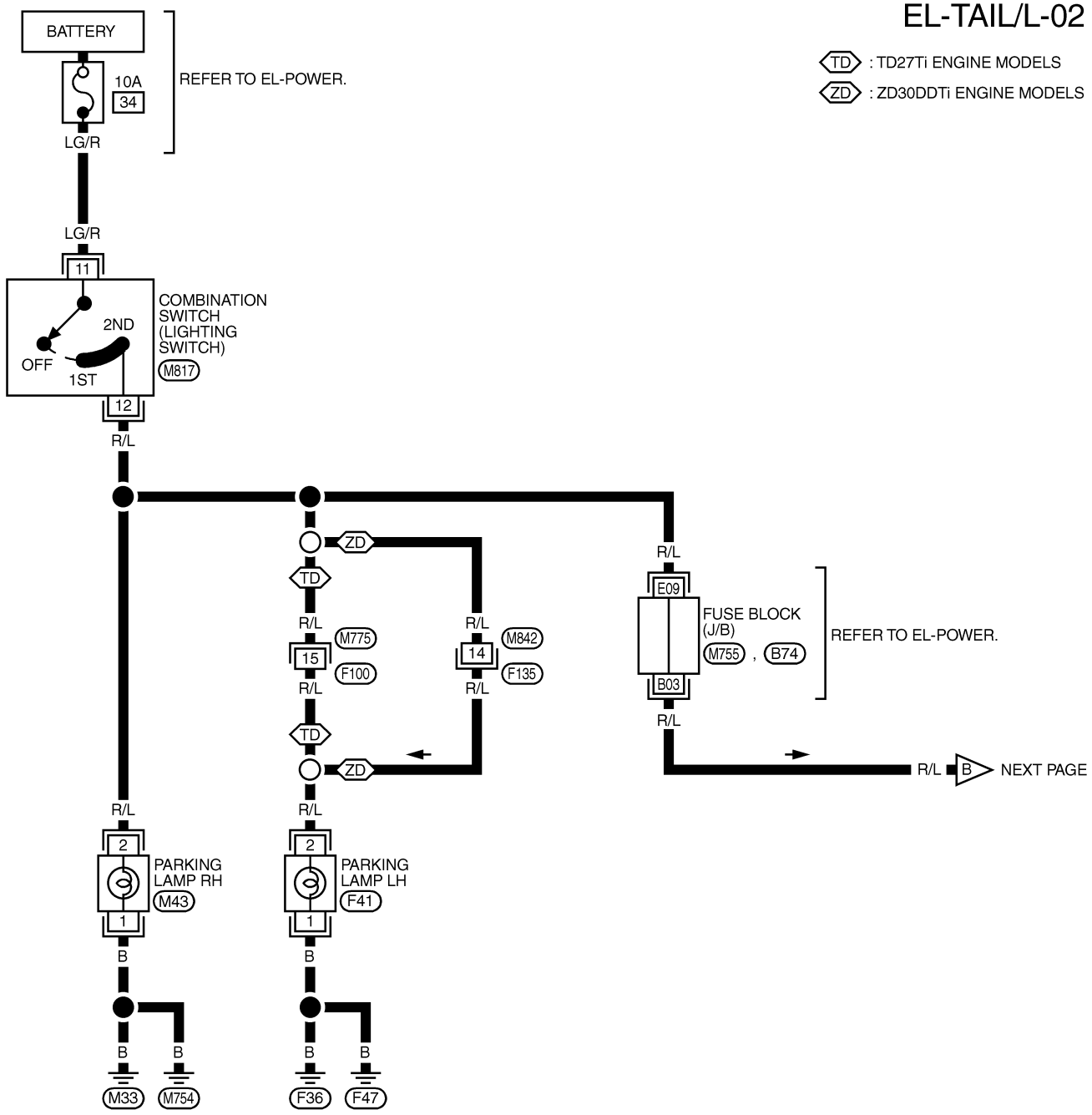


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Wiring Diagram — TAIL/L — (Cont'd)

RHD MODELS

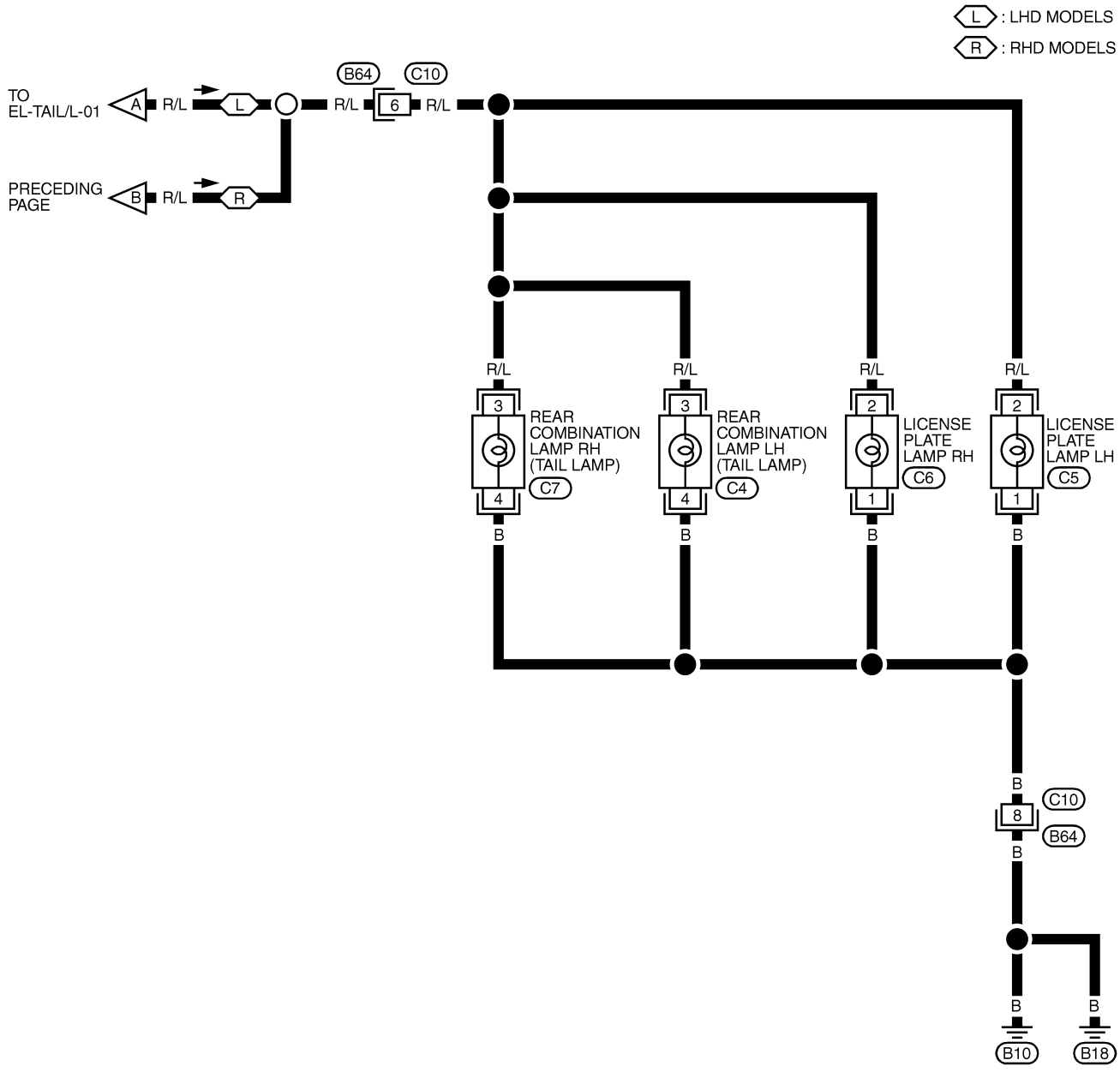


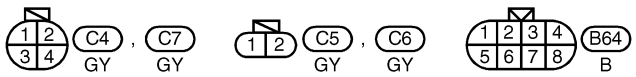
YEL072D

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Wiring Diagram — TAIL/L — (Cont'd)

EL-TAIL/L-03



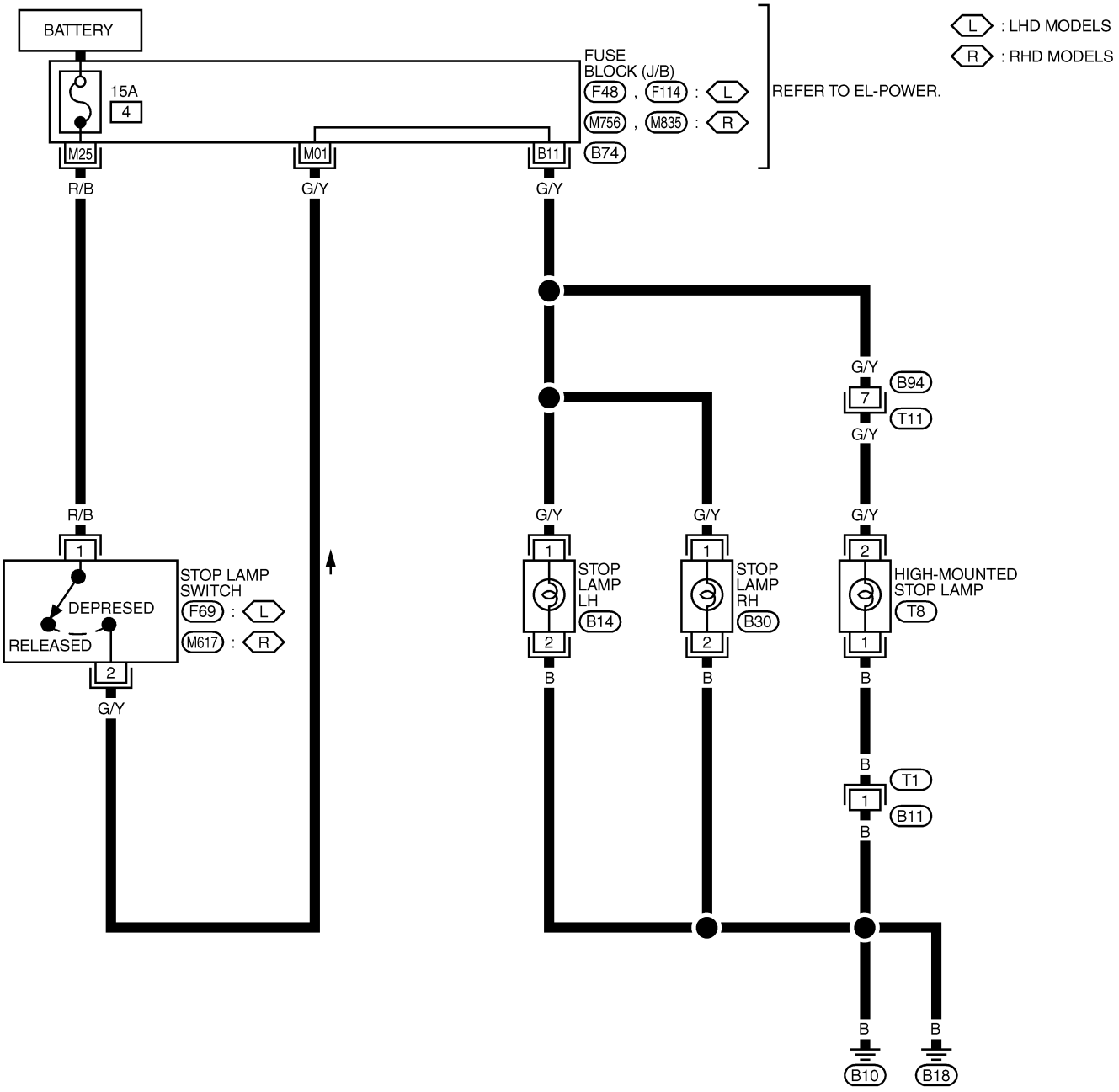


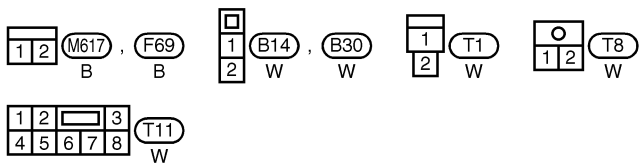
YEL073D

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Wiring Diagram — STOP/L —

EL-STOP/L-01





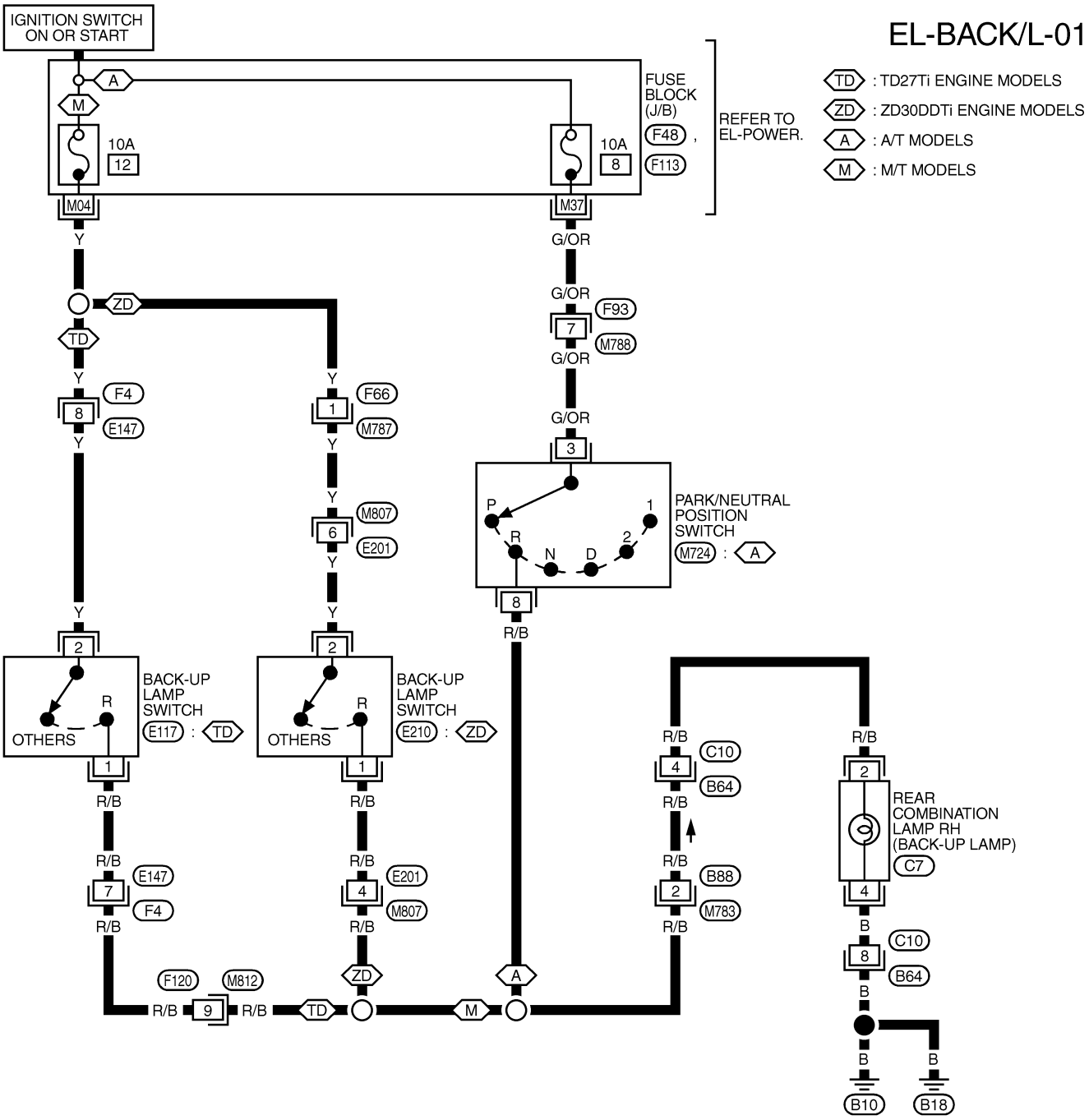
REFER TO THE FOLLOWING.
M756 , M835 , F48 , F114 , B74 -FUSE BLOCK-JUNCTION BOX (J/B)

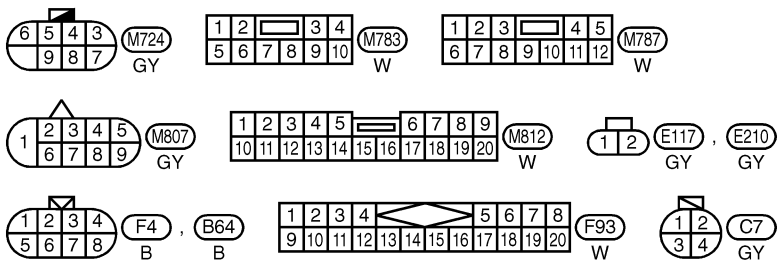
YEL074D

http://vnx.su/

Wiring Diagram — BACK/L —

LHD MODELS





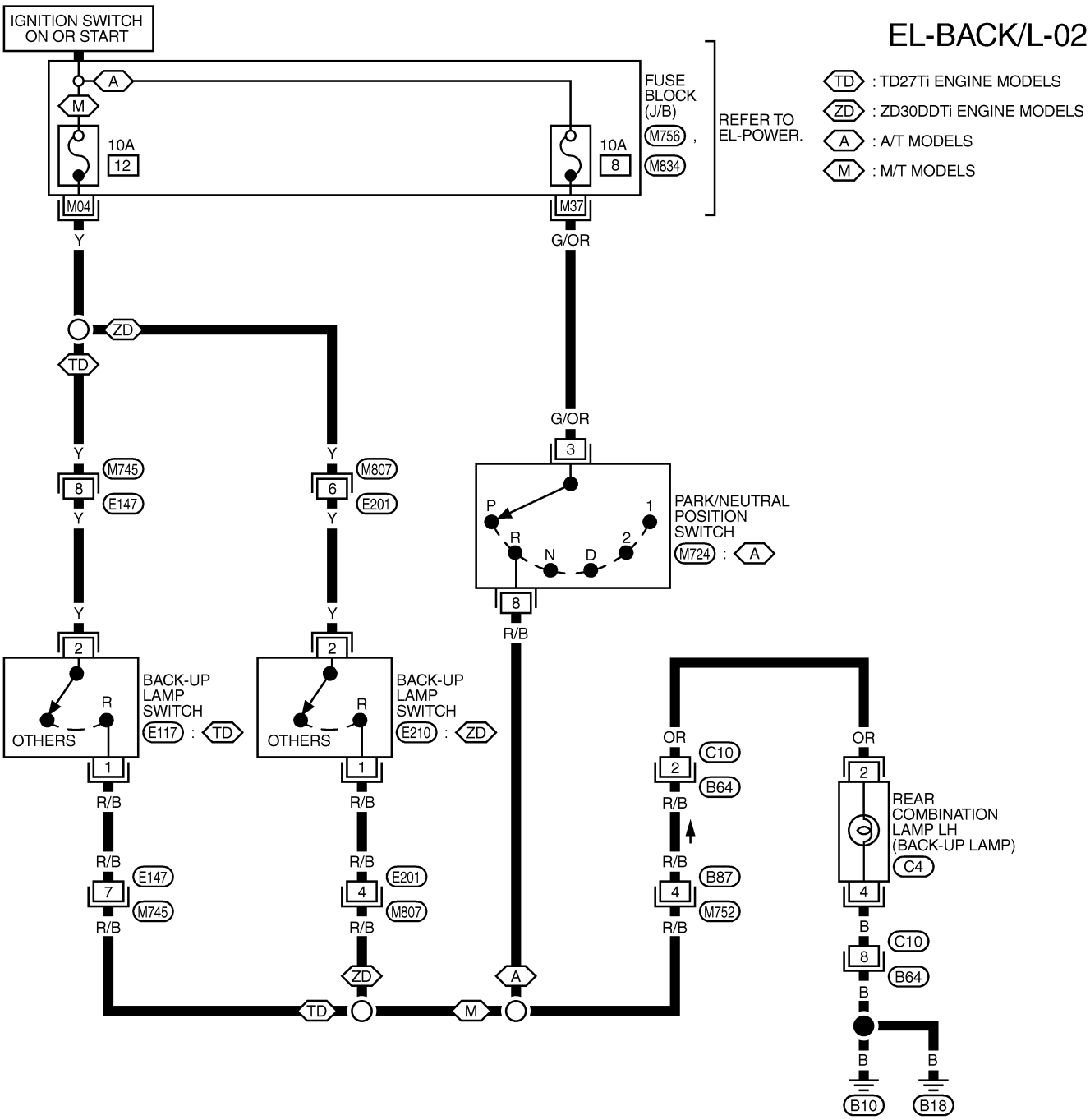
REFER TO THE FOLLOWING.
F48 , F113 -FUSE BLOCK-JUNCTION BOX (J/B)

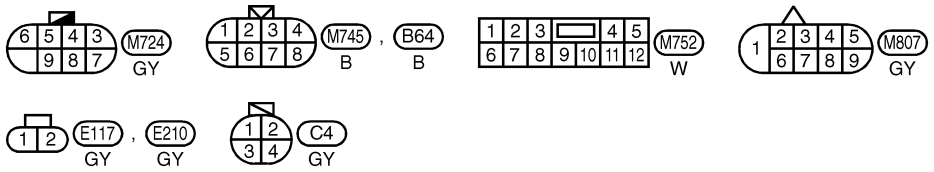
YEL075D

http://vnx.su/

Wiring Diagram — BACK/L — (Cont'd)

RHD MODELS





REFER TO THE FOLLOWING.
M756 , M834 -FUSE BLOCK-JUNCTION BOX (J/B)

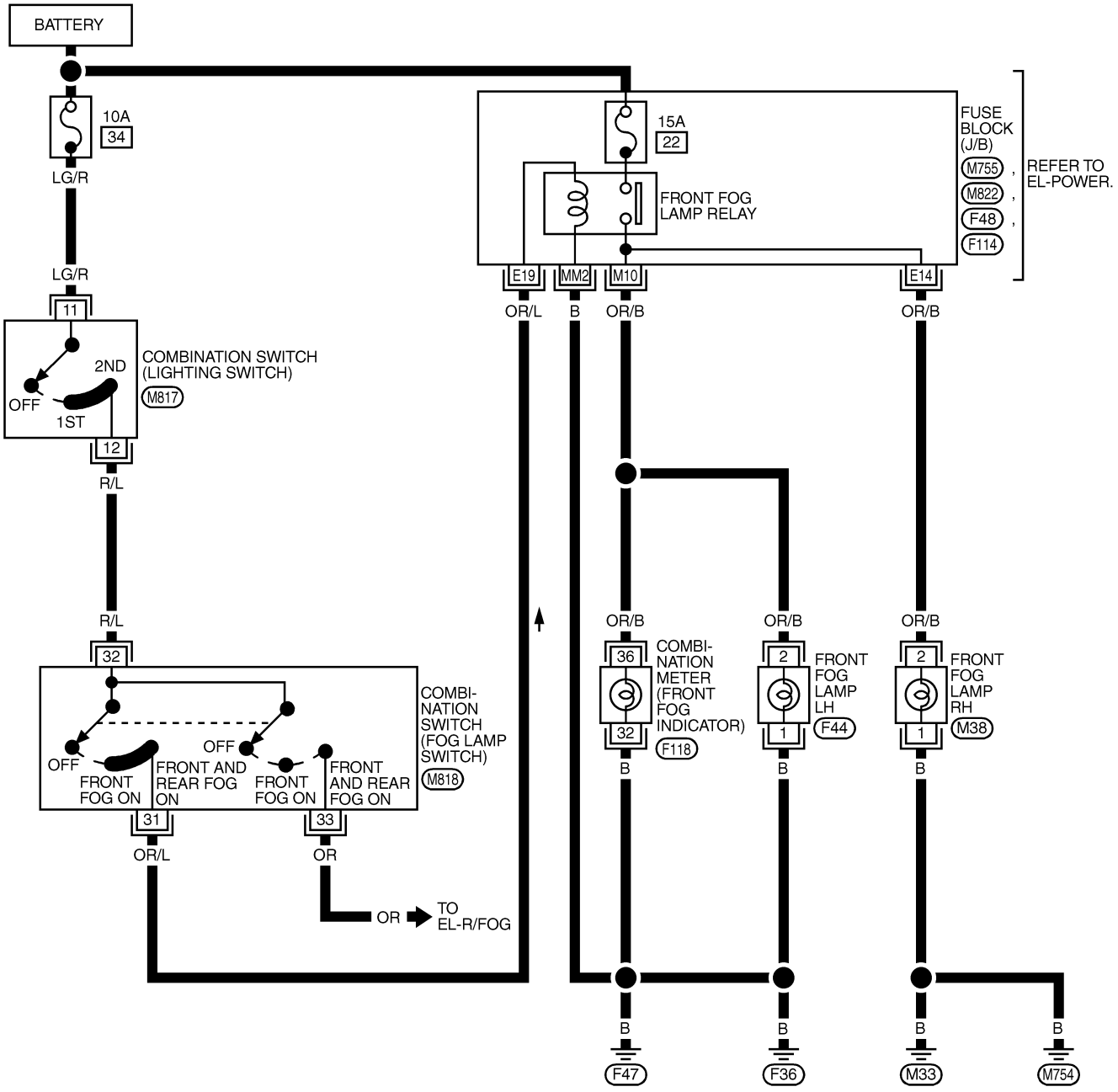
YEL076D

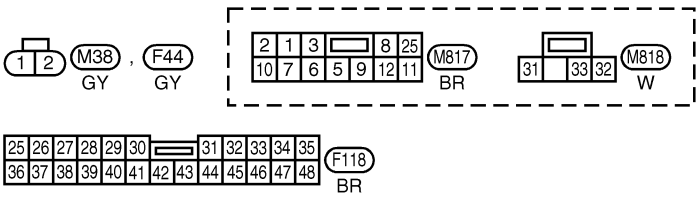
http://vnx.su/

Wiring Diagram — F/FOG —

LHD MODELS

EL-F/FOG-01





REFER TO THE FOLLOWING.
M755 , M822 , F48 , F114
-FUSE BLOCK-
JUNCTION BOX (J/B)

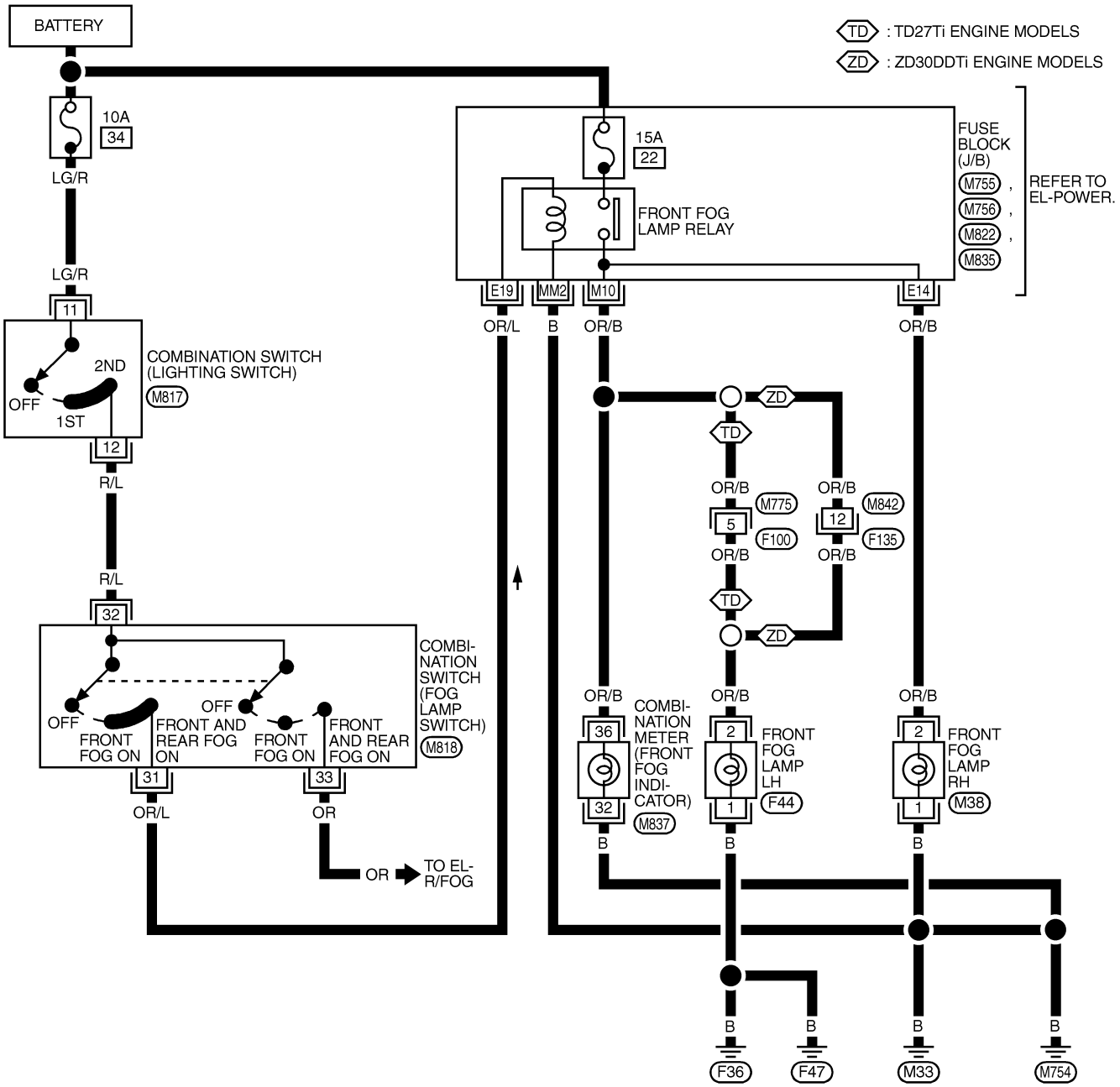
YEL735E

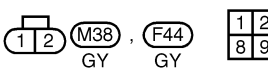
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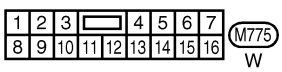
Wiring Diagram — F/FOG — (Cont'd)

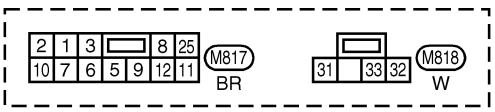
RHD MODELS

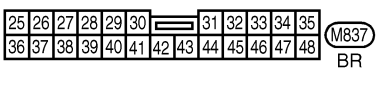
EL-F/FOG-02











REFER TO THE FOLLOWING.
F135 -SUPER MULTIPLE JUNCTION (SMJ)
M755 , M756 , M822 , M835
-FUSE BLOCK- JUNCTION BOX (J/B)

YEL736E

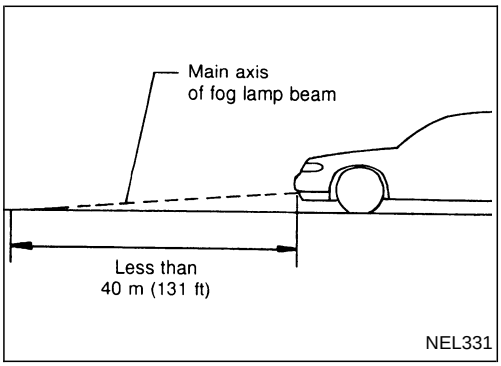
http://vnx.su/

Front Fog Lamp Aiming Adjustment

When performing fog lamp aiming adjustment, use an aiming machine, aiming wall screen or headlamp tester. The aimer should be in good operational condition, calibrated and used according to the relevant operation manuals supplied with the unit.
If an aimer is not available, aiming adjustment can be done as follows:
For details, refer to the regulations in your own country.

CAUTION:
- **Keep all tires inflated to correct pressures.**
- **Place vehicle and tester on one and the same flat surface.**
- **Ensure that there is no-load in the vehicle other than coolant, engine oil (filled up to correct level), full fuel tank and the driver (or equivalent weight placed in driver's position).**

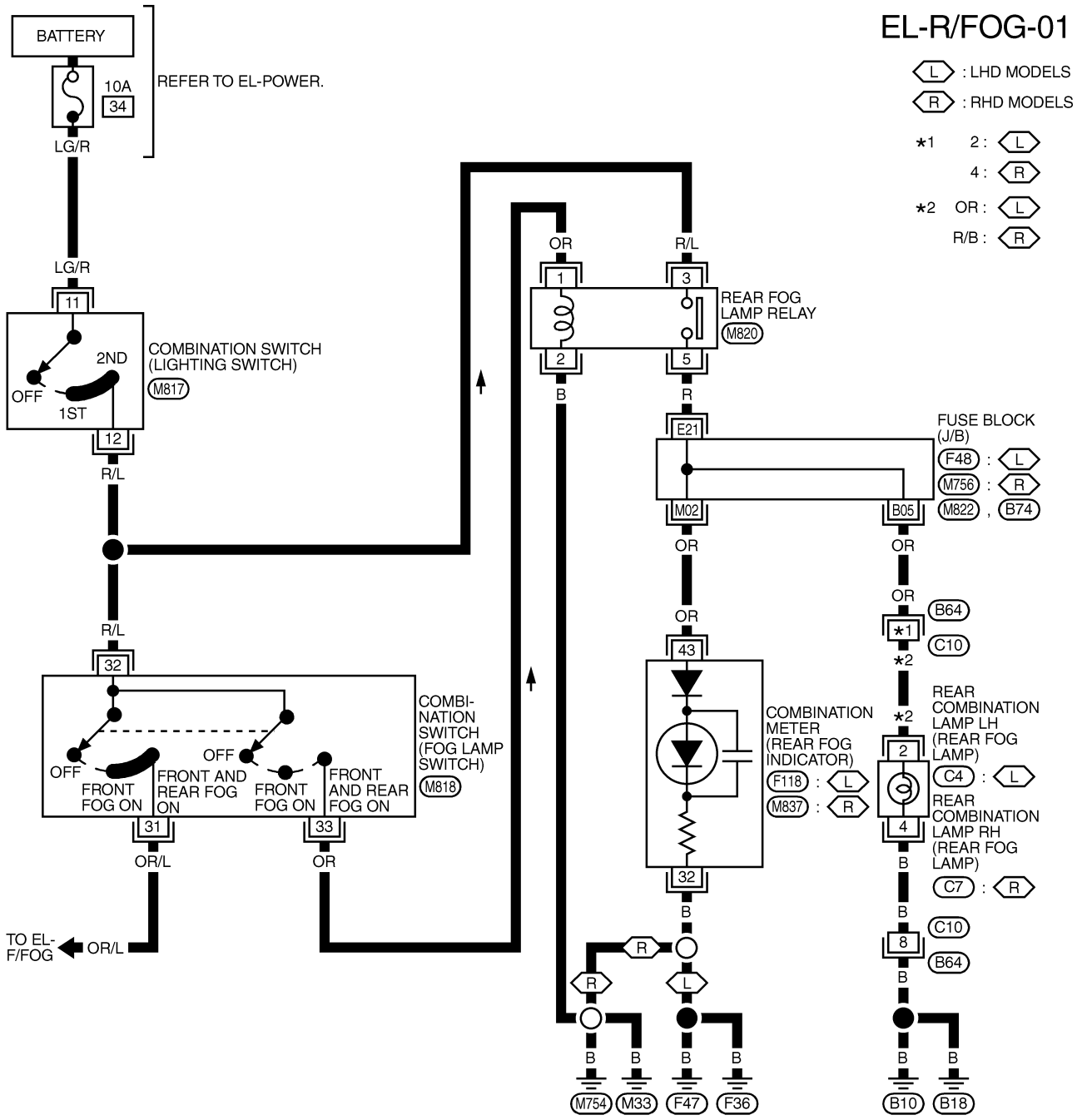
For details of front fog lamp aiming adjustment, refer to "Aiming Adjustment", EL-47.

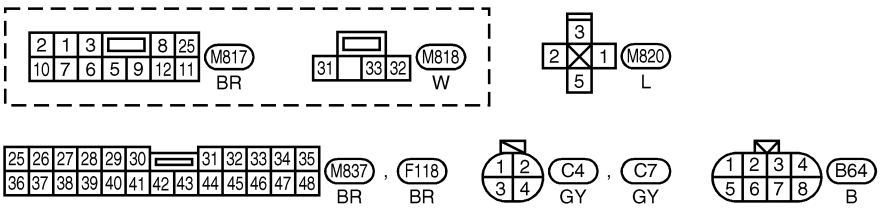


Check the distance between the vehicle and the ground illumination point of the main axis of the fog lamp beam. Keep the distance to approximately 40 m (131 ft).

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Wiring Diagram — R/FOG —





REFER TO THE FOLLOWING.
M756 , M822 , F48 , B74
-FUSE BLOCK-
JUNCTION BOX (J/B)

YEL737E

http://vnx.su/

System Description

TURN SIGNAL OPERATION

Power is supplied at all times
- through 10A fuse [No. 5, located in fuse block (J/B)]
- to time control unit terminal U09, and

With the ignition switch in the ON or START position, power is supplied
- through 10A fuse [No. 26, located in fuse block (J/B)]
- to time control unit terminal U01

Ground is supplied to time control unit terminal U16
- through fuse block (J/B) terminal MM2
- through body grounds F36 and F47 (LHD models) or
- through body grounds M33 and M754 (RHD models).

LH Turn

When the turn signal switch is turned to the L position, ground is supplied from body grounds M33 and M754
- to time control unit terminal U02
- through fuse block (J/B) terminal E03
- through turn signal switch terminals 3 and 1

With ground is supplied, time control unit controls the flashing of the LH turn signal lamps.
Power is supplied from time control unit terminal U15
- to front turn signal lamp LH terminal 2,
- to side turn signal lamp LH terminal 2 and
- to rear combination lamp LH terminal 1

Ground is supplied to the front turn signal lamp LH terminal 1 through body grounds F36 and F47.
Ground is supplied to the side turn signal lamp LH terminal 1 through body grounds F36 and F47.
Ground is supplied to the rear combination lamp LH terminal 4 through body grounds B10 and B18.

RH Turn

When the turn signal switch is turned to the R position, ground is supplied from body grounds M33 and M754
- to time control unit terminal U04
- through fuse block (J/B) terminal E18
- through turn signal switch terminals 2 and 1

With ground is supplied, time control unit controls the flashing of the RH turn signal lamps.
Power is supplied from time control unit terminal U11
- to front turn signal lamp RH terminal 2,
- to side turn signal lamp RH terminal 2 and
- to rear combination lamp RH terminal 1

Ground is supplied to the front turn signal lamp RH terminal 1 through body grounds M33 and M754.
Ground is supplied to the side turn signal lamp RH terminal 1 through body grounds M33 and M754.
Ground is supplied to the rear combination lamp RH terminal 4 through body grounds B10 and B18.

HAZARD LAMP OPERATION

With the hazard switch in the ON position, ground is supplied from body grounds F36, F47 (LHD models) or M33, M754 (RHD models)
- to time control unit terminal U05
- through fuse block (J/B) terminal M46
- through hazard switch terminals 17 and 19

With ground is supplied, time control unit controls the flashing of the hazard warning lamps.
Power is supplied from time control unit terminal U15
- to front turn signal lamp LH terminal 2,
- to side turn signal lamp LH terminal 2 and
- to rear combination lamp LH terminal 1

Power is supplied from time control unit terminal U11
- to front turn signal lamp RH terminal 2,
- to side turn signal lamp RH terminal 2 and
- to rear combination lamp RH terminal 1

Ground is supplied to terminal 1 of each front turn signal lamp through body grounds F36, F47 (LHD models) or M33, M754 (RHD models).
Ground is supplied to terminal 1 of each side turn signal lamp through body grounds F36, F47 (LHD models)

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System Description (Cont'd)

or M33, M754 (RHD models).
Ground is supplied to terminal 4 of each rear combination lamp through body grounds B10 and B18.
With power and ground supplied, the time control unit controls the flashing of the hazard warning lamps, and time control unit supplies power to combination meter terminals 7 or 33, to flash hazard warning indicator.

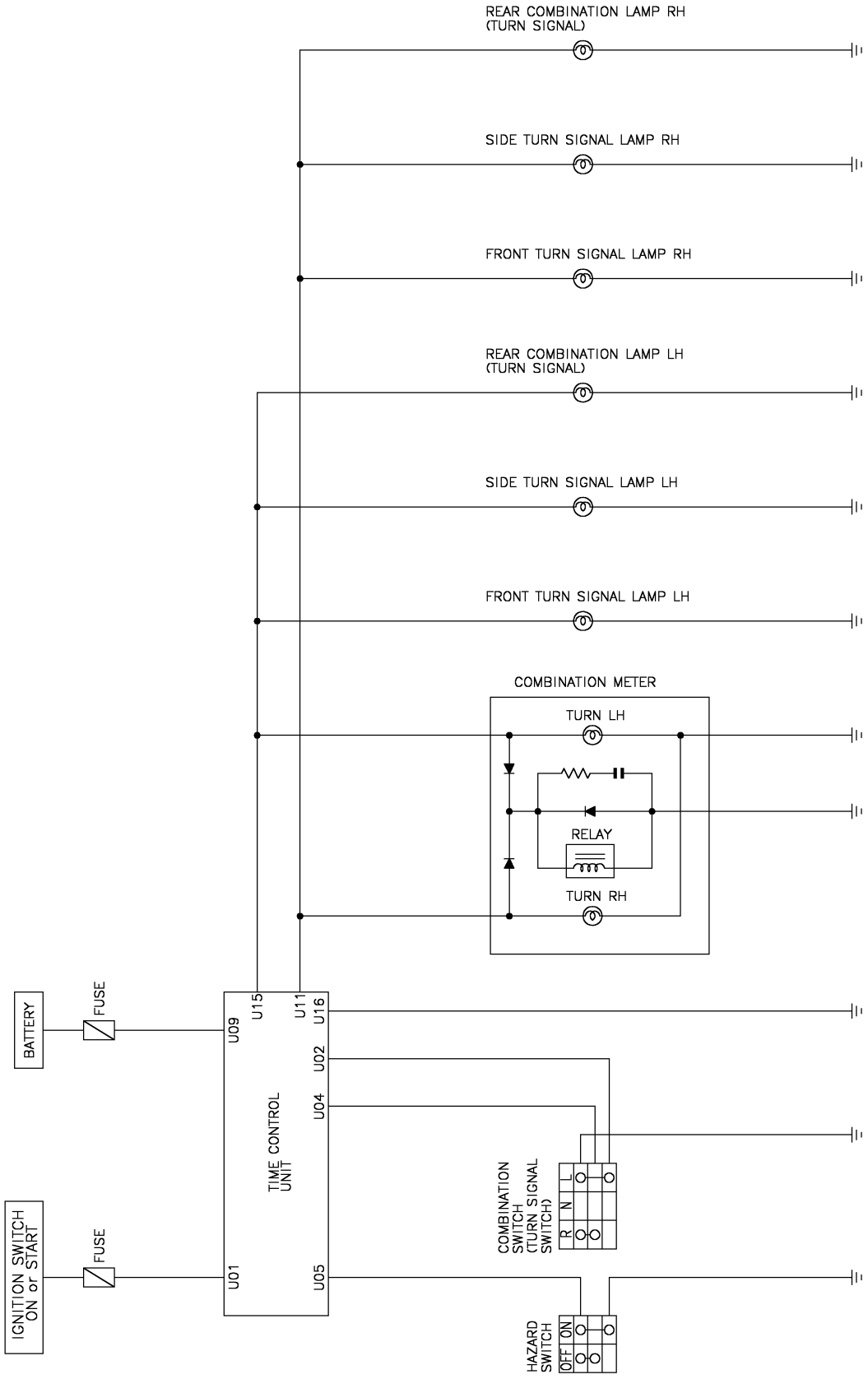
HAZARD REMINDER OPERATION FOR MULTI-REMOTE CONTROL SYSTEM

When the doors are locked or unlocked by multi-remote controller, time control unit controls turn lamps hazard reminder flashes as follows.

- Locked operation: Flash once
- Unlock operation: Flash twice

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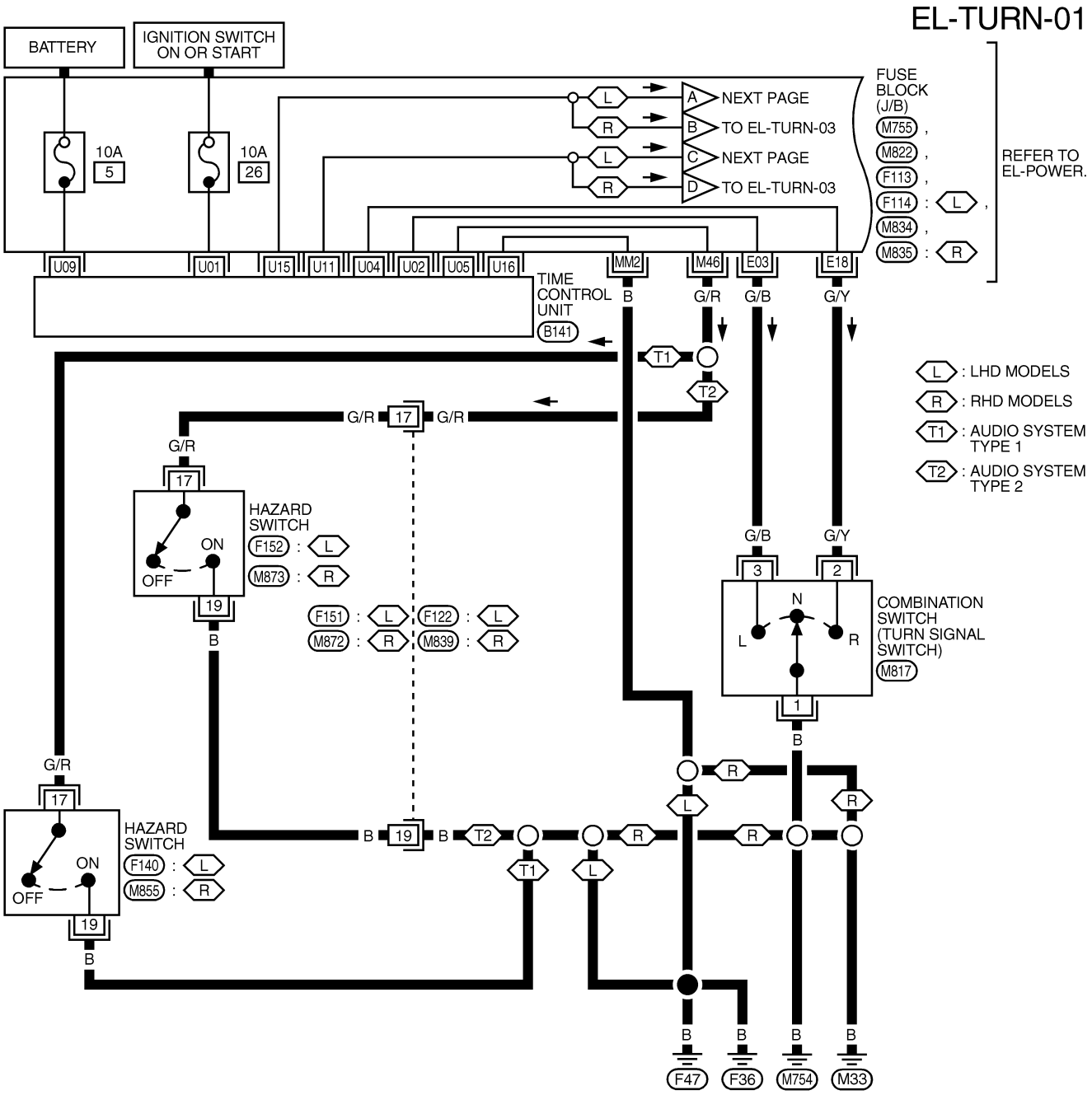
Schematic

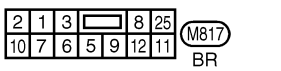


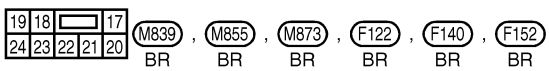
YEL089D

http://vnx.su/

Wiring Diagram — TURN —









*: THIS CONNECTOR IS NOT SHOWN IN "HARNESS LAYOUT" , EL SECTION.

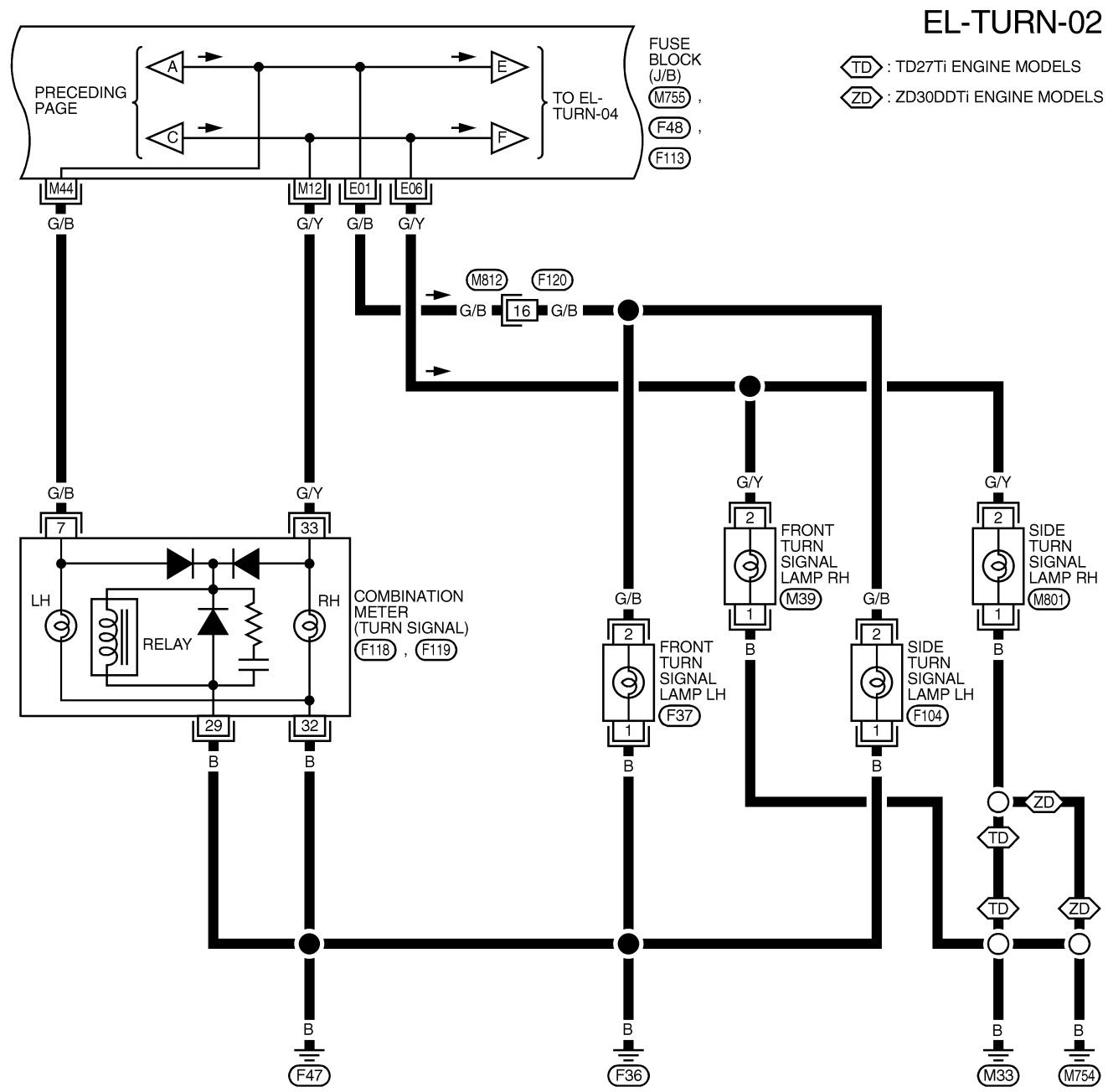
REFER TO THE FOLLOWING.
M755 , M822 , M834 , M835 , F113 , F114 -FUSE BLOCK- JUNCTION BOX (J/B)

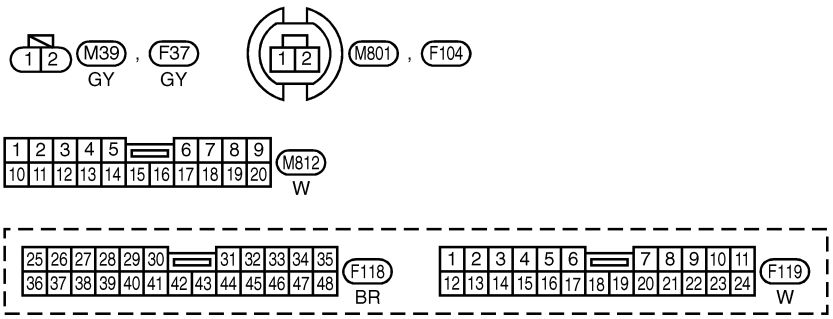
YEL759E

http://vnx.su/

Wiring Diagram — TURN — (Cont'd)

LHD MODELS





REFER TO THE FOLLOWING.
M755 , F48 , F113
-FUSE BLOCK-
JUNCTION BOX (J/B)

YEL091D

http://vnx.su/

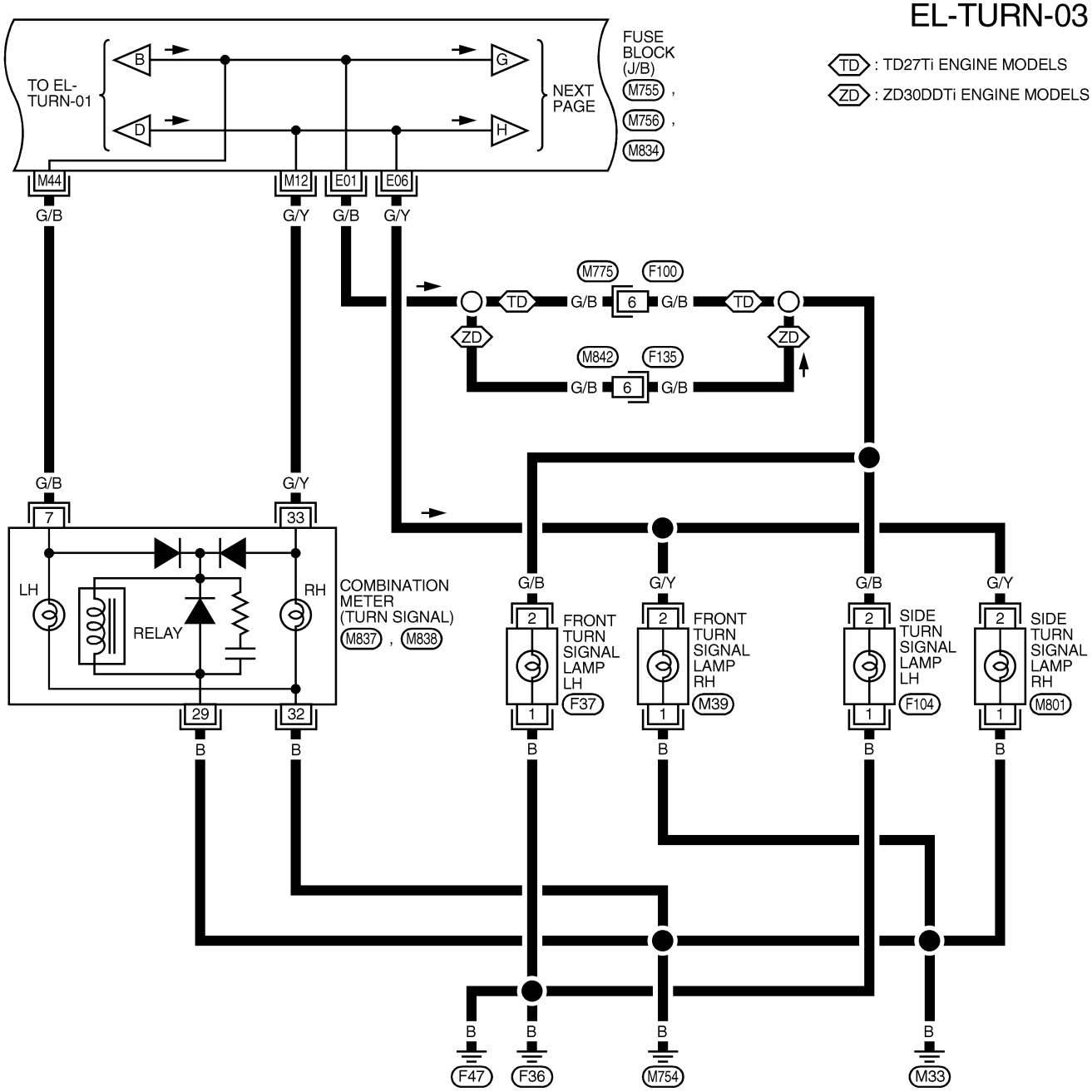
Wiring Diagram — TURN — (Cont'd)

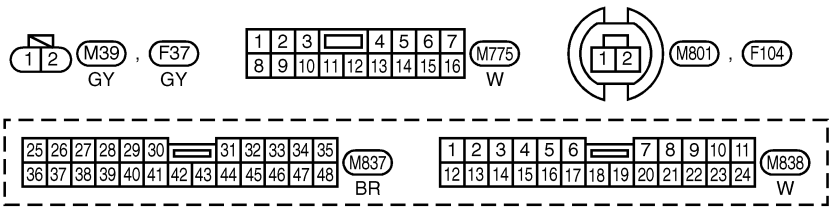
RHD MODELS

EL-TURN-03

TD : TD27Ti ENGINE MODELS

ZD : ZD30DDTi ENGINE MODELS



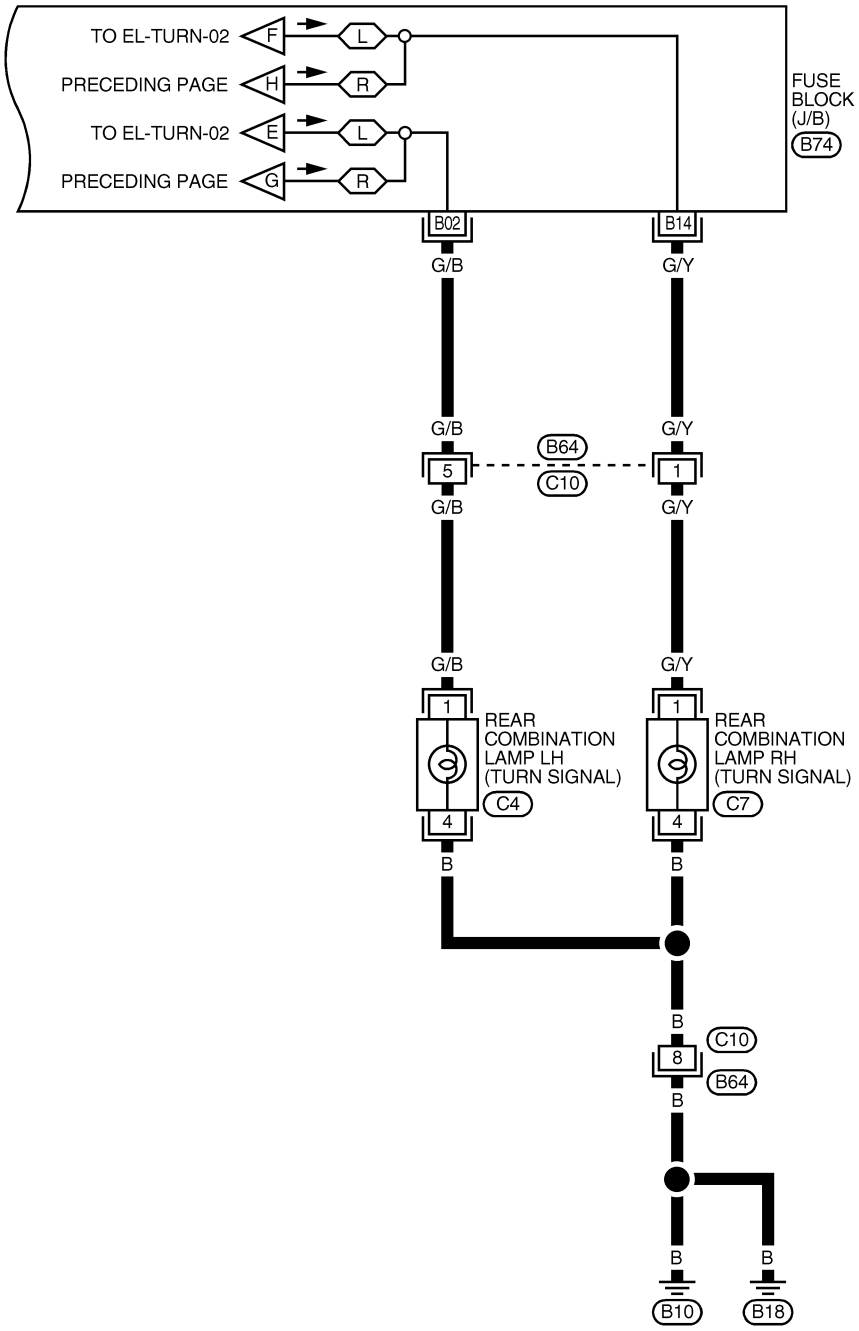


REFER TO THE FOLLOWING.
F135 -SUPER MULTIPLE JUNCTION (SMJ)
M755 , M756 , M834
-FUSE BLOCK-
JUNCTION BOX (J/B)

YEL092D

http://vnx.su/

Wiring Diagram — TURN — (Cont'd)



C4 GY , C7 GY

B64 B

REFER TO THE FOLLOWING.
B74 -FUSE BLOCK-
JUNCTION BOX (J/B)

YEL093D

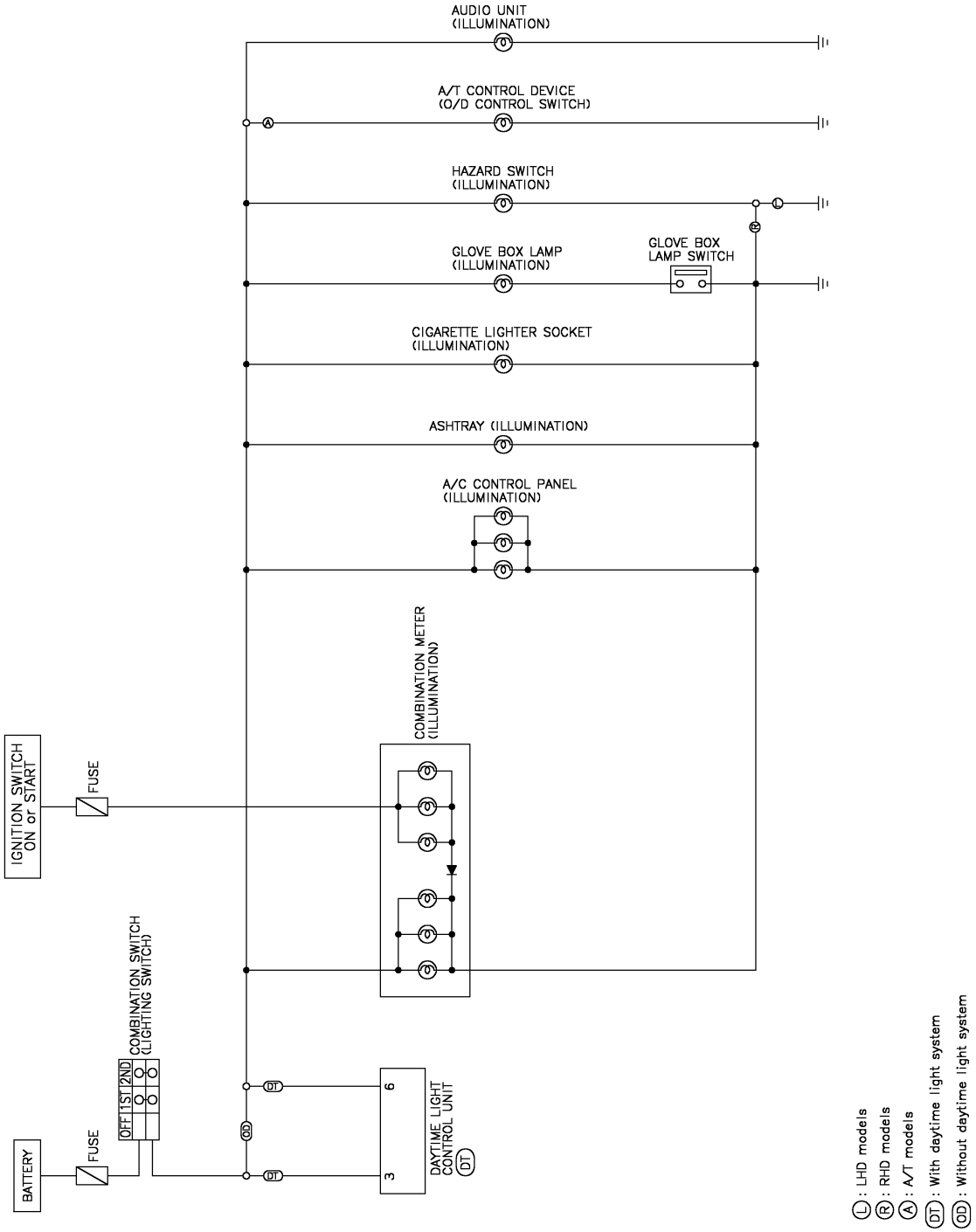
http://vnx.su/

Trouble Diagnoses

Symptom	Possible cause	Repair order
Turn signal and hazard warning lamps do not operate.	1. Time control unit 2. Time control unit circuit	1. Check power door lock operation. 2. Check power supply and ground circuit for time control unit.
Turn signal lamps do not operate but hazard warning lamps operate.	1. Turn signal switch 2. Open in turn signal switch circuit	1. Check turn signal switch. 2. Check turn signal switch ground for open circuit.
Hazard warning lamps do not operate but turn signal lamps operate.	1. Hazard switch 2. Open in hazard switch circuit	1. Check hazard switch. 2. Check the following. ● Harness for open or short between time control unit and hazard switch ● Hazard switch ground for open circuit
Front turn signal lamp LH or RH does not operate.	1. Bulb 2. Open in front turn signal lamp circuit	1. Check bulb. 2. Check power supply and ground circuit for front turn signal lamp.
Side turn signal lamp LH or RH does not operate.	1. Bulb 2. Open in side turn signal lamp circuit	1. Check bulb. 2. Check power supply and ground circuit for side turn signal lamp.
Rear combination lamp LH or RH does not operate.	1. Bulb 2. Open in rear combination lamp circuit	1. Check bulb. 2. Check power supply and ground circuit for rear combination lamp.
LH and RH turn indicators do not operate.	1. Ground	1. Check grounds circuit between combination meter and body grounds.
LH or RH turn indicator does not operate.	1. Bulb 2. Open in indicator power circuit	1. Check bulb in combination meter. 2. Check circuit between combination meter and fuse block (J/B)

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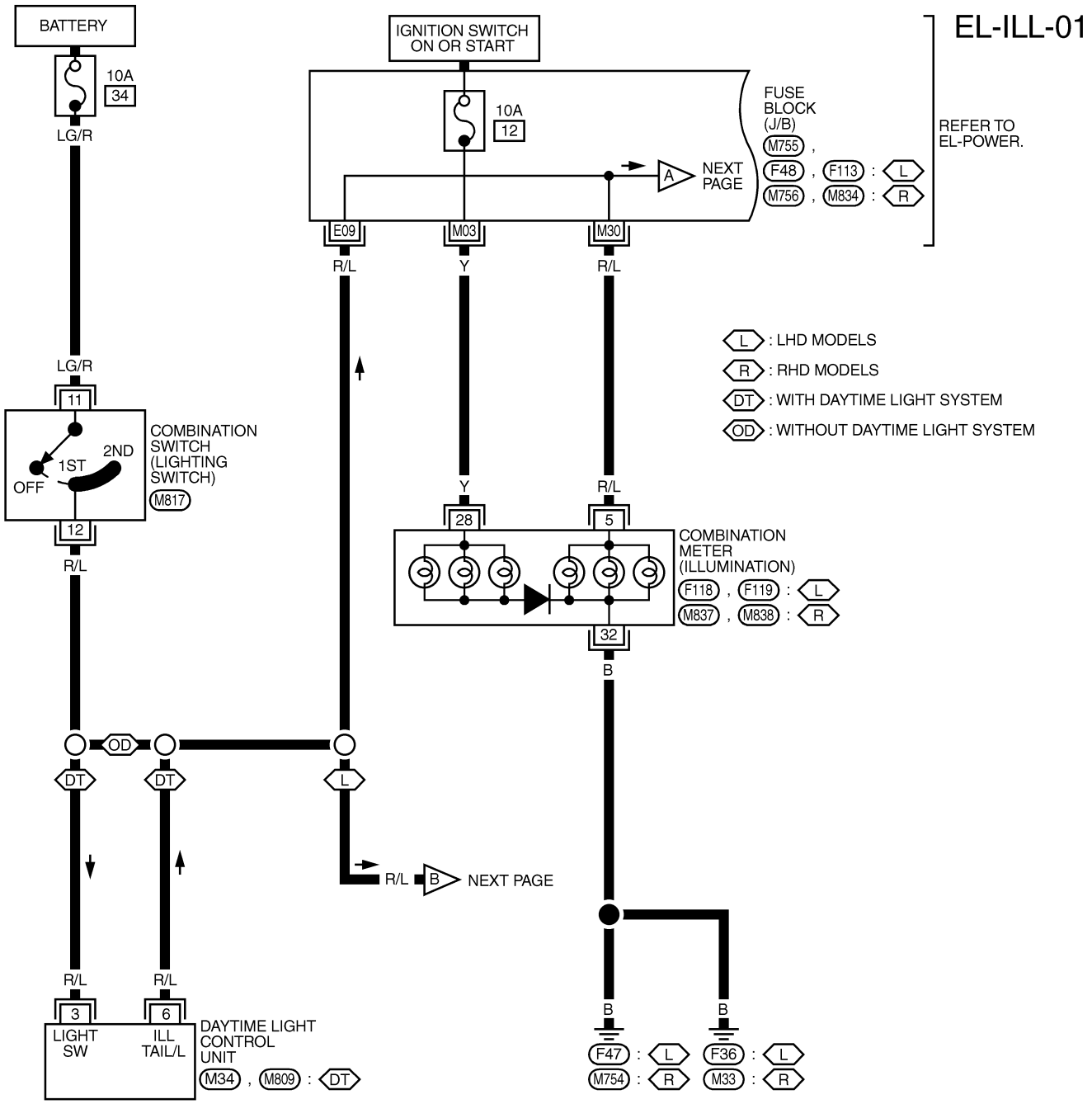
Schematic

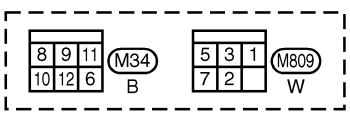


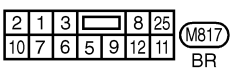
YEL738E

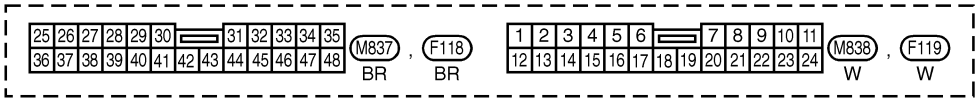
http://vnx.su/

Wiring Diagram — ILL —









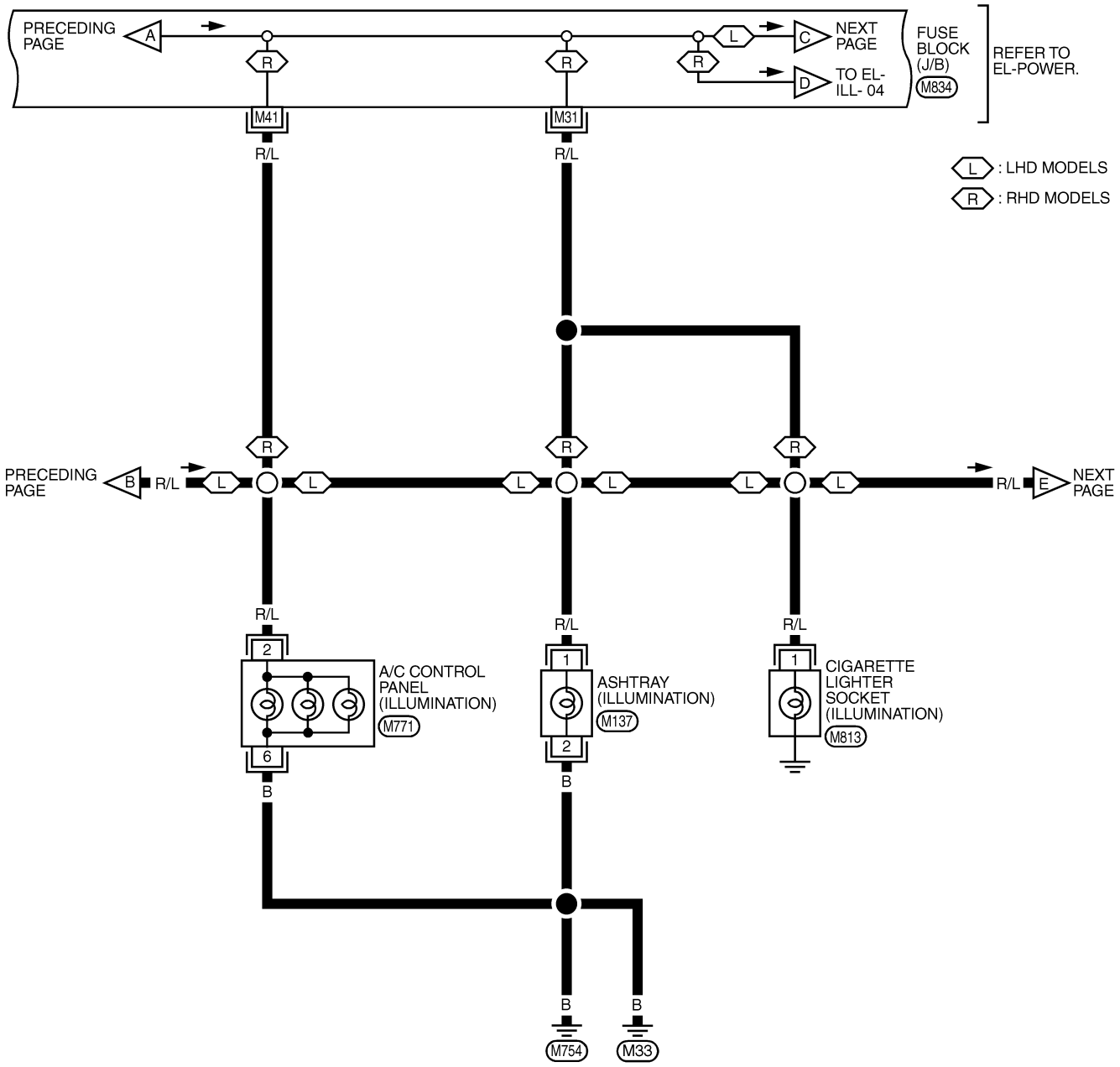
REFER TO THE FOLLOWING.
M755 , M756 , F48 , F113 ,
M834
-FUSE BLOCK-
JUNCTION BOX (J/B)

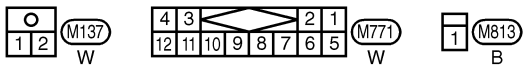
YEL739E

http://vnx.su/

Wiring Diagram — ILL — (Cont'd)

EL-ILL-02





REFER TO THE FOLLOWING.
M834 -FUSE BLOCK-
JUNCTION BOX (J/B)

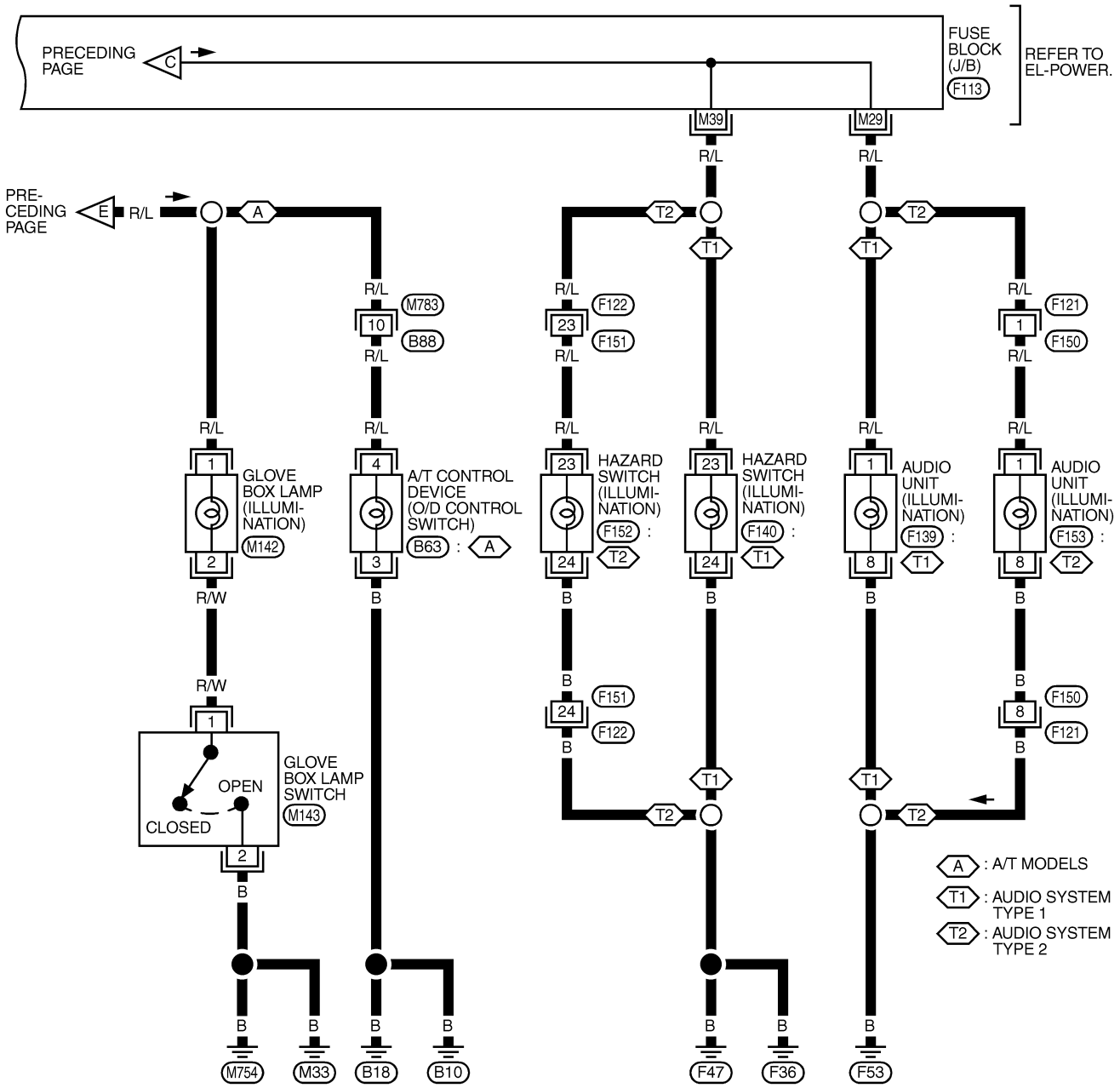
YEL740E

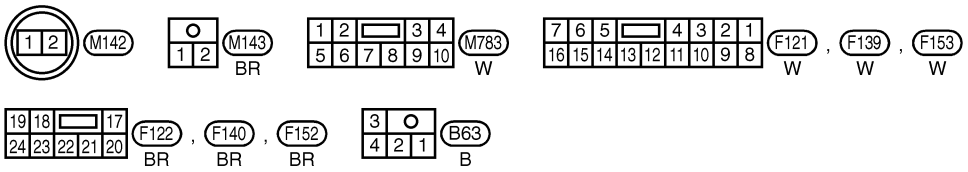
http://vnx.su/

Wiring Diagram — ILL — (Cont'd)

LHD MODELS

EL-ILL-03





REFER TO THE FOLLOWING.
F113 -FUSE BLOCK-
JUNCTION BOX (J/B)

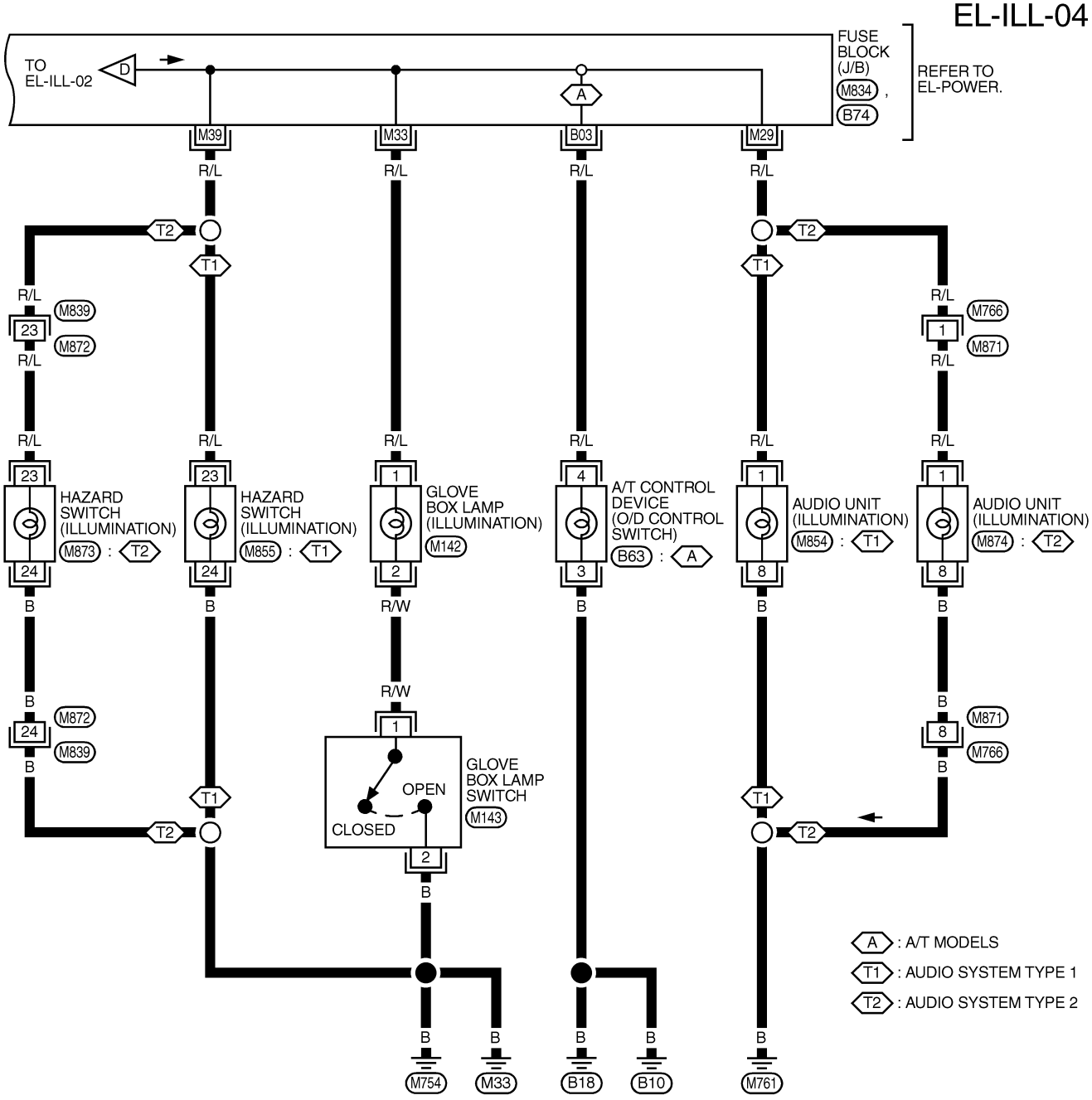
YEL760E

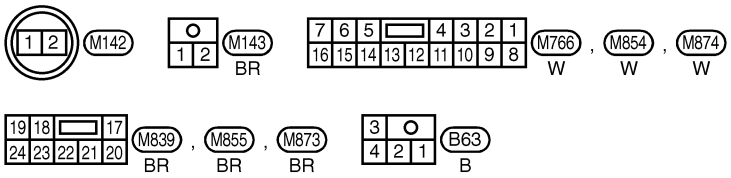
http://vnx.su/

Wiring Diagram — ILL — (Cont'd)

RHD MODELS

EL-ILL-04





REFER TO THE FOLLOWING.
M834, B74 -FUSE BLOCK-JUNCTION BOX (J/B)

YEL761E

http://vnx.su/

System Description

POWER SUPPLY AND GROUND

Power is supplied at all times:
- through 15A fuse [No. 5, located in the fuse block (J/B)]
- to time control unit terminal U09,
- through 10A fuse [No. 16, located in the fuse block (J/B)]
- to front interior lamp terminal 1,
- to rear interior lamp terminal 1 (Wagon models)
- to rear room lamp terminal 2 (Hardtop models)
- to sunroof switch and map lamps terminal 3 (with sunroof),
- to map lamp terminal 2 (without sunroof).

Ground is supplied:
- through body grounds terminals F36, F47 (LHD models) or M33, M754 (RHD models).
- through fuse block terminal MM2
- to time control unit terminal U16

When the driver side door is opened, ground is supplied:
- through driver side door switch case ground and terminal 1, and
- through fuse block terminal B07
- to time control unit terminal U06

When any door is opened, ground is supplied:
- through case ground and terminal 1 of each door switch,
- through fuse block terminal B01
- to time control unit terminal U07.

When the driver side door is unlocked by the door lock/unlock switch, the time control unit receives a ground signal:
- through body grounds B10 and B18
- to power window main switch terminal 3
- from power window main switch terminal 7
- to time control unit terminal U37.

When a signal, or combination of signals is received by the time control unit, ground is supplied:
- through time control unit terminal U12 and fuse block terminal R01
- to front interior room lamp terminal 2.
- to rear interior lamp terminal 2 (Wagon models).
- to rear interior room lamp terminal 1 (Hardtop models).

With power and ground supplied, the interior room lamps illuminate when the lamp switch is in “DOOR” position.

SWITCH OPERATION

When interior room lamp switch is in “ON” position, ground is supplied:
- through front interior lamp case ground.
- through rear interior lamp case ground (Wagon models).

When sunroof switch and map lamps (with sunroof) is ON, ground is supplied:
- through body grounds F36, F47 (LHD models) or M33, M754 (RHD models)
- through fuse block terminal MM2 and R03
- to sunroof switch map lamps terminal 2.

When map lamp (without sunroof) is ON, ground is supplied:
- through body grounds F36, F47 (LHD models) or M33, M754 (RHD models)
- through fuse block terminal MM2 and R03
- to map lamp terminal 1.

With power and ground supplied, the interior room lamps, map lamps illuminate.

INTERIOR ROOM LAMP TIMER OPERATION

When interior room lamp switch is in the “DOOR” position, the time control unit keeps the interior room lamp illuminated for about 30 seconds when:
- unlock signal is supplied from door lock/unlock switch while all doors are closed
- unlock signal is supplied from remote controller or door key cylinder while all doors are closed
- driver’s door is opened and then closed

The timer is canceled when:
- driver’s door is locked,

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System Description (Cont'd)

- driver's door is opened, or
- ignition switch is turned ON.

ON-OFF Control

When the driver side door, front passenger door, rear LH or RH door is opened, the interior room lamp turns on while the interior room lamp switch is in the "DOOR" position.

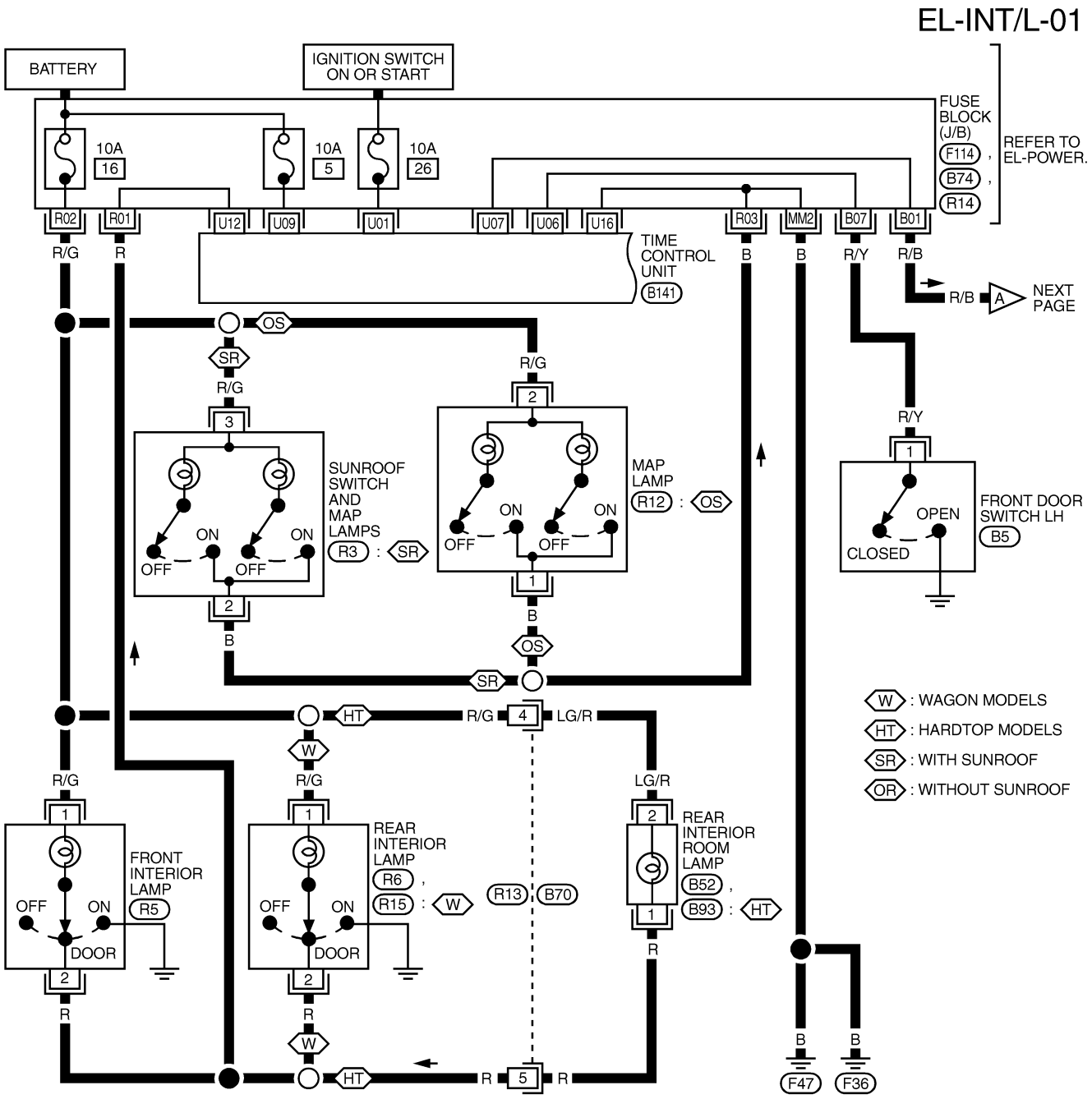
Battery Saver

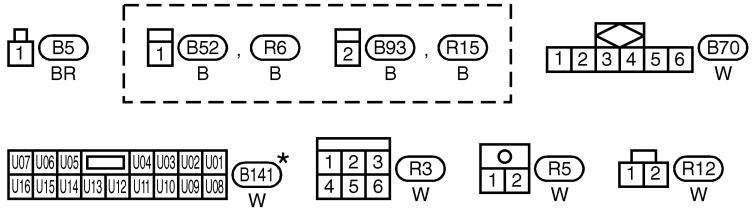
The interior room lamp is turned OFF automatically with the lamp switch in the "DOOR" position after about 30 minutes, if the lamp remains lit by the door switch open signal.

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Wiring Diagram — INT/L —

LHD MODELS





REFER TO THE FOLLOWING.
F114 , B74 , R14
-FUSE BLOCK-
JUNCTION BOX (J/B)

* : THIS CONNECTOR IS NOT SHOWN IN "HARNESS LAYOUT" , EL SECTION.

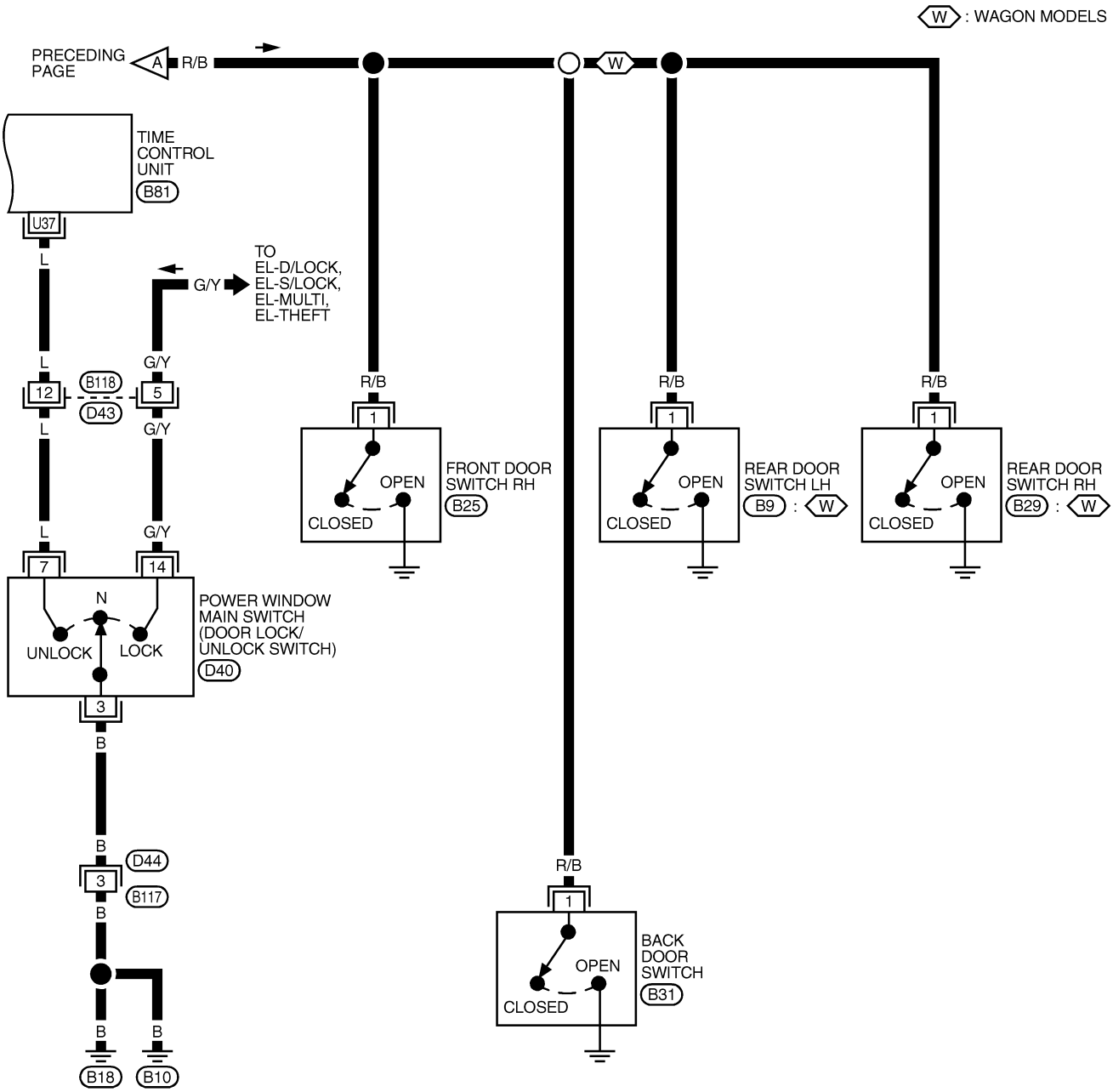
YEL860E

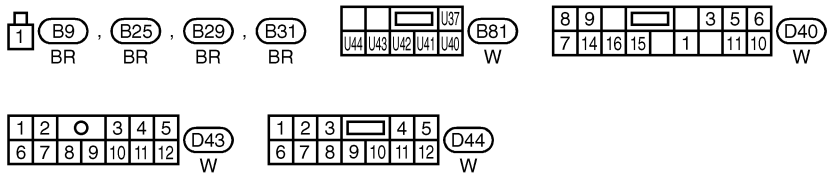
http://vnx.su/

Wiring Diagram — INT/L — (Cont'd)

LHD MODELS

EL-INT/L-02



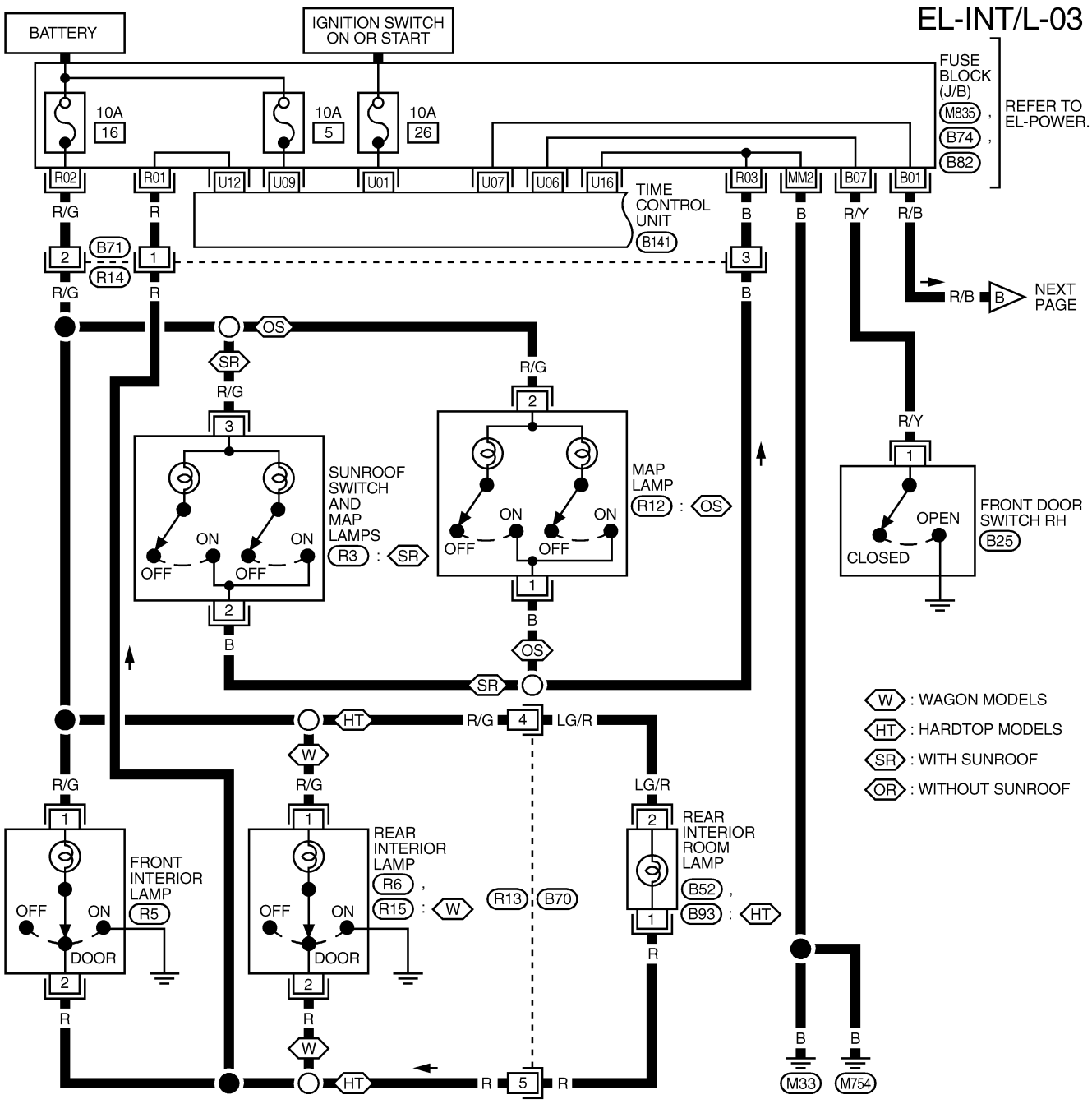


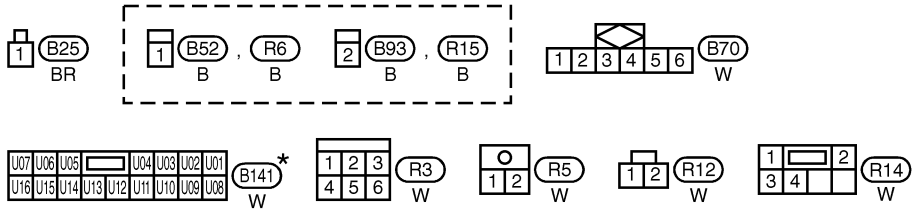
YEL861E

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Wiring Diagram — INT/L — (Cont'd)

RHD MODELS





★ : THIS CONNECTOR IS NOT SHOWN IN "HARNESS LAYOUT" , EL SECTION.

REFER TO THE FOLLOWING.
M835 , B74 , B82
-FUSE BLOCK-
JUNCTION BOX (J/B)

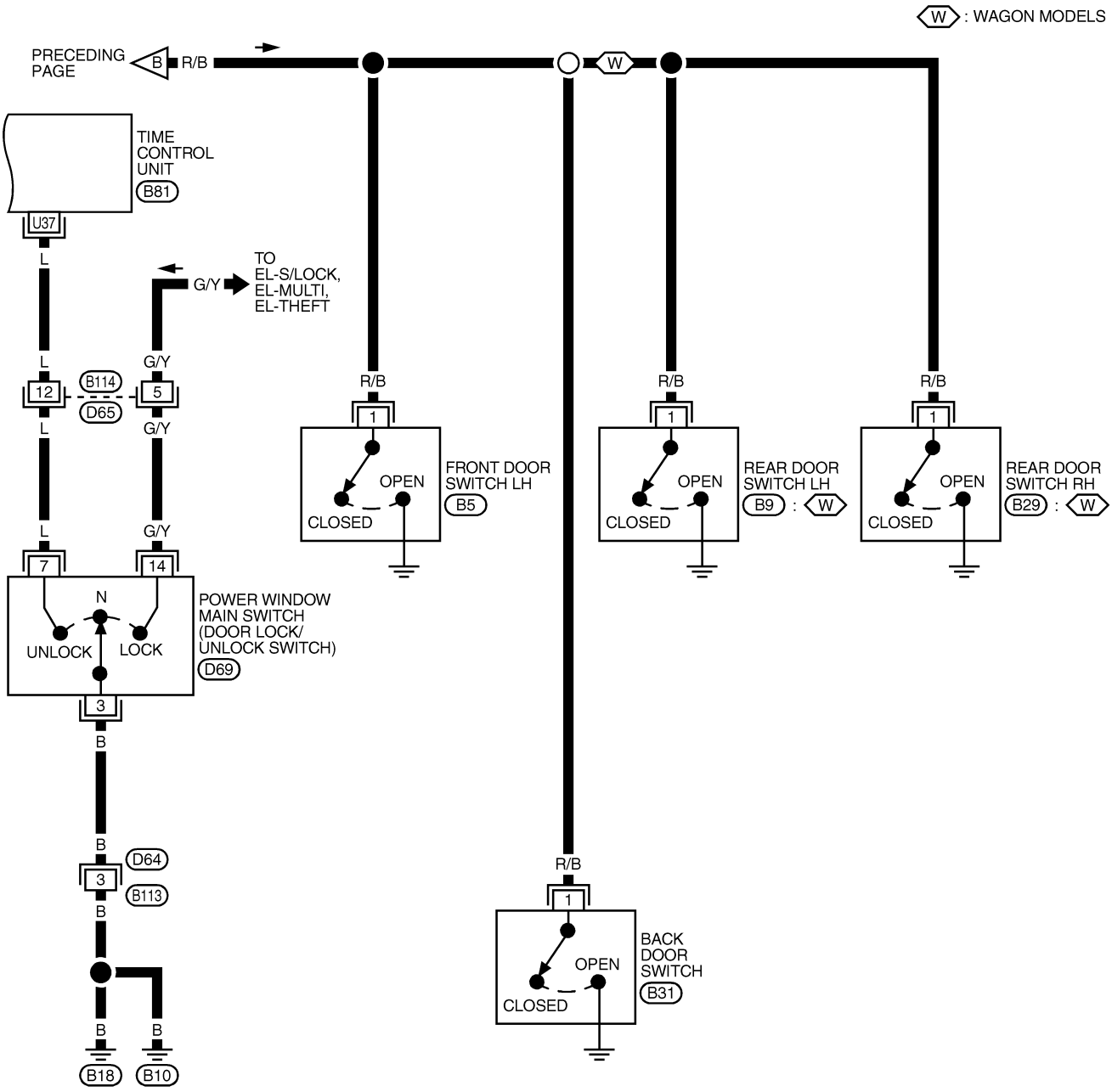
YEL862E

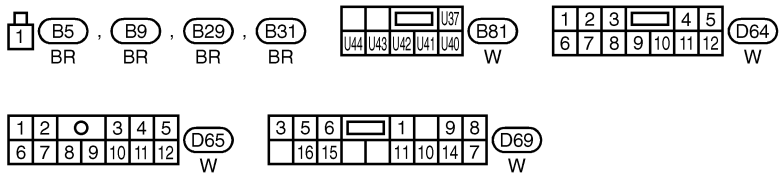
http://vnx.su/

Wiring Diagram — INT/L — (Cont'd)

RHD MODELS

EL-INT/L-04





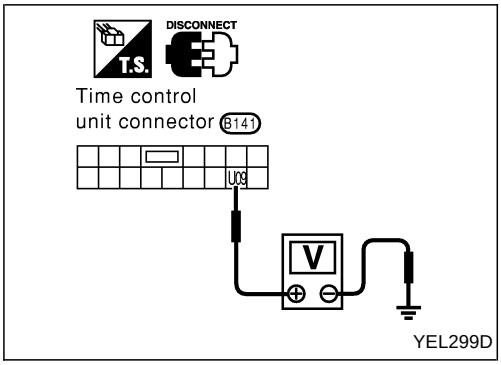
YEL863E

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Trouble Diagnoses

SYMPTOM CHART

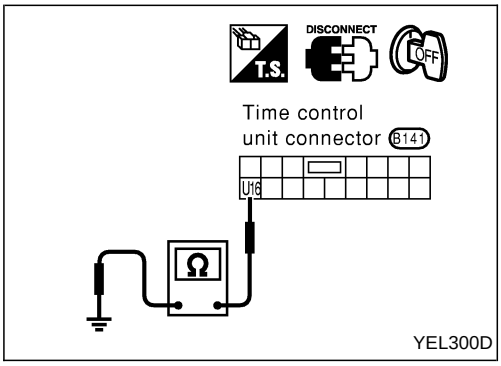
Symptom	Diagnoses service procedure
Interior room lamp timer does not operate.	1. Preliminary check. 2. Check ignition signal. 3. Check driver side door switch. 4. Check door lock/unlock switch. 5. Check other door switch.
Interior room lamp timer cannot be cancelled.	1. Preliminary check. 2. Check ignition signal. 3. Check driver side door switch. 4. Check door lock/unlock switch.



PRELIMINARY CHECK (Power supply and ground circuit check)

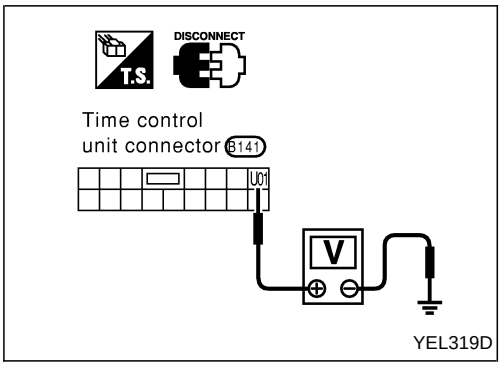
Main power supply circuit check

Terminals		Ignition switch position		
⊕	⊖	LOCK	ACC	ON
U09	Ground	Battery voltage	Battery voltage	Battery voltage



Ground circuit check

Terminals	Continuity
U16 - Ground	Yes



IGNITION SWITCH “ON” CIRCUIT CHECK

Terminals		Ignition switch position		
⊕	⊖	OFF	ACC	ON
U01	Ground	0V	0V	Battery voltage

If NG, check the following.

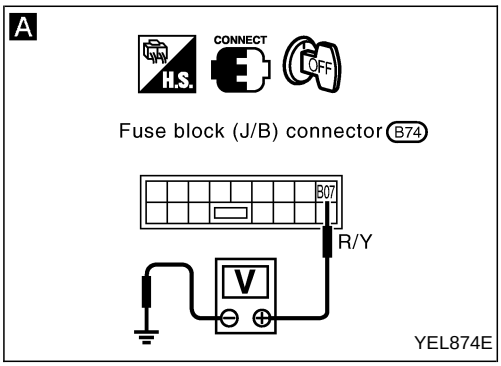
- 10A fuse [No. 26, located in the fuse block (J/B)]
- Harness for open or short

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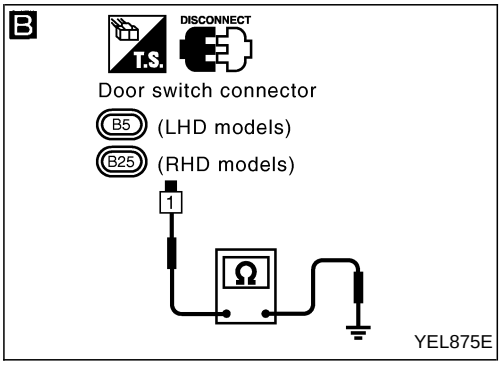
Trouble Diagnoses (Cont'd)

DRIVER SIDE DOOR SWITCH CHECK

A



B



A

CHECK DOOR SWITCH INPUT SIGNAL.
Check voltage between fuse block (J/B) and ground.

	Terminals	Condition	Voltage (V)
Driver side door	B07	Opened	0
		Closed	Approx. 12

OK → Door switch is OK.

NG ↓

B

CHECK DOOR SWITCH.
1. Disconnect door switch connector.
2. Check continuity between door switch terminal 1 and ground.

	Terminals	Condition	Continuity
Door switch	① - ground	Closed	No
		Open	Yes

NG → Replace door switch.

OK ↓

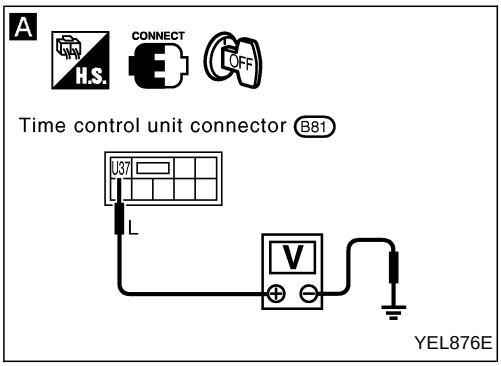
Check the following.
- Door switch case ground condition
- Harness for open or short between control unit and door switch

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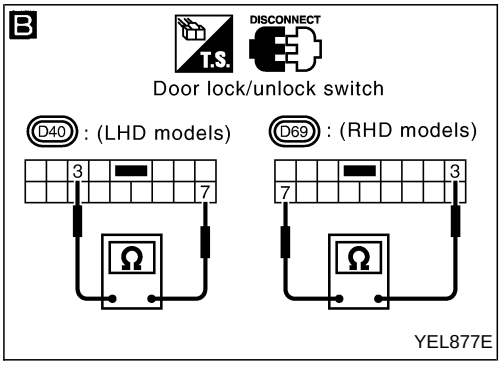
Trouble Diagnoses (Cont'd)

DOOR LOCK/UNLOCK SWITCH CHECK

A



B



A

CHECK DOOR LOCK/UNLOCK SWITCH INPUT SIGNAL.
Check voltage between time control unit connector terminal (U37) and ground.

Terminals		Condition	Voltage (V)
⊕	⊖		
U37	Ground	Locked	Approx. 12 (Approx. 20 sec.)
		Unlocked	0

OK → Door lock/unlock switch is OK.

NG ↓

B

CHECK DOOR LOCK/UNLOCK SWITCH.
1. Disconnect door lock/unlock switch connector.
2. Check continuity between door lock/unlock switch terminals.

Terminals	Condition	Continuity
⑦ - ③	Locked	No
	Unlocked	Yes

NG → Replace door lock/unlock switch.

OK ↓

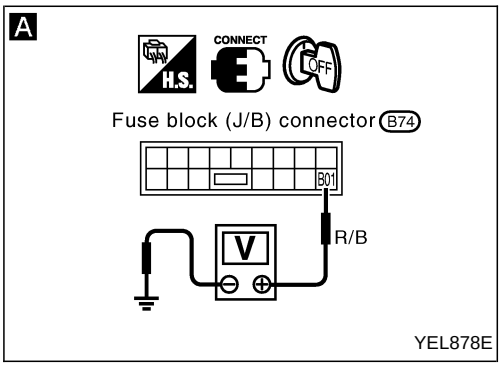
Check the following:
- Door lock/unlock switch ground circuit.
- Harness for open or short-circuit between control unit and door lock/unlock switch

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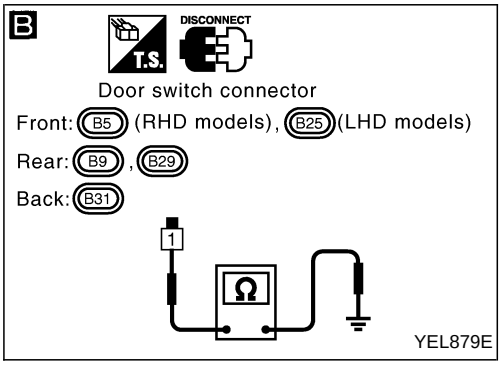
Trouble Diagnoses (Cont'd)

OTHER DOOR SWITCH CHECK

A



B



A

CHECK DOOR SWITCH INPUT SIGNAL.
Check voltage between fuse block (J/B) and ground.

	Terminals	Condition	Voltage (V)
Other door	B01	Opened	0
		Closed	Approx. 12

OK → Door switch is OK.

NG ↓

B

CHECK DOOR SWITCH.
1. Disconnect door switch connector.
2. Check continuity between door switch terminals.

	Terminals	Condition	Continuity
Other door switches	① - ground	Closed	No
		Open	Yes

NG → Replace door switch.

OK ↓

Check the following.
- Door switch ground condition
- Harness for open or short between control unit and door switch

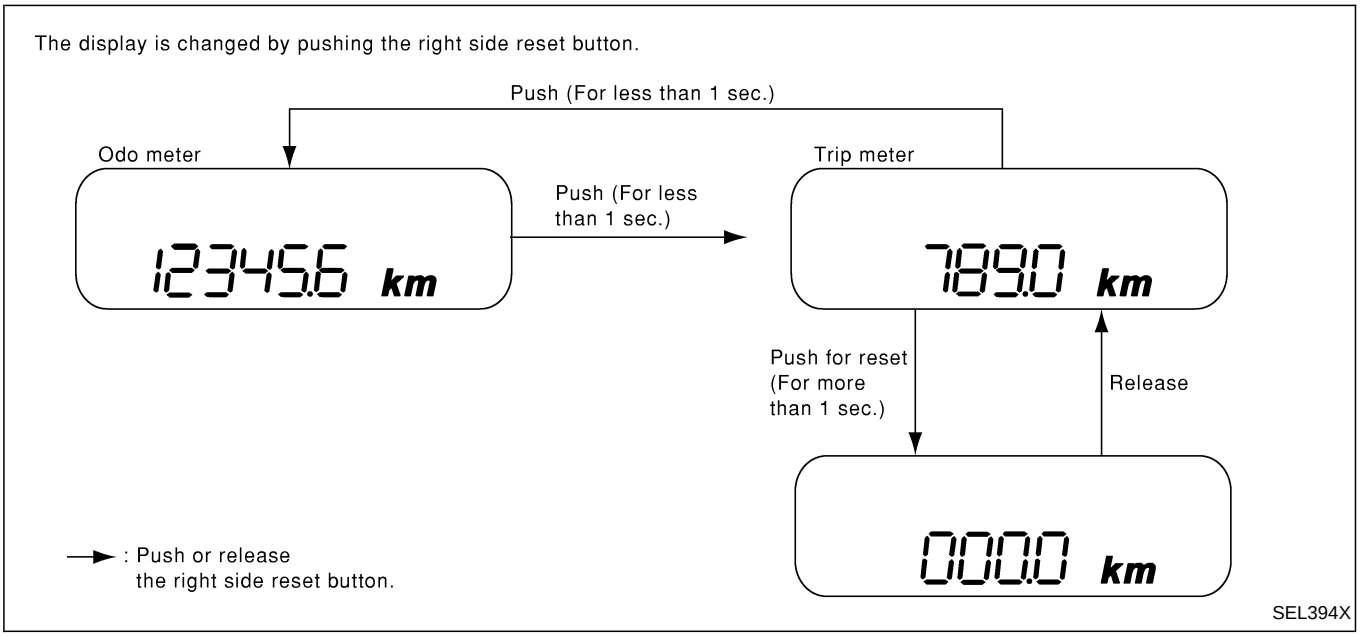
http://vnx.su/

System Description

UNIFIED CONTROL METER

- Speedometer, odo/trip meter, tachometer, fuel gauge and water temperature gauge are controlled totally by control unit built-in combination meter.
- Digital meter is adopted for odo/trip meter.*
  *The record of the odo meter is kept even if the battery cable is disconnected. The record of the trip meter is erased when the battery cable is disconnected.
- Odo/trip meter segment can be checked in diagnosis mode.
- Meter/gauge can be checked in diagnosis mode.

HOW TO CHANGE THE DISPLAY FOR ODO/TRIP METER



NOTE:
Turn ignition switch to the “ON” position to operate odo/trip meter.

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System Description (Cont'd)

POWER SUPPLY AND GROUND CIRCUIT

Power is supplied at all times
- through 10A fuse [No. 16, located in the fuse block (J/B)]
- to combination meter terminal 27.

With the ignition switch in the ON or START position, power is supplied
- through 10A fuse [No. 12, located in the fuse block (J/B)]
- to combination meter terminal 28.

Ground is supplied
- through body grounds F36, F47 (LHD models) or M33, M754 (RHD models)
- to combination meter terminal 29.

WATER TEMPERATURE GAUGE

The water temperature gauge indicates the engine coolant temperature.
Thermal transmitter provides a engine coolant temperature signal to combination meter for water temperature gauge.

TACHOMETER

The tachometer indicates engine speed in revolution per minutes (rpm). ECM provides an engine speed signal to combination meter for tachometer.

FUEL GAUGE

The fuel gauge indicates the approximate fuel level in the fuel tank.
The fuel gauge is regulated by a variable ground signal supplied
- from body grounds B10 and B18
- through terminal 3 of the fuel level sensor unit and
- through terminal 2 (TD27Ti engine) or 1 (ZD30DDTi engine) of the fuel level sensor unit
- to combination meter terminal 13 for the fuel gauge.

SPEEDOMETER

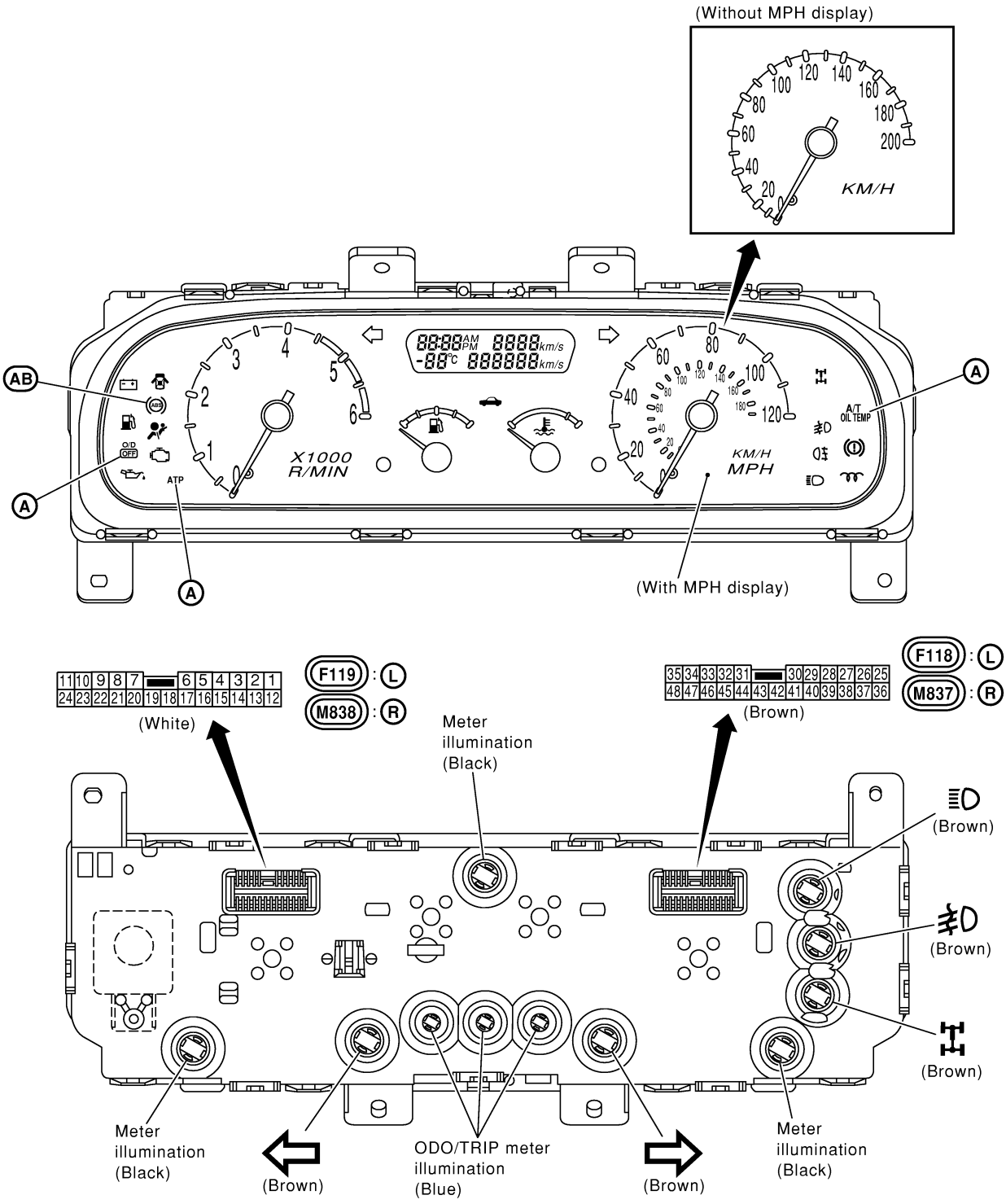
The combination meter receives a signal from vehicle speed sensor. The speedometer converts the signal into the vehicle speed displayed.

AMBIENT TEMPERATURE GAUGE

Ambient temperature sensor provides the signal for ambient temperature to combination meter.

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Combination Meter



Bulb socket color	Bulb wattage
Brown	1.4 W
Black	3.0 W
Blue	0.56 W

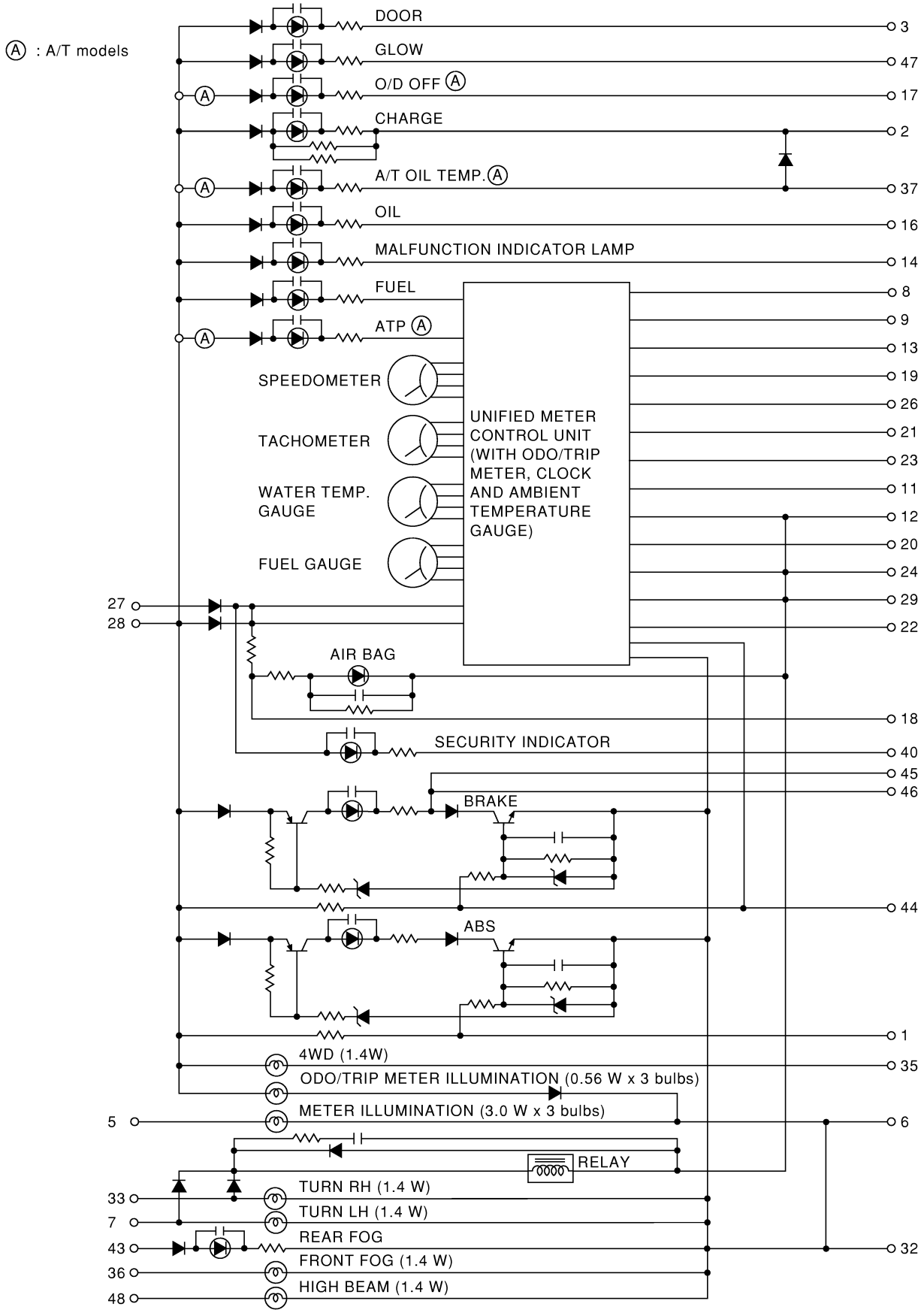
( ): Warning bulb socket color

(L) : LHD models
(R) : RHD models
(A) : A/T models
(AB) : With ABS

YEL281D

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Schematic

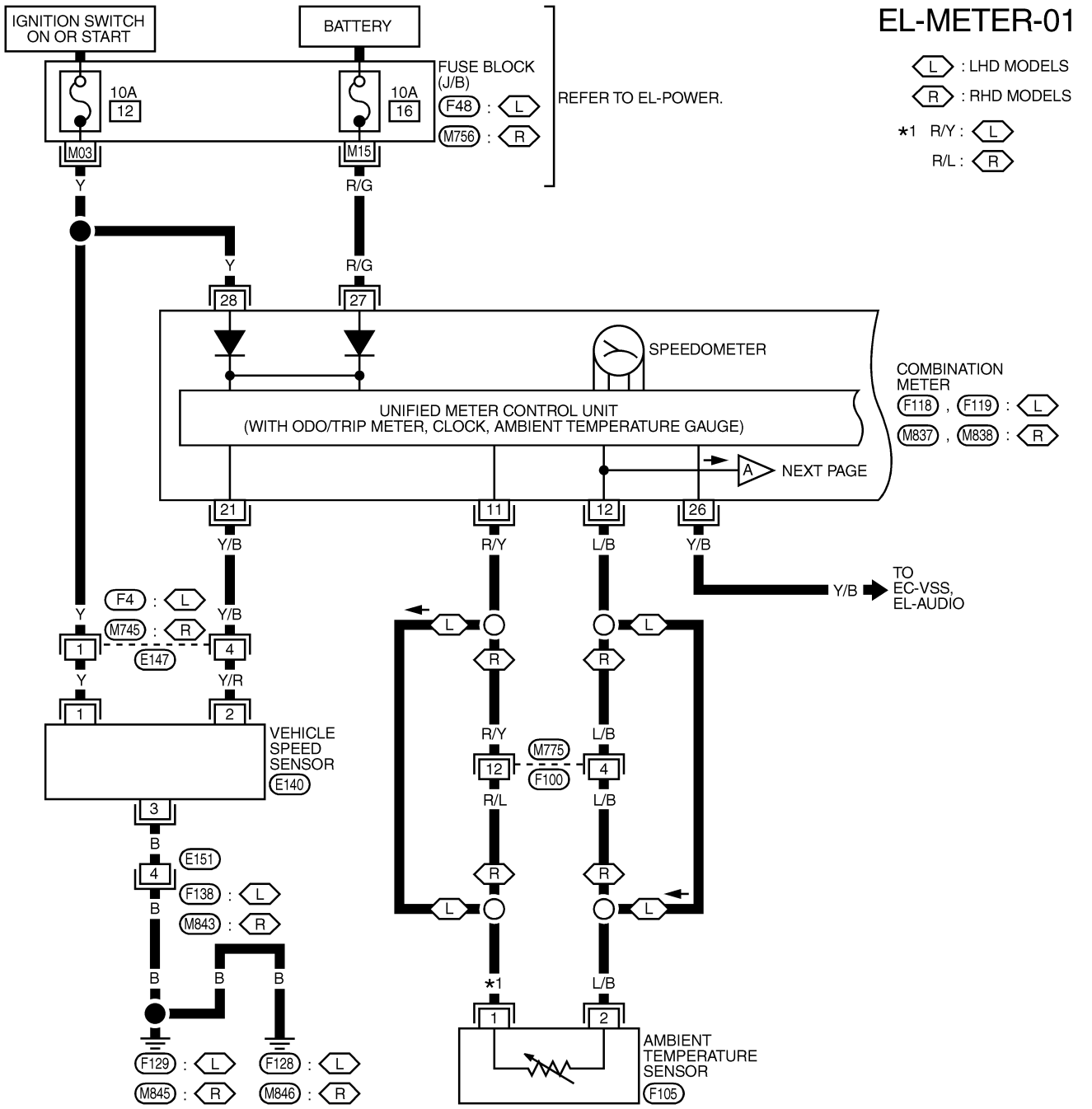


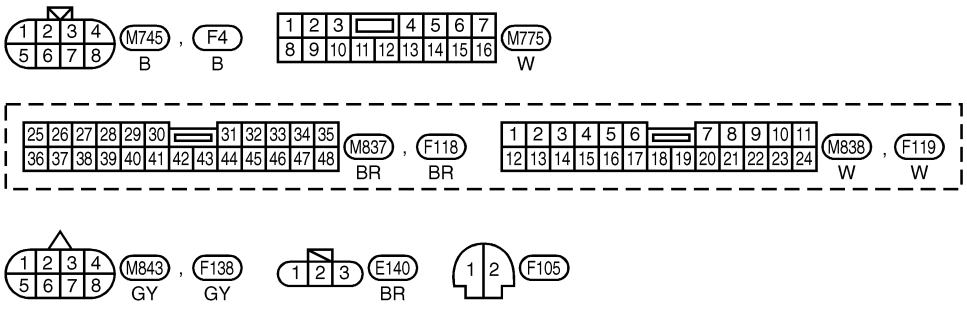
YEL280D

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Wiring Diagram — METER —

TD27Ti ENGINE MODELS





REFER TO THE FOLLOWING.
M756 , F48 -FUSE BLOCK-JUNCTION BOX (J/B)

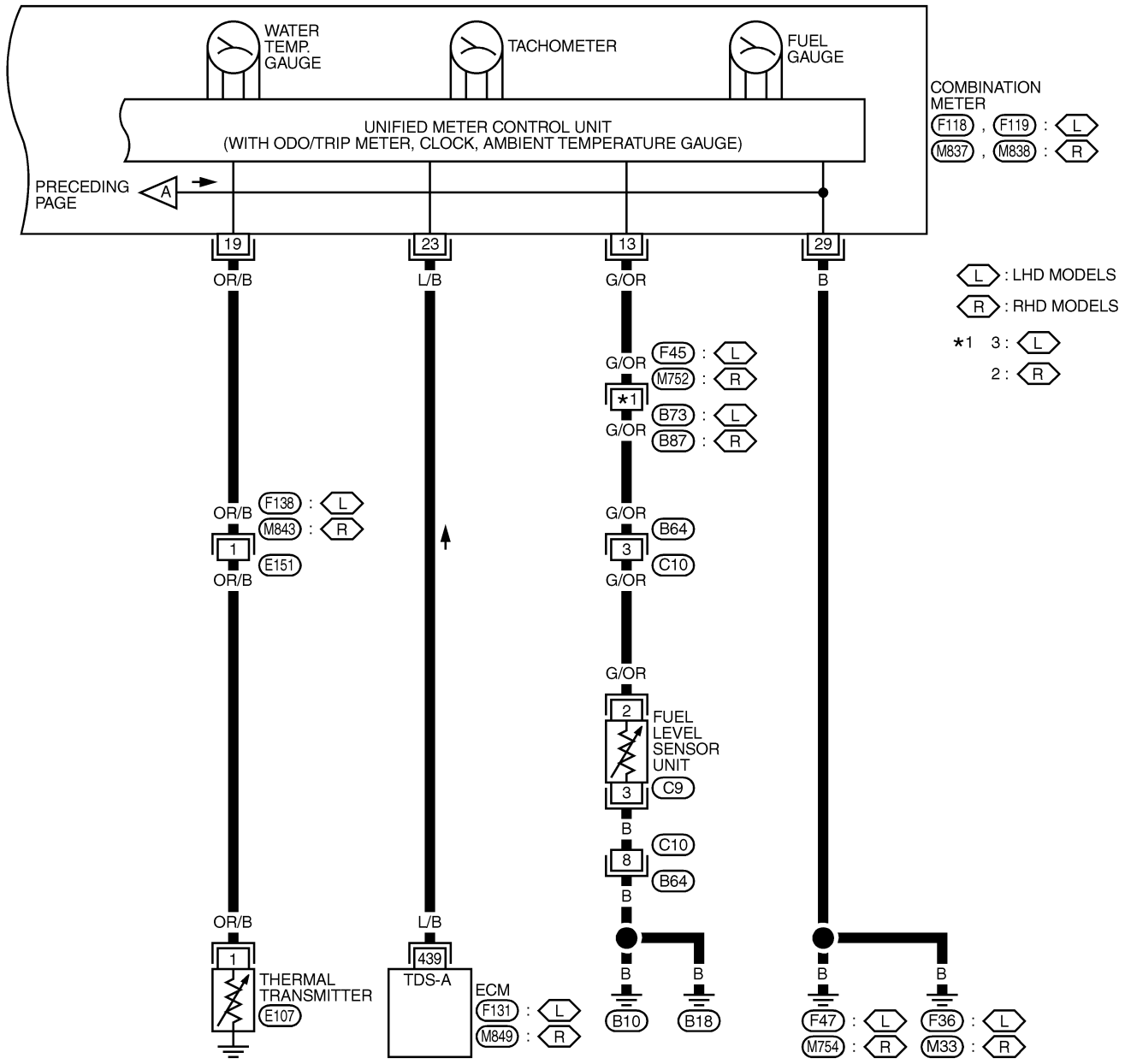
YEL094D

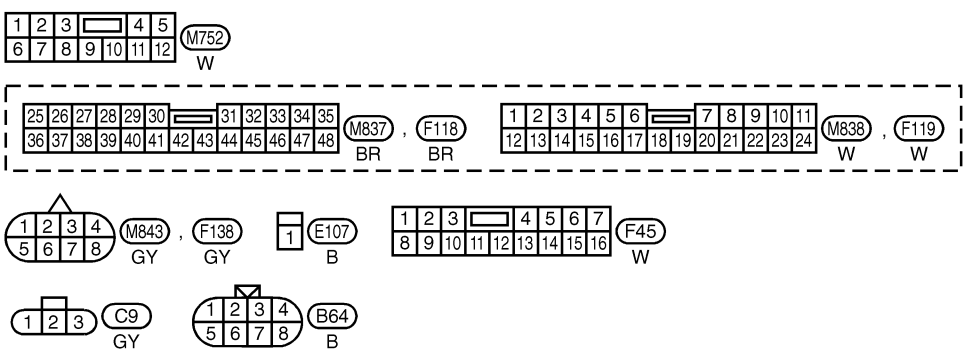
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Wiring Diagram — METER — (Cont'd)

TD27Ti ENGINE MODELS

EL-METER-02





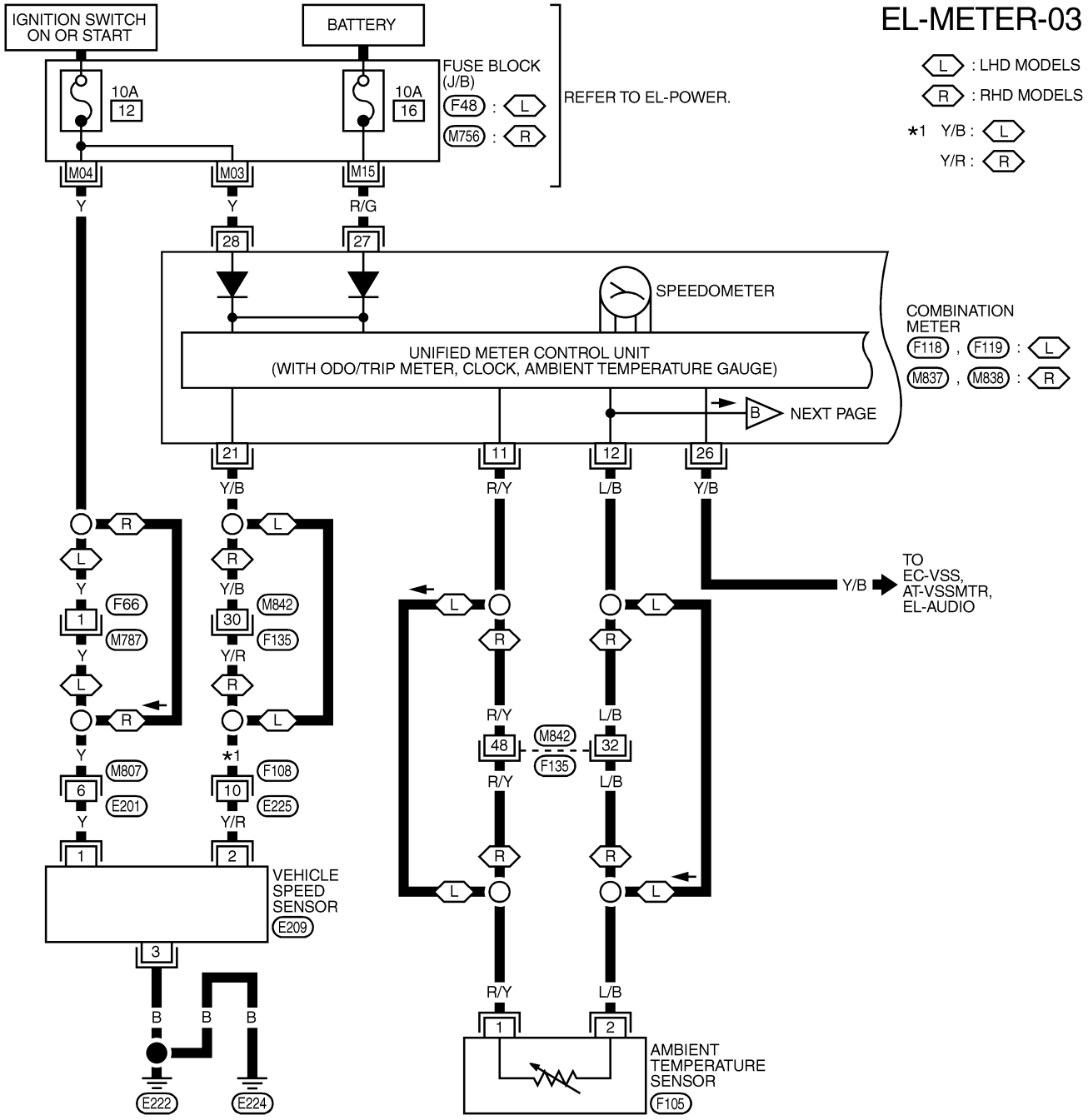
REFER TO THE FOLLOWING.
M849 , F131 -ELECTRICAL UNITS

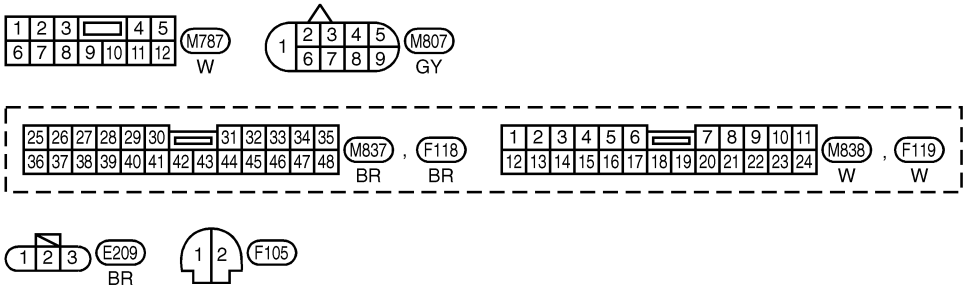
YEL741E

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Wiring Diagram — METER — (Cont'd)

ZD30DDTi ENGINE MODELS





REFER TO THE FOLLOWING.
F108 , F135 -SUPER MULTIPLE JUNCTION (SMJ)
M756 , F48 -FUSE BLOCK-JUNCTION BOX (J/B)

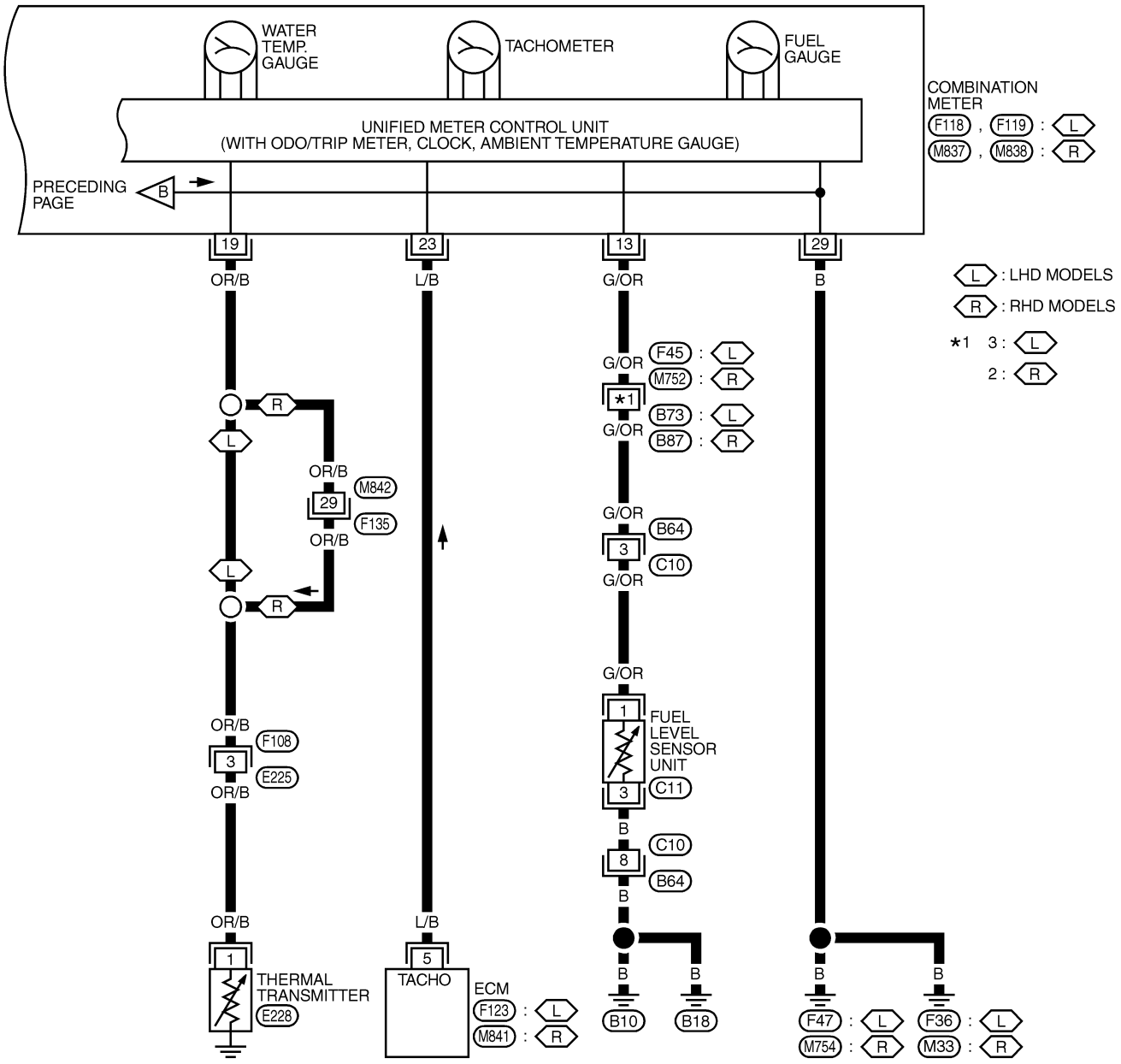
YEL096D

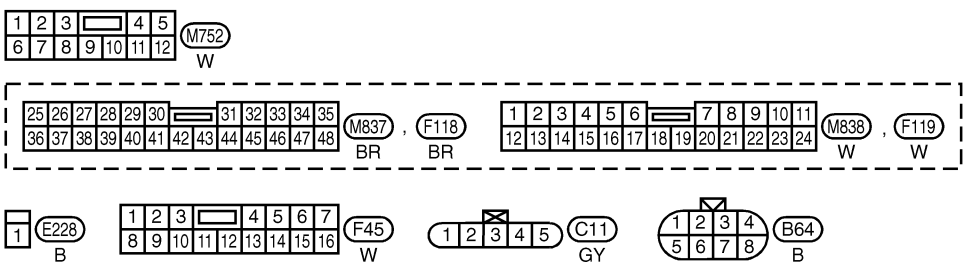
http://vnx.su/

Wiring Diagram — METER — (Cont'd)

ZD30DDTi ENGINE MODELS

EL-METER-04





REFER TO THE FOLLOWING.
F108 , F135 -SUPER MULTIPLE JUNCTION (SMJ)
M841 , F123 -ELECTRICAL UNITS

YEL742E

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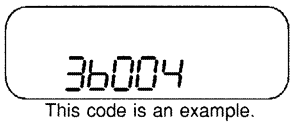
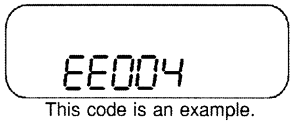
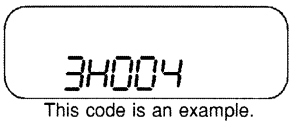
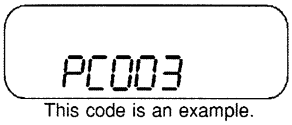
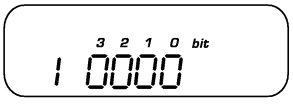
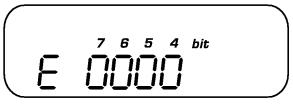
Combination Meter Self-Diagnosis

PERFORMING SELF-DIAGNOSIS MODE

1. Turn the ignition switch to the “LOCK” position.
2. Press both reset buttons on the combination meter and keep them depressed.
3. Turn the ignition switch to the “ON” position, while keeping the reset buttons pressed.
4. Release both reset buttons within 5 seconds after ignition switch is “ON”, then self-diagnosis will start. The sequence (A to I) is activated by press the either reset buttons.

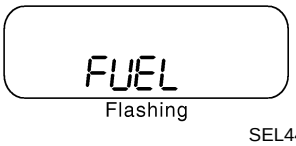
NOTE:

If either reset button is not pressed for 20 seconds at each step or if the ignition switch is turned OFF, the self-diagnosis mode is exited.

	Check items	Display	Remarks
A)	Odometer segment test		All odo trip meter segments are ON.
B)	Software code	 This code is an example. NEL735	This information is not used for service. Please skip this step.
C)	EEPROM code	 This code is an example. NEL736	This information is not used for service. Please skip this step.
D)	Hardware code	 This code is an example. NEL737	This information is not used for service. Please skip this step.
E)	PCB code	 This code is an example. NEL738	This information is not used for service. Please skip this step.
F)	Meter/gauge test (Sweeping movement)	 Flashing SEL440X	Tachometer, speedometer, fuel level gauge and water temperature gauge have sweeping movement test. (The meter/gauges operate MIN. → MAX., MAX. → MIN. for 2 times) The odo trip meter segment flashes during the sweep movement.
G)	Error 1 (Bit 0 - Bit 3)	 SEL441X	The segment of each bit displays “0”, meaning no failure. If the bit(s) displays figures other than “0”, the item of the bit has failed. For details, refer to “Failure chart for Error 1 and Error E” below.
H)	Error E (Bit 4 - Bit 7)	 SEL442X	

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Combination Meter Self-Diagnosis (Cont'd)

	Check items	Display	Remarks
I)	Fuel warning lamp test	 Flashing SEL443X	Fuel warning lamp is on and odo trip meter segment "FUEL" flashes.

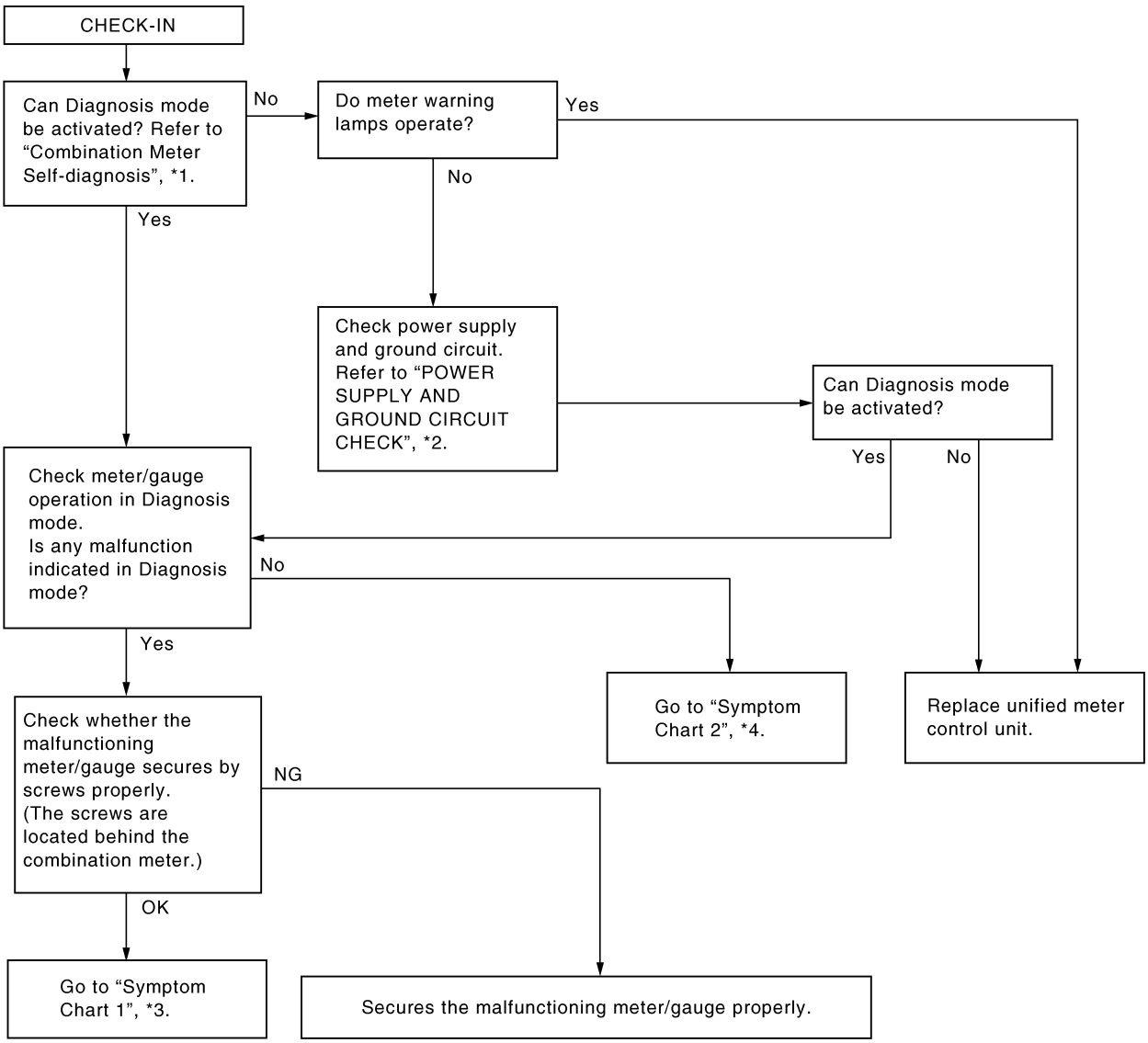
Failure Chart for "Error 1" and "Error E"

Bit	Detectable items	Description of the failure		Displayed figure on the bit	
				Failure	No failure
0	Speedometer input signal	No input signal When no signal is detected for 30 minutes continuously with the ignition ON, it should be judged as signal failure. (If input signal is detected later, then the judgement will be canceled immediately.)		1	0
		Abnormal input signal When any signal of frequency which would not exist in normal conditions is detected, it should be judged as signal failure.		2	
1	Tachometer input signal	No input signal When no signal is detected for 30 minutes continuously with the ignition ON, it should be judged as signal failure. (If input signal is detected later, then the judgement will be canceled immediately.)		1	0
		Abnormal input signal When any signal of frequency which would not exist in normal conditions is detected, it should be judged as signal failure.		2	
2	Fuel level input signal	Short circuit When short circuit of the signal line is detected for 5 seconds or more, it should be judged as short-circuit failure.		1	0
		Open circuit When open circuit of the signal line is detected for 5 seconds or more, it should be judged as open-circuit failure.		2	
3	Water temperature input signal	Short circuit When short circuit of the signal line is detected for 5 seconds or more, it should be judged as short-circuit failure.		1	0
4	Outside air temperature input signal	Short circuit When short circuit of the signal line is detected for 5 seconds or more, it should be judged as short-circuit failure.		1	0
		Open circuit When open circuit of the signal line is detected for 5 seconds or more, it should be judged as open-circuit failure.		2	
5	Reset buttons	Short circuit for reset buttons When the short circuit is continuously detected for 5 minutes or more, it should be judged as short-circuit failure.	Right side reset button has failed.	1	0
			Left side reset button has failed.	2	
			Both reset buttons have failed.	3	
6	—	—		0	0
7	CPU	EEPROM failure		1	0
		CPU RAM failure		2	

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Trouble Diagnoses

PRELIMINARY CHECK



SEL361WB

*1: Combination Meter Self-Diagnosis (EL-90)

*2: POWER SUPPLY AND GROUND CIRCUIT CHECK (EL-83)

*3: Symptom Chart 1 (EL-93)

*4: Symptom Chart 2 (EL-93)

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Trouble Diagnoses (Cont'd)

SYMPTOM CHART

Symptom Chart 1 (Malfunction is Indicated in Diagnosis Mode)

Symptom	Possible causes	Repair order
Odo/trip meter indicates malfunction in Diagnosis mode.	Unified meter control unit	Replace unified meter control unit.
Multiple meter/gauge indicate malfunction in Diagnosis mode.		
One of speedometer/ tachometer/fuel gauge/ water temp. gauge indicates malfunction in Diagnosis mode.	1. Meter/Gauge 2. Unified meter control unit	1. Check resistance of meter/gauge indicating malfunction. If the resistance is NG, replace the meter/gauge. 2. If the resistance of meter/gauge is OK, replace unified-meter control unit.

Symptom Chart 2 (No Malfunction is Indicated in Diagnosis Mode)

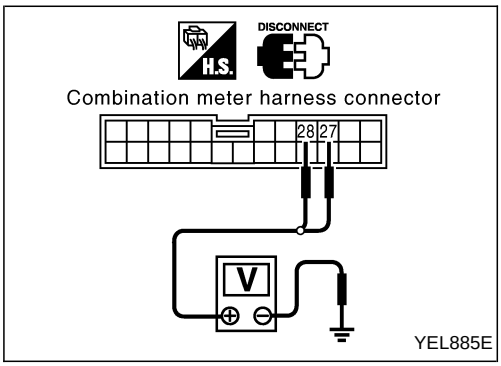
Symptom	Possible causes	Repair order
One of speedometer/ tachometer/fuel gauge/ water temp. gauge is malfunctioning.	1. Sensor signal - Vehicle speed signal - Engine revolution signal - Fuel gauge - Water temp. gauge	1. Check the sensor for malfunctioning meter/gauge. INSPECTION/VEHICLE SPEED SENSOR (Refer to EL-95.) INSPECTION/ENGINE REVOLUTION SIGNAL (Refer to EL-96.) INSPECTION/FUEL LEVEL SENSOR UNIT (Refer to EL-96.) INSPECTION/THERMAL TRANSMITTER (Refer to EL-97.)
Multiple meter/gauge are malfunctioning. (except odo/ trip meter)	2. Unified meter control unit	2. Replace unified meter control unit.

Before starting trouble diagnoses below, perform PRELIMINARY CHECK, EL-92.

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Trouble Diagnoses (Cont'd)

POWER SUPPLY AND GROUND CIRCUIT CHECK

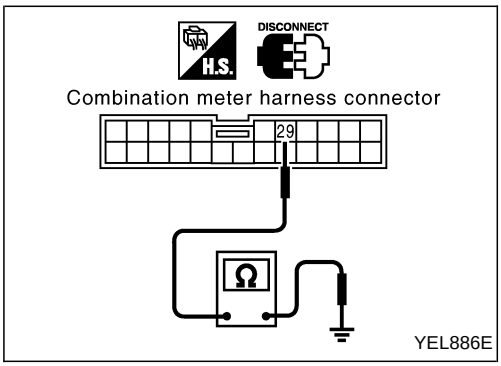


Power Supply Circuit Check

Terminals		Ignition switch position		
(+)	(–)	OFF	ACC	ON
27	Ground	Battery voltage	Battery voltage	Battery voltage
28	Ground	0V	0V	Battery voltage

If NG, check the following.

- 10A fuse [No. 12, located in fuse block (J/B)]
- 10A fuse [No. 16, located in fuse block (J/B)]
- Harness for open or short between fuse and combination meter



Ground Circuit Check

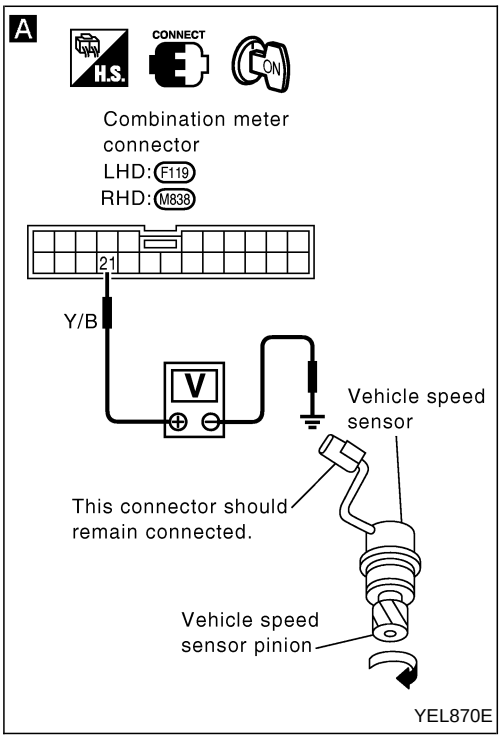
Terminals	Continuity
29 - Ground	Yes

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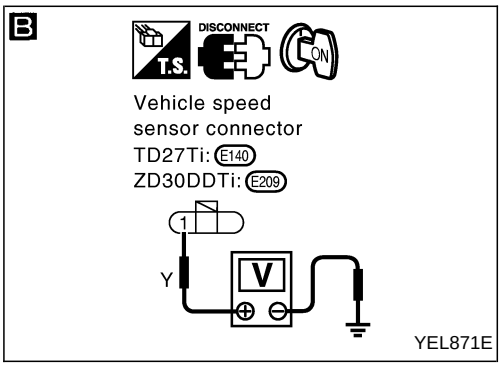
Trouble Diagnoses (Cont'd)

INSPECTION/VEHICLE SPEED SENSOR

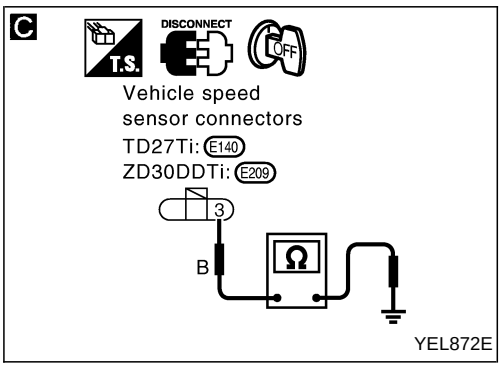
A



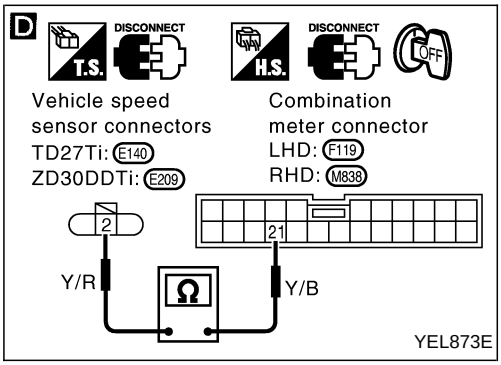
B



C



D



A

CHECK VEHICLE SPEED SENSOR OUTPUT.
1. Remove vehicle speed sensor from transmission.
2. Turn ignition switch to "ON" position.
3. Check voltage between combination meter terminals ㉑ and ground while quickly turning speed sensor pinion.

Tester pointer should remove.

OK → Vehicle speed sensor is OK.

NG ↓

B

CHECK POWER SOURCE.
- Re-install vehicle speed sensor.
- Disconnect vehicle speed sensor connector.

Check voltage between vehicle speed sensor connector terminal ① and ground.

Battery voltage should exist.

NG → Check harness for open or short between vehicle speed sensor and fuse.

OK ↓

C

CHECK GROUND CIRCUIT OF VEHICLE SPEED SENSOR
- Turn ignition switch to the "LOCK" position.

Check continuity between vehicle speed sensor harness connector terminal ③ and body ground.

Continuity should exist.

NG → Repair harness or connector

OK ↓

D

Check continuity between speedometer harness connector terminal ㉑ and vehicle speed sensor connector terminal ② .

Continuity should exist.

NG → Repair harness and connector.

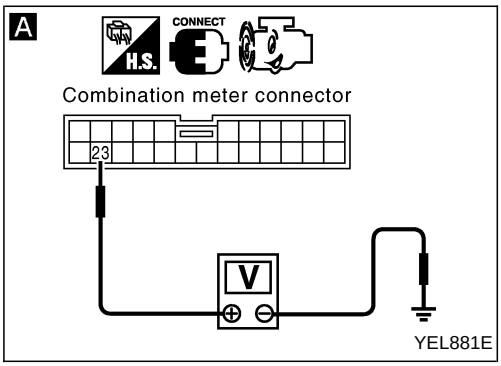
OK ↓

Replace vehicle speed sensor.

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Trouble Diagnoses (Cont'd)

INSPECTION/REVOLUTION SIGNAL



A

CHECK ECM OUTPUT SIGNAL.
1. Start engine.
2. Check voltage between combination meter terminal 23 and ground at idle and 2,000 rpm.

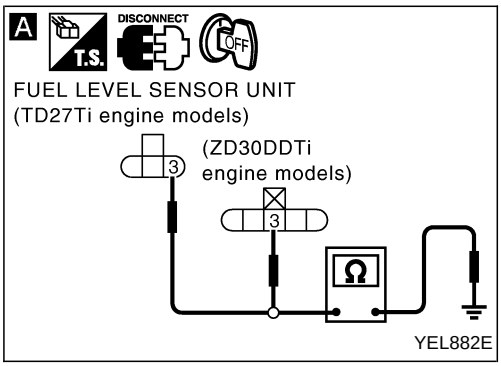
Higher rpm = Higher voltage
Lower rpm = Lower voltage
Voltage should change with rpm.

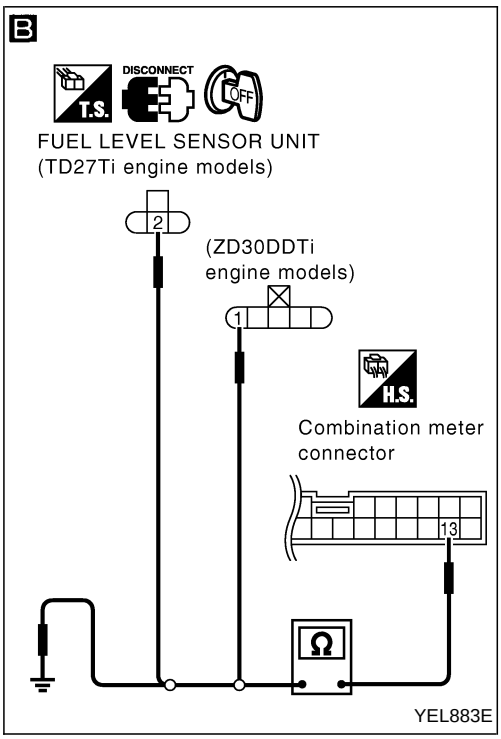
NG → Check harness for open or short between ECM and meter.

OK ↓

Engine revolution signal is OK.

INSPECTION/FUEL LEVEL SENSOR UNIT





A

CHECK GROUND CIRCUIT FOR FUEL LEVEL SENSOR UNIT.
1. Disconnect fuel level sensor unit harness connector.
2. Check continuity between fuel level sensor unit terminal 3 and ground.

Continuity should exist.

NG → Repair harness or connector.

OK ↓

CHECK FUEL LEVEL SENSOR UNIT.
Refer to "FUEL LEVEL SENSOR UNIT CHECK" (EL-98).

NG → Replace fuel level sensor unit.

OK ↓

B

CHECK HARNESS FOR OPEN OR SHORT.
1. Disconnect fuel level sensor unit harness connector and combination meter harness connector.
2. Check continuity between combination meter terminal 13 and fuel level sensor unit terminal 2 (TD27Ti engine) or 1 (ZD30DDTi engine).

Continuity should exist.

3. Check continuity between combination meter terminal 13 and ground.

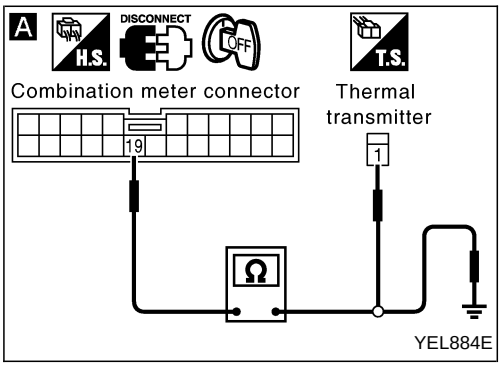
Continuity should not exist.

NG → Repair harness or connector.

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Trouble Diagnoses (Cont'd)

INSPECTION/THERMAL TRANSMITTER



CHECK THERMAL TRANSMITTER.
Refer to "THERMAL TRANSMITTER CHECK" (EL-98).

NG → Replace thermal transmitter.

OK ↓

A

CHECK HARNESS FOR OPEN OR SHORT.

1. Disconnect combination meter connector and thermal transmitter connector.
2. Check continuity between combination meter terminal 19 and thermal transmitter terminal 1.

Continuity should exist.

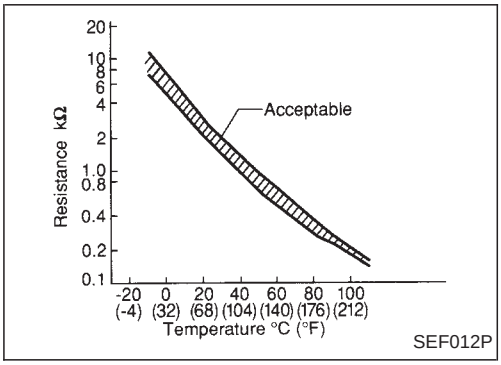
3. Check continuity between combination meter terminal 19 and ground.

Continuity should not exist.

NG → Repair harness or connector.

OK ↓

Thermal transmitter is OK.



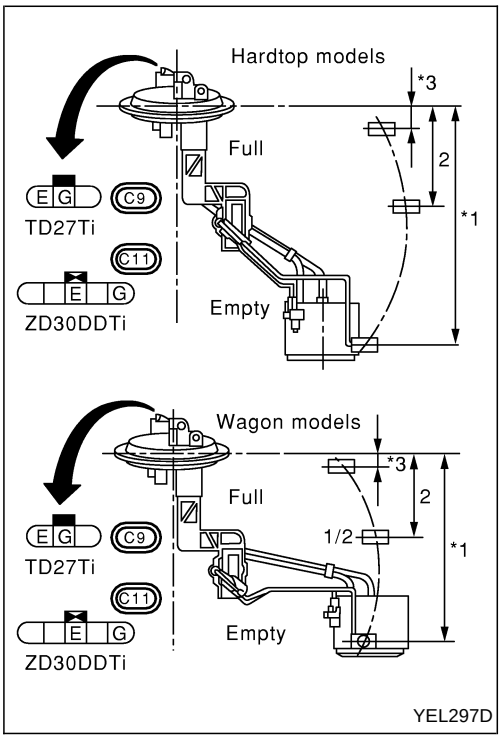
Components Inspection

AMBIENT TEMPERATURE SENSOR

<Reference data>

Intake air temperature °C (°F)	Resistance kΩ
−20 (−4)	10.5 - 10.8
0 (32)	6.1 - 6.24
20 (68)	3.0 - 3.1
50 (122)	0.85 - 1.04

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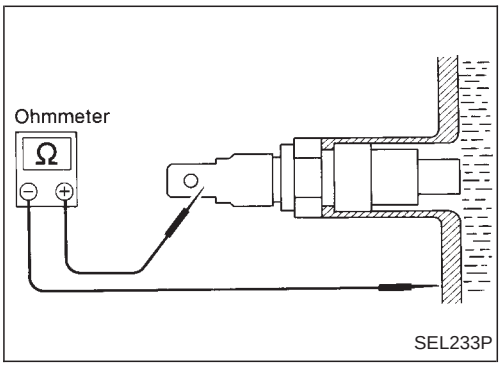
Fuel Level Sensor Unit Check

- For removal, refer to FE section.

Check the resistance between terminals (G) and (E).

Ohmmeter		Float position mm (in)						Resistance value (Ω)
				TD27Ti		ZD30DDTi		
(+)	(−)			Hardtop models	Wagon models	Hardtop models	Wagon models	
G	E	*3	Full	36 (1.42)	25 (0.98)	37 (1.46)	27 (1.06)	Approx. 7
		2	1/2	159 (6.26)	120 (4.72)	160 (6.30)	120 (4.72)	96 - 108
		*1	Empty	286 (11.26)	218 (8.58)	282 (11.10)	220 (8.66)	280 - 290

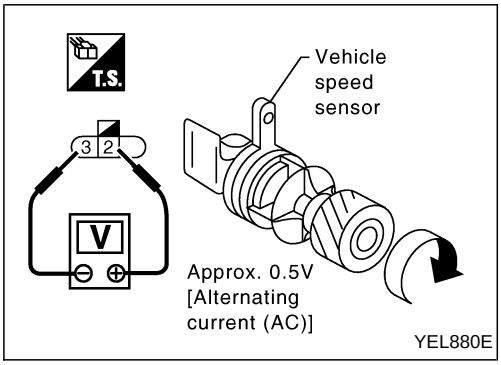
Values *1 and *3: with the dipstick float at its lower or upper limit.



Thermal Transmitter Check

Check the resistance between the terminals of thermal transmitter and body ground.

Water temperature	Resistance
65°C (149°F)	Approx. 951 - 1,109Ω
91°C (196°F)	Approx. 431 - 510Ω

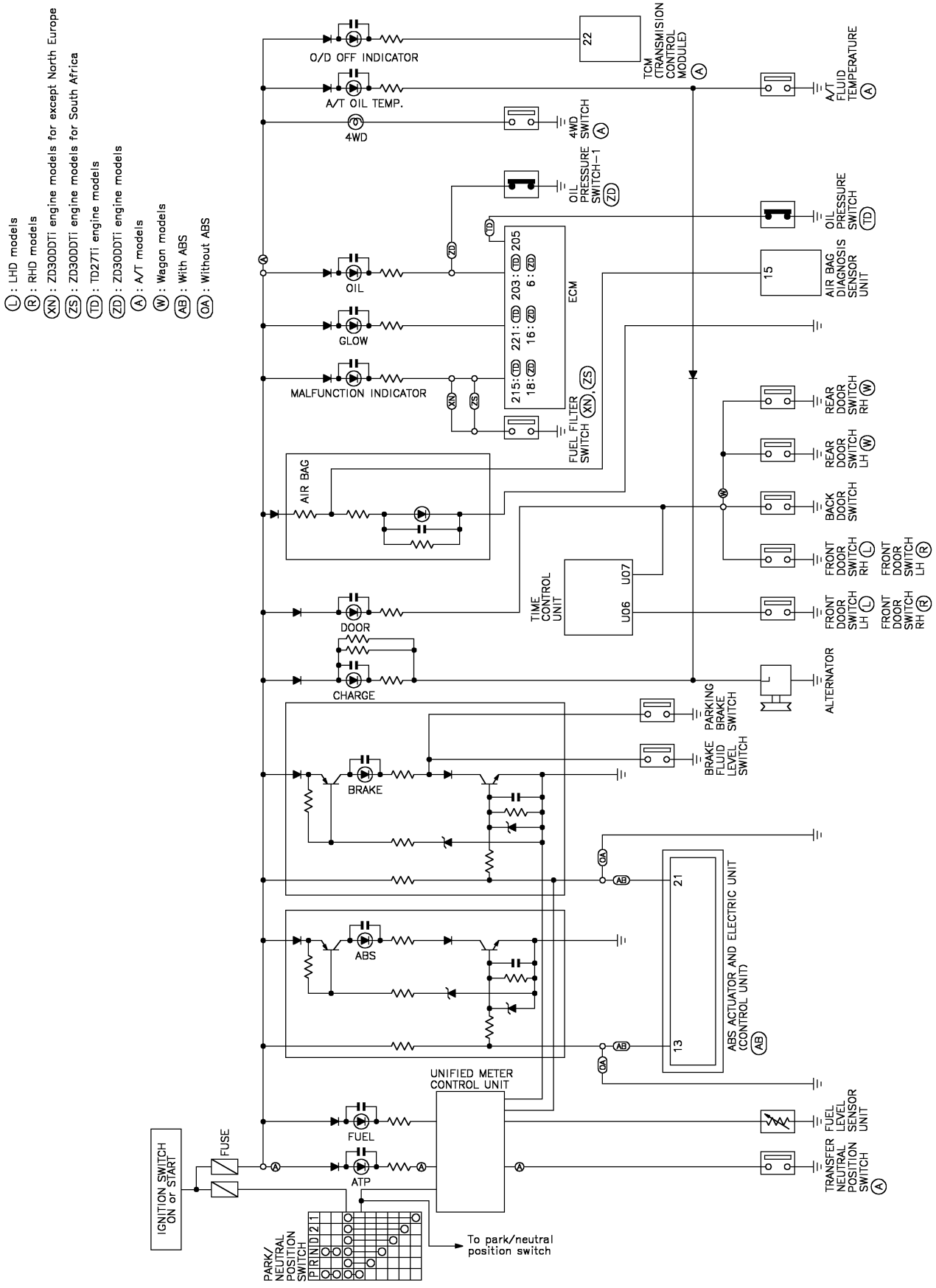


VEHICLE SPEED SENSOR SIGNAL CHECK

1. Remove vehicle speed sensor from transmission.
2. Turn vehicle speed sensor pinion quickly and measure voltage between terminals 2 and 3.

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Schematic

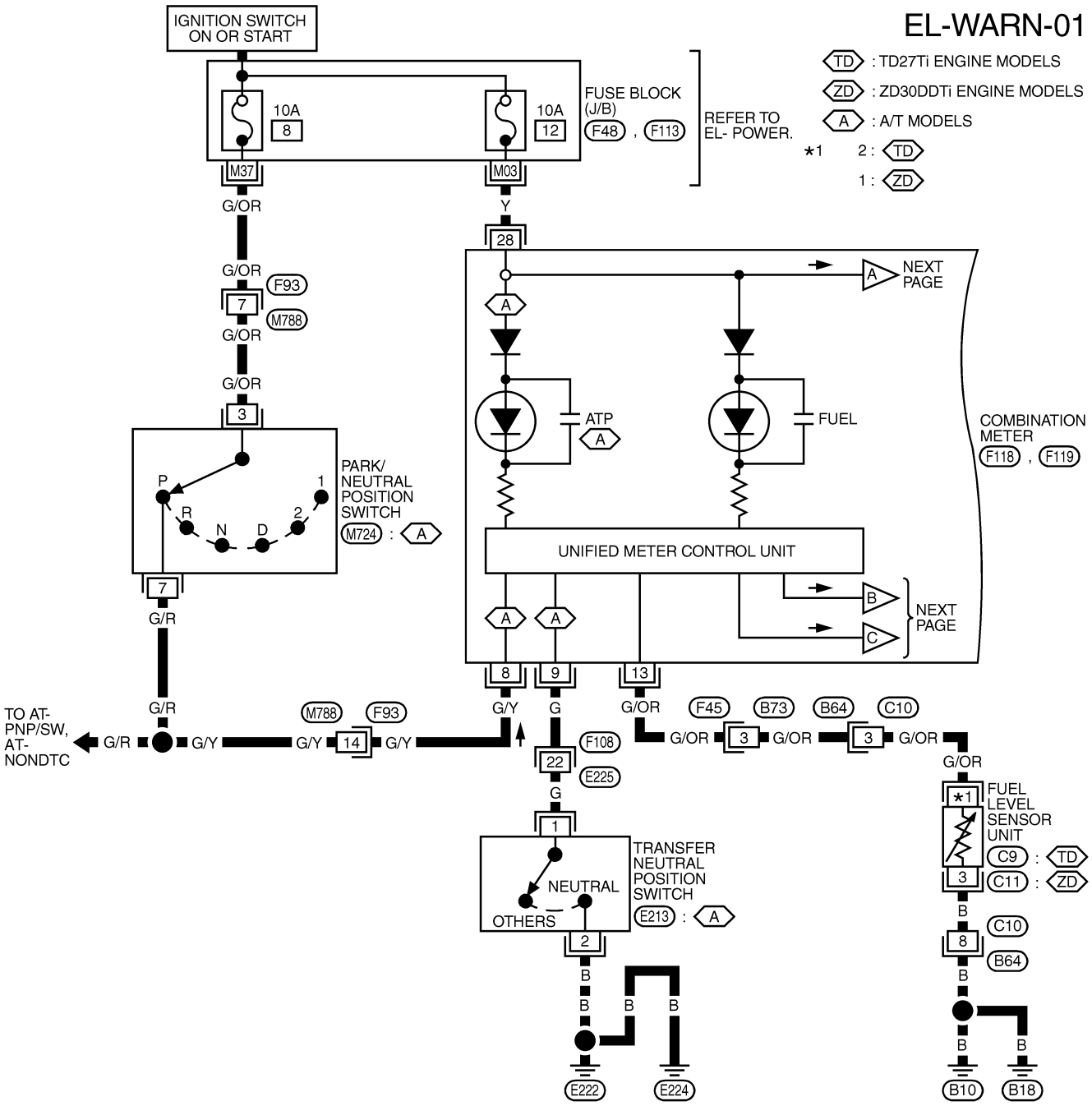


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Wiring Diagram — WARN —

LHD MODELS



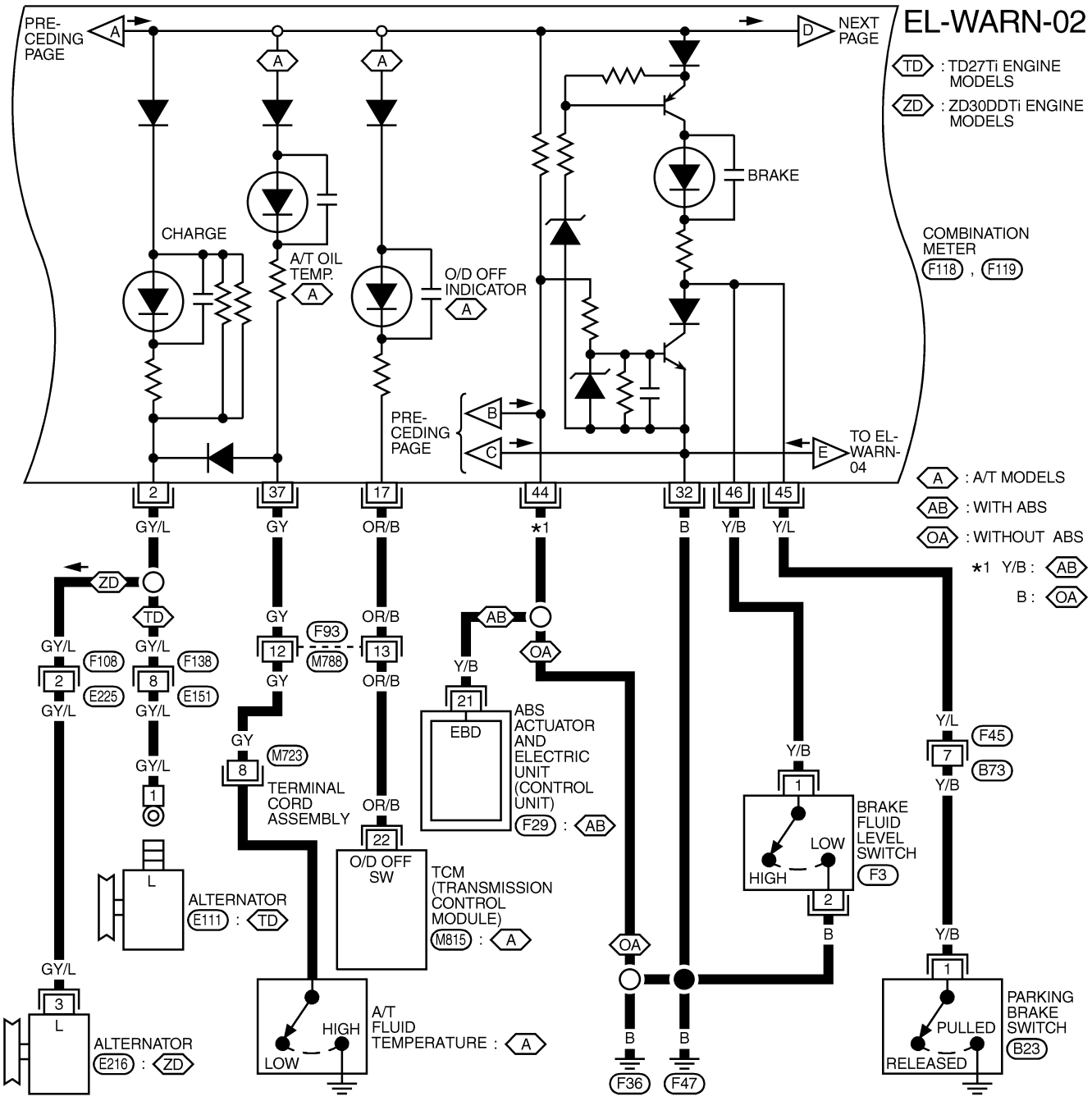
REFER TO THE FOLLOWING.
F108 -SUPER MULTIPLE JUNCTION (SMJ)
F48 , F113 -FUSE BLOCK-JUNCTION BOX (J/B)

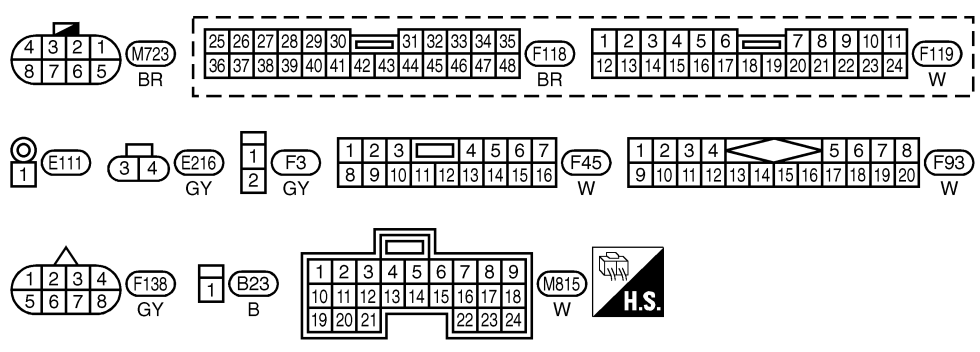
YEL763E

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Wiring Diagram — WARN — (Cont'd)

LHD MODELS





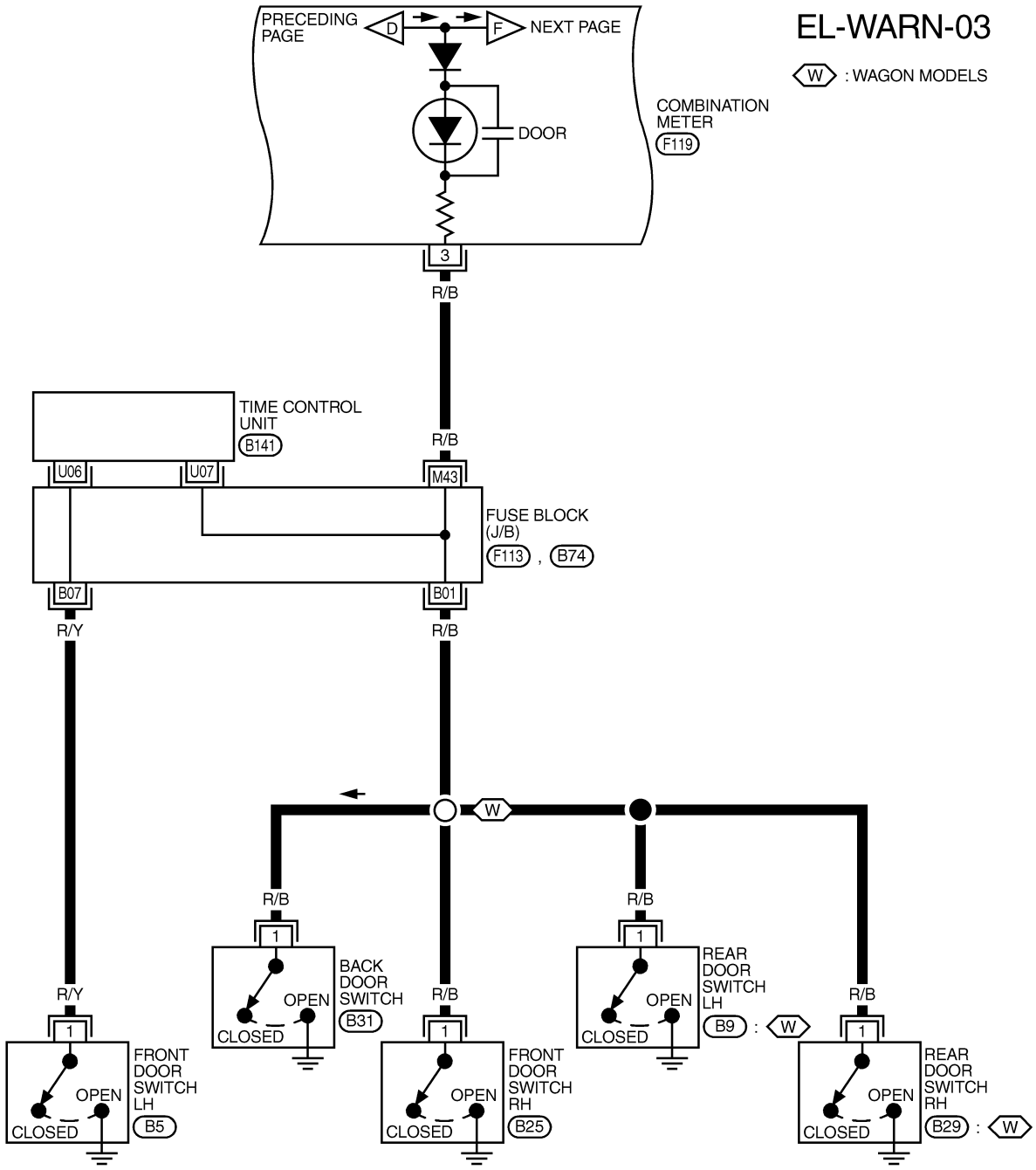
REFER TO THE FOLLOWING.
F108 -SUPER MULTIPLE JUNCTION (SMJ)
F29 -ELECTRICAL UNITS

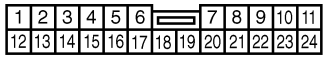
YEL764E

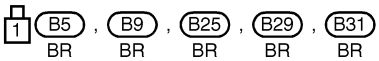
http://vnx.su/

Wiring Diagram — WARN — (Cont'd)

LHD MODELS









∗ : THIS CONNECTOR IS NOT SHOWN IN "HARNESS LAYOUT", EL SECTION.

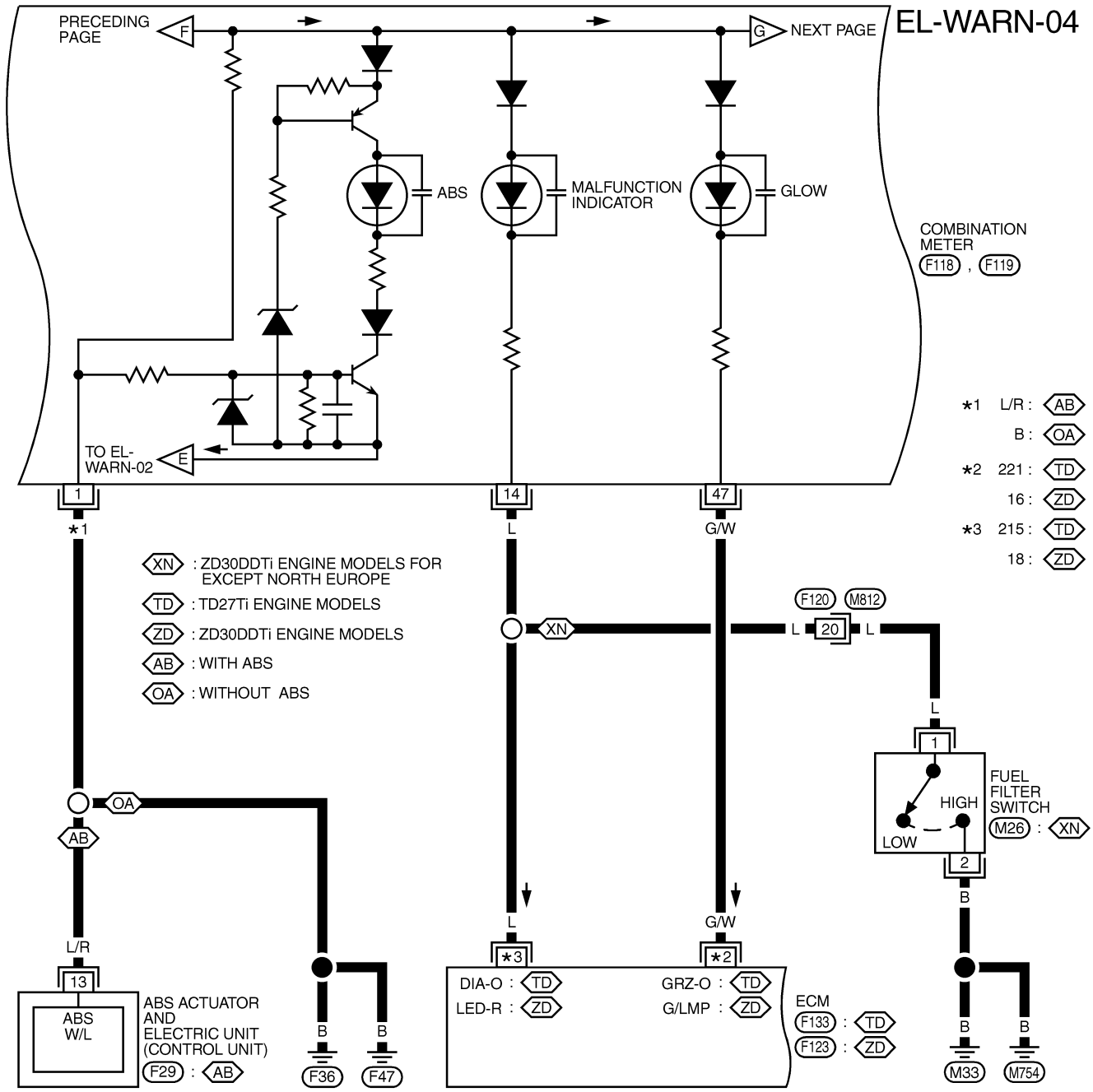
REFER TO THE FOLLOWING.
F113 , B74 -FUSE BLOCK-JUNCTION BOX (J/B)

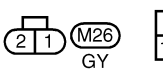
YEL765E

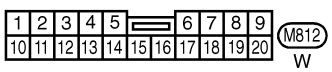
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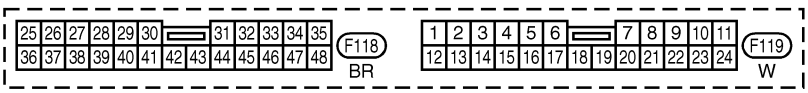
Wiring Diagram — WARN — (Cont'd)

LHD MODELS









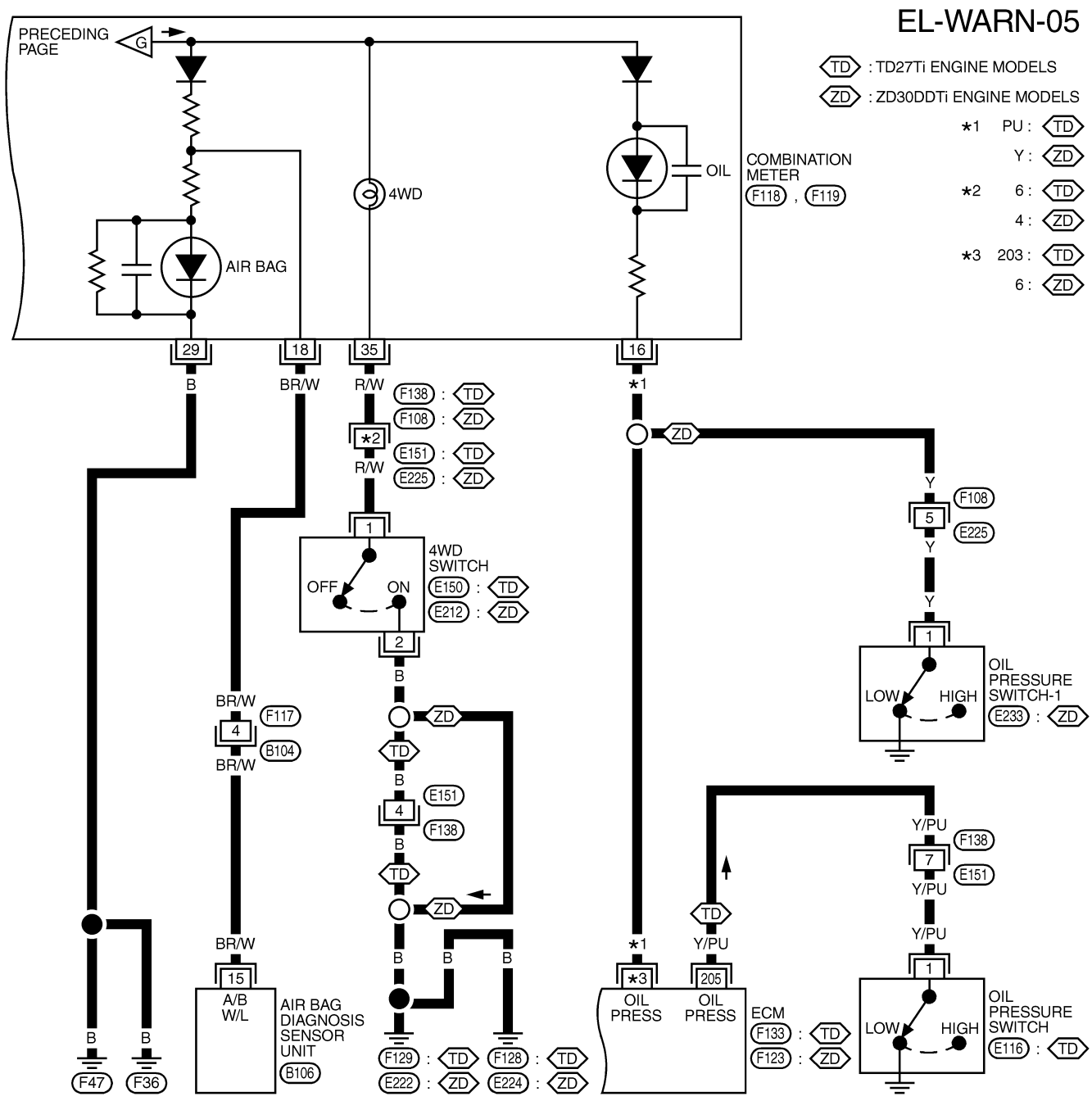
REFER TO THE FOLLOWING.
F29 , F133 , F123
-ELECTRICAL UNITS

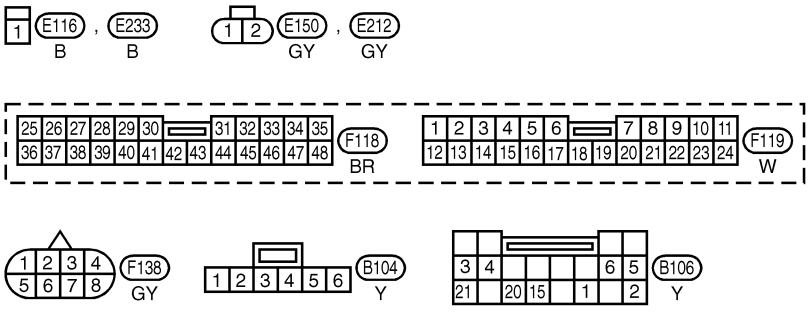
YEL766E

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Wiring Diagram — WARN — (Cont'd)

LHD MODELS





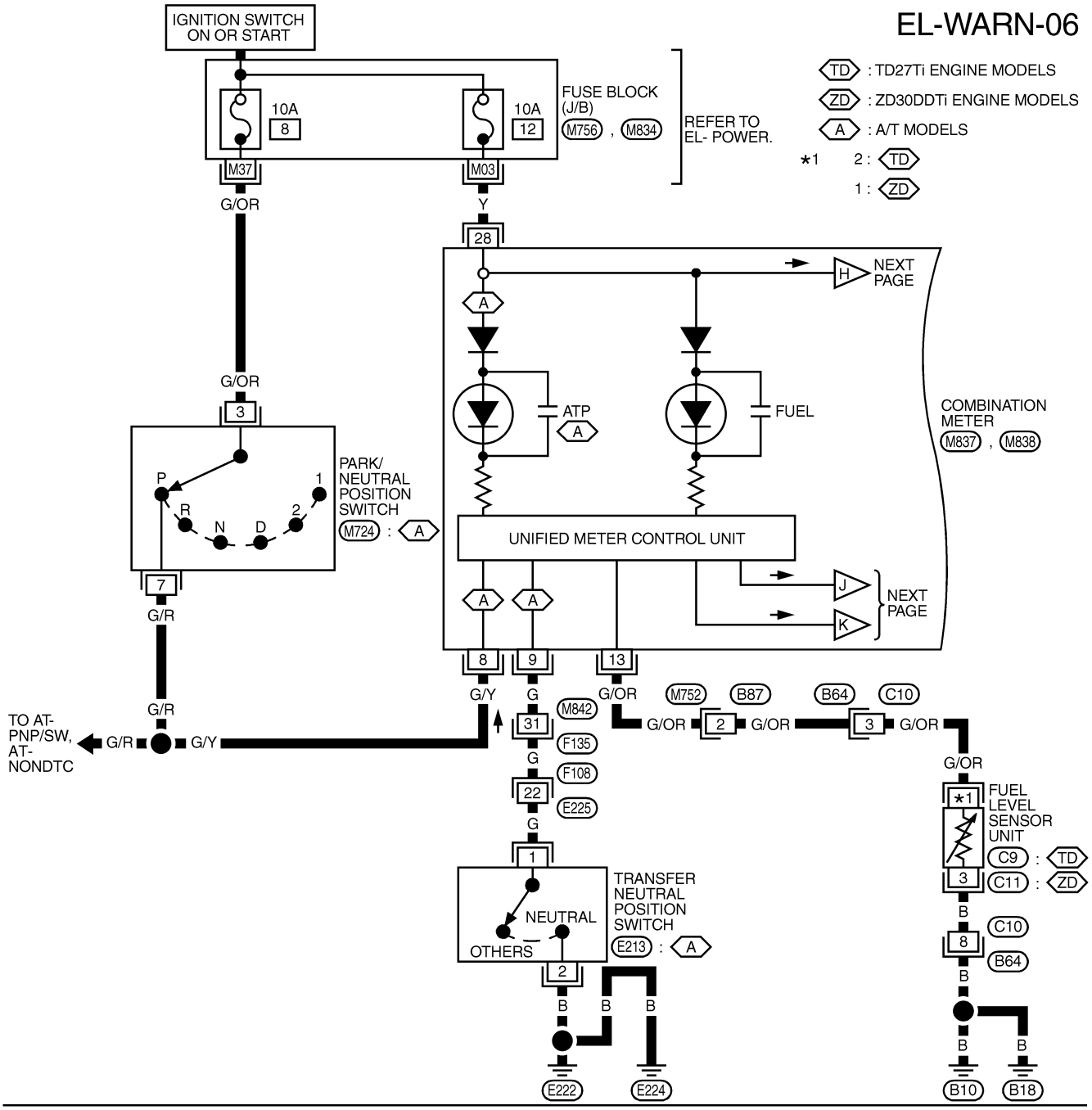
REFER TO THE FOLLOWING.
F108 -SUPER MULTIPLE JUNCTION (SMJ)
F123 , F133 -ELECTRICAL UNITS

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Wiring Diagram — WARN — (Cont'd)

RHD MODELS



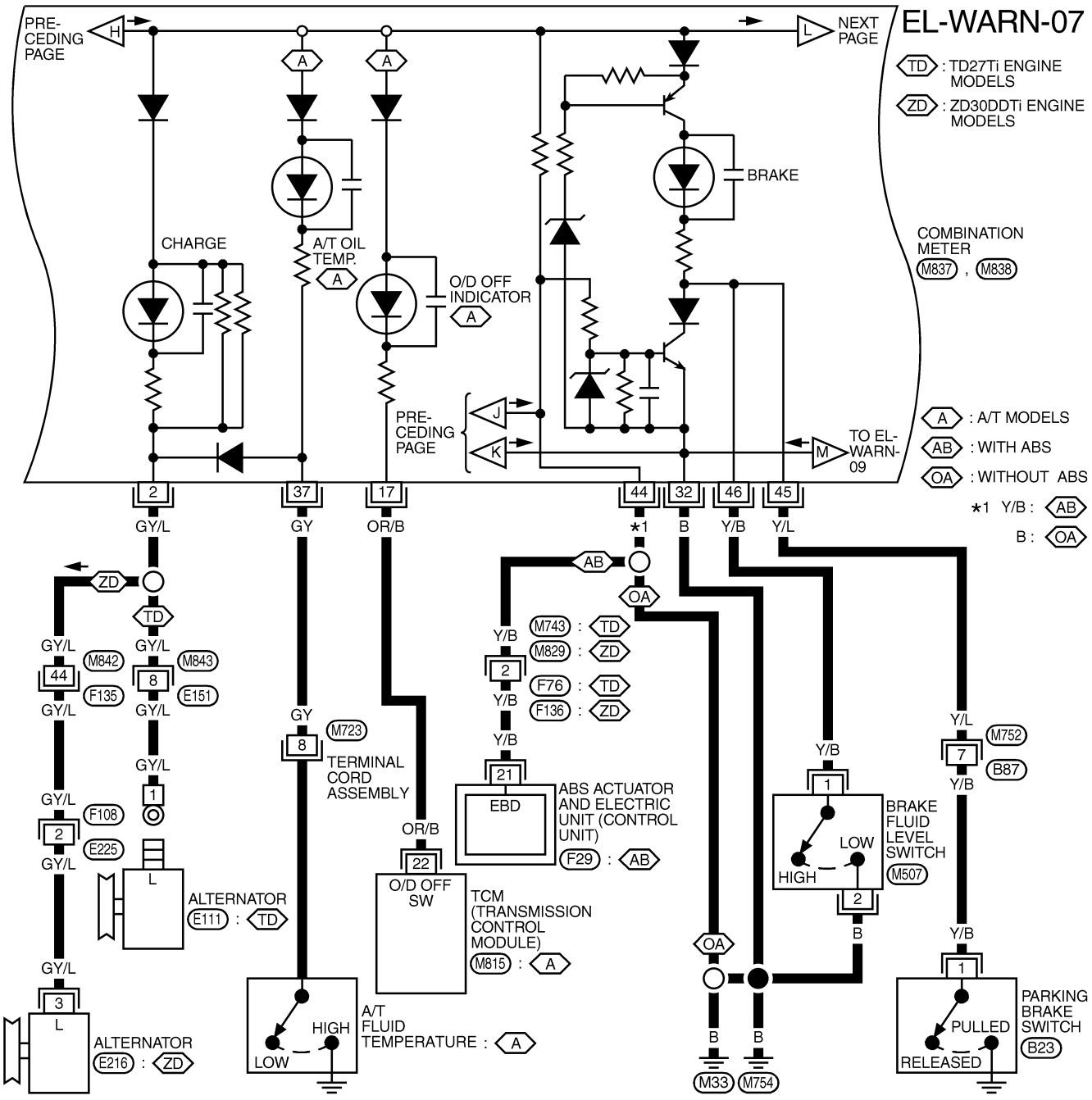
REFER TO THE FOLLOWING.
F108 , F135 -SUPER MULTIPLE JUNCTION (SMJ)
M756 , M834 -FUSE BLOCK-JUNCTION BOX (J/B)

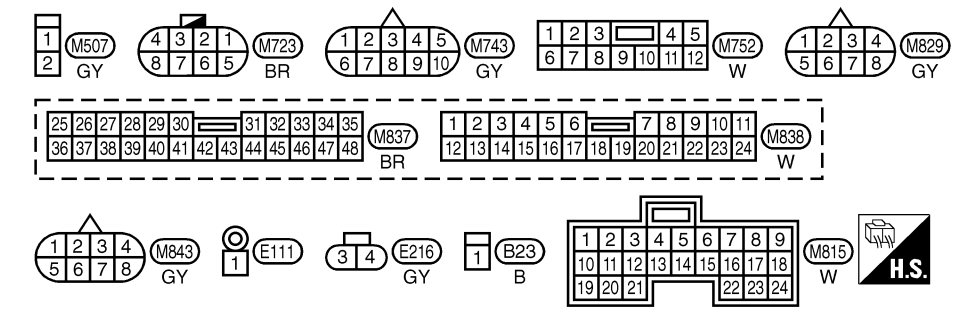
YEL768E

http://vnx.su/

Wiring Diagram — WARN — (Cont'd)

RHD MODELS





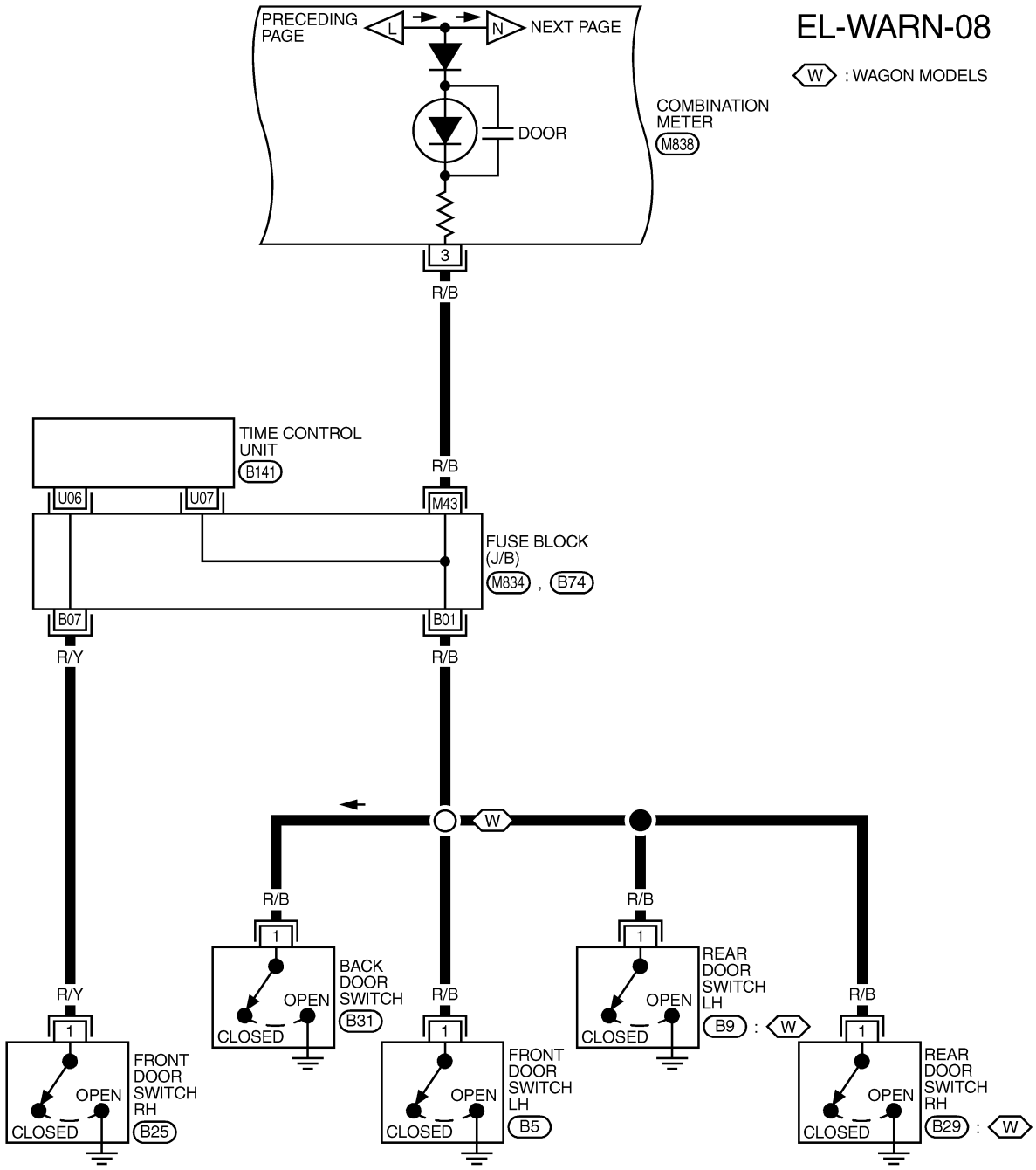
REFER TO THE FOLLOWING.
F108 , F135 -SUPER MULTIPLE JUNCTION (SMJ)
F29 -ELECTRICAL UNITS

YEL769E

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Wiring Diagram — WARN — (Cont'd)

RHD MODELS



M838 W

B5 BR , B9 BR , B25 BR , B29 BR , B31 BR

B141 * W

REFER TO THE FOLLOWING.
M834 , B74 -FUSE BLOCK-JUNCTION BOX (J/B)

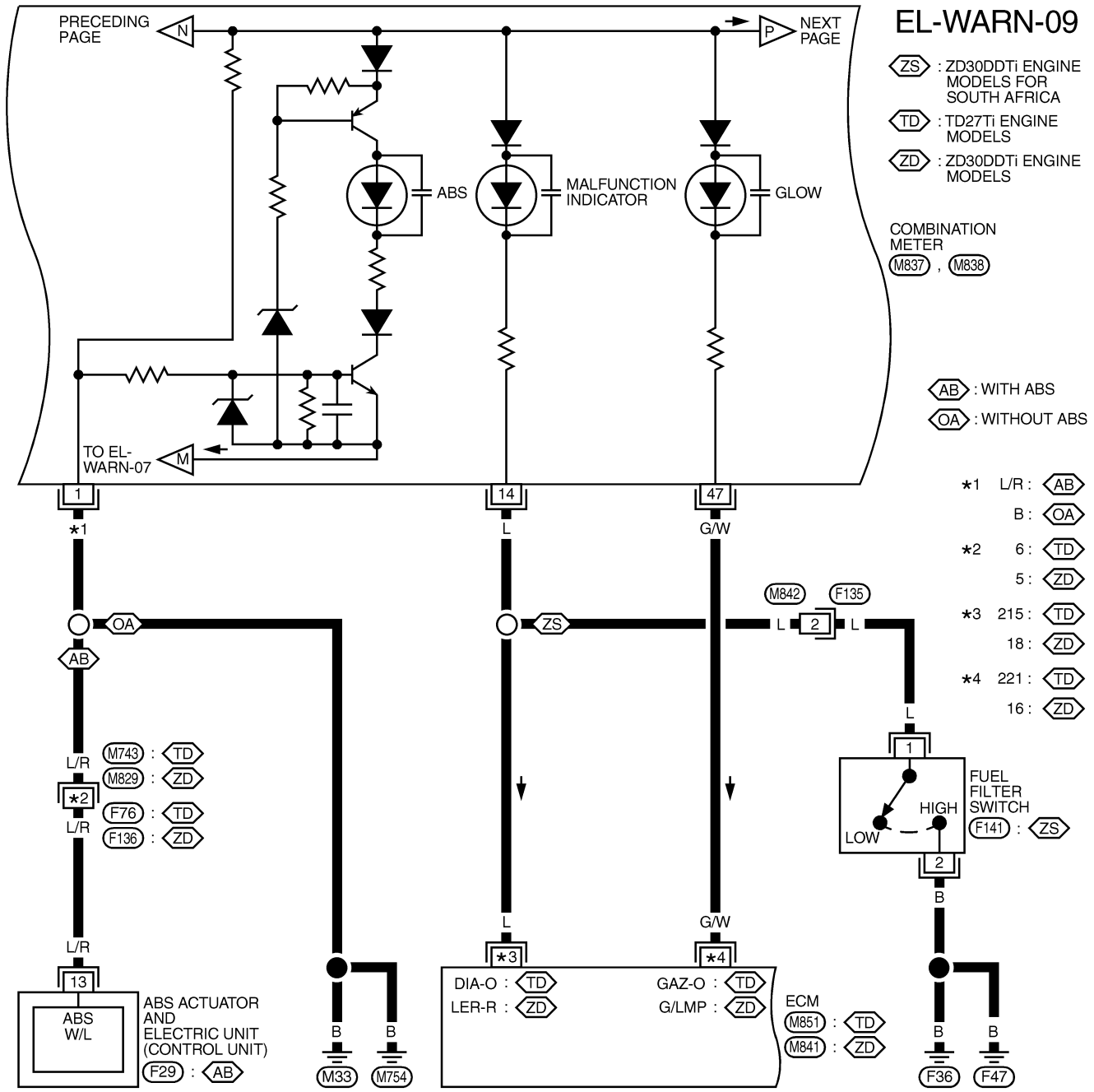
* : THIS CONNECTOR IS NOT SHOWN IN "HARNESS LAYOUT", EL SECTION.

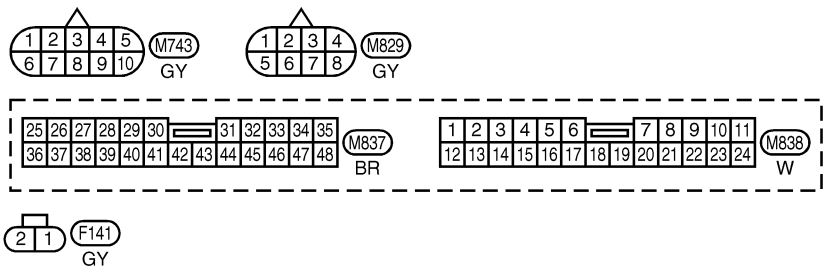
YEL770E

http://vnx.su/

Wiring Diagram — WARN — (Cont'd)

RHD MODELS





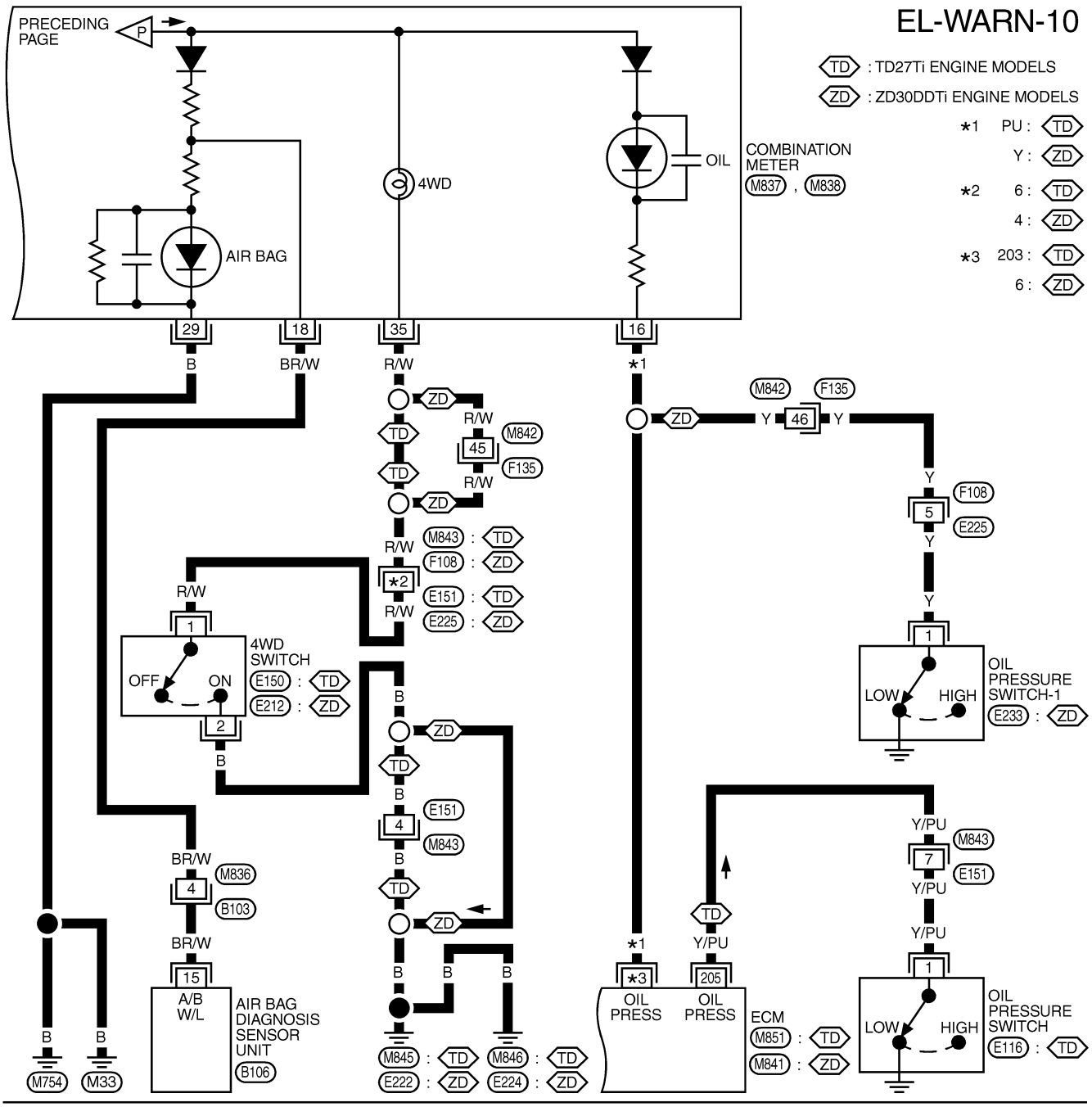
REFER TO THE FOLLOWING.
F135 -SUPER MULTIPLE JUNCTION (SMJ)
M841 , M851 , F29
-ELECTRICAL UNITS

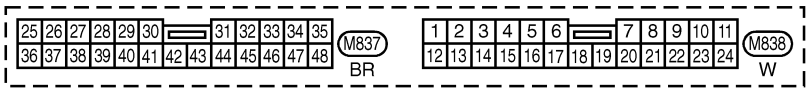
YEL771E

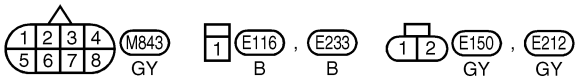
http://vnx.su/

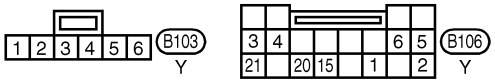
Wiring Diagram — WARN — (Cont'd)

RHD MODELS





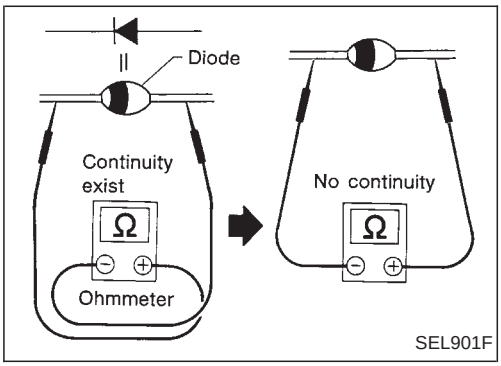




REFER TO THE FOLLOWING.
F108 , F135 -SUPER MULTIPLE JUNCTION (SMJ)
M841 , M851 -ELECTRICAL UNITS

YEL772E

http://vnx.su/

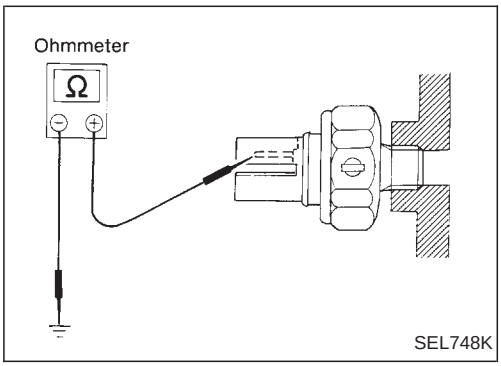


Electrical Components Inspection

DIODE CHECK

- Check continuity using an ohmmeter.
- Diode is functioning properly if test results are as shown in the figure at left.
- Check diodes at the combination meter harness connector instead of on the combination meter assembly. Refer to “Warning Lamp/Wiring Diagram”, EL-100.

NOTE:
Specification may vary depending on the type of tester. Before performing this inspection, be sure to refer to the instruction manual for the tester to be used.



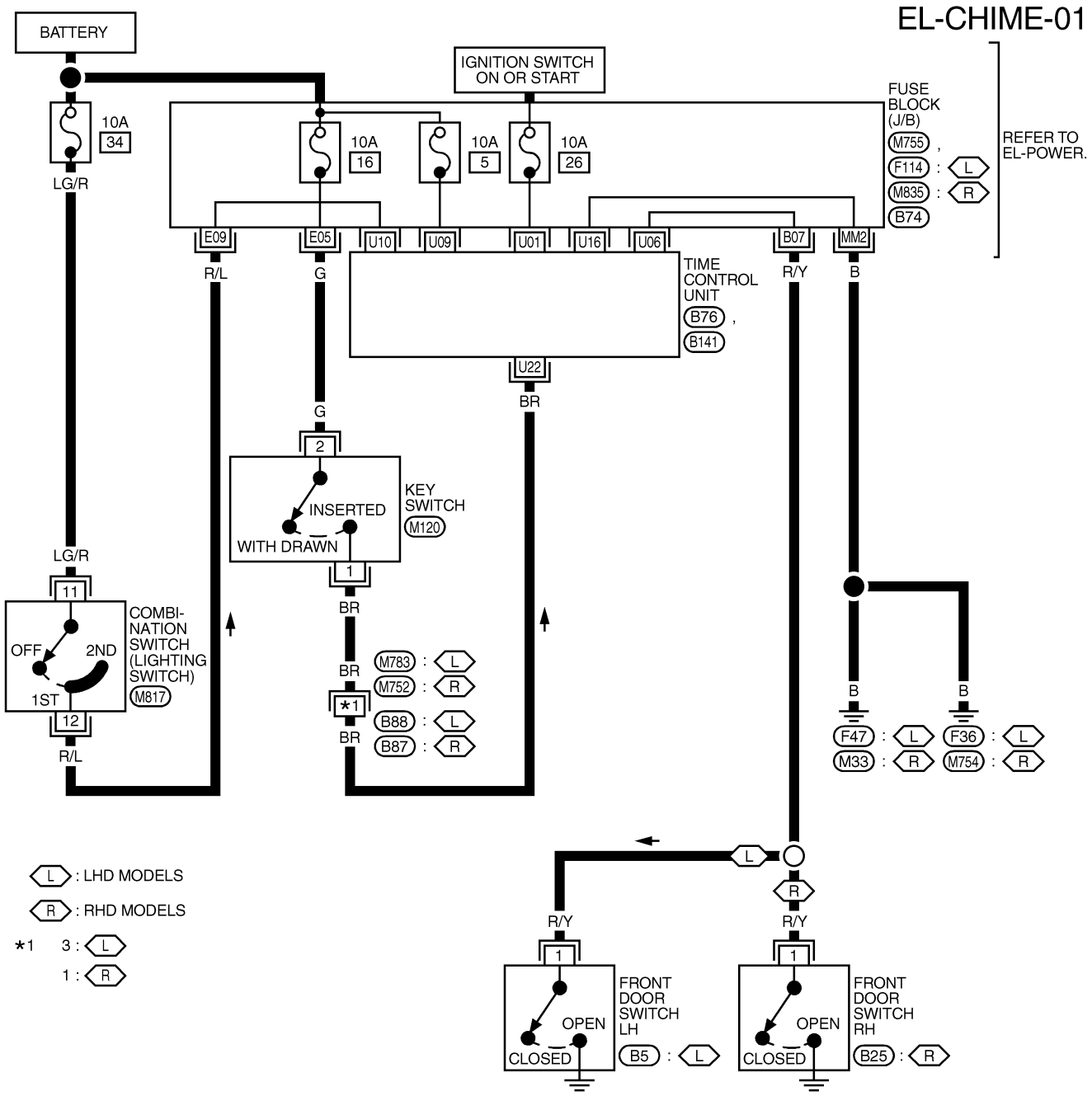
Oil Pressure Switch Check

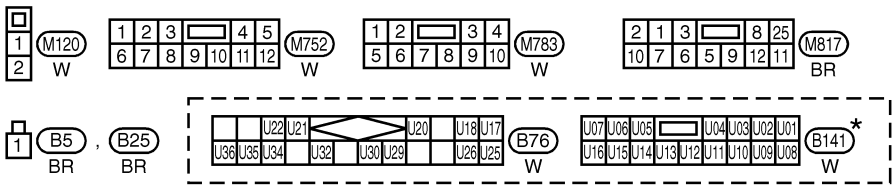
Check the continuity between the terminals of oil pressure switch and body ground.

	Oil pressure kPa (bar, kg/cm^2, psi)	Continuity
Engine start	More than 10 - 20 (0.10 - 0.20, 0.1 - 0.2, 1.4 - 2.8)	NO
Engine stop	Less than 10 - 20 (0.10 - 0.20, 0.1 - 0.2, 1.4 - 2.8)	YES

http://vnx.su/

Wiring Diagram — CHIME —





*: THIS CONNECTOR IS NOT SHOWN IN "HARNESS LAYOUT", EL SECTION.

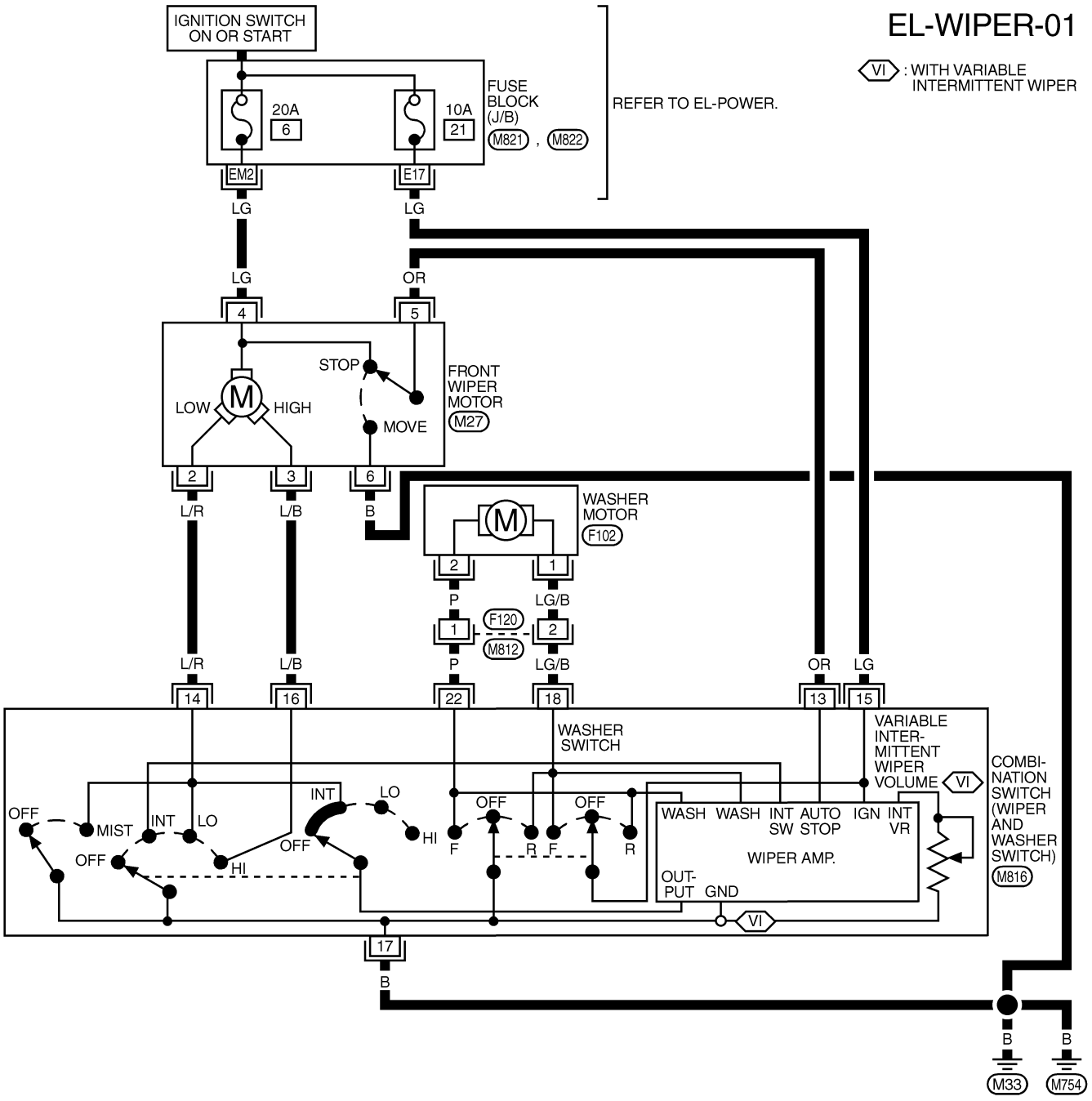
REFER TO THE FOLLOWING.
M755 , M835 , F114 , B74
-FUSE BLOCK-
JUNCTION BOX (J/B)

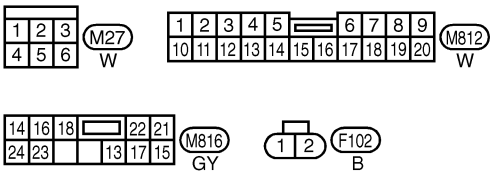
YEL773E

http://vnx.su/

Wiring Diagram — WIPER —

LHD MODELS





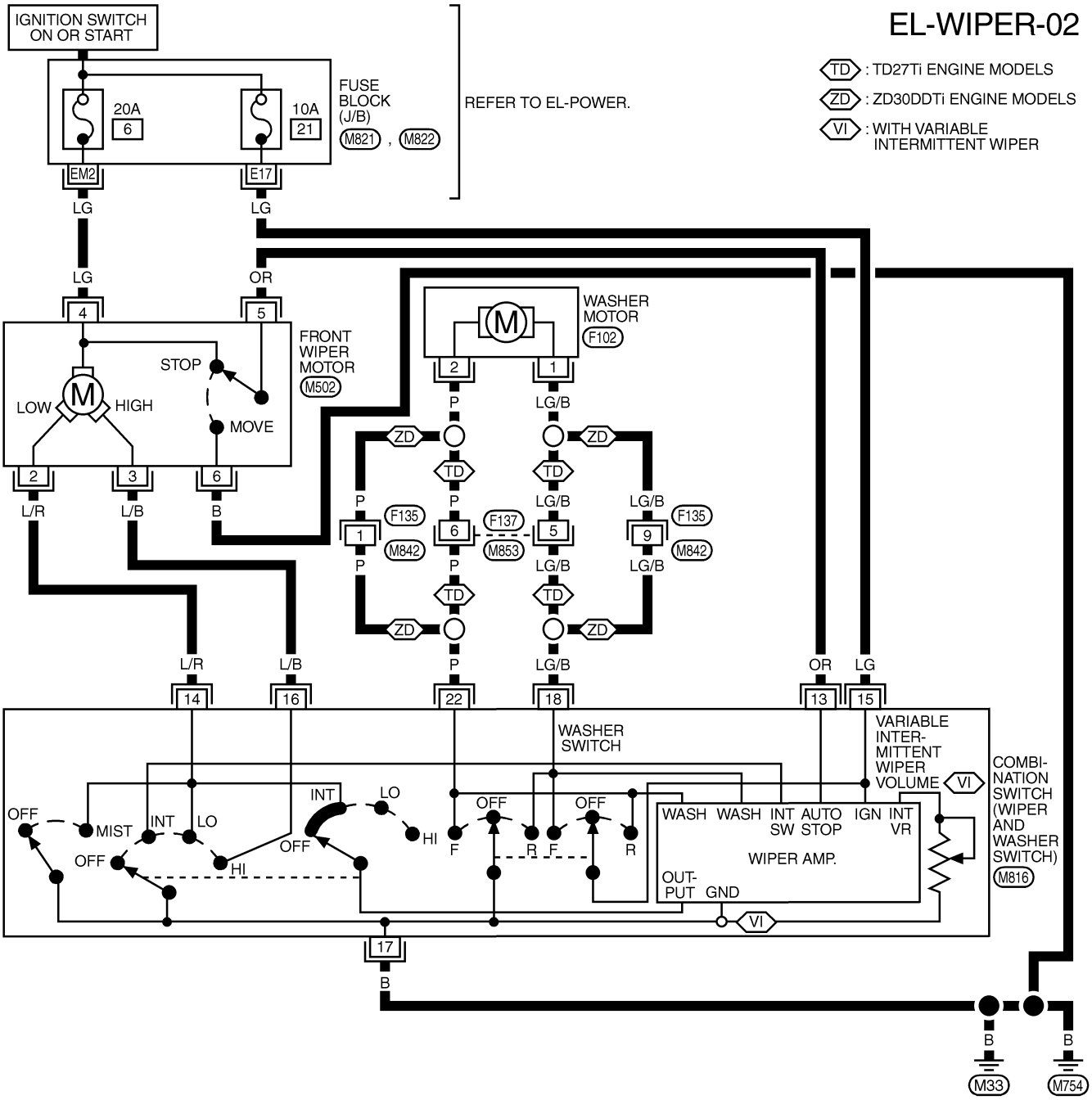
REFER TO THE FOLLOWING.
M821 , M822 -FUSE BLOCK-JUNCTION BOX (J/B)

YEL774E

http://vnx.su/

Wiring Diagram — WIPER — (Cont'd)

RHD MODELS



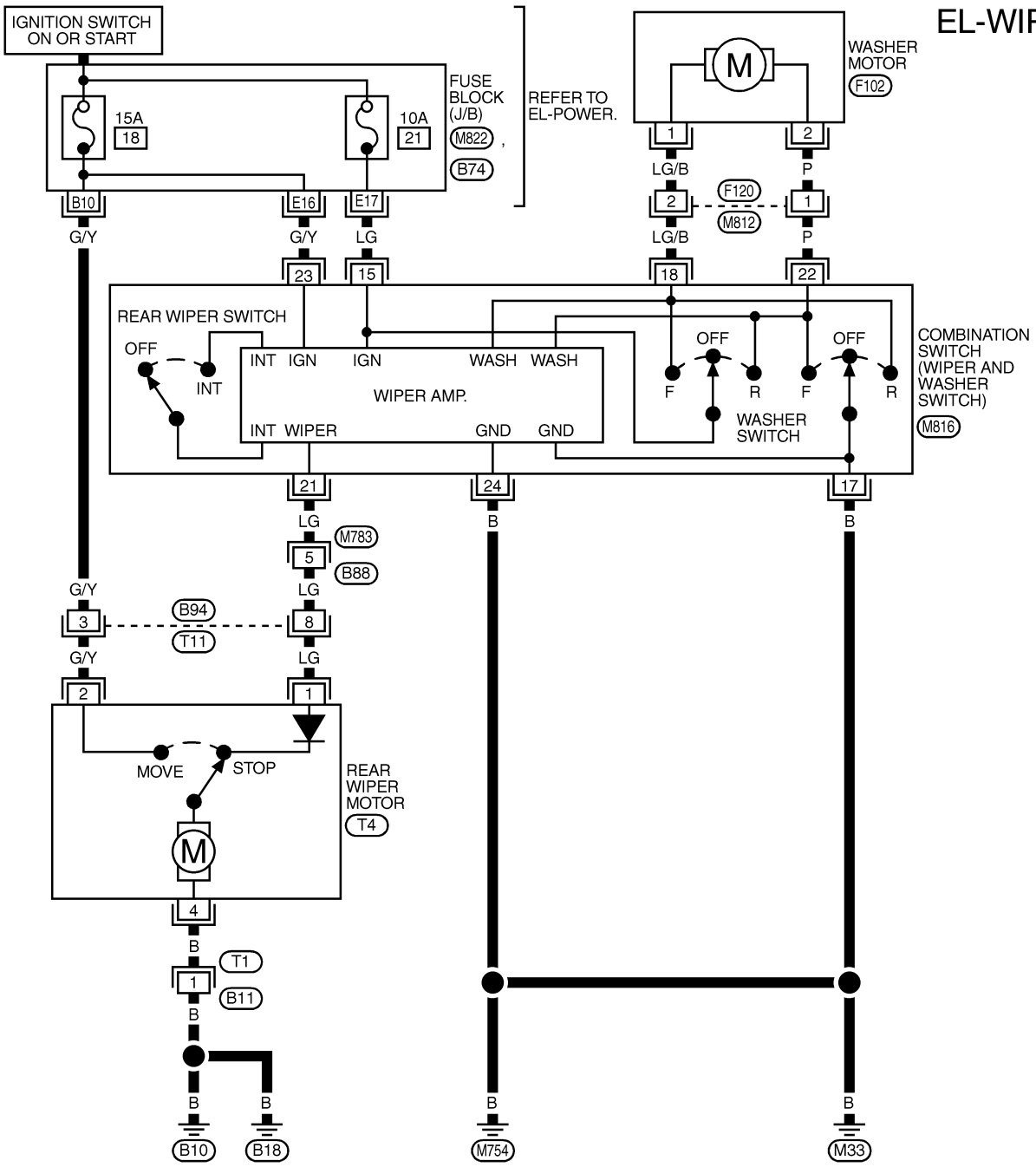
REFER TO THE FOLLOWING.
F135 -SUPER MULTIPLE JUNCTION (SMJ)
M821 , M822 -FUSE BLOCK-JUNCTION BOX (J/B)

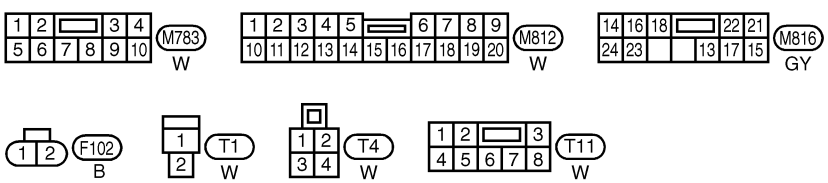
YEL111D

http://vnx.su/

Wiring Diagram — WIP/R —

LHD MODELS





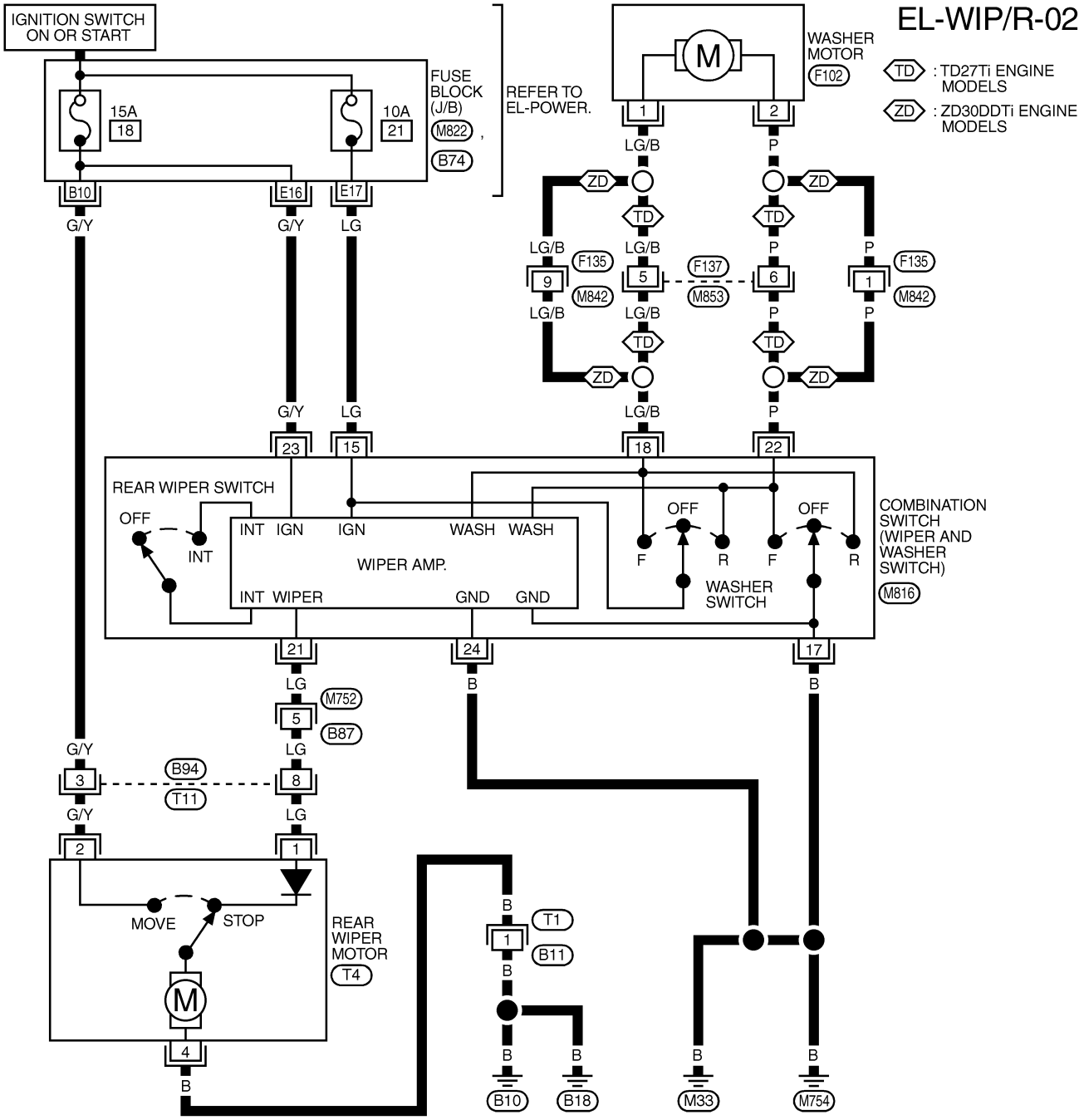
REFER TO THE FOLLOWING.
M822 , B74 -FUSE BLOCK-JUNCTION BOX (J/B)

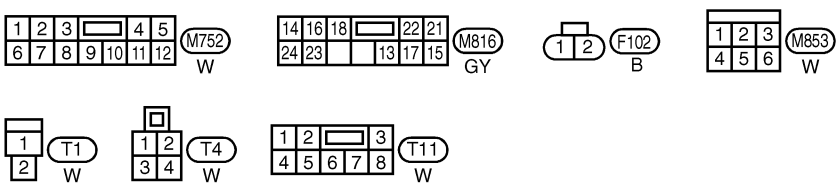
YEL112D

http://vnx.su/

Wiring Diagram — WIP/R — (Cont'd)

RHD MODELS





REFER TO THE FOLLOWING.
F135 -SUPER MULTIPLE JUNCTION (SMJ)
M822 , B74 -FUSE BLOCK-JUNCTION BOX (J/B)

YEL775E

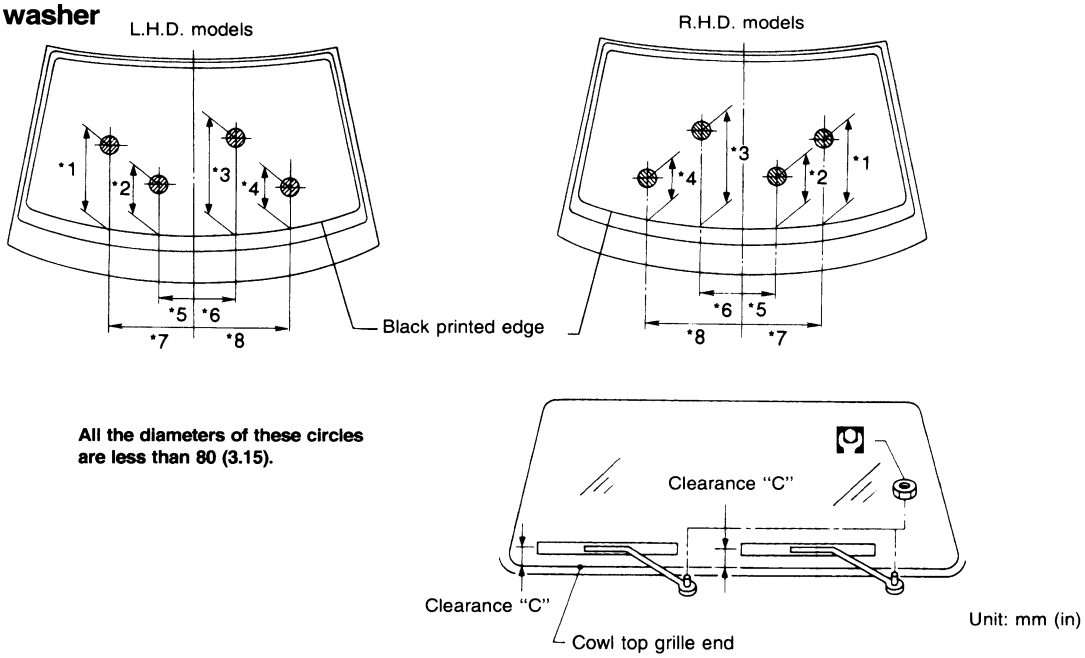
http://vnx.su/

Installation

1. Prior to wiper arm installation, turn on wiper switch to operate wiper motor and then turn it “OFF” (Auto Stop).
2. Lift the blade up and then set it down onto glass surface to set the blade center to clearance “C” or “D” immediately before tightening nut.
3. Eject washer fluid. Turn on wiper switch to operate wiper motor and then turn it “OFF”.
4. Ensure that wiper blades stop within clearance “C” or “D”.
   Clearance “C”: 25 - 35 mm (0.98 - 1.38 in)
   Clearance “D”: 25 - 35 mm (0.98 - 1.38 in)

- Tighten windshield wiper arm nuts to specified torque.
  Front wiper:
  : 20 - 30 N·m (2.1 - 3.0 kg-m, 15 - 22 ft-lb)
  Rear wiper:
  : 11.0 - 16.0 N·m
  (1.12 - 1.63 kg-m, 8.1 - 11.8 ft-lb)

Front wiper and washer

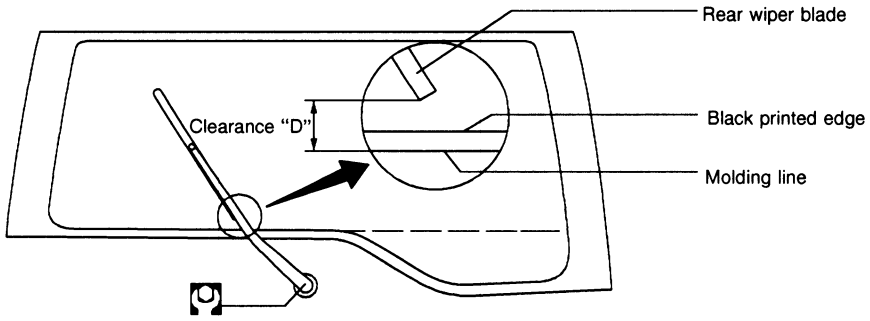


***1: 344 (13.54)**
***2: 210 (8.27)**
***3: 401 (15.79)**
***4: 166 (6.54)**
***5: 117 (4.61)**
***6: 200 (7.87)**
***7: 317 (12.48)**
***8: 426 (16.77)**

All the diameters of these circles are less than 80 (3.15).

YEL077

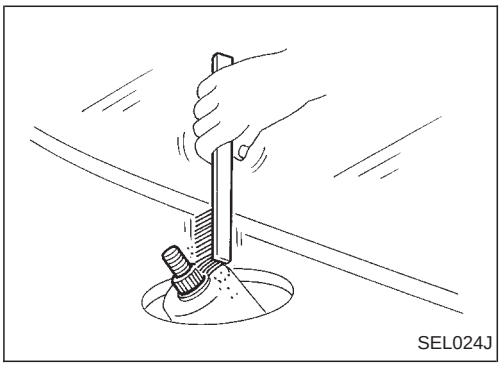
Rear wiper



NEL628

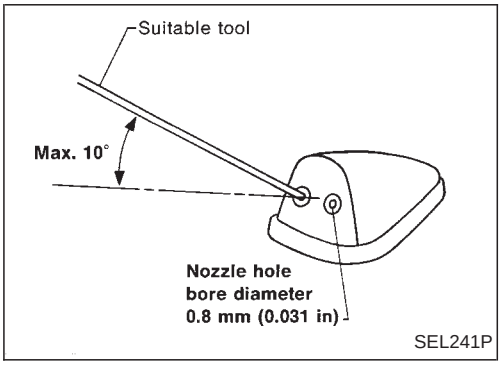
http://vnx.su/

Installation (Cont'd)


SEL024J

- **Before reinstalling wiper arm, clean up the pivot area as illustrated. This will reduce possibility of wiper arm looseness.**

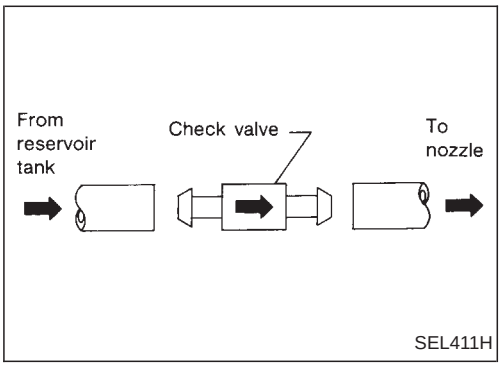
Washer Nozzle Adjustment



SEL241P

- Adjust washer nozzle with suitable tool as shown in the figure at left.
  Adjustable range: ±10°

Check Valve



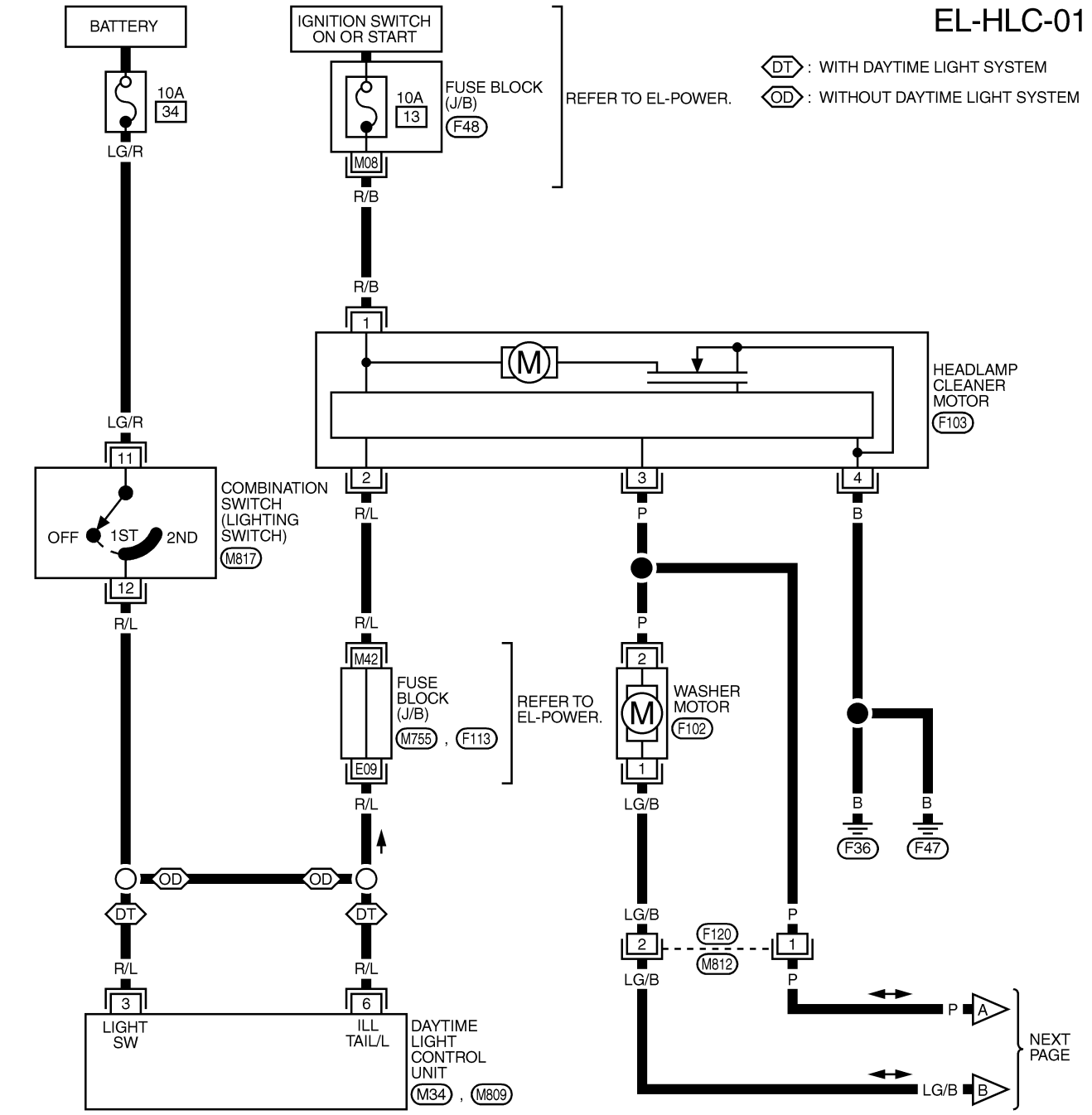
SEL411H

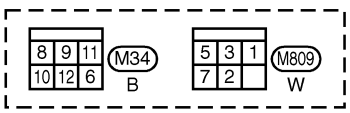
- A check valve is provided in the washer fluid line. Be careful not to connect check valve to washer tube in the wrong direction.

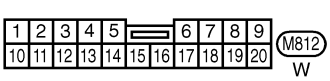
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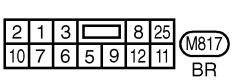
Wiring Diagram — HLC —

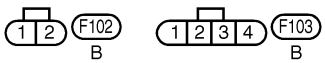
LHD MODELS











REFER TO THE FOLLOWING.
M755 , F48 , F113
-FUSE BLOCK-
JUNCTION BOX (J/B)

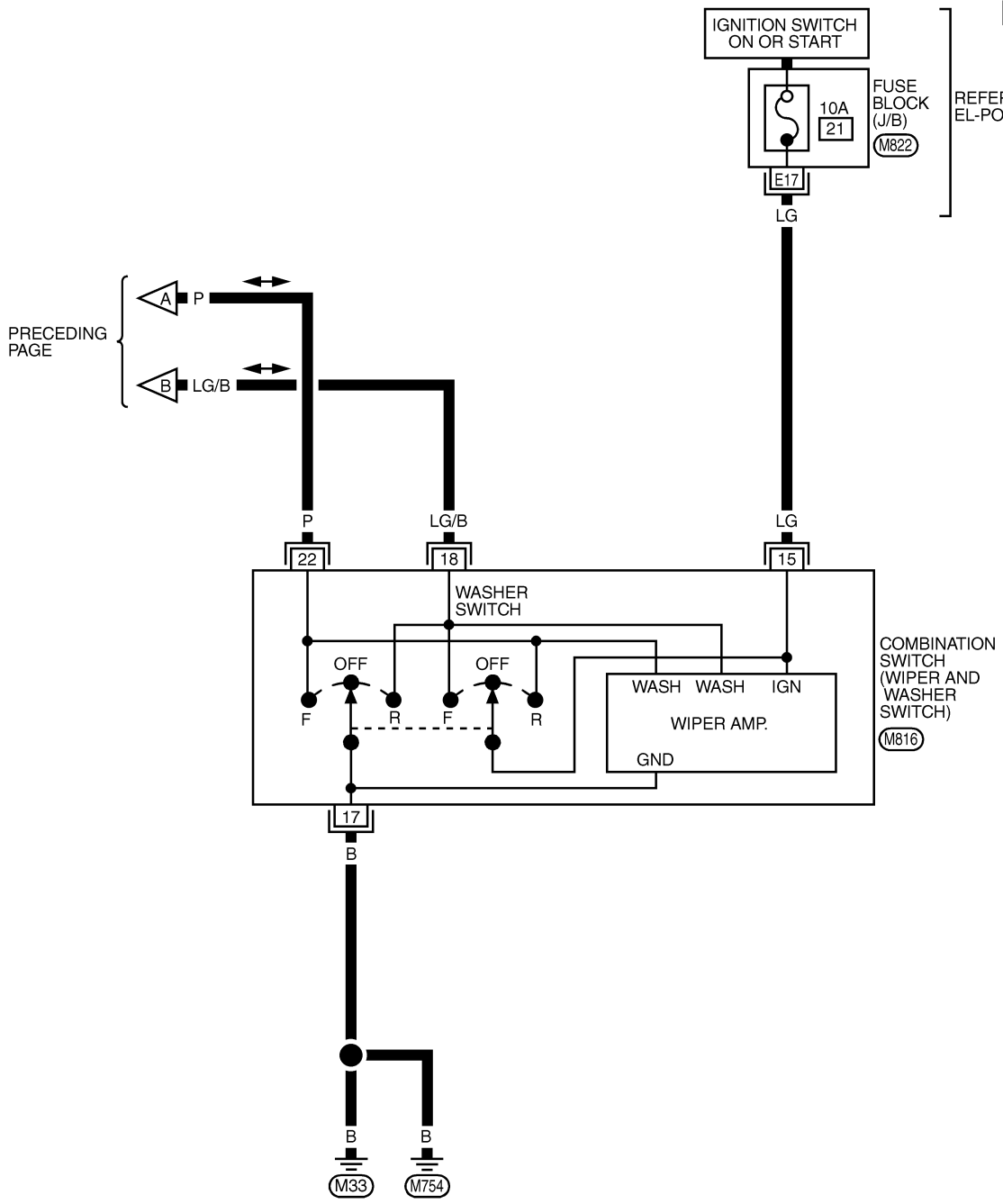
YEL114D

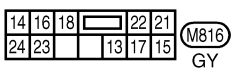
http://vnx.su/

Wiring Diagram — HLC — (Cont'd)

LHD MODELS

EL-HLC-02





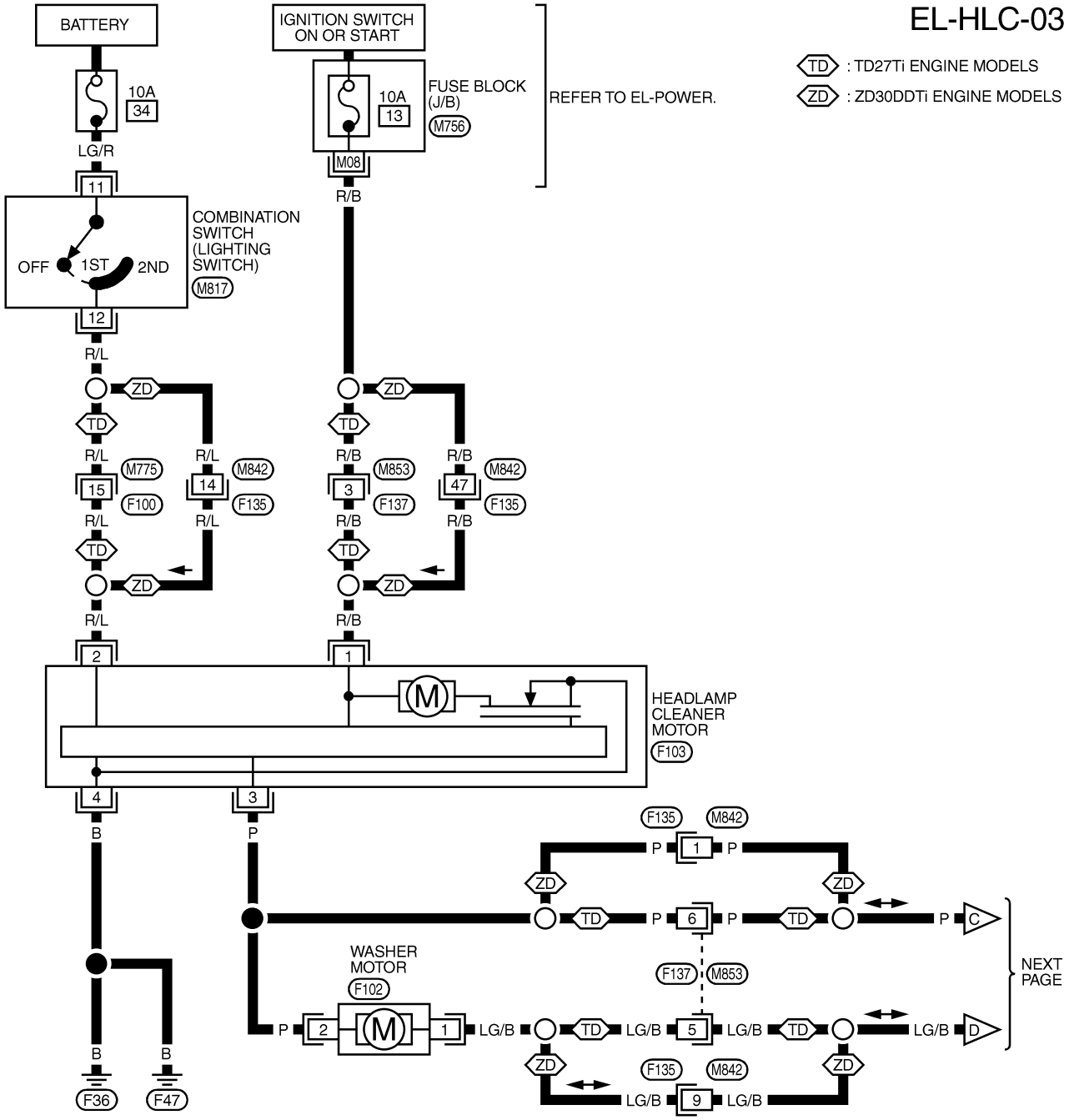
REFER TO THE FOLLOWING.
M822 -FUSE BLOCK-
JUNCTION BOX (J/B)

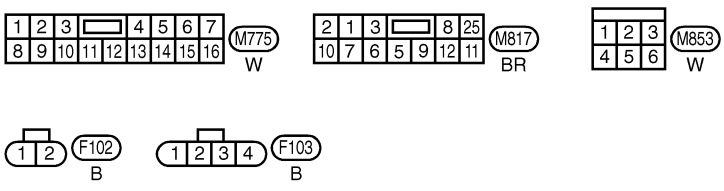
YEL115D

http://vnx.su/

Wiring Diagram — HLC — (Cont'd)

RHD MODELS





REFER TO THE FOLLOWING.
F135 -SUPER MULTIPLE JUNCTION (SMJ)
M756 -FUSE BLOCK-JUNCTION BOX (J/B)

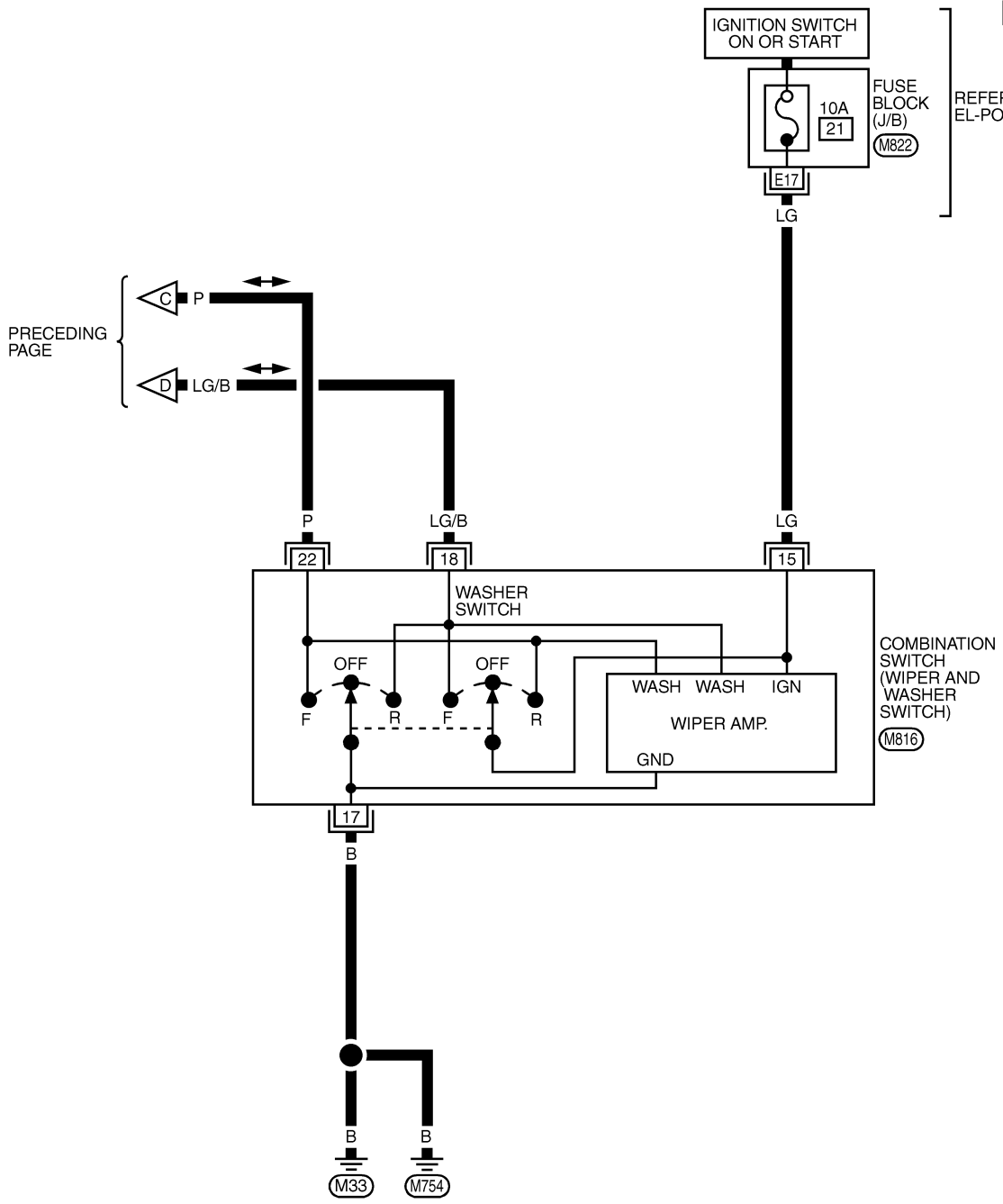
YEL776E

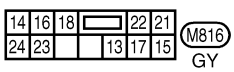
http://vnx.su/

Wiring Diagram — HLC — (Cont'd)

RHD MODELS

EL-HLC-04





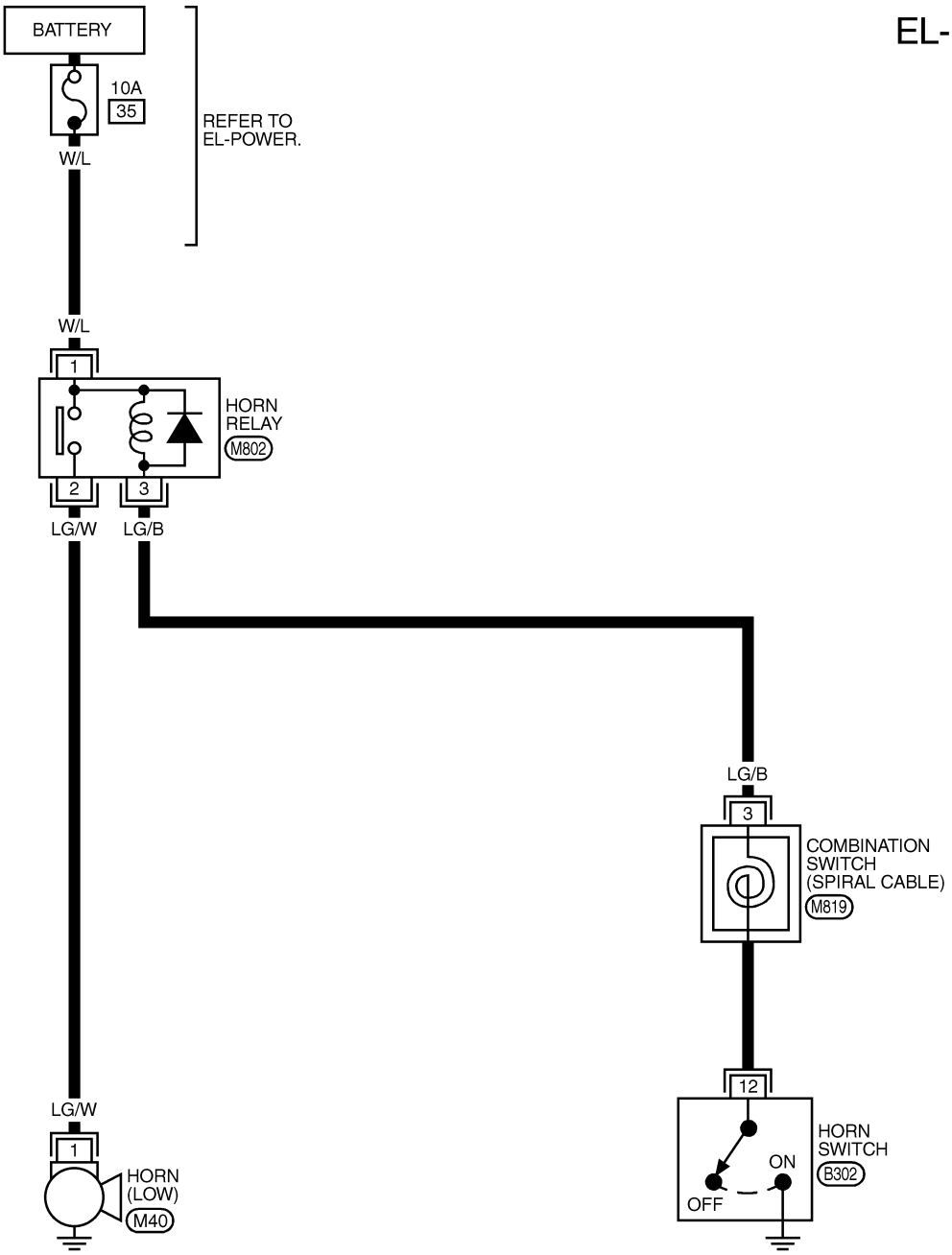
REFER TO THE FOLLOWING.
M822 -FUSE BLOCK-
JUNCTION BOX (J/B)

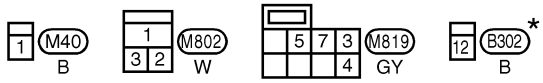
YEL117D

http://vnx.su/

Wiring Diagram — HORN —

EL-HORN-01



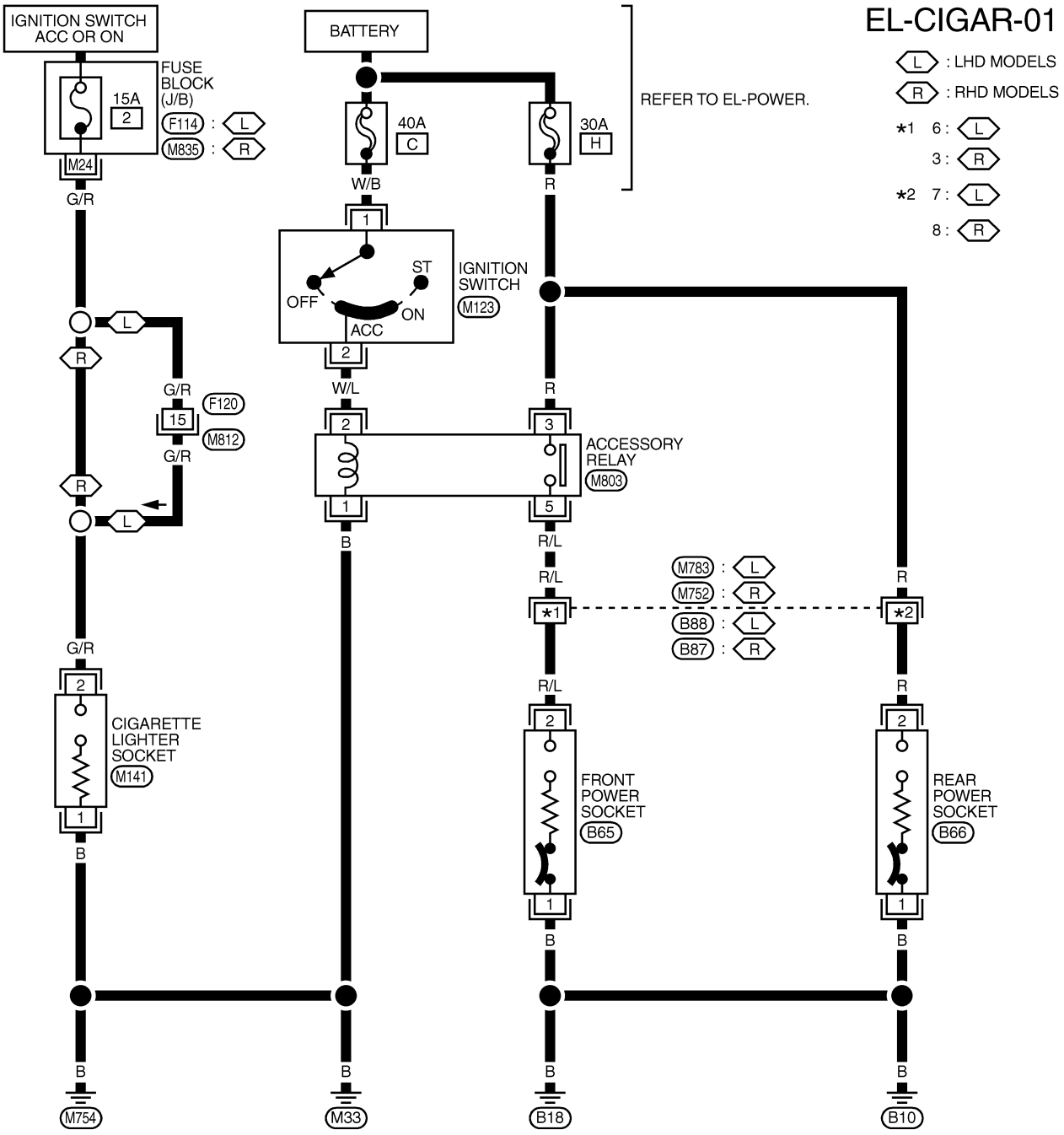


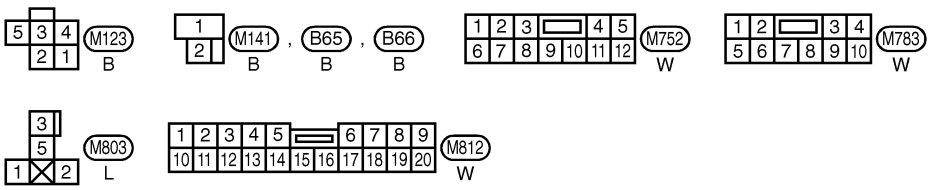
* : THIS CONNECTOR IS NOT SHOWN IN “HARNESS LAYOUT” , EL SECTION.

YEL777E

http://vnx.su/

Wiring Diagram — CIGAR —



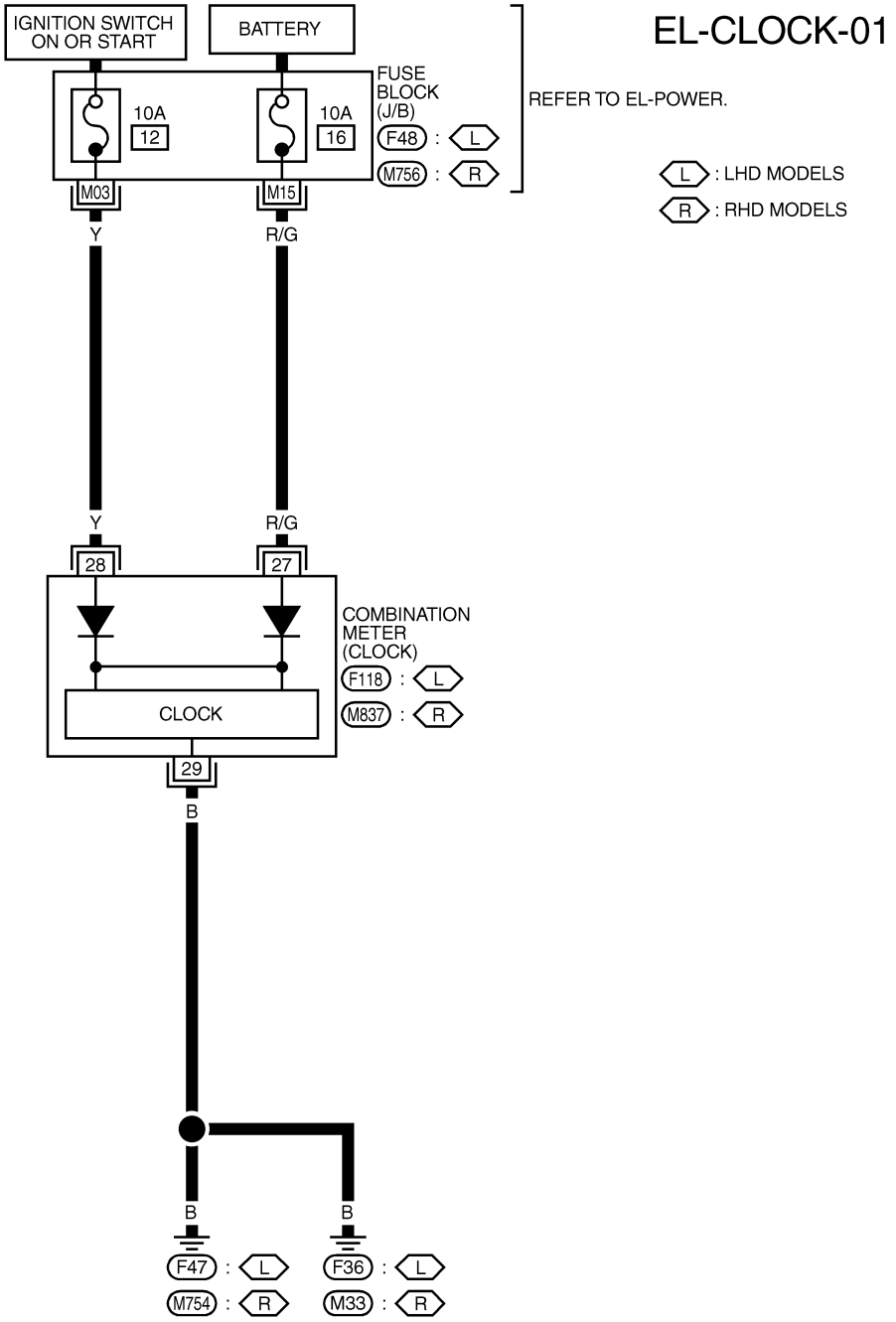


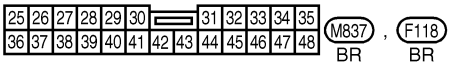
REFER TO THE FOLLOWING.
M835 , F114 -FUSE BLOCK-JUNCTION BOX (J/B)

YEL778E

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Wiring Diagram — CLOCK —





REFER TO THE FOLLOWING.
M756 , F48
-FUSE BLOCK-
JUNCTION BOX (J/B)

YEL198D

http://vnx.su/

System Description

The rear window defogger system is controlled by the time control unit. The rear window defogger operates only for approximately 15 minutes.
Rear window defogger switch is built into the A/C control panel.
Power is supplied at all times
- through 10A fuse [No. 5, located in the fuse block (J/B)]
- to time control unit terminal U09.

With the ignition switch in the ON or START position, power is supplied
- through 10A fuse [No. 26, located in the fuse block (J/B)]
- to time control unit terminal U01
- to rear window defogger relay coil power side.

Ground is supplied
- to time control unit terminal U16
- through terminal MM2 of fuse block (J/B)
- through body grounds F36, F47 (LHD models) or M33, M754 (RHD models)
- to terminal 5 of A/C control panel (rear window defogger switch)
- through body grounds M33 and M754.

When the rear defogger switch is turned ON, ground is supplied
- through terminals 3 and 5 of A/C control panel (rear defogger switch)
- through terminal M19 of fuse block (J/B)
- to time control unit terminal U03.

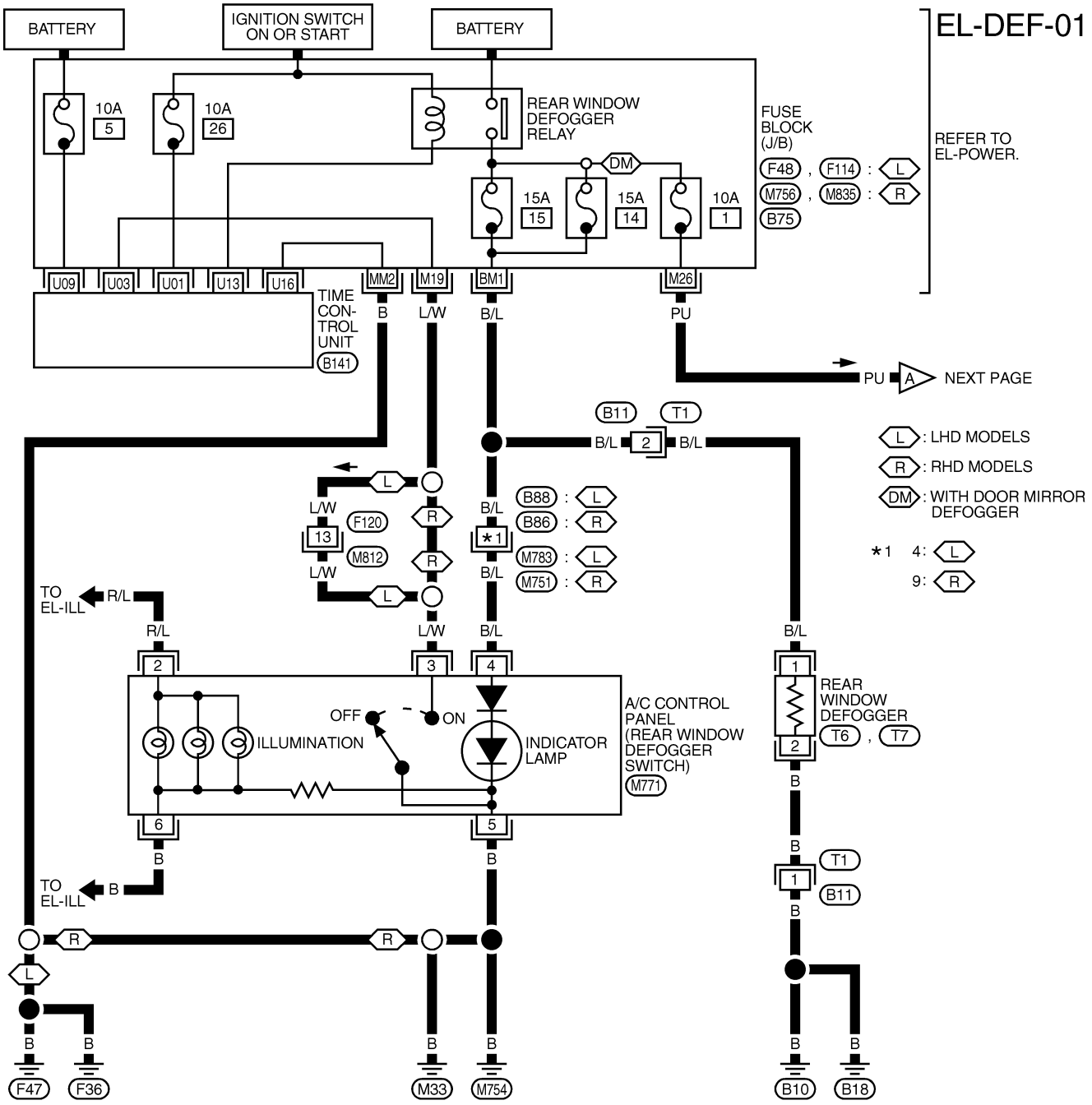
Terminal U13 of time control unit then supplies ground to the rear window defogger relay coil ground side.
With power and ground supplied, the rear window defogger relay is energized.
Power is supplied
- through 15A fuse [No. 14 and No. 15, located in the fuse block (J/B)]
- to the rear window defogger terminal 1
- through 10A fuse [No. 1, located in the fuse block (J/B)]
- to door mirror LH/RH (defogger) terminal 3.

Ground is supplied
- to rear window defogger terminal 2
- to door mirror LH/RH terminal 2
- through body grounds B10 and B18.

With power and ground supplied, the rear window defogger filaments heat and defog the rear window.
When the system is activated, the rear window defogger indicator illuminates in the rear window defogger switch.

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Wiring Diagram — DEF —

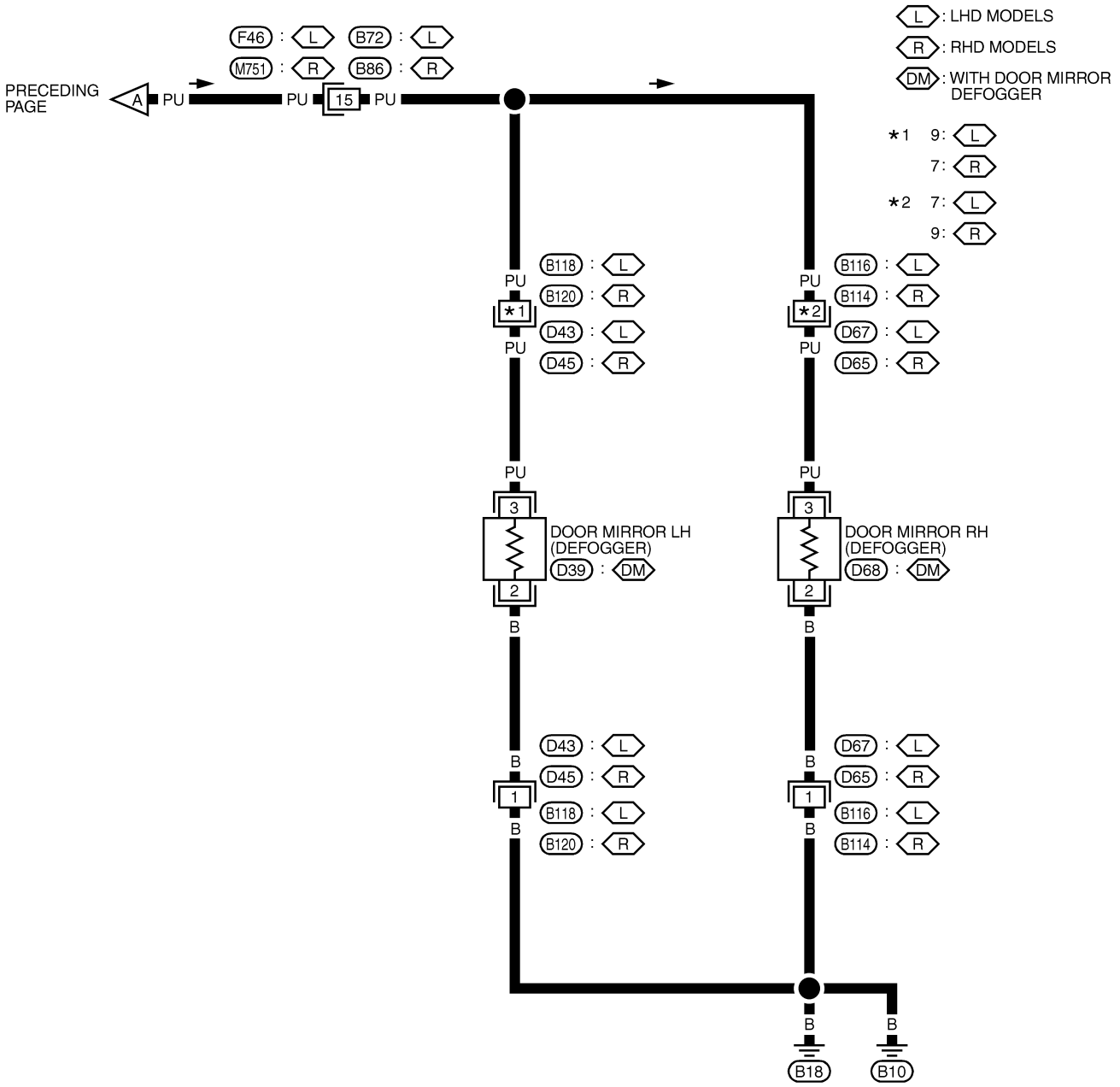


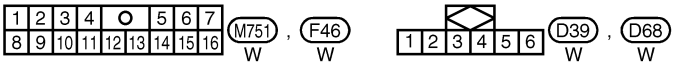
YEL779E

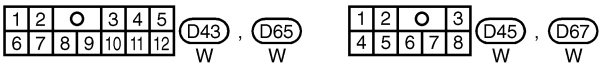
http://vnx.su/

Wiring Diagram — DEF — (Cont'd)

EL-DEF-02







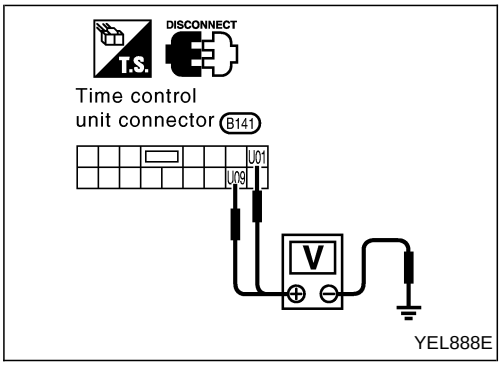
YEL121D

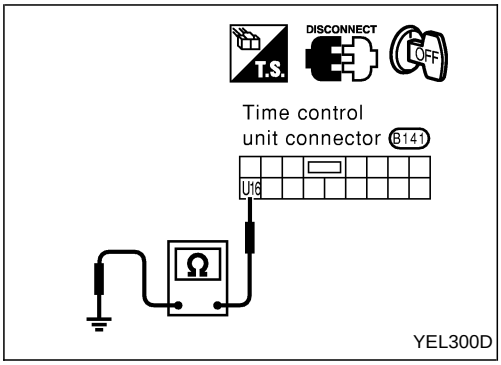
http://vnx.su/

Trouble Diagnoses

SYMPTOM CHART

Symptom	Diagnoses service procedure
Rear window defogger and door mirror defogger do not activate.	1. Check time control unit power supply and ground circuit. 2. Check rear window defogger switch. 3. Check rear window defogger switch circuit. 4. Check rear window defogger signal. 5. Check rear window defogger relay.
Rear window defogger or door mirror defogger do not activate.	1. Check fuse (No. 14, No. 15 or No. 1). 2. Check filament. 3. Check harness between fuse block (J/B) and defogger. 4. Check defogger ground circuit.
Rear window defogger and door mirror defogger do not go off after activating about 15 minutes.	1. Check time control unit power supply and ground circuit. 2. Check rear window defogger switch. 3. Check rear window defogger switch circuit.





POWER SUPPLY AND GROUND CIRCUIT CHECK

Main power supply circuit check

Terminals		Ignition switch position		
⊕	⊖	OFF	ACC	ON
U09	Ground	Battery voltage	Battery voltage	Battery voltage
U01	Ground	—	—	Battery voltage

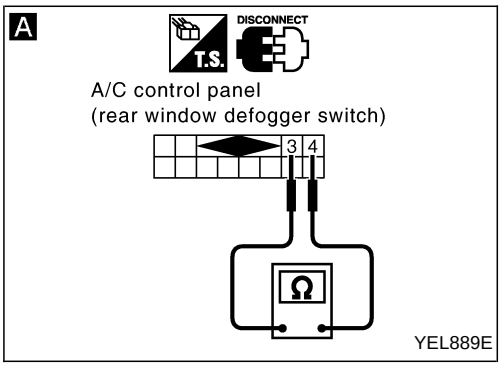
Ground circuit check

Terminals	Continuity
U16 - Ground	Yes

http://vnx.su/

Trouble Diagnoses (Cont'd)

CHECK REAR WINDOW DEFOGGER SWITCH



A

1. Disconnect A/C control panel connector (rear window defogger switch) (M771).
2. Check continuity between terminals ③ and ⑤.

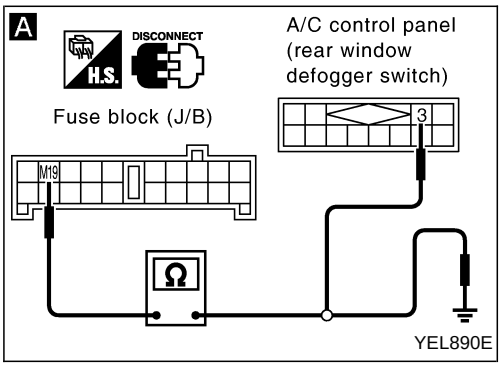
With rear window defogger switch ON:
Continuity should exist.
With rear window defogger switch OFF:
Continuity should not exist.

NG → Replace rear window defogger switch.

OK ↓

Rear window defogger switch is OK.

CHECK REAR WINDOW DEFOGGER SWITCH CIRCUIT



A

1. Check continuity between fuse block (J/B) connector terminal (M19) and A/C control panel connector terminal ③.

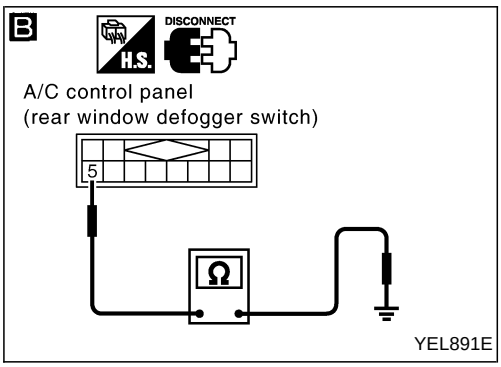
Continuity should exist.

2. Check continuity between fuse block (J/B) connector terminal (M19) and ground.

Continuity should not exist.

NG → Repair harness or connector.

OK ↓



B

1. Check continuity between A/C control panel connector terminal ⑤ and ground.

Continuity should exist.

NG → Repair harness or connector.

OK ↓

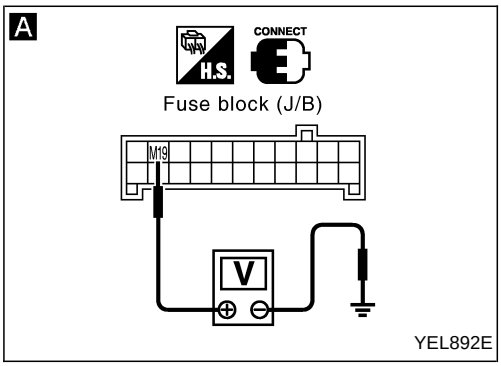
Rear window defogger switch circuit is OK.

http://vnx.su/

Trouble Diagnoses (Cont'd)

CHECK REAR WINDOW DEFOGGER SIGNAL

A



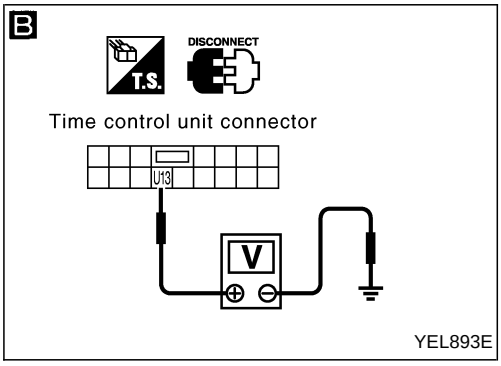
1. Check voltage between fuse block (J/B) terminal (M19) and ground.

With rear window defogger switch ON:
Approx. 0V
With rear window defogger switch OFF:
Battery voltage

NG → Replace time control unit.

OK ↓

B



1. Disconnect time control unit.
2. Ignition switch ON.
3. Check voltage between time control unit terminal (U13) and ground.

Battery voltage should exist.

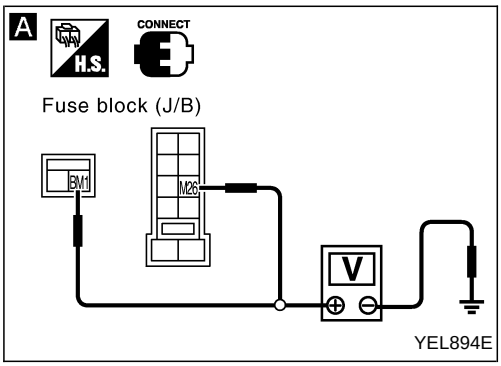
NG → Replace time control unit.

OK ↓

Rear window defogger signal is OK.

CHECK REAR WINDOW DEFOGGER RELAY

A



1. Check voltage between fuse block (J/B) terminals (BM1), (M26) and ground.

With rear window defogger switch ON:
Battery voltage

NG → Replace rear window relay.

OK ↓

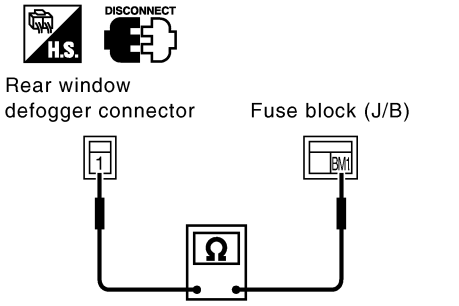
Rear window defogger relay is OK.

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Trouble Diagnoses (Cont'd)

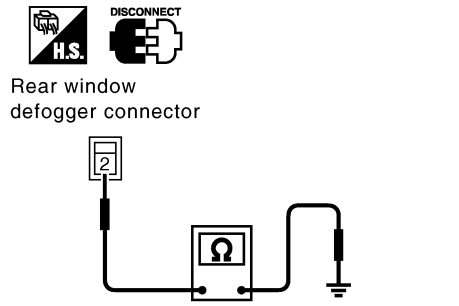
CHECK REAR WINDOW/DOOR MIRROR DEFOGGER CIRCUIT

A



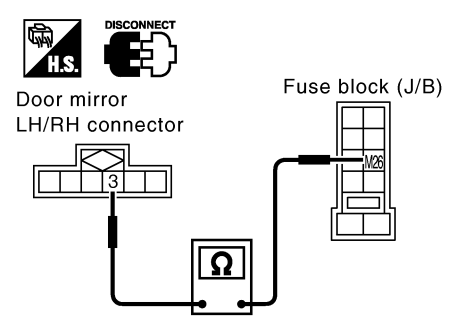
YEL895E

B



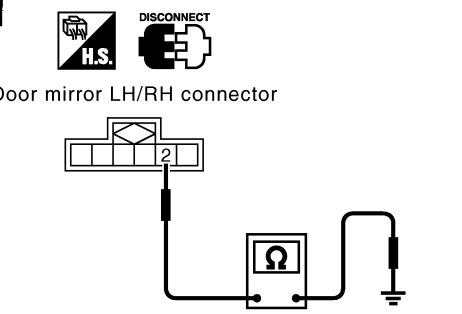
YEL896E

C



YEL897E

D



YEL898E

A B

CHECK REAR WINDOW DEFOGGER CIRCUIT.

1. Disconnect rear window defogger connector.
2. Check continuity between rear window defogger connector terminal 1and fuse block (J/B) terminal (BM1).

Continuity should exist.

3. Check continuity between rear window defogger connector terminal ② and ground.

Continuity should not exist.

NG → Repair or replace harness.

OK ↓

C D

CHECK DOOR MIRROR DEFOGGER CIRCUIT.

1. Disconnect door mirror defogger connector.
2. Check continuity between door mirror defogger connector terminal ③ and fuse block (J/B) terminal (M26).

Continuity should exist.

3. Check continuity between door mirror defogger connector terminal ② and ground.

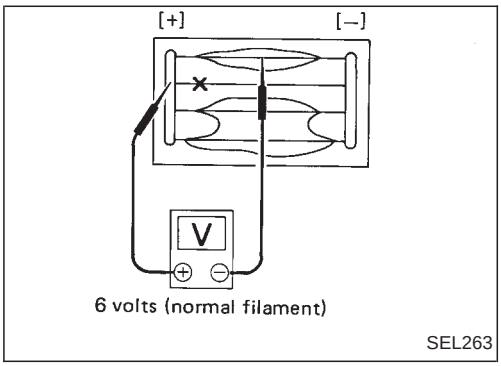
Continuity should exist.

NG → Repair or replace harness.

OK ↓

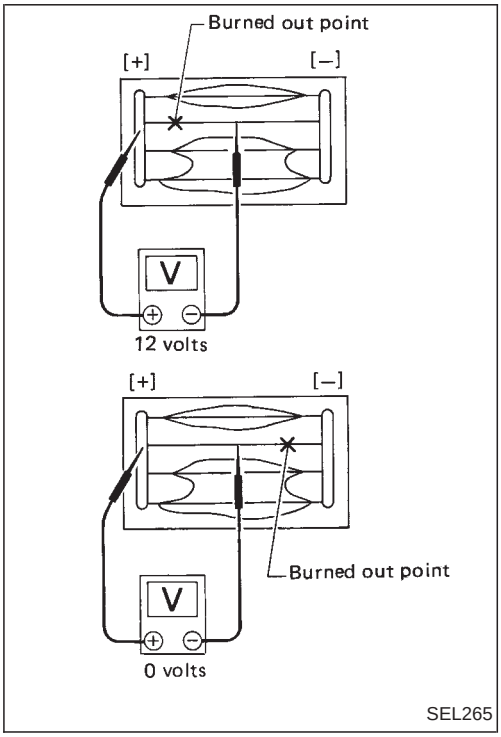
Rear window defogger and door mirror defogger circuit is OK.

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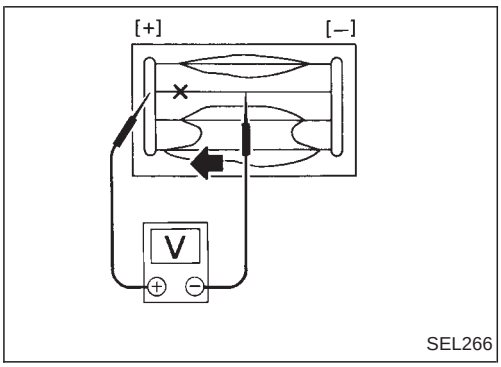


Filament Check

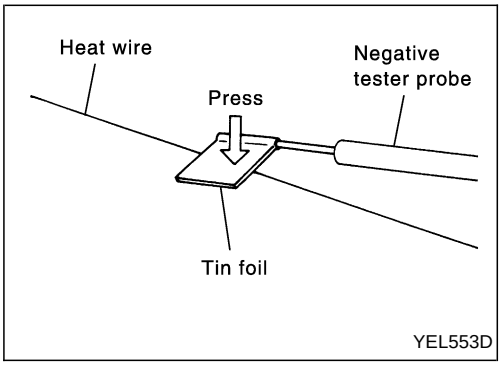
1. Attach probe circuit tester (in volt range) to middle portion of each filament.
   6 volts = Normal filament



2. If a filament is burned out, circuit tester registers 0 or 12 volts.



3. To locate burned out point, move probe to left and right along filament to determine point where tester needle swings abruptly.



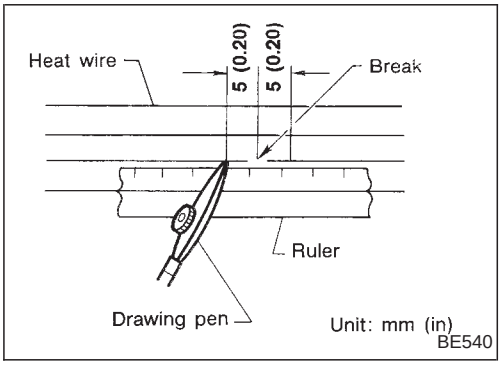
- **When measuring voltage, wind a piece of tin foil around the top of the negative probe and press the foil against the wire with your finger.**

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Filament Repair

REPAIR EQUIPMENT

1. Conductive silver composition (Dupont No. 4817 or equivalent)
2. Ruler 30 cm (11.8 in) long
3. Drawing pen
4. Heat gun
5. Alcohol
6. Cloth

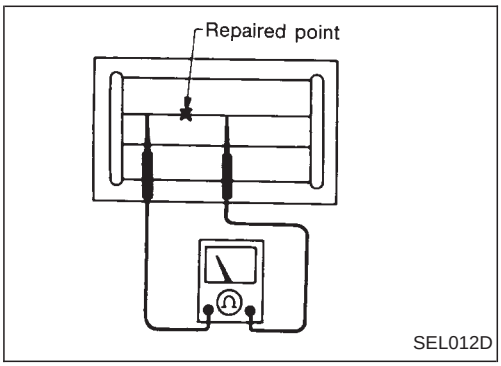


REPAIRING PROCEDURE

1. Wipe broken heat wire and its surrounding area clean with a cloth dampened in alcohol.
2. Apply a small amount of conductive silver composition to tip of drawing pen.

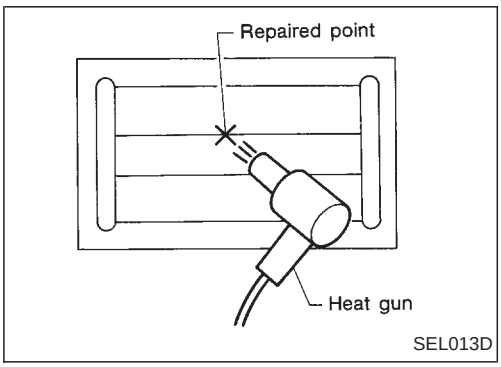
Shake silver composition container before use.

3. Place ruler on glass along broken line. Deposit conductive silver composition on break with drawing pen. Slightly overlap existing heat wire on both sides [preferably 5 mm (0.20 in)] of the break.



4. After repair has been completed, check repaired wire for continuity. This check should be conducted 10 minutes after silver composition is deposited.

Do not touch repaired area while test is being conducted.



5. Apply a constant stream of hot air directly to the repaired area for approximately 20 minutes with a heat gun. A minimum distance of 3 cm (1.2 in) should be kept between repaired area and hot air outlet. If a heat gun is not available, let the repaired area dry for 24 hours.

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System Description

Refer to Owner's Manual for audio system operating instructions.
Power is supplied at all times
- through 15A fuse (No. 33, located in the fuse and fusible link box)
- to audio unit terminal 9
- to CD auto changer terminal 32 (With CD auto changer).

With the ignition switch in the ACC or ON position, power is supplied
- through 10A fuse [No. 3, located in the fuse block (J/B)]
- to audio unit terminal 3,
- to CD auto changer terminal 36 (With CD auto changer).

Ground is supplied
- through body ground F53 (LHD models) or M761 (RHD models)
- to audio unit terminal 8 and
- to CD auto changer terminal 35 (With CD auto changer).

Audio signals are supplied
- through audio unit terminals 7, 10, 11, 12, 13, 14, 15, 16
- to terminals 1 and 2 of front door speaker LH and RH
- to terminals 1 and 2 of rear door speaker LH and RH (Wagon models) or
- to terminals 1 and 2 of rear speaker LH and RH (Hardtop models)
- to terminals 1 and 2 of tweeter LH and RH.

NATS AUDIO LINK

Description

The link with the NATS IMMU implies that the audio unit can basically only be operated if connected to the matching NATS IMMU to which the audio unit was initially fitted on the production line.
Since radio operation is impossible after the link with the NATS is disrupted, the stolen audio unit is basically useless since special equipment is required to reset the audio unit.

Initialization process for audio units that are linked to the NATS IMMU

New audio units will be delivered to the factories in the "NEW" state, i.e. ready to be linked with the vehicle's NATS. When the audio unit in "NEW" state is first switched on at the factory, it will start up communication with the vehicle's immobiliser control unit (IMMU) and send a code (the "audio unit Code") to the IMMU. The IMMU will then store this code, which is unique to each audio unit, in its (permanent) memory.
Upon receipt of the code by the IMMU, the NATS will confirm correct receipt of the audio unit code to the audio unit. Hereafter, the audio unit will operate as normal.
During the initialization process, "NEW" is displayed on the audio unit display. Normally though, communication between audio unit and IMMU takes such a short time that the audio unit seems to switch on directly without showing "NEW" on its display.

Normal operation

Each time the audio unit is switched on afterwards, the audio unit code will be verified between the audio unit and the NATS before the audio unit becomes operational. During the code verification process, "WAIT" is shown on the audio unit display. Again, the communication takes such a short time that the audio unit seems to switch on directly without showing "WAIT" on its display.

When the radio is locked

In case of a audio unit being linked with the vehicle's NATS (immobiliser system), disconnection of the link between the audio unit and the IMMU will cause the audio unit to switch into the lock ("SECURE") mode in which the audio unit is fully inoperative. Hence, repair of the audio unit is basically impossible, unless the audio unit is reset to the "NEW" state for which special decoding equipment is required.
Clarion has provided their authorized service representatives with so called "decoder boxes" which can bring the audio unit back to the "NEW" state, enabling the audio unit to be switched on after which repair can be carried out. Subsequently, when the repaired audio unit is delivered to the final user again, it will be in the "NEW" state as to enable re-linking the audio unit to the vehicle's immobiliser system. As a result of the above, repair of the audio unit can only be done by an authorized Clarion representative.

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System Description (Cont'd)

Service instruction

Item	Radio linked with IMMU and/or SECU
Battery disconnection	No additional action required
Radio needs repair	Repair needs to be done by authorised representative of radio manufacturer since radio cannot be operated unless it is reset to NEW state, using special decoding equipment
Replacement of radio by new part	Radio is delivered in NEW state. If possible, the radio will automatically link up with the immobiliser system. If this appears not possible, CATS code needs to be manually input
Transferring radio to another vehicle/ replacement of radio by an "old" part	Radio needs to be reset to NEW state by authorised representative of radio manufacturer
Replacement of IMMU by new part	Radio will request for CATS code input prior to establishing the link with the IMMU
Replacement of IMMU by old part	If a radio code has already been stored in memory of the IMMU, the radio cannot be linked to it. After switching on the radio, it will display "SECURE" after 1 minute. Operation can only be established after resetting the ratio by an authorised representative of radio manufacturer

CATS code input procedure

1. Radio displays "CODE IN" after the power is switched ON.
2. Enter CATS code (4-digits) by pressing the preset buttons (using 1 to 4).
   Press the preset buttons for the necessary amount of times for the number of each digits.
   e.g. CATS code is "5432"
   Press No. 1 preset button for 5 times
   Press No. 2 preset button for 4 times
   Press No. 3 preset button for 3 times
   Press No. 4 preset button for 2 times
3. Press the ∧ button.
4. If the code is OK, the radio will power ON.
   If the code is NG, the radio will be locked up as below. After the lock up, the radio will display "CODE IN" again.
   1st to 3rd attempt: The radio will be locked for 10 seconds after each attempt
   4th to 20th attempt: The radio will be locked for 60 minutes after each attempt
   Over 20th attempt: The radio will be locked completely

SPEED DEPENDENT VOLUME CONTROL

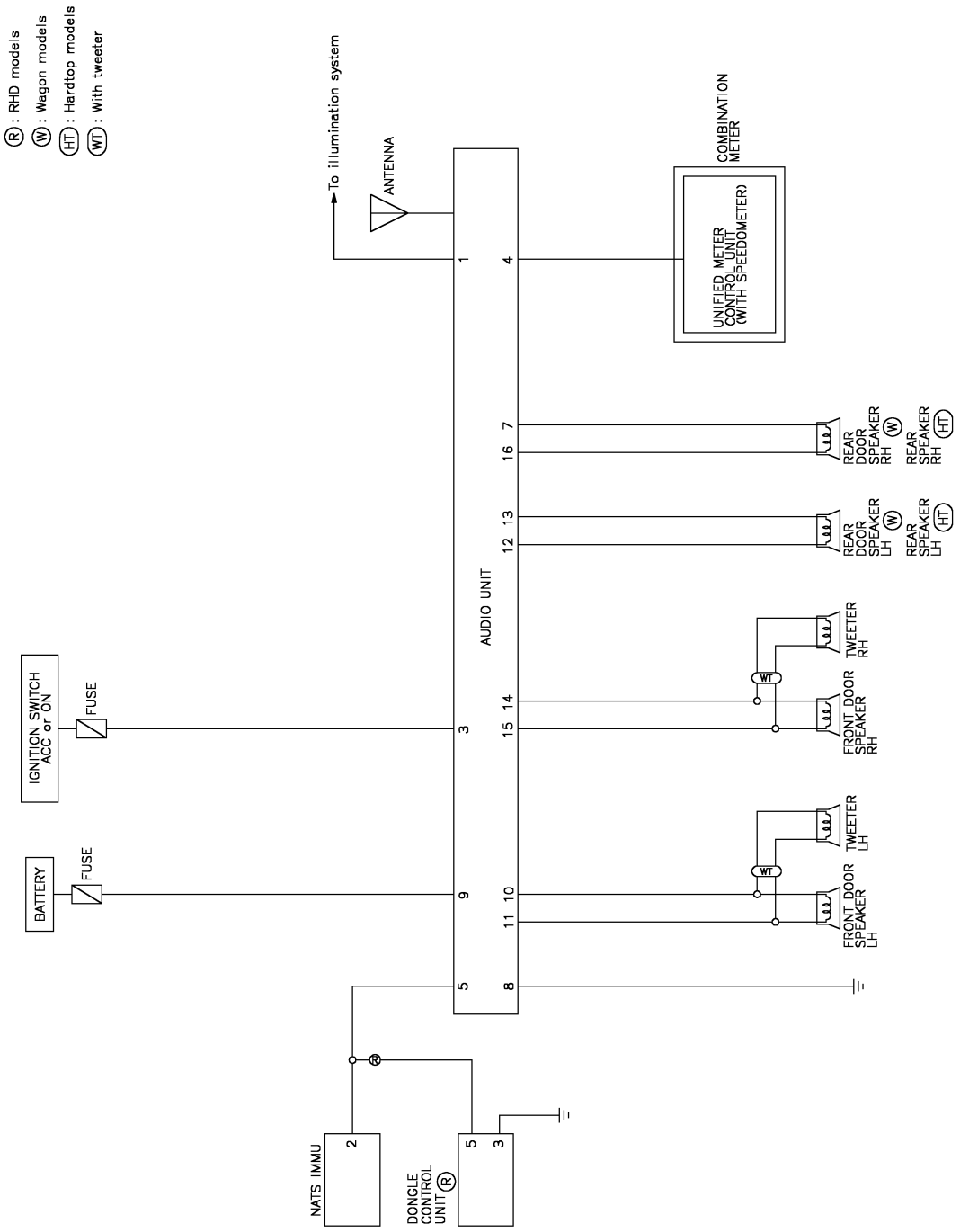
Description

If activated, the radio output volume will be automatically adjusted to compensate for increased driving noises at higher driving speeds. The radio receives a speed signal from the combination meter and selects the output volume.

http://vnx.su/

Schematic

TYPE 1 (WITHOUT CD AUTO-CHANGER)

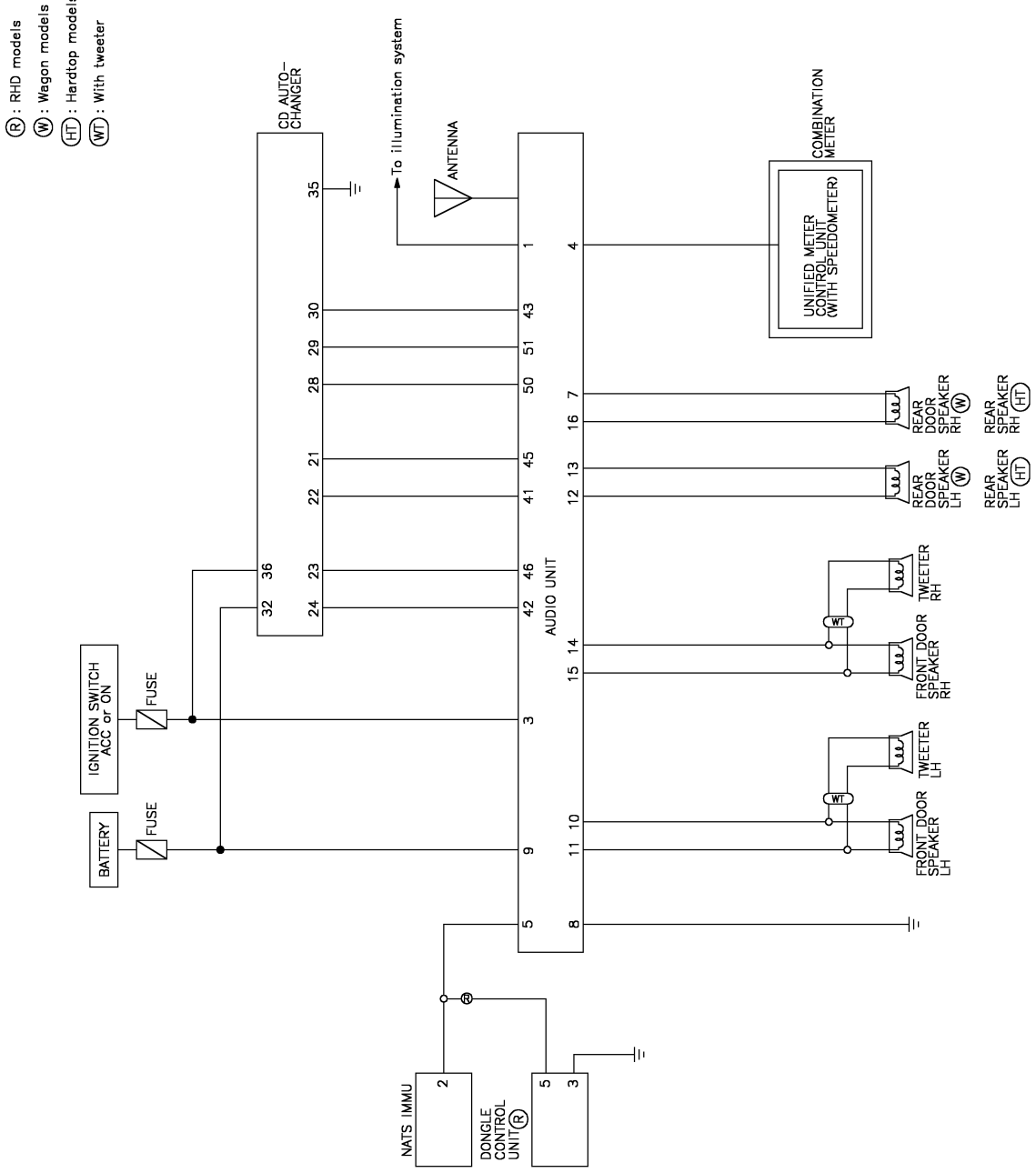


YEL780E

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Schematic (Cont'd)

TYPE 2 (WITH CD AUTO-CHANGER)

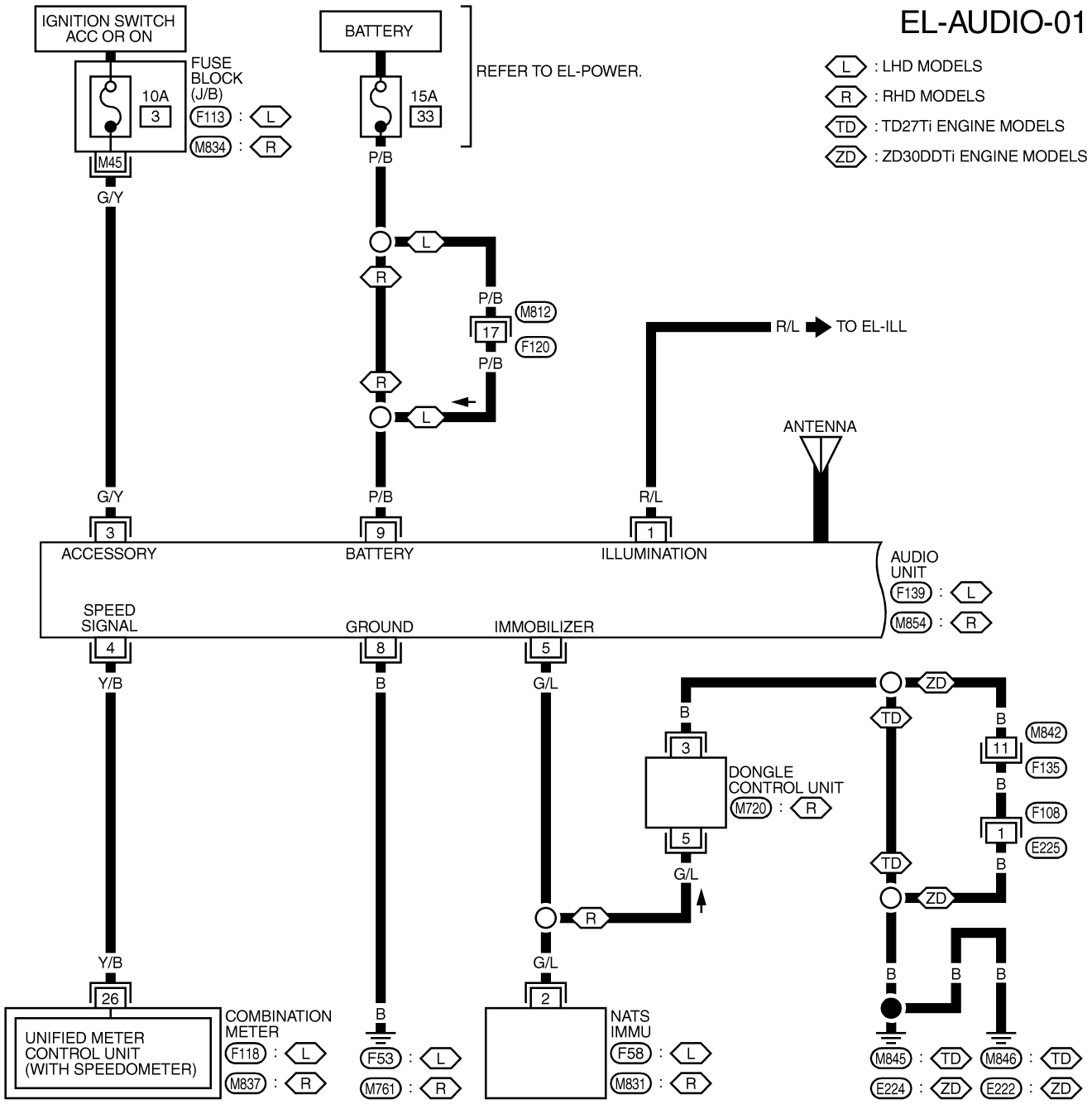


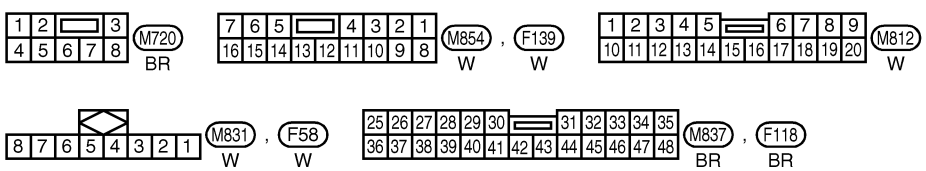
YEL781E

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Wiring Diagram — AUDIO —

TYPE 1 (WITHOUT CD AUTO-CHANGER)





REFER TO THE FOLLOWING.
F108 , F135 -SUPER MULTIPLE JUNCTION (SMJ)
M834 , F113 -FUSE BLOCK-JUNCTION BOX (J/B)

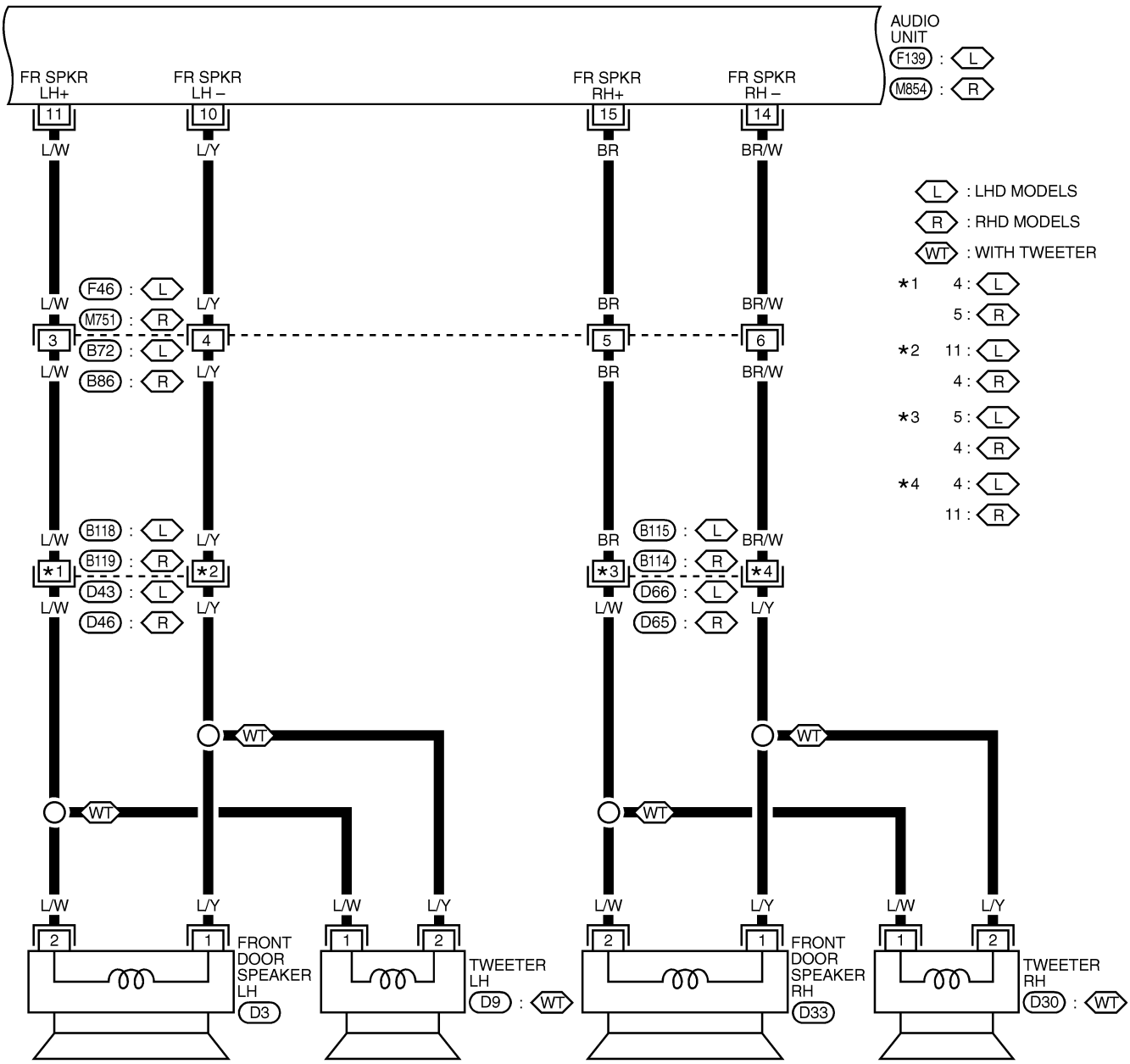
YEL124D

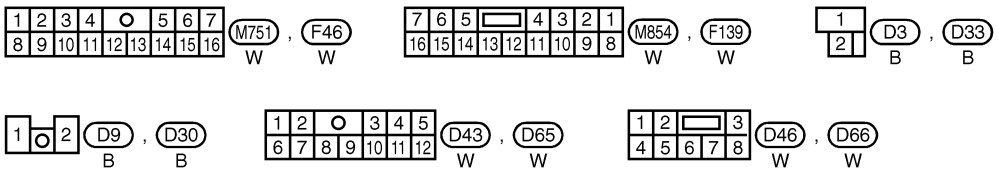
http://vnx.su/

Wiring Diagram — AUDIO — (Cont'd)

TYPE 1 (WITHOUT CD AUTO-CHANGER)

EL-AUDIO-02





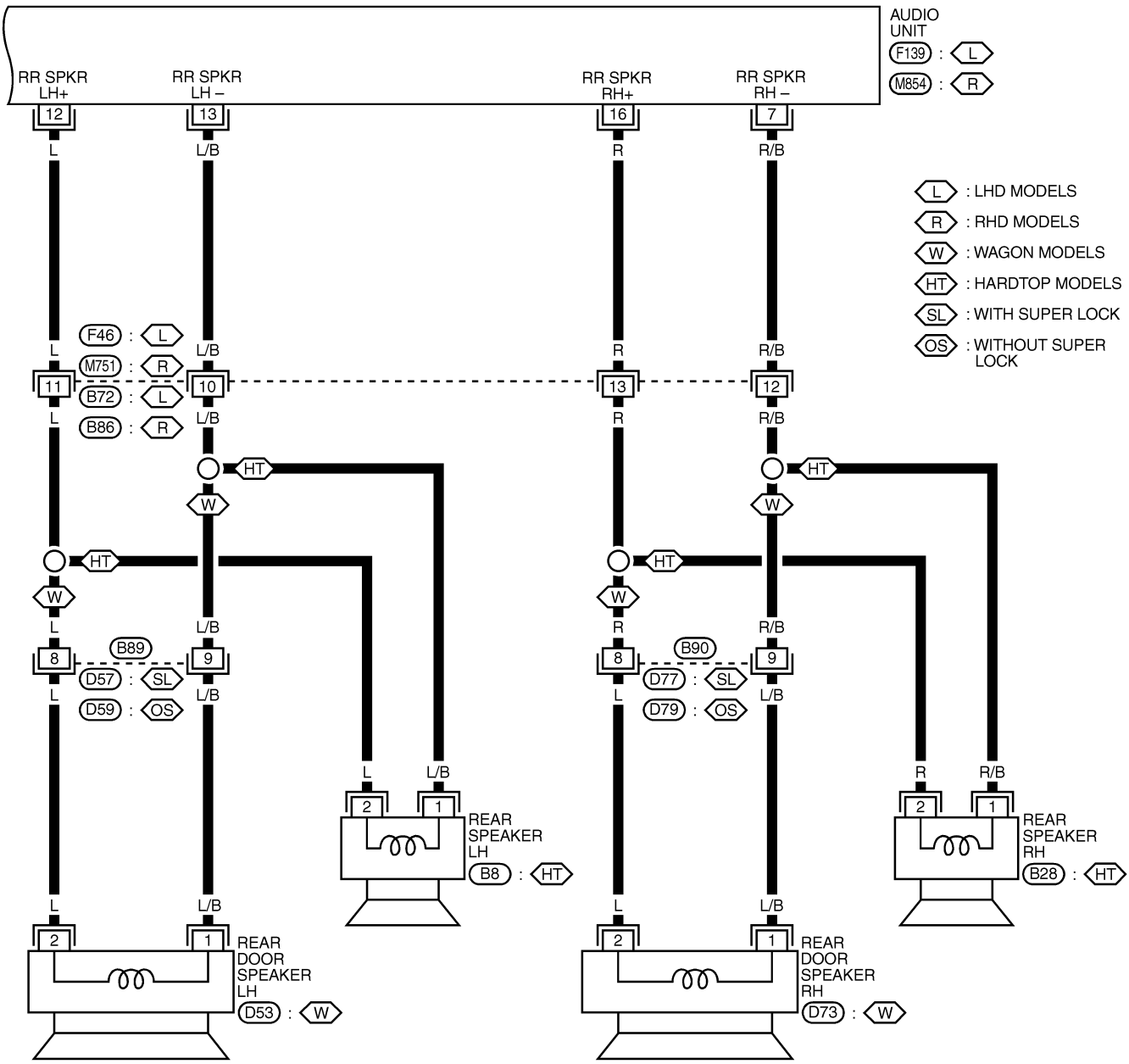
YEL125D

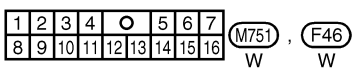
http://vnx.su/

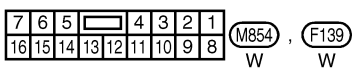
Wiring Diagram — AUDIO — (Cont'd)

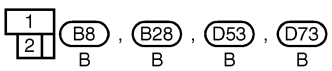
TYPE 1 (WITHOUT CD AUTO-CHANGER)

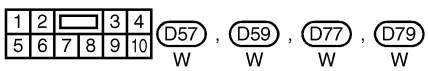
EL-AUDIO-03









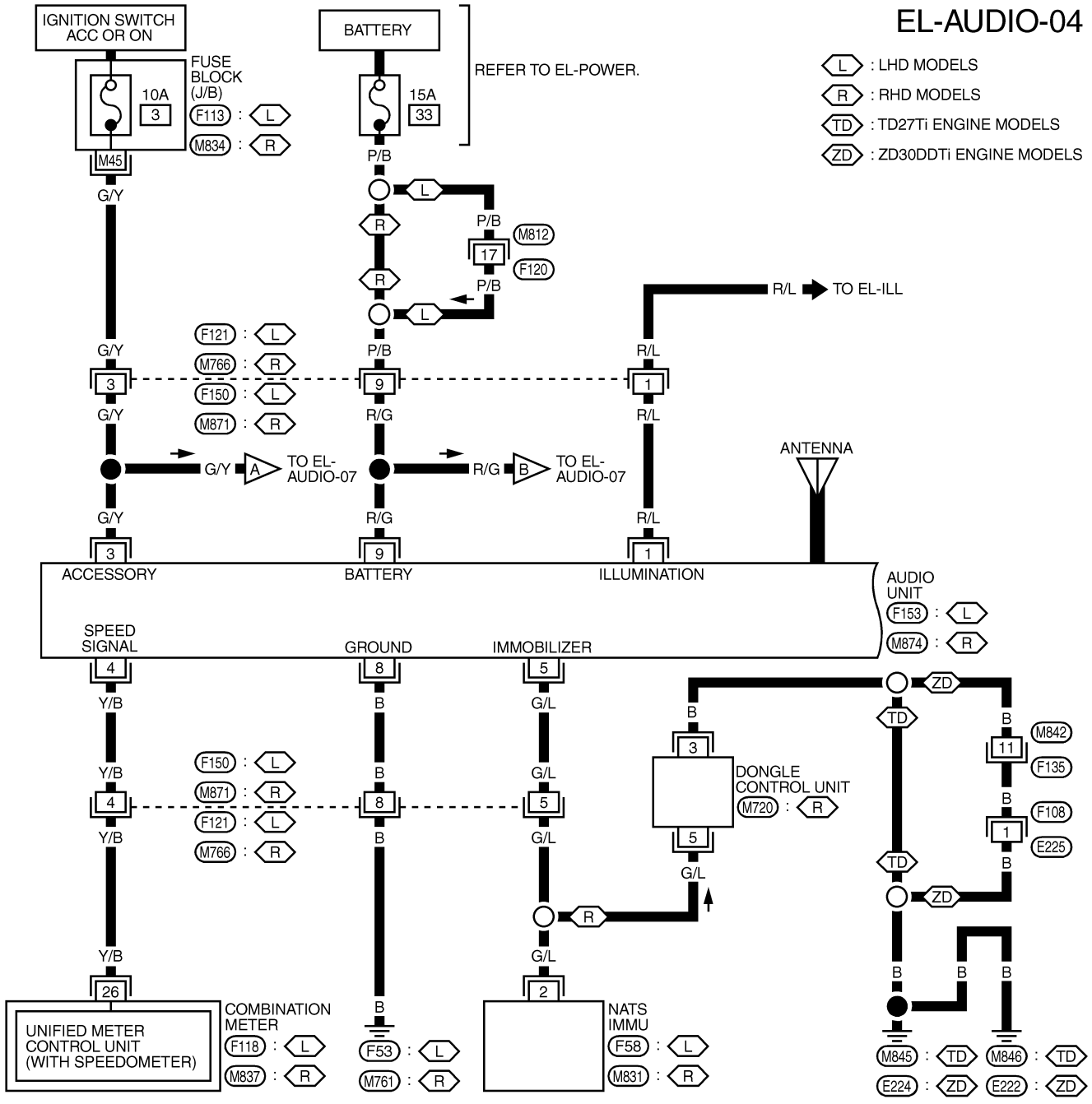


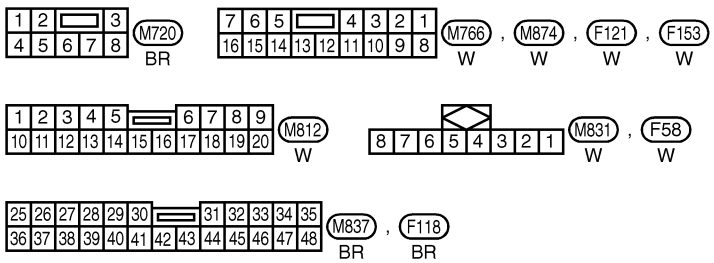
YEL126D

http://vnx.su/

Wiring Diagram — AUDIO — (Cont'd)

TYPE 2 (WITH CD AUTO-CHANGER)





REFER TO THE FOLLOWING.
F108 , F135 -SUPER MULTIPLE JUNCTION (SMJ)
M834 , F113 -FUSE BLOCK-JUNCTION BOX (J/B)

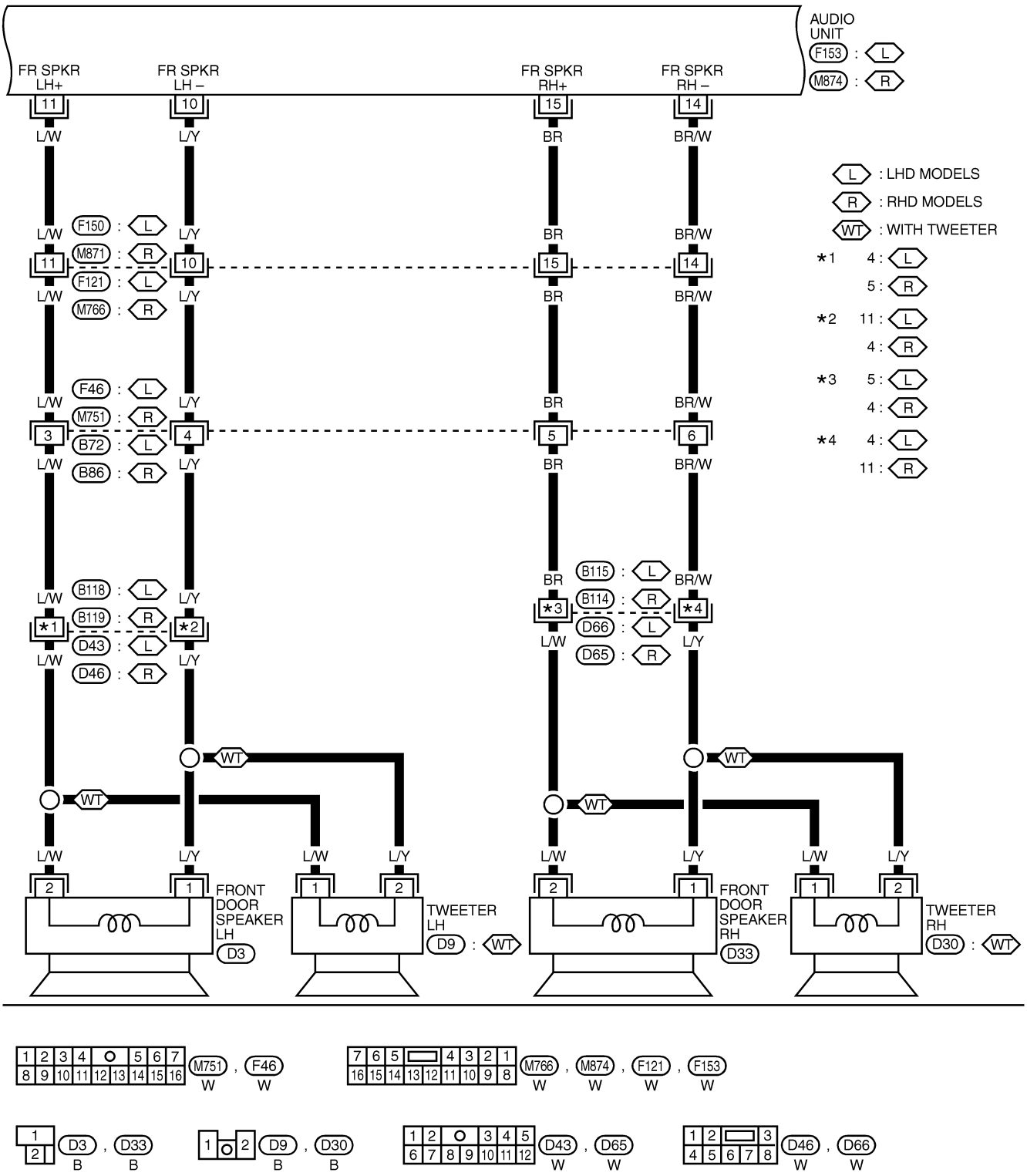
YEL869E

http://vnx.su/

Wiring Diagram — AUDIO — (Cont'd)

TYPE 2 (WITH CD AUTO-CHANGER)

EL-AUDIO-05



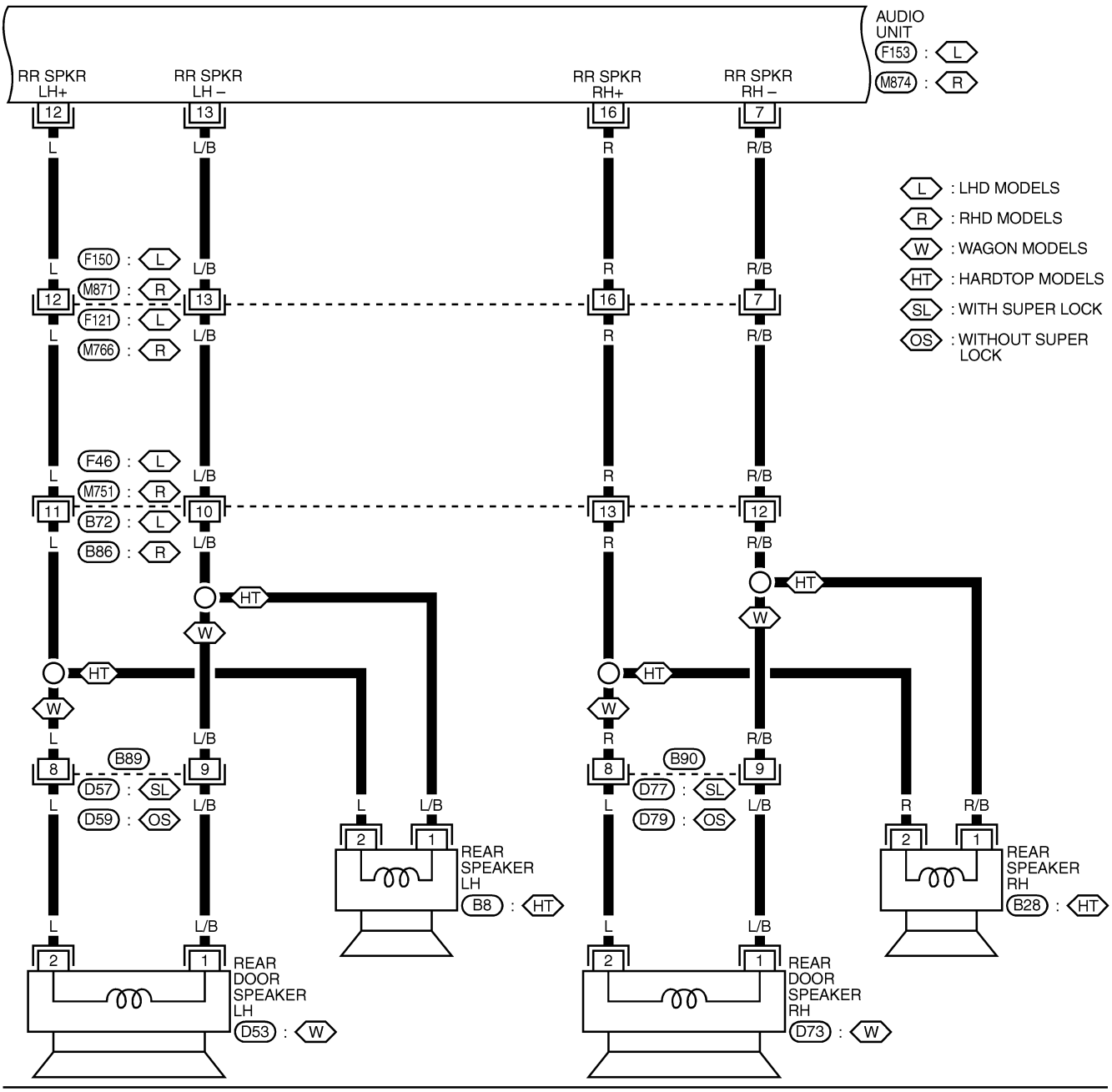
YEL128D

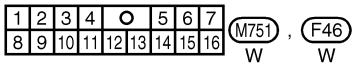
http://vnx.su/

Wiring Diagram — AUDIO — (Cont'd)

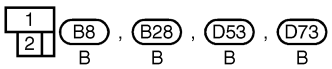
TYPE 2 (WITH CD AUTO-CHANGER)

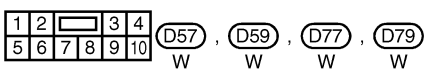
EL-AUDIO-06











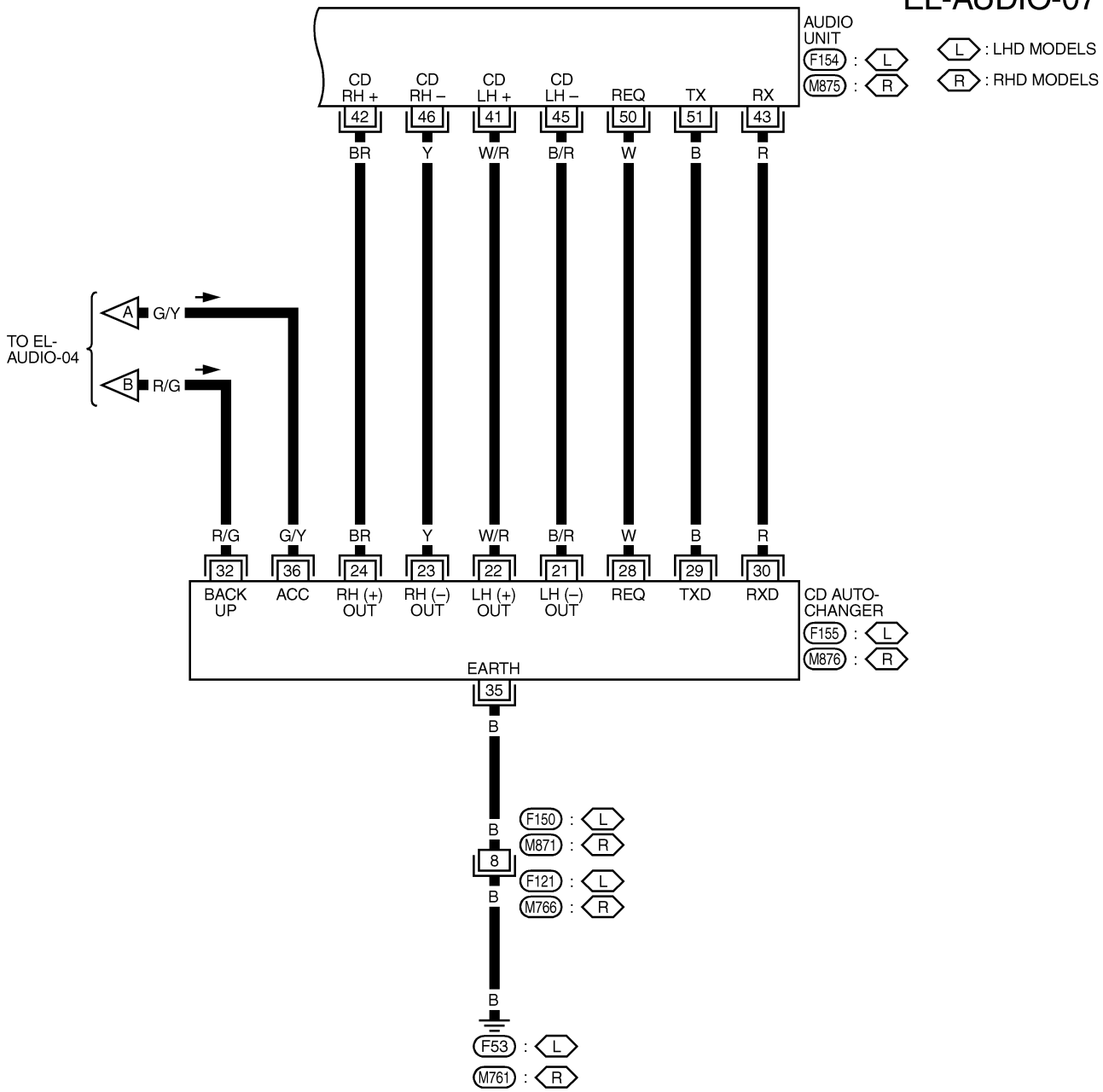
YEL129D

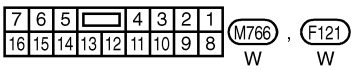
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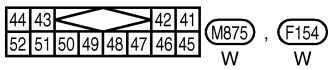
Wiring Diagram — AUDIO — (Cont'd)

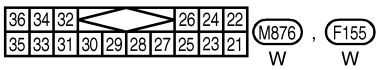
TYPE 2 (WITH CD AUTO-CHANGER)

EL-AUDIO-07









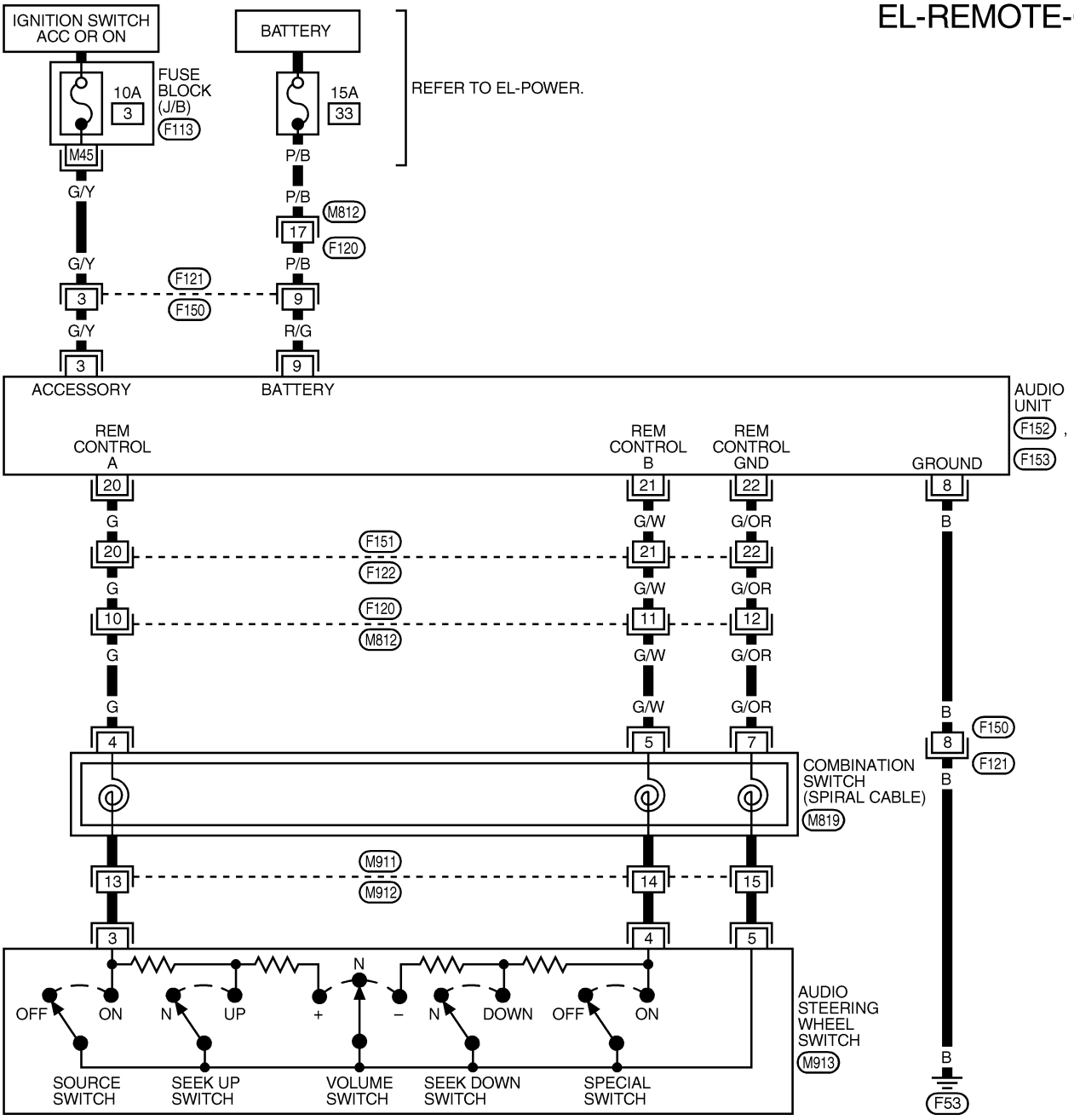
YEL782E

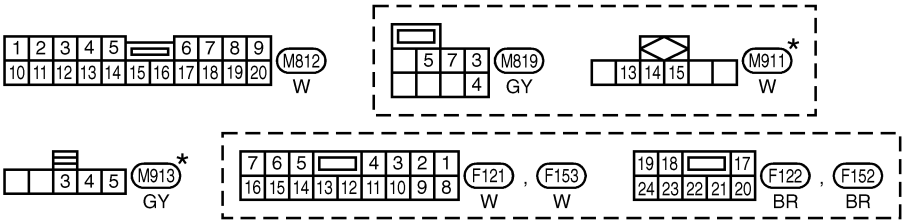
http://vnx.su/

Wiring Diagram — REMOTE —

LHD MODELS

EL-REMOTE-01





REFER TO THE FOLLOWING.
F113 -FUSE BLOCK-
JUNCTION BOX (J/B)

*: THIS CONNECTOR IS NOT SHOWN IN "HARNESS LAYOUT", EL SECTION.

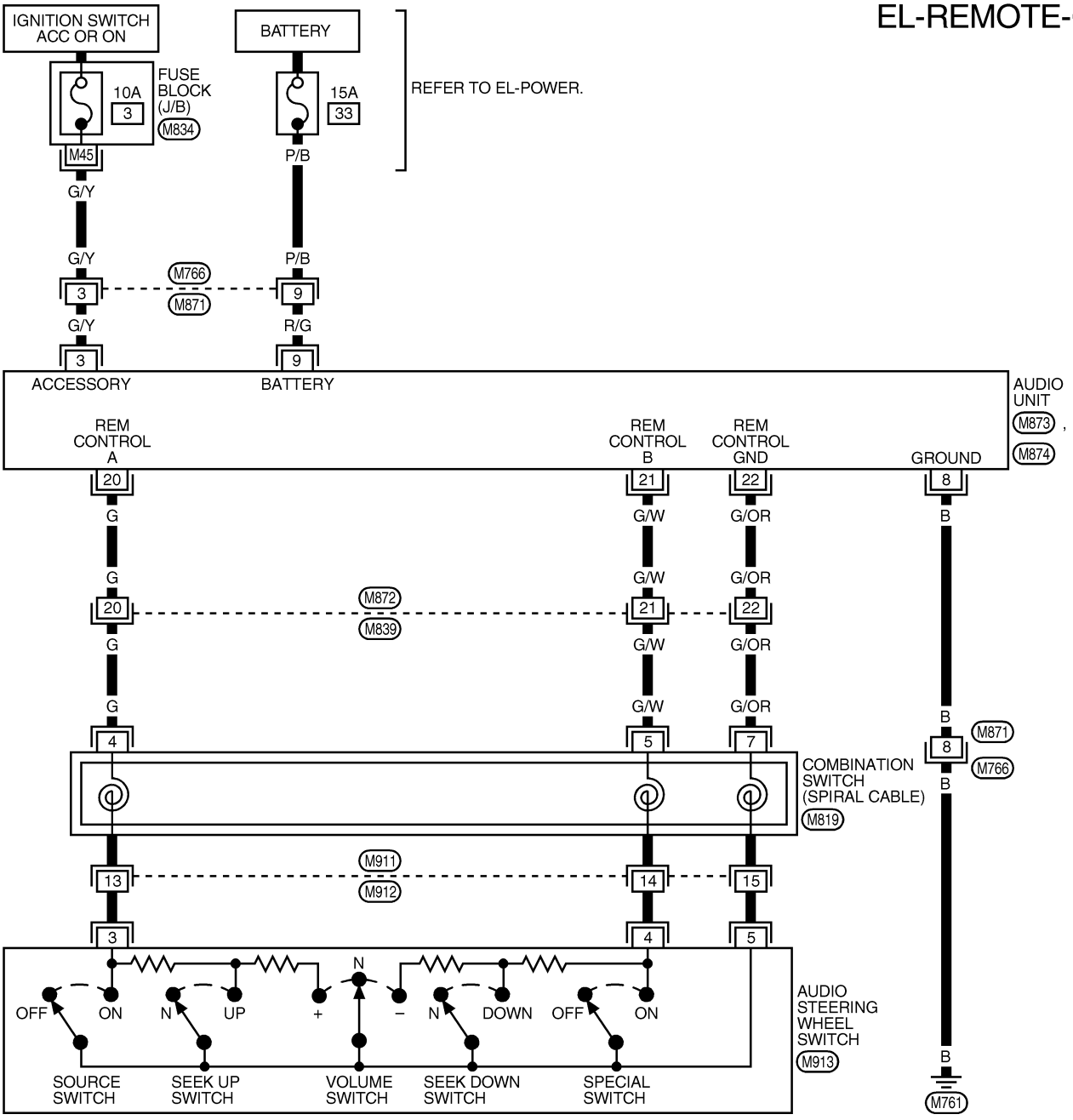
YEL131D

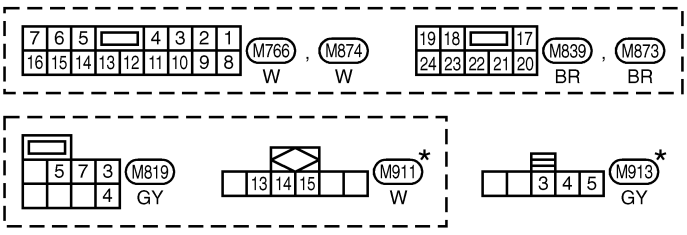
http://vnx.su/

Wiring Diagram — REMOTE — (Cont'd)

RHD MODELS

EL-REMOTE-02





*: THIS CONNECTOR IS NOT SHOWN IN "HARNESS LAYOUT", EL SECTION.

REFER TO THE FOLLOWING.
M834 -FUSE BLOCK-JUNCTION BOX (J/B)

YEL132D

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Trouble Diagnoses

Symptom	Possible cause	Repair order
Radio inoperative (no digital display and no sound from speakers).	1. 10A Fuse 2. Poor radio ground 3. Radio	1. Check 10A fuse [No. 3], located in fuse block (J/B)]. Turn ignition switch ON and verify battery positive voltage is present at terminal ③ of radio. 2. Check radio ground. 3. Remove radio for repair.
Radio controls are operational, but no sound is heard from any speaker.	1. Radio output 2. Radio	1. Check radio output voltages. 2. Remove radio for repair.
Radio presets are lost when ignition switch is turned OFF.	1. 15A fuse 2. Radio	1. Check 15A fuse [No. 33, located in fuse and fusible box] and verify battery positive voltage is present at terminal ⑨ of radio. 2. Remove radio for repair.
Individual speaker is noisy or inoperative.	1. Speaker 2. Radio output 3. Speaker circuit 4. Radio	1. Check speaker. 2. Check radio output voltages. 3. Check wires for open or short between radio and speaker. 4. Remove radio for repair.
Radio stations are weak or noisy.	1. Antenna 2. Poor radio ground 3. Radio	1. Check antenna. 2. Check radio ground. 3. Remove radio for repair.
Radio generates noise in AM and FM modes with engine running.	1. Poor radio ground 2. Loose or missing ground bonding straps 3. Ignition condenser or rear window defogger noise suppressor condenser 4. Alternator 5. Ignition coil or secondary wiring 6. Radio	1. Check radio ground. 2. Check ground bonding straps. 3. Replace ignition condenser or rear window defogger noise suppressor condenser. 4. Check alternator 5. Check ignition coil and secondary wiring. 6. Remove radio for repair.
Radio generates noise in AM and FM modes with accessories on (switch pops and motor noise).	1. Poor radio ground 2. Antenna 3. Accessory ground 4. Faulty accessory	1. Check radio ground. 2. Check antenna. 3. Check accessory ground. 4. Replace accessory.

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Trouble Diagnoses (Cont'd)

CD AUTOCHANGER

Symptom	Possible cause	Repair order
No play of the CD after CD play button is pushed.	1. Radio (The radio is not working.) 2. Harness connection (Magazine does not eject.) 3. Discs 4. Magazine does not eject or a disc remains in CD player. 5. Changer	1. Remove the radio for repair. 2. Check harness connection. 3. Inspect disc. (Refer to testing magazines and discs.) 4. Reset the changer. (Disconnect harness connector at the changer and reconnect after 30 sec.) 5. Remove the changer for repair.
CD skipping.	1. Rough road driving 2. Discs 3. Bracket 4. Changer	1. System is not malfunctioning. 2. Inspect discs. (Refer to testing magazines and discs.) 3. Check and repair bracket and installation of changer. 4. Remove the changer for repair.
Error code [NO DISC] is shown on the radio after CD play button is pressed.	1. Magazine setting 2. Magazine 3. Changer	1. Confirm the magazine is pushed completely. 2. Inspect magazine. (Refer to testing magazines and discs.) 3. Remove the changer for repair.

Testing magazines and discs

1. Confirm discs are installed correctly into the magazine (not upside down).
2. Visually inspect/compare the customer's discs with each other and other discs.
   Identify any of the following conditions:
   - Discs with a large outside diameter. [Normal size is 120 mm (4.72 in).]
   - Discs with rough or lipped edges.
   - Discs with excessive thickness [Normal size is 1.2 mm (0.047 in).]
   - Discs with scratches, abrasions, or pits on the surface.
   - Discs with grease/oil, fingerprints, foreign material.
   - Discs are warped due to excessive heat exposure.
3. Slide/place the discs in and out of the various magazine positions.
   Identify any discs and/or positions that require additional force for placement/ejection. If interference (sticking, excessive tensions) is found, replace the magazine or the discs.

Note:

- **Discs which are marginally out of specification (ex. dirty, scratched and so on) may play correctly on a home stereo.**
  However, when used in the automative environment skipping may occur due to the added vehicle movement and/or vibration due to road conditions. Autochangers should not be replaced when discs are at fault.
- **Use a soft damp cloth to wipe the discs starting from the center outward in radial direction. Never use chemical cleaning solutions to clean the discs.**

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Inspection

SPEAKER

1. Disconnect speaker harness connector.
2. Measure the resistance between speaker terminals ① and ②.
- The resistance should be 2 - 4Ω.
3. Using jumper wires, momentarily connect a 9V battery between speaker terminals ① and ②.
- A momentary hum or pop should be heard.

ANTENNA

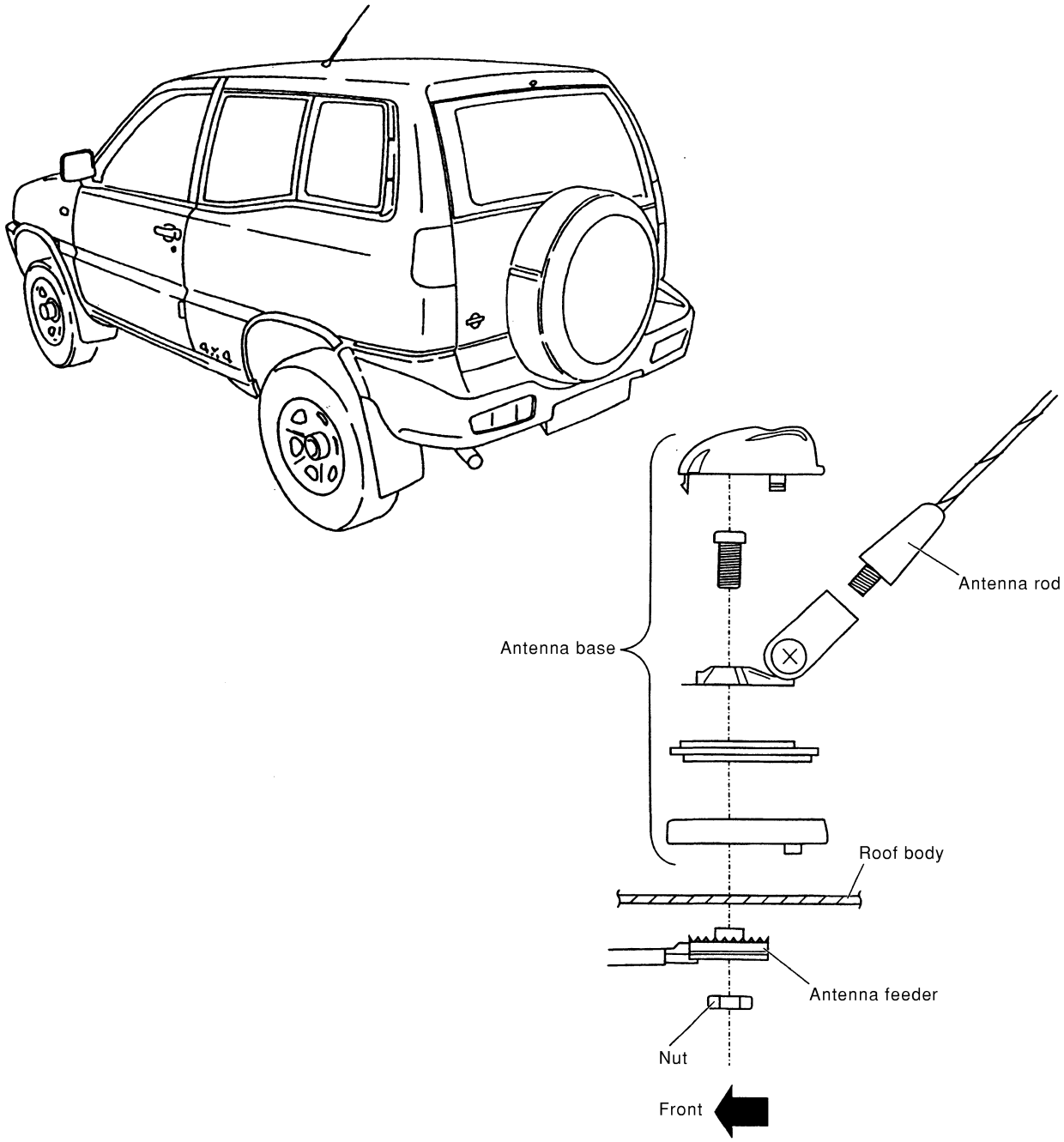
Using a jumper wire, clip an auxiliary ground between antenna and body.
- If reception improves, check antenna ground (at body surface).
- If reception does not improve, check main feeder cable for short circuit or open circuit.

RADIO

All voltage inspections are made with:
- Ignition switch ON or ACC
- Radio ON
- Radio connected (If removed for inspection, supply a ground to the case using a jumper wire.)

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Location of Roof Mounted Antenna



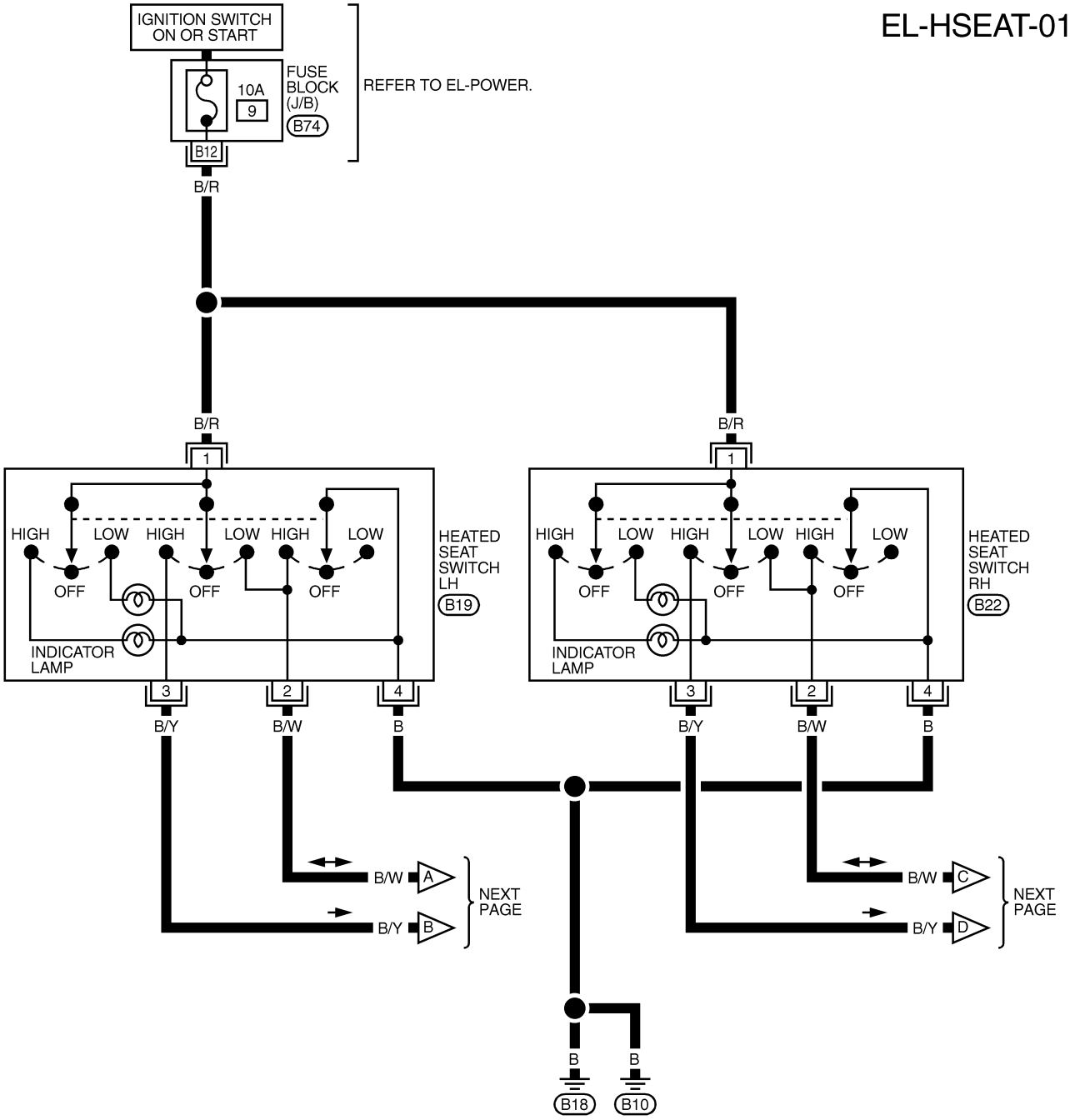
YEL602D

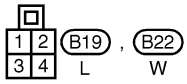
http://vnx.su/

Wiring Diagram — HSEAT —

LHD MODELS WITH SEAT HEATER

EL-HSEAT-01





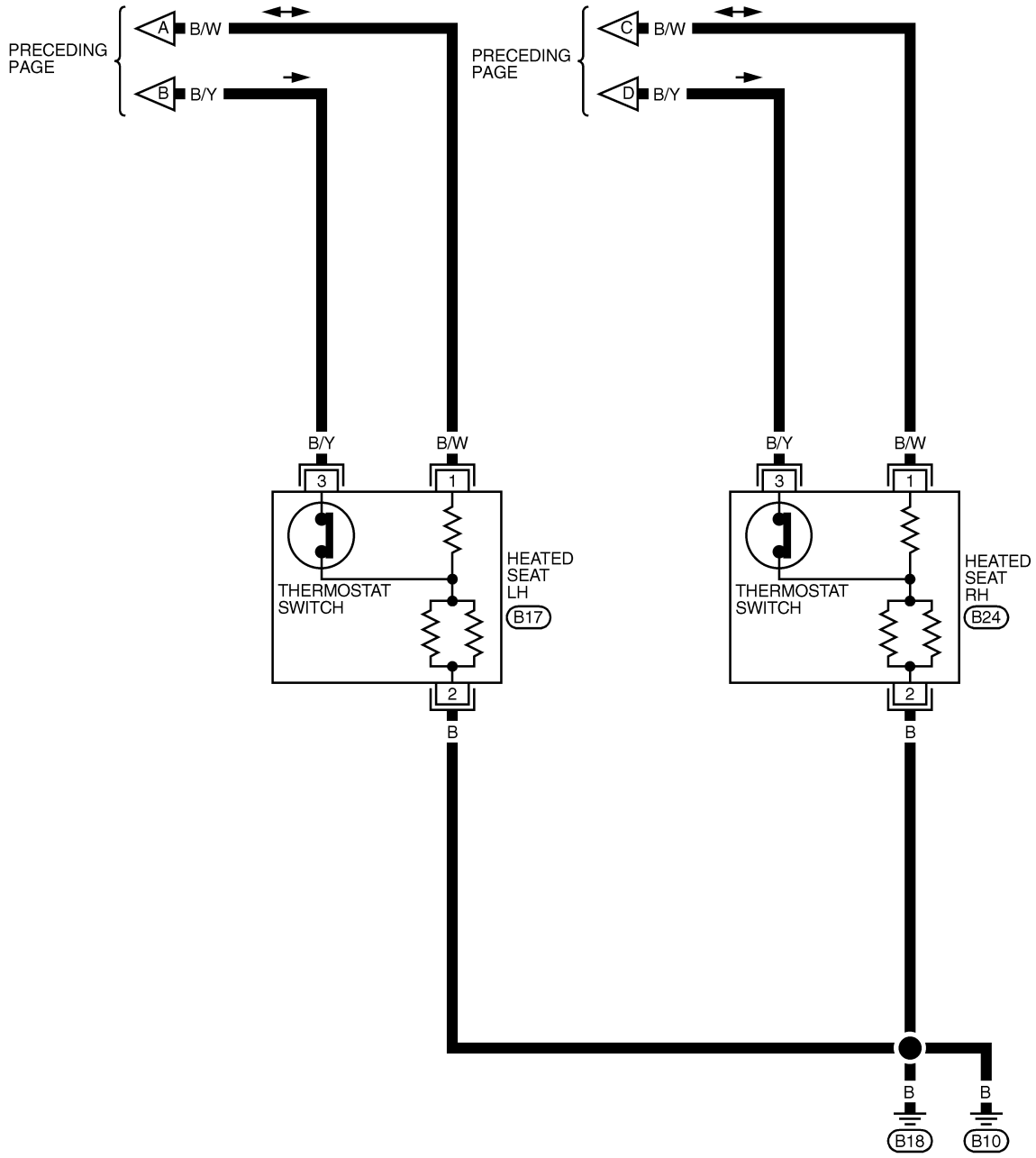
REFER TO THE FOLLOWING.
B74 -FUSE BLOCK-
JUNCTION BOX (J/B)

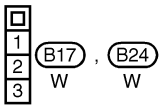
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http://vnx.su/

Wiring Diagram — HSEAT — (Cont'd)

EL-HSEAT-02



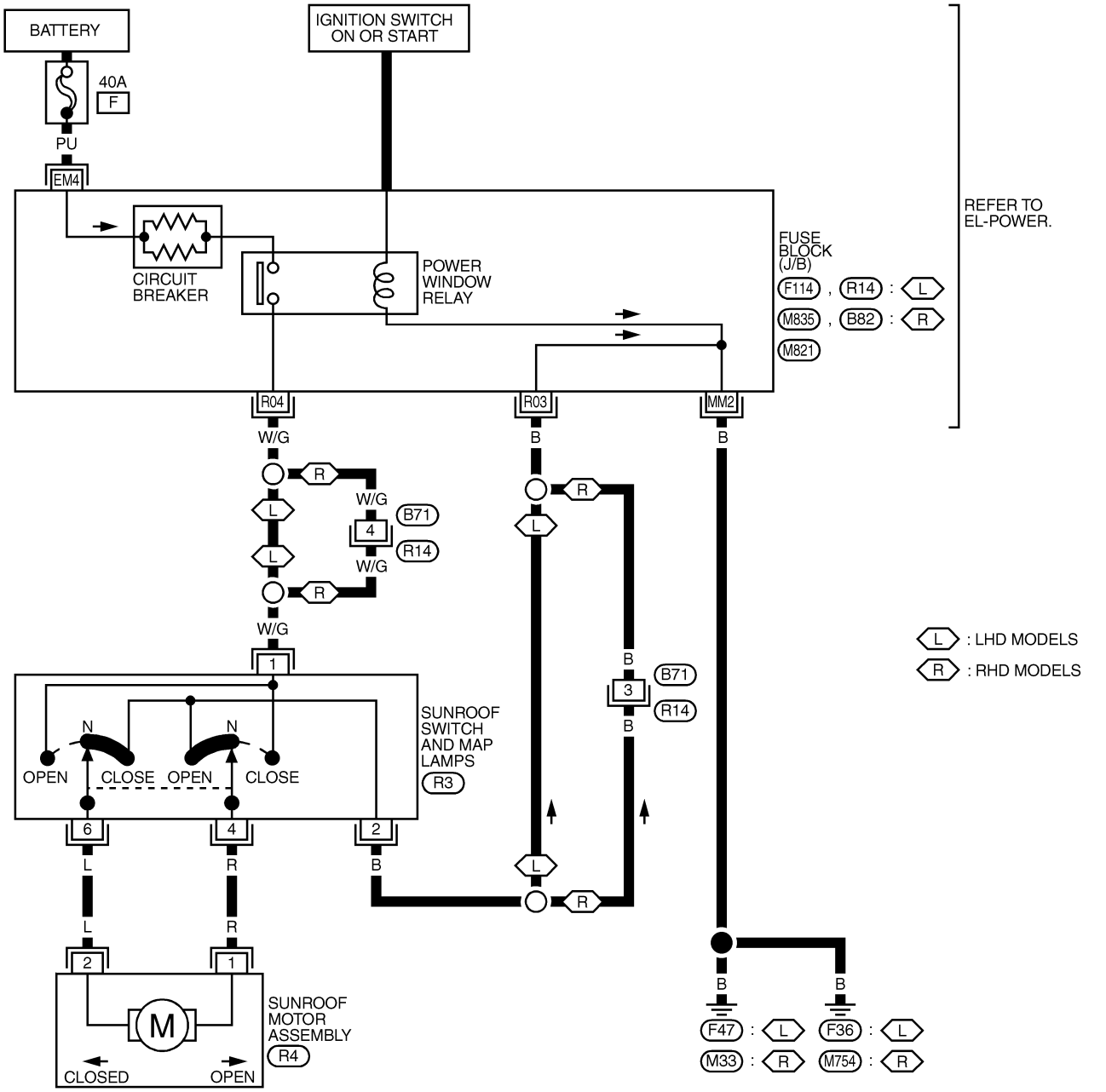


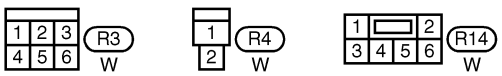
YEL134D

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Wiring Diagram — SROOF —

EL-SROOF-01





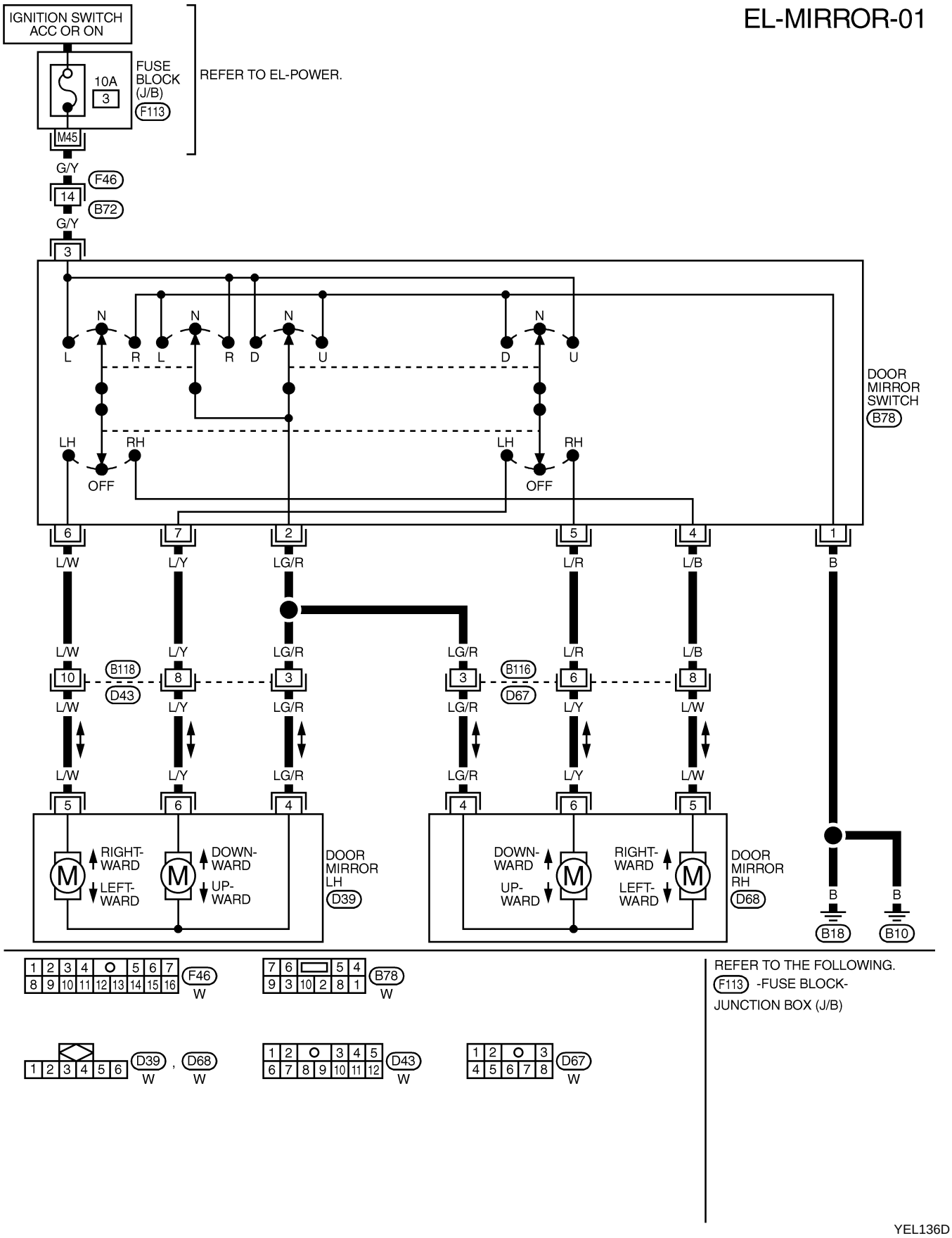
REFER TO THE FOLLOWING.
M821 , M835 , F114 , B82 , R14 -FUSE BLOCK-JUNCTION BOX (J/B)

YEL135D

http://vnx.su/

Wiring Diagram — MIRROR —

LHD MODELS

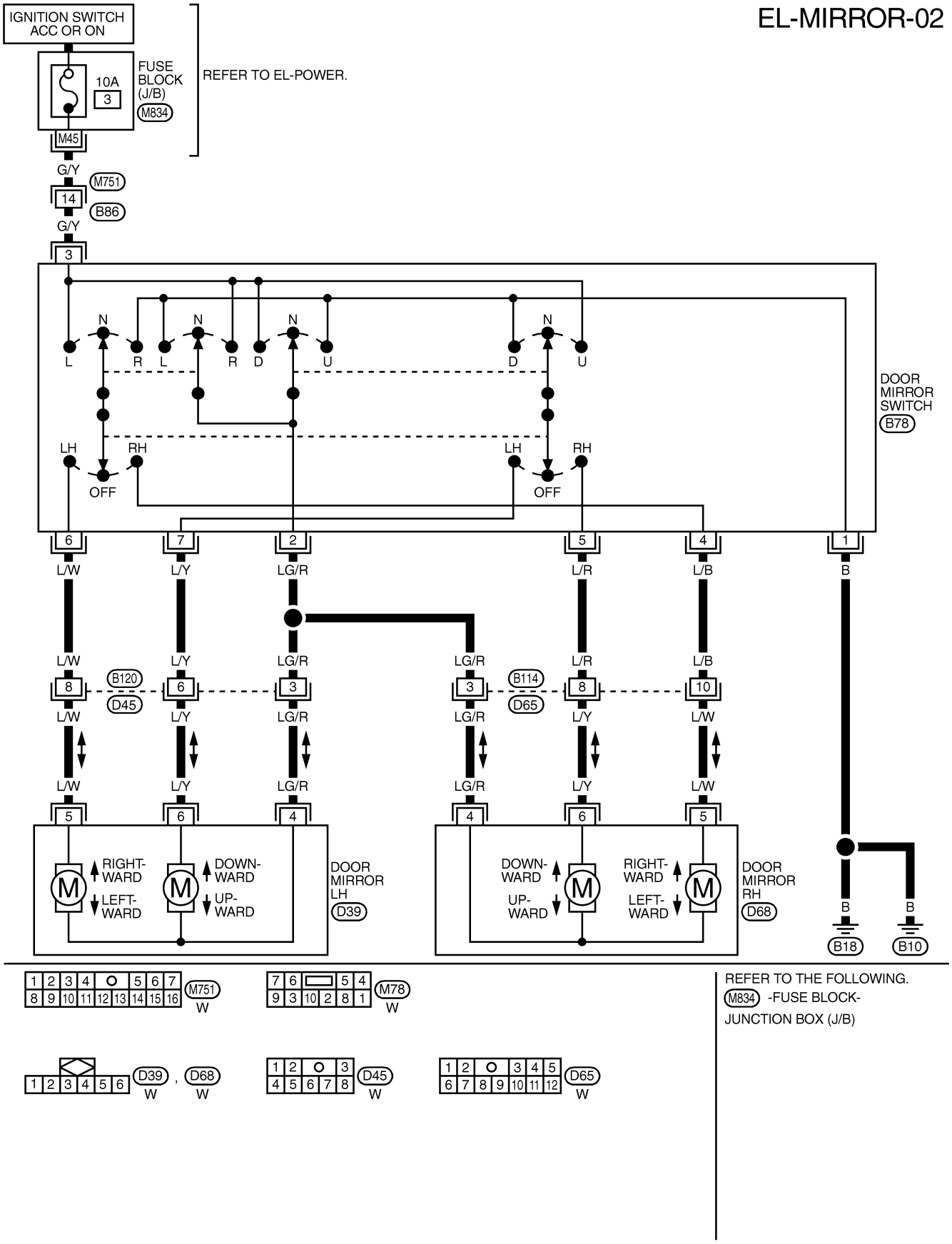


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Wiring Diagram — MIRROR — (Cont'd)

RHD MODELS

EL-MIRROR-02



YEL137D

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System Description

Power is supplied at all times
- from 40A fusible link (letter **F**, located in fuse and fusible link box)
- through circuit breaker [built-in fuse block (J/B)]
- to power window relay [built-in fuse block (J/B)].

With ignition switch in ON or START position, power is supplied
- to power window relay

Ground is supplied to power window relay
- through body grounds F36, F47 (LHD models) or M33, M754 (RHD models).

The power window relay is energized and power is supplied
- through power window relay
- to power window main switch terminal 1,
- to power window sub-switch front passenger side terminal 5,
- to power window sub-switch rear LH and RH terminal 5 (models with rear power window).

MANUAL OPERATION

Front Door (Driver Side)

Ground is supplied
- to power window main switch terminal 3
- through body grounds B10 and B18.

WINDOW UP

When the driver's window switch in the power window main switch is pressed in the up position, power is supplied
- through power window main switch terminal 9
- to driver side power window motor terminal 2.

Ground is supplied
- through power window main switch terminal 1
- to driver side power window motor terminal 8.

Then, the motor raises the window until the switch is released.

WINDOW DOWN

When the driver's window switch in the power window main switch is pressed in the down position, power is supplied
- through power window main switch terminal 8
- to driver side power window motor terminal 1.

Ground is supplied
- to driver side power window motor terminal 2
- through power window main switch terminal 9.

Then, the motor lowers the window until the switch is released.

Front Door (Passenger Side)

Ground is supplied
- to power window main switch terminal 3
- through body grounds B10 and B18.

NOTE:

Numbers in parentheses are terminal numbers, when power window switch is pressed in the UP and DOWN positions respectively.

POWER WINDOW MAIN SWITCH OPERATION

Power is supplied
- through power window main switch (5, 6)
- to power window sub-switch front passenger side (3, 4).

The subsequent operation is the same as the front power window sub-switch operation.

FRONT POWER WINDOW SUB-SWITCH OPERATION

Power is supplied
- through front power window sub-switch (1, 2)
- to power window motor front passenger side (2, 1).

Ground is supplied
- to front passenger side power window motor (1, 2)
- through front power window sub-switch (2, 1)
- to front power window sub-switch (4, 3)

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System Description (Cont'd)

- through power window main switch (6, 5).

Then, the motor raises or lowers the window until the switch is released.

Rear Door

Rear door windows will raise and lower in the same manner as passenger's door window.

POWER WINDOW LOCK

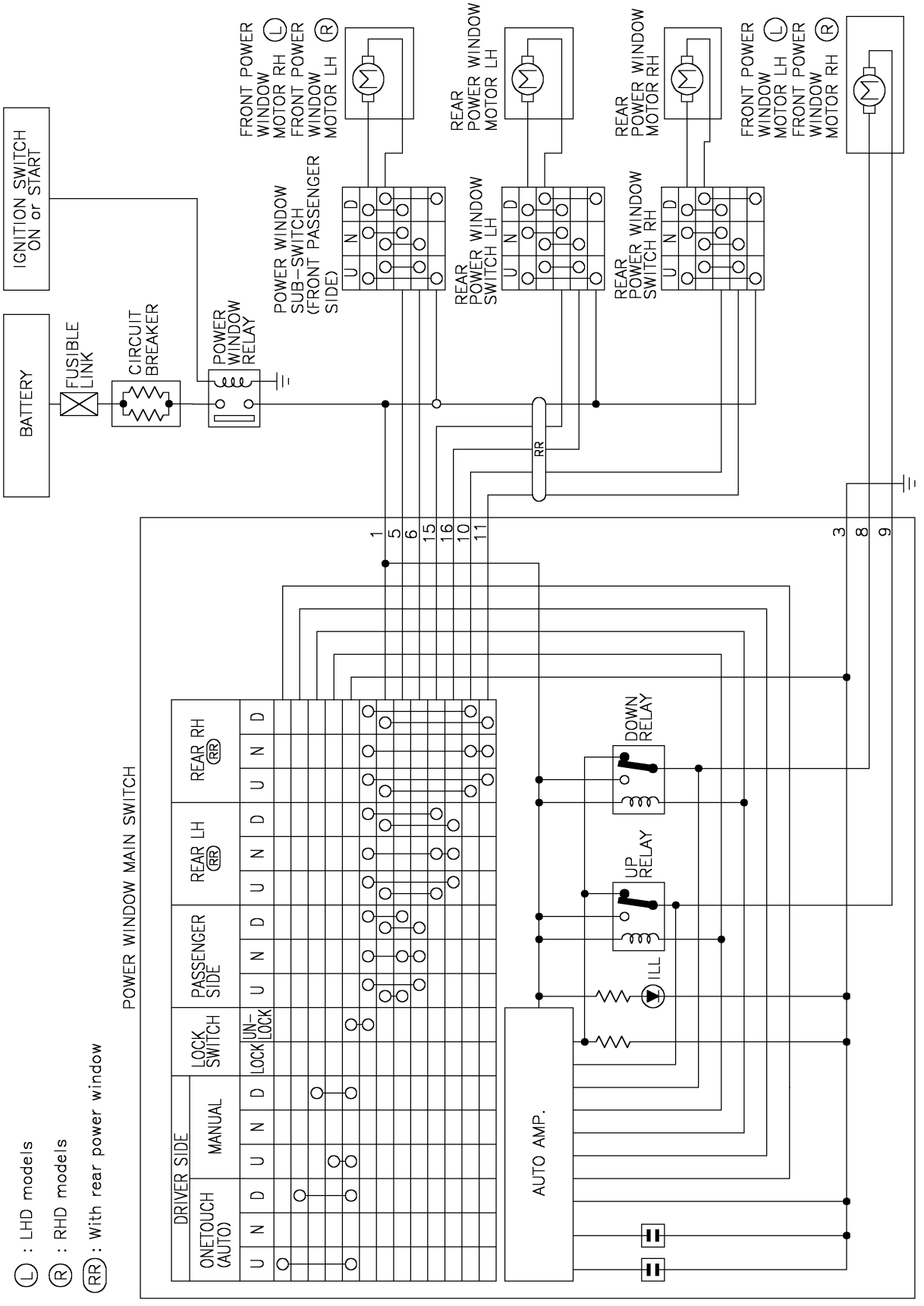
The power window lock is designed to lock operation of all windows except for driver's door window.
When the lock switch is pressed to lock position, ground of the sub-switches in the power window main switch is disconnected. This prevents the power window motors from operating.

AUTO OPERATION

The power window AUTO feature enables the driver to open the driver's window without holding the window switch in the down position.
The AUTO feature operates on the driver's window.

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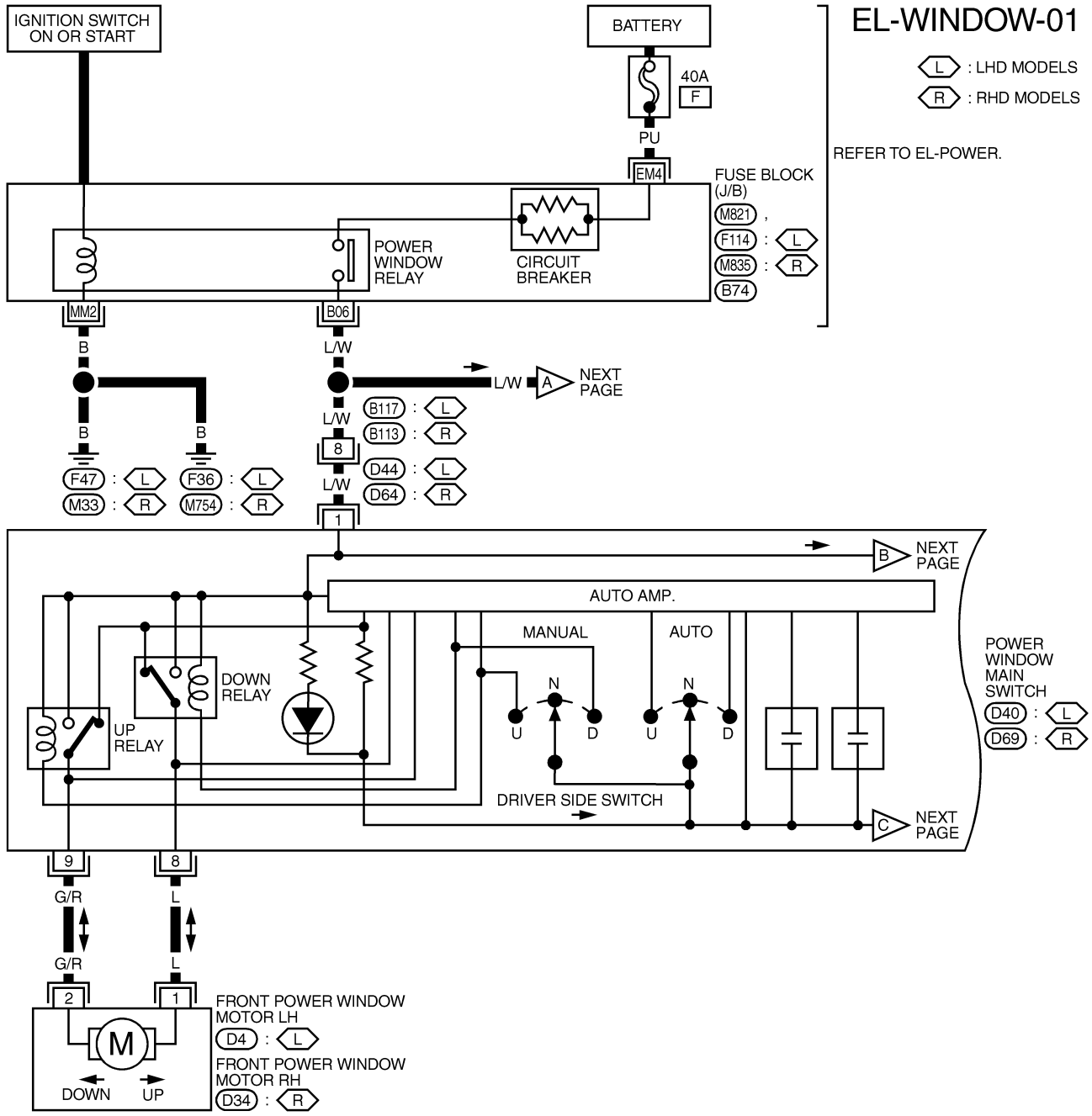
Schematic

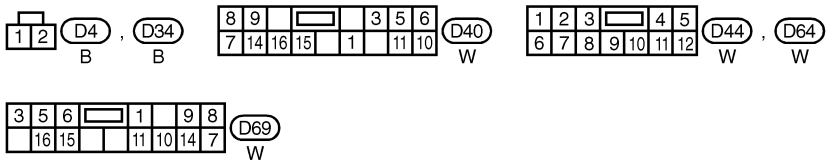


YEL784E

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Wiring Diagram — WINDOW —





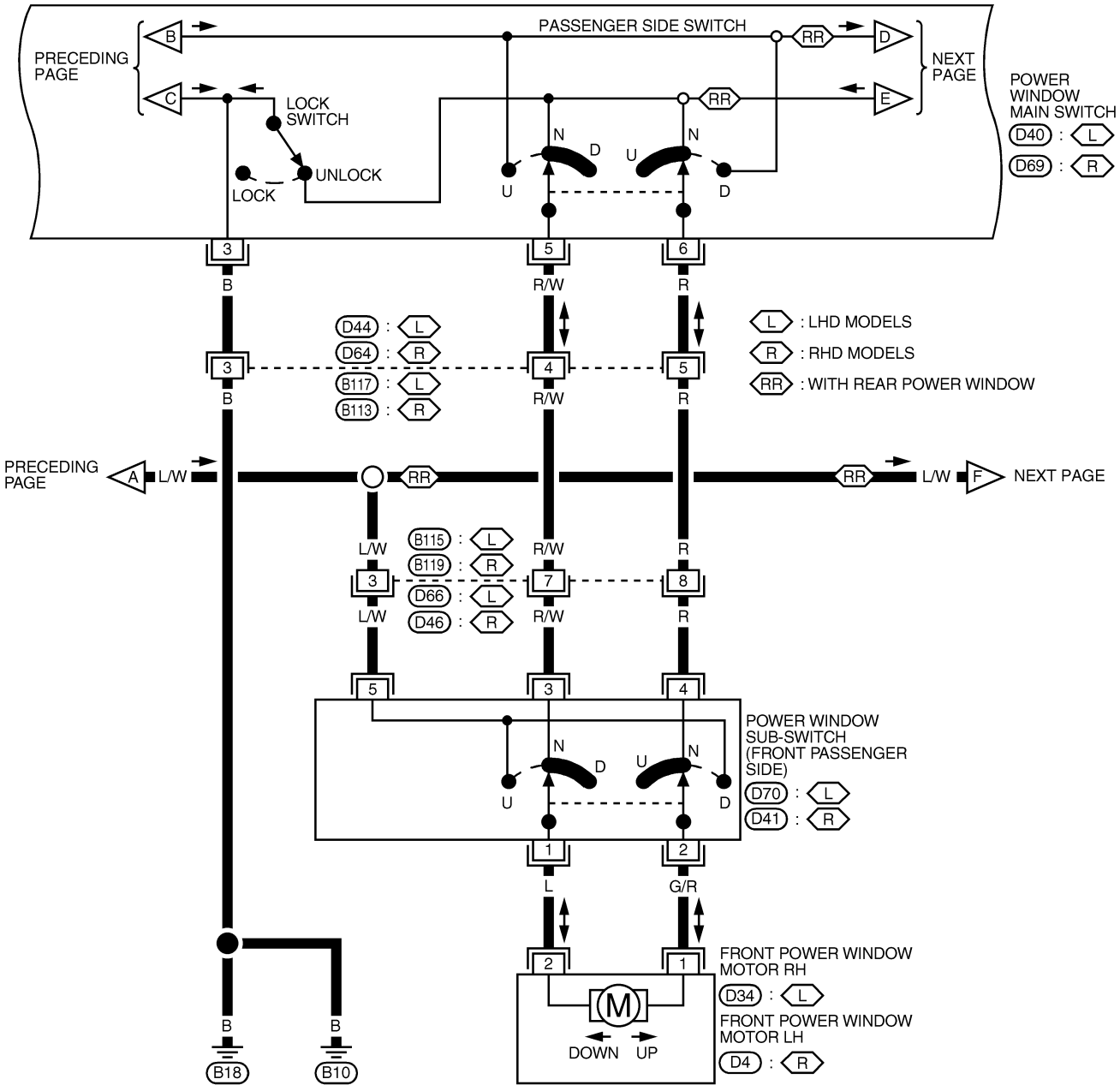
REFER TO THE FOLLOWING.
M821 , M835 , F114 , B74
-FUSE BLOCK-
JUNCTION BOX (J/B)

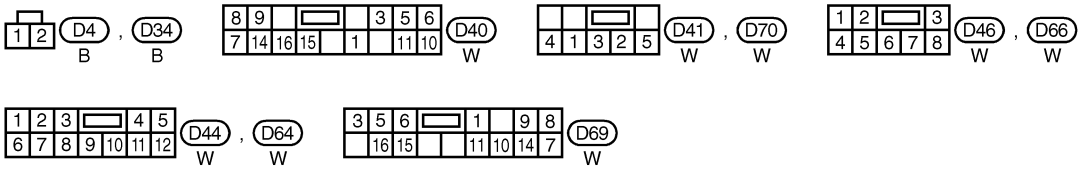
YEL785E

http://vnx.su/

Wiring Diagram — WINDOW — (Cont'd)

EL-WINDOW-02



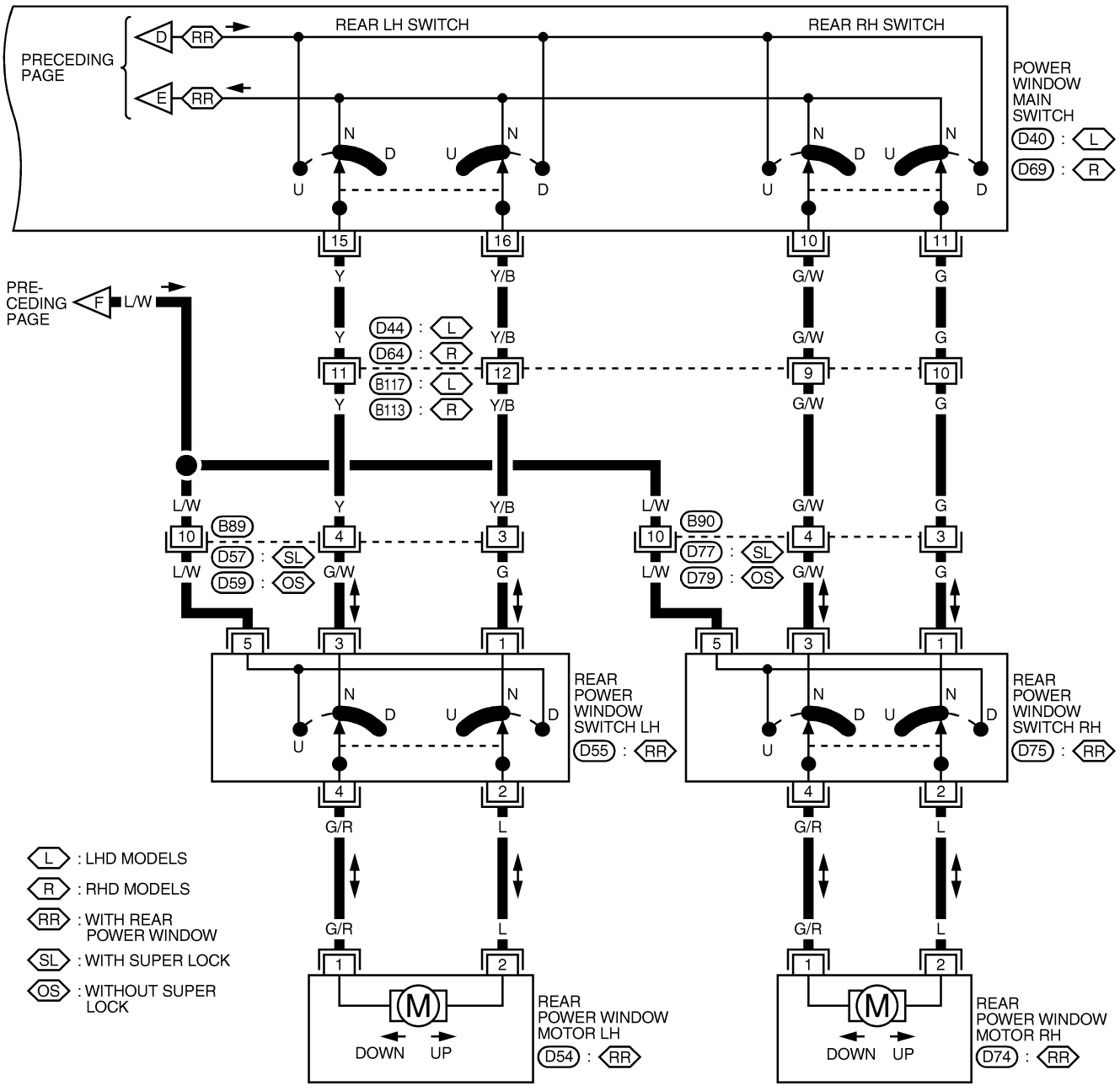


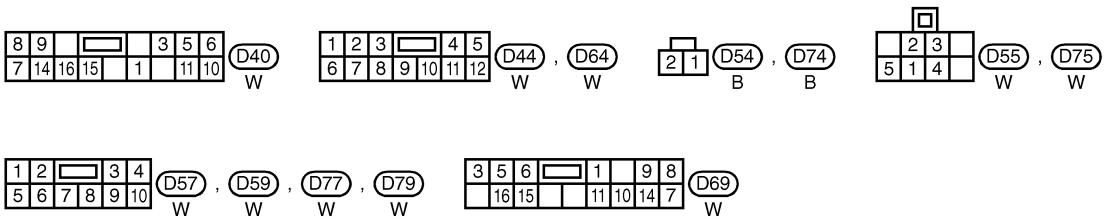
YEL786E

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Wiring Diagram — WINDOW — (Cont'd)

EL-WINDOW-03





YEL787E

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Trouble Diagnoses

Symptom	Possible cause	Repair order
None of the power windows can be operated using any switch.	1. 40A fusible link, for circuit breaker 2. Power window relay 3. Ground circuit 4. Power window main switch	1. Check 40A fusible link (letter **F**, located in fuse and fusible link box) and circuit breaker. 2. Check power window relay [built in the fuse block (J/B)]. 3. Check the following: a. Check ground circuit of power window main switch. b. Check power window relay ground circuit. 4. Check power window main switch.
Driver side power window cannot be operated but other windows can be operated.	1. Driver side power window motor circuit 2. Driver side power window motor 3. Power window main switch	1. Check harness between power window main switch and driver side power window motor for open or short circuit. 2. Check driver side power window motor. 3. Check power window main switch.
One or more power windows except driver's side window cannot be operated.	1. Power window sub-switches 2. Power window motors 3. Power window main switch 4. Power window circuit	1. Check power window sub-switch. 2. Check power window motor. 3. Check power window main switch. 4. Check the following. a. Check harness between fuse block (J/B) terminal B06 and power window sub-switch terminal 5. b. Check harnesses between power window main switch and power window sub-switch for open/short circuit. c. Check harnesses between power window sub-switch and power window motor for open/short circuit.
Power windows except driver's side window cannot be operated using power window main switch but can be operated by power window sub-switch.	1. Power window main switch	1. Check power window main switch.
Driver side power window automatic operation does not function properly.	1. Power window main switch	1. Check power window main switch.

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System Description

OPERATION

Power door lock/unlock operation by door key cylinder

- With the key inserted into front door key cylinder, turning it to LOCK will lock all doors.
- With the key inserted into front door key cylinder, turning it to UNLOCK will unlock all doors.

Power door lock/unlock operation by multi-remote controller

- Pressing multi-remote controller LOCK button will lock all doors.
- Pressing multi-remote controller UNLOCK button once will unlock driver door. Then, if an unlock signal is sent from the remote controller again within 5 seconds, all other doors will be unlocked.

Power door lock/unlock operation by lock/unlock switch

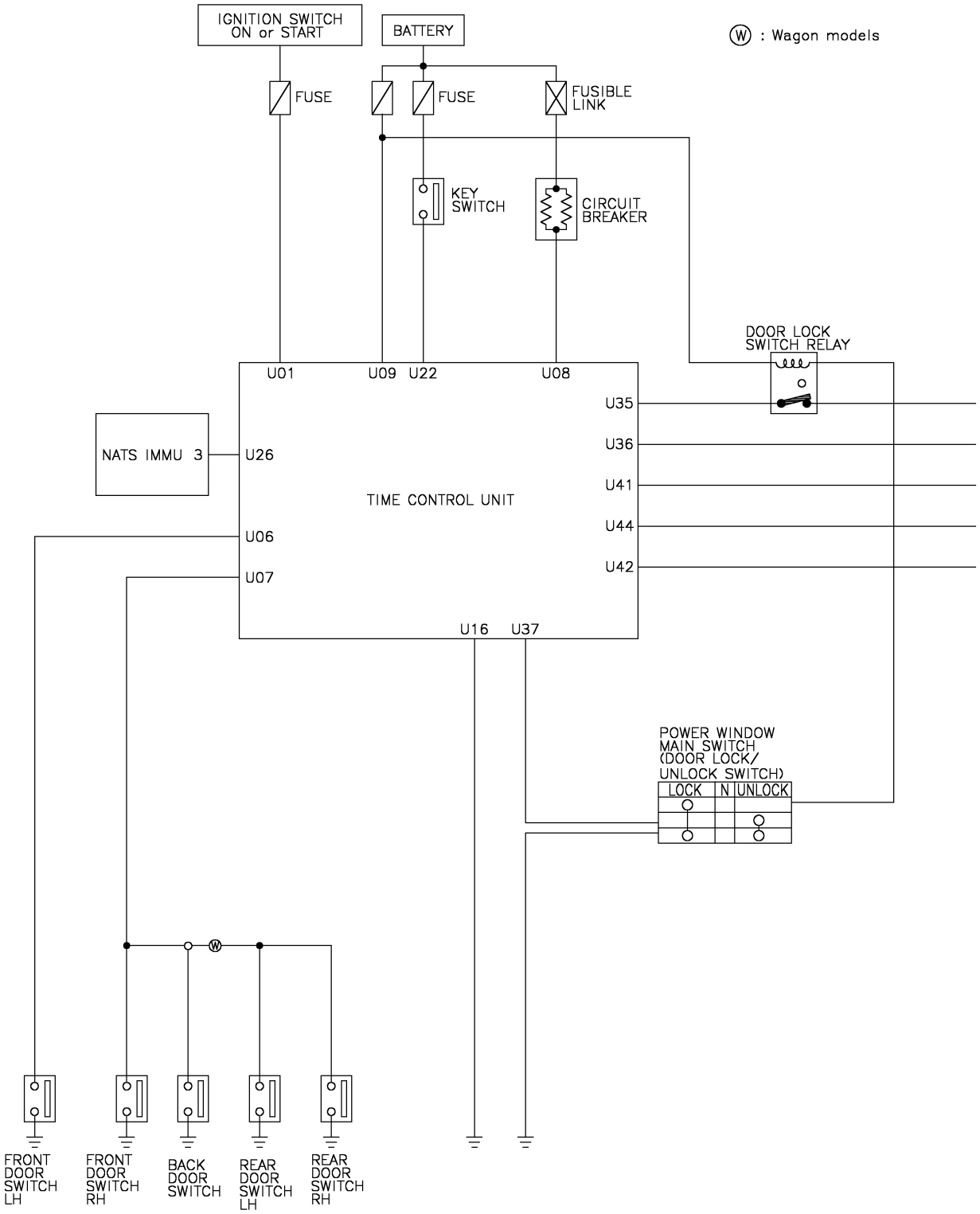
- With lock/unlock switch on driver door trim setting to LOCK will lock all doors.
- With lock/unlock switch on driver door trim setting to UNLOCK will unlock all doors.

Key reminder system

- If the ignition key is in the ignition key cylinder and driver door is open, setting lock/unlock switch, lock knob, key or multi-remote controller to “LOCK” locks the door once but then immediately unlocks all doors. (signal from door unlock sensor driver side)

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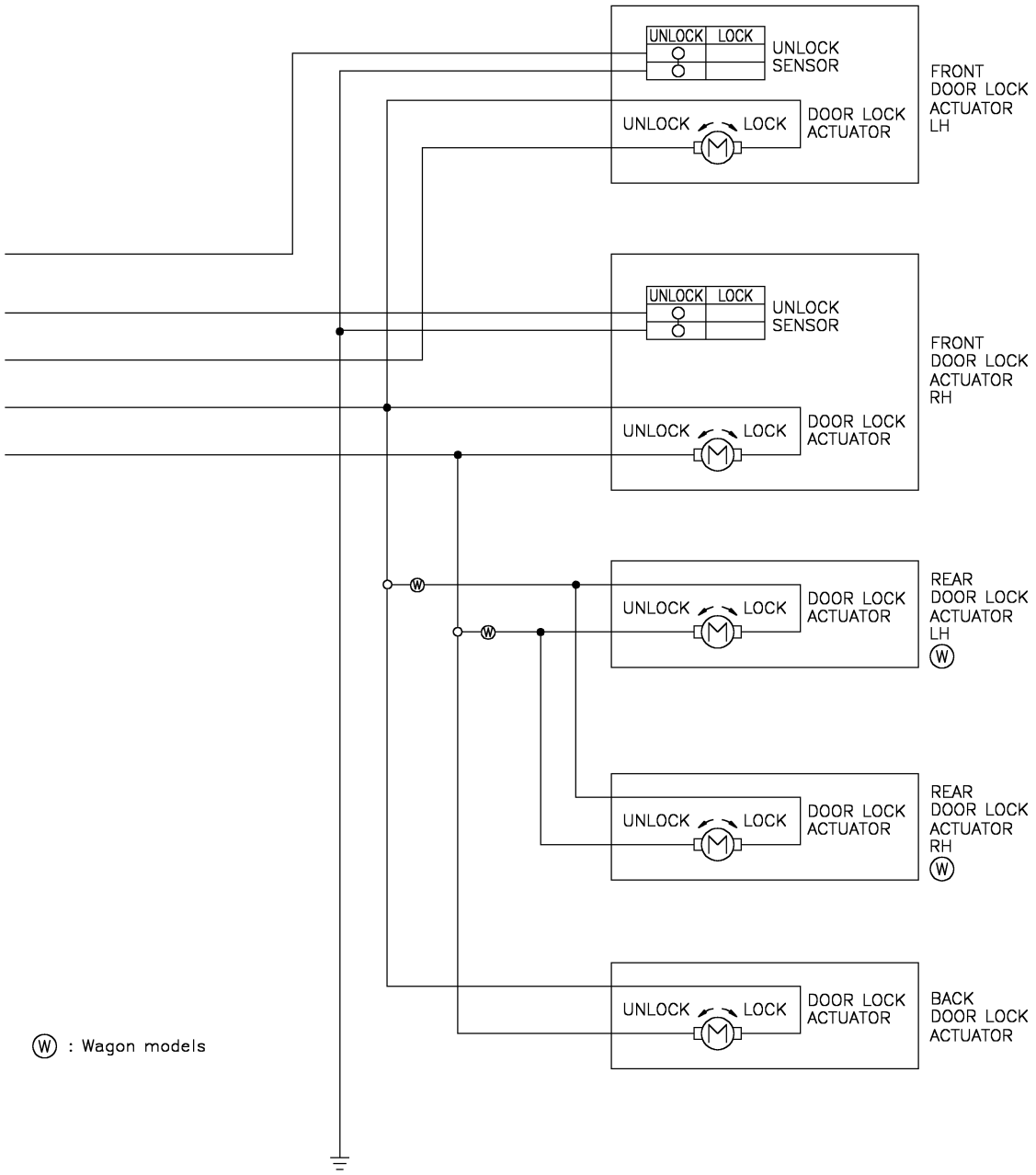
Schematic



YEL142D

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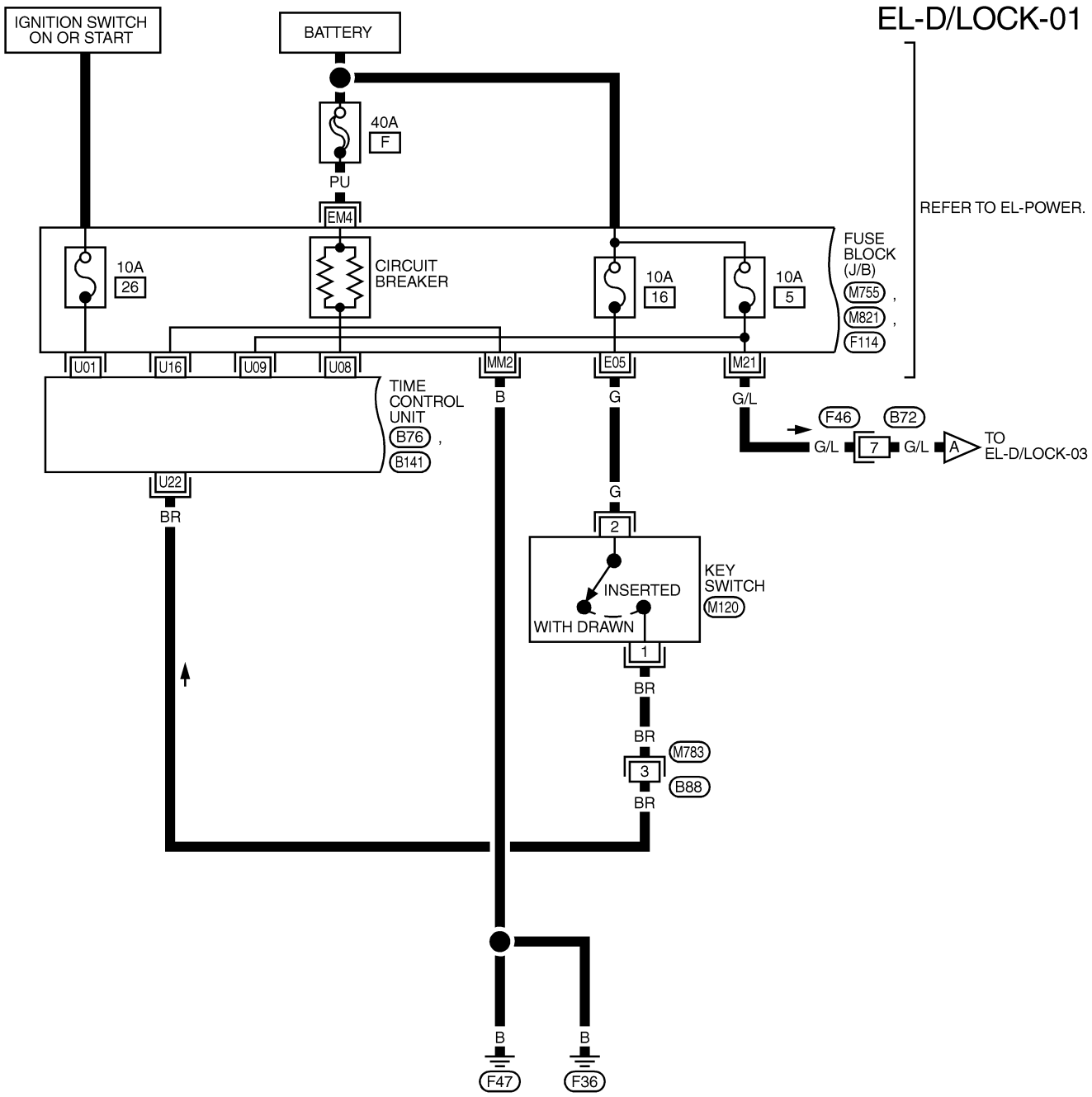
Schematic (Cont'd)

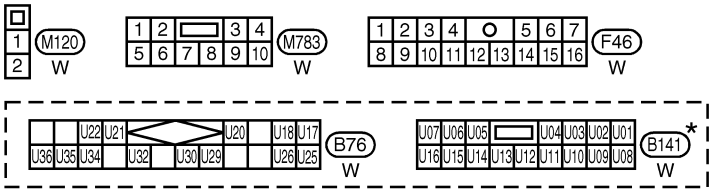


YEL143D

http://vnx.su/

Wiring Diagram — D/LOCK —





*: THIS CONNECTOR IS NOT SHOWN IN "HARNESS LAYOUT", EL SECTION.

REFER TO THE FOLLOWING.
M755 , M821 , F114
-FUSE BLOCK-
JUNCTION BOX (J/B)

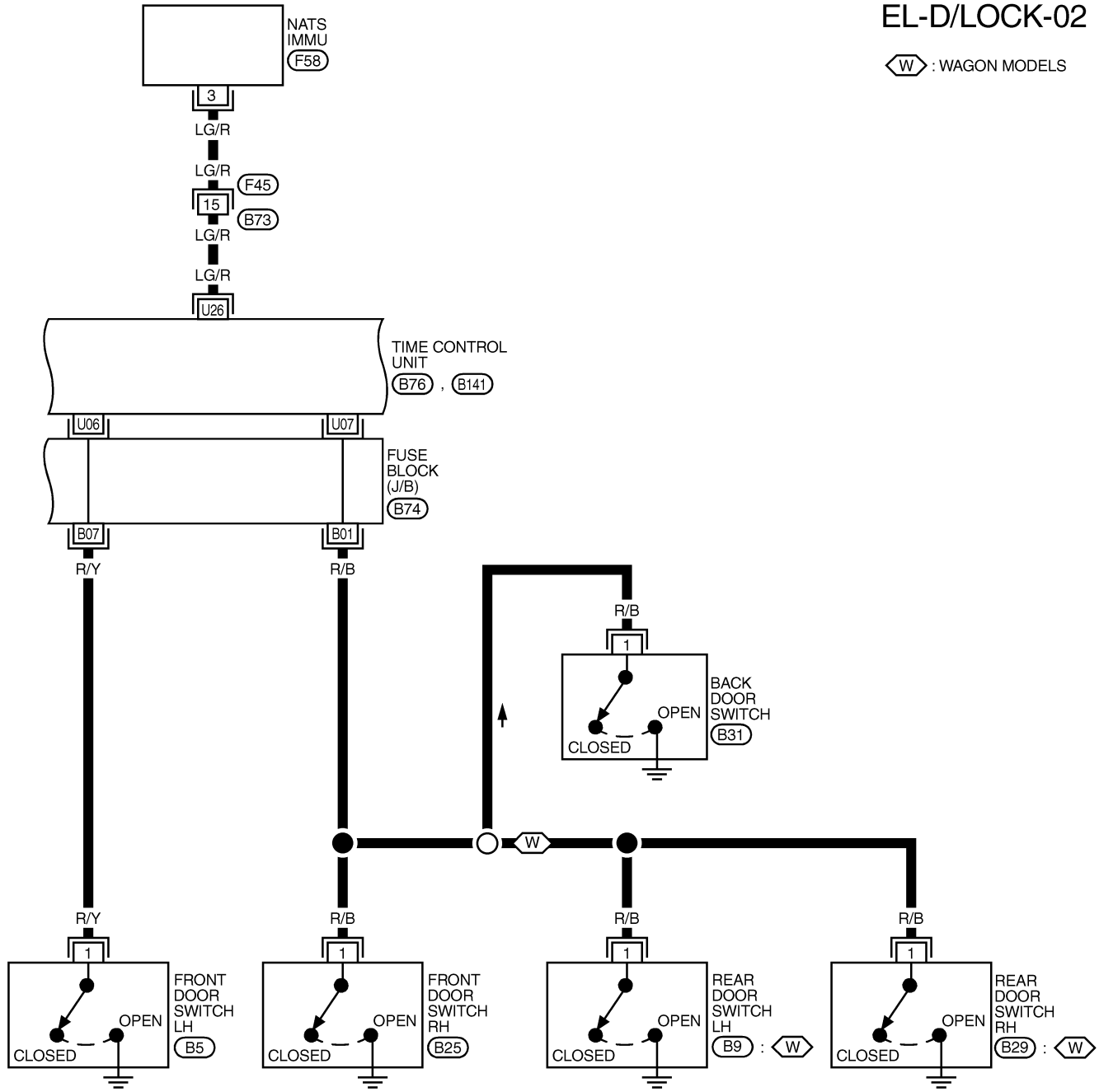
YEL743E

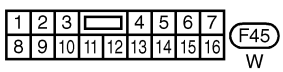
http://vnx.su/

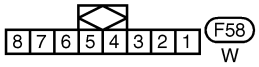
Wiring Diagram — D/LOCK — (Cont'd)

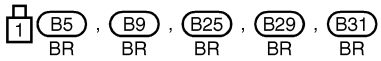
EL-D/LOCK-02

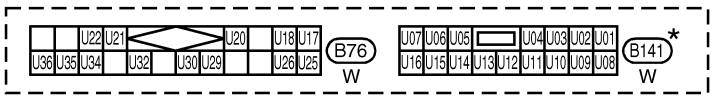
W : WAGON MODELS











REFER TO THE FOLLOWING.
B74 -FUSE BLOCK-JUNCTION BOX (J/B)

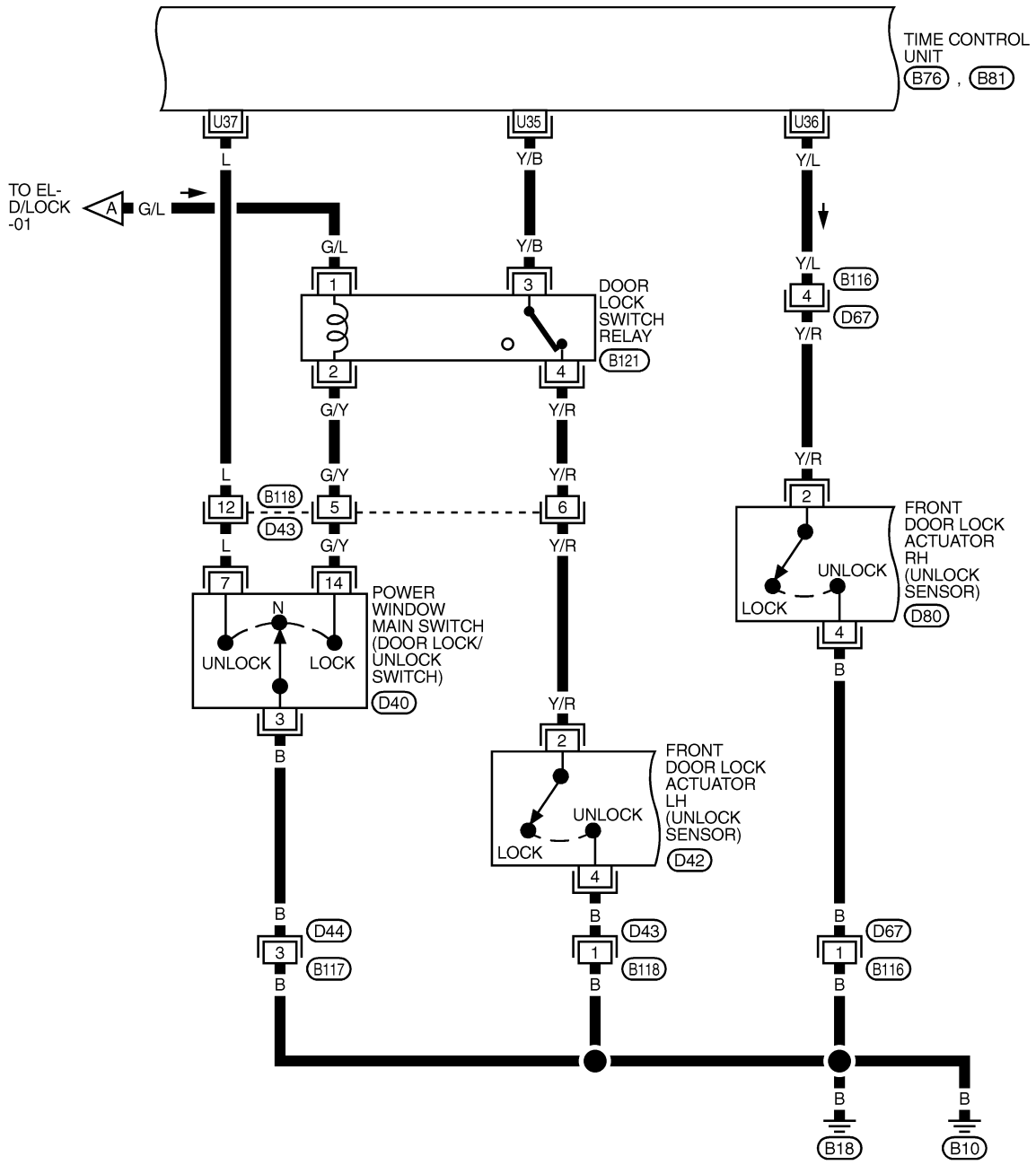
*: THIS CONNECTOR IS NOT SHOWN IN "HARNESS LAYOUT", EL SECTION.

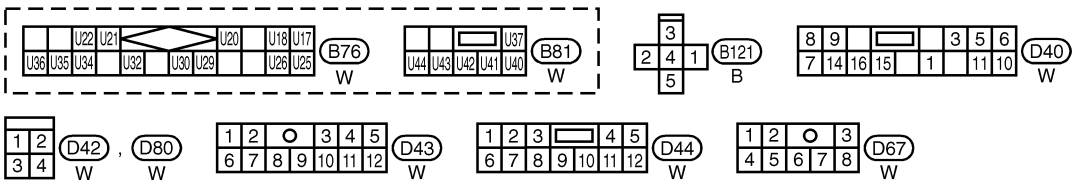
YEL145D

http://vnx.su/

Wiring Diagram — D/LOCK — (Cont'd)

EL-D/LOCK-03



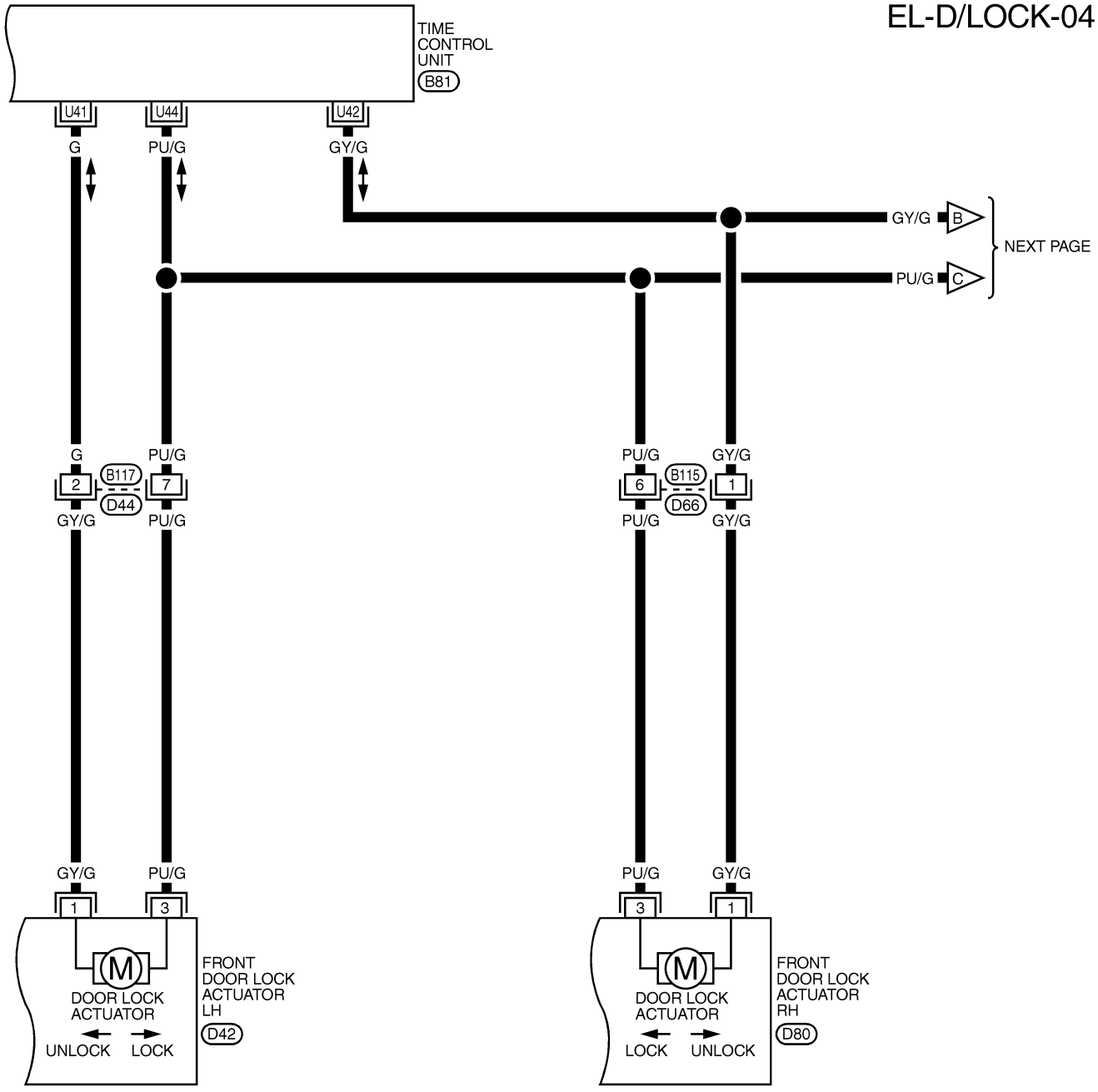


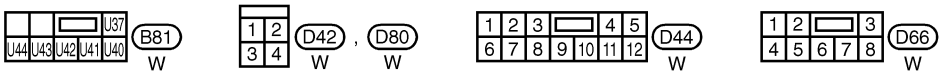
YEL744E

http://vnx.su/

Wiring Diagram — D/LOCK — (Cont'd)

EL-D/LOCK-04



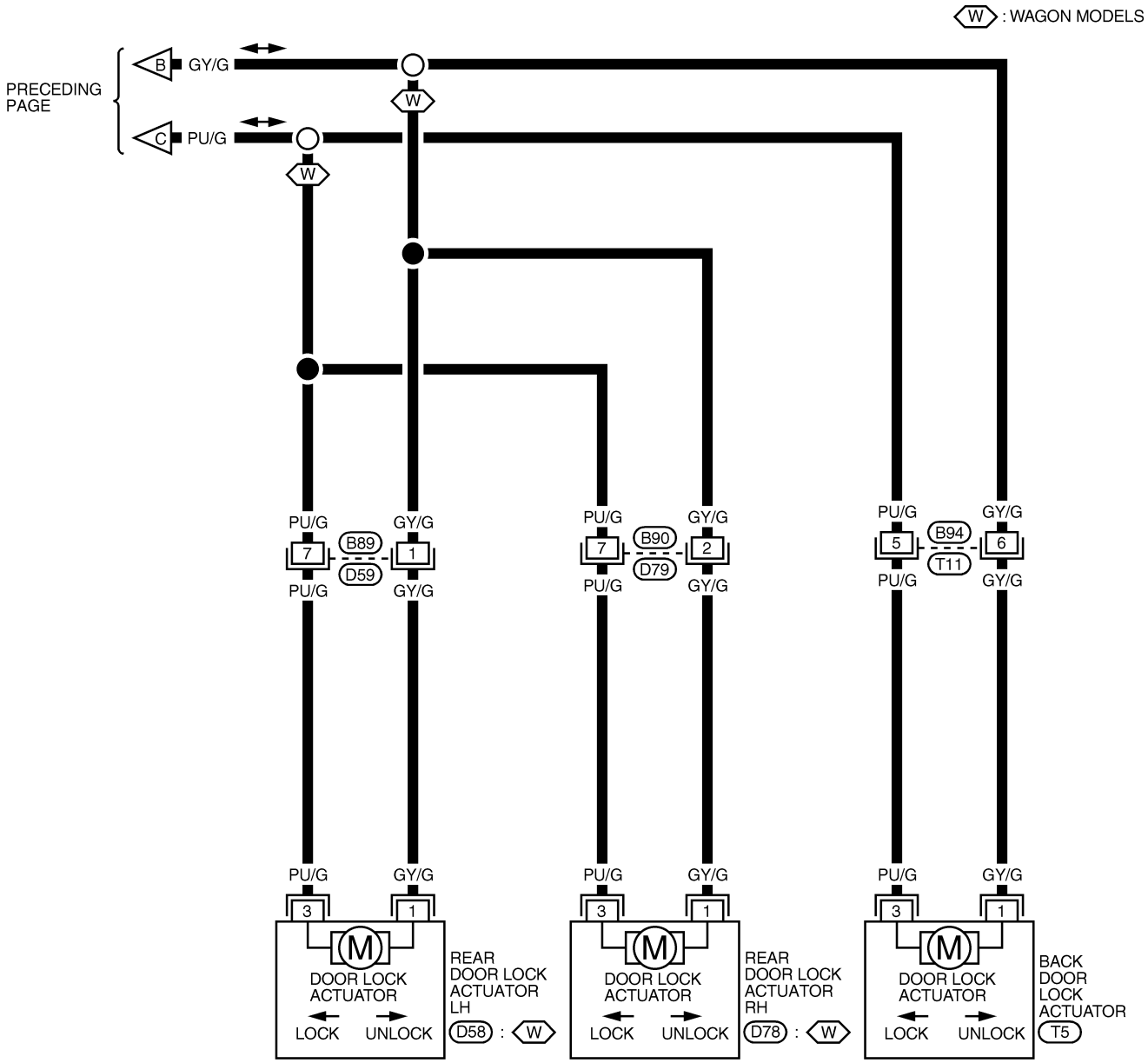


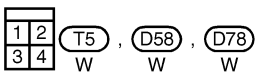
YEL147D

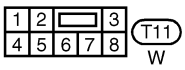
http://vnx.su/

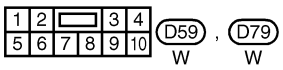
Wiring Diagram — D/LOCK — (Cont'd)

EL-D/LOCK-05







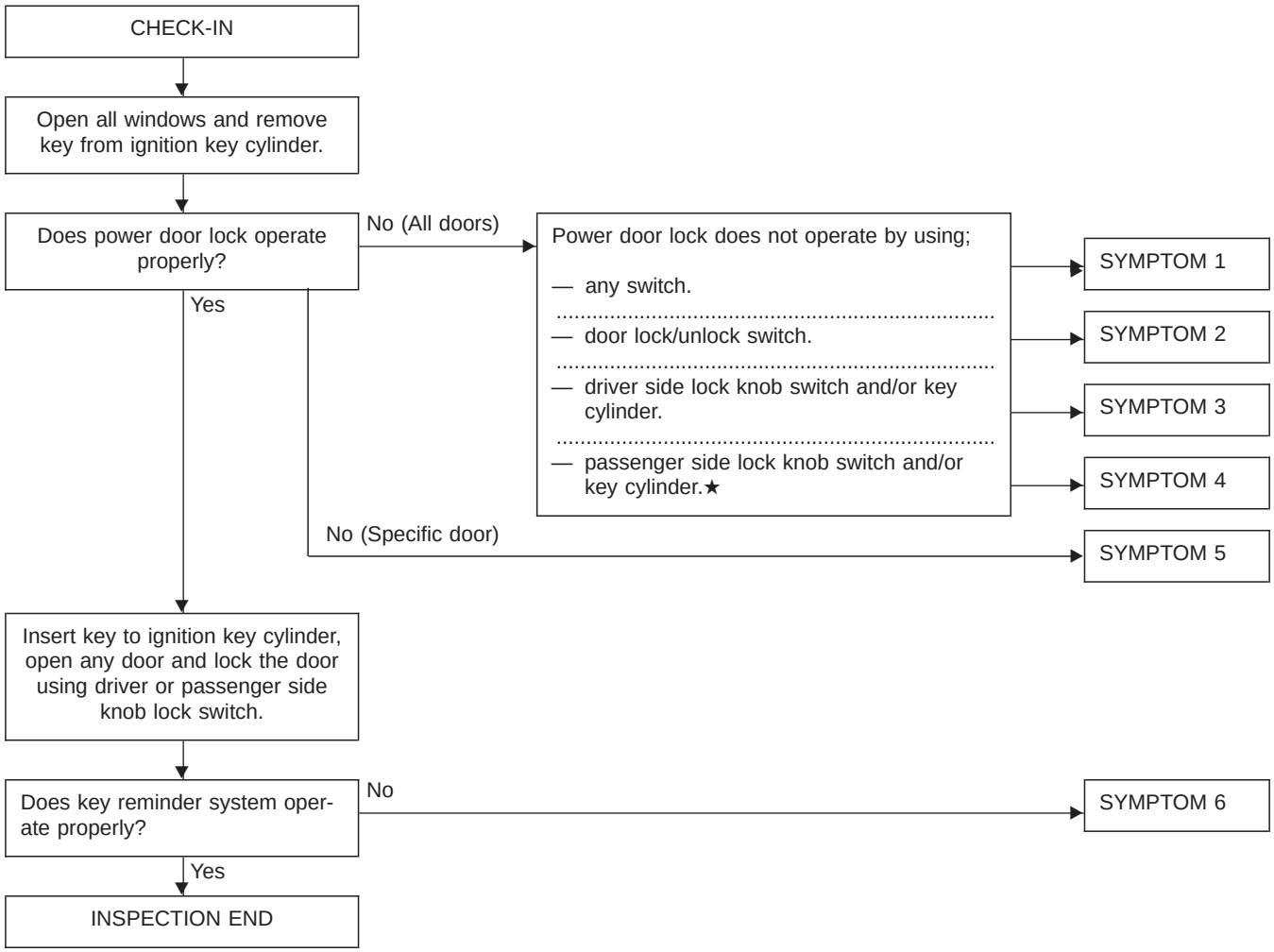


YEL148D

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Trouble Diagnoses

PRELIMINARY CHECK



After performing preliminary check, continue with diagnostic procedure in "SYMPTOM CHART", EL-172.

★ When one or more doors are opened with lock knob on passenger door set to LOCK, only passenger door will lock. (Power door lock system will not operate.)

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Trouble Diagnoses (Cont'd)

Before starting trouble diagnoses below, perform "PRELIMINARY CHECK", EL-171.

Symptom numbers in the symptom chart correspond with those of Preliminary check.

SYMPTOM CHART

REFERENCE PAGE		EL-173	EL-174	EL-175	EL-176	EL-177	EL-178
SYMPTOM		Power supply and ground circuit check	Procedure 1 (Door unlock sensor check)	Procedure 2 (Door lock/unlock switch check)	Procedure 3 (Door lock actuator check)	Procedure 4 (Door switch check)	Procedure 5 (Ignition key switch check)
1	Power door lock does not operate using any switch.	X	X		X		
2	Power door lock does not operate using door lock/unlock switch.			X			
3	Power door lock does not operate with any switch of driver side.		X				
4	Power door lock does not operate with any switch of passenger side.		X			X	
5	Specific door lock actuator does not operate.				X		
6	*Key reminder system does not operate.					X	X

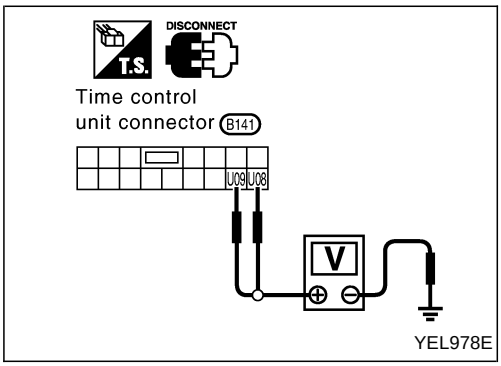
X: Applicable

*: Make sure the power door lock system operates properly.

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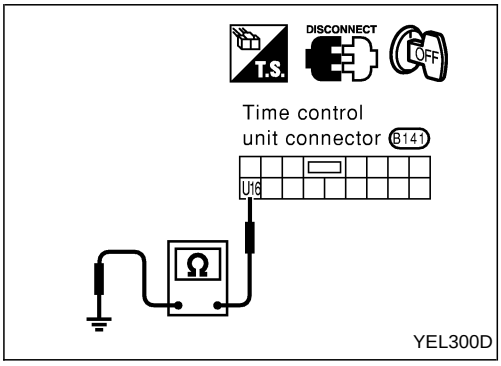
Trouble Diagnoses (Cont'd)

POWER SUPPLY AND GROUND CIRCUIT CHECK



Main power supply circuit check

Terminals		Ignition switch position		
⊕	⊖	LOCK	ACC	ON
U08	Ground	Battery voltage	Battery voltage	Battery voltage
U09				



Ground circuit check

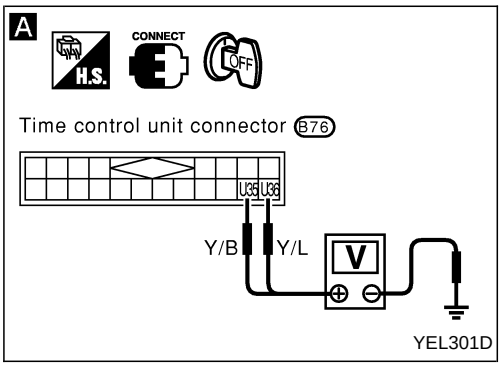
Terminals	Continuity
U16 - Ground	Yes

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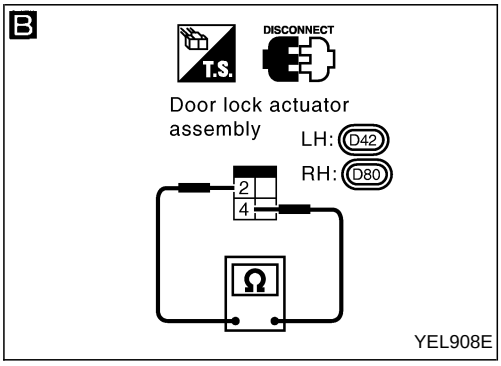
Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 1
(Door unlock sensor check)

A



B



A

CHECK DOOR UNLOCK SENSOR INPUT SIGNAL.
Check voltage between time control unit connector terminals U35 or U36 and ground.

	Terminals ⊕	Terminals ⊖	Condition	Voltage (V)
Driver side	U35	Ground	Locked	Approx. 12 (Approx. 20 sec.)
			Unlocked	0
Passenger side	U36	Ground	Locked	Approx. 12 (Approx. 20 sec.)
			Unlocked	0

OK → Door unlock sensor is OK.

NG ↓

B

CHECK DOOR UNLOCK SENSOR.
1) Disconnect door unlock sensor connector.
2) Check continuity between door unlock sensor terminals.

Terminals	Condition	Continuity
② - ④	Locked	No
	Unlocked	Yes

NG → Replace door lock actuator assembly.

OK ↓

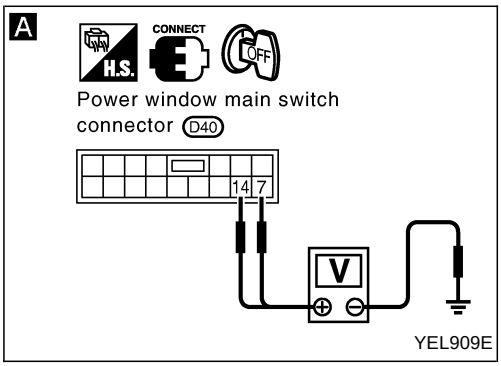
Check the following:
- Door unlock sensor ground circuit.
- Harness for open or short-circuit between control unit and door unlock sensor

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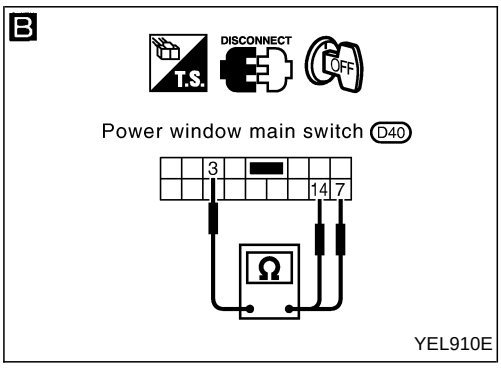
Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDUE 2
(Door lock/unlock switch check)

A



B



A

Check voltage between power window main switch terminals ⑦ , ⑭ and ground.

Terminals ⊕	Terminals ⊖	Condition	Voltage (V)
⑦	Ground	Locked	5
		Unlocked	0
⑭	Ground	Locked	0
		Unlocked	12

OK → Power window main switch (door lock/unlock switch) is OK.

NG ↓

B

CHECK POWER WINDOW MAIN SWITCH.

1) Disconnect power window main switch harness connector.
2) Check continuity between power window main switch terminals ⑦ , ⑭ and ③ .

Terminals		Condition	Continuity
⑦	③	Locked	No
		Unlocked	Yes
⑭		Locked	Yes
		Unlocked	No

NG → Repair or replace power window main switch.

OK ↓

Check the following.

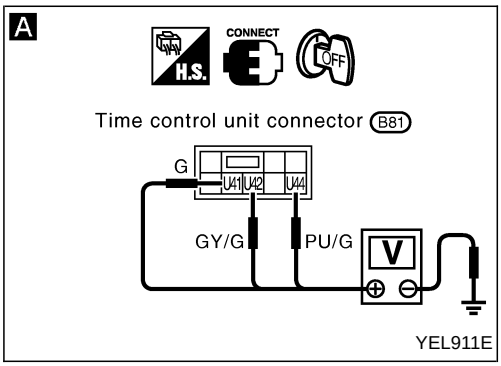
- Harness between TCU and power window main switch.
- Power window main switch ground circuit
- Door lock switch relay
- Harness between fuse block and door lock relay, door lock relay and power window main switch

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Trouble Diagnoses (Cont'd)

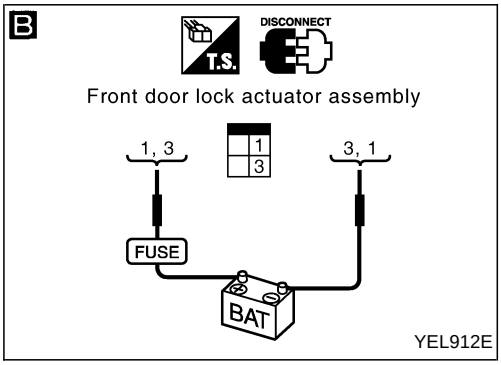
DIAGNOSTIC PROCEDURE 3 (Door lock actuator check)

A



YEL911E

B



YEL912E

A

CHECK DOOR LOCK ACTUATOR CIRCUIT.
Check voltage for door lock actuator.

Knob lock switch condition	Terminals ⊕	Terminals ⊖	Voltage (V)
Unlock → Lock	U41	Ground	Approx. 12 (Approx. 5 seconds)
	U42		
Lock → Unlock	U44	Ground	

Before operating passenger side knob lock switch, close all doors.

NG → Door lock actuator is OK.

OK ↓

B

CHECK DOOR LOCK ACTUATOR.
1. Disconnect door lock actuator connector.
2. Apply 12V direct current to door lock actuator and check operation.

Door lock actuator operation	Terminals ⊕	Terminals ⊖
Unlocked → Locked	①	③
Locked → Unlocked	③	①

NG → Replace door lock actuator assembly.

OK ↓

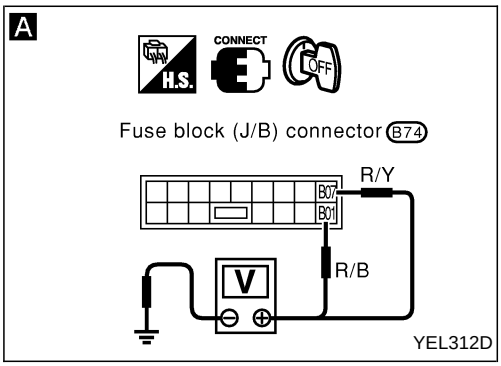
Check harness between control unit and door lock actuator.

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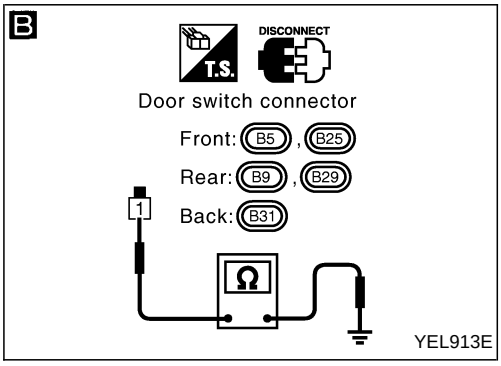
Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 4 (Door switch check)

A



B



A

CHECK DOOR SWITCH INPUT SIGNAL.
Check voltage between fuse block (J/B) and ground.

	Terminals	Condition	Voltage (V)
Driver side door	B07	Opened	0
		Closed	Approx. 12
Other door	B01	Opened	0
		Closed	Approx. 12

OK → Door switch is OK.

NG ↓

B

CHECK DOOR SWITCH.
1) Disconnect door switch connector.
2) Check continuity between door switch terminals.

Terminals	Condition	Continuity
① - ground	Closed	No
	Open	Yes

NG → Replace door switch.

OK ↓

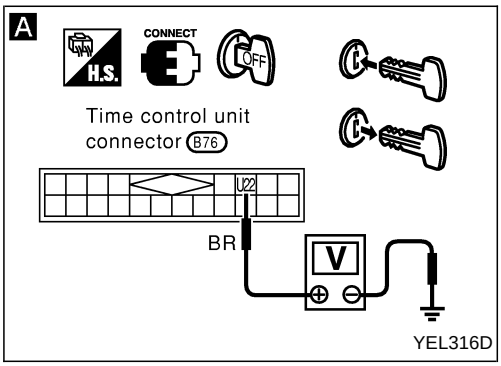
Check the following.
- Door switch ground condition
- Harness for open or short between control unit and door switch

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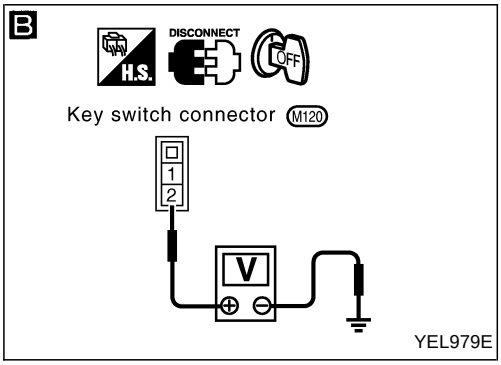
Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 5
(Key switch check)

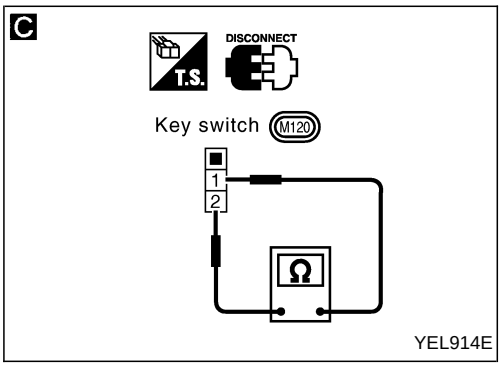
A



B



C



A

CHECK KEY SWITCH INPUT SIGNAL.
Check voltage between control unit terminal (U22) and ground.

Condition of key switch	Voltage (V)
Key is inserted	Approx. 12
Key withdrawn	0

OK → Key switch is OK.

NG ↓

B

CHECK KEY SWITCH POWER SUPPLY.
Check voltage between key switch harness terminal ② and ground.
Battery voltage should exist.

NG → Check the following.
- 10A fuse [No. 16, located in fuse block (J/B)]
- Harness for open or short between key switch and fuse

OK ↓

C

CHECK KEY SWITCH.
1) Disconnect key switch connector.
2) Check continuity between ignition switch terminals.

Terminals	Condition	Continuity
① - ②	Key is inserted.	Yes
	Key is withdrawn.	No

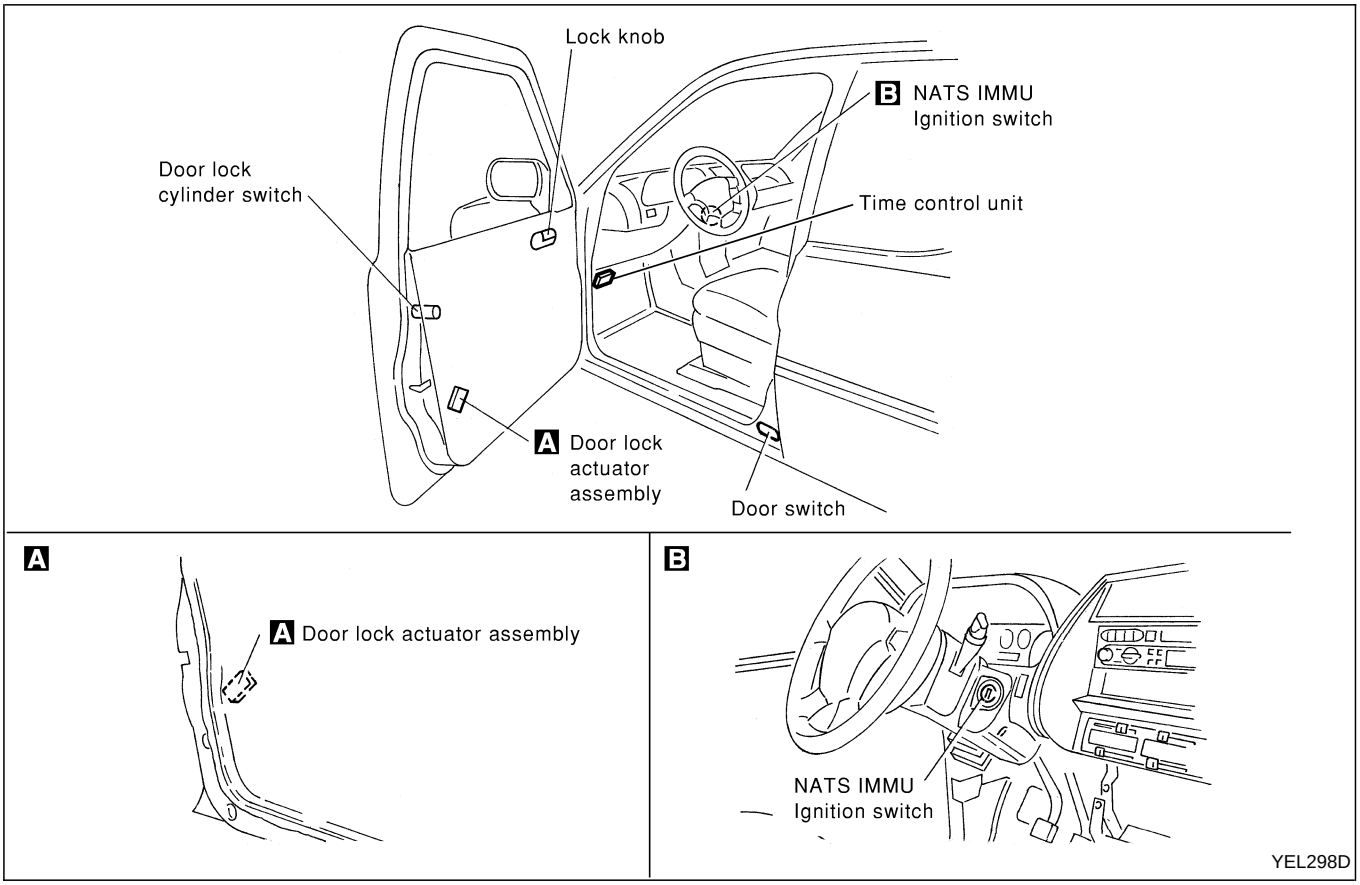
NG → Replace key switch.

OK ↓

Check harness for open or short between control unit and key switch.

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Component Parts Location

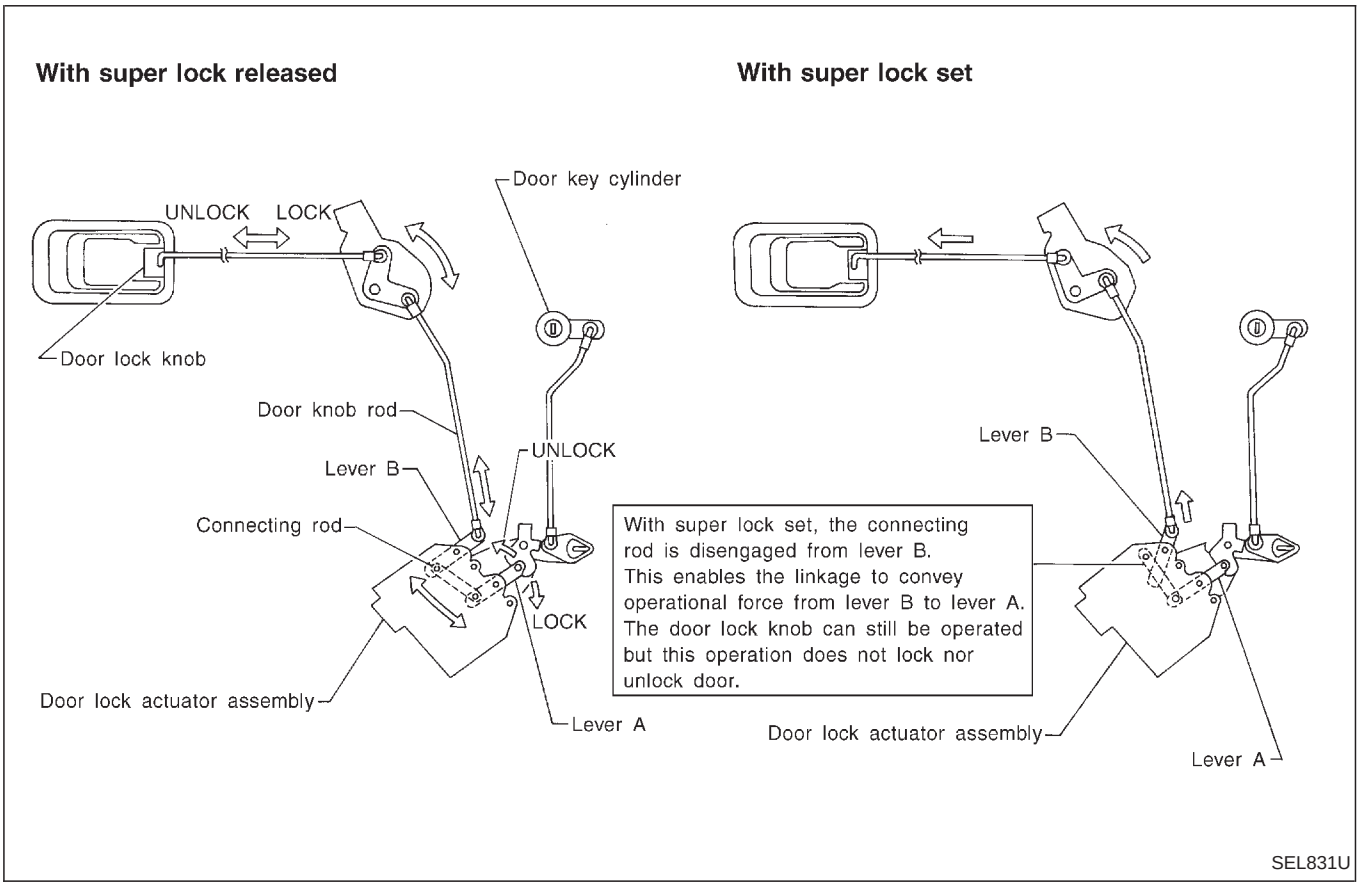


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System Description

OUTLINE

Power door lock system with super lock and key reminder is controlled by super lock control unit. Super lock has a higher anti-theft performance than conventional power door lock systems.
When super lock is in the released condition, lock knob operation can lock or unlock door.
When super lock is in set condition, lock knob operation cannot lock nor unlock door.



OPERATION

Power door lock/unlock and super lock set/release operation by door key cylinder

- With the key inserted into door key cylinder on driver or passenger door, turning it to LOCK will lock all doors and set super lock while all doors are closed or one or more door is open.
- With the key inserted into door key cylinder on driver or passenger door, turning it to UNLOCK will unlock all doors and release super lock.

Power door lock and super lock release operation (by NATS IMMU signal)

- With the key inserted into ignition key cylinder and turning it to “ON” for about 5 - 6 sec. will unlock all doors and release super lock.

Power door lock/unlock operation by lock knob

- Setting lock knob on driver or passenger door to LOCK while all doors are closed, will cause all doors to lock.
  Setting lock knob on passenger door to lock when one or more doors are open will lock passenger door only. (Power door lock system will not operate.)
- Setting lock knob on driver or passenger door to UNLOCK while all doors are closed will unlock all doors.

Lock knob operation cannot control super lock.

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System Description (Cont'd)

Key reminder system

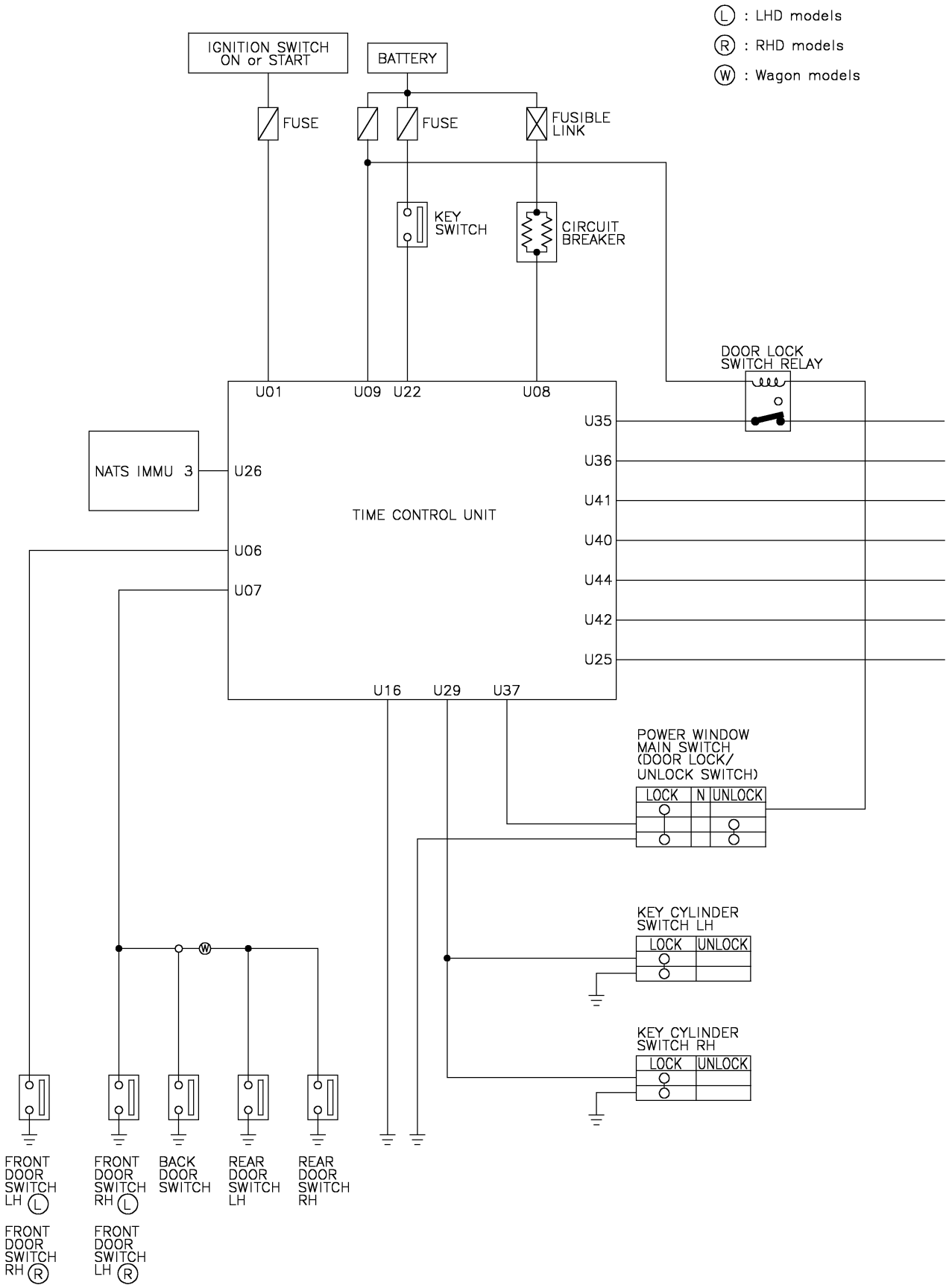
- If the ignition key is in the ignition cylinder and any door is open, setting the lock & unlock switch and lock knob on driver door to "LOCK" locks the door once but then immediately unlocks it.

System initialization

- System initialization is required when battery cables are reconnected. Conduct one of the following:
  — insert the key into ignition key cylinder and turn it to "ON."
  — LOCK/UNLOCK operation using door key cylinder.

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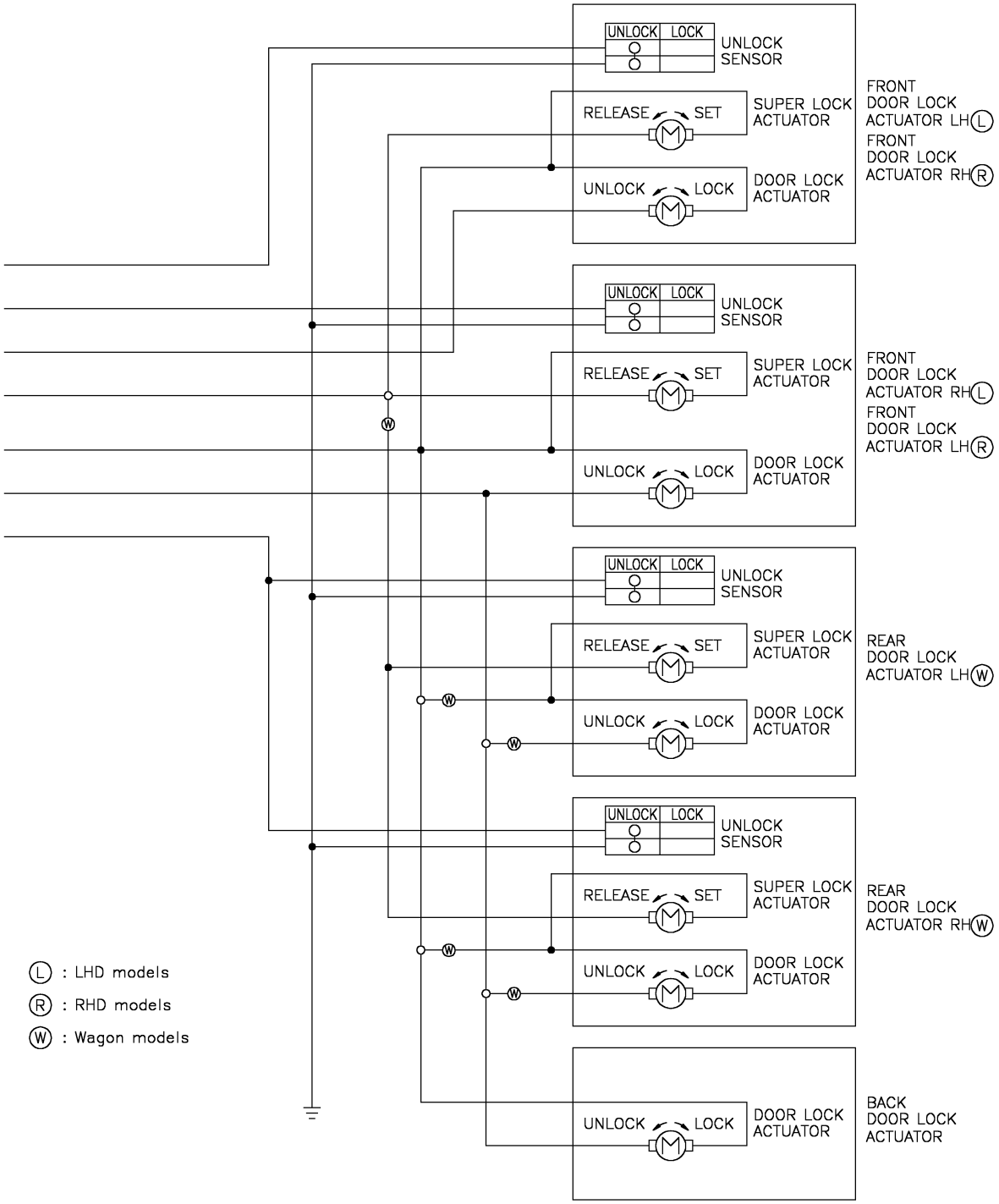
Schematic



YEL864E

http://vnx.su/

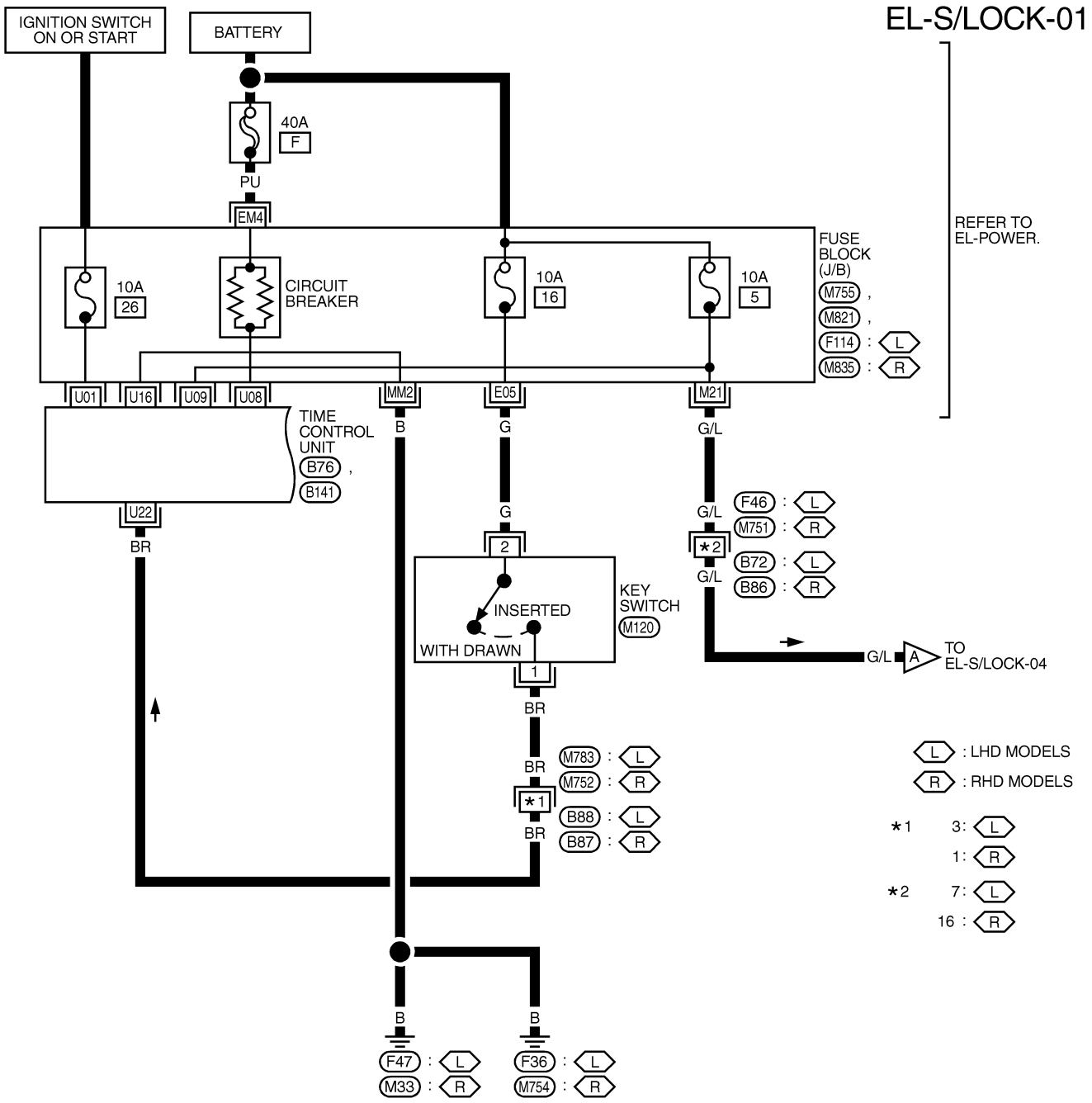
Schematic (Cont'd)



YEL150D

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Wiring Diagram — S/LOCK —

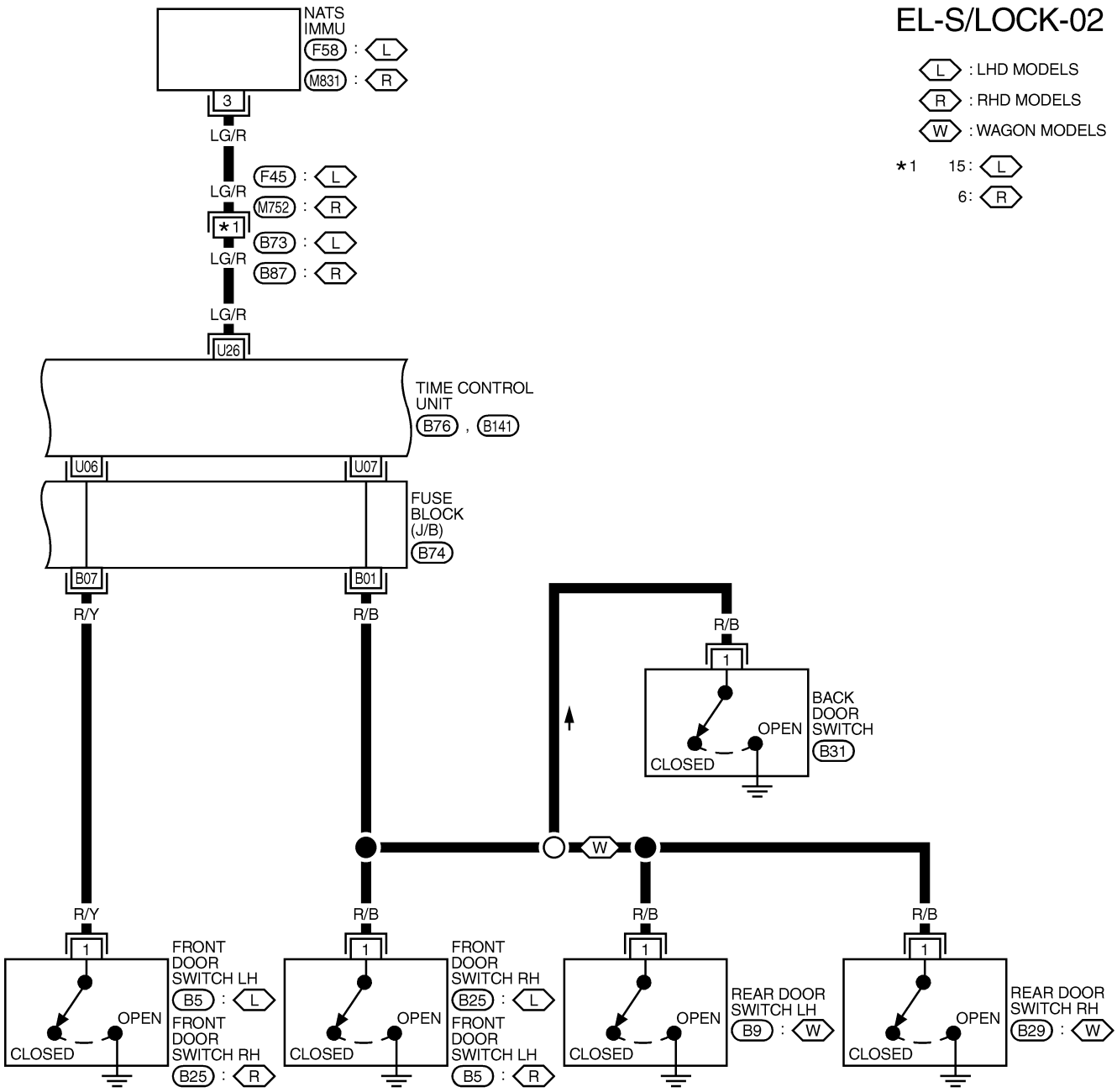


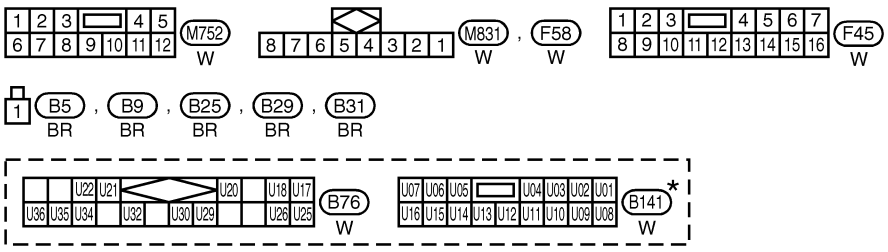
*: THIS CONNECTOR IS NOT SHOWN IN "HARNESS LAYOUT", EL SECTION.

YEL745E

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Wiring Diagram — S/LOCK — (Cont'd)





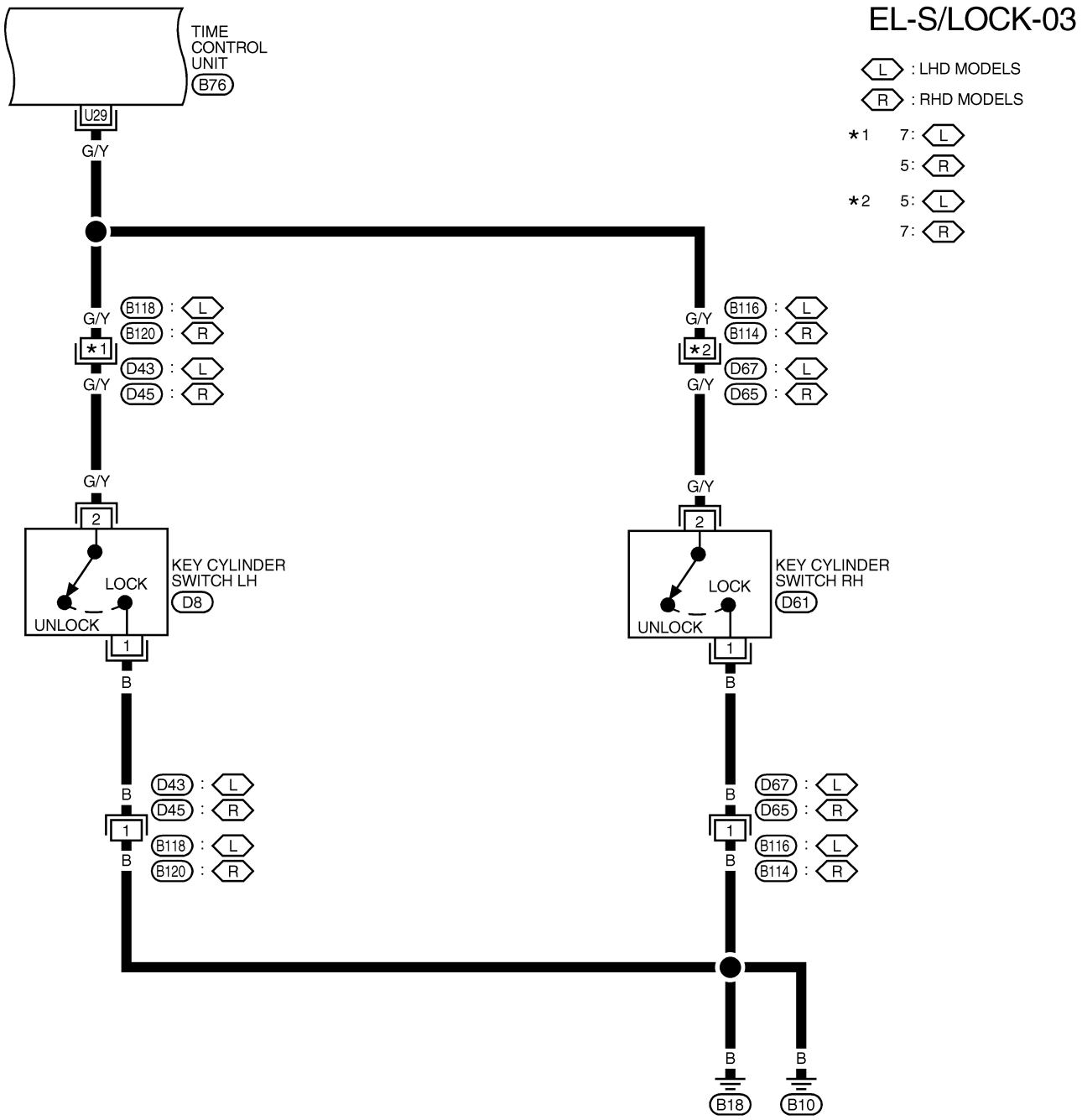
*: THIS CONNECTOR IS NOT SHOWN IN "HARNESS LAYOUT", EL SECTION.

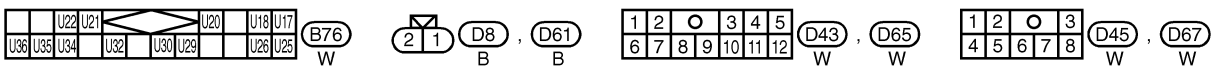
REFER TO THE FOLLOWING.
B74 -FUSE BLOCK-
JUNCTION BOX (J/B)

YEL152D

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Wiring Diagram — S/LOCK — (Cont'd)



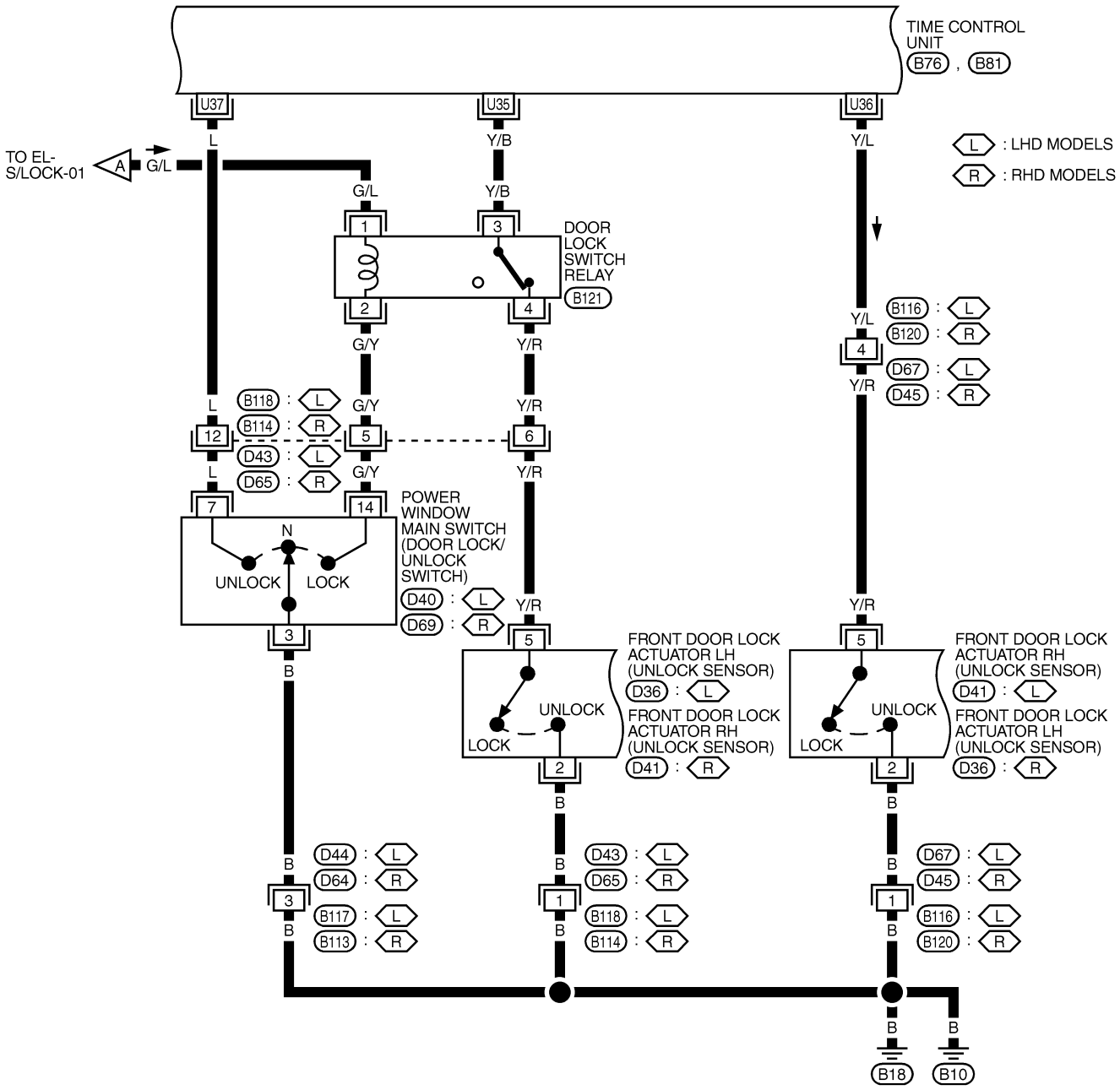


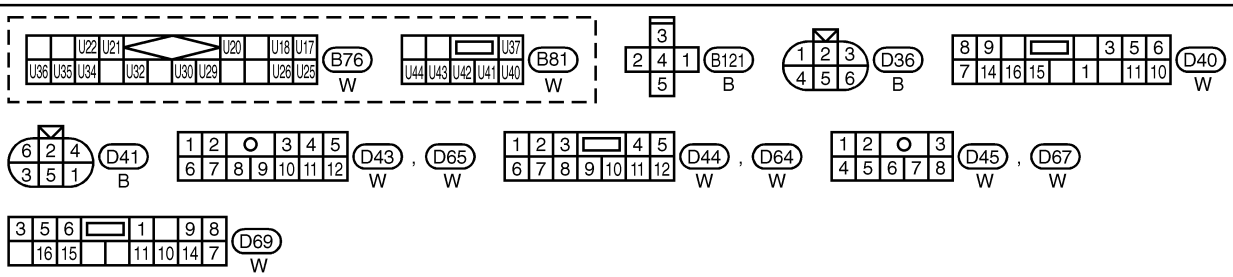
YEL865E

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Wiring Diagram — S/LOCK — (Cont'd)

EL-S/LOCK-04

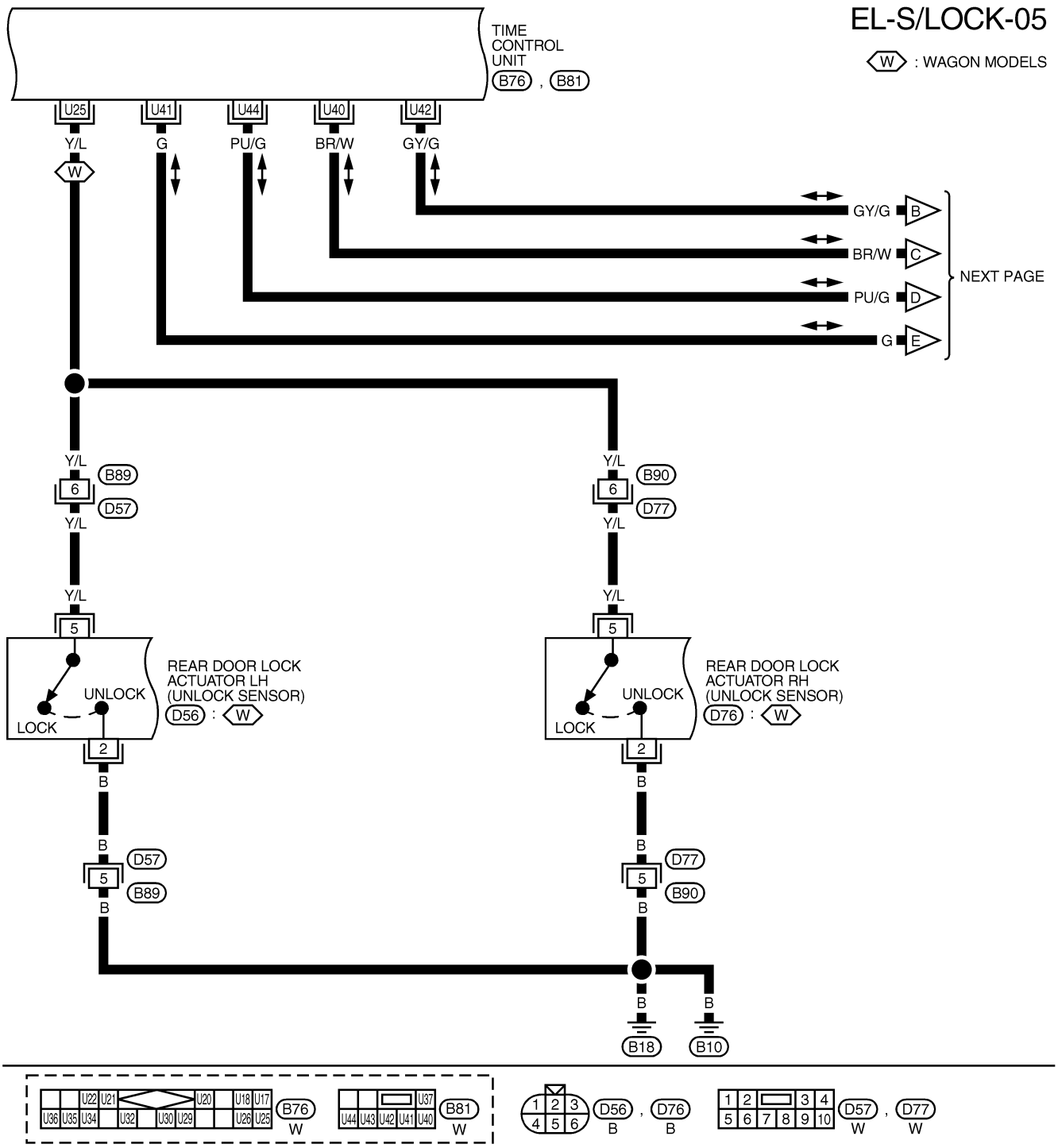




YEL746E

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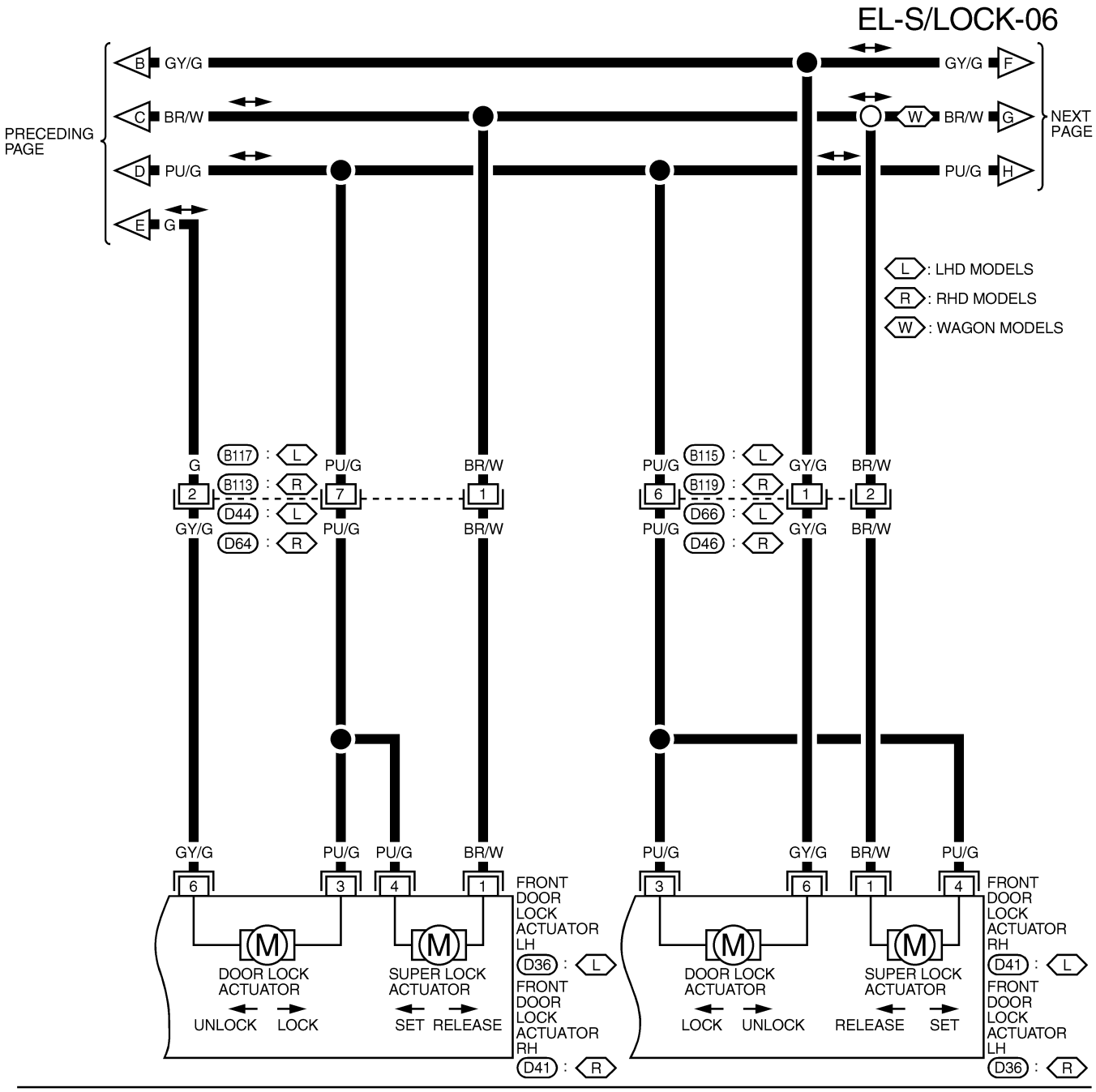
Wiring Diagram — S/LOCK — (Cont'd)

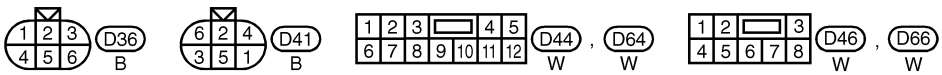


YEL155D

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Wiring Diagram — S/LOCK — (Cont'd)



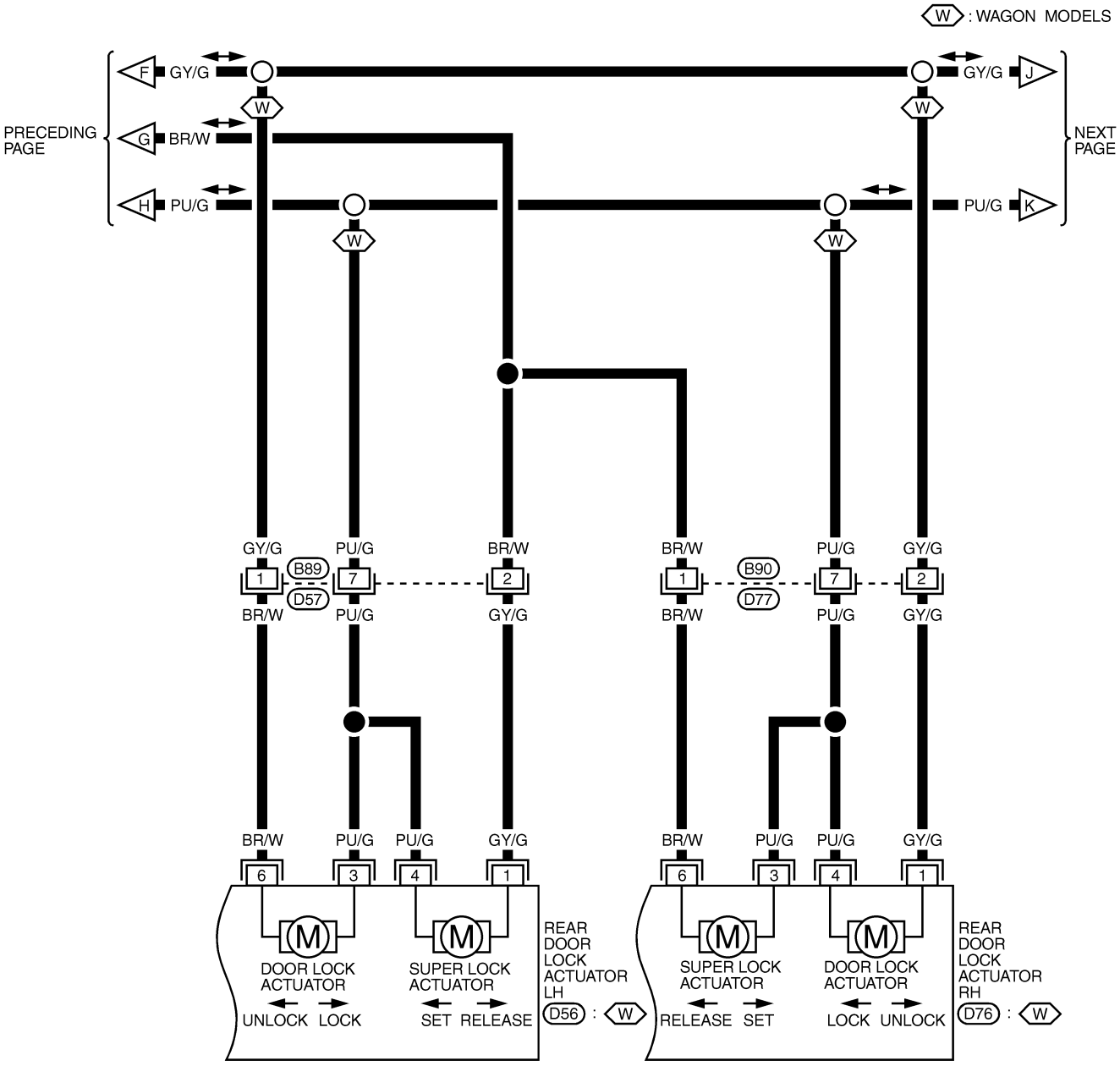


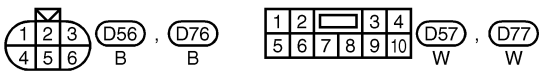
YEL156D

http://vnx.su/

Wiring Diagram — S/LOCK — (Cont'd)

EL-S/LOCK-07



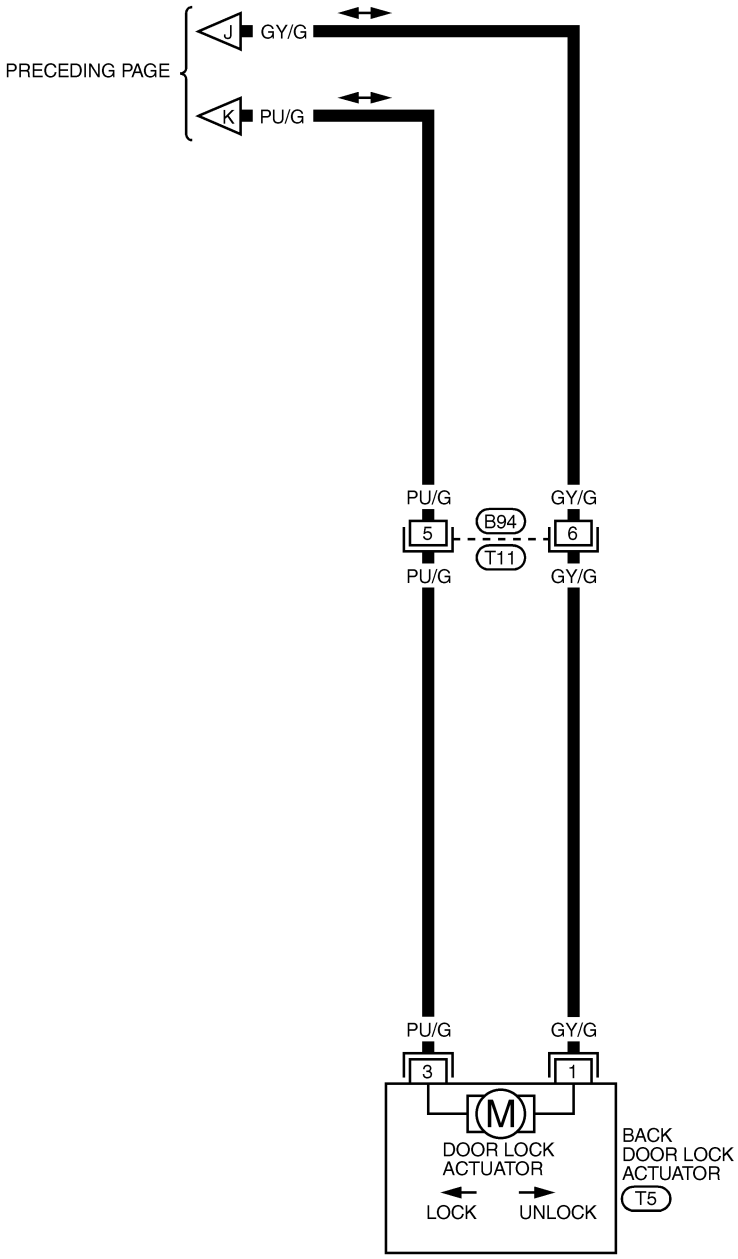


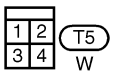
YEL157D

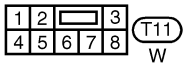
http://vnx.su/

Wiring Diagram — S/LOCK — (Cont'd)

EL-S/LOCK-08





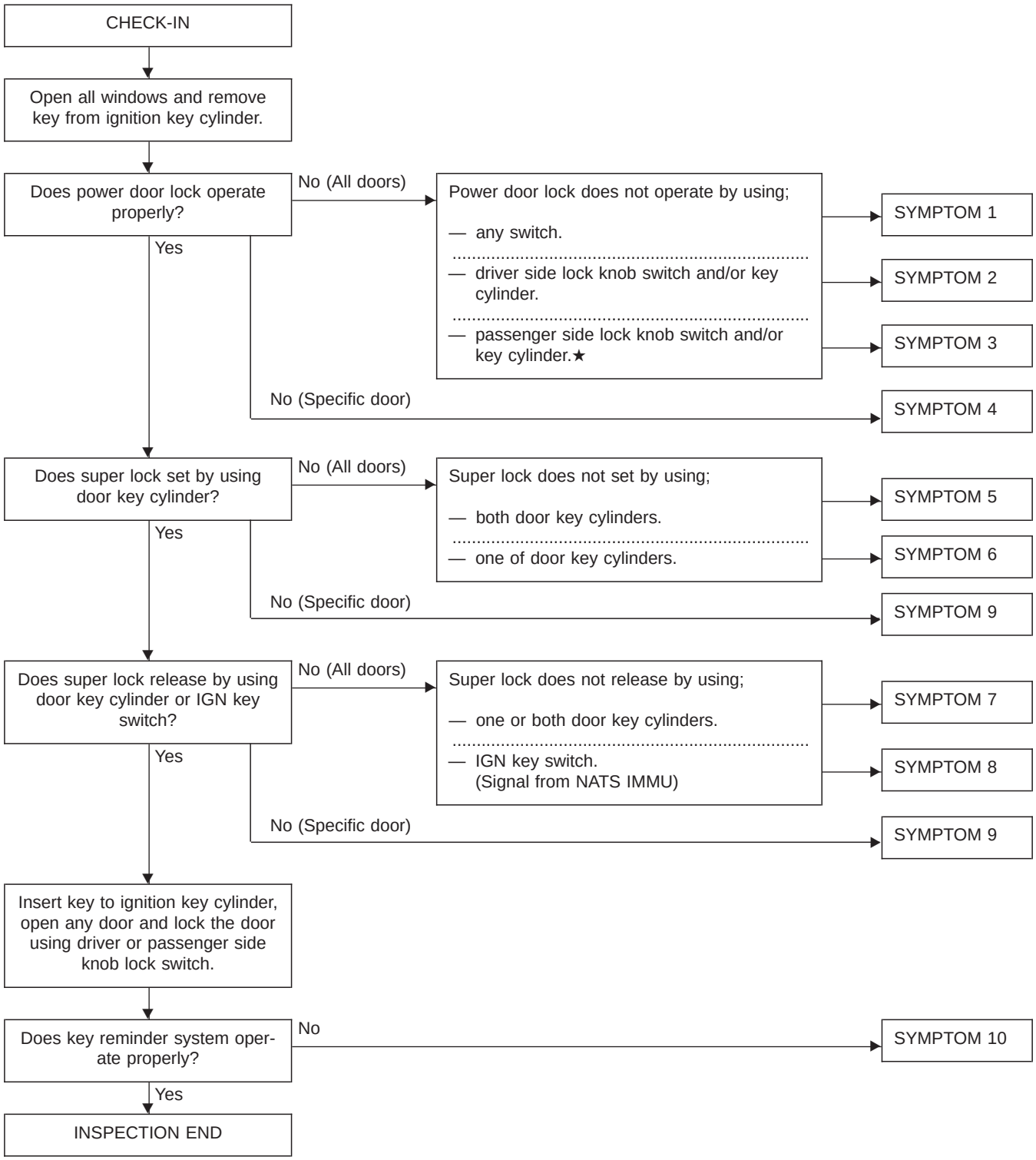


YEL158D

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Trouble Diagnoses

PRELIMINARY CHECK



After performing preliminary check, continue with diagnostic procedure in "SYMPTOM CHART", EL-193.

★ When one or more doors are opened with lock knob on passenger door set to LOCK, only passenger door will lock. (Power door lock system will not operate.)

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Trouble Diagnoses (Cont'd)

Before starting trouble diagnoses below, perform "PRELIMINARY CHECK", EL-192.

Symptom numbers in the symptom chart correspond with those of Preliminary check.

SYMPTOM CHART

REFERENCE PAGE		EL-194	EL-195	EL-196	EL-197	EL-198	EL-199	EL-200	EL-201	EL-201
SYMPTOM		Power supply and ground circuit check	Procedure 1 (Door unlock sensor check)	Procedure 2 (Door key cylinder switch check)	Procedure 3 (Door lock actuator check)	Procedure 4 (Super lock actuator check)	Procedure 5 (Door switch check)	Procedure 6 (NATS release signal check)	Procedure 7 (Ignition key switch check)	Procedure 8 (Ignition switch "ON" circuit check)
1	Power door lock does not operate using any switch.	X	X		X					
2	Power door lock does not operate with any switch of driver side.		X							
3	Power door lock does not operate with any switch of passenger side.		X				X			
4	Specific door lock actuator does not operate.				X					
5	Super lock cannot be set by both door key cylinders.	X		X		X			X	X
6	Super lock cannot be set by one of door key cylinders.			X						
7	*Super lock cannot be released by one or both door key cylinders.		X							
8	*Super lock cannot be released by ignition key switch. (Signal from NATS IMMU)							X		
9	Specific super lock actuator does not operate.					X				
10	*Key reminder system does not operate.						X		X	

X: Applicable

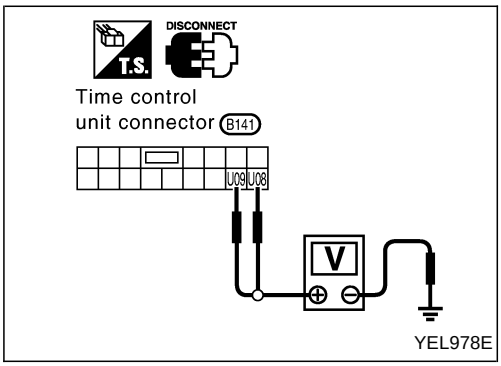
*: Make sure the power door lock system operates properly.

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Trouble Diagnoses (Cont'd)

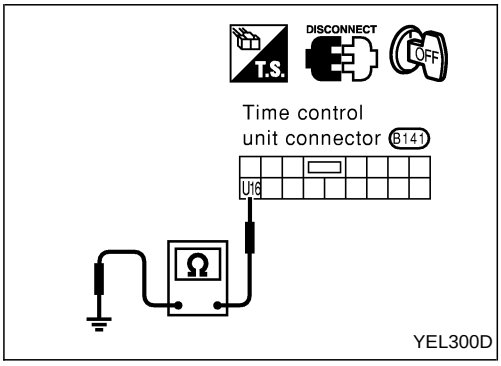
POWER SUPPLY AND GROUND CIRCUIT CHECK

Main power supply circuit check



Terminals		Ignition switch position		
⊕	⊖	LOCK	ACC	ON
U08	Ground	Battery voltage	Battery voltage	Battery voltage
U09				

Ground circuit check



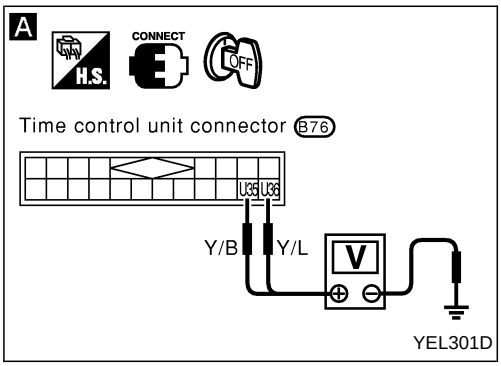
Terminals	Continuity
U16 - Ground	Yes

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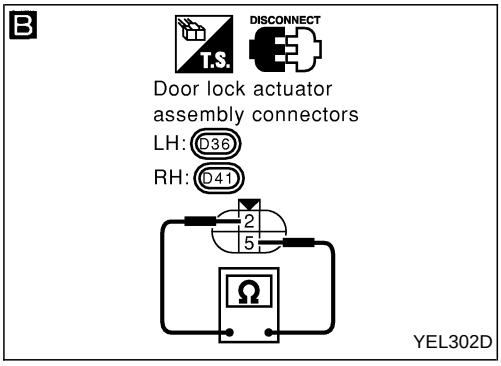
Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 1
(Door unlock sensor check)

A



B



A

CHECK DOOR UNLOCK SENSOR INPUT SIGNAL.
Check voltage between time control unit connector terminals (U35) or (U36) and ground.

	Terminals ⊕	Terminals ⊖	Condition	Voltage (V)
Driver side	U35	Ground	Locked	Approx. 12 (Approx. 20 sec.)
			Unlocked	0
Passenger side	U36	Ground	Locked	Approx. 12 (Approx. 20 sec.)
			Unlocked	0

OK → Door unlock sensor is OK.

NG ↓

B

CHECK DOOR UNLOCK SENSOR.
1) Disconnect door unlock sensor connector.
2) Check continuity between door unlock sensor terminals.

Terminals	Condition	Continuity
② - ⑤	Locked	No
	Unlocked	Yes

NG → Replace door lock actuator assembly.

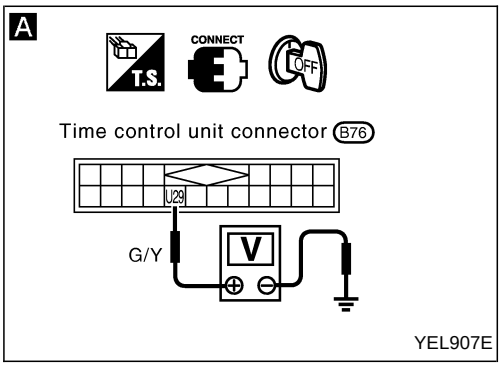
OK ↓

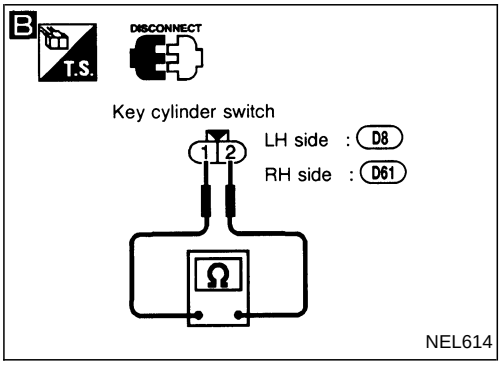
Check the following:
- Door unlock sensor ground circuit.
- Harness for open or short-circuit between control unit and door unlock sensor

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Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 2
(Door key cylinder switch check)





A

CHECK DOOR KEY CYLINDER SWITCH INPUT SIGNAL (LOCK SIGNAL).
Check voltage between time control unit connector terminal U29 and ground.

Key cylinder switch operation	Voltage (V)
Lock	0
Unlock/neutral	Approx. 5

OK → Door key cylinder switch is OK.

NG ↓

B

CHECK DOOR KEY CYLINDER SWITCH.
1) Disconnect door key cylinder switch connector.
2) Check continuity between door key cylinder switch terminals.

Terminals	Key position	Continuity
①- ②	Unlock/neutral	No
	Lock	Yes

NG → Replace key cylinder switch.

OK ↓

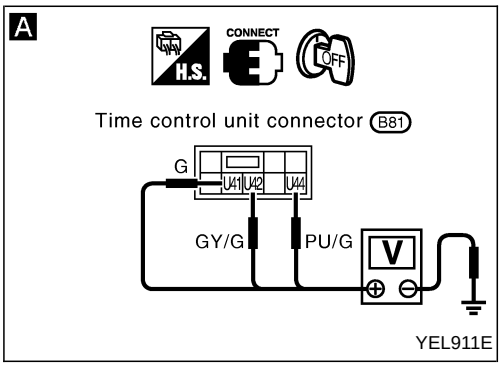
Check the following:
- Harness connectors
- Door key cylinder switch ground circuit
- Harness for open or short-circuit between time control unit and door key cylinder.

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Trouble Diagnoses (Cont'd)

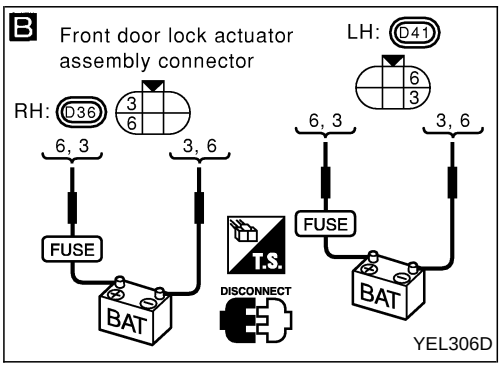
DIAGNOSTIC PROCEDURE 3 (Door lock actuator check)

A



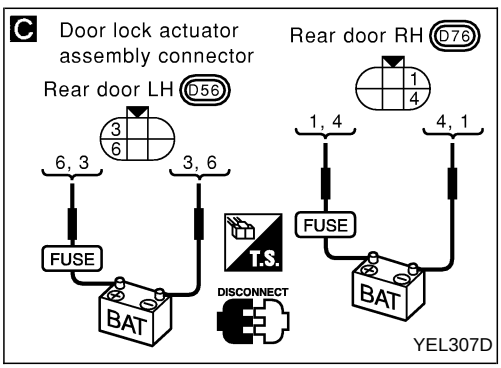
YEL911E

B



YEL306D

C



YEL307D

A

CHECK DOOR LOCK ACTUATOR CIRCUIT.
Check voltage for door lock actuator.

Knob lock switch condition	Terminals ⊕	Terminals ⊖	Voltage (V)
Unlock → Lock	U41, U42	Ground	Approx. 12 (Approx. 5 seconds)
Lock → Unlock	U44	Ground	

Before operating passenger side knob lock switch, close all doors.

NG → Door lock actuator is OK.

OK ↓

B C

CHECK DOOR LOCK ACTUATOR.
1. Disconnect door lock actuator connector.
2. Apply 12V direct current to door lock actuator and check operation.

OK → Check harness between control unit and door lock actuator.

Front door

Door lock actuator operation	Terminals ⊕	Terminals ⊖
Unlocked → Locked	⑥	③
Locked → Unlocked	③	⑥

Rear door

Door lock actuator operation	Terminals ⊕	Terminals ⊖
Unlocked → Locked	⑥: (LH) ①: (RH)	③: (LH) ④: (RH)
Locked → Unlocked	③: (LH) ④: (RH)	⑥: (LH) ①: (RH)

NG ↓

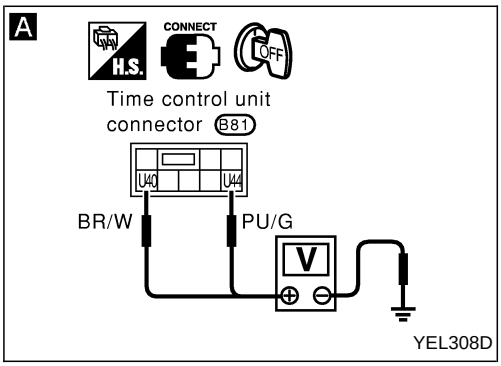
Replace door lock actuator assembly.

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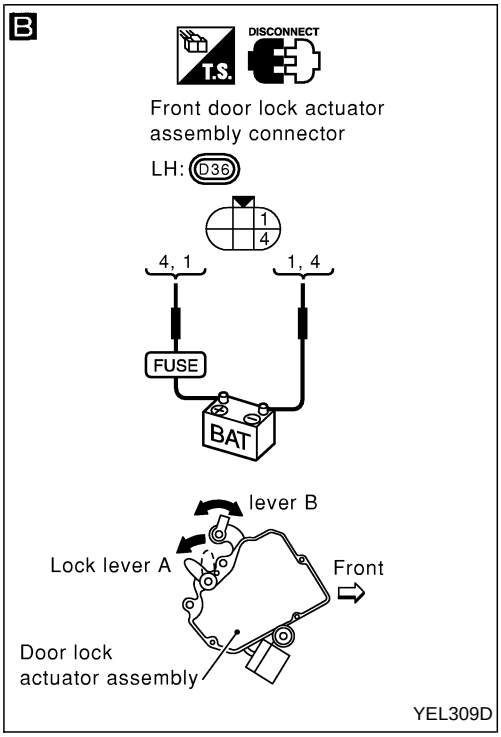
Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 4
(Super lock actuator check)

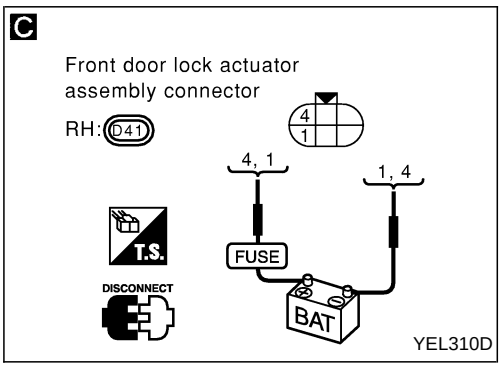
A



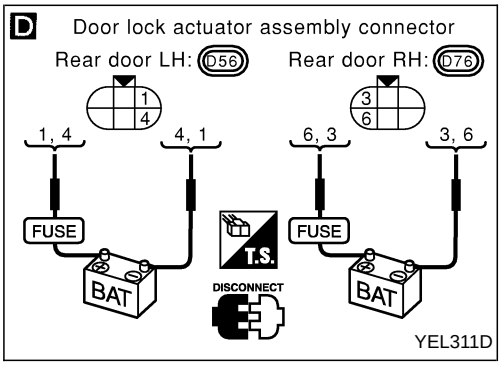
B



C



D



A

CHECK SUPER LOCK ACTUATOR CIRCUIT.
Check voltage for super lock actuator.

Door key cylinder switch condition	Terminals ⊕	Terminals ⊖	Voltage (V)
Lock (Set)	U40	Ground	Approx. 12
Unlock (Released)	U44	Ground	

Note:
Put the system in set condition before checking release signal.

NG → Super lock actuator is OK.

OK ↓

B C D

CHECK SUPER LOCK ACTUATOR.
1. Disconnect door lock actuator assembly connector.
2. Set lever A in lock position.
3. Apply 12V direct current to door lock actuator assembly and check operation.

OK → Check harness between control unit and door lock actuator assembly.

Front door

Super lock actuator operation	Terminals ⊕	Terminals ⊖	Connection from lever A to lever B
Released → Set	①	④	Disconnect
Set → Released	④	①	Connect

Rear door

Super lock actuator operation	Terminals ⊕	Terminals ⊖	Connection from lever A to lever B
Released → Set	①: (LH) ⑥: (RH)	④: (LH) ③: (RH)	Disconnect
Set → Released	④: (LH) ③: (RH)	①: (LH) ⑥: (RH)	Connect

NG ↓

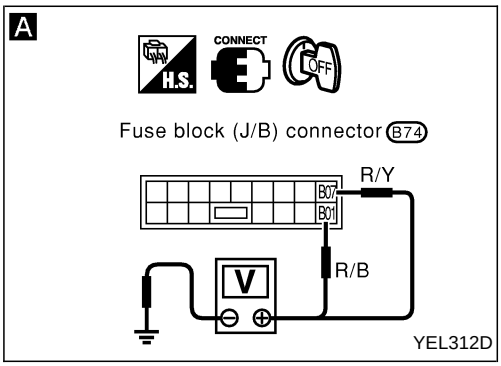
Replace door lock actuator assembly.

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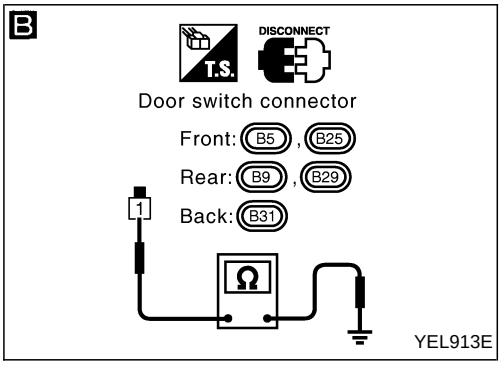
Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 5
(Door switch check)

A



B



A

CHECK DOOR SWITCH INPUT SIGNAL.
Check voltage between fuse block (J/B) and ground.

	Terminals	Condition	Voltage (V)
Driver side door	B07	Opened	0
		Closed	Approx. 12
Other door	B01	Opened	0
		Closed	Approx. 12

OK → Door switch is OK.

NG ↓

B

CHECK DOOR SWITCH.
1) Disconnect door switch connector.
2) Check continuity between door switch terminals.

	Terminals	Condition	Continuity
Other door switches	① - ground	Closed	No
		Open	Yes

NG → Replace door switch.

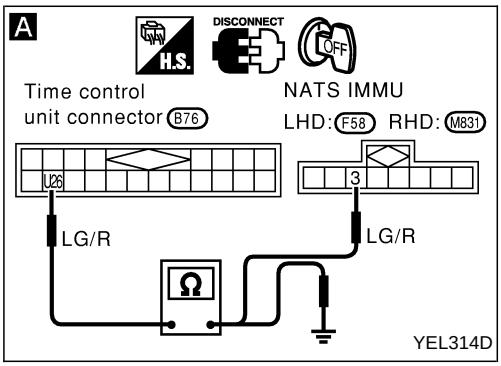
OK ↓

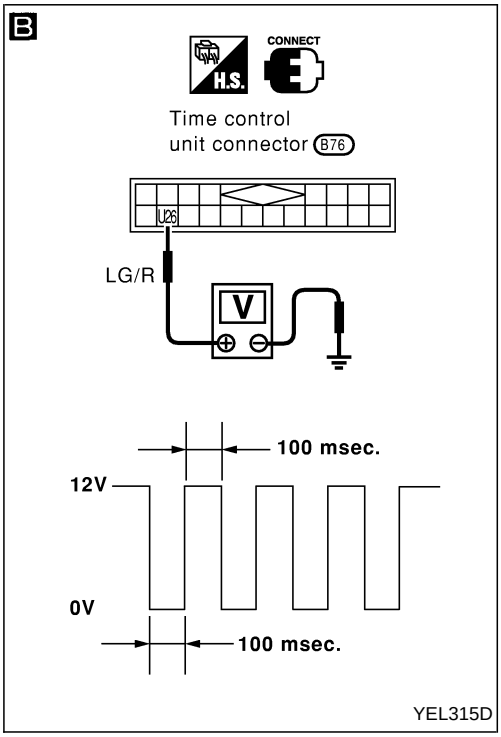
Check the following.
- Door switch ground condition
- Harness for open or short between control unit and door switch

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Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 6 (NATS release signal check)





Does engine start properly?

No → Check NATS system.

Yes ↓

A

CHECK NATS SIGNAL CIRCUIT.

1) Disconnect control unit connector and NATS IMMU connector.
2) Check continuity between control unit terminal (U26) and NATS IMMU terminal ③ .
   Continuity should exist.
3) Check continuity between control unit terminal (U26) and ground.
   Continuity should not exist.

NG → Repair harness.

OK ↓

B

CHECK NATS RELEASE SIGNAL.

1) Connect control unit connector and NATS IMMU connector.
2) Check voltage between control unit terminal (U26) and ground.

Ignition switch condition	Voltage (V)
LOCK	12
More than 10 seconds after ignition switch turned to "ON" position	
For 10 seconds after ignition switch turned to "ON" position	Pulse

NG → Check NATS system.

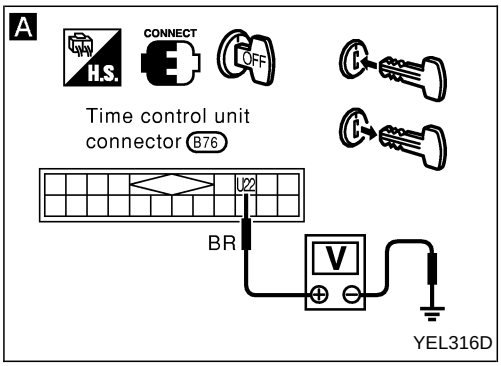
OK ↓

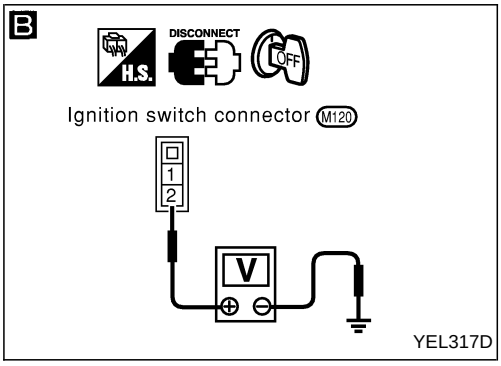
Replace time control unit.

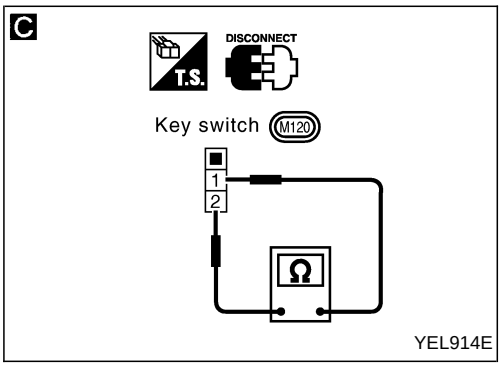
http://vnx.su/

Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 7 (Ignition switch check)







A

CHECK IGNITION SWITCH INPUT SIGNAL.
Check voltage between control unit terminal U22 and ground.

Condition of key switch	Voltage (V)
Key is inserted	Approx. 12
Key withdrawn	0

OK → Ignition switch is OK.

NG ↓

B

CHECK IGNITION SWITCH POWER SUPPLY.
Check voltage between ignition switch harness terminal ② and ground.
Battery voltage should exist.

NG → Check the following.
- 10A fuse [No. 16, located in fuse block (J/B)]
- Harness for open or short between ignition switch and fuse

OK ↓

C

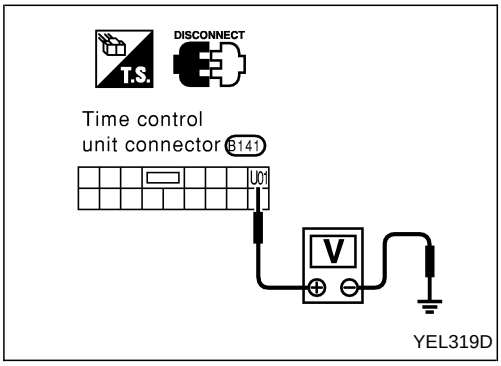
CHECK IGNITION SWITCH.
1. Disconnect ignition switch connector.
2. Check continuity between ignition switch terminals.

Terminals	Condition	Continuity
① - ②	Key is inserted.	Yes
	Key is withdrawn.	No

NG → Replace ignition switch.

OK ↓

Check harness for open or short between control unit and ignition switch.



DIAGNOSTIC PROCEDURE 8 (Ignition switch "ON" circuit check)

Terminals		Ignition switch position		
⊕	⊖	OFF	ACC	ON
U01	Ground	0V	0V	Battery voltage

If NG, check the following.
- 10A fuse [No. 26, located in the fuse block (J/B)]
- Harness for open or short

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System Description

POWER AND GROUND

Power is supplied at all times
- to time control unit terminal U09 and
- to door lock switch relay terminal 1
- through 10A fuse [No. 5, located in the fuse block (J/B)], and
- to key switch terminal 2
- through 10A fuse [No. 16, located in the fuse block (J/B)].

When the key switch is ON (ignition key is inserted in key cylinder), power is supplied
- through key switch terminal 1
- to time control unit terminal U22.

When the door switch driver side is ON (door is OPEN), ground is supplied
- to time control unit terminal U06
- through door switch driver side terminal 1 and case ground.

When any of the other door switches is ON (door is OPEN), ground is supplied
- to time control unit terminal U07
- through door switch terminal 1 and case ground.

When lock/unlock switch is LOCK, ground is supplied
- to power window main switch terminal 3
- through body grounds B10 and B18.

Door lock operation signal is supplied
- through power window main switch terminal 14
- to door lock switch relay terminal 2.

With power and ground supplied, door lock switch relay is energized, and the door lock operation signal is supplied to time control unit terminal U35.
Door unlock operation signal is supplied
- through power window main switch terminal 7
- to time control unit terminal U37.

Remote controller signal is inputted to time control unit (The antenna of the system is combined with time control unit).

FUNCTION

Multi-remote control system has the following function.
- Door lock (and set super lock)
- Door unlock (and release super lock)
- Hazard reminder

LOCK OPERATION

To lock door by multi-remote controller, the key switch must be at OFF.
When the LOCK signal is input to time control unit (the antenna of the system is combined with time control unit), time control unit controls to lock doors and set super lock (models with super lock).

UNLOCK OPERATION

Normal Mode

When UNLOCK signal is input to time control unit (the antenna of the system is combined with time control unit), time control unit controls to unlock doors and release super lock (models with super lock).

Anti Hi-jack Mode

When the UNLOCK signal is input to time control unit (the antenna of the system is combined with time control unit), time control unit controls to unlock driver's door and release super lock (models with super lock).
Then, if an unlock signal is sent from the remote controller again within 5 seconds, all other doors will be unlocked.

HAZARD REMINDER

When the doors are locked or unlocked by multi-remote controller, supply power to turn lamps hazard reminder flashes as follows
- Lock operation: Flash once
- Unlock operation: Flash twice

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System Description (Cont'd)

AUTO DOOR LOCK OPERATION

Auto lock function signal is sent for operation when any of the following signals are not sent within 5 minutes after the unlock signal is sent from the multi-remote controller:

- when door switch is turned ON for open
- when the ignition switch is turned ON
- when the lock signal is sent from the multi-remote controller
- when ignition switch is inserted in ignition key cylinder

MULTI-REMOTE CONTROLLER ID CODE ENTRY

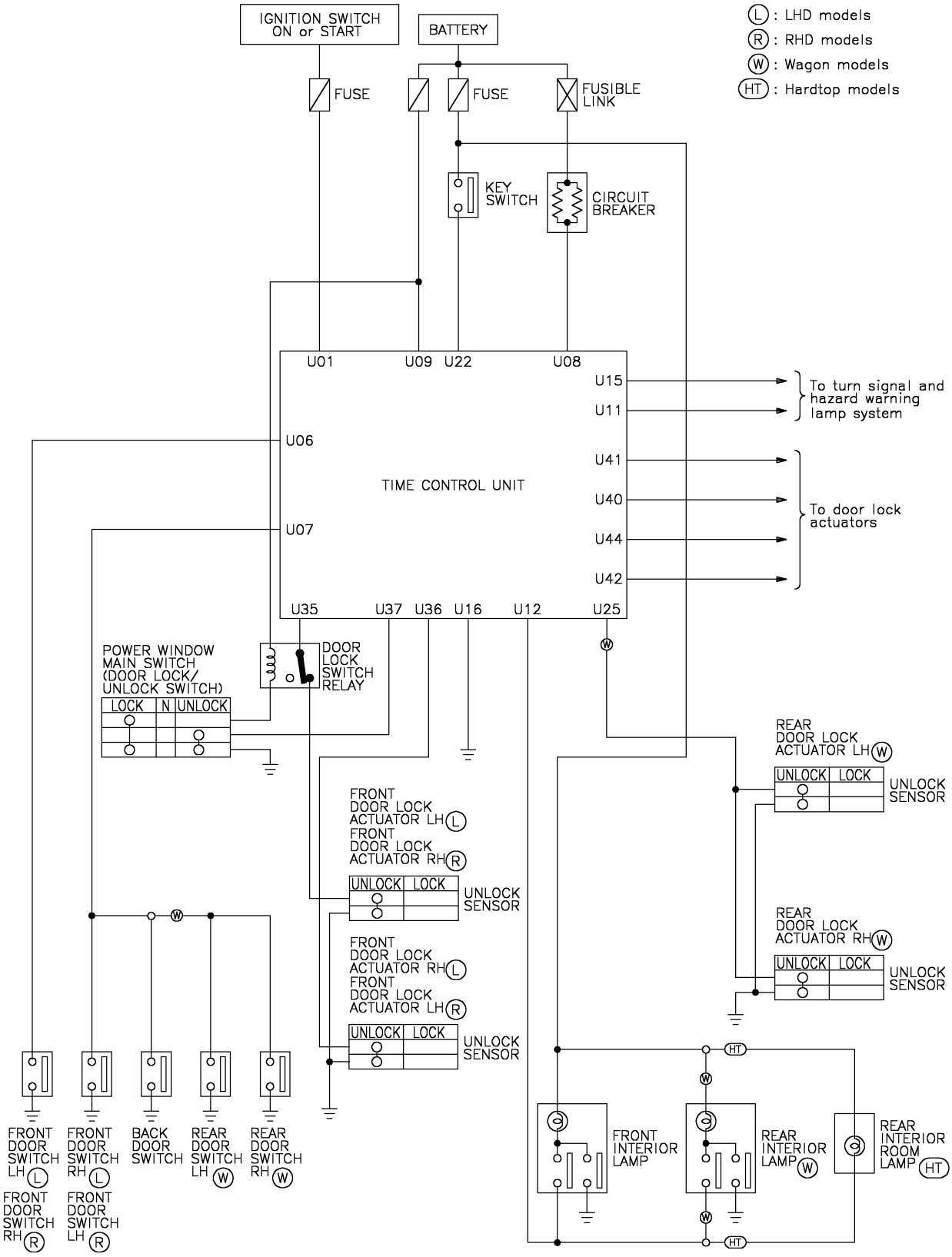
A maximum of four remote controllers can be entered.
To enter ID code entry, the following signals must be input to the time control unit.

- Ignition switch (ON)
- Signal from remote controller

For detailed procedure, refer to "ID Code Entry Procedure" in EL-215.

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Schematic

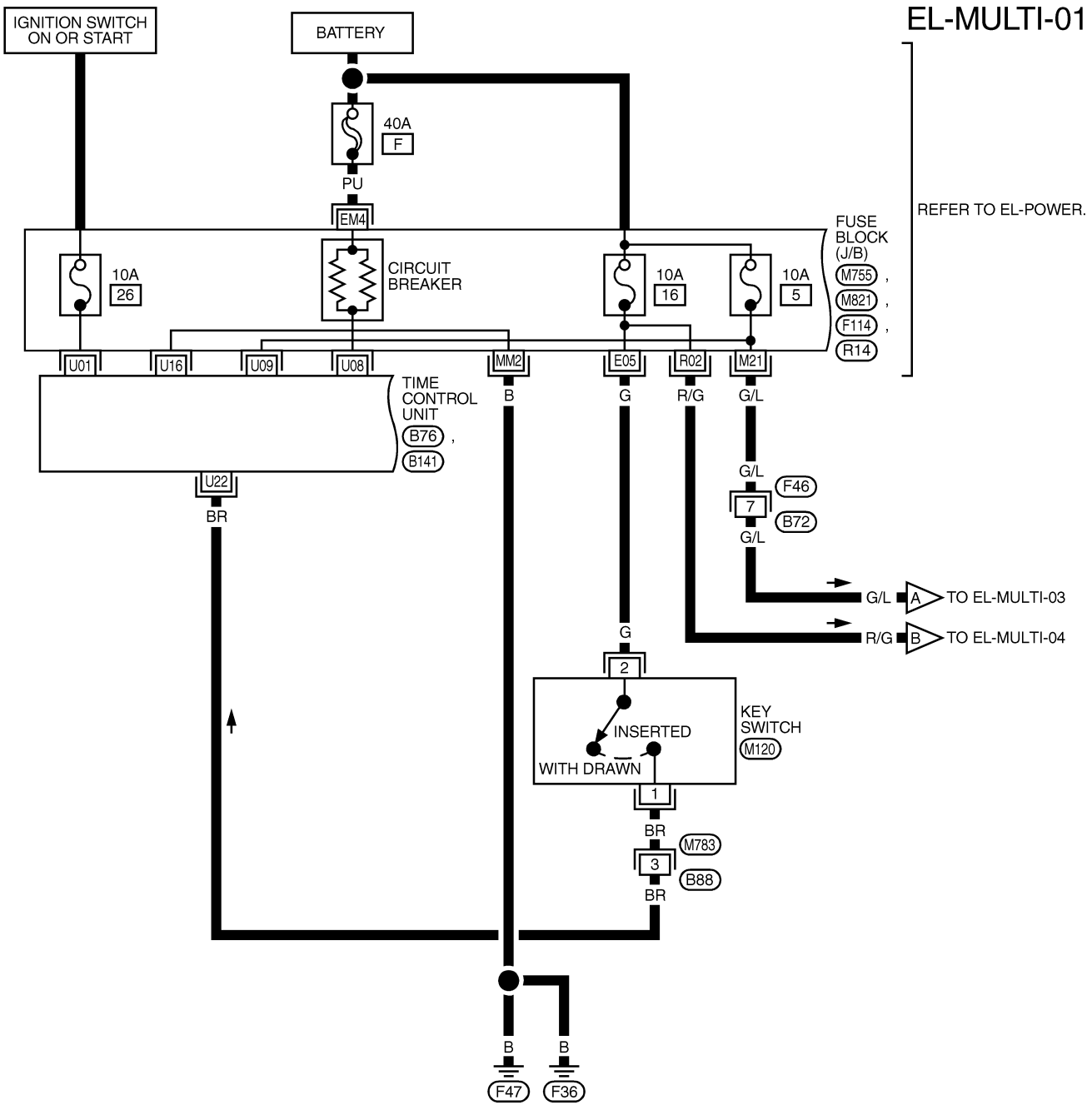


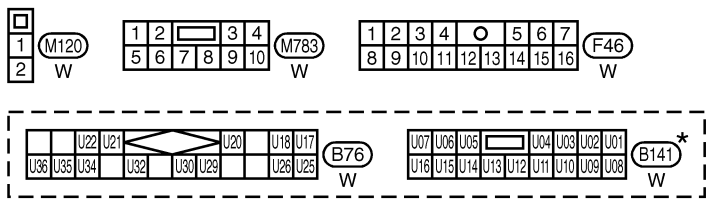
YEL159D

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Wiring Diagram — MULTI —

LHD MODELS





REFER TO THE FOLLOWING.
M755 , M821 , F114 , R14
-FUSE BLOCK-
JUNCTION BOX (J/B)

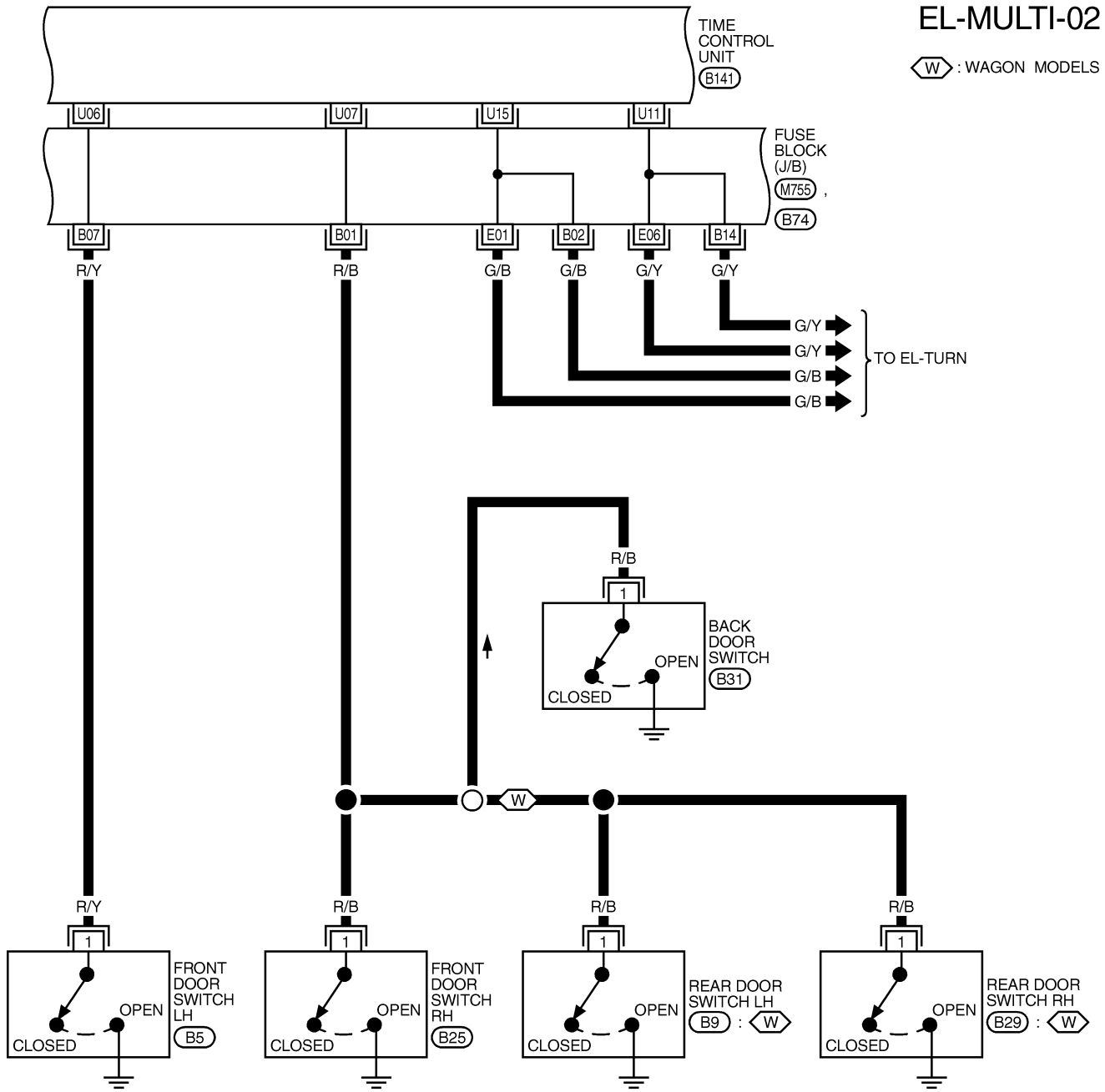
* : THIS CONNECTOR IS NOT SHOWN IN “HARNESS LAYOUT”, EL SECTION.

YEL747E

http://vnx.su/

Wiring Diagram — MULTI — (Cont'd)

LHD MODELS



1 B5 BR , B9 BR , B25 BR , B29 BR , B31 BR

U07 U06 U05 U04 U03 U02 U01
U16 U15 U14 U13 U12 U11 U10 U09 U08
B141 * W

REFER TO THE FOLLOWING.
M755 , B74 -FUSE BLOCK-JUNCTION BOX (J/B)

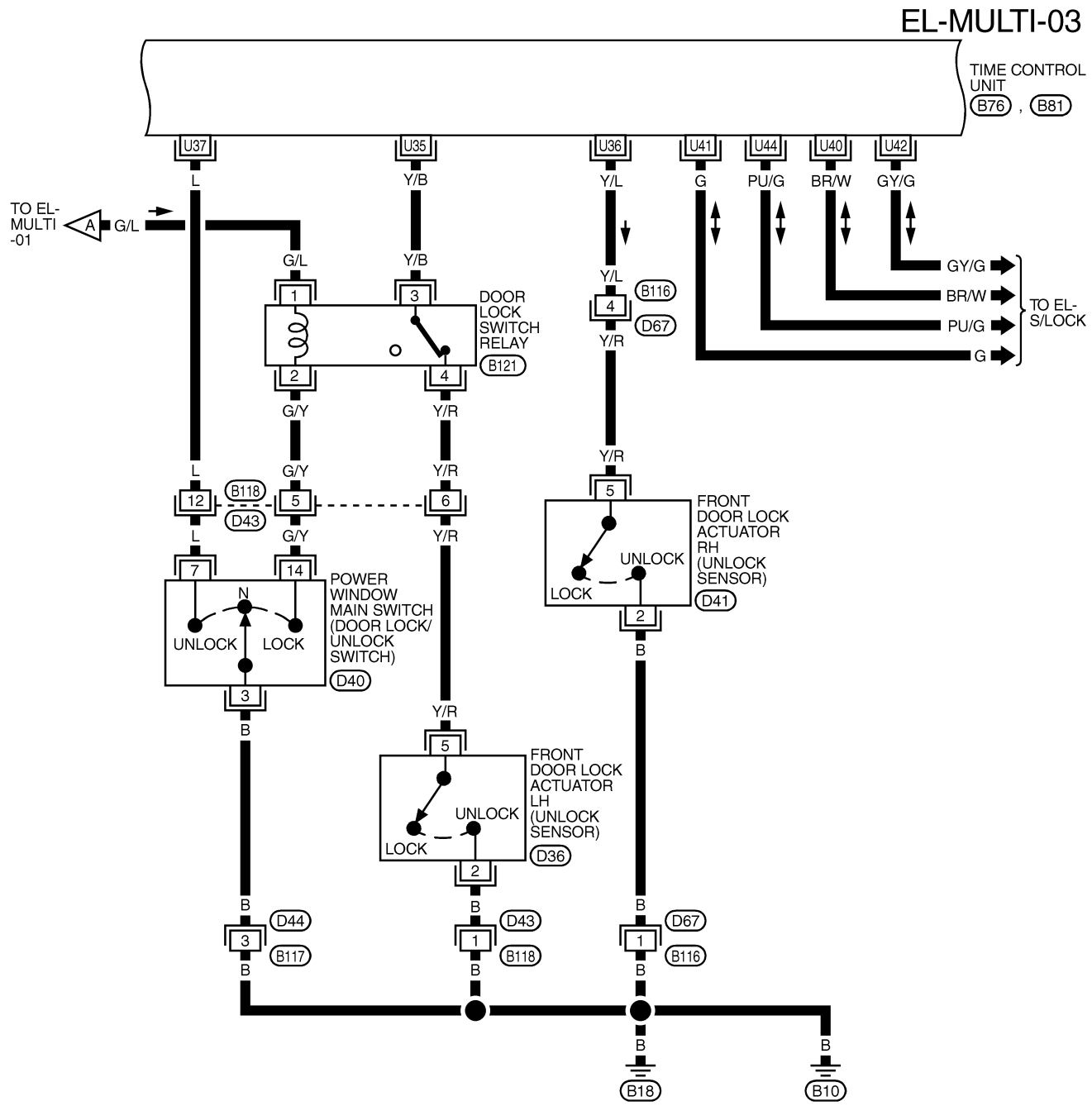
* : THIS CONNECTOR IS NOT SHOWN IN "HARNESS LAYOUT", EL SECTION.

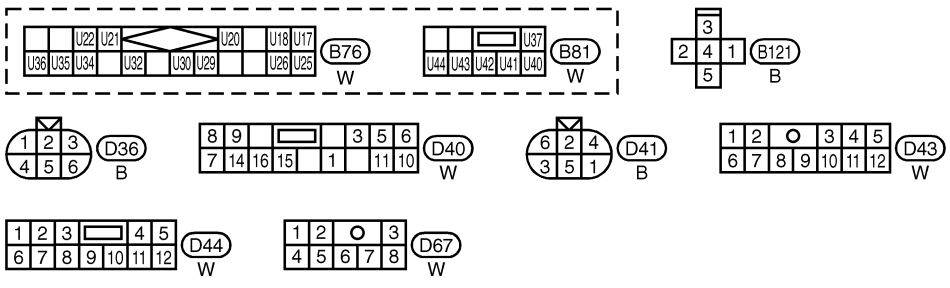
YEL161D

http://vnx.su/

Wiring Diagram — MULTI — (Cont'd)

LHD MODELS



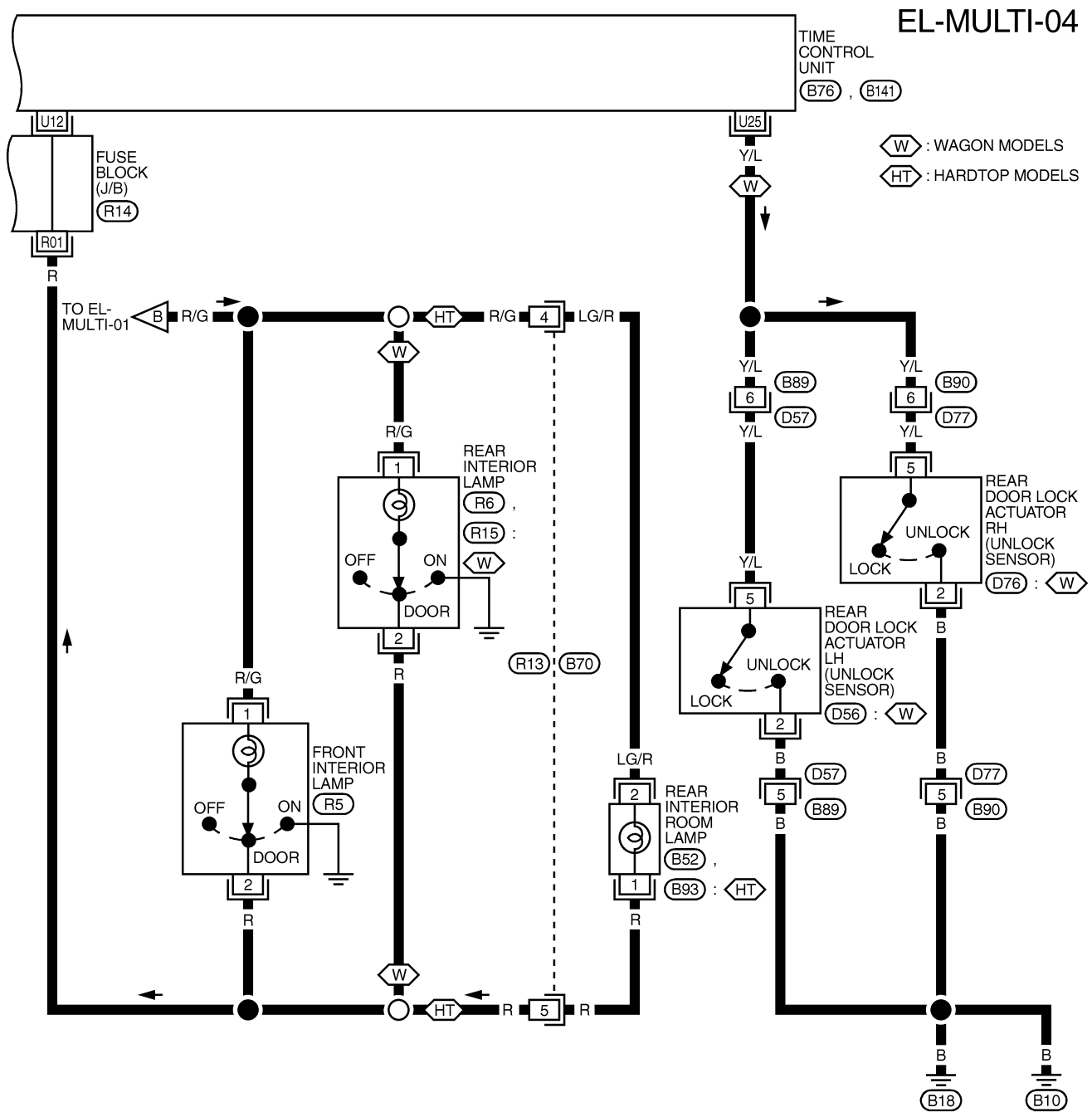


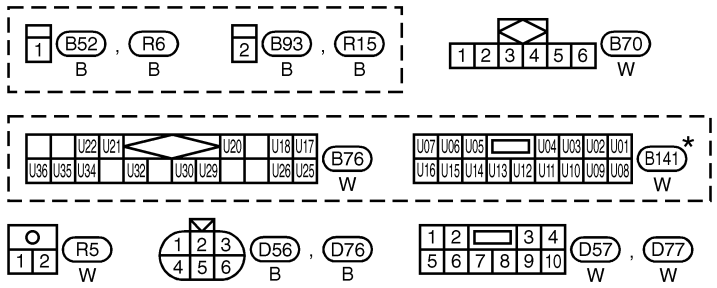
YEL748E

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Wiring Diagram — MULTI — (Cont'd)

LHD MODELS





★ : THIS CONNECTOR IS NOT SHOWN IN "HARNESS LAYOUT", EL SECTION.

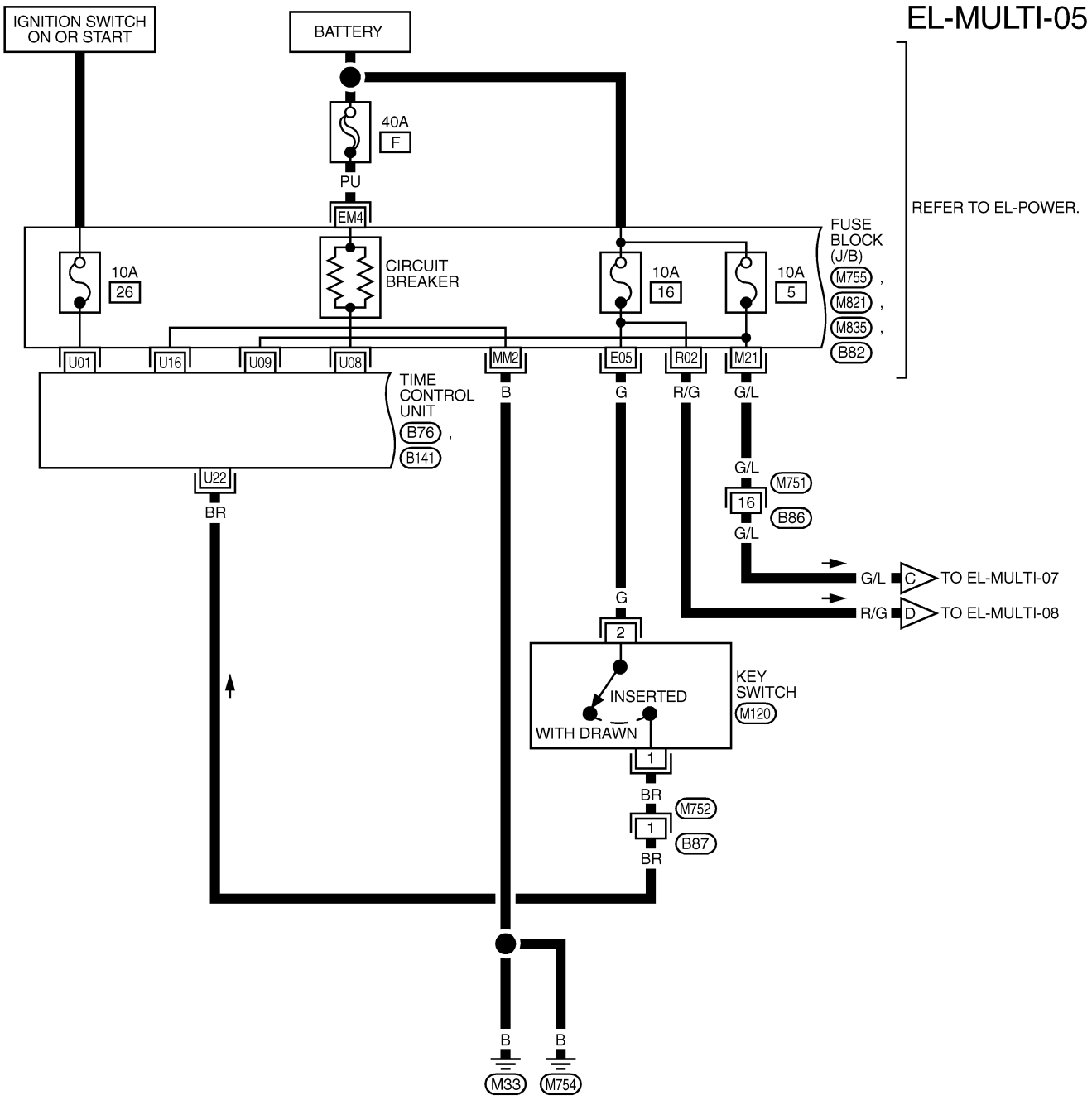
REFER TO THE FOLLOWING.
R14 -FUSE BLOCK-JUNCTION BOX (J/B)

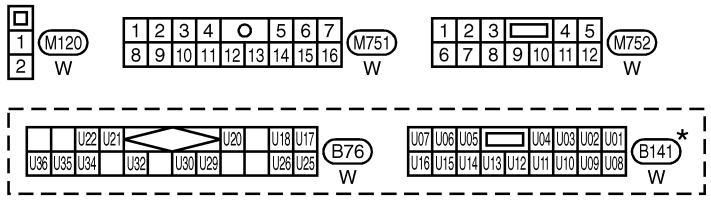
YEL163D

http://vnx.su/

Wiring Diagram — MULTI — (Cont'd)

RHD MODELS





REFER TO THE FOLLOWING.
M755 , M821 , M835 , B82
-FUSE BLOCK-
JUNCTION BOX (J/B)

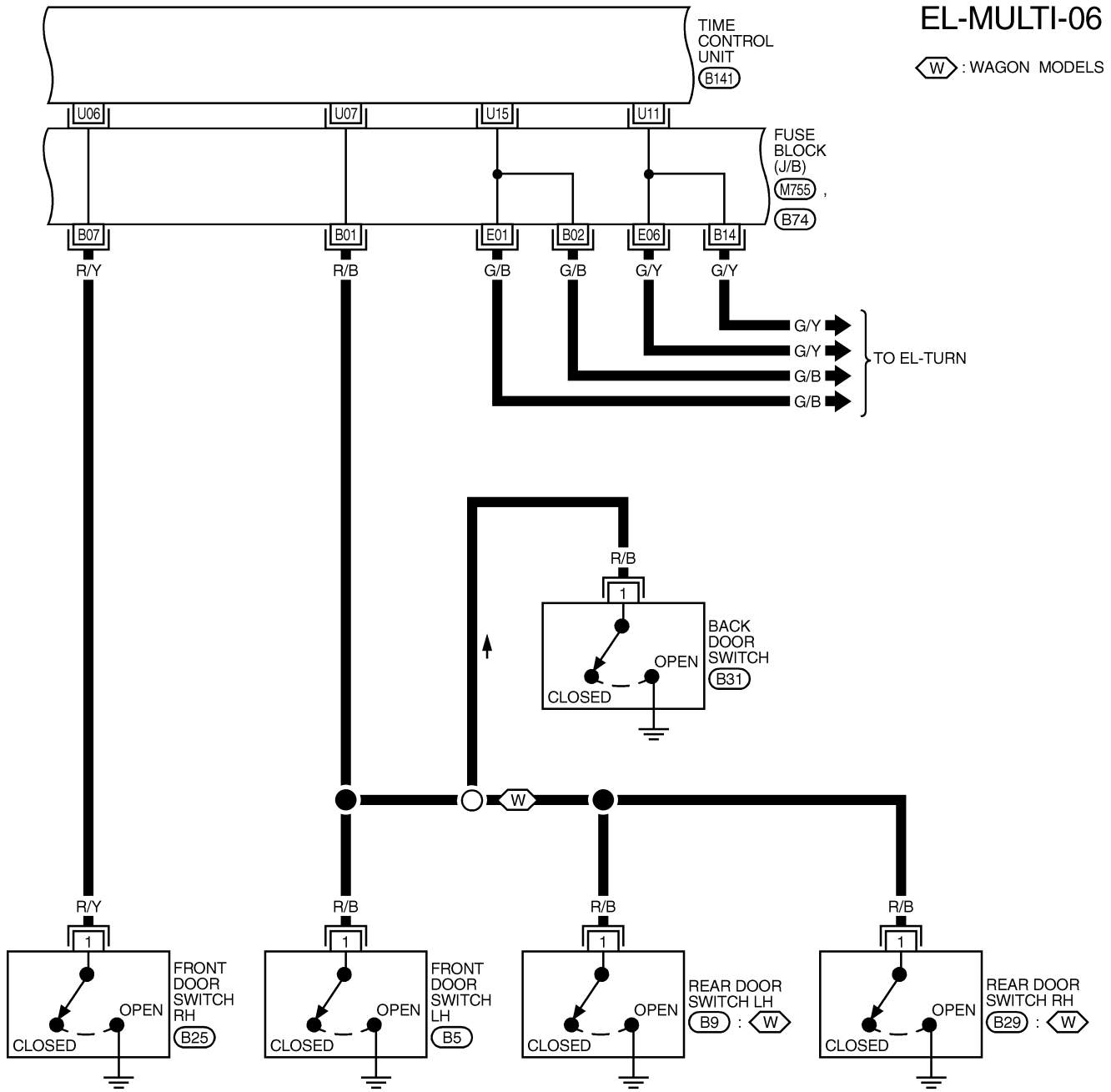
*: THIS CONNECTOR IS NOT SHOWN IN "HARNESS LAYOUT", EL SECTION.

YEL749E

http://vnx.su/

Wiring Diagram — MULTI — (Cont'd)

RHD MODELS



1 B5 BR, B9 BR, B25 BR, B29 BR, B31 BR

U07 U06 U05 U04 U03 U02 U01 / U16 U15 U14 U13 U12 U11 U10 U09 U08 B141* W

REFER TO THE FOLLOWING.
M755, B74 -FUSE BLOCK-JUNCTION BOX (J/B)

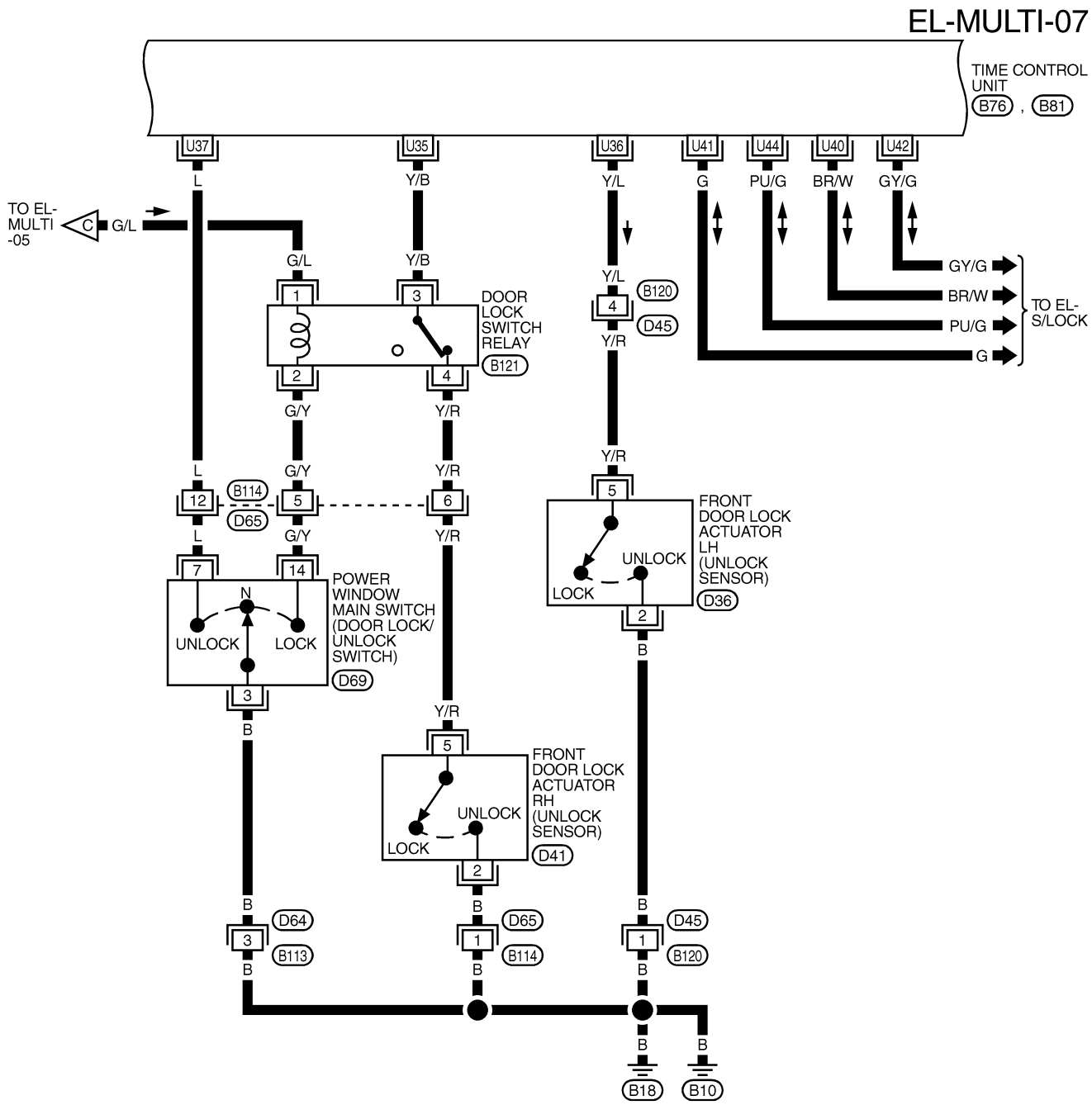
*: THIS CONNECTOR IS NOT SHOWN IN "HARNESS LAYOUT", EL SECTION.

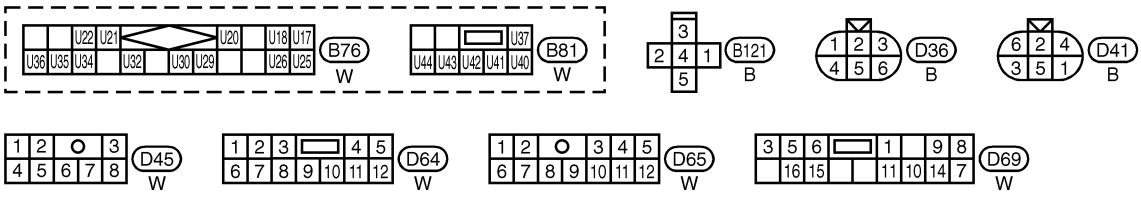
YEL165D

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Wiring Diagram — MULTI — (Cont'd)

RHD MODELS



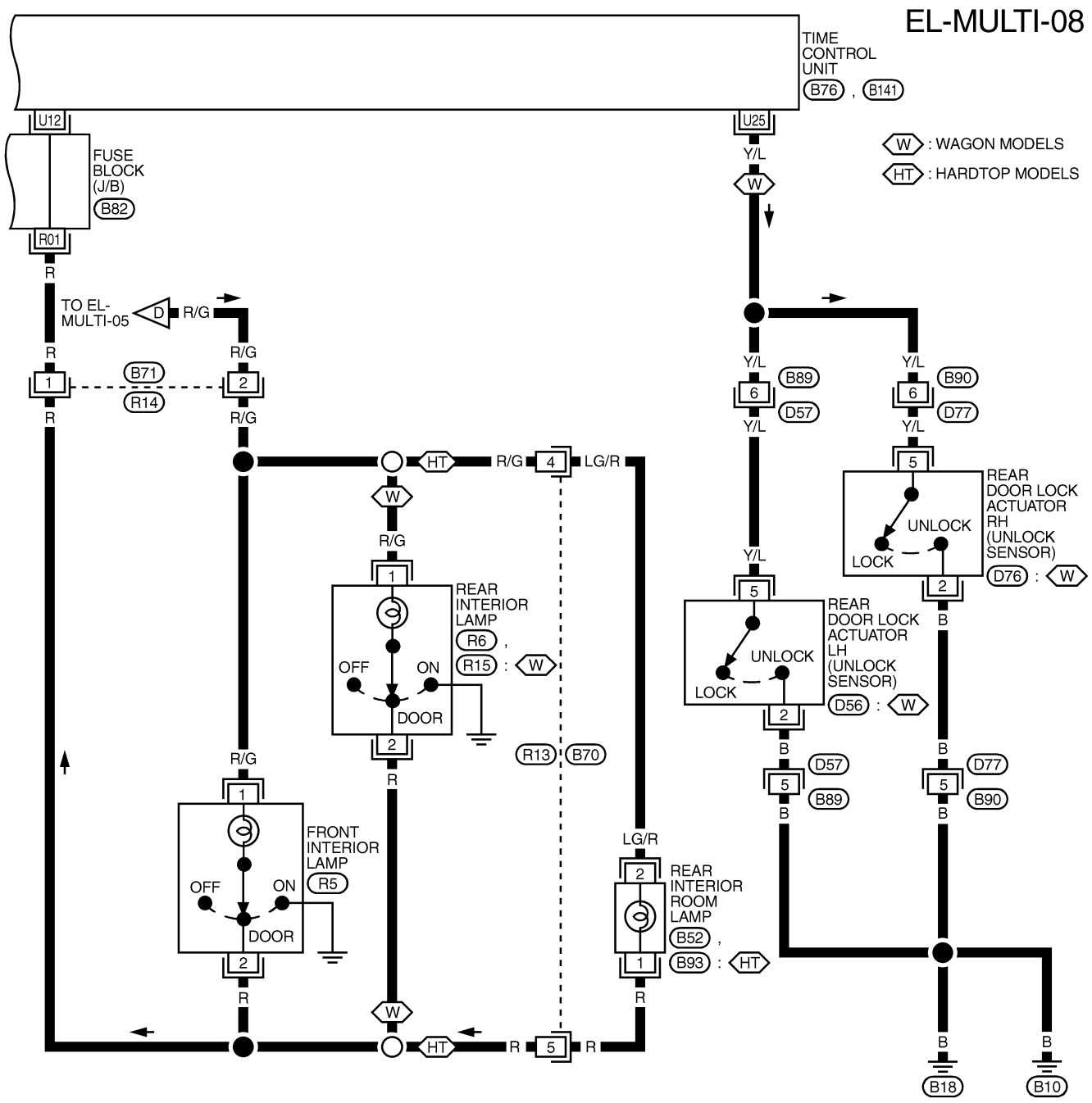


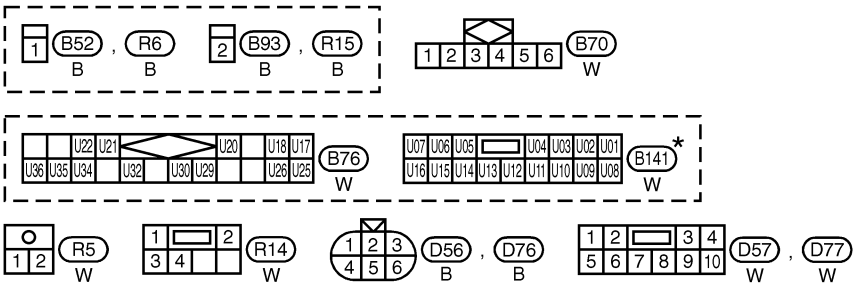
YEL750E

http://vnx.su/

Wiring Diagram — MULTI — (Cont'd)

RHD MODELS





★ : THIS CONNECTOR IS NOT SHOWN IN "HARNESS LAYOUT", EL SECTION.

REFER TO THE FOLLOWING.
B82 -FUSE BLOCK-
JUNCTION BOX (J/B)

YEL751E

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Trouble Diagnoses

If doors can not be unlocked by remote controller operation then the following procedure is required.

A) Unlock the vehicle by a mechanical key in the drivers door key cylinder.
Note: this may cause the alarm to sound.

B) Put the key in ignition, turn to ON position for at least five seconds. Assuming the ignition key contains a valid transponder then a signal will be generated by the immobilizer which will disarm the alarm and allow key learn mode to be entered.

C) Turn ignition OFF and wait for ten seconds.

SYMPTOM CHART

Symptom	Possible cause	Diagnoses/service order
No doors can be locked or unlocked by remote control operation.	1. Remote controller battery 2. Power door lock system 3. Key switch (insert) 4. Door switch 5. Power supply circuit for time control unit 6. Ground circuit for time control unit 7. Remote controller	1. Check remote controller battery. Refer to EL-214. 2. Check that power door lock operates properly. If NG, check power door lock. 3. Check key switch (insert) signal at terminal (U22) of time control unit. 4. Check door switch signal at terminals (B01) and (B07) of time control unit (Fuse block). 5. Make sure battery voltage is present at terminal (U09) of time control unit. 6. Check continuity between terminal (MM2) of time control unit (Fuse block) and ground. 7. Replace remote controller. Refer to EL-215.
The new ID of remote controller cannot be entered.	1. Remote controller battery 2. Key switch (insert) 3. Door switch 4. Driver's door unlock sensor 5. Ignition ON power supply circuit for time control unit 6. Remote controller	1. Check remote controller battery. Refer to EL-214. 2. Check key switch (insert) signal at terminal (U22) of time control unit. 3. Check door switch signal at terminals (B01) and (B07) of time control unit (Fuse block). 4. Check driver's door unlock sensor signal at terminal (U35) of time control unit. 5. Make sure battery voltage is present at terminal (U01) of time control unit while ignition switch is in ON position. 6. Replace remote controller. Refer to EL-215.

Refer to "TIME CONTROL UNIT INSPECTION TABLE" on EL-214 to check the control unit signals.

NOTE:

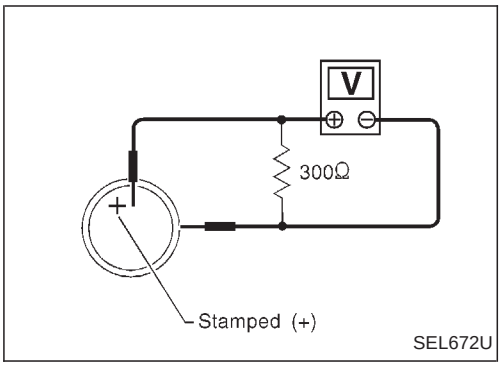
- The unlock operation of multi-remote control system does not activate with key inserted in the ignition key cylinder.
- The lock operation of multi-remote controller does not activate with the key inserted in the ignition key cylinder or if one of the doors is opened.

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Trouble Diagnoses (Cont'd)

TIME CONTROL UNIT INSPECTION TABLE

Terminal No.	Wire color	Connections	Operated condition	Voltage (V) (approximate values)
U01	—	Ignition switch (via ignition relay)	Ignition key "ON" position	12
U06 (B07)	—	Driver door switch	OFF (Closed) → ON (Open)	12 → 0
U07 (B01)	—	All door switches	OFF (Closed) → ON (Open)	12 → 0
U08	—	Power source (C/B)	—	12
U09	—	Power source (Fuse)	—	12
U16	—	Ground	—	0
U22	BR	Ignition key switch (Insert)	Key inserted → key removed from ignition key cylinder	12 → 0
U25	Y/L	Rear door unlock sensors	Rear doors: Locked → Unlocked	12 → 0
U35	Y/B	Driver door unlock sensor	Driver door: Locked → Unlocked	12 → 0
U36	Y/L	Passenger door unlock sensor	Passenger door: Locked → Unlocked	12 → 0



REMOTE CONTROLLER BATTERY CHECK

Remove battery and measure voltage between battery positive and negative terminals, ⊕ and ⊖.
Then, use the 300Ω resistor as shown in figure.

Measuring terminal		Standard value
⊕	⊖	
Battery positive terminal ⊕	Battery negative terminal ⊖	2.5 - 3.0V

Note:
Remote controller does not function if battery is not set correctly.

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ID Code Entry Procedure

Enter the identity (ID) code manually when:
- remote controller or TCU is replaced.
- an additional remote controller is activated.

Activation of the registration mode:

The vehicle must have been unlocked by either the multi-remote controller or a transponder OK signal (TPOK) from the vehicle's immobilizer.
Preparation: - Make sure all doors unlock.
- Make sure all multi-remote controllers to be registered are available.
- Make sure the batteries of all multi-remote controllers are in a good condition.
- Make sure all transmitting sources are out of the neighbourhood of the vehicle.
- Make sure the battery of the vehicle is in a good condition.

↓

Switch ignition-switch exactly six times from the "LOCK" to the "ON" position within 10 seconds and return the ignition switch to the "LOCK" position (leaving the key in the ignition switch).

↓

After 2 seconds the registration mode is activated. The turn signal lamps will flash twice.

NG → Switch ignition-switch exactly six times from the "LOCK" to the "ON" position within 10 seconds and return the ignition switch to the "LOCK" position (leaving the key in the ignition switch).

↓ OK

Proceed with the registration mode.

NOTE
The registration mode is exited when:
- The ignition-switch is turned to the "ON" position.
- a multi-remote controller ID code had registered after 4 ID codes have been registered (then, all of the registered ID codes are erased).
- No multi-remote controller or ignition switch input is received within 120 seconds.

Registration mode

Press and hold the "UNLOCK" button of the multi-remote controller.

↓

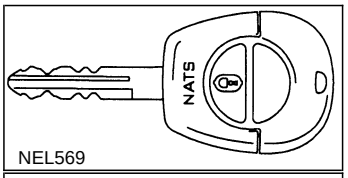
Press the "LOCK" button 3 times.

↓

Release the "UNLOCK" button.
(At this time, the original (previous) ID code(s) are erased.)

→ If the multi-remote controller code is registered correctly, the turn signal lamp will flash once.
(If 4 ID codes have been registered, the turn signal lamp will flash 3 times.)

NG → Press and hold the "UNLOCK" button of the multi-remote controller.



NEL569

OK ↓

Do you want to register another multi-remote controller? (max. 4)
(If 4 controllers have been registered, you should turn the ignition switch to the ON position.)

No ↓

Yes → Press and hold the "UNLOCK" button of the multi-remote controller.

Turn the ignition switch to the ON position.

→ If the multi-remote controller registration is performed correctly, the turn signal lamp will flash twice.
(If 4 ID codes have been registered, the turn signal lamp will not flash.)

OK ↓

NG → Press and hold the "UNLOCK" button of the multi-remote controller.

Take the ignition key out of the ignition switch and confirm the functioning of all multi-remote controllers by locking and unlocking the vehicle with each of the multi-remote controllers.

↓

End

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System Description

The TCU (Time Control Unit) has the following functions.

INTERIOR LAMP TIMER

The interior lamp timer is controlled by the TCU.
The TCU keeps the interior lamp illuminated for about 30 seconds when:

- the ignition key is turned from “ON” to “ACC” to “LOCK”
- the driver’s door is unlocked
- a door is opened and then closed while the ignition switch is in the “OFF” position. (Interior lamp switch in the “DOOR” position).

The timer is canceled when:

- driver’s door is locked, or
- ignition switch is turned “ON”.

IGNITION KEY WARNING CHIME AND LIGHT WARNING CHIME

The ignition key and light warning chime are controlled by the TCU.
The warning chime is combined with the TCU.
The light warning chime will not sound, when ignition switch is in the “ON” or “START” position. (When power supply exists at TCU terminal (U01).)
With ignition switch in the OFF position, driver’s door open, and lighting switch in 1ST or 2ND position, warning chime will sound.
Or, with the key in the ignition switch in the “ACC” or “OFF” position, and locking the driver’s door from the outside, the warning buzzer will sound.

REAR WINDOW DEFOGGER TIMER

The rear window defogger and door mirror defogger system are controlled by the TCU.
The rear window and door mirror defogger operate only for approximately 15 minutes.

POWER DOOR LOCK (Super Lock)

The power door lock (super lock) is controlled by the TCU.
For further information, refer to “POWER DOOR LOCK — Super Lock” (EL-179).

MULTI-REMOTE CONTROL SYSTEM

The multi-remote control system is controlled by the TCU.
When the following input signals are both supplied:

- Key switch OFF (when ignition key is not inserted in key cylinder);
- door switch CLOSED (when all the doors are closed);

The two above signals are already input into time control unit. At this point, time control unit receives a LOCK signal from remote controller. Time control unit locks all doors and set super lock with input of LOCK signal from remote controller.
When an UNLOCK signal is sent from remote controller once, driver’s door will be unlocked and release super lock.
Then, if an UNLOCK signal is sent from remote controller again, all other door will be unlocked.

MULTI-REMOTE CONTROLLER ID CODE ENTRY

For detailed procedure, refer to “ID Code Entry Procedure” (EL-215).

THEFT WARNING SYSTEM

The theft warning system is controlled by the TCU.
For further information, refer to “THEFT WARNING SYSTEM” (EL-243).

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System Description (Cont'd)

FUNCTION

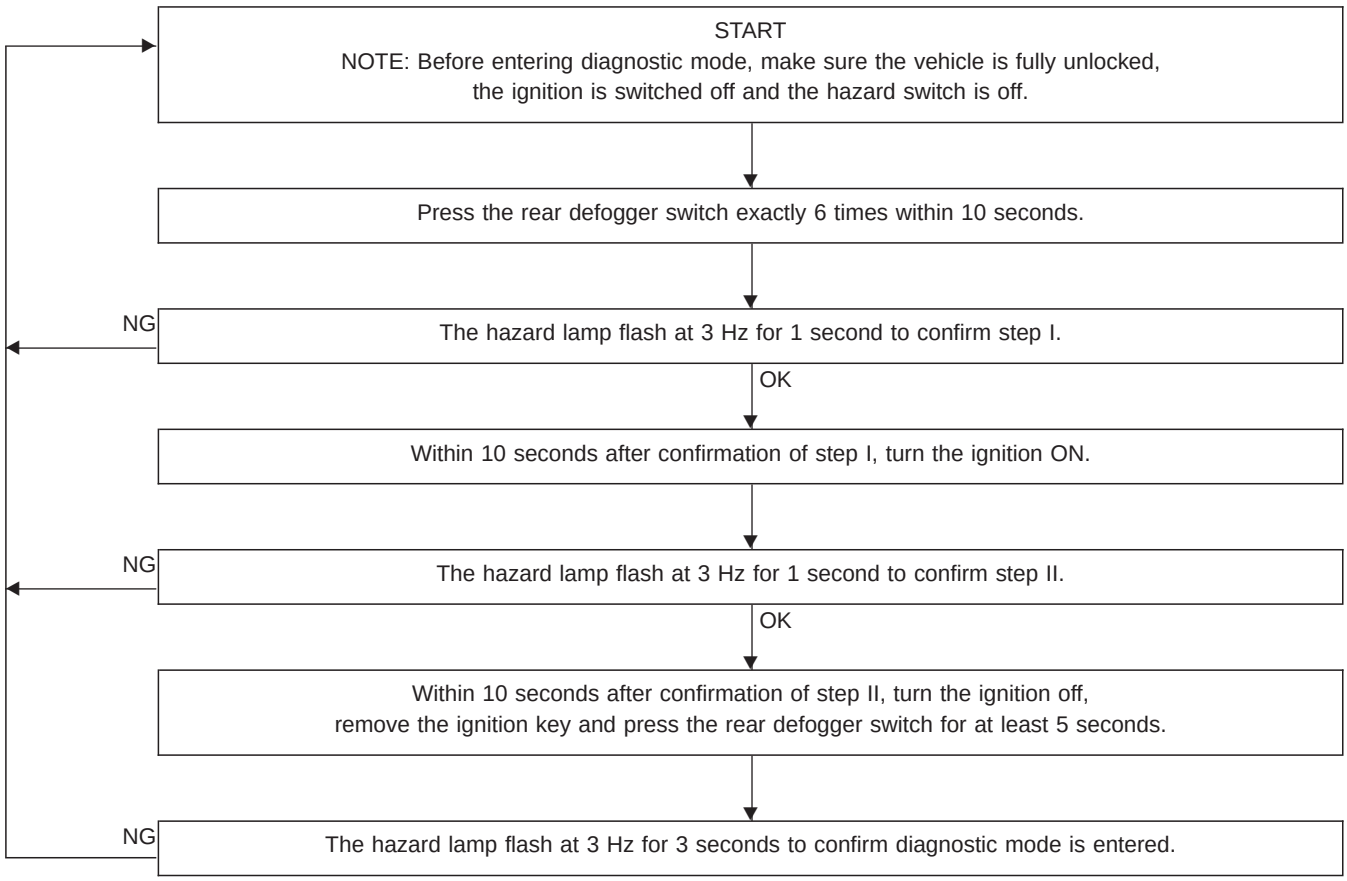
- The TCU has the following control functions.

Item		Details of control
Direction indicators		Switches the director indicators (Left, Right or All) when the combination switch or hazard switch is operated.
Light warning chime		Sounds warning chime when driver's door is opened with light switch in the 1st or 2nd position and ignition switch "OFF".
Ignition key warning chime		Sounds warning chime when driver's door is opened with key in ignition and the driver door lock knob is moved from the "unlock" position to the "lock" position.
Rear window defogger timer		Turn off rear window defogger and door mirror heater, if equipped, about 15 minutes after the rear window defogger switch is turned "ON".
Battery saver		Shuts off interior lamp in 30 minutes if any door is left open when ignition switch is "OFF". The battery saver will reset if ignition switch is cycled or any door is opened or closed.
Interior lamp timer		Keep interior lamp illuminated for about 30 seconds when: ● driver's door is unlocked, ● the ignition is switched off, ● driver's door is opened and then closed. The timer is cancelled, and interior lamp turns off when: ● driver's door is locked, or ● ignition switch is turned "ON".
Theft warning system	Normal operation	Monitors doors, hood, boot lid, door locks, volumetric sensors (if not excluded) and ignition when armed. Flashes the direction indicators and sounds the horn for 30 seconds in case one of the monitored sensors is triggered.
	Diagnostic mode	Indicates the last three alarm triggers by flashing the direction indicators.
Central door lock		Centrally locks and unlocks the vehicle
Super lock		Activates and de-activates the super lock system.

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Trouble Diagnosis

The Time Control Unit includes software to help during development testing, manufacturing and service.
It allows the technician to put it into Diagnostic Mode. In this mode, all switch inputs can be tested for continuity and if so equipped, alarm triggers identified.
When the time control unit is in Diagnostic Mode, the control unit tests the component and indicate the result by the hazard lamp flashing.
On vehicles with a theft warning system, the TCU will first indicate the source of the last three alarm triggers by flashing the hazard lamp. (Refer to “THEFT WARNING SYSTEM”, EL-243.)



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Trouble Diagnosis (Cont'd)

Checks

Once in Diagnostic Mode (and after identifying the last three alarm triggers in case a theft warning system is equipped on the vehicle), the following inputs can be tested.

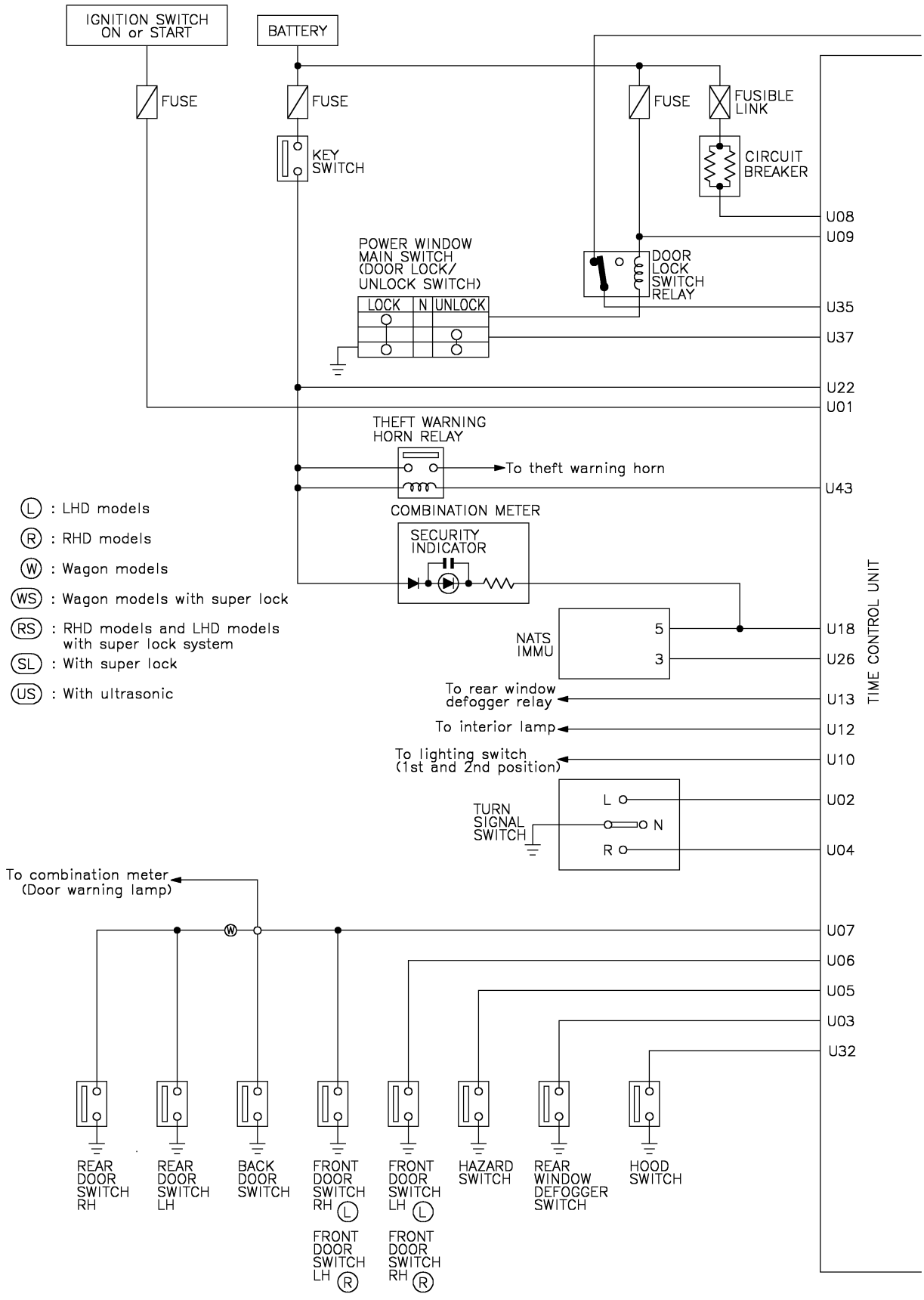
USER ACTION	TCU Reaction	COMPONENT TESTED
Driver's door opened from closed (all other doors closed)	Hazards flash once	Driver's door open signal
Passenger or rear door opened from closed (all other doors closed)	Hazards flash once	Door open signal for opened door
Driver's door locked from unlocked	Hazards flash once	Driver's door status signal
Passenger door locked from unlocked	Hazards flash once	Assist door status signal
Rear doors locked from unlocked (with ultrasonic model)	Hazards flash once	Rear doors status signal
Ultrasonics cancel switch is pressed (with ultrasonic model)	Hazards flash once	U/S cancel signal
Trunk or back door is opened from closed	Hazards flash once	Trunk open signal
Hood is opened from closed (with ultrasonic model)	Hazards flash once	Hood open signal
Hazard switch is pressed from off	Hazards flash once	Hazard switch signal
Turn signal switch is moved to left from off	Hazards flash once	Left turn signal
Turn signal switch is moved to right from off	Hazards flash once	Right turn signal
Key turned to lock position in door	Hazards flash once *	Key cylinder lock switch signal
Lighting switch turned 1st position or 2nd position from off	Hazards flash once	Tail lamp signal
Key put in ignition cylinder from out	Hazards flash once	Key in detect signal
Central unlock switch is pressed	Hazards flash once	Central unlock/Trunk release signal

*) Hazards may flash a second time because of Driver's door status signal change. The min. delay time between flash actions is 100 ms.

In case the system does not operate as described above, check the concerned circuit for open or short. After completion, the Diagnostic Mode can be switched off by pressing the rear defogger switch or by turning the ignition to "ON". The hazard lamp will flash at 3 Hz for 3 seconds to confirm that Diagnostic Mode has been switched off.

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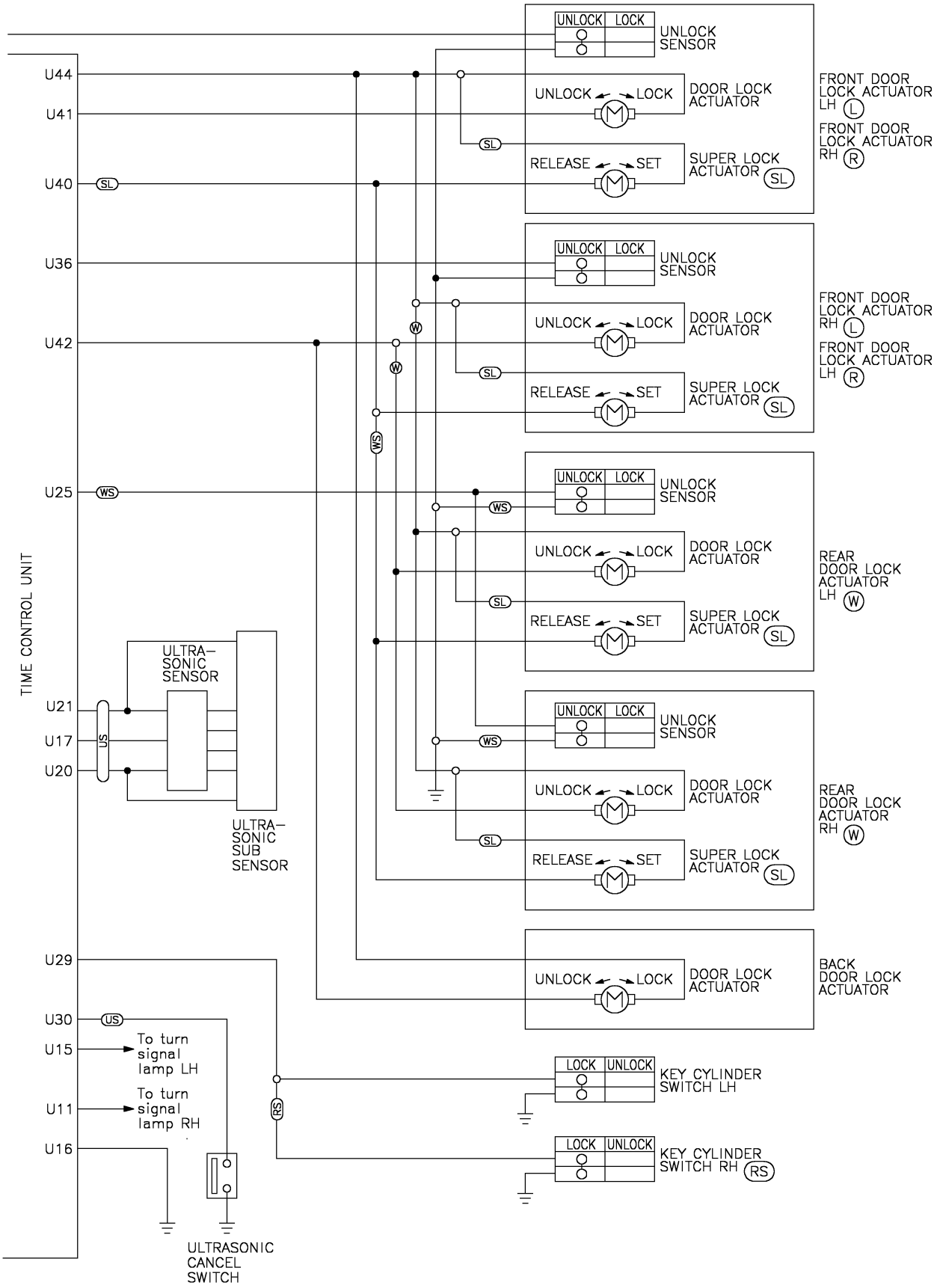
Schematic



YEL752E

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Schematic (Cont'd)



YEL866E

http://vnx.su/

System Description

NATS has the following immobilizer functions:

- This version of NATS has dongle control unit to improve its anti-theft performance (RHD models). Dongle control unit has its own ID which is registered into NATS IMMU. So if dongle unit is replaced, initialization must be carried out.
- When malfunction of dongle unit is detected:
  The security indicator lamp illuminates for about 15 minutes after ignition switch is turned to ON.
  — When dongle control unit has a malfunction, and the indicator lamp is illuminated, engine can not be started. However engine can be started only one time when security indicator lamp turns off in about 15 minutes after ignition switch is turned to ON.
- Since only NATS ignition keys, whose ID nos. have been registered into the ECM and IMMU of NATS, allow the engine to run, operation of a stolen vehicle without a NATS registered key is prevented by NATS. That is to say, NATS will immobilize the engine if someone tries to start it without the registered key of NATS.
- All of the originally supplied ignition key IDs have been NATS registered.
  If requested by the vehicle owner, a maximum of five key IDs can be registered into the NATS components.
- The NATS security indicator (NATS security ind.) blinks when the ignition switch is in “OFF” or “ACC” position. Therefore, NATS warns outsiders that the vehicle is equipped with the anti-theft system.
- When NATS detects trouble, the security indicator lamp lights up as follows.

Condition IGN ON and	With dongle		Without dongle	
	MIL	Security indicator	MIL	Security indicator
NATS malfunction (except dongle control unit) is detected	—	6 times blinking Staying ON after ignition switch is turned ON	—	Staying ON
Only malfunction of dongle control unit is detected.	—	Staying ON for about 15 minutes after ignition switch is turned ON	—	—
Malfunction of NATS and engine related parts are detected.	Staying ON	6 times blinking Staying ON after ignition switch is turned ON	Staying ON	Staying ON
Only engine related part malfunction is detected.	Staying ON	—	Staying ON	—
Just after initialization of NATS	—	6 times blinking	—	—

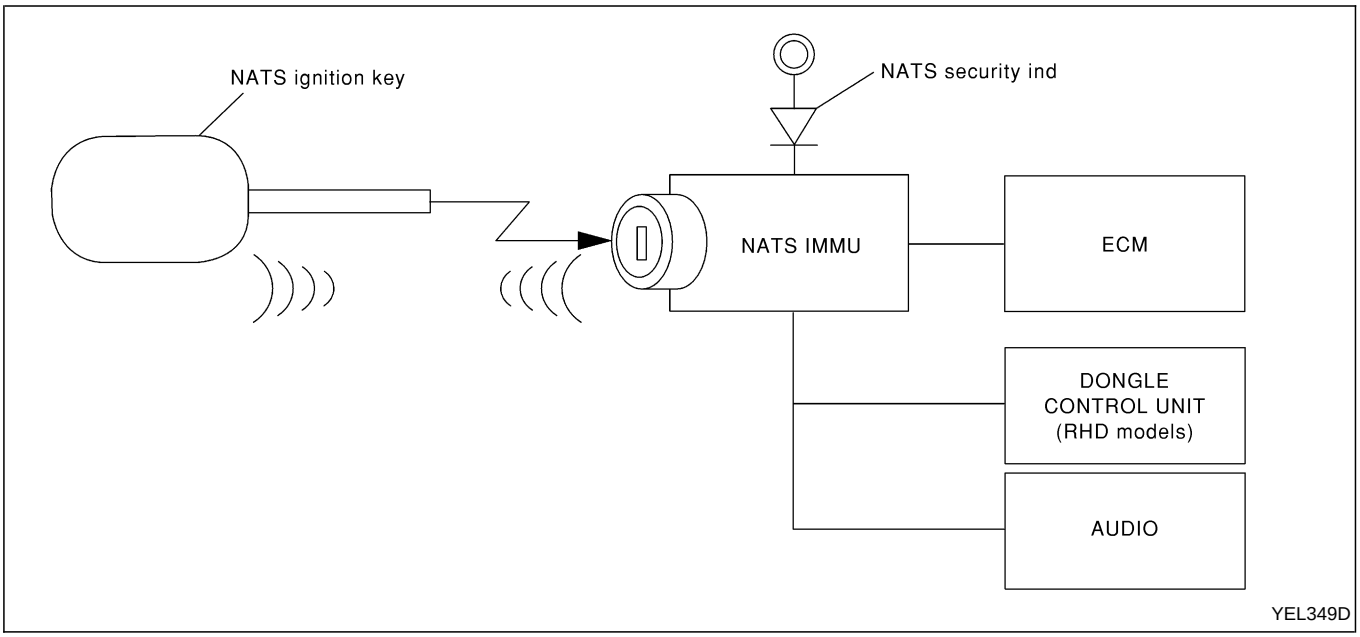
- NATS trouble diagnoses, system initialization and additional registration of other NATS ignition key IDs must be carried out using CONSULT-II hardware and CONSULT-II NATS software.
  Regarding the procedures of NATS initialization and NATS ignition key ID registration, refer to CONSULT-II operation manual, NATS.
- **When servicing a malfunction of the NATS (indicated by lighting up of security Indicator Lamp) or registering another NATS ignition key ID no., it may be necessary to re-register original key identification. Therefore, be sure to receive all keys and the PIN code from vehicle owner.**

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System Composition

The immobilizer function of the NATS for Nissan model R20 consists of the following:

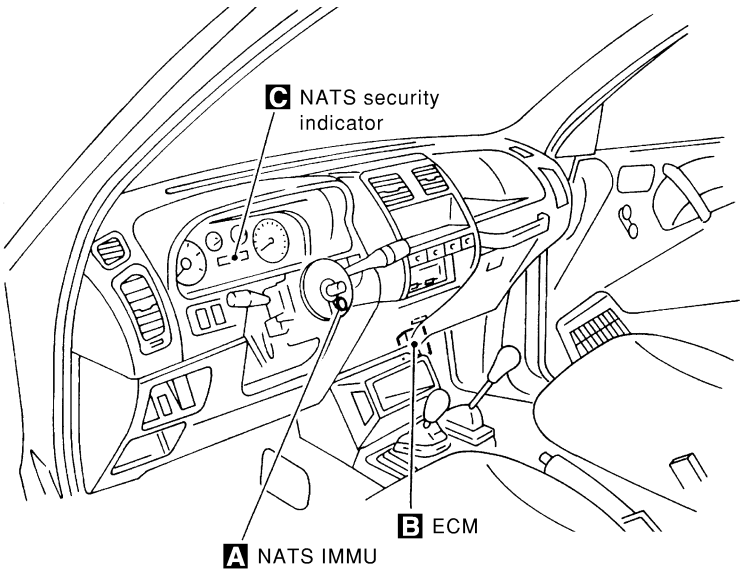
- NATS ignition key
- NATS immobilizer control unit (NATS IMMU), located in the ignition key cylinder
- Engine control module (ECM)
- Dongle control unit (RHD models)
- NATS security indicator
- NATS audio link

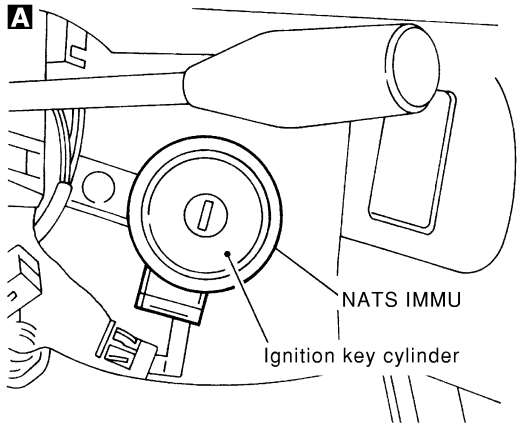


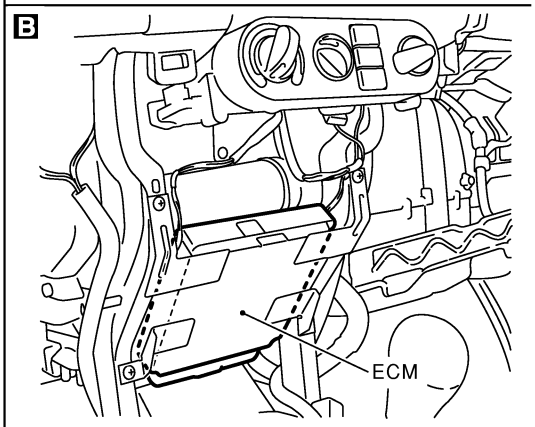
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Component Parts Location

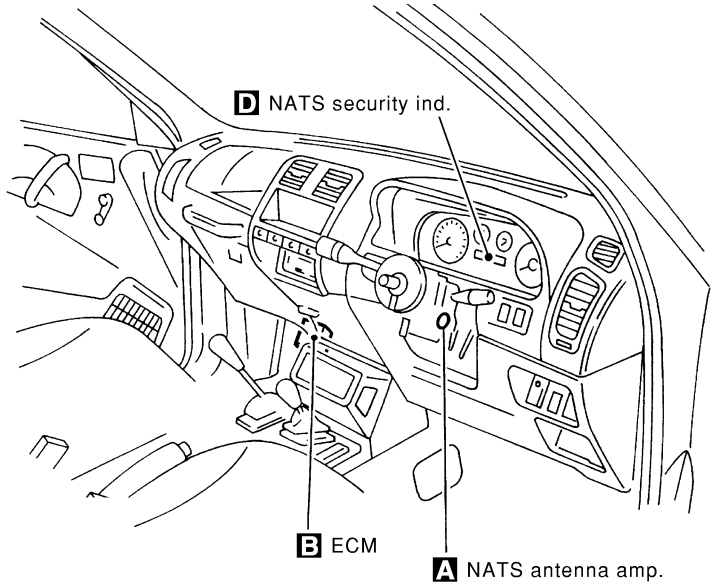
LHD models







RHD models

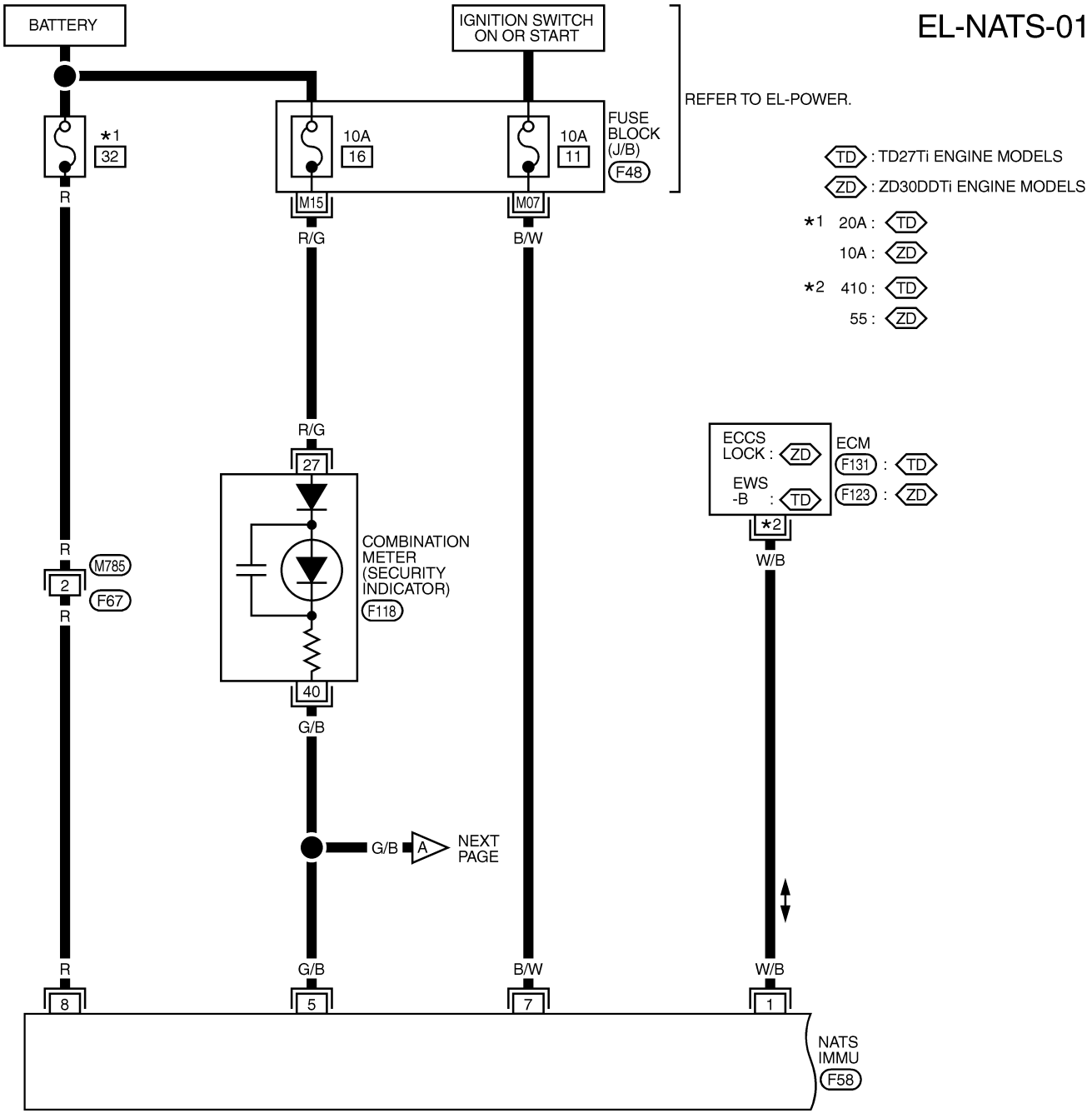


YEL320D

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Wiring Diagram — NATS —

LHD MODELS





REFER TO THE FOLLOWING.
F48 -FUSE BLOCK-JUNCTION BOX (J/B)
F123 , F131 -ELECTRICAL UNITS

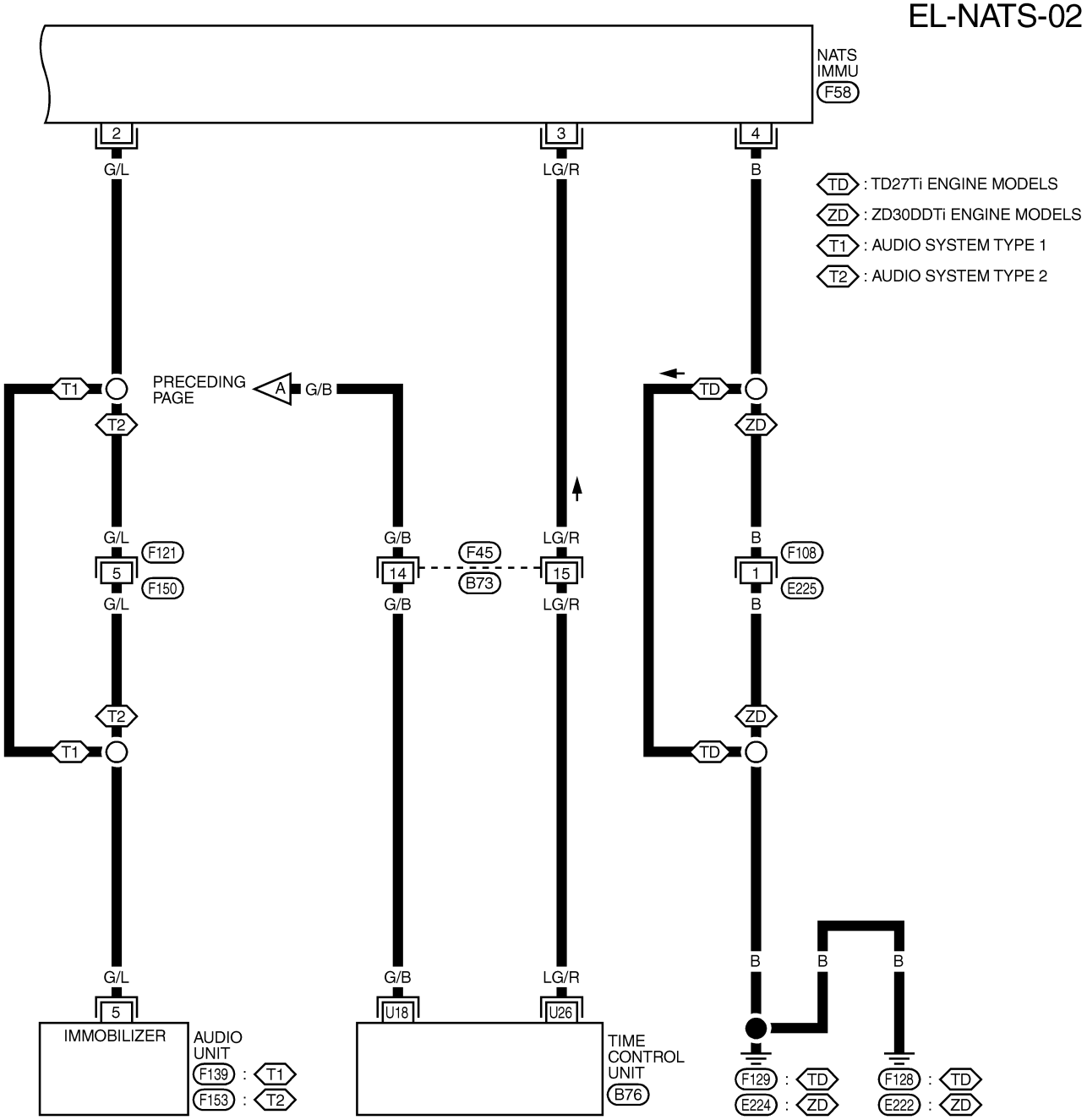
YEL187D

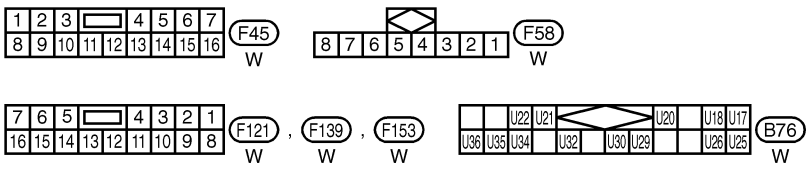
http://vnx.su/

Wiring Diagram — NATS — (Cont'd)

LHD MODELS

EL-NATS-02





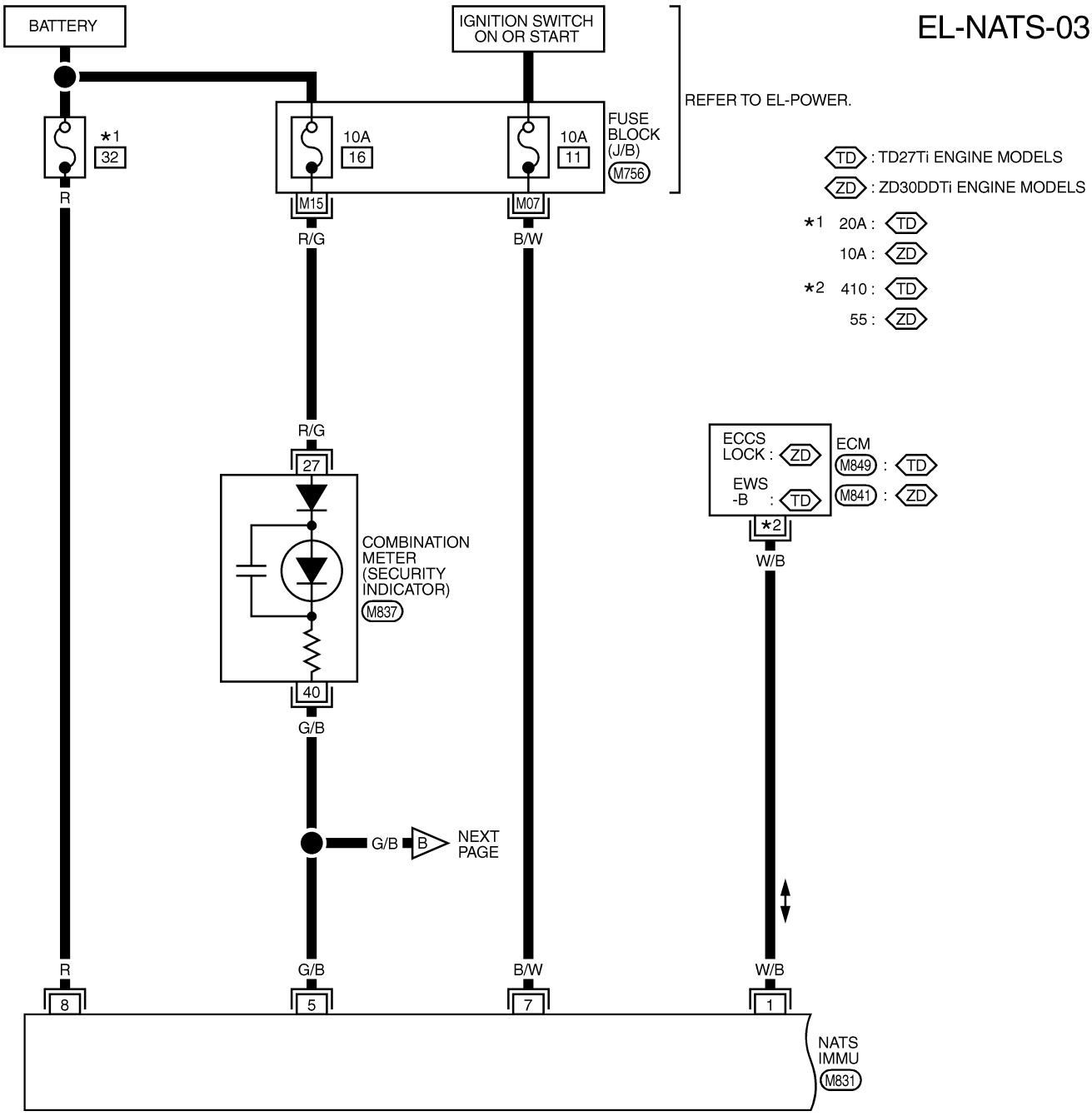
REFER TO THE FOLLOWING.
F108 -SUPER MULTIPLE JUNCTION (SMJ)

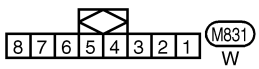
YEL753E

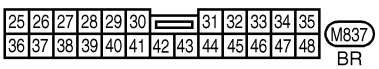
http://vnx.su/

Wiring Diagram — NATS — (Cont'd)

RHD MODELS







REFER TO THE FOLLOWING.
M756 -FUSE BLOCK-
JUNCTION BOX (J/B)
M841 , M849
-ELECTRICAL UNITS

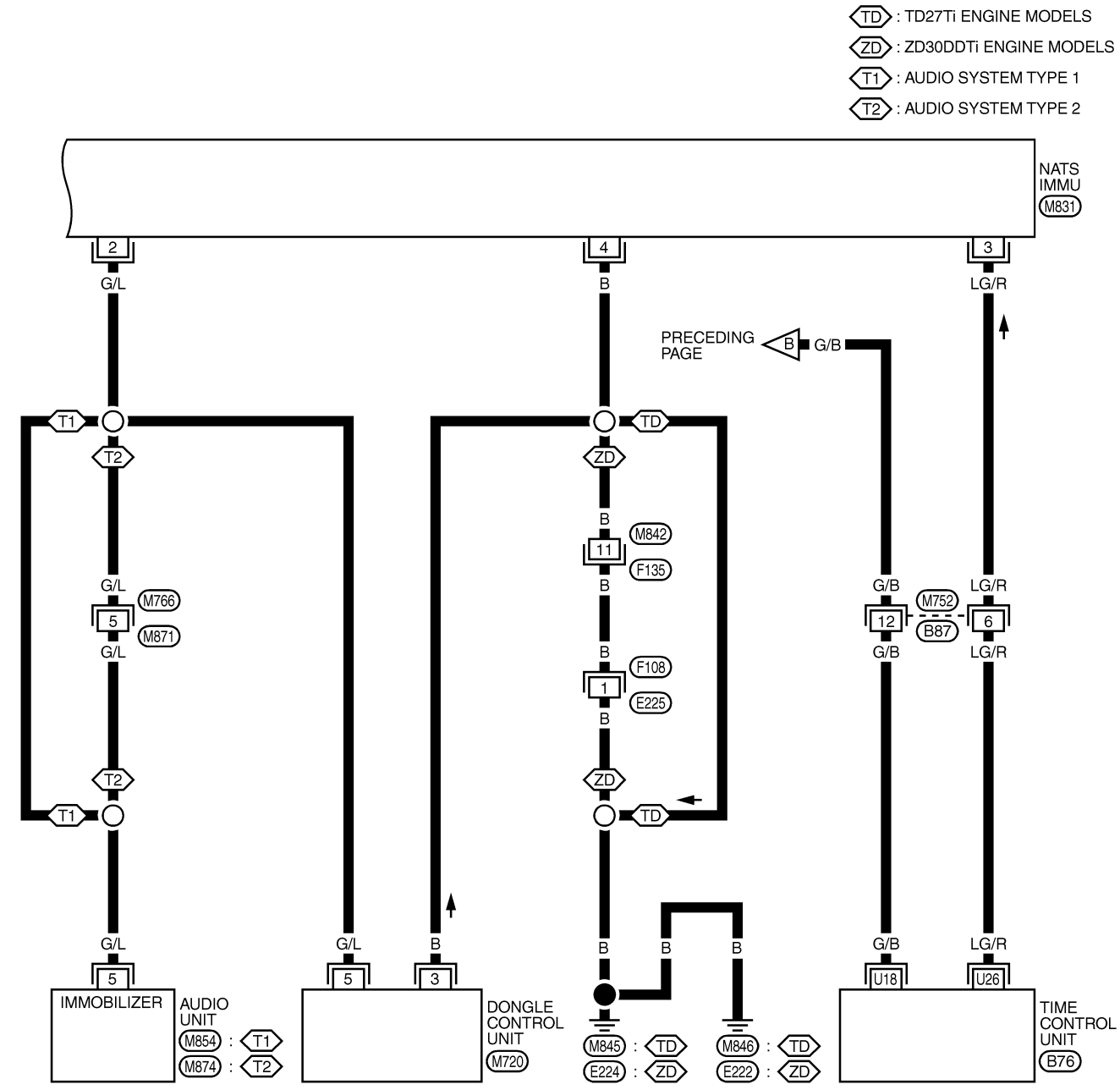
YEL189D

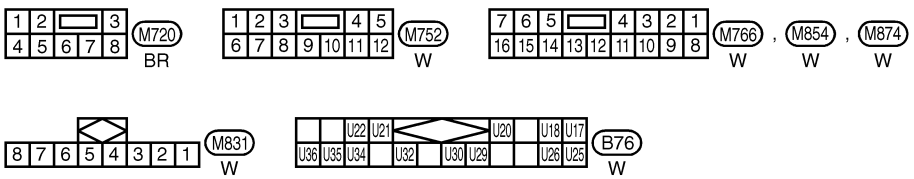
http://vnx.su/

Wiring Diagram — NATS — (Cont'd)

RHD MODELS

EL-NATS-04

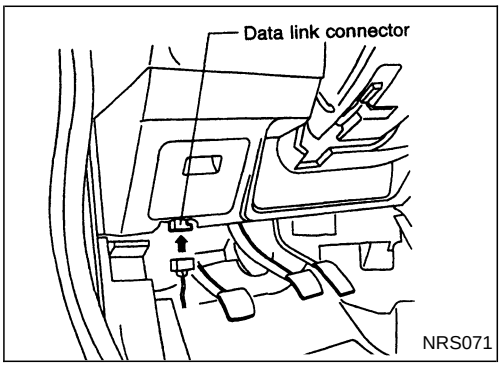




REFER TO THE FOLLOWING.
F108 , F135 -SUPER MULTIPLE JUNCTION (SMJ)

YEL788E

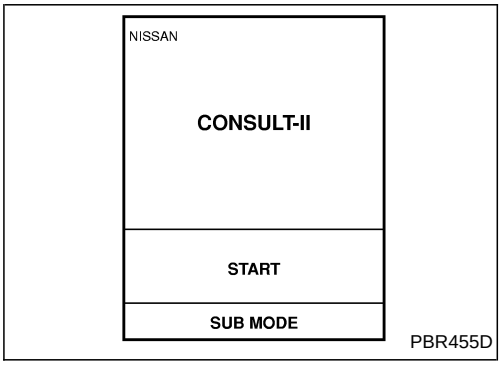
http://vnx.su/



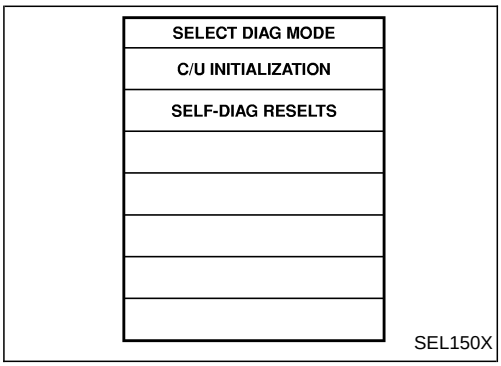
CONSULT-II

CONSULT-II INSPECTION PROCEDURE

1. Turn ignition switch OFF.
2. Connect “CONSULT-II” to Data link connector.



3. Insert NATS program card into CONSULT-II.
   ⇐: **Program card**
   NATS (AEN02C-1)
4. Turn ignition switch ON.
5. Touch “START”.



6. Perform each diagnostic test mode according to each service procedure.

For further information, see the CONSULT-II Operation Manual, NATS.

CONSULT-II DIAGNOSTIC TEST MODE FUNCTION

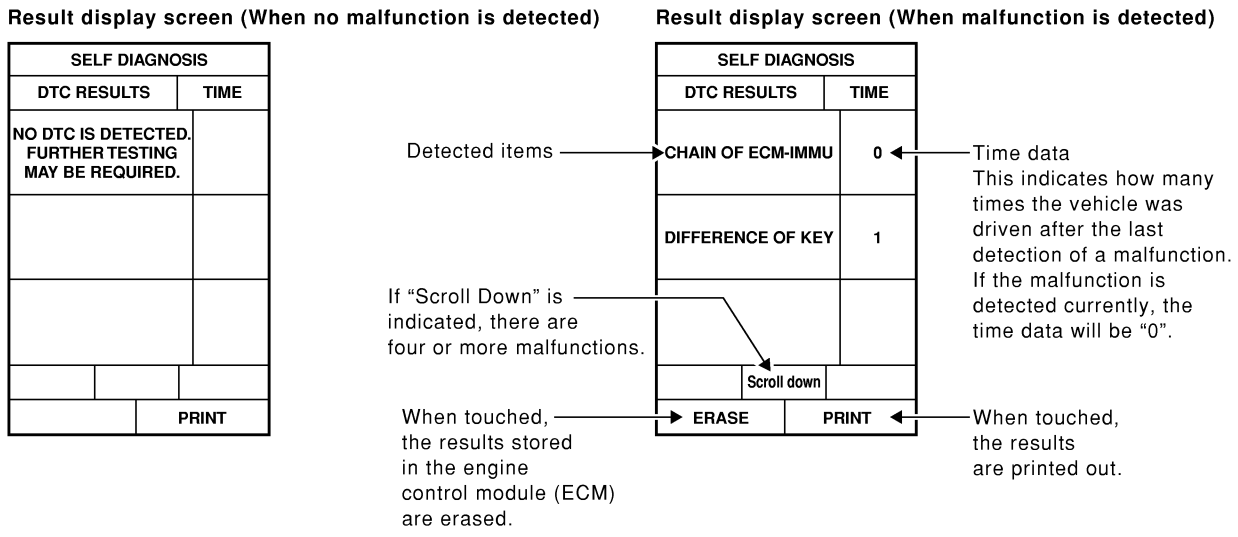
CONSULT-II DIAGNOSTIC TEST MODE	Description
C/U INITIALIZATION	When replacing any of the following components, C/U initialization is necessary. [NATS ignition key/IMMU/ECM/Dongle]
SELF-DIAGNOSTIC RESULTS	Detected items (screen terms) are as shown in the chart below.

NOTE:
When any initialization is performed, all ID previously registered will be erased and all NATS ignition keys must be registered again.
The engine cannot be started with an unregistered key. In this case, the system may show “DIFFERENCE OF KEY” or “LOCK MODE” as a self-diagnostic result on the CONSULT-II screen.
When initialization is performed for RHD models for Europe, security indicator will flash six times to demonstrate recognition of dongle ID.

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CONSULT-II (Cont'd)

HOW TO READ SELF-DIAGNOSTIC RESULTS



SEL308W

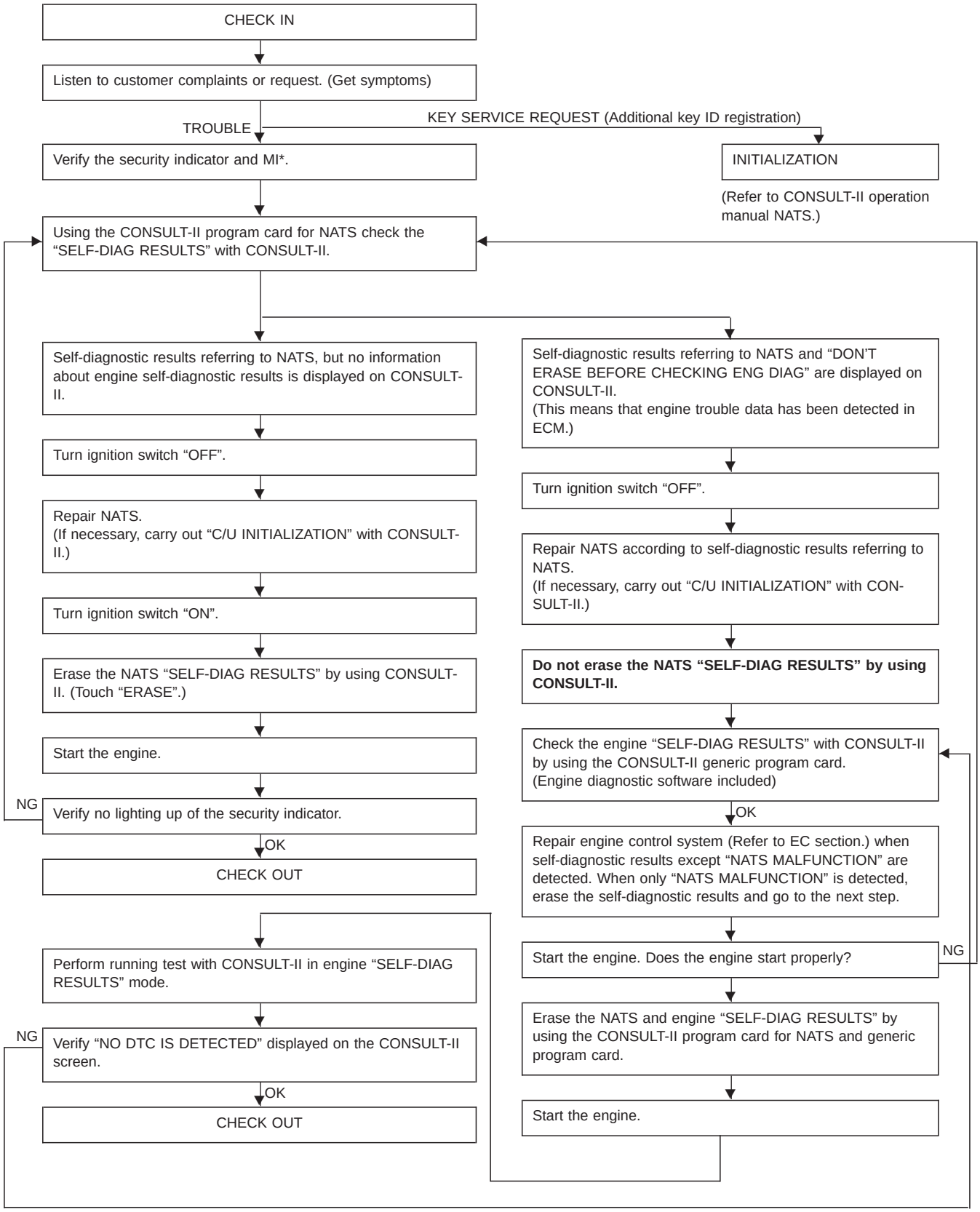
NATS SELF-DIAGNOSTIC RESULTS ITEM CHART

Detected items (NATS program card screen terms)	Malfunction is detected when ...	Reference page
CHAIN OF ECM-IMMU	Communication impossible between ECM and IMMU	EL-234
DIFFERENCE OF KEY	IMMU can receive the key ID signal but the result of ID verification between key ID and IMMU is NG.	EL-236
CHAIN OF IMMU-KEY	IMMU cannot receive the key ID signal. Or the registered ID signal from dongle unit can not be received when the IMMU request the ID.	EL-237
ID DISCORD, IMM-ECM	The result of ID verification between IMMU and ECM is NG. System initialization is required.	EL-239
DON'T ERASE BEFORE CHECKING ENG DIAG	All engine trouble codes except NATS trouble code have been detected in ECM.	EL-231
LOCK MODE	When the starting operation is carried out five or more times consecutively under the following conditions, NATS will shift the mode to one which prevents the engine from being started. ● Unregistered ignition key is used. ● IMMU or ECM is malfunctioning.	EL-240

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Trouble Diagnoses

WORK FLOW



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Trouble Diagnoses (Cont'd)

SYMPTOM MATRIX CHART 1

(Self-diagnosis related item)

SYMPTOM	Displayed "SELF-DIAG RESULTS" on CONSULT-II screen	DIAGNOSTIC PROCEDURE (Reference page)	SYSTEM (Malfunctioning part or mode)	REFERENCE PART NO. OF ILLUSTRATION ON NEXT PAGE
• Security indicator lighting up* • Engine does not start	CHAIN OF ECM-IMMU	PROCEDURE 1 (EL-234)	Open circuit in battery voltage line of IMMU circuit	C1
			Open circuit in ignition line of IMMU circuit	C2
			Open circuit in ground line of IMMU circuit	C3
			Open circuit in communication line between IMMU and ECM	C4
			Short circuit between IMMU and ECM communication line and battery voltage line	C4
			Short circuit between IMMU and ECM communication line and ground line	C4
			ECM	B
			IMMU	A
	DIFFERENCE OF KEY	PROCEDURE 2 (EL-236)	Unregistered key	D
			IMMU	A
	CHAIN OF IMMU-KEY	PROCEDURE 3 (EL-237)	Malfunction of key ID chip	E
			IMMU	A
			Open circuit in ground line of dongle circuit	C6
			Open or short circuit in communication line between IMMU and dongle control unit	C5
			Dongle control unit	G
	ID DISCORD, IMM-ECM	PROCEDURE 4 (EL-239)	System initialization has not yet been completed.	F
			ECM	B
	LOCK MODE	PROCEDURE 5 (EL-240)	LOCK MODE	D
• MI staying ON • Security indicator lighting up*	DON'T ERASE BEFORE CHECKING ENG DIAG	WORK FLOW (EL-231)	Engine trouble data and NATS trouble data have been detected in ECM.	—

*: When NATS detects trouble, the security indicator lights up while ignition key is in the "ON" position.
*: When the vehicle is equipped with dongle control unit (RHD models), the security indicator blinks 6 times just after ignition switch is turned to ON. Then the security indicator lights up while ignition key is in the "ON" position.

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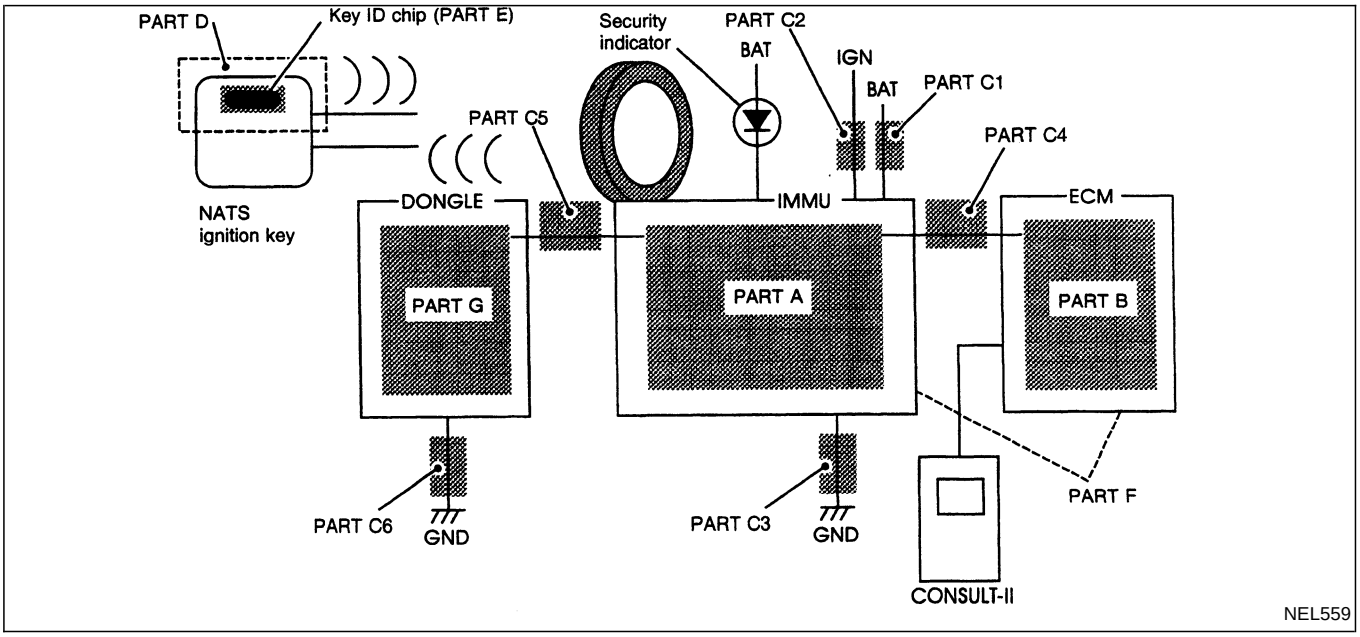
Trouble Diagnoses (Cont'd)

SYMPTOM MATRIX CHART 2

(Non self-diagnosis related item)

SYMPTOM	DIAGNOSTIC PROCEDURE (Reference page)	SYSTEM (Malfunctioning part or mode)	REFERENCE PART NO. OF ILLUSTRATION ON NEXT PAGE
• Security ind. does not light up.	PROCEDURE 6 (EL-241)	Security ind.	
		Open circuit between Fuse and NATS IMMU	
		Continuation of initialization mode	
		NATS IMMU	
Security ind. does not blink just after initialization even if the vehicle is equipped with dongle unit.	PROCEDURE 7 (EL-242)	NATS might be initialized without connecting dongle unit properly.	
		Open circuit in ground line of dongle control circuit	C6
Security ind. does not blink just after ignition switch is turned to ON when some malfunction related to NATS is detected even if the vehicle is equipped with dongle unit.		Open or short circuit in communication line between IMMU and dongle control unit	C5
		Dongle control unit	G

DIAGNOSTIC SYSTEM DIAGRAM



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Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 1

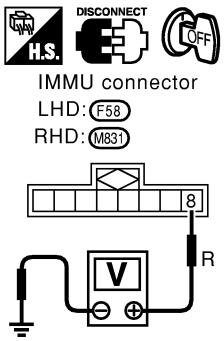
Self-diagnostic results:
"CHAIN OF ECM-IMMU" displayed on CONSULT-II screen

A

SELF DIAGNOSIS	
DTC RESULTS	TIME
CHAIN OF ECM-IMMU	0

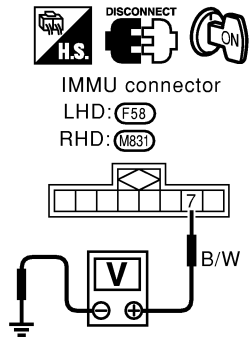
YEL471B

B



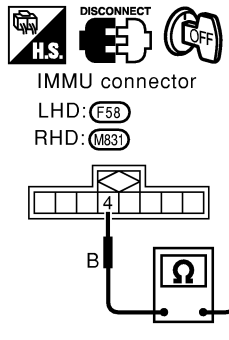
YEL322D

C



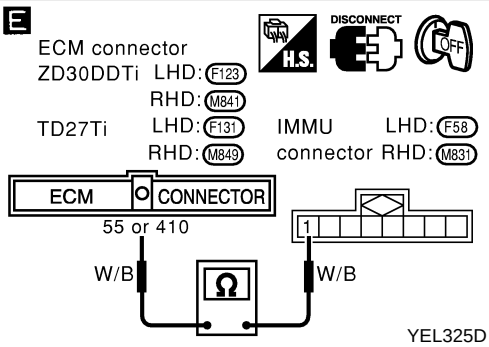
YEL323D

D



YEL324D

E



YEL325D

A

Confirm SELF-DIAGNOSTIC RESULTS "CHAIN OF ECM-IMMU" displayed on CONSULT-II screen.

OK

B

CHECK POWER SUPPLY CIRCUIT FOR IMMU.
Check voltage between NATS IMMU terminal ⑧ and ground.
Battery voltage should exist.

NG →
Check the following.
- 10A fuse (ZD30DDTi models) or 20A fuse (TD27Ti models) (No. 32)
- Harness for open or short between fuse and NATS IMMU connector
Ref. part No. C1

OK

C

CHECK IGN SW. ON SIGNAL.
Check voltage between NATS IMMU terminal ⑦ and ground while ignition switch is "ON" position.
Battery voltage should exist.

NG →
Check the following.
- 10A fuse (No. 11 , located in the fuse block)
- Harness for open or short between fuse and NATS IMMU connector
Ref. part No. C2

OK

D

CHECK GROUND CIRCUIT FOR IMMU.
Check continuity between NATS IMMU terminal ④ and ground.
Continuity should exist.

NG →
Repair harness.
Ref. part No. C3

OK

E

CHECK COMMUNICATION OPEN CIRCUIT.
Check continuity between NATS IMMU terminal ① and ECM terminal 410 (TD27Ti models) or 55 (ZD30DDTi models).
Continuity should exist.

NG →
Repair harness.
Ref. part No. C4

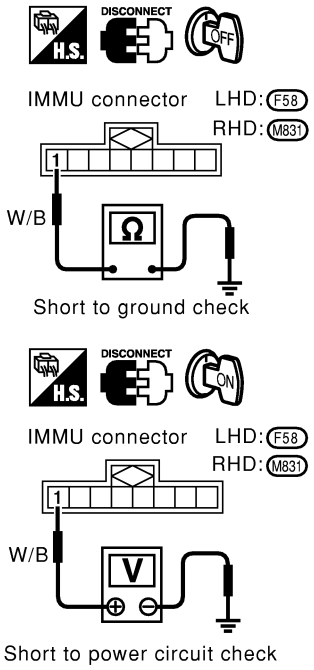
OK

Ⓐ

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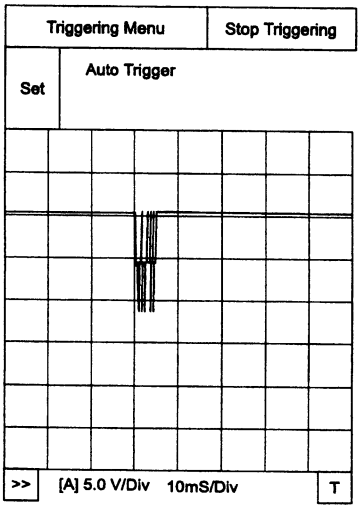
Trouble Diagnoses (Cont'd)

F



YEL326D

G



NEL543

Ⓐ

F

CHECK COMMUNICATION LINE SHORT CIRCUIT.

1. Disconnect ECM connector and NATS IMMU connector.
2. Check continuity between NATS IMMU terminal ① and ground.
   Continuity should not exist.
3. Turn ignition switch to ON.
4. Check voltage between IMMU terminal ① and ground.
   No voltage should exist.

NG → Repair harness.
Ref. part No. C4

OK ↓

G

Check the signal from ECM to NATS IMMU.

1. Check the signal between ECM terminal (410) (TD27Ti models) or (55) (ZD30DDTi models) and ground with CONSULT-II or oscilloscope when ignition switch is turned ON.
2. Some signals can be detected during 750 msec. just after ignition switch is turned "ON".

NG → ECM is malfunctioning.
1. Replace ECM.
   Ref part No. B
2. Perform initialization procedure, refer to "CONSULT-II operation manual NATS".

OK ↓

NATS IMMU is malfunctioning.
1. Replace NATS IMMU.
   Ref. part No. A
2. Perform initialization with CONSULT-II.
   For the initialization procedure, refer to "CONSULT-II operation manual NATS".

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Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 2

Self-diagnostic results:
"DIFFERENCE OF KEY" displayed on CONSULT-II screen

A

SELF DIAGNOSIS	
DTC RESULTS	TIME
DIFFERENCE OF KEY	0

YEL478B

B

IMMU INITIALIZATION
INITIALIZATION FAIL
THEN IGN KEY SW 'OFF' AND 'ON', AFTER CONFIRMING SELF-DIAG AND PASSWORD, PERFORM C/U INITIALIZATION AGAIN.

YEL479B

A

Confirm SELF-DIAGNOSTIC RESULTS "DIFFERENCE OF KEY" displayed on CONSULT-II screen.

OK ↓

PERFORM INITIALIZATION.
Perform initialization with CONSULT-II.
Re-register all NATS ignition key IDs.
For the initialization procedure, refer to "CONSULT-II operation manual NATS".
Can the system be initialized?
Note: If the initialization is not completed or fails, CONSULT-II shows B message on the screen.

No →
- NATS IMMU is malfunctioning.
1. Replace NATS IMMU. Ref. part No. A
2. Perform initialization with CONSULT-II. For the initialization procedure, refer to "CONSULT-II operation manual NATS".

Yes ↓

Start engine.

END
(Ignition key ID had been unregistered.)

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Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 3

Self-diagnostic results:
"CHAIN OF IMMU-KEY" displayed on CONSULT-II screen

A

SELF DIAGNOSIS	
DTC RESULTS	TIME
CHAIN OF IMMU-KEY	0

YEL480B

A

Confirm SELF-DIAGNOSTIC RESULTS "CHAIN OF IMMU-KEY" displayed on CONSULT-II screen.

OK

CHECK NATS IGNITION KEY ID CHIP. Can the engine start with another registered NATS ignition key?

Yes →
- Ignition key ID chip is malfunctioning.
1. Replace the ignition key. Ref. part No. E
2. Perform initialization with CONSULT-II. For the initialization procedure, refer to "CONSULT-II operation manual NATS".

No

CHECK NATS IMMU INSTALLATION. Refer to "How to Replace NATS IMMU" in EL-242.

NG → Reinstall NATS IMMU correctly.

OK

Is this vehicle equipped with dongle control unit (RHD models)?

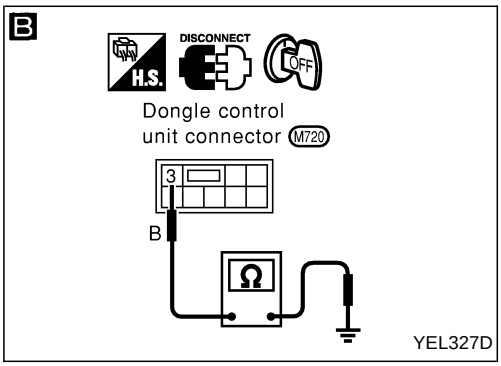
No →
IMMU is malfunctioning.
1. Replace NATS IMMU. Ref part No. A
2. Perform initialization with CONSULT-II For the initialization procedure, refer to "CONSULT-II operation manual NATS".

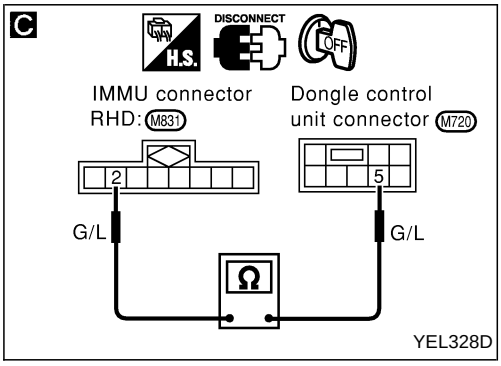
Yes

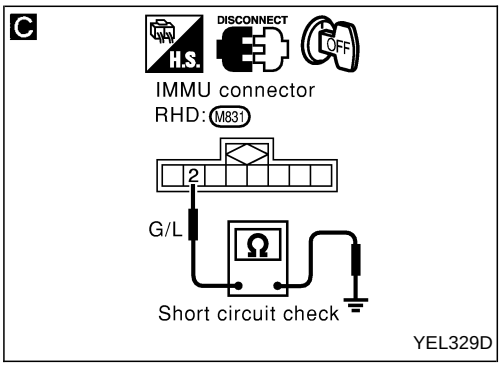
Ⓐ

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Trouble Diagnoses (Cont'd)







Ⓐ

CHECK HARNESS CONNECTOR CONNECTION.
Check the following harness connector connection.
M720
Does the engine start?

Yes → System is OK.
(The malfunction is caused by improper connector connection.)

No ↓

B

CHECK GROUND CIRCUIT FOR DONGLE UNIT.
Check continuity between dongle control unit terminal ③ and ground.
Continuity should exist.

No → Repair harness.

Yes ↓

C

CHECK INTERFACE CIRCUIT.
1. Check continuity between IMMU terminal ② and dongle control unit terminal ⑤ (Open circuit check)
   Continuity should exist.
2. Check continuity between IMMU terminal ② and ground. (Short circuit check)
   Continuity should not exist.

No → Repair harness.

Yes ↓

Dongle unit is malfunctioning.
1. Replace dongle control unit.
2. Perform initialization with CONSULT-II. For the initialization procedure, refer to "CONSULT-II operation manual NATS".

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Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 4

Self-diagnostic results:
"ID DISCORD, IMM-ECM" displayed on CONSULT-II screen

A

SELF DIAG RESULTS	
DTC RESULTS	TIME
ID DISCORD, IMM-ECM	0

C2SDD01

B

IMMU INITIALIZATION
INITIALIZATION FAIL
THEN IGN KEY SW 'OFF' AND 'ON', AFTER CONFIRMING SELF-DIAG AND PASSWORD, PERFORM C/U INITIALIZATION AGAIN.

YEL479B

A

Confirm SELF-DIAGNOSTIC RESULTS "ID DISCORD, IMM-ECM*" displayed on CONSULT-II screen.

* "ID DISCORD, IMM-ECM": Registered ID of IMMU is in discord with that of ECM.

↓

PERFORM INITIALIZATION.
Perform initialization with CONSULT-II.
Re-register all NATS ignition key IDs.
For the initialization procedure, refer to "CONSULT-II operation manual NATS".
Can the system be initialized?
Note: If the initialization is not completed or fails, CONSULT-II shows B message on the screen.

No →

- ECM is malfunctioning.

1. Replace ECM.
   Ref. part No. B
2. Perform initialization with CONSULT-II.
   For the initialization procedure, refer to "CONSULT-II operation manual NATS".

↓ Yes

Start engine. (END)
(System initialization was not completed.
Ref. part No. F)

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Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 5

Self-diagnostic results: "LOCK MODE" displayed on CONSULT-II screen

A

SELF DIAGNOSIS	
DTC RESULTS	TIME
LOCK MODE	0

YEL484B

B

IMMU INITIALIZATION
INITIALIZATION FAIL
THEN IGN KEY SW 'OFF' AND 'ON', AFTER CONFIRMING SELF-DIAG AND PASSWORD, PERFORM C/U INITIALIZATION AGAIN.

YEL479B

A

Confirm SELF-DIAGNOSTIC RESULTS "LOCK MODE" is displayed on CONSULT-II screen.

1. Turn the ignition switch to OFF position.
2. Turn the ignition key switch to ON position with a registered key. (Do not start engine.) Wait for 5 seconds.
3. Return the key to the OFF position.
4. Repeat steps 2 and 3 twice (total of three cycles).
5. Start the engine.

Can the engine start?

Yes → System is OK. (Now the system is escaped from "LOCK MODE".)

No

CHECK NATS IMMU INSTALLATION. Refer to "How to Replace NATS IMMU" in EL-242.

NG → Reinstall NATS IMMU correctly.

OK

PERFORM INITIALIZATION.
Perform initialization with CONSULT-II.
For the initialization procedure, refer to "CONSULT-II operation manual NATS".
Can the system be initialized?
Note: If the initialization is incompleted or failed, CONSULT-II shows B message on the screen.

Yes → System is OK.

No

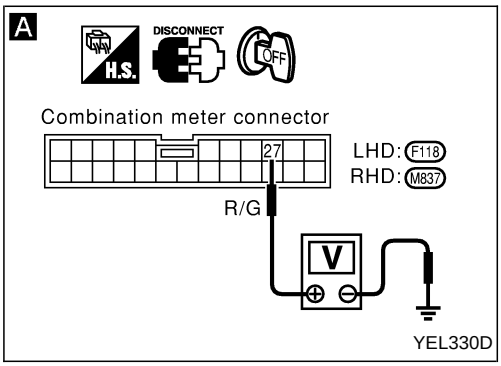
Go to DIAGNOSTIC PROCEDURE 4, EL-237 to check "CHAIN OF IMMU-KEY".

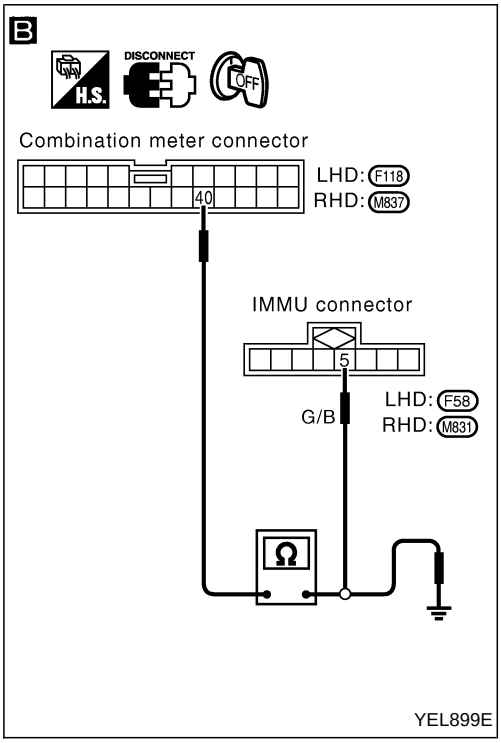
http://vnx.su/

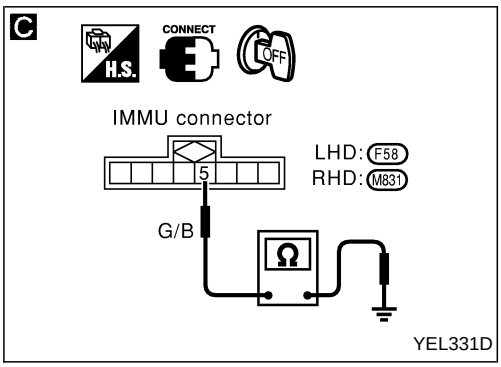
Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 6

"SECURITY INDICATOR LAMP DOES NOT LIGHT UP"







Check 10A fuse (No. 16 , located in the fuse block).
NG → Replace fuse.

OK ↓

NATS INITIALIZATION
1. Install the 10A fuse.
2. Perform initialization with CONSULT-II. For the operation of initialization, refer to "CONSULT-II operation manual NATS".

↓

Turn ignition switch "OFF".

↓

Start engine and turn ignition switch "OFF".

↓

Check the security ind. lighting.
OK → INSPECTION END

NG ↓

A

Check voltage between combination meter connector terminal (27) and ground.
Voltage: Battery voltage
NG → Check harness for open or short between fuse and combination meter.

OK ↓

CHECK SECURITY INDICATOR LAMP.
NG → Repair or replace combination meter.

OK ↓

B

CHECK HARNESS BETWEEN COMBINATION METER AND NATS IMMU.
1. Disconnect combination meter and NATS IMMU connector.
2. Check continuity between combination meter terminal (40) and NATS IMMU harness connector terminal (5) .
Continuity should exist.
3. Check continuity between combination meter harness connector terminal (40) and ground.
Continuity should not exist.

NG → Repair or replace harness.

OK ↓

C

CHECK NATS IMMU FUNCTION.
1. Connect combination meter connector and NATS IMMU connector.
2. Check continuity between NATS IMMU terminal (5) and ground.
Continuity should exist intermittently.

NG → NATS IMMU is malfunctioning. Replace IMMU.

↓

Perform initialization with CONSULT-II. For the operation of initialization, refer to "CONSULT-II operation manual NATS".

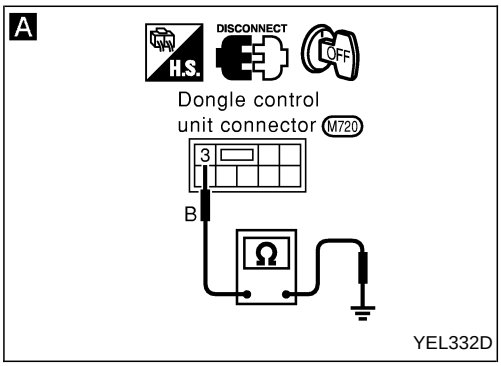
OK ↓

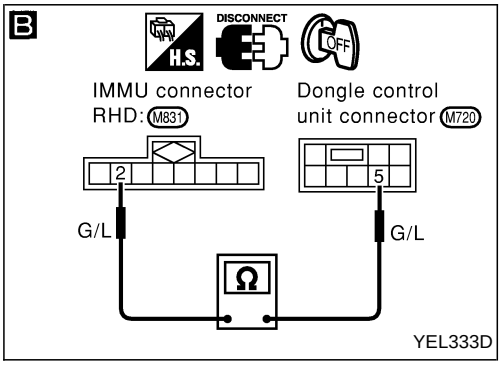
INSPECTION END

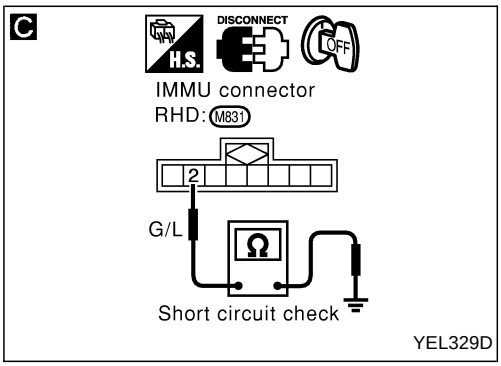
http://vnx.su/

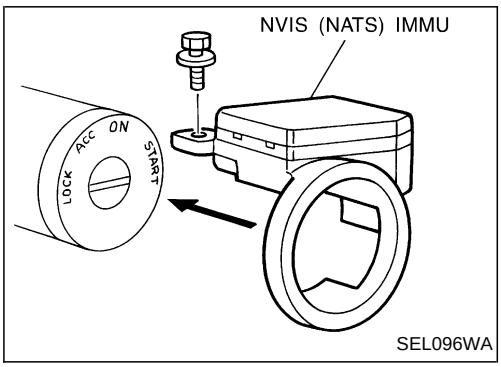
Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 7









Perform initialization with CONSULT-II
Check the following harness connector connection.
M720
Then initialize NATS. For the operation of initialization, refer to "CONSULT-II operation manual NATS".
Does the security indicator blink just after the initialization?

Yes → System is OK.
(The malfunction is caused by improper connector connection.)

No ↓

A

CHECK GROUND CIRCUIT FOR DONGLE UNIT.
Check continuity between dongle control unit terminal ③ and ground.
Continuity should exist.

No → Repair harness.

Yes ↓

B C

CHECK INTERFACE CIRCUIT.
1. Check continuity between IMMU terminal ② and dongle control unit terminal ⑤ (Open circuit check)
   Continuity should exist.
2. Check continuity between IMMU terminal ② and ground. (Short circuit check)
   Continuity should not exist.

No → Repair harness.

Yes ↓

Dongle unit is malfunctioning.
1. Replace dongle control unit.
2. Perform initialization with CONSULT-II. For the initialization procedure, refer to "CONSULT-II operation manual NATS".

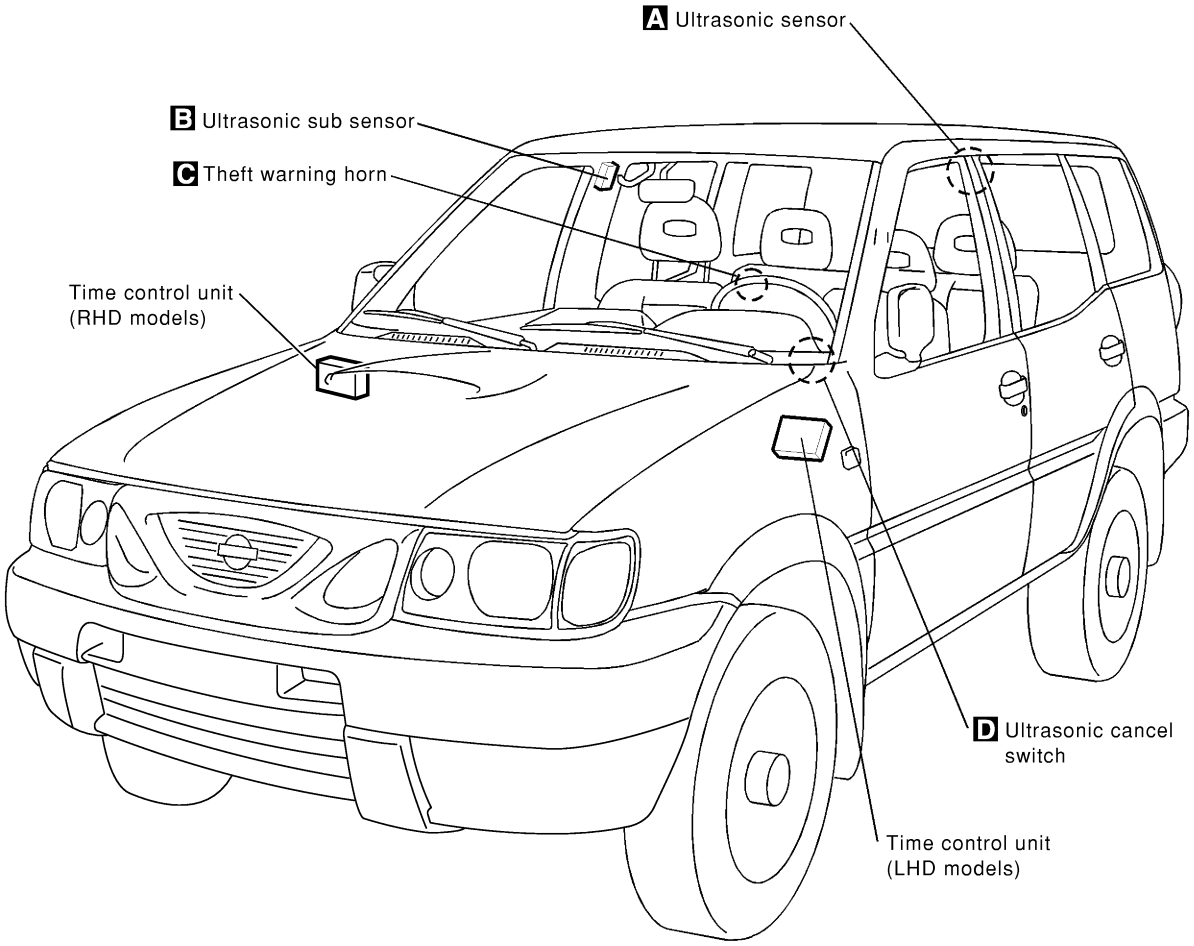
How to Replace NATS IMMU

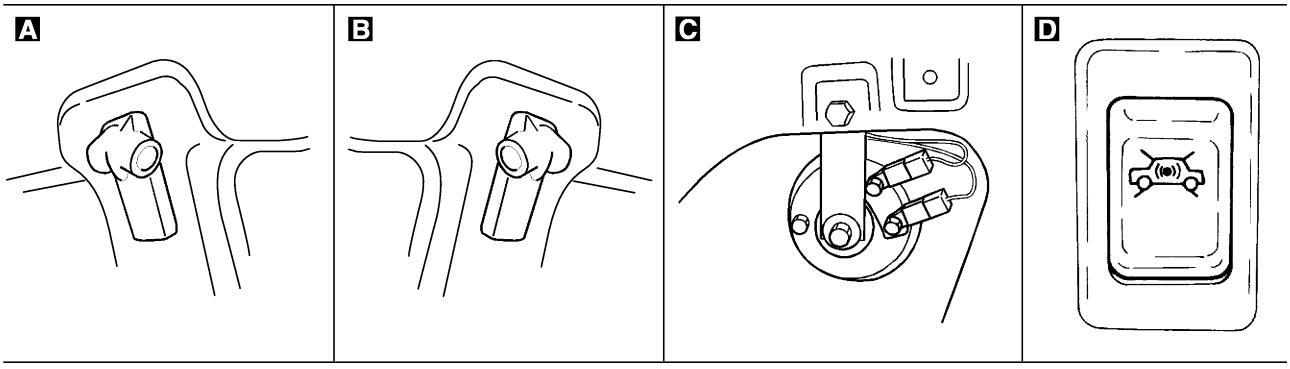
NOTE:

- **If NATS IMMU is not installed correctly, NATS system will not operate properly and SELF-DIAG RESULTS on CONSULT-II screen will show "LOCK MODE" or "CHAIN OF IMMU-KEY".**

http://vnx.su/

Components Parts and Harness Connector Location





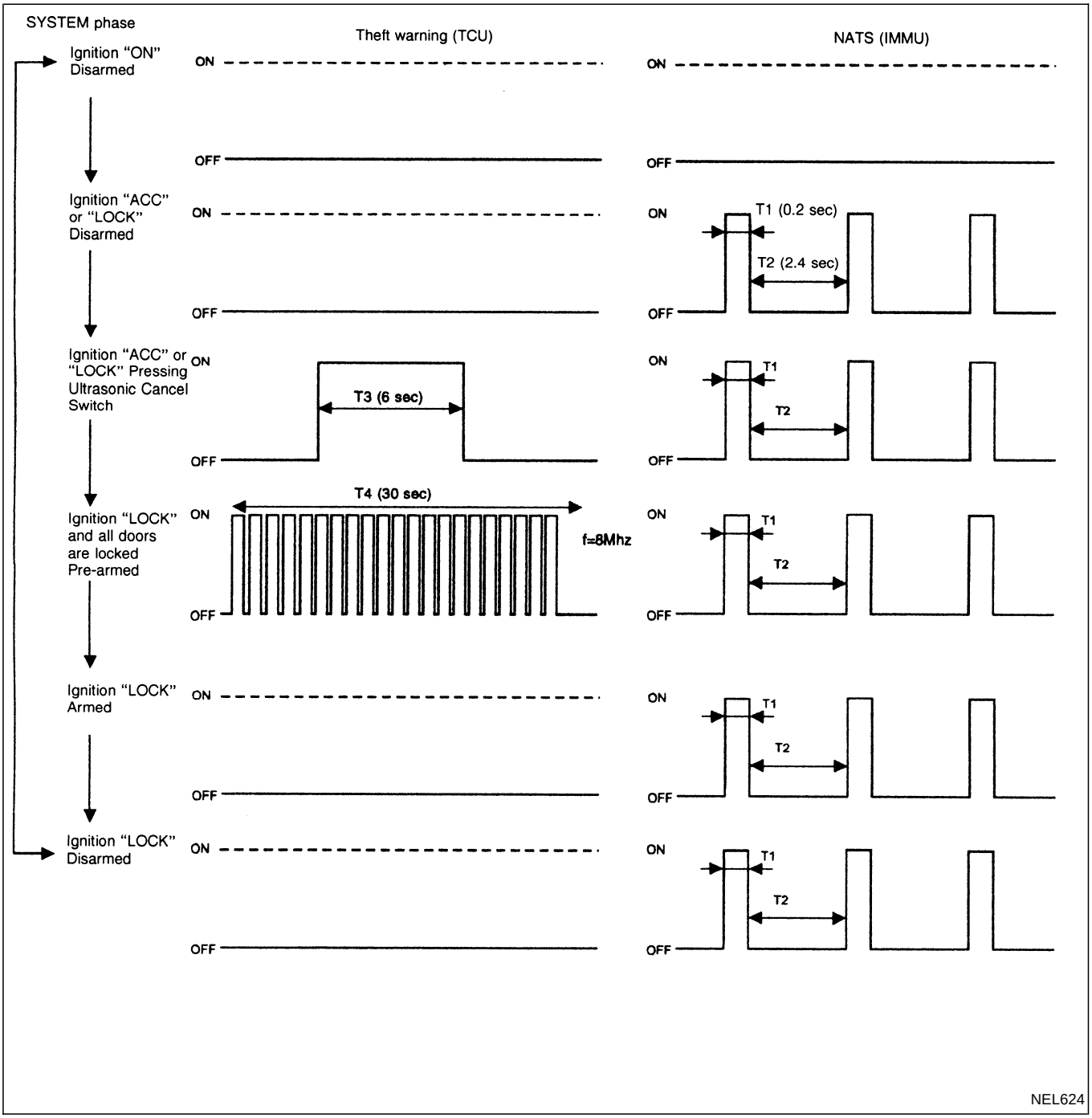
YEL335D

http://vnx.su/

System Description

OPERATION FLOW

The SECURITY indicator can be operated by both the IMMU (for NATS) and the TCU (for Theft Warning). The flow chart shows both operations.



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System Description (Cont'd)

SETTING THE THEFT WARNING SYSTEM

Initial condition

(1) Close all doors.
(2) Close hood.

Pre-armed phase and armed phase

The theft warning system turns into the "pre-armed" phase when hood and all doors are closed and locked by key or multi-remote controller. (The security indicator lamp blinks intermittently for 30 seconds.)
After about 30 seconds, the system automatically shifts into the "armed" phase (the system is set).

CANCELING THE SET THEFT WARNING SYSTEM

When the following (a) or (b) operation is performed, the armed phase is canceled.
(a) Unlock the doors with the multi-remote controller.
(b) Insert key in ignition key cylinder and turn it to ON. Then NATS IMMU will send a disarm signal to the time control unit.

ACTIVATING THE ALARM OPERATION OF THE THEFT WARNING SYSTEM

Make sure the system is in the armed phase. When the following operation (a) (b) (c) or (d) is performed, the system sounds the horns and flashes the hazard lamp for about 30 seconds.
(a) Engine hood or any door is opened before unlocking door with the multi-remote controller.
(b) A door is unlocked without using the multi-remote controller.
(c) The ignition is switched ON without using a NATS registered key.
(d) The ultrasonic sensing is triggered.

POWER SUPPLY AND GROUND CIRCUIT

Power is supplied at all times.
- Through 10A fuse [No. 16 , located in the fuse block (J/B)]
- to combination meter (security indicator lamp) terminal 27 .
- through 10A fuse [No. 5 , located in the fuse block (J/B)]
- to time control unit terminal U09 .

With the ignition switch in the ON or START position, power is supplied
- through 10A fuse [No. 26 , located in the fuse block (J/B)]
- to time control unit terminal U01 .

Ground is supplied
- to time control unit terminal U16
- through body grounds F36 and F47 (LHD models), or M33 and M754 (RHD models).

INITIAL CONDITION TO ARM THE SYSTEM

The operation of the theft warning system is controlled by all the doors and hood.
To activate the theft warning system, the time control unit must receive signals indicating all the doors and hood are closed and the doors are locked.
When a door is open, time control unit terminal U06 or U07 receives a ground signal from each door switch.
When a door is unlocked, time control unit terminal U25 , U35 or U36 receives a ground signal from each door unlock sensor.
When the hood is open, time control unit terminal U32 receives a ground signal
- from the hood switch
- through body grounds M33 and M754 .

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System Description (Cont'd)

THEFT WARNING SYSTEM ARMING (With key or remote controller used to lock doors)

If the key is used to lock doors, time control unit terminal (U29) receives a ground signal
- from terminal ② of the key cylinder switch
- through body grounds (B18) and (B10).

If this signal or lock signal from remote controller is received by the time control unit, the theft warning system will arm automatically.
When arming the theft warning system, time control unit terminal (U18) supplies ground intermittently to terminal ㊵ of the combination meter. The security lamp will blink intermittently for approximately 30 seconds (and then blink every 2.6 seconds, due to NATS).
Now the theft warning system is in armed phase.

THEFT WARNING SYSTEM ALARM OPERATION

The theft warning system is triggered by
- opening a door
- opening back door
- opening the hood
- unlocking door without using the multi-remote controller
- switching the ignition ON without a NATS registered key
- triggering the ultrasonic sensors

Once the theft warning system is in armed phase, if the time control unit receives a signal at terminal (U25), (U35), (U36) (door unlock sensor), (U06), (U07) (door switch), (U32) (hood switch), or (U30) (ultrasonic sensor) the theft warning system will be triggered. The hazard lamps flash and the horn sounds intermittently.
Power is supplied at all times
- through 10A fuse [No. 16 , located in the fuse block (J/B)]
- to theft warning horn relay.

If the theft warning system is triggered, ground is supplied
- from terminal (U43) of the time control unit
- to theft warning horn relay.

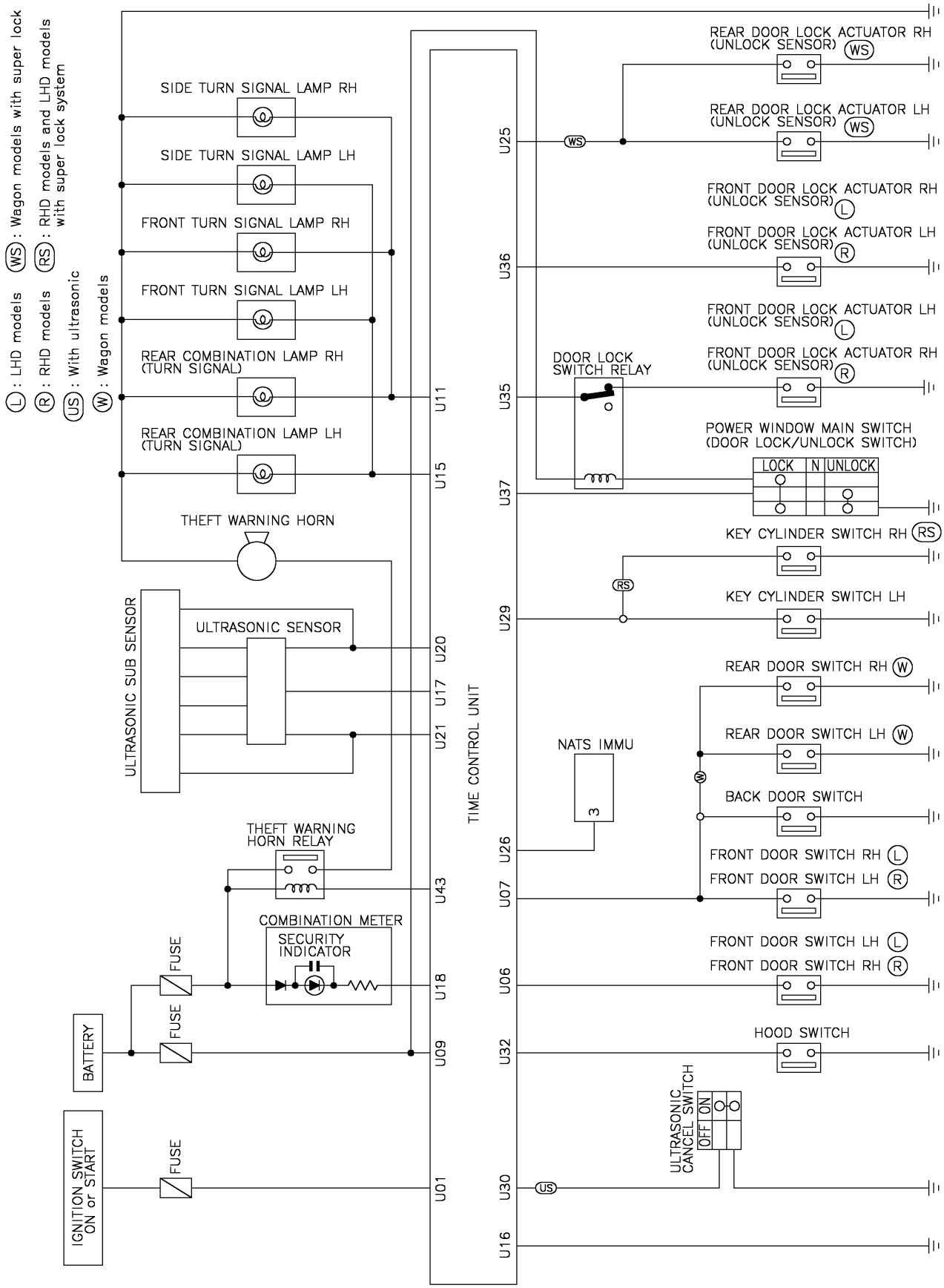
The hazard lamps flash and the horn sounds intermittently.
The alarm automatically turns off after 30 seconds but will reactivate if the vehicle is tampered with again, or if the initial cause remains present.

THEFT WARNING SYSTEM ALARM DISARMING

The theft warning system alarm operation can be deactivated by either unlocking the vehicle with the remote controller, or turning the ignition to the "ON" position with a registered NATS key.

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Theft Warning System/Schematic

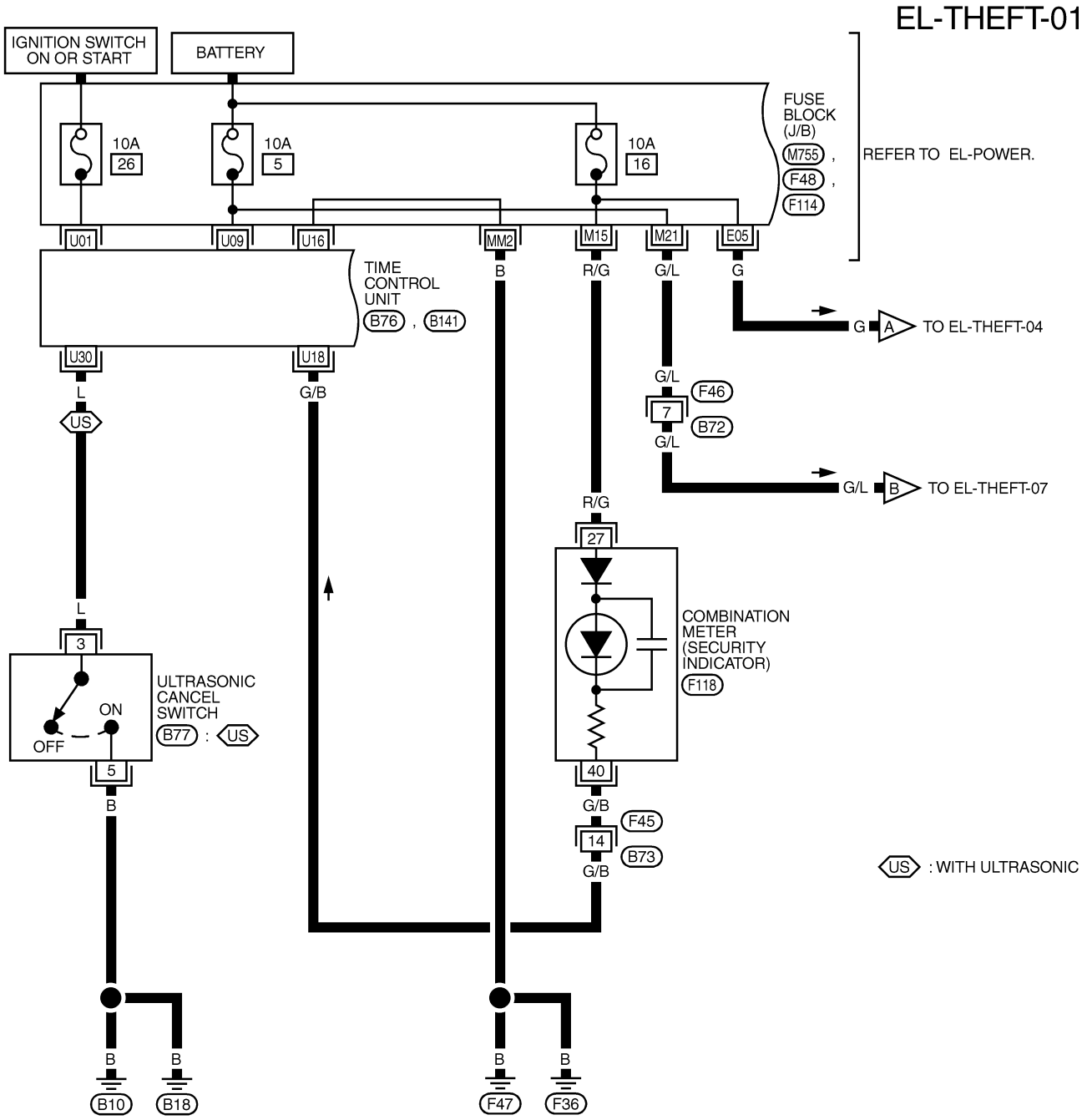


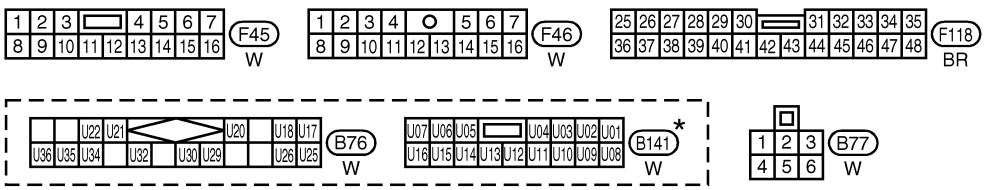
YEL754E

http://vnx.su/

Wiring Diagram — THEFT —

LHD MODELS





* : THIS CONNECTOR IS NOT SHOWN IN "HARNESS LAYOUT", EL SECTION.

REFER TO THE FOLLOWING.
M755 , F48 , F114
-FUSE BLOCK-
JUNCTION BOX (J/B)

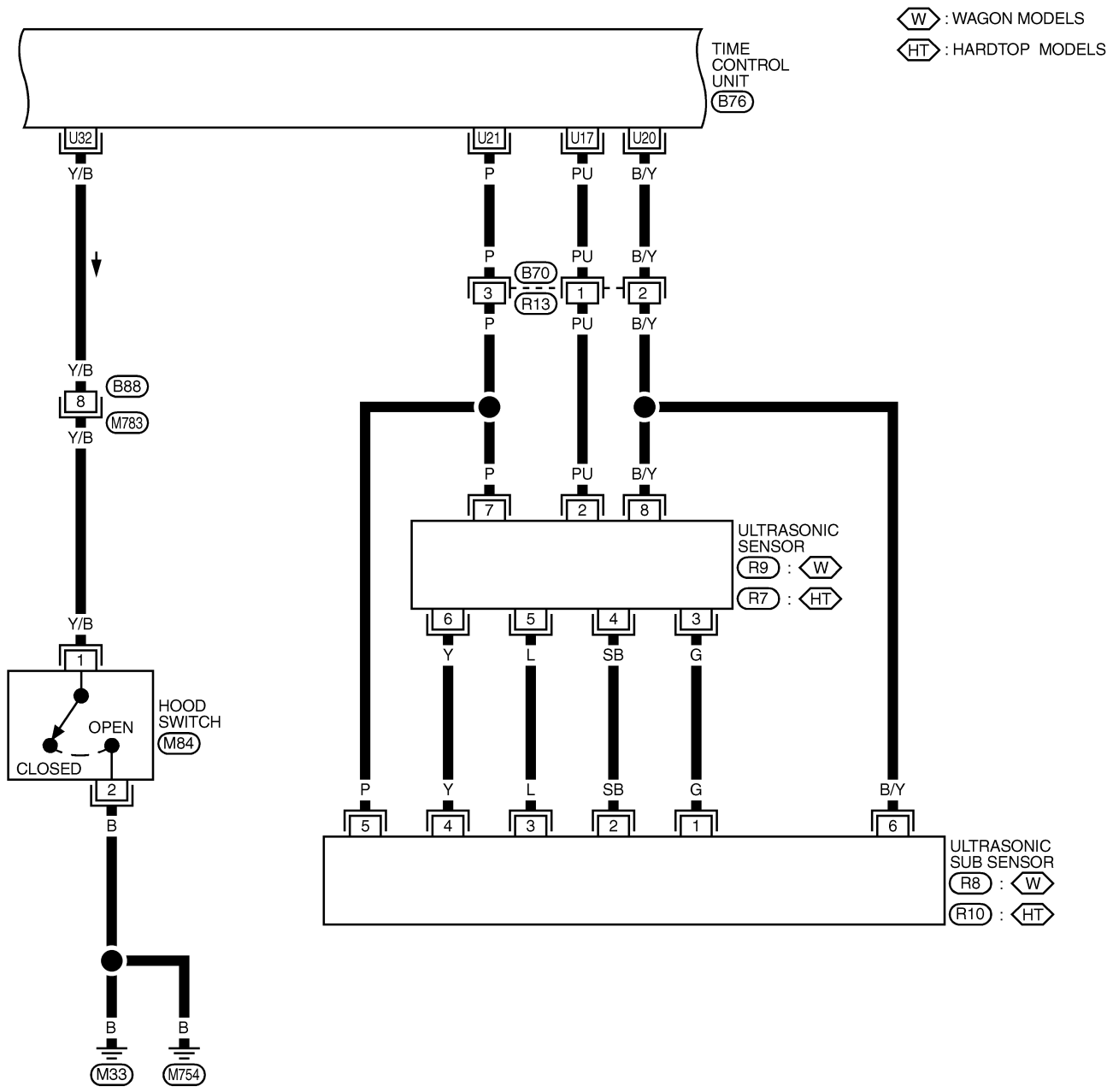
YEL755E

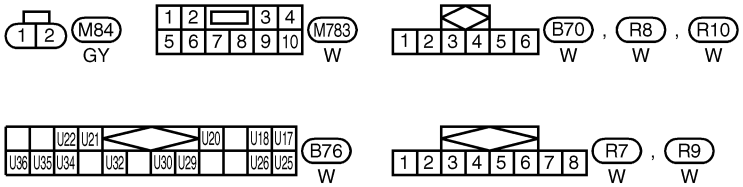
http://vnx.su/

Wiring Diagram — THEFT — (Cont'd)

LHD MODELS

EL-THEFT-02





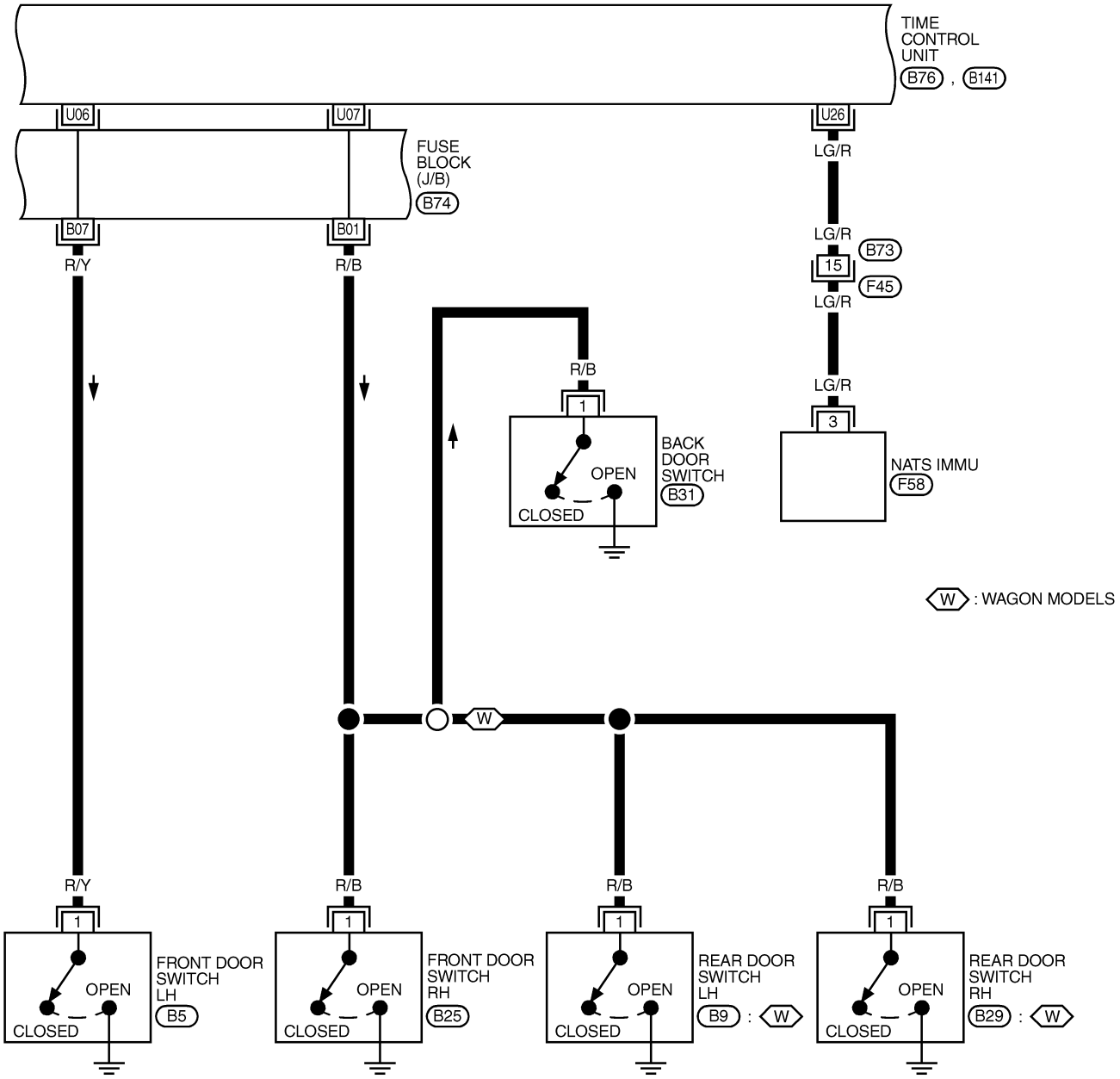
YEL172D

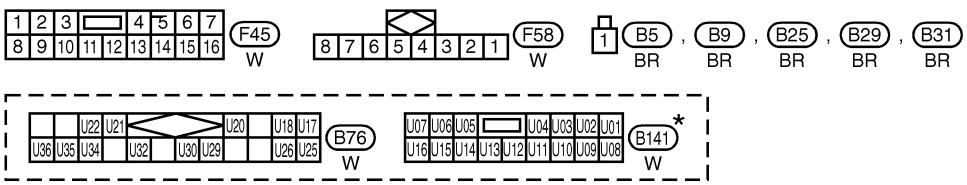
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Wiring Diagram — THEFT — (Cont'd)

LHD MODELS

EL-THEFT-03





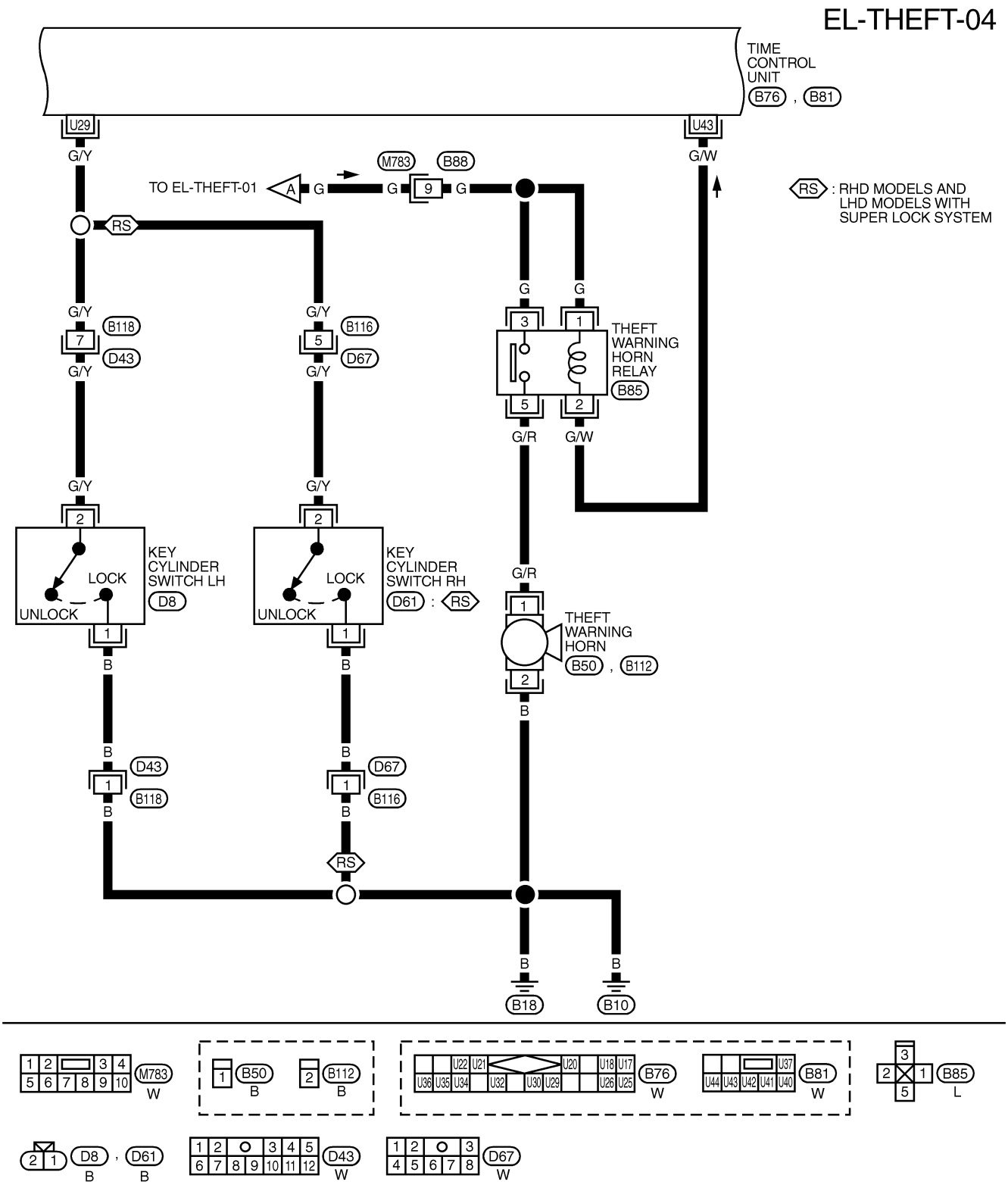
REFER TO THE FOLLOWING.
B74 -FUSE BLOCK-
JUNCTION BOX (J/B)

YEL173D

http://vnx.su/

Wiring Diagram — THEFT — (Cont'd)

LHD MODELS



YEL867E

http://vnx.su/

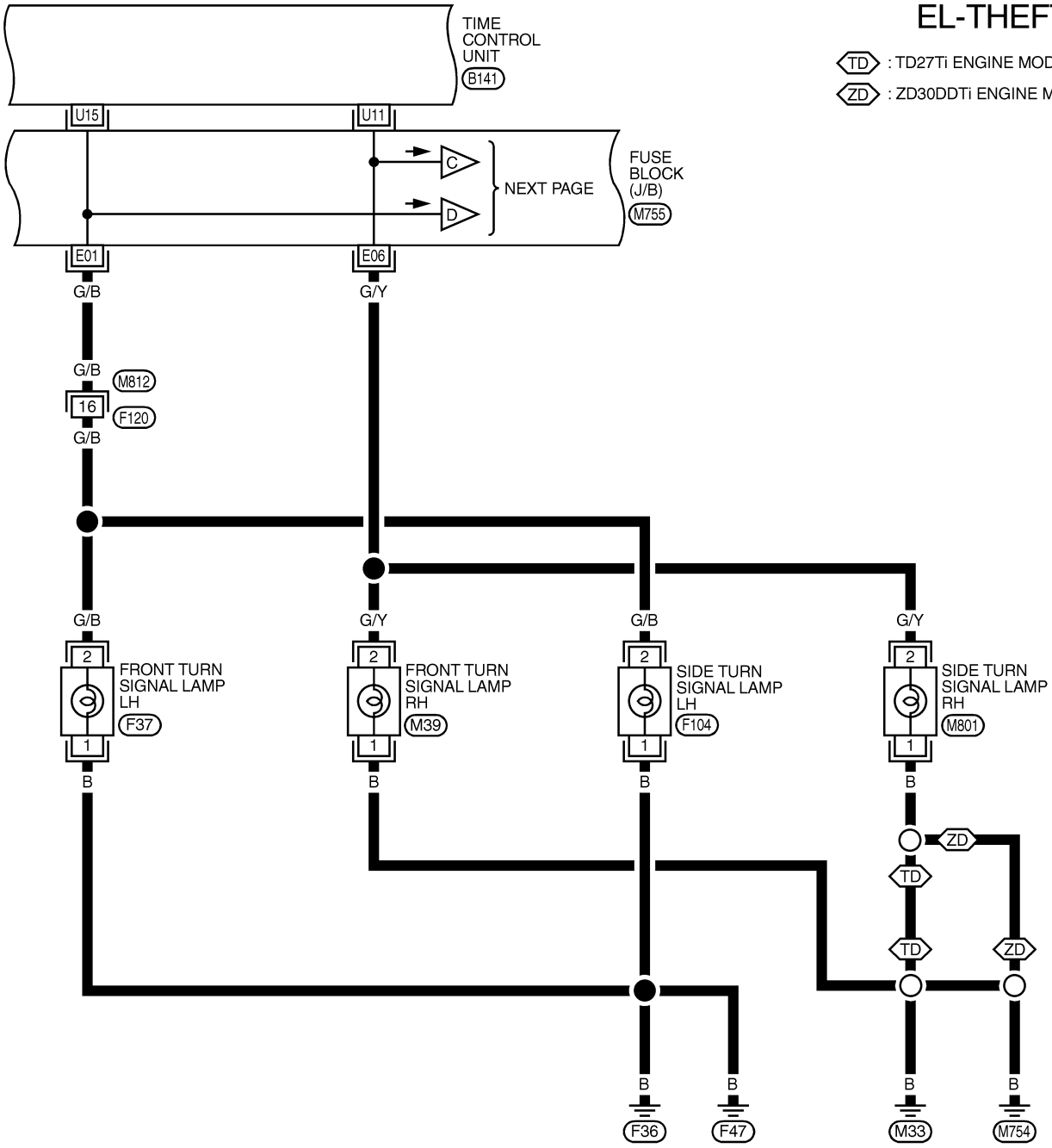
Wiring Diagram — THEFT — (Cont'd)

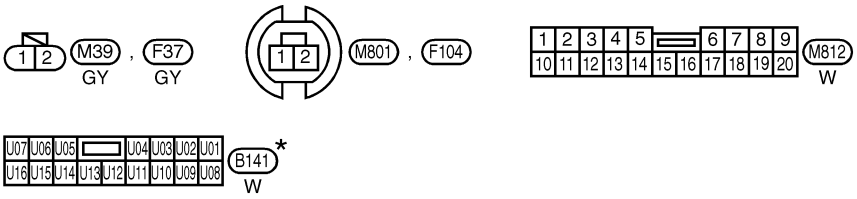
LHD MODELS

EL-THEFT-05

TD : TD27Ti ENGINE MODELS

ZD : ZD30DDTi ENGINE MODELS





★ : THIS CONNECTOR IS NOT SHOWN IN "HARNESS LAYOUT", EL SECTION.

REFER TO THE FOLLOWING.
M755 -FUSE BLOCK-JUNCTION BOX (J/B)

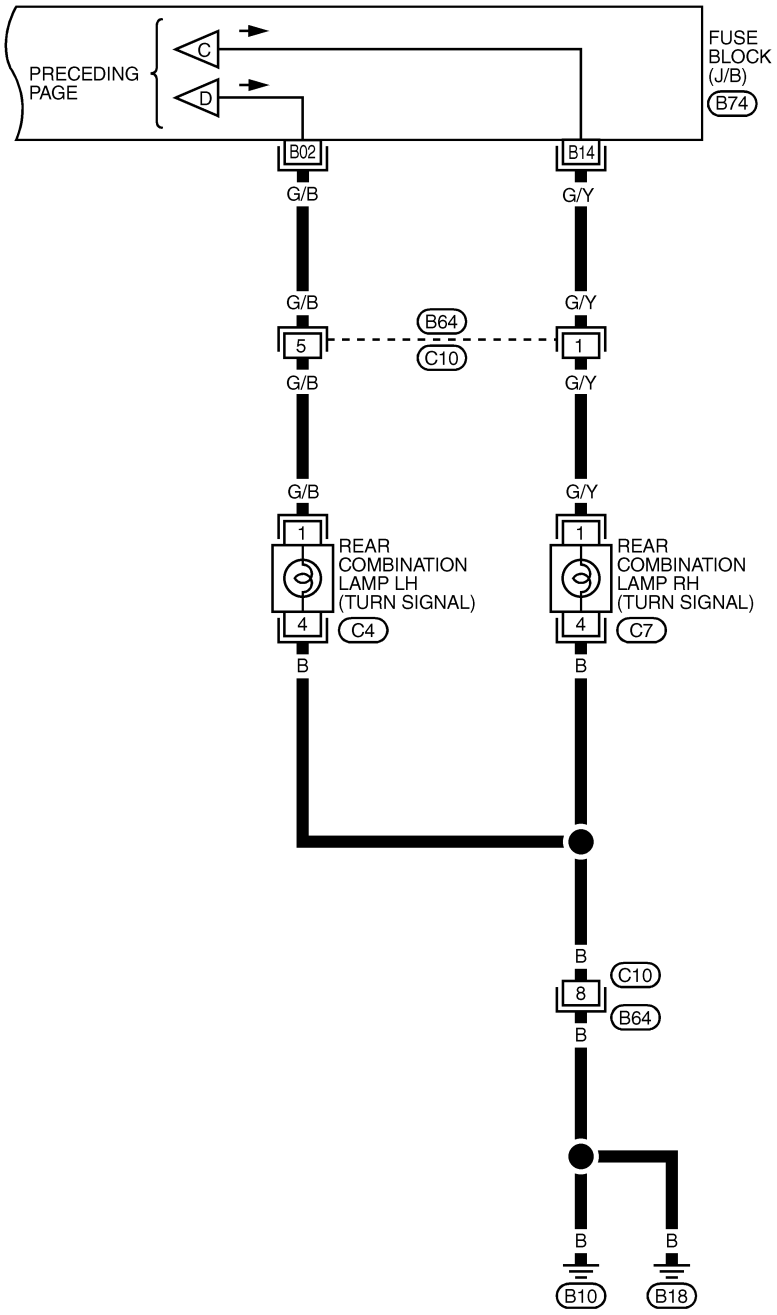
YEL175D

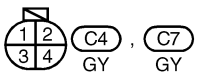
http://vnx.su/

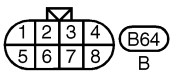
Wiring Diagram — THEFT — (Cont'd)

LHD MODELS

EL-THEFT-06







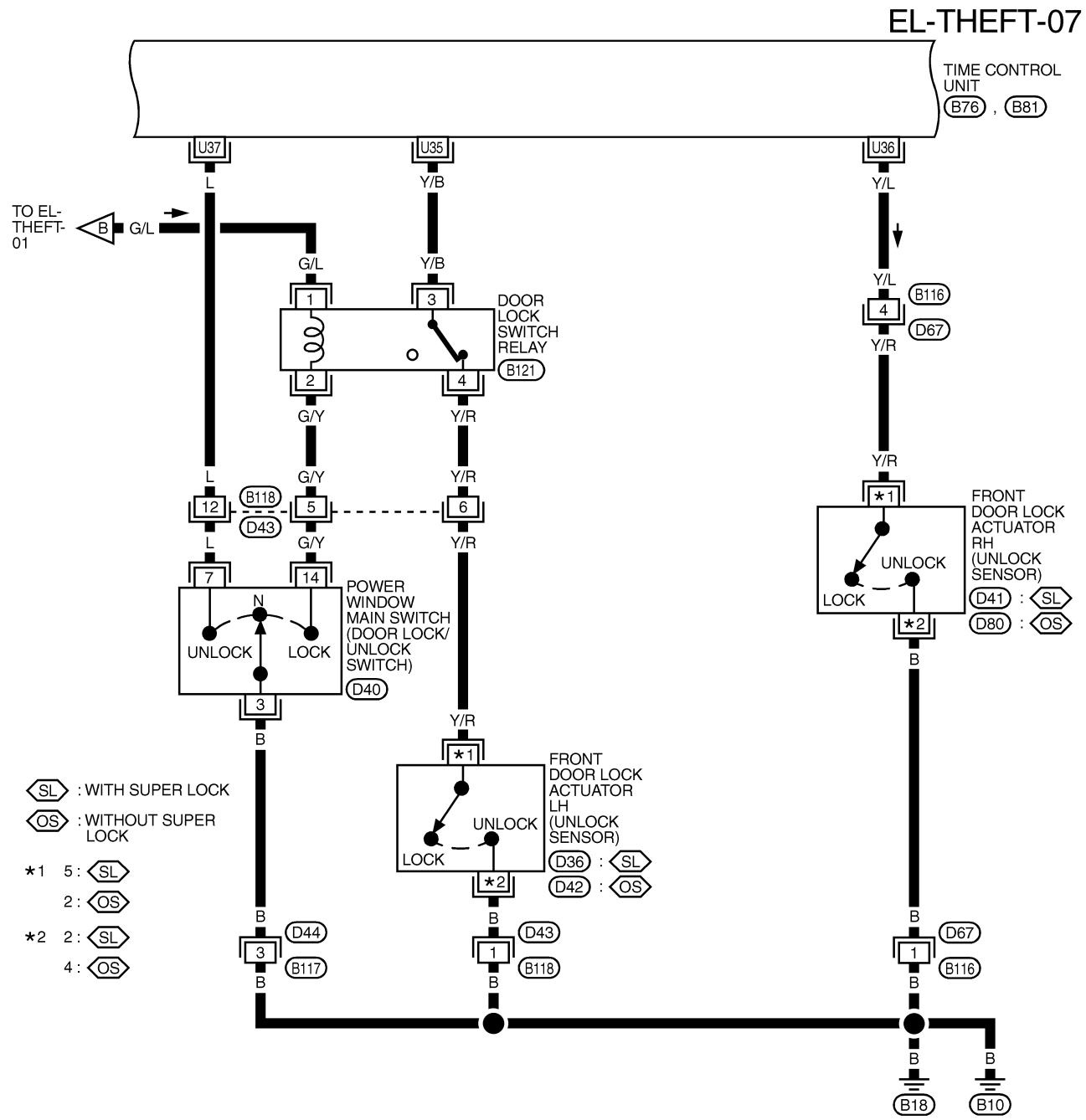
REFER TO THE FOLLOWING.
B74 -FUSE BLOCK-JUNCTION BOX (J/B)

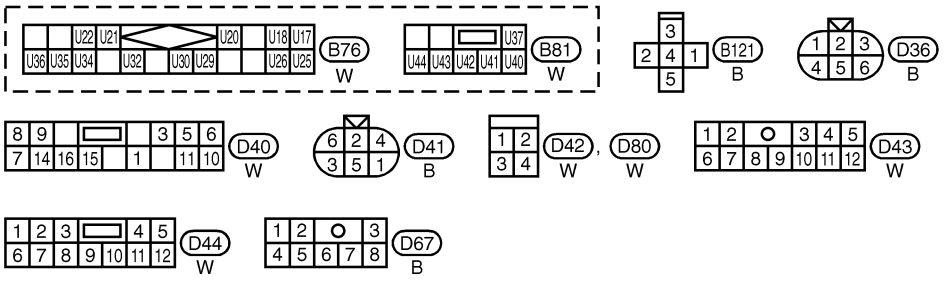
YEL176D

http://vnx.su/

Wiring Diagram — THEFT — (Cont'd)

LHD MODELS





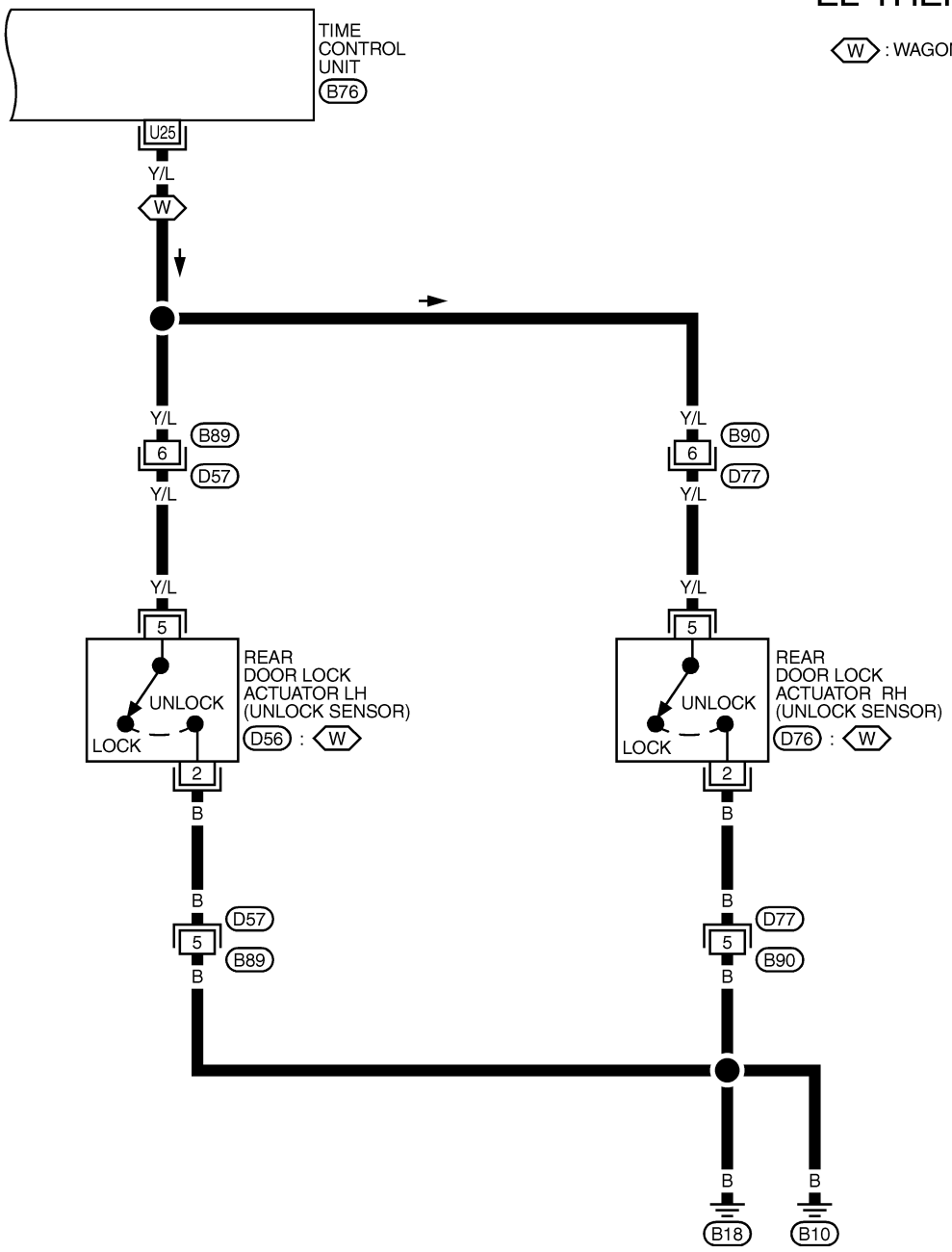
YEL756E

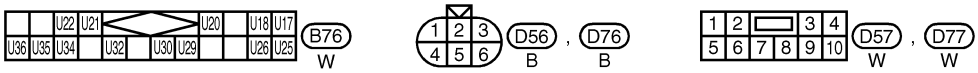
http://vnx.su/

Wiring Diagram — THEFT — (Cont'd)

LHD MODELS WITH SUPER LOCK

EL-THEFT-08





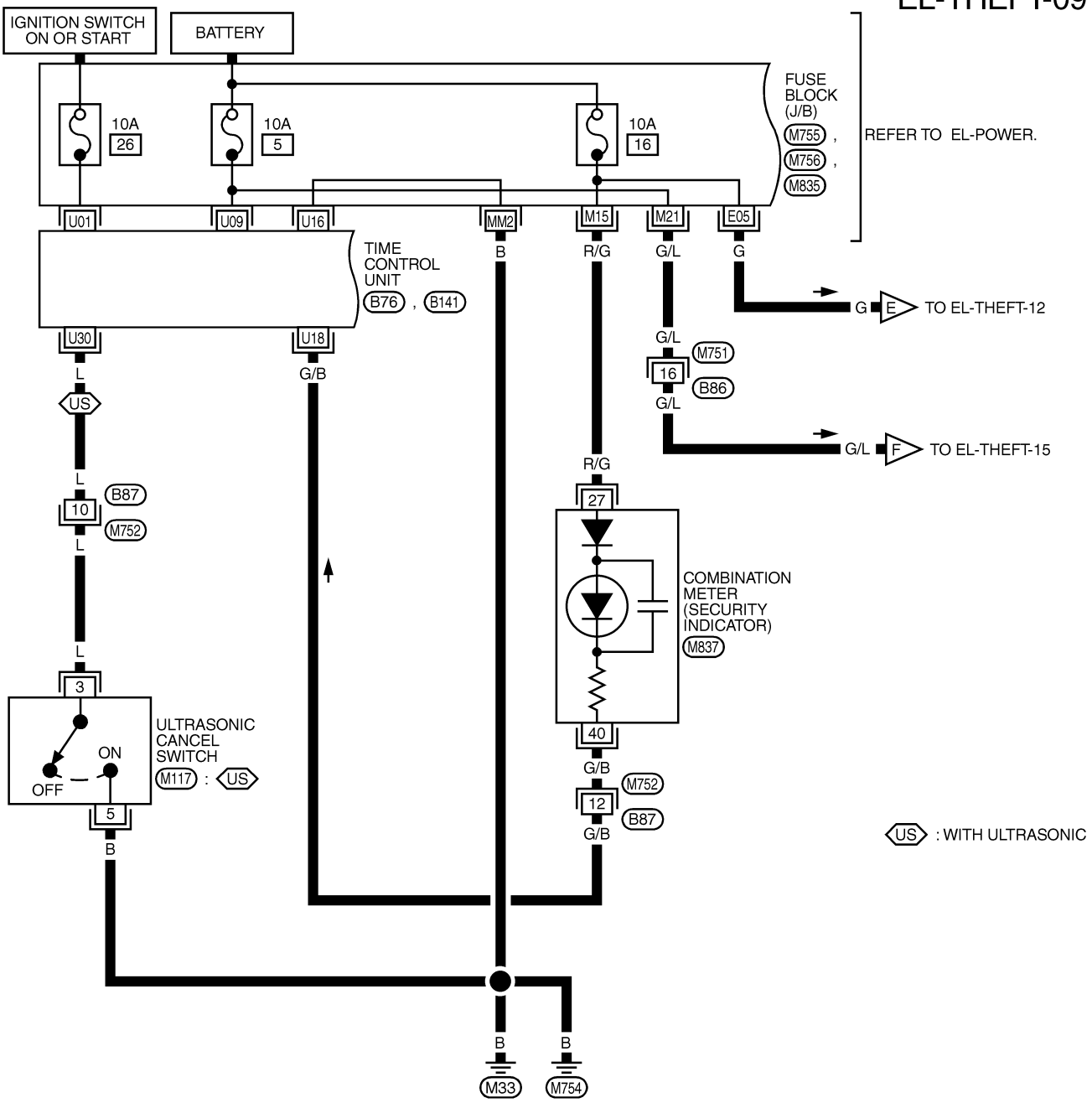
YEL178D

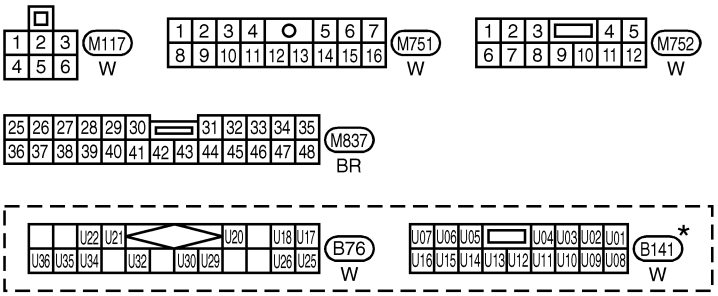
http://vnx.su/

Wiring Diagram — THEFT — (Cont'd)

RHD MODELS

EL-THEFT-09





* : THIS CONNECTOR IS NOT SHOWN IN "HARNESS LAYOUT", EL SECTION.

REFER TO THE FOLLOWING.
M755 , M756 , M835
-FUSE BLOCK-
JUNCTION BOX (J/B)

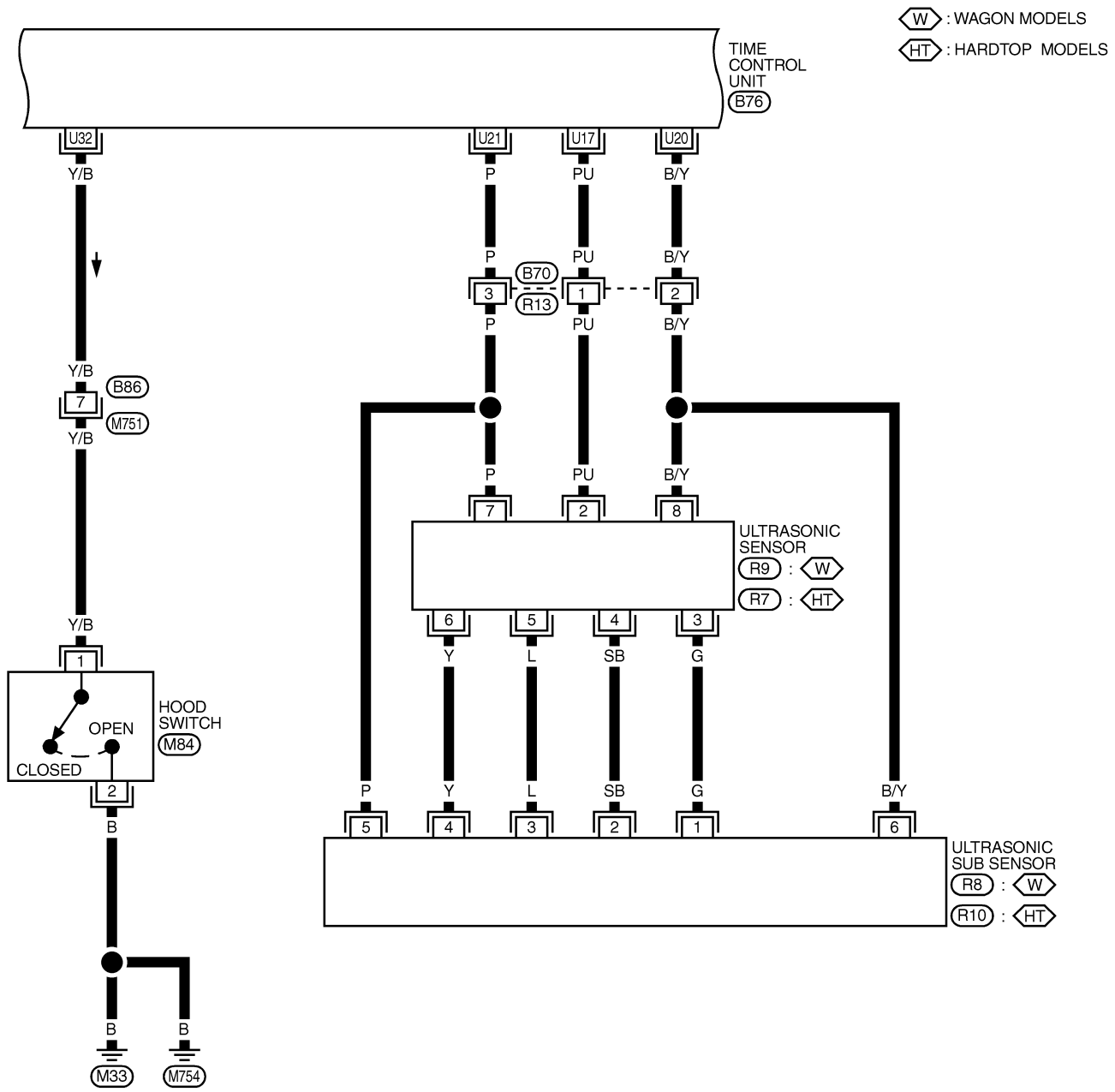
YEL757E

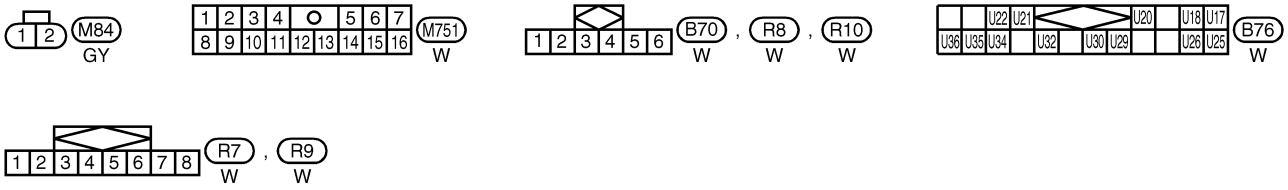
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Wiring Diagram — THEFT — (Cont'd)

RHD MODELS

EL-THEFT-10





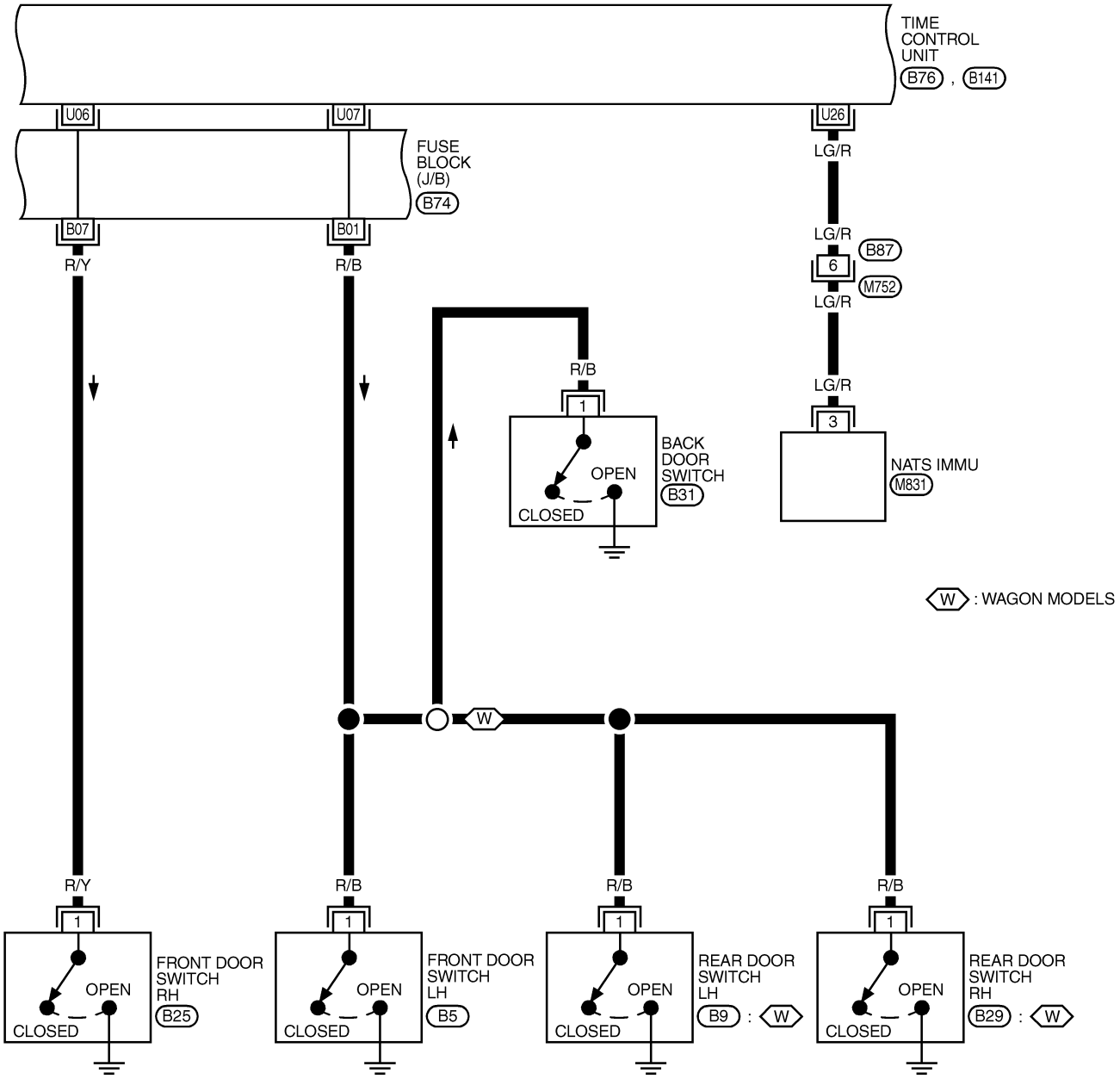
YEL180D

http://vnx.su/

Wiring Diagram — THEFT — (Cont'd)

RHD MODELS

EL-THEFT-11



M752 W

M831 W

B5 , B9 , B25 , B29 , B31 BR

B76 W

B141 W *

* : THIS CONNECTOR IS NOT SHOWN IN "HARNESS LAYOUT", EL SECTION.

REFER TO THE FOLLOWING.
B74 -FUSE BLOCK-JUNCTION BOX (J/B)

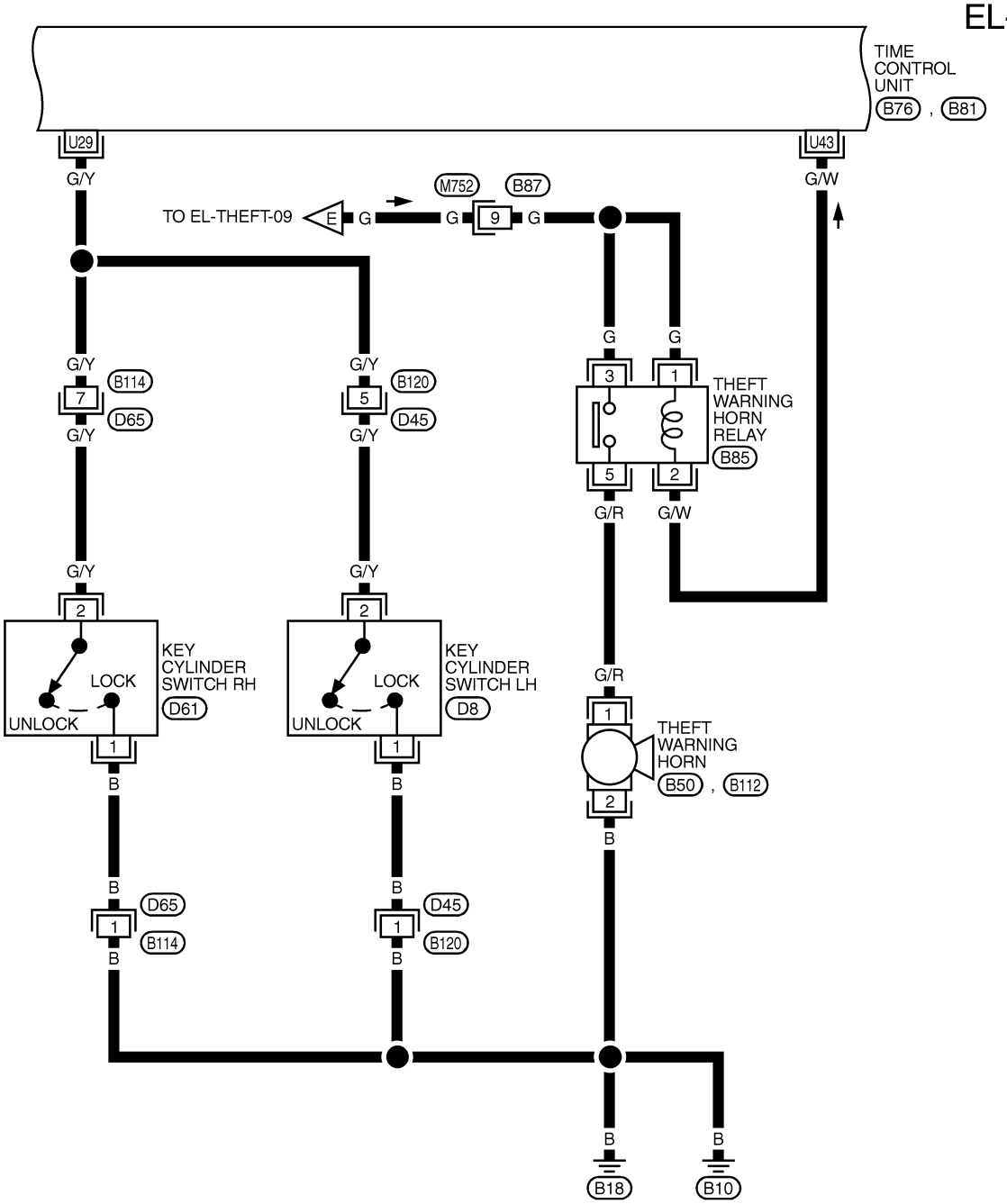
YEL181D

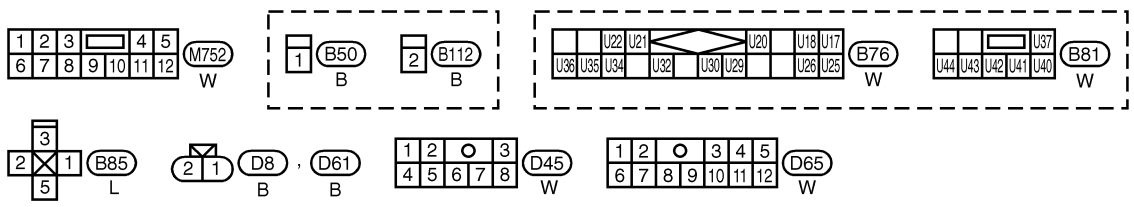
http://vnx.su/

Wiring Diagram — THEFT — (Cont'd)

RHD MODELS

EL-THEFT-12





YEL868E

http://vnx.su/

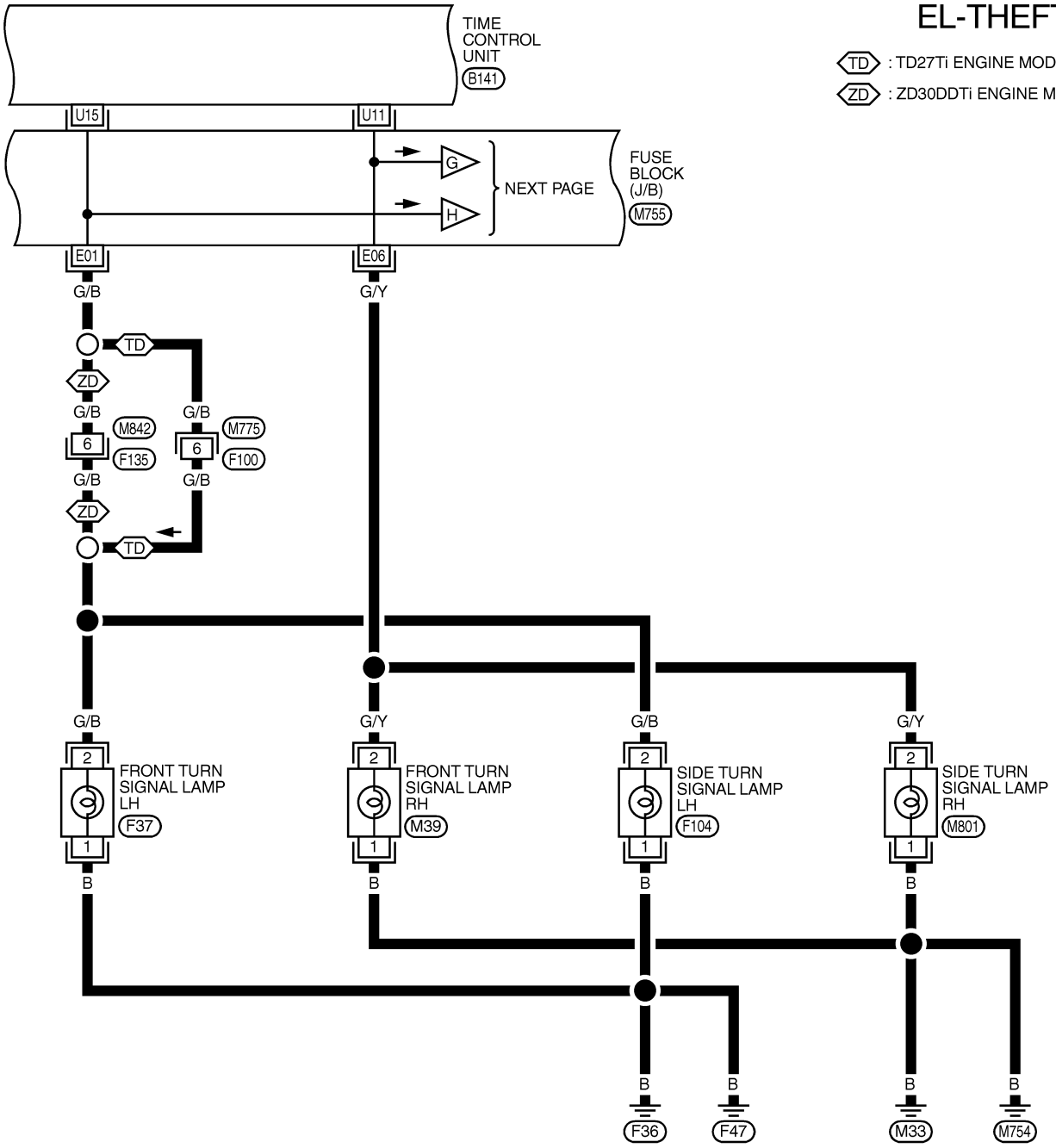
Wiring Diagram — THEFT — (Cont'd)

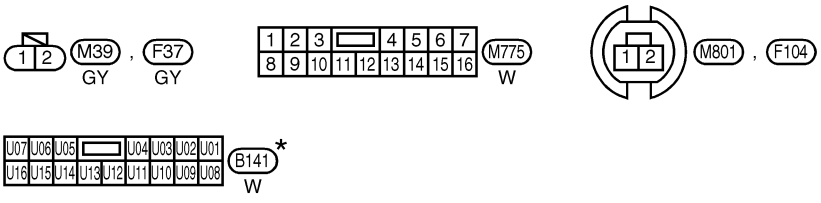
RHD MODELS

EL-THEFT-13

TD : TD27Ti ENGINE MODELS

ZD : ZD30DDTi ENGINE MODELS





* : THIS CONNECTOR IS NOT SHOWN IN "HARNESS LAYOUT", EL SECTION.

REFER TO THE FOLLOWING.

F135 -SUPER MULTIPLE JUNCTION (SMJ)

M755 -FUSE BLOCK-JUNCTION BOX (J/B)

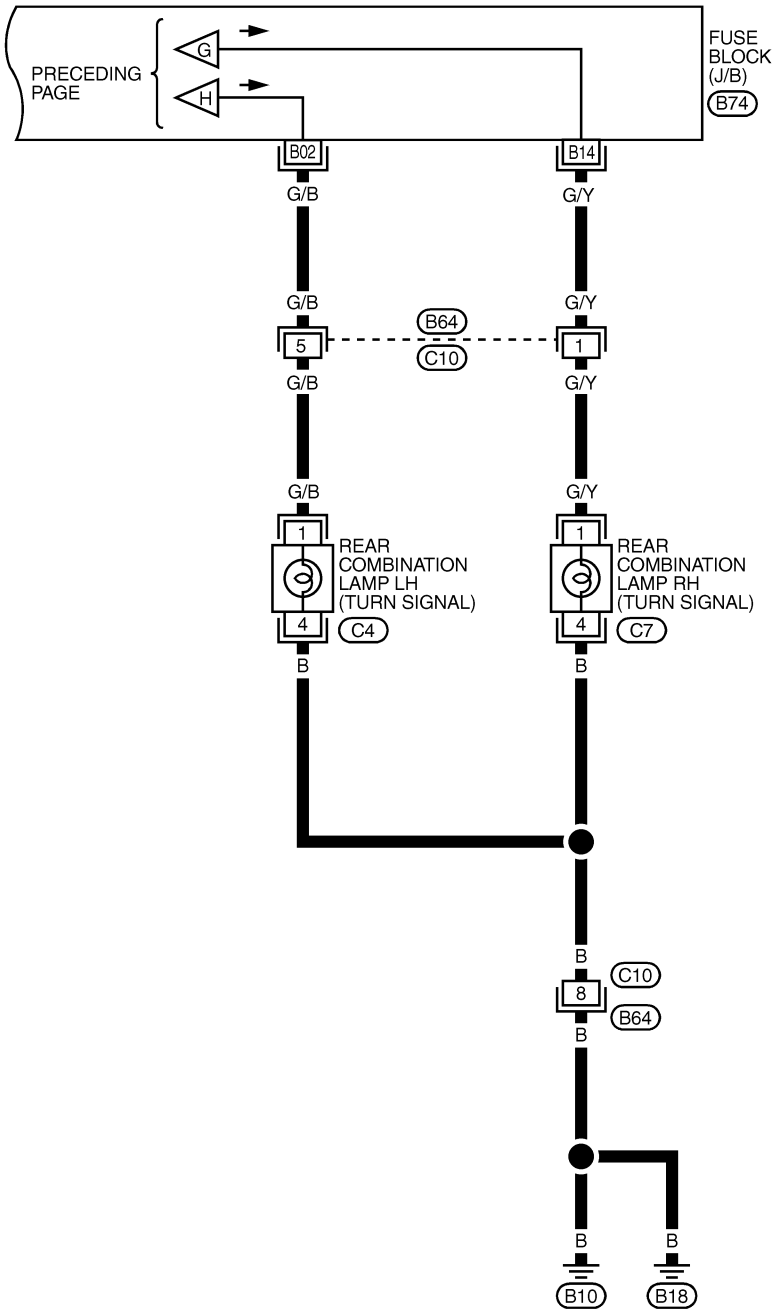
YEL183D

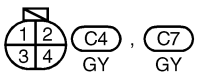
http://vnx.su/

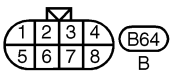
Wiring Diagram — THEFT — (Cont'd)

RHD MODELS

EL-THEFT-14







REFER TO THE FOLLOWING.
B74 -FUSE BLOCK-JUNCTION BOX (J/B)

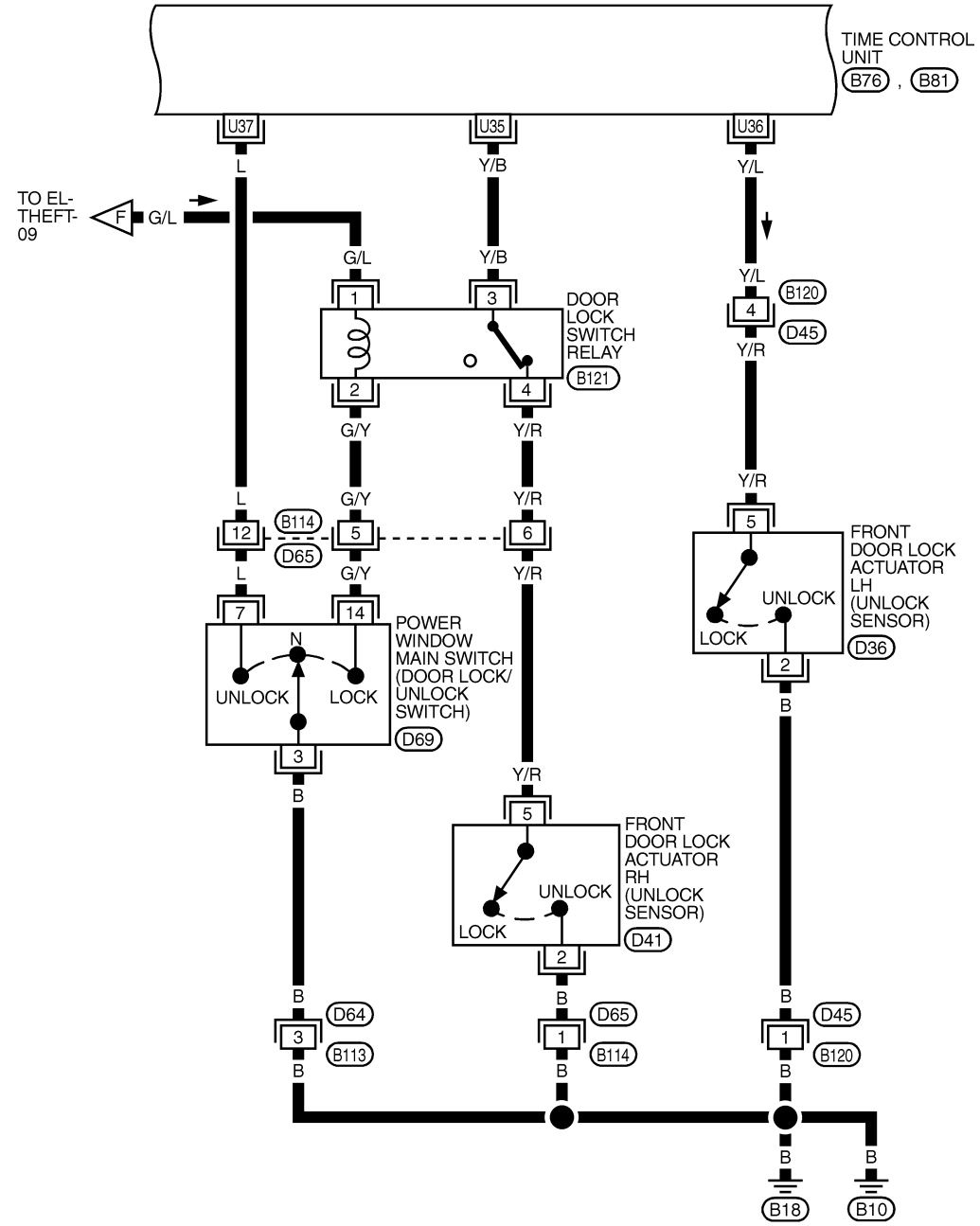
YEL184D

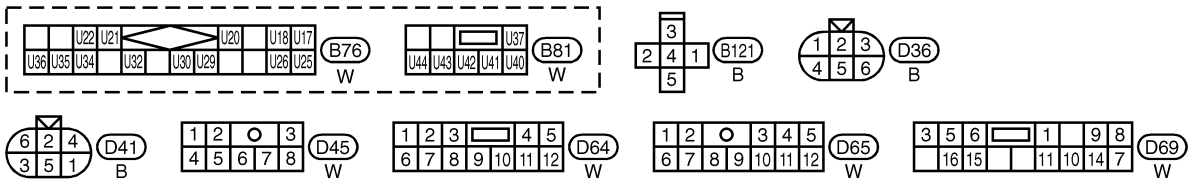
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Wiring Diagram — THEFT — (Cont'd)

RHD MODELS

EL-THEFT-15





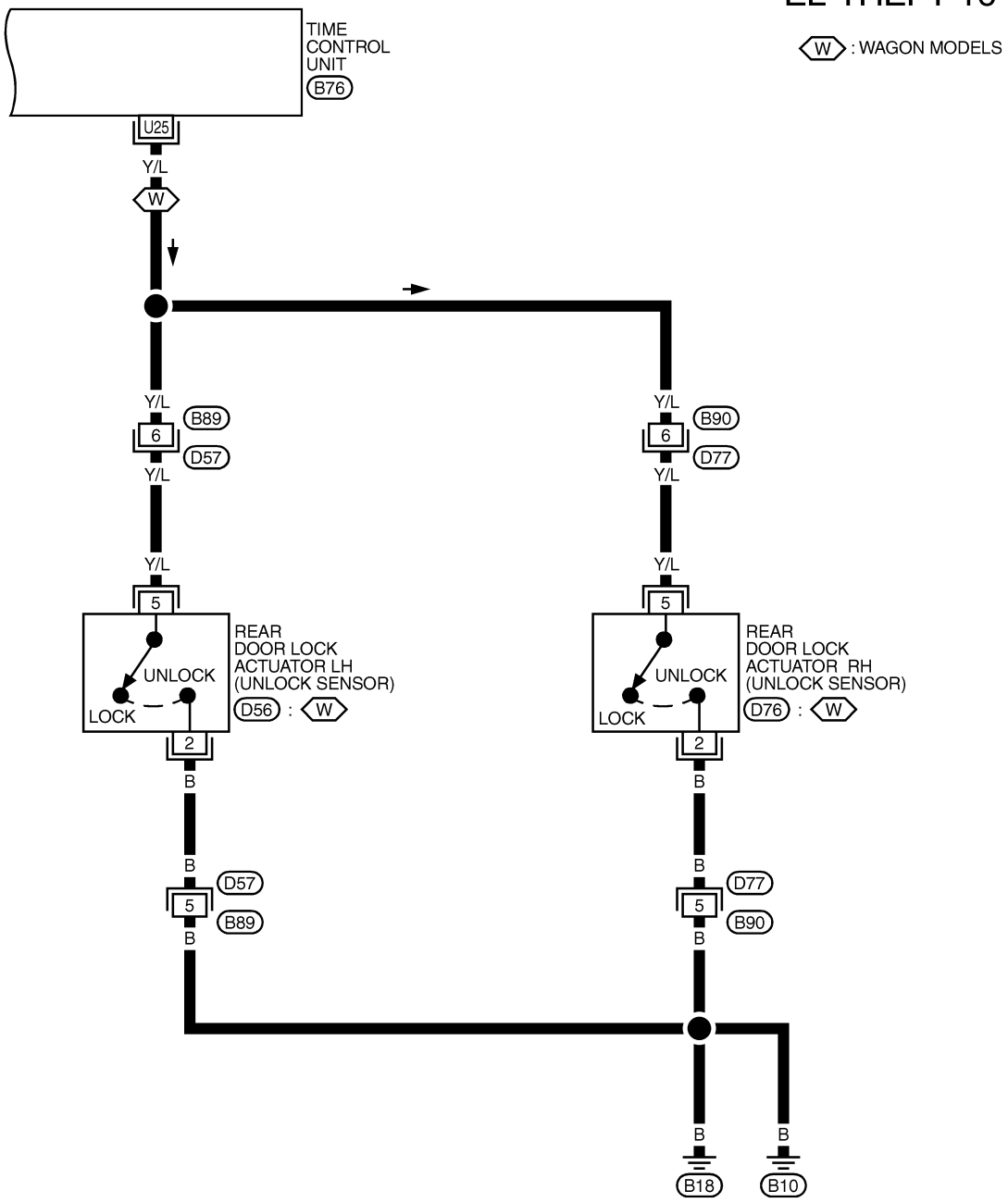
YEL758E

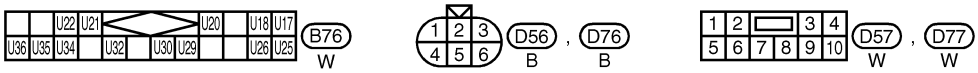
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Wiring Diagram — THEFT — (Cont'd)

RHD MODELS

EL-THEFT-16





YEL186D

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Trouble Diagnoses

Alarm Trigger Feedback

To verify the last three triggers that activated the theft warning system, the Time Control Unit (TCU) can be switched into Diagnostic Mode (see page EL-218 how to enter Diagnostic Mode).
Approximately 2 seconds after the TCU has finished flashing the hazard lamp to confirm that the Diagnostic Mode has been successfully entered, the TCU will generate a short beep indicating the trigger that will be displayed. A single beep means the most recent trigger, three beeps means the oldest trigger. Following each beep or group of beeps, the hazard lamp will flash to indicate the alarm trigger.

Source of Alarm Trigger	Number (of flashes)
Driver's door lock status switch	1
Passenger door lock status switch	2
Rear door lock status switch	3
Ignition line	4
Driver's door open switch	5
Other door open switch	6
Trunk or back door open switch	8
Hood switch	9
Ultrasonic sensors	10

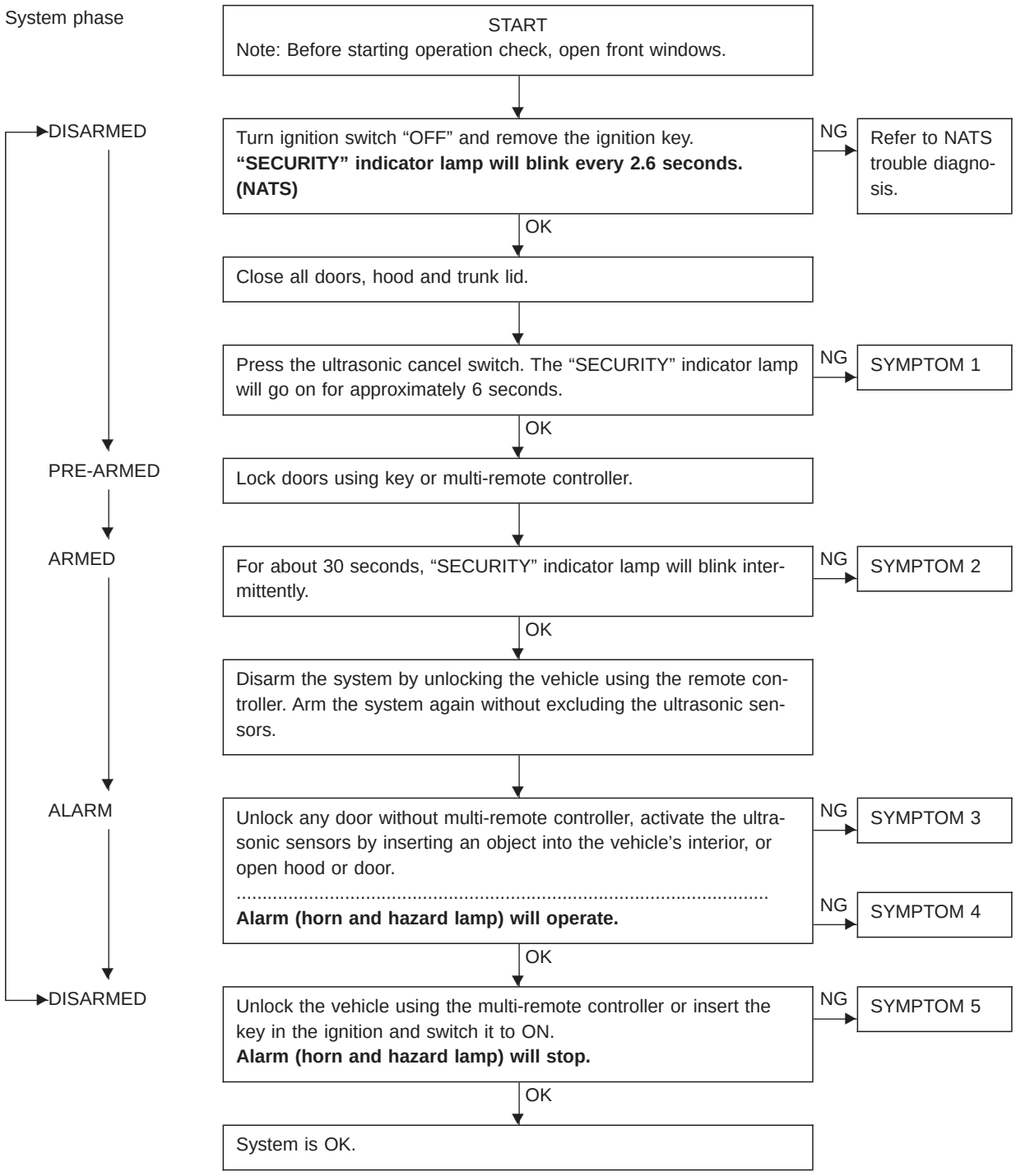
In case there have been no alarm triggers, there will be no indicator flashes between the audible signals. After completing the alarm trigger feedback, the TCU will enter Diagnostic Mode as described on page EL-218.
Before continuing trouble diagnoses on the next page, perform the checks as mentioned in the table on page EL-219.

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Trouble Diagnoses (Cont'd)

PRELIMINARY CHECK

The system operation is canceled by turning the ignition switch to "ON" at any step between START and ARMED in the following flow chart.



After performing preliminary check, go to "SYMPTOM CHART", EL-266.

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Trouble Diagnoses (Cont'd)

Before starting trouble diagnoses below, perform "PRELIMINARY CHECK", EL-265.

Symptom numbers in the symptom chart correspond with those of Preliminary check.

SYMPTOM CHART

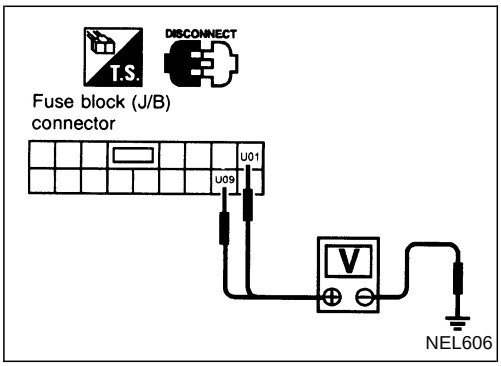
Procedure			—	Power supply and ground circuit check		Diagnostic procedure						—	—
REFERENCE PAGE			EL-265	EL-267	EL-267	EL-268	EL-270	EL-271	EL-272	EL-273	EL-274	EL-204	EL-222
SYMPTOM			Preliminary check	Power supply circuit check	Ground circuit check	Diagnostic Procedure 1 (Door, hood and back door switch check)	Diagnostic Procedure 2 (Security indicator lamp check)	Diagnostic Procedure 3 (Door unlock sensor check)	Diagnostic Procedure 4 (Door key cylinder switch check)	Diagnostic Procedure 5 (Theft warning horn alarm check)	Diagnostic procedure 6 (Hazard lamp alarm check)	Check "MULTI-REMOTE CONTROL" system.	Check "NATS (Nissan Anti-Theft system)".
1	Security indicator does not turn "ON" or blinking.		X	X	X		X						
2	Theft warning system cannot be set by...	All items	X	X	X	X		X					
		Door out side key	X	X	X				X				
		Multi-remote control	X	X	X							X	
3	*1 Theft warning system does not alarm when...	Any door is opened.	X	X	X	X							
		Any door is unlocked without using key or multi-remote controller	X	X	X			X					
4	Theft warning alarm does not activate.	All function	X	X	X	X		X					
		Horn alarm	X	X	X					X			
		Hazard lamp	X	X	X						X		
5	Theft warning system cannot be canceled by...	Turning the ignition ON *2	X	X	X								X
		Multi-remote controller	X	X	X							X	

X: Applicable
*1: Make sure the system is in the armed phase.
*2: Make sure the key is NATS registered.

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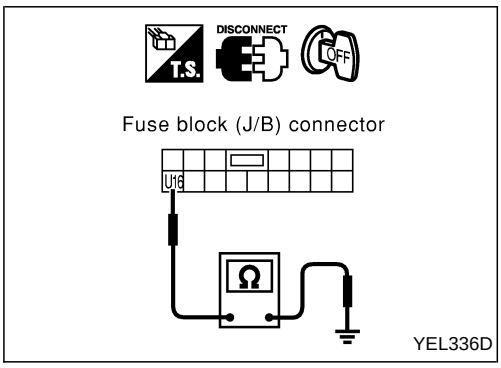
Trouble Diagnoses (Cont'd)

POWER SUPPLY AND GROUND CIRCUIT CHECK



Main power supply circuit check

Terminals		Ignition switch position		
⊕	⊖	OFF	ACC	ON
U09	Ground	Battery voltage	Battery voltage	Battery voltage
U01	Ground	0V	0V	Battery voltage



Ground circuit check

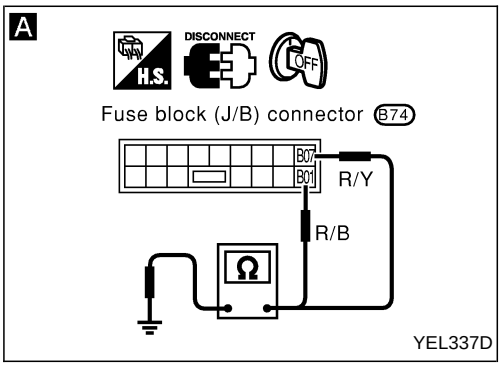
Terminals	Continuity
U16 - Ground	Yes

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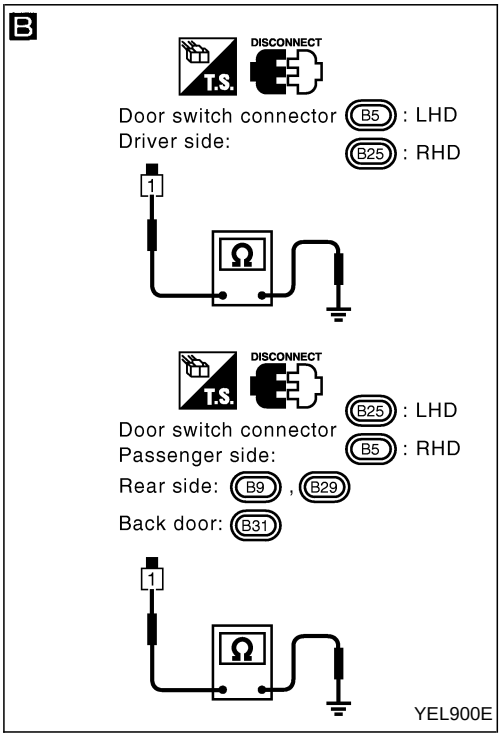
Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 1-(1)
(Door switch check)

A



B



A

CHECK DOOR SWITCH INPUT SIGNAL.
Remove time control unit from fuse block.
Note: Junction block (J/B) is very fragile. TCU should be removed carefully to avoid breaking the locking bars.
Check continuity between fuse block (J/B) and ground.

	Terminals	Condition	Continuity
Driver side door	B07	Opened	Yes
		Closed	No
Other door	B01	Opened	Yes
		Closed	No

OK → Door switch is OK.

NG ↓

B

CHECK DOOR SWITCH.
1. Disconnect door switch connector.
2. Check continuity between door switch terminals.

Terminals	Condition	Continuity
① - ground	Closed	No
	Open	Yes

NG → Replace door switch.

OK ↓

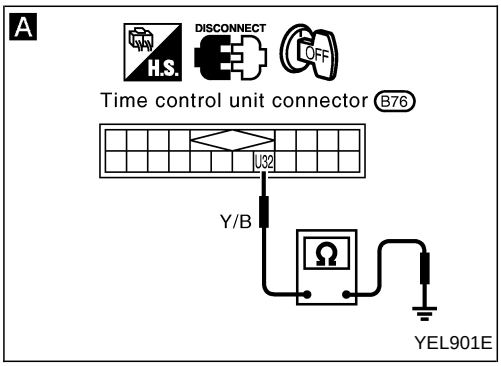
Check the following.
- Door switch ground condition
- Harness for open or short between control unit and door switch

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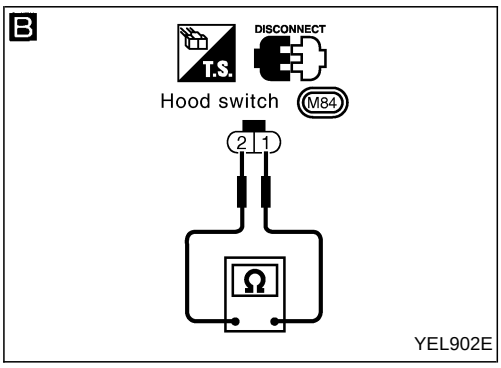
Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 1-(2)
(Hood switch check)

A



B



A

CHECK HOOD SWITCH INPUT SIGNAL.
Remove time control unit from fuse block.
Note: Junction block (J/B) is very fragile. TCU should be removed carefully to avoid breaking the locking bars.
Check continuity between control unit terminal U32 and ground.

Condition	Continuity
Hood is open.	Yes
Hood is closed.	No

OK → Hood switch is OK.

NG ↓

B

CHECK HOOD SWITCH.
1. Disconnect hood switch connector.
2. Check continuity between hood switch terminals.

Terminals	Condition	Continuity
① - ②	Pushed	No
	Released	Yes

NG → Replace hood switch.

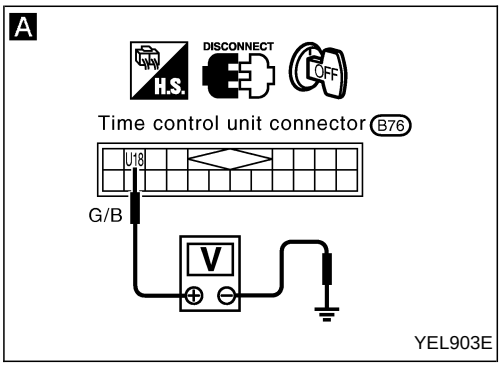
OK ↓

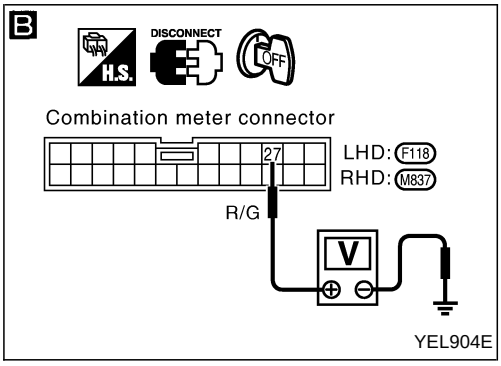
Check the following.
- Hood switch ground circuit
- Harness for open or short between control unit and hood switch

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Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 2 (Security indicator check)





A

CHECK INDICATOR LAMP OUTPUT SIGNAL.
1. Remove time control unit from fuse block.
   Note: Junction block (J/B) is very fragile. TCU should be removed carefully to avoid breaking the locking bars.
2. Check voltage between time control unit terminal (U18) and ground.
   Battery voltage should exist.

OK → Security indicator lamp is OK.

NG ↓

CHECK INDICATOR LAMP.

NG → Replace indicator lamp.

OK ↓

B

CHECK POWER SUPPLY CIRCUIT FOR INDICATOR.
1. Disconnect combination meter connector.
2. Check voltage between combination meter terminal (27) and ground.
   Battery voltage should exist.

NG → Check the following:
- 10A fuse [No. 16 , located in the fuse block (J/B)]
- Harness for open or short between combination meter and fuse

OK ↓

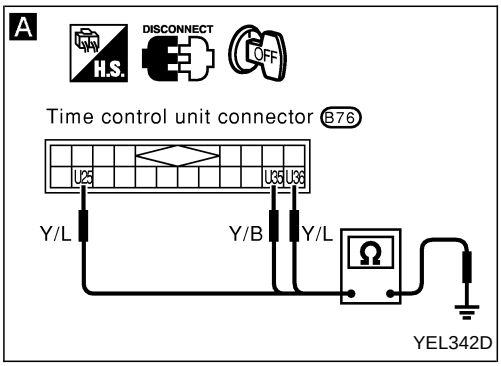
Check harness for open or short between combination meter connector and time control unit.

http://vnx.su/

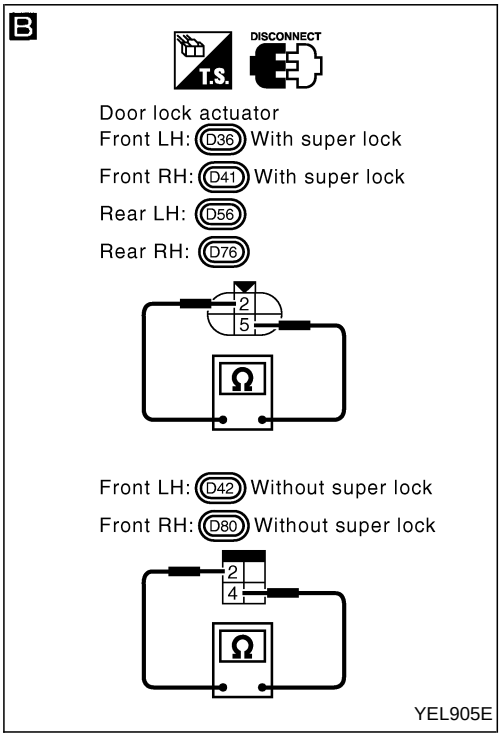
Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 3 (Door unlock sensor check)

A



B



A

CHECK DOOR UNLOCK SENSOR INPUT SIGNAL.
Remove time control unit from fuse block.
Note: Junction block (J/B) is very fragile. TCU should be removed carefully to avoid breaking the locking bars.
Check continuity between time control unit terminals ㉕, ㉟, ㊱ and ground.

	Terminals		Condition	Continuity
	⊕	⊖		
Driver side door	U35	Ground	Locked	No
			Unlocked	Yes
Passenger side door	U36	Ground	Locked	No
			Unlocked	Yes
Rear door	U25	Ground	Locked	No
			Unlocked	Yes

OK → Door unlock sensor is OK.

NG ↓

B

CHECK DOOR UNLOCK SENSOR.
1. Disconnect door unlock sensor connector.
2. Check continuity between door unlock sensor terminals.

	Terminals	Condition	Continuity
Front with super lock and rear	②-⑤	Locked	No
		Unlocked	Yes
Front without super lock	②-④	Locked	No
		Unlocked	Yes

NG → Replace door unlock sensor.

OK ↓

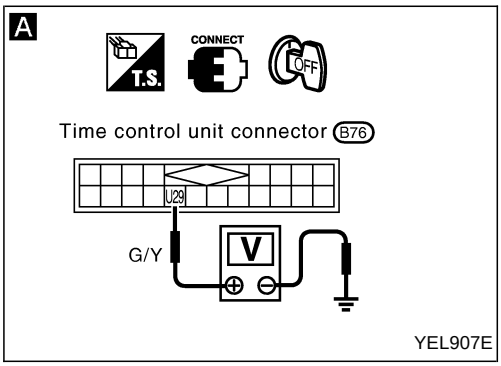
Check the following:
- Door unlock sensor ground circuit
- Harness for open or short between control unit and door unlock sensor

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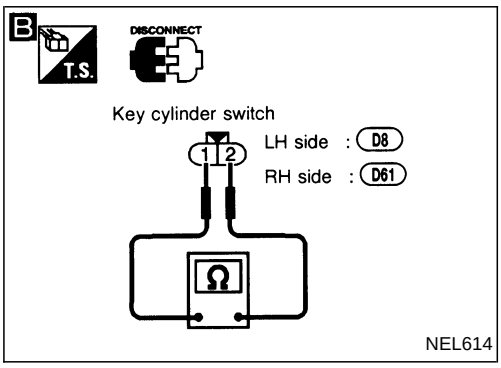
Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 4
(Door key cylinder switch check)

A



B



A

CHECK DOOR KEY CYLINDER SWITCH INPUT SIGNAL (LOCK SIGNAL).
Check voltage between time control unit connector terminal (U29) and ground.

Key cylinder switch operation	Voltage (V)
Lock	0
Unlock/neutral	5

OK → Door key cylinder switch is OK.

NG ↓

B

CHECK DOOR KEY CYLINDER SWITCH.
1. Disconnect door key cylinder switch connector.
2. Check continuity between door key cylinder switch terminals.

Terminals	Key position	Continuity
①- ②	Unlock/neutral	No
	Lock	Yes

NG → Replace key cylinder switch.

OK ↓

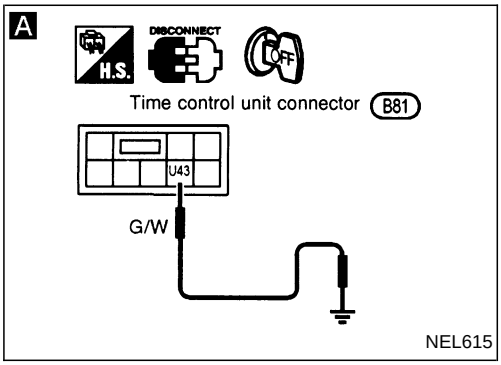
Check the following:
- Harness connectors between key cylinder switch and time control unit
- Door key cylinder switch ground circuit
- Harness for open or short-circuit between time control unit and door key cylinder.

http://vnx.su/

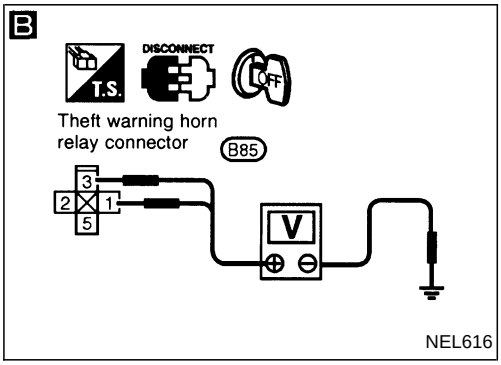
Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 5
(Theft warning horn alarm check)

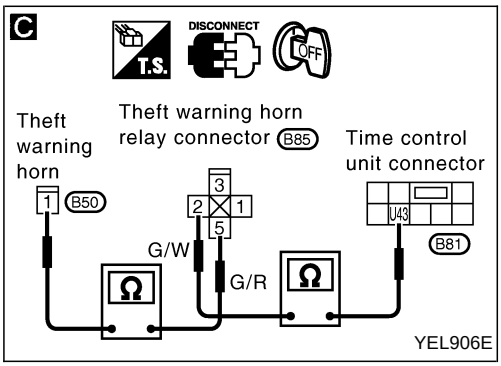
A



B



C



A

CHECK THEFT WARNING HORN ALARM OPERATION.
1. Remove time control unit from fuse block.
   Note: Junction block (J/B) is very fragile. TCU should be removed carefully to avoid breaking the locking bars.
2. Apply ground to time control unit connector terminal (U43) .

Does horn alarm activate?

Yes → Theft warning horn is OK.

No ↓

Check theft warning horn relay.

NG → Replace.

OK ↓

B

CHECK POWER SUPPLY FOR THEFT WARNING HORN RELAY.
1. Disconnect theft warning horn relay connector.
2. Check voltage between terminal ① and ground, and ③ and ground.

Battery voltage should exist.

NG → Check the following:
- 10A fuse (No. 16, located in the fuse and fusible link box)
- Harness for open or short between theft warning horn relay and fuse

OK ↓

C

CHECK THEFT WARNING HORN RELAY CIRCUIT.
1. Disconnect theft warning horn relay connector.
2. Check continuity between theft warning horn relay ② and time control unit terminal (U43).
   Continuity should exist.
3. Check continuity between theft warning horn relay ⑤ and theft warning horn connector terminal 1.
   Continuity should exist.

NG → Repair harness.

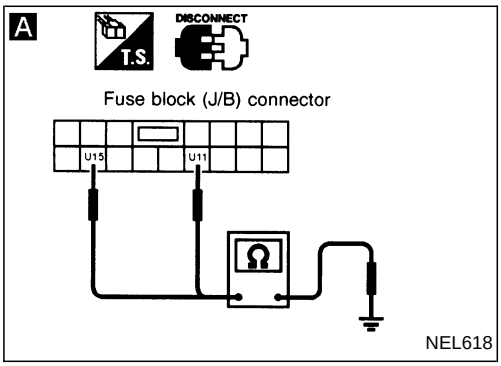
OK ↓

Check harness for open between theft warning horn and ground.

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Trouble Diagnoses (Cont'd)

DIAGNOSTIC PROCEDURE 6 (Hazard lamp alarm check)



Push hazard switch to ON.
Check hazard lamp operation.

OK → Replace time control unit.

NG ↓

A

1. Remove time control unit from fuse block (J/B).
   Note: Junction block (J/B) is very fragile. TCU should be removed carefully to avoid breaking the locking bars.
2. Check harness continuity between fuse block (J/B) terminals (U11) and (U15) and ground.
   Continuity should exist.

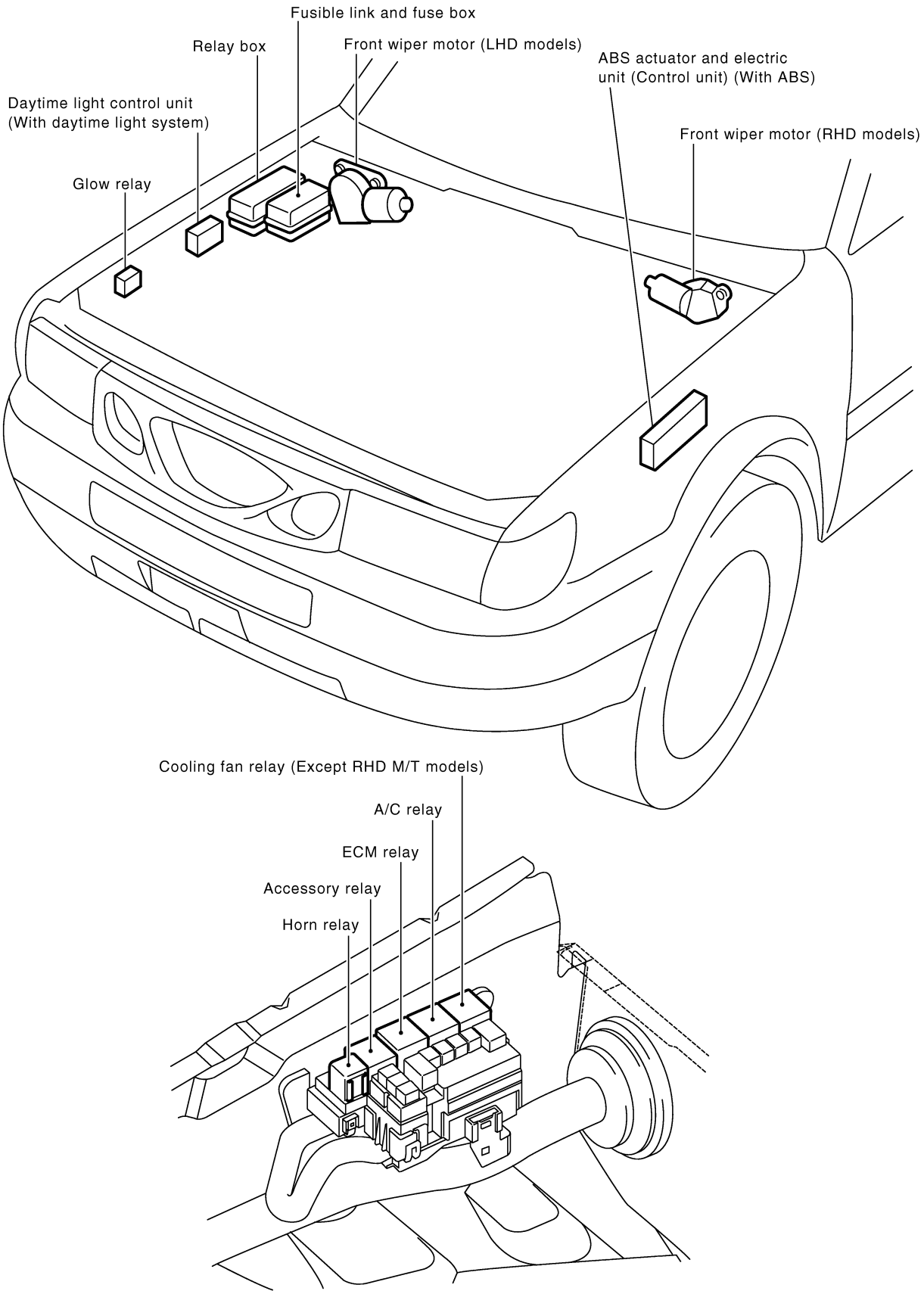
NG → Check the following.
- Harness connectors
- Fuse block (J/B)
- Turn signal lamps
- Harness between time control unit and turn signal lamps, turn signal lamps and ground.

OK ↓

Replace time control unit.

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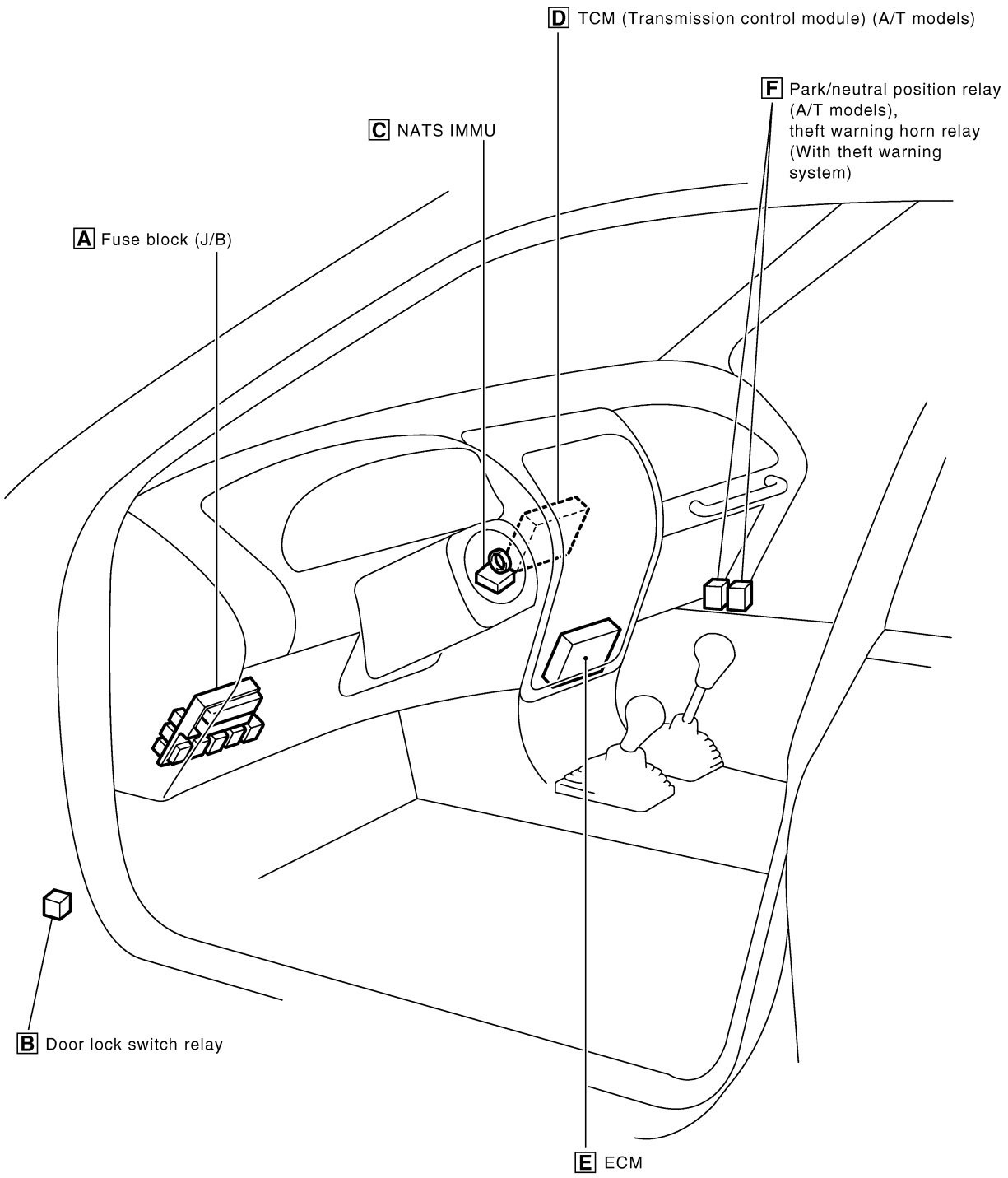
Engine Compartment



YEL842E

http://vnx.su/

Passenger Compartment/LHD Models

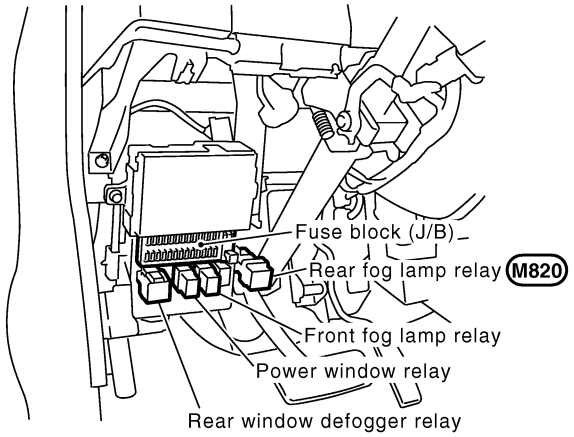


YEL843E

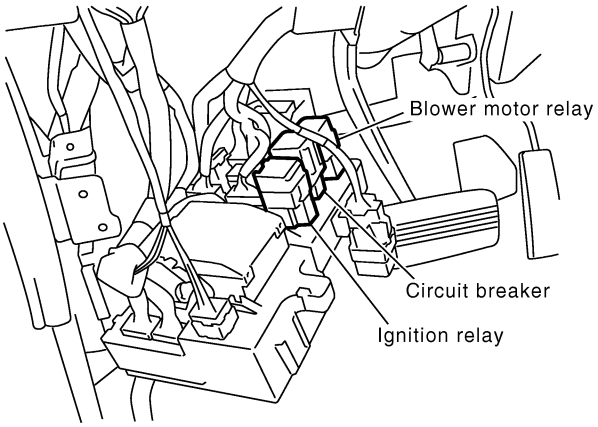
http://vnx.su/

Passenger Compartment/LHD Models (Cont'd)

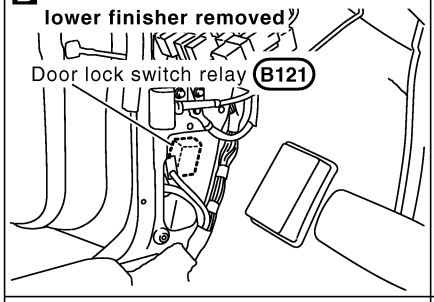
A Dash side LH



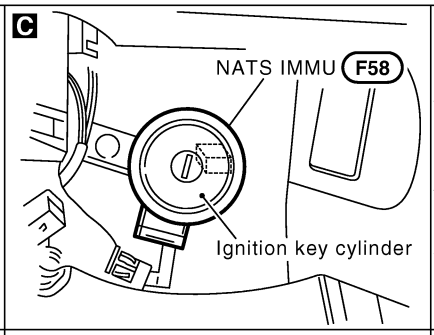
In back of the fuse block (J/B)



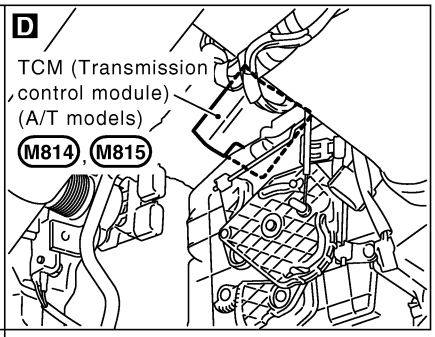
B Driver side view with dash side lower finisher removed



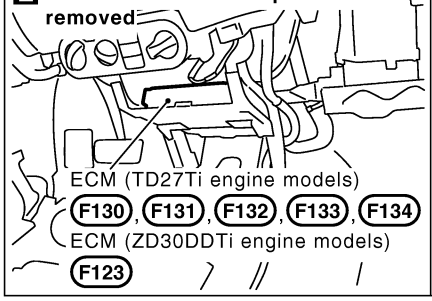
C



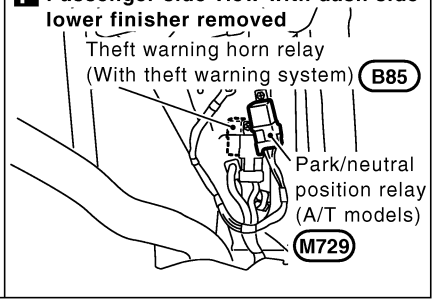
D



E View with instrument panel center removed



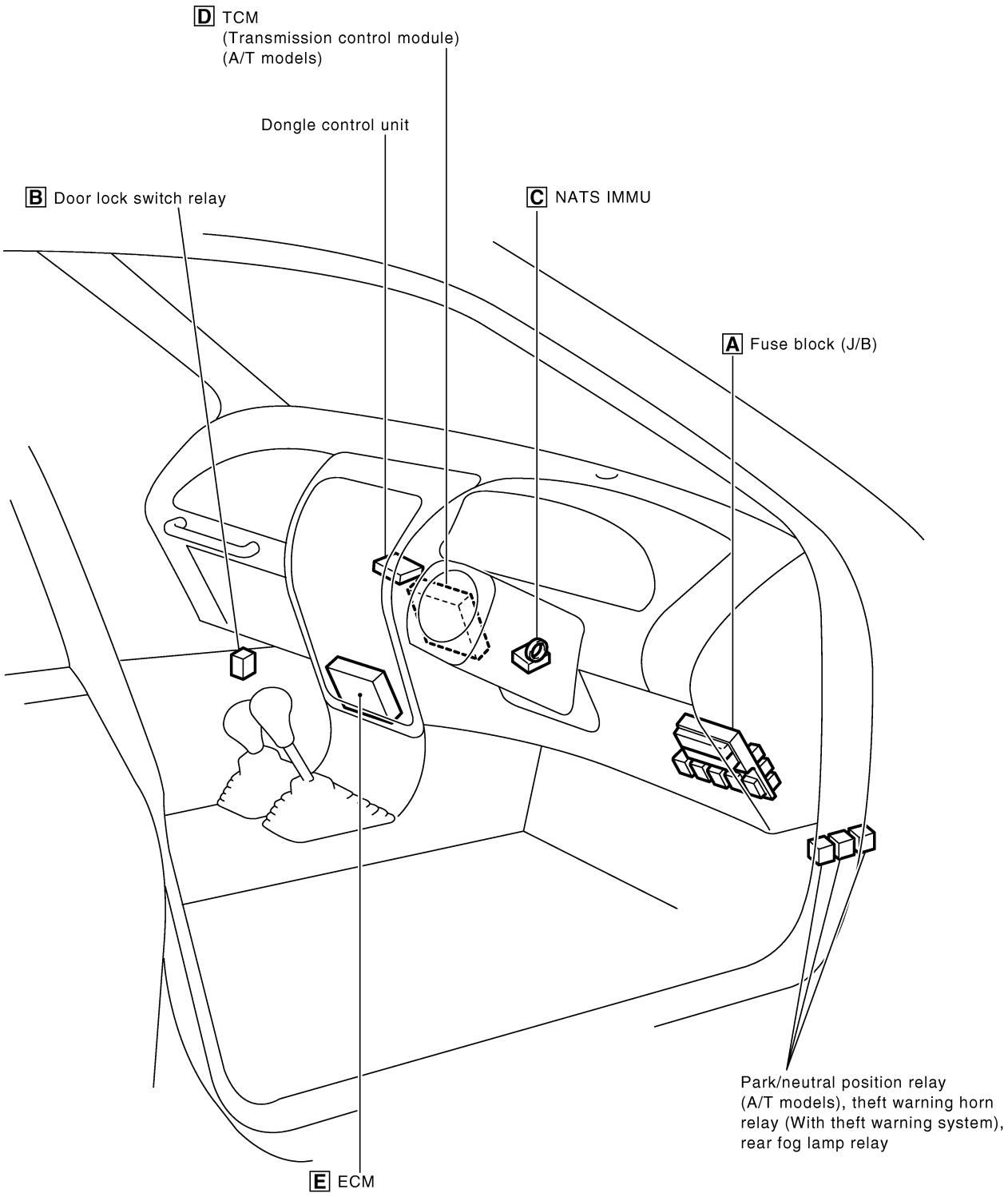
F Passenger side view with dash side lower finisher removed



YEL844E

http://vnx.su/

Passenger Compartment/RHD Models

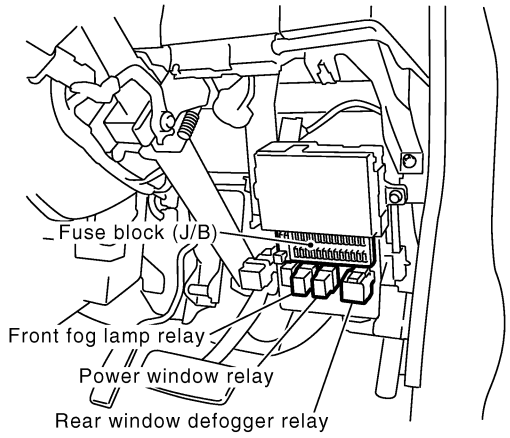


YEL845E

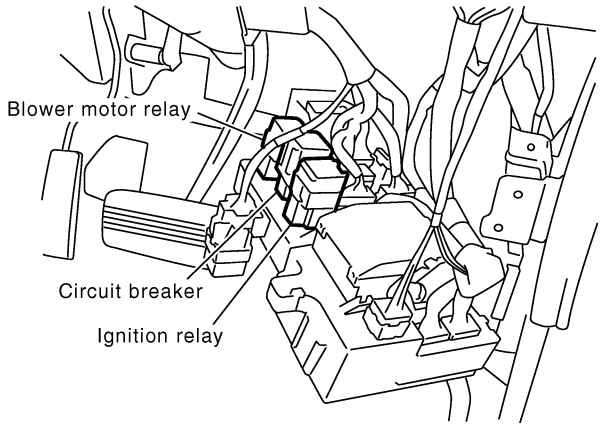
http://vnx.su/

Passenger Compartment/RHD Models (Cont'd)

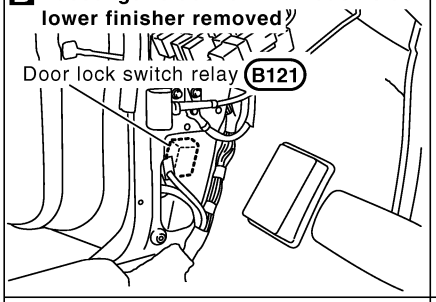
A Dash side RH



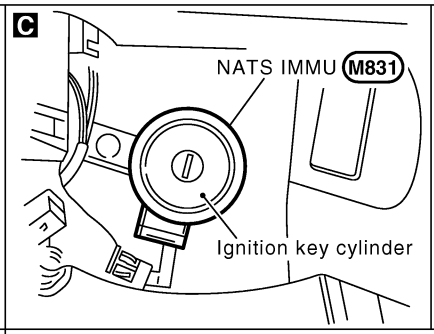
In back of the fuse block (J/B)



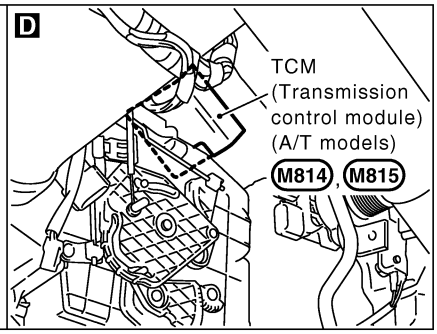
B Passenger side view with dash side lower finisher removed



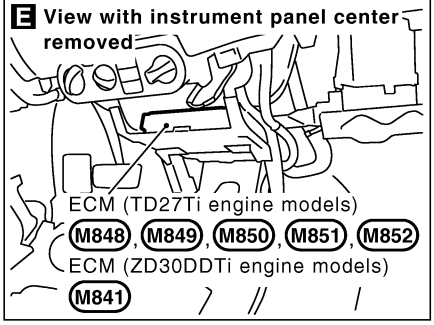
C



D



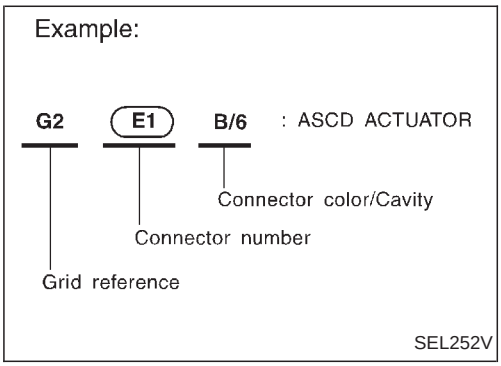
E View with instrument panel center removed



YEL846E

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How to Read Harness Layout



The following Harness Layouts use a map style grid to help locate connectors on the drawings:
- Main Harness (Engine Compartment, Passenger Compartment)
- EFC Harness (Engine Compartment, Passenger Compartment)
- Body Harness

TO USE THE GRID REFERENCE

1. Find the desired connector number on the connector list.
2. Find the grid reference.
3. On the drawing, find the crossing of the grid reference letter column and number row.
4. Find the connector number in the crossing zone.
5. Follow the line (if used) to the connector.

CONNECTOR SYMBOL

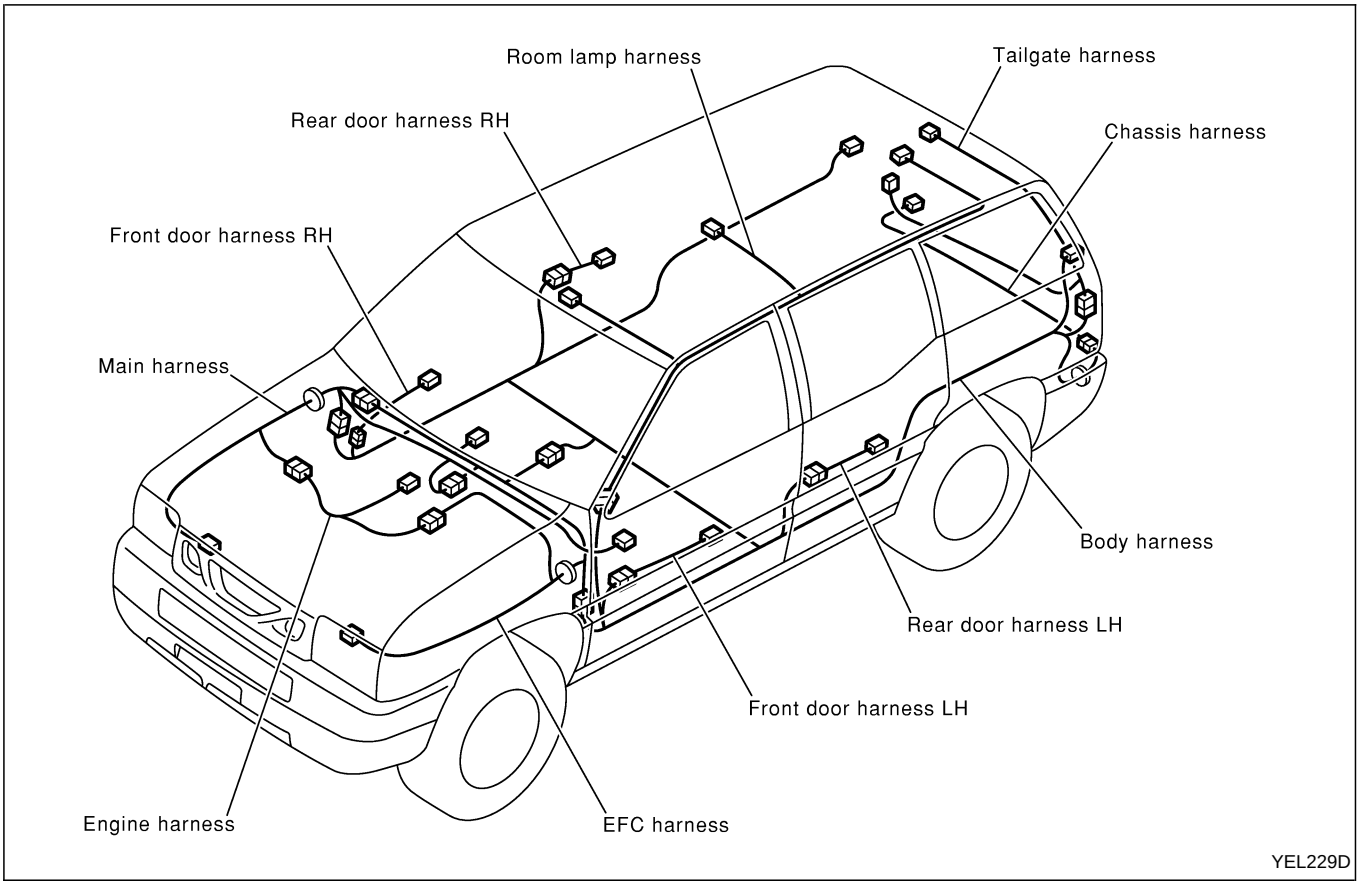
Main symbols of connector (in Harness Layout) are indicated in the below.

Connector type	Water proof type		Standard type	
	Male	Female	Male	Female
• Cavity: Less than 4 • Relay connector				
• Cavity: From 5 to 8				
• Cavity: More than 9				
• Ground terminal etc.	—			

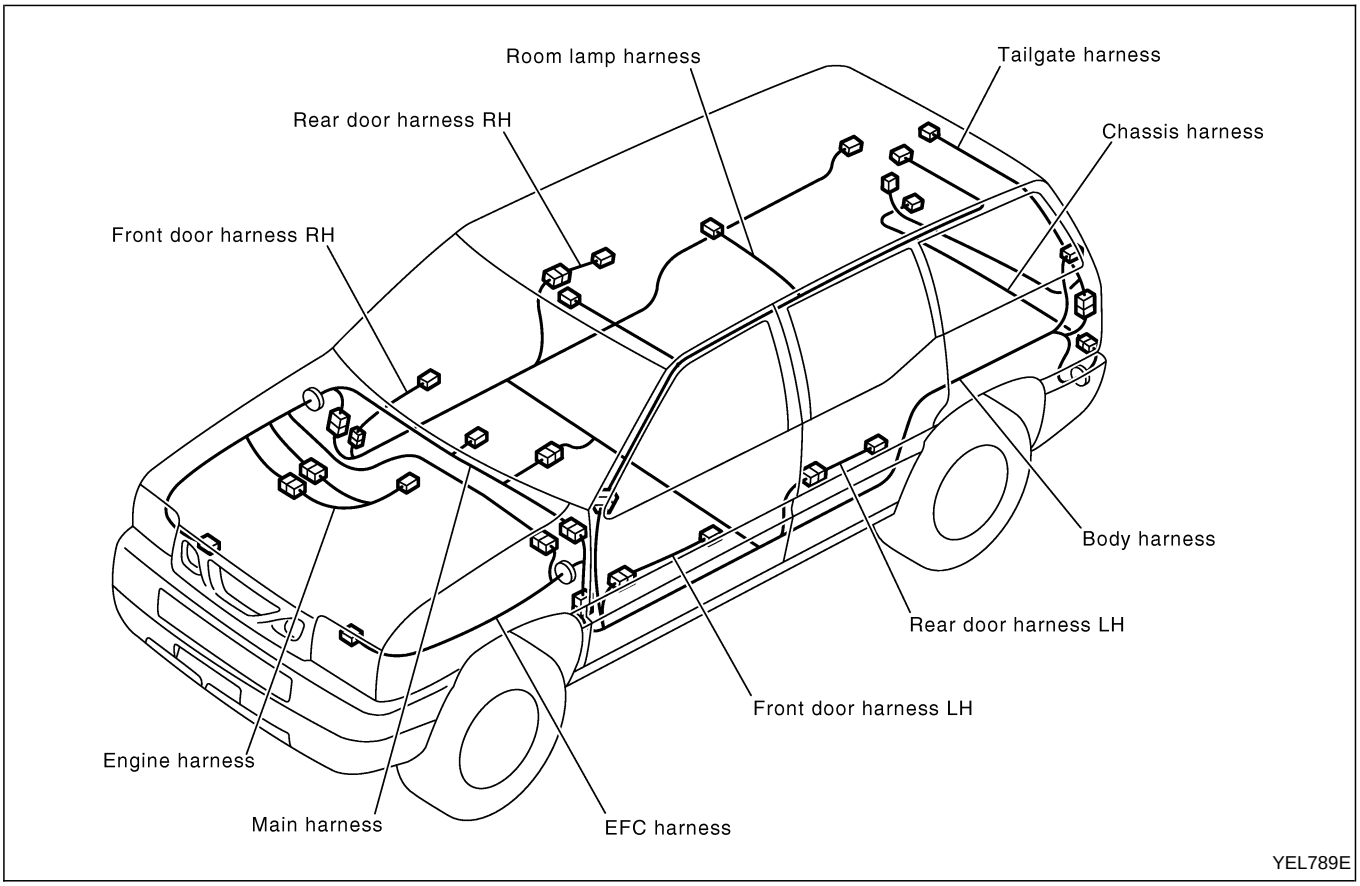
http://vnx.su/

Outline

LHD MODELS



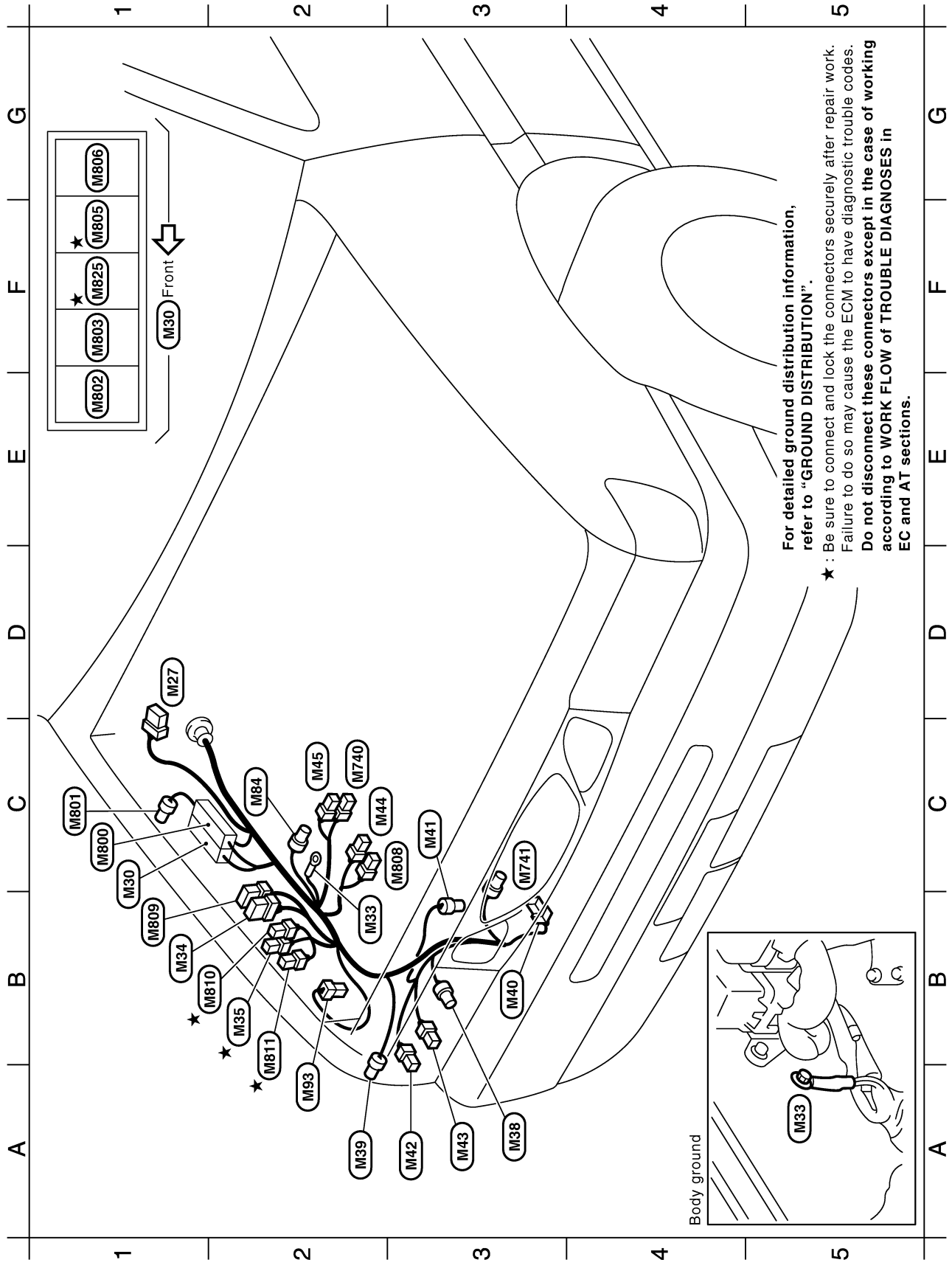
RHD MODELS



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Main Harness

ENGINE COMPARTMENT • LHD TD27Ti ENGINE MODELS



YEL790E

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Main Harness (Cont'd)

D1	M27	W/6	:	Front wiper motor
F1	M30	–	:	Relay box
B2	M33	–	:	Body ground
B1	M34	B/6	:	Daytime light control unit (With daytime light system)
B2 ★	M35	W/1	:	Glow relay
A3	M38	GY/2	:	Front fog lamp RH
A2	M39	GY/2	:	Front turn signal lamp RH
B3	M40	B/1	:	Horn (Low)
C3	M41	B/3	:	Headlamp aiming motor RH
A3	M42	B/3	:	Headlamp RH
A3	M43	B/2	:	Parking lamp RH
C2	M44	B/1	:	Battery
C2	M45	B/2	:	To E103
C2	M84	GY/2	:	Hood switch
A2	M93	B/2	:	Washer motor
C2	M740	B/1	:	To E142
C3	M741	GY/2	:	Dual-pressure switch
C1	M800	–	:	Fusible link and fuse box
C1	M801	–/2	:	Side turn signal lamp RH
E1	M802	W/3	:	Horn relay
F1 ★	M803	L/4	:	Accessory relay
F1	M805	L/4	:	A/C relay
G1	M806	L/4	:	Cooling fan relay
C3	M808	B/1	:	Battery
B1	M809	W/6	:	Daytime light control unit (With daytime light system)
B2 ★	M810	W/1	:	Glow relay
B2 ★	M811	G/2	:	Glow relay
F1 ★	M825	L/4	:	ECM relay

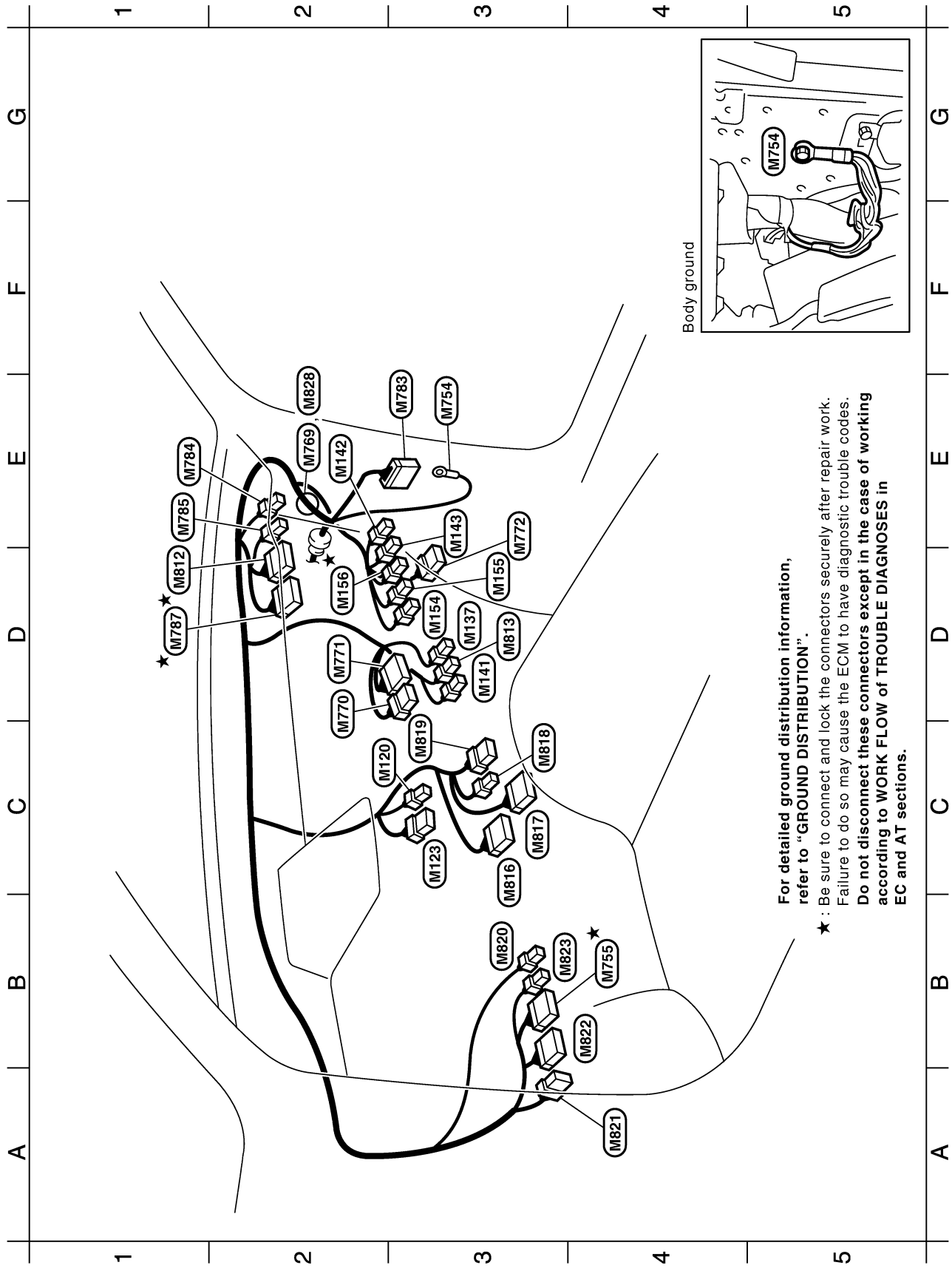
★ : Be sure to connect and lock the connectors securely after repair work. Failure to do so may cause the ECM to have diagnostic trouble codes.
Do not disconnect these connectors except in the case of working according to WORK FLOW of TROUBLE DIAGNOSES in EC and AT sections.

YEL791E

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Main Harness (Cont'd)

PASSENGER COMPARTMENT • LHD TD27Ti ENGINE MODELS



YEL792E

http://vnx.su/

Main Harness (Cont'd)

C2	M120	W/2	:	Key switch
C3	M123	B/5	:	Ignition switch
D3	M137	W/2	:	Ashtray illumination
D3	M141	B/2	:	Cigarette lighter socket
E2	M142	–/2	:	Glove box lamp
E3	M143	BR/2	:	Glove box lamp switch
D3	M154	W/2	:	Blower motor
D3	M155	BR/4	:	Fan resistor
D2	★ M156	W/4	:	Thermo control amplifier
E3	M754	–	:	Body ground
B4	★ M755	W/16	:	Fuse block (J/B)
E2	M769	–	:	Resistor
C2	M770	W/6	:	A/C control panel (Fan switch)
D2	M771	W/12	:	A/C control panel
D3	M772	B/6	:	Intake door motor
E3	M783	W/10	:	To B88
E1	M784	B/2	:	To F68
E1	M785	W/3	:	To F67
D1	★ M787	W/12	:	To F66
D1	★ M812	W/20	:	To F120
D3	M813	B/1	:	Cigarette lighter illumination
C3	M816	GY/12	:	Combination switch (Wiper and washer switch)
C3	M817	BR/12	:	Combination switch (Lighting switch)
C3	M818	W/4	:	Combination switch (Fog lamp switch)
C3	M819	GY/8	:	Combination switch (Spiral cable)
B3	M820	L/4	:	Rear fog lamp relay
A4	M821	W/6	:	Fuse block (J/B)
B4	M822	W/12	:	Fuse block (J/B)
B3	M823	B/2	:	Fuse block (J/B)
E2	M828	–	:	Diode-3

★ : Be sure to connect and lock the connectors securely after repair work. Failure to do so may cause the ECM to have diagnostic trouble codes.
Do not disconnect these connectors except in the case of working according to WORK FLOW of TROUBLE DIAGNOSES in EC and AT sections.

Diode-3 M828

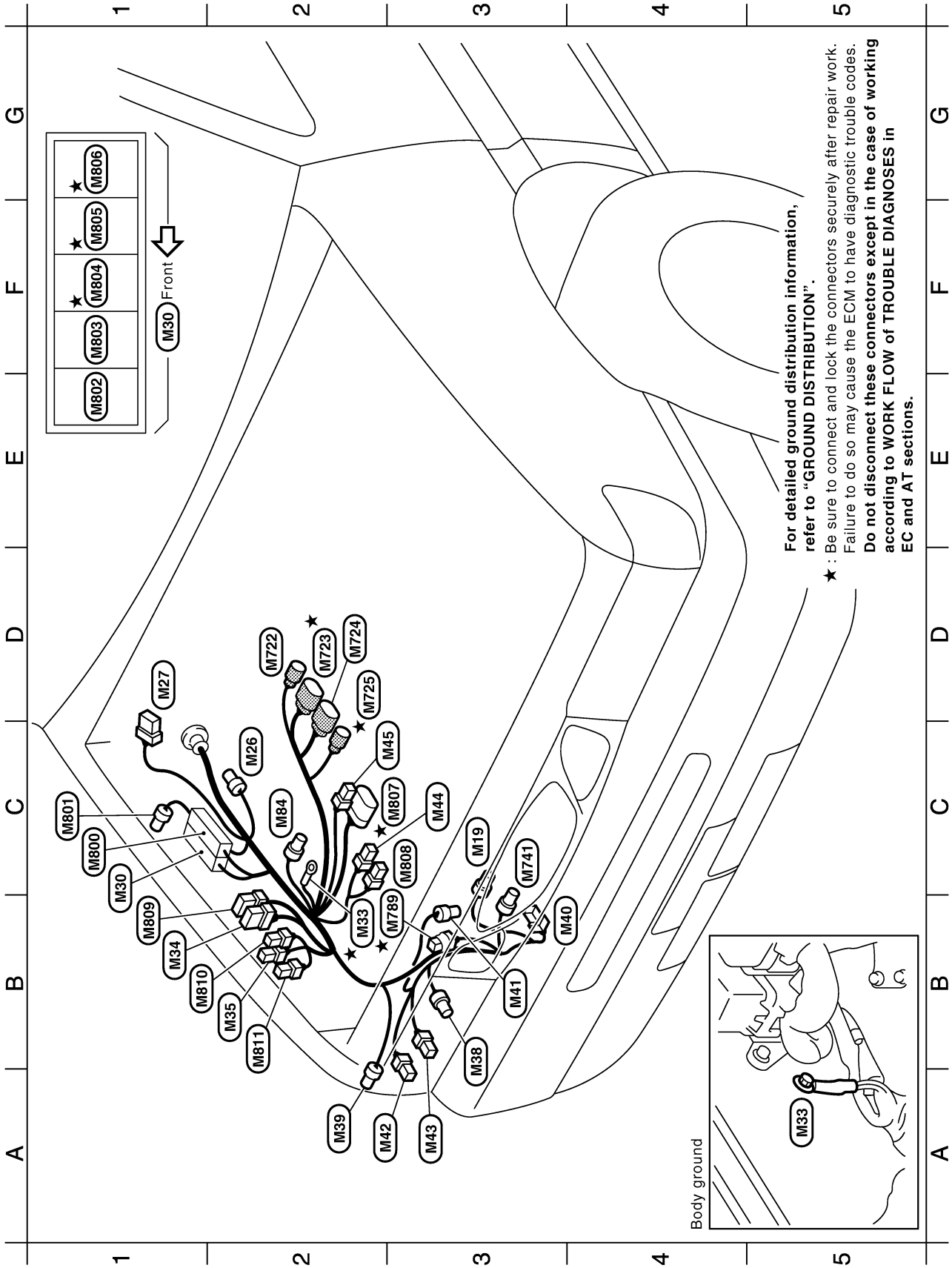
A/C control panel — Compressor

YEL793E

http://vnx.su/

Main Harness (Cont'd)

ENGINE COMPARTMENT • LHD ZD30DDTi ENGINE MODELS



YEL794E

http://vnx.su/

Main Harness (Cont'd)

C3	M19	B/2	: Cooling fan motor (A/T models)
C2	M26	GY/2	: Fuel filter switch (Except for North Europe)
D1	M27	W/6	: Front wiper motor
F1	M30	–	: Relay box
B2 ★	M33	–	: Body ground
B1	M34	B/6	: Daytime light control unit (With daytime light system)
B2	M35	W/1	: Glow relay
A3	M38	GY/2	: Front fog lamp RH
A2	M39	GY/2	: Front turn signal lamp RH
B3	M40	B/1	: Horn (Low)
B3	M41	B/3	: Headlamp aiming motor RH
A2	M42	B/3	: Headlamp RH
A3	M43	B/2	: Parking lamp RH
C3	M44	B/1	: Battery
C2	M45	B/2	: To E202
C2	M84	GY/2	: Hood switch
D2	M722	GY/2	: Park/neutral position switch (A/T models)
D2 ★	M723	BR/8	: Terminal cord assembly (A/T models)
D2	M724	GY/8	: Park/neutral position switch (A/T models)
D2 ★	M725	GY/3	: Revolution sensor (A/T models)
C3	M741	GY/2	: Dual-pressure switch
B3 ★	M789	W/2	: Condenser (A/T models)
C1	M800	–	: Fusible link and fuse box
C1	M801	–/2	: Side turn signal lamp RH
E1	M802	GY/3	: Horn relay
F1	M803	L/4	: Accessory relay
F1 ★	M804	BR/6	: ECM relay
F1 ★	M805	L/4	: A/C relay
G1 ★	M806	L/4	: Cooling fan relay
C3 ★	M807	GY/9	: To E201
C3	M808	B/1	: Battery
B1	M809	W/6	: Daytime light control unit (With daytime light system)
B1	M810	W/1	: Glow relay
B2	M811	G/2	: Glow relay

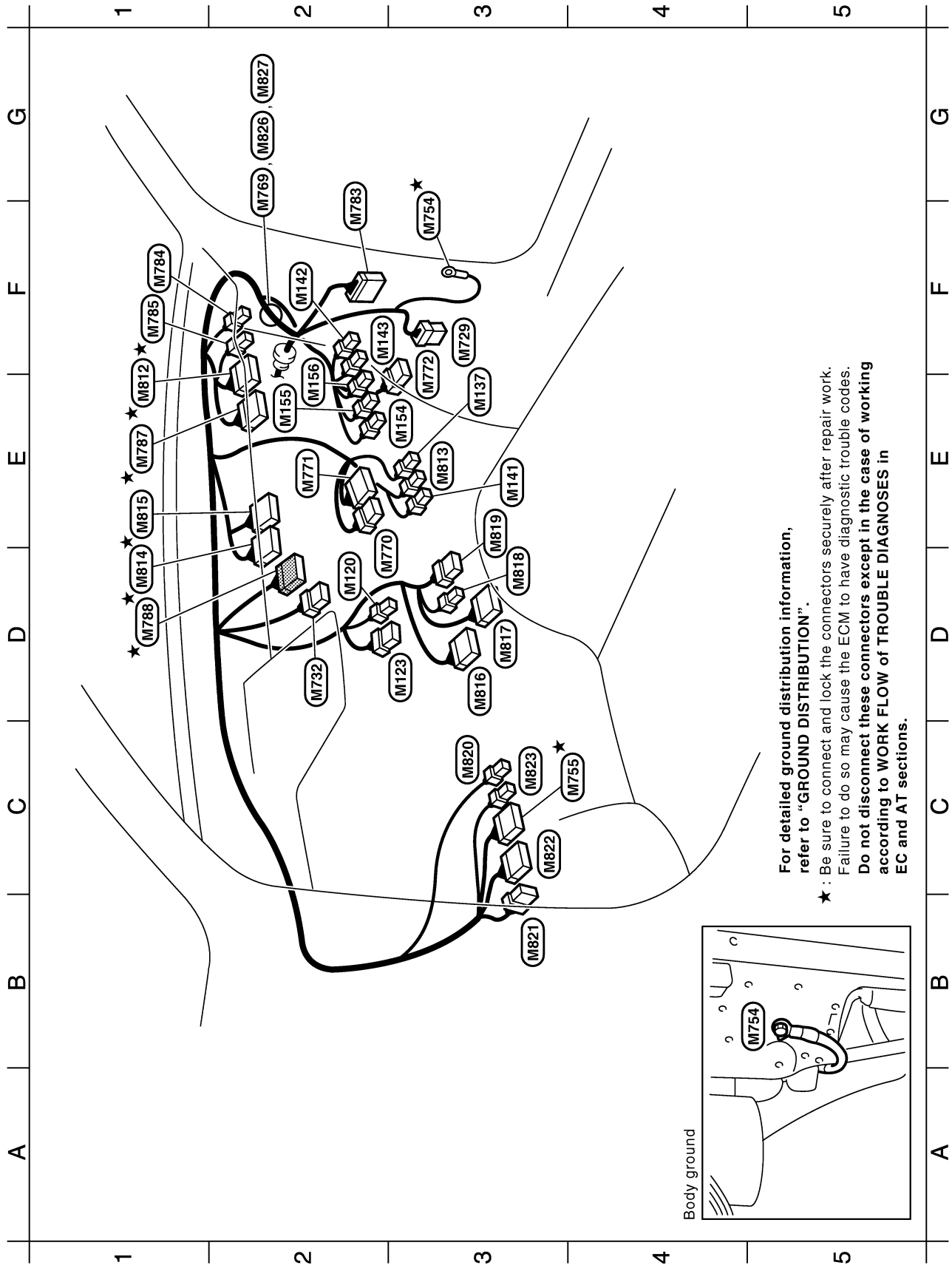
★ : Be sure to connect and lock the connectors securely after repair work.
Failure to do so may cause the ECM to have diagnostic trouble codes.
Do not disconnect these connectors except in the case of working according to WORK FLOW of TROUBLE DIAGNOSES in EC and AT sections.

YEL795E

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Main Harness (Cont'd)

PASSENGER COMPARTMENT • LHD ZD30DDTi ENGINE MODELS



YEL796E

http://vnx.su/

Main Harness (Cont'd)

D2	M120	W/2	: Key switch
D3	M123	B/5	: Ignition switch
E3	M137	W/2	: Ashtray illumination
E3	M141	B/2	: Cigarette lighter socket
F2	M142	/2	: Glove box lamp
F2	M143	BR/2	: Glove box lamp switch
E3	M154	W/2	: Blower motor
E2	M155	BR/4	: Fan resistor
E2	M156	W/4	: Thermo control amplifier
F3	M729	BR/6	: Park/neutral position relay (A/T models)
D2	M732	W/8	: A/T mode switch (A/T models)
F3 ★	M754	–	: Body ground
C3 ★	M755	W/16	: Fuse block (J/B)
F2	M769	–	: Resistor
D2	M770	W/6	: A/C control panel (Fan switch)
E2	M771	W/12	: A/C control panel
E3	M772	B/6	: Intake door motor
F2	M783	W/10	: To B88
F1	M784	B/2	: To F68
F1 ★	M785	W/3	: To F67
E1 ★	M787	W/12	: To F66
D1 ★	M788	W/20	: To F93
E1 ★	M812	W/20	: To F120
E3	M813	B/1	: Cigarette lighter illumination
D1 ★	M814	GY/24	: TCM (Transmission control module) (A/T models)
E1 ★	M815	W/24	: TCM (Transmission control module) (A/T models)
D3	M816	GY/12	: Combination switch (Wiper and washer switch)
D3	M817	BR/12	: Combination switch (Lighting switch)
D3	M818	W/4	: Combination switch (Fog lamp switch)
E3	M819	GY/8	: Combination switch (Spiral cable)
C3	M820	L/4	: Rear fog lamp relay
B3	M821	W/6	: Fuse block (J/B)
C3	M822	W/12	: Fuse block (J/B)
C3	M823	B/2	: Fuse block (J/B)
G2	M826	–	: Diode-1 (A/T models)
G2	M827	–	: Diode-2 (A/T models)

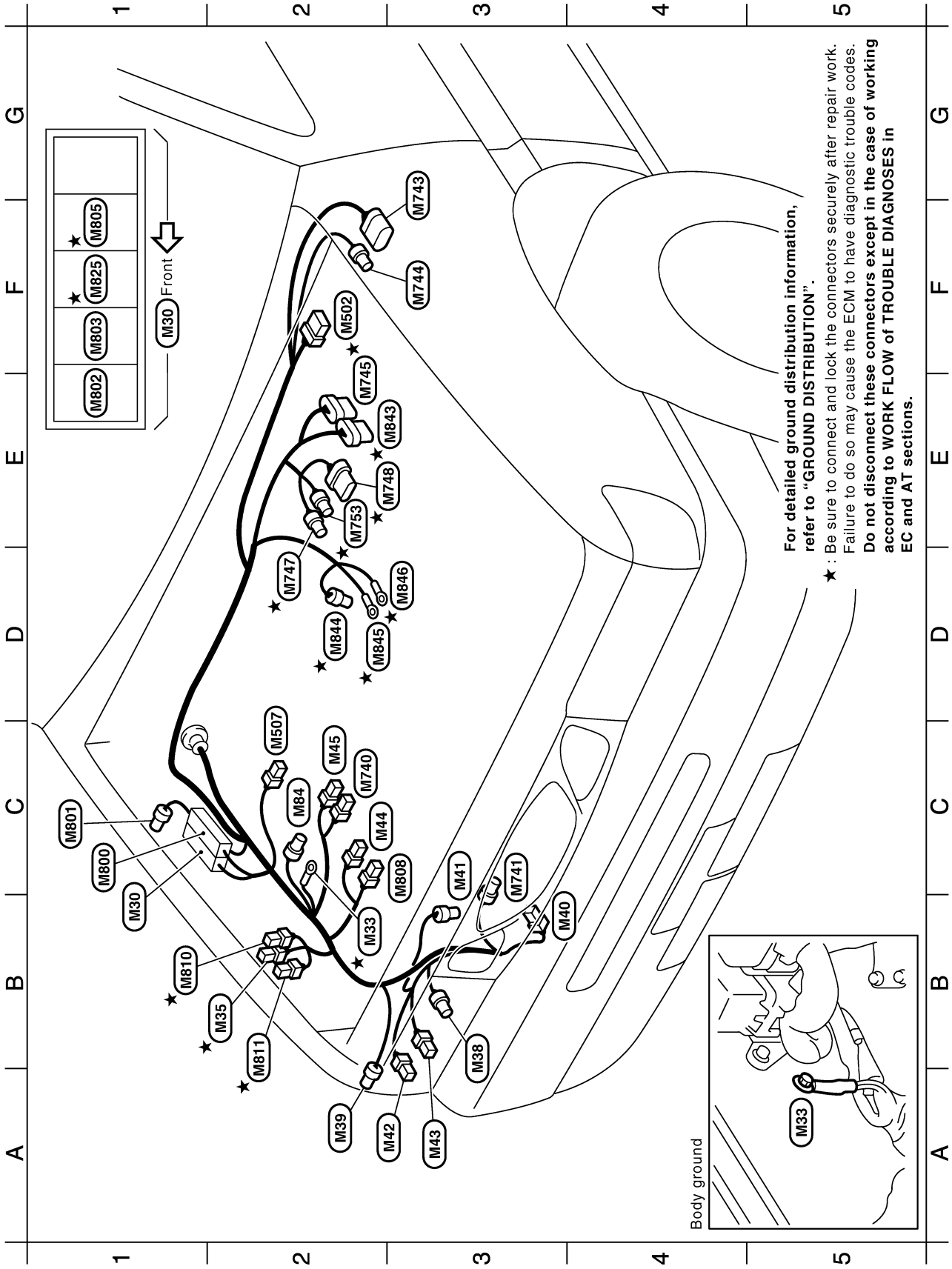
★ : Be sure to connect and lock the connectors securely after repair work. Failure to do so may cause the ECM to have diagnostic trouble codes. **Do not disconnect these connectors except in the case of working according to WORK FLOW of TROUBLE DIAGNOSES in EC and AT sections.**

YEL797E

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Main Harness (Cont'd)

MAIN HARNESS ENGINE COMPARTMENT • RHD TD27Ti ENGINE MODELS



YEL798E

http://vnx.su/

Main Harness (Cont'd)

F1	M30	–	: Relax box
B2	★ M33	–	: Body ground
B2	★ M35	W/1	: Glow relay
B3	M38	GY/2	: Front fog lamp RH
A2	M39	GY/2	: Front turn signal lamp RH
B3	M40	B/1	: Horn (Low)
C3	M41	B/3	: Headlamp aiming motor RH
A3	M42	B/3	: Headlamp RH
A3	M43	B/2	: Parking lamp RH
C2	M44	B/1	: Battery
C2	M45	B/2	: To E103
C2	M84	GY/2	: Hood switch
F2	M502	W/6	: Front wiper motor
C2	M507	GY/2	: Brake fluid level switch
C2	M740	B/1	: To E142
C3	M741	GY/2	: Dual-pressure switch
F3	M743	GY/10	: To F76 (With ABS)
F3	M744	GY/2	: To F79 (With ABS)
E2	★ M745	B/8	: To E147
D2	★ M747	–/3	: TVC and SHUT off
E2	★ M748	–/7	: Electronic control fuel injection pump
E2	★ M753	W/2	: Needle lift sensor
C1	M800	–	: Fusible link and fuse box
C1	M801	–/2	: Side turn signal lamp RH
E1	M802	W/3	: Horn relay
F1	M803	L/4	: Accessory relay
F1	★ M805	L/4	: A/C relay
C3	M808	B/1	: Battery
B1	★ M810	W/1	: Glow relay
A2	★ M811	G/2	: Glow relay
F1	★ M825	L/4	: ECM relay
E3	★ M843	GY/8	: To E151
D2	★ M844	–/3	: Crankshaft position sensor (TDC)
D2	★ M845	–	: Engine ground
D3	★ M846	–	: Engine ground

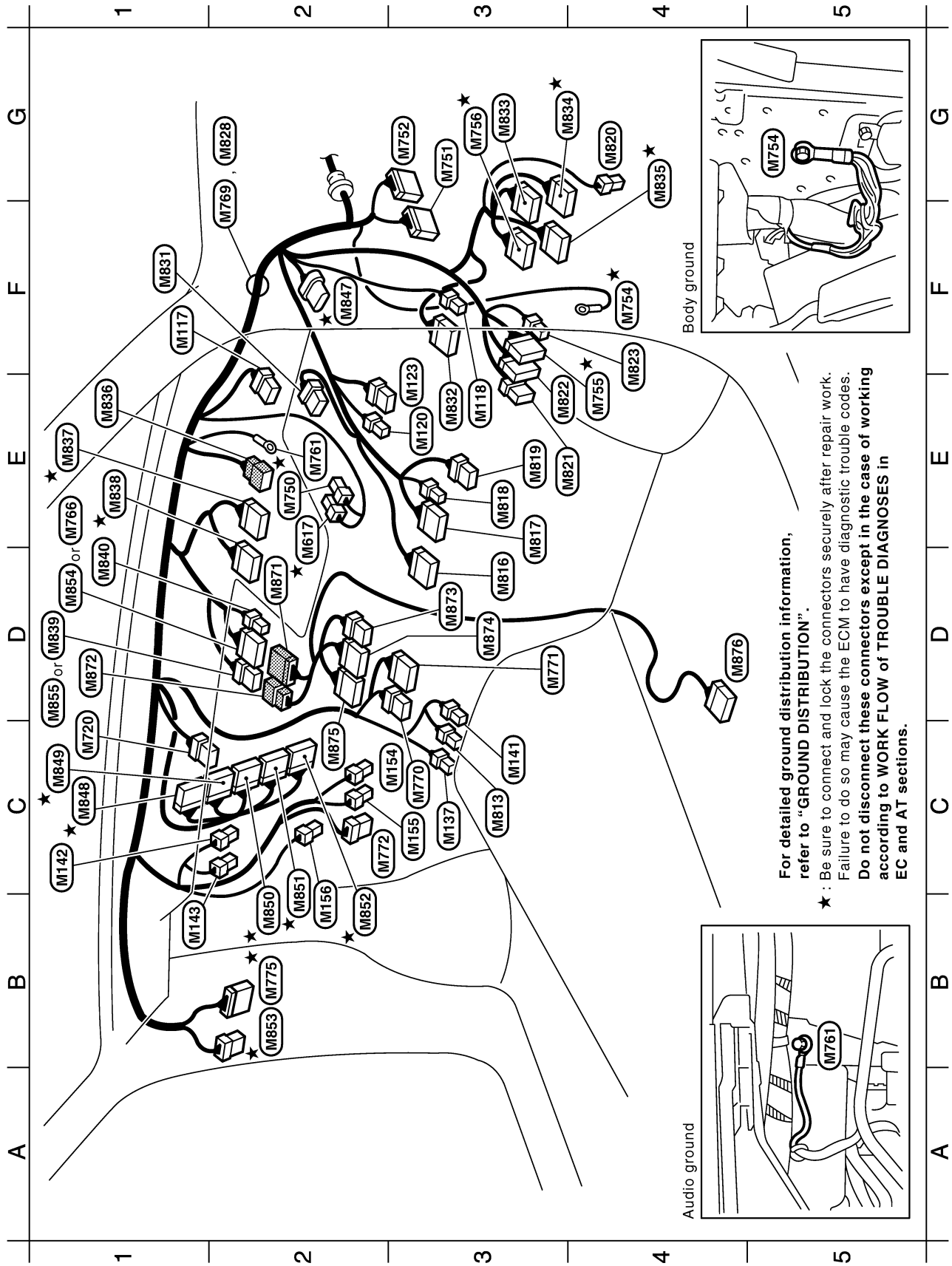
★ : Be sure to connect and lock the connectors securely after repair work. Failure to do so may cause the ECM to have diagnostic trouble codes.
Do not disconnect these connectors except in the case of working according to WORK FLOW of TROUBLE DIAGNOSES in EC and AT sections.

YEL799E

http://vnx.su/

Main Harness (Cont'd)

PASSENGER COMPARTMENT • RHD TD27Ti ENGINE MODELS



YEL800E

http://vnx.su/

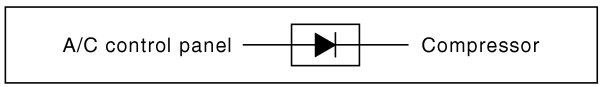
F1	M117	W/6	:	Ultrasonic cancel switch
E3	M118	W/4	:	Headlamp aiming switch
E3	M120	W/2	:	Key switch
E3	M123	B/5	:	Ignition switch
C3	M137	W/2	:	Ashtray illumination
C3	M141	B/2	:	Cigarette lighter socket
C1	M142	–/2	:	Glove box lamp
B1	M143	BR/2	:	Glove box lamp switch
C3	M154	W/2	:	Blower motor
C3	M155	BR/4	:	Fan resistor
B2	M156	W/4	:	Thermo control amplifier
D2	★ M617	B/2	:	Stop lamp switch
C1	M720	BR/8	:	Dongle control unit
E2	★ M750	L/2	:	Brake switch
G3	M751	W/16	:	To B86
G3	M752	W/12	:	To B87
F4	★ M754	–	:	Body ground
E4	★ M755	W/16	:	Fuse block (J/B)
G3	★ M756	W/20	:	Fuse block (J/B)
E2	M761	–	:	Audio ground
E1	M766	W/16	:	To M871 (Type 2)
F2	M769	–	:	Resistor
C3	M770	W/6	:	A/C control panel (Fan switch)
D3	M771	W/12	:	A/C control panel
C2	M772	B/6	:	Intake door motor
B2	★ M775	W/16	:	To F100
C3	M813	B/1	:	Cigarette lighter illumination
D3	M816	GY/12	:	Combination switch (Wiper and washer switch)
D3	M817	BR/12	:	Combination switch (Lighting switch)
E3	M818	W/4	:	Combination switch (Fog lamp switch)
E3	M819	GY/8	:	Combination switch (Spiral cable)
G4	M820	L/4	:	Rear fog lamp relay
E4	M821	W/6	:	Fuse block (J/B)
E3	M822	W/12	:	Fuse block (J/B)
F4	M823	B/2	:	Fuse block (J/B)
G2	M828	–	:	Diode-3
F1	M831	W/8	:	NATS IMMU
E3	M832	W/16	:	Data link connector
G3	M833	W/10	:	Fuse block (J/B)
G3	★ M834	GY/20	:	Fuse block (J/B)
G4	★ M835	GY/10	:	Fuse block (J/B)
E1	M836	Y/6	:	To B103
E1	★ M837	BR/24	:	Combination meter
E1	★ M838	W/24	:	Combination meter
D1	M839	BR/8	:	To M872 (Type 2)
D1	M840	W/1	:	Navigation
F2	★ M847	–/6	:	Accelerator work unit
C1	★ M848	B/9	:	ECM
C1	★ M849	B/40	:	ECM
B2	★ M850	B/52	:	ECM
B2	★ M851	B/24	:	ECM
B2	★ M852	B/9	:	ECM
B2	★ M853	W/6	:	To F137
D1	M854	W/16	:	Audio unit (Type 1)
D1	M855	BR/8	:	Audio unit (Type 1)

Audio sub-harness (Type 2)

D2	M871	W/16	:	To M766
D1	M872	BR/8	:	To M839
D3	M873	BR/8	:	Audio unit
D3	M874	W/16	:	Audio unit
C2	M875	W/12	:	Audio unit
D4	M876	W/16	:	CD auto-changer (With CD auto-changer)

★ : Be sure to connect and lock the connectors securely after repair work.
Failure to do so may cause the ECM to have diagnostic trouble codes.
Do not disconnect these connectors except in the case of working according to WORK FLOW of TROUBLE DIAGNOSES in EC and AT sections.

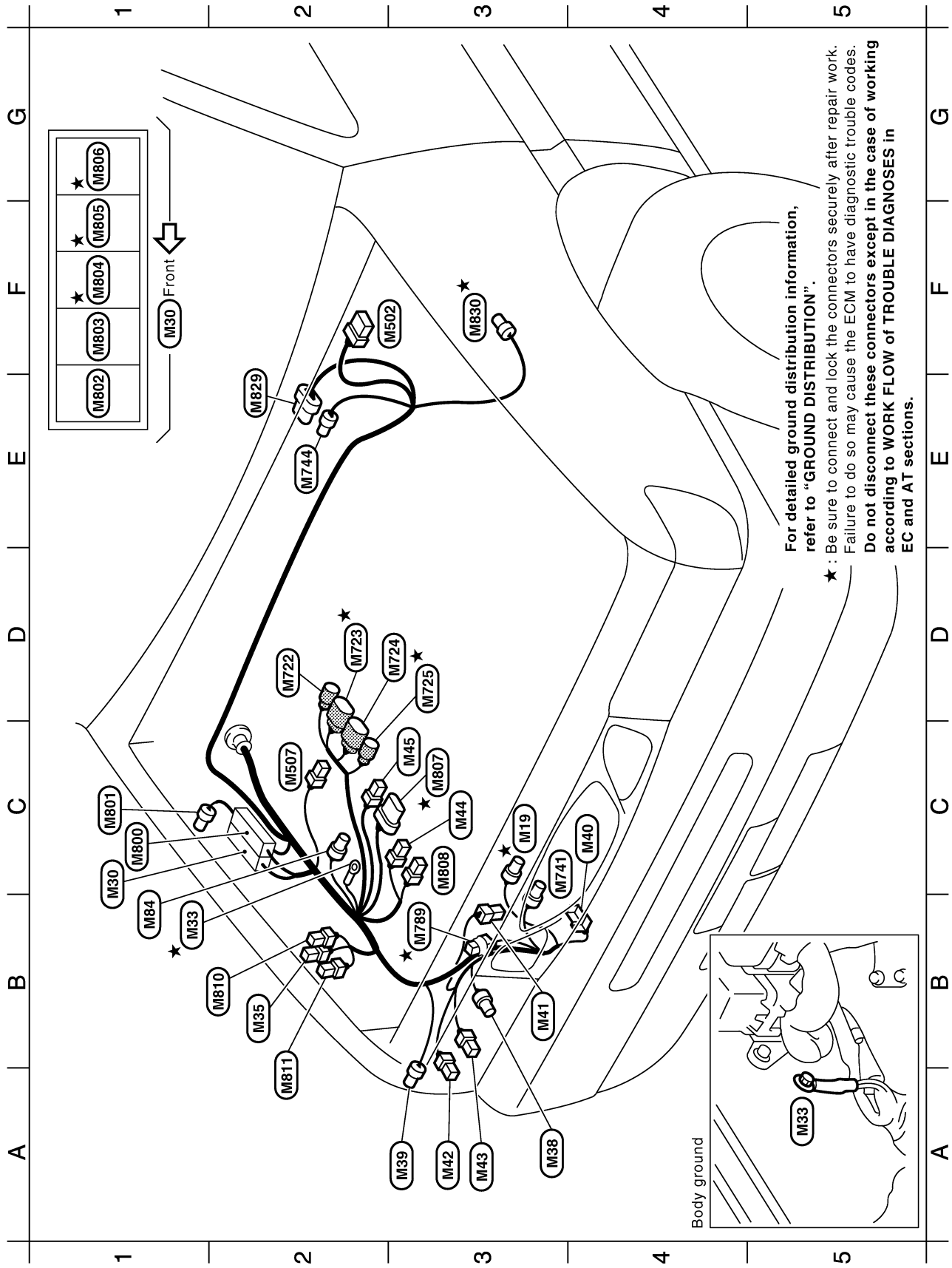
Diode-3 M828



http://chx.su/

Main Harness (Cont'd)

MAIN HARNESS ENGINE COMPARTMENT • RHD ZD30DDTi ENGINE MODELS



YEL802E

http://vnx.su/

Main Harness (Cont'd)

C3	★ M19	B/2	: Cooling fan motor (A/T models)
C1	M30	–	: Relay box
B1	★ M33	–	: Body ground
B2	M35	W/1	: Glow relay
A3	M38	GY/2	: Front fog lamp RH
A3	M39	GY/2	: Front turn signal lamp RH
C4	M40	B/1	: Horn (Low)
B3	M41	B/3	: Headlamp aiming motor RH
A3	M42	B/3	: Headlamp RH
A3	M43	B/2	: Parking lamp RH
C3	M44	B/1	: Battery
C3	M45	B/2	: To E202
B1	M84	GY/2	: Hood switch
F2	M502	W/6	: Front wiper motor
C2	M507	GY/2	: Brake fluid level switch
D2	M722	GY/2	: Park/neutral position switch (A/T models)
D2	★ M723	BR/8	: Terminal cord assembly (A/T models)
D3	M724	GY/8	: Park/neutral position switch (A/T models)
D3	★ M725	GY/3	: Revolution sensor (A/T models)
C3	M741	GY/2	: Dual-pressure switch
E2	★ M744	GY/2	: F79
B3	★ M789	W/2	: Condenser (A/T models)
C1	M800	–	: Fusible link and fuse box
C1	M801	–/2	: Side turn signal lamp RH
E1	M802	GY/3	: Horn relay
F1	M803	L/4	: Accessory relay
F1	★ M804	BR/6	: ECM relay
F1	★ M805	L/4	: A/C relay
G1	★ M806	L/4	: Cooling fan relay (A/T models)
C3	★ M807	GY/9	: To E201
C3	M808	B/1	: Battery
B2	M810	W/1	: Glow relay
A2	M811	G/2	: Glow relay
E2	M829	GY/8	: To F136
F3	★ M830	GY/2	: Dropping resistor (A/T models)

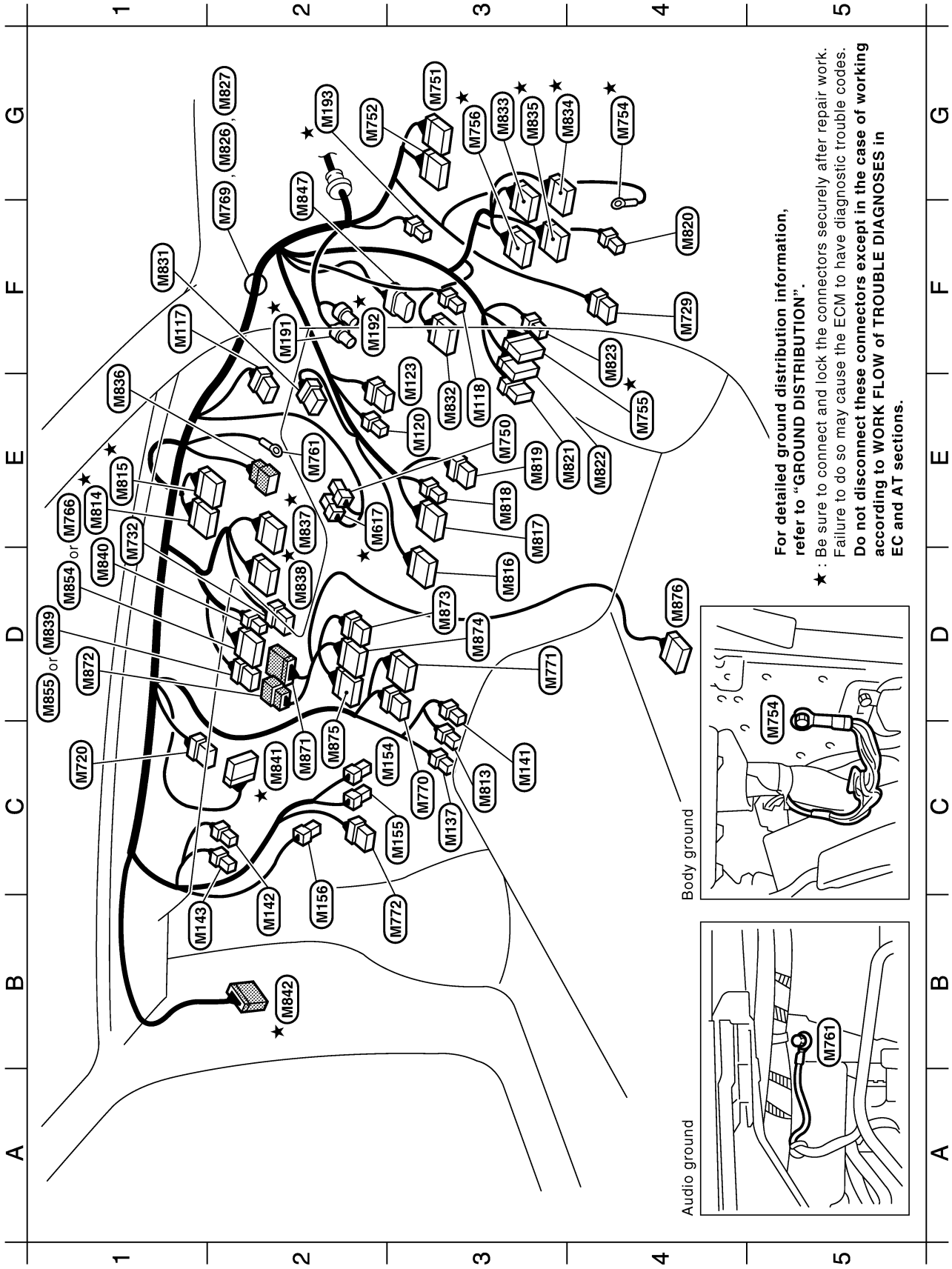
★ : Be sure to connect and lock the connectors securely after repair work. Failure to do so may cause the ECM to have diagnostic trouble codes.
Do not disconnect these connectors except in the case of working according to WORK FLOW of TROUBLE DIAGNOSES in EC and AT sections.

YEL803E

http://vnx.su/

Main Harness (Cont'd)

PASSENGER COMPARTMENT • RHD ZD30DDTi ENGINE MODELS



YEL804E

http://vnx.su/

Main Harness (Cont'd)

F1 M117 W/6 : Ultrasonic cancel switch
E3 M118 W/4 : Headlamp aiming switch
E3 M120 W/2 : Key switch
E3 M123 B/5 : Ignition switch
C3 M137 W/2 : Ashtray illumination
C3 M141 B/2 : Cigarette lighter socket
B2 M142 –/2 : Glove box lamp
B1 M143 BR/2 : Glove box lamp switch
C2 M154 W/2 : Blower motor
C3 M155 BR/4 : Fan resistor
B2 M156 W/4 : Thermo control amplifier
★ F2 M191 BR/3 : Accelerator position sensor
★ F2 M192 GY/3 : Accelerator position switch
★ G2 M193 W/3 : Accelerator switch (F/C)
★ E2 M617 B/2 : Stop lamp switch
C1 M720 BR/8 : Dongle control unit
F4 M729 BR/6 : Park/neutral position relay (A/T models)
D1 M732 W/8 : A/T mode switch (A/T models)
E3 M750 L/2 : Brake switch-2
G3 M751 W/16 : To B86
G2 M752 W/12 : To B87
★ G4 M754 – : Body ground
★ ★ E4 M755 W/16 : Fuse block (J/B)
★ G3 M756 W/20 : Fuse block (J/B)
E2 M761 – : Audio ground
E1 M766 W/16 : To M871 (Type 2)
F2 M769 – : Resistor
C3 M770 W/6 : A/C control panel (Fan switch)
D3 M771 W/12 : A/C control panel
B3 M772 B/6 : Intake door motor
C3 M813 B/1 : Cigarette lighter socket
★ E1 M814 GY/24 : TCM (Transmission control module) (A/T models)
★ E1 M815 W/24 : TCM (Transmission control module) (A/T models)
D3 M816 GY/12 : Combination switch (Wiper and washer switch)
E3 M817 BR/12 : Combination switch (Lighting switch)
E3 M818 W/4 : Combination switch (Fog lamp switch)
E3 M819 GY/8 : Combination switch (Spiral cable)
F4 M820 L/4 : Rear fog lamp relay
E3 M821 W/6 : Fuse block (J/B)
E4 M822 W/12 : Fuse block (J/B)
F4 M823 B/2 : Fuse block (J/B)

G2 M826 – : Diode-1 (A/T models)
G2 M827 – : Diode-2 (A/T models)
F1 M831 W/8 : NATS IMMU
E3 M832 W/16 : Data link connector
G3 M833 W/10 : Fuse block (J/B)
★ G3 M834 GY/20 : Fuse block (J/B)
★ G3 M835 GY/10 : Fuse block (J/B)
E1 M836 Y/6 : To B103
★ E2 M837 BR/24 : Combination meter
★ D2 M838 W/24 : Combination meter
D1 M839 BR/8 : To M872 (Type 2)
★ D1 M840 W/1 : Navigation
★ C2 M841 W/88 : ECM
★ B2 M842 SMJ : To F135
F2 M847 –/6 : Accelerator work unit
D1 M854 W/16 : Audio unit (Type 1)
D1 M855 BR/8 : Audio unit (Type 1)

Audio sub-harness (Type 2)

C2 M871 W/16 : To M766
D1 M872 BR/8 : To M839
D3 M873 BR/8 : Audio unit
D3 M874 W/16 : Audio unit
C2 M875 W/12 : Audio unit
D4 M876 W/16 : CD auto-changer (With CD auto-changer)

★: Be sure to connect and lock the connectors securely after repair work. Failure to do so may cause the ECM to have diagnostic trouble codes. **Do not disconnect these connectors except in the case of working according to WORK FLOW of TROUBLE DIAGNOSES in EC and AT sections.**

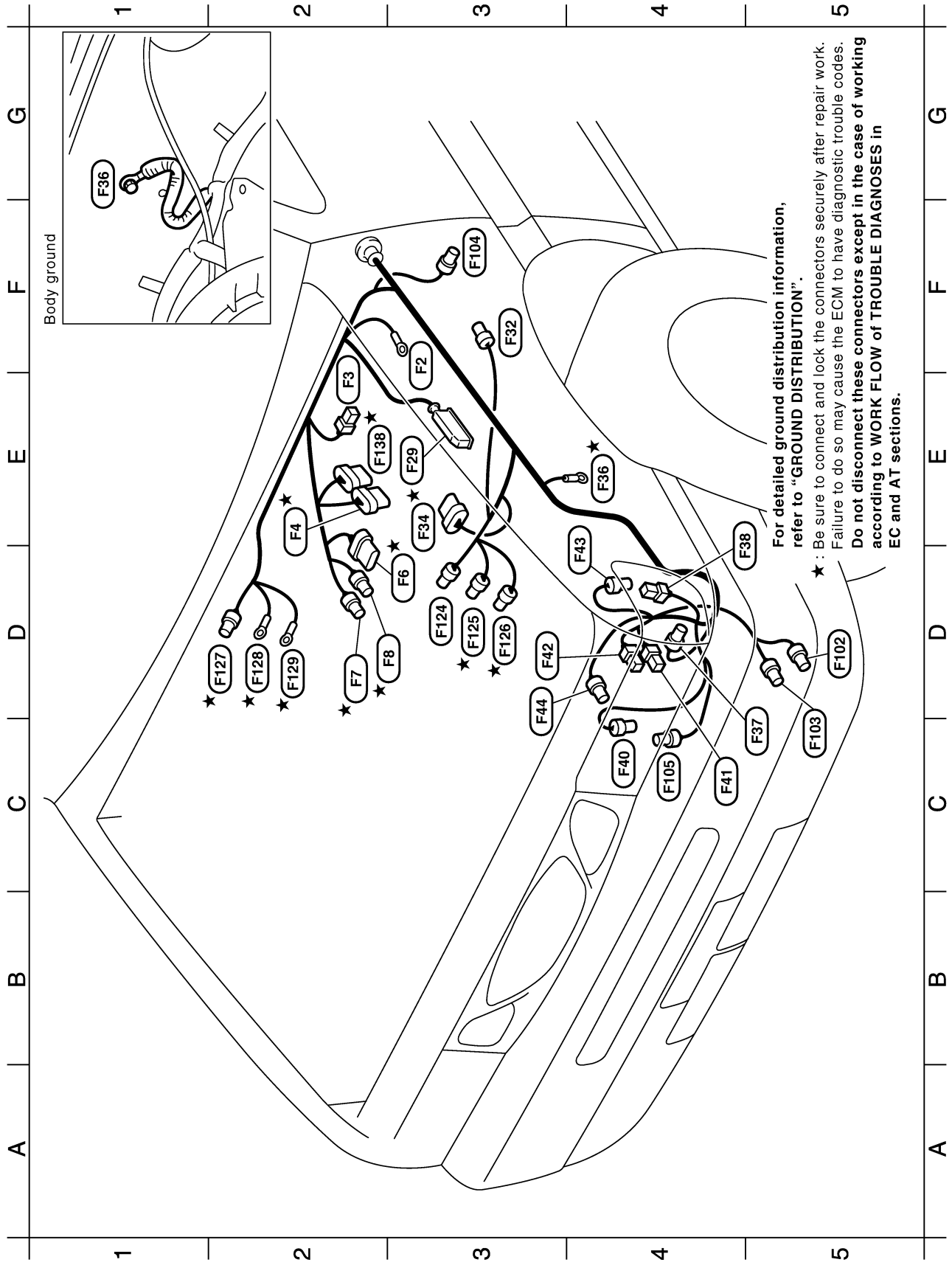
Diode-1 M826, Diode-2 M827

YEL805E

http://vnx.su/

EFC Harness

ENGINE COMPARTMENT • LHD TD27Ti ENGINE MODELS



YEL806E

http://vnx.su/

EFC Harness (Cont'd)

F3		F2	–	: ABS ground (With ABS)
E2		F3	GY/2	: Brake fluid level switch
E2	★	F4	B/8	: To E147
D3	★	F6	–/7	: Electronic control fuel injection pump
D2	★	F7	–/3	: TVC and SHUT off
D2	★	F8	W/2	: Needle lift sensor
E3		F29	B/31	: ABS actuator and electric unit (Control unit) (With ABS)
F3		F32	BR/2	: Front wheel sensor LH (With ABS)
E3	★	F34	–/5	: Mass air flow sensor
E4	★	F36	–	: Body ground
C5		F37	GY/2	: Front turn signal lamp LH
D4		F38	W/2	: Condenser
C4		F40	B/2	: Cooling fan motor
C4		F41	B/2	: Parking lamp LH
D3		F42	B/3	: Headlamp LH
D4		F43	B/3	: Headlamp aiming motor LH
D3		F44	GY/2	: Front fog lamp LH
D5		F102	B/2	: Washer motor
C5		F103	B/4	: Headlamp cleaner motor
F3		F104	–/2	: Side turn signal lamp LH
C4		F105	–/2	: Ambient temperature sensor
D3		F124	B/2	: Throttle control solenoid valve
D3	★	F125	B/2	: EGR control solenoid valve A
D3	★	F126	B/2	: EGR control solenoid valve B
D2	★	F127	–/3	: Crankshaft position sensor (TDC)
D2	★	F128	–	: Engine ground
D2	★	F129	–	: Engine ground
E2	★	F138	GY/8	: To E151

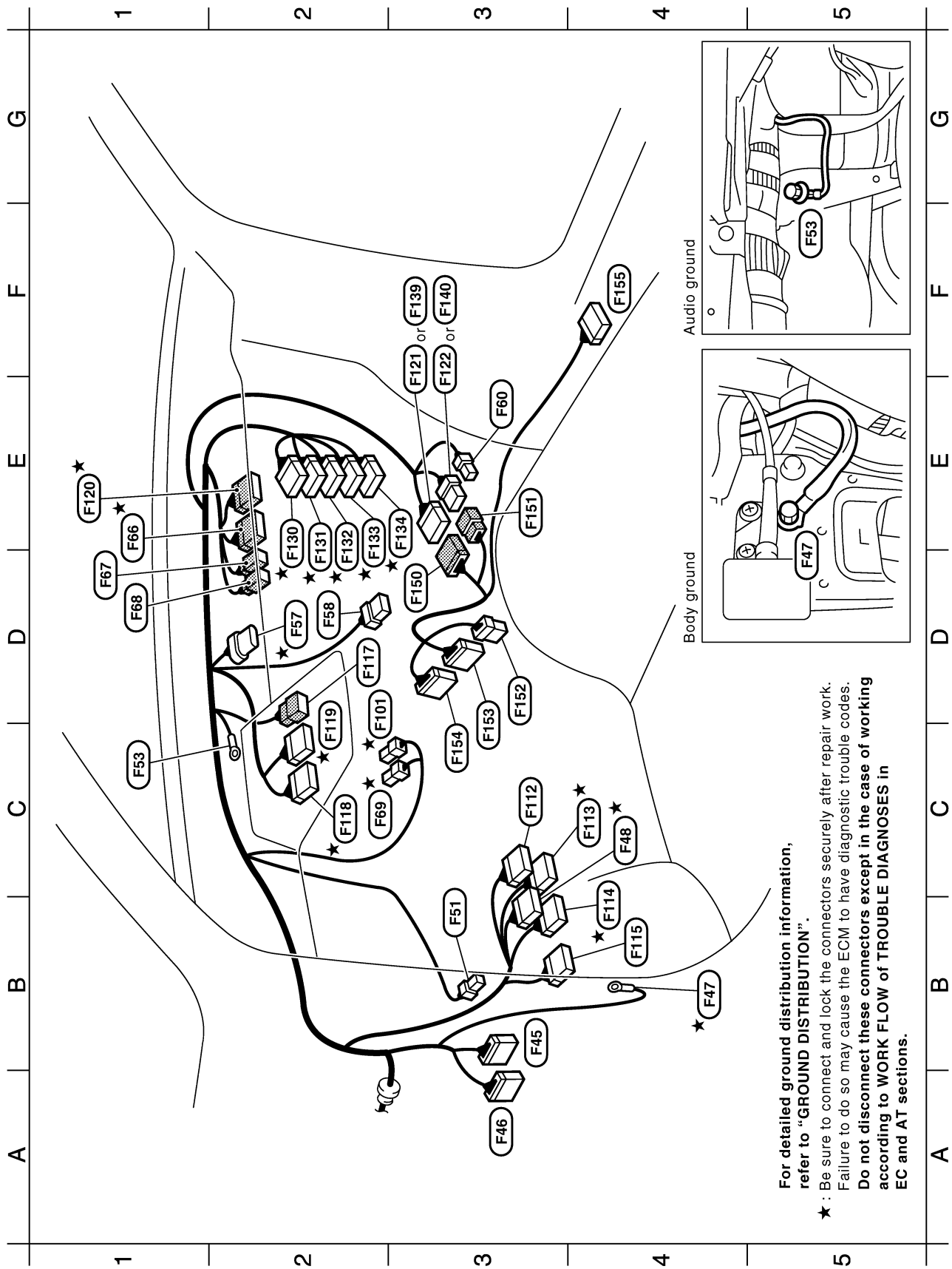
★ : Be sure to connect and lock the connectors securely after repair work.
Failure to do so may cause the ECM to have diagnostic trouble codes.
Do not disconnect these connectors except in the case of working according to WORK FLOW of TROUBLE DIAGNOSES in EC and AT sections.

YEL807E

http://vnx.su/

EFC Harness (Cont'd)

PASSENGER COMPARTMENT • LHD TD27Ti ENGINE MODELS



YEL808E

http://vnx.su/

EFC Harness (Cont'd)

B3 F45 W/16 : To B73
A3 F46 W/16 : To B72
★ B4 F47 – : Body ground
★ C4 F48 W/20 : Fuse block (J/B)
B3 F51 W/4 : Headlamp aiming switch
C1 F53 – : Audio ground
★ D2 F57 –/6 : Accelerator work unit
D2 F58 W/8 : NATS IMMU
E3 F60 W/1 : Navigation
★ E1 F66 W/12 : To M787
D1 F67 W/3 : To M785
D1 F68 B/2 : To M784
★ ★ C2 F69 B/2 : Stop lamp switch
★ C2 F101 L/2 : Brake switch
C3 F112 W/10 : Fuse block (J/B)
★ ★ C4 F113 GY/20 : Fuse block (J/B)
★ B4 F114 GY/10 : Fuse block (J/B)
B4 F115 W/16 : Data link connector
D2 F117 Y/6 : To B104
★ ★ C2 F118 BR/24 : Combination meter
★ ★ C2 F119 W/24 : Combination meter
★ E1 F120 W/20 : To M812
F3 F121 W/16 : To F150 (Type 2)
F3 F122 BR/8 : To F151 (Type 2)
★ ★ D2 F130 B/9 : ECM
★ ★ D2 F131 B/40 : ECM
★ ★ D2 F132 B/52 : ECM
★ ★ D2 F133 B/24 : ECM
★ E3 F134 B/9 : ECM
F3 F139 W/16 : Audio unit (Type 1)
F3 F140 BR/8 : Audio unit (Type 1)

Audio sub-harness (Type 2)

D3 F150 W/16 : To F121
E3 F151 BR/8 : To F122
D3 F152 BR/8 : Audio unit
C3 F153 W/16 : Audio unit
C3 F154 W/12 : Audio unit
F4 F155 W/16 : CD auto-changer (With CD auto-changer)

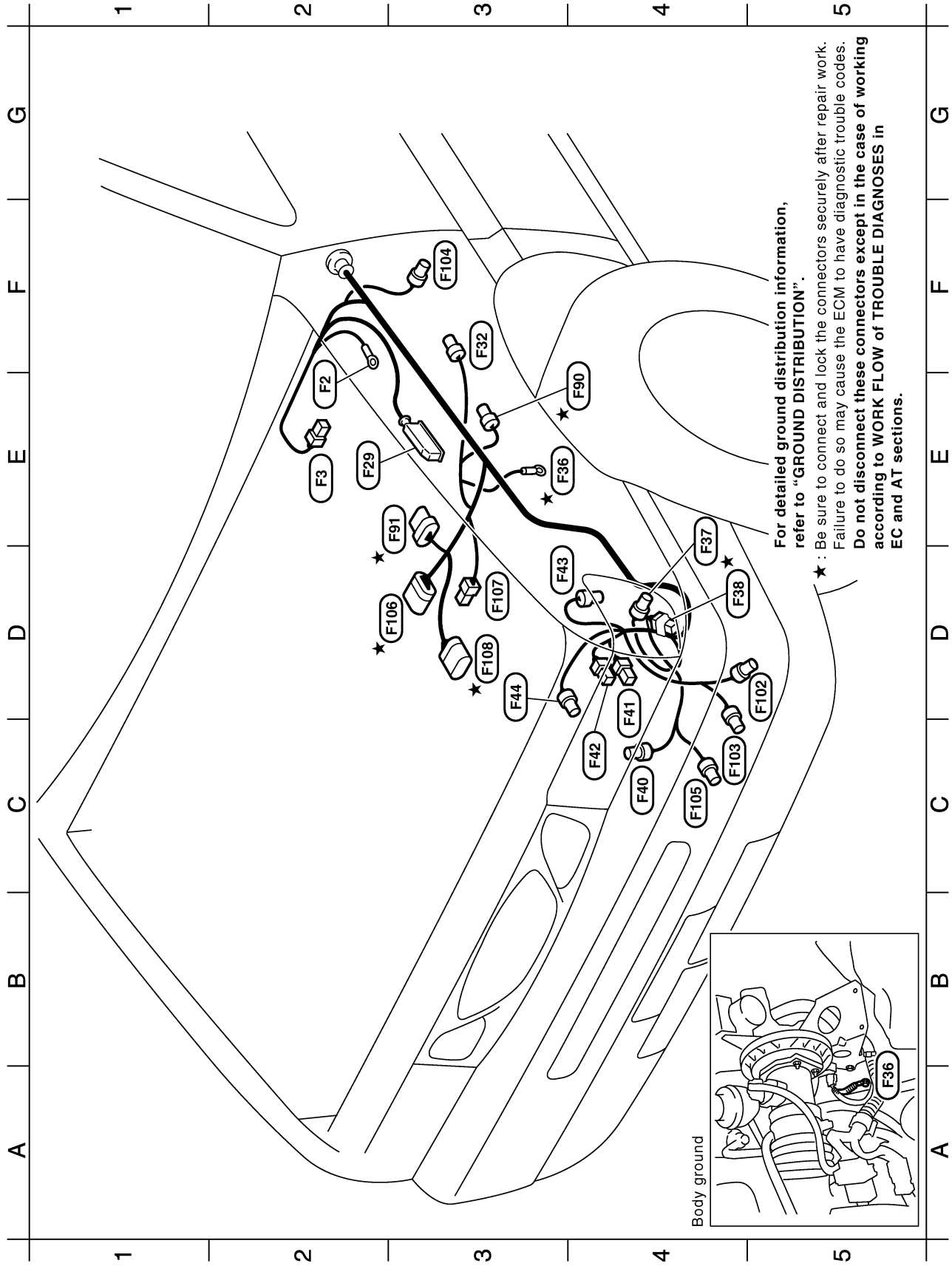
★: Be sure to connect and lock the connectors securely after repair work. Failure to do so may cause the ECM to have diagnostic trouble codes.
Do not disconnect these connectors except in the case of working according to WORK FLOW of TROUBLE DIAGNOSES in EC and AT sections.

YEL809E

http://vnx.su/

EFC Harness (Cont'd)

ENGINE COMPARTMENT • LHD ZD30DDTi ENGINE MODELS



For detailed ground distribution information, refer to "GROUND DISTRIBUTION".

★: Be sure to connect and lock the connectors securely after repair work. Failure to do so may cause the ECM to have diagnostic trouble codes. **Do not disconnect these connectors except in the case of working according to WORK FLOW of TROUBLE DIAGNOSES in EC and AT sections.**

YEL810E

http://vnx.su/

EFC Harness (Cont'd)

E2	F2	–	: ABS ground
E2	F3	GY/2	: Brake fluid level switch
E2	F29	B/31	: ABS actuator and electric unit (Control unit)
F3	F32	BR/2	: Front wheel sensor LH
★ E3	F36	–	: Body ground
D4	F37	GY/2	: Front turn signal lamp LH
★ D4	F38	W/2	: Condenser (M/T models)
C4	F40	B/2	: Cooling fan motor (M/T models)
C4	F41	B/2	: Parking lamp LH
C4	F42	B/3	: Headlamp LH
D3	F43	B/3	: Headlamp aiming motor LH
D3	F44	GY/2	: Front fog lamp LH
★ E4	F90	GY/2	: Dropping resistor
★ E3	F91	–/5	: Mass air flow sensor
D5	F102	B/2	: Washer motor
C4	F103	B/4	: Headlamp cleaner motor
F3	F104	–/2	: Side turn signal lamp LH
C4	F105	–/2	: Ambient temperature sensor
★ D3	F106	GY/10	: To E227
D3	F107	–/2	: Variable nozzle turbocharger control solenoid valve
★ D3	F108	SMJ	: To E225

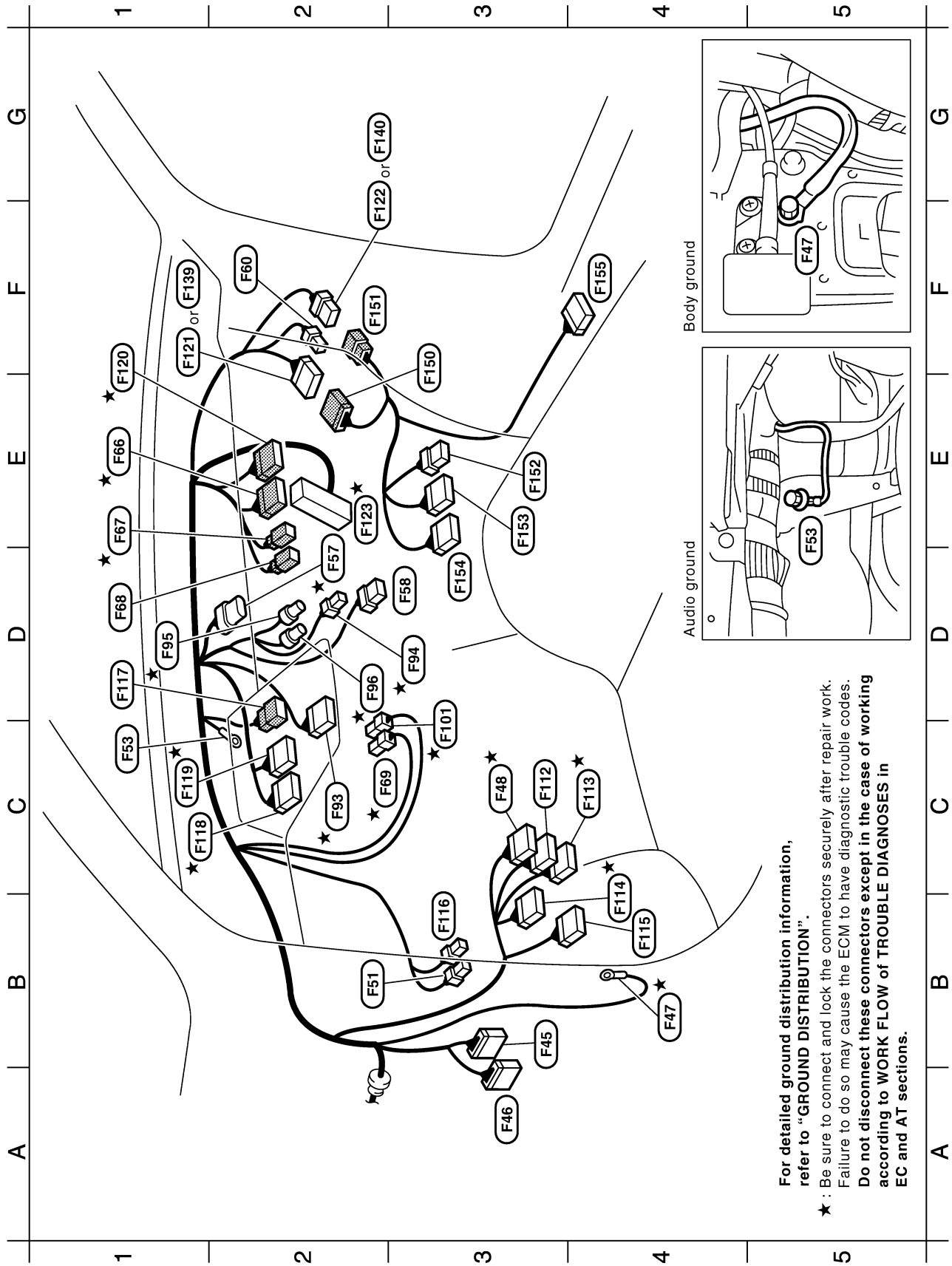
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Do not disconnect these connectors except in the case of working according to WORK FLOW of TROUBLE DIAGNOSES in EC and AT sections.

YEL811E

http://vnx.su/

EFC Harness (Cont'd)

PASSENGER COMPARTMENT • LHD ZD30DDTi ENGINE MODELS



YEL812E

http://vnx.su/

B3		F45	W/16	: To B73
A3		F46	W/16	: To B72
B4	★	F47	–	: Body ground
C3	★	F48	W/20	: Fuse block (J/B)
B2		F51	W/4	: Headlamp aiming switch
C1		F53	–	: Audio ground
D2	★	F57	–/6	: Accelerator work unit (M/T models)
D3		F58	W/8	: NATS IMMU
F2		F60	W/1	: Navigation
E1	★	F66	W/12	: To M787
E1	★	F67	W/3	: To M785
D1		F68	B/2	: To M784
C2	★	F69	B/2	: Stop lamp switch
C2	★	F93	W/20	: To M788
D3	★	F94	W/3	: Accelerator switch (F/C)
D1	★	F95	GY/3	: Accelerator position switch
D2	★	F96	BR/3	: Accelerator position sensor
C3	★	F101	L/2	: Brake switch (M/T models)
C3		F112	W/10	: Fuse block (J/B)
C4	★	F113	GY/20	: Fuse block (J/B)
B4	★	F114	GY/10	: Fuse block (J/B)
B4		F115	W/16	: Data link connector
B3		F116	W/4	: Heat up switch
D1		F117	Y/6	: To B104
C1	★	F118	BR/24	: Combination meter
C1	★	F119	W/24	: Combination meter
E1	★	F120	W/20	: To M812
F1		F121	W/16	: To F150 (Type 2)
F2		F122	BR/8	: To F151 (Type 2)
E2	★	F123	W/88	: ECM
F1		F139	W/16	: Audio unit (Type 1)
G2		F140	BR/8	: Audio unit (Type 1)

Audio sub-harness (Type 2)

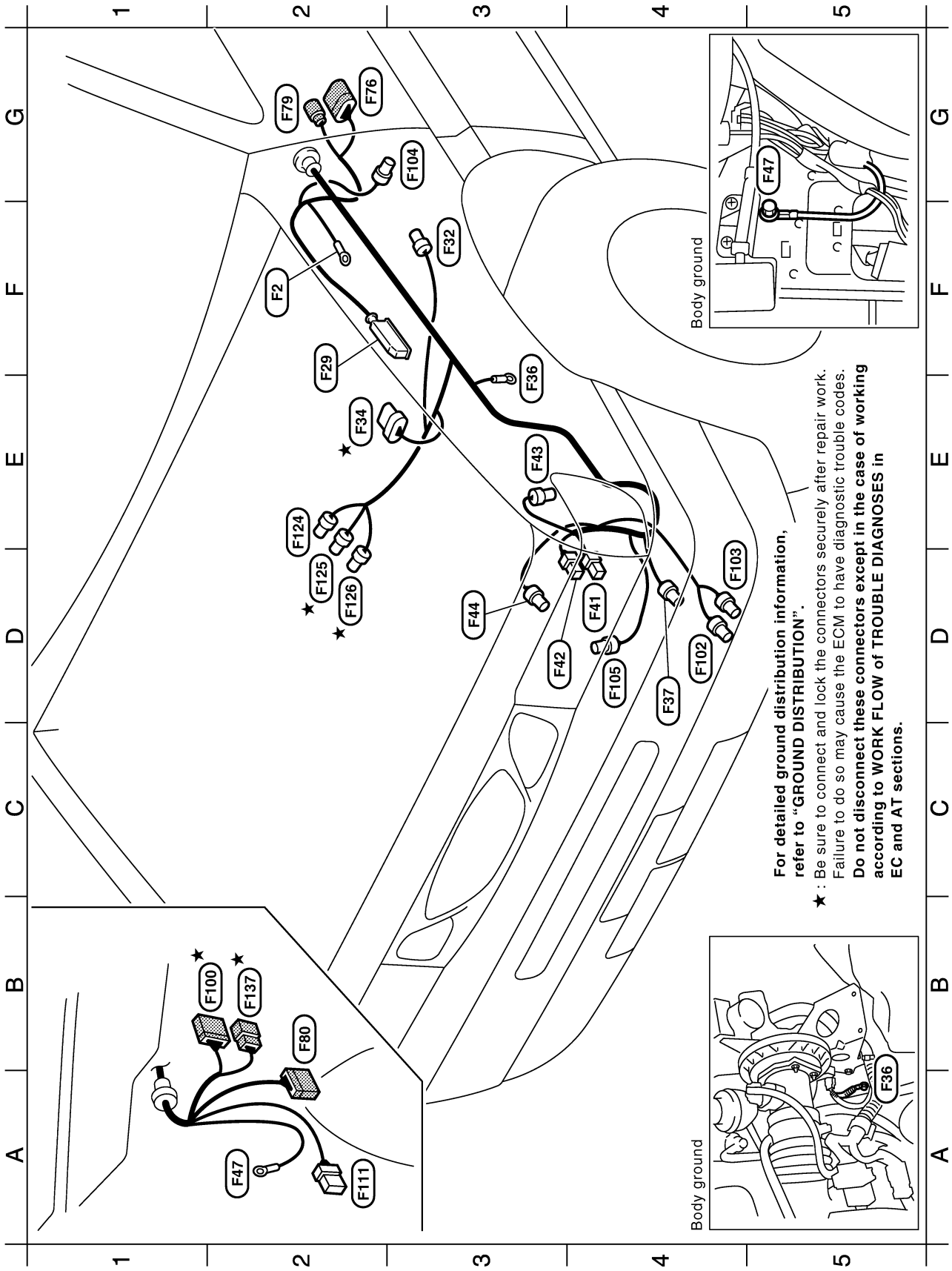
E3	F150	W/16	: To F121
F2	F151	BR/8	: To F122
E3	F152	BR/8	: Audio unit
E3	F153	W/16	: Audio unit
D3	F154	W/12	: Audio unit
F4	F155	W/16	: CD auto-changer (With CD auto-changer)

★ : Be sure to connect and lock the connectors securely after repair work.
Failure to do so may cause the ECM to have diagnostic trouble codes.
Do not disconnect these connectors except in the case of working according to WORK FLOW of TROUBLE DIAGNOSES in EC and AT sections.

http://vnx.su/

EFC Harness (Cont'd)

EFC HARNESS ENGINE COMPARTMENT • RHD TD27Ti ENGINE MODELS



YEL814E

http://vnx.su/

EFC Harness (Cont'd)

F2	F2	–	:	ABS ground (With ABS)
F2	F29	B/31	:	ABS actuator and electric unit (Control unit) (With ABS)
F3	F32	BR/2	:	Front wheel sensor LH
E2	F34	–/5	:	Mass air flow sensor
E3	F36	–	:	Body ground
D4	F37	GY/2	:	Front turn signal lamp LH
D4	F41	B/2	:	Parking lamp LH
D3	F42	B/3	:	Headlamp LH
E3	F43	B/3	:	Headlamp aiming motor LH
D3	F44	GY/2	:	Front fog lamp LH
A2	F47	–	:	Body ground
G2	F76	GY/10	:	To M743 (With ABS)
G2	F79	GY/2	:	To M744 (With ABS)
B2	F80	W/10	:	To B67 (With ABS)
B2	F100	W/16	:	To M775
D4	F102	B/2	:	Washer motor
D4	F103	B/4	:	Headlamp cleaner motor
G3	F104	–/2	:	Side turn signal lamp LH
D4	F105	–/2	:	Ambient temperature sensor
A2	F111	B/5	:	Headlamp relay LH
E2	F124	B/2	:	Throttle control solenoid valve
D2	F125	B/2	:	EGR control solenoid valve A
D2	F126	B/2	:	EGR control solenoid valve B
B2	F137	W/6	:	To M853

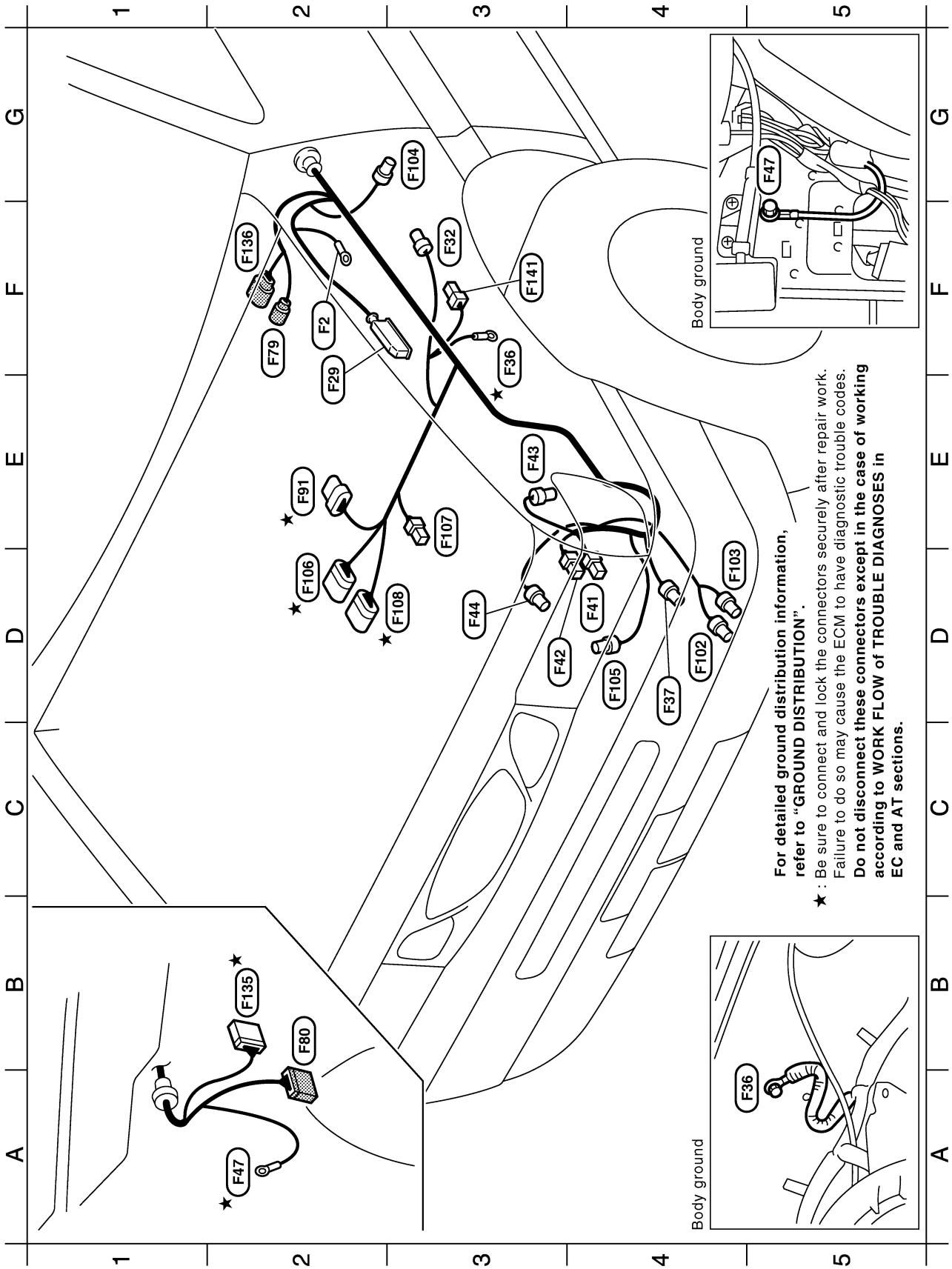
★ : Be sure to connect and lock the connectors securely after repair work.
Failure to do so may cause the ECM to have diagnostic trouble codes.
Do not disconnect these connectors except in the case of working according to WORK FLOW of TROUBLE DIAGNOSES in EC and AT sections.

YEL815E

http://vnx.su/

EFC Harness (Cont'd)

EFC HARNESS ENGINE COMPARTMENT • RHD ZD30DDTi ENGINE MODELS



YEL816E

http://vnx.su/

EFC Harness (Cont'd)

F2	F2	–	: ABS ground
E2	F29	B/31	: ABS actuator and electric unit (Control unit)
F3 ★	F32	BR/2	: Front wheel sensor LH
F3	F36	–	: Body ground
D4	F37	GY/2	: Front turn signal lamp LH
D4	F41	B/2	: Parking lamp LH
D3	F42	B/3	: Headlamp LH
E3	F43	B/3	: Headlamp aiming motor LH
D3 ★	F44	GY/2	: Front fog lamp LH
A2	F47	–	: Body ground
F2	F79	GY/2	: To M744
B2 ★	F80	W/10	: To B67
E2 ★	F91	–/5	: Mass air flow sensor
D4	F102	B/2	: Washer motor
D4	F103	B/4	: Headlamp cleaner motor
G3	F104	–/2	: Side turn signal lamp LH
D4	F105	–/2	: Ambient temperature sensor
D2 ★	F106	GY/10	: To E227
E3	F107	–/2	: Variable nozzle turbocharger control solenoid valve
D3 ★	F108	SMJ	: To E225
B2 ★	F135	SMJ	: To M842
F2	F136	GY/8	: To M829
F3	F141	W/2	: Filter

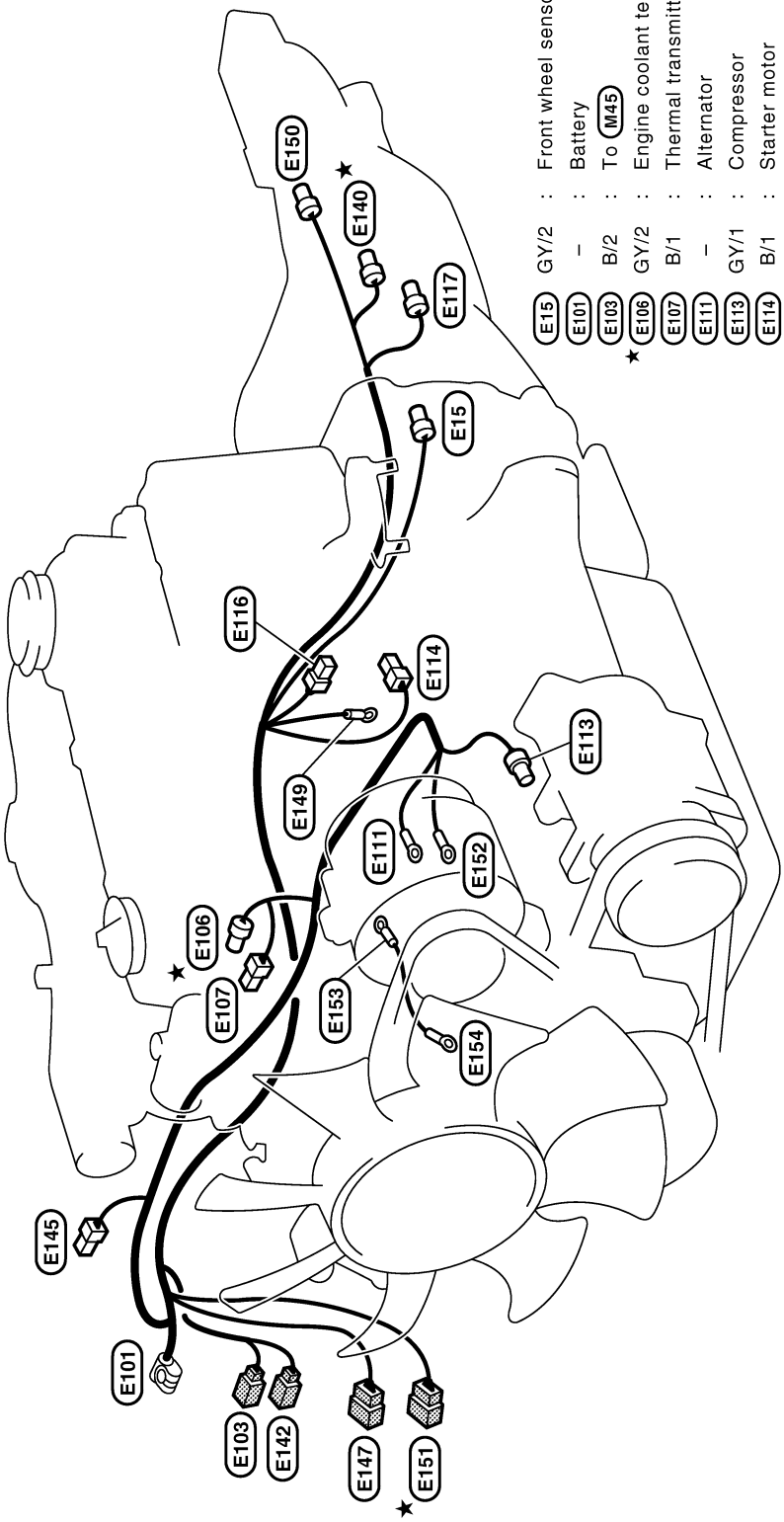
★ : Be sure to connect and lock the connectors securely after repair work.
Failure to do so may cause the ECM to have diagnostic trouble codes.
Do not disconnect these connectors except in the case of working according to WORK FLOW of TROUBLE DIAGNOSES in EC and AT sections.

YEL817E

http://vnx.su/

Engine Harness

TD27Ti ENGINE MODELS



E15	GY/2	:	Front wheel sensor RH
E101	–	:	Battery
E103	B/2	:	To M45
★ E106	GY/2	:	Engine coolant temperature sensor
E107	B/1	:	Thermal transmitter
E111	–	:	Alternator
E113	GY/1	:	Compressor
E114	B/1	:	Starter motor
E116	B/1	:	Oil pressure switch
E117	GY/2	:	Back-up lamp switch
★ E140	BR/3	:	Vehicle speed sensor
E142	B/1	:	To M740
E145	L/2	:	Glow plug
E147	B/8	:	To M745 (RHD models)
			To F4 (LHD models)
E149	–	:	Starter motor
E150	GY/2	:	4WD switch
★ E151	GY/8	:	To M843 (RHD models)
			To F138 (LHD models)
E152	–	:	Alternator
E153	–	:	Alternator
E154	–	:	Body ground

For detailed ground distribution information, refer to "GROUND DISTRIBUTION".

★ : Be sure to connect and lock the connectors securely after repair work. Failure to do so may cause the ECM to have diagnostic trouble codes. **Do not disconnect these connectors except in the case of working according to WORK FLOW of TROUBLE DIAGNOSES in EC and AT sections.**

YEL818E

http://vnx.su/

Engine Harness (Cont'd)

ZD30DDTi ENGINE MODELS

For detailed ground distribution information, refer to "GROUND DISTRIBUTION".

★: Be sure to connect and lock the connectors securely after repair work. Failure to do so may cause the ECM to have diagnostic trouble codes. **Do not disconnect these connectors except in the case of working according to WORK FLOW of TROUBLE DIAGNOSES in EC and AT sections.**

★ E201	GY/9	: To	M807
E202	B/2	: To	M45
E203	–	: Body ground	
E204	B/2	: Intake air control valve control solenoid valve	
E205	BR/2	: Swirl control valve control solenoid valve	
E206	–	: Battery (+)	
E207	B/1	: Starter motor	
E208	–	: Starter motor	
★ E209	BR/3	: Vehicle speed sensor	
E210	GY/2	: Back-up lamp switch (M/T models)	
E211	GY/2	: Front wheel sensor RH	
E212	GY/2	: 4WD switch	
E213	B/2	: Park/neutral position switch (M/T models)	
		Transfer neutral position switch (A/T models)	
E214	–	: Alternator	
E215	–	: Alternator	
E216	GY/2	: Alternator	
E217	B/1	: Oil pressure switch-2	
★ E218	GY/6	: EGR volume control valve	
★ E219	GY/2	: Engine coolant temperature sensor	
★ E220	GY/6	: To E231	
E221	–	: Engine ground	
★ E222	–	: Engine ground	
★ E223	GY/3	: Charge air pressure sensor	
★ E224	–	: Engine ground	
★ E225	SMJ	: To F108	
E226	B/1	: Compressor	
★ E227	GY/10	: To F106	
E228	B/1	: Thermal transmitter	
★ E229	B/3	: Crankshaft position sensor (TDC)	
E230	B/1	: To E241	
E233	B/1	: Oil pressure switch-1	

Glow sub-harness

E241	B/1	: To	E230
E242	–	: Glow plug	

Injection pump sub-harness

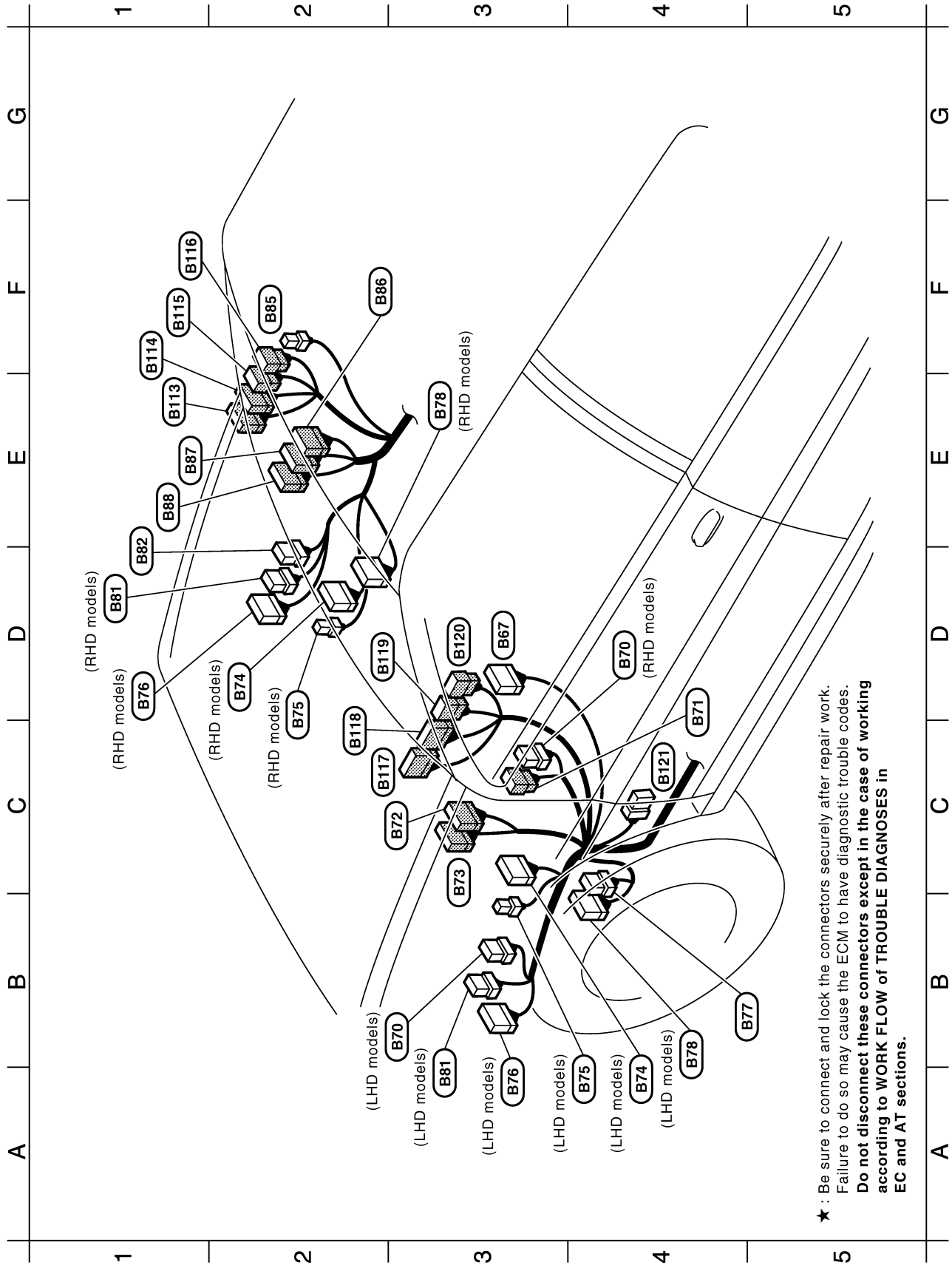
★ E231	GY/6	: To	E220
★ E232	–/9	: Electronic control fuel injection pump	

YEL819E

http://vnx.su/

Body Harness

HARDTOP MODELS (Front side)



YEL820E

http://vnx.su/

Body Harness (Cont'd)

D3	B67	W/10	: To F80	(RHD models)
D4, B3	B70	W/6	: To R13	
C4	B71	W/6	: To R14	(RHD models)
C3	B72	W/16	: To F46	(LHD models)
C3	B73	W/16	: To F45	(LHD models)
D2, A4	B74	BR/16	: Fuse block (J/B)	
C2, A4	B75	B/2	: Fuse block (J/B)	
D1, A3	B76	W/20	: Time control unit	
B4	B77	W/6	: Ultrasonic cancel switch (With ultrasonic for LHD models)	
E3, A4	B78	W/10	: Door mirror switch (With mirror control system)	
D1, A3	B81	W/8	: Time control unit	
D1	B82	W/6	: Fuse block (J/B) (RHD models)	
F2	B85	L/4	: Theft warning horn relay (With theft warning system)	
F2	B86	W/16	: To M751 (RHD models)	
E1	B87	W/12	: To M752 (RHD models)	
E1	B88	W/10	: To M783 (LHD models)	
E1	B113	W/12	: To D64 (RHD models)	
F1	B114	W/12	: To D65 (RHD models)	
F1	B115	W/8	: To D66 (LHD models)	
F1	B116	W/8	: To D67 (LHD models)	
C2	B117	W/12	: To D44 (LHD models)	
C2	B118	W/12	: To D43 (LHD models)	
D2	B119	W/8	: To D46 (RHD models)	
D3	B120	W/8	: To D45 (RHD models)	
C4	B121	B/5	: Door lock switch relay	

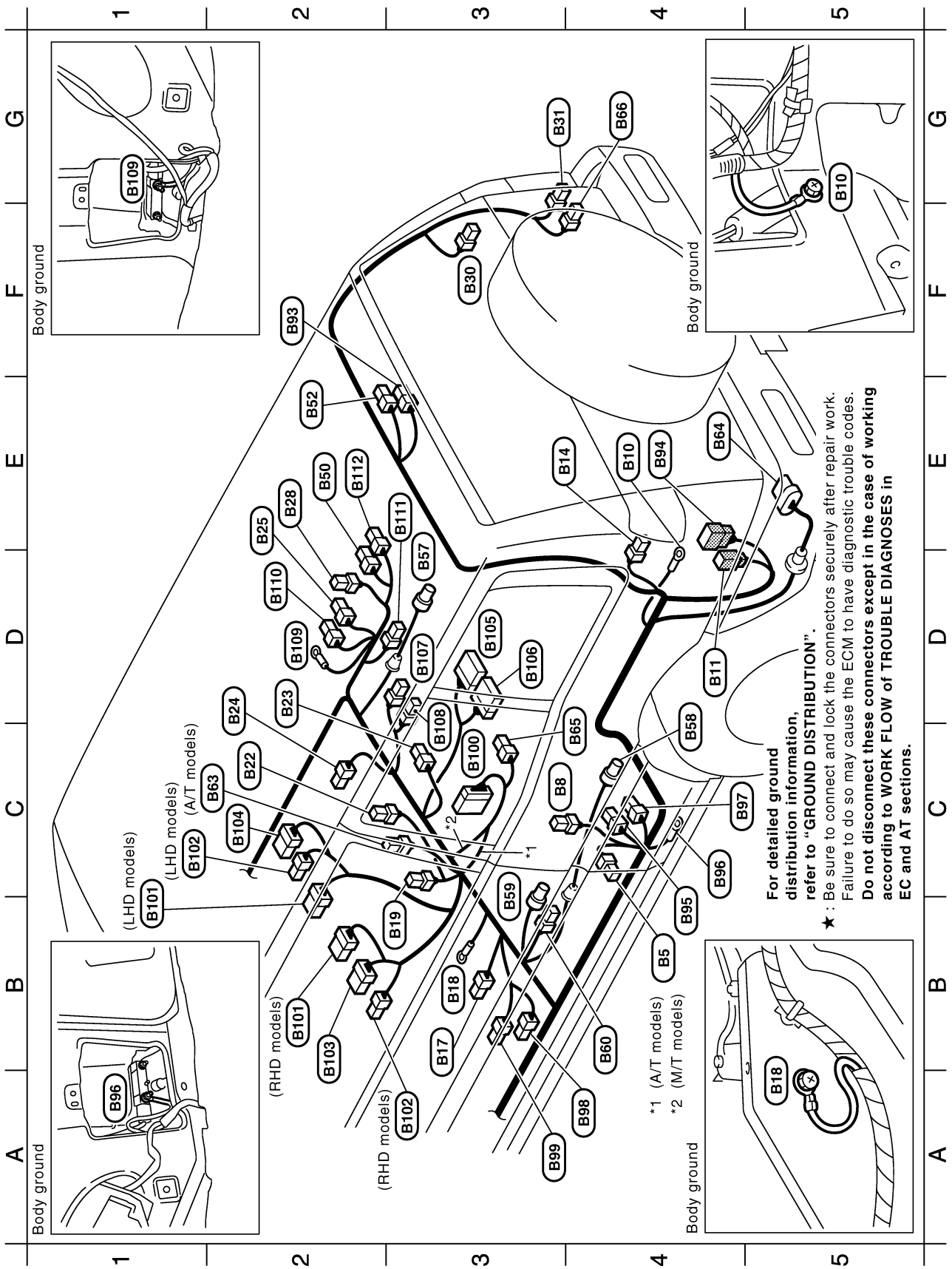
★ : Be sure to connect and lock the connectors securely after repair work.
Failure to do so may cause the ECM to have diagnostic trouble codes.
Do not disconnect these connectors except in the case of working according to WORK FLOW of TROUBLE DIAGNOSES in EC and AT sections.

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Body Harness (Cont'd)

HARDTOP MODELS (Rear side)



YEL822E

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Body Harness (Cont'd)

B4	B5	BR/1	: Front door switch LH
C3	B8	B/2	: Rear speaker LH
E4	B10	–	: Body ground
D4	B11	W/2	: To T1
E3	B14	W/2	: Stop lamp LH
B3	B17	W/3	: Heated seat LH (With seat heater)
B3	B18	–	: Body ground
B3	B19	L/4	: Heated seat switch LH (With seat heater)
C2	B22	W/4	: Heated seat switch RH (With seat heater)
D2	B23	B/1	: Parking brake switch
D2	B24	W/3	: Heated seat RH (With seat heater)
E2	B25	BR/1	: Front door switch RH
E2	B28	B/2	: Rear speaker RH
F3	B30	W/2	: Stop lamp RH
G3	B31	BR/1	: Back door switch
E2	B50	B/1	: Theft warning horn (With theft warning system)
E2	B52	B/1	: Rear interior room lamp
D3	B57	BR/2	: Rear wheel sensor RH (With ABS)
C4	B58	BR/2	: Rear wheel sensor LH (With ABS)
B3	B59	BR/2	: G sensor (With ABS)
B4	B60	GY/2	: G sensor (With ABS)
C2	B63	B/4	: A/T control device (Overdrive control switch) (A/T models)
E4	B64	B/8	: To C10
C4	B65	B/2	: Front power socket
G4	B66	B/2	: Rear power socket
F2	B93	B/1	: Rear interior room lamp
E4	B94	W/8	: To T11
B4	B95	Y/2	: Front LH seat belt pre-tensioner
C4	B96	–	: Body ground (With side air bag)
C4	B97	Y/2	: Satellite sensor LH (With side air bag)
A4	B98	–/2	: Front side air bag module LH (With side air bag)
A3	B99	–/1	: Front side air bag module LH (With side air bag)
C3	B100	Y/12	: Air bag diagnosis sensor unit
B1	B101	Y/6	: Combination switch (Spiral cable)
C1, A3	B102	Y/2	: Front passenger air bag module
B2	B103	Y/6	: To M836 (RHD models)
C2	B104	Y/6	: To F117 (LHD models)
D3	B105	Y/12	: Air bag diagnosis sensor unit
D3	B106	Y/20	: Air bag diagnosis sensor unit
D3	B107	–/1	: Front side air bag module RH (With side air bag)
C3	B108	–/2	: Front side air bag module RH (With side air bag)
D2	B109	–	: Body ground (With side air bag)
D2	B110	Y/2	: Satellite sensor RH (With side air bag)
E3	B111	Y/2	: Front RH seat belt pre-tensioner
E2	B112	B/1	: Theft warning horn (With theft warning system)

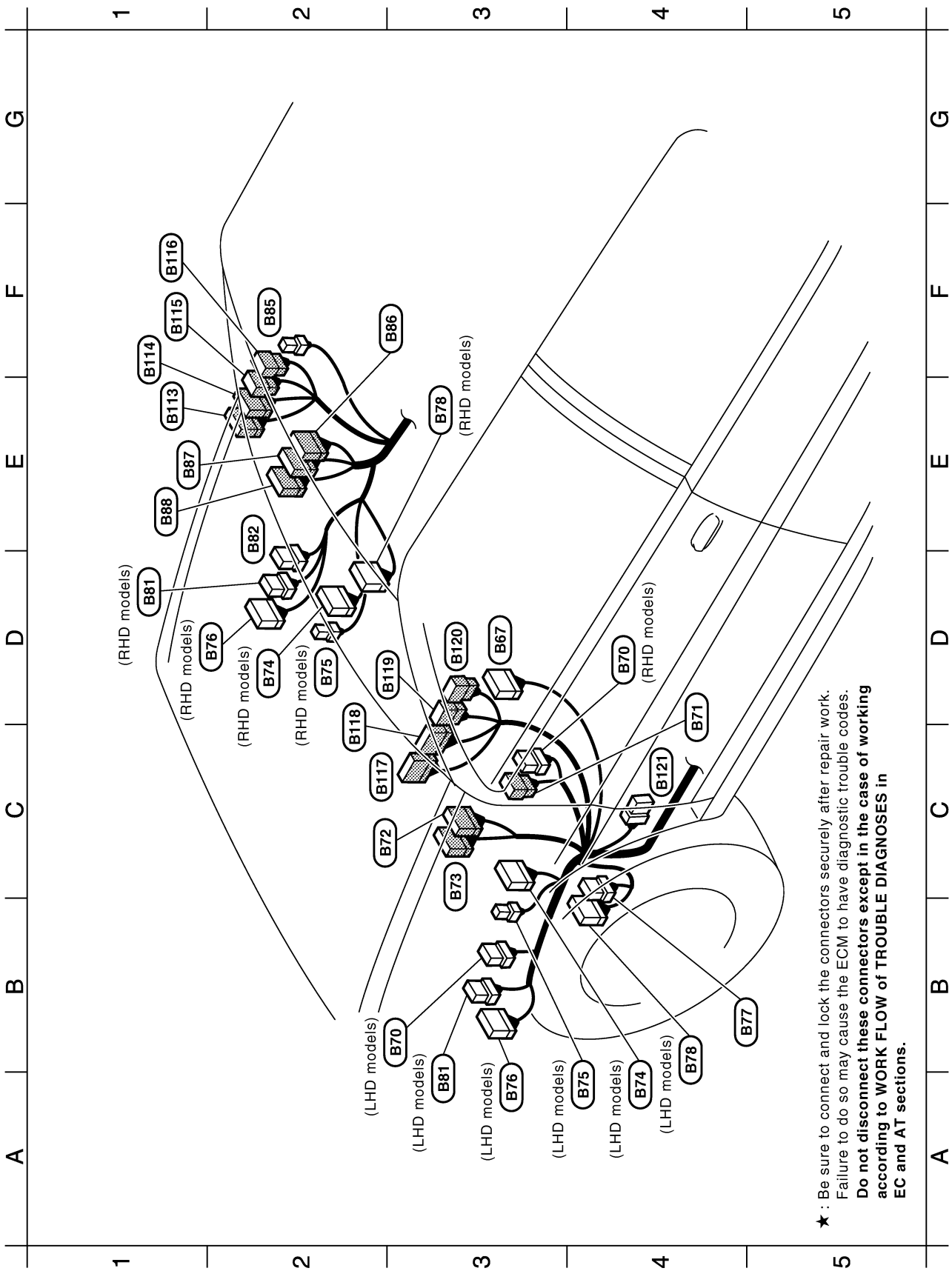
★: Be sure to connect and lock the connectors securely after repair work. Failure to do so may cause the ECM to have diagnostic trouble codes. **Do not disconnect these connectors except in the case of working according to WORK FLOW of TROUBLE DIAGNOSES in EC and AT sections.**

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Body Harness (Cont'd)

WAGON MODELS (Front side)



YEL824E

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Body Harness (Cont'd)

D3	B67	W/10	: To F80	(RHD models)
D4, B3	B70	W/6	: To R13	
D4	B71	W/6	: To R14	(RHD models)
C2	B72	W/16	: To F46	(LHD models)
C3	B73	W/16	: To F45	(LHD models)
D2, A4	B74	BR/16	: Fuse block (J/B)	
D2, A4	B75	B/2	: Fuse block (J/B)	
D2, A3	B76	W/20	: Time control unit	
B4	B77	W/6	: Ultrasonic cancel switch (With ultrasonic for LHD models)	
E3, B4	B78	W/10	: Door mirror switch (With mirror control system)	
D1, A3	B81	W/8	: Time control unit	
E2	B82	W/6	: Fuse block (J/B) (RHD models)	
F2	B85	L/4	: Theft warning horn relay (With theft warning system)	
F3	B86	W/16	: To M751	(RHD models)
E1	B87	W/12	: To M752	(RHD models)
E1	B88	W/10	: To M783	(LHD models)
E1	B113	W/12	: To D64	(RHD models)
F1	B114	W/12	: To D65	(RHD models)
F1	B115	W/8	: To D66	(LHD models)
F1	B116	W/8	: To D67	(LHD models)
C2	B117	W/12	: To D44	(LHD models)
C2	B118	W/12	: To D43	(LHD models)
D2	B119	W/8	: To D46	(RHD models)
D3	B120	W/8	: To D45	(RHD models)
C4	B121	B/5	: Door lock switch relay	

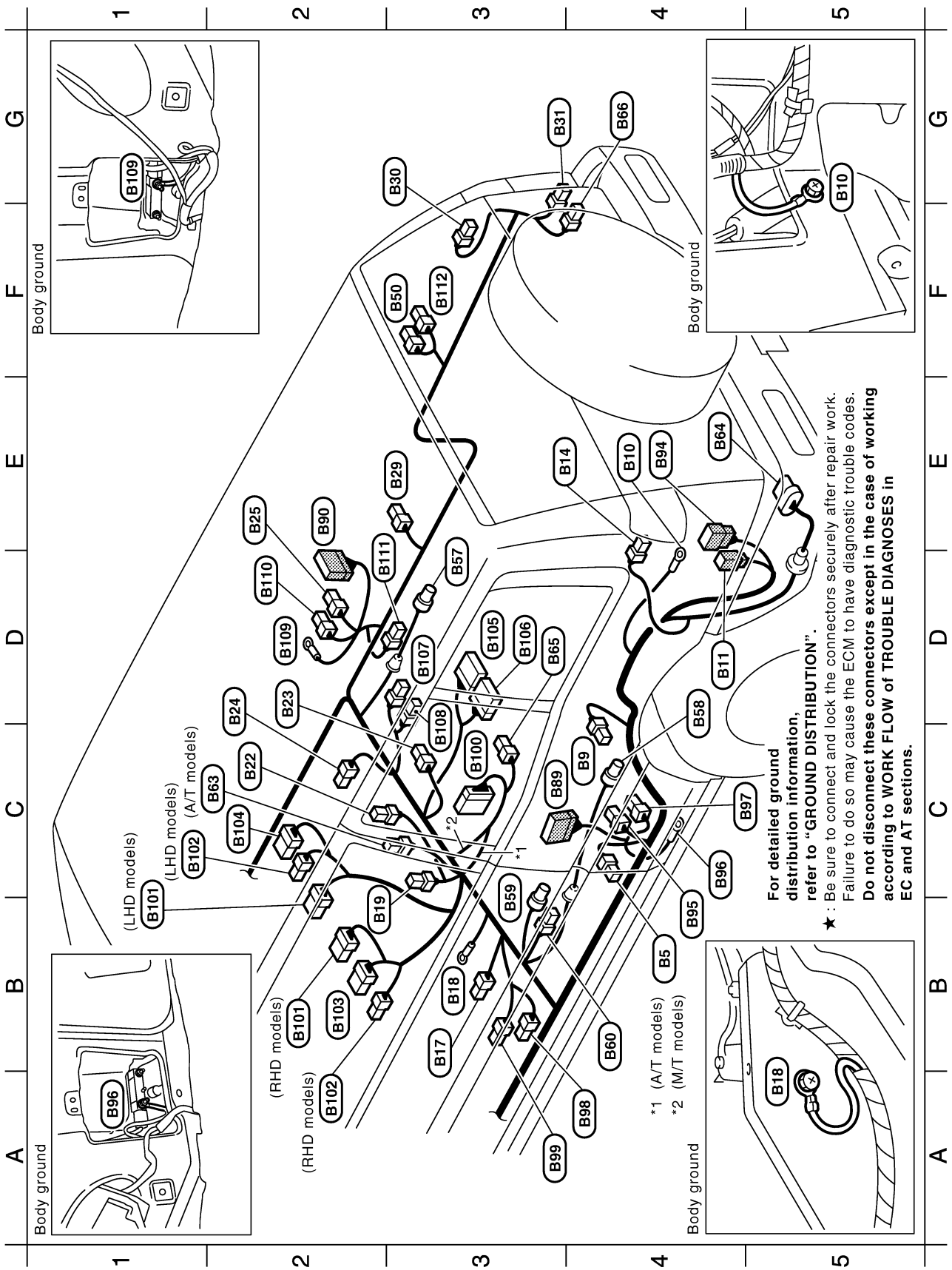
★ : Be sure to connect and lock the connectors securely after repair work. Failure to do so may cause the ECM to have diagnostic trouble codes. **Do not disconnect these connectors except in the case of working according to WORK FLOW of TROUBLE DIAGNOSES in EC and AT sections.**

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Body Harness (Cont'd)

WAGON MODELS (Rear side)



YEL826E

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Body Harness (Cont'd)

B4 B5 BR/1 : Front door switch LH
C4 B9 BR/1 : Rear door switch LH
E4 B10 – : Body ground
D4 B11 W/2 : To T1
E3 B14 W/2 : Stop lamp LH
B3 B17 W/3 : Heated seat LH (With seat heater)
B3 B18 – : Body ground
B2 B19 L/4 : Heated seat switch LH (With seat heater)
C2 B22 W/4 : Heated seat switch RH (With seat heater)
D2 B23 B/1 : Parking brake switch
D2 B24 W/3 : Heated seat RH (With seat heater)
E2 B25 BR/1 : Front door switch RH
E3 B29 BR/1 : Rear door switch RH
G3 B30 W/2 : Stop lamp RH
G3 B31 BR/1 : Back door switch
F3 B50 B/1 : Theft warning horn (With theft warning system)
D3 B57 BR/2 : Rear wheel sensor RH (With ABS)
D4 B58 BR/2 : Rear wheel sensor LH (With ABS)
B3 B59 BR/2 : G sensor (With ABS)
B4 B60 GY/2 : G sensor (With ABS)
C2 B63 B/4 : A/T control device (Overdrive control switch) (A/T models)
E4 B64 B/8 : To C10
D3 B65 B/2 : Front power socket
G4 B66 B/2 : Rear power socket
C3 B89 W/10 : To D57 (With super lock)
W/10 : To D59 (Without super lock)
E2 B90 W/10 : To D77 (With super lock)
W/10 : To D79 (Without super lock)
E4 B94 W/8 : To T11
B4 B95 Y/2 : Front LH seat belt pre-tensioner
C4 B96 – : Body ground (With side air bag)
C4 B97 Y/2 : Satellite sensor LH (With side air bag)
A4 B98 –/2 : Front side air bag module LH (With side air bag)
A3 B99 –/1 : Front side air bag module LH (With side air bag)
C3 B100 Y/12 : Air bag diagnosis sensor unit
B1, B2 B101 Y/6 : Combination switch (Spiral cable)
C1, A2 B102 Y/2 : Front passenger air bag module
B2 B103 Y/6 : To M836 (RHD models)
C2 B104 Y/6 : To F117 (LHD models)
D3 B105 Y/12 : Air bag diagnosis sensor unit

D3 B106 Y/20 : Air bag diagnosis sensor unit
D3 B107 –/1 : Front side air bag module RH (With side air bag)
C3 B108 –/2 : Front side air bag module RH (With side air bag)
D2 B109 – : Body ground (With side air bag)
D2 B110 Y/2 : Satellite sensor RH (With side air bag)
D2 B111 Y/2 : Front RH seat belt pre-tensioner
F3 B112 B/1 : Theft warning horn (With theft warning system)

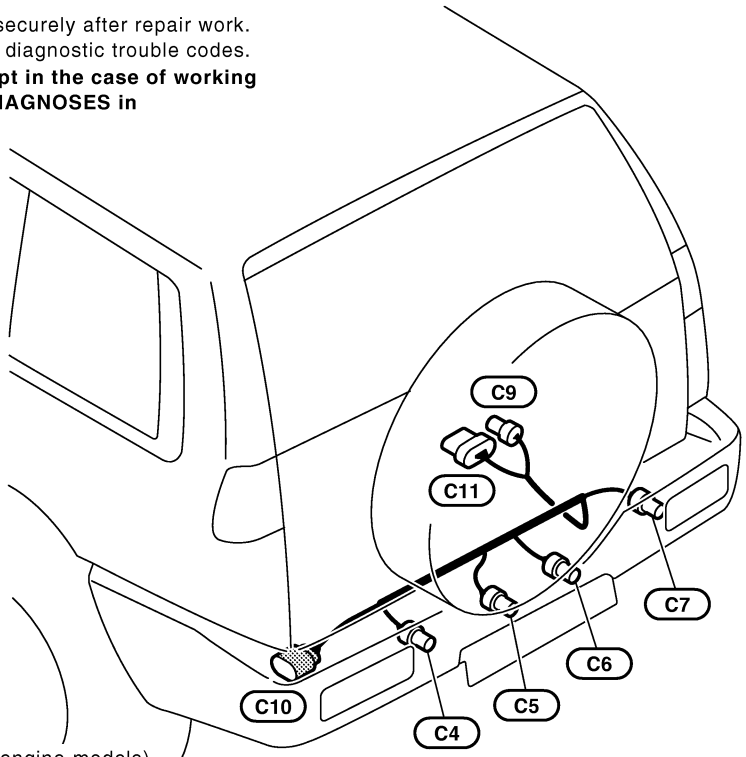
★: Be sure to connect and lock the connectors securely after repair work. Failure to do so may cause the ECM to have diagnostic trouble codes. **Do not disconnect these connectors except in the case of working according to WORK FLOW of TROUBLE DIAGNOSES in EC and AT sections.**

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Chassis Harness

★ : Be sure to connect and lock the connectors securely after repair work. Failure to do so may cause the ECM to have diagnostic trouble codes. **Do not disconnect these connectors except in the case of working according to WORK FLOW of TROUBLE DIAGNOSES in EC and AT sections.**

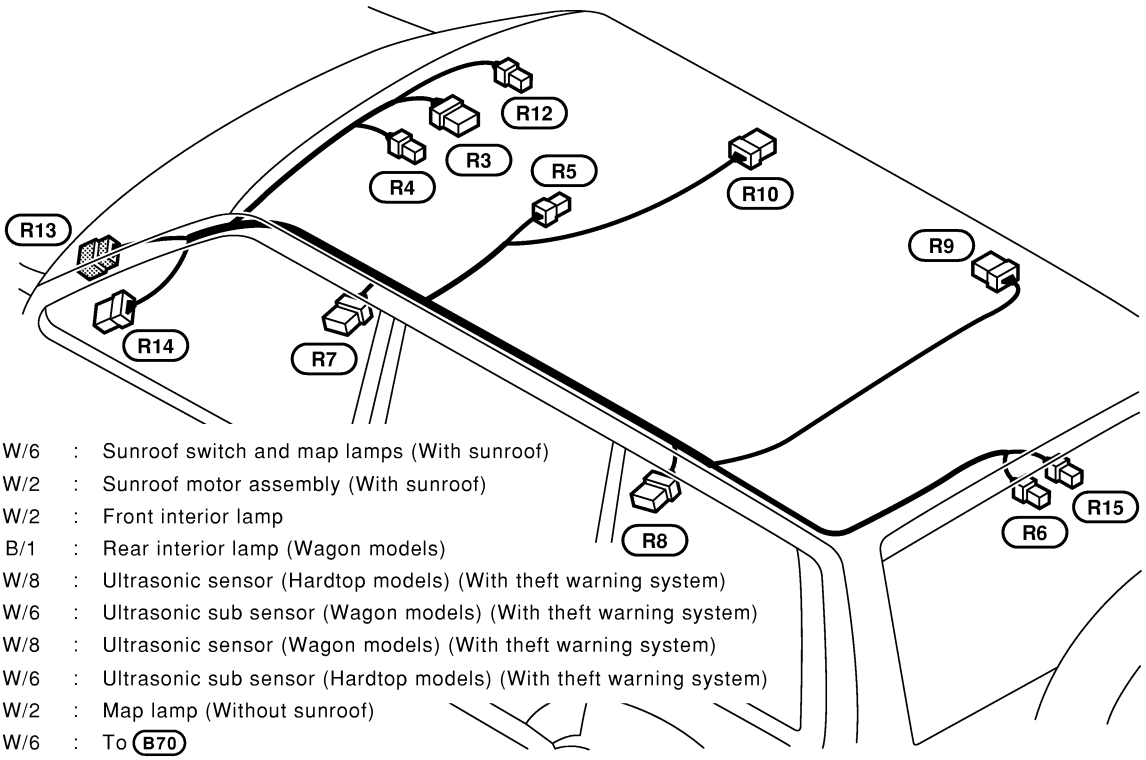


C4	GY/4	:	Rear combination lamp LH
C5	GY/2	:	License plate lamp LH
C6	GY/2	:	License plate lamp RH
C7	GY/4	:	Rear combination lamp RH
C9	W/3	:	Fuel level sensor unit (TD27Ti engine models)
C10	B/8	:	To B64
C11	GY/5	:	Fuel level sensor unit (ZD30DDTi engine models)

YEL828E

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Room Lamp Harness

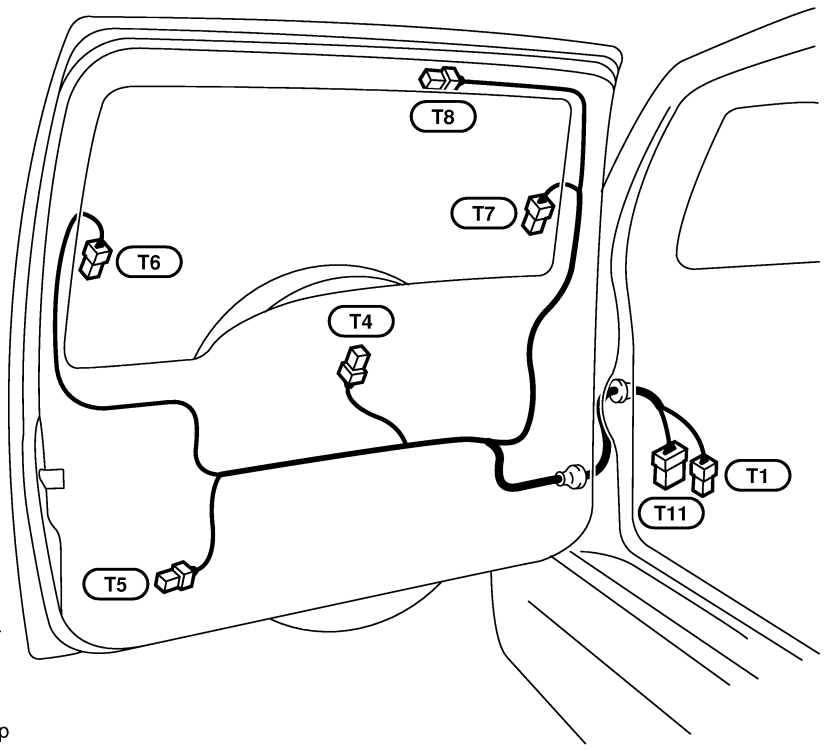


R3	W/6	:	Sunroof switch and map lamps (With sunroof)
R4	W/2	:	Sunroof motor assembly (With sunroof)
R5	W/2	:	Front interior lamp
R6	B/1	:	Rear interior lamp (Wagon models)
R7	W/8	:	Ultrasonic sensor (Hardtop models) (With theft warning system)
R8	W/6	:	Ultrasonic sub sensor (Wagon models) (With theft warning system)
R9	W/8	:	Ultrasonic sensor (Wagon models) (With theft warning system)
R10	W/6	:	Ultrasonic sub sensor (Hardtop models) (With theft warning system)
R12	W/2	:	Map lamp (Without sunroof)
R13	W/6	:	To B70
R14	W/6	:	Fuse block (J/B) (LHD models) To B71 (RHD models)
R15	B/1	:	Rear interior lamp (Wagon models)

YEL268D

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Tailgate Harness



T1	W/2	:	To B11
T4	W4	:	Rear wiper motor
T5	W/4	:	Back door lock actuator
T6	B/1	:	Rear window defogger
T7	B/1	:	Rear window defogger
T8	W/2	:	High-mounted stop lamp
T11	W/8	:	To B94

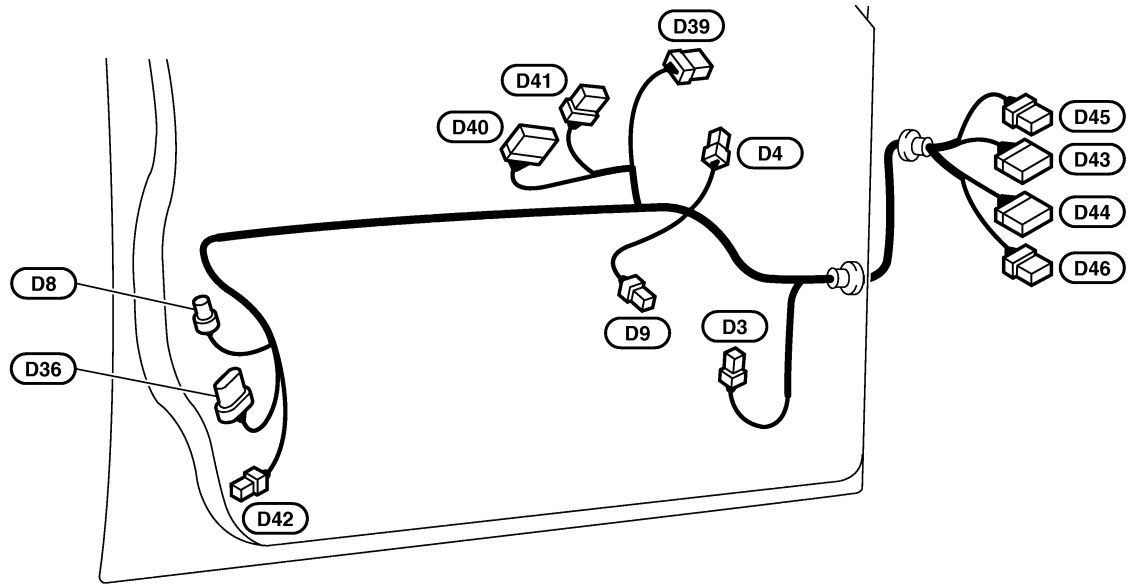
YEL269D

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Door Harness (LH side)

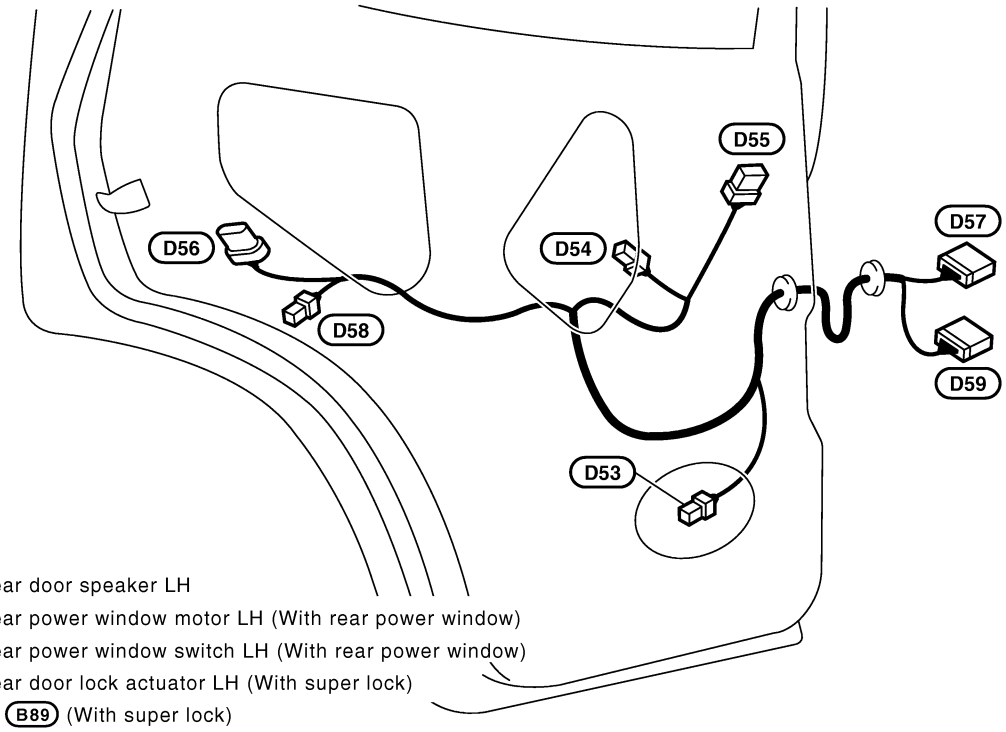
FRONT

- D3 B/2 : Front door speaker LH
- D4 B/2 : Front power window motor LH
- D8 B/2 : Key cylinder switch LH (With key cylinder switch)
- D9 B/2 : Tweeter LH (With tweeter)
- D36 B/6 : Front door lock actuator LH (With super lock)
- D39 W/6 : Door mirror LH (With mirror control system)
- D40 W/16 : Power window main switch (LHD models)
- D41 W/8 : Power window sub-switch (Front passenger side) (RHD models)
- D42 W/4 : Front door lock actuator LH (Without super lock)
- D43 W/12 : To B118 (LHD models)
- D44 W/12 : To B117 (LHD models)
- D45 W/8 : To B120 (RHD models)
- D46 W/8 : To B119 (RHD models)



YEL829E

REAR



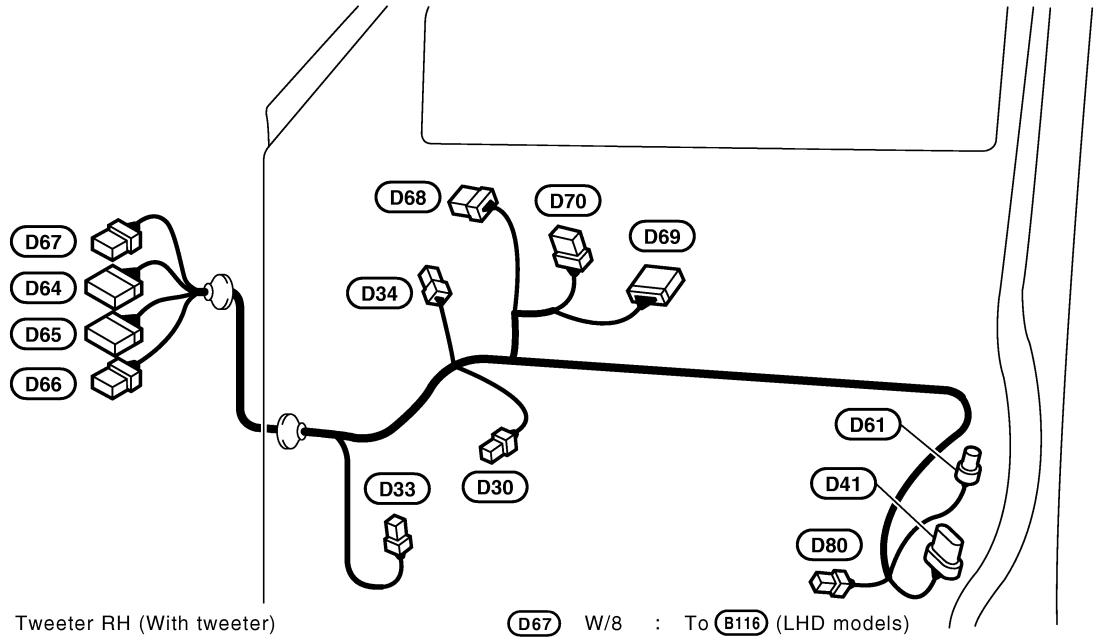
- D53 B/2 : Rear door speaker LH
- D54 B/2 : Rear power window motor LH (With rear power window)
- D55 W/8 : Rear power window switch LH (With rear power window)
- D56 B/6 : Rear door lock actuator LH (With super lock)
- D57 W/10 : To B89 (With super lock)
- D58 W/4 : Rear door lock actuator LH (Without super lock)
- D59 W/10 : To B89 (Without super lock)

YEL830E

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Door Harness (RH side)

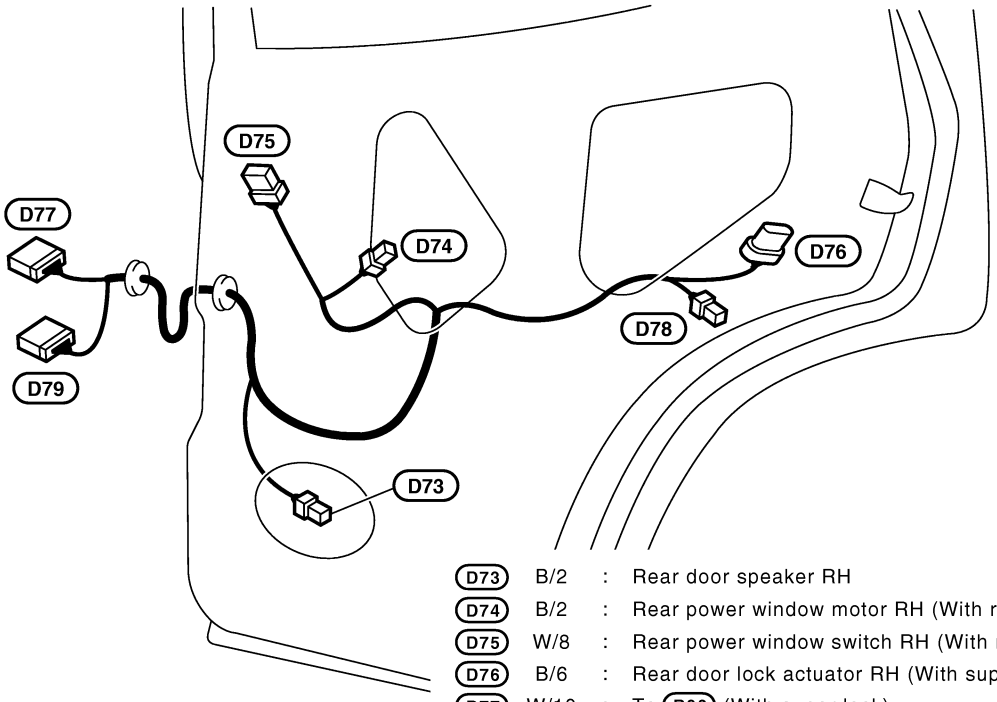
FRONT



D30	B/2	:	Tweeter RH (With tweeter)
D33	B/2	:	Front door speaker RH
D34	B/2	:	Front power window motor RH
D41	B/6	:	Front door lock actuator RH (With super lock)
D61	B/2	:	Key cylinder switch RH (With key cylinder switch)
D64	W/12	:	To B113 (RHD models)
D65	W/12	:	To B114 (RHD models)
D66	W/8	:	To B115 (LHD models)
D67	W/8	:	To B116 (LHD models)
D68	W/6	:	Door mirror RH (With mirror control system)
D69	W/16	:	Power window main switch (RHD models)
D70	W/8	:	Power window sub-switch (Front passenger side) (LHD models)
D80	W/4	:	Front door lock actuator RH (Without super lock)

YEL831E

REAR



D73	B/2	:	Rear door speaker RH
D74	B/2	:	Rear power window motor RH (With rear power window)
D75	W/8	:	Rear power window switch RH (With rear power window)
D76	B/6	:	Rear door lock actuator RH (With super lock)
D77	W/10	:	To B90 (With super lock)
D78	W/4	:	Rear door lock actuator RH (Without super lock)
D79	W/10	:	To B90 (Without super lock)

YEL832E

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Headlamps

	Wattage (W)
High/Low	60/55 (H4)

Exterior Lamps

		Wattage (W)
Front fog lamp		51 (HB4)
Front turn lamp		21
Side turn signal lamp		5
Parking lamp		5
Rear combination lamp	Turn signal	21
	Tail lamp	5
	Back-up	21
	Rear fog	21
Stop lamp		21
High-mounted stop lamp		21
License plate lamp		5

Interior Lamps

	Wattage (W)
Map lamp	5
Front interior lamp	10
Rear interior lamp	5

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Use the chart below to find out what each wiring diagram code stands for.
Refer to the wiring diagram code in the alphabetical index to find the location (page number) of each wiring diagram.

Code	Section	Wiring Diagram Name
A/C, M	HA	MANUAL AIR CONDITIONER
A/CCUT	EC	AIR CONDITIONER CUT CONTROL
ABS	BR	ANTI-LOCK BRAKE SYSTEM
ACC/SW	EC	ACCELERATOR SWITCH (FC)
APS	AT, EC	ACCELERATOR POSITION SENSOR
AT/C	EC	A/T CONTROL
AUDIO	EL	AUDIO
BA/FTS	AT	A/T FLUID TEMPERATURE SENSOR AND TCM POWER SUPPLY
BACK/L	EL	BACK-UP LAMP
BOOST	EC	TURBOCHARGER BOOST SENSOR
BRK/SW	EC	BRAKE SWITCH
CHARGE	SC	CHARGING SYSTEM
CHIME	EL	WARNING CHIME
CIGAR	EL	CIGARETTE LIGHTER
CKPS	EC	CRANK SHAFT POSITION SENSOR (OBD)
CLOCK	EL	CLOCK
COOL/F	EC	COOLING FAN CONTROL
D/LOCK	EL	POWER DOOR LOCK
DEF	EL	REAR WINDOW DEFOGGER
DTRL	EL	HEADLAMP — WITH DAYTIME LIGHT SYSTEM
ECMRLY	EC	ECM RELAY
ECTS	EC	ENGINE COOLANT TEMPERATURE SENSOR
EGRC/V	EC	EGR VALVE AND EVAP CANISTER PURGE CONTROL SOLENOID VALVE
EGVC/V	EC	EGR VOLUME CONTROL VALVE
ENGSS	AT	ENGINE SPEED SIGNAL
F/FOG	EL	FRONT FOG LAMP
FTS	AT	A/T FLUID TEMPERATURE SENSOR
GLOW	EC	QUICK GLOW SYSTEM
H/AIM	EL	HEADLAMP AIMING CONTROL SYSTEM
H/LAMP	EL	HEADLAMP
HEATER	HA	HEATER SYSTEM
HEATUP	EC	HEAT UP SWITCH
HLC	EL	HEADLAMP CLEANER
HORN	EL	HORN
HSEAT	EL	HEATED SEAT
ILL	EL	ILLUMINATION
INJPMP	EC	ELECTRONIC CONTROL FUEL INJECTION PUMP
INT/L	EL	INTERIOR AND MAP LAMPS
INT/V	EC	INTAKE AIR CONTROL VALVE CONTROL SOLENOID VALVE
LPSV	AT	LINE PRESSURE SOLENOID VALVE
MAFS	EC	MASS AIR FLOW SENSOR
MAIN	AT	MAIN POWER SUPPLY AND GROUND CIRCUIT
MAIN	EC	MAIN POWER SUPPLY AND GROUND CIRCUIT
METER	EL	SPEEDOMETER, TACHOMETER, TEMP. AND FUEL GAUGES
MIL	EC	MALFUNCTION INDICATOR
MIL/DL	EC	MIL AND DATA LINK CONNECTORS
MIRROR	EL	DOOR MIRROR
MULTI	EL	REMOTE KEYLESS ENTRY SYSTEM
NATS	EL	NISSAN ANTI-THEFT SYSTEM
NLS	EC	NEEDLE LIFT SENSOR
NONDTC	AT	NON-DETECTABLE ITEMS
OILPSW	EC	OIL PRESSURE SWITCH
OILP/W	EC	OIL PRESSURE WARNING
OVRCSV	AT	OVER RUN CLUTCH SOLENOID VALVE
PNP/SW	AT	PARK/NEUTRAL POSITION SWITCH
PNP/SW	EC	NEUTRAL POSITION SWITCH
R/FOG	EL	REAR FOG LAMP
REMOTE	EL	AUDIO (REMOTE CONTROL SWITCH)
S/LOCK	EL	POWER DOOR LOCK-SUPER LOCK
S/SIG	EC	START SIGNAL
SROOF	EL	SUNROOF
SRS	RS	SUPPLEMENTAL RESTRAINT SYSTEM
SSV/A	AT	SHIFT SOLENOID VALVE A
SSV/B	AT	SHIFT SOLENOID VALVE B

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Code	Section	Wiring Diagram Name
START	SC	STARTING SYSTEM
STOP/L	EL	STOP LAMP
SWL/V	EC	SWIRL CONTROL VALVE CONTROL SOLENOID VALVE
TAIL/L	EL	PARKING, LICENSE, TAIL AND STOP LAMPS
TCV	AT	TORQUE CONVERTER CLUTCH SOLENOID VALVE
THEFT	EL	VEHICLE SECURITY (THEFT WARNING) SYSTEM
THLCNT	EC	THROTTLE CONTROL SOLENOID VALVE
TURN	EL	TURN SIGNAL AND HAZARD WARNING LAMP

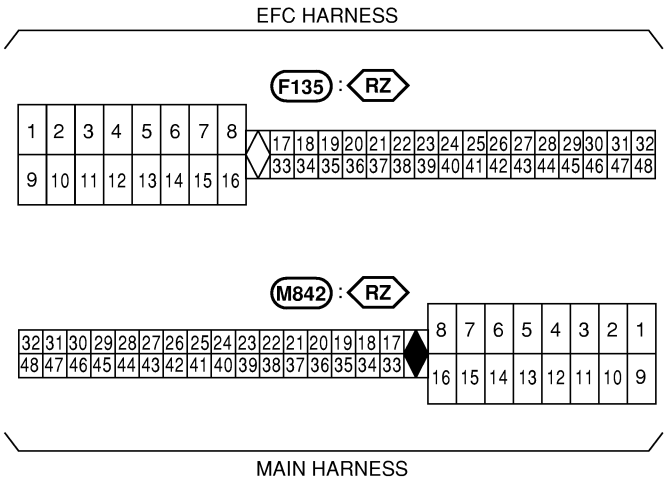
Code	Section	Wiring Diagram Name
TVC&SO	EC	TVC AND SHUT OFF
VNT	EC	VARIABLE NOZZLE TURBOCHARGER CONTROL SOLENOID VALVE
VSS	EC	VEHICLE SPEED SENSOR
VSSA/T	AT	VEHICLE SPEED SENSOR A/T (REVOLUTION SENSOR)
VSSMTR	AT	VEHICLE SPEED SENSOR MTR
WARN	EL	WARNING LAMPS
WINDOW	EL	POWER WINDOW
WIP/R	EL	REAR WIPER AND WASHER
WIPER	EL	FRONT WIPER AND WASHER

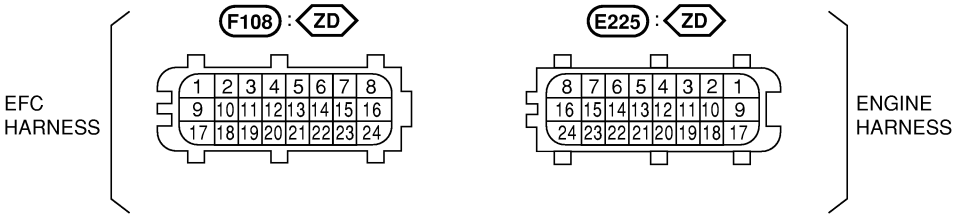
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NOTES

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Terminal Arrangement





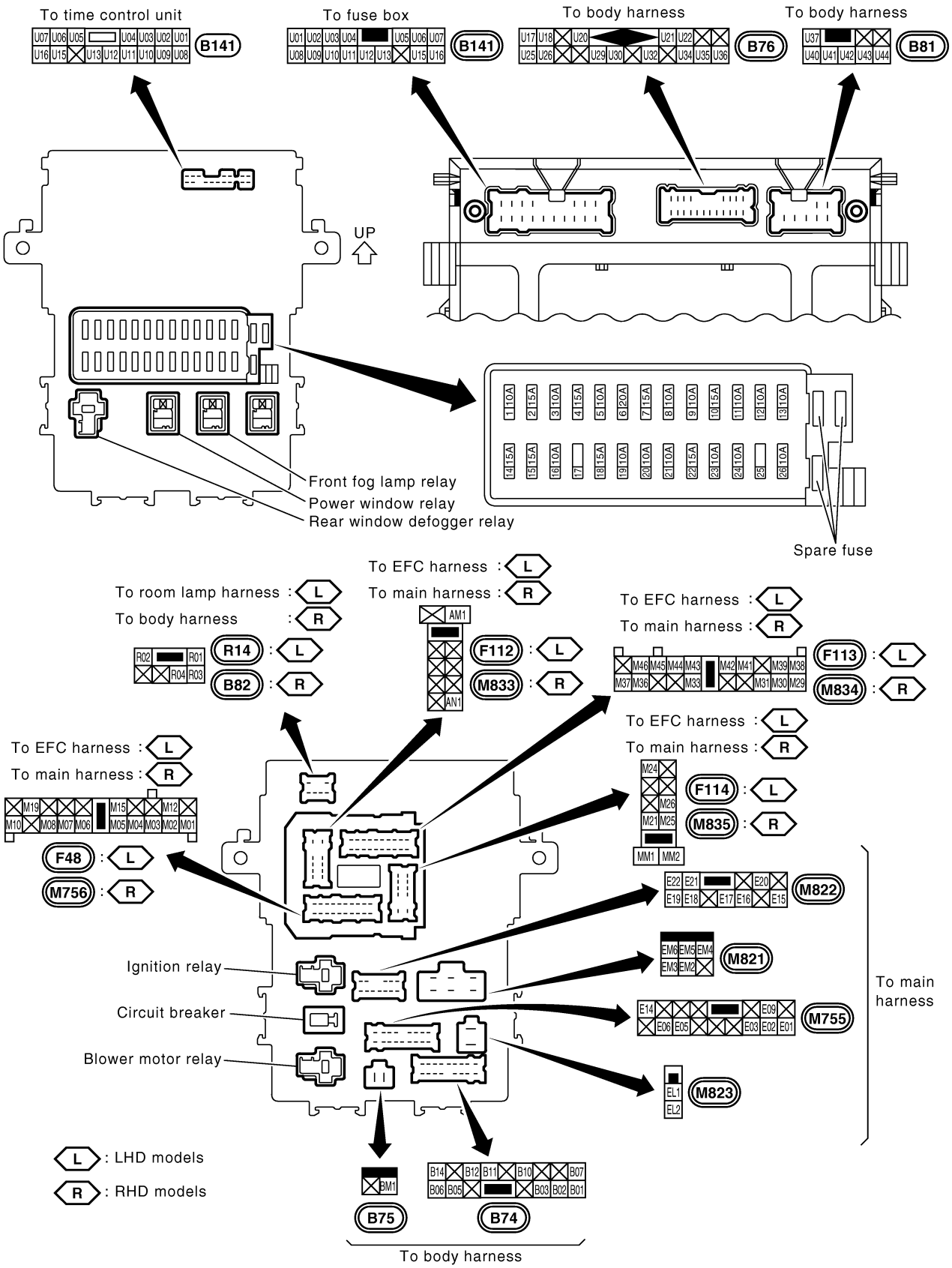
RZ : ZD30DDTi engine for RHD models

ZD : ZD30DDTi engine models

YEL274D

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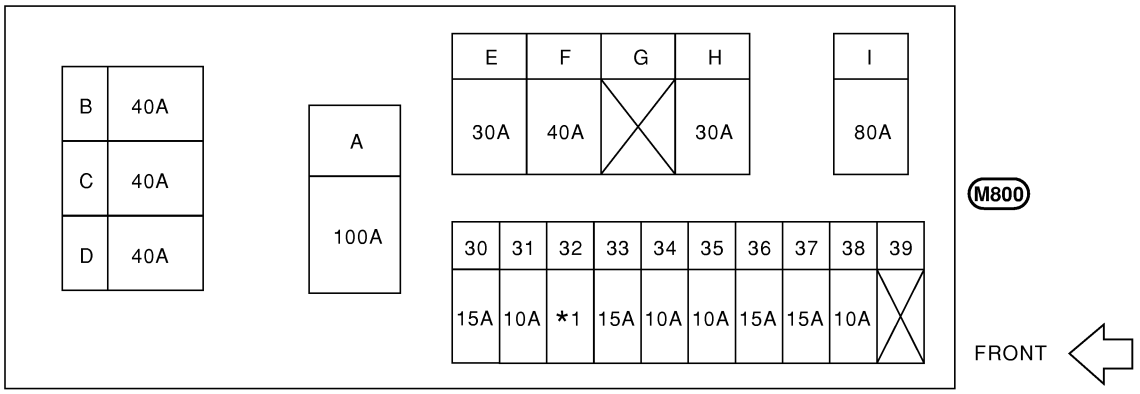
Terminal Arrangement



YEL847E

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Terminal Arrangement



*1 20A : TD27Ti engine models

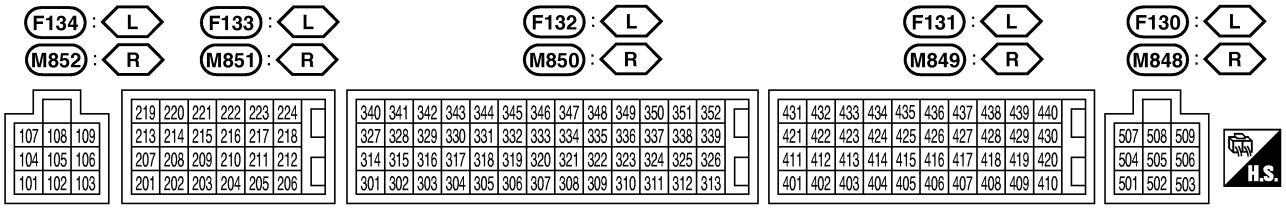
10A : ZD30DDTi engine models

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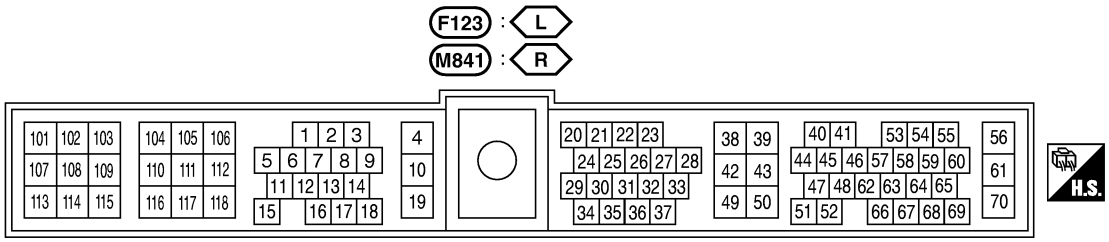
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Terminal Arrangement

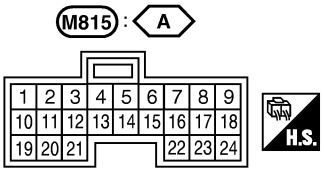
ECM (TD27Ti engine)



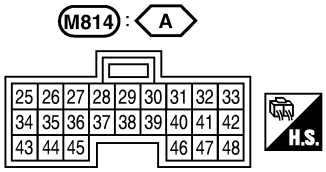
ECM (ZD30DDTi engine)



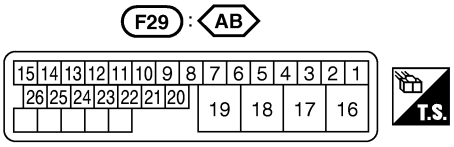
TCM (Transmission control module)



TCM (Transmission control module)



ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT)



L : LHD models
R : RHD models
A : A/T models
AB : With ABS

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