SECTION CHG
CHARGING SYSTEM

CONTENTS

PRECAUTION

PRECAUTIONS

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

INFOID:0000000008132940

The Supplemental Restraint System such as “AIR BAG” and “SEAT BELT PRE-TENSIONER”, used along with a front seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. This system includes seat belt switch inputs and dual stage front air bag modules. The SRS system uses the seat belt switches to determine the front air bag deployment, and may only deploy one front air bag, depending on the severity of a collision and whether the front occupants are belted or unbelted. Information necessary to service the system safely is included in the “SRS AIR BAG” and “SEAT BELT” of this Service Manual.

WARNING:

Always observe the following items for preventing accidental activation.

- **To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision that would result in air bag inflation, all maintenance must be performed by an authorized NISSAN/INFINITI dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see “SRS AIR BAG”.**
- **Never use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses can be identified by yellow and/or orange harnesses or harness connectors.**

PRECAUTIONS WHEN USING POWER TOOLS (AIR OR ELECTRIC) AND HAMMERS

WARNING:

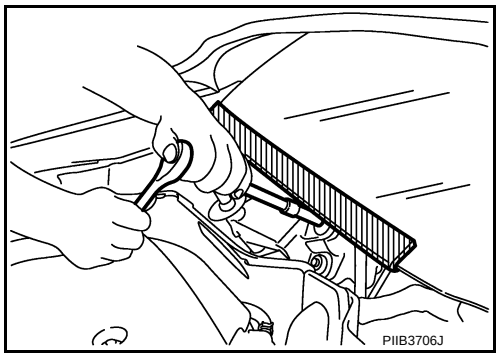
Always observe the following items for preventing accidental activation.

- **When working near the Air Bag Diagnosis Sensor Unit or other Air Bag System sensors with the ignition ON or engine running, never use air or electric power tools or strike near the sensor(s) with a hammer. Heavy vibration could activate the sensor(s) and deploy the air bag(s), possibly causing serious injury.**
- **When using air or electric power tools or hammers, always switch the ignition OFF, disconnect the battery, and wait at least 3 minutes before performing any service.**

Precaution for Procedure without Cowl Top Cover

INFOID:0000000008132941

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



Precautions For Xenon Headlamp Service

INFOID:0000000008132942

WARNING:

Comply with the following warnings to prevent any serious accident.

- **Disconnect the battery cable (negative terminal) or the power supply fuse before installing, removing, or touching the xenon headlamp (bulb included). The xenon headlamp contains high-voltage generated parts.**
- **Never work with wet hands.**
- **Check the xenon headlamp ON-OFF status after assembling it to the vehicle. Never turn the xenon headlamp ON in other conditions. Connect the power supply to the vehicle-side connector.**

(Turning it ON outside the lamp case may cause fire or visual impairments.)
- **Never touch the bulb glass immediately after turning it OFF. It is extremely hot.**

CAUTION:

Comply with the following cautions to prevent any error and malfunction.
- **Install the xenon bulb securely. (Insufficient bulb socket installation may melt the bulb, the connector, the housing, etc. by high-voltage leakage or corona discharge.)**
- **Never perform HID circuit inspection with a tester.**
- **Never touch the xenon bulb glass with hands. Never put oil and grease on it.**
- **Dispose of the used xenon bulb after packing it in thick vinyl without breaking it.**
- **Never wipe out dirt and contamination with organic solvent (thinner, gasoline, etc.).**

Precaution for Power Generation Voltage Variable Control System

INFOID:0000000008132943

CAUTION:

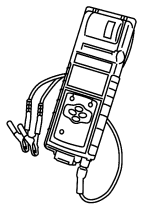
For this model, the battery current sensor that is installed to the battery cable at the negative terminal measures the charging/discharging current of the battery, and performs various controls. If the electrical component or the ground wire is connected directly to the battery terminal, the current other than that being measured with the battery current sensor is charging to or discharging from the battery. This condition causes the malfunction of the control, and then the battery discharge may occur. Do not connect the electrical component or the ground wire directly to the battery terminal.

PREPARATION

PREPARATION

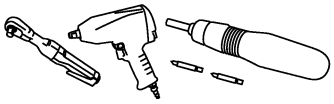
Special Service Tools

INFOID:0000000009397629

Tool number (Kent-Moore No.) Tool name	Description
— (—) Model GR8-1200 NI Multitasking battery and electrical diagnostic station  AWIIA1239ZZ	Tests batteries, starting and charging systems and charges batteries. For operating instructions, refer to diagnostic station instruction manual.
— (—) Model EXP-800 NI Battery and electrical diagnostic analyzer  JSMIA0806ZZ	Tests batteries and charging systems. For operating instructions, refer to diagnostic analyzer instruction manual.

Commercial Service Tools

INFOID:0000000008132945

Tool name	Description
Power tool  PIIB1407E	Loosening bolts, nuts and screws

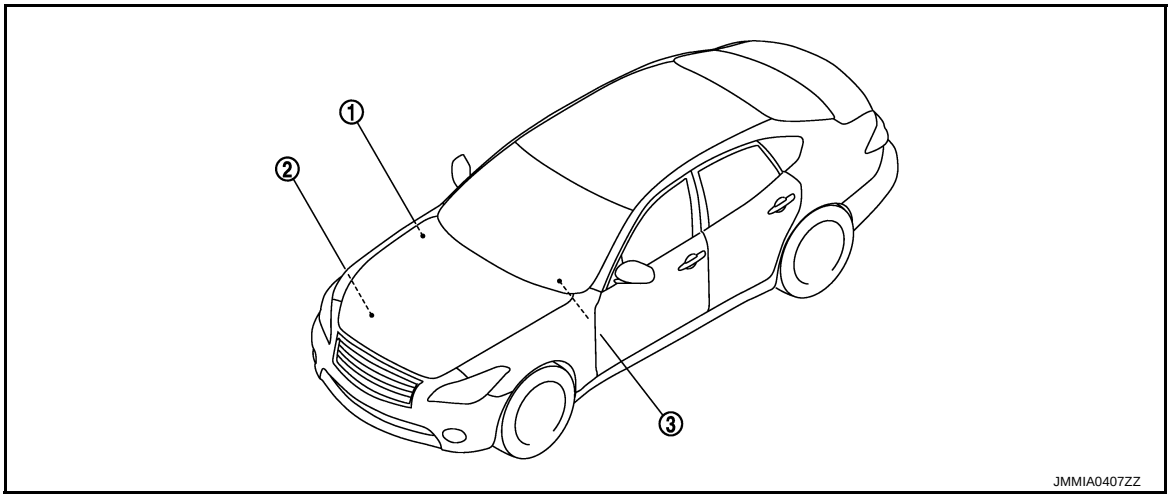
SYSTEM DESCRIPTION

COMPONENT PARTS

CHARGING SYSTEM

CHARGING SYSTEM : Component Parts Location

INFOID:0000000008132946



1. IPDM E/R
   Refer to PCS-5, "IPDM E/R : Component Parts Location".
2. Alternator
3. Charge warning lamp

CHARGING SYSTEM : Component Description

INFOID:0000000008132947

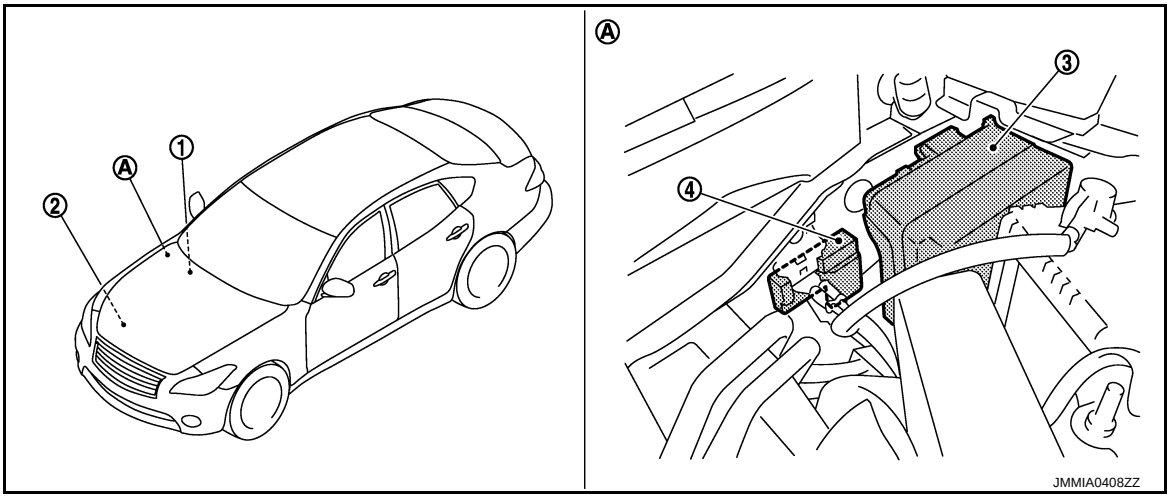
Component part		Description
Alternator	“B” terminal	Refer to CHG-21, "Description".
	“S” terminal	Refer to CHG-25, "Description".
	“L” terminal	Refer to CHG-22, "Description".
	“C” terminal	Used for the power generation voltage variable control system. Refer to CHG-8, "POWER GENERATION VOLTAGE VARIABLE CONTROL SYSTEM : System Description".
Combination meter (Charge warning lamp)		The IC voltage regulator warning function activates to illuminate the charge warning lamp, if any of the following symptoms occur while alternator is operating: • Excessive voltage is produced. • No voltage is produced.
IPDM E/R		Used for the power generation voltage variable control system. Refer to CHG-8, "POWER GENERATION VOLTAGE VARIABLE CONTROL SYSTEM : System Description".

POWER GENERATION VOLTAGE VARIABLE CONTROL SYSTEM

POWER GENERATION VOLTAGE VARIABLE CONTROL SYSTEM : Component

Parts Location

INFOID:0000000008132948



1. ECM
   Refer to EC-37, "ENGINE CONTROL SYSTEM : Component Parts Location" (VQ37VHR) or EC-948, "ENGINE CONTROL SYSTEM : Component Parts Location" (VK56VD).
2. Alternator
3. IPDM E/R
   Refer to PCS-5, "IPDM E/R : Component Parts Location".
4. Battery current sensor (with battery temperature sensor)

A. Engine room dash panel (RH)

POWER GENERATION VOLTAGE VARIABLE CONTROL SYSTEM : Component Description

INFOID:0000000008132949

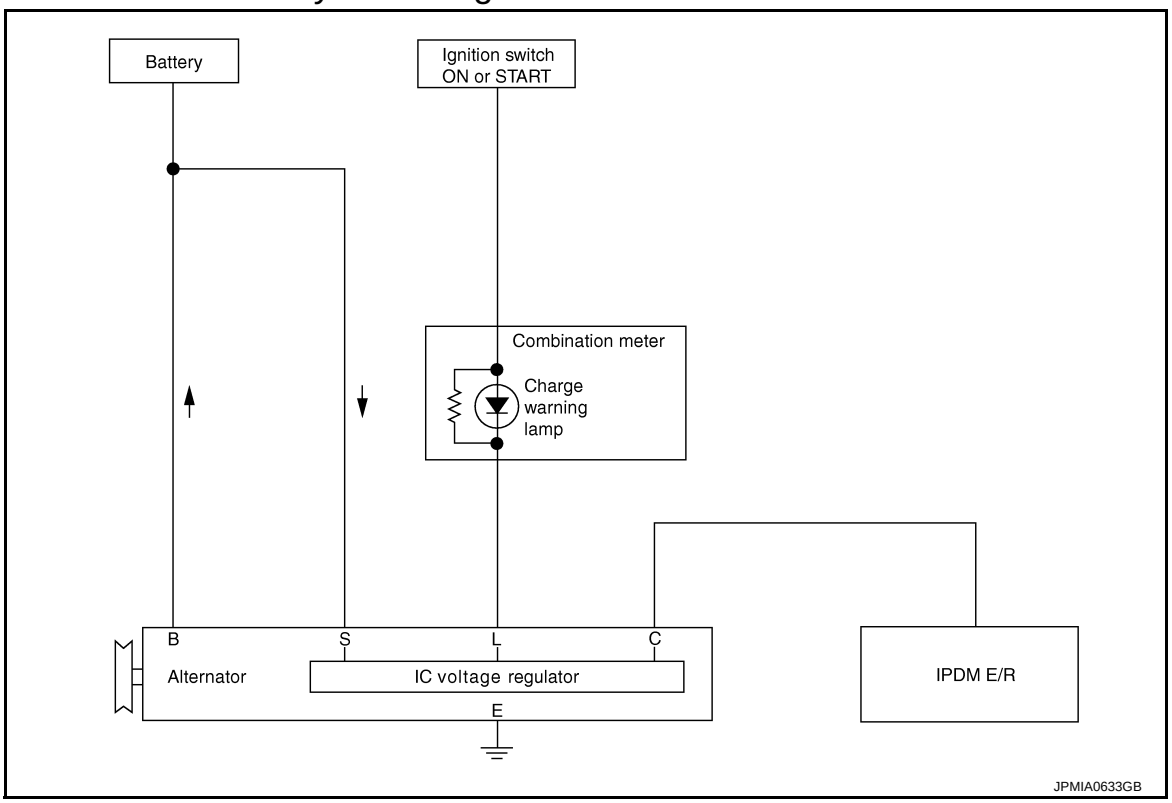
Component part	Description
Battery current sensor (with battery temperature sensor)	EC-44, "Battery Current Sensor (With Battery Temperature Sensor)" (VQ37VHR) EC-955, "Battery Current Sensor (With Battery Temperature Sensor)" (VK56VD)
ECM	Battery current sensor detects the charging/discharging current of the battery. ECM judges the battery condition based on this signal. ECM judges whether to perform the power generation voltage variable control according to the battery condition. When performing the power generation voltage variable control, ECM calculates the target power generation voltage according to the battery condition and sends the calculated value as the power generation command value to IPDM E/R.
IPDM E/R	IPDM E/R converts the received power generation command value into the power generation command signal (PWM signal) and sends it to the IC voltage regulator.
Alternator (IC voltage regulator)	IC voltage regulator controls the power generation voltage by the target power generation voltage based on the received power generation command signal. When there is no power generation command signal, the alternator performs the normal power generation according to the characteristic of the IC voltage regulator.

SYSTEM

CHARGING SYSTEM

CHARGING SYSTEM : System Diagram

INFOID:0000000008132950



CHARGING SYSTEM : System Description

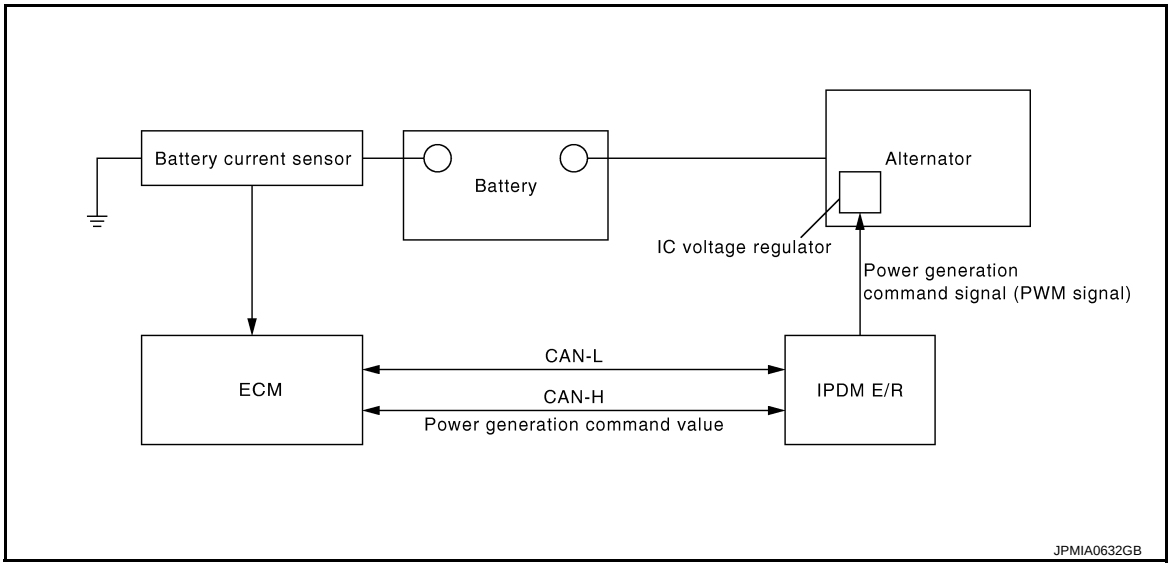
INFOID:0000000008132951

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 voltage regulator.

POWER GENERATION VOLTAGE VARIABLE CONTROL SYSTEM

POWER GENERATION VOLTAGE VARIABLE CONTROL SYSTEM : System Diagram

INFOID:0000000008132952



POWER GENERATION VOLTAGE VARIABLE CONTROL SYSTEM : System De-

scription

INFOID:0000000008132953

By performing the power generation voltage variable control, the engine load due to the power generation of the alternator is reduced and fuel consumption is decreased.

NOTE:

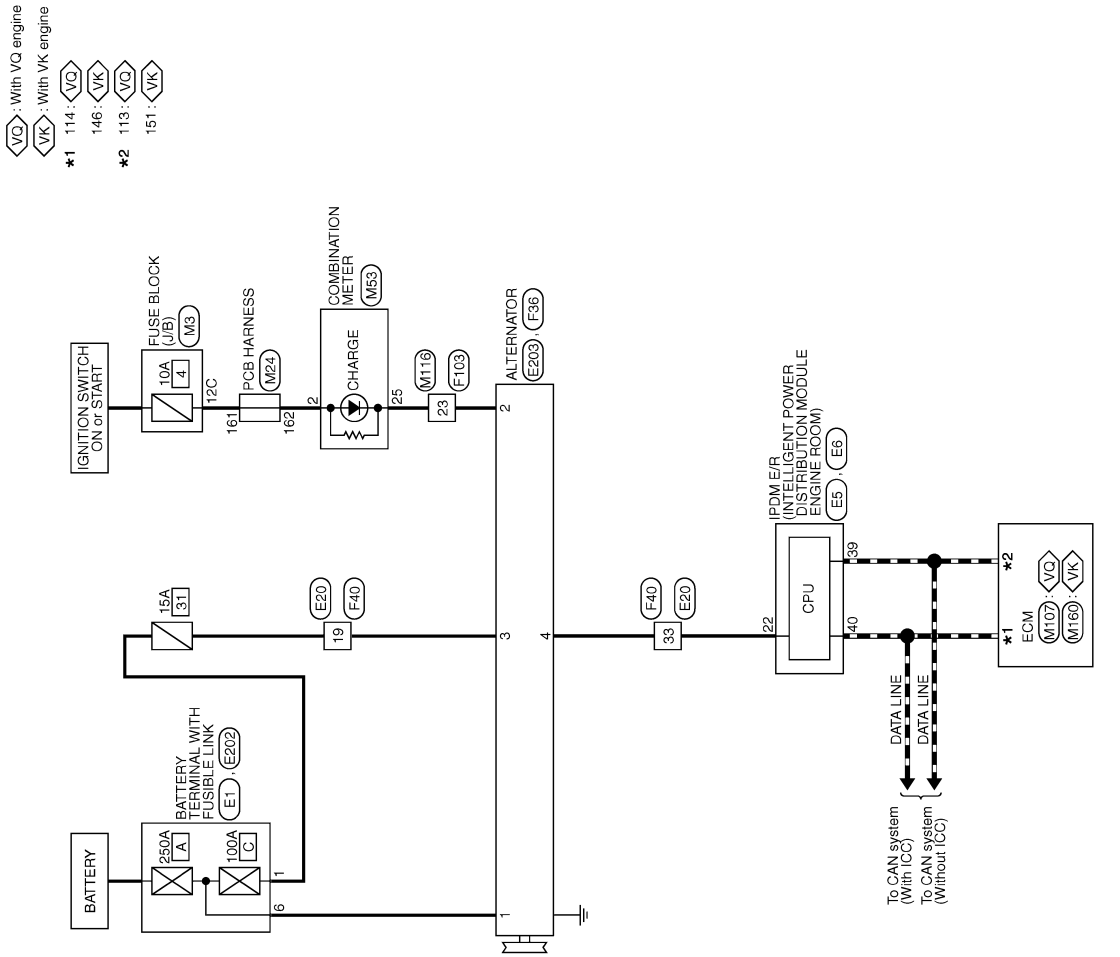
When any malfunction is detected in the power generation voltage variable control system, the power generation is performed according to the characteristic of the IC voltage regulator of the alternator.

WIRING DIAGRAM

CHARGING SYSTEM

Wiring Diagram

INFOID:0000000008132954



BASIC INSPECTION

DIAGNOSIS AND REPAIR WORK FLOW

Work Flow (With EXP-800 NI or GR8-1200 NI)

INFOID:0000000008132955

CHARGING SYSTEM DIAGNOSIS WITH EXP-800 NI OR GR8-1200 NI

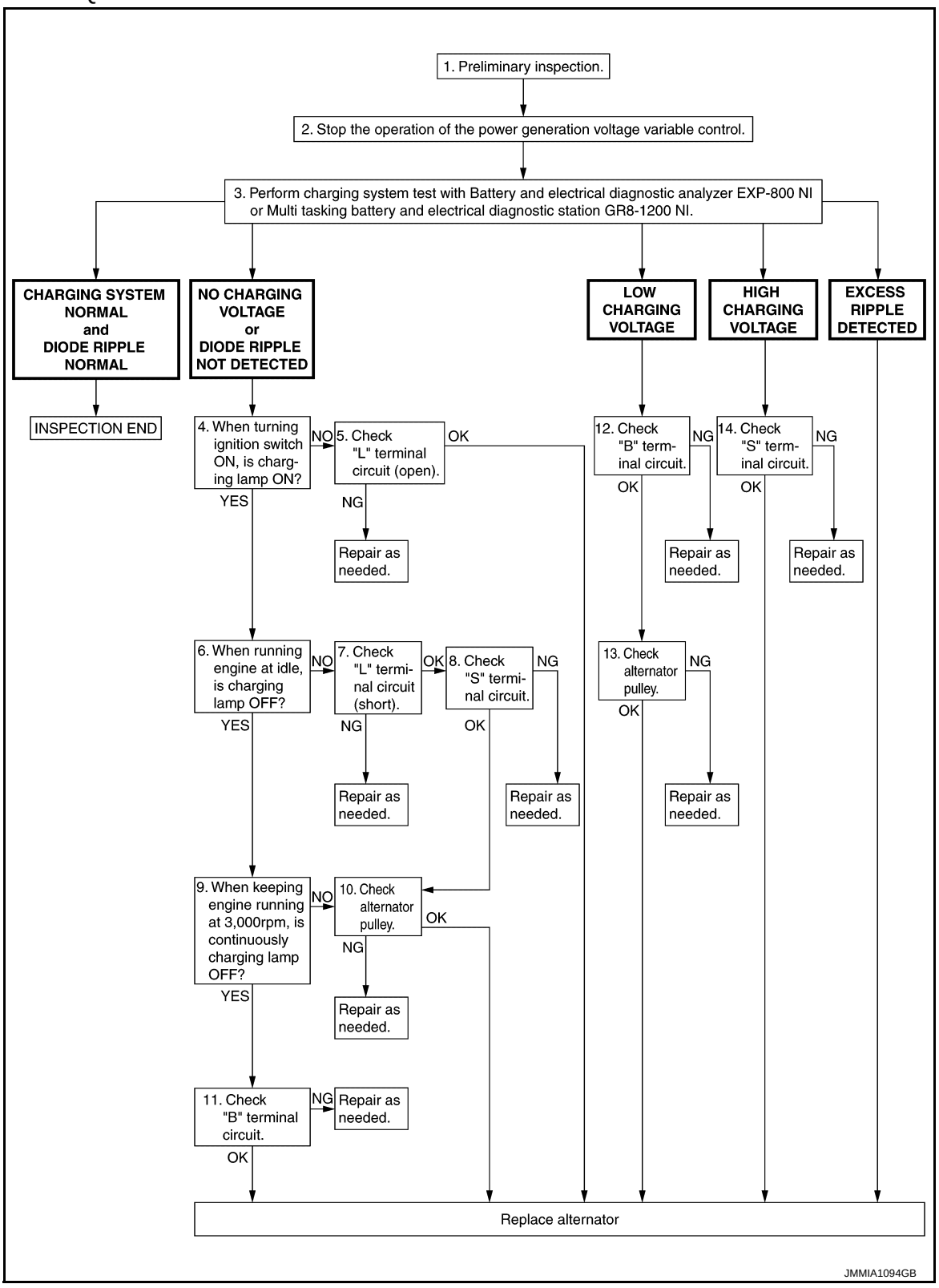
To test the charging system, use the following special service tools:

- EXP-800 NI Battery and electrical diagnostic analyzer
- GR8-1200 NI Multitasking battery and electrical diagnostic station

NOTE:

Refer to the applicable Instruction Manual for proper charging system diagnosis procedures.

OVERALL SEQUENCE



DETAILED FLOW

NOTE:

To ensure a complete and thorough diagnosis, the battery, starter and alternator test segments must be done as a set from start to finish.

1.PRELIMINARY INSPECTION

Perform the preliminary inspection. Refer to CHG-18, "Inspection Procedure".

>> GO TO 2.

2. STOP POWER GENERATION VOLTAGE VARIABLE CONTROL SYSTEM

Stop the operation of the power generation voltage variable control in either of the following procedures.

- After selecting “ENGINE” of “SELECT SYSTEM” using CONSULT, set the DUTY value of “ALTERNATOR DUTY” to 0 % by selecting “ALTERNATOR DUTY” of “Active Test”. Continue “Active Test” until the end of inspection. (When the DUTY value is 0 or 100 %, the normal power generation is performed according to the characteristic of the IC voltage regulator of the alternator.)
- Turn the ignition switch OFF, and disconnect the battery current sensor connector. [However, DTC (P1550 - P1554) of the engine might remain. After finishing the inspection, connect the battery current sensor connector and erase the self-diagnosis results history of the engine using CONSULT.]

>> GO TO 3.

3. DIAGNOSIS WITH EXP-800 NI OR GR8-1200 NI

Perform the charging system test using Multitasking battery and electrical diagnostic station GR8-1200 NI or Battery and electrical diagnostic analyzer EXP-800 NI. Refer to the applicable Instruction Manual for proper testing procedures.

Test result

CHARGING SYSTEM NORMAL>>Charging system is normal and will also show “DIODE RIPPLE” test result.
NO CHARGING VOLTAGE>>GO TO 4.
LOW CHARGING VOLTAGE>>GO TO 12.
HIGH CHARGING VOLTAGE>>GO TO 14.
DIODE RIPPLE NORMAL>>Diode ripple is OK and will also show “CHARGING VOLTAGE” test result.
EXCESS RIPPLE DETECTED>>Replace the alternator. Perform “DIODE RIPPLE” test again using Multitasking battery and electrical diagnostic station GR8-1200 NI or Battery and electrical diagnostic analyzer EXP-800 NI to confirm repair.
DIODE RIPPLE NOT DETECTED>>GO TO 4.

4. INSPECTION WITH CHARGE WARNING LAMP (IGNITION SWITCH IS ON)

Turn the ignition switch ON.

Does the charge warning lamp illuminate?

YES >> GO TO 6.
NO >> GO TO 5.

5. “L” TERMINAL CIRCUIT (OPEN) INSPECTION

Check “L” terminal circuit (open). Refer to CHG-22, "Diagnosis Procedure".

Is the “L” terminal circuit normal?

YES >> Replace alternator. Refer to CHG-28, "VQ37VHR : Removal and Installation (2WD)" (VQ37VHR[2WD]), CHG-29, "VQ37VHR : Removal and Installation (AWD)" (VQ37VHR[AWD]) or CHG-33, "VK56VD : Removal and Installation" (VK56VD).
NO >> Repair as needed.

6. INSPECTION WITH CHARGE WARNING LAMP (IDLING)

Start the engine and run it at idle.

Does the charge warning lamp turn OFF?

YES >> GO TO 9.
NO >> GO TO 7.

7. “L” TERMINAL CIRCUIT (SHORT) INSPECTION

Check “L” terminal circuit (short). Refer to CHG-24, "Diagnosis Procedure".

Is the “L” terminal circuit normal?

YES >> GO TO 8.
NO >> Repair as needed.

8. “S” TERMINAL CIRCUIT INSPECTION

Check “S” terminal circuit. Refer to CHG-25, "Diagnosis Procedure".

Is the “S” terminal circuit normal?

YES >> GO TO 10.
NO >> Repair as needed.

9. INSPECTION WITH CHARGE WARNING LAMP (ENGINE AT 3,000 RPM)

Increase and maintain the engine speed at 3,000 rpm.

Does the charge warning lamp remain off?

YES >> GO TO 11.
NO >> GO TO 10.

10. INSPECTION OF ALTERNATOR PULLEY

Check alternator pulley. Refer to CHG-30, "VQ37VHR : Inspection (With EXP-800 NI or GR8-1200 NI)" (VQ37VHR) or CHG-33, "VK56VD : Inspection (With EXP-800 NI or GR8-1200 NI)" (VK56VD).

Is alternator pulley normal?

YES >> Replace alternator. Refer to CHG-28, "VQ37VHR : Removal and Installation (2WD)" (VQ37VHR[2WD]), CHG-29, "VQ37VHR : Removal and Installation (AWD)" (VQ37VHR[AWD]) or CHG-33, "VK56VD : Removal and Installation" (VK56VD).
NO >> Repair as needed.

11. “B” TERMINAL CIRCUIT INSPECTION

Check “B” terminal circuit. Refer to CHG-21, "Diagnosis Procedure".

Is “B” terminal circuit normal?

YES >> Replace alternator. Refer to CHG-28, "VQ37VHR : Removal and Installation (2WD)" (VQ37VHR[2WD]), CHG-29, "VQ37VHR : Removal and Installation (AWD)" (VQ37VHR[AWD]) or CHG-33, "VK56VD : Removal and Installation" (VK56VD).
NO >> Repair as needed.

12. “B” TERMINAL CIRCUIT INSPECTION

Check “B” terminal circuit. Refer to CHG-21, "Diagnosis Procedure".

Is “B” terminal circuit normal?

YES >> GO TO 13.
NO >> Repair as needed.

13. INSPECTION OF ALTERNATOR PULLEY

Check alternator pulley. Refer to CHG-30, "VQ37VHR : Inspection (With EXP-800 NI or GR8-1200 NI)" (VQ37VHR) or CHG-33, "VK56VD : Inspection (With EXP-800 NI or GR8-1200 NI)" (VK56VD).

Is alternator pulley normal?

YES >> Replace alternator. Refer to CHG-28, "VQ37VHR : Removal and Installation (2WD)" (VQ37VHR[2WD]), CHG-29, "VQ37VHR : Removal and Installation (AWD)" (VQ37VHR[AWD]) or CHG-33, "VK56VD : Removal and Installation" (VK56VD).
NO >> Repair as needed.

14. “S” TERMINAL CIRCUIT INSPECTION

Check “S” terminal circuit. Refer to CHG-25, "Diagnosis Procedure".

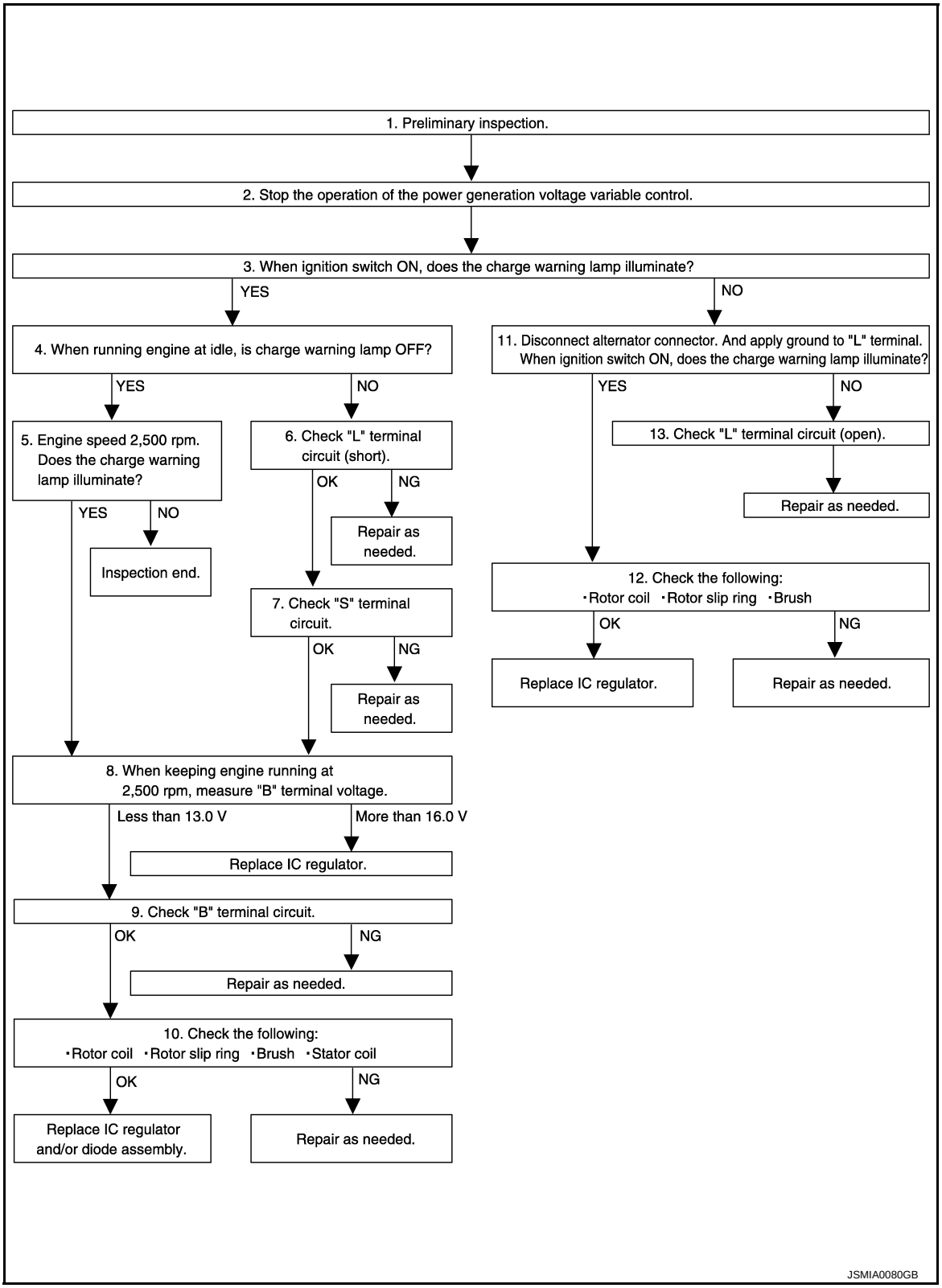
Is the “S” terminal circuit normal?

YES >> Replace alternator. Refer to CHG-28, "VQ37VHR : Removal and Installation (2WD)" (VQ37VHR[2WD]), CHG-29, "VQ37VHR : Removal and Installation (AWD)" (VQ37VHR[AWD]) or CHG-33, "VK56VD : Removal and Installation" (VK56VD).
NO >> Repair as needed.

Work Flow (Without EXP-800 NI or GR8-1200 NI)

INFOID:0000000008272766

OVERALL SEQUENCE



DETAILED FLOW

1. PRELIMINARY INSPECTION

Perform the preliminary inspection. Refer to CHG-18, "Inspection Procedure".

>> GO TO 2.

2.STOP POWER GENERATION VOLTAGE VARIABLE CONTROL SYSTEM

Stop the operation of the power generation voltage variable control in either of the following procedures.

- After selecting “ENGINE” of “SELECT SYSTEM” using CONSULT, set the DUTY value of “ALTERNATOR DUTY” to 0 % by selecting “ALTERNATOR DUTY” of “Active Test”. Continue “Active Test” until the end of inspection. (When the DUTY value is 0 or 100 %, the normal power generation is performed according to the characteristic of the IC regulator of the alternator.)
- Turn the ignition switch OFF, and disconnect the battery current sensor connector. [However, DTC (P1550 - P1554) of the engine might remain. After finishing the inspection, connect the battery current sensor connector and erase the self-diagnostic results history of the engine using CONSULT.]

>> GO TO 3.

3.INSPECTION WITH CHARGE WARNING LAMP (IGNITION SWITCH IS ON)

When ignition switch ON

Does the charge warning lamp illuminate?

YES >> GO TO 4.
NO >> GO TO 11.

4.INSPECTION WITH CHARGE WARNING LAMP (IDLING)

Start the engine and run it at idle.

Does the charge warning lamp turn OFF?

YES >> GO TO 5.
NO >> GO TO 6.

5.INSPECTION WITH CHARGE WARNING LAMP (ENGINE AT 2,500 RPM)

Increase and maintain the engine speed at 2,500 rpm.

Does the charge warning lamp illuminate?

YES >> GO TO 8.
NO >> INSPECTION END

6.“L” TERMINAL CIRCUIT (SHORT) INSPECTION

Check “L” terminal circuit (short). Refer to CHG-24, "Diagnosis Procedure".

Is the inspection result normal?

YES >> GO TO 7.
NO >> Repair as needed.

7.“S” TERMINAL CIRCUIT INSPECTION

Check “S” terminal circuit. Refer to CHG-25, "Diagnosis Procedure".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Repair as needed.

8.MEASURE “B” TERMINAL VOLTAGE

Engine start. When keeping engine running at 2,500 rpm, measure “B” terminal voltage.

What voltage does the measurement result show?

Less than 13.0 V>>GO TO 9.
More than 16.0 V>>Replace IC regulator.

9.“B” TERMINAL CIRCUIT INSPECTION

Check “B” terminal circuit. Refer to CHG-21, "Diagnosis Procedure".

Is the inspection result normal?

YES >> GO TO 10.
NO >> Repair as needed.

10.DISASSEMBLE AND CHECK ALTERNATOR

Check the following conditions. Refer to CHG-30, "VQ37VHR : Inspection (Without EXP-800 NI or GR8-1200 NI)" (VQ37VHR) or CHG-34, "VK56VD : Inspection (Without EXP-800 NI or GR8-1200 NI)" (VK56VD).

- Rotor coil
- Rotor slip ring
- Brush
- Stator coil

Are these normal?

YES >> Replace IC regulator and/or diode assembly.
NO >> Repair as needed.

11. INSPECTION WITH CHARGE WARNING LAMP (IGNITION SWITCH IS ON)

1. Disconnect alternator connector. And apply ground to “L” terminal.
2. Turn the ignition switch ON.

Does the charge warning lamp illuminate?

YES >> GO TO 12.
NO >> GO TO 13.

12. DISASSEMBLE AND CHECK ALTERNATOR

Check the following conditions. Refer to CHG-30, "VQ37VHR : Inspection (Without EXP-800 NI or GR8-1200 NI)" (VQ37VHR) or CHG-34, "VK56VD : Inspection (Without EXP-800 NI or GR8-1200 NI)" (VK56VD).

- Rotor coil
- Rotor slip ring
- Brush

Are these normal?

YES >> Replace IC regulator.
NO >> Repair as needed.

13. CHECK “L” TERMINAL CIRCUIT (OPEN)

Check “L” terminal circuit (open). Refer to CHG-22, "Diagnosis Procedure".

>> Repair as needed.

CHARGING SYSTEM PRELIMINARY INSPECTION

Inspection Procedure

INFOID:0000000008132956

1.CHECK BATTERY TERMINALS CONNECTION

Check if battery terminals are clean and tight.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair battery terminals connection.

2.CHECK FUSE

Check for blown fuse and fusible link.

Unit	Power source (Power supply terminals)	Fuse No.
Alternator	Battery (“S” terminal)	31
Combination meter	Ignition switch ON (“L” terminal)	4

Is the inspection result normal?

YES >> GO TO 3.
NO >> Be sure to eliminate the cause of malfunction before installing new fuse.

3.CHECK “E” TERMINAL CONNECTION

Check if “E” terminal (alternator ground harness) is clean and tight.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair “E” terminal connection.

4.CHECK DRIVE BELT TENSION

Check drive belt tension. Refer to the following.

- VQ37VHR: EM-22, "Checking"
- VK56VD: EM-175, "Checking"

Is the inspection result normal?

YES >> INSPECTION END
NO >> Repair as needed.

POWER GENERATION VOLTAGE VARIABLE CONTROL SYSTEM OPERATION INSPECTION

Inspection Procedure

INFOID:0000000008132957

CAUTION:

When performing this inspection, always use a charged battery that has completed the battery inspection. (When the charging rate of the battery is low, the response speed of the voltage change will become slow. This can cause an incorrect inspection.)

1.CHECK ECM (CONSULT)

Perform ECM self-diagnosis with CONSULT. Refer to the following.

- VQ37VHR: EC-87, "CONSULT Function"
- VK56VD: EC-1002, "CONSULT Function"

Self-diagnostic results content

No malfunction detected>> GO TO 2.
Malfunction detected>> Check applicable parts, and repair or replace corresponding parts.

2.CHECK OPERATION OF POWER GENERATION VOLTAGE VARIABLE CONTROL SYSTEM

1. Connect CONSULT and start the engine.
2. The selector lever is in “P” or “N” position and all of the electric loads and A/C, etc. are turned OFF.
3. Select “ALTERNATOR DUTY” at “Active Test” of “ENGINE”, and then check the value of “BATTERY VOLT” monitor when DUTY value of “ALTERNATOR DUTY” is set to 40.0 %.

“BATTERY VOLT”

2 seconds after setting the DUTY value of “ALTERNATOR DUTY” to 40.0 % : 12 - 13.6 V

4. Check the value of “BATTERY VOLT” monitor when DUTY value of “ALTERNATOR DUTY” is set to 80.0%.

“BATTERY VOLT”

20 seconds after setting the DUTY value of “ALTERNATOR DUTY” to 80.0 % : +0.5 V or more against the value of “BATTERY VOLT” monitor when DUTY value is 40.0 %

Is the measurement value within the specification?

YES >> INSPECTION END
NO >> GO TO 3.

3.CHECK IPDM E/R (CONSULT)

Perform IPDM E/R self-diagnosis with CONSULT. Refer to PCS-13, "CONSULT Function (IPDM E/R)".

Self-diagnostic results content

No malfunction detected>> GO TO 4.
Malfunction detected>> Check applicable parts, and repair or replace corresponding parts.

4.CHECK HARNESS BETWEEN ALTERNATOR AND IPDM E/R

1. Turn ignition switch OFF.
2. Disconnect alternator connector and IPDM E/R connector.
3. Check continuity between alternator harness connector and IPDM E/R harness connector.

Alternator		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	
F36	4	E5	22	Existed

4. Check continuity between alternator harness connector and ground.

Alternator		Ground	Continuity
Connector	Terminal		
F36	4		Not existed

Is the inspection result normal?

YES >> Replace IPDM E/R.
NO >> Repair harness or connector between IPDM E/R and alternator.

DTC/CIRCUIT DIAGNOSIS

B TERMINAL CIRCUIT

Description

INFOID:0000000008132958

"B" terminal circuit supplies power to charge the battery and to operate the vehicle's electrical system.

Diagnosis Procedure

INFOID:0000000008132959

1.CHECK "B" TERMINAL CONNECTION

1. Turn ignition switch OFF.
2. Check if "B" terminal is clean and tight.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair "B" terminal connection. Confirm repair by performing complete Charging system test using EXP-800 NI or GR8-1200 NI (if available). Refer to the applicable Instruction Manual for proper testing procedures.

2.CHECK "B" TERMINAL CIRCUIT

Check voltage between alternator "B" terminal and ground.

(+)		(–)	Voltage (Approx.)
Alternator			
Connector	Terminal		
E203	1	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 3.
NO >> Check harness for open between alternator and fusible link.

3.CHECK "B" TERMINAL CONNECTION (VOLTAGE DROP TEST)

1. Start engine, then engine running at idle and warm.
2. Check voltage between battery positive terminal and alternator "B" terminal.

(+)	(–)		Voltage (Approx.)
	Alternator		
	Connector	Terminal	
Battery positive terminal	E203	1	Less than 0.2 V

Is the inspection result normal?

YES >> "B" terminal circuit is normal. Refer to CHG-11, "Work Flow (With EXP-800 NI or GR8-1200 NI)" or CHG-15, "Work Flow (Without EXP-800 NI or GR8-1200 NI)".
NO >> Check harness between battery and alternator for poor continuity.

L TERMINAL CIRCUIT (OPEN)

Description

INFOID:0000000008132960

The “L” terminal circuit controls the charge warning lamp. The charge warning lamp turns ON when the ignition switch is set to ON or START. When the alternator is providing sufficient voltage with the engine running, the charge warning lamp turns OFF. If the charge warning lamp illuminates with the engine running, a malfunction is indicated.

Diagnosis Procedure

INFOID:0000000008132961

1.CHECK “L” TERMINAL CONNECTION

1. Turn ignition switch OFF.
2. Check if “L” terminal is clean and tight.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair “L” terminal connection. Confirm repair by performing complete Charging system test using EXP-800 NI or GR8-1200 NI (if available). Refer to the applicable Instruction Manual for proper testing procedures.

2.CHECK “L” TERMINAL CIRCUIT (OPEN)

1. Disconnect alternator connector.
2. Apply ground to alternator harness connector terminal.
3. Check condition of the charge warning lamp with the ignition switch in the ON position.

Alternator		Ground	Condition	
Connector	Terminal		Ignition switch position	Charge warning lamp
F36	2		ON	illuminate

Does it illuminate?

YES >> “L” terminal circuit is normal. Refer to CHG-11, "Work Flow (With EXP-800 NI or GR8-1200 NI)" or CHG-15, "Work Flow (Without EXP-800 NI or GR8-1200 NI)".
NO >> GO TO 3.

3.CHECK HARNESS CONTINUITY (OPEN CIRCUIT)

1. Disconnect the battery cable from the negative terminal.
2. Disconnect the combination meter connector.
3. Check continuity between alternator harness connector and combination meter harness connector.

Alternator		Combination meter		Continuity
Connector	Terminal	Connector	Terminal	
F36	2	M53	25	Existed

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair or replace the harness.

4.CHECK HARNESS CONTINUITY (OPEN CIRCUIT)

Check continuity between combination meter harness connector and fuse block (J/B).

Combination meter		Fuse block (J/B)		Continuity
Connector	Terminal	Connector	Terminal	
M53	2	M3	12C	Existed

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair or replace the harness.

5.CHECK POWER SUPPLY CIRCUIT

1. Connect the battery cable to the negative terminal.
2. Check voltage between combination meter harness connector and ground.

(+)		(–)	Condition	Voltage (Approx.)
Combination meter				
Connector	Terminal			
M53	2	Ground	When the ignition switch is in ON position	Battery voltage

Is the inspection result normal?

YES >> Replace combination meter.
NO >> Inspect the power supply circuit. Refer to PG-27, "Wiring Diagram - IGNITION POWER SUPPLY - ".

L TERMINAL CIRCUIT (SHORT)

Description

INFOID:0000000008132962

The “L” terminal circuit controls the charge warning lamp. The charge warning lamp turns ON when the ignition switch is set to ON or START. When the alternator is providing sufficient voltage with the engine running, the charge warning lamp turns OFF. If the charge warning lamp illuminates with the engine running, a malfunction is indicated.

Diagnosis Procedure

INFOID:0000000008132963

1.CHECK “L” TERMINAL CIRCUIT (SHORT)

1. Turn ignition switch OFF.
2. Disconnect alternator connector.
3. Turn ignition switch ON.

Does charge warning lamp illuminate?

YES >> GO TO 2.
NO >> Refer to CHG-11, "Work Flow (With EXP-800 NI or GR8-1200 NI)" or CHG-15, "Work Flow (Without EXP-800 NI or GR8-1200 NI)".

2.CHECK HARNESS CONTINUITY (SHORT CIRCUIT)

1. Turn ignition switch OFF.
2. Disconnect the battery cable from the negative terminal.
3. Disconnect combination meter connector.
4. Check continuity between combination meter harness connector and ground.

Combination meter		Ground	Continuity
Connector	Terminal		
M53	25		Not existed

Is the inspection result normal?

YES >> Replace combination meter.
NO >> Repair or replace the harness.

S TERMINAL CIRCUIT

Description

INFOID:0000000008132964

The output voltage of the alternator is controlled by the IC voltage regulator at the “S” terminal detecting the input voltage.
The “S” terminal circuit detects the battery voltage to adjust the alternator output voltage with the IC voltage regulator.

Diagnosis Procedure

INFOID:0000000008132965

1.CHECK “S” TERMINAL CONNECTION

1. Turn ignition switch OFF.
2. Check if “S” terminal is clean and tight.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair “S” terminal connection. Confirm repair by performing complete Charging system test using EXP-800 NI or GR8-1200 NI (if available). Refer to the applicable Instruction Manual for proper testing procedures.

2.CHECK “S” TERMINAL CIRCUIT

Check voltage between alternator harness connector and ground.

(+)		(–)	Voltage (Approx.)
Alternator			
Connector	Terminal		
F36	3	Ground	Battery voltage

Is the inspection result normal?

YES >> Refer to CHG-11, "Work Flow (With EXP-800 NI or GR8-1200 NI)" or CHG-15, "Work Flow (Without EXP-800 NI or GR8-1200 NI)".
NO >> Check harness for open between alternator and fuse.

SYMPTOM DIAGNOSIS

CHARGING SYSTEM

Symptom Table

INFOID:0000000008132966

Symptom	Reference
Discharged battery	Refer to CHG-11, "Work Flow (With EXP-800 NI or GR8-1200 NI)" or CHG-15, "Work Flow (Without EXP-800 NI or GR8-1200 NI)".
The charge warning lamp does not illuminate when the ignition switch is set to ON.	
The charge warning lamp does not turn OFF after the engine starts.	
The charging warning lamp turns ON when increasing the engine speed.	

REMOVAL AND INSTALLATION

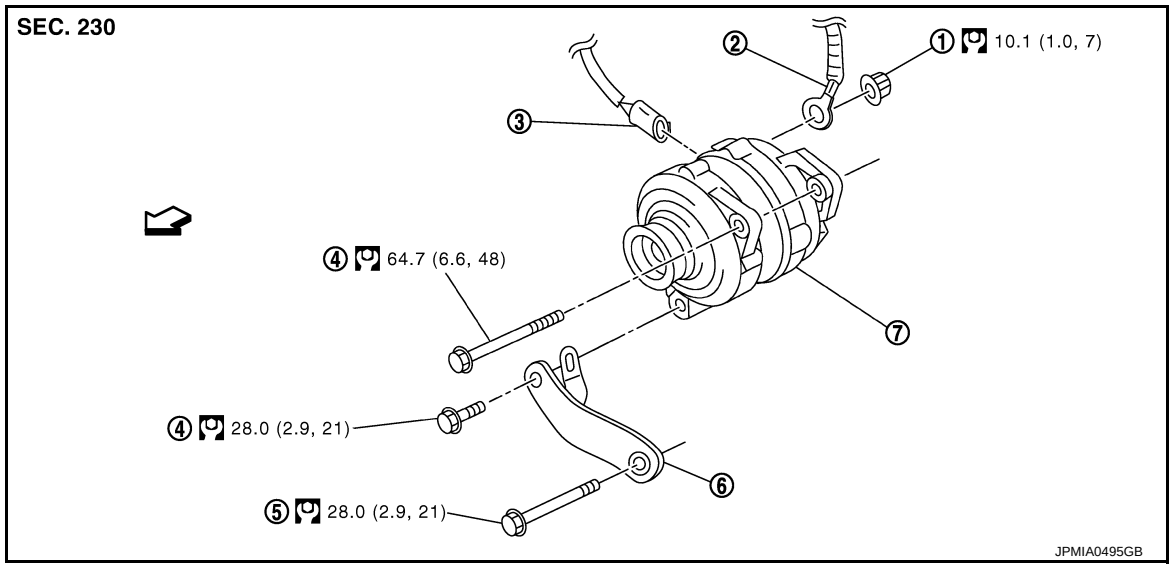
ALTERNATOR

VQ37VHR

VQ37VHR : Exploded View

INFOID:0000000008132967

REMOVAL



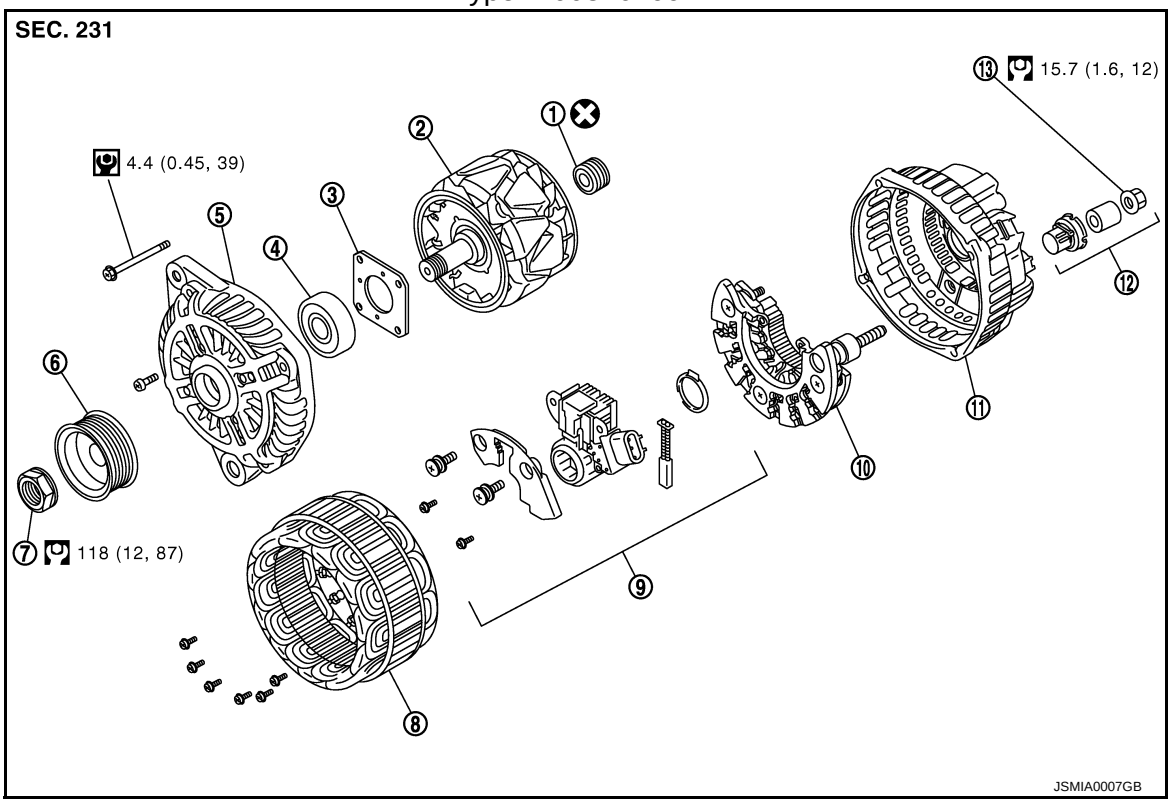
1. “B” terminal nut
2. “B” terminal harness
3. Alternator connector
4. Alternator mounting bolt
5. Alternator stay mounting bolt
6. Alternator stay
7. Alternator

⇦ : Engine front

Refer to GI-4, "Components" for symbols in the figure.

DISASSEMBLY

Type: A003TJ1991B



1. Rear bearing
2. Rotor assembly
3. Retainer
4. Front bearing
5. Front bracket assembly
6. Pulley
7. Pulley nut
8. Stator assembly
9. IC voltage regulator assembly
10. Diode assembly
11. Rear bracket assembly
12. Terminal set
13. “B” terminal nut

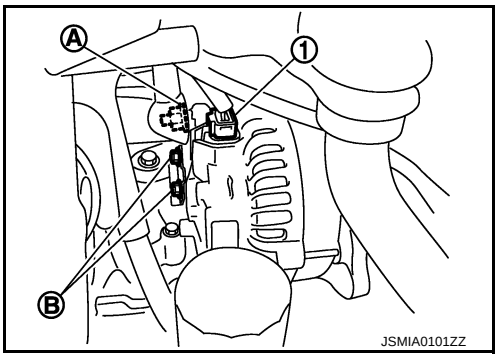
Refer to GI-4, "Components" for symbols in the figure.

VQ37VHR : Removal and Installation (2WD)

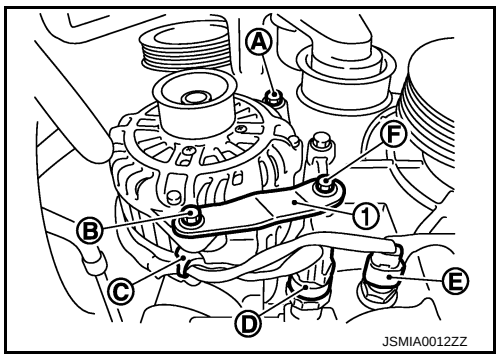
INFOID:0000000008132968

REMOVAL

1. Disconnect the battery cable from the negative terminal. Refer to PG-142, "Removal and Installation".
2. Remove engine under cover. Refer to EXT-28, "ENGINE UNDER COVER : Removal and Installation"
3. Remove drive belt. Refer to EM-22, "Removal and Installation"
4. Disconnect alternator connector (1).
5. Remove “B” terminal nut (A), and disconnect “B” terminal harness.
6. Remove the harness bracket bolts (B).



7. Remove oil pressure switch harness clip (C) from alternator stay (1).
8. Disconnect oil pressure switch connector (D) and oil temperature sensor connector (E).
9. Remove alternator mounting bolt (B) and alternator stay mounting bolt (F), and then remove alternator stay.
10. Remove alternator mounting bolt (A).



11. Remove alternator assembly downward from the vehicle.

INSTALLATION

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

CAUTION:

- **Be careful to tighten “B” terminal nut carefully.**
- **Install alternator, and check tension of belt. Refer to EM-22, "Checking".**
- **For this model, the power generation voltage variable control system that controls the power generation voltage of the alternator has been adopted. Therefore, the power generation voltage variable control system operation inspection should be performed after replacing the alternator, and then check that the system operates normally. Refer to CHG-19, "Inspection Procedure".**

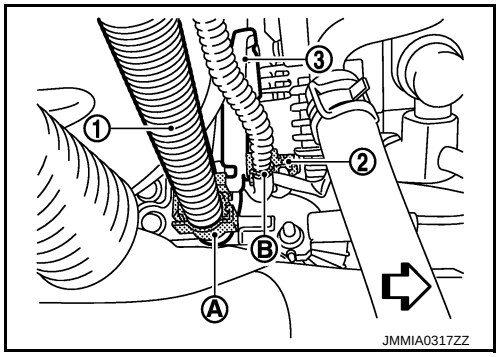
VQ37VHR : Removal and Installation (AWD)

INFOID:0000000008132969

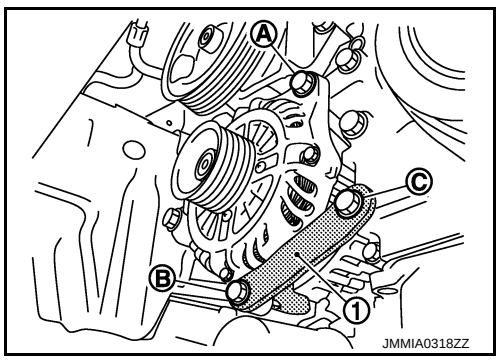
REMOVAL

1. Disconnect the battery cable from the negative terminal. Refer to PG-142, "Removal and Installation"
2. Remove air duct (inlet). Refer to EM-29, "Removal and Installation"
3. Remove air cleaner case RH. Refer to EM-29, "Removal and Installation".
4. Remove “B” terminal harness (1) from harness clamp (A).
5. Remove harness clip (B) from harness bracket (3).
6. Disconnect alternator connector (2).

⇦ : Vehicle front

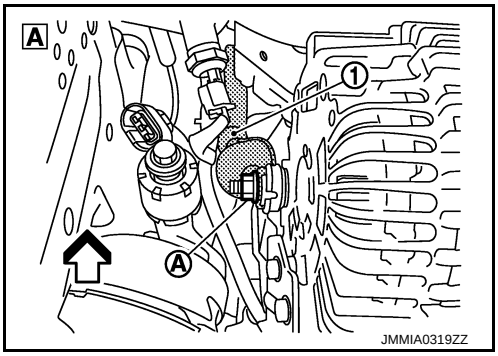


7. Remove engine under cover. Refer to EXT-28, "ENGINE UNDER COVER : Removal and Installation".
8. Remove drive belt. Refer to EM-22, "Removal and Installation".
9. Remove alternator mounting bolt (B) and alternator stay mounting bolt (C), and then remove alternator stay (1).
10. Remove alternator mounting bolt (A).



11. Remove alternator from engine and laterally rotate to a position so that “B” terminal nut (A) is visible.
CAUTION:
Be careful not to damage engine oil filter.
12. Remove “B” terminal nut, and disconnect “B” terminal harness (1).

⇦ : Vehicle front



13. Remove alternator assembly downward from the vehicle.

INSTALLATION

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

CAUTION:
- **Be careful to tighten “B” terminal nut carefully.**
- **Install alternator, and check tension of belt. Refer to EM-22, "Checking".**
- **For this model, the power generation voltage variable control system that controls the power generation voltage of the alternator has been adopted. Therefore, the power generation voltage variable control system operation inspection should be performed after replacing the alternator, and then check that the system operates normally. Refer to CHG-19, "Inspection Procedure".**

VQ37VHR : Inspection (With EXP-800 NI or GR8-1200 NI)

INFOID:0000000008132970

ALTERNATOR PULLEY INSPECTION

Perform the following.
- Make sure that alternator pulley does not rattle.
- Make sure that alternator pulley nut is tight. Refer to CHG-27, "VQ37VHR : Exploded View".

VQ37VHR : Inspection (Without EXP-800 NI or GR8-1200 NI)

INFOID:0000000008273003

INSPECTION AFTER DISASSEMBLY

Rotor Check

1. Resistance test

Resistance	**: Refer to SDS CHG-35, "Alternator".**

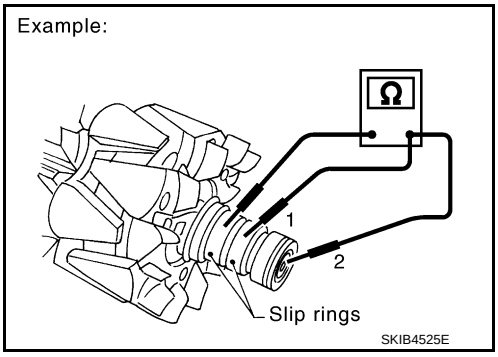
- Replace the rotor if the measurement value is outside of the specified range.

2. Insulator test
- Replace the rotor if continuity exists.

3. Check slip ring for wear.

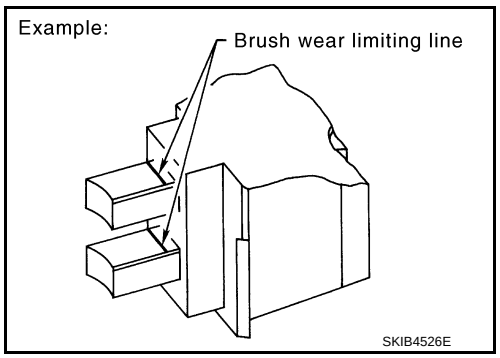
Slip ring minimum outer diameter	**: Refer to SDS CHG-35, "Alternator".**

- Replace the rotor if the measurement value is outside of the specified range.



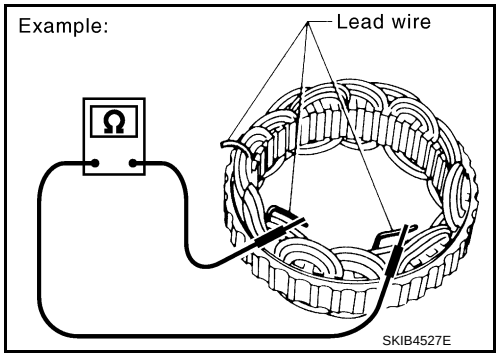
Brush Check

1. Check smooth movement of brush.
   - Check brush holder and clean if it is not smooth.
2. Check brush for wear.
   - Replace brush if it is worn down to the limit line.

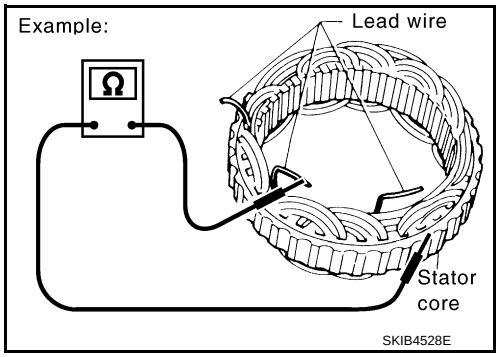


Stator Check

1. Continuity test
   - Replace the stator if continuity does not exist.



2. Ground test
   - Replace the stator if continuity exists.

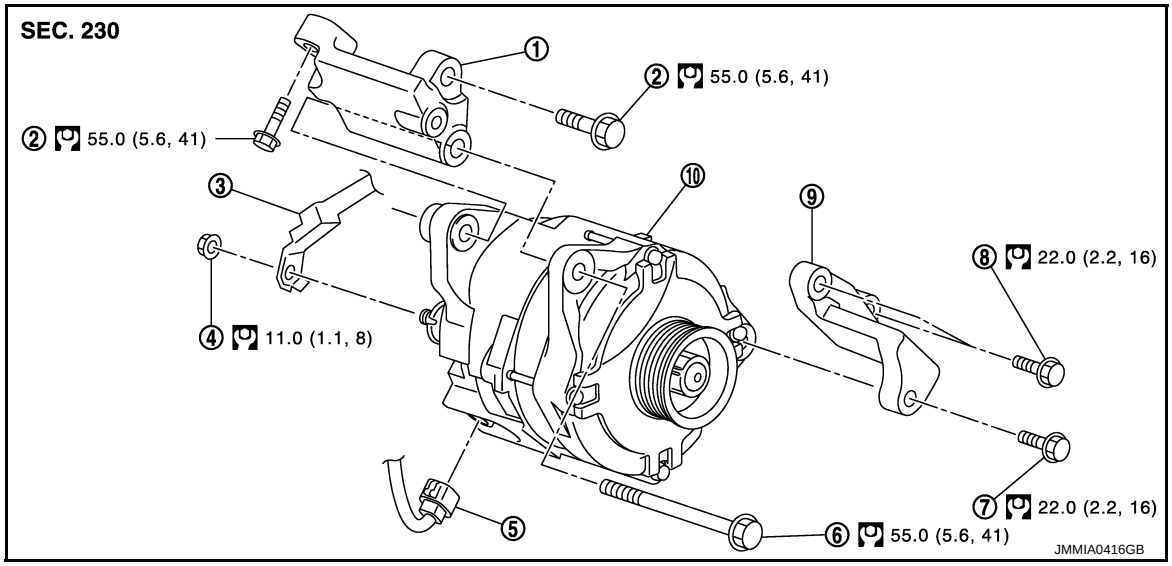


VK56VD

VK56VD : Exploded View

INFOID:0000000008132971

REMOVAL

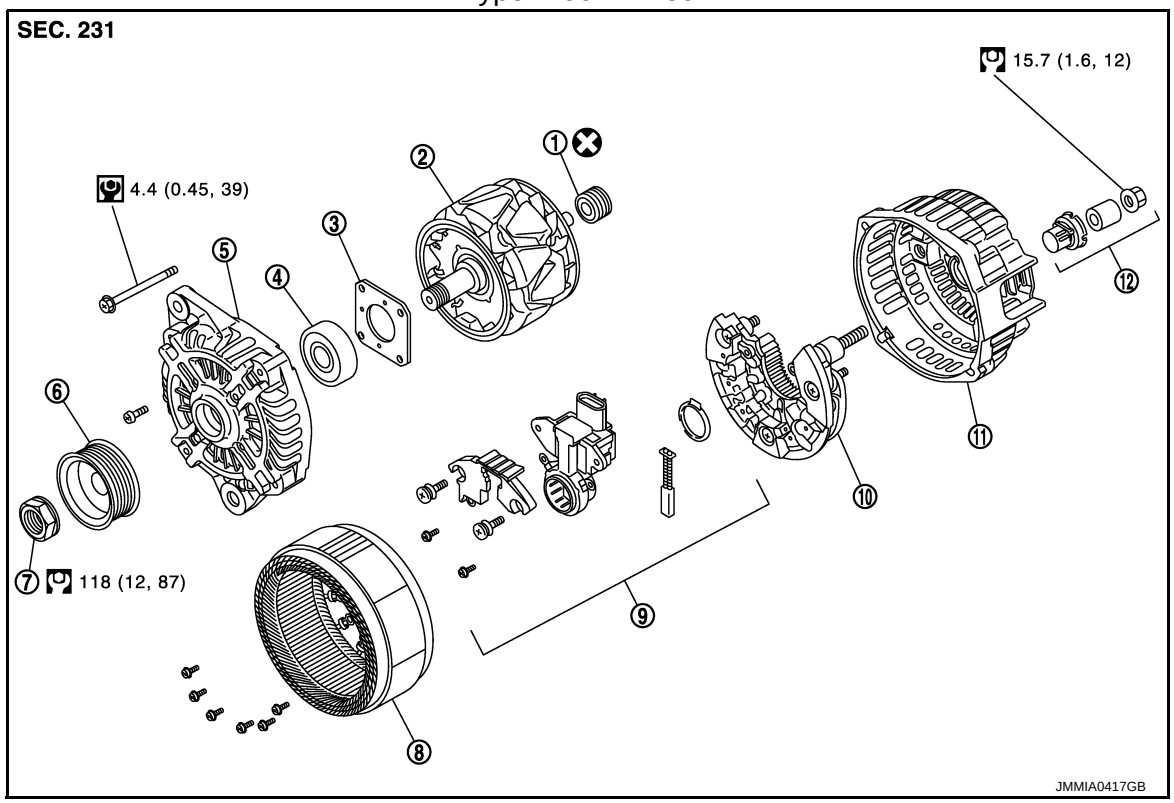


1. Alternator bracket
2. Alternator bracket mounting bolt
3. “B” terminal harness
4. “B” terminal nut
5. Alternator connector
6. Alternator mounting bolt upper
7. Alternator mounting bolt lower
8. Alternator stay mounting bolt
9. Alternator stay
10. Alternator

Refer to GI-4, "Components" for symbols in the figure.

DISASSEMBLY

Type: A002TX1591



1. Rear bearing
2. Rotor assembly
3. Retainer
4. Front bearing
5. Front bracket assembly
6. Pulley
7. Pulley nut
8. Stator assembly
9. IC voltage regulator assembly

10. Diode assembly 11. Rear bracket assembly 12. Terminal set

Refer to GI-4, "Components" for symbols in the figure.

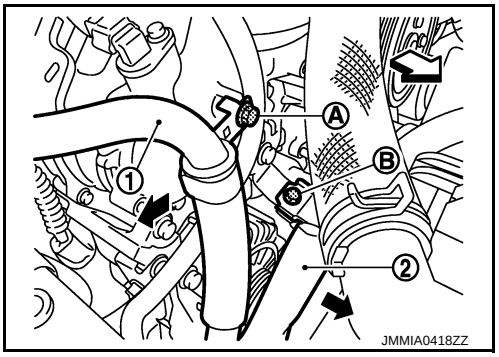
VK56VD : Removal and Installation

INFOID:0000000008132972

REMOVAL

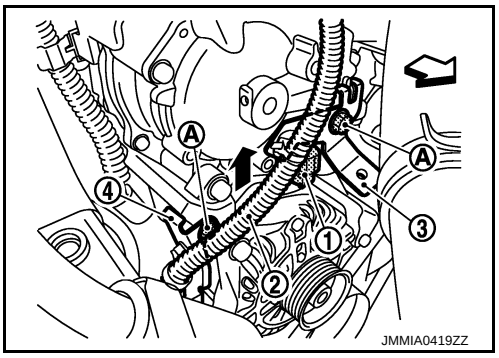
1. Disconnect the battery cable from the negative terminal. Refer to PG-142, "Removal and Installation".
2. Remove air duct (inlet) and air cleaner case (bank 2). Refer to EM-184, "Removal and Installation".
3. Remove drive belt. Refer to EM-176, "Removal and Installation".
4. Remove mounting bolt (A) and (B). Move power steering suction hose (1) and power steering high pressure piping (2) and secure work space.

⇦ : Vehicle front



5. Remove harness bracket mounting bolt (A).
6. Disconnect VDC harness connector (1)
7. Move harness (2) together with harness brackets (3) and (4), and secure work space.

⇦ : Vehicle front



8. Remove engine under cover. Refer to EXT-28, "ENGINE UNDER COVER : Removal and Installation".
9. Disconnect alternator connector.
10. Remove “B” terminal nut, and disconnect “B” terminal harness.
11. Remove alternator mounting bolt lower.
12. Remove alternator mounting bolt upper.
13. Remove alternator assembly upward from the vehicle.

INSTALLATION

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

CAUTION:

- **Be careful to tighten “B” terminal nut carefully.**
- **Install alternator, and check tension of belt. Refer to EM-175, "Checking".**
- **For this model, the power generation voltage variable control system that controls the power generation voltage of the alternator has been adopted. Therefore, the power generation voltage variable control system operation inspection should be performed after replacing the alternator, and then check that the system operates normally. Refer to CHG-19, "Inspection Procedure".**

VK56VD : Inspection (With EXP-800 NI or GR8-1200 NI)

INFOID:0000000008132973

ALTERNATOR PULLEY INSPECTION

Perform the following.

- Make sure that alternator pulley does not rattle.
- Make sure that alternator pulley nut is tight. Refer to CHG-31, "VK56VD : Exploded View".

VK56VD : Inspection (Without EXP-800 NI or GR8-1200 NI)

INFOID:0000000008273005

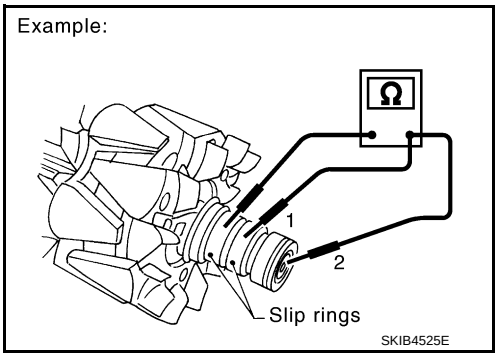
INSPECTION AFTER DISASSEMBLY

Rotor Check

1. Resistance test

Resistance	**: Refer to SDS CHG-35, "Alternator".**

- Replace the rotor if the measurement value is outside of the specified range.



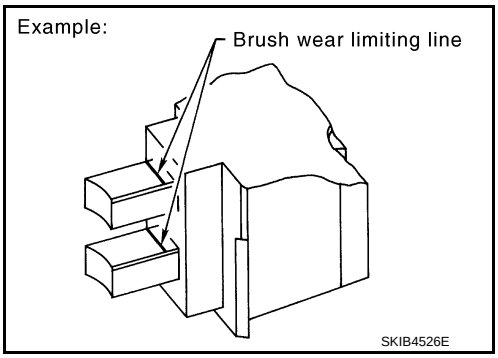
2. Insulator test
   - Replace the rotor if continuity exists.
3. Check slip ring for wear.

Slip ring minimum outer diameter	**: Refer to SDS CHG-35, "Alternator".**

- Replace the rotor if the measurement value is outside of the specified range.

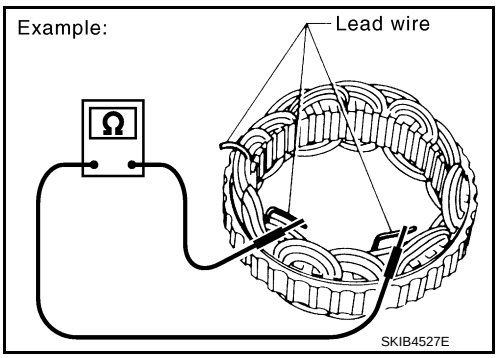
Brush Check

1. Check smooth movement of brush.
   - Check brush holder and clean if it is not smooth.
2. Check brush for wear.
   - Replace brush if it is worn down to the limit line.

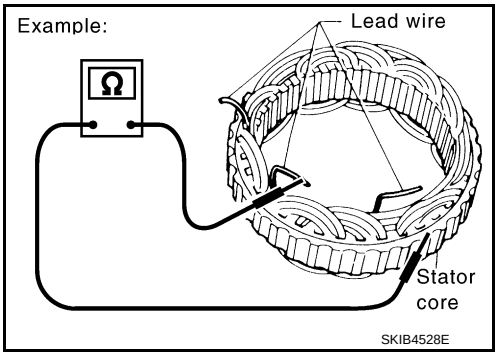


Stator Check

1. Continuity test
   - Replace the stator if continuity does not exist.



2. Ground test
   - Replace the stator if continuity exists.



SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

Alternator

INFOID:0000000008132974

Applied model		VQ37VHR	VK56VD
Type		A003TJ1991B	A002TX1591
		MITSUBISHI make	
Nominal rating	[V - A]	12 -130	12 -150
Ground polarity		Negative	
Minimum revolution under no-load (When 13.5 V is applied)	[rpm]	Less than 1,300	
Hot output current (When 13.5 V is applied)	[A/ rpm]	More than 108/2,500 More than 124/5,000	More than 126/2,500 More than 152/5,000
Regulated output voltage	[V]	14.1 – 14.7*	

*: Adjustment range of power generation voltage variable control is 11.4 - 15.6 V.