

SECTION **CHG**
CHARGING SYSTEM

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PRECAUTIONS

< PRECAUTION >

PRECAUTION

PRECAUTIONS

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

INFOID:000000006601098

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. Information necessary to service the system safely is included in the "SRS AIR BAG" and "SEAT BELT" of this Service Manual.

The vehicle may be equipped with a passenger air bag deactivation switch. Because no rear seat exists where a rear-facing child restraint can be placed, the switch is designed to turn off the passenger air bag so that a rear-facing child restraint can be used in the front passenger seat. The switch is located in the center of the instrument panel, near the ashtray. When the switch is turned to the ON position, the passenger air bag is enabled and could inflate for certain types of collision. When the switch is turned to the OFF position, the passenger air bag is disabled and will not inflate. A passenger air bag OFF indicator on the instrument panel lights up when the passenger air bag is switched OFF. The driver air bag always remains enabled and is not affected by the passenger air bag deactivation switch.

WARNING:

- To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN/INFINITI dealer.
- Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see the "SRS AIR BAG".
- Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses can be identified by yellow and/or orange harnesses or harness connectors.
- The vehicle may be equipped with a passenger air bag deactivation switch which can be operated by the customer. When the passenger air bag is switched OFF, the passenger air bag is disabled and will not inflate. When the passenger air bag is switched ON, the passenger air bag is enabled and could inflate for certain types of collision. After SRS maintenance or repair, make sure the passenger air bag deactivation switch is in the same position (ON or OFF) as when the vehicle arrived for service.

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

WARNING:

- When working near the Air Bag Diagnosis Sensor Unit or other Air Bag System sensors with the ignition ON or engine running, DO NOT 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 Necessary for Steering Wheel Rotation after Battery Disconnect

INFOID:000000006601099

NOTE:

- Before removing and installing any control units, first turn the ignition switch to the LOCK position, then disconnect both battery cables.
- After finishing work, confirm that all control unit connectors are connected properly, then re-connect both battery cables.
- Always use CONSULT-III to perform self-diagnosis as a part of each function inspection after finishing work. If a DTC is detected, perform trouble diagnosis according to self-diagnosis results.

For vehicle with steering lock unit, if the battery is disconnected or discharged, the steering wheel will lock and cannot be turned.

If turning the steering wheel is required with the battery disconnected or discharged, follow the operation procedure below before starting the repair operation.

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PRECAUTIONS

< PRECAUTION >

OPERATION PROCEDURE

1. Connect both battery cables.
NOTE:
Supply power using jumper cables if battery is discharged.
2. Turn the ignition switch to ACC position.
(At this time, the steering lock will be released.)
3. Disconnect both battery cables. The steering lock will remain released with both battery cables disconnected and the steering wheel can be turned.
4. Perform the necessary repair operation.
5. When the repair work is completed, re-connect both battery cables. With the brake pedal released, turn the ignition switch from ACC position to ON position, then to LOCK position. (The steering wheel will lock when the ignition switch is turned to LOCK position.)
6. Perform self-diagnosis check of all control units using CONSULT-III.

Precaution for Power Generation Voltage Variable Control System

INFOID:000000006532093

CAUTION:

For thailand 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

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PREPARATION

PREPARATION

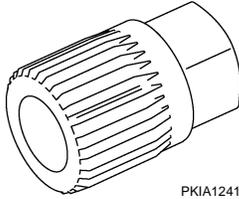
Commercial Service Tools

INFOID:000000006532094

Tool name	Description
<p>Power tool</p>  <p>PIIB1407E</p>	<p>Loosening bolts, nuts and screws</p>

Special Service Tools

INFOID:000000006601097

Tool number Tool name	Description
<p>KV10118200 (included in the adapter kit: Mot. 1732) Alternator pulley adapter</p>  <p>PKIA1241E</p>	<p>Removing and installing alternator pulley</p>

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COMPONENT PARTS

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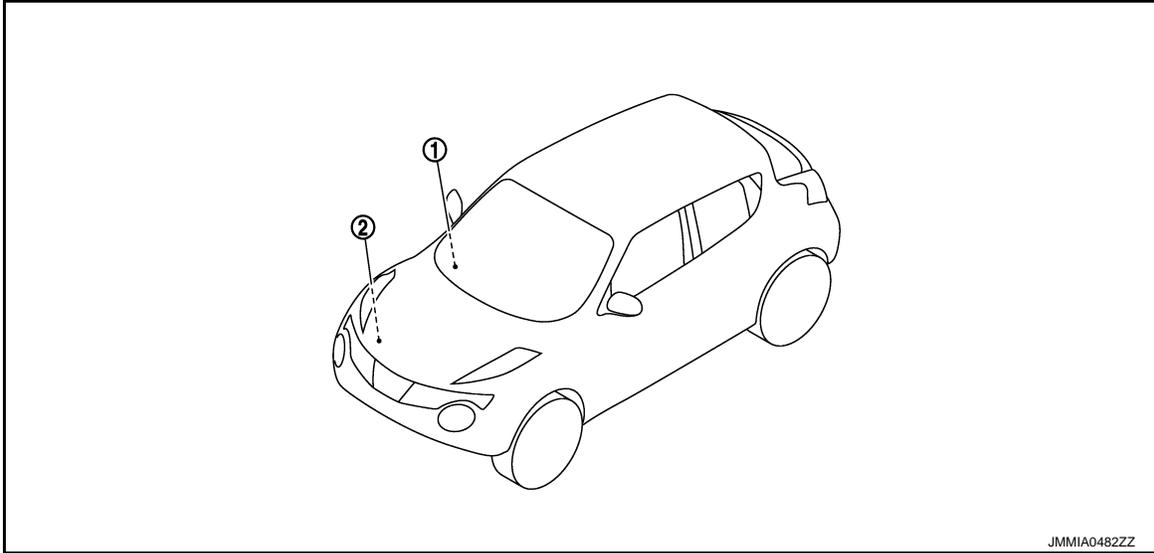
SYSTEM DESCRIPTION

COMPONENT PARTS

CHARGING SYSTEM

CHARGING SYSTEM : Component Parts Location

INFOID:000000006532095



JMMIA0482ZZ

1. Charge warning lamp (On the combination meter)
2. Alternator

CHARGING SYSTEM : Component Description

INFOID:000000006532096

Component part		Description
Alternator	"B" terminal	Refer to CHG-20, "Description" .
	"S" terminal	Refer to CHG-24, "Description" .
	"L" terminal	Refer to CHG-21, "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: <ul style="list-style-type: none">• Excessive voltage is produced.• No voltage is produced.

POWER GENERATION VOLTAGE VARIABLE CONTROL SYSTEM

POWER GENERATION VOLTAGE VARIABLE CONTROL SYSTEM : Component Parts Location

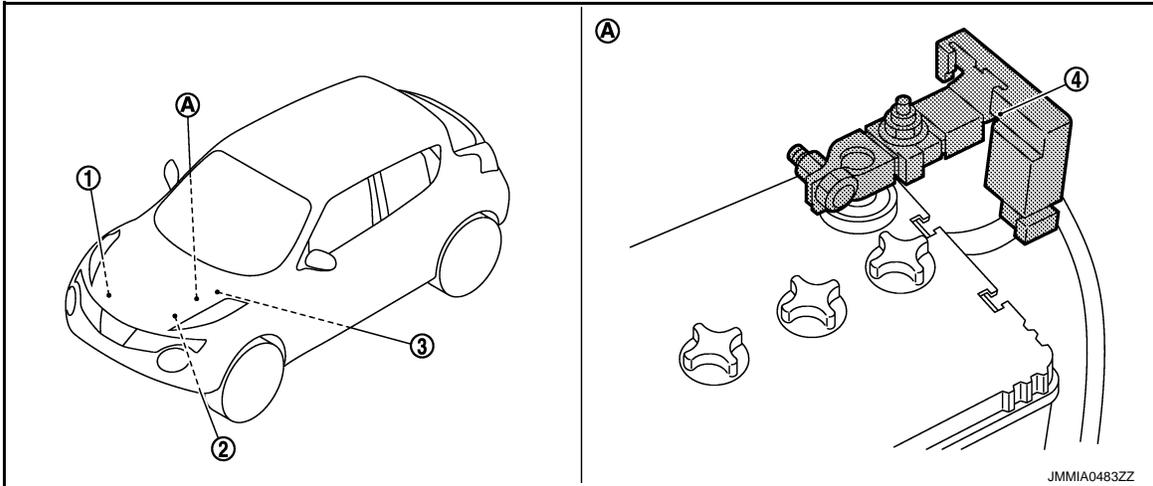
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NOTE:

COMPONENT PARTS

< SYSTEM DESCRIPTION >

This system is applied only for models with battery current sensor. The battery current sensor is installed to the battery cable at the negative terminal.



- 1. Alternator
- 2. ECM
Refer to [EC-25. "ENGINE CONTROL SYSTEM : Component Parts Location"](#) (MR16DDT), [EC-455. "ENGINE CONTROL SYSTEM : Component Parts Location"](#) (HR16DE), [EC-813. "Component Parts Location"](#) (K9K).
- 3. IPDM E/R
Refer to [PCS-5. "Component Parts Location"](#) (with Intelligent Key system), [PCS-37. "Component Parts Location"](#) (without Intelligent Key system).
- 4. Battery current sensor (with battery temperature sensor)
- A. Battery

POWER GENERATION VOLTAGE VARIABLE CONTROL SYSTEM : Component Description

INFOID:000000006532098

Component part	Description
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.
Battery current sensor (with battery temperature sensor)	Battery current sensor is installed to the battery cable at the negative terminal, and it detects the charging/discharging current of the battery and sends the voltage signal to ECM according to the current value.
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 signal 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.

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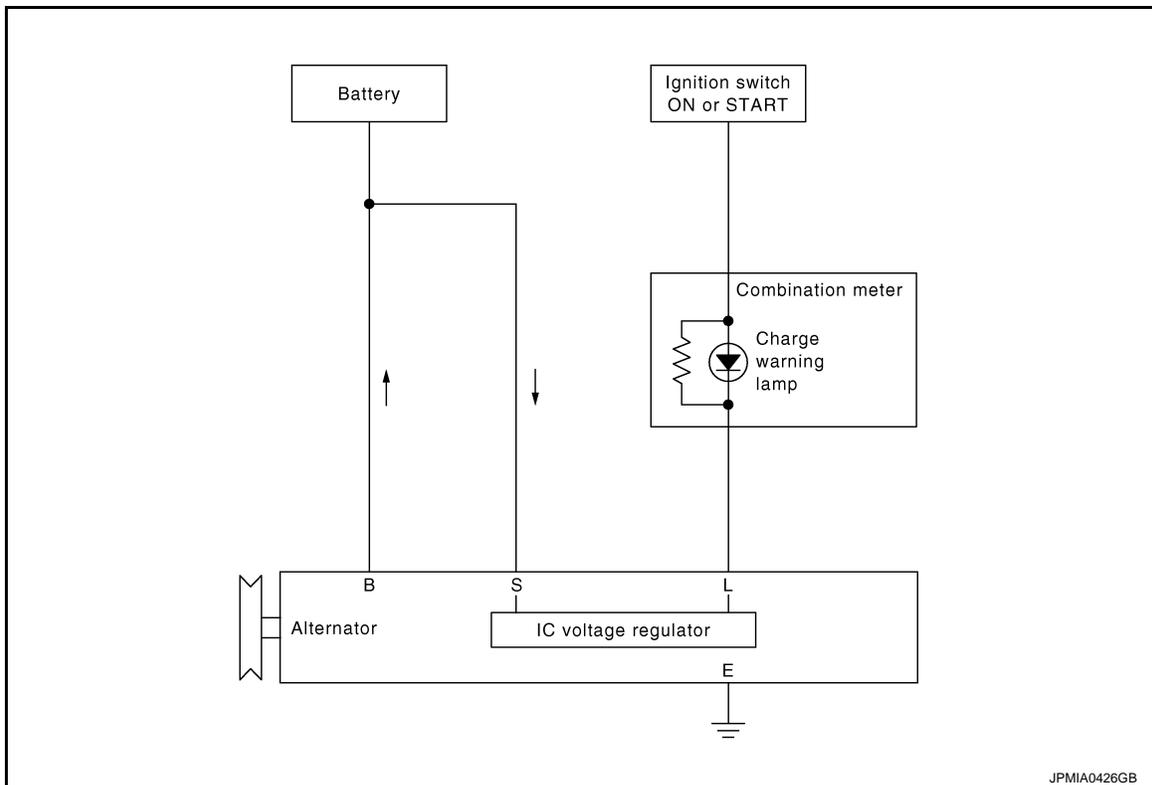
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CHARGING SYSTEM

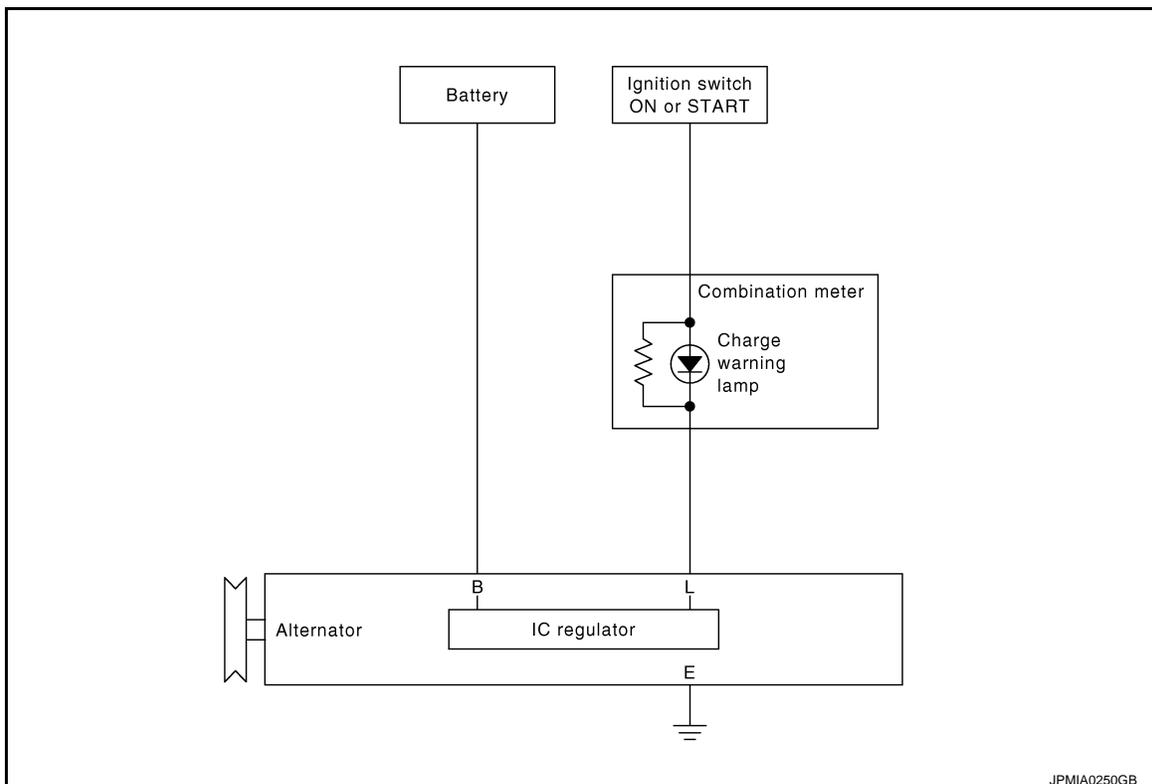
CHARGING SYSTEM : System Diagram

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GASOLINE ENGINE MODELS



DIESEL ENGINE MODELS



SYSTEM

< SYSTEM DESCRIPTION >

CHARGING SYSTEM : System Description

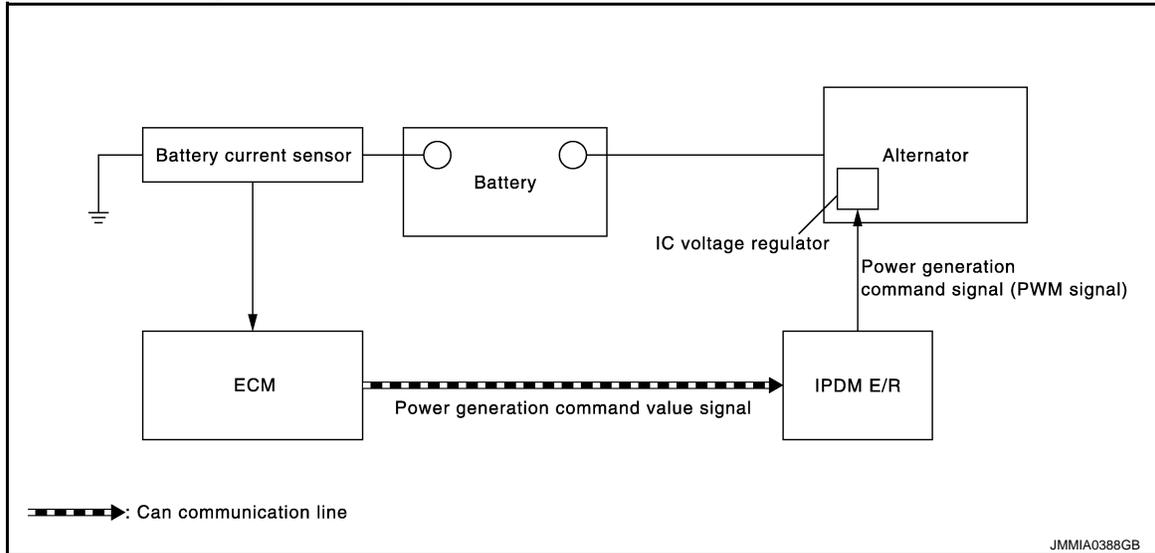
INFOID:000000006532100

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 (Gasoline Engine Models)

INFOID:000000006532101



POWER GENERATION VOLTAGE VARIABLE CONTROL SYSTEM : System Description (Gasoline Engine Models)

INFOID:000000006532102

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.

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CHARGING SYSTEM

< WIRING DIAGRAM >

WIRING DIAGRAM

CHARGING SYSTEM

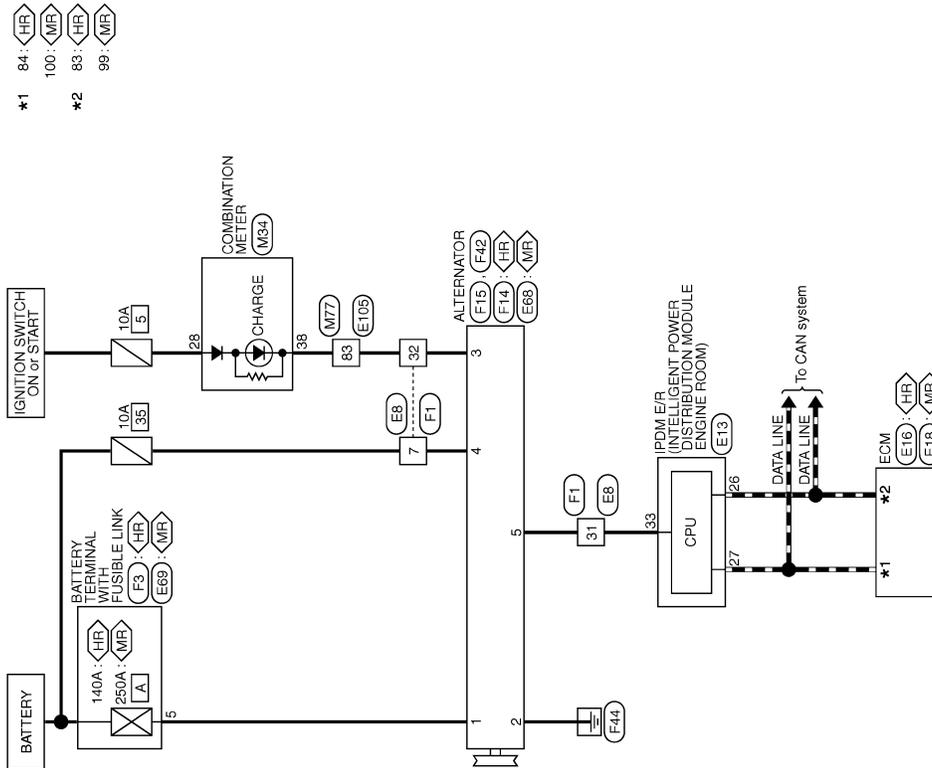
Wiring Diagram

INFOID:000000006532103

GASOLINE ENGINE MODELS

For connector terminal arrangements, harness layouts, and alphabets in a  (option abbreviation; if not described in wiring diagram), refer to [GI-12, "Connector Information/Explanation of Option Abbreviation"](#).

CHARGING SYSTEM (WITH GASOLINE ENGINE)



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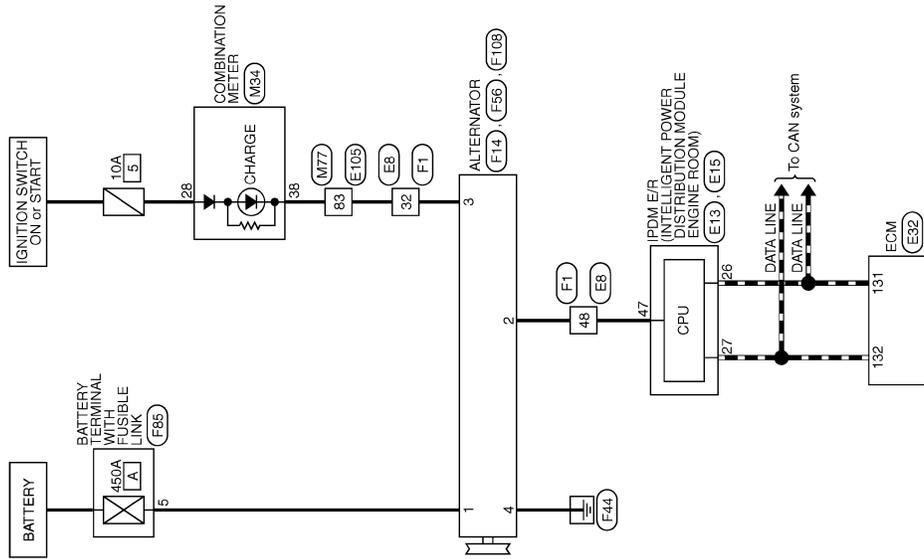
CHARGING SYSTEM

< WIRING DIAGRAM >

DIESEL ENGINE MODELS

For connector terminal arrangements, harness layouts, and alphabets in a  (option abbreviation; if not described in wiring diagram), refer to [GI-12, "Connector Information/Explanation of Option Abbreviation"](#).

CHARGING SYSTEM (WITH DIESEL ENGINE)



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DIAGNOSIS AND REPAIR WORKFLOW

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BASIC INSPECTION

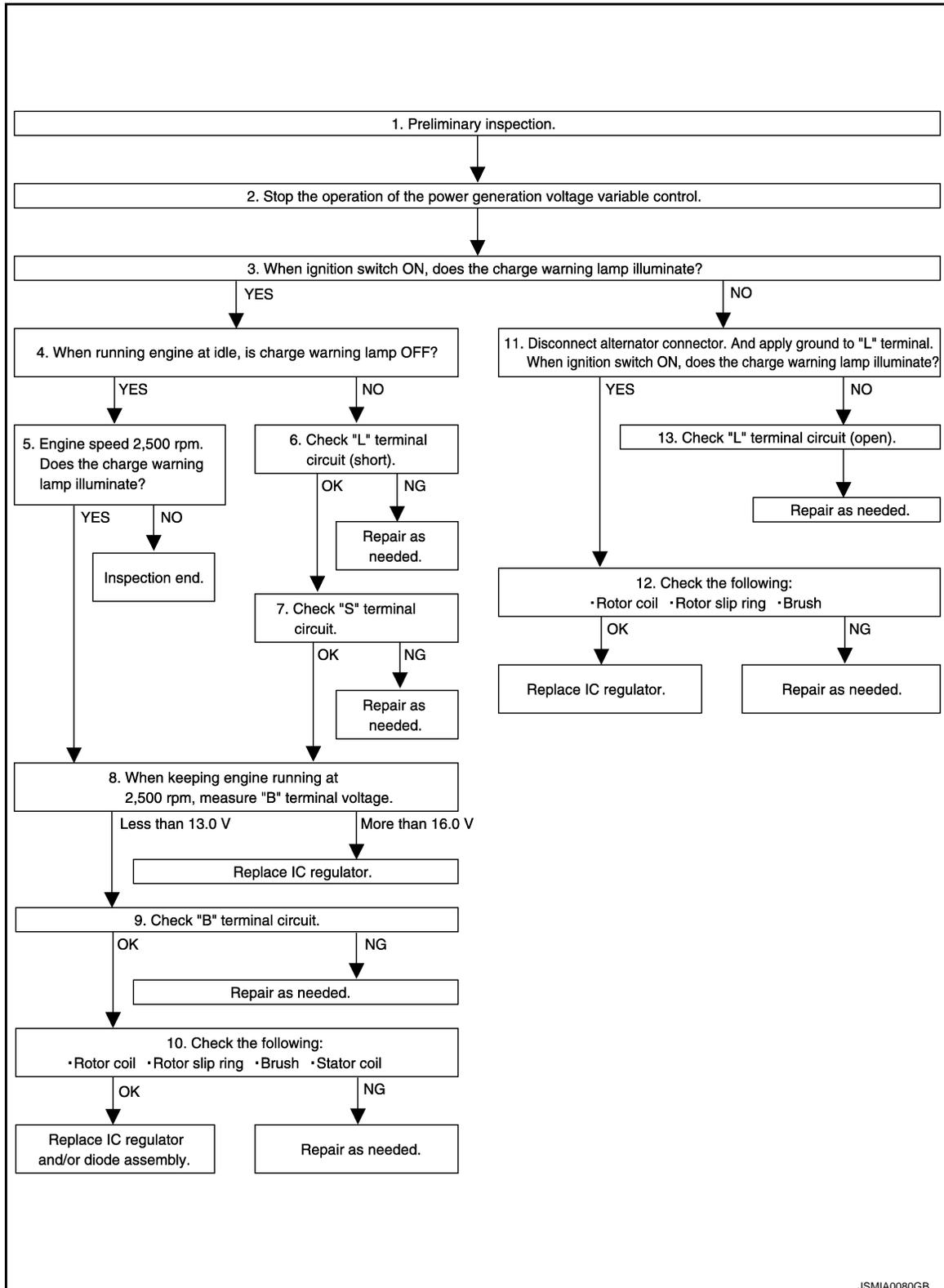
DIAGNOSIS AND REPAIR WORKFLOW

GASOLINE ENGINE MODELS

GASOLINE ENGINE MODELS : Work Flow

INFOID:000000006532104

OVERALL SEQUENCE



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DIAGNOSIS AND REPAIR WORKFLOW

< BASIC INSPECTION >

DETAILED FLOW

1. PRELIMINARY INSPECTION

Perform the preliminary inspection. Refer to [CHG-17, "Inspection Procedure"](#).

Models with battery current sensor >> GO TO 2.

Models without battery current sensor >> GO TO 3.

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-III, 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-III.]

>> GO TO 3.

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

Turn the 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

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-23, "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-24, "Diagnosis Procedure"](#).

Is the inspection result normal?

YES >> GO TO 8.

NO >> Repair as needed.

8. MEASURE "B" TERMINAL VOLTAGE

Start engine. 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 voltage regulator.

9. "B" TERMINAL CIRCUIT INSPECTION

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DIAGNOSIS AND REPAIR WORKFLOW

< BASIC INSPECTION >

Check "B" terminal circuit. Refer to [CHG-20, "Diagnosis Procedure"](#).

Is the inspection result normal?

YES >> GO TO 10.

NO >> Repair as needed.

10. DISASSEMBLE AND CHECK ALTERNATOR

Check the following conditions.

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

Refer to [CHG-29, "HR16DE : Inspection"](#) (HR16DE), [CHG-33, "MR16DDT : Inspection"](#) (MR16DDT).

Are these normal?

YES >> Replace IC voltage regulator and/or diode assembly.

NO >> Repair as needed.

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

1. Disconnect alternator connector and ground "L" harness side.

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.

- Rotor coil
- Rotor slip ring
- Brush

Refer to [CHG-29, "HR16DE : Inspection"](#) (HR16DE), [CHG-33, "MR16DDT : Inspection"](#) (MR16DDT).

Are these normal?

YES >> Replace IC voltage regulator.

NO >> Repair as needed.

13. CHECK "L" TERMINAL CIRCUIT (OPEN)

Check "L" terminal circuit (open). Refer to [CHG-21, "Diagnosis Procedure"](#).

>> Repair as needed.

DIESEL ENGINE MODELS

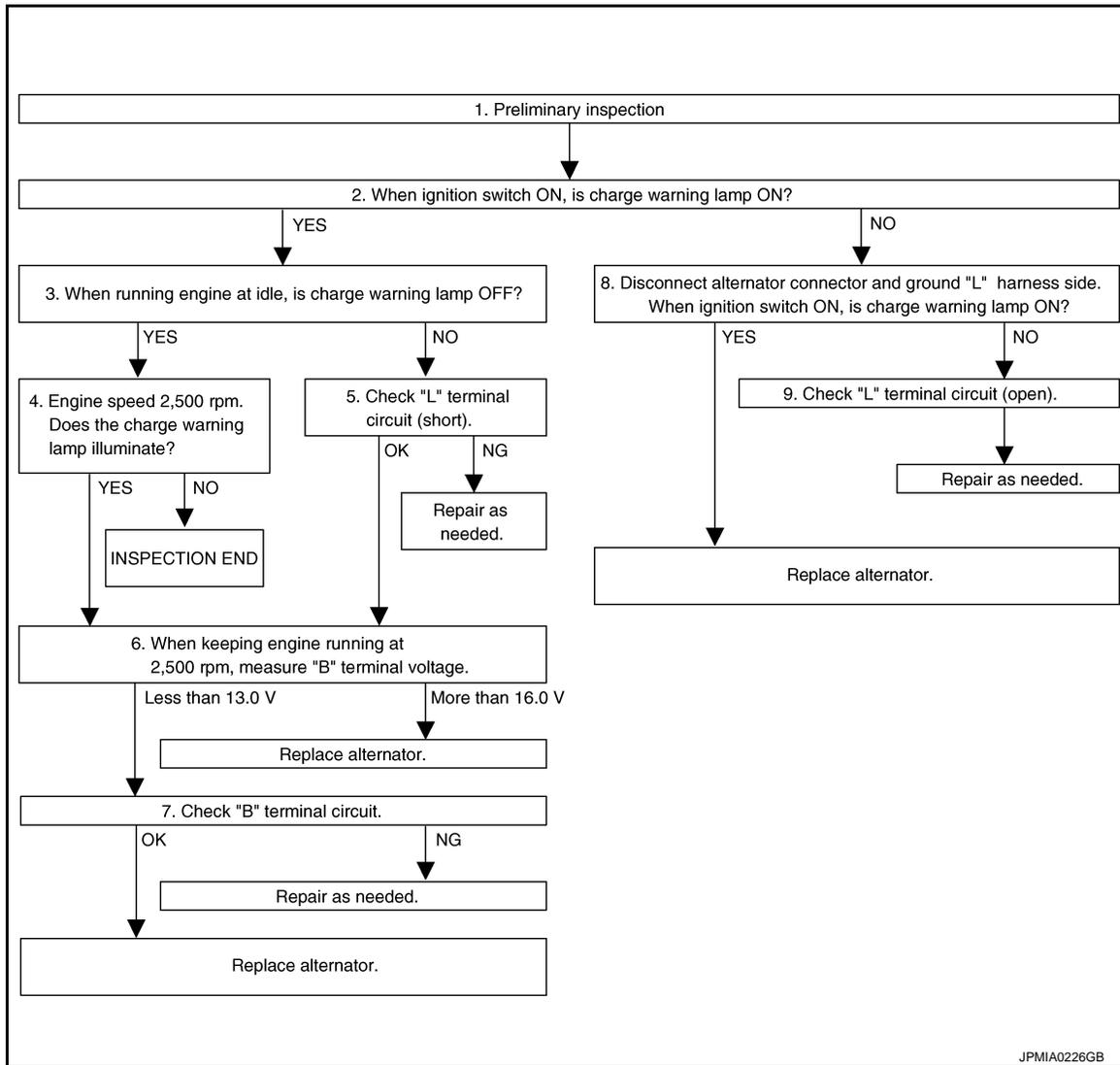
DIAGNOSIS AND REPAIR WORKFLOW

< BASIC INSPECTION >

DIESEL ENGINE MODELS : Work Flow

INFOID:000000006635053

OVERALL SEQUENCE



DETAILED FLOW

1. PRELIMINARY INSPECTION

Perform the preliminary inspection. Refer to [CHG-17, "Inspection Procedure"](#).

>> GO TO 2.

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

Turn the ignition switch ON.

Does the charge warning lamp illuminate?

YES >> GO TO 3.

NO >> GO TO 8.

3. INSPECTION WITH CHARGE WARNING LAMP (IDLING)

Start the engine and run it at idle.

Does the charge warning lamp turn OFF?

YES >> GO TO 4.

NO >> GO TO 5.

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

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DIAGNOSIS AND REPAIR WORKFLOW

< BASIC INSPECTION >

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

Does the charge warning lamp illuminate?

YES >> GO TO 6.

NO >> INSPECTION END

5. "L" TERMINAL CIRCUIT (SHORT) INSPECTION

Check "L" terminal circuit (short). Refer to [CHG-23, "Diagnosis Procedure"](#).

Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair as needed.

6. 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 7.

More than 16.0 V >> Replace alternator.

7. "B" TERMINAL CIRCUIT INSPECTION

Check "B" terminal circuit. Refer to [CHG-20, "Diagnosis Procedure"](#).

Is the inspection result normal?

YES >> Replace alternator.

NO >> Repair as needed.

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

1. Disconnect alternator connector and ground "L" harness side.

2. Turn the ignition switch ON.

Does the charge warning lamp illuminate?

YES >> Replace alternator.

NO >> GO TO 9.

9. CHECK "L" TERMINAL CIRCUIT (OPEN)

Check "L" terminal circuit (open). Refer to [CHG-21, "Diagnosis Procedure"](#).

>> Repair as needed.

CHARGING SYSTEM PRELIMINARY INSPECTION

< BASIC INSPECTION >

CHARGING SYSTEM PRELIMINARY INSPECTION

Inspection Procedure

INFOID:000000006532105

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.

Gasoline engine models

Unit	Power source (Power supply terminals)	Fuse No.
Alternator	Battery ("S" terminal)	35
Combination meter	Ignition switch ON ("L" terminal)	5

Diesel engine models

Unit	Power source (Power supply terminals)	Fuse No.
Combination meter	Ignition switch ON ("L" terminal)	5

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 (ALTERNATOR GROUND)

Check if "E" terminal (alternator ground) is clean and tight.

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair "E" terminal (alternator ground) connection.

4. CHECK DRIVE BELT TENSION

Check drive belt tension. Refer to the following.

- HR16DE engine models: [EM-154, "Checking"](#)
- MR16DDT engine models: [EM-20, "Checking"](#)
- K9K engine models: [EM-276, "Checking Drive Belts"](#)

Is the inspection result normal?

YES >> INSPECTION END

NO >> Repair as needed.

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POWER GENERATION VOLTAGE VARIABLE CONTROL SYSTEM OPERATION INSPECTION

< BASIC INSPECTION >

POWER GENERATION VOLTAGE VARIABLE CONTROL SYSTEM OPERATION INSPECTION

Inspection Procedure

INFOID:000000006532106

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-III)

Perform ECM self-diagnosis with CONSULT-III. Refer to [EC-501, "CONSULT-III Function"](#) (MR16DDT), or [EC-835, "CONSULT-III Function"](#) (K9K).

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-III and start the engine.
2. Check that the selector lever is in "P" or "N" position and that 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-III)

Perform IPDM E/R self-diagnosis with CONSULT-III. Refer to [PCS-14, "CONSULT-III Function \(IPDM E/R\)"](#) (with Intelligent Key system), [PCS-45, "CONSULT-III Function \(IPDM E/R\)"](#) (without Intelligent Key system).

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 harness connector		IPDM E/R harness connector		Continuity
Connector	Terminal	Connector	Terminal	
F15	5	E13	33	Existed

POWER GENERATION VOLTAGE VARIABLE CONTROL SYSTEM OPERATION INSPECTION

< BASIC INSPECTION >

4. Check continuity between alternator harness connector and ground.

Alternator harness connector		Ground	Continuity
Connector	Terminal		
F15	5		Not existed

Is the inspection result normal?

YES >> Replace IPDM E/R.

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

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B TERMINAL CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

DTC/CIRCUIT DIAGNOSIS

B TERMINAL CIRCUIT

Description

INFOID:000000006532107

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

Diagnosis Procedure

INFOID:000000006532108

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.

2. CHECK "B" TERMINAL CIRCUIT

Check voltage between alternator "B" terminal and ground.

Terminals			Voltage (Approx.)
(+)	(-)		
Alternator "B" terminal	Terminal		Battery voltage
F14 (HR16DE, K9K) E68 (MR16DDT)	1		

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.

Terminals			Voltage (Approx.)
(+)	(-)		
Battery positive terminal	Alternator "B" terminal	Terminal	Less than 0.2 V
	F14 (HR16DE, K9K) E68 (MR16DDT)	1	

Is the inspection result normal?

- YES >> "B" terminal circuit is normal. Refer to [CHG-12. "GASOLINE ENGINE MODELS : Work Flow"](#) (gasoline engine models) or [CHG-15. "DIESEL ENGINE MODELS : Work Flow"](#) (diesel engine models).
NO >> Check harness between battery and alternator for poor continuity.

L TERMINAL CIRCUIT (OPEN)

< DTC/CIRCUIT DIAGNOSIS >

L TERMINAL CIRCUIT (OPEN)

Description

INFOID:000000006532109

The "L" terminal circuit controls the charge warning lamp. The charge warning lamp illuminates 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 will go off. If the charge warning lamp illuminates with the engine running, a malfunction is indicated.

Diagnosis Procedure

INFOID:000000006532110

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.

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 harness connector	Terminal	Ground	Condition	
			Ignition switch position	Charge warning lamp
F15 (HR16DE, MR16DDT) F56 (K9K)	3		ON	Illuminate

Does it illuminate?

- YES >> "L" terminal circuit is normal. Refer to [CHG-12. "GASOLINE ENGINE MODELS : Work Flow"](#) (gasoline engine models) or [CHG-15. "DIESEL ENGINE MODELS : Work Flow"](#) (diesel engine models).
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 harness connector		Combination meter harness connector		Continuity
Connector No.	Terminal No.	Connector No.	Terminal No.	
F15 (HR16DE, MR16DDT) F56 (K9K)	3	M34	38	Existed

Is the inspection result normal?

- YES >> GO TO 4.
NO >> Repair the harness or connector.

4. CHECK HARNESS CONTINUITY (OPEN CIRCUIT)

Check continuity between combination meter harness connector M34 terminal 28 and 10A fuse [No.5 located in the fuse block (J/B)].

Does continuity exist?

- YES >> GO TO 5.
NO >> Repair 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.

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L TERMINAL CIRCUIT (OPEN)

< DTC/CIRCUIT DIAGNOSIS >

Terminals		(-)	Condition	Voltage (Approx.)
(+)	Terminal			
Combination meter harness connector				
M34	28	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-15, "Wiring Diagram - IGNITION POWER SUPPLY -](#)

["](#)

L TERMINAL CIRCUIT (SHORT)

< DTC/CIRCUIT DIAGNOSIS >

L TERMINAL CIRCUIT (SHORT)

Description

INFOID:000000006532111

The "L" terminal circuit controls the charge warning lamp. The charge warning lamp illuminates 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 will go off. If the charge warning lamp illuminates with the engine running, a malfunction is indicated.

Diagnosis Procedure

INFOID:000000006532112

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-12. "GASOLINE ENGINE MODELS : Work Flow"](#) (gasoline engine models) or [CHG-15. "DIESEL ENGINE MODELS : Work Flow"](#) (diesel engine models).

2. CHECK HARNESS CONTINUITY (SHORT CIRCUIT)

1. Turn the 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 harness connector		Ground	Continuity
Connector No.	Terminal No.		
M34	38		Not existed

Is the inspection result normal?

YES >> Replace combination meter.

NO >> Repair the harness.

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S TERMINAL CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

S TERMINAL CIRCUIT

Description

INFOID:000000006532113

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:000000006532114

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.

2. CHECK "S" TERMINAL CIRCUIT

Check voltage between alternator harness connector and ground.

Terminals		Voltage (Approx.)
(+)	(-)	
Alternator harness connector	Terminal	Battery voltage
F15	4	
	Ground	

Is the inspection result normal?

YES >> Refer to [CHG-12, "GASOLINE ENGINE MODELS : Work Flow"](#).

NO >> Check harness for open between alternator and fuse.

CHARGING SYSTEM

< SYMPTOM DIAGNOSIS >

SYMPTOM DIAGNOSIS

CHARGING SYSTEM

Symptom Table

INFOID:000000006532115

Symptom	Reference
Discharged battery	Refer to CHG-12, "GASOLINE ENGINE MODELS : Work Flow" (gasoline engine models) or CHG-15, "DIESEL ENGINE MODELS : Work Flow" (diesel engine models).
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.	

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ALTERNATOR

< REMOVAL AND INSTALLATION >

REMOVAL AND INSTALLATION

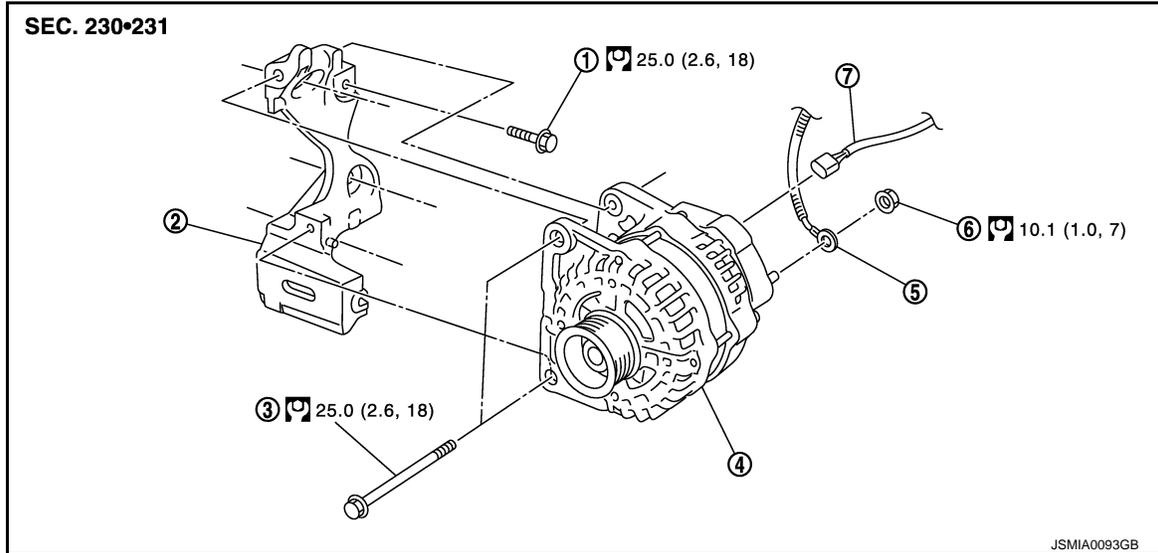
ALTERNATOR

HR16DE

HR16DE : Exploded View

INFOID:000000006601086

REMOVAL



- | | | |
|-------------------------------------|-------------------------|-----------------------------|
| 1. Alternator bracket mounting bolt | 2. Alternator bracket | 3. Alternator mounting bolt |
| 4. Alternator | 5. "B" terminal harness | 6. "B" terminal nut |
| 7. Alternator connector | | |

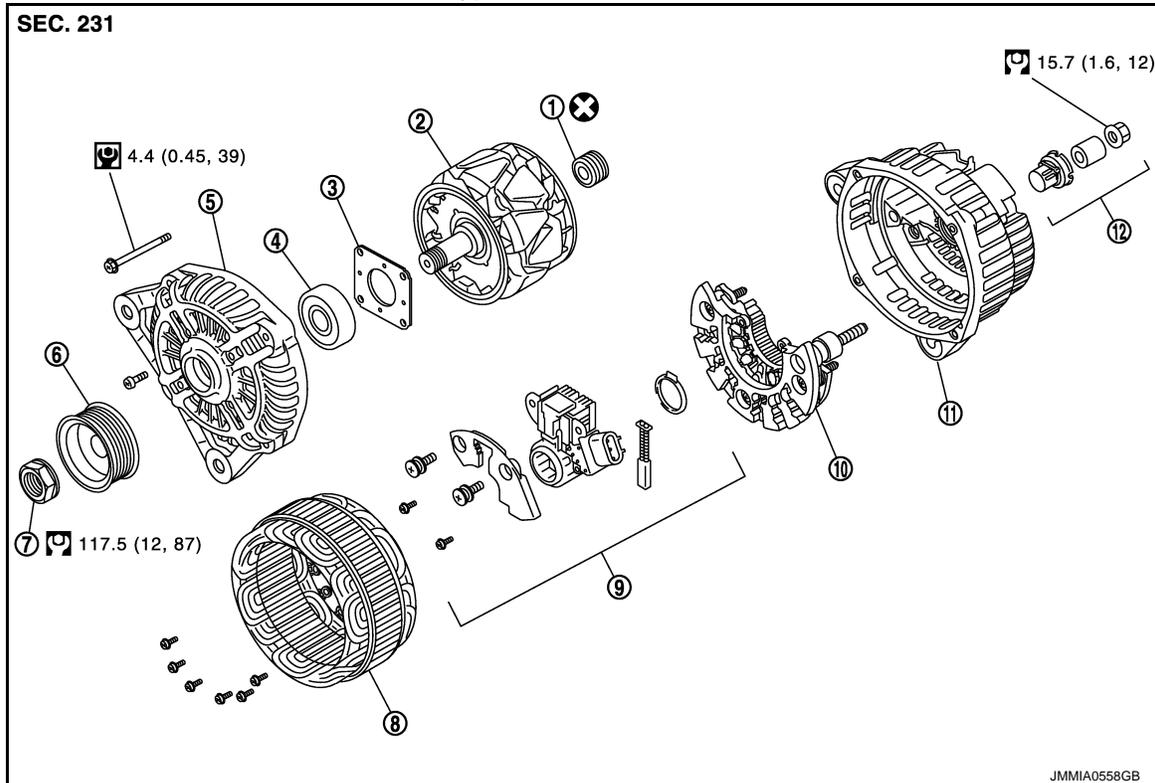
 : N·m (kg-m, ft-lb)

DISASSEMBLY

ALTERNATOR

< REMOVAL AND INSTALLATION >

Type: A002TJ1291ZE



- | | | |
|--------------------|---------------------------|----------------------------------|
| 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 |

⊗ : Do not reuse

☐ : N·m (kg-m, in-lb)

☐ : N·m (kg-m, ft-lb)

HR16DE : Removal and Installation

INFOID:000000006601087

REMOVAL

1. Disconnect the battery cable from the negative terminal. Refer to [PG-124, "Removal and Installation"](#).
2. Remove radiator reservoir tank. Refer to [CO-17, "Exploded View"](#).
3. Remove drive belt. Refer to [EM-155, "Removal and Installation"](#).
4. Disconnect alternator connector.
5. Remove "B" terminal nut and disconnect "B" terminal harness.
6. Remove alternator mounting bolts.
7. Remove alternator upward from the vehicle.

INSTALLATION

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

CAUTION:

- Temporarily tighten the alternator bolts in order from the lower to the upper, and then tighten them in order from the upper to the lower.
- For the alternator, the front side (pulley side) surface is the reference surface. Fit the reference surface to the alternator mounting part, and then tighten the bolts.
- Be careful to tighten "B" terminal nut carefully.
- Install alternator, and check tension of belt. Refer to [EM-154, "Checking"](#).

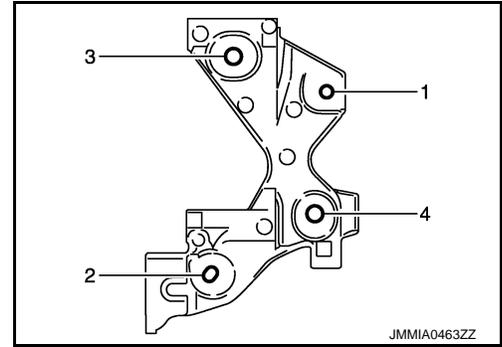
NOTE:

ALTERNATOR

< REMOVAL AND INSTALLATION >

Tighten mounting bolts according to the following procedures for installing alternator bracket.

1. Temporarily tighten mounting bolt (1).
2. Temporarily tighten mounting bolt (2).
3. Tighten mounting bolts in numerical order as shown in the figure.



HR16DE : Disassembly and Assembly

INFOID:000000006532118

DISASSEMBLY

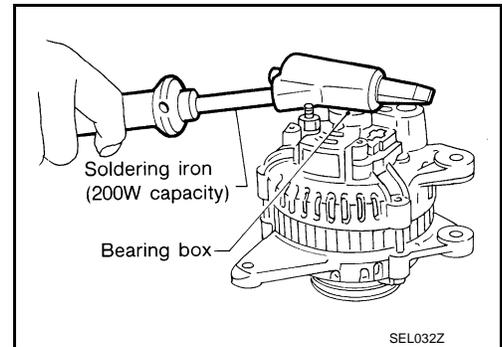
Rear Cover

NOTE:

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 only the bearing box section until the temperature increases to approximately 30°C (86°F) with a soldering iron (200W capacity).

CAUTION:

Never use a heat gun, as it can damage diode assembly.



ASSEMBLY

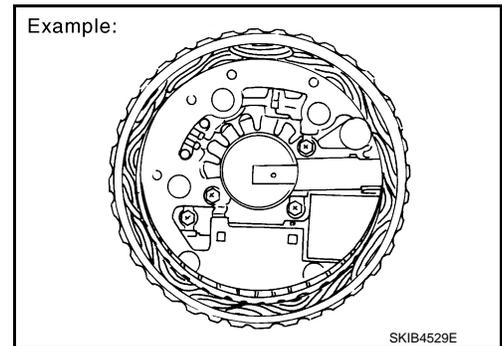
Rear Bearing

CAUTION:

- Never reuse rear bearing. Replace with a new one.
- Never lubricate rear bearing outer race.

Rear Cover Installation

1. Fit brush assembly, diode assembly, regulator assembly and stator.



ALTERNATOR

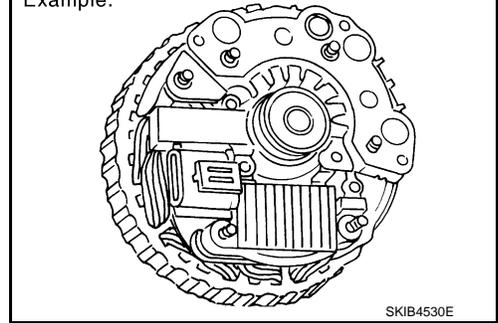
< REMOVAL AND INSTALLATION >

2. Push brushes up with fingers and install them to rotor.

NOTE:

Take care not damage slip ring sliding surface.

Example:



SKIB4530E

INFOID:000000006532119

HR16DE : Inspection

INSPECTION

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.

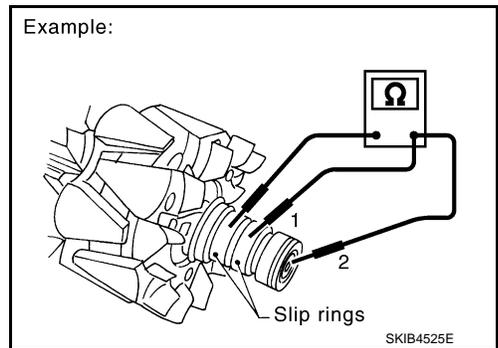
Slip ring minimum outer diameter : Refer to SDS [CHG-35, "Alternator"](#).

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

Brush Check

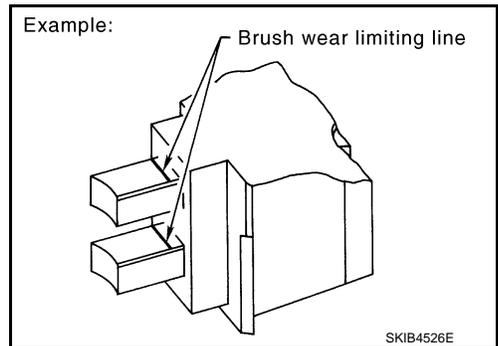
1. Check smooth movement of brush.
 - Check brush holder and clean if it is not smooth.
2. Check brush for wear.
 - Replace brush if it is worn down to the limit line.

Example:



SKIB4525E

Example:

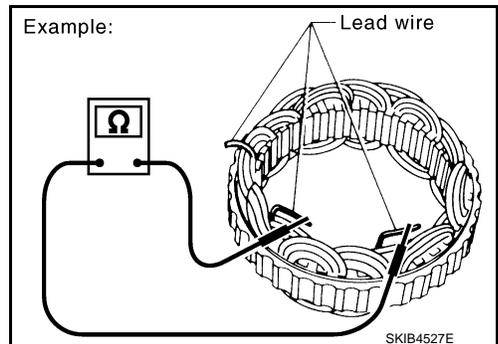


SKIB4526E

Stator Check

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

Example:



SKIB4527E

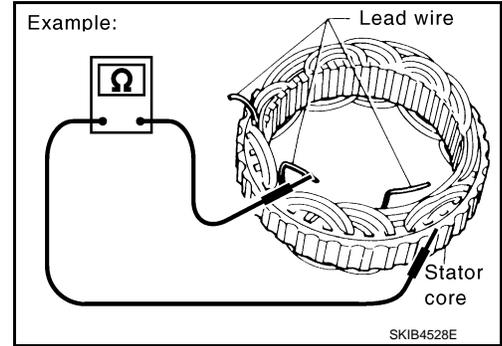
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ALTERNATOR

< REMOVAL AND INSTALLATION >

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

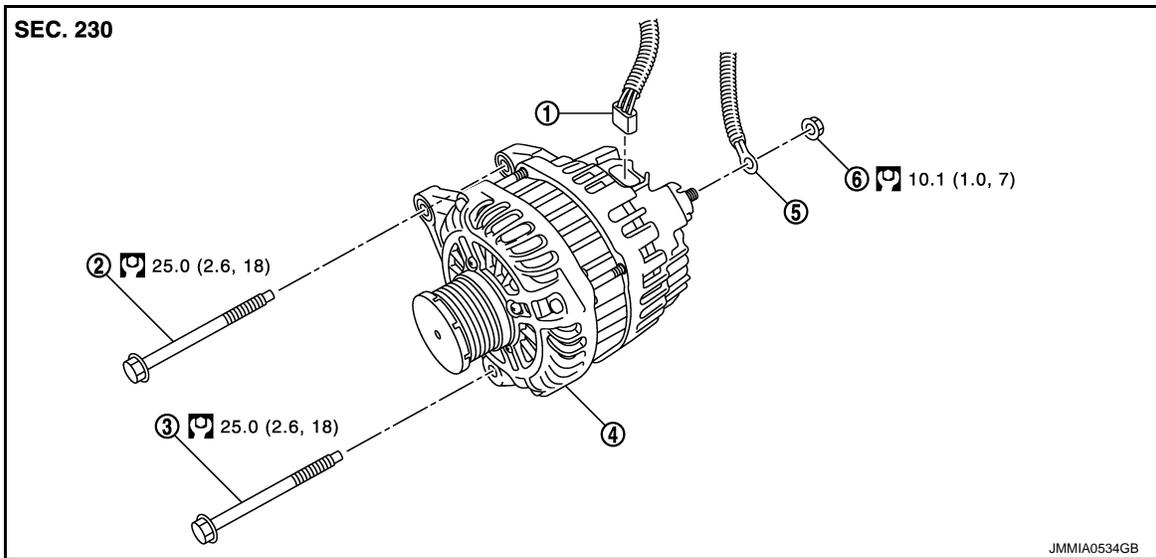


MR16DDT

MR16DDT : Exploded View

INFOID:000000006601092

REMOVAL



- | | | |
|-------------------------|-------------------------------------|-------------------------------------|
| 1. Alternator connector | 2. Alternator mounting bolt (upper) | 3. Alternator mounting bolt (lower) |
| 4. Alternator | 5. "B" terminal harness | 6. "B" terminal nut |

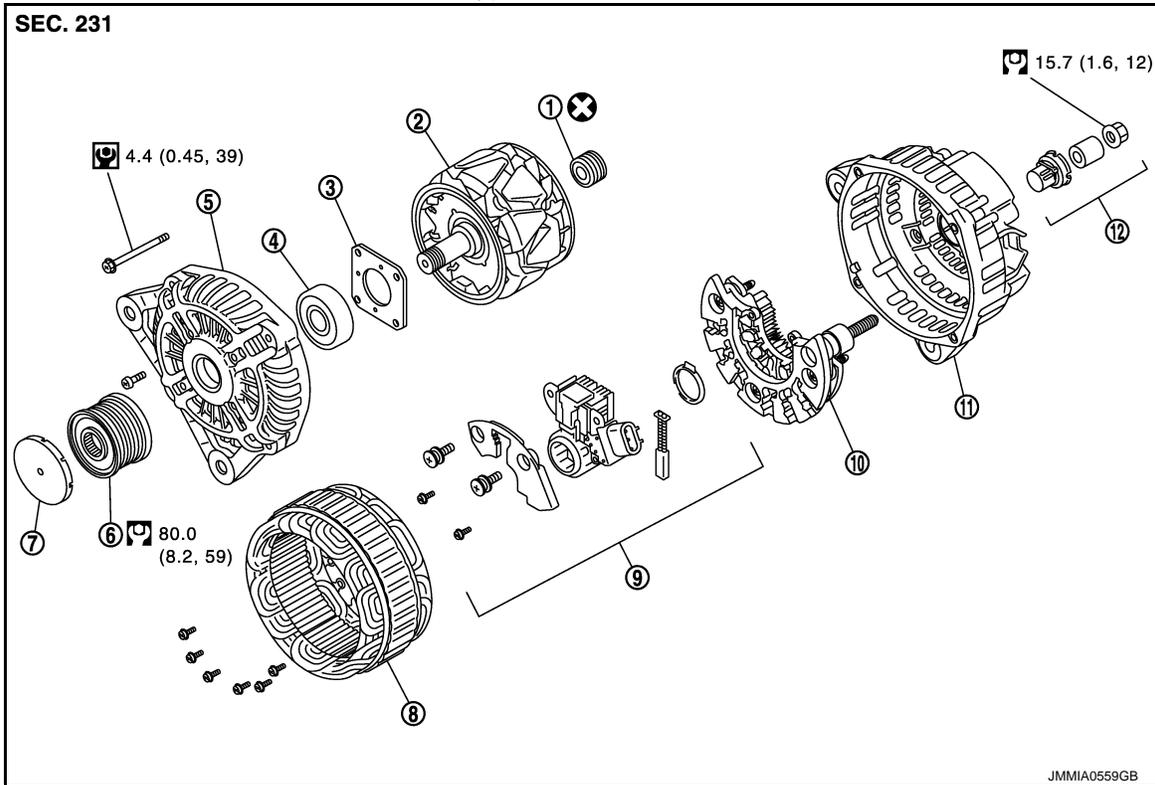
: N·m (kg·m, ft·lb)

DISASSEMBLY

ALTERNATOR

< REMOVAL AND INSTALLATION >

Type: A002TJ1381



- | | | |
|--------------------|---------------------------|----------------------------------|
| 1. Rear bearing | 2. Rotor assembly | 3. Retainer |
| 4. Front bearing | 5. Front bracket assembly | 6. Pulley |
| 7. Pulley cap | 8. Stator assembly | 9. IC voltage regulator assembly |
| 10. Diode assembly | 11. Rear bracket assembly | 12. Terminal set |

- ⊗ : Do not reuse
- ◻ : N·m (kg-m, in-lb)
- ◻◻ : N·m (kg-m, ft-lb)

MR16DDT : Removal and Installation

INFOID:000000006601093

REMOVAL

1. Disconnect the battery cable from the negative terminal. Refer to [PG-124, "Removal and Installation"](#).
2. Remove charge air cooler. Refer to [EM-31, "Removal and Installation"](#).
3. Remove drive belt. Refer to [EM-20, "Removal and Installation"](#).
4. Disconnect alternator connector.
5. Remove "B" terminal nut and disconnect "B" terminal harness.
6. Remove alternator mounting bolt (upper).
7. Completely loosen alternator mounting bolt (lower), and pull it out until the bolt head is in contact with the side member. And then, remove the alternator by pulling it forward.

NOTE:

The alternator can be removed together with the bolts by pulling it forward and using the thermostat housing bolt hole cutout.

8. Remove alternator forward from the vehicle.

INSTALLATION

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

CAUTION:

- Temporarily tighten the alternator bolts in order from the lower to the upper, and then tighten them in order from the upper to the lower.

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ALTERNATOR

< REMOVAL AND INSTALLATION >

- For the alternator, the front side (pulley side) surface is the reference surface. Fit the reference surface to the alternator mounting part, and then tighten the bolts.
- Be careful to tighten "B" terminal nut carefully.
- Install alternator, and check tension of belt. Refer to [EM-20, "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 make sure that the system operates normally. Refer to [CHG-18, "Inspection Procedure"](#).

MR16DDT : Disassembly and Assembly

INFOID:000000006601094

DISASSEMBLY

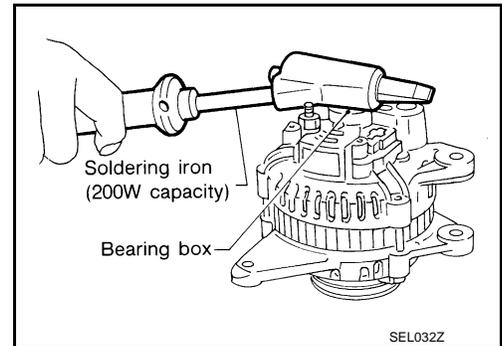
Rear Cover

NOTE:

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 only the bearing box section until the temperature increases to approximately 30°C (86°F) with a soldering iron (200W capacity).

CAUTION:

Never use a heat gun, as it can damage diode assembly.



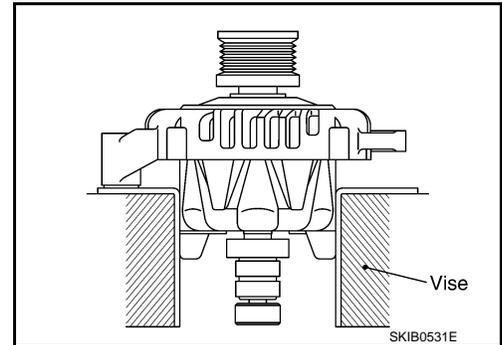
Front Cover

1. Set rotor to the vise.

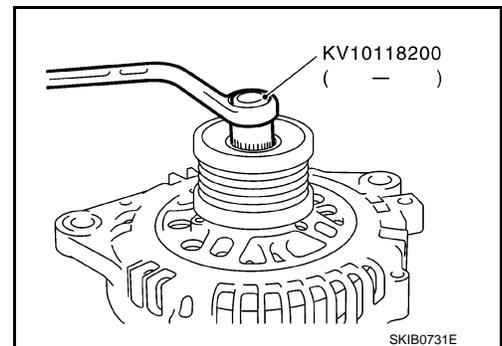
CAUTION:

- Be careful not to damage the rotor.
- Use copper plate or thick cloth for rotor in the vise.

2. Remove pulley cap, using suitable tool.



3. Remove alternator pulley, using alternator pulley adaptor [SST].



ASSEMBLY

Rear Bearing

CAUTION:

- Never reuse rear bearing. Replace with a new one.
- Never lubricate rear bearing outer race.

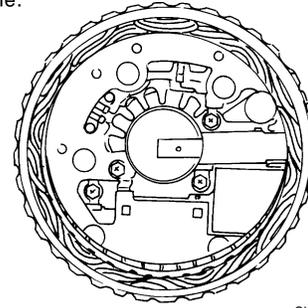
Rear Cover Installation

ALTERNATOR

< REMOVAL AND INSTALLATION >

1. Fit brush assembly, diode assembly, regulator assembly and stator assembly.

Example:



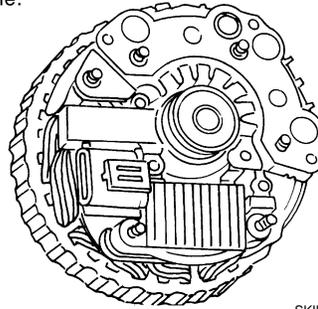
SKIB4529E

2. Push brushed up with fingers and install them to rotor.

NOTE:

Take care not damage slip ring sliding surface.

Example:



SKIB4530E

INFOID:000000006532123

MR16DDT : Inspection

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

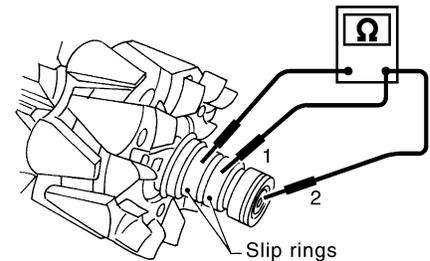
- Replace the rotor if continuity exists.

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.

Example:

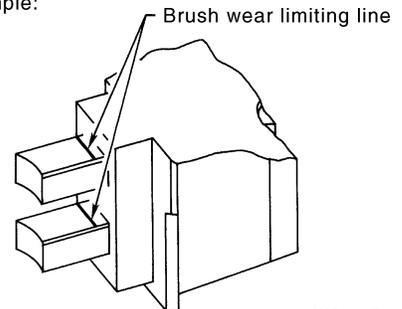


SKIB4525E

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.

Example:



SKIB4526E

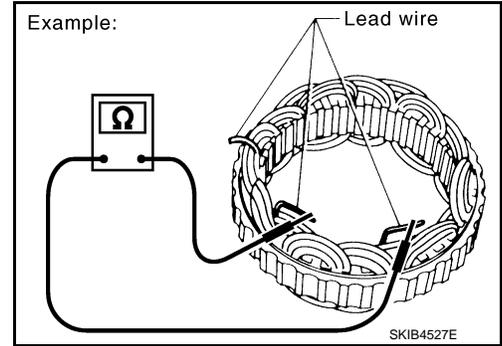
Stator Check

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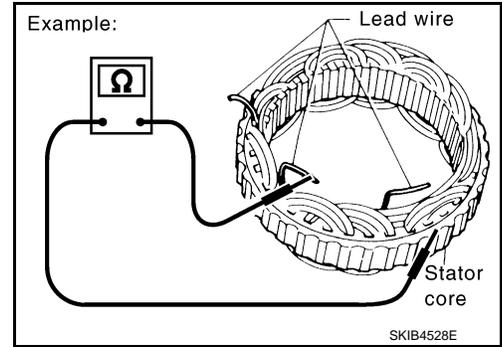
ALTERNATOR

< REMOVAL AND INSTALLATION >

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)

SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

Alternator

INFOID:0000000006532124

Applied model	HR16DE	MR16DDT	K9K
Type	A002TJ1291	A002TJ1381	—
	MITSUBISHI make		—
Nominal rating [V - A]	12 -110		—
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 21/1,300 More than 95/2,500 More than 116/5,000		—
Regulated output voltage [V]	14.1 - 14.7*		—
Minimum length of brush [mm (in)]	More than 5.00 (0.1969)		—
Brush spring pressure [N (g, oz)]	4.1 - 5.3 (439 - 520, 15.5 - 18.4)		—
Slip ring minimum outer diameter [mm (in)]	More than 22.1 (0.870)		—
Rotor (Field coil) resistance [Ω]	1.8 - 2.2		—

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

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