

SECTION **CHG**
CHARGING SYSTEM

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DIAGNOSIS AND REPAIR WORKFLOW

< BASIC INSPECTION >

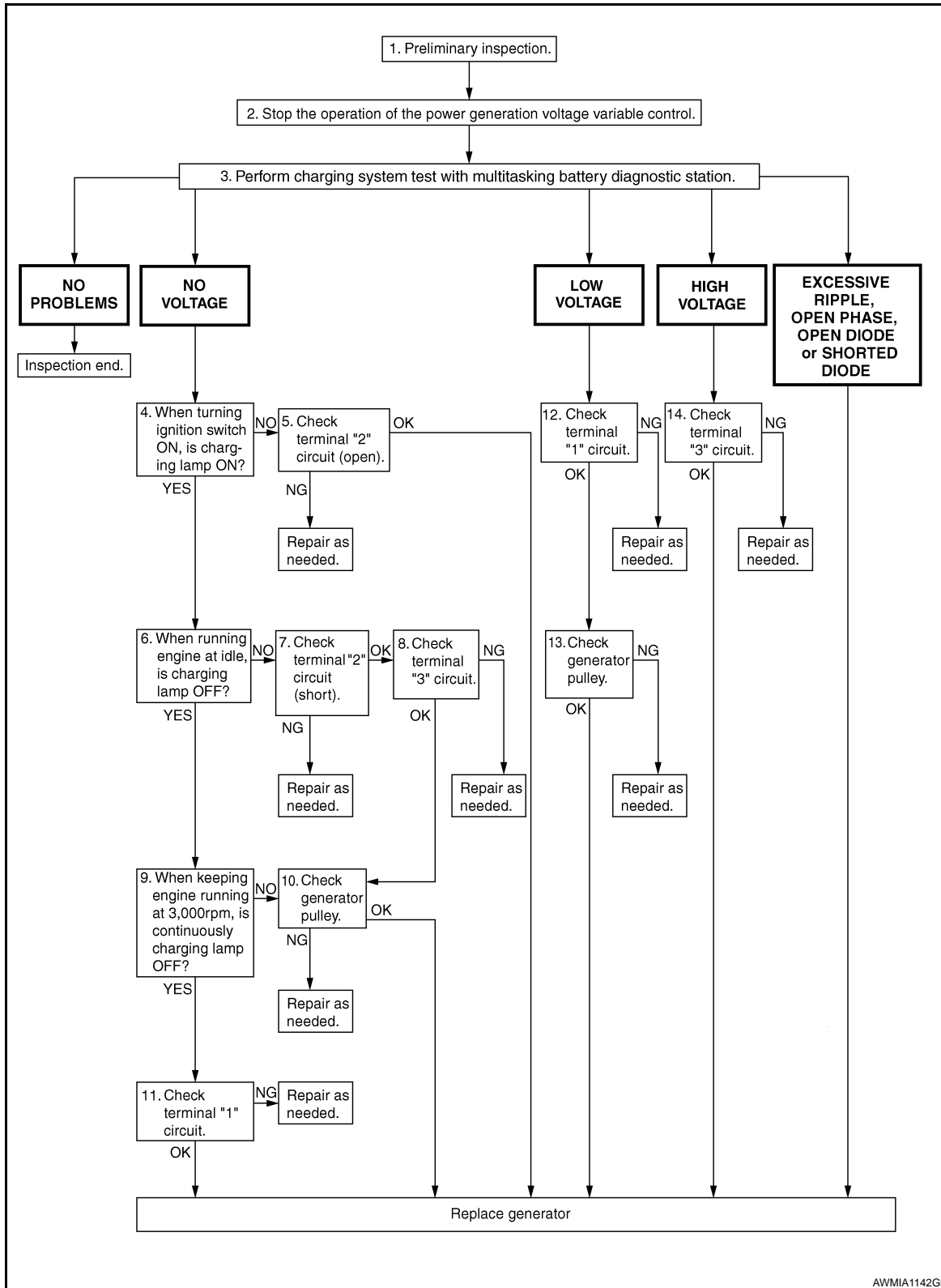
BASIC INSPECTION

DIAGNOSIS AND REPAIR WORKFLOW

Work Flow

INFOID:000000003899376

OVERALL SEQUENCE



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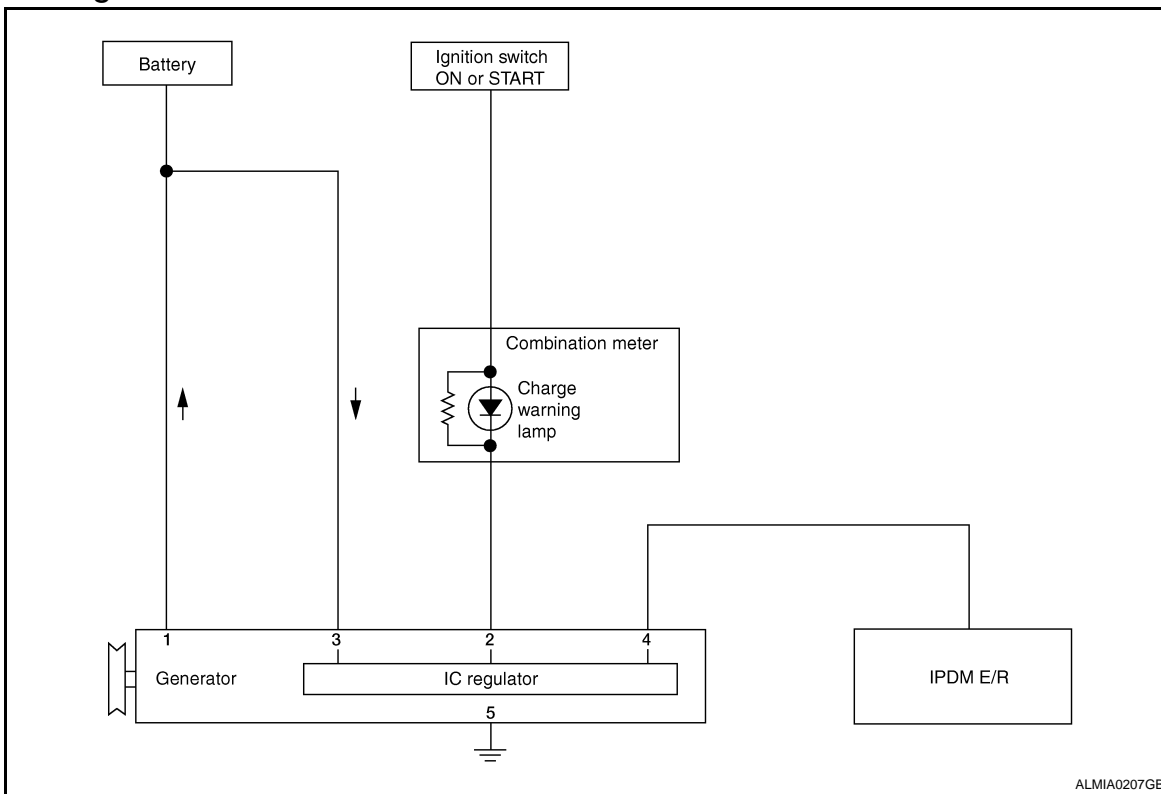
CHARGING SYSTEM

< FUNCTION DIAGNOSIS >

FUNCTION DIAGNOSIS

CHARGING SYSTEM

System Diagram



System Description

INFOID:000000003899378

The generator 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.

Component Description

INFOID:000000003899379

Component part		Description
Generator	Terminal "1"	Refer to CHG-8, "Description" .
	Terminal "2"	Refer to CHG-9, "Description" .
	Terminal "3"	Refer to CHG-10, "Description" .
	Terminal "4"	Used for the power generation voltage variable control system. Refer to CHG-4, "System Description" .
Combination meter (Charge warning lamp)		The IC regulator warning function activates to illuminate the charge warning lamp if any of the following symptoms occur while generator is operating: <ul style="list-style-type: none"> Excessive voltage is produced. No voltage is produced.
IPDM E/R		Used for the power generation voltage variable control system. Refer to CHG-4, "System Description" .

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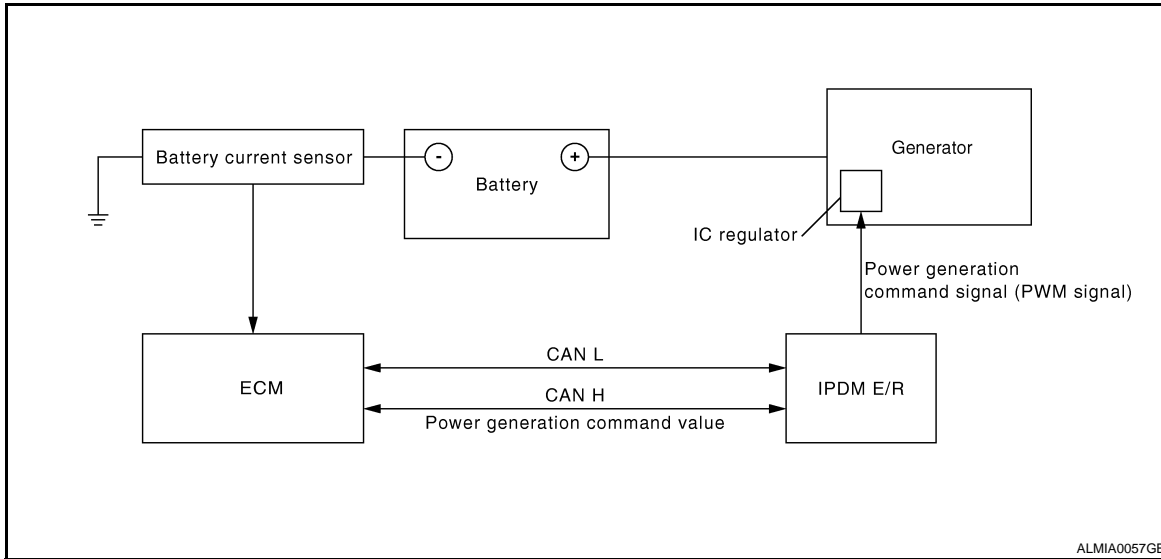
POWER GENERATION VOLTAGE VARIABLE CONTROL SYSTEM

< FUNCTION DIAGNOSIS >

POWER GENERATION VOLTAGE VARIABLE CONTROL SYSTEM

System Diagram

INFOID:000000003899380



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System Description

INFOID:000000003899381

Power generation variable voltage control system has been adopted. By varying the voltage to the generator, engine load due to power generation of the generator is reduced and fuel consumption is decreased.

NOTE:

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

Component Description

INFOID:000000003899382

Component part	Description
Battery current sensor	The battery current sensor is installed on the battery cable at the negative terminal. The battery current sensor detects the charging/discharging current of the battery and sends a voltage signal to the ECM according to the current value detected.
ECM	The battery current sensor detects the charging/discharging current of the battery. The ECM judges the battery condition based on this signal. The ECM judges whether to request more output via the power generation voltage variable control according to the battery condition. When performing the power generation voltage variable control, the ECM calculates the target power generation voltage according to the battery condition and sends the calculated value as the power generation command value to the IPDM E/R.
IPDM E/R	The IPDM E/R converts the received power generation command value into a pulse width modulated (PWM) command signal and sends it to the IC regulator.
Generator (IC regulator)	The IC regulator controls the power generation voltage by the target power generation voltage based on the received PWM command signal. When there is no PWM command signal, the generator performs the normal power generation according to the characteristic of the IC regulator.

CHARGING SYSTEM PRELIMINARY INSPECTION

< COMPONENT DIAGNOSIS >

COMPONENT DIAGNOSIS

CHARGING SYSTEM PRELIMINARY INSPECTION

Inspection Procedure

INFOID:000000003899383

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 or Fusible Link
Generator	Battery (terminal 3)	Fuse 29
	Battery (terminal 1)	Fusible Link A
Combination meter	Ignition switch ON (terminal 2)	Fuse 4

Is the inspection result normal?

YES >> GO TO 3

NO >> Be sure to eliminate cause of malfunction before installing new fuse or fusible link.

3. CHECK GENERATOR GROUND TERMINAL CONNECTION

Check if connector E230 terminal 5 (generator ground harness) is clean and tight.

Is the inspection result normal?

YES >> GO TO 4

NO >> Repair connection.

4. CHECK DRIVE BELT TENSION

Check drive belt tension. Refer to [CHG-22. "Inspection"](#).

Is the inspection result normal?

YES >> Inspection End.

NO >> Repair as needed.

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POWER GENERATION VOLTAGE VARIABLE CONTROL SYSTEM OPERATION INSPECTION

< COMPONENT DIAGNOSIS >

POWER GENERATION VOLTAGE VARIABLE CONTROL SYSTEM OPERATION INSPECTION

Inspection Procedure

INFOID:000000003899384

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-123, "CONSULT-III 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-III 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" in "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-15, "CONSULT - III 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 GENERATOR AND IPDM E/R

1. Turn ignition switch OFF.
2. Disconnect generator connector and IPDM E/R connector.

POWER GENERATION VOLTAGE VARIABLE CONTROL SYSTEM OPERATION INSPECTION

< COMPONENT DIAGNOSIS >

3. Check continuity between generator harness connector F7 (A) terminal 4 and IPDM E/R harness connector F10 (B) terminal 76.

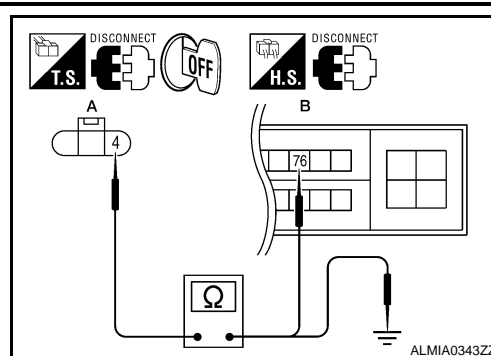
A		B		Continuity
Connector	Terminal	Connector	Terminal	
F7	4	F10	76	Yes

4. Check continuity between generator harness connector F7 (A) terminal 4 and ground.

A		—	Continuity
Connector	Terminal		
F7	4	Ground	No

Is the inspection result normal?

- YES >> Replace IPDM E/R. Refer to [PCS-40. "Removal and Installation"](#).
 NO >> Repair harness or connector between IPDM E/R and generator.



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B TERMINAL CIRCUIT

< COMPONENT DIAGNOSIS >

B TERMINAL CIRCUIT

Description

INFOID:000000003899385

The terminal "1" (B) circuit supplies power to charge the battery and operate the vehicle's electrical system.

Diagnosis Procedure

INFOID:000000003899386

1.CHECK TERMINAL "1" CONNECTION

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

Is the inspection result normal?

YES >> GO TO 2

NO >> Repair terminal "1" connection. Confirm repair by performing complete Starting/Charging system test. Refer to diagnostic station instruction manual.

2.CHECK TERMINAL "1" CIRCUIT

Check voltage between generator connector F6 terminal 1 and ground.

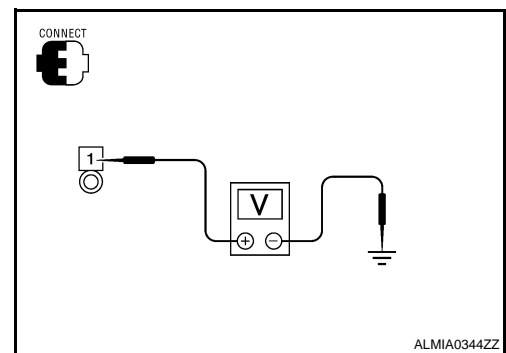
1 - ground

Battery voltage

Is the inspection result normal?

YES >> GO TO 3

NO >> Check harness for open between generator and fusible link.



3.CHECK TERMINAL "1" CONNECTION (VOLTAGE DROP TEST)

1. Start engine, then engine running at idle and warm.
2. Check voltage between battery positive terminal and generator connector F6 terminal 1.

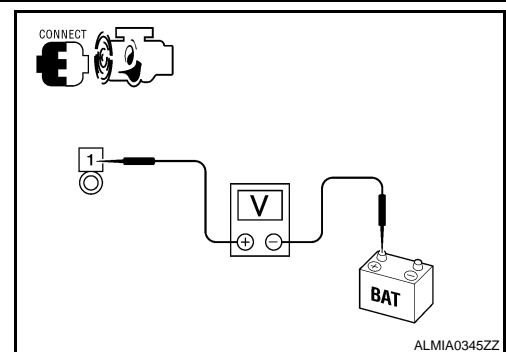
1 - B+

Less than 0.2V

Is the inspection result normal?

YES >> Terminal "1" circuit is normal. Refer to [CHG-2. "Work Flow"](#).

NO >> Check harness between battery and generator for high resistance.



L TERMINAL CIRCUIT

< COMPONENT DIAGNOSIS >

L TERMINAL CIRCUIT

Description

INFOID:000000003899387

The terminal "2" (L) circuit controls the charge warning lamp. The charge warning lamp illuminates when the ignition switch is set to ON or START. When the generator 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:000000003899388

1. CHECK CHARGE WARNING LAMP CIRCUIT CONNECTION

Check to see if generator connector F7 terminal 2 is clean and tight.

Is the connection secure?

YES >> GO TO 2

NO >> Repair the connection. Confirm repair by performing complete Starting/Charging system test. Refer to diagnostic station instruction manual.

2. CHECK CHARGE WARNING LAMP CIRCUIT

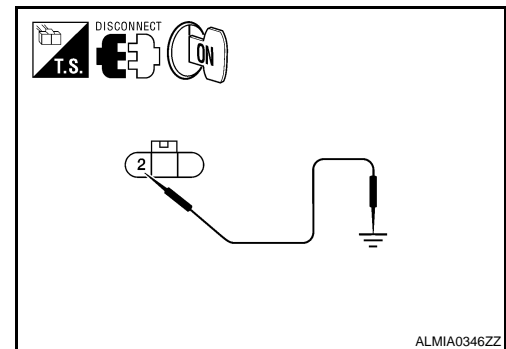
1. Disconnect generator connector F7.
2. Apply ground to generator harness connector F7 terminal 2 with the ignition switch in the ON position.

Charge lamp should illuminate

Does it illuminate?

YES >> Check generator function. Refer to [CHG-2, "Work Flow"](#).

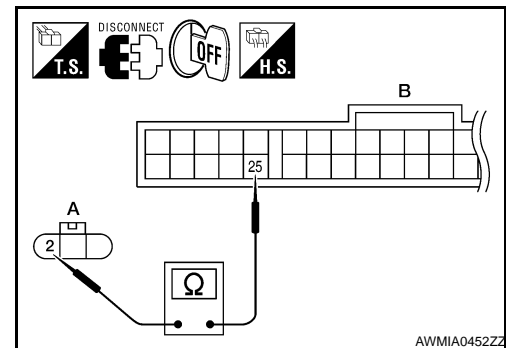
NO >> GO TO 3



3. CHECK HARNESS CONTINUITY (OPEN CIRCUIT)

1. Turn ignition switch OFF.
2. Disconnect the generator connector F7.
3. Disconnect the combination meter connector M24.
4. Check continuity between generator harness connector F7 (A) terminal 2 and combination meter harness connector M24 (B) terminal 25.

A		B		Continuity
Connector	Terminal	Connector	Terminal	
F7	2	M24	25	Yes



Is continuity present?

YES >> Replace the combination meter. Refer to [MWI-144, "Removal and Installation"](#).

NO >> Repair the harness or connector.

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S TERMINAL CIRCUIT

< COMPONENT DIAGNOSIS >

S TERMINAL CIRCUIT

Description

INFOID:000000003899389

The output voltage of the generator is controlled by the IC regulator at terminal "3" (S) detecting the input voltage. Terminal "3" circuit detects the battery voltage to adjust the generator output voltage with the IC regulator.

Diagnosis Procedure

INFOID:000000003899390

1. CHECK VOLTAGE REGULATOR CIRCUIT CONNECTION

Check to see if connector F7 terminal 3 is clean and tight.

Is the inspection result normal?

YES >> GO TO 2

NO >> Repair terminal connection. Confirm repair by performing complete Starting/Charging system test.
Refer to diagnostic station instruction manual.

2. CHECK VOLTAGE REGULATOR CIRCUIT

Check voltage between generator harness connector F7 terminal 3 and ground.

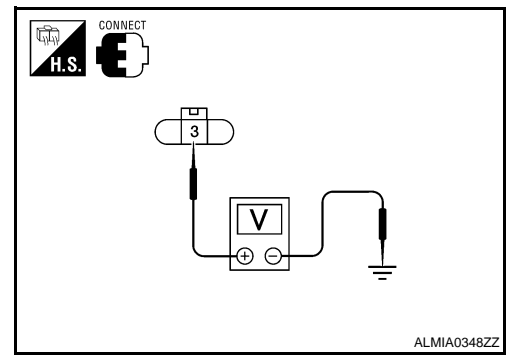
3 - ground

Battery voltage

Does battery voltage exist?

YES >> Refer to [CHG-2. "Work Flow"](#).

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



CHARGING SYSTEM

< COMPONENT DIAGNOSIS >

CHARGING SYSTEM

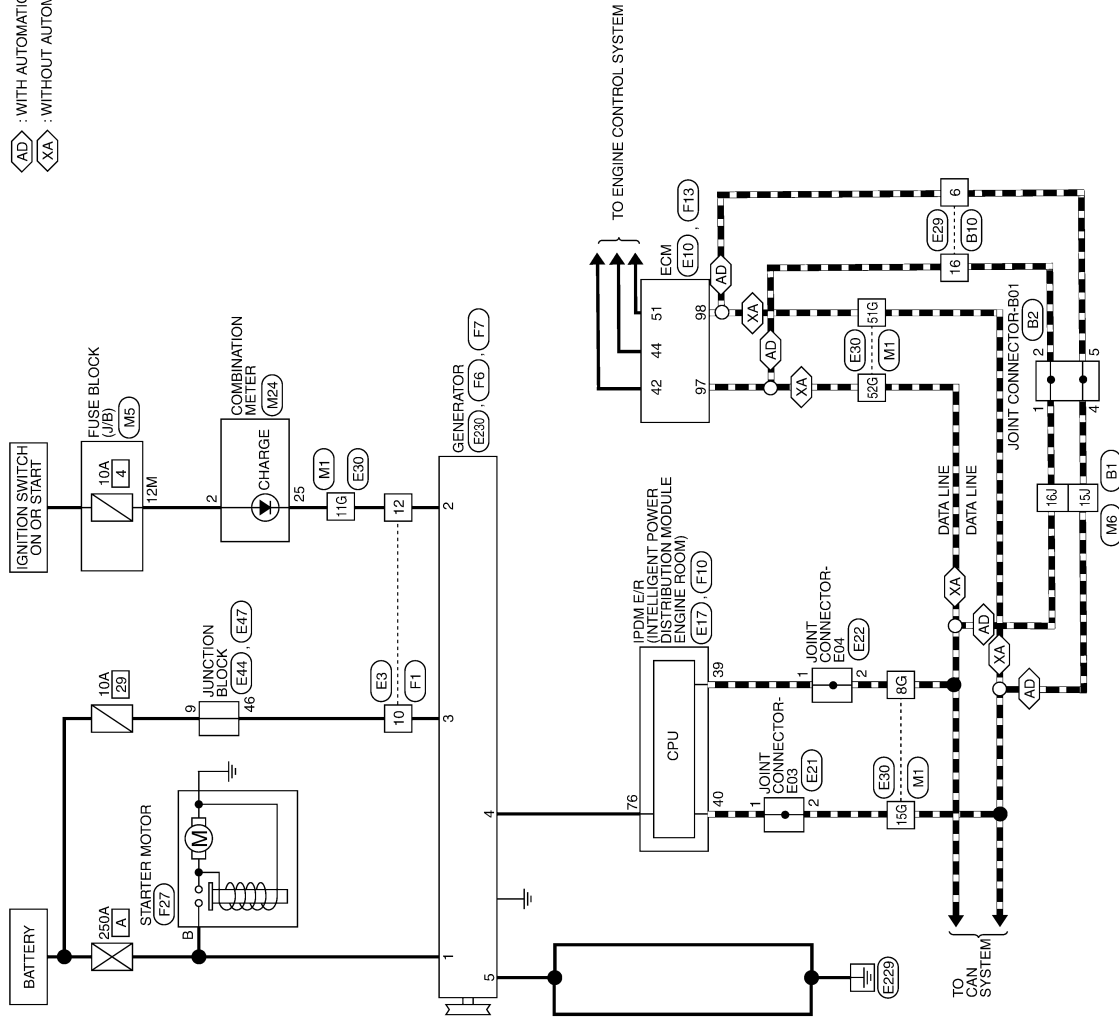
Wiring Diagram

INFOID:000000003899391

■ ■ ■ : DATA LINE

 (AD) : WITH AUTOMATIC DRIVE POSITIONER

 (XA) : WITHOUT AUTOMATIC DRIVE POSITIONER



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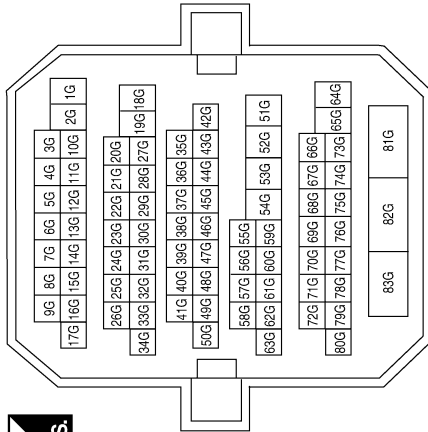
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CHARGING SYSTEM

< COMPONENT DIAGNOSIS >

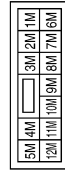
CHARGING SYSTEM CONNECTORS

Connector No.	M1
Connector Name	WIRE TO WIRE
Connector Color	WHITE



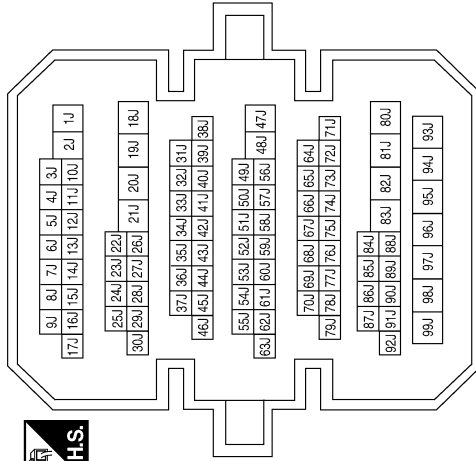
Terminal No.	Color of Wire	Signal Name
8G	P	-
11G	BR	-
15G	L	-
51G	L	-
52G	P	-

Connector No.	M5
Connector Name	FUSE BLOCK (J/B)
Connector Color	WHITE



Terminal No.	Color of Wire	Signal Name
12M	O	-

Connector No.	M6
Connector Name	WIRE TO WIRE
Connector Color	WHITE

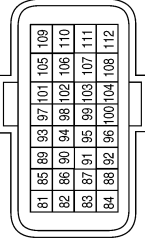


Terminal No.	Color of Wire	Signal Name
15J	L	-
16J	P	-

CHARGING SYSTEM

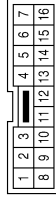
< COMPONENT DIAGNOSIS >

Connector No.	E10
Connector Name	ECM
Connector Color	BLACK



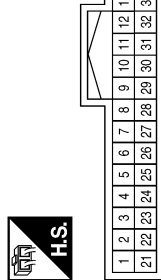
Terminal No.	Color of Wire	Signal Name
97	P	CAN-L
98	L	CAN-H

Connector No.	E3
Connector Name	WIRE TO WIRE
Connector Color	WHITE



Terminal No.	Color of Wire	Signal Name
10	W	-
12	LG	-

Connector No.	M24
Connector Name	COMBINATION METER
Connector Color	WHITE



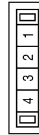
Terminal No.	Color of Wire	Signal Name
2	O	IGN
25	BR	CHG

Connector No.	E22
Connector Name	JOINT CONNECTOR-E04
Connector Color	WHITE



Terminal No.	Color of Wire	Signal Name
1	P	-
2	P	-

Connector No.	E21
Connector Name	JOINT CONNECTOR-E03
Connector Color	WHITE



Terminal No.	Color of Wire	Signal Name
1	L	-
2	L	-

Connector No.	E17
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Color	WHITE



Terminal No.	Color of Wire	Signal Name
39	P	CAN-L
40	L	CAN-H

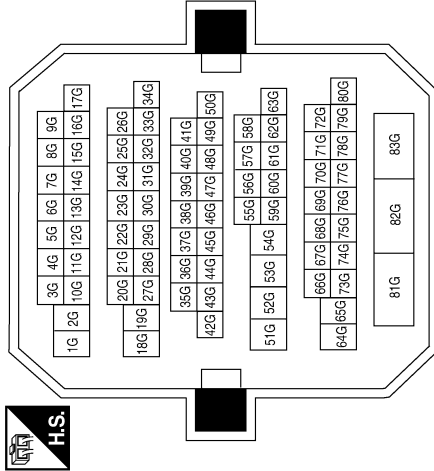
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CHARGING SYSTEM

< COMPONENT DIAGNOSIS >

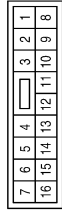
Terminal No.	Color of Wire	Signal Name
8G	P	-
11G	LG	-
15G	L	-
51G	L	-
52G	P	-

Connector No.	E30
Connector Name	WIRE TO WIRE
Connector Color	WHITE



Terminal No.	Color of Wire	Signal Name
6	L	-
16	P	-

Connector No.	E29
Connector Name	WIRE TO WIRE
Connector Color	WHITE

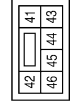


Connector No.	E230
Connector Name	GENERATOR
Connector Color	-



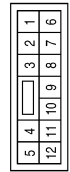
Terminal No.	Color of Wire	Signal Name
5	B	GND

Connector No.	E47
Connector Name	JUNCTION BLOCK
Connector Color	WHITE



Terminal No.	Color of Wire	Signal Name
46	W	-

Connector No.	E44
Connector Name	JUNCTION BLOCK
Connector Color	BROWN



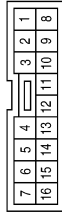
Terminal No.	Color of Wire	Signal Name
9	BR	-

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CHARGING SYSTEM

< COMPONENT DIAGNOSIS >

Connector No.	F1
Connector Name	WIRE TO WIRE
Connector Color	WHITE



Terminal No.	Color of Wire	Signal Name
10	Y/B	-
12	BR	-

Connector No.	F6
Connector Name	GENERATOR
Connector Color	-



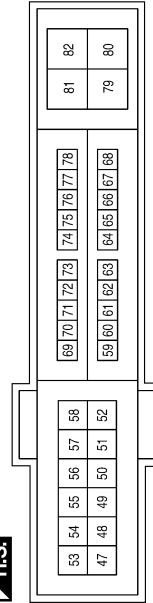
Terminal No.	Color of Wire	Signal Name
1	B/R	BATT

Connector No.	F7
Connector Name	GENERATOR
Connector Color	BLACK



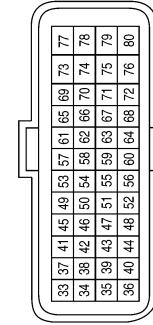
Terminal No.	Color of Wire	Signal Name
2	BR	CHG
3	Y/B	BATT
4	SB	-

Connector No.	F10
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Color	WHITE



Terminal No.	Color of Wire	Signal Name
76	SB	ALTC

Connector No.	F13
Connector Name	ECM
Connector Color	BROWN



Terminal No.	Color of Wire	Signal Name
42	BR	CURSEN
44	G/B	GNDA-CURSEN INTPRESS 1
51	R/Y	AVCC1-CURSEN, INTPRES 1

Connector No.	F27
Connector Name	STARTER MOTOR
Connector Color	-



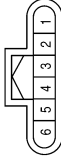
Terminal No.	Color of Wire	Signal Name
B	B/R	BATT

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CHARGING SYSTEM

< COMPONENT DIAGNOSIS >

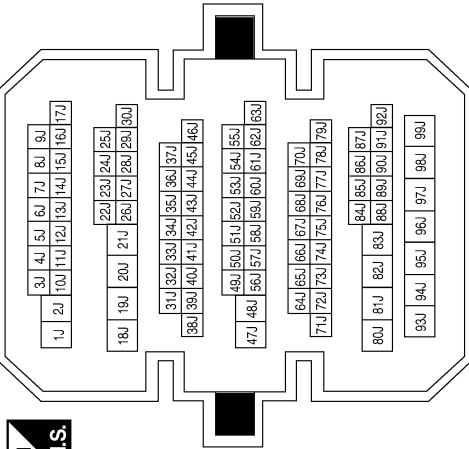
Connector No.	B2
Connector Name	JOINT CONNECTOR-B01
Connector Color	BLACK



Terminal No.	Color of Wire	Signal Name
1	P	-
2	P	-
4	L	-
5	L	-

Terminal No.	Color of Wire	Signal Name
15J	L	-
16J	P	-

Connector No.	B1
Connector Name	WIRE TO WIRE
Connector Color	WHITE



Connector No.	B10
Connector Name	WIRE TO WIRE
Connector Color	WHITE



Terminal No.	Color of Wire	Signal Name
6	L	-
16	P	-

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CHARGING SYSTEM

< SYMPTOM DIAGNOSIS >

SYMPTOM DIAGNOSIS

CHARGING SYSTEM

Symptom Table

INFOID:000000003899393

Symptom	Reference
Battery discharged	Refer to CHG-2, "Work Flow" .
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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PRECAUTIONS

< PRECAUTION >

PRECAUTION

PRECAUTIONS

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

INFOID:000000003899394

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 SR and SB section of this Service Manual.

WARNING:

- To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN/INFINITI dealer.
- Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see the SR section.
- Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses can be identified by yellow and/or orange harnesses or harness connectors.

Precautions Necessary for Steering Wheel Rotation after Battery Disconnect

INFOID:000000004394029

NOTE:

- Before removing and installing any control units, first turn the push-button 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.

This vehicle is equipped with a push-button ignition switch and a 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 procedure below before starting the repair operation.

OPERATION PROCEDURE

1. Connect both battery cables.

NOTE:

Supply power using jumper cables if battery is discharged.

2. Carry the Intelligent Key or insert it to the key slot and turn the push-button 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 push-button ignition switch from ACC position to ON position, then to LOCK position. (The steering wheel will lock when the push-button 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:000000003899395

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

PRECAUTIONS

< PRECAUTION >

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.

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Special Service Tool

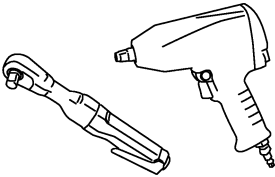
INFOID:000000003899396

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

Tool number (Kent-Moore No.) Tool name	Description
<p>— (→) Model GR-8 Multitasking Battery Diagnostic Station</p>  <p style="text-align: right;">AWIIA1239ZZ</p>	<p>Tests batteries, starting and charging systems. For operating instructions, refer to diagnostic station instruction manual.</p>

Commercial Service Tool

INFOID:000000003899397

Tool name	Description
<p>Power tool</p>  <p style="text-align: right;">PBIC0190E</p>	<p>Loosening bolts and nuts</p>

GENERATOR

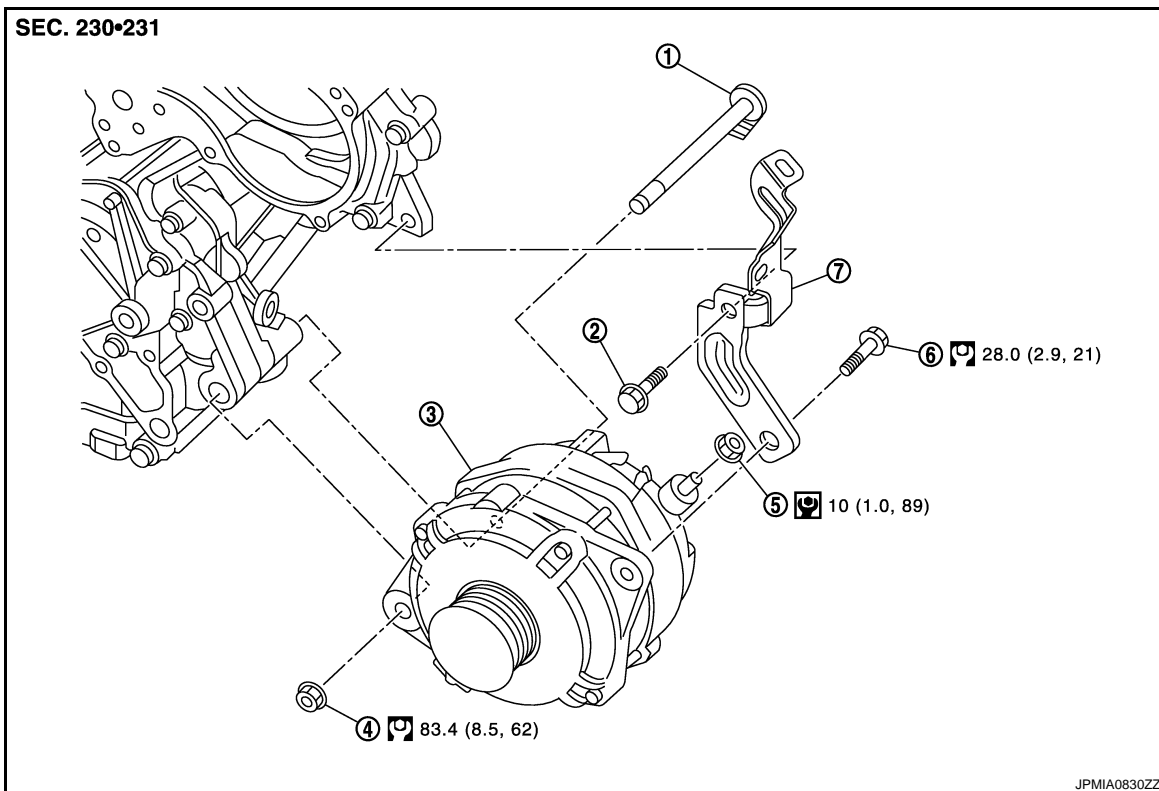
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ON-VEHICLE REPAIR

GENERATOR

Exploded View

INFOID:000000004237161



- | | | |
|---------------------------|------------------------|-------------------------|
| 1. Lower generator bolt | 2. Generator stay bolt | 3. Generator |
| 4. Lower generator nut | 5. "B" terminal nut | 6. Upper generator bolt |
| 7. Generator stay bracket | | |

Removal and Installation

INFOID:000000003899398

VQ35DE

REMOVAL

1. Disconnect the negative battery terminal.
2. Drain engine coolant. Refer to [CO-10, "Changing Engine Coolant"](#).
3. Remove engine room cover.
4. Remove RH front wheel and tire assembly. Refer to [WT-62, "Adjustment"](#).
5. Remove front/right-side engine undercover.
6. Remove air cleaner and duct assembly. Refer to [EM-23, "Removal and Installation"](#).
7. Remove battery tray. Refer to [PG-67, "Removal and Installation \(Battery Tray\)"](#).
8. Remove cooling fan assembly. Refer to [CO-15, "Removal and Installation"](#).
9. Evacuate A/C system. Refer to [HA-34, "Collection and Charge"](#).
10. Remove the drive belt. Refer to [EM-14, "Removal and Installation"](#).
11. Remove the A/C compressor. Refer to [HA-44, "Removal and Installation for Compressor"](#).
12. Remove idler pulley.
13. Remove A/C idler pulley.
14. Disconnect the oil pressure switch.
15. Disconnect the generator harness connectors.
16. Remove the generator bolt and nuts, using power tools.

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GENERATOR

< ON-VEHICLE REPAIR >

17. Slide the generator out and remove.

INSTALLATION

Installation is in the reverse order of removal. Refer to [CHG-21, "Exploded View"](#)

CAUTION:

Be sure to tighten "B" terminal nut carefully.

- Install generator and check tension of belt. Refer to [EM-14, "Checking Drive Belts"](#).
- For this model, the power generation voltage variable control system that controls the power generation voltage of the generator has been adopted. Therefore, the power generation voltage variable control system operation inspection should be performed after replacing the generator, and then make sure that the system operates normally. Refer to [CHG-3, "System Description"](#).

Inspection

INFOID:000000003899399

GENERATOR PULLEY INSPECTION

Perform the following.

- Make sure that generator pulley does not rattle.
- Make sure that generator pulley nut is tight.

Generator pulley nut : 118 N-m (12.0 kg-m, 87 ft-lb)

SERVICE DATA AND SPECIFICATIONS (SDS)

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SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

Generator

INFOID:000000003899400

Application	VQ35DE
Type	A003TJ1791ZC
	Hatachi
Nominal rating	12V-130A
Ground polarity	Negative
Minimum revolution under no-load (when 13.5 volts are applied)	Less than 1,300 rpm
Hot output current (when 13.5 volts are applied)	More than 61A/1800 rpm More than 109A/2,500 rpm More than 129A/5,000 rpm
Regulated output voltage	14.1 - 14.7V* @ 20°C
Minimum length of brush	More than 5 mm (0.24 in)
Brush spring pressure	4.1 - 5.3 N (418 - 541 g, 14.7 - 19.1 oz)
Slip ring minimum outer diameter	More than 22.1 mm (0.870 in)
Rotor (Field coil) resistance	1.8 - 2.2 ohms

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

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