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SECTION SC

STARTING & CHARGING SYSTEM

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PRECAUTIONS

PRECAUTIONS

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

NKS003NB

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

WARNING:

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

Precautions for Power Generation Voltage Variable Control System

NKS003NC

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.

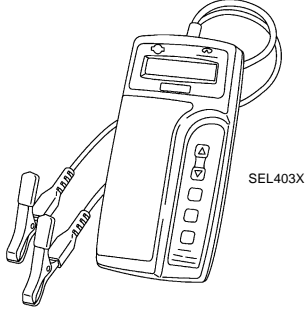
PREPARATION

PREPARATION

PFP:00002


Special Service Tools

NKS003ND

Tool number (Kent-Moore No.) Tool name	Description
<p>— (J-44373 Model 620) Battery/Starting/Charging system tester</p> 	

Commercial Service Tools

NKS003NE

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

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SC

BATTERY

BATTERY

PFP:00011

How to Handle Battery

NKS003NF

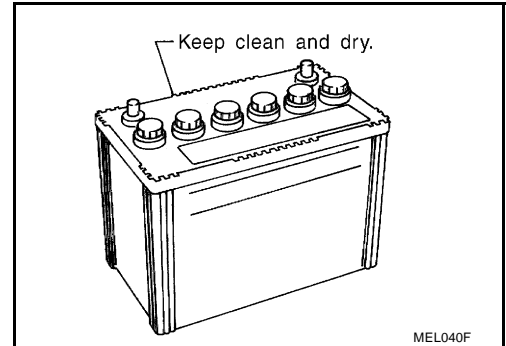
CAUTION:

- If it becomes necessary to start the engine with a booster battery and jumper cables, use a 12-volt booster battery.
- After connecting battery cables, ensure that they are tightly clamped to battery terminals for good contact.
- Never add distilled water through the hole used to check specific gravity.

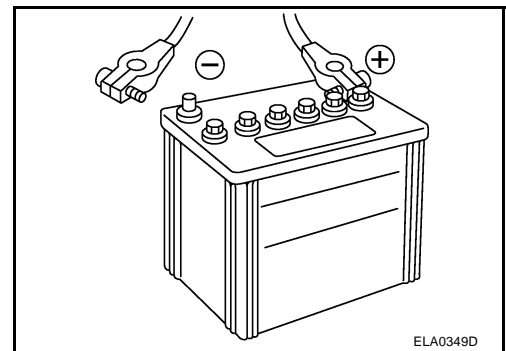
METHODS OF PREVENTING OVER-DISCHARGE

The following precautions must be taken to prevent over-discharging a battery.

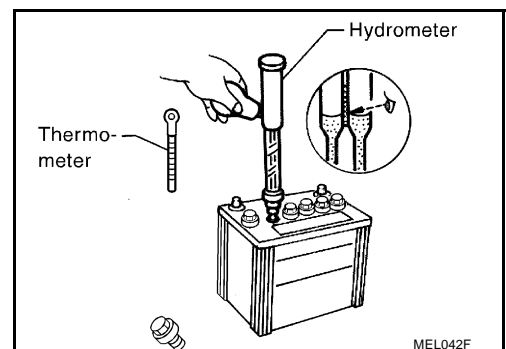
- The battery surface (particularly its top) should always be kept clean and dry.
- The terminal connections should be clean and tight.
- At every routine maintenance, check the electrolyte level. This also applies to batteries designated as "low maintenance" and "maintenance-free".



- When the vehicle is not going to be used over a long period of time, disconnect the battery cable from the negative terminal. (If the vehicle has an extended storage switch, turn it off.)



- Check the charge condition of the battery. Periodically check the specific gravity of the electrolyte. Keep a close check on charge condition to prevent over-discharge.



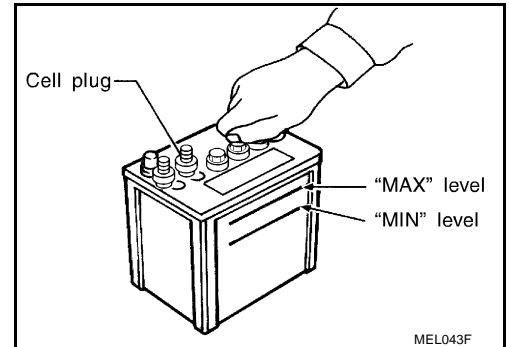
BATTERY

CHECKING ELECTROLYTE LEVEL

WARNING:

Never allow battery fluid to come in contact with skin, eyes, fabrics, or painted surfaces. After touching a battery, never touch or rub your eyes until you have thoroughly washed your hands. If acid contacts eyes, skin or clothing, immediately flush with water for 15 minutes and seek medical attention.

- Remove the cell plug using a suitable tool.
- Add distilled water up to the MAX level.

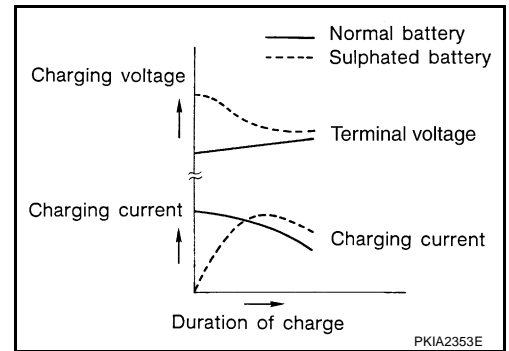


Sulphation

A battery will be completely discharged if it is left unattended for a long time and the specific gravity will become less than 1.100. This may result in sulphation on the cell plates.

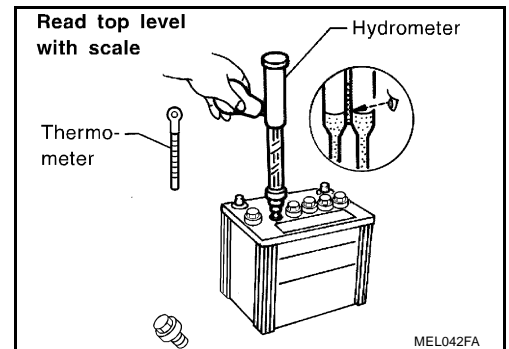
To determine if a battery has been "sulphated", note its voltage and current when charging it. As shown in the figure, less current and higher voltage are observed in the initial stage of charging sulphated batteries.

A sulphated battery may sometimes be brought back into service by means of a long, slow charge, 12 hours or more, followed by a battery capacity test.



SPECIFIC GRAVITY CHECK

1. Read hydrometer and thermometer indications at eye level.
2. Use the chart below to correct your hydrometer reading according to electrolyte temperature.



BATTERY

Hydrometer Temperature Correction

Battery electrolyte temperature [°C (°F)]	Add to specific gravity reading
71 (160)	0.032
66 (150)	0.028
60 (140)	0.024
54 (130)	0.020
49 (120)	0.016
43 (110)	0.012
38 (100)	0.008
32 (90)	0.004
27 (80)	0
21 (70)	-0.004
16 (60)	-0.008
10 (50)	-0.012
4 (40)	-0.016
-1 (30)	-0.020
-7 (20)	-0.024
-12 (10)	-0.028
-18 (0)	-0.032

Corrected specific gravity	Approximate charge condition
1.260 - 1.280	Fully charged
1.230 - 1.250	3/4 charged
1.200 - 1.220	1/2 charged
1.170 - 1.190	1/4 charged
1.140 - 1.160	Almost discharged
1.110 - 1.130	Completely discharged

CHARGING THE BATTERY

CAUTION:

- Never “quick charge” a fully discharged battery.
- Keep the battery away from open flame while it is being charged.
- When connecting the charger, connect the leads first, then turn on the charger. Never turn on the charger first, as this may cause a spark.
- If battery electrolyte temperature rises above 55 °C (131 °F), stop charging. Always charge battery at a temperature below 55 °C (131 °F).

Charging Rates

Amps	Time
50	1 hour
25	2 hours
10	5 hours
5	10 hours

Do not charge at more than 50 ampere rate.

NOTE:

The ammeter reading on your battery charger will automatically decrease as the battery charges. This indicates that the voltage of the battery is increasing normally as the state of charge improves. The charging amps indicated above refer to initial charge rate.

BATTERY

- If, after charging, the specific gravity of any two cells varies more than 0.050, the battery should be replaced.

Trouble Diagnosis with Battery/Starting/Charging System Tester (Battery)

NKS003NG

CAUTION:

When working with batteries, always wear appropriate eye protection.

NOTE:

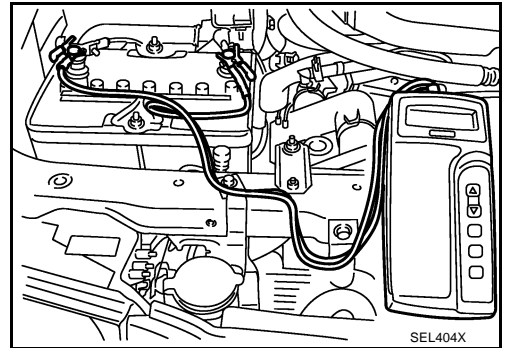
- To ensure a complete and thorough diagnosis, the battery, starter and alternator test segments must be done as a set from start to finish.
- If battery surface charge is detected while testing, the tester will prompt you to turn on the headlamps to remove the surface charge.
- If necessary, the tester will prompt you to determine if the battery temperature is above or below 0 °C (32 °F). Choose the appropriate selection by pressing the up or down arrow button, then press “ENTER” to make the selection.

1. Turn off all loads on the vehicle electrical system. Clean or repair as necessary.
2. Visually inspect the battery, battery terminals and cable ends with ignition switch in “OFF” position.

NOTE:

The contact surface between the battery terminals, cable ends and tester leads must be clean for a valid test. A poor connection will prevent testing and a “CHECK CONNECTION” message will appear during the test procedures. If this occurs, clean the battery terminals, reconnect them and restart the test.

3. Connect the red tester lead clamp to the positive battery terminal, and the black to the negative terminal.
4. The tester will turn on automatically. Using the arrow keys, select “IN-VEHICLE” on the tester and then press the “ENTER” key.



SELECT TEST ↑↓
IN-VEHICLE ↵

SEL405X

5. Locate the battery **type** and **rating** stamped or written on the top case of the battery to be tested.

NOTE:

The battery **rating** will have either of the following.

- **CCA:** Cold Cranking Amps (490 CCA, 550 CCA, etc.)
- **JIS:** Japanese Industrial Standard.

When using the battery tester: Use the CCA rating only.

- The tester requires the CCA rating for the battery be entered exactly as it is written or stamped on the battery.
 - **U.S. market:** Refer to the latest “Battery Testing” Technical Service Bulletin (TSB) for a chart which contains these ratings listed by vehicle.
 - **You must not use the JIS rating.**
6. Using the arrow and “ENTER” keys alternately, select the battery type and rating.

NOTE:

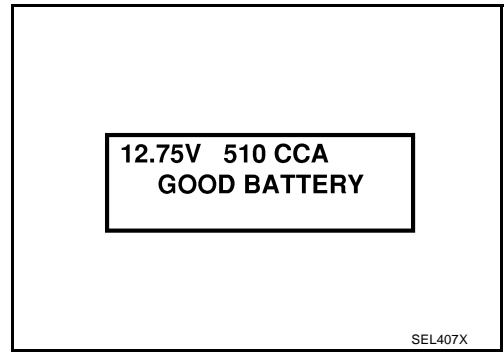
The tester lists five choices; CCA, JIS, IEC, DIN, and EN. **Use only the CCA choice .**

SELECT INPUT ↑↓
TEST USING: CCA ↵

PKIC1310E

BATTERY

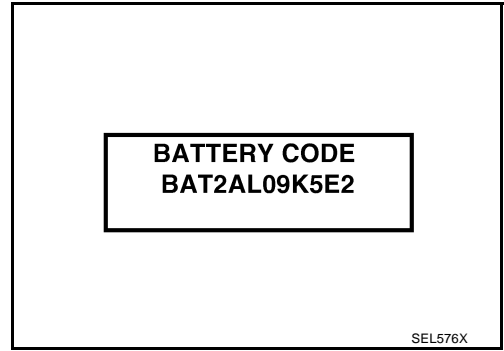
7. Press "ENTER" to begin the test. Diagnosis results are displayed on the tester. Refer to [SC-8, "DIAGNOSTIC RESULT ITEM CHART"](#).



8. Press "ENTER", then test output code is displayed. Record the test output code on the repair order.
9. Toggle back to the "DIAGNOSTIC SCREEN" for test results.

NOTE:

- If necessary, the tester will ask the user to determine if the battery has just been charged. Choose the appropriate selection by pressing the up or down arrow button and then press the "ENTER" button to make the selection.
- When testing a battery installed in a vehicle that has recently been driven, select "BEFORE CHANGE".
- If the battery has just been slow charged due to a "CHARGE & RETEST" decision by the tester, and the tester asks the user "BEFORE CHARGE/AFTER CHARGE", select "AFTER CHARGE".



DIAGNOSTIC RESULT ITEM CHART

Diagnostic item	Service procedure
GOOD BATTERY	Battery is OK, go to "Trouble Diagnosis", "STARTING SYSTEM". Refer to SC-13, "Trouble Diagnosis with Battery/Starting/Charging System Tester (Starting)" .
REPLACE BATTERY	Replace battery. Before replacing battery, clean the battery cable clamps and battery posts. Perform battery test again with Battery/Starting/Charging system tester. If second test result is "Replace Battery", then do so. Perform battery test again to confirm repair.
BAD CELL-REPLACE	Replace the battery. Perform battery test again with Battery/Starting/Charging system tester to confirm repair.
GOOD-RECHARGE	Perform the slow battery charging procedure. (Initial rate of charge is 10 A for 12 hours.) Perform battery test again with Battery/Starting/Charging system tester.
CHARGE & RETEST	Perform the slow battery charging. (Initial rate of charge is 10 A for 12 hours.) Perform battery test again with Battery/Starting/Charging system tester to confirm repair. NOTE: If the tester asks the user "BEFORE CHARGE/AFTER CHARGE", select "AFTER CHARGE".

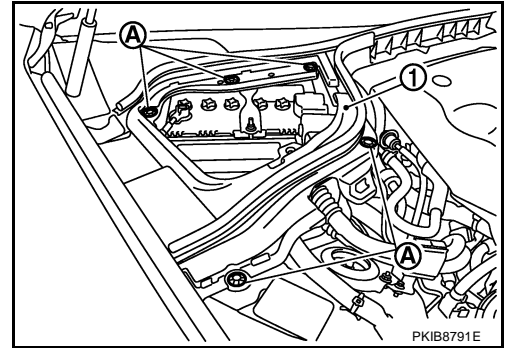
BATTERY

NKS003NH

Removal and Installation

REMOVAL

1. Remove engine room cover RH.
2. Remove battery cover.
3. Remove the clips (A), and remove hoodledge cover RH (1).

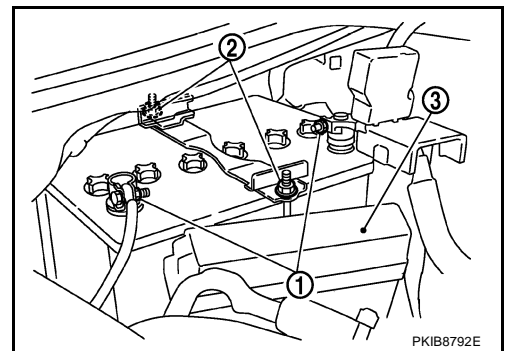


4. Loosen battery terminal nuts (1), and disconnect both battery cables from battery terminals.

CAUTION:

When disconnecting, disconnect the battery cable from the negative terminal first.

5. Remove battery fix frame mounting nuts (2) and battery fix frame.
6. Remove relay box (3) from the bracket.
7. Remove battery.



INSTALLATION

Installation is the reverse order of removal.

CAUTION:

When connecting, connect the battery cable to the positive terminal first.

Battery fix frame mounting nut

: 4.4 N·m (0.45 kg-m, 39 in-lb)

Battery terminal nut

: 5.4 N·m (0.55 kg-m, 48 in-lb)

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STARTING SYSTEM

STARTING SYSTEM

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System Description

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Power is supplied at all times

- through 15A fuse (No. 78, located in the IPDM E/R)
- to CPU of IPDM E/R,
- through 15A fuse (No. 71, located in the IPDM E/R)
- to CPU of IPDM E/R.

Ground is supplied

- to IPDM E/R terminals 38 and 51
- from grounds E22 and E43.

When the selector lever in the P or N position, power is supplied

- from TCM, and through A/T assembly terminal 9
- to IPDM E/R terminal 53.

And then provided that IPDM E/R receives a starter relay ON signal with CAN communication, starter relay is energized.

With the ignition switch in the START position, power is supplied

- through IPDM E/R terminal 3
- to starter motor terminal 1.

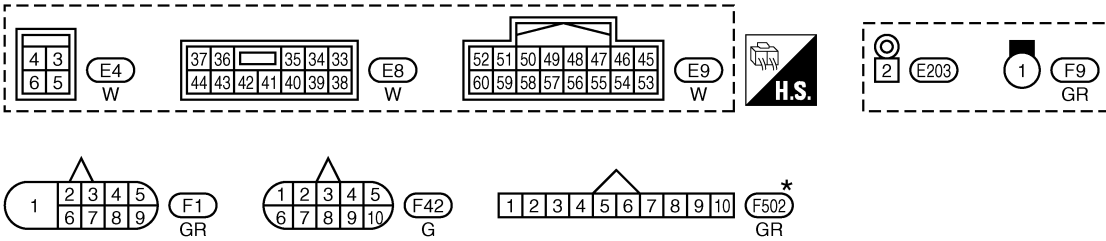
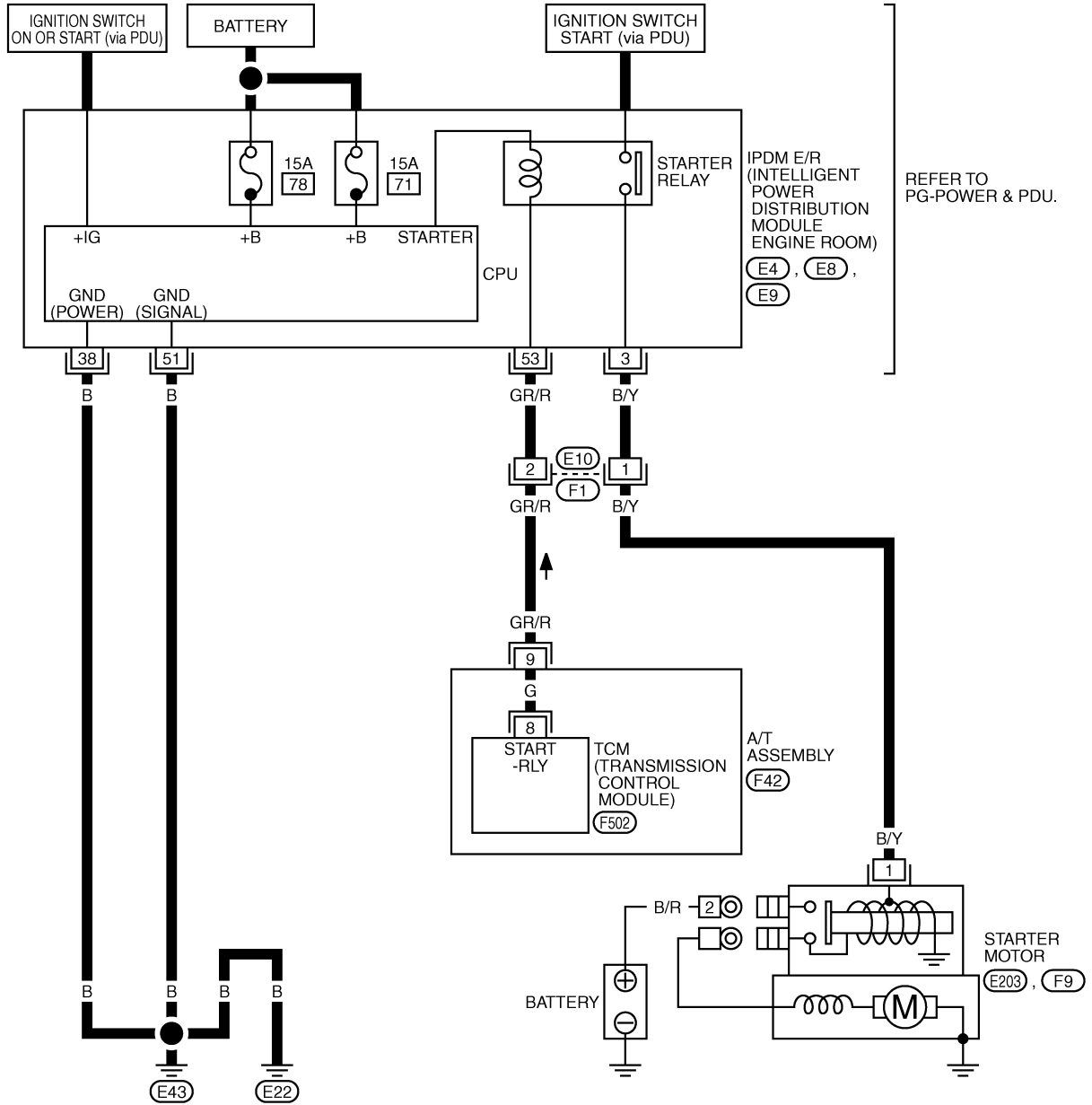
The starter motor plunger closes and provides a closed circuit between the battery and starter motor. The starter motor is grounded to the engine block. With power and ground supplied, cranking occurs and the engine starts.

STARTING SYSTEM

Wiring Diagram — START — VQ35DE ENGINE MODELS

NKS003NJ

SC-START-01



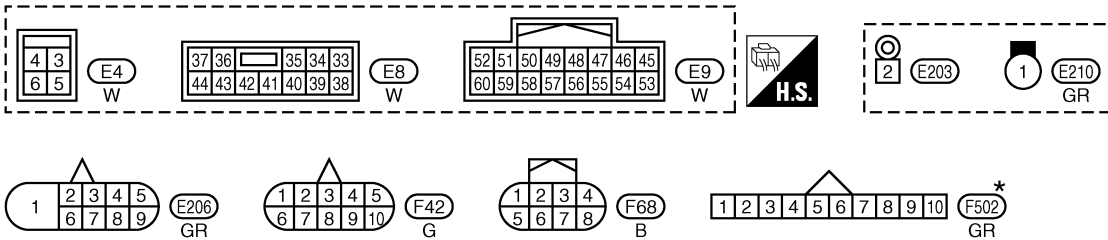
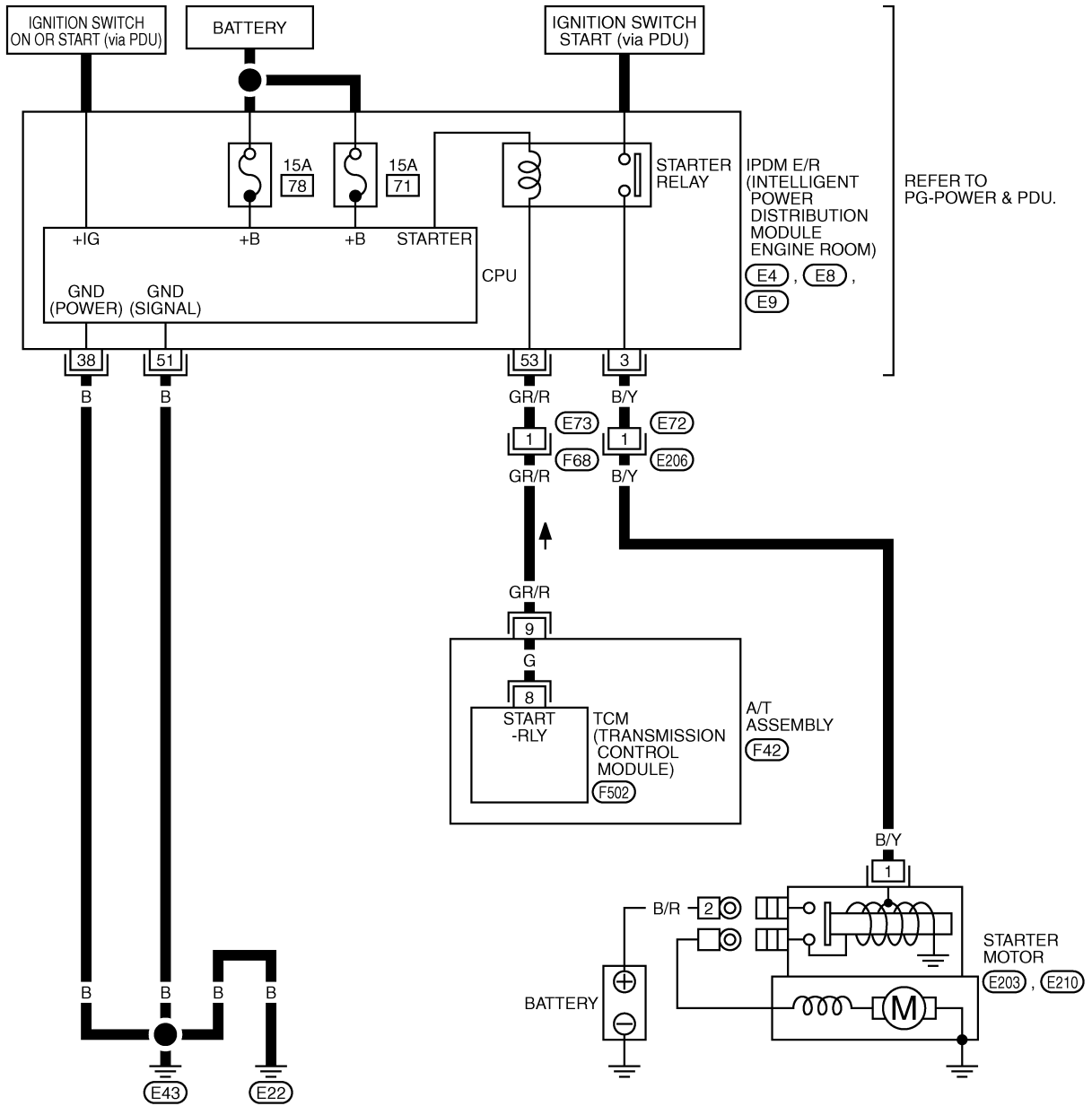
*: THIS CONNECTOR IS NOT SHOWN IN "HARNESS LAYOUT", PG SECTION.

TKWT3232E

STARTING SYSTEM

VK45DE ENGINE MODELS

SC-START-02



*: THIS CONNECTOR IS NOT SHOWN IN "HARNESS LAYOUT", PG SECTION.

TKWT3233E

STARTING SYSTEM

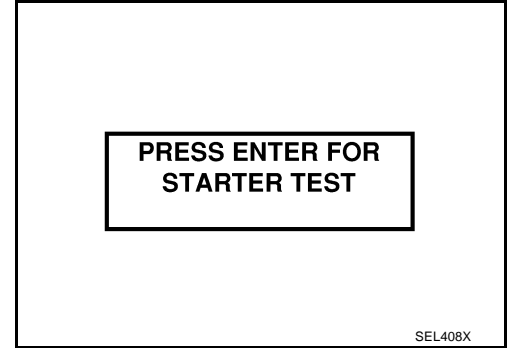
Trouble Diagnosis with Battery/Starting/Charging System Tester (Starting)

NKS003NK

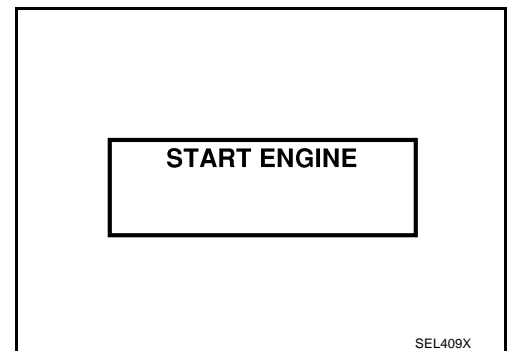
NOTE:

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. Turn off all loads on the vehicle electrical system.
2. Perform battery test with Battery/Starting/Charging system tester. Refer to [SC-7, "Trouble Diagnosis with Battery/Starting/Charging System Tester \(Battery\)"](#).
3. Press "ENTER" to begin the starting system test.



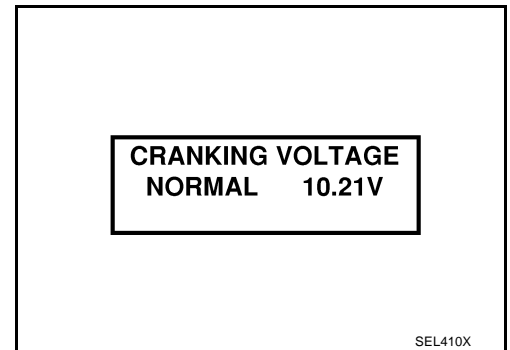
4. Start the engine.



5. Diagnostic result is displayed on the tester. Refer to [SC-13, "DIAGNOSTIC RESULT ITEM CHART"](#).

NOTE:

- If the starter performs normally but the engine does not start, perform engine diagnosis.
- For intermittent "NO CRANK" or "NO STARTER OPERATION" incidents, go to DIAGNOSTIC PROCEDURE 2.

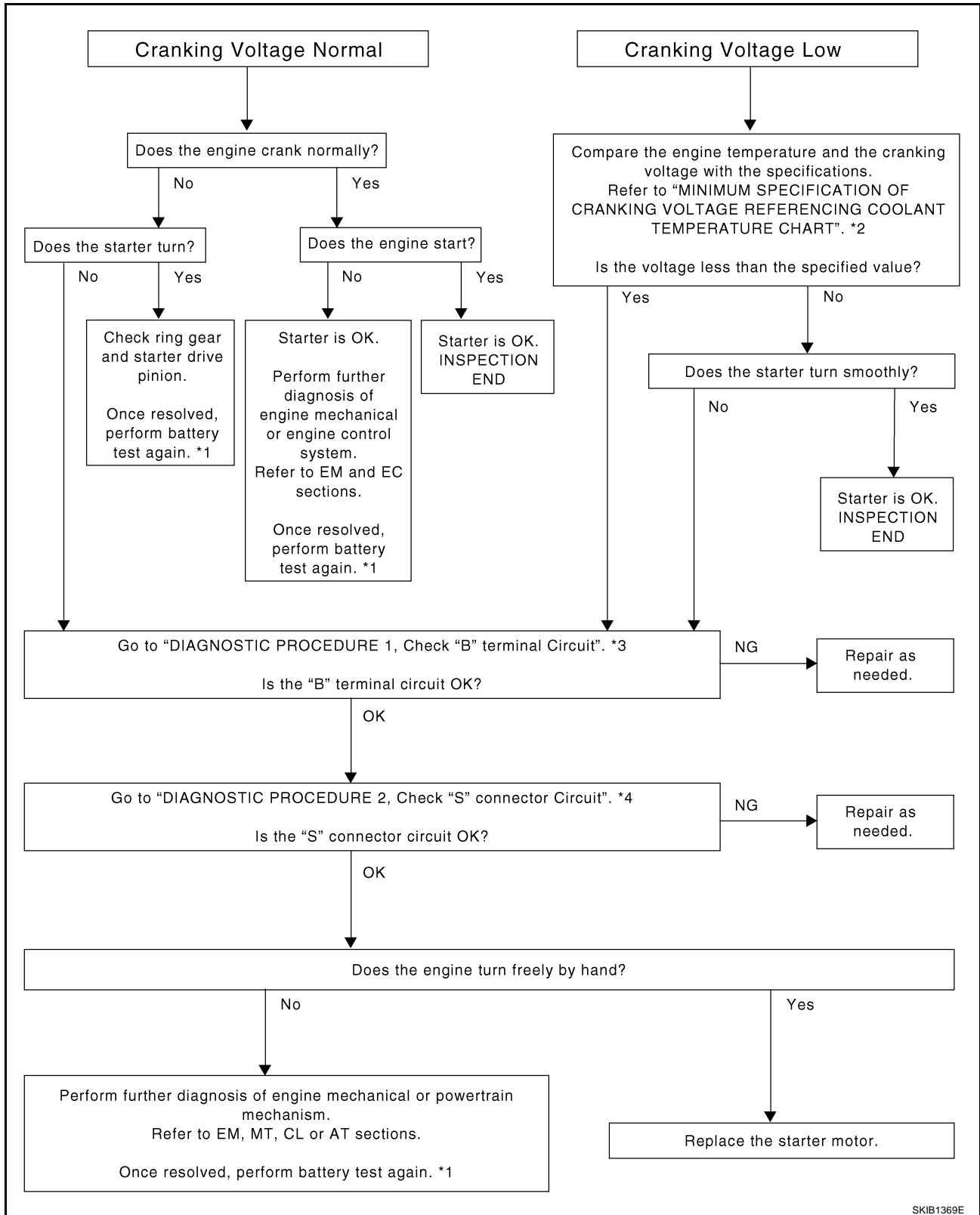


DIAGNOSTIC RESULT ITEM CHART

Diagnostic item	Service procedure
CRANKING VOLTAGE NORMAL	Go to SC-14, "WORK FLOW" .
CRANKING VOLTAGE LOW	
CHARGE BATTERY	Perform the slow battery charging procedure. (Initial rate of charge is 10A for 12 hours.) Perform battery test again with Battery/Starting/Charging system tester. Refer to SC-7, "Trouble Diagnosis with Battery/Starting/Charging System Tester (Battery)" .
REPLACE BATTERY	Before replacing battery, clean the battery cable clamps and battery posts. Perform battery test again with Battery/Starting/Charging system tester. Refer to SC-7, "Trouble Diagnosis with Battery/Starting/Charging System Tester (Battery)" . If second test result is "REPLACE BATTERY", then do so. Perform battery test again to confirm repair.

STARTING SYSTEM

WORK FLOW



SKIB1369E

*1 [SC-7, "Trouble Diagnosis with Battery/Starting/Charging System Tester \(Battery\)"](#)

*2 [SC-16, "MINIMUM SPECIFICATION OF CRANKING VOLTAGE REFERENCING COOLANT TEMPERATURE"](#)

*3 [SC-15, "Check "B" Terminal Circuit"](#)

*4 [SC-16, "Check "S" Connector Circuit"](#)

STARTING SYSTEM

DIAGNOSTIC PROCEDURE 1

Check "B" Terminal Circuit

CAUTION:

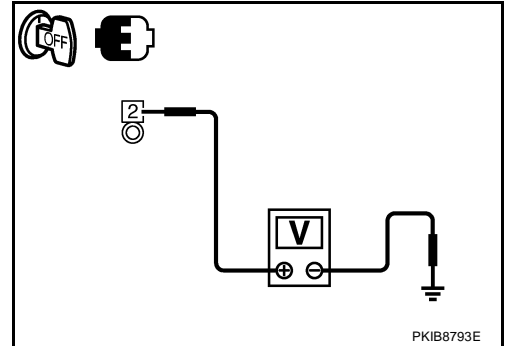
Perform diagnosis under the condition that engine cannot start by the following procedure.

1. Remove fuel pump fuse.
2. Crank or start the engine (where possible) until the fuel pressure is released.

1. CHECK "B" TERMINAL CIRCUIT

1. Turn ignition switch OFF.
2. Make sure that starter motor "B" terminal connection is clean and tight.
3. Check voltage between starter motor "B" terminal and ground.

Terminals		(-)	Voltage (Approx.)
(+)	Terminal		
Starter motor "B" terminal	Terminal	(-)	Battery voltage
E203	2	Ground	



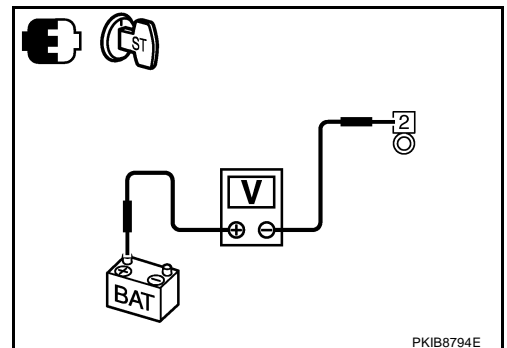
OK or NG

- OK >> GO TO 2.
 NG >> Check harness between battery and starter motor for open circuit.

2. CHECK BATTERY CABLE CONNECTION STATUS (VOLTAGE DROP TEST)

Check voltage between starter motor battery positive terminal and starter motor "B" terminal.

(+) Terminal	Terminals (-)		Condition	Voltage (Approx.)
	Starter motor "B" terminal	Terminal		
Battery positive terminal	E203	2	When the ignition switch is in START position	Less than 0.5 V



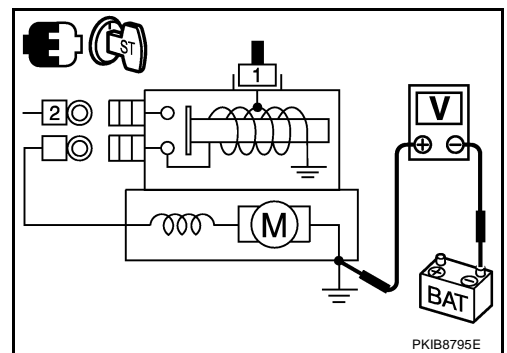
OK or NG

- OK >> GO TO 3.
 NG >> Check harness between the battery and the starter motor for poor continuity.

3. CHECK GROUND CIRCUIT STATUS (VOLTAGE DROP TEST)

Check voltage between starter motor case and battery negative terminal.

Terminals		Condition	Voltage (Approx.)
(+)	(-)		
Starter motor case	Battery negative terminal	When the ignition switch is in START position	Less than 0.2 V



OK or NG

- OK >> "B" terminal circuit is OK. Further inspection necessary. Refer to [SC-14, "WORK FLOW"](#).
 NG >> Check the starter motor case and ground for poor continuity.

STARTING SYSTEM

DIAGNOSTIC PROCEDURE 2

Check "S" Connector Circuit

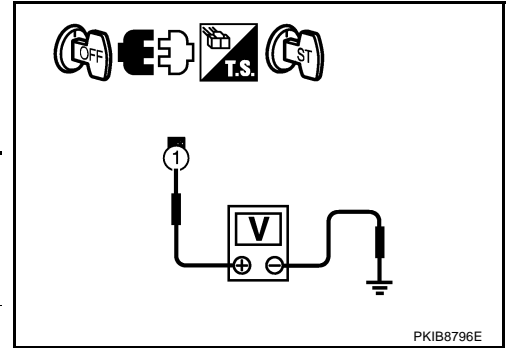
CAUTION:

Perform diagnosis under the condition that engine cannot start by the following procedure.

1. Remove fuel pump fuse.
2. Crank or start the engine (where possible) until the fuel pressure is released.

1. CHECK "S" CONNECTOR CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect starter motor connector.
3. Check voltage between starter motor harness connector and ground.



Terminals		Condition	Voltage (Approx.)
(+)	(-)		
Starter motor connector	Terminal		
F9 (VQ35DE) E210 (VK45DE)	1	When the ignition switch is in START position	Battery voltage

OK or NG

OK >> "S" connector circuit is OK. Further inspection necessary. Refer to [SC-14, "WORK FLOW"](#) .

NG >> Check the following.

- Ignition switch and PDU
- IPDM E/R
- Harness between starter motor and IPDM E/R

MINIMUM SPECIFICATION OF CRANKING VOLTAGE REFERENCING COOLANT TEMPERATURE

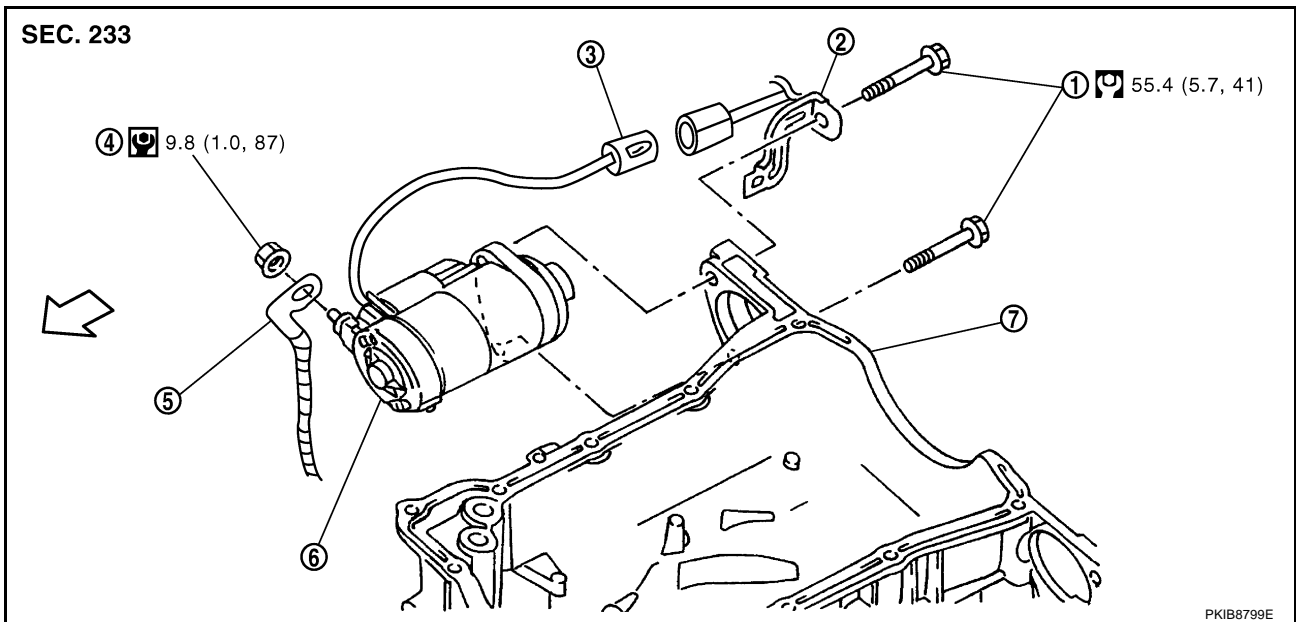
Engine coolant temperature [°C (°F)]	Voltage [V]
-30 to -20 (-22 to -4)	8.6
-19 to -10 (-2 to 14)	9.1
-9 to 0 (16 to 32)	9.5
More than 1 (More than 34)	9.9

STARTING SYSTEM

Removal and Installation VQ35DE ENGINE MODELS (2WD)

NKS003NL

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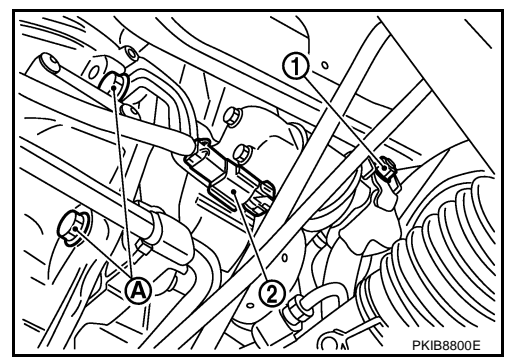


- | | | |
|--------------------------------|-------------------------|-----------------------|
| 1. Starter motor mounting bolt | 2. Harness clip bracket | 3. "S" connector |
| 4. "B" terminal nut | 5. "B" terminal harness | 6. Starter motor |
| 7. Oil pan | Ⓜ : N·m (kg-m, ft-lb) | Ⓜ : N·m (kg-m, in-lb) |

↔ : Engine front

Removal

1. Disconnect the battery cable from the negative terminal.
2. Remove engine front and rear undercover, using power tools.
3. Remove "B" terminal nut (1).
4. Disconnect "S" connector (2).
5. Remove starter motor mounting bolts (A), using power tools.
6. Remove starter motor downward from the vehicle.



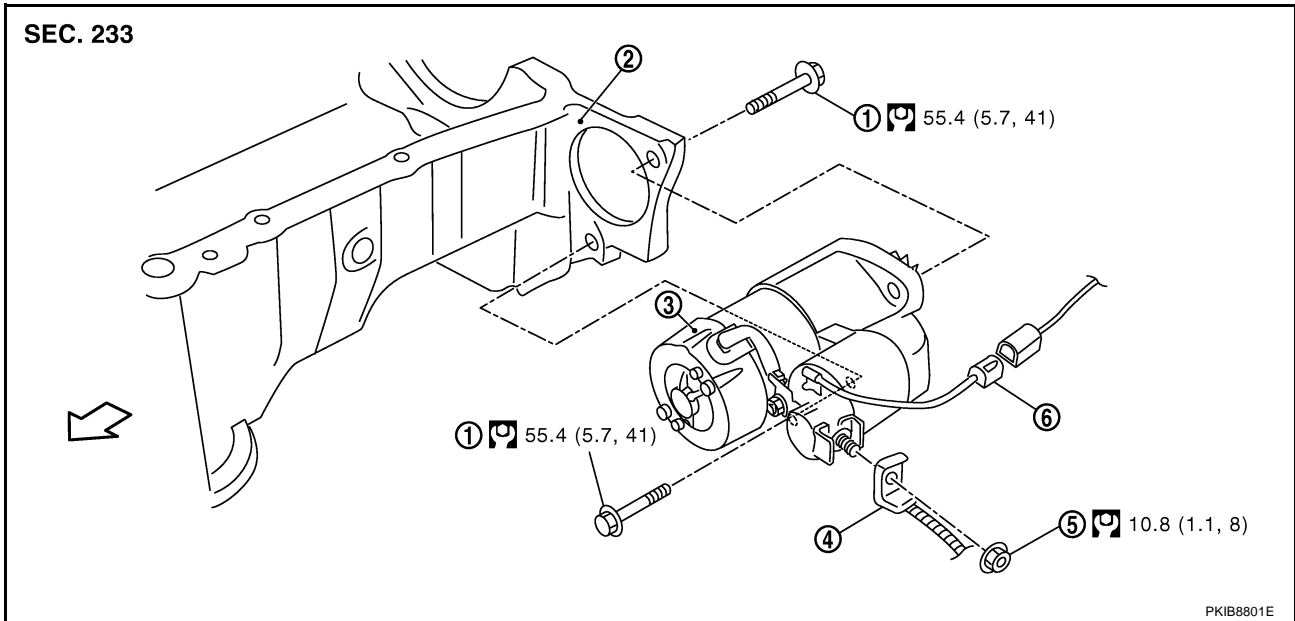
Installation

Installation is the reverse order of removal.

CAUTION:
Be sure to tighten "B" terminal nut carefully.

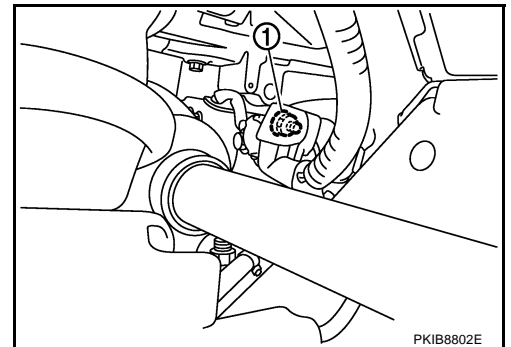
STARTING SYSTEM

VQ35DE ENGINE MODELS (AWD)

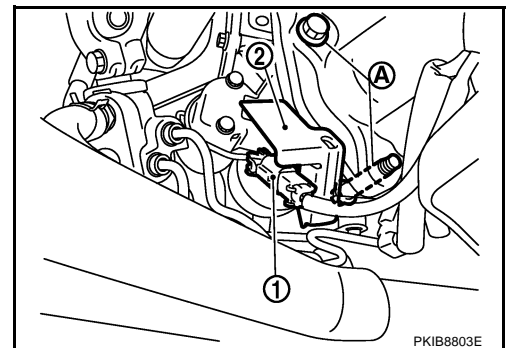


Removal

1. Disconnect the battery cable from the negative terminal.
2. Remove engine rear undercover, using power tools.
3. Remove exhaust mounting bracket. Refer to [EM-183, "EXHAUST MANIFOLD AND THREE WAY CATALYST"](#).
4. Remove "B" terminal nut (1).



5. Disconnect "S" connector (1).
6. Remove starter motor mounting bolts (A) and harness bracket (2), using power tools.
7. Remove starter motor downward from the vehicle.



Installation

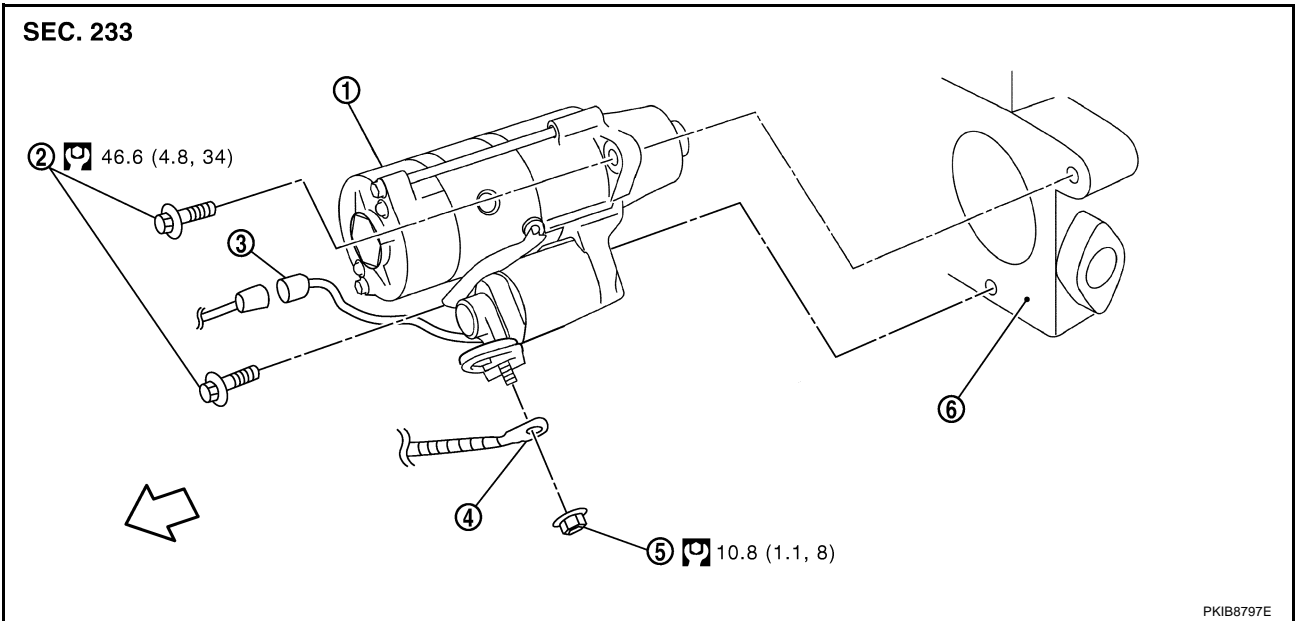
Installation is the reverse order of removal.

CAUTION:

Be sure to tighten "B" terminal nut carefully.

STARTING SYSTEM

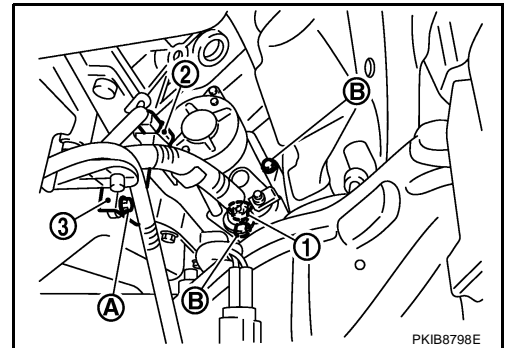
VK45DE ENGINE MODELS



- | | | |
|-------------------------|--------------------------------|-------------------|
| 1. Starter motor | 2. Starter motor mounting bolt | 3. "S" connector |
| 4. "B" terminal harness | 5. "B" terminal nut | 6. Cylinder block |
- : N·m (kg·m, ft·lb) : Engine front

Removal

1. Disconnect the battery cable from the negative terminal.
2. Remove engine front and rear undercover, using power tools.
3. Remove left engine mounting insulator and left engine mounting bracket. Refer to [EM-244, "ENGINE ASSEMBLY"](#).
4. Remove "B" terminal nut (1).
5. Disconnect "S" connector (2).
6. Remove the bolt (A) and the harness bracket (3).
7. Remove starter motor mounting bolts (B), using power tools.
8. Remove starter motor forward from the vehicle.



Installation

Installation is the reverse order of removal.

CAUTION:

Be sure to tighten "B" terminal nut carefully.

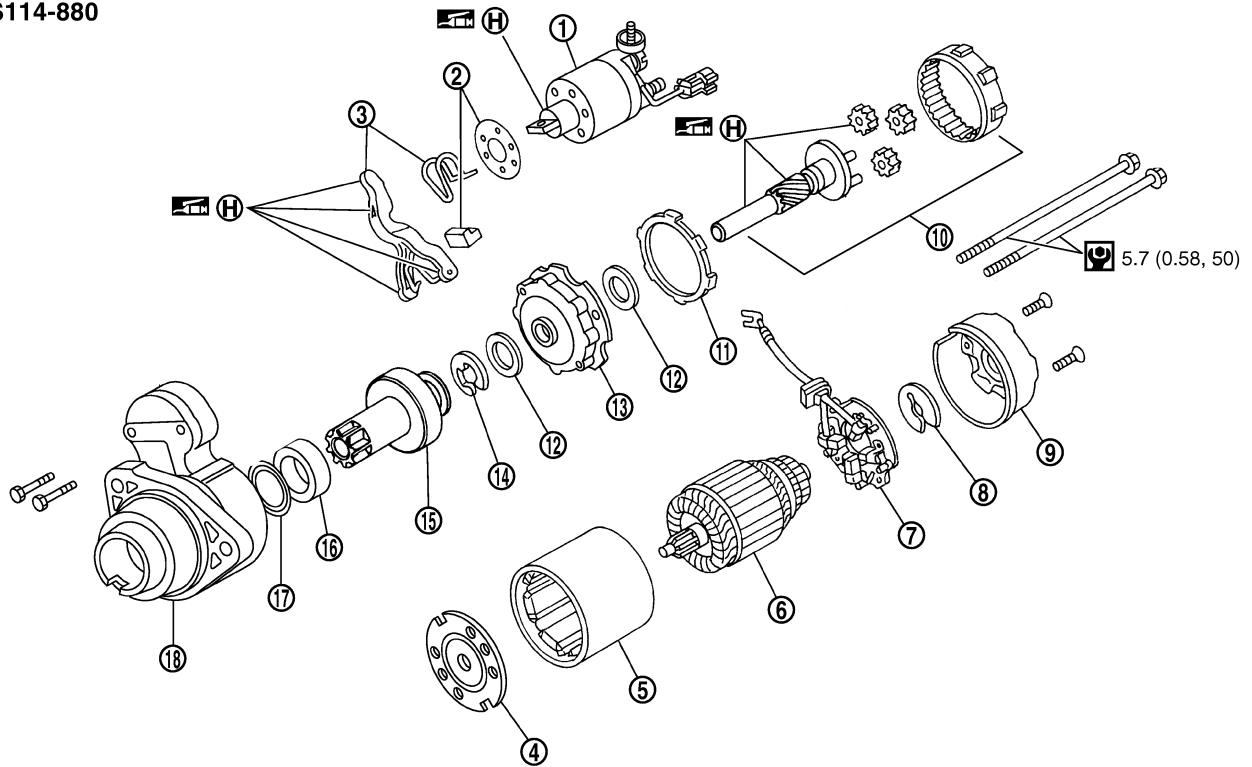
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STARTING SYSTEM

Disassembly and Assembly VQ35DE ENGINE MODELS (2WD)


NKS003NM

SEC. 233
S114-880



PKIB8804E

- | | | |
|-----------------------------|-------------------|------------------------|
| 1. Magnetic switch assembly | 2. Dust cover kit | 3. Shift lever set |
| 4. Center bracket (A) | 5. Yoke assembly | 6. Armature assembly |
| 7. Brush holder assembly | 8. Thrust washer | 9. Rear cover assembly |
| 10. Shaft gear assembly | 11. Packing | 12. Thrust washer |
| 13. Center bracket (P) | 14. E-ring | 15. Pinion assembly |
| 16. Ball bearing | 17. Caul | 18. Gear case assembly |

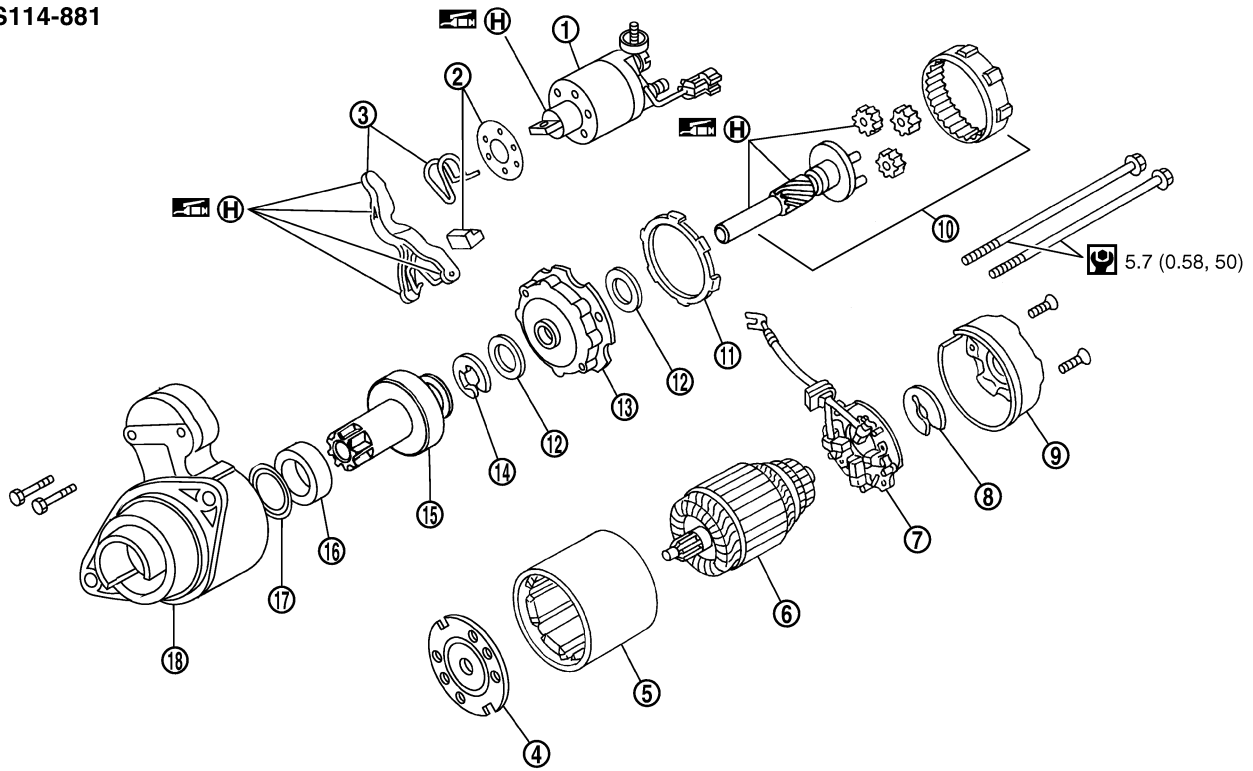
 : N·m (kg-m, in-lb)

 (H): High-temperature grease point


STARTING SYSTEM


VQ35DE ENGINE MODELS (AWD)

SEC. 233
S114-881



- | | | |
|-----------------------------|-------------------|------------------------|
| 1. Magnetic switch assembly | 2. Dust cover kit | 3. Shift lever set |
| 4. Center bracket (A) | 5. Yoke assembly | 6. Armature assembly |
| 7. Brush holder assembly | 8. Thrust washer | 9. Rear cover assembly |
| 10. Shaft gear assembly | 11. Packing | 12. Thrust washer |
| 13. Center bracket (P) | 14. E-ring | 15. Pinion assembly |
| 16. Ball bearing | 17. Caul | 18. Gear case assembly |

 : N·m (kg·m, in·lb)

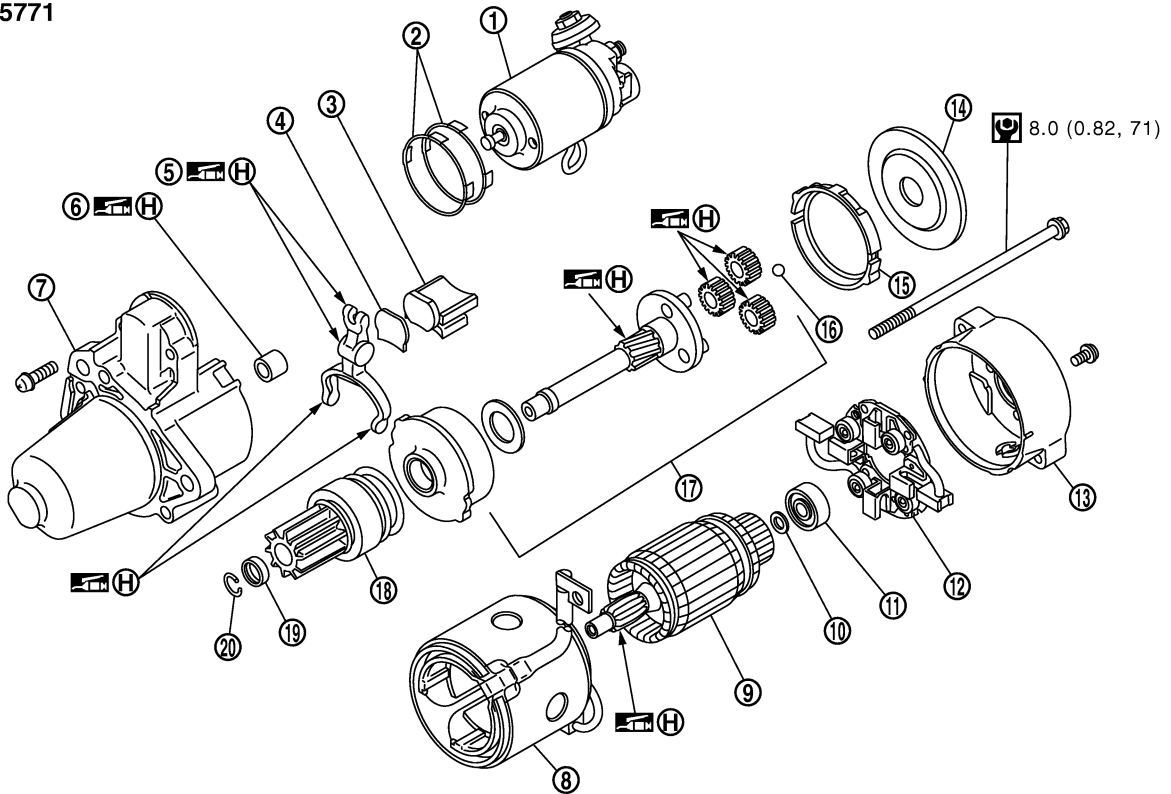
 (H): High-temperature grease point

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STARTING SYSTEM


VK45DE ENGINE MODELS


SEC. 233
M2T85771



PKIB8653E

- | | | |
|-----------------------------|-------------------------|---------------------------|
| 1. Magnetic switch assembly | 2. Adjusting plate | 3. Packing |
| 4. Plate | 5. Shift lever | 6. Sleeve bearing |
| 7. Front bracket assembly | 8. Yoke assembly | 9. Armature assembly |
| 10. Washer | 11. Rear bearing | 12. Brush holder assembly |
| 13. Rear bracket assembly | 14. Cover | 15. Packing |
| 16. Ball | 17. Shaft gear assembly | 18. Clutch gear assembly |
| 19. Pinion stopper | 20. Stopper clip | |

 : N·m (kg·m, in·lb)

 (H): High-temperature grease point

INSPECTION AFTER DISASSEMBLY

Pinion/Clutch Check

- Inspect pinion teeth.
 - Replace pinion if teeth are worn or damaged. (Also check condition of ring gear teeth.)
- Inspect reduction gear teeth.
 - Replace reduction gear if teeth are worn or damaged. (Also check condition of armature shaft gear teeth.)
- Check to see if pinion locks in one direction and rotates smoothly in the opposite direction.
 - If it locks or rotates in both directions, or unusual resistance is evident, replace.

CHARGING SYSTEM

CHARGING SYSTEM

PFP:00011

System Description DESCRIPTION

NKS003NN

The alternator provides DC voltage to operate the vehicle's electrical system and to keep the battery charged. The voltage output is controlled by the IC regulator.

Power is supplied at all times

- through 10A fuse [No. 36, located in the fuse, fusible link and relay block (J/B)]
- to alternator terminal 4 ("S" terminal).

"B" terminal supplies power to charge the battery and operate the vehicle's electrical system. Output voltage is controlled by the IC regulator at terminal 4 ("S" terminal) detecting the input voltage.

The alternator is grounded to the engine block.

With the ignition switch in the ON or START position, power is supplied

- through 10A fuse [No. 14, located in the fuse block (J/B)]
- to combination meter terminal 12 for the charge warning lamp.

Ground is supplied at signal

- to combination meter terminal 22
- through alternator terminal 3 ("L" terminal).

Then power and ground are supplied, the charge warning lamp will illuminate.

When the alternator is providing sufficient voltage with the engine running, the ground is opened and the charge warning lamp will go off.

If the charge warning lamp illuminates with the engine running, a malfunction is indicated.

Ground is supplied

- to alternator terminal 2 ("E" terminal)
- through grounds E222, E223 and E224. (VQ35DE)
- through ground E212. (VK45DE)

MALFUNCTION INDICATOR

The IC 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.

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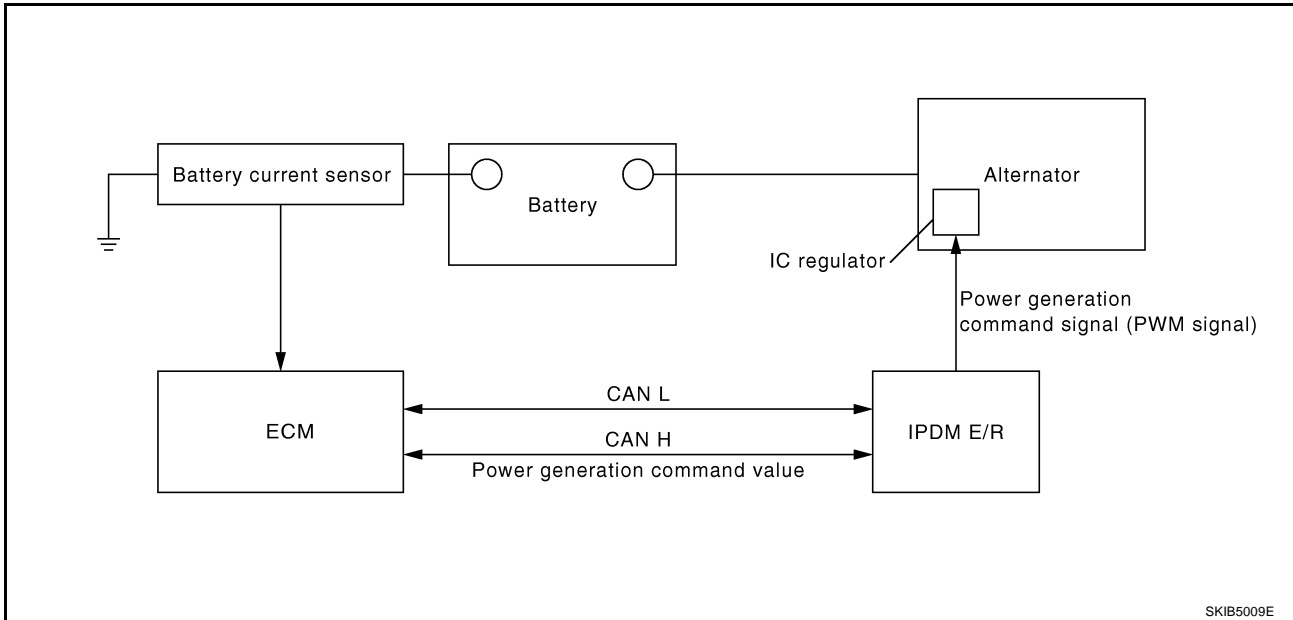
L

M

CHARGING SYSTEM

POWER GENERATION VOLTAGE VARIABLE CONTROL SYSTEM

Power generation voltage variable control system that controls the power generation voltage of the alternator has been adopted. 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.



Operation Description

- The 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 converts the received power generation command value into the power generation command signal (PWM signal) and sends it to the IC regulator.
- The IC 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 regulator.

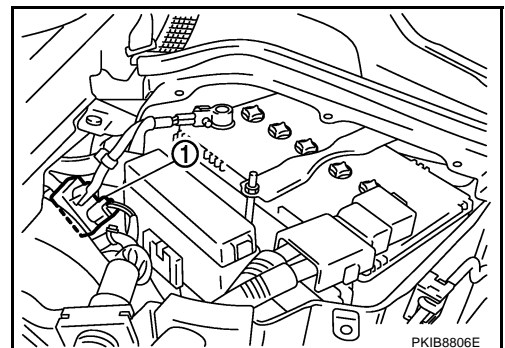
NOTE:

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 regulator of the alternator.

Main Component Part

BATTERY CURRENT SENSOR

- Battery current sensor (1) 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.



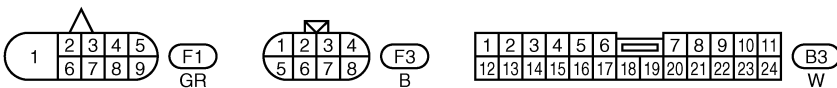
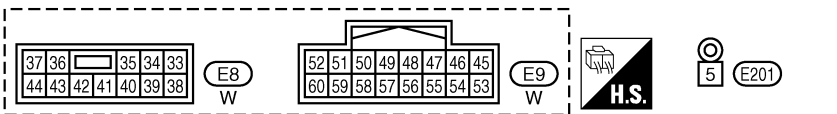
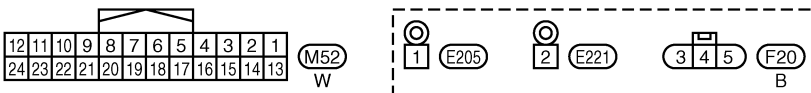
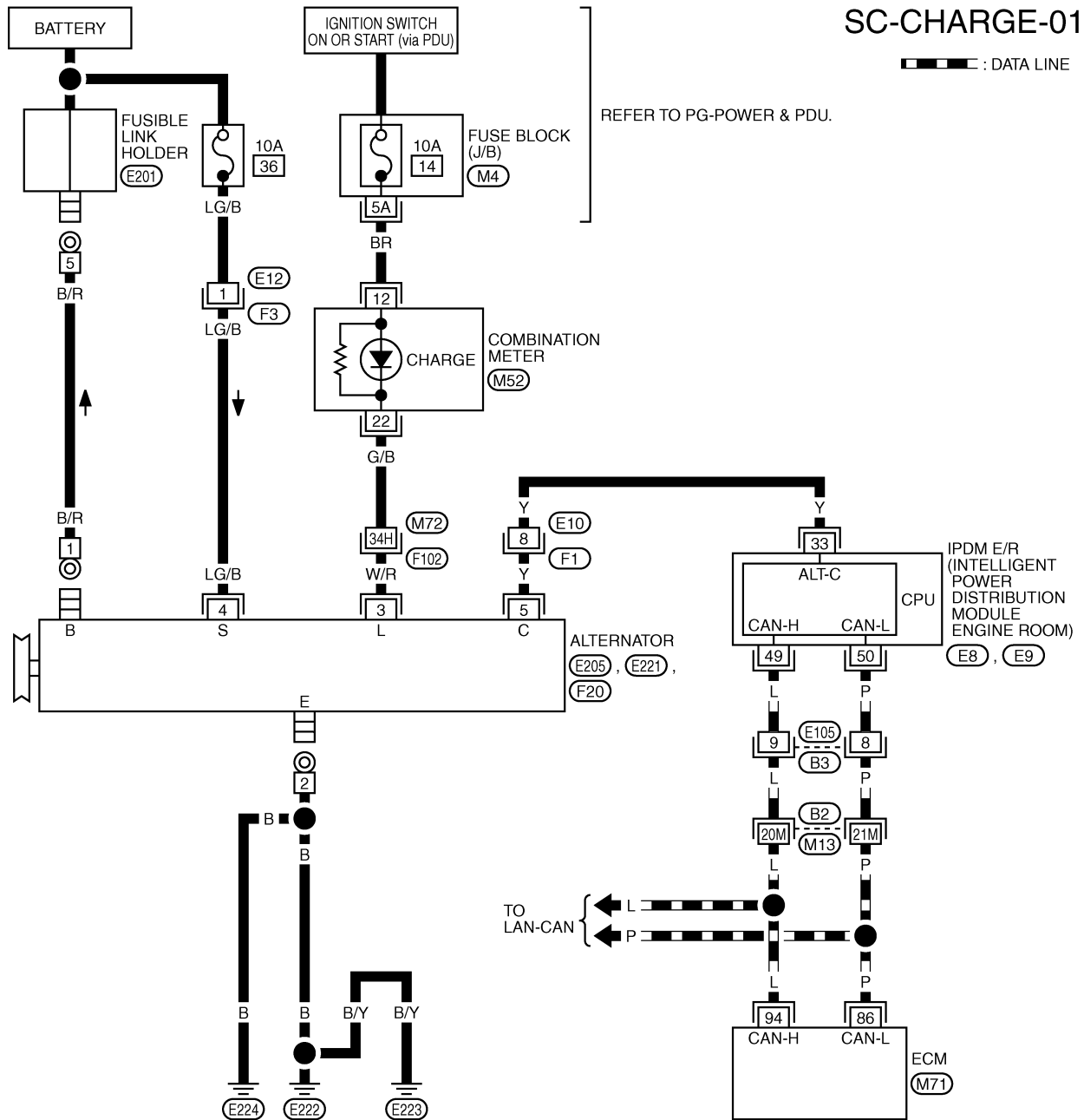
CHARGING SYSTEM

Wiring Diagram — CHARGE — VQ35DE ENGINE MODELS (2WD)

NKS003NO

SC-CHARGE-01

▬ : DATA LINE



REFER TO THE FOLLOWING.

(F102), (B2) -SUPER MULTIPLE JUNCTION (SMJ)

(M4) -FUSE BLOCK-JUNCTION BOX (J/B)

(M71) -ELECTRICAL UNITS

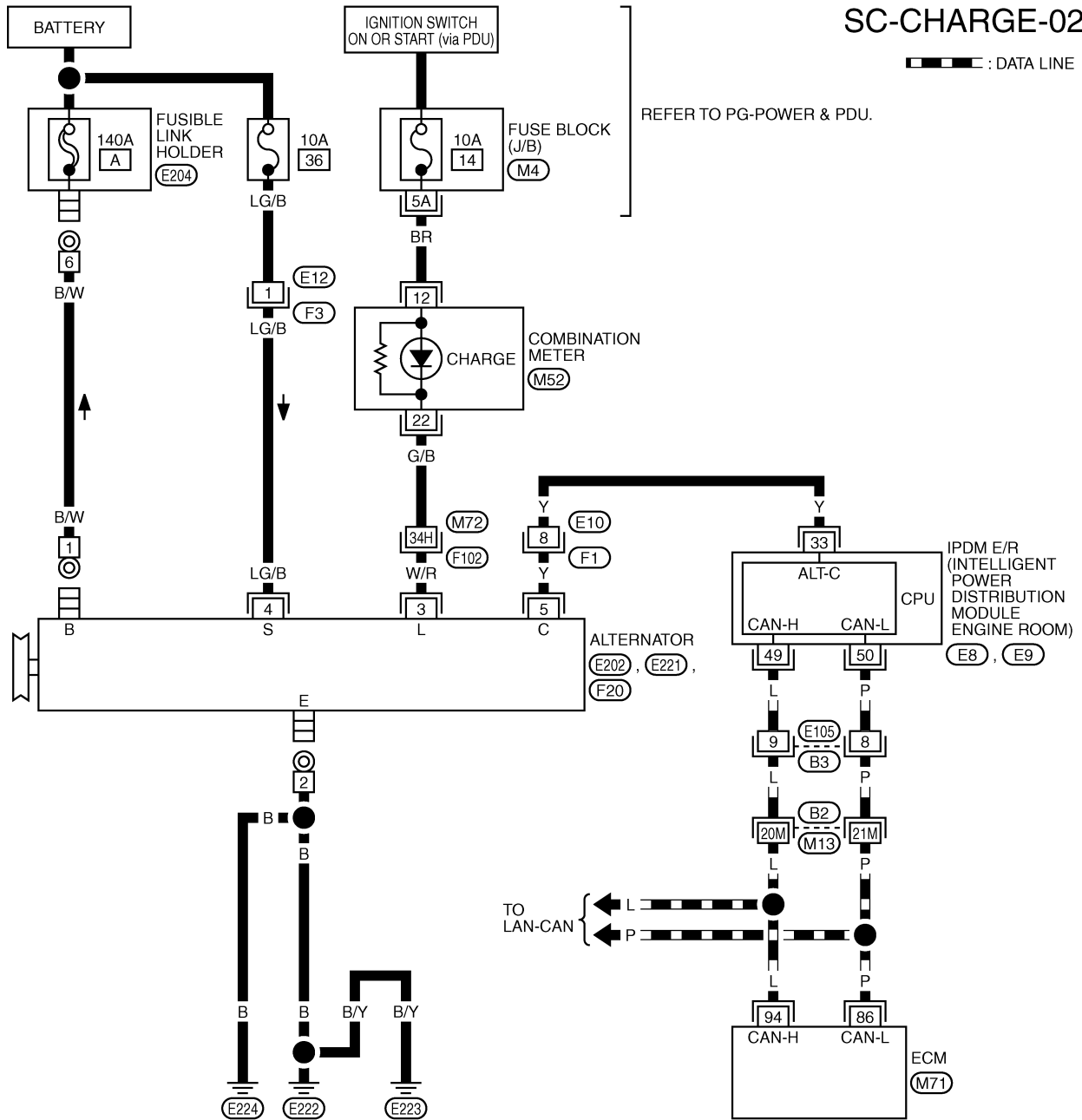
TKWT3234E

CHARGING SYSTEM

VQ35DE ENGINE MODELS (AWD)

SC-CHARGE-02

▬ : DATA LINE



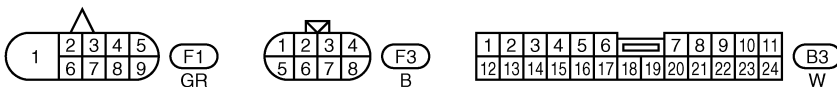
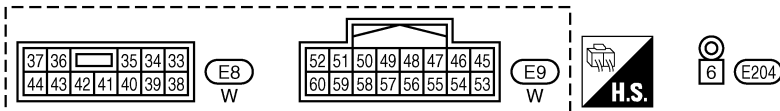
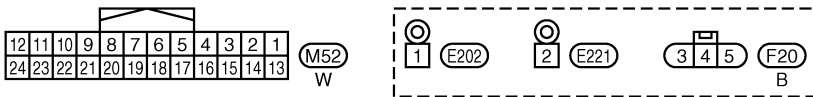
REFER TO PG-POWER & PDU.

REFER TO THE FOLLOWING.

(F102), (B2) -SUPER MULTIPLE JUNCTION (SMJ)

(M4) -FUSE BLOCK-JUNCTION BOX (J/B)

(M71) -ELECTRICAL UNITS



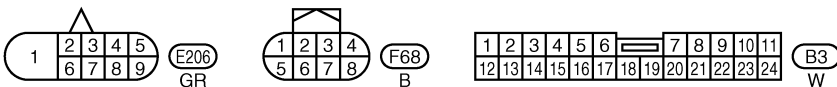
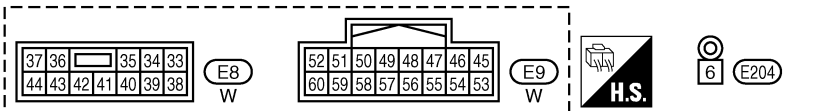
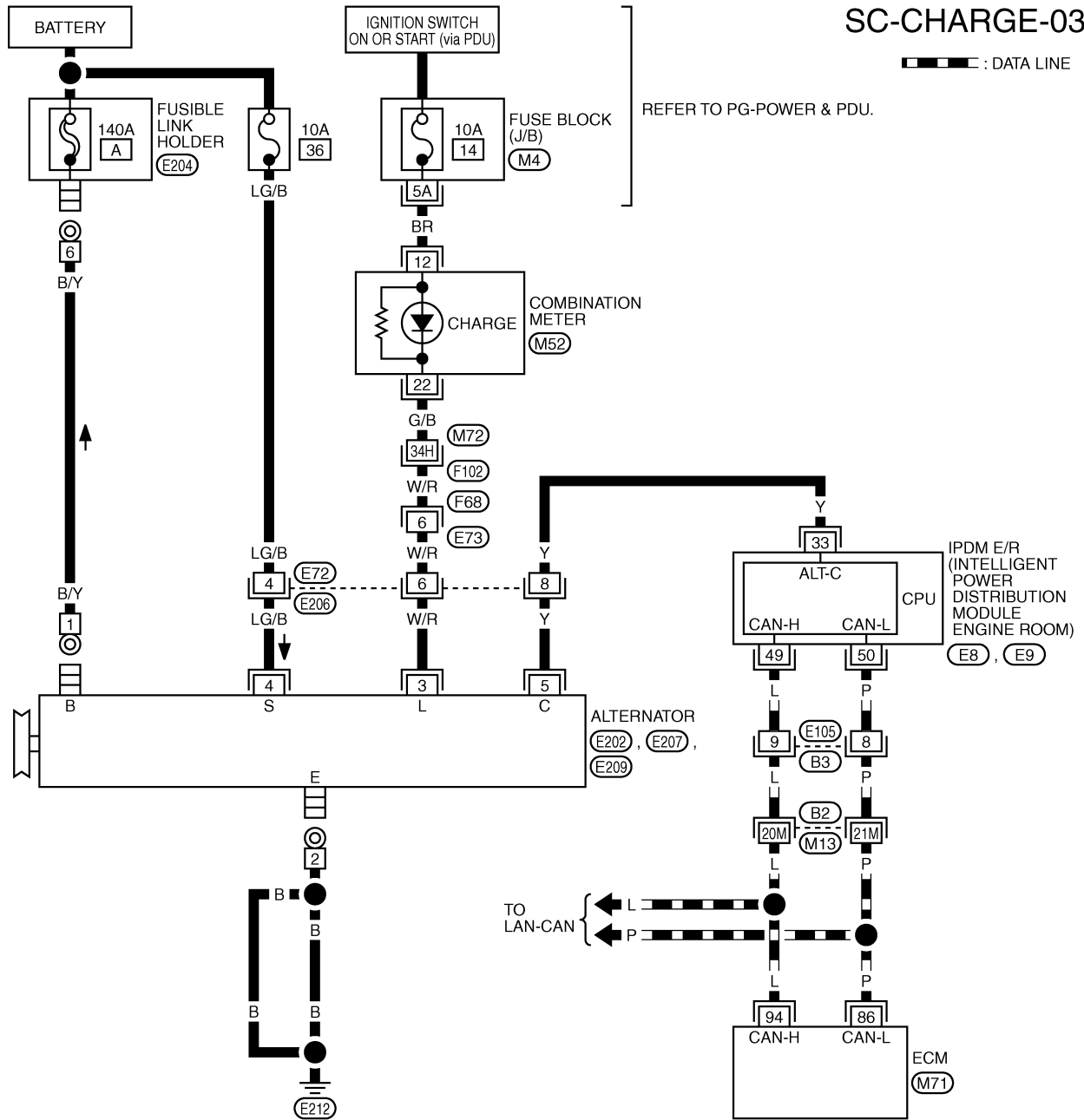
TKWT3235E

CHARGING SYSTEM

VK45DE ENGINE MODELS

SC-CHARGE-03

▬ : DATA LINE



REFER TO THE FOLLOWING.

(F102, B2) -SUPER MULTIPLE JUNCTION (SMJ)

(M4) -FUSE BLOCK-JUNCTION BOX (J/B)

(M71) -ELECTRICAL UNITS

TKWT3236E

CHARGING SYSTEM

Trouble Diagnoses with Battery/Starting/Charging System Tester (Charging)

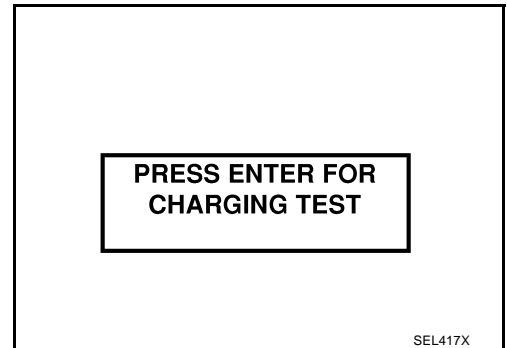
NKS003NP

NOTE:

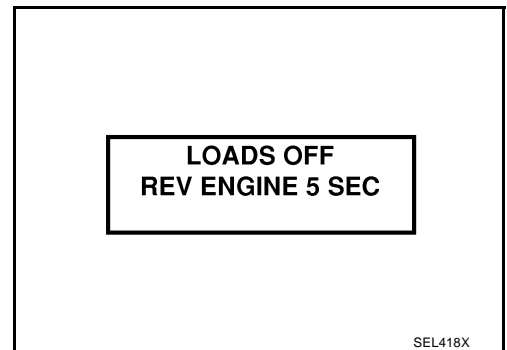
To ensure a complete and thorough diagnosis, the battery, starter and alternator test segments must be done as a set from start to finish.

Before starting, perform the preliminary inspection. Refer to [SC-32, "PRELIMINARY INSPECTION"](#).

1. Stop the operation of the power generation voltage variable control in either of the following procedures.
 - After selecting "ENGINE" of "SELECT SYSTEM" using CONSULT-II, 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-II.]
2. Turn off all loads on the vehicle electrical system.
3. Perform battery and starting system test with Battery/Starting/Charging system tester.
4. Press "ENTER" to begin the charging system test.
5. Start engine.



6. Press "ENTER" until "LOADS OFF REV ENGINE 5 SEC" is displayed.
7. Raise and hold the engine speed at 1,500 to 2,000 rpm for about 5 seconds, then return the engine to idle. Once the increase in engine rpm is detected, press "ENTER" to continue.

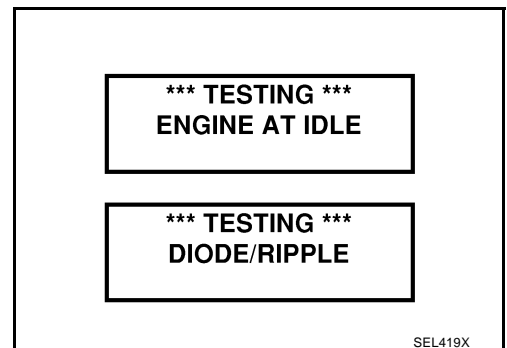


NOTE:

- If after 30 seconds an increase in engine idle speed is not detected, "RPM NOT DETECTED" will display.
 - Some engines may have a higher idle initially after starting, particularly when the engine is cold. The tester may detect this without any other action being taken. If this occurs, continue on with the testing process. The final results will not be affected.
8. The tester now checks the engine at idle and performs the DIODE/RIPPLE check.
 9. When complete, the tester will prompt you to turn on the following electrical loads.
 - Heater fan set to highest speed. Do not run the A/C or windshield defroster.
 - Headlamp high beam
 - Rear window defogger

NOTE:

Do not run the windshield wipers or any other cyclical loads.



CHARGING SYSTEM

10. Press "ENTER" to continue.



TURN LOADS ON
ENTER TO CONT...

SEL420X

11. Raise and hold the engine speed at 1,500 to 2,000 rpm for about 5 seconds, then return the engine to idle. Once the increase in engine rpm is detected, press "ENTER" to continue.

NOTE:

If after 30 seconds an increase in engine idle speed is not detected, "RPM NOT DETECTED" will be displayed. Press "ENTER" to restart the test.



LOADS ON
REV ENGINE 5 SEC

SEL421X

12. Diagnostic result is displayed on the tester. Refer to [SC-30](#), "[DIAGNOSTIC RESULT ITEM CHART](#)".



CHARGING SYSTEM
NORMAL

SEL422X

13. Press "ENTER" then test output code is displayed. Record the test output code on the repair order.

14. Toggle back to the "DIAGNOSTIC SCREEN" for test results.



CHARGING CODE
ALTSTD7HJ934

SEL577X

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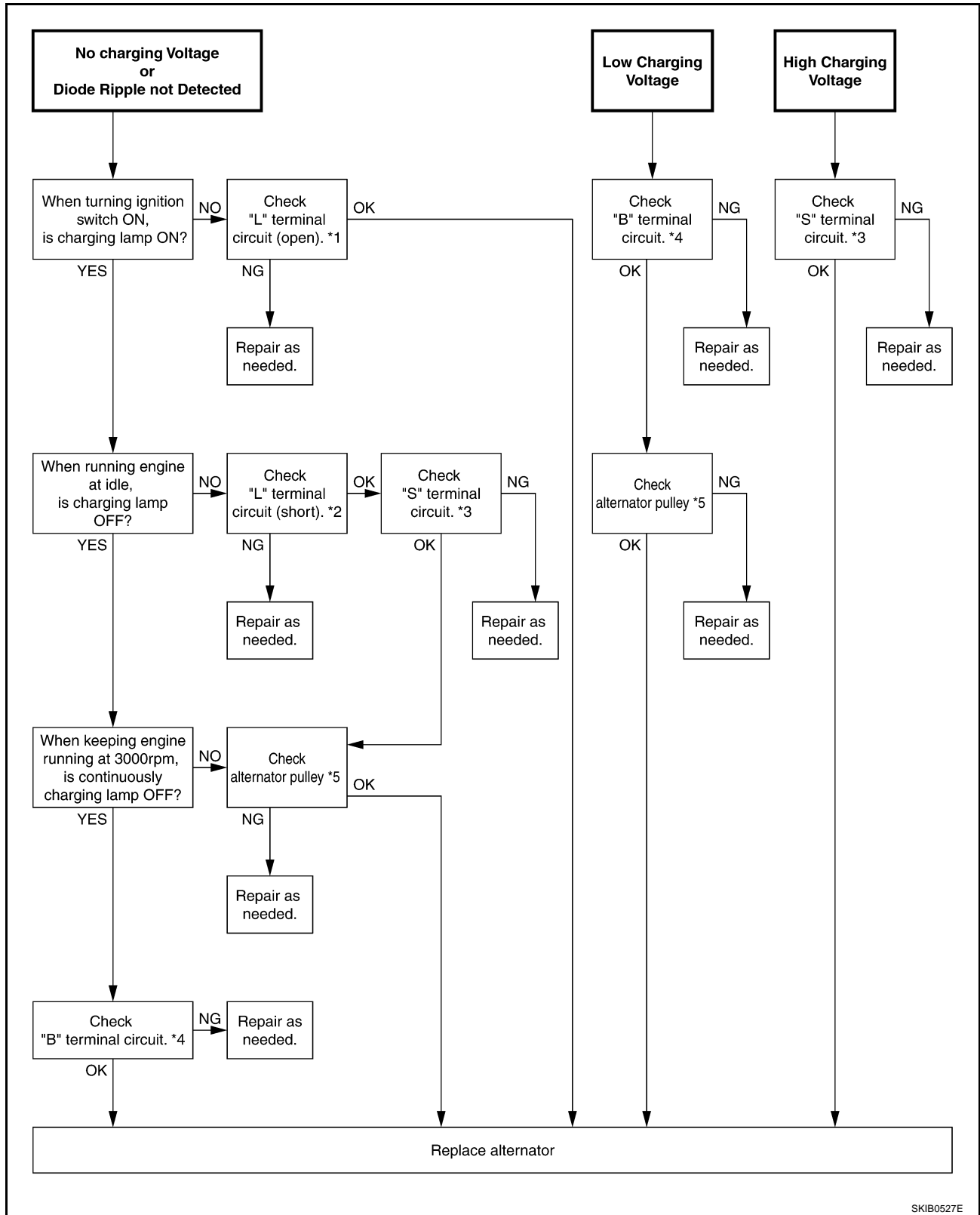
CHARGING SYSTEM

DIAGNOSTIC RESULT ITEM CHART

Diagnostic item	Service procedure
CHARGING SYSTEM NORMAL	Charging system is normal and will also show "DIODE RIPPLE" test result.
NO CHARGING VOLTAGE	Go to SC-31, "WORK FLOW" .
LOW CHARGING VOLTAGE	
HIGH CHARGING VOLTAGE	
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 Battery/Starting/Charging system tester to confirm repair.
DIODE RIPPLE NOT DETECTED	Go to SC-31, "WORK FLOW" .

CHARGING SYSTEM

WORK FLOW



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- *1 [SC-32, "Check "L" Terminal Circuit \(Open\)"](#)
- *2 [SC-33, "Check "L" Terminal Circuit \(Short\)"](#)
- *3 [SC-33, "Check "S" Terminal Circuit"](#)
- *4 [SC-34, "Check "B" Terminal Circuit"](#)
- *5 [SC-38, "Alternator Pulley Inspection" \(VQ35DE\)](#)
[SC-40, "Alternator Pulley Inspection" \(VK45DE\)](#)

SKIB0527E

CHARGING SYSTEM

PRELIMINARY INSPECTION

1. CHECK BATTERY TERMINALS CONNECTION

Check if battery terminals are clean and tight.

OK or NG

OK >> GO TO 2.

NG >> Repair battery terminals connection.

2. CHECK FUSE AND FUSIBLE LINK

Check for blown fuse and fusible link.

Unit	Power source (Power supply terminals)	Fuse and fusible link No.
Alternator	Battery ("S" terminal)	36
Combination meter	Ignition switch ON ("L" terminal)	14

OK or NG

OK >> GO TO 3.

NG >> Be sure to eliminate cause of malfunction before installing new fuse.

3. CHECK "E" TERMINAL CONNECTION

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

OK or NG

OK >> GO TO 4.

NG >> Repair "E" terminal connection.

4. CHECK ALTERNATOR DRIVE BELT TENSION

Check alternator drive belt tension. Refer to [EM-15, "Checking Drive Belts"](#) (VQ35DE) or [EM-174, "Checking Drive Belts"](#) (VK45DE).

OK or NG

OK >> INSPECTION END

NG >> Repair as needed.

DIAGNOSTIC PROCEDURE 1

Check "L" Terminal Circuit (Open)

1. CHECK "L" TERMINAL CONNECTION

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

OK or NG

OK >> GO TO 2.

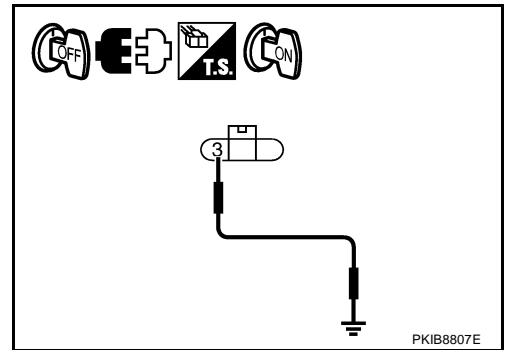
NG >> Repair "L" terminal connection. Confirm repair by performing complete Battery/Starting/Charging system test. Refer to [SC-28, "Trouble Diagnoses with Battery/Starting/Charging System Tester \(Charging\)"](#).

CHARGING SYSTEM

2. CHECK "L" TERMINAL CIRCUIT (OPEN)

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

Alternator connector	Terminal	Ground	Condition	
			Ignition switch position	Charge warning lamp
F20 (VQ35DE) E209 (VK45DE)	3		ON	illuminate



OK or NG

- OK >> Go to [SC-31, "WORK FLOW"](#) .
NG >> Check the following.

- Harness for open between combination meter and alternator
- Harness for open between combination meter and fuse
- Charge warning lamp (Combination meter)

DIAGNOSTIC PROCEDURE 2

Check "L" Terminal Circuit (Short)

1. CHECK "L" TERMINAL CIRCUIT (SHORT)

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

Charge warning lamp should illuminate?

- YES >> Check the following.
- Harness for short between combination meter and alternator
 - Charge warning lamp (Combination meter)
- NO >> Go to [SC-31, "WORK FLOW"](#) .

DIAGNOSTIC PROCEDURE 3

Check "S" Terminal Circuit

1. CHECK "S" TERMINAL CONNECTION

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

OK or NG

- OK >> GO TO 2.
NG >> Repair "S" terminal connection. Confirm repair by performing complete Battery/Starting/Charging system test. Refer to [SC-28, "Trouble Diagnoses with Battery/Starting/Charging System Tester \(Charging\)"](#) .

CHARGING SYSTEM

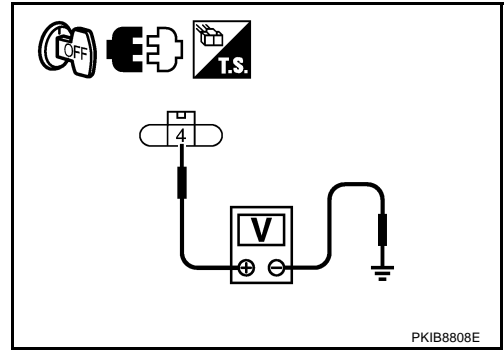
2. CHECK "S" TERMINAL CIRCUIT

Check voltage between alternator harness connector and ground.

Terminals		(-)	Voltage (Approx.)
(+) Alternator connector			
Terminal			
F20 (VQ35DE) E209 (VK45DE)	4	Ground	Battery voltage

OK or NG

- OK >> Go to [SC-31, "WORK FLOW"](#).
 NG >> Check harness for open between alternator and fuse.



DIAGNOSTIC PROCEDURE 4

Check "B" Terminal Circuit

1. CHECK "B" TERMINAL CONNECTION

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

OK or NG

- OK >> GO TO 2.
 NG >> Repair "B" terminal connection. Confirm repair by performing complete Battery/Starting/Charging system test. Refer to [SC-28, "Trouble Diagnoses with Battery/Starting/Charging System Tester \(Charging\)"](#).

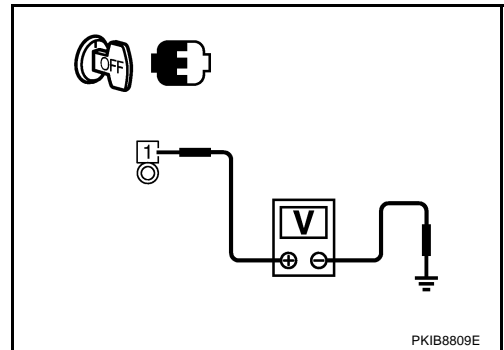
2. CHECK "B" TERMINAL CIRCUIT

Check voltage between alternator "B" terminal and ground.

Terminals		(-)	Voltage (Approx.)
(+) Alternator "B" terminal			
Terminal			
E205 [VQ35DE (2WD)] E202 [VQ35DE (AWD)/VK45DE]	1	Ground	Battery voltage

OK or NG

- OK >> GO TO 3.
 NG >> Check harness for open between alternator and fusible link.



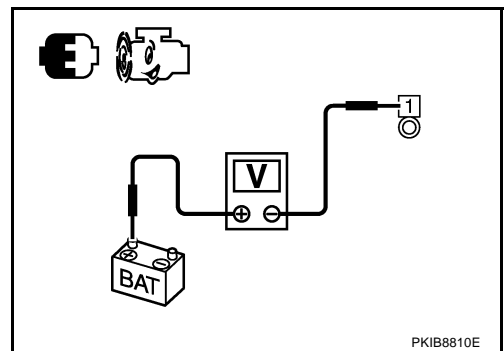
3. CHECK "B" TERMINAL CONNECTION (VOLTAGE DROP TEST)

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

(+) Battery positive terminal	Terminals		Voltage (Approx.)
	(-)		
	Alternator "B" terminal	Terminal	
	E205 [VQ35DE (2WD)] E202 [VQ35DE (AWD)/VK45DE]	1	Less than 0.2 V

OK or NG

- OK >> Go to [SC-31, "WORK FLOW"](#).
 NG >> Check harness between battery and alternator for poor continuity.



CHARGING SYSTEM

Power Generation Voltage Variable Control System Operation Inspection

NKS003N0

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. Never connect the electrical component or the ground wire directly to the battery terminal.
- When performing this inspection, always use the charged battery that completed the battery inspection. (When the charging rate of the battery is low, the response speed of the voltage change will become slow. This is a cause of an incorrect inspection.)

INSPECTION PROCEDURE

1. CHECK ECM (CONSULT-II)

Perform ECM self-diagnosis with CONSULT-II. Refer to [EC-133, "CONSULT-II Function \(ENGINE\)"](#) (VQ35DE) or [EC-846, "CONSULT-II Function \(ENGINE\)"](#) (VK45DE).

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-II 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

Example)

ACTIVE TEST			
ALTERNATOR DUTY	40.0 %		
MONITOR			
BATTERY VOLT	12.3V		
BAT CUR SEN	2190mV		
Qu	UP	DOWN	Qd
MODE	BACK	LIGHT	COPY

PKIB4503E

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 %

Example)

ACTIVE TEST			
ALTERNATOR DUTY	80.0 %		
MONITOR			
BATTERY VOLT	14.5V		
BAT CUR SEN	2780mV		
Qu	UP	DOWN	Qd
MODE	BACK	LIGHT	COPY

PKIB4504E

OK or NG

OK >> INSPECTION END

NG >> GO TO 3. (The charging condition of the battery should be normal.)

3. CHECK IPDM E/R (CONSULT-II)

Perform IPDM E/R self-diagnosis with CONSULT-II. Refer to [PG-20, "CONSULT-II 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.

CHARGING SYSTEM

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 (A) and IPDM E/R harness connector (B).

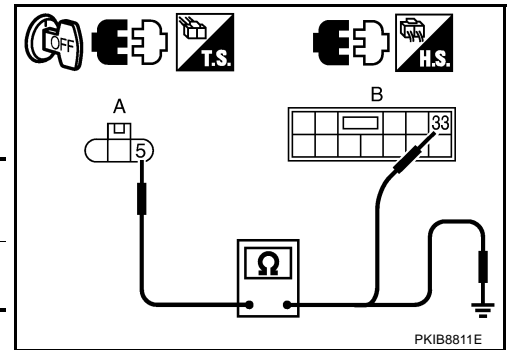
A		B		Continuity
Connector	Terminal	Connector	Terminal	
F20 (VQ35DE) E209 (VK45DE)	5	E8	33	Yes

4. Check continuity between alternator harness connector (A) and ground.

A		Ground	Condition
Connector	Terminal		
F20 (VQ35DE) E209 (VK45DE)	5		No

OK or NG

- OK >> Replace IPDM E/R.
 NG >> Repair harness or connector between IPDM E/R and alternator.

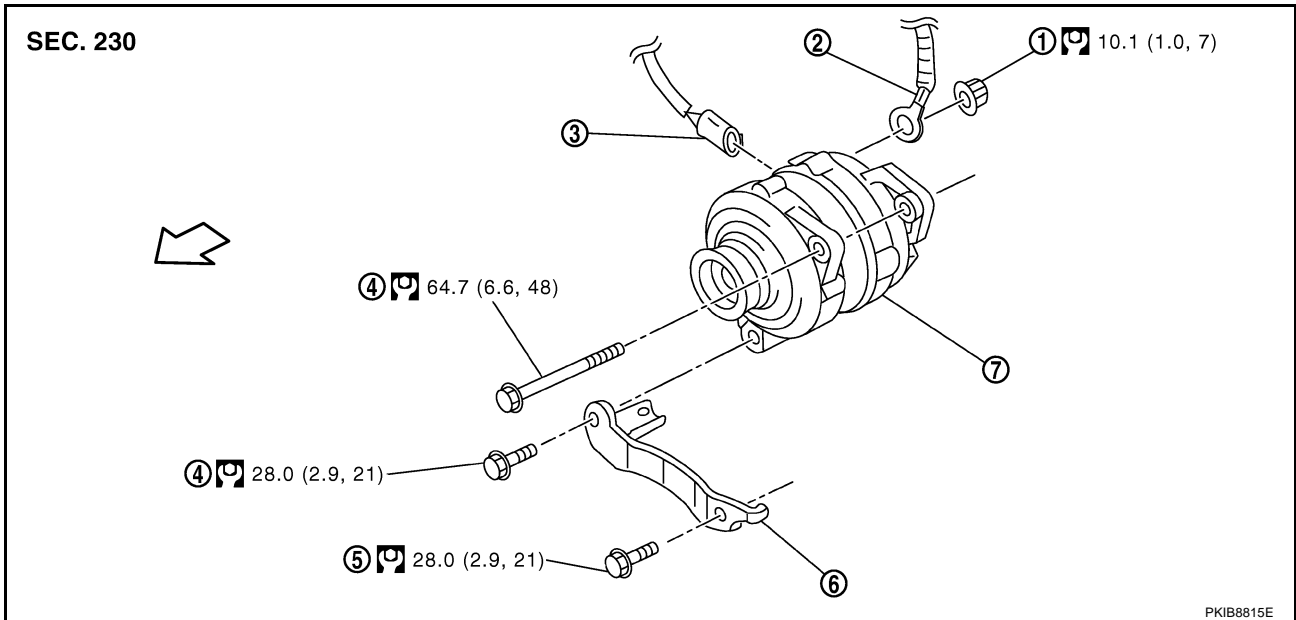


CHARGING SYSTEM

Removal and Installation VQ35DE ENGINE MODELS

NKS003NR

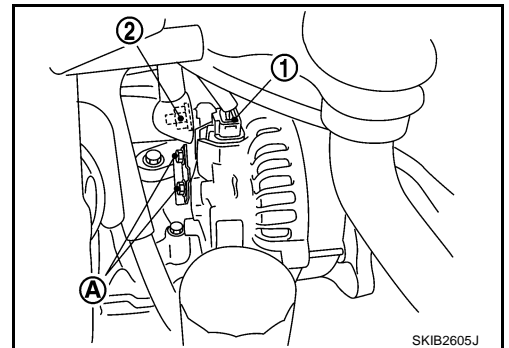
A
B
C
D
E
F
G
H
I
J
K
L
M



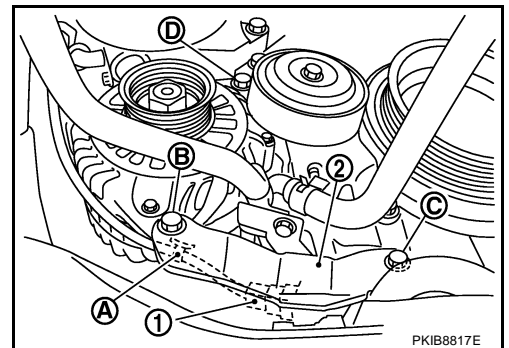
- | | | |
|-----------------------------|----------------------------------|-------------------------|
| 1. "B" terminal nut | 2. "B" terminal harness | 3. Alternator connector |
| 4. Alternator mounting bolt | 5. Alternator stay mounting bolt | 6. Alternator stay |
| 7. Alternator | : N·m (kg-m, ft-lb) | : Engine front |

Removal (2WD Models)

1. Disconnect the battery cable from the negative terminal.
2. Remove engine front undercover, using power tools.
3. Remove alternator and power steering oil pump belt. Refer to [EM-15, "DRIVE BELTS"](#).
4. Disconnect alternator connector (1).
5. Remove "B" terminal nut (2).
6. Remove the harness bracket bolts (A).



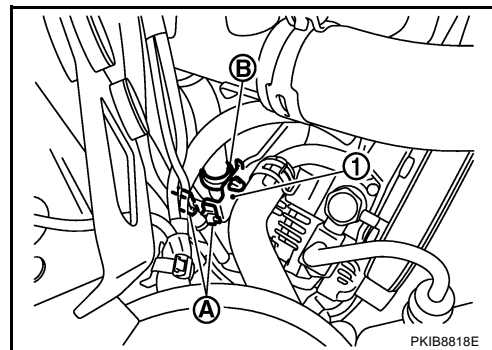
7. Remove oil pressure switch harness clip (A) from alternator stay.
8. Disconnect oil pressure switch connector (1).
9. Remove alternator mounting bolt (B) and alternator stay mounting bolt (C) using power tools, then remove alternator stay (2).
10. Remove alternator mounting bolt (D), using power tools.
11. Remove alternator assembly downward from the vehicle.



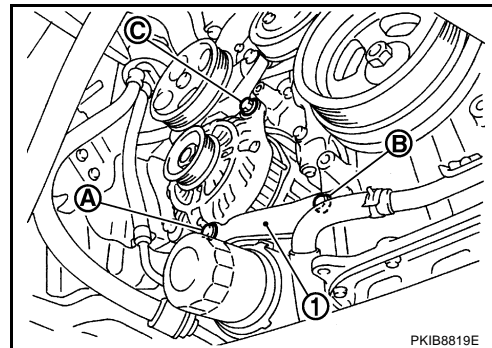
CHARGING SYSTEM

Removal (AWD Models)

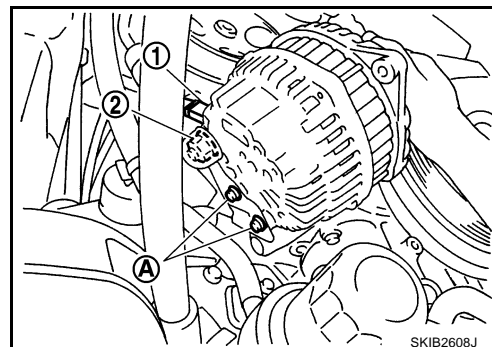
1. Disconnect the battery cable from the negative terminal.
2. Remove power steering oil reservoir tank from the bracket.
3. Remove the clips (A) and the hose clamp (B) from the harness bracket (1).



4. Remove engine front undercover, using power tools.
5. Remove alternator and power steering oil pump belt. Refer to [EM-15, "DRIVE BELTS"](#).
6. Remove alternator mounting bolt (A) and alternator stay mounting bolt (B) using power tools, then remove alternator stay (1).
7. Remove alternator mounting bolt (C), using power tools.



8. Pull and turn alternator, and then remove the harness bracket bolts (A).
9. Disconnect alternator connector (1).
10. Remove "B" terminal nut (2).
11. Remove alternator assembly downward from the vehicle.



Alternator Pulley Inspection

Perform the following.

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

Alternator pulley nut:

: 118 N·m (12.0 kg·m, 87 ft·lb)

Installation

Installation is the reverse order of removal.

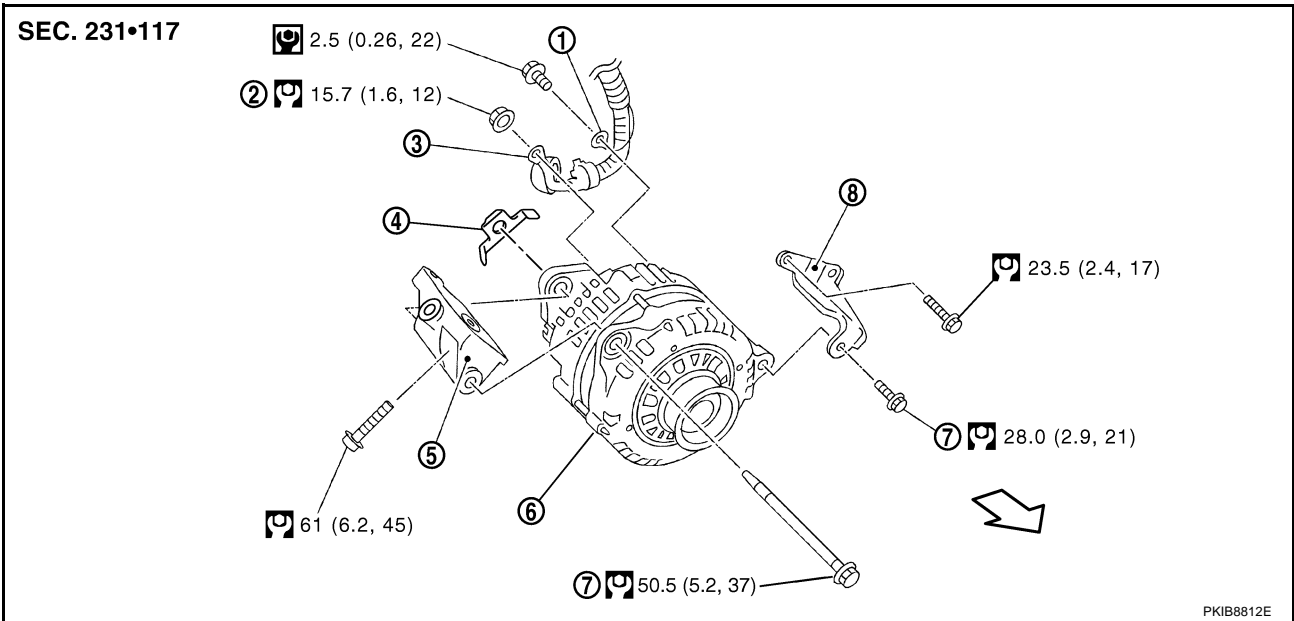
CAUTION:

Be sure to tighten "B" terminal nut carefully.

- Install alternator, and check tension of belt. Refer to [EM-15, "Checking Drive Belts"](#).
- 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 [SC-35, "Power Generation Voltage Variable Control System Operation Inspection"](#).

CHARGING SYSTEM

VK45DE ENGINE MODELS



1. Alternator ground harness
4. Alternator nut
7. Alternator mounting bolt

2. "B" terminal nut
5. Alternator bracket
8. Alternator stay

3. "B" terminal harness
6. Alternator

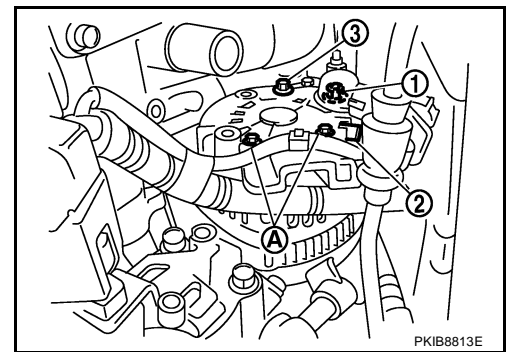
: N·m (kg-m, in-lb)

: N·m (kg-m, ft-lb)

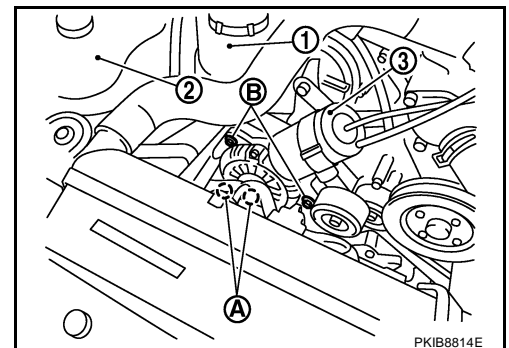
: Engine front

Removal

1. Disconnect the battery cable from the negative terminal.
2. Remove engine front undercover, using power tools.
3. Remove "B" terminal nut (1).
4. Disconnect alternator connector (2).
5. Remove alternator ground harness mounting bolt (3).
6. Remove the harness bracket bolts (A).



7. Remove air intake duct. Refer to [EM-177, "AIR CLEANER AND AIR DUCT"](#) .
8. Remove alternator, water pump and A/C compressor belt. Refer to [EM-174, "DRIVE BELTS"](#) .
9. Remove power steering oil reservoir tank (1) from the bracket, engine coolant reservoir tank (2) and vacuum tank (3).
10. Remove the harness clips (A).
11. Remove alternator mounting bolts (B), using power tools.
12. Remove alternator assembly upward.



CHARGING SYSTEM

Alternator Pulley Inspection

Perform the following.

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

Alternator pulley nut:

: 118 N·m (12.0 kg-m, 87 ft-lb)

Installation

Installation is the reverse order of removal.

CAUTION:

Be sure to tighten “B” terminal nut carefully.

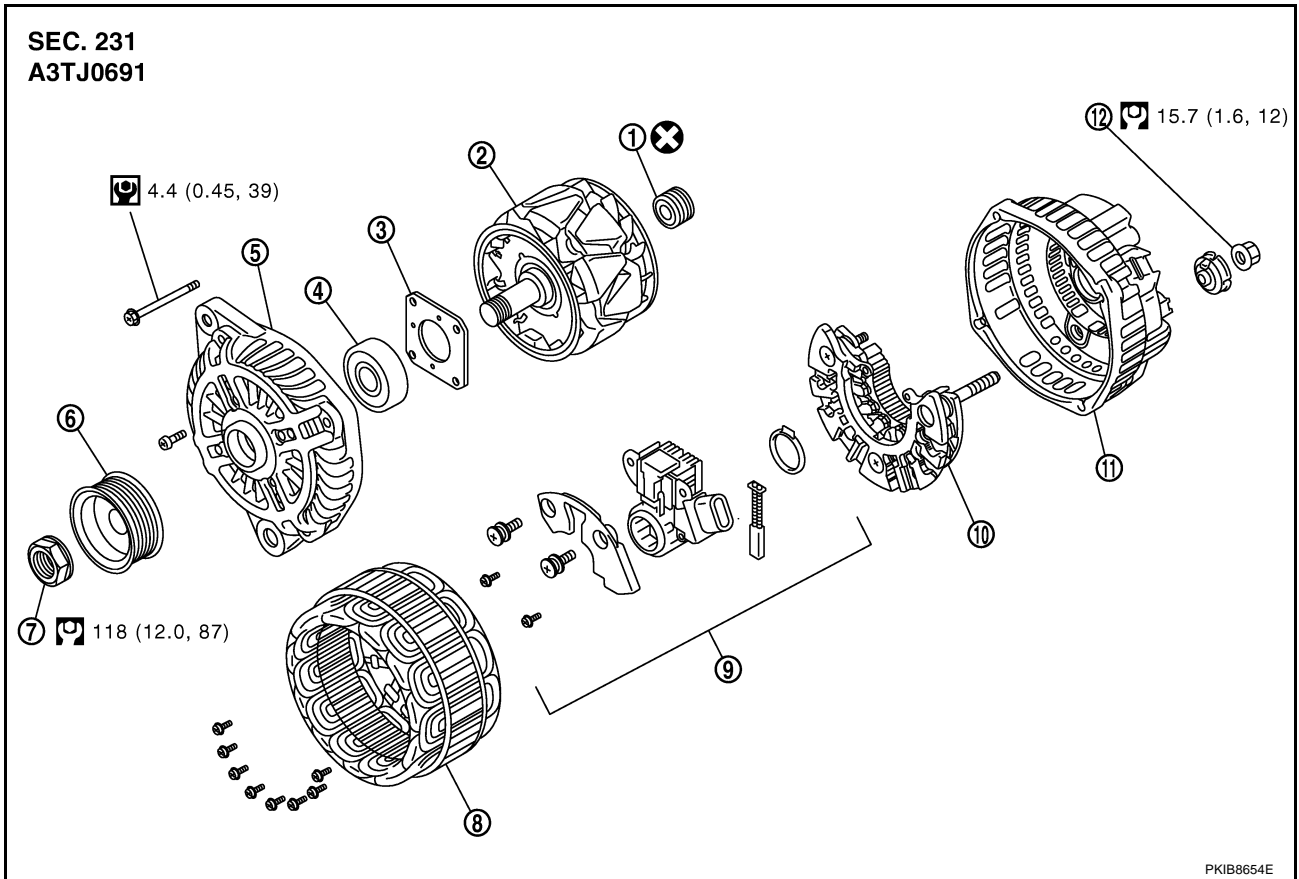
- Install alternator, and check tension of belt. Refer to [EM-174, "Checking Drive Belts"](#) .
- For this model, the power generation voltage variable control system that controls the power generation voltage of the alternator has been adopted. Therefore, the power generation voltage variable control system operation inspection should be performed after replacing the alternator, and then make sure that the system operates normally. Refer to [SC-35, "Power Generation Voltage Variable Control System Operation Inspection"](#) .

CHARGING SYSTEM

Disassembly and Assembly VQ35DE ENGINE MODELS

NKS003NS

A
B
C
D
E
F
G
H
I
J
SC
L
M



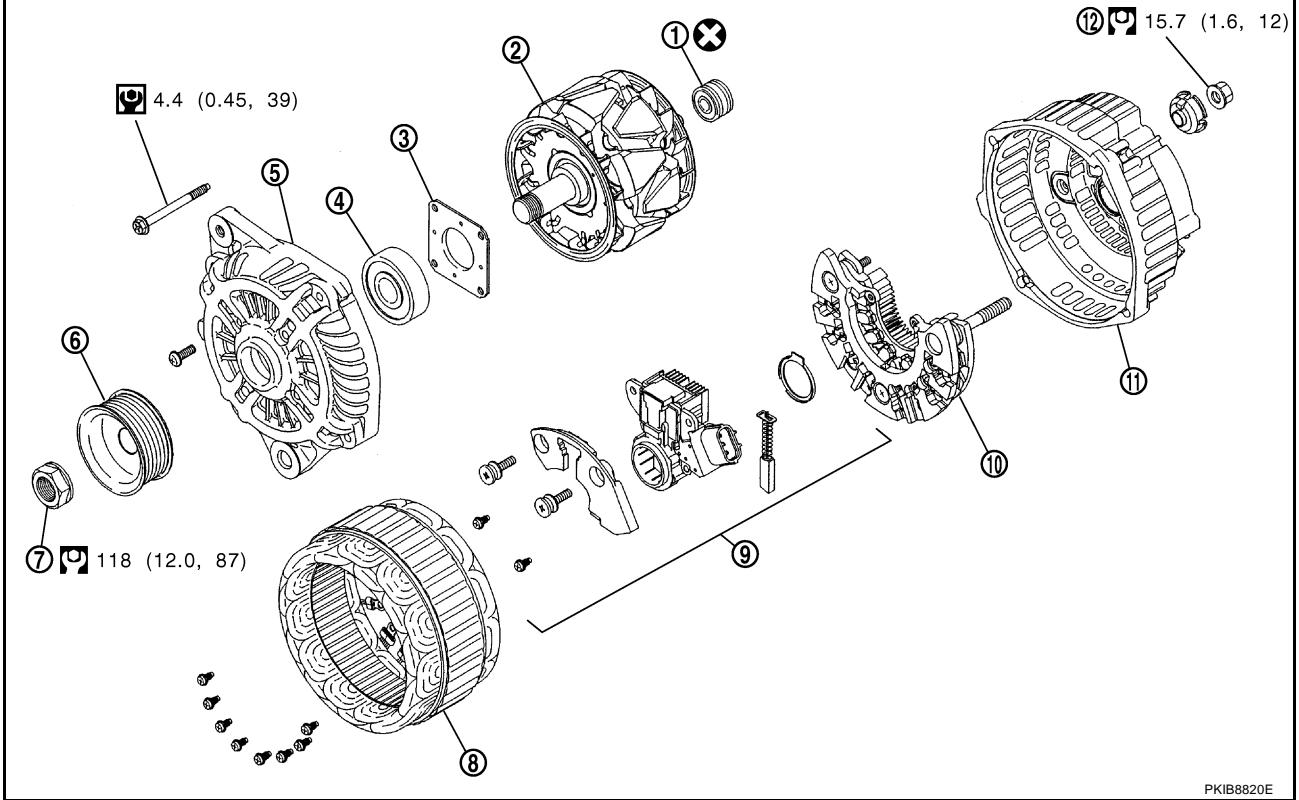
PKIB8654E

- | | | |
|---------------------|---------------------------|---|
| 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. "B" terminal nut |
| : N·m (kg·m, in·lb) | : N·m (kg·m, ft·lb) | : Always replace after every disassembly. |

CHARGING SYSTEM

VK45DE ENGINE MODELS

SEC. 231
A3TJ0591



PKIB8820E

- | | | |
|---------------------|---------------------------|---|
| 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. "B" terminal nut |
| : N·m (kg·m, in·lb) | : N·m (kg·m, ft·lb) | : Always replace after every disassembly. |

SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

PPF:00030

Battery

NKS003NT

Type		110D26L
20 hour rate capacity	[V - Ah]	12 - 75
Cold cranking current (For reference value)	[A]	720

Starter

NKS003NU

Applied model		VK45DE	VQ35DE	VQ35DE
		2WD		AWD
Type		M2T85771	S114-880	S114-881
		MITSUBISHI make	HITACHI make	
		Reduction gear type		
System voltage	[V]	12		
No-load	Terminal voltage	[V] 11		
	Current	[A] Less than 145	Less than 90	
	Revolution	[rpm] More than 3,300	More than 2,880	
Minimum diameter of commutator	[mm (in)]	31.4 (1.236)	28.0 (1.102)	
Minimum length of brush	[mm (in)]	11.0 (0.433)	10.5 (0.413)	
Brush spring tension	[N (kg, lb)]	26.7 - 36.1 (2.72 - 3.68, 6.80 - 8.12)	16.2 (1.65, 3.6)	
Clearance between bearing metal and armature shaft	[mm (in)]	Less than 0.2 (0.008)		
Clearance between pinion front edge and pinion stopper	[mm (in)]	0.5 - 2.0 (0.020 - 0.079)	0.3 - 2.5 (0.012 - 0.098)	

Alternator

NKS003NV

Applied model		VK45DE	VQ35DE
Type		A3TJ0591	A3TJ0691
		MITSUBISHI make	
Nominal rating	[V - A]	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 35/1,300 More than 105/2,500 More than 136/5,000	
Regulated output voltage	[V]	14.1 - 14.7 *	
Minimum length of brush	[mm (in)]	More than 5.00 (0.197)	
Brush spring pressure	[N (g, oz)]	4.1 - 5.3 (418 - 540, 14.8 - 19.1)	
Slip ring minimum outer diameter	[mm (in)]	More than 22.1 (0.870)	
Rotor (Field coil) resistance	[Ω]	1.6 - 2.0	

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

SERVICE DATA AND SPECIFICATIONS (SDS)
