

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

SECTION SC

STARTING & CHARGING SYSTEM

CONTENTS

PRECAUTIONS	2	VOLTAGE REFERENCING COOLANT TEMPERATURE	16
Precautions for Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER"	2	Removal and Installation	17
Wiring Diagrams and Trouble Diagnosis	2	VK45DE ENGINE MODELS	17
PREPARATION	3	VQ35DE ENGINE MODELS (2WD)	18
Special Service Tools	3	VQ35DE ENGINE MODELS (AWD)	19
Commercial Service Tools	3	Disassembly and Assembly	20
BATTERY	4	Inspection After Disassembly	22
How to Handle Battery	4	PINION/CLUTCH CHECK	22
METHODS OF PREVENTING OVER-CHARGE	4	CHARGING SYSTEM	23
CHECKING ELECTROLYTE LEVEL	5	System Description	23
SPECIFIC GRAVITY CHECK	5	Wiring Diagram — CHARGE —	24
CHARGING THE BATTERY	6	VK45DE ENGINE MODELS	24
Trouble Diagnosis with Battery/Starting/Charging		VQ35DE ENGINE MODELS	25
System Tester	6	Trouble Diagnosis with Battery/Starting/Charging System Tester	26
DIAGNOSTIC RESULT ITEM CHART	8	DIAGNOSTIC RESULT ITEM CHART	27
Removal and Installation	9	WORK FLOW	28
REMOVAL	9	DIAGNOSTIC PROCEDURE 1	29
INSTALLATION	9	DIAGNOSTIC PROCEDURE 2	30
STARTING SYSTEM	10	DIAGNOSTIC PROCEDURE 3	31
System Description	10	DIAGNOSTIC PROCEDURE 4	32
Wiring Diagram — START —	11	DIAGNOSTIC PROCEDURE 5	33
VK45DE ENGINE MODELS	11	MALFUNCTION INDICATOR	33
VQ35DE ENGINE MODELS	12	Removal and Installation	34
Trouble Diagnosis with Battery/Starting/Charging		VK45DE ENGINE MODELS	34
System Tester	13	VQ35DE ENGINE MODELS	35
DIAGNOSTIC RESULT ITEM CHART	13	Disassembly and Assembly	37
WORK FLOW	14	SERVICE DATA AND SPECIFICATIONS (SDS)	39
DIAGNOSTIC PROCEDURE 1	15	Battery	39
DIAGNOSTIC PROCEDURE 2	16	Starter	39
MINIMUM SPECIFICATION OF CRANKING		Alternator	39

PRECAUTIONS

PRECAUTIONS

PFP:00001

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

AKS00794

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.

Wiring Diagrams and Trouble Diagnosis

AKS00796

When you read wiring diagrams, refer to the following:

- Refer to [GI-15, "How to Read Wiring Diagrams"](#) in GI section.
- Refer to [PG-3, "POWER SUPPLY ROUTING CIRCUIT"](#) for power distribution circuit in PG section.

When you perform trouble diagnosis, refer to the following:

- Refer to [GI-11, "HOW TO FOLLOW TEST GROUPS IN TROUBLE DIAGNOSES"](#) in GI section.
- Refer to [GI-27, "How to Perform Efficient Diagnosis for an Electrical Incident"](#) in GI section.

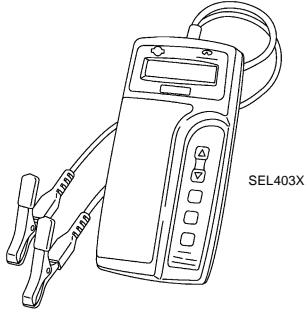
PREPARATION

PREPARATION

PFP:00002

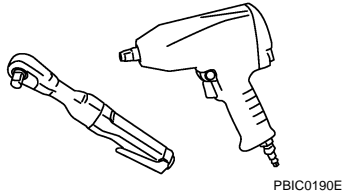
Special Service Tools

AKS00797

Tool number Tool name	Description
J-44373 Model 620 Battery/Starting/Charging system tester	

Commercial Service Tools

AKS00798

Tool number Tool name	Description
Power tool	

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

SC

BATTERY

BATTERY

PFP:AYBGL

How to Handle Battery

AKS00799

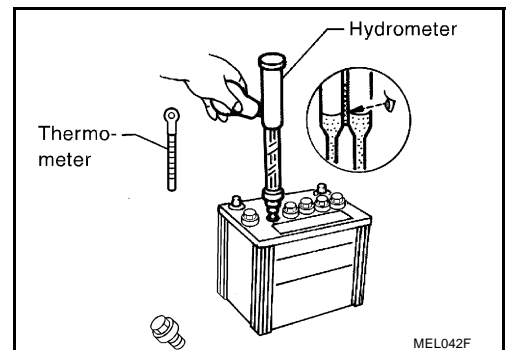
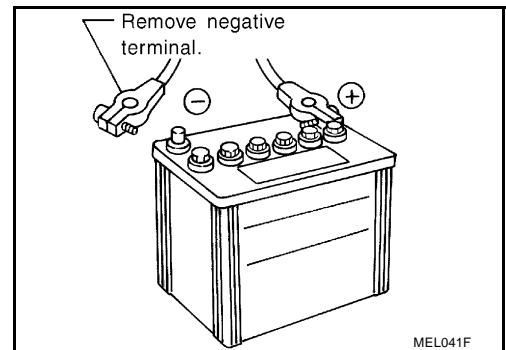
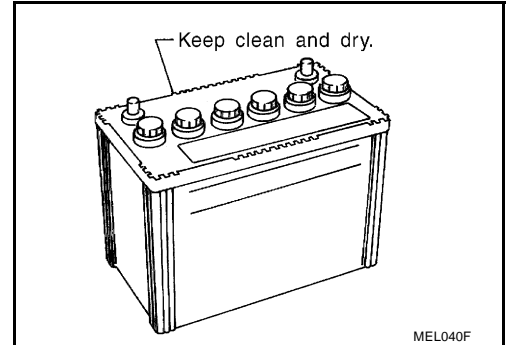
CAUTION:

- 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.

METHODS OF PREVENTING OVER-DISCHARGE

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

- The battery surface (particularly its top) should always be kept clean and dry.
- The terminal connections should be clean and tight.
- At every routine maintenance, check the electrolyte level. This also applies to batteries designated as “low maintenance” and “maintenance-free”.
- When the vehicle is not going to be used over a long period of time, disconnect the negative battery cable.
- 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.



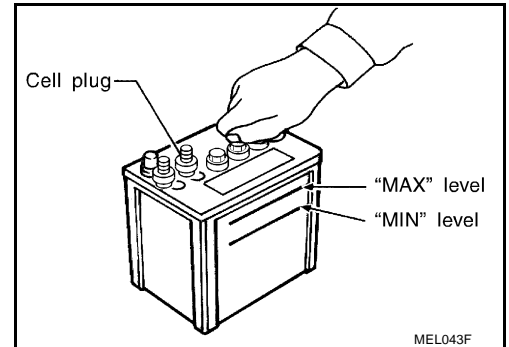
BATTERY

CHECKING ELECTROLYTE LEVEL

WARNING:

Do not allow battery fluid to come in contact with skin, eyes, fabrics, or painted surfaces. After touching a battery, do not touch or rub your eyes until you have thoroughly washed your hands. If acid contacts eyes, skin or clothing, immediately flush with water for 15 minutes and seek medical attention.

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

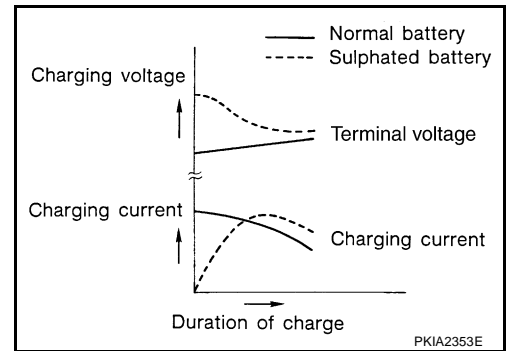


Sulphation

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.

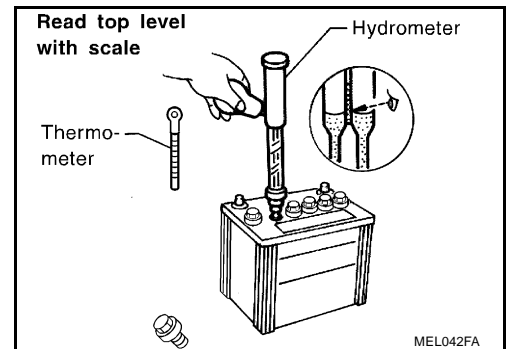
To determine if a battery has been “sulphated”, note its voltage and current when charging it. As shown in the figure, less current and higher voltage are observed in the initial stage of charging sulphated batteries.

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.



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

BATTERY

Battery electrolyte temperature °C (°F)	Add to specific gravity reading
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:

- Do not “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. Do not 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

Amp	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.

- 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

AKS0079A

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.

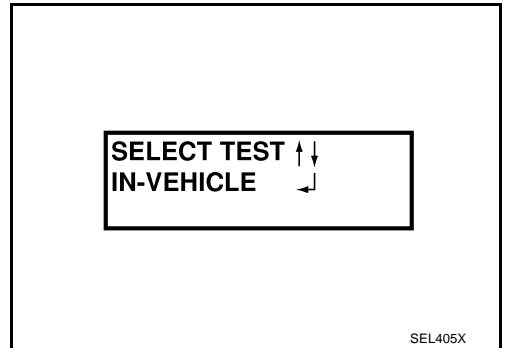
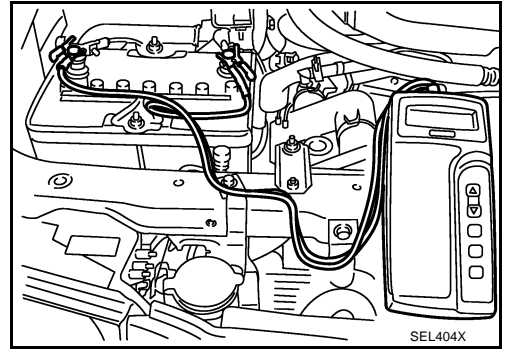
BATTERY

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 post and 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.



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

NOTE:

The battery type and rating will have either of the following.

CCA: Cold Cranking Amps (490 CCA, 550 CCA, etc.)

JIS: Japanese Industrial Standard.

Battery is stamped with a number such as:

80D26L: 80 (rank of output), D (physical size-depth), 26 (width in cm). The last character L (post configuration) is not input into the tester.

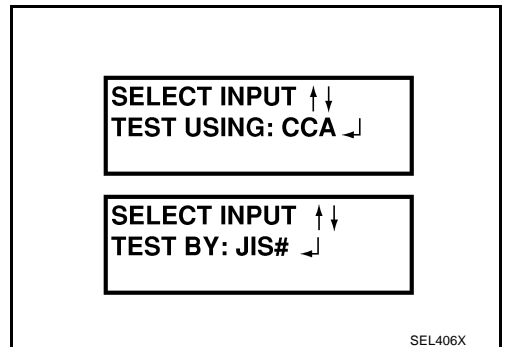
The tester requires the rating for the battery be entered exactly as it is written or stamped on the battery. Do not attempt a CCA conversion for JIS stamped batteries. JIS must be input directly.

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. Only use CCA or JIS.

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



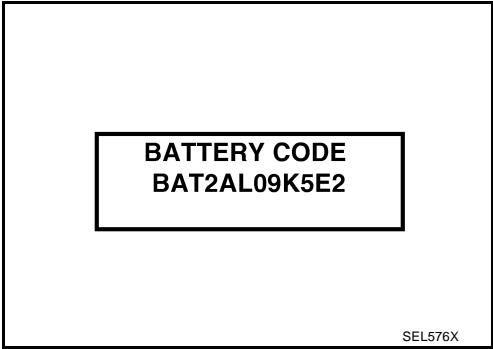
A
B
C
D
E
F
G
H
I
J
SC
L
M

BATTERY

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 CHARGE".
- 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

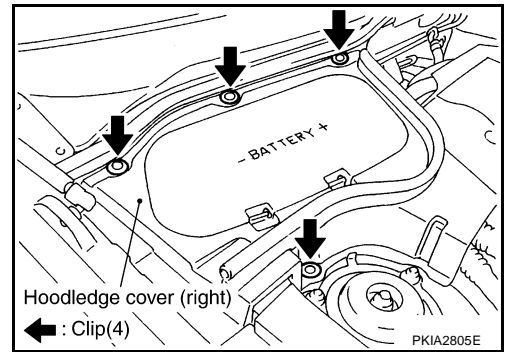
Diagnostic item	Service procedure
GOOD BATTERY	Battery is OK, go to "Trouble Diagnosis", "STARTING SYSTEM". Refer to SC-13. "Trouble Diagnosis with Battery/Starting/Charging System Tester" .
REPLACE BATTERY	Replace battery. Before replacing battery, clean the battery cable clamps and battery posts. Perform 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 10A for 12 hours.)
CHARGE & RETEST	Perform the slow battery charging. (Initial rate of charge is 10A 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

Removal and Installation

REMOVAL

1. Remove hoodledge cover (right).

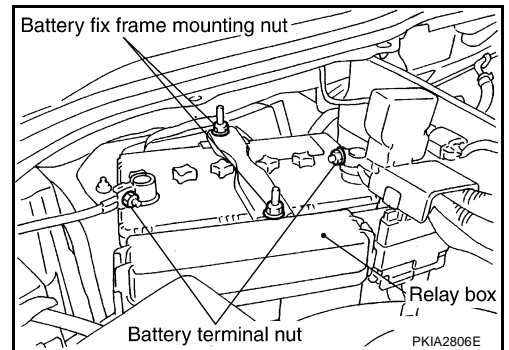


2. Disconnect negative battery cable and positive battery cable.

CAUTION:

When disconnecting, disconnect negative battery cable first.

3. Remove battery fix frame mounting nuts and battery fix frame.
4. Remove relay box from bracket.
5. Remove battery.



INSTALLATION

Install in the reverse order of removal.

CAUTION:

When connecting, connect positive battery cable first.

Battery fix frame mounting nut

: 3.9 N·m (0.4 kg-m, 35 in-lb)

Battery terminal nut

: 5.4 N·m (0.55 kg-m, 48 in-lb)

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

STARTING SYSTEM

PFP:23300

System Description

AKS0079C

Power is supplied at all times:

- through 40A fusible link (letter F, located in the fuse and fusible link box)
- to ignition switch terminal 1
- through 15A fuse (No. 78, located in the IPDM E/R)
- to CPU of IPDM E/R
- through 10A fuse (No. 71, located in the IPDM E/R)
- to CPU of IPDM E/R.

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.

Ground is supplied:

- to IPDM E/R terminals 38, 50 and 60
- from body grounds E21, E50 and E51.

With the ignition switch in the START position, and provided that the IPDM E/R receives a starter relay ON signal from the CAN lines, the IPDM E/R is energized and power is supplied:

- from ignition switch terminal 5
- to IPDM E/R terminal 4 and
- 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

AKS0079D

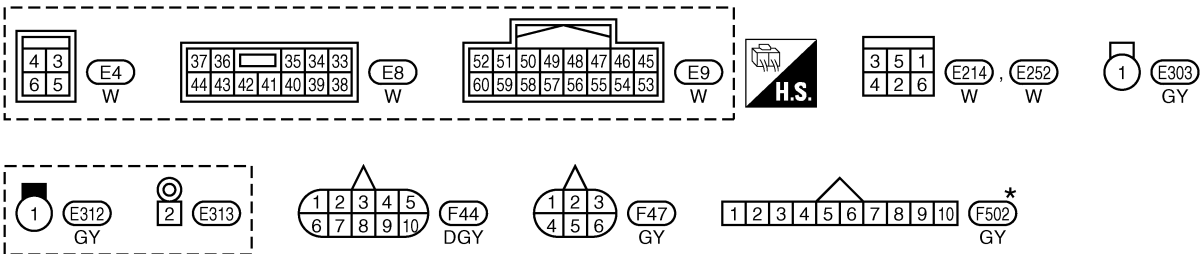
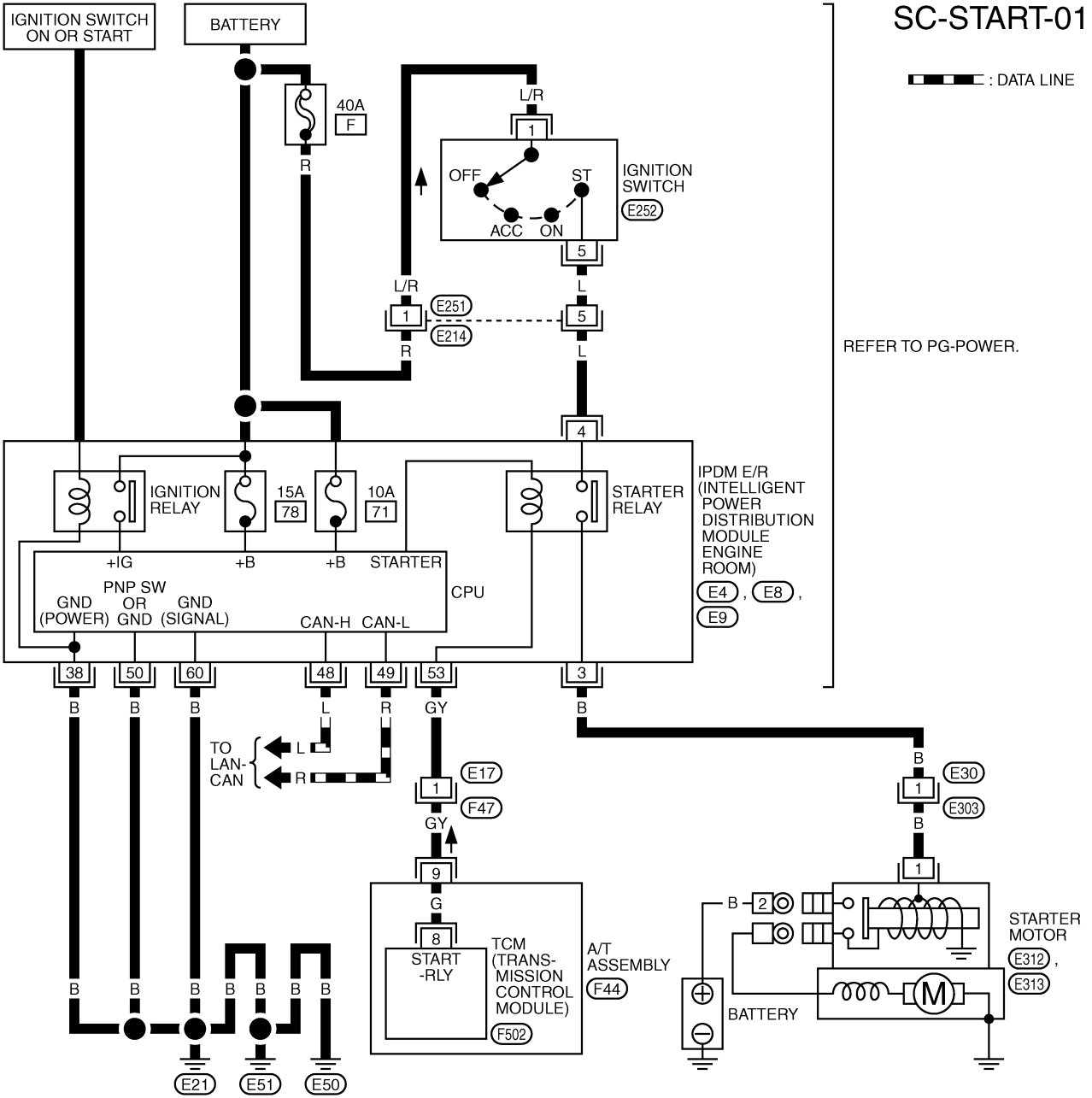
Wiring Diagram — START — VK45DE ENGINE MODELS

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

SC-START-01

▬ : DATA LINE

REFER TO PG-POWER.



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

TKWM1275E

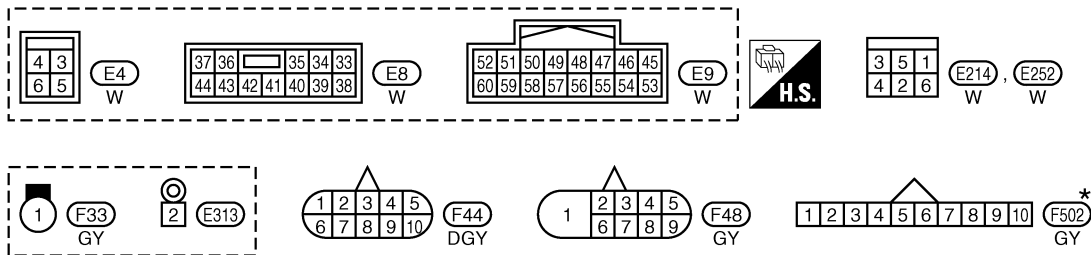
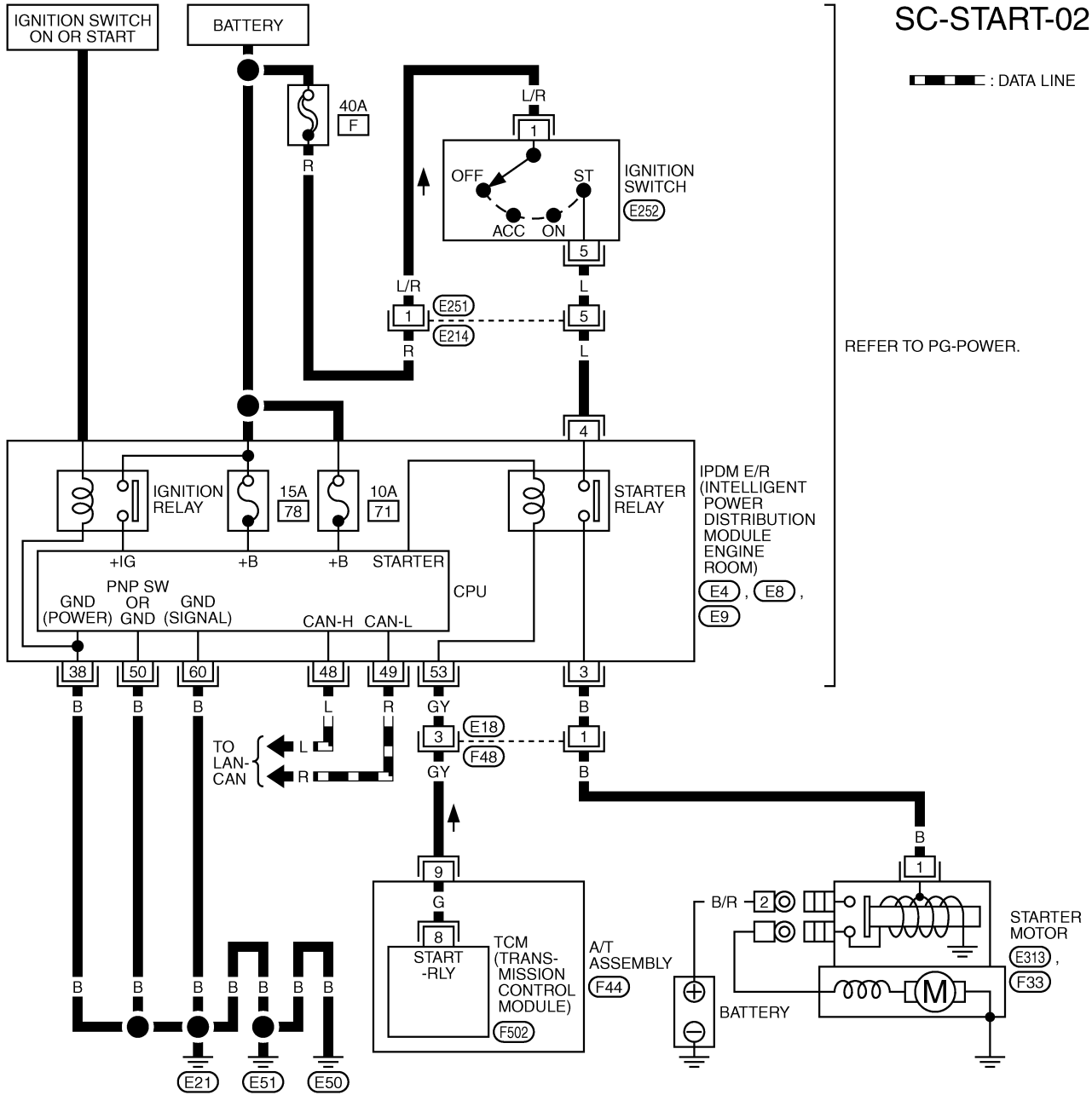
STARTING SYSTEM

VQ35DE ENGINE MODELS

SC-START-02

▬ : DATA LINE

REFER TO PG-POWER.



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

TKWM1276E

STARTING SYSTEM

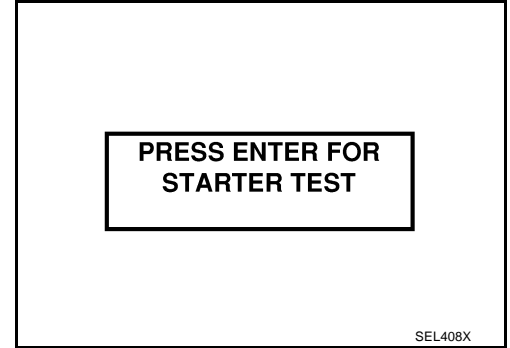
Trouble Diagnosis with Battery/Starting/Charging System Tester

AKS0079E

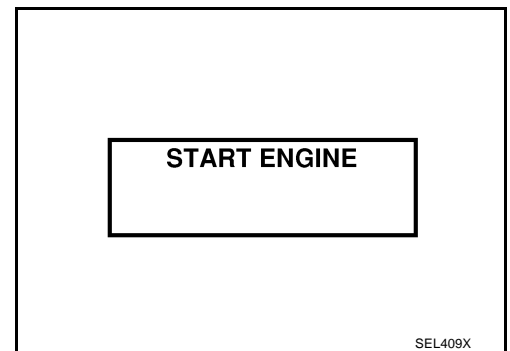
NOTE:

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-6, "Trouble Diagnosis with Battery/Starting/Charging System Tester"](#).
3. Press "ENTER" to begin the starting system test.



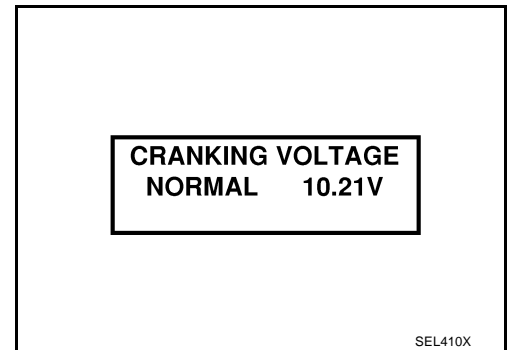
4. Start the engine.



5. Diagnosis 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, refer to [SC-16, "DIAGNOSTIC PROCEDURE 2"](#).

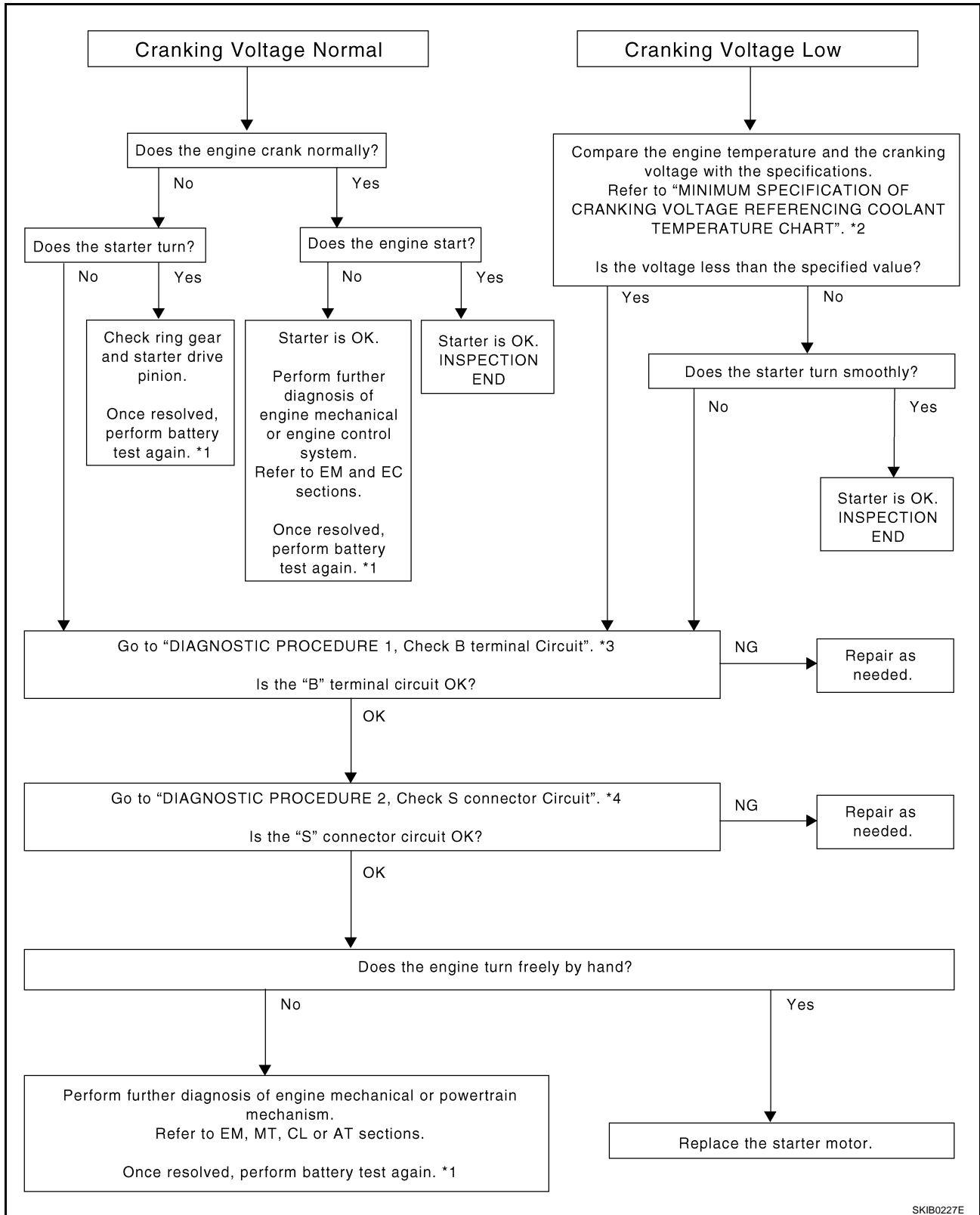


DIAGNOSTIC RESULT ITEM CHART

Diagnostic item	Service procedure
CRANKING VOLTAGE NORMAL	Go to SC-14, "WORK FLOW" .
CRANKING VOLTAGE LOW	Go to SC-14, "WORK FLOW" .
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-6, "Trouble Diagnosis with Battery/Starting/Charging System Tester" .
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-6, "Trouble Diagnosis with Battery/Starting/Charging System Tester" . If second test result is "REPLACE BATTERY", then do so. Perform battery test again to confirm repair.

STARTING SYSTEM

WORK FLOW



SKIB0227E

*1 [SC-6. "Trouble Diagnosis with Battery/Starting/Charging System Tester".](#)

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

*3 [SC-15. "DIAGNOSTIC PROCEDURE 1".](#)

*4 [SC-16. "DIAGNOSTIC PROCEDURE 2".](#)

STARTING SYSTEM

DIAGNOSTIC PROCEDURE 1

Check "B" Terminal Circuit

1. CHECK POWER SUPPLY FOR STARTER MOTOR "B" TERMINAL

1. Remove fuel pump fuse.
2. Crank or start the engine (where possible) until the fuel pressure is released.
3. Turn ignition switch OFF.
4. Make sure that the starter motor B terminal E313 terminal 2 (B)^{*1} or (B/R)^{*2} connection is clean and tight.
5. Check voltage between starter motor B terminal E313 terminal 2 (B)^{*1} or (B/R)^{*2} and ground using a digital circuit tester.

Battery voltage should exist.

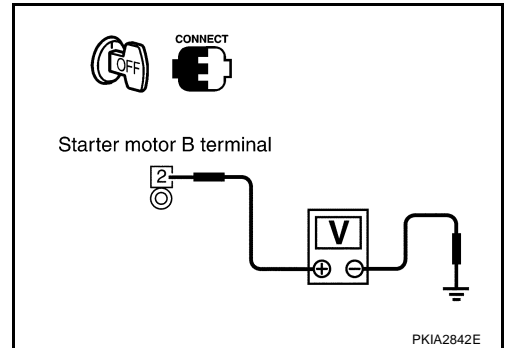
NOTE:

*1: VK45DE, *2: VQ35DE

OK or NG

OK >> GO TO 2.

NG >> Check harness between the battery and the starter motor for open circuit.



2. CHECK BATTERY HARNESS CONNECTION (VOLTAGE DROP TEST)

Check voltage between starter motor B terminal E313 terminal 2 (B)^{*1} or (B/R)^{*2} and battery positive terminal using a digital circuit tester.

**When the ignition switch is in START position,
Voltage: Less than 0.5V**

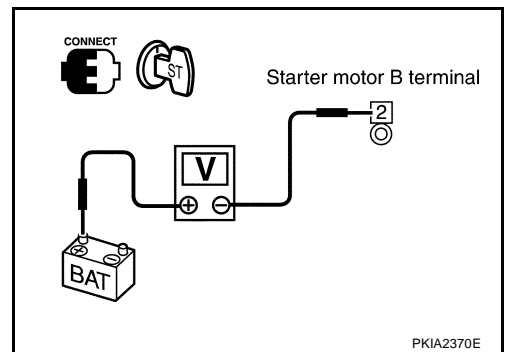
NOTE:

*1: VK45DE, *2: VQ35DE

OK or NG

OK >> GO TO 3.

NG >> Check harness between the battery and the starter motor for poor continuity.



3. CHECK STARTER MOTOR GROUND CIRCUIT (VOLTAGE DROP TEST)

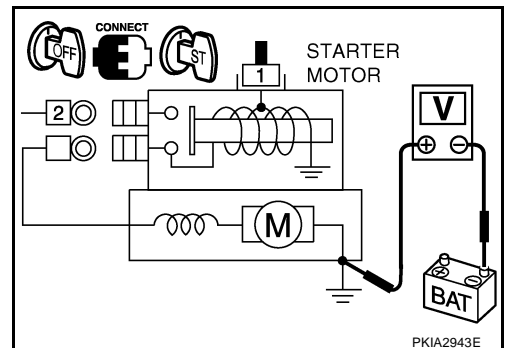
1. Turn ignition switch OFF.
2. Check voltage between starter motor case and battery negative terminal using a digital circuit tester.

**When the ignition switch is in START position,
Voltage: Less than 0.2V**

OK or NG

OK >> Starter motor "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

1. CHECK POWER SUPPLY FOR STARTER MOTOR "S" CONNECTOR

1. Remove fuel pump fuse.
2. Crank or start the engine (where possible) until the fuel pressure is released.
3. Turn ignition switch OFF.
4. Disconnect starter motor S connector.
5. Check voltage between starter motor harness connector E312*¹ or F33*² terminal 1 (B) and ground using a digital circuit tester.

When the ignition switch is in START position, Battery voltage should exist.

NOTE:

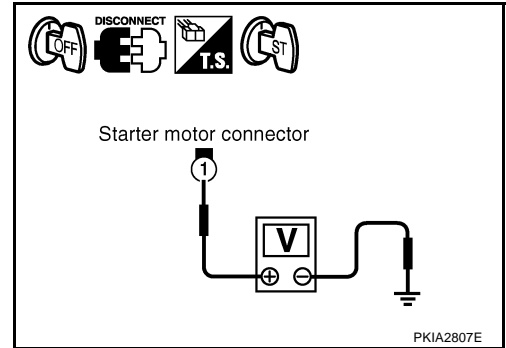
*1: VK45DE, *2: VQ35DE

OK or NG

OK >> GO TO 2.

NG >> Check the following.

- 40A fusible link (letter F , located in fuse and fusible link box)
- Ignition switch
- Starter relay [within the IPDM E/R (intelligent power distribution module engine room)].
- Harness for open or short



2. CHECK "S" TERMINAL CONNECTION (VOLTAGE DROP TEST)

1. Turn ignition switch OFF.
2. Connect starter motor S connector.
3. Check voltage between starter motor harness connector E312*¹ or F33*² terminal 1 (B) and battery positive terminal using a digital circuit tester.

When the ignition switch is in START position, Voltage: Less than 1V

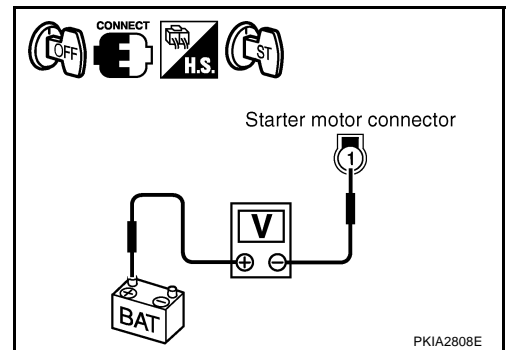
NOTE:

*1: VK45DE, *2: VQ35DE

OK or NG

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

NG >> Check harness between the battery and the starter motor "S" connector for poor continuity.



MINIMUM SPECIFICATION OF CRANKING VOLTAGE REFERENCING COOLANT TEMPERATURE

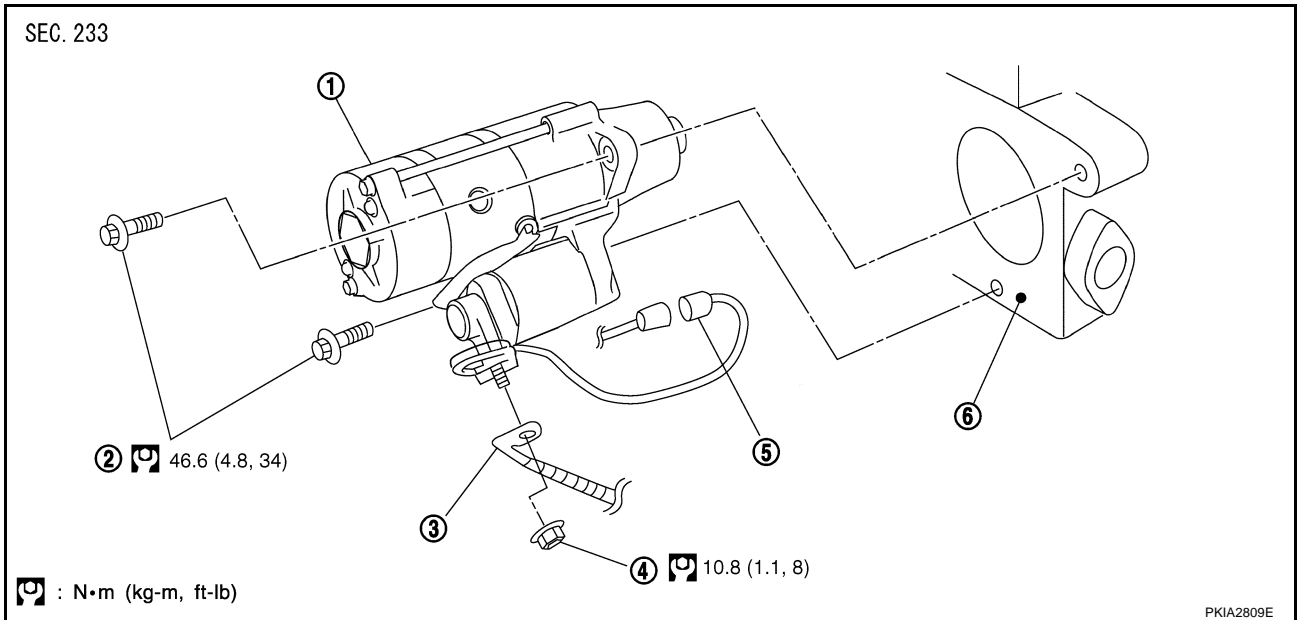
Engine coolant temperature	Voltage V
-30°C to -20°C (-22°F to -4°F)	8.4
-19°C to -10°C (-2°F to 14°F)	8.9
-9°C to 0°C (16°F to 32°F)	9.3
More than 1°C (More than 34°F)	9.7

STARTING SYSTEM

Removal and Installation VK45DE ENGINE MODELS

AKS00BQ1

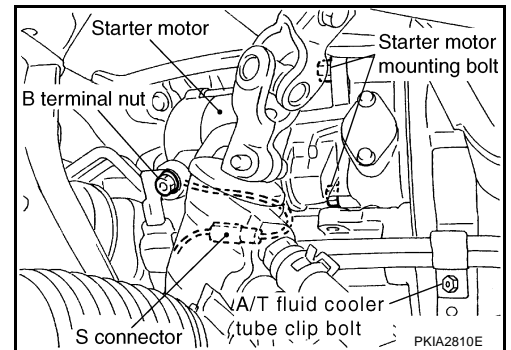
A
B
C
D
E
F
G
H
I
J
SC
L
M



- | | | |
|-------------------|--------------------------------|-----------------------|
| 1. Starter motor | 2. Starter motor mounting bolt | 3. B terminal harness |
| 4. B terminal nut | 5. S connector | 6. Cylinder block |

Removal

1. Disconnect negative battery cable.
2. Remove engine front and rear undercover, using power tools.
3. Disconnect S connector.
4. Remove B terminal nut.
5. Remove starter motor mounting bolts.
6. Loosen A/T fluid cooler tube clip bolts. Refer to [AT-266](#), "[TRANSMISSION ASSEMBLY](#)" in "AUTOMATIC TRANSMISSION (A/T)" section.
7. Remove starter motor to the direction of under side the vehicle.



Installation

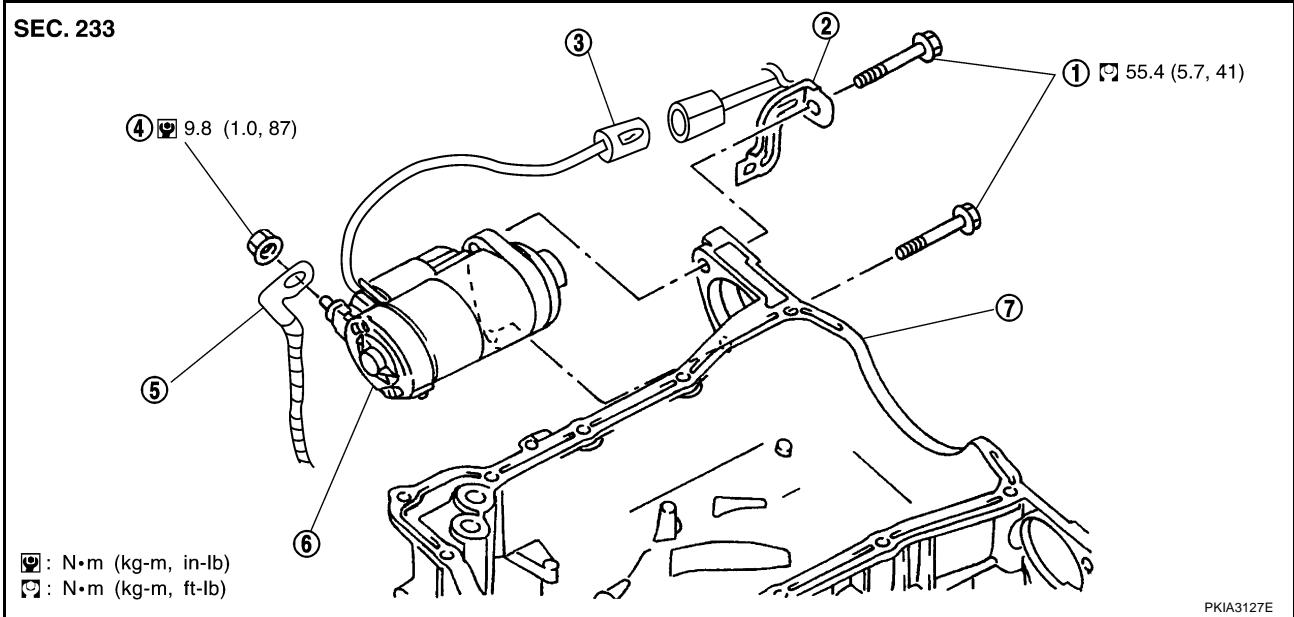
Install in the reverse order of removal.

CAUTION:
Be sure to tighten B terminal nut carefully.

STARTING SYSTEM

VQ35DE ENGINE MODELS (2WD)

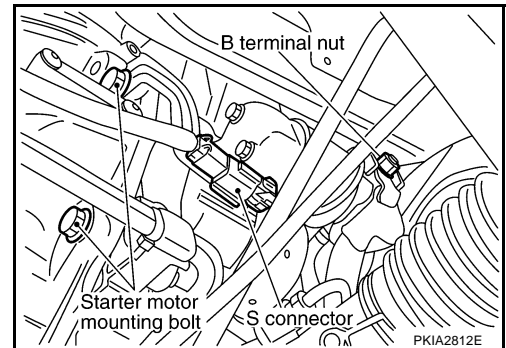
SEC. 233



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

Removal

1. Disconnect negative battery cable.
2. Remove engine rear undercover, using power tools.
3. Disconnect S connector.
4. Remove B terminal nut.
5. Remove starter motor mounting bolts and harness clip bracket, using power tools.
6. Remove starter motor to the direction of under side the vehicle.



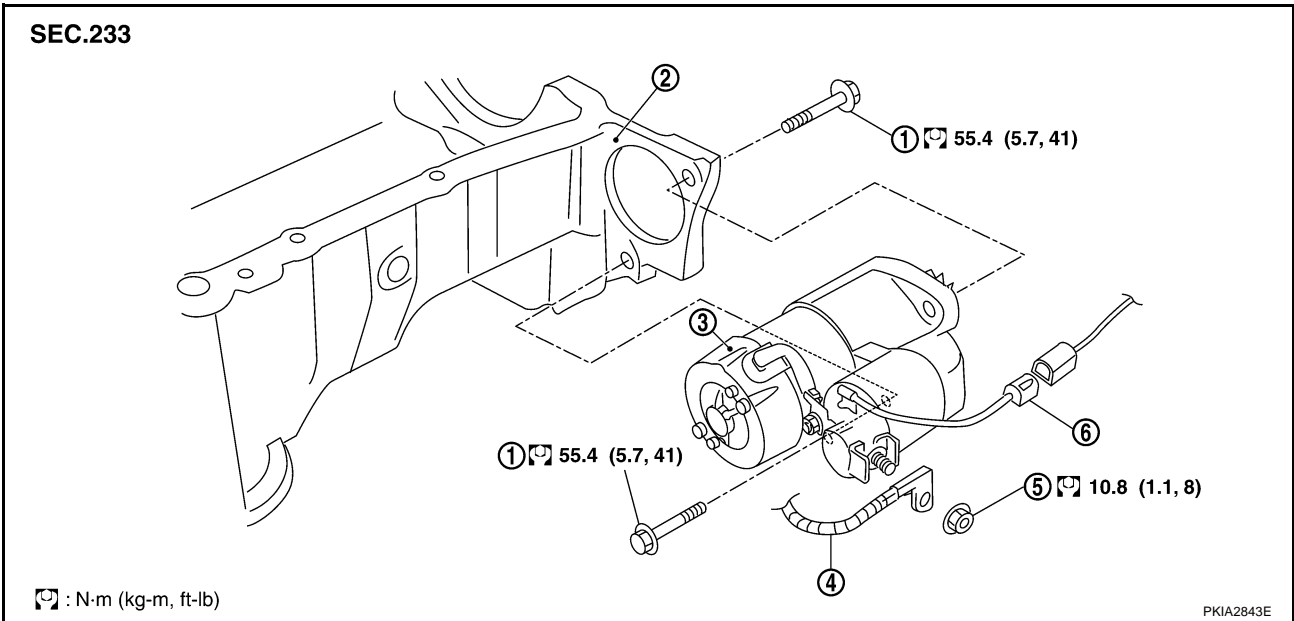
Installation

Install in the reverse order of removal.

CAUTION:
Be sure to tighten B terminal nut carefully.

STARTING SYSTEM

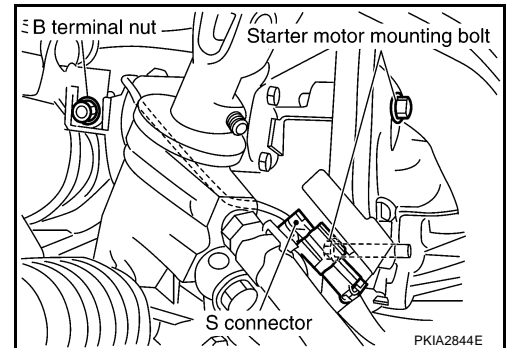
VQ35DE ENGINE MODELS (AWD)



- | | | |
|--------------------------------|-------------------|------------------|
| 1. Starter motor mounting bolt | 2. Oil pan | 3. Starter motor |
| 4. B terminal harness | 5. B terminal nut | 6. S connector |

Removal

1. Disconnect negative battery cable.
2. Remove engine front and rear undercover, using power tools.
3. Disconnect S connector.
4. Remove B terminal nut.
5. Remove starter motor mounting bolts.
6. Remove starter motor to the direction of under side the vehicle.



Installation

Install in the reverse order of removal.

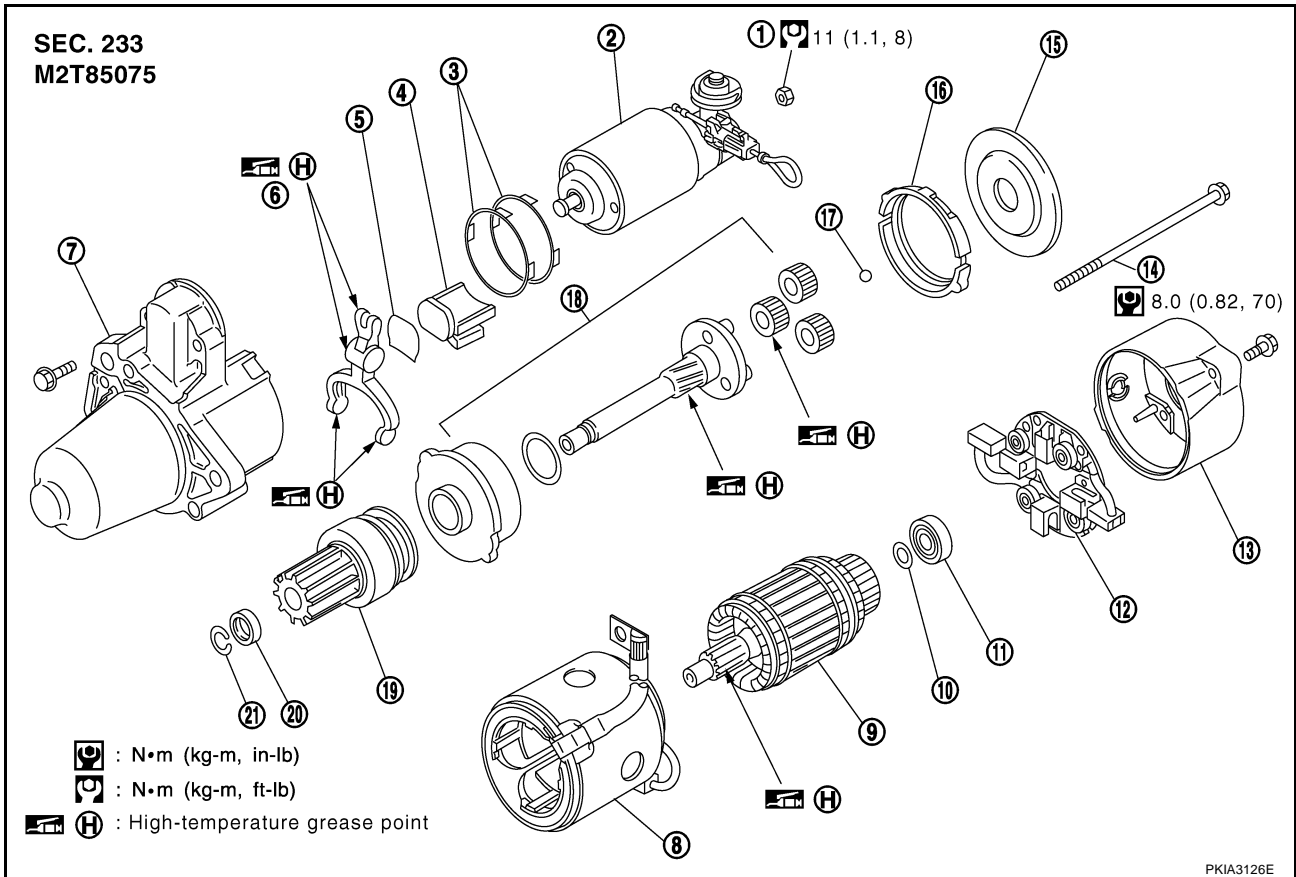
CAUTION:

Be sure to tighten B terminal nut carefully.

STARTING SYSTEM

Disassembly and Assembly

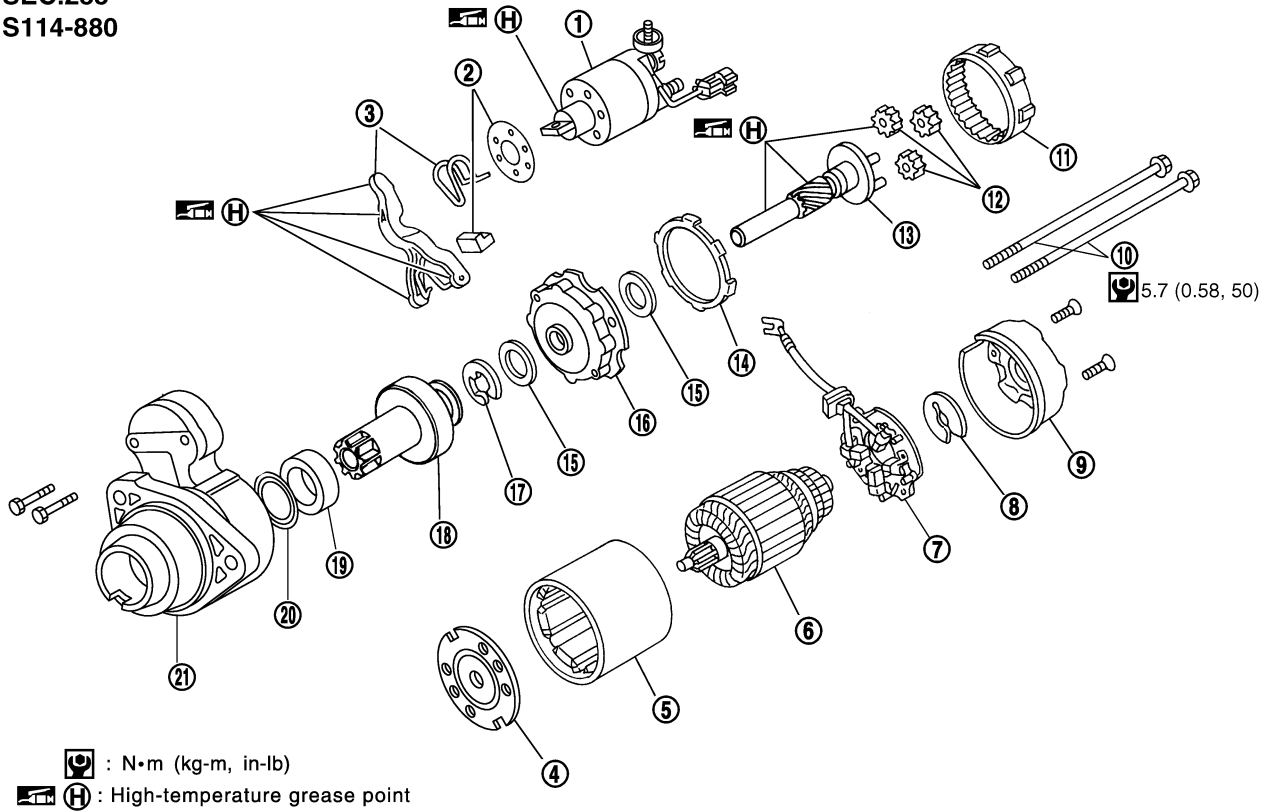
AKS0079R



- | | | |
|---------------------------|-----------------------------|---------------------------|
| 1. Nut | 2. Magnetic switch assembly | 3. Adjusting plate |
| 4. Packing | 5. Plate | 6. Shift lever |
| 7. Front bracket assembly | 8. Yoke assembly | 9. Armature assembly |
| 10. Washer | 11. Rear bearing | 12. Brush holder assembly |
| 13. Rear bracket assembly | 14. Through-bolt | 15. Cover |
| 16. Packing | 17. Ball | 18. Shaft gear assembly |
| 19. Clutch gear assembly | 20. Pinion stopper | 21. Stopper clip |

STARTING SYSTEM

SEC.233
S114-880

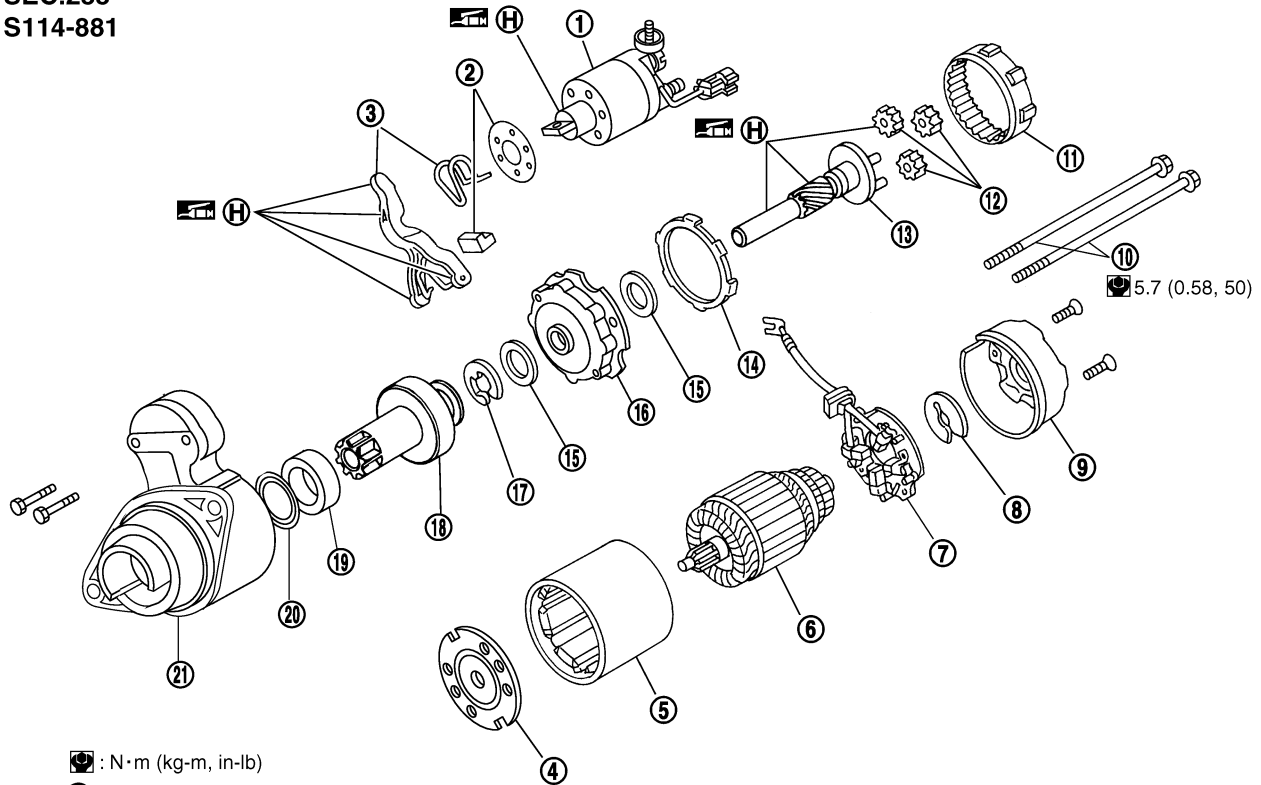


- | | | |
|-----------------------------|-------------------|------------------------|
| 1. Magnetic switch assembly | 2. Dust cover kit | 3. Shift lever set |
| 4. Center bracket (A) | 5. Yoke assembly | 6. Armature assembly |
| 7. Brush holder assembly | 8. Thrust washer | 9. Rear cover assembly |
| 10. Through-bolt | 11. Internal gear | 12. Planetary gear |
| 13. Pinion shaft | 14. Packing | 15. Thrust washer |
| 16. Center bracket (P) | 17. E-ring | 18. Pinion assembly |
| 19. Ball bearing | 20. Caul | 21. Gear case assembly |

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

STARTING SYSTEM

SEC.233
S114-881



: N·m (kg-m, in-lb)

(H) : High-temperature grease point

PKIA2845E

- | | | |
|-----------------------------|-------------------|------------------------|
| 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. Through-bolt | 11. Internal gear | 12. Planetary gear |
| 13. Pinion shaft | 14. Packing | 15. Thrust washer |
| 16. Center bracket (P) | 17. E-ring | 18. Pinion assembly |
| 19. Ball bearing | 20. Caul | 21. Gear case assembly |

Inspection After Disassembly PINION/CLUTCH CHECK

AKS0079H

1. Inspect pinion teeth.
 - Replace pinion if teeth are worn or damaged. (Also check condition of ring gear teeth.)
2. Inspect reduction gear teeth.
 - Replace reduction gear if teeth are worn or damaged. (Also check condition of armature shaft gear teeth.)
3. 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:23100

System Description

AKS0079I

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. 33, located in the fuse and fusible link box)
- to alternator terminal 4 (S).

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

The charging circuit is protected by the 120A fusible link (VK45DE and VQ35DE AWD).

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 7 for the charge warning lamp.

Ground is supplied:

- to combination meter terminal 2
- through alternator terminal 3 (L)
- to alternator terminal E (VK45DE) or through body ground (VQ35DE)
- through body ground E304 (VK45DE).

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

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

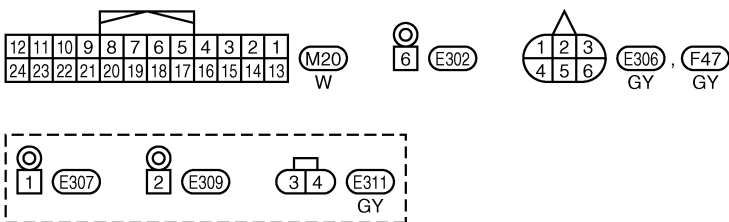
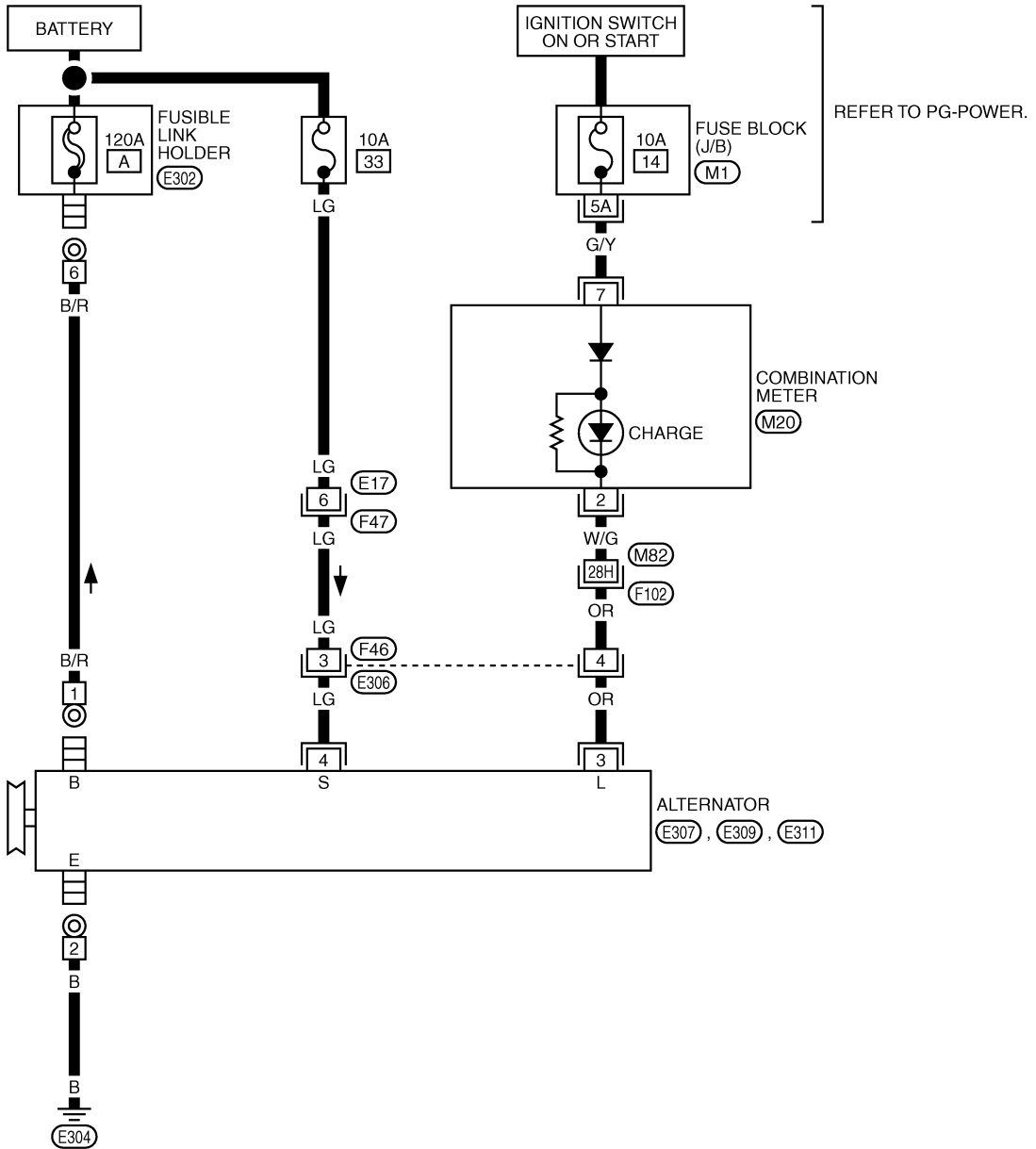
A
B
C
D
E
F
G
H
I
J
SC
L
M

CHARGING SYSTEM

AKS0079J

Wiring Diagram — CHARGE — VK45DE ENGINE MODELS

SC-CHARGE-01



REFER TO THE FOLLOWING.

(F102) -SUPER MULTIPLE
JUNCTION (SMJ)

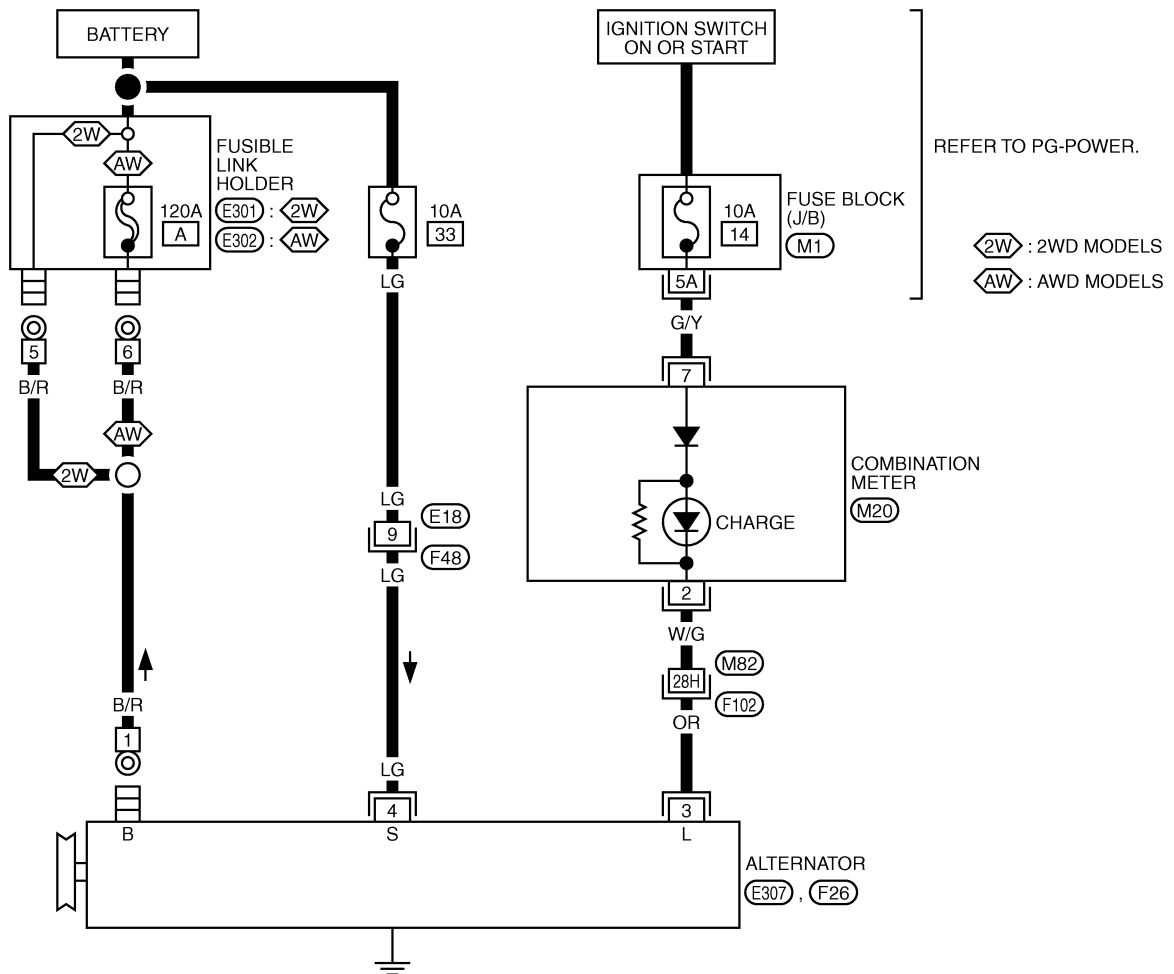
(M1) -FUSE BLOCK-JUNCTION
BOX (J/B)

TKWM0550E

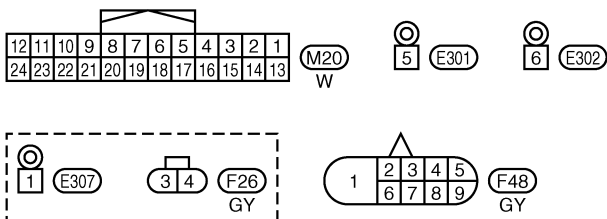
CHARGING SYSTEM

VQ35DE ENGINE MODELS

SC-CHARGE-02



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



REFER TO THE FOLLOWING.
 (F102) -SUPER MULTIPLE JUNCTION (SMJ)
 (M1) -FUSE BLOCK-JUNCTION BOX (J/B)

TKWM0551E

CHARGING SYSTEM

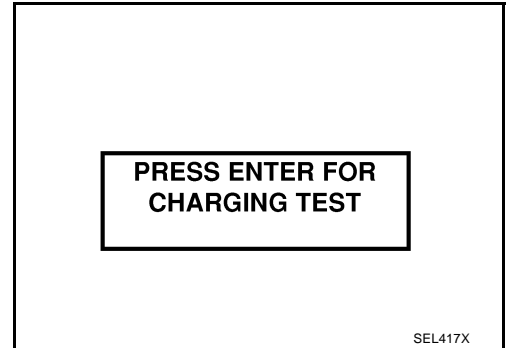
Trouble Diagnosis with Battery/Starting/Charging System Tester

AKS0079K

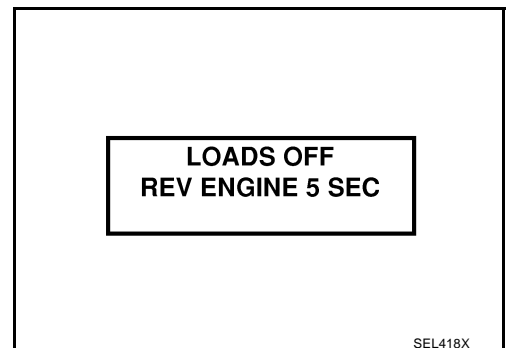
NOTE:

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 and starting system test with Battery/Starting/Charging system tester.
3. Press "ENTER" to begin the charging system test.
4. Start engine.



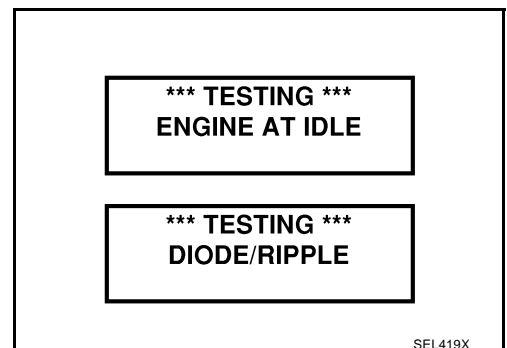
5. Press "ENTER" until "LOADS OFF REV ENGINE 5 SEC" is displayed.
6. Raise and hold the engine speed at 1,500 to 2,000 rpm for about 5 seconds, then return the engine to idle. Once the increase in engine rpm is detected, press "ENTER" to continue.



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.

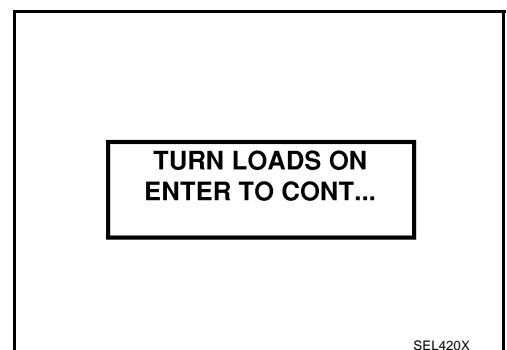
7. The tester now checks the engine at idle and performs the DIODE/RIPPLE check.
8. When complete, the tester will prompt you to turn on the following electrical loads.
 - Heater fan set to highest speed. Do not run the A/C or windshield defroster.
 - Headlamp high beam
 - Rear window defogger



NOTE:

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

9. Press "ENTER" to continue.

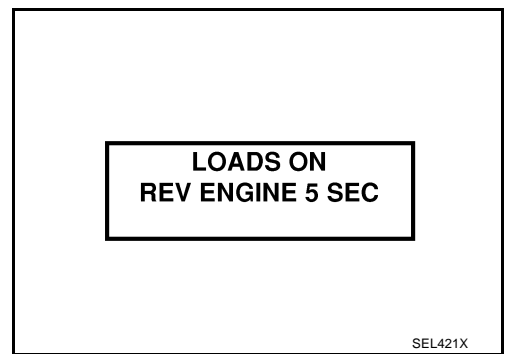


CHARGING SYSTEM

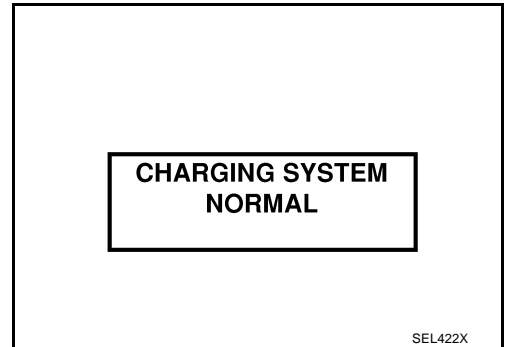
10. Raise and hold the engine speed at 1,500 to 2,000 rpm for about 5 seconds, then return the engine to idle. Once the increase in engine rpm is detected, press "ENTER" to continue.

NOTE:

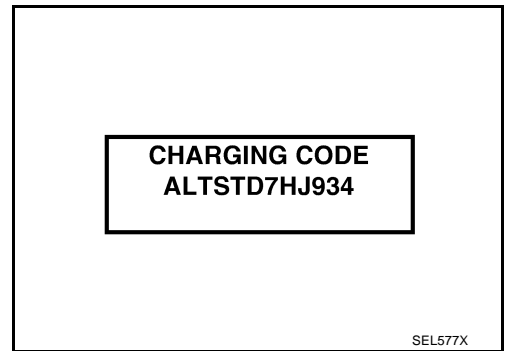
If after 30 seconds an increase in engine idle speed is not detected, "RPM NOT DETECTED" will be displayed. Press "ENTER" to restart the test.



11. Diagnostic result is displayed on the tester. Refer to [SC-27](#), "[DIAGNOSTIC RESULT ITEM CHART](#)".



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

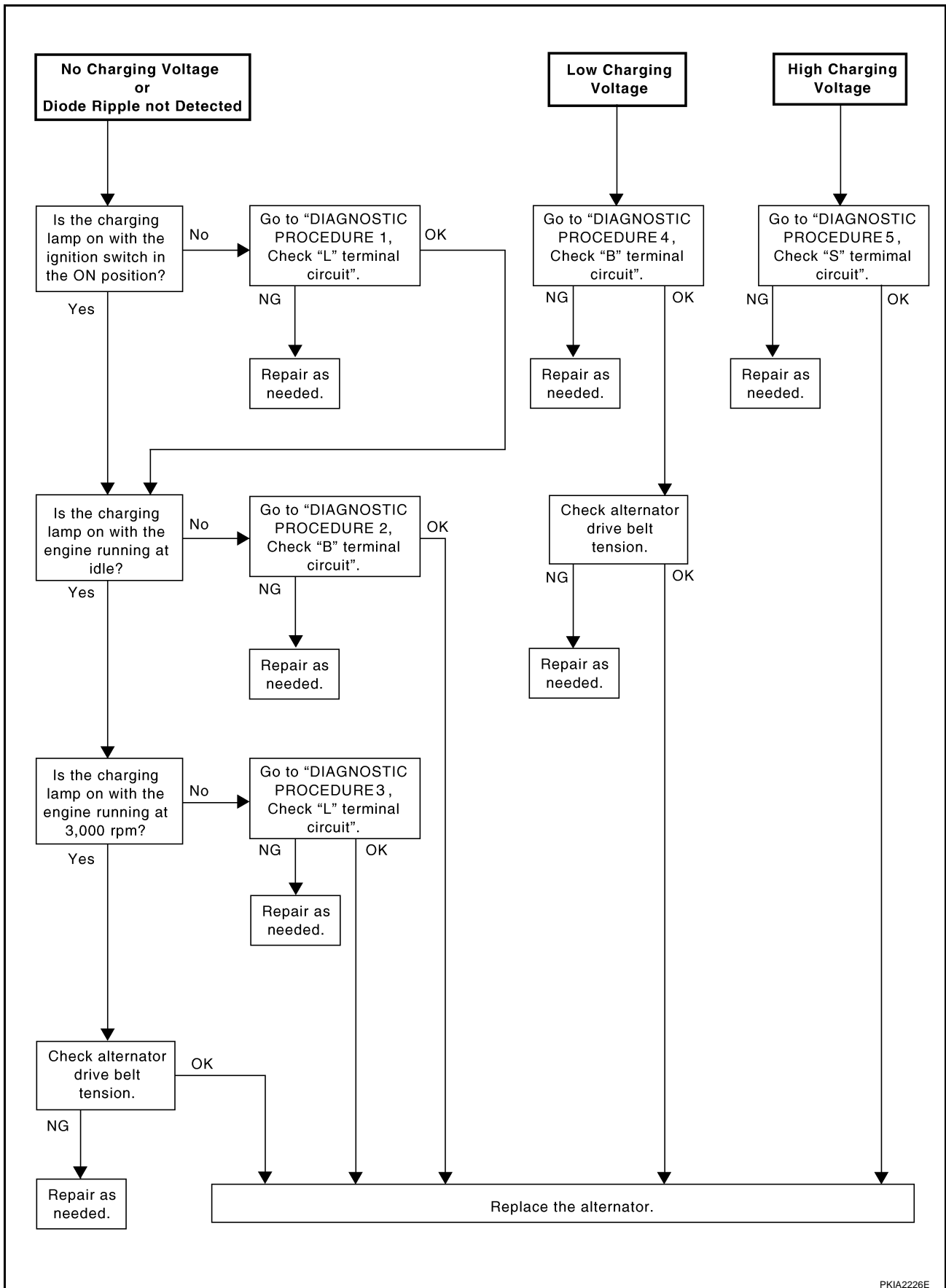


DIAGNOSTIC RESULT ITEM CHART

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-28 , " WORK FLOW ".
LOW CHARGING VOLTAGE	Go to SC-28 , " WORK FLOW ".
HIGH CHARGING VOLTAGE	Go to SC-28 , " WORK FLOW ".
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-28 , " WORK FLOW ".

CHARGING SYSTEM

WORK FLOW



PKIA2226E

CHARGING SYSTEM

DIAGNOSTIC PROCEDURE 1

Check "L" Terminal Circuit

1. CHECK "L" TERMINAL CONNECTION

1. Turn ignition switch OFF.
2. Check to see 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.

2. CHECK "L" TERMINAL CIRCUIT

1. Disconnect alternator connector.
2. Apply ground to alternator harness connector E311*¹ or F26*² terminal 3 (OR) with the ignition switch in the ON position.

CHARGE lamp should light up.

NOTE:

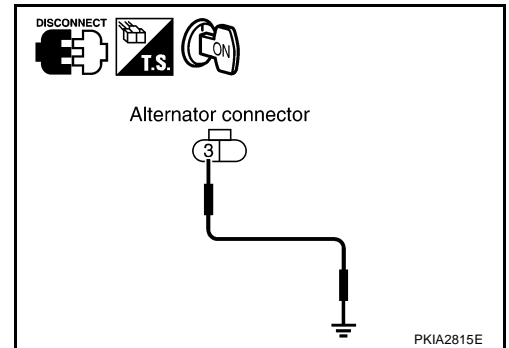
*1: VK45DE, *2: VQ35DE

OK or NG

OK >> Go to [SC-28. "WORK FLOW"](#) .

NG >> Check the following.

- 10A fuse [No. 14, located in fuse block (J/B)]
- CHARGE lamp
- Harness for open or short between combination meter and fuse
- Harness for open or short between combination meter and alternator



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

CHARGING SYSTEM

DIAGNOSTIC PROCEDURE 2

Check "B" Terminal Circuit

1. CHECK "B" TERMINAL CONNECTION

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

OK or NG

- OK >> GO TO 2. Confirm repair by performing complete Battery/Starting/Charging system test.
NG >> Repair "B" terminal connection.

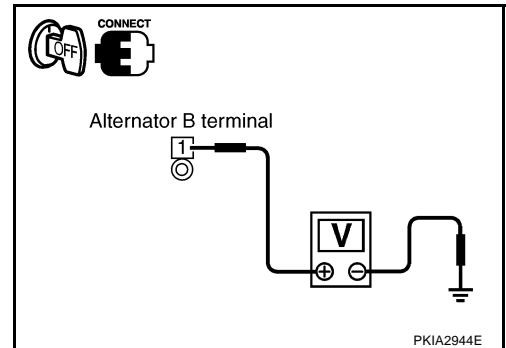
2. CHECK ALTERNATOR "B" TERMINAL CIRCUIT

Check voltage between alternator B terminal E307 terminal 1 (B/R) and ground using a digital circuit tester.

Battery voltage should exist.

OK or NG

- OK >> GO TO 3.
NG >> Check the following.
- 120A fusible link [fusible link holder (VK45DE and VQ35DE AWD)]
 - Harness for open or short between alternator and fusible link (VK45DE and VQ35DE AWD)
 - Harness for open or short between alternator and battery (VQ35DE 2WD)



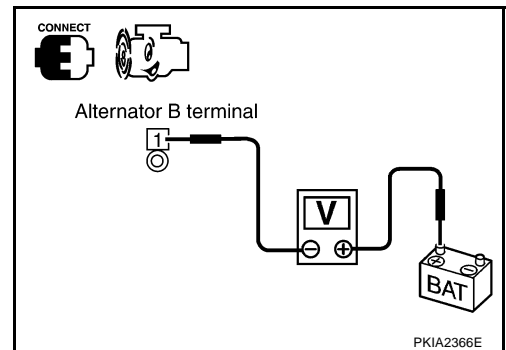
3. CHECK "B" TERMINAL CONNECTION (VOLTAGE DROP TEST)

1. Start the engine.
2. When the engine running at idle and warm, check voltage between alternator B terminal E307 terminal 1 (B/R) and battery positive terminal using a digital circuit tester.

Voltage: Less than 0.2V

OK or NG

- OK >> Replace the alternator. Confirm repair by performing complete Battery/Starting/Charging system test.
NG >> Check harness between the battery and the alternator for poor continuity.



CHARGING SYSTEM

DIAGNOSTIC PROCEDURE 3

Check "L" Terminal Circuit

1. CHECK "L" TERMINAL CONNECTION

1. Turn ignition switch OFF.
2. Check to see 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.

2. CHECK "L" TERMINAL CIRCUIT

1. Disconnect alternator connector.
2. Apply ground to alternator harness connector E311*¹ or F26*² terminal 3 (OR) with the ignition switch in the ON position.

CHARGE lamp should light up.

NOTE:

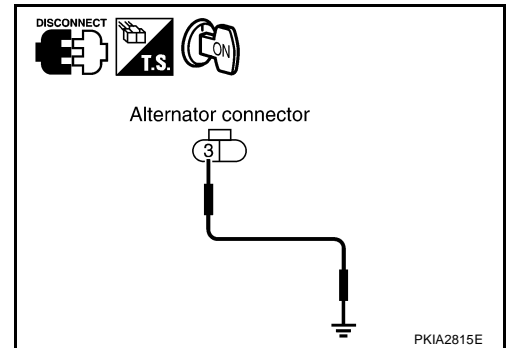
*1: VK45DE, *2: VQ35DE

OK or NG

OK >> Replace the alternator. Confirm repair by performing complete Battery/Starting/Charging system test.

NG >> Check the following.

- 10A fuse [No. 14, located in fuse block (J/B)]
- CHARGE lamp
- Harness for open or short between combination meter and fuse
- Harness for open or short between combination meter and alternator



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

CHARGING SYSTEM

DIAGNOSTIC PROCEDURE 4

Check "B" Terminal Circuit

1. CHECK "B" TERMINAL CONNECTION

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

OK or NG

- OK >> GO TO 2. Confirm repair by performing complete Battery/Starting/Charging system test.
NG >> Repair "B" terminal connection.

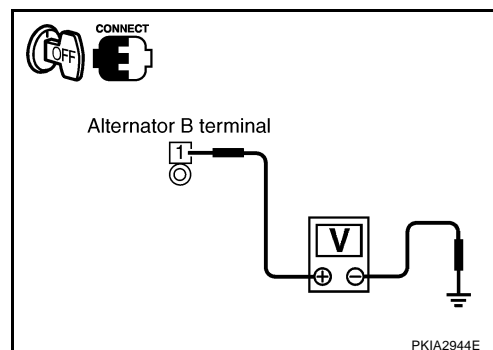
2. CHECK ALTERNATOR "B" TERMINAL CIRCUIT

Check voltage between alternator B terminal E307 terminal 1 (B/R) and ground using a digital circuit tester.

Battery voltage should exist.

OK or NG

- OK >> GO TO 3.
NG >> Check the following.
- 120A fusible link [fusible link holder (VK45DE and VQ35DE AWD)]
 - Harness for open or short between alternator and fusible link (VK45DE and VQ35DE AWD)
 - Harness for open or short between alternator and battery (VQ35DE 2WD)



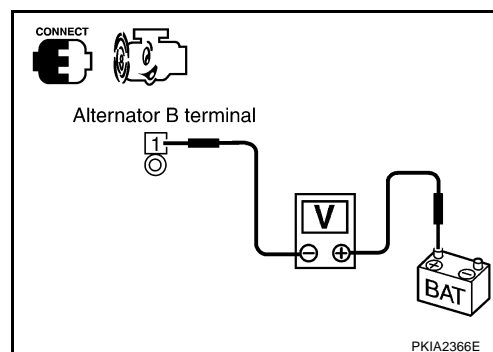
3. CHECK "B" TERMINAL CONNECTION (VOLTAGE DROP TEST)

1. Start the engine.
2. When the engine running at idle and warm, check voltage between alternator B terminal E307 terminal 1 (B/R) and battery positive terminal using a digital circuit tester.

Voltage: Less than 0.2V

OK or NG

- OK >> GO TO 4.
NG >> Check harness between the battery and the alternator for poor continuity.



4. CHECK ALTERNATOR DRIVE BELT TENSION

1. Turn ignition switch OFF.
2. Check alternator drive belt tension. Refer to [EM-169. "Checking Drive Belts"](#) (VK45DE) or [EM-15. "Checking Drive Belts"](#) (VQ35DE) in "ENGINE MECHANICAL (EM)" section.

Does drive belt tension normal?

YES or NO

- YES >> Replace the alternator. Confirm repair by performing complete Battery/Starting/Charging system test.
NO >> Readjust drive belt tension. Refer to [EM-169. "Tension Adjustment"](#) (VK45DE) or [EM-15. "Tension Adjustment"](#) (VQ35DE) in "ENGINE MECHANICAL (EM)" section.

CHARGING SYSTEM

DIAGNOSTIC PROCEDURE 5

Check "S" Terminal Circuit

1. CHECK "S" TERMINAL CONNECTION

1. Turn ignition switch OFF.
2. Check to see 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.

2. CHECK ALTERNATOR "S" TERMINAL CIRCUIT

Check voltage between alternator harness connector E311^{*1} or F26^{*2} terminal 4 (LG) and ground using a digital circuit tester.

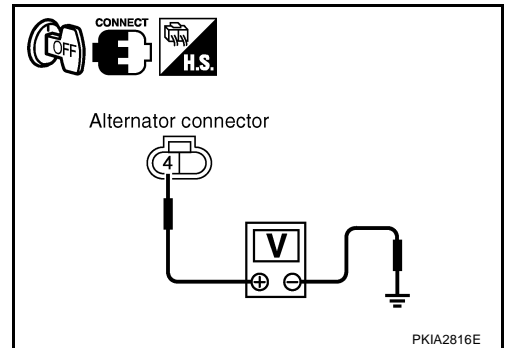
Battery voltage should exist.

NOTE:

*1: VK45DE, *2: VQ35DE

OK or NG

- OK >> GO TO 3.
NG >> Check the following.
- 10A fuse (No. 33, located in fuse and fusible link box)
 - Harness for open or short between alternator and fuse



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

1. Start the engine.
2. When the engine running at idle and warm, check voltage between alternator connector E311^{*1} or F26^{*2} terminal 4 (LG) and battery positive terminal using a digital circuit tester.

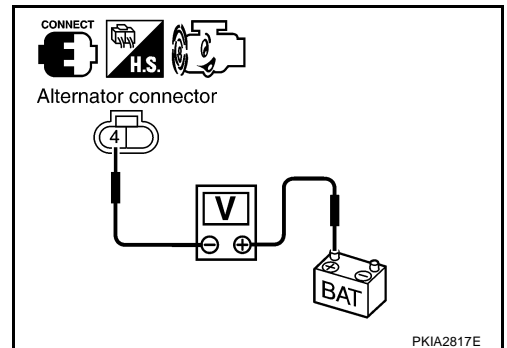
Voltage: Less than 0.2V

NOTE:

*1: VK45DE, *2: VQ35DE

OK or NG

- OK >> Replace the alternator. Confirm repair by performing complete Battery/Starting/Charging system test.
NG >> Check harness between the battery and the alternator for poor continuity.



MALFUNCTION INDICATOR

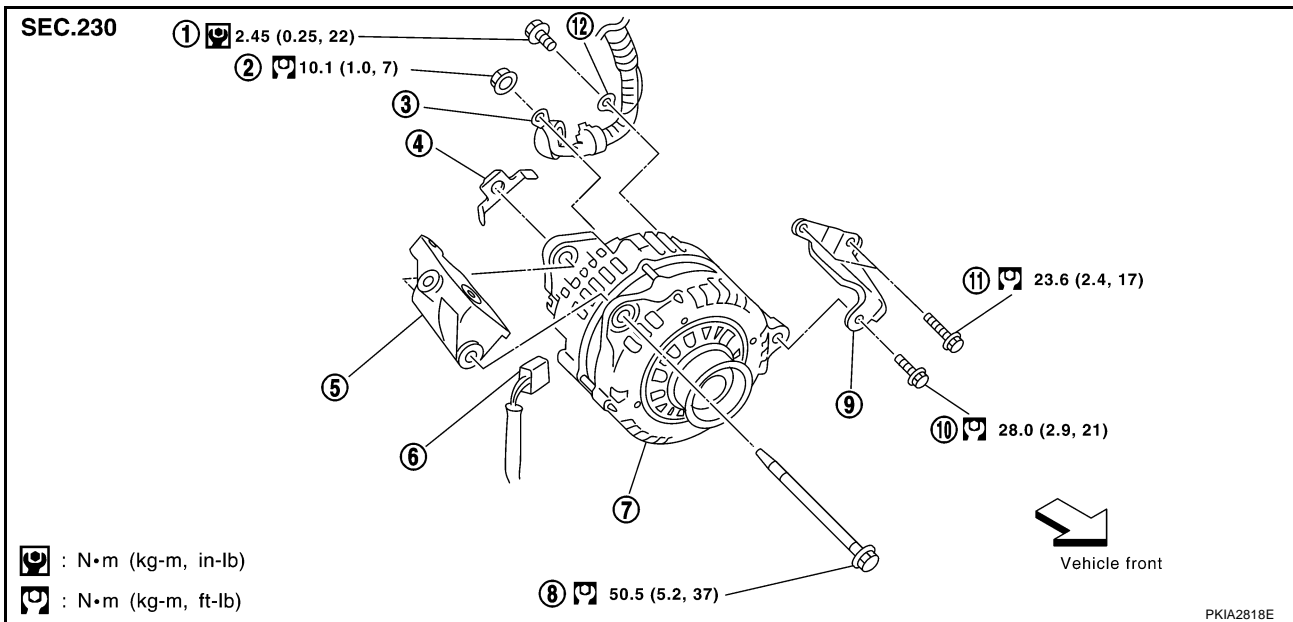
The IC regulator warning function activates to illuminate "CHARGE" warning lamp, if any of the following symptoms occur while alternator is operating:

- Excessive voltage is produced.
- No voltage is produced.

CHARGING SYSTEM

AKS00816

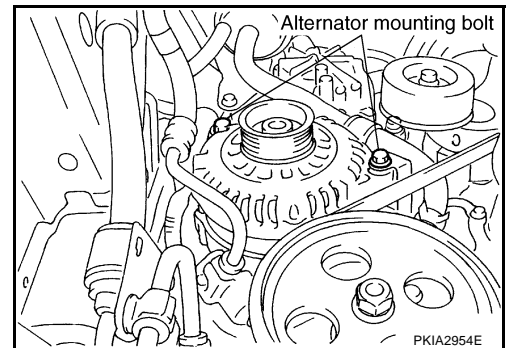
Removal and Installation VK45DE ENGINE MODELS



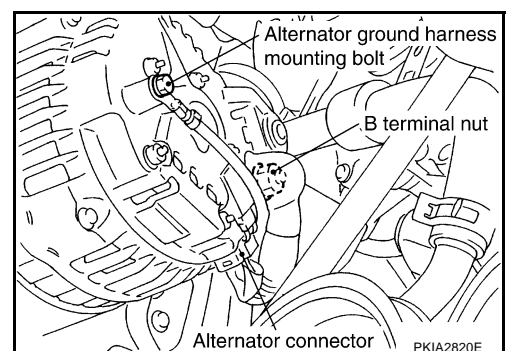
- | | | |
|--|-----------------------------------|----------------------------------|
| 1. Alternator ground harness mounting bolt | 2. B terminal nut | 3. Alternator B terminal harness |
| 4. Alternator Nut | 5. Alternator bracket | 6. Alternator connector |
| 7. Alternator | 8. Alternator mounting bolt | 9. Alternator stay |
| 10. Alternator mounting bolt | 11. Alternator stay mounting bolt | 12. Alternator ground harness |

Removal

1. Disconnect negative battery cable.
2. Remove engine front undercover, using power tools.
3. Remove cooling fan lower shroud. Refer to [CO-39, "RADIATOR"](#) in "ENGINE COOLING SYSTEM (CO)" section.
4. Remove alternator, water pump and A/C compressor belt. Refer to [EM-169, "Removal and Installation"](#) in "ENGINE MECHANICAL (EM)" section.
5. Remove alternator mounting bolts, using power tools.



6. Disconnect alternator connector.
7. Remove B terminal nut.
8. Remove alternator ground harness mounting bolt.
9. Remove alternator assembly to the direction of under side the vehicle.



CHARGING SYSTEM

Installation

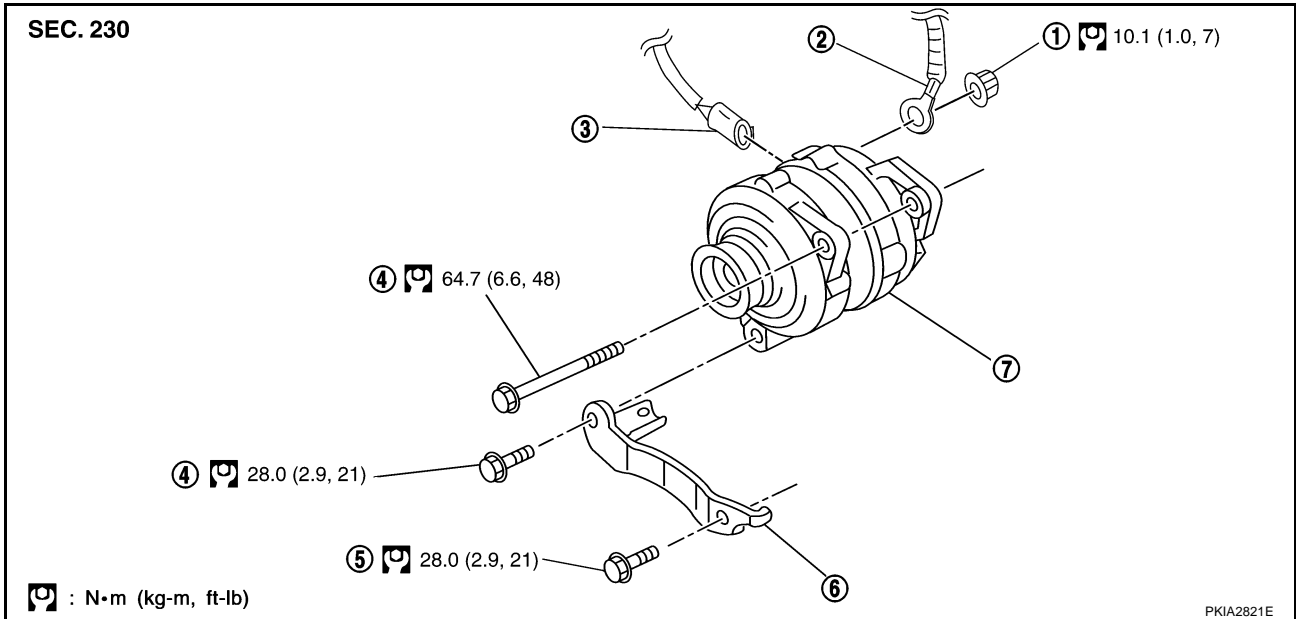
Note the following, and install in the reverse order of removal.

- Install alternator, and check tension of belt. Refer to [EM-169, "Checking Drive Belts"](#) in "ENGINE MECHANICAL (EM)" section.

CAUTION:

Be sure to tighten B terminal nut carefully.

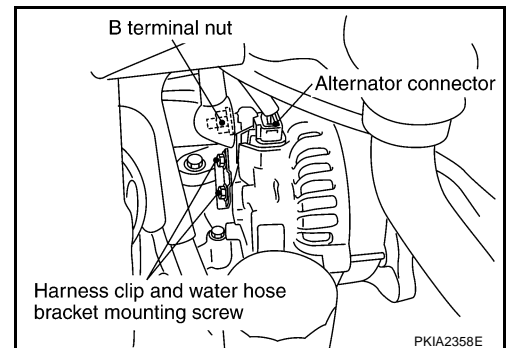
VQ35DE ENGINE MODELS



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

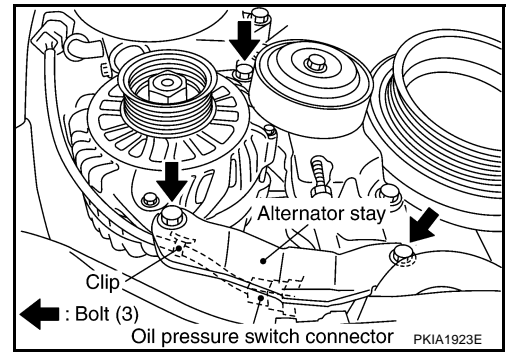
Removal

1. Disconnect negative battery cable.
2. Remove engine front undercover, using power tools.
3. Remove alternator and power steering belt. Refer to [EM-16, "Removal and Installation"](#) in "ENGINE MECHANICAL (EM)" section.
4. Disconnect alternator connector.
5. Remove B terminal nut.
6. Remove harness clip and water hose bracket from alternator.



CHARGING SYSTEM

7. Remove oil pressure switch harness clip from alternator stay. (2WD)
8. Disconnect oil pressure switch connector. (2WD)
9. Remove alternator stay mounting bolts and alternator stay, using power tools.
10. Remove alternator mounting bolt, using power tools.



11. Remove alternator assembly to the direction of under side the vehicle.

Installation

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

- Install alternator, and check tension of belt. Refer to [EM-15, "Checking Drive Belts"](#) in "ENGINE MECHANICAL (EM)" section.

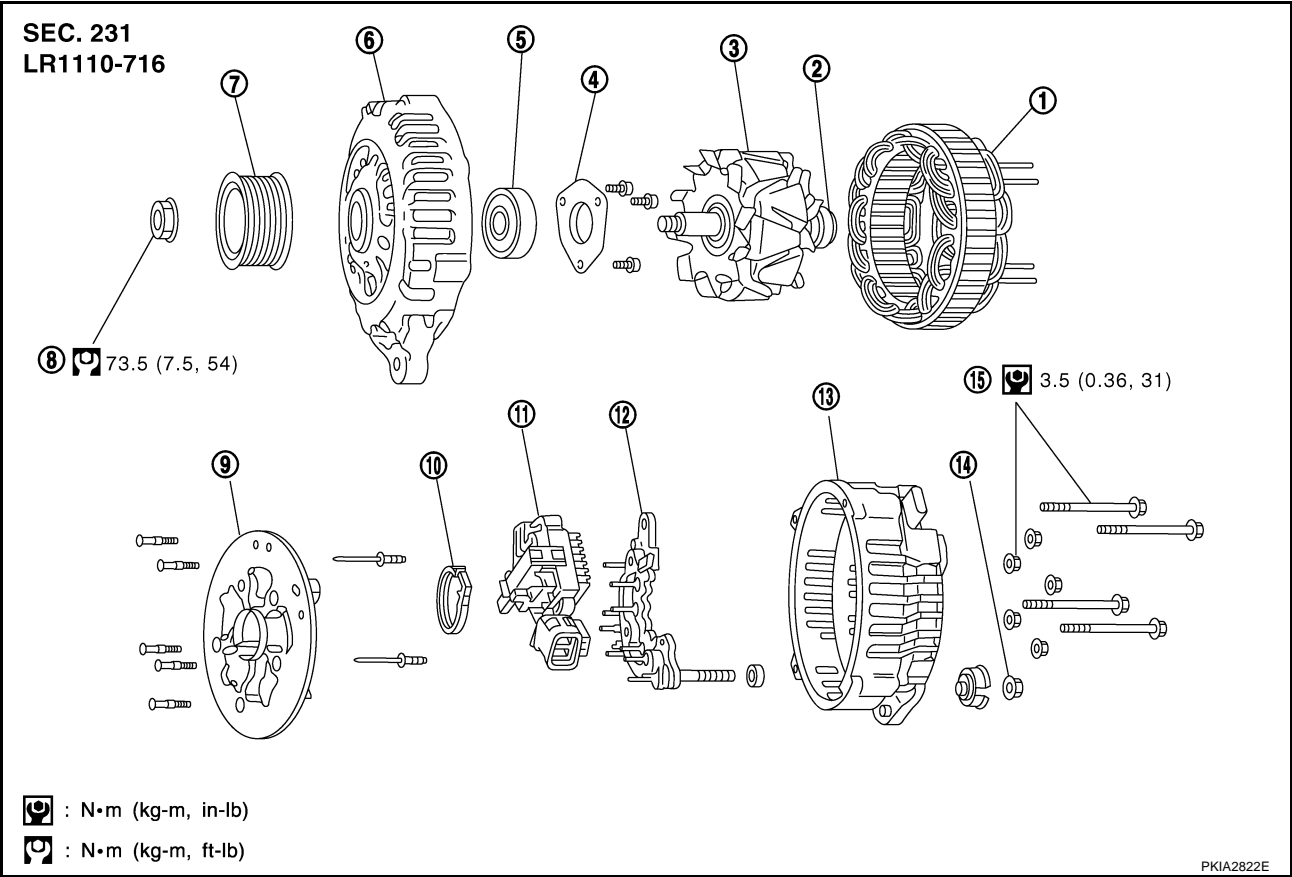
CAUTION:

Be sure to tighten **B** terminal nut carefully.

CHARGING SYSTEM

Disassembly and Assembly

AKS007AI



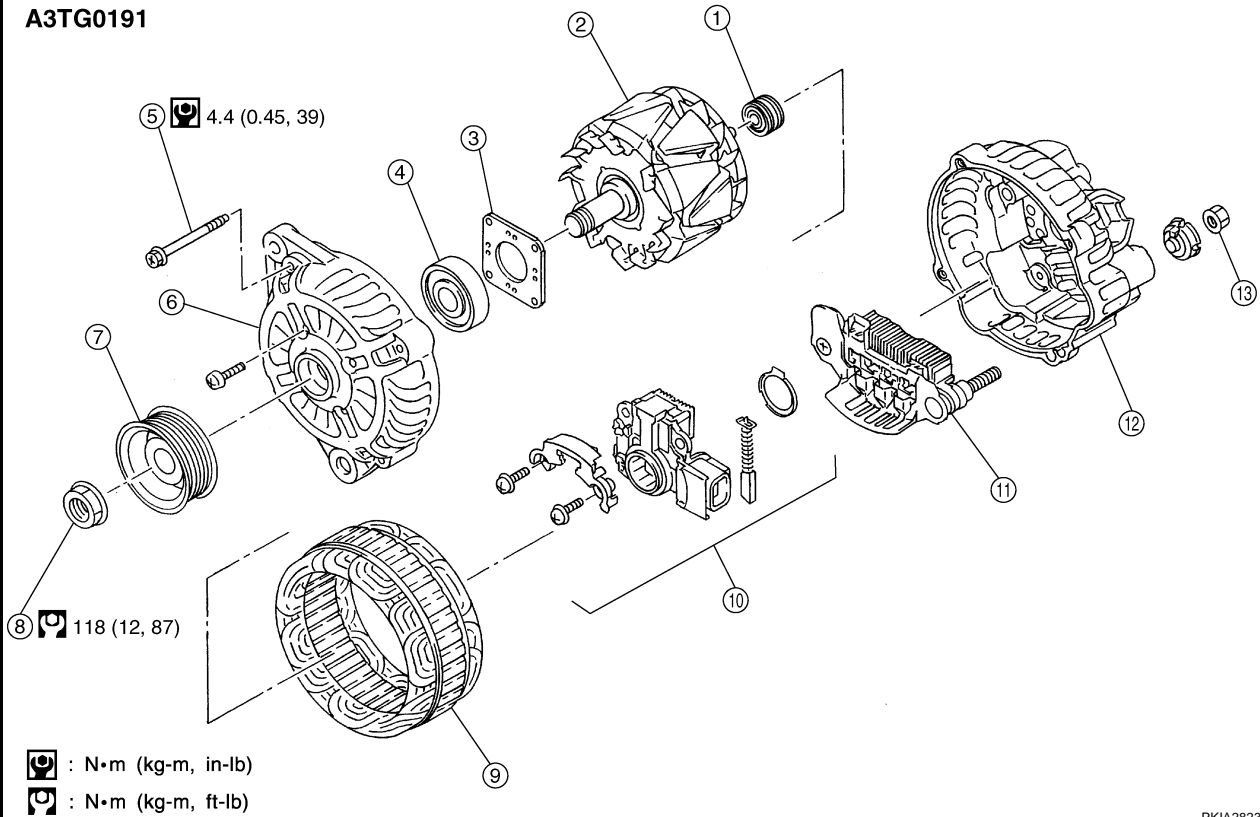
A
B
C
D
E
F
G
H
I
J
L
M

SC

- | | | |
|---------------------------|-----------------------------------|---------------------------|
| 1. Stator assembly | 2. Slip ring | 3. Rotor assembly |
| 4. Retainer | 5. Front bearing | 6. Front bracket assembly |
| 7. Pulley | 8. Pulley nut | 9. Fun guide |
| 10. Double labyrinth seal | 11. IC voltage regulator assembly | 12. Diode assembly |
| 13. Rear bracket assembly | 14. B terminal nut | 15. Through-bolt and nut |

CHARGING SYSTEM

SEC.231
A3TG0191



PKIA2823E

- | | | |
|-----------------------------------|--------------------|---------------------------|
| 1. Rear bearing | 2. Rotor assembly | 3. Retainer |
| 4. Front bearing | 5. Through-bolt | 6. Front bracket assembly |
| 7. Pulley | 8. Pulley nut | 9. Stator assembly |
| 10. IC voltage regulator assembly | 11. Diode assembly | 12. Rear bracket assembly |
| 13. B terminal nut | | |

SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

PPF:00030

Battery

AKS0079N

Type		80D23L
Capacity	V - AH	12 - 52
Cold cranking current (For reference value) A		582

Starter

AKS0079O

Applied model		VK45DE	VQ35DE (2WD)	VQ35DE (AWD)
		M2T85075	S114 - 880	S114 - 881
Type		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

AKS0079P

Applied model		VK45DE	VQ35DE
Type		LR1110 - 716	A3TG0191
		HITACHI make	MITSUBISHI make
Nominal rating	V - A	12 - 110	
Ground polarity		Negative	
Minimum revolution under no-load (When 13.5V is applied) rpm		Less than 1,100	Less than 1,000
Hot output current (When 13.5V is applied) rpm	A/	More than 70/1,800 More than 91/2,500 More than 110/5,000	More than 37/1,300 More than 92/2,500 More than 103/5,000
Regulated output voltage	V	14.1 - 14.7	
Minimum length of brush	mm (in)	More than 6.00 (0.236)	More than 5.00 (0.197)
Brush spring pressure	N (g, oz)	1.00 - 3.43 (102 - 350, 3.60 - 12.34)	4.9 - 6.1 (499 - 622, 17.62 - 21.94)
Slip ring minimum outer diameter	mm (in)	More than 26.0 (1.024)	More than 22.1 (0.870)
Rotor (Field coil) resistance	Ω	2.31	1.7 - 2.1

SERVICE DATA AND SPECIFICATIONS (SDS)
