

A  
B  
C  
D  
E

# SECTION SC

## STARTING & CHARGING SYSTEM

### CONTENTS

<p><b>PRECAUTIONS</b> ..... 2</p> <p>  Precautions for Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER" ..... 2</p> <p>  Precautions for Battery Service ..... 2</p> <p>  Wiring Diagrams and Trouble Diagnosis ..... 2</p> <p><b>PREPARATION</b> ..... 3</p> <p>  Special Service Tools ..... 3</p> <p>  Commercial Service Tools ..... 3</p> <p><b>BATTERY</b> ..... 4</p> <p>  How to Handle Battery ..... 4</p> <p>    METHODS OF PREVENTING OVER-DISCHARGE ..... 4</p> <p>    CHECKING ELECTROLYTE LEVEL ..... 5</p> <p>    SPECIFIC GRAVITY CHECK ..... 5</p> <p>    CHARGING THE BATTERY ..... 6</p> <p>  Trouble Diagnoses with Battery/Starting/Charging System Tester ..... 6</p> <p>    DIAGNOSTIC RESULT ITEM CHART ..... 8</p> <p>  Removal and Installation ..... 9</p> <p>    REMOVAL ..... 9</p> <p>    INSTALLATION ..... 9</p> <p><b>STARTING SYSTEM</b> ..... 10</p> <p>  System Description ..... 10</p> <p>    M/T MODEL ..... 10</p> <p>    A/T MODEL ..... 11</p> <p>  Wiring Diagram — START — ..... 12</p> <p>    M/T MODEL ..... 12</p> <p>    A/T MODEL ..... 14</p> <p>  Trouble Diagnosis with Battery/Starting/Charging System Tester ..... 15</p> <p>    DIAGNOSTIC RESULT ITEM CHART ..... 15</p> <p>    WORK FLOW ..... 16</p>	<p>    DIAGNOSTIC PROCEDURE 1 ..... 17</p> <p>    DIAGNOSTIC PROCEDURE 2 ..... 18</p> <p>    MINIMUM SPECIFICATION OF CRANKING VOLTAGE REFERENCING COOLANT TEMPERATURE ..... 18</p> <p>  Removal and Installation ..... 19</p> <p>    REMOVAL ..... 19</p> <p>    INSTALLATION ..... 19</p> <p>  Disassembly and Assembly ..... 20</p> <p>    INSPECTION AFTER DISASSEMBLY ..... 20</p> <p><b>CHARGING SYSTEM</b> ..... 21</p> <p>  System Description ..... 21</p> <p>    MALFUNCTION INDICATOR ..... 21</p> <p>  Wiring Diagram — CHARGE — ..... 22</p> <p>  Trouble Diagnosis with Battery/Starting/Charging System Tester ..... 23</p> <p>    DIAGNOSTIC RESULT ITEM CHART ..... 24</p> <p>    WORK FLOW ..... 25</p> <p>    PRELIMINARY INSPECTION ..... 26</p> <p>    DIAGNOSTIC PROCEDURE 1 ..... 27</p> <p>    DIAGNOSTIC PROCEDURE 2 ..... 28</p> <p>    DIAGNOSTIC PROCEDURE 3 ..... 28</p> <p>    DIAGNOSTIC PROCEDURE 4 ..... 29</p> <p>  Removal and Installation ..... 30</p> <p>    REMOVAL ..... 30</p> <p>    ALTERNATOR PULLEY INSPECTION ..... 31</p> <p>    INSTALLATION ..... 31</p> <p>  Disassembly and Assembly ..... 32</p> <p><b>SERVICE DATA AND SPECIFICATIONS (SDS)</b> ..... 33</p> <p>  Battery ..... 33</p> <p>  Starter ..... 33</p> <p>  Alternator ..... 33</p>
--	--

SC

# PRECAUTIONS

## PRECAUTIONS

PFP:00001

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

AKS004VG

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 Battery Service

AKS004UO

Before disconnecting the battery, lower both the driver and passenger windows. This will prevent any interference between the window edge and the vehicle when the door is opened/closed. During normal operation, the window slightly raises and lowers automatically to prevent any window to vehicle interference. The automatic window function will not work with the battery disconnected.

### Wiring Diagrams and Trouble Diagnosis

AKS003YV

When reading wiring diagrams, refer to the following:

- [GI-14, "How to Read Wiring Diagrams"](#)
- [PG-4, "POWER SUPPLY ROUTING CIRCUIT"](#) for power distribution circuit

When performing trouble diagnosis, refer to the following:

- [GI-10, "HOW TO FOLLOW TEST GROUPS IN TROUBLE DIAGNOSES"](#)
- [GI-26, "How to Perform Efficient Diagnosis for an Electrical Incident"](#)

# PREPARATION

## PREPARATION

PFP:00002

### Special Service Tools

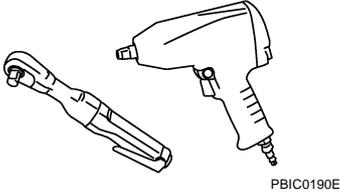
AKS003YW

Tool number Tool name	Description
J-44373 Model 620 Battery/Starting/Charging system tester	 <p>SEL403X</p>

### Commercial Service Tools

AKS003YX

Tool number Tool name	Description
Power tool	Loosening bolts and nuts



PBIC0190E

A

B

C

D

E

F

G

H

I

J

**SC**

L

M

# BATTERY

## BATTERY

PFP:AYBGL

### How to Handle Battery

AKS003YY

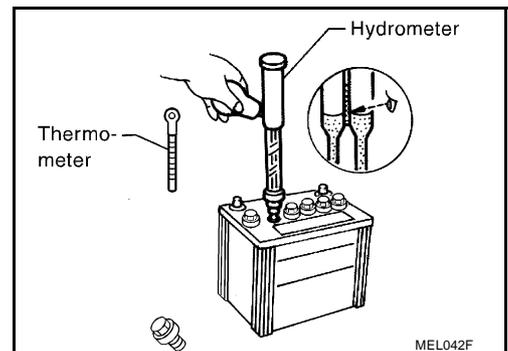
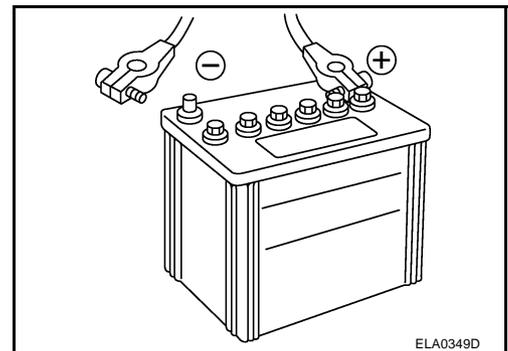
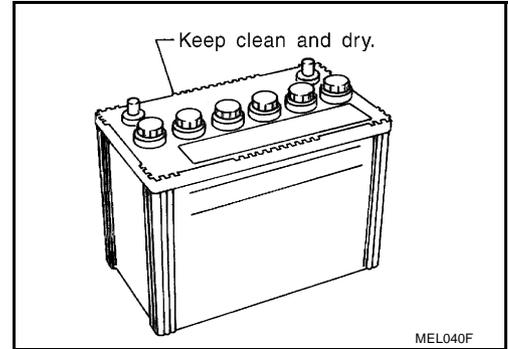
#### CAUTION:

- 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 battery cable from the negative terminal.
- 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.



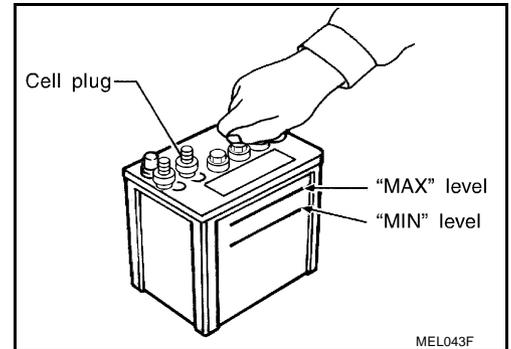
# BATTERY

## 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.

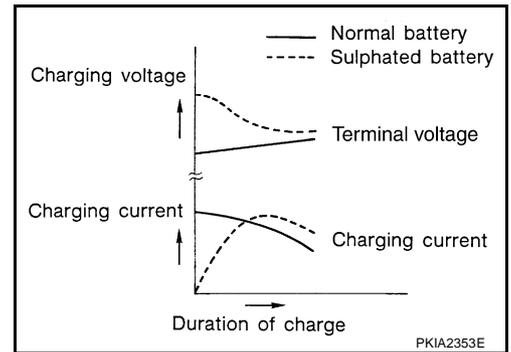


## Sulphation

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.

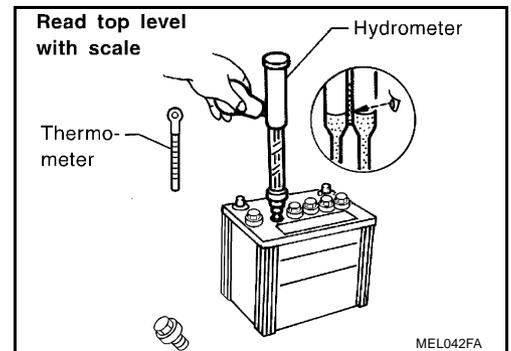
To determine if a battery has been "sulphated", note its voltage and current when charging it. As shown in the figure, less current and higher voltage are observed in the initial stage of charging sulphated batteries.

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.



## 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:

- 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

Never 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 Diagnoses with Battery/Starting/Charging System Tester

AKS003YZ

### CAUTION:

When working with batteries, always wear appropriate eye protection.

### NOTE:

- To ensure a complete and thorough diagnosis, the battery, starter and generator 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.

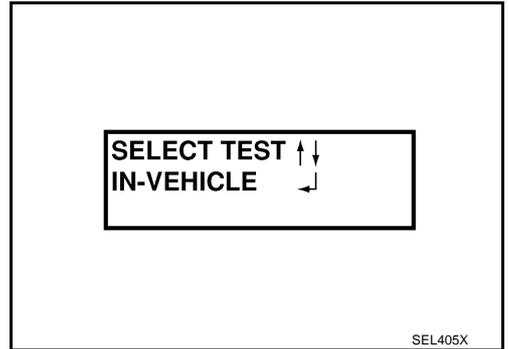
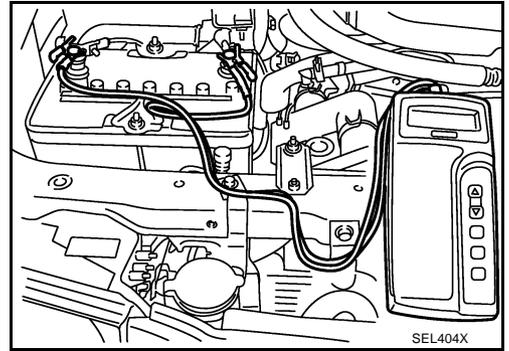
# BATTERY

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 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.

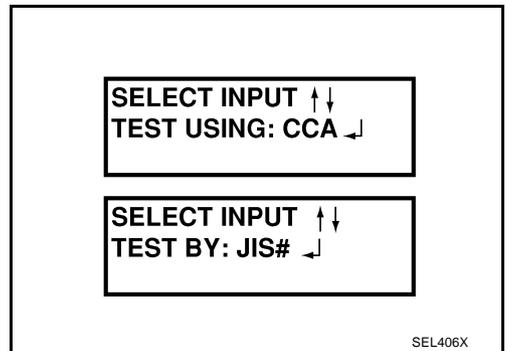
The tester requires the rating for the battery be entered exactly as it is written or stamped on the battery. Do not attempt a CCA conversion for JIS stamped batteries. JIS must be input directly.

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"](#).



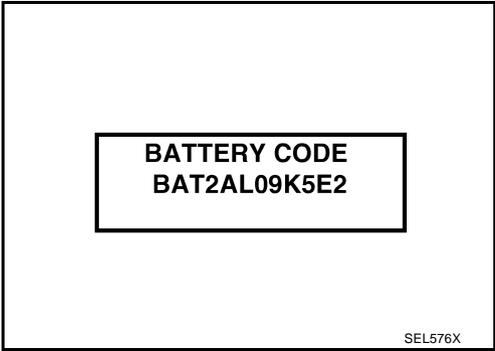
A  
B  
C  
D  
E  
F  
G  
H  
I  
J  
SC  
L  
M

# 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 <a href="#">SC-15. "Trouble Diagnosis with Battery/Starting/Charging System Tester"</a> .
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. <b>NOTE:</b> If the tester asks the user "BEFORE CHARGE/AFTER CHARGE", select "AFTER CHARGE".



# BATTERY

AKS003Z0

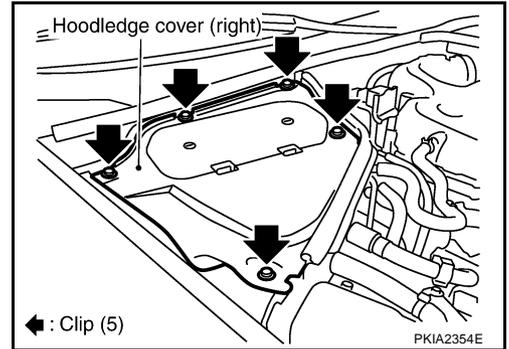
## Removal and Installation

### REMOVAL

#### CAUTION:

Before disconnecting the battery, lower both the driver and passenger windows. This will prevent any interference between the window edge and the vehicle when the door is opened/closed. During normal operation, the window slightly raises and lowers automatically to prevent any window to vehicle interference. The automatic window function will not work with the battery disconnected.

1. Remove hoodedge cover (right).

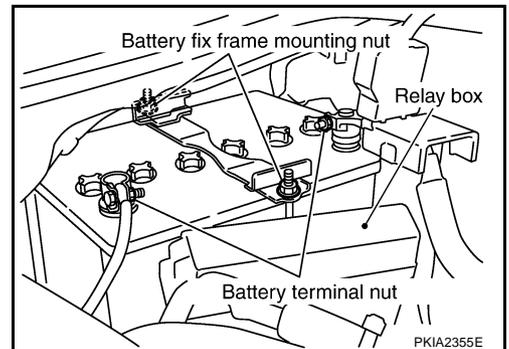


2. Disconnect both battery cables from terminals.

#### CAUTION:

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

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

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

## STARTING SYSTEM

PFP:23300

### System Description M/T MODEL

AKS003Z1

Power is supplied at all times

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

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

- from ignition relay (located in the IPDM E/R)
- to 10A fuse (No. 89, located in the IPDM E/R)
- through IPDM E/R terminal 25
- to clutch interlock switch terminal 1.

When the clutch pedal is depressed, power is supplied

- through clutch interlock switch terminal 2
- to IPDM E/R terminal 53.

Ground is supplied

- to IPDM E/R terminals 38, 50 and 60
- from grounds E17 and E43.

Then starter relay is turn ON.

With the ignition switch in the START position, 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

---

## A/T MODEL

Power is supplied at all times

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

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

- from ignition relay (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 A/T assembly terminal 9
- to IPDM E/R terminal 53.

Ground is supplied

- to IPDM E/R terminals 38, 50 and 60
- from grounds E17 and E43.

Then starter relay is turn ON.

With the ignition switch in the START position, 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.

A

B

C

D

E

F

G

H

I

J

SC

L

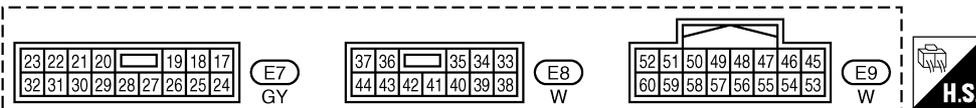
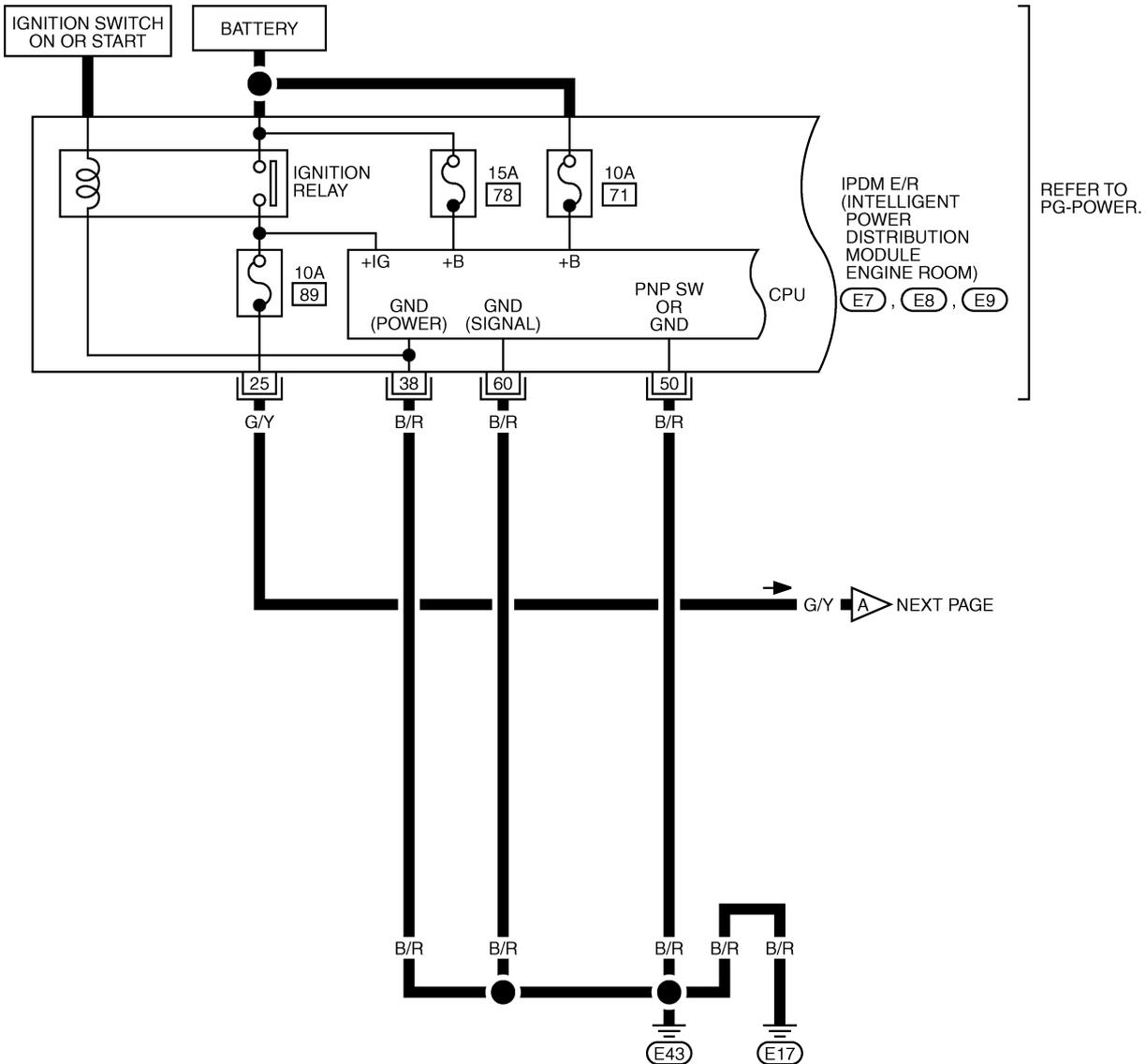
M

# STARTING SYSTEM

## Wiring Diagram — START — M/T MODEL

AKS003Z2

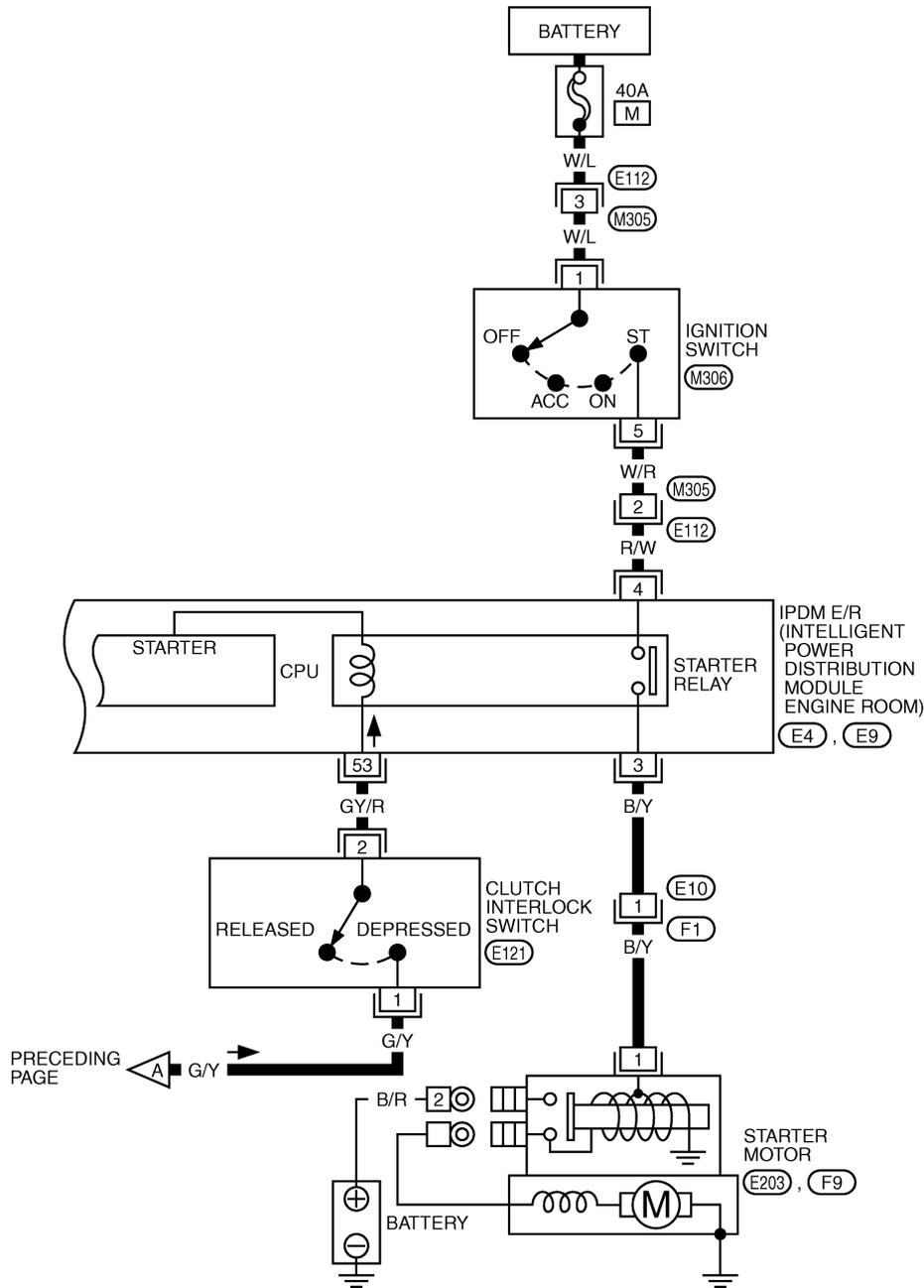
SC-START-01



TKWM2603E

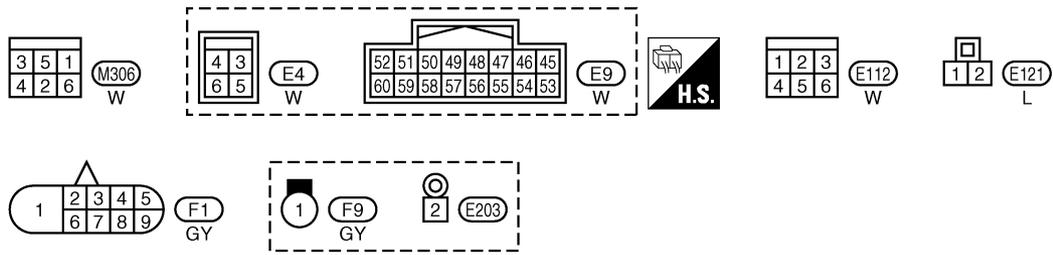
# STARTING SYSTEM

SC-START-02



REFER TO PG-POWER.

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

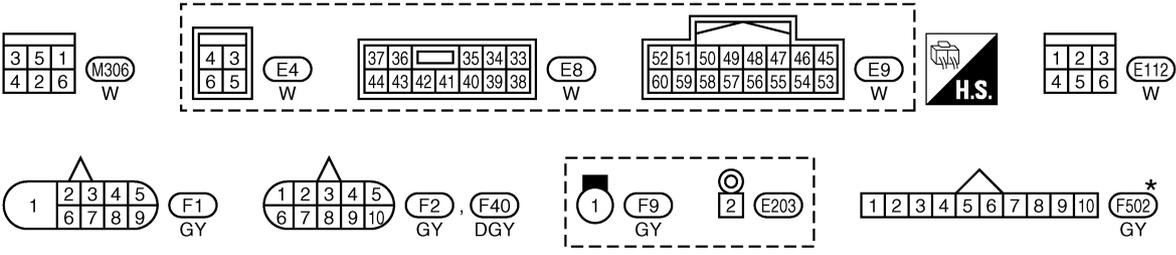
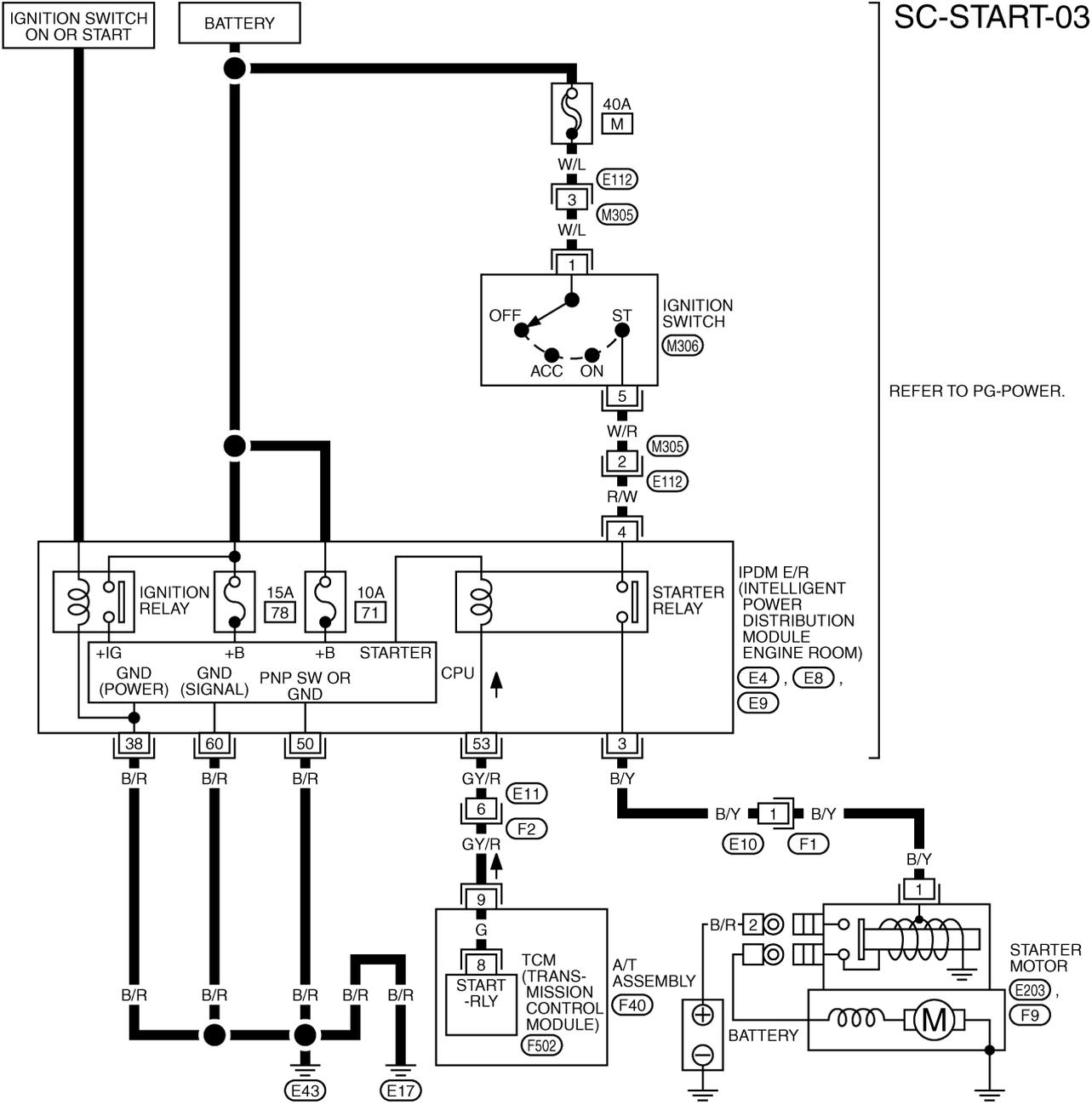


TKWM2180E

# STARTING SYSTEM

A/T MODEL

SC-START-03



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

TKWM2181E

# STARTING SYSTEM

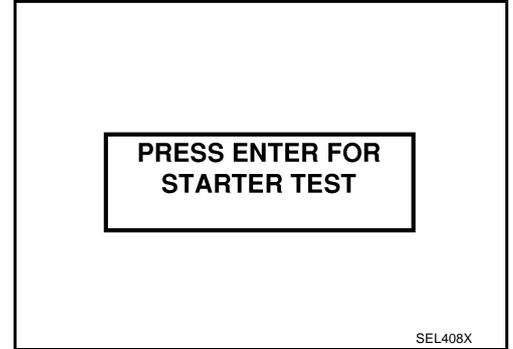
## Trouble Diagnosis with Battery/Starting/Charging System Tester

AKS003Z3

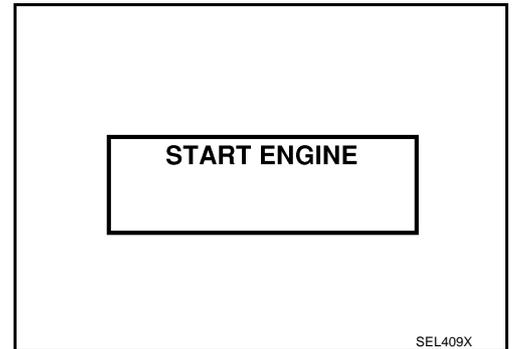
### NOTE:

To ensure a complete and thorough diagnosis, the battery, starter and generator 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 Diagnoses with Battery/Starting/Charging System Tester"](#).
3. Press "ENTER" to begin the starting system test.



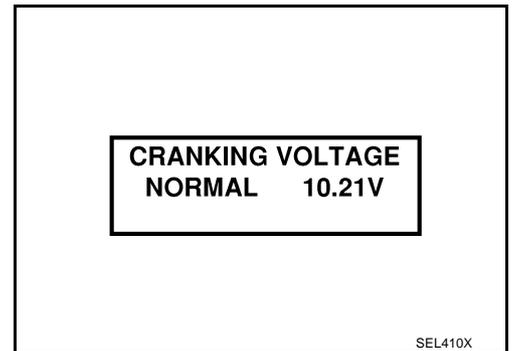
4. Start the engine.



5. Diagnostic result is displayed on the tester. Refer to [SC-15, "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-18, "DIAGNOSTIC PROCEDURE 2"](#).

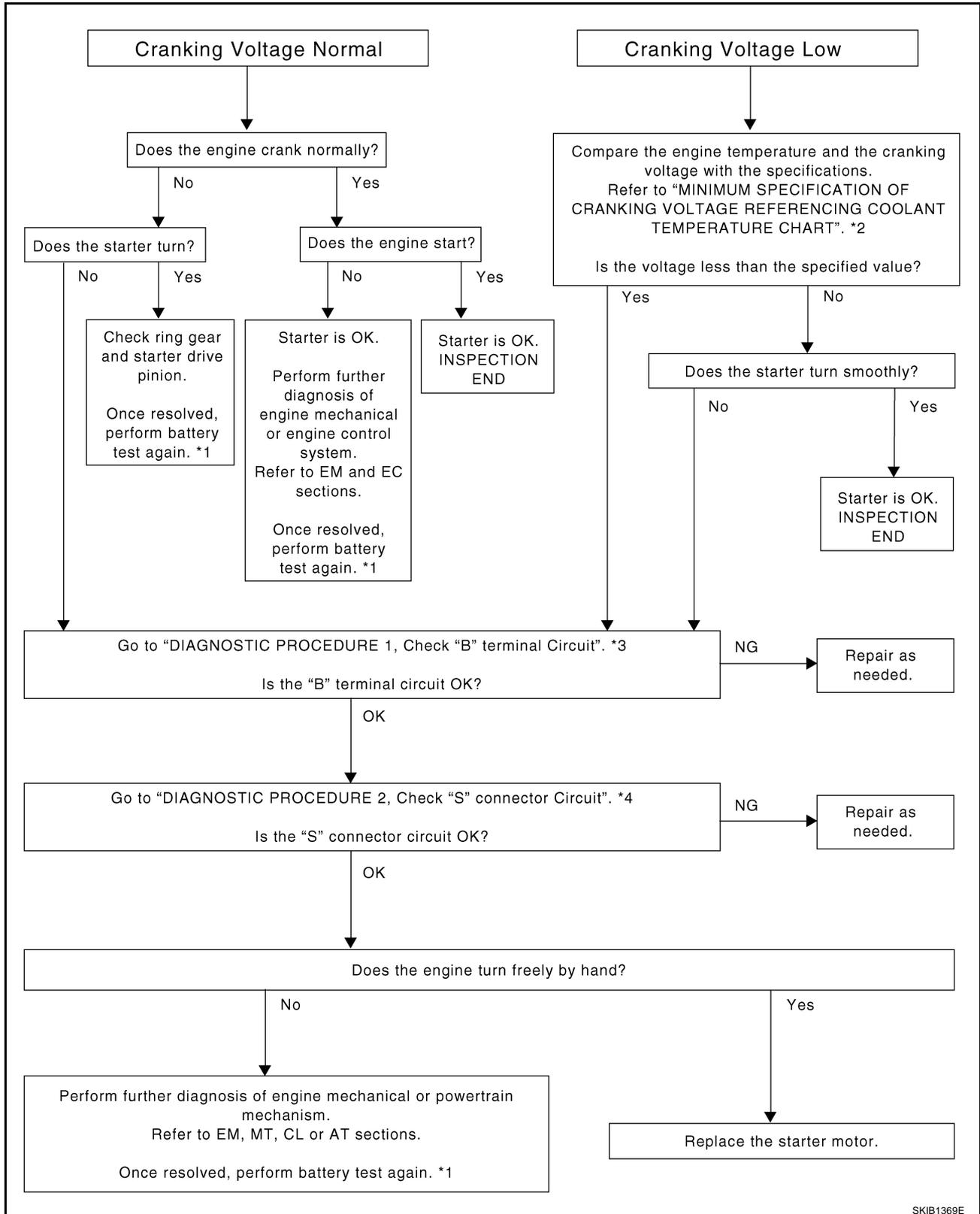


## DIAGNOSTIC RESULT ITEM CHART

Diagnostic item	Service procedure
CRANKING VOLTAGE NORMAL	Go to <a href="#">SC-16, "WORK FLOW"</a> .
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 <a href="#">SC-6, "Trouble Diagnoses with Battery/Starting/Charging System Tester"</a> .
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 <a href="#">SC-6, "Trouble Diagnoses with Battery/Starting/Charging System Tester"</a> . If second test result is "REPLACE BATTERY", then do so. Perform battery test again to confirm repair.

# STARTING SYSTEM

## WORK FLOW



SKIB1369E

\*1 [SC-15, "Trouble Diagnosis with Battery/ Starting/Charging System Tester"](#).

\*2 [SC-18, "MINIMUM SPECIFICATION OF CRANKING VOLTAGE REFERENCING COOLANT TEMPERATURE"](#).

\*3 [SC-17, "Check "B" Terminal Circuit"](#).

\*4 [SC-18, "Check "S" Connector Circuit"](#).



# STARTING SYSTEM

## DIAGNOSTIC PROCEDURE 1

### Check "B" Terminal Circuit

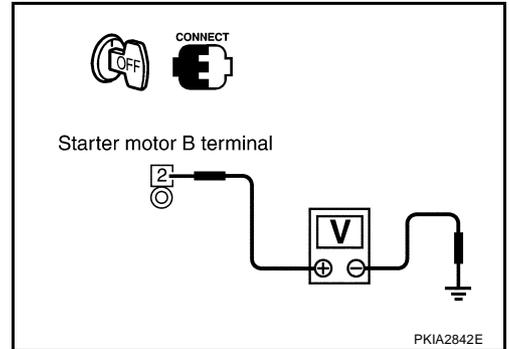
#### 1. CHECK POWER SUPPLY FOR STARTER MOTOR "B" TERMINAL

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 E203 terminal 2 (B/R) connection is clean and tight.
5. Check voltage between starter motor "B" terminal E203 terminal 2 (B/R) and ground using.

**2 (B/R) – Ground : Battery voltage**

#### OK or NG

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



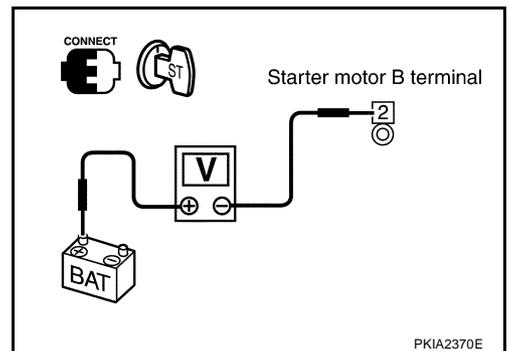
#### 2. CHECK BATTERY CABLE CONNECTION (VOLTAGE DROP TEST)

Check voltage between starter motor "B" terminal E203 terminal 2 (B/R) and battery positive terminal.

**2 (B/R) – Ground  
When the ignition switch is in START position : Less than 0.5 V**

#### OK or NG

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



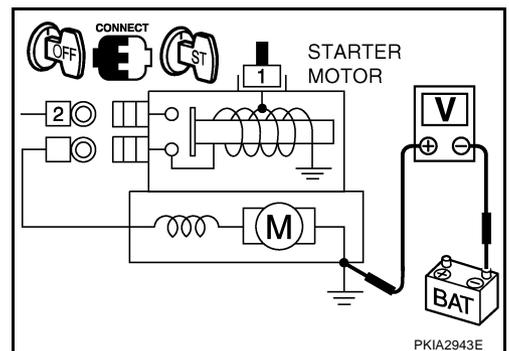
#### 3. CHECK STARTER MOTOR GROUND CIRCUIT (VOLTAGE DROP TEST)

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

**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-16, "WORK FLOW"](#) .  
NG >> Check 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" TERMINAL

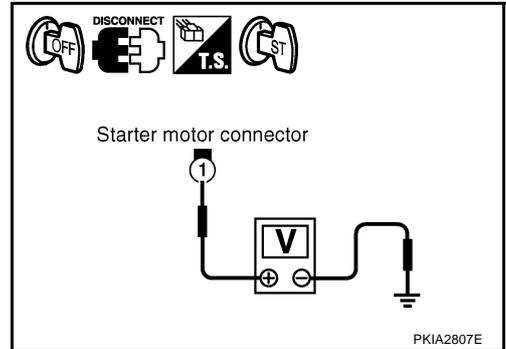
1. Remove fuel pump fuse.
2. Crank or start the engine (where possible) until the fuel pressure is released.
3. Turn ignition switch OFF.
4. Disconnect starter motors connector.
5. Check voltage between starter motor connector F9 terminal 1 (B/Y) and ground.

**1 (B/Y) – Ground**

**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-16, "WORK FLOW"](#).
- NG >> Check the following.
- 40A fusible link (letter M, located in fuse and fusible link block)
  - Ignition switch
  - Starter relay (within the IPDM E/R)
  - Harness for open or short



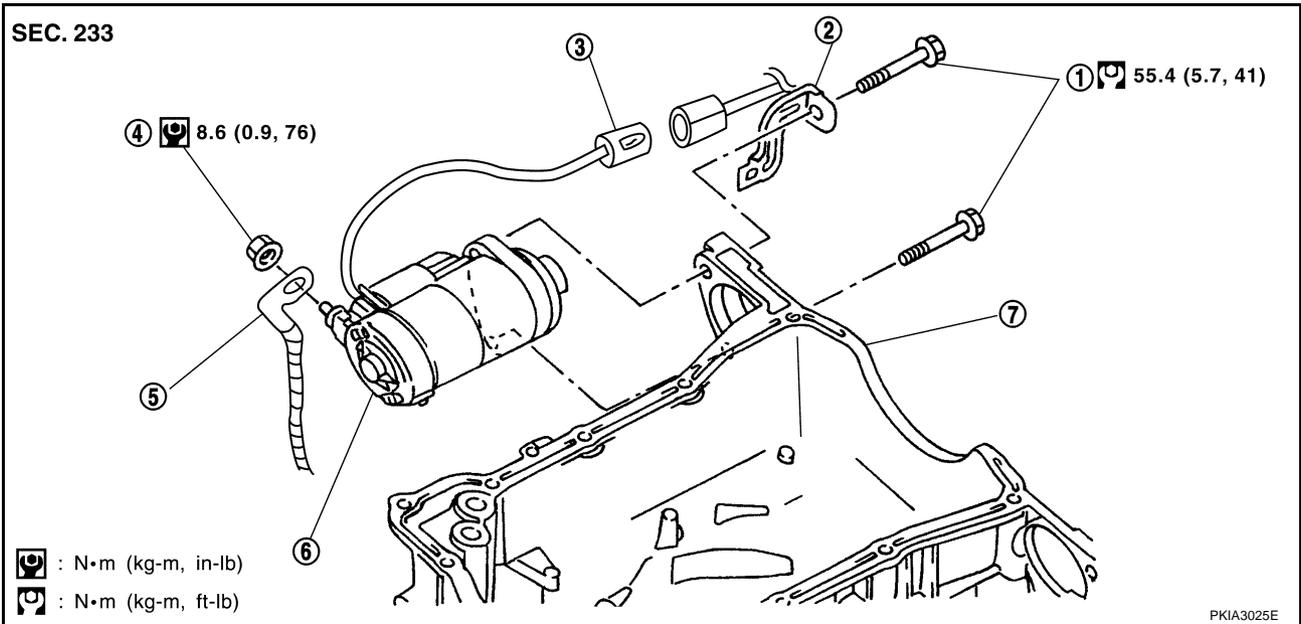
### MINIMUM SPECIFICATION OF CRANKING VOLTAGE REFERENCING COOLANT TEMPERATURE

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

AKS003Z4



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

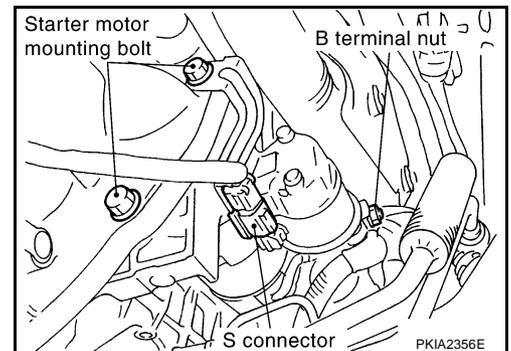
### REMOVAL

1. Open the driver and front passenger window, and then disconnect the battery cable from the negative terminal.

#### CAUTION:

Before disconnecting the battery, lower both the driver and passenger windows. This will prevent any interference between the window edge and the vehicle when the door is opened/closed. During normal operation, the window slightly raises and lowers automatically to prevent any window to vehicle interference. The automatic window function will not work with the battery disconnected.

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 connector clip bracket, using power tools.
6. Remove starter motor downward from the vehicle.



### INSTALLATION

Installation is the reverse order of removal.

#### CAUTION:

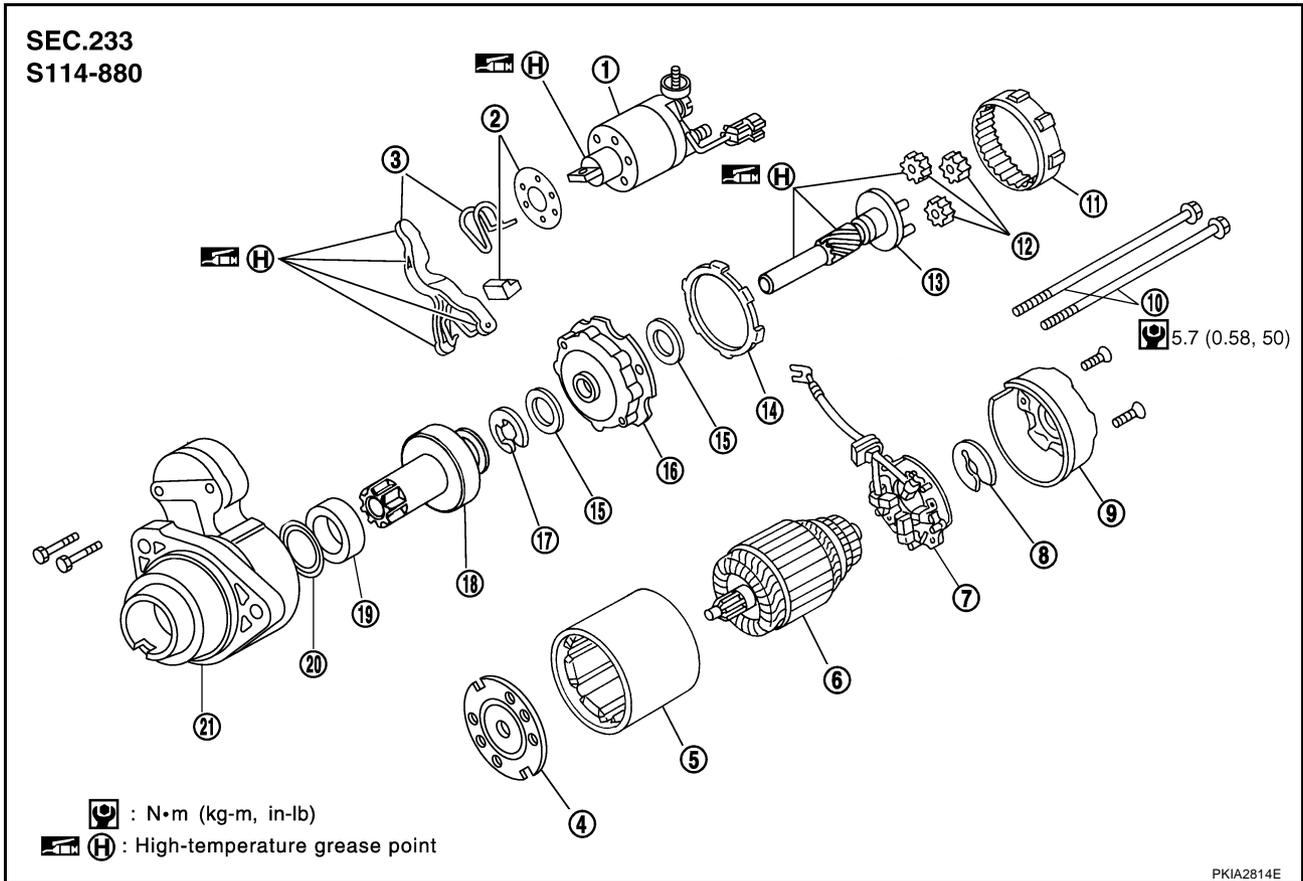
Be sure to tighten "B" terminal nut carefully.

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

# STARTING SYSTEM

## Disassembly and Assembly

AKS0099C



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

- 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

PF2:23100

### System Description

AKS003Z7

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

- 10A fuse (No. 36, located in the fuse and fusible link block)
- 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 terminals 22 and 23 for the charge warning lamp.

Ground is supplied

- to combination meter terminal 41
- through alternator terminal 3 ("L" terminal)
- to alternator terminal 2 ("E" terminal)
- through grounds E212 and E213.

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.

### 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.

A

B

C

D

E

F

G

H

I

J

SC

L

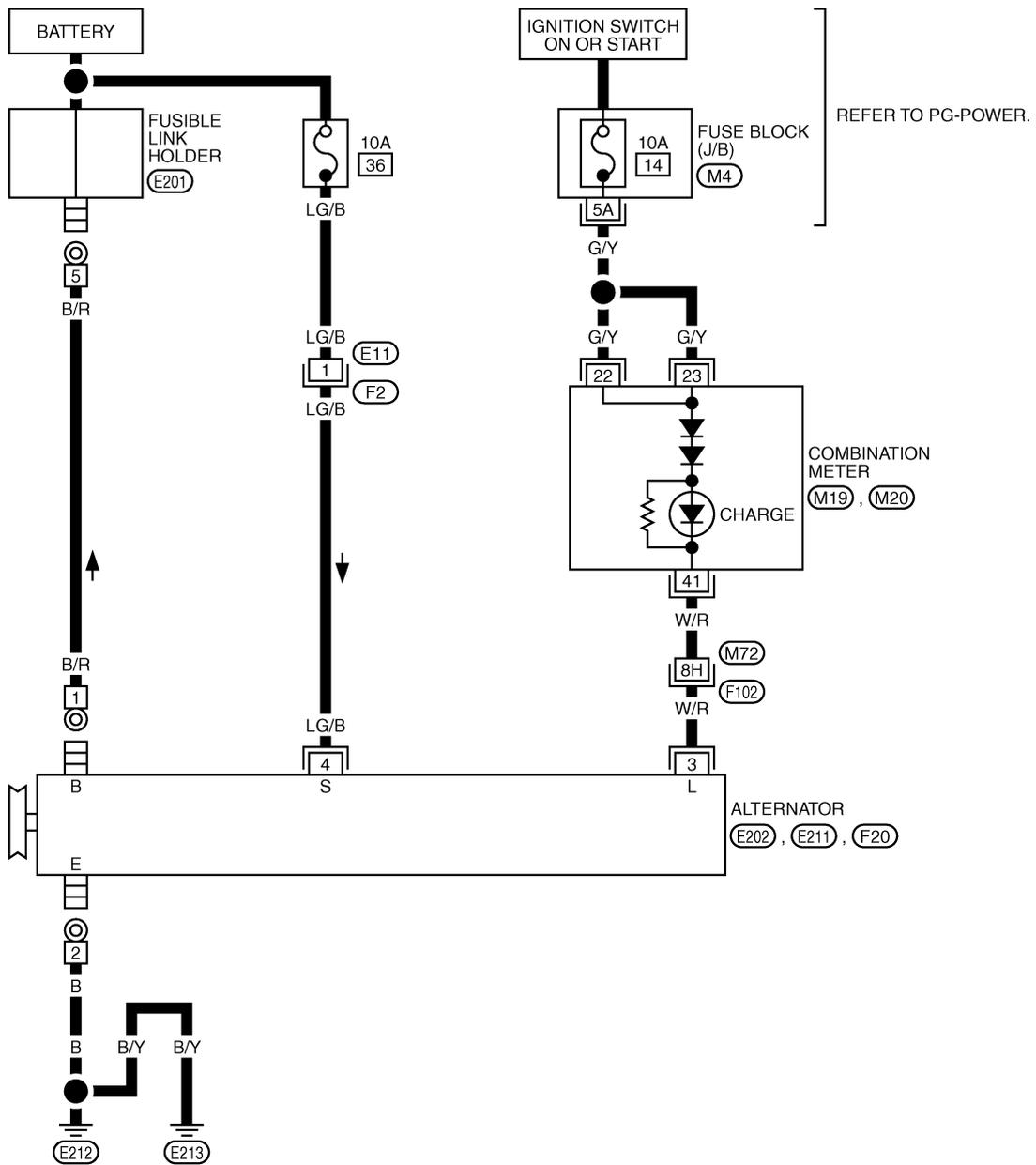
M

# CHARGING SYSTEM

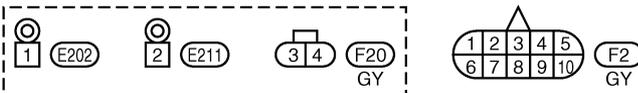
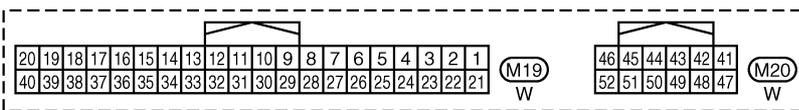
## Wiring Diagram — CHARGE —

AKS003Z8

### SC-CHARGE-01



REFER TO PG-POWER.



REFER TO THE FOLLOWING.

- (F102) -SUPER MULTIPLE JUNCTION (SMJ)
- (M4) -FUSE BLOCK-JUNCTION BOX (J/B)

TKWM2182E

# CHARGING SYSTEM

## Trouble Diagnosis with Battery/Starting/Charging System Tester

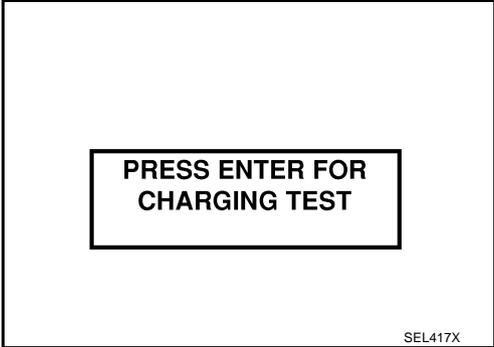
AKS003Z9

### 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-26, "PRELIMINARY INSPECTION"](#).**

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.



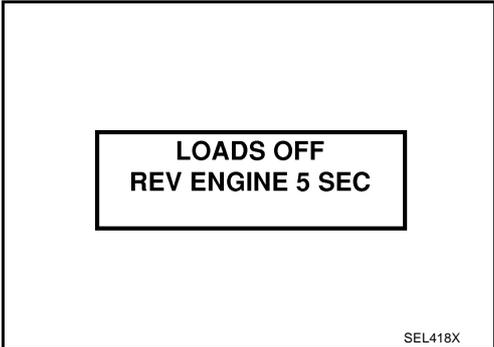
PRESS ENTER FOR  
CHARGING TEST

SEL417X

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 speed 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.



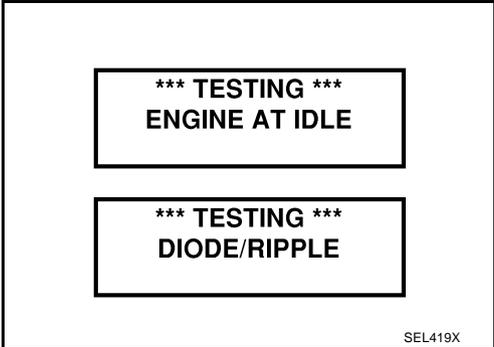
LOADS OFF  
REV ENGINE 5 SEC

SEL418X

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.

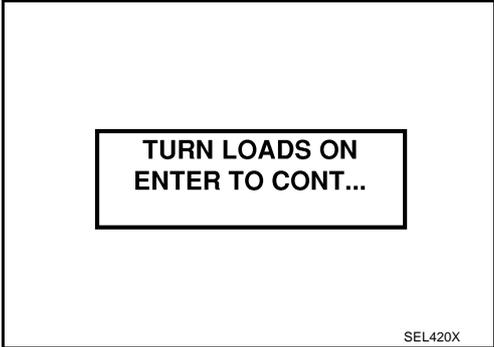


\*\*\* TESTING \*\*\*  
ENGINE AT IDLE

\*\*\* TESTING \*\*\*  
DIODE/RIPPLE

SEL419X

9. Press "ENTER" to continue.



TURN LOADS ON  
ENTER TO CONT...

SEL420X

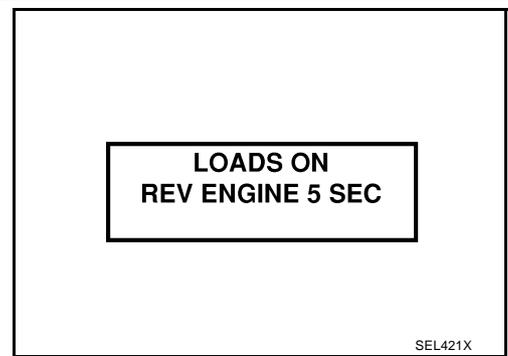
A  
B  
C  
D  
E  
F  
G  
H  
I  
J  
SC  
L  
M

# CHARGING SYSTEM

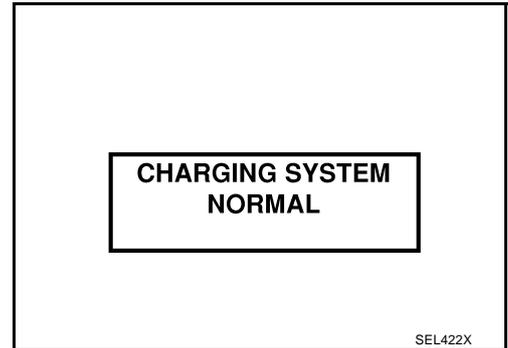
10. Raise and hold the engine speed at 1,500 to 2,000 rpm for about 5 seconds, then return the engine to idle. Once the increase in engine rpm is detected, press "ENTER" to continue.

**NOTE:**

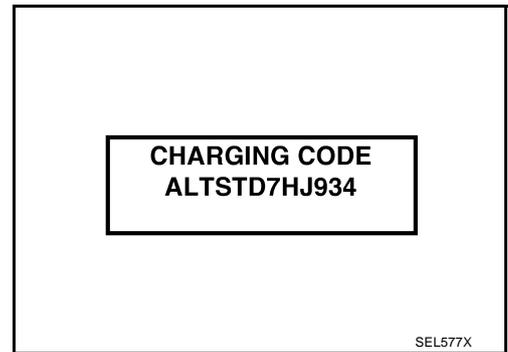
If after 30 seconds an increase in engine idle speed is not detected, "RPM NOT DETECTED" will be displayed. Press "ENTER" to restart the test.



11. Diagnostic result is displayed on the tester. Refer to [SC-24, "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.



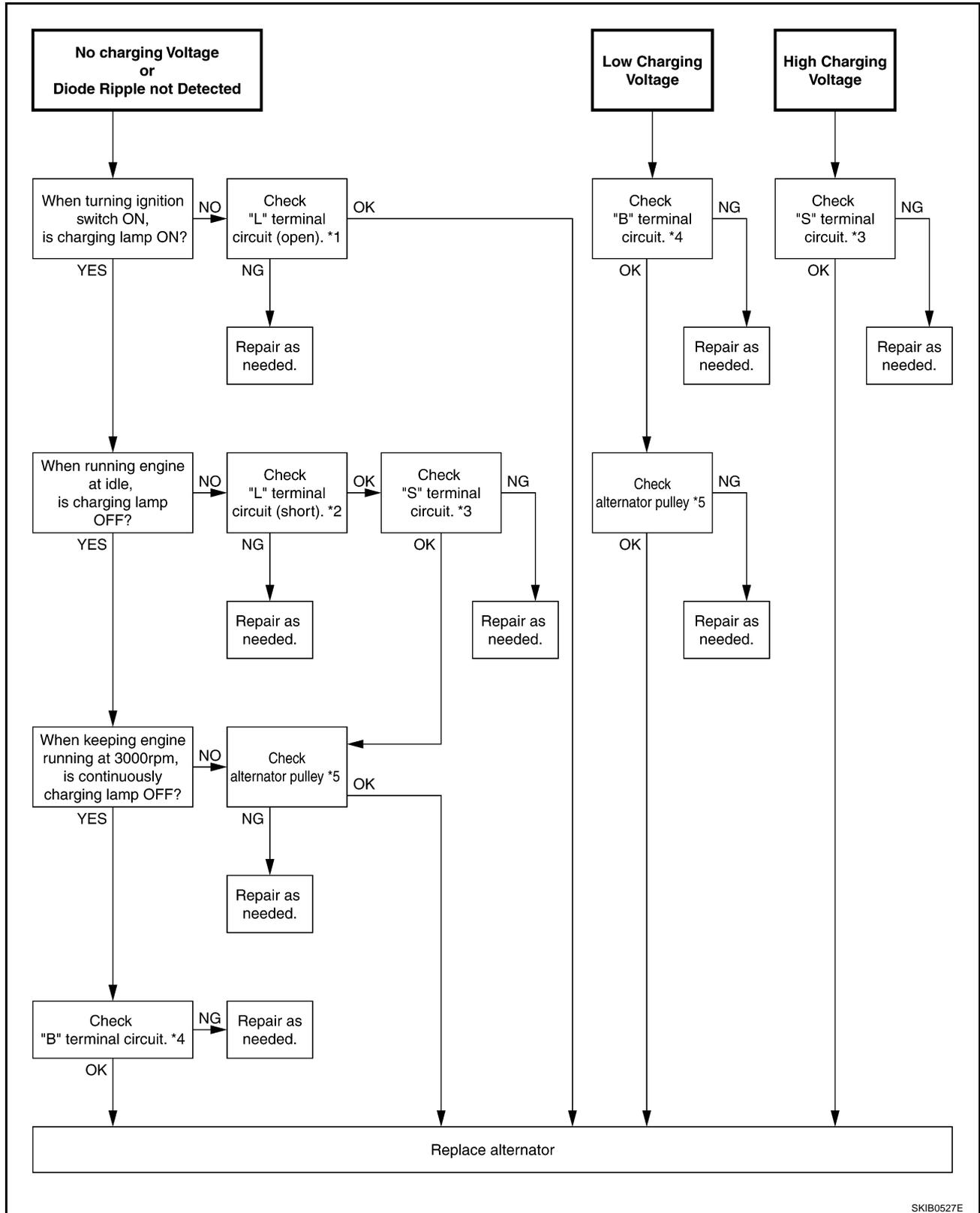
## DIAGNOSTIC RESULT ITEM CHART

Diagnostic item	Service procedure
CHARGING SYSTEM NORMAL	Charging system is normal and will also show DIODE RIPPLE test result.
NO CHARGING VOLTAGE	Go to <a href="#">SC-25, "WORK FLOW"</a> .
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 <a href="#">SC-25, "WORK FLOW"</a> .



# CHARGING SYSTEM

## WORK FLOW



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

\*1 [SC-27, "Check "L" Terminal Circuit \(Open\)"](#) \*2 [SC-28, "Check "L" Terminal Circuit \(Short\)"](#) \*3 [SC-28, "Check "S" Terminal Circuit"](#)  
 \*4 [SC-29, "Check "B" Terminal Circuit"](#) \*5 [SC-31, "ALTERNATOR PULLEY INSPECTION"](#)

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 alternator and combination meter fuses.

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

OK or NG

OK >> GO TO 3.

NG >> If fuse is blown, be sure eliminate cause of malfunction before installing new fuse.

### 3. CHECK "E" TERMINAL CONNECTION

---

Check if "E" terminal 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-13, "Checking Drive Belts"](#) .

OK or NG

OK >> INSPECTION END

NG >> Repair as needed.

# CHARGING SYSTEM

## 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.

#### 2. CHECK "L" TERMINAL CIRCUIT (OPEN)

1. Disconnect alternator connector.
2. Apply ground to alternator harness connector F20 terminal 3 (W/R) with the ignition switch in the ON position.

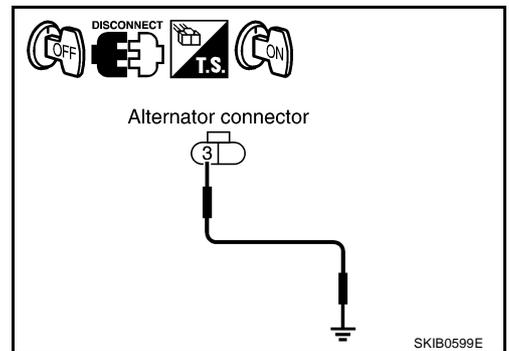
**3 (W/R) – Ground : Charge warning lamp should light up.**

OK or NG

OK >> Go to [SC-25, "WORK FLOW"](#) .

NG >> Check the following.

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



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

# CHARGING SYSTEM

## 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 light up?

YES >> Check the following.

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

NO >> Go to [SC-25, "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.

#### 2. CHECK ALTERNATOR "S" TERMINAL CIRCUIT

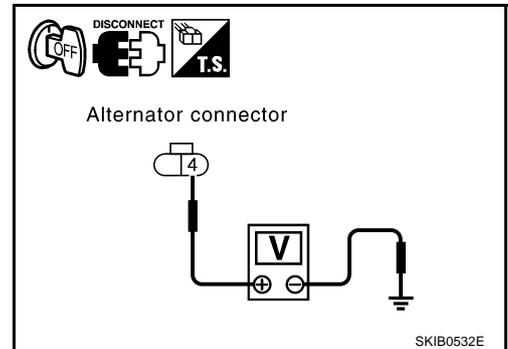
1. Disconnect alternator connector.
2. Check voltage between alternator harness connector F20 terminal 4 (LG/B) and ground.

**4 (LG/B) – Ground : Battery voltage**

OK or NG

OK >> Go to [SC-25, "WORK FLOW"](#) .

NG >> Check harness for open between alternator and fuse.



# CHARGING SYSTEM

## 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.

#### 2. CHECK ALTERNATOR "B" TERMINAL CIRCUIT

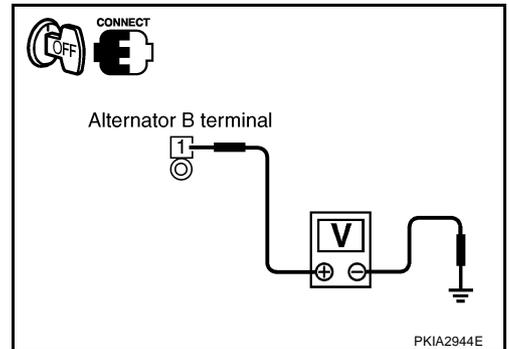
Check voltage between alternator "B" terminal E202 terminal 1 (B/R) and ground.

**1 (B/R) – Ground : Battery voltage**

OK or NG

OK >> GO TO 3.

NG >> Check harness for open between alternator and battery.



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

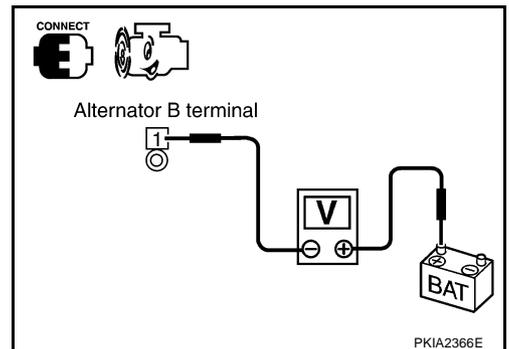
1. Start engine.
2. When engine running at idle and warm, check voltage between alternator "B" terminal E202 terminal 1 (B/R) and battery positive terminal.

**1 (B/R) – Battery positive terminal : Less than 0.2 V**

OK or NG

OK >> Go to [SC-25. "WORK FLOW"](#).

NG >> Check harness between battery and alternator for poor continuity.

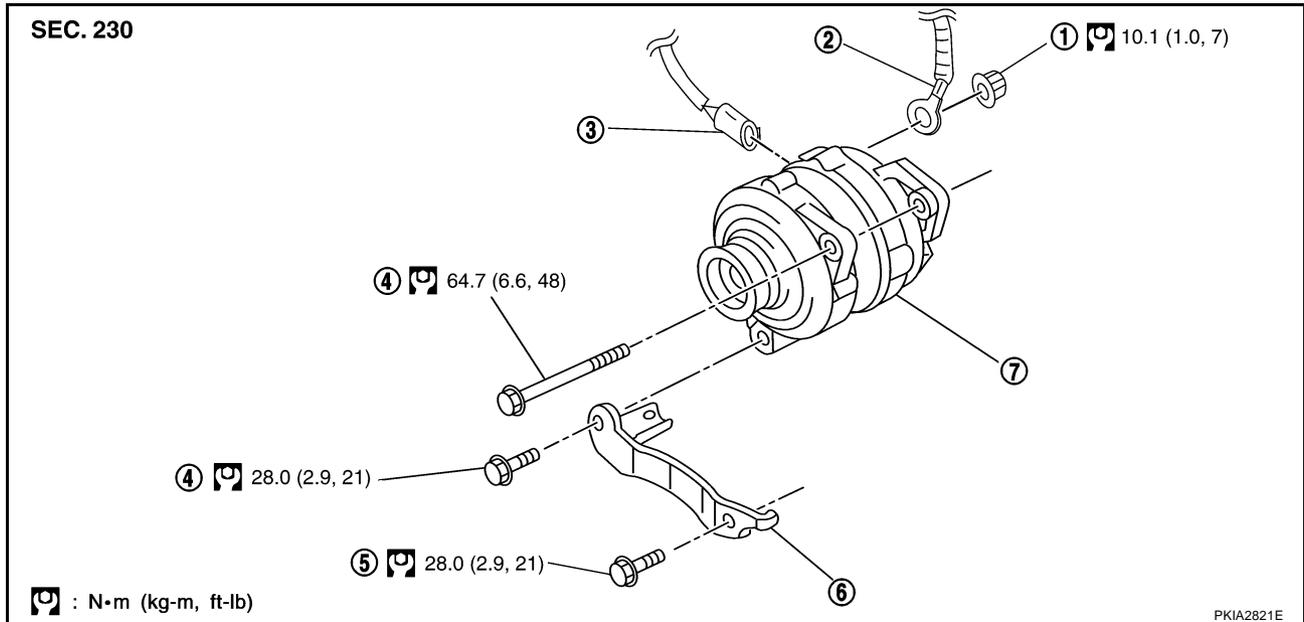


A  
B  
C  
D  
E  
F  
G  
H  
I  
J  
SC  
L  
M

# CHARGING SYSTEM

## Removal and Installation

AKS003ZA



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

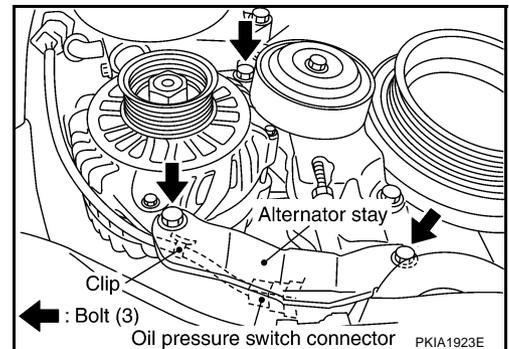
### REMOVAL

- Open the driver and front passenger window, and then disconnect the battery cable from the negative terminal.

#### CAUTION:

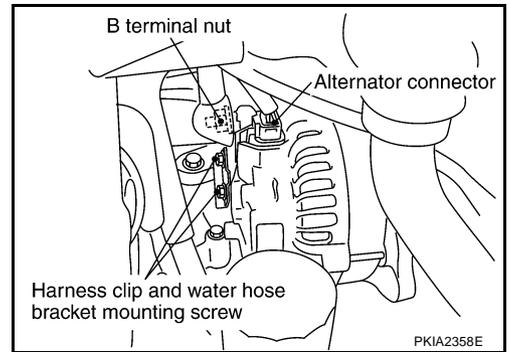
**Before disconnecting the battery, lower both the driver and passenger windows. This will prevent any interference between the window edge and the vehicle when the door is opened/closed. During normal operation, the window slightly raises and lowers automatically to prevent any window to vehicle interference. The automatic window function will not work with the battery disconnected.**

- Remove front air spoiler (with front air spoiler).
- Remove engine front undercover, using power tools.
- Remove engine right side undercover.
- Remove radiator cooling fan assembly. Refer to [CO-21, "COOLING FAN"](#).
- Remove alternator and power steering belt. Refer to [EM-14, "Removal and Installation"](#).
- Remove oil pressure switch harness clip from alternator stay.
- Disconnect oil pressure switch connector.
- Remove alternator stay mounting bolts and alternator stay, using power tools.
- Remove alternator mounting bolt, using power tools.



# CHARGING SYSTEM

11. Disconnect alternator connector.
12. Remove "B" terminal nut.
13. Remove harness clip and water hose bracket from alternator.
14. 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.

- Install alternator, and check tension of belt. Refer to [EM-13, "Tension Adjustment"](#).

### CAUTION:

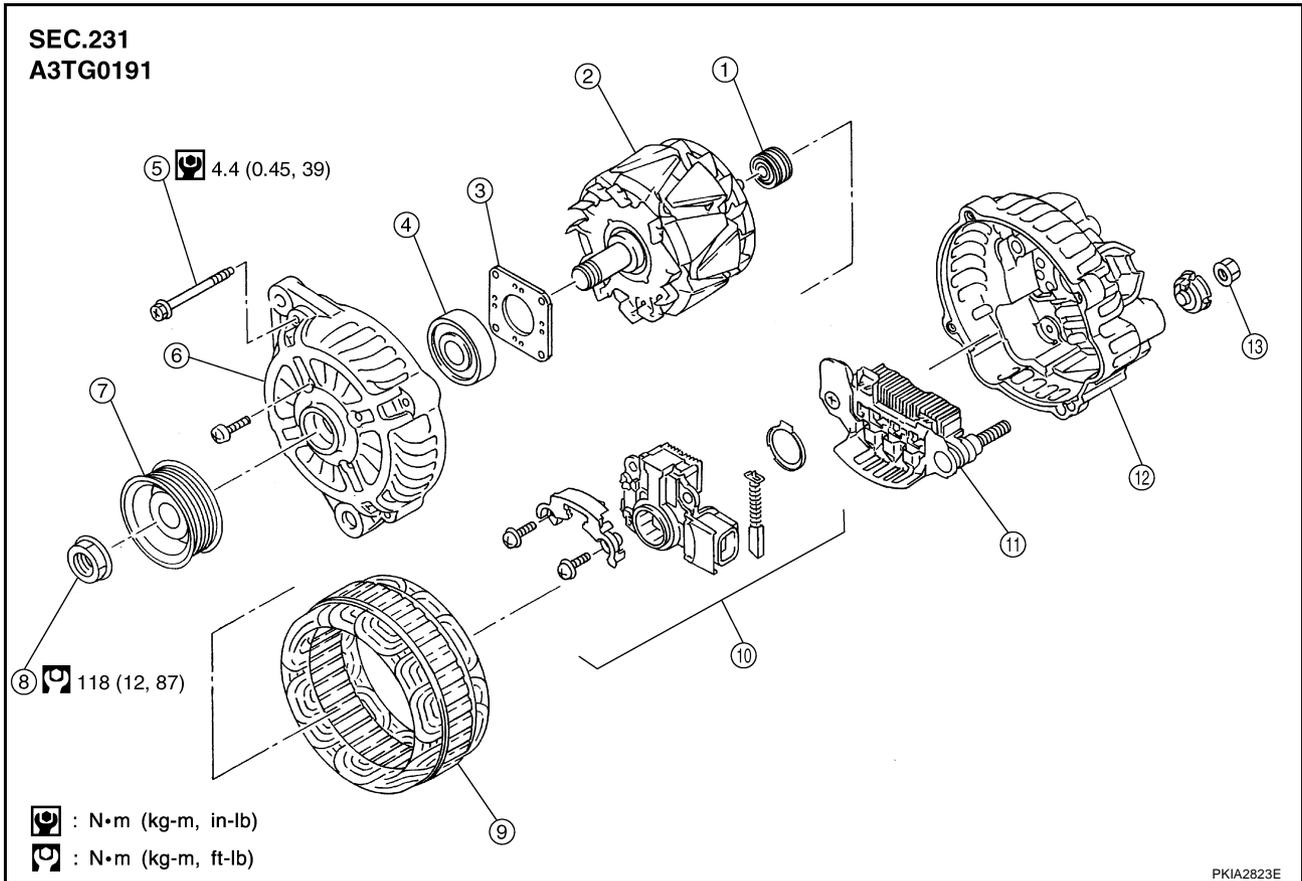
Be sure to tighten "B" terminal nut carefully.

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

# CHARGING SYSTEM

## Disassembly and Assembly

AKS003ZB



- |                                   |                    |                           |
|-----------------------------------|--------------------|---------------------------|
| 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)

PFP:00030

### Battery

AKS00C30

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

### Starter

AKS00C31

Type	S114-880	
	HITACHI make	
	Reduction gear type	
System voltage	12 V	
No-load	Terminal voltage	11 V
	Current	Less than 90 A
	Revolution	More than 2,880 rpm
Minimum diameter of commutator	28.0 mm (1.102 in)	
Minimum length of brush	10.5 mm (0.413 in)	
Brush spring tension	16.2 N (1.65 kg, 3.6 lb)	
Clearance between bearing metal and armature shaft	Less than 0.2 mm (0.008 in)	
Clearance between pinion front edge and pinion stopper	0.3 - 2.5 mm (0.012 - 0.098 in)	

### Alternator

AKS00C32

Type	A3TG0191	
	MITSUBISHI make	
Nominal rating	12 V - 110 A	
Ground polarity	Negative	
Minimum revolution under no-load (When 13.5 V is applied)	Less than 1,000 rpm	
Hot output current (When 13.5 V is applied)	More than 37 A/1,300 rpm More than 92 A/2,500 rpm More than 103 A/5,000 rpm	
Regulated output voltage	14.1 - 14.7 V	
Minimum length of brush	More than 5.00 mm (0.197 in)	
Brush spring pressure	4.9 - 6.1 N (499 - 622 g, 17.62 - 21.94 oz)	
Slip ring minimum outer diameter	More than 22.1 mm (0.870 in)	
Rotor (Field coil) resistance	1.7 - 2.1 Ω	

# SERVICE DATA AND SPECIFICATIONS (SDS)

---