

A
B
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SECTION SC

STARTING & CHARGING SYSTEM

CONTENTS

<p>PRECAUTIONS 2</p> <p style="padding-left: 20px;">Precautions for Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER" 2</p> <p>PREPARATION 3</p> <p style="padding-left: 20px;">Special Service Tool 3</p> <p style="padding-left: 20px;">Commercial Service Tools 3</p> <p>BATTERY 4</p> <p style="padding-left: 20px;">How to Handle Battery 4</p> <p style="padding-left: 40px;">METHODS OF PREVENTING OVER-DISCHARGE 4</p> <p style="padding-left: 40px;">CHECKING ELECTROLYTE LEVEL 4</p> <p style="padding-left: 40px;">SPECIFIC GRAVITY CHECK 5</p> <p style="padding-left: 40px;">CHARGING THE BATTERY 6</p> <p style="padding-left: 20px;">Trouble Diagnoses with Battery Service Center 6</p> <p style="padding-left: 20px;">Removal and Installation 7</p> <p style="padding-left: 40px;">REMOVAL 7</p> <p style="padding-left: 40px;">INSTALLATION 7</p> <p>STARTING SYSTEM 8</p> <p style="padding-left: 20px;">System Description 8</p> <p style="padding-left: 40px;">M/T MODEL 8</p> <p style="padding-left: 40px;">A/T MODEL 8</p> <p style="padding-left: 20px;">Wiring Diagram — START — 9</p> <p style="padding-left: 40px;">M/T MODEL 9</p> <p style="padding-left: 40px;">A/T MODEL 10</p> <p style="padding-left: 20px;">Trouble Diagnoses with Starting/Charging System Tester (Starting) 11</p>	<p style="padding-left: 20px;">WORK FLOW 11</p> <p style="padding-left: 20px;">DIAGNOSTIC PROCEDURE 1 12</p> <p style="padding-left: 20px;">DIAGNOSTIC PROCEDURE 2 13</p> <p style="padding-left: 20px;">MINIMUM SPECIFICATION OF CRANKING VOLTAGE REFERENCING COOLANT TEMPERATURE 14</p> <p style="padding-left: 20px;">Removal and Installation 14</p> <p style="padding-left: 40px;">M/T MODELS 14</p> <p style="padding-left: 40px;">A/T MODELS 15</p> <p>CHARGING SYSTEM 16</p> <p style="padding-left: 20px;">System Description 16</p> <p style="padding-left: 20px;">Wiring Diagram — CHARGE — 17</p> <p style="padding-left: 20px;">Trouble Diagnoses with Starting/Charging System Tester (Charging) 18</p> <p style="padding-left: 40px;">WORK FLOW 18</p> <p style="padding-left: 40px;">DIAGNOSTIC PROCEDURE 1 19</p> <p style="padding-left: 40px;">DIAGNOSTIC PROCEDURE 2 20</p> <p style="padding-left: 40px;">DIAGNOSTIC PROCEDURE 3 21</p> <p style="padding-left: 40px;">MALFUNCTION INDICATOR 22</p> <p style="padding-left: 20px;">Removal and Installation 22</p> <p style="padding-left: 40px;">REMOVAL 22</p> <p style="padding-left: 40px;">INSTALLATION 22</p> <p>SERVICE DATA AND SPECIFICATIONS (SDS) 23</p> <p style="padding-left: 20px;">Battery 23</p> <p style="padding-left: 20px;">Starter 23</p> <p style="padding-left: 20px;">Generator 23</p>
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A
B
C
D
E
F
G
H
I
J
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PRECAUTIONS

PRECAUTIONS

PFP:00001

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

EKS008XV

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.

PREPARATION

PREPARATION

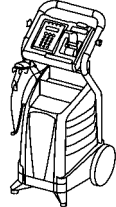
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Special Service Tool

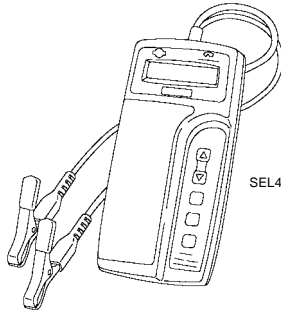
EKS008XX

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

Tool number (Kent-Moore No.) Tool name	Description
(J-48087) Battery Service Center	Tests battery. For operating instructions, refer to Technical Service Bulletin and Battery Service Center User Guide.
(J-44373) Model 620 Starting/Charging system tester	Tests starting and charging systems. For operating instructions, refer to Technical Service Bulletin.



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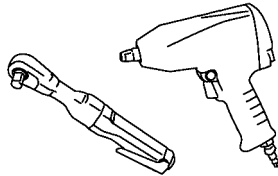


SEL403X

Commercial Service Tools

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Tool number Tool name	Description
Power tool	Loosening bolts and nuts



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BATTERY

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BATTERY

How to Handle Battery

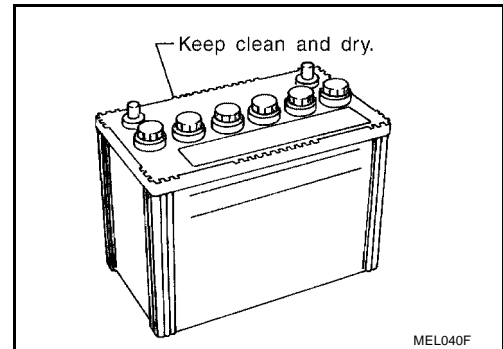
CAUTION:

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

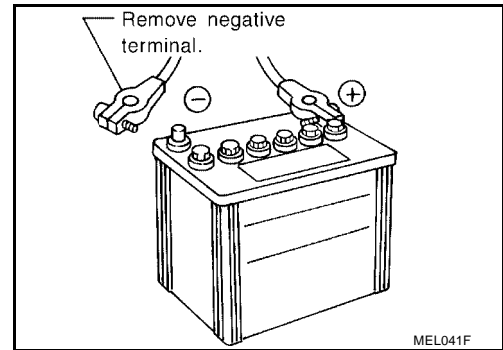
METHODS OF PREVENTING OVER-DISCHARGE

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

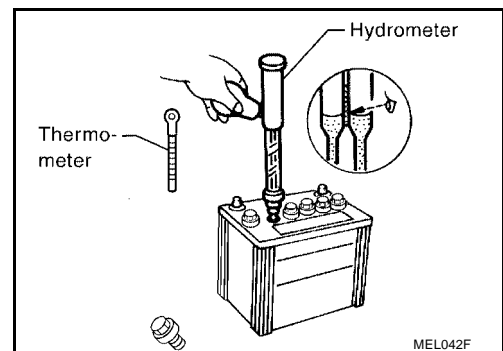
- The battery surface (particularly its top) should always be kept clean and dry.
- The terminal connections should be clean and tight.
- At every routine maintenance, check the electrolyte level. This also applies to batteries designated as "low maintenance" and "maintenance-free".



- When the vehicle is not going to be used over a long period of time, disconnect the negative battery 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.



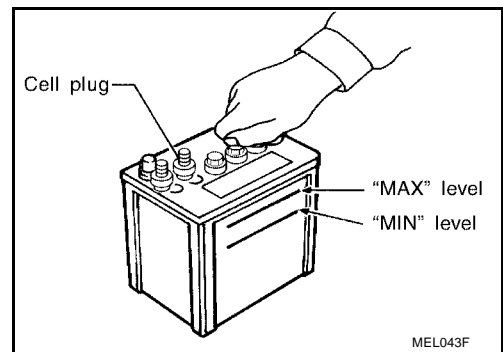
CHECKING ELECTROLYTE LEVEL

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.

BATTERY

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

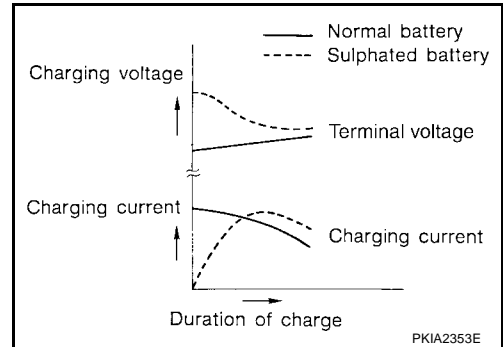


Sulfation

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.

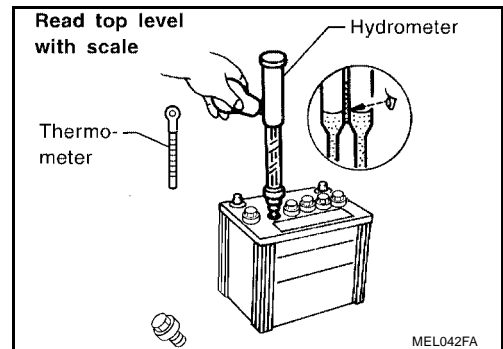
To determine if a battery has been “sulfated”, note its voltage and current when charging it. As shown in the figure, less current and higher voltage are observed in the initial stage of charging sulfated batteries.

A sulfated 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 following chart 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
16 (60)	-0.008
10 (50)	-0.012
4 (40)	-0.016
-1 (30)	-0.020
-7 (20)	-0.024

A
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C
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E
F
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H
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J
SC
L
M

BATTERY

Battery electrolyte temperature °C (°F)	Add to specific gravity reading
-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 60°C (140°F), stop charging. Always charge battery at a temperature below 60°C (140°F).

Charging Rates

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

Do not charge at more than 50 ampere rate.

NOTE:

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

- If, after charging, the specific gravity of any two cells varies more than .050, the battery should be replaced.

Trouble Diagnoses with Battery Service Center

EKS008Y0

For battery testing, use Battery Service Center (J-48087). For details and operating instructions, refer to Technical Service Bulletin and/or Battery Service Center User Guide.

BATTERY

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Removal and Installation

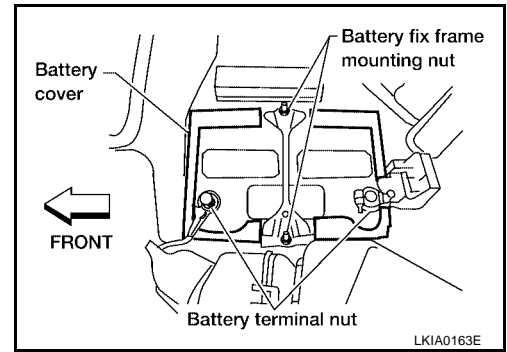
REMOVAL

1. Disconnect negative battery terminal and positive battery terminal.

CAUTION:

When removing, remove negative battery terminal first.

2. Remove battery fix frame mounting nuts and battery fix frame.
3. Remove battery cover.
4. Remove battery.



INSTALLATION

Installation is in the reverse order of removal.

CAUTION:

When installing, install positive battery terminal first.

Battery fix frame mounting nut : 4.0 - 4.9 N·m (0.4 - 0.5 kg·m, 35 - 43 in·lb)

Battery terminal nut : 3.0 - 3.9 N·m (0.3 - 0.4 kg·m, 26 - 34 in·lb)

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

STARTING SYSTEM

System Description M/T MODEL

Power is supplied at all times:

- through 40A fusible link (letter **m** , located in the fuse and fusible link box)
- to ignition switch terminal B.

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

- from ignition switch terminal ST
- to intelligent power distribution module engine room (IPDM E/R) terminal 4.

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

- through 10A fuse [No. 12, located in the fuse block (J/B)]
- to IPDM E/R terminal 53.

When the clutch pedal is depressed, ground is supplied to IPDM E/R terminal 50 through the clutch interlock switch and body grounds E15 and E24.

Provided that the IPDM E/R receives a starter relay on signal from the BCM over the CAN lines, the IPDM E/R is energized and power is supplied:

- from terminal 3 of the IPDM E/R
- to terminal S of the starter motor windings.

The starter motor plunger closes and provides a closed circuit between the battery and the starter motor. The starter motor is grounded to the cylinder block. With power and ground supplied, the starter motor operates.

In the event that the CAN communication line fails, the IPDM E/R will continue to receive a starter relay on signal from the BCM as long as the ignition switch remains in the START or ON positions.

A/T MODEL

Power is supplied at all times:

- through 40A fusible link (letter **m** , located in the fuse and fusible link box)
- to ignition switch terminal B.

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

- from ignition switch terminal ST
- to IPDM E/R terminal 4.

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

- through 10A fuse [No. 12, located in the fuse block (J/B)]
- to park/neutral position (PNP) switch terminal 5.

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

- through PNP switch terminal 1
- to IPDM E/R terminal 53.

Provided that the IPDM E/R receives a starter relay on signal from the BCM over the CAN lines, the IPDM E/R is energized and power is supplied:

- from terminal 3 of the IPDM E/R
- to terminal S of the starter motor windings.

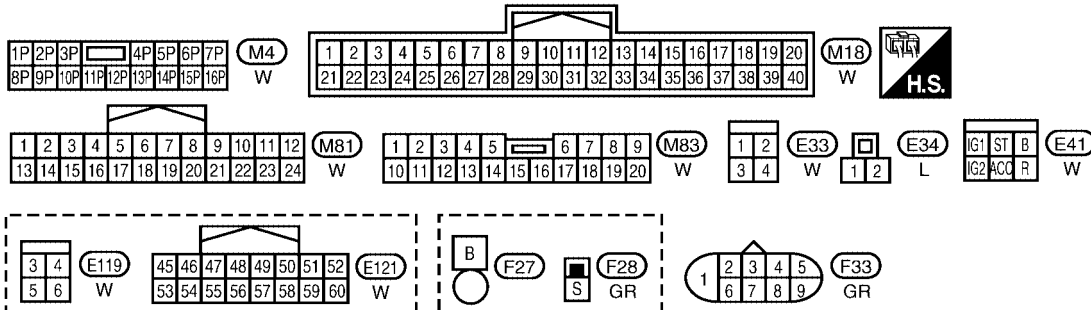
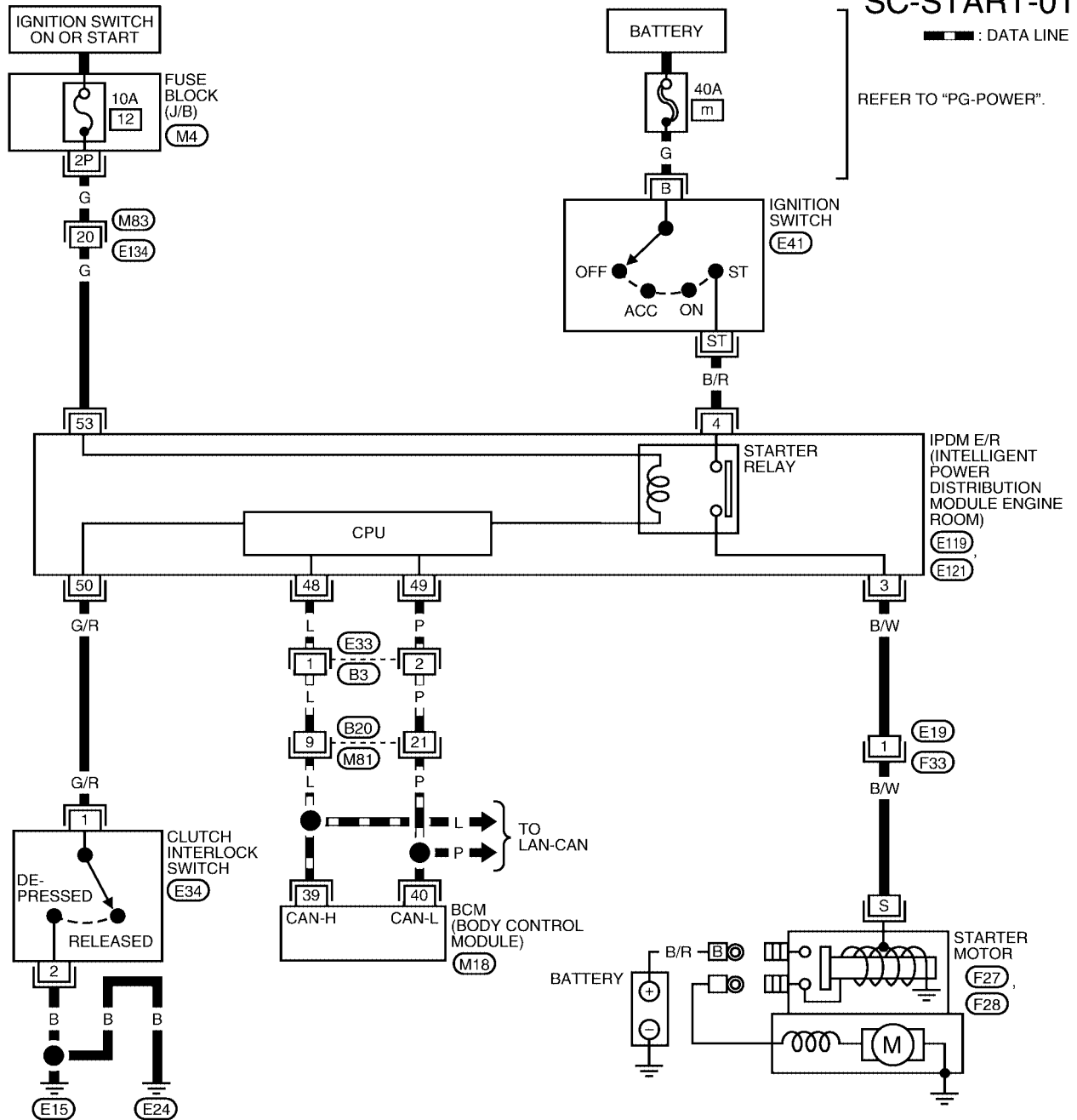
The starter motor plunger closes and provides a closed circuit between the battery and the starter motor. The starter motor is grounded to the cylinder block. With power and ground supplied, the starter motor operates.

In the event that the CAN communication line fails, the IPDM E/R will continue to receive a starter relay on signal from the BCM as long as the ignition switch remains in the START or ON positions.

STARTING SYSTEM

EKS008Y3

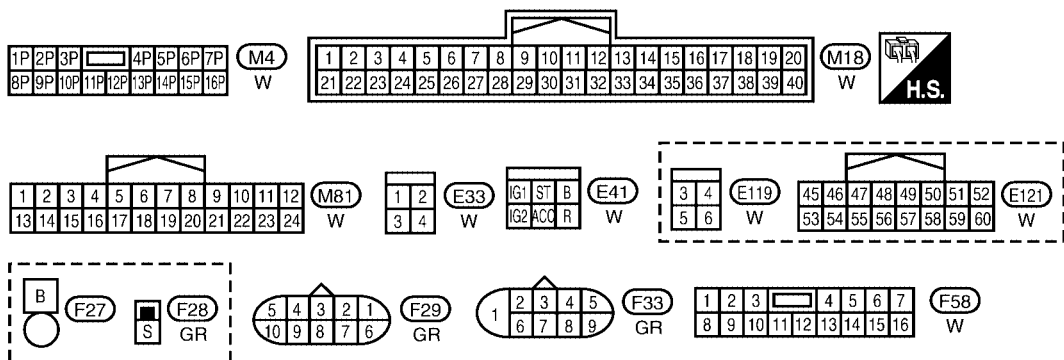
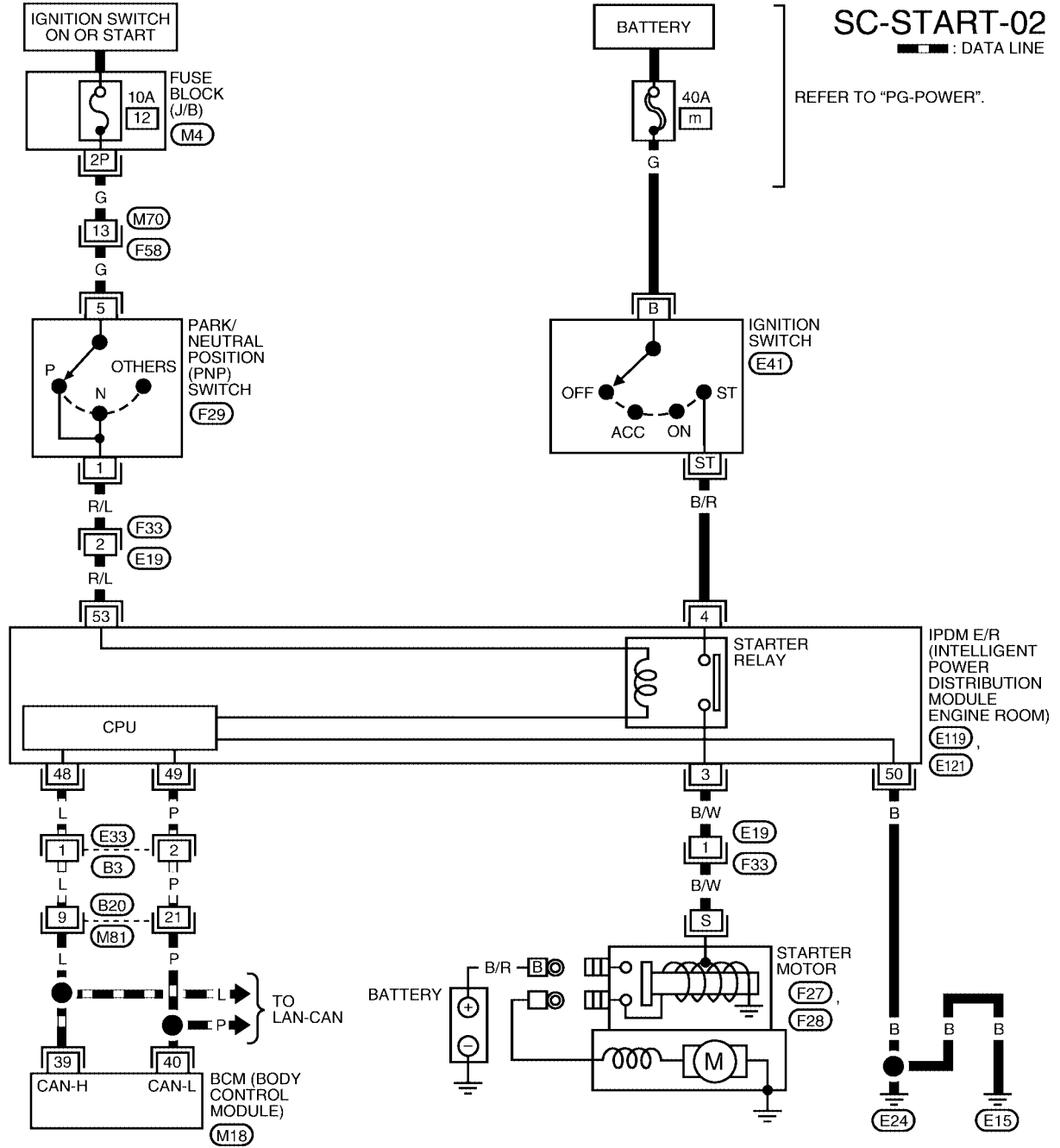
Wiring Diagram — START — M/T MODEL



WKWA3576E

STARTING SYSTEM

A/T MODEL



WKWA3577E

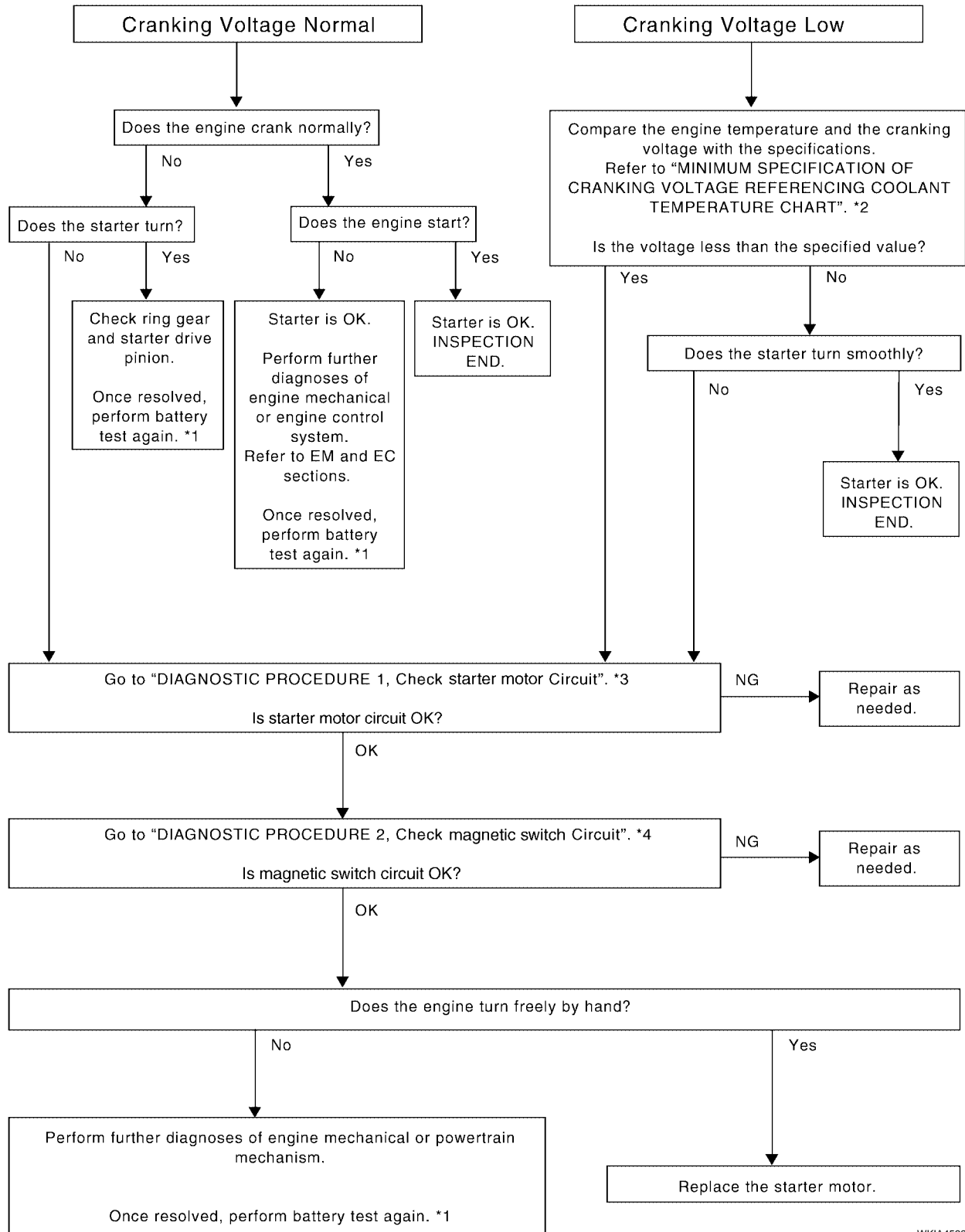
STARTING SYSTEM

EKS008Y4

Trouble Diagnoses with Starting/Charging System Tester (Starting)

For starting system testing, use Starting/Charging System Tester (J-44373). For details and operating instructions, refer to Technical Service Bulletin.

WORK FLOW



WKIA4532E

STARTING SYSTEM

*1 For battery testing, use Battery Service Center (J-48087).
For details and operating instructions, refer to Technical Service Bulletin and/or Battery Service Center User Guide

*2 [SC-12. "Check Starter Motor Circuit"](#)

*3 [SC-13. "DIAGNOSTIC PROCEDURE 2"](#)

*4 [SC-13. "Check Magnetic Switch Circuit"](#)

DIAGNOSTIC PROCEDURE 1 Check Starter Motor Circuit

1. CHECK POWER SUPPLY TO STARTER MOTOR

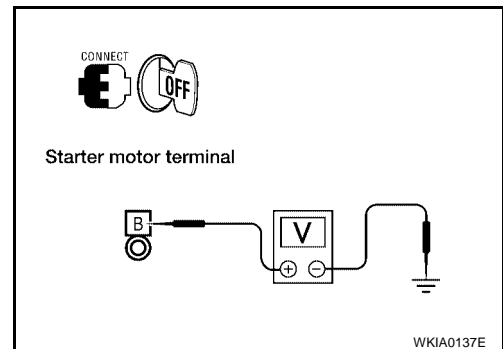
1. Remove the fuel pump fuse.
2. Crank or start the engine (where possible) until the fuel pressure is released.
3. Turn the ignition switch OFF.
4. Check that the starter motor connector F27 terminal B connection is clean and tight.
5. Check voltage between starter motor connector F27 terminal B and ground using a digital circuit tester.

Battery voltage should exist

OK or NG

OK >> GO TO 2.

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



2. CHECK VOLTAGE DROP ON STARTER MOTOR CIRCUIT

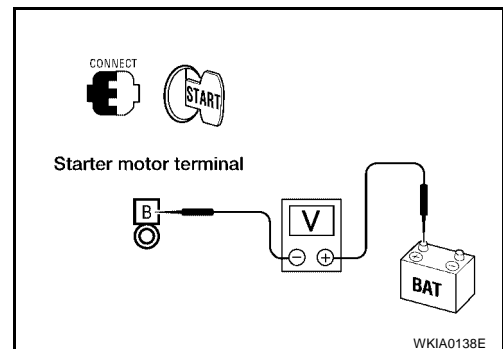
1. Check voltage between starter motor connector F27 terminal B and battery positive terminal using a digital circuit tester.

Ignition switch in START : Less than 0.5V

OK or NG

OK >> GO TO 3.

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



3. CHECK VOLTAGE DROP ON STARTER MOTOR GROUND CIRCUIT

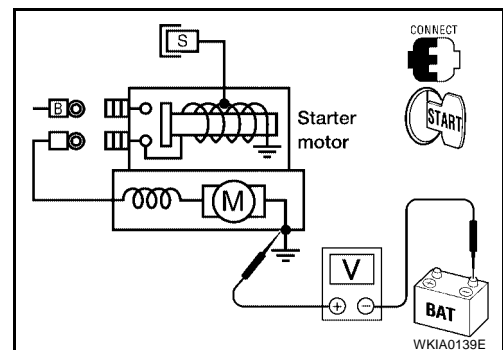
1. Check voltage between starter motor case and battery negative terminal using a digital circuit tester.

Ignition switch in START : Less than 0.2V

OK or NG

OK >> Starter motor ground circuit is OK. Further inspection is necessary. Refer to [SC-11. "WORK FLOW"](#).

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



STARTING SYSTEM

DIAGNOSTIC PROCEDURE 2

Check Magnetic Switch Circuit

1. CHECK POWER SUPPLY FOR MAGNETIC SWITCH

1. Remove the fuel pump fuse.
2. Crank or start the engine (where possible) until the fuel pressure is released.
3. Turn the ignition switch OFF.
4. Disconnect starter motor connector F28.
5. Check voltage between starter motor connector F28 terminal S and ground using a digital circuit tester.

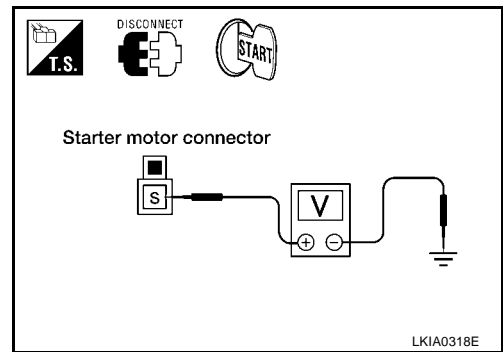
Ignition switch in : Battery voltage
START

OK or NG

OK >> GO TO 2.

NG >> Check the following.

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



2. CHECK VOLTAGE DROP ON MAGNETIC SWITCH CIRCUIT

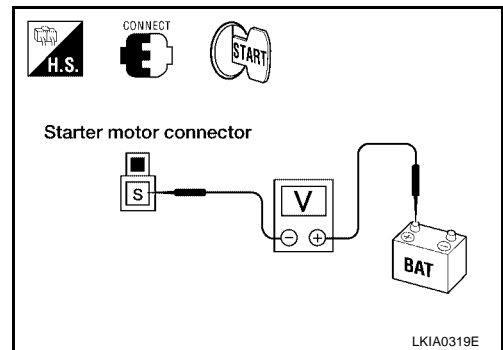
1. Connect starter motor connector F28.
2. Check voltage between starter motor connector F28 terminal S and battery positive terminal using a digital tester.

Ignition switch in : Less than 1V
START

OK or NG

OK >> Magnetic switch circuit is OK. Further inspection is necessary. Refer to [SC-11, "WORK FLOW"](#).

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



STARTING SYSTEM

MINIMUM SPECIFICATION OF CRANKING VOLTAGE REFERENCING COOLANT TEMPERATURE

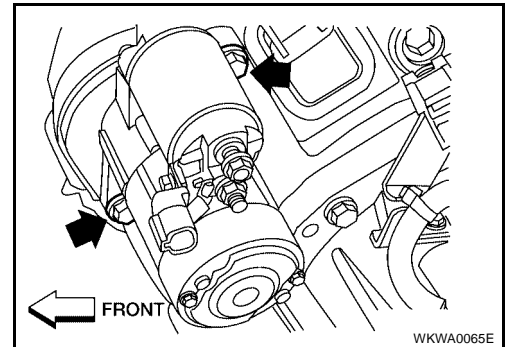
Engine coolant temperature	Voltage V
-30°C to -20°C (-22°F to -4°F)	8.4
-19°C to -10°C (-2°F to 14°F)	8.9
-9°C to 0°C (16°F to 32°F)	9.3
More than 1°C (More than 34°F)	9.7

Removal and Installation M/T MODELS

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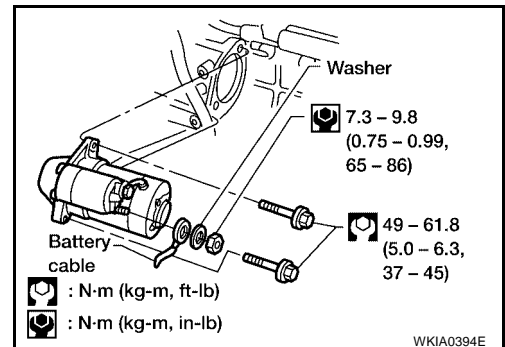
Removal

1. Disconnect the negative battery terminal.
2. Raise and support the vehicle.
3. Remove the harness protector from the starter engine room harness.
4. Disconnect the starter harness connectors.
5. Remove the two starter mounting bolts, using power tools.
6. Remove the starter.



Installation

To install, reverse the removal procedure.

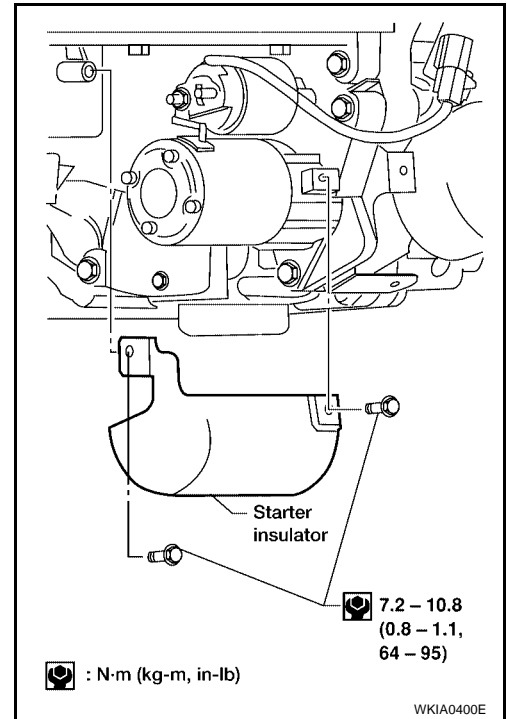


STARTING SYSTEM

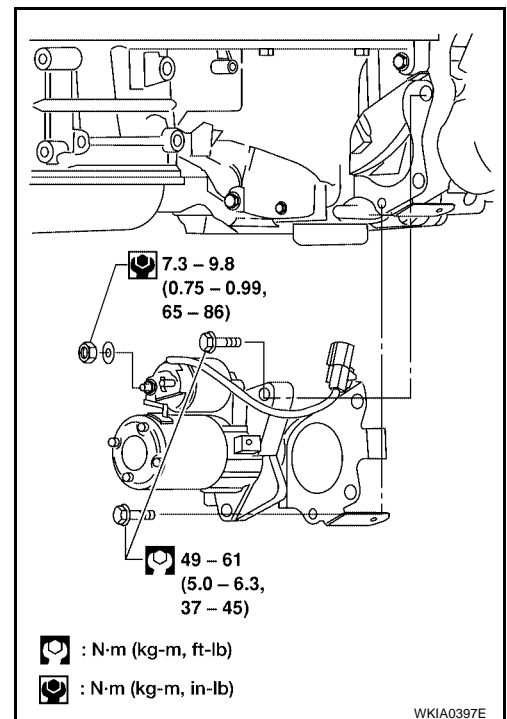
A/T MODELS

Removal

1. Disconnect the negative battery terminal.
2. Remove the starter insulator.



3. Remove the harness bracket and harness protector from the starter engine room harness.
4. Disconnect the starter harness connectors.
5. Remove the two starter bolts, using power tools.
6. Remove the starter.



Installation

Installation is in the reverse order of removal.

CHARGING SYSTEM

PF2:23100

System Description

EKS008Y8

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

Power is supplied at all times to generator terminal S through:

- 10A fuse (No. 26, located in the fuse and fusible link box).

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 S detecting the input voltage. The charging circuit is protected by the 120A fusible link (letter **a**, located in the fusible link box).

Ground is supplied:

- to generator terminal E
- through body ground E116.

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 23 for the charge warning lamp.

Ground is supplied to terminal 17 of the combination meter through terminal L of the generator. With power and ground supplied, the charge warning lamp will illuminate. When the generator is providing sufficient voltage with the engine running, the ground is opened and the charge warning lamp will go off.

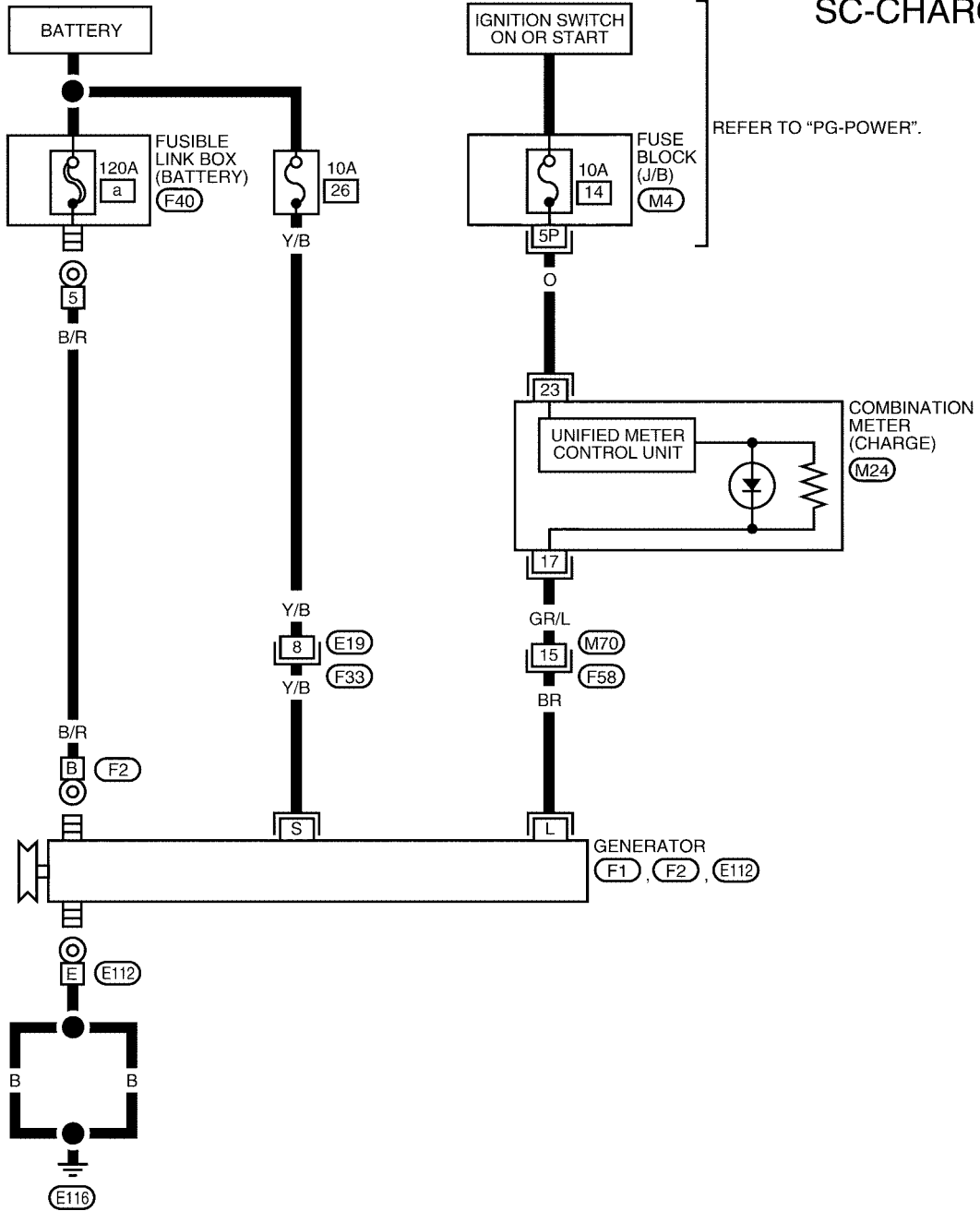
If the charge warning lamp illuminates with the engine running, a fault is indicated.

CHARGING SYSTEM

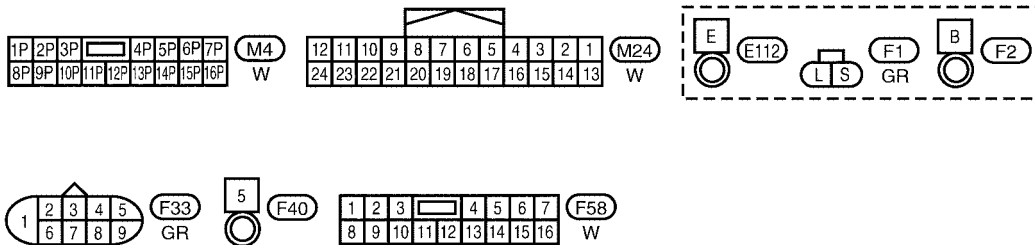
Wiring Diagram — CHARGE —

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SC-CHARGE-01



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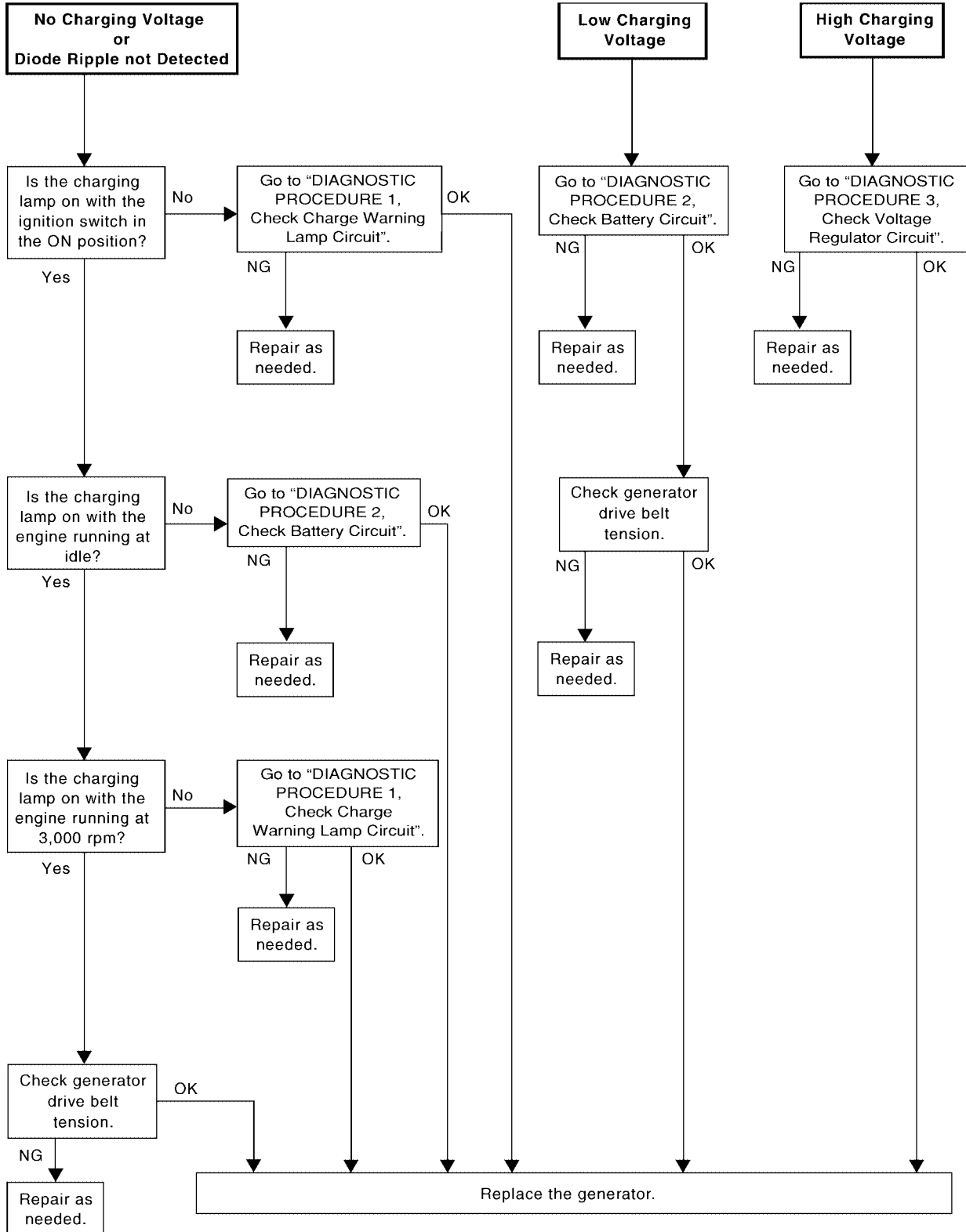
CHARGING SYSTEM

Trouble Diagnoses with Starting/Charging System Tester (Charging)

EKS008YA

For charging system testing, use Starting/Charging System Tester (J-44373). For details and operating instructions, refer to Technical Service Bulletin.

WORK FLOW



WKIA4022E

CHARGING SYSTEM

DIAGNOSTIC PROCEDURE 1

Check Charge Warning Lamp Circuit

1. CHECK CHARGE WARNING LAMP CIRCUIT CONNECTION

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 Starting/Charging system test.

2. CHECK CHARGE WARNING LAMP CIRCUIT

1. Disconnect F1 connector from generator.
2. Apply ground to connector F1 terminal L with the ignition switch in the ON position.

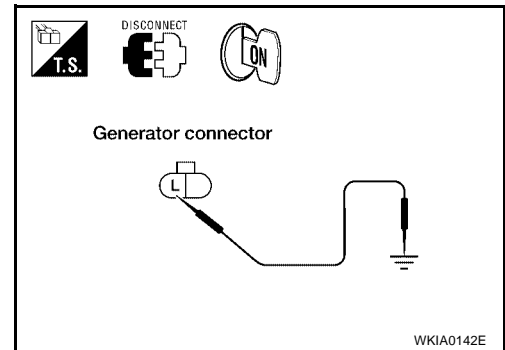
CHARGE lamp should light up.

OK or NG

OK >> GO TO [SC-18. "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 generator



CHARGING SYSTEM

DIAGNOSTIC PROCEDURE 2

Check Battery Circuit

1. CHECK BATTERY CIRCUIT CONNECTION

Check to see if "B" terminal is clean and tight.

OK or NG

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

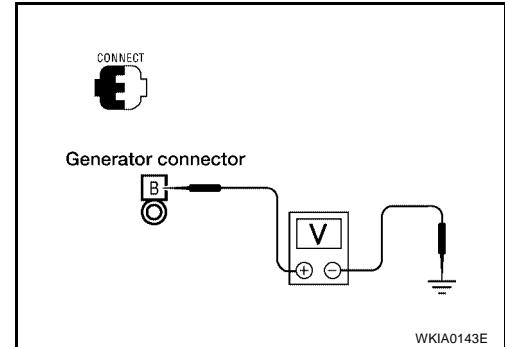
2. CHECK BATTERY CIRCUIT

Check voltage between generator connector F2 terminal B 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 (letter **a** , located in fusible link box)
 - Harness for open or short between generator and fusible link



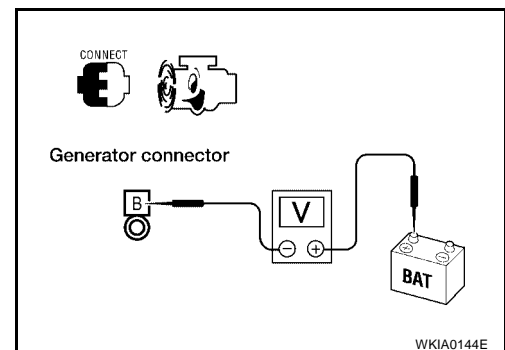
3. CHECK VOLTAGE DROP ON BATTERY CIRCUIT

Check voltage between generator connector F2 terminal B and battery positive terminal using a digital tester.

**With engine running : Less than 0.2V
at idle and warm**

OK or NG

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



CHARGING SYSTEM

DIAGNOSTIC PROCEDURE 3

Check Voltage Regulator Circuit

1. CHECK VOLTAGE REGULATOR CIRCUIT CONNECTION

Check to see if terminal "S" is clean and tight.

OK or NG

OK >> GO TO 2.

NG >> Repair terminal "S" connection. Confirm repair by performing complete Starting/Charging system test.

2. CHECK VOLTAGE REGULATOR CIRCUIT

Check voltage between generator connector F1 terminal S and ground using a digital circuit tester.

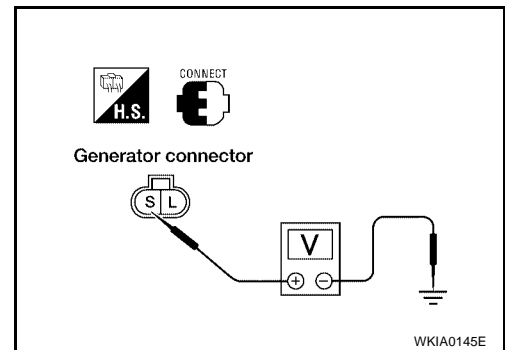
Battery voltage should exist.

OK or NG

OK >> GO TO 3.

NG >> Check the following.

- 10A fuse (No. 26, located in fuse and fusible link box)
- Harness for open or short between generator and fuse



3. CHECK VOLTAGE DROP ON VOLTAGE REGULATOR CIRCUIT

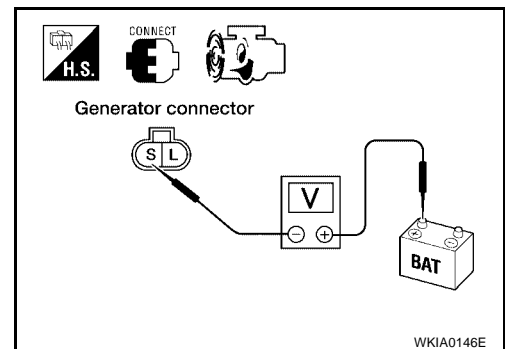
Check voltage between generator connector F1 terminal S and battery positive terminal using a digital tester.

**With engine running : Less than 0.2V
at idle and warm**

OK or NG

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

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



CHARGING SYSTEM

MALFUNCTION INDICATOR

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

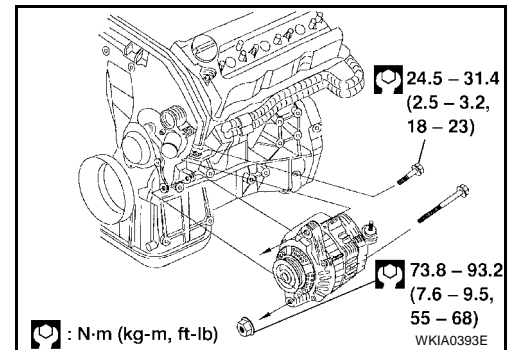
- Excessive voltage is produced.
- No voltage is produced.

Removal and Installation

EKS008YB

REMOVAL

1. Disconnect the negative battery terminal.
2. Remove radiator. Refer [CO-13, "Removal and Installation"](#) .
3. Remove the drive belt. Refer to [EM-13, "DRIVE BELTS"](#) .
4. Remove idler pulley.
5. Remove the generator adjustable top mount, using power tools.
6. Remove the generator lower bolt and nut, using power tools.
7. Disconnect the generator harness connectors.
8. Remove the generator upper bolt, using power tools.
9. Remove the generator.



INSTALLATION

Installation is in the reverse order of removal.

- After installation adjust drive belt refer to [EM-13, "Checking Drive Belts"](#) .

SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

PF0:00030

Battery

EKS008YD

Type	Gr. 24
Capacity (20 HR) minimum V-AH	12-56
Cold cranking current A (For reference value)	550 @ -18°C (0°F)

Starter

EKS008YE

Application	M/T model	A/T model
Manufacturer	Mitsubishi M000T87281ZC	Mitsubishi M000T20771ZC
Type	Reduction gear type	
System voltage	12V	
No-load	Terminal voltage	11V
	Current	90A Max.
	Revolution	2,800 rpm Min.
Minimum diameter of commutator	28.8 mm	
Minimum length of brush	7.0 mm	
Brush spring tension	18.3-24.8 N (1.87-2.53 kg, 4.11-5.58 lb)	
Clearance between pinion front edge and pinion stopper	0.5-2.0 mm	

Generator

EKS008YF

Type	TG12C014
	Valeo
Nominal rating	12V-110A
Ground polarity	Negative
Minimum revolution under no-load (When 13.5 volts is applied)	1100 rpm
Hot output current (When 13.5 volts is applied)	More than 27A/1,500 rpm More than 90A/2,500 rpm More than 112A/5,000 rpm
Regulated output voltage	14.2 - 14.6V @ 25°C
Minimum length of brush	4.4 mm (0.173 in)
Brush spring pressure	1.8 - 3.1 N (0.184 - 0.32 kg, 0.40 - 0.70 lb)
Slip ring minimum outer diameter	12.0 mm (.47 in)
Rotor (Field coil) resistance	2.3 ohms

SERVICE DATA AND SPECIFICATIONS (SDS)
