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SECTION SC

STARTING & CHARGING SYSTEM

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PRECAUTIONS

PRECAUTIONS

PFP:00001

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

EKS008KU

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

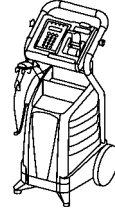
PF0:00002

Special Service Tool

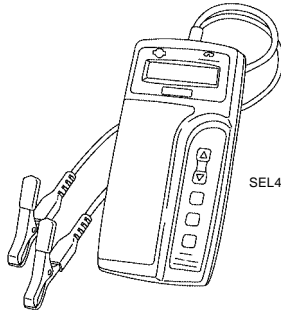
EKS008KW

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.



WKIA5280E

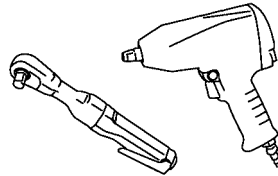


SEL403X

Commercial Service Tools

EKS008KX

Tool number Tool name	Description
Power tool	Loosening bolts and nuts



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BATTERY

PFP:AYBGL

EKS008KY

BATTERY

How to Handle Battery

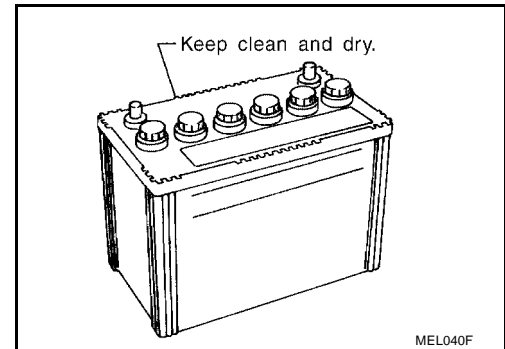
CAUTION:

- 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.

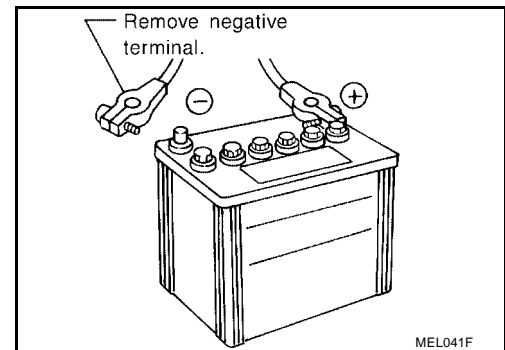
METHODS OF PREVENTING OVER-DISCHARGE

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

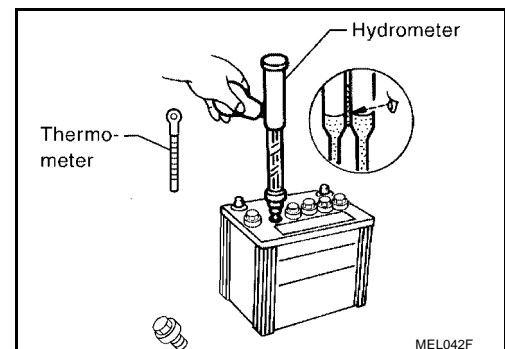
- The battery surface (particularly its top) should always be kept clean and dry.
- The terminal connections should be clean and tight.
- At every routine maintenance, check the electrolyte level. This also applies to batteries designated as "low maintenance" and "maintenance-free".



- 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.



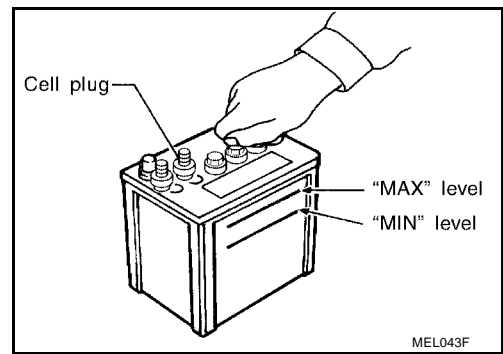
CHECKING ELECTROLYTE LEVEL

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.

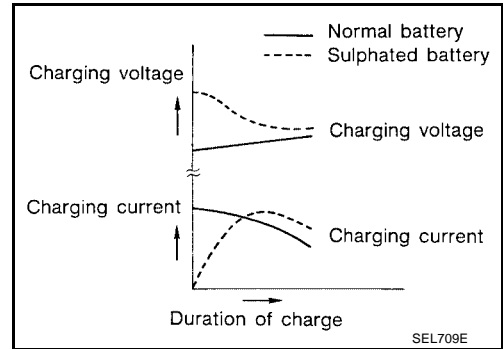


Sulphation

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.

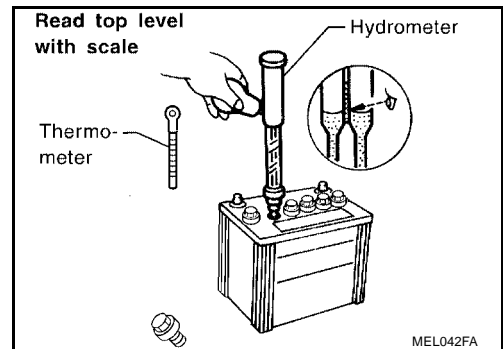
To determine if a battery has been “sulphated”, note its voltage and current when charging it. As shown in the figure, less current and higher voltage are observed in the initial stage of charging sulphated batteries.

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 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

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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

EKS008KZ

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.

STARTING SYSTEM

PFP:23300

STARTING SYSTEM

System Description M/T MODELS

EKS008L0

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 request ON signal from the BCM over the CAN lines, the IPDM E/R grounds the starter relay 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 between the IPDM E/R and the BCM, the IPDM E/R will default to a starter relay request ON signal as long as the ignition switch remains in the START or ON position.

A/T MODELS

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 (PNP) switch terminal 1 (with 4 A/T) or terminal 5 (with 5 A/T).

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

- through PNP switch terminal 2 (with 4 A/T) or terminal 1 (with 5 A/T)
- to IPDM E/R terminal 53.

Provided the IPDM E/R receives a starter relay request ON signal from the BCM over the CAN lines, the IPDM E/R grounds the starter relay 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 between the IPDM E/R and the BCM, the IPDM E/R will default to a starter relay request ON signal as long as the ignition switch remains in the START or ON position.

CAN Communication System Description

EKS008L1




Refer to [LAN-20, "CAN COMMUNICATION"](#) .

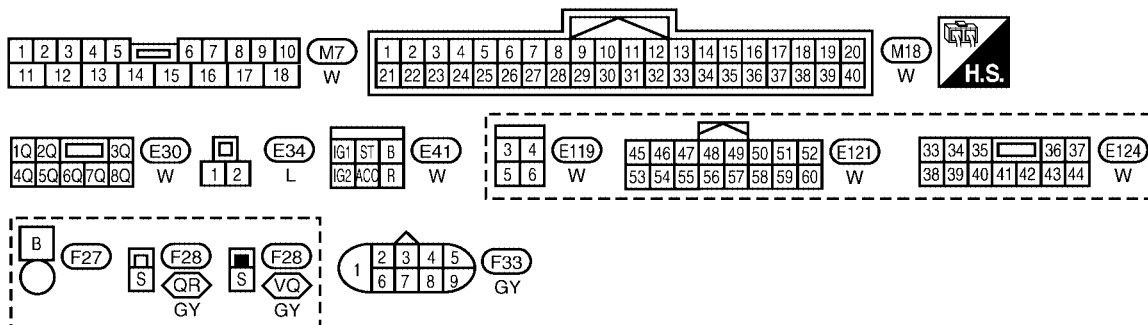
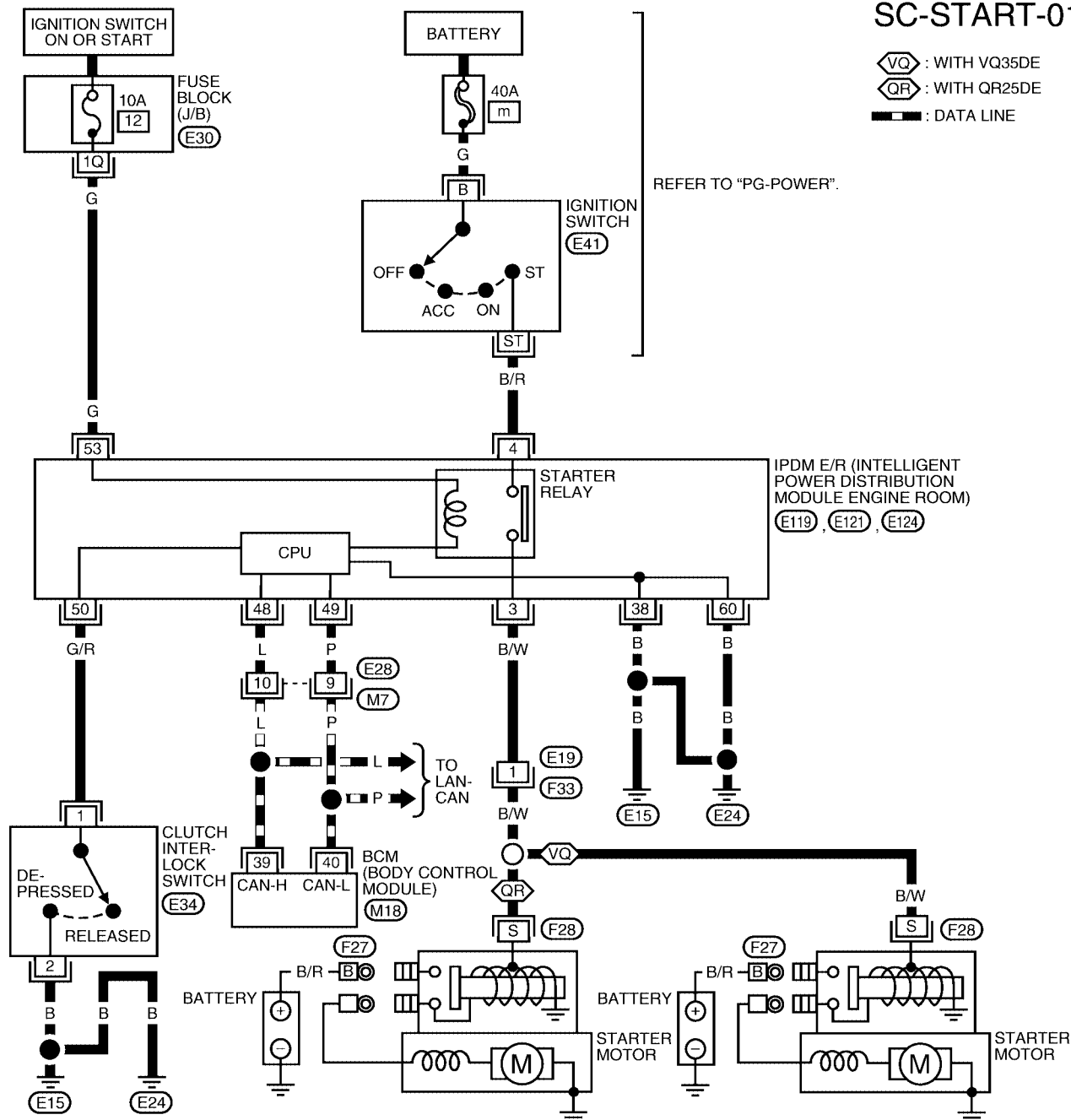
STARTING SYSTEM

EKS008L2

Wiring Diagram — START — M/T MODELS

SC-START-01

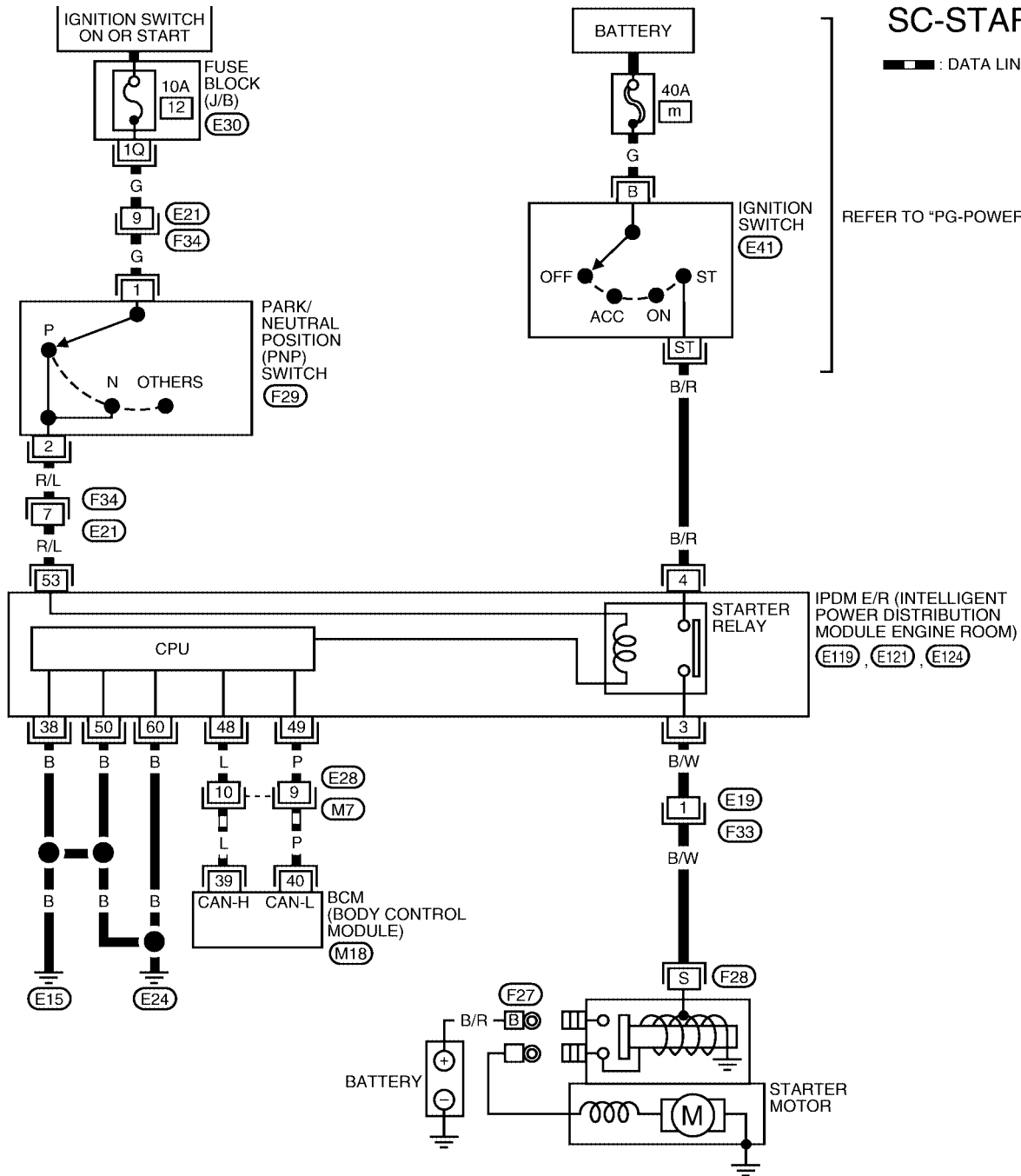
 : WITH VQ35DE
 : WITH QR25DE
 : DATA LINE



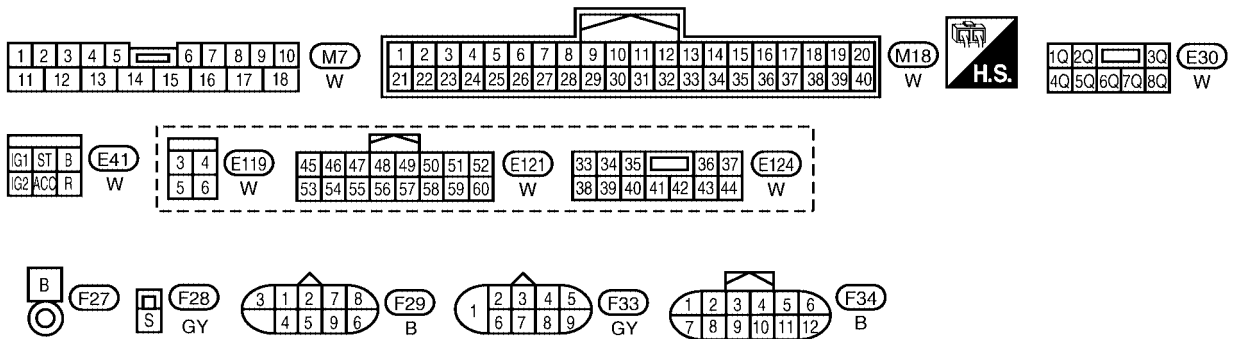
WKWA2905E

STARTING SYSTEM

4 A/T MODEL



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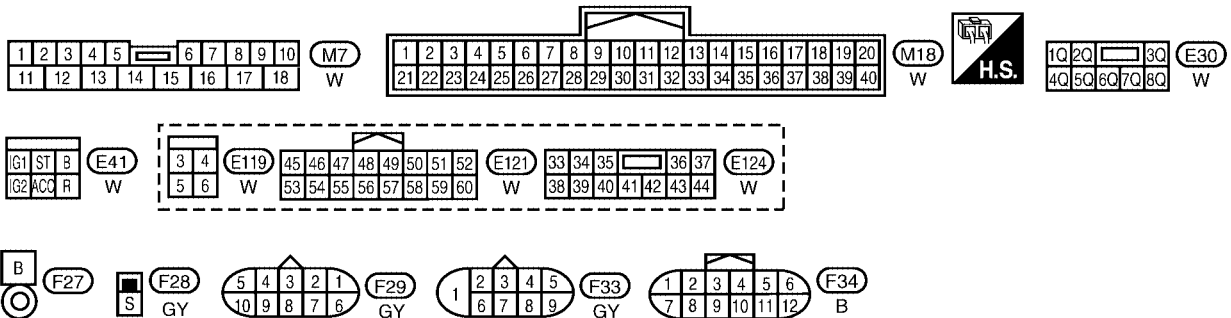
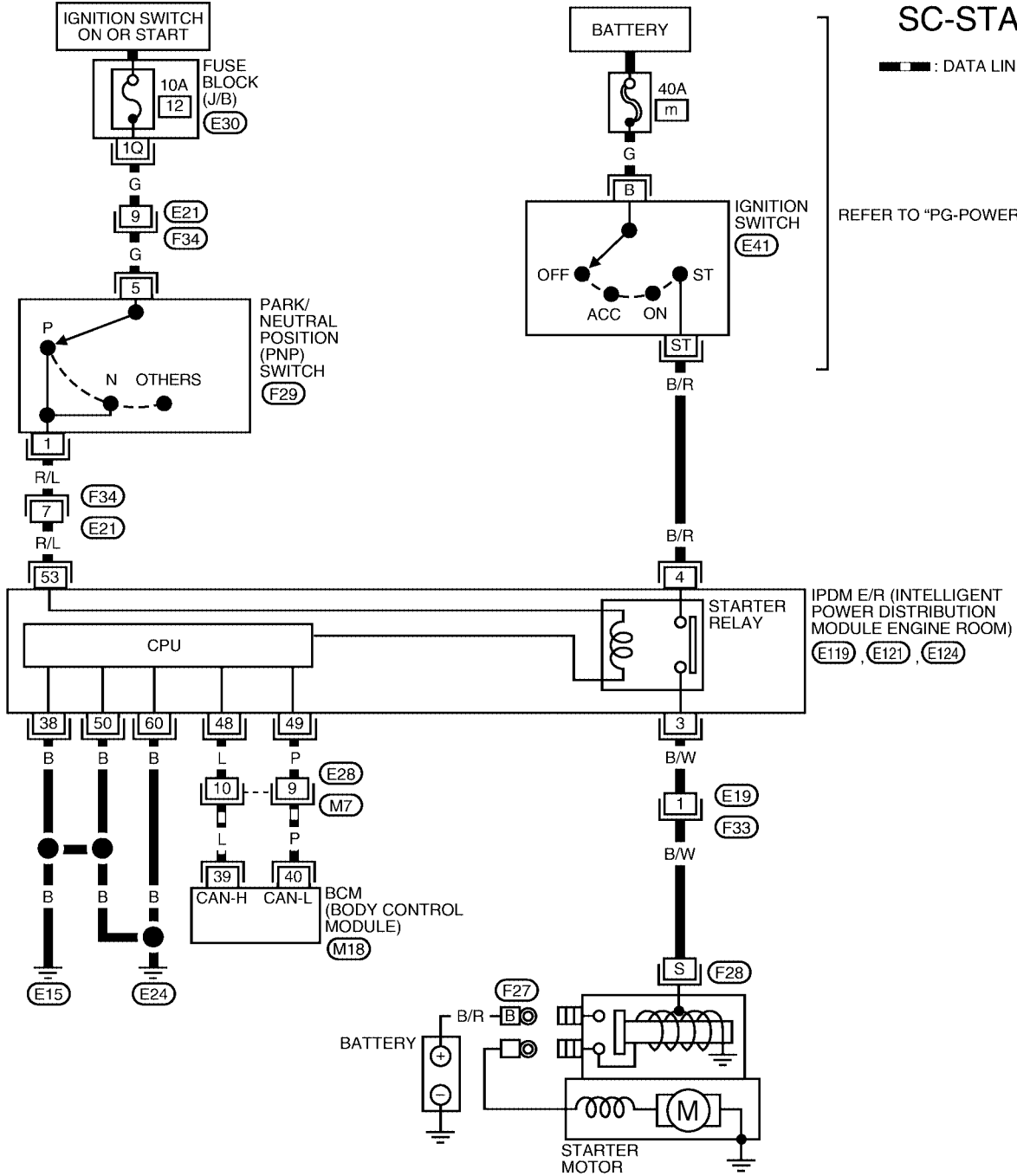
STARTING SYSTEM

5 A/T MODEL

SC-START-03

— : DATA LINE

REFER TO "PG-POWER".



WKWA5553E

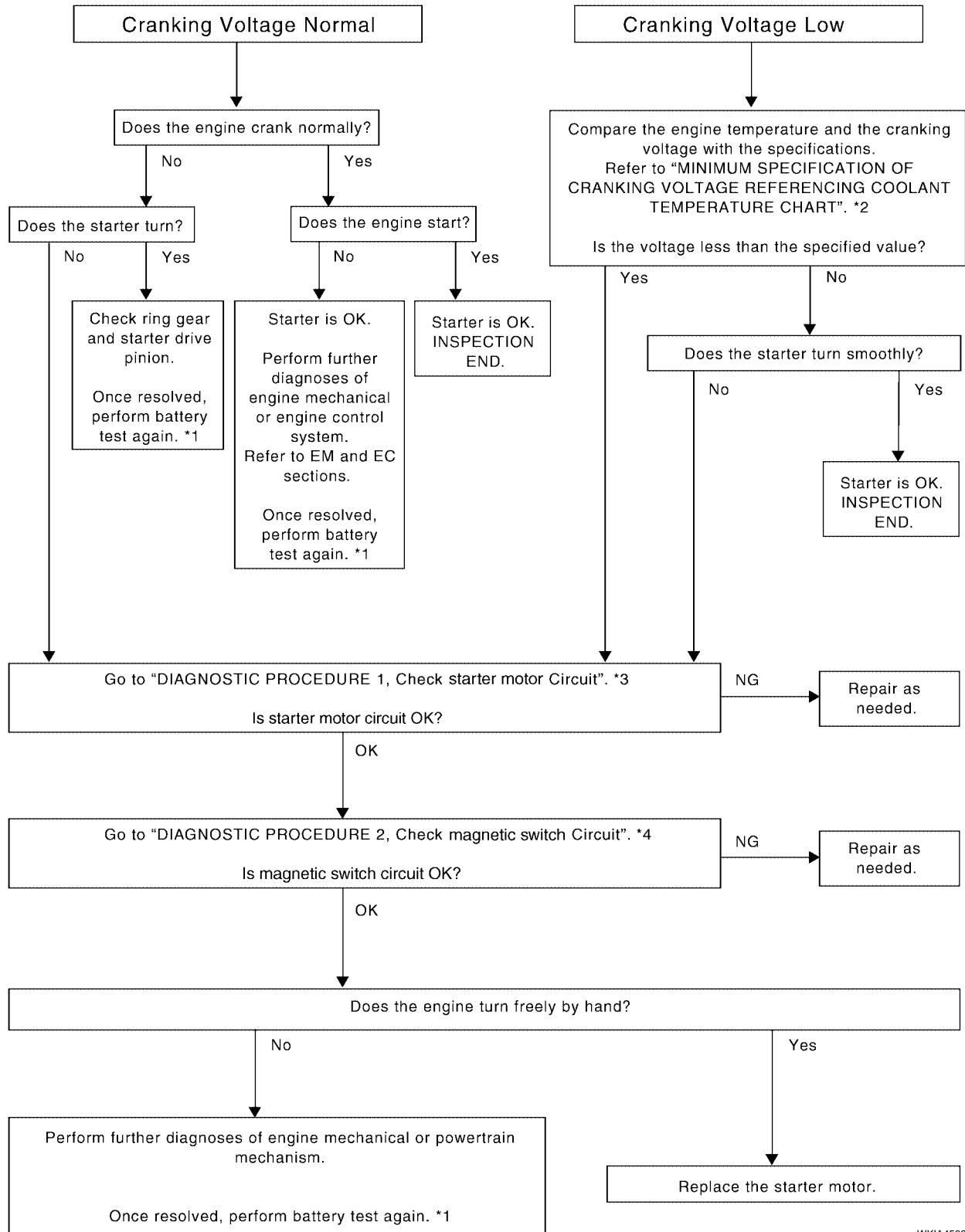
STARTING SYSTEM

EKS008L3

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.

*4 [SC-14. "Check Magnetic Switch Circuit"](#)

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

*3 [SC-14. "DIAGNOSTIC PROCEDURE 2"](#)

DIAGNOSTIC PROCEDURE 1 Check Starter Motor Circuit

1. CHECK POWER SUPPLY TO STARTER MOTOR

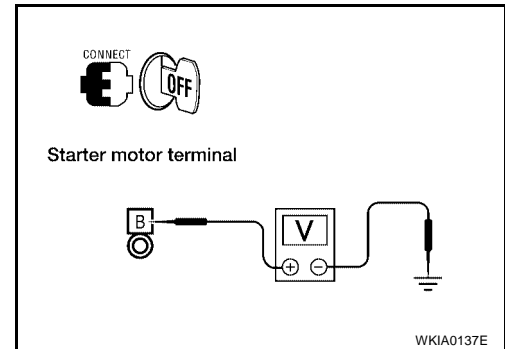
1. Remove the fuel pump fuse.
2. Crank or start the engine (where possible) until the fuel pressure is released.
3. Turn the ignition switch OFF.
4. Check that the starter motor connector F27 terminal B connection is clean and tight.
5. Check voltage between starter motor connector F27 terminal B and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

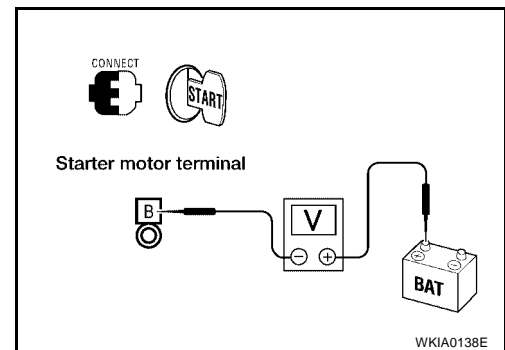
1. Turn the ignition switch to START.
2. Check voltage between starter motor connector F27 terminal B and battery positive terminal using a digital circuit tester.

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.



STARTING SYSTEM

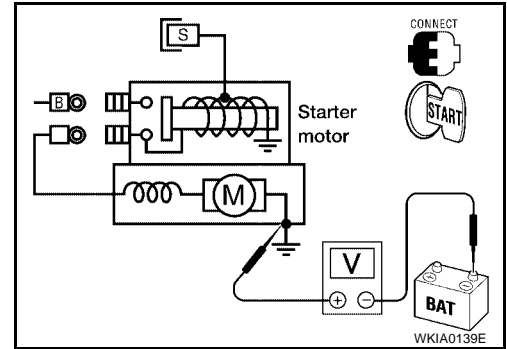
3. CHECK VOLTAGE DROP ON STARTER MOTOR GROUND CIRCUIT

1. Turn the ignition switch to START.
2. 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 for poor continuity between the starter motor case and battery negative terminal.



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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.

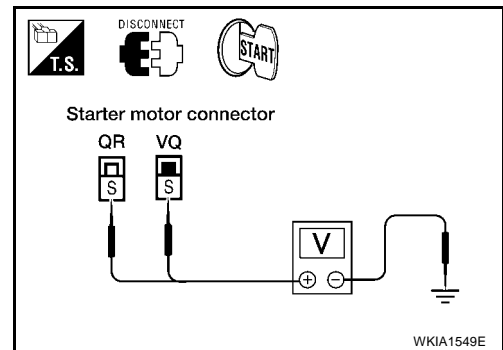
Ignition switch in START. : Battery voltage

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

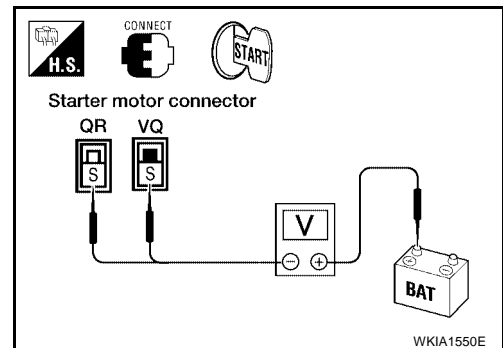
1. Connect starter motor connector F28.
2. Check voltage between starter motor connector F28 terminal S and battery positive terminal using a digital tester.

Ignition switch in START. : Less than 1V

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 magnetic switch for poor continuity.



STARTING SYSTEM

MINIMUM SPECIFICATION OF CRANKING VOLTAGE REFERENCING COOLANT TEMPERATURE

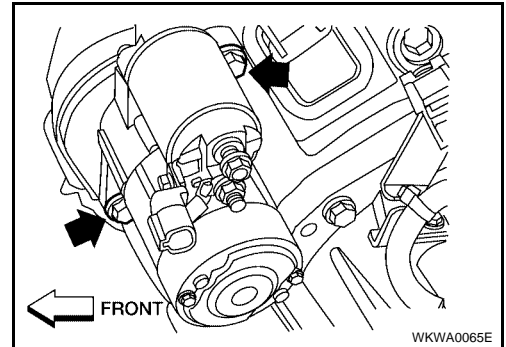
Engine coolant temperature	Voltage V	
	QR25DE	VQ35DE
-30°C to -20°C (-22°F to -4°F)	8.7	8.4
-19°C to -10°C (-2°F to 14°F)	9.2	8.9
-9°C to 0°C (16°F to 32°F)	9.6	9.3
More than 1°C (More than 34°F)	10.0	9.7

Removal and Installation M/T MODELS

EKS008L4

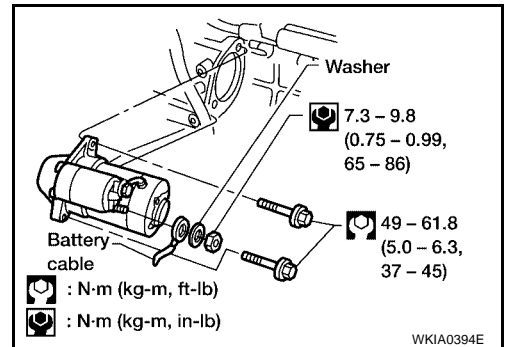
REMOVAL

1. Disconnect the negative battery terminal.
2. Remove the air cleaner case (upper) and the air cleaner to electronic throttle control actuator tube. Refer to [EM-17, "REMOVAL"](#).
3. Remove the harness protector from the starter motor engine room harness.
4. Disconnect the starter motor harness connectors.
5. Remove the two starter motor bolts, using power tools.
6. Remove the starter motor.



INSTALLATION

Installation is in the reverse order of removal.



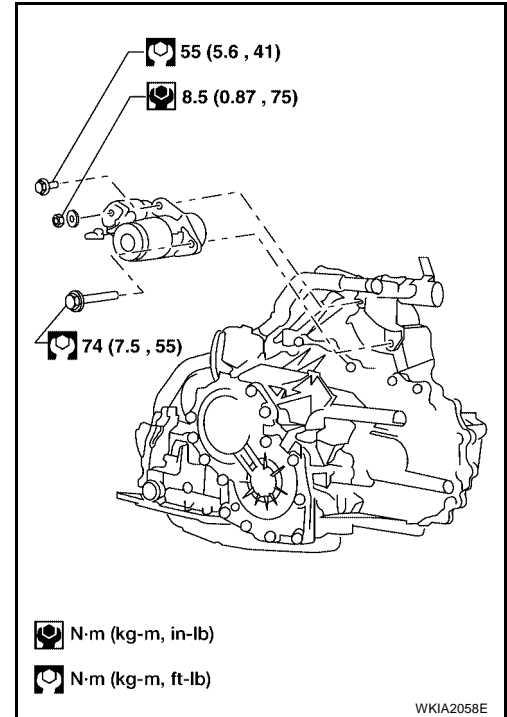
STARTING SYSTEM

EKS00C2R

Removal and Installation 4-SPEED A/T MODELS

REMOVAL

1. Disconnect the negative battery terminal.
2. Remove the air cleaner case (upper) and the air cleaner to electric throttle control actuator tube.
3. Remove the 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

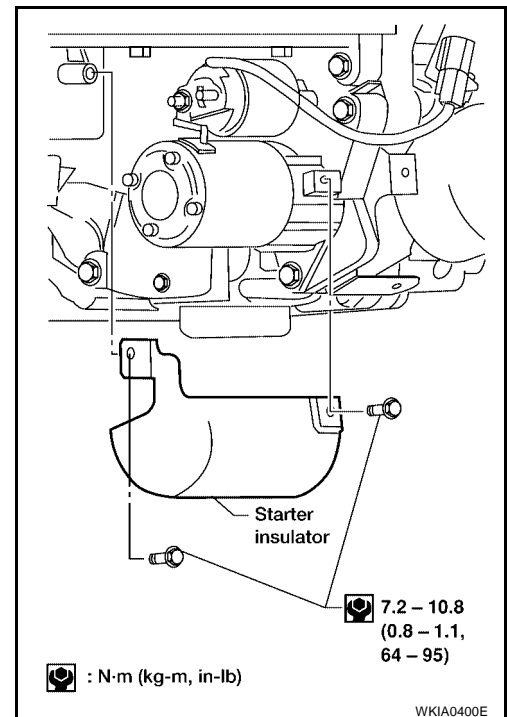
Installation is in the reverse order of removal.

Removal and Installation 5-SPEED A/T MODELS

EKS00C2Q

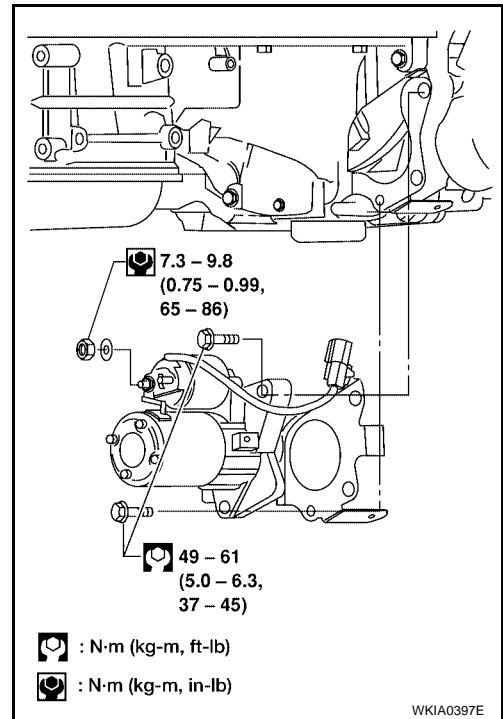
REMOVAL

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.



STARTING SYSTEM

5. Remove the two starter bolts, using power tools.
6. Remove the starter.



INSTALLATION

Installation is in the reverse order of removal.

Pinion/Clutch Check

EKS008L5

1. Inspect pinion assembly teeth.
 - Replace pinion assembly if teeth are worn or damaged. (Also check condition of ring gear teeth.)
2. Inspect planetary gears/planetary gear teeth.
 - Replace planetary gears/planet gears if teeth are worn or damaged. (Also check condition of pinion shaft/drive shaft gear teeth.)
3. Check to see if pinion assembly locks in one direction and rotates smoothly in the opposite direction.
 - If it locks or rotates in both directions, or if unusual resistance is evident, replace.

CHARGING SYSTEM

PFP:23100

System Description

EKS008L6

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 B through:

- 120A fusible link (letter **a** , located in the fusible link box).

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.

The generator 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 22 for the charge warning lamp.

Ground is supplied to terminal 14 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.

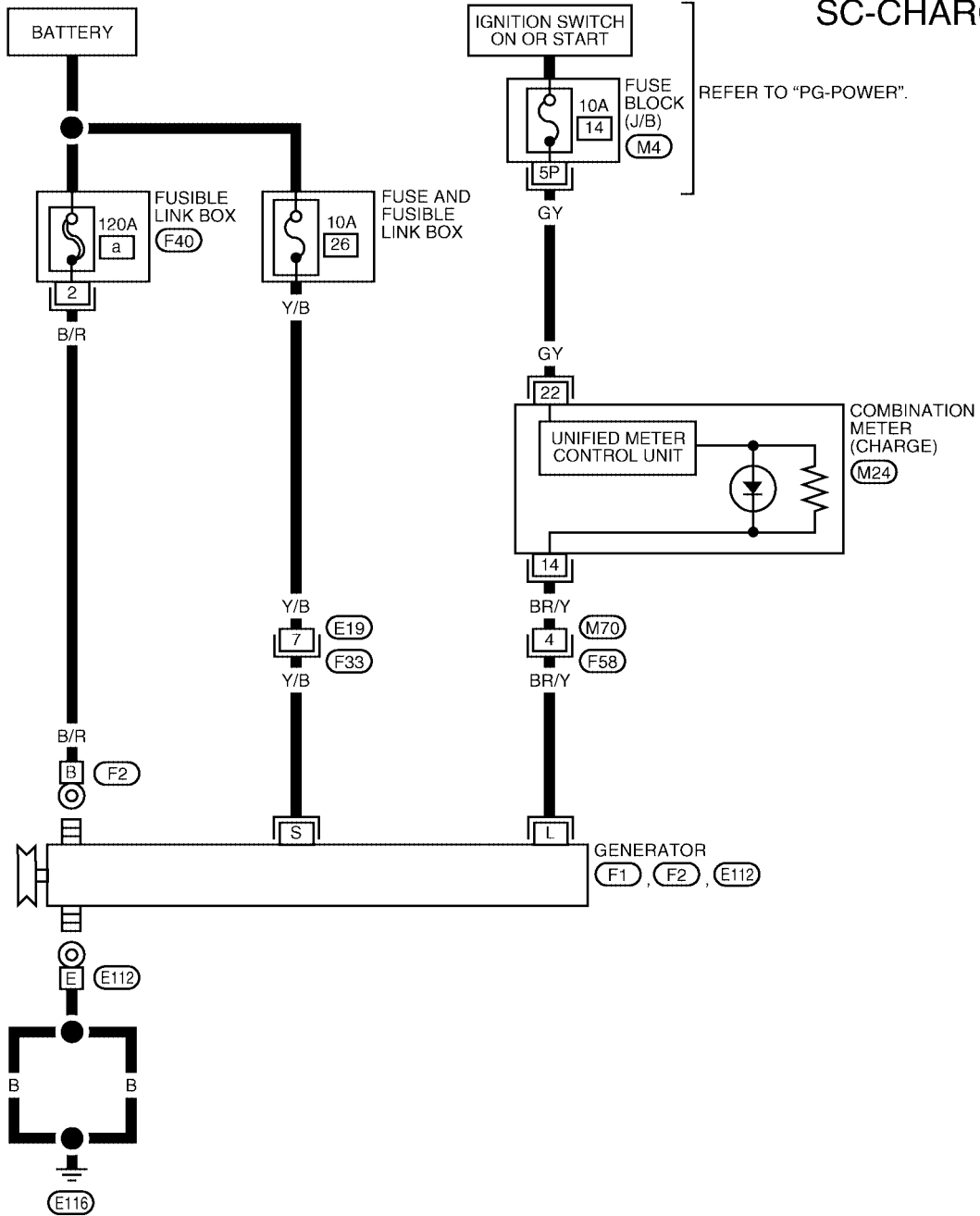
If the charge warning lamp illuminates with the engine running, a fault is indicated.

CHARGING SYSTEM

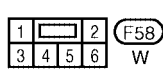
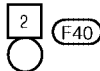
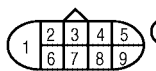
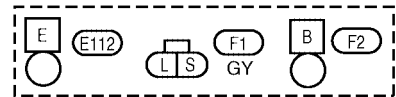
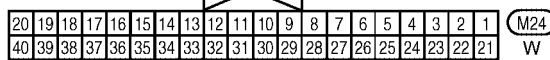
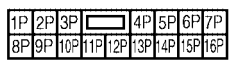
Wiring Diagram — CHARGE —

EKS008L7

SC-CHARGE-01



A
B
C
D
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G
H
I
J
SC
L
M



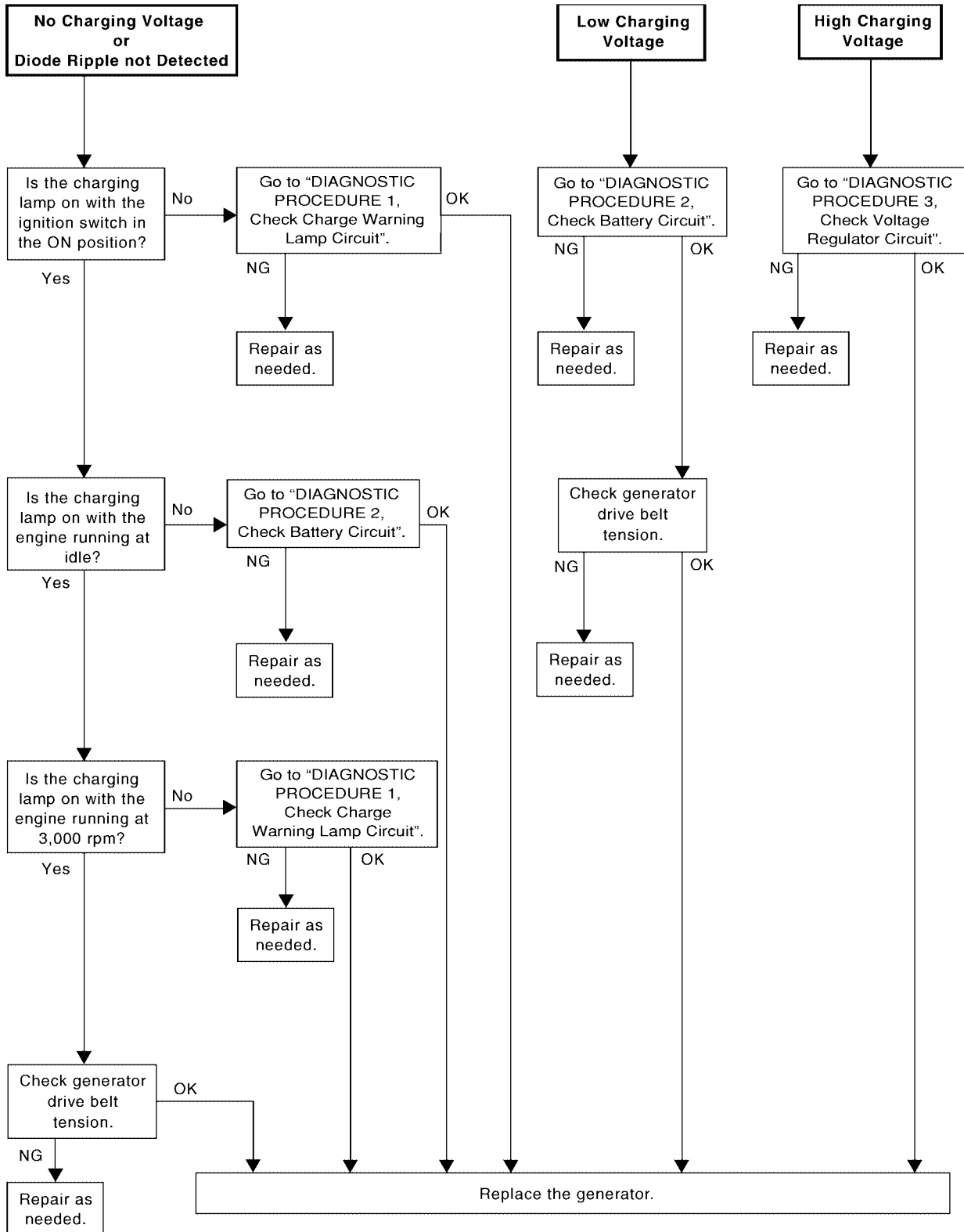
CHARGING SYSTEM

Trouble Diagnoses with Starting/Charging System Tester (Charging)

EKS008L8

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 terminal "L" is clean and tight.

OK or NG

OK >> GO TO 2.

NG >> Repair terminal "L" 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.

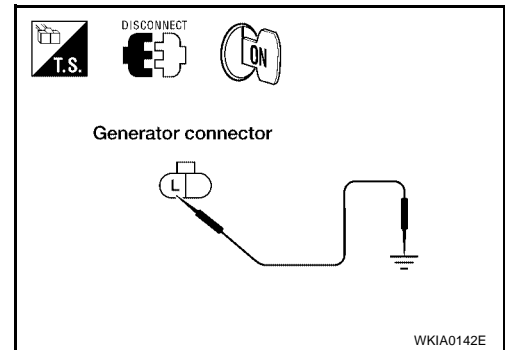
CHARGE lamp should light up.

OK or NG

OK >> Replace the generator. Confirm repair by performing complete 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 generator



CHARGING SYSTEM

DIAGNOSTIC PROCEDURE 2

Check Battery Circuit

1. CHECK BATTERY CIRCUIT CONNECTION

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

OK or NG

OK >> GO TO 2.

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

2. CHECK BATTERY CIRCUIT

Check voltage between generator connector F2 terminal B and ground using a digital circuit tester.

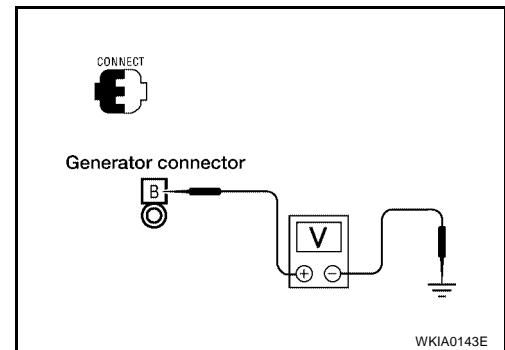
Battery voltage should exist.

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

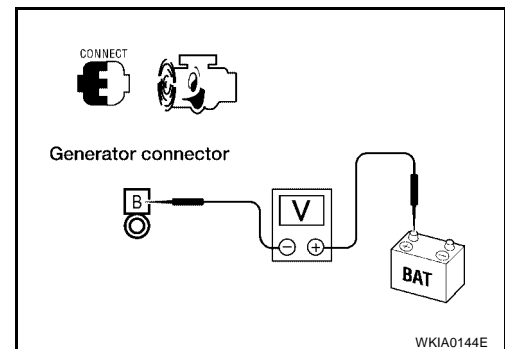
Check voltage between generator connector F2 terminal B and battery positive terminal using a digital tester.

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

OK or NG

OK >> Replace the generator. Refer to [SC-24, "Removal and Installation"](#) . 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.

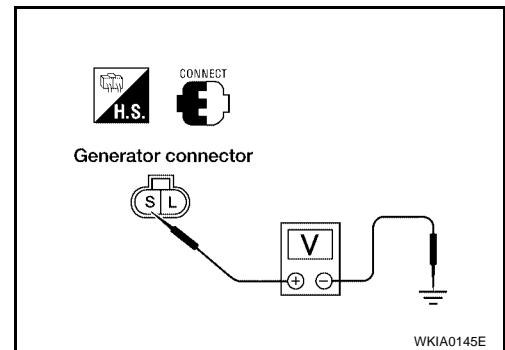
Battery voltage should exist.

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

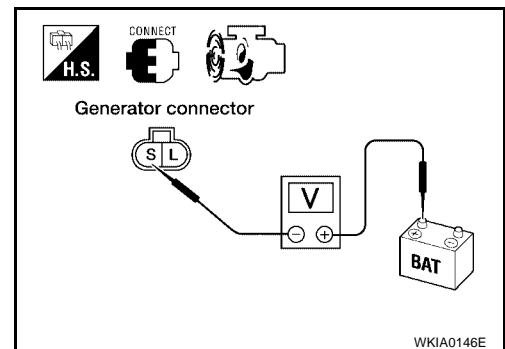
Check voltage between generator connector F1 terminal S and battery positive terminal using a digital tester.

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

OK or NG

OK >> Replace the generator. Refer to [SC-24, "Removal and Installation"](#) . 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:

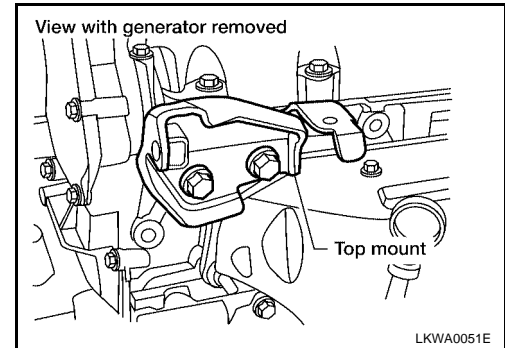
- Excessive voltage is produced.
- No voltage is produced.

Removal and Installation QR25DE

EKS008L9

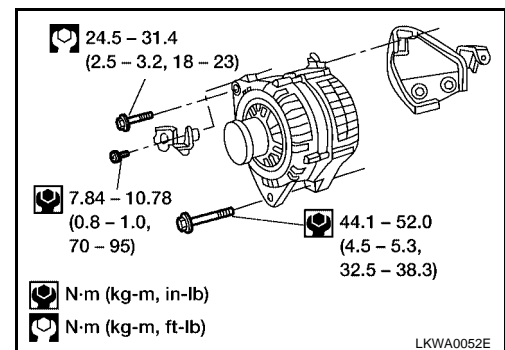
Removal

1. Disconnect the negative battery terminal.
2. Remove the engine cover.
3. Remove the front/right-side engine undercover, using power tools.
4. Remove the drive belt.
5. Disconnect the generator harness connector.
6. Disconnect the engine ground wire from top mount.
7. Remove the generator upper and lower bolts, using power tools.
8. Set the generator aside and remove the generator top mount.
9. Slide the generator out and remove.



Installation

Installation is in the reverse order of removal.



VQ35DE

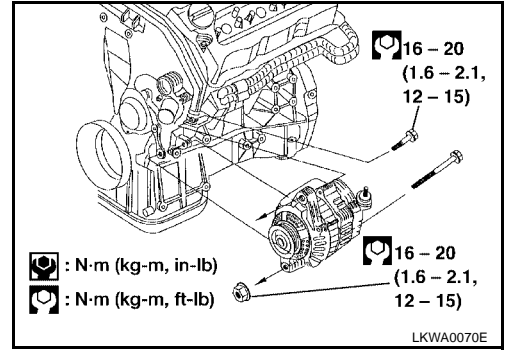
Removal

1. Disconnect the negative battery terminal.
2. Remove radiator, refer [CO-34, "Removal and Installation"](#) .
3. Remove front/right-side engine undercover.
4. Remove the drive belt, refer to [EM-15, "Removal and Installation"](#) .
5. Remove idler pulley.
6. Remove the generator adjustable top mount, using power tools.
7. Remove the generator lower mount bolt and nuts, using power tools.
8. Remove the generator lower front bracket bolt, using power tools.
9. Disconnect the generator harness connectors.
10. Slide the generator out and remove.

CHARGING SYSTEM

Installation

Installation is in the reverse order of removal.



A

B

C

D

E

F

G

H

I

J

SC

L

M

SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

PFP:00030

Battery

EKS008LA

Type	GR.24F (BCI)
Capacity (20 HR) minimum V-AH	12-63
Cold cranking current A (For reference value)	550 @ -18°C (0°F)

Starter

EKS008LB

Application	QR25DE		VQ35DE	
	M/T model	A/T model	M/T model	A/T model
Manufacturer	Mitsubishi M001T87181ZC	Mitsubishi M001T68781ZC	Mitsubishi M000T87281ZC	Mitsubishi M000T87181ZC
Type	Reduction gear type			
System voltage	12V			
No-load	Terminal voltage	11V		
	Current	90A Max.		
	Revolution	2,750 rpm Min.	2,800 rpm Min.	
Minimum diameter of commutator	28.8 mm			
Minimum length of brush	5.5mm	7.0 mm		
Brush spring tension	15.0-20.4 N (1.53-2.08 kg, 3.37-4.59 lb)	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

EKS008LC

Application	QR25DE	VQ35DE
Type	LR1110-721	LR1110-726
	HITACHI	
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 35A/1,300 rpm More than 91A/2,500 rpm More than 110A/5,000 rpm	
Regulated output voltage	14.1 - 14.7V	
Minimum length of brush	6 mm (0.236 in)	
Brush spring pressure	1.000 - 3.432 N (0.102 - 0.350 kg, 0.225 - 0.772 lbs)	
Slip ring minimum outer diameter	26.0 mm (1.024 in)	
Rotor (Field coil) resistance	2.31 ohms	