

SECTION

SC

STARTING & CHARGING SYSTEM

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PRECAUTIONS

PRECAUTIONS

PFP:00011

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

EKS007AR

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. Information necessary to service the system safely is included in the SRS and SB section of this Service Manual.

WARNING:

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

Wiring Diagrams and Trouble Diagnosis

EKS00312

When reading wiring diagrams, refer to the following:

- [GI-14, "How to Read Wiring Diagrams"](#) in GI section
- [PG-2, "POWER SUPPLY ROUTING"](#) for power distribution circuit in PG section

When performing trouble diagnosis, refer to the following:

- [GI-10, "HOW TO FOLLOW TEST GROUPS IN TROUBLE DIAGNOSES"](#) in GI section
- [GI-23, "How to Perform Efficient Diagnosis for an Electrical Incident"](#) in GI section

PREPARATION

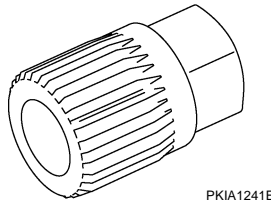
PREPARATION

PFP:00002

Special Service Tools

EKS000RD

Tool number Tool name	Description
KV10118200 Alternator pulley adapter	Removing alternator pulley



PKIA1241E

A

B

C

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M

BATTERY

BATTERY

PFP:00011

How to Handle Battery

EKS00313

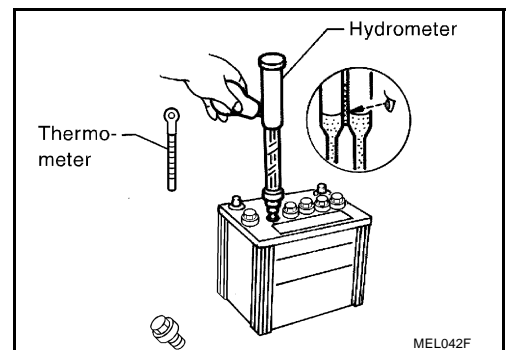
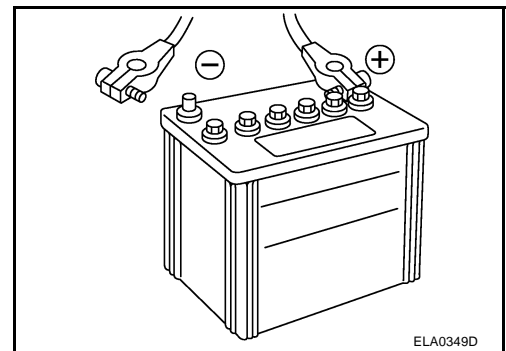
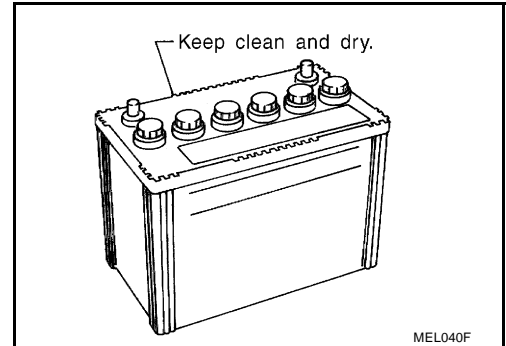
CAUTION:

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

METHODS OF PREVENTING OVER-DISCHARGE

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

- The battery surface (particularly its top) should always be kept clean and dry.
- The terminal connections should be clean and tight.
- At every routine maintenance, check the electrolyte level. This also applies to batteries designated as "low maintenance" and "maintenance-free".
- When the vehicle is not going to be used over a long period of time, disconnect the battery cable from the negative terminal. (If the vehicle has an extended storage switch, turn it off.)
- Check the charge condition of the battery. Periodically check the specific gravity of the electrolyte. Keep a close check on charge condition to prevent over-discharge.



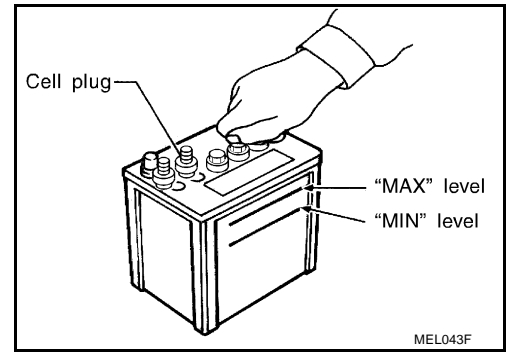
CHECKING ELECTROLYTE LEVEL

WARNING:

Never 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.

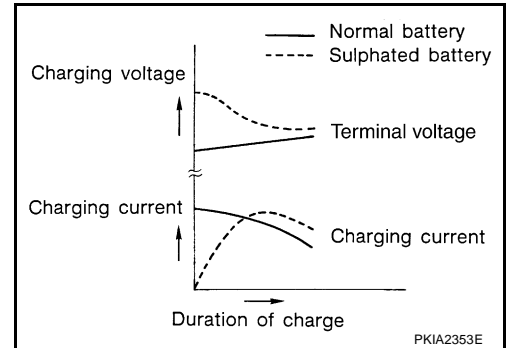


Sulphation

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.

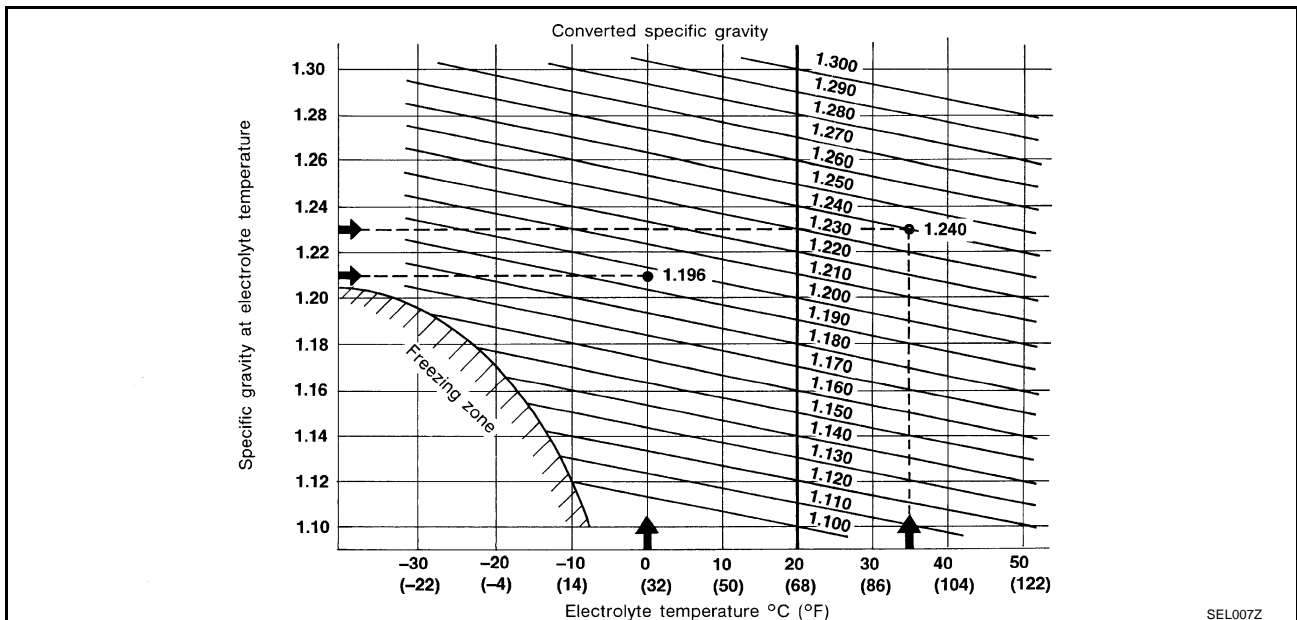
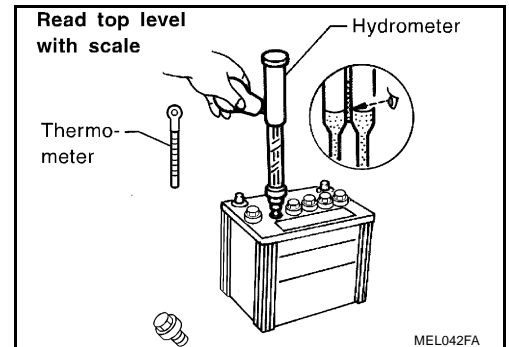


SPECIFIC GRAVITY CHECK

1. Read hydrometer and thermometer indications at eye level.
2. Convert into specific gravity at 20 °C (68 °F).

Example:

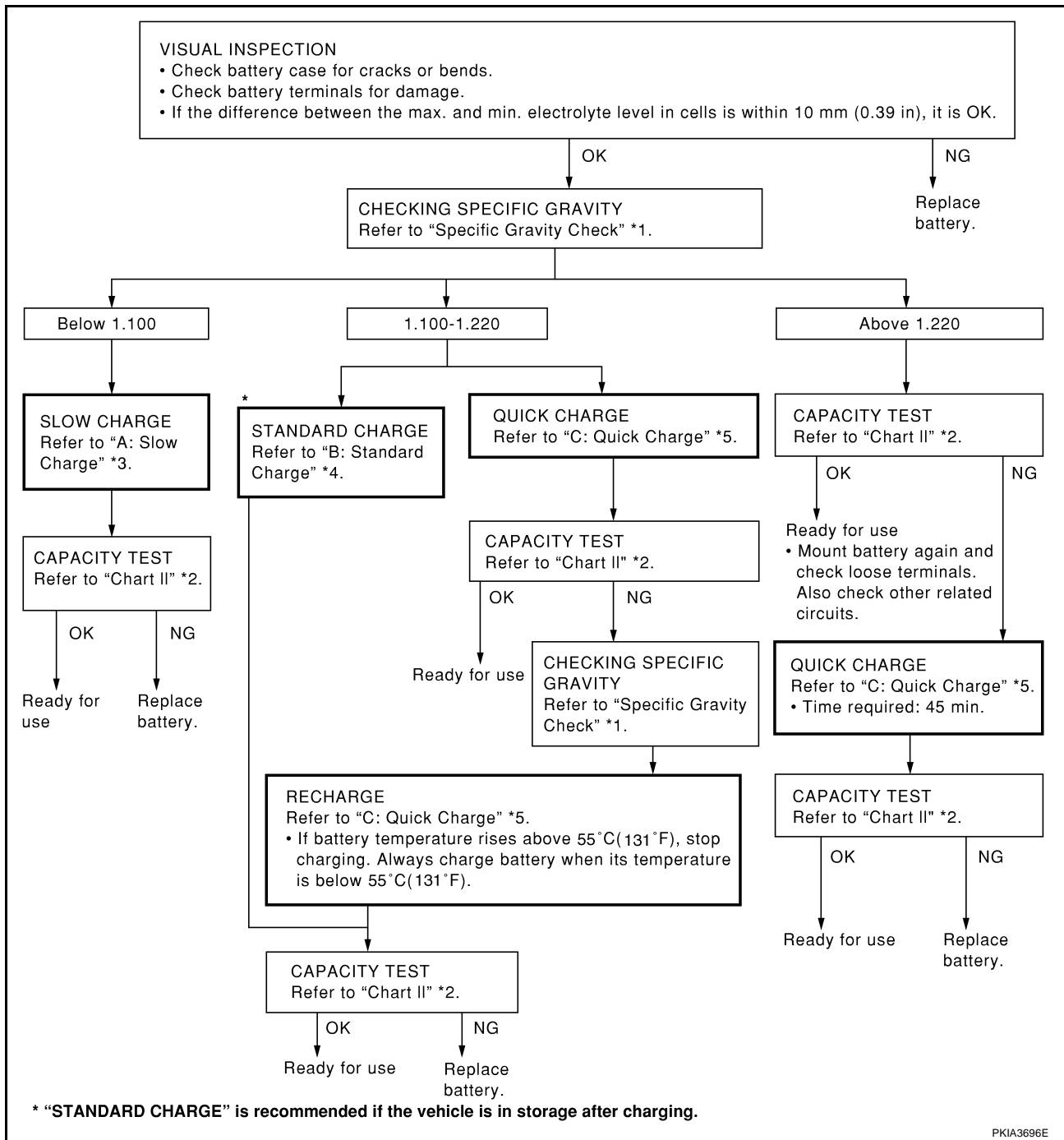
- When electrolyte temperature is 35 °C (95 °F) and specific gravity of electrolyte is 1.230, converted specific gravity at 20 °C (68 °F) is 1.240.
- When electrolyte temperature is 0 °C (32 °F) and specific gravity of electrolyte is 1.210, converted specific gravity at 20 °C (68 °F) is 1.196.



BATTERY

Battery Test and Charging Chart CHART I

EKS00314



PKIA3696E

*1: [SC-5. "SPECIFIC GRAVITY CHECK"](#)

*2: [SC-7. "CHART II"](#)

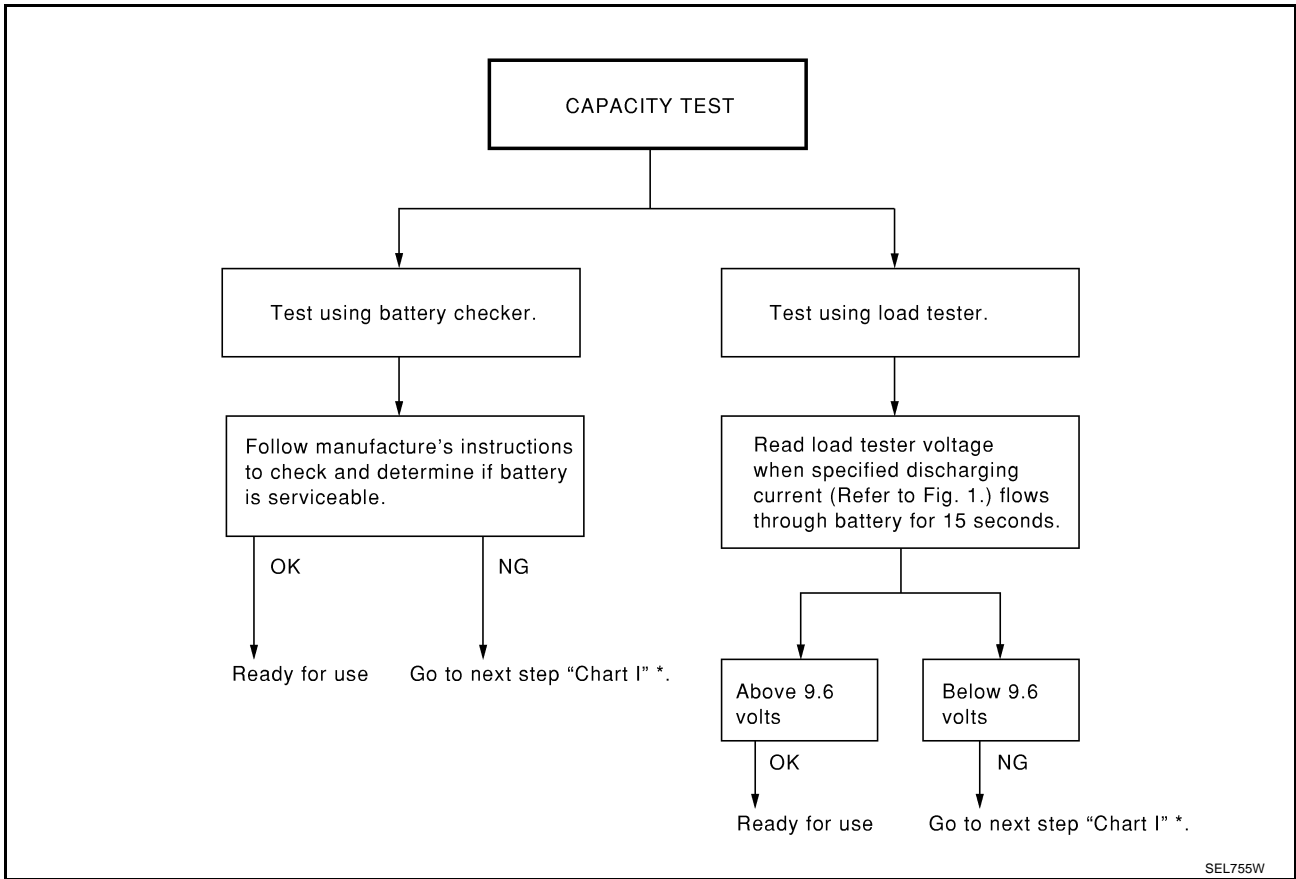
*3: [SC-8. "A: SLOW CHARGE"](#)

*4: [SC-9. "B: STANDARD CHARGE"](#)

*5: [SC-11. "C: QUICK CHARGE"](#)

BATTERY

CHART II



*: [SC-6, "CHART I"](#)

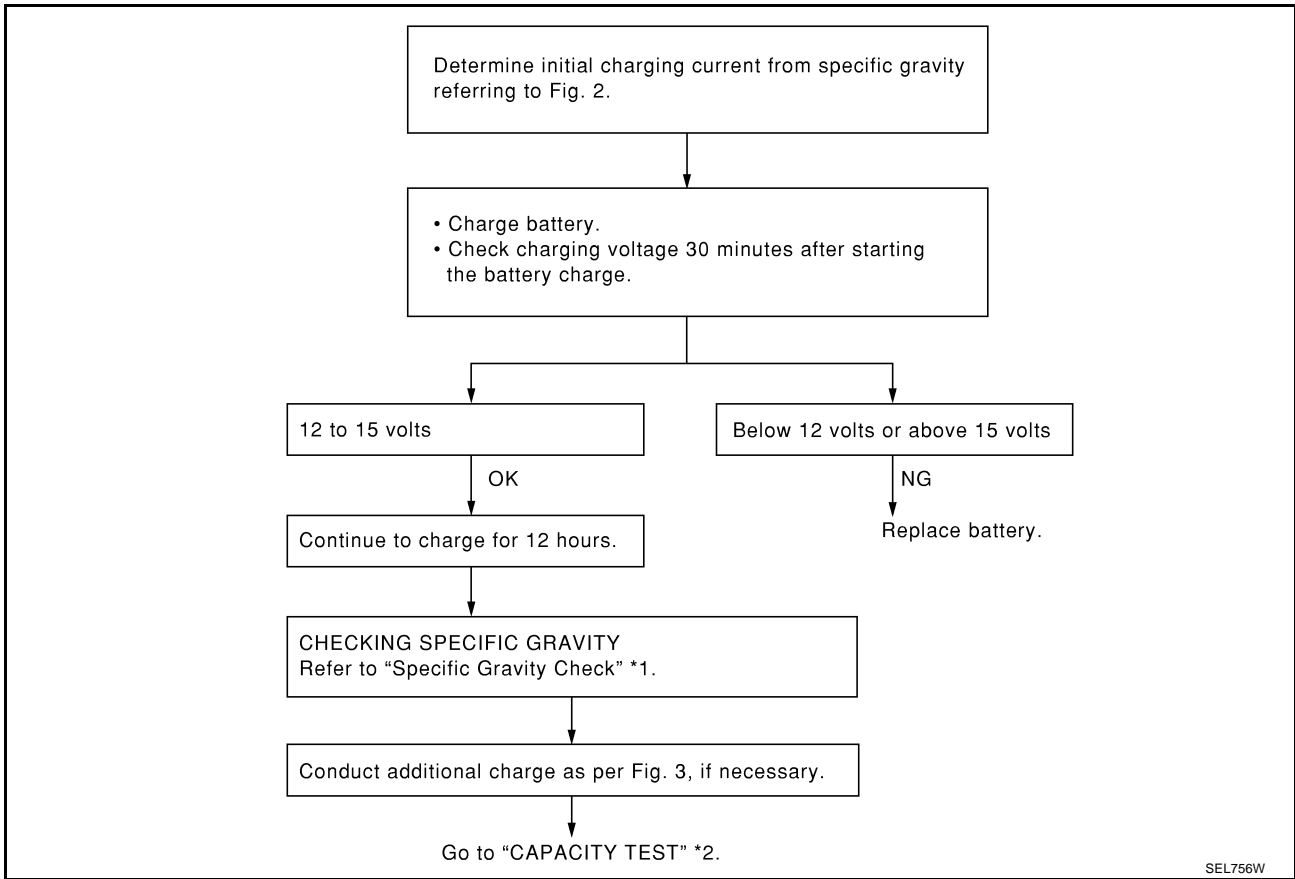
Fig. 1 Discharging Current (Load Tester)

Type	Current (A)
28B19R(L)	90
34B19R(L)	99
46B24R(L)	135
55B24R(L)	135
50D23R(L)	150
55D23R(L)	180
65D26R(L)	195
80D23R(L)	195
80D26R(L)	195
75D31R(L)	210
95D31R(L)	240
115D31R(L)	240
025 [YUASA type code]	240
027 [YUASA type code]	285
110D26R(L)	300
95E41R(L)	300
067 [YUASA type code]	325
130E41R(L)	330
096 [YUASA type code]	375

- Check battery type and determine the specified current using the table.

BATTERY

A: SLOW CHARGE



*1: [SC-5, "SPECIFIC GRAVITY CHECK"](#)

*2: [SC-7, "CHART II"](#)

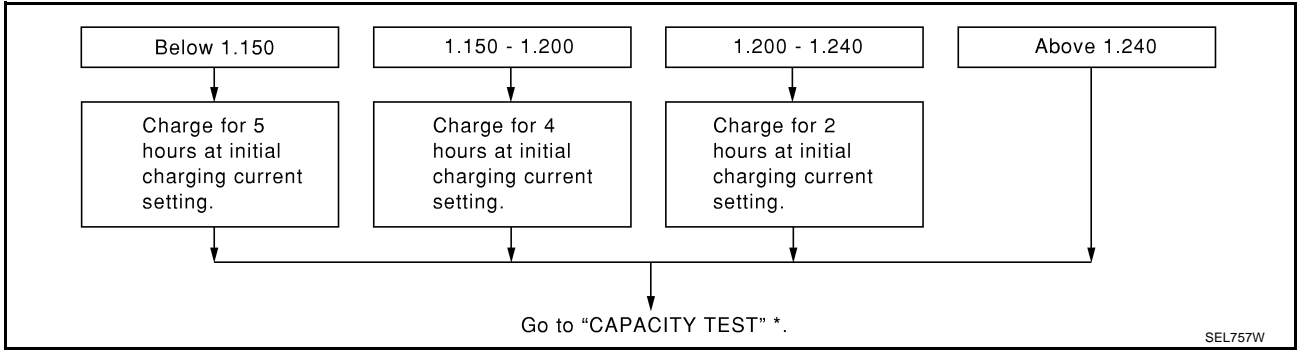
Fig. 2 Initial Charging Current Setting (Slow Charge)

CON- VERTED SPECIFIC GRAVITY	BATTERY TYPE																		
	28B19R(L)	34B19R(L)	46B24R(L)	55B24R(L)	50D23R(L)	55D23R(L)	025 [YUASA type code]	027 [YUASA type code]	65D26R(L)	80D23R(L)	80D26R(L)	067 [YUASA type code]	096 [YUASA type code]	75D31R(L)	95D31R(L)	115D31R(L)	110D26R(L)	95E41R(L)	130E41R(L)
Below 1.100	4.0 (A)	5.0 (A)		7.0 (A)				8.0 (A)				8.5 (A)	9.0 (A)	10.0 (A)				14.0 (A)	

- Check battery type and determine the specified current using the table.
- After starting charging, adjustment of charging current is not necessary.

BATTERY

Fig. 3 Additional Charge (Slow Charge)

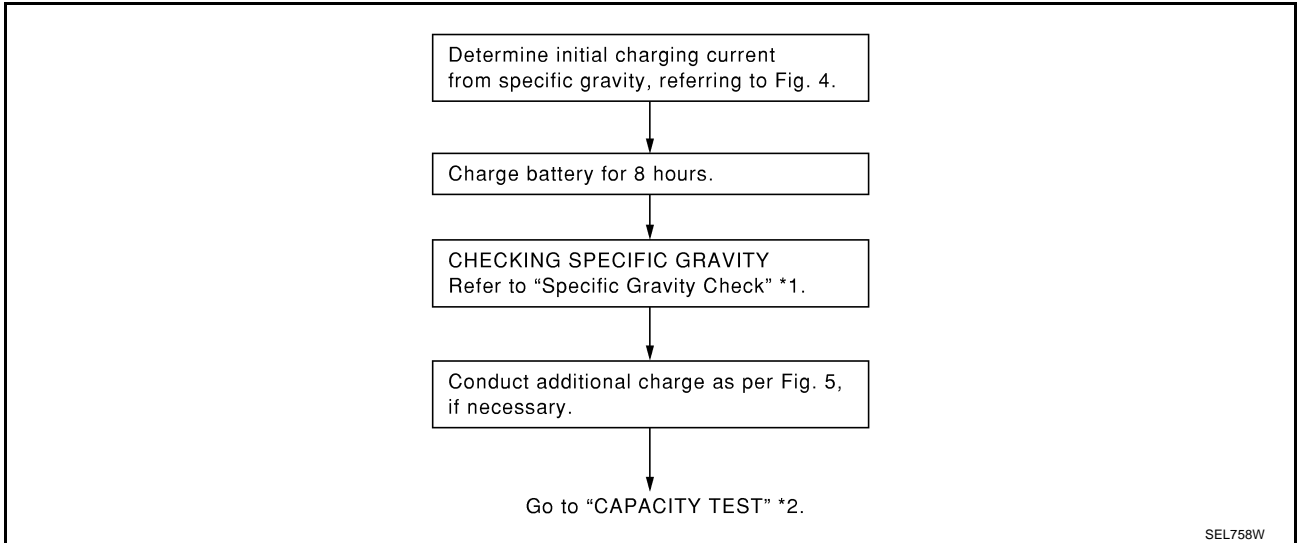


*: [SC-7, "CHART II"](#)

CAUTION:

- Set charging current to specified value in Fig. 2. If charger is not capable of producing specified current value, set its charging current as close to that value as possible.
- Keep battery away from open flame while it is being charged.
- When connecting charger, connect leads first, then turn on charger. Never turn on charger first, as this may cause a spark.
- If battery temperature rises above 55 °C (131 °F), stop charging. Always charge battery when its temperature is below 55 °C (131 °F).

B: STANDARD CHARGE



*1: [SC-5, "SPECIFIC GRAVITY CHECK"](#)

*2: [SC-7, "CHART II"](#)

Fig. 4 Initial Charging Current Setting (Standard Charge)

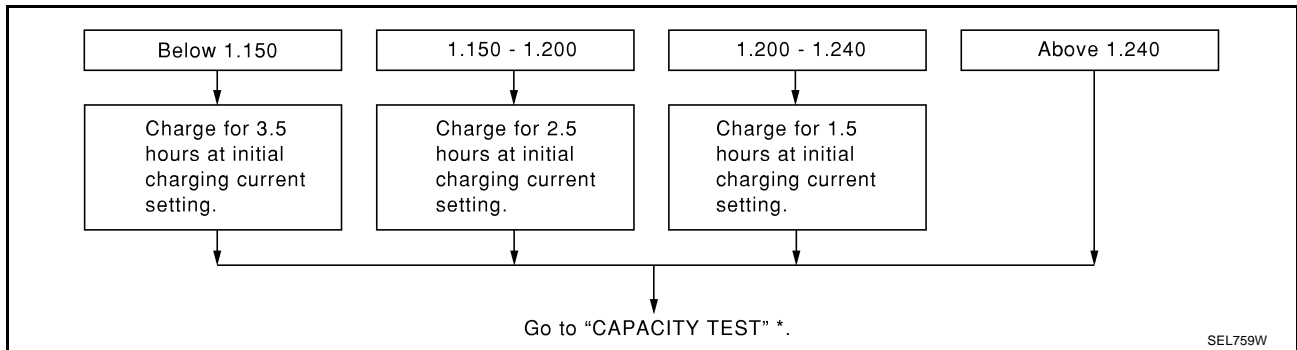
CON- VERTED SPECIFIC GRAVITY	BATTERY TYPE																	
	28B19R(L)	34B19R(L)	46B24R(L)	55B24R(L)	50D23R(L)	55D23R(L)	025 [YUASA type code]	027 [YUASA type code]	65D26R(L)	80D23R(L)	80D26R(L)	067 [YUASA type code]	096 [YUASA type code]	75D31R(L)	95D31R(L)	115D31R(L)	110D26R(L)	95E41R(L)
1.100 - 1.130	4.0 (A)		5.0 (A)		6.0 (A)			7.0 (A)						8.0 (A)	9.0 (A)			13.0 (A)
1.130 - 1.160	3.0 (A)		4.0 (A)		5.0 (A)			6.0 (A)						7.0 (A)	8.0 (A)			11.0 (A)

BATTERY

CON- VERTED SPECIFIC GRAVITY	BATTERY TYPE																		
	28B19R(L)	34B19R(L)	46B24R(L)	55B24R(L)	50D23R(L)	55D23R(L)	025 [YUASA type code]	027 [YUASA type code]	65D26R(L)	80D23R(L)	80D26R(L)	067 [YUASA type code]	096 [YUASA type code]	75D31R(L)	95D31R(L)	115D31R(L)	110D26R(L)	95E41R(L)	130E41R(L)
1.160 - 1.190	2.0 (A)		3.0 (A)		4.0 (A)				5.0 (A)					6.0 (A)	7.0 (A)				9.0 (A)
1.190 - 1.220	2.0 (A)		2.0 (A)		3.0 (A)				4.0 (A)					5.0 (A)	5.0 (A)				7.0 (A)

- Check battery type and determine the specified current using the table.
- After starting charging, adjustment of charging current is not necessary.

Fig. 5 Additional Charge (Standard Charge)



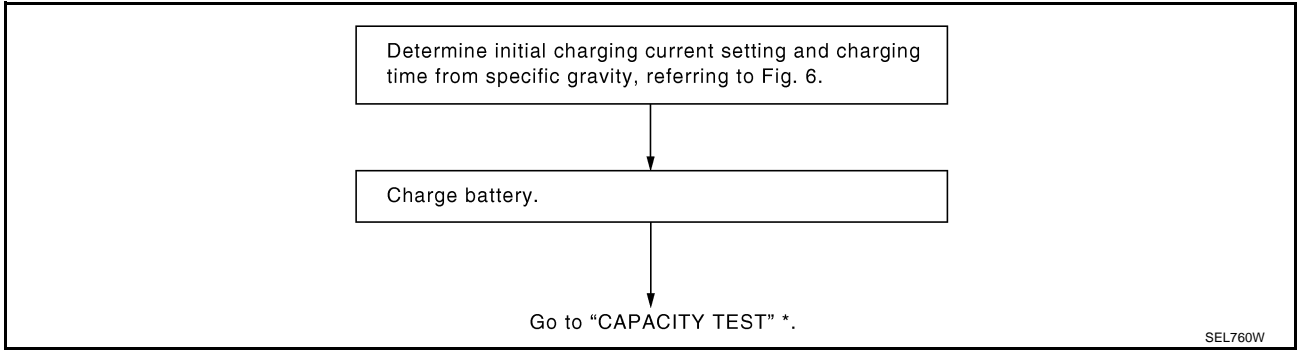
*: [SC-7, "CHART II"](#)

CAUTION:

- Never use standard charge method on a battery whose specific gravity is less than 1.100.
- Set charging current to specified value in Fig. 4. If charger is not capable of producing specified current value, set its charging current as close to that value as possible.
- Keep battery away from open flame while it is being charged.
- When connecting charger, connect leads first, then turn on charger. Never turn on charger first, as this may cause a spark.
- If battery temperature rises above 55 °C (131 °F), stop charging. Always charge battery when its temperature is below 55 °C (131 °F).

BATTERY

C: QUICK CHARGE



*: SC-7. "CHART II"

Fig. 6 Initial Charging Current Setting and Charging Time (Quick Charge)

BATTERY TYPE		28B19R(L)	34B19R(L)	46B24R(L)	55B24R(L)	50D23R(L)	55D23R(L)	65D26R(L)	80D23R(L)	80D26R(L)	025 [YUASA type code]	027 [YUASA type code]	067 [YUASA type code]	096 [YUASA type code]	75D31R(L)	95D31R(L)	115D31R(L)	110D26R(L)	95E41R(L)	130E41R(L)
CURRENT [A]		10 (A)	15 (A)			20 (A)						25 (A)		30 (A)				40 (A)		
CONVERTED SPECIFIC GRAVITY	1.100 - 1.130	2.5 hours																		
	1.130 - 1.160	2.0 hours																		
	1.160 - 1.190	1.5 hours																		
	1.190 - 1.220	1.0 hour																		
	Above 1.220	0.75 hour (45 min.)																		

- Check battery type and determine the specified current using the table.
- After starting charging, adjustment of charging current is not necessary.

CAUTION:

- **Never use quick charge method on a battery whose specific gravity is less than 1.100.**
- **Set initial charging current to specified value in Fig. 6. If charger is not capable of producing specified current value, set its charging current as close to that value as possible.**
- **Keep battery away from open flame while it is being charged.**
- **When connecting charger, connect leads first, then turn on charger. Never turn on charger first, as this may cause a spark.**
- **Be careful of a rise in battery temperature because a large current flow is required during quick-charge operation.**
If battery temperature rises above 55 °C (131 °F), stop charging. Always charge battery when its temperature is below 55 °C (131 °F).
- **Never exceed the charging time specified in Fig. 6, because charging battery over the charging time can cause deterioration of the battery.**

BATTERY

Removal and Installation


EKS00315

Observe the following to ensure proper servicing.


CAUTION:

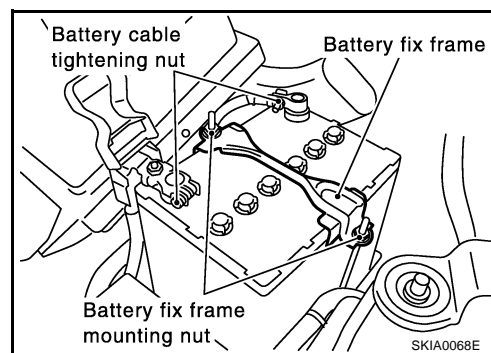
- When disconnecting, disconnect the battery cable from the negative terminal first. But when connecting, connect the battery cable to the positive terminal first.
- Tighten parts to the specified torque shown below.

Battery fix frame mounting nut:

: 3.5 - 5.3 N·m (0.36 - 0.54 kg-m, 31 - 46 in-lb)

Battery cable tightening nut:

: 3.0 - 5.0 N·m (0.31 - 0.51 kg-m, 27 - 44 in-lb)



CHARGING SYSTEM

PFP:00011

System Description

EKS00316

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

Power is supplied at all times

- through 10A fuse (No. 34, located in the fuse and fusible link box)
- 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 charging circuit is protected by the 120A (Gasoline engine models) or 100A (Diesel engine models) fusible link (letter A, located in the fuse and fusible link box).

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. 11, located in the fuse block (J/B)]
- to combination meter terminal 2 for the charge warning lamp.

Ground is supplied with power and ground supplied

- to terminal 5 of the combination meter
- through alternator terminal 3 ("L" terminal)
- to alternator terminal E (Gasoline engine models) or through body ground (Diesel engine models)
- through ground E30 (Gasoline engine models).

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

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

A

B

C

D

E

F

G

H

I

J

SC

L

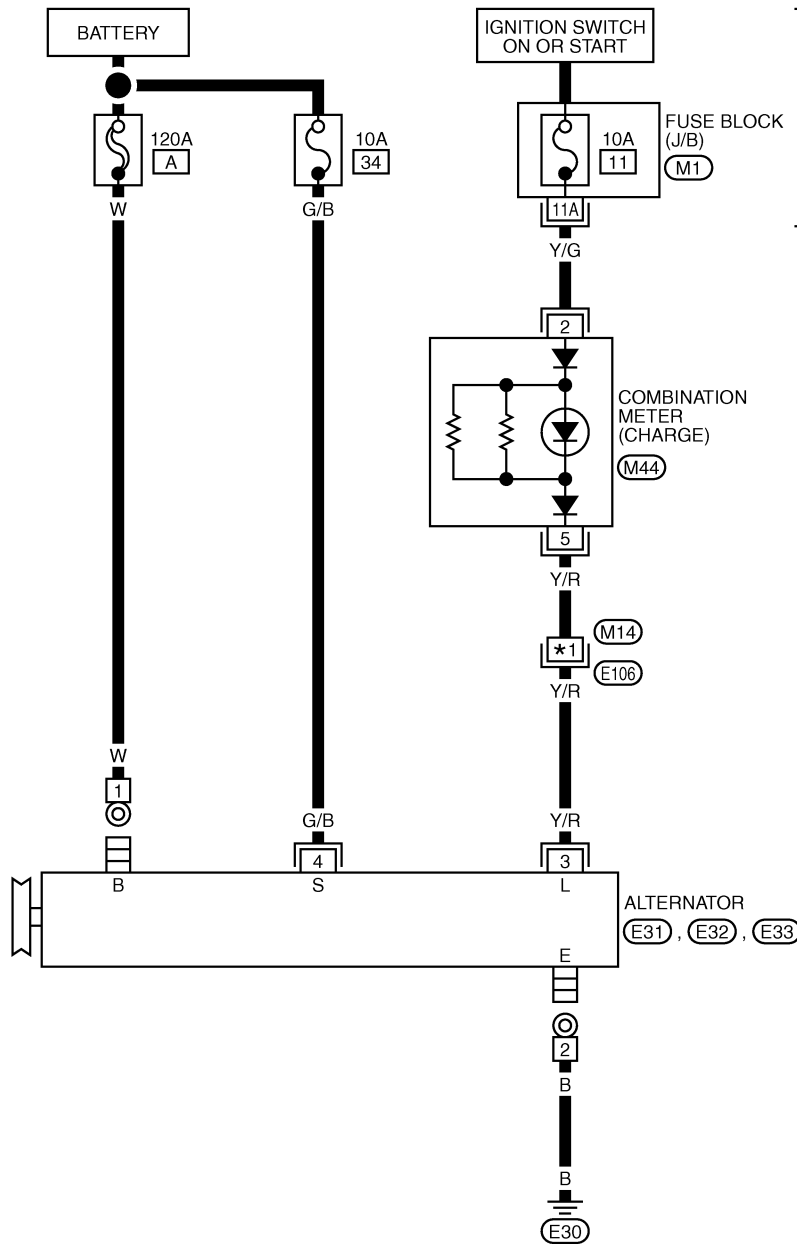
M

CHARGING SYSTEM

Wiring Diagram — CHARGE — /With Gasoline Engine

EKS00317

SC-CHARGE-01



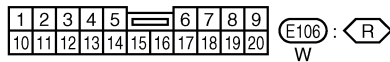
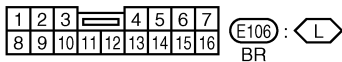
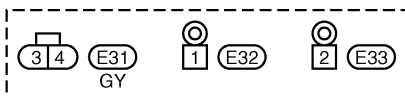
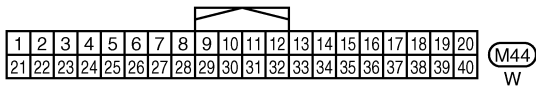
REFER TO PG-POWER.

L : LHD MODELS

R : RHD MODELS

*1 4 : L

14 : R



REFER TO THE FOLLOWING.

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

TKWA1513E

CHARGING SYSTEM

Wiring Diagram — CHARGE — /With Diesel Engine

EKS00EAF

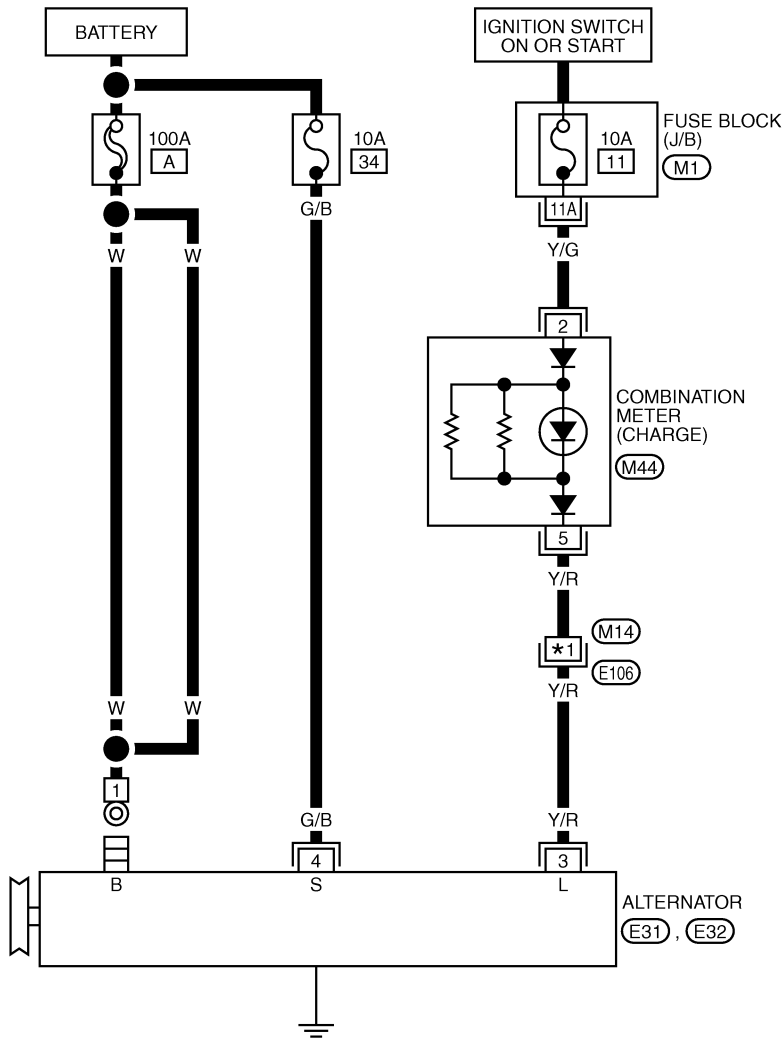
SC-CHARGE-02

L : LHD MODELS

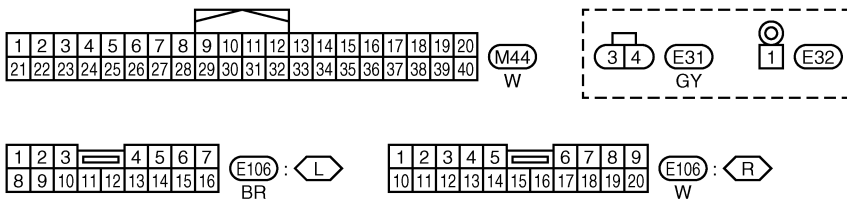
R : RHD MODELS

*1 4 : L

14 : R



REFER TO PG-POWER.



REFER TO THE FOLLOWING.

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

TKWA1514E

CHARGING SYSTEM

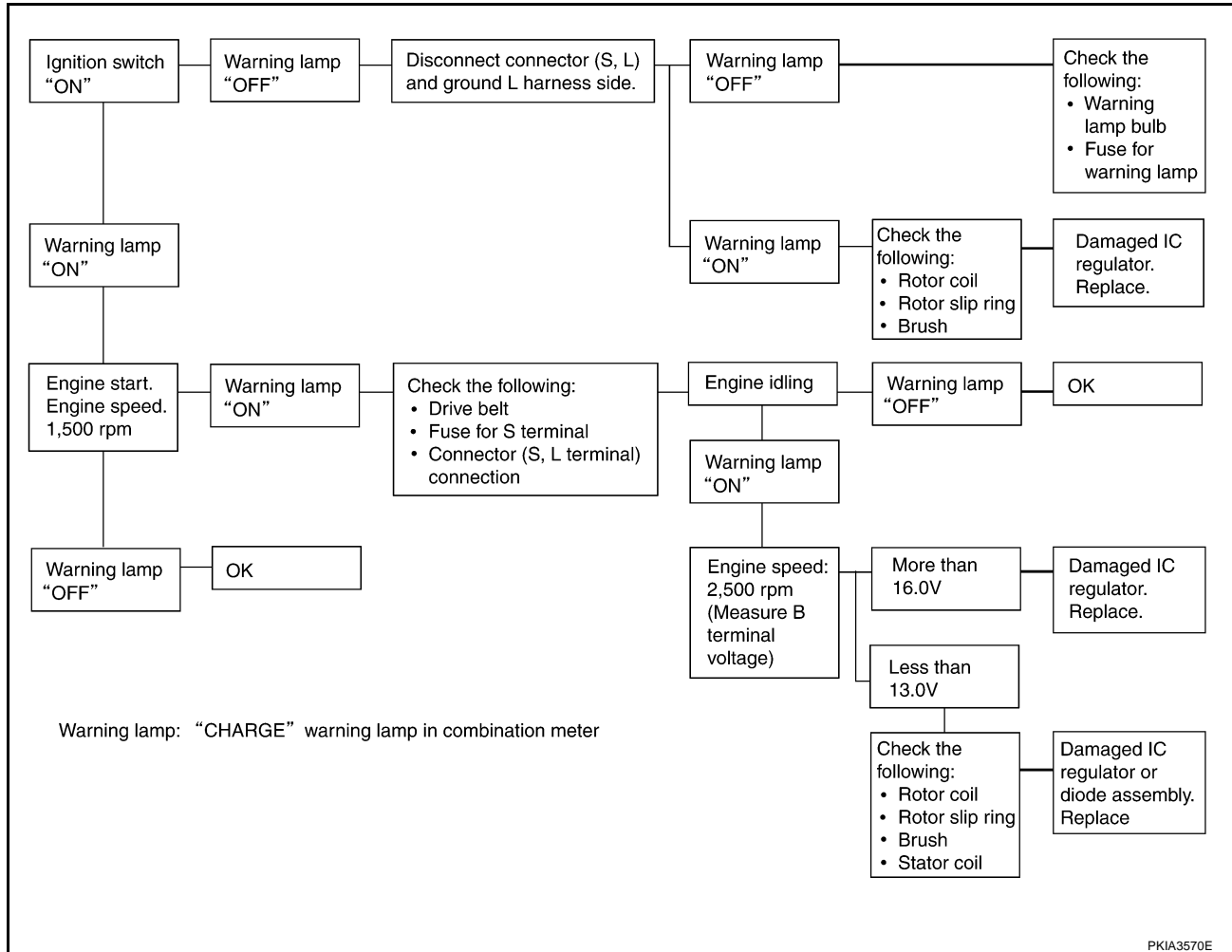
Trouble Diagnosis

EKS00319

Before performing an alternator test, make sure that the battery is fully charged. A 30-volt voltmeter and suitable test probes are necessary for the test. The alternator can be checked easily by referring to the Inspection Table.

- Before starting, inspect the fusible link.
- Use fully charged battery.

WITH IC REGULATOR



NOTE:

- If the inspection result is OK even though the charging system is malfunctioning, check the "B" terminal connection. (Check the tightening torque and voltage drop.)
- Check condition of rotor coil, rotor slip ring, brush and stator coil. If necessary, replace malfunctioning parts with new ones.

MALFUNCTION INDICATOR

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

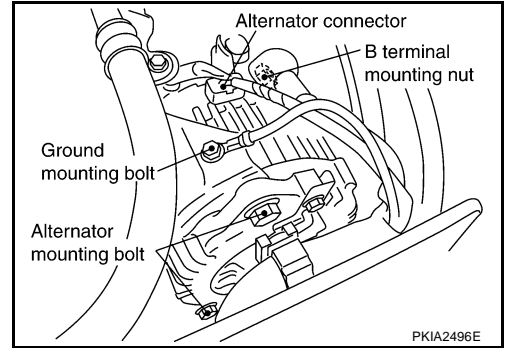
- Excessive voltage is produced.
- No voltage is produced.

CHARGING SYSTEM

Removal and Installation REMOVAL (QR ENGINE MODELS)

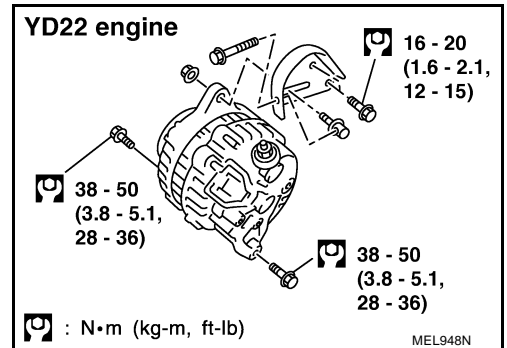
EKS0031A

1. Disconnect the battery cable from the negative terminal.
2. Remove drive belt. Refer to [EM-13. "Checking Drive Belts"](#) in EM section.
3. Remove alternator harness mounting bolt, ground mounting bolt, alternator connector and "B" terminal mounting nut.
4. Remove alternator assembly upward.
5. Remove alternator mounting bolts.



REMOVAL (YD ENGINE MODELS)

1. Disconnect the battery cable from the negative terminal.
2. Remove alternator harness mounting bolt, alternator connector and "B" terminal mounting nut.
3. Remove alternator and water pump belt. Refer to [EM-140. "Checking Drive Belts"](#) in EM section.
4. Remove alternator bracket mounting bolts and alternator bracket.
5. Remove alternator mounting bolts.
6. Remove alternator assembly upward.



ALTERNATOR PULLEY INSPECTION (QR ENGINE MODELS)

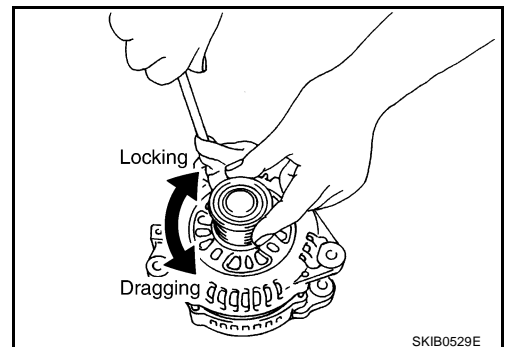
One-Way Clutch Pulley Check

Fix rotor with inserting a suitable tool rolled with a cloth.

CAUTION:

Be careful not to damage the rotor.

1. Check for locking. (Outer ring is turned clockwise when viewed from the front.)
 - If it rotates in both directions... Replace pulley.
2. Check for dragging. (Outer ring is turned counterclockwise when viewed from the front.)
 - If it locks or unusual resistance is felt... Replace pulley.



CHARGING SYSTEM

INSTALLATION




Installation is the reverse order of removal.

- Install alternator, and check tension of belt. Refer to [EM-13, "Tension Adjustment"](#) (QR engine models) or [EM-140, "Tension Adjustment"](#) (YD engine models) in EM section.





CAUTION:

Be sure to tighten “B” terminal mounting nut carefully.

QR Engine Models

B terminal nut:	 : 7.9 - 11.0 N·m (0.8 - 1.11 kg-m, 6.0 - 8.0 ft-lb)
Ground bolt:	 : 2.3 - 2.6 N·m (0.23 - 0.27 kg-m, 20 - 23 in-lb)
Alternator mounting bolt:	 : 59 - 69 N·m (6.1 - 7.1 kg-m, 45 - 51 ft-lb)

YD Engine Models

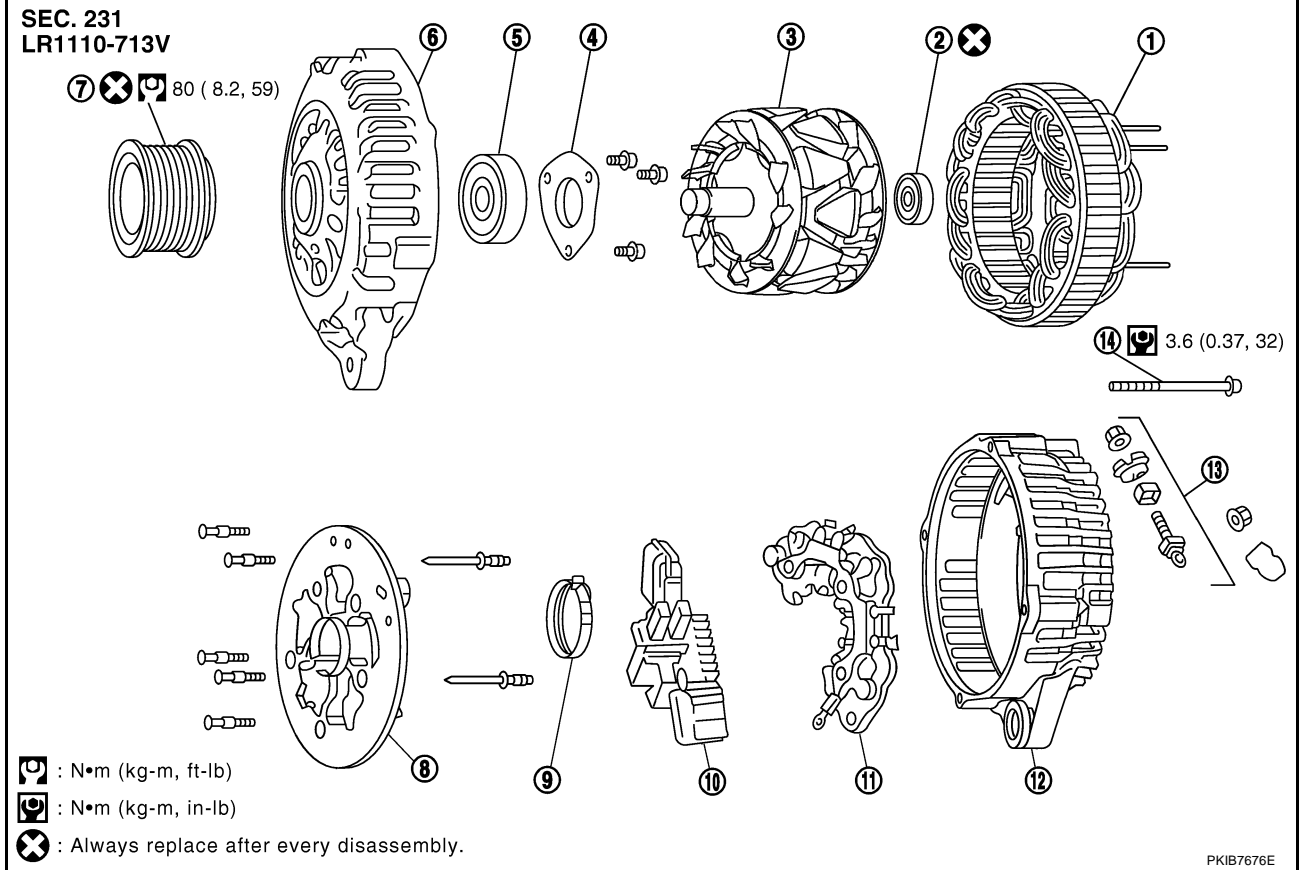
B terminal nut:	 : 7.9 - 11.0 N·m (0.8 - 1.11 kg-m, 6.0 -8.0 ft-lb)
Ground bolt:	 : 2.3 - 2.6 N·m (0.23 - 0.27 kg-m, 20 - 23 in-lb)
Alternator mounting bolt (upper side):	 : 16 - 20 N·m (1.6 - 2.1 kg-m, 12 - 15 ft-lb)
Alternator mounting bolt (lower side):	 : 38 - 50 N·m (3.8 - 5.1 kg-m, 28 - 36 ft-lb)

CHARGING SYSTEM

Disassembly and Assembly

EKS0031B

QR ENGINE MODELS



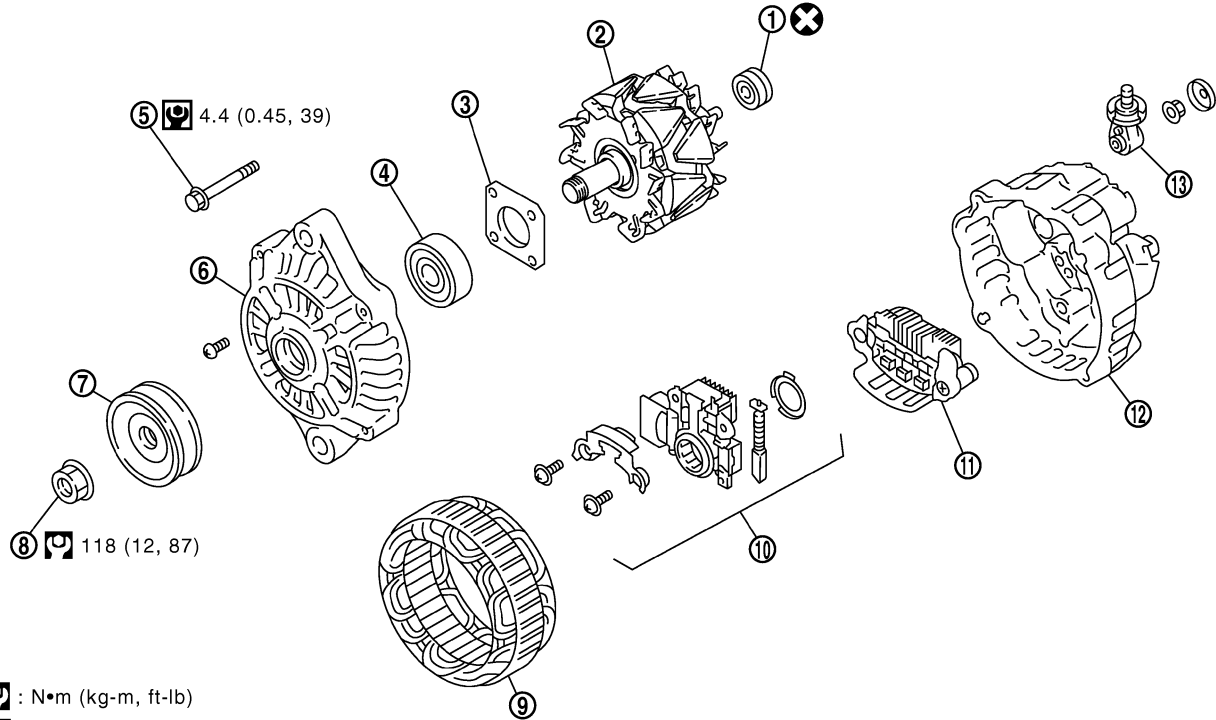
- | | | |
|-----------------------------------|--------------------|-------------------|
| 1. Stator | 2. Rear bearing | 3. Rotor |
| 4. Retainer | 5. Front bearing | 6. Front cover |
| 7. Pulley | 8. Fan guide | 9. Labyrinth seal |
| 10. IC voltage regulator assembly | 11. Diode assembly | 12. Rear cover |
| 13. Terminal assembly | 14. Through-bolt | |

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CHARGING SYSTEM

YD ENGINE MODELS

SEC. 231
A3TB0771



PKIB9810E

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

DISASSEMBLY

Rear Cover

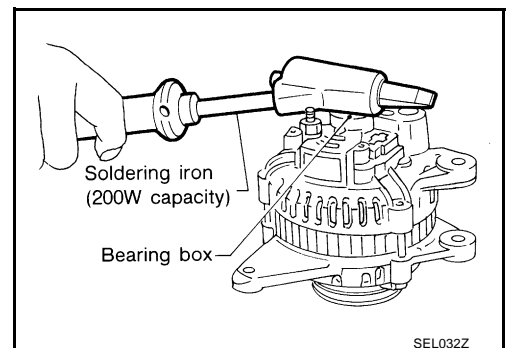
1. Remove through-bolt (4).
2. Remove rear cover.

NOTE:

Rear cover may be hard to remove because a ring is used to lock outer race of rear bearing. To facilitate removal of rear cover, heat just bearing box section with a 200 W soldering iron until the temperature increases by about 30 °C.

CAUTION:

Never use a heat gun, as it can damage diode assembly.



CHARGING SYSTEM

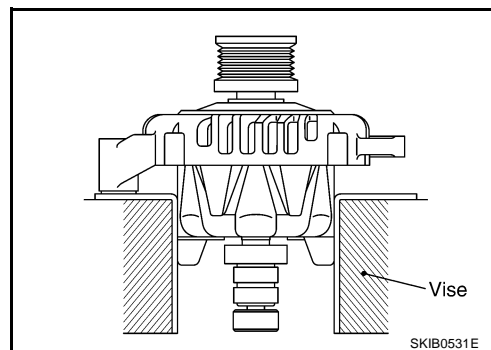
Front Cover (For LR1110-713V)

1. Set rotor to the vise.

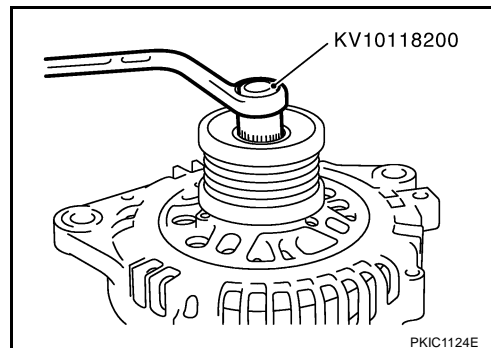
CAUTION:

- Be careful not to damage the rotor.
- Use copper plate or thick cloth for rotor in the vise.

2. Remove pulley cap, using suitable tool.



3. Remove alternator pulley, using alternator pulley adaptor [SST].



INSPECTION

Rotor Check

1. Resistance test

Resistance

: Refer to SDS. SC-36.
"Alternator" .

- Not within the specified values... Replace rotor.

2. Insulator test

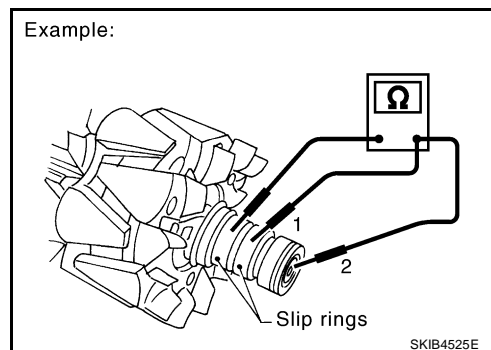
- Continuity exists... Replace rotor.

3. Check slip ring for wear.

**Slip ring minimum
outer diameter**

: Refer to SDS. SC-36.
"Alternator" .

- Not within the specified values... Replace rotor.



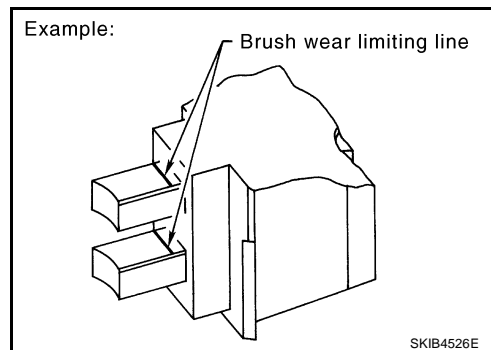
Brush Check

1. Check smooth movement of brush.

- Not smooth... Check brush holder and clean.

2. Check brush for wear.

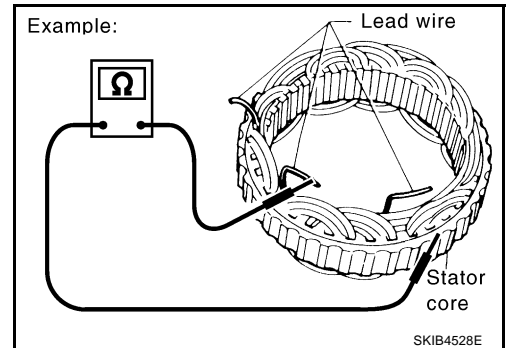
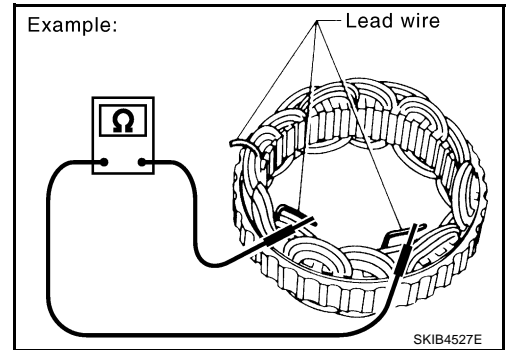
- Replace brush if it is worn down to the limit line.



CHARGING SYSTEM

Stator Check

1. Continuity test
 - No continuity... Replace stator.
2. Ground test
 - Continuity exists... Replace stator.



ASSEMBLY

Assembly is the reverse order of disassembly.

CAUTION:

Note the tightening torque shown, in the figure.

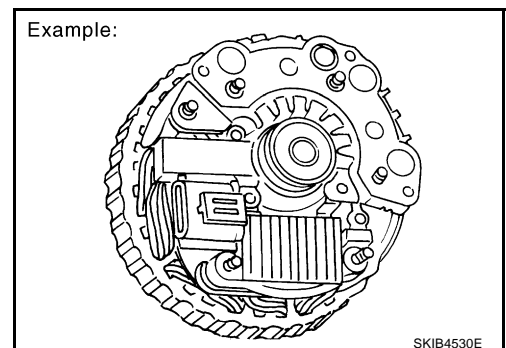
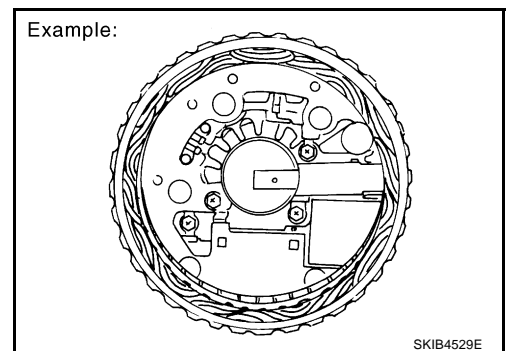
Rear Bearing

CAUTION:

- Never reuse rear bearing. Replace with a new one.
- Never lubricate rear bearing outer race.

Rear Cover Installation

1. Fit brush assembly, diode assembly, regulator assembly and stator.
2. Push brushes up with fingers and install them to rotor.
Take care not to damage slip ring sliding surface.



STARTING SYSTEM

STARTING SYSTEM

PFP:00011

System Description M/T MODELS

EKS0031F

Power is supplied at all times

- through 30A fusible link (letter J, located in the fuse and fusible link box)
- to ignition switch terminal 1.

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

- from ignition switch terminal 5
- to starter motor harness connector 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/T MODELS

Power is supplied at all times

- through 30A fusible link (letter J, located in the fuse and fusible link box)
- to ignition switch terminal 1.

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

- from ignition switch terminal 5
- to park/neutral position relay terminal 5.

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

- through 10A fuse [No. 13, located in the fuse block (J/B)]
- to park/neutral position relay terminal 1.

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

- to park/neutral position relay terminal 2
- through the park/neutral position switch terminals 1 and 2, and
- through grounds F9 and F10.

Then park/neutral position relay is energized and power is supplied

- from park/neutral position relay terminal 3
- to starter motor harness connector 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.

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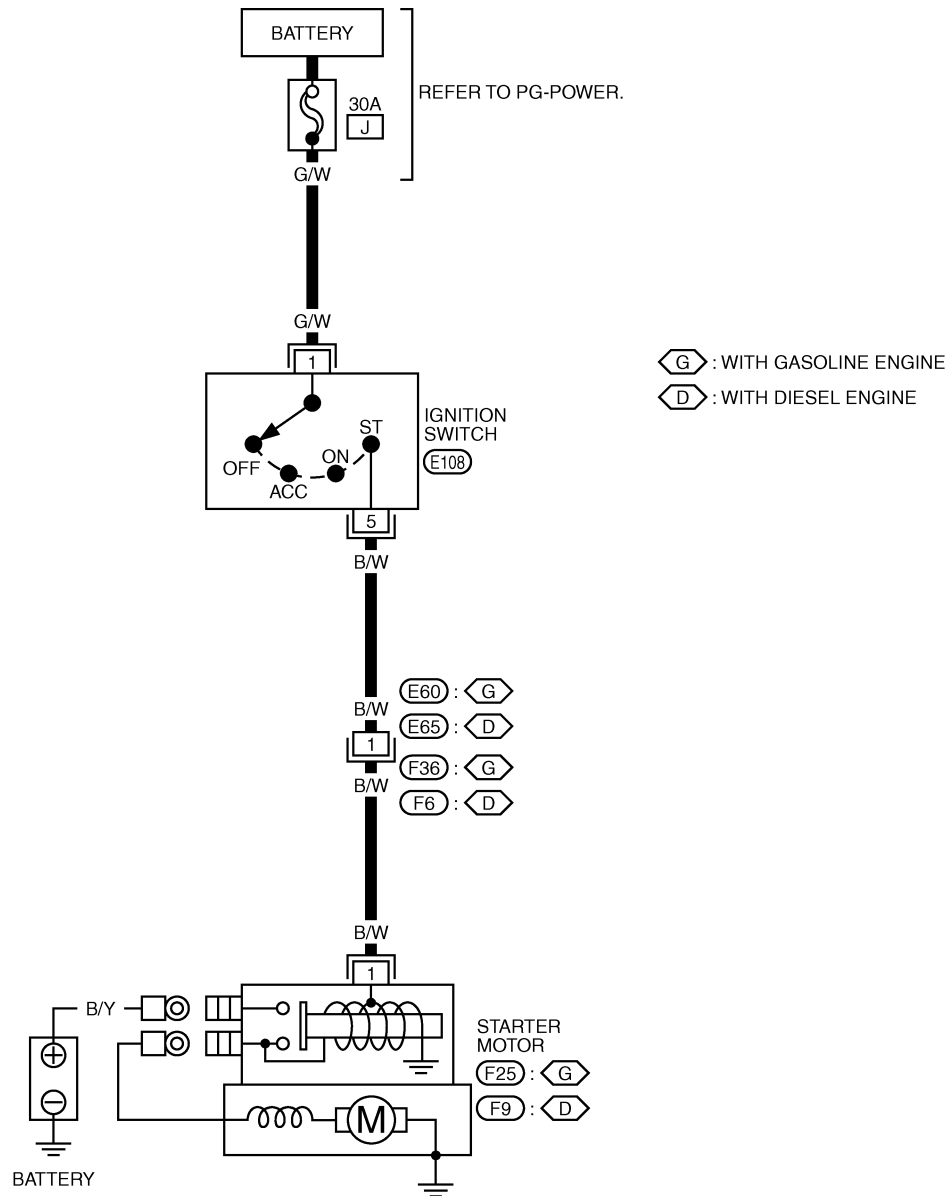
M

STARTING SYSTEM

Wiring Diagram — START — /M/T Models

EKS0031G

SC-START-01



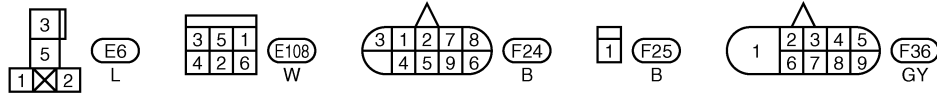
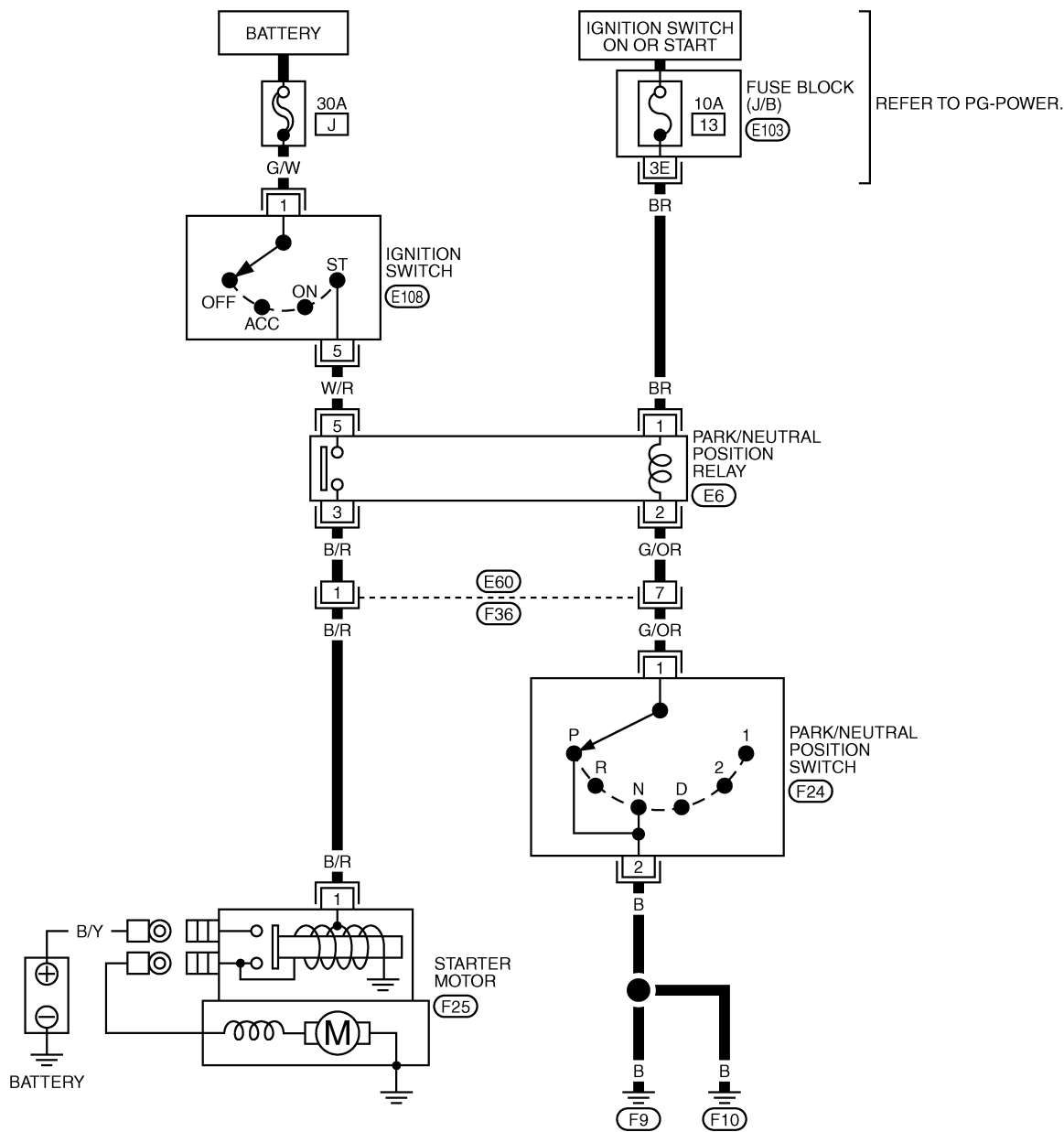
TKWA0056E

STARTING SYSTEM

Wiring Diagram — START — /A/T Models

EKS0031H

SC-START-02



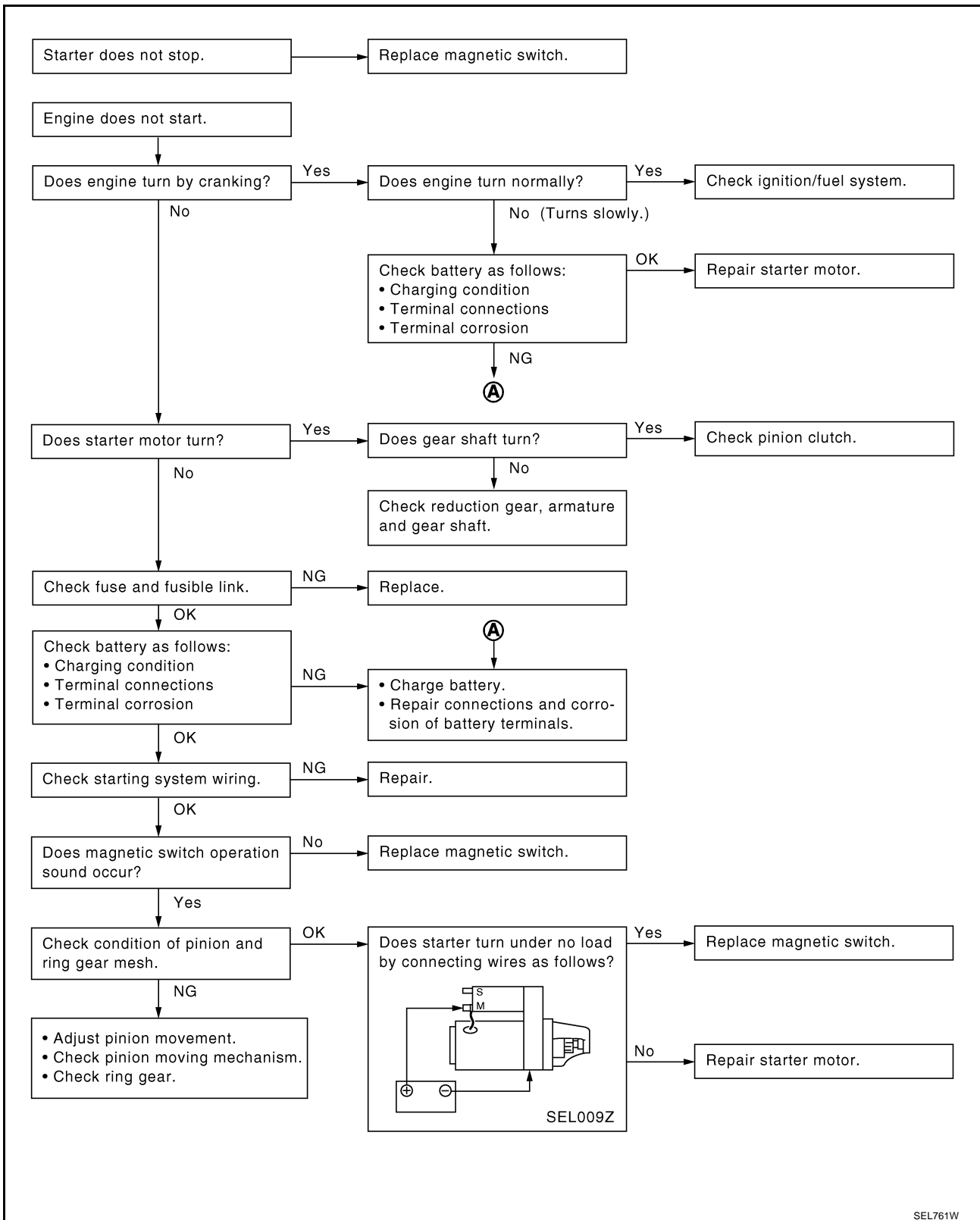
REFER TO THE FOLLOWING.
E103 -FUSE BLOCK-JUNCTION BOX (J/B)

STARTING SYSTEM

Trouble Diagnosis

EKS00311

If any malfunction is found, immediately disconnect the battery cable from the negative terminal.



SEL761W

STARTING SYSTEM

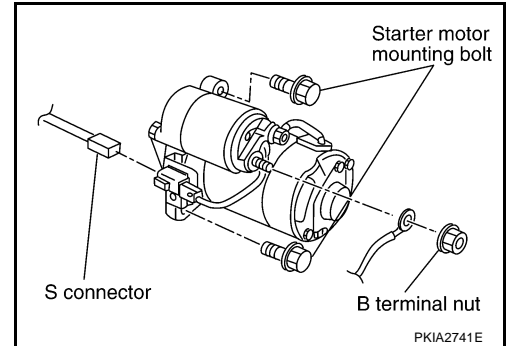
Removal and Installation

REMOVAL

EKS0031J

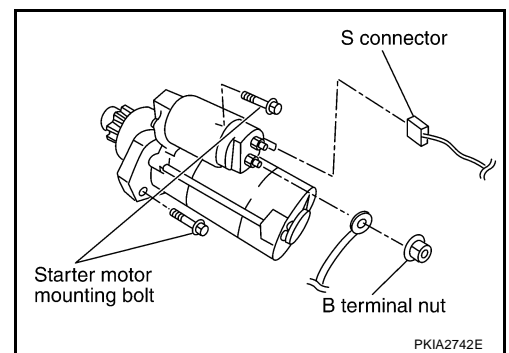
M/T Models

1. Disconnect the battery cable from the negative terminal.
2. Remove air duct. Refer to [EM-16, "AIR CLEANER AND AIR DUCT"](#) (QR engine models) or [EM-142, "AIR CLEANER AND AIR DUCT"](#) (YD engine models).
3. Disconnect "S" connector and "B" terminal from starter motor.
4. Remove starter motor mounting bolts.
5. Remove starter motor upward.



A/T Models

1. Disconnect the battery cable from the negative terminal.
2. Remove air duct and air cleaner assembly. Refer to [EM-16, "AIR CLEANER AND AIR DUCT"](#) (QR engine models).
3. Remove A/T selector cable and harness from bracket.
4. Disconnect "S" connector and "B" terminal from starter motor.
5. Remove starter motor upward.



INSTALLATION

Installation is the reverse order of removal.

QR Engine Models (M/T)

- B terminal nut:** : 9.81 - 11.8 N·m (1.0 - 1.2 kg-m, 87 - 104 in-lb)
- Starter motor mounting bolt:** : 98.1 - 127.0 N·m (10.0 - 13.0 kg-m, 73 - 94 ft-lb)

QR Engine Models (A/T)

- B terminal nut:** : 7.3 - 9.8 N·m (0.75 - 1.00 kg-m, 65 - 87 in-lb)
- Starter motor mounting bolt:**
- Upper side:** : 41.2 - 52.0 N·m (4.2 - 5.3 kg-m, 31 - 38 ft-lb)
 - Lower side:** : 98.1 - 127.0 N·m (10.0 - 13.0 kg-m, 73 - 94 ft-lb)

YD Engine Models

- B terminal nut:** : 9.81 - 11.8 N·m (1.0 - 1.2 kg-m, 87 - 104 in-lb)
- Starter motor mounting bolt:** : 41.2 - 52.0 N·m (4.2 - 5.3 kg-m, 31 - 38 ft-lb)

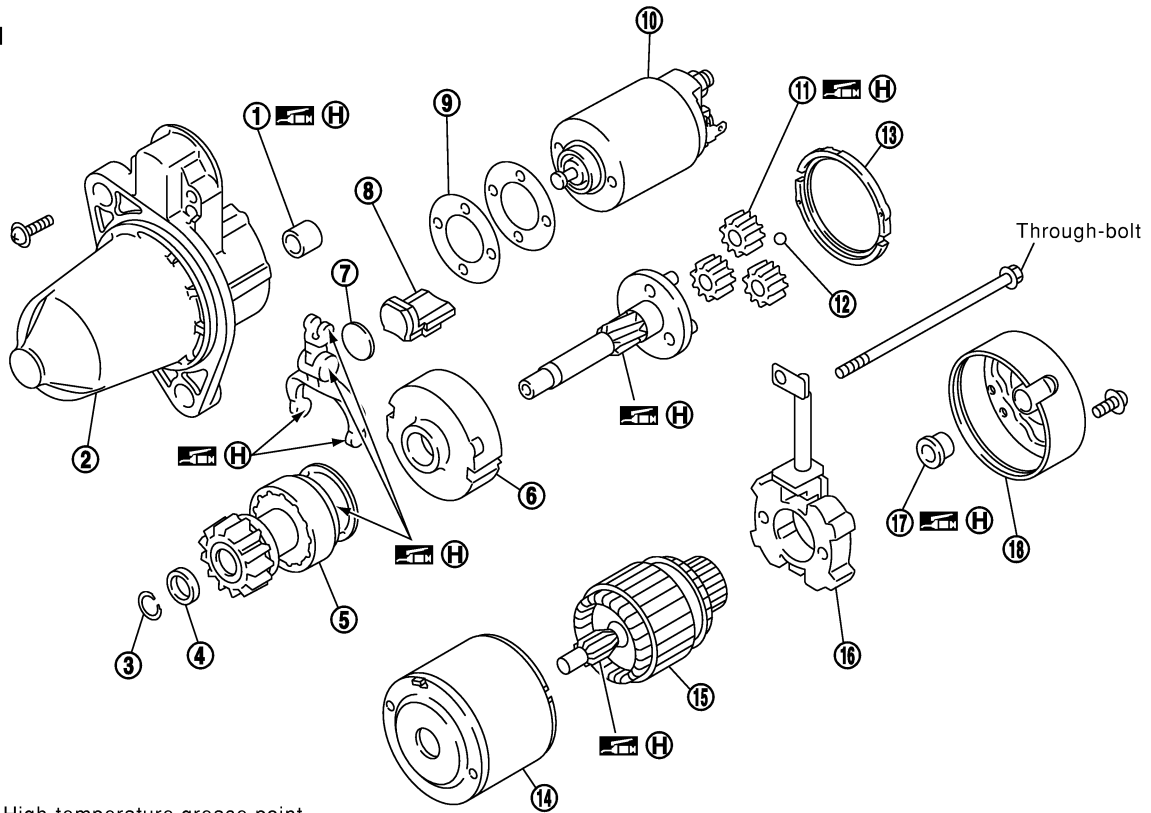
STARTING SYSTEM


Disassembly and Assembly QR ENGINE MODELS

EKS0031K

M/T Models

SEC. 233
M0T87081



 H : High-temperature grease point

PKIA0464E

- | | | |
|------------------------------|--------------------|--------------------|
| 1. Sleeve bearing | 2. Gear case | 3. Stopper clip |
| 4. Pinion stopper | 5. Pinion assembly | 6. Internal gear |
| 7. Plate | 8. Packing | 9. Adjusting plate |
| 10. Magnetic switch assembly | 11. Planetary gear | 12. Ball |
| 13. Packing | 14. Yoke | 15. Armature |
| 16. Brush holder assembly | 17. Rear bearing | 18. Rear cover |

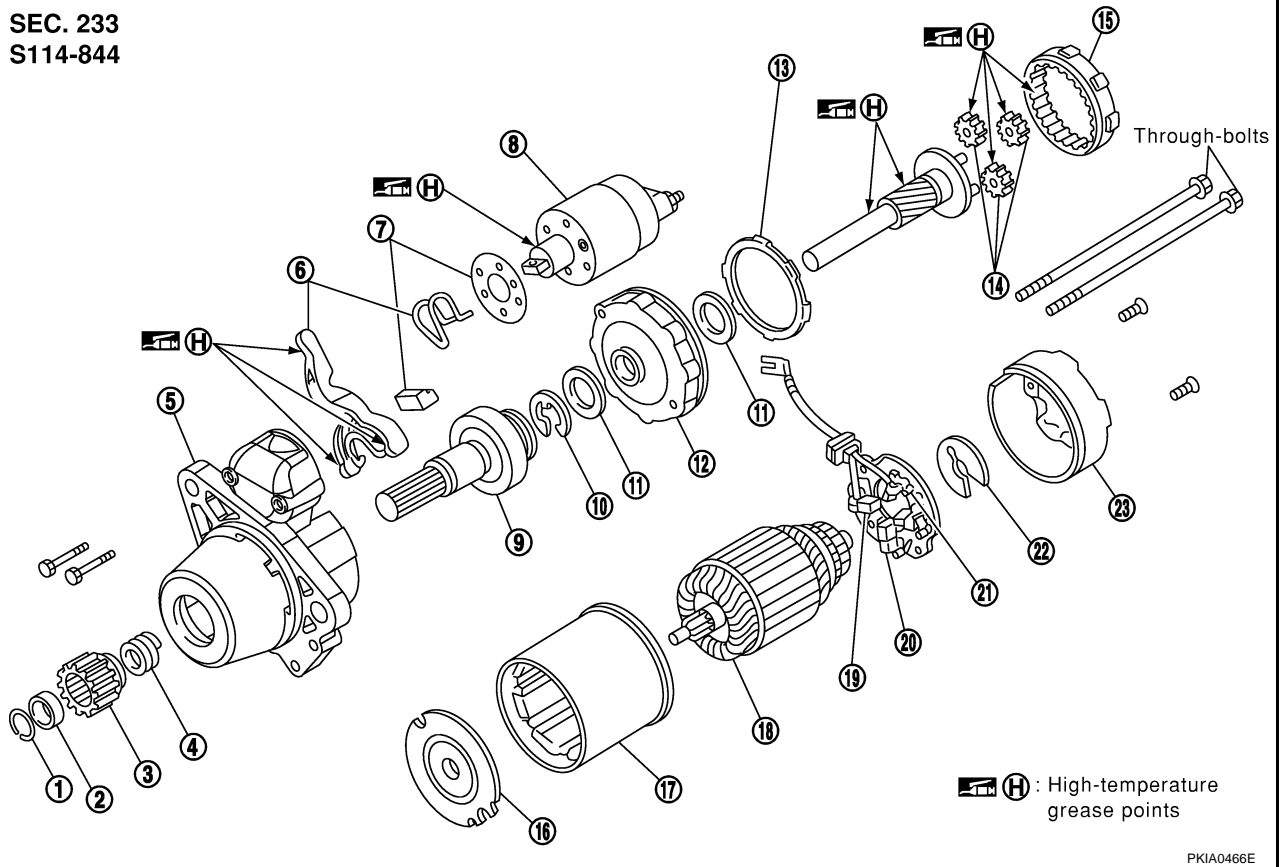
Through-bolt:

: 4.1 - 7.4 N·m (0.45 - 0.72 kg-m, 36.3 - 65.5 in-lb)

STARTING SYSTEM

A/T Models

SEC. 233
S114-844



- | | | |
|---------------------------|-----------------------------|------------------------|
| 1. Pinion stopper clip | 2. Pinion stopper | 3. Pinion |
| 4. Pinion spring | 5. Gear case assembly | 6. Shift lever set |
| 7. Dust cover kit | 8. Magnetic switch assembly | 9. Clutch assembly |
| 10. E-ring | 11. Thrust washer | 12. Center bracket (P) |
| 13. Packing | 14. Planetary gear | 15. Internal gear |
| 16. Center bracket (A) | 17. Yoke assembly | 18. Armature assembly |
| 19. Brush holder assembly | 20. Brush (-) | 21. Brush spring |
| 22. Thrust washer | 23. Rear cover assembly | |

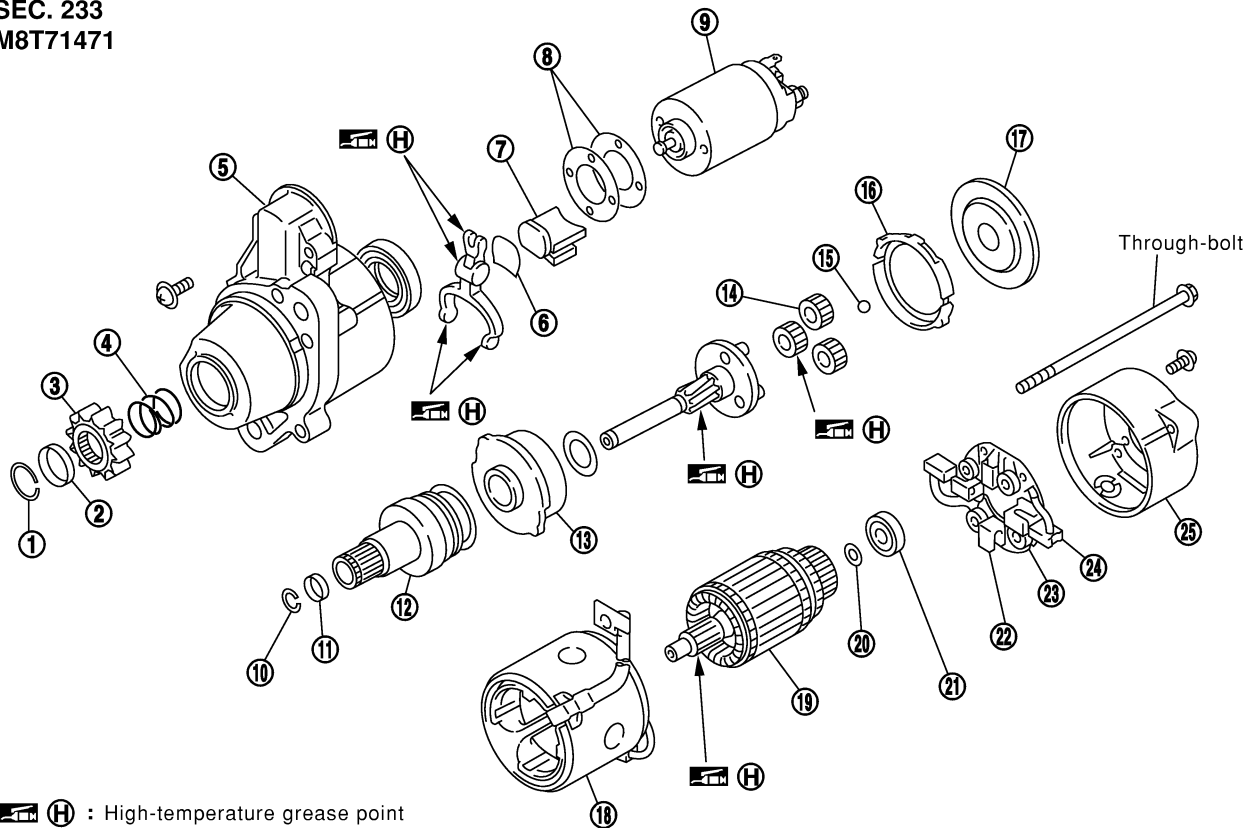
Through-bolt:

: 4.9 - 6.4 N·m (0.50 - 0.65 kg-m, 43.4 - 56.4 in-lb)

STARTING SYSTEM

YD ENGINE MODELS

SEC. 233
M8T71471



PKIA0465E

- | | | |
|---------------------------|--------------------|-----------------------------|
| 1. Stopper clip | 2. Pinion stopper | 3. Pinion |
| 4. Spring | 5. Gear case | 6. Plate |
| 7. Packing | 8. Adjusting plate | 9. Magnetic switch assembly |
| 10. Snap ring | 11. Retainer ring | 12. Over running clutch |
| 13. Internal gear | 14. Planetary gear | 15. Ball |
| 16. Packing | 17. Cover | 18. Yoke |
| 19. Armature | 20. Washer | 21. Rear bearing |
| 22. Brush holder assembly | 23. Brush spring | 24. Brush (-) |
| 25. Rear cover | | |

Through-bolt:

: 5.6 - 10.4 N·m (0.57 - 1.06 kg-m, 49.5 - 92.0 in-lb)

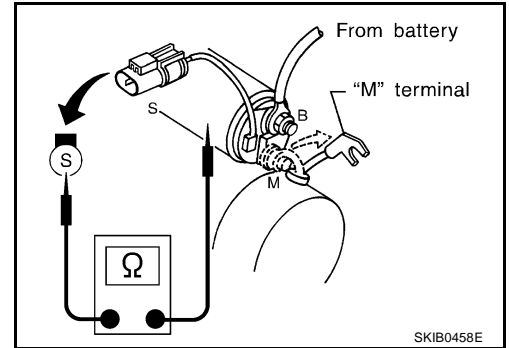
STARTING SYSTEM

Inspection

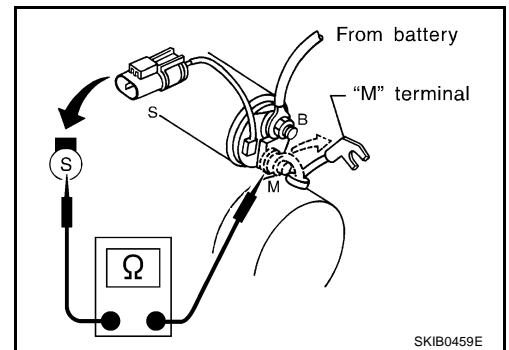
MAGNETIC SWITCH CHECK

EKS0031L

- Before starting to check, disconnect the battery cable from the negative terminal.
 - Disconnect "M" terminal of starter motor.
1. Continuity test (between "S" terminal and switch body).
 - No continuity... Replace.

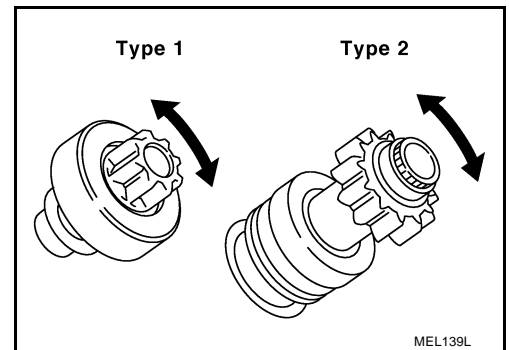


2. Continuity test (between "S" terminal and "M" terminal).
 - No continuity... Replace.



PINION/CLUTCH CHECK

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



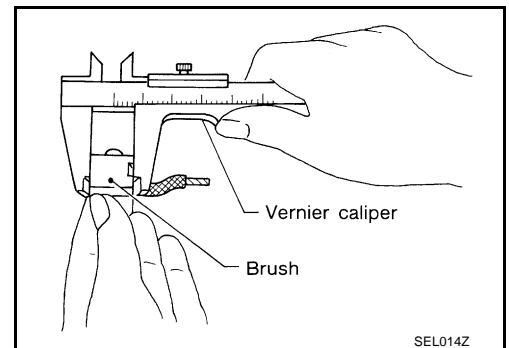
BRUSH CHECK

Brush

Check wear of brush.

Wear limit length : Refer to SDS. [SC-36, "Starter"](#) .

- Excessive wear... Replace.



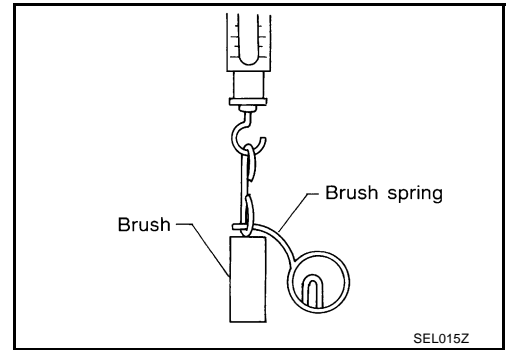
STARTING SYSTEM

Brush Spring Check

Check brush spring tension with brush spring detached from brush.

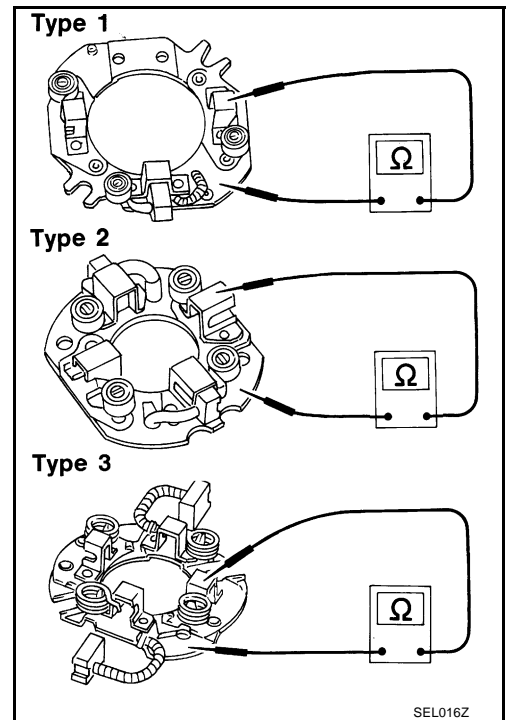
Spring tension : Refer to SDS. [SC-36, "Starter"](#) .
(with new brush)

- Not within the specified values... Replace.



Brush Holder

1. Perform insulation test between brush holder (positive side) and its base (negative side).
 - Continuity exists.... Replace.
2. Check brush to see if it moves smoothly.
 - If brush holder is bent, replace it; if sliding surface is dirty, clean.

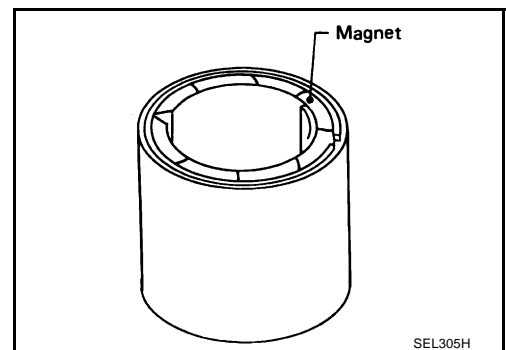


YOKE CHECK

Magnet is secured to yoke by bonding agent. Check magnet to see that it is secured to yoke and for any cracks. Replace malfunctioning parts as an assembly.

CAUTION:

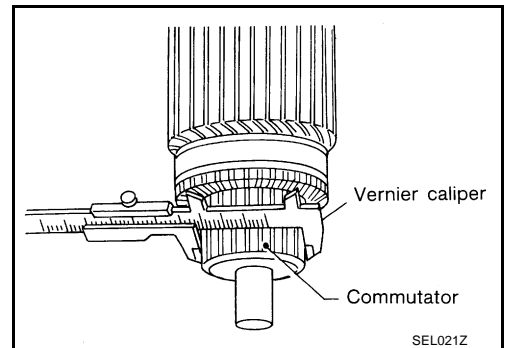
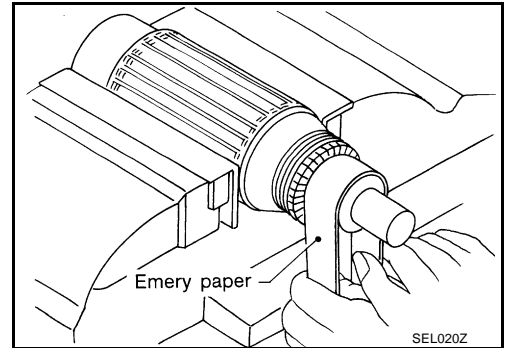
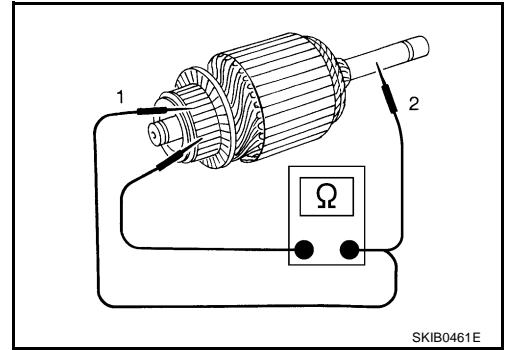
Never clamp yoke in a vice or strike it with a hammer.



STARTING SYSTEM

ARMATURE CHECK

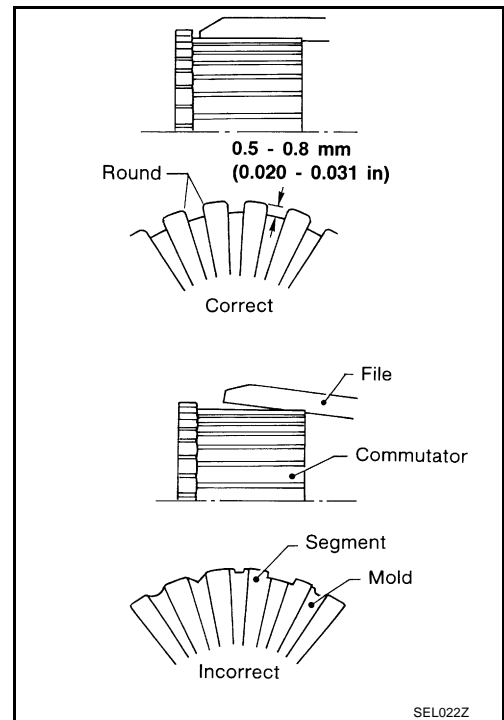
1. Continuity test (between two segments side by side).
 - No continuity... Replace.
2. Insulation test (between each commutator bar and shaft).
 - Continuity exists.... Replace.
3. Check commutator surface.
 - Rough... Sand lightly with No. 500 - 600 emery paper.
4. Check diameter of commutator.
 - **Commutator minimum diameter** : Refer to SDS. SC-36.
"Starter" .
 - Less than specified value... Replace.



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STARTING SYSTEM

5. Check depth of insulating mold from commutator surface.
- Less than 0.2 mm (0.008 in)... Undercut to 0.5 to 0.8 mm (0.020 to 0.031 in).



Assembly

Apply high-temperature grease to lubricate the bearing, gears and frictional surface when assembling the starter.

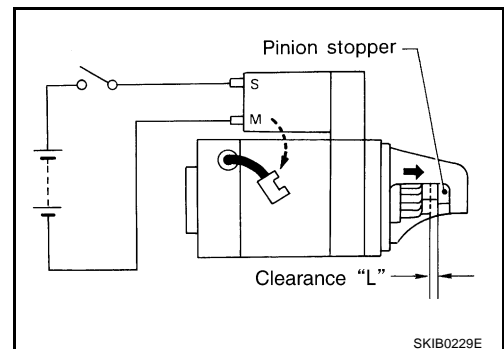
Carefully observe the following instructions.

PINION PROTRUSION LENGTH ADJUSTMENT

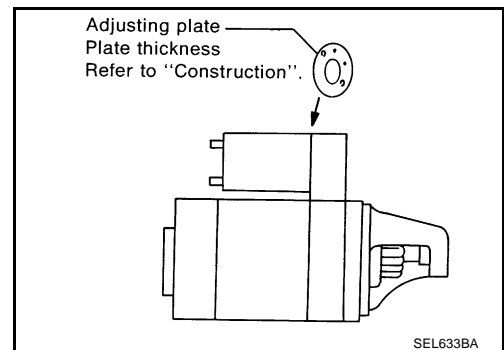
Clearance [QR Engine Models (M/T)]

With pinion driven out by magnetic switch, push pinion back to remove slack and measure clearance "L" between the front edge of the pinion and the pinion stopper.

Clearance "L" : Refer to SDS. [SC-36, "Starter"](#) .



- Not in the specified value... Adjust by adjusting plate.



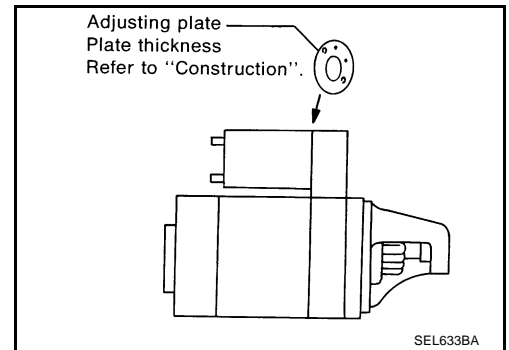
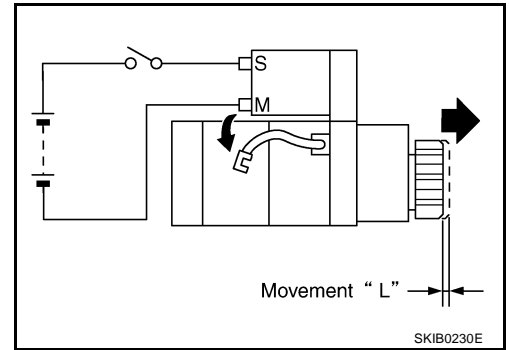
STARTING SYSTEM

Movement [QR Engine Models (A/T), YD Engine Models]

Compare movement "L" in height of pinion when it is pushed out with magnetic switch energized and when it is pulled out by hand until it touches stopper.

Movement "L" : Refer to SDS. [SC-36. "Starter"](#) .

- Not in the specified value...Adjust by adjusting plate.



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SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

PFP:00030

Battery

EKS0031Q

Applied model	QR20, QR25 engine		YD22 engine
	Except for Northern Europe	For Northern Europe	
Type	55D23L	80D23L	110D26L
Capacity [V - AH]	12-48	12-52	12-64

Starter

EKS0031R

Applied model		QR20, QR25 engine		YD22 engine	
		A/T	M/T		
Type		S114-844	M0T87081	M8T71471	
		HITACHI make	MITSUBISHI make		
		Reduction			
System voltage		[V]	12		
No-load	Terminal voltage	[V]	11.0		
	Current	[A]	Less than 90	Less than 90	Less than 145
	Revolution	[rpm]	More than 2,700	More than 2,500	More than 3,300
Minimum diameter of commutator		[mm (in)]	28.0 (1.102)	28.8 (1.134)	31.4 (1.236)
Minimum length of brush		[mm (in)]	10.5 (0.413)	7.0 (0.276)	11.0 (0.433)
Brush spring tension		[N (kg, lb)]	16.2 (1.65, 3.64)	15.0 - 20.4 (1.5 - 2.1, 3.4 - 4.6)	26.7 - 36.1 (2.7 - 3.7, 6.0 - 8.2)
Clearance between bearing metal and armature shaft		[mm (in)]	Less than 0.2 (0.008)		—
Clearance “L” between pinion front edge and pinion stopper		[mm (in)]	—	0.5 - 2.0 (0.020 - 0.079)	—
Movement “L” in height of pinion assembly		[mm (in)]	0.3 - 2.5 (0.012 - 0.098)	—	0.5 - 2.0 (0.020 - 0.079)

Alternator

EKS0031S

Applied model		QR20, QR25 engine	YD22 engine
Type		LR1110-713V	A3TB0771
		HITACHI make	MITSUBISHI make
Nominal rating [V - A]		12-110	12-90
Ground polarity		Negative	
Minimum revolutions under no-load (When 13.5 V is applied) [rpm]		Less than 1,100	Less than 1,300
Hot output current (When 13.5 V is applied) [A/rpm]		(More than 35/1,300) More than 70/1,800 More than 91/2,500 More than 110/5,000	More than 29/1,300 More than 76/2,500 More than 88/5,000
Regulated output voltage [V]		14.1 - 14.7	
Minimum length of brush [mm (in)]		More than 6.0 (0.236)	More than 5.0 (0.197)
Brush spring pressure [N (g, oz)]		1.0 - 3.43 (102 - 350, 3.60 - 12.34)	4.8 - 6.0 (490 - 610, 17.28 - 21.51)
Slip ring minimum diameter [mm (in)]		More than 26.0 (1.024)	More than 22.1 (0.870)
Rotor coil resistance at 20 °C (68 °F) [Ω]		2.16 - 2.46	2.1 - 2.5