

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”

EKS00415

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 harness connectors.

Wiring Diagrams and Trouble Diagnosis

EKS00416

When you read wiring diagrams, refer to the followings:

- [GI-14, "How to Read Wiring Diagrams"](#) in GI section
- [PG-3, "POWER SUPPLY ROUTING"](#) for power distribution circuit in PG section

When you perform trouble diagnosis, refer to the followings:

- [GI-10, "How to Follow Trouble Diagnoses"](#) in GI section
- [GI-24, "How to Perform Efficient Diagnosis for an Electrical Incident"](#) in GI section

BATTERY

BATTERY

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How to Handle Battery

EKS00417

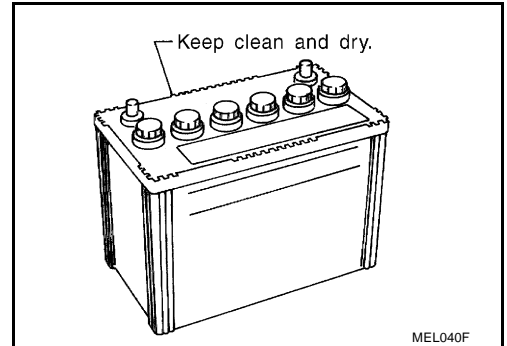
CAUTION:

- 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.

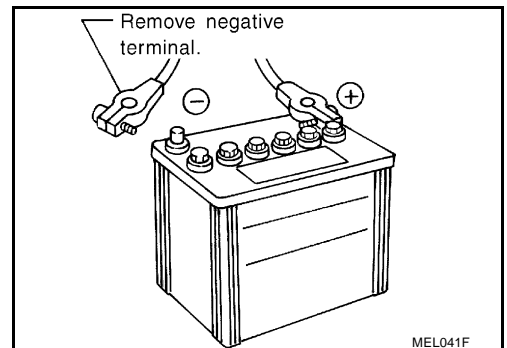
METHODS OF PREVENTING OVER-DISCHARGE

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

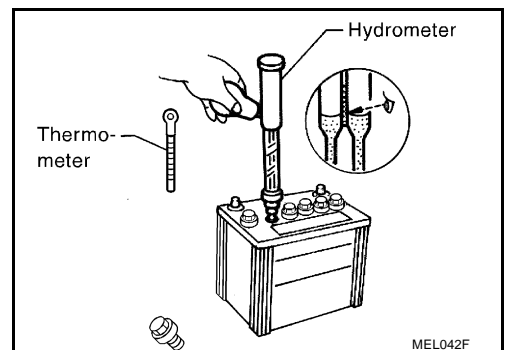
- The battery surface (particularly its top) should always be kept clean and dry.
- The terminal connections should be clean and tight.
- At every routine maintenance, check the electrolyte level. This also applies to batteries designated as "low maintenance" and "maintenance-free".



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



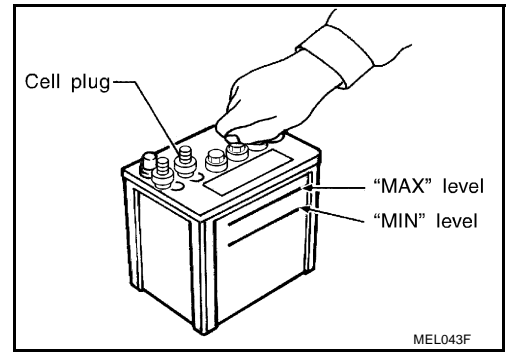
CHECKING ELECTROLYTE LEVEL

WARNING:

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.

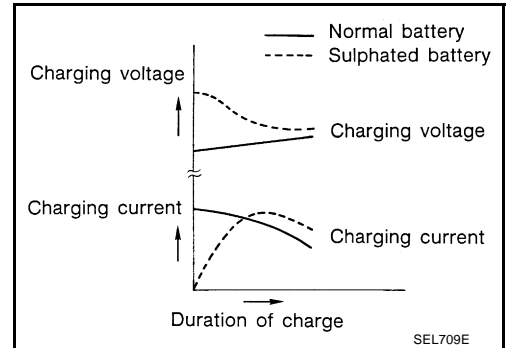


Sulphation

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.

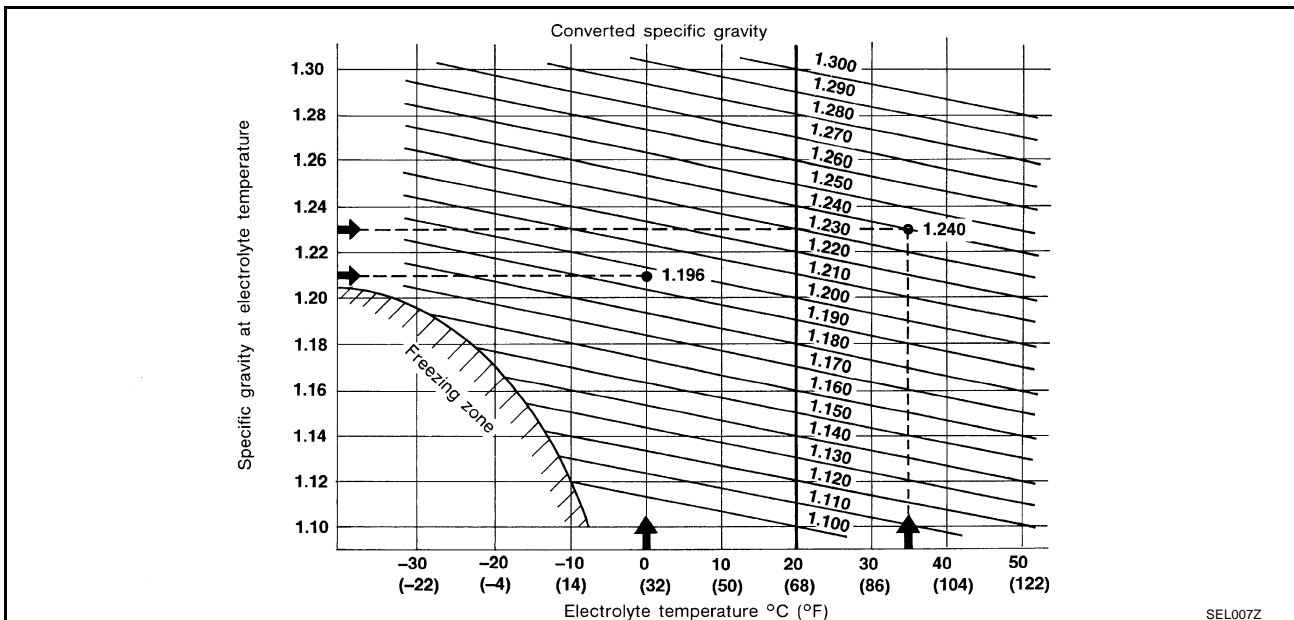
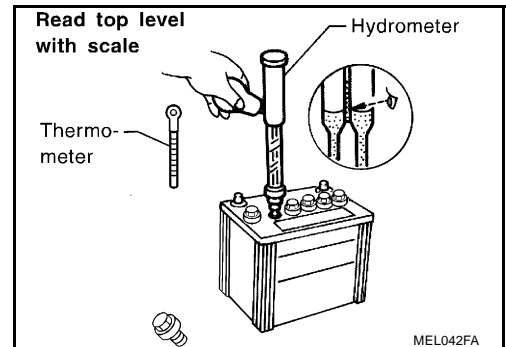


SPECIFIC GRAVITY CHECK

1. Read hydrometer and thermometer indications at eye level.
2. 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.

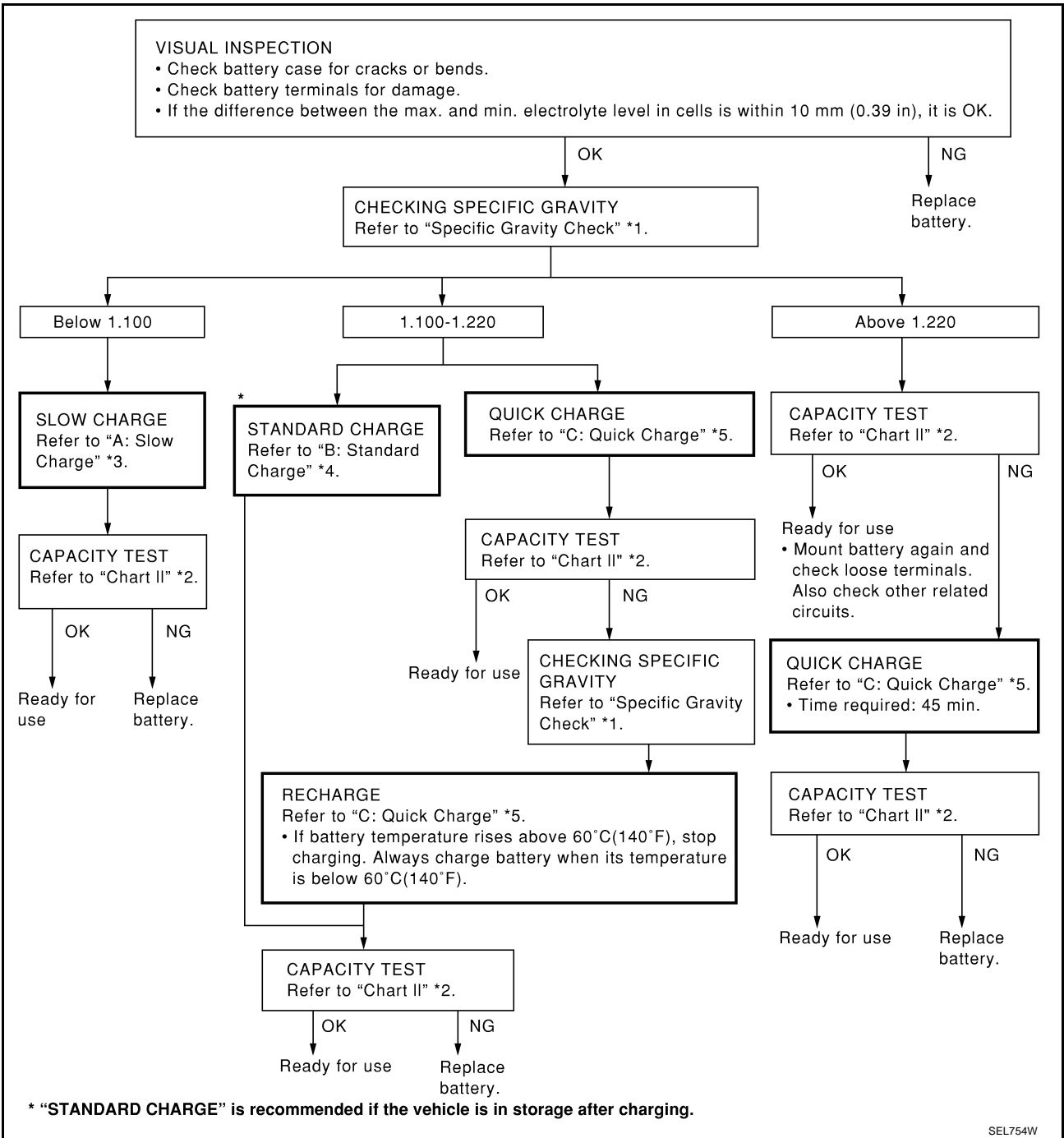


BATTERY

Battery Test and Charging Chart CHART I

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SEL754W

*1. [SC-4](#)

*2. [SC-6](#)

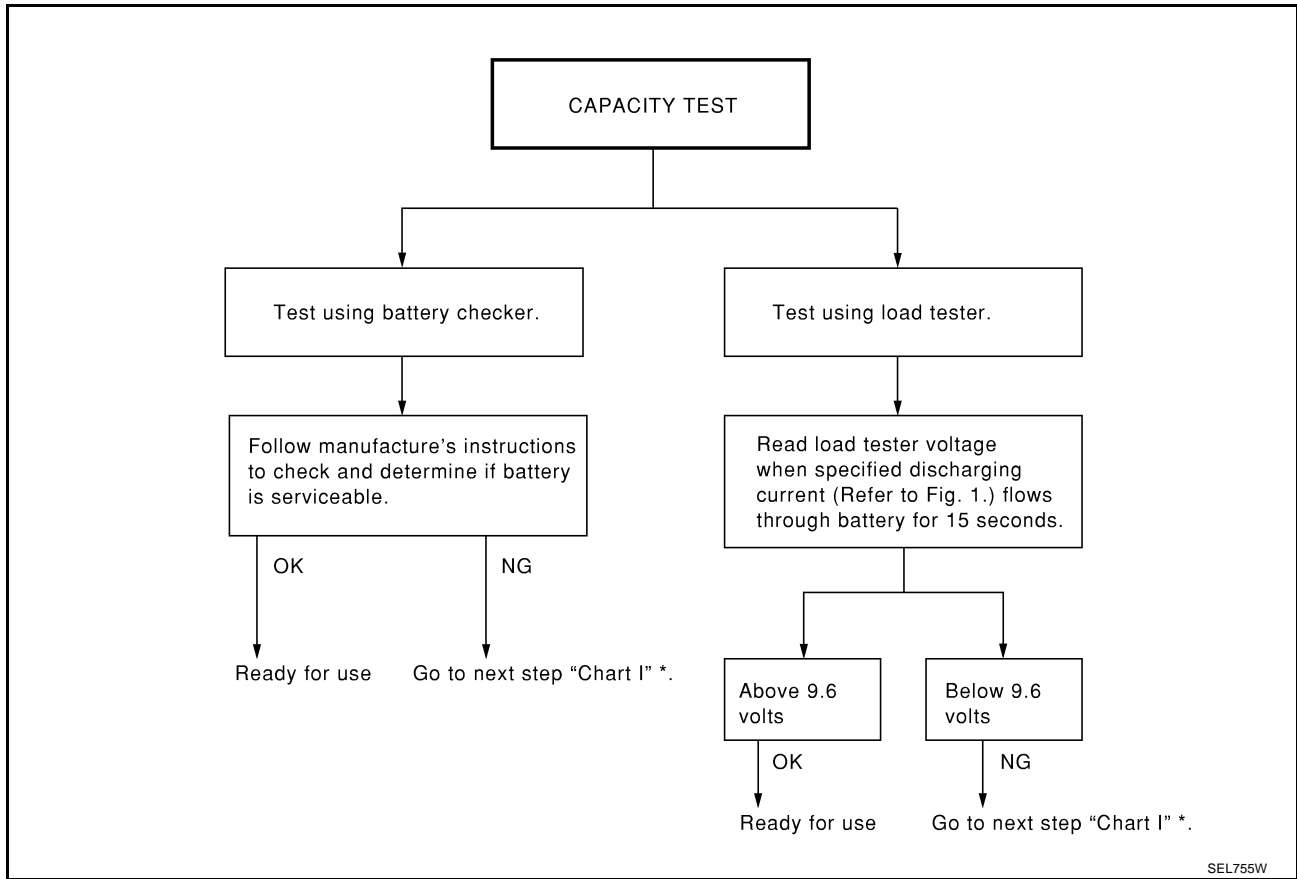
*3. [SC-7](#)

*4. [SC-8](#)

*5. [SC-10](#)

BATTERY

CHART II



*. [SC-5](#)

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

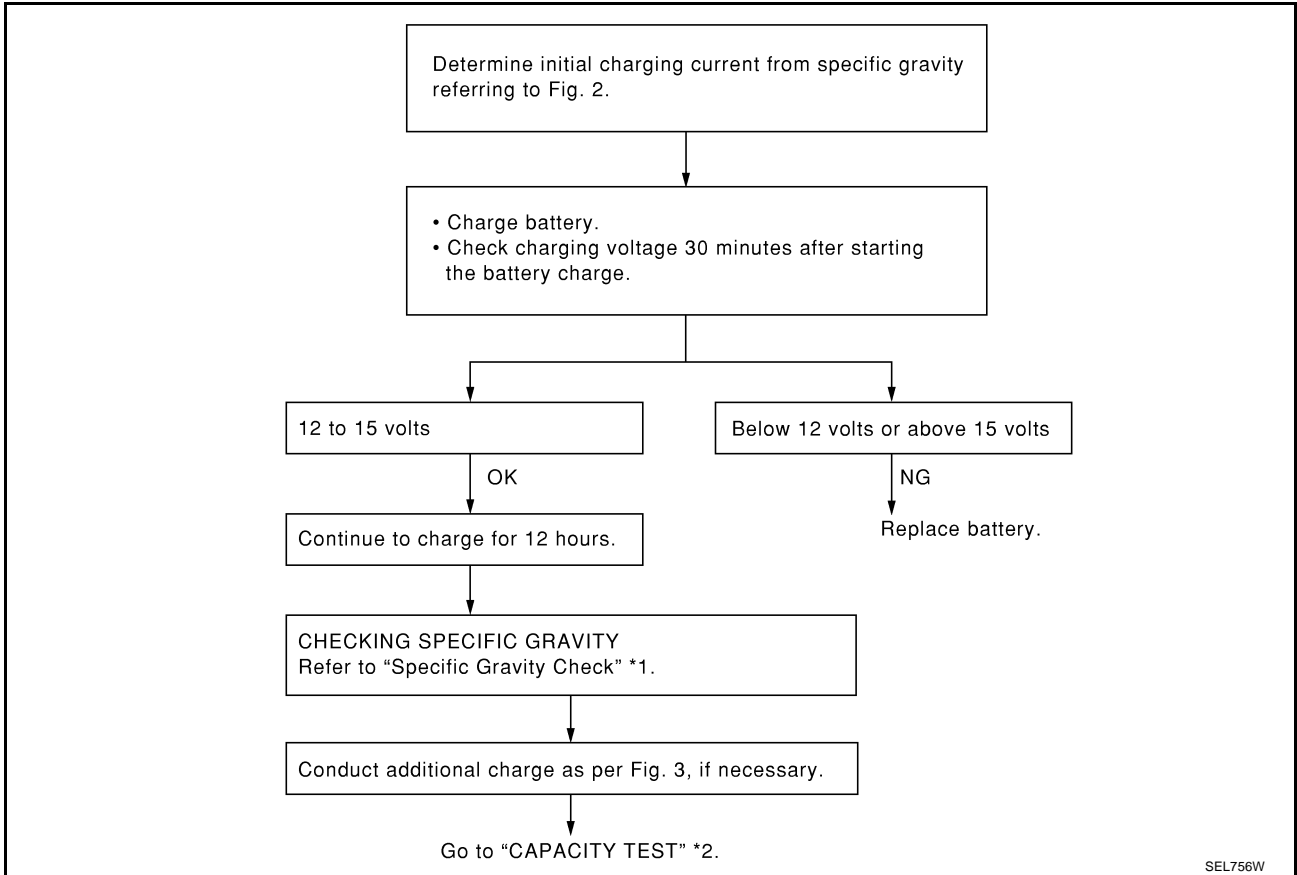
Fig. 1 Discharging Current (Load Tester)

Type	Current (A)
28B19R(L)	90
34B19R(L)	99
46B24R(L)	135
55B24R(L)	135
50D23R(L)	150
55D23R(L)	180
65D26R(L)	195
80D26R(L)	195
75D31R(L)	210
063 [YUASA type code]	210
95D31R(L)	240
115D31R(L)	240
025 [YUASA type code]	240
065 [YUASA type code]	255
027 [YUASA type code]	285
075 [YUASA type code]	300
110D26R(L)	300
95E41R(L)	300
067 [YUASA type code]	325

BATTERY

Type	Current (A)
130E41R(L)	330
096 [YUASA type code]	375
096 [YUASA type code]	375
010S [YUASA type code]	360

A: SLOW CHARGE



*1. [SC-4](#)

*2. [SC-6](#)

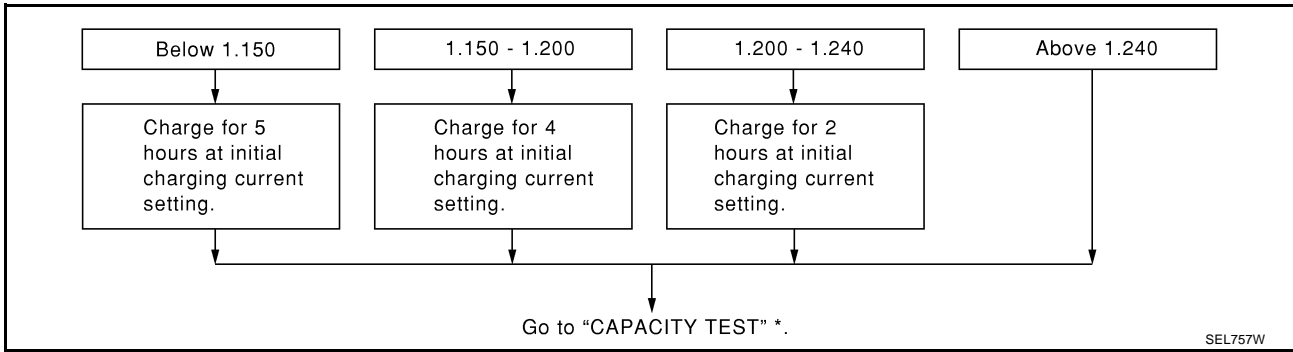
Fig. 2 Initial Charging Current Setting (Slow Charge)

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)	80D26R(L)	063 [YUASA type code]	067 [YUASA type code]	096 [YUASA type code]	75D31R(L)	95D31R(L)	115D31R(L)	110D26R(L)	95E41R(L)	065 [YUASA type code]	075 [YUASA type code]	096L [YUASA type code]	010S [YUASA type code]	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)				11.0 (A)		14. .0 (A)				

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

BATTERY

Fig. 3 Additional Charge (Slow Charge)

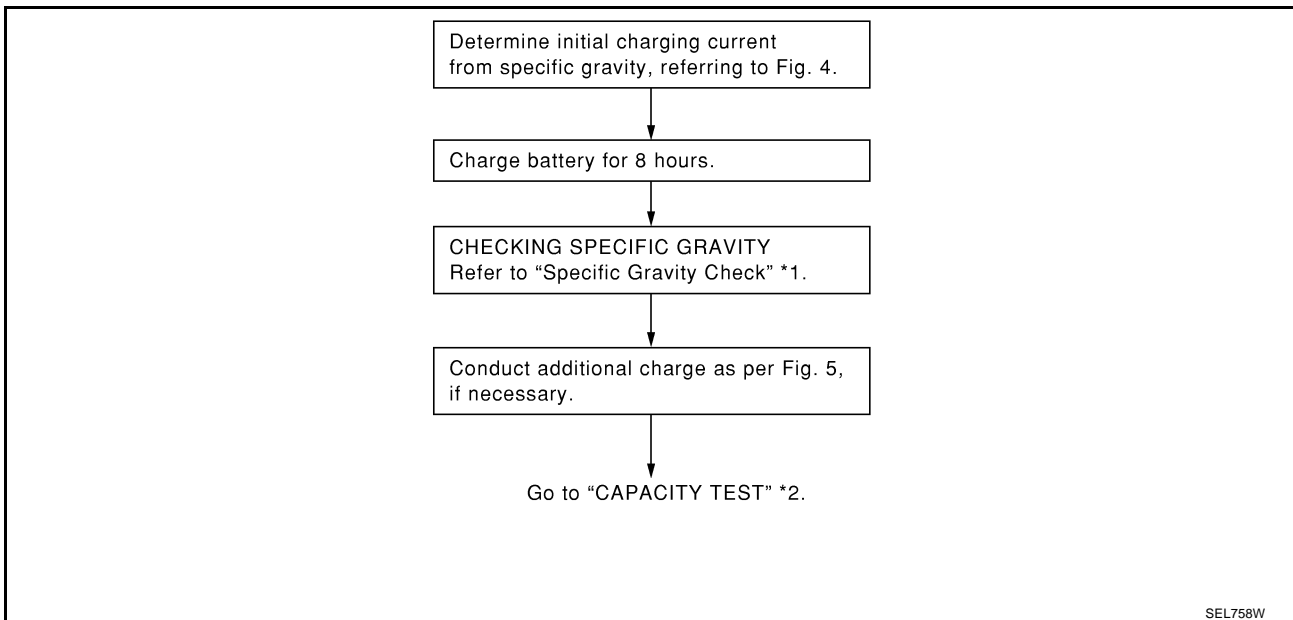


*. [SC-6](#)

CAUTION:

- Set charging current to value specified 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. Do not turn on charger first, as this may cause a spark.
- If battery temperature rises above 60°C (140°F), stop charging. Always charge battery when its temperature is below 60°C (140°F).

B: STANDARD CHARGE



*1. [SC-4](#)

*2. [SC-6](#)

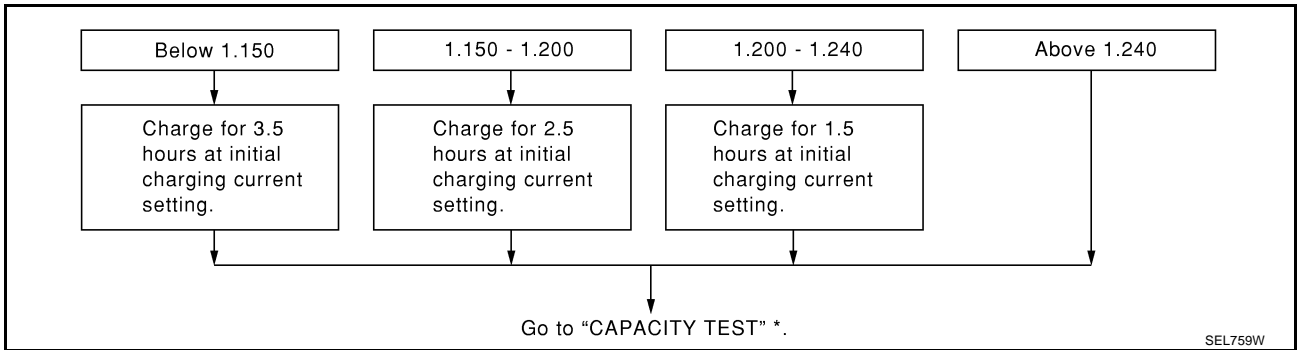
BATTERY

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)	80D26R(L)	063 [YUASA type code]	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)	10.0 (A)	11.0 (A)	12.0 (A)	13.0 (A)	14.0 (A)	15.0 (A)	16.0 (A)	17.0 (A)	18.0 (A)	19.0 (A)	20.0 (A)	21.0 (A)
1.130 - 1.160	3.0 (A)	4.0 (A)	5.0 (A)	6.0 (A)	7.0 (A)	8.0 (A)	9.0 (A)	10.0 (A)	11.0 (A)	12.0 (A)	13.0 (A)	14.0 (A)	15.0 (A)	16.0 (A)	17.0 (A)	18.0 (A)	19.0 (A)	20.0 (A)
1.160 - 1.190	2.0 (A)	3.0 (A)	4.0 (A)	5.0 (A)	6.0 (A)	7.0 (A)	8.0 (A)	9.0 (A)	10.0 (A)	11.0 (A)	12.0 (A)	13.0 (A)	14.0 (A)	15.0 (A)	16.0 (A)	17.0 (A)	18.0 (A)	19.0 (A)
1.190 - 1.220	2.0 (A)	2.0 (A)	3.0 (A)	4.0 (A)	5.0 (A)	6.0 (A)	7.0 (A)	8.0 (A)	9.0 (A)	10.0 (A)	11.0 (A)	12.0 (A)	13.0 (A)	14.0 (A)	15.0 (A)	16.0 (A)	17.0 (A)	18.0 (A)

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

Fig. 5 Additional Charge (Standard Charge)



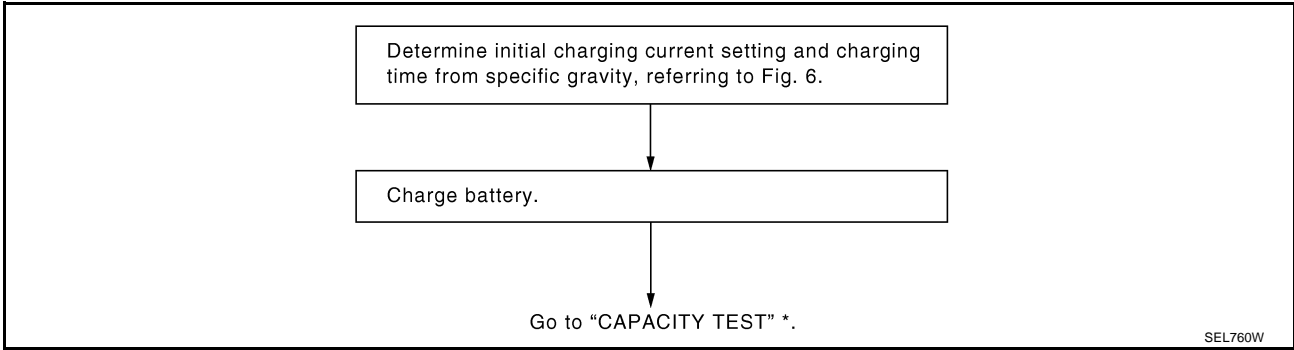
*. [SC-6](#)

CAUTION:

- Do not use standard charge method on a battery whose specific gravity is less than 1.100.
- Set charging current to value specified 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. Do not turn on charger first, as this may cause a spark.
- If battery temperature rises above 60°C (140°F), stop charging. Always charge battery when its temperature is below 60°C (140°F).

BATTERY

C: QUICK CHARGE



*. SC-6

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)	80D26R(L)	025 [YUASA type code]	027 [YUASA type code]	063 [YUASA type code]	067 [YUASA type code]	096 [YUASA type code]	065 [YUASA type code]	075 [YUASA type code]	096L [YUASA type code]	010S [YUASA type code]	75D31R(L)	95D31R(L)	115D31R(L)	110D26R(L)	95E41R(L)	130E41R(L)	
CUR-RENT [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 hours																							
	Above 1.220	0.75 hours (45 min.)																							

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

CAUTION:

- Do not use quick charge method on a battery whose specific gravity is less than 1.100.
- Set initial charging current to value specified 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. Do not 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 60°C (140°F), stop charging. Always charge battery when its temperature is below 60°C (140°F).
- Do not 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


EKS004/9

Observe the following to ensure proper servicing.


CAUTION:

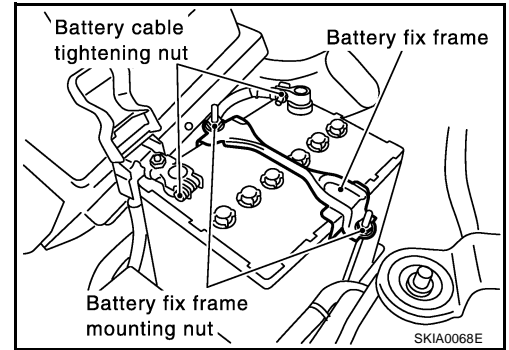
- When removing, remove negative terminal first. But for installation, install positive terminal first.
- Tighten parts to the specified torque shown below.

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)



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CHARGING SYSTEM

PFP:00011

System Description

EKS0041A

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 to alternator terminal 4 (S) through:

- 120A (QR and YD engine models) or 100A (QG engine models) fusible link (letter A, located in the fuse and fusible link box), and
- 10A fuse (No. 35, 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 4 (S) detecting the input voltage. The charging circuit is protected by the 120A (QR and YD engine models) or 100A (QG engine models) link.

The alternator is grounded to the engine block.

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

- 10A fuse [No. 30, located in the fuse block (J/B)]
- to combination meter terminal 26 (LHD models) or terminal 13 (RHD models) for the charge warning lamp.

Ground is supplied With power and ground supplied

- to terminal 17 (LHD models) or terminal 4 (RHD models) of the combination meter
- through terminal 3 (L) of the alternator.

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 fault is indicated.

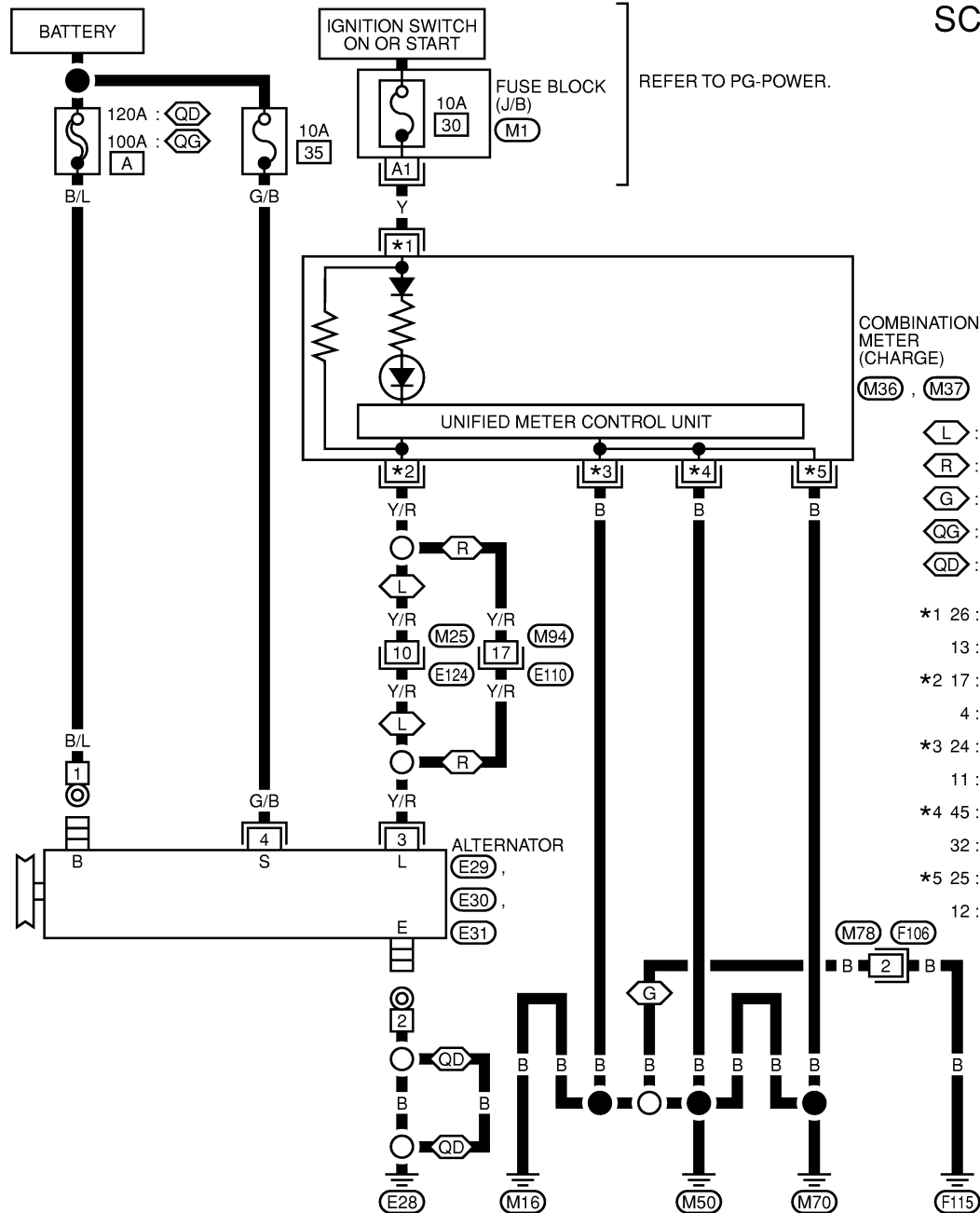
CHARGING SYSTEM

Wiring Diagram — CHARGE —

EKS0041B

SC-CHARGE-01

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COMBINATION
METER
(CHARGE)

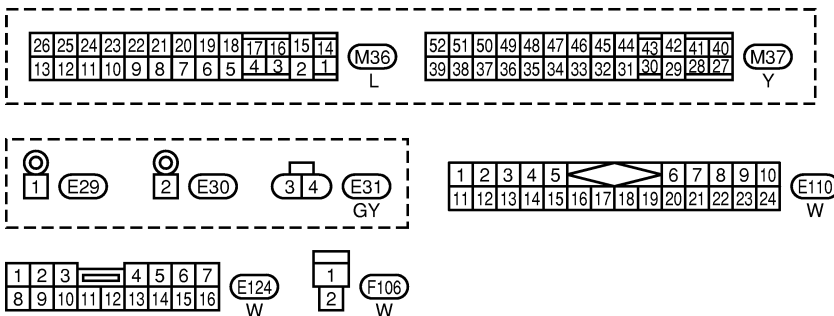
(M36), (M37)

- (L) : LHD MODELS
- (R) : RHD MODELS
- (G) : WITH GASOLINE ENGINE
- (QG) : WITH QG ENGINE
- (QD) : WITH QR ENGINE OR DIESEL ENGINE

- *1 26 : (L)
13 : (R)
- *2 17 : (L)
4 : (R)
- *3 24 : (L)
11 : (R)
- *4 45 : (L)
32 : (R)
- *5 25 : (L)
12 : (R)

REFER TO THE FOLLOWING.

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



MKWA0479E

CHARGING SYSTEM

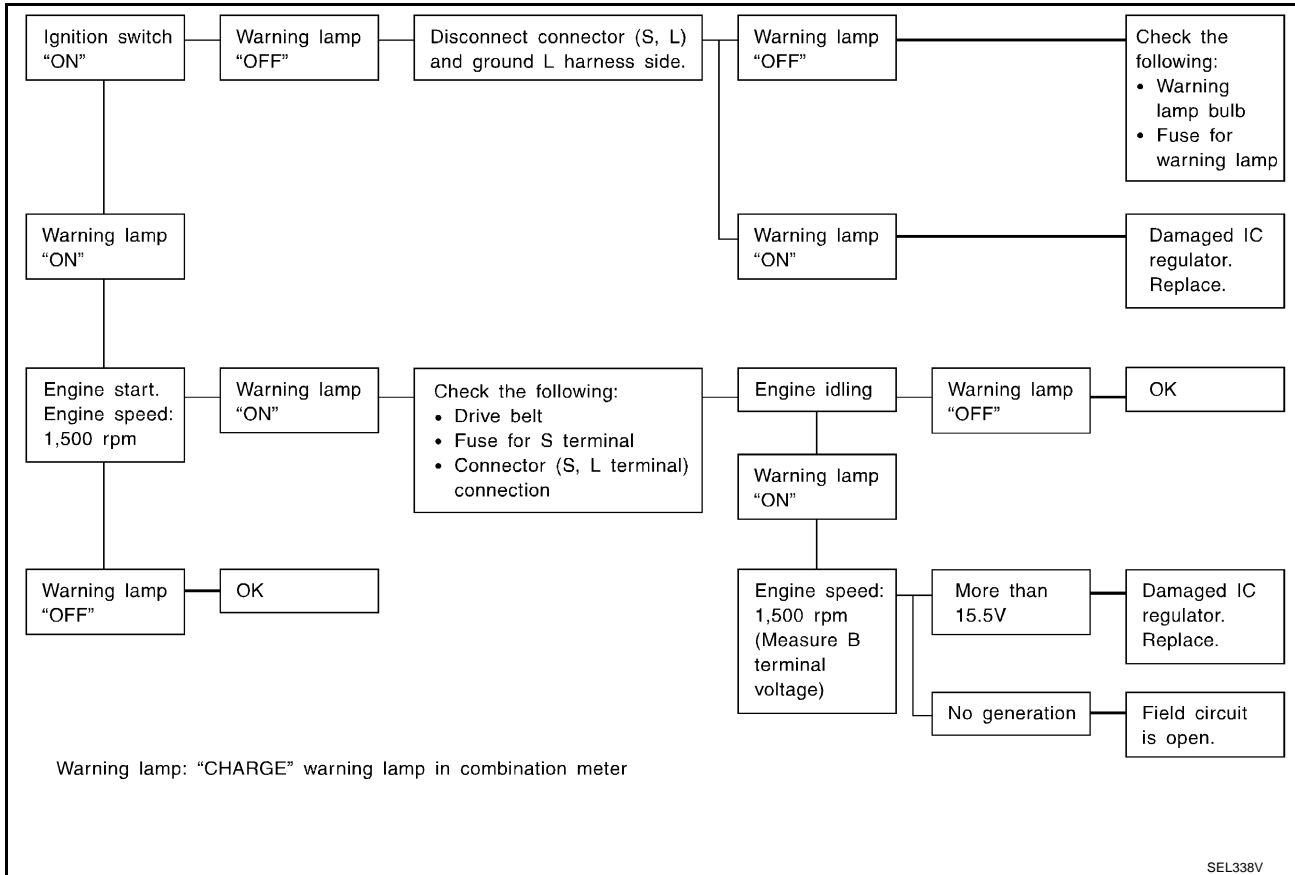
Trouble Diagnoses

EKS0041C

Before conducting 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.)
- When field circuit is open, check condition of rotor coil, rotor slip ring and brush. If necessary, replace faulty 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:

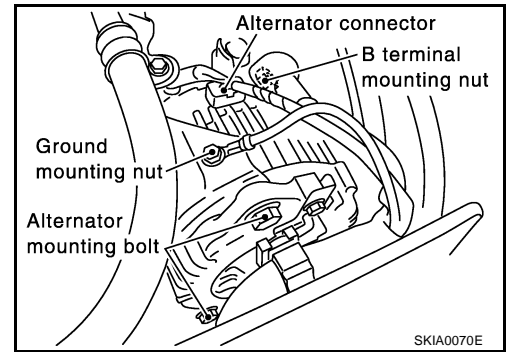
- Excessive voltage is produced.
- No voltage is produced.

CHARGING SYSTEM

Removal and Installation

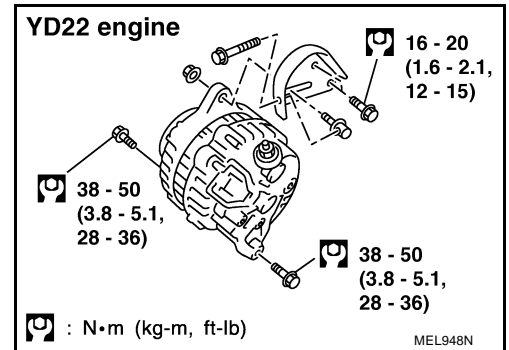
REMOVAL (QG AND QR ENGINE MODELS)

1. Disconnect battery ground cable.
2. Remove alternator drive belt. Refer to [EM-15, "Checking Drive Belts"](#) (QG), [EM-120, "Checking Drive Belts"](#) (QR) in EM section.
3. Disconnect alternator harness mounting bolt, ground mounting bolt, alternator connector and B terminal mounting nut.
4. Remove alternator mounting bolts.
5. Disconnect alternator assembly from vehicle upper side.



REMOVAL (YD ENGINE MODELS)

1. Remove alternator harness.
2. Loosen alternator upper nut and lower bolt.
3. Loosen drive belt. Refer to [EM-221, "Checking Drive Belts"](#) in EM section.
4. Remove alternator bracket bolts (two).
5. Remove alternator upper nut and lower bolt.
6. Remove alternator.



INSTALLATION

Install in the reverse order of removal, taking care of the following point.

- Install alternator, and check tension of belt. Refer to [EM-120, "Tension Adjustment"](#) (QR engine models) or [EM-221, "Tension Adjustment"](#) (YD engine models) in "ENGINE MECHANICAL (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, 70 - 97 in-lb)
Ground bolt:	: 2.3 - 2.6 N·m (0.23 - 0.27 kg-m, 20 - 23 in-lb)
Alternator mounting bolt (lower side):	: 59 - 69 N·m (6.1 - 7.1 kg-m, 45 - 51 ft-lb)

QG and YD Engine Models

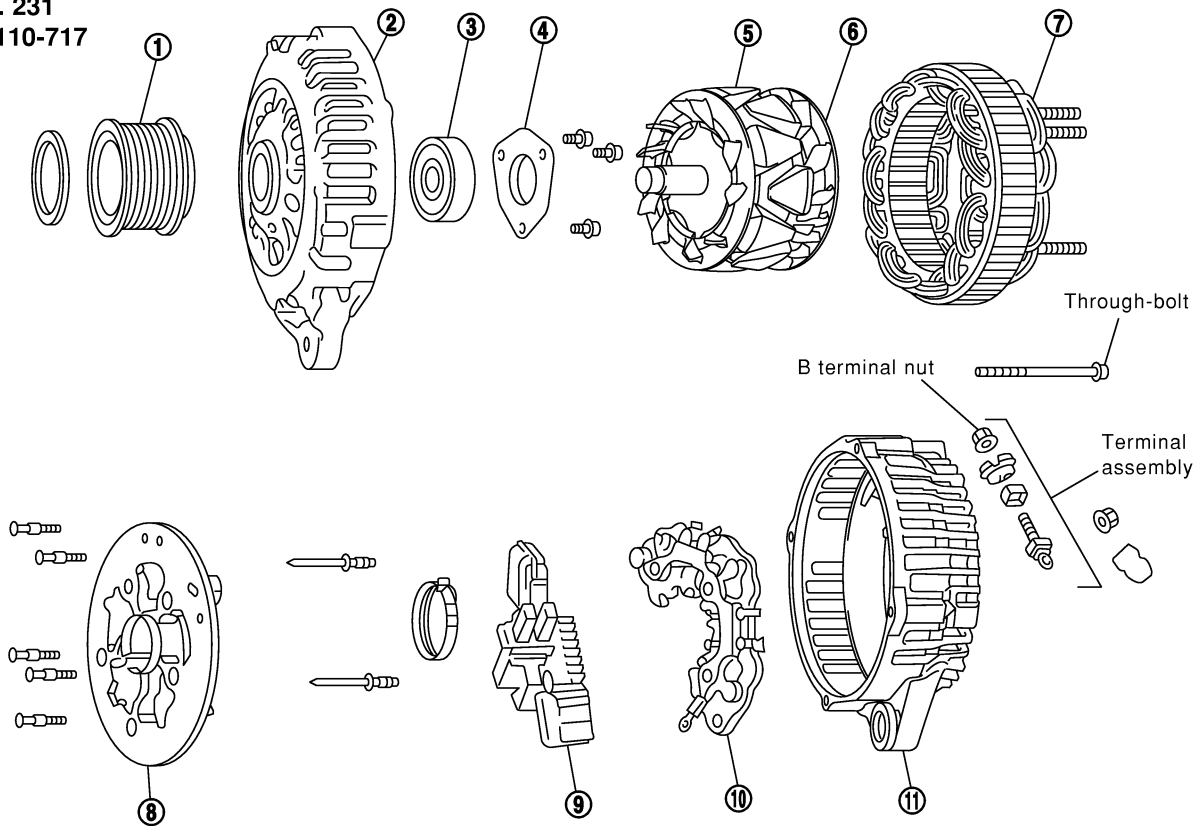
B terminal nut:	: 7.9 - 11.0 N·m (0.8 - 1.11 kg-m, 70 - 97 in-lb)
Ground bolt:	: 2.3 - 2.6 N·m (0.23 - 0.27 kg-m, 20 - 23 in-lb)
Alternator mounting bolt (lower side):	: 38 - 50 N·m (3.8 - 5.1 kg-m, 28 - 36 ft-lb)

CHARGING SYSTEM

Disassembly and Assembly

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SEC. 231
LR1110-717

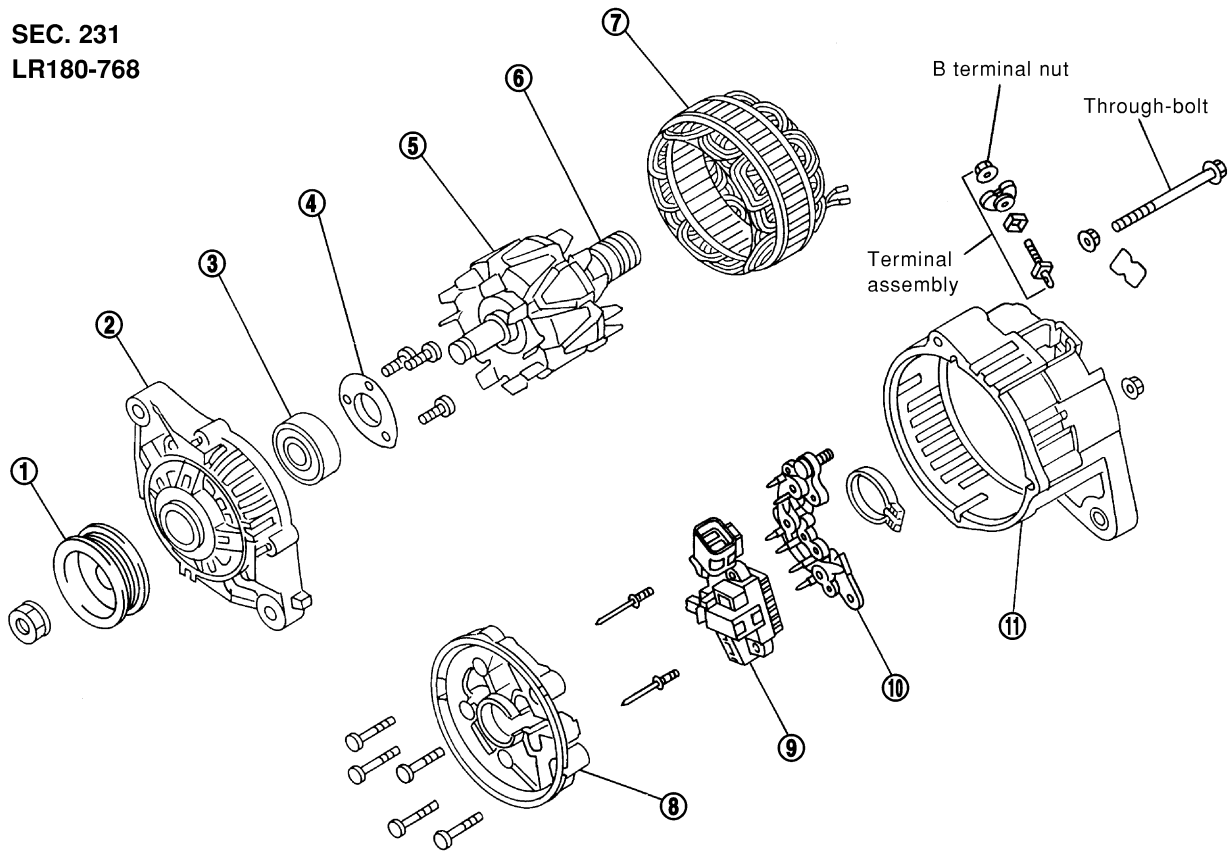


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- | | | |
|--------------------|----------------|----------------------------------|
| 1. Pulley | 2. Front cover | 3. Front bearing |
| 4. Retainer | 5. Rotor | 6. Slip ring |
| 7. Stator | 8. Fan guide | 9. IC voltage regulator assembly |
| 10. Diode assembly | 11. Rear cover | |

CHARGING SYSTEM

SEC. 231
LR180-768



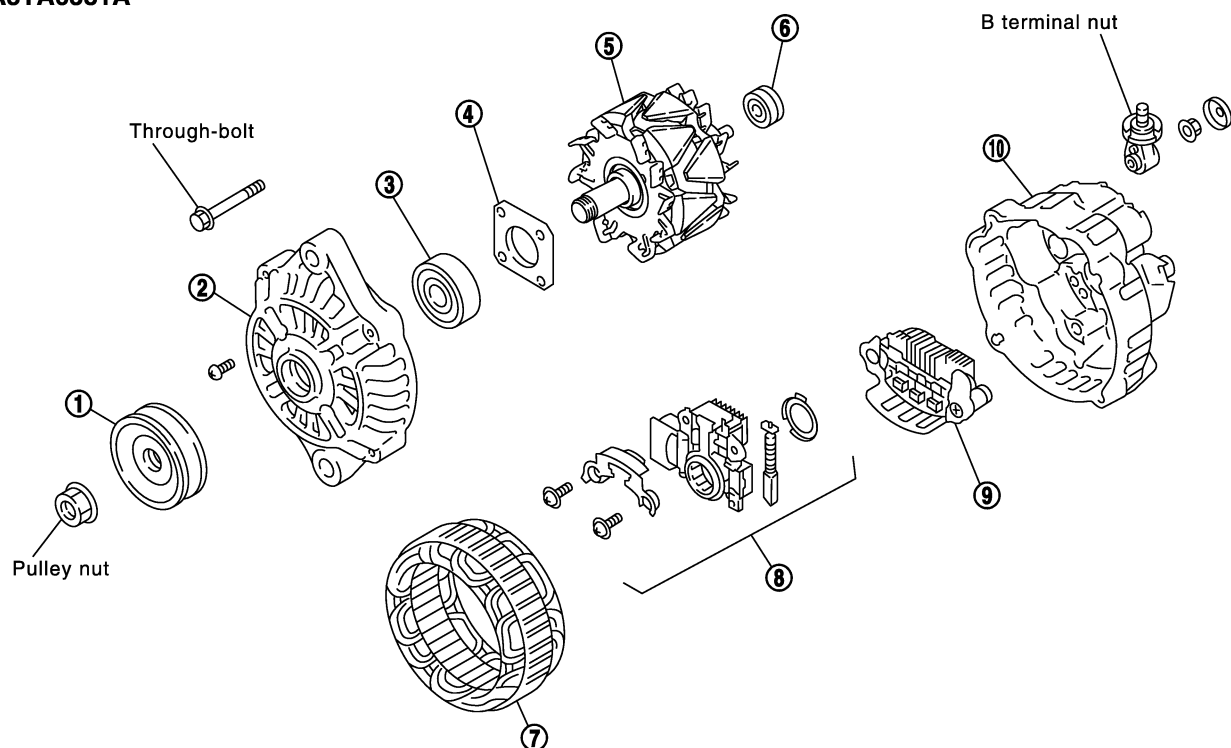
- | | | |
|--------------------|----------------|----------------------------------|
| 1. Pulley | 2. Front cover | 3. Front bearing |
| 4. Retainer | 5. Rotor | 6. Slip ring |
| 7. Stator | 8. Fan guide | 9. IC voltage regulator assembly |
| 10. Diode assembly | 11. Rear cover | |

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CHARGING SYSTEM


SEC. 231 A3TA6581A



- | | | |
|----------------|----------------------------------|-------------------|
| 1. Pulley | 2. Front cover | 3. Front bearing |
| 4. Retainer | 5. Rotor | 6. Rear bearing |
| 7. Stator | 8. IC voltage regulator assembly | 9. Diode assembly |
| 10. Rear cover | | |

Through-bolt & nut:

LR1110-717, LR180-768

 : 3.14 - 3.9 N·m (0.320 - 0.398 kg-m, 27.8 - 34.5 in-lb)

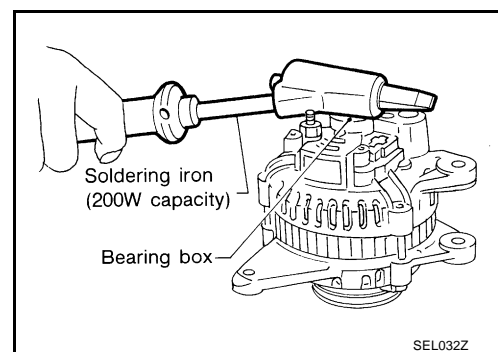
A3TA6581A

 : 3.5 - 5.3 N·m (0.36 - 0.54 kg-m, 31.0 - 46.9 in-lb)

Pulley mounting nut:

 : 99 - 137 N·m (10.1 - 14.0 kg-m, 73.0 - 101.1 ft-lb)

Disassembly REAR COVER



CHARGING SYSTEM

CAUTION:

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 200W soldering iron. Do not use a heat gun, as it can damage diode assembly.

REAR BEARING

CAUTION:

- Do not reuse rear bearing after removal. Replace with a new one.
- Do not lubricate rear bearing outer race.

Inspection

ROTOR CHECK

1. Resistance test

Resistance

: Refer to SDS.[SC-42](#),
"Alternator"

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

2. Insulator test

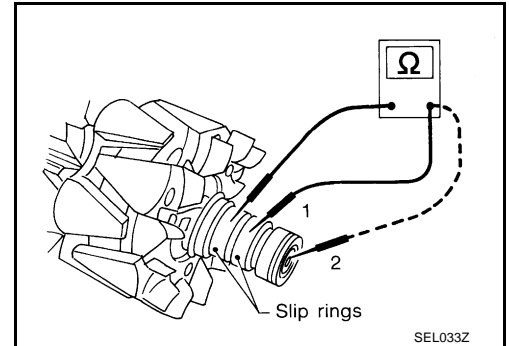
- Continuity exists... Replace rotor.

3. Check slip ring for wear.

**Slip ring minimum
outer diameter**

: Refer to SDS.[SC-42](#),
"Alternator"

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



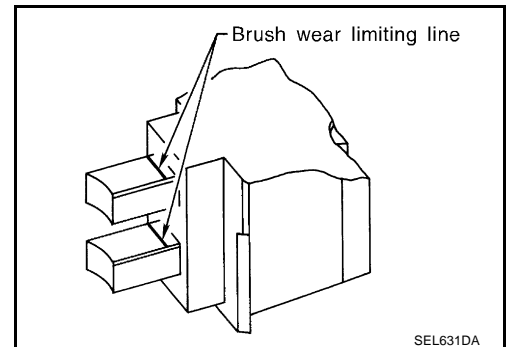
BRUSH CHECK

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.



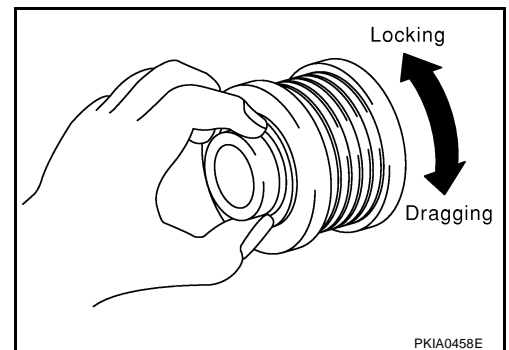
PULLEY CHECK (WITH CLUTCH TYPE)

1. Check for locking (Outer ring is turned counterclockwise when viewed from the rear).

- If it rotates in both directions... Replace pulley.

2. Check for dragging (Outer ring is turned clockwise when viewed from the rear).

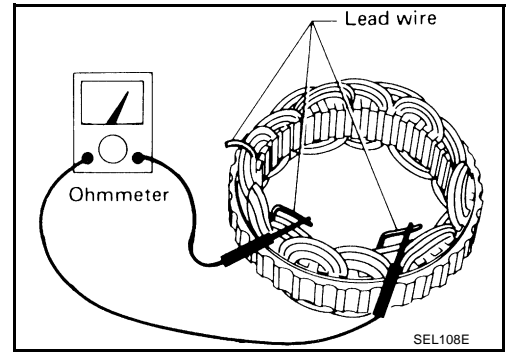
- If it locks or unusual resistance is felt... Replace pulley.



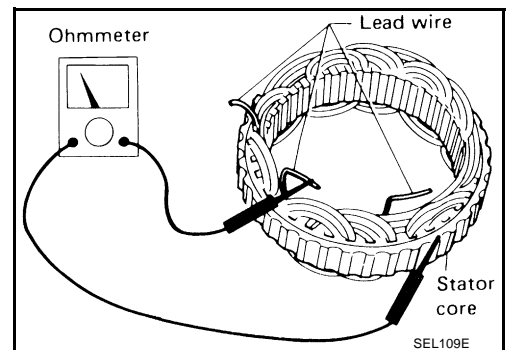
CHARGING SYSTEM

STATOR CHECK

1. Continuity test
 - No continuity... Replace stator.



2. Ground test
 - Continuity exists... Replace stator.



EKS0041H

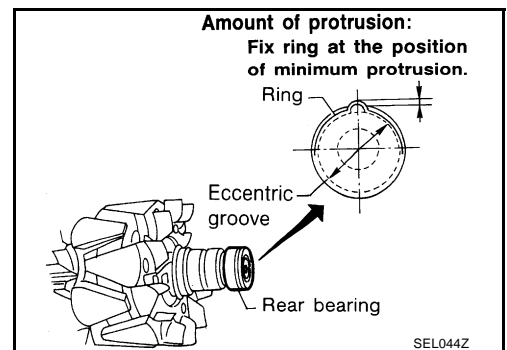
Assembly

RING FITTING IN REAR BEARING

- Fix ring into groove in rear bearing so that it is as close to the adjacent area as possible.

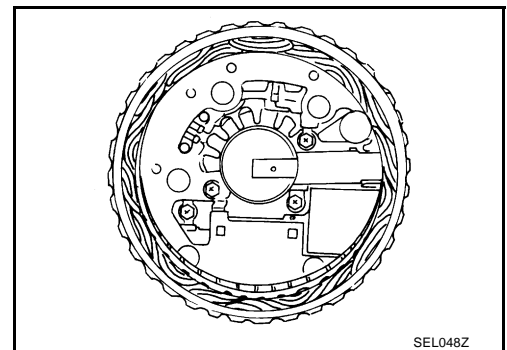
CAUTION:

Do not reuse rear bearing after removal.



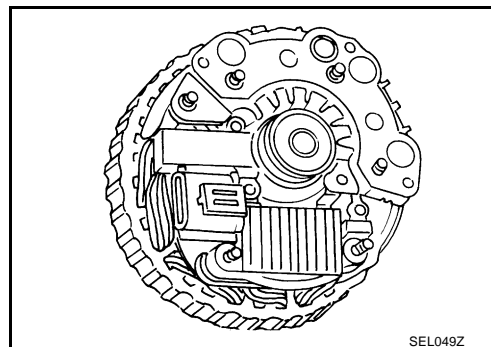
REAR COVER INSTALLATION

1. Fit brush assembly, diode assembly, regulator assembly and stator.



CHARGING SYSTEM

2. Push brushes up with fingers and install them to rotor.
Take care not to damage slip ring sliding surface.



A

B

C

D

E

F

G

H

I

J

SC

L

M

STARTING SYSTEM

PFP:00011

System Description M/T MODELS

EKS004II

Power is supplied at all times

- through 40A fusible link (letter J, located in the fuse and fusible link box)
- to ignition switch terminal 1.

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

- from ignition switch terminal 5
- to smart entrance control unit terminal 58
- from smart entrance control unit terminal 59
- 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 40A fusible link (letter J, located in the fuse and fusible link box)
- to ignition switch terminal 1.

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

- through 10A fuse [No. 20 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
- to smart entrance control unit terminal 59
- from smart entrance control unit terminal 58
- through the park neutral position switch terminals 1 and 2, and
- through body grounds, F27.

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

- from park/neutral position relay 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.

CVT MODELS

Power is supplied at all times

- through 40A fusible link (letter J, located in the fuse and fusible link box)
- to ignition switch terminal 1.

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

- through 10A fuse [No. 20 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
- to smart entrance control unit terminal 59
- from smart entrance control unit terminal 58
- through the park neutral position switch terminals 1 and 2, and
- through body grounds, F27.

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

- from park/neutral position relay terminal 5
- to starter motor harness connector terminal 1.

STARTING SYSTEM

The starter motor plunger closes and provides a closed circuit between the battery and starter motor. The starter motor is grounded to the engine block. With power and ground supplied, cranking occurs and the engine starts.

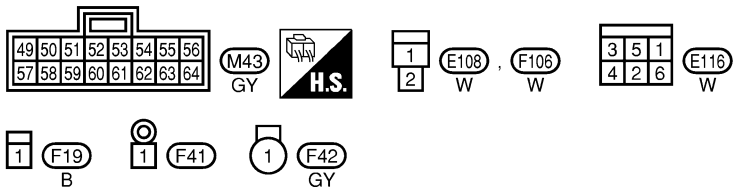
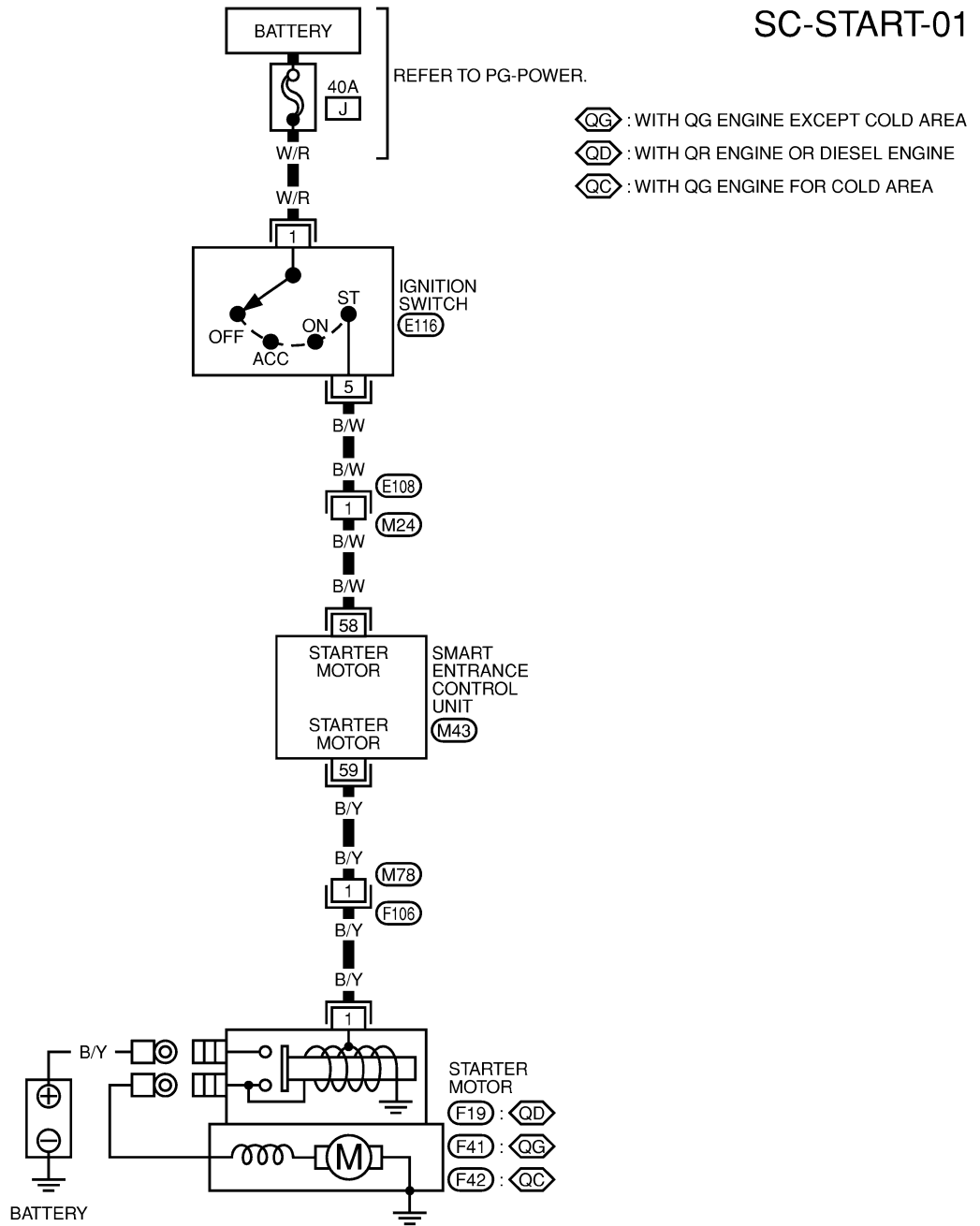
- A
- B
- C
- D
- E
- F
- G
- H
- I
- J
- SC
- L
- M

STARTING SYSTEM

Wiring Diagram — START —/M/T Models

EKS004IJ

SC-START-01

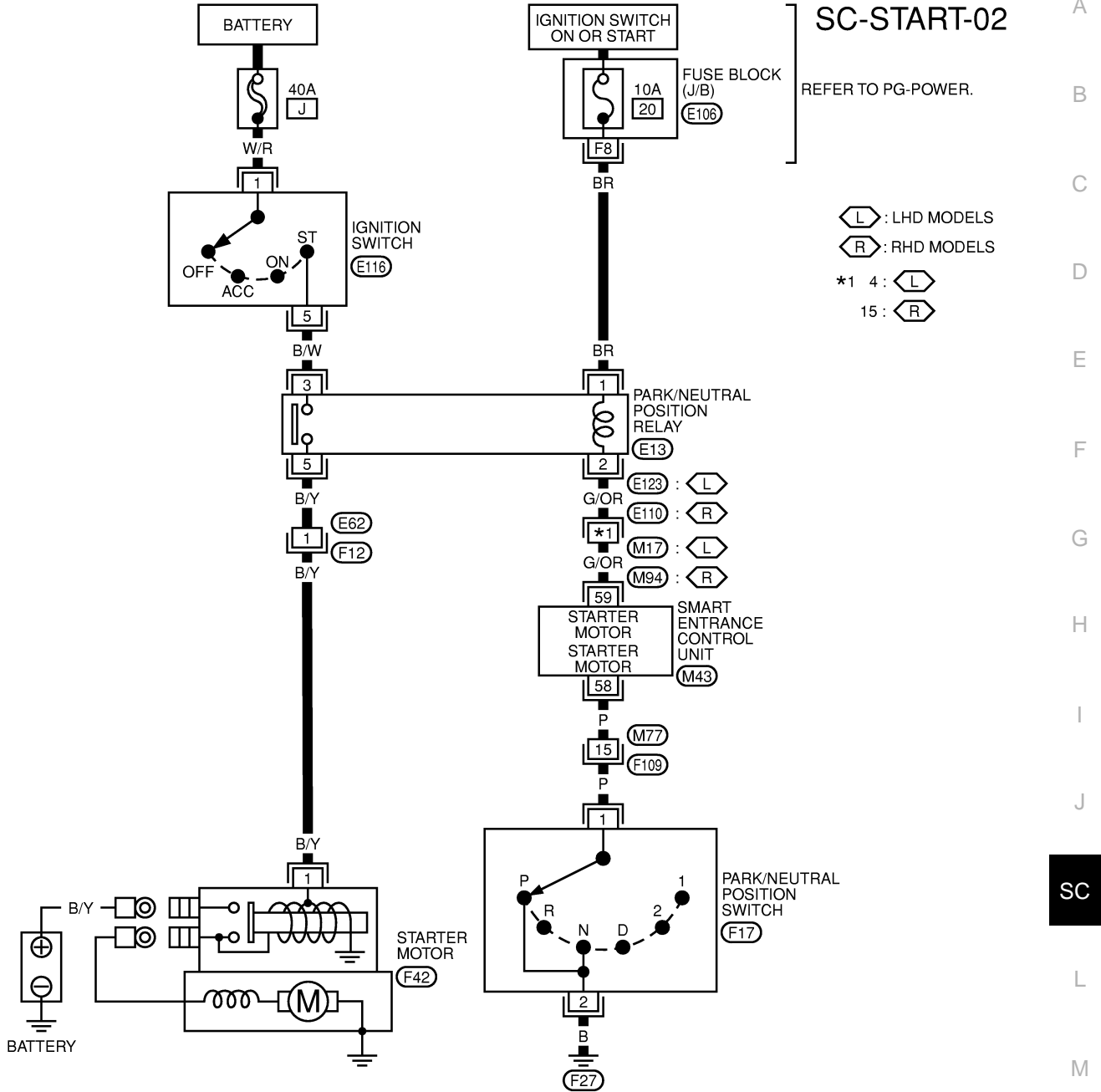


MKWA0039E

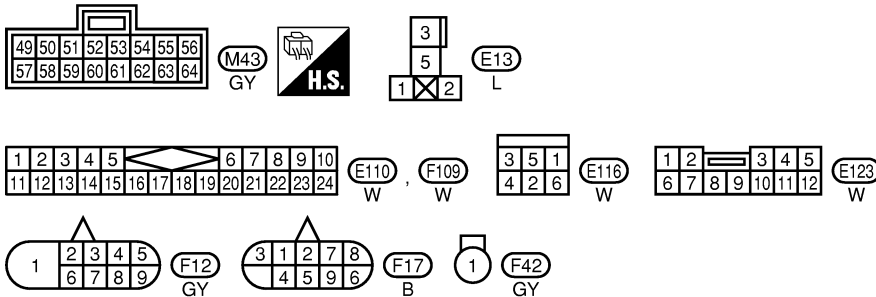
STARTING SYSTEM

Wiring Diagram — START —/A/T Models

EKS004IK



SC



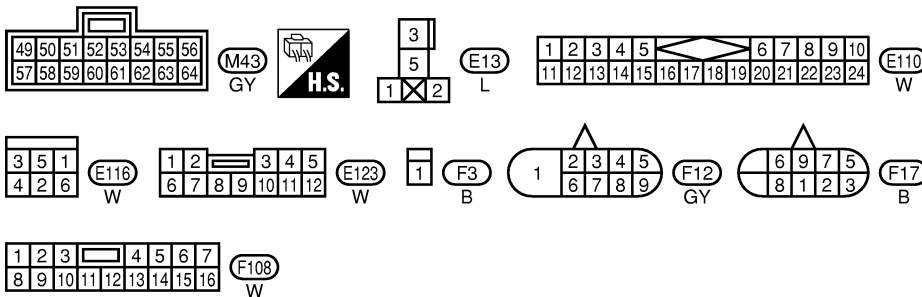
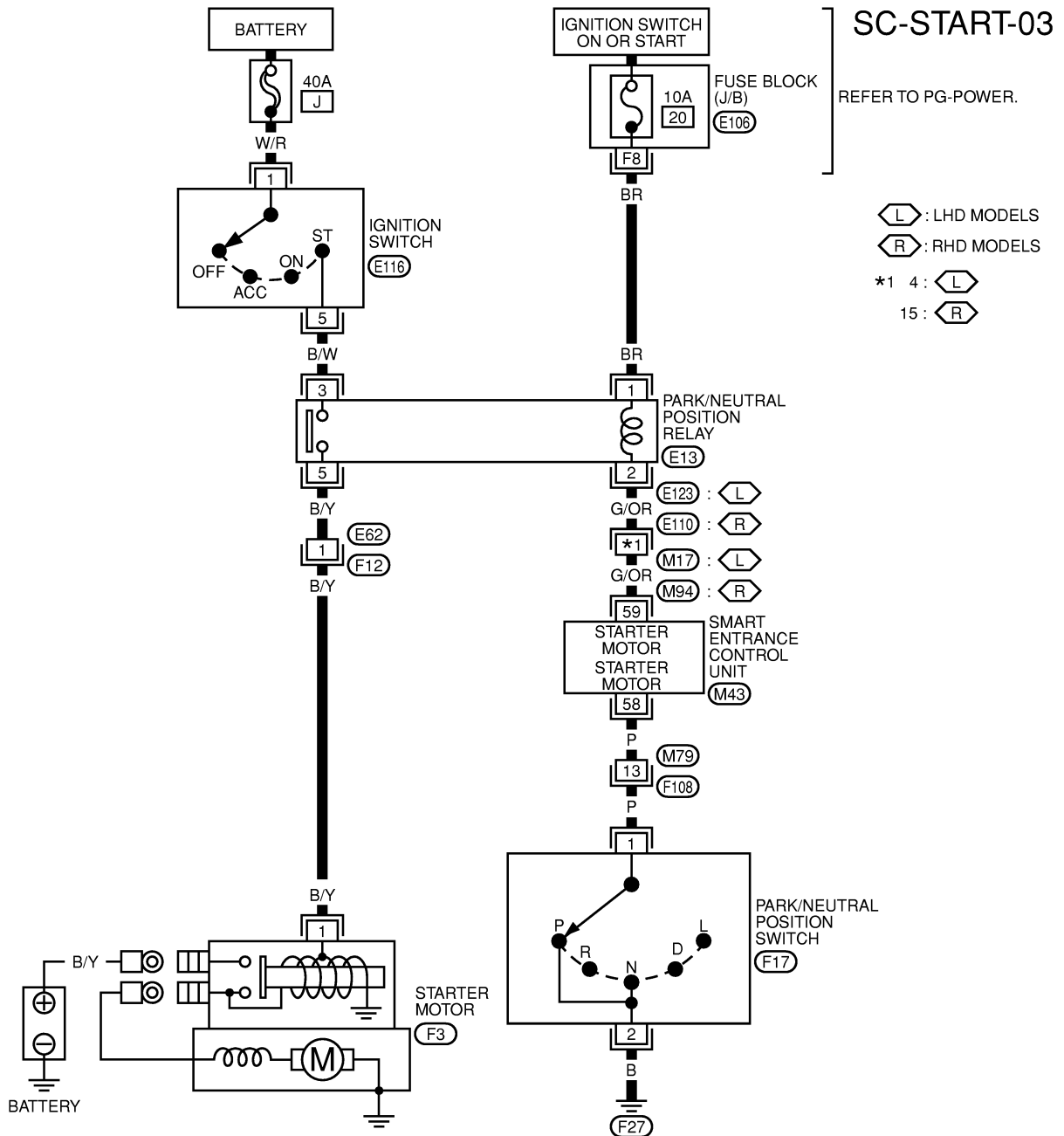
REFER TO THE FOLLOWING.
(E106) -FUSE BLOCK-JUNCTION BOX (J/B)

MKWA0477E

STARTING SYSTEM

Wiring Diagram — START —/CVT Models

EKS004IL



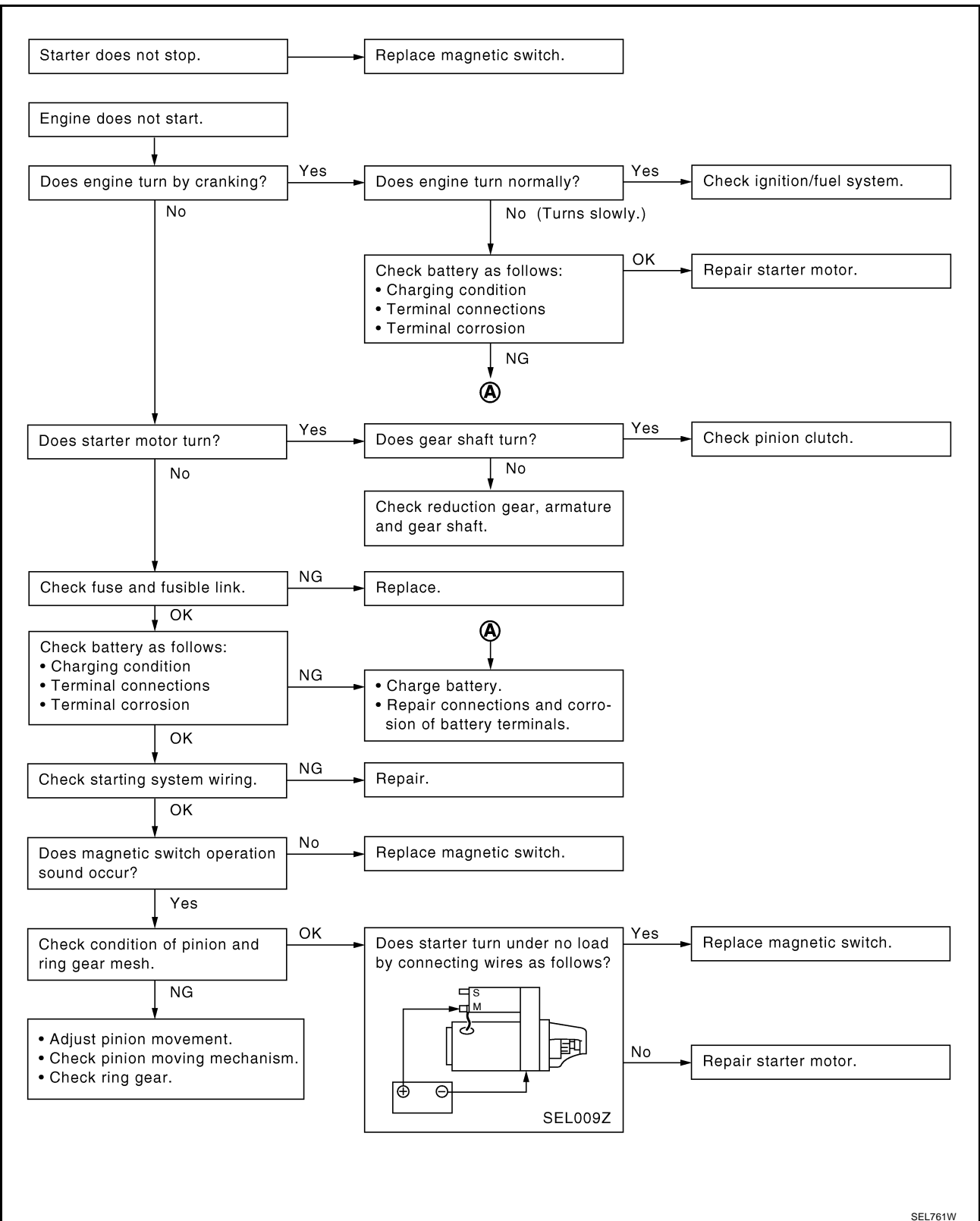
REFER TO THE FOLLOWING.
(E106) -FUSE BLOCK JUNCTION
 BOX (J/B)

STARTING SYSTEM

Trouble Diagnoses

EKS0041M

If any abnormality is found, immediately disconnect battery negative terminal.



SEL761W

STARTING SYSTEM

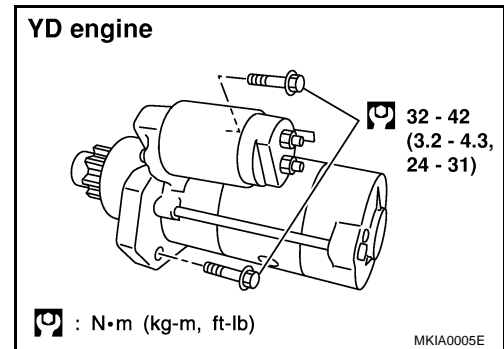
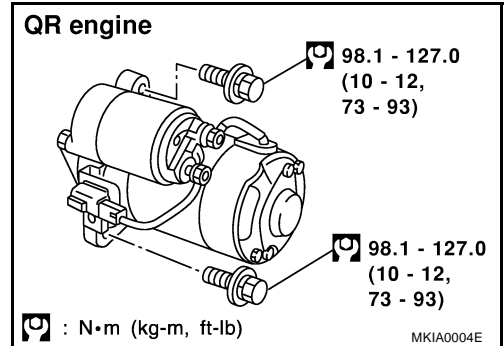
EKS004LZ

Removal and Installation

REMOVAL

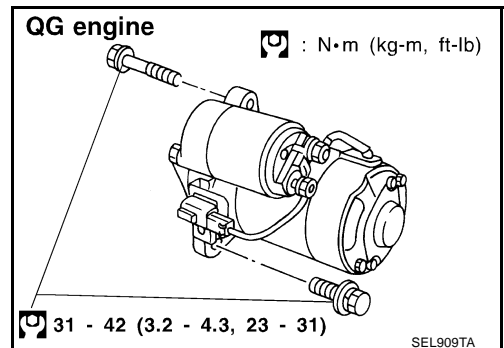
QR and YD Engine Models

1. Disconnect negative battery cable.
2. Remove air duct. Refer to [EM-122, "AIR CLEANER AND AIR DUCT"](#) (QR engine models) or [EM-223, "AIR CLEANER AND AIR DUCT"](#) (YD engine models).
3. Disconnect S terminal and B terminal from starter motor.
4. Remove starter motor mounting bolts.
5. Remove starter motor from upper side the vehicle.



QG Engine Models

1. Remove battery negative cable from battery.
2. Remove intake air duct. Refer to [EM-18, "AIR CLEANER AND AIR DUCT"](#).
3. Remove starter motor mounting bolts.
4. Remove battery cable from starter motor.
5. Disconnect harness connector from starter motor harness.
6. Remove intake manifold support bracket.
7. Remove starter motor from under the vehicle.



INSTALLATION

Install in the reverse order of removal.

QR Engine Models (M0T87081)

- B terminal nut:** : 9.81 - 11.8 N·m (1.0 - 1.2 kg-m, 87 - 112 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 (S114-876, S114-840)

- B terminal nut:** : 7.3 - 9.8 N·m (0.75 - 1.00 kg-m, 65 - 87 in-lb)
- Starter motor mounting bolt:** : 98.1 - 127.0 N·m (10.0 - 13.0 kg-m, 73 - 94 ft-lb)


QG Engine Models (S114-800B, 0 001 116 006, D7E 31)

- B terminal nut:** : 7.3 - 9.8 N·m (0.75 - 1.00 kg-m, 65 - 87 in-lb)
- Starter motor mounting bolt:** : 31 - 42 N·m (3.2 - 4.3 kg-m, 23 - 31 ft-lb)


STARTING SYSTEM

YD Engine Models (M8T71471)

B terminal nut:

 : 9.81 - 11.8 N·m (1.0 - 1.2 kg-m, 87 - 112 in-lb)

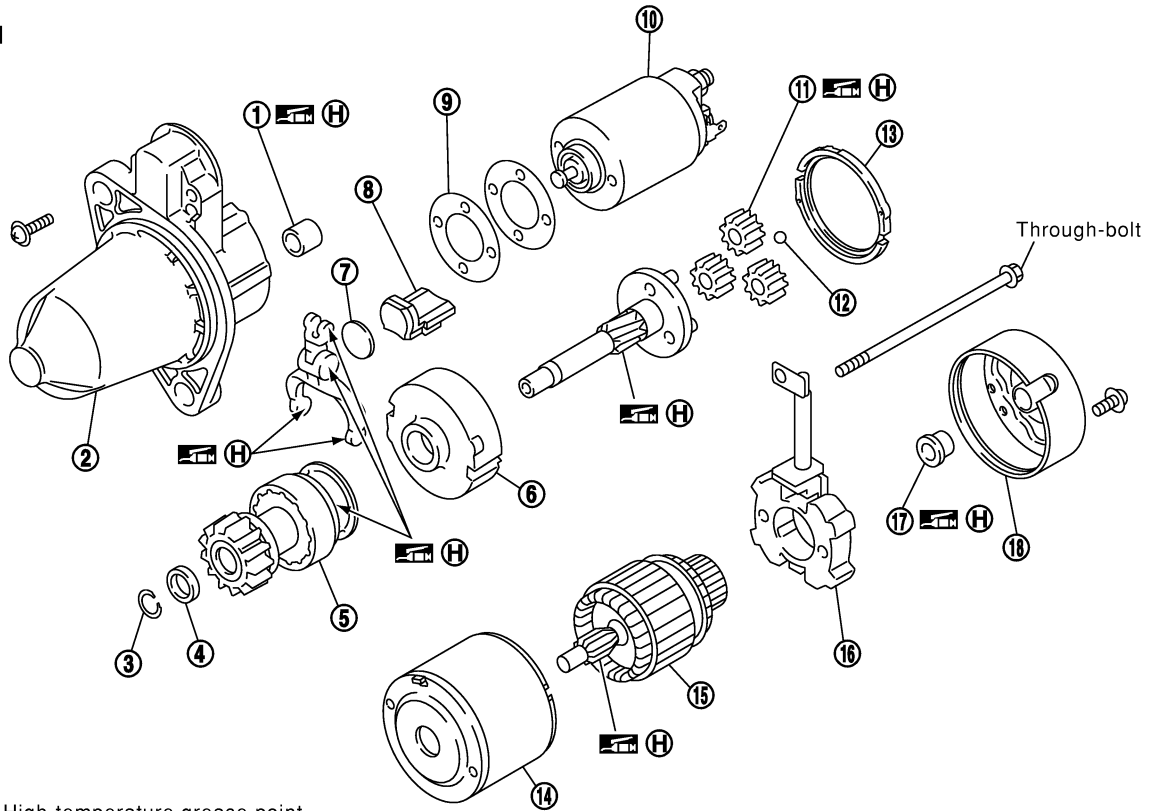
Starter motor mounting bolt:

 : 41.2 - 52.0 N·m (4.2 - 5.3 kg-m, 31 - 38 ft-lb)

Disassembly and Assembly

EKS00410

SEC. 233
M0T87081



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 |

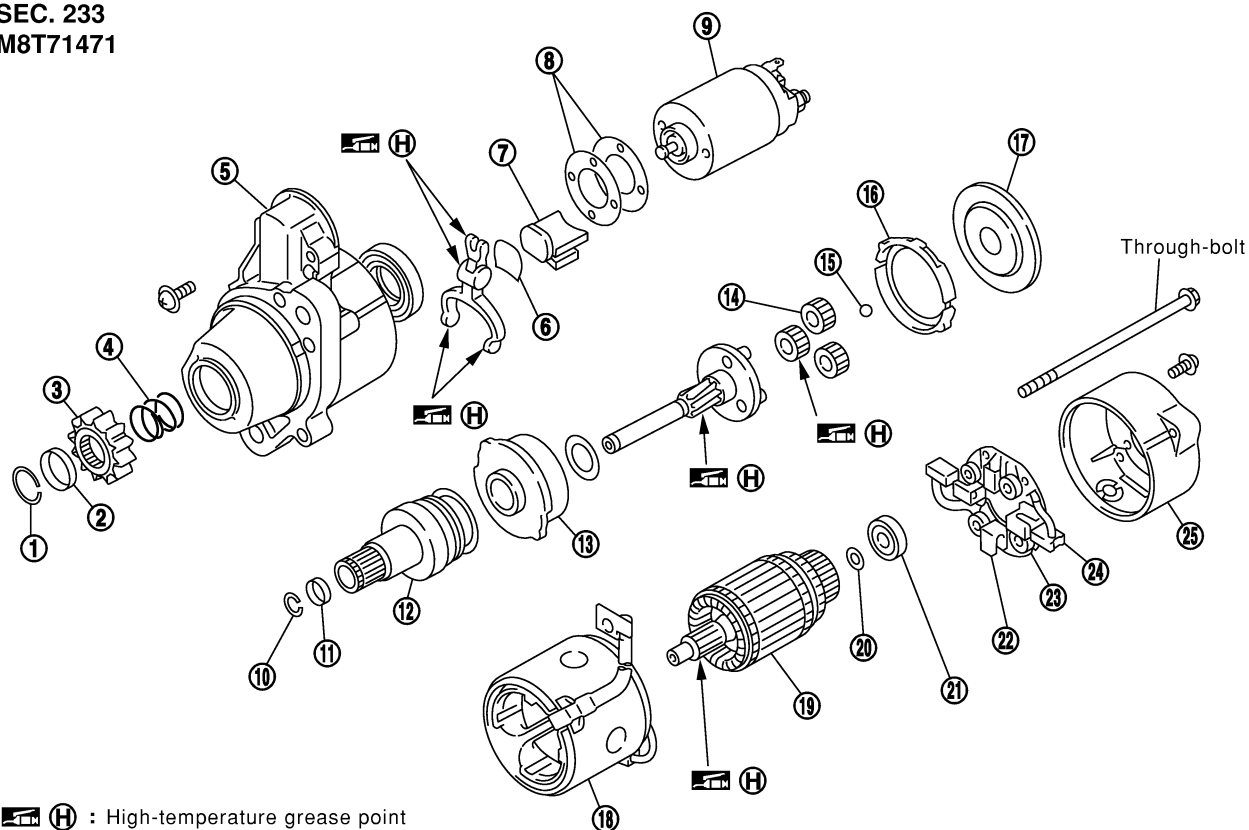
SC

L

M

STARTING SYSTEM

SEC. 233
M8T71471

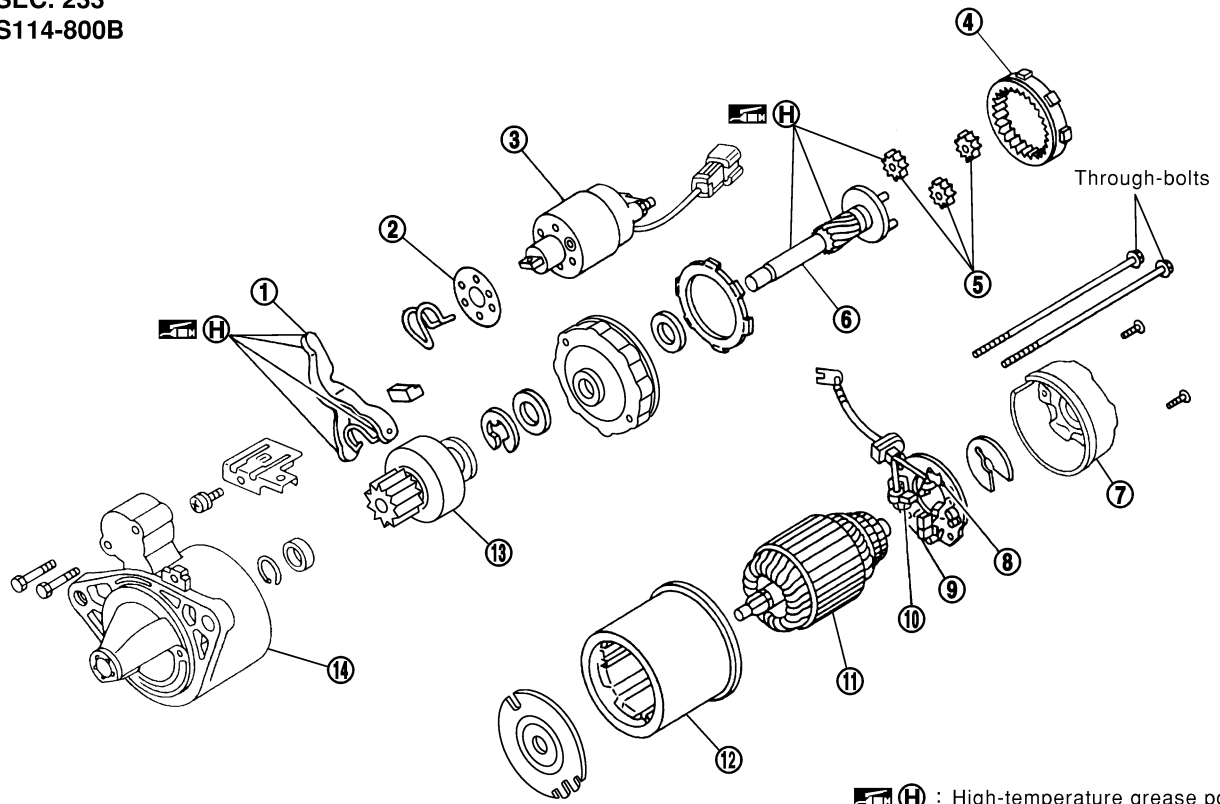


PKIA0465E

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

STARTING SYSTEM

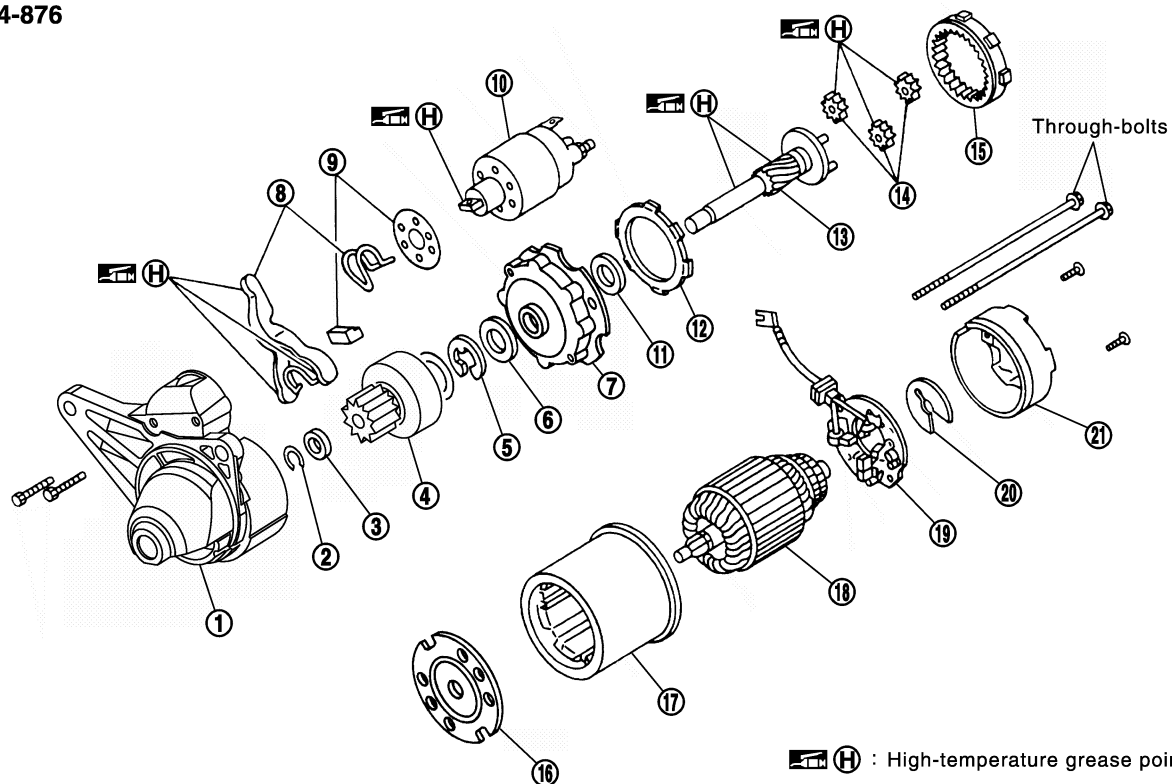
SEC. 233
S114-800B



- | | | |
|---------------------|--------------------|-----------------------------|
| 1. Shift lever | 2. Adjusting plate | 3. Magnetic switch assembly |
| 4. Internal gear | 5. Planetary gear | 6. Pinion shaft |
| 7. Rear cover | 8. Brush spring | 9. Brush (-) |
| 10. Brush (+) | 11. Armature | 12. Yoke |
| 13. Pinion assembly | 14. Gear case | |

STARTING SYSTEM

SEC. 233
S114-876

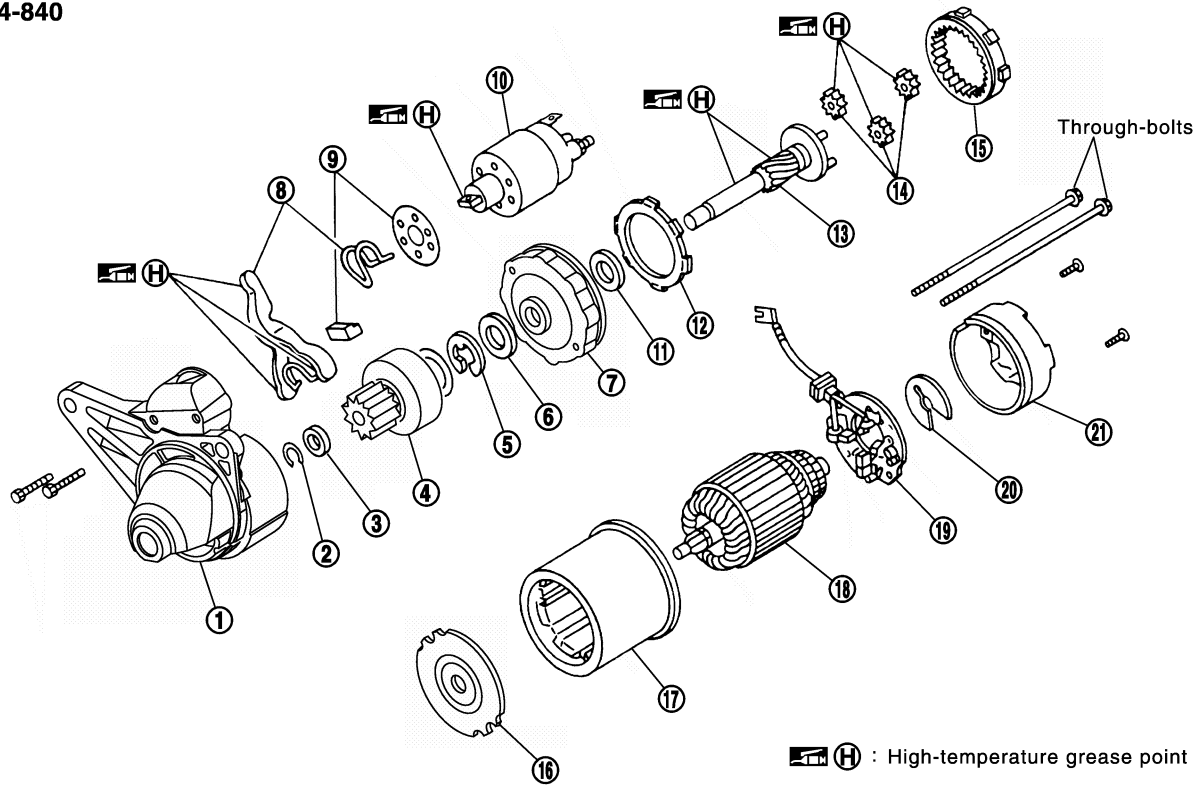


MK1A0007E

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

STARTING SYSTEM

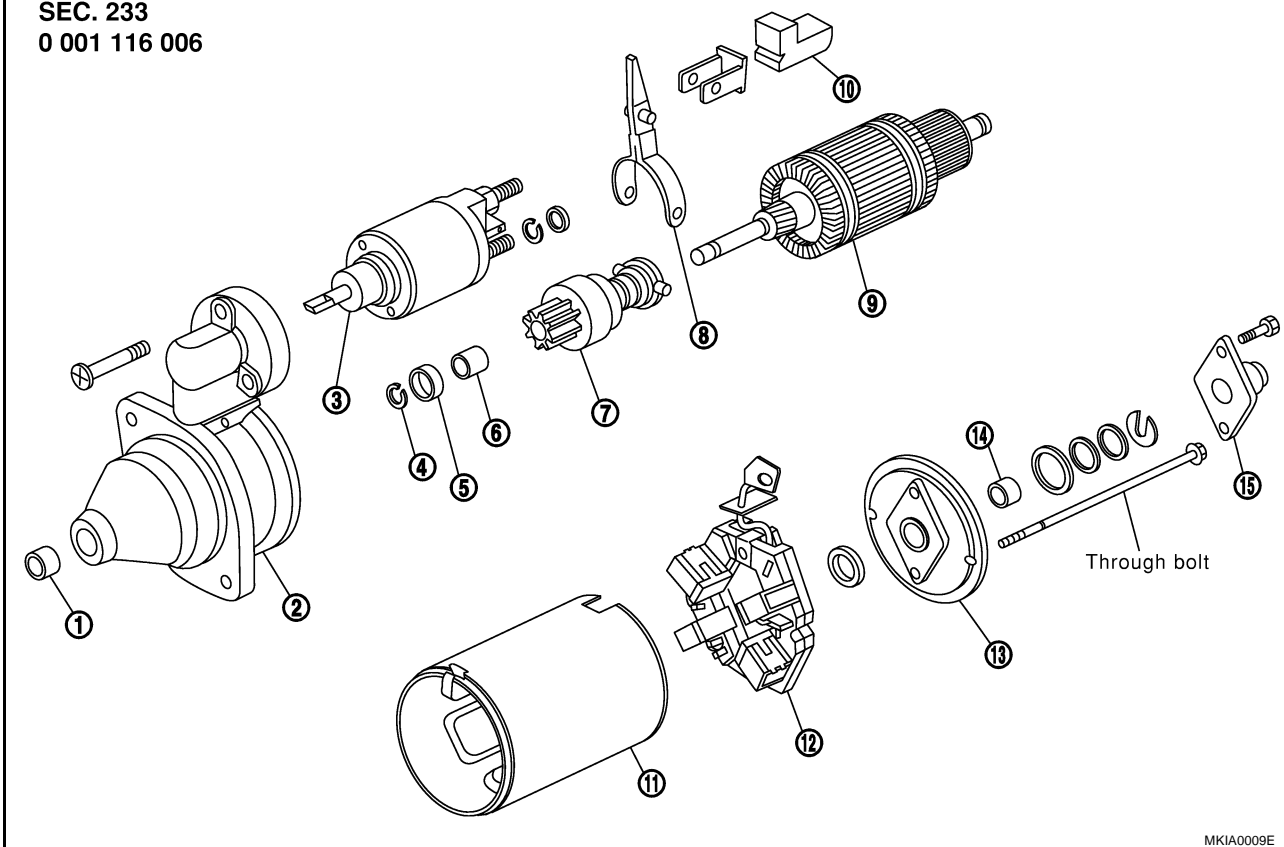
SEC. 233 S114-840



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

STARTING SYSTEM

SEC. 233
0 001 116 006

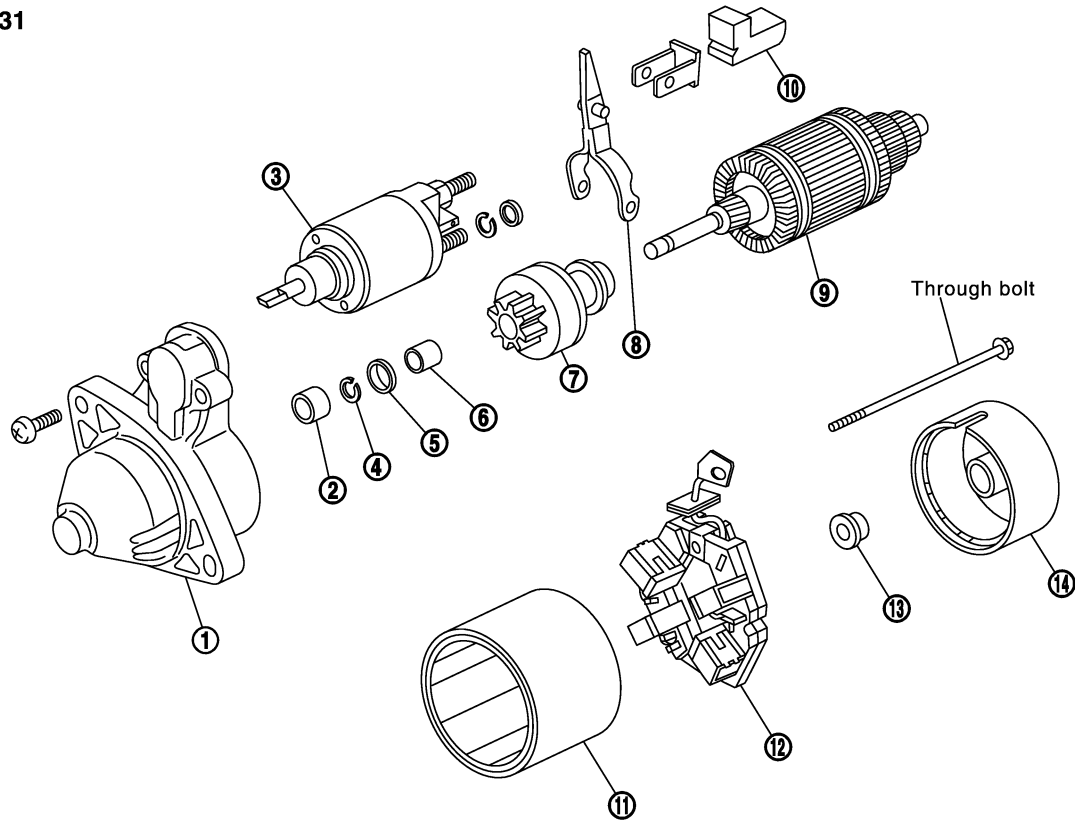


MK1A0009E

- | | | |
|--------------------|-------------------|-----------------------------|
| 1. Bushing | 2. Gear case | 3. Magnetic switch assembly |
| 4. Stopper clip | 5. Pinion stopper | 6. Bushing |
| 7. Pinion assembly | 8. Shift lever | 9. Armature |
| 10. Packing | 11. Yoke | 12. Brush holder |
| 13. Rear cover | 14. Bushing | 15. Cap |

STARTING SYSTEM

SEC. 233 D7E 31



MKIA0010E

- | | | |
|--------------------|-------------------|-----------------------------|
| 1. Gear case | 2. Bushing | 3. Magnetic switch assembly |
| 4. Stopper clip | 5. Pinion stopper | 6. Bushing |
| 7. Pinion assembly | 8. Shift lever | 9. Armature |
| 10. Packing | 11. Yoke | 12. Brush holder |
| 13. Bushing | 14. Rear cover | |

Through-bolt:

M0T87081

 : 4.1 - 7.1 N·m (0.45 - 0.72 kg-m, 39.1 - 62.5 in-lb)

M8T71471

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

S114-800B, S114-876, S114-840

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

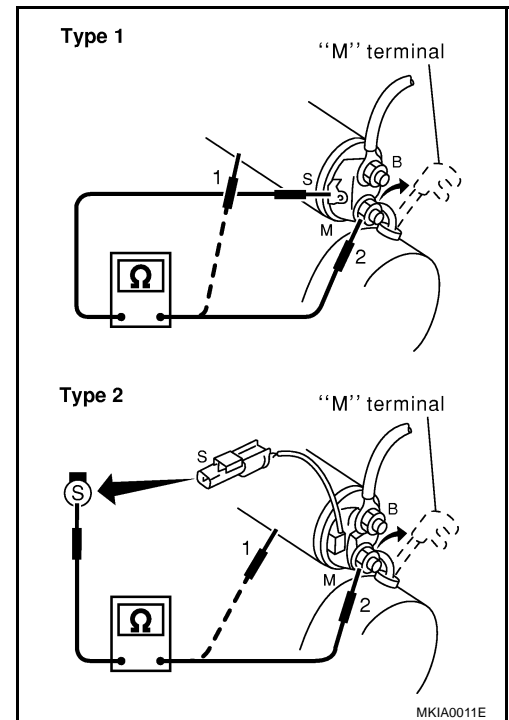
Inspection MAGNETIC SWITCH CHECK

- Before starting to check, disconnect battery ground cable.
- Disconnect "M" terminal of starter motor.

EKS004IP

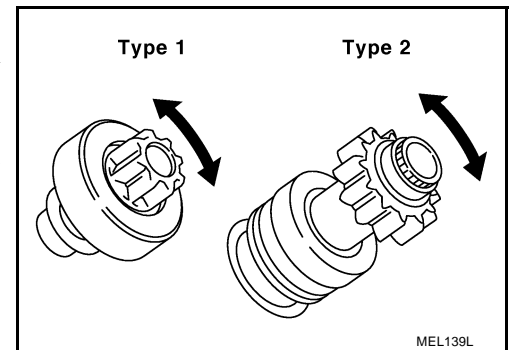
STARTING SYSTEM

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

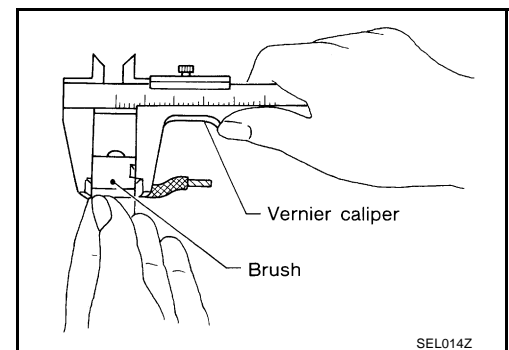
Brush

Check wear of brush.

Wear limit length

**: Refer to SDS. SC-41.
"Starter" .**

- Excessive wear ... Replace.



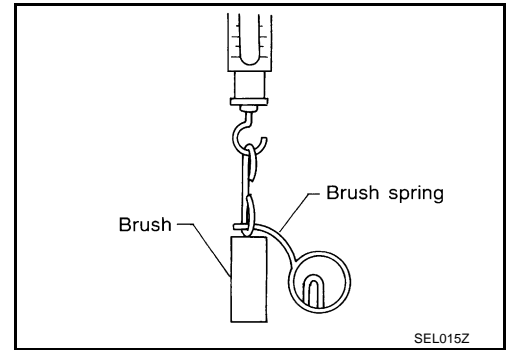
STARTING SYSTEM

Brush Spring Check

Check brush spring pressure with brush spring detached from brush.

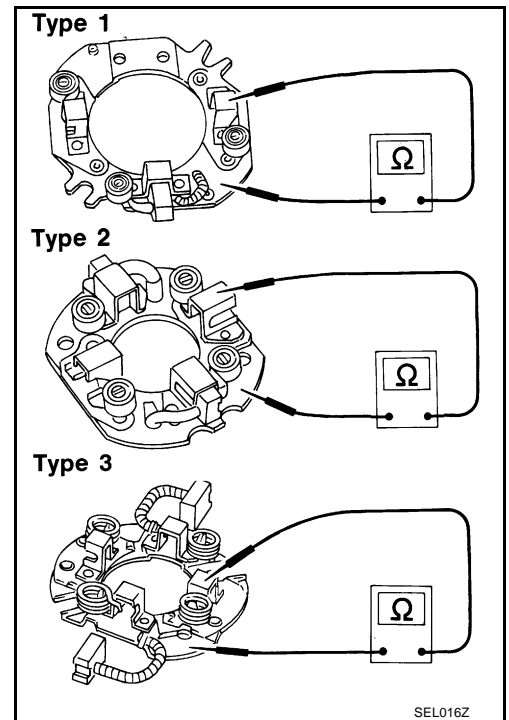
Spring pressure (with new brush) : Refer to SDS. **SC-41, "Starter"** .

- 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.

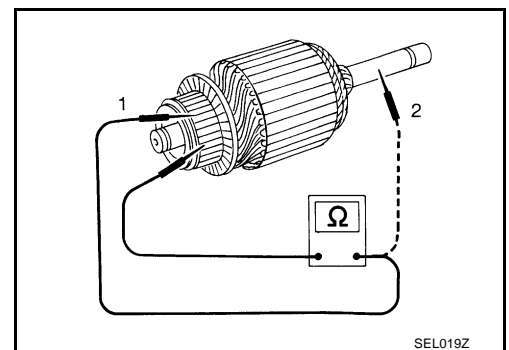


YOKE CHECK

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:

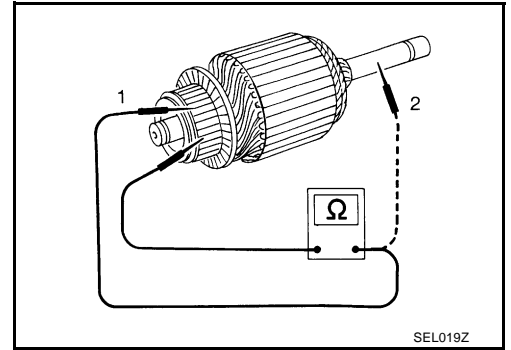
Do not clamp yoke in a vice or strike it with a hammer.



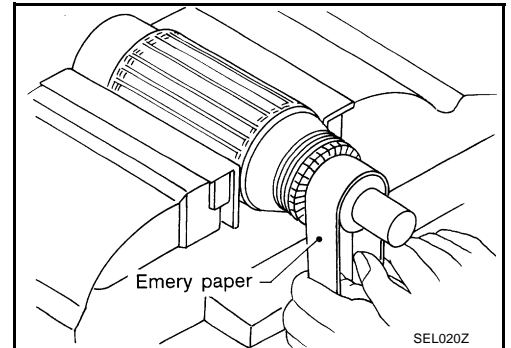
STARTING SYSTEM

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.



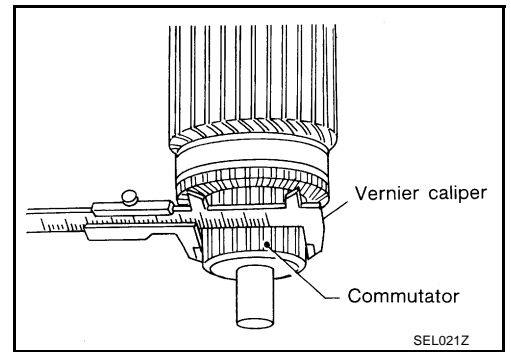
3. Check commutator surface.
 - Rough ... Sand lightly with No. 500 - 600 emery paper.



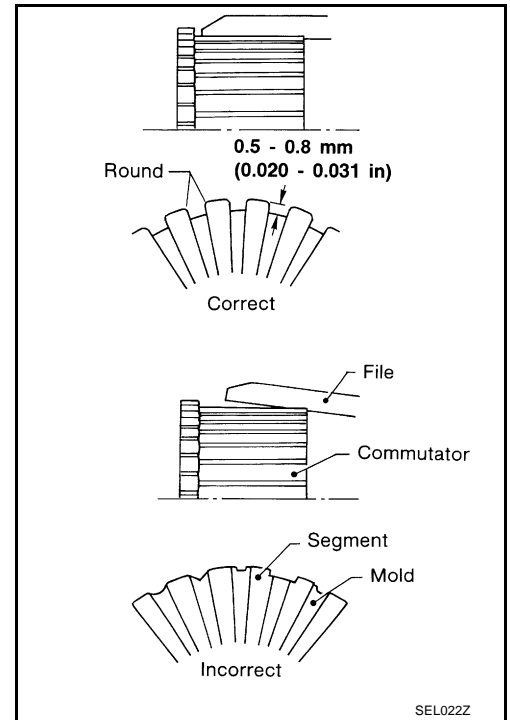
4. Check diameter of commutator.

Commutator minimum diameter : Refer to SDS. [SC-41](#), ["Starter"](#) .

 - Less than specified value ... Replace.
5. Check depth of insulating mold from commutator surface.



STARTING SYSTEM



- Less than 0.2 mm (0.008 in) ... Undercut to 0.5 to 0.8 mm (0.020 to 0.031 in)

Assembly

EKS0041Q

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

Carefully observe the following instructions.

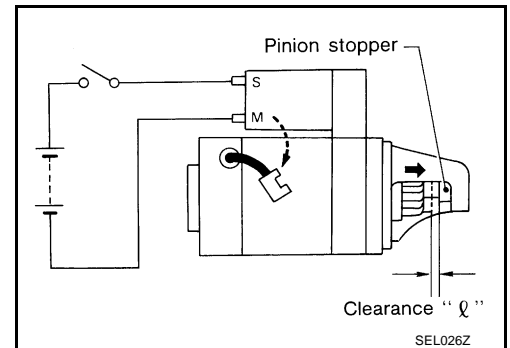
PINION PROTRUSION LENGTH ADJUSTMENT

Clearance (QG and QR Engine Models)

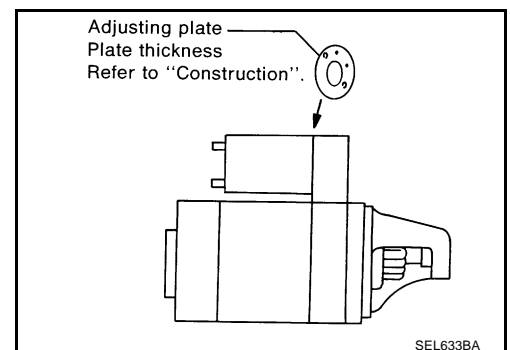
With pinion driven out by magnetic switch, push pinion back to remove slack and measure clearance "ℓ" between the front edge of the pinion and the pinion stopper.

Clearance "ℓ"

: Refer to SDS. [SC-41](#).
"Starter".



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



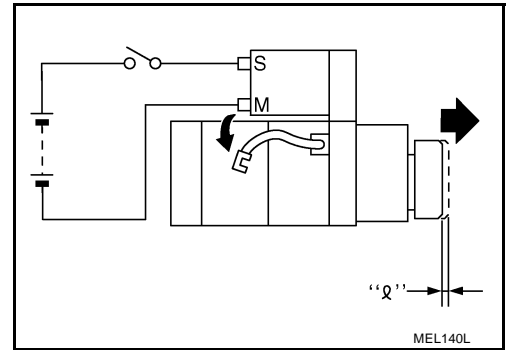
STARTING SYSTEM

Movement (YD Engine Models)

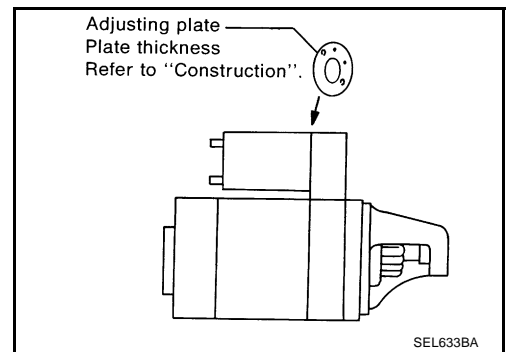
Compare movement “ ℓ ” in height of pinion when it is pushed out with magnetic switch energized and when it is pulled out by hand until it touches stopper.

Movement “ ℓ ”

**: Refer to SDS. SC-41,
"Starter" .**



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



SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

PPF:00030

Battery

EKS004M0

Applied model	QG and QR engine	QR engine	QG engine	YD engine
	Standard	Option	Option	
Type	LB1 + (063)	LB2 (065)	LB2 + (075)	LB3 (010S)
Capacity V-AH	12-38	12-45	12-45	12-56

Starter

EKS004IS

Type		S114-876	S114-840	M0T87081	M8T71471
		HITACHI		MITSUBISHI	
		Reduction			
Applied model		QR20 engine			YD22 engine
		Standard	Option		
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 2,300	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)		12.7 - 17.7 (1.3 - 1.8, 2.9 - 4.0)	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 pin-ion stopper mm (in)		0.3 - 2.5 (0.012 - 0.098)		0.5 - 2.0 (0.020 - 0.079)	—
Movement “ℓ” in height of pinion assembly mm (in)		—			0.5 - 2.0 (0.020 - 0.079)

Type	0 001 116 006	D7E 31	S114-800B
	BOSCH	Valeo	HITACHI
	Non-reduction		Reduction
Applied model	QG engine		
System voltage V	12		
No-load	Terminal voltage V	11.5	11.0
	Current A	Less than 48	Less than 45
	Revolution rpm	More than 5,800	More than 12,000
Minimum diameter of commutator mm (in)	33.5 (1.391)	28.2 (1.110)	28.0 (1.102)
Minimum length of brush mm (in)	3.5 (0.138)	6.15 (0.242)	10.5 (0.413)
Brush spring tension N (kg, lb)	5.2 (0.53, 1.17) at 7.5 mm (0.295 in) brush length	16.2 - 19.8 (1.65 - 2.02, 3.46 - 4.45)	12.7 - 17.7 (1.3 - 1.8, 2.9 - 4.0)
Clearance between bearing metal and armature shaft mm (in)	—	0.05 (0.0020)	—
Clearance “ℓ” between pinion front edge and pinion stopper mm (in)	0.0 - 3.9 (0 - 0.154)	Max. 1 (0.039)	0.3 - 2.5 (0.012 - 0.0998)
Movement “ℓ” in height of pinion assembly mm (in)	—		—

SERVICE DATA AND SPECIFICATIONS (SDS)

Alternator

EKS004IT

Type	LR1110-717	LR180-768	A3TA6581A
	HITACHI make		MITSUBISHI make
Applied model	QR engine	QG engine	YD engine
Nominal rating V-A	12-110	12-80	12-110
Ground polarity	Negative		
Minimum revolutions under no-load (When 13.5V is applied) rpm	Less than 1,100	Less than 1,000	Less than 1,300
Hot output current (When 13.5V 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 23/1,300 More than 66/2,500 More than 78.5/5,000	More than 29/1,300 More than 78/2,500 More than 102/5,000
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)	1.00 - 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° (68°F) Ω	2.31	2.67	1.8 - 2.1