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# SECTION SC

## STARTING & CHARGING SYSTEM

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# PRECAUTIONS

## PRECAUTIONS

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

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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

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When you read wiring diagrams, refer to the followings:

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

When you perform trouble diagnosis, refer to the followings:

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

# BATTERY

## BATTERY

PFP:00011

### How to Handle Battery

EKS00417

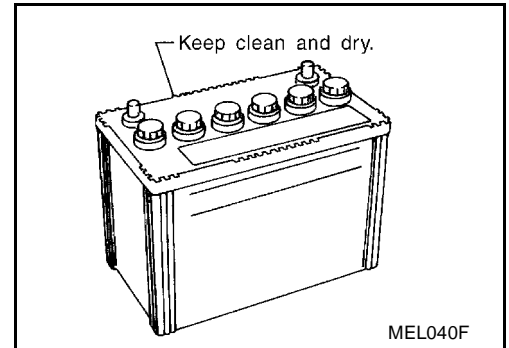
#### CAUTION:

- 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.

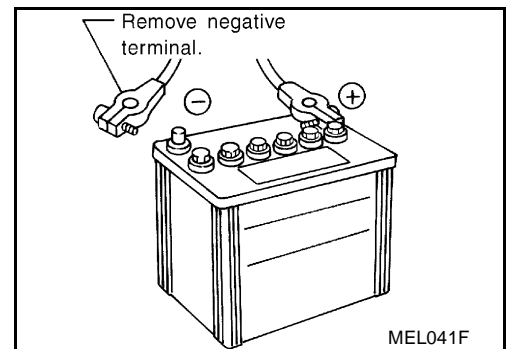
#### METHODS OF PREVENTING OVER-DISCHARGE

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

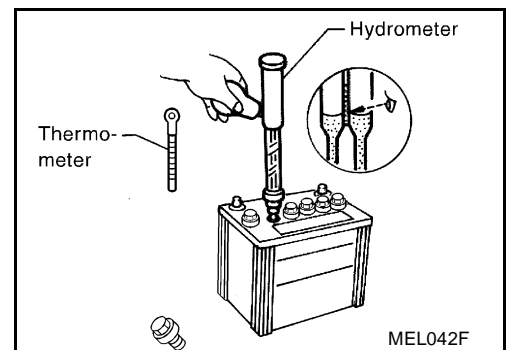
- The battery surface (particularly its top) should always be kept clean and dry.
- The terminal connections should be clean and tight.
- At every routine maintenance, check the electrolyte level. This also applies to batteries designated as "low maintenance" and "maintenance-free".



- 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

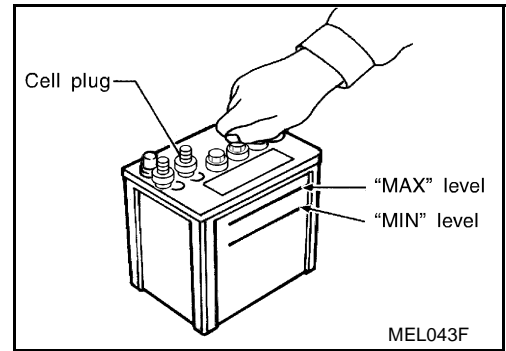
#### WARNING:

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.

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# BATTERY

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

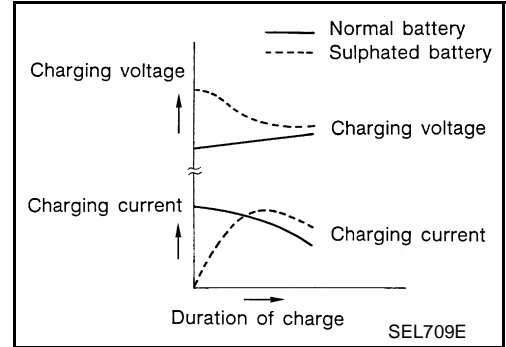


## Sulphation

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.

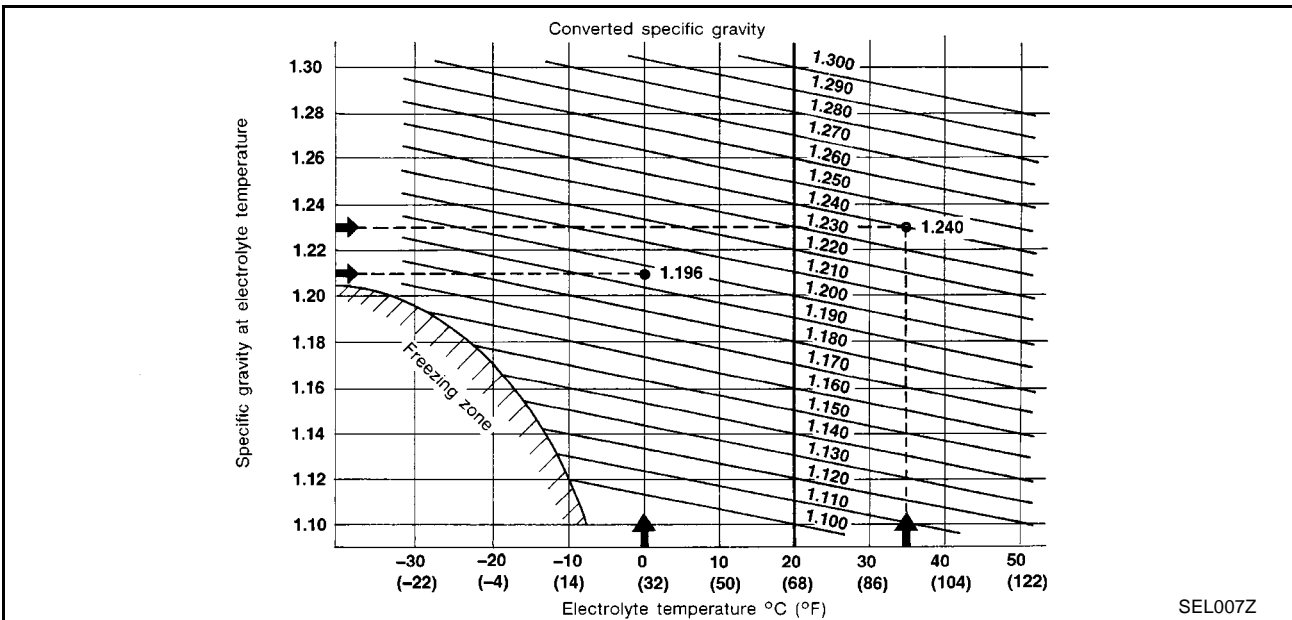
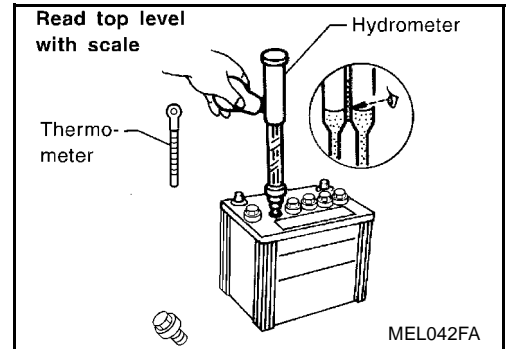


## SPECIFIC GRAVITY CHECK

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

Example:

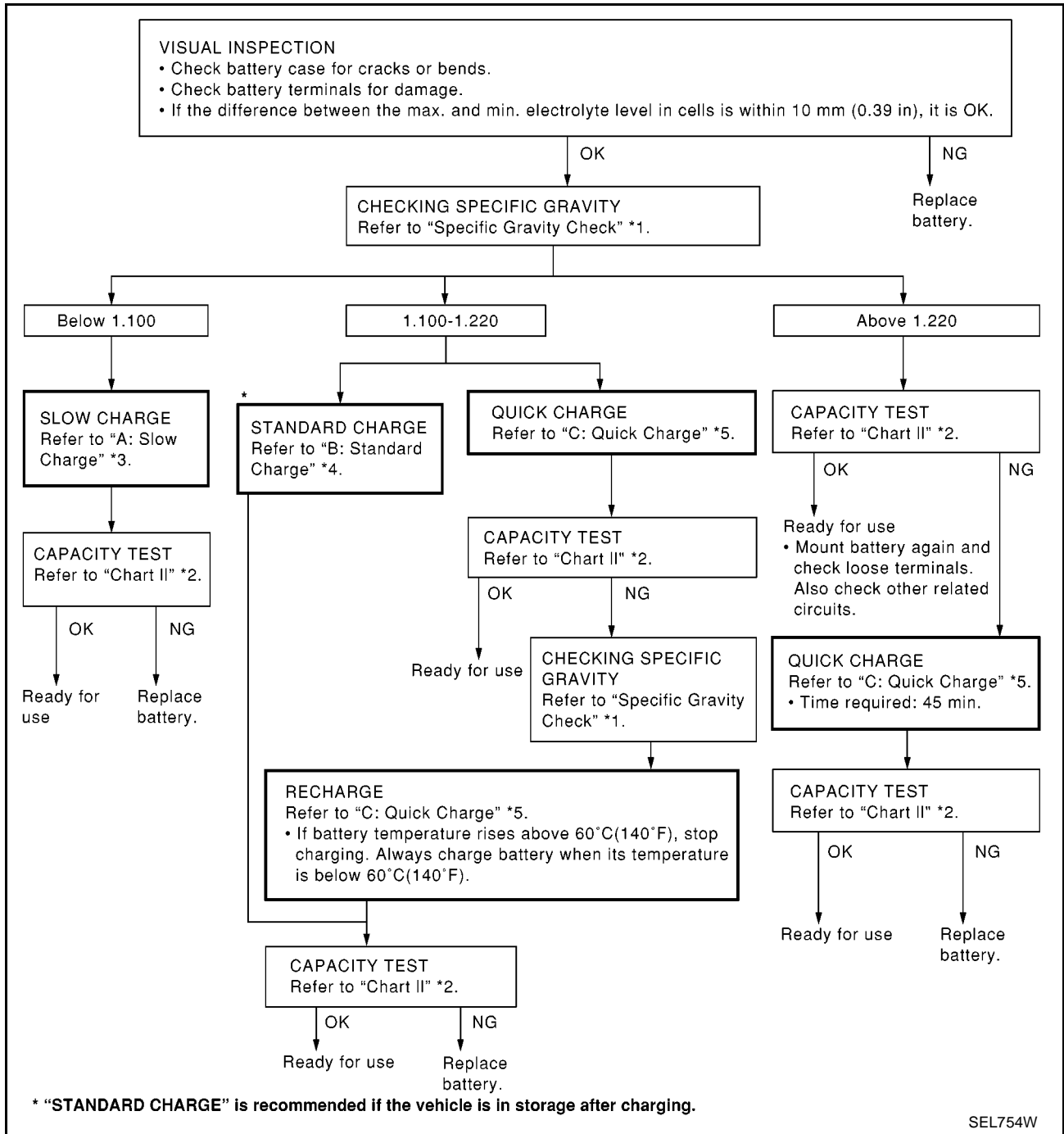
- When electrolyte temperature is 35°C (95°F) and specific gravity of electrolyte is 1.230, converted specific gravity at 20°C (68°F) is 1.240.
- When electrolyte temperature is 0°C (32°F) and specific gravity of electrolyte is 1.210, converted specific gravity at 20°C (68°F) is 1.196.



# BATTERY

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## Battery Test and Charging Chart CHART I



\*1. [SC-4](#)

\*2. [SC-6](#)

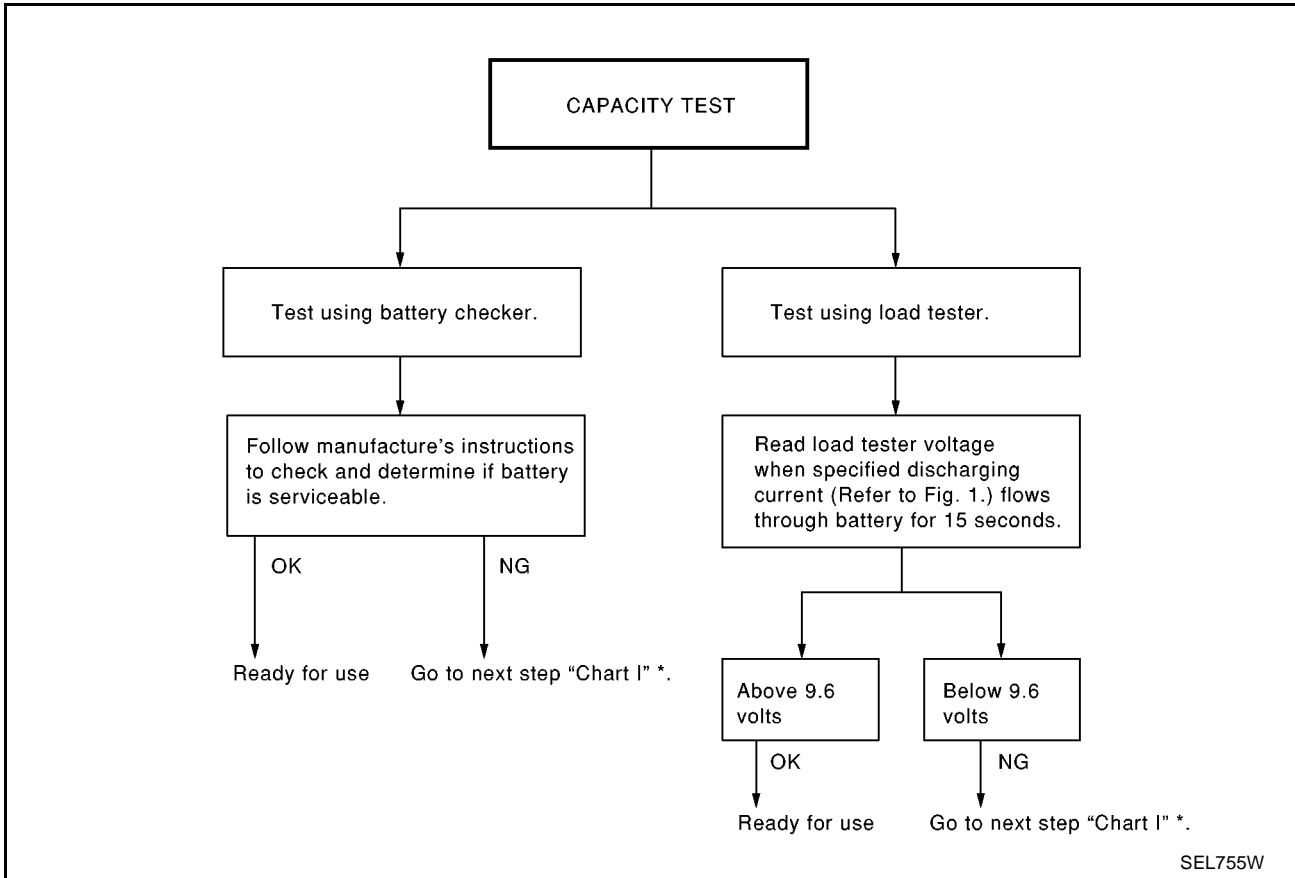
\*3. [SC-7](#)

\*4. [SC-8](#)

\*5. [SC-10](#)

# BATTERY

## CHART II



\*. [SC-5](#)

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

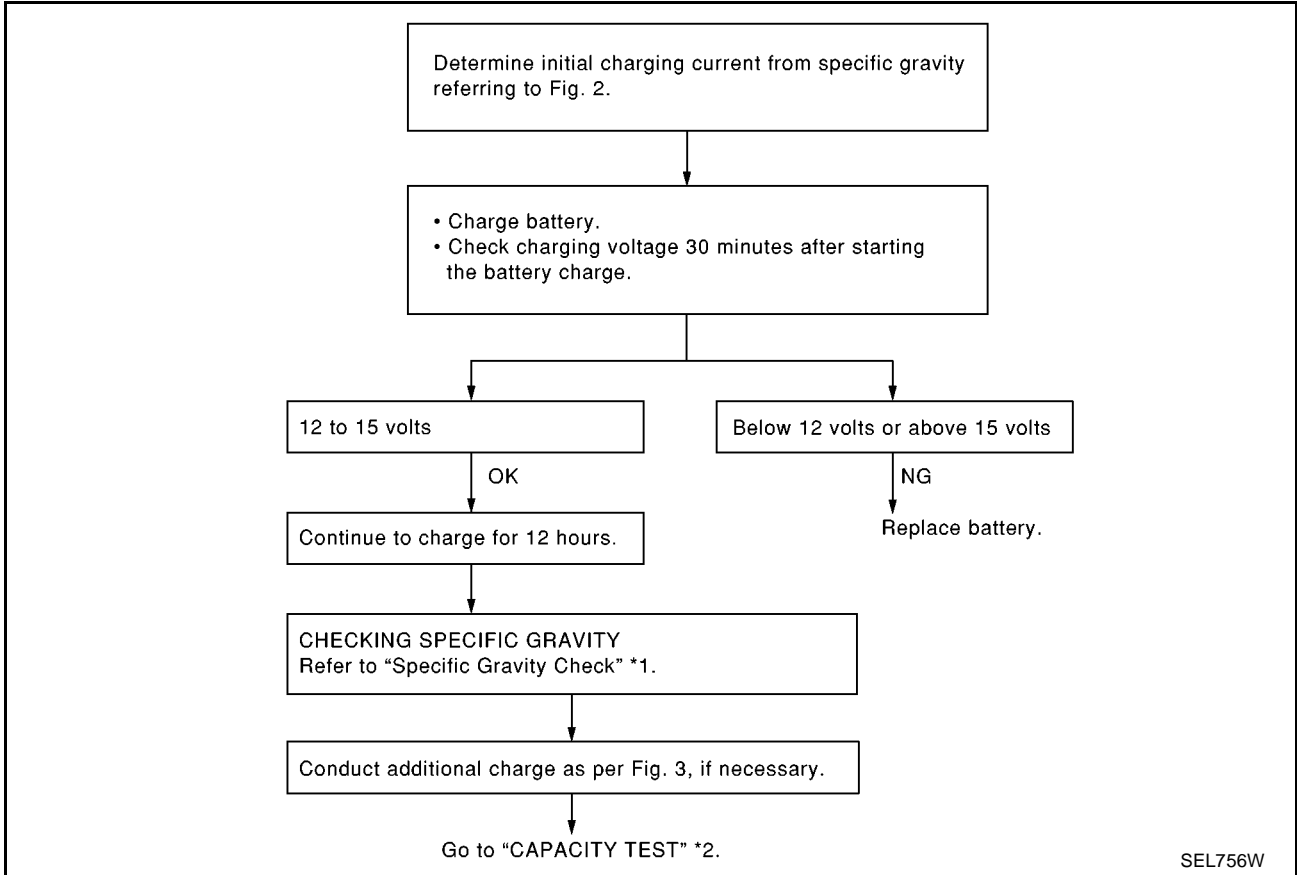
**Fig. 1 Discharging Current (Load Tester)**

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

# BATTERY

Type	Current (A)
067 [YUASA type code]	325
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](#)

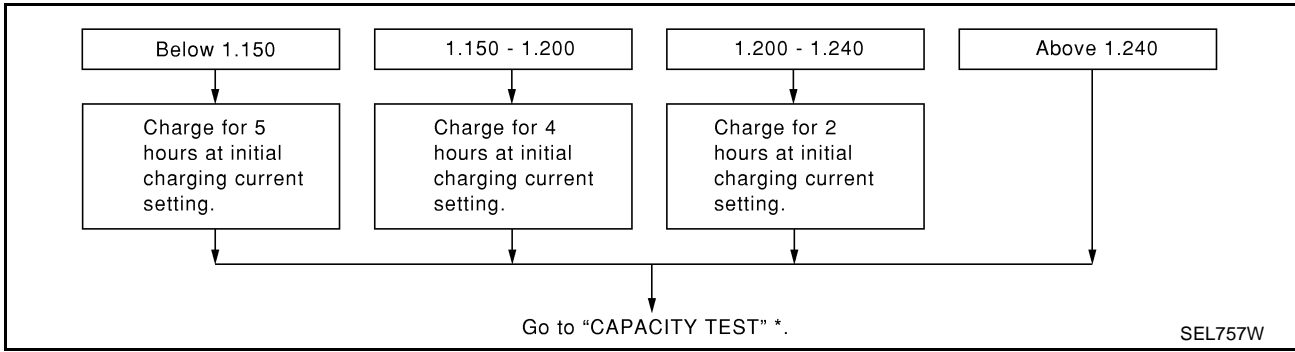
**Fig. 2 Initial Charging Current Setting (Slow Charge)**

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]
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)**

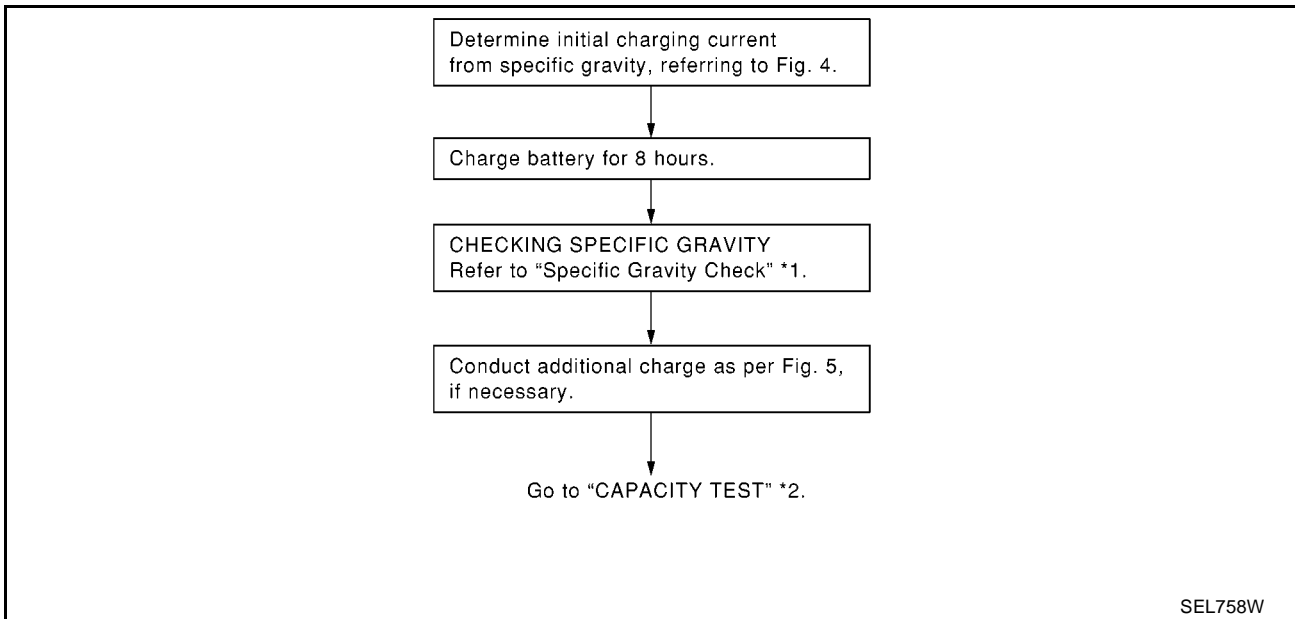


\*. [SC-6](#)

## 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](#)



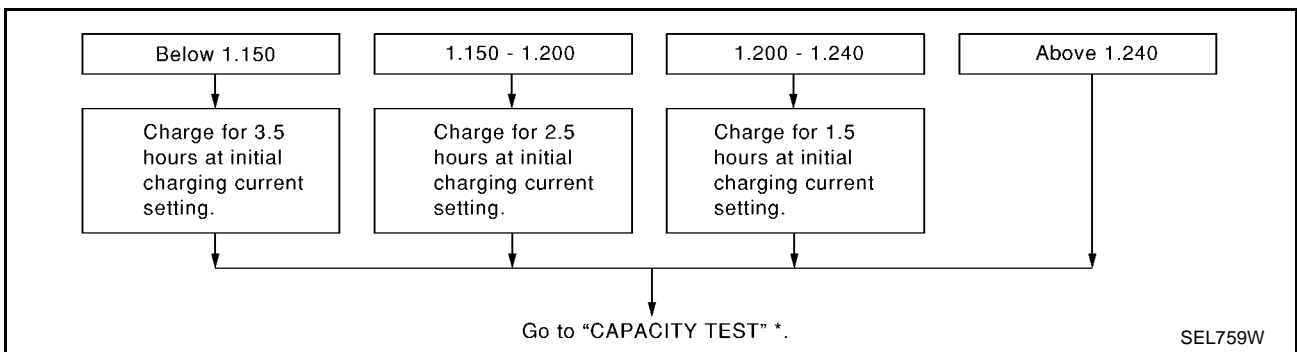
# BATTERY

**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)	065 [YUASA type code]	075 [YUASA type code]	096L [YUASA type code]	010S [YUASA type code]
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)	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)				9.0 (A)	11.0 (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)							
1.190 - 1.220	2.0 (A)	2.0 (A)	3.0 (A)		4.0 (A)				5.0 (A)	5.0 (A)				6.0 (A)	7.0 (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)**



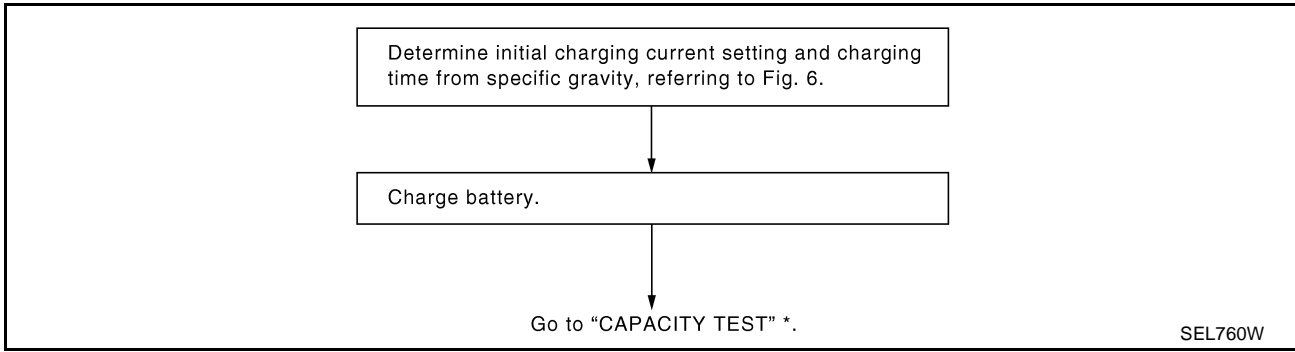
\*. [SC-6](#)

**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


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Observe the following to ensure proper servicing.


### CAUTION:

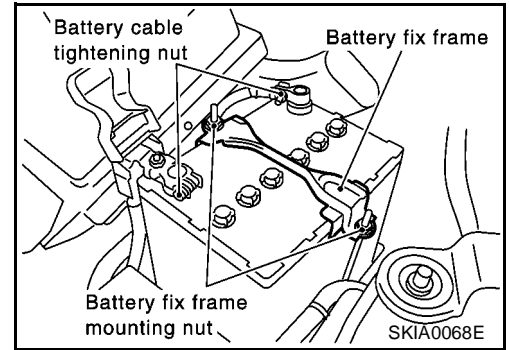
- When removing, remove negative terminal first. But for installation, install positive terminal first.
- Tighten parts to the specified torque shown below.

#### 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

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## CHARGING SYSTEM

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### 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.

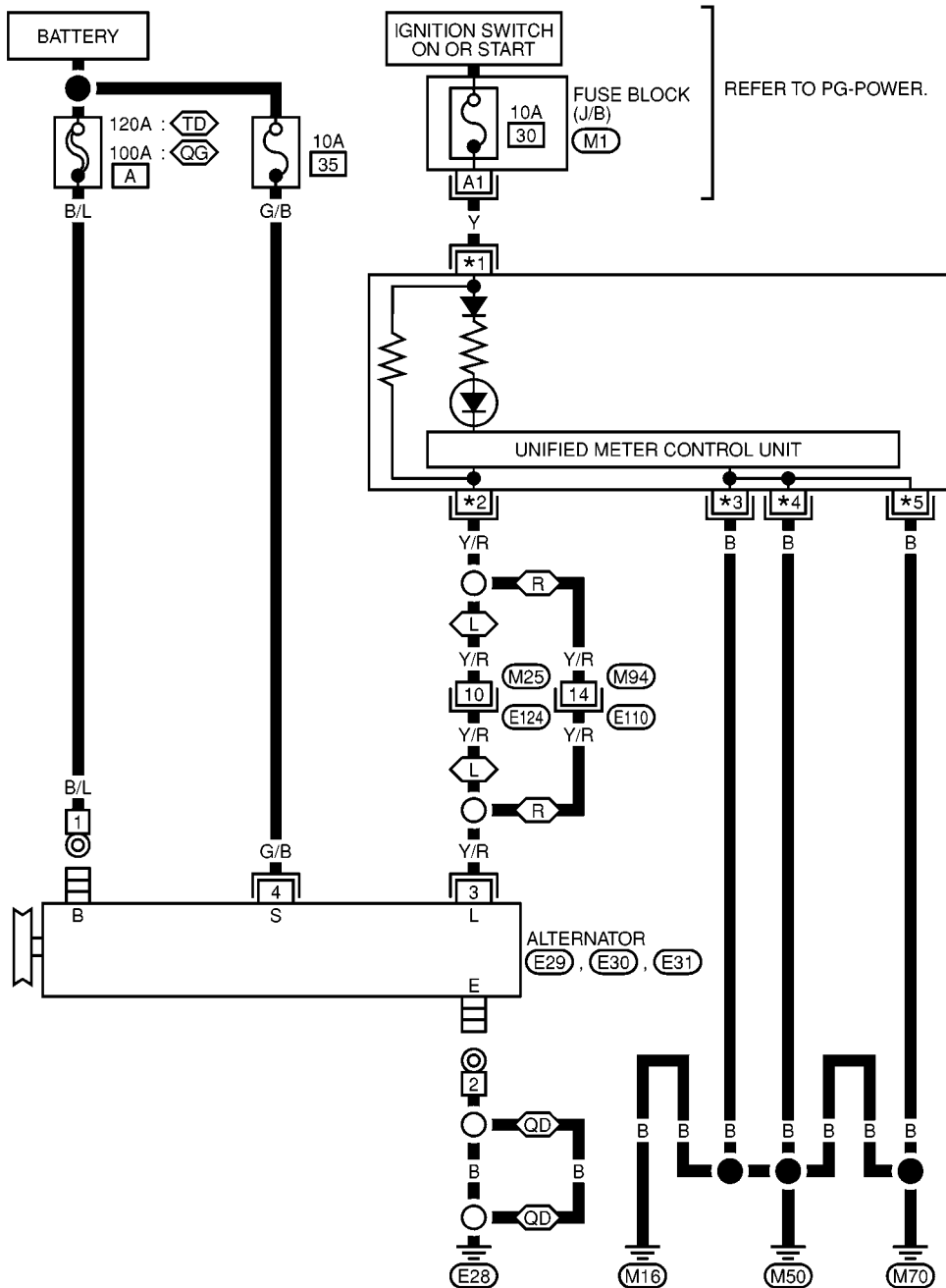
If the charge warning lamp illuminates with the engine running, a fault is indicated.

# CHARGING SYSTEM

## Wiring Diagram — CHARGE —

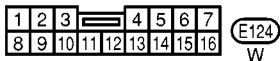
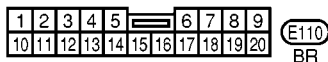
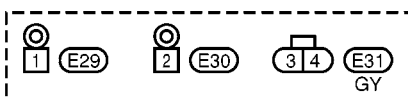
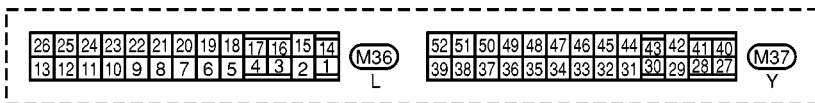
EKS0041B

### SC-CHARGE-01



COMBINATION METER (CHARGE) (M36, M37)

- ⬅ L : LHD MODELS
  - ➡ R : RHD MODELS
  - ⬅ 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)

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# CHARGING SYSTEM

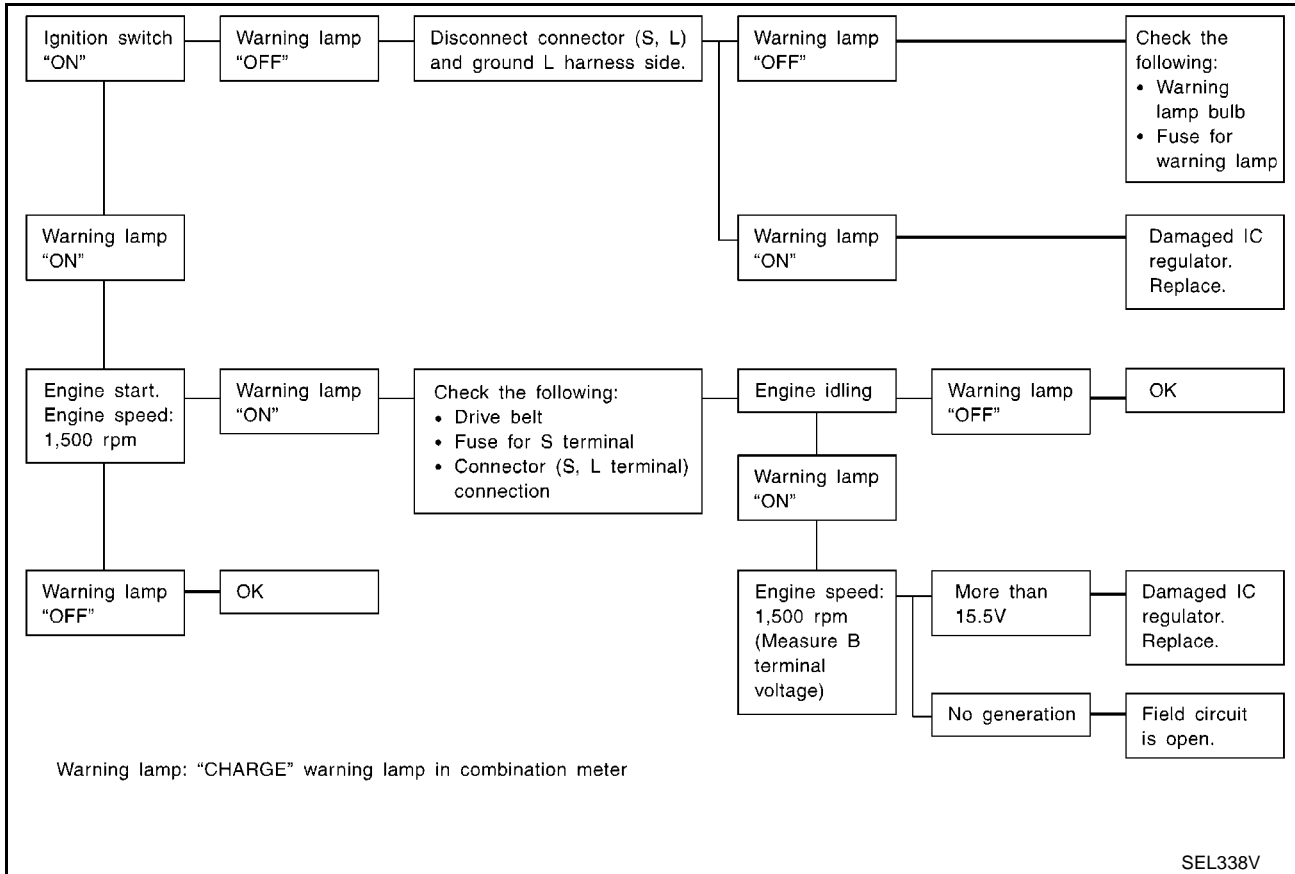
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## Trouble Diagnoses

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.

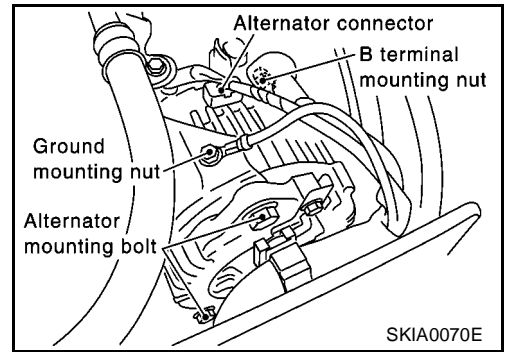
# CHARGING SYSTEM

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## Removal and Installation

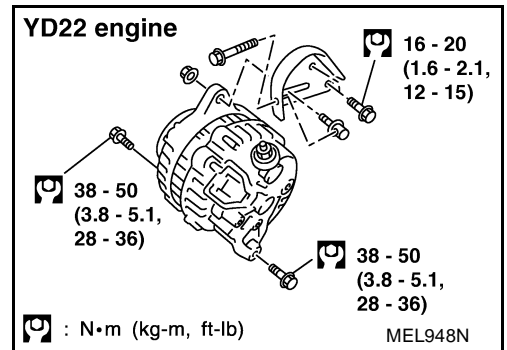
### REMOVAL (QG AND QR ENGINE MODELS)

1. Disconnect battery ground cable.
2. Remove alternator drive belt. Refer to [EM-14, "Checking Drive Belts"](#) (QG), [EM-112, "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-211, "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-112, "Tension Adjustment"](#) (QR engine models) or [EM-211, "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)

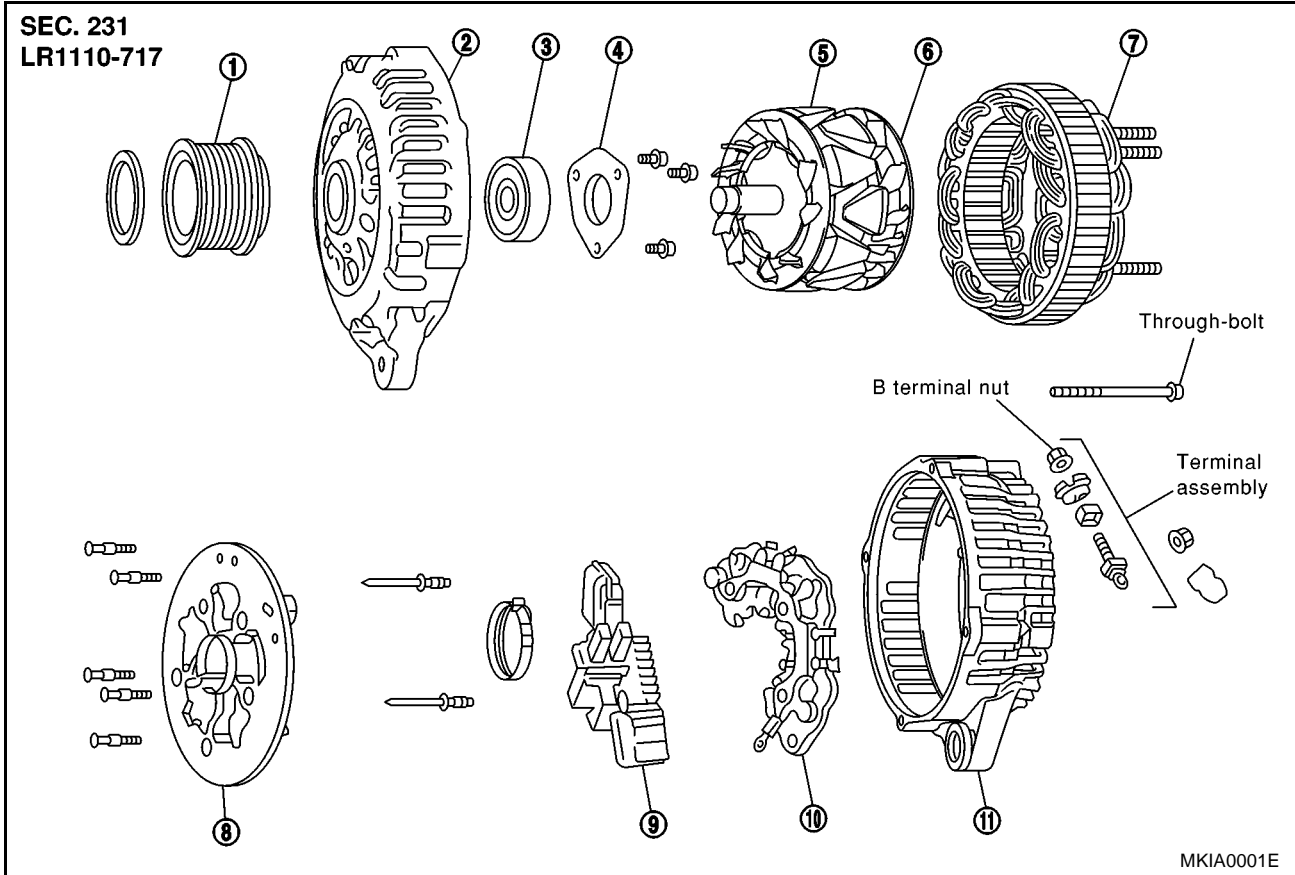
### QG and YD Engine Models

- 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

EKS004LY

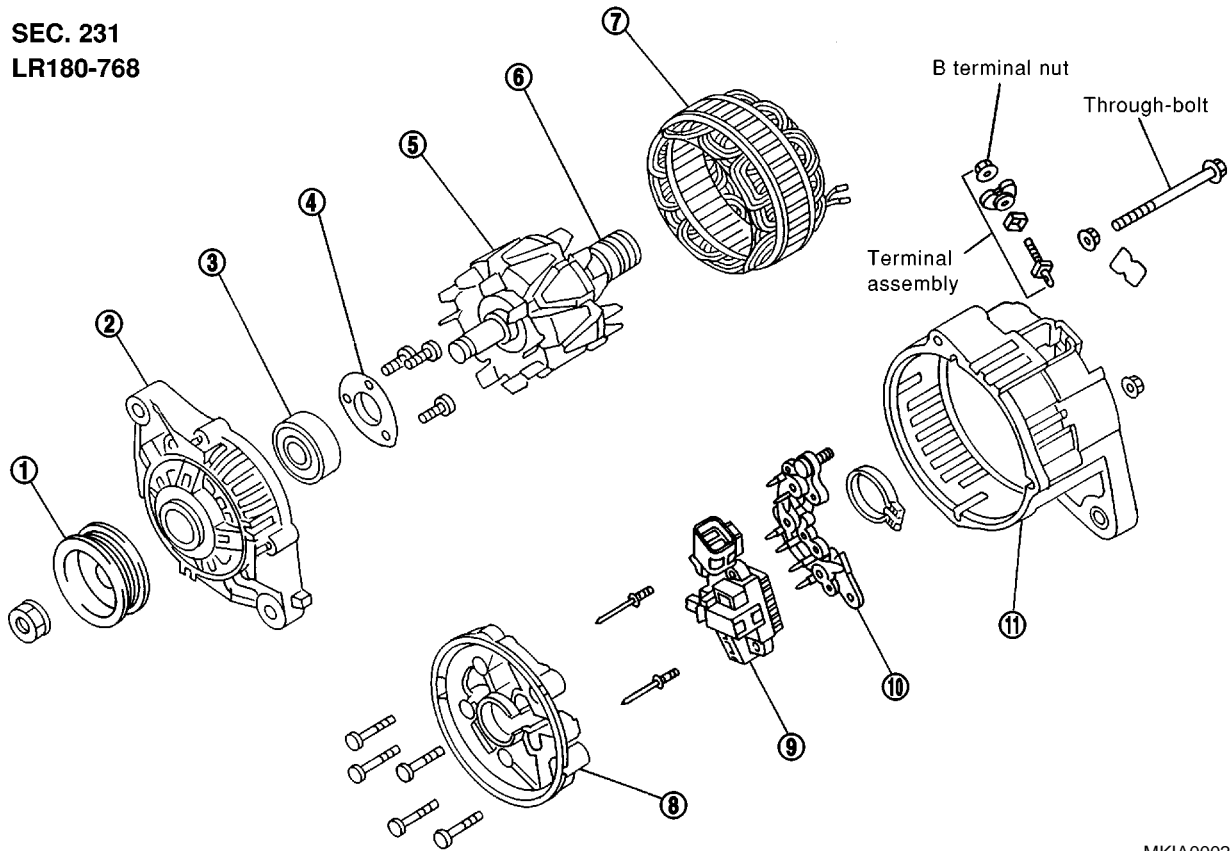


- |                    |                |                                  |
|--------------------|----------------|----------------------------------|
| 1. Pulley          | 2. Front cover | 3. Front bearing                 |
| 4. Retainer        | 5. Rotor       | 6. Slip ring                     |
| 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 |                                  |

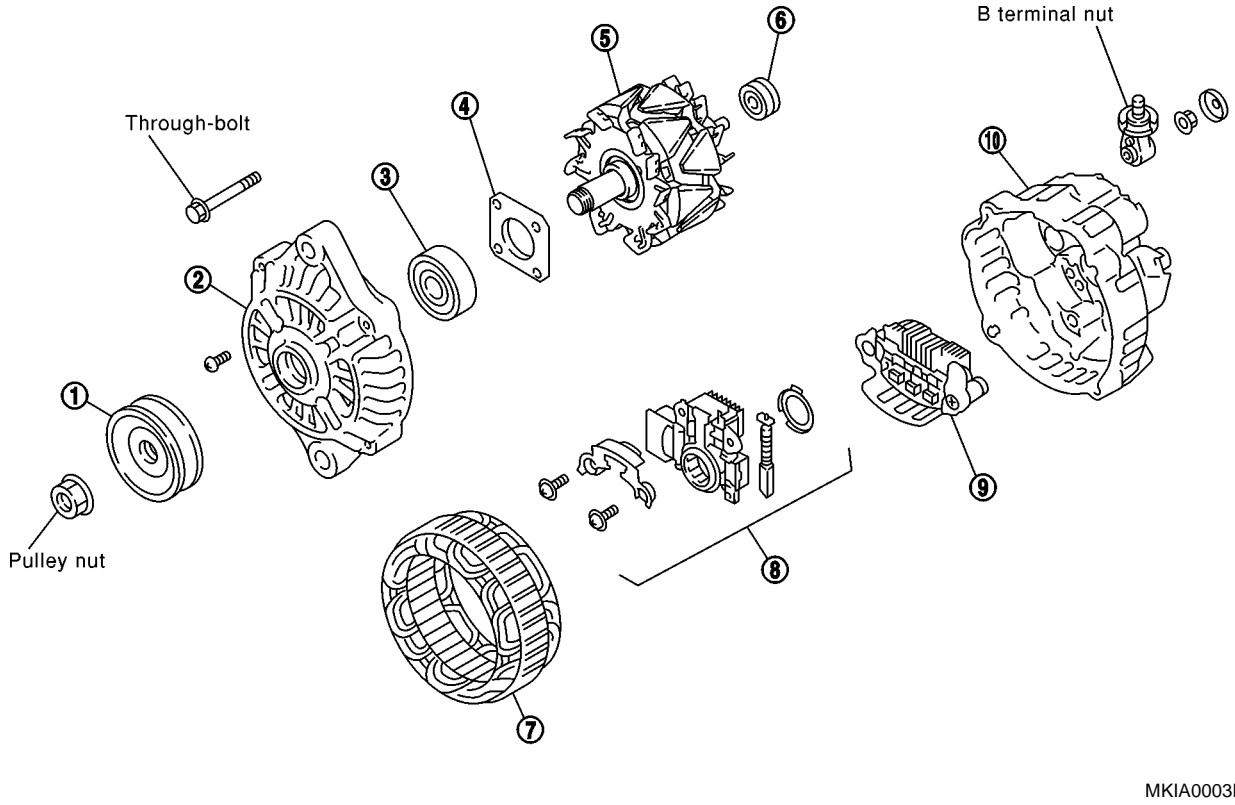
MKIA0002E

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# CHARGING SYSTEM

SEC. 231  
A3TA6581



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

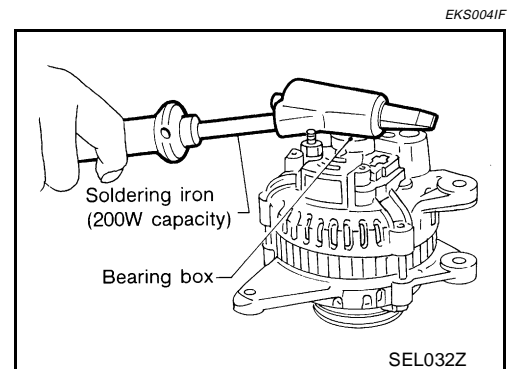
A3TA6581

: 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)

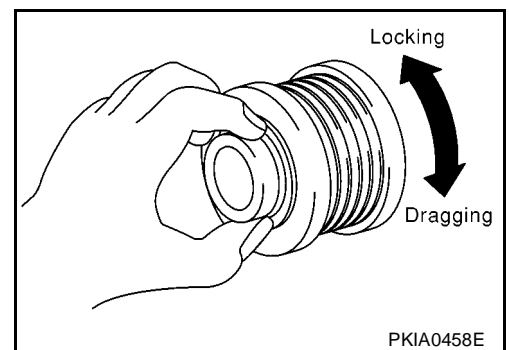
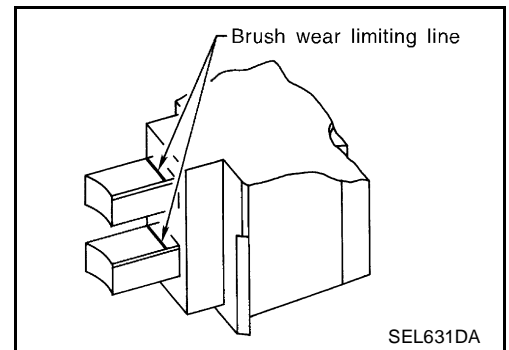
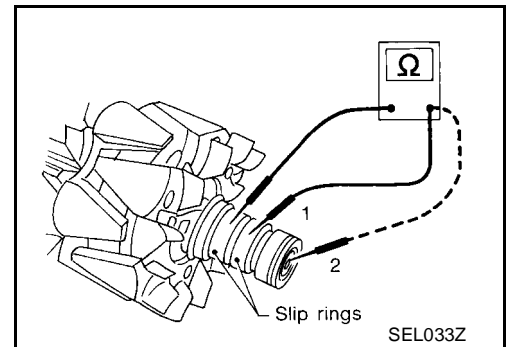
1. Check for locking (Outer ring is turned counterclockwise when viewed from the rear).

- 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.

EKS004IG

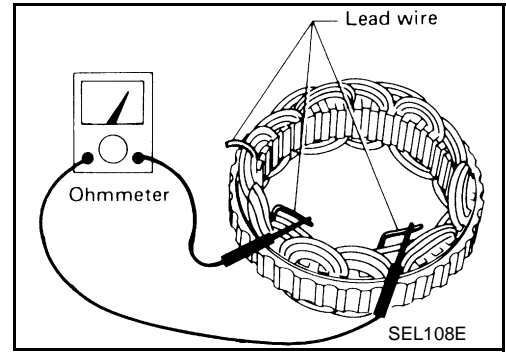


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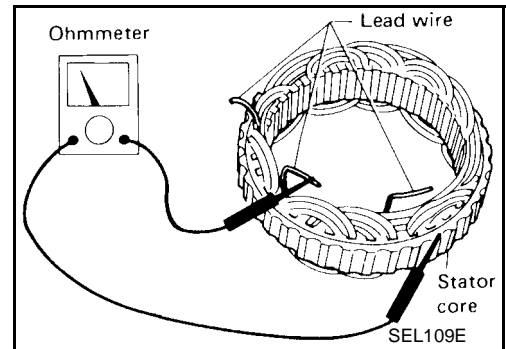
# CHARGING SYSTEM

## STATOR CHECK

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



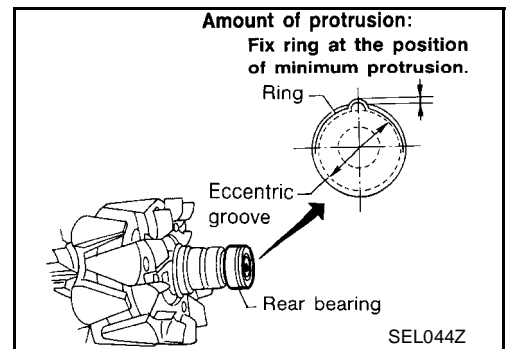
2. Ground test
  - Continuity exists... Replace stator.



## Assembly RING FITTING IN REAR BEARING

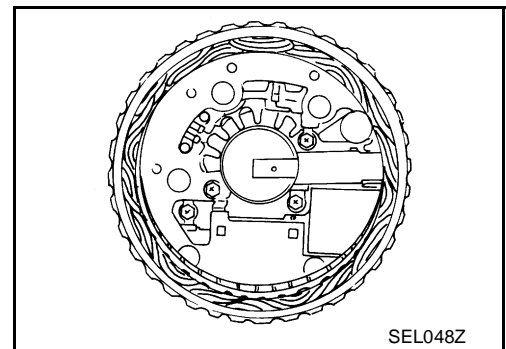
- Fix ring into groove in rear bearing so that it is as close to the adjacent area as possible.

**CAUTION:**  
Do not reuse rear bearing after removal.



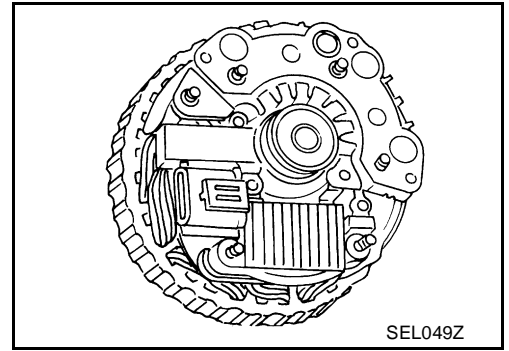
## REAR COVER INSTALLATION

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.**



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## 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
- to ECM terminal 74.

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

- from park/neutral position relay terminal 5

# STARTING SYSTEM

---

- 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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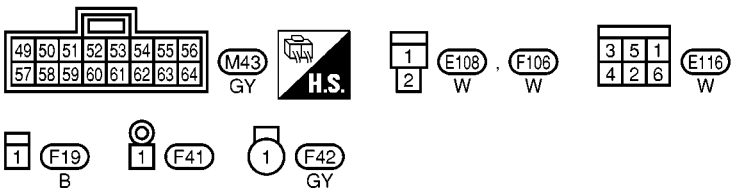
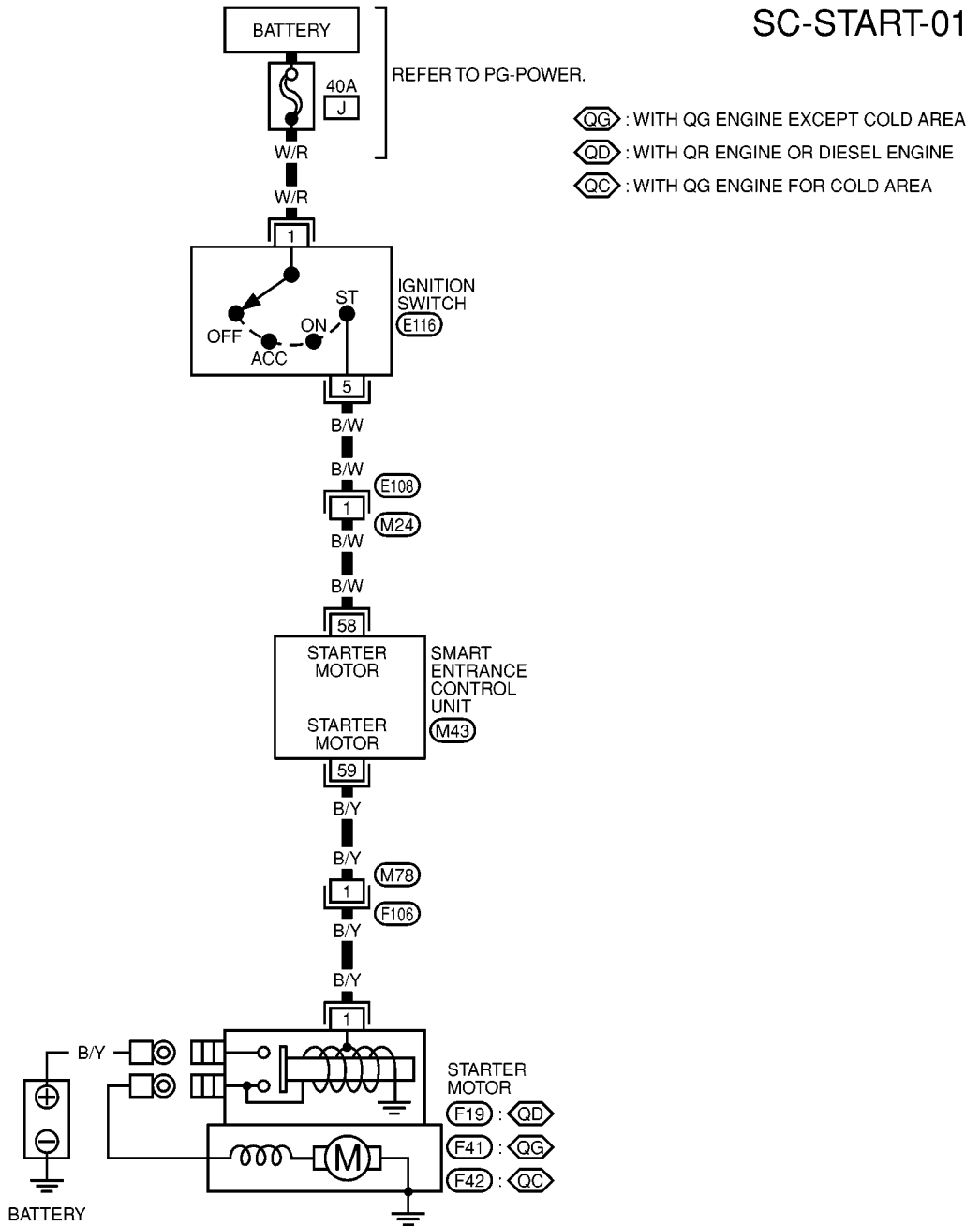
M

# STARTING SYSTEM

## Wiring Diagram — START —/M/T Models

EKS004JJ

### SC-START-01



MKWA0039E



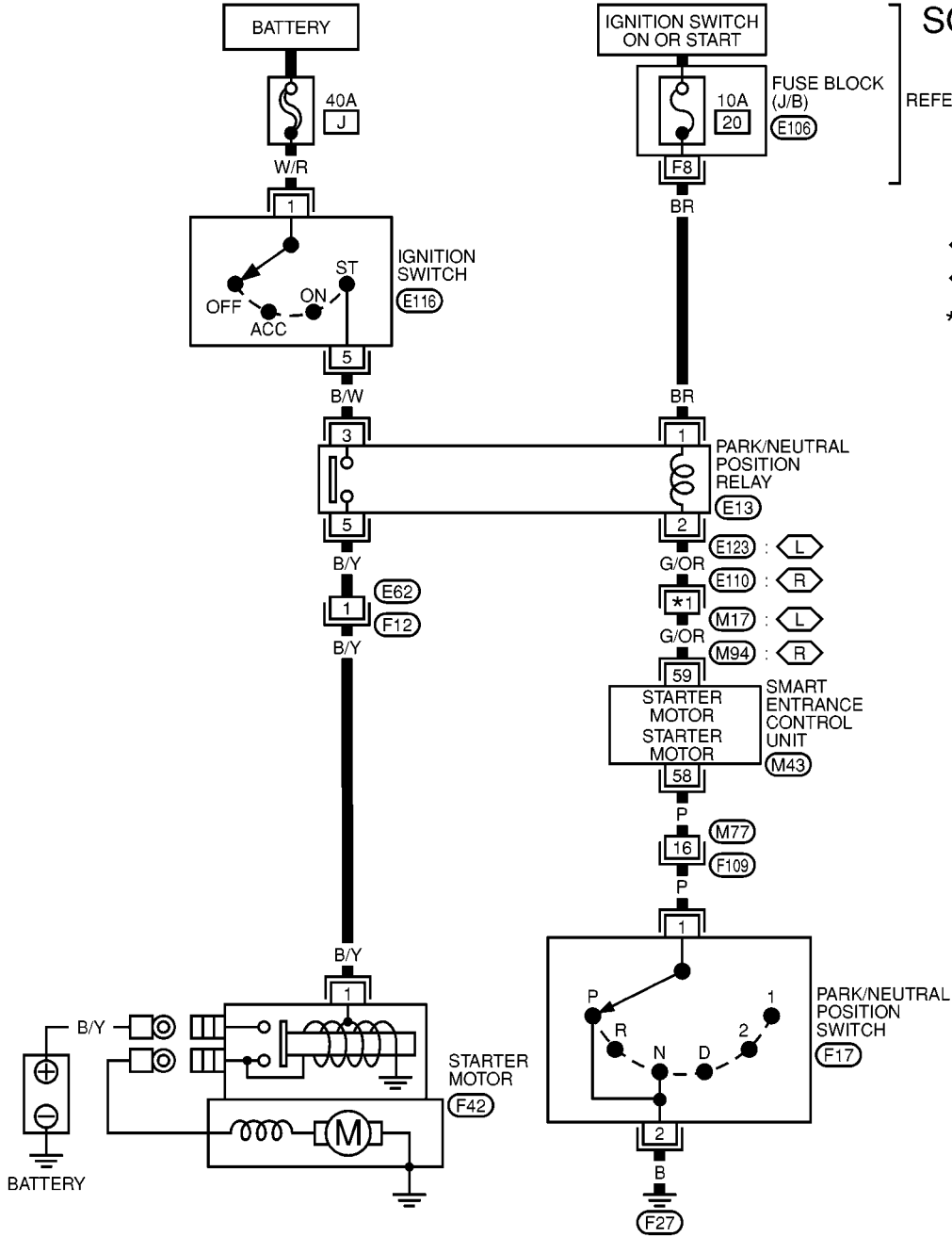
# STARTING SYSTEM

## Wiring Diagram — START —/A/T Models

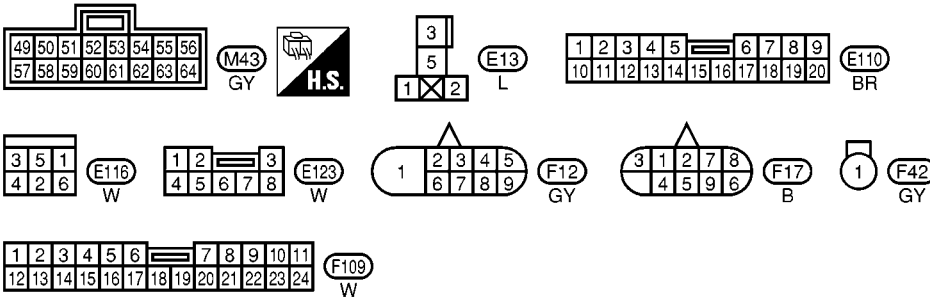
EKS0041K

### SC-START-02

REFER TO PG-POWER.



- (L) : LHD MODELS
- (R) : RHD MODELS
- \*1 7 : (L)
- 13 : (R)



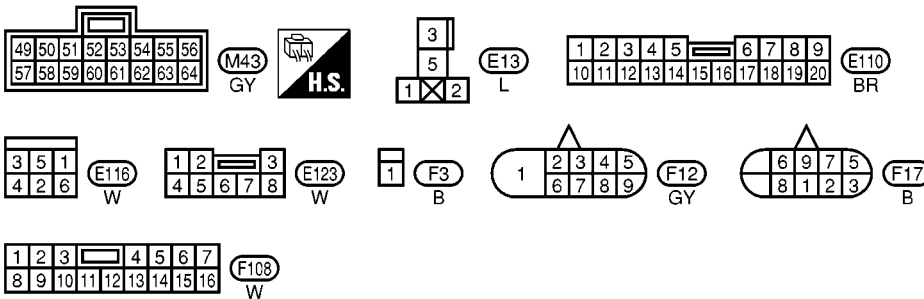
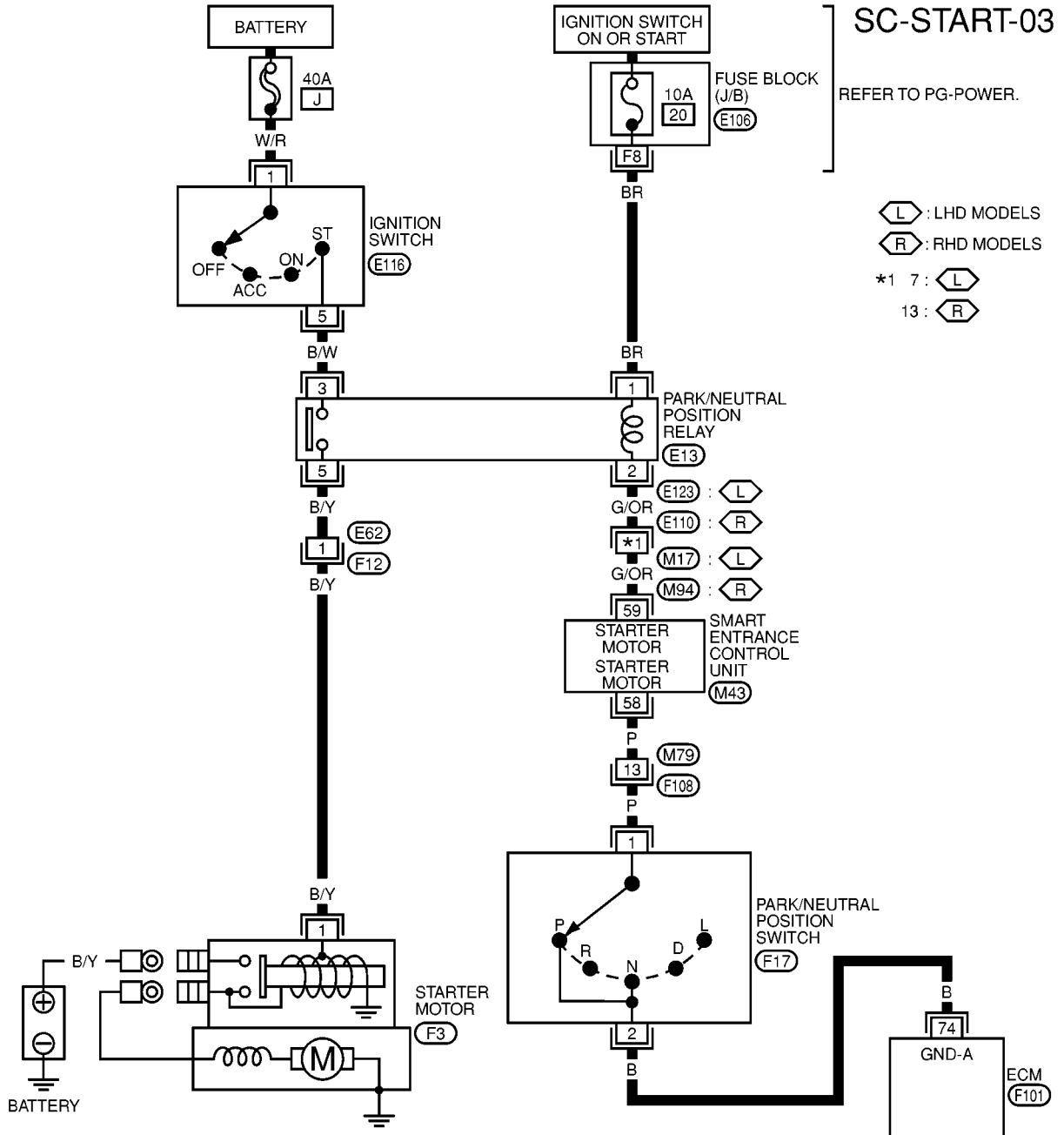
REFER TO THE FOLLOWING.  
 (E106) - FUSE BLOCK-JUNCTION BOX (J/B)

MKWA0040E

# STARTING SYSTEM

## Wiring Diagram — START —/CVT Models

EKS0041L



REFER TO THE FOLLOWING.  
 (E106) - FUSE BLOCK JUNCTION BOX (J/B)  
 (F101) - ELECTRICAL UNITS

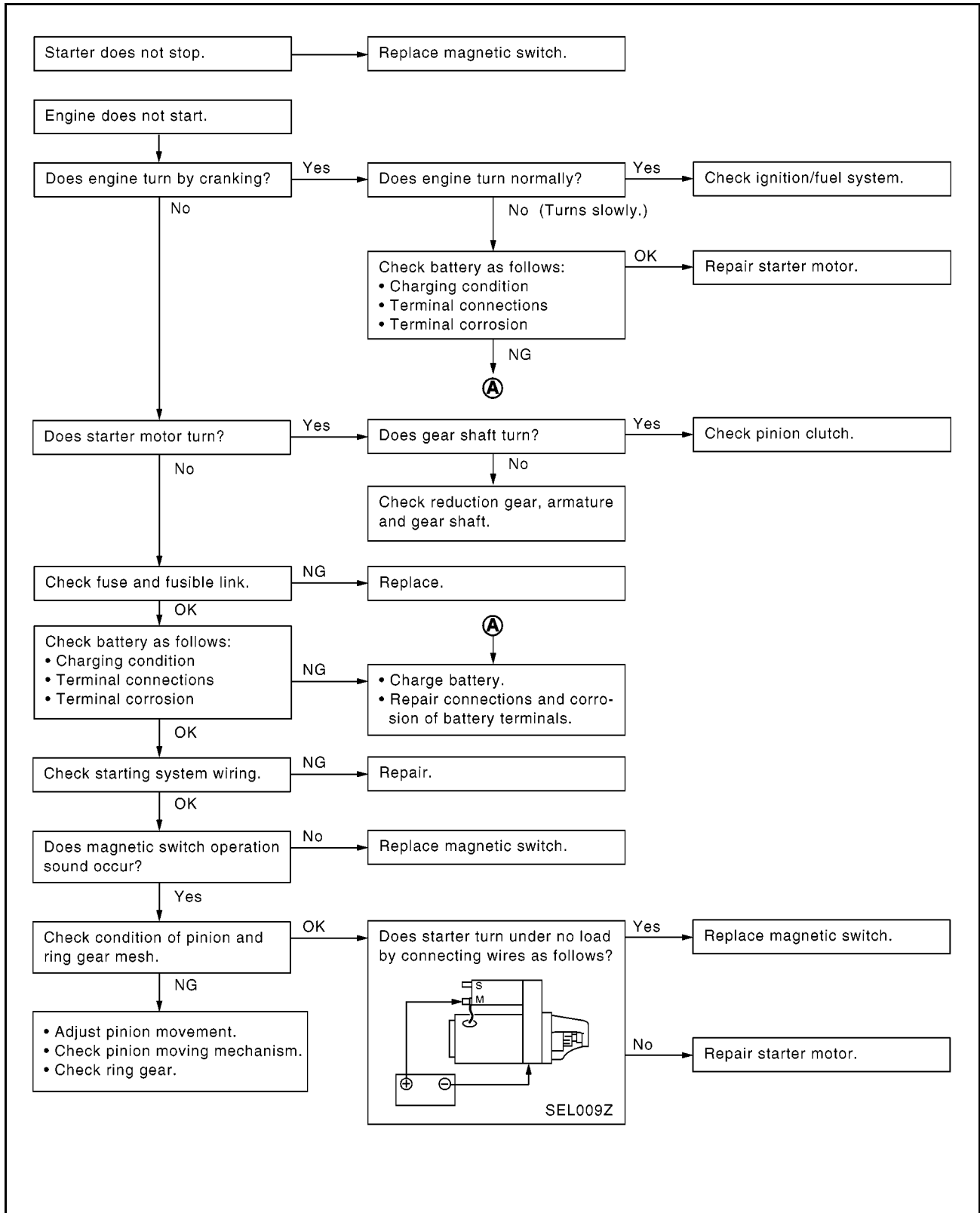
MKWA0041E

# STARTING SYSTEM

EKS0041M

## Trouble Diagnoses

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



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# STARTING SYSTEM

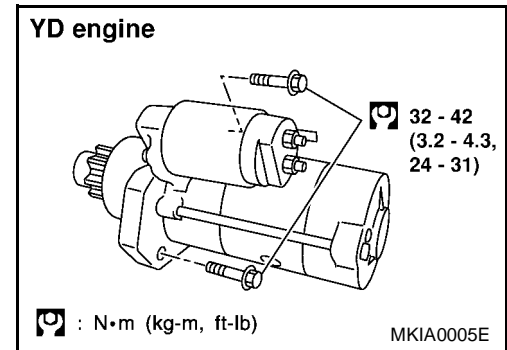
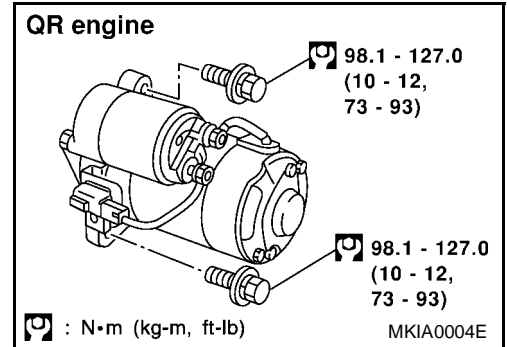
EKS004LZ

## Removal and Installation

### REMOVAL

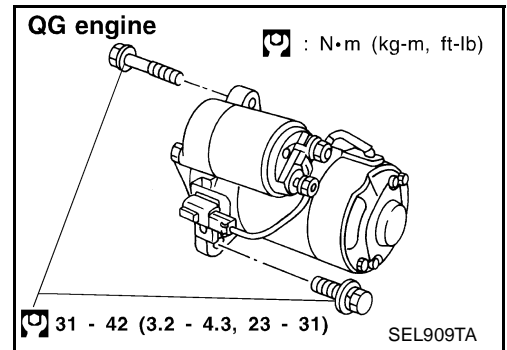
#### QR and YD Engine Models

1. Disconnect negative battery cable.
2. Remove air duct. Refer to [EM-114, "AIR CLEANER AND AIR DUCT"](#) (QR engine models) or [EM-213, "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-17, "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)

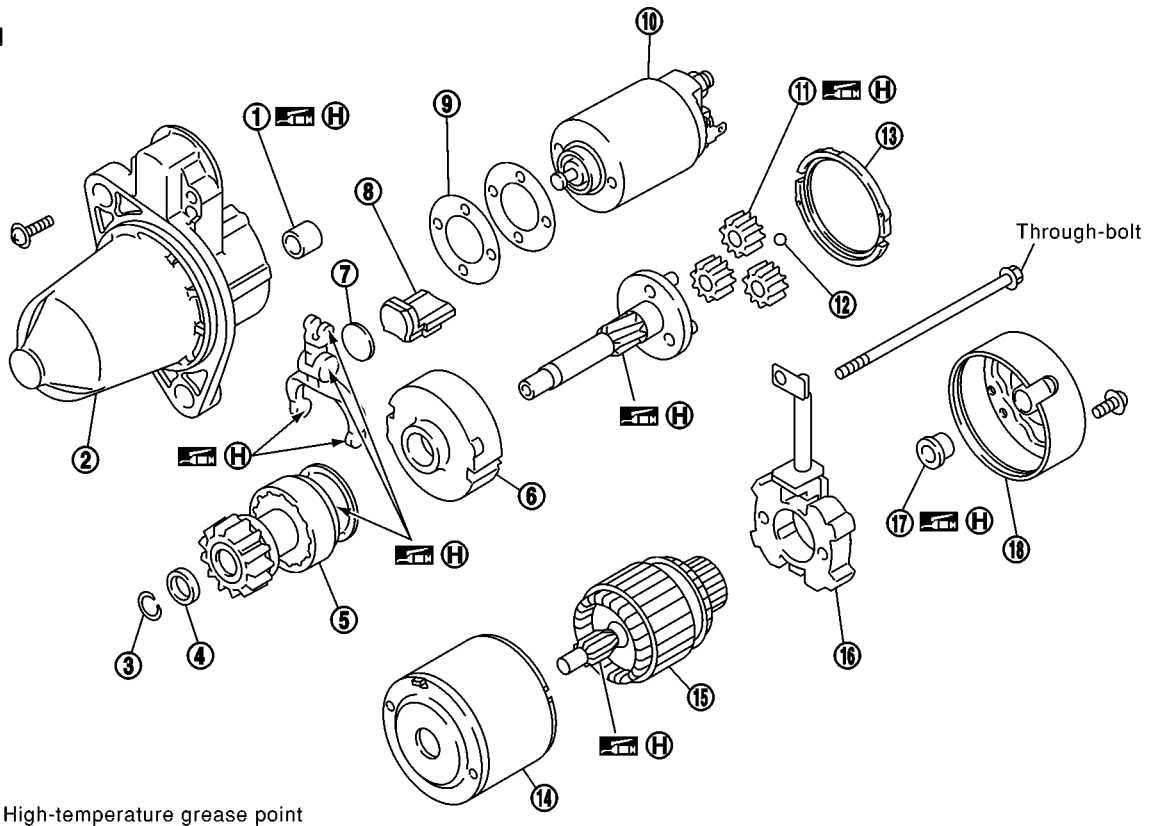
Starter motor mounting bolt:

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

## Disassembly and Assembly

EKS00410

SEC. 233  
MOT87081



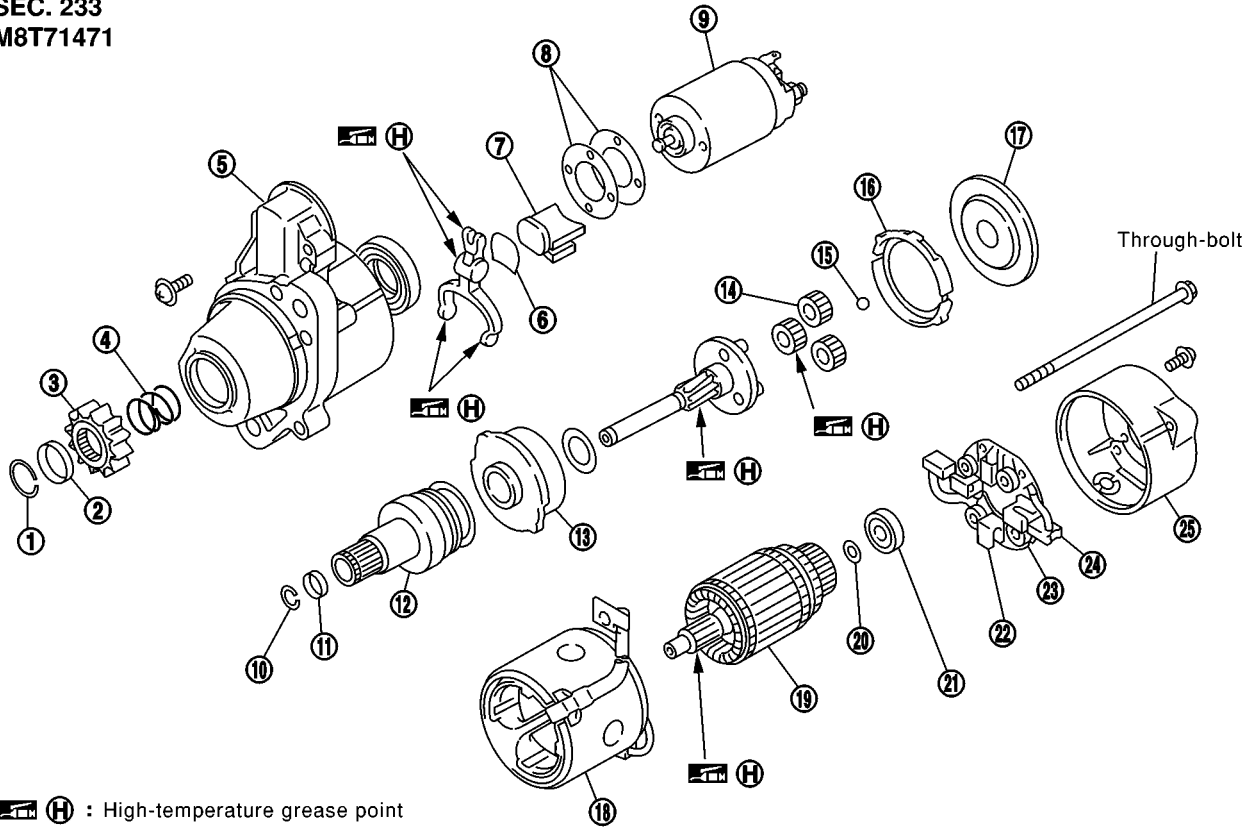
PKIA0464E

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

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# STARTING SYSTEM

SEC. 233  
M8T71471



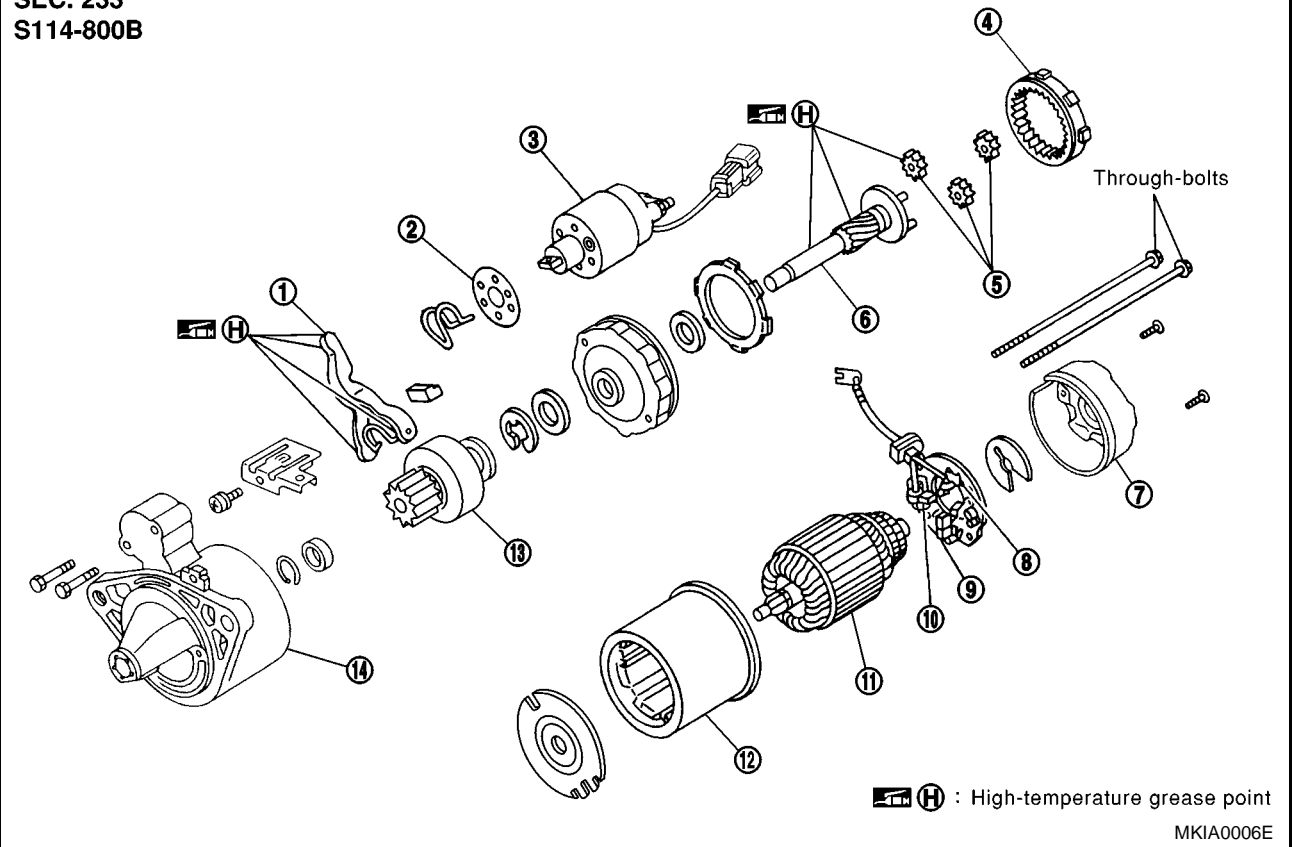
(H) : High-temperature grease point

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



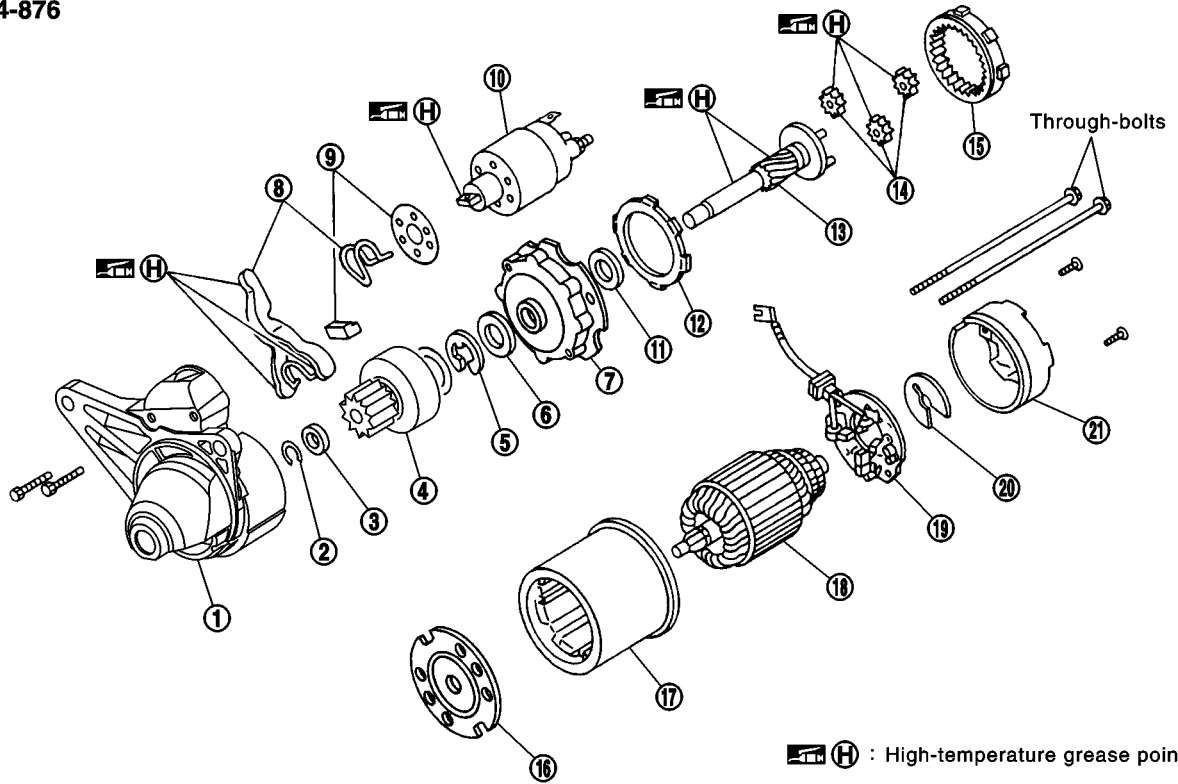
- |                     |                    |                             |
|---------------------|--------------------|-----------------------------|
| 1. Shift lever      | 2. Adjusting plate | 3. Magnetic switch assembly |
| 4. Internal gear    | 5. Planetary gear  | 6. Pinion shaft             |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

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# STARTING SYSTEM

SEC. 233  
S114-876



 H : High-temperature grease point

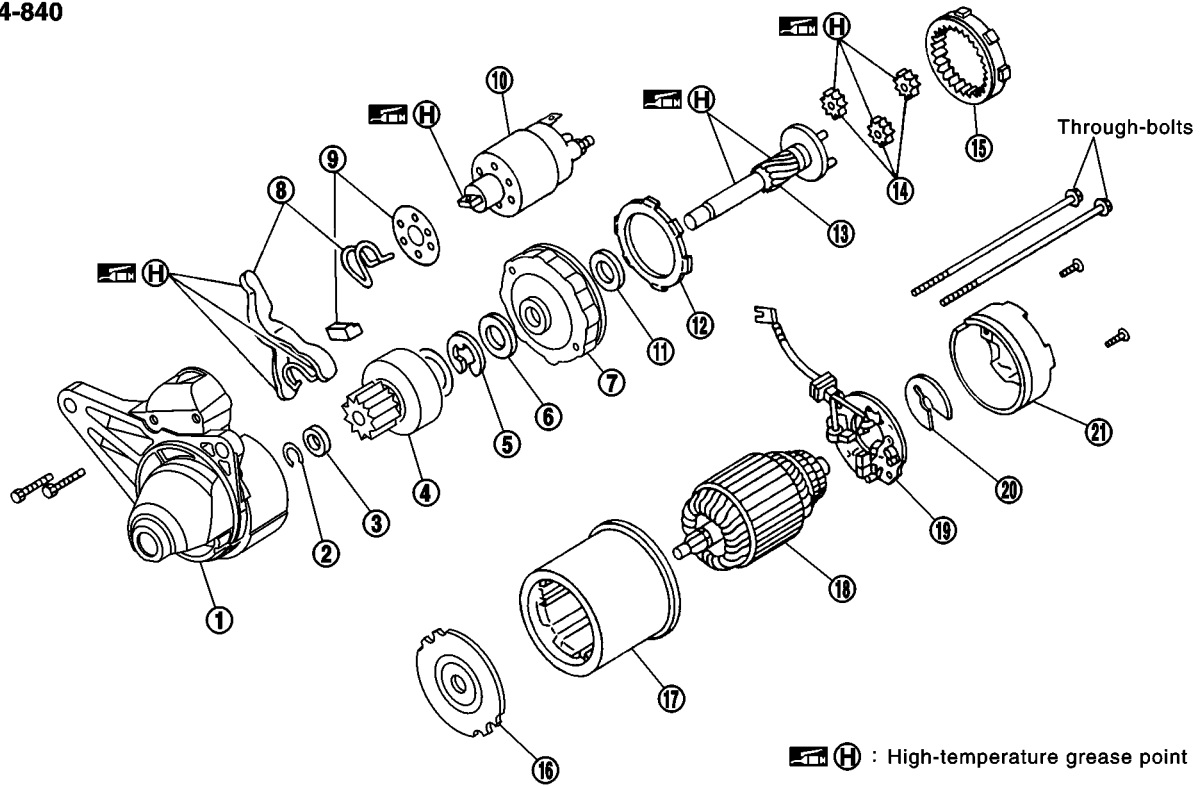
MKIA0007E

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

(H) : High-temperature grease point

MKIA0008E

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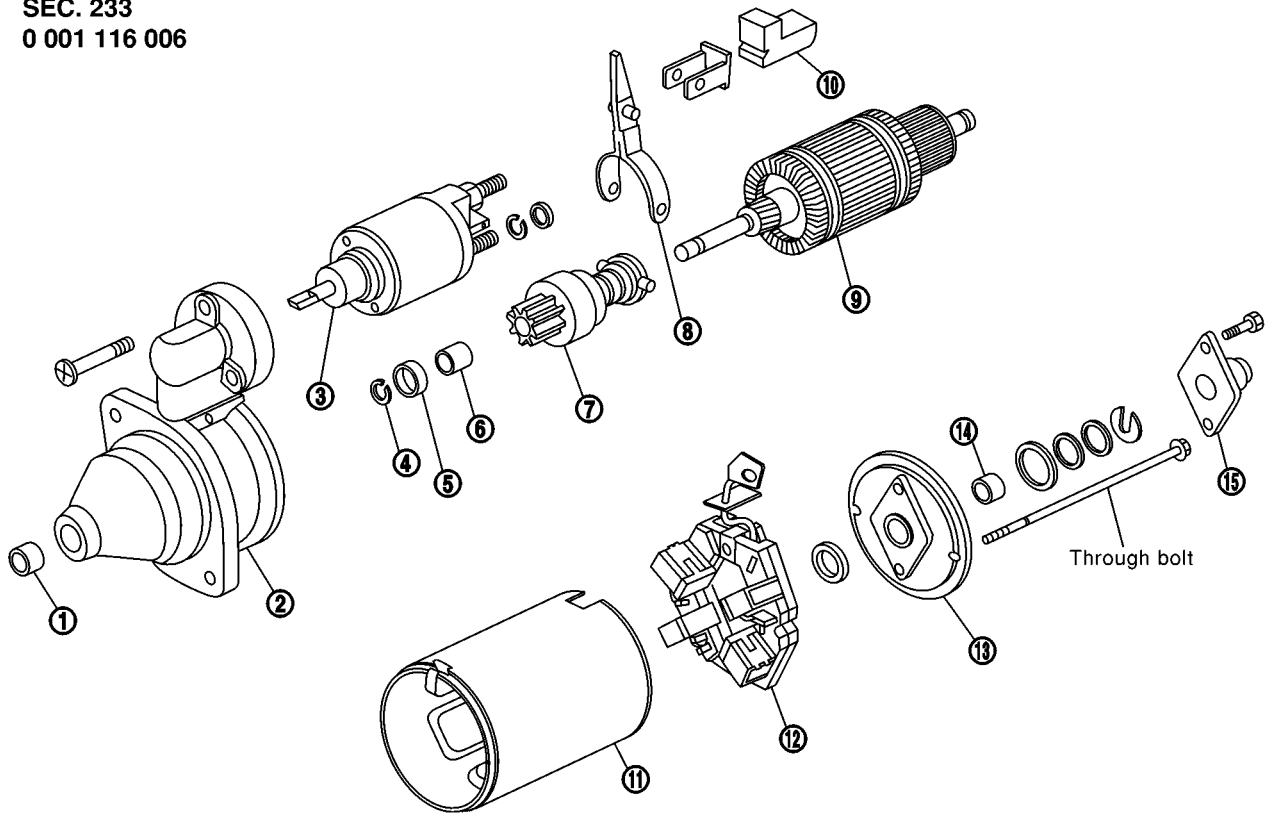
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# STARTING SYSTEM

SEC. 233  
0 001 116 006

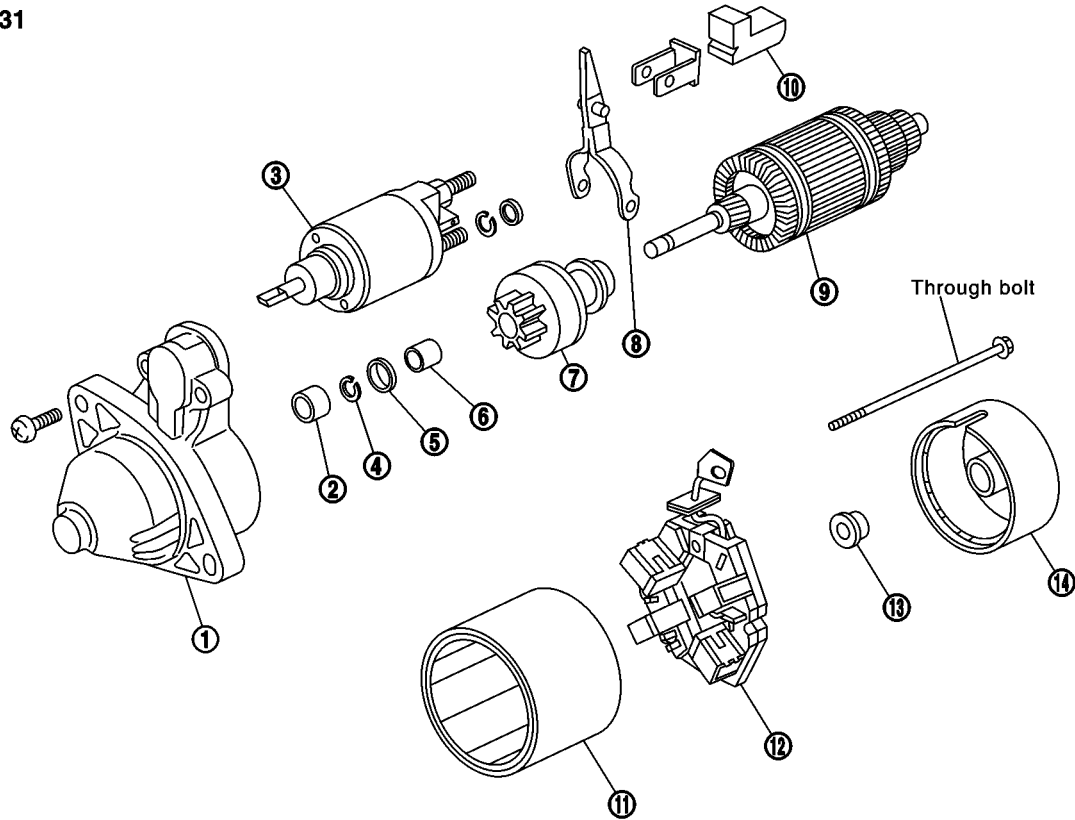


MKIA0009E

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



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

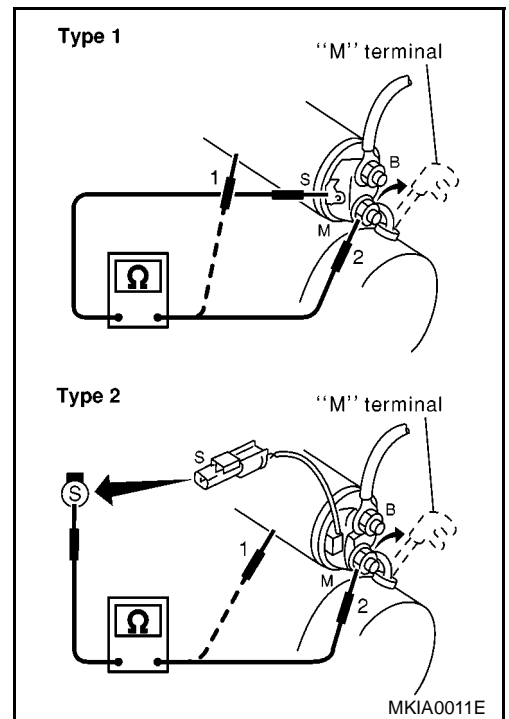
### MAGNETIC SWITCH CHECK

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

EKS0041P

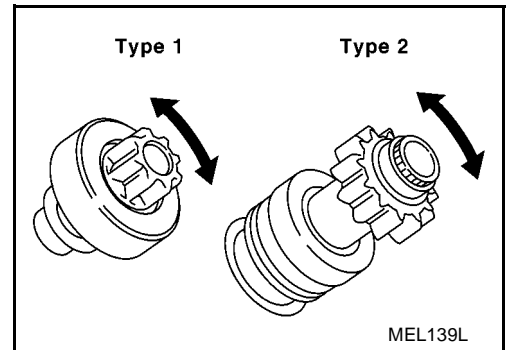
# STARTING SYSTEM

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

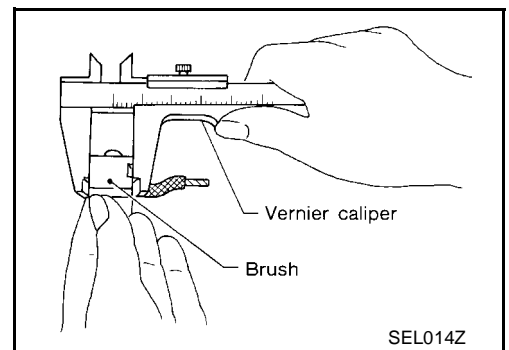
### Brush

Check wear of brush.

**Wear limit length**

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

- Excessive wear ... Replace.



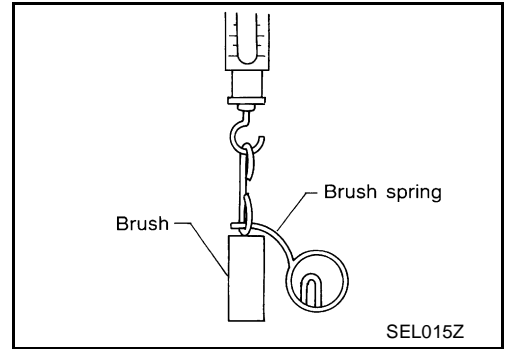
# STARTING SYSTEM

## Brush Spring Check

Check brush spring pressure with brush spring detached from brush.

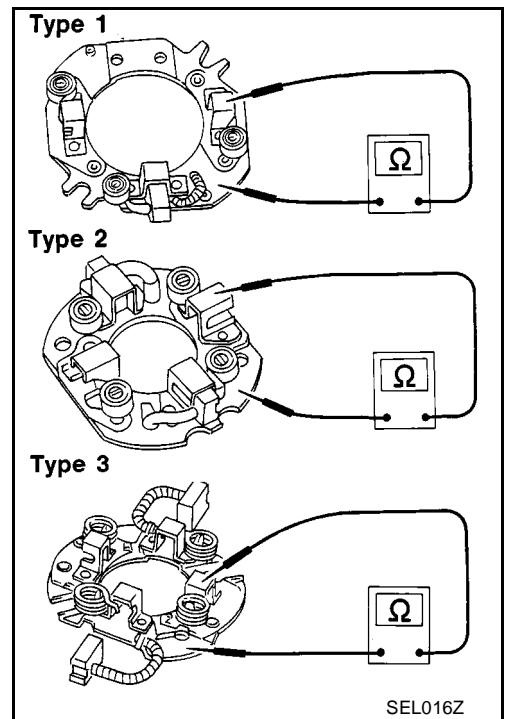
**Spring pressure (with new brush)** : Refer to SDS. [SC-41](#). ["Starter"](#) .

- 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.

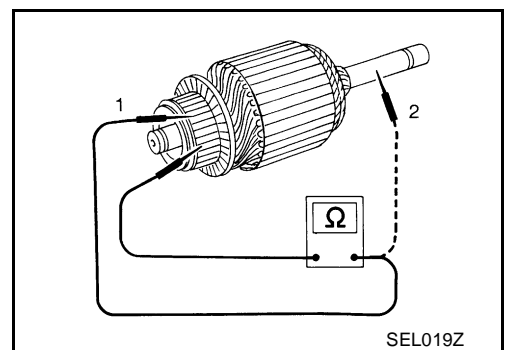


## YOKE CHECK

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:

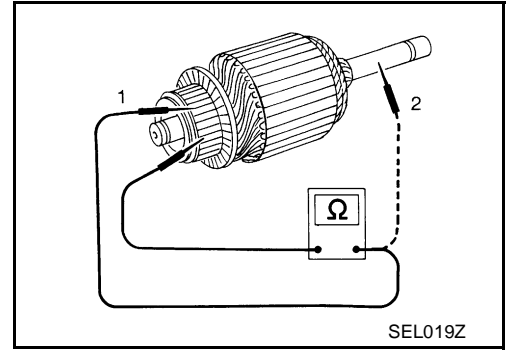
**Do not clamp yoke in a vice or strike it with a hammer.**



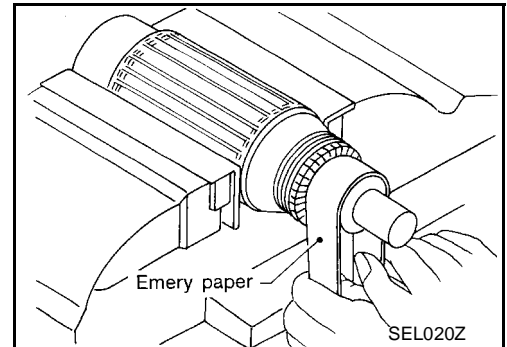
# STARTING SYSTEM

## 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.



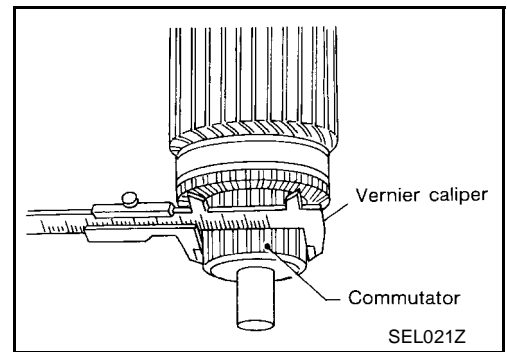
3. Check commutator surface.
  - Rough ... Sand lightly with No. 500 - 600 emery paper.



4. Check diameter of commutator.

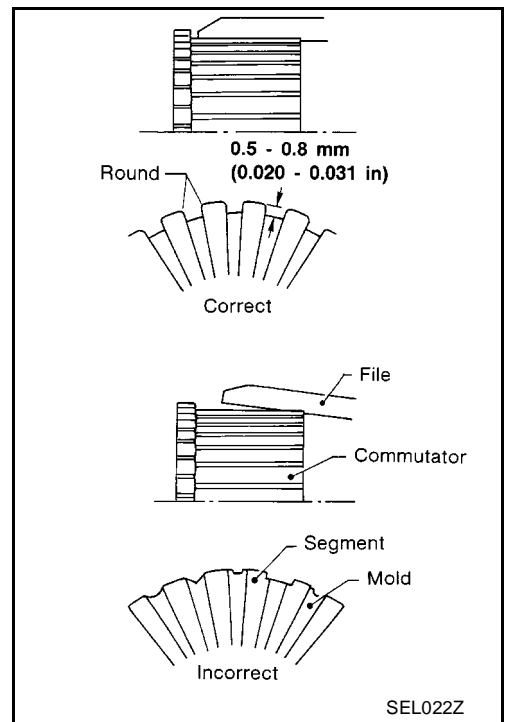
**Commutator minimum diameter** : Refer to SDS. [SC-41, "Starter"](#) .

- Less than specified value ... Replace.



# 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.

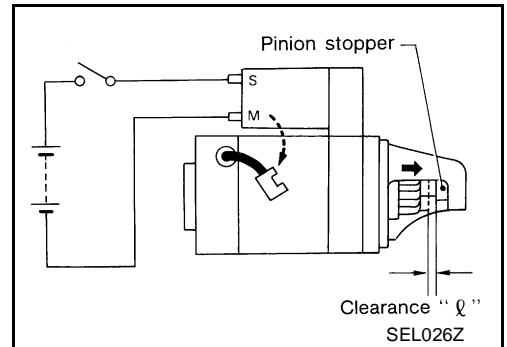
### PINION PROTRUSION LENGTH ADJUSTMENT

#### Clearance (QG and QR Engine Models)

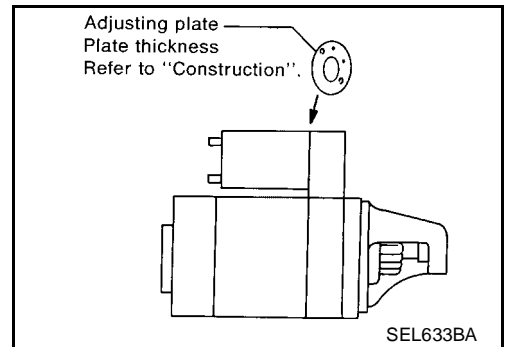
With pinion driven out by magnetic switch, push pinion back to remove slack and measure clearance "ℓ" between the front edge of the pinion and the pinion stopper.

Clearance "ℓ"

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



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



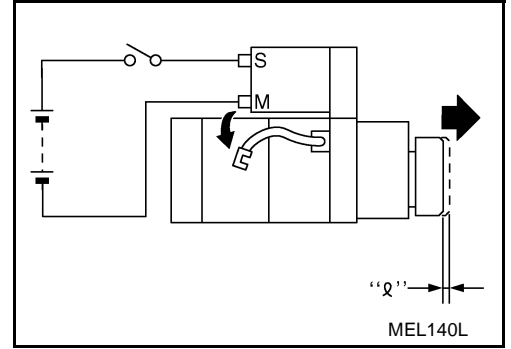
# STARTING SYSTEM

## Movement (YD Engine Models)

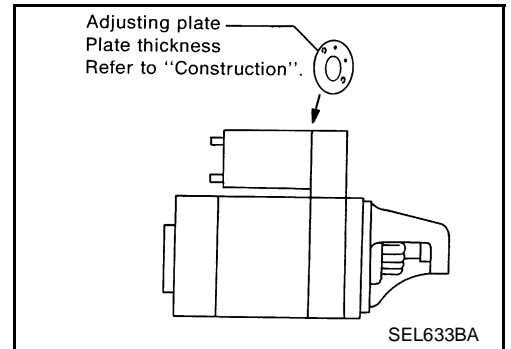
Compare movement “ $l$ ” in height of pinion when it is pushed out with magnetic switch energized and when it is pulled out by hand until it touches stopper.

**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 145
	Revolution rpm	More than 2,300	More than 2,700	More than 2,500
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 pinion 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	11.0
	Current A	Less than 48	Less than 45	Less than 90
	Revolution rpm	More than 5,800	More than 12,000	More than 2,700
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

EKS0041T

Type	LR1110-717	LR180-768	A3TA6581AKD
	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