

A
B
C

SECTION SC

STARTING & CHARGING SYSTEM

CONTENTS

<p>PRECAUTIONS 3</p> <p> Precautions for Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER" 3</p> <p>PREPARATION 4</p> <p> Special Service Tools 4</p> <p>BATTERY 5</p> <p> How to Handle Battery 5</p> <p> METHODS OF PREVENTING OVER-CHARGE 5</p> <p> CHECKING ELECTROLYTE LEVEL 5</p> <p> SPECIFIC GRAVITY CHECK 6</p> <p> Battery Test and Charging Chart 7</p> <p> CHART I 7</p> <p> CHART II 8</p> <p> A: SLOW CHARGE 9</p> <p> B: STANDARD CHARGE 10</p> <p> C: QUICK CHARGE 12</p> <p> Removal and Installation 13</p> <p>CHARGING SYSTEM 14</p> <p> System Description 14</p> <p> Wiring Diagram — CHARGE — 15</p> <p> VQ ENGINE MODELS 15</p> <p> YD ENGINE MODELS 17</p> <p> Trouble Diagnosis 18</p> <p> DIAGNOSIS PROCEDURE 18</p> <p> PRE-DIAGNOSIS INSPECTION 18</p> <p> DIAGNOSIS CHART BY SYMPTOM 18</p> <p> INSPECTION FLOW BY CHARGE WARNING LAMP 18</p> <p> CHARGE WARNING LAMP LINE INSPECTION.. 19</p> <p> VOLTAGE DETECTION LINE AND CHARGE WARNING LAMP INSPECTION 20</p> <p> INSPECTION OF INSUFFICIENT ALTERNATOR POWER GENERATION 22</p> <p> INSPECTION OF EXCESSIVE ALTERNATOR POWER GENERATION 22</p> <p> DARK CURRENT INSPECTION 23</p> <p> OPERATION PROCEDURE OF CURRENT MEASUREMENT PROBE FOR CONSULT-II 24</p>	<p> Removal and Installation 25</p> <p> REMOVAL (VQ ENGINE MODELS) 25</p> <p> REMOVAL (YD ENGINE MODELS) 25</p> <p> INSTALLATION 25</p> <p> Disassembly and Assembly 26</p> <p> VQ ENGINE MODELS 26</p> <p> YD ENGINE MODELS 27</p> <p> Disassembly 27</p> <p> REAR COVER 27</p> <p> REAR BEARING 27</p> <p> Inspection 28</p> <p> ROTOR CHECK 28</p> <p> BRUSH CHECK 28</p> <p> PULLEY CHECK (WITH CLUTCH TYPE) 28</p> <p> STATOR CHECK 28</p> <p> Assembly 29</p> <p> RING FITTING IN REAR BEARING 29</p> <p> REAR COVER INSTALLATION 29</p> <p>STARTING SYSTEM 30</p> <p> System Description 30</p> <p> A/T MODELS 30</p> <p> M/T MODELS 30</p> <p> Wiring Diagram — START — / VQ Engine Models.. 31</p> <p> A/T MODELS 31</p> <p> M/T MODELS 32</p> <p> Wiring Diagram — START — / YD Engine Models.. 33</p> <p> A/T MODELS 33</p> <p> M/T MODELS 34</p> <p> Trouble Diagnoses 35</p> <p> Removal and Installation 36</p> <p> REMOVAL (VQ ENGINE MODELS) 36</p> <p> REMOVAL (YD ENGINE MODELS) 37</p> <p> INSTALLATION 37</p> <p> Disassembly and Assembly 38</p> <p> VQ ENGINE MODELS 38</p> <p> YD ENGINE MODELS 39</p> <p> Inspection 39</p> <p> MAGNETIC SWITCH CHECK 39</p> <p> PINION/CLUTCH CHECK 40</p> <p> BRUSH CHECK 40</p>
--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

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

SC

YOKE CHECK	41	SERVICE DATA AND SPECIFICATIONS (SDS)	44
ARMATURE CHECK	42	Battery	44
Assembly	43	Starter	44
PINION PROTRUSION LENGTH ADJUST- MENT	43	Alternator	44

PRECAUTIONS

PRECAUTIONS

PF:00011

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

GKS000RS

The Supplemental Restraint System such as “AIR BAG” and “SEAT BELT PRE-TENSIONER”, used along with a front seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. Information necessary to service the system safely is included in the SRS and SB section of this Service Manual.

WARNING:

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

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

SC

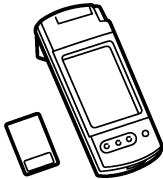
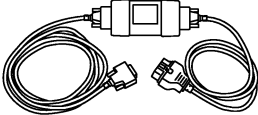
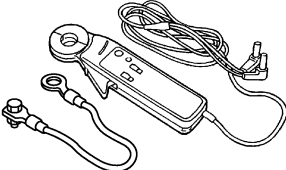
PREPARATION

PREPARATION

PF0:00002

Special Service Tools

GKS000RU

Tool name	Description
<p>CONSULT-II unit, and Program card</p>  <p>PBIA3527J</p>	
<p>CONSULT-II CONVERTER</p>  <p>PBIA3526J</p>	<p>System diagnose and inspection</p>
<p>Current measurement probe for CONSULT-II EG1187 1900</p>  <p>MKIA0065E</p>	

BATTERY

BATTERY

PF0:00011

How to Handle Battery

GKS000RV

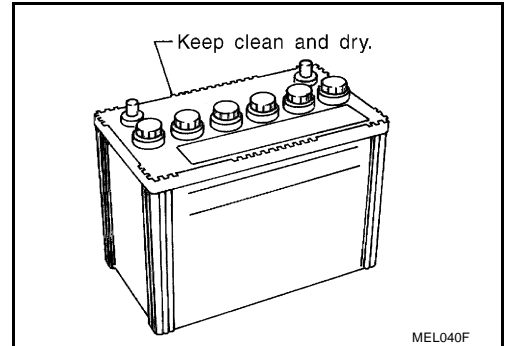
CAUTION:

- 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.

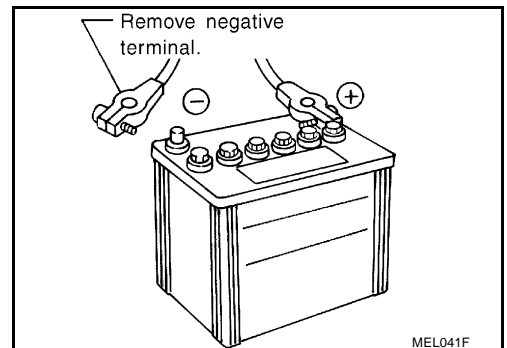
METHODS OF PREVENTING OVER-DISCHARGE

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

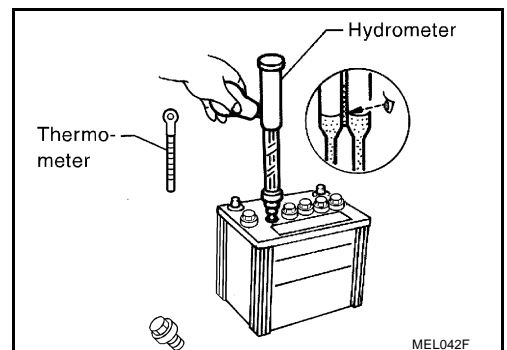
- The battery surface (particularly its top) should always be kept clean and dry.
- The terminal connections should be clean and tight.
- At every routine maintenance, check the electrolyte level. This also applies to batteries designated as "low maintenance" and "maintenance-free".



- 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

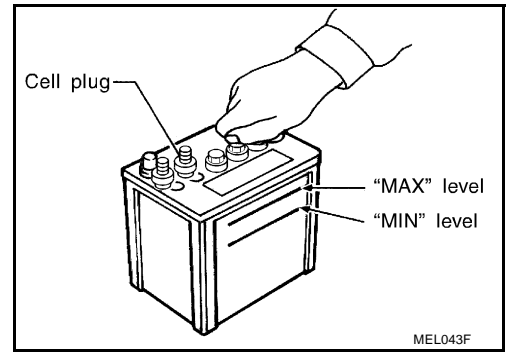
WARNING:

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.

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

BATTERY

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

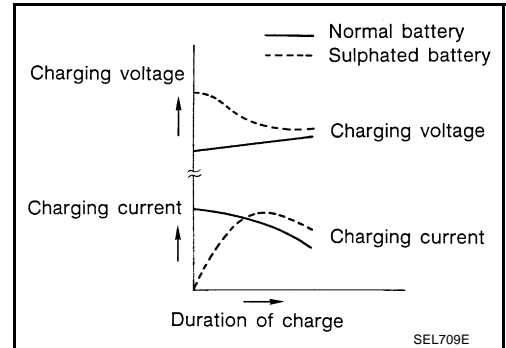


Sulphation

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.

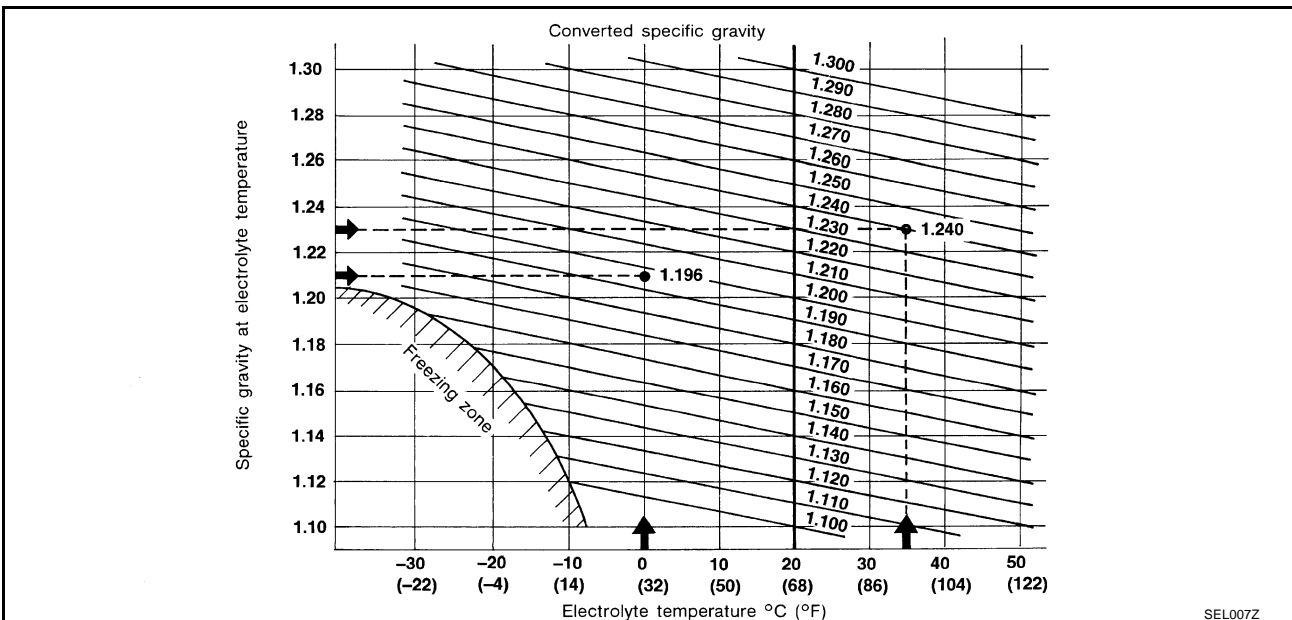
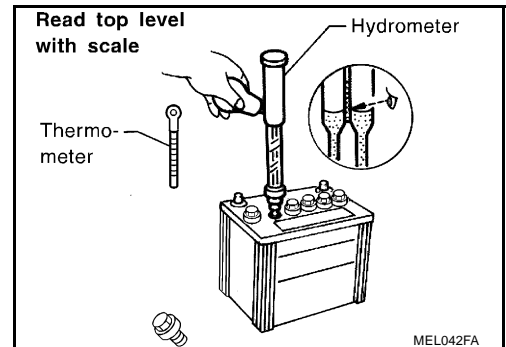


SPECIFIC GRAVITY CHECK

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

Example:

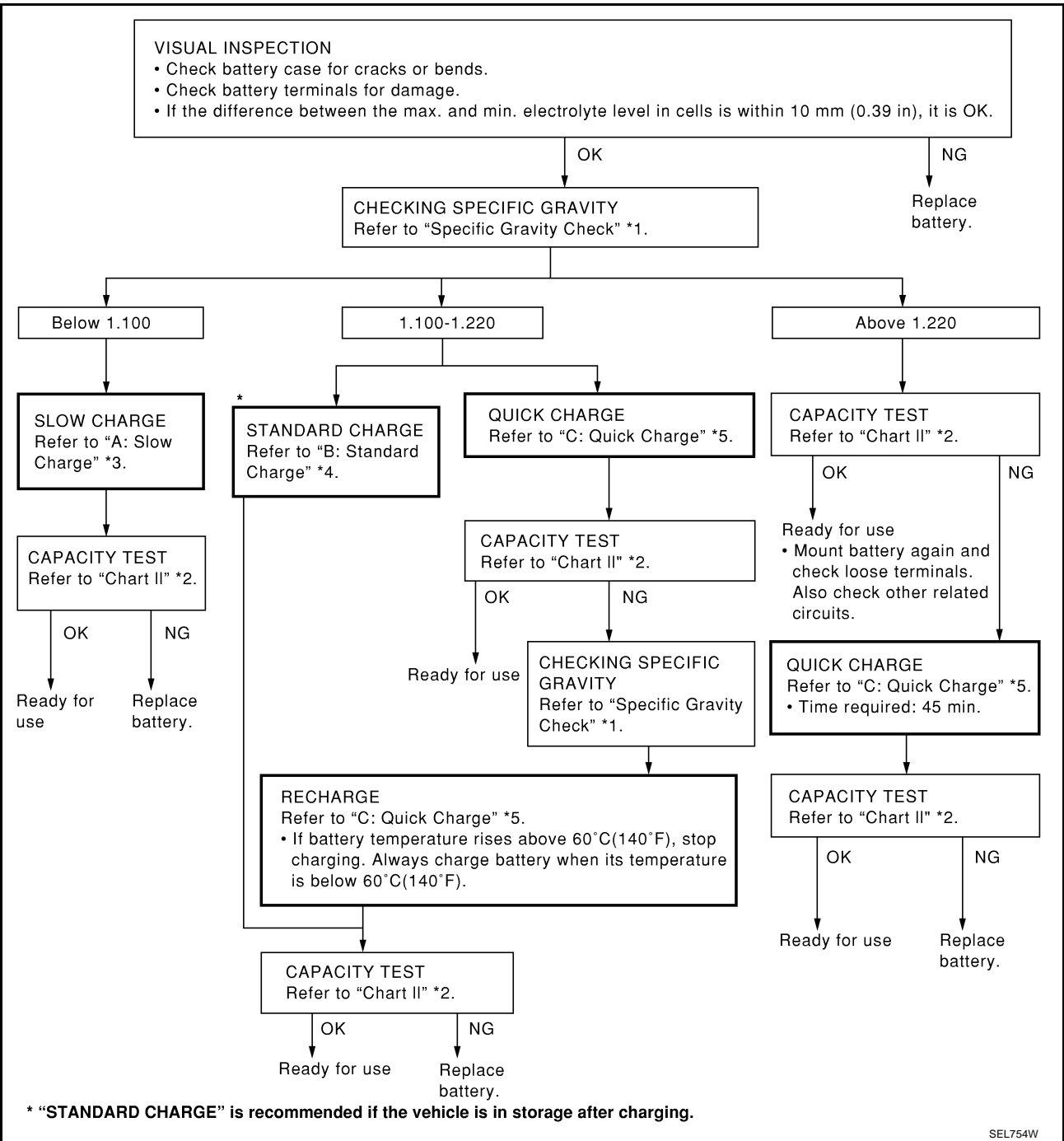
- When electrolyte temperature is 35°C (95°F) and specific gravity of electrolyte is 1.230, converted specific gravity at 20°C (68°F) is 1.240.
- When electrolyte temperature is 0°C (32°F) and specific gravity of electrolyte is 1.210, converted specific gravity at 20°C (68°F) is 1.196.



BATTERY

GKS000RW

Battery Test and Charging Chart CHART I



*1. [SC-6](#)

*2. [SC-8](#)

*3. [SC-9](#)

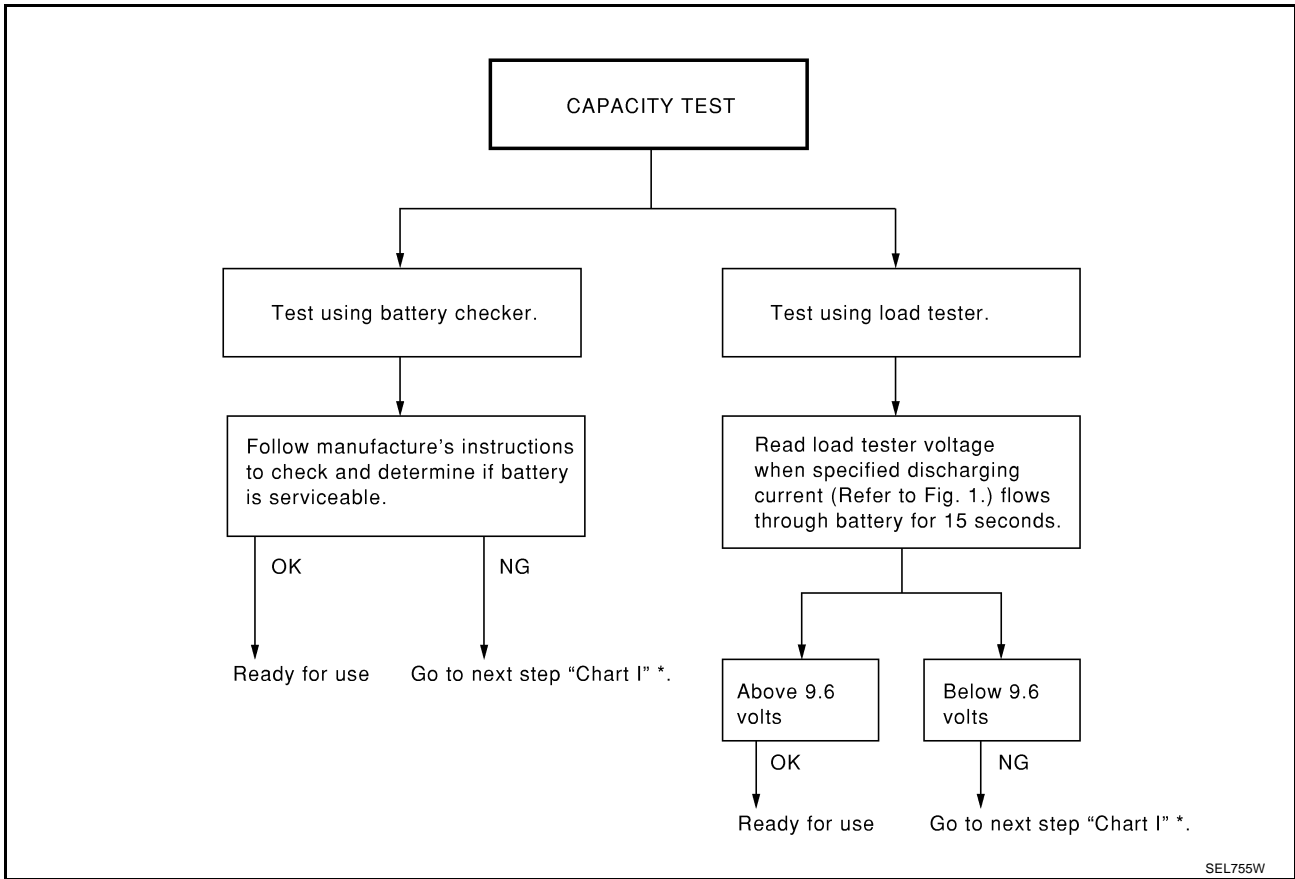
*4. [SC-10](#)

*5. [SC-12](#)

SEL754W

BATTERY

CHART II



*. [SC-7](#)

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

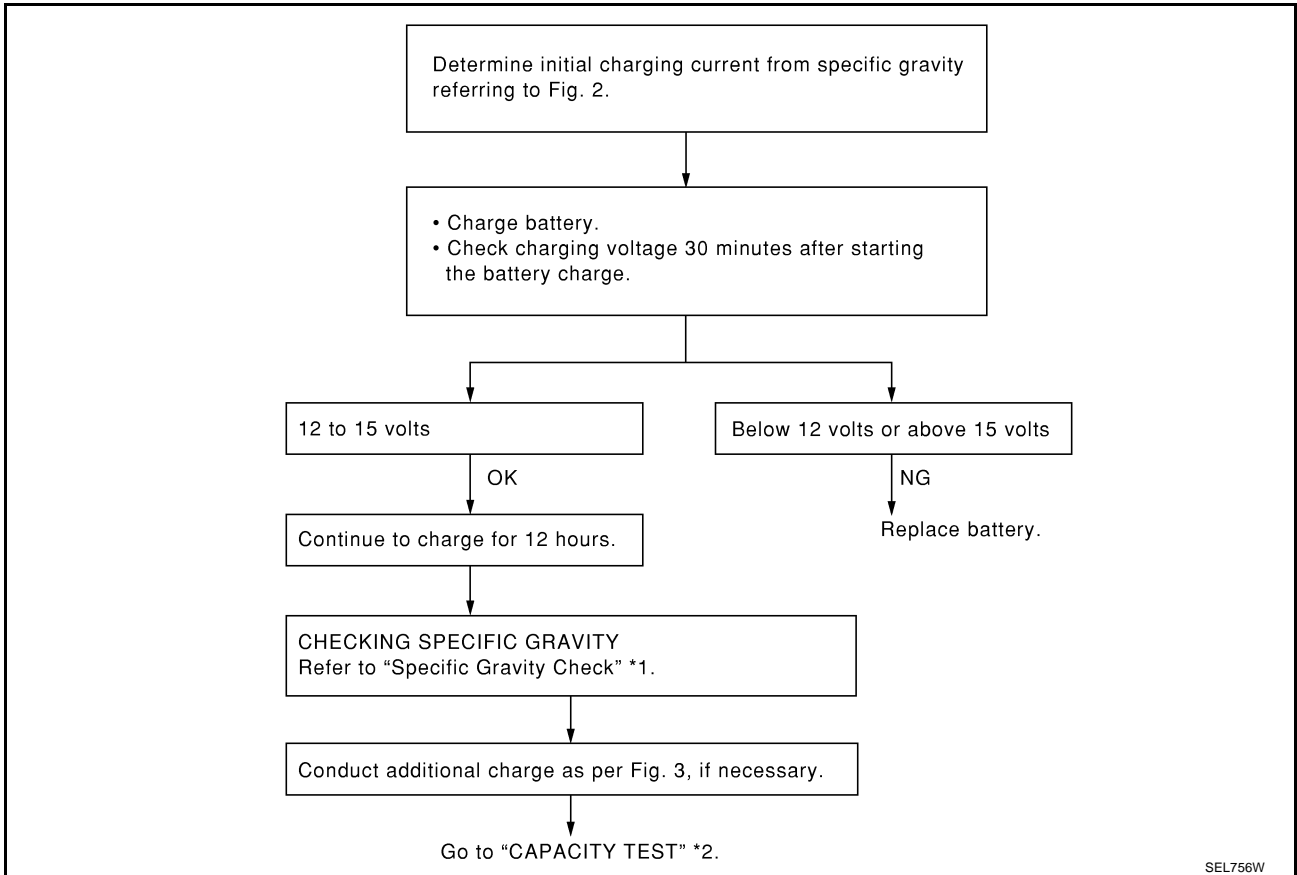
Fig. 1 Discharging Current (Load Tester)

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
L2/580L [EXIDE type code]	350
096 [YUASA type code]	375
096 [YUASA type code]	375
010S [YUASA type code]	360
L3/760L [EXIDE type code]	420

A: SLOW CHARGE



*1. [SC-6](#)

*2. [SC-8](#)

SEL756W

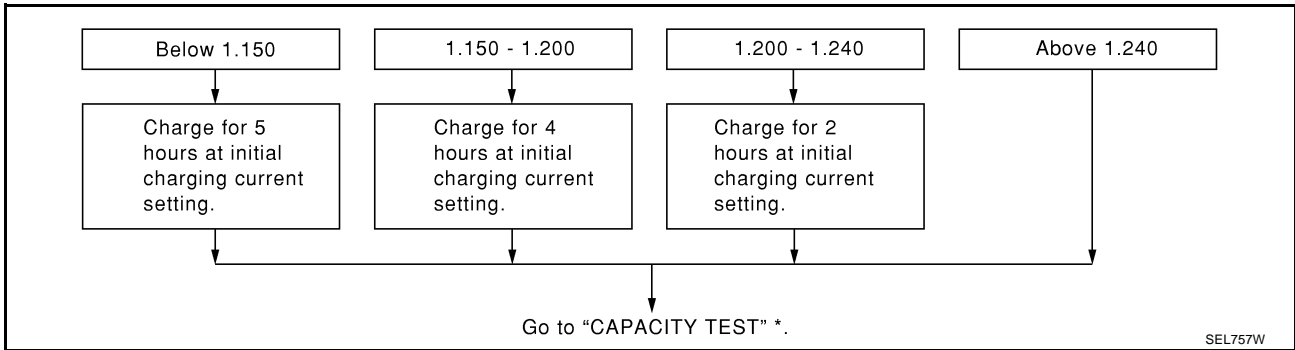
Fig. 2 Initial Charging Current Setting (Slow Charge)

CON- VERTED SPECIFIC GRAVITY	BATTERY TYPE																							
	28B19R(L)	34B19R(L)	L2/580L [EXIDE type code]	46B24R(L)	55B24R(L)	L3/760L [EXIDE type code]	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)

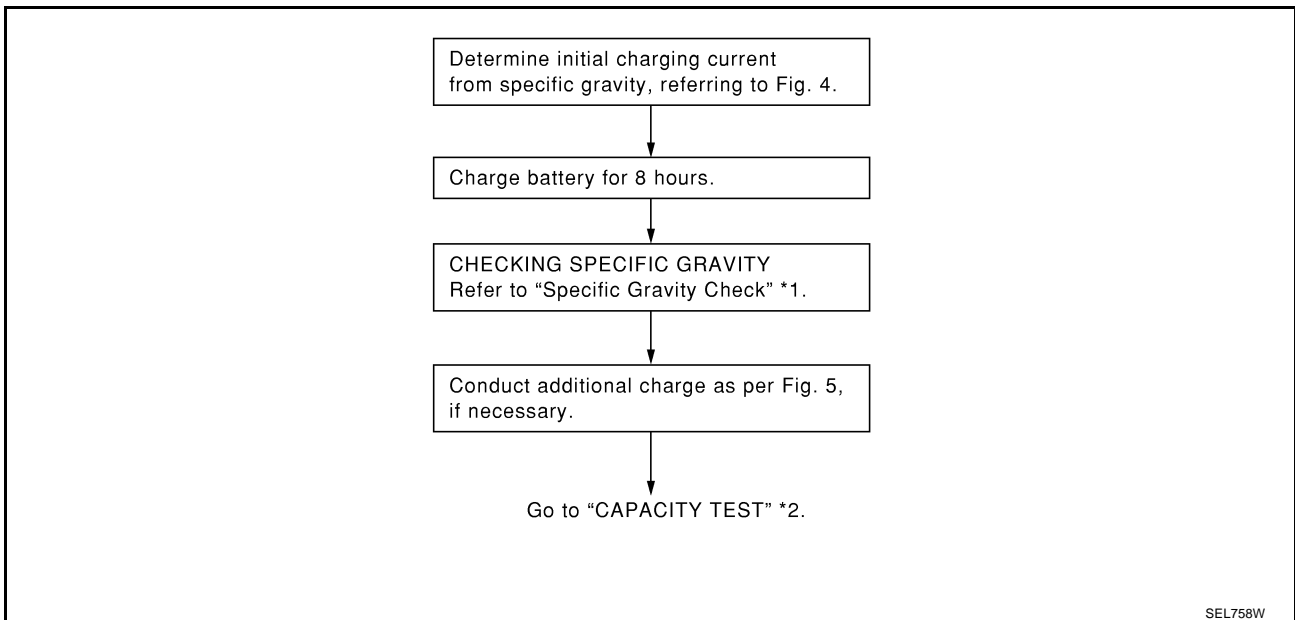


*. [SC-8](#)

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-6](#)

*2. [SC-8](#)

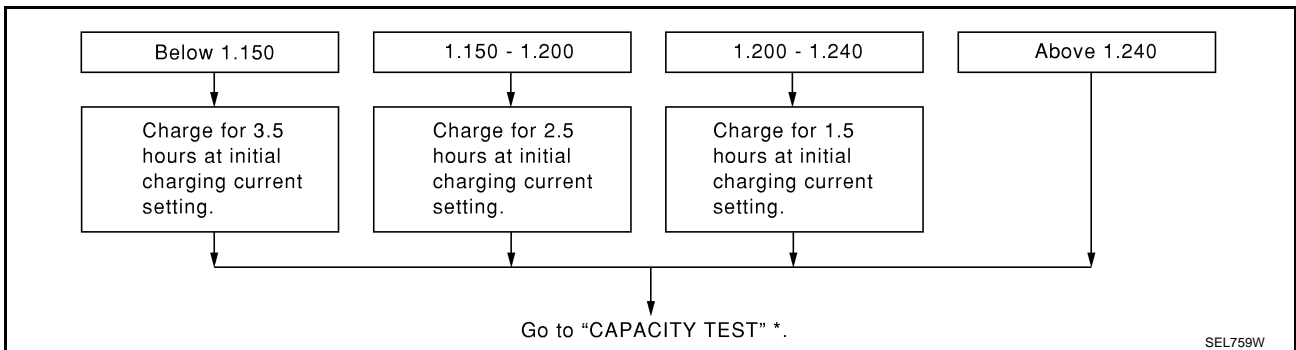
BATTERY

Fig. 4 Initial Charging Current Setting (Standard Charge)

CONVERTED 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]	L2/580L [EXIDE type code]	096L [YUASA type code]	010S [YUASA type code]	L3/760L [EXIDE 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)



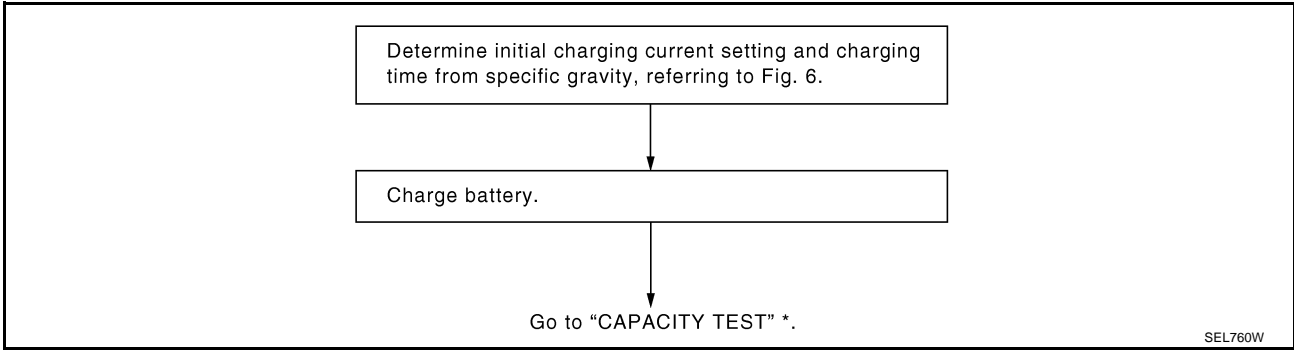
*: [SC-8](#)

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-8

SEL760W

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]		L2/580L [EXIDE type code]		096L [YUASA type code]		010S [YUASA type code]		L3/760L [EXIDE type code]		75D31R(L)		95D31R(L)		115D31R(L)		110D26R(L)		95E41R(L)		130E41R(L)	
	CURRENT [A]	10 (A)		15 (A)		20 (A)		25 (A)		30 (A)		40 (A)																																						
CONVERTED SPECIFIC GRAVITY	1.100 - 1.130	2.5 hours																																																
	1.130 - 1.160	2.0 hours																																																
	1.160 - 1.190	1.5 hours																																																
	1.190 - 1.220	1.0 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

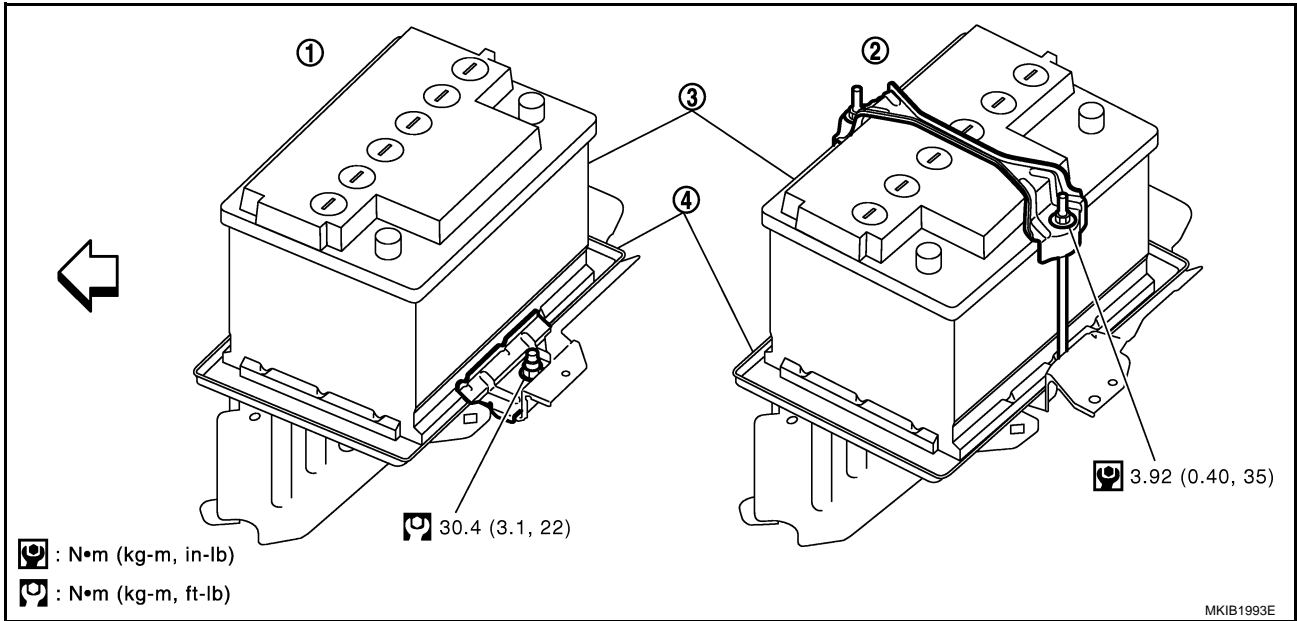
GKS000RX

Removal and Installation

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 as shown in figure.



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

CHARGING SYSTEM

CHARGING SYSTEM

PFP:00011

System Description

GKS000RY

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 through:

- 15A fuse (No. 30, located in the fuse and fusible link box).

Terminal 1 supplies power to charge the battery and operate the vehicle's electrical system. Output voltage is controlled by the IC regulator at terminal 4 detecting the input voltage. The charging circuit is protected by the 140A fusible link (letter "A", located in the fuse and fusible link box) .

The alternator is grounded to the engine block.

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

- 10A fuse [No. 14, located in the fuse block (J/B)]
- to combination meter terminal 16 for the charge warning lamp.

Ground is supplied With power and ground supplied

- to terminal 2 of the combination meter
- through terminal 3 of the alternator.

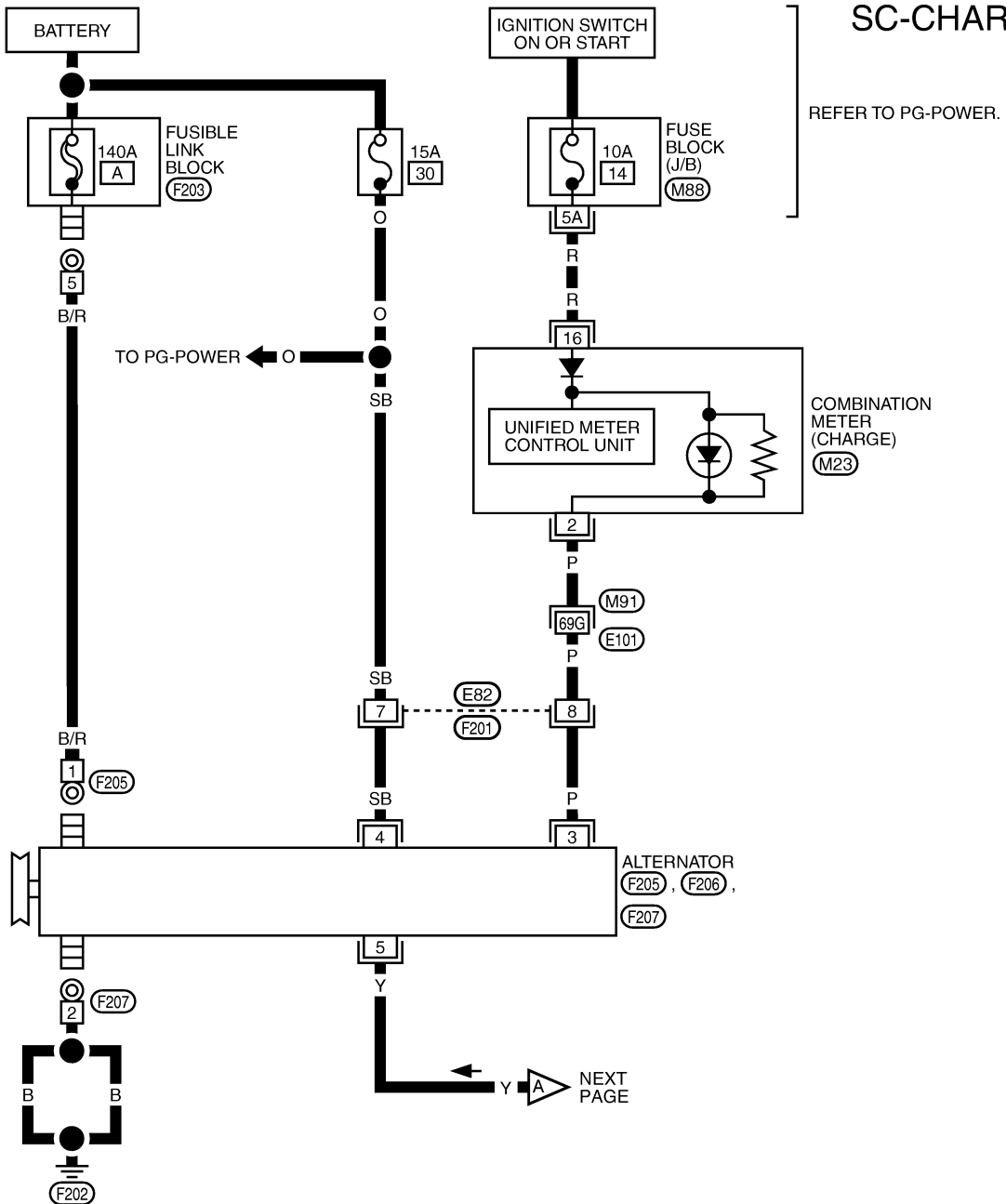
If the charge warning lamp illuminates with the engine running, a fault is indicated.

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.

CHARGING SYSTEM

GKS000RZ

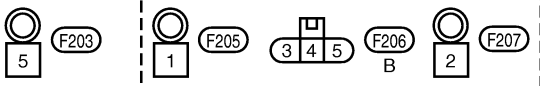
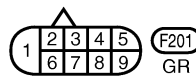
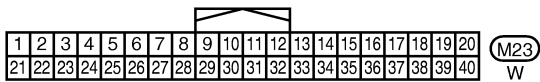
Wiring Diagram — CHARGE — VQ ENGINE MODELS



SC-CHARGE-01

REFER TO PG-POWER.

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



REFER TO THE FOLLOWING.

(M91) - SUPER MULTIPLE JUNCTION (SMJ)

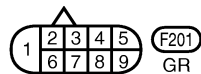
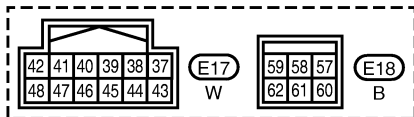
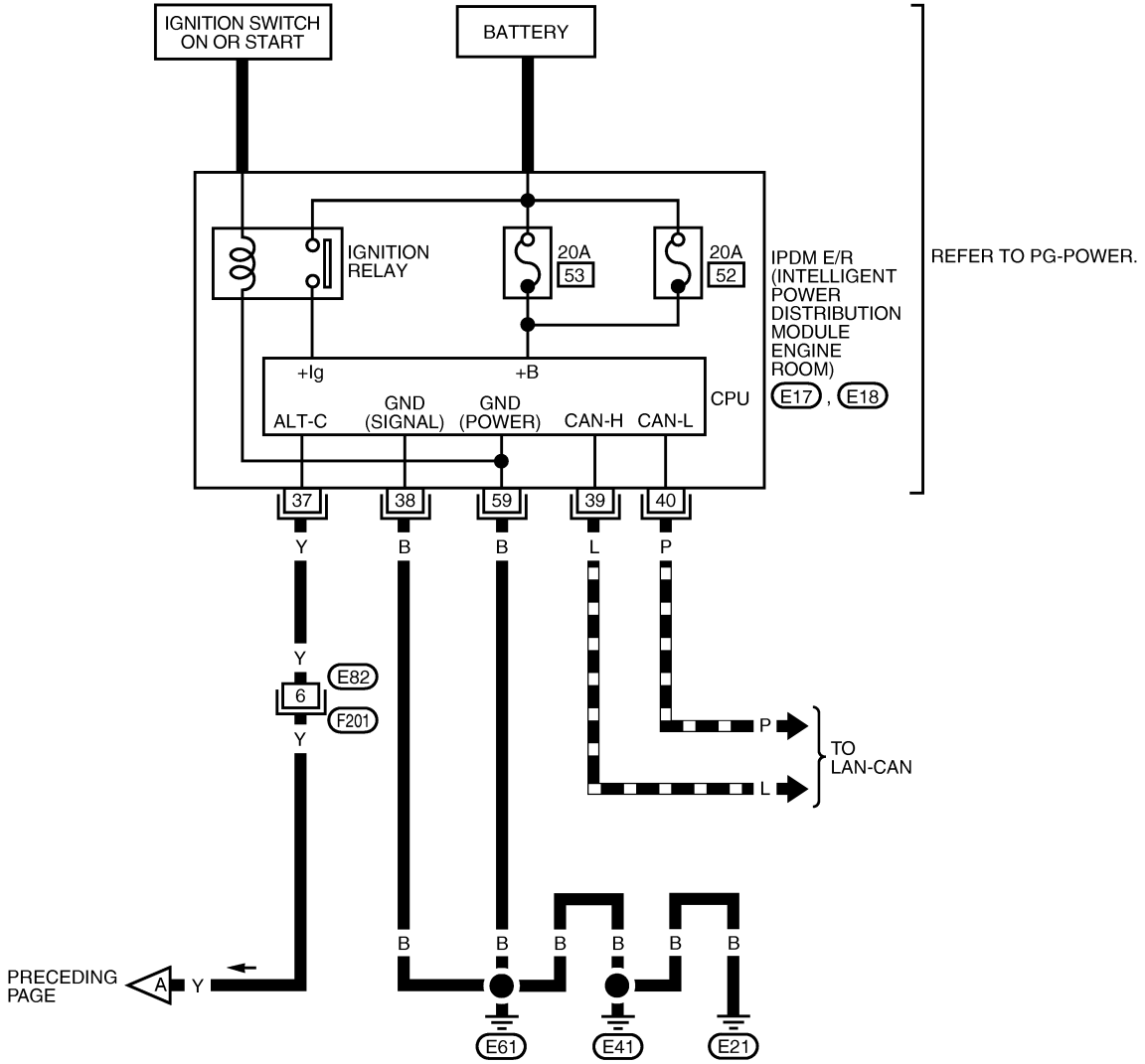
(M88) - FUSE BLOCK - JUNCTION BOX (J/B)

MKWA4228E

CHARGING SYSTEM

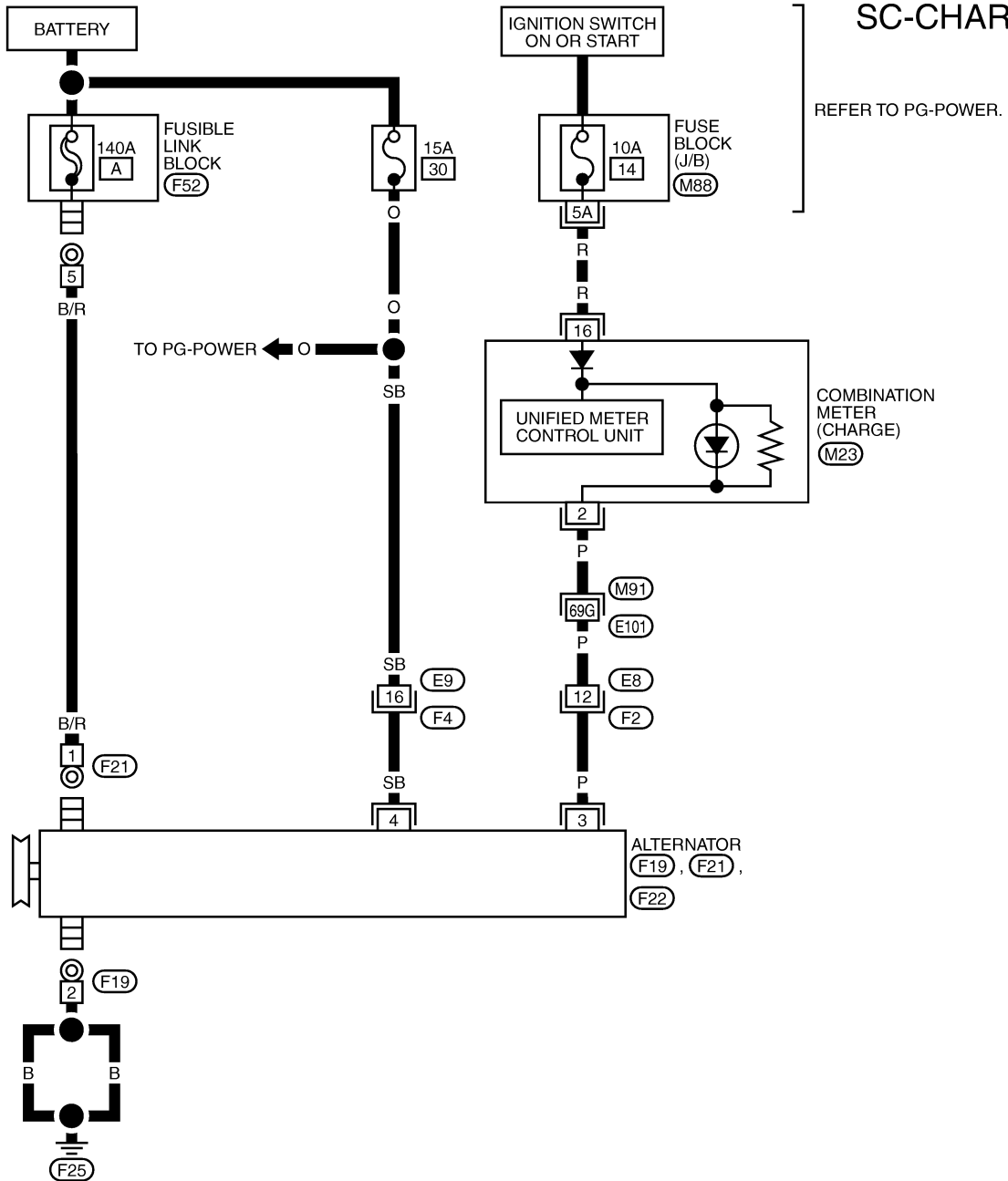
SC-CHARGE-02

▬ : DATA LINE

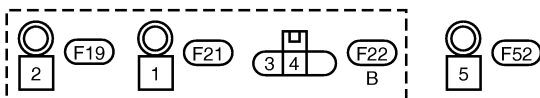
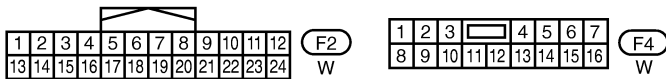
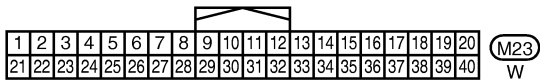


CHARGING SYSTEM

YD ENGINE MODELS



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



REFER TO THE FOLLOWING.

(M91) - SUPER MULTIPLE JUNCTION (SMJ)

(M88) - FUSE BLOCK - JUNCTION BOX (J/B)

CHARGING SYSTEM

GKS000S0

Trouble Diagnosis DIAGNOSIS PROCEDURE

1. Check malfunction symptoms or customer's remarks.
2. Perform pre-diagnosis inspection. Refer to [SC-18, "PRE-DIAGNOSIS INSPECTION"](#) .
3. Perform trouble diagnosis for each trouble symptom. Refer to [SC-18, "DIAGNOSIS CHART BY SYMPTOM"](#)
4. Repair or replace parts indicated inspection flow based on the charge warning lamp. Refer to [SC-18, "INSPECTION FLOW BY CHARGE WARNING LAMP"](#) .
5. End

PRE-DIAGNOSIS INSPECTION

1. Perform alternator belt inspection. Refer to [EM-14, "DRIVE BELTS"](#) (VQ), [EM-156, "DRIVE BELTS"](#) (YD).
2. Inspect battery.
3. Check alternator terminal 1 for loose or improper connection.
4. Check alternator connector 4 and 3 terminals for loose connection, disconnection and bend.
5. Check connecting condition of harness for charging system harness (fusible link terminal and battery terminal).
6. After performing 1 to 5 above, go to trouble diagnosis for symptoms. Refer to [SC-18, "DIAGNOSIS CHART BY SYMPTOM"](#) .

DIAGNOSIS CHART BY SYMPTOM

Symptom	Reference page
Battery discharge	Refer to SC-18, "INSPECTION FLOW BY CHARGE WARNING LAMP" .
Charge warning lamp illuminates.	Refer to SC-18, "INSPECTION FLOW BY CHARGE WARNING LAMP" .
Other than the above symptoms (splashing out of battery fluid, nasty smell and others)	SC-22, "INSPECTION OF EXCESSIVE ALTERNATOR POWER GENERATION" .

INSPECTION FLOW BY CHARGE WARNING LAMP

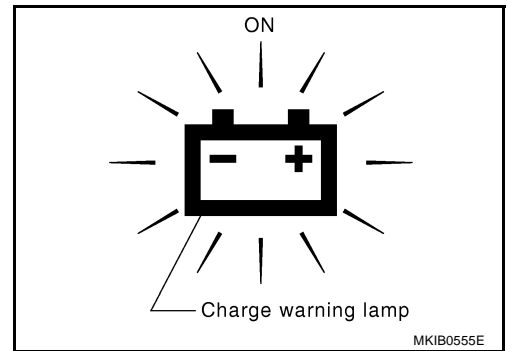
1. CHARGE WARNING LAMP INSPECTION

1. Turn ignition switch ON.
2. Check if charge warning lamp illuminates.

Does charge warning lamp illuminate?

YES >> GO TO 2.

NO >> Go to [SC-19, "CHARGE WARNING LAMP LINE INSPECTION"](#) .



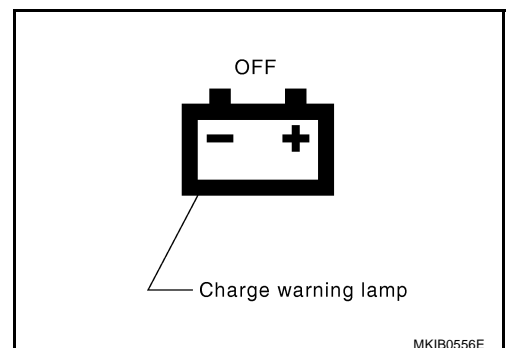
2. CHARGE WARNING LAMP INSPECTION

1. Start engine.
2. Check if charge warning lamp goes off.

Does charge warning lamp goes off?

YES >> GO TO 3.

NO >> Go to [SC-20, "VOLTAGE DETECTION LINE AND CHARGE WARNING LAMP INSPECTION"](#) .



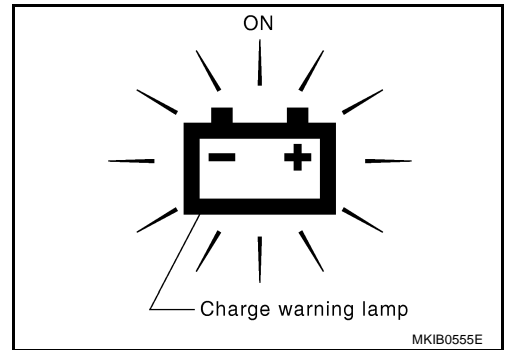
CHARGING SYSTEM

3. CHARGE WARNING LAMP INSPECTION

1. Set engine speed at 2,500 rpm.
2. Check if charge warning lamp illuminates.

Does charge warning lamp illuminate?

- YES >> Go to [SC-22, "INSPECTION OF EXCESSIVE ALTERNATOR POWER GENERATION"](#) .
- NO >> Go to [SC-22, "INSPECTION OF INSUFFICIENT ALTERNATOR POWER GENERATION"](#) .



CHARGE WARNING LAMP LINE INSPECTION

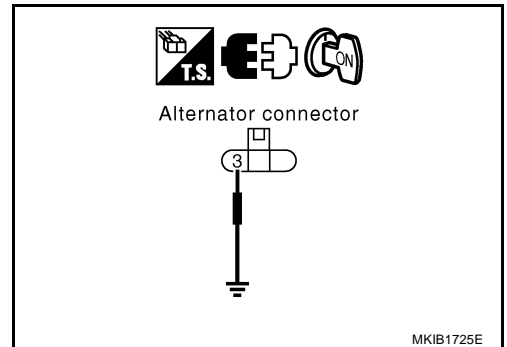
CAUTION:

If open circuit is detected in alternator connector terminal 3, alternator cannot start generating.

INSPECTION PROCEDURE

1. CHARGE WARNING LAMP INSPECTION

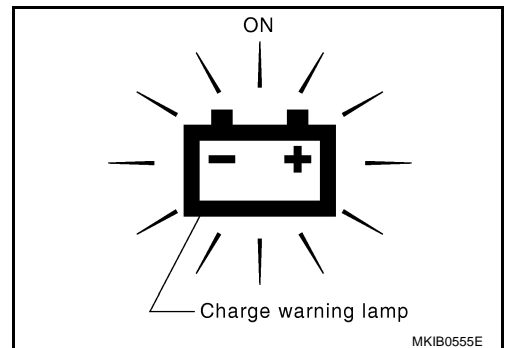
1. Turn ignition switch OFF.
2. Remove alternator connector.
3. Connect alternator connector terminal 3 to ground.



4. Turn ignition switch ON.

Does charge warning lamp illuminate?

- YES >> GO TO 4.
- NO >> GO TO 2.



2. CONNECTOR INSPECTION

1. Turn ignition switch OFF.
2. Check combination meter and terminals (meter side, and harness side) for damage, deformation or improper connection.

OK or NG

- OK >> GO TO 3.
- NG >> Repair terminals and connectors.

CHARGING SYSTEM

3. CONTINUITY INSPECTION

1. Disconnect combination meter connector.
2. Check continuity between combination meter connector terminal 2 and alternator connector terminal 3.

2 - 3 : Continuity should exist.

OK or NG

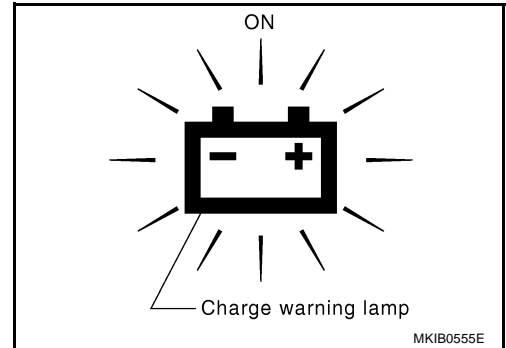
- OK >> Replace combination meter. (Do not replace alternator, since it is normal.)
NG >> Repair the harnesses or connectors. (Do not replace alternator, since it is normal.)

4. CHARGE WARNING LAMP INSPECTION

1. Turn ignition switch OFF.
2. Connect alternator connector.
3. Turn ignition switch ON.

Does charge warning lamp illuminate?

- YES >> Repair alternator connector. (Poor connection and intermittent problem) (Do not replace alternator, since it is normal.)
NO >> Replace alternator. (circuit malfunction in alternator)



VOLTAGE DETECTION LINE AND CHARGE WARNING LAMP INSPECTION

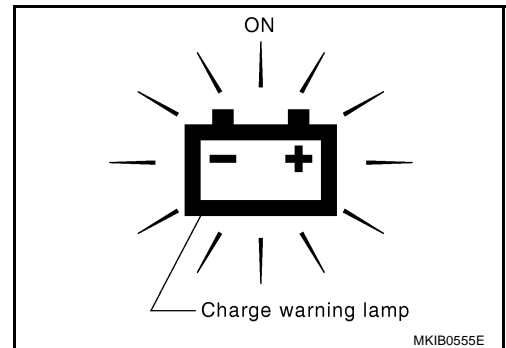
INSPECTION PROCEDURE

1. CHARGE WARNING LAMP INSPECTION

1. Turn ignition switch OFF.
2. Remove alternator connector.
3. Turn ignition switch ON.

Does charge warning lamp stay ON?

- YES >> GO TO 6.
NO >> GO TO 2.



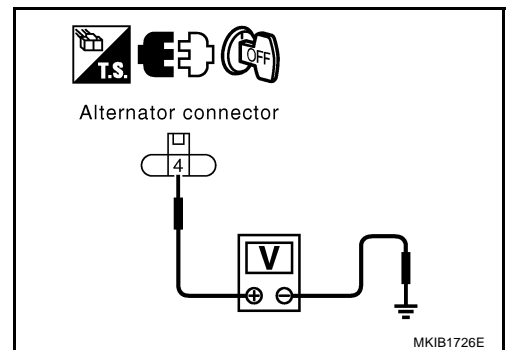
2. VOLTAGE INSPECTION

Check voltage between alternator connector terminal 4 and ground.

4 - Ground : 12V or more

Is the inspection result 12V or more?

- YES >> Replace alternator.
NO >> GO TO 3.



CHARGING SYSTEM

3. CONNECTOR INSPECTION

1. Turn ignition switch OFF.
2. Check alternator connector and terminal 4 (alternator side, and harness side) for damage, deformation or improper connection.

OK or NG

- OK >> GO TO 4.
NG >> Repair terminals and connectors.

4. CHECK FUSE

Check if any of the following fuses in the alternator are blown.

- Check 10A fuse

OK or NG

- OK >> GO TO 5.
NG >> If fuse is blownout, be sure to eliminate cause of malfunction before installing new fuse.

5. CONTINUITY INSPECTION

1. Turn ignition switch OFF.
2. Disconnect combination meter connector.
3. Check continuity between combination meter connector terminal 2 and ground, and combination meter connector terminal 2 and alternator terminal 3.

2 - Ground : Continuity should not exist.

2 - 3 : Continuity should exist.

OK or NG

- OK >> Replace combination meter. (Do not replace alternator, since it is normal.)
NG >> Repair the harnesses or connectors. (Do not replace alternator, since it is normal.)

A

B

C

D

E

F

G

H

I

J

SC

L

M

CHARGING SYSTEM

INSPECTION OF INSUFFICIENT ALTERNATOR POWER GENERATION

CAUTION:

Check them using charged battery performed battery inspection.

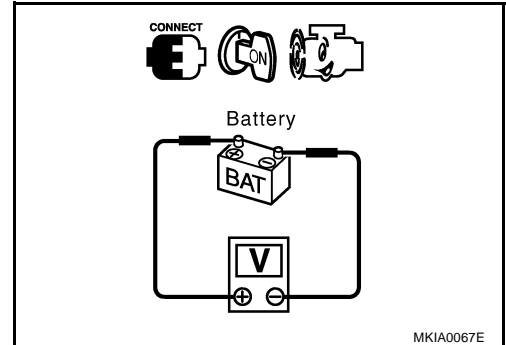
1. VOLTAGE INSPECTION

1. Increase engine speed to 2,500 rpm.
2. Turn electrical load to ON. (Headlamp LO turns on, blower fan motor maximum airflow amount)
3. Check battery voltage.

Is the inspection result 12.8V to 15.1V?

YES >> GO TO 2.

NO >> Replace alternator. (Alternator power generation error.)



2. CURRENT INSPECTION

1. Turn ignition switch OFF.
2. Disconnect the battery ground cable.
3. Attach current measurement probe for CONSULT-II to the harness for alternator terminal B. (If the probe can not be attached properly, then connect the sub-harness between alternator terminal B and the vehicle side harness as shown in figure, and attach the probe to sub-harness.)
4. Connect battery ground cable.
5. Increase engine speed to 2,500 rpm.
6. Turn electrical load to ON. (Headlamp LO turns on, blower fan motor maximum airflow amount, rear window defogger)
7. Check alternator terminal B current.

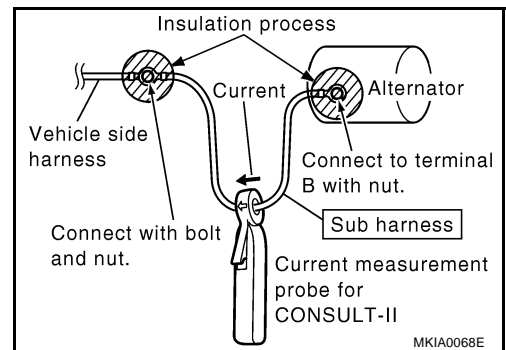
CAUTION:

Be careful of rotating parts because the engine is running.

Is the inspection result 30A or more?

YES >> GO TO dark current inspection. Refer to [SC-23, "DARK CURRENT INSPECTION"](#). (Alternator is normal. Do not replace.)

NO >> Replace alternator. (Alternator power generation error.)



INSPECTION OF EXCESSIVE ALTERNATOR POWER GENERATION

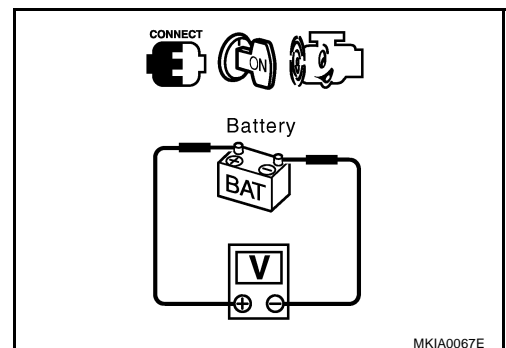
1. ALTERNATOR VOLTAGE INSPECTION

1. Increase engine speed to 2,500 rpm.
2. Check battery voltage.

Is the inspection result 16V or less?

YES >> GO TO 2.

NO >> Replace alternator. (Excessive alternator power generation.)



CHARGING SYSTEM

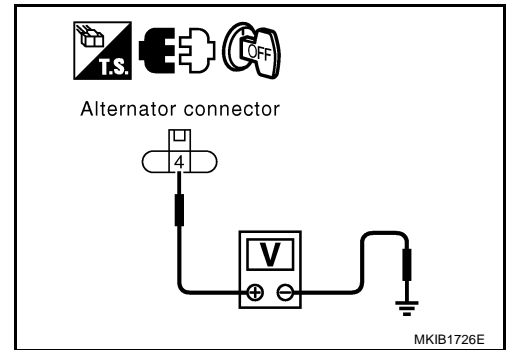
2. BATTERY VOLTAGE INSPECTION

1. Turn ignition switch OFF.
2. Disconnect alternator connector.
3. Turn ignition switch ON.
4. Check voltage between alternator connector terminal 4 and ground.

4 - Ground : 12V or more

Is the inspection result 12V or more?

- YES >> Replace alternator. (Alternator power generation error)
NO >> GO TO 3.



3. CHECK FUSE

Check if any of the following fuses in the alternator are blown.

- Check 15A fuse

OK or NG

- OK >> Repair the harnesses.
NG >> If fuse is blownout, be sure to eliminate cause of malfunction before installing new fuse.

DARK CURRENT INSPECTION

Dark Current: Small current while ignition switch is "OFF".

NOTE:

- If battery ground cable is disconnected from battery terminal, a large dark current may not be reproduced. When battery discharge occurs, never disconnect battery terminal while using ammeter.
- Do not connect CONSULT-II CONVERTER to data link connector when measuring dark current. CONSULT-II power should be supplied using AC adapter or internal battery.

1. Attach current measurement probe for CONSULT-II to battery ground cable. Refer to [SC-24. "OPERATION PROCEDURE OF CURRENT MEASUREMENT PROBE FOR CONSULT-II"](#) .
2. Check that all electrical equipment is turned OFF.
3. Remove key. Close and lock doors. Check that room lamp turns off.
4. Measure dark current. Is it 50mA or less? Refer to [SC-24. "OPERATION PROCEDURE OF CURRENT MEASUREMENT PROBE FOR CONSULT-II"](#) .

NOTE:

Dark current stable time is different due to equipment and use of the vehicle. If it is not 50mA or less after leaving for 1 minute, measure dark current again after leaving for 30 minutes or more.

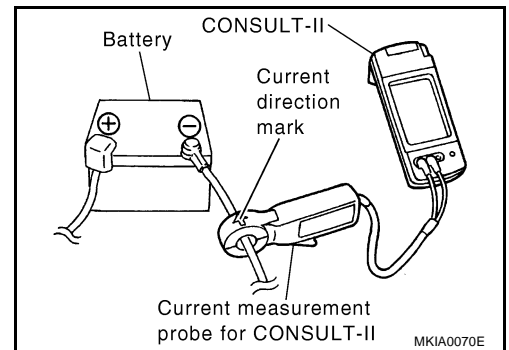
If YES, GO TO 7. If NO, GO TO 5.

5. Remove and install fuses one by one. Search for the fuse that greatly changes dark current.

NOTE:

If dark current is greatly reduced when removing the fuse, and even if dark current is not greatly increased when installing it again, the fuse circuit may be the cause.

6. Check that dark current changes when moving the suspect circuit harness. If dark current changes, check harness for short. If dark current does not change, electronic unit in the circuit may not be entering the energy-saving mode when it turns OFF. If it does not enter the energy-saving mode, replace electronic unit.
7. No malfunction for alternator and electrical equipment. Electric load may be larger than alternator generating ability. Check the customer's usage.

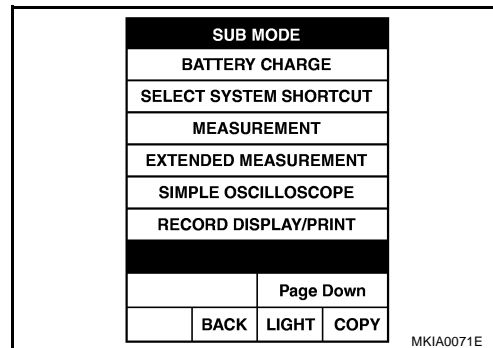


CHARGING SYSTEM

OPERATION PROCEDURE OF CURRENT MEASUREMENT PROBE FOR CONSULT-II

For details, refer to the supplied "CONSULT-II Current Probe Operation Manual".

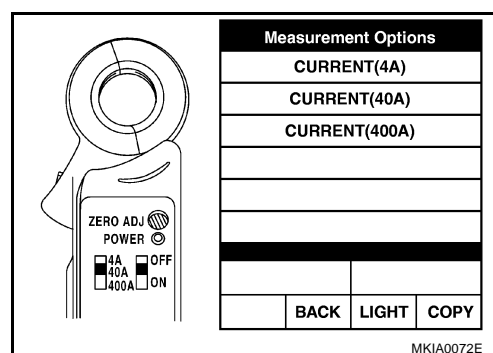
1. Turn current probe power supply OFF and connect to CONSULT-II. (Red: CH1, Black: Ground)
2. Touch "SUB MODE".
3. Touch "Extending Measurement Mode" on "SUB MODE" screen.
4. CAUTION is displayed, touch "OK".



5. Set current probe range switch at the range to measure, turn current probe power supply ON. When measuring dark current, set 4A range. (Check that POWER indicator turns on. Refer to CONSULT-II Current Probe Operation Manual.)
6. Touch the same measuring range at CONSULT-II.

NOTE:

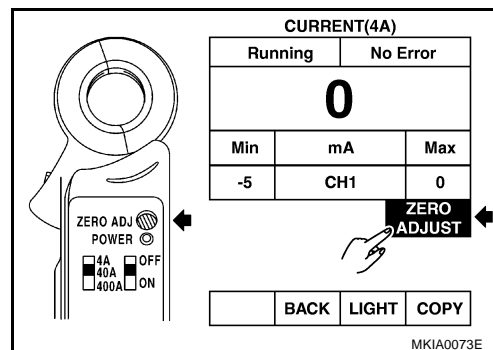
If current probe measuring range is different from CONSULT-II measuring range, incorrect value is displayed.



7. Adjust 0 point of current probe or CONSULT-II. (Do not clamp anything to probe.)

NOTE:

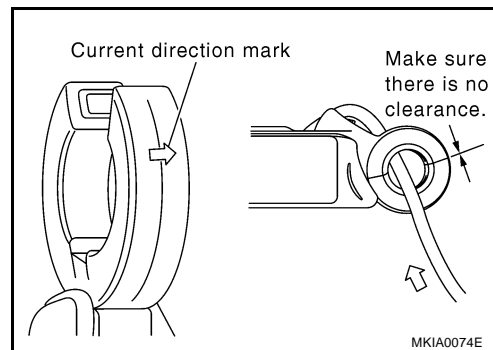
If 0 point is dislocated greatly, adjust at current probe side generally.



8. Align current direction mark, clamp harness, and measure current. If current direction is incorrect, it is displayed negative value.

NOTE:

- When current is measured, close probe joint securely.
- If multiple harnesses are clamped, measurement cannot be performed. Always clamp only one.

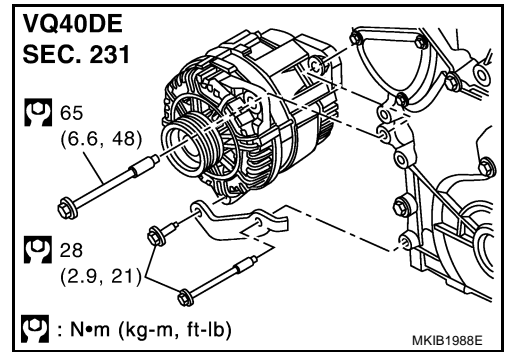


CHARGING SYSTEM

GKS000S1

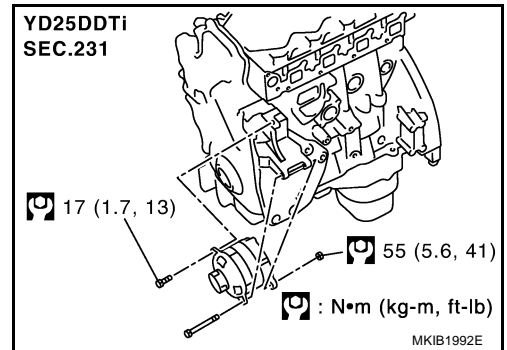
Removal and Installation REMOVAL (VQ ENGINE MODELS)

1. Disconnect negative battery cable.
2. Remove radiator fan shroud, Refer to [CO-21, "COOLING FAN"](#) .
3. Remove drive belt. Refer to [EM-14, "Checking Drive Belts"](#) .
4. Remove alternator stay.
5. Remove alternator upper mounting bolt.
6. Disconnect alternator harness connectors .
7. Remove alternator.



REMOVAL (YD ENGINE MODELS)

1. Disconnect negative battery cable.
2. Remove intercooler hose and duct
3. Disconnect alternator harness.
4. Remove drive belt. Refer to [EM-156, "Checking Drive Belts"](#) .
5. Remove alternator upper mounting bolt.
6. Remove alternator lower mounting nut and bolt .
7. Remove alternator.



INSTALLATION

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

- Install alternator, and check tension of drive belt. Refer to [EM-14, "Tension Adjustment"](#) (VQ), [EM-157, "Deflection Adjustment"](#) (YD).

CAUTION:

Be sure to tighten alternator terminal 1 mounting nut carefully.

YD engine models - B terminal nut:

: 7.9 - 11.0 N•m (0.8 - 1.11 kg-m, 70 - 97 in-lb)

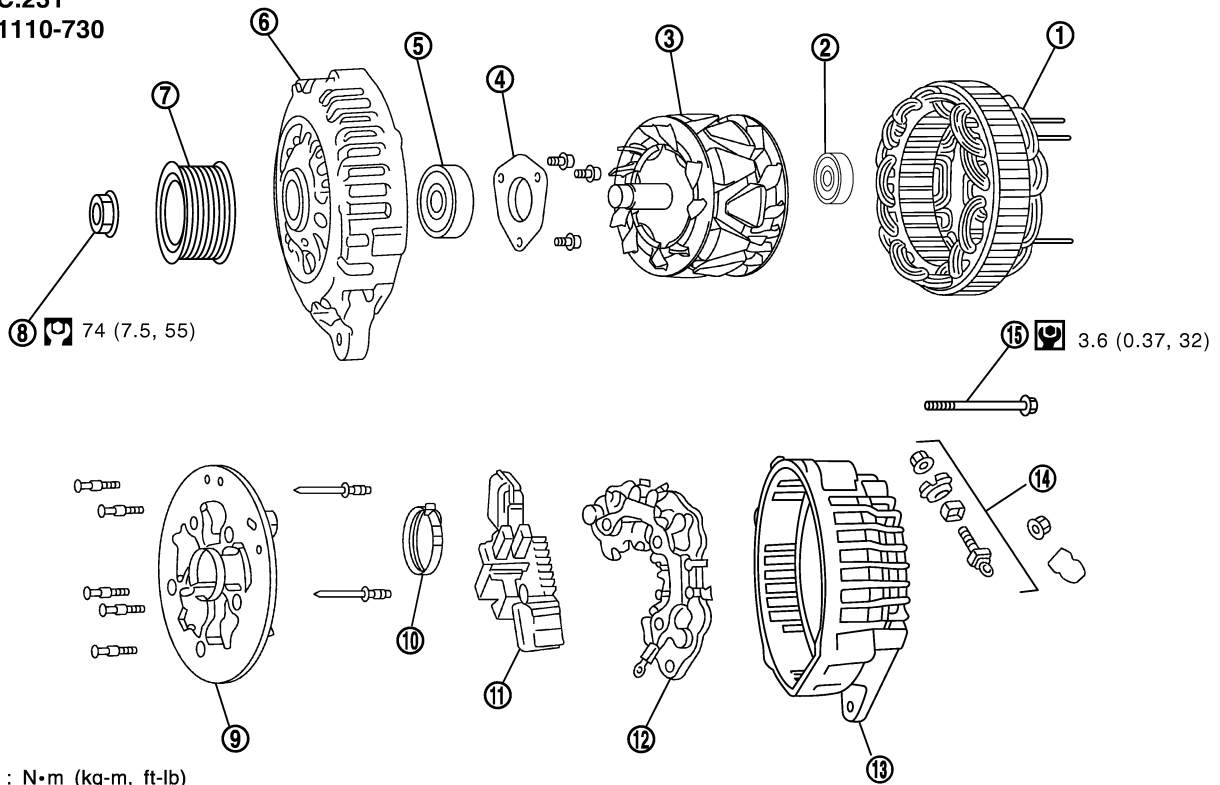
A
B
C
D
E
F
G
H
I
J
SC
L
M

CHARGING SYSTEM

GKS000S2

Disassembly and Assembly VQ ENGINE MODELS

SEC.231
LR1110-730



: N·m (kg-m, ft-lb)

: N·m (kg-m, in-lb)

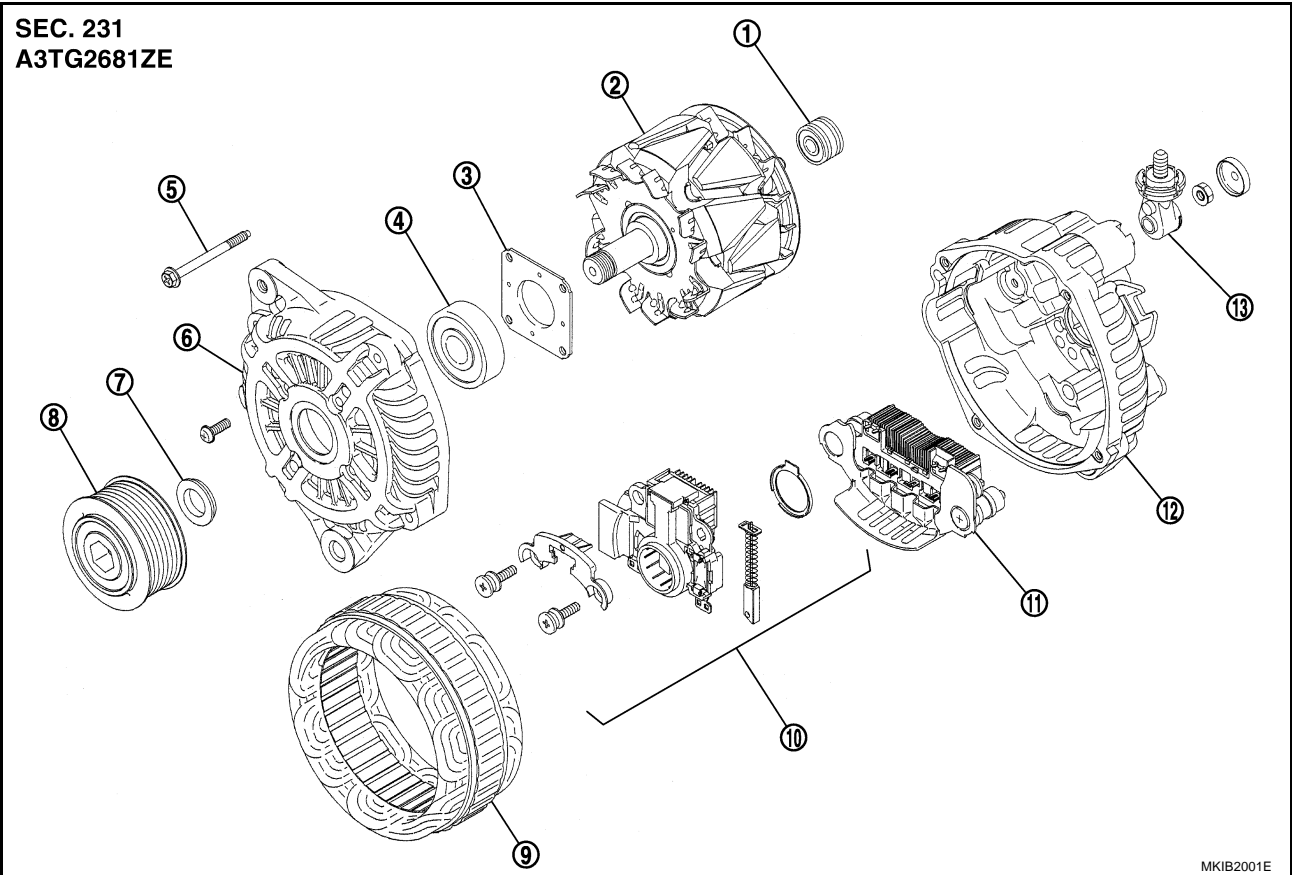
MKIB2210E

- | | | |
|---------------------------|-----------------------------------|--------------------|
| 1. Stator | 2. Rear bearing | 3. Rotor assembly |
| 4. Retainer | 5. Front bearing | 6. Front cover |
| 7. Pulley | 8. Pulley nut | 9. Fan guide |
| 10. Double labyrinth seal | 11. IC voltage regulator assembly | 12. Diode assembly |
| 13. Rear cover | 14. Terminal set | 15. Through bolt |

CHARGING SYSTEM

YD ENGINE MODELS

SEC. 231
A3TG2681ZE

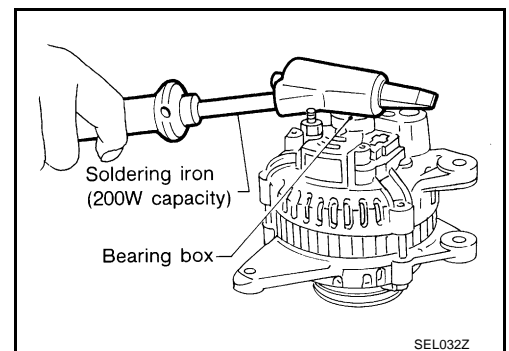


MKIB2001E

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

Disassembly REAR COVER

GKS000S3



SEL032Z

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.

CHARGING SYSTEM

GKS000S4

Inspection ROTOR CHECK

1. Resistance test

Resistance : Refer to SDS. [SC-44](#),
"Alternator"

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

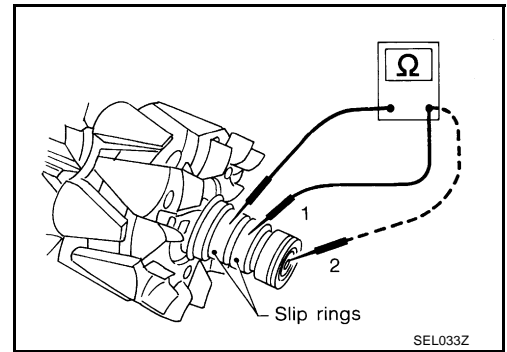
2. Insulator test

- Continuity exists... Replace rotor.

3. Check slip ring for wear.

**Slip ring minimum
outer diameter** : Refer to SDS. [SC-44](#),
"Alternator"

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



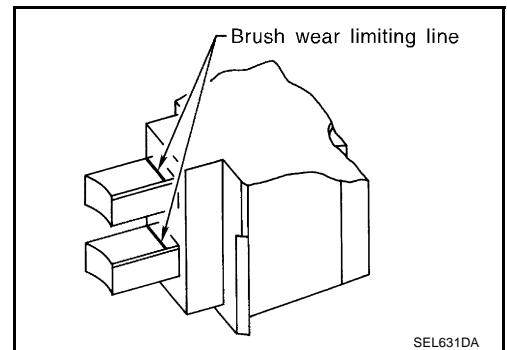
BRUSH CHECK

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.



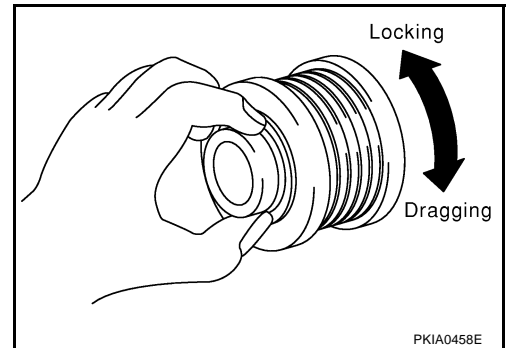
PULLEY CHECK (WITH CLUTCH TYPE)

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).

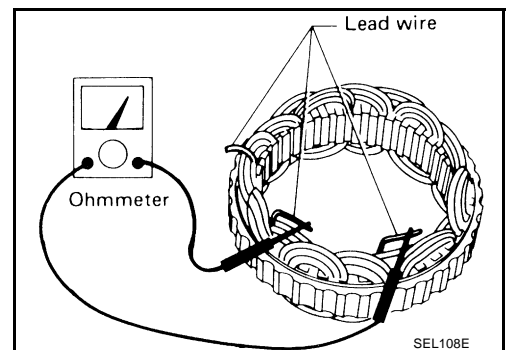
- If it locks or unusual resistance is felt... Replace pulley.



STATOR CHECK

1. Continuity test

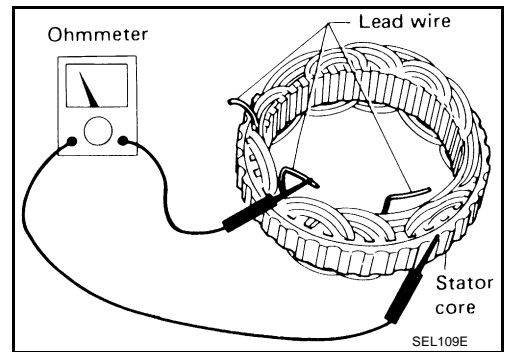
- No continuity... Replace stator.



CHARGING SYSTEM

2. Ground test

- Continuity exists... Replace stator.



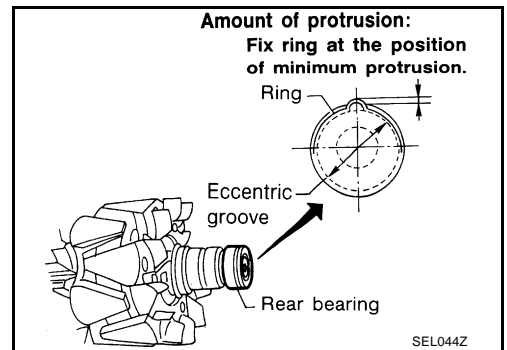
GKS000S5

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.

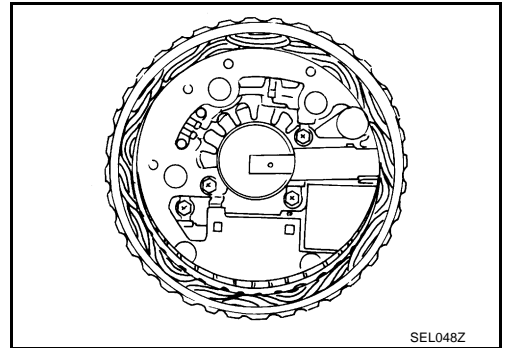
CAUTION:

Do not reuse rear bearing after removal.

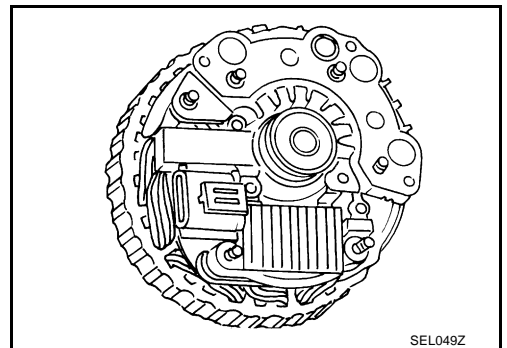


REAR COVER INSTALLATION

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



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

STARTING SYSTEM

PFP:00011

System Description A/T MODELS

GKS000S6

Power is supplied at all times:

- to starter motor terminal 1 and
- 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 START position, power is supplied:

- from ignition switch terminal 5
- to IPDM E/R terminal 21.

With the ignition switch in the ON or START position, power is supplied to IPDM E/R CPU, and the selector lever in the P or N position, power is supplied:

- through A/T assembly terminal 9
- to IPDM E/R terminal 48.

Ground is supplied at all times:

- to IPDM E/R terminals 38 and 59
- from body grounds E21, E41 and E61.

Then the starter relay is turned ON.

The IPDM E/R starter relay is energized and power is supplied:

- from terminal 19 of IPDM E/R
- to terminal 2 of the starter motor.

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

M/T MODELS

Power is supplied at all times:

- to starter motor terminal 1 and
- 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 START position, power is supplied:

- from ignition switch terminal 5
- to IPDM E/R terminal 21.

With the start signal is input to IPDM E/R CPU, power is supplied:

- through IPDM E/R terminal 14
- to IPDM E/R terminal 48.

Ground is supplied at all times:

- to IPDM E/R terminals 38 and 59
- from body grounds E21, E41 and E61.

Then the starter relay is turned ON.

The IPDM E/R starter relay is energized and power is supplied:

- from terminal 19 of IPDM E/R
- to terminal 2 of the starter motor.

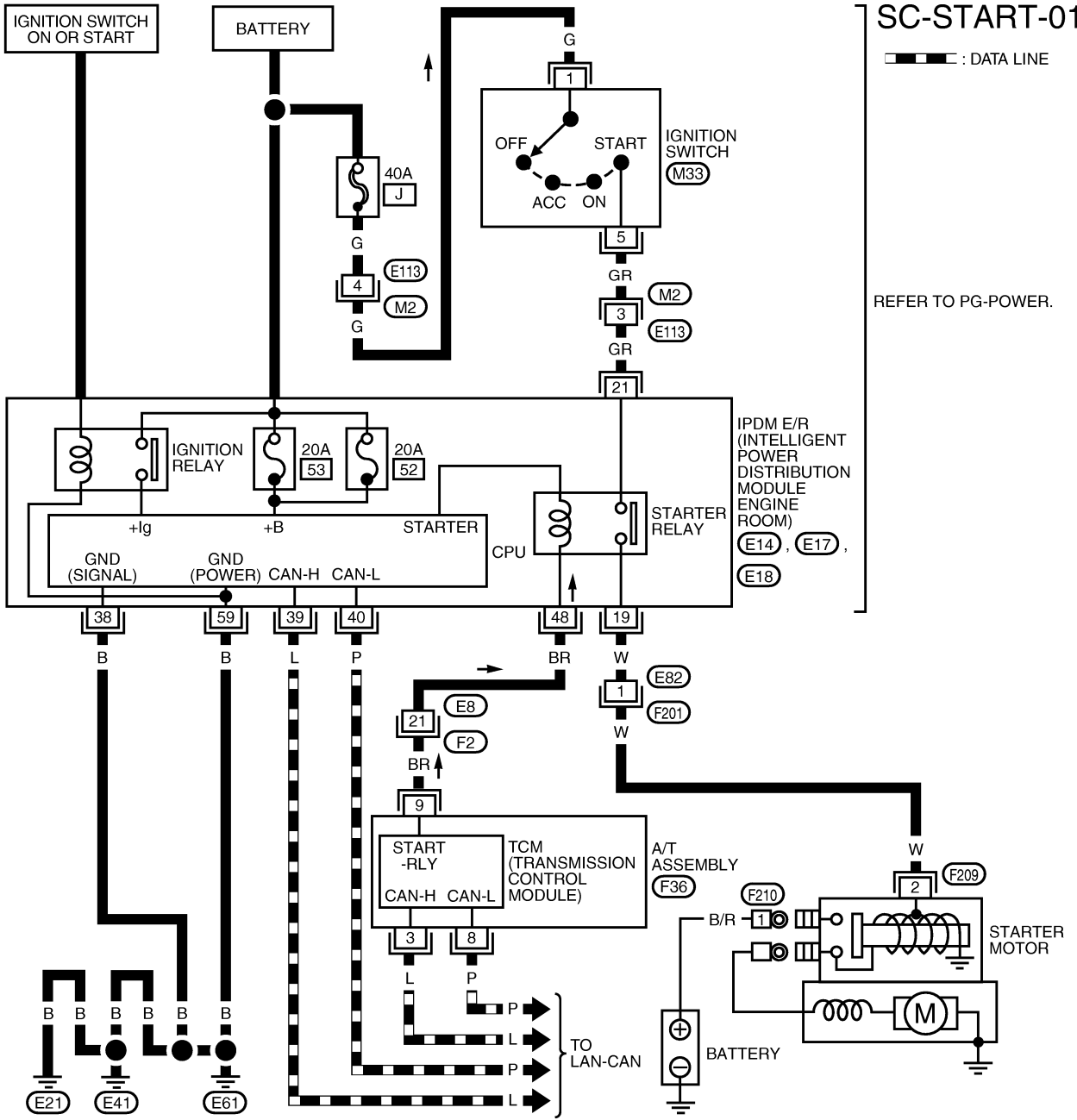
The starter motor plunger closes and provides a closed circuit between the battery and the starter motor. The starter motor is grounded to the cylinder block. With power and ground supplied, the starter motor operates.

STARTING SYSTEM

Wiring Diagram — START — / VQ Engine Models A/T MODELS

GKS00057

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



1	2	3
4	5	6

(M2) W

3	5	1
4	2	6

(M33) W

21	20	19
24	23	22

(E14) W

42	41	40	39	38	37
48	47	46	45	44	43

(E17) W

59	58	57
62	61	60

(E18) B



1	2	3	4	5	6	7	8	9	10	11	12
13	14	15	16	17	18	19	20	21	22	23	24

(F2) W

1	2	3	4	5
6	7	8	9	10

(F36) G

1	2	3	4	5
6	7	8	9	

(F201) GR

2

(F209) GY

1

(F210) B

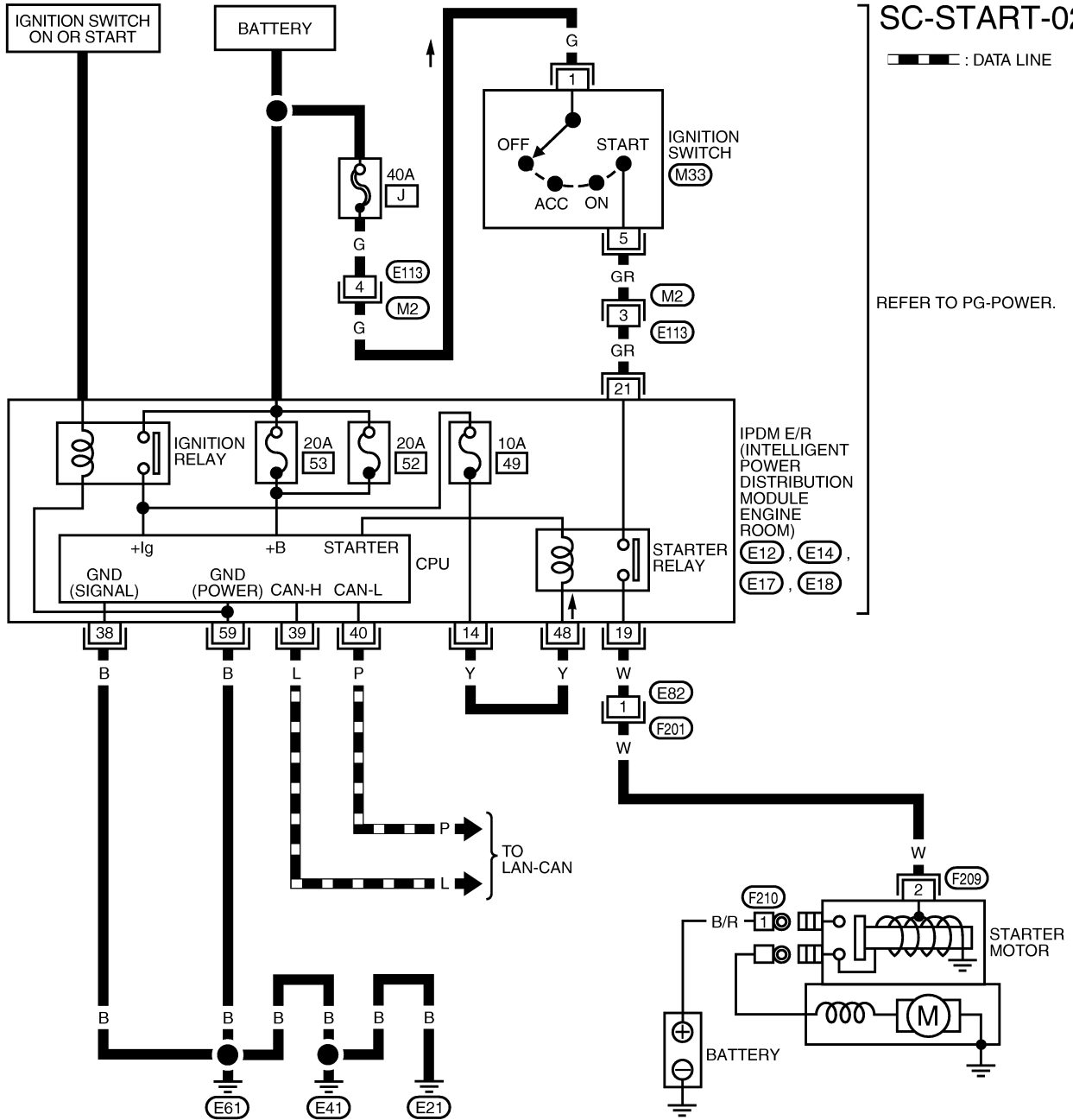
STARTING SYSTEM

M/T MODELS

SC-START-02

▬ : DATA LINE

REFER TO PG-POWER.



1	2	3
4	5	6

3	5	1
4	2	6

9	8	7	6	5	4	3		
18	17	16	15	14	13	12	11	10

21	20	19
24	23	22

42	41	40	39	38	37
48	47	46	45	44	43

59	58	57
62	61	60

1	2	3	4	5
6	7	8	9	

2

1

1

1

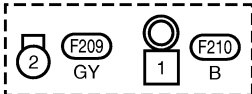
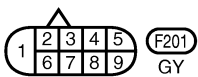
1

1

1

1

1

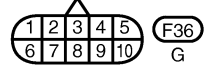
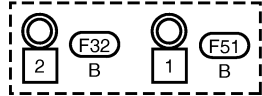
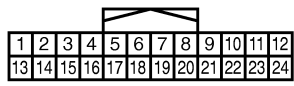
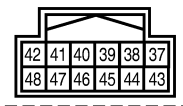
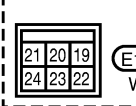
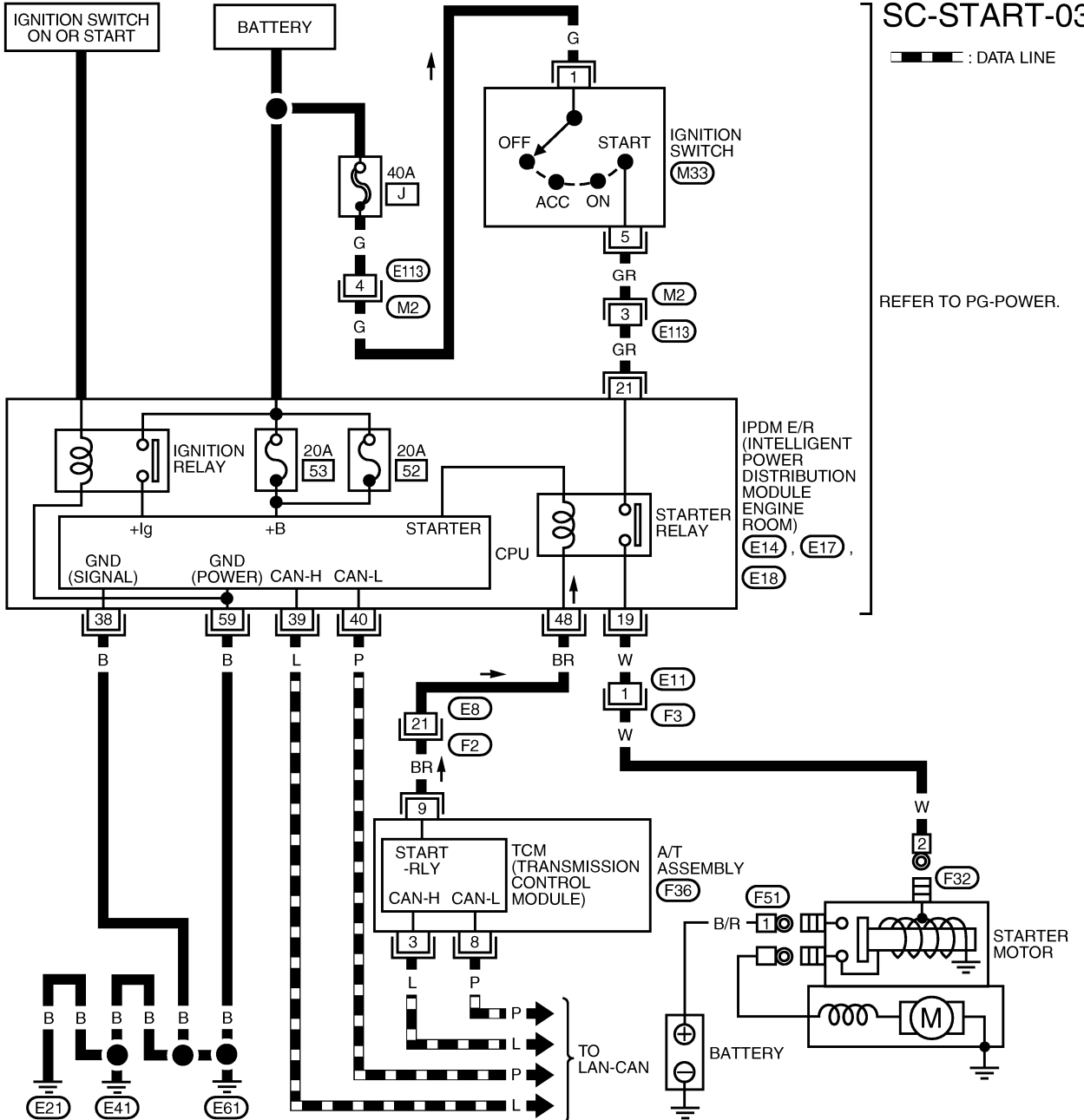


STARTING SYSTEM

Wiring Diagram — START — / YD Engine Models A/T MODELS

GKS0008

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



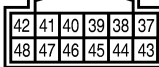
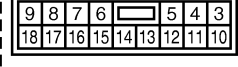
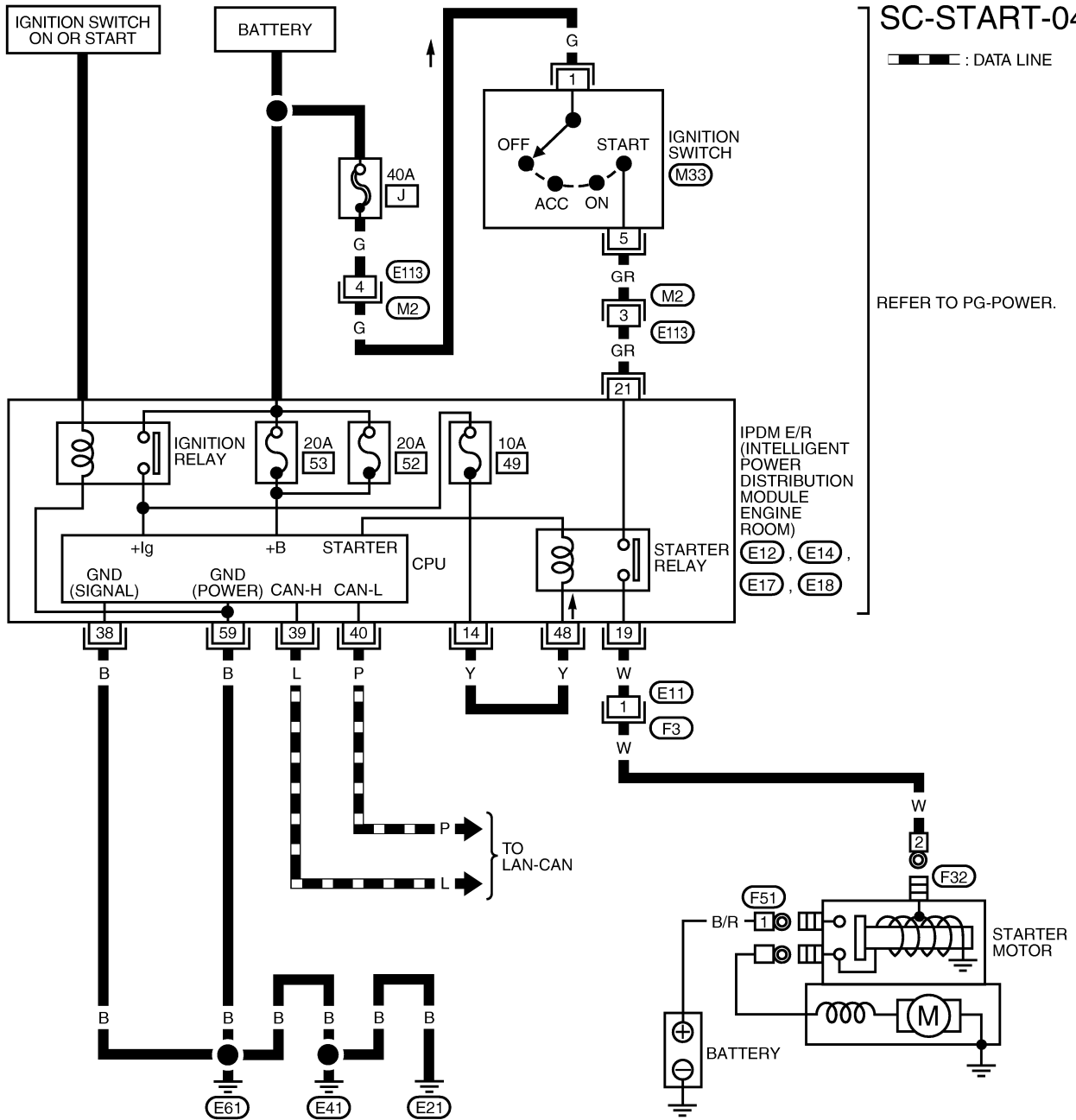
STARTING SYSTEM

M/T MODELS

SC-START-04

▬ : DATA LINE

REFER TO PG-POWER.

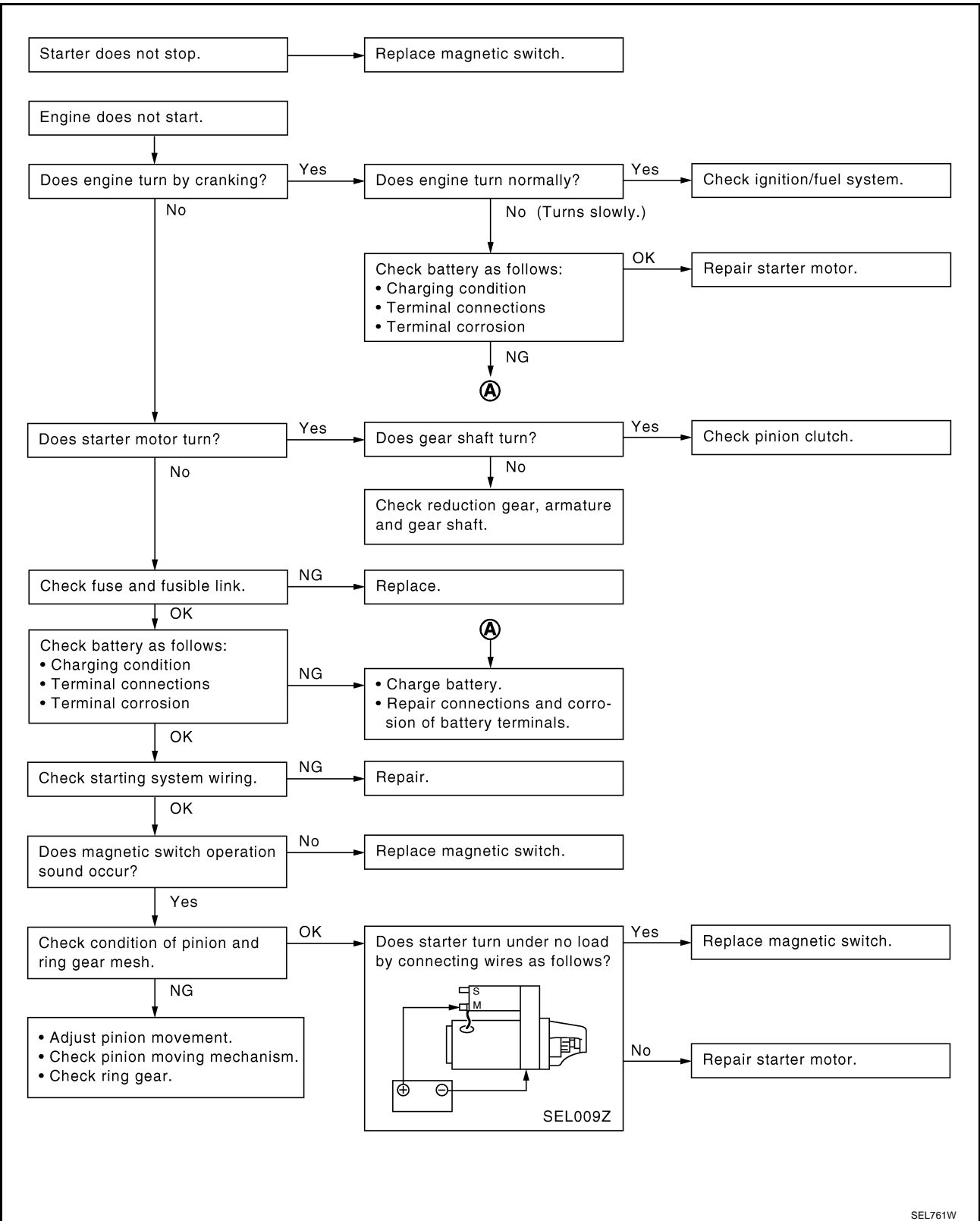


STARTING SYSTEM

GKS000S9

Trouble Diagnoses

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

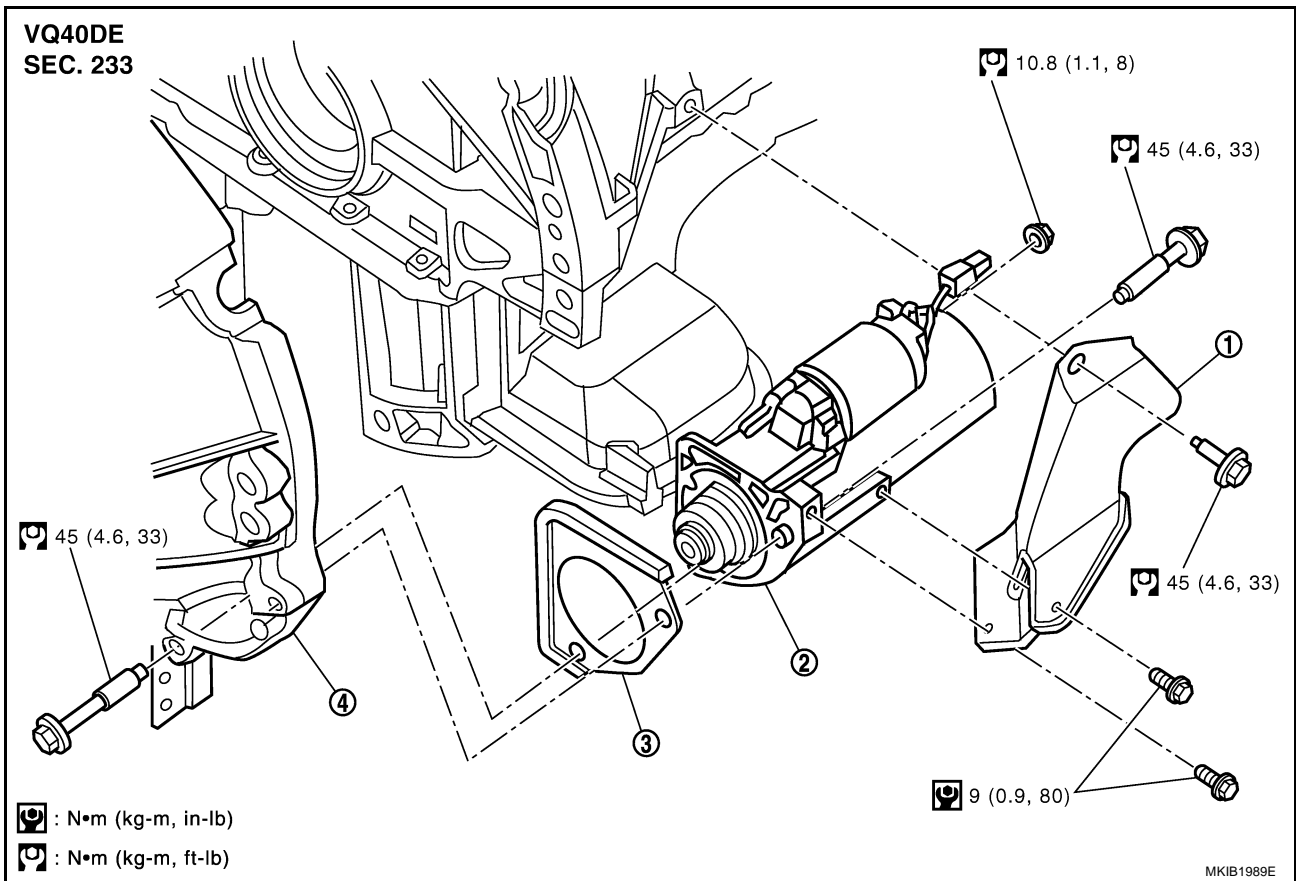


SEL761W

STARTING SYSTEM

GKS000SA

Removal and Installation REMOVAL (VQ ENGINE MODELS)



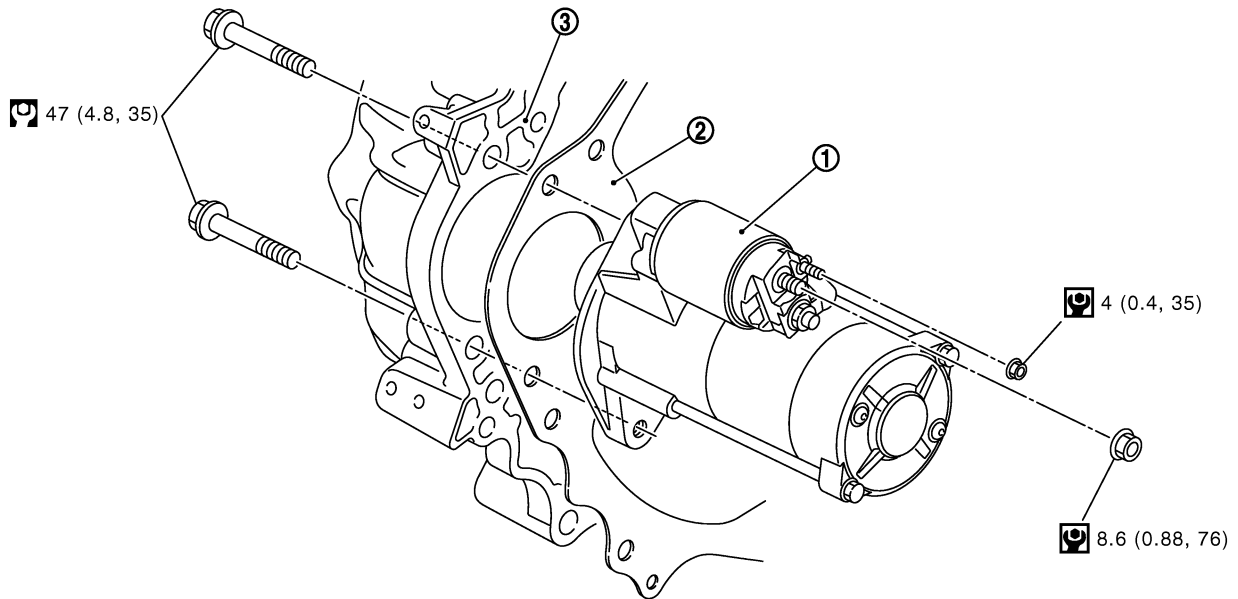
1. Starter cover
2. Starter motor assembly
3. Starter cover plate (rear)
4. Transmission case

1. Disconnect negative battery cable.
2. Remove engine undercovers.
3. Remove exhaust manifold cover from exhaust manifold (right bank) to gain access to starter cover bolts. Refer to [EX-3, "REMOVAL"](#).
4. Remove starter cover bolts and starter cover.
5. Remove terminal 1 and disconnect terminal 2 from starter motor.
6. Remove starter motor mounting bolts (two).
7. Remove starter motor.

STARTING SYSTEM

REMOVAL (YD ENGINE MODELS)

YD25DDTi
SEC. 233



: N•m (kg-m, ft-lb)

: N•m (kg-m, in-lb)

MKIB1991E

1. Starter motor assembly

2. Rear plate

3. Transmission case

1. Disconnect negative battery cable.
2. Remove engine under covers.
3. Disconnect S terminal and B terminal from starter motor.
4. Remove starter motor mounting bolts (two).
5. Remove starter motor from bottom side the vehicle.

INSTALLATION

Install in the reverse order of removal.

(M8T76071ZE, M1TA0072)

B terminal nut :

: **7.35 - 9.81 N•m (0.75 - 1.0 kg-m, 65 - 87 in-lb)**

S terminal nut :

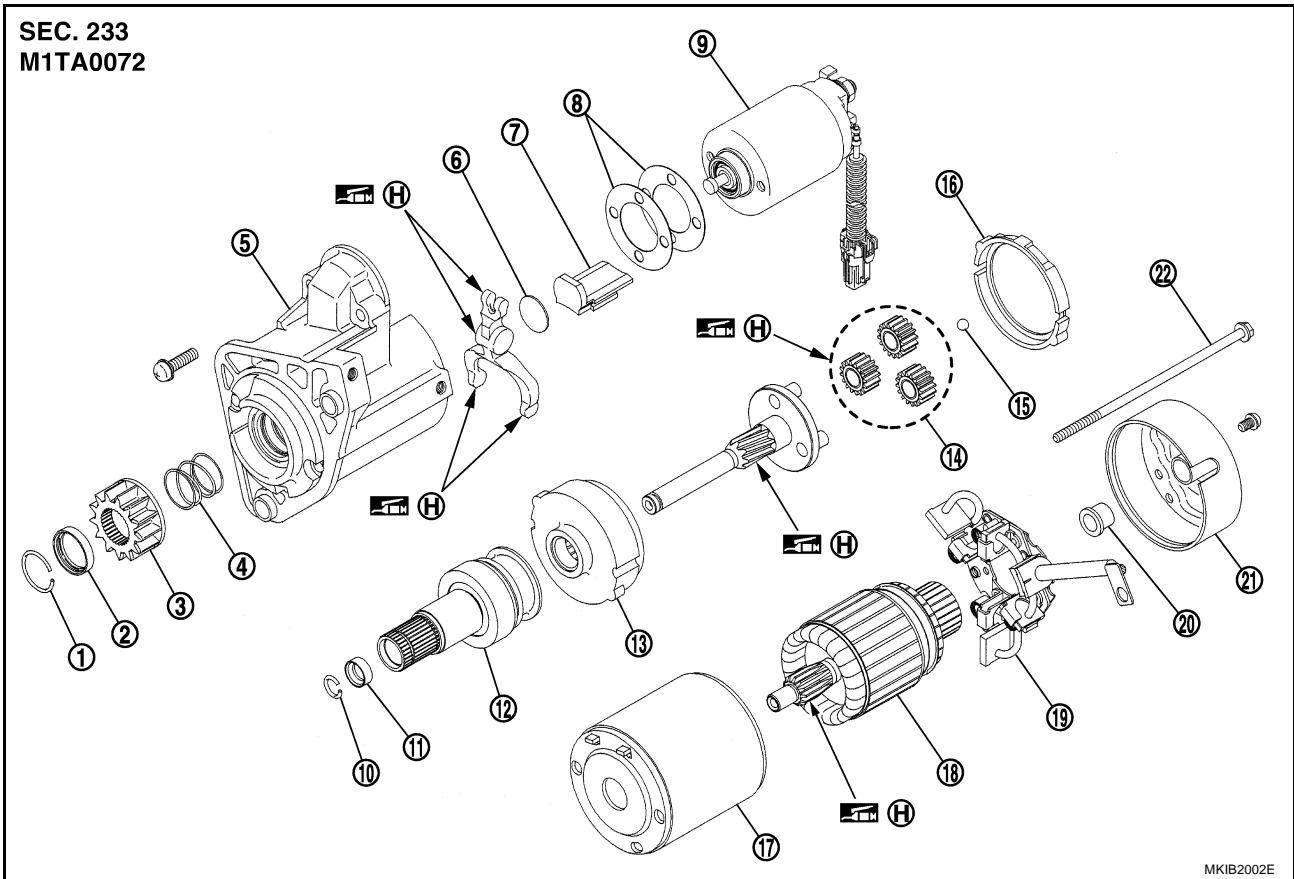
: **3.0 - 5.0 N•m (0.3 - 0.5 kg-m, 27 - 44 in-lb)**

STARTING SYSTEM


GKS000SB

Disassembly and Assembly VQ ENGINE MODELS

SEC. 233
M1TA0072



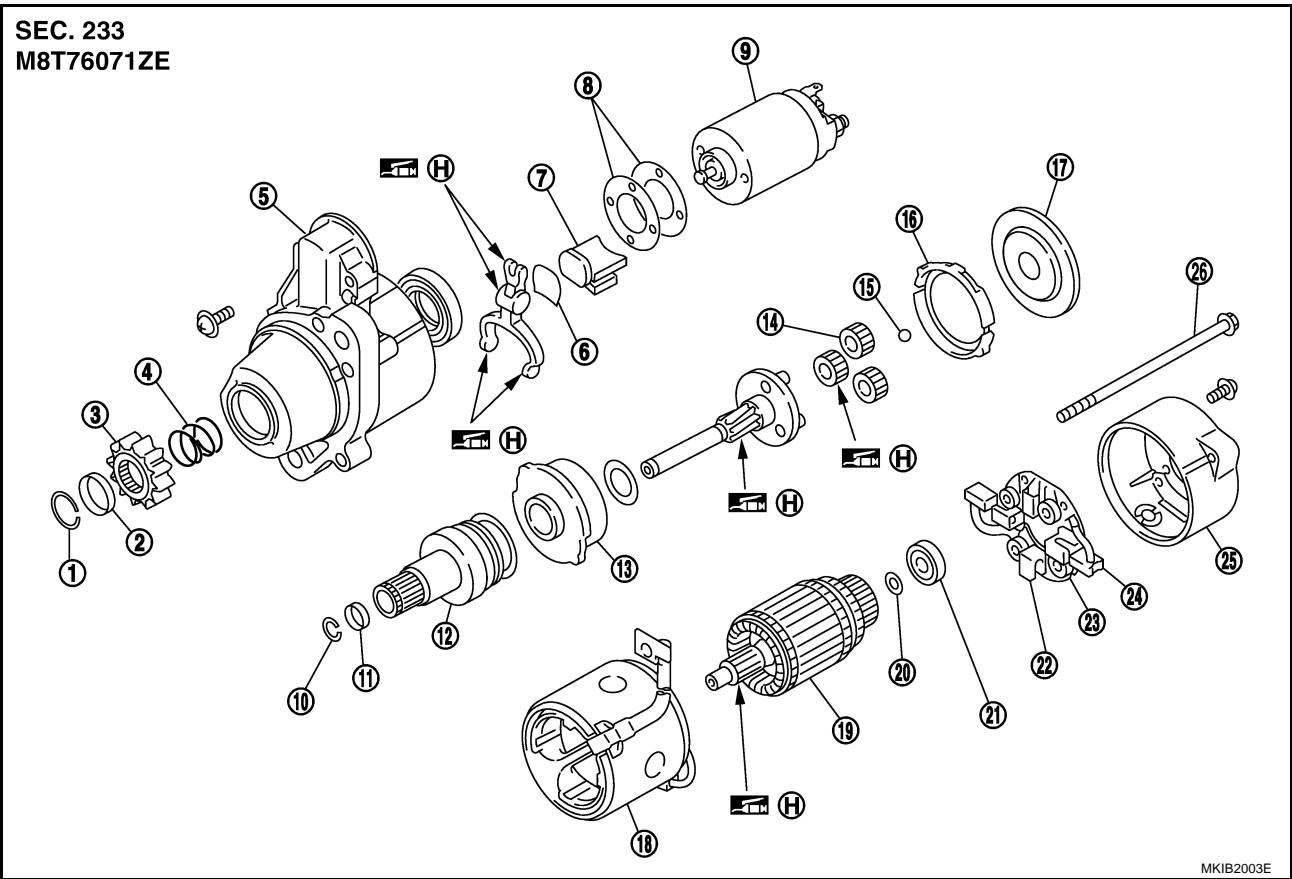
MKIB2002E

- | | | |
|---------------------------|------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| 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. Yoke | 18. Armature |
| 19. Brush holder assembly | 20. Rear bearing | 21. Rear cover |
| 22. Through-bolt |  (H): High-temperature grease point | |

STARTING SYSTEM

YD ENGINE MODELS

SEC. 233
M8T76071ZE



MKIB2003E

- | | | |
|---------------------------|--------------------|-----------------------------|
| 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 | 26. Through bolt | |

(H): High-temperature grease point

Inspection MAGNETIC SWITCH CHECK

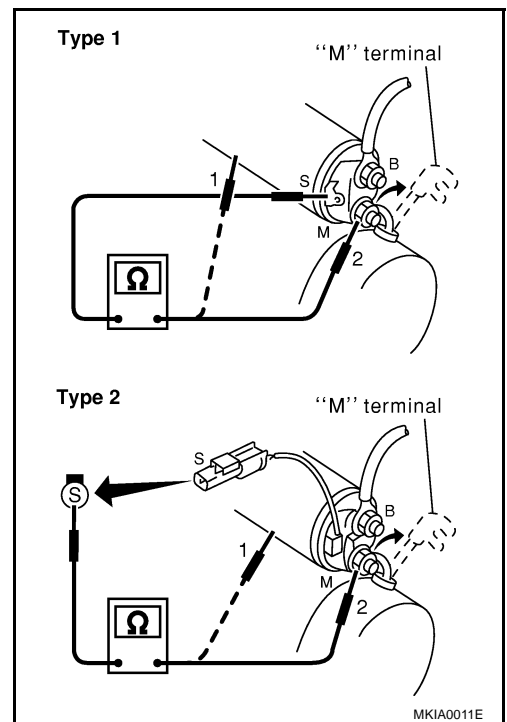
- Before starting to check, disconnect battery ground cable.
- Disconnect "M" terminal of starter motor.

GKS000SC

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

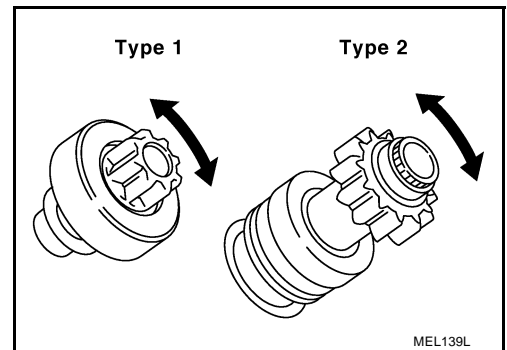
STARTING SYSTEM

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

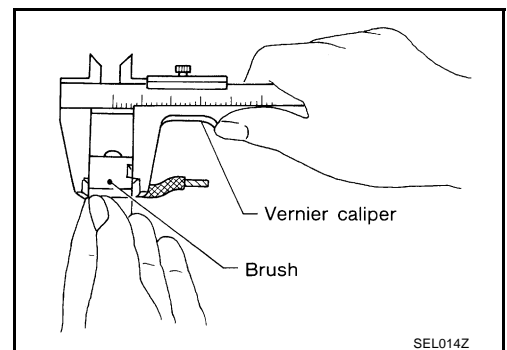
Brush

Check wear of brush.

Wear limit length

**: Refer to SDS. [SC-44.](#)
["Starter"](#) .**

- Excessive wear... Replace.



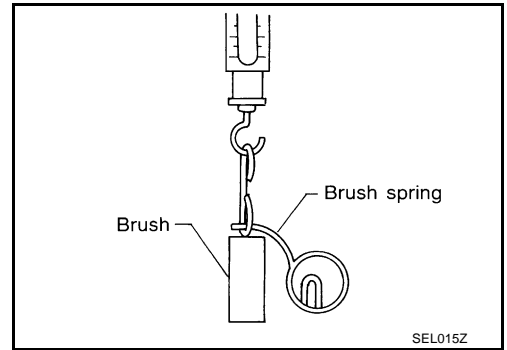
STARTING SYSTEM

Brush Spring Check

Check brush spring pressure with brush spring detached from brush.

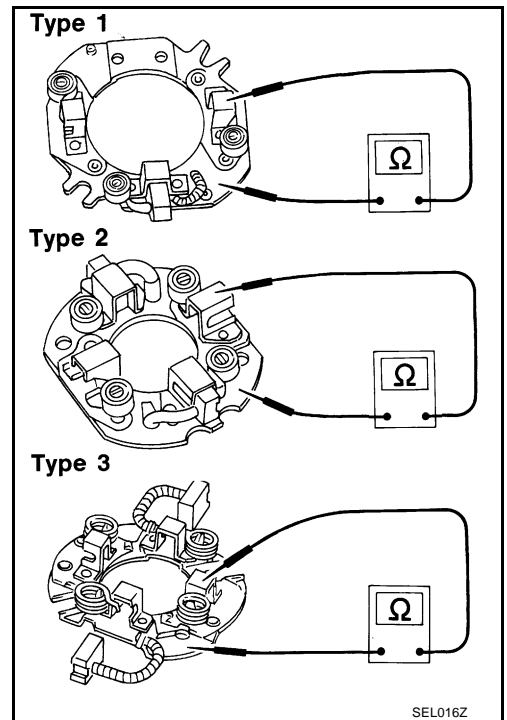
Spring pressure (with new brush) : Refer to SDS. [SC-44](#), "[Starter](#)".

- 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.

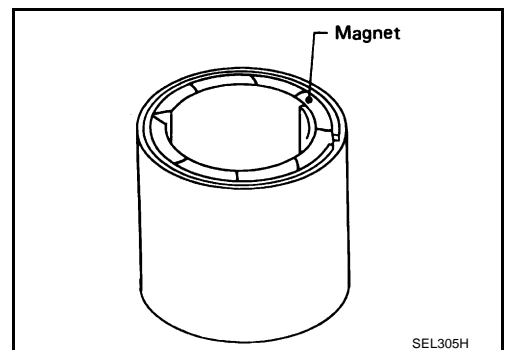


YOKE CHECK

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:

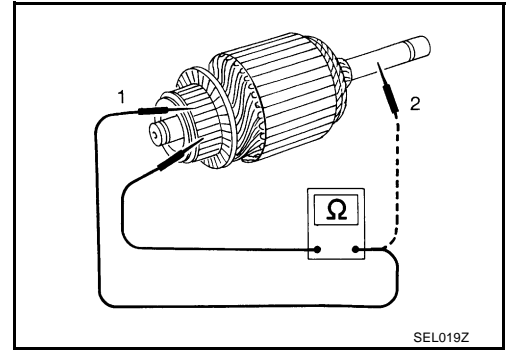
Do not clamp yoke in a vice or strike it with a hammer.



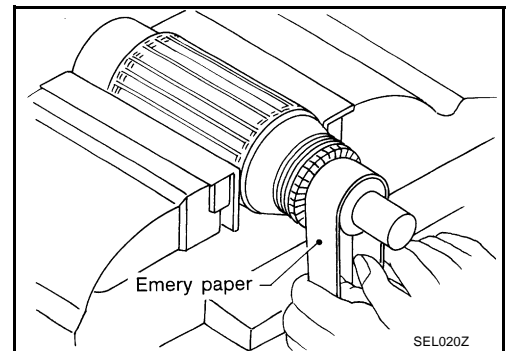
STARTING SYSTEM

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.



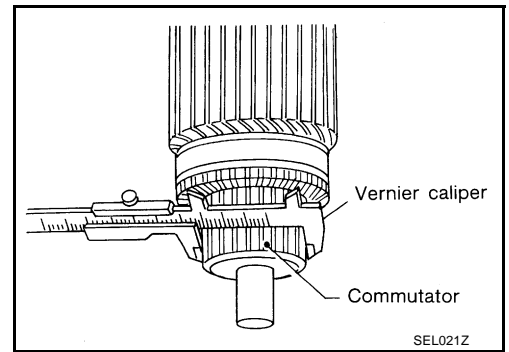
3. Check commutator surface.
 - Rough... Sand lightly with No. 500 - 600 emery paper.



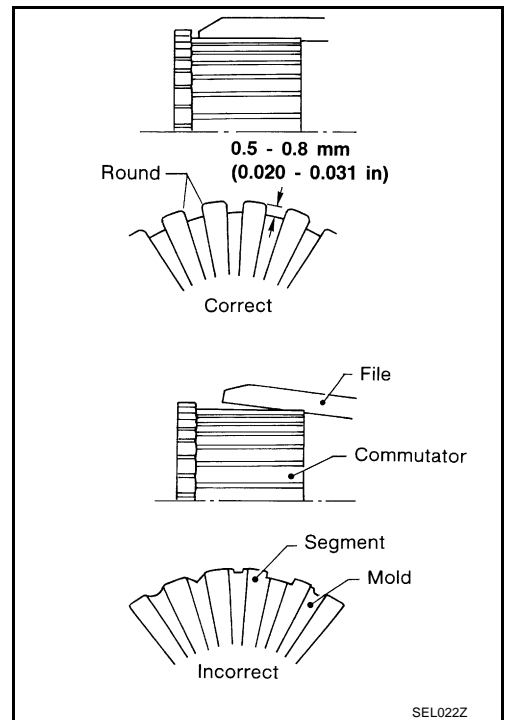
4. Check diameter of commutator.

Commutator minimum diameter : Refer to SDS. [SC-44, "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

GKS000SD

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

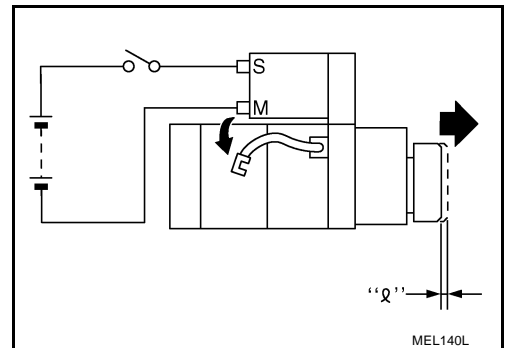
Carefully observe the following instructions.

PINION PROTRUSION LENGTH ADJUSTMENT

Movement

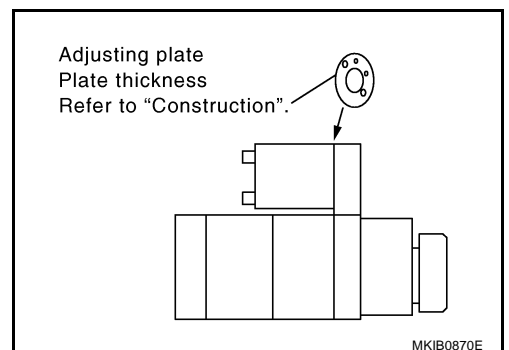
Compare movement “ ℓ ” in height of pinion when it is pushed out with magnetic switch energized and when it is pulled out by hand until it touches stopper.

Movement “ ℓ ” : Refer to [SC-44, "Starter"](#) .



SC

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



SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

PFP:00030

Battery

GKS000SE

Applied model	YD25 engine	VQ40 engine
Type	L3/760L	L2/580L
Capacity V-AH	12-75	12-65

Starter

GKS000SF

Applied model		M8T76071ZE	M1TA0072
Type		MITSUBISHI	
		Reduction	
Applied model		YD25 engine	VQ40 engine
System voltage V		12	
No-load	Terminal voltage V	11.0	
	Current A	Less than 145	Less than 120
	Revolution rpm	More than 3,400	More than 3,100
Minimum diameter of commutator mm (in)		31.4 (1.236)	28.8 (1.134)
Minimum length of brush mm (in)		11.0 (0.433)	10.0 (0.394)
Brush spring tension N (kg, lb)		26.7 - 36.1 (2.72 - 3.68, 6.0 - 8.12)	23.4 - 31.6 (2.39 - 3.22, 5.26 - 7.10)
Clearance between bearing metal and armature shaft mm (in)		—	
Clearance “ℓ” between pinion front edge and pinion stopper mm (in)		—	
Movement “ℓ” in height of pinion assembly mm (in)		0 (0, 0)	0.5 - 2.0 (0.020 - 0.079)

Alternator

GKS000SG

Type	A3TG2681ZE	LR1110-730
	MITSUBISHI make	HITACHI make
Applied model	YD25 engine	VQ40 engine
Nominal rating V-A	12-130	12-110
Ground polarity	Negative	
Minimum revolutions under no-load (When 13.5V is applied) rpm	Less than 1,000	Less than 1,100
Hot output current (When 13.5V is applied) A/rpm	More than 33/1,300 More than 105/2,500 More than 122/5,000	More than 35/1,300 More than 70/1,800 More than 91/2,500 More than 110/5,000
Regulated output voltage V	14.1 - 14.7	
Minimum length of brush mm (in)	More than 5.0 (0.197)	More than 6.0 (0.236)
Brush spring pressure N (g, oz.)	4.8 - 6.0 (490 - 610, 17.28 - 21.51)	1.0 - 3.4 (102 - 347, 3.60 - 12.23)
Slip ring minimum diameter mm (in)	More than 22.1 (0.870)	More than 26.0 (1.024)
Rotor coil resistance at 20° (68°F) Ω	1.7 - 2.1	2.16 - 2.45