STARTING & CHARGING SYSTEMS

SECTION SC

CONTENTS

PRECAUTIONS 2
Supplemental Restraint System (SRS) ″AIR BAG″ and ″SEAT BELT PRE-TENSIONER″ 2
Wiring Diagrams and Trouble Diagnoses 2
BATTERY 3
How to Handle Battery 3
Battery Test and Charging Chart 6
STARTING SYSTEM 13
System Description 13
Wiring Diagram - START - 14
Trouble Diagnoses 16
Construction 17
Magnetic Switch Check 19
Pinion/Clutch Check 19
Brush Check 20
Field Coil Check 20
Armature Check 21
Assembly 22
CHARGING SYSTEM 23
System Description 23
Wiring Diagram - CHARGE - 24
Trouble Diagnoses 26
Construction 27
Disassembly 28
Inspection 28
Assembly 29
SERVICE DATA AND SPECIFICATIONS (SDS) 30
Battery 30
Starter 30
Alternator 30

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

The Supplemental Restraint System such as “AIR BAG” and “SEAT BELT PRE-TENSIONER” used along with a seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. The SRS system composition which is available to NISSAN MODEL R20 is as follows (The composition varies according to the destination and optional equipment.):

- For a frontal collision
  The Supplemental Restraint System consists of driver air bag module (located in the center of the steering wheel), front passenger air bag module (located on the instrument panel on passenger side), front seat belt pre-tensioners, a diagnosis sensor unit, warning lamp, wiring harness and spiral cable.
- For a side collision
  The Supplemental Restraint System consists of front side air bag module (located in the outer side of front seat), side air bag (satellite) sensor, diagnosis sensor unit (one of components of air bags for a frontal collision), wiring harness, warning lamp (one of components of air bags for a frontal collision).

Information necessary to service the system safely is included in the **RS 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 should be performed by an authorized NISSAN 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 RS 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 harness connector.**

Wiring Diagrams and Trouble Diagnoses

When you read wiring diagrams, refer to the following:

- GI-10, “HOW TO READ WIRING DIAGRAMS”
- EL-6, “POWER SUPPLY ROUTING” for power distribution circuit

When you perform trouble diagnoses, refer to the following:

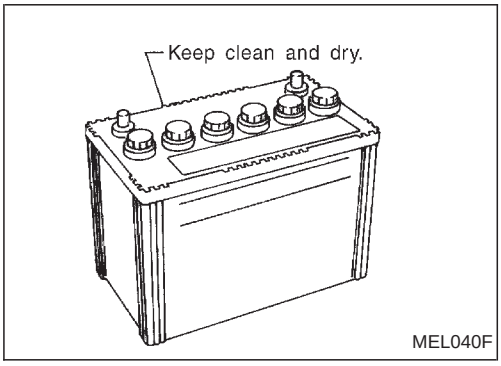
- GI-25, “HOW TO FOLLOW TEST GROUPS IN TROUBLE DIAGNOSES”
- GI-22, “HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT”

How to Handle Battery

CAUTION:

If it becomes necessary to start the engine with a booster battery and jumper cables,

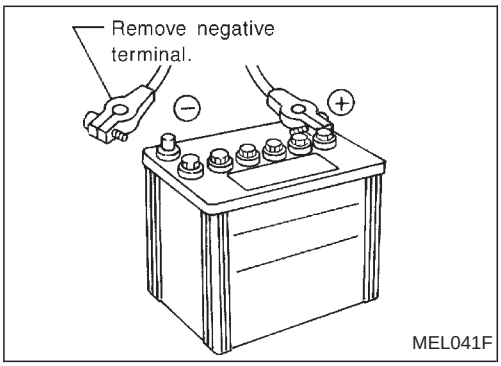
1) **Use a 12-volt booster battery.**
2) **After connecting battery cables, ensure that they are tightly clamped to battery terminals for good contact.**



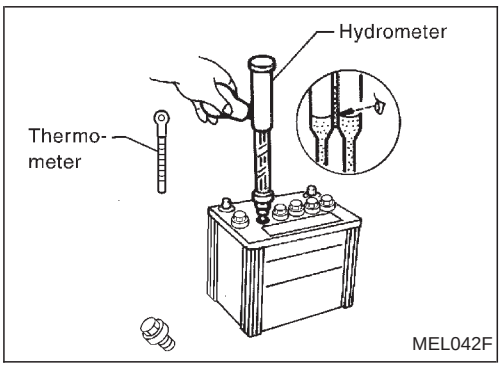
METHODS OF PREVENTING OVER-DISCHARGE

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

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



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



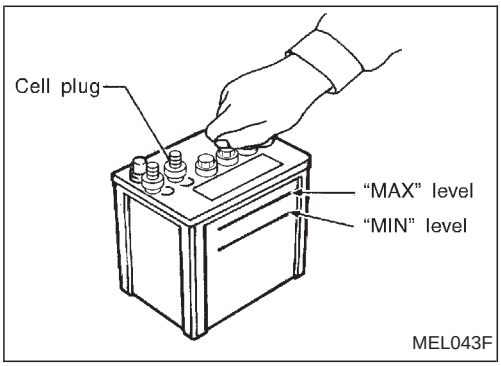
- Check the charge condition of the battery. Periodically check the specific gravity of the electrolyte. Keep a close check on charge condition to prevent over-discharge.

CHECKING ELECTROLYTE LEVEL

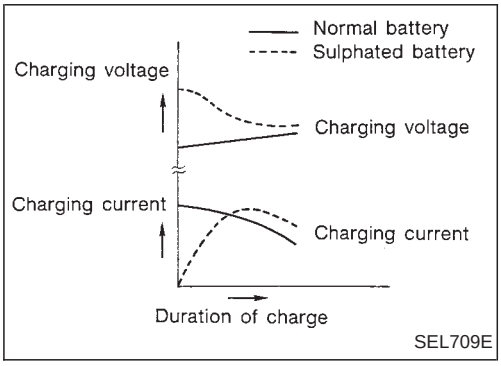
WARNING:

Do not allow battery fluid to come in contact with skin, eyes, fabrics, or painted surfaces. After touching a battery, do not touch or rub your eyes until you have thoroughly washed your hands. If acid contacts eyes, skin or clothing, immediately flush with water for 15 minutes and seek medical attention.

How to Handle Battery (Cont'd)

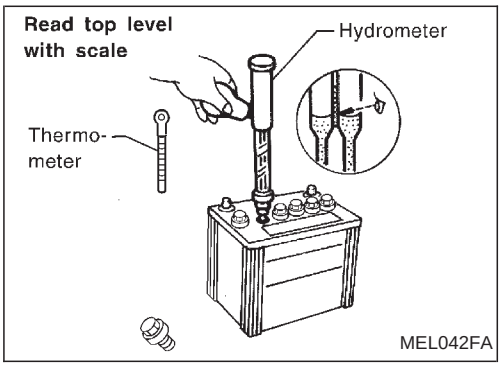


- Remove the cell plug using a suitable tool.
- Add distilled water up to the MAX level.



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

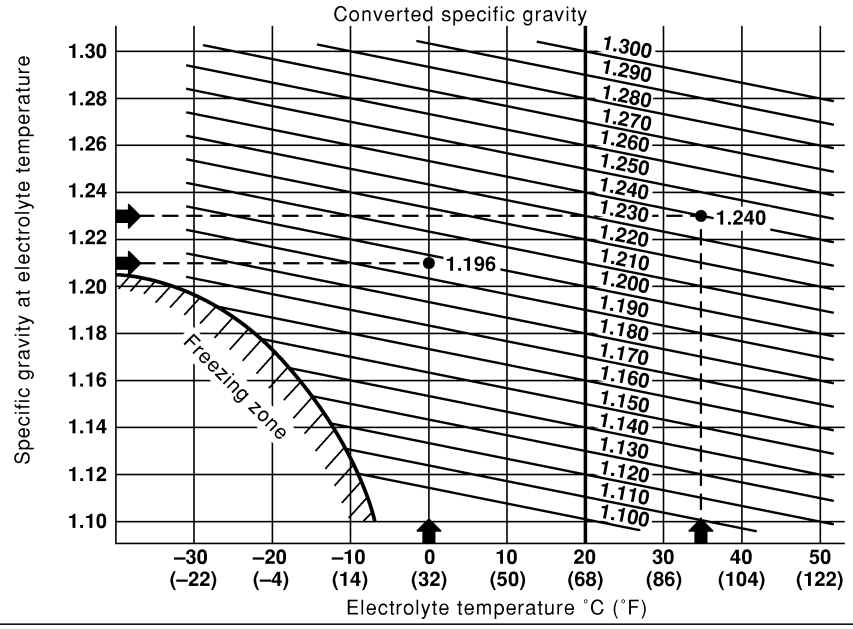
1. Read hydrometer and thermometer indications at eye level.

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.

How to Handle Battery (Cont'd)



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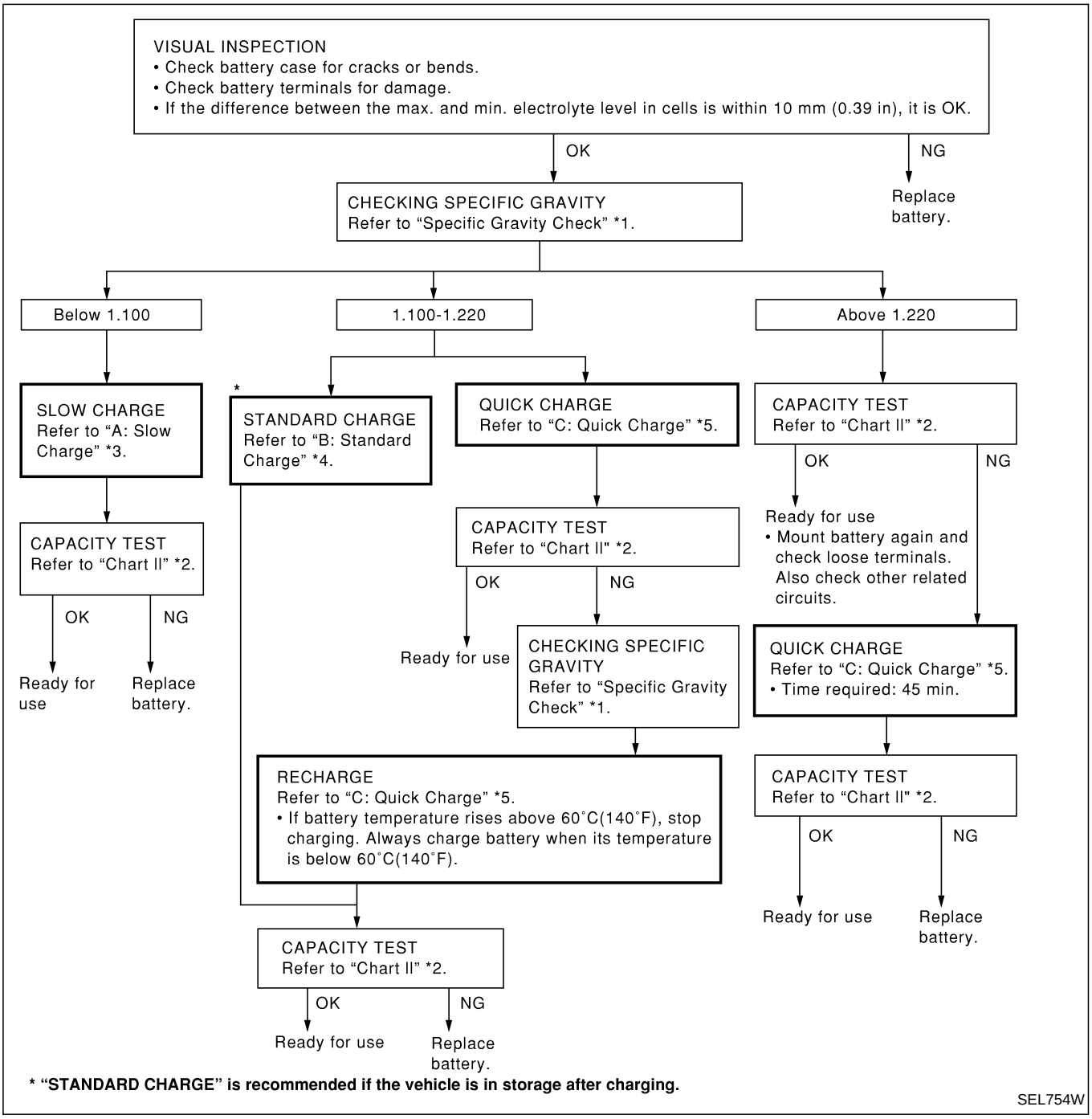
Battery Test and Charging Chart

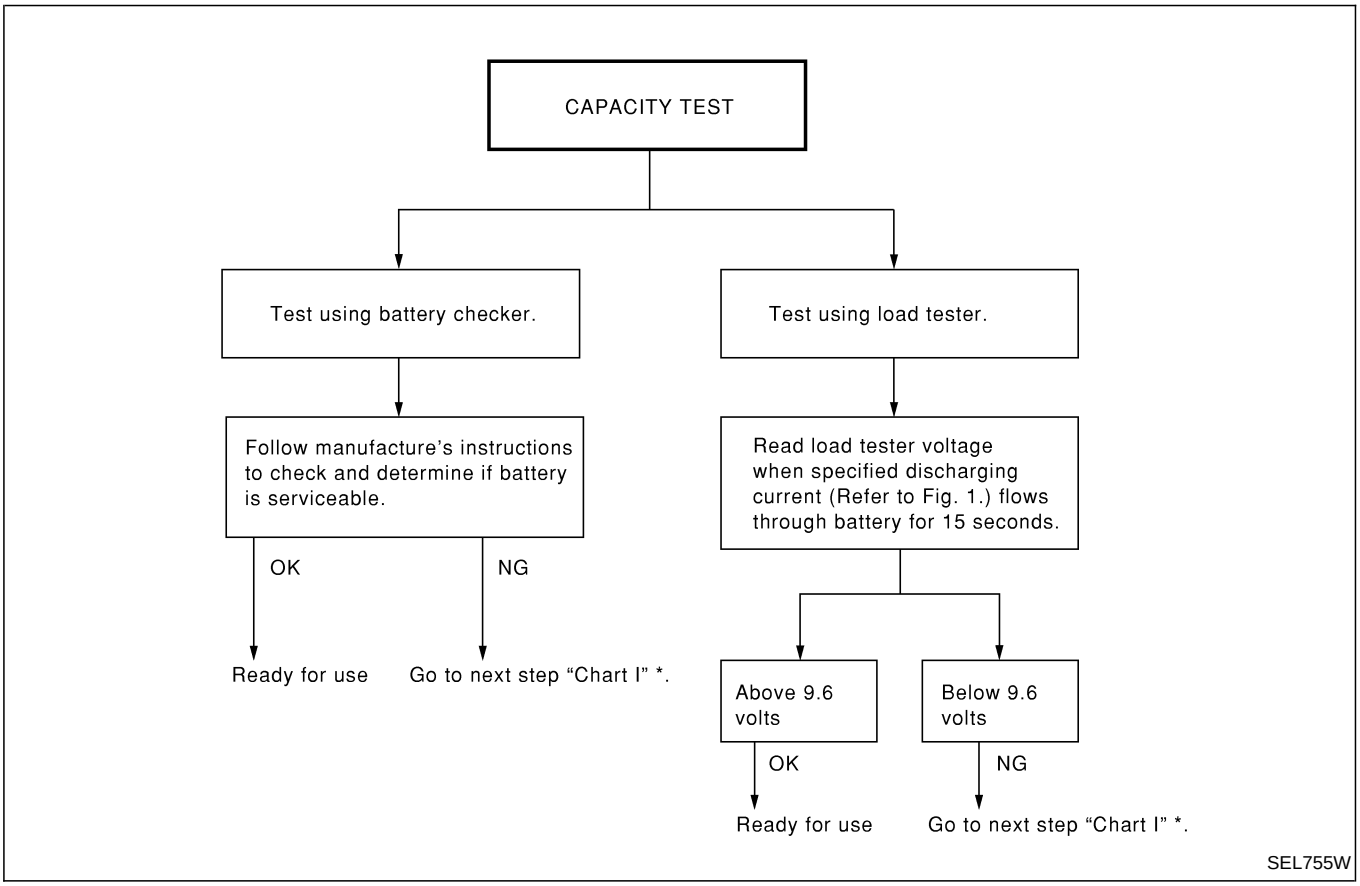
CHART I



*1: SC-4
*2: SC-7
*3: SC-8
*4: SC-10
*5: SC-11

Battery Test and Charging Chart (Cont'd)

CHART II



*: SC-6

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

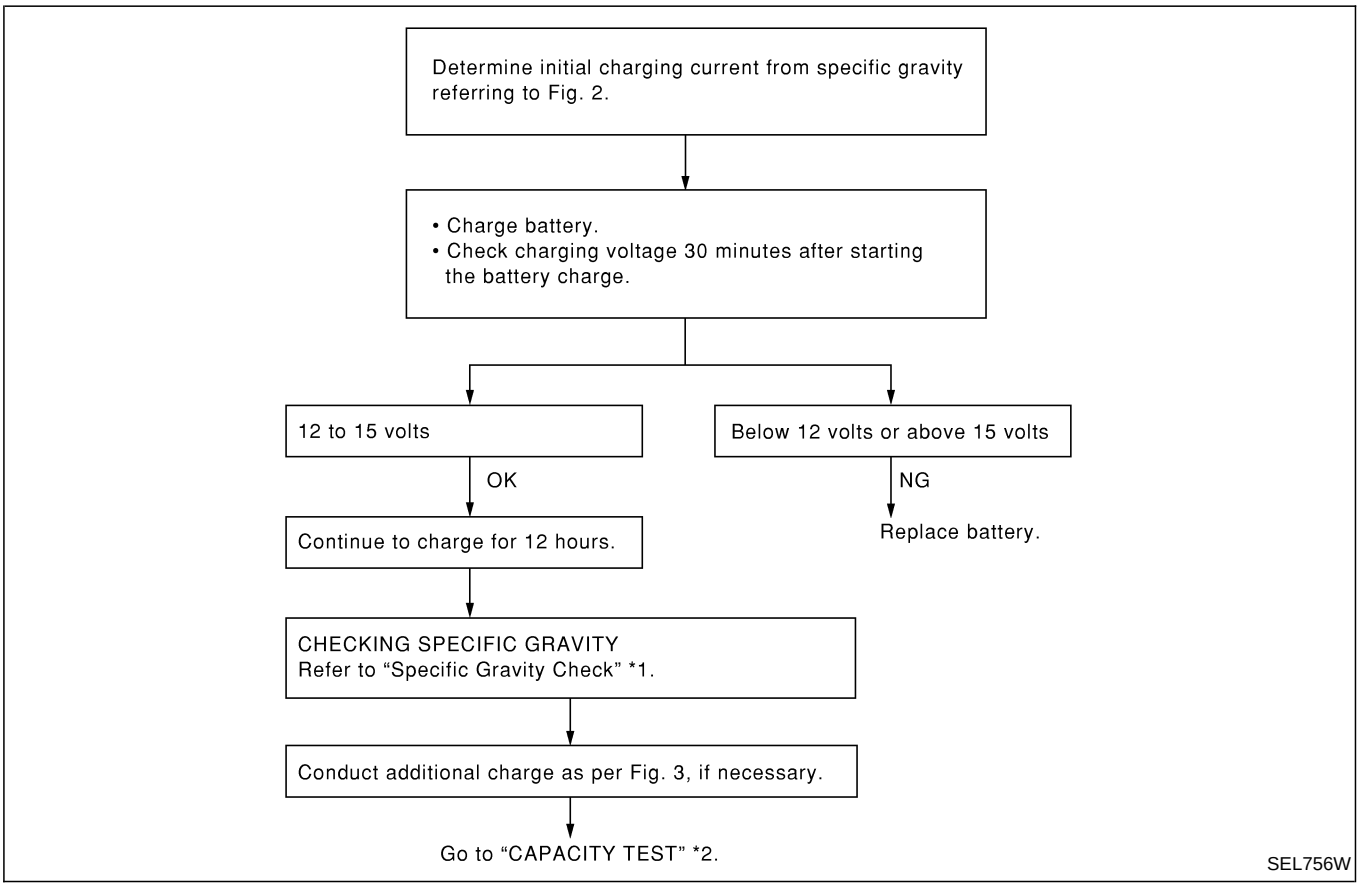
Fig. 1 DISCHARGING CURRENT (Load Tester)

Type	Current (A)
28B19R(L)	90
34B19R(L)	99
46B24R(L)	135
55B24R(L)	135
50D23R(L)	150
55D23R(L)	180
65D26R(L)	195
L2-580 R/L (65 Ah)	195
80D26R(L)	195
75D31R(L)	210
063 [YUASA type code]	210
L3-760 R/L (75 Ah)	225
95D31R(L)	240
115D31R(L)	240
025 [YUASA type code]	240
065 [YUASA type code]	255
027 [YUASA type code]	285

Battery Test and Charging Chart (Cont'd)

Type	Current (A)
075 [YUASA type code]	300
110D26R(L)	300
95E41R(L)	300
067 [YUASA type code]	325
130E41R(L)	330
096 [YUASA type code]	375
096L [YUASA type code]	375
010S [YUASA type code]	360

A: SLOW CHARGE



*1: SC-4 *2: SC-7

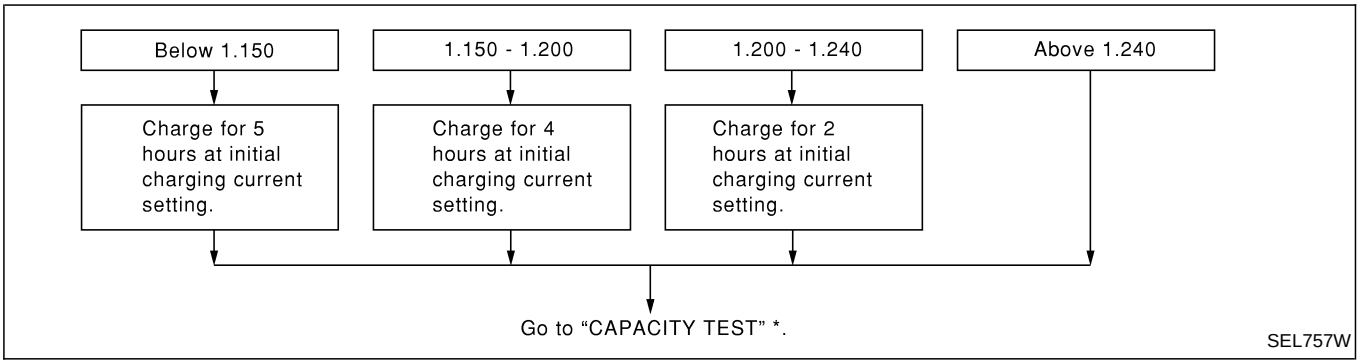
Battery Test and Charging Chart (Cont'd)

Fig. 2 INITIAL CHARGING CURRENT SETTING (Slow 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)	L2-580 R/L (65 Ah)	063 [YUASA type code]	067 [YUASA type code]	096 [YUASA type code]	75D31R(L)	L3-760 R/L (75 Ah)	95D31R(L)	115D31R(L)	110D26R(L)	95E41R(L)	065 [YUASA type code]	075 [YUASA type code]	096L [YUASA type code]	010S [YUASA type code]	130E41R(L)
Below 1.100	4.0 (A)		5.0 (A)		7.0 (A)				8.0 (A)					8.5 (A)	9.0 (A)		10.0 (A)						11.0 (A)		14.0 (A)

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

Fig. 3 ADDITIONAL CHARGE (Slow charge)



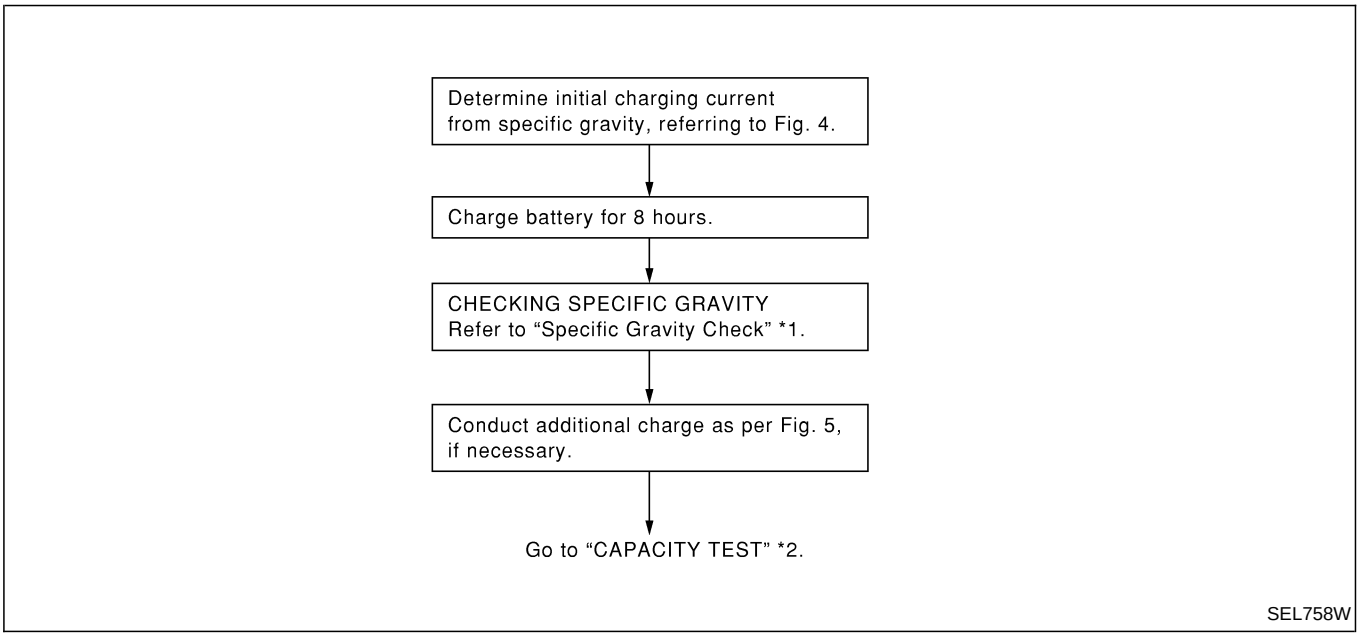
*: SC-7

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).**

Battery Test and Charging Chart (Cont'd)

B: STANDARD CHARGE



*1: SC-4 *2: SC-7

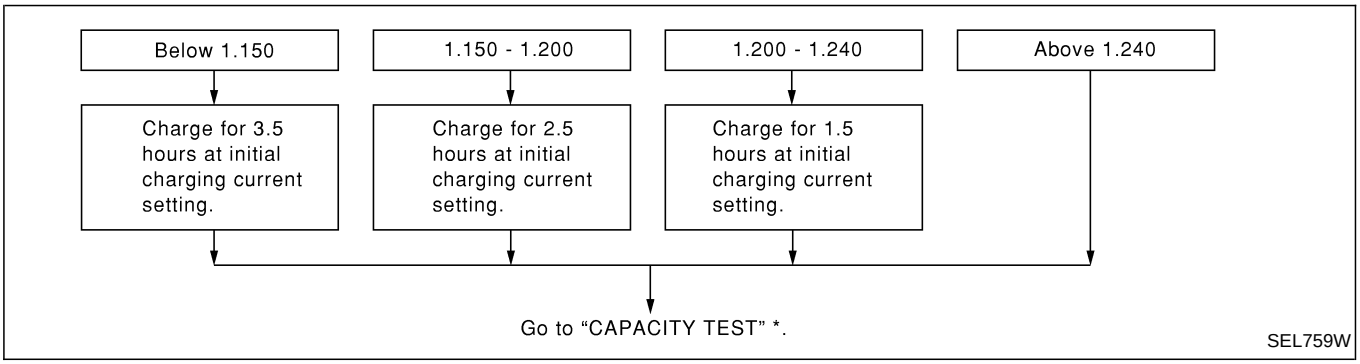
Fig. 4 INITIAL CHARGING CURRENT SETTING (Standard charge)

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)	L2-580 R/L (65 Ah)	80D26R(L)	063 [YUASA type code]	067 [YUASA type code]	096 [YUASA type code]	75D31R(L)	L3-760 R/L (75 Ah)	95D31R(L)	115D31R(L)	110D26R(L)	95E41R(L)	065 [YUASA type code]	075 [YUASA type code]	096L [YUASA type code]	010S [YUASA type code]	130E41R(L)
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.

Battery Test and Charging Chart (Cont'd)

Fig. 5 ADDITIONAL CHARGE (Standard charge)

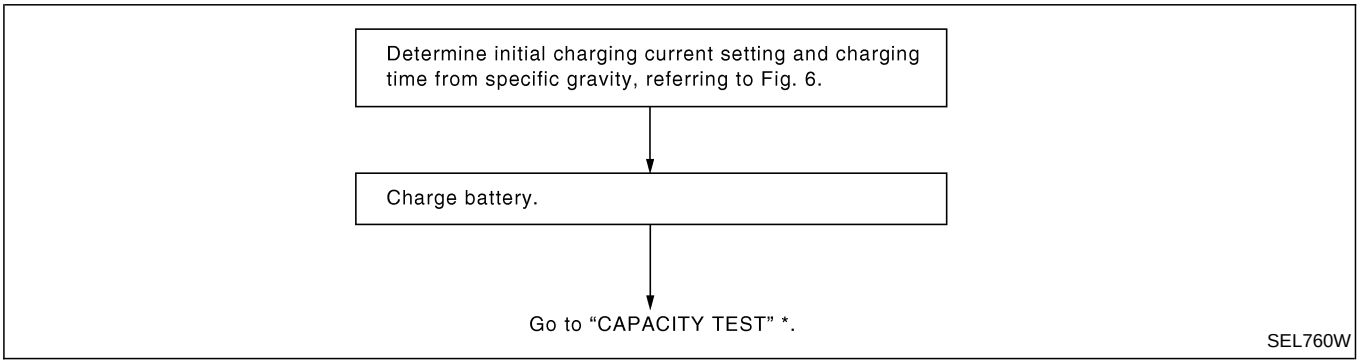


*: SC-7

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).**

C: QUICK CHARGE



*: SC-7

Battery Test and Charging Chart (Cont'd)

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)	L2-580 R/L (65 Ah)	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)	L3-760 R/L (75 Ah)	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.**

System Description

M/T MODELS

Power is supplied at all times
- through 40A fusible link (letter **C**, located in the fuse and fusible link box)
- to ignition switch terminal 1.

With the ignition switch in START position, power is supplied
- from ignition switch terminal 1
- to starter motor harness connector terminal 4.

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 **C**, 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 1
- to park/neutral position relay terminal 4.

With the ignition switch ON or START position, power is supplied
- through 10A fuse [No. 8, located in the fuse block (J/B)]
- to park/neutral position (PNP) relay terminal 1.

With the selector lever in the P or N position, ground is supplied
- to park/neutral position relay terminal 2 through the park/neutral position switch
- from body grounds, M754 and M33.

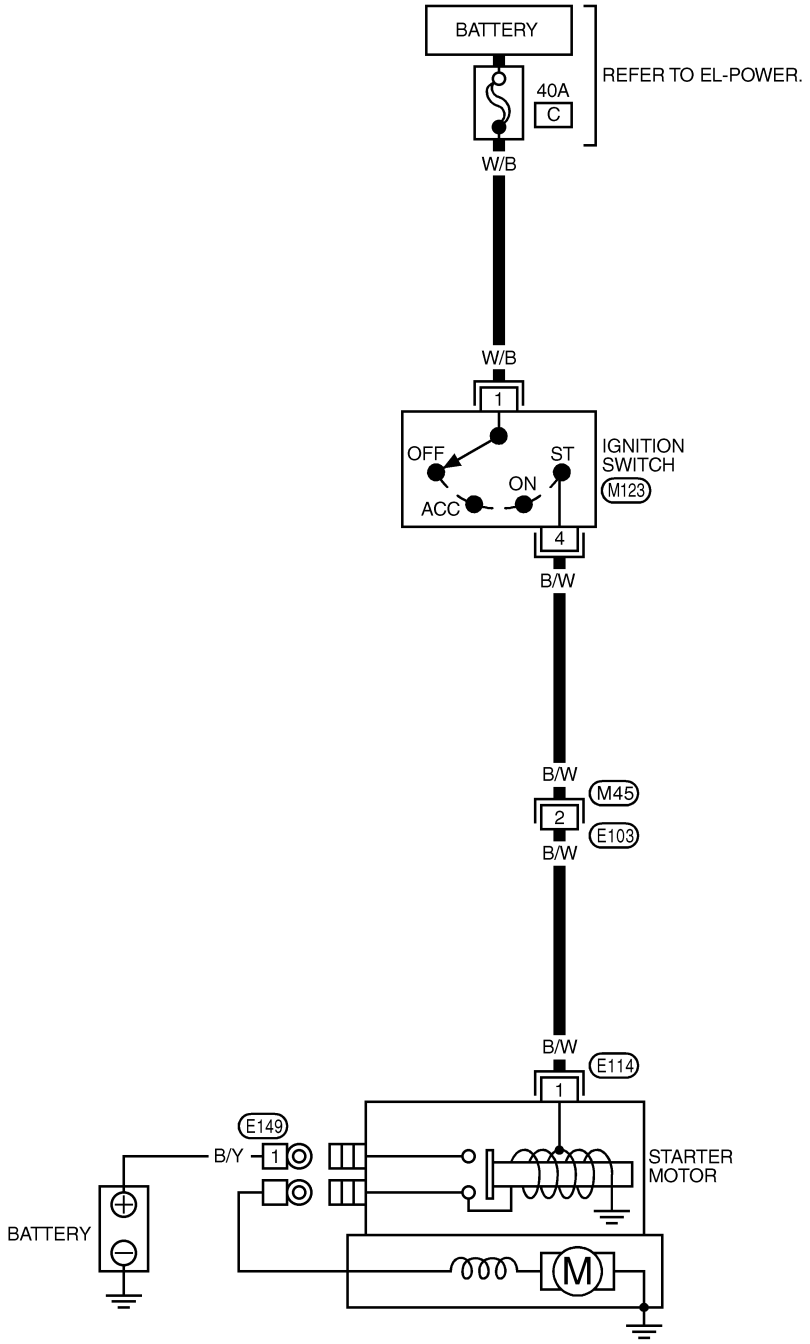
Then park/neutral position relay is energized and power is supplied
- from park/neutral position relay terminal 3
- to starter motor harness connector terminal 1.

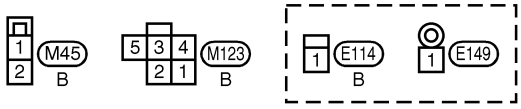
The starter motor plunger closes and provides a closed circuit between the battery and starter motor. The starter motor is grounded to the engine block. With power and ground supplied, cranking occurs and the engine starts.

Wiring Diagram — START —

TD27Ti ENGINE MODELS

SC-START-01

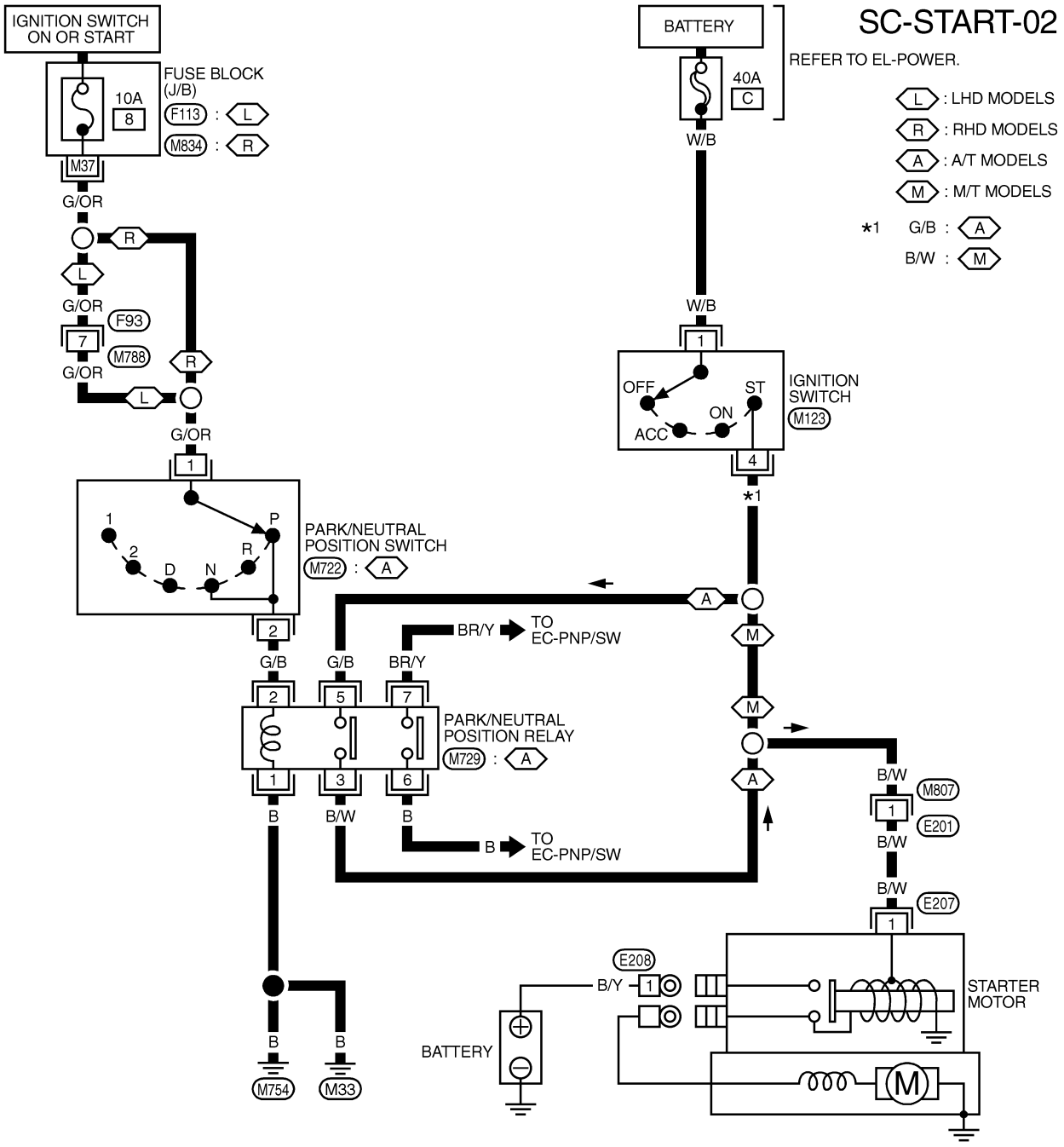


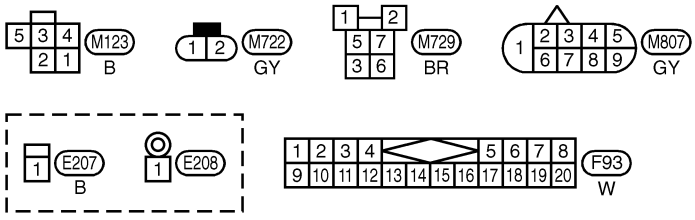


YEL053D

Wiring Diagram — START — (Cont'd)

ZD30DDTi ENGINE MODELS



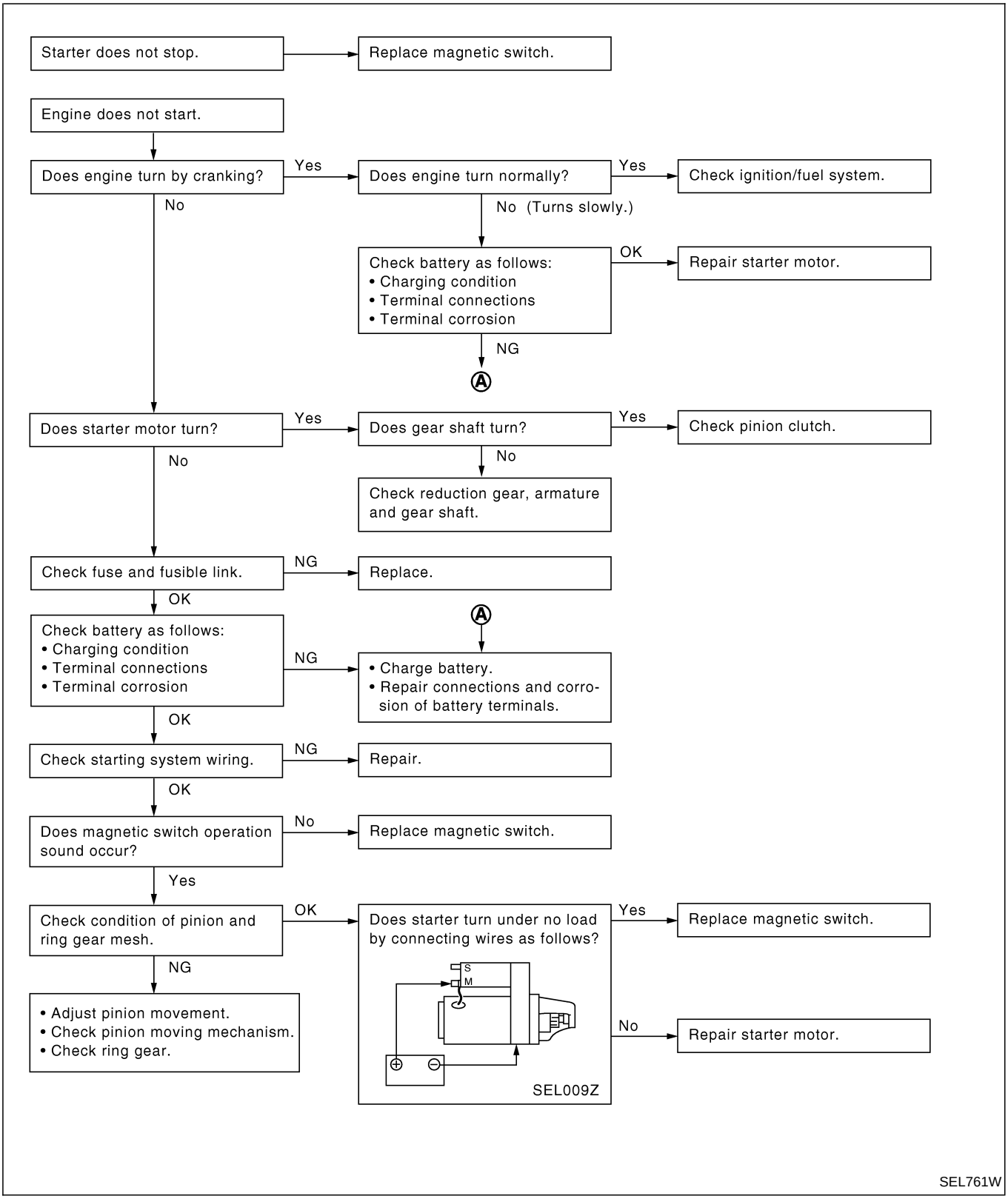


REFER TO THE FOLLOWING.
M834 , F113 -FUSE BLOCK-JUNCTION BOX (J/B)

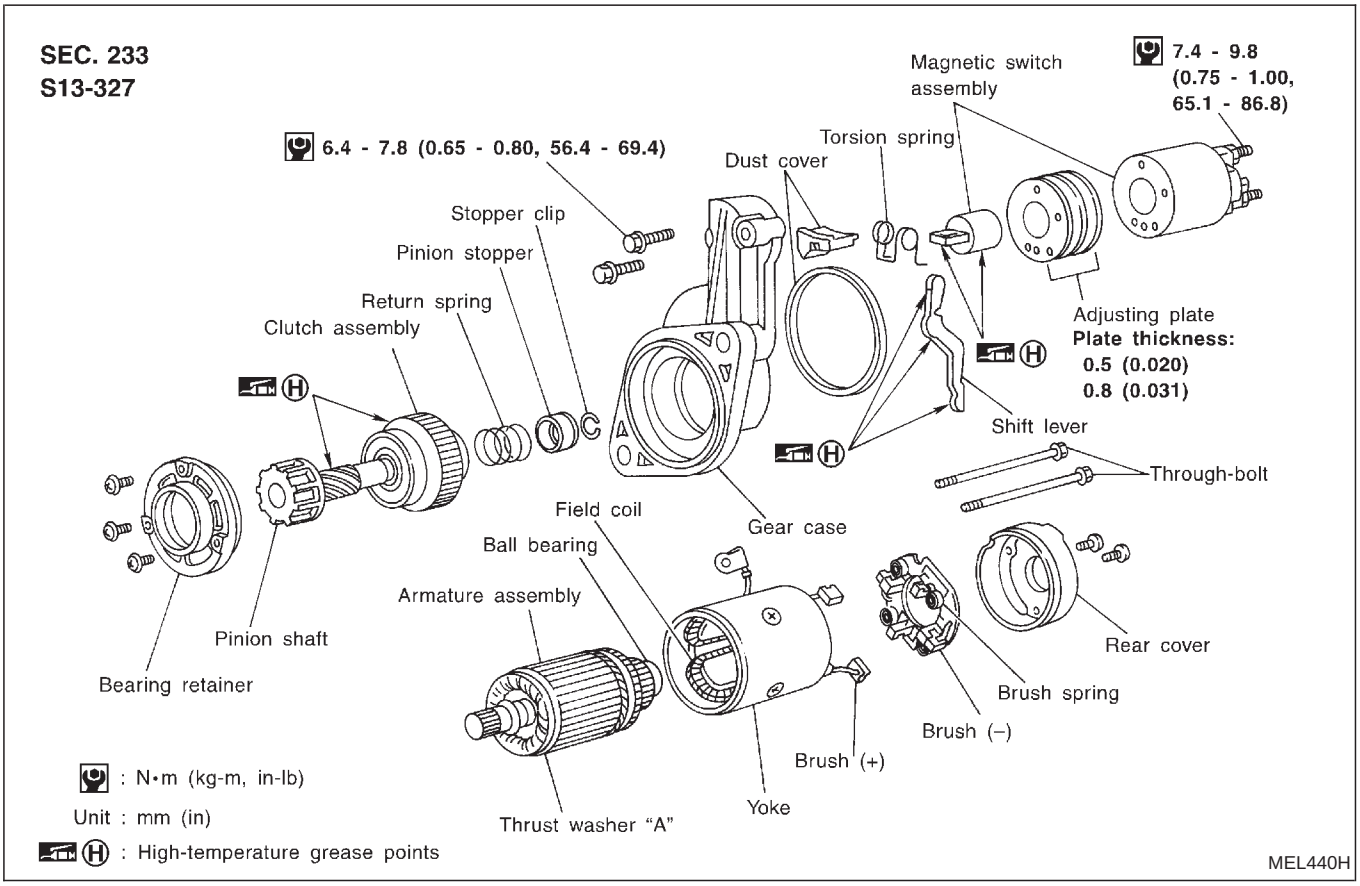
YEL054D

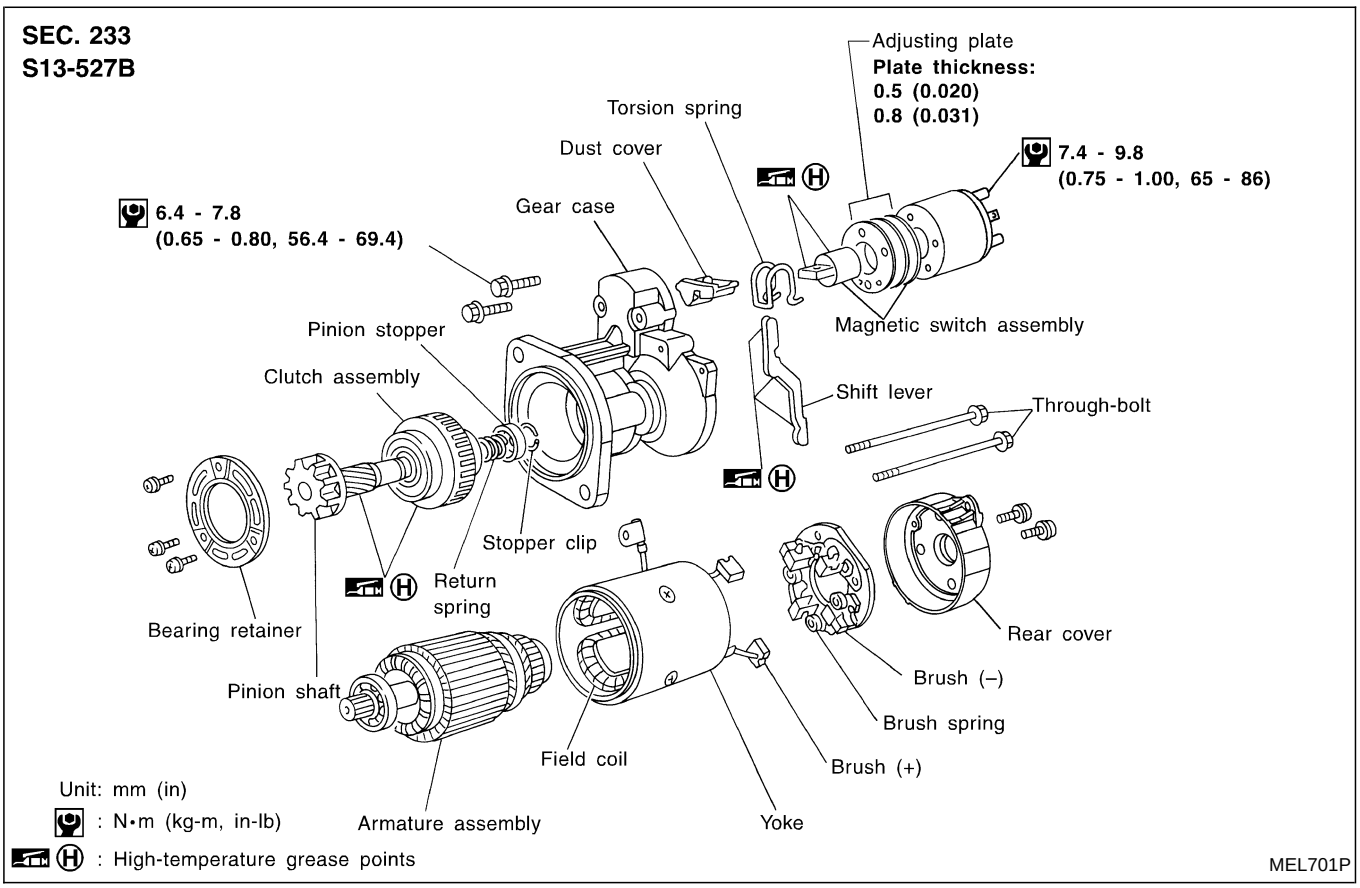
Trouble Diagnoses

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

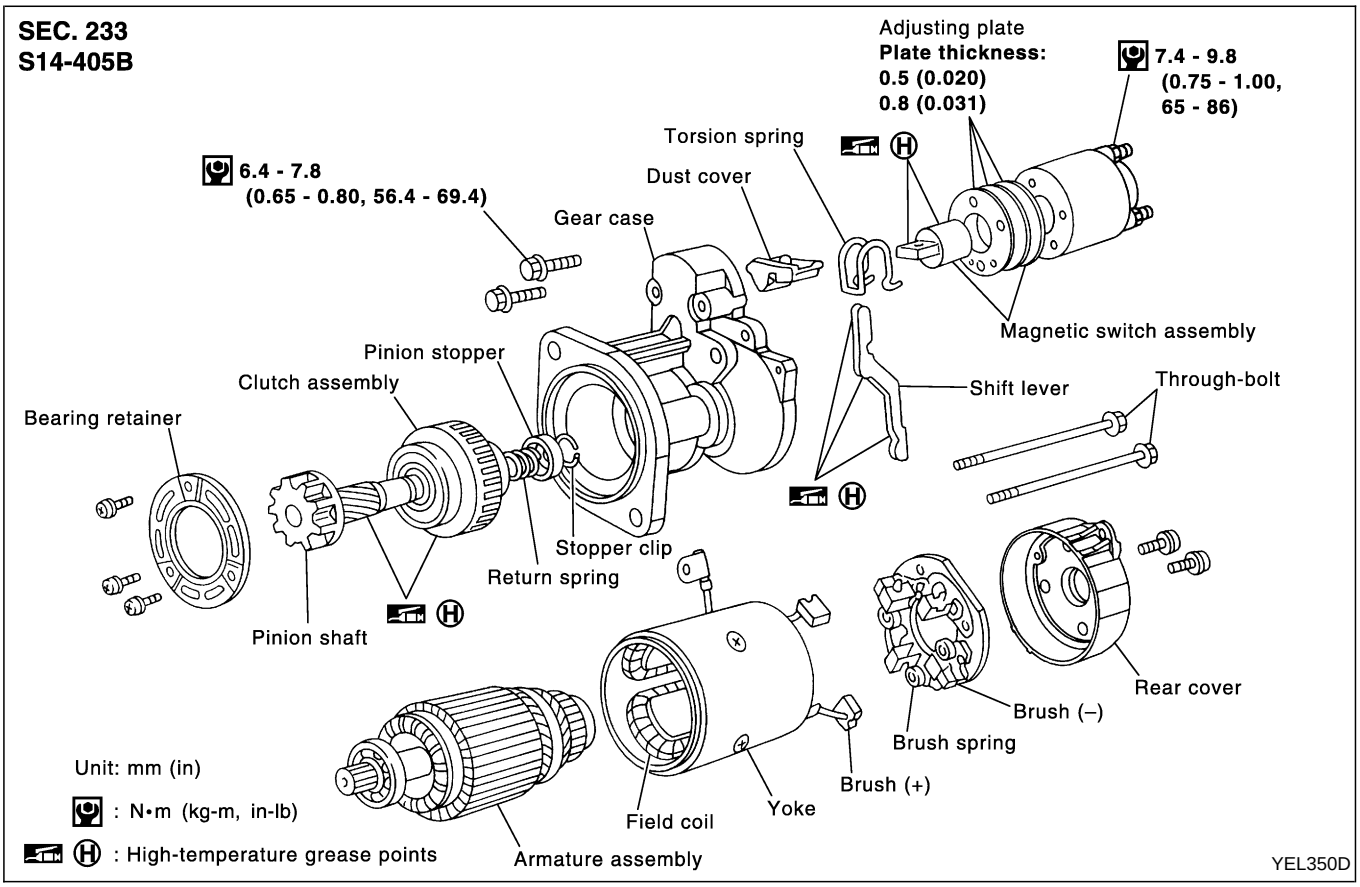


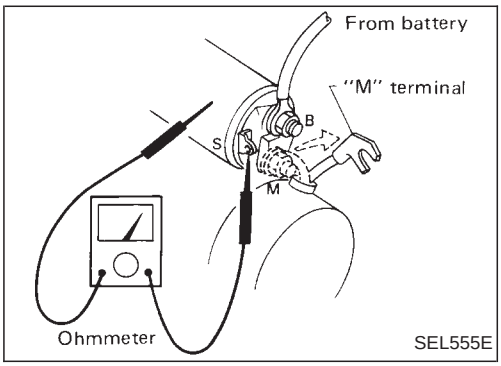
Construction





Construction (Cont'd)



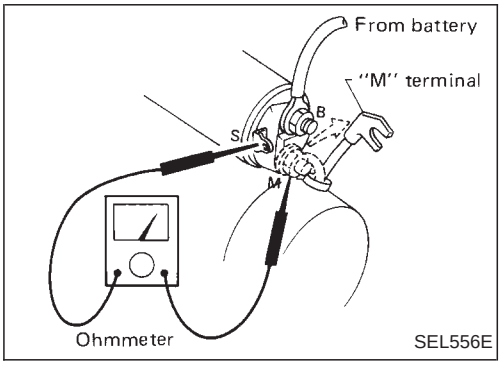


Magnetic Switch Check

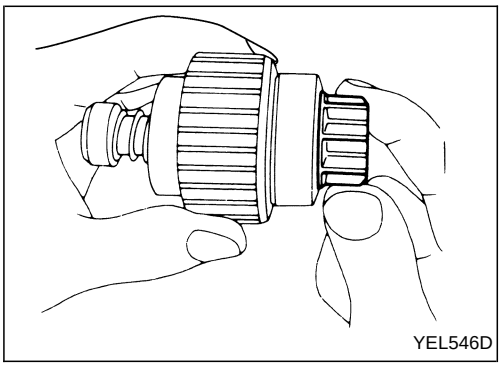
Magnetic Switch Check

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

1. Continuity test (between "S" terminal and switch body).
   - No continuity ... Replace.

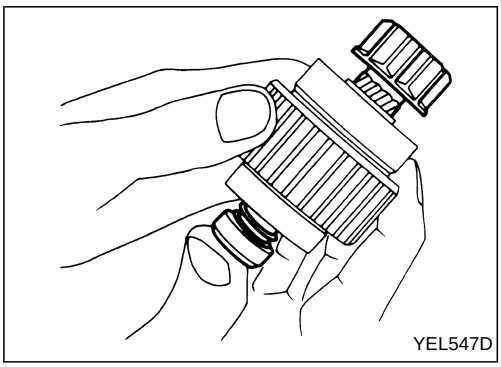


2. Continuity test (between "S" terminal and "M" terminal).
   - No continuity ... Replace.

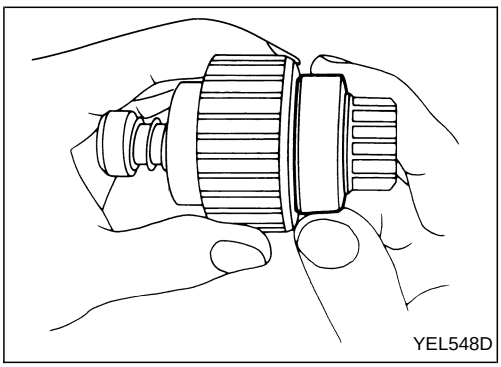


Pinion/Clutch Check

1. Check to see if pinion locks in one direction and rotates smoothly in the opposite direction.
   - If it does not lock (or locks) in either direction or unusual resistance is evident ... Replace.



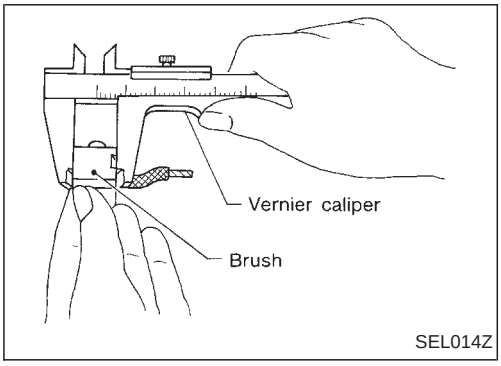
2. Check pinion movement
   - If it is hard to move, apply grease or, if necessary, replace.



3. Check ball bearing.
   Spin outer race of ball bearing to ensure that it turns smoothly without binding.
   - Abnormal resistance ... Replace.

Pinion/Clutch Check (Cont'd)

4. Inspect pinion teeth.
   - Replace pinion if teeth are worn or damaged. (Also check condition of ring gear teeth.)
5. Inspect reduction gear teeth.
   - Replace reduction gear if teeth are worn of damaged. (Also check condition of armature shaft gear teeth.)



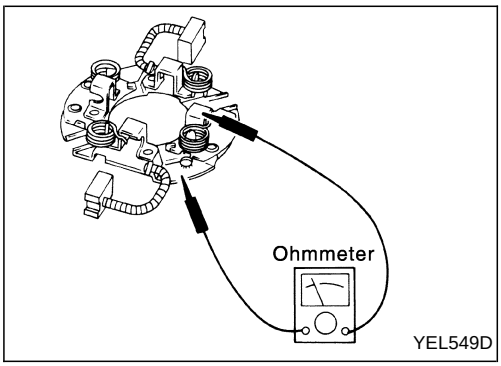
Brush Check

BRUSH

Check wear of brush.

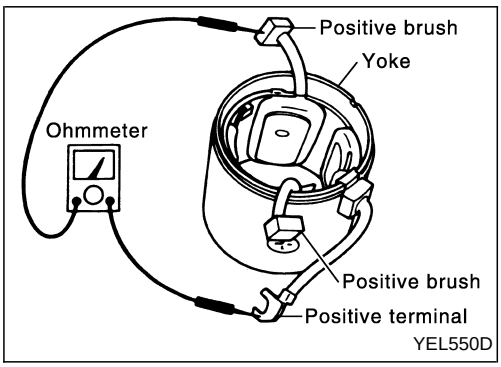
Wear limit length:
Refer to SDS (SC-30).

- Excessive wear ... Replace.



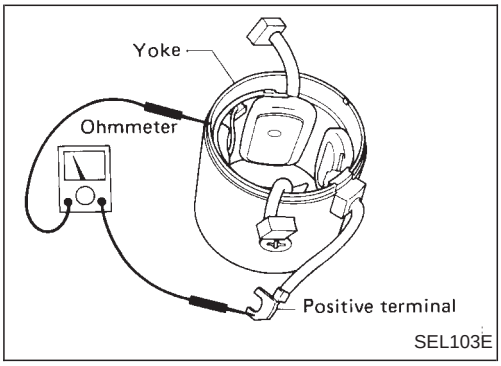
BRUSH HOLDER

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.

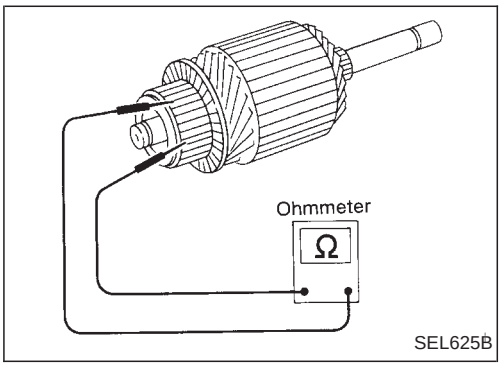


Field Coil Check

1. Continuity test (between field coil positive terminal and positive brushes).
   - No continuity ... Replace field coil.

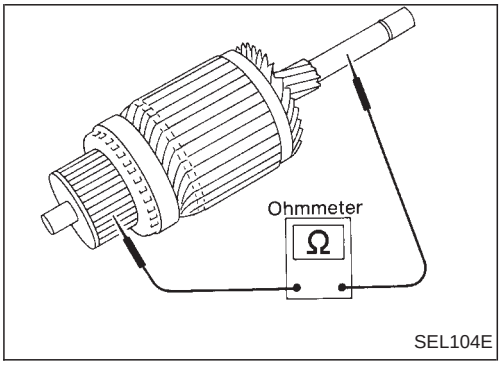


2. Insulation test (between field coil positive terminal and yoke).
   - Continuity exists ... Replace field coil.

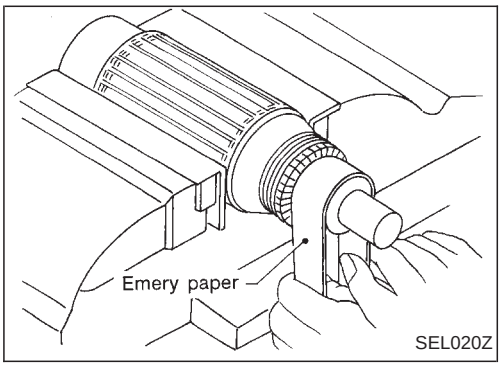


Armature Check

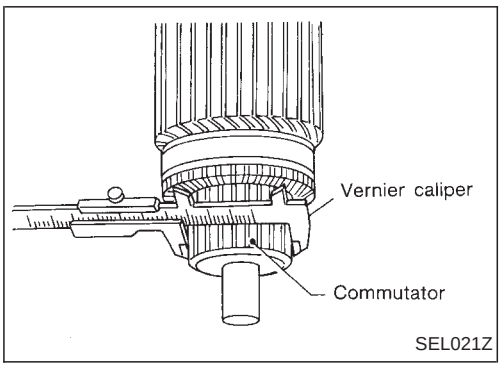
1. Continuity test (between two segments side by side).
   - No continuity ... Replace.



2. Insulation test (between each commutator bar and shaft).
   - Continuity exists ... Replace.

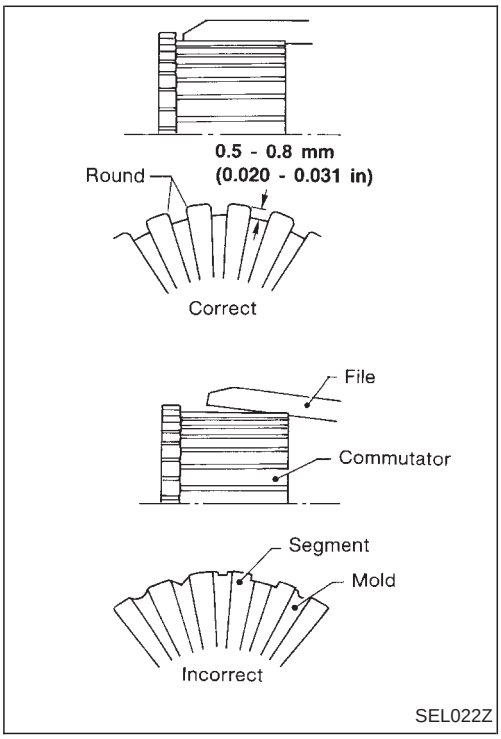


3. Check commutator surface.
   - Rough ... Sand lightly with No. 500-600 emery paper.



4. Check diameter of commutator.
   Commutator minimum diameter:
   Refer to SDS (SC-30).
   - Less than specified value ... Replace.

Armature Check (Cont'd)



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

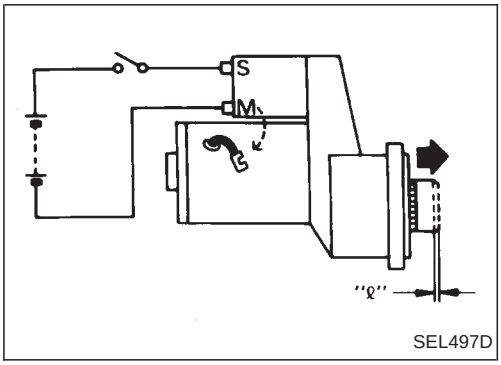
Assembly

Carefully observe the following instructions.

GREASE POINT

- Rear cover metal
- Gear case metal
- Center bracket metal
- Frictional surface of pinion
- Moving portion of shift lever
- Plunger of magnetic switch
- Reduction gear

PINION PROTRUSION LENGTH ADJUSTMENT

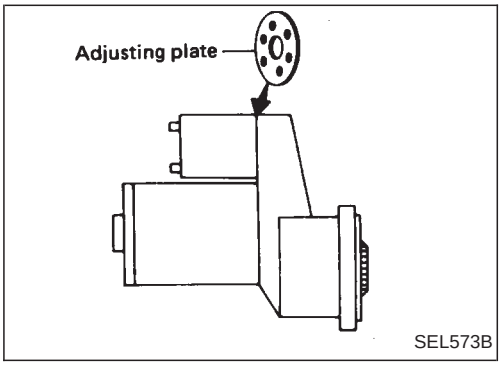


Reduction gear type

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-30).



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

System Description

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:

- 10A fuse (No. 31, located in the fuse and fusible link box).

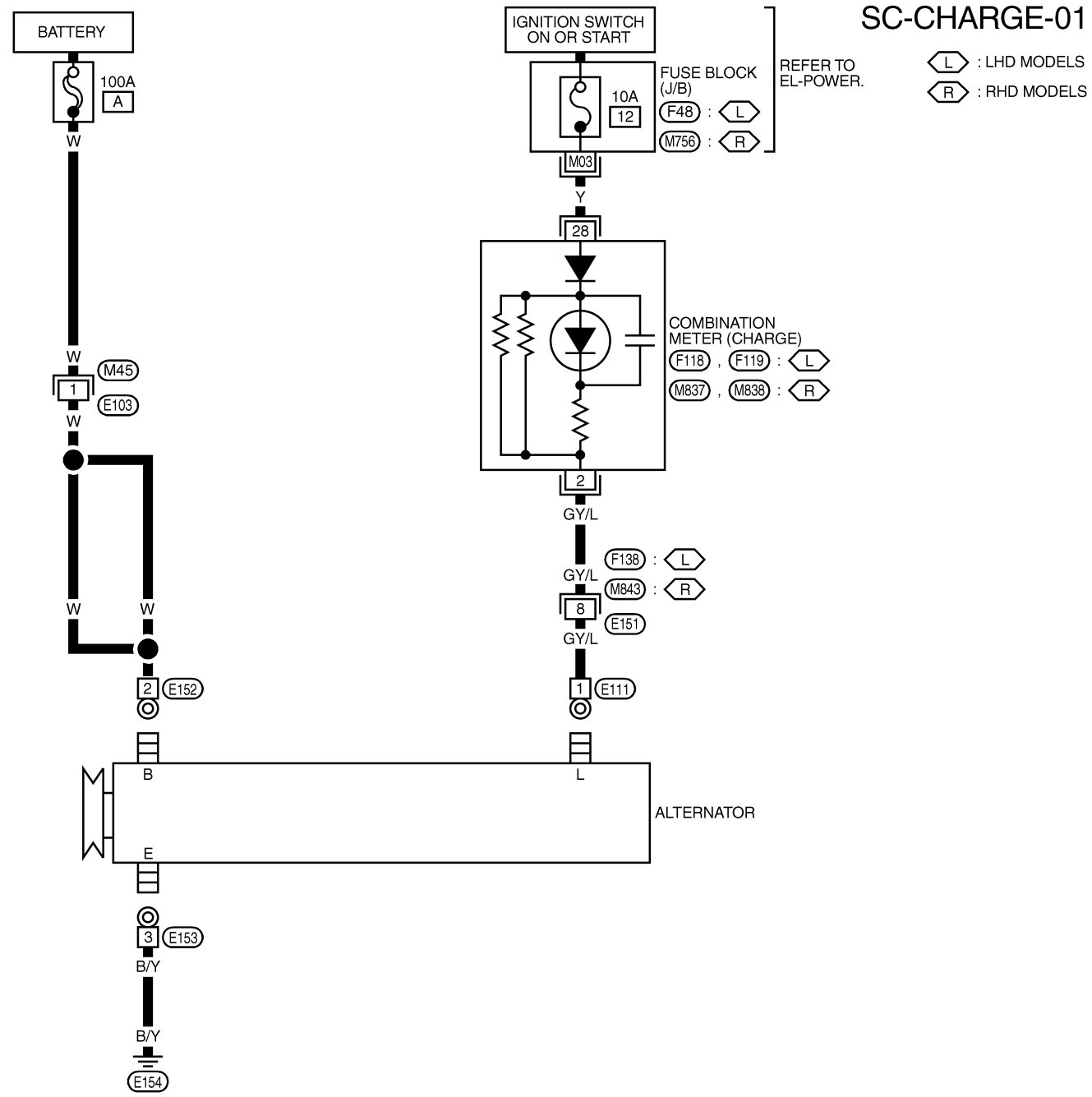
Terminal B supplies power to charge the battery and operate the vehicle's electrical system. Output voltage is controlled by the IC regulator at terminal 4 (S) detecting the input voltage (ZD30DDTi engine models). The charging circuit is protected by the 100A (A/T models) fusible link.
The alternator is grounded to the engine block.
With the ignition switch in the ON or START position, power is supplied

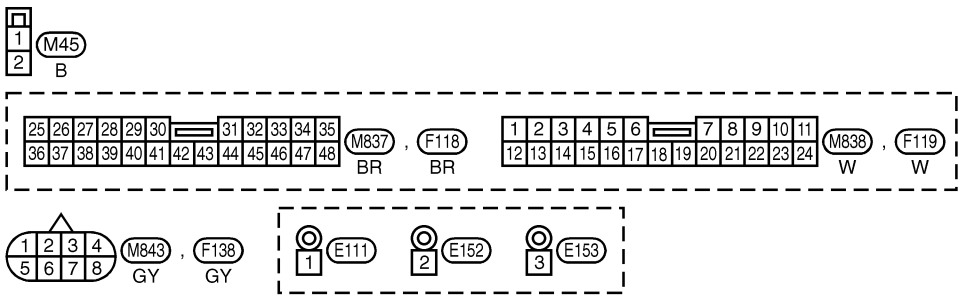
- through 10A fuse [No. 12, located in the fuse block (J/B)]
- to combination meter terminal 28 for the charge warning lamp.

Ground is supplied to terminal 2 of the combination meter through terminal 1(L) (TD27Ti engine models) or 3(L) (ZD30DDTi engine model) of the alternator. With power and ground supplied, the charge warning lamp will illuminate. When the alternator is providing sufficient voltage with the engine running, the ground is opened and the charge warning lamp will go off.
If the charge warning lamp illuminates with the engine running, a malfunction is indicated.

Wiring Diagram — CHARGE —

TD27Ti ENGINE MODELS



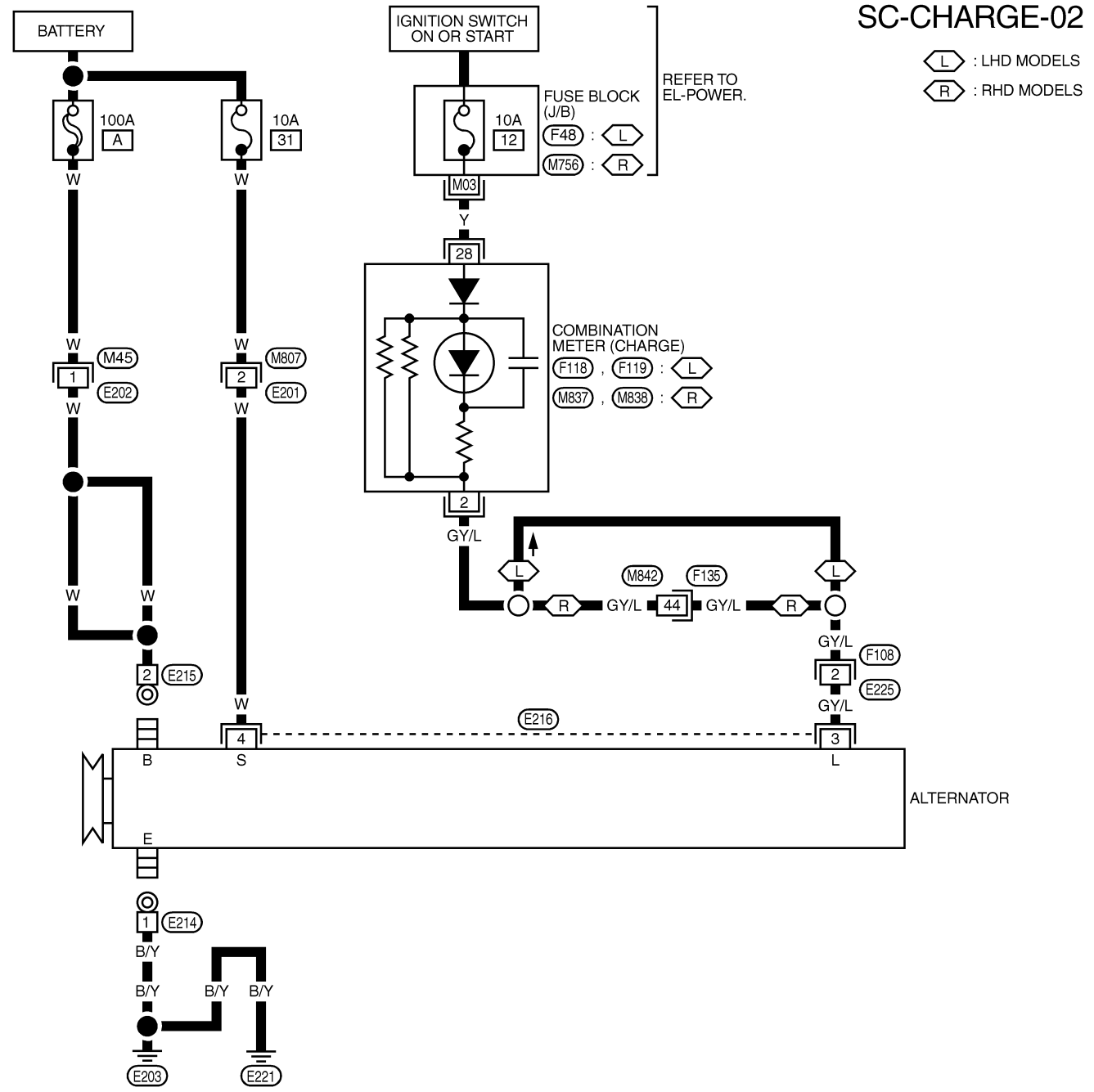


REFER TO THE FOLLOWING.
M756 , F48 -FUSE BLOCK-JUNCTION BOX (J/B)

YEL055D

Wiring Diagram — CHARGE — (Cont'd)

ZD30DDTi ENGINE MODELS



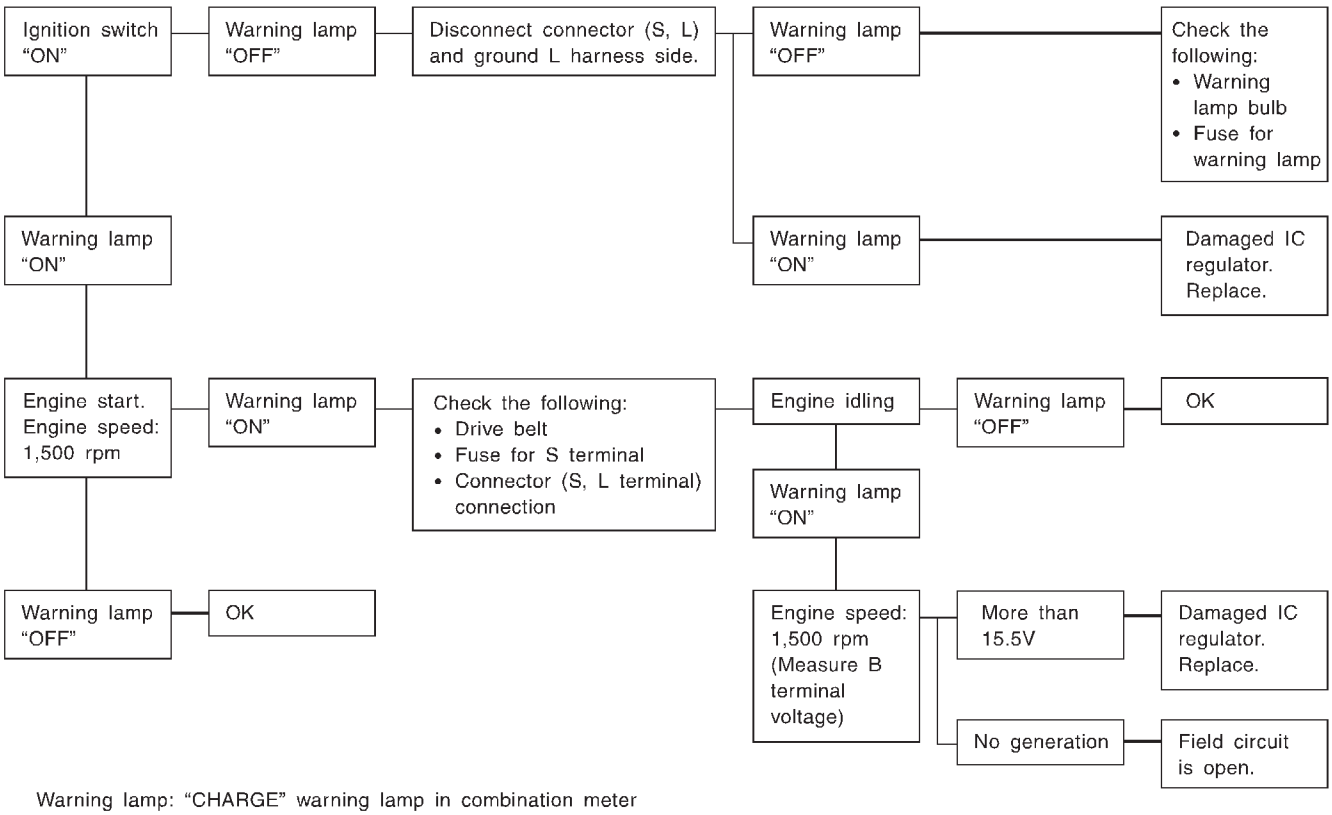
YEL056D

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



Warning lamp: "CHARGE" warning lamp in combination meter

SEL338V

NOTE:

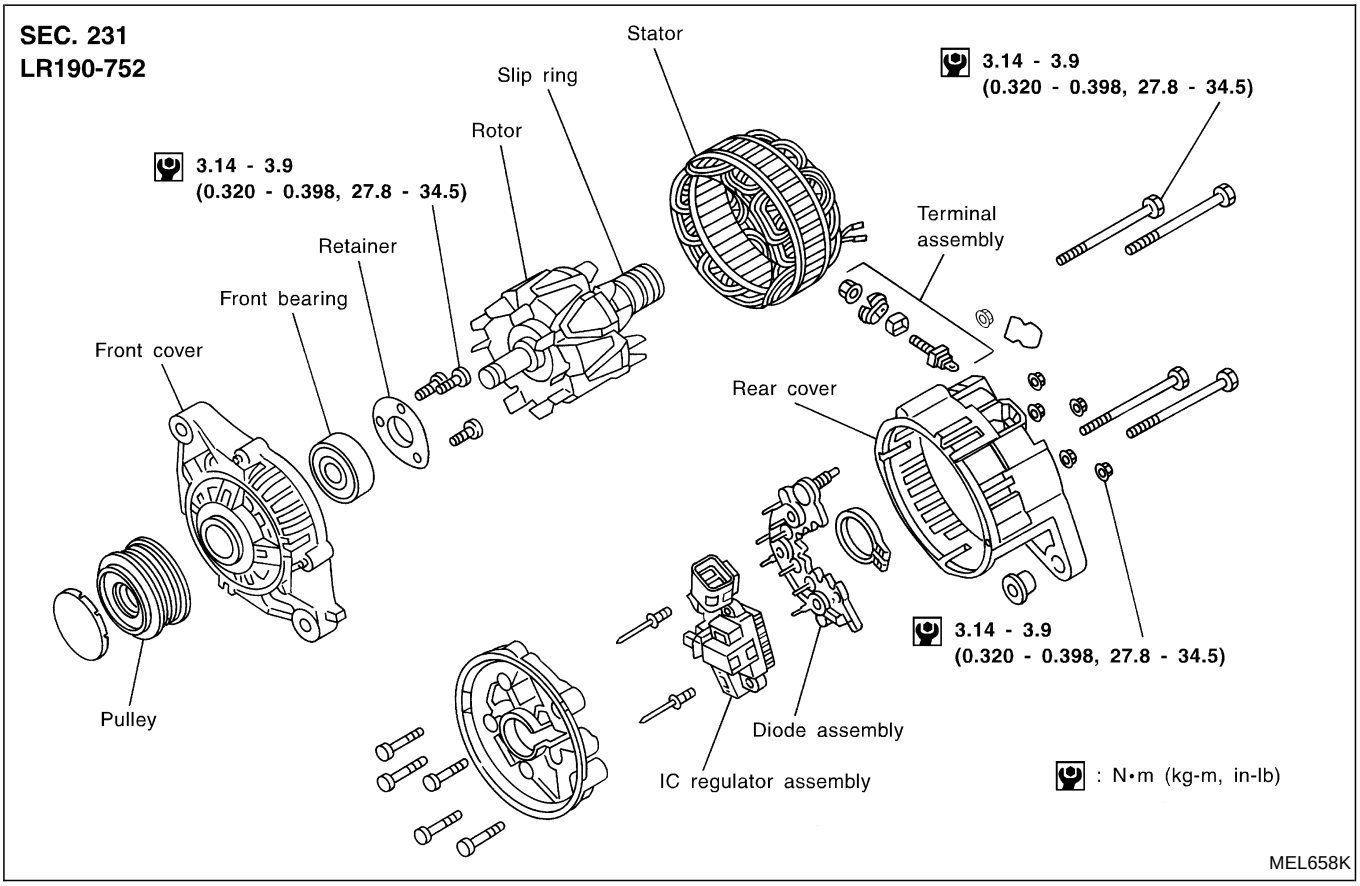
- If the inspection result is OK even though the charging system is malfunctioning, check the B terminal connection. (Check the tightening torque.)
- When field circuit is open, check condition of rotor coil, rotor slip ring and brush. If necessary, replace faulty parts with new ones.

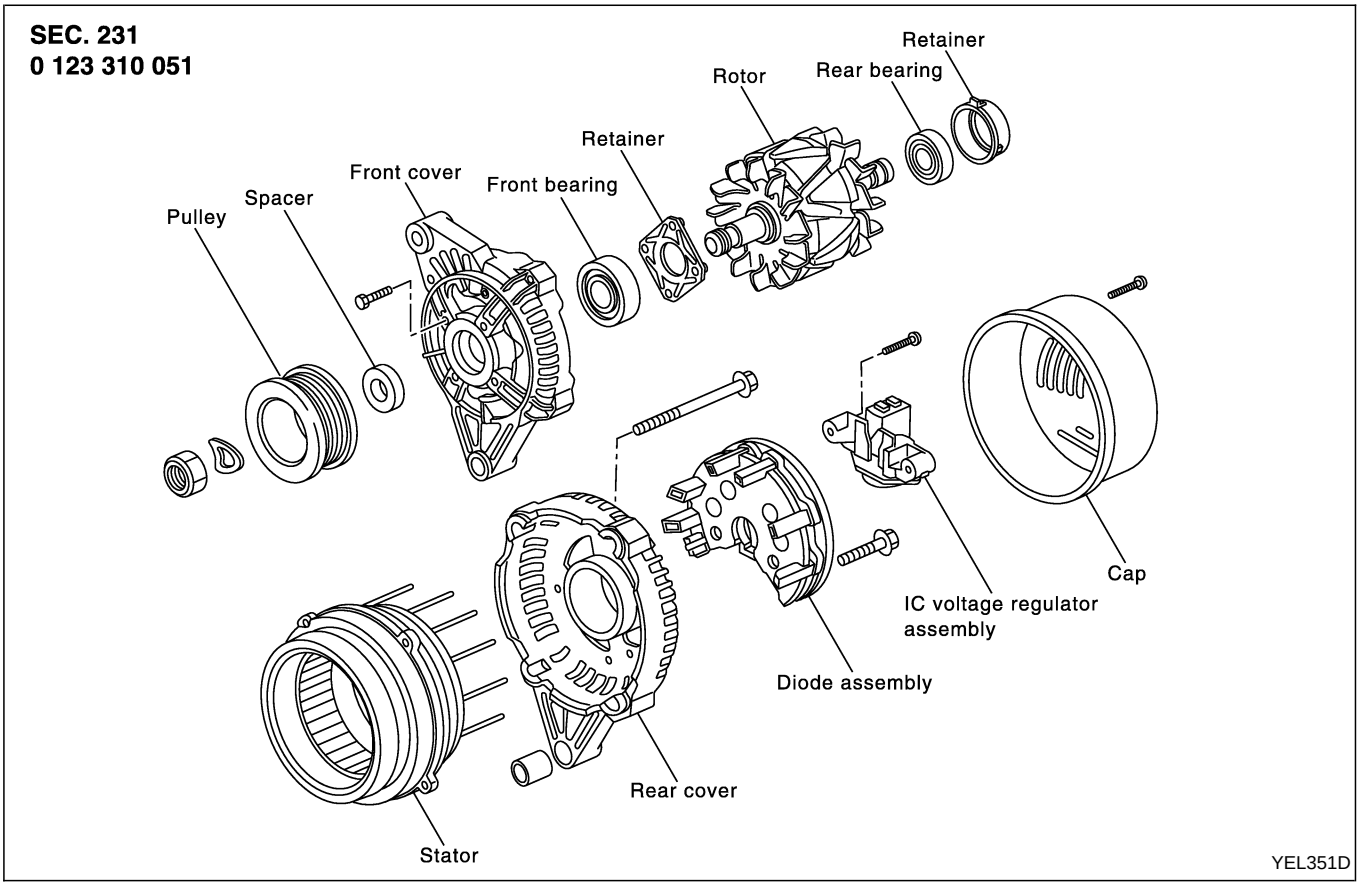
MALFUNCTION INDICATOR

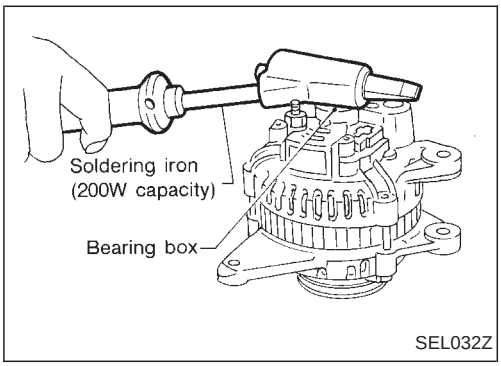
The IC regulator warning function activates to illuminate "CHARGE" warning lamp, if any of the following symptoms occur while alternator is operating:

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

Construction







Disassembly

REAR COVER

CAUTION:

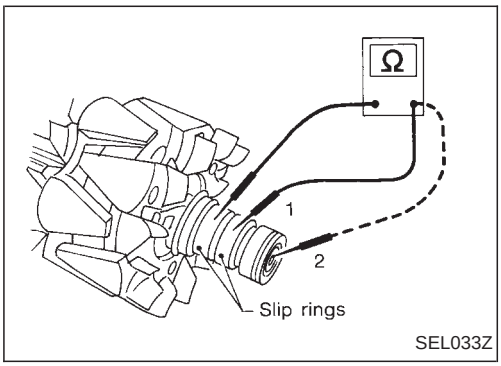
Rear cover may be hard to remove because a ring is used to lock outer race of rear bearing. To facilitate removal of rear cover, heat just bearing box section with a 200W soldering iron.

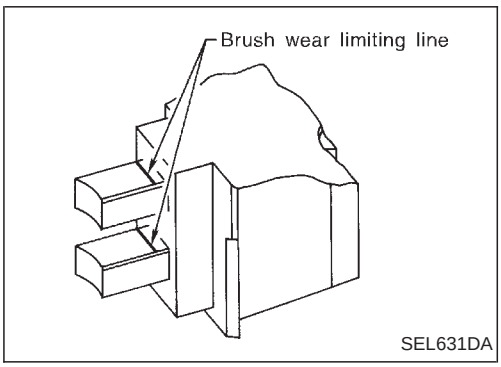
Do not use a heat gun, as it can damage diode assembly.

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-30).

- 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-30).

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

BRUSH CHECK

1. Check smooth movement of brush.

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

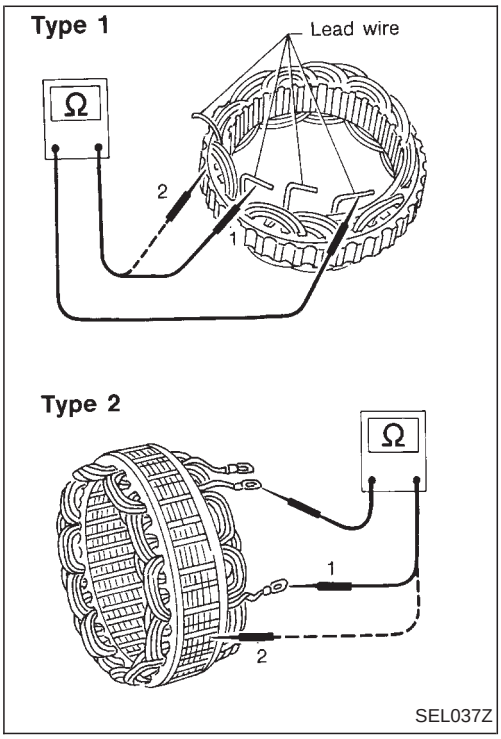
2. Check brush for wear.

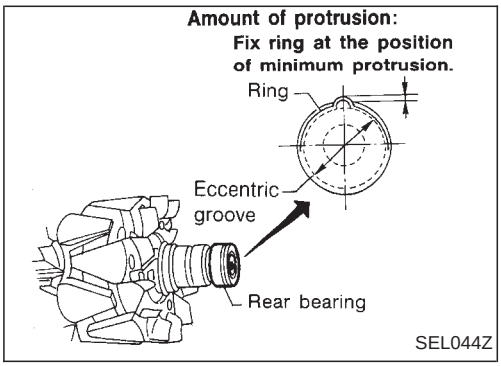
- Replace brush if it is worn down to the limit line.

Inspection (Cont'd)

STATOR CHECK

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





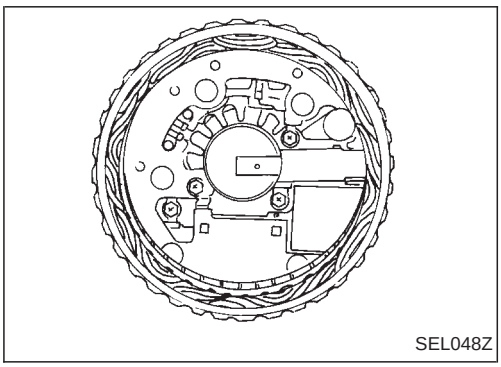
Assembly

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:

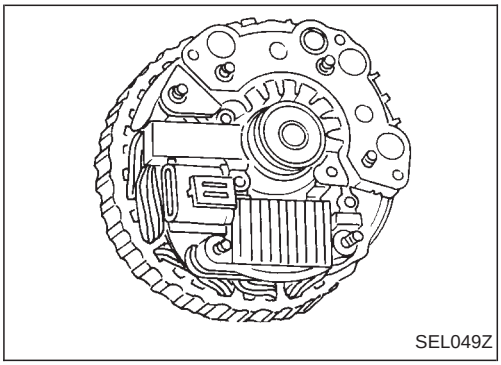
Do not reuse rear bearing after removal.



REAR COVER INSTALLATION

1. Fit brush assembly, diode assembly, regulator assembly and stator.
2. Push brushes up with fingers and install them to rotor.

Take care not to damage slip ring sliding surface.



Battery

Applied model	TD27Ti		ZD30DDTi	
Type	L2-580 R (65 Ah)	L2-580 L (65 Ah)	L3-760 R (75 Ah)	L3-760 L (75 Ah)
Capacity V-AH	12-55		12-64	

Starter

Type			S13-327	S13-527B	S14-405B
			HITACHI make		
Applied model			TD27Ti	ZD30DDTi	
System voltage		V	12		
No-load	Terminal voltage	V	11.0		
	Current	A	Less than 160		
	Revolution	rpm	More than 4,000	More than 3,300	More than 2,700
Minimum diameter of commutator		mm (in)	35.5 (1.398)		35.5 (1.398)
Minimum length of brush		mm (in)	9.0 (0.354)	11.0 (0.433)	11.0 (0.433)
Brush spring tension		N (kg, lb)	—	28.4 - 34.3 (2.9 - 3.5, 6.4 - 7.7)	28.4 - 34.3 (2.9 - 3.5, 6.4 - 7.7)
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)	0.3 - 1.5 (0.012 - 0.059)	0.3 - 2.0 (0.012 - 0.079)	0.3 - 2.0 (0.012 - 0.079)

Alternator

Type		LR190-752	0 123 310 051
		HITACHI make	BOSCH make
Applied model		ZD30DDTi	TD27Ti
Nominal rating	V-A	12-90	12-70
Ground polarity		Negative	
Minimum revolutions under no-load (When 13.5V is applied)	rpm	Less than 1,000	Less than 1,000
Hot output current (When 13.5V is applied)	A/rpm	More than 23/1,300 More than 65/2,500 More than 87/5,000	More than 26/1,300 More than 58/2,500 More than 72/5,000
Regulated output voltage	V	14.1 - 14.7	
Minimum length of brush	mm (in)	More than 6.0 (0.237)	2 (0.08)
Brush spring pressure	N (g, oz)	1.00 - 3.43 (102 - 350, 3.60 - 12.34)	1.80 - 2.40 (184.6 - 244.8, 6.47 - 8.63)
Slip ring minimum diameter	mm (in)	More than 26.0 (1.024)	13.8 (0.543)
Rotor coil resistance at 20° (68°F)	Ω	2.67	2.47 - 2.73