



# TX1

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# WORKSHOP MANUAL

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## Section 8A

## Engine Electrics

(Starter, Alternator, Heater Plugs)

At the time of going to print, the illustrations and text appearing in this workshop manual are representative of manufacture. Whilst retaining the basic features shown herein, the manufacturer reserves the right to make, at any time, and without necessarily updating this manual, any alterations considered convenient for improvement or for any other reason.

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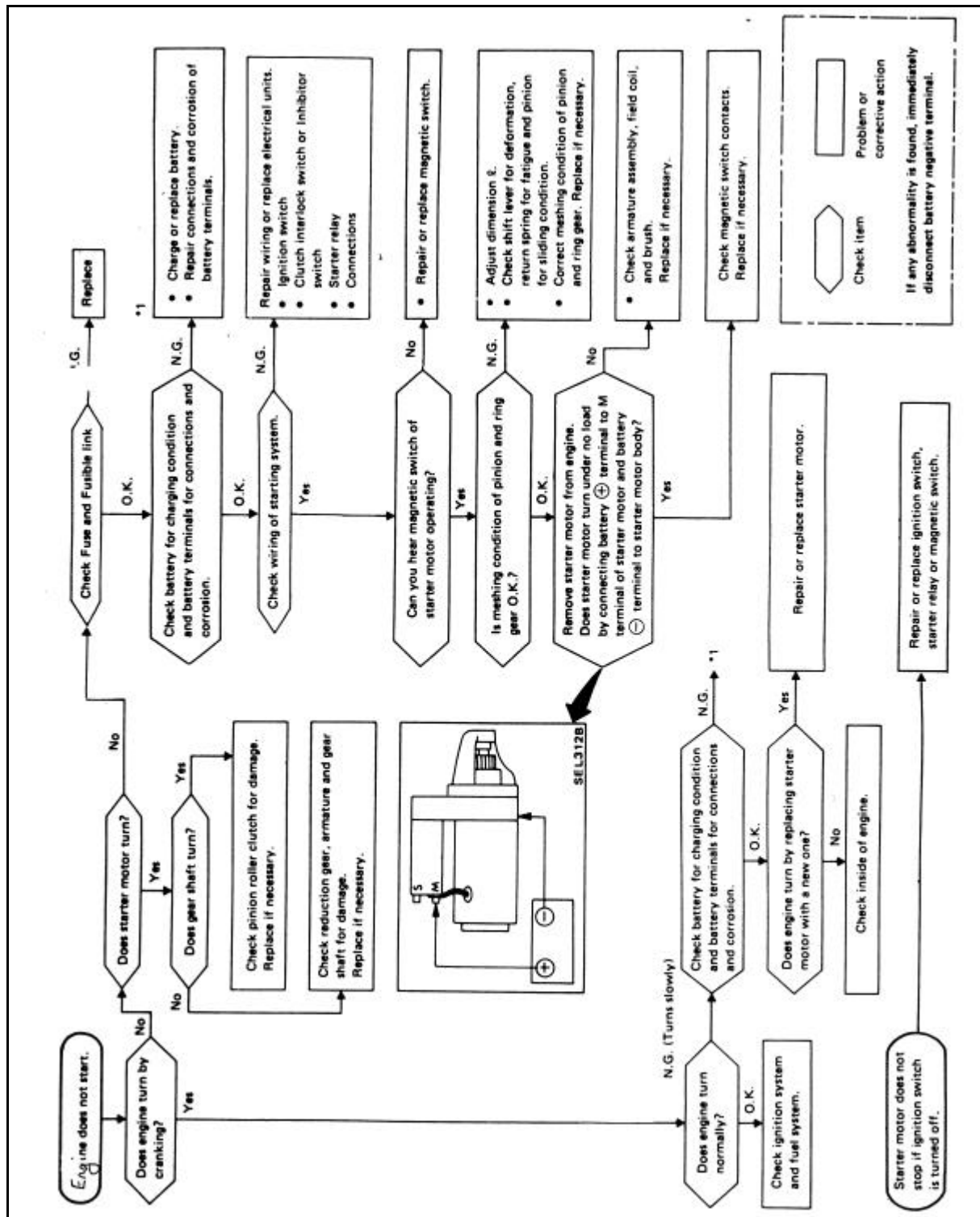
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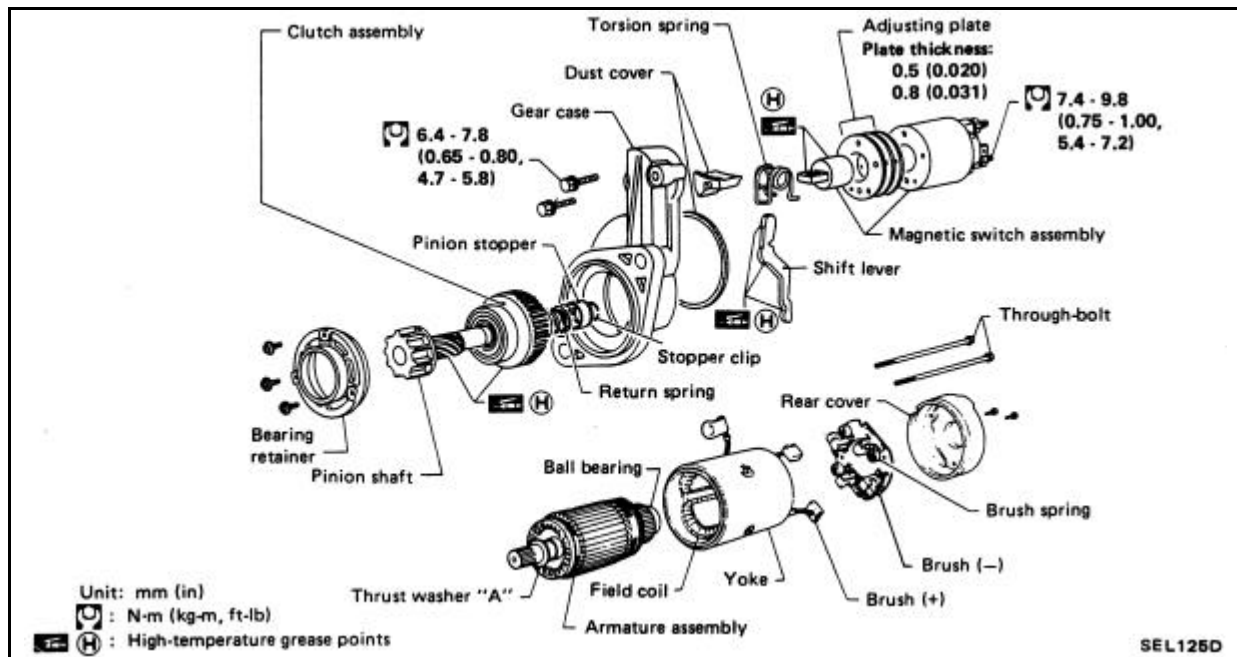
# STARTING SYSTEM - STARTER

## Troubleshooting



## STARTING SYSTEM - STARTER

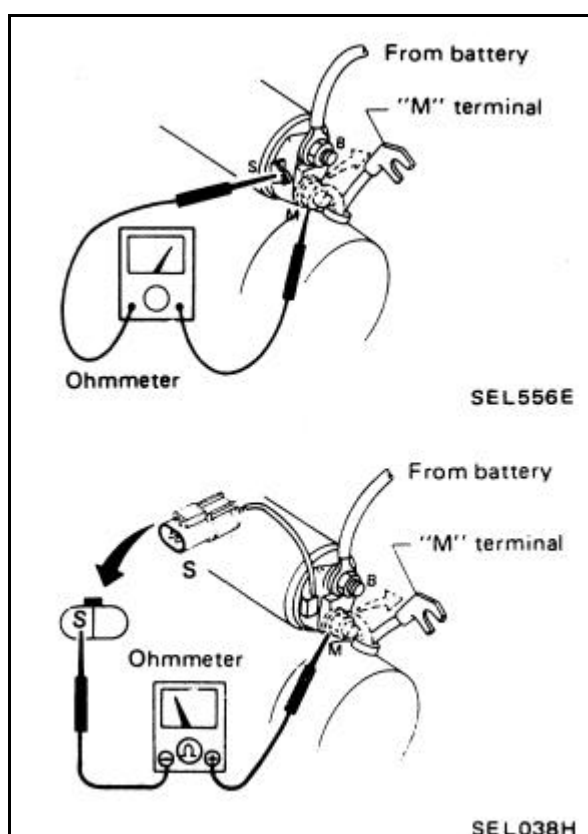
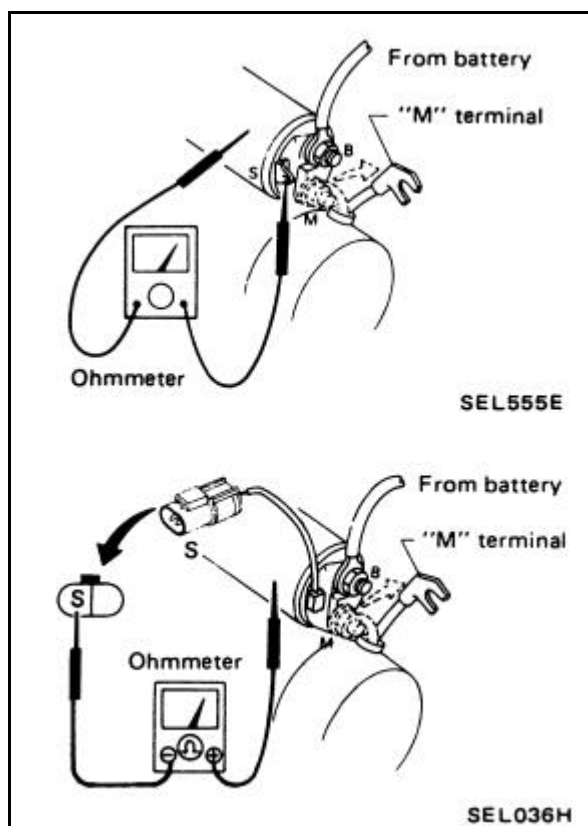
### Construction



## STARTING SYSTEM - STARTER

### Starter Motor Solenoid

- 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.

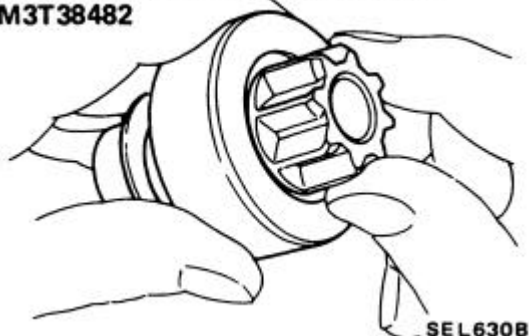


## STARTING SYSTEM - STARTER

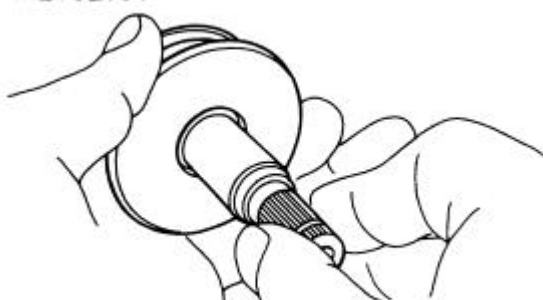
### Pinion/Clutch Check

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.

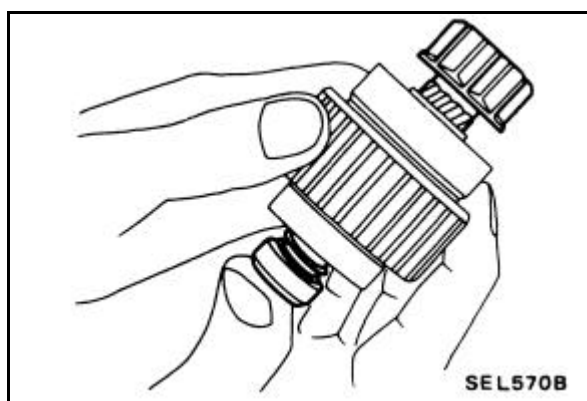
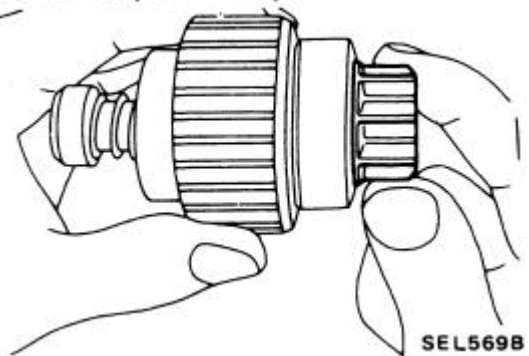
**S114-348, -607, -608, M3T29482D,  
M3T38482**



**M2T52881**



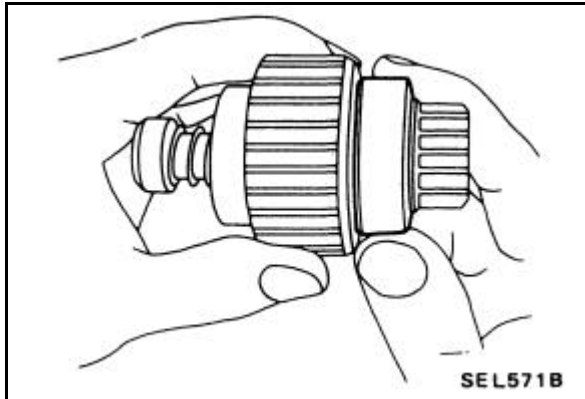
**S114-296A, S13-106A, -107A**



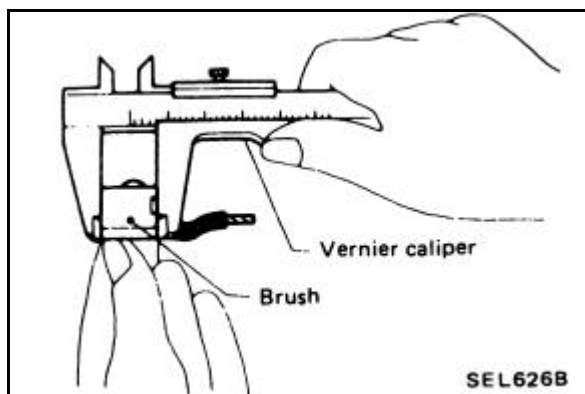
2. Check pinion movement.
  - If it is hard to move, apply grease or, if necessary, replace.

## STARTING SYSTEM - STARTER

### Pinion/Clutch Check (Cont'd)



3. Check ball bearing.  
Spin outer race of ball bearing to ensure that it turns smoothly without binding.
  - Abnormal resistance ... Replace.
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 or damaged. (Also check condition of armature shaft gear teeth.)



### Brush Check

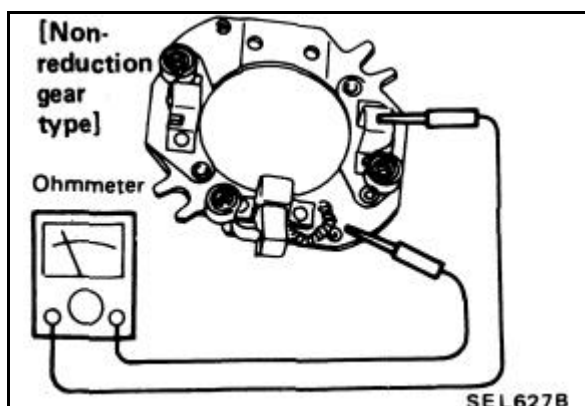
#### BRUSH

Check wear of brush.

Wear limit length:

Refer to "Service Data and Specifications."

- Excessive wear... Replace.



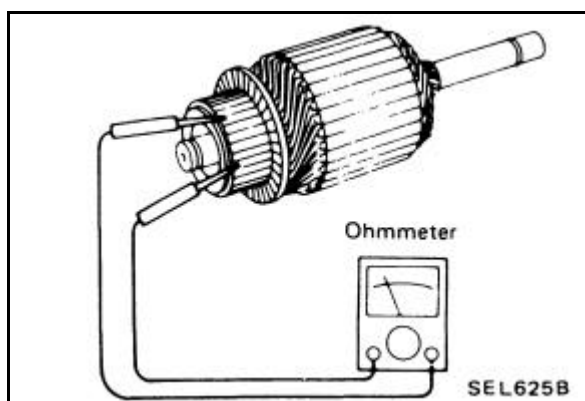
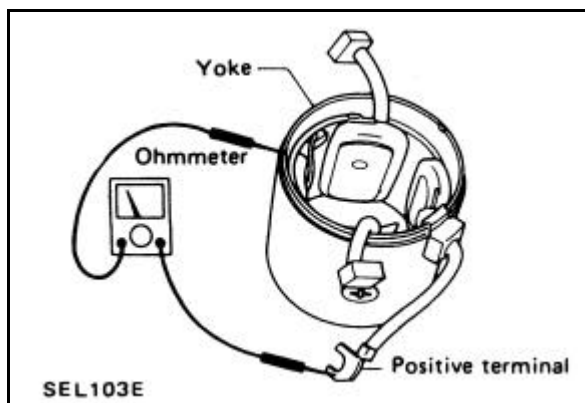
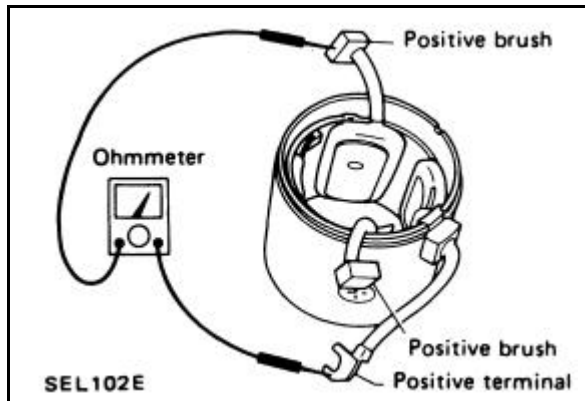
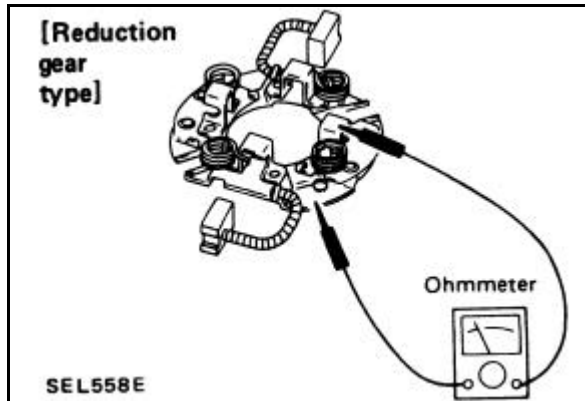
#### BRUSH HOLDER

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.



## STARTING SYSTEM - STARTER

### Brush Check (Cont'd)



### Field Coil Check

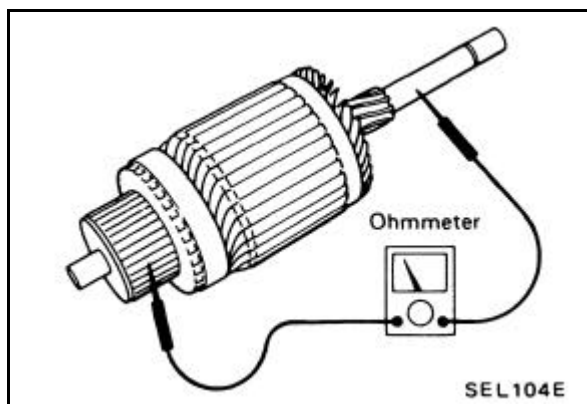
- Continuity test (between field coil positive terminal and positive brushes).
  - No continuity ... Replace field coil.
- Insulation test (between field coil positive terminal and yoke).
  - Continuity exists ... Replace field coil.

### Armature Check

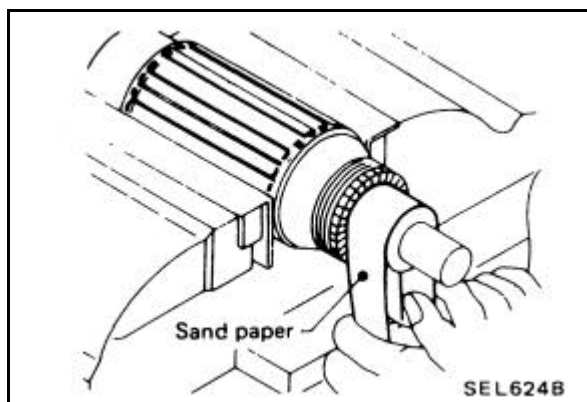
- Continuity test (between two segments side by side).
  - No continuity ... Replace.

## STARTING SYSTEM – STARTER

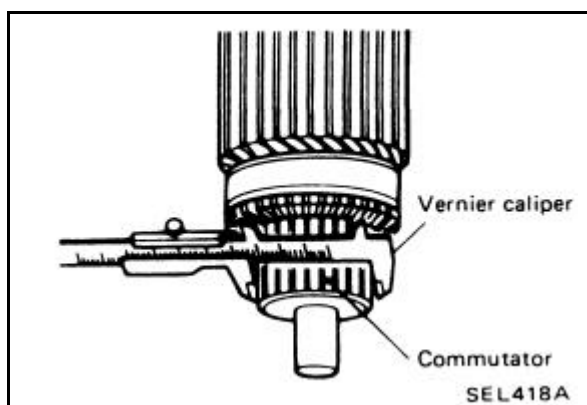
### Armature Check (Cont'd)



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



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



4. Check diameter of commutator.

**Commutator minimum diameter:**

**Refer to "Service Data and Specifications."**

- Less than specified value ... Replace.

## STARTING SYSTEM – STARTER

### Armature Check (Cont'd)

5. Check depth of insulating mica 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.

#### HIGH TEMPERATURE 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
- Armature shaft gear

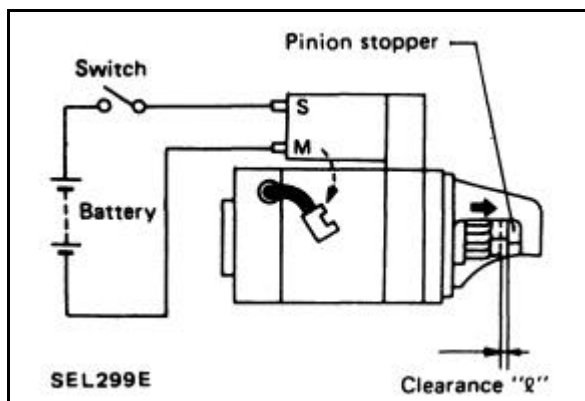
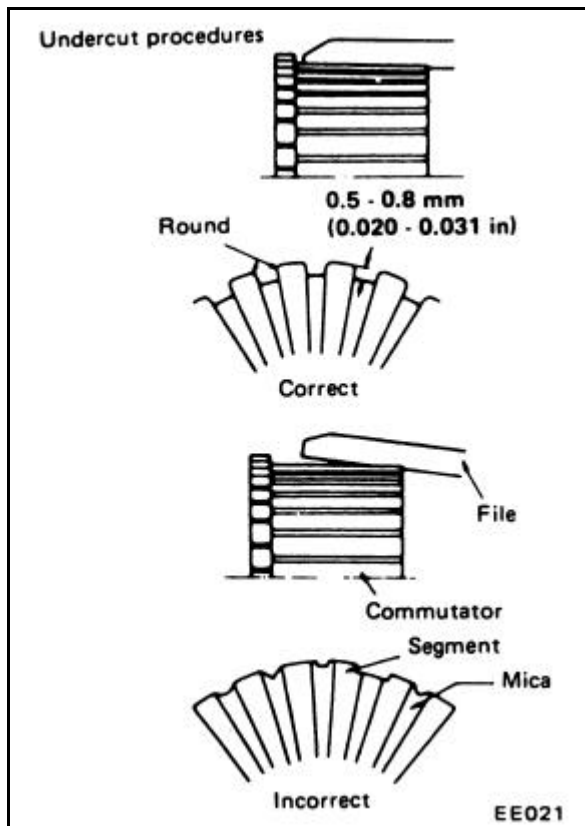
#### PINION PROTRUSION LENGTH ADJUSTMENT

Non-reduction gear type

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

**Clearance "ℓ":**

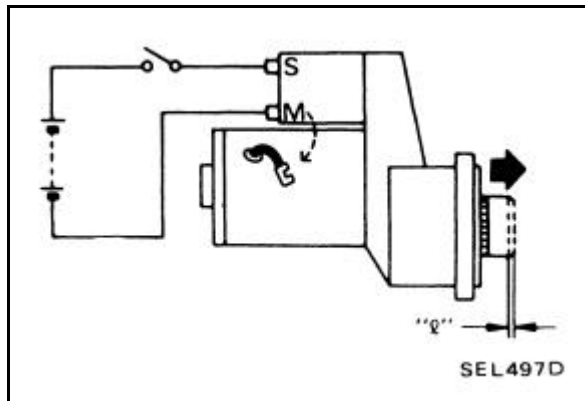
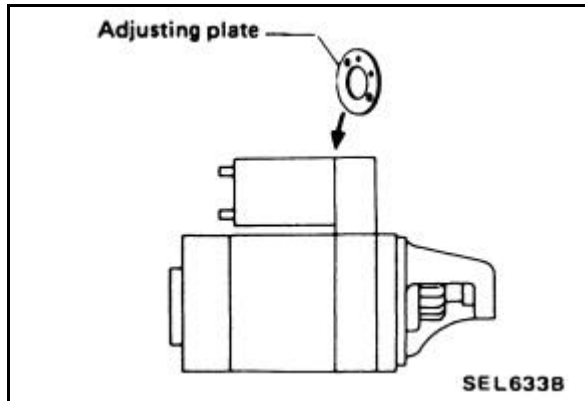
**Refer to "Service Data and Specifications."**



## STARTING SYSTEM – STARTER

### Assembly (Cont'd)

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



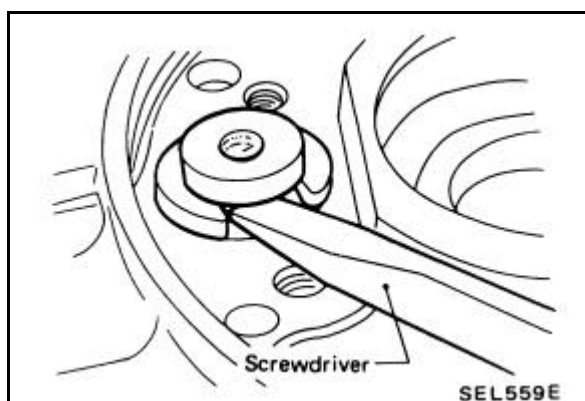
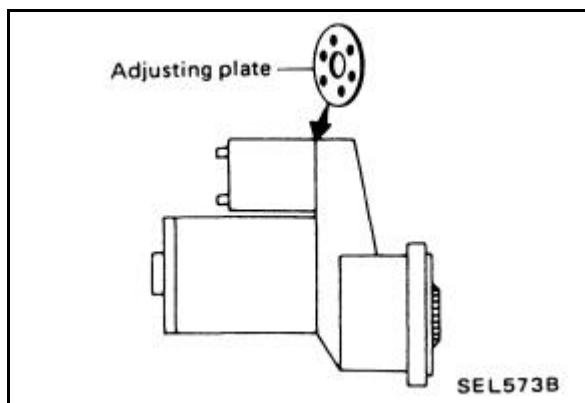
### Reduction gear type

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

**Movement "ℓ":**

**Refer to "Service Data and Specifications."**

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



### PINION SHAFT THRUST GAP ADJUSTMENT

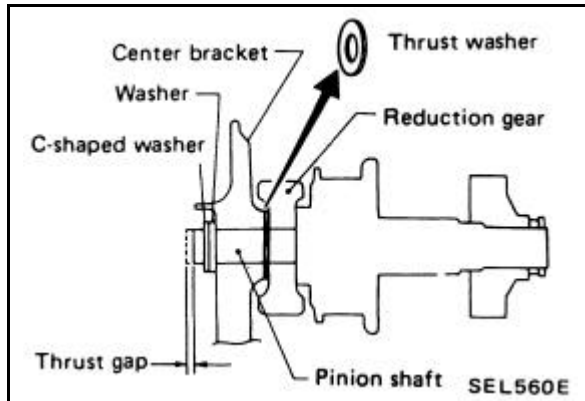
M2T52881

Check thrust gap with a gap gauge by pulling pinion shaft in the axial direction with a screwdriver.

**Maximum of thrust gap:**

**0.5 mm (0.020 in)**

## STARTING SYSTEM – STARTER



### Assembly (Cont'd)

- If thrust gap is over the specified value, adjust it with thrust washer.

## SERVICE DATA AND SPECIFICATIONS (S.D.S.)

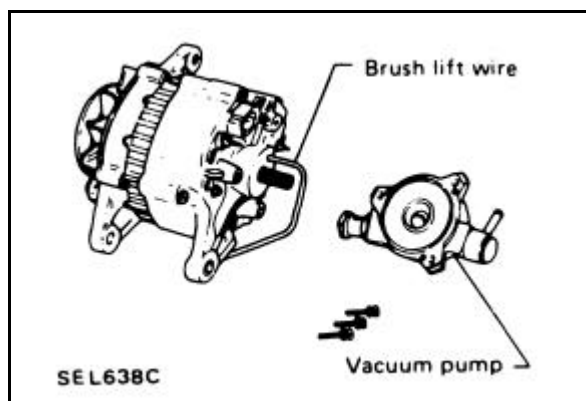
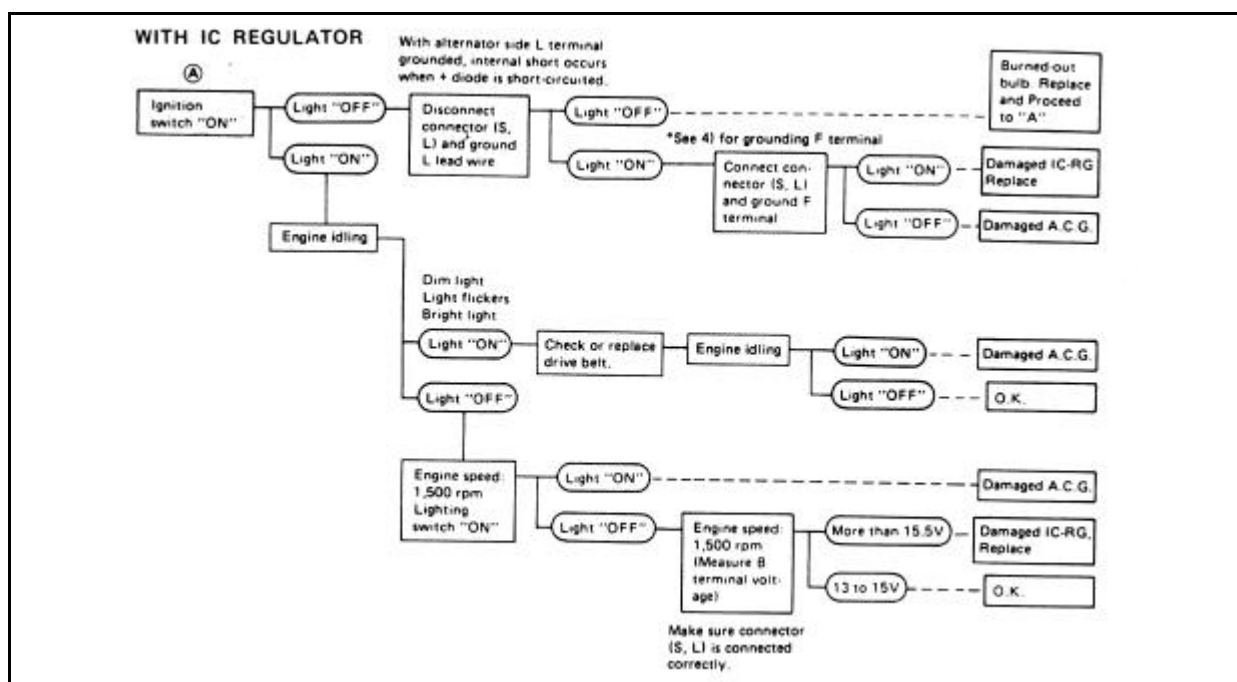
Type	Reduction
System voltage V	12
No-load	11
Terminal voltage V	
Current A	Less than 100
Revolution rpm	More than 3,900
Minimum diameter of commutator mm(in)	35.5 (1.398)
Minimum length of brush mm (in)	9 (0.35)
Brush spring tension N (kg, lb)	26.5–32.4 (2.7-3.3, 6.0-7.3)
Clearance of bearing metal and armature shaft mm (in)	-
Clearance "ℓ" between pinion front edge and pinion stopper mm (in)	-
Movement "ℓ" in height of pinion mm (in)	0.3-1.5 (0.012-0.059)

## CHARGING SYSTEM

### Trouble-shooting

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 trouble-shooting, inspect the fusible link.



1. Use fully charged battery
- 2) Light : Charge warning light  
A.C.G. : Alternator parts except IC regulator  
IC-RG : IC regulator  
O. K. : IC-alternator is in good condition

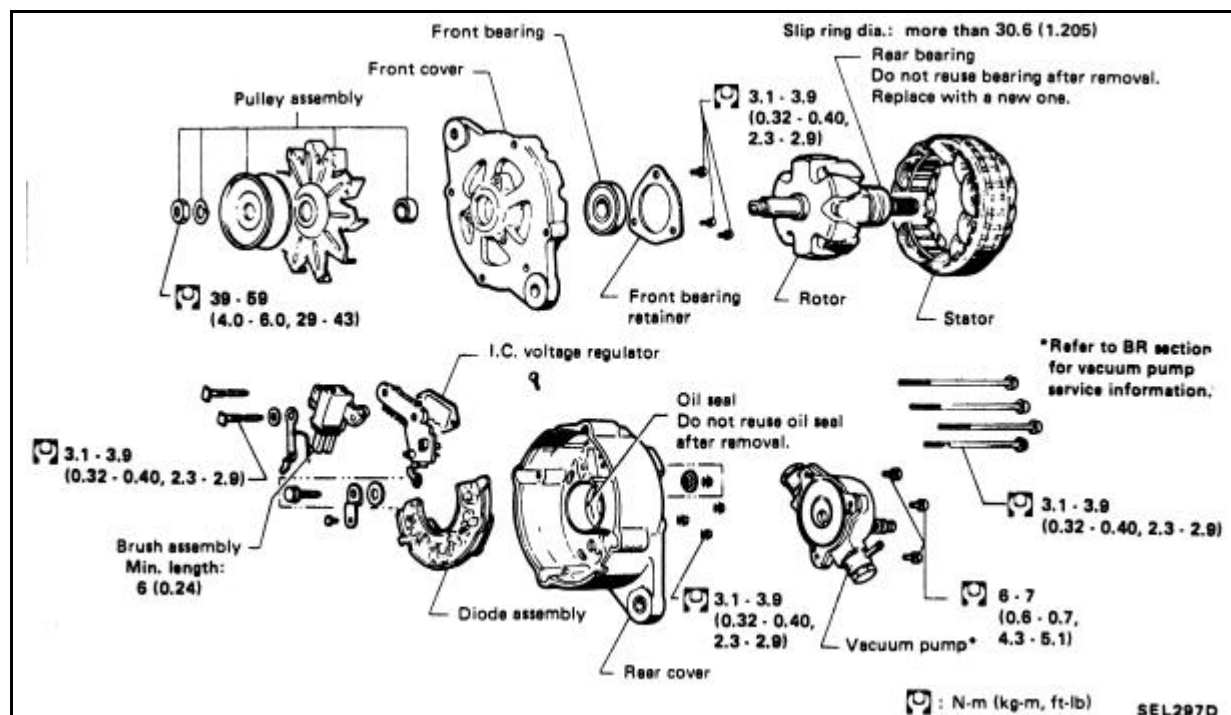
When reaching "Damaged A.C.G.", remove alternator from vehicle and disassemble, inspect and correct or replace faulty parts

3) \*Method of grounding F terminal

Remove vacuum pump and connect tip of wire to brush and attach wire to alternator body.

## CHARGING SYSTEM – ALTERNATOR

### Construction



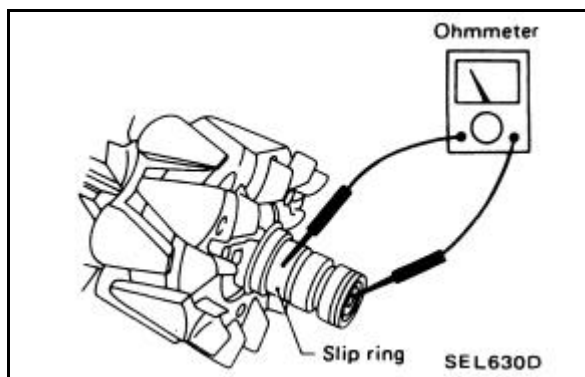
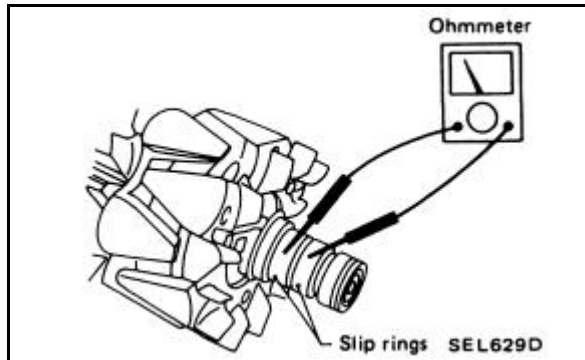


## CHARGING SYSTEM - ALTERNATOR

### Disassembly

#### ROTOR SLIP RING CHECK

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



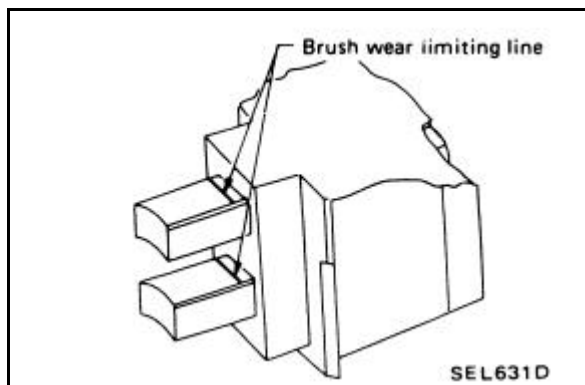
2. Insulator test
  - Continuity exists ... Replace rotor.
3. Check slip ring for wear.

**Slip ring minimum outer diameter:**

**Refer to "Service Data and Specifications."**

#### 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.



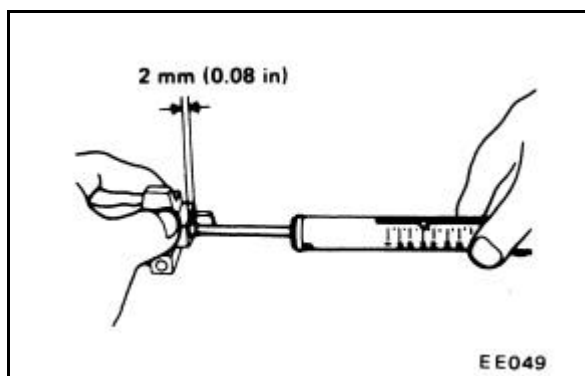
3. Check brush lead wire for damage.
  - Damaged ... Replace.
4. Check brush spring pressure.

Measure brush spring pressure with brush projected approximately 2 mm (0.08 in) from brush holder.

**Spring pressure:**

**Refer to "Service Data and Specifications."**

- Not within the specified values ... Replace.



## CHARGING SYSTEM - ALTERNATOR

### Disassembly (Cont'd)

#### STATOR CHECK

To test the stator or diode, separate them by unsoldering the connecting wires.

#### CAUTION:

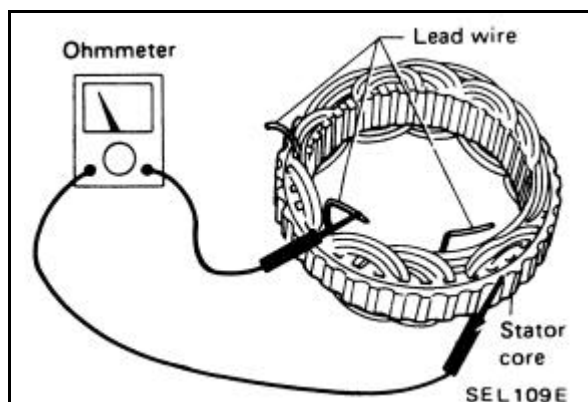
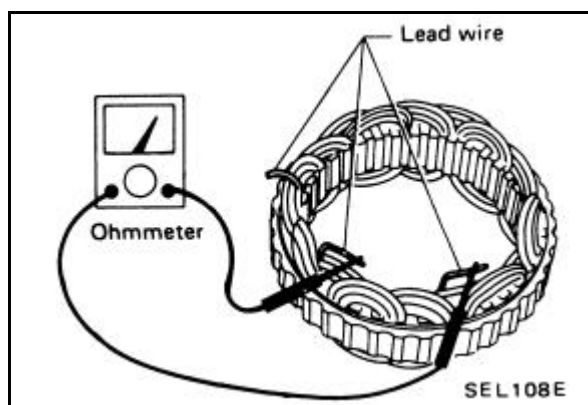
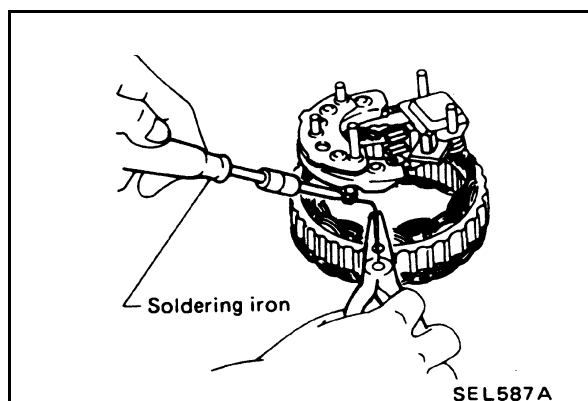
Use only as much heat as required to melt solder. Otherwise, diodes will be damaged by excessive heat.

1. Continuity test

- No continuity ... Replace stator.

2. Ground test

- Continuity exists ... Replace stator.



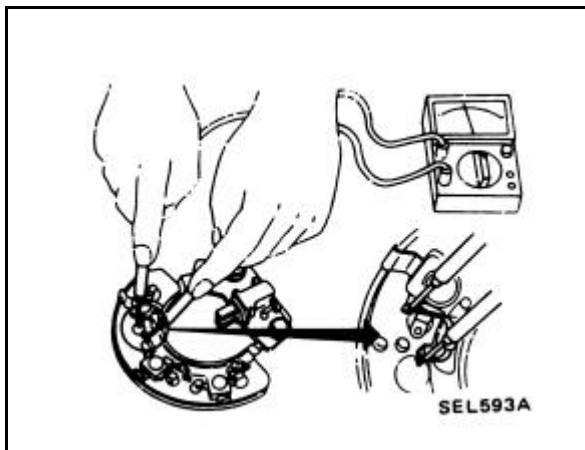
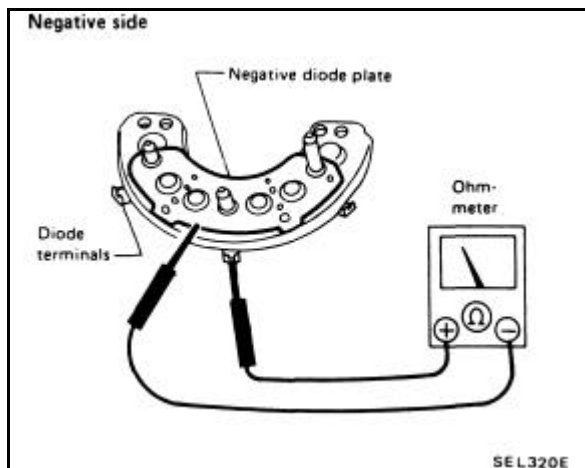
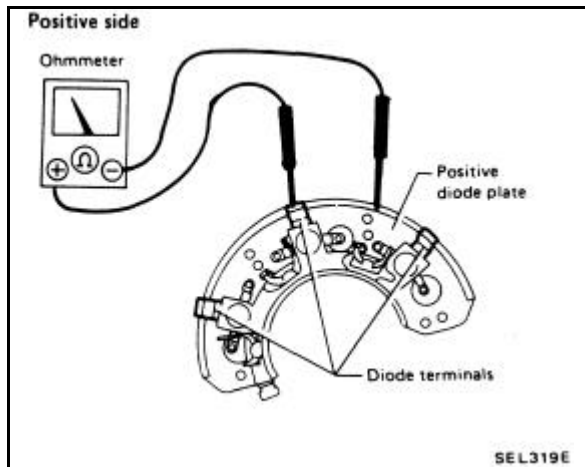
## CHARGING SYSTEM - ALTERNATOR

### Diode Check

#### MAIN DIODES

- Use an ohmmeter to check condition of diodes as indicated in chart below.
- If any of the test results is not satisfactory, replace diode assembly.

	Ohmmeter probes		Continuity
	Positive $\bar{A}$	Negative $\bar{A}$	
Diodes check (Positive side)	Positive diode plate	Diode terminals	Yes
	Diode terminals	Positive diode plate	No
Diodes check (Negative side)	Negative diode plate	Diode terminals	No
	Diode terminals	Negative diode plate	Yes



#### SUB-DIODES

- Attach ohmmeter's probe to each end of diode to check for continuity.
- Continuity is N.G. ... Replace diode assembly.

### Assembly

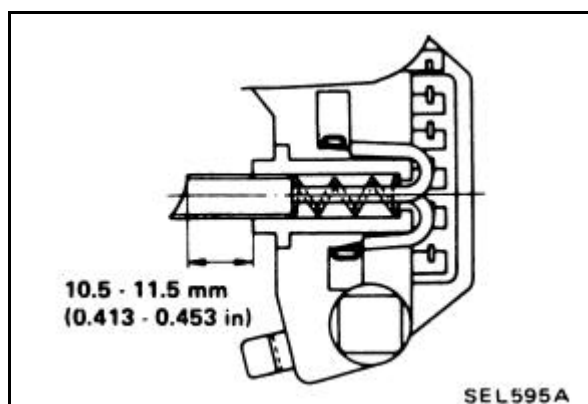
Carefully observe the following instructions. When soldering each stator coil lead wire to diode assembly terminal, carry out the operation as fast as possible.

## CHARGING SYSTEM – ALTERNATOR

### Assembly (Cont'd)

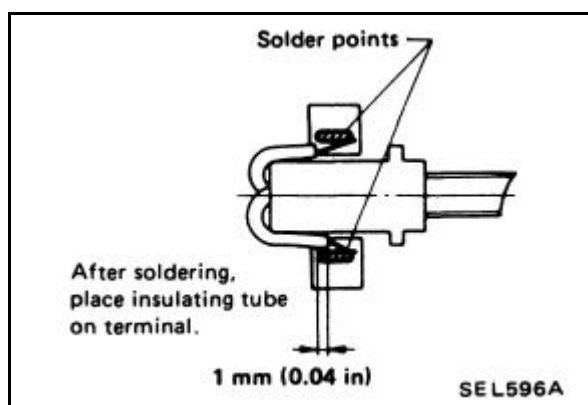
#### WHEN SOLDERING BRUSH LEAD WIRE

- (1) Position brush so that it extends 10.5 to 11.5 mm (0.413 to 0.453 in) from brush holder.



- (2) Coil lead wire 1.5 times around terminal groove. Solder outside of terminal.

When soldering, be careful not to let solder adhere to insulating tube as it will weaken the tube and cause it to break.

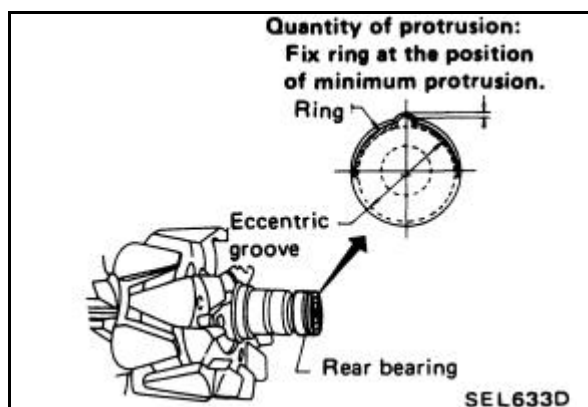


#### RING FITTING IN REAR BEARING

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

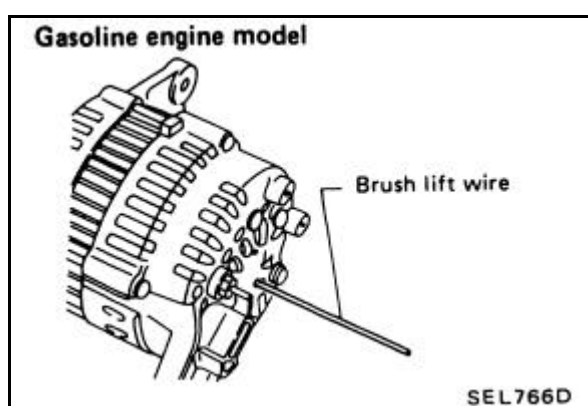
#### CAUTION:

Do not reuse rear bearing after removal.



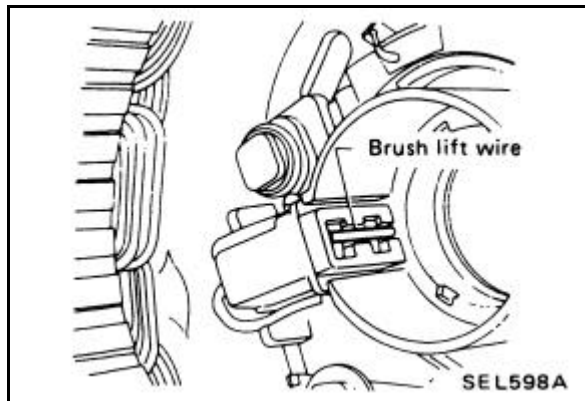
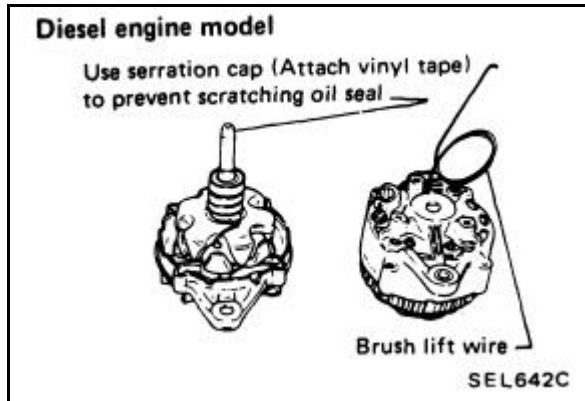
#### REAR COVER INSTALLATION

- (1) Before installing front cover with pulley and rotor with rear cover, push brush tip with fingers and retain brush, by inserting brush lift into brush lift hole from outside.
- (2) After installing front and rear sides of alternator, pull out brush lift wire.



## CHARGING SYSTEM – ALTERNATOR

### Assembly (Cont'd)



## CHARGING SYSTEM – ALTERNATOR

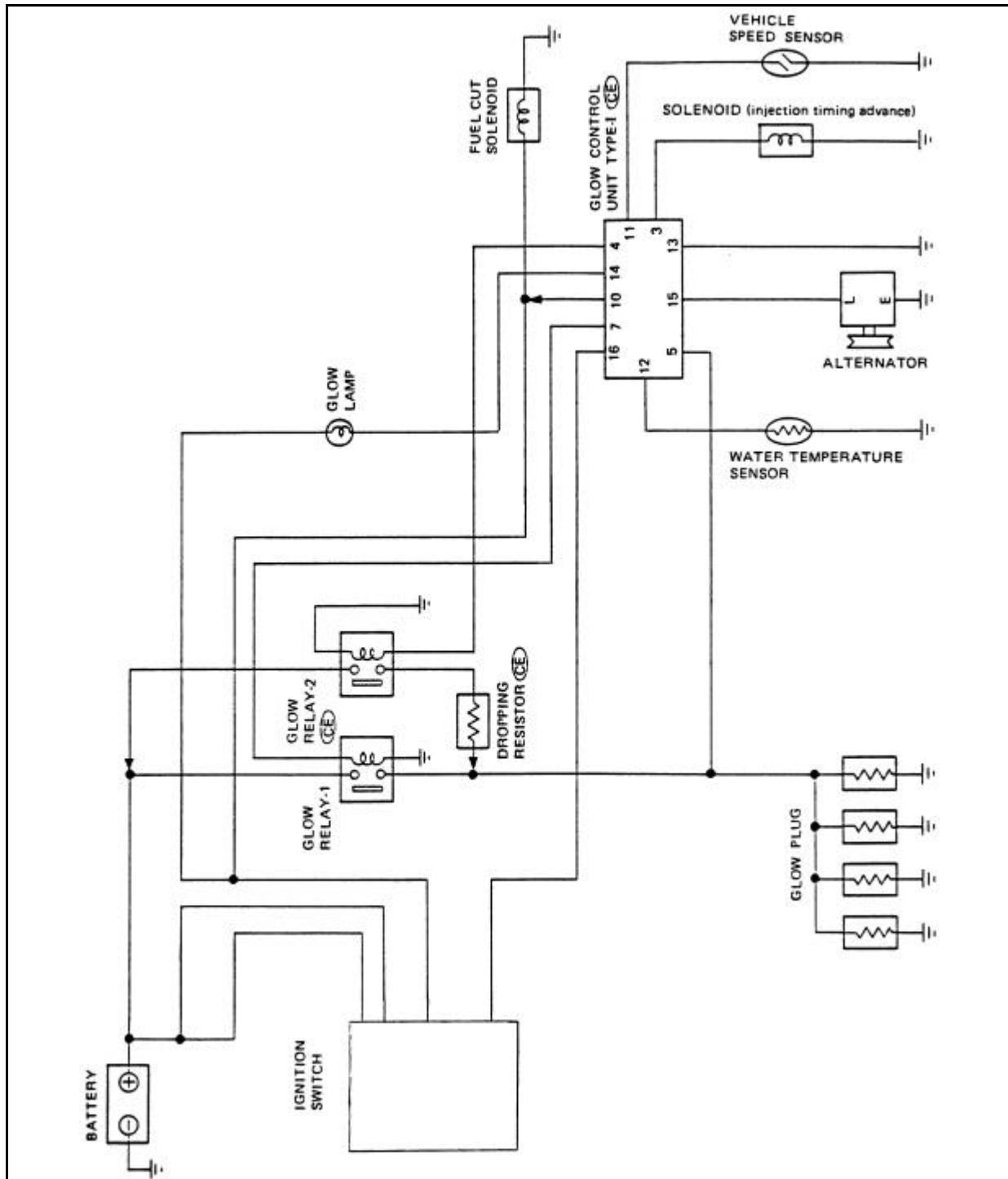
### Service Data and Specifications (S.D.S.)

Type	IC regulator built-in type	
	HITACHI	
Applied model	TD27 M/T	TD27 A/T
Nominal rating V-A	12-70	
Ground polarity	Negative	
Minimum revolution under no-load (When 14 volts is applied) rpm	Less than 1,000	
Hot output current A/rpm	More than 16/1,300 More than 42/2,500 More than 50/5,000	More than 26/1,300 More than 58/2,500 More than 68/5,000
Regulated output voltage V	14.4-15.0	
Minimum length of brush mm (in)	6 (0.24)	
Brush spring pressure N (g, oz)	2.501-3.383 (255-345, 8.99-12.17)	
Slip ring minimum outer diameter mm (in)	30.6 (1.205)	

## QUICK GLOW SYSTEM

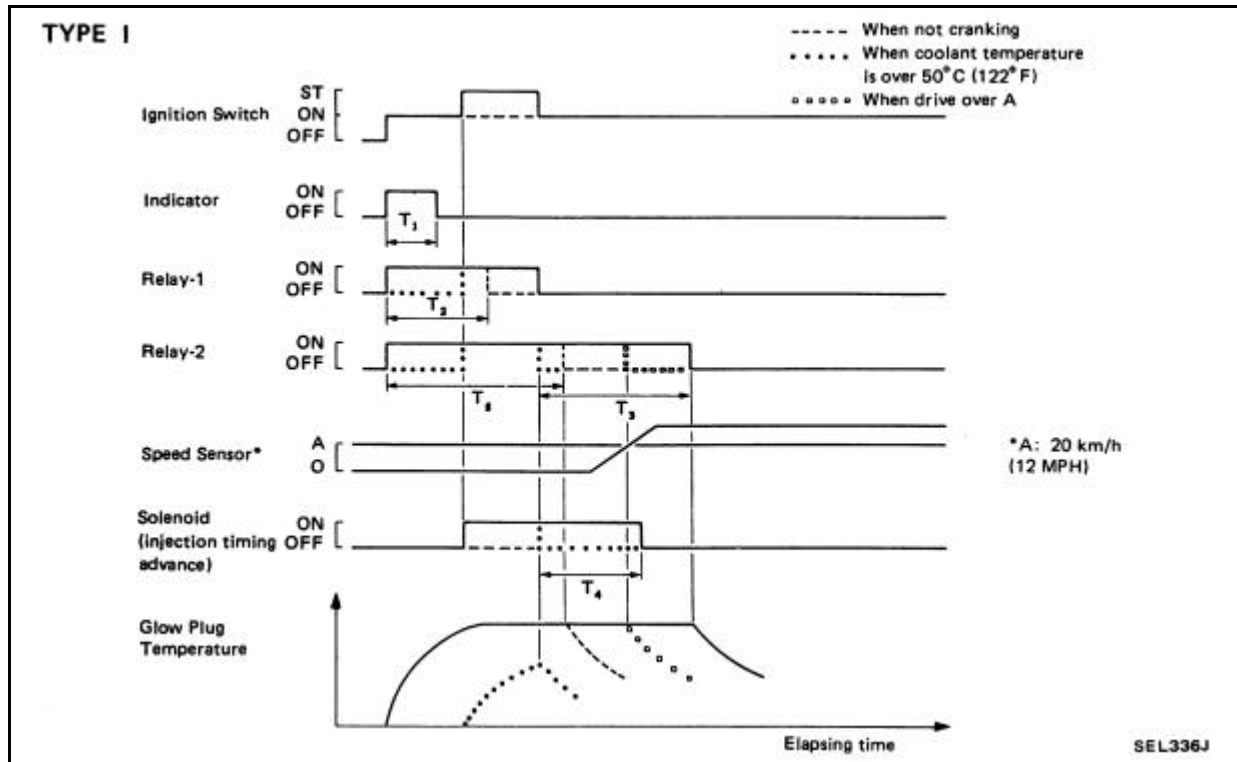
### Schematic

(Refer to Vehicle Wiring Diagrams for precise layout)



## QUICK-GLOW SYSTEM

### Description



When coolant temperature is lower than 50°C (122°F), the relay-1 and the relay-2 are turned on at the same time that the ignition switch is turned on. From this time, the "high-level" electric current flows through the glow plugs and heats them up quickly. After  $T_1$  seconds have passed, the control unit turns off the indicator. The relay-1 automatically turns off after it has been on for  $T_2$  seconds or the cranking time, whichever is longer.

The solenoid valve (for advance injection timing) is turned on at the time that the ignition switch is turned to "START". The relay-2 remains on for  $T_3$  seconds and the solenoid valve remains on for  $T_4$  seconds after the ignition switch has returned to "ON" from "START". The relay-2 allows the "low-level" current to flow through the glow plugs. The solenoid valve advances injection timing. These features improve the combustion performance of the engine after it has started.



## QUICK-GLOW SYSTEM

### Description (Cont'd)

When the coolant temperature is higher than 50°C (122°F), the relay-2 is turned on only during engine cranking.

When the coolant temperature is higher than 10°C (50°F), the solenoid valve is turned on only during engine cranking.

T<sub>1</sub> : approx. 2-6 sec. (Varies with coolant temperature and glow plug terminal voltage.)

T<sub>2</sub> : approx. 3-11 sec. (Varies with glow plug terminal voltage.)

T<sub>3</sub> : approx. 60-180 sec. (When coolant temperature is below 50°C (122°F), varies with coolant temperature.)

0 sec. (When coolant temperature is over 50°C (122°F).)

T<sub>4</sub> : approx. 30 sec. (When coolant temperature is below 10°C (50°F).)

0 sec. (When coolant temperature is over 10°C (50°F).)

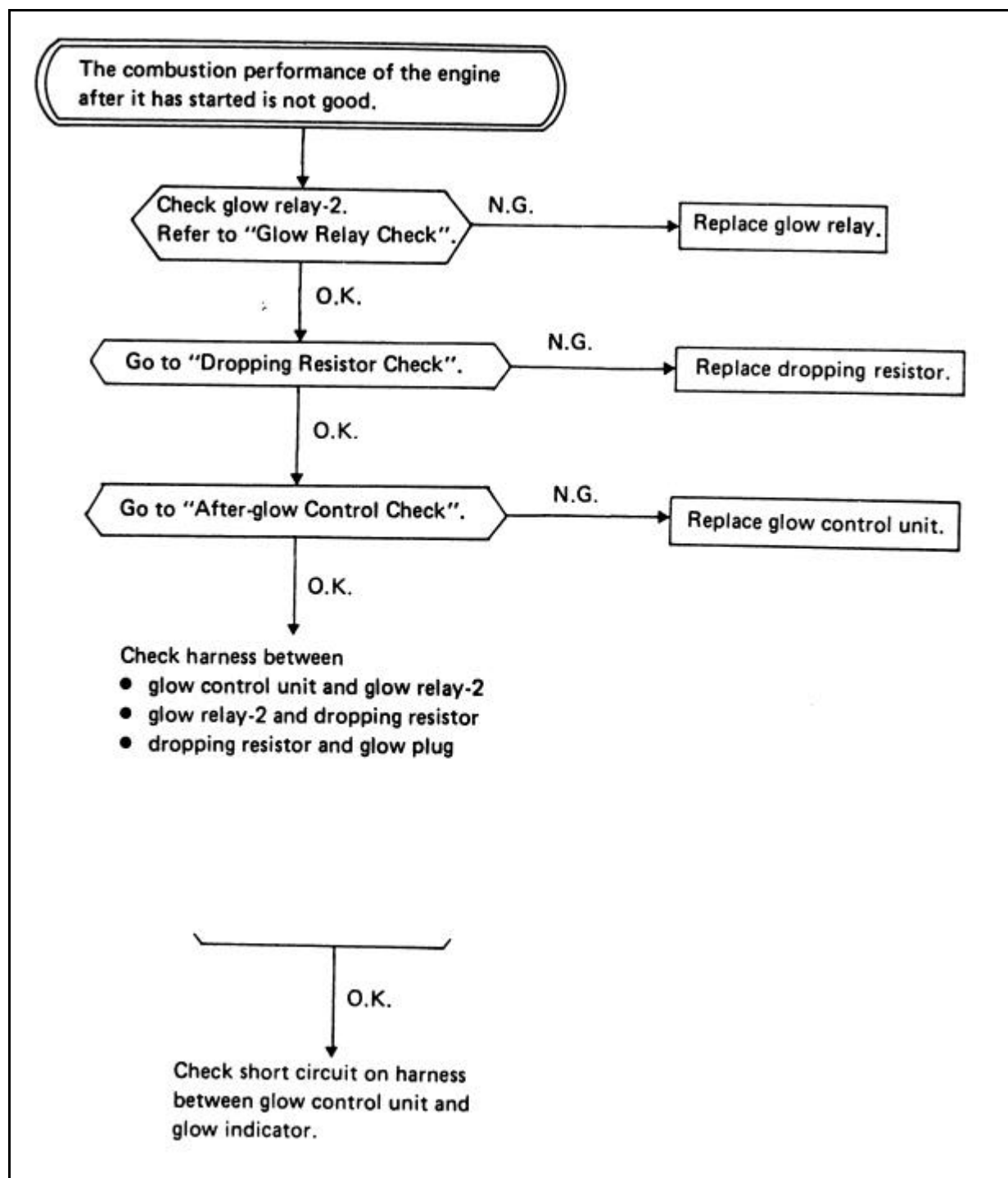
T<sub>5</sub> : approx. 30 sec.

- When the ignition switch is repeatedly turned "ON" and "OFF", T<sub>2</sub> becomes shorter.

## QUICK-GLOW SYSTEM

### Troubleshooting

For models with system type 1 only



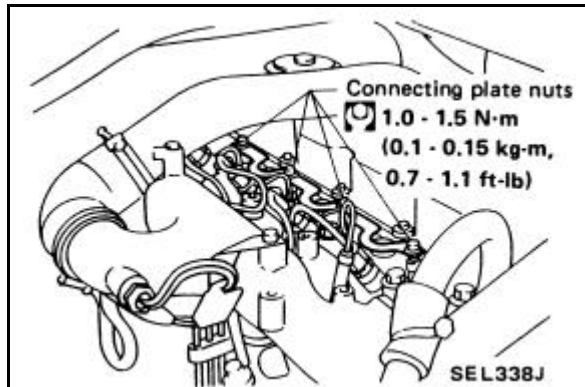
## QUICK-GLOW SYSTEM

### Check

(NOTE: The illustrations used are for guidance only. They illustrate the Nissan original equipment layout).

### GLOW PLUG CONNECTING PLATE NUTS CHECK

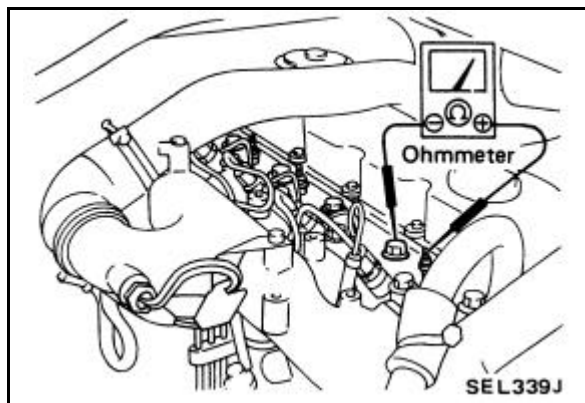
Check that all glow plug connecting plate nuts and harness nut are installed securely.



### GLOW PLUG CHECK

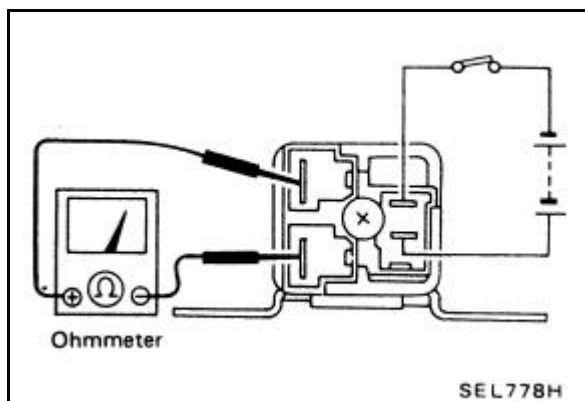
Remove glow plug connecting plate and perform continuity test between each glow plug and cylinder head.

No continuity ... Replace glow plug.



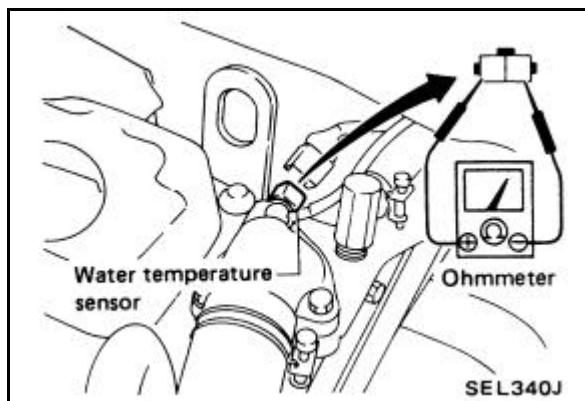
### GLOW RELAY CHECK

The glow relay is normally open. For check, refer to STANDARDIZED RELAY.



### WATER TEMPERATURE SENSOR UNIT CHECK

Measure resistance to temperature as shown.



Coolant temp. °C (°F)	Resistance kW
-15 (5)	11.5
0 (32)	5.6
10 (50)	3.7
40 (104)	1.2

## QUICK-GLOW SYSTEM

### Check (Cont'd)

(NOTE: The illustrations used are for guidance only. They illustrate the Nissan original equipment layout).

### DROPPING RESISTOR CHECK (For type 1 only)

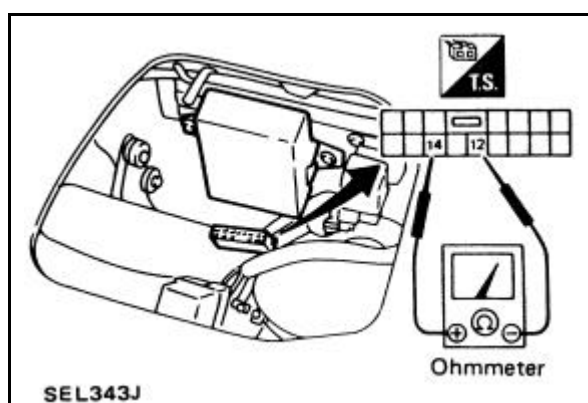
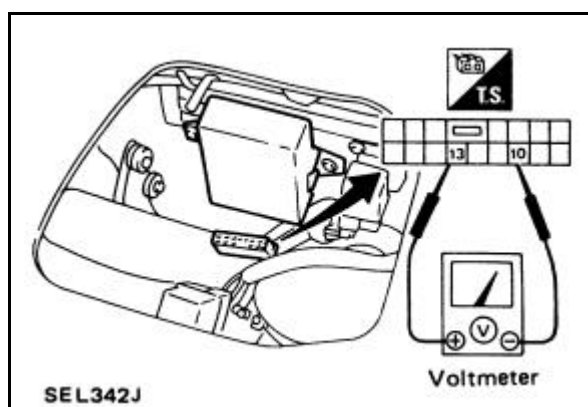
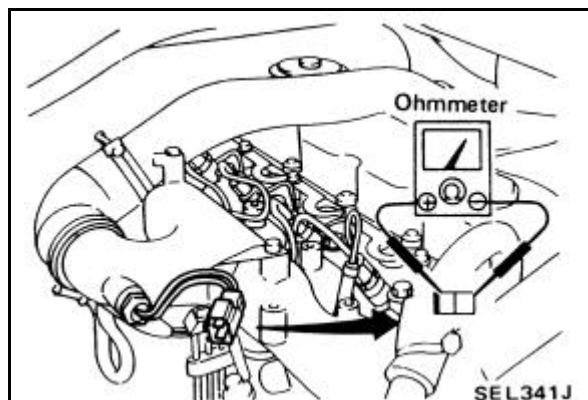
Measure resistance between terminals.

Resistance: approx.  $0.3\ \Omega$

### Control Unit Check (For Type I only)

### POWER SUPPLY CIRCUIT CHECK

Disconnect harness connector from glow control unit and perform voltage check and continuity check.



Voltmeter terminals		Ignition switch position		
(+)	(-)	OFF	ACC	ON
(10)	(13)	0V	0V	Approx. 12V
Ohmmeter terminals		Ignition switch OFF		
(+)	(-)			
(13)	Body ground	Continuity exists		

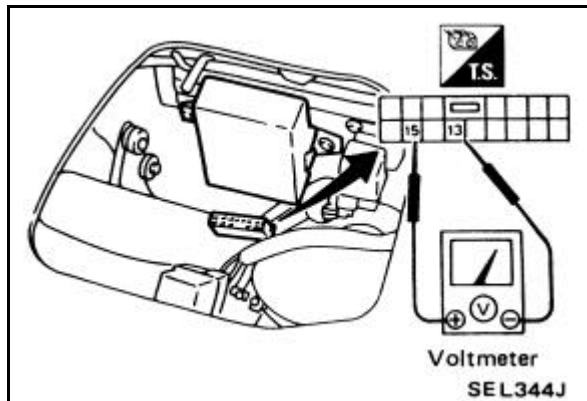
### WATER TEMPERATURE SENSOR CIRCUIT CHECK

- Check continuity between terminals (12) and (14). Measure resistance to temperature approximately as shown in "Water temperature sensor check".

## QUICK-GLOW SYSTEM

### Control Unit Check (For Type I only) (Cont'd)

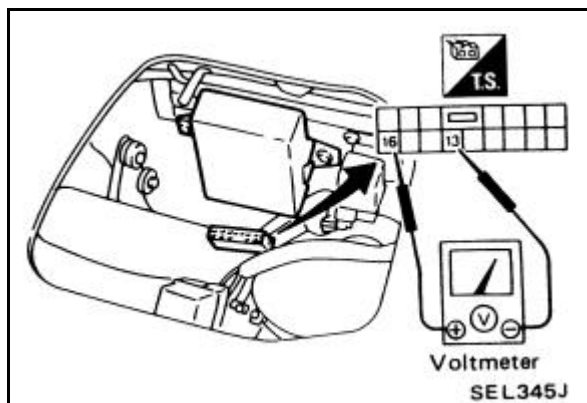
(NOTE: The illustrations used are for guidance only. They illustrate the Nissan original equipment layout).



#### CIRCUIT TO ALTERNATOR'S "L" TERMINAL CHECK

1. Turn ignition switch OFF.
2. Disconnect harness connector from glow control unit.
3. Disconnect harness connector from the alternator's "L" terminal.
4. Check terminal voltage between (15) and (13) when the ignition switch is turned to ON.

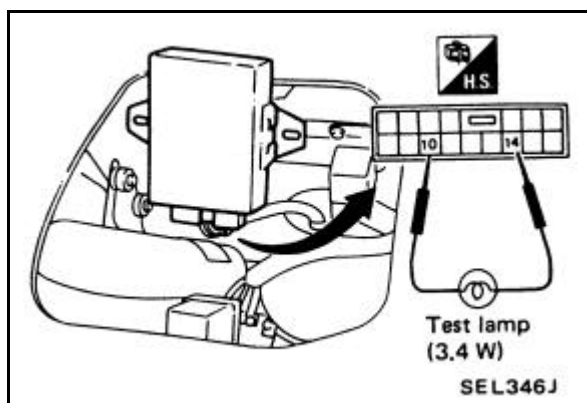
**Voltage: approx. 12V**



#### START SIGNAL INPUT CHECK

1. Turn ignition switch OFF.
2. Disconnect harness connector from the starter motor's "S" terminal.
3. Check terminal voltage between (16) and (13) when the ignition switch is at "START".

**Voltage: approx. 12V**



#### GLOW INDICATOR CONTROL CHECK

1. Turn ignition switch OFF.
2. Leave harness connector joined to glow control unit.
3. Connect test lamp to glow control unit as shown.
4. Turn ignition switch to ON and measure the time the test lamp stays lit.

## QUICK-GLOW SYSTEM

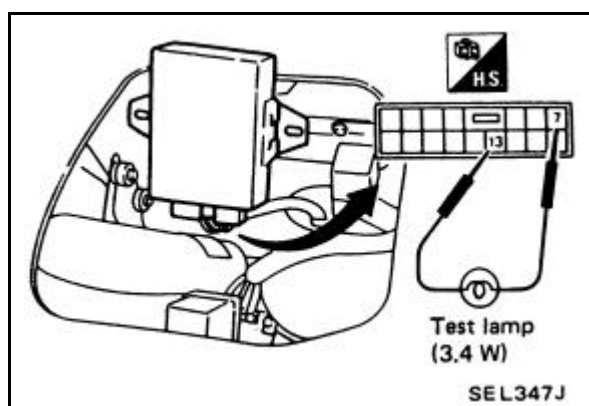
### Control Unit Check (For Type I only) (Cont'd)

(**NOTE:** The illustrations used are for guidance only. They illustrate the Nissan original equipment layout).

Time the test lamp should stay lit.

Approx. 2 - 6 seconds.

(Varies with coolant temperature and glow plug terminal voltage.)



### PRE-GLOW CONTROL CHECK

1. Turn ignition switch OFF.
2. Leave harness connector joined to glow control unit.
3. Connect test lamp to glow control unit as shown.
4. Turn ignition switch to ON and measure the time the test lamp stays lit.

Time the test lamp should stay lit.

Approx. 3 - 11 seconds.

(Varies with glow plug terminal voltage)

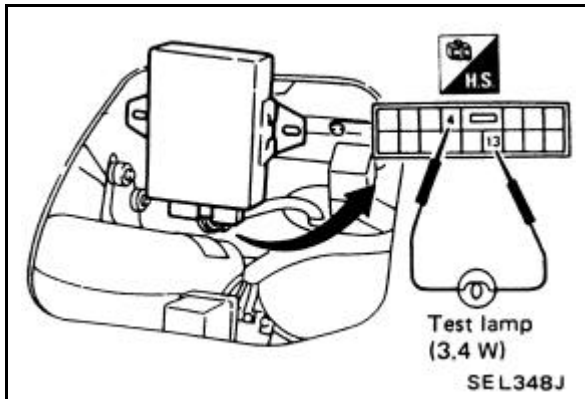
The time will be shortened if ignition switch is OFF only a short time.

Therefore, when measuring the time, leave ignition switch OFF for more than 5 minutes, and then turn ignition switch to ON.

## QUICK-GLOW SYSTEM

### Control Unit Check (For Type I only) (Cont'd)

(**NOTE:** The illustrations used are for guidance only. They illustrate the Nissan original equipment layout).



#### AFTER-GLOW CONTROL CHECK

1. Connect test lamp to glow control unit as shown.
2. Disconnect the harness connector from starter motor "S" terminal.
3. Make sure that test lamp comes on when ignition switch is turned to START.
4. Measure the time the test lamp stays lit when ignition switch is turned to ON from START.

Time the test lamp should stay lit.

Below 50°C (122°F)  
Approx. 60 - 180 seconds  
(Varies with coolant temperature)

Over 50°C (122°F)  
0 second

