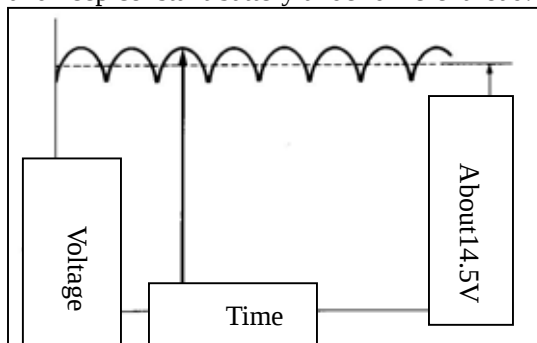




Chapter 5 Charging System

I. Overview

Charging system is a system which uses electronic power output by alternator to charge battery and keep constant battery under different load.

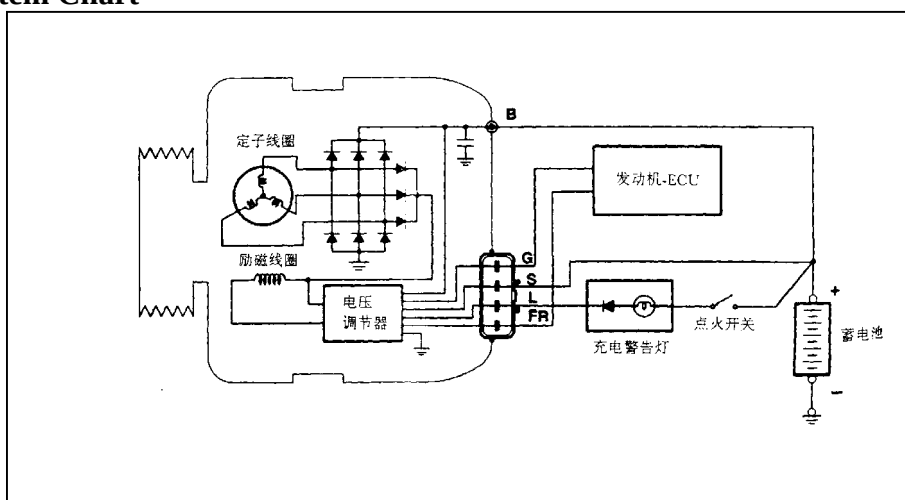


Principle

The rotation of excited exciting winding generates AC voltage.

The AC current is rectified to DC voltage through diode as wave band as left figure shows. The average output voltage variety is small under alternator load.

System Chart



定子线圈 stator winding 励磁线圈 exciting winding 电压调节器 voltage regulator

发动机 engine 充电警告灯 charge warning light 点火开关 ignition switch 蓄电池 storage battery

When ignition switch is ON, current go through exciting winding, which will be initially excited. When stator winding begin to generate electricity after engine starting, the exciting winding is excited by the output current of the stator winding.

If the exciting current increases, the alternator output power increases. If the exciting current decreases, the output power decreases. When battery voltage (alternator S terminal voltage) reaches 14.4V regulation voltage, exciting current will be cut off. When battery voltage drops to regulation voltage, voltage regulator will adjust output voltage and keep it at invariable level by controlling exciting current.



Additionally, when exciting current is stable, alternator output voltage increase with engine speed increasing.



Alternator Specification

Item	Specification
Type	Battery voltage measurement
Rated Output Power V/A	12/90
Voltage Regulator	Embedded electronic adjustment

Check Specification

Item		Standard Value	Limit value
Alternator output circuit voltage drop (at 30A)			Max. Value 0.3
Voltage regulation range Voltage regulator usage temperature	- 20	14.2 - 15.4	
	20	13.9 - 14.9	
	60	13.4 - 14.6	
	80	13.1 - 14.5	
Output current			70% rated output current

Special Tool

Tool	Number	Name	Purpose
	MB991519	Alternator wiring connector	Check S terminal voltage of alternator

II. Voltage measurement experiment for alternator output circuit

Check adjustment and experiment sequence

The experiment is designed to check if the wiring between alternator B terminal and battery anode (including fuse) is OK.

1. Please check the following items before testing.
 - a) Alternator installation status
 - b) Alternator transmission belt tension
 - c) Fuse status
 - d) If abnormal noise exists during alternator running
2. Turn ignition switch to OFF.



3. Remove cathode cable of F battery
4. Disassemble alternator output cable from terminal B. Place a 0-100A DC ammeter for test in series between terminal B and removed output cable.

(Connect anode cable of ammeter to B and connect cathode cable to the removed output cable.)

Remarks: It is recommended to use clamp ammeter which may measure it even alternator output cable is not removed.

The reason is that if the contact of alternator terminal B is not good, it may cause output current dropping. Therefore, if loosening terminal B to connect test ammeter suddenly when checking vehicle, it is impossible to find out the failure reason due to contact defeat when connecting.

5. Connect a digital voltmeter between alternator terminal B and battery anode. (Connect voltmeter anode cable to terminal B and connect volt cathode to battery anode.)

6 . Install engine tachometer.

7 . Connect battery cathode cable.

8 . Engine cover is kept open.

9 . Start on engine.

10. When engine speed is 2500r/min, motor load is adjusted by opening/closing headlamp and other lamps, which keeps ammeter reading a little higher than 30A. Decrease engine speed slowly to ensure ammeter reading is 30A, and at the moment read the voltmeter reading. Limit value: max. 0.3V

Remarks: When motor output power is too large to drop ammeter reading to 30A, adjust it to 40A and read voltage difference reading. The limit value is changed to max. 0.4V at this moment.

11. If voltmeter reading is higher than limit value, we can regard it as alternator output cable defeat.

Therefore, please check wiring between alternator terminal B and battery anode (Including fuse).

If the terminal is loose or wiring color changes due to excessive heat, it should be repaired and then make a test again.

12. Make engine running at idle speed after experiment finish

13. Shut off all lights and turn ignition switch to OFF

14. Remove battery cathode cable.

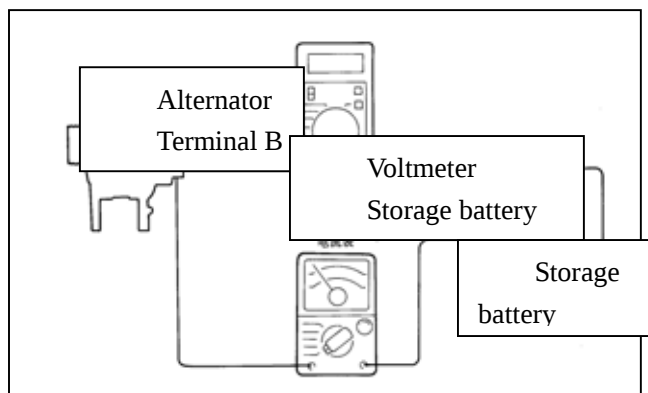
15. Remove ammeter, voltmeter and engine tachometer for test.

16. Connect alternator output cable to generator B terminal.

17. Connect battery cathode cable.



Output Circuit Voltage Drop Measuring Schematic Diagram



III. Output current

measurement experiment

The experiment is designed to check if alternator output current is OK.

1. Please check the following items before experiment.

- Alternator installation status
- Battery status

Remarks: It is recommended to be in the status of slight battery discharge. If using battery full of power, it always can't make experiment properly due to electronic load shortage.

- Alternator transmission belt tension
- Fuse status
- If abnormal noise exists during alternator running

2. Turn ignition switch to OFF.

3. Remove battery cathode cable.

4. Remove alternator output cable from alternator terminal B. Connect a DC 0-100A ammeter in series between terminal B and removed output cable. (Connect ammeter anode cable to terminal B and then connect ammeter cathode cable to the removed output cable.)

Caution: The connecting components must be fixed firmly with screw and nut, for large current will go through them. Don't use clamp to fix them.

Remarks: It is recommended to use clamp ammeter which may measure it even alternator output cable is not removed.

5. Connect a 0-20V voltmeter for test between terminal B and ground. (Connect voltmeter anode



cable to terminal B and connect voltmeter cathode to ground safely.)

6. Install engine tachometer.
7. Connect battery cathode cable.
8. Keep engine cover open.
9. Check if voltmeter reading is the same as battery voltage.

Remarks: If voltage is 0V, it means the wiring between alternator terminal B and battery anode is disconnected or the fuse is broken.

10. Keep lighting switch ON and start on engine after headlamp lighting.
11. Headlamp is adjusted to high beam position and heater blower switch is turned to large volume position. Engine speed increase to 2500 r/min and the ammeter shows the max. output current value.

Limit value: 70% rated output current

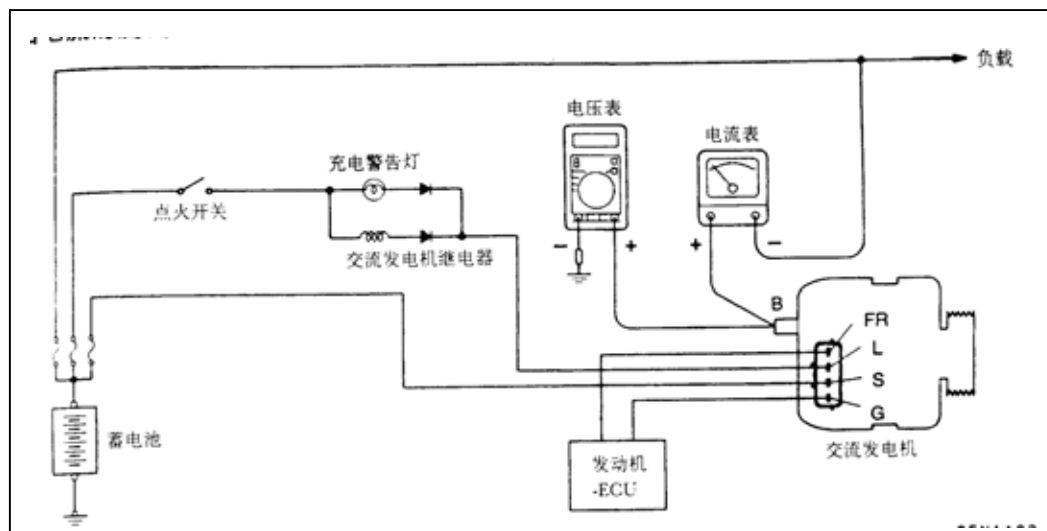
Remarks :

- Rated output current is represented on alternator nameplate.
- Due to charging current decreasing violently after engine starting, maximum current must be read quickly.
- Output current changes with electronic load or alternator body temperature changing.
- If motor vehicle load is too small during testing, the output current can't reach regulated value even alternator works well. If so, it may open headlamp to make battery discharged or open lamps on other motor vehicles, which will increase electronic load. And then make test again.
- If alternator body temperature or environment temperature is too high, output current often can't reach to the regulated current. If so, wait until alternator is cooled and then make test again.

12. Ammeter reading should be higher than limit value. If it is lower than limit value but alternator output cable is ok, please remove alternator from engine and check it further.
13. Keep engine running at idle speed after experiment finish.
14. Turn ignition switch OFF.
15. Remove battery cathode cable.
16. Remove ammeter, voltmeter, engine tachometer for test.
17. Alternator output cable is connected to alternator B terminal.
18. Connect battery cathode cable.

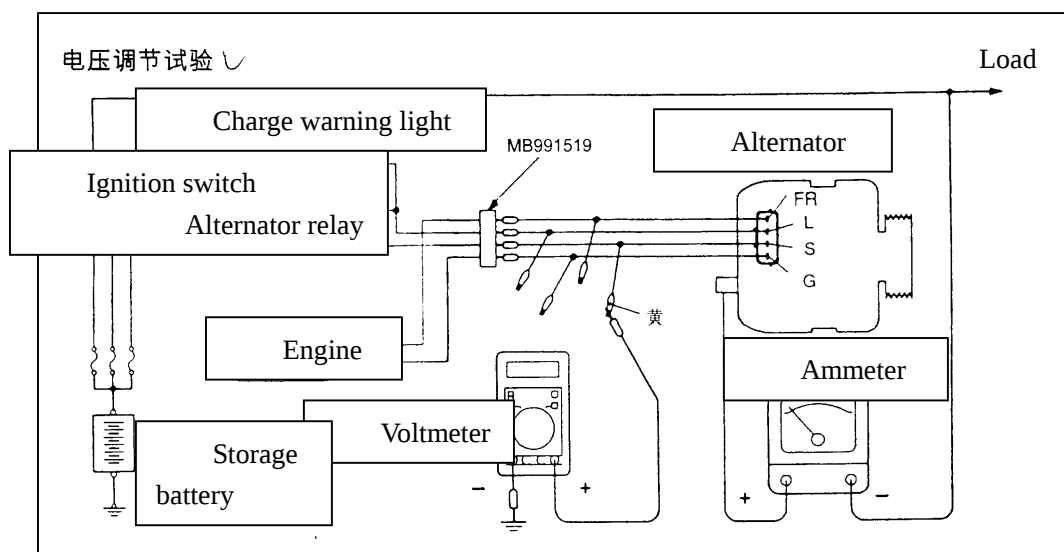


Output Current Measuring Schematic Diagram



负载 Load 电压表 Voltmeter 电流表 Ammeter 充电警告灯 Charge warning light 点火开关 Ignition switch
蓄电池 Storage battery 交流发电机继电器 Alternator relay 交流发电机 Alternator 发动机 Engine

IV. Voltage Adjustment Experiment



The experiment is designed to check if voltage regulator may control alternator output voltage.

1. Please check the following items before experiment.



-
- Alternator installation status.
 - Check vehicle battery status. Battery should be in full power status.
 - Alternator transmission belt tension
 - Fuse status
 - If abnormal noise exists during engine running
2. Turn ignition switch OFF.
 3. Remove battery cathode cable.
 4. Connect digital voltmeter to alternator B terminal and ground. (Connect voltmeter anode cable to S terminal and then connect voltmeter cathode cable to ground safely.)
 5. Remove alternator output cable from alternator B terminal.
 6. Connect a DC 0-100A ammeter in series between terminal B and removed output cable. (Connect ammeter anode cable to terminal B and then connect ammeter cathode cable to the removed output cable.)
 7. Install engine tachometer.
 8. Connect battery cathode cable.
 9. Turn ignition switch ON. Check if voltmeter reading is the same as battery voltage.

Remarks: If voltage is 0V, it means the wiring between alternator terminal B and battery anode is disconnected or the fuse is broken.

10. Close all lights and accessories.
11. Start on engine.
12. Increase engine speed to 2500 r / min.
13. Read voltmeter indicator when alternator output current drops to 10A.
14. If voltmeter reading is the same as voltage regulator reading, it means voltage regulator works well.

If voltage value is not within the standard value range, it means voltage regulator or alternator is not functioned properly.

15. Keep engine running at idle speed after experiment finish.
16. Turn ignition switch OFF.
17. Remove battery cathode cable.
18. Remove ammeter, voltmeter and engine tachometer for test.
19. Connect alternator output cable to alternator terminal B.
20. Connect battery cathode cable.

Voltage Regulation Standard Value

Check terminal	Voltage Regulator Usage Temperature ()	Standard Value
Terminal " S "	- 20	14.2 ~ 15.4
	20	13.9 ~ 14.9
	60	13.4~14.6

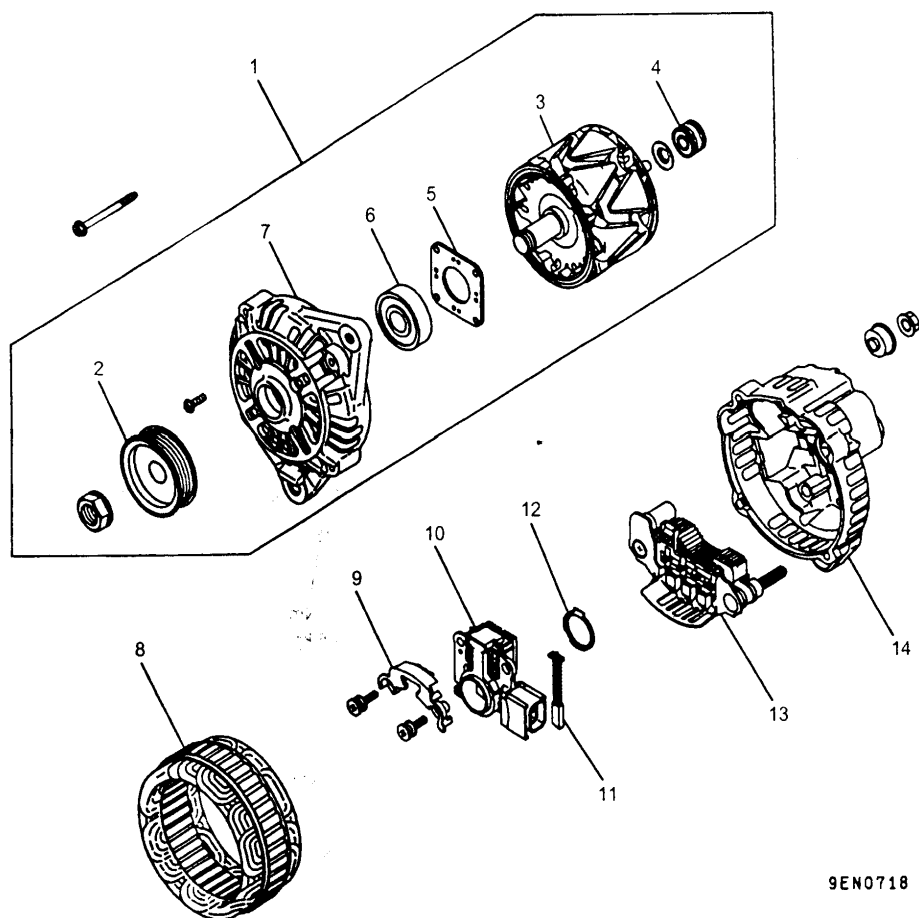


	80	13.1~14.5
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V. Alternator

Disassembly and Installation



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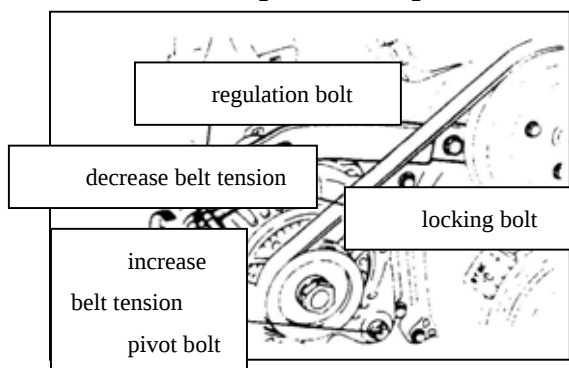
分解步骤

1. 前盖总成
2. 皮带轮
3. 转子
4. 后轴承
5. 轴承护圈
6. 前轴承
7. 前盖

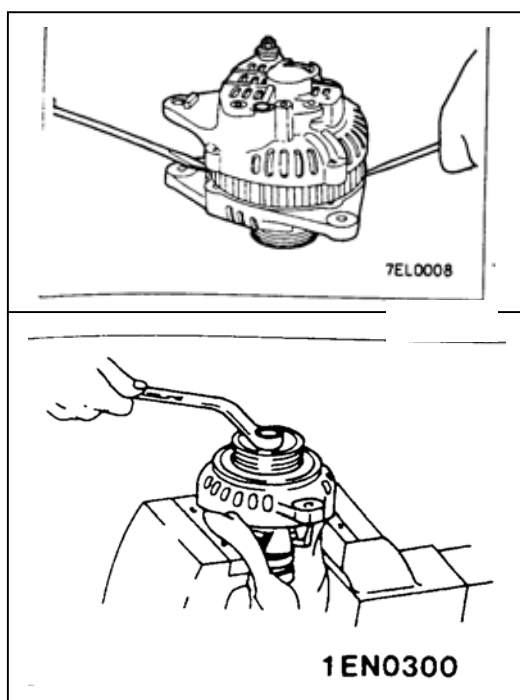
8. 定子
9. 压板
10. 调节器总成
11. 电刷
12. 抛油环
13. 整流器总成
14. 后盖

**分解步骤 Disassembling steps**

1. 前盖总成 front cover assembly
2. 皮带轮 pulley
3. 转子 rotor
4. 后轴承 rear bearing
5. 轴承护圈 bearing collar
6. 前轴承 front bearing
7. 前盖 front cover
8. 定子 stator
9. 压板 pressure board
10. 调节器总成 regulator assembly
11. 电刷 electric brush
12. 抛油环 oil slinger
13. 整流器总成 rectifier assembly
14. 后盖 rear cover

Disassemble Operation Tips**Transmission Belt Disassemble**

- 1 . Loosen pintle bolt/nut and locking bolt as shown.
- 2 . Loosen regulation bolt and uplift it.
- 3 . Push alternator towards engine and then disassemble transmission belt.

**Front Cover Assembly Disassemble**

- 1、Disassemble all bolts.
- 2、Insert flat head screwdriver between front cover and stator iron core and pry it adown to separate them.

Caution :

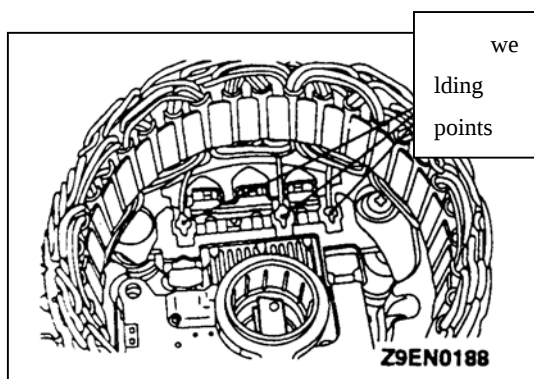
Do not insert screwdriver too deep so as to avoid damaging stator iron core.

Pulley Disassemble

Place pulley upwards and fix rotor on table vice, disassemble pulley.

Caution :

Don't destroy rotor.



Stator/Regulator assembly disassemble

1. Use electric iron (180-250W) to un-weld stator, which should be finished in 4 seconds, preventing heat transfer to diode.

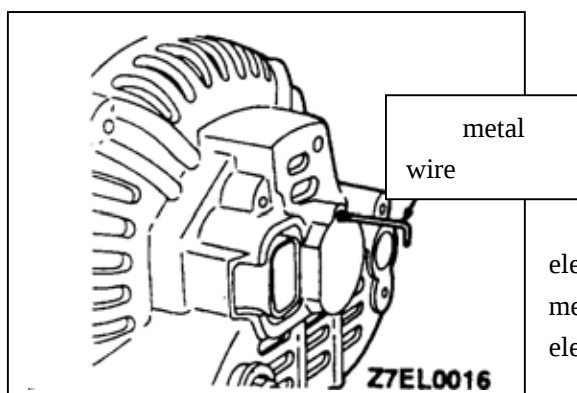
2. When rectifier is removed from electric brush bracket, the two welding points on the rectifier should be un-welded.

焊点 welding points

Caution

(1) When welding/un-welding welding points, please finish welding/un-welding as soon as possible instead of letting heat transferring from electric iron to diode.

(2) Don't pull diode cable forcibly.



Reassemble Operation Tips

Regulator assembly installation

After installing regulator assembly, push electric brush inside and at the same time insert metal wire into the hole of rear cover to fix the electric brush.

Remarks

Insert metal wire to fix electric brush and it will make rotor installation earlier.

