

# REPAIR INSTRUCTIONS



**ALTERNATORS** **S.E.V.** **MARCHAL**





*This present publication  
which is intended for the ALFA ROMEO Service Organisation  
contains instructions for checking and repairing the S.E.V. MARCHAL alternator.*

*When repairing an alternator  
only genuine spare parts must be used  
as only these ensure interchangeability and perfect operation of the assembly.*

*This Manual should always be kept up-to-date  
in respect of the data and information issued in the  
"Information Sheets" and the "Up-dating instructions"  
both these publications are issued periodically by the Service Technical Office.*

**Alfa Romeo** Service Division



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## DESCRIPTION

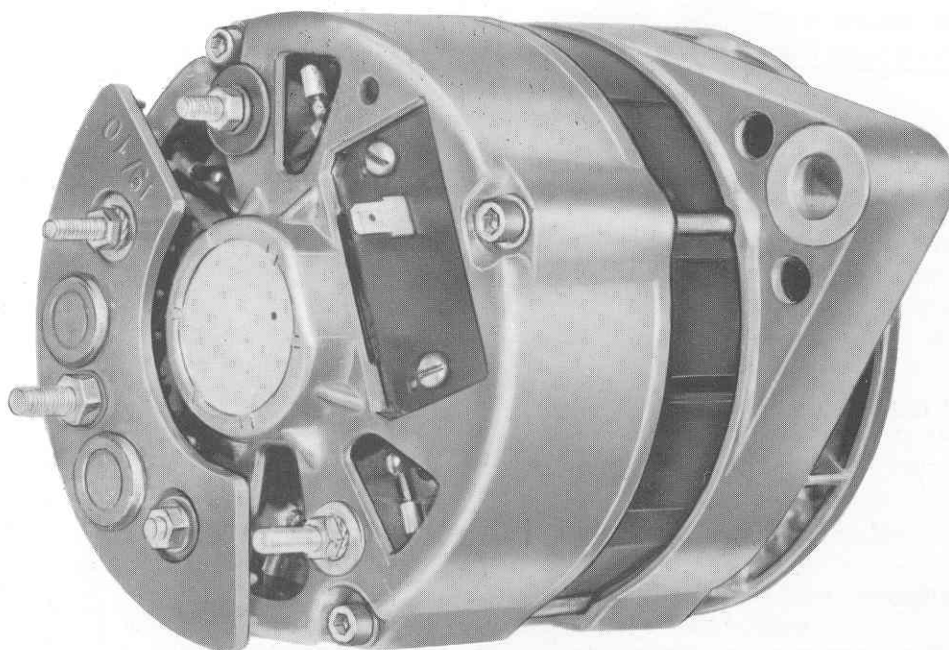
The alternator produces a three-phase alternating current, rectified by diodes. It consists of essentially:

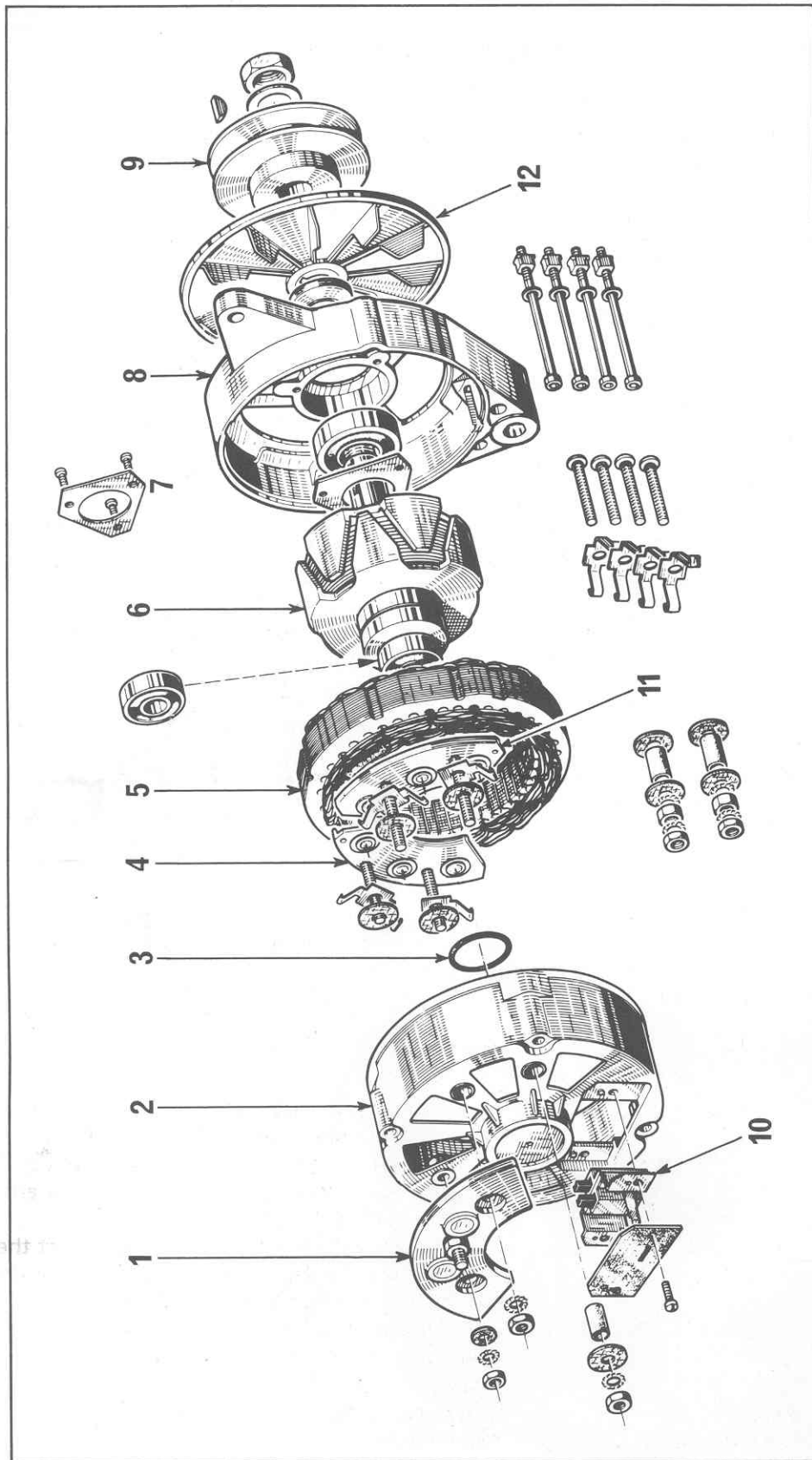
- Rotor
- Stator
- Carbon brush holder (the excitation current is transmitted to the rotor winding via slip rings).
- Heat sink for positive diodes (3 rectifying diodes): Red identification marks.
- Heat sink for negative diodes (3 rectifying diodes): Black identification marks.
- Front housing (adjacent to pulley and fan)
- Rear housing (adjacent to brush holder and terminals)
- Cooling fan
- Driving pulley
- Carrier for protection diodes.

## TECHNICAL DATA

### OPERATING CHARACTERISTICS AT 25°C

Type	Voltage	Amperage	RPM alternator	Ratio, alternator pulley/engine pulley
Three-Phase 14-50/60	14	54	5000	1.7 – 2.2



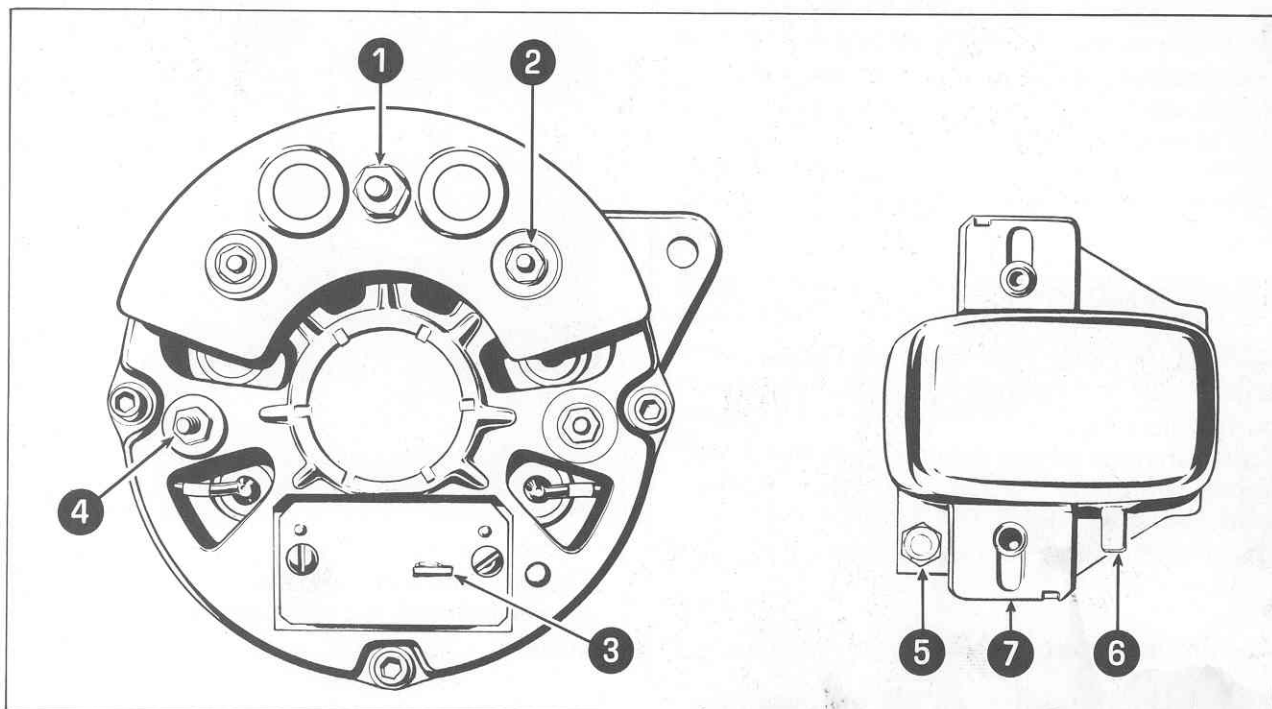


- |   |                               |    |                               |
|---|-------------------------------|----|-------------------------------|
| 1 | Carrier for protection diodes | 7  | Bearing retaining plate       |
| 2 | Rear housing                  | 8  | Front housing                 |
| 3 | "O"-ring                      | 9  | Pulley                        |
| 4 | Heat sink for negative diodes | 10 | Brush holder                  |
| 5 | Stator                        | 11 | Heat sink for positive diodes |
| 6 | Rotor                         | 12 | Fan                           |



## CONNECTIONS

- 1 = (B +) Connection to battery.
- 2 = (D +/61) Connection to protection diodes and charging warning light, connection to the (61 +) terminal of the regulator.
- 3 = (DF) Connection to brush holder; connection to the (DF) terminal of the regulator
- 4 = (D -) Connection for alternator earth.
- 5 = (DF) (Exc) Connection to the (DF) terminal of the alternator.
- 6 = (61 +) Connection to the (D+/61) terminal of the alternator.
- 7 = Connection for regulator earth.



## ESSENTIAL PRECAUTIONS

### ALTERNATOR - REGULATOR

Do not:

- Earth the excitation terminal of the alternator or regulator;
- Invert the regulator connections
- Disconnect the regulator or battery when the alternator is running;
- Remove the alternator without first disconnecting the battery cables;
- Operate the regulator without connecting it to the negative alternator terminal;
- Carry out tests on the alternator/regulator, either on the car or on the bench, without connecting the battery.

### DIODES

If, during tests or when overhauling, it be-

comes necessary to unsolder connections, the instructions on page 8 must be strictly adhered to.

### BATTERY

When testing an alternator, the battery must be in perfect conditions and fully charged.

When boost charging the battery on the car, it is necessary to disconnect the positive and negative battery terminal.

When re-connecting the battery ensure that the polarity has not been reversed as this would damage the diodes and the regulator.

For electric checks and tests, use a test instrument or a (12 V. 0,1 A) test lamp with 12 V. battery.

Never use a test lamp straight from 110 to 220 V. mains supply.



## CHECKS

### ALTERNATOR CHARGE

If the alternator is not charging:

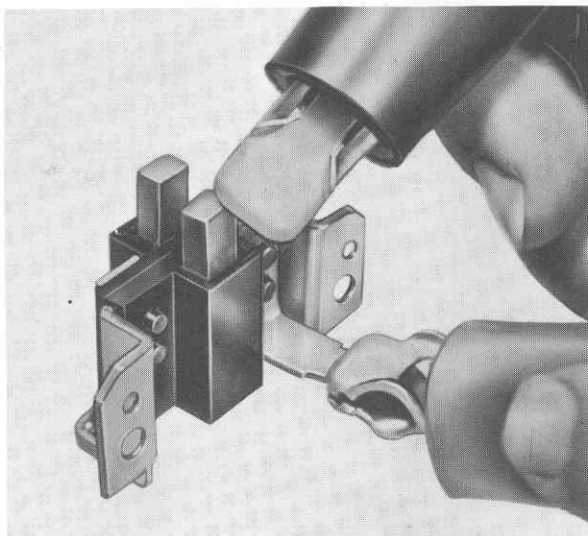
- stop the engine and check the belt tension: an insufficiently tightened belt reduces the alternator output due to belt slip.
- connect a voltmeter to the battery terminals, start the engine and check that the voltage increases progressively.

### BRUSH HOLDER

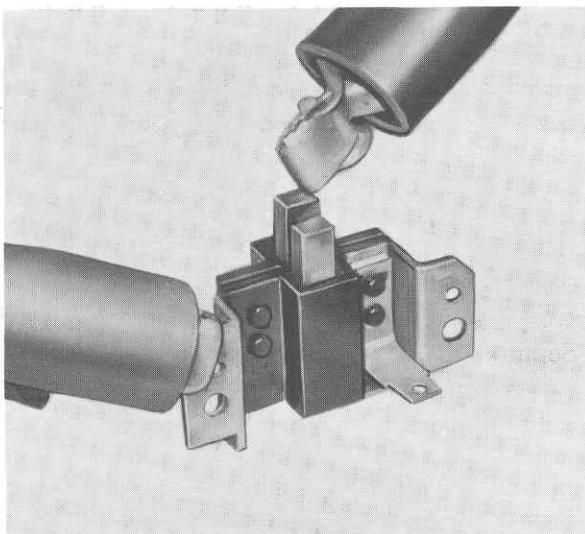
Remove the cover from the brush holder. Check that the carbon brushes seat correctly on the slip rings. Ensure that the carbon brushes move smoothly within the holder. If required, clean brushes with trichlorethylene.

#### A) Continuity test

Remove the brush holder. Set the measuring instrument to the "Ohm" reading position. Place one terminal of the instrument on the "insulated" carbon brush and the other on the live terminal.



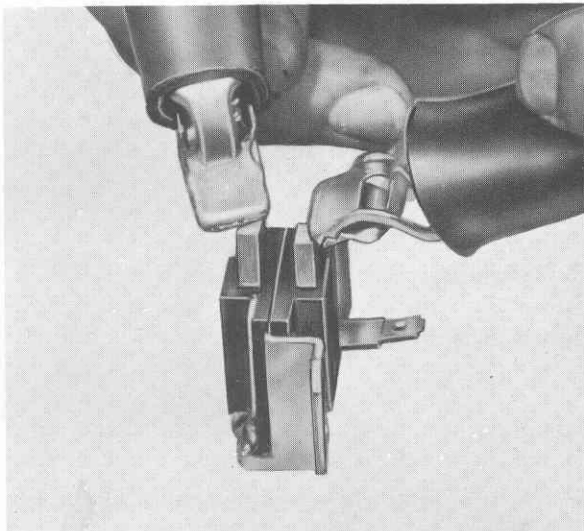
Place one terminal on the earthed carbon brush and the other on the brush holder plate.



The resistance should be nil in both cases, even when the brushes and the holder are shaken.

#### B) Insulation test

Place the terminals one on each carbon brush: The resistance should be infinite (no movement of the needle).







## DISMANTLING

### A) Carbon brush holder

Remove:

- The two retaining screws.
- Cover
- Brush holder, freeing it carefully from its centralising pins.

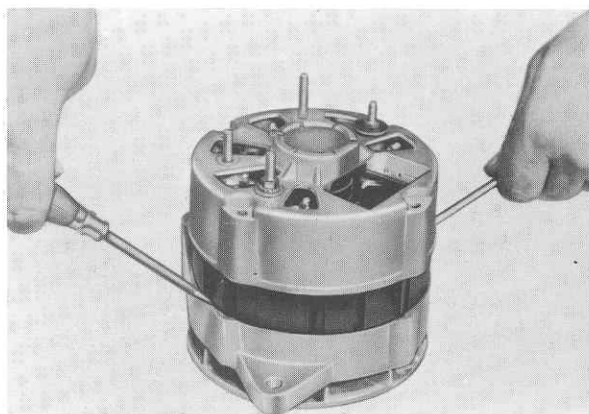
### B) Protection diodes carrier (Anti-surge device)

Remove:

- Fixing nuts and washers.
- Protection diodes carrier (anti-surge device)

### C) Rear housing and stator

- Remove the four retaining screws with their washers and nuts.
- Separate the rear housing/stator assembly from the front assembly, using two screwdrivers inserted in the diametrically opposed notches between stator and front housing. In order to prevent damaging the stator winding, care should be taken not to insert the screwdrivers more than 2 mm.
- Remove the fixing nuts and washers of the positive and negative diode carrier.
- Separate the stator from the rear housing.



### D) Front housing

Remove:

- Pulley nut, holding the rotor in a vice with soft jaws.
- Pulley, fan and key.

Free the rotor from the front housing by tapping on the shaft end. This operation is only required for the replacement of the front bearing.

## ASSEMBLY

Reverse dismantling procedure.

### A) Front housing

Lock the three bearing plate securing screws. Tightening torque for pulley nut: 4 kgm.

### B) Rear housing and stator

Correctly assemble the insulating washers and bushes.

After assembly, check that the negative terminal is connected to earth and that the positive diode carrier is correctly insulated.

Ensure that the connecting cables between stator and diodes are correctly positioned in order to prevent any interference with the rotor, and to prevent the passage of the retaining screws being obstructed. Tightening torque for screws: 0,3 kgm.

### C) Protection diode carrier (anti-surge device)

The carrier is fixed to a positive and to a negative terminal.

### D) Insulation test

Place one terminal of the ohmmeter to the positive terminal and the other to the negative terminal. Then invert the connections. The needle should only move in one of the two tests, but not in both.

If necessary, check that the insulating washers are correctly fitted.





## CHECKING DISMANTLED COMPONENTS

Electrical checks and tests should be carried out by means of a suitable measuring instrument or a 12 V 0,1 Amp. test lamp with 12 V battery.

Never use a test lamp from a 110/220 V. mains supply.

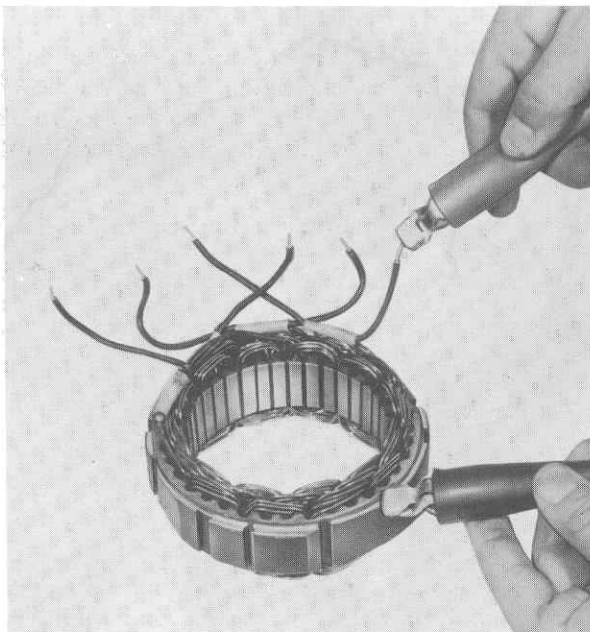
### STATOR WINDINGS

#### A) Visual check

Some coils of the winding might be shorted. In such cases, excessive overheating takes place and a visual check may be sufficient to detect the fault (part of the winding being burned).

#### B) Electrical test

Unsolder the connecting cables from the diodes to the stator. Place one terminal of the Ohmmeter in turn on all the ends of the winding, and the other on the laminations. The needle should not move. If it does it indicates that the winding is earthed. Replace the stator and check the three phases.



### DIODES

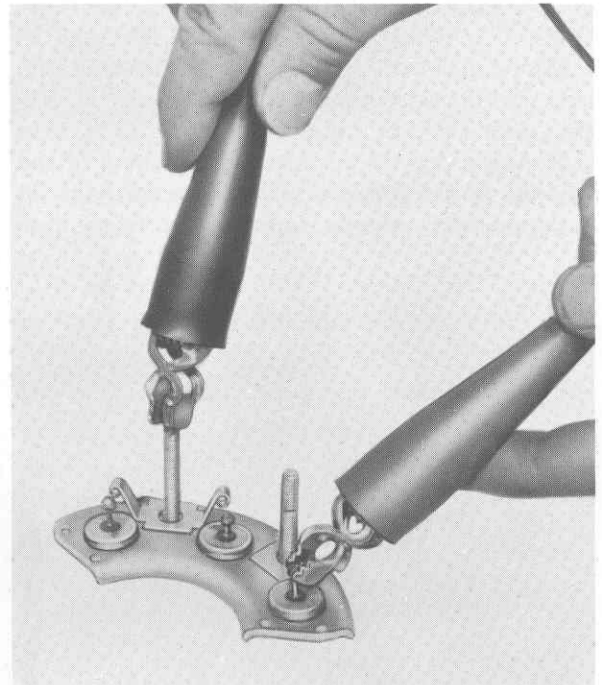
(This operation must be carried out with the diodes disconnected from the circuit).

Place one terminal of the Ohmmeter in turn on each pin of the diode, and the other terminal on the diode carrier.

Then transpose the Ohmmeter terminals.

The Ohmmeter should indicate some resistance in only one direction, otherwise the diode in question is either in an open or short circuit. The complete diode carrier should be replaced, even if only one diode is faulty.

Proceed in the same manner for the protection diodes (anti-surge device).



### ROTOR

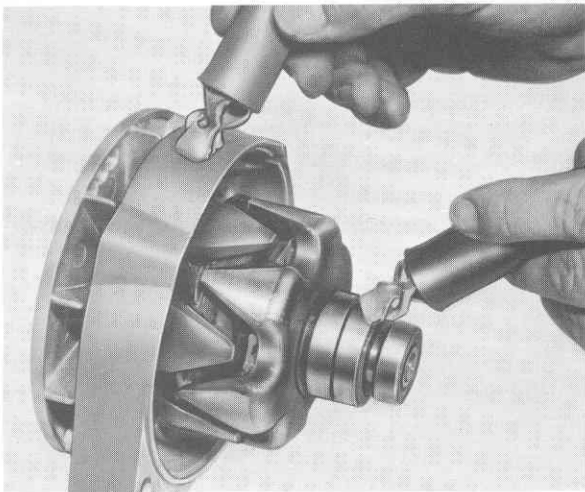
Check condition of slip rings. These must be free from grease or scoring. Clean with a cloth soaked in trichlorethylene. Avoid polishing slip rings, as this may result in a poor contact with the brushes.

Check also the condition of the winding (damaged insulation, broken outlet cables, etc.). Carry out electrical test.



### Insulation check

To check the insulation, place one terminal of the Ohmmeter to earth, and the other one on each one of the slip rings in turn. The resistance must be infinite.



### Checking the winding

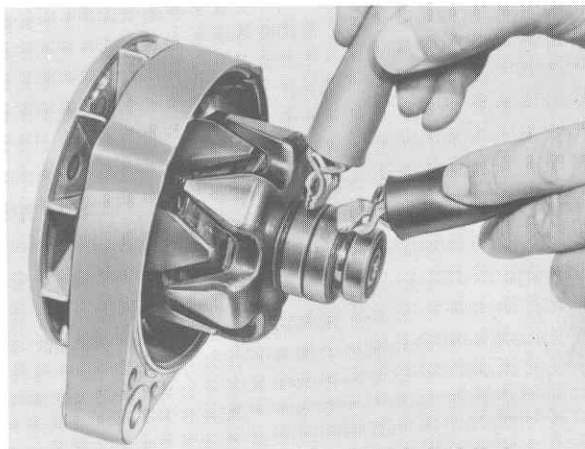
Place the two terminals of the Ohmmeter on the slip rings respectively. The resistance (at 25° C) should be:

$$4 \pm 0,3 \Omega$$

If the resistance is zero, the rotor is short circuited.

If the resistance is less than the value specified above, the rotor is partially short circuited.

If the resistance is infinite, the excitation winding is open circuited.



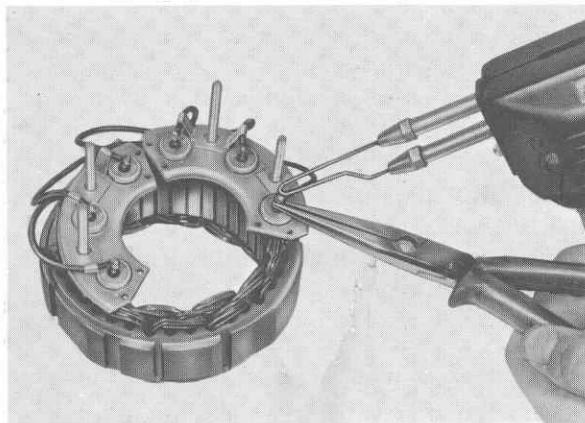
## REPAIRS

### REPLACING DIODES

Mark the cables connecting the diodes to the stator, and unsolder them.

Before soldering, place the three cables on the diodes in the same position and in the original form, in order to avoid twisting them during assembly.

Grip the pin of the diode with a pair of pliers, as illustrated, to provide increased cooling during the soldering operation.



Solder the cable with a sufficiently powerful soldering iron (100 to 150 W), well heated, to ensure instant soldering.

Proceed in a similar manner for the other diodes.

Take care not to invert the diode carriers (heat sinks). The positive carrier is insulated from earth by means of insulating washers and bushes. The negative diode carrier is not insulated.

**Note:** The complete diode assembly must be replaced, even if only one diode is faulty.

### OVERHAULING THE REAR HOUSING

#### Replacing the rubber ring.

Remove the ring from its seat.

Clean seat carefully.

Check that the breather hole located at the bottom of the cover, is free.

Fit new ring, lubricating it and its seat with mineral oil, or if possible, with castor oil.



## REPLACING FRONT BEARING

### To extract bearing

Hold the rotor in a vice with wood jaws to protect the claw-poles.

Protect the thread on the rotor shaft, using a nut.

Extract the bearing using a suitable extractor puller.

### Assembly

Fit the bearing retaining plate, placing it to the bearing bossing from the rotor side. Fit the housing with the new bearing to the rotor, using a press and a sleeve that rests on the bearing inner race.

**Warning:** When refitting the bearing, care should be taken to prevent damage to the rotor shaft thread.

## REPLACING THE REAR BEARING

### To extract bearing

Hold the rotor in a vice and grip with moderate pressure. Protect rotor by means of wooden jaws.

Extract bearing using a suitable extractor puller.

### Assembly

Fit new bearing using a press and a sleeve forcing on the bearing inner race.

## MAINTENANCE

### SLIP RINGS

If the slip rings show signs of grease, clean them using a cloth soaked in trichlorethylene.

### ALTERNATOR

— Lubrication. The alternator requires no lubrication. The two bearings are sealed and do not require periodic attention.

— Belt tension. Check periodically the belt tension.

— Idling speed. As the alternator charges the battery even at idling speed, it may in certain cases be beneficial to alter the idling speed setting.

### REGULATOR

The regulator does not require any adjustments or maintenance.





## OPERATING FAULTS

SYMPTOM	CAUSE
<b>Alternator does not charge</b>	<ul style="list-style-type: none"> <li>– Insufficient belt tension</li> <li>– Charging circuit or earth return circuit broken</li> <li>– Faulty carbon brushes</li> <li>– Short-circuited diodes</li> <li>– Broken excitation circuit</li> <li>– Broken rotor windings</li> <li>– Voltage regulator ineffective</li> <li>– Earthed stator windings</li> <li>– Protection diodes in open circuit</li> <li>– Earthed protection diodes carrier</li> </ul>
<b>Insufficient or irregular output</b>	<ul style="list-style-type: none"> <li>– Insufficient belt tension</li> <li>– Intermittent interruption of charging circuit</li> <li>– Worn carbon brushes</li> <li>– Ineffective voltage regulator</li> <li>– Rectifier diode in open or short circuit</li> <li>– Partially short-circuited rotor</li> <li>– Open-circuited, earthed or partially short-circuited stator</li> </ul>
<b>Excessive output</b>	<ul style="list-style-type: none"> <li>– Ineffective voltage regulator</li> <li>– Inverted connections between voltage regulator and alternator</li> </ul>
<b>Noisy alternator</b>	<ul style="list-style-type: none"> <li>– Worn drive belt</li> <li>– Loose pulley</li> <li>– Alternator pulley not aligned with crankshaft pulley</li> <li>– Faulty bearings</li> <li>– Short-circuited rectifier diode</li> <li>– Loose alternator</li> </ul>

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