

# Generator and Regulator

## (Three-Element Voltage/Current Regulator)

Job No.
15—10

The generator LJ/GEG 160/12/2500 R 8 has a rated output of 160 Watts. The voltage is 12 V. The maximum output which the generator is capable of delivering continuously without suffering any damage is, however, 50 % above the rated output, that is to say, a continuous output of 240 Watts is permissible.

It is necessary for the generator to be disconnected from and reconnected to the battery circuit in accordance with the various engine speed ranges and within certain fixed voltage ranges. This means that the battery is kept fully charged all the time but not over-charged.

The apportioning of the load between generator and battery is arranged for by means of the so-called "regulator". The regulator, a three-element voltage/current regulator, Type RS/UA 160/12/15, is fixed to the right wheel-arch.

The following assemblies are fitted in the regulator housing (see Fig. 15—10/2):

- a) **The Voltage Regulator**, which maintains a constant voltage at varying engine speeds and varying loads
- b) **The Current Regulator**, which causes a steep voltage drop when the maximum current is flowing and thus protects the generator from being overloaded
- c) **The Switch**, which automatically connects the generator to the battery circuit and disconnects it as required

### a) Voltage Regulator

The voltage regulator is a two-contact regulator.

Spring-loaded contacts are incorporated in the exciter circuit of the generator and are opened by means of an electro-magnet which in turn is operated by the generator voltage as soon as the nominal voltage is exceeded (see Fig. 15—10/2, Circuit Diagram ④). When the contacts are opened, a resistance is switched into the exciter current circuit, causing the generator voltage to drop. The magnetic force of the electro-magnet is correspondingly weakened as a result so that the contacts can once more be closed by the pressure of the spring. Thus the suitable average exciter current for the various operating conditions of the generator is conveyed to it by means of a periodic strengthening and weakening of the exciter current. In this way, the regulator operates in the so-called lower regulation range at low engine speeds (see Fig. 15—10/2, Circuit Diagram ⑥). At high engine speeds, the regulator operates in the higher regulation range (see Fig. 15—10/2, Circuit Diagram ⑦). In this regulation range, the exciter coil is periodically shorted out.

### b) Current Regulator

The spring-loaded contacts of the current regulator are in series with the contacts of the voltage regulator in the exciter current circuit (see Fig. 15—10/2, Circuit Diagram ④). The contacts are opened by an electro-magnet which in turn is governed by the strength of the charging current as soon as the maximum permissible charging current has been reached (see Fig. 15—10/2, Circuit Diagram ⑧). When the contacts are opened, a resistance is switched into the exciter current circuit and this resistance causes the generator voltage to drop off sharply (Fig. 15—10/1).

The sharp cut-off or drop in the voltage curve at the moment that the current regulator comes into operation has given this form of regulator the name of "cut-off type" (voltage current regulator). The voltage regulator is put out of operation by virtue of the sharp drop in generator voltage, that is to say, its contacts remain closed in the lower regulation range.

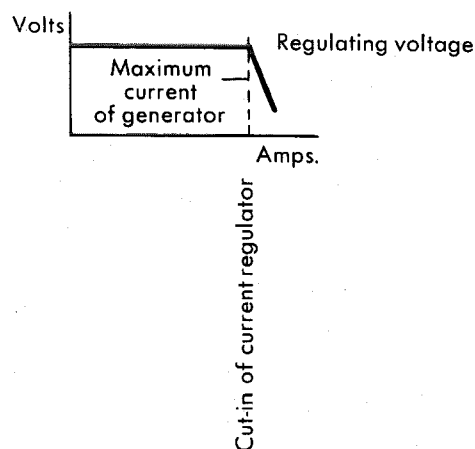


Fig. 15 — 10/1

#### c) Switch

The switch connects the generator to the battery as soon as the voltage of the generator is higher than the battery voltage (see Fig. 15 — 10/2, Circuit Diagrams ④ and ⑤). As in the case of the voltage regulator, the contacts are closed via the voltage coil by an electro-magnet which is governed by the voltage of the generator.

The second coil, the current coil of the electro-magnet, is in the charging circuit. When the engine speed decreases, it causes the contacts to open and the generator to be disconnected from the battery. The reverse current which flows at low engine speed causes the magnetic field of the voltage coil to be weakened so that the armature is released and the contacts open.

#### d) Charging Light

The charging light, which is connected via the ignition switch between the terminal D + (61) and the terminal B + (51), operates in conjunction with the switch contact of c) above. The charging light lights up when the ignition is switched on and the generator is not turning or is turning so slowly that the cut-in voltage has not yet been reached.

The charging light is extinguished when the switch has connected the generator to the battery circuit. But the battery is not charged until at higher engine speed the generator delivers more current than the consumer units actually in use are taking since only the superfluous current is available for charging purposes.

# Bosch Regulator and Cutout

## Type RS/UA (three-element current-voltage regulator)

