Chapter 4

VOLTAGE REGULATOR, TYPE J

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LEADING PARTICULARS

Voltage regulator, Type J	*Stores Ref. 5UC/522*
Carbon pile	*Stores Ref. 5UC/3279*
Trimmer resistor (5 ohms)...	*Stores Ref. 5UC/5082*
Ballast resistor (26 ohms)	*Stores Ref. 5UC/3273*
Coil current...	*1·1 to 1·21 amp.*
Pile resistance range	*2 to 25 ohms*

Introduction

1. The voltage regulator, Type J, is used on aircraft to control the d.c. output of the generator, Type UKX. It incorporates a voltage regulator and a current limiting unit which maintain the generator output at 28 volts d.c., 60 amp. For parallel running, a linkage arrangement introduces a slightly falling volts/load characteristic to ensure that the load is equally shared by the two generators.

DESCRIPTION

2. The voltage regulator, Type J, operates on the standard carbon pile principle described in A.P.4343, Vol. 1, Sect. 6, Chap. 1. The current unit in this regulator is that remote from the terminal block assembly as shown in fig. 1; the underside is illustrated in fig. 2. A variable trimmer resistor is incorporated in series with the voltage coil, the adjuster, which is slotted for screwdriver operation, being brought to the front through a hole in the base plate. The carbon pile is 1·875 in. long, and consists of 1 mm. washers, with a silver disc at each end; connection to the external circuit is made through silver contacts.

3. A circuit diagram is given in fig. 3, in which it can be seen that additional windings in the voltage unit are used for stabilizing. A high resistance winding is connected across the field, acting in the same direction as and superimposed on, the main voltage coil. A third coil is wound in series with the pile to balance the effect of the shunt stabilizing coil under steady conditions. With rapid changes of speed or load, the shunt stabilizing coil acts as a damping device and prevents hunting.

INSTALLATION

4. The regulator should be mounted in an upright position with the terminal block at the bottom. For details of the cable connections, reference should be made to the appropriate Aircraft Handbook. It is essential that the link should be in the correct position

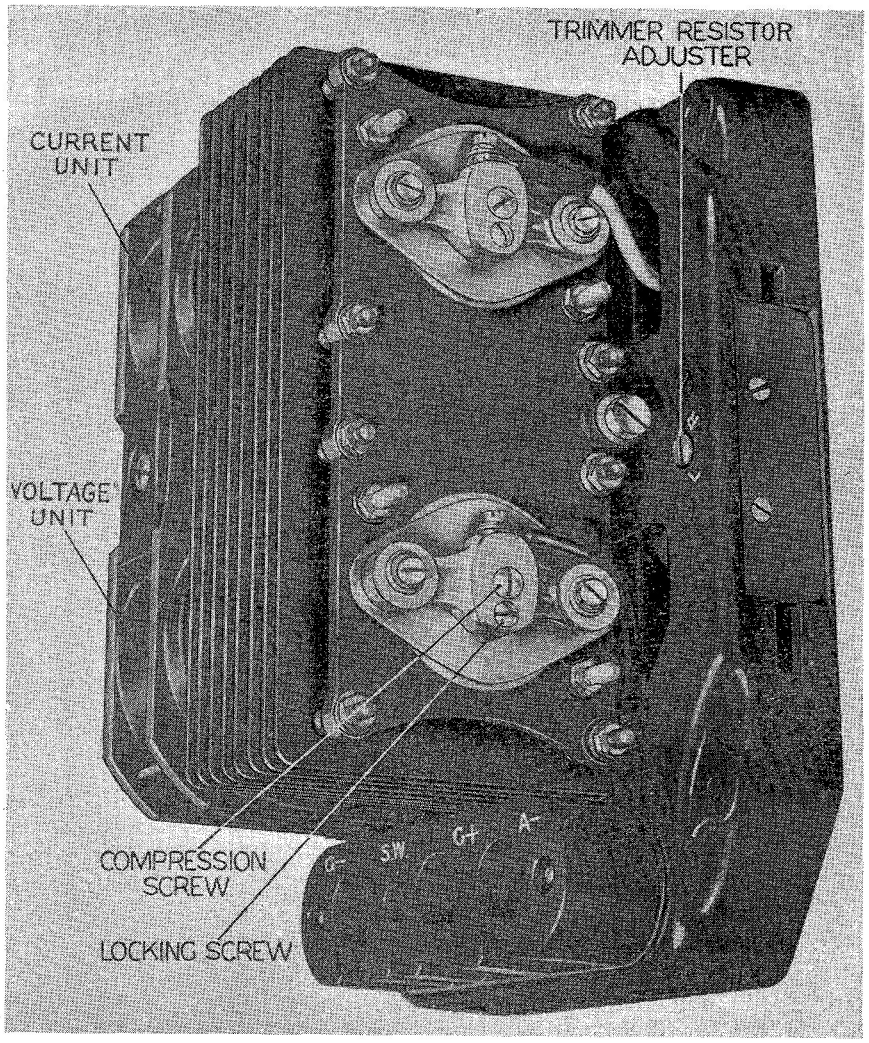


Fig. 1. Voltage regulator, Type J

for the particular installation. The link is removed by withdrawing the screws; it should then be placed in its new position, and the screws firmly tightened down.

SERVICING

5. General servicing instructions for this type of regulator are given in A.P.4343, Vol. 1, Sect. 6, Chap. 1. That chapter describes the fitting of a new pile stack, and the method of adjusting a regulator which is out of order. If any adjustment is made, the regulator must be fully tested for regulation and stability.

Final voltage adjustment

6. Connect the regulator in a test circuit as shown in fig. 3, using a generator, Type UKX, driven by a bench testing set with a suitable switchboard and loading panel. With the generator running at approximately 5,000 r.p.m., the voltage adjustment should be made as described in A.P.4343, Vol. 1, Sect. 6, Chap. 1. Before commencing tests, check that the link is in the correct position, i.e. across terminals C and B, and that the contact arm of the trimmer resistor is in the mid position.

7. When the final voltage adjustment has been made, check that the current in the voltage operating coil is between 1·10 and 1·21 amp. with 28 volts applied across the voltage coil and ballast and trimmer resistors in series. The regulator should then be tested for regulation and stability.

Regulation test

8. With the link in the position C–B, run the generator from rest to 3,000 r.p.m. on no load. Increase the generator speed from 3,000 r.p.m. to 6,000 r.p.m., then decrease the speed until the pile is working at 2·0 ohms, given by $\frac{V2}{A2}$. Throughout the test, the line voltage as measured on V1 must remain within the limits of 27·0 and 28·5 volts.

Stability test (voltage unit)

9. To check stability of the voltage regulator unit, switch full load on and off at least three times at generator speeds of 4,000 r.p.m., 5,000 r.p.m. and 6,000 r.p.m. Under these conditions, the regulator should be critically damped.

10. Immediately following the above test, slacken the pile compression screw of the voltage unit $\frac{1}{8}$th of a turn, and repeat the stability test in para. 9. Under this condition, the armature spring must respond and settle with not more than two oscillations.

11. Providing the regulator satisfies the test in para. 10, the original setting is to be restored and the regulation test in para. 8 repeated.

Note . . .

Before readings are taken, the regulator must be operated over its full resistance range (corresponding to generator speeds of 3,000 *r.p.m.*–6,000 *r.p.m.*–3,000 *r.p.m.) for not less than three cycles.*

Current unit

12. The following test must be made for correct operation of the current unit, remembering that the current unit is that remote from the terminal block.

13. With the generator running at 5,000 r.p.m., adjust the variable load resistor until the line voltage indicated on V1 is reduced to 14·0 volts; the reading indicated on A1 should be not less than 64 amp. and not greater than 67·5 amp. This limiting current is set by adjusting the magnet core of the current unit; screwing the core in (clockwise)

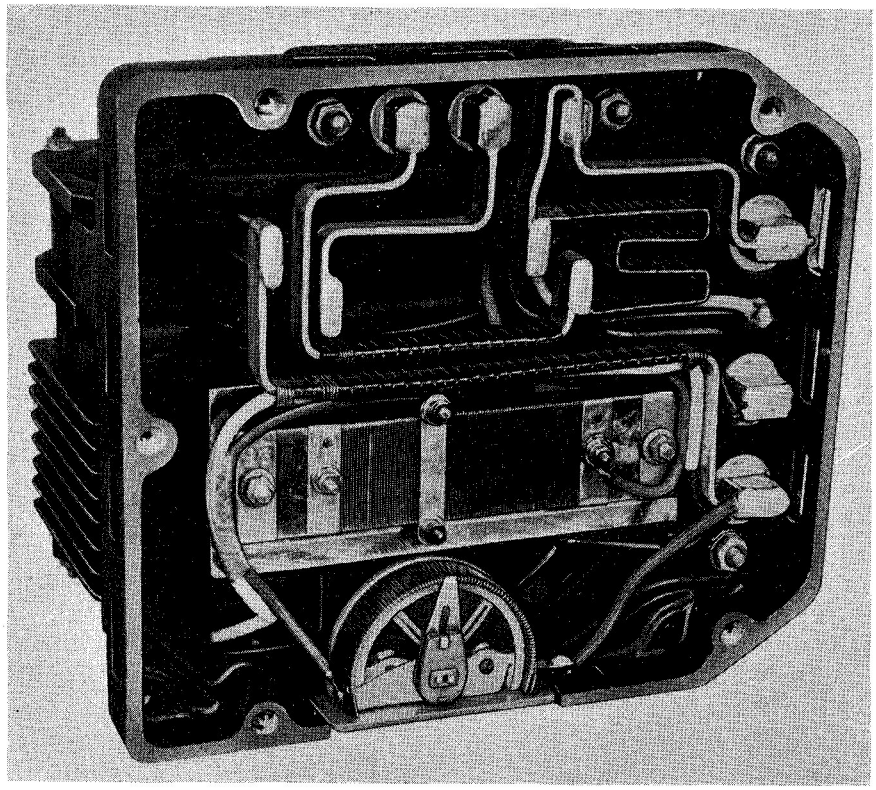


Fig. 2. Underside of regulator

will lower the limiting current, and screwing out (anti-clockwise) will raise it.

Stability test (current unit)

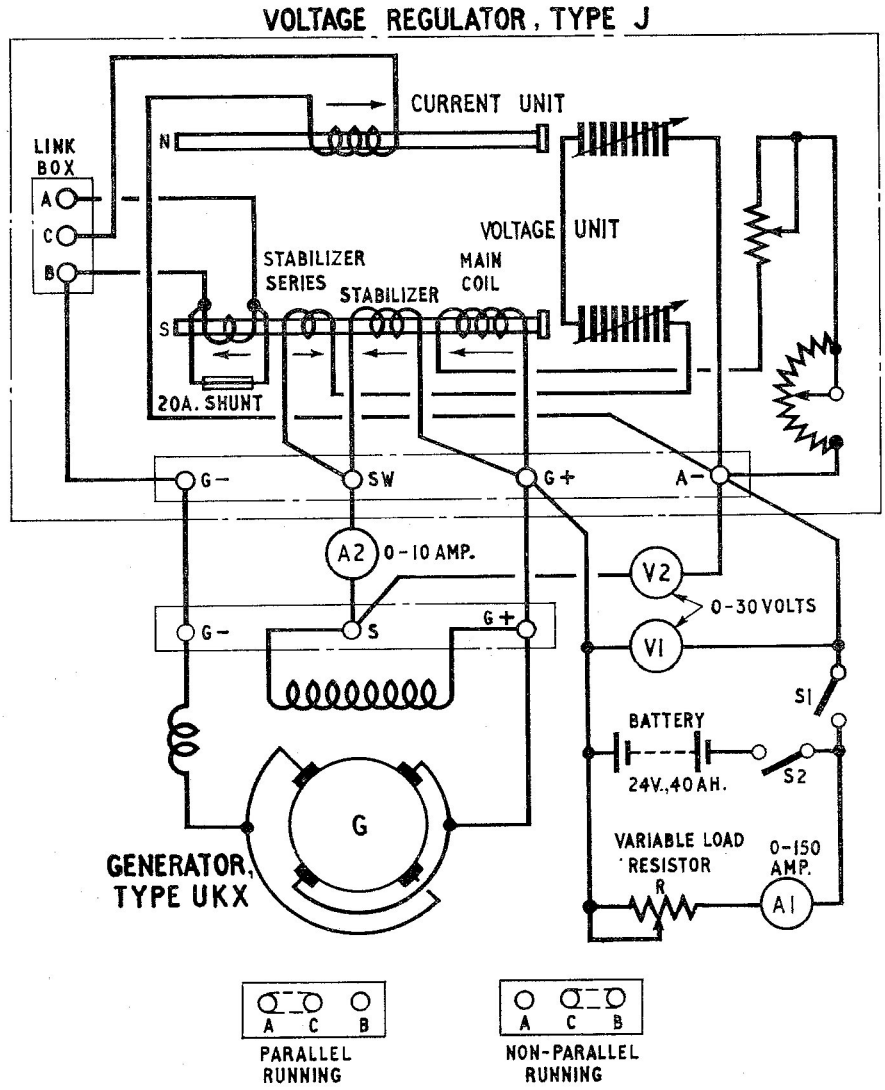
14. To check the stability of the current regulator, connect a 24-volt, 40 amp. hr. battery across the load terminals, and adjust the variable load resistor until the line voltage indicated on V1 is reduced to 25·0 volts, with the generator running at a speed of 5,000 r.p.m. The battery and resistance load is then to be switched on and off at least three times. Under this condition, the regulator must respond rapidly and show no signs of sustained hunting.

15. Immediately following the above test, the pile compression screw of the current unit is to be slackened $\frac{1}{8}$th of a turn, and the stability test in para. 14 repeated. With this setting, the regulator should respond rapidly and show no signs of sustained hunting.

16. Provided the regulator satisfies the test in para. 15, the original setting is to be restored and the test in para. 13 repeated.

Compounding test

17. With the link in the position for parallel running (i.e., A–C), giving a falling volts/load characteristic, and the generator running at 5,000 r.p.m., application of the full load of 60 amp. should reduce the line voltage to between the limits of 25·5 and 26·9 volts.



LINKING ARRANGEMENT

Fig. 3. Circuit diagram