

Chapter 1 VOLTAGE REGULATOR, TYPE 91 (ROTAX F3802)

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LEADING PARTICULARS

Voltage regulator, Type 91	Ref. No. 5UC/5522
<i>Controlled voltage</i>	112 volts \pm 2½ per cent
<i>Maximum pile loading</i>	250 watts
<i>Pile resistance range</i>	10 to 180 ohms
<i>Carbon pile (4 off)</i>	Ref. No. 5UC/6150
<i>Operating coil current</i>	0.6 to 0.66 amp.
<i>Operating coil resistance (cold)</i>	54 ohms
<i>Shunt stabilizing winding</i>	4,250 ohms
<i>Series stabilizing winding (2 in parallel)</i>	0.08 ohms
<i>Equalizing coil resistance</i>	0.265 ohms
<i>Equalizing resistor (1.25 ohms, 10 watt)</i>	Ref. No. 5UC/6154
<i>Semi-adjustable ballast resistor (2 off)</i>	Ref. No. 5UC/6286
(80 ohms, 40 watts)	
<i>Trimmer resistor, Type 7</i>	Ref. No. 5UC/5523
<i>Dimensions</i>	8½ in. \times 6½ in. \times 7⅞ in.
<i>Weight</i> 18 lb. (approx.)

Introduction

1. The voltage regulator, Type 91, is used to control the output of the d.c. generator, Type 551, at 112 volts \pm 2½ per cent.

DESCRIPTION

2. This regulator (*fig. 1*) is of the multi-pile type, provided with four carbon piles connected in series-parallel. Apart from the modified construction to accommodate the four piles, the voltage regulator is similar in construction and principle of operation to the single-pile type described in A.P.4343, Vol. 1, Sect. 6, Chap. 1.

3. To mount the four piles, a stub shaft projects from the armature clamp plate (*fig. 2*). A gimbal arm, pinned to this stub axle, carries two pressure arms which are

pinned to spindles projecting from the ends of the gimbal arm. At the ends of the pressure arms are fitted brass ferrules which are insulated from the arms by mica. The ferrules house carbon terminal plugs which contact the piles. A strap connector links the pair of ferrules on each pressure arm.

4. At the other end of the unit, each pile bracket is screwed to the end plate and is insulated from it by mica washers. Each pile is fitted with its own terminal plug, adjustable ferrule, compression and locking screws, and lead connecting screw. The assembly is protected by a cover which is attached to the end plate by four screws.

5. The four ceramic tubes, housing the pile stacks, are enclosed within a finned cooler

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(A.L.7, June 58)

which dissipates the heat generated by the stacks. Each pile is 2.5 in. long, and consists of a minimum of 130 0.5-mm. washers.

6. The regulator unit and a moulded terminal block are mounted on the top plate of a rectangular base plate provided with four fixing holes, beneath which are the semi-adjustable ballast resistors. A trimmer resistor, Type 7 (40 ohms, $7\frac{1}{2}$ watts) is connected between terminals 2 and 7, i.e., across part of one of the 80-ohm ballast resistors. This ensures that in the event of open-circuiting of one of the trimmer leads, the voltage level is still maintained within safe limits.

7. Series and shunt stabilizing windings are incorporated in the regulator unit, also an equalizing coil in series with a resistance; this ensures that the load is shared equally when

two or more generators are run in parallel. The coil is such that the application of 1 volt across the coil causes the line voltage to fall by approximately one third.

SERVICING

8. 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 preliminary mechanical adjustment for a regulator which is completely out of order. When any adjustment is made, the regulator must afterwards be subjected to full test.

Note . . .

When setting up the regulator, ensure that the pressure arms are parallel with the armature by measuring the distance between the insulating bush at the base of each pile stack and the

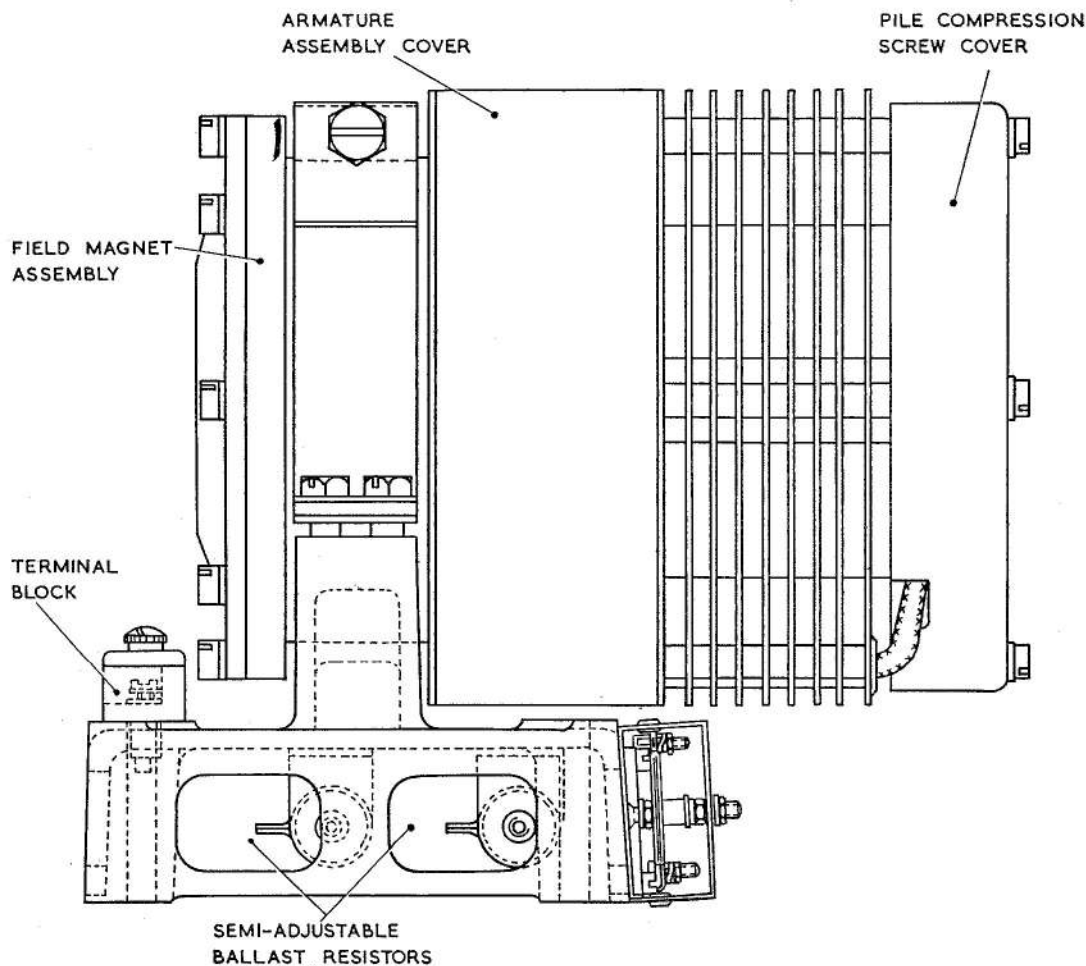


Fig. 1. Voltage regulator, Type 91

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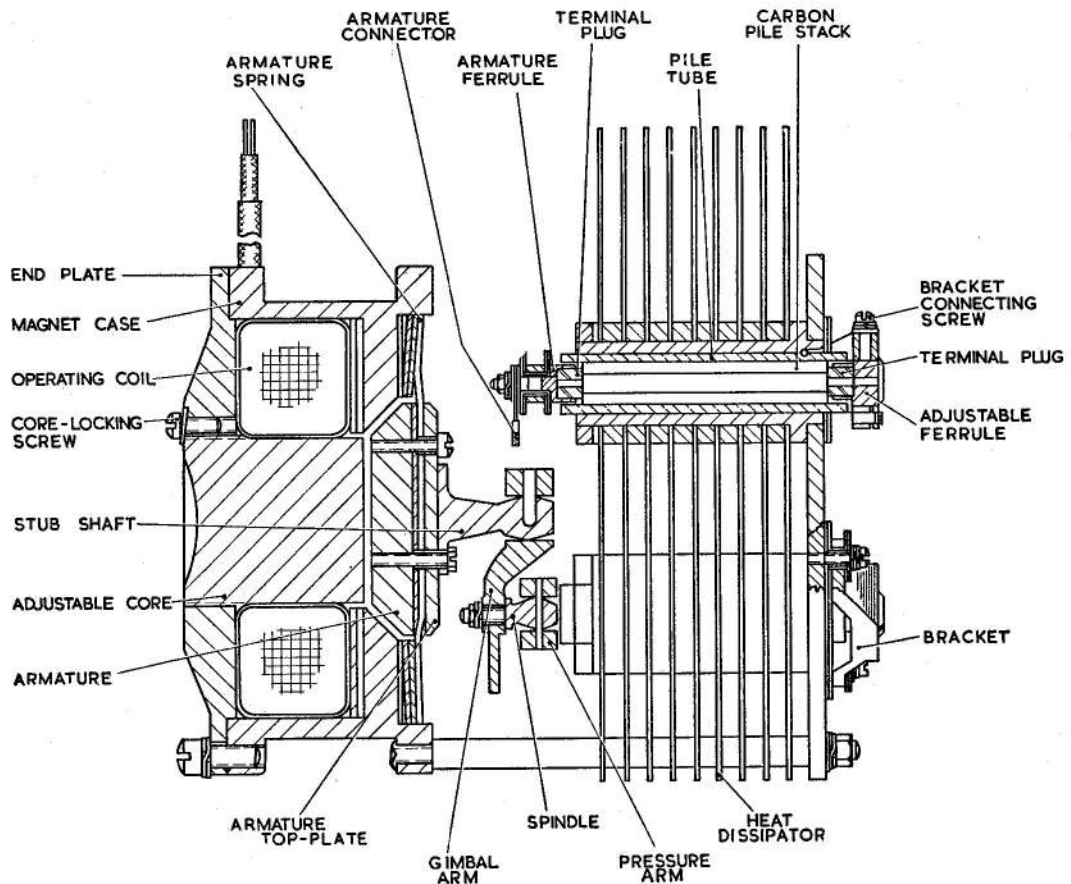


Fig. 2. Sectional view of regulator

armature clamp plate with a pair of inside calipers. Make individual adjustments to each compression screw until the four measured distances are equal. Subsequent adjustments must be made equally on each pile stack, in order to maintain the pressure arms level.

Testing of regulator

9. Connect the regulator in the test circuit shown in fig. 4. The generator used need not necessarily be the generator used on the aircraft, but it should preferably have similar characteristics for the purpose of checking stability.

10. Disconnect and insulate the blue lead from the pile end bracket, and substitute the test lead from SW1 (fig. 4). With the stabilizing windings disconnected by switching SW1 to the test lead, the regulator must be adjusted to control the generator output at 112 volts with the coil current shown on

A1 adjusted to within the limits of 0.6 and 0.66 amp. cold.

Regulation test

11. Run the generator at constant speed, and by variation of the series and diverter resistors, increase the pile resistance as measured by V_2/A_2 smoothly from 15 ohms to 180 ohms, and then decrease to 15 ohms. Repeat this cycle, and over this cyclic variation of pile resistance, the controlled voltage V_1 must be maintained within the limits of 112 volts $\pm 2\frac{1}{2}$ per cent.

Note . . .

It is important that the diverter resistor should always be switched in or out at its maximum value.

Equalizing test

12. With the equalizing potentiometer short-circuited, connect a separate supply of 0.5 volts across terminals 5 and 4, the positive

(A.L.2, Nov. 57)

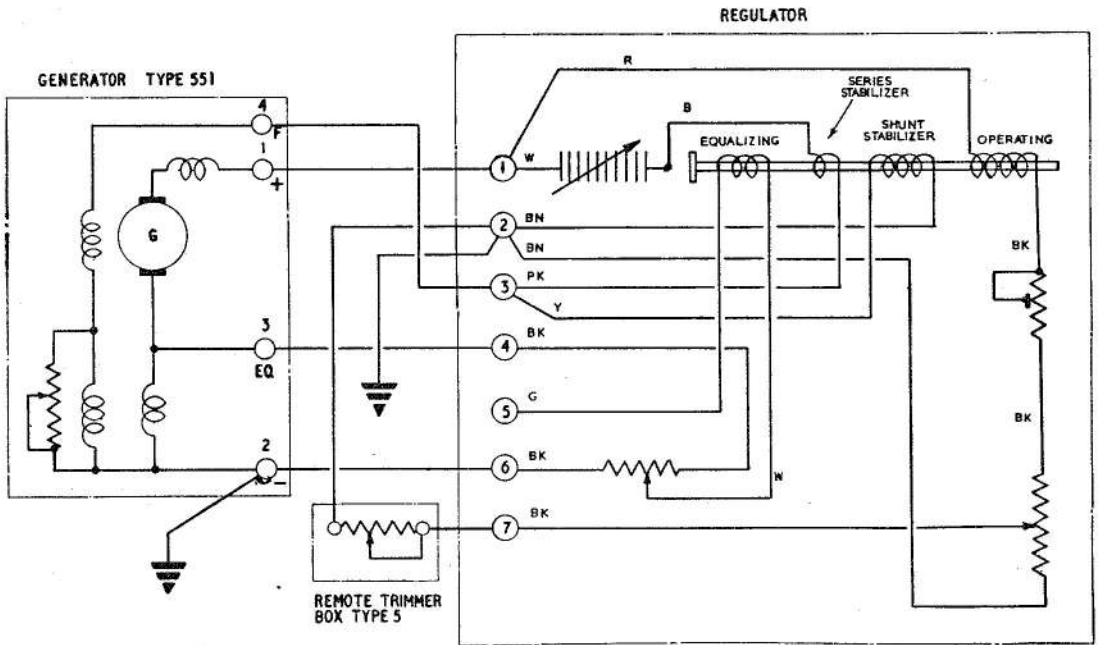


Fig. 3. Circuit diagram

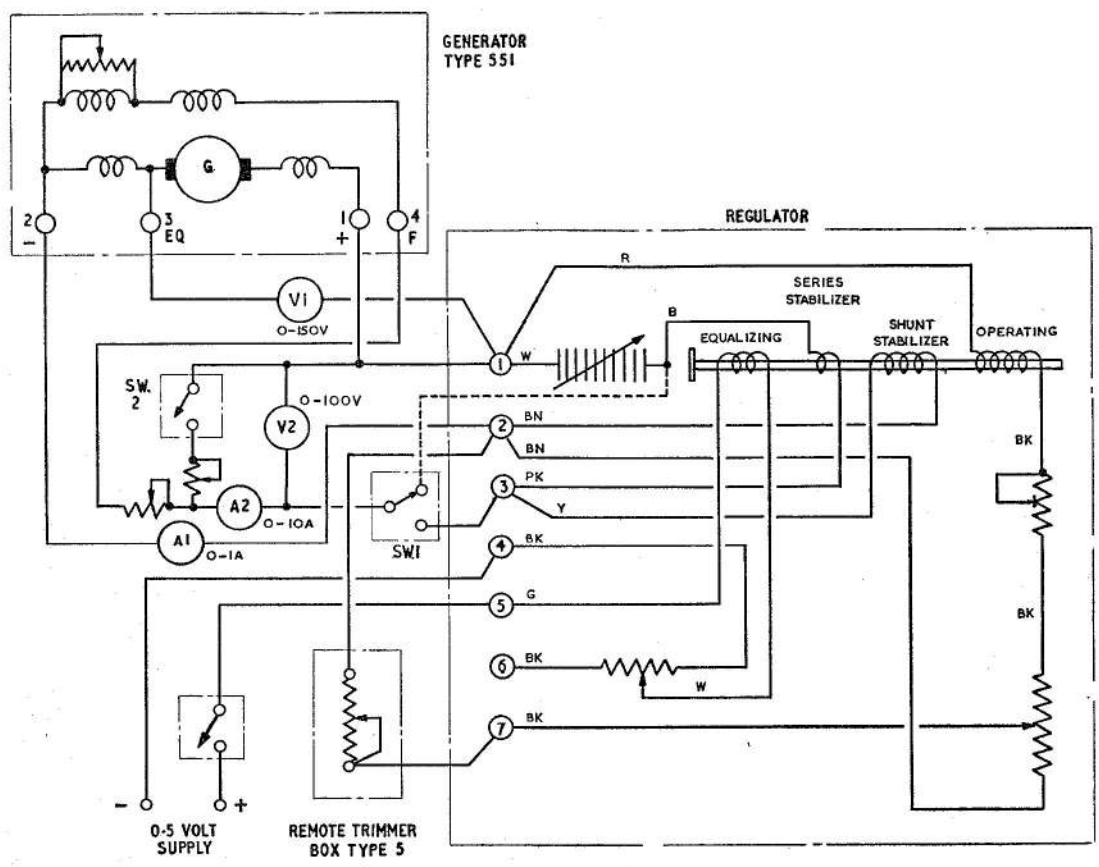


Fig. 4. Test circuit diagram

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lead being connected to terminal 5. On the application of this voltage, the line volts V1 must be reduced to between 92 and 96 volts.

Stability tests

13. ◀ Remove the test lead from the pile end bracket, and replace the blue lead which was disconnected according to the instructions given in para. 10. Switch SW1 to the lead connected to terminal 3 to bring the stabilizing windings into circuit.

14. Connect a 200-ohm 50-watt variable resistance across a switch which is in series with the generator shunt field. Open the switch and run the generator to 9,000–10,000 r.p.m., and adjust the resistance so that the pile is operating at 10 ohms as measured by

V2/A2. Close and open the switch three times, and check for hunting. The generator should be on no load. ▶

15. Following this test, slacken the pile compression screws $\frac{1}{4}$ turn, i.e., equivalent to 0.009 in. pile movement, and repeat the stability test. At this setting of the pile compression screws, the regulator must respond without any tendency to sustained hunting.

16. Provided the regulator satisfies the test in para. 15, restore the pile compression screws to their original settings, and repeat the regulation test.

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