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**Chapter 45****VOLTAGE REGULATOR, TYPE 23/47848E**

(Completely revised)

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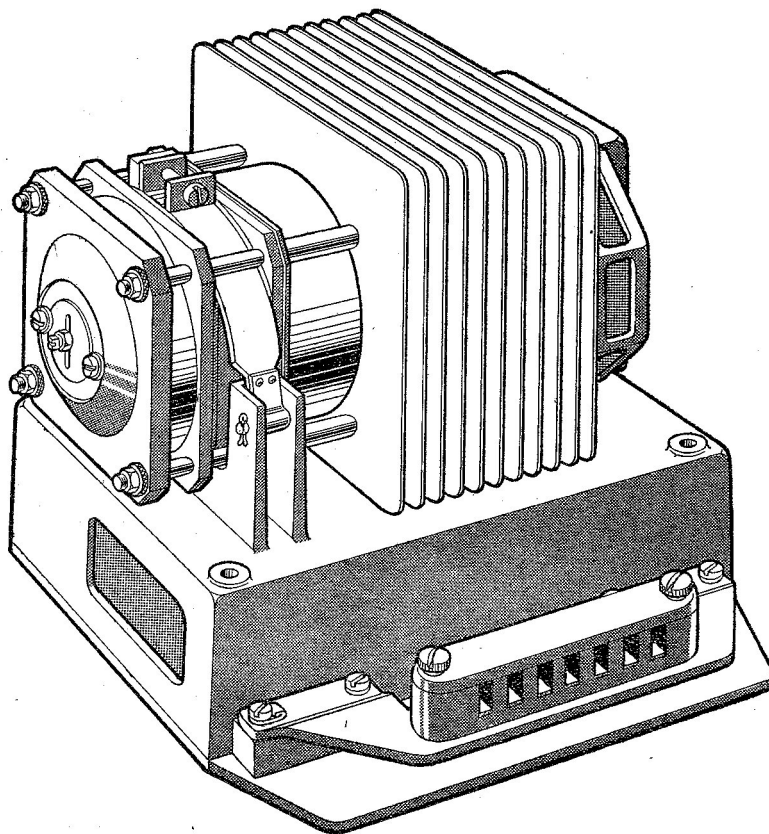
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**LEADING PARTICULARS**

<i>Voltage regulator Type 23/47848E</i> ... ..	Ref. No. 5UC/6673
<i>Controlled voltage</i> ... ..	30V $\pm$ 2½% d.c.
<i>Max. pile loading</i> ... ..	103W
<i>Pile resistance range</i> ... ..	0.6 to 11 ohms
<i>Operating coil current</i> ... ..	0.92 to 0.95 amp
<i>Operating coil resistance</i> ... ..	9.75 ohms (cold)
<i>Ballast resistor (fixed)</i> ... ..	10 ohms 15 watts
<i>Ballast resistor (adjustable)</i> ... ..	2 $\times$ 12 ohms
<i>Trimmer resistance</i> ... ..	10 ohms
<i>Stabilizing shunt coil resistance</i> ... ..	387 ohms
<i>Stabilizing series coil resistance</i> ... ..	0.012 ohm
<i>Equalizing coil resistance</i> ... ..	0.26 ohm

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**Fig. 1. Voltage regulator Type 23/47848E**

### **Introduction**

1. The voltage regulator Type 23/47848E is used in conjunction with the transformer rectifier unit, Type U1801, to control the output of the a.c. generator, Type N0504. The 208 volt, 3-phase output is stepped down and rectified in the transformer-rectifier unit to supply the operating coil of the voltage regulator at 30 volt level. The carbon pile of the voltage regulator is in series with the a.c. generator field winding.

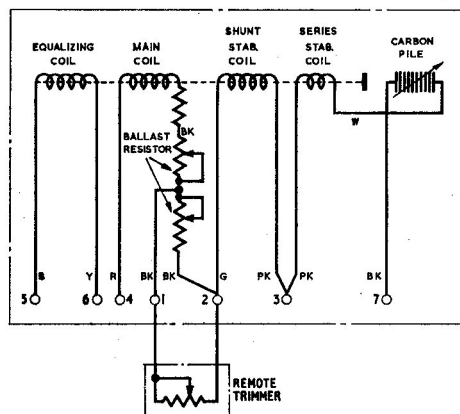
### **DESCRIPTION**

2. The regulator (fig. 1) is of the carbon pile type and in general construction and principle of operation is similar to the standard design described in A.P.113D-0003—16 (formerly A.P.4343, Vol 1, Sect. 6, Chap. 1). The regulator incorporates a carbon pile  $2\frac{3}{4}$  in. long made up of not less than fifteen 3 mm washers interleaved with twenty-eight 1 mm washers assembled two and one.

3. The carbon washers are located in a ceramic tube enclosed in a finned cooler which dissipates the heat from the carbon pile. This unit, with the armature assembly is mounted on a base under which is housed the adjustable ballast, fixed ballast and trimmer resistors.

4. The main coil is connected in series with the ballast resistances across the transformed and rectified output of the a.c. generator. Voltage stabilizing is assisted by the provision of additional windings embodied with the main operating coil. Under normal conditions the shunt and series stabilizing ampere turns counter balance, but under conditions of transients, the ampere turns in the shunt stabilizing winding tend to reduce the total magnetic force, thus providing a stabilizing influence on the performance of the regulator. An equalizing coil is fitted to allow for load sharing between generators operating in parallel. This coil is such that

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**Fig. 2. Diagram of internal connections**

with 0.5V applied across it in the correct direction, the line voltage is reduced from 30V to 25V.

#### Installation

5. The regulator should be mounted with

the axis of the carbon pile horizontal and the regulator base in a vertical plane. It should be in such a position that there is no restriction to free circulating air through the cooling fins.

#### SERVICING

6. General servicing instructions for this type of regulator are given in A.P.113D-0003—16 (formerly A.P.4343, Vol. 1, Sect. 6, Chap. 1), where information will be found on changing the carbon pile, and on setting up a regulator which is completely out of adjustment. The latter part of this publication gives information on Repair and Reconditioning on this type of regulator. When any adjustment is made the regulator must afterwards be subjected to a full test.

#### Note . . .

*The correct setting for the pile compression screw on this regulator is in the dip position.*

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# Appendix A

## STANDARD SERVICEABILITY TEST

### for

## VOLTAGE REGULATOR, TYPE 23/47848E

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#### **Introduction**

1. The following tests should be applied to the regulator whenever it is necessary to determine its serviceability.

#### **Test equipment**

2. (1) A.C. generator Rotax Type N0504, or d.c. generator Type P3.

(2) Transformer rectifier unit Type U1801.

(3) Multimeter Type 12889 (V1), Ref. No. 5QP/17447.

(4) Voltmeter 0-40V (V2), Ref. No. 5Q/234.

(5) Voltmeter 0-3V (V3).

(6) Ammeter 0-3A (A1), Ref. No. 5Q/3093.

(7) Ammeter 0-20A (A2), Ref. No. 5Q/25093.

(8) Remote trimmer 10 ohms, Ref. No. 5UC/5525.

(9) Switch S.P. 20A Type N.S.F. (S1), Ref. No. 5CW/6518.

(10) Switch S.P. 3A Type N.S.F. (S2), Ref. No. 5CW/4787.

(11) Variable resistor 15 ohms (R1), Ref. No. 10W/9846.

(12) Variable resistor 30 ohms, 1 amp (R2).

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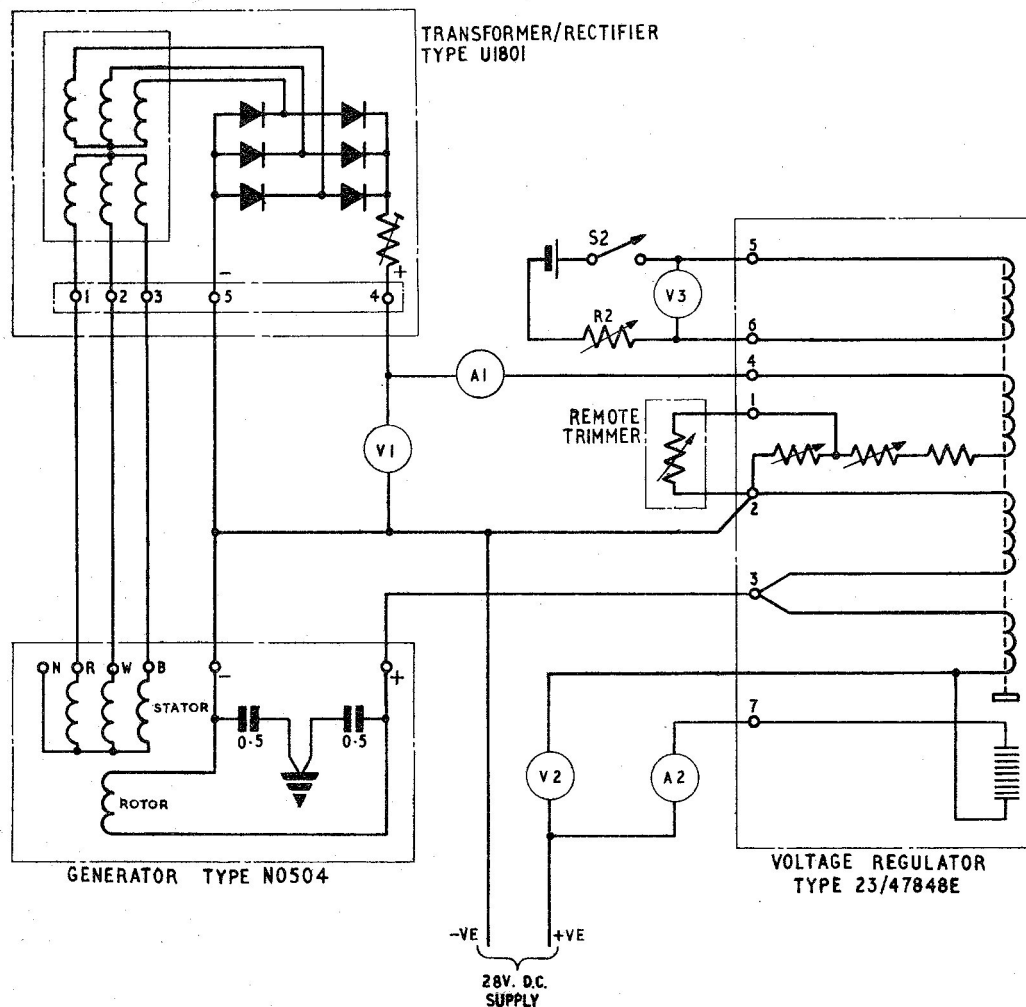


Fig. 1. Test circuit diagram, using a.c. generator Rotax Type N0504

(13) Battery, dry, 4.5V.

(14) Insulation resistance tester Type C, Ref. No. 5G/152.

### TEST PROCEDURE

#### General

3. The regulator Type 23/47848E should be tested in conjunction with its associated a.c. generator Rotax Type N0504 and transformer rectifier unit Type U1801. If these are not available, the tests can be made using a suitable d.c. generator such as a Type P3.

4. Connect the regulator into the appropriate test circuit as shown in fig. 1 and fig. 2. If a d.c. generator is used for testing, disconnect the regulator shunt and series

stabilizing windings by removing the white lead from the pile top bracket.

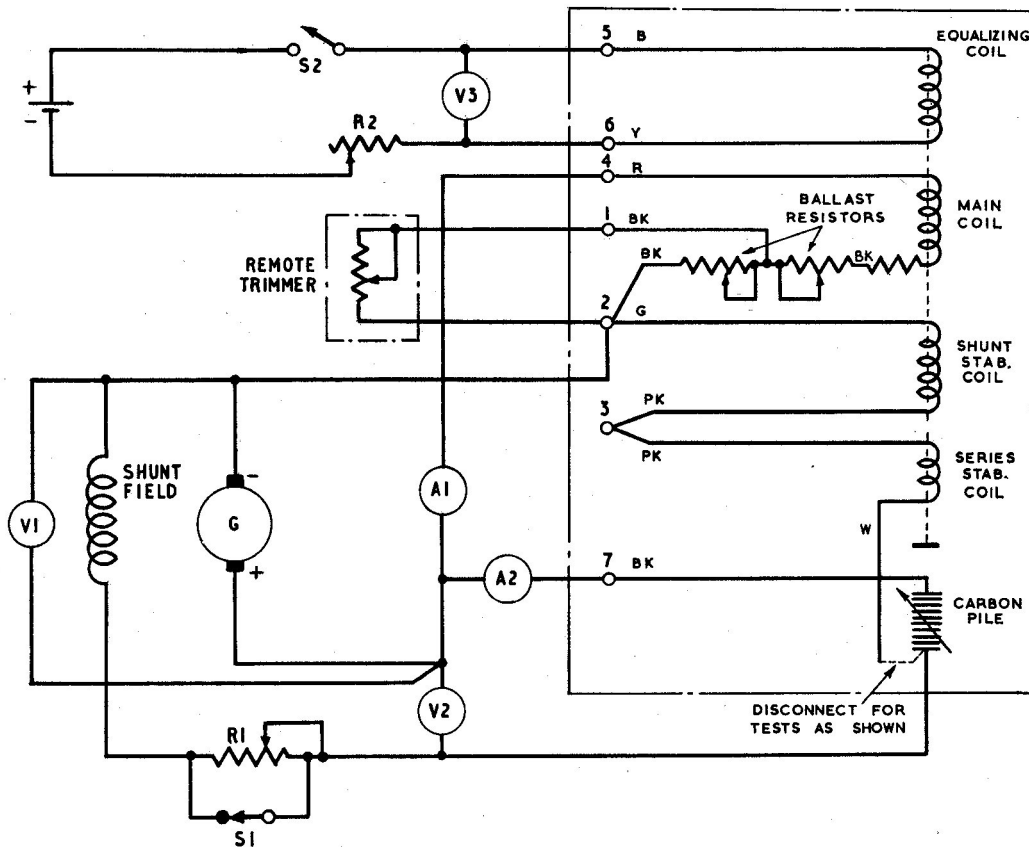
#### Note . . .

1. Switch S2 should be open for all tests except as described in para. 7.

2. Switch S1 should be closed for all tests except as described in para. 9.

5. With the regulator cold, run the generator at normal speed and on no load. Set the remote trimmer in the electrical mid-position. The output voltage at V1 should be 28V and the operating coil current A1 within the limits of 0.92A and 0.95A. If this voltage and current is not obtained refer to A.P.113D-0003—16, para. 40 to 45 (formerly

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**Fig. 2. Test circuit diagram, using d.c. generator Type P3**

A.P.4343, Vol. 1, Sect. 6, Chap. 1, para. 40 to 45).

### Note . . .

*The correct setting for the pile compression screw on this regulator is in the dip position.*

### Regulation test

6. Run the generator over a speed range so that the pile resistance, as measured by the ratio  $V_2/A_2$ , varies smoothly from 0.6 to 11 to 0.6 ohms. Repeat this cycle and check that the controlled voltage is maintained within the limits of 29.5V and 30.75V.

### Equalizing test

7. Close switch S2 and adjust R2 so that V3 reads 0.5V. Open switch S2. Run the generator at constant speed, check that the controlled voltage V1 is 30V, close switch

S2. Under this condition V1 should be reduced from 30V to 25V.

### Stability test

### A.C. generator

8. Run the generator at a speed to give a maximum pile resistance of 11 ohms as measured by the ratio  $V_2/A_2$ . Switch on and off at least three times  $\frac{1}{4}$  load,  $\frac{1}{2}$  load and full load. Under these conditions the regulator should be critically damped.

### D.C. generator

9. Disconnect S1 from the pile bracket and reconnect to terminal 3. Reconnect the white lead to the pile top bracket. Run the generator at a speed to give a maximum pile resistance of 11 ohms as measured by the ratio  $V_2/A_2$ . Open switch S1 and adjust R1 to give minimum pile resistance of 0.6

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ohms. Switch S1 on and off at least three times, under this condition the regulator should be critically damped.

#### *A.C./D.C. generators*

**10.** Provided the regulator satisfies the test in para. 8 or 9, turn the pile compression screw counter-clockwise by a  $\frac{1}{4}$  turn and repeat the appropriate stability test. At this setting of the pile compression screw the regulator should respond without tendency to sustained hunting. Provided the regulator meets this requirement, restore the pile compression screw to its original setting, and

repeat the regulation test described in para. 6.

#### **Note . . .**

*When using D.C. generator disconnect the white lead and reconnect S1 to the pile top bracket before commencing the regulation test.*

#### **Insulation resistance test**

**11.** Using the insulation resistance tester Type C, measure the insulation resistance between all connecting leads and the frame, the reading should be not less than 5 megohms.

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