

## Chapter 28

### VOLTAGE REGULATOR, TYPE 79A

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#### LEADING PARTICULARS

<b>Voltage regulator, Type 79A</b>	...	Ref. No. 5UC/6346
Controlled voltage	...	25.5 to 28.5 volts
Maximum pile loading	...	180 watts
Pile resistance range	...	2 to 30 ohms
Operating coil current	...	1.05 to 1.1 amp. at 20 deg. C.
Operating coil resistance	...	6.5 ohms
Equalizing coil	...	0.18 ohms
Adjustable ballast resistor (1 adjuster) (12 ohms)	...	Ref. No. 5UC/1028
Adjustable ballast resistor (2 adjusters) (12 ohms)	...	Ref. No. 5UC/1028
Fixed ballast resistor (10 ohms, 20 watts)	...	Ref. No. 5UC/6196
Remote trimmer (10 ohms, 7½ watts)	...	Ref. No. 5UC/5780
Stabilizing transformer series resistor (15 ohms, 30 watts)	...	Ref. No. 5UC/6199
Stabilizing transformer	...	Ref. No. 5UC/6197
Primary winding	...	2.04 ohms
Secondary winding	...	0.56 ohms
Current transformer	...	Ref. No. 5UC/6198
Primary winding	...	0.63 ohms
Secondary winding	...	0.84 ohms
Dimensions	...	9.41 in × 6.06 in. × 5.5 in.
Weight	...	10 lb. (approx.)

## Introduction

1. The voltage regulator, Type 79A, is used to control the output of the 9 kW generator, Type 512 or 512A, at between 25.5 and 28.5 volts. It is generally similar to the Type 79 (Ref. No. 5UC/5834), which it supersedes, but differs in having a higher resistance pile, and in the incorporation of a copper slug at the armature end of the magnet core.

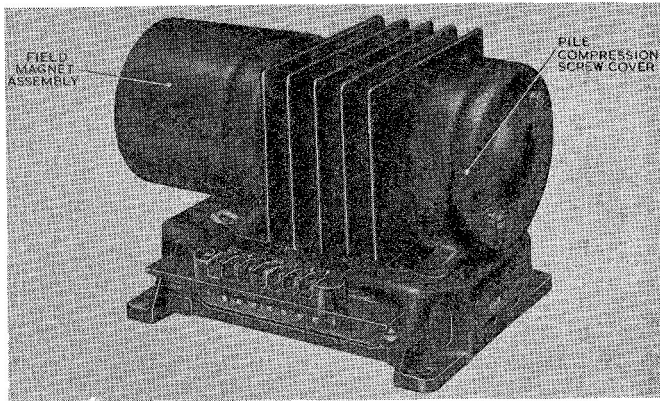


Fig. 1. Voltage regulator, Type 79A

## DESCRIPTION

2. This regulator (*fig. 1*) is of the single carbon pile type, and in general construction and principle of operation is similar to the standard design as described in A.P.4343, Vol. 1, Sect. 6, Chap. 1. The pile is 4 in. long, and consists of a minimum of 103 1-mm. grade CY6 washers.

3. The regulator unit (*fig. 2*) is mounted on a base, beneath which are the associated resistors and stabilizing transformers. A remote trimmer (10 ohms,  $7\frac{1}{2}$  watts) is connected across terminals 1 and 4, i.e., across the fixed ballast resistor or trimmer diverter, which is in series with the operating coil. This ensures that in the event of open-circuiting of one of the trimmer leads, the voltage level is still maintained within safe limits.

4. Two adjustable ballast resistors are fitted, one with one adjuster and the other with two. Part of the latter, that between terminals 1 and 7, is used as a voltage boost resistor, to ensure an adequate differential voltage when bringing a generator on to a bus-bar already being supplied with current. When the generator has been connected, that part of the resistor is automatically short-circuited and so rendered ineffective.

5. An equalizing coil is incorporated, to ensure that the load is shared approximately equally between generators operating in parallel. This coil is such that the application of 0.25 volts across terminals 2 and 6, derived from the voltage drop on the generator series winding during a period of overload, will cause the line voltage to fall to between 25.25 and 25.75 volts.

6. Two transformers, a stabilizing and a current transformer, are fitted to maintain

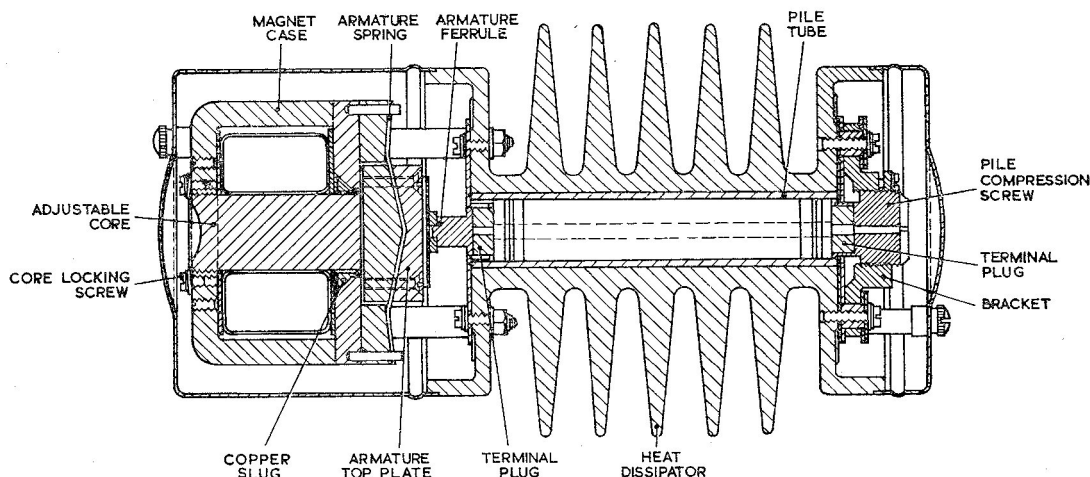


Fig. 2. Sectional view of regulator

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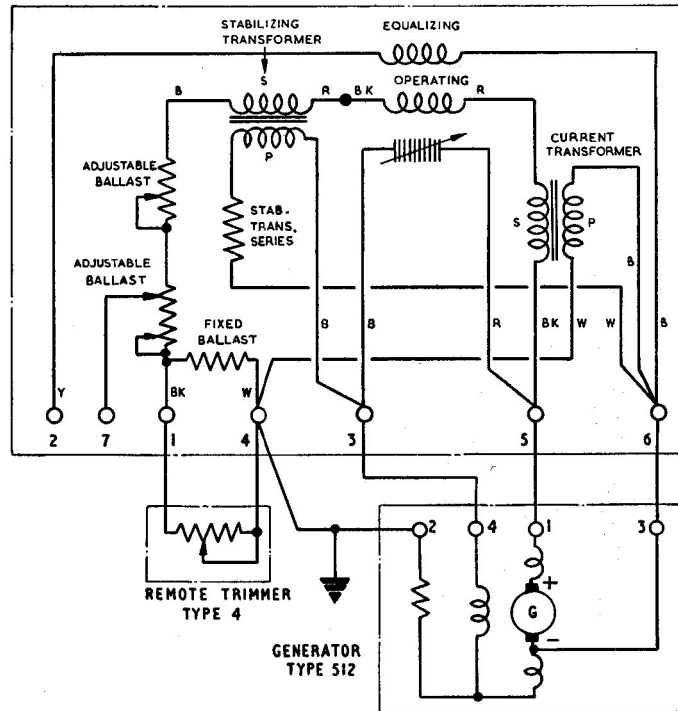


Fig. 3. Circuit diagram

the stability of the regulator during sudden speed or load changes and switching of the generator field, and are connected as shown in the circuit diagram in fig. 3.

7. The stabilizing transformer has its primary winding connected across the generator shunt field and its secondary in series with the operating coil. Under stable conditions, no voltage is induced in the secondary winding, but when the generator speed increases, a voltage will be induced in the secondary winding such as to oppose the compensating effect of the operating coil and so damp any tendency towards oscillation. A similar action results from the operation of the current transformer, due to variations in generator output current.

#### 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.

#### Testing of regulator

9. Connect the regulator in the test circuit shown in fig. 4. The generator used should be the Type 512, to ensure that the stability characteristics of the regulator are checked. Terminals 1 and 7 must be connected together for all tests except that in para. 12.

10. With the stabilizing windings disconnected by disconnecting the white lead from terminal 6 to the stabilizing transformer, the regulator must be adjusted to control the generator output at 28 volts, with the coil current shown on A1 adjusted to within the limits of 1.05 and 1.1 amp. cold.

#### Regulation test

11. Run the generator over the speed range of 3,000 to 7,000 r.p.m., and in addition vary the series and diverter resistors to increase the pile resistance as measured by  $V_2/A_2$  smoothly from 2 ohms to 30 ohms, and then

(A.L.5, Apr. 58)

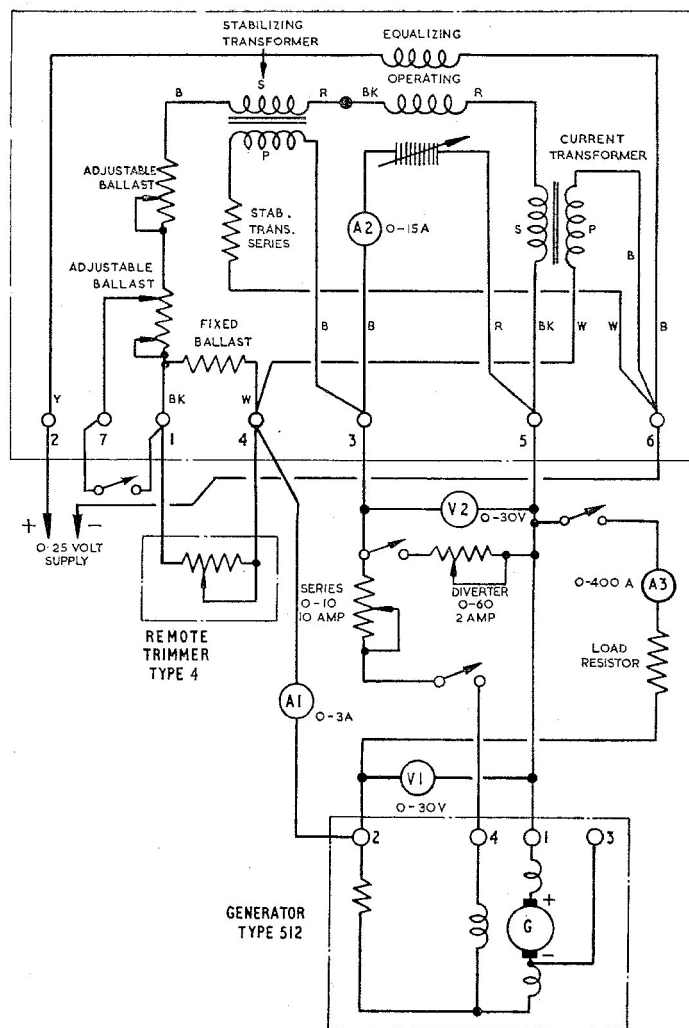


Fig. 4. Test circuit diagram

decrease to 2 ohms. Repeat this cycle, and over this cyclic variation of pile resistance, the controlled voltage V1 must be maintained within the limits of 25.5 and 28.5 volts.

**Note . . .**

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

**Voltage boost test**

**12.** With terminals 1 and 7 connected together, adjust the control level to 28 volts. When terminals 1 and 7 are open-circuited, the controlled voltage should rise by  $1.25 \pm 0.25$  volts.

**Equalizing test**

**13.** Connect a separate supply of 0.25 volts across the equalizing coil, the positive lead being connected to terminal 2. On the application of this voltage, the line volts V1 must be reduced to between 25.25 and 25.75 volts.

**Stability tests**

**14.** With the stabilizing windings connected in circuit, the series resistor shorted and the diverter resistor open-circuited, the regulator must be critically damped under the following conditions:—

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- (1) With the generator on no load, switch the shunt field on and off three times at generator speeds of 4,000 r.p.m., 7,000 r.p.m., and 10,000 r.p.m.
  - (2) With the generator on full load of 300 amp., or as much as is available, switch the load on and off three times at the same generator speeds.
- 15.** Following the test in para. 14, slacken the pile compression screw  $\frac{3}{16}$  turn, i.e., equivalent to 0.006 in. pile movement, and repeat the stability test. At this setting of the pile compression screw, the regulator must respond without tendency to sustained hunting.

**16.** Provided the regulator satisfies the test in para. 15, restore the pile compression screw to its original setting, and repeat the regulation test.

**17.** During the stability tests, a check must be made for any sign of a low amplitude, high frequency oscillation on the regulator, of the order of 150 c/s. If present, this oscillation can normally be detected by hearing or by touching the regulator, or high impedance earphones may be connected in series with a 0.1 mF capacitor across the pile. If it is not possible to eliminate such an oscillation by adjustment of the regulator, the regulator must be rejected.

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