Cancelled - obsolete

Chapter 2

VOLTAGE REGULATOR, TYPE F12

LIST OF CONTENTS

Cancelled A.L. No. 5

LIST OF ILLUSTRATIONS

LEADING PARTICULARS

Voltage regulator, Type F12	Stores Ref. 5UC/191
Carbon pile	Stores Ref. 5UC/365
Trimmer resistor (3 ohms)	Stores Ref. 5UC/5905
Ballast resistor (12 ohms)	Stores Ref. 5UC/1028
Voltage coil current	1·0 to 1·1 amp.
Pile resistance range	... 3 to 35 ohms

Introduction

1. The voltage regulator, Type F12, is used on aircraft to control the output of the generator, Type LX. It incorporates a voltage regulator and a current limiting unit which maintain the generator output at 14 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 F12, 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 nearest the terminal block.

3. A circuit diagram is given in fig. 1. The ballast and trimmer resistors in series with the voltage coil are fitted underneath the base plate, the trimmer adjuster, which is slotted for screwdriver operation, being brought out to the front through a hole in the base plate.

4. A linkage arrangement is incorporated to make provision for either single or parallel running. When two or more generators are operating in parallel, a compounding winding on the voltage unit is brought into circuit, which causes a reduction in the generator line voltage of approximately 6½ per cent from no load to full load, thus ensuring that the load is equally shared between the generators.

5. The compounding winding is a single turn, with a shunt, so that with a full load of 60 amp., 40 amp. pass through the coil and 20 amp. through the shunt.

6. It will be seen in the circuit diagram in fig. 1 that the operating coils of the voltage unit are so connected that they have polarity opposite to that of the current unit. In each instance, the start lead of the coil is indicated on the diagram by the letters SR, and on the regulator is coloured red. It is essential that this polarity be maintained should the internal connections of the regulator be disturbed at any time.

(A.L.2, Nov. 57)

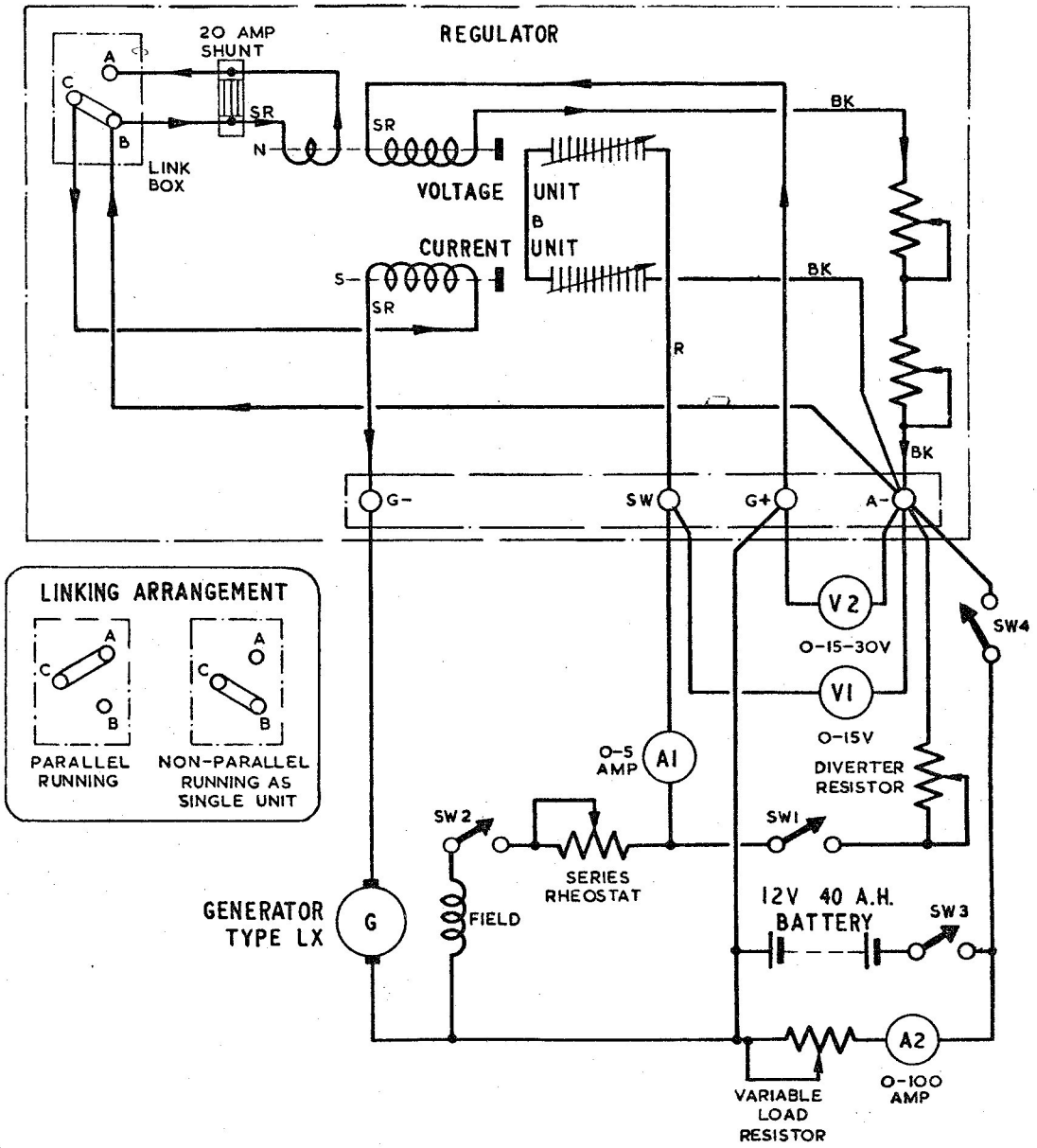

Fig. 1. Test circuit diagram

INSTALLATION

7. 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 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

8. General servicing instructions for this type of regulator are given in A.P.4343, Vol. 1, Sect. 6, Chap. 1. That chapter described 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.

9. Before connecting the regulator in the test circuit, check that the current in the voltage coil is between 1·0 and 1·1 amp. with 14 volts applied across the voltage coil and ballast and trimmer resistors in series. The adjustable arm of the trimmer should be in the mid position.

Final voltage adjustment

10. Connect the regulator in the test circuit as shown in fig. 1, the generator used being the Type LX. For all tests, the speed of the generator should be 5,000 r.p.m. unless otherwise specified, and the adjustable arm of the trimmer resistor should be in the mid position.

11. With the link connected between terminals C and B (level volts/load characteristic), adjust the regulator to control at 14 volts approximately on no load. The rheostat in series with the shunt field must be shorted out, and the pile diverter resistor open-circuited by means of SW1 for this adjustment.

12. Close SW1 and adjust the diverter resistor until the line voltage is increased to 30. Switch the diverter resistor on and off at least three times.

13. Following the test in para. 12, re-adjust the regulator to control at 14 volts as specified in para. 11.

Stability test (voltage unit)

14. Immediately following the test in para. 13, check the stability of the regulator as follows.

(1) Adjust the diverter resistor to give 10 ohms in the pile, measured by the ratio V1/A1.

(2) Increase the pile resistance to 35 ohms.

Test each of the conditions (1) and (2):—

(*a*) By means of SW4 switch on and off a load of 50 amp. at least three times.

(*b*) By means of SW2 open and close the generator shunt field at least three times.

Under these conditions, the regulator must be critically damped.

15. Slacken the pile compression screw of the voltage unit $\frac{1}{8}$ turn, and repeat the stability tests for conditions (1) and (2), para. 14. Under these conditions, the regulator spring must respond and settle with not more than two oscillations.

16. Provided the regulator satisfies the test in para. 15, restore the original setting and check the regulation as follows.

Regulation test

17. Before readings are taken, run the regulator up to maximum resistance of 35 ohms and then reduce to a minimum resistance of 3 ohms for not less than three cycles.

18. With the pile resistance measured by the ratio V1/A1 (pile volts/field current) increasing from 3 ohms to 35 ohms, and then decreasing to 3 ohms, the line voltage indicated on voltmeter V2 must be maintained between the limits of 13·5 and 14·25 volts. Variation of pile resistance is obtained by adjusting the series rheostat and the diverter resistor.

19. Immediately following the test in para. 18, check the minimum pile resistance as follows. The generator is to be shut down, then started up from rest and its speed increased until the line voltage indicated on voltmeter V2 is 13·75. Under this condition, the pile resistance measured by the ratio V1/A1 must not exceed 1·8 ohms.

20. With the generator running at 5,000 r.p.m., adjust the variable load resistor until the ammeter A2 indicates 60 amp.; under these conditions, the line voltage V2 should be maintained at approximately the same value as under the no load condition.

Note . . .

The rheostat in series with the shunt field must be shorted out and the diverter resistor open-circuited for all load tests.

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21. With the load increased by adjusting the variable load resistor until the line voltage indicated on V2 is reduced to 7 volts, the reading indicated on A2 must not be less than 64 amp. and must not exceed 67·5 amp.

Stability test (current unit)

22. Connect a 12-volt, 40 a.h. battery across the load terminals, and adjust the variable load resistor until the voltage indicated on V2 is reduced to 12 with the generator running at a speed of 5,000 r.p.m. Switch the battery and resistance load on and off at least three times. Under this condition, the regulator must respond rapidly and show no signs of sustained hunting.

23. Immediately following the test in para. 22, slacken the pile compression screw of the current element $\frac{1}{4}$ turn and repeat the stability test. Under this condition, the regulator spring must respond and settle with not more than two oscillations.

24. Provided the regulator satisfies the test in para. 23, restore the original setting and repeat the test in para. 21.

Compounding test

25. With the link connected between terminals C and A (falling volts/load characteristic) and with the generator running at 5,000 r.p.m., the application of a load of 60 amp. should cause the line voltage to be reduced from the no load value to between the limits of 12·8 and 13·4 volts.