Chapter 8

(SYNCHRONIZING MONITORING UNIT E.E. TYPE AE 7508)

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LIST OF ILLUSTRATIONS

LEADING PARTICULARS

Synchronizing Monitoring Unit, E.E. Type AE 7508	*Ref. No.* 5UC/6542
System	200*V*, 3 *phase*, 400 *c/s*
Temperature range	... −65°*C to* +70°*C*
Cooling	... *Natural*
Altitude range	0—65,000 *ft.*
Weight	... 2 *lb.*

Introduction

1. The synchronizing mounting unit, E.E. Type AE 7508 is for use in a.c. multi-hyphen generator system. Its function is to provide automatic parallelling of the generators within the system, by sensing the frequency and phase angle of one line of the incoming generator before connecting it to the synchronizing bus-bars. The unit takes the form of a box enclosed on three sides by a cover, the electrical connections being made through one end via a breeze plug and flying leads.

DESCRIPTION

Case assembly

2. This is part of the box like structure to which the cover is fitted. It is a light alloy fabricated assembly containing anchor plates and integral stiffnuts accommodating the screws which secure the cover. Welded to each end are mounting brackets which form the feet of the unit and in which are the holes for locating the attaching screws securing the unit to the airframe. In the bottom of the

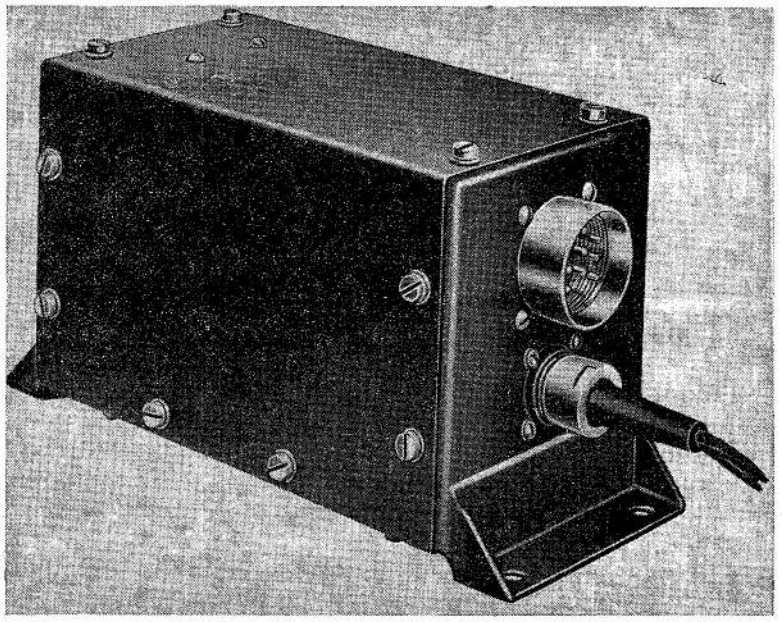

Fig. 1. Synchronizing Monitoring Unit, E.E. Type AE 7508

unit are five holes accommodating the attaching screws fastening the base assembly to the case assembly.

Base assembly

3. This is an assembly of the main electrical components of the unit, together with the base. At one end of the base a bakelite moulded terminal block is fitted which terminates the two flying leads, the lead from resistor R1, and the lead from the negative side of the rectifier bridge. The relay bracket assembly is fitted at the other end of the unit to that of the terminal block and accommodates two relay sockets. The bracket is channel shaped and formed from a strip of light alloy. The moulded relay sockets are each secured to the bracket with a screw, spring washer and nut.

4. The resistor panel encapsulation, fitted to the base between the terminal block and relay bracket assembly, encloses the resistors R1, R2, R3 and R4. In addition to this it forms the support for the rectifier panel assembly. A spacer, fitted between the encapsulation and the rectifier panel, has studs machined on both ends. One end securing the encapsulation with the stud part passed through the base and locked in position with spring washers and nuts, the other end is passed through the rectifier panel assembly and is secured in the same manner.

5. A rectifier bridge providing a d.c. supply to the relays is fitted to the top side of the rectifier panel. The germanium rectifiers comprising the bridge, are assembled to U-shaped brackets, which are manufactured from brass strip. Mounted at the other end of this rectifier panel is an electrolytic capacitor mounted on a small brass bracket. At the other side of the rectifier panel, secured by a light alloy clip, a silicon junction diode acts as a blocking rectifier to reverse current in the capacitor circuit.

OPERATION

6. The operation of the unit when installed in a two channel system is given in the following paragraphs. Before an incoming generator may be switched onto the bus-bars the following conditions have to be fulfilled:—

(1) The voltage of the incoming generator must be the same as the bus-bar voltage.

(2) The frequency of the incoming machine must be approximately equal to that of the bus-bar.

(3) The phase angle of the incoming machine must be the same as that of the bus-bar.

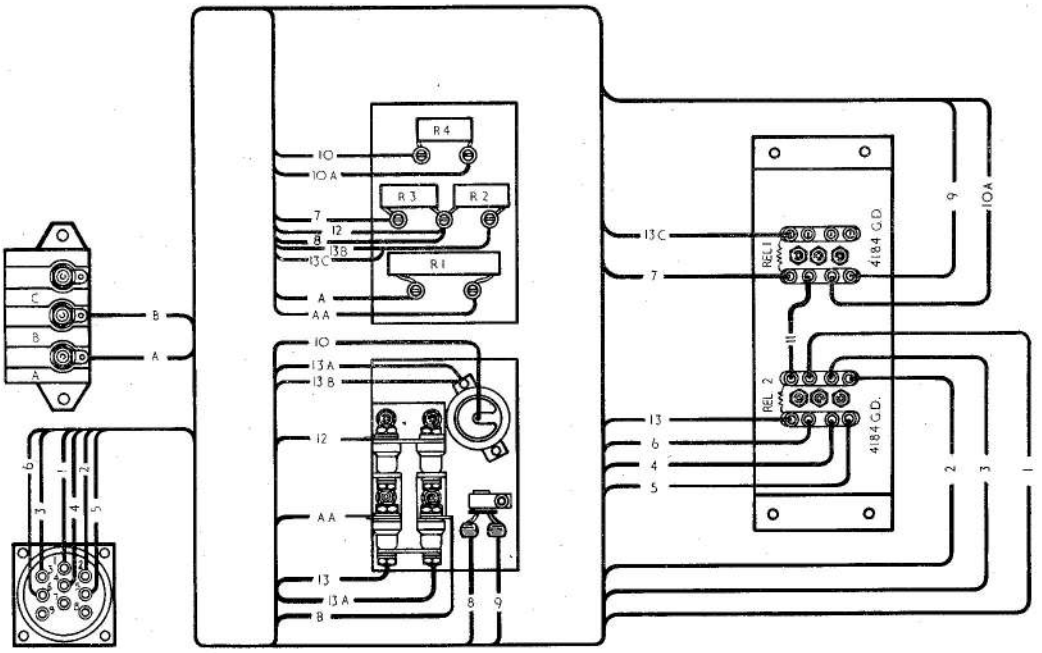

Fig. 2. Wiring diagram

7. The voltage of the incoming generator is controlled by the voltage regulator, and the frequency by the governor mechanism on the constant speed drive unit. The function of this unit is to sense the relationship between the phase angle of the incoming generator and that of the synchronizing bus-bars, and thereafter to complete the circuit via relay 2 to the closing coil of the magnetic switch which connects the incoming generator to the synchronizing bus-bar.

8. Assuming that one generator is already "on line" with an output of 200V, 400 c/s and a second generator with an output of 200V, 380 c/s and with its frequency still rising towards the operating frequency of 400 c/s, is to be brought on line. One a.c. side of the rectifier bridge is connected to one line of the synchronizing bus-bars, and the other, is connected through the synchronizing selector switch which is now selected to the incoming generator, to the same line of the incoming generator feeders. With the frequency of the synchronizing bus-bar higher than that of the incoming generator the phase angle between the two voltages will be constantly changing (fig. 3). The resultant voltage across the rectifier bridge will therefore also be constantly changing with the result that relay 1 will be opening and closing at the frequency of this change.

9. When relay 1 closes, the positive d.c. output from the rectifier bridge is fed through diode D1 and resistor R4 to charge the capacitor C1, the negative side of the capacitor is connected to the negative side of the rectifier bridge. It will be seen from the wiring diagram fig. 2 that when relay 1 drops out the circuit is completed from the capacitor C1 to relay 2. When the frequency difference between the synchronizing bus-bars and the incoming generator (beat frequency) is down to 2 c/s relay 2 operates completing the circuit, via the synchronizing selector switch, to the closing coil on the magnetic switch which brings the incoming generator "on line". If the beat frequency is above 2 c/s relay 1 drops out before capacitor C1 becomes sufficiently charged to provide enough power to operate relay 2. Thus, until the 2 c/s difference is reached, relay 1 continues to pull in and drop out and relay 2 remains inoperative.

INSTALLATION

10. The mounting of the unit to the airframe is made through four 2 B.A.

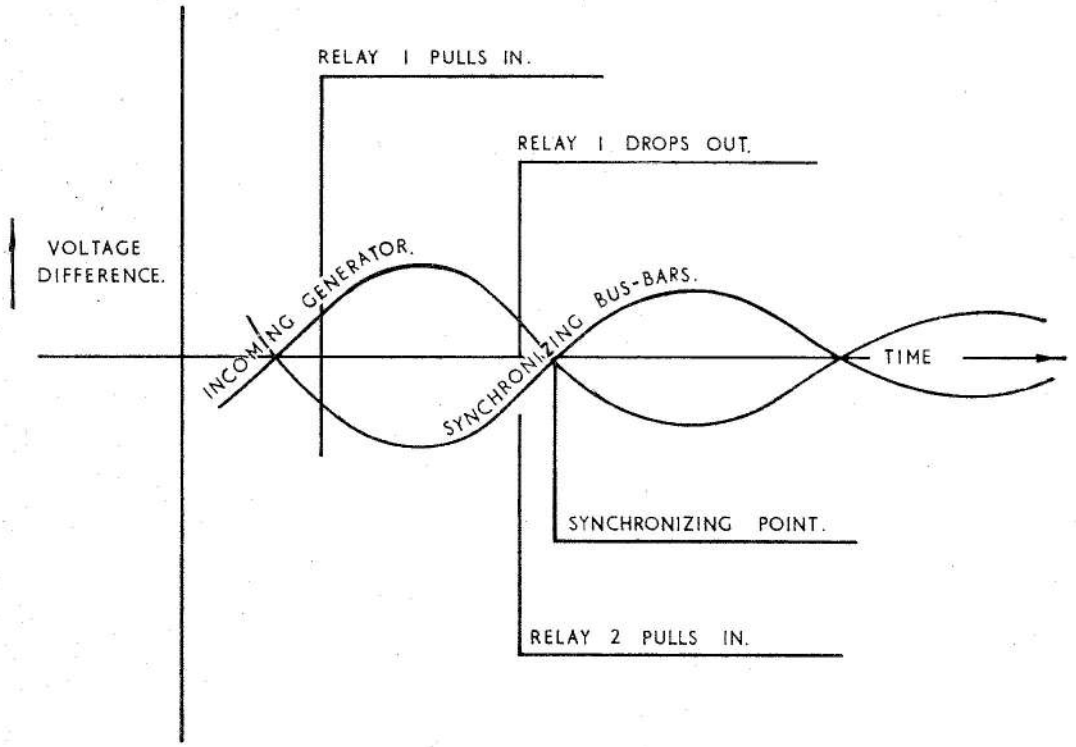

Fig. 3. Relationship of phase angle

clearance holes drilled in the feet fitted to the base of the unit. The electrical connections are made from the aircraft electrical system by means of flying leads which pass through a gland to an internal terminal block, and through a "Breeze" plug adjacent to the gland.

SERVICING

11. The only servicing which should be carried out when the unit is installed in an aircraft are the following precautionary inspections.

(1) All external screws for security.

(2) Metal casings for signs of corrosion.

(3) Electrical connections at the plugs, and the flying leads for signs of deterioration of the installation.

The unit should be removed for bay servicing at periods specified in the appropriate Servicing Schedule.

TESTING

12. The unit should be subjected to the following tests before being released for service after an overhaul.

Wiring check

13. Continuity test the wiring in accordance with fig. 2.

Insulation test

◄ **14.** Measure the leakage current using a 0–50 μA industrial grade ammeter or multimeter type 12889 with a 0·5 megohm ($\frac{1}{4}$W) resistor in series with the positive probe as shown in fig. 5. Connect the test circuit (fig. 5) to a d.c. supply variable between zero and 28V. Increase the voltage gradually from zero to 28V. The leakage current should not exceed 1·4 μA when this voltage is applied between:—

(1) pins 1A and 1B shorted together and frame.

(2) pins of plug 2 and frame.

Before removing test circuit decrease supply gradually to zero. ►

Functional check

15. (1) Remove the cover and check that with no supply to the unit a short circuit is indicated between pins 1 and 3 and betweer pins 4 and 6.

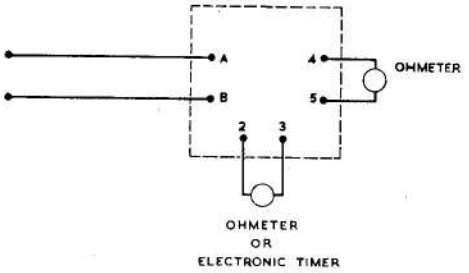

Fig. 4. Test circuit

(2) Connect a 0–230V, 400 c/s 3-phase supply to the flying leads and an ohmeter across plug pins 2 and 3, and across pins 4 and 5. Slowly increase the supply voltage from 0 to 230V. Slowly decrease the supply voltage from 230 to 0 V. This should be repeated five or six times before checking for correct operation of the unit.

(3) Slowly increase the supply voltage from 0 to 230 V, relay 1 should now have operated. Measure the voltage across resistor R2 (1,500 ohms) this should be 18 V d.c. ± 2 volt. This may be achieved by connecting the voltmeter across the rectifier bridge.

(4) Slowly decrease the supply voltage from 230 to 0V, the ohmeter should indicate a short circuit when the input voltage reaches a value of 115 V or less.

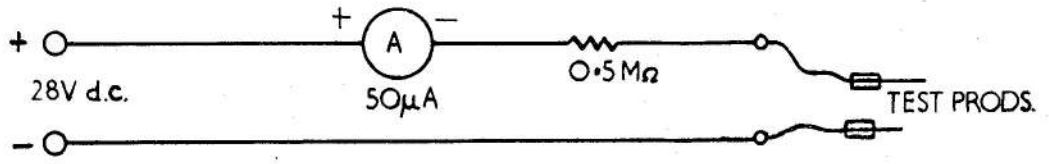

Fig. 5. Insulation test circuit