Chapter 15

A.C. VOLTAGE PICK-UP BOX
(E.E.) Type AE7702, Mk. 2)

LIST OF CONTENTS

LIST OF ILLUSTRATIONS

LEADING PARTICULARS

A.C. voltage pick-up box, Type AE7702, Mk. 2	*Ref. No*
Input voltage	*200V line voltage* *115V phase voltage applied to each transformer primary* *28V d.c. via relay contacts*
Frequency of main supply	*400 c/s*
Main contact rating	*5 amp. non-inductive load at 28V d.c.*
Temperature range	*−65° to +70°C*
Cooling	*Natural*
Altitude range	*0–65,000 ft.*
Weight	*2 lb. 8 oz.*

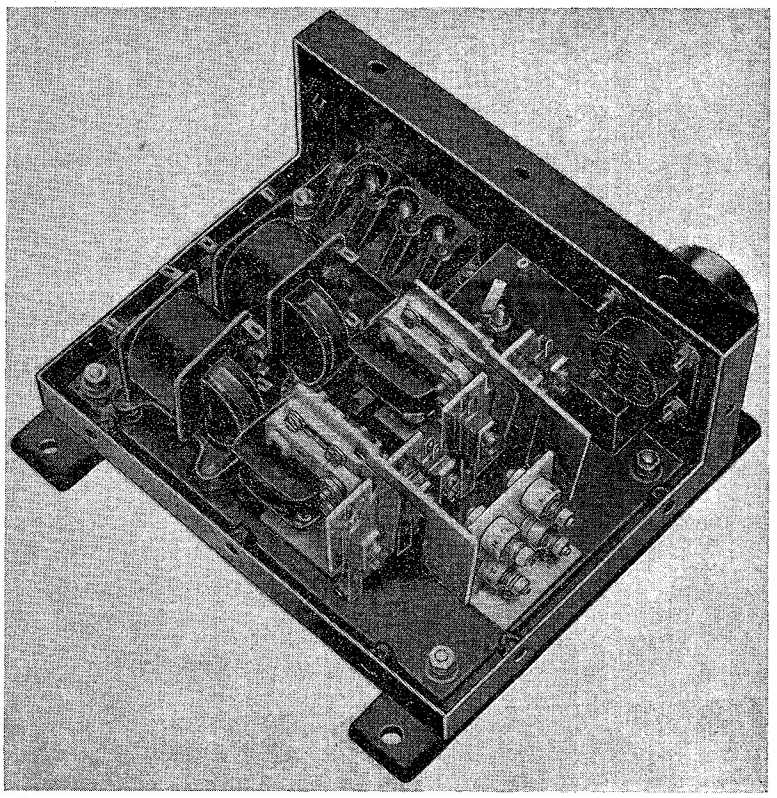


Fig. 1. Voltage pick-up box, Type AE 7702, Mk. 2 (without cover or wiring)

Introduction

1. The unit is designed for use in multi-generator a.c. system. Its function is to prevent connection of the ground, or auxiliary power units, to the synchronizing bus-bars when the main aircraft generators are on line. Conversely, if any one of the available power supplies was on line the unit would prevent either one of the other two supplies from being connected to the synchronizing bus-bars.

DESCRIPTION

2. The unit comprises the following assemblies: to avoid complexity, each assembly will be described individually.

Base and front assembly

3. This consists of two mounting strap feet and a fabricated base and front. Attached to the base and front are double anchor plates providing location for the cover screw when the cover is finally fitted.

Panel assembly

4. This is an assembly of the relays, transformers, rectifiers, encapsulated resistors, and the tufnol panel, forming the main electrical component assembly of the unit.

5. The relays operate from a 28V d.c. supply. The relay contacts are operated on the simple lever principle by the armature, which pivots on self-lubricating bearings housed in two protruding side brackets of the relay. The armature is balanced, and as such it will operate efficiently when mounted in any attitude, and will be unresponsive to any gravitational force applied to it either under normal operating conditions or under shock conditions. Two contacts of the relay are normally closed and one normally open. The contacts are formed from refined silver, and are rated at 5 amps non-inductive loading at 28V d.c. This, in conjunction with high contact pressure, ensures good electrical contact with little or no voltage drop across them when closed. The contacts are buffered and close stacked, and all the tags are at one end. The pick-up voltage of the relay at normal room temperature (20°/25°C) is just less than 20·5V d.c. and the drop out voltage is in the range of 10–7V d.c.

6. The two transformers are centre-tapped types providing the power to energize the relay coils. The connections to and from the transformers are made via double ended soldering tags, one end of each being used for the internal primary or secondary connections, and the other end for the external input and output leads.

7. Four rectifiers are mounted on a rectifier bracket which in turn is secured to the panel. The rectifiers are all germanium junction types, and each provides half-wave rectification from the transformer supplies to the relay coils. The rectifiers are hermetically sealed and will therefore operate satisfactorily in all climatic conditions. Connections from the transformers to the rectifiers are made via rolled flag tags attached to the rectifiers. The connections to the relays are made at the bracket end of the rectifiers by means of rolled cable ends.

8. The resistor encapsulation is secured to the panel with two 6 B.A. screws. The value of each of the two resistors in 3·3 kΩ $\pm$ 5%, and each is connected in parallel with the primary windings of a transformer. This is to ensure the relays drop out when zero potential occurs across the synchronizing bus-bars; for included in the system is a parallel indicating light circuit, which when alive causes a slight voltage to be applied across the primary windings of each transformer. If the resistors were removed from the circuit this slight voltage would be sufficient to hold in the relays.

9. A terminal block is provided, from which flying leads are brought out through a gland in the cover. These leads are the connections to the synchronizing bus-bars.

10. A tufnol panel forms the mounting for the previously described assemblies. The panel itself is fitted to the base and front assembly. The cover encloses the previously described assemblies. On top of the cover two securing screws, wire-locked, with a lead seal crimped to the locking wire, ensure the unit is not tampered with during service or storage life.

OPERATION

11. The model is not a calibrated unit, and operates as an ON/OFF unit. When a potential is applied across the primary windings of the transformers, the step down output voltage is rectified and applied across the relay coils causing two contacts to open and one to close. The contacts connect or disconnect the associated contactors which bring on line or isolate the auxiliary, ground, or air power supplies.

INSTALLATION

12. The mounting of the unit in the aircraft is made through the four holes situated in the feet (*fig.* 4) and may be fitted in any attitude.

13. The electrical connections are made from the aircraft electrical system to the breeze plug and to the flying leads attached to the unit. The flying leads form the connecting link between the bus-bars and the unit. The breeze plug/socket connection links the unit with the generator, ground or auxiliary power, main contactors.

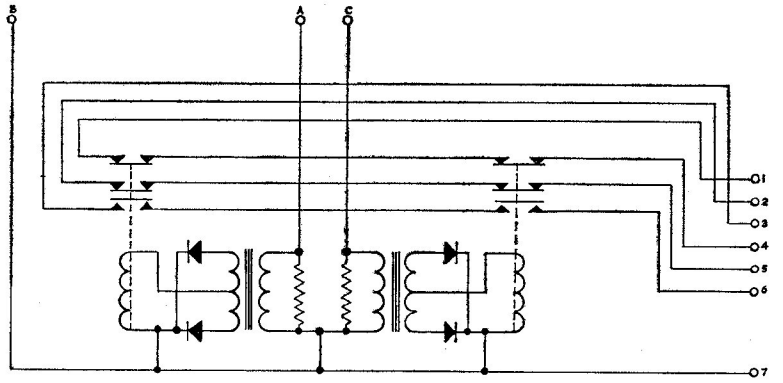
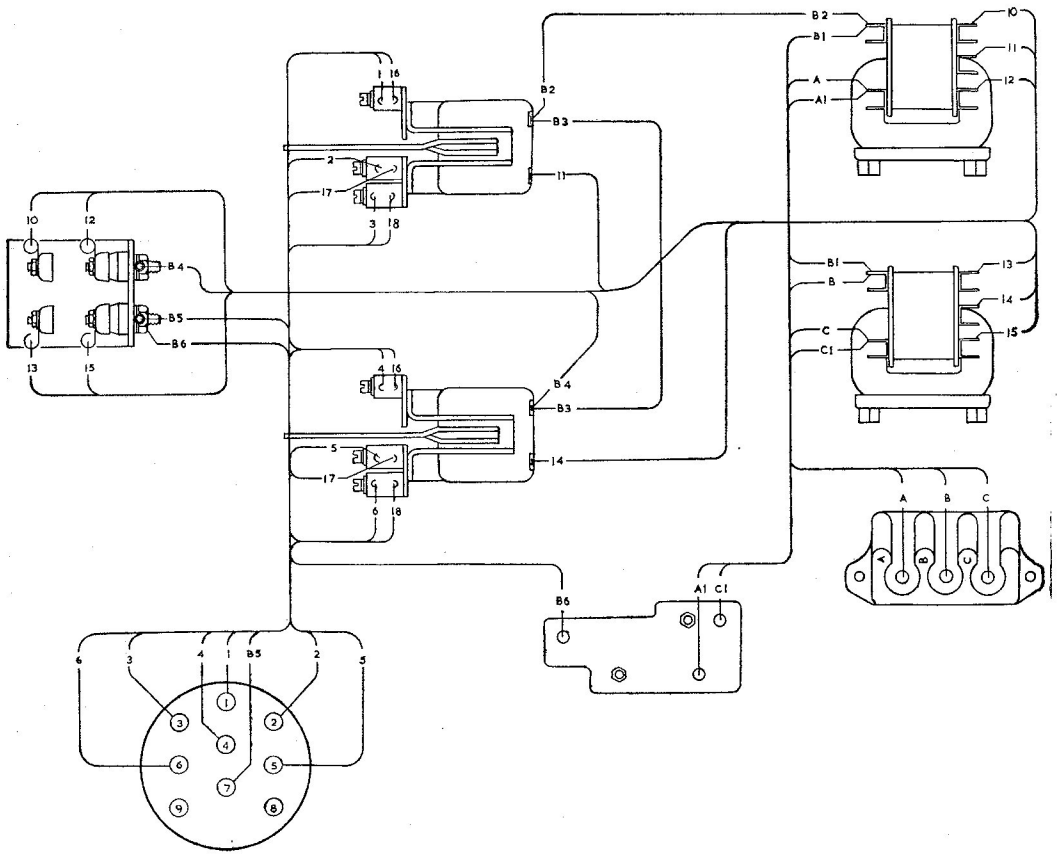


Fig. 2. Wiring diagram (theoretical)



Lead Reference Table

Ident.	Colour	Ident.	Colour	Ident.	Colour	Ident.	Colour
A	GREEN	**B5**	RED	**4**	VIOLET	**13**	ORANGE
A1	GREEN	**B6**	RED	**5**	WHITE	**14**	GREY
B	RED	**C**	BLUE	**6**	BROWN	**15**	ORANGE
B1	RED	**C1**	BLUE	**10**	ORANGE	**16**	VIOLET
B2	RED	**1**	VIOLET	**11**	BLACK	**17**	WHITE
B3	RED	**2**	WHITE	**12**	ORANGE	**18**	BROWN
B4	RED	**3**	BROWN				

Fig. 3. Diagram of connections

SERVICING

14. The unit is fitted with an "anti-tampering" device in the form of locking wire and a lead seal fitted to screws in the cover. The only servicing which should be carried out when the unit is installed in an aircraft are the following precautionary inspections.

(1) All external nuts, bolts, etc., for security.

(2) Metal casings for signs of corrosion (If this is evident remove unit to servicing bay).

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

15. The unit should be removed for bay servicing at the periods specified in the appropriate Servicing Schedule. Each component should be examined separately, without removing it from its mounting. Examine components for signs of damage, deterioration and corrosion.

16. The method of manufacture, design, and construction of the components in this unit does not readily admit to repair and only the remaking of soldered joints should be attempted. Any component found to be defective should therefore be replaced with a new serviceable item.

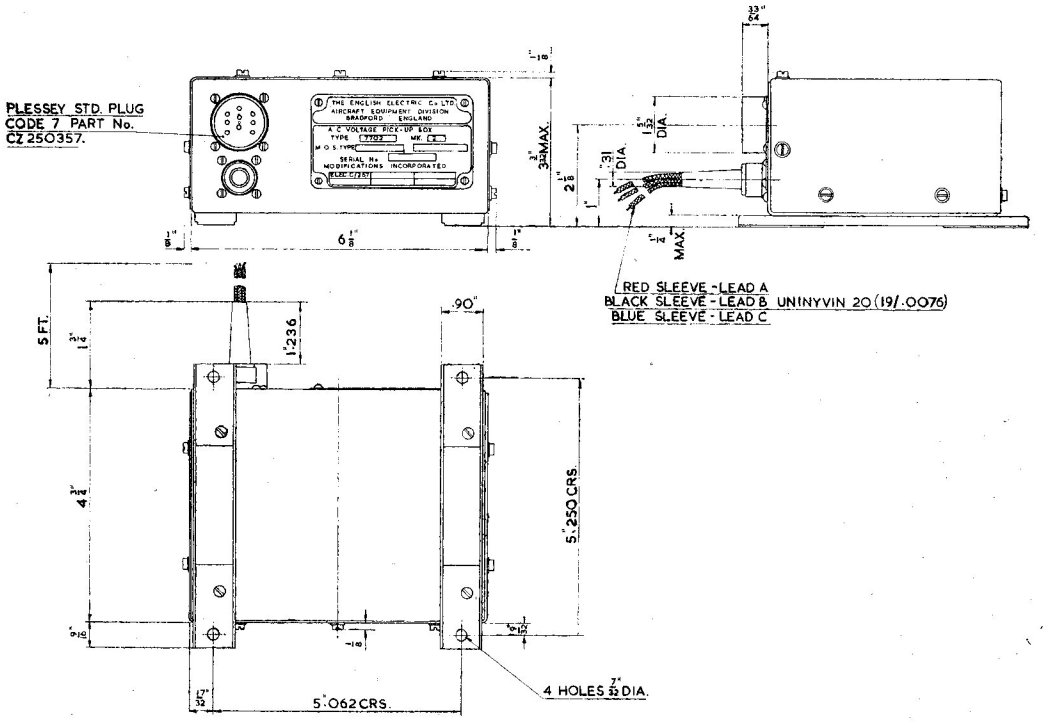


Fig. 4. Installation diagram

TESTING

Wiring test

17. The wiring should be tested for continuity to the connection diagram as shown in fig. 3.

Functional test

18. Connect the unit to the test circuit (*fig.* 5). Switch on 28V d.c. supply and apply 115V (with respect to earth) 400 c/s to S1 and S2. With S3, S4, and S5 switched to the lamp circuit, test as follows:—

Switches		Lamps	
On	Off	On	Off
	S1, S2	X, Y	Z
S1	S2		X, Y, Z
S2	S1		X, Y, Z
S1, S2		Z	X, Y

Repeat the above test, but with 88V (with respect to earth) 400 c/s applied to S1 and S2.

Contact mV drop test

19. (1) With the unit still connected in the test circuit switch in the 2 amp. purely resistive loads through S3, S4 and S5.

(2) Switch on 28V, d.c. supply and apply 115V (with respect to earth) 400 c/s to S1 and S2.

(3) Measure the voltage drop across the normally closed contacts of each relay, with switches, S1 and S2 open, and across the normally open contacts of each relay, with switches S1 and S2 closed. The voltage drop across each set of contacts must not exceed 60 mV.

(4) Repeat the above test, but measure the voltage drop across the terminals 1 and 4, 2 and 5, and 3 and 6. The voltage drop should be less than 200 mV for each test.

(5) Measure the voltage drop between pin 7 and lead B (tail end) when the value obtained must not exceed 250 mV.

Insulation test

◀ **20.** 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. 6. Connect the test circuit. (fig. 6) 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 in turn between each designation shown and the remainder

(1) lead A (pin 1A)

(2) terminal 1 (2F)

(3) terminal 2 (2A)

(4) terminal 3 (2B)

(5) terminal 6 (2C)

(6) frame

Before removing test circuit decrease voltage gradually to zero. ▶

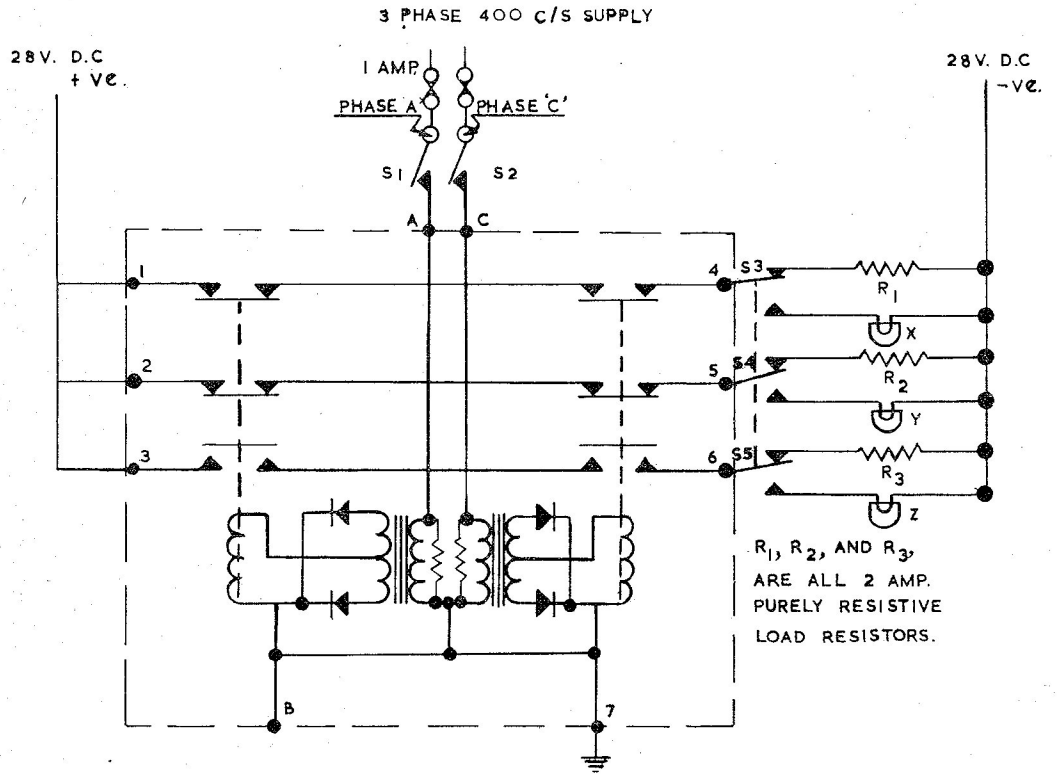


Fig. 5. Test circuit diagram

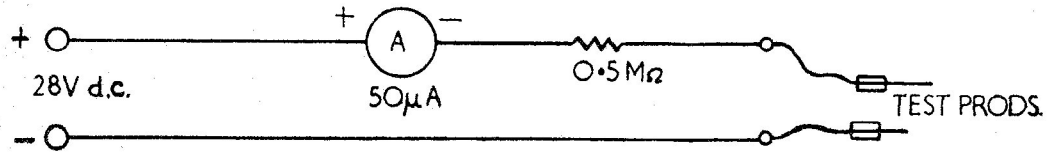


Fig. 6. Insulation test circuit