

Chapter 9

POWER SUPPLY UNIT, TYPE B, Ref. No. 6A/6822 and TYPE C, Ref. No. 6A/8548

(Completely revised)

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Introduction

1. The power supply unit, Type B or C (PSU), forms part of the air data systems, Mk. 1A and 1B (ADS). The unit (fig. 1) is normally housed in the aircraft frame and is secured by two pivoted screw clamps which engage on two lugs at the front of the power supply unit. Alternatively, the unit may be housed in a PSU mounting tray, Ref. No. 6A/6159, into which it is guided by means of locating dowels in the rear of the mounting tray and bushes in the rear of the PSU. The unit measures approximately $9 \times 7\frac{1}{4} \times 5\frac{1}{2}$ in. and weighs approximately $9\frac{1}{2}$ lb. The unit is also incorporated in test sets, Type 9, 9A and 9B.

2. A number of a.c. and d.c. supplies are required for the various amplifiers, motor-tachogenerators, and potentiometers within the separate units of the air data system. The power supply unit is designed to supply most of these requirements

from a centralized source and thus incorporates all power supply components with the exception of three reference transformers contained in the air data computer. The primaries of these transformers are fed from the 25V reference phase of the power supply unit and the secondaries supply the 7.5–0–7.5V required as the reference for the ring demodulators associated with the computer.

3. No external controls are provided. Two potentiometer networks, used for setting up the 10V and 20V signal voltages, are accessible on removing the unit cover. They consist of RV3/RV4 and R16/RV1/R15 (fig. 6). The power supply unit is not fused internally and the input supply must be fused externally.

4. The a.c. power supplies provided, together with their phase relationship with respect to the 25V (REF. 1) reference phase and their function

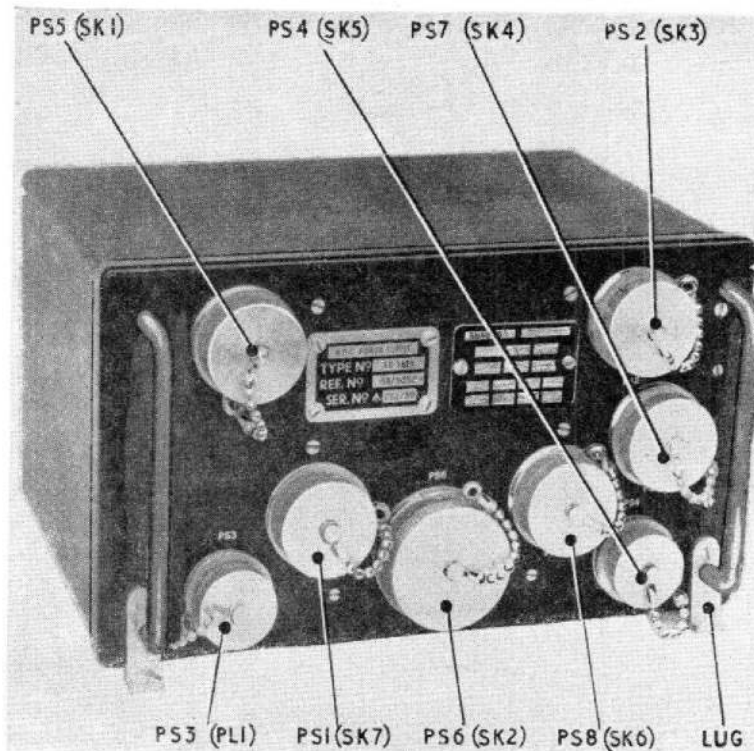


Fig. 1. Power supply unit—front view

within the system, are listed in Table 1. The d.c. power supplies and their functions are listed in Table 2.

Note . . .

Because of the way in which the primaries of transformers T1 and T2 are connected, the 25V (REF. 1) voltage is in quadrature with phase B-C of the 115V input supply.

Construction

5. The power supply unit consists of a chassis mounted between two side-frames bolted to a front panel. Rigidity is provided by two triangular tie plates (fig. 2) which fit between the upper limbs of the side-frames, and by a further tie plate bolted across the rear ends of the side-frames. A bracket (fig. 5) bolted to the rear of the front panel carries the power failure relay, torque switch, choke L4, and three preset potentiometers RV1, RV3 and RV4.

6. Two transformers, T1 and T2, are mounted between the chassis and the tie plates (fig. 2 and 3), and a third transformer T3 is mounted on the rear of the front panel (fig. 2). Three chokes, L1, L2 and L3 are mounted on the underside of the chassis (fig. 3). A panel inset in the left-hand side-frame supports all the components associated with the d.c. supplies (fig. 4b). A second panel, inset in the right-hand side-frame, is a distribution panel (fig. 4a), and its terminals are connected either to the pins of the seven socket connectors mounted on the front panel (fig. 1), to the source of supply related to those pins or to

the PSU chassis. Also mounted on the front panel is the input plug PS3 (PLI) (fig. 1), which connects to the 115V, 3-phase, 400 c/s aircraft supply. The front panel is fitted with two carrying handles, and the unit is protected by a cover which may be removed after unscrewing two screws at the rear of the unit.

Modifications

7. Modification ADS/98 converts Type B units to Type C units and entails the removal of the earth connection from pin 16 of transformer T1 as noted on fig. 6. Modifications ADS/99 and 113 are applicable to both Type B and Type C units and introduce cable supports and extra strengthening brackets to eliminate the possibility of damage from resonance. These modifications are not shown in fig. 2 and 3. Modification ADS/160 removes the link between SK1 (PS5) pin B and T2 pin 12 and straps the former direct to chassis. This modification also applies to both Type B and Type C units.

Circuit description

Safety circuit

8. A safety circuit is provided to protect the system against one or more phase failures or low input voltages. This circuit consists of a torque switch, Mk. 1, Type B, Ref. No. 6G/18, (S1), which operates in conjunction with a power failure relay unit (S2), both units being mounted on a bracket bolted to the front panel (fig. 5). The torque switch is fully described in A.P.4685, Vol. 1, Part 2, Sect. 1, Chap. 3.

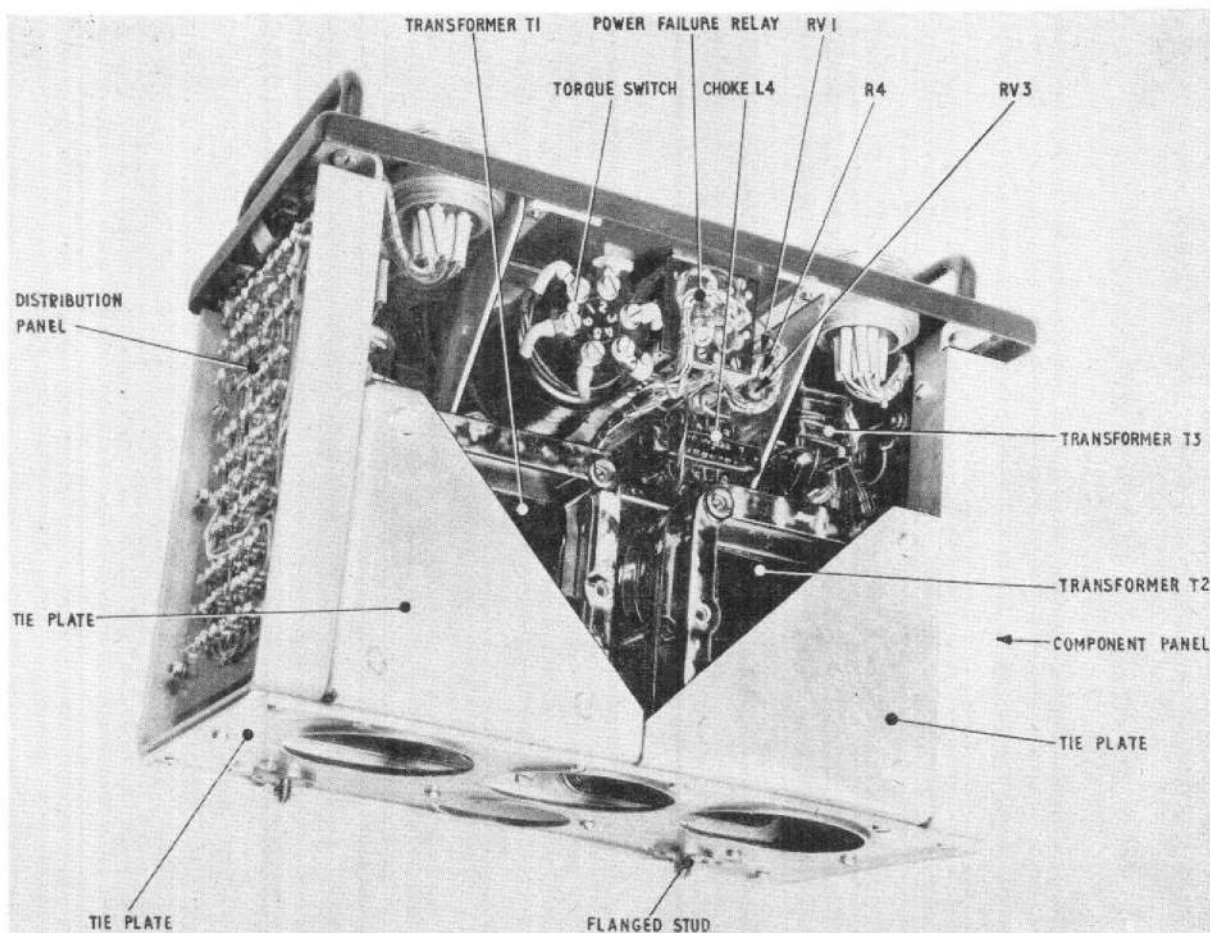


Fig. 2. Top view of chassis (pre-mod. ADS/99 and 113)

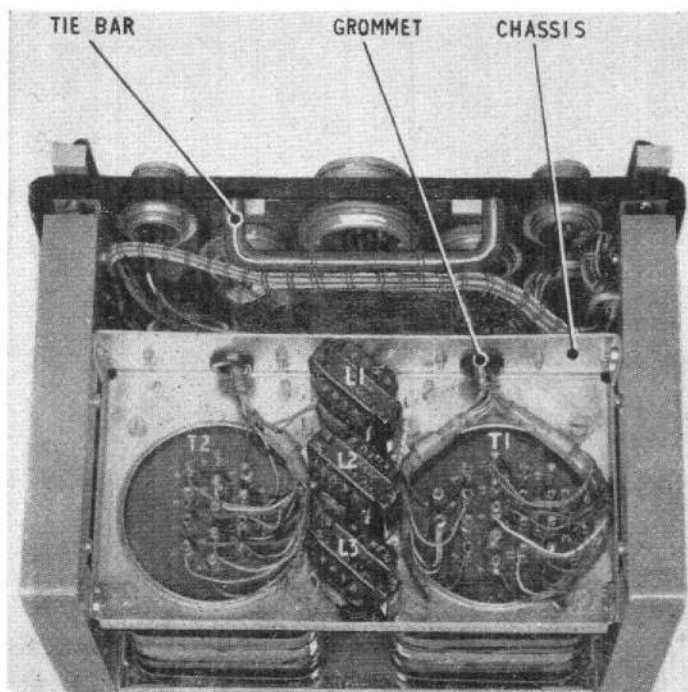


Fig. 3. Underside view of chassis (pre-mod. ADS/99 and 113)

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DISTRIBUTION PANEL

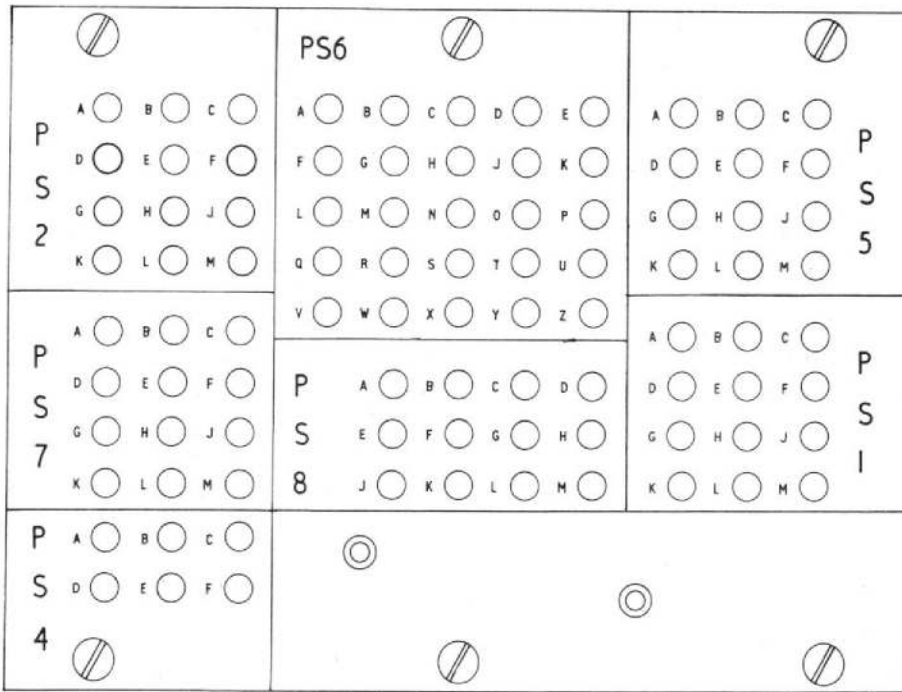


FIG.4 a

COMPONENT PANEL

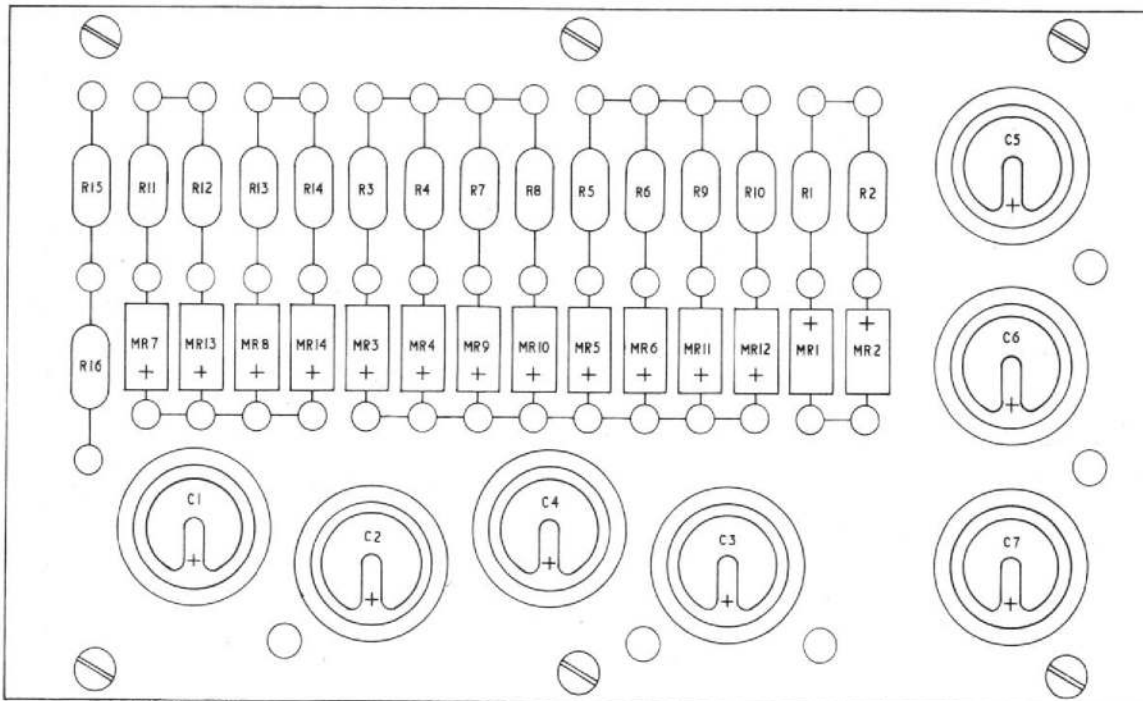


FIG.4b

Fig. 4. Distribution and component panels

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9. When the 115V, 3-phase, 400 c/s supply is applied to the power supply unit, the torque switch closes provided that the phase rotation is correct and that the voltage is above the cut-in value of $100 \pm 5V$. This completes the circuit to the solenoid of relay RLA/2 (fig. 6), thus closing the relay contacts and connecting phases A and C to the Scott-connected primaries of transformers T1, T2 and T3. Phase B is directly connected to T2 pin 1. Should the phase rotation or the voltage be incorrect, the switch will remain open. Should the supply voltage between any two phases of the supply subsequently fall below the cut-out value of $85 \pm 5V$, the torque switch will open and break the supply to T1, T2 and T3. The switch will close again if the voltage increases to above the cut-in voltage.

10. The d.c. supply required to operate relay RLA/2 is obtained from a small transformer built into the relay unit. The primary of this transformer is connected across phases B and C of the 115V input, and the secondary feeds a full-wave rectifier-circuit consisting of MR1 and MR2 and the current-limiting resistors R1 and R2.

Outputs

11. The secondaries of the three transformers T1, T2 and T3 provide all the PSU outputs. The primaries are Scott-connected (fig. 6) in order to advance the phase of the 50V output from T2 by 90° with respect to the 25V reference output from T1.

12. Transformer T1 provides all the a.c. outputs with the exception of the 50V quadrature supply and the 20V(X), 20V(Y), 10V(X) and 10V(Y) supplies.

13. Transformer T2 provides the 50V quadrature supply and $-30V$, $-6V$ and $+9V$ d.c. supplies. The 50V supply is obtained from pins 4 and 5 and provides the reference phase for the motor section of all motor-tachogenerators.

14. The $-30V$ d.c. supply is obtained from pins 9 and 10 of T2 via a half-wave rectifier consisting of the silicon diodes MR1 and MR2 in series-parallel with the current limiting resistors R1 and R2. The positive line is earthed, thus producing

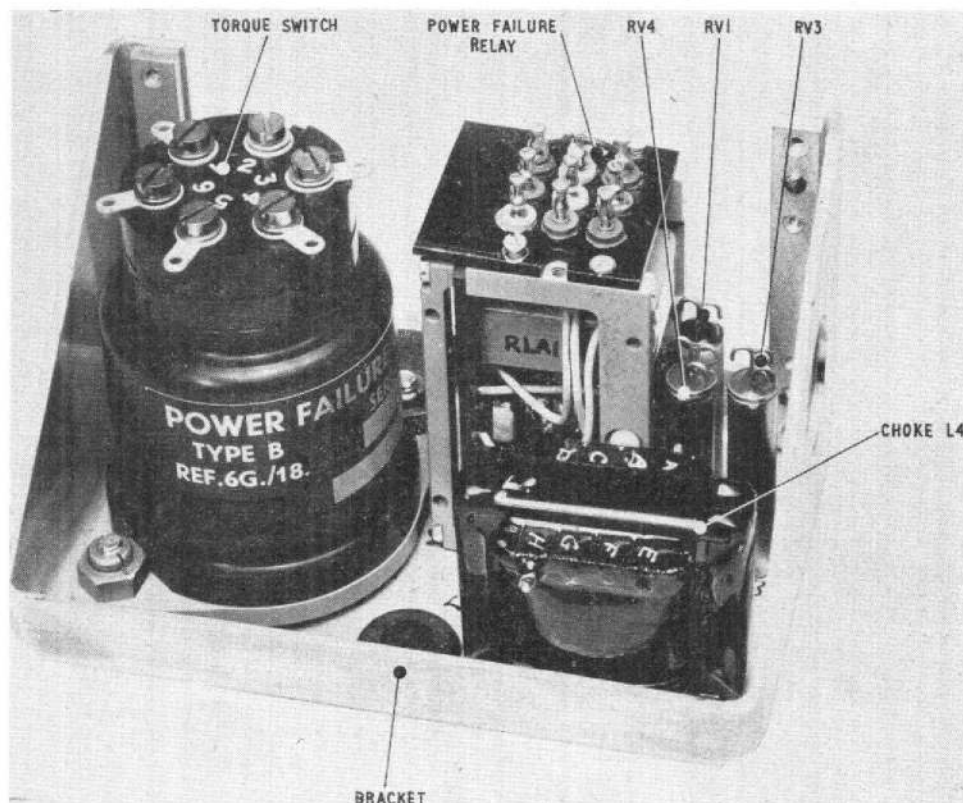


Fig. 5. Power failure unit

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a negative output, smoothed by the pi type filter L1, C3 and C4.

15. The -6V d.c. supplies are obtained from pins 6, 7 and 8 of T2 via the full-wave rectifier circuit consisting of two similar groups of parallel silicon diodes MR3/MR4/MR9/MR10 and MR5/MR6/MR11/MR12 with which are associated the current-limiting resistors R3/R4/R7/R8 and R5/R6/R9/R10. The positive side of this output is earthed, and choke input smoothing is provided by L2/C1/C6 and L4/C5 in the return lead to the centre-tap. Two outputs are provided, nominated -6V(A) and -6V(B).

16. The +9V d.c. supply is obtained from pins 11, 12 and 13 of T2 via the full-wave rectifier consisting of two similar groups of silicon diodes MR7/MR13 and MR8/MR14 with which are associated the current-limiting resistors R11/R12 and R13/R14. Choke input smoothing is provided

by L3/C2/C7, and the centre-tap of the secondary is earthed to provide the +9V output.

17. Transformer T3 is connected in parallel with transformer T1 and provides the 20V(X), 20V(Y), 10V(X) and 10V(Y) supplies. The two 20V outputs are set-up during calibration, for maximum load, by means of the potentiometer network R16/RV1/R15. A further potentiometer network is provided in the air data computer for adjusting these two outputs with operational loading. The preset potentiometers RV4 in the 10V(X) and RV3 in the 10V(Y) lines are used for setting-up the respective supplies.

Earth system

18. The air data system has two primary earth lines, bias earth (Bias E) and signal earth (Sig. E). Both these return to the PSU and, together with Ref. 2, the other zero voltappings of T1, T2 and T3 and the wiper of RV1, are connected to the PSU chassis direct or via the distribution panel.

TABLE 1
A.C. supplies

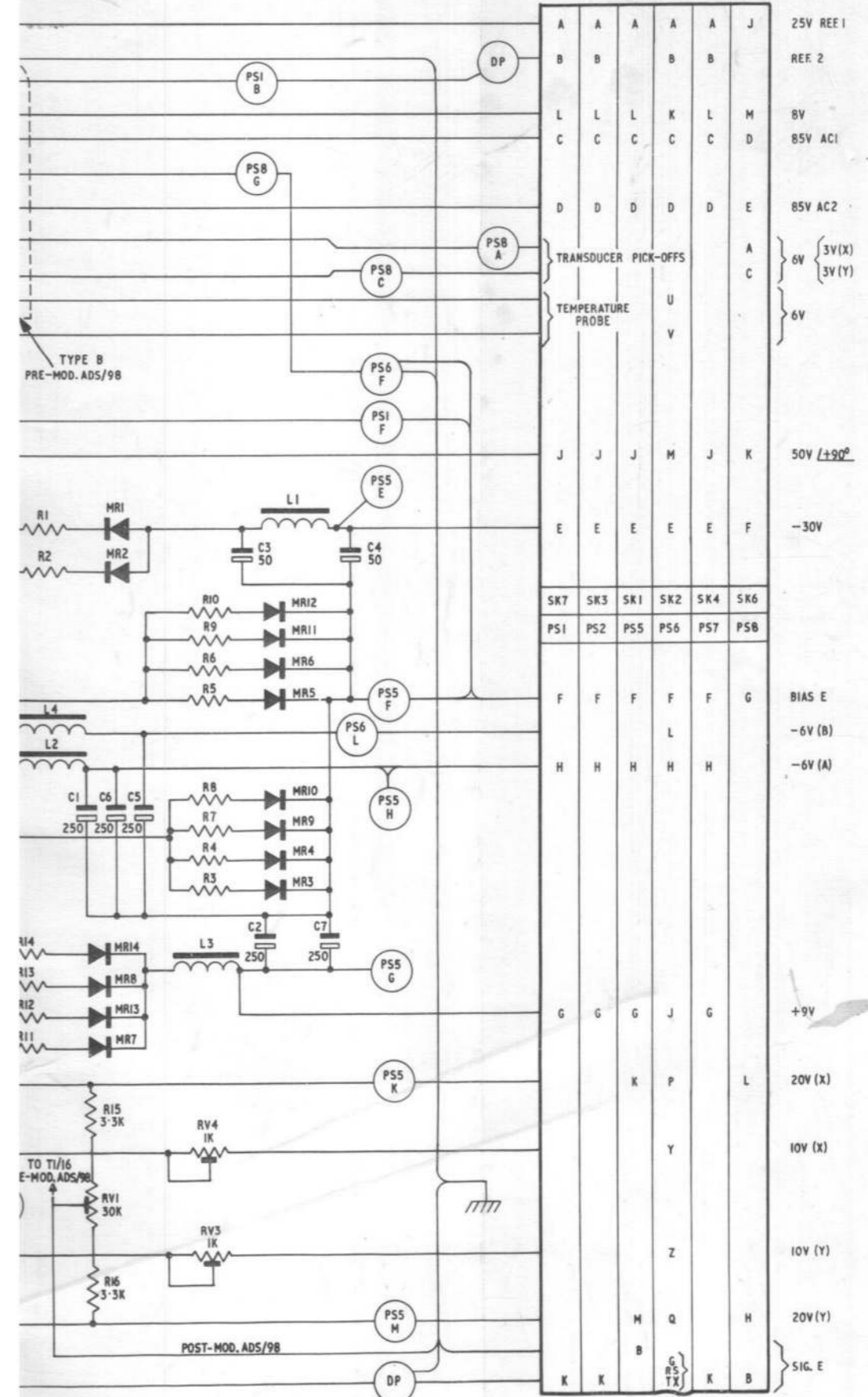
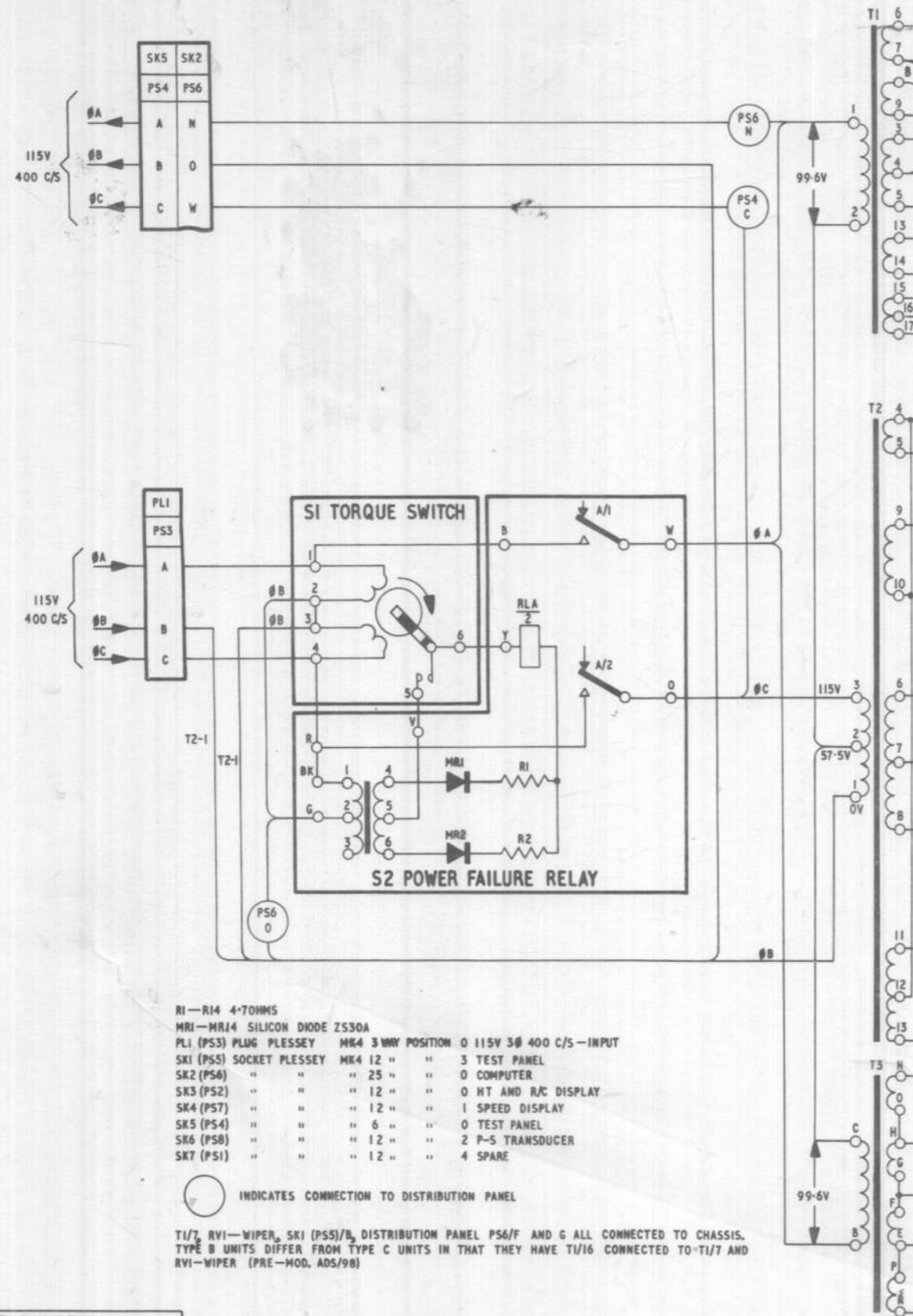
Voltage (400 c/s)	Phase with respect to reference	Function
25V (REF. 1)		Reference voltage, transducer servo amplifier demodulators. (REF. 2 earthed to chassis)
8V	Anti-phase	Tachogenerator excitation phase
85V (AC1)	In-phase	Magnetic amplifier transducer load windings
85V (AC2)	Anti-phase	
20V(X)	Anti-phase	ADS signal voltage supply
20V(Y)	In-phase	
10V(X)		Vertical speed potentiometer supply (Mk. 1A air data computers pre-mod. ADS/168 and Mk. 1B air data computers pre-serial number 133/63 only)
10V(Y)		
6V (Called 3V (X) and 3V (Y))		Transducer pick-off excitation
6V		Temperature probe resistance bridge supply (used in Mk. 1B system only)
50V	90° in advance	Motor-tachogenerator motor reference phase
115V (A)		Transducer heater elements, via RLB and RLC (where still fitted)
115V (C)		
115V (A)		Synchro excitation supply
115V (B)		

TABLE 2
D.C. supplies

Voltage	Function
-30V	Magnetic amplifier transducer bias and supply to relays RLB and RLC in computer where still fitted
-6V (A)	Collector voltage (VT1 and VT2)
-6V (B)	Emitter bias (VT3 and VT4)
-6V (B)	Collector voltage (VT3 and VT4)
+9V	Emitter bias (VT1 and VT2)

} in transistor amplifiers

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AIR DIAGRAM
6320 AG/MIN

ISSUE 4

BY COMMAND OF THE DEFENCE COUNCIL
 FOR USE IN THE
 NAVAL SERVICE/ROYAL AIR FORCE
 (Prepared by the Ministry of Aviation)

ADS. Mk I—Power supply unit Type B, Ref. No. 6A/6822 and
 RES

pe C, Ref. No. 6A/8548—circuit diagram (post-mod. ADS/160) Fig. 6
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