SECTION 2

VARIABLE RESISTANCE FREQUENCY MODULATED DRIVE BAY BA13/5

2.1 Introduction

The BA13/5 bay is equipped with two EP7/2 modulator-drive units, one of which is normally operational while the other acts as a spare. The equipment is designed to comprise a single-channel fixed-frequency modulator-drive for feeding the output amplifiers of a transmitter, or it may be used by itself as a low-power transmitter with an output of 5 watts.

The normal drive output, drive A, is routed via a change-over panel PA18/3 to two outputs normally used for feeding two r.f. amplifiers, and the standby drive B is correctly terminated. A fault in drive A results in automatic substitution of drive B.

Two sets of power supply units are provided and they are fed with 240-volt mains inputs through a distribution panel type MDP/4.

2.2 Assembly

The general arrangement is to be seen in Fig. 1.3, showing the normal and standby drives placed above and below the change-over panel. The two sets of supply units are mounted at the top of the bay, to keep the heat developed well away from the drive circuits. The unit interconnections are by multi-way and coaxial plugs and sockets.

2.3 Description of Auxiliaries

2.3.1 Stabilised Power Supplier PS2/6 (Fig. 7)

This is a miscellaneous low-voltage d.c. supply unit producing:

(a) 50-volt bias.
(b) 8·9-volt supply for the transistor modulator.
(c) 6·8-volt bias for the 12·3-Mc/s unit.
(d) 24-volt supply for operating the modulation monitor.

The supplier is constructed on a CH1/3 chassis and all external connections are via a Painton 24-way plug and socket. Mains transformer T1 is protected by 1-ampere fuses (FS1 and FS2) and its four secondary windings are connected to semiconductor diodes in bridge formation. The rectifiers are followed by conventional smoothing circuits comprising either RC or LC combinations. Some stabilisation is obtained in the 50-volt supply by the inclusion of a neon stabiliser (G55/1K) in the load circuit. The 8·9-volt and 6·8-volt circuits employ semiconductors MR5 and MR6 respectively for the same purpose. Stabilisation is not included in the 24-volt supply.

Performance figures in the following table represent an average of results obtained on twelve units.

Nominal Voltage	*Output*		*Regulation (per cent)*	*Hum Level*
	Volts	*At:*		
50	−55	10 mA	1·8	−53 dB
8·9	9·4	40 mA	1·2	−57 dB
6·8	6·8	5 mA	1·1	−43 dB
24	−25·7	50 mA	39	−57 dB

2.3.2 Unstabilised Power Supplier PS3/4A (Fig. 8)

This is the main d.c. power supplier, used in conjunction with the stabiliser PS2/5A. The h.t. voltage can be either 240 volts or 300 volts, depending on the adjustment of a transformer secondary tap. When used with the EP7/2 equipment the h.t. should be set to 300 volts.

The supplier is constructed on a CH1/3 chassis and all external connections are via a Painton 24-way plug and socket.

Details of this unit are in Part 3 of Instruction G.2.

2.3.3 Stabilised Power Supplier PS2/5A (Fig. 9)

The stabiliser operates on the d.c. from the PS3/4A supplier, reducing the effective h.t. voltage to a nominal 260 volts. The mains transformer incorporated to meet internal heater requirements has one winding providing an external feed, used in this instance with heaters in EP7/2 sub-units employing valves. The stabiliser is constructed on a CH1/3 chassis and external connections are via a Painton 24-way plug and socket.

Further information about this supplier is available from Part 2 of Instruction G.2. It comprises description relevant to the PS2/2A supplier, with a circuit basically identical to that of the PS2/5A, and amending information referring to the few differences in the last-mentioned, notably

use of an internal reference voltage instead of one obtained externally.

2.3.4 Drive Change-over Panel PA18/3 (Fig. 10)

The basic functions of this panel are to:

(a) Split the drive-A output into two equal outputs while maintaining electrical isolation between the two r.f. amplifier inputs.
(b) Correctly terminate the spare drive (B).
(c) Automatically reverse conditions (a) and (b) in the event of drive-A failure.

Rectifiers D1 and D2 (Fig. 10) and their associated circuits rectify the outputs of drives A and B to provide d.c. for excitation of relays D and E respectively. For normal drive output, both relays are energised so that contacts D1 and E1 are closed.

If drive A is to be used as the service drive, with drive B as spare, the switch SWA is set to a position marked *A or B*. Consequently relay F is energised via the oven-control protective circuits and closed D1 contacts. Because the F1 contacts are in their make position, relay G is rendered inoperative, and through the closed F2 contacts the relays A, B and C are energised. The closed A1 and C1 contacts connect the drive-A output to the hybrid ring input, and the closed B1 contacts terminate drive B into a 50-ohm dummy load.

If drive A fails, or its output falls by a predetermined amount (usually 3 dB), relay D is de-operated and relay G becomes energised owing to release of the hitherto operated F1 contacts. The simultaneous release of the F2 contacts causes de-energising of relays A, B and C, which release their contacts to unoperated states as in Fig. 10. Thus drive B is connected to the hybrid ring and drive A is terminated in 50 ohms. The level at which automatic change-over occurs is preset by adjustment of currents through the sensitive centre-balanced relays D and E by way of the variable resistors R8 and R9.

The above-mentioned selection can be reversed, making drive A the standby, by putting switch SWA to the *B or A* position. For special purposes either drive A or drive B can be isolated by moving the switch to *A* and *B* positions. The panel also provides the necessary earth-return path, via PLA4, for supplying information to a Telephone Indicator Panel type TIP/2A; see Section 2 of Instruction T.1. The sequence of signals indicating main-drive and standby-drive conditions are determined by the energising of relays F and G.

The hybrid ring basically contains suitable lengths of cable, arranged in ring formation, to provide a transmission path from the input to both output amplifiers while isolating them from each other.

Referring to Fig. 10, a drive signal applied to the hybrid-in point is connected to transmitter A through clockwise and counter-clockwise paths which are $0{\cdot}25\lambda$ and $1{\cdot}25\lambda$ respectively. The two signals arriving at the output-amplifier A take-off point are therefore equal in amplitude and displaced by λ, so they are additive and a transmission path exists. A similar path exists between the hybrid-in point and the take-off point for output-amplifier B. The electrical paths between the A and B take-off points, however, are $0{\cdot}5\lambda$ and λ long, and as they differ by $0{\cdot}5\lambda$ the two signals are opposite in phase and are subtractive. The two output amplifiers are therefore electrically isolated from each other.

R2 is a balancing network which acts as a protective load when the hybrid circuit becomes unbalanced due to the disconnection of either of the r.f. amplifiers. The network is electrically isolated from the hybrid-ring input by its connection through two signal paths differing by $0{\cdot}5\lambda$.

Electrical lengths of coaxial cable included in the panel wiring, and particularly those associated with dummy loads, are carefully adjusted for correct matching during the setting-up procedure. Any change to, or disturbance of, this wiring will result in faulty operation of the panel.

In addition to the basic switching functions as described, the performance requirements are that:

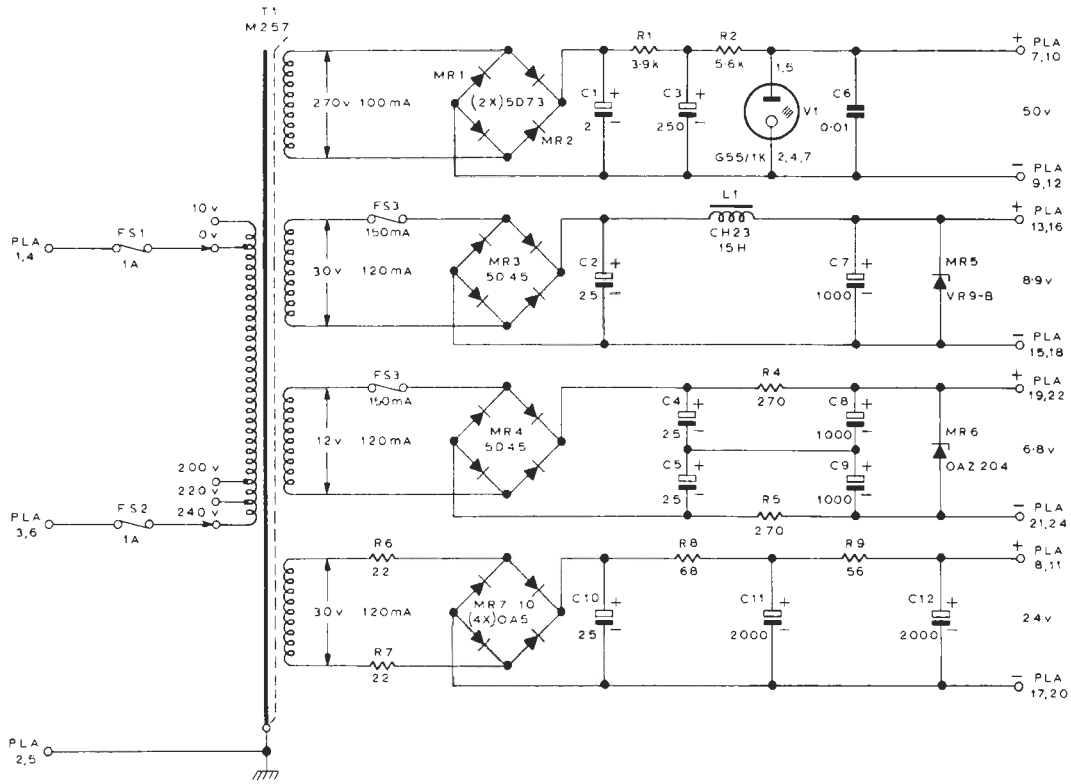
(a) The impedance looking into either the drive-A and drive-B socket should be 50 ohms ± 5 per cent, non-reactive. The maximum permissible j term is ± 10 ohms.
Note: An admittance bridge can be used to check these impedances, but it must be connected to measuring points through a $0{\cdot}5\lambda$ length of cable.
(b) Measuring with a 50-ohm wattmeter, the output power of the individual drives is 5 watts ± 5 per cent for all conditions of the change-over panel, and distribution of power to the two transmitters is such that:

$$P_B = P_A \pm 5 \text{ per cent.}$$

2.3.5 Mains Distribution Panel MDP/4

This panel is a 19-in by $5\frac{1}{4}$-in mild-steel plate fitted with four 13-ampere sockets. Two sockets are used for supplying mains feed to the two sets of power suppliers.

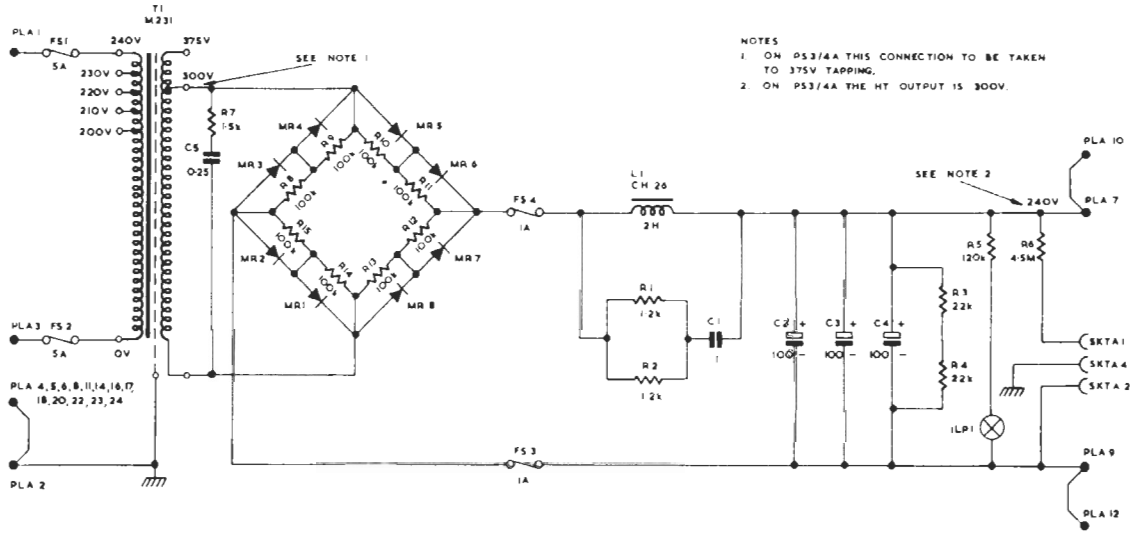
PWG(X)/JR/0565



COMP	TYPE	TOLERANCE PER CENT
C1	T.C.C. SCE76PE/PVC	−20+50
C2	T.C.C. SCE79DC/PVC	−20+50
C3	PLESSEY CE933/1	−20+50
C4	T.C.C. SCE79DC/PVC	−20+50
C5	T.C.C. SCE79DC/PVC	−20+50
C6	HUNT BM21KV	±25
C7	PLESSEY CE1205/1	−20+50
C8	PLESSEY CE1205/1	−20+50
C9	PLESSEY CE1205/1	−20+50
C10	T.C.C. SCE79DE/PVC	−20+50
C11	PLESSEY CE17165/13	−20+50
C12	PLESSEY CE17165/13	−20+50
R1	PAINTON P301A	±5
R2	PAINTON P301A	±5
R4	PAINTON P301A	±5
R5	PAINTON P301A	±5
R6	PAINTON MV1A	±5
R7	PAINTON MV1A	±5
R8	PAINTON MV1A	±5
R9	PAINTON MV1A	±5

STABILISED POWER SUPPLIER PS2/6 : CIRCUIT.

FIG 8
ALSO IN G2

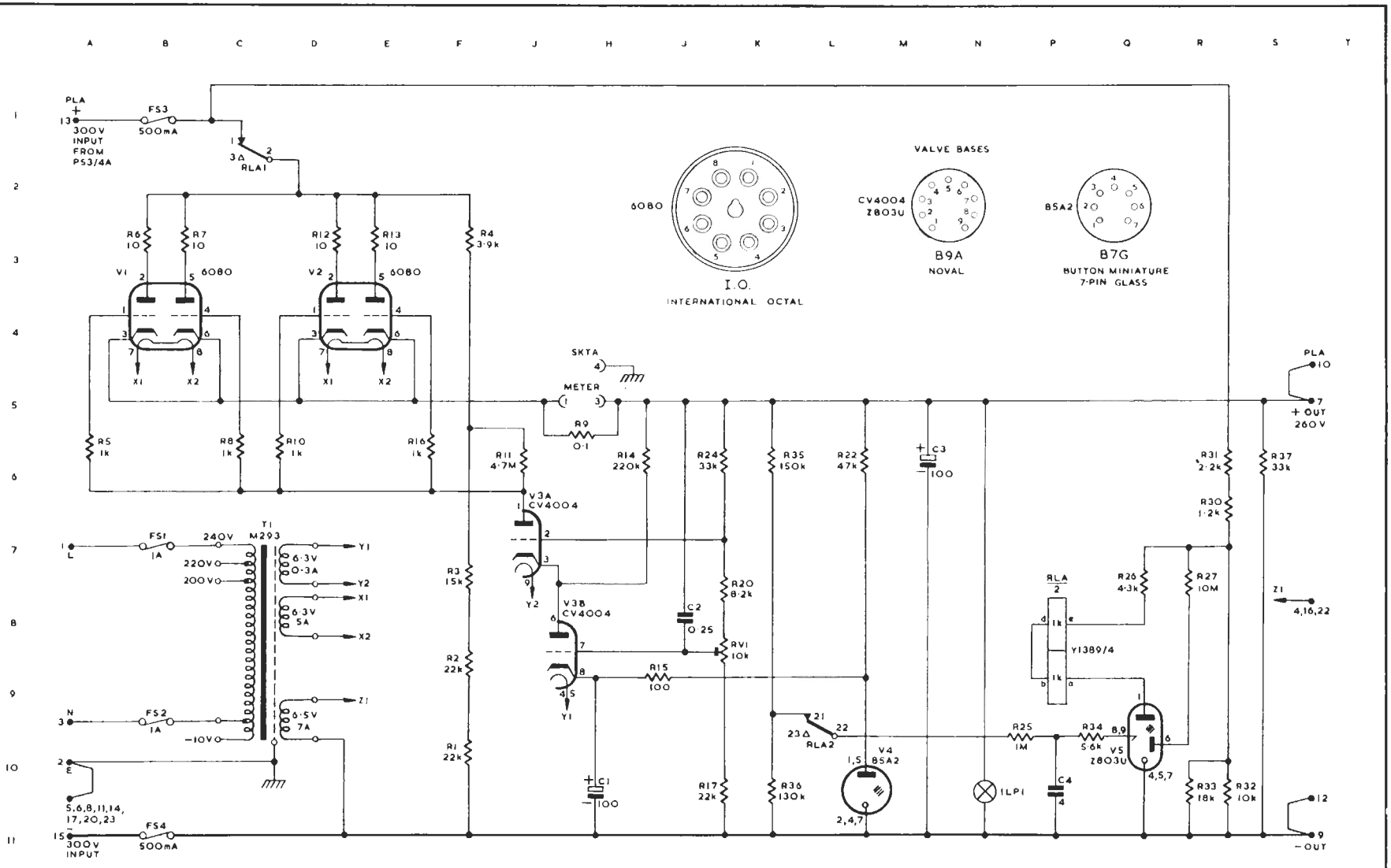


COMP	TYPE	TOLERANCE PER CENT	COMP	TYPE	TOLERANCE PER CENT
C1	DUBILIER B 209		R1	PAINTON P 301A	5
C2	PLESSEY CE 8045/1		R2	PAINTON P 301A	5
C3	PLESSEY CE 8045/1		R3	PAINTON P 302A	5
C4	PLESSEY CE 8045/1		R4	PAINTON P 302A	5
C5	DUBILIER B 149		R5	ERIE 9	10
			R6	PAINTON 76	2
MR1	PLESSEY 6G8		R7	PAINTON P 301A	5
MR2	PLESSEY 6G8		R8	PAINTON P 302A	5
MR3	PLESSEY 6G8		R9	PAINTON P 302A	5
MR4	PLESSEY 6G8		R10	PAINTON P 302A	5
MR5	PLESSEY 6G8		R11	PAINTON P 302A	5
MR6	PLESSEY 6G8		R12	PAINTON P 302A	5
MR7	PLESSEY 6G8		R13	PAINTON P 302A	5
MR8	PLESSEY 6G8		R14	PAINTON P 302A	5
			R15	PAINTON P 302A	5

UNSTABILISED POWER SUPPLIERS PS3/4 & PS3/4A: CIRCUIT

COMPONENT TABLE: FIG. 9

Comp.	Loc.	Type	Tolerance per cent
C1	H10	Plessey CE874/1	
C2	J8	Hunts B513K	
C3	M6	Plessey CE874/1	
C4	P10	Hunt B553	
ILP1	N10	Neoflex ZGL/230	
R1	F10	Erie 8	10
R2	F9	Erie 8	10
R3	F8	Erie 8	10
R4	F3	Erie 9	10
R5	A6	Erie 9	10
R6	B3	Erie 8	10
R7	B3	Erie 8	10
R8	C6	Erie 9	10
R9	H6	Erie 8 2-2 Megohm ±10 per cent carry winding of 22 S.W.G. Eureka cotton-covered wire to make a resistance of 0·1 ohm	2
R10	D6	Erie 9	10
R11	J6	Erie 9	10
R12	D3	Erie 8	10
R13	E3	Erie 8	10
R14	H6	Erie 9	10
R15	J9	Erie 9	10
R16	F6	Erie 9	10
R17	J10	Erie 108	2
R20	J7	Erie 109	2
R22	L6	Erie 8	10
R24	J6	Erie 108	2
R25	P9	Erie 9	10
R26	Q7	Erie 109	2
R27	R7	Erie 9	10
R30	R7	Painton P301A	5
R31	R6	Painton P301A	5
R32	R10	Painton P302A	5
R33	R10	Painton P302A	5
R34	P10	Erie 9	10
R35	K6	Erie 108	2
R36	K10	Erie 108	2
R37	S6	Painton P302A	5
RV1	J8	Morganite LH/WN	20
T1	C8	M293	

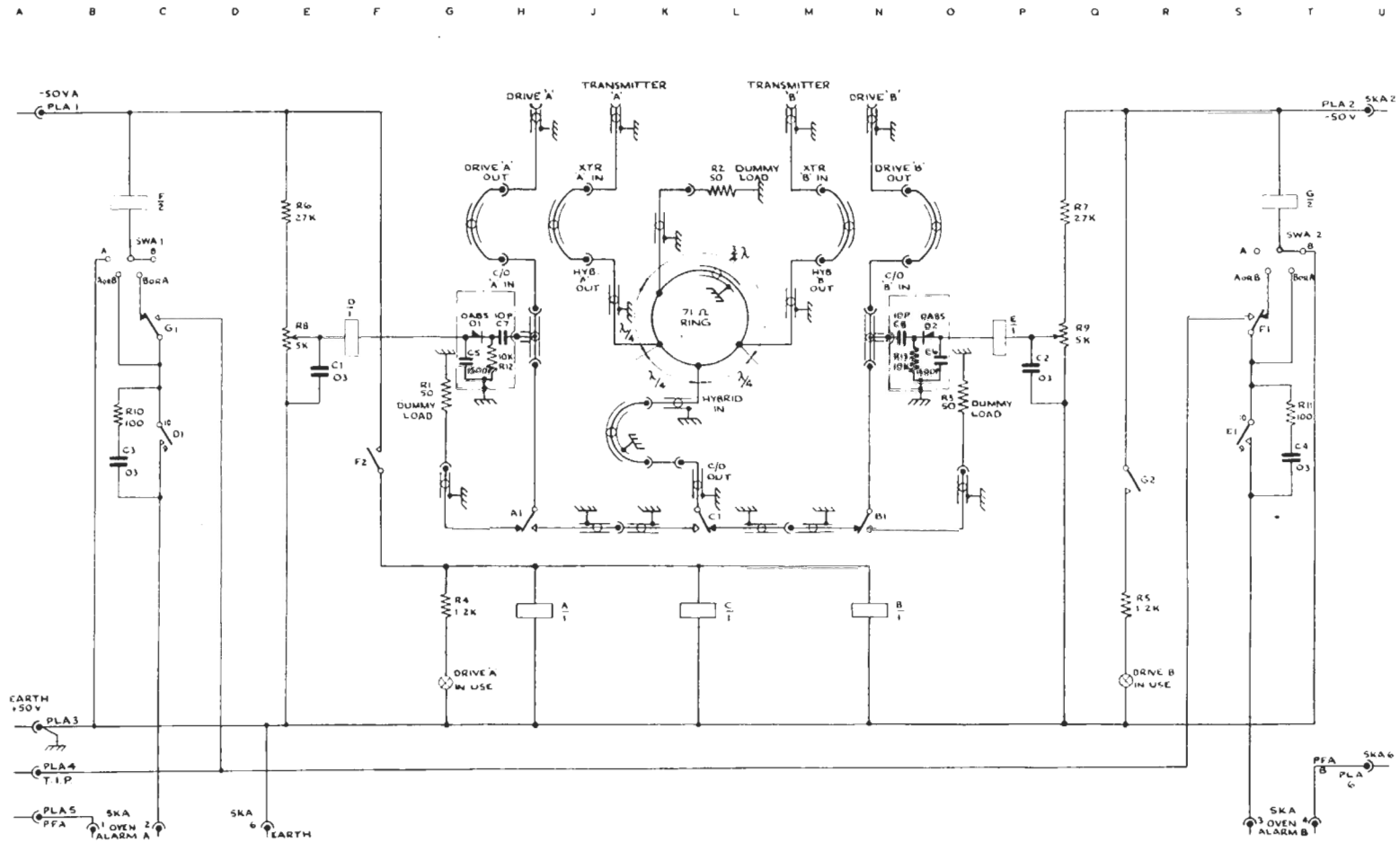


STABILISED POWER SUPPLIER PS2/5A : CIRCUIT

T3 SECTION 2
FIG 9
(ALSO IN G2)

COMPONENT TABLE: FIG. 10

Comp.	Loc.	Type	Tolerance per cent	Comp.	Loc.	Type	Tolerance per cent
C1	E5	Hunt BM15KV		R1	G5	Erie 8	10
C2	P5	Hunt BM15KV		R2	L2	Erie 8	10
C3	B6	Hunt BM15KV		R3	O5	Erie 8	10
C4	T6	Hunt BM15KV		R4	G8	Painton P301A	5
C5	G5	Erie K170051/362		R5	Q8	Painton P301A	5
C6	O5	Erie K170051/362		R6	E3	Erie 8	10
C7	H5	Erie NO30AD		R7	Q3	Erie 8	10
C8	N5	Erie NO30AD		R8	E5	Colvern CLR1132/15S	
				R9	Q5	Colvern CLR1132/15S	
				R10	B6	Erie 8	10
RLA	H8	B. and R. AO7/3		R11	T6	Erie 8	10
RLB	N8	B. and R. AO7/3		R12	H5	Erie 9	10
RLC	L8	B. and R. AO7/3		R13	N5	Erie 9	10
RLD	F5	T.M.C. 51B1/2(Z)					
RLE	P5	T.M.C. 51B1/2(Z)					
RLF	C3	S.T.C. 4190GE					
RLG	T3	S.T.C. 4190GE					



DRIVE CHANGE-OVER UNIT PA18/3 : CIRCUIT

T3
SECTION 8
FIG 10