AIR PUBLICATION

116D-0133-1B

UHF TRANSMITTER-RECEIVERS (ARC52 AND DERIVATIVES) SPECIAL TEST EQUIPMENT FOR SECOND LINE SERVICING

GENERAL AND TECHNICAL INFORMATION

BY COMMAND OF THE DEFENCE COUNCIL

L T Dunnett

Ministry of Defence

FOR USE IN THE
ROYAL NAVY
ROYAL AIR FORCE

(Prepared by the Ministry of Technology)

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PREFACE

The subject matter in this publication may be affected by Defence Council Instructions, Servicing Schedules or "General Orders and Modifications" Leaflets. If possible, Amendment Lists are issued to correct this publication accordingly, but it is not always practicable to do so. When an Instruction, Servicing Schedule, or Mod Leaflet contradicts any portion of this publication, the Instruction, Servicing Schedule or Leaflet is to be taken as the overriding authority.

The inclusion of references to items of equipment does not constitute authority for demanding the items.

Each leaf bears the date of issue. Subsequent amendments to the Initial Issue also bear the number of the Amendment List with which it was issued. New or amended technical matter will be indicated by black triangles positioned in the text thus: ◄ —— ► to show the extent of the amendment text, and thus: ►◄ to show where text has been deleted. When a Chapter is issued in a completely revised form the triangles will not appear, but instead the words "(Completely Revised)" will appear at the head of the relevant Chapter.

In January 1974 under AL 9, the number of this publication was amended from AP 116D-0133-1B to AP 116D-0133-1B3D in order to accommodate sub-topic 3D information.

WARNING

BERYLLIA

The equipments covered in this publication may include components containing Sintered Beryllium Oxide (Beryllia) material which is a hazard to health. It is a ceramic-like material having high insulation and heat transfer properties. There is no standard colour coding which would allow easy recognition. More detailed information is given in AP 3158 Vol. 2 (2nd Edition), Leaflet H37.

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(Completely revised)

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Introduction

1. The test equipment and tools required for first and second line servicing the ARC52 and derivative type transmitter-receivers are listed in the tables given in this Chapter. The items of general test equipment and special-to-type have been tabled separately for ease of reference. Wherever further information on an item is available elsewhere, this is quoted. In this respect, it should be noted that the special-to-type items are described in other chapters in this publication.

Accessories for signal generators CT394 and CT394A

2. A number of accessories are required for use with the signal generators CT394 and CT394A (Table 1, item 8). Certain of these are supplied with the instrument, but others require separate requisition. The items are as follows:—

(1) Cable assembly, power, electrical, 5995–99–945–9896 (formerly Ref. No. 10HA/8539), 5 ft. long. Supplied with both CT394 and CT394A.

(2) Connector, flexible, 5995–99–972–8884, 50-ohms r.f. output cable 54 in. long. Supplied only with CT394A.

(3) Adaptor, electrical, plug-to-socket, 5935–99–940–1652. Not supplied. This is a type N to BNC adaptor for use with the CT394 and CT394A; it enables a smaller cable assembly to be connected to the r.f. output of the instrument.

(4) Connector, flexible, 5995–99–972–8882, 50-ohms r.f. output cable 12 in. long. Not supplied. Used in conjunction with adaptor (5).

(5) Adaptor, plug-to-socket, electrical 5935–99–972–8894. Not supplied. This is a 'T' adaptor and is used in conjunction with the connector (4) for use with the CT394 only. The input to the crystal calibrator circuit on this instrument is via a socket on the front panel to which the r.f. output of the instrument must be connected. The 'T' adaptor and 12 in. r.f. cable permit crystal calibration to be done while the r.f. output is in use. The CT394A has an internal connection between the two circuits, these two items are therefore not required.

(6) Lead, test, 6625–99–943–3486. Not supplied. This item consists of a coaxial type N socket, which may be fitted to the end of the r.f. output cable; it has two crocodile clips on short leads at the other end. It contains a 300V d.c. working 0·001 μF capacitor connected in series with the centre conductor, and this permits the signal generator to be connected to a point of relatively high d.c. potential.

(7) Fuse unit, radio frequency, concentric, 5920–99–932–4381. Not supplied. This device has a coaxial type N plug at one end and socket at the other; internally is fitted a fuse link 5920–99–999–3402. Its purpose is to protect the signal generator from high voltages which may be present on the unit to which the r.f. output of the signal generator is connected.

TABLE 1

General test equipment

Item No.	Nomenclature	Ref. No.	Required at servicing lines		Further details	Remarks
			R.A.F.	R.N.		
1	Multimeter unit	6625–99–943–1532		1		
	or					
	Testmeter Type F	5QP/1		1		
	or					
	Testmeter Type D1	5QP/10610		1		
2	Multimeter CT498A	5QP/1057049	1, 2 & 3			
	or					
	Multimeter CT498	5QP/17447	1, 2 & 3	2 & 4	A.P.2536C	
	or					
	Multimeter set (Formerly multimeter Type 9980)	6625–99–943–1524	1, 2 & 3	2 & 4	A.P.2536C	
	or					
	Multimeter, Type 1	5QP/16411	1, 2 & 3	2 & 4	A.P.2536C	
3	Multimeter set electronic CT471C	10S/9556255	2 & 3		A.P.117G–0602–1	
	or					
	Multimeter CT429 (Formerly multimeter electronic, Type 13267	6625–99–943–8384 10S/17050)	2 & 3	2 & 4	A.P.4837H	
	or					
	Multimeter, electronic CT38	10S/16308	2 & 3	2 & 4	A.P.2879AG	
	or					
	Voltmeter, electronic CT54	6625–99–943–2418		2 & 4	A.P.2536C	
4	Tester, insulation resistance, Type C	5G/152	2		A.P.4343S	
	or					
	Tester insulation	F19/5047		1, 2 & 4		
	or					
	Tester insulation, 1000V	5G/2282	3		A.P.4343S	

TABLE 1 (contd.)

Item No.	Nomenclature	Ref. No.	Required at servicing lines		Further details	Remarks
			R.A.F.	R.N.		
5	Wattmeter, absorption, AF	6625-99-914-9811	2 & 3	2 & 4		For a.f. measurements.
	or					
	Wattmeter, absorption, AF, CT44	6625-99-949-0510	2 & 3	2 & 4	A.P.117B-0405-1	
	or					
	Output meter, Type 2	10S/11934	2 & 3	2 & 4	A.P.2548H	
6	Wattmeter, absorption, CT419	6625-99-943-5568	2 & 3	2 & 4	A.P.117B-0403-1	For r.f. measurements.
	or					
	Wattmeter, absorption	AN/URM-43 (ME-11/U)		2 & 4		
7	Wattmeter, absorption CT443	6625-99-999-3591	2 & 3	2 & 4	A.P.117B-0401-1	For low power r.f. measurements.
8	Signal generator set CT394B	10S/1061189	2 & 3			For r.f. tests (para. 2).
	or					
	Generator, signal, set CT394A	6625-99-901-9983	2 & 3	2 & 4	A.P.117E-0213-1	
	or					
	Generator, signal, CT394A	6625-99-972-6346	2 & 3	2 & 4	A.P.2531HA	
	or					
	Signal generator CT394	6625-99-943-1911		2 & 4	A.P.2531H	
9	Audio and video signal signal generator	6625-99-104-7574	2 & 3		A.P.117E-0101-1	For a.f. tests.
	or					
	Audio and video signal generator	6625-99-944-9754	2 & 3	4	A.P.4737AE	
	or					
	Generator, signal (Formerly signal generator Type 16728	6625-99-999-9604 10S/17703)			A.P.117E-0105-1	
	or					
	Signal generator Type 65	10S/16344	2 & 3	2 & 4	A.P.2536C	
	or					
	Generator, signal Type 65B	6625-99-932-4976	2 & 3	2 & 4	A.P.2536C	
	or					
	Oscillator unit Type 25	10V/11940	2 & 3		A.P.2879W	

TABLE 1 (contd.)

Item No.	Nomenclature	Ref. No.	Required at servicing lines		Further details	Remarks
			R.A.F.	R.N.		
10	Signal generator CT452A	6625–99–900–8337	2 & 3	2 & 4	A.P.117E–0207–1	For i.f. tests.
	or					
	Signal generator Type 57A	10S/16823		2 & 4	A.P.2538J	
	or					
	Signal generator Type 56A	10S/16822	2 & 3		A.P.2879D	
	or					
	Signal generator Type 56	10S/647	2 & 3		A.P.2879D	
11	Indicator distortion	6625–99–001–2681	3		B.R.1771(37)	
	or					
	Indicator, distortion	6625–99–944–7661 (formerly 10S/17639)	3	4	A.P.4837R	
12	Headset jetlite J231	10AH/1075192	1, 2 & 3			
	or					
	Headset, telephone, Type 9	10AH/14	1, 2 & 3	2 & 4	A.P.2876A	
	and					
	Microphone assembly, Type 48	10A/14381	1, 2 & 3	2 & 4		
13	Oscilloscope set, CT436	6625–99–913–8618	2 & 3	2 & 4	A.P.117K–0103–1	
	or					
	Oscilloscope, Type 13A	10S/831	2 & 3	2 & 4	A.P.2879AF	
14	Oscilloscope, CT414	6625–99–943–1632	2 & 3	2 & 4	A.P.2563DW	
15	Universal Bridge set CT530	10S/9553163	3		A.P.117E–0801–1	
	or					
	Bridge, universal CT375	6625–99–943–2442	3		A.P.2563EL	
16	Leak locator CT105	10S/1048464	2 & 3	2 & 4	A.P.117X–0101–1	
17	Capsule, Arcton	10AF/545	2 & 3	2 & 4		
18	Leak indicator kit, CT106	10S/9468729	1, 2 & 3	1, 2 & 4		
19	Pump, pressurizing for aircraft radio equipment	4G/1047435	1, 2 & 3	1, 2 & 4		

TABLE 1 (contd.)

Item No.	Nomenclature	Ref. No.	Required at servicing lines		Further details	Remarks
			R.A.F.	R.N.		
20	Gauge, pressure	4G/2595	1, 2 & 3	1, 2 & 4	A.P.117X–0101–1	
21	Stop watch, Mk. 3	6B/117	1, 2 & 3	2 & 4		
	or					
	Stop watch, Mk. 3A	6B/221		2 & 4		
	or					
	Stop watch	6645–99–910–1002 (formerly 6B/9101001)	1, 2 & 3			
22	Clip, Type 414	10H/20832		2 & 4		
23	Clip, electrical	5940–99–913–3677		2 & 4		Alligator style No. 1
24	Fan, electric (formerly fan, circulating, desk)	4140–99–110–2928 5P/2341)	2 & 3	2 & 4		For cooling equipment.
25	Cooler, air electronic equipment	5821–99–913–2641 (formerly 10K/21080)		2 & 4		115V, 400 Hz, 3-phase.
	or					
	Cooler, air electronic equipment	5821–99–913–2640 (formerly 10K/16869)		2 & 4		230V, 50 Hz single phase.
26	Meter, electrical, frequency	6625–99–913–2642		4		
27	Counter, electrical	6680–99–913–2643		4		
28	Radio servicing trolley	10S/16667		2 & 4		Used with item 13.
29	Resistor, variable (d.c. range 0–29 V)			4		

TABLE 2
Special-to-type test equipment (electrical)

Item No.	Nomenclature	Ref. No.	Required at servicing lines		Further details	Remarks
			R.A.F.	R.N.		
1	Test set, ultra high frequency equipment Type 15056	6625–99–943–4149	1 & 2	1 & 2	A.P.117M–0101–1	Primarily for pre-flight testing of aircraft installation.
2	Test kit	6625–99–943–7031		1 & 2	Chap. 2	Bench convertor sets.
	or					
	Test kit	6625–99–943–7032	2		Chap. 2	
3	Test kit (AN/ARC52)	6625–99–943–6904	2	2	Chap. 3	
4	Test kit, transmitter-receiver, radio	6625–99–999–3075		2	Chap. 4	
5	Control unit, transmitter-receiver, radio Type C1607/ ARC52	5821–99–942–8543	2	1 & 2		Serviceable unit for test purposes.
	or					
	Type C1607/4	5821–99–945–5739				
6	Control, receiver muting	5821–99–943–3247		1 & 2		Serviceable unit for test purposes.
7	Simulator, microphone	6625–99–945–0061	2		Chap. 8	For units servicing both airborne and ground installations or ground installations only.
8	Simulator, microphone	6940–99–943–6545	2	2	Chap. 8	For units servicing airborne installations only. Simulates a microphone input, being used in conjunction with an external a.f. oscillator.
9	Cover, r.f. amplifier, test side	5821–99–932–1806		2		Equipment side covers with holes to provide access for module alignment.
10	Cover, preamplifier, test side	5821–99–932–1804		2		
11	Cover, spectrum generator, test side	5821–99–932–1916		2		
12	Cover, guard receiver, test side	5821–99–932–2388		2		

TABLE 2 (contd.)

Item No.	Nomenclature	Ref. No.	Required at servicing lines		Further details	Remarks
			R.A.F.	R.N.		
13	Monitor, audio/radio frequency	6625–99–943–7328	2	2	Chap. 7	
14	Calibrator, frequency	6625–99–999–2642		2	Chap. 6	
15	Power supply	5821–99–932–2942	2	2	Chap. 5	

TABLE 3

Tools—general

Item No.	Nomenclature	Ref. No.	Required at servicing lines		Further details	Remarks
			R.A.F.	R.N.		
1	Extractor, electronic valve	5120–99–097–0289		2		For type B7G and B9A valves.
2	Insulation hood, insulator	5970–99–913–3676		2		Series S.I.C.59 (moulded).
3	Soldering iron, electric	3439–99–110–2101		2		Litesol list 51.
4	Screwdriver, cross point	5120–99–910–5864 (Formerly 1C/6410)	2	2		
5	Screwdriver, cross point	5120–99–910–5865 (Formerly 1C/6411)	2	2		
6	Wrench, socket	5120–99–120–0369	2	2		For use in the adjustment of locknuts on the control unit.
7	Wrench, socket	5120–99–120–0370		2		For 42-way Ampherol plug.
8	Wrench key, socket head screw	5120–99–910–6058 (Formerly 1C/6242)		2		$\frac{1}{16}$ in. Allen.
9	Gauge	1H/57		2		4–24 grammes.

TABLE 3 (contd.)

Item No.	Nomenclature	Ref. No.	Required at servicing lines		Further details	Remarks
			R.A.F.	R.N.		
10	Gauge, contact tension	5210–99–913–3675		2		Correx setting gauge, 0–100 grammes.
11	Gauge, thickness	5210–99–910–5207 (Formerly 1B/4110)				
12	Alignment tool, electronic equipment	5120–99–120–0367		2		For adjusting capacitor vanes.
13	Adjuster, spring, communications equipment	5120–99–943–7463		2		For use in affixng C-retainer rings to control unit memory drums.
14	Adjuster, spring, communications equipment	5120–99–943–7464		2		For use in affixing C-retainer rings to various mechanism shafts.
15	Adjuster, spring, communications equipment	5120–99–943–7465	2			For use in affixing C-retainer rings to various mechanism shafts.
16	Adjuster, spring, communications equipment	5120–99–943–7466		2		For use in affixing C-retainer rings to various mechanism shafts.
17	Thumbscrew	5305–99–943–7755		2		Screw to secure side covers (Table 2) to the module under test.

Chapter 2

TEST KITS (BENCH CONNECTOR SETS)

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Introduction

1. Both bench connector sets described in this chapter were originally designed for the transmitter-receiver ARC52. Subsequent modifications and the provision of ancillary items (para. 18 to 19) permit the R.A.F. bench connector set to be used for all later variants. Of these later variants, only the PTR374 has been accepted into R.N. service where a complete bench rig is available for servicing (A.P.117M-0201-1).

Test kit (R.N. bench connector set)

2. This test kit which forms the R.N. bench connector set is issued under Cat. No. 6625-99-943-7031 and comprises an interconnecting box 5821-99-932-1919 and five connectors, as follows:-

(1) 42-way, 8 ft. long (connector 5995-99-932-3721).

(2) 30-way, 4 ft. long (connector 5995-99-932-3722).

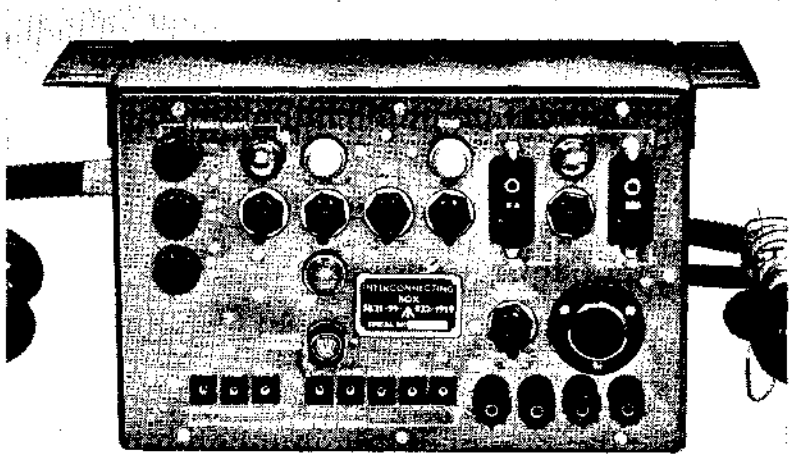


Fig. 1. Test kit, 6625-99-943-7031 (R.N. bench connector set)—top (Mod. 3)

(3) 6-way, 6 ft. long (connector, special purpose, electrical 5995–99–932–1800).

(4) 6-way, 15 ft. long (connector, special purpose, electrical 5995–99–932–1802).

(5) 12-way, 4 ft. long (connector, special purpose, electrical 5995–99–932–1801) (test extension connector).

3. The R.N. bench connector set is designed primarily for bulkhead mounting, in permanent installations where space may be limited. A general view of this equipment is given at fig. 1 showing the control panel layout, whilst in fig. 2 the view is from the underside and shows all five connectors.

4. Facilities are provided on the interconnecting box 5821–99–932–1919 to simulate the controls normally provided in an aircraft installation. Indications of certain functions, for example tone modulation, are given by the indicator lamps. Terminals for connecting a microphone simulator (Chap. 8) are provided to permit the testing of the microphone circuit and measurement of a.f. output. A switch is incorporated for the selection of appropriate input conditions for either a dynamic or a carbon microphone. A socket on the control panel permits the connection of a standard microphone/telephone headset (e.g. head-set Type 9) for test purposes.

5. The interconnecting box of this bench connector set is used in place of the one in the aircraft installation in order to provide means for connecting together on the service test bench the various items of the Type TR4/ARC52 and Type TR5/ARC52 equipments. These include the control unit Type C1607/ARC52 or C1607/4, the receiver muting control (when fitted) and a.c. and d.c. primary power supplies. The interconnecting box also facilitates connection of the test set, U.H.F. equipment, Type 15056 (A.P.117M–0101–1) so that performance tests can be made. The provision of additional test sockets on the interconnecting box enables various measurements to be made using an external meter.

6. Connection of the transmitter-receiver is by means of the 42-way, 8 ft. connector (5995–99–932–3721) to socket SKT1 of the interconnecting box. The 30-way, 4 ft. connector (5995–99–932–3722) is employed to connect the control unit to socket SKT3 of the interconnecting box. The control, receiver muting (when used in the installation) is connected to the interconnecting box at socket SKT4 by means of the 6-way, 6 ft. connector (5995–99–932–1800). The 12-way, 4 ft. test extension connector (5995–99–932–1801) is used in connecting up the test set, U.H.F. equipment, Type 15056.

7. Primary power supplies of 115V, 400 Hz, 3-phase a.c. (phase to earth) and of 27·5V d.c. are connected to the equipment by means of the 6-way, 15 ft. connector (5995–99–932–1802) which is applied to the plug PL1 on the interconnecting box (fig. 7). The 27·5V d.c. supply is routed from PL1A to two push-buttons, thermal type circuit breakers S2 and S4, either one of which is selected by the double pole changeover switch S3 according to the transmitter-receiver equipment to be tested. Switch S2, rated at 5A, is selected when S3 is set to

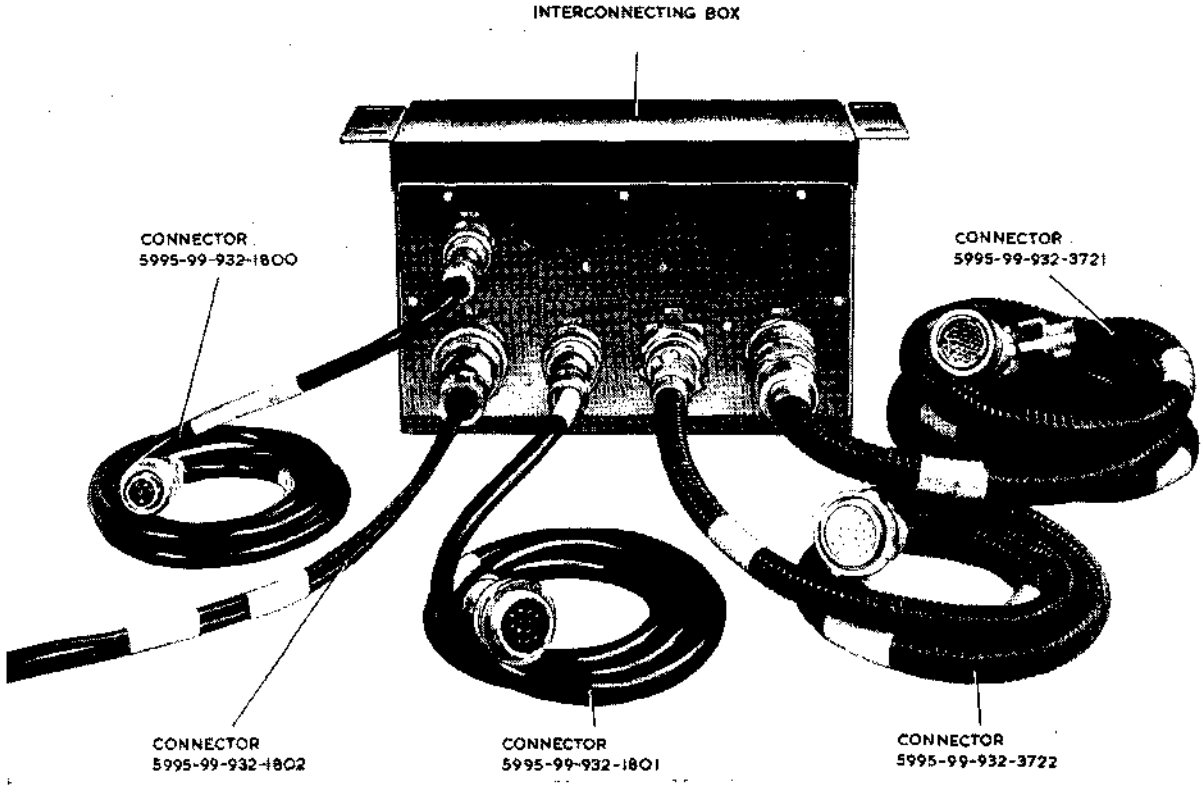


Fig. 2. Test kit, 6625–99–943–7031 (R.N. bench connector set)—underside

the TR4 position (left); switch S4, rated at 25A (or 20A—see note), is selected when S3 is set to the TR5 position (right).

Note . . .

On interconnecting boxes 5821–99–932–1919 *having serial numbers* 0200–0223 *inclusive, a* 25*A circuit breaker (Ref. No.* 5CY/2562) *should have been fitted for S4, under modification instructions S.T.I Radio (Airborne)*/130, *in place of the* 15*A circuit breaker originally fitted but found later to be inadequate for protection of the equipment. Production models from serial number* 0224 *onwards will have a* 20*A circuit breaker embodied during manufacture (Mod.* 5892).

8. With the switch S3 set to the TR4 position, depressing the appropriate push-button on the circuit breaker S2 connects the 27·5V d.c. supply to the equipment under test and, by means of the contacts E and F on S3, this supply is also connected to the 3-phase supply switch S1. At the same time the red lamp (ILP2) is illuminated to indicate that the 27·5V d.c. supply is switched on.

9. The 3-phase supply switch S1 is operative only when S3 is set to the TR4 position, switching the 27·5V d.c. supply to the relay RLA which, in turn, connects the 3-phase a.c. power supply to the equipment. Fuses FS1, FS2 and FS3, each rated at 2A, are included in the 3-phase lines between the input plug PL1 and the contacts or relay RLA. The voltage of each phase can be measured at the test points TP2, TP3 and TP4 on the control panel by connecting a multimeter CT498 (or equivalent) between these points and earth (TP8). All test point positions are marked with appropriate annotation. The red indicator lamp ILP1 is connected in series with R1 between the phase 2 line and earth and is illuminated when the 3-phase a.c. supply is switched on.

10. The jack socket JK1 is the mic/tel socket for connecting a headset; the connections to JK1 are duplicated at the terminals T1, T2, T3 and T4 (PHONE, EARTH, MIC(a), and MIC(b) respectively) and these terminals may be used for monitoring the audio output and for connecting the microphone simulator (Chap. 8). The switch S5 is included for adjustment of the circuit when using either a balanced (dynamic) or unbalanced (carbon) microphone; both positions are clearly marked on the control panel.

11. The auxiliary audio output is fed to pole K of socket SKT1 and thence to pole 6 of the unitor PL5/SKT5. At pole 6 of SKT5, the output is terminated by a load resistor R2 and may be measured at the test point TP6 (AUX. AUDIO).

12. Following upon the reduction of the receiver muting delay to the audio amplifier sub-unit from four seconds to half a second (Mod. 5900), the existing CARRIER SQUELCH lampholder ILP3 has been replaced under Mod. 5901 by a lampholder which incorporates a switch (PRESS TO TEST CARRIER SQUELCH); in addition, a 4μF capacitor C1 is placed in circuit (fig. 5). With the lamp switch in the normal position, capacitor C1 extends the shortened muted delay to between three and four seconds which is sufficient for the measurement of noise content of the signal-to-noise ratio. The muting level setting operation remains unaffected. The lampholder switch is depressed for testing the

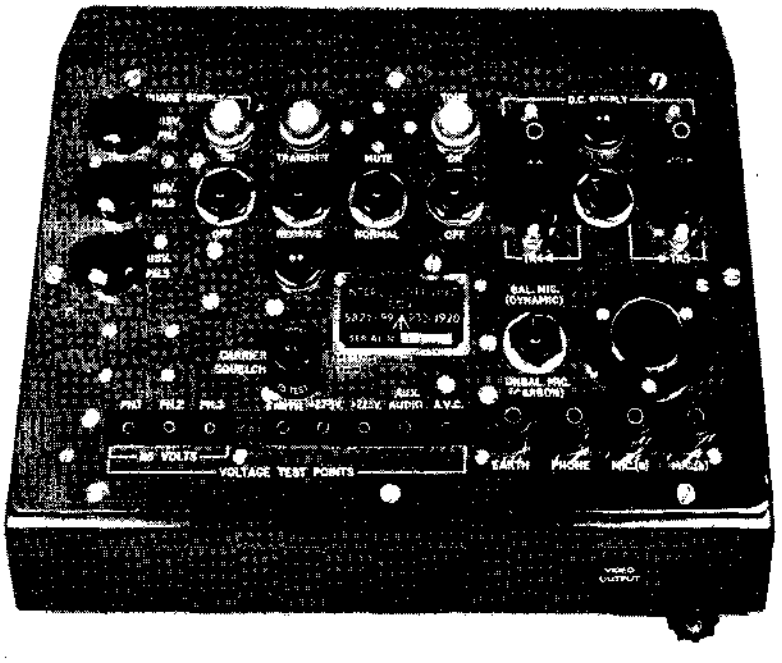


Fig. 3. Test kit, 6625–99–943–7032 (R.A.F. bench connector set)—front (Mod. 4)

carrier squelch system when required. Carrier squelch operation is indicated by the lighting of the indicator lamp connected between pole F of socket SKT1 and the 27·5V d.c. supply at pole A of SKT1 and pole P of SKT3 via poles 16 and 14 of the unitor PL5/SKT5. The purpose of the unitors PL5/SKT5 and PL6/SKT6 is primarily to allow the front and rear panel assemblies to be detached.

13. The tone facility of the transmitter-receiver can be switched on or off by means of switch S6 (TONE); the amber lamp ILP4 is illuminated when tone is on.

14. Switch S7 is marked TRANSMIT-RECEIVE and when set to the RECEIVE position the relay RLB is at rest, with the contracts RLB1/21 and 22 closed to supply 27·5V d.c. to the green indicator lamp ILP5. At the same time, contacts RLB2/1 and 2 are closed so that the receiver muting switch S8 can be operated. When switch S7 is set to the TRANSMIT position, relay RLB is energized, contacts RLB1/21 and 22 are opened (extinguishing the green lamp ILP5) and contacts RLB1/22 and 23 are then closed to illuminate the amber lamp ILP6. Contacts RLB2/1 and 2 are open-circuited in the transmit condition.

15. A summary of test points provided on the control panel is as follows:—

TP1 — +225V h.t.	TP5 — A.V.C.
TP2 — PH3 } 115	TP6 — AUX. AUDIO
TP3 — PH2 } Volts	TP7 — +27·5V d.c.
PT4 — PH1 } a.c.	TP8 — EARTH

Test kit (R.A.F. bench connector set)

16. The test kit 6625–99–943–7032 is the bench connector set for R.A.F. use and comprises an interconnecting box 5821–99–932–1920 with the connectors listed in para. 2 (except item 5). This set is shown in fig. 3 and 4.

17. The interconnecting box of the R.A.F. bench connector set (5821–99–932–1920) is similar to that forming part of the R.N. bench connector set (para. 5) but is housed in a different case and provides additional facilities as required for testing PTR175, PTR177 and PTR374 type equipments as well as ARC52 types. The case is designed for bench mounting and has a sloping front panel (fig. 3). The only difference in control disposition as compared with the R.N. set is the addition of a sealed terminal labelled VIDEO OUTPUT. This affords a convenient monitoring point in data link installations. The circuit diagram is given in fig. 6 from which it will be seen that provision is made for testing equipments using 50 kc/s channel spacing and providing both u.h.f. and v.h.f. facilities, as well as ARC52 types.

Interconnecting box 5840–99–107–6455

18. The interconnecting box 5840–99–107–6455, fig. 5, is provided to adapt the test kit 6625–99–943–7032 (R.A.F. bench connector set) for bench testing the transmitter-receiver PTR374 and its associated control unit and frequency channel indicator.

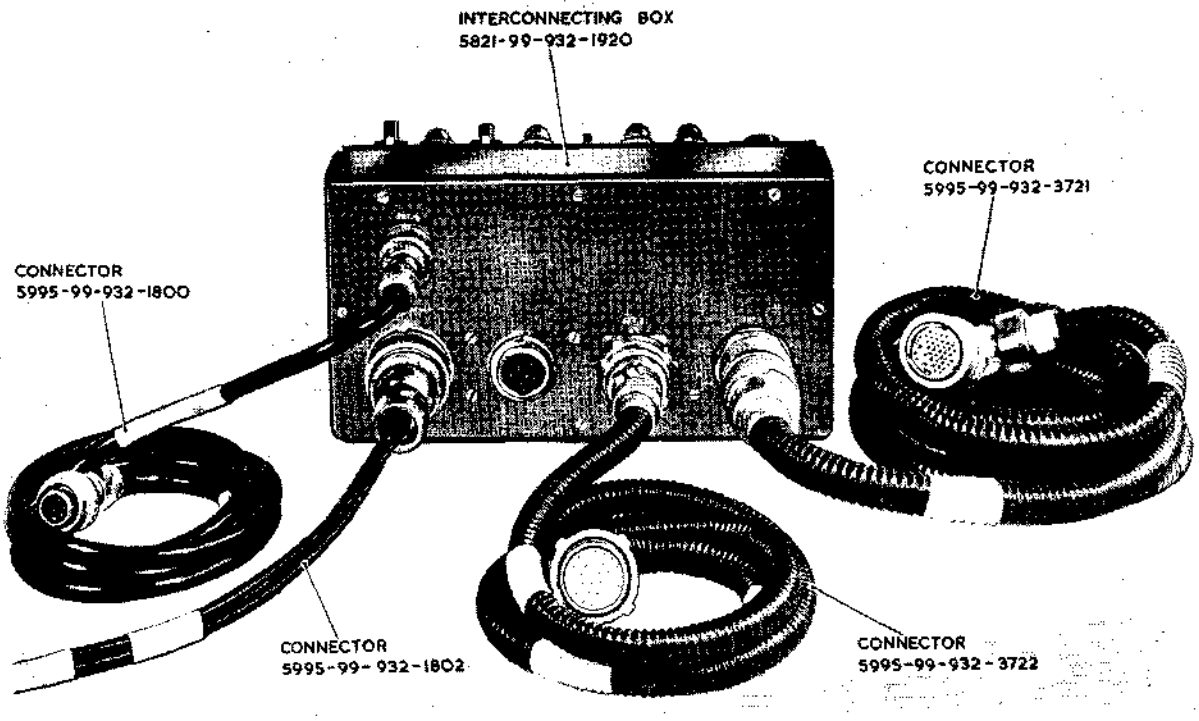


Fig. 4. Test kit, 6625–99–943–7032 (R.A.F. bench connector set)—rear

19. Primarily a junction box was used to interconnect the PTR374 equipment and the bench connector set. The interconnecting box (adaptor box), incorporates a microphone preamplifier, indicators, and test points to facilitate tests not provided for in the bench connector set.

20. Four controls are provided on the adaptor box. They are:—

(1) *SIG.GEN/TEST SET UHF.* The microphone input test signal source, which may be an a.f. signal generator or the test set, UHF, is selected by this switch.

(2) *MIC. LEVEL.* By means of this switch, the selected microphone input test signal is applied to the transmitter-receiver either directly or via the preamplifier.

(3) *SQUELCH DISABLE.* Biased to the OFF position, this switch is depressed to disable the transmitter-receiver squelch circuits by application of 27·5V d.c. to the squelch line.

(4) *TEST LAMPS.* Then the TEST LAMPS button is depressed all indicator lamps on the adaptor box should light, verifying their serviceability.

21. Three indicator lamps, ILP11, ILP12 and ILP13, provide visual indication that the 115V a.c. supply is switched on at the bench connector set. One lamp ILP1 (IP RELAY GND) indicates when the equipment is switched to the transmit condition. Other lamps provide indication of functions selected at the control unit as follows:—

ILP2: ADF ON
ILP3: ADF ANTENNA
ILP4: STANDBY 1
ILP5: STANDBY 2
ILP6 and 7: COMM T.C.
ILP8 and 9: NAV. T.C.
ILP10: PTR374

22. The microphone preamplifier is used to raise the level of the audio test signal from the test set, UHF (preset at 10 mV open circuit for a 200 ohms balanced microphone) to 500 mV at 200 ohms impedance, to meet the requirements for tests on the PTR374 when set to operate at high microphone input levels. When the MIC. LEVEL switch S4 is set to AMP, the signal input is applied via C1 and C2 between base and emitter of VT1 (fig. 9). Transistors VT1 and VT2 together comprise a two-stage amplifier with coupling via C3 and gain adjustment by means of RV1 in VT2 emitter circuit. The amplified signal at VT2 collector is coupled via an emitter follower stage, VT3, to the transmitter-receiver. When S4 is set to DIRECT, the selected microphone input signal is coupled directly to the transmitter-receiver and the preamplifier is isolated.

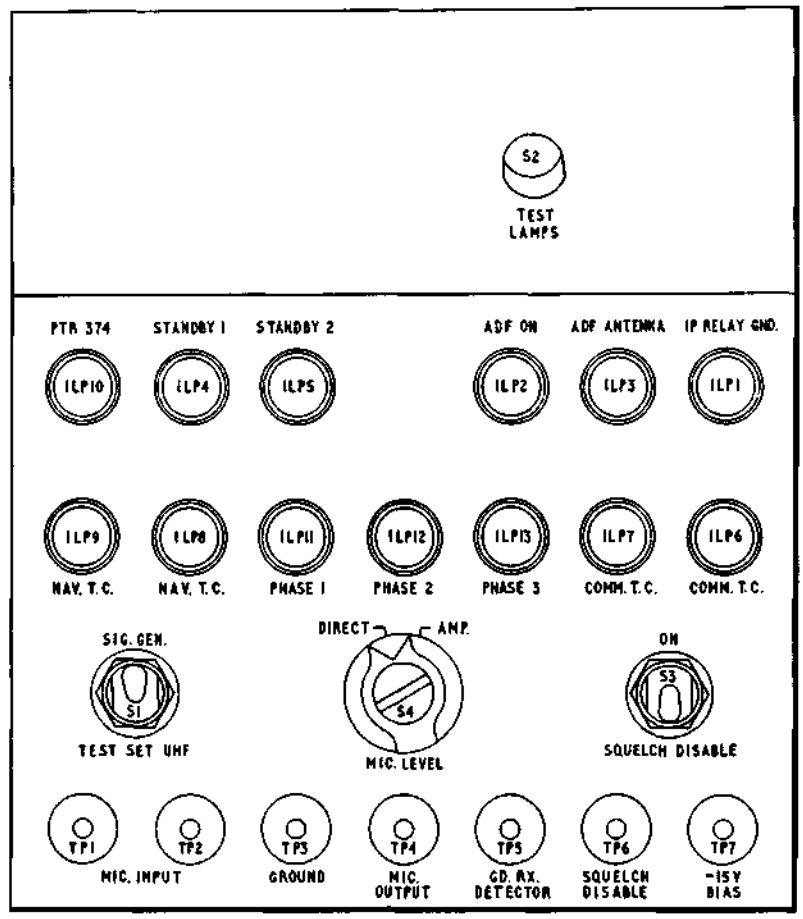


Fig. 5. Interconnecting box, 5840-99-107-6455—panel layout

23. Power for the preamplifier is derived from the 27·5V d.c. supply. This is connected via the dropping resistor R9 to Zener diode D1 and capacitor C6, these two components maintain a steady +10V d.c. transistor supply voltage.

24. Test points and terminals provided are as follows:—

(1) *MIC. INPUT*, (TP1 and TP2). These terminals are provided for connection of an a.f. signal generator as a microphone input test signal source.

(2) *GROUND*, (TP3). A common frame terminal.

(3) *MIC. OUTPUT*, (TP4). A test point provided for monitoring the microphone signal input level to the transmitter-receiver.

(4) *GD.RX DETECTOR*, (TP5). Guard receiver detector test point.

(5) *SQUELCH DISABLE*, (TP6). Squelch disable line test point.

(6) *−15V BIAS*, (TP7). Bias test point.

25. Coaxial relay RL1 and sockets SKT1, SKT6 and SKT7 constitute a safety interlock when the adaptor box is used as part of a test rig, electronic for R.N. purposes (see A.P.117M–0201–1).

26. Four connectors are provided with the interconnecting box: they are detailed below:—

(1) Wiring harness 6625–99–194–4254

(2) Wiring harness 6625–99–194–4255

(3) Wiring harness 6625–99–194–4256

(4) Wiring harness 6625–99–194–4257

27. A block diagram showing test bench interconnections for PTR374 testing is given in fig. 6.

Test stand, transmitter-receiver 6625–99–194–4147

28. The test stand, transmitter-receiver 6625–99–194–4147 provides a means of mounting the transmitter-receiver PRT374 on the test bench, which gives ready access to all sides of the equipment whilst it is connected to the test equipment.

29. The stand comprises a rigid base in the form of a rectanglar metal box, with a turntable mounted on its upper face. The PTR374 is mounted on the turntable, standing vertically on its front panel, and is locked in position by a toggle clamp. A 57-pole socket attached to the turntable mates with P1401 on the PTR374 and, except for pole A of P1401, is connected via a cable to a 57-pole plug on the test stand base. Pole A, the aerial connector of the PTR374, is connected directly to a coaxial aerial socket on the test stand base. To prevent damage to the cable connector, the turntable is prevented, by a stop, from being rotated through a full revolution. A lever-operated stop locates in cutouts in a plate attached to the turntable to enable the transmitter-receiver to be locked rigidly in one of a number of positions throughout the full range of rotation of the turntable.

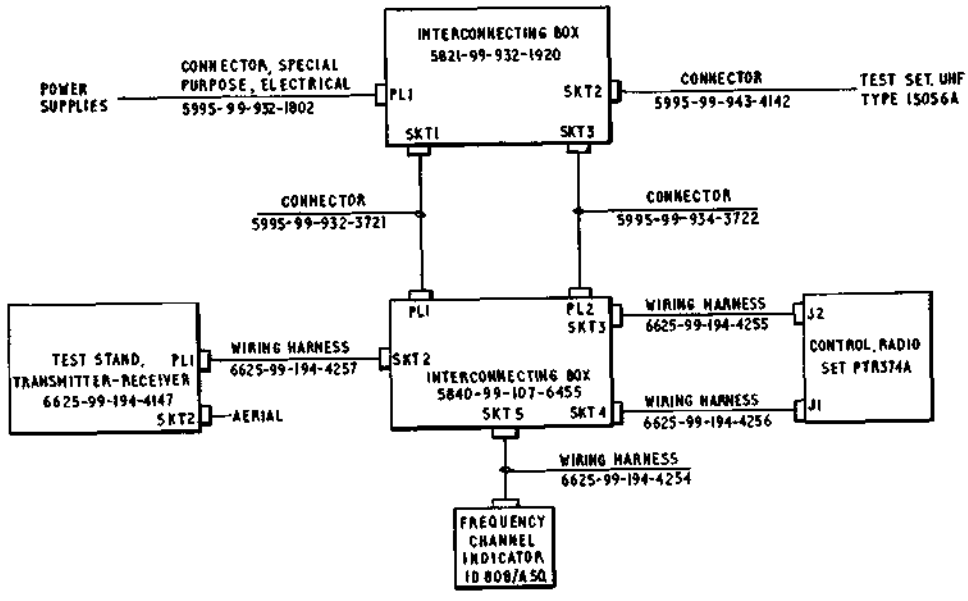


Fig. 6. Interconnections for PTR374 tests

TABLE 1

Modifications

Mod. No.	Class	Vol. 2 Leaflet	Vol. 2 A.L.	Label No.	Brief details of change
			INTERCONNECTING BOX (R.N.) 5821-99-932-1919		
5892	B/3	B40	51	1	Replace the 25 amp. circuit breaker, fitted as an interim measure on the introduction of the British dynamotor, by a 20 amp. circuit breaker. Introduced on development of a satisfactory 20 amp. circuit breaker. This modification cancels S.T.I./Radio (Airborne)/30.
5901	B/2	B35	55	2	Replace the existing "carrier squelch" lampholder with one incorporating a switch and add a 4μF capacitor. Required for signal/noise testing using a 4 sec. muting delay when Mod. No. 5900 has been embodied in the ARC52 Audio Amplifier Unit.
6157	B/2	B61	79 and 113	3	Add a terminal board and two diodes, and make minor wiring changes. Required to prevent tone transmission during chanelling and to ensure correct operation of indicating lamps.
9942	B/0	B164	249	4	Provision of facilities for testing ARI.23143 series when using carbon microphone.
◄A4094	C/3 WOTSAC	B246	400	5	Replace obsolete jack, telephone 5935-99-940-1787 by jack, telephone 5935-99-955-4661 which is smaller, necessitating an adaptor plate.
A4096	C/3 WOTSAC	B249	403	6	Replace obsolete circuit breakers 5925-99-913-1015 and 5925-99-932-3454 (S2, S4) by circuit breakers 5925-99-622-2411 and 5925-99-519-5104 which are smaller and have a different method of fixing, necessitating mounting plates. ►
			INTERCONNECTING BOX (R.A.F.) 5821-99-932-1920		
5892	B/3	B40	51	1	(As above).
5901	B/2	B35	55	2	(As above).
6157	B/2	B61	79 and 113	3	(As above).
8411	B/3	B112	170 and 117	4	Add an outlet and wiring to provide facilities for testing ARC52 derivatives.
9942	B/3	B164	249	5	(As above).
◄1585	C/3 as required	◄ B199	307 ►	6	Replace the 5A circuit breaker (S2) by a 10A circuit breaker in order to obviate operation during channel changing when servicing PTR374 equipments.►
◄A4095	C/3 WOTSAC	B245	399	7	(Details as for Mod. No. A4094 above).
A4097	C/3 WOTSAC	B247	401	8	Replace obsolete circuit breakers 5925-99-913-1015 and 5925-99-955-0803 (S2, S4) by circuit breakers 5925-99-622-2411 and 5925-99-626-0382 which are smaller and have a different method of fixing, necessitating mounting plates. ►

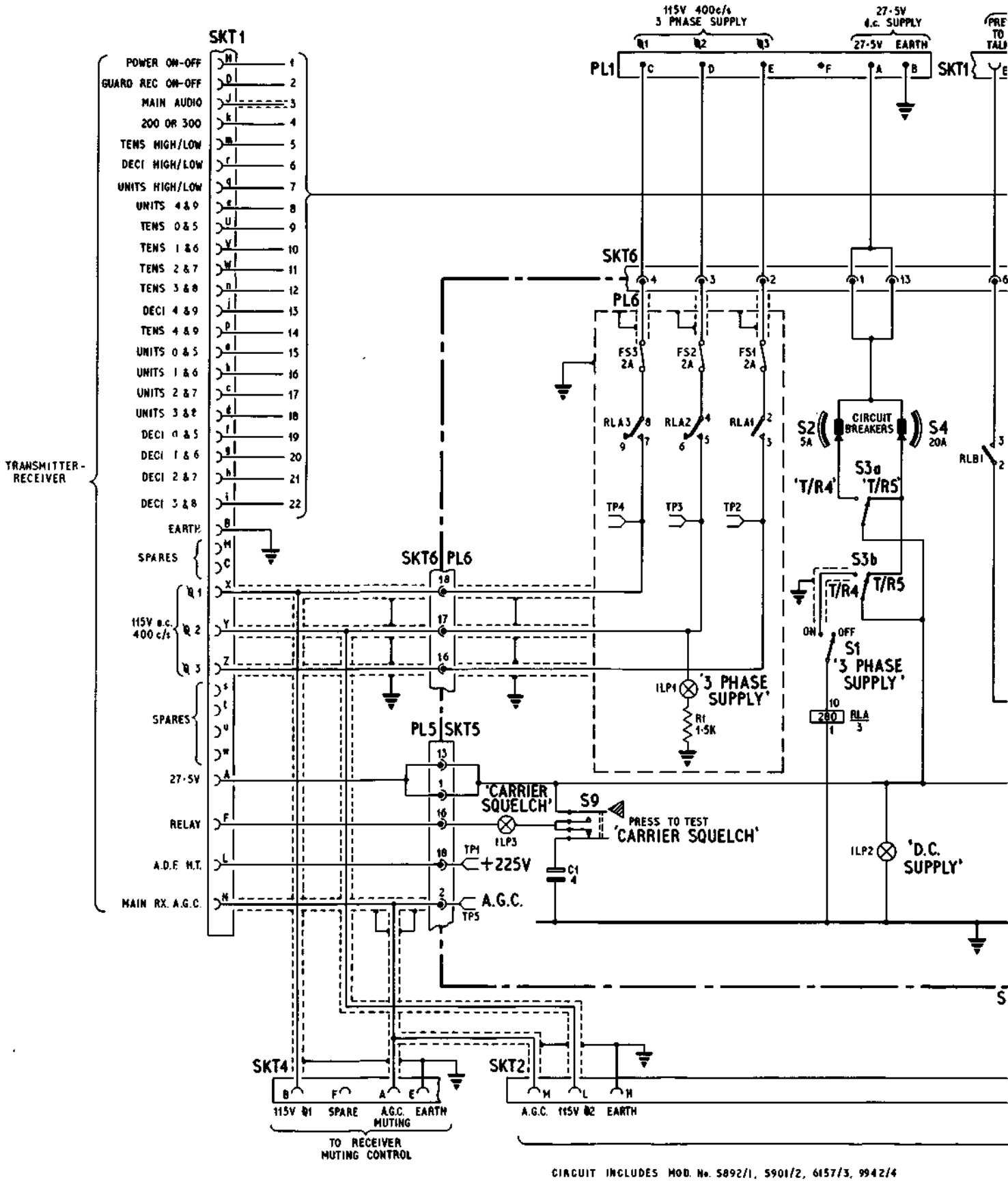
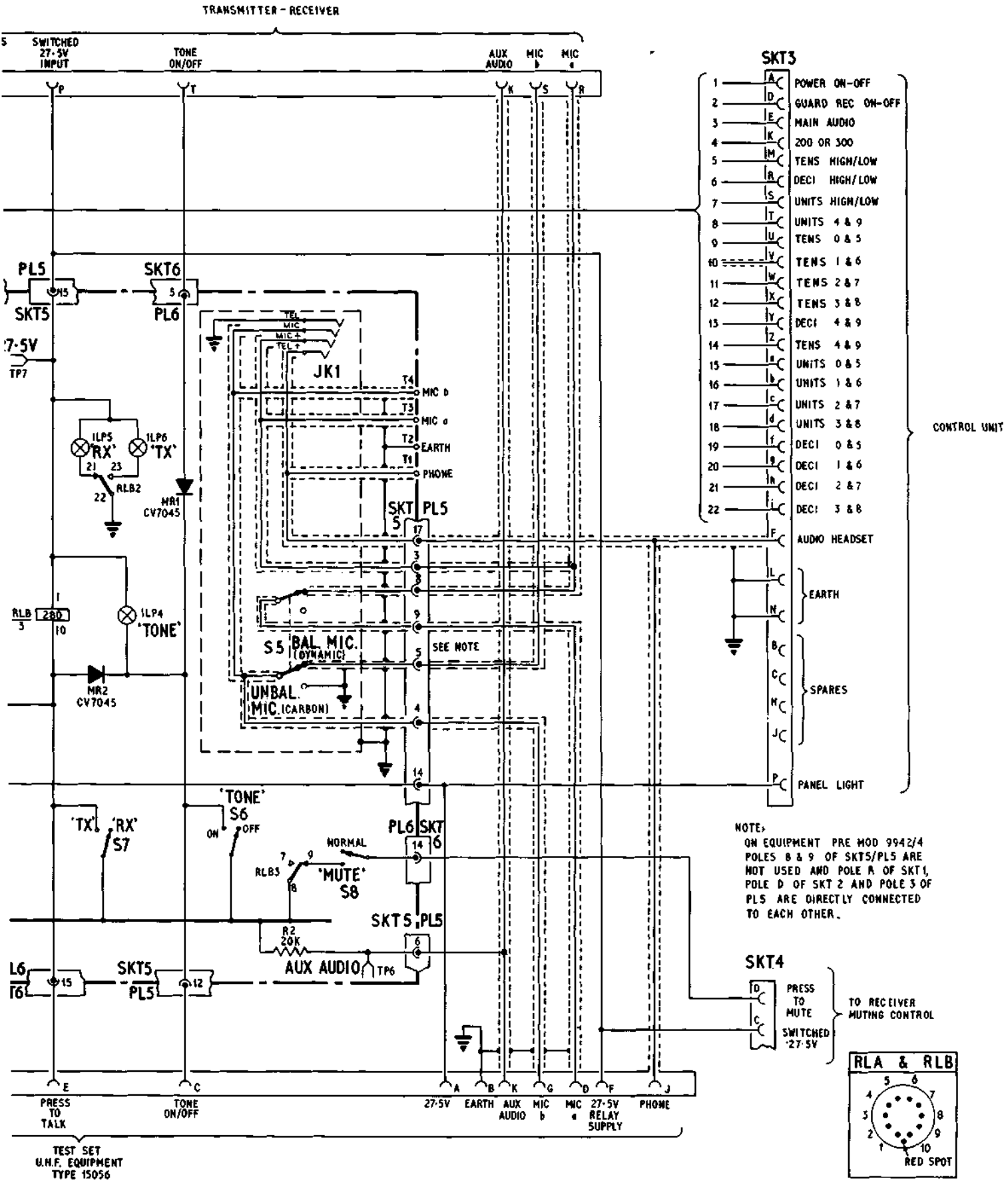


Fig. 7

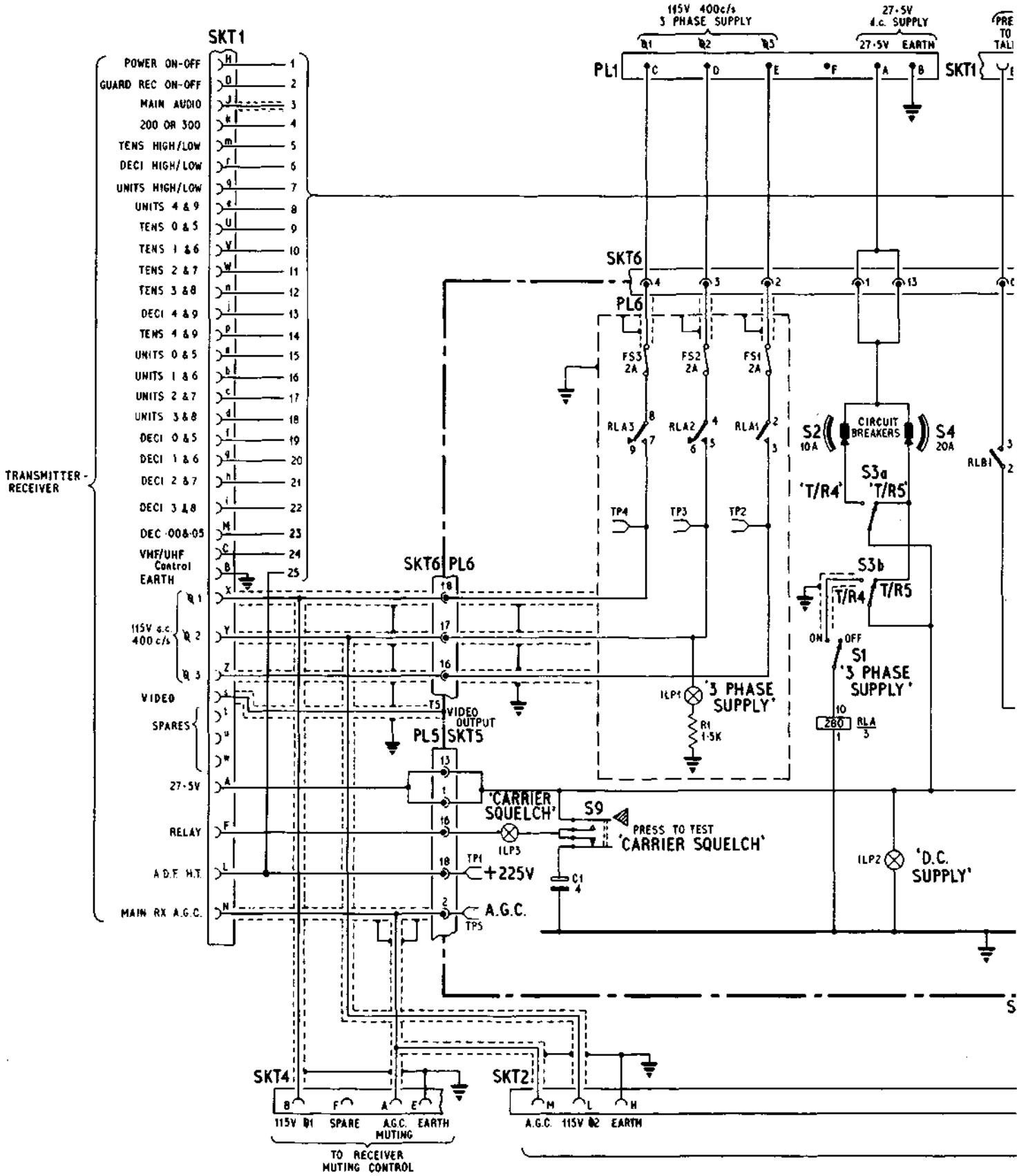
A.L.S, Feb. 70.

Interconnecting box 5



21-99-932-1919: circuit

Fig. 7



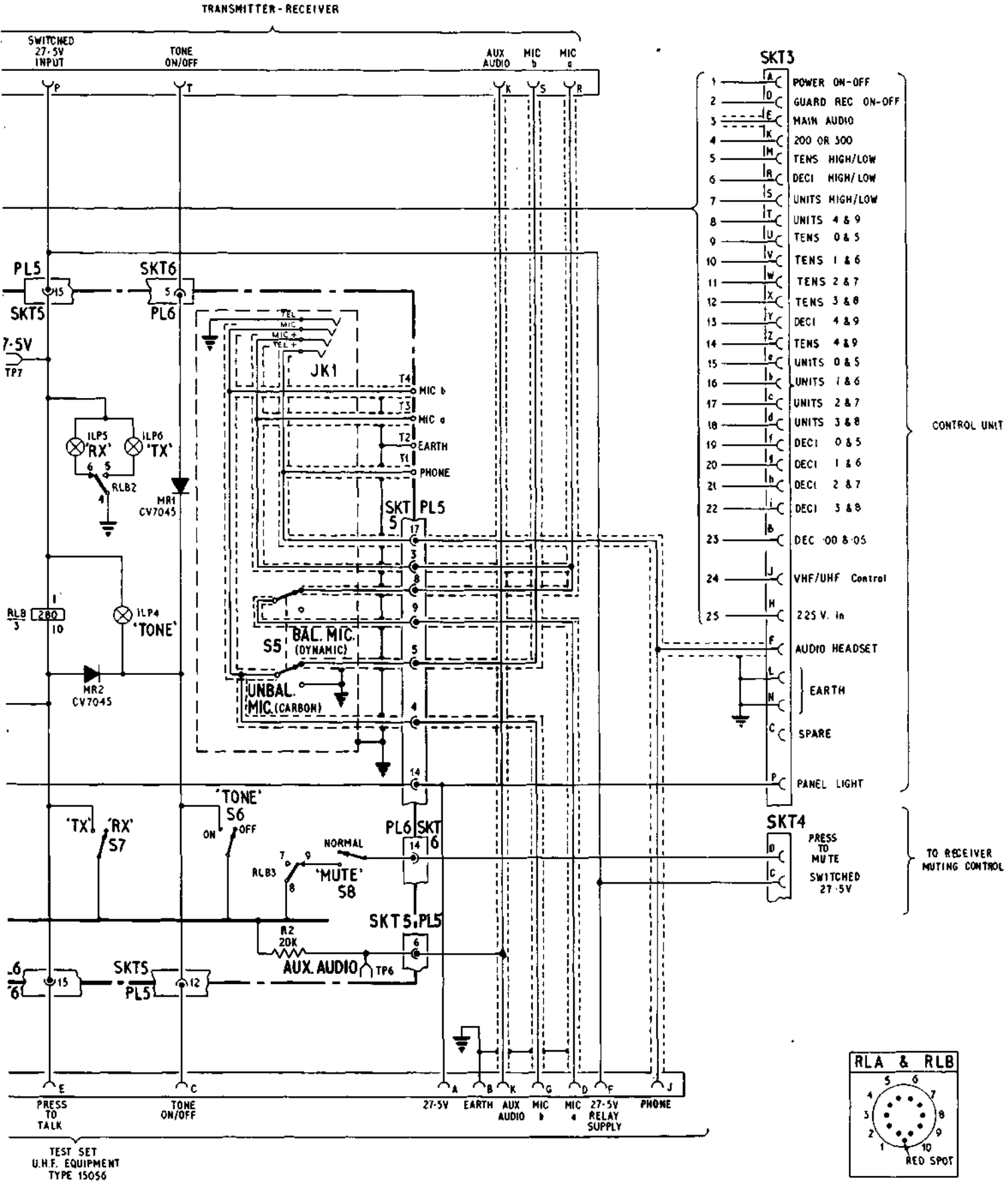
CIRCUIT INCLUDES MOD No. 5892/1, 5901/2, 6457/3, 8411/4, 9942/5, 1585/6.

956/4 840296 526021 790 5/70

Fig. 8

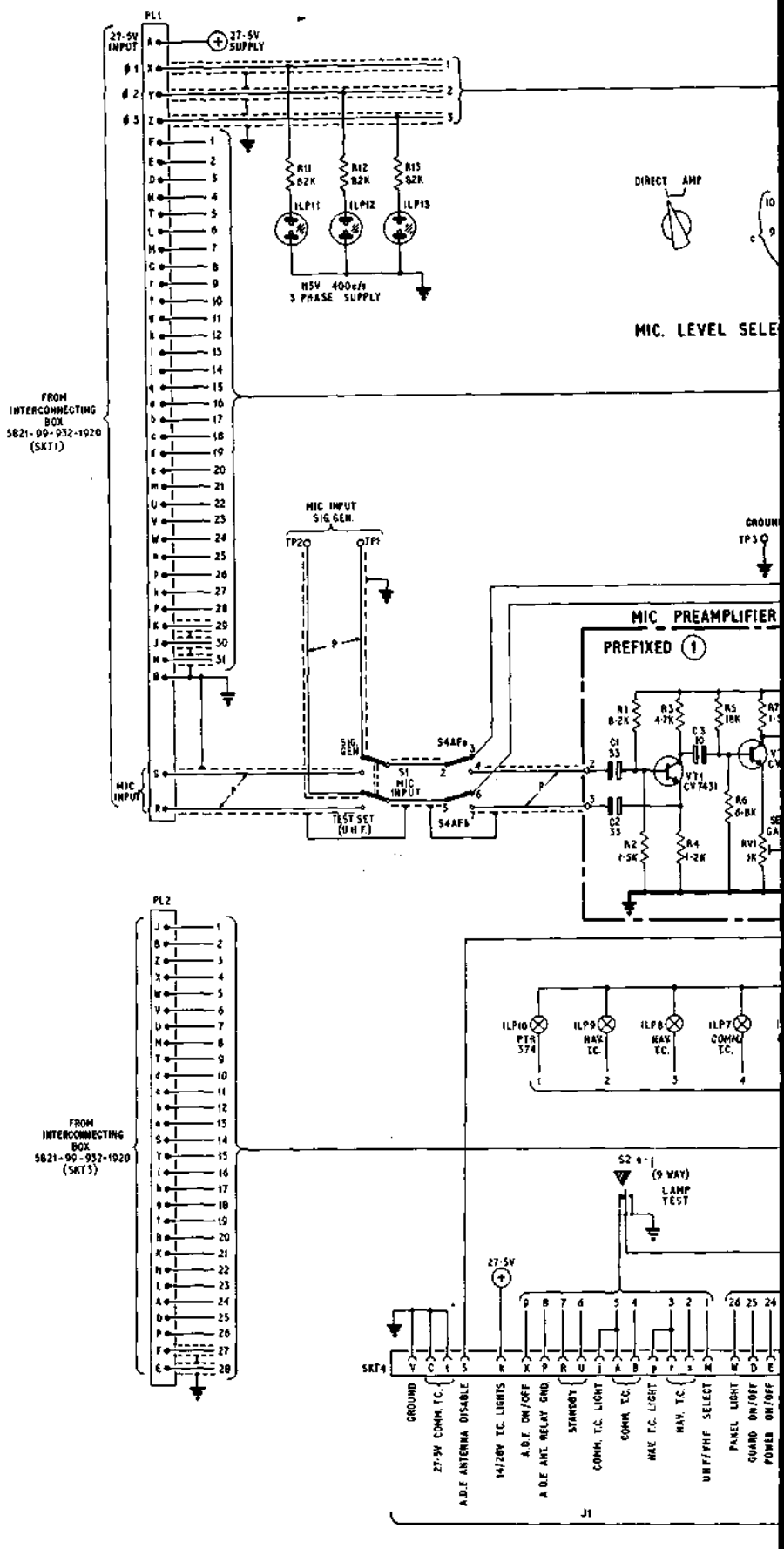
A.L.5, Feb. 70.

Interconnecting box 5



21-99-932-1920 : circuit

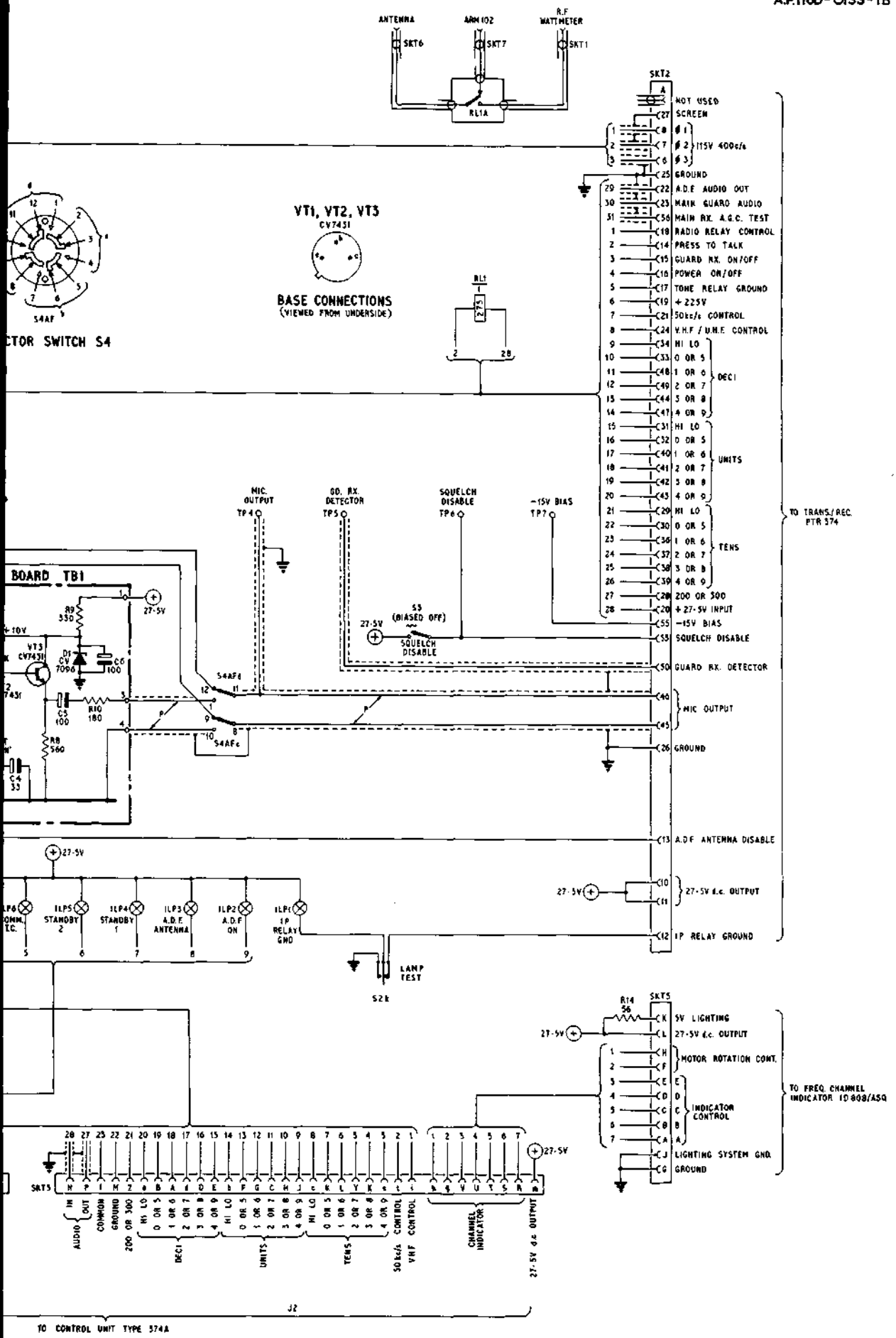
Fig. 8



956/4 630559 373222 829 1/69

Fig. 9
A.L.2, Aug '68

Intercon



necting box 5840-99-107-6455: circuit

Fig. 9
2

Chapter 3

TEST KIT (AN/ARC52) 6625-99-943-6904

LIST OF CONTENTS

LIST OF TABLES

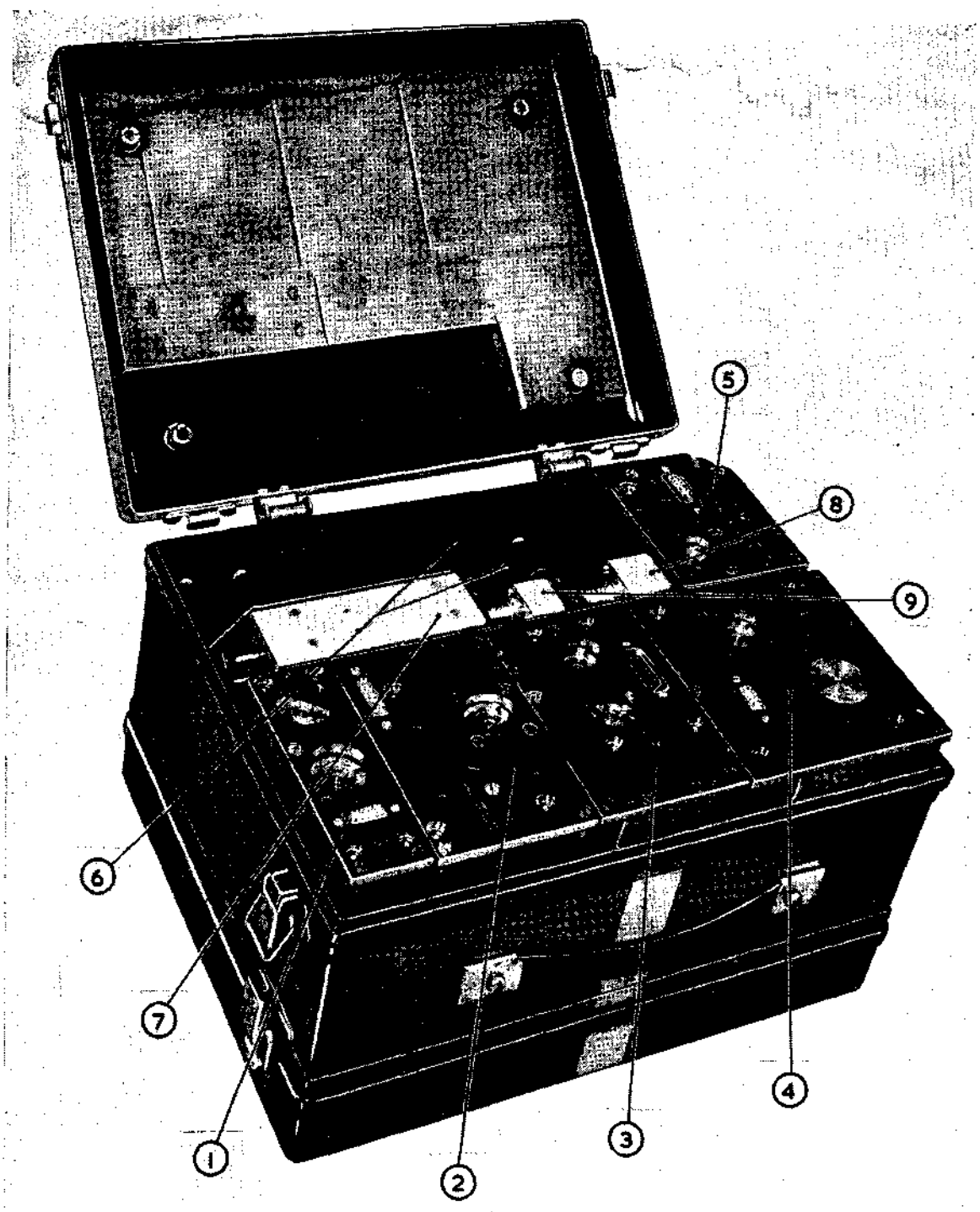
LIST OF ILLUSTRATIONS

General

1. The test kit (AN/ARC52), 6625-99-943-6904, as supplied complete with carrying case for R.A.F. use is illustrated in fig. 1. For R.N. servicing purposes, the contents only are supplied. The test kit comprises the items listed in Table 1.

Test pedestals

2. The test pedestals which form part of the test kit (AN/ARC52) (Table 1, item 1 to 5) are shown in fig. 2. They constitute stands which enable the mechanically tuned sub-units under test to be raised above the level of the remaining modules to facilitate adjustment or alignment. Connection to the main chassis assembly is by means of extension connectors incorporated in each pedestal. The tuning mechanism is operated by the extension shafts in each pedestal which are fitted with Oldham couplers for engagement with the couplers on the gear plate assembly of the main chassis assembly.



KEY

No.	ITEM	No.	ITEM
1.	PEDESTAL, OSCILLATOR, TEST	7.	MONITOR, RADIO FREQUENCY
2.	PEDESTAL, SPECTRUM GENERATOR, TEST	8.	SOCKET ASSEMBLY ELECTRICAL (ADAPTOR) 5935-99-932-1911
3.	PEDESTAL, INTERMEDIATE FREQUENCY, TEST	9.	SOCKET ASSEMBLY ELECTRICAL (ADAPTOR) 5935-99-932-1912
4.	PEDESTAL, POWER AMPLIFIER, TEST		
5.	PEDESTAL, RECEIVER, TEST		
6.	MAINTENANCE KITS, ELECTRONIC EQUIPMENT		

Fig. 1. Test kit (AN/ARC52) with lid of carrying case open

TABLE 1

Test kit (AN/ARC52)—contents

Item No.	Description	Cat. No.
1	Pedestal, intermediate frequency, test	6625-99-943-6880
2	Pedestal, oscillator, test	6625-99-943-6881
3	Pedestal, power amplifier, test	6625-99-943-6882
4	Pedestal, receiver test	6625-99-943-6883
5	Pedestal, spectrum generator, test	6625-99-943-6884
6	Cable assembly, radio frequency	5995-99-932-1905
7	Cable assembly, radio frequency	5995-99-932-1907
8	Cable assembly, radio frequency	5995-99-932-1909
9	Cable assembly, radio frequency	5995-99-932-2129
10	Cable assembly, radio frequency (4 off)	5995-99-932-2130
11	Cable assembly, radio frequency	5995-99-932-4021
12	Cable assembly, radio frequency (3 off)	5995-99-951-4456
13	Cable assembly, radio frequency (2 off)	5995-99-951-4457
14	Socket assembly, electrical (adaptor)	5935-99-932-1911
15	Socket assembly, electrical (adaptor)	5935-99-932-1912
16	Adaptor, electrical, plug to plug (8 off)	5935-99-945-0059
17	Cable assembly, power, electrical	5995-99-932-1799
18	Cable assembly, power, electrical	5995-99-932-1803
19	Cable assembly, power, electrical	5995-99-932-1902
20	Cable assembly, power, electrical	5995-99-932-1903
21	Cable assembly, power, electrical	5995-99-932-1908
22	Cable assembly, power, electrical (4 off)	5995-99-932-1910
23	Cable assembly, power, electrical	5995-99-951-4458
24	Monitor, radio frequency	6625-99-943-6879
25	Maintenance kit, electronic equipment (formerly tool kit, radio adjustment) (10 piece)	5821-99-943-1512
26	Maintenance kit, electronic equipment (formerly tool kit, radio adjustment) (6 piece)	5821-99-932-4985

Coaxial connectors and adaptors (fig. 3)

3. These connectors and adaptors (Table 1, items 6 to 16) are used in conjunction with the test pedestals for connecting the sub-units to the transmitter-receiver and also for connecting up test equipment, such as a signal generator, to the modules under test. The cable assembly, radio frequency 5995-99-932-4021 (Table 1, item 11) incorporates a 39 ohm, $\frac{1}{4}$ watt, series resistor which is encapsulated in the adaptor at one end. This provides impedance matching of the signal generator Type 56 (output Z = 10 ohms) to the module input (50 ohms).

Multi-way connectors (fig. 4)

4. These connectors are listed in Table 1 (items 17 to 23) and are employed for connecting the chassis and sub-units when the latter are operated after removal from the chassis.

Monitor, radio frequency

5. The monitor, radio frequency, 6625-99-943-6879 (Table 1, item 24) is shown in fig. 5. It consists of a coaxial 50-ohm termination and is provided with a detector circuit which enables the output level of the spectrum generator unit to be tested using a multimeter, electronic, CT429 which measures the d.c. voltage at the detector.

6. The circuit of this monitor is shown in fig. 6. The r.f. signal which is applied to the nominal 50-ohms input circuit, consisting of the coaxial socket SKT1 and resistor R1, is fed to the detector circuit comprising the germanium diode MR1 ◀(CV7110)▶, capacitor C1 and the resistor R2. The resultant voltage appears at the two spring loaded terminals, which provide connections for the external meter (CT429) used for measuring the output.

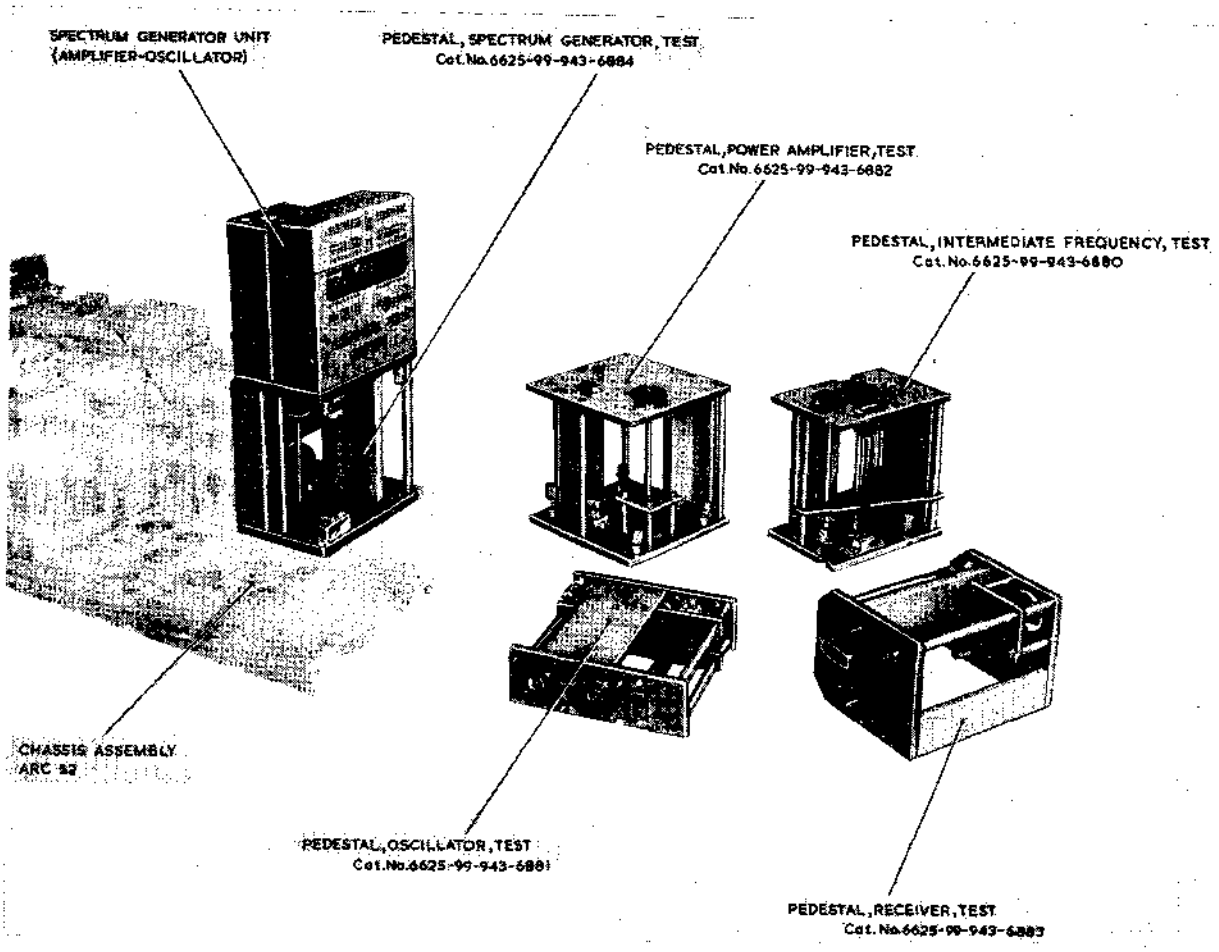


Fig. 2. Test pedestals—showing methods of use

Maintenance kits, electronic equipment (fig. 7)

7. Both maintenance kits (Table 1, items 25 and 26) are incorporated in the test kit (AN/ARC 52) and contain the special tools required during the testing and alignment of the transmitter-receiver; the use of each item is described at the relevant stages of the procedures. In the illustration, the tools are annotated with key numbers corresponding with the item numbers in Tables 2 and 3 which list each item in the two maintenance kits.

Modifications

8. This chapter is amended to include changes resulting from the modifications summarized in Table 4. Details of these modifications are contained in Vol. 2 of this Air Publication.

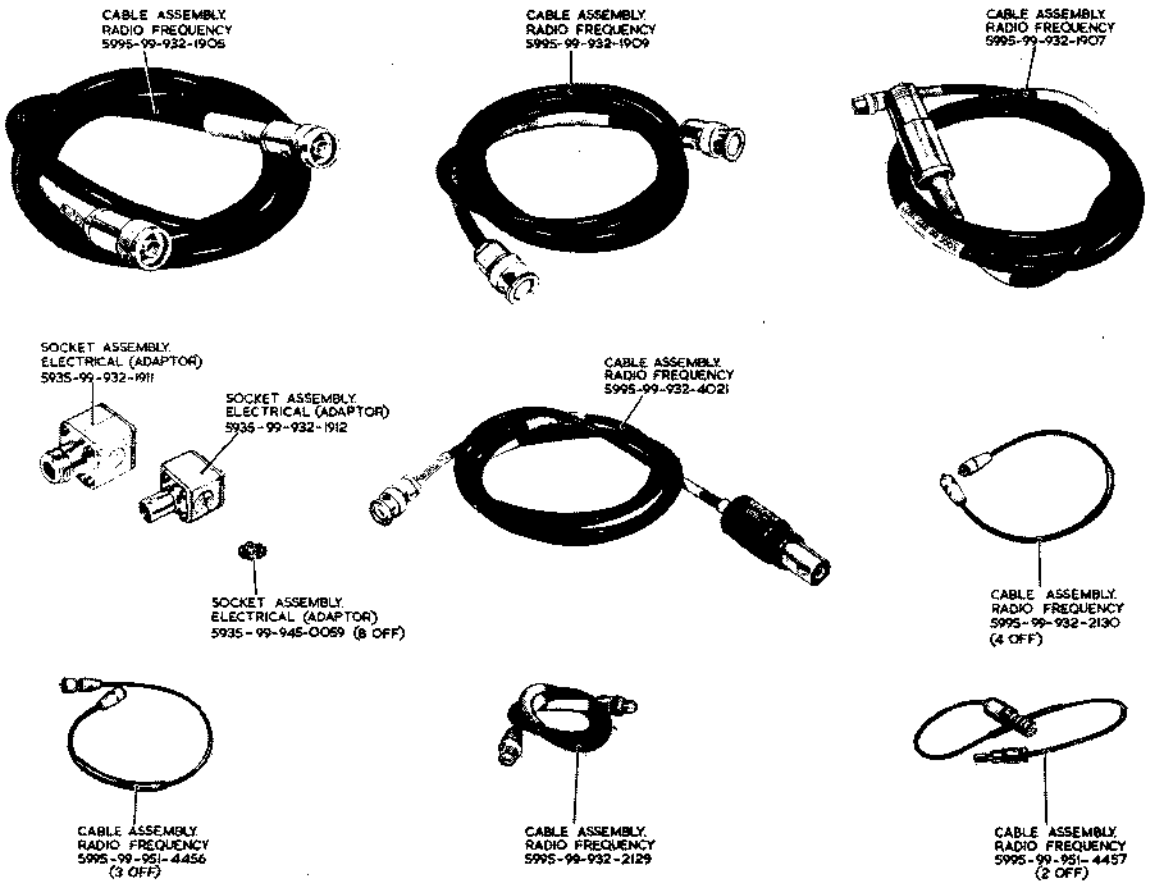


Fig. 3. Test kit (AN/ARC52) coaxial connectors and adaptors

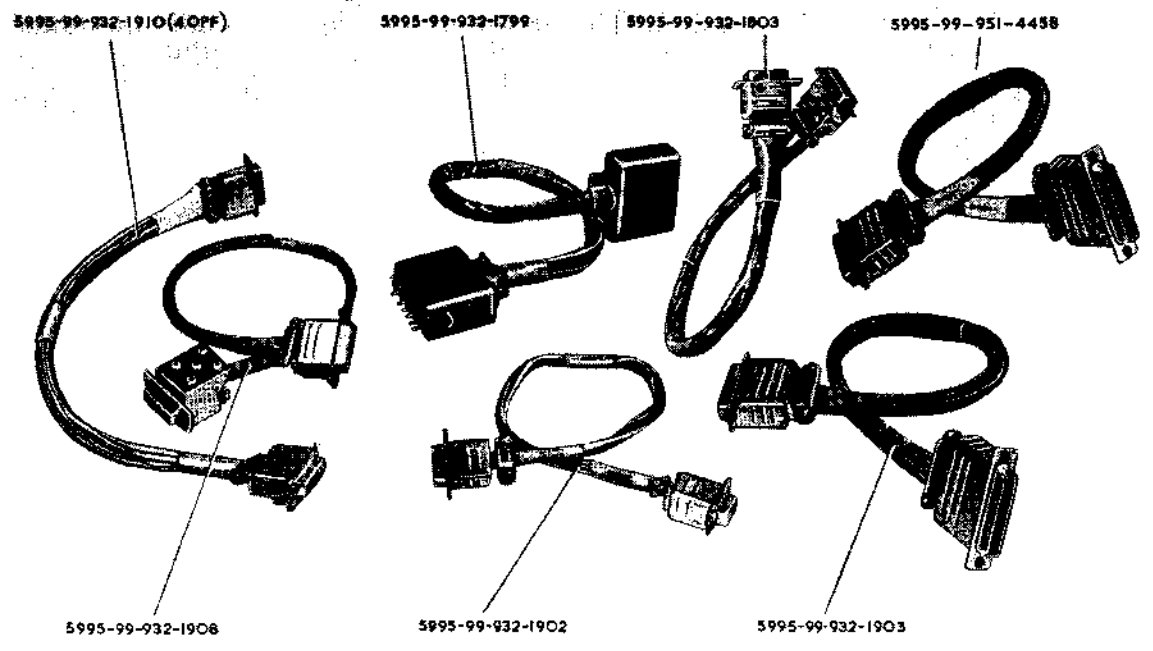


Fig. 4. Test kit (AN/ARC52) multi-way connectors

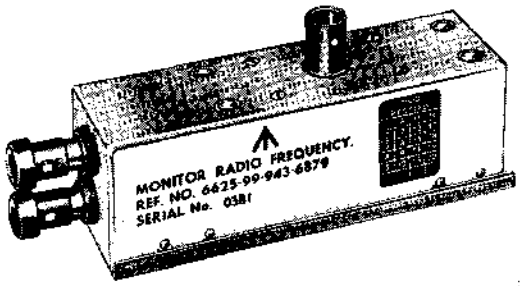


Fig. 5. Monitor, radio frequency 6625–99–943–6879

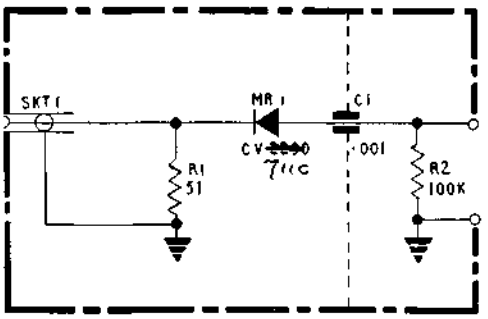


Fig. 6. Monitor, radio frequency, 6625–99–943–6879: circuit

TABLE 2

Maintenance kit, electronic equipment, 5821–99–943–1512—contents

Item No.	Description	Cat. No.
1	Alignment tool, electronic equipment	5120–99–942–9597
2	Alignment tool, electronic equipment	5120–99–942–9598
3	Alignment tool, electronic equipment	5120–99–942–9599
4	Tuning wand, electronic equipment	5120–99–943–1514
5	Alignment tool, electronic equipment	5120–99–943–7322
6	Wrench, key (No. 4 Bristow)	5120–99–942–9648
7	Wrench, key (No. 6 Bristow)	5120–99–942–9649
8	Wrench, key (No. 8 Bristow)	5120–99–942–9650
9	Wrench, key ($\frac{1}{8}$ in. Allen)	5120–99–942–9651
10	Screwdriver, cross tip	5120–99–942–9504
11	Carrier, tool	5140–99–943–1511

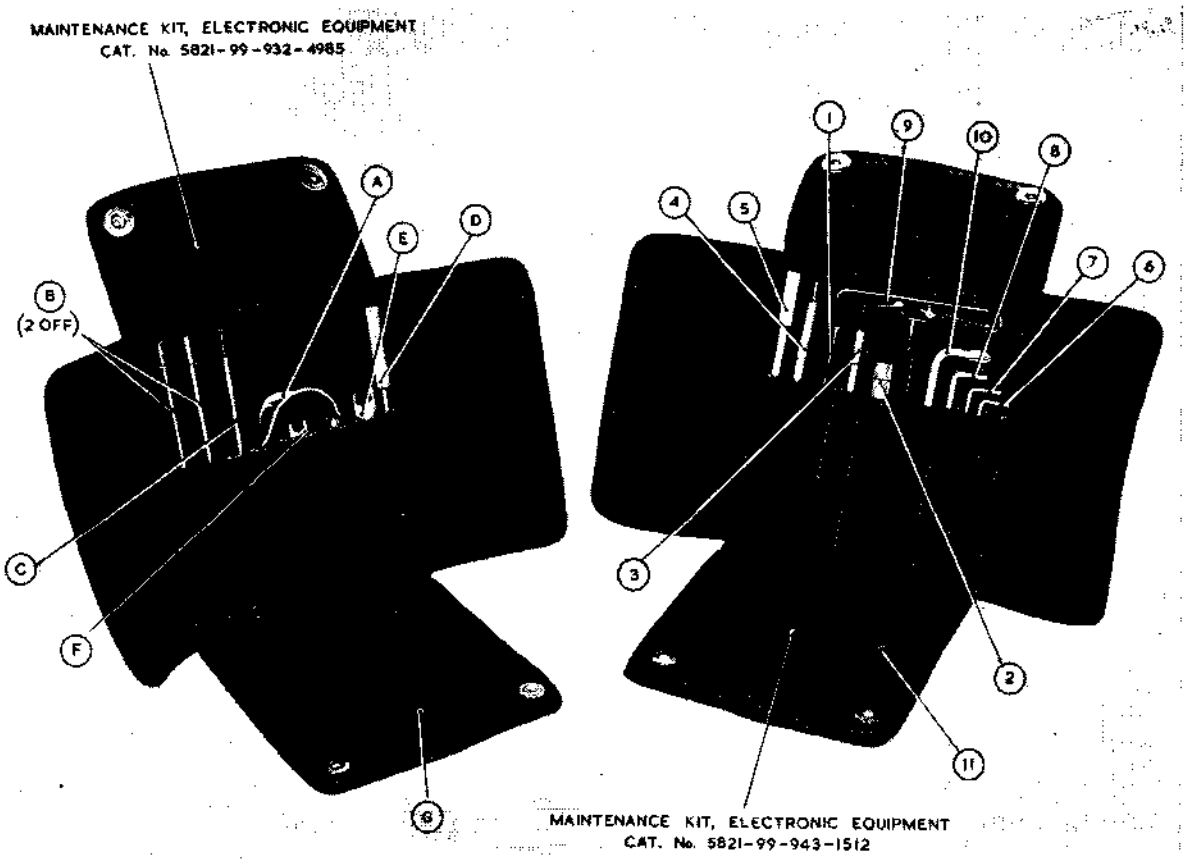


Fig. 7. Maintenance kits, electronic equipment

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TABLE 3

Maintenance kit, electronic equipment 5821-99-932-4985—contents

Item No.	Description	Cat. No.
A	Extractor, electronic valve	5120-99-946-1108
B	Test lead attachment (2 off)	6625-99-943-7028
C	Test lead attachment	6625-99-999-0840
D	Alignment tool, electronic equipment	5120-99-943-8594
E	Spanner, open jaw, fixed	5120-99-120-0368
F	Spanner, open jaw, fixed	5120-99-951-4455
G	Carrier, tool	5140-99-943-8847

TABLE 4

Modifications

Mod. No.	Class	Vol. 2 Leaflet	Vol. 2 A.L.	Label No.	Brief details of change
			TEST KIT 6625-99-943-6904		
8379	B/3 by return to Contractor (R.A.F.)	B102	159	1	Add six new cable assemblies, replace the contents label with an amended contents label and add a modification record label; provides facilities for testing ARC52 derivatives. Mod. Nos. 8380 and 8381 are associated.
			PEDESTAL, RECEIVER TEST 6625-99-943-6883		
8380	B/3 by return to Contractor (R.A.F.)	B103	160	1	Provide a hole and cut-out in the base plate to provide facilities for testing ARC52 derivatives. Mod. Nos. 8379 and 8381 are associated.
			MAINTENANCE KIT, ELECTRONIC EQUIPMENT 5821-99-932-4958		
8381	B/3 by return to Contractor (R.A.F.)	B104	161	—	Add a spanner, open jaw, fixed 5120-99-951-4455, to the contents of the kit to provide facilities for testing ARC52 derivatives. Mod. Nos. 8379 and 8380 are associated.
			CONNECTOR 5995-99-932-1905 AND CONNECTOR 5995-99-935-1907		
5700	B/3	B38	49	N/A	Fit an improved plug, known as Type "UKN". Introduced to prevent short circuiting of coaxial cable conductor to the screen, caused by rotation of Type "N" connectors breaking off pieces of the screen.

Chapter 4

MODULE TEST KITS

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Introduction

1. The test kit, transmitter-receiver, radio 6625–99–999–3075 and the test rig, electronic 6625–99–194–9028 (both referred to hereinafter as test kits) are compound equipments designed for the test and alignment of individual modules of transmitter-receiver Type ARC52 and PTR374 respectively, when the modules are removed from the parent equipment. Provision is also made for testing the associated control units. The PTR374 test kit is designed to be compatible for use with both ARC52 and PTR374 modules, but the ARC52 test kit can only be used with ARC52 modules and those modules which are common to both parent transmitter-receivers. This chapter describes both test kits and their methods of use, while A.P.116D–0105–1, 2nd edition, Chap. 8 and A.P.116D–0129–1, Chap. 7 describe the test and alignment procedures for each module and control unit of the ARC52 and PTR374 respectively.

Description

2. The test kits are designed for use in R.N. second line servicing and, as they permit the test and alignment of individual modules of the transmitter-receivers without the necessity for mounting them on the main chassis assembly, the test kits are of particular advantage in workshops where bench space is limited. Some items of the test kits are used at R.A.F. third line servicing.

3. Both test kits comprise a series of test sets or jigs, together with associated interconnecting boxes, and the necessary connectors for the interconnections between the module under test and the various items of test equipment. The complete ARC52 test kit comprises the items listed in Table 1 and that for the PTR374 the items listed in Table 2. In addition, certain modules, of known serviceability and performance, of the parent transmitter-receivers are used in conjunction with the test kits. The ARC52 modules (used with the ARC52 test kit) are as follows:—

(1) Amplifier, radio frequency (main receiver and transmitter pre-amplifier) 5821–99–942–8554, which is used for testing the amplifier, radio frequency (r.f. power amplifier).

(2) Spectrum generator unit 5821–99–942–8552, which is used for testing the amplifier, radio frequency (main receiver and transmitter pre-amplifier) and the amplifier, radio frequency (r.f. power amplifier).

TABLE 1

Test kit, transmitter-receiver, radio 6625-99-999-3075—contents

Item No.	Description	Cat. No.	Remarks
1	Interconnecting box	5821-99-999-2643	See para. 6.
2	Test set, amplifier (1·85 MHz)	6625-99-999-2363	Used in conjunction with item 1 for testing the intermediate frequency unit (1·85 MHz).
3	Test set, radio	6625-99-999-2365	Used in conjunction with item 1 for testing the receiver unit.
4	Test set, tuning unit	6625-99-999-2644	Used in conjunction with item 1 for testing the tuning unit, radio frequency
5	Test set, amplifier (modulator)	6625-99-999-2364	Used in conjunction with item 1 for testing the modulator, radio transmitter.
6	Test set, amplifier (audio)	6625-99-999-2366	Used in conjunction with item 1 for testing the amplifier, audio frequency.
7	Test set, control unit	6625-99-952-8806	Used in conjunction with item 1 for testing the control, radio set Type C1607/4.
8	Test jig, oscillator	6625-99-999-1046	Used for testing the spectrum generator.
9	Test set, amplifier (main receiver and transmitter pre-amplifier)	6625-99-999-2362	Used for testing the amplifier, radio frequency (main receiver and transmitter pre-amplifier).
10	Test jig, power amplifier	6625-99-999-1865	Used for testing the amplifier, radio frequency (r.f. power amplifier).
11	Test set, amplifier (20–30 MHz)	6625-99-999-4424	Used for testing the intermediate frequency unit (20–30 MHz)
12	Test set, oscillator	6625-99-999-2384	Used for testing the oscillator unit.
13	Interconnecting box	5821-99-999-0819	Used in conjunction with item 14 for testing the power unit, direct current.
14	Dummy load, electrical	5985-99-999-1866	Used in conjunction with items 13 and 15.
15	Cable assembly, power, electrical	5995-99-945-9895	4-pole, one socket outlet only (2 off).
16	Cable assembly, power, electrical	5995-99-932-1903	25-pole, plug and socket outlets.
17	Cable assembly, power, electrical	6150-99-999-8159	30-pole, plug and socket outlets.
18	Cable assembly, power, electrical	6625-99-952-8802	6-pole, plug and socket outlets.
19	Cable assembly, power, electrical	5995-99-932-1910	15-pole, plug and socket outlets.
20	Cable assembly, power, electrical	6625-99-952-8801	30-pole, socket outlets.
21	Cable assembly, power, electrical	6150-99-999-8158	10-pole, 12-pole plug and 10-pole socket outlets.

TABLE 1 (*continued*)

Item No.	Description	Cat. No.	Remarks
22	Cable assembly, power, electrical	6150–99–999–8160	10-pole, plug and socket outlets.
23	Cable assembly, power, electrical	6150–99–999–4743	25-pole, plug and socket outlets.
24	Clip, spring tension	5340–99–915–0268	Used with item 11 for securing Oldham couplers of module under test (2 off).

TABLE 2

Test rig, electronic 6625–99–194–9028—contents

Item No.	Description	Cat. No.	Remarks
1	Interconnecting box, test set	6625–99–194–5275	See para. 16.
2	Test set, amplifier (1·8/1·85 MHz)	6625–99–194–5273	Used in conjunction with item 1 for testing the amplifier, intermediate frequency (1825/500 kHz).
3	Test set, radio	6625–99–999–2365	Used in conjunction with item 1 for testing the receiver unit.
4	Test set, tuning unit	6625–99–999–2644	Used in conjunction with item 1 for testing the tuning unit, radio frequency
5	Test set, amplifier (modulator)	6625–99–999–2364	Used in conjunction with item 1 for testing the modulator, radio transmitter.
6	Test set, amplifier (audio)	6625–99–999–2366	Used in conjunction with item 1 for testing the amplifier, audio frequency.
7	Control, interconnecting box, test set	6625–99–194–5272	Used in conjunction with item 1 for testing the control, radio set Type PTR374A.
8	Test jig, oscillator	6625–99–999–1046	Used for testing the amplifier-oscillator (spectrum generator).
9	Test set, amplifier (pre-amplifier)	6625–99–194–9019	Used in conjunction with item 10 for testing the amplifier, radio frequency (v.h.f./u.h.f. r.f. amplifier).
10	Test rig, amplifier (receiver and transmitter pre-amplifier).	6625–99–194–9064	Used in conjunction with item 9.
11	Test jig, power amplifier	6625–99–999–1865	Used for testing the amplifier, radio frequency (r.f. power amplifier).
12	Test set, amplifier (20–30 MHz)	6625–99–194–5274	Used for testing the amplifier, intermediate frequency (20–30 MHz).
13	Test set, oscillator	6625–99–999–2384	Used for testing the oscillator unit.
14	Test set, relay-oscillator	6625–99–955–6582	Used in conjunction with item 15 for testing the amplifier-oscillator-relay assembly.

TABLE 2 (*continued*)

Item No.	Description	Cat. No.	Remarks
15	Interconnecting box	6625-99-955-6584	Used in conjunction with item 14.
16	Interconnecting box	5821-99-999-0819	Not used with PTR374.
17	Dummy load, electrical	5985-99-999-1866	Used in conjunction with item 18.
18	Test set, electrical power	6625-99-194-6536	Used in conjunction with item 17 for testing power supplies.
19	Maintenance kit	6625-99-194-9018	See Table 3.

TABLE 3

Maintenance kit (Table 2, item 19) 6625-99-194-9018—contents

Item No.	Description	Qty.	Cat. No.	Remarks
1	Cable assembly, power, electrical	1	5995-99-932-4017	12-pole, plug and socket outlets.
2	Cable assembly, power, electrical	2	5995-99-945-9895	4-pole, one socket outlet only.
3	Cable assembly, power, electrical	1	6150-99-999-8159	30-pole, plug and socket outlets.
4	Cable assembly, radio frequency	1	5995-99-932-4021	Coaxial, plug and socket outlets.
5	Cable assembly, power, electrical	1	5995-99-932-1910	15-pole, plug and socket outlets.
6	Wiring harness	1	6625-99-194-5276	41-pole, plug and socket outlets.
7	Wiring harness	1	6625-99-194-5277	41-pole, plug and socket outlets.
8	Cable assembly, power, electrical	1	6150-99-999-8158	10-pole, 12-pole plug and 10-pole socket outlets.
9	Cable assembly, power, electrical	1	6625-99-194-9065	20-pole, plug and socket outlets.
10	Cable assembly, power, electrical	2	6150-99-999-8160	10-pole, plug and socket, outlets.
11	Cable assembly, radio frequency	1	5995-99-932-1907	Coaxial, plug outlets.
12	Cable assembly, radio frequency	1	6625-99-194-9066	Coaxial.
13	Cable assembly, radio frequency	2	5995-99-955-6580	Coaxial, plug outlets.
14	Cable assembly, radio frequency	6	5995-99-932-2130	Miniatures coaxial, plug outlets.
15	Cable assembly, radio frequency	1	5995-99-932-1909	Coaxial, plug outlets.
16	Cable assembly, power, electrical	1	5995-99-955-6581	42-pole, plug and socket outlets.
17	Wiring harness	1	6625-99-194-5278	4-pole, plug and socket outlets.

TABLE 3 (*continued*)

Item No.	Description	Qty.	Cat. No.	Remarks
18	Wiring harness, branched	1	6625–99–194–5279	18-pole, one socket and five plug outlets.
19	Cable assembly, power, electrical	1	6150–99–999–4743	25-pole, plug and socket outlets.
20	Cable assembly, power, electrical	1	5995–99–932–1903	25-pole, plug and socket outlets (not used with PTR374).
21	Lead, testing	1	6625–99–943–3486	Used in conjunction with Table 2, item 3.
22	Adaptor, electrical, plug-to-plug	1	5935–99–196–4636	Coaxial plug-to-plug adaptor.
23	Adaptor, electrical, plug-to-socket	1	5935–99–940–1652	Coaxial plug-to-socket adaptor.
24	Socket assembly, electrical	1	5935–99–932–1912	BNC to miniature coaxial adaptor.
25	Socket assembly, electrical or adaptor, electrical, plug-to-plug	8	5935–99–932–2381 5935–99–945–0059	Miniature coaxial plug-to-plug adaptor
26	Cover, guard receiver, test side	1	5821–99–932–2388	Used in conjunction with Table 2, item 3.
27	Cover, spectrum generator, test side	1	5821–99–932–1916	Used in conjunction with Table 2, item 8.
28	Thumbscrew	12	5305–99–943–7755	Used for securing items 26 and 27.
29	Clip, spring tension	2	5340–99–915–0268	Used with Table 2, item 12 for securing Oldham couplers of module under test.
30	Alignment tool, electronic equipment.	1	5120–99–120–0367	Used for capacitor vane adjustment.
31	Maintenance kit, electronic equipment.	1	5821–99–943–1512	See Chap. 3, Table 2.
32	Maintenance kit, electronic equipment	1	5821–99–932–4985	See Chap. 3, Table 3.

4. The PTR374 modules (used with the PTR374 test kit) are as follows:—

(1) Amplifier, radio frequency (v.h.f./u.h.f. r.f. amplifier) 5821–99–971–1785, which is used for testing the amplifier, radio frequency (r.f. power amplifier).

(2) Amplifier oscillator (spectrum generator) 5840–99–107–5451, which is used for testing the amplifier, radio frequency (v.h.f./u.h.f. r.f. amplifier) and the amplifier, radio frequency (r.f. power amplifier).

5. In general, the module under test is mounted on the appropriate test set or jig, which is provided with the necessary plugs and/or sockets for connecting the module to the test equipment. Those test sets or jigs which are used for testing tuneable modules are provided with manual controls for setting the modules to particular frequencies for alignment purposes. Power supplies for use with the test kits are derived from the power supply (425V) 5821–99–932–2942, which is described in Chap. 5, but a separate 28V (nominal) d.c. supply is required for testing the transmitter-receiver power supplies, the tuning unit, radio frequency and the control, radio set Type PTR374A. A 115V, 400 Hz, 3-phase supply is also required for testing the power supplies of the PTR374.

Interconnecting box 5821–99–999–2643

6. This interconnecting box (Table 1, item 1), which forms part of the ARC52 test kit, is used in conjunction with the appropriate test set and serves as the control unit when testing the following:—

(1) Intermediate frequency unit (1·85 MHz) (para. 18 to 20) 5821–99–942–8556

(2) Receiver unit (guard) (para. 23 to 25) 5821–99–942–8558

(3) Tuning unit, radio frequency (para. 26 to 29) 5821-99-942-8549

(4) Modulator, radio transmitter (para. 30 to 33) 5821-99-942-8548

(5) Amplifier, audio frequency (para. 34 to 37) 5821-99-942-8555

(6) Relay unit (para. 103) 5821-99-942-8545

(7) Control unit, transmitter-receiver radio Type C1607/ARC52 (para. 104 to 107) 5821-99-942-8543

(8) Control, radio set Type C1607/4 (para. 38 to 40) 5821-99-945-5739

7. The interconnecting box is illustrated in fig. 1 and 2, the principal connectors are shown in fig. 3 and a circuit diagram is given in fig. 36 at the end of this chapter. Supplies from the power supply (425V) are connected to the interconnecting box via the 12-pole cable assembly 5995-99-932-4017, which is supplied with the power supply, and the POWER UNIT plug PL7. The 28V (nominal) d.c. supply required for testing the tuning unit, radio frequency is connected to the interconnecting box via a 4-pole cable assembly (Table 1, item 15) and the 28V D.C. plug PL6.

8. The relay unit is connected to the interconnecting box via a 25-pole cable assembly (Table 1, item 16) and the RELAY UNIT socket SKT2. The test sets associated with the intermediate frequency unit, the receiver unit, the modulator, radio transmitter and the amplifier, audio frequency are connected to the interconnecting box via a 30-pole cable assembly (Table 1, item 17) and the TEST UNIT socket SKT4, and the same cable assembly is used to connect the test set associated with the tuning unit, radio frequency to the interconnecting box via the MECH. DRIVE plug PL3. When testing the control units, this cable assembly connects them to the interconnecting box via the CONTROL UNIT C1607 socket SKT1. The test set associated with the Type C1607/4 is connected to the interconnecting box via a 6-pole cable assembly (Table 1, item 18) and plug PL8.

9. The MODULE SELECTOR switch S1 connects power supplies to the module under test via the interlock relays RL1 and RL2, which are energized, as indicated by illumination of the SUPPLY lamp ILP13, by the operation of a switch on the module test set in use. In the AUDIO position of S1, a potentiometer chain consisting of R1, R2 and RV1 is connected in circuit. RV1, the CARRIER SQUELCH LEVEL control, is used in conjunction with the TEST socket SKT5 and the CARRIER SQUELCH push button S9 and indicator lamp ILP15 to test the

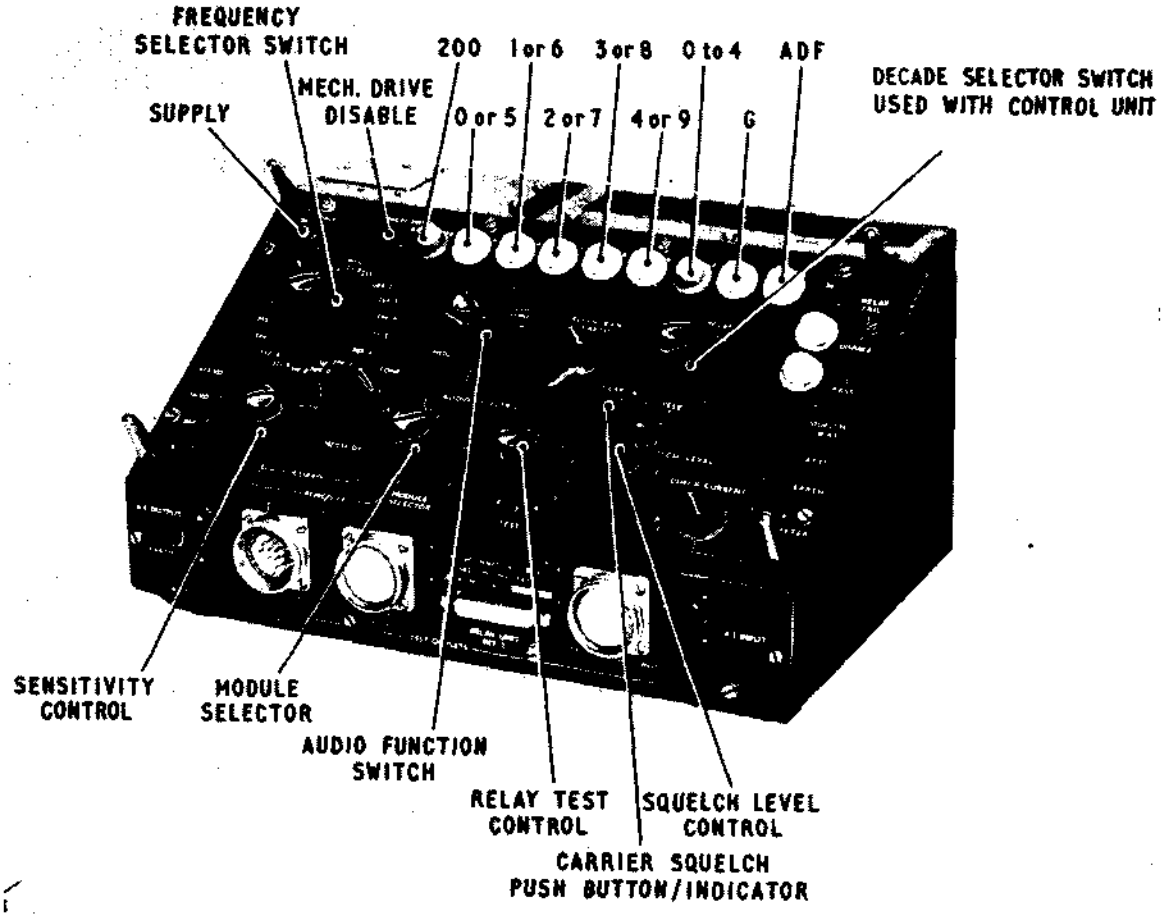

Fig. 1. Interconnecting box 5821-99-999-2643: front view

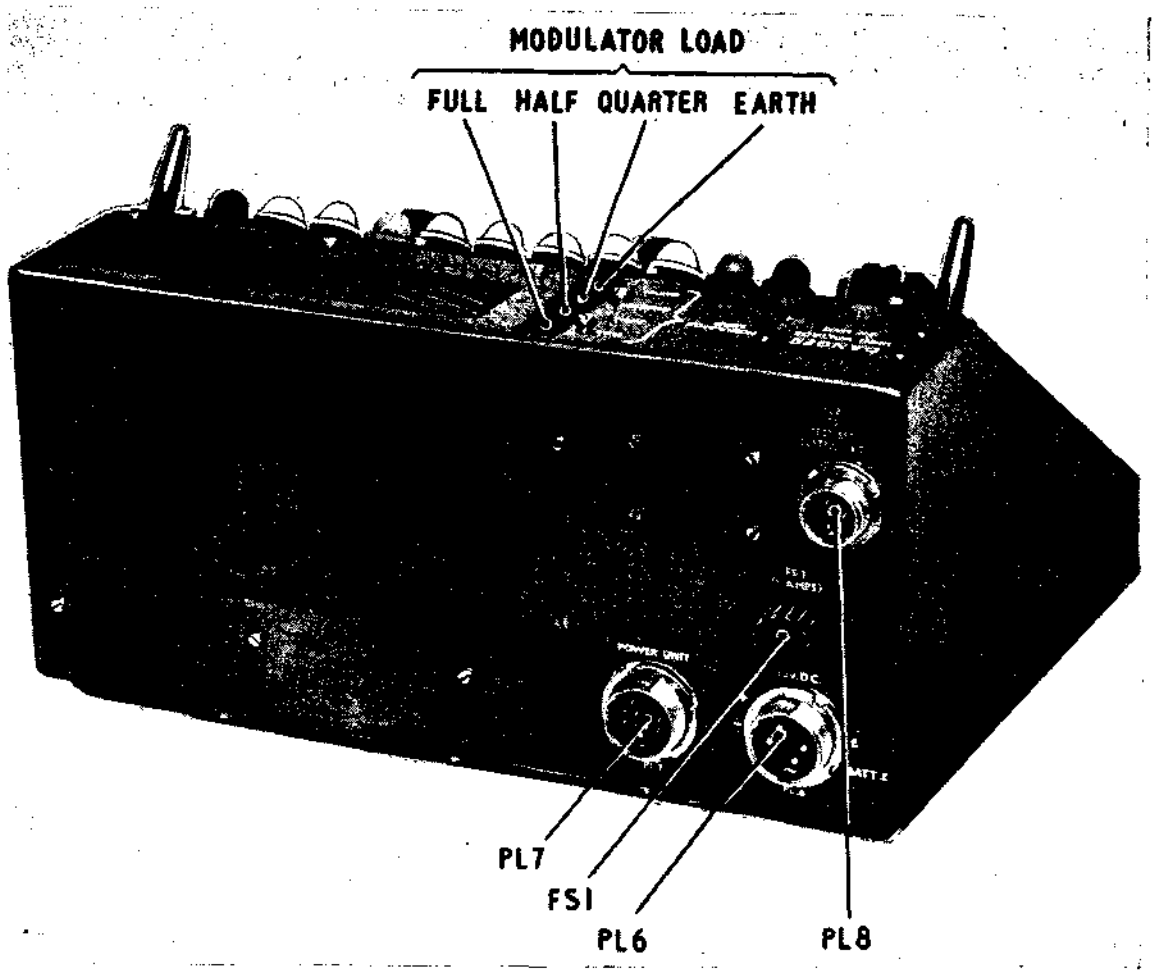

Fig. 2. Interconnecting box 5821-99-999-2643: rear view

operation of the d.c. squelch amplifier in the amplifier, audio frequency. Position 5 of S1, between the MOD and AUDIO positions, is not used.

10. Switch S2 is the AUDIO function switch, the MOD position of which is used when S1 is also set to MOD, for testing the modulator, radio transmitter. The ATT^r position of S2 is used when S1 is set to CONTROL, for testing the volume controls of the control units by measurement of the audio output at the ATT^r test socket SKT10. The other positions of S2 are used when S1 is set to AUDIO, for testing the amplifier, audio frequency. When testing the modulator, radio transmitter, the audio input signal is derived from a microphone simulator (Chap. 8), which is connected to the A.F. INPUT terminals TP1 and TP2, but for other tests the audio input is derived from a signal generator TF1370 connected to the same terminals. A load consisting of R9 and C1 is normally in circuit, but is disconnected by the opening of contacts 8 and 9 on switch wafer S2Ar when the switch is set to G for testing the receiver unit (guard receiver).

11. The frequency selector switch S3 is used, when S1 is set to MECH. DRIVE, for testing the tuning unit, radio frequency and enables all positions of each indexing drum on the module to be tested. Operation of the disable line is verified by the MECH. DRIVE DISABLE lamp ILP14. The current drawn by the module can be measured at the METER + and − TEST sockets SKT12 and SKT13 when the CHECK CURRENT switch S8 is operated.

12. The MEGACYCLES switch S4 is used (when S1 is set to CONTROL) for testing the frequency selection circuits of the control units; correct operation being indicated by the illumination in sequence of indicator lamps ILP1 to ILP9. The RE-ENTRANT EARTH switch S7 provides a test of the control unit re-entrant earth system.

13. When testing the relay unit, S1 is set to RELAY and the TEST switch S5 provides continuity tests of all connections to the unit. The appropriate circuit conditions are then indicated by the RELAY PASS, FAIL and DISABLE lamps ILP10, ILP11 and ILP12 respectively, as described in A.P.116D-0105-1, 2nd edition, Chap. 8.

14. The TONE switch S6 is used (when S1 is set to MOD) for testing the modulator, radio transmitter under tone modulation conditions. External test equipment must be disconnected from the A.F. INPUT terminals before operating the switch. Resistors R4 to R8 constitute a modulator load, which is tapped to provide quarter, half and full load voltages between test sockets SKT9 (earth) and SKT8, SKT7 and SKT6 respectively.

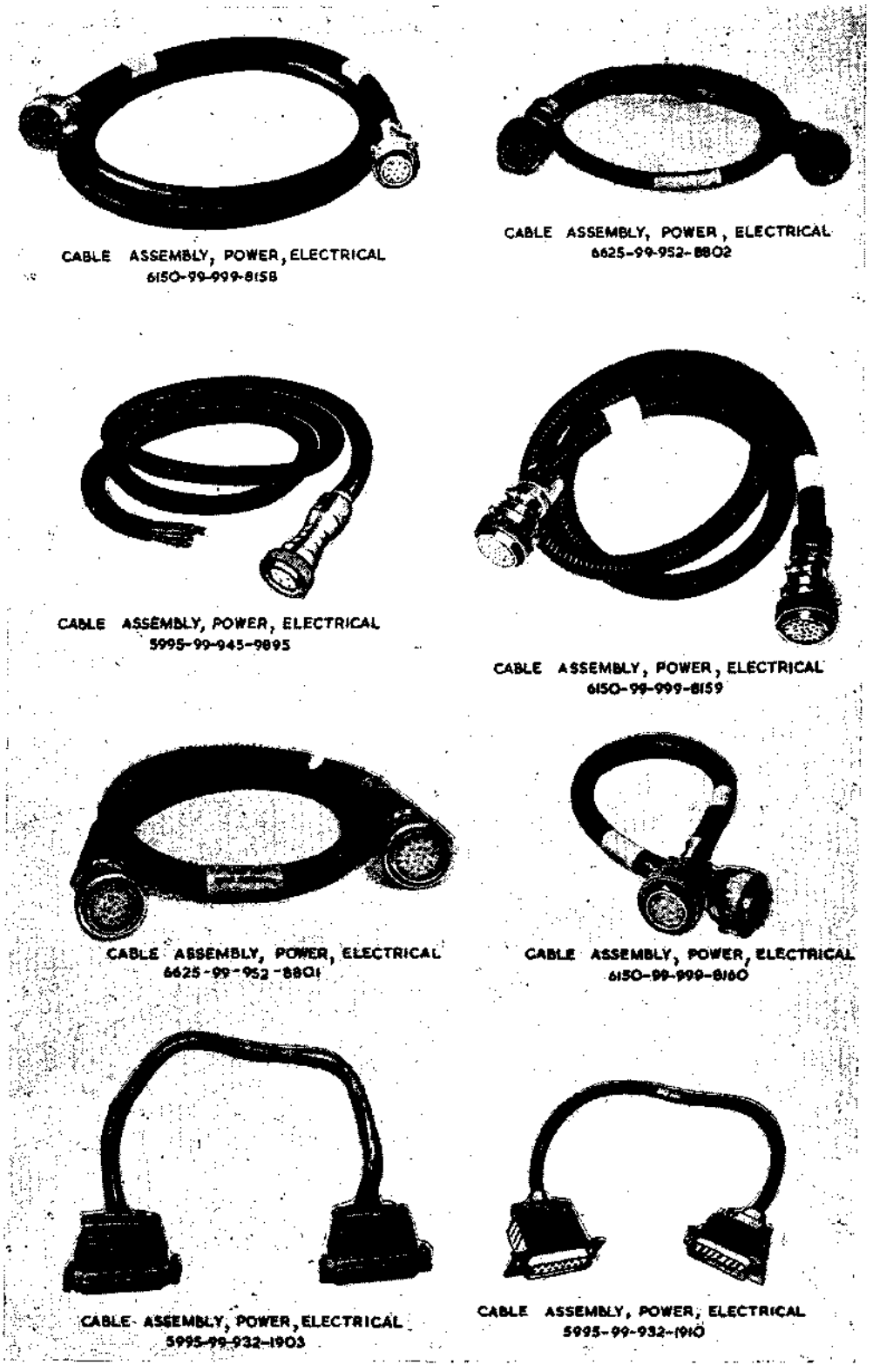

Fig. 3. Connectors used with interconnecting boxes 5821-99-999-2643 and 6625-99-194-5275

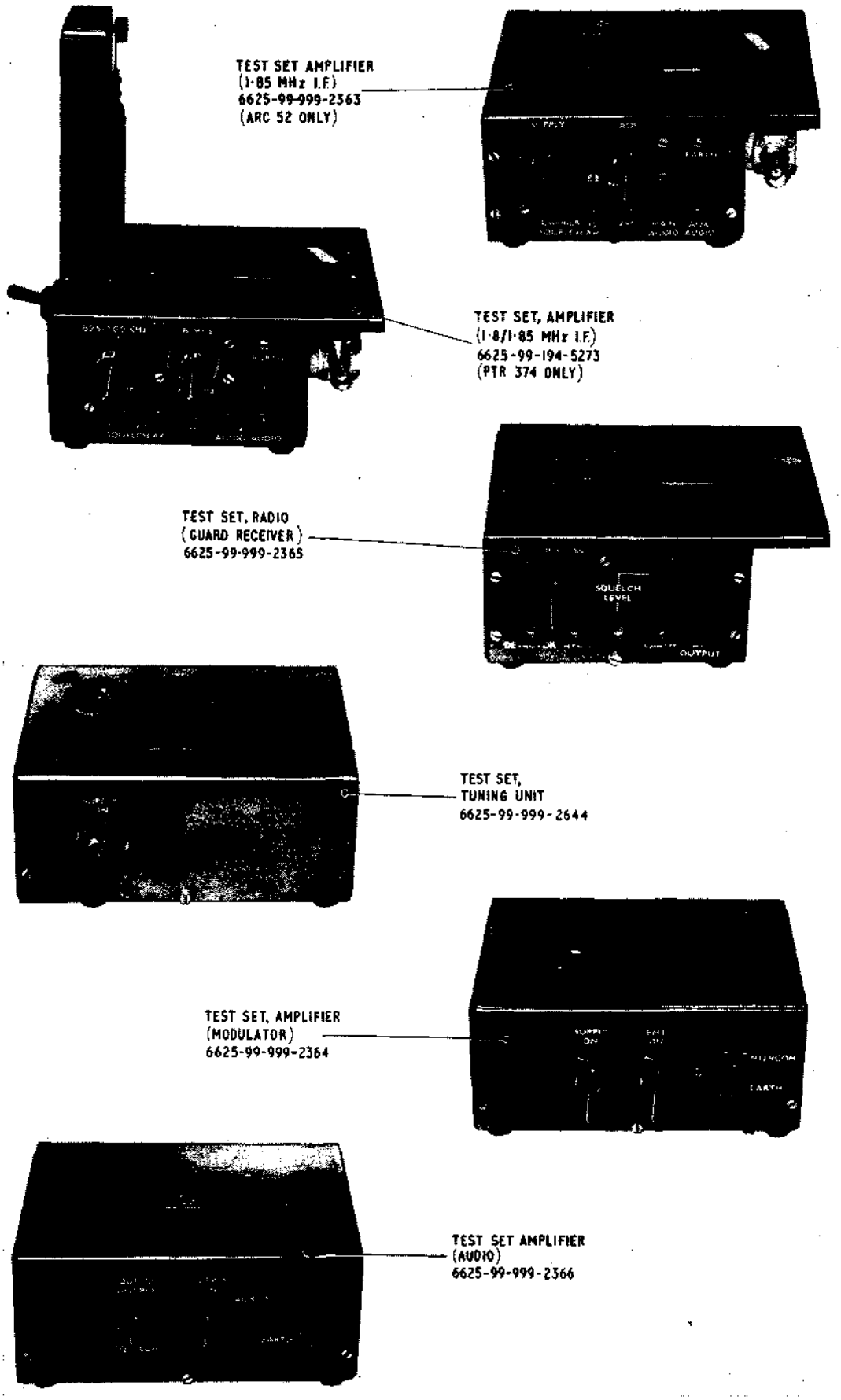

Fig. 4. Test sets for use with interconnecting boxes 5821-99-999-2643 and 6625-99-194-5275

15. The SENSITIVITY control RV2 is used, with S1 set to 1·85 MC/S I.F. or GUARD, to simulate the sensitivity control of the parent transmitter-receiver when testing the intermediate frequency unit (1·85 MHz) or the receiver unit.

Interconnecting box, test set 6625-99-194-5275

16. This interconnecting box (Table 2, item 1) forms part of the PTR374 test kit and is basically similar to that of the ARC52 test kit described in para. 6 to 15 and illustrated in fig. 1 and 2. Externally, the two boxes are identical and their methods of operation are the same, but there are minor differences in the internal wiring. A circuit diagram of the PTR374 interconnecting box is given in fig. 37 at the end of this chapter. Modules tested by this interconnecting box, in conjunction with the appropriate test set, are as follows:—

(1) Amplifier, intermediate frequency (1825/500 kHz) (para. 21 and 22) 5821-99-971-1784
(2) Receiver unit (guard) (para. 23 to 25) 5821-99-942-8558
(3) Tuning unit, radio frequency (para. 26 to 29) 5821-99-942-8549
(4) Modulator, radio transmitter (para. 30 to 33) 5821-99-942-8548
(5) Amplifier, audio frequency (para. 34 to 37) 5821-99-942-8555
(6) Control, radio set Type PTR374A (para. 41 to 43) 5821-99-956-8143

17. Most of the connectors described in para. 7 and 8 are used and form part of a maintenance kit (Table 3), which is included in the P
Interconnections provided by these co
as follows:—

(1) Power supply (425V) to interconnecting box—Table 3, item 1.
(2) 28V (nominal) d.c. supply to interconnecting box—Table 3, item 2.
(3) Interconnecting box to amplifier, intermediate frequency; receiver unit; tuning unit, radio frequency; modulator, radio transmitter amplifier, audio frequency and test set associated with control, radio set Type PTR374A Table 3, item 3.

Test set, amplifier (1·85 MHz) 6625-99-999-2363

18. This test set (Table 1, item 2) forms part of the ARC52 test kit and is used in conjunction with the interconnecting box (Table 1, item 1) for testing the intermediate frequency unit (1·85 MHz) 5821-99-942-8556. The test set is illustrated in fig. 4 and a circuit diagram is given in fig. 5.

19. The module under test is powered by the power supply (425V) and interconnections between this, the interconnecting box and the test set are made as described in para. 7 and 8.

20. When the MODULE SELECTOR switch of the interconnecting box is set to 1·85 MC/S I.F. and the test set SUPPLY switch S1 to ON, power supplies are applied to the module under test. Resistors and capacitors in the test set terminate the outputs from the module under test and test sockets provide for voltage measurements. The ADF/NORMAL switch

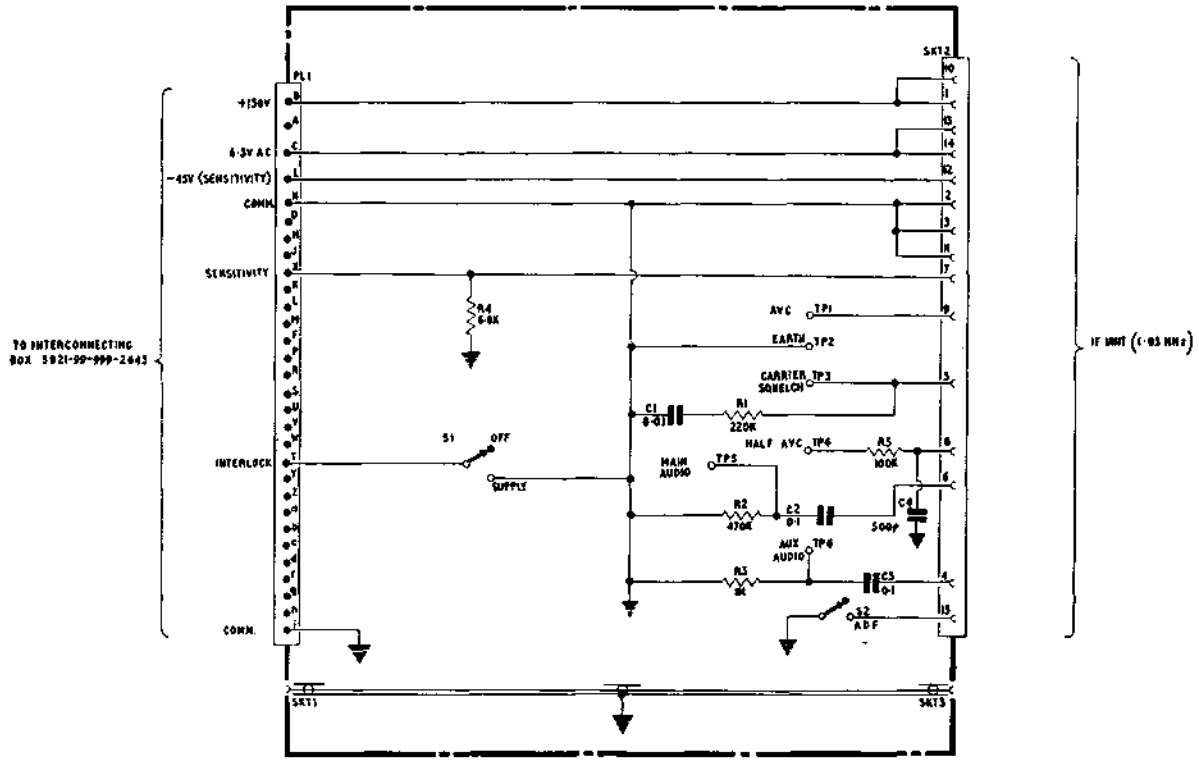

Fig. 5. Test set, amplifier (1·85 MHz) 6625-99-999-2363: circuit

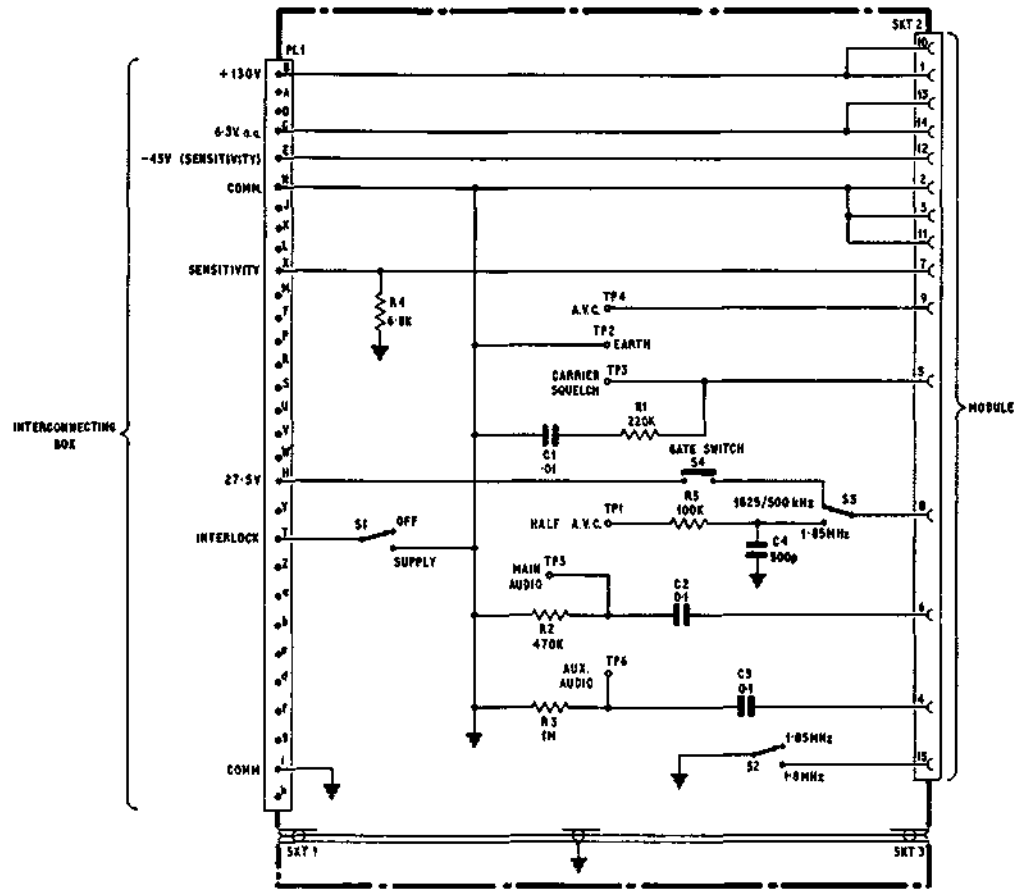

Fig. 6. Test set, amplifier (1·8/1·85 MHz) 6625–99–194–5273: circuit

S2 is not used in some installations and should be left in the NORMAL position. The coaxial lead between sockets SKT1 and SKT3 provides for the connection of an r.f. signal generator, e.g. CT452A, and connections at pole 7 of socket SKT2 and pole X of plug PL1 enable the sensitivity of the module under test to be controlled by the SENSITIVITY control on the interconnecting box.

Test set, amplifier (1·8/1·85 MHz) 6625–99–194–5273

21. This test set (Table 2, item 2) forms part of the PTR374 test kit and is used in conjunction with the interconnecting box (Table 2, item 1) for testing the amplifier, intermediate frequency (1825/500 kHz) 5821–99–971–1784. It is basically similar to the corresponding ARC52 test set described in para. 18 to 20 and can be used for testing the ARC52 intermediate frequency unit (1·85 MHz). The test set is illustrated in fig. 4 and a circuit diagram is given in fig. 6.

22. On this test set, the ADF/NORMAL switch S2 is replaced by a 1·8 MHz/1·85 MHz switch, which simulates the selection of a 50 kHz or 100 kHz channel by the parent equipment when testing PTR374 modules, but is not used with ARC52 modules. The 1825/500 KHz/1·85 MHz switch S3 is used in the 1·85 MHz position, when testing ARC-52 modules, to connect the half a.g.c. output to the ½AVC test socket TP1. When testing PTR374 modules, S3 is set to the 1825/500 KHz position and connects the 27·5V supply to the module via the gate switch S4 to energize the oscillator circuit. S4 is held closed by the edge of the filter assembly on PTR374 modules only and prevents the inadvertent application of the 27·5V supply to ARC52 modules. A coaxial cable assembly (Table 3, item 4) is provided for the connection of the r.f. signal generator.

Test set, radio 6625–99–999–2365

23. This test set (Table 1, item 3 and Table 2, item 3) forms part of both the ARC52 and the PTR374 test kits and is used in conjunction with the interconnecting box (Table 1, item 1 and Table 2, item 1) for testing the receiver unit (guard) 5821–99–942–8558. The test set is illustrated in fig. 4 and a circuit diagram is given in fig. 7.

24. The module under test is powered by the power supply (425V) and interconnections between this, the interconnecting box and the test set are made as described in para. 7, 8 and 17. If certain tuning controls of the module under test are inaccessible when the module is fitted to the test set, a 15-pole cable assembly (Table 1, item 19 and Table 3, item 5) may be used to connect the module to the test set.

25. When the MODULE SELECTOR switch of the interconnecting box is set to GUARD and the test set

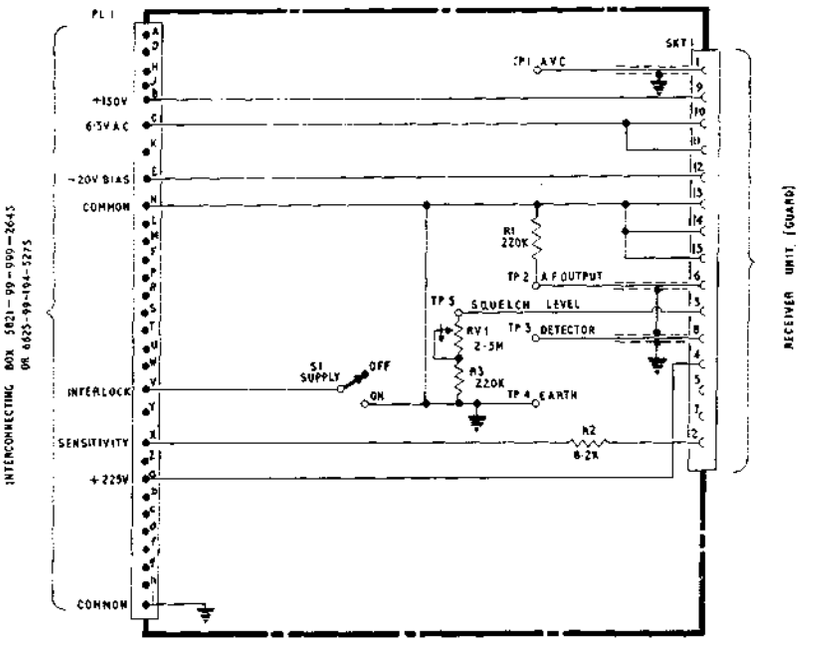

Fig. 7. Test set, radio 6625–99–999–2365: circuit

SUPPLY ON switch S1 is closed, power supplies are applied to the module under test. Resistor R1 constitutes the load across the a.f. output, which can be measured at the AF OUTPUT test socket TP2. Squelch level is adjustable by means of the SQUELCH LEVEL potentiometer RV1 and may be measured between the EARTH and SQUELCH LEVEL test sockets TP4 and TP5 respectively. Additional test sockets TP1 and TP3 are provided for the measurement of a.g.c. and detector voltages. Connections at pole X of plug PL1 and pole 2 of socket SKT1 enable the sensitivity of the module under test to be adjusted by means of the SENSITIVITY control on the interconnecting box. The r.f. signal input from a signal generator CT394A is applied to the module direct.

Test set, tuning unit 6625–99–999–2644

26. This test set (Table 1, item 4 and Table 2, item 4) forms part of both the ARC52 and the PTR374 test kits and is used in conjunction with the interconnecting box (Table 1, item 1 and Table 2, item 1) for testing the tuning unit, radio frequency 5821–99–942–8549. The test set is illustrated in fig. 4 and a circuit diagram is given in fig. 8.

27. The module under test is powered by the power supply (425V) and a separate 28V (nominal) d.c. supply. Interconnections between the power supplies, the interconnecting box and the test set are made as described in para. 7, 8 and 17.

28. When the MODULE SELECTOR switch of the interconnecting box is set to MECH. DRIVE and the test set SUPPLY ON switch S1 is closed, power supplies are applied to the module under test and the current drawn may be measured by connecting an ammeter to the METER + and − TEST sockets and pressing the CHECK CURRENT switch of the interconnecting box. The frequency selector switch on the interconnecting box permits the module under test to be set to positions corresponding to the following frequencies:—

(1) 222·0 MHz (7) 288·6 MHz (13) 344·1 MHz
(2) 233·1 MHz (8) 299·7 MHz (14) 355·2 MHz
(3) 244·2 MHz (9) 300·0 MHz (15) 366·3 MHz
(4) 255·3 MHz (10) 310·8 MHz (16) 377·4 MHz
(5) 266·4 MHz (11) 321·9 MHz (17) 388·5 MHz
(6) 277·5 MHz (12) 333·0 MHz (18) 399·6 MHz

29. Thus each indexing drum of the module under test is set to all its positions if the sequence is completed. The MECH. DRIVE DISABLE indicator lamp on the interconnecting box enables the operation of the disable line to be verified.

Tes set, amplifier (modulator) 6625–99–999–2364

30. This test set (Table 1, item 5 and Table 2, item 5) forms part of both the ARC52 and the PTR374 test kits and is used in conjunction with the interconnecting box (Table 1, item 1 and Table 2, item 1) for testing the modulator, radio transmitter 5821–99–942–8548. The test set is illustrated in fig. 4 and 9 and a circuit diagram is given in fig. 10.

31. The module under test is powered by the power supply (425V) and interconnections between this, the interconnecting box and the test set are made as described in para. 7, 8 and 17.

32. When the MODULE SELECTOR switch of the interconnecting box is set to MOD and the test set SUPPLY ON switch S1 is closed, the module under test is switched on, but the h.t. and e.h.t. supplies

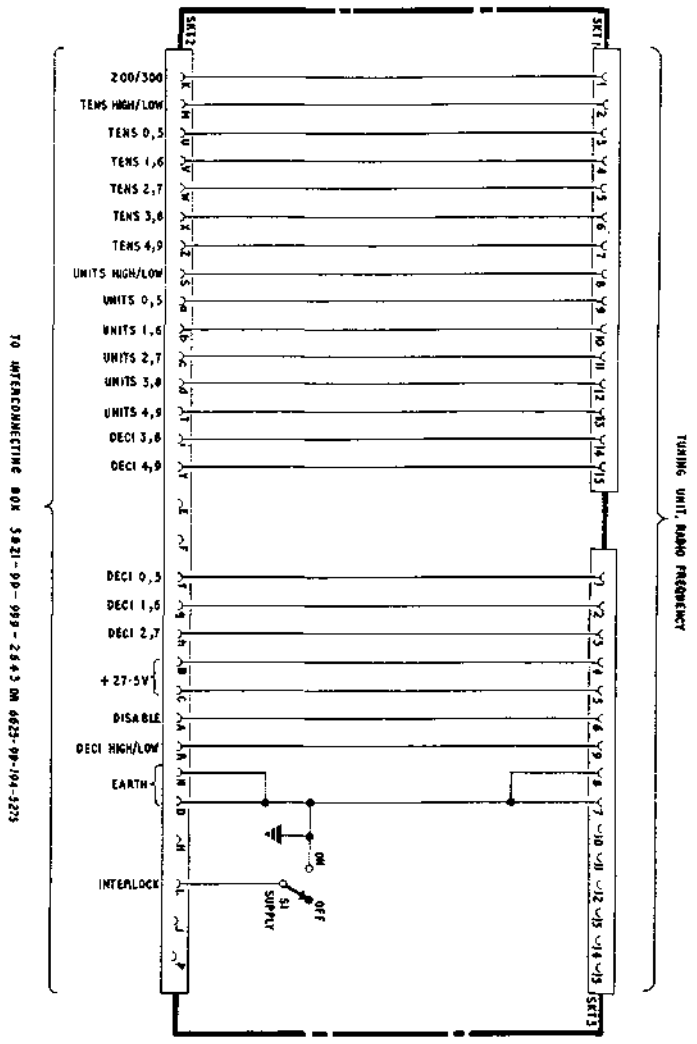

Fig. 8. Test set, tuning unit 6625–99–999–2644: circuit

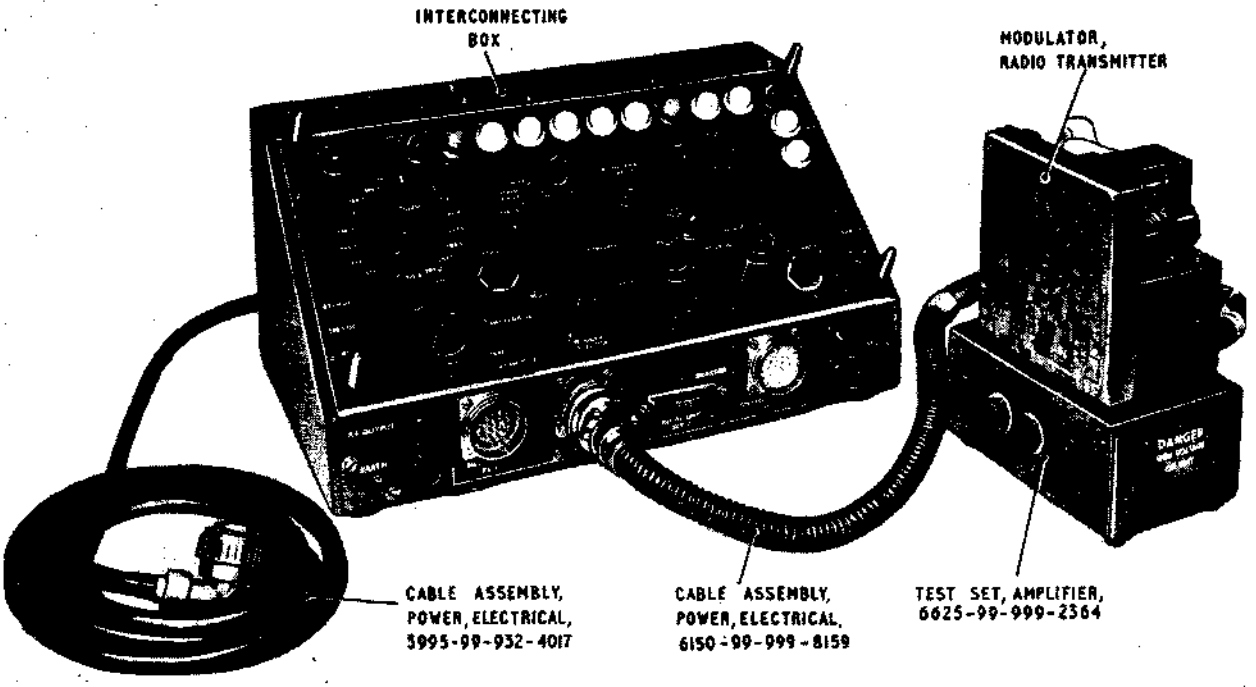

Fig. 9. Modulator, radio transmitter connected for test

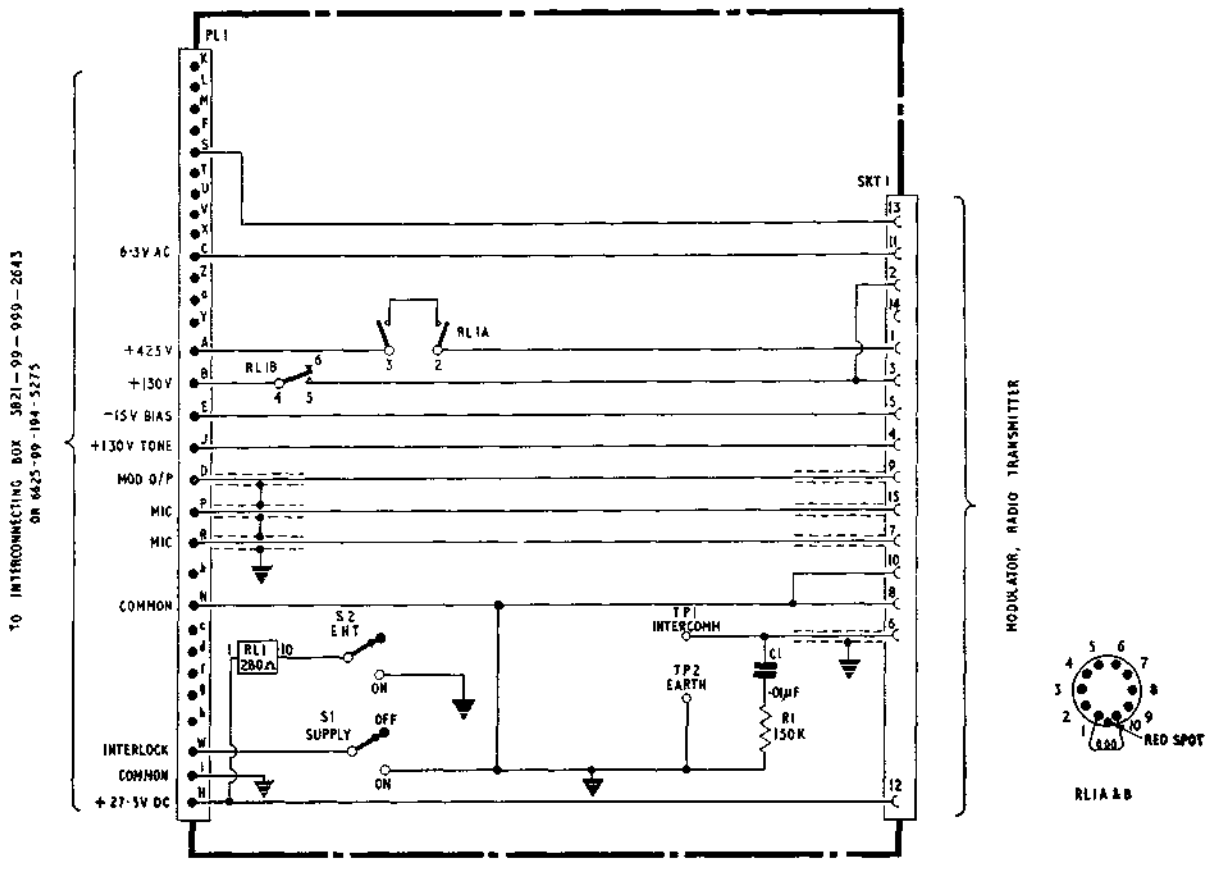

Fig. 10. Test set, amplifier (modulator) 6625-99-999-2364: circuit

are controlled by the EHT ON switch S2, which operates the relay RL1. Contacts RL1A carry the +425V supply and contacts RL1B carry the +130V supply. A resistive load, with tappings for full, half and quarter load, to simulate the load of the power amplifier stage is included in the interconnecting box. The sidetone load consists of capacitor C1 in series with resistor R1 and the INTERCOM and EARTH test sockets, TP1 and TP2 respectively, are provided for measurement of the r.m.s. value of the sidetone output voltage.

33. An audio input signal to the module under test is obtained by setting the AUDIO function switch of the interconnecting box to the MOD position and connecting an a.f. source, e.g. from the microphone simulator (Chap. 8), to the A.F. INPUT terminals of the interconnecting box. The TONE switch of the interconnecting box enables the module under test to be operated under tone modulation conditions.

Test set, amplifier (audio) 6625-99-999-2366

34. This test set (Table 1, item 6 and Table 2, item 6) forms part of both the ARC52 and the PTR374 test kits and is used in conjunction with the interconnecting box (Table 1, item 1 and Table 2, item 1) for testing the amplifier, audio frequency 5821-99-942-8555. The test set is illustrated in fig. 4 and a circuit diagram is given in fig. 11.

35. The module under test is powered by the power supply (425V) and interconnections between this, the interconnecting box and the test set are made as described in para. 7, 8 and 17.

36. When the MODULE SELECTOR switch of the interconnecting box is set to AUDIO and the test set SUPPLY ON switch S1 is closed, power supplies are applied to the module under test. The audio function switch of the interconnecting box makes provision for the following audio inputs:—

(1) Main

(2) Main and auxiliary simultaneously

(3) Auxiliary

(4) Guard

(5) Sidetone

(6) Attenuator (this position of the switch is used to provide an input to the VOL control on the control units, thus enabling the attenuation to be measured).

37. The SQUELCH DISABLE switch S2 simulates the squelch disable circuit of the parent equipment and the CARRIER SQUELCH push button and indicator lamp, TEST socket and CARRIER SQUELCH LEVEL control of the interconnecting box enable the operation of the d.c. squelch amplifier in the module to be tested. The AUX. AUDIO and EARTH test sockets, TP1 and TP2 respectively, provide for measurement of the auxiliary audio output.

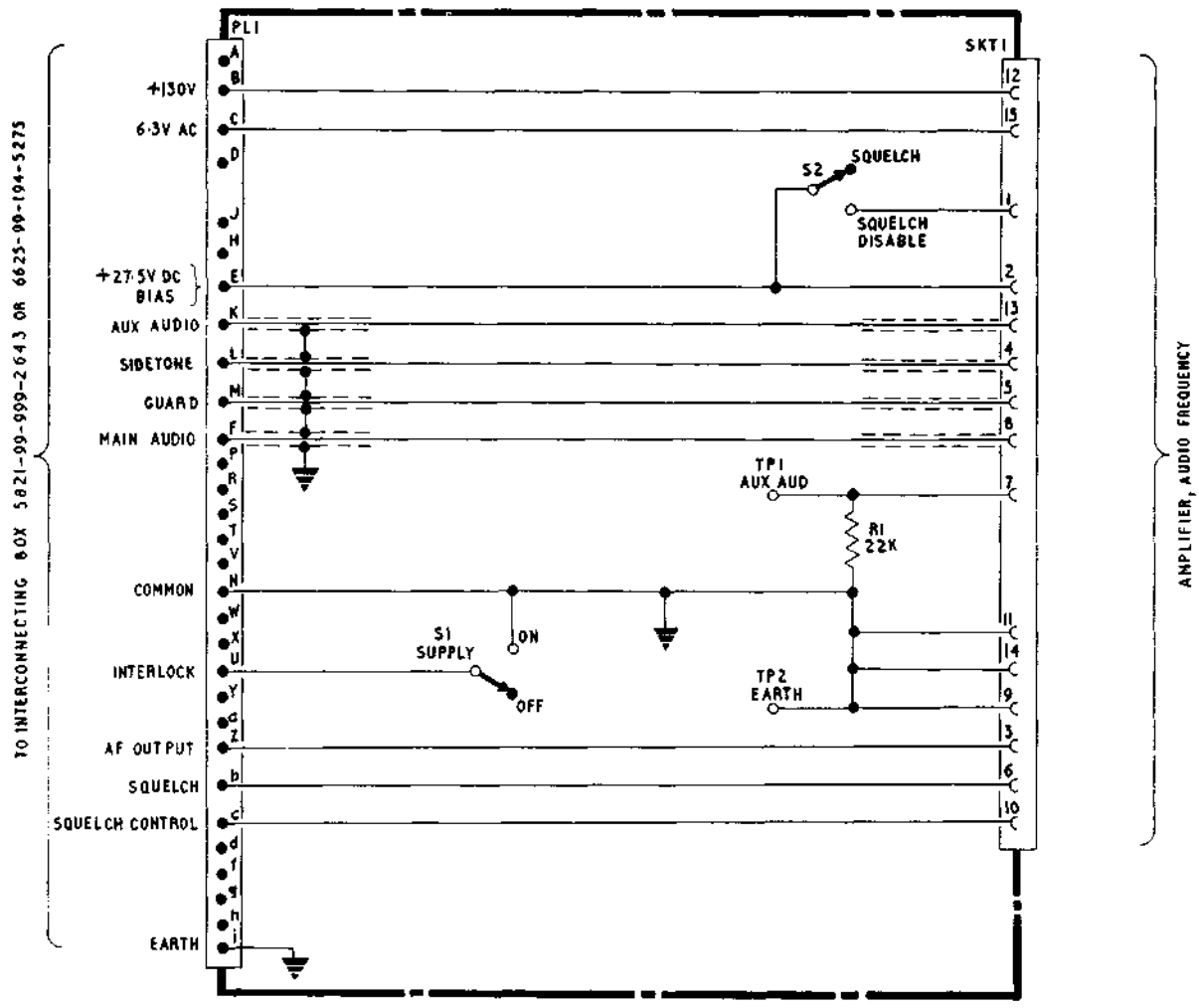

Fig. 11. Test set, amplifier (audio) 6625–99–999–2366: circuit

Test set, control unit 6625–99–952–8806

38. This test set (Table 1, item 7) forms part of the ARC52 and is used in conjunction with the interconnecting box (Table 1, item 1) for testing the control, radio set Type C1607/4 5821–99–945–5739. The test set is illustrated in fig. 12 and a circuit diagram is given in fig. 38 at the end of this chapter.

39. The control unit under test is powered by the power supply (425V). Interconnections between the power supply, the interconnecting box and the test set are made as described in para. 7 and 8. In addition, a 30-pole cable assembly (Table 1, item 20) is used to connect plug PLA on the test set to plug PLC on the control unit under test.

40. The control, radio set Type C1607/4 incorporates facilities additional to those embodied in the control unit Type C1607/ARC52 and these circuits are tested by means of the test set, which carries a CHANNEL selector switch SA and two rows of indicator lamps. Those in the lower row (ILP1–ILP5) are coloured blue and indicate the serviceability of the data link control circuits in the parent transmitter-receiver. These lamps light as the control unit function switch is rotated. In the upper row, two lamps (ILP6 and ILP7) are coloured green and are associated with the remote visual channel indication circuits, and two (ILP8 and ILP9) are coloured yellow and are associated with the v.h.f. on/off control and the 50 kHz frequency selection circuits respectively. Further details of the test set are given in para. 108 to 112.

Control, interconnecting box, test set 6625–99–194–5272

41. This test set (Table 2, item 7) forms part of the PTR374 test kit and is used in conjunction with the interconnecting box (Table 2, item 1) for testing the control, radio set Type PTR374A 5821–99–956–8143. The test set is illustrated in fig. 13 and a circuit diagram is given in fig. 39 at the end of this chapter.

42. The control unit under test is powered by the power supply (425V) and a separate 28V (nominal) d.c. supply. Interconnections between the power supplies, the interconnecting box and the test set are made as described in para. 7, 8 and 17. In addition, a 41-pole wiring harness (Table 3, item 6) is used to connect socket SKT1 on the test set to plug J2 on the control unit and a further 41-pole wiring harness (Table 3, item 7) is used to connect SKT2 on the test set to plug J1 on the control unit.

Fig. 12. Test set, control unit 6625-99-952-8806

43. The control, radio set Type PTR374A incorporates facilities additional to those embodied in the control unit Type C1607/ARC52 and these circuits are tested by means of the test set, which carries a channel selector switch and indicator lamps which provide indication of the correct operation of the controls on the unit under test. Further details of the test set are given in para. 113 to 116.

Test jig, oscillator 6625-99-999-1046

44. This test jig (Table 1, item 8 and Table 2, item 8) forms part of both the ARC52 and the PTR374 test kits and is used for testing the spectrum generator 5821-99-942-8552 of the ARC52 and the amplifier-oscillator (spectrum generator) 5840-99-107-451 of the PTR374. The test jig, with the module under test in position, is illustrated in fig. 14 and a circuit diagram is given in fig. 15.

45. The module under test is powered by the power supply (425V), to which the test jig is connected by a 10-pole cable assembly (Table 1, item 21 and Table 3, item 8).

46. Facilities are provided for manually setting the module under test to any one of 18 test frequencies. Monitoring of the module output level is provided either by a monitor, radio frequency (Chap. 3), in conjunction with a multimeter, electronic CT429, or by a wattmeter, absorption CT443. The output frequency is measured by a calibrator, frequency (Chap. 6) and the generator section is tested by measurement of the voltage at test point H of the module under test. This test jig is also used in conjunction with a serviceable module for testing the amplifiers, radio frequency, as described in para. 48, 52 and 64 and illustrated in fig. 21.

Test set, amplifier (main receiver and transmitter pre-amplifier) 6625-99-999-2362

47. This test set (Table 1, item 9) forms part of the ARC52 test kit and is used for testing the amplifier, radio frequency (main receiver and transmitter pre-amplifier) 5821-99-942-8554. The test set is illustrated in fig. 16 and 17 and a circuit diagram is given in fig. 40 at the end of this chapter.

48. The test set and the module under test are powered by the power supply (425V), to which the test set is connected via plug PL1 and the 12-pole cable assembly supplied with the power supply. Drive to the module is provided by the test jig, oscillator (para. 44 to 46), fitted with a serviceable spectrum generator, and a signal generator CT394A which simulates the 20 MHz to 30 MHz signal in the transmit condition and the received signal in the frequency range 225 MHz to 399·9 MHz. Power supplies for the spectrum generator are carried by socket SKT2 on the test set, a 10-pole cable assembly

Fig. 13. Control, interconnecting box, test set 6625–99–194–5272

Table 1, (item 22) and plug PL1 on the test jig, oscillator. This combination of equipment, using a serviceable main receiver and transmitter pre-amplifier, is also used for testing the amplifier, radio frequency (r.f. power amplifier), as described in para. 64 and illustrated in fig. 21.

49. The test set provides facilities for manually setting the module under test to any one of 19 test frequencies and incorporates a 25 MHz selective amplifier which simulates the receive circuits of the intermediate frequency unit (20/30 MHz). The output from the receiver r.f. amplifier section of the module is fed to the test set via socket SKT3 and applied via a 25 MHz filter to a two-stage selective amplifier V1, V2 operating at 25 MHz. The amplifier output is detected by MR1 and the resultant d.c. is monitored at the METER test sockets T/SKT1 and T/SKT2 by the 50μA d.c. range of a multimeter CT498.

50. The u.h.f. drive from the transmitter pre-amplifier section of the module under test (loaded by the r.f. power amplifier) is measured either by a wattmeter, absorption CT443 or by the monitor, radio frequency (Chap. 3) in conjunction with the multimeter, electronic CT429.

Test set, amplifier (v.h.f./u.h.f. r.f. amplifier) 6625–99–194–9015

51. This test set, which forms part of the PTR374 test kit, is a compound equipment consisting of a test set, amplifier (pre-amplifier) (Table 2, item 9), a test jig, amplifier (receiver and transmitter pre-amplifier) (Table 2, item 10) and the necessary connectors. It is used for testing the amplifier, radio frequency (v.h.f./u.h.f. r.f. amplifier) 5821–99–971–1785 and can also be used for testing the ARC52 amplifier, radio frequency (main receiver and transmitter pre-amplifier). The test jig serves as a mounting for the module under test and the test set serves as an interconnecting box and control panel. The test set is illustrated in fig. 18 and a circuit diagram is given in fig. 41 at the end of this chapter.

52. The test set and the module under test are powered by the power supply (425V), to which the test set is connected via plug PL1 and a 12-pole cable assembly (Table 3, item 1). Interconnections between the test set and test jig are provided by a 20-pole cable assembly (Table 3, item 9), which connects socket SKT1 on the test set to plug PL1 on the test jig. Drive to the module under test is provided by the test jig, oscillator (para. 44 to 46), fitted with a serviceable spectrum generator, and a

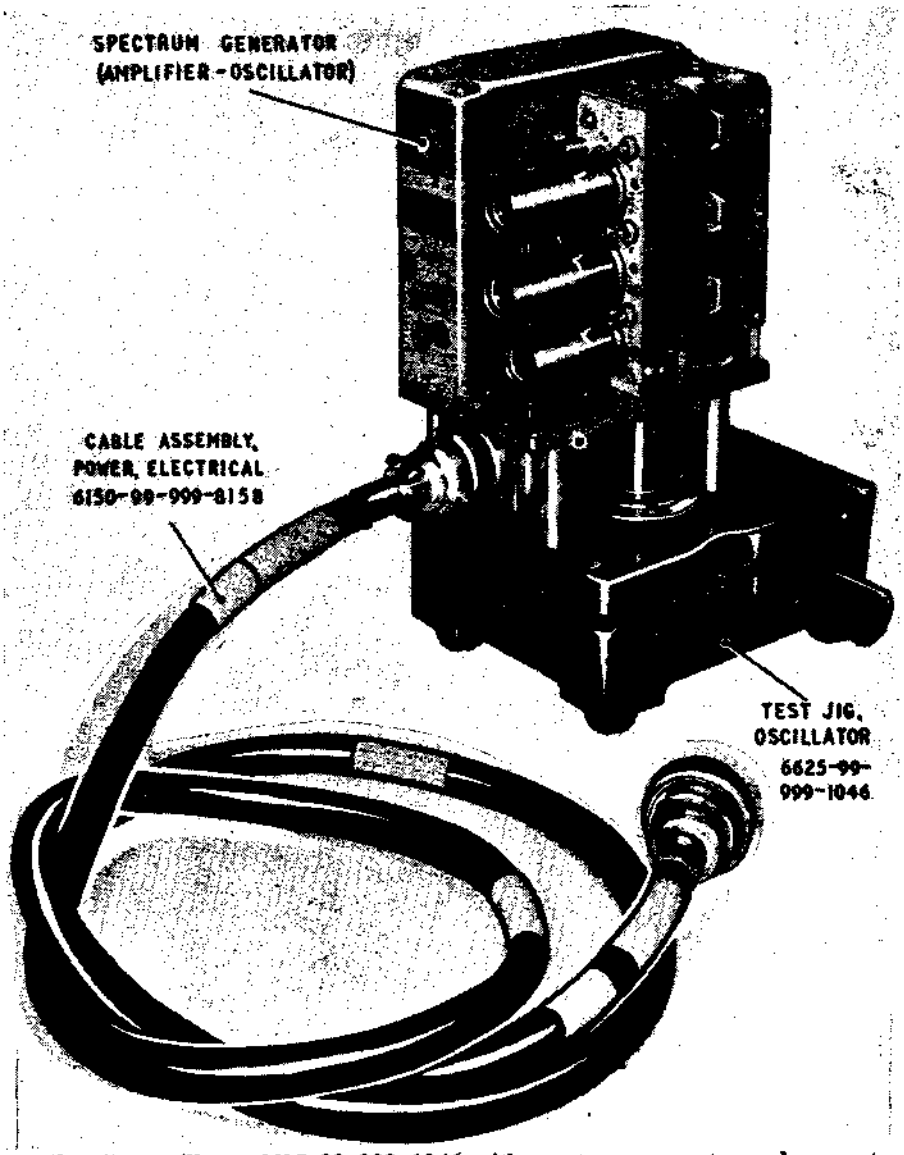

Fig. 14. Test jig, oscillator 6625-99-999-1046 with spectrum generator and connector in position

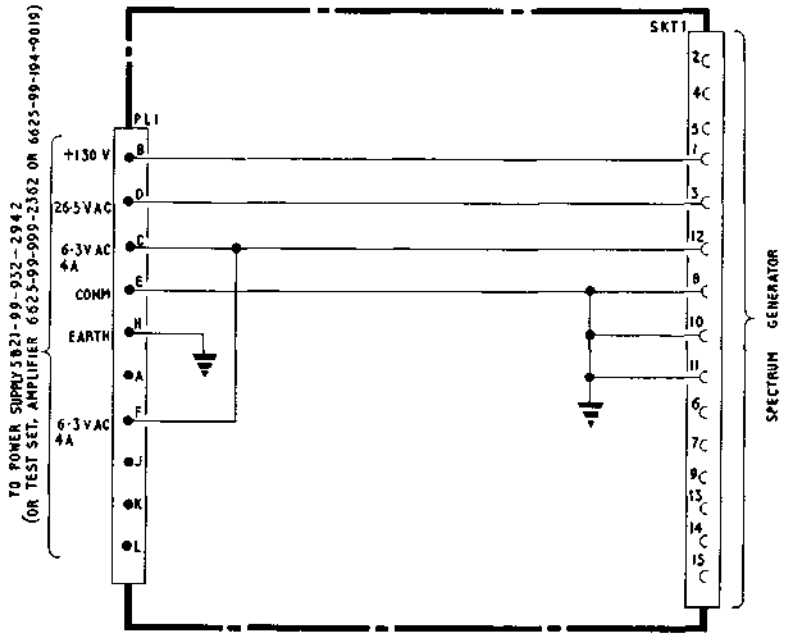

Fig. 15. Test jig, oscillator, 6625-99-999-1046: circuit

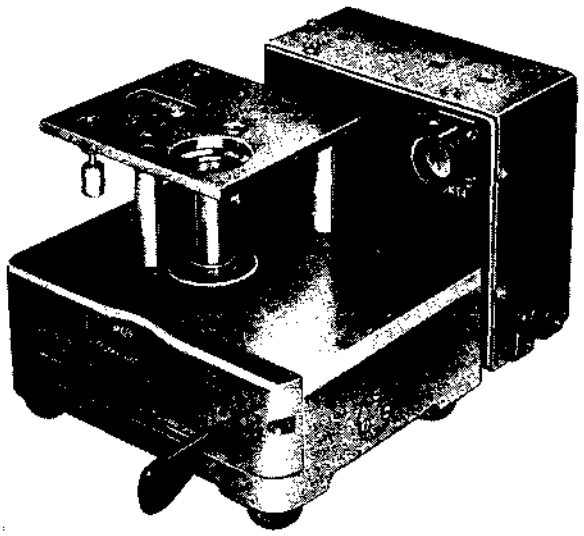

Fig. 16. Test set, amplifier (main receiver and transmitter pre-amplifier) 6625–99–999–2362: general view

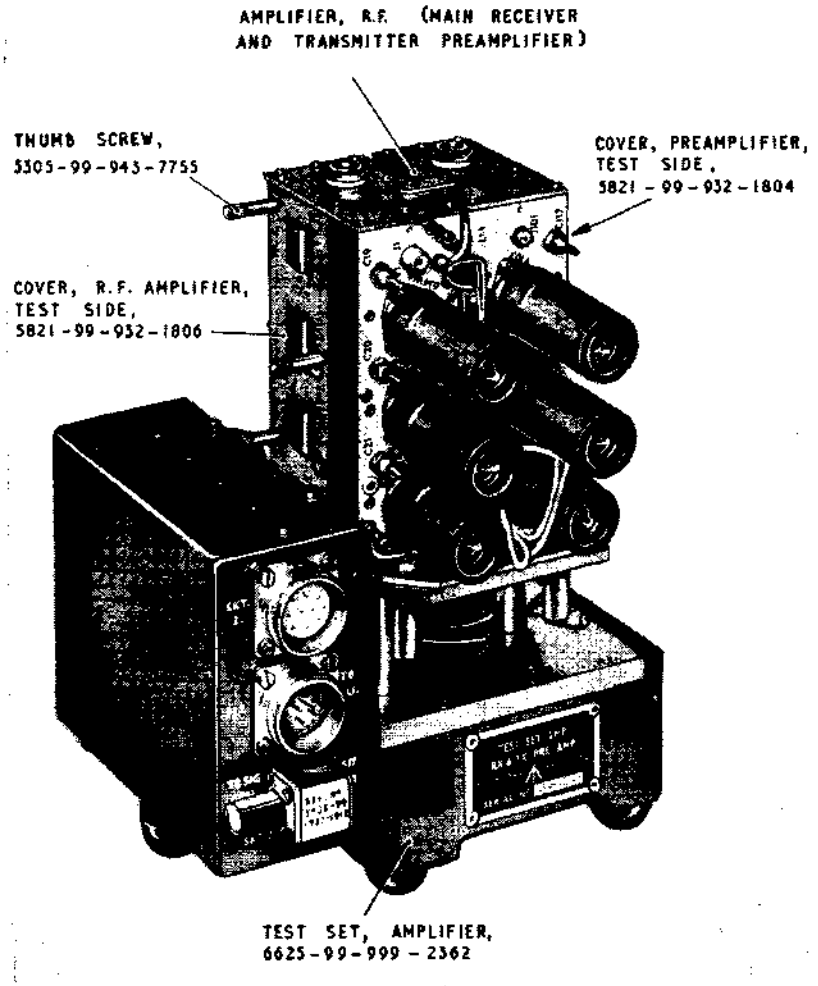

Fig. 17. Test set, amplifier 6625–99–999–2362 and module fitted with side test covers

signal generator CT394A, which simulates the 20 MHz to 30 MHz signal in the transit condition and the received signal in the receive condition. Power supplies for the spectrum generator are carried by socket SKT4 on the test set, a 10-pole cable assembly (Table 3, item 10) and plug PL1 on the test jig, oscillator. This combination of equipment, using a serviceable v.h.f./u.h.f. r.f. amplifier, is also used for testing the amplifier, radio frequency (r.f. power amplifier) (para. 64).

53. The test jig provides facilities for manually setting the module under test to any one of a number of test frequencies and the test set contains a fixed 25·7 MHz selective amplifier, which simulates the receive circuits of the amplifier, intermediate frequency (20–30 MHz). Also contained in the test set are a simulated v.h.f. spectrum generator, power and signal distribution circuits and switches, the settings of which determine the mode of operation of the test set.

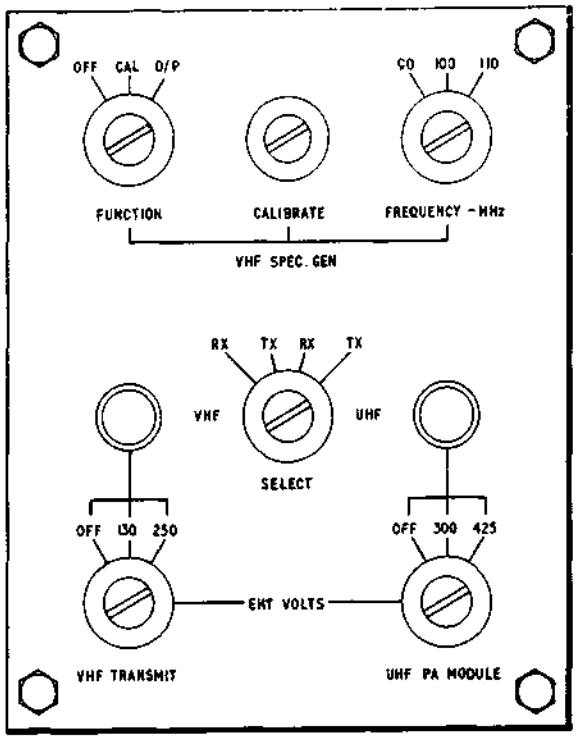

Fig. 18. Test set, amplifier (pre-amplifier) 6625-99-194-9019)

54. The output from the receiver r.f. amplifier section of the module under test is fed to the test set via socket SKT3 and applied via a 25·7 MHz filter to a two-stage selective amplifier V1, V2 operating at 25·7 MHz. The amplifier output is detected by MR1 and the resultant d.c. is monitored at test sockets T/SKT1 and T/SKT2.

55. The circuit of the test set v.h.f. spectrum generator is similar to that of the amplifier-oscillator-relay assembly of the PTR374, with the exception of the supply to the amplifier transistors VT1 and VT2, which is made variable in order that the output level may be adjusted. This supply is derived from the +130V d.c. supply to the test set and is applied across the divider chain R27, R28 and D1. The voltage across D1 is used to supply the transistor circuits via the CALIBRATE control RV1. The generator output may be applied, by setting the appropriate switches of the test set, to test socket T/SKT5 for calibration or to socket SKT5 or SKT6 for connection to the module under test.

56. Switching of the generator output is performed by the FUNCTION switch S1 which, in the CAL position, applies h.t. to the generator via the VHF positions of the SELECT switch S2 and energizes relay RL2. Under these conditions the generator output is applied to test socket T/SKT5 via relay contacts RL2A for calibration by a multimeter CT471. In the O/P position of S1, the h.t. supply remains connected to the generator, but RL2 is not energized and RL2A connects the generator output to socket SKT5 or SKT6, depending on the condition or relay RL1, which is operated by S2.

57. The required mode of operation of the test set is selected by the SELECT switch S2 which, in the VHF RX position, connects the h.t. supply to the v.h.f. circuits in the module under test and to the test set v.h.f. spectrum generator if S1 is set to CAL or O/P; it also connects +27·5V to the transmit/receive circuits of the module under test via pole R of socket SKT1. In the VHF TX position, S2 applies an earth to SKT1/R, to switch the module under test to the transmit condition, energizes RL1 to connect the test set v.h.f. spectrum generator signal to socket SKT6 via relay contacts RL1A and makes the v.h.f. transmitter e.h.t. supply available at the module if the VHF TRANSMIT switch S5 is set to 130 or 250. The e.h.t. supply is stabilized at 250V by zener diodes D2 and D3.

58. When S2 is set to UHF RX, the +130V d.c. supply to the module v.h.f. circuits and to the test set v.h.f. spectrum generator is disconnected, +27·5V d.c. is applied to SKT1/R to switch the module to receive and RL1 is de-energized. In the UHF TX position, the switch applies an earth to SKT1/R to switch the module to transmit, connects +130V d.c. to the module u.h.f. transmit circuits via SKT1/A and makes the e.h.t. supply available at the UHF PA MODULE switch S4 for testing the r.f. power amplifier.

59. The required operating frequency of the test set v.h.f. spectrum generator is selected by the FREQUENCY −MHz switch S3, which completes the earth return of the cathode of the required oscillator valve, whilst applying a +27·5V bias to the cathodes of the other two valves. In position 90 of S3, the 90 MHz oscillator V3 is operative, in the 100 position, the 100 MHz oscillator V4 is operative and in the 110 position, the 110 MHz oscillator V5 is operative.

60. The UHF PA MODULE switch S4 is used when testing the r.f. power amplifier to apply the required e.h.t. to the module under test. In position 300 of the switch, e.h.t. is applied to the module via switch wafer S4AFb and dropping resistor R31, but in the 425

position, R31 is by-passed and the full e.h.t. is applied. In both the 300 and 425 positions of S4, the UHF PA MODULE indicator lamp ILP2 is illuminated.

61. The VHF TRANSMIT switch S5 applies the required e.h.t. to the v.h.f. power amplifier of the v.h.f./u.h.f. r.f. amplifier under test. In the 130 position of the switch, the +130V e.h.t. supply is applied to the module via R30, the current through which may be monitored by an external meter connected between test sockets T/SKT3 and T/SKT4. In the 250 position, the e.h.t. supply is dropped across R31 and fed to the module at 250V. In both the 130 and 250 positions of the switch the VHF TRANSMIT indicator lamp ILP1 is illuminated.

62. When testing the receive circuits of the ARC52 main receiver and transmitter pre-amplifier, the received signal is simulated by the signal generator CT394A, the output of which is connected to the module by a coaxial cable assembly (Table 3, item 11). The corresponding signal for the PTR374 v.h.f./u.h.f. r.f. amplifier is also provided by the CT394A to which the module is connected by another coaxial cable assembly (Table 3, item 12). This cable assembly is also used when measuring

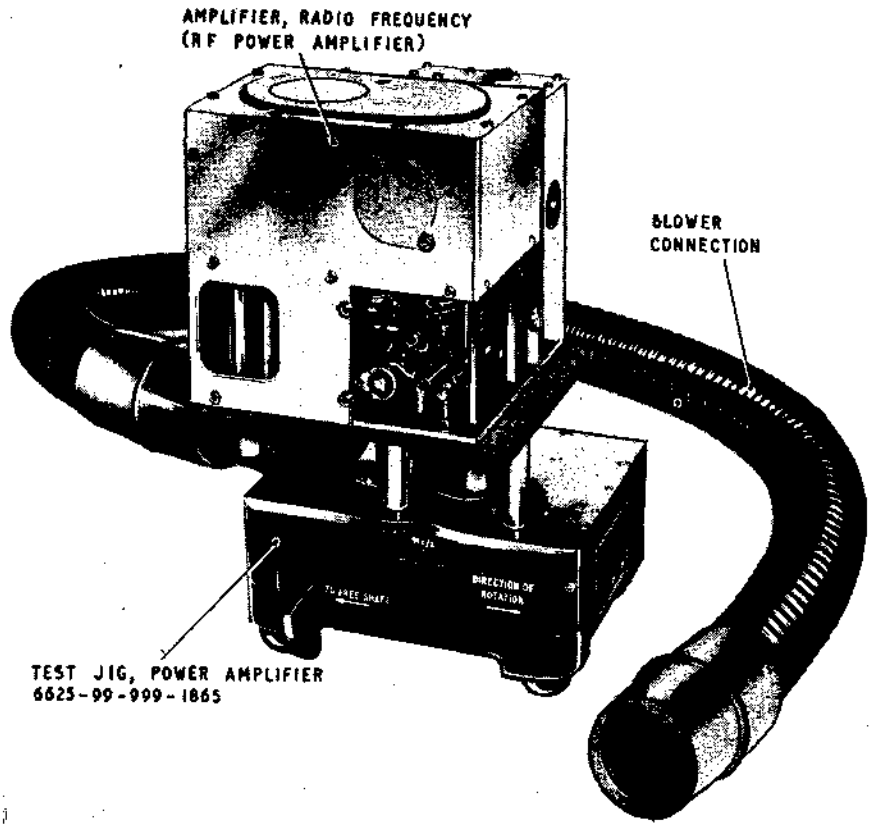

Fig. 19. Test jig, power amplifier 6625–99–999–1865 with module in position

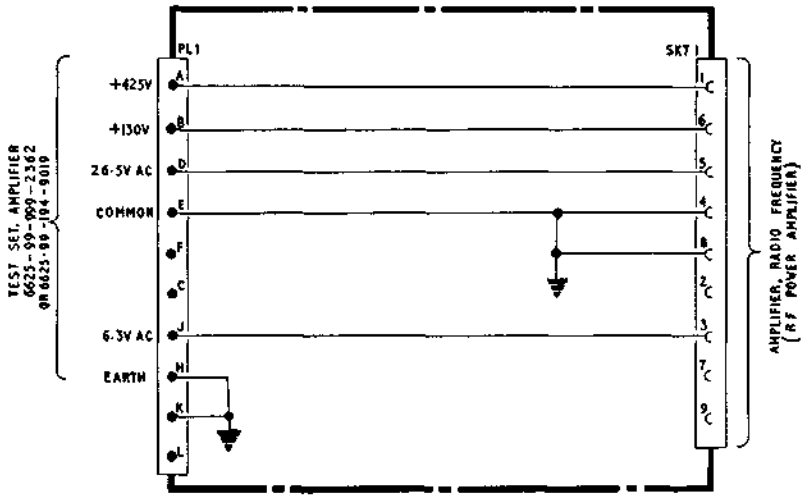

Fig. 20. Test jig, power amplifier 6625–99–999–1865: circuit

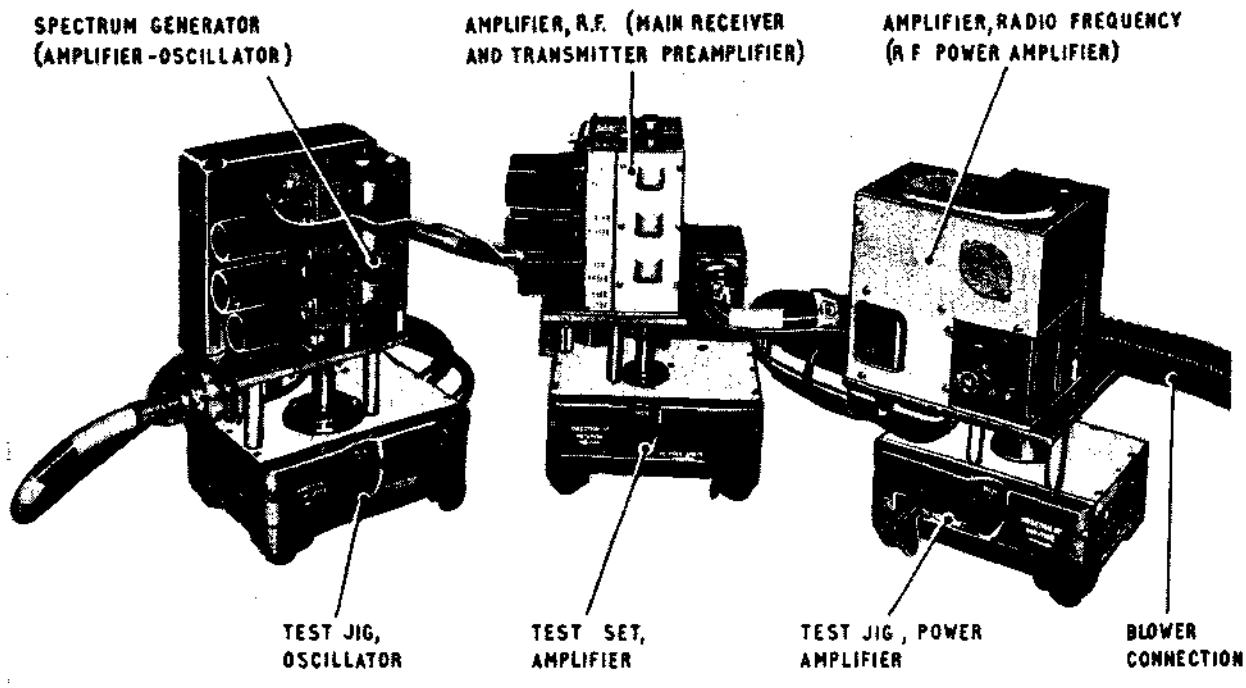

Fig. 21. Test set and jigs with modules in position for testing the amplifier, radio frequency (r.f. power amplifier)

the PTR374 v.h.f. transmitter output to connect the wattmeter absorption CT419 to the module under test. The u.h.f. transmitter output from both the ARC52 and PTR374 modules is measured by a wattmeter, absorption CT443, to which the module under test is connected by a coaxial cable assembly (Table 3, item 13) and a miniature coaxial cable assembly (Table 3, item 14). The latter cable assembly also connects the ouput of the spectrum generator to the module under test when testing u.h.f. circuits and connects the output of the v.h.f. spectrum generator in the test set to the module under test when testing PTR374 v.h.f. circuits. The 20 MHz to 30 MHz signal used in testing the transmit circuits is derived from a signal generator CT394A, to which the module under test is connected by a coaxial cable assembly (Table 3, item 15).

Test jig, power amplifier 6625-99-999-1865

63. This test jig (Table 1, item 10 and Table 2, item 11) forms part of both the ARC52 and the PTR374 test kits and is used for testing the amplifier, radio frequency (r.f. power amplifier) 5821-99-942-8559. The test jig, with the module under test in position, is illustrated in fig. 19 and a circuit diagram is given in fig. 20.

64. Drive to the module under test is provided by the test jig, oscillator and either the ARC52 test set, amplifier (para. 48) or the PTR374 test set, amplifier (para. 52), each equipped with a serviceable module, Power supplies for the r.f. power amplifier under test are derived from the power supply (425V) via socket SKT4 on the ARC52 test set, or socket SKT2 on the PTR374 test set, and a 10-pole cable assembly (Table 1, item 22 and Table 3, item 10). The arrangement of the test set and jigs with their modules in position, using ARC52 equipment, is shown in fig. 21.

65. Facilities are provided for setting the module under test to any one of 19 test frequencies and cooling of the power amplifier valve is by means of an external blower unit (Chap. 1, Table 1, item 25) and the tube connection shown in fig. 19. The power output from the module under test is measured by a wattmeter, absorption CT419 or an equivalent alternative.

Test set, amplifier (20-30 MHz) 6625-99-999-4424

66. This test set (Table 1, item 11) forms part of the ARC52 test kit and is used for testing the intermediate frequency unit (20-30 MHz) 5821-99-942-8557. The test set is illustrated in fig. 22, 23 and 24 and a circuit diagram is given in fig. 42 at the end of this chapter.

67. The test set and the module under test are powered by the power supply (425V), to which the test set is connected via the 12-pole cable assembly 5995-99-932-4017 supplied with the power unit. Provision is made for the connection of a signal generator CT394A, which simulates the input to the module under test, and setting-up of the test set is carried out in conjunction with a signal generator CT452A.

68. Provision is made on the test set for continuous manual tuning of the module under test, but the shaft positions for 20·7 MHz, 25·5 MHz and

29·7 MHz are arranged to lock. The manual tuning shaft dials (fig. 23) are on the left of the mounting head. Twist-to-lock controls are provided for the 1·0 MHz and 0·1 MHz shafts, adjacent to the tuning dials, and a pull-to-release control for each shaft is located at the front of the mounting head, as shown in fig. 24. The module under test is mounted on the head on its side and it is therefore necessary that the Oldham couplers are located and held centrally in position, two spring clips (Table 1, item 24) being provided for this purpose.

69. Incorporated in the test set is a crystal controlled oscillator which operates at any one of the frequencies 22·55 MHz, 27·35 MHz and 31·55 MHz to simulate the inputs from the oscillator unit of the parent equipment and give first intermediate frequencies of 20·7 MHz, 25·5 MHz and 29·7 MHz. These frequencies are those at which the test set tuning shafts can be locked. A complete 1·85 MHz receiver is included to simulate the 1·85 MHz intermediate frequency unit of the parent equipment and a load circuit is provided to simulate test point T. Also included is a 1·85 MHz crystal controlled oscillator for accurate calibration of the signal generator CT452A and provision is made for transmit/receive switching.

70. Valves V1 and V2 constitute a two-stage amplifier which simulates the 1·85 MHz intermediate frequency unit of the parent transmitter-receiver. It receives from the module under test, signals at the second i.f. of 1·85 MHz, which are fed via the coaxial connector SKT6 and the tuned circuit C45, L1, L2, C5 to the fixed frequency amplifier V1. The output from V1 is transformer coupled to the second fixed frequency amplifier V2. Top capacity coupling is provided by capacitor C44 to improve the high frequency response.

71. The signals from V2 are detected by the diode MR1 and applied via the low-pass filter R18, C29, C31 to the audio amplifier V5. Audio signals from V5 can be monitored at the AUDIO test socket TP5 or, by means of a headset at the PHONES jack JK1. When the RECEIVE/TRANSMIT switch S2 is in the RECEIVE position, the audio signal from the detector is connected by S2AFc to the METER test socket TP2, where it can be monitored by an external valve voltmeter, e.g. CT429.

72. The valve V4 operates as a crystal controlled Colpitts oscillator which simulates the oscillator unit of the parent transmitter-receiver. The OSC DRIVE control RV1 sets the screen potential and, therefore, the output amplitude, and the oscillator

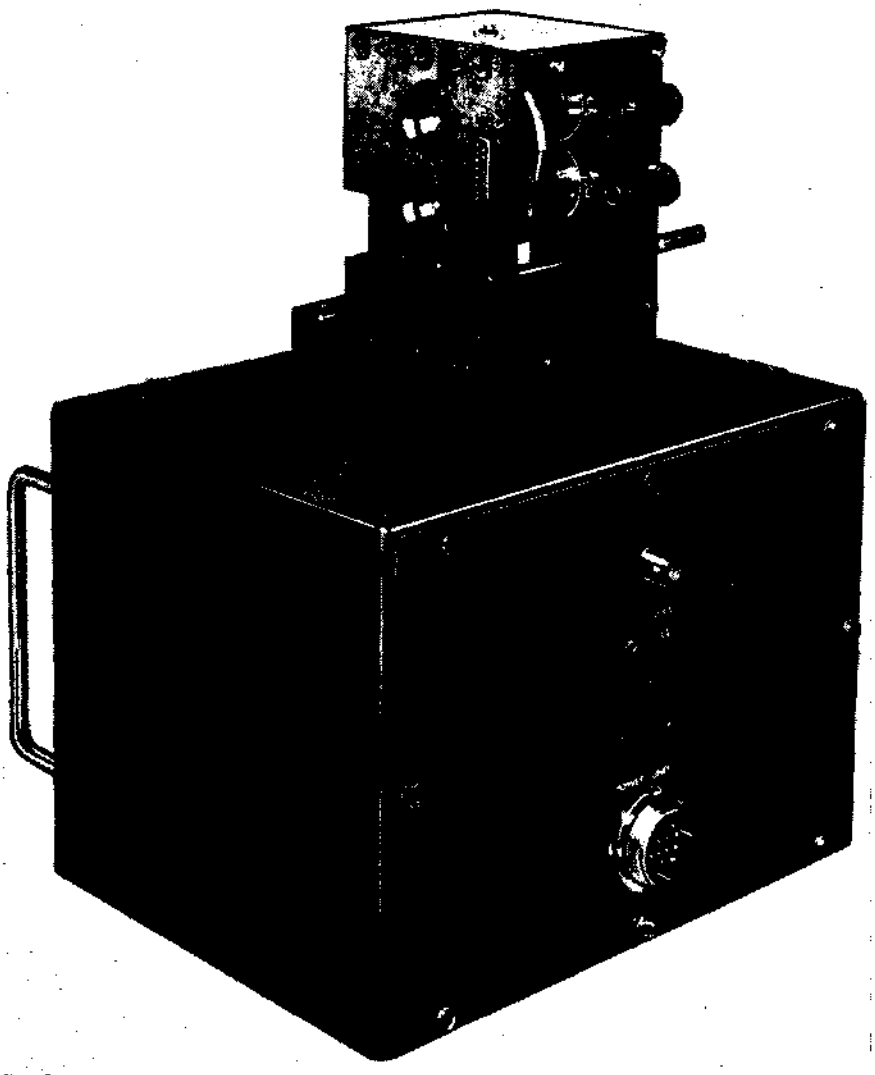

Fig. 22. Test set, amplifier (20–30 MHz) 6625–99–999–4424 and 6625–99–194–5274: rear view

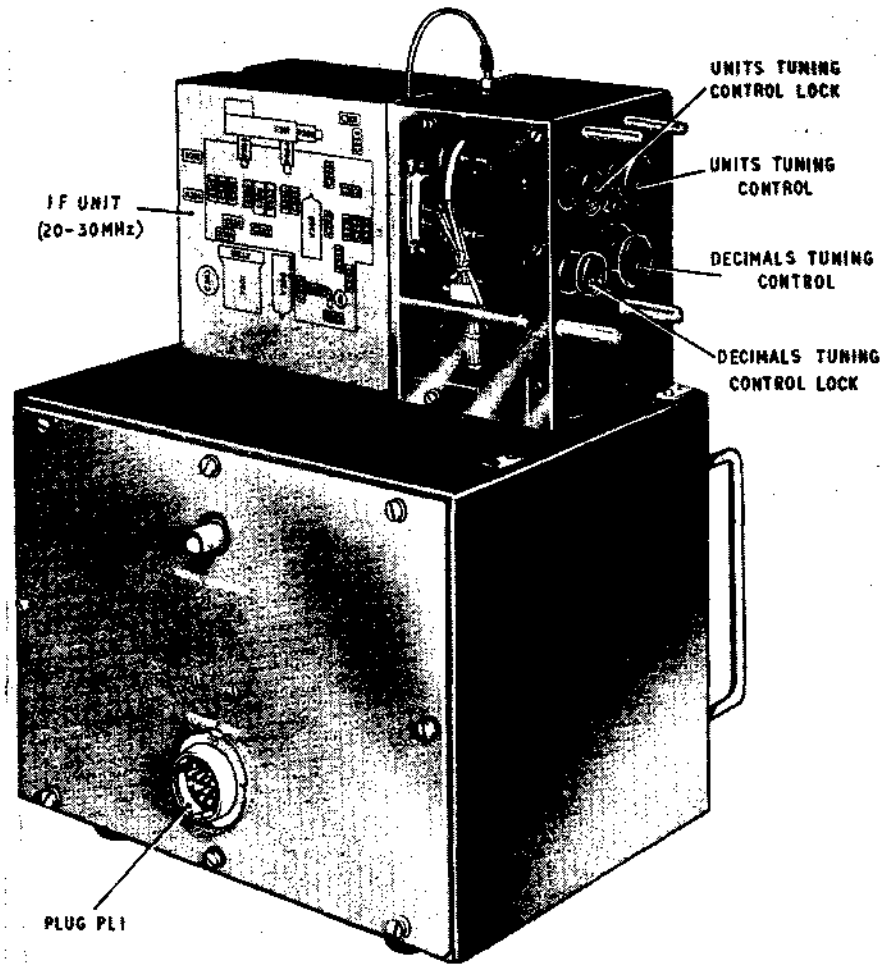

Fig. 23. Test set amplifier (20–30 MHz) 6625-99-999-4424 and 6625-99-194-5274 with module in position: rear view

drive can be measured on a multimeter, electronic CT429 connected to the OSC. CHECK test socket TP3. The crystals, which are selected by the OSCILLATOR FREQUENCY M/CS switch S4, have fundamental frequencies of 11·275 MHz, 13·675 MHz and 15·775 MHz respectively. During testing, the second harmonic of the crystal frequency is selected in the module under test.

73. In the transmit condition, the 20–30 MHz intermediate frequency unit provides the drive to the transmitter pre-amplifier, but for test purposes the load presented by the pre-amplifier is simulated in the test set. The output of the module under test is connected via the coaxial connector SKT5 to the filter C23, L8, R16, C27. After detection by the diode MR2, it is connected via R19 and S2AFc to the METER test socket TP2, where it may be monitored on the CT429.

74. Valve V3 operates in a high stability, crystal-controlled, Colpitts oscillator circuit at a frequency of 1·85 MHz. When the 1·85 M/C CRYSTAL switch S3 is set to ON, the output from V3 is fed to MR1, where it beats with the 1·85 MHz signal from V2. The resultant beat note is amplified in V5 and can be monitored at the PHONES jack JK1. In this way, the signal generator can be set accurately to give an i.f. of 1·85 MHz by tuning for zero beat. A measure of oscillator activity can be obtained at the XTAL CHECK socket TP4.

75. During testing, transmit/receive switching is effected by S2 in the test set. When the H.T. switch S1 is set to ON and S2 to the RECEIVE position, the power supply is connected by S2AFa to the appropriate circuits of the test set and the module under test, and S2AFc connects the audio output from the 1·85 MHz receiver to the METER test socket TP2. When S2 is in the TRANSMIT position, S2AFa connects the +130V supply to the transmit circuits in the module under test and S2AFb completes the

earth return for the transmit-receive relay in the module, thereby energizing the relay. For testing under transmit conditions, S2AFc connects the output of the transmitter pre-amplifier simulator (para. 73) to the METER test socket TP2.

Test set, amplifier (20–30 MHz) 6625–99–194–5274

76. This test set (Table 2, item 12) forms part of the PTR374 test kit and is used for testing the amplifier, intermediate frequency (20–30 MHz) 5821–99–971–1783. It is basically similar to the corresponding ARC52 test set described in para. 66 to 75 and can be used for testing the ARC52 intermediate frequency unit (20–30 MHz). The test set is illustrated in fig. 22, 23 and 25 and a circuit diagram is given in fig. 43 at the end of this chapter.

77. On this test set, the 1·85 M/C CRYSTAL switch S3 is replaced by the OSC. switch, the setting of which determines the operating frequency of the crystal-controlled oscillator V3. Two crystals, XL1 (1·85 MHz) and XL6 (1·8 MHz) are incorporated in the grid circuit of V3, which operates at the frequency of the selected crystal. Crystal selection is achieved by the same method used for oscillator crystal selection in the module under test. Switch wafer S3ABa is the test set crystal selector, S3AFa selects the required crystal in the module under test and S3AFc connects the h.t. supply to V3 when either crystal is selected. V1 and V2 simulate the amplifier, intermediate frequency (1825/500 kHz) of the parent transmitter-receiver and operate at 1·8 MHz or 1·85 MHz, the output from V2 beating with the output at the corresponding frequency from V3 for calibration of the signal generator (para. 74). The 1·8 position of S3 is not used when testing ARC52 modules.

Test set, oscillator 6625–99–999–2384

78. This test set (Table 1, item 12 and Table 2, item 13) forms part of both the ARC52 and the PTR374 test kits and is used for testing the oscillator unit 5821–99–942–8553. The test set is illustrated in fig. 26 and 27 and a circuit diagram is given in fig. 28.

79. The module under test is powered by the power supply (425V), to which the test set is con-

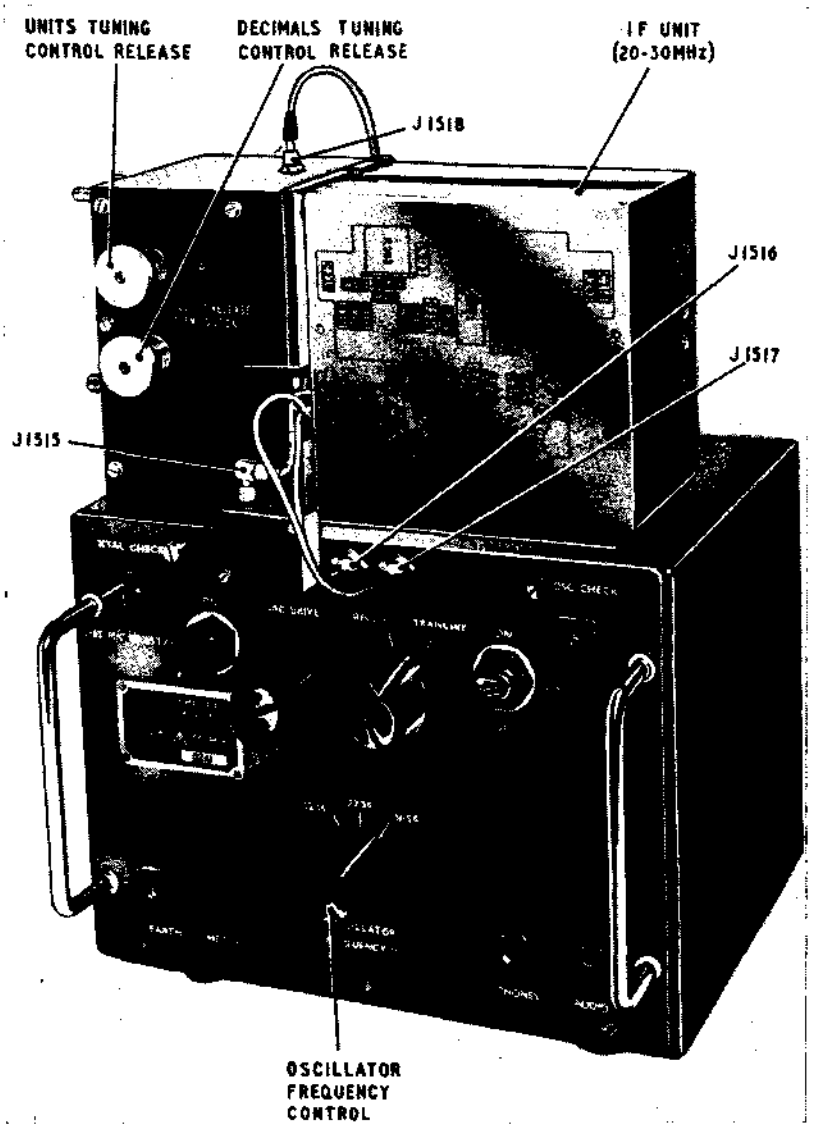

Fig. 24. Test set, amplifier (20–30 MHz) 6625–99–999–4424 with module in position: front view

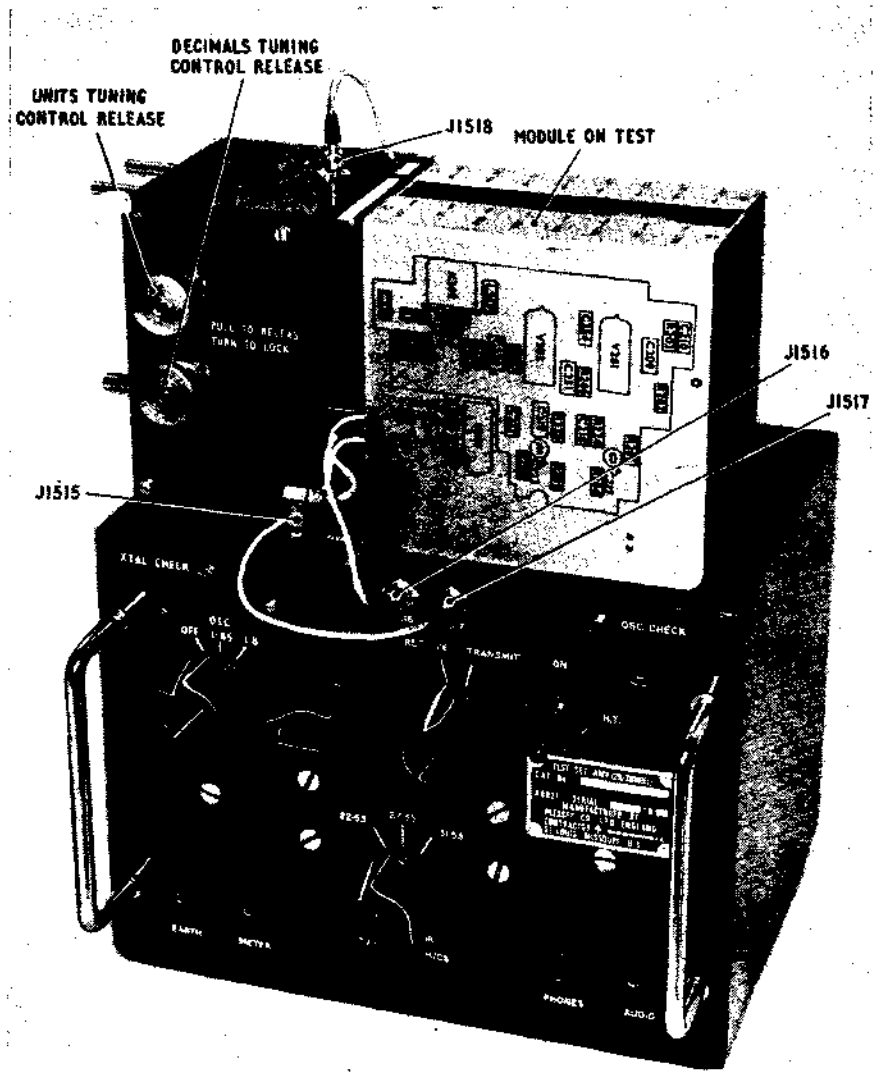

Fig. 25. Test set, amplifier (20–30 MHz) 6625-99-194-5274 with module in position: front view

nected via a 10-pole cable assembly (Table 1, item 21 and Table 3, item 8) and the POWER UNIT plug PL1.

80. The test set provides an r.f. load and a detector circuit which is employed in conjunction with a valve voltmeter, e.g. multimeter, electronic CT471, for monitoring the ouput level of the mixer stage of the module under test. Either oscillator may be selected for test by setting the DISABLE OSC. switch S1 to 0·1 MC/S or 1·0 MC/S. The switch directs a bias voltage to the oscillators via fly-leads, which are integral with the test set, and test points J and K of the module. Simple indexing discs on the two shafts fitted with Oldham couplers are incorporated, to enable the operator to tune by hand the module under test in both 0·1 MHz and 1·0 MHz steps.

81. The h.t. supply to the mixer stage of the module under test is connected via resistors R1 and R2, the latter resistor simulating the load normally presented to the oscillator by resistor R228 in the 20–30 MHz i.f. amplifier in the parent transmitter-receiver. The mixer output is developed across R2 and is coupled by C4 to MR1, the resultant d.c. being developed across RV1 and R4. The slider of RV1 is set to give a d.c. output at the D.C. OUTPUT test socket TP1 equivalent to that obtained from a serviceable module, calibration of the test set being effected by injecting a signal from a signal generator CT394A at the R.F. socket SKT2 and setting RV1 to obtain the correct level at TP1.

Test set, relay-oscillator 6625-99-955-6583

82. This test set, which forms part of the PTR374 test kit, is a compound equipment consisting of a test set, relay-oscillator (Table 2, item 14), an interconnecting box (Table 2, item 15) and the necessary connectors. It is used for testing the amplifier-oscillator-relay assembly 5821-99-971-1782. The complete test set is illustrated in fig. 29 and a circuit diagram is given in fig. 44 at the end of this chapter.

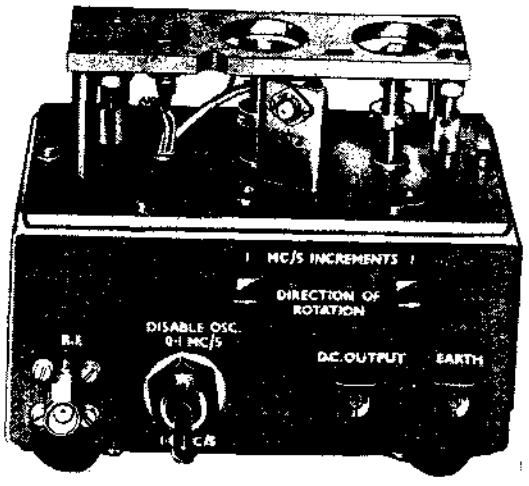

Fig. 26. Test set, oscillator 6625-99-999-2384: front view

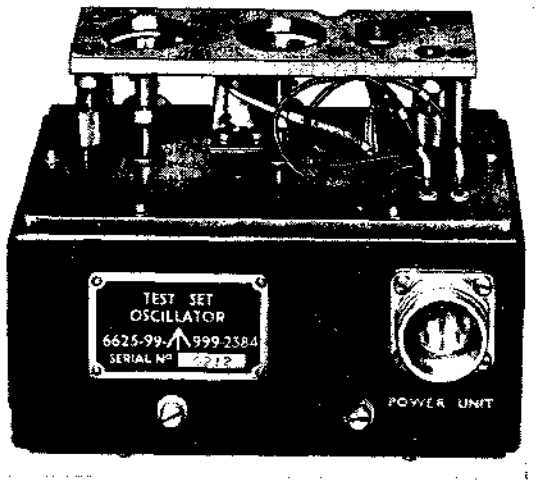

Fig. 27. Test set, oscillator 6625-99-999-2384: rear view

83. The module under test is powered by the power supply (425V), to which the test set is connected via the P.S.U. (130v) plug PLA and a 12-pole cable assembly (Table 3, item 1), and interconnections between the test set and the interconnecting box, on which the module is mounted, are made via the INTERCONNECTING BOX socket SKTB, a 42-pole cable assembly (Table 3, item 16) and the TEST SET RELAY OSCILLATOR UNIT plug PLC on the interconnecting box. Connections to external instruments for monitoring the outputs of the module under test are made via the RX. R.F. O/P and TX. R.F. O/P sockets SKTE and SKTF respectively on the interconnecting box, and two coaxial cable assemblies (Table 3, item 13).

84. The test set provides facilities for mounting the module under test and verifying the correct operation of the relay circuits in the module by energizing individual relays and observing the operation of indicator lamps, which are connected in series with the relay contacts and a d.c. supply. Provision is made for operating the oscillator and amplifier circuits in the module under simulated operational conditions and monitoring their outputs on an external frequency counter and a wattmeter. In addition, resistors and capacitors in the relay circuits may be connected, via a switch on the test set, to terminals which facilitate component testing with external instruments.

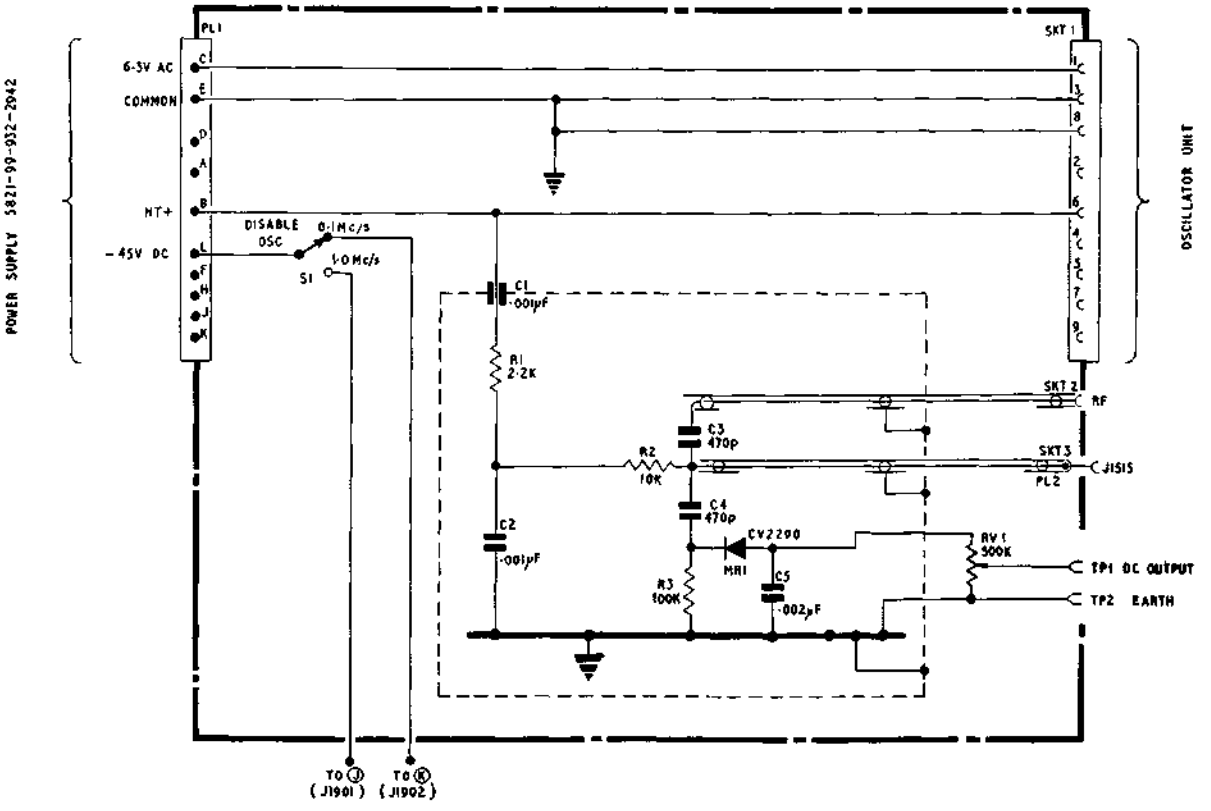

Fig. 28. Test set, oscillator 6625-99-999-2384: circuit

85. The −130V d.c. supply from the power supply is applied to the 130V D.C. indicator lamp ILP20, which is illuminated immediately the supply is applied, and thence via the ON position of the 130V D.C. switch SB, wafer SC2F of the TEST SELECTOR switch and wafer SD2F of the FUNCTION switch to the module under test. The switch circuits are arranged to ensure that the 130V supply is applied to the module only when required for a specific test, as indicated by illumination of the 130V D.C. lamp ILP9.

86. A nominal 28V d.c. supply from the power supply is applied to the 27·5V D.C. indicator lamp ILP19, which is illuminated immediately the supply is applied, and to pole SAa of the 18V D.C. −27·5V D.C. switch, which provides for operation of the valve heaters and relays of the module under test at either of these voltages. When switch SA is set to either of these positions, the supply is fed via diode D1 to the voltage regulator circuit VT1, VT2 and the reference network R30, D2, D3 and D4. Two reference levels are provided by this network to control the regulator output at 18V or 27·5V, according to the setting of SA. The reference voltage is applied to the base of VT1 and controls VT1 collector current, which in turn controls VT2 collector current to maintain the emitter potential of VT2 at the voltage selected by SA. This voltage is applied via the 27·5 18V D.C. I.A. fuse FS1 to the module under test and is also applied to the module as the oscillator disabling voltage via resistors R1, R2 and R3, all as indicated by illumination of the 27·5V D.C. indicator lamp ILP11.

87. Individual relays in the module under test are energized by connecting the relay returns to earth via the TEST SELECTOR switch SC. Correct operation of the relay contacts is then indicated by illumination of the appropriate indicator lamps, which are connected in series with the relay contacts and either the −27·5V (or −18V) or the −130V supply. Switch positions 14 to 20 inclusive are used to operate the module under test at each of its three frequencies and in both transmit and receive conditions in order that the output signals may be monitored. The TEST SELECTOR switch must be set to the OFF position when testing components with the FUNCTION switch.

88. The FUNCTION switch SD provides for the connection of components in the relay circuits of the module under test to the RESISTANCES & CAPACITANCES + and − terminals TP1 and TP2 to facilitate component testing on external instruments. In the TEST position, the switch completes the circuits of indicator lamps used in other tests, so that the switch must be in this position, except when testing components.

Test set, electrical power (DC) 6625-99-999-0201

89. This test set, which forms part of both the ARC52 and the PTR374 test kits, is a compound equipment consisting of an interconnecting box (Table 1, item 13 and Table 2, item 16), a dummy load, electrical (Table 1, item 14 and Table 2, item 17) and the necessary connectors. It is used for testing the power unit, direct current 5821-99-942-8547 of the ARC52 and, although not used with the PTR374, is included in the PTR374 test kit

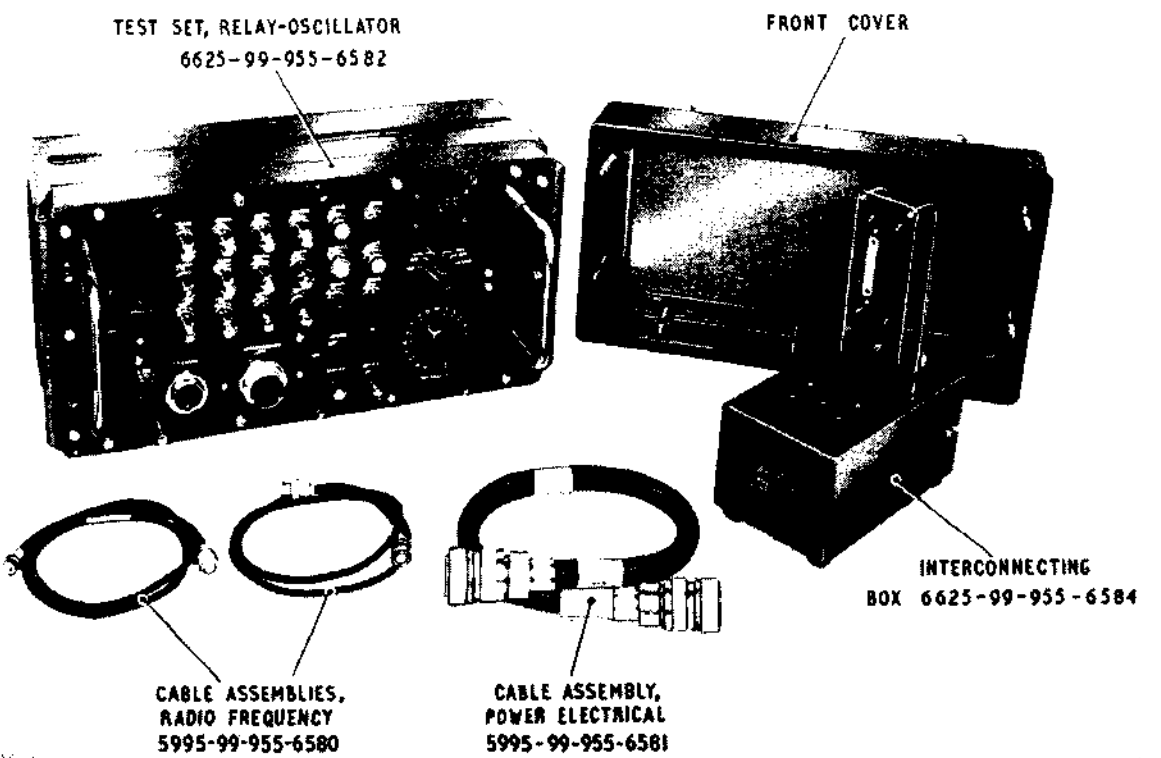

Fig. 29. Test set, relay-oscillator 6625-99-995-6583

in order to make the kit compatible, as far as possible, with that for the ARC52. The interconnecting box is illustrated in fig. 30, 31 and 32 and the dummy load, electrical in fig. 33. Circuit diagrams of the dummy load and the interconnecting box are given in fig. 34 and fig. 45 at the end of this chapter.

90. The interconnecting box serves as a base on which the unit under test may be mounted in the normal operating position (fig. 30), or detached from its mounting (fig. 32). Facilities are provided for operating the unit under load conditions, which may be set by switches to simulate those existing in the parent transmitter-receiver, and for measuring output voltages by means of a multimeter CT498 (or alternative). The unit is driven by a 28V (nominal) d.c. supply, which is fed via a 4-pole cable assembly (Table 1, item 15) and the 28V D.C. SUPPLY plug PL1 on the rear of the interconnecting box (fig. 31). Outputs of the unit under test are loaded by the dummy load, which contains a number of wirewound resistors to simulate various circuits and is connected via the LOAD UNIT socket SKT2 on the rear of the interconnecting box, a 25-pole cable assembly (Table 1, item 23) and the INTERCONNECTING BOX plug PL1 on the dummy load.

91. The nominal 28V d.c. supply is connected to the unit under test via the D.C. SUPPLY switch S5, fuse FS1 (or a 20A circuit breaker CB1 if Mod. No. 7501 is incorporated) and the NORMAL position of the CHECK CURRENT switch S4. In the CHECK CURRENT position, the supply current can be monitored on the multimeter connected between the POSITIVE and NEGATIVE CHECK CURRENT test sockets T/SKT1 and T/SKT2. When S4 is set to NORMAL, the supply voltage can be monitored by the multimeter at the +27·5V D.C. SUPPLY test socket T/SKT9, and the D.C. SUPPLY ON indicator lamp ILP1 is illuminated.

92. The earth connection necessary to energize relay K1101 in the unit under test and thus operate the unit is completed via resistor R1 when the MODULE switch S1 is closed. Under these conditions the MODULE ON indicator lamp ILP2 is illuminated and, apart from the e.h.t., the various outputs from the unit under test, suitably loaded by the dummy load, appear at test sockets T/SKT3 to T/SKT8 and T/SKT10 to T/SKT13.

93. When the EHT switch S2 is open, the e.h.t. output from the unit is isolated from the test set circuits and the load conditions on the unit simulate reception conditions in the parent transmitter-receiver. When the switch is closed, the e.h.t. is connected via S2A to the +425V D.C. test socket T/SKT3 and loaded by the dummy load. Pole S2B of the switch changes the load conditions on the +130V and +27·5V outputs from the unit under test to simulate transmission conditions in the parent equipment.

94. The A.D.F. switch S3 simulates relay contact K901B in the relay unit of the parent equipment and, when closed, connects the +225V d.c. output from the unit to the dummy load and to the +225V D.C. test socket T/SKT12.

95. The −45V d.c. bias voltage is normally loaded by the dummy load, but when the NORMAL/BIAS TEST switch S6 is set to BIAS TEST, the dummy load is disconnected from this output and resistor R2 is connected in its place.

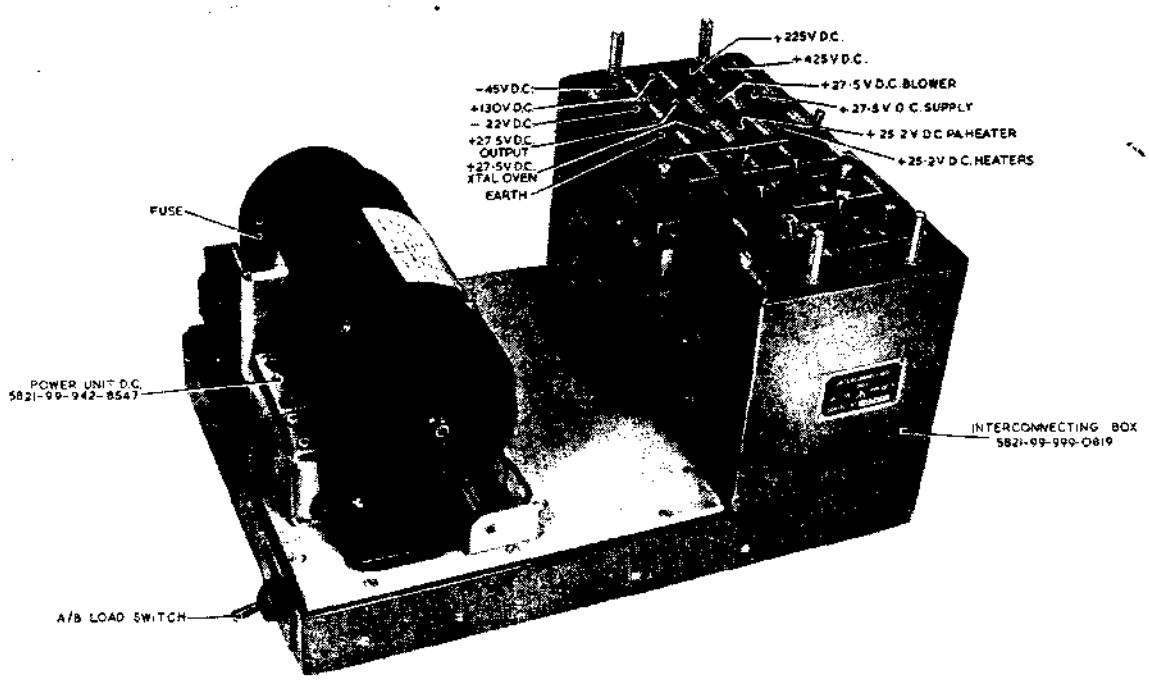

Fig. 30. Interconnecting box 5821-99-999-0819 with power unit, direct current in position

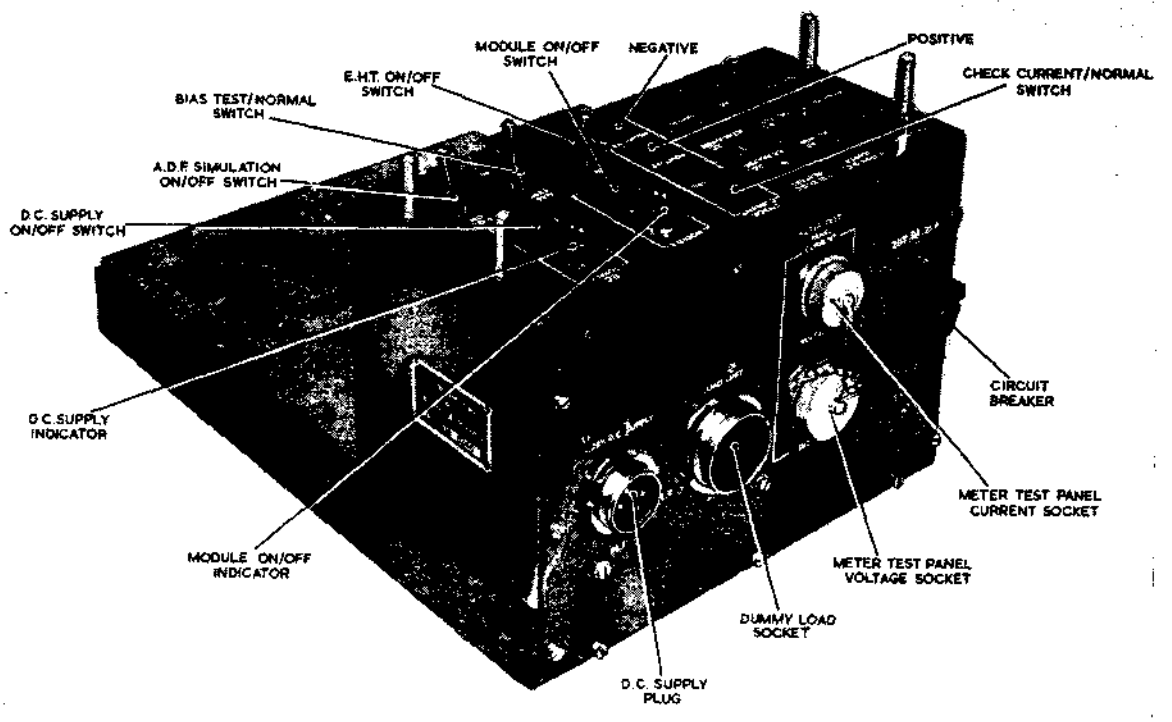

Fig. 31. Interconnecting box 5821-99-999-0819: rear view

96. Switch S7 on the front of the interconnecting box and resistors R3 and R4 are incorporated to provide different load conditions for testing power units, direct current used in other installations and, except when testing these particular units, the switch should always be in position A.

97. All test sockets are connected either to the METER TEST PANEL VOLTAGE socket SKT1 or the METER TEST PANEL CURRENT socket SKT5 on the rear of the interconnecting box, SKT1 and SKT5 being provided for possible future connection to a remote instrument panel.

Test set, electrical power (AC) 6625-99-194-9017

98. This test set, which forms part of the PTR374 test kit, is a compound equipment consisting of a test set, electrical power (Table 2, item 18) a dummy load, electrical (Table 2, item 17) and the necessary connectors. It is used for testing the power supply circuits incorporated in the main chassis of the PTR374. The test set is illustrated in fig. 35 and a circuit diagram is given in fig. 46 at the end of this chapter.

99. Facilities are provided for controlling the primary power supplies to the chassis under test and test sockets enable measurements to be made of current consumption and voltage outputs. The test set is powered by a 28V (nominal) d.c. supply to which the test set is connected via plug PL1 and a 4-pole cable assembly (Table 3, item 2) and a 115V, 400 Hz, 3-phase supply, which is connected via plug PL2 and a 4-pole wiring harness (Table 3, item 17).

Interconnections between the test set and the chassis under test are provided by an 18-pole, branched wiring harness (Table 3, item 18), which connects socket SKT2 on the test set to plug P1401 and socket J1501, J1503, J1504 and J1509 on the chassis. The dummy load simulates the normal operational loads on the power supply circuits and is connected to the test set via socket SKT3 and a 25-pole cable assembly (Table 3, item 19).

100. The 28V supply is connected via fuse FS1 and the D.C. SUPPLY ON switch S1 which, when closed, feeds the supply to the chassis under test, via the CHECK CURRENT switch S2, and to the D.C. SUPPLY ON indicator lamp ILP4. In the open position of S2, the METER test sockets T/SKT3 and T/SKT4 enable the current drawn to be measured. The 28V± test socket T/SKT2 is provided for monitoring the supply voltage. Relay RL1 controls the a.c. supply to the chassis under test and is energized by the 28V supply, when the 3-PHASE SUPPLY ON switch S3 is closed, to complete the supply connections to the chassis under test and to the PH1, PH2 and PH3 indicator lamps ILP1, ILP2 and ILP3 and the corresponding test sockets T/SKT12, T/SKT13 and T/SKT14. The POWER ON switch S4 completes the supply circuit for the power on/off relay K1401 in the chassis under test, which is energized to connect supplies to the chassis circuits.

101. The 6·3V a.c. supplies from plugs J1501 and J1503 on the chassis under test are connected to the dummy load via resistors R5 and R4 respectively,

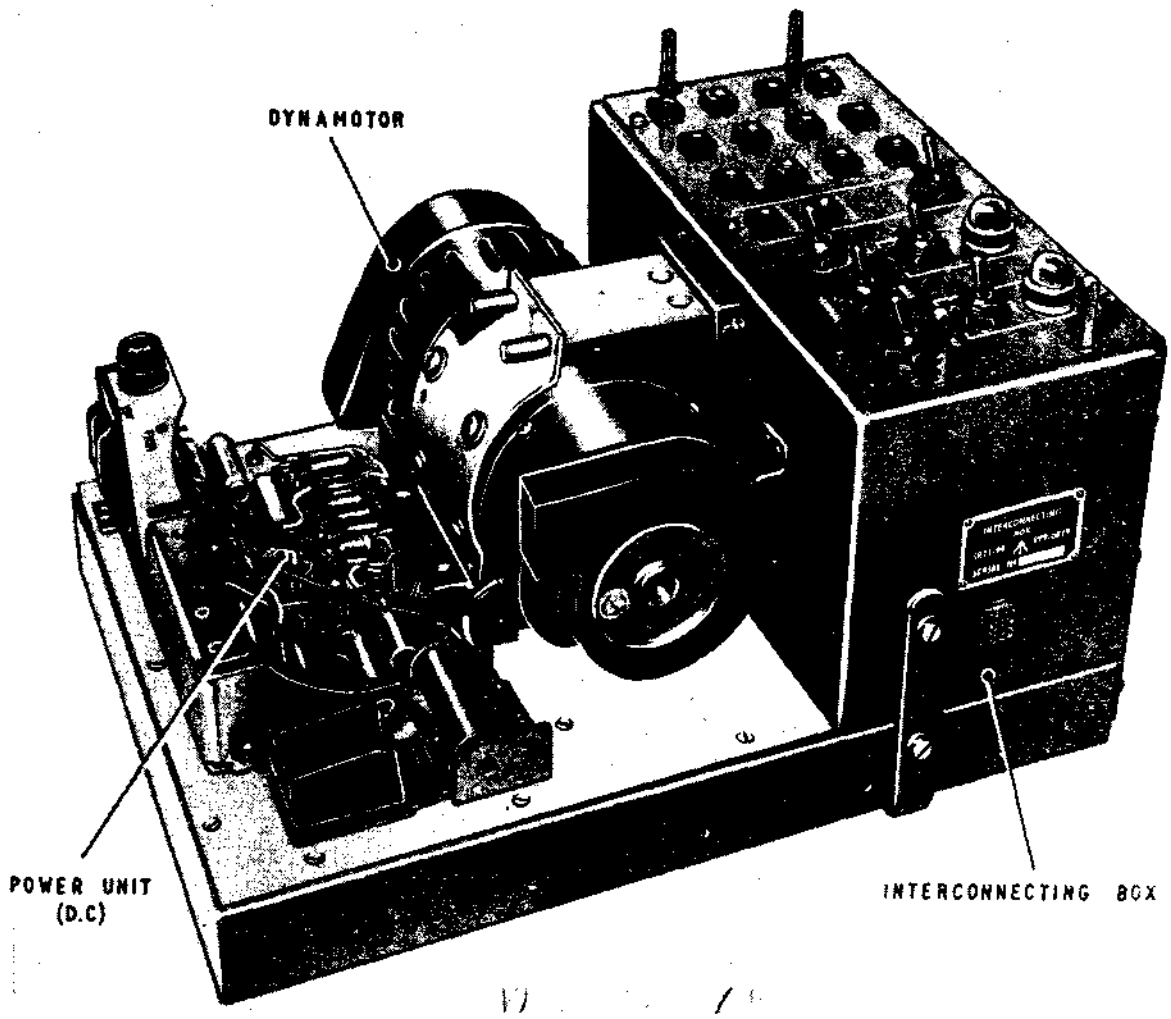

Fig. 32. Interconnecting box 5821-99-999-0819 and power unit, direct current with dynamotor in raised position

which are preset to give the required load current. The 6·3V a.c. supply from plug J1504 is loaded only by the preset resistor R6. All power supply outputs from the chassis under test are provided with test sockets (T/SKT5 to T/SKT11) to facilitate measurement of the output voltages.

Supplementary testing

102. The interconnecting box (Table 1, item 1) is used to verify the correct operation of the relay unit 5821-99-942-8545 and the control unit Type C1607/ARC52, and, in conjunction with the test set, control unit (Table 1, item 7), the control, radio set Type C1607/4. The interconnecting box, test set, (Table 2, item 1), in conjunction with the control, interconnecting box, test set (Table 2, item 7), is used to verify the correct operation of the control, radio set Type PTR374A. The use of the interconnecting boxes in testing these units is described separately in the following paragraphs.

Relay unit

103. The power supply (425V), the interconnecting box and the relay unit under test are interconnected (para. 7 and 8) and power supplies are applied to the relay unit when the interconnecting box MODULE SELECTOR switch is set to RELAY. The interconnecting box TEST switch is used to test the operation of the various relays in the unit under test. Position 1 verifies the serviceability of the RELAY FAIL indicator lamp and of the relay testing circuit and positions 2 to 9 inclusive test the relays in accordance with the functions listed in Table 4. The RELAY FAIL, DISABLE or PASS indicator lamps light as appropriate at each switch position.

Fig. 33. Dummy load, electrical 5985-99-999-1866 and cable assembly, power, electrical 6150-99-999-4743

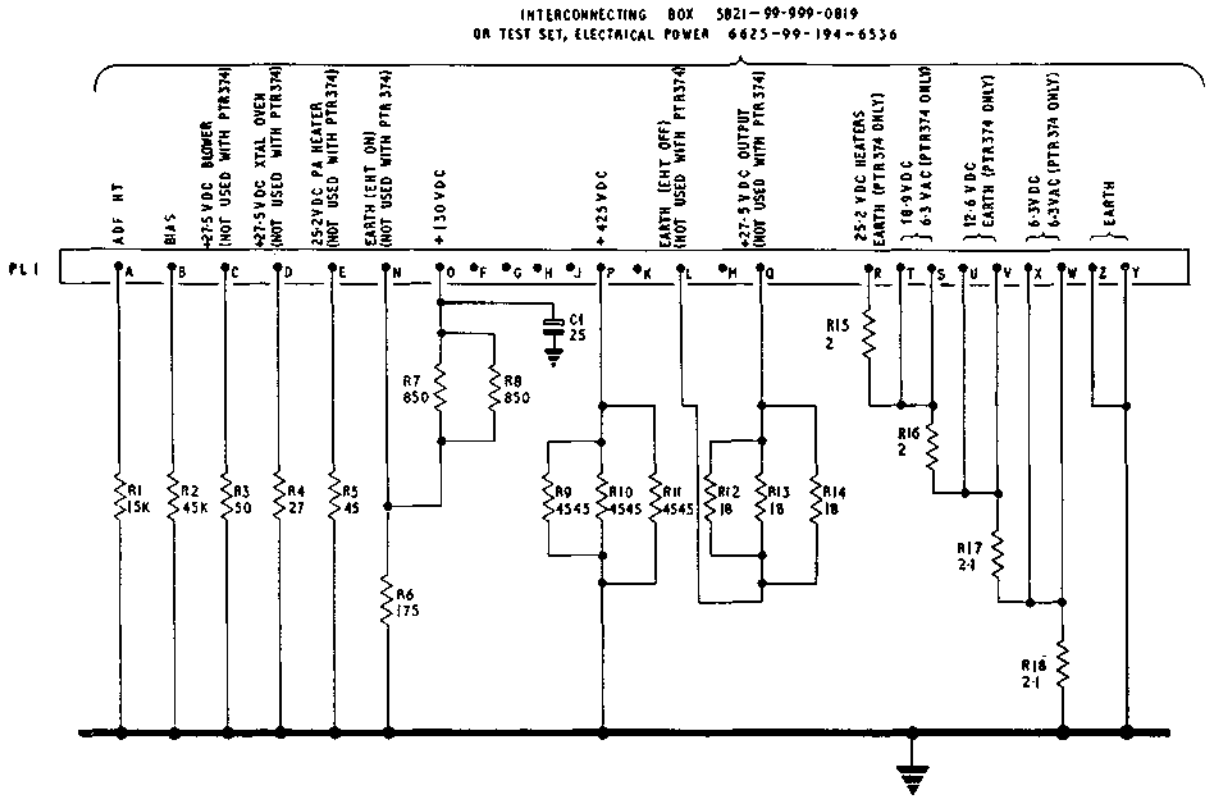

Fig. 34. Dummy load, electrical 5985–99–999–1866: circuit

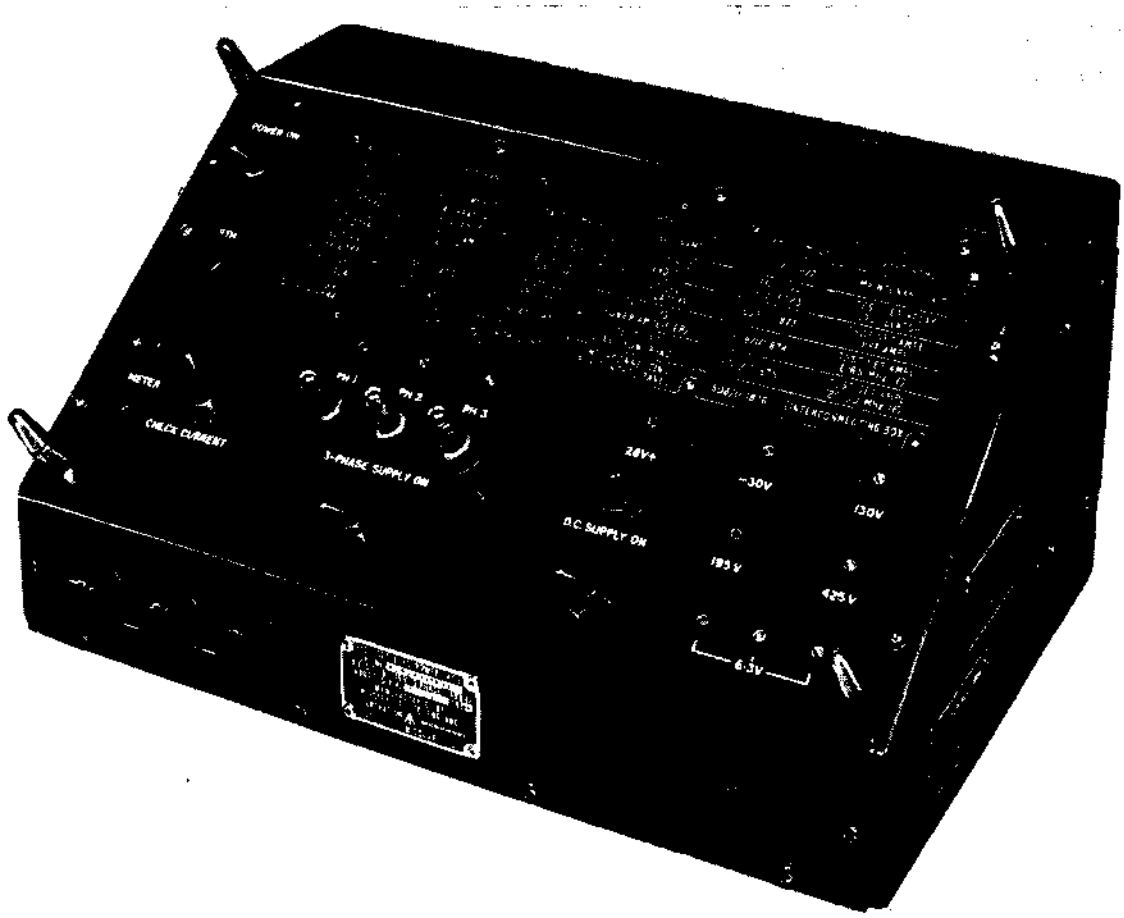

Fig. 35. Test set, electrical power 6625–99–194–6536

TABLE 4

Relay unit test functions

Interconnecting box TEST switch position		1	2	3	4	5	6	7	8	9
Relay energized		—	—	K901	—	K901	K901	K902	K903	K901 K904
Earth applied to relay via P901 Pole No.		—	—	11	—	11	11	14	12	13
Correct indication	FAIL (red)	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
	DISABLE (amber)	ON	OFF	ON	ON	ON	ON	ON	ON	ON
	PASS (green)	OFF	ON	ON	ON	ON	ON	ON	ON	ON
FAIL—earth pole on P901		—	15	2	18	20	22	24	4	21
DISABLE—supply pole on P901		10	10	10	10	10	10	3	10	10
PASS—earth pole on P901		22	2	15	21	18	4	22	24	20
Relay or associated wiring unserviceable if:—	FAIL incorrect	CHECK INTERCONNECTING BOX	K901	K901	K901	K904	K902	K903	K901	K901
	DISABLE incorrect	K902	K902	K902	K902	K902	K902	K902	K902	K902
	PASS incorrect	K901	K901	K901	K901	K901	K901	K902	K903	K901 K904
Voltage at squelch		0	0	Approx −20V	0	0	0	Same as d.c. input supply	0	0

Control Unit Type C1607/ARC52

104. The power supply (425V), the interconnecting box and the control unit under test are interconnected (para. 7 and 8) and power supplies are applied to the control unit when the interconnecting box MODULE SELECTOR switch is set to CONTROL. Certain switches on the interconnecting box are used in conjunction with the indicator lamps across the top of the front panel to verify that the switch wiring of the control unit under test is in order.

105. The indicator lamps used in control unit testing commence with the third from the left, and readng from left to right, are marked as follows :—

(1) 200 (4) 2 or 7 (7) 0 to 4,
(2) 0 or 5 (5) 3 or 8 (8) G
(3) 1 or 6 (6) 4 or 9 (9) ADF

106. The MEGACYCLES switch has three positions marked 10, 1·0 and 0·1, so that by setting the switch to 10, the wiring associated with the 10 MHZ selector switch in the control unit can be tested. If the wiring is in order, the appropriate indicator lamps light e.g. for position 7, the 2 or 7 lamp (para. 105 (4)) should light and the 0 to 4 lamp should be extinguished. This procedure is the same for units and decimals switches. The 200 lamp should light when the 200/300 switch on the control unit under test is set to 200 or the RE-ENTRANT EARTH switch on the interconnecting box is operated. This switch is used to verify the operation of the re-entrant earth system.

107. The G and ADF lamps light when the function switch of the control unit under test is set to either T/R + G or to ADF. All lamps should extinguish when the function switch is set to OFF.

Control, radio set Type C1607/4

108. The power supply (425V), the interconnecting box, the test set and the control unit under test are interconnected (para. 39) and the interconnecting box is used for testing this control unit in the same manner as for the Type C1607/ARC52 (para. 104 to 107). The additional circuits peculiar to the Type C1607/4 are tested by the test set in conjunction with the interconnecting box.

109. The test set has two rows of indicator lamps which are identified as follows:—

G-TENS	M-UNITS	DECIMAL ·00/·05	V.H.F.
DISPLAY	TEST SIGNAL	HSR DISABLE	SIGNAL CONVERTER	HSR

110. If the CHANNEL switch on the test set is rotated in unity with that on the control unit under test, the green M-UNITS and G-TENS lamps indicate the continuity of the channel indicating circuits.

111. The u.h.f./v.h.f. control circuit is tested by selecting a v.h.f. channel, either manually or by operation of the preset channel selector switch, when the V.H.F. lamp should light. Similarly, the DECIMAL ·00/·05 lamp indicates the correct functioning of the 50 kHz control circuit when a channel at a 50 kHz point is selected.

112. The remaining indicator lamps enable the circuits associated with the function switch to be tested. The circuits which are additional to those in the control unit Type C1607/ARC52 are for use in data link installations. With the GUARD/DATA switch on the control unit in the DATA position, the lamp indication is as follows:—

Switch position	Lamp indication
OFF	Nil
T/R	HRS DISABLE, SIGNAL CONVERTER, HSR
T/R + G	HSR DISABLE, SIGNAL CONVERTER, HSR
ADF	HSR DISABLE, SIGNAL CONVERTER, HSR
DL	DISPLAY, SIGNAL CONVERTER, HSR
DL/T	DISPLAY, SIGNAL CONVERTER, TEST SIGNAL, HSR
T/R ON, DL OFF	HSR DISABLE, HSR

Control, radio set Type PTR374A

113. The power supply (425V), the 28V (nominal) d.c. supply, the interconnecting box, the test set and the control unit under test are interconnected (para. 42) and the interconnecting box is used for testing this control unit in the same manner as for the Type C1607/ARC52 (para. 104 to 107). The additional circuits peculiar to the Type PTR374A are tested by the test set in conjunction with the interconnecting box.

114. Correct selection of those functions of the control unit function switch not tested by the interconnecting box is indicated by illumination of the STAND BY 1, STAND BY 2, VHF/UHF, STAND BY TEST SET, ADF AE DISABLE and 28V lamps on the test set front panel. Decimal frequency selection and the selection of v.h.f. channel frequencies is indicated by the illumination of the ·00/·05 and VHF lamps and correct operation of the COMM CMD and NAV CMD switches by the COMM TAKE COMMAND and NAV TAKE COMMAND lamps.

115. Switching of the control unit remote visual indicator lines by means of the CHAN switch, earths one or more of five connections and joins together the remainder of the five. The five REMOTE VISUAL INDICATORS lamps in the test set are each connected in series with one visual indicator line and a 28V d.c. supply. The test set channel selector switch S1, when set to the same position as the control unit CHAN switch, earths those visual indicator lines which are not earthed in the control unit and thus, when the switch settings coincide, all five of these lamps are illuminated. Operation of the TEST switch S2 causes the indicator lamps associated with lines not earthed in the control unit to be extinguished. The direction of rotation of the remote visual indicator control is indicated by the CCW (counter-clockwise) and CW (clockwise) DIRECTION lamps.

116. The TEST LAMPS switch S3 is provided to verify the serviceability of all test set indicator lamps.

Test kit maintenance

117. Maintenance of the items included in the test kits should be performed in accordance with current practice for this type of equipment. The equipment should be maintained in a clean, dry and undamaged condition throughout its service life and care must be taken to avoid rough handling of switches, controls and connectors. Whilst the equipment is in use on the bench, the working area should be kept clear of servicing tools, soldering irons, etc.

118. Periodically examine the interior of each unit and ensure that all components and wiring are secure and undamaged. Any wiring requiring replacement should be replaced with the correct grade of wire and follow the same form as in the original. Wiring should be checked against the relevant circuit diagram of the equipment.

119. Examine connectors before coupling them to the test units, ensuring that they are undamaged and that the plug and socket terminations make good, firm contact with the mating components on the related equipment.

120. In general, such faults as may occur on test jigs and test sets can be readily traced, using standard fault location procedures in conjunction with the circuit diagrams. Details of the important parameters concerning certain of the test sets are given in para. 121 to 135. On completion of any repairs to items included in the test kits, tests should be made to confirm that the items comply with the parameters given in para. 121 to 135 where applicable and the serviceability of the items should then be confirmed by performance of the relevant module test procedure, using a module of known serviceability and performance, as described in

A.P.116D-0105-1, 2nd edition, Chap. 8 and A.P.116D-0129-1, Chap. 7.

Test set, amplifier (main receiver and transmitter pre-amplifier) 6625-99-999-2362

121. Verify satisfactory performance of this test set as follows:—

(1) Set all switches of the power supply (425V) to OFF and turn the voltage adjusting controls fully counter-clockwise.

(2) Connect the test set to the power supply and set the power supply SUPPLY and 130 VDC switches to ON. Adjust the power supply 130 VDC ADJ control to obtain an indication of 130V on the power supply meter.

(3) Set the output of a signal generator CT394A to 25 MHz at a level of 2mV (open circuit) and connect it to SKT3 (J1518) on the test set.

(4) Connect a multimeter, electronic CT471 (set to 4V d.c. range) between the test set METER sockets. The CT471 indication should be not less than 1·5V.

Test set, amplifier (pre-amplifier) 6625-99-194-9019

122. Verify satisfactory performance of this test set as follows:—

(1) Set all switches of the power supply (425V) to OFF and turn the voltage adjusting controls fully counter-clockwise.

(2) Connect the test set to the power supply, set the SUPPLY, 130 VDC and 27·5 VDC switches to ON, and adjust the 130 VDC ADJ control to obtain an indication of 130V on the power supply meter.

(3) Set the test set controls as follows:—

Switch	Position
FUNCTION	CAL
SELECT	VHF TX
FREQUENCY	90
UHF PA MODULE	OFF
VHF TRANSMIT	OFF
CALIBRATE	Fully counter-clockwise

(4) Connect a multimeter, electronic CT471 (set to 4V d.c. range) between test sockets T/SKT1 and T/SKT5. The CT471 indication should increase smoothly from zero to 1·5V (minimum) as the CALIBRATE control is turned to the fully clockwise position. Repeat this test with the FREQUENCY switch set to 100 and then to 110. Disconnect the CT471.

(5) Set the FUNCTION switch to O/P and, using a calibrator, frequency 6625-99-999-2642, measure the frequency of the signal at socket SKT6 with the FREQUENCY switch set to each of its three positions in turn. These frequencies should be within 2 kHz of the nominal frequencies and, if necessary, L6 (90 MHz), L8 (100 MHz) or L10 (110 MHz) should be adjusted to obtain the required result.

(6) Set the SELECT switch to VHF RX. Connect a wattmeter, absorption CT443 to socket SKT5 and set the FREQUENCY switch to 100. Adjust L14 for maximum CT443 indication, which should be not less than 25mW.

(7) Set the FREQUENCY switch to 90 and then to 110 and verify that a CT443 indication of not less than 25mW is obtained at each setting. If necessary, L14 may be readjusted to obtain a satisfactory output at each selected frequency.

(8) Transfer the CT443 to socket SKT6, when zero indication should be obtained. Set the SELECT switch to VHF TX, when the CT443 indication should be within 0·5mW of the indications obtained in (6) and (7) for each setting of the FREQUENCY switch. Disconnect the CT443.

(9) Set the output of a signal generator CT394A to 25·7 MHz at a level of 2mV (open circuit) and connect it to socket SKT3 on the test set.

(10) Connect the CT471 (set to 4V d.c. range) between test sockets T/SKT1 and T/SKT2. The CT471 indication should be not less than 1·5V.

Test sets, amplifier (20–30 MHz) 6625-99-999-4424 and 6625-99-194-5274

123. Following repairs to these test sets, the alignment procedure (para. 124) should be performed and the tests described in para. 125 to 133 should then be applied to verify the serviceability of the test set.

124. The alignment procedure is as follows:—

(1) Set the test set H.T. switch and all switches of the power supply (425V) to OFF and connect the power supply to the test set. Set the power supply SUPPLY and 130 VDC switches to ON and adjust the 130 VDC ADJ control to obtain a power supply meter indication of 130V.

(2) Connect a multimeter, electronic CT471 (set to 1·2V d.c. range) between the test set EARTH and METER test sockets (positive to EARTH).

(3) Set the test set RECEIVE/TRANSMIT switch to RECEIVE, the 1·85 M/C CRYSTAL switch (ARC52 test kit) or the OSC. switch (PTR374 test kit) to OFF and the H.T. switch to ON.

(4) Using a calibrator, frequency 6625-99-999-2642, set the frequency of a signal generator CT452A to 1·87 MHz and then connect the CT452A to J1516 on the test set. Adjust the CT452A output level for a convenient indication on the CT471 and adjust L1 for maximum indication on the CT471.

Note . . .

The inductor cores are sealed with varnish, oil 8010-99-947-7826, *which must be softened and removed with remover, paint* 8010-99-947-7825 *before adjustment of the cores is attempted, and resealed with the varnish on completion of the alignment procedure.*

(5) Set the CT452A frequency to 1·83 MHz and adjust L2 for maximum CT471 indication.

(6) Set the CT452A frequency to 1·85 MHz and adjust L3 and L5 for maximum CT471 indication.

(7) With the same output level at each frequency, adjust L4 to give equal CT471 indications when the CT452A is set to 1·82 MHz and 1·88 MHz in turn.

(8) Repeat (5) and (6) and then seal the inductor cores.

125. With the equipment connected as in para. 124, measure the bandwidth as follows:—

(1) Set the CT452A frequency to 1·85 MHz and adjust its output level for a convenient CT471 indication. Note the CT452A output level and the CT471 indication.

(2) Verify that the CT452A output level required at both 1·82 MHz and 1·88 MHz to obtain the CT471 indication noted in (1) is not greater than 6dB up on the output level noted in (1).

126. Measure the detector sensitivity with the equipment connected as in para. 124. With the CT452A frequency set to 1·85 MHz and its output level set to 100μV, the CT471 indication should be not less than 0·25V.

127. Measure the sensitivity of the amplifier stages, which should be such that with an input signal at J1516 of 1·85 MHz at a level of 100μV and modulated to a depth of 30% at 1000 Hz, the r.m.s. voltage developed at the AUDIO test socket is not less than 0·5V as measured on the CT471. Note the CT471 indication obtained under these conditions.

128. Measure the a.f. characteristics by noting the CT471 indication obtained, with all other conditions as in para. 127, when the modulation frequency is set to 300 Hz and then to 10kHz. The difference between the CT471 indications and that obtained in para. 127 should not exceed 6dB.

129. Set the 1·85 M/C CRYSTAL switch (ARC52 test kit) to ON or the OSC. switch (PTR374 test kit) to the 1·8 and 1·85 positions in turn and measure the activity of the crystal oscillator at the XTAL CHECK test socket. The voltage developed at this socket should be not less than 1·5V negative with respect to the EARTH test socket.

130. Using the calibrator, frequency, measure the crystal oscillator frequeucy at the anode of V3. The frequency should be within 450 Hz of the nominal crystal frequency.

131. Turn the OSC. DRIVE control fully clockwise and measure the injection oscillator activity at the OSC. CHECK test socket at each setting of the OSCILLATOR FREQUENCY M/CS switch. The voltage developed at this socket should be not less than 3·5V negative with respect to the EARTH test socket.

132. Using the calibrator, frequency, measure the injection oscillator frequency at socket J1515. The frequency should be within 5 kHz of the nominal frequency selected by the OSCILLATOR FREQUENCY M/CS switch.

133. Set the RECEIVE/TRANSMIT switch to TRANSMIT and inject signals of 1V r.m.s. at frequencies of 20·7, 25·5 and 29·7 MHz into socket J1517. At each frequency, the voltage indicated by the CT471 connected between the METER (negative) and EARTH test sockets should be not less than 0·4V d.c.

Test set, oscillator 6625-99-999-2384

134. To adjust the d.c. level at the D.C. OUTPUT socket on this test set, remove the cover from the underside and proceed as follows:—

(1) Connect the output of a signal generator CT394A to the test set R.F. socket.

(2) Connect a multimeter, electronic CT471 (set to 1·2V d.c. range) between the D.C. OUTPUT and EARTH test sockets.

(3) Set the CT394A frequency to 25 MHz and its output level to 500mV, unmodulated.

(4) Adjust RV1 for a CT471 indication of 250mV.

(5) Remove the test equipment and refit the test set cover.

Test set, relay-oscillator 6625-99-955-6582

135. Test the d.c. output of this test set by verifying that the d.c. voltage at SKTB, pole d, with 28V d.c. applied at PLA, pole D, is 18V $\pm$2V d.c. with the 18V D.C. −27·5V D.C. switch set to 18V D.C. and 27·5V $\pm$2V d.c. with the switch set to 27·5V D.C.

Modifications

136. This chapter includes changes due to all relevant modifications up to and including No. 0456. Details of these modifications are contained in Vol. 2 of this Air Publication; a summary of each modification is given in Table 5.

TABLE 5

Modifications

Mod. No.	Class	Vol. 2 Leaflet	Vol. 2 A.L.	Label No.	Brief details of change
			TEST KIT, TRANSMITTER-RECEIVER, RADIO 6625-99-999-3075		
9250	B/2 (R.N.)	B120	181	—	Provide an additional test set and two cable assemblies to enable testing of facilities by control, radio set, Type C1607/4/ARC52. Mod. No. 9251 is associated.
			INTERCONNECTING BOX 5821-99-999-2643		
0740	B/2 (R.N.)			3	Change the value of resistor R1 from 3·3k to 4·7k and R2 from 22k to 10k; this is to provide a squelch bias voltage variation of +10V to −10V.
7407	B/3 (R.N.)	B89	128	1	Replace fourteen plastic lenses with glass lenses, as plastic type become distorted due to heat. To implement this change, nine replacement holders are also required.
9251	B/2 (R.N.)	B119	180	2	Fit a new plug and modify wiring to permit use of new unit and cable assemblies introduced by Mod. No. 9250.
			TEST SET, AMPLIFIER 6625-99-999-2362		
7409	B/2 (R.N.)	B87	126	1	The power supply cable assembly for use with this unit carries a +425V line from the power source used. This is taken through the unit to an output socket to the test jig, oscillator 6625-99-999-1046, but is not required and is a source of potential danger to users. The line through the test set, amplifier is to be removed.
			TEST SET, AMPLIFIER 6625-99-999-4424		
7410	B/3 (R.N.)	B90	129 & 143	1	Mod. No. 6498 to the intermediate frequency unit 5821-99-942-8557 adds ferrules and sleeves as support for microdot connectors at their emergence points. When offered up to the test set, amplifier, these additions foul the orifices through which they should pass and these are to be enlarged.
			INTERCONNECTING BOX 5821-99-999-0819		
◄ 7408	B/3 (R.N.)	B88	127	1	Replace the plastic lenses with glass to eliminate distortion from heat and replace associated lamps with higher-rated types to standardize.
7501	B/3 (R.N.)	B91	132 & 144	2	Replace 20A fuse unit with a 20A circuit breaker to withstand current surge when switching on with a power unit fitted for testing.
9304	C/3	B136	199	3	Add R3, R4 and switch S7 to provide for testing derivative equipment.
9818	B/3	B150	226	4	Provide correct facility for monitoring ADF voltage at the meter test panel socket.
A4098	C/3 WOTSAC	B248	402	5	Replace obsolete circuit breaker 5925-99-999-1015 with circuit breaker 5925-99-622-2411 which has a different method of fixing and is smaller, necessitating a mounting plate. ►

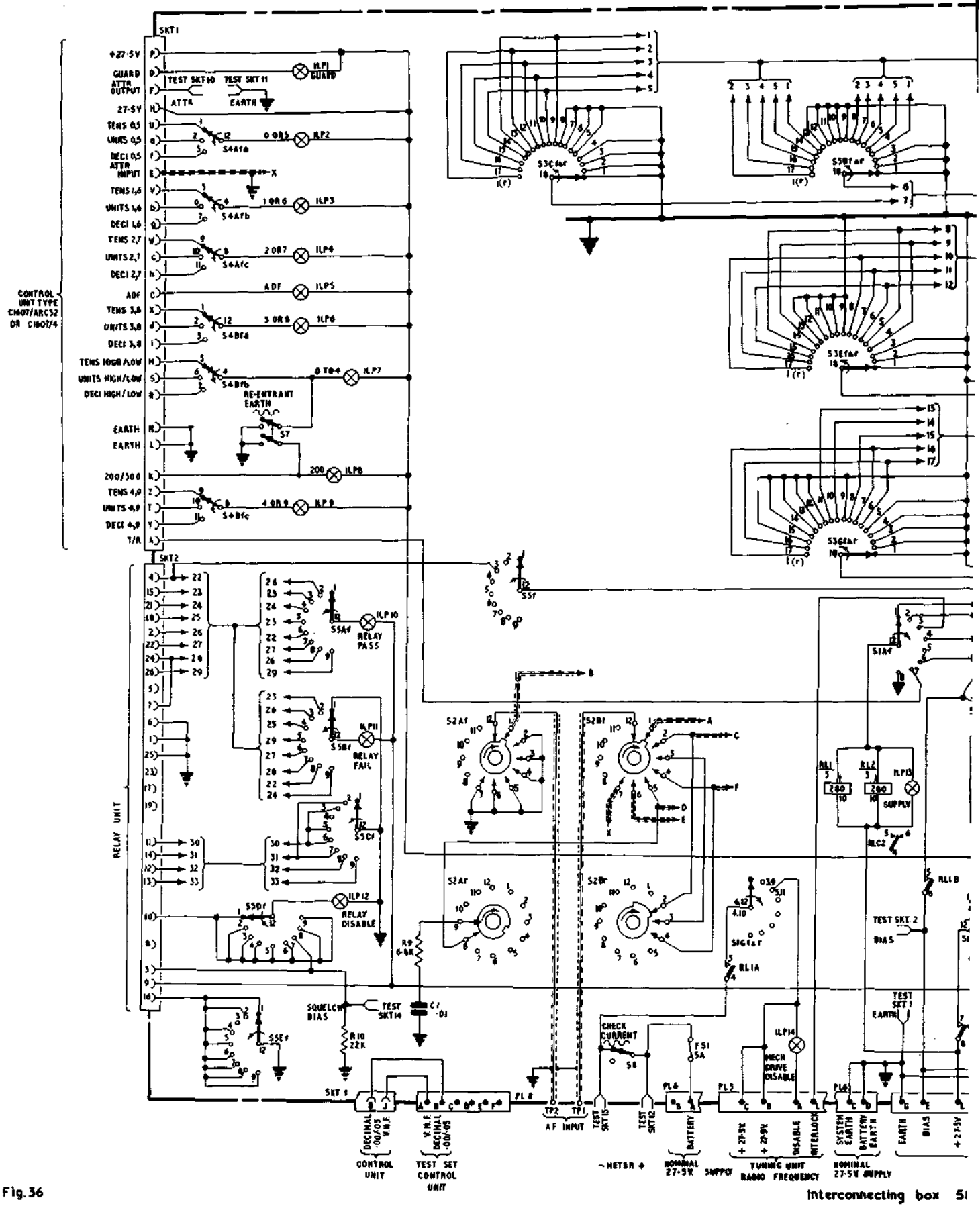

Fig. 36

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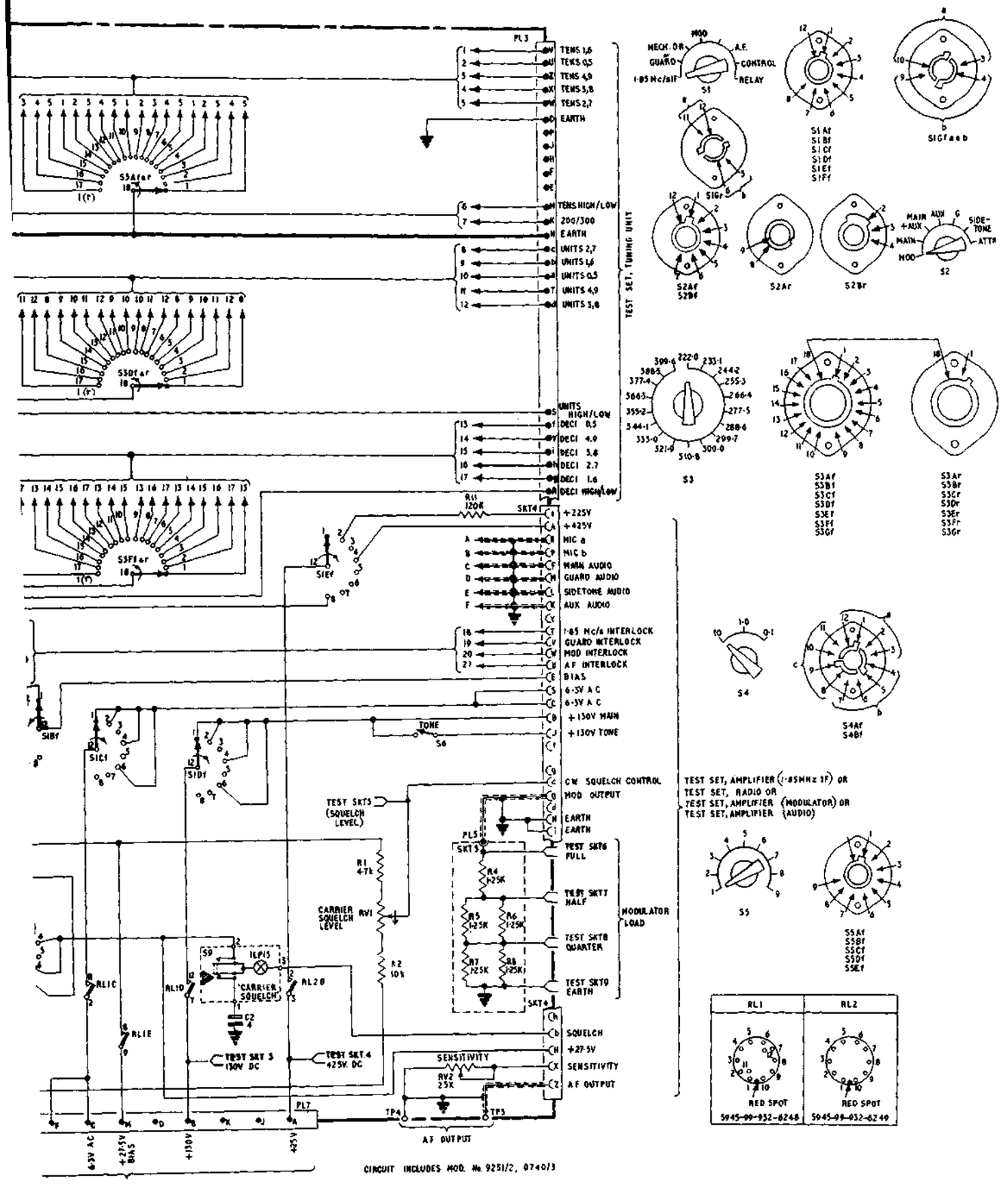


99-999-2643 : circuit

Fig. 36
4

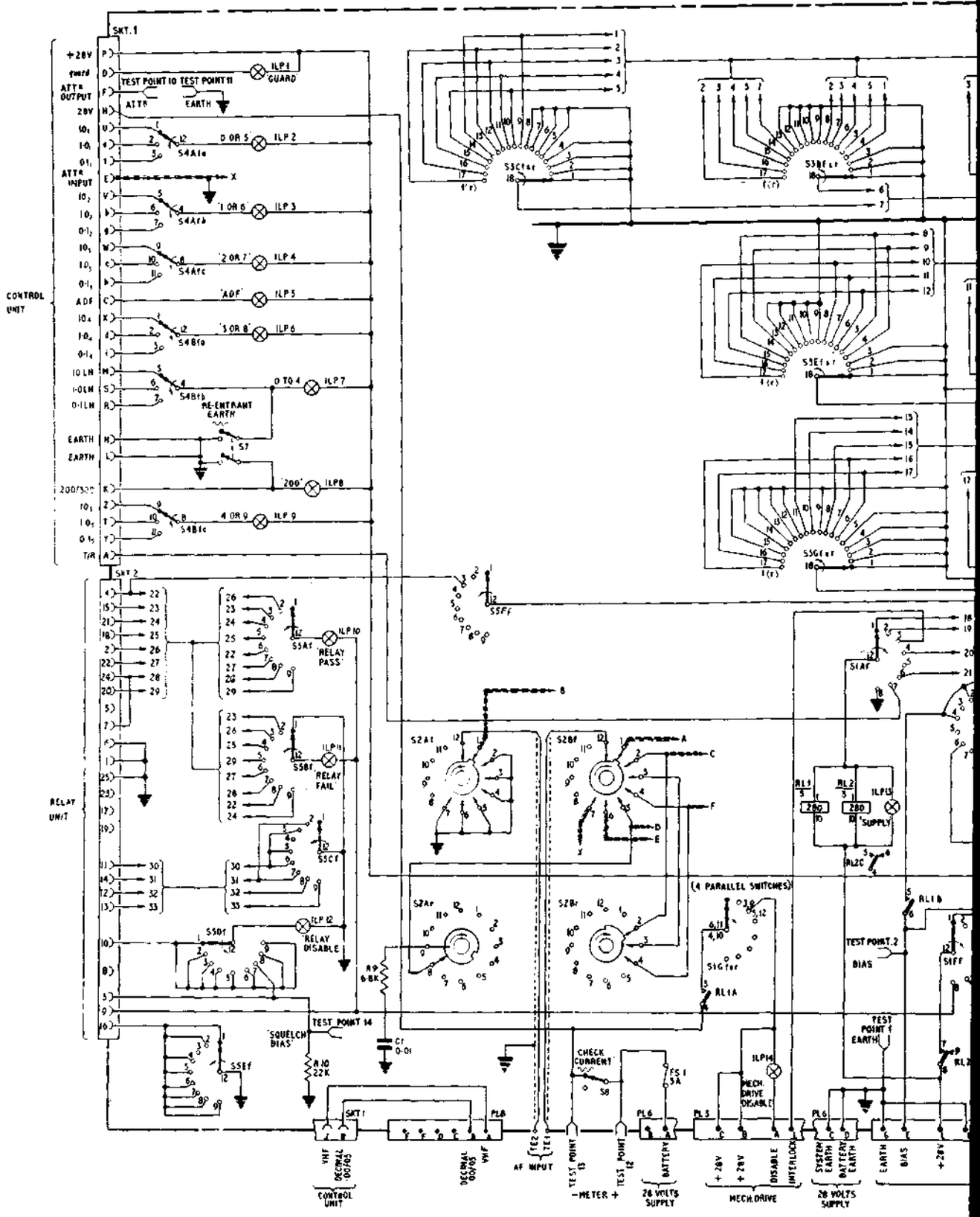
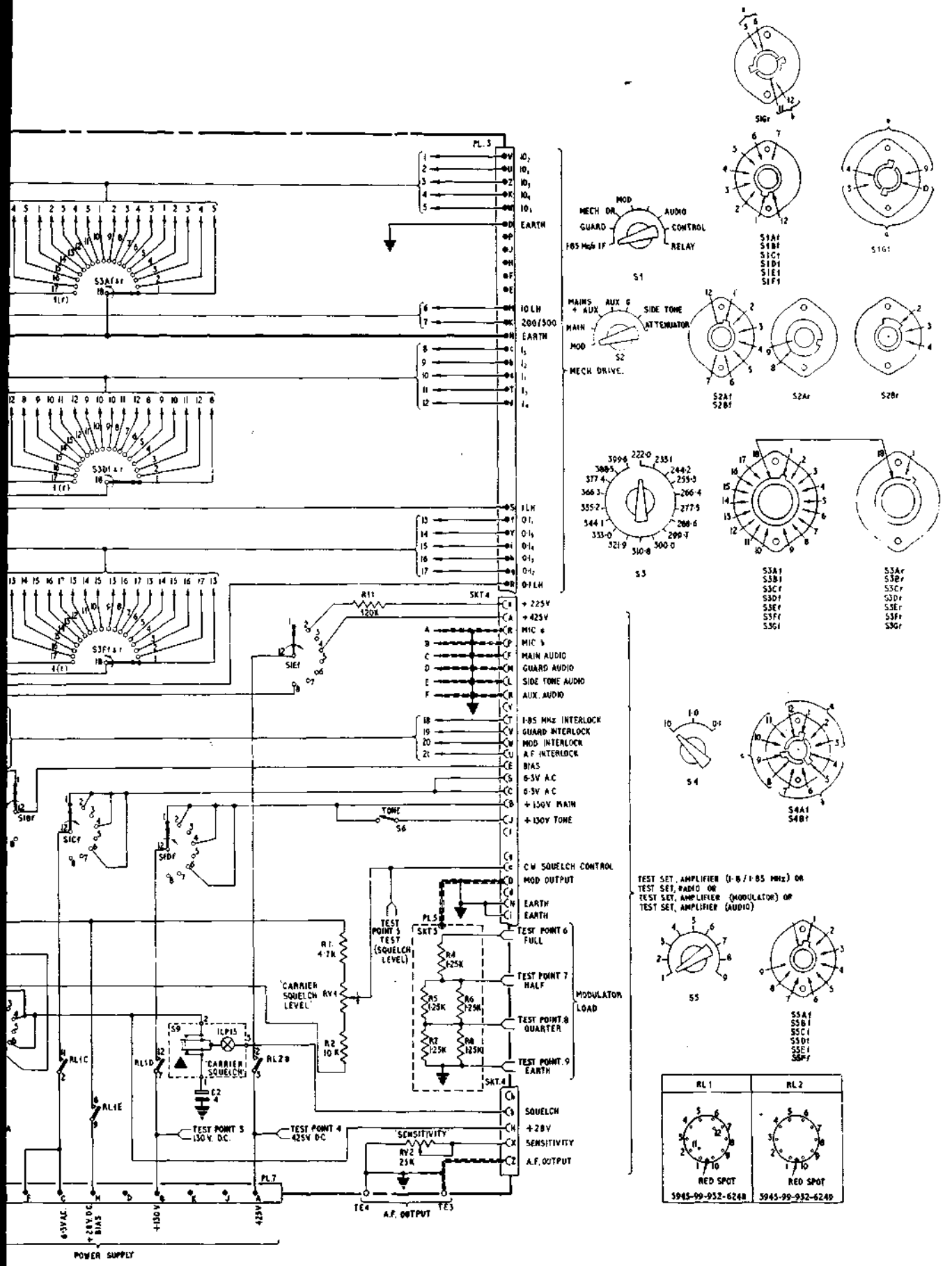


Fig. 37 Interconnecting box, test set 6625—9

A.L.4, Aug '68



— 194 — 5275 ; circuit

Fig. 37

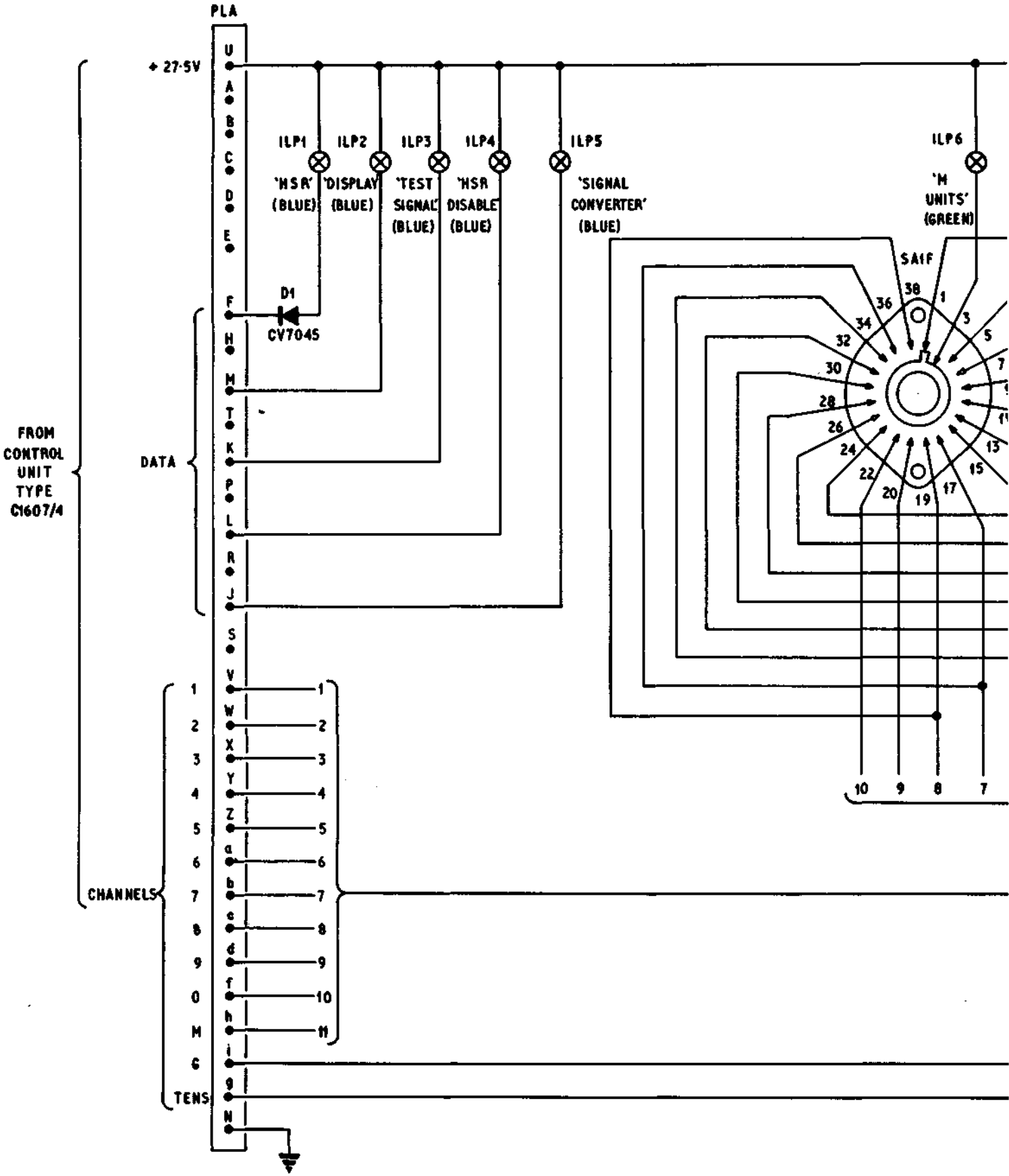
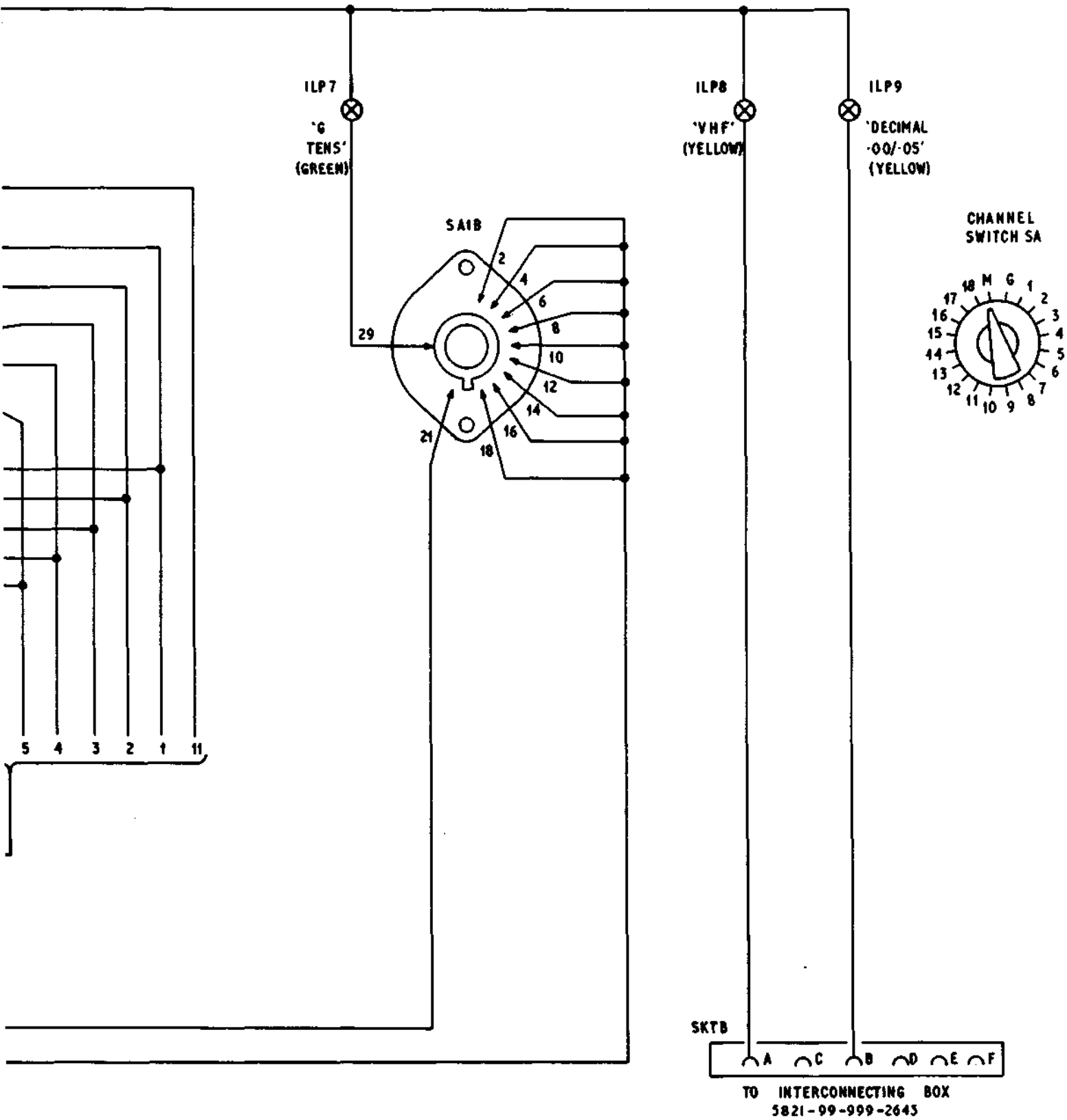
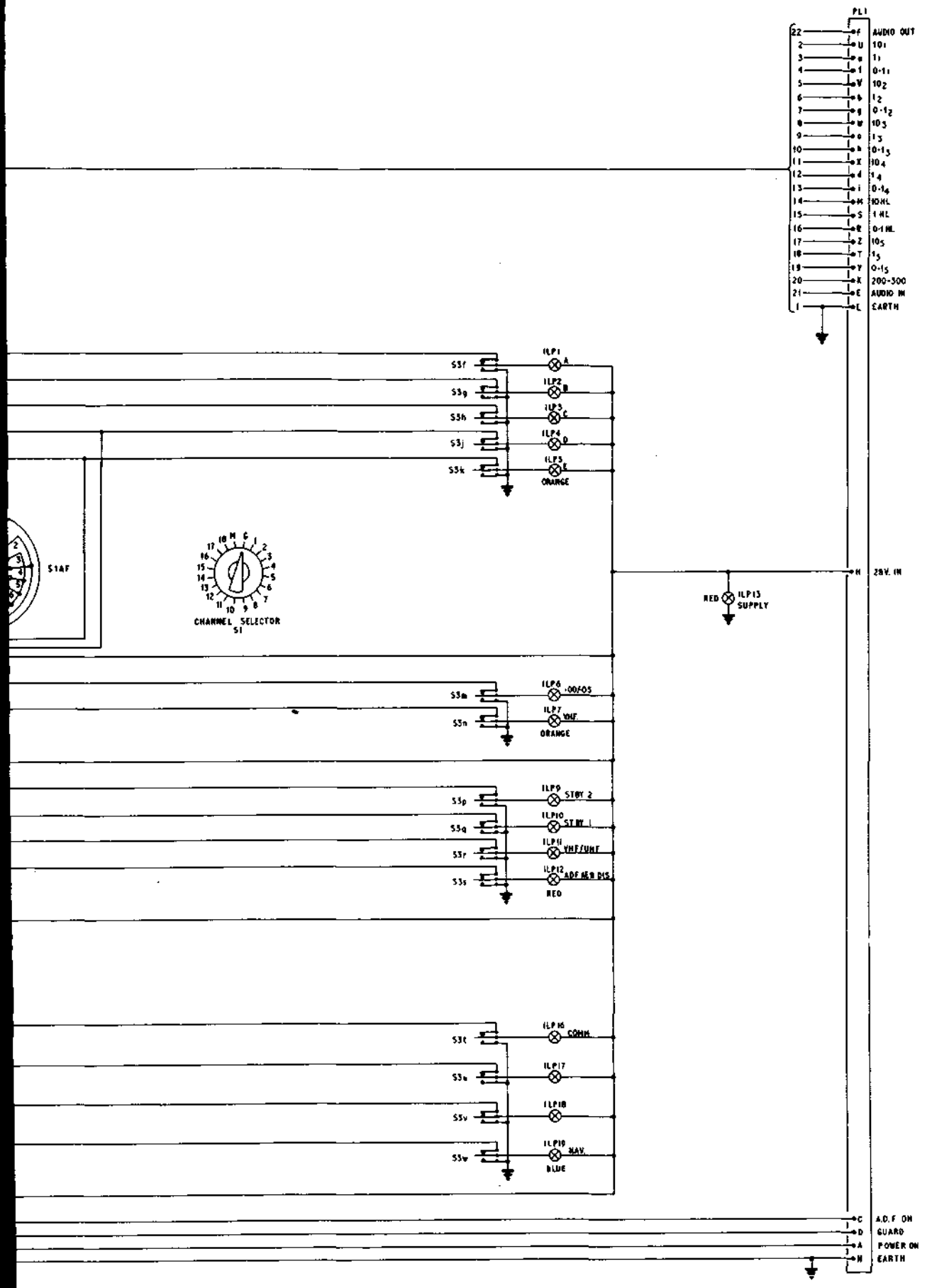


Fig. 38 Test set, control unit



625-99-952-8806 : circuit

Fig.38



box, test set 6625-99-194-5272 : circuit

Fig.39

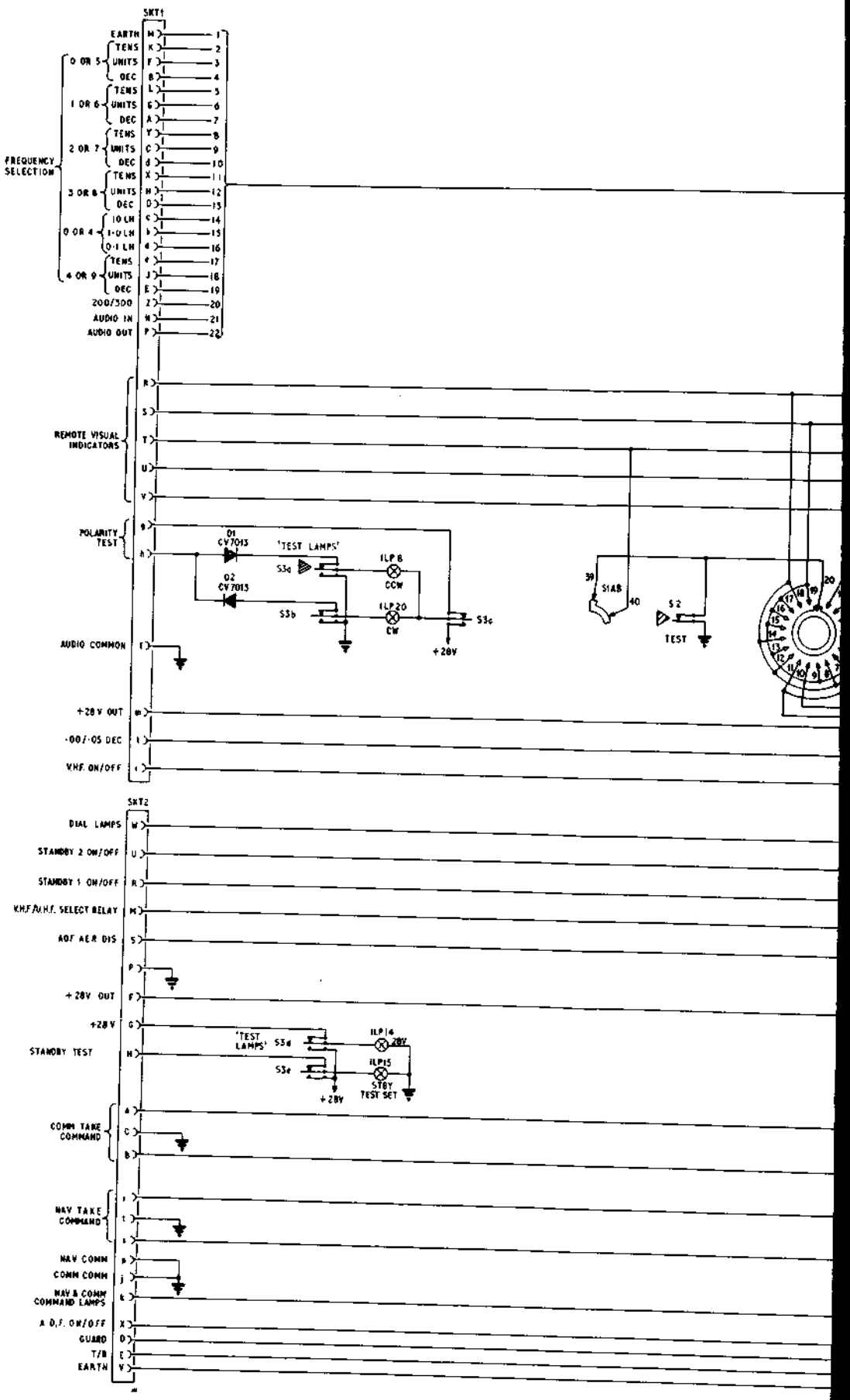


Fig. 39

Control ,interconnecti

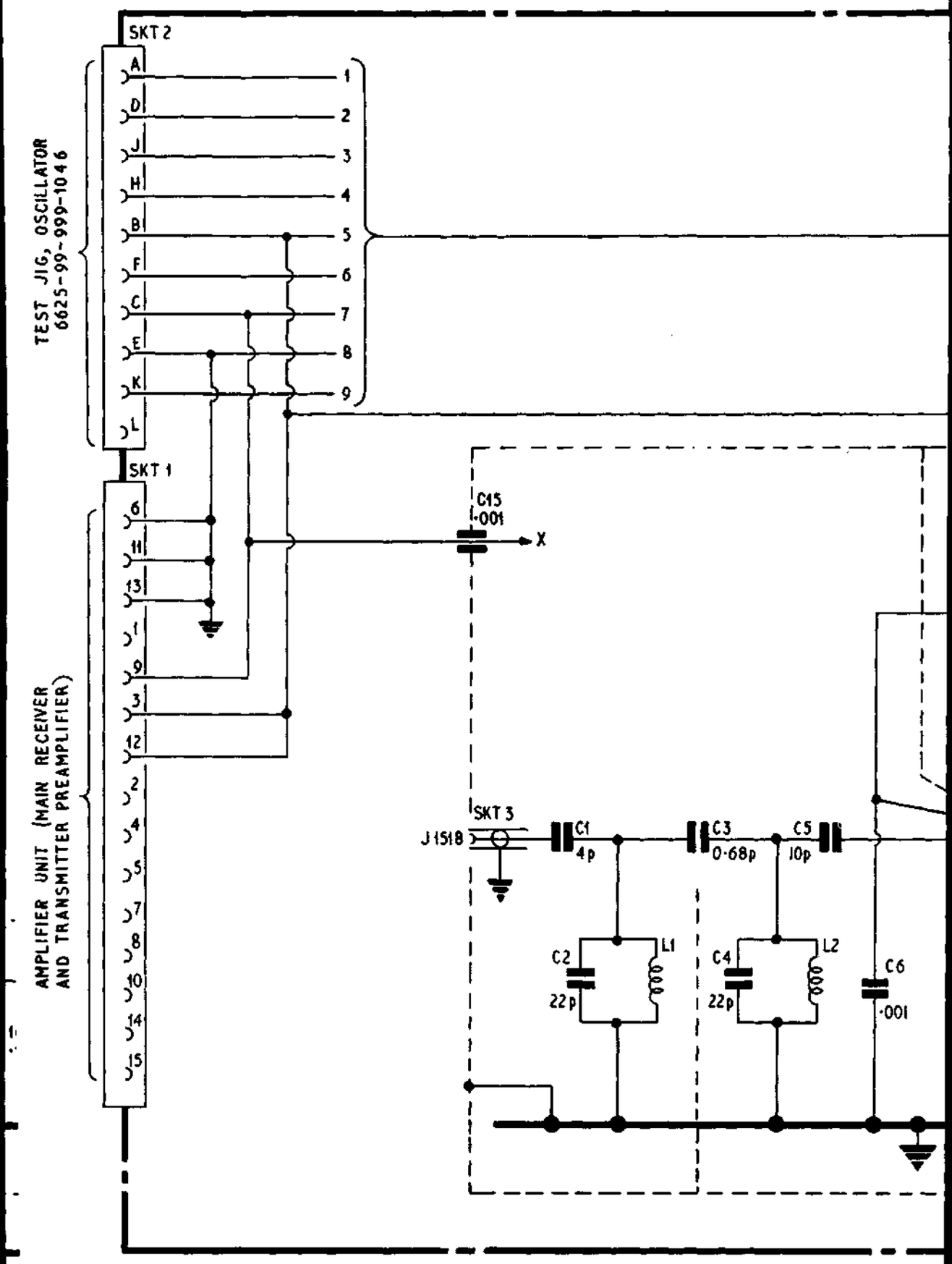


Fig. 40 Test set, amplifier (main receiver

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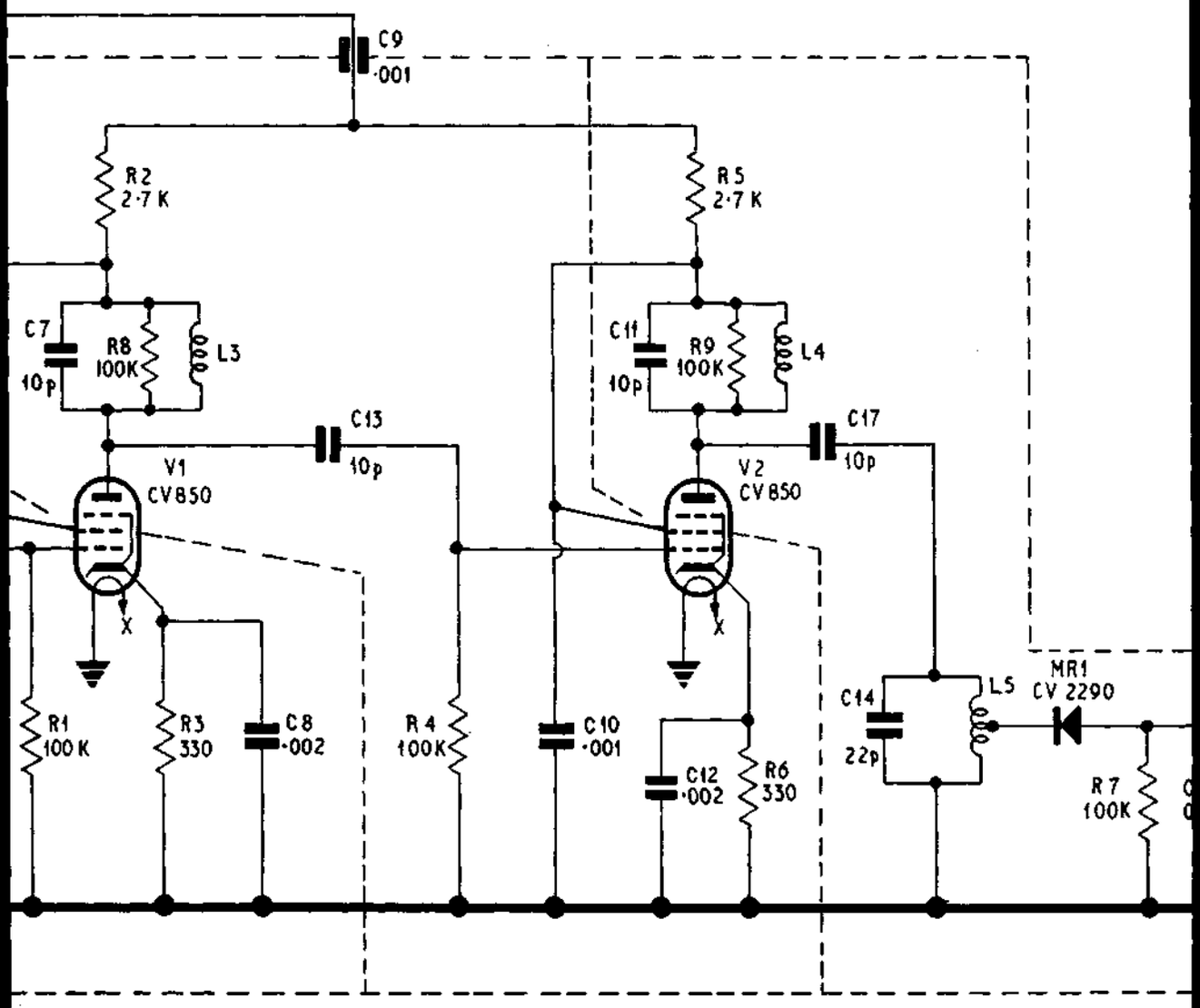


and transmitter pre-amplifier) 6625-99-999-2362: circuit

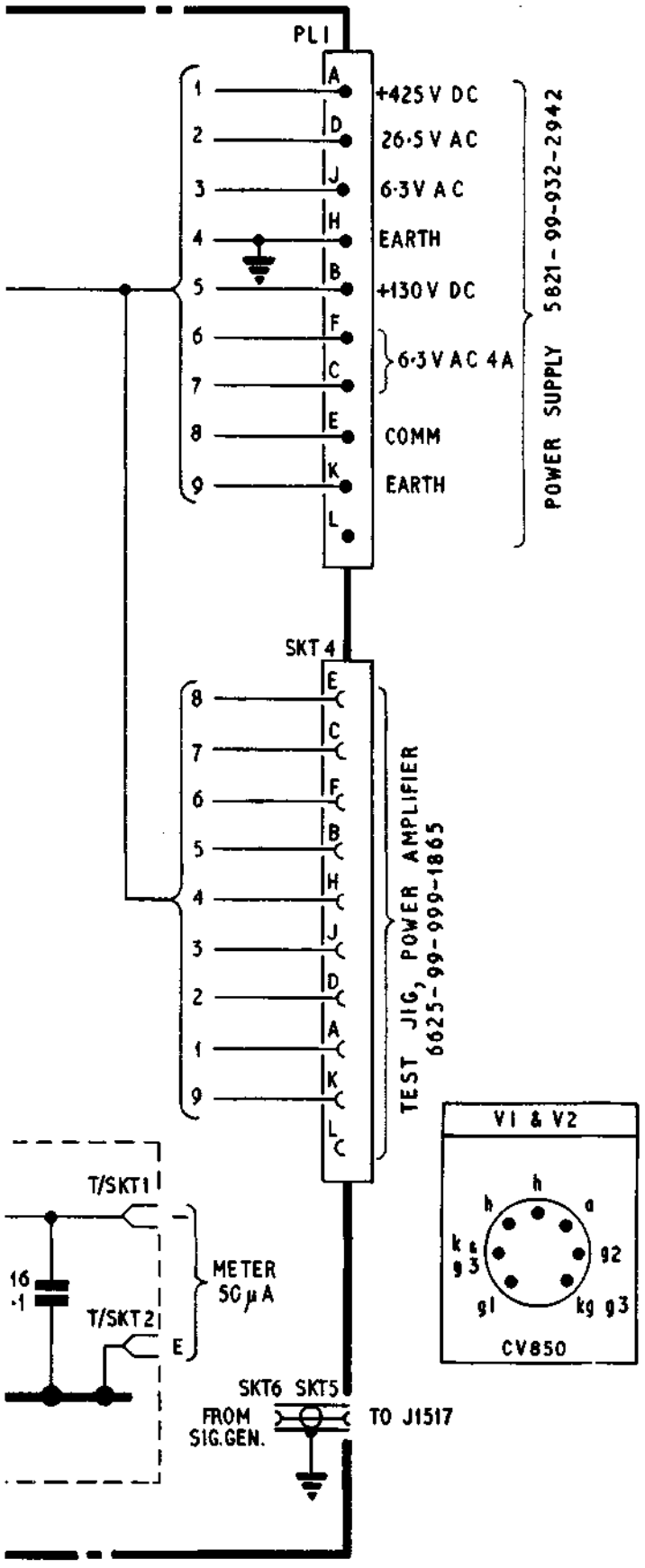

PL1
1
2
3
4
5
6
7
8
9
A
D
J
H
B
F
C
E
K
L
+425 V DC
26·5 V AC
6·3 V AC
EARTH
+130 V DC
6·3 V AC 4A
COMM
EARTH
POWER SUPPLY 5821-99-932-2942
SKT 4
TEST JIG, POWER AMPLIFIER 6625-99-999-1865
V1 & V2
h
a
g2
g3
g1
kg
CV850
T/SKT1
16
·1
T/SKT2
METER 50 μA
SKT6 SKT5
FROM SIG.GEN.
TO J1517

Fig. 40

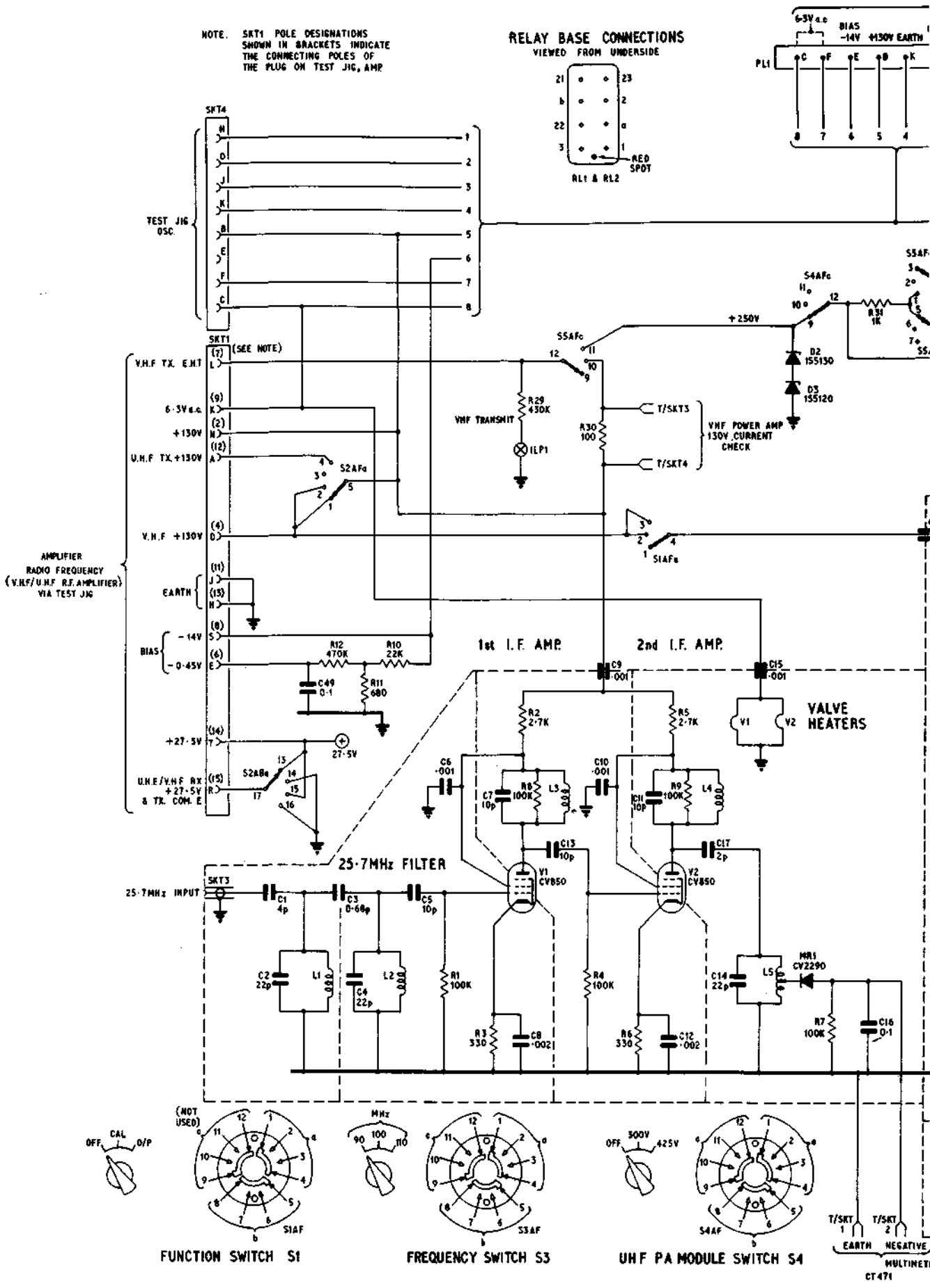
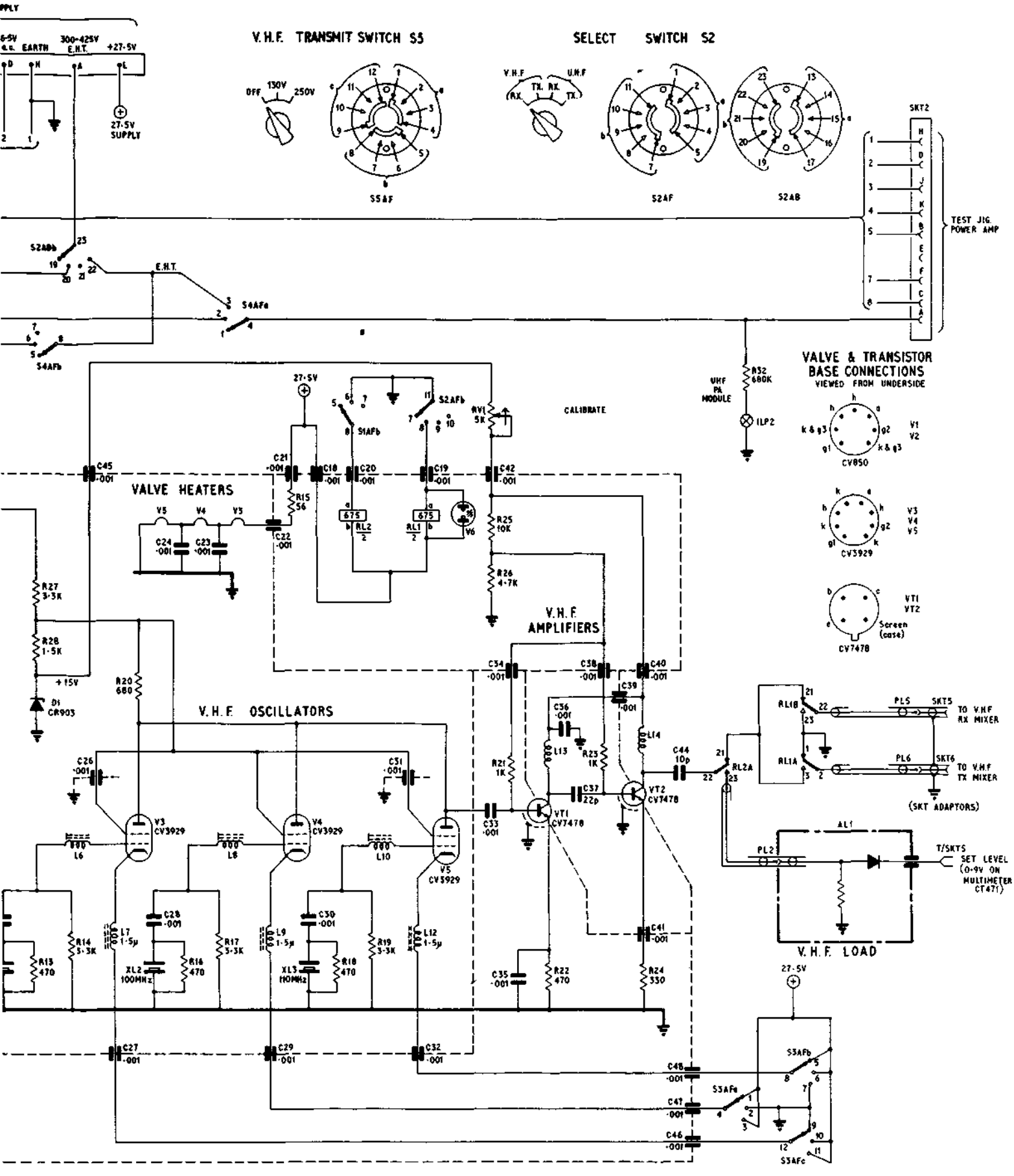


Fig. 41

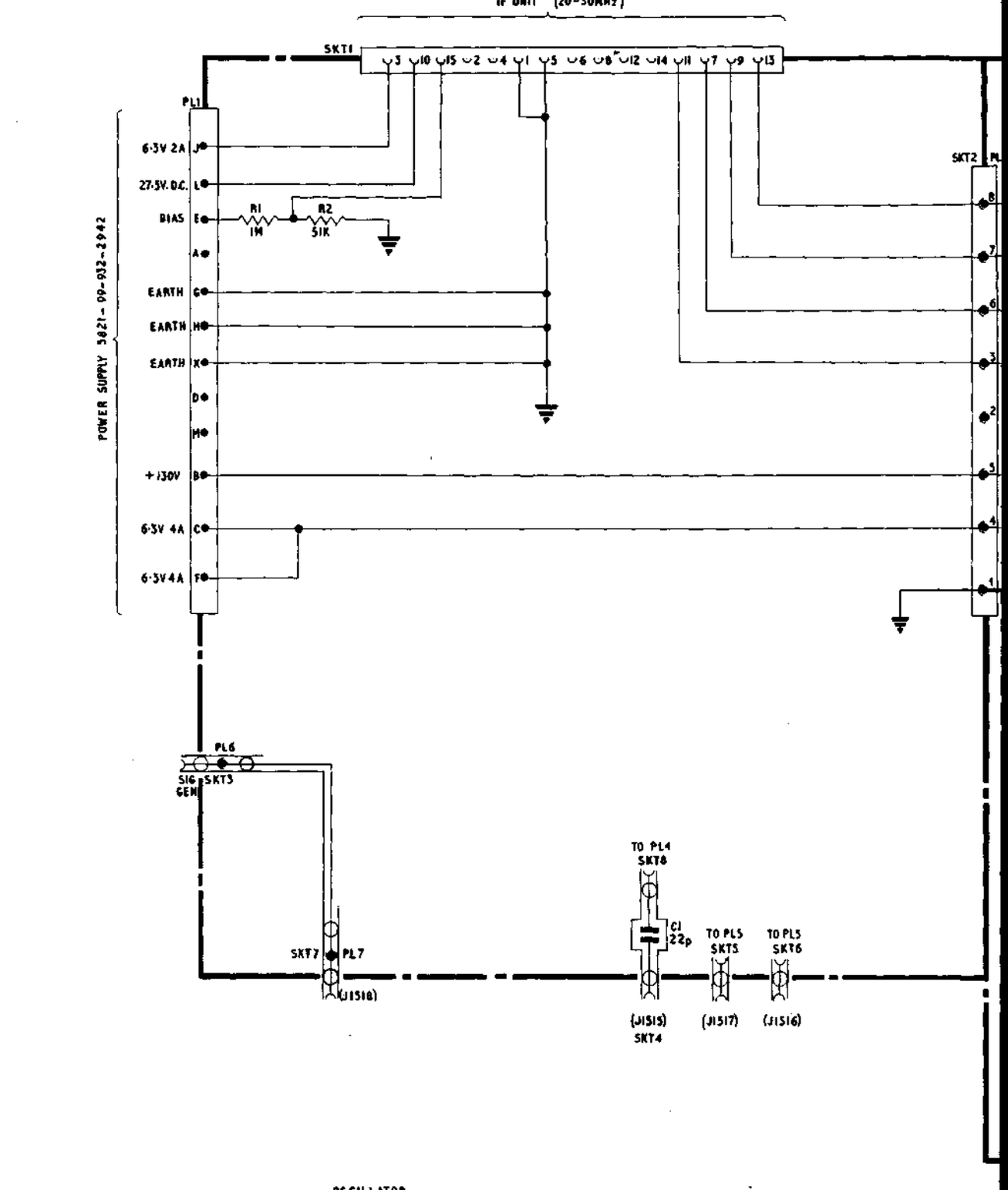
Test set, amplifier (pre-amplif

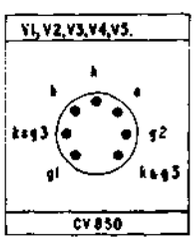
A.L.4, Aug. '68

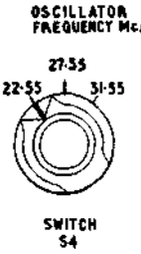


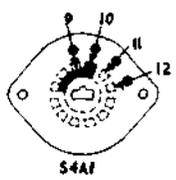
)6625-99-194-9019 : circuit

Fig. 4









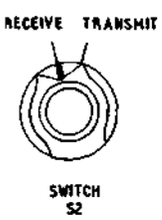
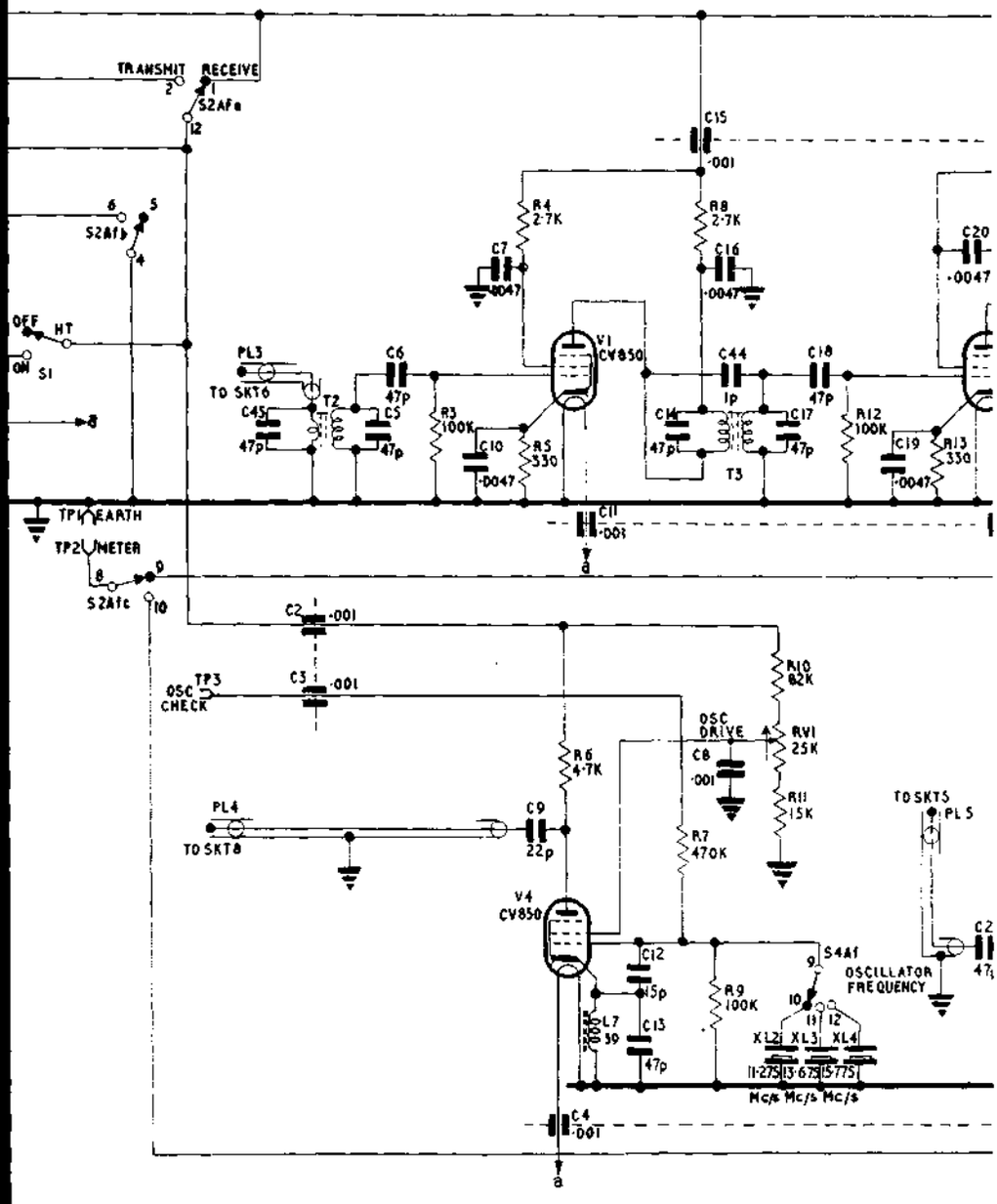


Fig. 42

A.L.4, Aug.'68

Test set, c



mplifier (20-30MHz i.f.) 6625-99-999-4424 : circuit

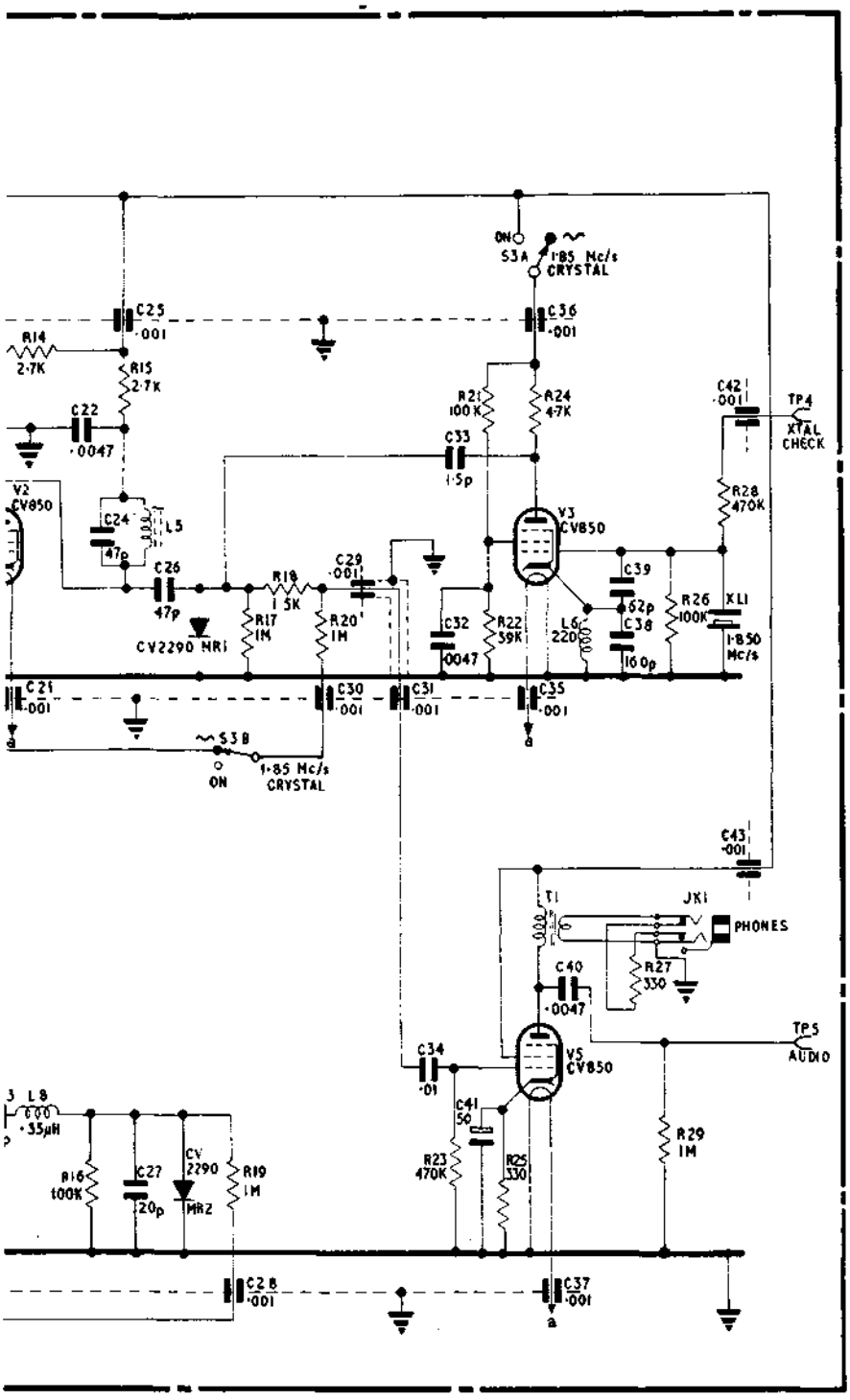

ON
S3A
1·85 Mc/s CRYSTAL
C25 ·001
C36 ·001
R14 2·7K
R15 2·7K
C22 ·0047
R21 100K
R24 4·7K
C33 1·5p
C42 ·001
TP4 XTAL CHECK
V2 CV850
C24 47p
L5
C26 47p
CV2290 MR1
R18 1·5K
R17 1M
R20 1M
C29 ·001
V3 CV850
C32 ·0047
R22 39K
L6 220
C39 62p
C38 160p
R26 100K
R28 470K
XL1 1·850 Mc/s
C21 ·001
C30 ·001
C31 ·001
C35 ·001
S3B
ON
1·85 Mc/s CRYSTAL
C43 ·001
T1
JK1
PHONES
R27 330
C40 ·0047
TP5 AUDIO
V5 CV850
C34 ·01
C41 50
R23 470K
R25 330
R29 1M
L8 ·35μH
R16 100K
C27 120p
CV 2290 MR2
R19 1M
C28 ·001
C37 ·001

Fig. 42

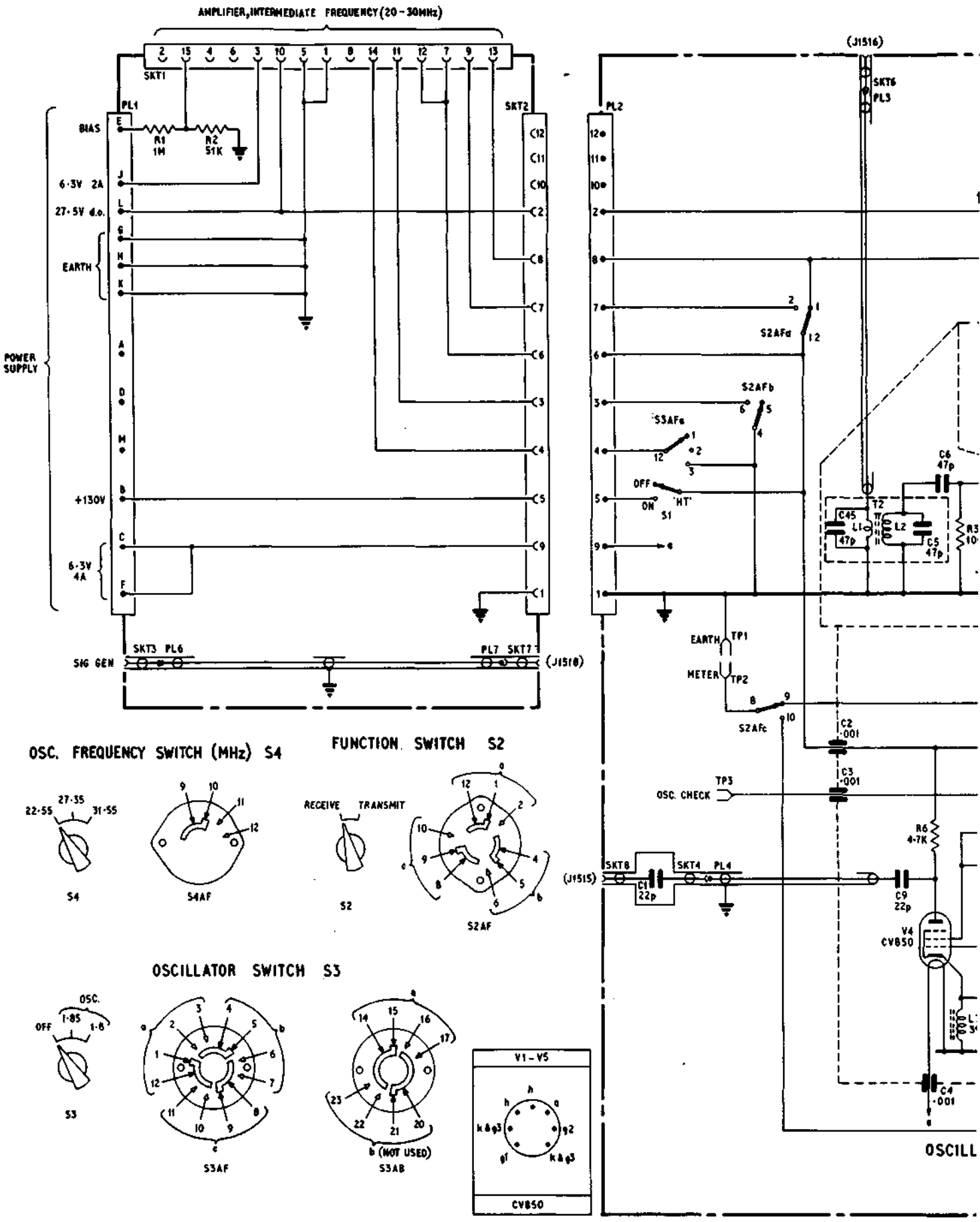
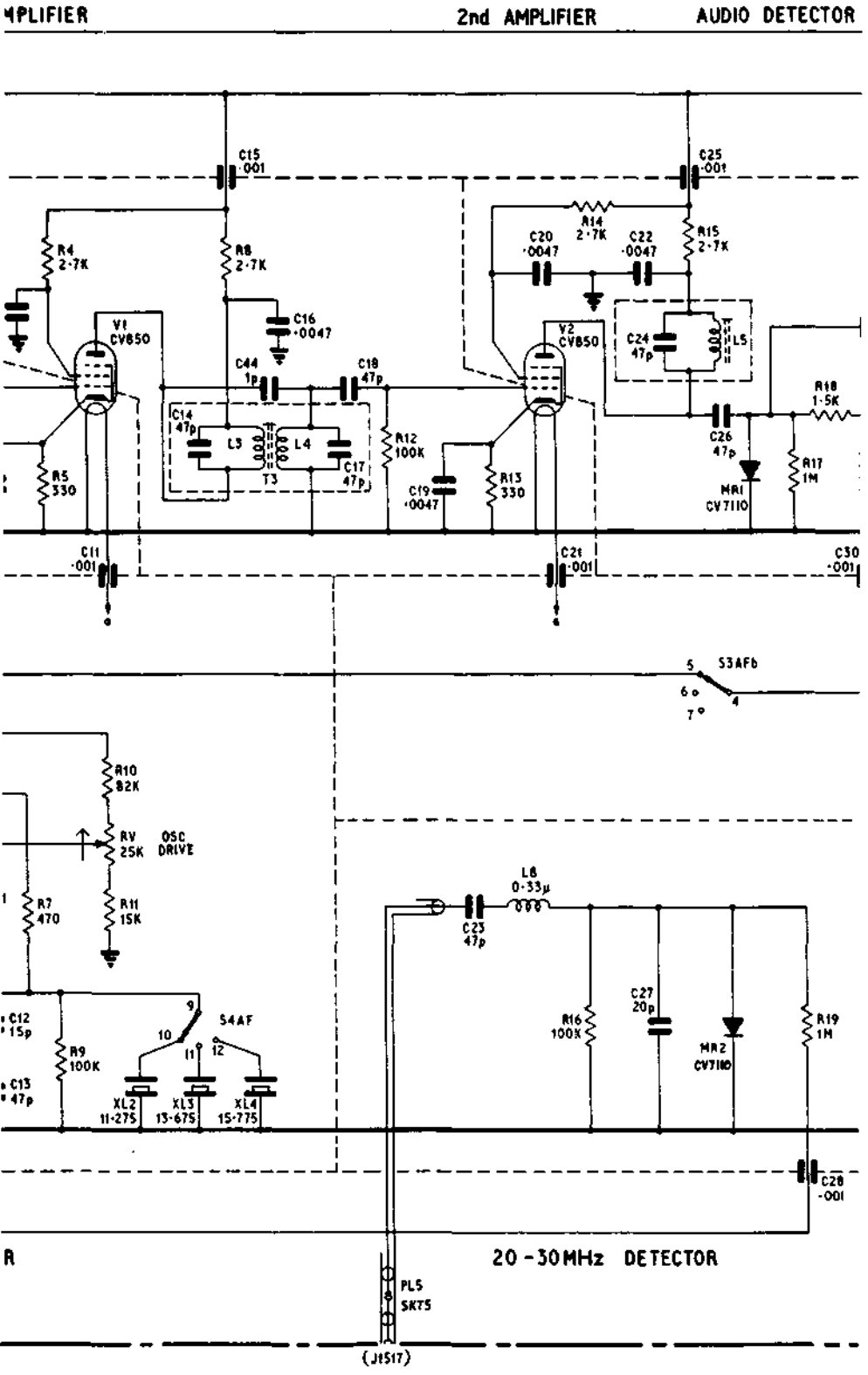


Fig. 43
A.L.4, Aug. '68



Test set, amplifier (20-30MHz) 6625-99-194-5274 : circuit

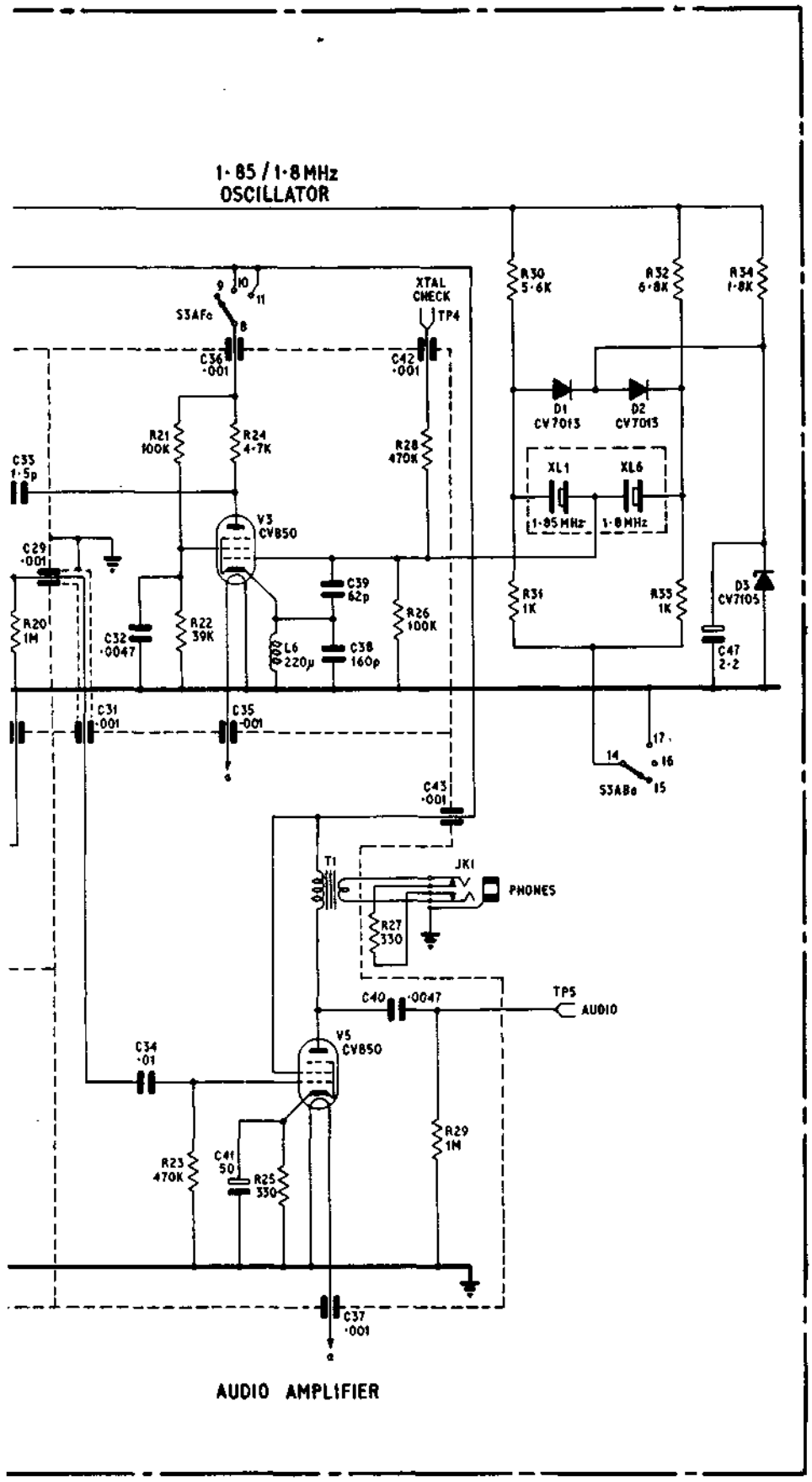

1·85 / 1·8 MHz
OSCILLATOR
S3AFa
XTAL
CHECK
TP4
C36
·001
C42
·001
R30
5·6K
R32
6·8K
R34
1·8K
D1
CV7013
D2
CV7013
R21
100K
R24
4·7K
R28
470K
C33
1·5p
XL1
XL6
1·85 MHz
1·8 MHz
V3
CV850
C29
·001
C39
62p
R20
1M
C32
·0047
R22
39K
L6
220μ
C38
160p
R26
100K
R31
1K
R33
1K
D3
CV7105
C47
2·2
C31
·001
C35
·001
S3ABa
C43
·001
T1
JK1
PHONES
R27
330
C40
·0047
TP5
AUDIO
V5
CV850
C34
·01
R23
470K
C41
50
R25
330
R29
1M
C37
·001
AUDIO AMPLIFIER

Fig. 43
4

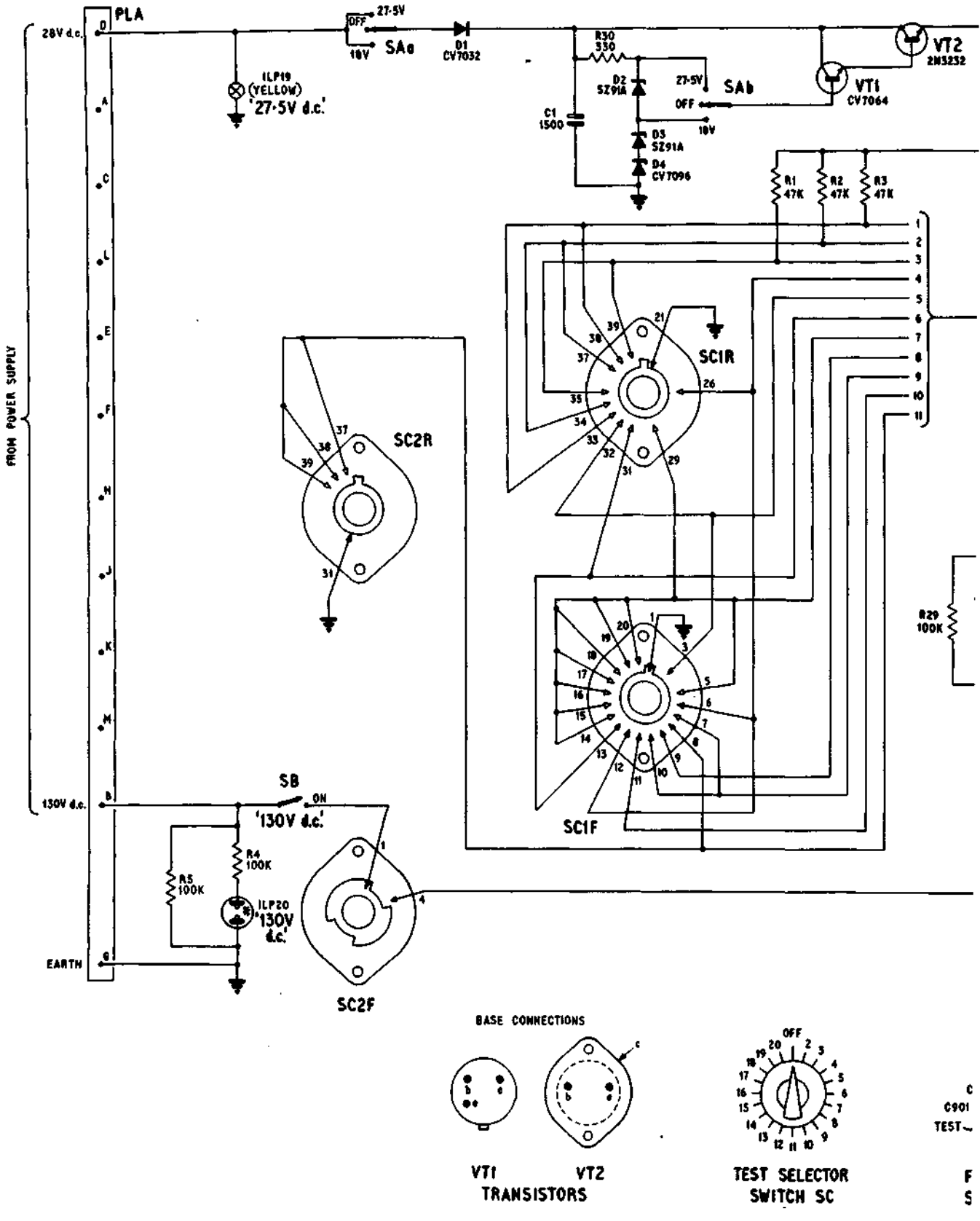
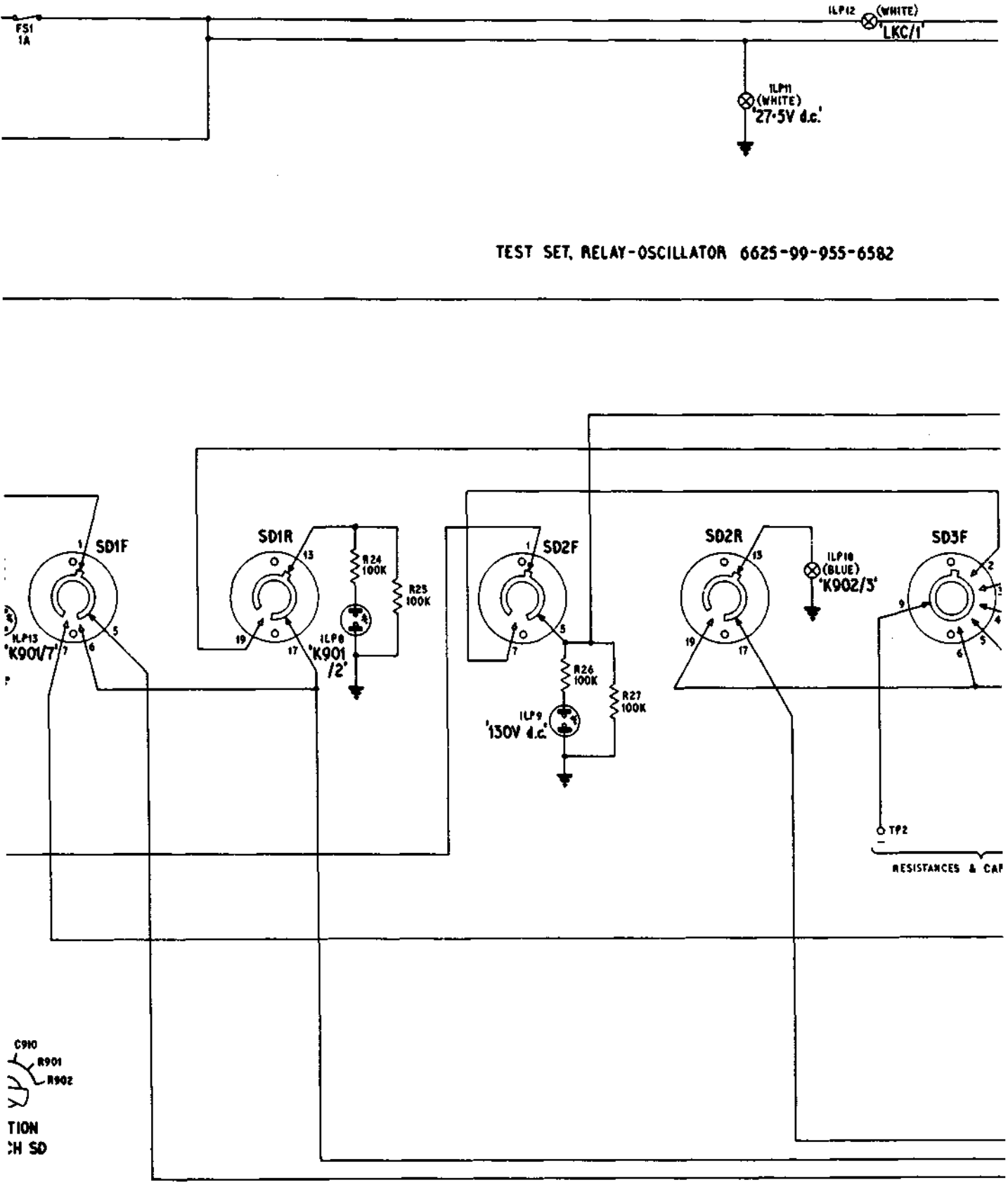

PLA
28V d.c.
FROM POWER SUPPLY
ILP19 (YELLOW) '27·5V d.c.'
27·5V
OFF
10V
SAa
D1 CV7032
R30 330
D2 SZ91A
SAb
C1 1500
D3 SZ91A
D4 CV7096
VT2 2N3232
VTi CV7064
R1 47K
R2 47K
R3 47K
SC1R
SC2R
SC1F
R29 100K
SB
ON
130V d.c.
R4 100K
R5 100K
ILP20 '130V d.c.'
EARTH
SC2F
BASE CONNECTIONS
VTI VT2
TRANSISTORS
TEST SELECTOR SWITCH SC

Fig. 44



Test set, relay-oscillator 6625-99-955-6583 : circuit

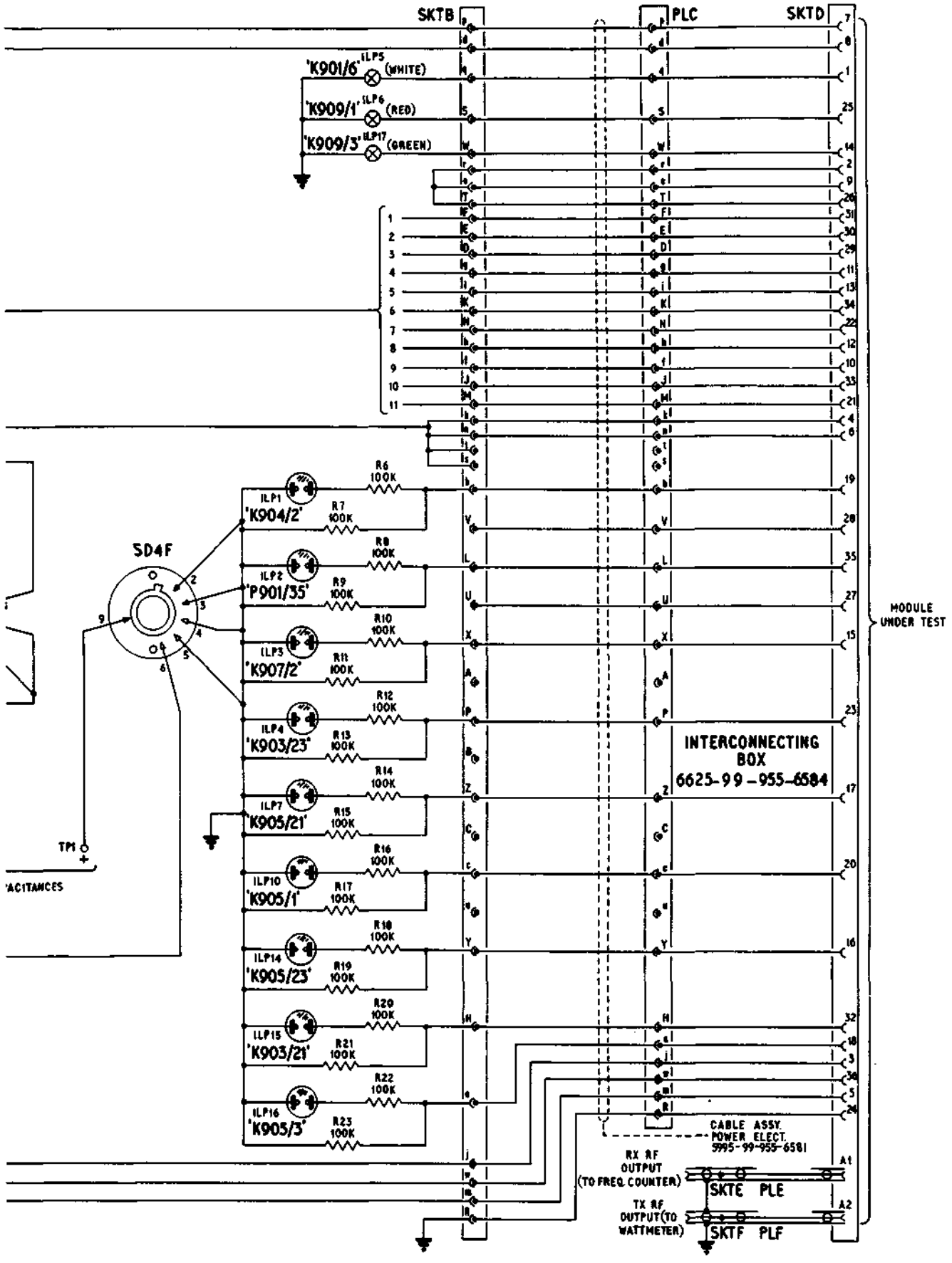

SKTB
PLC
SKTD
'K901/6' ILP5 (WHITE)
'K909/1' ILP6 (RED)
'K909/3' ILP17 (GREEN)
SD4F
ILP1 'K904/2'
ILP2 'P901/35'
ILP3 'K907/2'
ILP4 'K903/23'
ILP7 'K905/21'
ILP10 'K905/1'
ILP14 'K905/23'
ILP15 'K903/21'
ILP16 'K905/3'
R6 100K
R7 100K
R8 100K
R9 100K
R10 100K
R11 100K
R12 100K
R13 100K
R14 100K
R15 100K
R16 100K
R17 100K
R18 100K
R19 100K
R20 100K
R21 100K
R22 100K
R23 100K
TP1
INTERCONNECTING BOX
6625-99-955-6584
CABLE ASSY. POWER ELECT. 5995-99-955-6581
RX RF OUTPUT (TO FREQ. COUNTER)
TX RF OUTPUT (TO WATTMETER)
SKTE PLE
SKTF PLF
MODULE UNDER TEST

Fig. 44

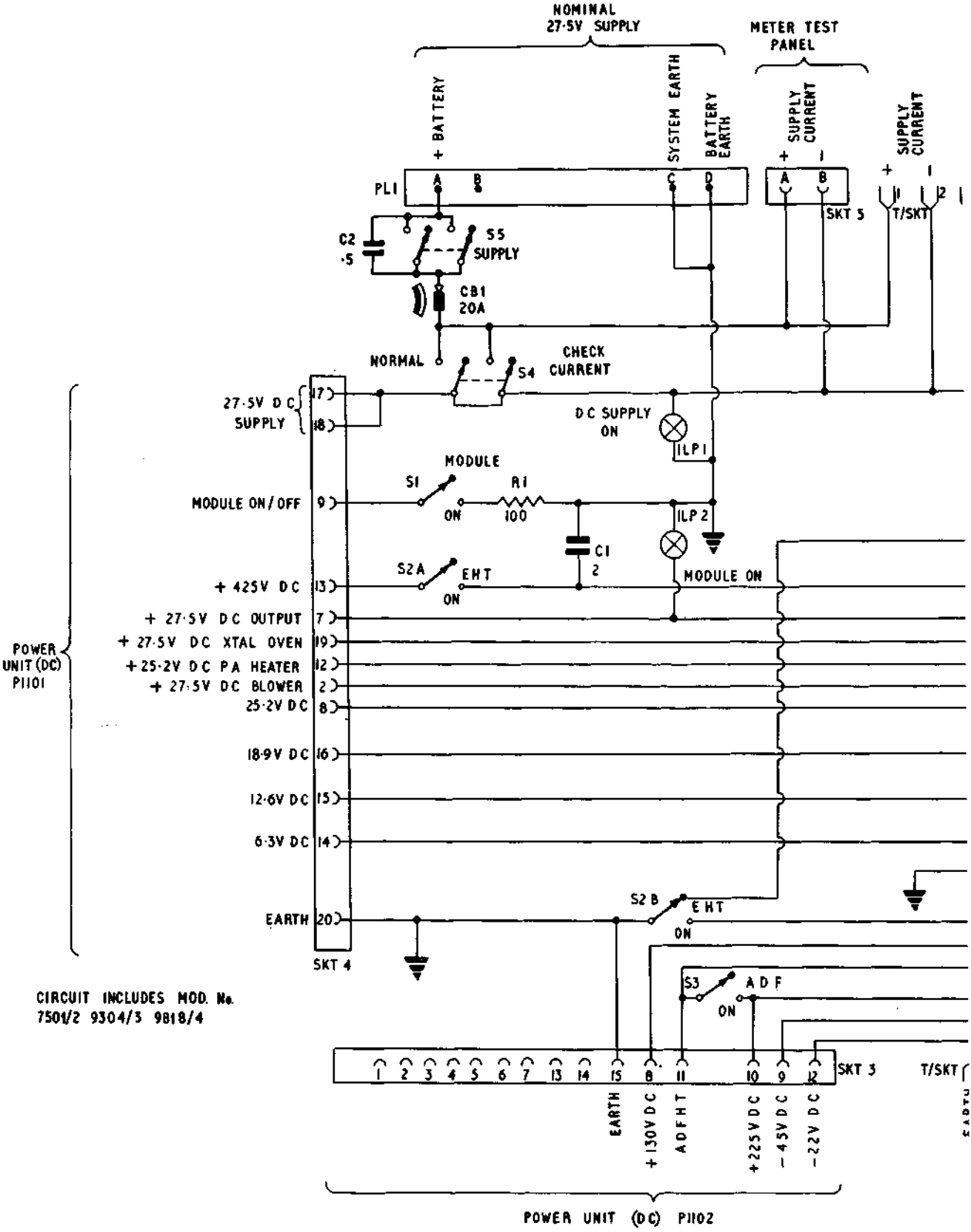
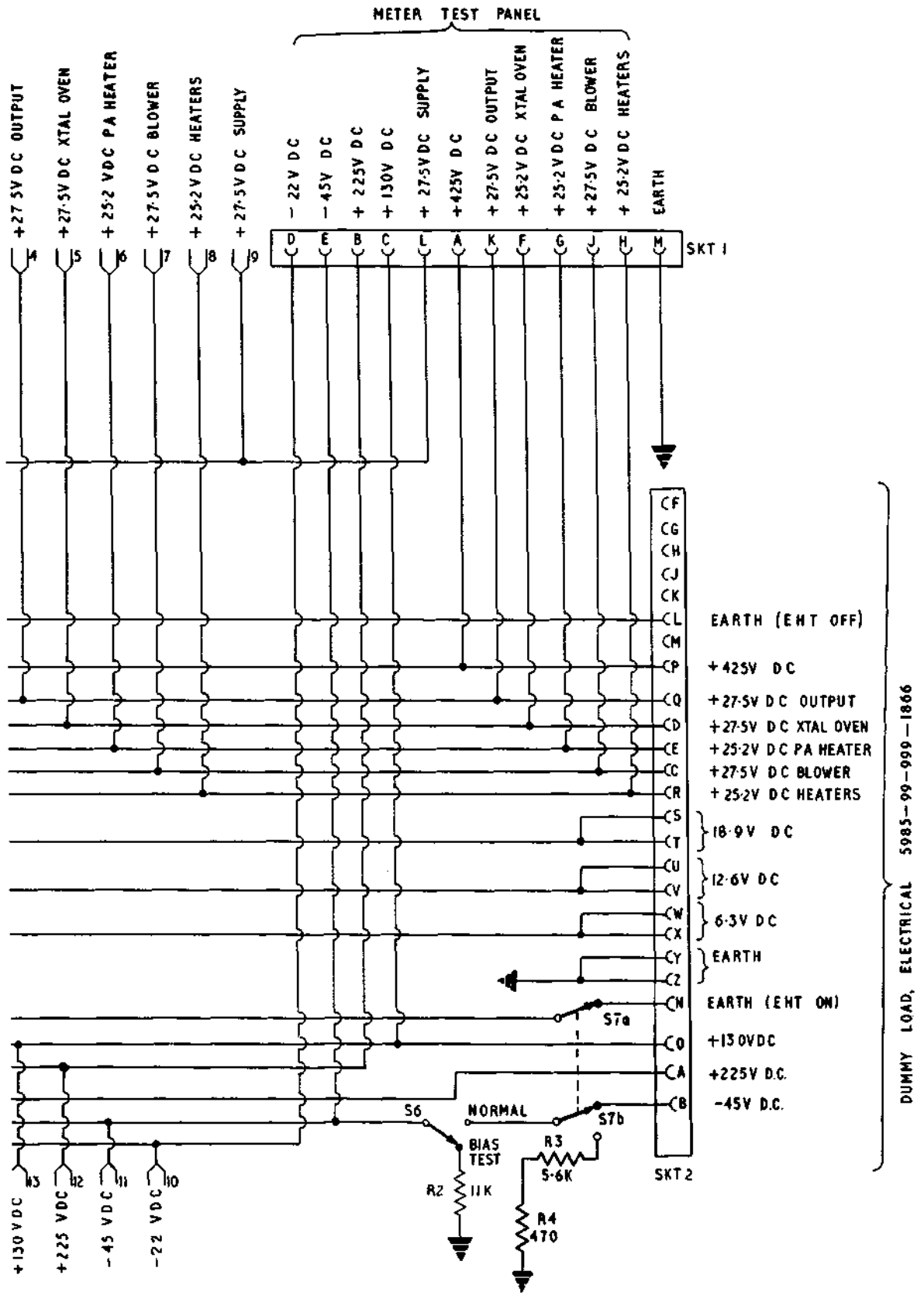


Fig. 45

Test set, electrical power (D.C.)— interco



ecting box 5821-99-999-0819: circuit

Fig. 45

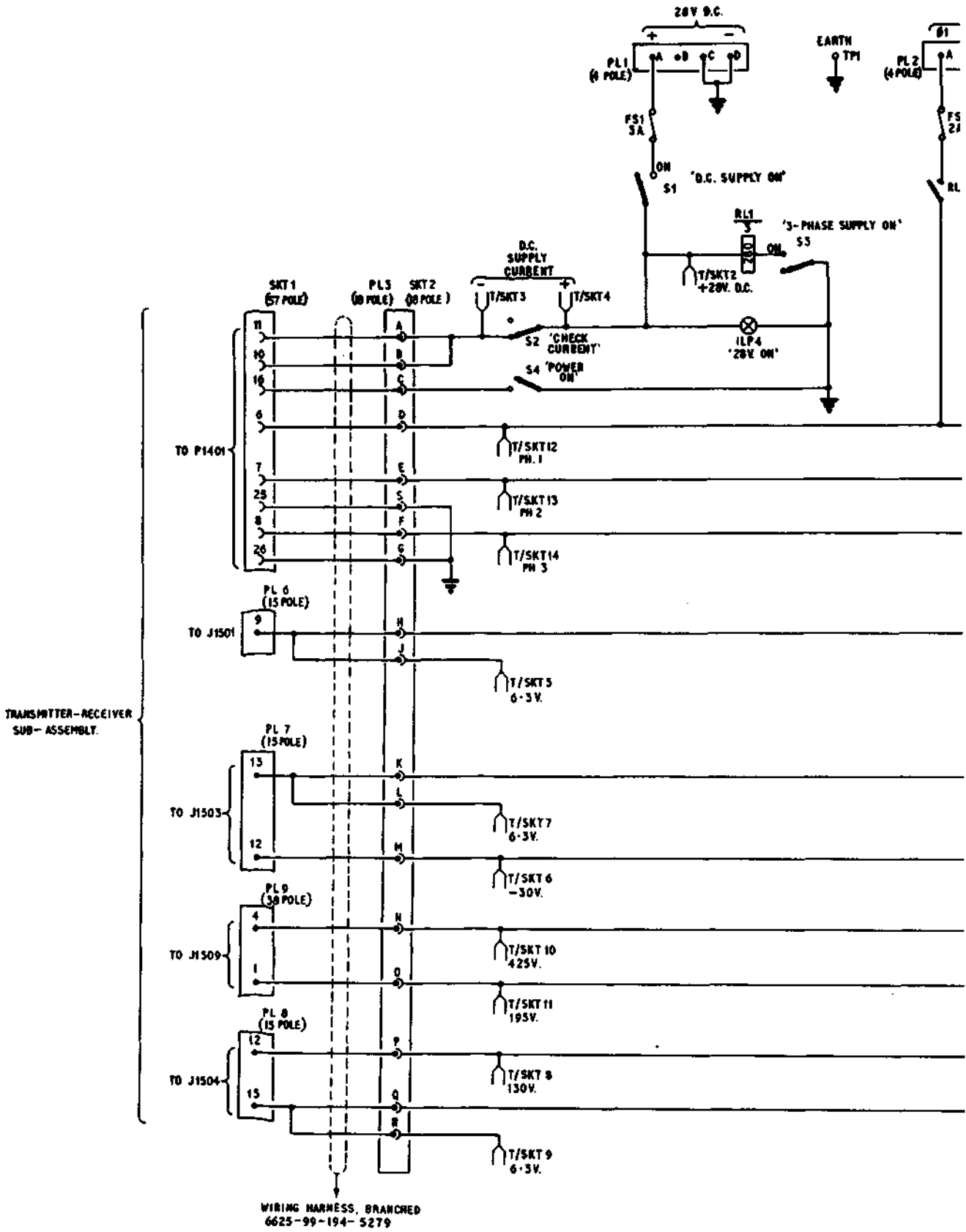
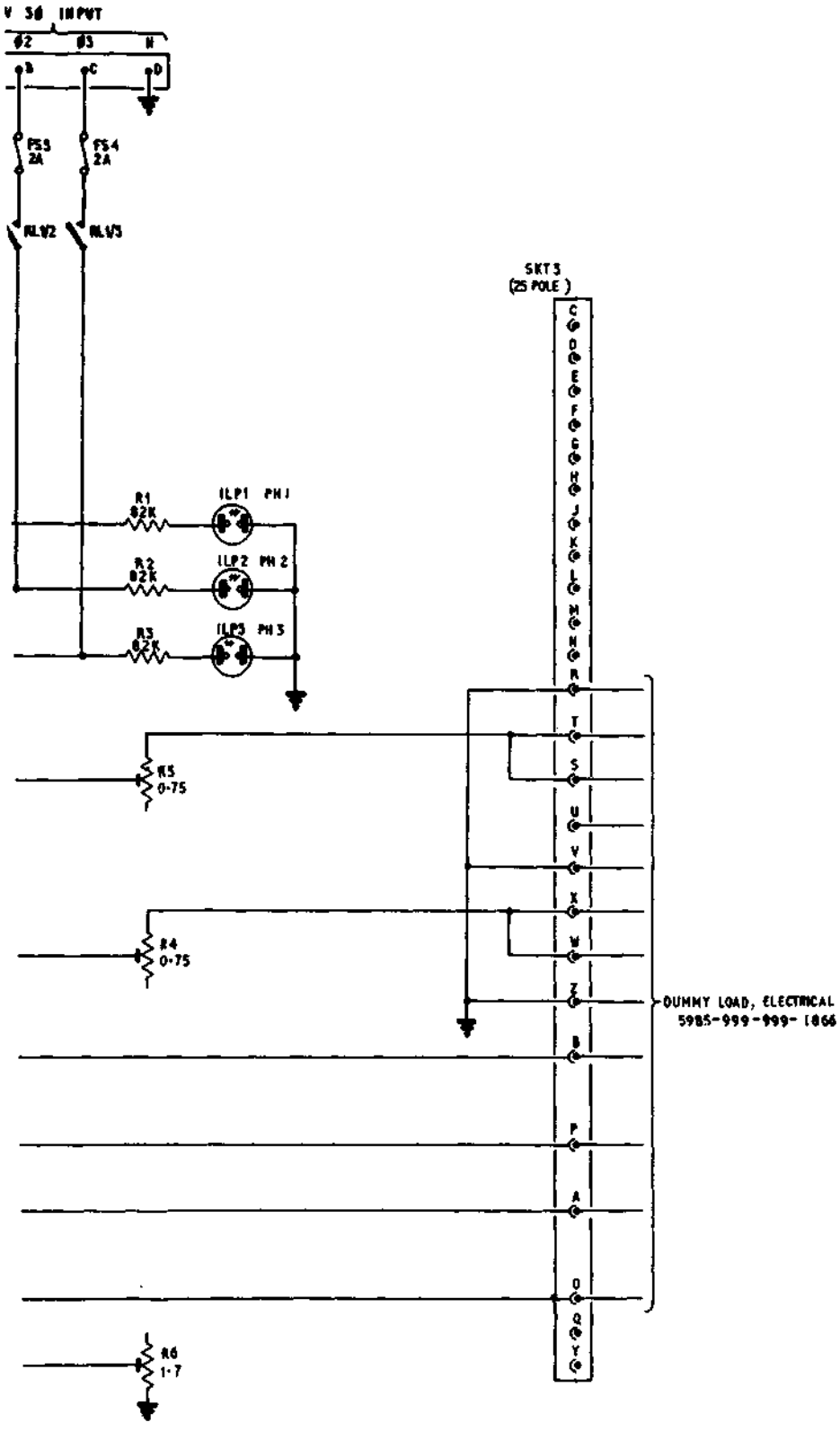


Fig. 46

Test set, electrical power (AC) 6625-99-



-6536 : circuit

Fig.46

Chapter 5

POWER UNIT (425V) 5821-99-932-2942

LIST OF CONTENTS

LIST OF ILLUSTRATIONS

LIST OF TABLES

LEADING PARTICULARS

Designation	*Power unit* (425*V*)
Ref. No.	5821-99-932-2942
Purpose	*Provision of h.t., l.t. and bias supplies when bench testing modules of the AN/ARC52 and derivatives, in conjunction with the test kit, transmitter-receiver, radio.*
Input supply	90–125*V or* 180–250*V single phase a.c. mains*, 45–65 *Hz.*
Power consumption	580*VA max.*
Dimensions (*approx.*)	19 *in.* × 10½ *in.* × 18 *in*
Dimensions (*approx*)	19 *in.* × 10½ *in.* × 18 *in.*
Weight (*approx*)	*Unit* 100 *lb.* *Connectors* 4 *lb.*

General

1. This unit is designed for supplying power to the test kit, transmitter-receiver, radio, 6625-99-999-3075 and certain other units of equipment used in second, third and fourth lines of servicing.

2. The power unit (425V) is shown in fig. 1 together with the connectors required, which are:—

(1) Cable assembly, power, electrical, 5995-99-932-4017; this is a 12-way output connector between the power unit and the test set or test jig in use.

(2) Cable assembly, power electrical, 5995-99-945-9896 (formerly connector Type 3429/1 Ref. No. 10HA/8359); this is a 3-way input connector between the mains supply and the power unit.

3. The unit operates from single phase a.c. mains supplies of 115V or 230V at 50 Hz (nominal) to provide stabilized h.t. outputs which are adjustable over the ranges required for all testing purposes. Provision is made for operation on supply voltages in the ranges 90V–125V or 180V–250V by the changing of links on an integral tap changing panel, mounted internally on the unit chassis. At any one tap setting, the equipment will operate safely without exceeding the rating of any component for supply variations of up to ±6% of the rated voltage for that tapping.

4. Because of the weight of this unit, support dowels must be fitted through the rear of the cover when the power unit is installed in a rack. For the same reason, care should be taken when removing the unit from the rack in order to avoid damage.

Construction

5. The power unit (425V) is housed in a fabricated metal chassis and is suitable for mounting in a standard 19 in. rack. Handles are fitted through the front panel for ease of removal and fitting of the unit in the rack (para. 4), and these handles also offer a measure of protection for the controls and components on the control panel should the unit become inverted on the bench.

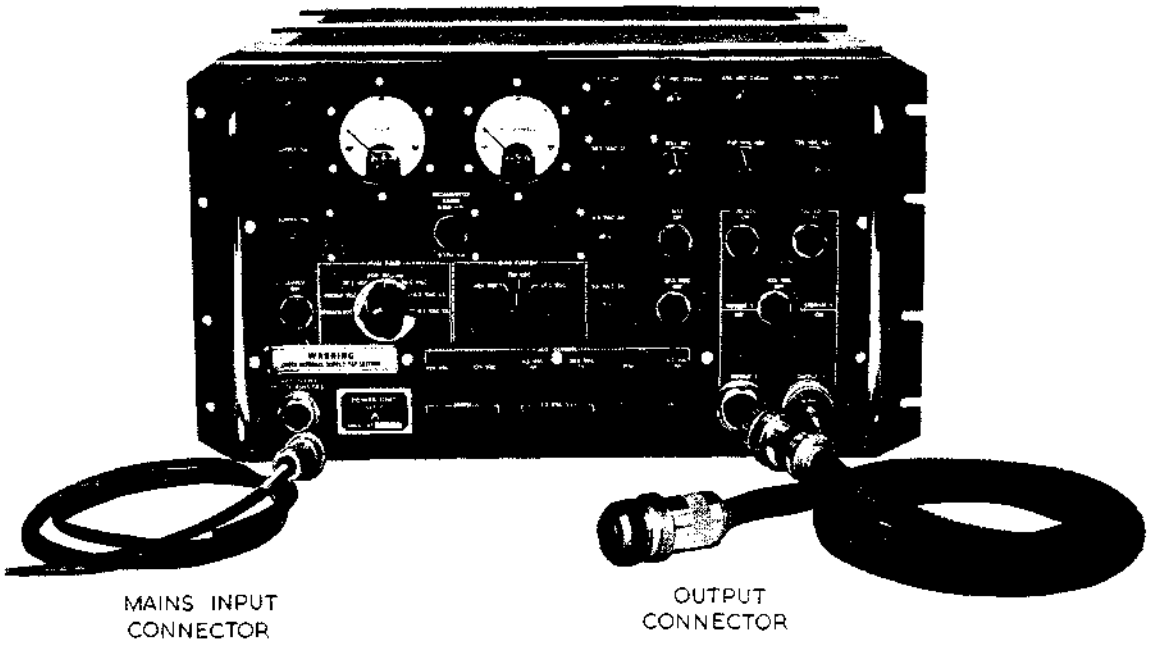


Fig. 1. Power unit (425V): 5821–99–932–2942 complete

6. Under normal operating conditions, sufficient ventilation is afforded with the cover in position; if necessary, however, the cover may be removed to provide increased ventilation if the unit is to be mounted in an enclosed rack. The internal layout and construction of the power unit make it essential that a free circulation of air is ensured throughout the equipment when in operation and rack mounting is recommended whenever possible.

7. A gate switch is fitted in the rear of the power unit. This is a mains cut-off switch which is normally closed by a probe fitted in the unit outer cover. When the unit is operated without the cover, e.g. during servicing or when rack-mounted, the gate switch may be actuated and retained in the closed position by means of a plunger in the side of the switch unit. The switch does not require resetting before the cover is refitted, as the action of the casing probe releases the switch retaining plunger automatically. ◄Where Mod. No. A5522 (Table 1) is embodied, a gate switch with a different action is fitted. When operating the unit out of its cover, the switch may be closed by pulling out the actuating plunger until it locks in position.►

Controls and components

8. The positions and layout of the controls and instruments on the front (control) panel are shown in fig. 1. The layout of the components within the unit chassis is shown in fig. 2 and 3.

9. Indicator lamps are fitted into the control panel which will light up when the equipment is operating and ready for use; that is, when the mains supply is on and at the point when h.t. is available showing that an internal thermal delay relay has operated and the 425V and 130V circuits are operative.

10. Two Mk. 4 12-way output sockets are let into the front panel of the power unit to accommodate the test connectors supplied. The order of pole connections for each of these connectors is as follows:—

Pole	Supply	Pole	Supply
A	+425V d.c.	G	Earth
B	+130V d.c.	H	Earth
C	6·3V a.c.	J	6·3V a.c. } isolated
D	26·5V a.c.	K	6·3V a.c. } heater
E	0 to −50V d.c.		} supply
F	6·3V a.c. (common to pole C)	L	Stabilized +27V d.c.
		M	+28V d.c.

Fuses

11. Fuses are provided for the protection of the mains input and all output rails (except the bias output). The fuses are contained separately in cartridge type fuse units having screw caps which are fitted into the front panel for ease of access.

12. Fuse ratings, Ref. Nos. and circuit references for this power unit are as follows:—

FS1 — 5A (5920–99–059–0112) mains input
FS2 — 5A (5920–99–059–0112) mains input
FS3 — 1A (5920–99–059–0109) stabilized 27V d.c.
FS4 — 500mA (5920–99–059–0108) 130V d.c. line
FS5 — 500 mA (5920–99–059–0108) 425V d.c. line
FS6 — 5A (5920–99–059–0112) 6·3V a.c. line
FS7 — 3A (5920–99–059–0111) 26·5V a.c. line
FS8 — 3A (5920–99–059–0111) 6·3V a.c. line
FS9 — 2A (5920–99–059–0110) T2 28·5V secondary.

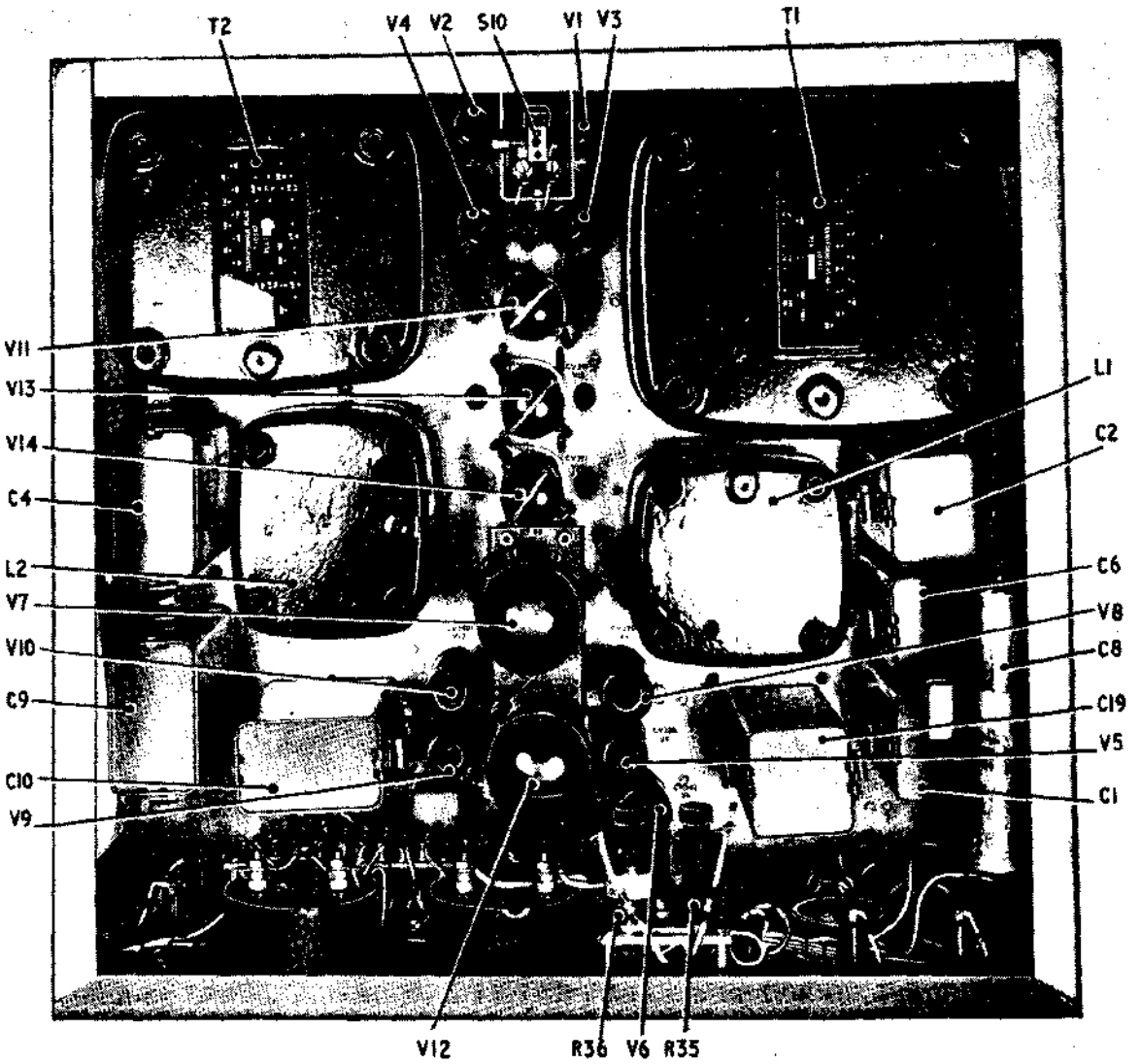


Fig. 2. Power unit (425V): top view with cover removed

Facilities

13. The supply facilities available from the power unit (425V) are as follows:—

(1) D.C. voltage	Current	Range
425V nominal	300mA	Variable, 375V to 475V
130V nominal	250mA	Variable, 90V to 200V at 250mA or 200V to 250V at 200 mA
0 to −50V	250μA	
28V	10mA	
27V (stabilized)	200mA	
(2) A.C. voltage	Current	
26·5V	2A	
12·6V	2A (obtained by connecting the two 6·3V outputs in series by external link)	
6·3V	4A	
6·3V	2A	

Performance summary

14. The performance of the power unit (425V) can be summarized as follows:—

(1) 425 d.c. supply (variable from 375V to 475V

Ripple and noise: Not exceeding 35mV r.m.s.

Stability: From no load to full load, less than 3% variation at 375V and 475V and less than 2% at 425V.

Voltage: Stable within 1% of 425V at a current of 300mA with a variation of mains voltage up to ±6% from 230V.

Output impedance: Below 28 ohms at 425V.

(2) 130V d.c. supply (variable from 90V to 250V).

Ripple and noise: Not exceeding 34mV r.m.s.

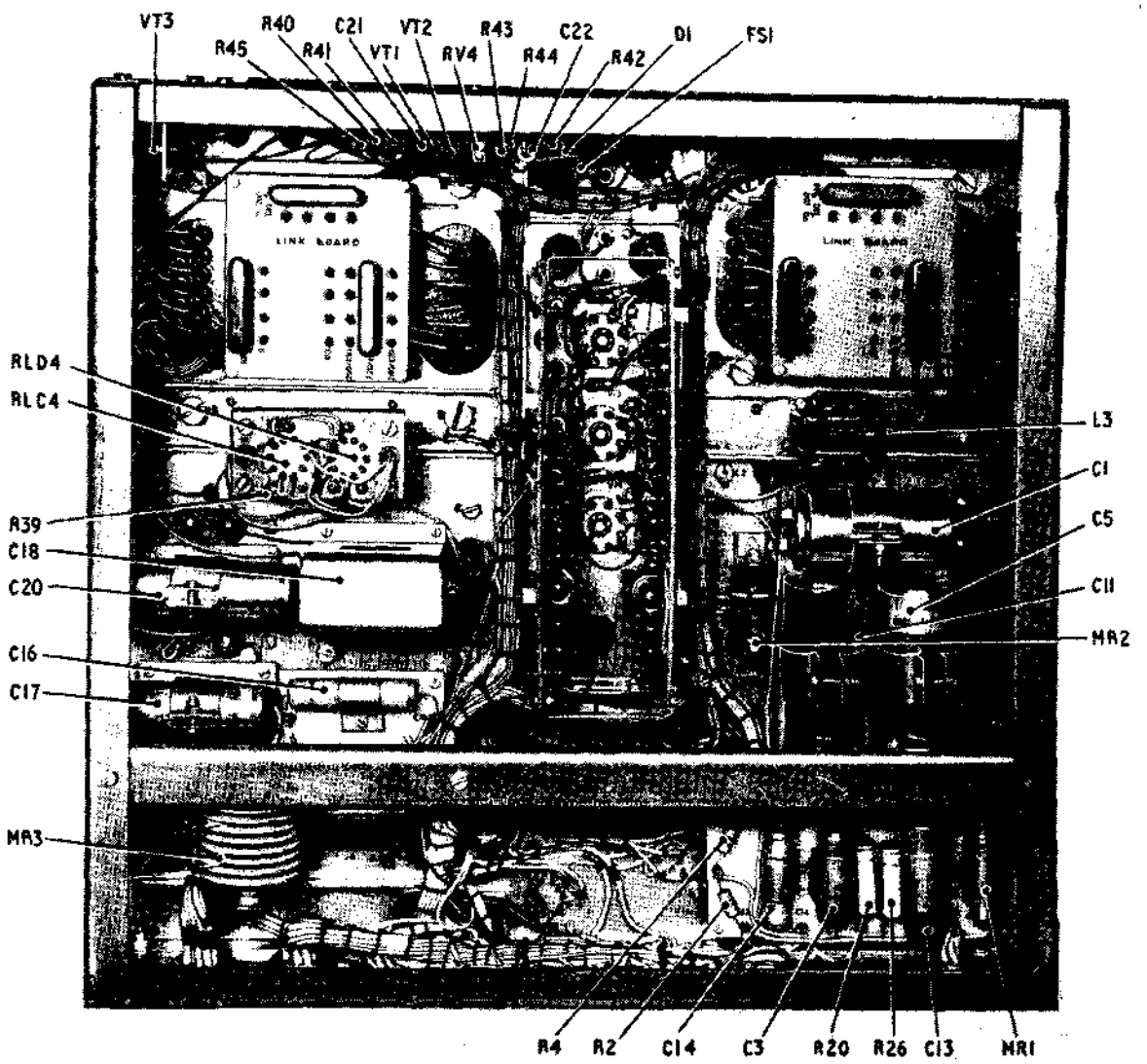


Fig. 3. Power unit (425V): underside view with cover removed

Stability: From no load to full load, less than 3% variation at 90V, 200V and 250V: less than 2% at 130V.

Voltage: Stable within 2% of 130V at current of 250mA with a variation of mains voltage up to ±6% from 230V.

(3) 0 to −50V bias supply

Ripple: Not exceeding 10mV r.m.s. with an output of −50V at a current of 250μA.

(4) Stabilized 27V d.c. supply

Voltage: Adjustable to +27V d.c. at a current of 200mA

Ripple: Not greater than 105mV r.m.s.

Stability: At a current of ~~1A~~ USA, the change in output voltage does not exceed 1V and the ripple does not exceed ~~350~~ 150 mV r.m.s.

(5) 28V d.c. supply.

Voltage: Within ±10% of 28V at a current of 10mA.

Ripple: Less than 100mV r.m.s.

(6) 26·5V a.c. supply.

Voltage: Within ±5% of 26·5V at full load.

(7) 12·6V a.c. supply.

Voltage: Within ±10% of 12·6V at full load. This supply is compounded of the supplies in sub-para. (8) below, which may be connected in series by external link between poles C and J of the 12-way connectors.

(8) 6·3V a.c. supplies (two).

Voltage: Within +10% and −5% of 6·3V at full load.

(9) Power consumption.

Not exceeding 580VA (all outputs fully loaded).

(10) Meter accuracy.

Voltmeter:	±5% for d.c. measurements; ±10% for a.c. measurements.
Ammeter:	5%

Operation

15. In general, an h.t. supply is derived from the rectified output from a transformer with a centre-tapped secondary winding which is regulated by voltage control valves (CV391) to provide a nominal 130V d.c. output and, by a similar means, a higher 425V potential. Full wave rectification is provided by half-wave rectifier valves (CV2235). Voltage regulation is achieved by the amplification of output voltage variations and the application of the resulting control voltages to the control grid of the series regulator valves. The voltage amplifier in the control loop is fed with a manually adjustable input signal proportional to the difference between its grid voltage and cathode voltage (obtained from a neon reference valve). All resulting control voltage variations, which are thus applied to the series regulator valves, are in a sense such as to oppose and thereby reduce the change in output voltage. The steady operating point of the voltage amplifier may be adjusted manually, by means of a potential divider network across the output line, thus providing a facility for resetting the output voltage to any value in the specified range.

16. A thermal relay valve is incorporated in the circuit to provide a warming up, or valve stabilizing period between switching on of the primary power and the energizing of the relay which completes the h.t. voltage circuit. The normal delay period is between 30 seconds and 70 seconds (depending upon ambient conditions) and after this interval a lamp (marked H.T. ON) on the front panel will glow to indicate that h.t. is available.

17. In addition to the main stabilized outputs of 425V and 130V, two further principal supplies are generated as follows:—

(1) 28V d.c. relay supply, derived from a full wave bridge rectifier circuit.

(2) 0 to −50V d.c. bias supply, which is also derived from a full wave bridge rectifier. Adjustment of the setting for this bias supply is provided by the variable resistor RV1, BIAS ADJ, control.

18. A second mains transformer is incorporated, having secondary windings from which are derived the auxiliary supplies for test set heaters, oven supply and low voltage requirements described in para. 13 and 14.

Circuit description

19. A circuit diagram of the complete power unit is given in fig. 4 at the end of this chapter. Mains supplies at 90–125V or 180–250V a.c., 45–65 Hz, are brought in at the three-pole Mk. 4 plug PL1 and coupled via the gate switch S10 to the double-pole SUPPLY ON/OFF switch S1. Protection for each line to the transformers T1 and T2 is provided by the fuses FS1 and FS2. A link board is fitted internally to enable the use of power supplies of 90–125V in steps of 5 volts or 180–250V in steps of 10 volts, by changing a link or links as required. Each supply link (fig. 3) is marked and may be compared with the link arrangement shown in the circuit diagram (fig. 4).

20. The 600–0–600V secondary winding of transformer T1 is connected to the full wave rectifier circuit comprising the diodes V1 and V2 (CV2235). The centre tap of the secondary winding is connected to earth via the relay contacts RLA1, thermistor X1 and the fuse FS5, in series arrangement. Other secondary windings of the transformer T1 provide the supplies for heating the valves V1, V2, V5, V8 and V12.

21. The d.c. output from this rectifier circuit is smoothed and stabilized and becomes the 425V output of the power unit. The action of the stabilizer circuit is as follows: A portion of the output voltage is tapped off the divider R23, RV2, R22 and R24 and is applied to the grid of the pentode valve V8. The cathode potential of this valve is stabilized by the neon V5 so that the anode current changes with output voltage variations. The amplified and inverted version at the anode of V8 is d.c. coupled to the grids of the series voltage control valves (V7 and V12); tending thus to maintain the output voltage constant. The variable resistor RV2 is the front panel control marked 425V D.C. ADJ. and is provided to vary the output between approximately 375V and 475V.

22. The transformer T2 has a 360–0–360V secondary winding which is connected to the anodes of the pair of diode valves V3 and V4 (CV2235) providing the full wave rectification. The transformer centre tap is connected via the fuse FS4 and the relay operated contacts B2 to earth. The d.c. output from this rectifier circuit is smoothed and stabilized in similar manner to the 425V output (para. 21); the fixed bias for the amplifier inverter V10 is in this instance, however, obtained from a separate rectifier (MR1) and applied to the control grid of the valve. In this way the full h.t. is applied to V10. The variable resistor RV3 (marked 130V D.C. ADJ.) varies the output between approximately 90V and 250V.

23. A Zener junction diode strap (MR8 and MR9) which is placed across this potential provides a +28V d.c. output supply at pole M of the sockets SKT1 and SKT2 and also at the terminal TP2 on the front panel (marked 28V D.C.).

24. A thermal relay (V6) is incorporated in the circuit to provide the 30–70 seconds delay period between switching on the SUPPLY ON/OFF switch (S1) and the energizing of relays RLA and RLB to complete the h.t. voltage circuits. This delay provides the warming up interval during which the valve heater supplies are applied in order to

stabilize the control valves in both the 130V and the 425V circuits.

25. Other secondary windings of the transformer T2 provide the supplies for heating valves V3 and V4, V6, V10 and V11, V13 and V14; also for the auxiliary a.c. heater outputs detailed in para. 13. Another secondary winding provides for a 0 to −50V supply, which is drawn from the bridge rectifier MR2 and is controlled by a 25k ohms variable resistor RV1. This control is fitted through the front (control) panel of the unit and is marked BIAS ADJ. An isolating switch (S2), marked BIAS ON, is provided in the circuit.

26. From the 28·5V secondary winding of transformer T2, the supply is rectified through the bridge rectifier MR3 (protected by the 2A fuse FS9) and then fed to the voltage stabilizer; the operation of this stabilizer is described in para. 27.

27. Any change in the 27V d.c. output, due to a change in output current or input voltage, causes a change in the voltage across R43, RV4 and R44; this results in a change in the base potential of VT1 via RV4. Since the emitter potential of VT1 is held constant by the Zener diode D1, the change in base potential results in a corresponding change of collector current and, therefore, collector voltage. This change is transferred to the base of VT2 and thence to VT3 such that the resulting change of VT3 current tends to restore the output voltage to its original level. The SET 27V control (RV4) permits the output voltage to be adjusted to 27V under normal load conditions.

28. The output from the stabilizer circuit is routed via the 1A fuse FS3 and the 27·5V D.C. ON switch S4 to poles L of the output sockets SKT1 and SKT2.

29. Facilities for reading current consumption in the 425V d.c., 130V d.c. and 27·5V d.c. output lines are provided by the READ CURRENT switch S6 in conjunction with the milliameter M1. This milliameter is shunted by the two resistors R35 and R36 which are connected in series for the 0–300mA range; R36 can be short-circuited by means of the switch S8 (marked MILLIAMETER RANGE) for the 0–500mA range.

30. The switch S7 (marked READ VOLTS) enables the output supplies to be connected, in turn, to the voltmeter M2 via the metering resistors (R28–R34) to verify that the voltages are correct. The a.c. output supplies are rectified by the bridge rectifier MR4, MR5, MR6 and MR7 before being fed to the voltmeter M2.

Servicing

31. Standard techniques normally employed in servicing this class of equipment should ensure continued, reliable service from this power unit. Attention should be regularly paid to maintaining the equipment in a clean and dry condition. Inspect the interior of the unit periodically for any evidence of overheating, which may arise from operating the unit without adequate internal air circulation.

32. Consult the circuit diagram when attempting to locate any fault arising in service. Sufficient information should be available in this way to enable any failure to be quickly found and remedied. All components are readily accessible for either inspection or servicing upon removal of the enclosing cover.

33. Each time before coupling up the equipment for use, examine the connectors. These should be undamaged, dry and in good general condition with the plug and socket terminations making good secure contact with the associated equipment.

34. Before using the power unit, make a brief serviceability test. The indicator lamps should light up when appropriate circuits are switched on and meter readings should remain steady. The failure of lamps or meters can be investigated along the following lines:—

(1) SUPPLY ON lamp fails to light—Verify that the input connector is correctly fitted between the mains source and the power unit. Ensure that the SUPPLY ON switch is operated. Ascertain that the correct mains supply is being used; the links may require adjustment to suit the bench source. Examine the fuses FS1 and FS2. Then ensure that the gate switch is operating and is closed by the probe on the cover. If the unit is operated without its cover, the gate switch can be closed and locked in that position by the locking plunger on the side of the switch. When these measures fail to clear the fault, test the lamp or change it with another which is known to be serviceable.

(2) H.T. ON lamp unlit—with the appropriate h.t. circuit switch operated, the first action to follow the switching on of the power unit mains supply is to bring in the valve stabilizing heater circuits for the power control valves. The second action follows the energizing of the relay which completes the main h.t. circuit selected; this is accompanied by an audible click. Should no relay click be noted, first ensure that the mains source switch is on and that the unit SUPPLY ON switch is operated. Examine and renew, if necessary, the fuse FS3. Should the relay click be clearly heard, however, suspect the lamp. Renewal of the lamp can be made from the front of the instrument panel.

(3) Meter reading and output drift—First examine the fuses of the appropriate h.t. circuit (fig. 4). Then suspect valves V8 and V10 according to the rail in use. Drift may also be attributed to failure of the meter; a comparison test using a sub-standard instrument should readily confirm if this is the fault. Drift may also occur in conditions of high humidity, by reason of a leak to the chassis mounting. It is important to note that in the event of a short-circuit at the output, damage to the meter could result. Should this contingency arise, examine the unit equipment under test for short-circuits or for conditions where excessive loadings can develop.

Modifications

35. This chapter has been revised and includes changes resulting from the modifications listed in Table 1.

TABLE 1

Modifications

Mod. No.	Class	Topic-2 Leaflet	A.L.	Label No.	Brief details
6106	B/3	B42	57	1	Re-route earth return of READ VOLTS switch, and SUPPLY ON lamp, to earth terminal of meter M2. Add new wire from ET2 to earth terminal of meter M1. Required to improve earth return circuits and ensure accurate meter readings.
7540	B/3 on replacement	B92	135	2	Replace 375mA fuse link and amend coding. Original fuse link no longer available.
1167	C/2 (RAF) C/4 on return to Contractor (RN)	B188	288	3	Fitting of 56-ohm resistor (R39) in 27V supply line to relays RLC and RLD to prevent overheating of relay coils.
1426	C/3 as required (RAF & RN)	◄B198	303, 336,342►	4	Introduction of voltage stabilizer circuit to reduce ripple content of +27V d.c. output and thus enable the power unit to be used for testing ARC52 derivative modules.
◄A5522	C/3 WOTSAC (RAF & RN)			5	Replace obsolete switch 5930-99-932-5300 (gate switch S10) by switch 5930-99-618-6327 which has different physical dimensions and requires a different method of fitting.►

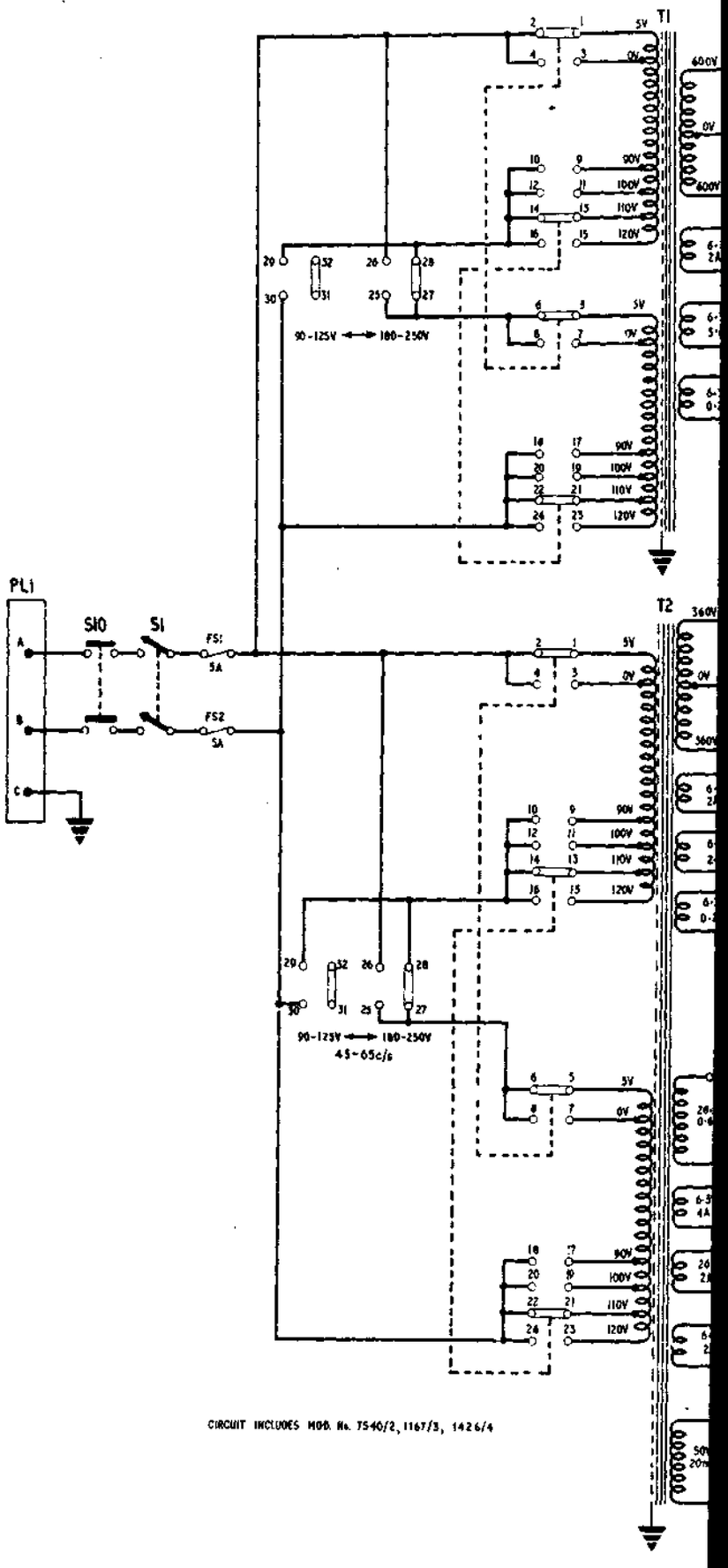
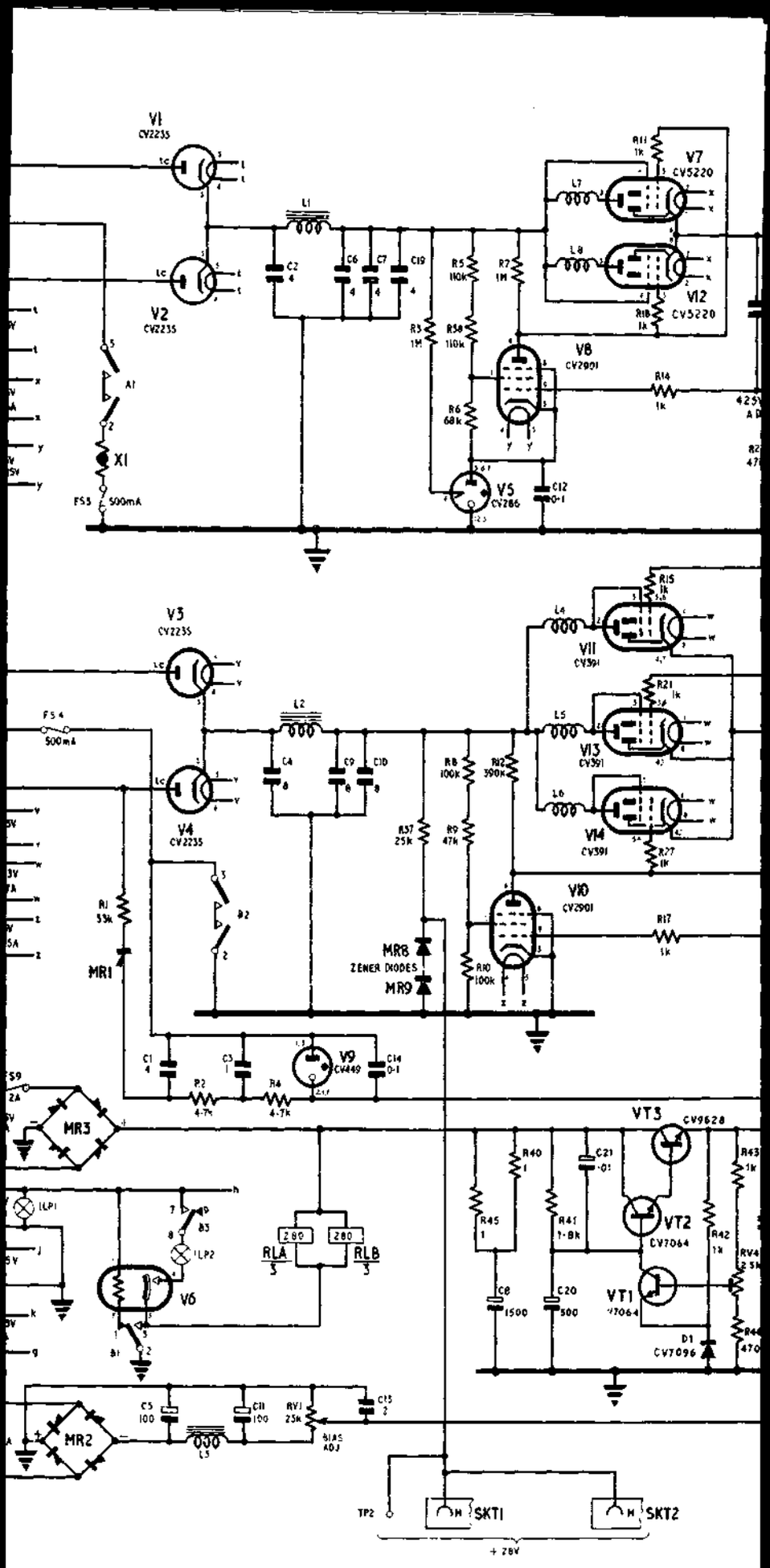
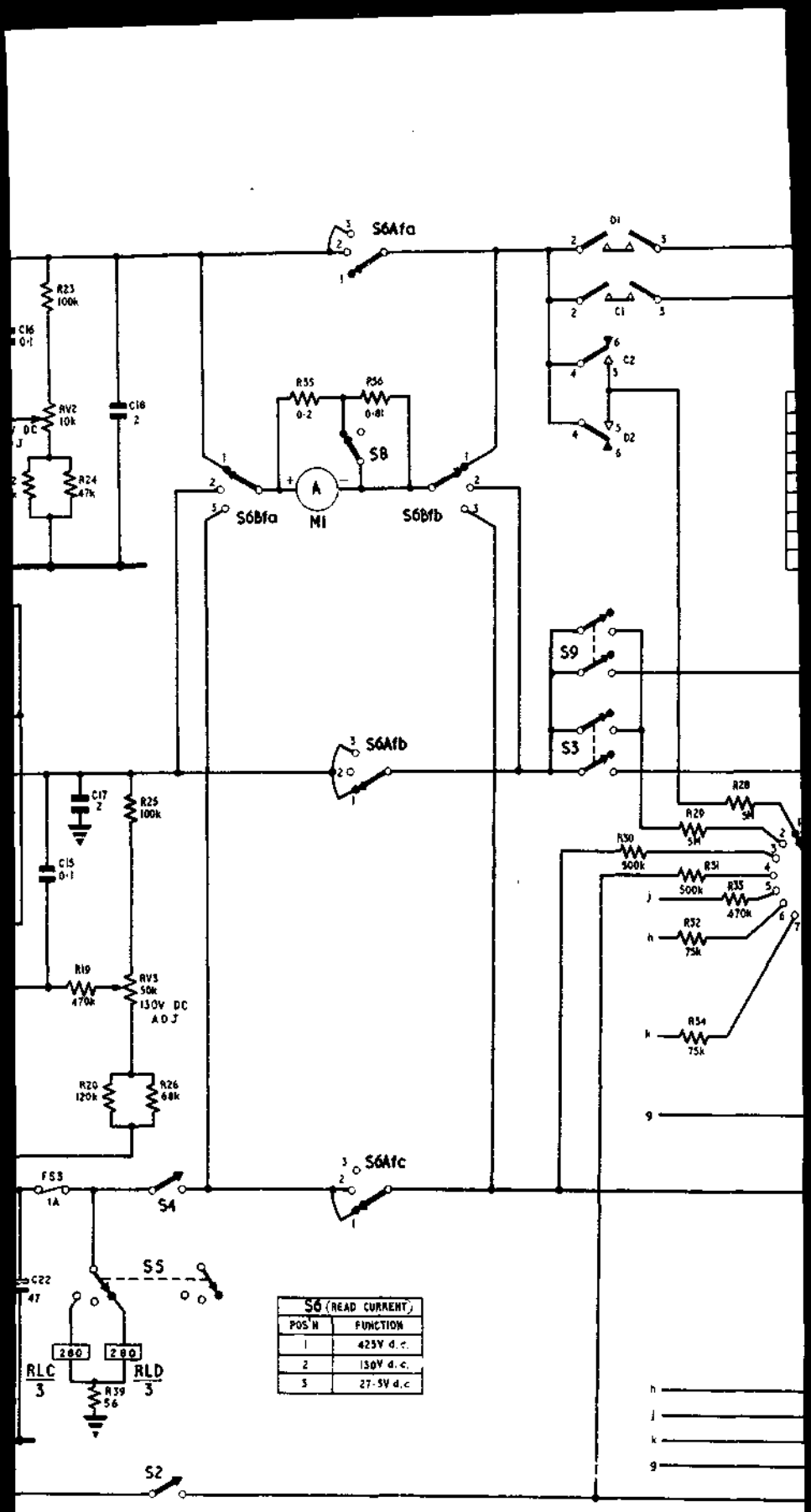


Fig.4
A.L.3, Aug. 68



Power unit (425V) 5821-99-9



32-2942 : circuit

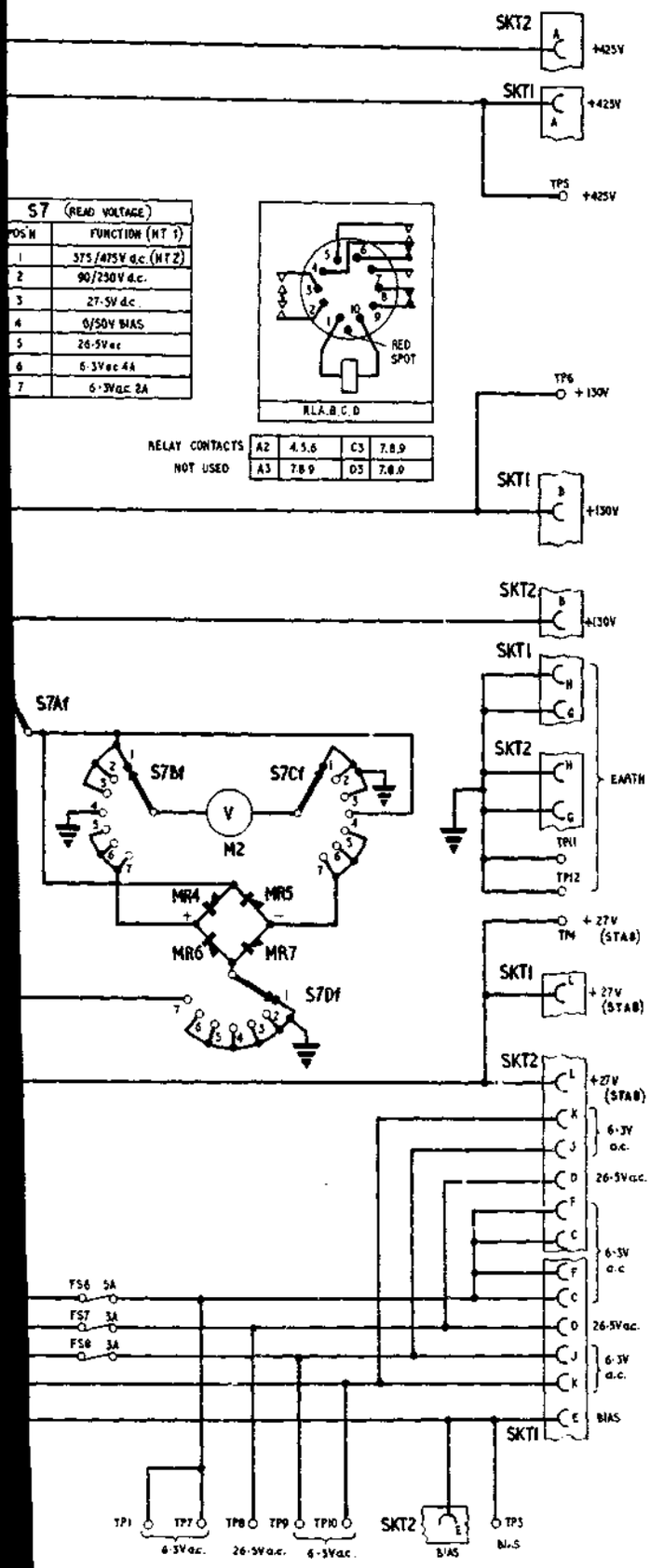

SKT2
+425V
SKT1
+425V
TP5
+425V
S7 (READ VOLTAGE)
POS'N
FUNCTION (HT 1)
1
375/475V d.c. (HT2)
2
90/250V d.c.
3
27·5V d.c.
4
0/50V BIAS
5
26·5Vac
6
6·3Vac 4A
7
6·3Vac 2A
RED SPOT
R.L.A.B.C.D
RELAY CONTACTS A2 4.5.6 C3 7.8.9
NOT USED A3 7.8.9 D3 7.8.9
TP6
+130V
SKT1
+130V
SKT2
+130V
SKT1
S7A1
S7B1
S7C1
V
M2
S7D1
MR4
MR5
MR6
MR7
SKT2
EARTH
TP11
TP12
TP4
+27V (STAB)
SKT1
+27V (STAB)
SKT2
+27V (STAB)
6·3V a.c.
26·5Vac.
6·3V a.c.
FS6 5A
FS7 3A
FS8 3A
26·5Vac.
6·3V a.c.
BIAS
SKT1
TP1
TP7
6·3Vac.
TP8
26·5Vac.
TP9
TP10
6·3Vac.
SKT2
BIAS
TP5
BIAS

Fig. 4

Chapter 6

CALIBRATOR, FREQUENCY

LIST OF CONTENTS

LIST OF TABLES

LIST OF ILLUSTRATIONS

LEADING PARTICULARS

Function	*Test equipment for the measurement of frequency errors when testing modules of the ARC 52 and derivative transmitter-receivers such as the spectrum generator unit, receiver unit (guard) and the I.F. unit (1·85 Mc/s). It can also be extended to measure errors in frequencies in the range 2 Mc/s to 20 Mc/s. The equipment comprises:* (1) *Calibrator, frequency.* (2) *Cable assembly, power electrical,* 5995-99-945-9896.
N.A.T.O. Stock No.	6625-99-999-2642
Power supply	*Single phase a.c.* 110*V to* 120*V or* 200*V to* 250*V,* 45 *c/s to* 65 *c/s: approximate consumption* 100*VA*
Dimensions (approx.)	19 *in.* × 7 *in.* × 18¼ *in.*
Weight (approx.)	49½ *lb.*

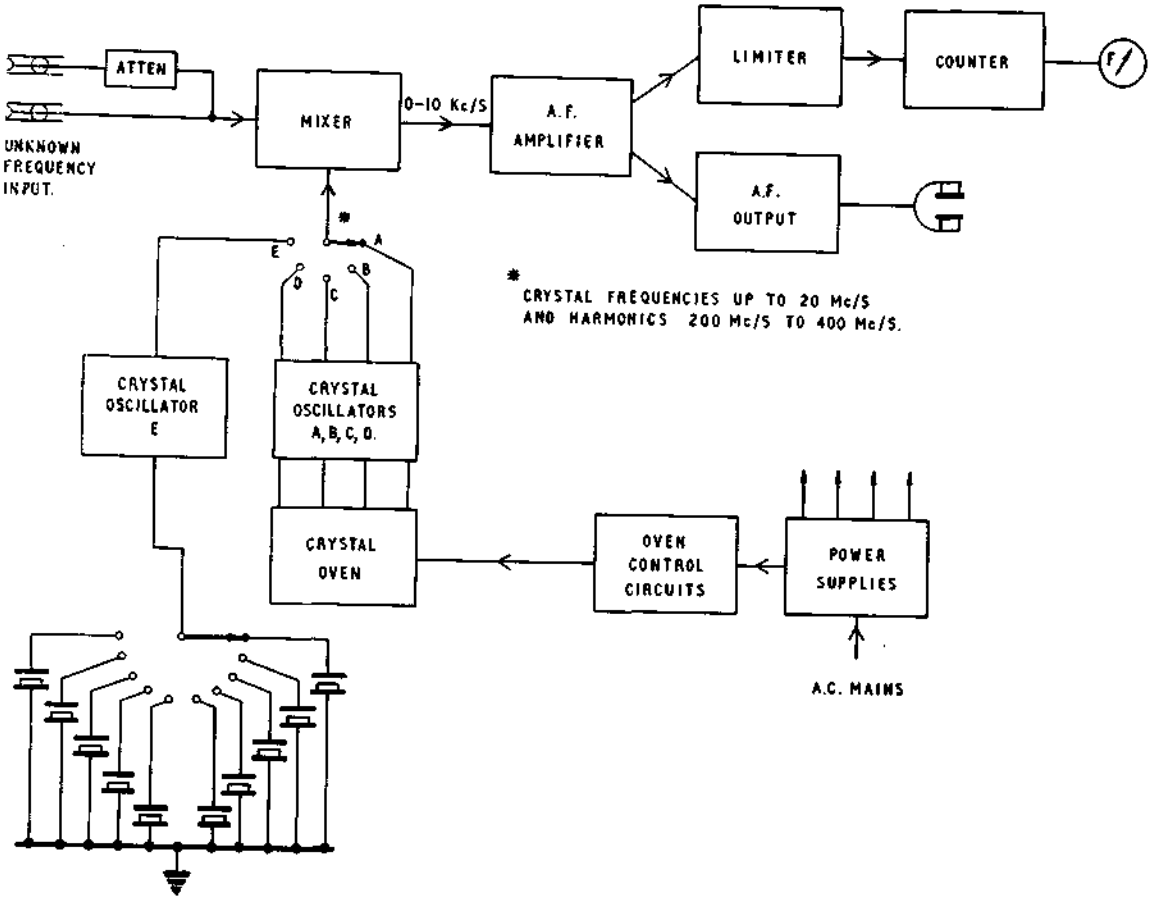


Fig. 1. Block diagram of calibrator, frequency

Introduction

1. The calibrator, frequency, 6625–99–999–2642 is an equipment for the frequency alignment of modules such as the spectrum generator unit, receiver unit (guard) and the IF unit (1·85 Mc/s) of the ARC52 and derivatives. It is also used in the testing of associated equipment; for example, the test set, UHF equipment, Type 15056 and the standby transmitter-receiver Type TR.10056.

2. The functions of the instrument can be extended to measure the error of other frequencies (by using RCL style D plug-in type crystals) from 2 Mc/s up to 20 Mc/s on fundamental frequencies.

3. The calibrator, frequency is a self-contained instrument designed to operate from single phase a.c. mains supplies in the ranges 110V to 120V and 200V to 250V. It is prepared for operation on different supply voltage levels by the adjustment of a voltage tap panel on the front of the instrument. The nominal 115V range is adjustable in 5V steps and the 230V nominal range in 10V steps. The mains supply frequency should be within the range 45 c/s to 65 c/s.

4. A block diagram of the calibrator, frequency is shown in fig. 1. The instrument comprises a mixer circuit into which is fed the frequency it is required to measure; also into the mixer is fed the output of one of five crystal controlled oscillators (para. 5 and 6). The resultant difference frequency is passed through an a.f. amplifier to a limiter stage and finally to an a.f. counter circuit. The output from this counter circuit is connected via the metering switch to a microammeter (calibrated 0–10 kc/s, f.s.d.) on the front panel. Provision is also made to monitor the difference frequency by means of headphones.

5. Four of the crystal oscillators (para. 4) resonate at fundamental frequencies of 10·0 Mc/s, 10·85 Mc/s, 12·15 Mc/s and 11·3 Mc/s; the crystals are enclosed in a temperature controlled oven. The oscillator required is selected by means of a switch on the front panel.

6. A fifth crystal oscillator operates on fundamental frequencies in the range 2 Mc/s–20 Mc/s. Ten crystal sockets are situated in a bank on the front panel and selected by the CRYSTAL BANK switch (S7); only five crystals are supplied in the bank in current equipment (para. 12 (3)). The output from this oscillator feeds into the mixer stage in a manner similar to that of the other four (para. 4).

7. With a power supply variation of not more than $\pm 6\%$ and operating within the ambient temperature range of 0°C to 55°C, the frequency stability of the temperature controlled crystal oscillators is better than two parts in 10^6.

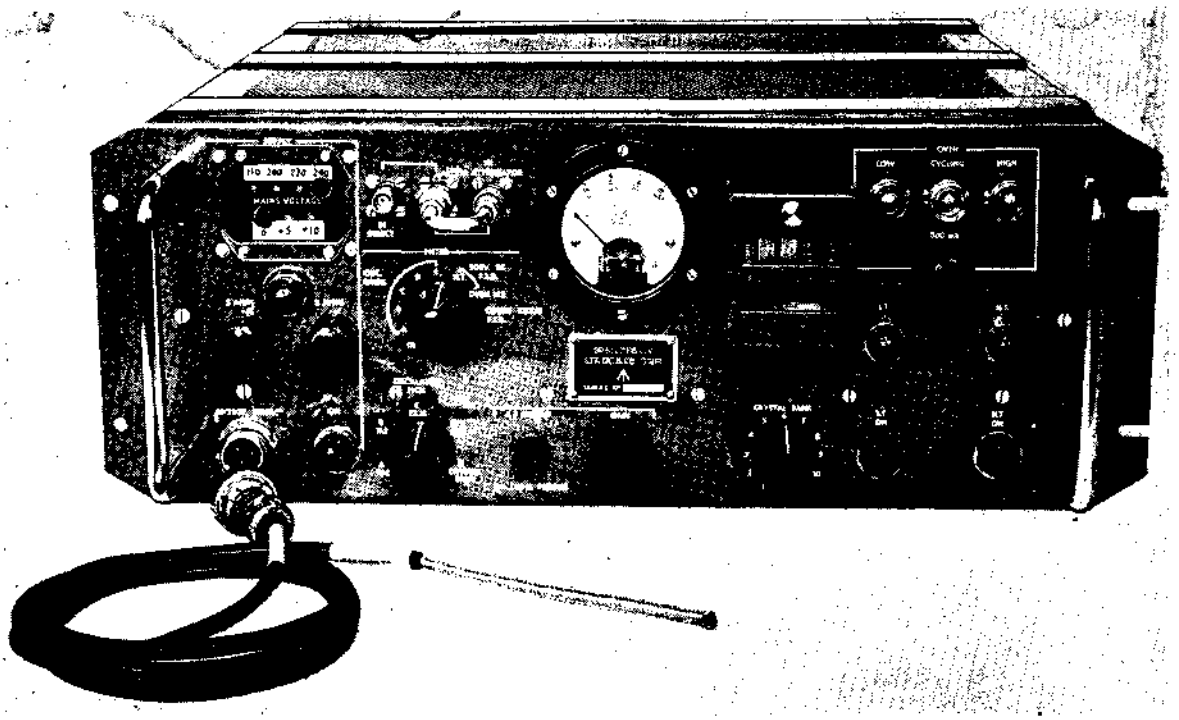


Fig. 2. Front panel layout

8. The signal to be measured is applied to a co-axial socket on the front panel. This signal of unknown frequency can be fed either directly to the mixer stage or through a 20dB attenuator pad and coaxial link (para. 12 (12)).

9. The equipment is supplied complete with a cable assembly, power electrical 5995-99-945-9896 ACS (formerly connector Type 3429/1 Ref. No. 10HA/8359), five feet in length, for coupling to the mains supply.

General description

10. The instrument is fabricated from steel sheet and enclosed within a thin gauge light alloy wrapping cover retained in position by cheese head screws. Removal of the cover provides access to all components on the chassis.

11. Two D shaped handles are fitted on the front panel to facilitate handling of the instrument and also to provide a measure of protection against damage to the components mounted on the front panel.

Front panel controls

12. All operating controls are grouped on the front panel, as shown in fig. 2. The functions of these components are as follows:—

(1) METER switch (S6)—When set to the OFF position the meter is isolated from the rest of the equipment. In positions A, B, C, D or E the meter indicates the grid current of the corresponding crystal oscillator. Setting the switch to H.T. enables the common h.t. voltage to be measured and in the OVEN H.T. position the voltage applied to the oven is indicated. Finally, at the position COUNT 10 KC/S F.S.D., the meter will read the frequency difference of the signal being measured.

(2) OSCILLATOR MC/S switch (S5)—When set to positions A 10·0, B 10·85, C 12·15, D 11·3 or E CRYSTAL BANK, h.t. is applied to the mixer and to the appropriate oscillator; also, the output of this oscillator is fed to the mixer. In the OFF position the switch isolates the mixer and oscillators from the h.t. supply.

(3) CRYSTAL BANK switch (S7)—With the OSCILLATOR MC/S switch set to position E CRYSTAL BANK the CRYSTAL BANK switch brings into circuit one of the external crystals; each crystal socket in the bank is numbered corresponding to its switch position.

(4) L.T. ON/OFF (S2), H.T. ON/OFF (S1) and SUPPLY ON/OFF (S9)—Three toggle switches which control the appropriate supplies. Switches S1 and S2 are so connected that a d.c. voltage cannot be supplied to the valve anodes before the application of heater supplies (para. 40).

(5) L.T. (ILP3), H.T. (ILP2) and SUPPLY (ILP1) lamps—Three signal lamps which light when the appropriate switch (sub-para. (4)) is made.

(6) OVEN LOW (ILP5), CYCLING (ILP4) and HIGH (ILP6) lamps—Lamps ILP4 and ILP5 light up to indicate when the oven is at low and normal temperatures respectively; indi-

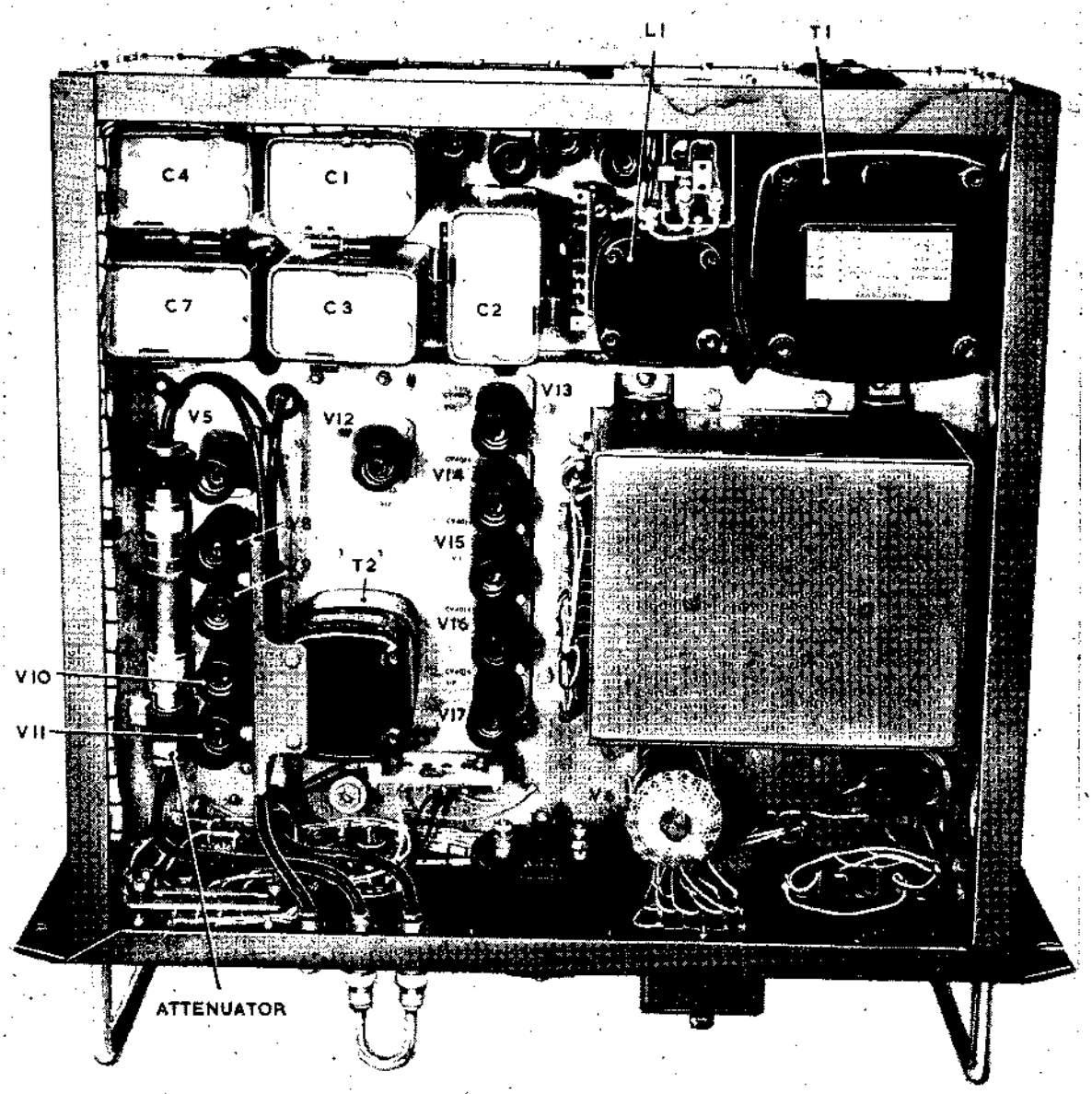


Fig. 3. Component layout above chassis

cating lamp ILP6, when alight, is a warning that the oven temperature is too high (para. 80 and 89).

(7) Fuses FS1, FS2 and FS3—Fuses FS1 and FS2, each rated at 2A, are in the mains supply; fuse FS3, rated at 500mA, is in series with the oven heating element.

(8) AF OUTPUT GAIN (RV2)—Controls the output level of a.f. to the headphones only.

(9) 150 OHMS PHONES—A Post Office type jack (JK1) making provision for plugging in a headset of 150 ohms impedance.

(10) A three-pole connector plug (PL1), annotated 110/250V, 45/65 c/s, which accepts the mains supply via the connector (para. 9).

(11) M1—A microammeter provided with three scales calibrated in current, voltage and frequency; this meter is used in conjunction with the METER SWITCH (S6) (sub-para. (1)).

(12) A coaxial link, situated on the left-hand side of the meter M1, may be set to one of two positions. When positioned to expose the IN DIRECT socket the unknown signal is fed directly to the mixer stage. For large signal inputs the link should be set to expose the IN VIA ATTENUATOR socket. In this latter position the link introduces a 20dB attenuator pad in series with the incoming signal and the mixer circuit.

Component layout

13. As shown in fig. 3 and 4 all components, with the exception of those mounted on the front panel and the gate switch on the rear panel, are fitted to one main chassis.

14. The rear of the chassis is stepped to give the necessary clearance for the larger components. This portion of the chassis contains the power supply unit.

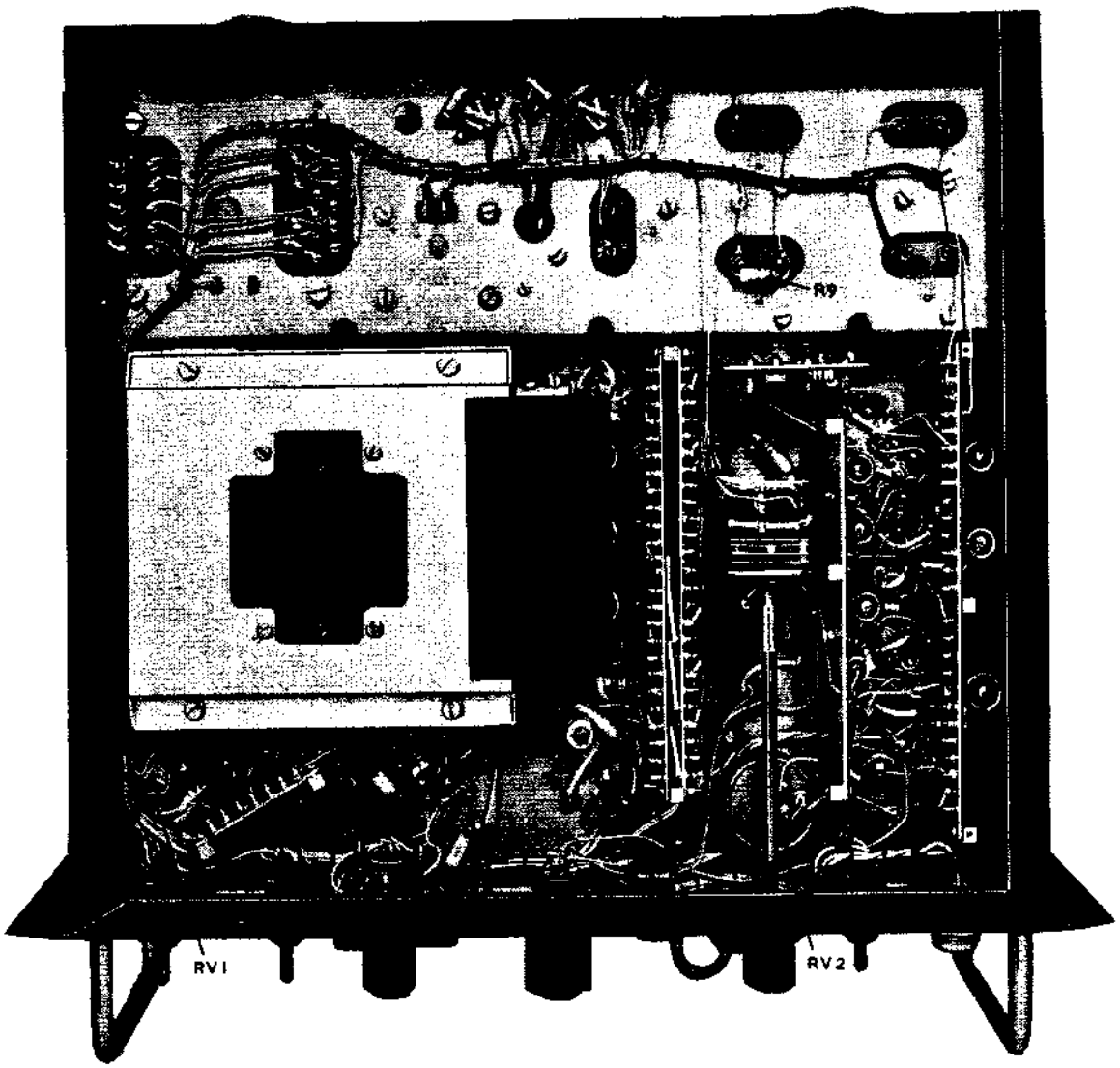


Fig. 4. Component layout under chassis

15. The mains transformer (T1) is secured to the chassis by four screws; two apertures serve to expose the terminal lugs of both the primary and secondary transformer windings. The smoothing choke (L1) is fitted similarly but the smoothing capacitors C1, C2, C3 and C4, together with the decoupling capacitor C7, are each retained in position by two clips.

16. At the rear of the capacitor C2 and choke L1 is situated the common h.t. rectifying valve (V1) together with its two voltage stabilizers (V2 and V3) and also the h.t. rectifier (V4) for the oven control circuit.

17. Fitted to the rear panel, above choke L1, is an isolating switch (S8) which disconnects the input power supply when the cover is removed. When it becomes necessary to operate the unit with the cover removed (e.g. during servicing) the switch may be held closed by a manual override plunger. ◄Where Mod. No. A5522 (Table 1) is embodied, an isolating switch with a different action is fitted. When operating the unit out of its cover, the switch may be closed by pulling out the actuating plunger until it locks in position. ►

18. The crystal oven extends through the chassis to the bottom of the instrument and is fixed to the chassis by four right-angled brackets. It is a self-contained unit which houses the grid circuits for the four temperature controlled crystal oscillators. These grid circuits are connected to their respective valves via an eleven-pole plug (PL2), integral with the oven unit, which mates with an eleven-pole socket (SKT2).

19. Each grid circuit contained in the oven has coarse and fine trimming capacitors which are accessible for calibrating purposes from the underside of the oven. A cover plate, fixed to the oven underside, may be removed by slackening two screws, then sliding the plate to the rear before lifting it clear. Removal of the cover exposes the eight trimmer spindles which are labelled COARSE, FINE and the related oscillator frequency, i.e. either 10 Mc/s, 10·85 Mc/s, 12·15 Mc/s or 11·3 Mc/s.

20. On the outer casing of the oven is mounted a tagboard on which are fitted components of the oven heater control bridge. On the top of the chassis and adjacent to valve V7 is the variable resistor RV1 which is used for adjusting the oven working temperature.

21. The attenuator pad is held in position on the top of the chassis in two sleeved clips. The coaxial connecting cable is fitted with type N connectors which plug into the two ends of the attenuator.

22. All the valves are mounted on the chassis top and arranged in groups with the five oscillator valves V13, V14, V15, V16 and V17 situated in a row adjacent to the oven. The paraphase amplifier valve (V12) is positioned separately and the valves of the a.f. amplifier (V5, V8 and V9) together with the limiter valve (V10) and counter valve (V11), form another row of five alongside the attenuator. The thyratron (V6) and its control valve (V7) are situated between the oven and the front panel.

23. The layout of the components on the underside of the chassis is a conventional arrangement of tagboards and direct wiring and is depicted in fig. 4.

Operating instructions

24. Set the three switches marked SUPPLY, L.T. and H.T. all to the OFF position and adjust the MAINS VOLTAGE tapping to the mains supply voltage.

25. Connect the instrument to the mains supply using the connector, then set the SUPPLY switch to the ON position. The SUPPLY indicating lamp and OVEN LOW lamp should both light.

26. The crystal oven of the frequency calibrator should now be permitted to reach its normal working temperature; this is indicated when the OVEN CYCLING lamp begins to flicker on and off and the OVEN LOW lamp is extinguished. The period required for the oven to attain its normal working temperature depends upon the ambient temperature but will normally be in the region of thirty minutes.

WARNING . . .

If, at any time the OVEN HIGH lamp should glow continuously, the supply should be switched off immediately. In no circumstances should the oven temperature be permitted to exceed 90°C.

27. Set the METER SWITCH to the H.T. position and set the L.T. switch to ON; the L.T. indicating lamp should glow immediately. After a pause of approximately thirty seconds, to allow the valve cathodes to obtain their normal operating temperatures, set the H.T. switch to the ON position. Between 10 seconds and 30 seconds after operating the H.T. switch, the neon stabilizing valves should strike; the H.T. lamp should then glow and the meter should show a reading between 248V and 372V.

28. With the calibrator, frequency now ready for use, connect to the appropriate input socket of the instrument the signal whose frequency is to be measured. The position of the coaxial link should be set as detailed in the servicing instructions applicable to the equipment on test; see Part 2, Sect. 3, or the Air Publication appropriate to the equipment.

29. The OSCILLATOR MC/S switch should be set so as to bring the required crystal oscillator into operation. The purposes for which the five positions are intended are as follows:—

(1) Position A 10·0—For measuring the frequency error of all eighteen indexed positions of the spectrum generator unit.

(2) Position B 10·85—For measuring the frequency error of the X oscillator of the test set, UHF, Type 15056.

(3) Position C 12·15—For measuring the frequency error of the Y oscillator of the test set, UHF, Type 15056.

(4) Position D 11·3—For measuring the frequency error of the Z oscillator of the test set, UHF, Type 15056.

(5) Position E CRYSTAL BANK—Brings in the oscillator which is used in conjunction with any one of the external crystals as selected by the CRYSTAL BANK switch (para. 30).

30. When the OSCILLATOR MC/S switch is rotated to position E CRYSTAL BANK, the CRYSTAL BANK switch should be set to the position corresponding to that of the required crystal number. Operating frequencies and intended functions, corresponding to the selected crystal number, are as follows:—

(1) Crystals numbered 1 (2·97 Mc/s), 2 (2·0 Mc/s) and 3 (2·03 Mc/s) are intended for use in the i.f. alignment procedure of the standby transmitter-receiver Type TR10056; crystals 1 and 3 resonate at the frequencies of the bandpass limits and crystal 2 at the i.f. mid-band.

(2) Crystal 4 (1·85 Mc/s) is intended for use in the second i.f. alignment procedure of the main and guard receivers of the ARC52 and derivative equipments.

(3) Crystal 5 (12·1 Mc/s) is intended for use in the alignment procedure of the receiver unit (guard) first i.f. of 36·3 Mc/s; at this position the third harmonic of the crystal frequency is used.

31. The METER switch should be set to the OSC. GRIDS position which corresponds to the selected position of the OSCILLATOR MC/S switch, i.e. A, B, C, D or E. The meter should then indicate that the selected oscillator is drawing not less than 25μA grid current.

32. Plug in a headset of 150 ohms impedance to the front panel jack labelled 150 OHMS PHONES and adjust the GAIN control to give a suitable level of audio frequency output.

33. The calibrator, frequency is designed to measure a frequency difference of up to 10 kc/s. If the METER switch is positioned to COUNT 10 KC/S F.S.D. when the difference frequency exceeds 10 kc/s the meter needle will deflect hard over to full scale. Under such conditions damage to the meter may ensue and to prevent this the following precautionary procedure should be adopted:—

(1) Set the METER switch to the OFF position.

(2) Adjust the frequency of the signal source being measured for a beat note, in the headset, which is the nearest approach to zero beat.

(3) Then set the METER switch to the COUNT 10 KC/S F.S.D. position and read the frequency difference in the meter.

Circuit description

Introduction

34. The circuit diagram for the calibrator, frequency is shown in fig. 5 at the end of this chapter. The circuit is drawn with each of the sub-circuits clearly defined and the following circuit description is divided under headings for each of these sub-circuits.

Power supplies

35. The mains supply is connected to the three-pole plug PL1. Pole C is earthed and the supply at poles A and B is fed via the isolating switch (S8), the double-pole SUPPLY ON/OFF switch (S9) and the two 2-amp. fuses (FS1 and FS2) to the MAINS VOLTAGE panel.

36. The primary winding of the mains transformer (T1) provides seven voltage tappings permitting the equipment to be operated from the following main supplies at 45 c/s to 65 c/s :—

(1)	110V	(7)	220V
(2)	115V	(8)	225V
(3)	120V	(9)	230V
(4)	200V	(10)	240V
(5)	205V	(11)	245V
(6)	210V	(12)	250V

37. The SUPPLY indicating lamp (ILP1), with a limiting resistor (R1) in series, is connected across the primary winding of transformer T1; the lamp will glow, therefore, only when the mains supply is connected across the primary winding.

38. The heater supplies to the valves are divided into four parallel networks, each of which is fed from its own 6·3V secondary winding of transformer T1; the four networks are detailed as follows:—

(1) Transformer (T1) terminals 14 and 15, winding marked Z (fig. 5)—supplying rectifier valve V1 (Type CV 493) via one pole of the H.T. ON/OFF switch (S1).

(2) Transformer (T1) terminals 30 and 31, winding marked Y (fig. 5)—supplying rectifier valve V4 (Type CV493) with resistor R10 in series.

(3) Transformer (T1) terminals 23 and 24—a 6·3V winding supplying thyratron V6 (Type CV 1848 or Type CV2253) together with its associated control valve V7 (Type CV492); one end of the winding is connected to earth and also one heater pin of each valve is taken to earth to complete the return line.

(4) Transformer (T1) terminals 20 and 21, winding marked X (fig. 5)—supplying the remaining valve heaters via one pole of the L.T. ON/OFF switch (S2); this winding has the L.T. indicating lamp (ILP3) connected across it, on the heater side of switch S2.

39. The four remaining secondary windings of transformer T1 include:—

(1) A 6·3V winding which supplies the oven temperature control bridge.

(2) A 190V winding to the anodes of rectifier valve V4 which produces the 250V h.t. supply.

(3) A 230V winding for the oven heater.

(4) A 300V–0–300V winding to the anodes of rectifier valve V1 which produces the 300V h.t. supply.

40. The double-pole switches S1 and S2 are each connected with one pole in a valve heater supply line (para. 38 (1) and (4)) and the other pole in the 300V winding centre tap earth return line. This is a precautionary measure which ensures that the h.t. is not connected before the valve heater supplies are applied.

41. The 300V h.t. supply is derived from a conventional full wave rectifying circuit with choke-capacity smoothing. The anodes of the rectifier valve V1 are supplied from the 300V–0–300V winding of transformer T1 via the series resistors R2 and R4. Smoothing is provided by capacitors C1 and C2 and coil L1; the h.t. indicating neon (ILP2) with a limiting resistor (R3) is connected across the smoothed output. The h.t. output is fed, via resistor R76, to the METER switch (S6) for the purpose of monitoring the h.t. voltage.

42. The h.t. for the a.f. output pentode (V9), the limiter valve (V10) and the counter valve (V11) is supplied direct from an unstabilized h.t. direct from the smoothing filter.

43. The 300V h.t. output voltage is stabilized by the two voltage regulators (V2 and V3) to provide the h.t. supply for the mixer valve (V12) and the oscillator in use, via the OSCILLATOR switch (S5), and for the a.f. amplifiers (V5 and V8).

44. The 250V h.t. supply for the double triode valve V7 is derived from a conventional half-wave

rectifying circuit with resistance-capacity smoothing. The anodes of the rectifier valve V4 are strapped together and supplied directly from the 190V winding of transformer T1. Smoothing is provided by capacitors C3 and C4 and the h.t. output (at c of fig. 5) is fed via resistor R79 to the METER switch (S6) for monitoring purposes.

Crystal oscillators

45. The five crystal oscillators A, B, C, D and E (comprising respectively valves V13, V14, V15, V16 and V17, and their associated components), are all of the electron coupled Colpitts type. The four valves V13, V14, V15 and V16 only, have temperature controlled grid circuits; the oscillator valve V17 operates in conjunction with a bank of plug-in crystals working at room ambient temperature.

46. The oscillators, A, B, C and D are four independent circuits, each of which is aligned to oscillate at the resonant frequency of its crystal. The circuits differ only inasmuch that the crystals employed resonate at different frequencies, i.e. XL1 (10 Mc/s), XL2 (10·85 Mc/s), XL3 (12·15 Mc/s), XL4 (11·3 Mc/s).

47. Only oscillator A will be considered in detail, the others are similar. The valve used is an r.f. pentode (Type CV4014) with the suppressor grid strapped externally to the cathode. The Colpitts circuit is formed by the screening grid which acts as the anode. H.T. is applied to the screen via the OSCILLATOR MC/S switch (S5) and dropper resistor R58. The control grid connected to one side of the crystal and the effective anode (screen) is connected to the earthy crystal plate, so far as r.f. is concerned, via capacitor C38. The cathode is capacitively tapped by capacitors C25 and C27 which are connected across the crystal. A d.c. path to earth for the cathode is provided by inductor L3 and resistor R57; a similar function for the control grid is performed by resistor R53 via the metering resistor (R54). The coarse trimmer (C24) and the fine trimmer (C56) are for alignment purposes (para.19).

48. The electron stream which passes through the screen is fluctuating at the crystal frequency and passes through the suppressor grid to the true anode. The fluctuating anode voltage across the anode load resistor (R59) is fed to the mixer grid via switch S5 and capacitor C36.

49. The oscillator E (V17) is fundamentally the same as oscillators A, B, C and D. The trimming capacitor (C54) is for adjustment during alignment to ensure that the nominal input capacity of each crystal bank socket is 30μF. The CRYSTAL BANK switch is wired so that both connections to the nine pairs of crystal sockets not in use are at earth potential.

Paraphase amplifier

50. The output of the selected oscillator A, B, C, D or E is fed to the triode valve V12 operating as a buffer with output connections in paraphase. The input is to the grid of valve V12, via switch S5, the balanced load R55 and R56 resulting in a push-pull output between the anode and cathode.

Input connections

51. The signal of the frequency to be measured is applied directly at socket SKT3 or via the attenuator at socket SKT5 to the terminating resistors R74 and R75; these two resistors provide resistive termination of the coaxial input connections at an impedance of 50 ohms.

Mixer

52. The mixer circuit is a balanced type comprising the network of diodes (MR5 and MR6) and resistors (R62 and R63) fed from the selected crystal oscillator via the paraphase amplifier valve V12.

53. The balanced push-pull output of the paraphase amplifier is finally developed across resistors R62 and R63 which form two arms of the mixer network.

54. Depending upon the alternative positive and negative voltage excursions of the cathode and anode of valve V12, both diodes (MR5 and MR6) are alternatively biased in the forward and reverse condition.

55. The input of the frequency to be measured is unbalanced (one line being earthed) and is connected between the junction of the diodes (MR5 and MR6) and earth.

56. The resultant output from the mixer circuit is developed across the resistors R69 and R70 and the required input to the following stage is tapped off at the junction of these resistors.

57. The signal developed across resistors R69 and R70 is a combination of the frequency to be measured and the output of the selected crystal oscillator. The crystal oscillator output, however, contains harmonics of the crystal as well as the fundamental frequency so that the resultant output, developed across resistors R69 and R70, will contain components whose frequency is the difference between the fundamental and harmonics of the crystal frequency (fc) and the frequency to be measured (fx.)

58. The calibrator, frequency will not identify the particular harmonic of the crystal oscillator, and it is assumed that the frequency of the input will be roughly known.

59. This difference frequency (para. 57) will be observed as an audio frequency fa, where fa=nfc $\pm$fx. Thus the condition of zero beat (fa=0) will be obtained when the measured frequency equals the relevant crystal harmonic (nfc).

60. The output of the mixer stage is fed to the input of the a.f. amplifier valve (V5) via coupling capacitor C8.

A.F. amplifier

61. The audio frequency derived from the mixer stage is amplified in a conventional manner through the triode V5 and double triode V8.

62. This amplified a.f. is taken to the squaring stage (i.e. the limiter valve V10) via capacitor C18 (para. 64) and also to the control grid of the a.f. output valve V9 via capacitor C19 and resistor R33. Valve V9 is an a.f. pentode (Type CV1138) employed in a conventional power output stage and is capable of delivering an a.f. power output of 50mW into a load of 150 ohms impedance throughout the range of 50 c/s to 10 kc/s. Negative feedback is incorporated from the secondary winding of transformer T2, via resistors R33 and R38, to the control grid. Audio power output is adjusted by the GAIN control (RV2), which is connected in parallel with the transformer T2 secondary, and fed to jack JK1 for use with a plug-in headset for monitoring purposes.

Limiter and counter

63. The limiter and counter circuits consist of valve stages V10 and V11 together with the bridge rectifier network comprising diodes MR1, MR2, MR3 and MR4 and meter M1.

64. The amplified difference frequency at the output of the amplifier valve V8 is applied to the control grid of the limiter valve (V10) via capacitor C18. Valve V10 is operated with a low screen voltage derived from the divider network resistors R89 and R42. This low screen voltage produces the characteristics of an effectively reduced control grid bias and the resultant waveform at the anode of limiter valve V10 approximates to a square wave having a mark-space ratio of approximately 1 : 1.

65. The square wave output of the limiter is fed via capacitor C28 to valve V11 which, with its associated components, operates as a Schmitt trigger circuit; the resultant waveform at the second anode of valve V11 is a steep edged square wave of constant amplitude. The amplitude is controlled by the trigger circuit and is unaffected by variations in signal frequency input.

66. Differentiation of this constant amplitude square wave is effected by the R–C network comprising the capacitor C30 plus the equivalent forward resistance of the diodes MR1–MR4 and resistor R51 together with the meter (M1); the resultant, differential signal is developed across the resistor R51.

67. Due to the rectifying action of the bridge network comprising the diodes MR1–MR4, all pulses developed across the resistor R51 are uni-directional.

68. The pulse repetition frequency is that of the a.f. input signal at V10, all the pulses being of constant amplitude. Thus, the mean current flowing in the meter is directly proportional to, and dependent upon, the frequency of the a.f. input signal at V10.

69. The meter scale is calibrated in cycles per second so that variations in mean current may be read directly as variations in frequency, up to a maximum of 10 kc/s.

Oven control

70. Control of the oven temperature is achieved by means of the Wheatstone bridge, a two-stage amplifier (V7) and a thyratron (V6).

71. Wound on the inner shell of the oven are three bifilar windings, each winding being in close contact with the shell and with each other. Two of the windings (crystal oven temperature sensing elements) are identical and are made from fine gauge, glass insulated, copper wire having a high positive temperature coefficient of resistance. These two windings form diagonally opposite arms of the Wheatstone bridge used in controlling the oven. The third winding is of glass insulated constantin wire and forms the oven heater (HR1).

72. The bridge consists of the two identical oven windings and two high stability wirewound resistors (R29 and R32), and is supplied with 6·3V a.c at 50 c/s from a secondary winding on transformer T1. Also incorporated in the bridge are a variable resistor (RV1) and a third wirewound resistor (R27). The function of RV1 is to enable the oven temperature to be set to 75°C; the resistor R27 acts as a compensating resistance for the effect of ambient temperature changes on the oven temperature. The value of this resistor (1·8 ohms) is such that the effect of reduced heat losses due to high ambient temperatures is effectively compensated in the range 0–65°C.

73. The bridge is coupled via capacitor C14 to the double triode amplifier (V7) which, in turn, is coupled via capacitor C12 to the control grid of the thyratron (V6). The thyratron is in series with the oven heater (HR1) and its supply. The heater is shunted by the lamp ILP4 with a resistor R11 in series.

74. On switching on, the bridge will be unbalanced due to the resistance of its oven windings being lower than that of the fixed arms. As a result, a.c. voltage will appear at the grid of valve V7 and the amplifier output is fed via capacitor C12 to the grid of the thyratron.

75. The anode of the thyratron is supplied with an alternating voltage in phase with the voltage supplied to the bridge. An a.c. bias is applied to the cathode of the thyratron valve such that, at any instant, the voltages at the grid and anode are always 180° out of phase.

76. On each positive half cycle of voltage applied to the anode the thyratron will strike. During this half cycle current will pass through the oven

heater HR1 causing the oven temperature to rise.

77. As the oven temperature rises so the two temperature sensing elements increase in resistance, bringing the bridge nearer to the balanced condition. The result is a decrease in the amplitude of the alternating voltage applied to the thyratron grid via valve V7.

78. This voltage will continue to decrease until eventually it is insufficient to overcome the standing bias on the thyratron. At this point the thyratron ceases to conduct, current no longer flows through the oven heater HR1 and the oven starts to cool. As the oven cools the bridge becomes unbalanced and the cycle is repeated.

79. Since the output of a Wheatstone bridge, fed with an alternating voltage, undergoes a phase reversal when the bridge is taken through balance it is impossible for the oven to overshoot its preset temperature unless a component breakdown occurs.

80. The thermal switch (S4) is adjusted so that, in the event of the oven temperature increasing beyond 82°C, the contacts will close, thus completing the circuit for the OVEN HIGH lamp (ILP6); the thermal switch S3 is so adjusted that its contacts open, switching off the OVEN LOW lamp (ILP5), when the oven temperature increases beyond approximately 68°C.

Servicing

General

81. The equipment should be maintained in a clean, dry and undamaged condition throughout its service life. Care must be taken to avoid rough handling of the switches and controls and to prevent the meter from being broken whilst the unit is on the bench. Keep the working area clear of any servicing tools, soldering irons, etc.

82. Periodically remove the cover and inspect the switches and wiring; access can be gained by removing the cheese head screws securing the cover.

83. When it is required to operate the unit with the cover removed, the isolating switch S8 ~~(para. 17) may be closed by a manual override plunger~~ in para 17.

WARNING . . .

Before attempting to renew any component, wiring, etc., suspected of being faulty, ensure that the isolating switch (S8) is open, the mains supply is switched off and disconnected from the unit.

84. Whenever a fault is suspected within the internal wiring a continuity test can readily be made using the multimeter Type 1 or similar instrument. Wiring is either of tinned copper 22 s.w.g., electrical equipment Type 2, 23/·0076 in. pink (6145–99–910–0191) or electrical equipment Type 2, 14/·0076 in. pink (6145–99–910–0185). Any renewal of wiring should be made only with the correct grade of wire; the connections should be made as neatly as possible, with care taken to avoid tails of excess solder. Remove any wire clippings and excess solder before replacing the cover or front panel.

85. Examine the connectors each time before coupling them to the frequency calibrator, the equipment on test and the mains supply. They should be undamaged and dry, with the plug and socket terminations making good, firm contact with the mating components on the related equipment; threads on connectors, etc., should have a thin film of grease applied periodically to facilitate their removal.

Overall testing

86. A circuit diagram of the complete unit is provided at fig. 5; a study of the diagram gives all the information necessary for clearing normal faults.

87. Before disconnecting either an electrolytic capacitor or a diode suspected of being faulty, note carefully the way in which the polarity is effected and fit the new component similarly.

88. Renewal of either the mixer valve (V12), crystal oscillator valves (V13–V17), or their associated components will necessitate realignment of the oscillators. Details are given in para. 49 and 103.

89. Extreme care should be exercised when changing components associated with the crystal oven, to ensure that the correct replacements are used. Failure to do so may lead to overheating of the oven and possible damage to the crystals.

WARNING . . .

If, at any time, the OVEN HIGH lamp should glow continuously, the supply should be switched off immediately. In no circumstances should the oven temperature be permitted to exceed 90°C.

90. When repairs or replacements have become necessary, tests should be made to determine that the equipment has been restored to a serviceable condition equivalent to that of a new unit, as issued, which has been inspected to factory standards.

91. Crystal oven and frequency counter circuits should be tested, therefore, to conform to the following standards of requirements which have been based on the manufacturer's production schedule.

Oven testing

92. If, due to renewal of components, etc., adjustment to the oven circuits should become necessary, the following procedure should be adhered to:—

(1) Set the front panel switches as follows:—

L.T.—OFF.
H.T.—OFF.
METER—OVEN H.T.
OSCILLATOR MC/S—E CRYSTAL BANK.
CRYSTAL BANK—any blank position.

(2) Take out the thyratron (V6) and its control valve (V7).

(3) Set the MAINS VOLTAGE tapping to 230V.

(4) Apply 230V ± 1V to the input plug and note the time between making contact to the mains and the h.t. measured at the junction of resistors R8 and R9 and capacitor C3 to reach 30 volts. This delay should be within the limits 20 sec–40 sec.

(5) The final voltage at this point should be 250V ± 10%.

(6) Ensure that the reading of the voltmeter on the front panel is within ± 10% of the voltage measured in sub-para. (5).

(7) The voltage measured at pole 3 of the thyratron valve (V6) should now be 250V a.c. ± 10%, and the voltage measured between poles 2 and 7 should be 6·3V a.c. ± 0·6V.

(8) Disconnect the mains supply and insert the thyratron (V6) and the control valve (V7).

(9) Ensure that the heaters of the rectifier valves V1 and V4 are cool, re-connect the mains supply and switch on.

(10) The OVEN LOW lamp (ILP5) should light immediately whilst the OVEN CYCLING lamp (ILP4) should glow continuously after an interval of 20–40 seconds.

(11) Now set the oven temperature preset control (RV1), located on the extreme right-hand side of the chassis, to approximately its midway position. Remove the plate from the oven lid and insert a thermometer of range 0°C–100°C in the centre hole. (The thermometer should be fitted with a copper foil sleeve about one inch long, enclosing the mercury bulb, to give close contact with the chassis inside the oven.)

(12) Clip a resistor (180 ohms ± 10%, ¼W) across the capacitor C17 which is mounted on the oven assembly. This unbalances the bridge control circuit; the OVEN CYCLING lamp (ILP4) will glow continuously and the oven temperature will increase rapidly.

WARNING . . .

It is imperative that the oven temperature should not exceed 90°C.

(13) At a temperature between 60°C and 74°C the OVEN LOW lamp (ILP5) should become extinguished.

(14) At a temperature between 77°C and 90°C the OVEN HIGH lamp (ILP6) should light.

WARNING . . .

If the OVEN HIGH lamp fails to light before a temperature of 90°C is reached, switch off the MAINS SUPPLY switch (S1) immediately and investigate the fault.

(15) On completion of the oven testing to this stage, switch off the mains supply and remove the 180 ohms test resistor.

Oven adjustment

93. Allow the thermometer reading to fall to 70°C then switch on the mains supply and allow 30 minutes for the oven to reach operating temperature; this is normally indicated by a slow flicker of the OVEN CYCLING lamp ILP4. To set the oven operating temperature to 75°C ± ~~5°C~~ 0·6°C, proceed as follows:—

(1) Note the initial oven temperature; if high reduce the temperature by rotating the oven temperature control (RV1) in a counter-clockwise direction.

(2) Allow half an hour for the oven temperature to stabilize then note the temperature again and repeat as necessary. At least one hour must be allowed after the final adjustment and before the end of the test; note the exact temperature of the oven at the end of the test.

(3) Remove the thermometer and copper foil and replace the oven lid cover plate.

Note . . .

If oven adjustment cannot be easily made, the frequency calibrator requires extensive servicing.

(4) A test should now be made to ensure that the change in frequency of the 10 Mc/s crystal does not exceed 10 c/s over a change in ambient temperature between 20°C and 65°C. The standard frequency source should be connected to the INDIRECT socket of the equipment which should be set up with the OSCILLATOR MC/S switch set to 10·0 Mc/s position (A) and the METER switch set to the OSC. GRIDS position A. Then, with the unit placed in an environmental test chamber at between 20°C and 25°C the calibrator, frequency should be provided with the normal power supplies (preferably an input maintained at 230V a.c.) and allowed to stabilize for a period of 12 hours. The crystal frequency at the end of this period should be recorded and then the temperature of the chamber raised to 65°C and maintained for at least two hours. Frequency drift of the crystal oscillator should again be recorded and the change in frequency denoted by the two readings should not exceed 10 c/s.

Counter adjustment and functional test

94. The equipment necessary for the testing of this part of the circuit is:—

TABLE 1

Modifications

(1) An a.f. milliwattmeter, having a characteristic impedance of 150 ohms, with a scale of 0–100mW; it should be calibrated at power levels, relative to 50mW of –6dB and +6dB.

(2) An a.f. signal generator capable of delivering a signal at levels of between 200mV and 25V at a frequency continuously variable from 15 c/s to 10 kc/s; the frequency accuracy of the a.f. signal generator should be within ±1% of the correct frequency between 150 c/s and 10 kc/s.

95. Connect the a.f. output meter to the jack JK1 marked A.F. OUTPUT 150 OHMS PHONES on the front panel. Connect the a.f. generator to the junction of resistors R69 and R70 and capacitor C44 and set the A.F. OUTPUT GAIN CONTROL (RV2) to maximum.

96. Close the L.T. switch (S2), wait 30 seconds then close the H.T. switch (S1) and verify that the time delay, between closing the switch and steady striking of the neon stabilizers (V2 and V3), is from 10–30 seconds.

97. Ensure that the voltage measured on the meter M1 is 310V ± 10%.

98. Set the a.f. signal generator to give an output of 200μV at 1 kc/s; the a.f. output measured at the 150 OHMS PHONES jack JK1 should be not less than 50mW

99. Now set the a.f. signal generator to give an output of 50mV and ensure that the output does not fall by more than 6dB over the range 50 c/s to 10 kc/s.

100. Adjust the a.f. signal generator to give 1mV output at 2·5 kc/s ± 1%. Then rotate the counter

(3) An oscilloscope with a d.c signal amplifier provided in its Y plate connections capable of indicating low frequency beat signals during standardization of the internal oscillator of the calibrator, frequency.

(4) A trimmer tool (5120-99-942-9597) or equivalent.

(5) A Q-meter, provided with a suitable test coil and test leads, capable of measuring the input capacity of the crystal bank (nominal capacity 30pF) at a frequency of 1·0 Mc/s.

(6) An a.f. milliwattmeter as described in para. 94 (1).

105. Before implementing the procedure, ensure that the crystal oven is operating in the manner specified in para. 92. Proceed as follows:—

(1) Set the OSCILLATOR MC/S switch (S1) to position A 10·0, METER SWITCH (S6) to OSC. GRIDS A and ensure that the 10·0 Mc/s oscillator is functioning.

(2) Adjust the fine trimmer capacitor (C56) to its midway position.

(3) Adjust the output of the standard frequency source to 10·0 Mc/s and connect to socket SKT3 (IN DIRECT).

(4) Plug in the headphones to jack JK1 on the front panel and adjust the A.F. OUTPUT GAIN CONTROL (RV2) to give a suitable ouput level.

(5) Connect the oscilloscope to the junction of capacitor C8 and resistor R12 via its Y-plate signal amplifier.

(6) The 10·0 Mc/s oscillator can now be adjusted, by means of the trimmer capacitors C24 and C56, until a condition of zero beat is obtained in the headphones and, simultaneously, a null is indicated on the oscillo-

TABLE 1 (contd.)

Mod. No.	Class	Vol. 2 Leaflet	A.L.	Label No.	Brief details of change
0894	C/3 on 3rd line repair WOTSAC (RAF) C/3 WOTSAC (RN)	B181	271	6	Replace holders, electronic valve, 5935-99-911-1103, used with valves V5 and V12 to V17, by holders, electronic valve, 5935-99-056-0094. Former items no longer available.
1111	D/3 on 3rd line repair WOTSAC (RAF) D/3 WOTSAC (RN)	B185	279	7	Replace sockets, crystal, 5935-99-913-3685, used with crystals XL1 to XL4 in the crystal oven, by sockets, quartz crystal unit, 5935-99-949-2027. Former items no longer available.
A4671	C/3 WOTSAC	◄B260	421►	8	Replace obsolete diodes CV4073 (MR1–MR4) with CV7367. The latter are self supporting so

Internal attenuator value

108. This test should be made in order to verify the attenuation of the 50 ohms internal attenuator at the input connector; it should be made at the frequency of 300 MHz.

(1) The coaxial link on the front panel must be removed.

(2) An r.f. signal source, having an output continuously variable from 0·1μV to 1·0V at a source of impedance of 50 ohms and continuously variable frequency in the range 200 MHz to 400 MHz, should be connected to the IN VIA ATTENUATOR socket on the front panel.

(3) A resistive load of 50 ohms provided with a voltmeter capable of reading 100mV to an accuracy not worse than ±5% should be connected to the coaxial socket SKT4.

(4) The output of the r.f. signal source should then be set to a level which will give a reading of 0·1V on the meter of the load unit. Record the reading of the output attenuator of the r.f. source.

(5) Disconnect the r.f. signal source and the resistive load. Reduce the output of the r.f. signal source to zero and then connect direct to the load unit, increasing the level until the meter of the load unit again reads 0·1V. Record the reading of the output attenuator of the r.f. source.

(6) The value of the internal attenuator is then obtained from the difference in scale readings (sub-para. 4 and 5); it should be 20dB ±0·5dB.

Modifications

109. This chapter is amended to include changes resulting from the modifications summarized in Table 1; full particulars are contained in Vol. 2 of this Air Publication.

TABLE 1

Modifications

Mod. No.	Class	Vol. 2 Leaflet	Vol. 2 A.L.	Label No.	Brief details of change
6319	B/3 by return to Contractor (R.A.F. only)	B53	70	1	Fit crystal retaining spring assembly. Introduced to prevent the trimming capacitor shorting to earth via the existing spring clip.
6345	B/2 by return to Contractor	B69	88	2	Change heater input wires with wire of greater current rating. Introduced to prevent voltage drop and thus maintain equipment within specification.
8951	B/3	B118	179	3	Change values of two crystals to enable the calibrator to be used for checking derivatives of ARC52.
9675	B/3 W.O.T.S.A.C.	B152	234	4	Add a terminal post, re-route one termination of resistor R15 and modify the wiring of V6 valve holder to enable CV2253 valves to be used as alternative to the CV1848.
0604	B/3 as required (R.A.F.) B/3 as required on repair or re-calibration (R.N.)	B170	256	5	Increase the value of capacitor C51 from 100pF to 150pF and physically reposition C51 to improve starting of the crystals.

TABLE 1 (contd.)

Mod. No.	Class	Vol. 2 Leaflet	Vol. 2 A.L.	Label No.	Brief details of change
0894	C/3 on 3rd line repair WOTSAC (RAF) C/3 WOTSAC (RN)	B181	271	6	Replace holders, electronic valve, 5935-99-911-1103, used with valves V5 and V12 to V17, by holders, electronic valve, 5935-99-056-0094. Former items no longer available.
1111	D/3 on 3rd line repair WOTSAC (RAF) D/3 WOTSAC (RN)	B185	279	7	Replace sockets, crystal, 5935-99-913-3685, used with crystals XL1 to XL4 in the crystal oven, by sockets, quartz crystal unit, 5935-99-949-2027. Former items no longer available.
A4671	C/3 WOTSAC	◄B260	421►	8	Replace obsolete diodes CV4073 (MR1-MR4) with CV7367. The latter are self supporting so when all four have been changed, the clamping bar is no longer required.
◄A5523	C/3 WOTSAC (RAF & RN)			9	Replace obsolete switch 5930-99-932-5300 (S8) by switch 5930-99-618-6327 which has different physical dimensions and requires a different method of fitting.►

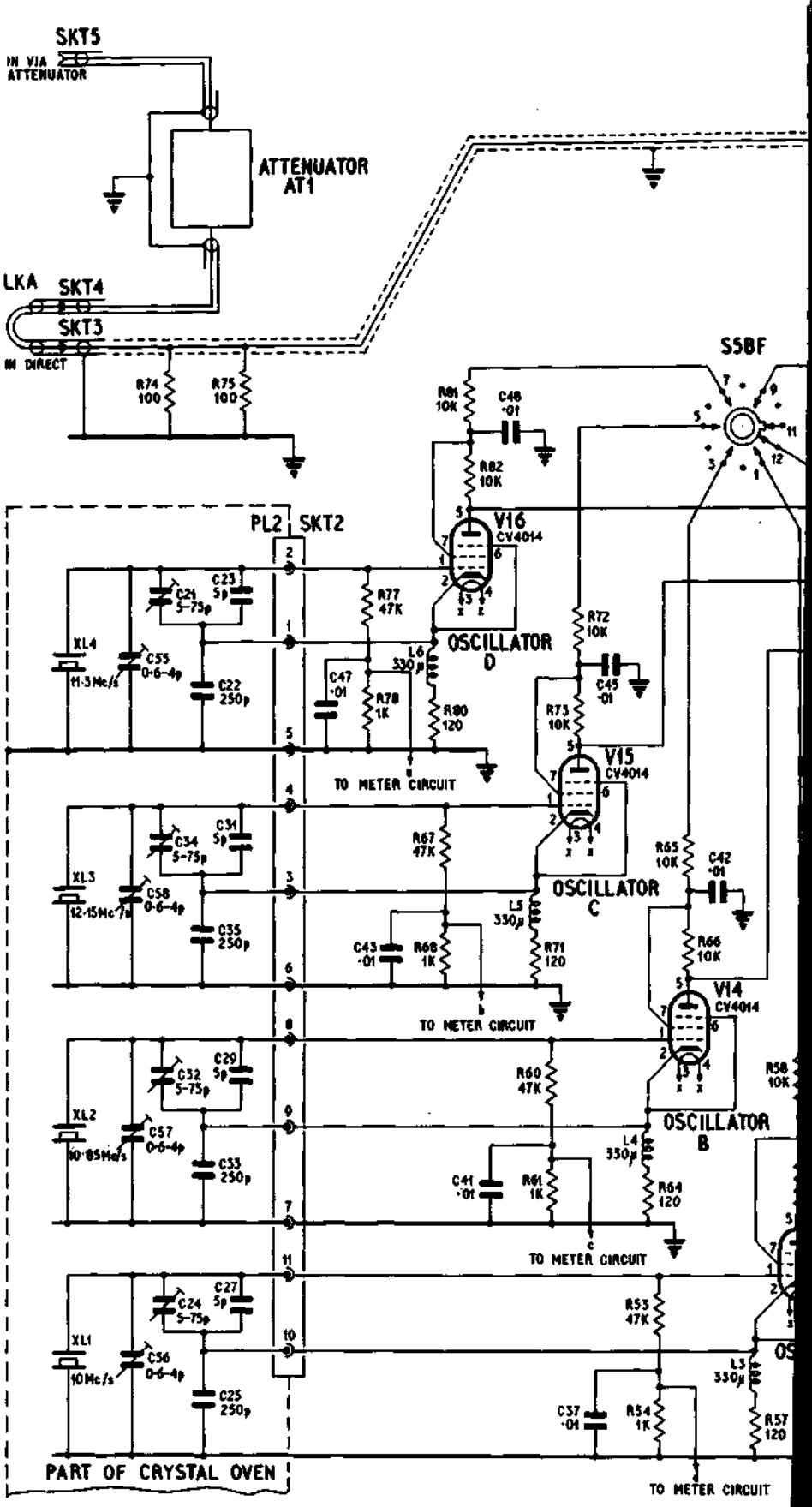


Fig.5
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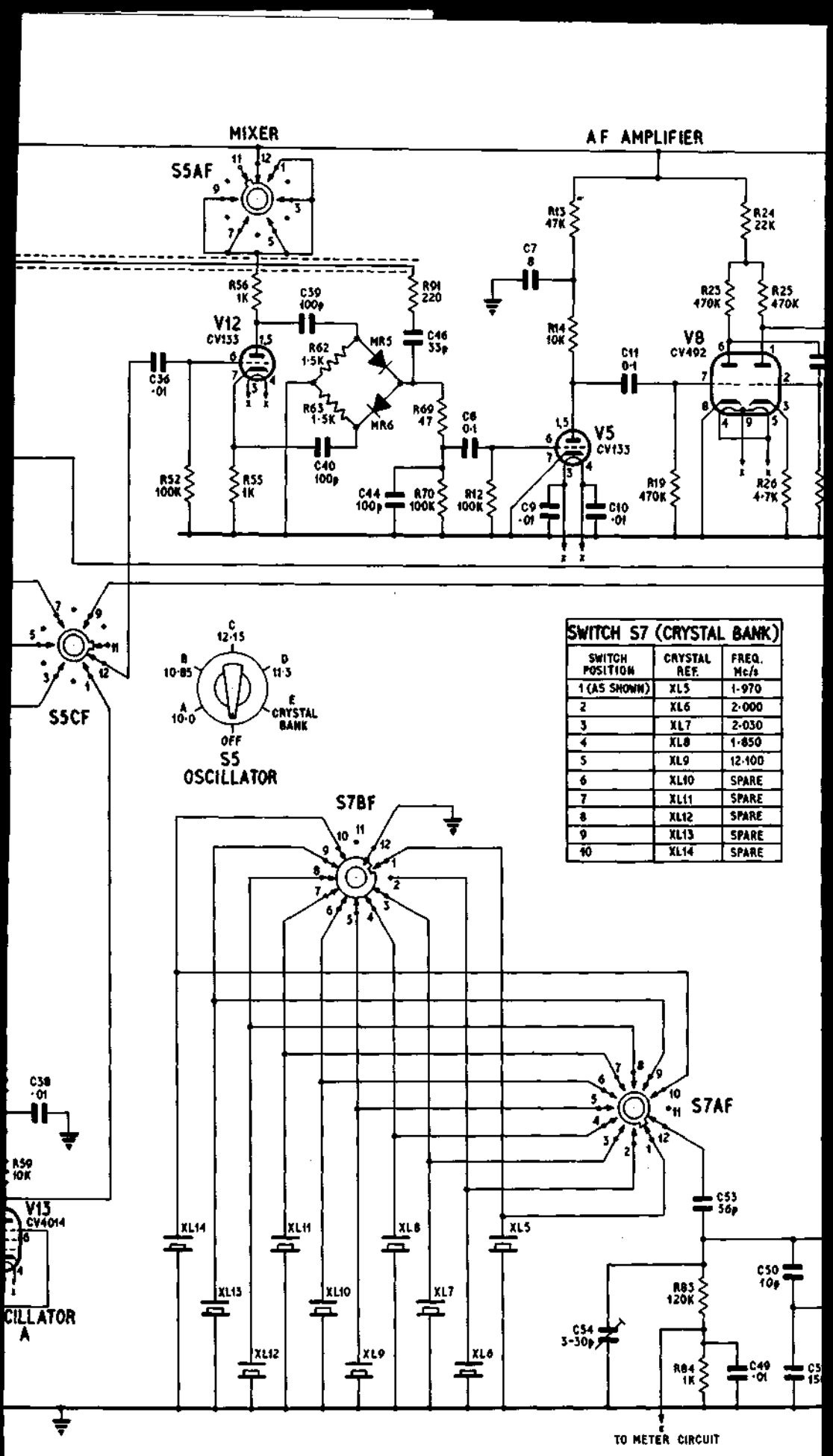
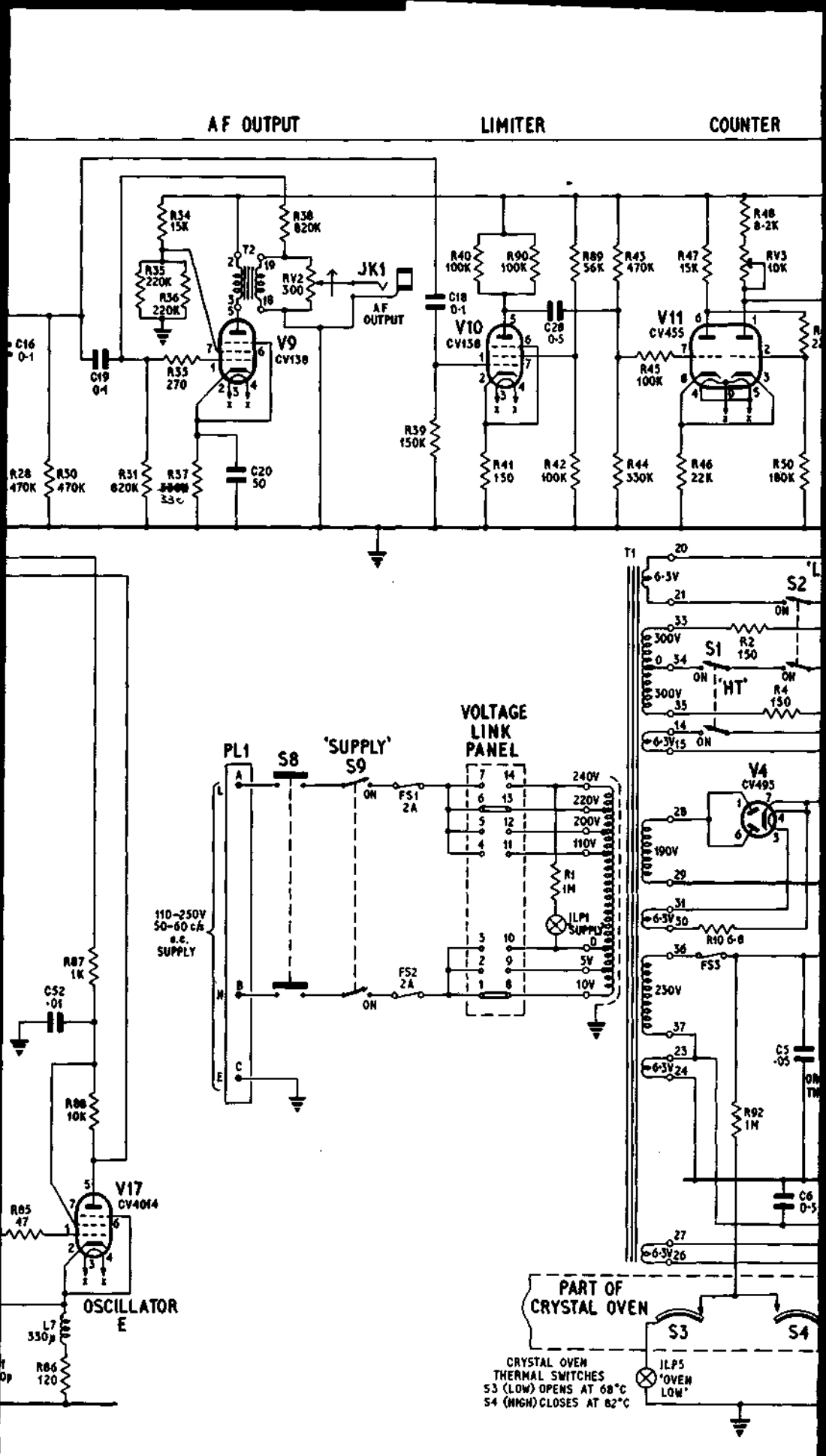
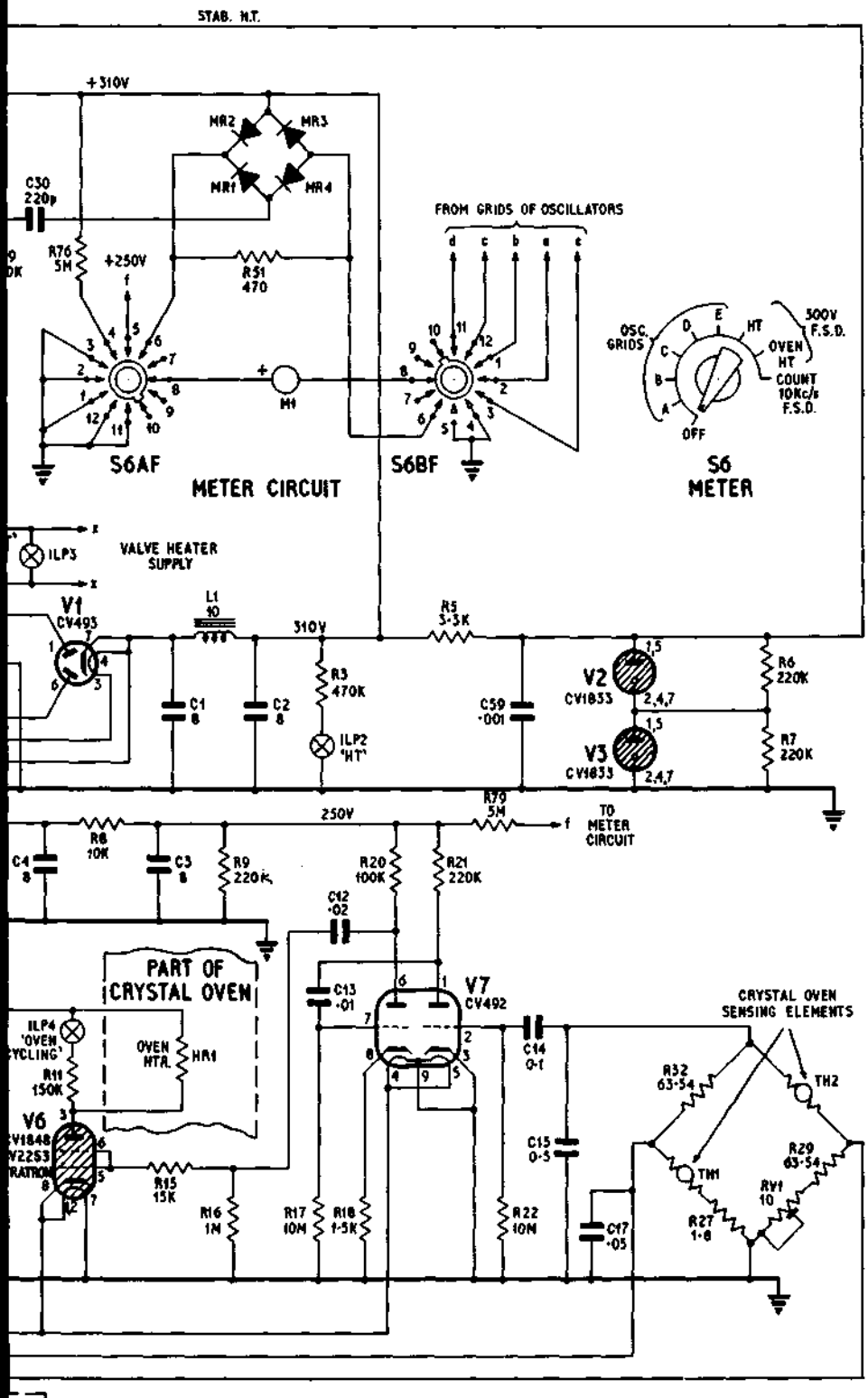


SWITCH S7 (CRYSTAL BANK)		
SWITCH POSITION	CRYSTAL REF.	FREQ. Mc/s
1 (AS SHOWN)	XL5	1·970
2	XL6	2·000
3	XL7	2·030
4	XL8	1·850
5	XL9	12·100
6	XL10	SPARE
7	XL11	SPARE
8	XL12	SPARE
9	XL13	SPARE
10	XL14	SPARE

Calibrator, frequen



cy 6625-99-999-2642 : circuit



POWER SUPPLIES

CIRCUIT INCLUDES MOD. No. 8951/3, 9675/4, 0604/5

Fig.5

Chapter 7

MONITOR, AUDIO/RADIO FREQUENCY

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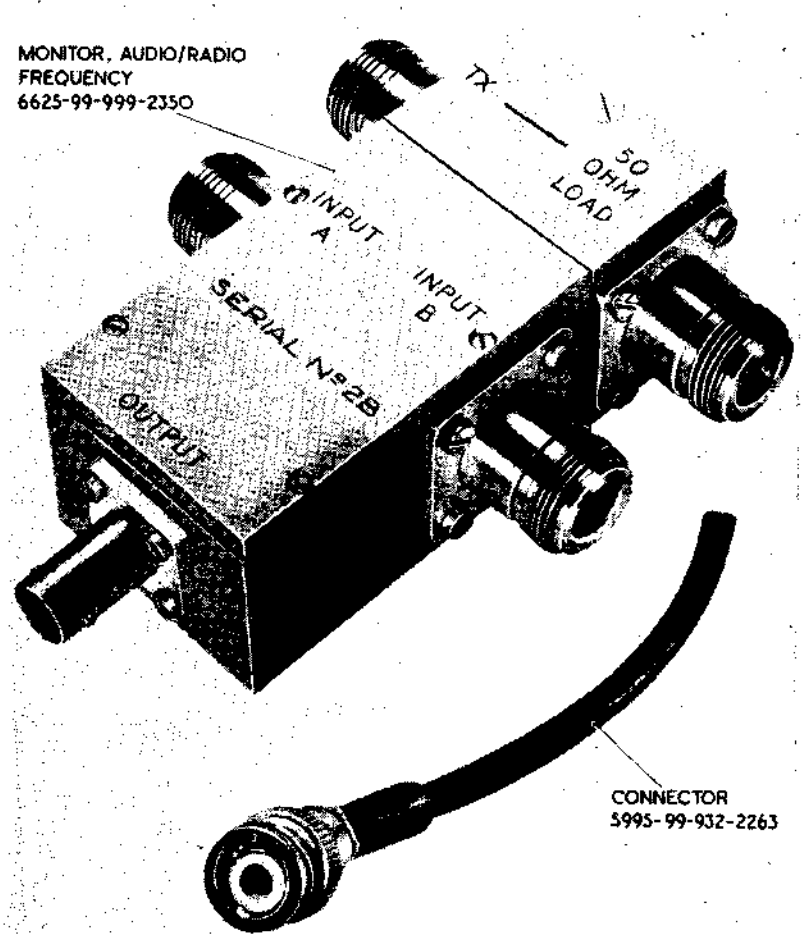

Fig. 1. Monitor, audio/radio frequency, 6625-99-943-7328

General

1. The complete monitor, audio/radio frequency, 6625-99-943-7328 comprises the monitor, audio/radio frequency, 6625-99-999-2350 and its associated connector 5995-99-932-2263 which is illustrated in fig. 1.

2. This unit is essentially a modulation envelope detector, designed for use at frequencies between 225·0 MHz and 400·0 MHz with an accuracy of measurement of modulation depth not worse than ± 10% for modulation depths of between 50% and 90%. When used in conjunction with the following items, it provides a means of measuring the modulation depth of the ARC52, PTR175 and TR10056 type transmitter-receivers.

(1) Wattmeter, absorption, CT419.
(2) Signal generator CT394 (or CT394A).
(3) Oscilloscope set CT436.
(4) Signal generator Type 16728.
(5) Simulator, microphone, 6940-99-943-6545.

3. The monitor, audio/radio frequency consists of an attenuator and mixer which are coupled to the equipment under test by means of a 50-ohm coaxial line. The mixer unit, when coupled to the external signal generator as the local oscillator, provides an output at 300 kHz which may be displayed on the external oscilloscope (para. 2 (3)). Filtering is provided in order to remove other products of the mixing process. The average modulation depth may then be calculated from the values of the peak and trough displacements of the resultant waveform on the oscilloscope and substituting values obtained in the following expression:—

$$\text{Average modulation depth (per cent)} = \frac{(A-B)\times 100}{(A-B)}$$

Where A is the peak to peak value of the waveform and B is the trough to trough value of the waveform.

Circuit description

4. The circuit of the monitor, audio/radio frequency, 6625-99-999-2350 is shown in fig. 2.

5. The voltage probe, in the attenuator network R1, R2 and R3, is coupled to the 50-ohm coaxial line, which connects the CT419 at SKT1 to the transmitter-receiver at SKT2. The signal appearing across R3 is mixed with a local oscillator signal (provided by the CT394 or CT394A at SKT3 or SKT4) in the germanium diode MR1 (CV2290), which acts as a non-linear detector. The resultant signal, which is developed across R6 and C1, is then fed to the filter C2, L1, which is tuned to approximately 300 kHz to provide an output of 50mV at SKT5. Choke L2 and capacitor C3 are included to filter out the higher frequency components of the mixing process. The additional input socket is provided to enable a comparison to be made with another signal generator.

Testing

6. The monitor should be tested, following lengthy periods of inoperation, to ensure that it retains its full functional requirements. In order to make all the tests, the test equipment listed in Table 1 is recommended.

7. The u.h.f. power source listed (Table 1, item 1) should comprise a signal generator having a nominal source of impedance of 50 ohms, an operating frequency range of from 225 MHz to 399·9 MHz, and the r.f. output power level should be continuously adjustable from 2W to 25W. Amplitude modulation must be available to depths up to 90% at a frequency of 1000 Hz ± 100 Hz. The Plessey TD3426/3 satisfies these requirements. The source must be coupled to the equipment under test by means of a coaxial system, the centre conductor of which should be 5 ft. ± 3 in. in length.

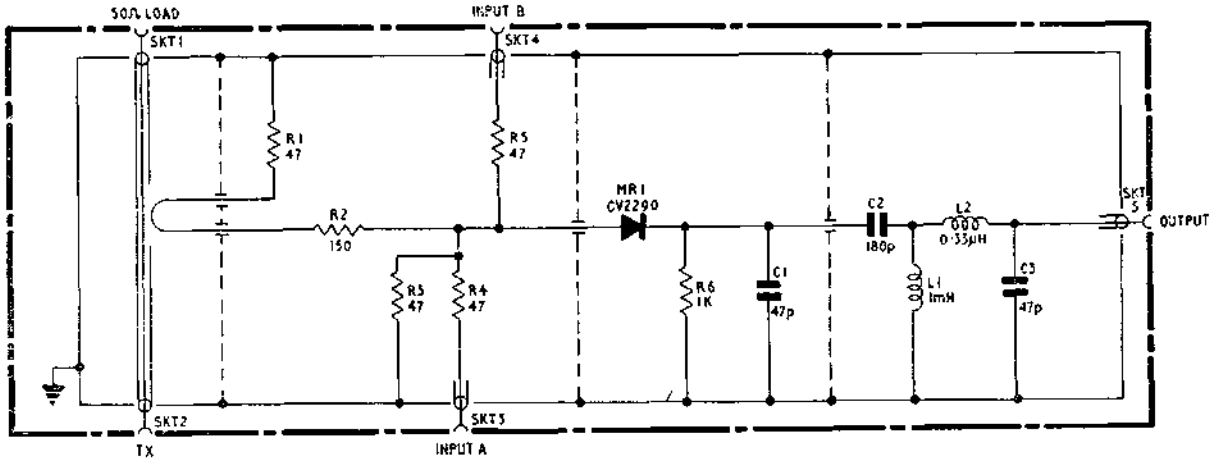

Fig. 2. Monitor, audio/radio frequency, 6625-99-999-2350: circuit

TABLE 1

Monitor, audio/radio frequency—test equipment

Item	Description	Other details
1	U.H.F. power source	(para. 7)
2	U.H.F. signal generators (two)	CT394 or CT394A
3	I.F. signal source	CT452
4	U.H.F. power load and meter	CT419
5	Valve millivoltmeter	CT429

8. Before coupling up the monitor, audio/radio frequency for testing, the equipment should first be carefully examined for evidence of damage or other visible unserviceability. Electrical tests should be made to ensure that the wiring of the equipment conforms to the circuit and that no inadvertent interconnections exist.

Filter resonant frequency and bandwidth

9. Connect the valve millivoltmeter to the OUTPUT socket (SKT5); a 470-kilohm resistor ($\pm$ 10%) must be connected between the meter terminals. Then couple the i.f. signal source to the INPUT B socket and adjust the output voltage level to obtain a deflection on the 300-millivolt range of the meter. Now adjust the frequency of the signal source to the point at which maximum output voltage is obtained; this should be 300 kHz $\pm$ 50 kHz. Increase the output voltage of the i.f. signal source by 3dB and increase also the frequency until the output voltage falls to its previous value. This frequency should be not less than 20 kHz and not more than 35 kHz higher than the centre frequency. Now decrease the frequency of the i.f. signal source until the output again decreases to its former value; this frequency must be not less than 20 kHz and not more than 35 kHz lower than the centre frequency.

Sensitivity

10. Connect the millivoltmeter to the OUTPUT socket, with the 470-kilohm resistor coupled between the meter terminals. Then connect the u.h.f. signal generator to the INPUT B socket; the output frequency should be set to 395·0 MHz at a level of 0·5V. Now connect another u.h.f. signal generator to the INPUT A socket, with the output of this unit set to 1·0V and frequency adjusted for maximum indication on the valve millivoltmeter (395·0 MHz approximately). The output level should be not less than 50 millivolts r.m.s. Repeat the test for input frequencies to the INPUT B socket of 325·0 MHz and 225·0 MHz.

11. Connect the millivoltmeter to the OUTPUT socket, with the 470-kilohm resistor again between the meter terminals, and connect the u.h.f. power source to the TX socket. The u.h.f. power load and meter should be connected to the 50 OHM LOAD socket of the equipment. Now set the output frequency of the power source to 243·0 MHz and adjust the output level for 2W dissipation in the load. A u.h.f. signal generator should then be coupled to the INPUT A socket and the output level set to 1·0V; with the output frequency adjusted for maximum indication on the millivoltmeter (approximately 243·0 MHz), the output level must be not less than 50 millivolts r.m.s.

TABLE 2

Modifications

Mod. No.	Class	Vol. 2 Leaflet	Vol. 2 A.L.	Label No.	Brief details of change
7545	B/0	B95	140	1	Change base material of six unreferenced parts from aluminium alloy to brass to ensure satisfactory silver plating.

Chapter 8

(Completely revised)

SIMULATOR, MICROPHONE 6625-99-945-0061

CONTENTS

TABLES

ILLUSTRATIONS

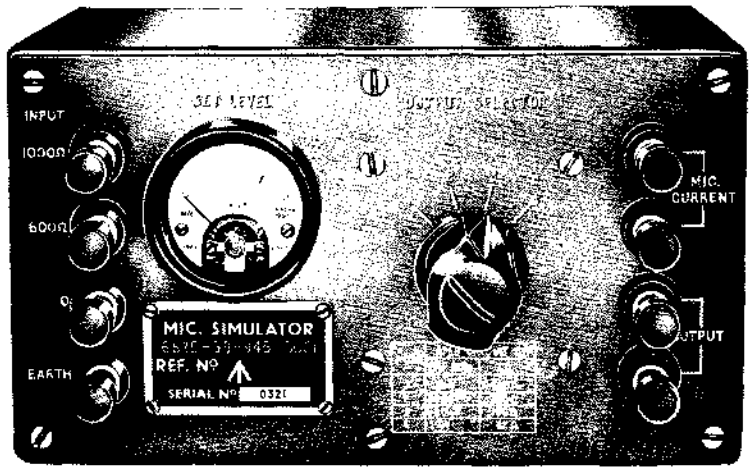

Fig.1 Simulator, microphone, 6625-99-945-0061

General (fig.1)

1. This simulates the various types of microphones used with the ARC52 and derivatives.

2. When supplied with an input from an audio oscillator with balanced or unbalanced output impedance of 600 ohms or 1000 ohms (eg Audio and Video signal generator 6625-99-104-7574) the simulator provides an a.f. voltage of known level and source impedance for testing the modulator section of the transmitter-receiver.

Circuit description (fig.2)

3. The a.f. signal is applied to the primary T1. The output from the secondary is fed to a divider RV1, R2 and thence to contacts on the 4-position switch S1. A portion of the voltage developed across the divider is fed via R1 to MR1 (CV448), and the resultant d.c. is indicated on M1. RV1 is used during calibration to set the meter to the calibration mark at 0·75 of f.s.d. for an input of 10V at S1B.

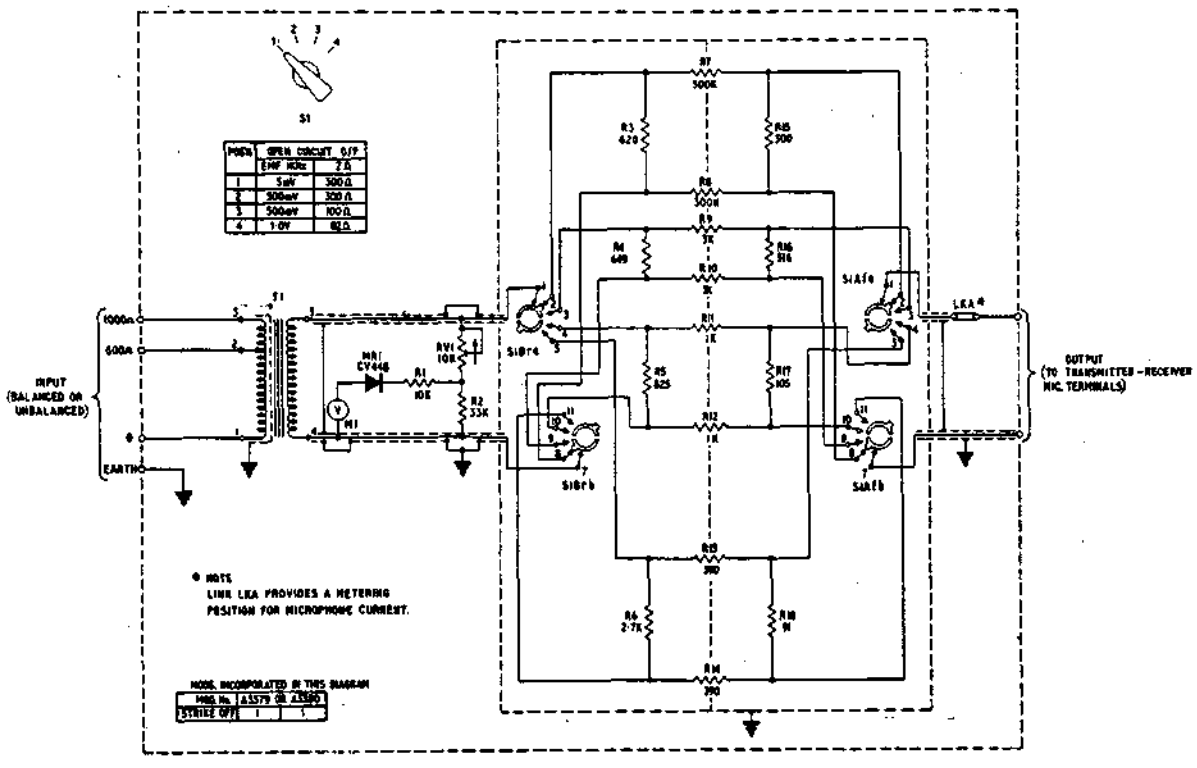

Fig.2 Simulator, microphone, 6625-99-945-0061: circuit

4. Four alternative outputs are provided by the resistance network attenuators, each of which is switched into circuit by S1:

(1) The first is made up of R3, R7, R8 and R15 and provides a balanced output of 5mV (open circuit) at an impedance of 300 ohms to simulate a dynamic microphone.

(2) The second comprises R4, R9, R10 and R16 and provides an unbalanced output of 500mV (open circuit) at 300 ohms to simulate a 300 ohms carbon microphone.

(3) R5, R11, R12 and R17 comprise the third network from which a balanced output of 500mV (open circuit) at 100 ohms impedance is obtained, and this simulates the characteristic of a 100 ohms carbon microphone.

(4) The fourth is formed by R6, R13, R14 and R18 to provide an unbalanced output of 1V (open circuit) at 82 ohms impedance which simulates an 82 ohms carbon microphone.

5. The microphone polarizing current which should flow when the modulator, radio transmitter is set for carbon microphone operation can be monitored by removing link LKA and inserting a suitable milliameter, eg multimeter CT498 (or alternative). LKA is between the MIC CURRENT terminals on the simulator front panel.

6. The simulator output should be applied to the transmitter-receiver via the bench connector set interconnecting box, 5821-99-932-1919 or 5821-99-932-1920 (Chap.2), or via the interconnecting box 5821-99-999-2643 and the test set, amplifier (modulator) (Chap.4) to the modulator unit under test.

7. The simulator is fed from the audio oscillator (eg audio and video signal generator 6625-99-104-7524) and the signal level from the oscillator adjusted until the pointer of the meter is at the calibrating mark. The outputs shown in Table 1 are then available (measured with no external load on the output of the simulator).

TABLE 1

Output voltages

Switch position (OUTPUT SELECTOR)	Output voltage (open circuit)
1	5mV
2	500mV
3	500mV
4	1·0V

Testing

8. The equipment should be tested, following lengthy periods of inoperation. The items of electronic test gear recommended are listed in Table 2.

TABLE 2

Test equipment

Item	Description	Ref. No.
1	Audio and video signal generator	6625-99-104-7574
2	Electronic multimeter CT471C	6625-99-955-6255
3	Oscilloscope set CT436	6625-99-913-8618
4	Multimeter CT498	5QP/17447

Initial setting-up and input impedance

9. Adjust RV1 with 1kHz input signal from a generator having an output impedance of 600 ohms such as the Audio and Video signal generator 6625-99-104-7574. Alternatively, a signal generator of 1000 ohms output impedance may be used but the accuracy will be affected slightly.

10. Set up as follows:

(1) Ensure that link LKA is inserted at the MIC CURRENT terminals (fig.2).

(2) Connect the simulator to the signal generator via the appropriate front panel terminals (fig.1) by suitable screened leads (as short as possible). During all tests connect the screening braid directly to the EARTH terminal on the front panel of the simulator which in its turn must be earthed to the main earth terminal on the audio oscillator.

(3) Connect a multimeter, electronic, CT471C (set to measure 12V a.c.) across the secondary of T1. Switch on the test equipment and set the signal generator to 1kHz. Adjust the output of the signal generator until the voltage across the secondary of T1 is exactly 10V.

(4) Adjust RV1 on the simulator until M1 reads on the calibration mark at 0.75 f.s.d. Lock RV1.

(5) Note the input voltage from the signal generator, it should not be more than:

(a) 12V r.m.s. if the signal generator has 600-ohm output impedance (ie Audio and Video signal generator 6625-99-104-7574).

(b) 15V r.m.s. if the signal generator has 1000-ohm output impedance (ie signal generator Type 65B).

Output impedance

11. The output impedance of the simulator is substantially resistive and should be measured, for each position of the MICROPHONE SELECTOR switch, by a d.c. test meter, eg multimeter CT498 (Table 3).

Distortion

12. Connect the simulator to the signal generator as in para.9 and maintain the input level with M1 indicating to the calibration mark 0.75 f.s.d. Connect the oscilloscope CT436 with its Y amplifiers to the input and output terminals. There should be no noticeable difference between the input and output waveforms over the range 150 Hz to 20 kHz.

TABLE 3

Output impedance values

Switch position (OUTPUT SELECTOR)	Output impedance	
	Normal value	Tolerance
1	300 ohms	± 2%
2	300 ohms	± 2%
3	100 ohms	± 2%
4	82 ohms	± 2%

Output and frequency response

13. Connect the simulator to the audio signal generator, as before, with the input level maintained with M1 indicating to the calibration mark 0·75 f.s.d. Adjust the frequency of the audio generator to 1 kHz and the open circuit output voltage measured at the output terminals with the MICROPHONE SELECTOR switch set at each position in turn:

Position	Voltage
1	5mV ± 5%
2	500mV ± 5%
3	500mV ± 5%
4	1·0V ± 5%

14. Measure the frequency response over the range 150 Hz to 20 kHz, at three datum frequencies. The output voltage should be within the limits as follows:

(1) 150 Hz - between - 1dB and +0·5dB

(2) 1 kHz - 0dB (reference)

(3) 20 kHz - between - 3·5dB and 0dB.

TABLE 4

Modifications

Mod. No.		Vol.2 Leaflet	A.L.	Label No.	Brief details of change
SIMULATOR MICROPHONE 6625-99-943-6545					
6394	B/S.0.0.	B78	107	N/A	Replace selector switch with four position type, add further attenuator network of 4 resistors, engrave front panel to show use of fourth switch position, replace Mod. Record Label and Plate Identification. On completion the unit becomes a "Simulator, Microphone 6625-99-945-0061."

TABLE 4 (Contd.)

Mod. No.	Vol.2 Leaflet	A.L.	Label No.	Brief details of change
A3379	C/3(RAF) B/2(RN)		1	Replace the microphone selector switch and associated resistors by a new switch and component assembly and change the front panel coding to rationalize the microphone outputs. Embodiment of this mod: identifies the equipment as simulator, microphone 6625-99-945-0061.
				SIMULATOR MICROPHONE 6625-99-945-0061
A3380	C/3(RAF) B/2(RN)		1	Change the value of 16 resistors, the selector switch wiring and the front panel coding to rationalize the microphone outputs.

UHF Tx-Rx's (ARC 52 SERIES)

SPECIAL TEST EQUIPMENT

FOR SECOND LINE SERVICING

SCALES OF SERVICING SPARES

The scales are based on information available at time or printing. Any dissatisfaction should be reported in accordance with AP 3158, Vol 2 (2nd Ed) Leaflet D6 to MOD(RAF), ADSM 25, via Command HQ.

Column Headings and Special Notes

Col 1 - Section and reference number.
2 - Nomenclature.
3 - Qty off per equipment.
4 - Items marked * are for second line servicing.
5 - Items marked * are "selected on test".
6 - Blank.
7 - Items marked * affect calibration of the equipment.
8 - Blank.
9 - Circuit reference part number or other reference.

Notes 1 After replacement of components that affect calibration, check the calibration. Where * appears in col 7 and more than one circuit reference is in col 9, components affecting calibration are underlined.

2 Items not scaled for 2nd line, are available for use "as required". Providing it does not affect calibration, AP 3158 Vol 2 Leaflet B41 refers.

1			1	4	5	6	7	8	9
5Q	999-3071	Ammeter 0-500 uA 1½ in dia	1						M1
10AC	944-0043	Washer nonmetallic	1						
10AK	097-0183	Insert control dial knob	1						
	097-0184	Cap electrical 43/64 in dia 13/32 in lg	1						
	097-0186	Knob ¼ in bore 1⅛ in od w/ skirt	1						
10AR	120-1090	Bumper rubber ¾ in dia 13/16 in h	4						
10CV	037-2373	Semiconductor device, diode	1						
10F	914-7672	Switch, rotary, wafer	1						S1
10H	102-4547	Terminal, quick disconnect	5						
	999-2791	Terminal, quick disconnect	3						
10K	999-3303	Transformer, audio frequency	1						T1
10W	011-9851	Resistor, variable 10 k ohms ± 10% ½ w 5/8 in lg	1						
	013-5465	Resistor, fixed, film 91 ohms ± 1% ¼ w	1						R18
	013-5861	Resistor, fixed, film 300 ohms ± 1% ⅛ w	1						R15
	013-5864	Resistor, fixed, film 390 ohms ± 1% ⅛ w	2						R13, R14
	013-5869	Resistor, fixed, film general purpose 620 ohms ± 1% ⅛ w	1						R3
	013-5874	Resistor, fixed, film 1 k ohms ± 1% ⅛ w	2						R11, R12
	013-5884	Resistor, fixed, film 2.7 k ohms ± 1% ⅛ w	1						R6
	013-5885	Resistor, fixed, film 3 k ohms ± 1% ⅛ w	2						R9, R10
	013-5933	Resistor, fixed, film 300 k ohms ± 1% ⅛ w	2						R7, R8
	021-9698	Resistor, Fixed, Film 10 k ohms ± 1% ⅛ w	1						R1
	021-9770	Resistor, fixed, film 33 k ohms ± 1% ⅛ w	1						R2
	622-0018	Resistor, fixed, film 825 ohms ± 1% ¼ w	1						R5

1		3	4	5	6	7	8	9
10W (Cont'd)								
622-0019	Resistor, fixed, film 649 ohms ± 1% ¼ w	1						R4
622-0020	Resistor, fixed, film 316 ohms ± 1% ¼ w	1						R16
622-0021	Resistor, fixed, film 105 ohms ± 1% ½ w	1						R17