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Colin Hinson
In the village of Blunham, Bedfordshire.

AIR PUBLICATION
116E-0252-6
(Formerly A.P.2531 D & E, Vol. 6)

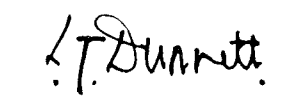
U.H.F. SINGLE CHANNEL TRANSMITTER RADIO 5820-99-932-5698(T.7355)

AND

AMPLIFIER RADIO FREQUENCY 5820-99-932-5693 (A.9365)

REPAIR AND RECONDITIONING INSTRUCTIONS

BY COMMAND OF THE DEFENCE COUNCIL



Ministry of Defence

FOR USE IN THE

ROYAL AIR FORCE

(Prepared by the Ministry of Technology)

NOTE TO READERS

The subject matter of this publication may be affected by Air Ministry Orders, Servicing schedules (Volume 5), or "General Orders and Modifications" leaflets in this A.P., in the associated publications listed below or even in some others. If possible, Amendment Lists are issued to correct this publication accordingly, but it is not always practicable to do so. When an Order, Servicing schedule, or leaflet contradicts any portion of this publication, the Order, 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, except the original issue of preliminaries, bears the date of issue and the number of the Amendment List with which it was issued. When this Volume is amended by the insertion of new or replacement leaves in an existing chapter, the new or amended technical information will be indicated by triangles, positioned in the text thus: ◀ ——— ▶ to show the extent of amended text, and thus: ▶◀ to show where text has been deleted. When a Part, Section, or Chapter is issued in a completely revised form, the triangles will not appear.

The reference number of this publication was altered from A.P.2531D and E, Vol. 6 to A.P.116E-0252-6 and the security grading changed from RESTRICTED to UNCLASSIFIED in December, 1969. No general revision of page captions has been undertaken, but the code appears in the place of the earlier A.P. reference and the word RESTRICTED removed on new or amended leaves issued subsequent to that date.

LIST OF ASSOCIATED PUBLICATIONS

	A.P.
U.H.F. Multichannel receiver radio 5820-99-932-5695 *Naval Receiver Outfits CUJ/CUL*	116E-0731-1
U.H.F. Multichannel transmitter radio 5820-99-932-5691 *and amplifier, radio frequency* 5820-99-932-5692 *Naval Types* 692/693 *series*	116*E*-0253-1
U.H.F. Single channel receiver radio 5820-99-932-5694 ...	116*E*-0730-1
12-24 *channel remote control equipment—ground*	116*M*-0501-1

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PART 2

MAJOR REPAIRS

SECTION 1

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Chapter 1

(Completely revised)

GENERAL INFORMATION

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LIST OF TABLES

Purpose of book

1. This volume gives detailed maintenance information on the sub-units of the single-channel transmitter radio 5820–99–932–5698 and amplifier, radio frequency 5820–99–932–5693. General fault-finding information to enable a faulty sub-unit to be located is given in Volume 1, Part 3.

Alignment instructions

2. Although the necessary information is given, R.A.F. second line servicing units should not attempt alignment except in an emergency. Third line servicing squadrons are more adequately equipped to perform the tasks. Full alignment of certain sub-units require the use of special test cradles, it is important that alignment is not attempted without these.

Power supplies

3. Power supplies for the sub-unit under test can be obtained from the transmitter by interconnecting it using the appropriate extension lead, or leads, supplied with the test set, radio 6625–99–943–3377. There is, however, no objection to the use of a separate power supply (of identical outputs) if available and found more convenient.

Test equipment

4. A list of the test equipment required is given in Table 1 together with a cross reference to the publication describing the test equipment and its method of operation.

Note . . .

Where the equipments quoted in the various chapters are in conflict with the items specified in Table 1, the latter should be regarded as preferred items.

Items of local manufacture

5. In addition to the items of test equipment listed in Table 1, certain test circuits are required as follows:–

(1) A test circuit comprising a 4·5V battery, a fixed resistor and a variable resistor for testing the meter circuit of the test set radio. The items required are:–

(a) Battery 4·5V.

(b) Resistor, composition, 3·3 Kilohms, ± 5%, $\frac{1}{4}$W (5905–99–021–5301).

(c) Resistor, variable, wirewound, 500 ohm, $\frac{1}{2}$W (5905–99–011–9498).

Note . . .

The NATO stock numbers in brackets are of suggested components, and equivalently rated components may be used.

Details of the test circuit connections and the methods of use are given in Sect. 4, Chap. 3.

(2) A similar test circuit for testing the monitor, radio frequency. The items required are:–

(a) Battery 4·5V.

(b) Resistor, variable, wirewound, 5 Kilohm, $\frac{1}{2}$W (5905–99–011–9661).

(c) Resistor, variable wirewound 500 ohm, $\frac{1}{2}$W (5905–99–011–9858).

(d) Resistor, fixed, composition 820 ohm, $\frac{1}{2}$W, 5% (5905–99–021–5232).

6. Full details on all items to be made locally and requirements of other special items of equipment etc. are given in the appropriate chapters.

TABLE 1

Test equipment requirements

Item No.	Nomenclature	Ref. No.	Further details	Remarks
1	Test set, multirange CT498A or Multimeter CT498	6625-99-105-7049 5QP/17447	A.P.120M-0105-1 A.P.120M-0106-1	
2	Multimeter, electronic CT471C	6625-99-955-6255	A.P.117G-0603-1	General use
3	Megger bridge Type B or Tester insulation Type E	5G/1708 5G/427	A.P.4343J	
4	Bridge set, universal CT530 or Test set Type 373A	6625-99-955-3163 10S/16460	A.P.117E-0801-1 A.P.2536C	For resistance measurements on test set radio
5	Test set, radio CT214	6625-99-943-2784	A.P.2879AQ	Power measurements
6	Line, r.f. transmission	5985-99-972-3929		For use with item 5
7	Signal generator CT433A or Signal generator CT433	6625-99-195-4684 6625-99-943-4059	A.P.117E-0106-1	(15Hz to 50kHz)
8	Test set Type 193A	10S/16400	A.P.2536C	Crystal activity tester
9	Oscilloscope CT436 (set) or Oscilloscope CT386A	6625-99-913-8618 6625-99-943-7177	A.P.117K-0103-1 A.P.2563EB	For ripple measurements on power supply and general use
10	Counter, electronic frequency	6625-99-223-2480		For frequency tests on amplifier oscillator
11	Frequency converter	6625-99-223-9374		
12	Active probe unit SA554	6625-99-519-1573		
13	Distortion factor meter or Indicator, distortion	6625-99-001-2681 6625-99-944-7661	 A.P.4837R	For high power amplifier
14	Power supply or Power supply	6110-99-945-8800 6110-99-945-8801	A.P.117C-0401-1 A.P.117C-0402-1	For testing line relay in transmitter.
15	Test set radio	6625-99-943-3377	Vol. 1	
16	Test cradle	10AR/5251	Sect. 2, Chap. 3	For Amplifier Oscillator
17	Headset, Low impedance	10AH/9		
18	Microphone Type 23	10A/12052		
19	Plug Type 170	10H/242	Sect. 2 Chap. 3	Microphone type plug—to switch on transmitter

TABLE 1 (contd.)

Item No.	Nomenclature	Ref. No	Further details	Remarks
20	Resistor, 560 ohm 10% $\frac{1}{2}$W	5905-99-022-1207	Sect. 2, Chap. 3	For use with item 19
21	Spanner, D.E. open jaw $\frac{1}{2}$in X $\frac{9}{16}$in. A.F.	1C/6339		To tighten or release clamping bolts holding equipment in a stack
22	Tools valve extractor	1H/100		
23	Alignment tool, electronic equipment	5120–99–999–3708	Slug adjuster	Supplied with transmitter
24	Alignment tool, electronic equipment	5120–99–999–3709	Vol. 1 Lock nut spanner	Supplied with transmitter
25	Alignment tool, electronic equipment	5120–99–999–3711	Trimmer screwdriver	Supplied with transmitter
26	Alignment tool, electronic equipment	5120–99–972–9815	–	Trimming tools for high power amplifier
27	Alignment tool, electronic equipment	5120–99–972–9814	–	Trimming tools for high power amplifier
28	Gauge, thickness	5120–99–910–5207		To check spacing of tuning capacitor vanes in amplifier oscillator
29	Adjuster armature No. 2	1H/47		For G.P.O. relays K.3000
30	Adjuster spring No. 1	1H/51		For G.P.O. relays K.3000
31	Adjuster spring No. 2	1H/52		For G.P.O. relays K.3000
32	Contact cleaner No. 1	1H/6		For G.P.O. relays K.3000
33	Gauges feeler No. 1	1H/7		For G.P.O. relays K.300
34	Gauges tension No. 1	1H/57		For G.P.O. relays K.300
35	Gauges tension No. 2	1H/58		For G.P.O. relays K.300
36	Insulator contact No. 1	1H/61		For G.P.O. relays K.300
37	Mirrors inspection	1B/4487		For G.P.O. relays K.300
38	Pliers adjusting No. 2	1H/64		For G.P.O. relays K.300
39	Screwdriver instrument No. 1	1C/2176		For G.P.O. relays K.300
40	Screwdriver instrument No. 2	1H/13		For G.P.O. relays K.300
41	Screwdriver instrument No. 5	1H/16		For G.P.O. relays K.300

TABLE 1 (contd.)

Item No.	Nomenclature	Ref. No.	Further details	Remarks
42	Transformer, variable power or Transformer, variable power	6120–99–945–8803 6120–99–945–8804	A.P.117C–0101–1	Testing of transmitter air blower
43	Stroboscope	6C/9549379		Dawe Stroboflash Model 1200E for speed checks on blower motor
44	Vacuum cleaner (large)	4G/5421		A.M.S.E.C. scale 105 refers
45	Moving coil microammeter (f.s.d. 100μA) internal resistance 500 ohm	5Q/16147	–	For tester amplifier oscillator
46	Resistors 2·2 Kilohm, 1% $\frac{1}{8}$W (2 off)	5905–99–021–9602	–	For use with item 43
47	Crystal unit quartz	ZDM 12·5 MHz		For testing amplifier oscillator
48	Crystal unit quartz	ZDM 13·055555 MHz		
49	Crystal unit quartz	ZDM 13·611111 MHz		
50	Crystal unit quartz	ZDM 14·166666 MHz		
51	Crystal unit quartz	ZDM 14·722222 MHz		
52	Crystal unit quartz	ZDM 15·277777 MHz		
53	Crystal unit quartz	ZDM 15·833333 MHz		
54	Crystal unit quartz	ZDM 16·388888 MHz		
55	Crystal unit quartz	ZDR 12·708333 MHz		
56	Crystal unit quartz	ZDR 13·124999 MHz		
57	Crystal unit quartz	ZDR 13·541666 MHz		
58	Crystal unit quartz	ZDR 13·958333 MHz		
59	Crystal unit quartz	ZDR 14·374999 MHz		
60	Crystal unit quartz	ZDR 14·791666 MHz		For testing amplifier oscillator
61	Crystal unit quartz	ZDR 15·208333 MHz		
62	Crystal unit quartz	ZDR 15·624999 MHz		
63	Crystal unit quartz	ZDR 16·041666 MHz		
64	Crystal unit quartz	ZDR 16·458333 MHz		
65	Crystal unit quartz	ZDR 16·662499 MHz		

SECTION 2

TRANSMITTER RADIO 5820-99-932-5698

Chapter 1

CHASSIS, ELECTRICAL EQUIPMENT 5820-99-932-3997 including COOLER, AIR, ELECTRONIC EQUIPMENT 5820-99-999-2382, PROBE ASSEMBLY 6625-99-999-2147 and PANEL, ELECTRONIC CIRCUIT 5999-99-618-3280

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TABLES

ILLUSTRATIONS

Introduction

Purpose of units

1. These units form part of the transmitter sub-assembly 5820-99-932-5706. The chassis forms a mounting for all the sub-units comprising the transmitter and, except for a direct coaxial connection, carries the electrical interconnections between the sub-units. These interconnections are provided by multi-pole plugs and sockets which are either chassis-mounted or on the ends of flying leads. The chassis-mounted sockets are floating to prevent damage to the plug pins when fitting a sub-unit into the chassis. Each sub-unit is retained in the chassis by captive screws which are ringed with green for identification. Fixed plugs and sockets on the rear of the chassis connect the mains supply, aerial, remote control equipment and amplifier, radio frequency, 5820-99-932-5693. The line relay is on the underside of the chassis and the low/high power selector link is on the right-hand side.

2. The transmitter front panel, part of the chassis assembly, is bolted to the base and side frames and carries all the main controls of the transmitter, including three manual slow motion drive mechanisms for tuning the amplifier oscillator to the required channel frequency. Each drive mechanism is fitted with a locking device and a dial calibrated in megacycles. Also on the front panel are a meter and associated twelve-position switch for metering specific points in the transmitter circuit. Five of these switch positions are used with a metering plug to meter voltages and currents in the power supply, the amplifier oscillator, or the modulator, radio transmitter. Metering data is shown on labels affixed to the front panel. Projecting pillars and the runner locking handles prevent damage to the front panel when the transmitter is placed face downwards.

3. A hinged cover on top of the chassis strengthens the chassis side panels and carries spare fuses and the alignment tools. Valve pin straighteners are mounted on the right-hand side panel.

4. The cooler provides cooling air via channels in the chassis for the sub-units of the transmitter. The cooler air inlet filter, filter cover and outlet are on the transmitter front panel.

5. The probe assembly, in series with the output from the amplifier oscillator, consists of a short length of coaxial line and two tower assemblies with pick-up loops adjacent to the centre conductor of the line. One tower measures forward power and the other reflected power. With the monitor, radio frequency, 6625-99-999-2378, the probe assembly measures:

R.F. power to the aerial.

Reflection coefficient.

Modulation depth.

AF component of the modulated wave.

6. The panel, electronic circuit (control module), which controls the temperature within the crystal oven on the amplifier oscillator (Chap.3), contains a resistor bridge circuit, an amplifier and a thyristor, part of the bridge being formed by a thermistor in the oven.Balance of the bridge, and hence control of the oven temperature, is provided by a variable resistor (18RV1). The panel is on the underside of the chassis.

CAUTION ...
The temperature control system described in para.6 is introduced by Mod. No. A3105 to the amplifier oscillator and Mod. No. A3106 to the chassis. Do NOT use a modified amplifier oscillator in an unmodified chassis or vice versa.

7. A servicing circuit of the chassis and probe assembly, and wiring and cableform diagrams of the chassis are given in fig. 2, 3 and 4 respectively. A servicing circuit and wiring diagram of the cooler are given in fig.5; a component layout diagram and circuit of the panel, electronic circuit appear in fig. 6.

Test equipment

8. The following items are required:

(1) Power supply, 6110-99-945-8800, or 8801.

(2) Test set, radio, 6625-99-943-3377.

(3) Tester, insulation resistance, Type E (5G/427).

(4) Multimeter, (5QP/17447).

▶ (5) Transformer, variable (10K/9458803).

(6) Socket, electrical, 5935-99-056-2506.

(7) Wattmeter to measure 100W at 115V r.m.s. 50Hz.

(8) Stroboscope to measure up to 3000 rev/min, eg. Stroboscope. (6C/9549379).

Servicing notes

Removal of sub-units

9. The procedures for removing the sub-units of the transmitter from the chassis (and the chassis from the cover) are in Topic 1, Part 2, Sect.1, Chap.2.

CAUTION ...
The panel, electronic circuit (para.6) operates from a floating 110V a.c. source and earthing any part of the panel can cause irreparable damage. Therefore ensure that the transmitter mains supply is switched off before removing the amplifier oscillator.

Plugs and sockets

10. Clean the threads of the plugs and sockets on the rear panel of the chassis when necessary and apply a light film of grease XG271 (G-382), 9150-99-910-0510.

Slow motion drives

11. With the locking lever of the slow motion drives (HG, TREBLER and PA) at FREE, rotation of the tuning knob should cause the driging pin to rotate smoothly. With the lever at LOCK the driving pin should be locked, even if the tuning knob is rotated. If stiffness occurs, lubricate with one or two drops of oil OM13, 9150-99-910-0570. Lubricate the gears of the slow motion drives when necessary by applying a light film of grease XG271 (G-382), 9150-99-910-0150, to the gear teeth only.

12. Should one of the slow motion drives become damaged or fail to function satisfactorily renew it as follows:-

(1) Set the three tuning knobs so that the driving pins are at the lowest point of their travel and remove the amplifier oscillator from the chassis.

(2) Remove the locking lever and tuning knob from their shafts, each secured by a grub screw.

(3) Remove the three nuts, spacers and countersunk screws which secure the slow motion drive to the front panel.

(4) Fit the replacement mechanism and the amplifier oscillator by reversing the above procedure, ensuring that the driving pins are correctly mated with the fork couplings of the amplifier oscillator.

Switches

13. Always renew a faulty switch.

Line relay

14. If line relay 9LR is faulty (para.23) renew it. The relay is secured to a bracket by two screws and washers, behind a panel under the chassis. The panel, secured by twelve screws, encloses one of the cooling air channels and is fitted with a gasket to form an airtight seal so that the efficiency of the cooling system is not impaired, ensure that the gasket is properly seated when replacing the panel.

Cooler

▶15. To ensure correct operation of the cooling system it is important to clean the air filter regularly (Topic 1, Part 2, Sect.1, Chap.2). If the fan in the cooler requires servicing, proceed in accordance with para. 15A to 15C.

15A. In order to service the fan, the cooler must be removed from the transmitter chassis and the fan then extracted from the cooler and dismantled. The procedure is as follows:-

(1) Remove two screws securing the filter cover to the transmitter front panel and remove the filter.

(2) Remove six screws securing the mounting plate of the cooler to the transmitter front panel and withdraw the cooler. ◀

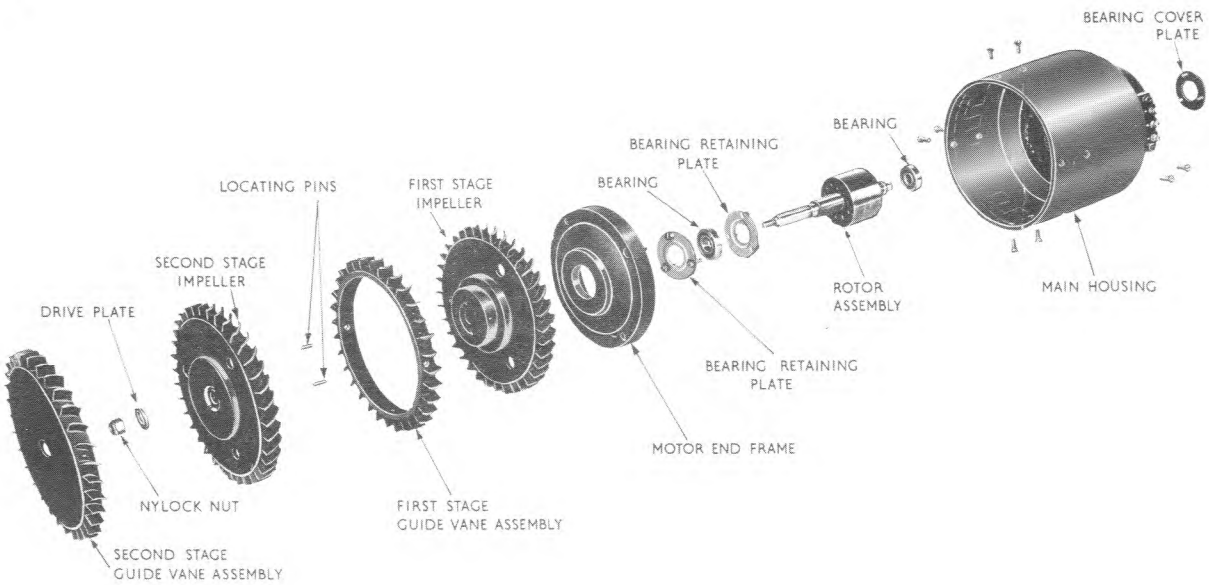


Fig.1 Exploded view of fan

(3) Remove the screws securing the earthing tag and the cable clamp to the inlet end of the fan.

(4) Unsolder the leads from the turret tags at the inlet end of the fan, ensuring that each lead is identified to facilitate correct subsequent reconnection.

(5) Slacken the jubilee slip around the cooler and carefully slide the fan out from the rear of the cooler chassis, taking care not to damage the turret tags on the fan.

Note ...

When dismantling the fan (sub-para.(6) to (8) refer to fig.1

(6) Remove four screws securing the second stage guide vane assembly in the main housing and withdraw the assembly. Unscrew the nut from the rotor assembly shaft and withdraw the drive plate. Withdraw the second stage impeller, taking care not to lose the two locating pins, and mark the impeller to ensure correct reassembly.

(7) Remove four screws securing the first stage guide vane assembly in the main housing and separate the end frame from the housing; at the same time withdraw the rotor assembly, taking care not to lose any shims from the shaft. One bearing may be withdrawn with the rotor assembly or may be left in the main housing. If the bearing is on the rotor shaft, slide it off; if it is in the main housing remove three screws and the cover plate from the housing and extract the bearing.

(8) Extract the second bearing from the end frame by removing three nuts, screws and washers which secure the bearing retaining plates and then pressing out the bearing.

▶15B. It is possible that the only servicing necessary on the fan will be cleaning and relubrication of the bearings. To do this, thoroughly wash both bearings in clean white spirit, dry thoroughly and recharge with grease XG275 to occuph $\frac{1}{3}$ to $\frac{1}{2}$ of the space in the bearings. Rotate the inner and outer tracks in counter directions until the grease is evenly distributed.

CAUTION ...

Do not overfill the bearings otherwise the fan may be damaged.

15C. Reassembly:-

(1) Assemble the fan by reversing the procedure of para.15A(6) to (8), ensuring that each bearing is returned to the position from which it was removed; all screws previously locked with varnish should be relocked with varnish to DEF.32 under the screw heads only.

(2) After assembly check that the fan impellers rotate freely and that there is no fouling of the fan housing.

(3) Fit the fan in the cooler and fit the cooler into the transmitter chassis by reversing the procedure of para. 15A(1) to (5).

(4) Check the performance of the cooler (para.26 to 28). ◀

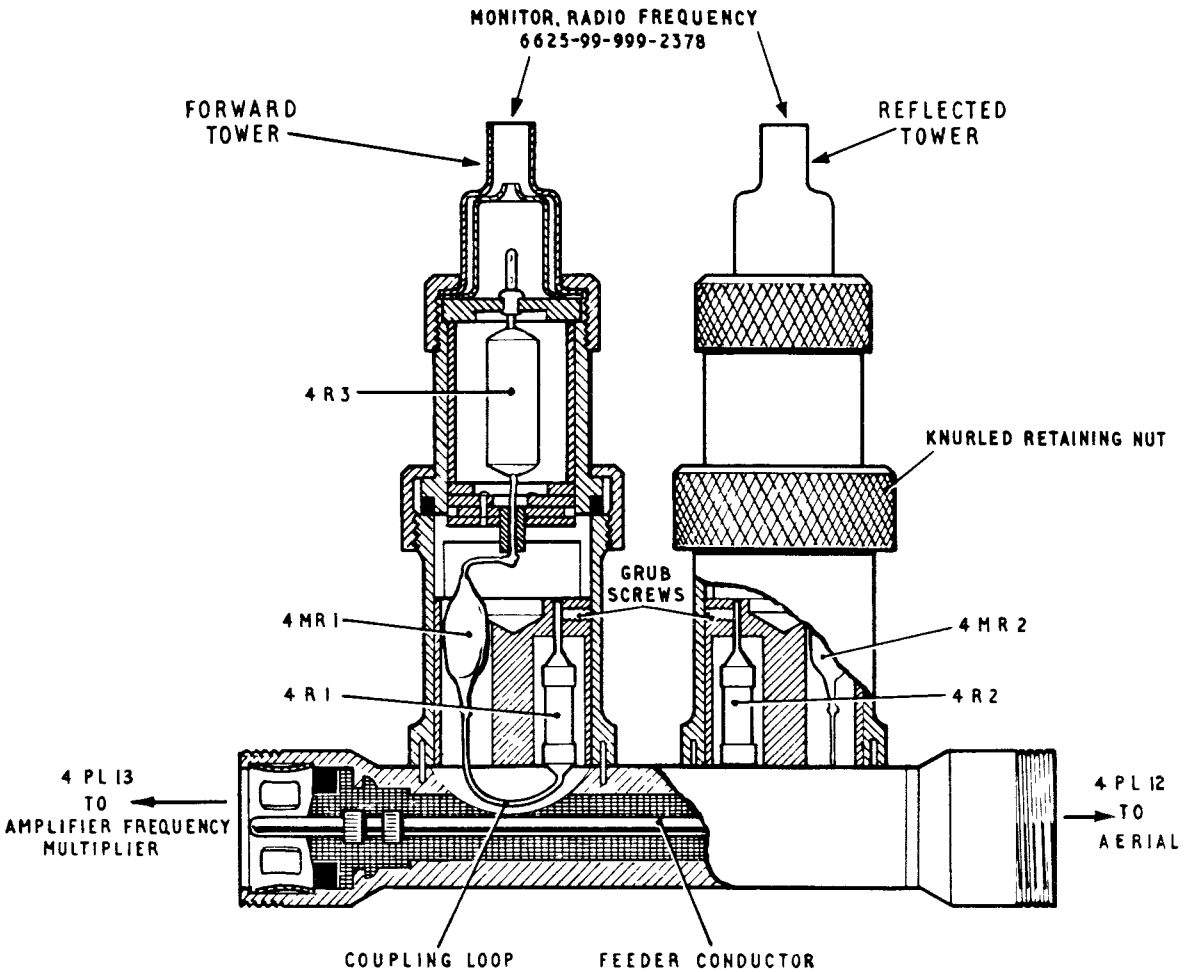


Fig.1A Probe assembly 6625-99-999-2147: construction

Renewal of probe assembly diodes

16. To renew a faulty diode (para 30):

(1) Remove the tower containing the faulty diode from the body of the probe assembly after first unscrewing the knurled retaining nut (fig. 1A).

(2) Undo the small grub screw in the side of the tower. (This grub screw secures the diode and coupling loop assembly in the tower).

(3) Using a soldering iron with a miniature bit, apply the tip of the iron, via the hole in the side of the tower, to the centre conductor.

(4) By pulling on the coupling loop moulding and exerting a levering action with the soldering iron, slide the diode

and coupling loop assembly from the tower.

Note ...

CV7110 diodes are being supplied as alternatives to CV2290. When replacing a CV2290 by a CV7110, both diodes must be changed, since the CV7110 has greater sensitivity. For the same reason, when fitting CV7110 diodes, ensure that Mod No 9753 has been embodied in the monitor, radio frequency (Chap 4).

(5) Cut away the faulty diode and insert a serviceable one, ensure that it is connected correctly as regards polarity.

(6) Re-insert the coupling loop assembly and diode in the tower and re-solder the connection.

(7) Secure the coupling loop assembly with the grub screw and refit the tower in the body of the probe assembly.

Panel, electronic circuit

17. If this panel is faulty, remove it by first noting and then unsoldering the wiring connections from the six terminations on the panel. Remove two 6BA cheesehead screws, washers and spacers which secure the panel to the chassis. If necessary to change any components this must be done with care, using a thermal shunt to protect the components and printed circuit track. Fit the panel by reversing the removal procedure.

18. After servicing or replacing the control module, check the temperature of the crystal oven on the amplifier oscillator and, if necessary, adjust (Part 2, Sect 2, Chap 3).

Chassis performance tests

General

19. Should a fault develop in the transmitter, use the metering system, in conjunction with the substitution of sub-units by those of known serviceability, to locate the fault. If the fault still persists, it is in the chassis so the following tests should be implemented.

Metering circuit

20. If the metering circuit (9M1, 9R1 and 9R2) is suspected, use the test set, radio for comparison as follows:

(1) Connect the test set METER socket to the transmitter power supply test socket 6SKT24 with the 9-pole connector supplied with the test set and switch on the transmitter.

(2) Turn the set METER SWITCH to position 4 (-48V supply) and note the reading on the test set meter. (Normally 52V-60V).

(3) Remove the test set connector from 6SKT24 and substitute the transmitter metering plug 9PL23.

(4) Turn the transmitter METER SWITCH to position 4 (-48V supply) and note the reading on the transmitter meter.

(5) If the transmitter meter reading is within one division, ie. 2V, of the test set meter reading the transmitter metering circuit is serviceable.

(6) Switch off the transmitter.

Insulation

21. Test the insulation of the chassis wiring with the insulation tester (para (3)), as follows:

(1) Remove the sub-units from the chassis, the MAINS, L.T. and H.T. indicator lamps from their holders and the plug (secured by a screw) from the LOW POWER/HIGH POWER link 9LKA.

(2) Measure the insulation resistance between poles V and W, S and T, and P and U of 9SKT3 and between each pole and the chassis.

(3) Measure the insulation resistance between the chassis and pole Y of 9PL1.

(4) Measure the insulation resistance between poles A and B 9PL17 and between each pole and the chassis.

(5) Measure the insulation resistance between the chassis and pole 24 of 9SKT46.

(6) The insulation resistance in each of the above cases, and also between all other points not intended to be connected, should be at least 40M.

(7) Refit the plug in the LOW POWER position in 9LKA.

Switches

22. Check the serviceability of the switches with the multimeter (para 8(4) by performing the continuity tests of Table 1.

Line relay

23. Test line relay 9LR as follows:

(1) Connect a link between poles 6 and 11 of 9SKT15.

(2) Set the output of the power supply (para 8(1)) to 30V and connect the power supply between the chassis and pole 5 of 9SKT20.

(3) Switch on the power supply and, using the multimeter (para 8(4)), test for continuity between pole T of 9SKT3 and pole T of 9PL1, and between poles V and W of 9PL1.

(4) Switch off the power supply and ensure that there is an open circuit between the points specified in sub-para (3).

(5) Disconnect the power supply and remove the link from 9SKT15.

Wiring

24. Test the chassis wiring by using the multimeter (para 8(4)) to perform the continuity tests of Table 2.

Note ...

The references in Table 2 to high power and low power denote the position of the plug in the LOW POWER/HIGH POWER link 9LKA.

TABLE 1

Chassis, electrical equipment - switch tests

Switch Position	Function	Continuity between
	METER switch 9S1	
1	+150V h.t. current (power supply) Amplifier grid current (drive unit) Enabler anode current (modulator)	9PL23/1 and 9M1+(via 4·4k) 9M1 - and 9PL23/3
2	+350V h.t. current (power supply) Doubler grid current (drive unit) First amplifier cathode current (modulator)	9PL23/2 and 9M1+(via 4·4k) 9M1 - and 9PL23/4
3	-48V supply (power supply) Phase splitter grid current (drive unit) Second amplifier cathode current (modulator)	9PL23/5 and 9M1+(via 4·4k) 9M1 - and 9PL23/8
4	-48V supply (power supply Third amplifier cathode current (modulator)	9PL23/6 and 9M1+(via 4·4k) 9M1 - and 9PL23/8
5	-150V bias (power supply) Driver grid current (drive unit) Output screen grid currents (modulator)	9PL23/7 and 9M1+(via 4·4k) 9M1 - and 9PL23/9
5	Driver anode currents (drive unit)	9SKT18/11 and 9M1+(via 4·4k) 9M1 - and 9SKT18/12
7	Trebler anode currents (amplifying unit	9SKT46/25 and 9M1+(via 4·4k) 9M1 - and 9SKT46/20

TABLE 1 (contd)

Chassis, electrical equipment - switch tests

Switch Position	Function	Continuity between
8	Power amplifier anode currents (amplifying unit)	9SKT46/10 and 9M1+(via 4·4k) 9M1 - and 9SKT46/5
9	Directional coupler	9SKT14/3 and 9M1+ 9M1 - and chassis
10	Mains supply voltage	9SKT20/11 and 9M1+(via 4·4k) 9M1 - and 9SKT20/12
11	+350V h.t. supply	9SKT20/14 and 9M1+(via 4·4k) 9M1 - and chassis
12	+300V h.t. supply	9SKT20/13 and 9M1+(via 4·4k) 9M1 - and chassis
	H.T. switch 9S2	
ON	Power supply relay switching	9SKT20/3 and 9SKT20/4
	MAINS switch 9S3	
ON	Mains supply (line) Mains supply (line) Mains supply (neutral) Mains supply (neutral)	9PL17/A and 9SKT20/1 9PL17/A and SKT20/6 9PL17/B and 9SKT20/16 9PL17/B and 9SKT20/21
	TUNE-REMOTE-LOCAL switch 9KTRL	
LOCAL	Power amplifier tune lead	9SKT46/3 and chassis (via 48k with RV1 fully clockwise or via 8·2k with RV1 fully counter-clockwise)
REMOTE	Remote power supply relay switching	9PL1/U and 9SKT3/T
TUNE	Local power supply relay switching Power amplifier tune lead Trebler tune lead EVOS control	9SKT3/T and 9SKT20/8 9SKT46/3 and chassis 9SKT46/23 (via 22k) 9PL1/X

TABLE 2

Chassis, electrical equipment - wiring tests

From	To	Function	Continuity between
Mains supply	MAINS indicator lamp	Mains supply (line) Mains supply (neutral)	9PL17/A and 9ILP3 (via 330k) 9PL17/B and 9ILP3
	Chassis	Mains supply (earth)	9PL17/C and chassis

TABLE 2 (contd)

Chassis, electrical equipment - wiring tests

From	To	Function	Continuity between
Power supply unit	Modulator unit	+400V h.t.	9PL21/25 and 9SKT45/1 (low power)
	Amplifying unit	+400V h.t.	9PL21/25 and 9SKT46/15 (high power)
		+350V h.t.	9PL21/24 and 9SKT46/24
	Drive unit	+350V h.t.	9PL21/24 and 9SKT18/10
	H.T. indicator lamp	+350V h.t.	9PL21/24 and 9ILP1 (via 680k)
		+350 h.t. return	9ILP1 and chassis
	Modulator unit	+300V h.t.	9PL21/15 and 9SKT15/17
	Drive unit	+150V h.t.	9PL21/20 and 9SKT18/6
	Control module	110V a.c. supply	9SKT20/2 and TS18/1
		110V a.c. supply	9SKT20/22 and TS18/2
	Cooler unit	110V to fan motor	9SKT20/7 and 9SKT22/1
		110V to fan motor	9SKT20/17 and 9SKT22/2
	Drive unit	-2·2V bias	9PL21/5 and 9SKT18/3
		-25V bias	9PL21/10 and 9SKT18/4
	Amplifying unit	-25V bias	9PL21/4 and 9SKT46/17
		-120V bias	9PL21/9 and 9SKT46/1
	Modulator unit	-150V bias	9PL21/23 and 9SKT15/4
	Chassis	-150V bias	9PL21/23 and chassis (via 15k) (low power)
	High power amplifier	-150V bias	9PL21/23 and 9SKT3/P (high power)
		-48V relay supply	9SKT20/9 and 9SKT3/V
	Remote control equipment	-48V relay supply	9SKT20/9 and 9PL1/Y
	Modulator unit	-48V relay supply	9SKT20/5 and 9SKT15/11 (via 500Ω)
	Drive unit	6·3V 1.t.	9PL21/6 and 9SKT18/9
		6·3V 1.t.	9PL21/16 and 9SKT18/1
	Amplifying unit	6·3V 1.t.	9PL21/1 and 9SKT46/16
		6·3V 1.t.	9PL21/17 and 9SKT46/6
		6·3V 1.t.	9PL21/11 and 9SKT46/21
		6·3V 1.t.	9PL21/21 and 9SKT46/11

TABLE 2 (contd)
Chassis, electrical equipment - wiring tests

From	To	Function	Continuity between
	Modulator unit	6·3V l.t.	9PL21/12 and 9SKT15/1
		6·3V l.t.	9PL21/2 and 9SKT15/13
		6·3V l.t.	9PL21/22 and 9SKT15/3
		6·3V l.t.	9PL21/7 and 9SKT15/14
	L.T. indicator lamp	6·3V l.t.	9PL21/8 and 9ILP2
		6·3V l.t.	9PL21/18 and 9ILP2
	Chassis	Chassis earth	9SKT20/10 and chassis
		Chassis earth	9SKT20/15 and chassis
		Chassis earth	9PL21/14 and chassis
Drive unit	Chassis	Heater earth	9SKT18/1 and chassis
Amplifying unit	Chassis	Heater earth	9SKT46/6 and chassis
		Chassis earth	9SKT46/7 " "
		Heater earth	9SKT46/11 " "
		Tune lead screen	9SKT46/2
Modulator unit	Chassis	Heater earth	9SKT15/13 " "
		Heater earth	9SKT15/14 " "
		Chassis earth	9SKT15/10 " "
		Chassis earth	9SKT15/8 " "
		Microphone lead screen	9SKT15/9 " "
		Microphone lead screen	9SKT15/15 " "
		Line relay supply screen	9SKT15/12 " "
		Line relay supply screen	9SKT15/18 " "
		Line relay return	9SKT15/6 (via 500Ω)
Monitor unit	Chassis	Chassis earth	9SKT14/2 and chassis
Cooler unit	Chassis	Chassis earth	9SKT22/3 " "
Control module	Drive unit	110V to crystal oven	TS18/3 and 9SKT18/5
		110V to crystal oven	TS18/6 and 9SKT18/2
		Oven thermistor lead	TS18/4 and 9SKT18/7
		Oven thermistor lead	TS18/5 and 9SKT18/8
Remote control equipment	Chassis	Chassis earth	9PL1/S and chassis
High power amplifier	Chassis	Chassis earth	9SKT3/0 " "
		H.T. switching	9SKT3/T " " (low power)
		H.T. switching	9SKT3/S " " (high power)
Remote control equipment	Modulator unit	Audio input	9SKT33/E and 9SKT15/16 (via 9JK1/R)
		Audio input	9SKT33/F and 9SKT15/7 (via 9JK1/T)

TABLE 2 (contd)

Chassis, electrical equipment -- wiring tests

To	From	Function	Continuity between
Modulator unit	Amplifying unit	Modulated h.t.	9SKT45/3 and 9SKT46/15 (low power)
	High power modulator	Modulated h.t.	9SKT45/1 and 9SKT5/B (high power)
		Modulated h.t.	9SKT45/3 and 9SKT5/A (high power)
Power supply unit	Remote control equipment	Remote power supply switching	9SKT20/8 and 9PL1/T
		EVOS control	9PL21/3 and 9PL1/X
	High power amplifier	Power supply operating loop	9SKT20/18 and 9SKT3/U (high power)
		Power supply operating loop	9SKT20/19 and 9SKT3/W
Probe assembly	Monitor unit	Forward power	Forward tower and 9SKT14/5
		Reflected power	Reflected tower and 9SKT14/8
	Aerial	R.F. output	9SKT12 and 9PL10

25. On satisfactory completion of the chassis tests, refit the MAINS, L.T. and H.T. indicator lamps, and replace the plug in the low power position of 9LKA. Secure the plug by means of the screw passing through its centre.

Cooler performance tests

General

26. After the cooler has been serviced:

(1) Check all wiring against the circuit diagram and ensure that the rotor turns freely in its bearings.

(2) Replace the air filter, ensuring that the aroow on it is pointing towards the cooler, and refit the filter cover.

(3) Link together poles 1 and 2 of 8PL22 and, using the insulation tester, measure the insulation resistance between these poles and the cooler casing. This should be at least 40MΩ.

(4) Remove the link from poles 1 and 2 of 8PL22.

(5) Test the cooler as described in the following paragraphs.

Current and insulation resistance measurements

27. Using the socket, electrical (para. 8(6)), connect poles 1 (line, 2 (neutral) and 3 (earth) to the output of the transformer, variable power (para 8(5)), with the multimeter (para 8(4)) in series with the live lead.

Set the output of the transformer to 115V r.m.s., the multimeter to the 1A a.c. range, connect the transformer to the a.c. mains supply and proceed as follows:

(1) Switch on the transformer and ensure that the impeller starts to rotate in the direction indicated by the arrow on the casing. Should the impeller not start, or rotate in the wrong direction, switch off immediately and re-examine all connections.

(2) Allow the cooler to run for at least 15 minutes and then note the input current indicated by the multimeter. This should not be greater than 450mA. If a wattmeter (para.8(7)) is available it may be used in place of the multimeter, in which case the power consumption should not be greater than 40W.

(3) Switch off the transformer and disconnect the cooler. Using the insulation tester, measure the insulation resistance between poles 1 and 3 and between poles 2 and 3 of 8PL22. This should be at least 40MΩ.

Speed measurement

28. Allow the cooler to run for at least 15 minutes and then, using a stroboscope (para.8(8)), measure the speed of rotation. This should be at least 28 rev/min.

29. On satisfactory completion of the tests, disconnect the cooler from all test equipment and remove the air filter cover and air filter. Refit the cooler, air filter and filter cover to the transmitter front panel, ensuring that the arrow on the air filter is pointing towards the transmitter.

Probe assembly performance tests

Diodes

30. The only components in the probe assembly liable to failure are the diodes, which may be tested by the measurement of their forward and back resistance. Remove in turn each tower from the body of the probe assembly after unscrewing the knurled retaining nut (fig.1A) and, using the multimeter (para.8(4)), measure the diode resistance between the tower body and the end of the diode accessible through the hole in the side of the tower. (The slight extra resistance due to 4R1 and 4R2 may be ignored for the purpose of this test). The forward resistance of a CV2290 diode should not exceed 600 ohms and that of a CV7110 400 ohms. The reverse resistance of both types should not be less than 20k. To renew a faulty diode see para.16.

31. When measuring as in para. 30, note that:

(1) If both towers have been removed from the body of the probe assembly they may be identified as follows:

(a) The upper (forward) tower has a screened lead coded black/green.

(b) The lower (reflected) tower has a screened lead coded black/yellow.

(2) If the monitor, radio frequency has not been removed from the chassis, take care to avoid false readings due to connections in parallel with the diodes, as follows:

(a) When measuring the resistance of diode 4MR1 (forward tower) set MON SWITCH to position 3, ie. R.COEFF.

(b) When measuring the resistance of diode 4MR2 (reflected tower) set MON SWITCH to any position except 3.

Conclusion

32. On satisfactory completion of the probe assembly tests, refit the towers in the probe assembly and the remaining sub-units to the chassis.

TABLE 3

Modifications

Mod. No.	Class	Topic 2 Leaflet	A.L.	Label No.	Brief details of change
Chassis, electrical equipment, 5820-99-932-3997					
4738	B/3	B1	2	1	Certain plugs and sockets substituted by a new pattern (red splash) in which air can circulate to reduce condensation.
4948	B/2	B6	7	2	Mains fuse in neutral line deleted and fuse in live line changed to surge-proof type.
6937	B/3	B36	40, 44	3	22 K (9R7) introduced to reduce power output when TUNE-REMOTE-LOCAL is set to TUNE.
8210	B/3	B39	59	4	New metering labels introduced with blank column for recording readings.
8799	B/2	B46	56, 62	5	Spares provision for fuse 9FS1 reduced from two to one and an insert for spares fuse for 6FS7 fitted. Mod. No. 8798 to the power supply is associated.
8800	B/3	B47	57, 70	6	9R3 changed from 47 to 8.2 and a parallel circuit comprising 9R8 (180 k) and 9RV1 (50 k) added in series between 9R3 and earth to control the screen bias supply to 2V2 in the amplifier oscillator.

TABLE 3 (cont)

Modifications

Mod. No.	Class	Topic Leaflet	A.L.	Label No.	Brief details of change
9529	B/2	B50	61	7	Spare 7A fuse provided for 6FS2. Mod. No. 9530 to the power supply is associated.
A3106	B/2			8	Panel, electronic circuit, 5999-99-618-3280 introduced to provide improved control of the temperature within the crystal oven on the amplifier oscillator. Mod. No. A3105 to the amplifier oscillator is associated.
Cooler, air, electronic equipment, 5820-99-999-2382					
5338	B/2	B9	10	1	Two 360-ohm resistors (R1, R2) added in series with phasing capacitor C1 to reduce voltage on capacitor.
5495	B/2 on replacement	B10	11	2	Air filter 10AR/3040 changed to new type coded 4130-99-999-2650.

MODS INCORPORATED IN THIS DIAGRAM

MOD. NO.	4948	6937	8800	A3106
STRIKE OFF	2	3	6	8

PROBE ASSY. 6625-99-999-2147

MONITOR RADIO FREQ. 6625-99-999-2378

AMPLIFIER OSCILLATOR 5820-99-999-2332

MODULATOR RADIO TRANSMITTER 5820-99-911-8326

POWER SUPPLY 5820-99-932-4003

COOLER AIR ELECTRONIC EQUIPMENT 5820-99-999-2382

PANEL ELECTRONIC CIRCUIT 5999-99-618-3280 (CONTROL MODULE)

TUNE REMOTE LOCAL KEY KTRL

METER SWITCH S1 (VIEWED FROM FRONT PANEL)

* NOTE. SINCE SWITCH TAG 12 IS USED AS A ROTOR CONTACT THE REAR OF THE WAFER CARRIES A DISPLACED ROTOR WHICH ON POSITION 12 OF THE SWITCH, CONNECTS WAFER TAG 12 TO WAFER TAG 11 ON THE REAR OF EACH WAFER

METERING TABLE		
SW. POS	MEASURING	F.S.D.
1-5	NOVAL 1-5	—
6	DRIVE UNIT V5 Ia+Ig2	100mA
7	TREBLER Ia+Ig2	100mA
8	PA Ia+Ig2	200mA
9	DIRECTIONAL COUPLER	—
10	MAINS SUPPLY	300V
11	RF H.T.	500V
12	MOD HT	500V

RELAY DESIGNATION		
RELAY	FUNCTION	REE No.
LR/2	LINE RELAY	5945-99-972-9829

NOTES:- FOR A.C. SUPPLIES OF 200V-250V FIT 2A FUSE
FOR A.C. SUPPLIES OF 105V-130V FIT 5A FUSE

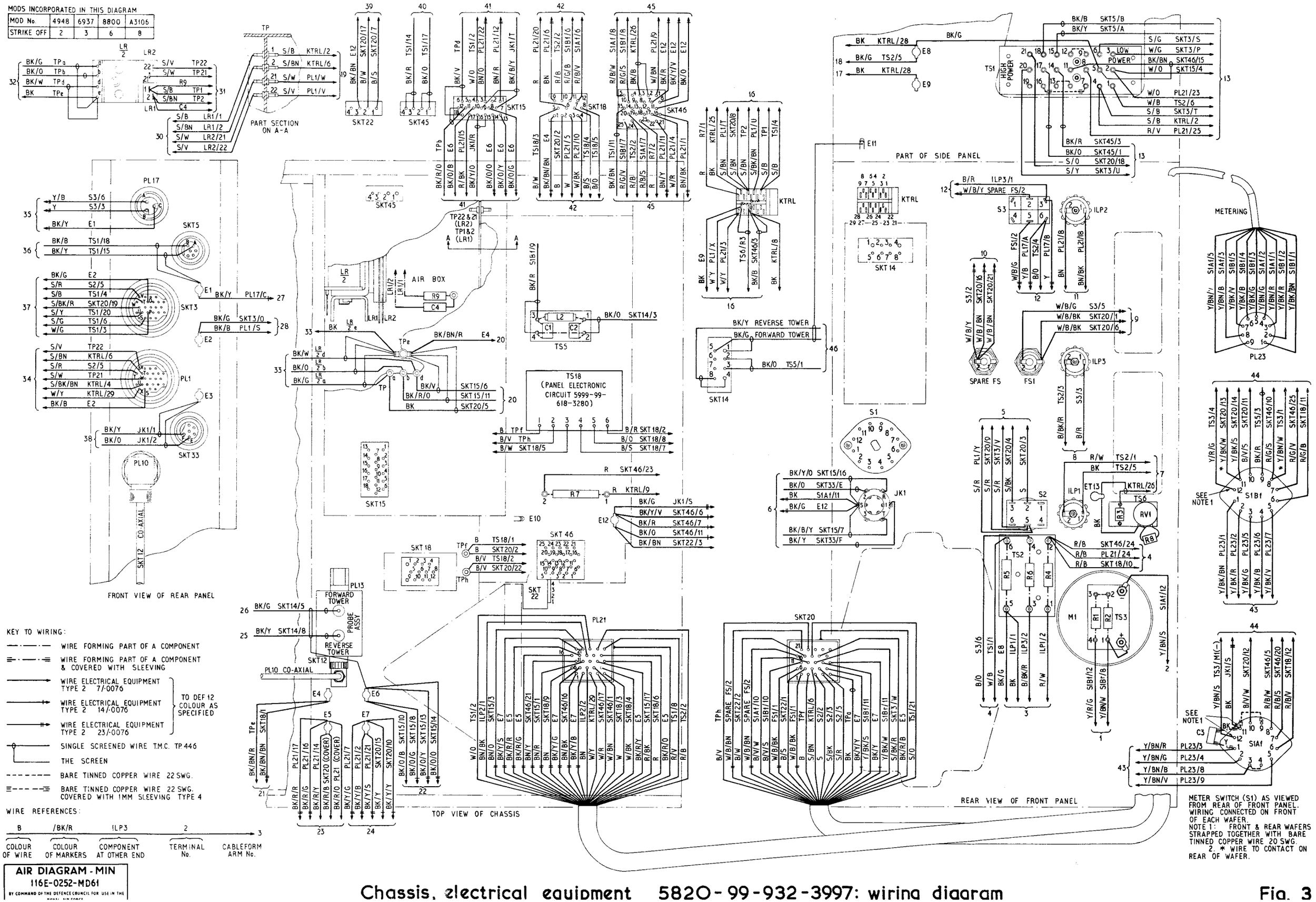
AIR DIAGRAM - MIN
116E-0252-MD60
BY COMMAND OF THE DEFENCE COUNCIL FOR USE IN THE ROYAL AIR FORCE
ISSUE 2 Prepared by the Ministry of Technology

Chassis, electrical equipment 5820-99-932-3997: servicing circuit

Fig. 2

MODS INCORPORATED IN THIS DIAGRAM

MOD No.	4948	6937	8800	A3106
STRIKE OFF	2	3	6	8



KEY TO WIRING:

- WIRE FORMING PART OF A COMPONENT
- WIRE FORMING PART OF A COMPONENT & COVERED WITH SLEEVING
- WIRE ELECTRICAL EQUIPMENT TYPE 2 7/-0076
- WIRE ELECTRICAL EQUIPMENT TYPE 2 14/-0076
- WIRE ELECTRICAL EQUIPMENT TYPE 2 23/-0076

TO DEF 12 COLOUR AS SPECIFIED

- SINGLE SCREENED WIRE T.M.C. TP 446
- THE SCREEN
- BARE TINNED COPPER WIRE 22 SWG.
- BARE TINNED COPPER WIRE 22 SWG. COVERED WITH 1MM SLEEVING TYPE 4

WIRE REFERENCES:

B /BK/R !LP3 2 3

COLOUR OF WIRE	COLOUR OF MARKERS	COMPONENT AT OTHER END	TERMINAL No.	CABLEFORM ARM No.

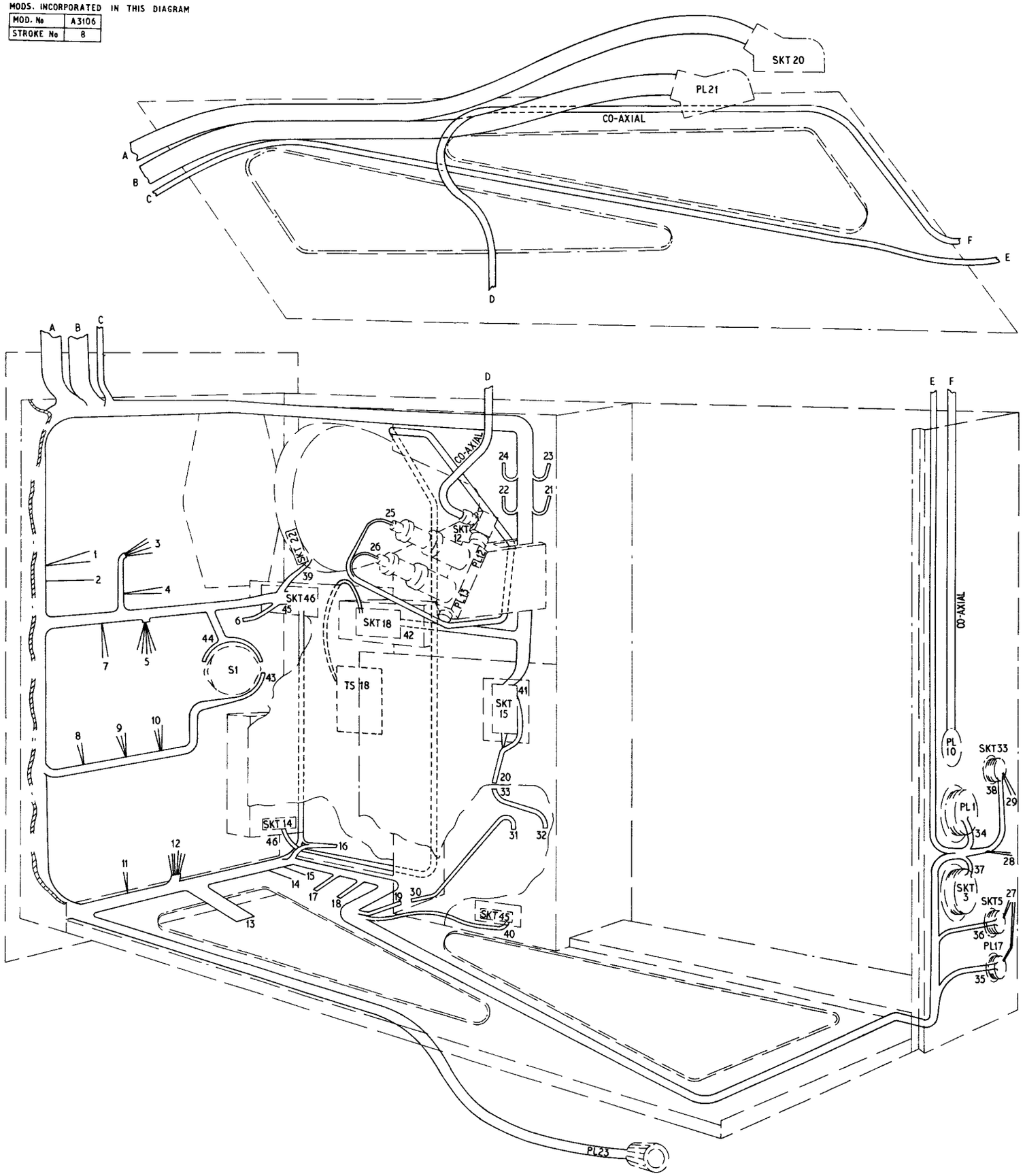
AIR DIAGRAM - MIN
116E-0252-MD61
BY COMMAND OF THE DEFENCE COUNCIL FOR USE IN THE ROYAL AIR FORCE

Chassis, electrical equipment 5820-99-932-3997: wiring diagram

Fig. 3

MODS. INCORPORATED IN THIS DIAGRAM

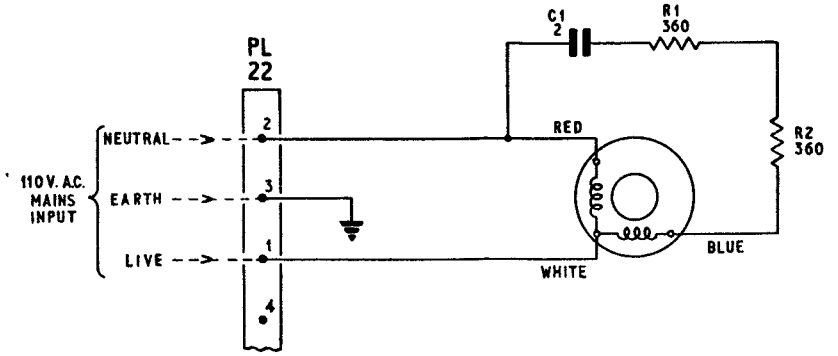
MOD. No	A3106
STROKE No	8



NOTE
Nos AT ENDS OF CABLEFORM ARMS CORRESPOND WITH Nos ON ARMS ON WIRING DIAGRAM FIG 3

Chassis, electrical equipment 5820-99-932-3997: cableform diagram

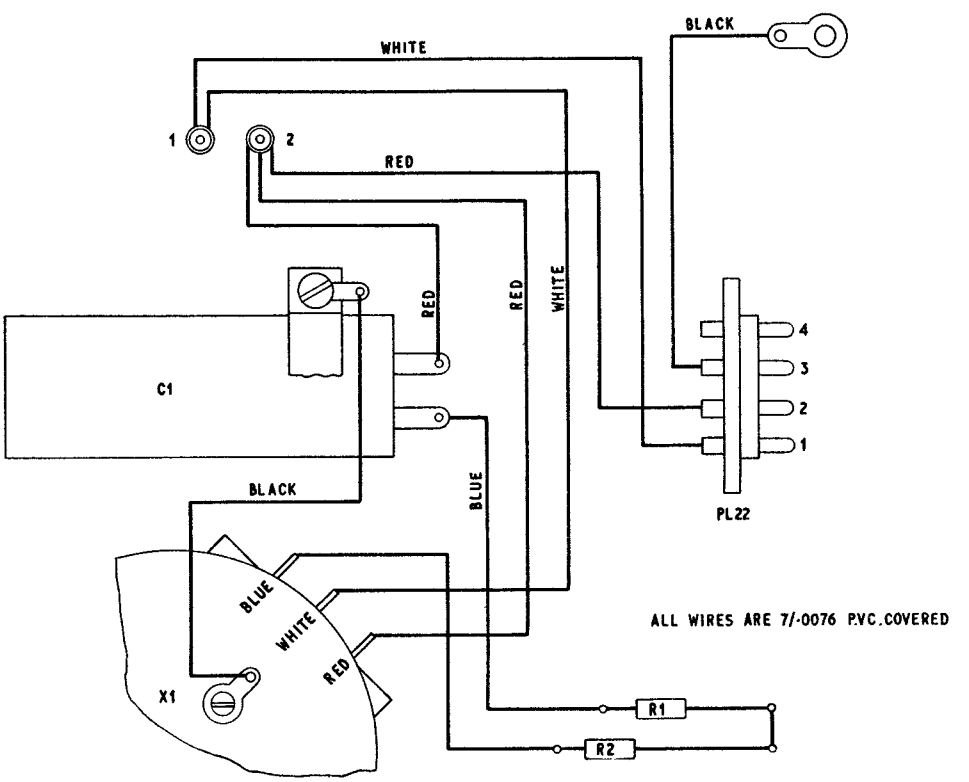
Fig. 4



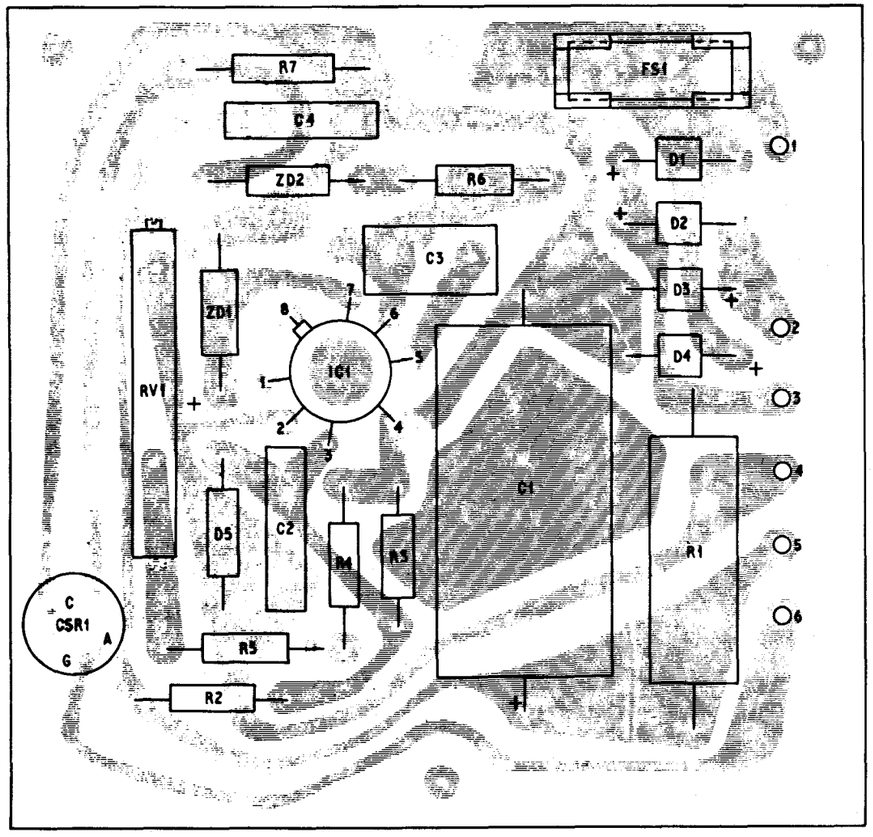
ALL COMPONENTS PREFIXED (8)

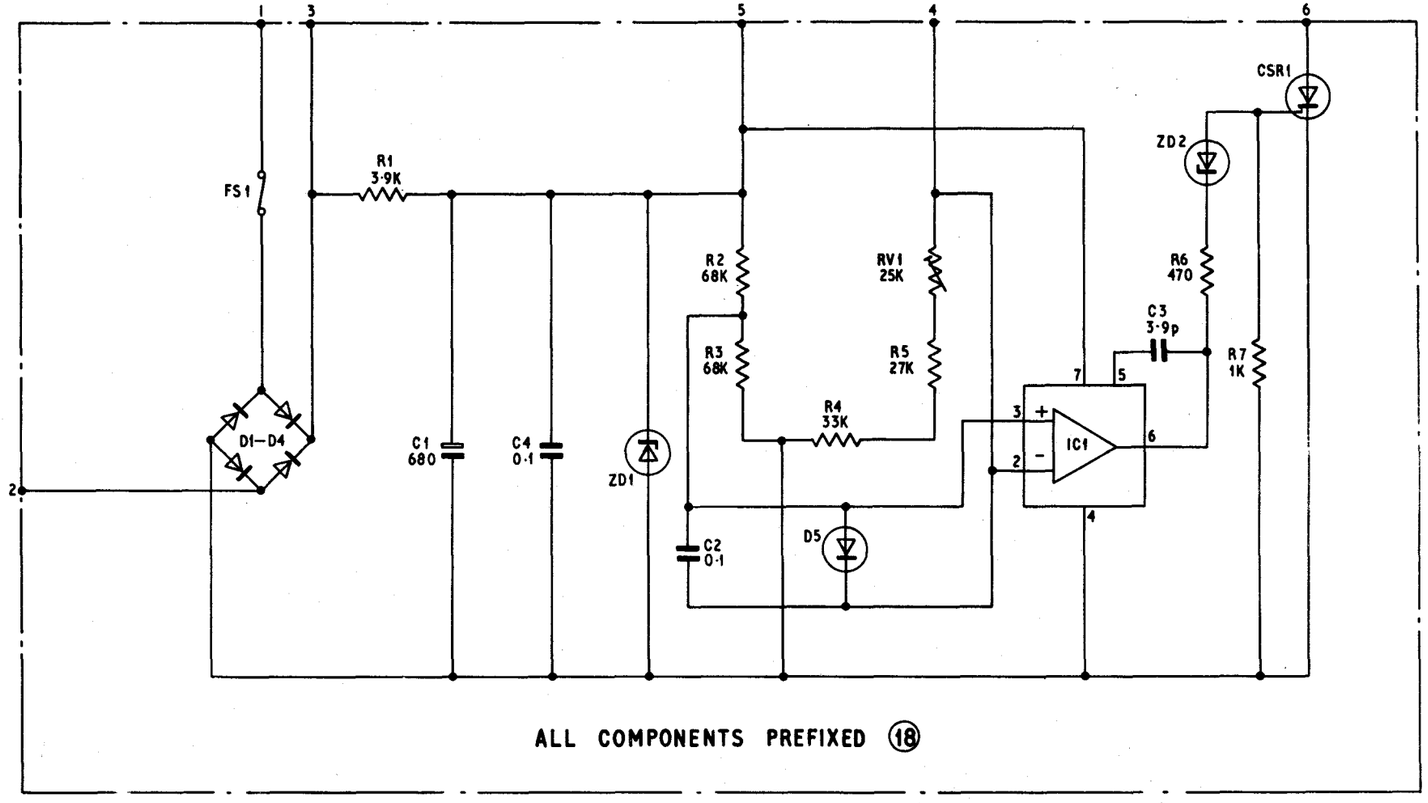
MODS. INCORPORATED IN THIS DIAGRAM

MOD. No.	5338
STRIKE OFF	1

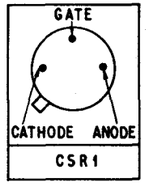


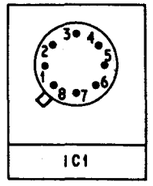
Cooler, air, electronic equipment 5820-99-999-2382: servicing circuit and wiring diagram Fig. 5





ALL COMPONENTS PREFIXED (18)





AIR DIAGRAM-MIN
116E-0252-MD63
BY COMMAND OF THE DEFENCE COUNCIL FOR USE IN THE ROYAL AIR FORCE
ISSUE 1 Prepared by the Ministry of Technology

Panel, electronic circuit, 5999-99-618-3280: Component layout and servicing circuit

Fig.6

Chapter 2

MODULATOR, RADIO TRANSMITTER 5820-99-911-8326

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LIST OF ILLUSTRATIONS

Introduction

1. The purpose of the modulator, radio transmitter 5820-99-972-8326, which for brevity is referred to as the modulator unit, is to amplify the microphone input signals in order to provide sufficient a.f. power for screen and anode modulation of the p.a. stage in the low power transmitter Type 9231 or for driving the final modulator in the amplifier (r.f. power) Type A.9365. The modulator unit comprises three amplifier stages and a class AB push-pull output stage: VOGAD, enabler, and clipper stages are also included in the unit and these may be brought into circuit if required.

2. The VOGAD (voice-operated gain-adjusting device) is a delayed a.g.c. circuit which keeps the mean level of the output of the first amplifier constant for varying input levels provided these are sufficient to overcome the delay voltage. The clipper stage clips the positive and negative peaks of large amplitude a.f. voltages and enables a high average modulation depth of the carrier to be maintained without undue distortion due to overmodulation. Since, to make effective use of VOGAD and clipper facilities, the modulator unit has considerable gain an enabler stage is included to mute the unit for all signals below a certain threshold and thus prevent modulation of the transmitter by extraneous noise.

Servicing notes

Test equipment

3. The following items of test equipment are required:—

(1) Signal generator, Type 65B in conjunction with transformer Type 3236 (10K/17631).

(2) Test set (radio) CT214.

(3) Two multimeters Type 9980 or similar.

(4) Multimeter CT38 or voltmeter, electronic CT54.

(5) Test set (radio) 6625-99-943-3377.

4. In addition to the test equipment listed in the previous paragraph a number of connectors and terminations are required. These are as follows:—

(1) A five-foot length of two core screened cable with a post office jack at one end and crocodile clips at the other end. The inner conductors should be connected to the 'ring' and 'tip' of the jack plug and the screen to the 'sleeve'. This lead is used to connect the signal generator output to the transmitter MICRO-INPUT socket. The cable assembly

5995-99-972-6014, which is included in the set of flexible connections in metal case 5995-99-972-8283, may be used for this purpose.

(2) An attenuator termination consisting of a 560-ohm resistor in series with a 56-ohm resistor. These resistors may be any ±5% pattern.

(3) A 4-kilohm dummy load of not less than 25 watt rating. Four 1-kilohm 6-watt resistors connected in series with a crocodile clip at both ends, may be used for this purpose.

Extension leads

5. For test purposes it is necessary to remove the modulator unit from the transmitter drawer. The unit is secured to the base of the chassis by four green ringed captive screws and when these are released the unit may be lifted straight out using the carrying handles provided. Supply voltages and signal inputs to the unit are obtained by connecting plug 1PL15 on the unit to the drawer using the extension lead provided with the test set, radio 6625-99-943-3377. As in a number of tests the 9-pole metering plug is plugged into socket 1SKT44 it will be found convenient to rest the modulator unit on the tray, electronic equipment or if this is not available an insulated sheet (wood, hardboard, Paxolin, etc.) laid across the top of the chassis assembly. Owing to the nature of the last arrangement CARE MUST BE TAKEN TO AVOID CONTACT WITH THE H.T. VOLTAGES PRESENT AT THE UNIT.

Measurement conditions

6. Unless otherwise stated the following conditions apply when the modulator unit is being operated via its extension lead:—

(1) The 4-kilohm dummy load (para. 4 (3)) is clipped across poles 1 and 3 of plug 1PL45 on the unit.

(2) On 1LKA the VOGAD link is left open and the enabler link closed (i.e. VOGAD operative, enabler inoperative).

(3) The CLIP-UNCLIP plug 1LKB is set to the UNCLIP position. (To change the position of this plug the green ringed captive screw in the centre of the plug must first be released).

(4) Throughout the tests care must be exercised to avoid regeneration. The dummy load must be kept away from the 18-way extension lead and the input attenuator termination. This also applies to the instruments connected to the dummy load. It is advisable to connect one side of the load to the modulator chassis by means of a screened lead. (This is conveniently done by using single core screened cable, the screen being connected to poles 3 and 4 of PL45 on the modulator, the inner to pole 1. For this purpose a 4-way socket 5935-99-956-2506 is useful).

Voltage measurements

7. Table 1 lists typical voltages, taken on a multimeter Type 9980, obtained at the anode, screen and cathode of the valves in the unit. In addition to the conditions of para. 6 the measurements are made with no microphone input signal to the transmitter. (The transmitter TUNE-OFF-TRANSMIT switch must be set to TUNE in order to complete the h.t. supply to the modulator unit). The figures given in the tables are based on a h.t. supply of 300 volts and due allowance must be made if the voltage is above or below this value. A convenient position at which to measure the h.t. voltage is the primary centre tap of 1T3.

TABLE 1

Modulator, radio transmitter 5820-99-911-8326 - voltage measurements (d.c.) taken on multimeter Type 9980

Position in circuit			Voltage reading
1V1 cathode	(pin 2)		1·3
1V1 anode	(pin 5)		70
1V1 screen	(pin 7)		100
1V2 cathode	(pin 2)		1·8
1V2 anode	(pin 5)		170
1V2 screen	(pin 7)		150
1V4 cathode	(pin 2)	see note at end of table	−80
1V4 anode	(pin 5)	see note at end of table	−80
1V5 cathode	(pin 2)		12
1V5 anode	(pin 5)		220
1V5 screen	(pin 7)		235

TABLE 1—*(contd.)*

Modulator, radio transmitter 5820-99-911-8326 - voltage measurements (d.c.) taken on multimeter Type 9980

Position in circuit	Voltage reading
1V6 cathode (pins 3 and 8)	26
1V6 anode (pins 1 and 6)	80
1V7 anode (pin 2)	290
1V8 anode (pin 2)	290
1V8 screen (pin 3) } 1V7 screen (pin 3) }	250 (1RV56 fully counter clockwise)
1V8 screen (pin 3) } 1V7 screen (pin 3) }	290 (1RV56 fully clockwise)

Note . . .

The anode and cathode voltages of 1V4 are measured with the enabler link open. When checking d.c. volts of 1V7 and 8 anodes, the voltmeter leads must be kept away from the connector to PL15, otherwise spurious oscillation can occur.

Performance checks

VOGAD operation and modulator gain

8. The check on the performance of the VOGAD circuits and on the modulator gain consists of measuring the input and output voltages at the modulator unit when the input voltage is just sufficient to operate the VOGAD circuits, increasing the input voltage 20 dB, and noting the increase in the output voltage. This increase should not exceed 1 dB. A multimeter Type 9980 should be used to measure the output voltage of the modulator unit. If a valve voltmeter instrument is used it must be ascertained that its accuracy is not affected by the distortion present in the output waveform.

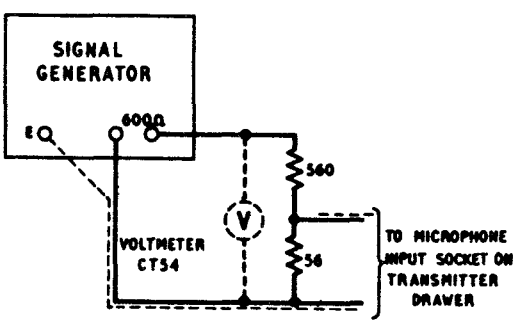


Fig. 1. VOGAD test circuit

9. Proceed as follows:—

(1) Remove the unit from the chassis assembly, interconnect it with the transmitter, and clip on the dummy load (para.6). Insert the 9-pole metering plug into socket 1SKT44 on the unit and set the transmitter drawer METER SWITCH to position 2 (1V1 cathode current). Set potentiometer 1RV4 on the modulator unit for maximum input to 1V1, i.e. fully clockwise.

(2) Using the connector and attenuator termination referred to in para. 4 (1) and 4 (2) connect the signal generator 600 ohm output (para. 3 (1)) to the MICROPHONE INPUT socket on the transmitter drawer (fig. 1). Connect a multimeter Type 9980 set to the 2·5V a.c. range, across the signal generator 600 ohm output terminals and another multimeter Type 9980, set to the 1000V a.c. range, across the dummy load.

Note . . .

It is not practicable to use only one multimeter and transfer it from one position to the other since disconnecting the multimeter from the signal generator will cause the output voltage to rise.

(3) Set the signal generator to give an output of 1000 c/s. Switch on the signal generator and transmitter and allow the equipment to warm up for a few minutes.

(4) Starting from minimum slowly advance the signal generator output control until the meter reading on the transmitter drawer begins to fall, note the two multimeter readings. The voltage across the signal generator terminals should not be greater than 0·275 volts and that across the dummy load should not be less than 260 volts.

(5) Increase the signal generator output until the multimeter across the signal generator terminals reads 2·5V and check that the voltage across the 4 kilohm dummy load has not increased by more than 1 dB. (An increase of 1dB represents a voltage increase of 1·12 times; e.g. if the initial output voltage was 300 this should not increase to more than 336V when the output from the signal generator is increased to 2·5V.)

10. Although the potentiometer 1RV4 is normally set fully clockwise and the performance check and figures given in para. 9 are based on such a setting, adjustment of 1RV4 may be desirable if the microphone is being used in a noisy position. Provided the microphone input is always sufficient to operate the VOGAD circuits, reduction of the modulator unit sensitivity by adjustment of 1RV4 will tend to reduce the background noise and may result in a clearer signal being transmitted. As however other factors are involved it is not possible to lay down any rules and the optimum setting of 1RV4 must be determined by trial.

Measurement of stage gain

11. A more detailed check on the performance of the modulator unit than that given in the previous paragraph may be made by measuring the gain of the individual stages of the unit using a voltmeter CT54. The figures obtained, though subject to errors owing to distortion of the waveform being measured, will be sufficiently accurate to indicate the serviceability or otherwise of the modulator unit.

12. Proceed as follows:—

(1) With the exception of the multimeter connected across the dummy load (this multimeter is not required), connect up the test equipment as for previous check (para. 9 (1) to 9 (3)) and advance the signal generator output control until the transmitter drawer meter reading begins to fall.

(2) With the signal generator output kept at this level measure the signal voltages at the electrodes of the valves in the unit using a voltmeter CT54 set to the appropriate a.c. range. Typical readings are given in Table 2.

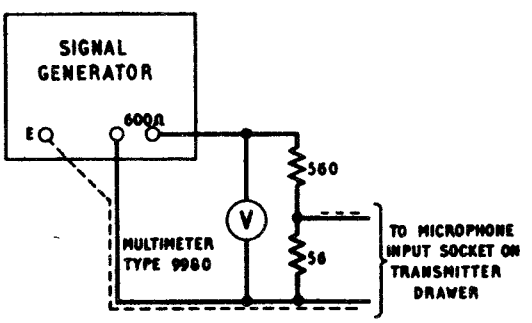


Fig. 2. Frequency response test circuit

Note . . .

Since this check will normally only be carried out on a suspected faulty unit, it may be found that the transmitter drawer meter reading has not started to fall when the signal generator output, indicated on the multimeter, is 0·275V. In this instance the signal generator output should be left at the 0·275V level.

TABLE 2

Modulator, radio transmitter 5820-99-911-8326 signal voltages taken on multimeter CT38 or voltmeter, electronic CT54

Position in circuit		Voltage reading
1V1 anode	(pin 5)	1·6
1V2 anode	(pin 5)	36
1V5 grid	(pin 1)	4·5
1V5 anode	(pin 5)	70
1V6A grid	(pin 7)	28
1V6A cathode	(pin 8)	8·5
1V6B grid	(pin 2)	28
1V6B cathode	(pin 3)	8·5
1V7 grid	(pin 5)	17·5
1V8 grid	(pin 5)	17·5

Note . . .

The readings at 1V6A and 1V6B grids are affected by the capacity of the valve voltmeter.

Frequency response

13. To check the frequency response proceed as follows:—

(1) Remove the unit from the chassis assembly, interconnect it with the transmitter, and clip on the dummy load (para. 6). On 1LKA make the VOGAD link thus rendering the VOGAD circuits inoperative. (The remaining measurement conditions are as para. 6).

(2) Using the connector and attenuator termination referred to in para. 4 (1) and 4 (2) connect the signal generator 65B 600 ohm output (para. 3 (1)) to the MICROPHONE INPUT socket on the transmitter drawer (fig. 2). Connect a voltmeter CT54 set to the 2·4 volts a.c. range across the signal generator 600 ohm output terminals.

(3) Set the signal generator to give an output of 1000c/s. Switch on the signal generator and transmitter and allow the equipment to warm up for a few minutes.

(4) Adjust the signal generator output control to give a reading of 1 volt on the voltmeter CT54 and then check that, when the signal generator is tuned from 150 c/s to 7 c/s the voltmeter reading remains constant, or nearly so, at 1 volt. (It will be found that nearly all signal generators 65B satisfy this requirement. If one is being used which does not, see para. 14). Reset the signal generator to 1000 c/s.

(5) Set the voltmeter CT54 to the 480 volt a.c. range, remove it from the signal generator terminals, and connect it across the dummy load. Adjust the signal generator to give a reading of 200 volts across the dummy load. Tune the signal generator to the frequencies listed in Table 3 and check that the voltmeter readings are within the limits quoted.

TABLE 3

Frequency response of modulator radio transmitter 5820–99–911–8326 (0 dB = 200 volts)

Frequency c/s	Voltmeter reading	dB down
150	Less than 25	More than 18
500	Not less than 140	Not more than 3
1000	200	0
3500	Not less than 140	Not more than 3
7000	Less than 100	More than 6

14. A difficulty arises while carrying out the check in para. 13 if the signal generator does not have a flat response over the required range, as a valve voltmeter with one side of the output earthed cannot be used for monitoring the signal generator output. However it is possible to work with a multimeter Type 9980 calibrated against a valve voltmeter as follows:–

(1) In order to give a larger reading on the multimeter, increase the higher resistance of the attenuator by 4·7 kilohms. The multimeter and signal generator are now across 4·7 kilohms and 560+56 ohms and the transmitter input across 56 ohms.

(2) Set the signal generator output to give the required input to the transmitter at 1 kHz (para. 13 (5)). Note the reading on the multimeter (2·5V range). Remove the post office jack and connect the valve voltmeter across the multimeter and signal generator. Note the reading on the valve voltmeter.

(3) Keeping the valve voltmeter reading constant by adjusting the signal generator output, note the multimeter reading for a number of frequencies in the band required.

(4) Remove the multimeter, re-insert the post office jack plug and proceed with the test using the multimeter calibration for monitoring the constant output.

Distortion

15. Excessive distortion in the modulator is usually associated with incorrect stage gain or a fault in the VOGAD circuits. The potentiometer 1RV56, which controls the potential to the screen grids of the output stage, should normally be turned fully clockwise; any other setting of this control may also cause the distortion to exceed the specified limit of 10%.

16. To measure the distortion proceed as follows:–

(1) Remove the modulator unit from the chassis assembly, interconnect it with the transmitter, and clip on the dummy load (para. 4(3)). Insert the 9-pole metering plug into socket 1SKT44 on the unit and set the transmitter drawer METER switch to position 2 (1V1 cathode current). Set potentiometer 1RV4 on the modulator unit for maximum input to 1V1 i.e. fully clockwise.

(2) Connect the 600Ω output of the signal generator 65B (para. 3 (1)) to the transmitter drawer MICROPHONE INPUT socket.

(3) Connect the distortion factor meter Ref. No. 10S/17639, in series with a 150 kilohm $\frac{1}{2}$-watt resistor across the 4 kilohm load.

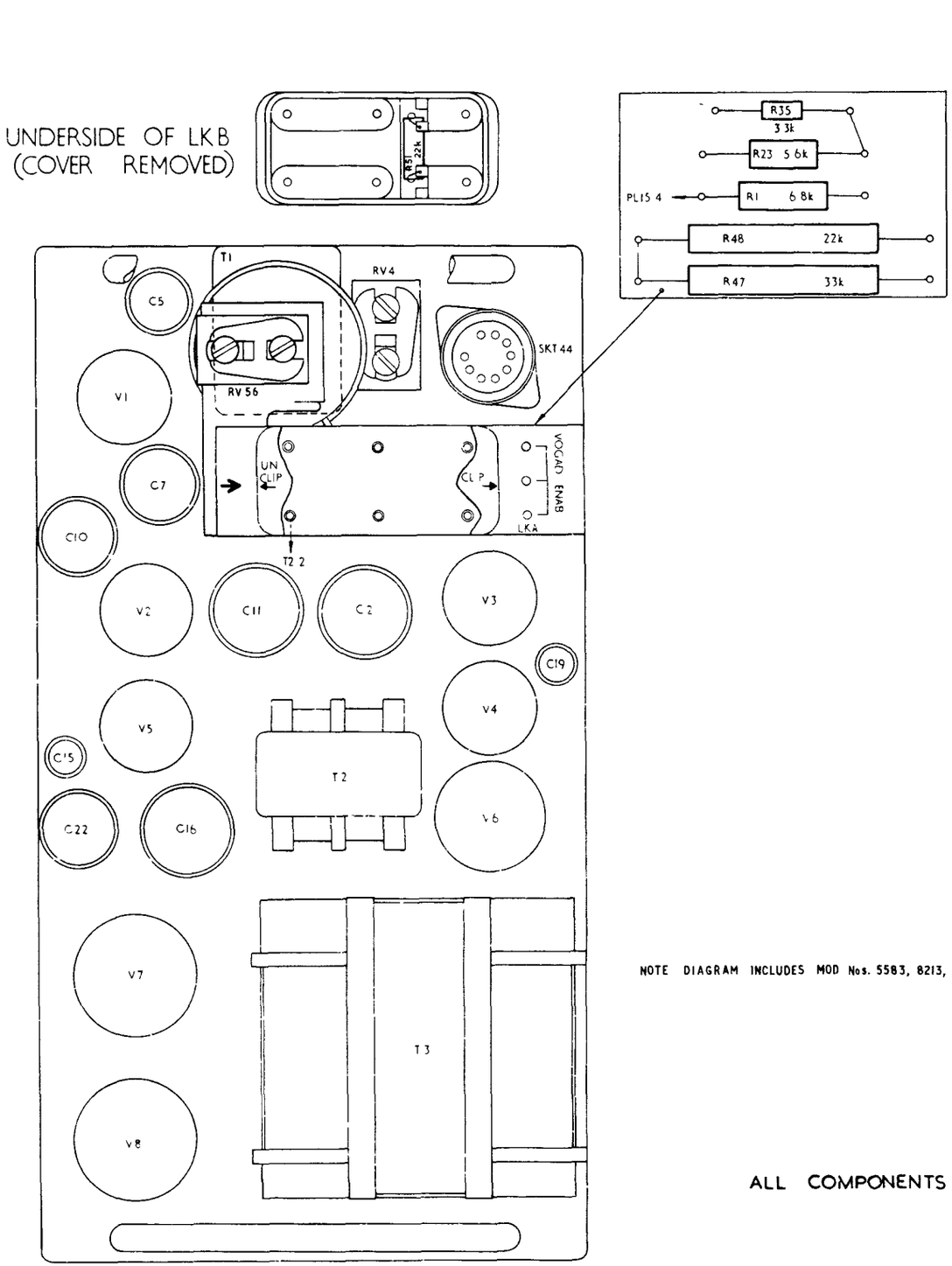
(4) Adjust the output of the signal generator 65B to 1 kHz. Slowly advance the signal generator output control until the meter on the transmitter drawer starts to fall. (As a guide, an input of about 25 millivolts is required to operate the modulator unit a.g.c. i.e. to cause the transmitter drawer meter reading to fall). Measure the distortion as described in the relevant air publication A.P. 4837R.

17. Without changing the output level from the signal generator, repeat the measurements at 250 Hz and 3500 Hz. In all cases the distortion should not exceed 10%.

TABLE 4

Modifications

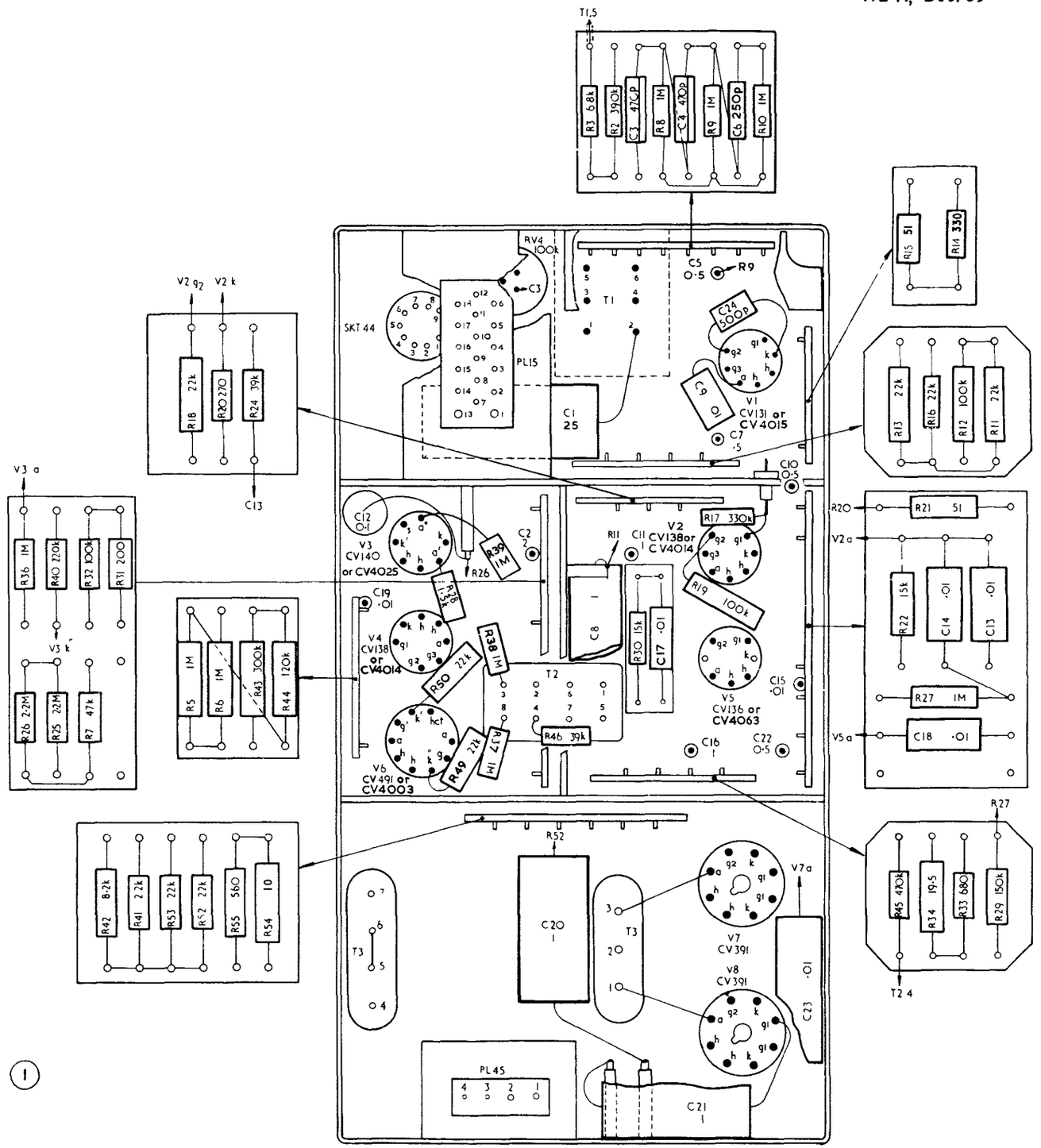
Mod. No.	Class	Topic–2 Leaflet	Topic–2 A.L.	Label No.	Brief details
5583	B/3 (on repair)	B19	21 & 25	1	1C1 changed from 2μF to 25μF to reduce hum.
8213	B/3	B41	48	2	1R14 changed from 270 ohms to 330 ohms and 1R15 changed from 100 ohms to 51 ohms to prevent readings on the transmitter meter exceeding f.s.d. 1R13 and 1R16 changed to a higher power rating to avoid overheating.
9757	B/3 (on replacement of CV 391)	B54	67	3	1R54 changed from 19·5 ohms to 10 ohms to keep the transmitter meter reading below f.s.d. when using high emission valves.
1135	C/3	B58	72 & 74	4	1RV56 changed from 10k to 50k and moved from inside the modulator chassis to a bracket on the top of the chassis to improve control of modulation depth and facilitate adjustment of 1RV56.
1283	C/0	◀ B59	75 ▶	5	1T2 replaced by an improved transformer and 1C6 changed from 0·001μF to 250pF to eliminate distortion.
◀ A3091	C/3 W.O.T.S.A.C.	B67	90	6	Replace absolete resistor, variable 5905–99–911–6898 (1RV4) by resistor variable 5905–99–618–6466; this necessitates the introduction of three additional wires.▶



TOP

NOTE DIAGRAM INCLUDES MOD Nos. 5583, 8213, 9757, 1135, 1283

ALL COMPONENTS PREFIXED (1)

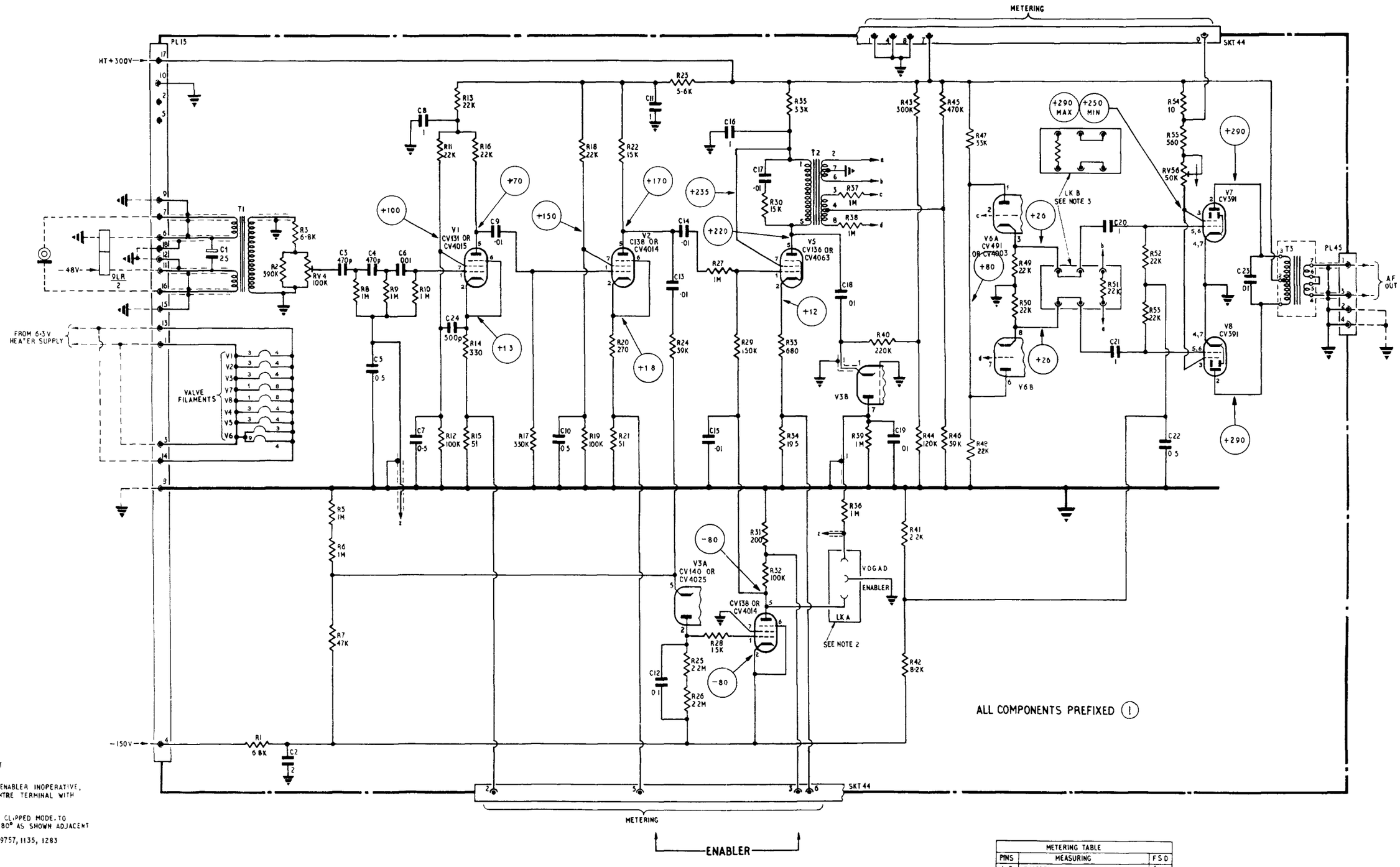


UNDERSIDE

AIR DIAGRAM - MIN
116E – 0252 – MD53
BY COMMAND OF THE DEFENCE COUNCIL FOR USE IN THE ROYAL AIR FORCE
ISSUE 2 Prepared by the Ministry of Technology

Modulator radio transmitter 5820-99-911-8326 – layout.

Fig. 3.



NOTE 1 V.O.G.A.D. BIAS OPERATES AT 20mV INPUT
ENABLER OPENS AT 2mV INPUT

NOTE 2 LINK A TO RENDER EITHER VOGAD OR ENABLER INOPERATIVE, CONNECT SERVICE NOT REQUIRED TO CENTRE TERMINAL WITH 22 S.W.G. TINNED COPPER WIRE

NOTE LINK B THE CIRCUIT SHOWS THE LINK IN CLIPPED MODE. TO LINK INTO UNCLIP MODE REVERSE PLUG 80° AS SHOWN ADJACENT

NOTE 4 CIRCUIT INCLUDES MOD No 5583, 8213, 9757, 1135, 1283

METERING TABLE		
PINS	MEASURING	F.S.D
1-3	ENABLER ANODE CURRENT	2½mA
2-4	V1 CATHODE CURRENT	10mA
5-8	V2 CATHODE CURRENT	10mA
6-8	ENABLER CONTROLLED VALVE IC	25mA
7-9	OUTPUT VALVES SCREEN CURRENT	50mA

AIR DIAGRAM - MIN
116E - 0252 - MD54
BY COMMAND OF THE DEFENCE COUNCIL FOR USE IN THE ROYAL AIR FORCE
ISSUE 3 Prepared by the Ministry of Technology

Modulator, radio transmitter 5820-99-911-8326: servicing circuit

Fig. 4

Chapter 3

(Completely revised)

AMPLIFIER OSCILLATOR 5820-99-999-2332

CONTENTS

TABLES

ILLUSTRATIONS

Introduction

General

1. The amplifier oscillator consists of a drive unit section and an amplifier section. The first stage of the drive unit section is a crystal-controlled oscillator multiplier which provides a signal at three or four times the crystal frequency, depending upon the operating frequency of the transmitter. The signal is fed via an amplifier, a frequency doubler and a phase splitter to a push-pull drive stage which provides an output between 75 MHz and 133 MHz to drive the frequency trebler stage of the amplifier section. The trebler drives the p.a. stage which provides at least 10W within the range 225 MHz to 399·9 MHz. The amplifier oscillator is tuned by mechanical drives on the transmitter front panel in conjunction with the internal metering system of the transmitter.

CAUTION...

This chapter concerns amplifier oscillators in which improved crystal oven temperature control has been introduced by Mod A3105 (Table 6). Therefore the heaters, crystal oven, 5820-99-618-3277 (modified version) and 5955-99-932-5555 (unmodified version) are not interchangeable. Fitting an unmodified heater (with a thermostat) in a modified equipment can result in erratic temperature excursion while a modified heater (with no thermostat), fitted to an unmodified equipment becomes overheated. This also applies to the amplifier oscillator itself, i.e. a modified unit must not be fitted into an unmodified chassis and vice versa.

Test equipment

2. The items of equipment required for servicing and testing the amplifier oscillator are listed in Table 1.

TABLE 1

Test equipment

Item	Ref.No.	Nomenclature	Remarks
1	5QP/17447	Multimeter CT498	
2	6625-99-943-2784	Test set, radio, CT214	
3	5985-99-972-3929	Line, r.f., transmission	For use with item 2
4	6625-99-943-3377	Test set, radio	
5	10AR/5251	Cradle, test	
6	6625-99-223-9375	Counter, electronic frequency	
7	6625-99-223-9374	Frequency converter	For use with item 6
8	6625-99-142-0648	Probe, electronic test	For use with item 6 and 7

TABLE 1 (cont.)

Item	Ref.No.	Nomenclature	Remarks
9	5120-99-999-3708	Alignment tool, electronic equipment	Supplied with transmitter
10	5120-99-999-3709	Alignment tool, electronic equipment	
11	5210-99-910-5207	Gauge, thickness	
12	ZDM 12·5 MHz	Crystal unit, quartz	
13	ZDM 13·055555 MHz	" " "	
14	ZDM 13·611111 MHz	" " "	
15	ZDM 14·166666 MHz	" " "	
16	ZDM 14·722222 MHz	" " "	
17	ZDM 15·277777 MHz	" " "	
18	ZDM 15·833333 MHz	" " "	
19	ZDM 16·388888 MHz	" " "	
20	ZDR 12·708333 MHz	" " "	
21	ZDR 13·124999 MHz	" " "	
22	ZDR 13·541666 MHz	" " "	
23	ZDR 13·958333 MHz	" " "	
24	ZDR 14·374999 MHz	" " "	
25	ZDR 14·791666 MHz	" " "	
26	ZDR 15·208333 MHz	" " "	
27	ZDR 15·624999 MHz	" " "	
28	ZDR 16·041666 MHz	" " "	
29	ZDR 16·458333 MHz	" " "	
30	ZDR 16·662499 MHz	" " "	

3. In addition to the items listed in Table 1, the following are required:

(1) A shorting plug comprising a plug Type 170, Ref.No.10H/242, with a 560-ohm, ½-W resistor 5905-99-022-1207 connected across the tip and ring.

(2) An ammeter comprising a moving coil meter, 100μA f.s.d. 500 ohms internal resistance, Ref.No.5Q/16147, with two 2·2 ± 1%, ⅛-W 5905-99-021-9602 connected in series to the positive terminal.

(3) An electronic temperature tester capable of measuring over the range 65° C to 85° C, accurate to ± 0·25° C, in ambient temperatures from

-40° C to +37° C. The device shall use a thermocouple which can be attached to the side of a crystal (Style D to DEF-4271A). The wiring between the thermocouple and the tester shall be such that there is minimum heat loss from the point of contact.

(4) A heater, crystal oven, 5820-99-618-3277 and a cover, quartz crystal holder, 5955-99-999-3800, both modified for introduction of a thermocouple and wiring (sub-para.(3)) in such a manner that heat loss from the oven is minimal.

(5) A BT-cut crystal unit, quartz, ZDM 16·111111 MHz to DEF-5271, calibrated for maximum turn-over frequency, between 70° C and 80° C, at 30pF input and with 5mW drive. The turn-over frequency shall be marked on the crystal can.

(6) Alignment tool, comprising a rod of synthetic-resin-bonded paper, or similar insulating material, not exceeding 3/16 in thick and not less that 6 in long, with one end shaped to form a screwdriver blade.

Removing and refitting the amplifier oscillator

4. (1) Disconnect the nine-pole test plug from its stowage position in 5SKT23.

(2) Uncouple the r.f. connector 2SKT13 from 4PL13 on the probe assembly.

(3) Set the HG, TREBLER and PA tuning controls so that, when viewed from above, the open ends of the fork couplings are pointing downwards, to avoid damage to the couplings as the unit is withdrawn.

CAUTION...

The crystal oven temperature control module (under the transmitter chassis) operates from a floating 110V a.c. source and earthing any part of this module can cause irreparable damage. Therefore switch off the transmitter mains supply before removing the amplifier oscillator.

(4) Release ten green-ringed captive screws (four on the drive unit section and six on the amplifier section) and, using the handles, lift the clear of the transmitter chassis.

5. Before refitting the amplifier oscillator the three coupling forks must be pointing downwards and the tuning controls set as in para.4(3) to correctly engage the couplings. Refit the unit by reversing para.4(1), (2) and (4).

Mechanical servicing

General

6. Perform the subsequent mechanical servicing procedures only as far as is necessary to remedy a particular fault. Note the following:

(1) The unit contains a number of feed-through capacitors susceptible to physical damage so take care when servicing in their vicinity.

(2) Screws and nuts not provided with locking devices must be locked on re-assembly with an approved locking varnish unless otherwise stated. Apply only a very small amount of varnish to the nut or screwhead.

Tuning capacitor

7. The tuning capacitor comprises one single-gang and three 2-gang capacitors mechanically connected by a gear train and bellows couplings. The capacitors, gears, etc. are assembled onto a casting to form a removable 7-gang capacitor unit secured to the front of the drive unit section. Although the complete 7-gang unit is not a referenced item many of its component parts are provisioned as replaceable.

8. Servicing of the 7-gang capacitor unit is aided by removal from the drive unit section, and the subsequent procedures are based on this practice. It may, however, be found expedient to change certain items without removing the capacitor unit; in such instances adapt the procedure appropriately.

CAUTION...

Before commencing servicing, remove 5V1, 5V2, 5V3, 5V4 and 5V5 from the drive unit section to avoid damage.

9. To remove the capacitor unit from the drive unit section:

(1) Take out seven 6 BA cheesehead screws and remove the cover from the gear train.

(2) Unsolder the two couplers 5C46 and 5C47 from pins 2 and 6 of 2V1 in the amplifier section, noting the connections.

(3) Take out one 6 BA countersunk screw securing the bracket of 2PL16 to a raised bracket on the drive unit chassis.

(4) Remove seven 6 BA cheesehead screws and washers which secure the amplifier section to the drive unit section and separate the two sections.

(5) Remove the four cover plates from the underside of the drive unit section.

(6) Remove the cover from tuning capacitors 5C13/5C20 and 5C28. The cover is secured to the chassis by two 6 BA cheesehead screws and to the capacitor unit casting by three 6 BA cheesehead screws, stiffnuts and washers.

(7) Unsolder the connections from the terminals of 5C13, 5C20, 5C28, 5C35 and 5C45, on the underside of the chassis, noting each connection.

(8) On the top of the chassis unsolder the chassis earth tags from the tuning capacitors, taking care to avoid damage to the capacitors and tags.

(9) On the underside of the chassis remove three 6 BA stiffnuts which secure the capacitor unit casting to the top of the chassis. Remove the 6 BA stiffnuts fitted to the ends of the three lower hexagonal pillars.

(10) Remove three 6 BA cheesehead screws and stiffnuts which secure the capacitor unit casting to the chassis skirt and separate the capacitor unit from the drive unit section.

CAUTION...

The tuning cores of 5L8 and 5L9 are withdrawn with the capacitor unit so take care to avoid damaging them. Remove the cores while servicing is performed.

10. Servicing of the capacitor unit involves changing the tuning capacitors, gears etc. and mechanically realigning the capacitors. All replaceable spares are identified in Table 2; the servicing procedures are in para.11 to 16.

11. To change the 2-gang capacitor 5C13/5C20 and/or the single-gang capacitor 5C28:

Note...

Adapt as necessary to change a bellows coupling.

(1) Unsolder trimmers 5C15 and 5C22 from 5C13 and 5C20 respectively.

(2) Slacken the two grub screws securing the bellows coupling to the capacitor shaft, then take out two 4 BA hexagon head screws and remove the capacitor.

(3) When 5C28 is to be changed implement sub-para.(4) to (8), otherwise proceed to sub-para.(9).

(4) Unsolder trimmer 5C31 from 5C28.

(5) Slacken the two grub screws securing the bellows coupling to the front end of the capacitor shaft, then take out two 4 BA hexagon head screws and remove the capacitor.

(6) Remove the bellows coupling from the rear end of the capacitor shaft and fit it to the new capacitor.

(7) Secure the new capacitor in position with two 4 BA hexagon head screws. Fully mesh the capacitor vanes, rotate the fork coupling to the relative position shown in fig.1 and then tighten the grub screws to secure the bellows coupling to the front end of the capacitor shaft.

(8) Solder trimmer 5C31 to 5C28.

(9) Secure the 2-gang capacitor in position with two 4 BA hexagon head screws. Ensure that the vanes of both the single-gang and the 2-gang capacitor are fully meshed and then tighten the grub screws to secure the bellows coupling to the shaft of the 2-gang capacitor.

(10) Solder trimmers 5C15 and 5C22 to 5C13 and 5C20 respectively.

12. When 2-gang capacitor 5C35 or its associated gear require changing, it is necessary to change both because the gear must be pinned to the capacitor shaft. Proceed as follows:

(1) Remove the cover (secured by four 6 BA cheesehead screws and spring washers) from the capacitor.

(2) Insert a $\frac{1}{8}$ in location pin into the holes of each of the two idler gears, remove the circlips from the rear end of the idler shafts and withdraw the gears and shafts.

(3) Punch out the taper pin securing the gear to the capacitor shaft, applying the punch to the smaller end of the pin, and remove the gear.

(4) Remove three screws, nuts and one washer which secure the mounting bracket of 5C35 to the rear of the main casting and withdraw the bracket and capacitor.

(5) Unsolder trimmer 5C39 from 5C35, take out two 4 BA hexagon head screws and separate the capacitor from the bracket.

(6) Fit a new capacitor to the bracket by reversing sub-para.(5) and then fit the bracket and capacitor to the main casting by reversing sub-para.(4), ensuring that the shaft rotates freely. Two of the bracket securing screws pass through adjustable bushes which may be altered to achieve free rotation of the shaft.

(7) Fit a new gear to the capacitor shaft so that the clearance between the rear face of the gear and the boss of the casting does not exceed 0·005 in. Tighten the grub screw.

(8) With all tuning capacitors fully meshed fit the two idler gears and remove the location pins.

(9) Again ensure that all tuning capacitors are fully meshed. Adjust 5C35 by slackening the grub screw of the gear, fully meshing the vanes and tightening the grub screw, ensuring that correct clearance (sub-para.(2)) is maintained.

(10) Holding 5C35 and its gear immobile, drill through the bush of the gear and the shaft (via the pilot hole) using a 0·076 in drill. Ream the hole to suit a new taper pin, using a 3/32 in taper reamer. Tap the pin into the hole.

13. Changing either 2-gang capacitor 5C45 or its gear necessitates changing both (see para.12) as follows:

(1) Insert a $\frac{1}{8}$ in location pin into the holes of the idler gear which meshes with the gear on the shaft of 5C45. Remove the circlip from the rear end of the idler shaft and withdraw the gear and shaft.

(2) Punch out the taper pin securing the gear to the capacitor shaft, applying the punch to the smaller end of the pin, and remove the gear.

(3) Remove three screws, nuts and one washer which secure the mounting bracket of 5C45 to the rear of the main casting and withdraw the bracket and capacitor.

(4) Unsolder trimmer 5C44 and two coupling capacitors 5C46 and 5C47 from 5C45. Take out two 4 BA hexagon head screws and separate the capacitor from the bracket.

(5) Fit a new capacitor to the bracket by reversing sub-para.(4) and then fit the bracket and capacitor to the main casting by reversing sub-para.(3), ensuring that the shaft rotates freely. Two of the bracket securing screws pass through adjustable bushes which may be altered to achieve free rotation.

(6) Fit a new gear to the capacitor shaft so that the clearance between the rear face of the gear and the boss of the casting does not exceed 0·005 in and tighten the grub screw.

(7) With all tuning capacitors fully meshed, fit the idler gear and remove the location pin.

(8) Again ensure that all tuning capacitors are fully meshed. Adjust 5C45 by slackening the grub screw of the gear, fully meshing the vanes and tightening the grub screw, ensuring that correct clearance (sub-para.(6)) is maintained.

(9) Holding 5C45 and its gear immobile, drill through the bush of the gear and the shaft (via the pilot hole) using a 0·076 in drill. Ream the hole to suit a new taper pin, using a 3/32 in taper reamer. Tap the pin into the hole.

14. To change an idler gear:

(1) Rotate the tuning capacitors to their fully meshed positions.

(2) Insert a $\frac{1}{8}$ in location pin into the holes of the idler gear. Remove the circlip from the rear and of the idler shaft and withdraw the gear and shaft.

(3) Fit a circlip to a new idler shaft and insert the shaft through the casting from the rear. Transfer the $\frac{1}{8}$ in location pin to a new idler gear and, ensuring that all tuning capacitors are still fully meshed, fit the gear to the shaft.

(4) With the shaft and circlip pressed against the rear of the casting, position the idler gear such that the clearance between the rear face of the gear and the boss of the casting does not exceed 0·005 in and then tighten the grub screw. Remove the location pin.

(5) Holding the gear and shaft immobile, drill through the bush and shaft (via the pilot hole) using a 0·076 in drill. Ream the hole to suit a new taper pin, using a 3/32 in taper reamer. Tap the pin into the hole.

15. If the fork coupling or its associated gear and shaft assembly are damaged change them as follows:

(1) Insert a $\frac{1}{8}$ in location pin into the holes of the idler gear which meshes with the gear on the shaft of the fork coupling.

(2) Remove the circlip from the rear end of the idler shaft and withdraw the gear and shaft.

(3) Punch out the taper pin which secures the fork coupling to its shaft, applying the punch to the smaller end of the pin, and remove the coupling.

(4) Slacken the two grub screws securing the bellows coupling to the shaft of the fork coupling.

(5) Remove the locking solder from the two 2 BA cheesehead screws which secure the bearing mounting plate and the shaft assembly, take out the screws and remove the plate and shaft assembly.

(6) Remove the bearing mounting plate from the shaft assembly, and fit it over the bearing of a new shaft assembly, locating the bearing against the shoulder of the mounting plate.

(7) Reverse sub-para.(5) ensuring that the screws, bearing mounting plate and the bearing retaining plate of the shaft assembly are locked with solder.

(8) Secure the bellow coupling to the shaft with the two grub screws, such that the clearance between the front face of the coupling and the casting or the rear bearing of the shaft assembly (whichever is closer) is not less than 0·005 in.

(9) Fit a new fork coupling onto the shaft such that the rear face of the bush is level with the front face of the bearing mounting plate, and with its position relative to the capacitor rotor vanes as shown in fig.1

(10) Tighten the grub screw of the coupling.

(11) Holding the coupling and shaft immobile, drill through the bush and shaft (via the pilot hole) using a 0·076 in drill.

(12) Ream the hole to suit a new taper pin, using a 3/32 in taper reamer. Tap the pin into the hole.

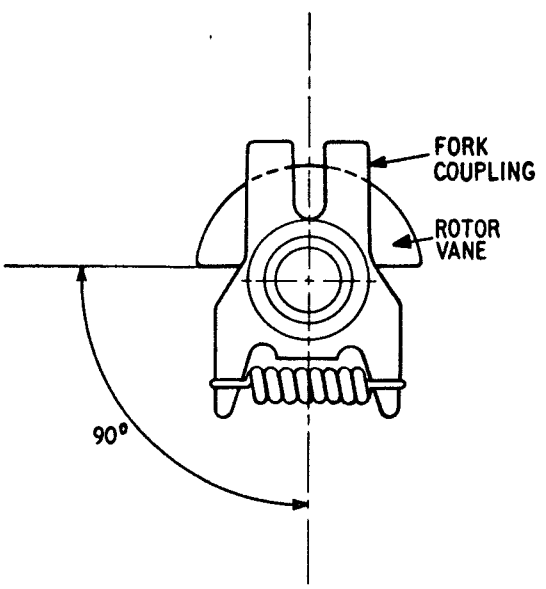


Fig.1 Alignment of fork coupling

TABLE 2

Tuning capacitor - components list

Cct.Ref.	NATO No.	Nomenclature	Remarks
5C13/5C20	5910-99-999-4963	Capacitor, var air dielectric, 6-76pF	2-gang capacitor
5C28	5910-99-999-4968	Capacitor, var air dielectric, 6-76pF	single-gang capacitor
5C35, 5C45	5910-99-999-4965	Capacitor, var air dielectric, 7-87pF	2-gang capacitors
	3020-99-618-2491	Gear spur	gear
	5820-99-618-3034	Gear assembly	idler gear
	3040-99-618-2290	Shaft, shouldered	idler shaft
	5365-99-618-4415	Ring, retaining	circlip
	3010-99-618-2133	Coupling, shaft, flexible	bellows coupling
	5820-99-618-2490	Pinion and bearing assembly	gear and shaft assembly
	5820-99-618-2134	Fork coupling	fork coupling
	5315-99-942-0950	Pin, tapered, plain	taper pin

16. When all mechanical servicing of the capacitor unit is complete, check alignment of the tuning capacitors and, if necessary, re-adjust:

(1) The alignment is correct when all the tuning capacitors fully mesh simultaneously and the position of the fork coupling relative to the rotor vanes is as in fig.1.

(2) The alignment of the fork coupling and capacitors 5C13/5C20 and 5C28 can be corrected by the bellows couplings, and that of 5C35 and 5C45 by removing the appropriate idler gear (after fitting a $\frac{1}{8}$ in location pin), correcting the alignment and refitting the idler gear.

17. To refit the capacitor unit:

(1) Reversing para.9.

(2) Fit the cover to 5C35.

(3) Insert the valves into their holders.

Crystal oven

18. The only part of the oven which may require servicing is the crystal holder. To remove the crystal holder from the drive unit section:

(1) Release the oven cover retainer and remove the cover, oven, crystal retainer and crystals.

(2) Carefully unsolder the two wires (one red and one green) from the thermistor terminals of the crystal holder, noting the connections.

(3) On the underside of the drive unit chassis remove two 6 BA cheesehead screws and washers which secure the hinged bracket of 5PL18.

(4) Taking care to avoid straining the wiring, move the bracket to expose the crystal oven heater socket connections and two retaining screws.

(5) Unsolder the two blue wires from the heater socket and two bare wires from the crystal terminals, noting the connections.

(6) Remove four 6 BA cheesehead screws which secure the crystal holder (one screw also retains a cableform clip) and remove the crystal holder from the drive unit chassis.

19. Servicing of the crystal holder may involve replacing:

top plate (plate, top, crystal unit, 5955-99-913-6727)

thermistor (resistor, thermal, 5905-99-618-3053)

mounting plate (plate, mounting, electrical equipment, 5999-99-999-4081)

plates, instruction, 9905-99-618-3522 (WORKING) or 9905-99-999-3796 (SPARE).

Dismantle the holder only as far as necessary, adapting the full dismantling and assembly procedure:

(1) Using a heat shunt carefully unsolder the thermistor from the terminals on the top plate.

(2) Take out two 6 BA countersunk screws and remove the retainer assembly. Remove the cork plate from the mounting plate.

(3) Remove four 6 BA countersunk screws and associated pillars, which secure the top plate to the mounting plate. This also releases the WORKING and SPARE instruction plates.

(4) Unsolder the wiring between the crystal terminals on the mounting plate and the socket poles on the top plate, noting the connections.

(5) To assemble the crystal holder reverse sub-para.(1) to (4), positioning the top plate with its socket poles adjacent to the crystal terminals, and ensuring that the two instruction plates are correctly fitted.

20. Fit the crystal holder to the drive unit section by reversing para.18. A complete new crystal holder is identified as a holder, crystal unit, 5820-99-618-3279.

Connector and capacitor assembly

21. This assembly, which feeds the carrier output from the p.a. stage of th amplifier section, comprises a length of coaxial cable fitted with an h.t. isolating capacitor 2C10 and terminating in 2SKT13. Part of the cable has its outer sheath removed and is fitted into a channel in the rear lecher lin of the p.a. stage. To change the connector and capacitor assembly;

(1) Remove the cover (secured by four 6 BA cheesehead screws) from the amplifier section.

(2) Take out two 6 BA cheesehead screws which secure the grommet plate of the connector and capacitor assembly to the rear of the amplifier section. (The longer of these screws, which also secures a cable clip, is fitted with a washer.)

(3) Remove the cover retaining clip (secured by four 8 BA cheesehead screws) from the rear panel of the amplifier section.

(4) Take out eight 6 BA countersunk screws and sixteen 6 BA cheesehead screws which secure the rear panel and remove the panel.

WARNING...

PERFORM ALL SUBSEQUENT SERVICING WITHIN THE AMPLIFIER SECTION WITH CARE, BECAUSE:

(1) CERTAIN INSULATORS ARE MADE FROM P.T.F.E. WHICH GIVES OFF HIGHLY TOXIC FUMES WHEN HEATED; SOLDER WITH CAUTION.

(2) THE RHODIUM PLATING ON THE LECHER LINES IS VULNERABLE AND CAN BE IRREPARABLY DAMAGED BY THE CARELESS HANDLING OF TOOLS ETC.

(5) Carefully unsolder the inner conductor of the coaxial cable from the solder tag of 2C8 and the braid from the projection on the lecher line.

(6) Unsolder the two red wired from the tag of 2C10.

(7) Release capacitor assembly 2C10 (secured by two 6 BA cheesehead screws), withdraw the coaxial cable from the channel in the lecher line and remove the connector and capacitor assembly from the unit

(8) Remove the cable clip from the redundant item and fit it in the same position on a new connector and capacitor assembly, 5820-99-102-6394.

(9) Fit the new connector and capacitor assembly by reversing sub-para.(1) to (7).

Examination

22. When mechanical servicing is complete, and before electrically testing and aligning, check that:

(1) All necessary servicing has been performed satisfactorily.

(2) All nuts and screws are fully tightened and securely locked (para.6(2)).

(3) No mechanical damage has been sustained during servicing.

(4) All covers are correctly fitted and secured.

Electrical testing and alignment

General

23. An amplifier oscillator which has been serviced must be electrical tested, and the tuned circuits realigned after changing tuning capacitors or renewing valves.

24. Certain testing and alignment must be performed with the amplifier oscillator removed from the transmitter (para.4) and coupled to the transmitter by means of two extension connectors (one 12-way and one 25-way) provided in the test set, radio, 6625-99-943-3377. When operating the equipment thus, take the following precautions:

(1) Since the forced air cooling is ineffective, avoid overheating by observing the duty cycle when TUNE-REMOTE-LOCAL is set to TUNE or LOCAL. While it may not be practical adhere strictly to a five minutes ON ten minutes OFF routing, switch on the h.t. for the minimum possible time only. For lengthy adjustments switch off the h.t. occasionally to allow the valves and components to cool, or use an electric fan to provide cooling.

(2) To load the h.t. supply, the trebler and p.a. stages, tune for maximum power output as indicated on a test set, radio, CT214 connected via a line, r.f., transmission, 5985-99-972-3929 to 2SKT13.

(3) When operating the transmitter with TUNE-REMOTE-LOCAL set to LOCAL, complete the h.t. supply by inserting the shorting plug (para.3(1)) into the front panel MIC socket.

Note...

In subsequent procedures, when a crystal is fitted in the oven, check that the top of the thermistor bead is level with the top of the crystal to ensure correct excursion of the oven temperature.

Voltage measurements

25. To measure the voltage levels in the amplifier oscillator operate the unit on extension connectors (para.24). Measure voltages in the drive unit section with the crystal removed and TUNE-REMOTE-LOCAL set to TUNE: measure

those in the amplifier section with TUNE-REMOTE-LOCAL set to LOCAL and the equipment tuned for maximum power output on 230 MHz. Typical readings on a multimeter CT498 are listed in Table 3, but are only a guide to assist in fault finding and not for indication of satisfactory performance.

TABLE 3

Voltage levels

Test point	Meter range	Typical reading
Junction 5R24/5R25 (h.t.)	1000V d.c.	+360
5C10 (stabilized h.t.)	250V d.c.	+150
5TP5 (-25V bias)	100V d.c.	-25
5SKT23 pole 1 (-2·2V bias)	10V d.c.	-2·2
5V1 pin 5 (anode)	250V d.c.	+150
5V1 pin 7 (screen)	250V d.c.	+120
5V1 pin 3 (heater)	10V a.c.	6·3 a.c.
5V2 pin 5 (anode)	250V d.c.	+110
5V2 pin 6 (screen)	250V d.c.	+100
5V2 pin 3 (heater)	10V a.c.	6·3 a.c.
5V3 pin 5 (anode)	1000V d.c.	+360
5V3 pin 7 (screen)	250V d.c.	+205
5V3 pin 2 (cathode)	25V d.c.	+14·5
5V3 pin 3 (heater)	10V a.c.	6·3 a.c.
5V4 pin 5 (anode)	1000V d.c.	+305
5V4 pin 7 (screen)	250V d.c.	+160
5V4 pin 2 (cathode)	25V d.c.	+6·5
5V4 pin 3 (heater)	10V a.c.	6·3 a.c.
5V5 pin 6 (anode A)	1000V d.c.	+350
5V5 pin 8 (anode B)	1000V d.c.	+350
5V5 pin 7 (screen)	250V d.c.	+230
5V5 pin 9 (heater)	10V a.c.	6·3 a.c.
Junction 2L1/2R7 (2V1 anodes)	1000V d.c.	+340
2C11 (2V1 screen)	1000V d.c.	+270 (Transmit) +190 (Tune)
2V1 pin 6 (grid B)	250V d.c.	-120

TABLE 3 (cont.)

Test point	Meter range	Typical reading
Junction 2L2/2C9 (2V2 anodes)	1000V d.c.	+370
Junction 2R12/2R14 (2V2 screen)	250V d.c.	+240 (Transmit) +145 (Tune)
Junction 2R9/2R10 (2V2 negative bias)	100V d.c.	-25

Metering

26. Use the built-in metering facilities to help locate faults by inserting the transmitter 9-pole metering plug into 9SKT23 on the drive unit section and using the transmitter front panel meter and METER SWITCH:

(1) With TUNE-REMOTE-LOCAL set to LOCAL the transmitter output power, as indicated on a test set, radio, CT214 (para.24(2)) should be not less than 10W. If the output is below normal use the metering system to localize the fault.

(2) If the grid currents of 5V2 to 5V5 in the drive unit section are low, satisfactory output from the drive unit (METER SWITCH position 7) should indicate the serviceability of the drive unit section.

(3) If the anode current of 2V2 (METER SWITCH position 8) is satisfactory the fault may be in the p.a. tuning lines or subsequent output circuits.

(4) Details of metering are given in Table 4. The limits quoted in the table are for guidance only, the recorded readings (para.27) and overall performance indicating serviceability.

27. Record meter readings obtained when the equipment is known to be fully serviceable in the blank column on the transmitter metering label, together with the frequency. Subsequent comparison can then be made to establish serviceability. Repairs or change of components (particularly valves) necessitates recording a new set of readings.

TABLE 4

Metering

METER SWITCH position	Currents metered	FSD	Limits
1	5V5 (amplifier) grid	200μA	6 min
2	5V3 (doubler) grid	200μA	6 min
3	5V4 (phase splitter) grid	500μA	6 min
4	Not used		

TABLE 4 (cont.)

METER SWITCH position	Currents metered	FSD	Limits
5	5V5A (driver) grid	500µA	6 min
6	5V5 (driver) combined anode and screen grid	100mA	30-60
7	2V1 (trebler) combined anode and screen grid	100mA	30-80
8	2V2 (p.a.) combined anode and screen grid	200mA	34-60

Valve renewal

28. Renewal of oscillator multiplier valve 5V1 should not affect the oscillator frequency. Renewal of any other valve in the amplifier oscillator may affect the transmitter power output, requiring realignment of the appropriate tuned circuits, using the internal metering system, without removing the amplifier oscillator from the transmitter.

29. If the valve in the trebler position (2V1) bears the manufacturers code KB/Q, make the following check:

(1) Remove the crystal oven cover and oven, fit the 16·388888 MHz test crystal into the WORKING socket and refit the oven and cover.

(2) Tune the transmitter to 295 MHz (AP 116E-0252-1, Part 1, Sect.2, Chap.3).

(3) Turn TREBLER tuning control 20 MHz either side of the tuning point and ascertain whether there is a second tuning point within these limits

(4) If a second tuning point exists (sub-para.(3)), that at a lower frequency is spurious and can be remedied by changing the trebler valve (2V1), preferably using a valve not coded KB/Q.

(5) After the valve is changed as in para.31(1) to (6).

(6) If the replacement valve bears the code KB/Q, repeat sub-para.(1) to (3) above.

Alignment of drive unit section after valve renewal

30. If the transmitter performance (para.26) is below normal after changing a valve in the drive unit section, proceed as follows:

(1) Remove the crystal oven cover and oven, fit the 16·662499 MHz test crystal into the WORKING socket and refit the oven and cover.

(2) Insert the transmitter 9-pole metering plug into 5SKT23 on the amplifier oscillator.

(3) Connect the ammeter (para.3(2)) across 5TP4 and 5TP5 (negative terminal to 5TP4) to measure 5V5B grid current.

(4) Switch on the transmitter, allow a 20-minute warm-up period and then tune the transmitter to 399·9 MHz (AP 116E-0252-1, Part 1, Sect.2, Chap.3).

(5) If 5V2 has been changed, set transmitter METER SWITCH to the following positions and, using the alignment tool (para.3(6)) adjust the trimmers for maximum indication on the front panel meter:

(a) Position 1 (5V2 grid current) and adjust ◄5C15►.

(b) Position 2 (5V3 grid current) and adjust 5C22.

(c) Position 3 (5V4 grid current) and adjust 5C31.

(d) Position 5 (5V5A grid current) and adjust 5339. Note this indication and that of the ammeter across 5TP4 and 5TP5 (5V5B grid current).

(6) Turn trimmer 5C38 clockwise until the front panel meter indication decreases by about 50%

(7) Repeat the adjustments to 5C39 and 5C38, in that order, unitl 5V5A and 5V5B grid currents are balanced to within 10%.

(8) If balance cannot be achieved, repeat sub-para.(5)(d) to (7), but turn 5C38 counterclockwise.

(9) Set METER SWITCH to position 9 and MON to POWER. Adjust trimmer 5C44 for maximum power output indication.

(10) Switch off the transmitter, remove the crystal oven cover, oven and test crystal and then refit the oven and cover.

(11) Uncouple the ammeter from 5TP4 and 5TP5.

(12) If 5V3 is changed, proceed as in sub-para.(1) to (4) and (5b) to (11).

(13) If 5V4 is changed, proceed as in sub-para.(1) to (4) and (5c) to (11).

(14) If 5V5 is changed, proceed as in sub-para.(1) to (4(and (5d) to (11).

Note...

After completing this alignment realign the amplifier section (para.31).

Alignment of amplifier section after valve renewal

31. If the transmitter performance (para.26) is below normal after changing a valve in the amplifier section, re-align by adjusting trimmers 2C3, 2C4 and 2C8 which are accessible via holes in the top of the screening cover which must remain in position. Proceed as follows:

(1) Remove the crystal oven cover and oven, fit the 16·662499 MHz test crystal into the WORKING socket and refit the oven and cover.

(2) Switch on the transmitter, allow a 20-minute warm-up period and then tune the transmitter to 399·9 MHz.

(3) If 2V1 has been changed, set transmitter METER SWITCH to position 8 (2V2 anode current) and, using the alignment tool 5120-99-999-3708, adjust trimmers 2C3 and 2C4 for maximum indication on the front panel meter.

(4) Set METER SWITCH to position 9 and MON SWITCH to POWER. Adjust trimmer 2C8 for maximum power output indication.

(5) Set METER SWITCH to position 8 and adjust TREBLER for maximum indication.

(6) Return METER SWITCH to position 9 and adjust P.A. for maximum indication.

(7) Repeat sub-para.(4) and (5) until no further increase in power output can be obtained.

(8) Switch off the transmitter, remove the crystal oven cover, oven and test crystal and refit the oven and cover.

(9) If 2V2 has been changed proceed as in sub-para.(1), (2) and (4) to (8).

Complete realignment of drive unit section

32. If ganging of the drive unit section is necessary, remove the amplifier oscillator from the transmitter (para.4) and fit it into the cradle, test, Ref.No.10AR/5251, ensuring that the fork couplings correctly engage the drive pins on the tuning controls. Secure the unit by means of its ten green-ringed screws. Connect the equipment as follows:

(1) Couple the amplifier oscillator to the transmitter using the 12-way and 25-way extension connectors supplied with the test set, radio, 6625-99-943-3377

(2) Connect METER socket of the test set to 5SKT23 on the amplifier oscillator using the 9-way extension connector supplied with the test set.

(3) Couple the test set, radio, CT214 to 2SKT13 (para.24(2)).

(4) Connect the ammeter (para.3(2)) across 5TP4 and 5TP5 (negative terminal to 5TP4).

33. Observing the precautions of para.24, proceed as follows:

(1) Remove the covers from tuners 5C13/5C20, 5C28 and 5C35, and the bottom cover plate beneath trimmer 5C38.

(2) Using the alignment tool (para.3(6)) adjust trimmers 5C15, 5C22, 5C31, 5C38, 5C39 and 5C44 to be half-meshed and then refit the cover to 5C35 and the bottom cover plate beneath 5C38.

(3) Remove the crystal oven cover and oven, fit the 12·5 MHz test crystal to the WORKING socket, the 16·662499 MHz test crystal to the SPARE socket and refit the oven and cover.

(4) Switch on the transmitter and allow a 20-minute warm-up period.

(5) Turn HG tuning control of the test cradle until the tuning capacitor vanes are fully meshed, then turn the control so that the tuning capacitor is rotated 7 degrees clockwise (viewed from the drivers end) and note the position of the HG control.

(6) Operate test set METER SWITCH to the following positions and, using the alignment tools 5120-99-999-3708 and 3709, unlock and adjust the cores of the inductors for maximum indication on the test set meter:

(a) Position 1 (5V2 grid current), adjust 5L3.

(b) Position 2 (5V3 grid current), adjust 5L5.

(c) Position 3 (5V4 grid current), adjust 5L7.

(d) Position 5 (5V5A grid current), adjust 5L8.

(e) Position 7 (2V1 anode current), adjust 5L9.

(7) Switch off the transmitter, remove the crystal oven cover and oven, and change over the two crystals, fitting the 16·662499 MHz crystal to the WORKING socket and the 12·5 MHz crystal to the SPARE socket.

(8) Refit the oven and cover and then switch on the transmitter.

(9) Turn HG tuning control of the test cradle so that the tuning capacitor is rotated a further 158 degrees clockwise, i.e. 165 degrees out of mesh.

(10) Set test set METER SWITCH to position 1, 2 and 3 and, using the alignment tool (para.3(6)) adjust trimmers 5C15, 5C22 and 5C31 respectively for maximum indication on the test set meter.

(11) Set METER SWITCH to position 5 (5V5A grid current) and adjust trimmer 5C39 for maximum indication on the meter. Note this indication and also that of the ammeter across 5TP4 and 5TP5 (5V5B grid current).

(12) Turn trimmer 5C38 clockwise until the test set meter indication decreases by about 50%.

(13) Repeat the adjustments to 5C39 and 5C38, in that order, until 5V5A and 5V5B grid currents are balanced to within 10%.

(14) If balance cannot be achieved by the method described, repeat sub-para.(11) to (13), but turning 5C38 counterclockwise.

(15) Set transmitter METER SWITCH to position 7 (2V1 anode current) and adjust trimmer 5C44 for maximum indication on the transmitter meter.

(16) Switch off the transmitter, remove the crystal over cover and oven and change over the two crystals, fitting the 12·5 MHz crystal to the WORKING socket and the 16·662499 MHz crystal to the SPARE socket.

(17) Refit the oven and cover and switch on the transmitter.

(18) Turn the tuning capacitor back to the 7-degree position noted in sub-para.(5) and then repeat sub-para.(6) to (10).

(19) Set test set METER SWITCH to position 5 (5V5A grid current) and adjust 5C39 for maximum indication on the test set meter.

(20) Set transmitter METER SWITCH to position 7 (2V1 anode current) and adjust 5C44 for maximum indication on the transmitter meter.

(21) Repeat sub-para.(16), (17) and then turn the tuning capacitor back to the 7-degree position noted in sub-para.(5).

(22) Repeat sub-para.(6) to (10), locking the core of each inductor after adjustment and ensuring that the meter reading remains at maximum in each case.

(23) Repeat sub-para.(19) and (20).

(24) Remove the cover from 5C35 and the bottom cover plate beneath 5C38 and check that trimmers 5C15, 5C22, 5C31, 5C38 and 5C44 are only partially meshed. If any trimmer is fully meshed or unmeshed readjust it to obtain maximum meter indication in a partially meshed condition.

(25) Refit all covers including that over 5C13/5C20 and 5C28.

(26) Switch off the transmitter, remove the crystal oven cover and oven and take out the crystal from the WORKING socket; switch on the transmitter and check that the front panel meter indicates zero.

(27) Switch off the transmitter.

Complete realignment of amplifier section

34. With the equipment connected as in para.32 and observing the precautions of para.24, align the amplifier section by adjusting trimmers 2C3, 2C4 and 2C8. These are accessible via holes in the screening cover which must be in position during the following alignment:

(1) With the 16·662499 MHz test crystal fitted to the WORKING socket, fit the oven and cover and switch on the transmitter.

(2) Using a screwdriver turn ADJ. P.A.I. on the transmitter front panel fully clockwise.

(3) Set test cradle HG, TREBLER and PA controls to approximately 400 MHz and transmitter METER SWITCH to position 7 (2V1 anode current).

(4) Adjust HG for maximum indication on the front panel meter.

(5) Adjust TREBLER so that the contact point of the wiper in ½ in from those ends of the lecher lines connected to the anodes of 2V1.

(6) Set transmitter METER SWITCH to position 8 (2V2 anode current) and, using the alignment tool 5120-99-999-3708, adjust trimmers 2C3 and 2C4 for maximum indication on the meter.

(7) Adjust PA for maximum power output indication on the test set, radio, CT214.

(8) Set transmitter METER SWITCH to position 8 (2V2 anode current) and observe the front panel meter reading. If this exceeds 60, turn ADJ. P.A.I. counterclockwise to reduce the reading to 60 or as close as possible.

(9) Adjust trimmer 2C8 for maximum power output indication on the CT214, adjust TREBLER for maximum indication on the transmitter meter and adjust PA for maximum power output.

(10) Repeat sub-para.(9) until no further increase in power output can be obtained.

Power output tests

35. When the amplifier oscillator has been fully aligned, test the power output over the full frequency range of the transmitter as follows:

(1) With the 12·5 MHz test crystal fitted to the WORKING socket, fit the oven and cover.

(2) Using a screwdriver turn ADJ. P.A.I. on the transmitter fully clockwise.

(3) Set TUNE-REMOTE-LOCAL to TUNE, transmitter METER SWITCH to position 7 (2V1 anode current).

(4) Adjust test cradle HG control for maximum indication on the front panel meter.

(5) Set transmitter METER SWITCH to position 8 (2V2 anode current) and adjust TREBLER for maximum indication on the meter.

(6) Adjust PA for maximum power output indication on the CT214.

(7) Set TUNE-REMOTE-LOCAL to LOCAL and repeat sub-para.(5) and (6).

(8) With transmitter METER SWITCH set to position 8 observe the meter reading. If this exceeds 60, turn ADJ. P.A.I. counterclockwise to reduce the reading to 60 or as close as possible.

(9) Note the power output indication on the CT214. This shall be not less than 10W.

(10) Set transmitter METER SWITCH to position 7 (2V1 anode current) and check that the meter reading is between 30 and 80.

(11) Set TUNE-REMOTE-LOCAL to TUNE, remove and cover from the amplifier section and, using the multimeter CT498, check that the d.c. voltage between 2V2 screen (pin 3) and chassis is between 125V and 155V. Refit the cover.

(12) Observe the power output indication on the CT214. This should not exceed 70% of that noted in sub-para.(9).

(13) Insert each of the test crystals listed in Table 5 into the WORKING socket of the crystal oven base, set HG, TREBLER and PA controls of the test cradle to the associated frequencies and repeat sub-para.(2) to (11).

(14) If the power output at any frequency is less than 10W, repeat para.34(9) at the frequency giving the lowest output. Increase the power output to 10W and then measure the output at the remaining frequencies. Repeat this procedure until the power output at all frequencies is not less than 10W.

TABLE 5

Test frequencies

Test crystal (MHz)	Transmitter frequency (MHz)	Test crystal (MHz)	Transmitter frequency (MHz)
13•055555	235	13•541666	325
13•611111	245	13•958333	335
14•166666	255	14•374999	345
14•722222	265	14•791666	355
15•277777	275	15•208333	365
15•833333	285	15•624999	375
16•388888	295	16•041666	385
12•708333	305	16•458333	395
13•124999	315	16•663499	399•9

Crystal oven temperature

36. Check the temperature within the crystal oven and if necessary adjust using the temperature tester (para.3(3)) and the test oven and cover (para.3(4)) as follows:

Note...

A thermometer is unsuitable.

(1) Switch off the transmitter, remove the crystal oven cover and oven and fit crystals (the frequency is immaterial) into the WORKING and SPARE sockets.

(2) Attach the thermocouple of the temperature tester to the side of the crystal in the SPARE socket, ensuring that good thermal contact is made, and then securely fit the test oven and cover.

(3) Switch on the transmitter and the temperature tester, and allow the oven temperature to stabilize for at least 30 minutes.

(4) Observe and note the temperature excursion of the crystal oven over four complete cycles. The mean temperature shall be 75° ± ◄1.5°C►

(5) If the mean temperature is outside the limits (sub-para.(4)) adjust 18RV1 on the oven control panel under the transmitter chassis. Rotate the adjusting screw clockwise to increase the temperature. A variation of 1° C is provided by 2-3 turns.

(6) After adjusting 18RV1, check the mean temperature as in sub-para.(4). Repeat this procedure until the temperature is satisfactory.

(7) If difficult to adjust the temperature, consider a faulty heater, crystal oven, thermistor or control module. To change the control module see Chap.1. When the faulty item has been changed, check and readjust the temperature.

(8) Switch off the transmitter and remove the test cover, oven, thermocouple and crystals.

Frequency test

37. Whenever frequency drift is suspected, or if trimmer 5C6 has been altered inadvertently, check the operational frequency and realign 5C6 if necessary as follows:

(1) With the transmitter switched off and the crystal oven cover and oven removed, fit the 15·833333 MHz test crystal into the WORKING socket and refit the oven and cover

(2) Attach the probe, electronic test to the top of the amplifier section so that the probe loop is inside the hole above the p.a. lecher lines but clear of the valve anodes.

(3) Connect the probe, the frequency counter and the frequency converter and set the input selector to 20dB.

(4) Switch on the transmitter and counter and allow 30-minute warm-up.

(5) Tune the equipment as in para.35(2) to (9) and check that the radiated frequency shown on the frequency counter is 285 MHz ± 10 kHz. If the frequency is outside these limits change the crystal and repeat the frequency check. If the frequency is still outside the limits proceed as in sub-para.(6) to (10).

(6) Switch off the transmitter, remove the crystal oven cover, oven and the 15·833333 MHz test crystal and fit the 16·11111 MHz calibrated crystal (para.3(5)) into the WORKING socket, noting the turnover frequency marked on the crystal.

(7) Refit the oven and cover, switch on the transmitter and allow 15-minute warm-up.

(8) Tune the equipment as in para.35(2) to (9), to 290 MHz.

(9) Observe the frequency excursion indicated on the counter through four cycles of the oven temperature and note the maximum frequency.

(10) As the frequency just reaches the maximum noted in sub-para.(9) adjust trimmer 5C6 (adjscent to 5V1) to set the maximum frequency to within ± 50 Hz of 18 times the turnover frequency noted in sub-para.(6).

(11) Switch off the transmitter, remove the crystal oven cover, oven and calibrated crystal, fit the 15·833333 MHz test crystal and refit the oven and cover.

(12) Switch on the transmitter and allow to warm-up for 15 minutes.

(13) Tune the equipment as in para.35(2) to (9) and check that the frequency shown on the counter is 285 MHz ± 10 kHz. If the frequency is outside the limits, check and where necessary readjust the oven temperature (para.36). Repeat the frequency check.

(14) Switch off the transmitter, remove the crystal oven cover, oven and test crystal and refit the oven and cover.

(15) Disconnect all test equipment, remove the amplifier oscillator from the test cradle and fit the unit into the transmitter (para.5).

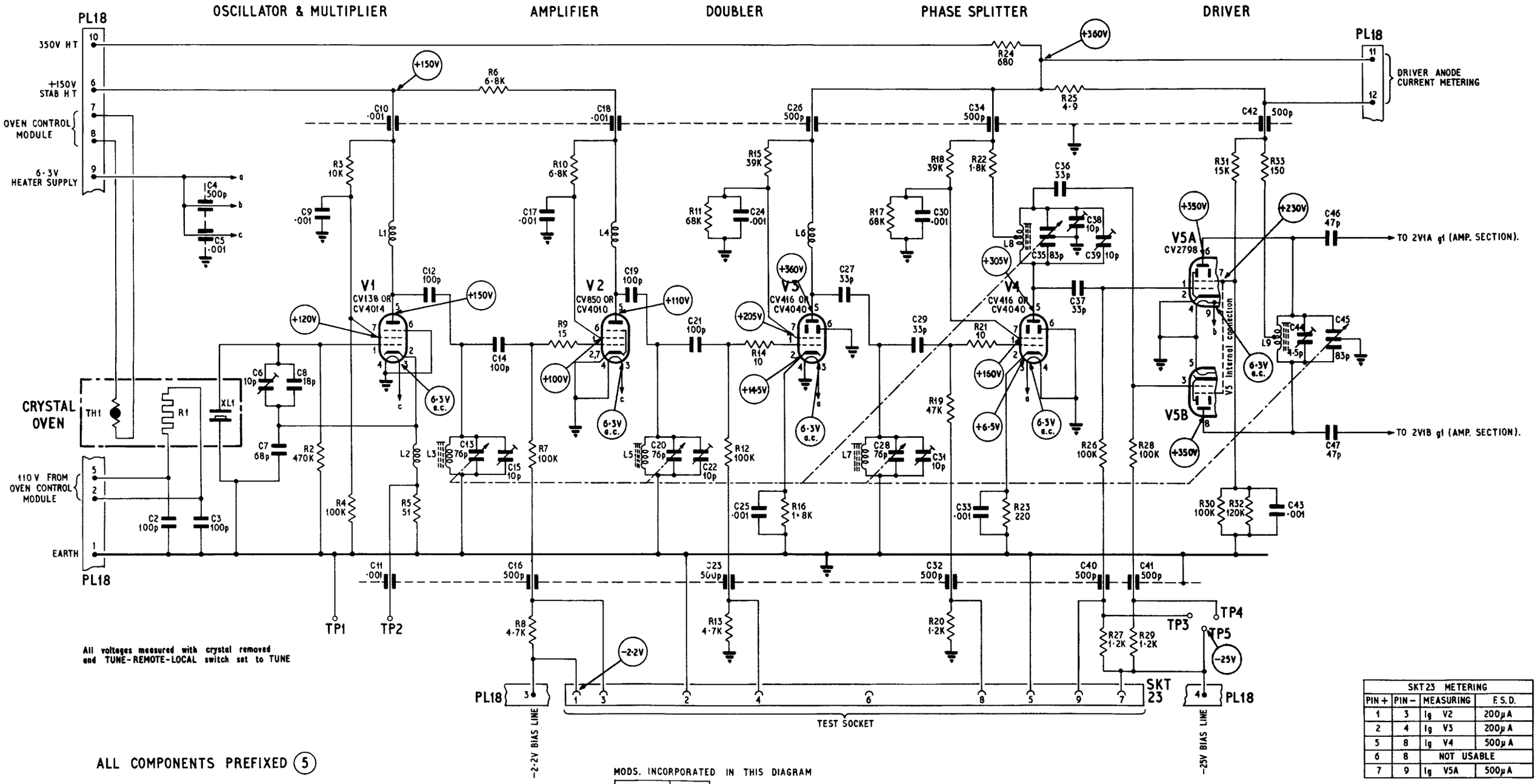
TABLE 6

Modifications

Mod. No.	Class	Topic -2 Leaflet	Topic -2 A.L.	Label No.	Brief details of change
5623	B/3	B12	13	1	Remove 2C14, 2C15, 2C16 and 2C17 as superfluous.
5874	B/2	B22	24	2	Add 0·02μF (5C48) to the crystal oven circuit to eliminate interference.
6330	B/2	B24	27 and 31	3	Fit spring plate to ensure good contact between the stud supporting plate of 2C8.
6936	B/3	B34	38	4	Change wiring to reduce h.t. voltage applied to the screen grid of 2V1. Mod.No.6937 to the chassis assembly is associated.
9347	B/2	B48	58	5	Add 220 ohm (5R34) in series which 5C48 in the crystal oven to minimize sparking at the thermostat contacts.
A2871	C/3 W.O.T.S.A.C.			6	Replace 5C9, 5C17, 5C24 and 5C25 by capacitors of same value but different fixing. Production of former items discontinued.

TABLE 6 (cont.)

Mod. No.	Class	Topic -2 Leaflet	Topic -2 A.L.	Label No.	Brief detals of change
A3105	B/2			7	Introduced improved method of crystal oven temperature control. Mod.No.A3106 to the chassis assembly is associated.



SKT 23 METERING			
PIN +	PIN −	MEASURING	F.S.D.
1	3	Ig V2	200μA
2	4	Ig V3	200μA
5	8	Ig V4	500μA
6	8	NOT USABLE	
7	9	Ig V5A	500μA

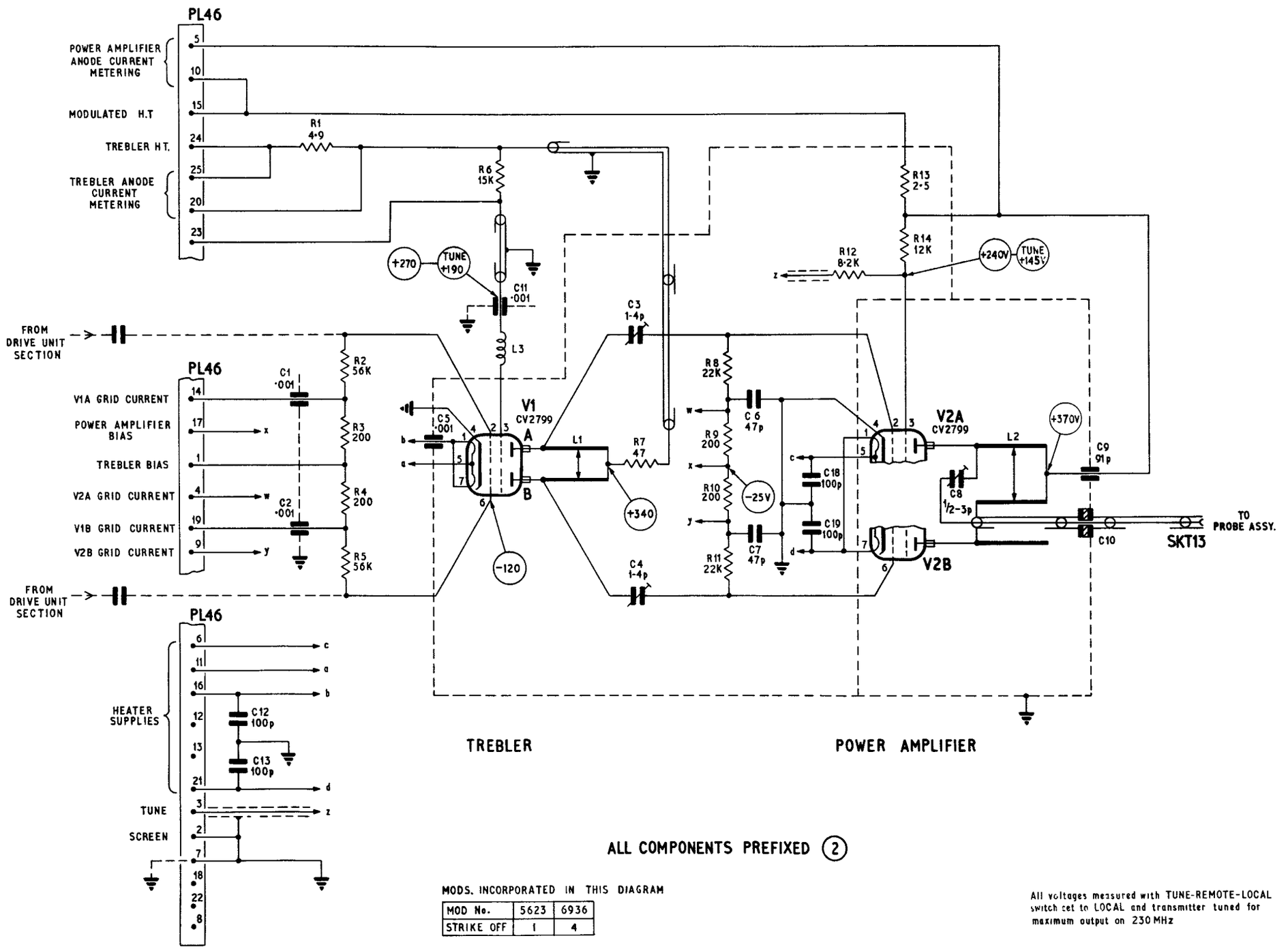
MODS. INCORPORATED IN THIS DIAGRAM

MOD No	A3105
STRIKE OFF	7

AIR DIAGRAM - MIN
116E-0252-MD64
BY COMMAND OF THE DEFENCE COUNCIL FOR USE IN THE ROYAL AIR FORCE
ISSUE 3 Prepared by the Ministry of Technology

Drive unit section of amplifier oscillator 5820-99-999-2332: servicing circuit

Fig. 2



ALL COMPONENTS PREFIXED (2)

MODS. INCORPORATED IN THIS DIAGRAM

MOD No.	5623	6936
STRIKE OFF	1	4

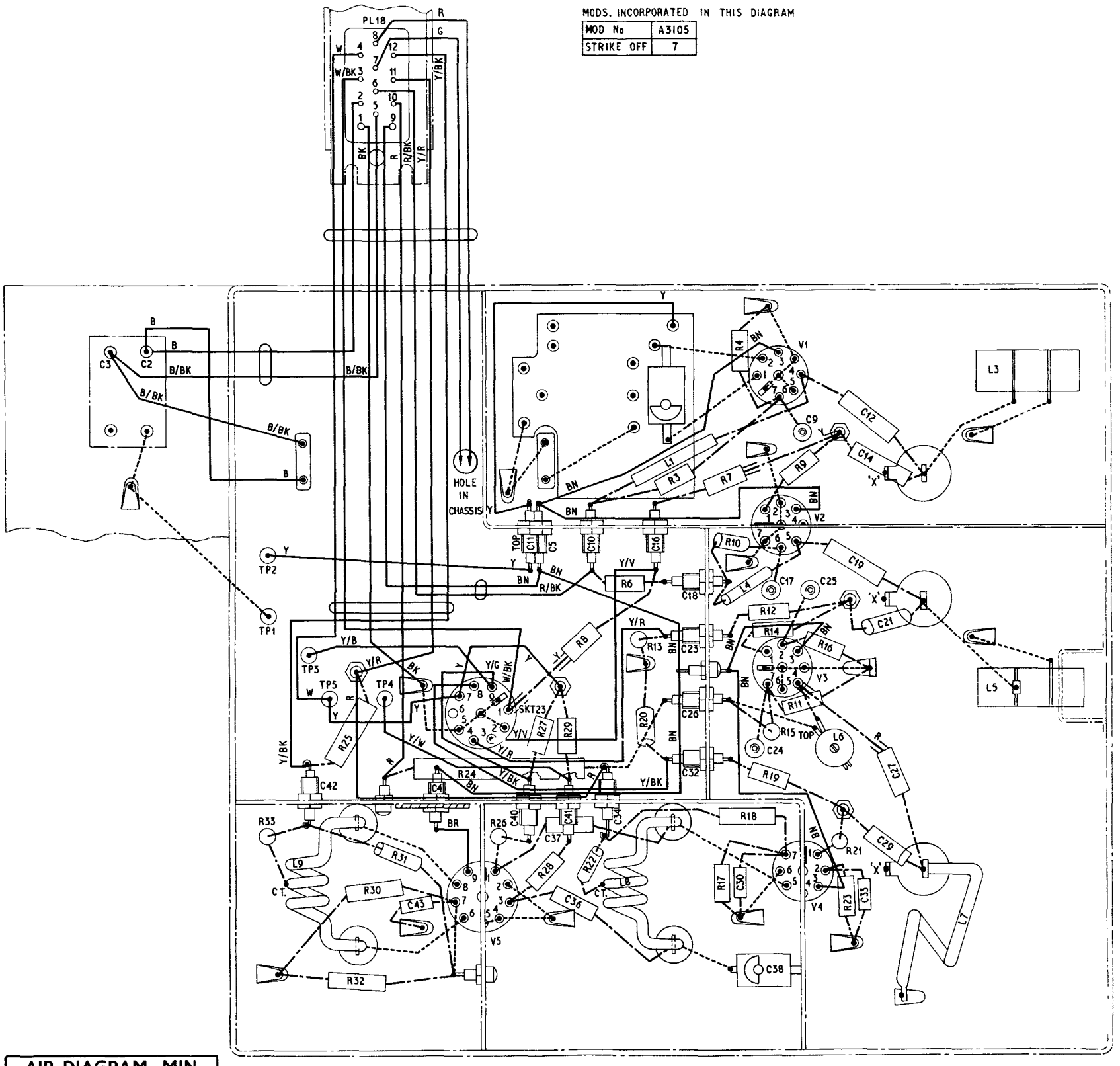
All voltages measured with TUNE-REMOTE-LOCAL switch set to LOCAL and transmitter tuned for maximum output on 230 MHz

AIR DIAGRAM - MIN
116 E - 0252 - MD65
BY COMMAND OF THE DEFENCE COUNCIL FOR USE IN THE ROYAL AIR FORCE
ISSUE 3 Prepared by the Ministry of Technology

Amplifier section of amplifier oscillator 5820-99-999-2332: servicing circuit Fig.3

MODS. INCORPORATED IN THIS DIAGRAM

MOD No	A3105
STRIKE OFF	7



N B. WHEN SOLDERING CONNECTIONS TO L5 & L6 ENSURE THAT CONNECTIONS ARE MADE TO COIL TERMINATIONS AND NOT TO END OF CIRCLIP.

KEY TO WIRING :—

- WIRE FORMING PART OF COMPONENT.
- WIRE FORMING PART OF COMPONENT & COVERED WITH SLEEVING.
- WIRE SILVER PLATED COPPER
- WIRE EQUIPMENT 7/·0076 (OR AS OTHERWISE MARKED) TO DEF 12.
- REPRESENT LEADS IN CABLEFORM.

LEADS TO BE AS SHORT & DIRECT AS POSSIBLE.

- Y/BK — DENOTES A YELLOW WIRE WITH BLACK MARKER.
- R — DENOTES A RED WIRE WITH NO MARKER

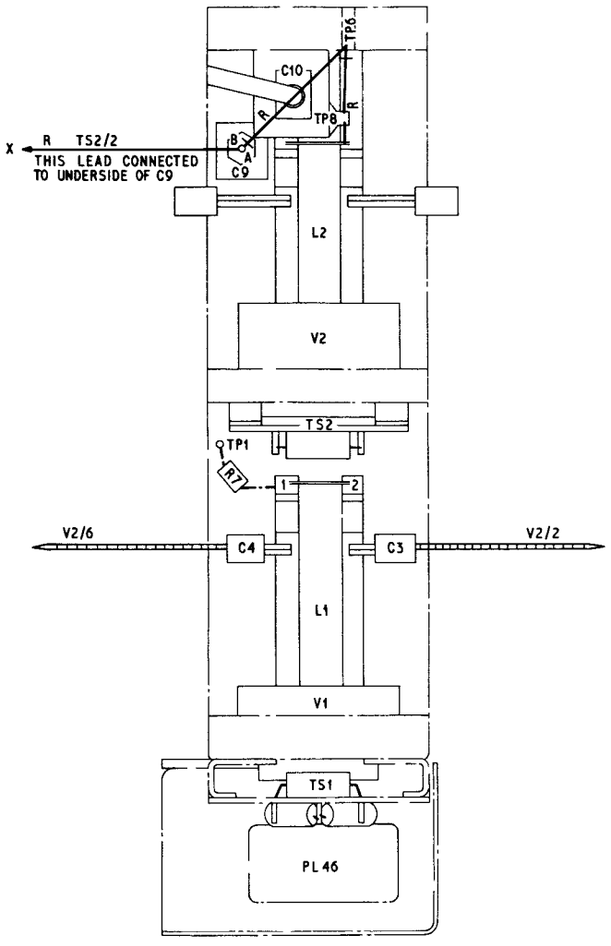
NOTES

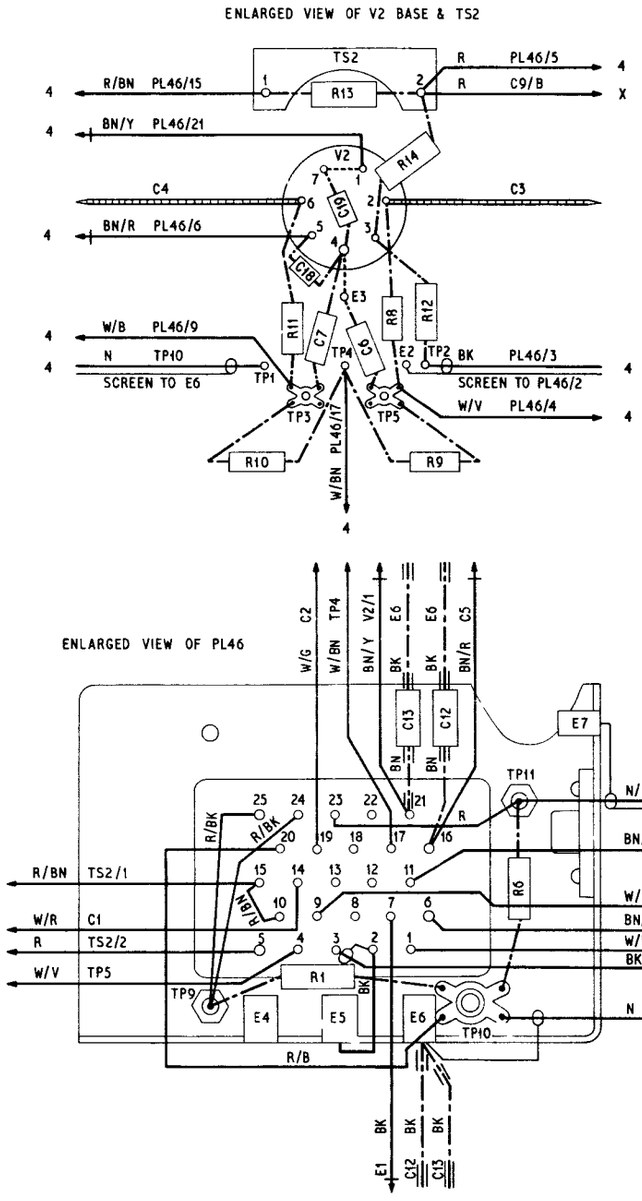
1. PIN 4 OF V2 & V4 PIN 5 OF V5 TO BE SOLDERED TO SCREENS
2. THE SILVER PLATED COPPER WIRE MUST NOT TOUCH THE CHASSIS EXCEPT AT EARTH TAGS
3. AT POINTS MARKED 'X' THE TAGS ON GANG CAPACITORS ARE TO BE SECURELY SOLDERED TO CHASSIS
4. ALL CONNECTIONS TO BE SOLDERED
5. C33 IS TO BE WIRED AS CLOSE AS IS PRACTICAL TO CHASSIS TO ENSURE FREE ADJUSTMENT OF L7 IRON DUST CORE (NOT SHOWN)
6. R33 TO CT L9 & R22 TO C.T L8 TO BE LOCATED AND SOLDERED INTO HOLES PROVIDED
7. THE FOLLOWING COMPONENTS ARE TO BE PROTECTED BY THERMAL SHUNTS DURING SOLDERING: 1. RESISTORS HIGH STABILITY 2. RESISTORS WIRE WOUND 1% TOL
8. MARKERS ITEMS 119 TO 124 TO BE FITTED WHERE INDICATED ON EACH END OF LEAD IN A VISIBLE POSITION
9. CONNECTIONS L7 L8 & L9 TO GANG CAPACITOR TAGS ARE TO BE SOLDERED IN POSITION BEFORE SOLDERING REMAINING COMPONENTS.

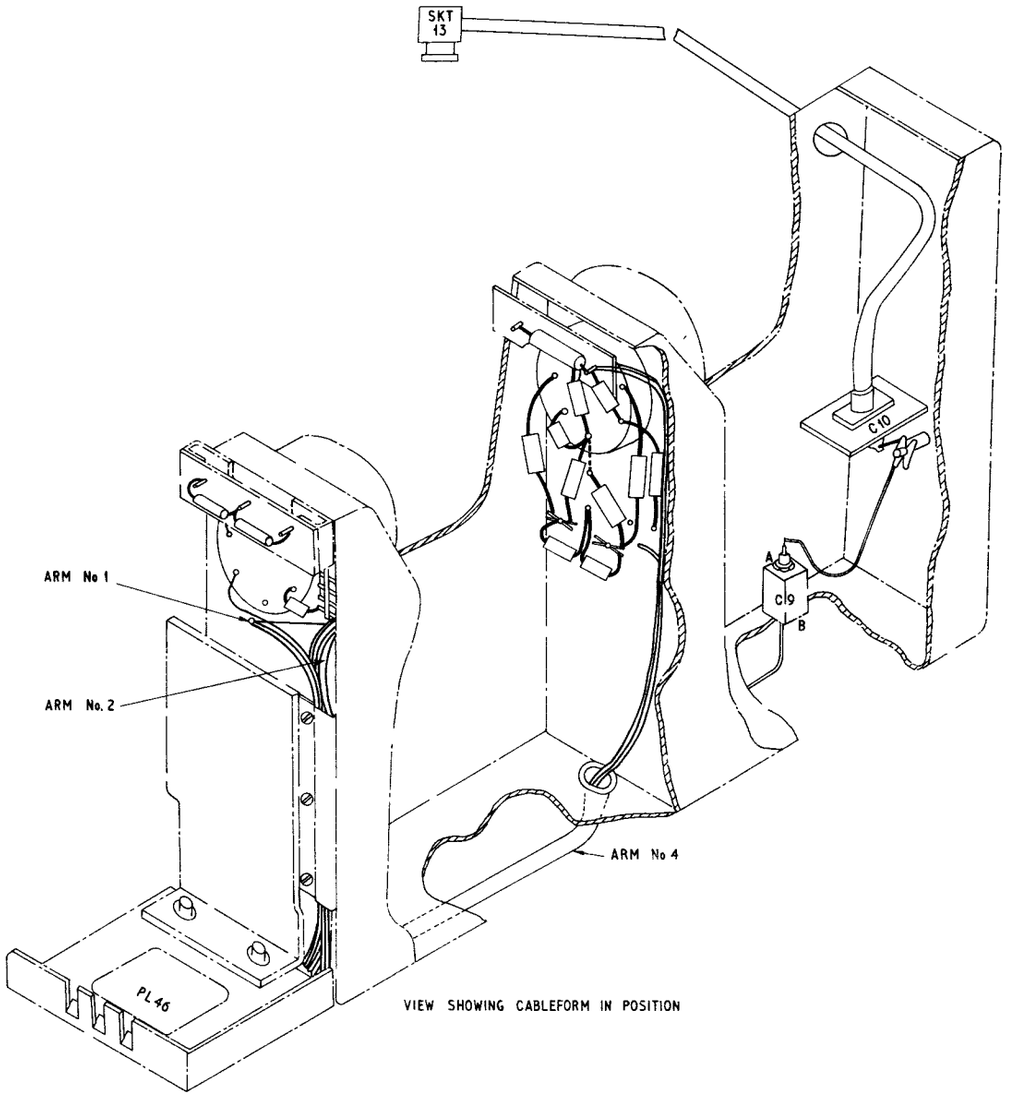
AIR DIAGRAM - MIN
116E - 0252 - MD66
BY COMMAND OF THE DEFENCE COUNCIL FOR USE IN THE ROYAL AIR FORCE
ISSUE 2 Prepared by the Ministry of Technology

Drive unit section of amplifier oscillator 5820-99-999-2332: wiring

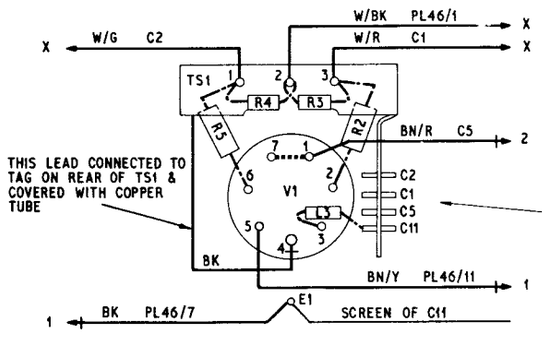
Fig. 4

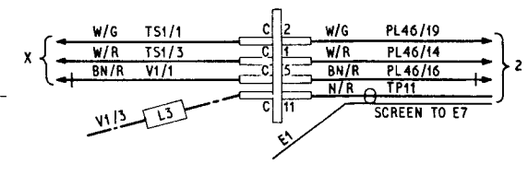






VIEW SHOWING CABLEFORM IN POSITION





NOTES:

1. ALL JOINTS TO BE SOLDERED
2. KEY TO WIRING —

——·——·——	DENOTES WIRE FORMING PART OF A COMPONENT
- - - - - - - -	DENOTES BARE SILVER PLATED COPPER WIRE 18 S W G
▭▭▭▭▭▭	DENOTES BARE SILVER PLATED PHOS BRONZE STRIP 35 S W.G $\frac{1}{8}$" WIDE
═══·═══	DENOTES WIRE FORMING PART OF A COMPONENT AND COVERED WITH SLEEVING
——o	DENOTES SINGLE SCREENED WIRE T.M.C TP446
——	DENOTES THE SCREEN
——→	DENOTES WIRE ELECTRICAL EQUIPMENT TYPE 2 7/-0076 } TO DEF 12
——+	DENOTES WIRE ELECTRICAL EQUIPMENT TYPE 2 14/-0076 } COLOUR AS SPECIFIED

Y	B	PL46	9	4	X
COLOUR OF WIRE	COLOUR OF MARKER	COMPONENT AT OTHER END	TERMINAL No	CABLEFORM ARM No	WIRES NOT IN CABLEFORM

MODS INCORPORATED IN THIS DIAGRAM

MOD. No	5623	6936
STRIKE OFF	1	4

AIR DIAGRAM-MIN
116E - 0252 - MD67
BY COMMAND OF THE DEFENCE COUNCIL FOR USE IN THE ROYAL AIR FORCE
ISSUE 2 Prepared by the Ministry of Technology

Amplifier section of amplifier oscillator 5820-99-999-2332: wiring

Fig. 5

Chapter 4

MONITOR, RADIO FREQUENCY, 6625-99-999-2378

CONTENTS

Introduction

Purpose of unit

1. The monitor, radio frequency, 6625-99-999-2378 (referred to as the monitor throughout the remainder of this chapter) is used in both the transmitter, radio, 5820-99-932-5698 and the amplifier, radio frequency, 5820-99-932-5693. The monitor operates in conjunction with the appropriate probe assembly (6625-99-999-2147 in the transmitter and 6625-99-999-0697 in the amplifier) to provide a means of metering r.f. power output, reflection coefficient (the degree of mismatch between the transmitter or the amplifier and the aerial system) and modulation depth.

Note...

The titles of the monitor controls are engraved on labels on the front panels of the transmitter and the amplifier. These titles differ between the two equipments, however, the CAL potentiometer 3RV2 and the MON jack socket 3JK1 on the transmitter being entitled CALIBRATE and MONITOR OUTPUT respectively on the amplifier. In addition, the

MON SWITCH (3S1) on the transmitter has no equivalent title on the amplifier. To avoid confusion, therefore, these controls will be referred to throughout the remainder of this chapter by their transmitter titles, i.e., CAL, MON and MON SWITCH respectively.

2. The metering facilities provided are selected by the MON SWITCH and indicated by the front panel meter when the METER SWITCH is set to position 9 (transmitter) or position 5 (amplifier). The facilities selected by the MON SWITCH are as follows:-

(1) POWER (r.f. power output).

(2) CAL (meter calibration by means of the CAL potentiometer).

(3) R.COEFF (reflected power in the aerial system expressed as a percentage of the forward power).

(4) MOD% (depth of modulation).

(5) MON (audio monitoring of the transmission via the MON jack socket).

Note...

The probe assemblies 6625-99-999-2147 and 6625-99-999-0697 are fitted with diodes CV2290 and CV448 respectively. CV7110 diodes are now being supplied as alternatives to the CV2290 (see also Chap. 1) and, since these alternatives have greater sensitivity, it has been necessary to change the value of the CAL control 3RV2 (Mod. No. 9753) to enable the monitor to be used with all three types of diode.

3. A servicing circuit and wiring diagram of the monitor are given in fig. 2 and 3 respectively at the end of this chapter.

Test equipment

4. The following items of test equipment are required:-

(1) ◀ Multimeter CT498 (Ref. No. 5QP/17447). ▶

(2) Signal generator Type 65B, 6625-99-932-4976.

(3) Headset, low impedance (Ref. No. 10AH/9).

(4) Components for a test assembly (fig. 1) as follows:-

(a) Resistor, variable, wirewound, 5 kilohm ½ W (5905-99-011-9861).

(b) Resistor, variable, wirewound, 500 ohm, ½ W (5905-99-011-9858).

(c) Resistor, fixed, composition, 820 ohm, ½ W, 5% (5905-99-021-5232).

(d) Battery, dry, 4.5V.

Note...

The stock numbers in brackets are of suggested components, any equivalently rated components may be used.

Servicing notes

Removal of unit

5. The procedure for removing and refitting the monitor is as follows:-

(1) Remove the MON SWITCH and CAL control knobs from their shafts on the front panel.

(2) Remove from the front panel the four screws (countersunk on the transmitter and cheese head on the amplifier) which secure the monitor to the rear of the panel.

(3) Withdraw the monitor from the rear of the front panel.

(4) Refit the monitor be reversing the removal procedure.

Switch renewal

6. Should a fault develop in the MON SWITCH no attempt must be made to effect a repair; the switch must be renewed.

Performance tests

7. If the transmitter or the amplifier performance is not satisfactory, the internal metering system should be used to locate the faulty section, as described in Sect. 1, Chap. 2 (transmitter), and Sect. 2, Chap. 2 (amplifier), of Vol. 1, Part 2, of this publication. Should all meter readings be normal, except those obtained with the METER SWITCH in position 9 (transmitter) or position 5 (amplifier), the fault is most likely to be in the probe assembly or the monitor. If the latter unit is suspect, switch off the equipment and test the monitor.

(1) Proceed as follows:-

(a) If the monitor in the transmitter is to be tested, unscrew the large knurled retaining nut on the upper (forward) tower of the probe assembly and pull the tower out of the assembly. Unscrew the small knurled nut at the top of the tower and, using a soldering iron with a miniature bit, unsolder the screened lead connected to the resistor inside the twoer.

(b) If the monitor in the amplifier is to be tested, remove the two screws which secure the small metal housing adjacent to the probe assembly and pull the housing away from the chassis side frame. Unsolder the screened lead from the junction of resistors 2R39 and 2R40 inside the housing.

(2) Connect the components of the test assembly (para. 4(4) as shown in fig. 1. Set the 5-kilohm resistor approximately to its centre of travel and the 500-ohm resistor for zero reading in the multimeter.

Set the multimeter to its 2.5V or 3V d.c. range.

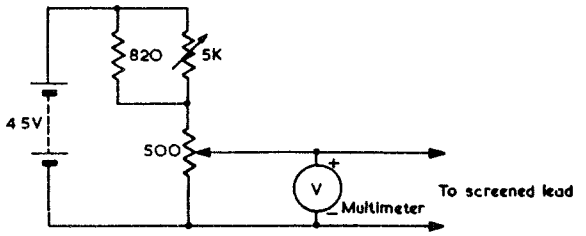


Fig.1. Test assembly circuit

(3) Connect the test assembly to the screened lead disconnected in sub-para. (1). The wiper of the 500-ohm resistor (positive of the multimeter) to the centre conductor of the screened lead and the negative of the battery (negative of the multimeter) to the screening.

Note...

If the monitor in the transmitter is being tested, a short length of sleeving over the centre conductor of the screened lead will prevent accidental contact with the ferrule.

(4) Set the METER SWITCH to position 9 (position 5 if the monitor in the amplifier drawer is being tested) and set the MON SWITCH TO POWER. Using the 500-ohm and 5-kilohm resistors of the test assembly as coarse and fine adjusters respectively, set them for a reading o 1.5V on the multimeter. The reading on the front panel meter should be between 47 and 57; note the actual reading.

(5) Set the CAL control fully counter-clockwise and the MON SWITCH TO CAL. Re-adjust the resistors of the test assembly to obtain the same reading on the front panel meter as in sub-para. (4). The reading on the multimeter should be between ◄ 2.7V and 3.1V ►.

(6) With the MON SWITCH left at CAL, reset the 500-ohm resistor of the test assembly for minimum reading on the multimeter. Turn the CAL control fully clockwise and carefully re-adjust the resistors of the test assembly to obtain the same front panel meter reading as in sub-para. (4). Note reading on the multimeter, this should be between 0.2V and ◄ 0.27 ►.

(7) Reset the 5-kilohm resistor of the test assembly approximately to its centre of travel and the 500-ohm resistor for zero reading in the multimeter. Unsolder the connections between the test assembly and the screened lead of the probe assembly and connect the test assembly in a similar way to:-

(a) If the monitor in the transmitter is being tested, to the screened lead disconnected from the lower (reflected) tower.

(b) If the monitor in the amplifier is being tested, to the screened lead disconnected from the junction of 2R37 and 2R38.

(8) Set the MON SWITCH to R.COEFF and re-adjust the 500-ohm and 5-kilohm resistors of the test assembly to obtain the same reading on the front panel meter as noted in sub-para. (4). The multimeter reading should now be the same as that noted in sub-para.(6).

(9) Disconnect the test assembly and connect the 600-ohm output terminals of the signal generator CT433 to the screened lead disconnected from the upper (forward) tower (or 2R39 and 2R40 junction in the case of the amplifier). Connect the multimeter, set to the 10V a.c. range, across the signal generator output.

(10) Switch on the signal generator, set its output frequency to 100 Hz and turn the METER SWITCH TO MOD%. With the CAL control still turned fully counter-clockwise, advance the signal generator OUTPUT control until full scale deflection is obtained on the front panel meter. Ensure that the multimeter reading lies between ◄ 4V and 6V ►.

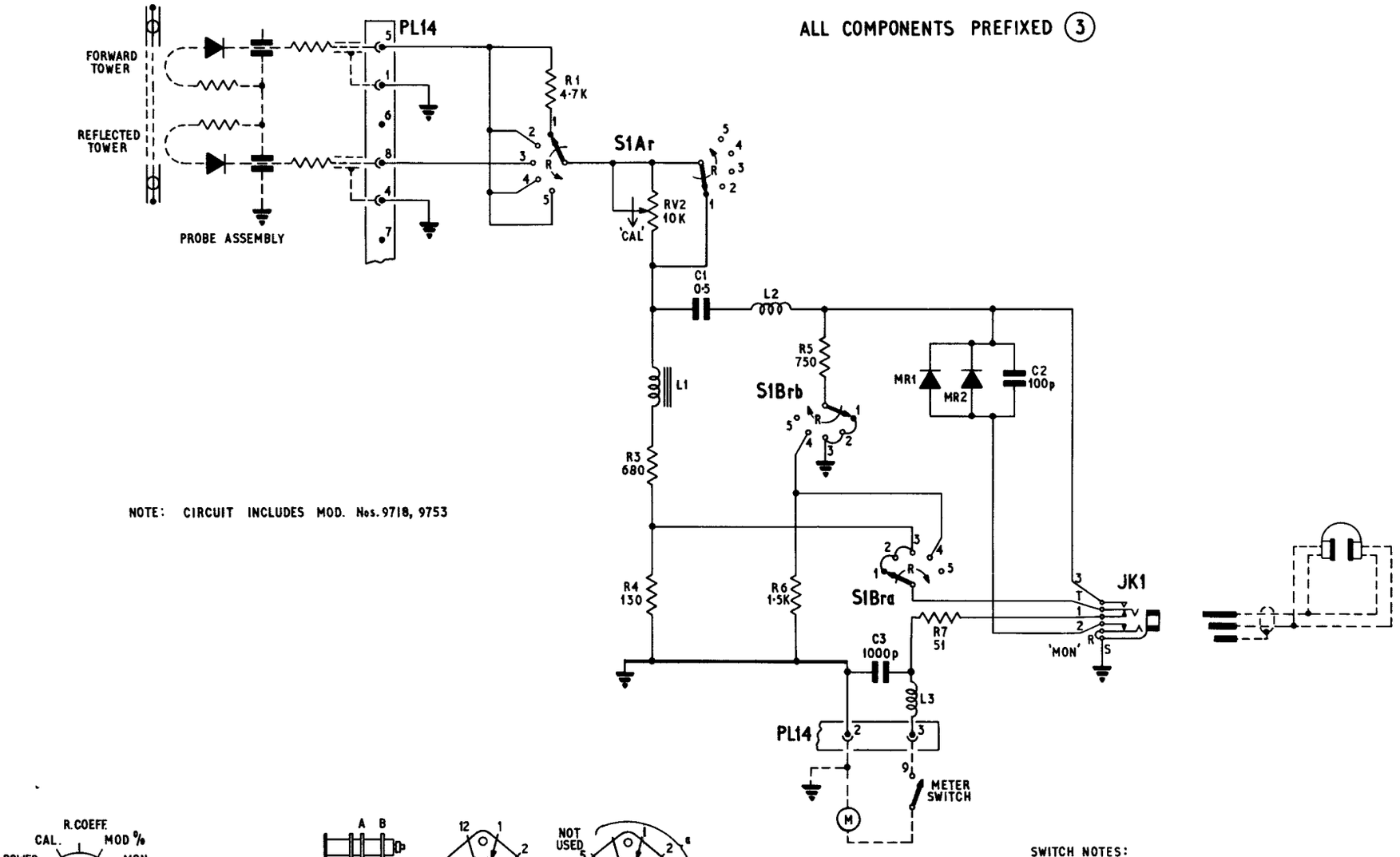
(11) Insert the plug of the headset into the MON socket and turn the MON SWITCH TO MON. Ensure that as the CAL control is slowly turned clockwise the level of the 1000 Hz note heard in the headset rises smoothly. (It may be necessary to reduce the signal generator output to perform this test).

8. On satisfactory completion of the performance tests, remove all test gear and restore the equipment to its normal operating conditions.

TABLE 1

Modifications

Mod. No.	Class	Topic - 2 Leaflet	A.L.	Label No.	Brief details of change
5396	B/2	B11	12	1	Change in lengths of certain wiring to reduce the possibility of spurious modulation being indicated on the meter
9718	B/3	B56	69	2	Change 3C3 from 0.01μF to 100pF and introduce low pass filter 3L3 between the junction 3R7/3C3 and pole 3 of 3PL14.
9753	B/3 on replacement of probe assembly	B55	68	3	Change 3RV2 from 5k to 10k to compensate for higher meter current due to the greater sensitivity of the CV7 110 diodes used in the probe assembly 6625-99-999-2147.



SWITCH NOTES:

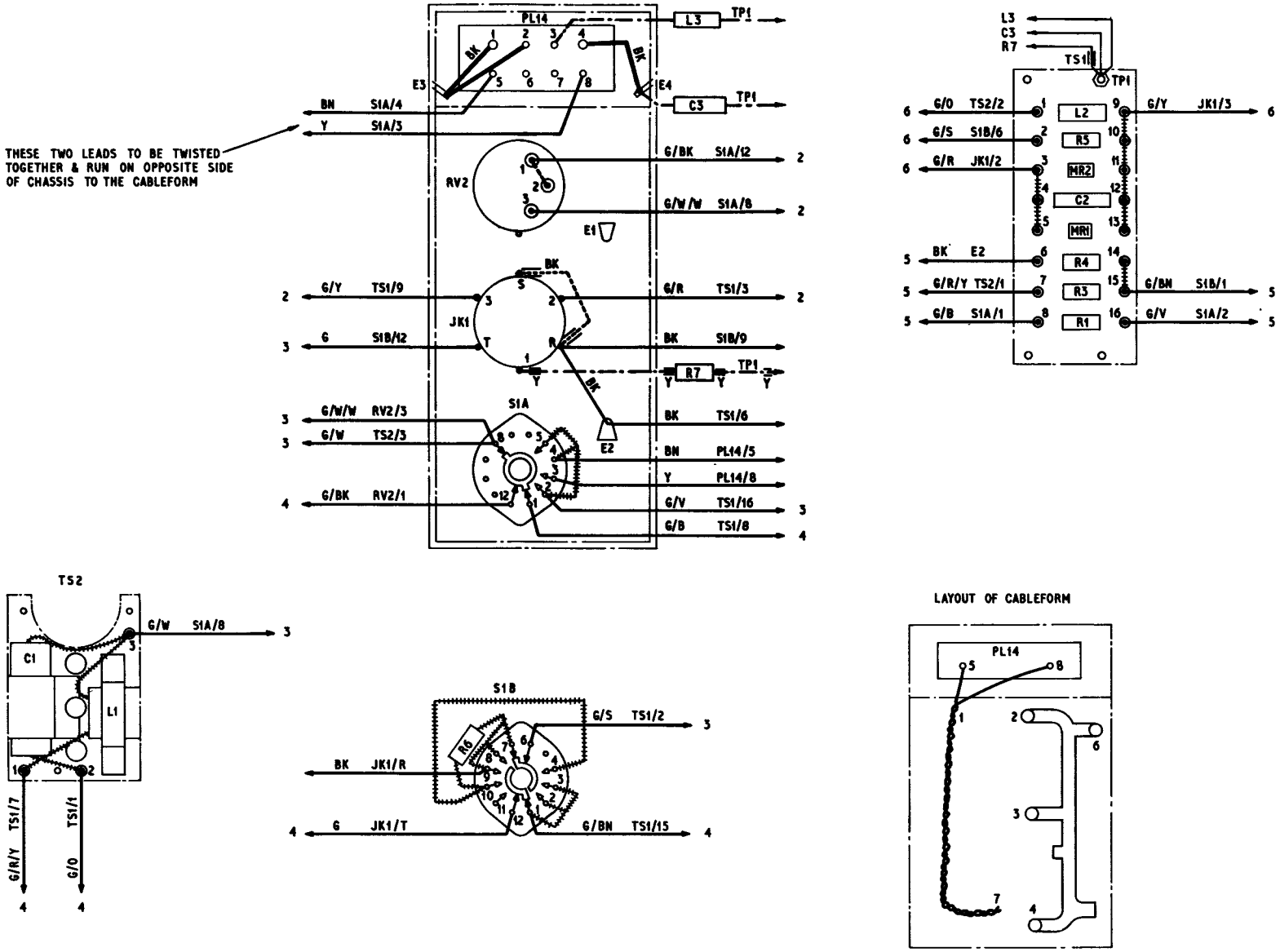
1. SWITCH SHOWN IN FULLY COUNTER-CLOCKWISE POSITION.
   SWITCH POS 1 FORWARD POWER.
   POS 2 CALIBRATE.
   POS 3 REFLECTION COEFFICIENT.
   POS 4 MOD DEPTH %
   POS 5 AURAL MONITORING.
2. ←R— INDICATES DIRECTION OF TRAVEL FOR CLOCKWISE ROTATION OF CONTROL KNOB.

AIR DIAGRAM 6726 Q /MIN.
ISSUE 2
BY COMMAND OF THE DEFENCE COUNCIL FOR USE IN THE NAVAL SERVICE/ROYAL AIR FORCE (Prepared by the Ministry of Aviation)

Monitor, radio frequency 6625-99-999-2378: servicing circuit

Fig. 2

D.88503 405 6/66 A.(C)Ltd. Gp.956/3 124M



NOTES:

1. KEY TO WIRING:-
   - DENOTES WIRE ELECTRICAL EQUIPMENT TYPE 2 7/-0076 } TO DEF. 12A COLOUR AS SPECIFIED.
   - DENOTES WIRE ELECTRICAL EQUIPMENT TYPE 2 14/-0076 }
   - DENOTES WIRING PREWIRED AT SUB-ASSEMBLY STAGE.
   - DENOTES WIRE FORMING PART OF A COMPONENT.
   - DENOTES WIRE FORMING PART OF A COMPONENT & SLEEVED.
   - DENOTES WIRE T.C. 22 S.W.G. TO B.S.128.
   - DENOTES WIRE T.C. 22 S.W.G. TO B.S.128 & SLEEVED.

   G /Y JK1 /3 → 2
   G = COLOUR OF WIRE; /Y = COLOUR OF MARKER; JK1 = COMPONENT AT OTHER END; /3 = TERMINAL No.; 2 = CABLEFORM ARM No.

2. CONNECTIONS TO SWITCH TO BE MADE AS LOW ON TAGS AS POSSIBLE.
3. ALL JOINTS TO BE SOLDERED.
4. ALL EARTH LEADS TO BE AS SHORT AS POSSIBLE.
5. HIGH STABILITY RESISTOR R7 TO BE PROTECTED BY A THERMAL SHUNT DURING SOLDERING.
6. DIAGRAM INCLUDES MOD. No. 9718.

Monitor, radio frequency 6625-99-999-2378: wiring diagram Fig. 3

AIR DIAGRAM
6726 R /MIN.
ISSUE 2

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FOR USE IN THE
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(Prepared by the Ministry of Aviation)

D.88503 405 6/66 A.(C)Ltd. Gp.956/3 124M

Chapter 5

POWER SUPPLY 5820-99-932-4003

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LIST OF ILLUSTRATIONS

Introduction

Purpose of unit

1. The function of the power supply 5820-99-932-4003 is to provide all h.t., l.t., bias and relay voltages required by the transmitter, radio 5820-99-932-5698. The power supply contains three mains transformers, the primary windings of which can be set to operate on supply voltages of 105V to 130V or 200V to 250V a.c. at 45 c/s to 65 c/s.

2. One mains transformer has a single secondary winding, the output of which is rectified by a full-wave valve rectifier and smoothed by a capacitor input filter to provide 400V h.t. for the transmitter p.a. stage. A resistor network drops the 400V supply to 350V to provide h.t. for the preceding r.f. stages and a neon stabilizer circuit connected to the 400V line provides a 150V stabilized h.t. supply for the crystal oscillator. Part of the output of this secondary winding is rectified by a full-wave metal rectifier and smoothed by a capacitor input filter to provide, via potential dividing networks, various negative bias supplies.

3. Another mains transformer also has a single secondary winding. Its output is rectified by a full-wave valve rectifier and smoothed by a capacitor input filter to provide a 300V h.t. supply for the transmitter modulator.

4. The third mains transformer has five secondary windings, four of which provide l.t. supplies of 6·3V. The output of the remaining secondary winding is rectified by a metal rectifier bridge to provide a negative 48V supply for the thermal delay, press-to-talk and line relays. The thermal delay relay allows the heaters of the valve rectifiers to warm up before the various h.t. circuits are loaded. The oscillator crystal oven and blower motor are supplied with 110V a.c. which is tapped off from the primary winding of this transformer. A metal rectifier bridge connected across the primary winding provides for metering of the mains supply voltage and provision is also made for metering certain supply voltages and currents in the unit. A servicing circuit and wiring and cableform diagrams are given in fig. 1, 2 and 3 respectively at the end of this Chapter.

Test equipment

5. The following items of test equipment are required:—

(1) Oscilloscope CT386A 6625–99–943–7177.

(2) Test set, radio 6625–99–943–3377.

Servicing notes

Removal of unit

6. Removal of the power supply from the transmitter is normally required only if major components have to be renewed. Should this prove necessary in installations where the transmitter is located at the bottom of a stack of equipment it may be found easier to withdraw the transmitter from the cover before attempting to remove the power supply from the transmitter, because the power supply securing screws are located on the underside of the transmitter. The procedure for removing and refitting the transmitter is described in A.P.116E–0252–1, Part 2, Sect. 1, Chap. 2. The procedure for removing and refitting the power supply is as follows:—

(1) Remove the two hinge screws at the rear of the chassis top cover, slacken the six securing screws (three on each side of the cover) and lift off the cover.

(2) Release the retaining clips from 6SKT20 and 6PL21 on the power supply chassis and remove 6SKT20 and 6PL21.

(3) Unscrew the four captive bolts next to the handles on the transmitter front panel and pull the transmitter forward to the extent of the slots in the runners. Unscrew the six green-ringed captive screws (located on the underside of the transmitter) which secure the power supply to the transmitter and lift the unit out of the transmitter.

(4) The power supply should be refitted by reversing the above procedure.

Extension connectors

7. If required, the complete transmitter may be operated with the power supply removed, thus facilitating servicing. Connections between power supply and transmitter are then made by means of the two 25-pole connectors supplied as part of the test set, radio.

Relay replacement

8. Should either of the relays in the power supply prove faulty, they must be renewed. The procedure for changing the delay relay $\frac{6DR}{2}$ is as follows:—

(1) Remove the relay retaining nut from the centre of the relay socket and lift off the relay retaining spring.

(2) Remove from the front of the chassis the four screws which secure the relay mounting bracket and pull the bracket clear of the chassis, taking care not to strain any of the leads connected to the relay socket. Remove the relay from its socket.

(3) Fit the new relay by reversing the above procedure.

9. The procedure for changing the press-to-talk relay $\frac{6PT}{4}$ is as follows:—

(1) Remove from the underside of the chassis the five green-ringed screws which secure the capacitor (6C13, 6C9, 6C2, 6C10) retaining bracket and pull the complete capacitor assembly clear of the chassis taking care not to strain any of the leads connected to the capacitor terminals.

(2) Remove from the front of the chassis the two screws which secure the relay mounting bracket and pull the bracket clear of the chassis, taking care not to strain any of the leads connected to the relay terminals. Note which lead is connected to each terminal and unsolder the leads from the terminals.

(3) Remove the two screws which secure the relay to the bracket.

(4) Fit the new relay by reversing the above procedure.

Internal metering

10. The built-in metering system associated with the transmitter may be used to measure certain voltages and currents in the power supply. To make use of the metering facilities, insert the orange-ringed 9-pole metering plug into 6SKT24 on the power supply chassis. Although the currents and voltages measured by the metering system should be within the limits listed in Table 1, these limits are not absolute. They should be used as a guide only and, where a meter indication is outside the given limits, ◀the overall performance of the transmitter should be considered as an indication of serviceability. Two metering labels, on the transmitter, each have a blank column in which readings should be recorded (see notes in Table 1).▶

TABLE 1

Power supply—internal metering

METER SWITCH position	Measurement	FSD	Limits *
1	+150V stabilized h.t. current	25mA	30–40
2	+350V h.t. current	500mA	34–56+
3 & 4	−48V supply	100V	50–60
5	−150V bias	300V	44–56
10	A.C. mains supply	300V	72–80
11	+400V h.t.	500V	66–86+
12	+300V h.t.	500V	50–70

*For guidance only: record actual readings taken on the fully serviceable equipment to establish serviceability. After servicing re-record the readings.
+Subject to variation according to frequency, so record this for subsequent comparisons.

Delay switch operation

11. Set MAINS and H.T. on the transmitter to ON and TUNE-REMOTE-LOCAL to TUNE. The blue L.T. lamp should light. Check that the red H.T. lamp lights between 30 and 70s after the L.T. lamp.

Ripple voltage measurements

12. Test the power supply smoothing circuits by measuring the ripple voltages on the +400V h.t.,+300V h.t., -150V bias and -48V supply lines, using the oscilloscope CT386A. The p-p voltages at the test points indicated, (accessible without removing the power supply) should not exceed:

(1) +400V h.t. line - 6R21/6R28 junction (6TS4/37): 15V.

(2) +300V h.t. line - 6R25/6C9 junction (6TS4/15: 4·2V.

(3) -150V bias line - 6L3/6C11 junction (6L3/B): 2·2V.

(4) -48V line - 6C17/6L5 junction (6C17/A): 15mV.

TABLE 2

Modifications

Mod. No.	Class	Topic -2 Leaflet	A.L.	Label No.	Brief details
4950	B/2	B7	8	1	Change 6FS1,2,4,5 and 6 to surge-proof types.
5014	B/2	B3	4	2	Add 4·7k (6R33) in parallel with relay 6DR/2 to prevent contact chatter.
5875	B/2	B21	23	3	Insert 1µF (6C18) across the crystal oven supply to eliminate mains-borne interference.
6322	B/2	B25	28	4	Change 6FS9 to surge-proof type.
6371	B/3 (on replacement)	B27	30	5	Replace 6C2 and 6C10 by closer tolerance types to reduce ripple on the 400V h.t. line.
6913	B/3	B33	37	6	Change 6R17 from 47k to 22k and 6R18 from 68k to 82k to reduce excessive anode dissipation of 2V1 in the amplifier oscillator.

TABLE 2 (cont)

Mod. No.	Class	Topic -2 Leaflet	A.L.	Label No.	Brief details
8798	B/2	B45	55	7	Change 6FS7 from 250 mA to 350 mA due to the rating of the former decreasing with temperature increase. Mod. No. 8799 to the main chassis is associated.
9530	B/2	B49	60	8	Change 6FS2 from 5A to 7A to withstand the high initial surge current when switching on the 1.t. supply. Mod. No. 9529 to the main chassis is associated.
A2572	C/3 on failure of relay 10F/ 0119882	B61	81	9	Introduce a fully interchangeable relay of improved internal design in lieu of relay armature 10F/0119882.
A3431	C/3	B68	91	10	Replace obsolete rectifier 6130-99-943-1730 (MR1) by rectifier 6130-99-105-1689; this necessitates the introduction of four additional wires and a threaded bush for mounting.
◄A4689	C/3			11	Reverse the wiring connections to the terminals of fuseholder FS1 to eliminate possible shock hazard.►

ALL COMPONENTS PREFIXED (6)

NOTES:
1 MAINS TAPPING PANEL CARRIES TWO SHORTING LINKS, WHICH CONNECT ALL THREE TRANSFORMERS TO THE MAINS SUPPLY. ONE PAIR OF LINKS PERMITS ANY INPUT VOLTAGE TO BE SELECTED.
2 EVOS BY MEANS OF THE LINK PROVIDED.
a. FOR NORMAL CONTROL CONNECT LKB/30 TO LKB/31 (EVOS OUT)
b FOR EVOS CONTROL CONNECT LKB/30 TO LKB/29 (EVOS IN)
3 BIAS CHAIN VOLTAGES QUOTED ARE ONLY APPROXIMATE AND ARE FOR EVOS OUT AND 'NO DRIVE ON SUB UNITS' CONDITIONS
4 FS1 HAS 2A FUSE FITTED FOR 230V INPUTS AND 5A FUSE FITTED FOR 110V INPUTS
5 CIRCUIT INCLUDES MOD NOS 4950, 5014, 5875, 6913, 8798, 9530

METERING CHART			
SKT24 +VE	PINS −VE	MEASURING	FSD
1	3	STABILIZED HT CURRENT	25mA
2	4	RF HT CURRENT	500mA
5	8	−48V	100V
6	8	−48V	100V
7	9	−150V	300V

AIR DIAGRAM-MIN
116E-0252-MD55
BY COMMAND OF THE DEFENCE COUNCIL FOR USE IN THE ROYAL AIR FORCE
ISSUE 3 Prepared by the Ministry of Technology

Power supply 5820-99-932-4003: servicing circuit

Fig. 1

Power supply 5820-99-932-4003: wiring diagram

Fig. 2

AIR DIAGRAM - MIN

116E-0252-MD68

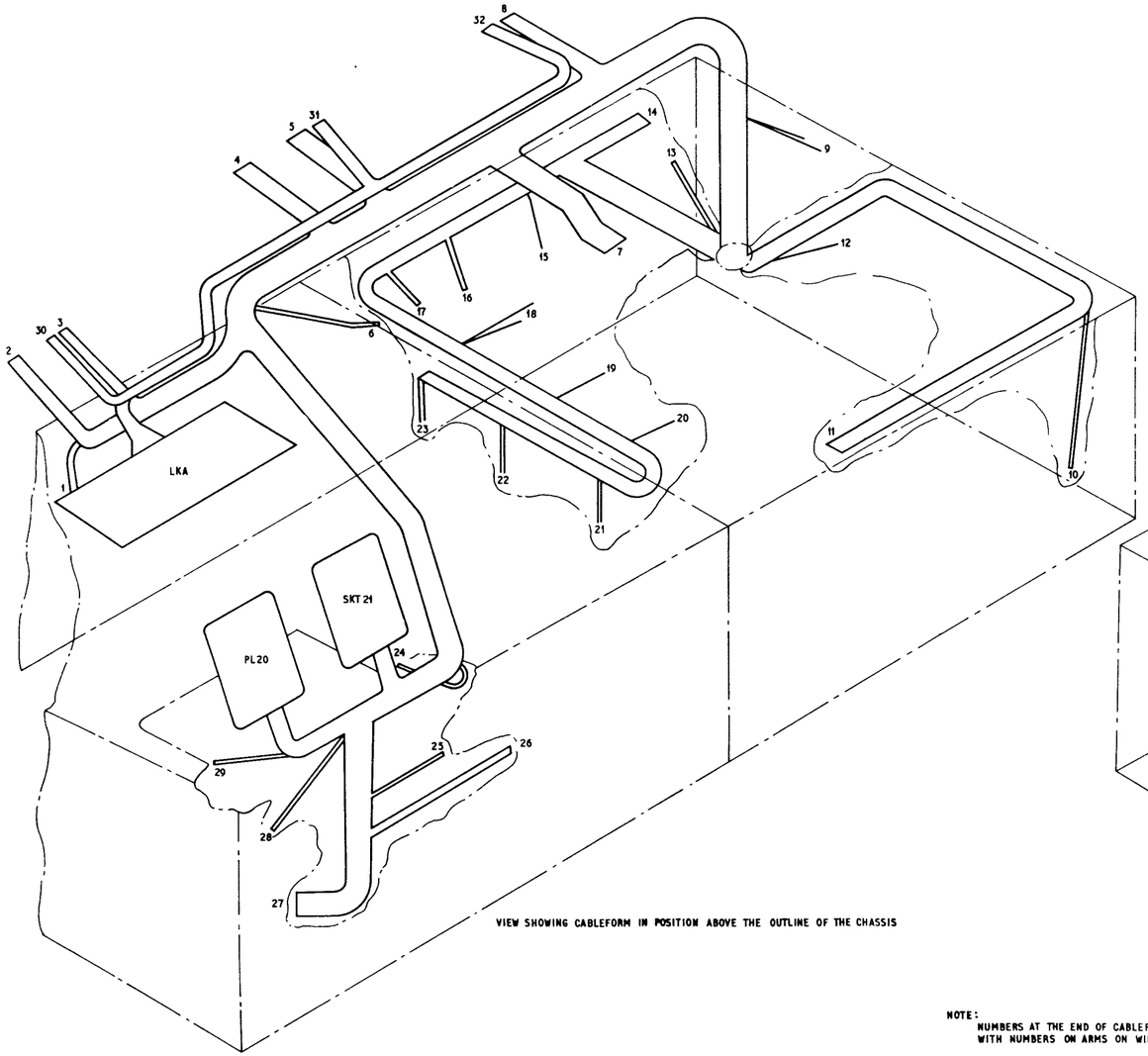
BY COMMAND OF THE DEFENCE COUNCIL FOR USE IN THE ROYAL AIR FORCE

ISSUE 3 Prepared by the Ministry of Defence

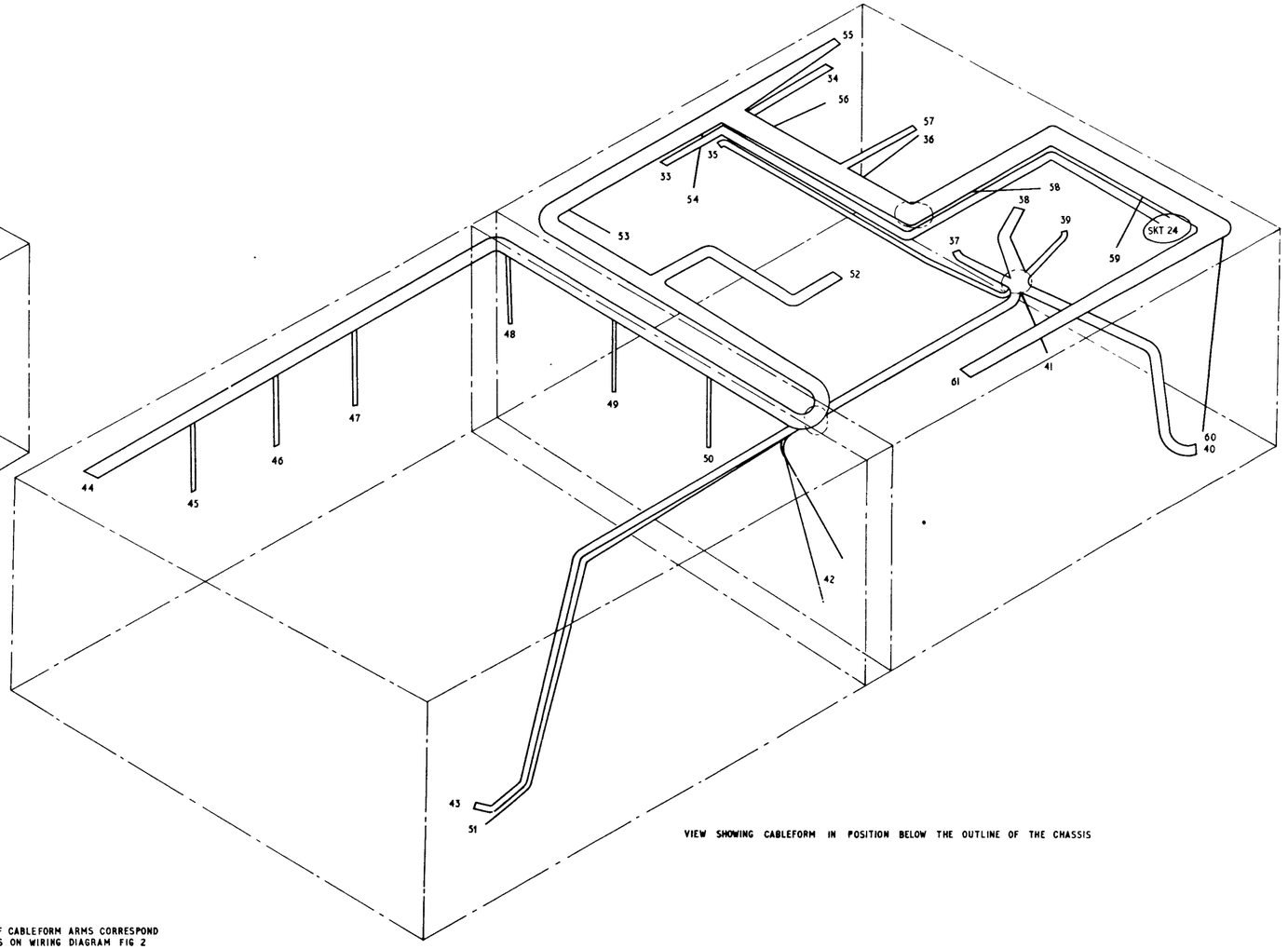
FORMERLY 6726 K/MIN

MODS INCORPORATED IN THIS DIAGRAM

MOD. No.	5014	5875	A3431	A4689
STRIKE OFF	2	3	10	11



VIEW SHOWING CABLEFORM IN POSITION ABOVE THE OUTLINE OF THE CHASSIS



VIEW SHOWING CABLEFORM IN POSITION BELOW THE OUTLINE OF THE CHASSIS

NOTE:
NUMBERS AT THE END OF CABLEFORM ARMS CORRESPOND WITH NUMBERS ON ARMS ON WIRING DIAGRAM FIG 2

AIR DIAGRAM 6726L/MIN.	
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Power supply 5820-99-932-4003: cableform diagram

Fig.3

Chapter 6

COVER, ELECTRICAL, FITTED 5820-99-999-0841 AND CABLE ASSEMBLY 5995-99-932-4013

LIST OF CONTENTS

LIST OF ILLUSTRATIONS

Introduction

Purpose of units

1. The cover, electrical, fitted 5820-99-999-0841, referred to throughout the remainder of this chapter as the cover, provides a dust and moisture-proof housing for the transmitter sub-assembly 5820-99-932-5706. Runners fitted in the cover enable the transmitter sub-assembly to be withdrawn for servicing and maintenance purposes. The transmitter sub-assembly may be disengaged from the runners and removed from the cover after unscrewing four bolts and disconnecting six internal connectors.

2. The cable assembly 5995-99-932-4013 is mounted on the rear panel of the cover and carries the air blowing port, the fixed plugs and sockets for the external electrical connections to the transmitter and the cables which connect these fixed plugs and sockets to the corresponding plugs and sockets on the rear of the transmitter sub-assembly. The cables are clamped to the bottom of the cover and take up the movement of the transmitter sub-assembly on its runners. Included in the cable assembly is a gate switch which automatically disconnects the mains supply from the transmitter sub-assembly when withdrawn on its runners. The gate switch may be manually operated to restore the mains supply to the transmitter sub-assembly when it is in the withdrawn position. A neon lamp mounted on the gate switch indicates the presence of the mains supply. A servicing circuit of the cable assembly is given in fig. 1 at the end of this chapter.

Test equipment

3. The following items of test equipment are required:—

(1) Tester, insulation resistance, Type E (Ref. No. 5G/427) *or*
megger-bridge, Type D (Ref. No. 5G/483).

(2) Multimeter Type 12889 (Ref. No. 5QP/17447) *or*
multimeter Type 9980, 6625-99-943-1524.

Servicing notes

Cover

4. The cover requires little maintenance, apart from greasing the runners when necessary. The runners should first be cleaned and then a light film of lubricant applied, using grease XG271 (G-382) 9150-99-910-0510. This necessitates the removal of the transmitter sub-assembly from the cover, the removal and refitting procedures being described in Vol. 1, Part 2, Sect. 1, Chap. 2, of this publication.

5. Should either of the runners become distorted, or otherwise damaged, so as to prevent the transmitter sub-assembly from sliding in and out of the cover freely, the damaged runner must be renewed. The procedure, after removing the transmitter sub-assembly from the cover, is as follows:—

(1) For the left-hand runner only, slacken the three screws which cleat the gate switch cables to the left-hand side of the cover and pivot the cleats upwards until they are clear of the cables.

(2) Each runner is screwed to a channel which is in turn bolted to the inside of the cover. First remove the complete channel and runner assembly by unscrewing from the

outside of the cover four Allen bolts which retain the channel. Then separate the channel and runner by extending the latter until it is locked in the fully open position and removing from the fixed member the four countersunk screws. These screws pass through elongated holes in the channel and terminate in two free anchor plates. Access to the two screws nearer the front of the runner is via holes in the sliding centre member.

(3) Fix together the channel and replacement runner by means of the countersunk screws and anchor plates, but leave the screws loose enough to enable the runner to be adjusted in a fore and aft direction after refitting in the cover.

(4) Refit the complete channel and runner assembly in the cover and secure by means of the four Allen bolts. In the case of the left-hand runner, care must be taken not to trap the gate switch cables between the side of the cover and the channel. Position the runner so that when it is fully closed and pulled forward against the latch its front face is $\frac{11}{16}$ inch behind the front of the cover sealing gasket. Taking care not to move the runner from this position, open it to its full extent and tighten the four securing screws.

(5) After fitting the left-hand runner, refit the gate switch cables into their cleats and tighten the cleat securing screws.

(6) Refit the transmitter sub-assembly into the cover and, if necessary, adjust the nuts on the front of the runners and the gate switch operating bolt, as described in Vol. 1, Part 2, Sect. 1, Chap. 2, of this publication.

Cable assembly

6. The cable assembly requires little maintenance, apart from greasing the threads of the plugs and sockets when necessary. The threads should first be cleaned and then a light film of lubricant applied, using grease XG271(G–382) 9150–99–910–0510.

7. Should it prove necessary to renew the cable assembly, the procedure described in Vol. 1, Part 2, Sect. 1, Chap. 2, of this publication should be followed. Should it prove necessary to renew an individual cable, the following procedure should be adopted:—

(1) Remove the external connectors from the fixed plugs and sockets on the rear of the cable assembly and then remove the transmitter sub-assembly from the cover.

(2) If either of the gate switch cables are to be renewed, release them from the cleats on the left-hand side of the cover. Remove the two screws which secure the gate switch mounting bracket to the cover and unsolder the leads of the appropriate cable from the terminals on the rear of the gate switch. If the cable from the mains input to the gate switch is to be renewed, release the cable from the cleat on the front of the cable assembly, unsolder the cable screening braid from the earth tag on the front of the cable assembly and unscrew the dust cap retainer and plug retaining nut from the MAINS IN plug 7PL16 on the rear of the cable assembly. Push the plug through its mounting hole and withdraw the cable from the cover. If the cable from the gate switch to the transmitter sub-assembly is to be renewed, remove the cable clamps from the cable assembly and the bottom of the cover and withdraw the cable from the cover.

(3) If the REMOTE, HPA, AF.IN or AF.OUT cable is to be renewed, remove the cable clamps from the cable assembly and the bottom of the cover and unsolder the cable screening braid from the earth tag on the underside of the cable assembly. Unscrew the dust cap retainer and retaining nut from the appropriate plug or socket on the rear of the cable assembly, push the plug or socket through its mounting hole and withdraw the cable from the cover.

(4) If the AE cable is to be renewed, remove the cable clamp from the bottom of the cover, unscrew the plug retaining nut from the AE plug 7PL8 on the rear of the cable assembly, push the plug through its mounting hole and withdraw the cable from the cover.

(5) Fit the new cable by reversing the above procedure, ensuring that cables on the bottom of the cover are clamped at the cable sleeve with the word TOP uppermost. It must also be ensured that cables lie flat on the bottom of the cover and are free from kinks and twists.

(6) Refit the transmitter sub-assembly into the cover and reconnect the external connectors to the rear of the cable assembly.

Electrical tests

8. The following procedure may be used to confirm the serviceability of the cables and gate switch of the cable assembly.

(1) Remove the external connectors from the fixed plugs and sockets on the rear of the cable assembly and pull the transmitter sub-assembly fully forward on its runners. Disconnect all cables of the cable assembly from the rear of the transmitter sub-assembly and remove the neon indicator lamp from its holder on the gate switch mounting bracket.

(2) Using the insulation tester (para. 3 (1)), measure the insulation resistance between pins A and B of the MAINS IN plug 7PL16

and between both of these pins and the plug body.

(3) Measure the insulation resistance between each pin and all the other pins of the TO REMOTE plug 7PL2, the TO HPA socket 7SKT4, the AF.IN socket 7SKT32 and the AF.OUT socket 7SKT6 and between each of these pins and the plug or socket bodies.

(4) Measure the insulation resistance between the inner conductor of the AE plug 7PL8 and the plug body. The insulation resistance in each case should be not less than 40MΩ.

(5) Using the multimeter (para. 3 (2)), test each lead in every cable for continuity.

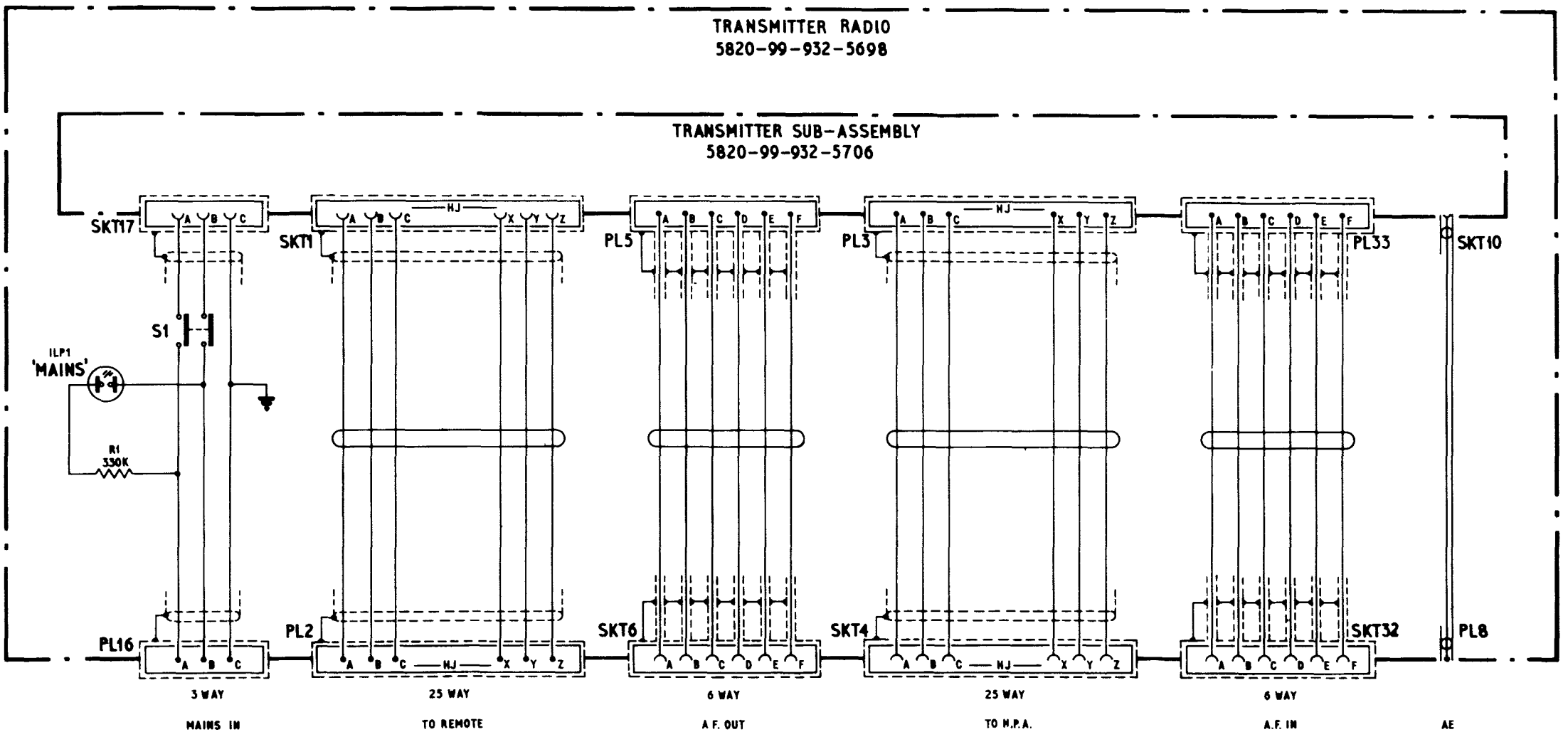
(6) Refit the neon indicator lamp in its holder, connect the mains supply to the MAINS IN plug 7PL16 and ensure that the neon indicator lamp is illuminated, irrespective of whether the gate switch is open or closed.

(7) Transfer the mains supply to socket 7SKT17 at the end of the cable from the gate switch to the transmitter sub-assembly. Close the gate switch and lock it in this position by pressing the spring-loaded catch on the right-hand side of the switch. Ensure that the neon indicator lamp is illuminated.

(8) Open the gate switch by pressing and releasing the actuating lever on the front. Ensure that the neon indicator lamp is extinguished.

(9) Disconnect the mains supply from socket 7SKT17 and reconnect the cables to the rear of the transmitter sub-assembly in the order shown in Vol. 1, Part 2, Sect. 1, Chap. 2, of this publication. Close the transmitter sub-assembly into the cover and reconnect the external connectors to the fixed plugs and sockets on the rear of the cable assembly.

ALL COMPONENTS PREFIXED (7)



AIR DIAGRAM 6726M/MIN.	
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Cable assembly 5995-99-932-4013: servicing circuit

Fig.1

RESTRICTED

SECTION 3

AMPLIFIER RADIO FREQUENCY
5820-99-932-5693

Chapter 1

(Completely revised)

AMPLIFIER SUB-ASSEMBLIES 5820-99-932-5708

CONTENTS

TABLES

ILLUSTRATIONS

WARNING...

HIGH VOLTAGES ARE USED IN THIS EQUIPMENT, SO TAKE CARE WHEN OPERATING WITH THE AMPLIFIER DRAWER OPEN, TO AVOID PERSONAL CONTACT WITH HIGH VOLTAGE TERMINALS, TEST POINTS ETC.

Introduction

Units of the amplifier sub-assemblies

1. The amplifier sub-assemblies, 5820-99-932-5708 (fig.3), i.e. the amplifier drawer, consist of the following:-

Amplifier, radio frequency, 5820-99-943-9066

Chassis, electrical equipment, 5820-99-932-3999

Probe assembly, 6625-99-999-0697

Monitor, radio frequency, 6625-99-999-2378

This chapter concerns only the first three items, servicing instructions for the monitor, radio frequency being given in Sect. 2, Chap. 4.

Note...

For stores reference purposes the probe assembly, 6625-99-999-0697, although obtainable separately if required, is part of the chassis, electrical equipment, 5820-99-932-3999.

Purpose of units

2. The amplifier, radio frequency, together with the screen and modulator valves in the chassis, electrical equipment, forms, one unit whose functions are:-

(1) To amplify separately the unmodulated carrier and the audio modulation from the transmitter.

(2) To apply high level modulation of the carrier.

The overall r.f. power gain is of the order of 10dB, thus increasing the nominal 10W output of the u.h.f. single channel transmitter, radio to between 100 and 150W.

3. The amplifier, radio frequency, (referred to as the r.f. amplifier) consists of a balanced buffer amplifier stage feeding a balanced power amplifier which is screen and anode modulated. The buffer amplifier input and output tuning circuits, which are quarter-wave resonant lines, are coupled together by a chain drive and a law-correcting mechanism. A radio frequency tuner sub-assembly 5820-99-999-2377 labelled P.A. GRID & INPUT TUNING, on the front panel of the chassis, electrical equipment rotates the short-circuiting wiper of the resonant lines. A radio frequency tuner sub-assembly 5820-99-999-2376 labelled P.A. ANODE TUNING, rotates the short-circuiting wiper of the quarter-wave resonant line which tunes the power amplifier anode circuit. Each of the above controls, frequency selector comprises a panel through which is mounted a drive, slow motion, 5820-99-999-2380.

Note...

The radio frequency tuner sub-assemblies 5820-99-999-2376 and 2377, although not (for stores reference purposes) a part of the amplifier sub-assemblies, will normally be left fitted to amplifiers sent for servicing.

4. The chassis, electrical equipment (the chassis assembly) consists of the anode and screen modulator stages, a p.a. guard valve, metering circuits and a fan assembly for forced air cooling. Part of the output from the anode modulator, which is a balanced stage fed from the transmitter, is applied to the control grid of the screen modulator. This valve is a cathode follower and the low impedance output is used to modulate the screens of the p.a. valves in the r.f. amplifier.

5. The probe assembly, in series with the output from the r.f. amplifier, consists of a short length of coaxial line and two tower assemblies with pick-up loops adjacent to the centre conductor of the line. One tower is used for forward power measurements and the other for reflected power measurements. In conjunction with the monitor, radio frequency the

probe assembly provides the following facilities:

(1) Measurement of r.f. power delivered to the aerial.

(2) Reflection coefficient measurements.

(3) Measurements of modulation depth.

(4) Aural monitoring of the a.f. component of the modulated wave.

Test equipment

6. Items of equipment required for servicing and testing the amplifier are listed in Table 1; for further details of an individual item see Sect. 1, Chap. 1.

TABLE 1

Test equipment

Item		Ref. No.	Nomenclature
1		6625-99-943-4059	Signal generator CT433
	OR	6625-99-943-4976	Signal generator Type 65B (see note
2		6625-99-943-8385	Test set oscillator and distortion meter CT373
	OR	6635-99-944-7661	Indicator, distortion
3		6625-99-105-7049	Multimeter CT498A
4		5G/1621	Tester, insulation resistance, Type A
5		6625-99-943-2784	Test set, radio, CT214
6		5985-99-972-3929	Line, r.f., trans mission
7		5120-99-972-9814	Alignment tool, electronic equipment
8		5120-99-972-9815	Alignment took, electronic equipment
10		5120-99-999-3708	Alignment tool, electronic equipment

Note...

Used in conjunction with transformer Type 3236, Ref. No. 10K/17631

7. In addition to the equipment of Table 1, the following items are required:

(1) A connector consisting of a five-foot length of two core screened cable with a plug Type 170, Ref. No. 10H/242, at one end

and spade terminals at the other end.

(2) A connector consisting of a five-foot length of screened cable with crocodile clips at each end, connected to the screen and the centre conductor.

(3) A 4.7-ohm, 1-watt resistor (e.g. 5905-99-011-1532).

(4) A 3-kilohm dummy load of not less than 250W rating; three 100-ohm, 100-watt resistors, 5905-99-024-2006 in series may be used. The load must be securely mounted on a large non-flammable insulating board (e.g. paxolin board covered by asbestos cloth).

(5) A plug Type 170, Ref. No. 10H/242, with a 560-ohm, ½-watt resistor, 5905-99-022-1207 connected across the tip and ring.

Removing and refitting the r.f. amplifier

8. Before the r.f. amplifier can be removed from the chassis assembly, remove the radio frequency tuner sub-assemblies (para. 3), each secured by three captive screws. The instructions for removing and fitting the r.f. amplifier are printed on the larger bottom cover of the unit. Where obliterated, refer to fig.1. After the r.f. amplifier is re-fitted, fit the two radio frequency tuner sub-assemblies, ensuring that the couplings are correctly mated by locating the red spot on the coupling of the r.f. amplifier between the two red spots on the coupling of the radio frequency tuner sub-assembly.

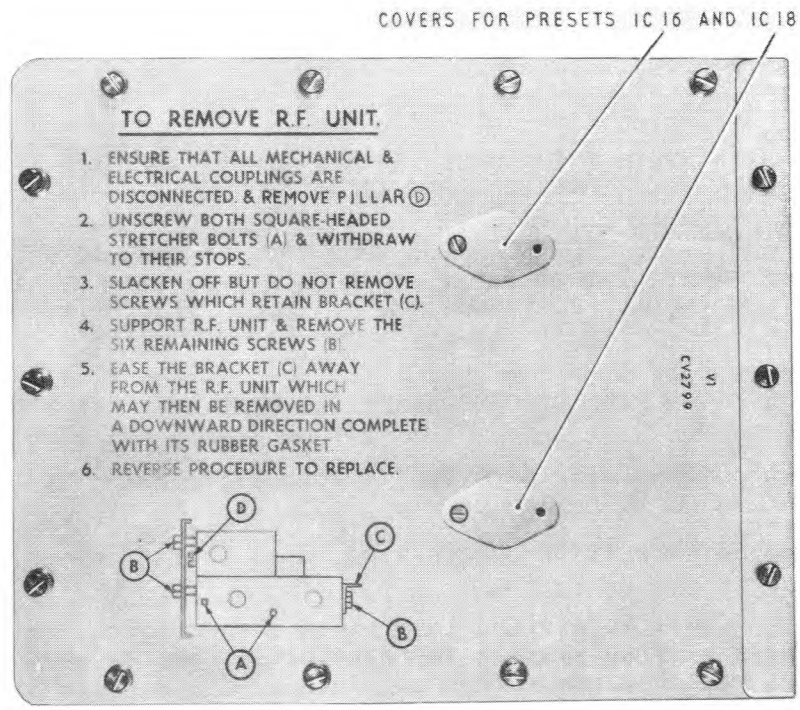


Fig.1 Amplifier, radio frequency: removal details

Mechanical servicing of the r.f. amplifier

General

9. Mechanical servicing of the r.f. amplifier includes changing the lecher line assemblies, the built-in capacitors and the 1V2 and 1V3 valveholders. Proceed only as far as required to remedy a particular fault and avoid unnecessary dismantling. Servicing of the r.f. amplifier necessitates removing the unit from the chassis assembly (para. 8).

10. To facilitate servicing, refer to fig.4 and observe the following precautions:

(1) Perform all servicing in a clean, dry, dust-free environment.

(2) The valveholders for 1V2 and 1V3, and certain insulators, are made from p.t.f.e. which, when heated, gives off highly toxic fumes. Solder in the vicinity of this material with the utmost care.

(3) The rhodium plating of the lecher lines is particularly vulnerable and can be irreparably damaged by the careless application of tools etc.

(4) Where servicing involves removing a ceramic shaft, take care to avoid fracture. Take care also when removing the shorting wiper and arm, to avoid damaging either the wiper contact or the surface of the lecher lines (sub-para.(3)). If a wiper becomes distorted, this can result in damage to the plating on the lines.

(5) The unit contains a number of built-in capacitors where the dielectric takes the form of a mica plate or disc. During assembly, ensure that each mica is clean and free from any foreign matter. Avoid contamination of the surfaces by perspiration etc. from the fingers.

WARNING...

WHEN USING TRICHLOROETHANE FOR CLEANING:

(1) ENSURE MAXIMUM VENTILATION.

(2) DO NOT SMOKE, EAT OR DRINK.

(3) DO NOT INHALE THE VAPOUR.

(4) AVOID CONTACT WITH THE SKIN.

(5) DO NOT IMMERSE ANY COMPONENTS FOR MORE THAN ONE MINUTE.

(6) DRY ALL COMPONENTS THOROUGHLY BEFORE REASSEMBLY; IF VARNISHED, DRY IN AN OVEN OR WITH WARM AIR.

(7) AFTER THE COMPLETION OF CLEANING, ALWAYS WASH BEFORE SMOKING OR EATING.

11. The r.f. amplifier is divided into three compartments, each fitted with a cover which must be removed for servicing. The details are as follows:

(1) The buffer grid tuning circuit is in the smaller lower compartment where the cover is secured by ten captive screws.

(2) The buffer anode tuning circuit is contained in the larger lower compartment where the cover is secured by eleven captive screws. Since this cover is overlapped by the smaller cover of the buffer gri compartment (sub-para. (1)), the smaller must be removed before the larger.

(3) The p.a. anode tuning circuit is in the upper compartment on which the cover is secured by twelve captive screws. When this cover is refitted,the two gauze-covered apertures must be positioned over the p.a. valves 1V2 and 1V3.

12. Certain servicing must be performed with the valves removed. To remove and fit the valves:

(1) To remove 1V1:

(a) In the buffer anode compartment release and remove the clamps (each secured by an 8 BA hexagon head screw) from the anode pins of 1V1.

(b) Release the valve retainer and gently ease the valve from its holder towards the lecher lines, tilting the valve so that the anode pins enter the space between the lines and the chassis until the base pins clear the valveholder.

(c) Further tilt the valve until the base pins point towards th underside of the unit and then withdraw the valve.

(2) To fit 1V1:

(a) Introduce it at an angle of about 45 degrees with the anode pins towards the top of the compartment, carefully moving the anode connectors aside, and then rotate the valve so that its thick base pin is at a right-angle to its correct position (bringing the pins into a line roughly parallel with the lecher lines).

(b) Insert the anode pins between the lines and then rotate and insert the valve into its holder.

(c) Fit and securely tighten the anode connector clamps and, with the valve firmly seated, fit the retainer.

(3) Remove the p.a. valves 1V2 and 1V3 from the p.a. anode compartment by releasing the retainers (each secured by three 6 BA cheesehead screws and washers), moving the retainers clear of the valves and then carefully withdrawing them from their valveholders.

CAUTION...

Sub-para.(4) must be followed with extreme care. Do not try to force a valve into its holder, otherwise the spring contacts of the holder may be broken or distorted causing faulty contact.

(4) To fit a p.a. valve:

(a) Approximately align the key of the locating spigot with its mating keyway in the valveholder.

(b) Insert the valve squarely in the holder (do not apply pressure) and, viewing the underside of the holder (in the buffe anode compartment), accurately align the key of the locating spigot with its mating keyway and the base pins with their respective spring contacts.

(c) Apply gentle pressure to the top of the valve (see warning) and ensure that it moves easily into the holder and that the electrode pins correctly engage their respective contacts.

(d) Secure the valve retainer.

13. If servicing involves removing the tuning shaft of either the buffer grid or the buffer anode tuning assemblies, first remove the chain drive which connects the two shafts (fig. 4) by releasing the $\frac{1}{4}$ in. 28 UNF hexagon head screw which secures the chain tensioning arm and rotating the arm counter clockwise to release the chain which can then be removed from the sprocket wheels. The chain cannot be completely removed from the unit since it passes under the bracket of the law corrector mechanism.

Buffer grid lecher line assembly

14. This procedure can also be issued for changing the tuning shaft, by ignoring the instructions applicable to the lecher lines:

(1) Remove the cover from the buffer grid compartment (para. 11(1)).

(2) Remove two 4 BA cheesehead screws and washers which secure the bracket of the law corrector mechanism and move the bracket to expose the end of the tuning shaft.

(3) Take out two 6 BA countersunk screws securing the law corrector arm to the end of the shaft and remove the law corrector mechanism together with the chain (para.13).

(4) Rotate the shaft to position the wiper contact in the gap between the ends of the lines and then slacken the 6 BA hexagon head screw which secures the wiper arm to the shaft.

(5) Remove the retaining circlip from the shaft and, holding the wiper arm, carefully withdraw the shaft from the front of the unit.

(6) Take out the wiper arm.

(7) Carefully unsolder trimmers 1C4 and 1C5 from the terminals at the ends of the lecher lines.

(8) At the rear of the unit remove the nut and washer securing 1PL22 to the chassis.

(9) Remove two 4 BA hexagon head screws and nuts which secure the lecher line assembly to the dividing wall of the two lower compartments. Remove two 4 BA hexagon head screws and nuts and four washers which secure the assembly to the bracket on the end wall of the

compartment and withdraw the assembly.

(10) Before fitting a new lecher line assembly (tuner, radio frequency, 5820-99-106-3945) check that the inner (contact) surfaces of the lines are clean. Where necessary, use a piece of soft, dust-free tissue, moistened with trichloroethane to clean the surfaces, DO NOT USE abrasive material. Clean the contact surfaces of the wiper contact similarly, taking care not to distort the wiper (para.10(4)).

(11) Fit the lecher line assembly by reversing sub-para.(4) to (6).

(12) Where the shaft is to be changed, the replacement item is identified as a shaft, drive, 3040-99-999-4377. Before fitting the shaft, ensure that the bearing surfaces are clean, using trichloroethane for cleaning where necessary, and then apply a thin film of grease XG-287 to the bearing surfaces.

(13) Insert the wiper arm between the lecher lines with the wiper contact in the gap between the ends of the lines and with the open end of the contact towards the ends of the lines to which 1C4 and 1C5 are connected. Holding the arm in this position, carefully insert the shaft through the front of the unit and the hole in the wiper arm to locate the rear end of the shaft in its bearing.

(14) Fit the retaining circlip to the shaft.

(15) Position the wiper arm centrally between the lecher lines and tighten the 6 BA hexagon head screw which secures the arm to the shaft. Check the accuracy of positioning by observing the compression of the wiper contact as it enters the ends of the lines; the compression of both sides of the contact should be as near equal as possible.

(16) Where necessary, readjust the arm on the shaft to achieve correct positioning.

(17) Refit the law corrector mechanism by reversing sub-para.(2), ensuring that the chain passes under the correct part of the bracket.

Buffer anode lecher line assembly

15. This procedure can also be adopted to change the mica insulator plate which forms the dielectric of the built-in capacitor 1C17, or the tuning shaft by ignoring the instructions applicable to the lecher lines:

(1) Remove the cover from the buffer anode compartment (para.11(2)), take out the buffer valve 1V1 (para.12(1)) and remove the chain (para.13).

(2) Rotate the shaft to position the wiper contact in the gap between the ends of the lines and then slacken the 6 BA hexagon head screw which secures the wiper arm to the shaft.

(3) Remove the retaining circlip from the shaft and, holding the wiper arm, carefully withdraw the shaft from the front of the unit. Take out the wiper arm.

(4) Unsolder 1L2 and 1L3 from the terminals at the ends of the lines.

(5) Remove the two 6 BA hexagon head screws and washers which secure the ends of the lecher lines to the sides of 1C16 and 1C18. (Fitted between the end of each line and the associated capacitor is a packing gauze. Retain these for subsequent refitting).

(6) Remove two 2 BA cheesehead screws, washers, p.t.f.e. insulators and mute securing the lecher line assembly to the chassis and lift out the assembly, taking care to avoid damaging the mica insulator plate (fitted between the ends of the lines and the chassis) which forms the dielectric for the built-in capacitor 1C17. (If the mica plate is damaged, fit new insulator plate, 5970-99-952-8753 upon reassembly).

(7) Before fitting a new lecher line assembly (tuner, radio frequency 5820-99-106-2561) check that the inner (contact) surfaces of the lines are clean. Where necessary use a piece of soft, dust-free tissue, moistened with trichloroethane to clean the surfaces. DO NOT USE abrasive material. Clean the contact surfaces of the wiper contact similarly, taking care not to distort the wiper (para. 10(4)).

(8) Fit the lecher line assembly by reversing sub-para.(3) to (5), ensuring that the mica insulator plate and the two packing gauzes are correctly positioned.

(9) Where the shaft is to be changed, the replacement item is identified as a shaft, drive, 3040-99-999-4772. Before fitting the shaft, ensure that the bearing surfaces are clean, using trichloroethane for cleaning where necessary, and then apply a thin film of grease XG-287 to the bearing surfaces.

(10) Insert the wiper arm between the lecher lines with the wiper contact in the gap between the ends of the lines and with the open end of the contact towards the ends of the lines which are connected to 1C16 and 1C18. Holding the arm in this position, carefully insert the shaft through the front of the unit and the hole in the wiper arm to locate the rear end of the shaft in its bearing.

(11) Fit the retaining circlip to the shaft.

(12) Position the wiper arm centrally between the lecher lines and tighten the 6 BA hexagon head screw which secures the arm to the shaft. Check the accuracy of positioning by observing the compression of the wiper contact as it enters the ends of the lines. The compression of both sides of the contact should be as near equal as possible. Where necessary, readjust the arm on the shaft to achieve correct positioning.

(13) Refit 1V1 (para. 12(2)).

P.A. anode lecher line assembly

16. This procedure can also be used for changing the tuning shaft, by ignoring the instructions applicable to the lecher lines:

(1) Remove the cover from the p.a. anode compartment (para. 11(3)).

(2) Rotate the shaft to position the wiper contact in the gap between the ends of the lines and then slacken the 6 BA hexagon head screw which secures the wiper arm to the shaft.

(3) Remove the retaining circlip from the shaft and, holding the wiper arm, carefully withdraw the shaft from the front of the unit. Take out the wiper arm.

(4) At the rear of the unit remove the nut and washer securing 1PL25 to the chassis.

(5) Remove two 2 BA cheesehead screws and nuts which secure the lecher line assembly to the chassis.

(6) Slacken the two 6 BA cheesehead securing screws of each of the two small cover plates on the left-hand end of the compartment and move the plates aside to expose the access holes.

(7) Inserting a screwdriver via the access holes (sub-para.(5)), remove four 6 BA cheesehead screws, washers and p.t.f.e. insulators securing the ends of the lecher lines to the valveholders 1V2 and 1V3.

(8) Lift out the lecher line assembly, taking care to avoid damaging the four mica insulator plates (two plates fitted between the end of each line and the associated valveholder) which form the dielectric of the built-in capacitors 1C27 and 1C28. Replace any damaged mica plates by new items (plate, capacitor, 5910-99-970-3592) upon reassembly.

(9) Before fitting a new lecher line assembly (tuner, radio frequency, 5820-99-106-2568) check that the inner (contact) surfaces of the lines are clean. Where necessary use a piece of soft, dust-free tissue, moistened with trichloroethane to clean the surfaces. DO NOT USE abrasive material. Clean the contact surfaces of the wiper contact similarly, taking care not to distort the wiper (para. 10(4)).

(10) Fit the lecher line assembly by reversing sub-para.(3) to (7) ensuring that before the four mica insulator plates are fitted, both surfaces of each plate are coated with a fine film of grease XG-250. These plates must be very carefully and correctly positioned during reassembly to avoid damage. Remove any surplus grease after fitting.

(11) Insert the wiper arm between the lecher lines with the wiper contact in the gap between the ends of the lines and with the open end of the contact away from the ends of the lines which form part of 1C27 and 1C28. Holding the arm in this position, carefully insert the shaft through the front of the unit and the hole in the wiper arm to locate the rear end of the shaft in its bearing.

(12) Fit the retaining circlip to the shaft.

(13) Position the wiper arm centrally between the lecher lines and tighten the 6 BA hexagon head screw which secures the arm to the shaft. Check the accuracy of positioning by observing the compression of the wiper contact as it enters the ends of the lines; the compression of both sides of the contact should be as near equal as possible. Where necessary, readjust the arm on the shaft to achieve correct positioning.

Valveholders

17. Where the valveholders for 1V2 and 1V3 require servicing or changing, proceed as follows:

(1) Remove the covers from the buffer anode and p.a. anode compartments (para. 11(2) and (3)) and remove 1V1, 1V2 and 1V3 (para. 12(1) and (3)).

(2) In the buffer anode compartment carefully unsolder and identify the connections from the 1V2 and 1V3 valve holders (see para. 10(2)).

(3) Remove the two 6 BA hexagon head screws which secure the ends of the buffer anode lecher lines to 1C16 and 1C18 on the valveholders. the packing gauzes fitted between the ends of the lines and the capacitors must be carefully retained for subsequent refitting.

(4) In the p.a. anode compartment unsolder 1L5 and 1L6 from 1V2 and 1V3 valveholders respectively, and the white wire of each valveholder from the built-in capacitors 1C21 and 1C22.

(5) Slacken the two 6 BA cheesehead securing screws of each of the two small cover plates on the left-hand end of the p.a. anode compartment and move the plates aside to expose the access holes.

(6) Inserting a screwdriver via the access holes (sub-para. (4)), remove four 6 BA cheesehead screws, washers and p.t.f.e. insulators securing the ends of the lecher lines to the valveholders.

(7) Slacken the two 2 BA cheesehead screws and nuts which secure the p.a. anode lecher line assembly to the chassis and carefully separate the assembly from the valveholders to allow removal of the four mica insulator plates which form the dielectric of built-in capacitors 1C27 and 1C28. Replace any damaged mica plates by new items (plate, capacitor, 5910-99-970-3592) upon reassembly.

(8) Each valveholder is secured by four 4 BA cheesehead screws which pass through the flange of the valveholder and the chassis to engage tapped holes in a horseshoe-shaped retaining ring in the buffer anode compartment. Remove the screws and retaining rings and take out the valveholders.

(9) The 1V2 valveholder includes built-in capacitors 1C16 and 1C23, and 1V3 valveholder includes 1C18 and 1C14. No servicing can be performed on 1C16 or 1C18, but the dielectric of 1C23 and 1C24 is in the form of replaceable mica rings. Each valveholder also contains a replaceable contact ring. To service a valveholder, proceed as in sub-para. (10). Where a fault in a valveholder cannot be remedied by sub-para. (9), change the complete valveholder (sub-para. 10)).

(10) To service a valveholder, refer to fig.2 and proceed:

(a) Remove eight 6 BA hexagon head screws and washers, take off the top assembly and remove the upper mica ring. Carefully unsolder the white lead from the tag of the contact ring and remove the contact ring and the mica ring from the base assembly.

(b) Where there has been breakdown of the mica dielectric, or if the mica rings are damaged, fit new items (capacitors, fixed, mica dielectric, 5910-99-117-0539).

(c) Replace broken or distorted contact ring by a new contract, electrical, 5999-99-117-0538. To replace the white lead, use 2½ in of wire, electrical equipment, 1/0.036 in p.t.f.e. insulated, white, Type C to Specification No. EL. 1930, 6145-99-910-0270.

(d) Place the lower mica ring and the contact ring on the base assembly with the spring contacts as in fig.2, and the solder tag adjacent to the white lead. Align the slots in the periphery of the rings with the holes in the flange of the base assembly and then carefully solder the white lead to the solder tag of the contact ring.

(e) Place the upper mica ring on the contact ring and ensure that the slots in the periphery of all three rings are accurately aligned with the holes in the flange of the base assembly.

(f) Fit the top assembly so that the two tapped holes in its side are diametrically opposite the hole from which the white lead emerges in the base assembly (fig.2). Fit the eight 6 BA hexagon head screws and washers, ensuring that the screws are evenly tightened; lock the screw threads with an approved varnish.

(g) Using a 500V insulation tester, check that the resistance between the white lead and each half of the valveholder is not less than infinity.

(11) Where a complete valveholder is to be changed, use new holders, valve 5935-99-911-6711 (for 1V2) and 5935-99-911-6710 (for 1V3).

(12) Fit each valveholder in its correct position in the p.a. anode compartment with four 4 BA cheesehead screws and a retaining ring (sub-para. (7)) but do not fully tighten the screws.

(13) Ensure that the four mica insulator plates (sub-para. (6)) are clean and that both surfaces of each plate are coated with a fine film of grease XG-250.

(14) Carefully position two plates between the end of each p.a. anode lecher line and the associated valveholder and secure the lines to the valveholders by reversing sub-para. (5). Remove any surplus grease.

(15) In the buffer anode compartment insert the packing gauzes (sub-para. (2)) between the ends of the lecher lines and the valveholders and secure each line with a 6 BA hexagon head screw.

(16) Check that the p.a. anode lecher lines are parallel with the front of the unit and then tighten the two 2 BA cheesehead screws and nuts which secure the lecher lines to the chassis. Fully tighten the valve-holder securing screws.

(17) Reverse sub-para. (2) to (4) and then refit 1V1, 1V2 and 1V3 (para. 12(2) and (4)).

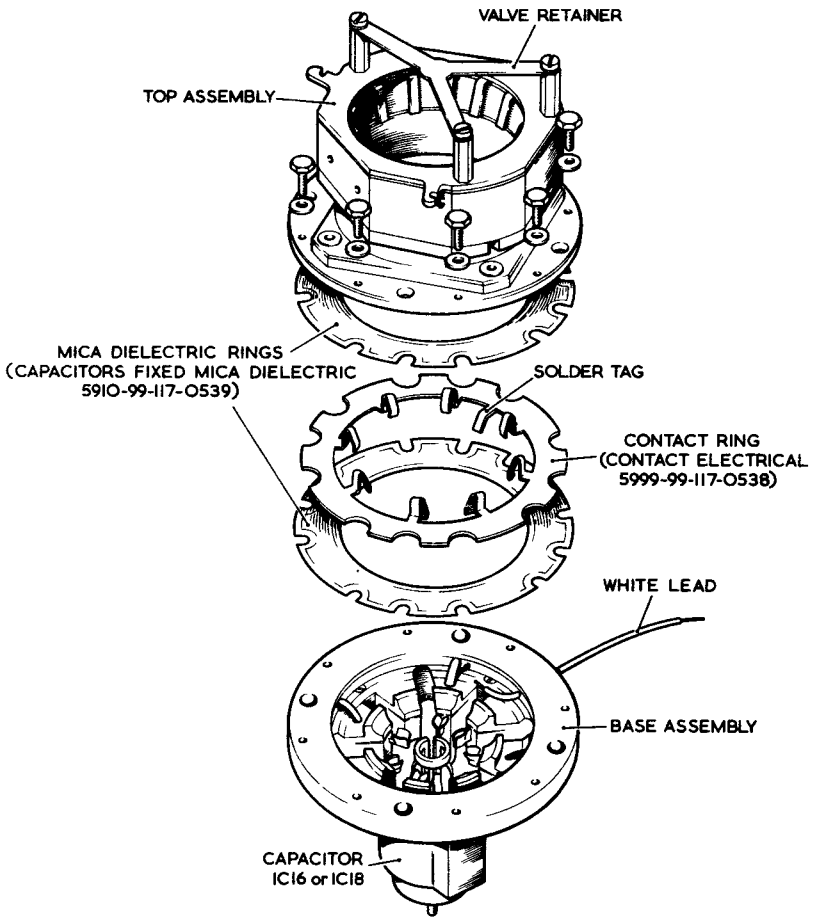


Fig.2 Exploded view of p.a. valveholder

Built-in capacitors

18. The r.f. amplifier contains 29 capacitors of which 24 are built-in. With the exception of 1C3, 1C16, 1C18 and 1C29, these capacitors can be serviced with referenced spares. Proceed as follows:

(1) 1C1, 1C2, 1C6, 1C7, 1C8, 1C11, 1C13, 1C15, 1C19, 1C20, 1C21, 1C33, 1C25 and 1C25 are all feedthrough types. Service as in para.19.

(2) Variable capacitor 1C14 is fitted across the buffer anode lecher lines. Service as in para. 20.

(3) 1C17 is formed by a mica dielectric plate fitted between the buffer anode lecher line assembly and the chassis. Replace the mica as in para. 15.

(4) 1C23 and 1C24 form part of the valveholders for 1V2 and 1V3 respectively. Replace the mica as in para. 17.

(5) 1C27 and 1C28 are formed by mica dielectric plates fitted between the ends of the p.a. anode lecher lines and the 1V2 and 1V3 valveholders respectively. The plates can be changed when servicing the lecher lines (para. 16) or the valveholders (para. 17), but, if no other servicing is required, change the plates as in para. 21.

19. The following procedure for servicing any of the built-in feed-through capacitors (para. 18(1)) apply in general to all the capacitors, although 1C25 and 1C26 comprise component parts which differ from the others (see Table 2). For location refer to fig.4:

(1) Remove the appropriate covers from the top and/or underside of the unit (para. 11).

(2) If the capacitor to be serviced is enclosed by the side panel on the housing of the 16-pole plug 1PL28, take out two 4 BA cheesehead screws and remove the panel. Where the capacitor is fitted through the front or rear face of the unit, remove the protective cover (secured by two 4 BA cheesehead screws and washers).

(3) Unsolder the connections from the capacitor, removing all surplus solder.

(4) Remove the nut, screw, two washers, two mica discs and an insulating washer which comprise the capacitor.

(5) Fit replacement parts as listed in Table 2.

(6) Fit the capacitor by reversing sub-para. (4), solder the connections to the spill portions of the capacitor screw and then refit the covers.

TABLE 2

Components parts for built-in capacitors

(para.19 and 20)

Cct. Ref.	NATO Stock No.	Other Ref.No.	Description
1C1,1C2	(5910-99-950-6057		Plate, capacitor (two per capacitor)
1C6-1C8 1C11, 1C13, 1C15, 1C19-1C22	(5330-99-950-6058		Washer, non-metallic
	(6310-99-950-6059		Washer, flat (two per capacitor)
	(5305-99-950-6078		Screw, set
	(5310-99-100-6962		Nut, plain, hex
	(5820-99-956-8738		Adjuster, resistor, variable
	(5340-99-948-8379		Insert, screw thread
1C14	(5310-99-956-8737		Nut, plain, plate

TABLE 2 (cont)

Cct. Ref.	NATO Stock No.	Other Ref. No.	Description
1C14	5305-99-120-1044 5310-99-941-8685		Screw, machine Washer, flat
1C25, 1C26	5970-99-913-1343 5310-99-945-0721 5970-99-913-1345 5305-99-945-0720		Insulator, washer (two per capacitor) Washer, recessed (two per capacitor) Insulator, washer Screw, set
		28M/10274	Nut, stiff

20. To change any of the component parts of the variable capacitor 1C14, refer to Table 2 for replacement items. Proceed as follows:

(1) Remove the cover from the buffer anode compartment (para.11(2)).

(2) Release the two 6 BA securing screws of the small cover plate on the front of the unit adjacent to the buffer anode tuning shaft, move the plate aside to expose the access hole for 1C14.

(3) Before commencing servicing of the capacitor, insert an alignment tool, electronic equipment, 5120-99-999-3708 via the access hole (sub-para.(2)) and unscrew the adjusting screw until it is completely withdrawn from the body of the capacitor. If the screw is to be changed, remove it and fit a new item.

(4) The nut plate which carries the adjusting screw can be changed by removing its two 8 BA cheesehead screws and washers and fitting a new plate in the reverse manner.

(5) To change the threaded p.t.f.e. insert, remove two 8 BA cheesehead screws and washers at the rear of the lecher line assembly, withdraw the insert and fit a new insert in the reverse manner.

(6) Refit and secure the small cover plate over the access hole.

21. Change the mica dielectric plates of 1C27 and 1C28 as follows:

(1) Remove the covers from the buffer anode and p.a. anode compartments (para. 11(2) and (3)).

(2) Slacken the two 6 BA cheesehead securing screws of each of the two small cover plates on the left-hand end of the p.a. anode compartment and move the plates aside to expose the access holes.

(3) Inserting a screwdriver via the access holes (sub-para.(2)), remove four 6 BA cheesehead screws, washers and p.t.f.e. insulators securing the ends of the lecher lines to the valveholders.

(4) Slacken the two 2 BA cheesehead screws and nuts which secure the p.a. anode lecher line assembly to the chassis and separate the assembly from the valveholders to allow removal of the four mica dielectric plates.

(5) Ensure that new plates, capacitor, 5910-99-970-3592 are clean and then apply a fine film of grease XG-250 to both surfaces of each plate.

(6) Carefully position two plates between the end of each p.a. anode lecher line and the associated valveholder and secure the lines to the valveholders by reversing sub-para.(5). Remove any surplus grease.

(7) Tighten the two 4 BA cheesehead screws and nuts to secure the p.a. anode lecher line assembly to the chassis.

(8) Refit and secure the small cover plate over the two access holes.

Alignment of lecher line wiper contacts

22. Check that the lecher line wiper contacts are aligned with respect to their shafts and that they are centrally positioned between the lecher lines; this is particularly important where the removal and fitting of lecher lines has been performed. Proceed as follows:

(1) With the three covers and the chain removed (para. 11 and 13 respectively) rotate the three shafts so that the arrow on the front end of each shaft is aligned with and pointing towards the associated arrow marked on the chassis.

(2) Position the three associated wiper contacts as follows:-

(a) Buffer grid: Align the arrow on the side of the wiper arm with the arrow marked on the inside radius of the front lecher line.

(b) Buffer anode: The point at which the wiper contact touches the lines should be adjacent to the body of 1C14.

(c) P.A. anode: The point at which the wiper contact touches the lines should be approximately $1\frac{1}{8}$ in from the ends of the lines which form part of 1C27 and 1C28.

(3) If any wiper contact is not at the position specified in sub-para.(2):

(a) Slacken the 6 BA hexagon head screw securing the wiper arm to the shaft and, holding the wiper arm firmly, rotate the shaft until its arrow is aligned with and pointing towards the arrow marked on the chassis.

(b) Tighten the wiper arm securing screw, ensuring that the position of the wiper arm relative to the shaft remains undisturbed.

(4) On each of the three tuning assemblies rotate the shaft and, as the wiper contact enters the ends of the lecher lines, check that the deflection of each tip of the contact is between 1/16 and 1/8 in and that the deflection of both sides of the contact is as near equal as possible. Where necessary adjust the position of the wiper arm between the lines to achieve the required deflection, ensuring that the appropriate positioning specified in sub-para.(2) is maintained.

23. When the chain drive from the buffer grid and buffer anode shafts has been removed, locate the chain in the sprocket wheels of both shafts and the tensioning arm, rotate the arm clockwise to just take up the slack in the chain and tighten the ¼ in 28 UNF hexagon head screw. The chain is only refitted now to prevent damage during subsequent operations so accurate relative positioning of the shafts is not necessary since the chain must be subsequently removed for alignment.

Examination

24. When mechanical servicing of the r.f. amplifier is complete, and before the unit is subjected to electrical testing and alignment:

(1) Check that all necessary servicing has been performed satisfactorily.

(2) Check that all nuts and screws have been fully tightened.

(3) Ensure that no mechanical damage has been sustained during servicing.

(4) Refit all covers (see para. 11).

25. Refit the r.f. amplifier into the chassis assembly (para. 8).

Mechanical servicing of the chassis assembly

26. All servicing on the chassis assembly (fig. 5) can be performed using standard procedures except for the fan assembly (para. 27) which provides forced air cooling for the amplifier drawer.

27. (1) In a chassis assembly where Mod. No. 6553 has been embodied, the fan assembly is a cooler, air, electronic equipment, 5820-99-914-7354.

(2) Where the Mod. has not been embodied the fan assembly comprises a motor, a.c., 6105-99-943-2195 mechanically coupled to a fan, vane, axial, 4140-99-943-2194. An unmodified chassis assembly should have Mod. No. 6553 (Table 6) embodied at this stage. This necessitates embodying Mod. No. 6554 in the cable assembly 5995-99-932-4014 and Mod. No. 6555 in the chassis, electrical equipment, 5820-99-999-2655 (part of the power drawer).

28. Details of servicing cooler, air, electronic equipment, 5820-99-914-7354 only are given in para. 29 to 40.

Fan assembly

General

29. The fan assembly requires servicing at intervals of 6 months involving removing and dismantling the assembly to clean and relubricate the bearings and, where necessary, to replace certain faulty components (fig. 6). Servicing must be performed in a clean, dry, dust-free environment.

Removal

30. Remove the fan assembly from the chassis assembly as follows:

(1) Remove the filter retainer (secured by four captive screws) from the front panel and extract the filter. In the left-hand side of the aperture disconnect 2PL36 from 2SKT36.

(2) Open the amplifier drawer and remove the top tray which is secured by six 2 BA cheesehead screws and two hinge bolts.

(3) Remove the relief valve assembly (secured by eight 4 BA cheesehead screws) from the top of the switch compartment and, using a rubber band or other suitable means, secure the level of the microswitch 2S4 so that it remains fully depressed when the pressure of the switch actuator is removed.

(4) Remove two $\frac{1}{4}$ in 28 UHF hexagon head screws, nuts and washers which secure the outlet flange of the fan assembly to the switch compartment.

CAUTION...

When handling the fan assembly take care not to damage the switch actuator.

(5) Supporting the fan assembly with the left hand, remove four $\frac{1}{4}$ in 28 UHF hexagon head screws and washers which secure it to the right-hand side-frame of the chassis.

(6) Ease the fan assembly forward to disengage the locating dowels of the outlet flange from the switch compartment, then raise the outlet flange to tilt the fan about 30 degrees, ease the fan backward to disengage the flexible duct from the front panel aperture and carefully lift the fan assembly from the chassis.

Servicing

31. Component parts of the fan assembly available as referenced spares are identified and illustrated in fig.6.

32. Dismantle the fan assembly as follows:

(1) Remove the housing from the 4-pole plug 2PL36 and unsolder the plug from the supply leads.

(2) Extract four 4 BA hexagon head screws and separate the flexible duct from the motor support flange, noting the orientation of the duct to ensure correct reassembly.

(3) Remove the switch actuator and shims which are secured by two 6 BA cheesehead screws and washers and then remove three 6 BA hexagon head screws and washers and separate the switch carrier from the fan assembly.

(4) Withdraw three 2 BA hexagon head screws and washers and separate the sixth stage stator from the assembly, using the slots at the periphery of the casing note that this stator is removed complete with the roller bearing outer, rollers and retaining cap (see also sub-para. (10)).

(5) Remove three 6 BA cheesehead screws and washers and withdraw the sixth stage impeller, taking care not to lose the two interstage locating pins.

(6) Remove four 2 BA nuts from the tie bolts and separate the fifth stage stator using the peripheral slots.

(7) Remove the remaining nuts from the tie bolts and withdraw the bolts.

(8) Alternately removing impeller and stator, remove the fifth, fourth, third and second stage impellers and the fourth, third and second stage stators, taking care not to lose the impeller locating pins.

(9) Take out four BA hexagon head screws and separate the first stage stator from the motor support flange.

(10) Insert a blade 3/32 in thick and 5/16 in wide in the end slot of the armature shaft. Remove the nut at the opposite end of the shaft and take off the motor support flange.

(11) Extract three 6 BA cheesehead screws and remove the first stage impeller.

(12) Unscrew the nut at the slotted end of the shaft and remove the convex washer. Withdraw the armature, rotor drum end cap (input end), ball bearing and retaining ring from the rotor drum, leaving the spring and second ball bearing in the rotor drum end cap (output end).

CAUTION...

> The ball bearings have been carefully selected for fit in their respective positions. Interchanging them is liable to damage the equipment. Therefore identify them to ensure return to correct positions upon reassembly.

(13) Remove the ball bearing and spring from the rotor drum end cap (output end).

(14) Remove the retaining cap (secured by three 6 BA cheesehead screws and washers) from the sixth stage stator and withdraw the roller bearing by inserting two 4 BA screws in the tapped holes provided.

33. Replace all worn or damaged bearings by new items (fig.6). New ball bearings may also be required if the armature is changed, and fitting a new sixth stage stator may necessitate changing the roller bearing. A new bearing must be carefully selected to be a light push fit, both on the shaft and in its housing; there must be no rotation of the bearing inner about the shaft or of the bearing outer within the housing.

34. Examine all other replaceable parts for evidence of wear or damage and obtain new items as necessary (fig.6). Where the serviceability of the armature windings is suspect, check that:

(1) The winding resistance across the yellow and blue supply leads is between 21.8 and 25.2 ohms.

(2) The winding resistance across the red and blue supply leads is between 26.5 and 30.5 ohms.

(3) The insulation resistance of the windings is not less than 2M at 500V d.c.

35. Where the existing bearings are to be refitted, these must first be washed in clean white spirit, dried thoroughly and then relubricated with grease XG-274 or XG-271. In the ball bearings the grease must occupy between 1/3 and 1/2 of the space in the ball race and the inner and outer tracks then counter-rotated to achieve even distribution of the grease. Lubricate the roller bearing by the application of a fine film of grease to the rollers.

CAUTION...

Avoid over-lubrication of the bearings since excessive grease can cause serious damage to the motor.

36. When reassembling the fan assembly, careful attention must be paid to the bearings. If the existing ball bearings are to be refitted, these must be returned to their former positions (para. 32(8) caution); new bearings must be selected as described in para. 33. Reassemble as follows:

(1) Insert the ball bearing into the rotor drum end cap (input end) and fit the retaining ring.

(2) Slide the armature into the rotor drum and fit the end cap (input end) to the drum.

(3) Secure the first stage impeller to the rotor drum with three 6 BA cheesehead screws and spring washers.

(4) Slide the motor support flange on to the armature shaft and secure it with the large nut, holding the shaft stationary by inserting a blade (para. 32(7)) into the slot at the opposite end of the shaft.

(5) Secure the first stage stator to the motor support flange using four 2 BA hexagon head screws and washers.

Note...

When fitting the stators and impellers (sub-para.(6)) it is essential to preserve the correct orientation. On impellers it is important not only that the locating pins and holes engage, but that the pin with the adjacent dimple locates in the hole with the adjacent dimple. Ensure that the impellers and stators are assembled in the correct sequence; the impellers are numbered for this purpose.

(6) Slide the second stage impeller on to the rotor drum and mate it to the first stage impeller. By alternately fitting stator and impeller, assemble the second, third and fourth stage stators and the third, fourth and fifth stage impellers.

(7) Fit the spring into the rotor drum end cap (output end) and slide the bearing on to the shaft. Place the convex face of the convex washer against the bearing and secure these items with the large nut.

(8) Thread the four tie bolts through the first four stator stages and assemble the fifth stage stator. Fit the eight 2 BA nuts to the tie bolts but do not fully tighten the nuts at this stage.

(9) Secure the sixth stage impeller to the rotor drum end cap (output end) with three 6 BA cheesehead screws and washers.

(10) Slide the roller bearing into the sixth stage stator and secure the retaining cap with three 6 BA cheesehead screws and washers Secure the sixth stage stator to the fifth stage with three 2 BA hexagon head screws and washers.

(11) Fit the switch carrier to the rotor drum end cap (output end) using three 6 BA hexagon head screws and washers.

(12) Check that the impellers rotate freely and then evenly tighten th nuts on the four tie bolts, ensuring that free rotation of the impellers is maintained.

(13) Secure the flexible duct to the motor support flange, using four 4 BA hexagon head screws, ensuring that the orientation of the duct is correct (para. 32(2)).

CAUTION ...

It is important that the correct switch actuator is fitted (sub-para. (14)) otherwise the microswitch 2S4 does not operate correctly (para. 38). The N.A.T.O. Stock No. 5930-99-970-6896 should be marked on the base moulding of the actuator, but where not present the actuator is identified by a green spot on the moulding.

(14) Secure the switch actuator and shims to the switch carrier with two 6 BA cheesehead screws and washers.

(15) Solder the red, blue and yellow supply leads to poles 1, 2 and 3 respectively of plug 2PL36 and fit the housing to the plug.

Refitting

37. Refit the fan assembly in the chassis assembly as follows:

(1) Reverse the procedures in para. 30(3) to (5) and couple 2PL36 to 2SKT36.

(2) Manually operate and lock the gate switch of the amplifier drawer and check that the cover of the air exhaust port (at the rear of the equipment is open.

(3) Operate MAINS of the amplifier power drawer to ON and check that the impellers of the fan assembly start to rotate in the direction indicated by the arrow on the outer casing of the fan assembly. Set MAINS to OFF.

(4) Fit the top tray to the chassis assembly and close the amplifier drawer.

(5) Fit the air filter in its housing in the amplifier front panel (with the arrow on the top edge of the filter pointing towards the equipment) and secure the filter retainer over the filter.

Note...

Before proceeding with the subsequent tests and adjustments, ensure that all cover panels are securely fitted.

Tests and adjustments

38. Test the operation of the relief valve and the centrifugally actuated microswitch 2S4 as follows:

(1) Check that the rear air exhaust port is open.

(2) Set METER SWITCH on the amplifier power drawer to position 2 (-48v) and set MAINS on the transmitter and amplifier power drawers to ON.

(3) As the fan assembly approaches full operating speed, aurally check that the relief valve closes and that microswitch 2S4 operates 'on' (indicated by a reading on the amplifier drawer meter) at the same instant as, or immediately after, the relief valve closes.

39. If the relief valve does not operate satisfactorily (para.38(3)) proceed as follows:

(1) Set MAINS on the amplifier power drawer to OFF and open the amplifier drawer.

(2) Remove the relief valve assembly from the top of the switch compartment.

(3) Remove the stiffnut and two 4 BA washers from the valve stem, fit a washer, flat, 2 BA, 5310-99-940-3514 to the stem and refit the 4 BA washers and stiffnut.

CAUTION...

The number of 2 BA washers fitted on the stem of the relief valve should not normally exceed three. Where evident that an excessive number of washers is required, check that the air filter is clean and that the air inlet and exhaust ports are free from obstructions.

(4) Refit the relief valve assembly to the top of the switch compartment.

(5) Manually operate and lock the gate switch of the amplifier drawer, set MAINS on the amplifier power drawer to ON and visually check that the relief valve closes as the fan assembly approaches full operating speed. Set MAINS to OFF.

(6) Repeat sub-para.(2) to (5), as necessary, to achieve correct operation of the relief valve.

(7) Close the amplifier drawer, set MAINS on the amplifier power drawer to ON and aurally check that the relief valve closes as the fan assembly approaches full speed. Set MAINS to OFF and allow the impellers of the fan assembly to come to rest. Repeat this procedure a further five times.

(8) If the relief valve does not operate satisfactorily in all six checks (sub-para.(7)), open the amplifier drawer, comply with sub-para.(2) to (4) and then repeat sub-para.(7).

40. If the operation of microswitch 2S4 is not satisfactory (para. 38(3)) adjust as follows:

(1) Set MAINS on the transmitter and amplifier power drawers to OFF and open the amplifier drawer.

(2) Remove the relief valve assembly from the top of the switch compartment, slacken the locknut of the microswitch bracket adjusting screw by $\frac{1}{4}$ turn and slacken the screws which secure the bracket to the side of the compartment.

(3) If the microswitch operated to 'on' before the relief valve closed, turn the adjusting screw VERY SLIGHTLY clockwise (as viewed from the front).

(4) If the microswitch failed to operate to 'on' before the fan assembly attained full speed, turn the adjusting screw VERY SLIGHTLY counterclockwise (as viewed from the front).

(5) Tighten the bracket securing screws and the locknut of the adjusting screw and refit the relief valve assembly.

(6) Close the amplifier drawer and check the operation of the microswitch (para. 38).

(7) Repeat sub-para. (1), (2), (3) or (4), (5) and (6), as necessary until correct operation of the switch is achieved.

Electrical testing and alignment

General

41. Owing to the difficulty of extending the high voltage power supplies it is not possible to use extension connectors for testing and alignment of the r.f. amplifier. All servicing must therefore be performed with this unit secured in position in the amplifier drawer.

42. When performing certain tests and alignment procedures it may not be practical to adhere strictly to a duty cycle of five minutes ON and ten minutes STANDBY, but it is important that h.t. supplies are not left on longer than necessary. To ensure an adequate flow of cool air past the p.a. valves 1V2 and 1V3, the bottom plate of the r.f. amplifier and the bottom panel of the chassis assembly must be securely fitted before switching on h.t. and 1.t. supplies.

Note...

Certain tests are required to be made with the equipment fully tuned and giving 100 to 150W output. Where mechanical servicing of the r.f. amplifier tuned circuits has been performed, carry out the alignment instructions in para. 51 to 58 so that the amplifier is correctly tuned.

43. To tune the transmitter and amplifier for maximum r.f. power output indication, uncouple the aerial feeder from the aerial socket on the amplifier cabinet and connect a test set, radio, CT214 to the aerial socket via a line, r.f., transmission, 5985-99-972-3929. Where the transmitter is unmodulated, insert a shorting plug (para.7(5)) into the MIC socket of the transmitter drawer to complete the h.t. supply. Full setting-up and tuning instructions are given in AP 116E-0252-1, Part 1, Sect. 3, Chap. 4.

WARNING...

VOLTAGES IN EXCESS OF 1000V ARE PRESENT IN THIS EQUIPMENT

R.F. amplifier voltage measurements

44. Voltages cannot be measured at the valveholders since the bottom plate of the r.f. amplifier must be in position (para. 42) before 1.t. and h.t. supplies are switched on. So make the measurements at the poles of 2SKT28 which are accessible after removing the cover of the socket:

(1) With the equipment switched OFF open the amplifier drawer, remove the cover (secured by four 6 BA countersunk screws) from 2SKT28 and then close the amplifier drawer.

(2) Switch on the equipment, allow a five-minute warming up period and then check that it is set up and tuned to the crystal frequency (para. 43).

(3) Open the amplifier drawer and operate the gate switch to restore the mains supply.

(4) Using a multimeter CT498 carefully measure the voltages at the poles of 2SKT28; typical voltages are given in Table 3. Except for the grid voltages, which are measured with the h.t. supply off (shorting plug removed from the transmitter MIC socket), the figures apply to an unmodulated equipment giving 100 to 150 watts output into a 50-ohm load (para. 43).

(5) On completion of the measurements switch OFF the equipment and secure the cover on 2SKT28.

TABLE 3

R.F. amplifier voltage measurements

Voltage measured	2SKT28 pole	Typical voltage
1V1 heater	6	6.3V a.c.
1V2 heater	13	6.0V a.c.
1V3 heater	3	6.0V a.c.
1V1a grid	10	-37V
1V1b grid	8	-37V
1V1 screen	12	200V
1V1a and b anode	5 and 11	450V
1V2 grid	16	0
1V3 grid	2	0
1V2 and 1V3 screen	1 and 15	180V
1V2 and 1V3 anode	4 and 14	980V

Chassis assembly voltage measurements

45. Measure voltages on the vertical terminal panel at the rear right-hand side of the amplifier drawer:

(1) Switch on the equipment, allow five-minute warming-up and then check that it is set up and tuned to the crystal frequency (para. 43).

(2) Open the amplifier drawer and operate the gate switch to restore the mains supply.

(3) Using a multimeter CT498 or 498A measure the voltages at the terminal panel; typical values are given in Table 4. The figures apply to an unmodulated equipment giving 100 to 150W output into a 50-ohm load (para. 43) with TUNE-TRANSMIT 2S3 at TRANSMIT.

TABLE 4

Chassis assembly voltage measurements

Voltage measured	Terminal	Typical voltage (V)
H.T. line and 2V4 anode	17	◄470►
2V2 anode (2S3 at TUNE)	12	◄115►
2V2 anode (2S3 at TRANSMIT)	12	◄300►
2V4 grid bias (2S3 at TUNE)	13	60
2V4 grid bias (2S3 at TRANSMIT)	13	◄175►
2V4 cathode (2S3 at TUNE)	18	85
2V4 cathode (2S3 at TRANSMIT)	18	180

Gain of anode modulator

46. The performance of the anode modulator can be checked by measuring the a.f. voltages developed across the primary of the modulation transformer 2T1. With the equipment switched OFF proceed as follows:

(1) Couple the test set, radio, CT214 to the aerial socket on the amplifier cabinet (para. 43). Open the transmitter drawer, insert the 9-pole metering plug into 1SKT44 of the modulator, radio transmitter, 5820-99-911-8326 (modulator unit) and then close the transmitter drawer. Set the transmitter METER SWITCH to position 2 (modulator first amplifier cathode current).

(2) Open the amplifier drawer and remove the fibre glass cover (secured by four 2 BA cheesehead screws) protecting the terminals of the modulation transformer 2T1. Close the amplifier drawer.

(3) Using the connector described in para. 7(1) connect the 600 output of the a.f. signal generator (Table 1) to the MIC socket of the transmitter drawer (the screen of the connector must be connected to the earth terminal of the signal generator). Set the signal tenerator frequency to 1000 Hz. (On the CT433 the 600Ω ATTENUATOR should be set to 20dB).

(4) Switch on the equipment, set up and tune it to any convenient frequency and, with TUNE-TRANSMIT at TRANSMIT, check that the r.f. power indication on the CT214 is not less than 100W. Switch on the a.f. signal generator and allow a five-minute warming-up period.

(5) Starting from minimum slowly increase the signal generator output until the a.g.c. of the transmitter modulator operates as in dicated by a decrease of 10 per cent in the reading on the transmitter drawer meter.

WARNING...

TAKE CARE WHEN MAKING THE MEASUREMENTS DESCRIBED IN SUB-PARA. (6) AS THE VOLTAGES INVOLVED ARE LETHAL.

(6) Open the amplifier drawer and operate the gate switch to restore the mains supply. Using a multimeter CT498 or 498A (1000V a.c. range) measure the voltages at the vertical terminal panel (para. 45) between terminal 8 and chassis and between terminal 10 and chassis. The voltages should be equal and not less than 180V. Measure the voltages between the centre tap of 2T1 and the anodes of 2V1 and 2V3. The figures obtained, although dependent upon the operating conditions of the r.f. amplifier, should be equal and within the limits 750-900V a.c.

47. Unsatisfactory anode modulator gain may be caused by:

(1) Faulty modulator valves 2V1 and 2V3.

(2) Faulty modulation transformer 2T1.

(3) Incorrect loading of 2T1 secondary winding due to a fault in the r.f. amplifier. Proceed as follows:

(1) With the equipment connected as in para. 46, switch OFF the equipment. Suitably identify the leads to 2T1 secondary and then unsolder these leads.

(2) Using a CT498 or 498A measure the resistance of 2T1 primary and secondary windings. The secondary resistance should be 30 ohms and the total primary 110 ohms (55 ohms from each anode to the centre tap).

(3) Connect a 3 k dummy load (para. 7(4)) across the 3.2 k secondary taps of 2T1 using insulated wire. Remove the 360V h.t. fuse 6FS6 on the front of the amplifier power drawer.

(4) Switch on the equipment and, using a CT498 or 498A set to its 1000V a.c. range (see para. 46(5) WARNING), measure the voltages between 2V1 anode and 2V3 centre tap and between 2V3 anode and 2T1 centre tap; these should be equal and approximately 800V. Measure the voltage across the dummy load; this should be 760V.

(5) If the distortion measurement (para. 48) is not being performed, switch OFF the equipment, solder the connections to 2T1 and refit the fibre glass cover on the transformer. Refit the 460V h.t. fuse 6FS6.

Anode modulator distortion

48. Excessive distortion in the anode modulator is usually accompanied by incorrect stage gain so check this first (para. 46 and 47). However, where distortion is measured apart from the gain check, the complete procedure is given below. Measure anode modulator distortion at the secondary winding of 2T1. With the equipment switched OFF proceed as follows:

(1) Couple the test set, radio, CT214 to the aerial socket on the amplifier cabinet (para.43).

(2) Open the transmitter drawer, insert the 9-pole metering plug into 1SKT44 of the modulator, radio transmitter, 5820-99-911-8326 (modulator unit) and then close the transmitter drawer.

(3) Set transmitter METER SWITCH to position 2 (modulator first amplifier cathode current).

(4) Open the amplifier drawer and remove the fibre glass cover (secured by four 2 BA cheesehead screws) protecting the terminals of the modulation transformer 2T1. Suitably identify the leads to 2T1 secondary and then unsolder these leads.

(5) Connect a 3 k dummy load (para. 7(4)) across the 3.2 k secondary of 2T1 using insulated wire. Remove the 460V h.t. fuse 6FS6 on the front of the amplifier power drawer.

Note...

The instructions in sub-para. (4) to (8) apply specifically to the use of the distortion meter CT373 which has a built-in signal generator; general instructions to cover the use of other distortion meters are given in brackets at the end of each sub-para.

(6) Connect the oscillator output of the distortion meter CT373 to the MIC socket on the transmitter drawer using the cable assembly (supplied with the CT373) with 3-point jack plugs at each end. (For meter with no built-in signal source, connect the 600-ohm output of an a.f. signal generator (Table 1) to the transmitter drawer MIC socket).

(7) Using the connector specified in para. 7(2) connect the distortion meter A.F. INPUT terminals across the dummy load, inserting 4.7M 1W in series with the input to the non-earthy terminal (the a.f. output across the load is of the order of 760V and the resistor serves to reduce this to a suitable level for the distortion meter).

(8) On the distortion meter set the oscillator controls to give 1000 Hz output into a 600-ohm balanced load with a floating centre tap. Set OUTPUT (COARSE) to -20dB, OUTPUT (FINE) fully counter-clockwise and METER FUNCTION to A.F. Set the V.V. & FILTER SELECTOR switch to SET LEVEL and the METER RANGE switch to the 100V range. (For a separate a.f. signal source, set it to give 1000 Hz output into a 600-ohm balanced load with a floating centre tap).

(9) Operate the amplifier drawer gate switch to restore the mains supply, switch on the equipment and the distortion meter (and, where applicable, the a.f. signal generator) and allow five-minute warming-up. Slowly advance the distortion meter OUTPUT (FINE) control (or the a.f. signal generator output) until the a.g.c. of the transmitter modulator unit operates as indicated by the transmitter meter reading starting to decrease. (Approximately 25 mV input is required to operate the modulator unit a.g.c.).

(10) Adjust the distortion meter FILTER AMP GAIN until the meter reads f.s.d. and measure distortion as described in the distortion meter handbook. The distortion should not exceed 15%.

Note...

If necessary to set METER RANGE to the 30V range to obtain f.s.d prior to measuring distortion, check the a.c. voltages and transformer 2T1 (para. 47(4)).

(11) Switch OFF the equipment, solder the connections to 2T1 and refi the fibre glass cover on the transformer. Refit the 460V h.t. fuse 6FS6.

Probe assembly diodes

49. The only components in the probe assembly liable to failure are the diodes which can be checked by measuring their forward and reverse resistance:

(1) Mounted on the left-hand side-frame of the amplifier drawer, adjacent to the probe assembly, are four resistors 2R37, 2R38, 2R39 and 2R40 enclosed by a metal cover secured by two 6 BA cheesehead screws. Remove this cover and unsolder the leads connected to 2R37 and 2R40.

(2) Using a multimeter CT429 measure the forward and reverse resistance of 4MR1 and 4MR2, connecting the CT429 between the probe body and the end of the lead removed from 2R37 for measurements of 4MR1, and between the probe body and the end of the lead removed from 2R40 for 4MR2 (ignore the resistances of 4R1, 4R3 and 4R2, 4R4). Typical forward and reverse resistance values are 700 ohms and 3M respectively.

(3) Solder the leads to 3R37 and 2R40 and fit the metal cover over the resistors.

50. To change a faulty diode:

(1) Unscrew the knurled retaining nut of the faulty tower and withdraw the tower from the body of the probe assembly. At the side of the tower undo the small grub screw which secures the diode and coupling loop.

(2) Using a soldering iron with a miniature bit apply the tip of the iron via the hole in the side of the tower to the centre conductor. By pulling on the coupling loop moulding and exerting a levering action with the soldering iron, withdraw the coupling loop and diode from the tower.

(3) Cut away the faulty diode and substitute a new one, observing correct polarity. Insert the coupling loop and diode in the tower and solder the connection.

(4) Secure the coupling loop with the grub screw and refit the tower in the probe assembly.

Notes on alignment

51. A distinction is made in subsequent alignment procedures between switching off the equipment and switching off the h.t. supplies, the former being necessary when, for example, the bottom cover plate of the r.f. amplifier is removed. The equipment can be switched off by the MAINS switches on the transmitter drawer and amplifier power drawer. The H.T. switch on the transmitter drawer can be used for switching off the h.t. supplies. Since high voltages are present in the amplifier drawer when the equipment is switched on it is advisable to remove the shorting plug from the MIC socket so that the h.t. supplies cannot be restored by inadvertent operation of the H.T. switch.

WARNING...

The h.t. supplies do NOT include the -150V and -48V supplies which are present at the chassis assembly except when the transmitter drawer MAINS switch is OFF.

52. Unless otherwise stated, references to METER SWITCH refer to the switch on the amplifier drawer. A metering table, giving the circuits metered in the different positions of the METER SWITCH, is shown in fig.8.

53. Before starting to align the r.f. unit it is necessary to remove the P.A. GRID & INPUT TUNING and P.A. ANODE TUNING radio frequency tuner sub-assemblies 5820-99-999-2377 and 2376 (para. 3 note), so tuning must be done by manually turning the tuning shaft couplings.

Preliminary adjustments

54. (1) With the equipment switched OFF remove the two radio frequency tuner sub-assemblies (para. 53) which are each secured by three captive screws. Using a flat spanner slacken the $\frac{1}{4}$ in 28 UNF hexagon head screw which secures the chain tensioning arm. Rotate the arm counterclockwise to release the chain and remove the chain from the sprocket wheel on the buffer anode tuning shaft.

(2) Remove the cover from the buffer grid compartment (para.11(1)).

(3) Turn the buffer grid tuning shaft until the arrow on the law corrector arm is aligned with, and pointing towards, the arrow marked on the front of the r.f. amplifier chassis. Check that the arrow marked on the wiper arm of the buffer grid lecher line 1L1 is in line with the arrow marked on the inside radius of the lecher line.

(4) If the condition specified in sub-para. (3) is not satisfied, slacken the wiper arm clamping screw and, taking care to keep the arrow on the law corrector arm aligned with the arrow on the chassis, adjust the position of the wiper arm to meet the requirement of sub-para.(3). Ensure that the wiper arm is centrally positioned between the lecher lines (see also para. 22(4)) and tighten the clamping screw. Refit the cover on the buffer grid compartment.

(5) Switch on the power supplies. Fit the appropriate crystal (16,662.5 kHz) and tune the transmitter HG, TREBLER and P.A. controls to 399.9 MHz. Set TUNE-TRANSMIT on the amplifier drawer to TUNE.

(6) Check that the r.f. drive to the amplifier is not less than 10W by uncoupling the r.f. connector from 7PL8 at the rear of the transmitter cabinet and coupling the test set, radio, CT214 to this plug via the line, r.f. transmission, 5985-99-972-3929.

(7) Insert a shorting plug (para. 7(5)) into the MIC socket on the transmitter drawer and check that the transmitter power output is not less than 10W.

(8) Remove the shorting plug from the MIC socket, uncouple the CT214 and refit the r.f. connector to 7PL8. Disconnect the aerial feeder from 7PL24 at the rear of the amplifier cabinet and couple the CT214 to 7PL24 as in (6).

(9) Insert the shorting plug into the MIC socket, set METER SWITCH to position 3 (p.a. grid current) and manually tune the buffer anode lecher line for maximum meter reading. Similarly tune the p.a. anode lecher line for maximum power indication on the CT214.

Alignment of buffer grid circuit

55. Continuing from para. 54:

(1) Set METER SWITCH to position 1 (buffer 1V1b grid current) and, using the alignment tool 5120-99-972-9814, adjust the trimmer 1C4 for maximum meter reading.

(2) Turn METER SWITCH to position 2 (buffer 1V1a grid current) and adjust the trimmer 1C5 for maximum meter reading.

(3) Return METER SWITCH to position 1 and check the setting of 1C5.

Note...

The settings of 1C4 and 1C5 are interdependent so it is necessary to alternately tune the trimmers for maximum meter readings consistent with a good balance between the readings.

(4) Where the lower of the two readings is less than 20, with the grid drives approximately equal, set METER SWITCH to the position (1 or 2) giving the lower reading and, using the alignment tool 5120-99-972-9815, adjust 1C3 for maximum meter reading. The setting of 1C3 is not critical and the adjustment not normally required.

Alignment of buffer anode circuit

56. (1) Switch OFF the h.t. supplies. Remove one 6 BA cheesehead screw from each of the two small cover plates, on the large bottom plate, beneath 1V2 and 1V3. Slacken the second screw of each plate and swivel the plates aside to expose the trimming access holes for 1C16 and 1C18.

(2) Switch on the h.t. supplies, set METER SWITCH to position 3 (1V3 grid current) and, using the alignment tool 5120-99-972-9814, adjust 1C16 for maximum reading.

(3) Turn METER SWITCH to position 4 (1V2 grid current) and adjust 1C18 for maximum meter reading.

Note...

Since the capacitor settings are interdependent they must be tuned alternately for maximum meter readings consistent with a good balance between the readings. The readings should not differ by more than 10% nor the lower be less than 30.

(4) Switch OFF the equipment (leaving it set up on 399.9 MHz) and check that the arrow on the coupling of the buffer anode tuning shaft is aligned with, and pointing towards, the arrow marked on the front of the r.f. amplifier. If the arrows are not aligned:

(a) Remove the cover from the buffer anode compartment (para. 11(2)).

(b) Carefully holding the lecher line wiper arm completely immobile, slacken the clamping screw of the arm.

(c) Rotate the shaft until the arrows are correctly aligned as above and retighten the clamping screw.

(5) Refit the covers on the buffer grid and anode compartments (see para. 11(2)).

(6) Carefully fit the chain to the sprocket wheels on the buffer anode and buffer grid shafts and, ensuring that the arrows on these shafts remain correctly aligned with their respective arrows on the front of the r.f. amplifier, rotate the chain tensioning arm clockwise to just take up the slack in the chain. Tighten the securing nut of the arm.

(7) Close and secure the two small cover plates (sub-para. (1)).

Ganging

57. After para.56, gang the buffer grid and anode circuits as follows:-

(1) Release the two 6 BA nuts of the sprocket wheel on the buffer anode shaft to permit slight independent adjustment of the grid and anode circuits (only limited independent adjustment is possible or necessary since the circuits have already been individually adjusted with the chain drive removed).

(2) Switch on the equipment.

(3) Set METER SWITCH TO position 1 (1V1b grid current) and tune the buffer grid lecher line for maximum meter reading.

(4) Set METER SWITCH to position 3 (1V3 grid current) and tune the buffer anode lecher line for maximum meter reading.

(5) Switch OFF the h.t. supplies and, taking care not to move the buffer grid and anode tuning shafts, tighten the two 6 BA nuts of the sprocket wheel on the buffer anode shaft.

(6) Fit a crystal for 225.0 MHz (12,500.0 kHz), switch on the h.t. supplies and tune the transmitter controls to 225 MHz.

(7) Set METER SWITCH to position 1 and tune the ganged buffer grid and anode circuits for maximum meter reading.

(8) Set METER SWITCH to position 3 and check that the circuits are still tuned for maximum meter reading (i.e. that the two peaks coincide).

(9) If the two tuning peaks (sub-para. (3)) do not coincide, set METER SWITCH to position 1 and retune the ganged circuits for maximum reading.

(10) Switch OFF the h.t. supplies, slacken the two 6 BA cheesehead securing screws of the small cover plate adjacent to the buffer anode tuning shaft and swivel the plate aside to expose the access hole for 1C14.

(11) Switch on the h.t. supplies, set METER SWITCH to position 3 and, using the alignment tool 5120-99-999-3708, adjust 1C14 for maximum meter reading.

(12) Close and secure the small cover plate.

(13) Retune the transmitter to 399.9 MHz (para.54(5)) and check that the maximum readings, at positions 1 and 3 of METER SWITCH, coincide. If they do not coincide repeat sub-para.(1) to (4) until the ganging is satisfactory, i.e. the grid and anode circuits tune together at both 225 MHz and 399.9 MHz.

(14) Check that the ganging is satisfactory over the whole frequency range by setting up and tuning the equipment to the frequencies listed in Table 5 and noting that the buffer grid and anode circuits tune together, i.e. maximum meter readings at METER SWITCH positions 1 and 3 are as near coincident as possible at each tuning point.

(15) An additional adjustment of ganging can be made by slackening the two 4 BA cheesehead screws which secure the bracket of the law corrector mechanism and raising or lowering the bracket, as required, until the ganging is satisfactory on all twelve channels.

TABLE 5

Test frequencies

Frequency (MHz)	Crystal (kHz)
399.9	ZDR 16,662.5
386.0	ZDR 16,083.33
372.0	ZDR 15,555.5
358.0	ZDR 14,915.55
344.0	ZDR 14,333.33
330.0	ZDR 13,750.0
313.0	ZDR 13,041.66
296.0	ZDM 16,444.4
279.0	ZDM 15,500.0
262.0	ZDM 14,555.5
245.0	ZDM 13,561.11
225.0	ZDM 12,500.0

Alignment of p.a. anode circuit

58. (1) Switch OFF the h.t. supplies, slacken the two 6 BA cheesehead securing screws of the small cover plate adjacent to the p.a. anode tuning shaft and swivel the plate aside to expose the access hole for 1C29. Slacken the shaft lock of preset 2RV24 and, using an insulated screw-driver, set the control to approximately midway (2RV24 is the upper of two potentiometers on a bracket at the rear right-hand side of the chassis assembly (fig. 5) with access to the shaft via a hole in the right-hand side-frame of the chassis).

(2) Switch on the h.t. supplies, set METER SWITCH on the power drawer to position 8 (p.a. anode current) and adjust 2RV24 for a reading of 76. (Do NOT secure the shaft lock as subsequent adjustment is necessary).

(3) Tune the transmitter to 399.9 MHz and set the amplifier METER SWITCH to position 3 (p.a. grid current).

(4) Tune the ganged buffer grid and anode circuits for maximum meter reading and tune the p.a. anode circuit for maximum power indication on the test set, radio CT214.

(5) Set TUNE-TRANSMIT on the amplifier drawer to TRANSMIT and, using the alignment tool 5120-99-999-3708, adjust 1C29 for power output of not less than 100W, at the same time adjusting the p.a. anode tuning shaft to keep the circuit on tune.

Note...

If 1C29 is increased in capacitance beyond a certain point this may give increased power output at 399.9 MHz but less at other frequencies.

(6) Check that there is no spurious oscillation by setting transmitter TUNE-REMOTE-LOCAL to REMOTE, noting the tuning position of the p.a. anode tuning shaft and then rotating the shaft approximately 10 degrees either side of the tuning point. There must be no reading on the CT214.

(7) Set transmitter TUNE-REMOTE-LOCAL to LOCAL and retune the p.a. anode circuit for maximum power indication on the CT214.

(8) Switch OFF the equipment and check that the arrow on the coupling of the p.a. anode tuning shaft is aligned with and pointing towards the arrow marked on the front of the r.f. amplifier. If the arrows are not aligned:

(a) Remove the cover from the p.a. anode compartment (para. 11(3)).

(b) Carefully holding the lecher line wiper arm completely immobile, slacken the clamping screw of the arm.

(c) Rotate the shaft until the arrows are correctly aligned as above and retighten the clamping screw.

(d) Refit the cover on the p.a. anode compartment (para. 11(3)).

(9) Tune the transmitter to each of the remaining frequencies listed in Table 5, tune the buffer and p.a. stages for maximum power output indication on the CT214 and ensure that the power output, at each frequency, is not less than 100W.

(10) If the power output at any frequency is less than 100W, readjust 1C29 (see sub-para. (4) and note) to provide the specified output at all twelve frequencies.

(11) Refit the P.A. GRID & INPUT TUNING and P.A. ANODE TUNING radio frequency tuner sub-assemblies (para. 8).

Adjustment of screen voltage control and check of power output

59. (1) Switch on the equipment, leaving TUNE-TRANSMIT at TRANSMIT and power drawer METER SWITCH at position 8 (p.a. anode current).

(2) Fit a 12,500.0 kHz crystal and tune the transmitter to 225.0 MHz.

(3) Tune the buffer and p.a. stages for maximum power output and adjust 2RV24 for a reading of 76 on the amplifier power drawer meter.

(4) Tune the transmitter to each of the remaining frequencies listed in Table 5, tune the buffer and p.a. stages for maximum power output and then note the reading on the amplifier power drawer meter.

(5) Tune the transmitter to the frequency at which the highest reading was noted in sub-para.(4), tune the buffer and p.a. stages for maximum power output and then adjust 2RV24 to bring the reading to 76. Lock 2RV24.

(6) With the equipment set up and tuned for maximum power output at any frequency (Table 5) remove the TX HT fuse 6FS8 on the transmitter power supply and check that the amplifier power drawer meter reading falls to below 55. Refit 6FS8.

Adjustment of screen modulator

60. (1) Open the transmitter drawer and operate the gate switch to restore the mains supply.

(2) On the transmitter modulator unit insert the 9-pole metering plug into 1SKT44 and check that the CLIP/UNCLIP plug is set to UNCLIP and that the VOGAD circuit is operative and the ENABLER circuit inoperative.

(3) Release the lock of 1RV56 and set fully counterclockwise.

(4) Set the transmitter METER SWITCH to position 2 (modulator first amplifier cathode current).

(5) Using the connector specified in para. 7(1), couple the 600Ω output of the a.f. signal generator (Table 1) to the MIC socket on the transmitter drawer. (The screen of the connector must be connected to the signal generator earth terminal).

(6) Set the signal generator frequency to 1000Hz (The 600Ω ATTENUATOR on the CT433 should be set to 20dB).

(7) Switch on the a.f. signal generator and allow five-minute warming-up.

(8) With the equipment set up and tuned on any convenient frequency and TUNE-TRANSMIT at TRANSMIT, slowly increase the a.f. signal generator output from minimum until the a.g.c. of the modulator unit starts to operate as indicated by the reading of the transmitter drawer meter starting to decrease.

(9) Open the amplifier drawer and operate the gate switch to restore the mains supply.

(10) Turn 2RV30 (at the rear right-hand side of the chassis below 2RV24) fully counterclockwise and then slowly rotate it clockwise until maximum power indication is obtained on the test set, radio, CT214.

(11) Close the amplifier drawer.

(12) Adjust 1RV56 of the transmitter modulator unit for maximum modulation depth indication on the CT214 (function switch position 4) and then adjust the control slightly counterclockwise to reduce the indication by 2-3 per cent (this improves the shape of the modulation envelope). Lock 1RV56.

(13) Close the transmitter drawer.

Check of modulation depth and distortion

61. A final measurement of the modulation depth and overall distortion should be made to ensure that both are within acceptable limits. To measure distortion a signal is applied to the MIC socket on the transmitter drawer and the distortion content of the a.f. component of the demodulated carrier wave measured at MONITOR OUTPUT socket on the amplifier drawer.

62. These instructions apply specifically to the use of the distortion meter CT373 which has its own built-in signal generator. Where applicable, instructions to cover the use of other distortion meters are given in brackets. Continuing from para.60:

(1) Switch OFF the h.t. supplies and, unless a distortion meter with no built-in signal source is to be used, disconnect the a.f. signal generator from the transmitter MIC socket.

(2) Set amplifier drawer METER SWITCH to position 5 (monitor unit) and the monitoring switch to MON. Turn CALIBRATE fully counter-clockwise.

(3) Connect the oscillator output of the distortion meter CT373 to the MIC socket on the transmitter drawer using the cable assembly (supplied with the CT373) with 3-point jack plugs at each end.

(4) Using the connector specified in para. 7(1) couple the MONITOR OUTPUT socket on the amplifier drawer to the distortion meter A.F. INPUT terminals. Leave the spade termination attached to the screen of the connector disconnected. (If the distortion meter does not contain a signal source, leave the a.f. generator connected (sub-para. (1) to provide the necessary modulation signal).

(5) On the distortion meter set the oscillator controls to give 100 Hz output into a 600-ohm balanced load with a floating centre tap.

(6) Set OUTPUT (COARSE) to -20dB, OUTPUT (FINE) fully counter-clockwise and METER FUNCTION to OSC. OUT. Set V.V. & FILTER SELECTOR to V.V. (If the a.f. signal generator is being used and the setting has not been altered from para.60(4), no further adjustments are necessary).

(7) Switch on the distortion meter and allow a five-minute warming-up.

(8) Switch on the h.t. supplies and set TUNE-TRANSMIT to TRANSMIT and transmitter METER SWITCH to position 2.

(9) Slowly advance distortion meter OUTPUT (FINE) until the a.g.c. of the transmitter modulator unit starts to operate as indicated by the reading on the transmitter drawer meter starting to fall. Check that the modulation depth, measured on the test set, radio, CT214, is not less than 75%.

Note...

A check may also be made of the a.f. signal output level from the distortion meter (or the a.f. signal generator). Where 1RV4 on the transmitter modulator unit is set fully clockwise this level is approximately 70 mV.

(10) With distortion meter V.V. & FILTER SELECTOR left at V.V., set METER FUNCTION to A.F.

(11) Adjust CALIBRATE on the amplifier drawer until the audio output signal from the monitor unit gives a reading between half and full scale deflection on the distortion meter with METER RANGE set to the appropriate range. (With distortion meters other than the CT373 adjust CALIBRATE on the amplifier drawer to give a suitable level of audio output signal for the particular meter).

(12) Measure the distortion as described in the distortion meter handbook. The distortion must not exceed 15%.

63. When all testing and alignment has been satisfactorily completed, switch OFF the equipment and disconnect all test equipment.

TABLE 6

Modifications

Mod. No.	Class	Topic-2 Leaflet	Topic-2 A.L.	Label No.	Brief details of change
Amplifier, radio frequency 5820-99-943-9066					
6628	B/3 (on failure)	◄B38	45►	1	Change of screws, set and washers recessed to prevent damage to mica dielectric of built-in capacitors 1C25 and 26
7376	B/3	◄B37	41►	2	Replacement of PTFE feed-through bush forming part of built-in capacitor 1C27 and 1C28 to overcome breakdown of the mica dielectric
9437	C/3 on replacement of CV 2519	◄B53	66►	3	Replace CV 2519 valves (1V2, 1V3 by CB 6137 valves to give improved performance and more robustness

TABLE 6 (contd.)

Mod. No.	Class	Topic -2 Leaflet	A.L.	Label No.	Brief details of change
◄A3227	C/3 W.O.T.S.A.C.	B66	87	4	Replace obsolete capacitor variable 5910-99-016-7002 (1C4, 1C5) by capacitor, variable 5910-99-618-3031.
A3602	C/3 on failure	B70	95 & 98	5	Replace contact, electrical 5950-99-999-4305 by contact assembly, electrical 5820-99-106-1682 to ensure maximum contact with the lecher lines.►
Chassis, electrical equipment 5820-99-932-3999					
4738	B/3 (RAF) B/2 (RN)	◄B1	2►	1	Substitution of certain plugs and sockets by a new pattern (red splash) in which air can circulate and reduce condensation.
5310	B/2	◄B8	9►	2	2R34 changed from 68k to 10k and 2R23 from 68k to 56k, to enable high-gain CV 2519 valves to be used in amplifying unit Type 9337.
5450	B/2	◄B20	22 & 42►	3	To fit a four-way plug and socket, cut away a flange and fit special bolts to facilitate removal of the motor and fan assembly for servicing.
5494	B/2 (on replacement)	◄E15	16►	4	Introduction of new type of air filter.
6553	B/2 (RAF-on failure)	◄B31	35►	5	Substitution of motor unit Type 9688 (Ref.No. 10K/19481) and fan blade assembly (Ref.No. 10K/19482) by cooler, air, electronic equipment, 5820-99-914-7354.
8212	B/3	◄B42	49 & 51►	6	Change of metering label. New type has blank column for recorded readings.
8797	B/3	◄B44	53►	7	Addition of an earth wire to permit simultaneous operation of selector units Type 9008

TABLE 6 (contd.)

Mod. No.	Class	Topic - 2 Leaflet	A.L.	Label No.	Brief details
9281	B/3	B51	63	8	Remove the louvres from the air filter cover and enlarge the air bleed holes around the base of the modulator valves (2V1 and 2V3) to reduce the working pressure of the cooling air flow.
0789	C/3(RAF)	B57	71	9	Drill three holes in the left-hand side-frame to facilitate access to 1C27 in the amplifying unit, (RF) Type 9337 to simplify servicing.
A2856	B/2	B63	◄96►	10	Change the value of 2R18 and 2R22 from 1k to 510 ohms, the value of 2R19 and 2R20 from 1k to 1.5k and change the associated wiring to reduce the a.f. drive voltage and thus prevent over-modulation.
◄A3993	B/2	B71	97 & 99	11	Introduce two 4.7k resistors (R41, R42) to overcome high distortion and over-modulation. Mod. No. A2856 is associated.►

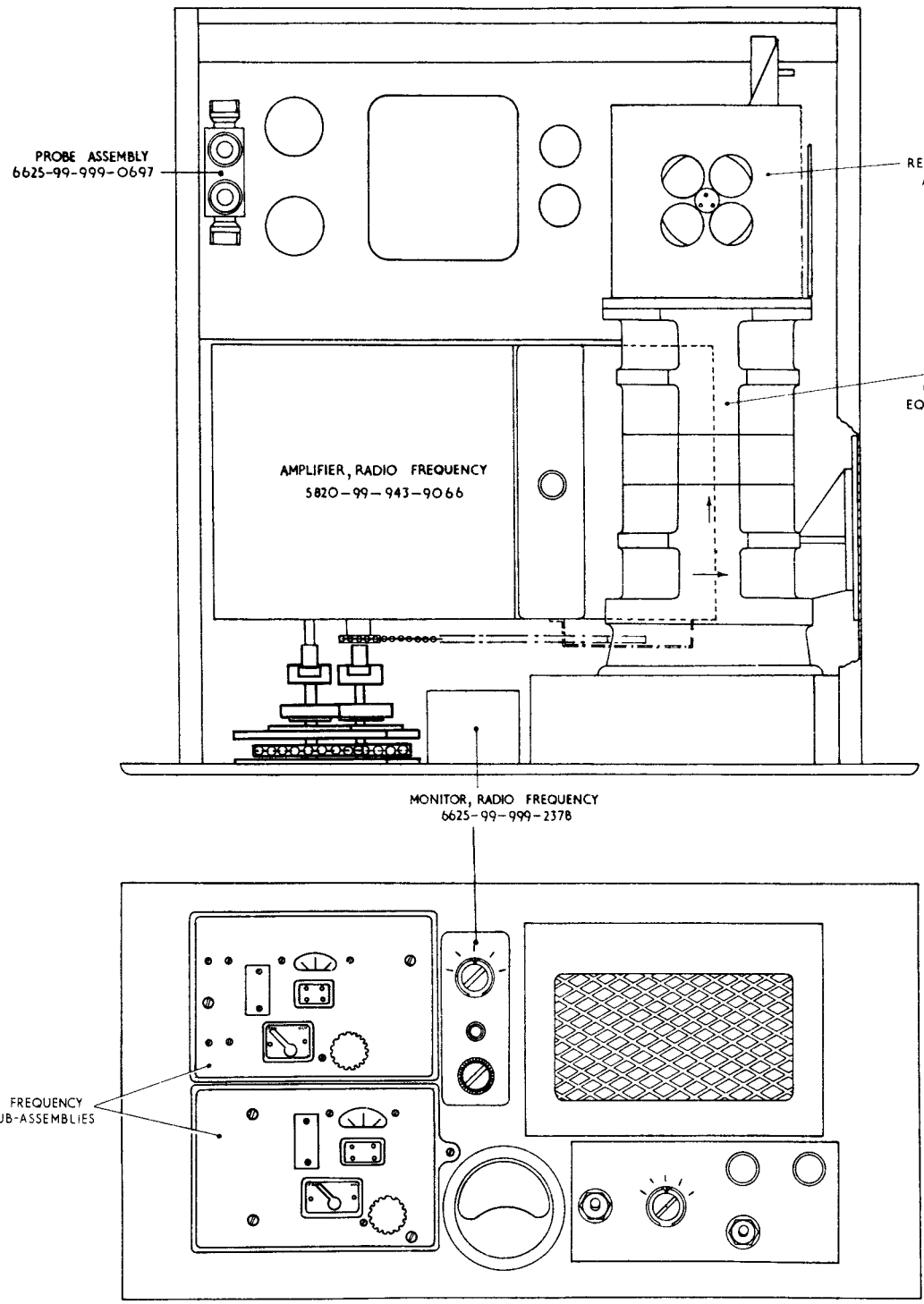
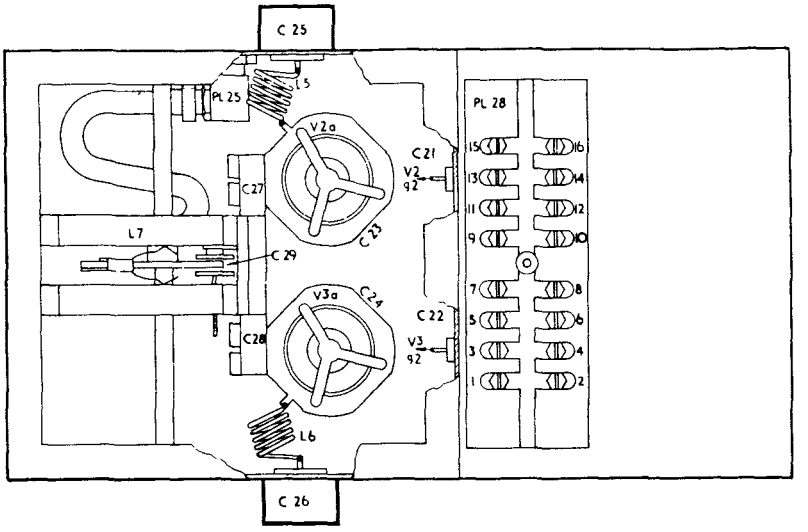


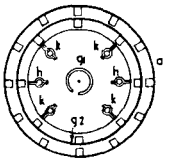
DIAGRAM INCLUDES MOD No 5494/4, 6553/5, 9281/8

AIR DIAGRAM-MIN
116E-0252-MD57
BY COMMAND OF THE DEFENCE COUNCIL FOR USE IN THE ROYAL AIR FORCE
ISSUE 1 Prepared by the Ministry of Technology

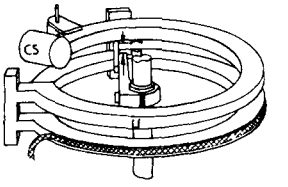
Amplifier sub-assemblies 5820-99-932-5708 Fig. 3

TOP VIEW



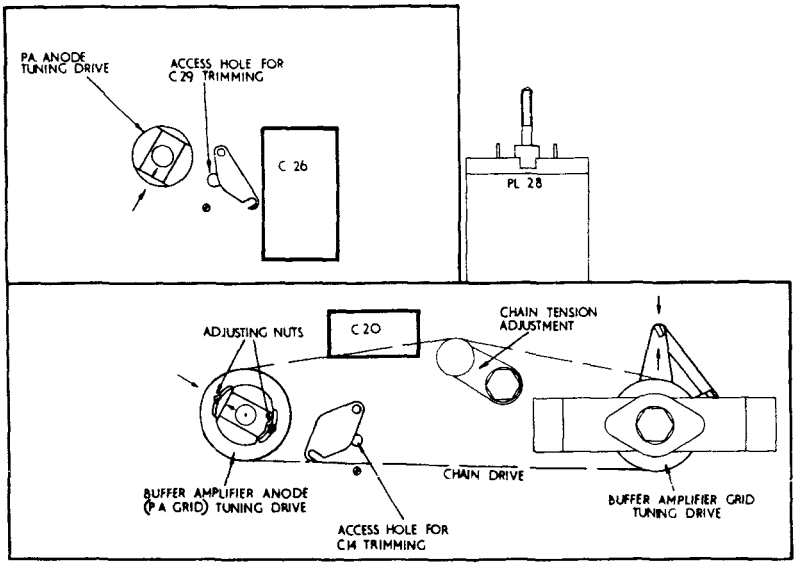


DETAILS OF V2 & V3 VALVE HOLDERS FROM TOP



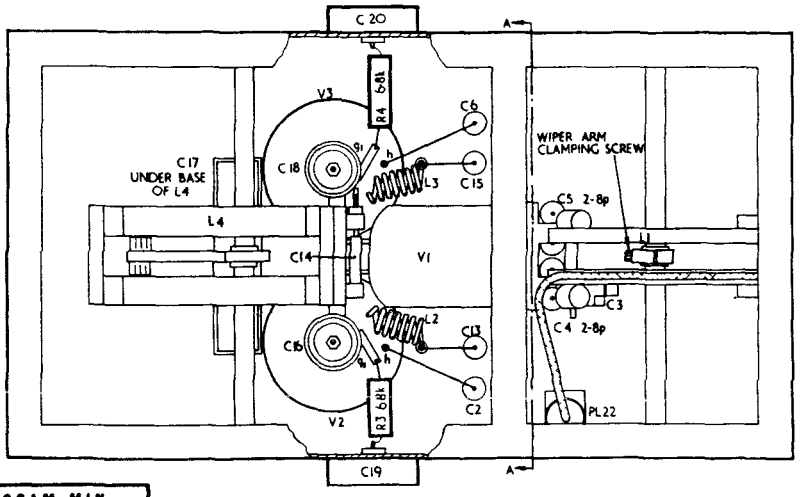
DETAILS OF L1 SHOWING LINING UP ARROW (SEE BOTTOM VIEW)

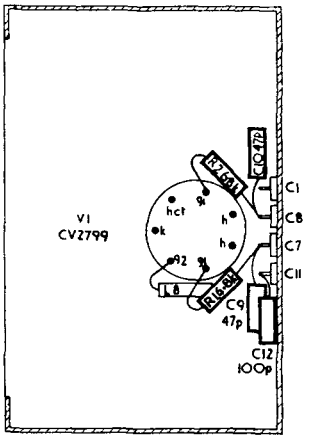
FRONT VIEW



ALL COMPONENTS PREFIXED (1)

BOTTOM VIEW





VIEW AT 'A-A'

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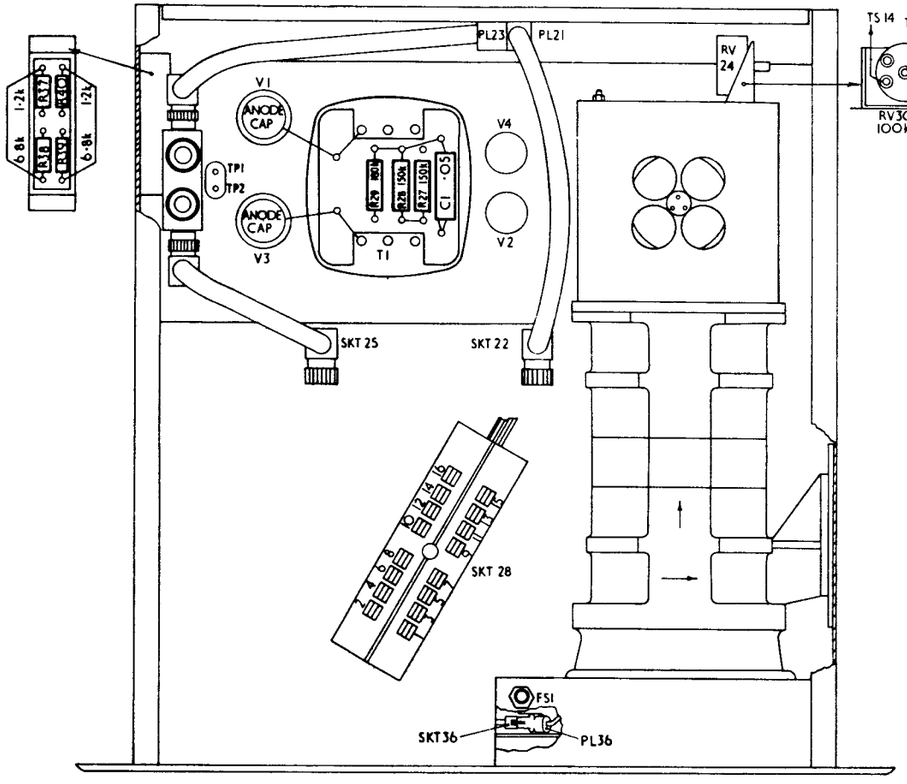
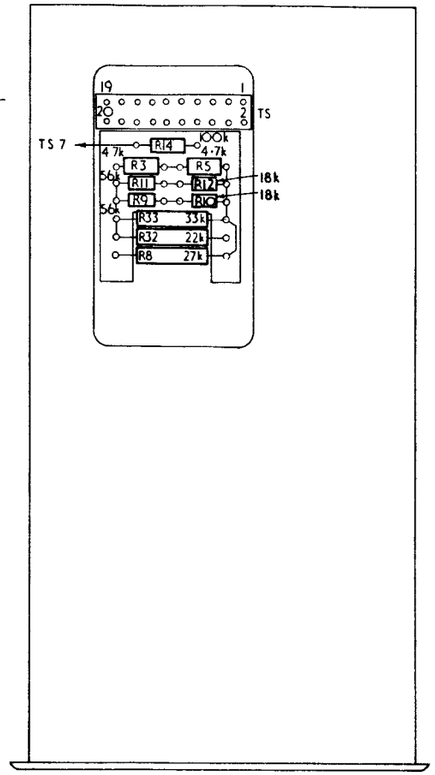
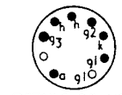
Amplifier, radio frequency 5820-99-943-9066 – layout Fig. 4



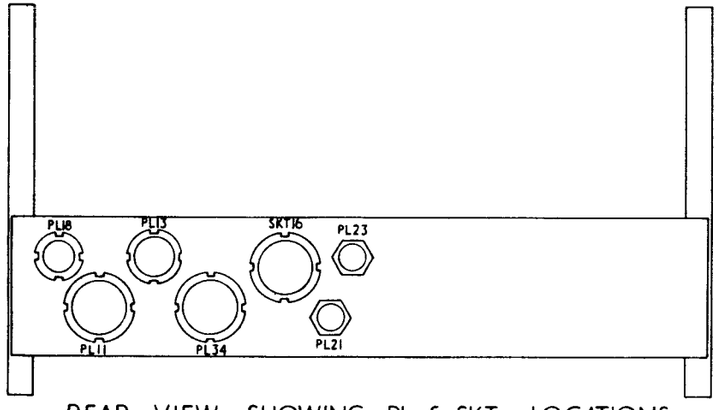
TOP VIEW



R.H. SIDE VIEW



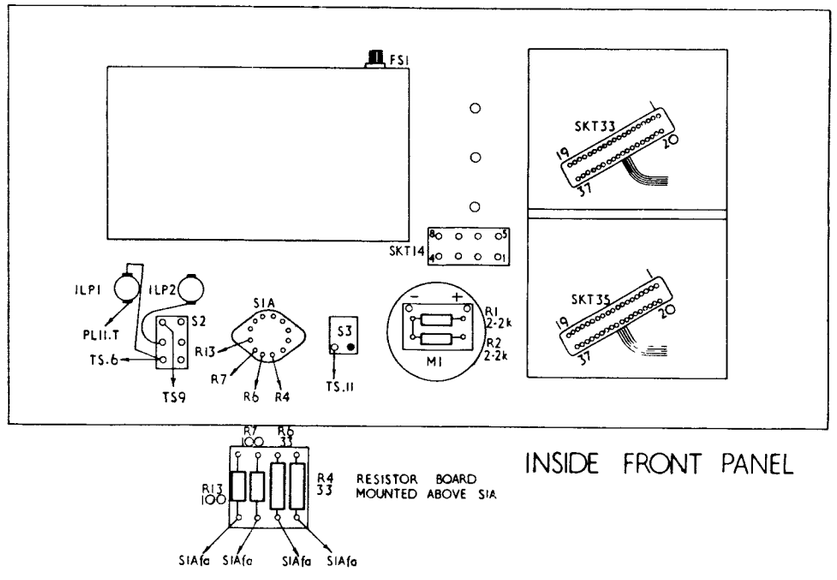
BOTTOM VIEW



REAR VIEW SHOWING PL. & SKT. LOCATIONS

ALL COMPONENTS PREFIXED (2)

DIAGRAM INCLUDES MOD. No. 5310/2, 5450/3, 6553/5, A2856/10.



INSIDE FRONT PANEL

RESISTOR BOARD MOUNTED ABOVE S1A

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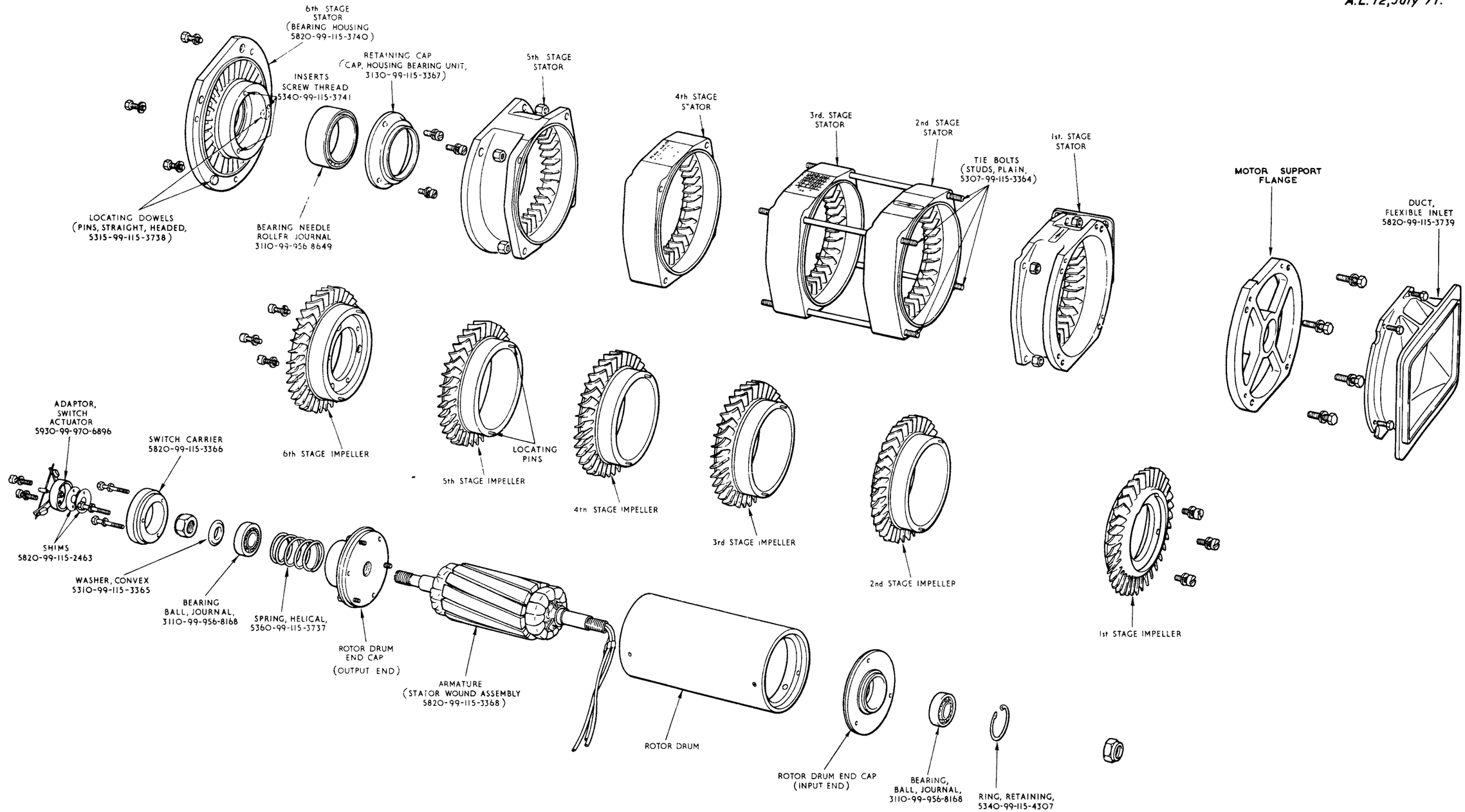
Chassis, electrical equipment 5820-99-932-3999 - layout

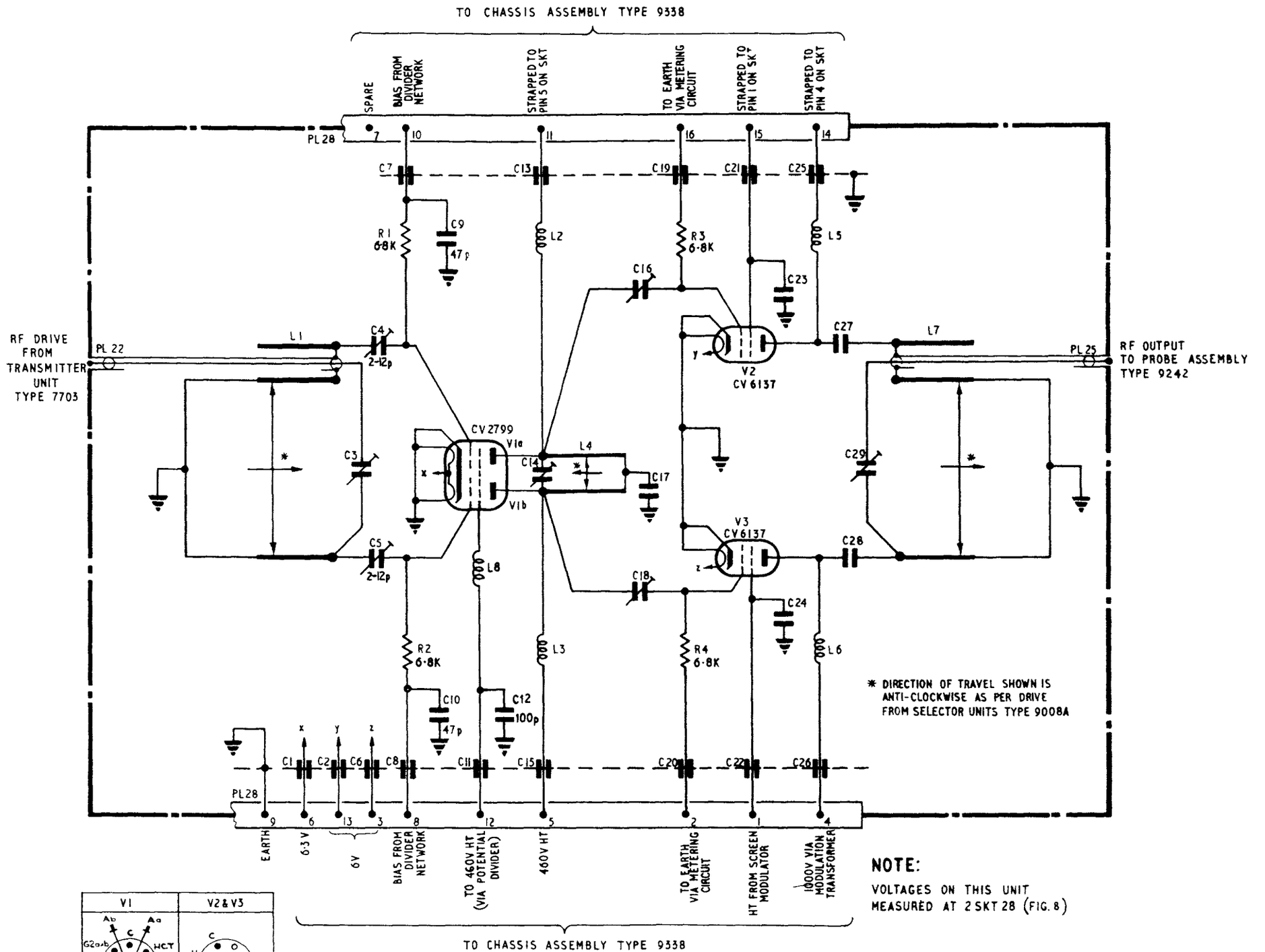
Fig. 5



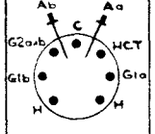
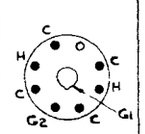
ALSO AVAILABLE AS
AIR DIAGRAM
116E-0253-MD67

Cooler, air, electronic equipment, 5820-99-914-7354 (fan assembly): exploded view

Fig. 6



NOTE:
VOLTAGES ON THIS UNIT MEASURED AT 2 SKT 28 (FIG. 8)

V1	V2 & V3
	
CV 2799	CV 6137

MODS INCORPORATED IN THIS DIAGRAM

MOD. No.	9437	A3227
STRIKE OFF	3	4

ALL COMPONENTS PREFIXED (1)

Amplifier radio frequency

5820-99-943-9066: servicing circuit

Fig. 7

AIR DIAGRAM-MIN
116E-0252-MD56
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METERING TABLE			
Sw. Pos.	MEASURING		F.S.D.
1	BUFFER (V1B) Ig	AMP UNIT (RF) TYPE 9337	5·0mA
2	BUFFER (V1A) Ig		5·0mA
3	POWER AMP (V3) Ig		15 mA
4	POWER AMP (V2) Ig		15 mA
5	MONITORING UNIT		

MODS. INCORPORATED IN THIS DIAGRAM

MOD. No.	5310	5450	6553	8797	A2856	A3993
STRIKE OFF	2	3	5	7	10	11

SELECTOR UNIT TYPE 9008A (BUFFER)

SELECTOR UNIT TYPE 9008A (POWER AMP)

AMPLIFYING UNIT (RF) TYPE 9337

PROBE ASSEMBLY TYPE 9242 (SEE SEPARATE TABLE BELOW FOR VALUES.)

BIAS NETWORK

ANODE MODULATOR

SCREEN MODULATOR

PA GUARD VALVE

MONITORING UNIT TYPE 7107

POWER AMP GUARD VALVE HEATER BRIDGE

V1 & V3	V2 & V4
CV2394	CV2129

S1 SWITCH BANK LOCATION

S1afe
S1afb
(AS VEIWED FROM CONTROL KNOB)

S1ar

WARNING
VOLTAGES MEASURED ON THIS SUB-UNIT ARE LETHAL.

NOTES:
1. BIAS MEASURED WITH h.t. SWITCHED OFF.
2. ALL VOLTAGES, UNLESS OTHERWISE STATED, TAKEN WITH TUNE-TRANSMIT SWITCHED AT TRANSMIT.

NOTE :-
TERMINALS 1-18 SHOWN ON CIRCUIT DIAGRAM ARE TERMINALS ON THE SEALED MODULATOR COMPARTMENT.

AIR DIAGRAM-MIN
116E-0252-MD51
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ALL COMPONENTS PREFIXED (2)

Chassis electrical equipment 5820-99-932-3999: servicing circuit

Fig. 8

Chapter 2

(Completely revised)

CHASSIS, ELECTRICAL EQUIPMENT 5820–99–999–2655

LIST OF CONTENTS

LIST OF TABLES

LIST OF ILLUSTRATIONS

Introduction

Purpose of unit

1. The chassis, electrical equipment 5820–99–999–2655, i.e. the amplifier power drawer, together with the relay assembly 5945–99–999–2603 constitutes the power supply for the amplifier drawer (amplifier sub-assemblies 5820–99–932–5708). Four mains transformers are used, three of which feed full wave rectifier circuits and provide h.t. supplies for the buffer amplifier, p.a., and modulator stages. (The rectifier valves for the 460V h.t. supply are mounted on the relay assembly 5945–99–999–2603). The remaining transformer has six l.t. secondary windings and is used for all l.t. supplies. In addition to the power supply components the amplifier power drawer contains a built-in metering system.

Test equipment

2. No items of test equipment are required other than a test set, multirange CT498A, 6625–99–105–7049 or a multimeter CT498, Ref. No. 5QP/17447.

Servicing notes

3. No routine servicing or alignment is required on this unit. Fault diagnosis must be carried out with the drawer secured in its runners since it is not possible to extend the cabinet cabling which connects to the back of the drawer.

Voltage and resistance measurements

4. Typical d.c. voltages are given in Table 1, all readings being taken with the amplifier drawer set up and tuned on a channel but with no modulation input.

TABLE 1

Voltage measurements (d.c.)

Position in circuit	Voltage reading
Junction of 6C18 and 6L3	490
Junction of 6F19 and 6L3	470

5. Approximate values of the resistances of the smoothing chokes used in the circuit are given in Table 2. A multimeter CT498A or CT498 may conveniently be used for resistance measurements.

TABLE 2

Resistance of smoothing chokes

Choke	Resistance
L1	100 ohms
L2	100 ohms
L3	160 ohms

Internal metering

6. The built-in metering system in the amplifier power drawer may be used to supplement the voltage measurements given in Table 1. It should however, be borne in mind that the –48V and –150V measurements indicate the serviceability, or otherwise, of the transmitter power drawer. The current measurements check the drive to, and the performance of, the amplifier drawer valves rather than the performance of the amplifier drawer power supply. Moreover, though unlikely, it is possible for the metering system itself to develop a fault and hence, when dealing with a faulty power drawer, the system should not be relied upon exclusively.

7. The metering limits, which are for guidance only, are given in Table 3: where a reading is outside the limits, the overall performance of the equipment should be considered as an indication of serviceability. A metering label is provided in the cover of the main tapping panel. Since certain limits have now been revised, those limits given in the label should be ignored; the label, however, has a blank column in which the actual readings obtained should be recorded (see notes in Table 3). The figures apply to a complete transmitter set up and tuned on a channel and giving not less than 100 watts output.

TABLE 3

Internal metering

Meter switch position	Circuit metered	Full-scale deflection	Limits*
1	Mains Input voltage	300V	72-80
2	–48V supply	200V	24-30
3	–150V supply	200V	66-84
4	Buffer amplifier anode volts	1kV	40-50†
5	Buffer amplifier anode current	200mA	32-56†
6	Screen modulator and p.a. guard anode current	100mA	40-100
7	Power amplifier anode volts	2kV	48-54†
8	Power amplifier anode current	500mA	56-80†
9	Anode modulator anode volts	2kV	48-54†
10	Anode modulator anode current	500mA	>14

* The figures quoted should be taken as a rough guide; actual figures for each equipment should be recorded for comparison with subsequent readings to establish serviceability. If a sub-unit or valve is changed, the associated readings, should be re-recorded.

† These readings vary with frequency. Record the frequency also for subsequent comparison.

TABLE 4

Modifications

Mod. No.	Class	Topic -2 Leaflet	Topic -2 A.L.	Label No.	Brief details
4738	B/3	B1	2	1	Substitute certain plugs and sockets for a new pattern (red splash) in which air can circulate and reduce condensation.
4946	B/2	B13	14	2	Remove fuse link in the neutral mains line and change all fuses to surge-proof types.
5309	B/2	B18	20	3	Change 6R27 from 5.1 to 2.5 ohms thus changing the f.s.d. of the front panel meter from 50 mA to 100 mA to accommodate the use of high-gain valves in the amplifier (Mod. No. 5310).
6555	B/2 on failure	B28	32	4	Remove 6C13, 14, 15 and 16 consequent upon Mod. No. 6553 to the amplifier chassis.
6330	B/2	B24	27 & 31	5	Earth pole 24 of 6SKT5 to ensure a safe earth path when the relay assembly 5945-99-999-2603 is removed for servicing.
8216	B/3	B40	47	6	Change 6R28 from 2.5 to 1.25 ohms. Replace the metering label by a type with a blank column in which readings may be recorded.
A3432	C/3 W.O.T.S.A.C.	B69	92	7	Replace obsolete rectifier 6130-99-943-1730 (MR1) by rectifier 6130-99-105-1689. This necessitates the introduction of four additional wires and a threaded bush for mounting.
▶A4687	C/3	B72	104	8	Reverse the wiring connections to the terminals of each fuseholder FS3, FS4, FS5, FS6 to eliminate possible shock hazard.◀

TABLE 4 (continued)

Mod. No.	Class	Topic-2 Leaflet	AL	Label No.	Brief details
▶A7182	C/3 WOTSAC	B74	109	9	Replace the two 8μF capacitors (6C11, 6C12), now obsolete, by one 16μF capacitor (6C11). ◀

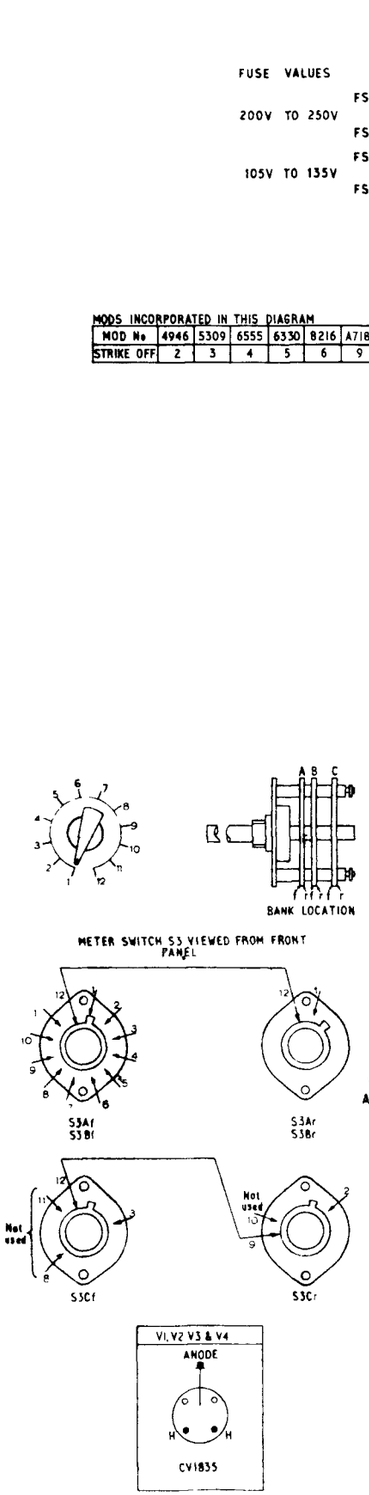
21191 117254 153 1-79 L.T. Ltd. RC1526

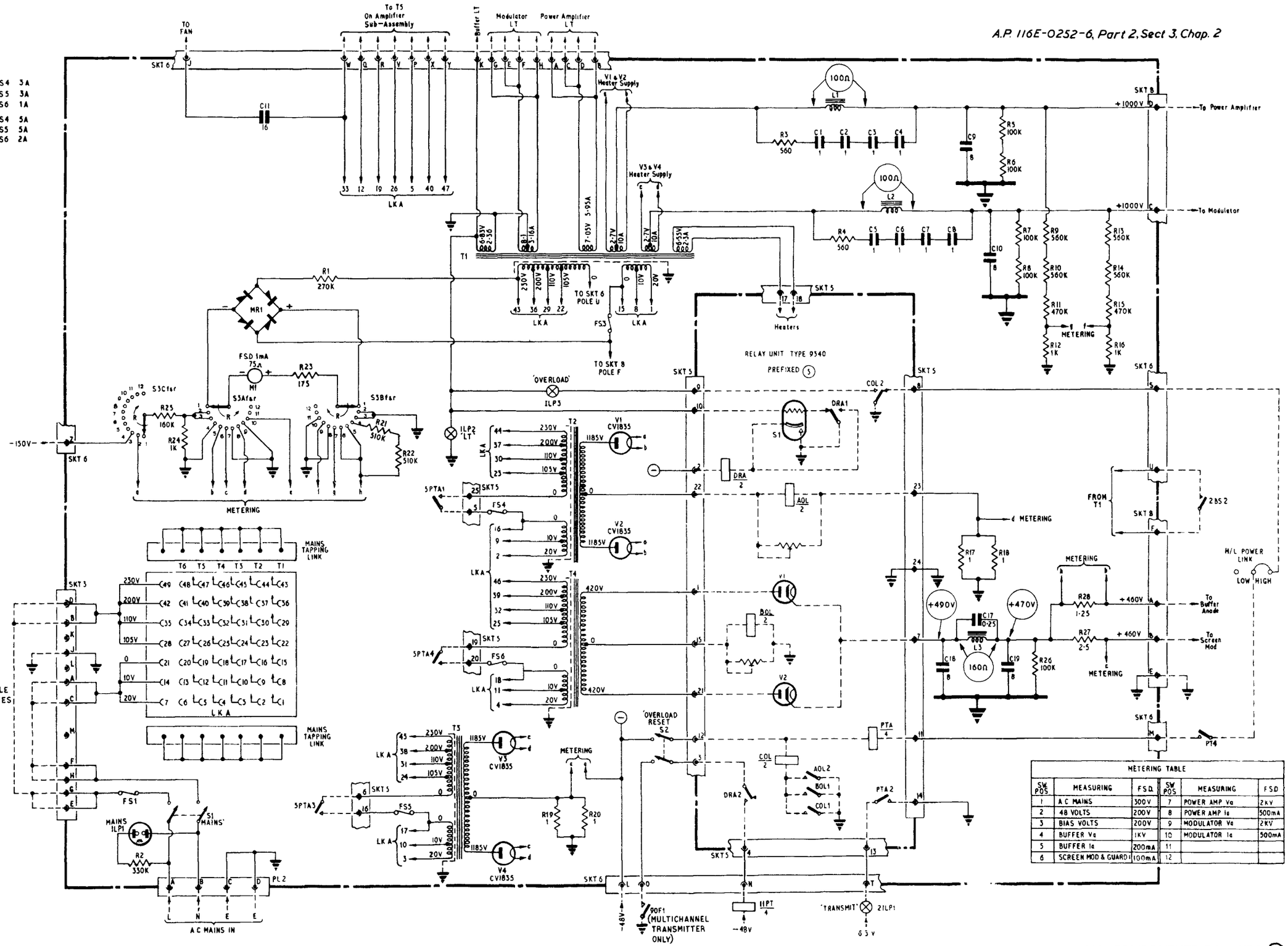
FUSE VALUES

200V TO 250V	FS1	5A	FS4	3A
			FS5	3A
	FS3	1A	FS6	1A
105V TO 135V	FS1	10A	FS4	5A
			FS5	5A
	FS3	2A	FS6	2A

MODS INCORPORATED IN THIS DIAGRAM

MOD No	4946	5309	6555	6330	8216	A7182
STRIKE OFF	2	3	4	5	6	9





METERING TABLE

SW POS	MEASURING	FSD	SW POS	MEASURING	FSD
1	A.C MAINS	300V	7	POWER AMP Va	2KV
2	48 VOLTS	200V	8	POWER AMP Ia	500mA
3	BIAS VOLTS	200V	9	MODULATOR Va	2KV
4	BUFFER Va	1KV	10	MODULATOR Ia	500mA
5	BUFFER Ia	200mA	11		
6	SCREEN MOD & GUARD I	100mA	12		

ALL COMPONENTS PREFIXED (6)
EXCEPT WHERE OTHERWISE INDICATED

Chassis electrical equipment 5820-99-999-2655: servicing circuit

Fig. 1.

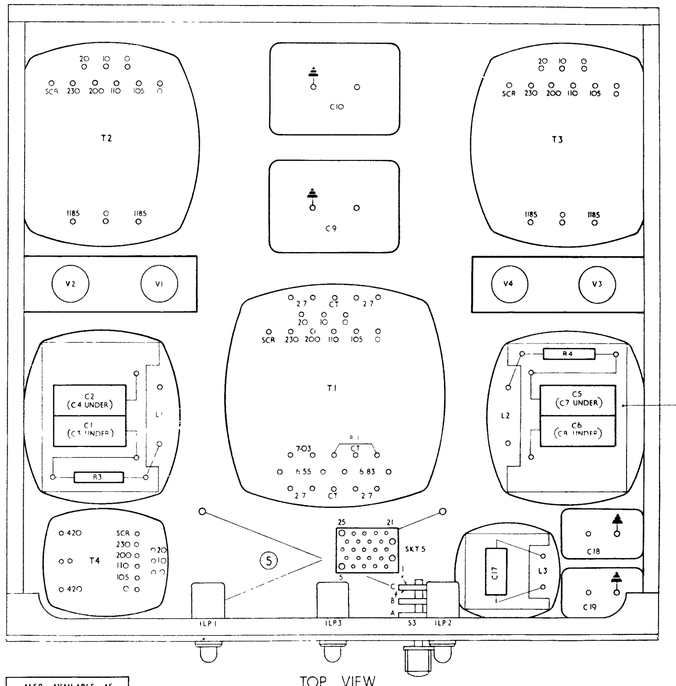
ALSO AVAILABLE AS
AIR DIAGRAM-MIN
116E-0253-MD77

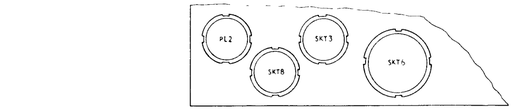
Dec 78 (Amdt. 18)

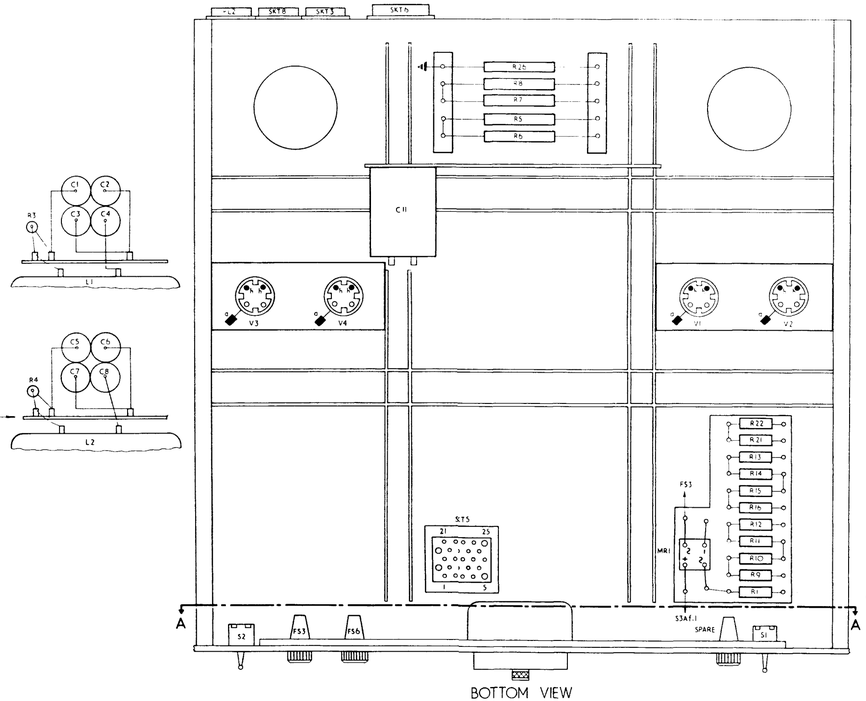
FORMERLY 6725BC/MIN

MODS INCORPORATED IN THIS DIAGRAM

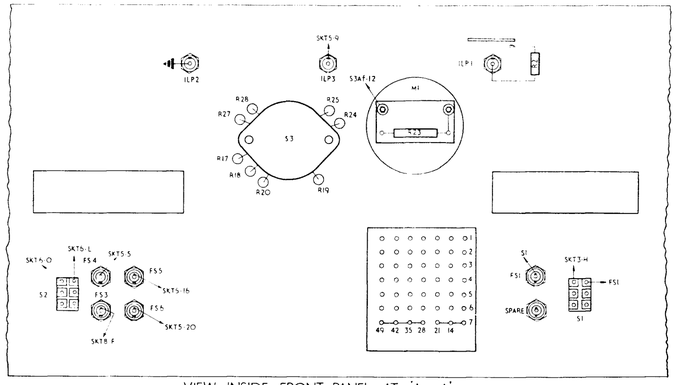
MOD. No	4946	6555	A3432	44681	A7182
STRIKE OFF	2	4	7	8	9

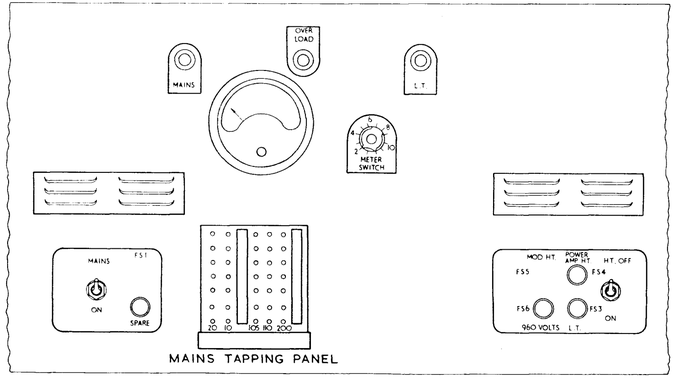




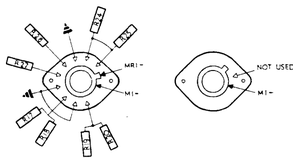


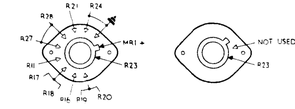
Chassis, electrical equipment 5820-99-999-2655-layout

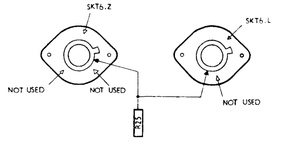




FRONT VIEW







ALL COMPONENTS PREFIXED (6)

ALSO AVAILABLE AS
AIR DIAGRAM-MIN
116E-0253-MD78

Dec 78 (Amdt 18)

Fig.2

Chapter 3

RELAY ASSEMBLY 5945-99-999-2603

LIST OF CONTENTS

Introduction

General

1. This unit is fitted in the chassis, electrical equipment 5820-99-999-2655, i.e. the amplifier power drawer, the two units constituting the power supply for the amplifier drawer. The relay assembly comprises three overload relays, h.t. relay, and a delay relay and switch. The unit also contains the two rectifier valves for the 460V h.t. supply.

2. The overload relays protect the h.t. supplies to the p.a. and buffer amplifier stages in the amplifier drawer and are associated with the H.T. OFF & OVERLOAD RESET switch. The h.t. relay which controls all h.t. supplies, is in series with a contact of the transmitter power drawer press-to-talk relay whose coil is, in turn, in series with a contact of the delay relay. The delay switch has two contacts, one being a bimetallic strip heated by a 6·4V a.c. It operates the delay relay,so there is a delay of one minute during which the press-to-talk and h.t. relays are inoperative for valves etc. to warm up.

Test equipment

3. The following items are required:

Test set (radio)CT214
Multimeter electronic CT471
Multimeter type CT498
Test set, radio 6625-99-943-3377

Maintenance of unit

General

4. No routine servicing or alignment is required. For fault diagnosis the unit can be operated out of the amplifier power drawer by using one of the 25-way extension leads included in the test set, radio 6625-99-943-3377.

Renewal of delays

5. No attempt should be made to repair or clean the contacts of the open-type relays. Renew when defective. The relays are protected by a cadmium-plated steel cover, with acrylic sheet panels, secured by 6 BA screws.

Voltage measurements

6. Except for the cathodes of 5V1 and 5V2, d.c. voltage measurements are not needed to check the performance. With the transmitter set up and tuned on a channel, the voltage at 5V1 and 5V2 cathodes about 490V. Note that an incorrect voltage at this point may be due to a fault in the amplifier power drawer.

Adjustment of overload potentiometers

General

7. Overloading of the 1000V h.t. supply is prevented by relay 5A0L in the secondary circuit of 6T2. This relay operates at an overload current determined by the setting of preset 5RV2 across the relay coil. Overloading of the 460V h.t. supply is similarly prevented by relay 5B0L, the current through which is adjusted by preset 5RV1. If either is to be adjusted, check the setting of the other. The instructions in para. 9 and 10 are written on this basis.

8. When adjusting 5RV1 and 5RV2 the unit, operated via its extension lead, should be in its normal position, i.e. vertical. Owing to the limted length of the extension lead adjust with the unit resting on an insulated sheet laid across the top of the chassis assembly. Access to the potentiometers and their locking screws is via holes in the sides of the unit.

WARNING...

THE H.T. VOLTAGES IN THE AMPLIFIER POWER SUPPLY ARE LETHAL.

Adjustment of 5RV2(1000V h.t. overload)

9. SWITCH OFF THE TRANSMITTER and proceed as follows:

(1) Disconnect the aerial feeder at the back of the cabinet housing the amplifier drawer and connect the test set, radio CT214 to the aerial output.

(2) Remove the relay unit from the amplifier power drawer and interconnect it with the drawer using the extension lead supplied in the test set, radio.

(3) Set the multimeter electronic CT471 to the 0·4V d.c. range and temporarily solder insulated leads across 5RV2.

(4) Slacken 5RV1 and 5RV2 locking screws and set both fully clockwise.

(5) Switch on the transmitter (operate the gate switch on the amplifier power drawer to restore the supply), allow it to warm up for five minutes, and tune it on any convenient frequency.

(6) Set METER SWITCH on the amplifier power drawer to position 8 (p.a. anode current).

(7) Detune ANODE TUNING selector unit on the amplifier drawer to give an amplifier power drawer meter reading of 78(390 mA).

(8) Slowly adjust 5RV2 by turning it counterclockwise to give a reading on the multimeter electronic CT471 of 202mV, ensuring that the amplifier power drawer meter reading remains at 78. Tighten 5RV2 locking screw.

(9) Detune ANODE TUNING selector unit further until the amplifier power drawer meter reading drops to zero and the red OVERLOAD lamp lights indicating that relay 5AOL has operated. Check that this occurs at a meter reading of approximately 82(410mA).

(10) Set TRANSIT-TUNE on the amplifier drawer to TUNE, switch off H.T. OFF & OVERLOAD RESET on the amplifier power drawer and return it to ON to restore the supply. Retune the transmitter.

(11) SWITCH OFF THE TRANSMITTER and disconnect the multimeter electronic from 5RV2.

Adjustment of 5RV1 (460V h.t. overload)

10. Continuing from para. 9 proceed as follows:

(1) Set the multimeter electronic to the 1·2V d.c. range and temporarily solder insulated leads across 5RV1.

(2) Disconnect the lead connected to the centre tap of the secondary 6T4 in the amplifier power drawer. Connect the multimeter Type 498, set to the 100mA d.c. range, between this lead and the centre tap

(-ve terminal of multimeter to the centre tap).

(3) Switch on the transmitter,allow it to warm up for five minutes, and check that it is tuned on the frequency selected.

(4) Detune GRID TUNING selector unit on the amplifier drawer to show 80mA on the multimeter Type 498.

(5) Slowly adjust 5RV1 until the multimeter CT471 reads 0·7V, ensuring that the multimeter Type 498 remains at 80mA. Tighten R5V1 locking screw.

(6) SWITCH OFF THE TRANSMITTER, disconnect the multimeter electronic and the multimeter Type 498. Resolder the lead to the centre tap of 6T4.

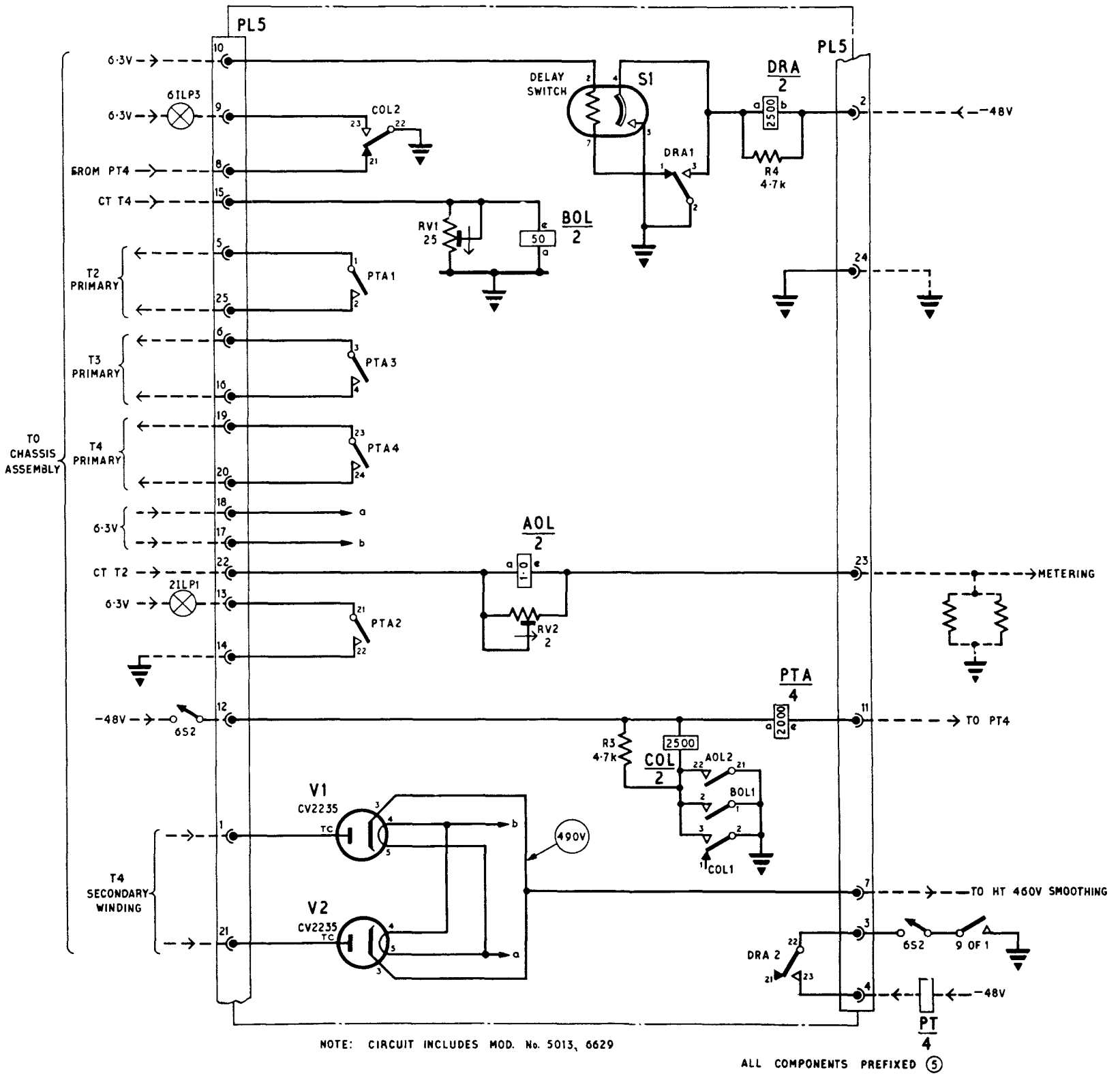
Note...

Relay 5BOL should operate when the 460V h.t. current is 170mA. The procedure of para. 10 gives the correct setting of 5RV1 for this, though checking is not normally possible since further detuning of GRID TUNING selector unit causes relay 5AOL to operate first.

◄ TABLE 1

Modifications

Mod No	Class	Topic-2 Leaflet	AL	Label No	Brief details of change
5013	B/2	B23	26	1	Add resistor in parallel with coils of DRA and COL relays to prevent contact chatter.
6629	B/2	B35	39	2	Earth pole 24 of 5PL5 to ensure a safe earth path when the relay unit is removed for servicing.
A2571	C/3 On failure of Relay Armature 10F/0119882 (RAF)	B60	80	3	Fit a fully interchangeable relay of improved internal design in lieu of Relay Armature 10F/0119882 ►

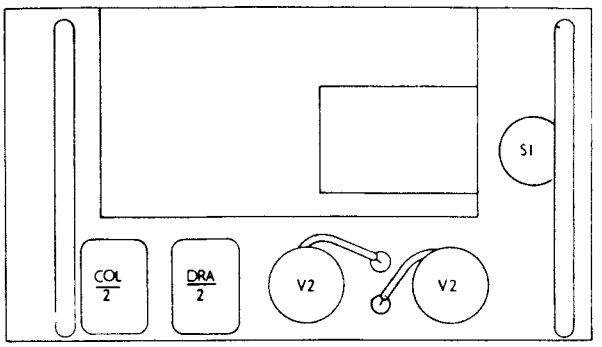


ALSO AVAILABLE AS
MIN AD 6725 BM

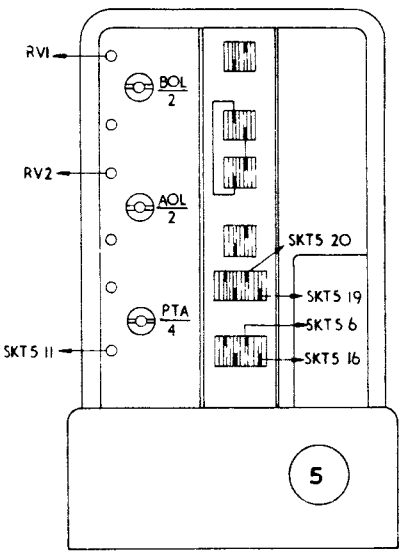
Relay assembly 5945-99-999-2603: servicing circuit

Fig. 1

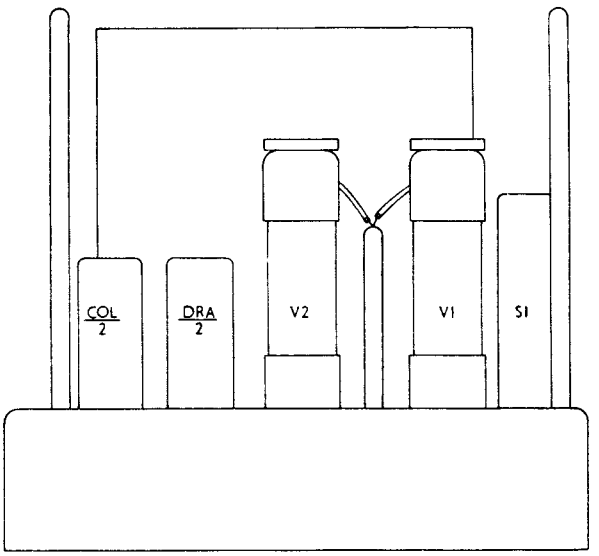
ALL COMPONENTS PREFIXED ⑤



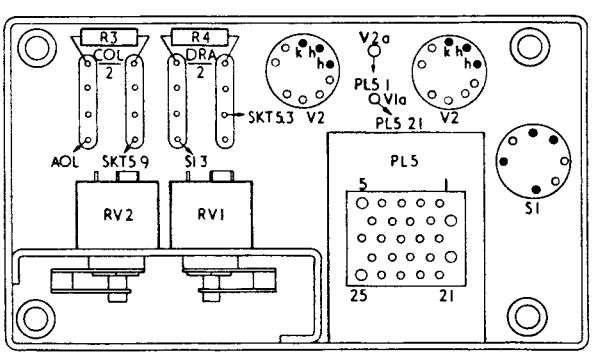
TOP VIEW



SIDE VIEW



FRONT VIEW



BOTTOM VIEW

ALSO AVAILABLE AS
MIN AD 6725 BN

Relay assembly 5945-99-999-2603 - layout Fig.2

Chapter 4

COVER, ELECTRICAL FITTED AND CABLE ASSEMBLIES

LIST OF CONTENTS

LIST OF ILLUSTRATIONS

Introduction

Purpose of units

1. The amplifier drawer (amplifier sub-assemblies 5820–99–932–5708) and the amplifier power drawer (power supply 5820–99–932–5707) are each housed in a cover, electrical fitted 5820–99–999–0841 which is an open fronted steel cabinet fitted with two telescopic runners. Electrical connections to the amplifier drawer are made via cable assembly 5995–99–932–4014 and to the amplifier power drawer cable assembly, composite 5995–99–999–2600. A cable assembly comprises a recessed metal panel fitted to, and forming part of, the rear of the cabinet and a number of cables terminated with free plugs and sockets which mate with the plugs and sockets on the back of the relevant drawer. External connections to the cabinet are by way of fixed plugs and sockets on the outside of the cable assembly panel.

Note . . .

The reason for adopting the method of construction described is that it enables a common cabinet to be used for all the drawers of the ground u.h.f. equipment.

2. The cable assembly 5995–99–932–4014 has a rectangular output port in its metal panel for the air from the cooler in the amplifier drawer. The port can, if required, be closed by a hinged cover at the rear of the panel. A ventilation safety switch, operated by the cover, cuts off the mains supply to the cooler when the cover is closed; this in turn prevents the application of h.t. and l.t. supplies to the drawer. Thus the equipment can only be operated when the cover is open and adequate cooling is available.

Test equipment

3. No items of test equipment are required other than a multimeter Type 9980 or multimeter model 8SX (i.e. model 8 Avc).

Cabinet runners

Greasing

4. Although no routine maintenance is required either on the cabinet or its runners, the latter should, when necessary, be greased. Clean the runners and then grease them lightly using grease XG271 (9150–99–910–0510).

Renewal

5. Should either of the runners in a cabinet become distorted or otherwise damaged, it must be renewed. The procedure is described in Sect. 2, Chap. 6.

Adjustment

6. After renewal of a runner or the fitting of a new drawer to a cabinet, it may be found necessary, to ensure proper locking of the drawer, to adjust the nuts on the front of the runners. Such an adjustment will also necessitate the resetting of the position of the gate switch operating bolt on the associated drawer. Both the runner adjustment and the resetting of the gate switch operating bolt are described in Vol. 1, Part 2, Sect. 1, Chap. 2. When following through the instructions, read "amplifier drawer" and "amplifier power drawer" in place of "transmitter drawer" and "transmitter power drawer" respectively.

Cable assemblies

Greasing

7. No routine maintenance is required though, when necessary, the threads of the plugs and sockets should be greased. Clean the threads and then apply a light film of grease XG271 (9150–99–910–0510).

Renewal of cable assembly 5995–99–932–4014

8. In the following instructions for renewal of a cable assembly it is assumed that the cabinet involved has been disconnected from the remainder of the equipment. Proceed as follows:—

(1) Supporting the gate switch, remove the two 4 B.A. screws securing it to the side of the cabinet and remove the three cable cleats (each cleat is held by a screw) which retain the gate switch cable in position along the side of the cabinet immediately above the left-hand runner assembly.

(2) Release, at the anchoring nuts at the sides of the cabinet, the earthing braids connecting the metal panel of the cable assembly to the cabinet.

(3) Remove the cable clamp at the bottom of the cabinet; this clamp is held in position by three 2 B.A. screws.

(4) Supporting the metal panel of the cable assembly with one hand, remove the twenty 4 B.A. countersunk screws securing it to the cabinet and withdraw the complete cable assembly with its gasket through the front of the cabinet. Place all the fixing screws, cable cleats, etc. in an accessory bag and tie the bag to the cable clamp bracket on the cable assembly.

(5) Untie the accessory bag, containing the fixing screws etc., from the new cable assembly and pass the complete assembly through the front opening of the cabinet. Place the gasket in position between the rear of the cabinet and the metal panel of the cable assembly and secure the panel using the twenty 4 B.A. countersunk screws.

(6) Lay the cables on the base of the cabinet in the order shown in fig. 1, ensuring that they lie flat, that they are free from acute

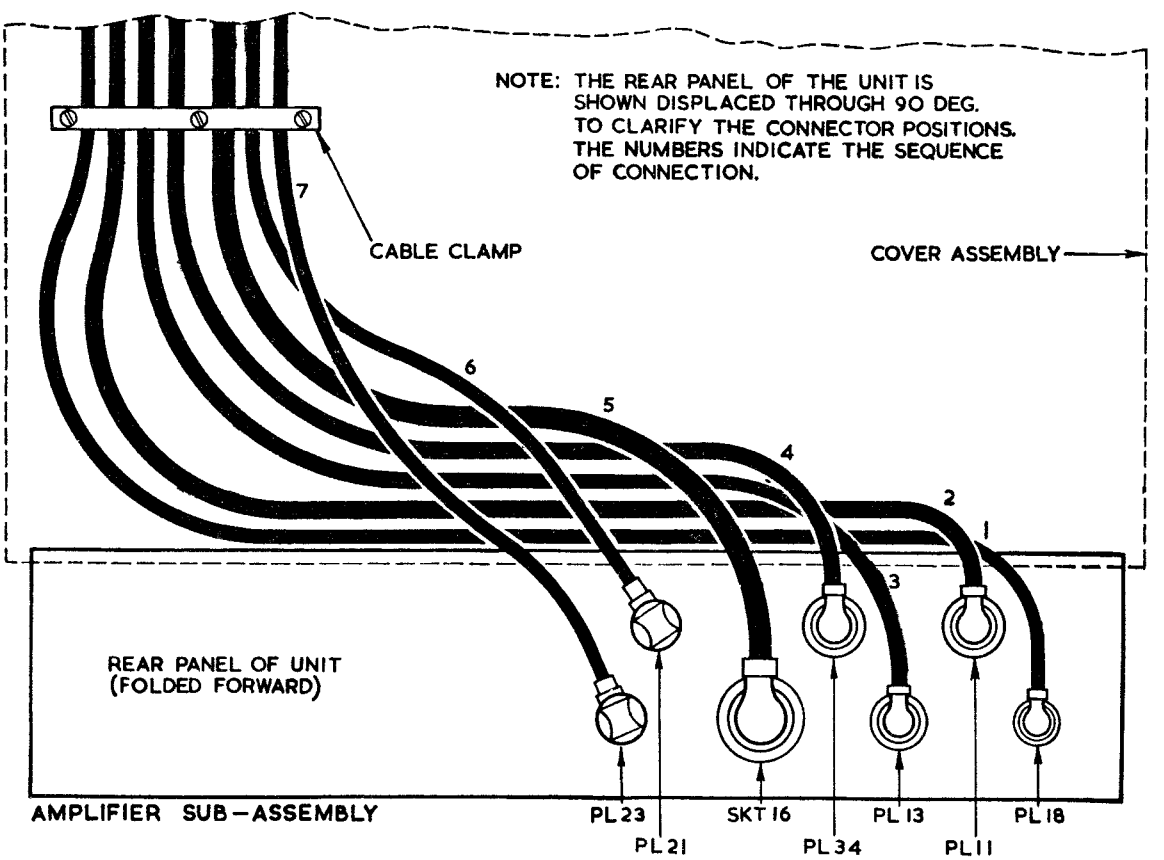


Fig. 1. Layout of cable assembly 5995–99–932–4014 in cabinet

bends, kinks, or twists, and that the word TOP in the centre of the rubber binding on each cable is uppermost. (Take care not to rotate any cable through 360°).

Note . . .

The position of the binding sleeves on the cables must not be altered.

(7) Place and secure the cable clamp in position, checking that each cable is clamped in the centre of its rubber binding.

(8) Connect and secure the earthing braids from the metal panel of the cable assembly to the anchoring nuts at the sides of the cabinet.

(9) Finally, fit the gate switch to the side of the cabinet with the two 4 B.A. screws and cleat the gate switch cable along the side of the cabinet above the left-hand runner using the cable cleats provided.

Renewal of ventilation safety switch

9. To renew the ventilation safety switch (fig. 2) on the panel of the cable assembly 5995–99–932–4014, proceed as follows:—

(1) Remove the two circlips retaining the guide pins in the slots in the cover stays, disengage the pins from the slots, and open the cover to the fullest extent permitted by the cover spring.

(2) Slacken and remove the upper locking nut (on the outside of the cable assembly panel) securing the switch; a box spanner will be found convenient for this operation. Lift off the locking washer and the cover spring from the mounting bush of the switch.

(3) Remove the two 4 BA. bolts, secured by nyloc nuts, passing through the body of the switch and fixing it to its supporting bracket. Take care not to lose the washers under the nyloc nuts.

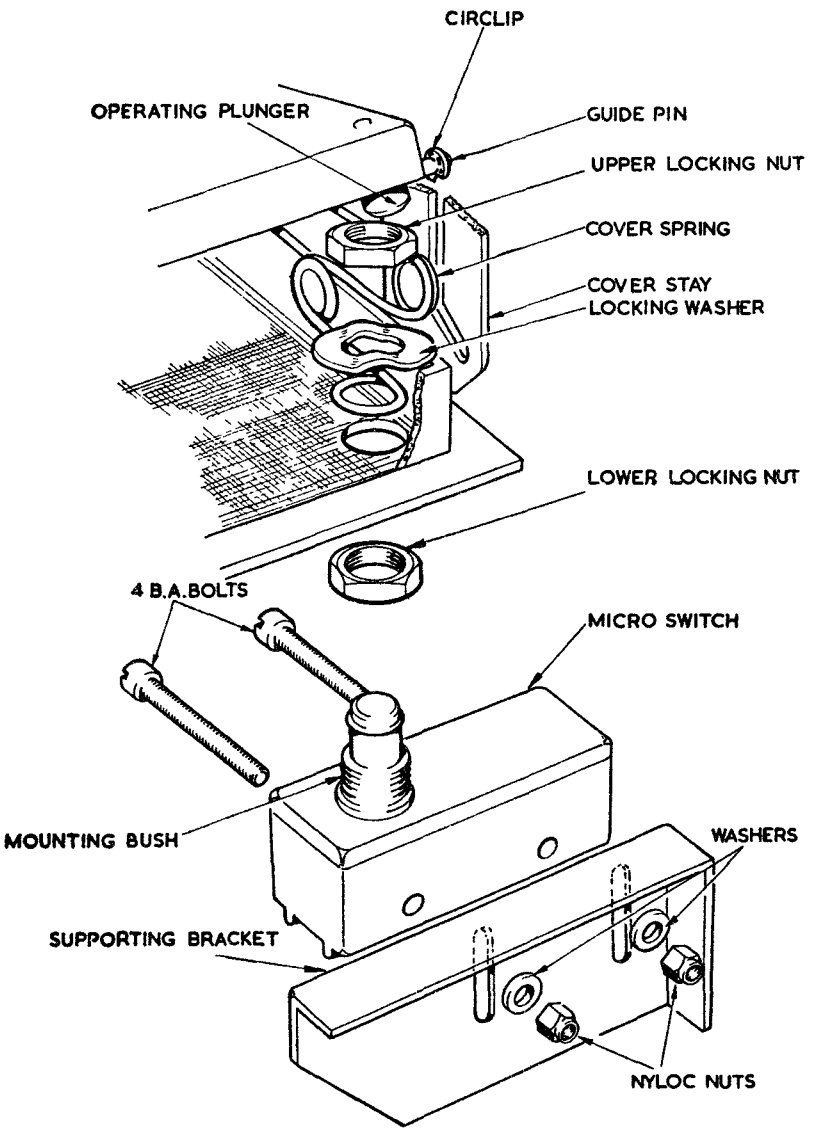


Fig. 2. Ventilation safety switch

(4) Remove the switch and unsolder its two connecting leads, noting carefully the tags to which the connections are made.

(5) Remove the upper locking nut from the replacement switch and loosely screw the lower locking nut to the bottom of the mounting bush, i.e. so that the nut just touches the switch body. (This is to allow for later adjustment of the switch position).

(6) Thread the mounting bush through the hole in the cable assembly panel and secure the switch to its supporting bracket with the two 4 B.A. bolts and nyloc nuts (do not omit the washers under the nyloc nuts) leaving the nuts sufficiently slack to enable the switch to be moved up and down in the slots of the bracket.

(7) Refit the cover spring and locking washer over the switch mounting bush and just start the upper locking nut on the thread of the mounting bush.

(8) Temporarily refit the guide pins in the slots of the cover stays, omitting the circlips. Using an Avo to check continuity, adjust the position of the switch until it is operated by the plunger in the cover just before the latter is fully closed.

(9) Tighten fully the nyloc securing nuts and, using a thin spanner, screw the lower locking nut until it is in contact with the cable assembly panel.

(10) Tighten the upper locking nut. It will be found easier to gain access to this nut if the cover guide pins are first released from the slots in the cover stays.

(11) Refit the guide pins in their slots and check, before proceeding further, that the operation of the switch is satisfactory, i.e. that it is actuated positively by the plunger before the cover is full closed.

(12) Finally, refit the circlips and solder the connecting wires to the appropriate tags of the switch.

Caution . . .

It is absolutely essential that connections be made to the NORMALLY CLOSED pair of tags.

Renewal of cable assembly, composite 5995–99–999–2600

10. After disconnecting the cabinet from the remainder of the equipment, proceed as in para. 8 above, referring in sub-para. (6) to fig. 3 in place of fig. 1.

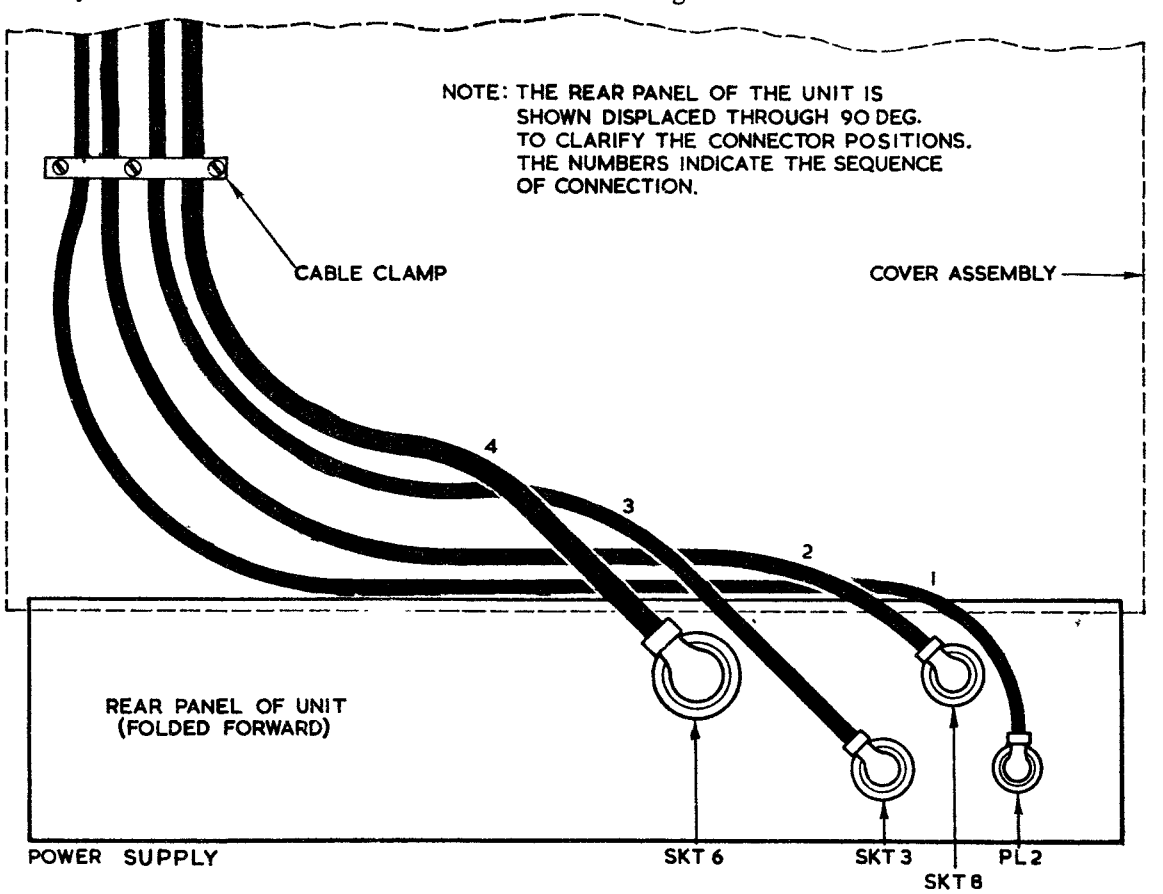
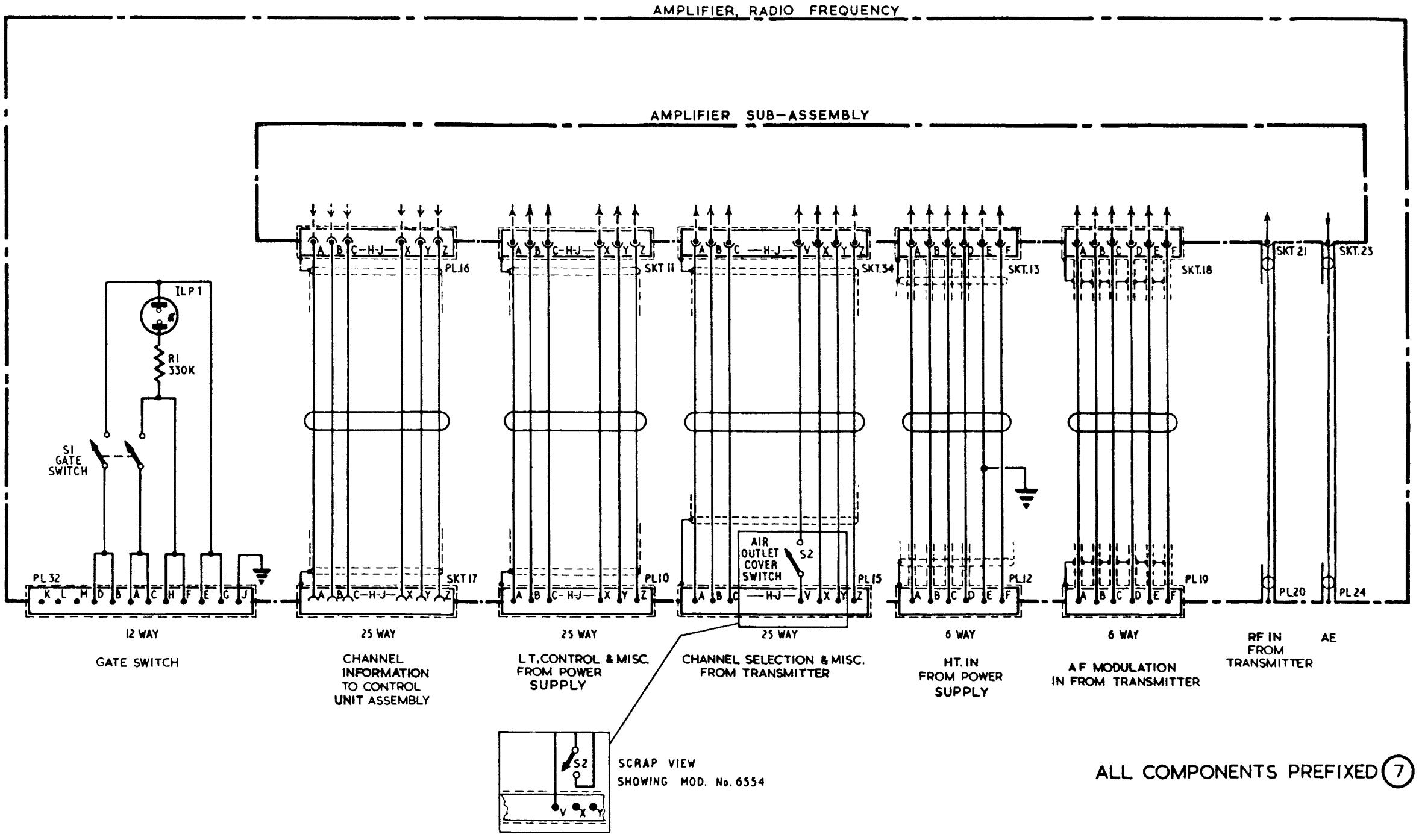


Fig. 3. Layout of cable assembly composite 5995–99–999–2600 in cabinet



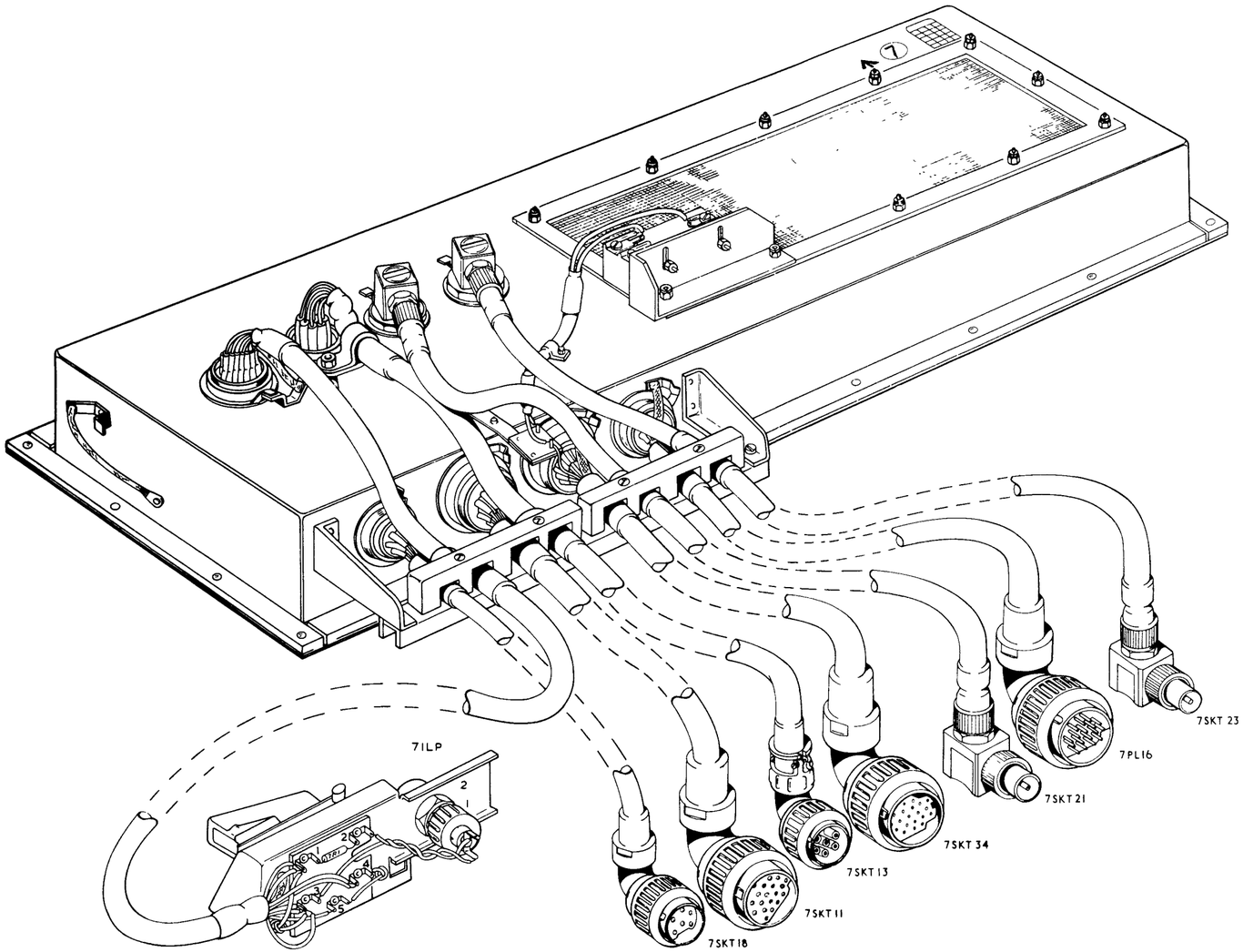
ALL COMPONENTS PREFIXED (7)

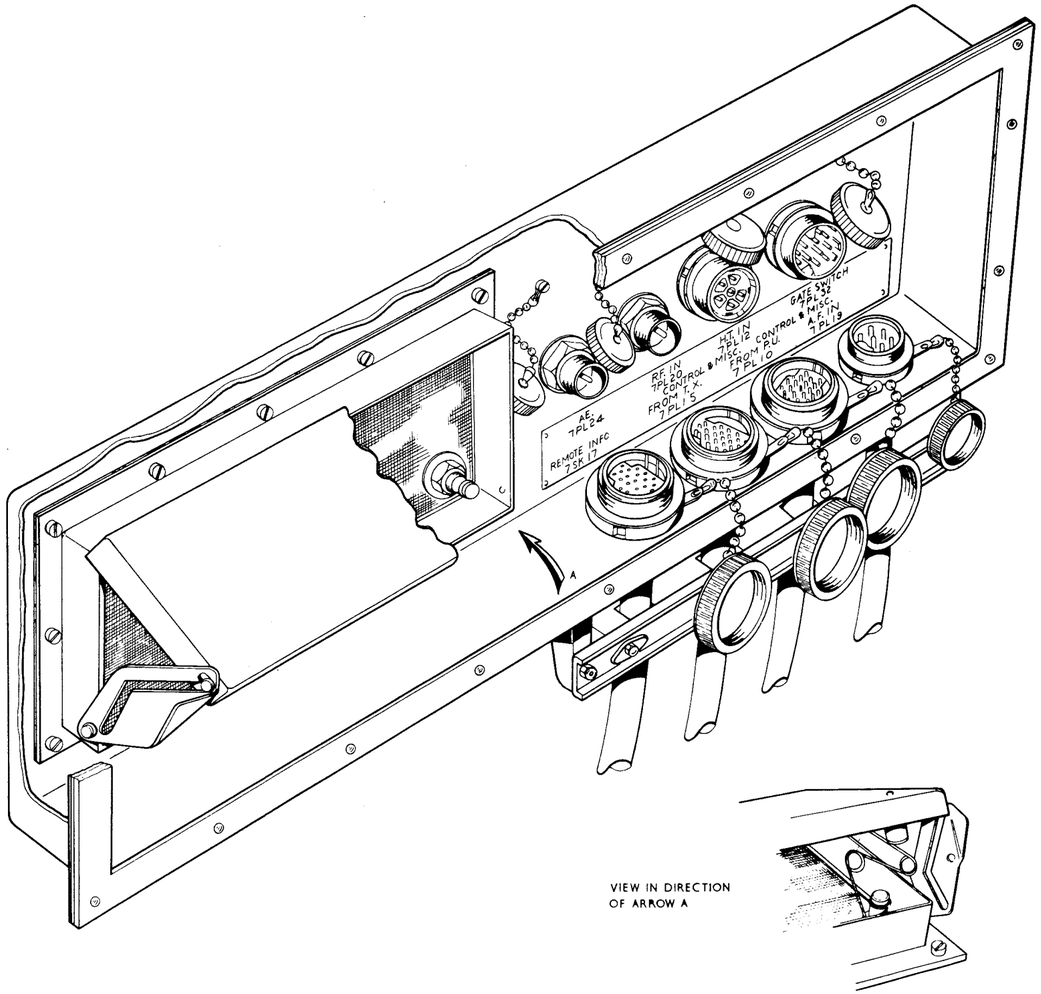
ALSO AVAILABLE AS
AIR DIAGRAM
6725 AS/MIN

Cable assembly 5995-99-932-4014 : servicing circuit

Fig.4

D89019 405 8/66 A.(C)Ltd Gp 956 3



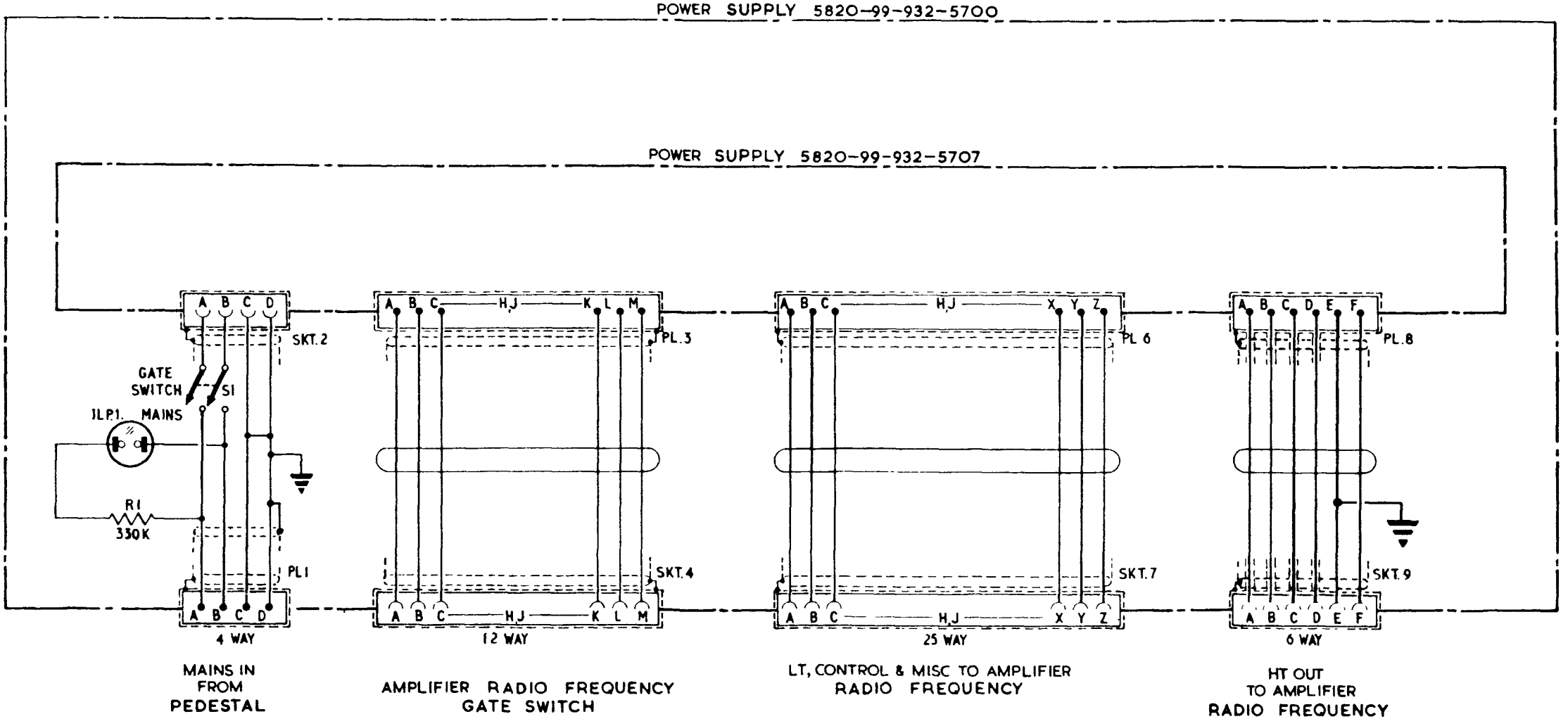


VIEW IN DIRECTION OF ARROW A

ALSO AVAILABLE AS
AIR DIAGRAM
6725AX/MIN.

Cable assembly 5995-99-932-4014 – layout

Fig. 5

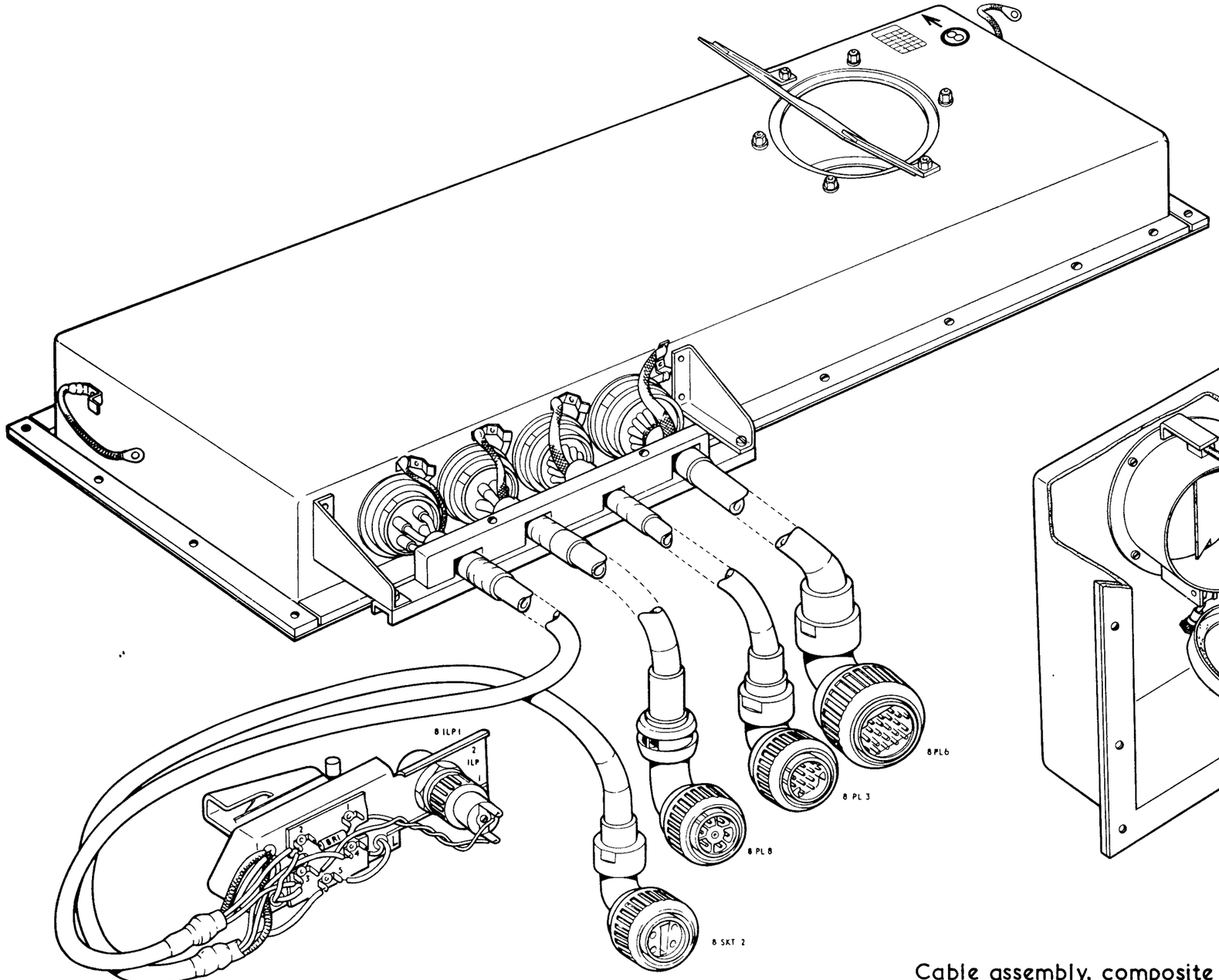


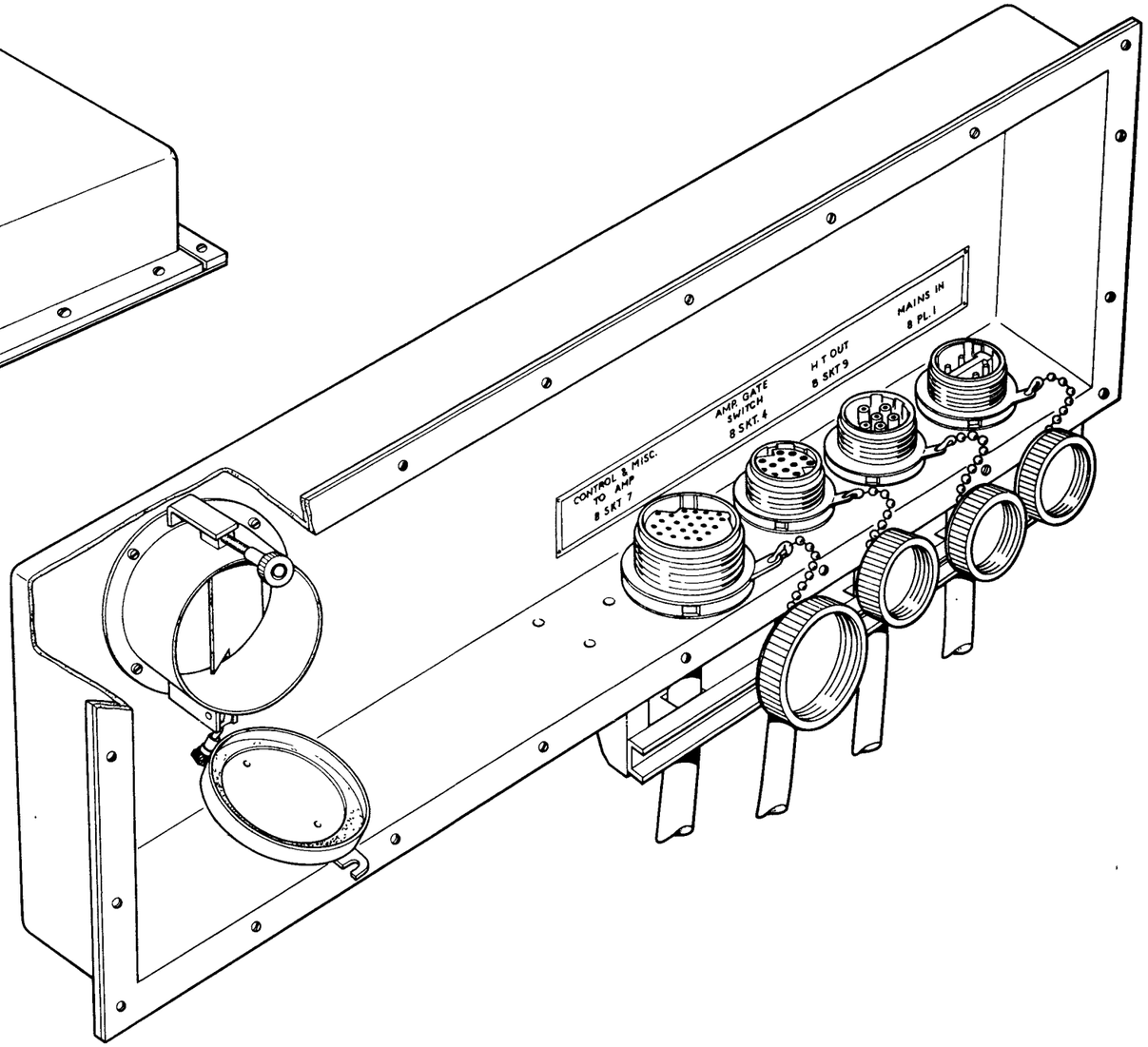
ALL COMPONENTS PREFIXED (8)

ALSO AVAILABLE AS
AIR DIAGRAM
6725AT/MIN

Cable assembly composite 5995-99-999-2600 : servicing circuit Fig. 6

D89019 405 8/66 A.(C)Ltd. Gp. 956/3





ALSO AVAILABLE AS
AIR DIAGRAM
6725AY/MIN.

Cable assembly, composite 5995-99-999-2600-layout

Fig. 7

D89019 405 8/66 A.(C)Ltd. Gp 956/3

SECTION 4

ANCILLARY EQUIPMENT

Chapter 1
(Completely revised)

COOLER, DRY AIR, ELECTRONIC EQUIPMENT 5820-99-932-3995

CONTENTS

TABLES

ILLUSTRATIONS

INTRODUCTION

1. This equipment, commonly known as the mass air blower, provides a flow of cooling air for the transmitters, receivers and amplifier power units of the ground u.h.f. equipment when operating under tropical conditions, i.e. at ambient temperatures between +37°C and + 55°C. Installation details, available accessories and the limitations of the blower with regard to the number of equipments it can serve are given in Topic 1 of this AP.

SERVICING

General

2. To ensure correct operation of the blower it is important to clean the air filter regularly (Topic 1, Part 2, Sect.1, Chap.3). If the fan in the blower requires servicing, proceed in accordance with para.3 to 6.

Removal of chassis

3. Remove the chassis, complete with fan, from the cover assembly as follows:

(1) Disconnect the mains supply by removing the mains input socket at the rear of the cover assembly.

(2) Release the four latches of the cover and, ensuring that the chassis moves freely on its runners, withdraw the chassis to its fullest extent.

(3) Remove the mains supply socket from the plug on the right-hand side panel.

(4) Lift the locks on the sides of the runners and, with the aid of an assistant, lift the chassis clear of the cover assembly.

Fan removal and servicing

4. In order to service the fan, it must be removed from the chassis and dismantled; the procedure is as follows:-

(1) Unsolder the three electrical connections from the turret tags on the fan casing, ensuring that each lead is identified to facilitate correct subsequent reconnection.

(2) Remove two nuts, screws and washers at each end of the chassis cross brace and remove the brace.

(3) Remove eight nuts, screws and washers securing the fan to the front panel.

(4) Remove four nuts, screws and washers securing the feet of the fan to the chassis and lift out the fan.

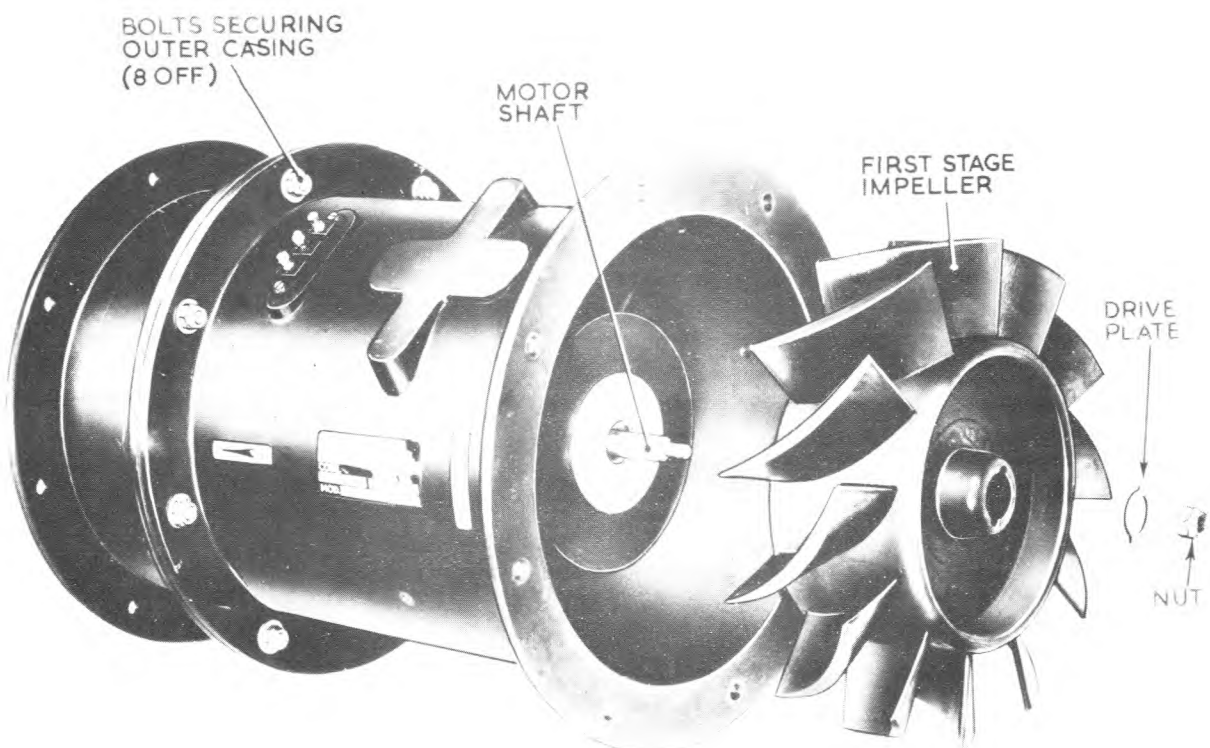


Fig. 1. First stage impeller removed

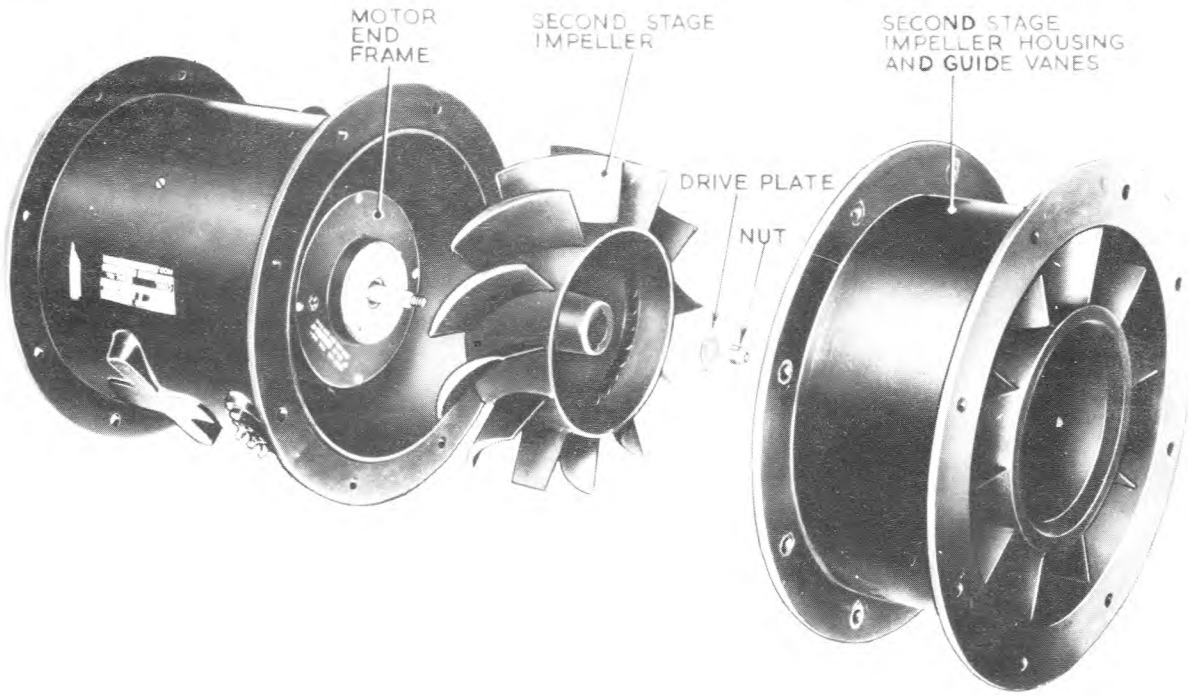


Fig.2. Second stage impeller and housing removed

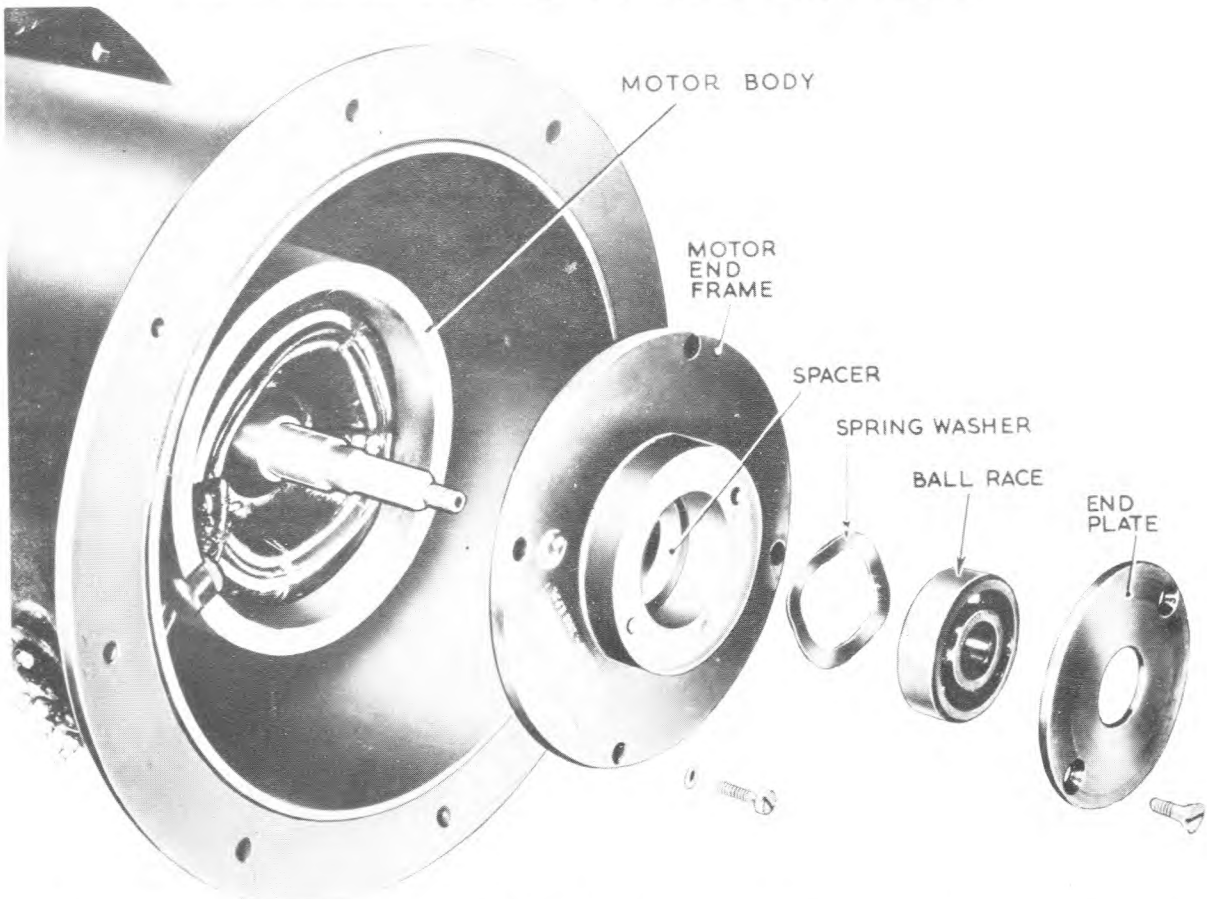


Fig.3. Second stage impeller end of fan with end plate and bearing removed

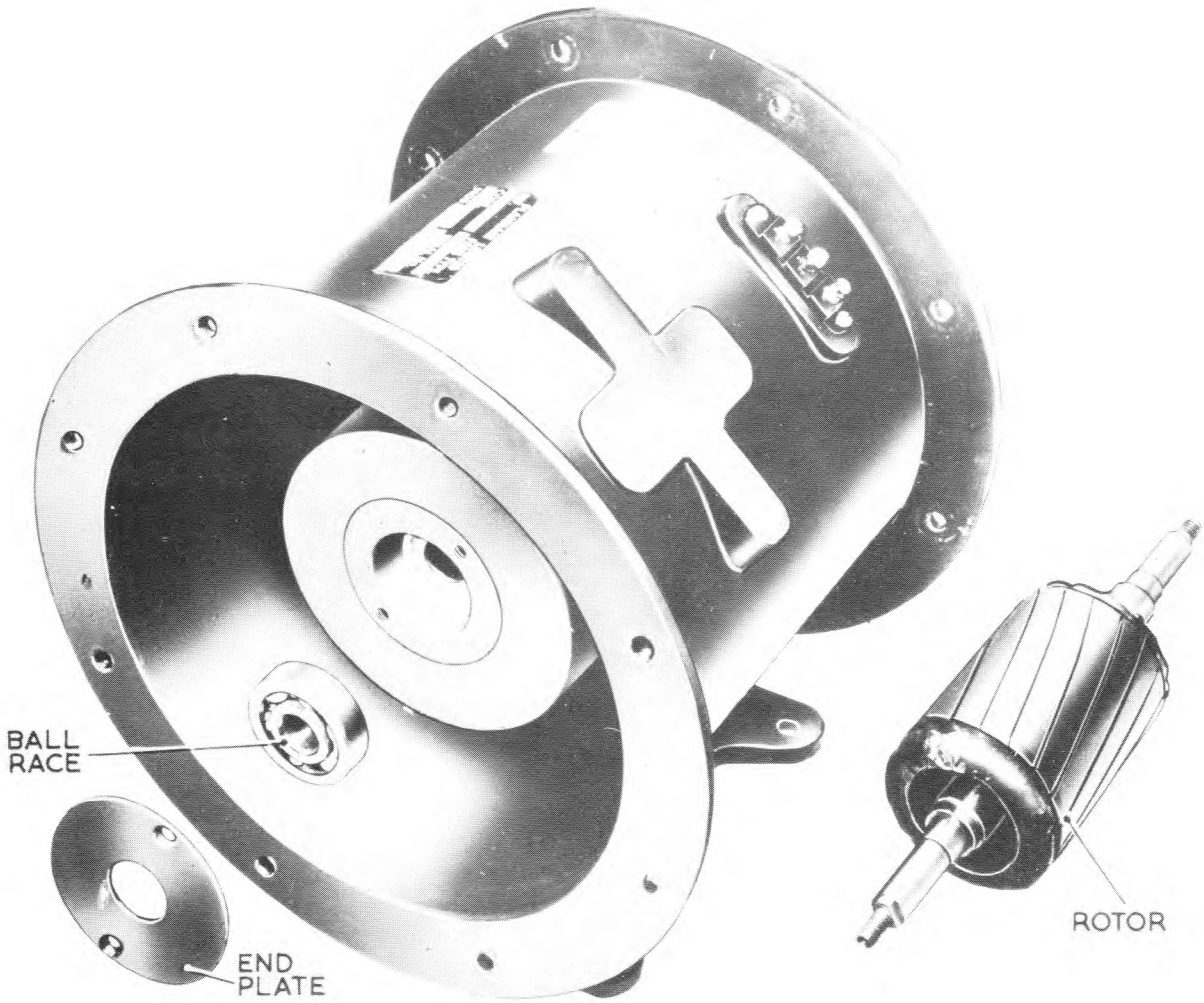


Fig.4. First stage impeller end of fan with end plate, bearing and rotor removed

Note ...
When dismantling the fan (sub-para.(5) to (10)) refer to fig.1, 2, 3 and 4.

(5) Unscrew the nut holding the drive plate and the first stage impeller on the rotor shaft at the front end of the fan; carefully withdraw the plate and impeller.

(6) Remove eight nuts, screws and washers securing the second stage impeller housing to the outer casing and separate the housing from the casing.

(7) Unscrew the nut holding the drive plate and the second stage impeller on the rotor shaft (fig.2) and carefully withdraw the plate and impeller ensuring that these do not become confused with the first stage items removed in sub-para.(5).

(8) Remove four screws and spring washers securing the motor end-frame to the motor casing (fig.3) and withdraw the end-frame.

(9) Remove two screws which secure the end plate to the motor end-frame (fig.3), remove the plate and press out the bearing taking care not to lose the spring washer and spacer.

(10) At the first stage impeller end remove two screws securing the end plate to the motor (fig.4) and remove the plate to expose the bearing; apply slight pressure to the rotor shaft to press out the bearing from its housing. Remove the bearing and withdraw the rotor.

5. It is possible that the only servicing necessary on the fan will be cleaning and relubrication of the bearings. To do this, thoroughly wash both bearings in clean white spirit, dry thoroughly and recharge with grease XG275 or XG271 to occupy $\frac{1}{3}$ to $\frac{1}{2}$ of the space in the bearings. Rotate the inner and outer tracks in counter directions until the grease is evenly distributed.

CAUTION ...
Do not overfill the bearings otherwise the fan may be damaged.

Reassembly

6. Reassemble the equipment in the following manner:-

(1) Assemble the fan by reversing the procedure of para. 4 (5) to (10), ensuring that each bearing is returned to the position from which it was removed; all screws previously locked with varnish should be relocked with varnish to DEF.32 under the screw heads only.

(2) After assembly ensure that the fan impellers rotate freely and that there is no fouling of the fan housing.

(3) Fit the fan into the chassis by reversing the procedure of para.4(1) to (4).

(4) Refit the blower chassis into its cover assembly by reversing the procedure of para.3.

(5) Check the performance of the blower (para. 8 to 12).

TEST EQUIPMENT

7. The following items are required:-

(1) Multimeter (5QP/17447)

(2) Wattmeter to measure up to 200W on a 230V r.m.s. 50Hz supply.

(3) Stroboscope to measure up to 3000 rev/min., e.g. stroboscope (6C/9549379)

FUNCTIONAL TESTS

8. After servicing check all wiring against the circuit diagram and ensure that the rotor rotates freely. Using the multimeter (ohms ✦ 100 range) measure the d.c. resistance of the motor windings as follows:-

Between terminals	Resistance T1 connected	T1 disconnected
Red and white	9 ohms	36 ohms
White and blue	45 ohms	45 ohms
Red and blue	54 ohms	81 ohms

9. Ensure that the voltage tapping plugs are correctly set and connect the equipment to the a.c. mains with the multimeter (1A r.m.s. range) in series. Switch on and note that the impeller starts to rotate in the direction indicated by the arrow marked on the fan casing; if the impeller does not start, or turns in the wrong direction, switch off immediately and recheck the wiring connections.

10. Allow the motor to attain normal running speed, then note the input current which should not exceed 0.54A if the air filter is not fitted or 0.7A if the filter is fitted. If a wattmeter is available, use it in place of the multimeter; the power consumption, without filter, should not exceed 130W and the consumption with filter should not exceed 155W.

11. With the motor running measure the voltages at the motor terminals; approximate normal readings should be

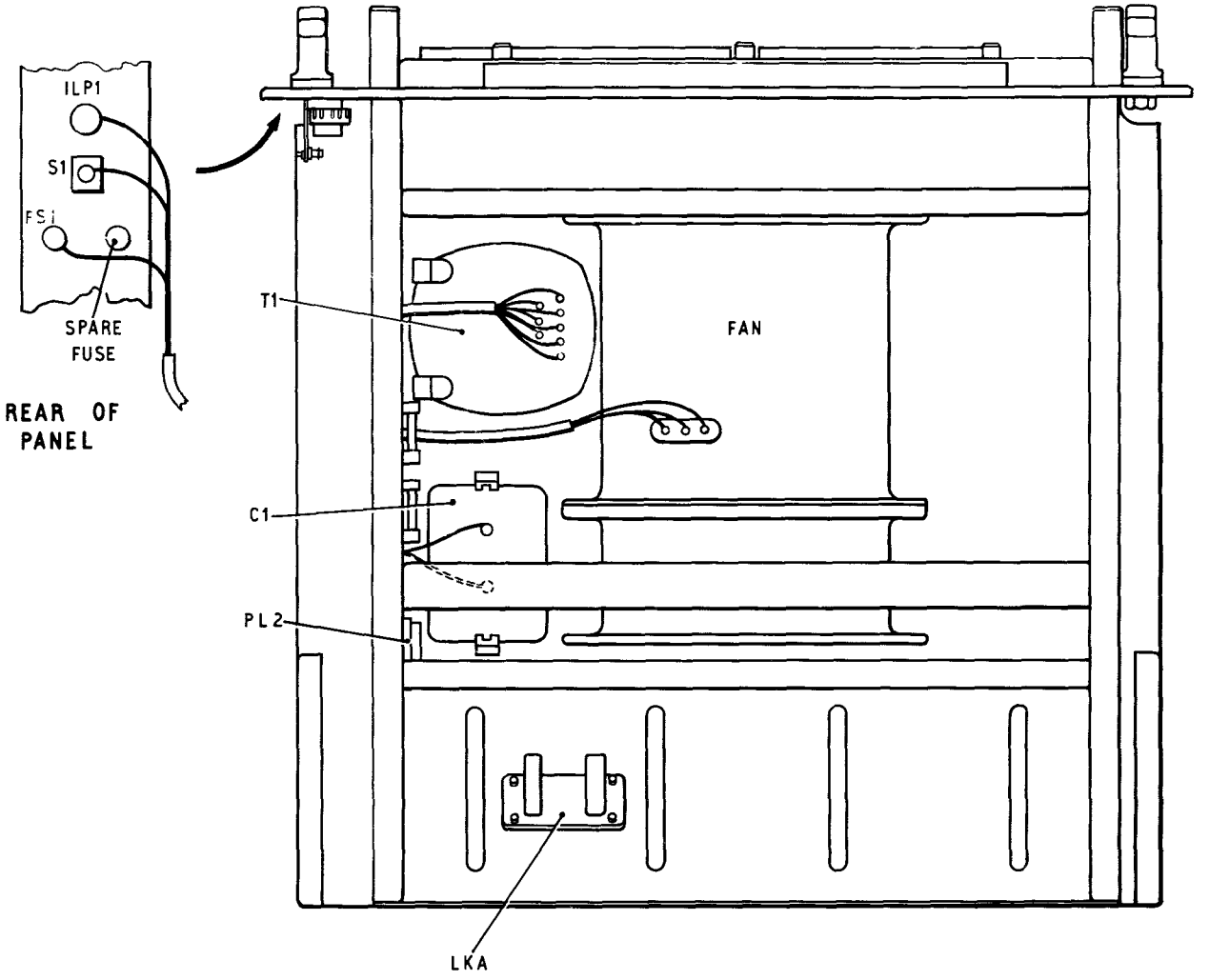
Between terminals	Volts a.c.
Red and white	230
White and blue	180
Red and blue	290

At no time must the voltage across phasing capacitor C1 (red and blue) exceed 350V r.m.s.

12. Remove the air filter and, observing the impeller via the filter aperture use the stroboscope to verify that the impeller speed is not less than 2700 rev/min.

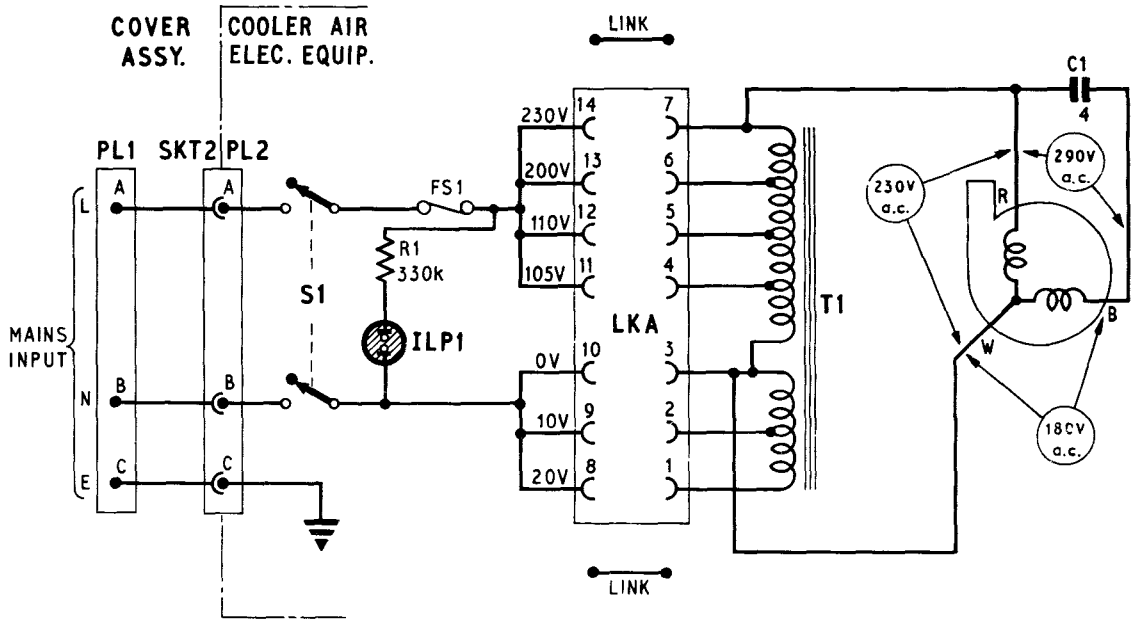
13. On satisfactory completion of the tests, disconnect all test equipment. Verify that the chassis moves smoothly on its runners and that the runner latches drop into position under their own weight. Ensure that the cover assembly corner latches engage securely with the latch plates and can be adjusted to be operable by normal finger pressure.

14. If the equipment is to be prepared for storage or transit, tighten the latch bolts and fit and secure the front (transit) cover. Close and secure all covers of the air outlets at the rear of the equipment.



MODS INCOPPORATED IN THIS DIAGRAM

MOD No	4944	6105
STRIKE OFF	1	4



AIR DIAGRAM MIN
116E-0252-MD52
BY COMMAND OF THE DEFENCE COUNCIL FOR USE IN THE ROYAL AIR FORCE

F

TABLE 1
Modifications

Mod. No.	Class	Topic 2 Leaflet	AL.	Strike off	Brief details
4944	B/2	B5	6	1	Change mains fuse FS1 to surge-proof type and delete fuse in neutral line.
5339	B/2 (RAF)	B32	36	2	Change capacitor C1 for one of higher voltage rating.
5493	B/2 on replacement	B14	15	3	Replace filter 10AR/3039 by filter 4130-99-999-2652.
6105	B/2	B26	29	4	Change wiring to lamp ILP1 to give additional warning of supply failure.
9571	C/3	B52	65	5	Remove louvres from filter cover to increase air pressure differential and reduce possibility of running in stalled condition

Chapter 2

AERIAL UNIT DESIGN 41

LIST OF CONTENTS

LIST OF ILLUSTRATIONS

Introduction

1. In normal circumstances, defective Aerial Units Design 41 should be replaced by new Units. However, in exceptional cases, such as the non-availability of a spare unit, it may become necessary to repair a defective unit. This chapter details the method of dismantling and reassembling of the unit and includes instructions for fitting a new internal cable and a new aerial insulator.

Note . . .

If either the upper or lower cones are damaged then the complete aerial must be renewed.

2. A cross-sectional view of the Aerial Unit is shown in fig. 2, and an exploded view in fig. 3.

3. For reassembling the aerial a circular distance piece $\frac{3}{32}$ in. thick will be required. This should consist of a disc approximately 1 in. in diameter with central $\frac{1}{8}$ in. diameter hole and a radial $\frac{1}{16}$ in. wide slot. The distance piece may be manufactured from any material.

Dismantling

4. All socket headed screws are varnished after assembly and therefore will be found somewhat stiff to remove; the use of a solvent is recommended.

To remove the upper cone and ceramic insulator

5. Unscrew the six 2 B.A. socket headed screws (3) which secure the upper cone (1) to the adaptor plate (2). Remove the upper cone.

6. Bend down the tab of the locking washer (16) and unscrew the lock nut (15). Remove the locking washer, the adaptor plate, and the seating ring (17).

7. Unscrew the six 2 B.A. nuts (14) from the socket headed screws (4). Lift off the clamping ring (5), the small seating ring (6), and the ceramic insulator (7). The large seating ring (22) and the pin (23) need not be disturbed.

Note . . .

After the insulator has been removed the upper screwed cone assembly should be supported by hand.

8. If the aerial is being dismantled only this far, e.g. to change the ceramic insulator, reassembly instructions start at para. 29.

To remove the cable

9. Unscrew the clamping screw (18), and lift off the upper screwed cone (21), the locating pin (20) and the sealing ring (19).

10. Insert the tip of a soldering iron in the slot in the cable spigot (8) and unsolder the inner conductor of the cable. Lift off the cable spigot.

11. Using a spanner, unscrew and remove the lower screwed cone (9). Lift off the thick gland washer (10) and lift up the metal braid of the cable.

12. Release the plug adaptor (34), at the base of the aerial, and the plug and cable assembly by

unscrewing the four 2 B.A. socket headed screws (35) which secure this assembly to the pedestal base. Remove the complete plug and cable assembly, with attached cable, by withdrawing it downwards from the pedestal base. Remove the thin gland washer (11) and the gland ring (12) from the screwed adaptor (13) in the centre part of the aerial.

13. Unscrew the retaining bush (31) from the gland body (24); a large screwdriver having a blade width of between $\frac{1}{2}$ in. and $\frac{11}{16}$ in. will be required for this, the use of a screwdriver having a wider blade will damage the thread of the gland body.

14. Holding the plug and cable assembly by the gland locating flange (33), push the cable downwards through the gland body. The halves of the di-electric (30), the spacing washer (28), and the thick gland washer (27) will now drop on to the bench.

15. Unsolder the coaxial plug (29), comb down the metal braid of the cable and slide off the thin gland washer (26) and the gland ring (25).

Fitting a new cable and reassembling the aerial

16. Before any of the socket headed screws are finally secured in position the threads should be coated with locking varnish.

17. Cut off an 18 in. length of uniradio 57 (Ref. No. 6145–100285) and prepare one end as shown in fig. 1. Tin the end of the conductor and wipe clean.

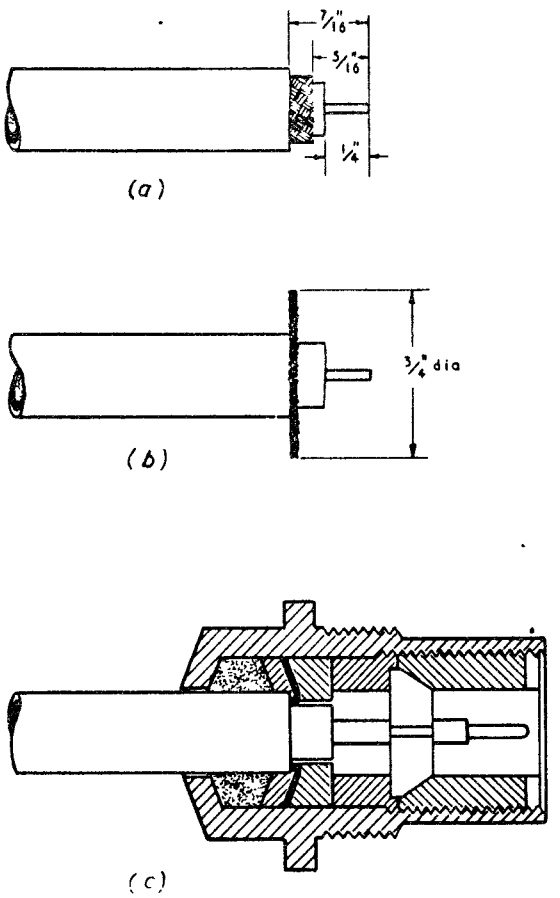


Fig. 1. Preparing the end of the cable

Fit, and then solder the coaxial plug (29) on the end of the conductor. In connection with this operation, the two following points should be noted:—

(1) Though the soldering groove should be filled with solder, care must be taken not to increase the outside diameter of the plug with surplus solder.

(2) Avoid excessive heat melting the polythene by holding the cable lightly in a vice and the plug in a pair of pliers: heat the plug with the iron and quickly slip the heated plug on the cable.

18. On to the unprepared end of the cable slip on first the thin gland washer (26) with the convex side towards the combed out braiding, and then the gland ring (25). Slide both items down the cable until the thin gland washer is in contact with the combed-out braiding.

19. Draw the unprepared end of the cable through the gland body (24). Place the thick gland washer (27) over the cable with the concave side towards the combed-out braiding. Fit the spacing washer (28) and the two halves of the dielectric (30) in position and secure the assembly with the retaining bush (31). Use the wide screwdriver (para. 13) to tighten the bush.

20. Pass the free end of the cable up the pedestal tube and through the central hole of the screwed adaptor (13) at the top of the tube. Temporarily secure the plug and cable assembly and plug adaptor (34) to the pedestal base with the four 2 B.A. socket headed screws (35).

21. Mark the outer sheath of the cable flush with the end of the screwed adaptor. Unscrew the four 2 B.A. socket headed screws and withdraw the cable and plug assembly downwards from the pedestal base. Unscrew the lock nut (32) and remove the gland locating flange (33) from the gland body (24).

22. Prepare the end of the cable as shown on fig. 1(a) and (b). Again pass this end of the cable up the pedestal tube and through the central hole of the screwed adaptor. Pull the cable through sufficiently far to enable access to be obtained to the $\frac{1}{8}$ in. length of braiding. (Since at the lower end of the cable the gland locating flange has been removed, the gland body can be drawn up inside the pedestal tube.)

23. Slide on the gland ring (12) and then the thin gland washer (11) taking care that the convex side of the washer is uppermost. Comb out the screened braiding and trim to $\frac{3}{4}$ in. diameter. Lower the cable back into the screwed adaptor until the combed-out braiding is in contact with the thin gland washer (11). Slide the thick gland washer (10) with its flat face uppermost into position and, using a spanner, screw the lower screwed cone (9) on to the screwed adaptor.

24. At the lower end of the cable, secure with the lock nut (32), the gland locating flange to the gland body, taking care not to put undue strain on the cable (at this stage the cable is only supported by the clamped braiding at its top end). Using the four 2 B.A. socket headed screws, secure the gland locating flange and plug adaptor to the pedestal base.

25. Cut off the cable $\frac{1}{2}$ in. above the top of the lower screwed cone and strip off the polythene insulation, thus leaving $\frac{1}{2}$ in. of the centre conductor projecting beyond the cone. Tin the end of the conductor and wipe clean.

26. Place the distance piece (para. 3) on top of the lower screwed cone. Ensure that the central hole of the cable spigot (8) is clear of solder and then fit this item on to the inner conductor of the cable MAKING SURE THAT THE LOCATING HOLE IN THE CABLE SPIGOT IS DIAMETRICALLY OPPOSITE THE LOCATING PIN (23) IN THE AERIAL PEDESTAL. (Failure to observe this point will make reassembly of the aerial impossible.)

27. Solder the cable spigot (8) to the centre conductor, taking care that the diameter of the spigot is not increased with surplus solder. Place the upper screwed cone (21) over the cable spigot aligning the pin in the screwed cone with the locating hole in the cable spigot.

28 Secure the upper screwed cone to the cable spigot with the clamping screw (18). Remove the distance piece from between the lower and upper screwed cones, at the same time supporting the weight of the upper screwed cone by hand.

Note . . .

After removal of the distance piece and until the insulator is in position the upper screwed cone assembly must be supported by hand. If the cone assembly is not supported its weight may break the $\frac{3}{32}$ in. length of centre conductor.

29. Slip the small seating ring (6) and the clamping ring (5) over the ceramic insulator (7). Place the seating ring (22) and the insulator in position making sure that the recesses in the insulator are correctly positioned with respect to the locating pin (20) in the upper screwed cone (21) and the pin (23) in the pedestal flange.

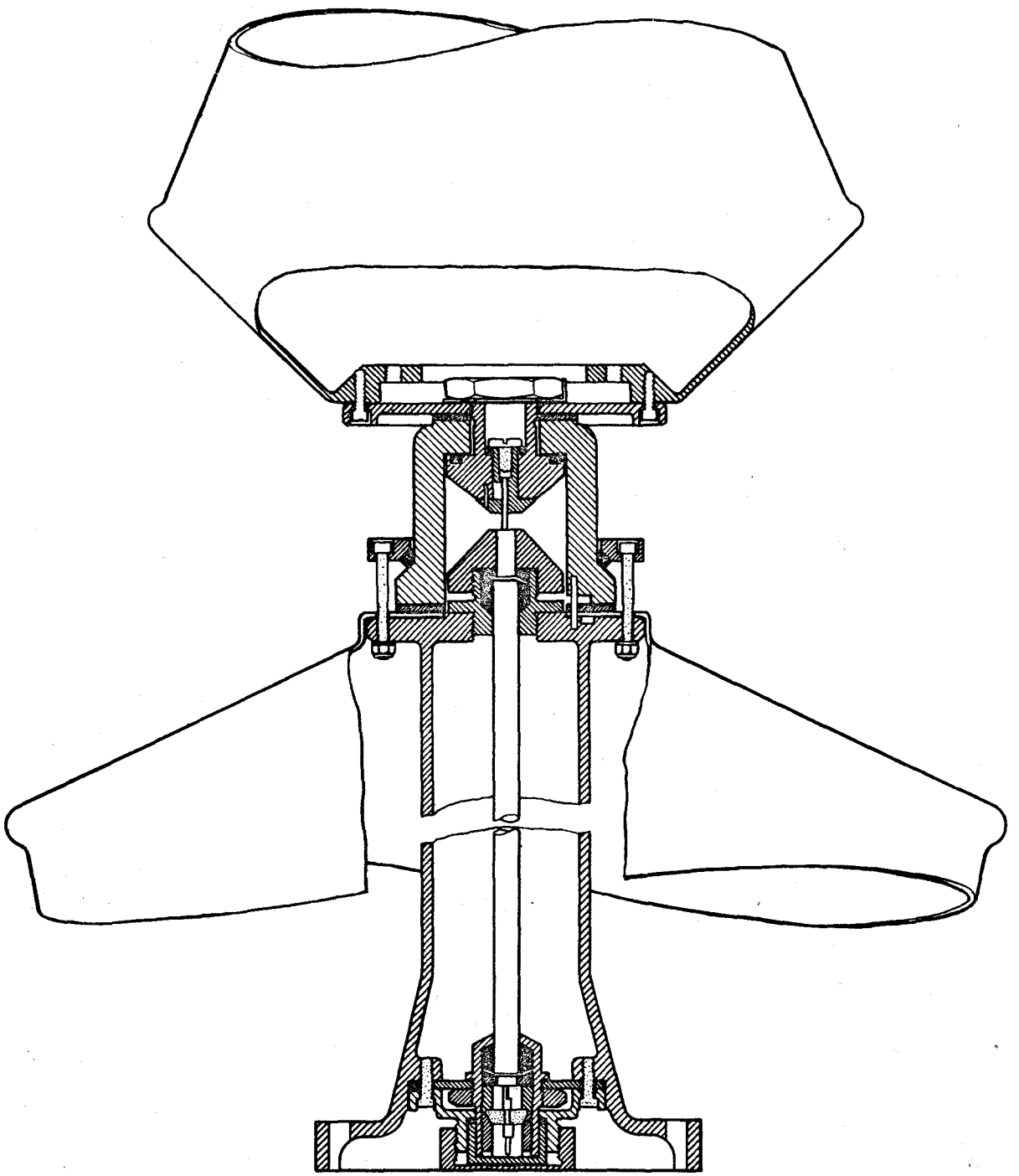
Note . . .

The above operation should be carried out without undue delay since the upper cone assembly must necessarily be released in order to lower the insulator into position.

30. Place the seating ring (17), adaptor plate (2) and the locking washer (16) into position and tighten up the lock nut (15) by hand.

31. Secure the clamping ring (5) by means of the six 2 B.A. socket headed screws (4) and nuts (15).

32. Tighten up the lock nut (15) and knock up the flat of the locking washer to prevent rotation of the lock nut. Secure the upper cone (1) to the adaptor plate (2) by means of the six 2 B.A. socket headed screws (3).



2 Cutaway view of Aerial Unit Design 41 Fig. 2

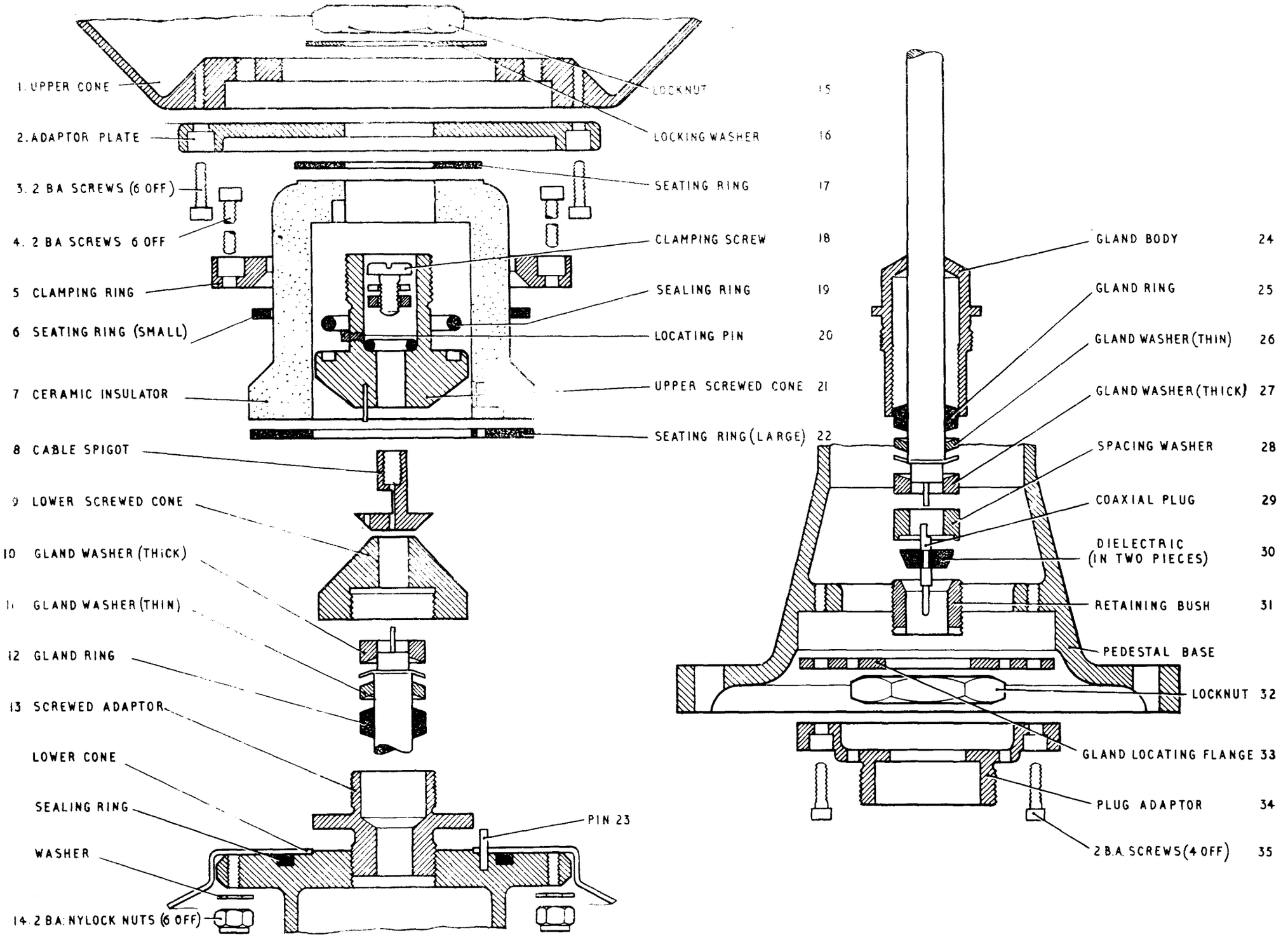


Fig. 3 Exploded view of Aerial Unit Design 41 Fig. 3

TABLE 1

Test set, radio—switch tests

Switch positions			Continuity between	Open circuit between
REVERSE-STOP-FORWARD K1	AUTOMATIC-MANUAL K2	CLUTCH FAST-SLOW S3		
FORWARD	MANUAL	FAST	Chassis and PL2/2	PL2/2 and PL2/7
FORWARD	AUTOMATIC	FAST	PL2/2 and PL2/7	Chassis and PL2/2
FORWARD	MANUAL	SLOW		Chassis and PL2/2
STOP	MANUAL	FAST	—	Chassis and PL2/2
STOP	MANUAL	—	—	Chassis and PL2/5
STOP	MANUAL	—	—	Chassis and PL2/6
FORWARD	MANUAL	—	Chassis and PL2/6	PL2/2 and PL2/6
FORWARD	AUTOMATIC	—	PL2/2 and PL2/6	—
REVERSE	AUTOMATIC	—	PL2/1 and PL2/5	Chassis and PL2/5
REVERSE	MANUAL	—	Chassis and PL2/5	PL2/1 and PL2/5
METER SWITCH S1	POLARIZED RELAY MEASUREMENTS S2			
RELAYS	OPERATE (MOTOR)	—	R2+ and PL1/2	—
RELAYS	OVERRIDE	—	R2+ and PL1/5	—
RELAYS	BIAS (MOTOR)	—	R2+ and PL1/4	
RELAYS	BIAS (CLUTCH)	—	R2+ and SKT1/2	—
RELAYS	OPERATE (CLUTCH)	—	R2+ and SKT1/4	—
RELAYS	OPERATE (CLUTCH)	—	M1- and PL1/4	—
RELAYS	BIAS (CLUTCH)	—	M1- and PL1/2	—
RELAYS	BIAS (MOTOR)	—	M1- and SKT1/4	—
RELAYS	OVERRIDE	—	M1- and SKT1/5	—
RELAYS	OPERATE (MOTOR)	—	M1- and SKT1/2	—
1	—		M1- and SKT2/3	—
2	—	—	M1- and SKT2/4	—
3	—	—	M1- and SKT2/8	—
4	—	—	M1- and SKT2/8	—
5	—	—	M1- and SKT2/9	—
8	—		M1- and SKT2/3	—
9	—		M1- and SKT2/4	—
10	—	—	M1- and SKT2/8	—
11	—	—	M1- and SKT2/8	—
12	—	—	M1- and SKT2/9	—
12	—	—	R2+ and SKT2/7	—
11	—	—	R2+ and SKT2/6	—
10	—	—	R2+ and SKT2/5	—
9	—	—	R2+ and SKT2/2	—
8	—	—	R2+ and SKT2/1	—
1	—	—	R2+ and SKT2/1	
2	—	—	R2+ and SKT2/2	—
3	—	—	R2+ and SKT2/5	—
4	—	—	R2+ and SKT2/6	—
5	—	—	R2+ and SKT2/7	—

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Chapter 3

TEST SET, RADIO, 6625-99-943-3377

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Introduction

Purpose of equipment

1. The test set, radio, 6625–99–943–3377 is designed tc facilitate first and second line servicing of the following equipments:—

(1) Receiver, radio, 5820–99–932–5694 (single-channel).

(2) Transmitter, radio, 5820–99-932–5698 (single-channel).

(3) Receiver, radio, 5820–99–932–5695 (multi-channel).

(4) Transmitter, radio, 5820–99–932–5691 (multi-channel).

2. The control panel of the test set includes a meter similar to that mounted on the front panel of the equipment under test and a meter switch This metering circuit can be connected to any of the test sockets of the equipment under test and used to make measurements similar to those obtainable with the internal metering system. Also mounted on the test set panel are the controls which permit manual operation of the frequency control systems used in the multi-channel equipments. All connections to the equipment under test are made by means of plugs and sockets, which are mounted on the test set control panel, and a set of seven extension connectors.

3. The test set is built into a steel attache-style case with a carrying handle and top and bottom hinged covers, each cover having four steel feet attached. The top cover, which contains all neces sary metering data, protects the control panel when the test set is not in use and the bottom cover encloses a compartment which houses the extension connectors. A servicing circuit and wiring diagram of the test set are given in fig. 2 and 3 respectively at the end of this Chapter.

Test equipment

4. The following items of test equipment are required:—

(1) Megohmeter set 6625–99–945–9195.

(2) Multimeter CT498.

(3) Tester, insulation resistance, Type E (Ref. No. 5G/427).

(4) Test circuit (fig. 1) comprising:—

(a) Battery, 4·5V.

(b) Resistor, composition 3·3 kilohm ¼W 5% (5905–99–021–5301).

(c) Resistor, variable, wirewound 500 ohm ½W (5905–99–011–9858).

Note . . .

The stock numbers in brackets are of suggested components, any equivalently rated may be used.

Servicing notes

Removal of control panel

5. All electrical components of the test set are mounted on the control panel, access to any component on the underside being gained by removing the eight countersunk screws from the panel and lifting out the complete panel assembly.

Switches

6. Should any of the switches become faulty, no attempt must be made to effect a repair; the faulty switch must be renewed.

Test procedures

General

7. The test procedures comprise simple insulation and continuity tests, measurement of resistor values and a comparison test of the meter, as described in the following paragraphs. These tests necessitate the removal of the control panel assembly from the case.

Insulation

8. Set the AUTOMATIC-MANUAL switch (K2) to the MANUAL position and, using the insulation tester, measure the insulation resistance between pole 7 of the MOTOR CONTROL plug PL2 and the chassis. The insulation resistance should be at least 40 megohms.

Meter

9. Connect the battery, 500-ohm potentiometer, 3·3-kilohm resistor and multimeter as shown in fig. 1 and set the multimeter to the 250μA d.c. range. After first ensuring that the slider of the potentiometer is set to the negative end of its travel, connect the free (negative) terminal of the multimeter and the negative pole of the battery to the positive and negative terminals respectively of the test set meter. Turn the test set METER SWITCH

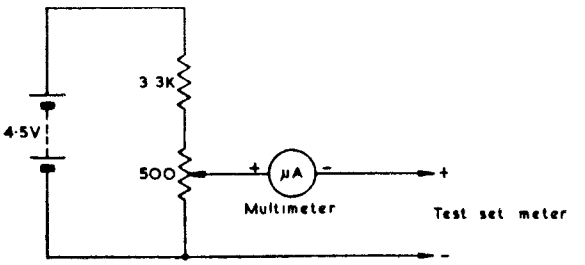


Fig. 1. Test circuit

to position 5 and proceed as follows:—

(1) Set the slider of the potentiometer to obtain a reading of 95μA on the multimeter and ensure that the test set meter reading lies between 90 and 100. (The test set meter has a rather sluggish movement, before taking readings, therefore, it is advisable to tap the case—not the glass.)

(2) Reduce the current through the circuit to 75μA, as indicated by the multimeter, and ensure that the test set meter reading lies between 71 and 79.

(3) Reduce the current to 25μA and ensure that the test set meter reading lies between 24 and 26.

(4) On satisfactory completion of the above tests, remove the test equipment.

Resistors

10. Using the megohmeter set to the appropriate range, and with the METER SWITCH set to position 5, measure the resistance between the points indicated, which should be as follows:—

(1) Poles 5 of SKT1 (POLARIZED RELAY) and PL1 (POLARIZED RELAY EXT.): between 9·9 ohms and 10·1 ohms.

(2) Poles 4 of SKT1 and PL1: between 32·34 ohms and 33·66 ohms.

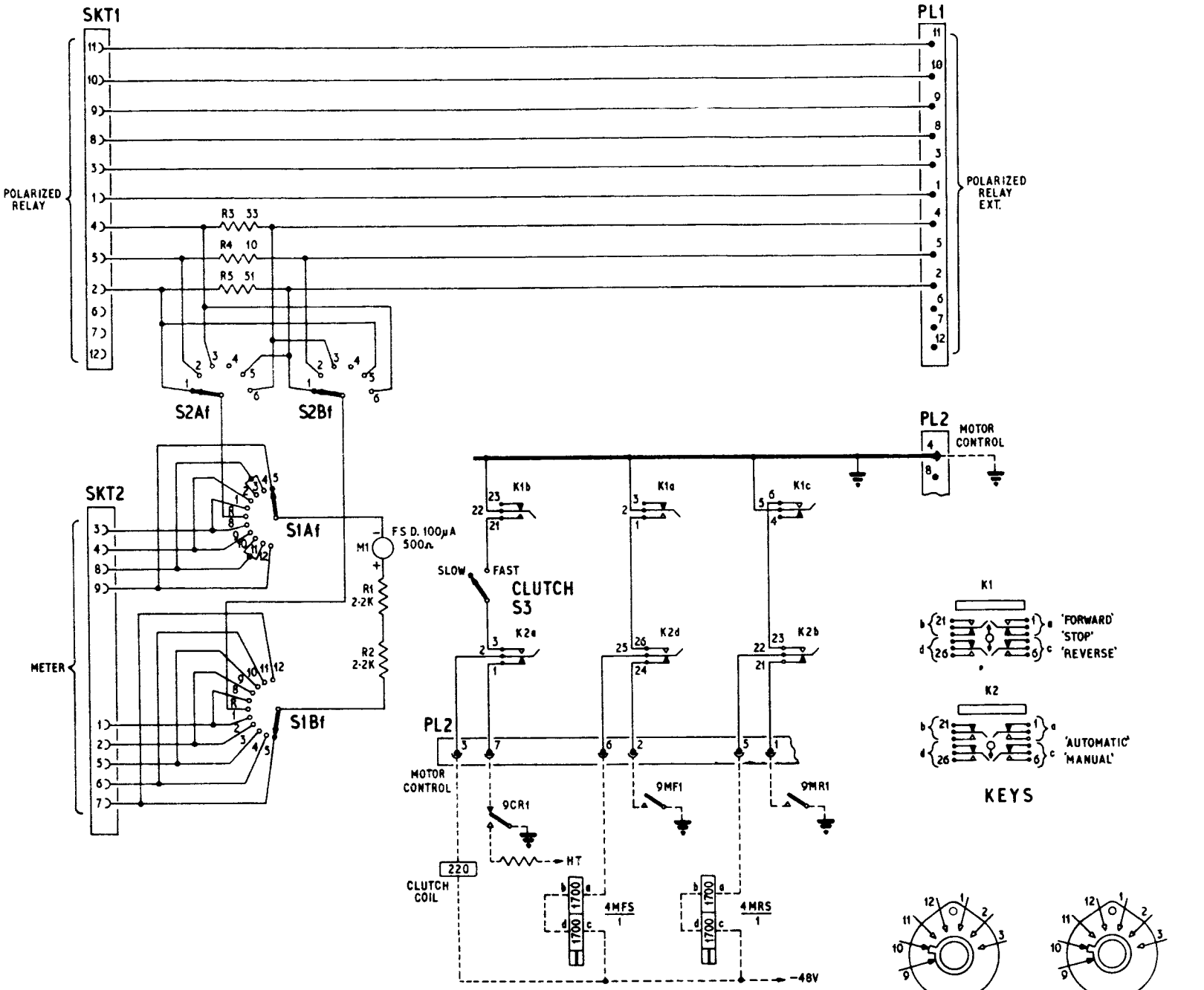
(3) Poles 2 of SKT1 and PL1: between 50·49 ohms and 51·51 ohms.

(4) Pole 7 of SKT2 (METER) and M1+: between 4356 ohms and 4444 ohms.

Switches

11. Using the multimeter as a continuity tester, verify the serviceability of the switches by performing the tests listed in Table 1.

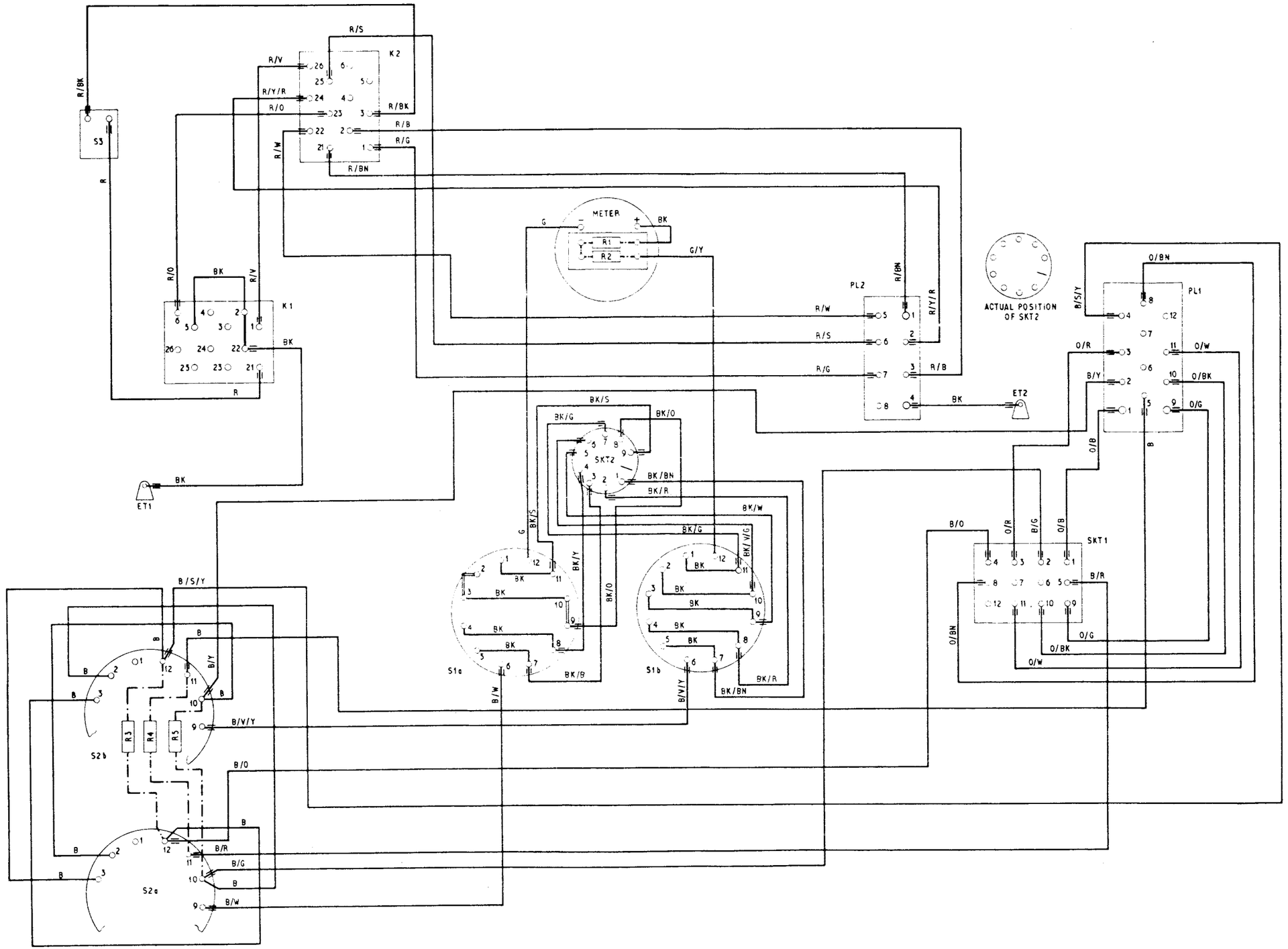
12. Complete the test procedures by using the multimeter to test for continuity between poles 1, 3, 8, 9, 10 and 11 of SKT1 and the corresponding poles of PL1. On satisfactory completion of the test procedures refit the control panel assembly in the case.



AIR DIAGRAM 6726N/MIN.	
ISSUE 1.	BY COMMAND OF THE DEFENCE COUNCIL FOR USE IN THE NAVAL SERVICE/ROYAL AIR FORCE (Prepared by the Ministry of Aviation)

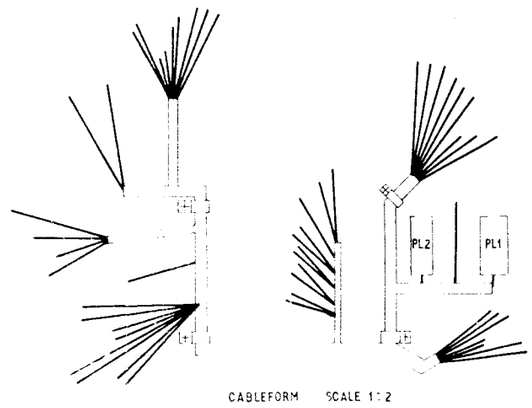
Test set, radio, 6625-99-943-3377: servicing circuit

Fig. 2



KEY TO WIRING :-

- DENOTES WIRE FORMING PART OF A COMPONENT
- DENOTES TINNED COPPER WIRE, 22 SWG.
- DENOTES WIRE, ELECTRICAL EQUIPMENT, TYPE 2, 7/-0076, TO DEF.12. COLOUR AS SPECIFIED
- DENOTES WIRE IN CABLEFORM



CABLEFORM SCALE 1:2

Test set, radio, 6625-99-943-3377: wiring diagram

Fig. 3

AIR DIAGRAM
6726P/MIN.
ISSUE 1.
BY COMMAND OF THE DEFENCE COUNCIL
FOR USE IN THE
NAVAL SERVICE ROYAL AIR FORCE
Prepared by the Ministry of Aviation

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