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Richard Hankins, VMARS Archivist, Spring 2004

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LIST OF ASSOCIATED PUBLICATIONS

A.P. Reference	Subject
A.P.1186, Vol. I, Sect. 5, Chap. 18	Test set, type 65
A.P.1186, Vol. I, Sect. 6, Chap. 10	Aerial, screened loop, type 3
A.P.1186D, Vol. I, Sect. 8, Chap. 5	Power units, type 32, 32A, 32B, 33, 33A, 33B, 34 34A, 35, and 35A
A.P.1186E, Vol. I, Sect. 6, Chap. 4	Power units, type 114 and 115

LAYOUT TREE FOR A.P.2548A

A.P.2548A

TRANSMITTERS, T.1154 SERIES
and
RECEIVERS, R.1155 SERIES

- **VOL. I**
  General description, instructions for use, installation, and servicing
  - **Chap. 1**—Transmitters, T.1154 series
  - **Chap. 2**—Receivers, R.1155 series
- **VOL. II**
  - **Part 1**
    (Leaflets)
    General orders and modifications
  - **Part 2** and **Part 3**
    Will be issued later to cover inspection and servicing
- **VOL. III**
  (None)
  Spare parts are listed in A.P.1086, Part 3A

This leaf issued in reprint
September, 1947

TRANSMITTERS, T.1154 SERIES

AND

RECEIVERS, R.1155 SERIES

LIST OF CHAPTERS

Note.—A list of contents appears at the beginning of each chapter.

CONCISE DETAILS OF TRANSMITTERS, Types T1154, T1154A, B, C, D, E, F, H, J, K, L, M, and N

Purpose of equipment...	Airborne transmitters used with receivers of the R.1155 group, except the T.1154D and T.1154E, which are used with R.1188 in mobile ground stations.
Type of wave	T.1154, T.1154B, T.1154C, T.1154D, T.1154F, T.1154H, T.1154J, T.1154K, T.1154L, T.1154M, T.1154N:—C.W., M.C.W. and R/T. T.1154A, T.1154E:—M.C.W., C.W.
Frequency range ...	T.1154, T.1154A, T.1154B, T.1154J, T.1154N:—10·0 Mc/s–3·0 Mc/s and 500 kc/s. to 200 kc/s. in three ranges. T.1154C, T.1154F, T.1154H, T.1154K, T.1154M:—16·7–2·35 Mc/s and 500 kc/s. to 200 kc/s. in 4 ranges. T.1154D, T.1154E:—8 Mc/s–2·5 Mc/s and 500 kc/s. to 200 kc/s. in three ranges. T.1154L:—5·5–1·5 Mc/s and 500–200 kc/s. in three ranges.
Frequency stability ...	Master oscillator control.
Percentage modulation	70 per cent.
Amplifier class	Class C, with suppressor grid modulation on M.C.W. and R/T.
Microphone type ...	Carbon granule, or electro-magnetic with sub-modulator such as A.1134 or A.1134A.
Valves	Master oscillator; sidetone and modulator; two indirectly-heated triodes, VT105 (Stores Ref. 10E/216). Power amplifier, two directly-heated pentodes, VT104 (Stores Ref. 10E/215).
Power input	From 12 or 24-V. rotary transformers, supplied from aircraft electrical system in airborne installations, or from a.c. mains *via* a rectifier on the ground. 1,200 volts, 200 mA. H.T.; 6 volts, 4 amps. L.T.; 6 volts 2·5 amps. keying relay (approx. 280 watts total).
Power output	50–80 watts; ¼ power on R/T and M.C.W.
Approximate overall dimensions	*Length* 17½ in. *Width* 16⅝ in. *Height* 11¼ in.
Weight	46 lb. 10 oz.
Associated equipment...	R.1155 (Stores Ref. 10D/98), R.1155A (Stores Ref. 10D/820), R.1155B (Stores Ref. 10D/13045), R.1155C (Stores Ref. 10D/1105), R.1155D (Stores Ref. 10D/1331), R.1155E (Stores Ref. 10D/1332), R.1155F (Stores Ref. 10D/1333), R.1155L (Stores Ref. 10D/1477), R.1155M (Stores Ref. 10D/1597), R.1155N (Stores Ref. 10D/1667). Switch unit Type J (Stores Ref. 10F/126) or aerial plug board (Stores Ref. 10H/681). Power units.—Type 32 (Stores Ref. 10K/17), Type 32A (Stores Ref. 10K/13063) or Type 32B (Stores Ref. 10K/1474). Type 33 (Stores Ref. 10K/18), Type 33A (Stores Ref. 10K/13064) or Type 33B (Stores Ref. 10K/1470). Type 34X (Stores Ref. 10K/61), Type 34A (Stores Ref. 10K/13065). Type 34 (Stores Ref. 10K/19). Type 35A (Stores Ref. 10K/13066) or Type 35 (Stores Ref. 10K/20). *For use on ground.*—Power unit, Type 114 (Stores Ref. 10K/350) or Type 115 (Stores Ref. 10K/351). For mobile ground station, rectifier Type 26 (Stores Ref. 10D/745). Aerial ammeter (Stores Ref. 10A/12227 or 10A/12667).

CHAPTER 1

TRANSMITTERS, Type T.1154, T.1154A, B, C, D, E, F, H, J, K, L, M, and N

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2, 3. Vernier adjustments, M.O. tuning (operative only when click stops are in use)
4. Retaining bar for plugs and sockets
5. Microphone sockets
6. Plug for output circuit matching, RED range
7. Screening can
8. Spring-loaded pivot for anode connector

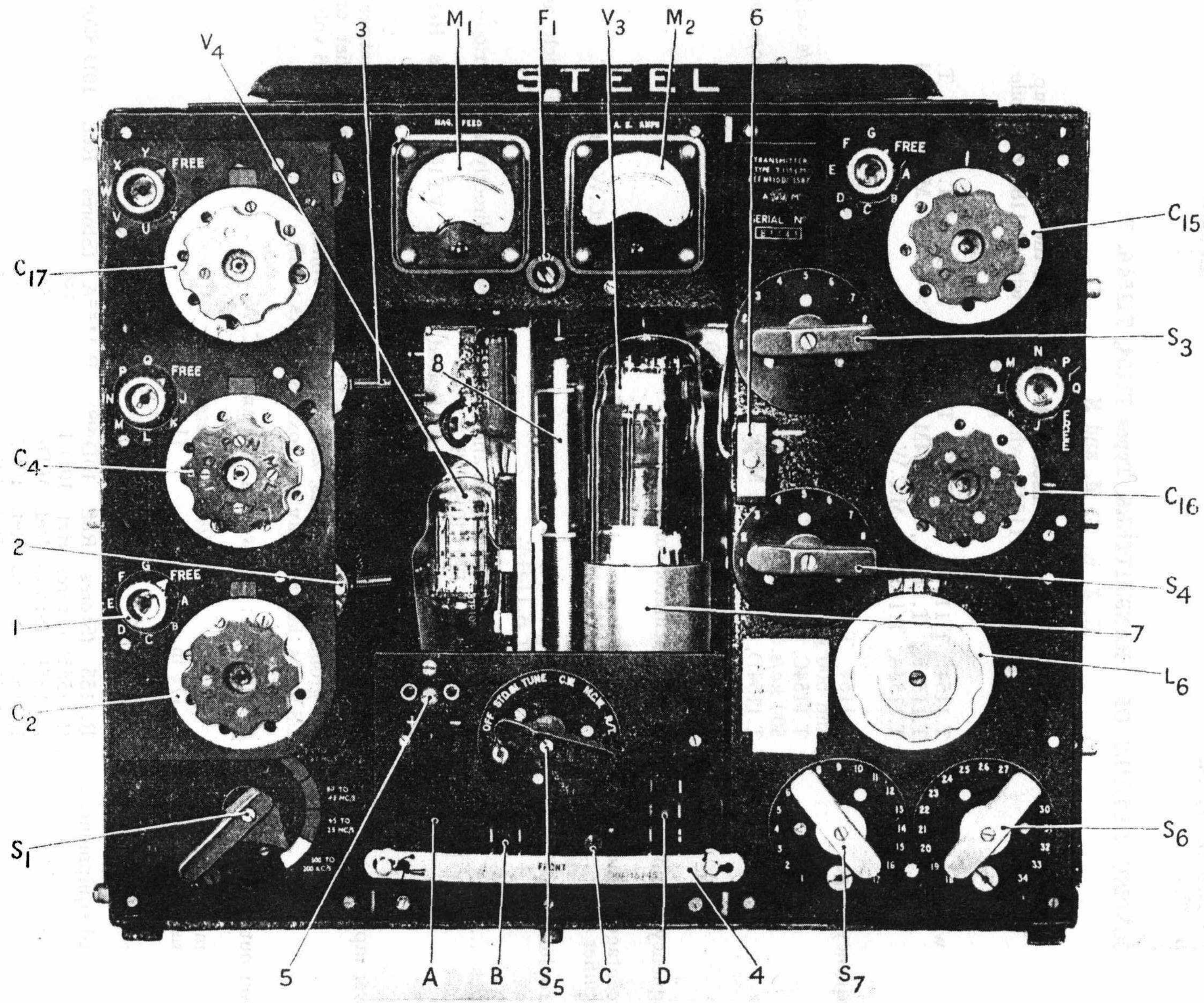

Fig. 1.—General view of T.1154M

CHAPTER 1

TRANSMITTERS, Types T.1154, T.1154A, B, C, D, E, F, H, J, K, L, M, and N

INTRODUCTION

1. Transmitters of the T.1154 series are designed primarily for installation in aircraft, to provide air-to-ground or air-to-air communication by W/T, and in all but two versions by R/T as well. Series L, however, is intended for installation in high-speed launches, and series D and E were introduced for mobile ground stations. Normally all these transmitters are used with receivers of the R.1155 series (see Chapter 2 of this publication).

Frequency coverage

2. Altogether there have been thirteen production varieties of the T.1154, the principal differences between them concerning frequency coverage and the provision or absence of R/T facilities. Component variations in the drive and output units, modifications of the "click-stop" mechanism for rapid selection of pre-set frequencies, and the use of steel or aluminium cases account for further versions. Table 1 enumerates the different types of transmitter and their frequency ranges. The colours stated in the table are those of the tuning controls for the ranges concerned.

TABLE 1

Frequency coverage of transmitters T.1154

T.1154, *T.1154A, T.1154B, T.1154J, T.1154N				
	Range 1	(H.F.),	BLUE	10 Mc/s to 5·5 Mc/s
	Range 2	(H.F.),	RED	5·5 Mc/s to 3·0 Mc/s
	Range 3	(M.F.),	YELLOW	500 kc/s to 200 kc/s
T.1154C, T.1154F, T.1154H, T.1154K, T.1154M				
	Range 1	(H.F.),	BLUE	16·7 Mc/s to 8·7 Mc/s
	Range 2	(H.F.),	BLUE	8·7 Mc/s to 4·5 Mc/s
	Range 3	(H.F.),	RED	4·5 Mc/s to 2·35 Mc/s
	Range 4	(M.F.)	YELLOW	500 kc/s to 200 kc/s
T.1154D, *T.1154E				
	Range 1	(H.F.),	BLUE	8 Mc/s to 4·5 Mc/s
	Range 2	(H.F.),	RED	4·5 Mc/s to 2·5 Mc/s
	Range 3	(M.F.),	YELLOW	500 kc/s to 200 kc/s
T.1154L				
	Range 2	(H.F.),	RED	5·5 M/cs to 3 Mc/s
	Range 2A	(H.F.),	BLUE	3 M/cs to 1·5 Mc/s
	Range 3	(M.F.),	YELLOW	500 kc/s to 200 kc/s

**Note*.—Transmitters marked with an asterisk provide C.W. and M.C.W. only. All others are for C.W., M.C.W., and R/T.

3. In all transmitters with three frequency ranges there are separate sets of tuning controls for each range, identified by colours as in the foregoing table. Series C, F, H, K, and M, however, use the same set of controls, coloured blue, for the two higher H.F. ranges.

4. Certain types of T.1154 are now obsolete or obsolescent and ultimately the series will be narrowed to three standard types for all applications. The position in this respect is shown in Table 2, the final standard versions being identified with a dagger. In the same table is shown the type of case, aluminium or steel, and of "click-stop" mechanism.

Pre-set frequency selection

5. The click-stop mechanism is arranged so that the tuning controls click into and are rigidly held in the correct position for pre-set frequencies. With the Multi-click system all the chosen frequencies are selected in turn as the tuning dials are rotated, and the operator sees which one is engaged at any moment by means of lettered tabs coming into view behind an aperture. The mechanism can be released to allow free rotation of the dials when setting up frequencies which have not been pre-selected.

6. The Uni-click mechanism on the other hand allows one click-stop to be brought into use at a time, the stop required being selected by turning a selector knob to the appropriate position on a lettered dial. Both mechanisms are fully described in para. 84 to 92.

TABLE 2

Stores Ref.	*Type*	*Case Aluminium (A) or Steel (S)*	*Click-stop Mechanism*	*Remarks*
10D/97	T.1154	A	Multi	Obsolete
10D/99	A	A	Multi	Obsolete
10D/196	B	A	Multi	Obsolescent.—Restricted to use in Halifax (B) only, but suitable for use in all bombers.
10D/198	C	A	Multi	Obsolescent.—Coastal version. Superseded by T.1154F.
10D/730	D	A	Multi	Obsolescent.—Provided for mobile ground stations, but superseded by T.1154K.
10D/731	E	A	Multi	Same construction as T.1154D.
10D/893	F	A	Multi	Obsolescent.—Coastal version. Used in Halifax (G.R.) and Sunderland aircraft, and in trainers where the steel version is unacceptable.
10D/1180	†H	A	Uni	T.1154F with Uni-click mechanism. For Halifaxes and flying boats.
10D/1329	J	S	Multi	Obsolescent. Steel version of T.1154B for all bombers other than Halifaxes.
10D/1330	K	S	Multi	Obsolescent. Steel version of T.1154F. Will be superseded by T.1154M.
10D/1455	†L	S	Uni	For high-speed launches and certain trainers of Technical Training Command.
10D/1587	†M	S	Uni	As T.1154K with Uni-click stops.
10D/1588	N	S	Uni	Steel version of T.1154B with Uni-click stops.

Aerial systems and switching

7. When installed in aircraft the transmitters work into the aircraft fixed aerial on the H.F. ranges and into the trailing aerial on M.F. The appropriate aerial is selected by the frequency range switching of the transmitter, but to provide for occasions when the normal aerial may not be available an external aerial selector switch type J (Stores Ref. 10F/126) is provided which can override the transmitter switch and connect the H.F. output circuit to the trailing aerial or the M.F. output circuit to the fixed aerial. Other positions of this switch are arranged to cut off the transmitter H.T. supply when the aerials are earthed, or when the associated receiver is being used for loop D/F.

8. In some early installations an aerial plugboard (Stores Ref. No. 10H/681) is provided in place of the aerial selector switch and the desired aerial is connected to the transmitter, on occasions when the automatic internal switching does not fulfil the requirements, by the interchange of plug and socket connections.

9. Either carbon-granule or electro-magnetic type microphones may be used for R/T with the transmitters equipped for telephony transmission, but when electro-magnetic microphones are used it is necessary to incorporate a suitable sub-modulating device such as the intercommunication (I/C) amplifier A.1134 (Stores Ref. 10U/11500) or A.1134A (Stores Ref. 10U/90) to provide the necessary microphone gain. The change from carbon to electro-magnetic operation entails a minor internal adjustment of the transmitter (see para. 28, 29). A detailed description of the amplifier A.1134 is given in Sect. 4, Chap. 2 of A.P.1186.

Power supplies

10. Power supplies for the airborne equipment are derived from the general aircraft electrical supply system of nominal 12-volt or 24-volt rating, through two rotary transformers with the necessary smoothing and filtering circuits. One of these units (referred to as the H.T. power unit) supplies 1200 volts H.T., and the other (the L.T. power unit) provides 6·3 volts L.T. The L.T. power unit is used, also, by the receiver installation, supplying H.T. and L.T. for the receiver, in addition to transmitter L.T.

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† Denotes final standard version

11. When used in a ground installation the rotary transformers may be run from accumulators "floating" across a mains rectifier such as the power unit type 115 (Stores Ref. 10K/351), or the transmitter may be supplied direct from a.c. mains through a rectifier such as the power unit type 114 (Stores Ref. 10K/350), which is tapped to provide the correct voltage inputs.

12. The overall dimensions of a transmitter, in its case, are approximately 17½ in. by 16¾ in. by 11¼ in. The weight of the instrument, complete with its suspension units and valves, is approximately 46 lb. 10 oz. The general appearance of a transmitter T.1154M is shown in fig. 1 and this illustration is representative of the remaining types except for the click-stop mechanism of the older versions.

GENERAL DESCRIPTION

13. Before considering the circuit arrangement of the transmitter it is necessary to understand the functions of the transmitter master switch (S_5, fig. 1). This has six (or in transmitters without R/T, five) positions, labelled as follows: OFF, STD.BI, TUNE, C.W., M.C.W., R/T. In the STD.BI position the input circuit of the L.T. power unit is completed and the transmitter valves are heated by the 6·3 volts output of that unit. When the switch is turned to TUNE, 6·3 volts from the L.T. power unit are applied to the starting relay of the H.T. machine, which on running produces 1,200 volts for the transmitter anodes. The circuit from the L.T. power unit to the H.T. starting relay passes through the aerial selector switch type J and is broken there when the switch is in the D/F or EARTH positions.

14. The remaining positions of the switch are shown in the basic circuit diagram, fig. 2. No frequency range switching is shown in this diagram, for the sake of simplicity. The annotations of the tuned circuit components are those for the BLUE range, but the general circuit is similar on all frequencies except for the aerial tuning arrangements on M.F., which are described later, and are shown inset.

Master oscillator circuit

15. It will be seen from fig. 2 that the transmitter consists of a master oscillator stage driving two pentode power amplifying valves in parallel. Only one of the P.A. valves is shown in the simplified diagram. The master oscillator valve, V_1, an indirectly-heated triode, has its tuned circuit, L_1 C_2, connected between grid and anode, and its H.T. supply is fed through a tapping point on the coil. This point is also in effect the cathode tap of the circuit, being at cathode potential from the point of view of R.F. by reason of its connection to earth *via* the condensers C_{18}, C_{19}. The circuit is therefore a series-fed Hartley oscillator. In this transmitter the cathodes are connected to chassis, which is however at a positive d.c. potential with respect to the H.T. negative line because of the voltage drop across the resistances R_9, R_{10} through which the whole H.T. current flows from the chassis back to its negative supply terminal.

P.A. and output circuits

16. The M.O. stage is connected to the directly-heated pentode power amplifier valves V_2, V_3 through the coupling condenser C_6. On the BLUE range the P.A. tuned circuit is the coil L_4 with the condenser C_{15} in parallel. The aerial is coupled directly to this circuit through a variable tapping controlled by the switch S_3 (fig. 1) on the front panel. Similar arrangements, using a separate set of components, apply on the RED range of all transmitters except those of series C, F, H, K, and M. In these versions the end of the aerial coil remote from the P.A. valve anodes is not normally earthed, although provision is made for earthing it, through two series condensers, in the circumstances described in para. 55. The P.A. circuit is shunt-fed through the H.F. choke HFC_1. A feed meter, M_1 is provided, and it should be noted that it reads only the current taken by the power amplifier valves. The input fuse F_1 carries the H.T. current to all valves in the transmitter.

17. On the YELLOW range the aerial itself provides the tuned circuit capacitance. The amount of inductance in the circuit is varied in steps by means of a tapped coil, a varying portion of which is short-circuited as the tapping is altered. The coil has a sliding iron-dust core for fine variations of inductance by permeability tuning. The anodes of V_2, V_3 are connected to the aerial coil through a variable tapping, which enables the valve loading to be adjusted to the best advantage. These arrangements are shown in the inset of fig. 2, and it will be seen that the P.A. circuit is shunt-fed as on the H.F. ranges. An aerial ammeter, M_2, is connected between L_6 and earth, to give an indication of aerial current.

Sidetone and modulator valve

18. The indirectly-heated triode valve V_4 acts either as a 1,200 cycle (approx.) oscillator to provide keying sidetone, or sidetone together with modulation of the transmitter output on M.C.W.; or as a modulator for R/T, when speech sidetone is also available from this valve provided a carbon microphone is in use. The modulating voltages are applied to the suppressor grids of the P.A. valves. Approximately 70 per cent. modulation is effected.

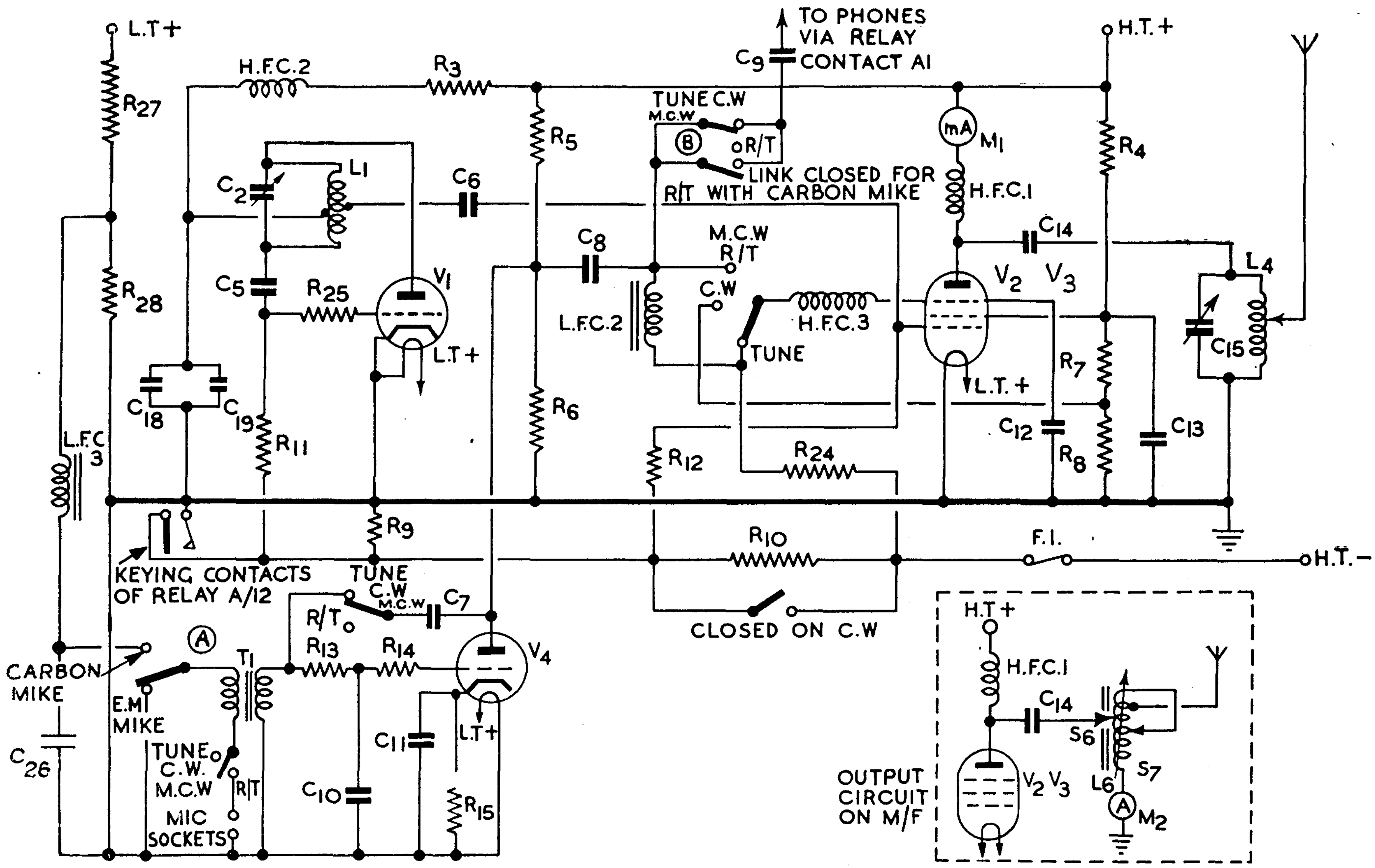

FIG. 2.—SIMPLIFIED CIRCUIT DIAGRAM, T.1154

"Tune" position of master switch

19. When the transmitter master switch is on TUNE and the key is up, the keying contacts of REL. A/12 are open, and the flow of H.T. current through the resistances R_9, R_{10} renders the control grids of the master oscillator and P.A. valves so negative with respect to their cathodes that no oscillation takes place, and the P.A. stage passes no current. With the key down the relay contacts close, short-circuiting R_9, so that the bias is removed from the control grids and the circuit oscillates. However, with the master switch at TUNE the resistance R_{10} is still in circuit and the suppressor grids of V_2, V_3 are negative to cathode on account of the voltage drop across that resistance, the bias being of the order of 45 volts. This is sufficient to prevent excessive feed to the P.A. valves caused by misadjustment when tuning, and permits short-range communication to be carried on. It should be noted that the suppressor grids are at filament potential to R.F. on account of condenser C_{12}. The power output on TUNE is approximately one quarter of that on C.W.

20. When the transmitter is oscillating the M.O. valve V_1 receives automatic bias from the grid leak and condenser combination C_5, R_{11}, the resistance R_9 being short-circuited as explained above, and the grid leak keyed to earth, *via* the keying relay contacts. The grid-stopper resistance R_{25} suppresses parasitic oscillations.

21. A resistance R_3 in the H.T. positive line serves to reduce the anode voltage of the oscillator valve. When the key is up, the increased bias reduces the anode current, giving less voltage drop in R_3 and a higher anode voltage to V_1, which helps this valve to commence to oscillate when the key is pressed. The increase of anode current then gives more drop in R_3 and the anode current then drops to the normal working value.

"C.W." position of master switch

22. On turning the master switch to C.W. the suppressor grids of V_2, V_3 are joined to a point on the potentiometer formed by the resistances R_4, R_7, and R_8 connected across the H.T. supply and acquire a positive potential, although still at earth potential to R.F. by virtue of the by-pass condenser C_{12}. At the same time the resistance R_{10} is short-circuited. The positive potential on the suppressor grids is approximately 20 volts and provides full-power conditions of working. The control grids of V_2, V_3 receive automatic bias from the grid leak and condenser R_{12}, C_6.

23. It will be noted that the screen grids of V_2 and V_3 are also supplied from a tapping on the potentiometer formed by R_4, R_7, and R_8. They are at earth potential to R.F. by reason of C_{13}.

Listening through

24. While the master switch is in the TUNE, M.C.W., or C.W. position the valve V_4 acts as an A.F. oscillator, anode-to-grid feedback being provided by the condenser C_7. The A.F. voltages across LFC_2 are fed to the operator's telephones through contacts on the keying relay which are closed when the key is down. When the key is raised these contacts break and another relay contact connects the telephones to the output of the receiver. In this way the operator is provided with "listening through" facilities, being able to hear a station calling him in the intervals of his keying.

25. It must be appreciated that the note heard when the key is pressed is due entirely to the valve V_4, which can be regarded in these circumstances as a valve buzzer, and gives no indication that the M.O. and P.A. stages are functioning correctly.

M.C.W. and R/T

26. With the master switch at M.C.W., V_4 continues to act as an A.F. oscillator, but now the voltages across LFC_2 are applied also to the P.A. suppressor grids *via* HFC_3 to modulate the output. At the same time the short-circuit is removed from R_{10} and the suppressor grids again receive a negative bias, which is varied by the modulating voltages.

27. On turning the master switch to R/T the anode-to-grid circuit of V_4 *via* C_7 is broken so that the valve ceases to oscillate and acts as an A.F. amplifier. The primary circuit of the microphone transformer is made, and the speech frequencies applied to the grid of V_4 appear amplified across LFC_2 and are passed to the suppressor grids of V_2, V_3, which again have a negative bias due to the voltage drop across R_{10}.

Use of carbon or E.-M. microphones

28. Two sockets on the transmitter panel allow for a modulating source to be connected. A plate inside the transmitter (but accessible from the back, as shown in fig. 11) engraved CARBON on one side and ELECTRO-MAGNETIC on the other can be turned round so that either label is showing

being held in position by six fixing screws. When the word CARBON is visible, link connections incorporated in the plate tap off a portion (2 volts) of the L.T. voltage from the junction of R_{27} and R_{28} for energising the microphone, and connect the operator's telephones in parallel with the input to the P.A. suppressor grids to provide him with sidetone.

29. When the plate is turned so that the word ELECTRO-MAGNETIC is showing, the microphone energising circuit is broken, as is also the link feeding sidetone to the telephones (see points A and B, fig. 2). In these circumstances it is the output of a sub-modulating amplifier (see para. 9) which is connected to the microphone sockets on the transmitter, and sidetone is provided from the amplifier.

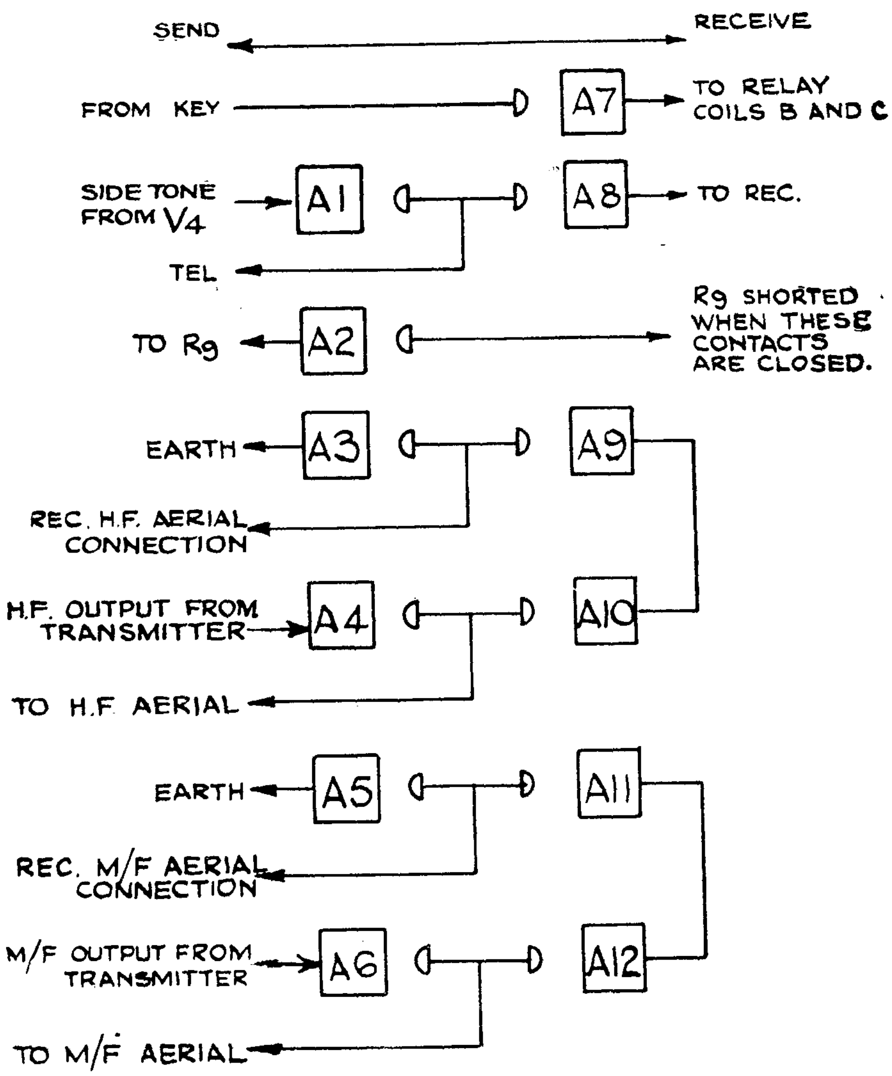

FIG. 3.—KEYING RELAY CONTACTS

Magnetic relay type 85 (keying relay)

30 Where mention has been made in the foregoing description of a relay in connection with keying and sidetone, it has referred to the magnetic relay type 85. This is a multi-contact relay with a row of moving contacts which move from side to side during keying to complete circuits through two rows of fixed contacts known respectively as the SEND and the RECEIVE contacts. It will be seen from fig. 3 that when at SEND, in addition to short-circuiting R_9 through the contacts A_2, and connecting the telephones to the output of the valve V_4 *via* A1, the relay completes aerial connections to the transmitter *via* A_4 or A_6. The particular aerial connected depends upon the position of the frequency range switch or the aerial selector switch type J. Both aerial connections from the receiver are earthed at contacts A_3 and A_5.

31. On moving to RECEIVE the relay removes the short-circuit from R_9, thus stopping oscillation, and connects the telephones and the aerial in use to the receiver.

Action of relay

32. The relay is operated by the 6-volt supply from the L.T. generator and is common to all versions of the transmitter. It can operate at a speed equivalent to more than 25 words a minute.

33. The relay incorporates three coils A, B, and C. The coil A is in circuit so long as the transmitter is switched on, that is, with the master-switch S_5 at any of the positions STD.BI, TUNE, C.W., M.C.W. or R/T. With S_5 in the STD.BI position the coil A only is energized and holds the relay in the RECEIVE position. The key is not in circuit. The coils can be seen in fig. 4, 5 and 6.

34. When the switch S_5 is in the TUNE, C.W., M.C.W., or R/T position the key is switched into circuit. Depression of the key energizes both B and C coils of the relay, the connection of the winding B being so arranged that its field neutralizes the field due to the holding coil A. At the instant when the nett field resulting from both coil A and coil B is zero the relay commences to move under the combined action of the spring contacts and coil C. The auxiliary contacts of the relay open, thus cutting off the current through the coil B. This sudden cessation of current in coil B causes a transient condition in the coil A which instantly reduces its current to zero. Thereafter the field of coil A is re-established, but not fully until after the elapse of a period considerably greater than the transit time of the relay. As coil C is energised simultaneously with coil B when the key is pressed, it follows that the relay motion initiated by coil B will be completed by the attraction of coil C.

35. When the key is released the relay returns rapidly to the RECEIVE position since the field of coil A is already re-established, and the current through coil C ceases as soon as the key contacts open.

Transmitters T.1154C, F, H, K, M

36. A complete circuit diagram of a transmitter providing C.W., M.C.W., and R/T communication on four frequency ranges (T.1154C, F, H, K, and M) is given in fig. 4. The transmitter master switch S_5 consists of six sections, identified on the diagram with the letters F, G, H, J, L, and M. In the OFF position of this switch, both the rotary transformer power units are idle and the equipment is inoperative.

37. In the STD.BI position a circuit is completed for the aircraft 12 or 24-volt supply from contact 4 of the Jones plug D on the front of the transmitter, through switch section H of S_5, back to contact 3 of plug D and thence to the L.T. power unit. It will be seen that the circuit through switch section H is made in all positions of S_5 except OFF.

38. The 6-volt output of the L.T. power unit is brought into the transmitter at contact 6 of plug D and divides as follows:—

(i) To coil A of the magnetic relay type 85, which goes over to RECEIVE.

(ii) To heaters of V_1 and V_4 and to the filaments of V_2, V_3. Resistances R_{30}, R_{31} are included in the filament circuit of the P.A. valves to reduce the current they take when the transmitter is at STD.BI. In some transmitters a single ·75-ohm resistance is used in place of R_{30} and R_{31}.

(iii) To contact 3 of Socket A for supply to the receiver.

In the TUNE position of S_5 the following processes occur:—

(iv) Limiting resistances R_{30}, R_{31} are short-circuited by sections F and G.

(v) The 6-volt supply is switched by sections F and G as follows:—

(*a*) To contact 13 of plug E, whence it is taken *via* the aerial selector switch type J (provided this is in one of the positions other than D/F or EARTH), back to contact 14 of plug E and thence via contact 8 of plug D to the starting relay of the H.T. power unit. The 1,200-volt output of this power unit is supplied to the transmitter at plug C.

(*b*) The 6-volt circuit is also taken from contact 13 of plug E, *via* relay coil B, and relay contact A_7 to contact 13 of plug B, but no current flows while the key is up. It will be seen that while the keying relay A/12 is at RECEIVE, relay coils B and C are short-circuited by relay contacts A_7.

39. When the key is pressed the 6-volt circuit through relay coil B is completed to earth via the key and as explained in para. 34 the flux from coil A, which has been holding the relay at RECEIVE, is neutralised, so that the relay begins to move under the pressure of the spring contacts. As soon as it does so relay contact A_7 breaks and the 6-volt circuit is diverted through coil C, holding the relay over at SEND. Relay contacts A_2 now short-circuit R_9 through pin 14 of plug B so that

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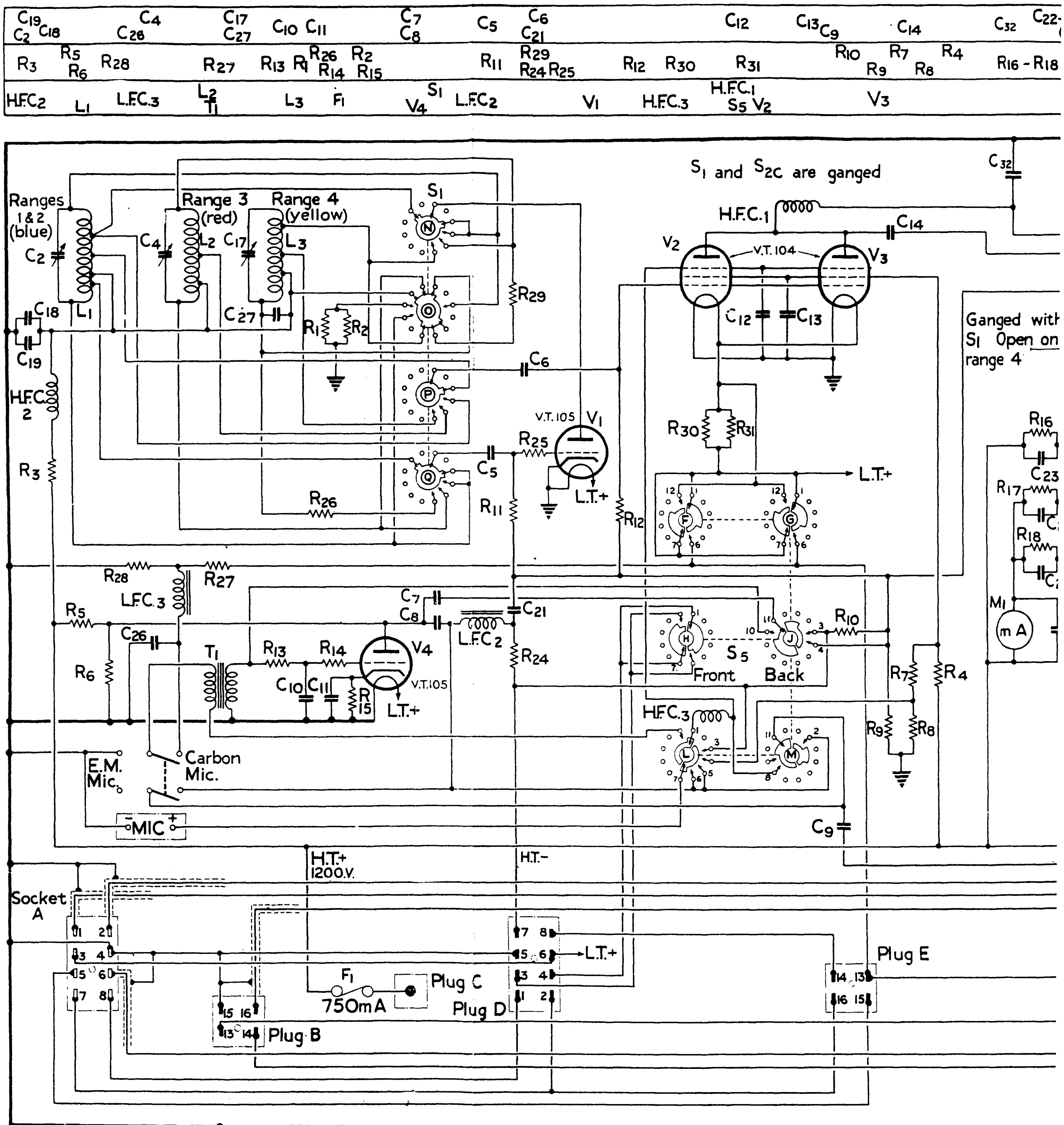
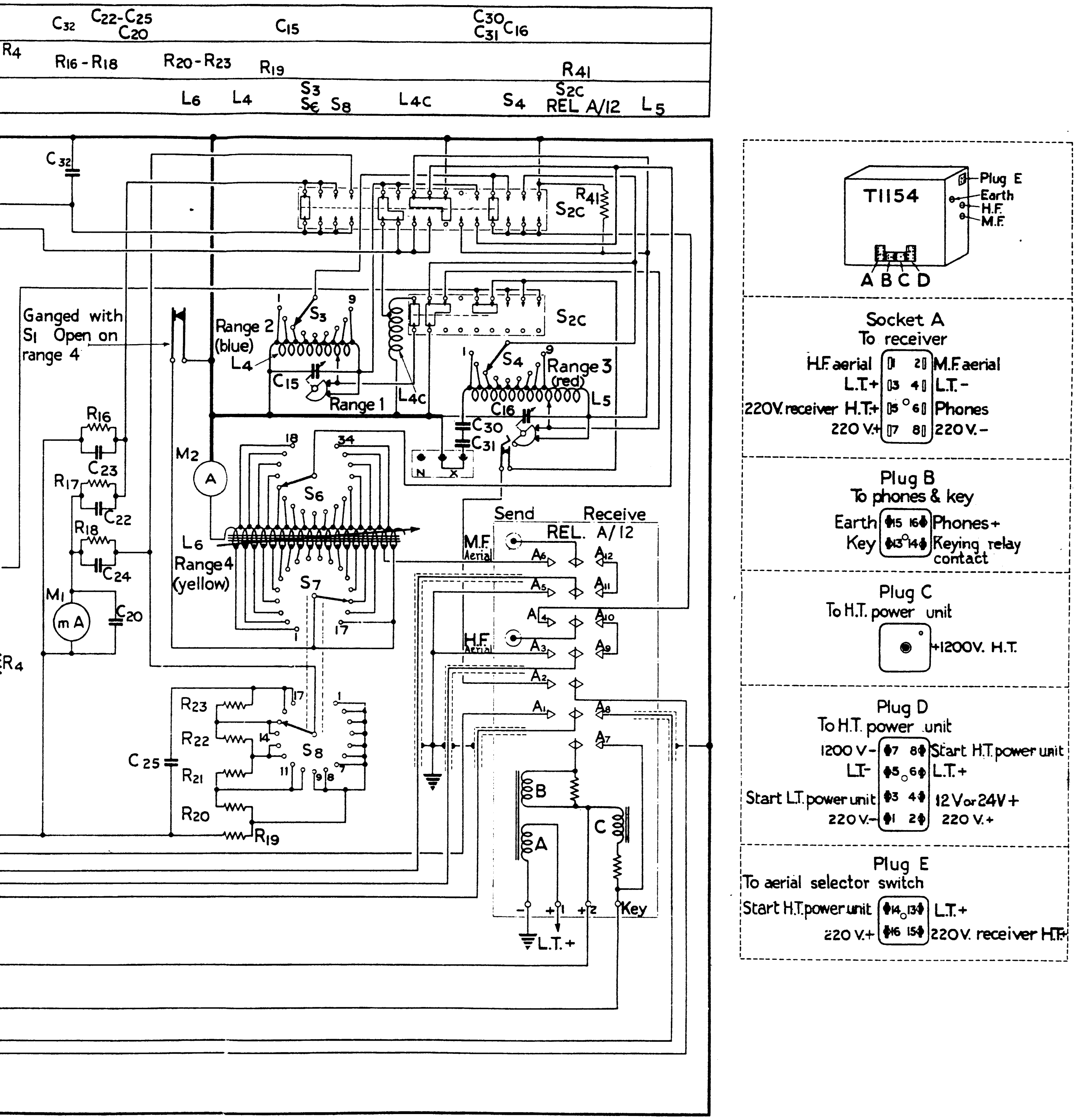


Note: S1 and S5 shown in extreme anti-clockwise position
Socket & plugs as viewed from front of transmitter.

FIG. 4

CIRCUIT OF

To face para. 36



UIT OF T. 1154 C, F, H, K, & M

FIG. 4

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the bias is removed from the control grids. The telephones are connected to the output of V_4, via contact 16 of plug B, relay contact A_1 and section M of S_5, enabling the operator to hear the sidetone note. V_4 is in an oscillating condition the whole time the master switch is at TUNE, since its grid is returned to the filament end of R_9.

40. It will be noted that the total H.T. current is still flowing through R_{10}; the suppressor grids of the P.A. valves are connected through HFC_3 and switch section L to the end of R_{10} which is negative with respect to the end to which the control grids are connected via S_5J, and so a bias on the suppressor grids is maintained.

41. When the master switch is turned to C.W. the suppressor grids are connected via S_5L to the junction of R_7 and R_8, whence they receive a positive bias, and R_{10} is short-circuited by S_5J.

42. On turning the master switch to M.C.W., section L of S_5 applies the A.F. oscillations of V_4, via C_8, to the suppressor grids of V_2 and V_3. The short-circuit is removed from R_{10} by switch section J so that the negative bias is re-established.

43. Similar conditions obtain on R/T, except that section J of S_5 disconnects the condenser C_7 between anode and grid of V_4 so that the valve ceases to oscillate and acts as an amplifier, and at the same time the microphone (or output of the external amplifier) is connected to the primary of T_1 via section L.

44. With S_5 at R/T the key is still in circuit and must be depressed for transmission to take place; alternatively a shorting switch connected across the key can be installed in a convenient position for the pilot. The key must be released, or the switch opened, to allow the keying relay to return to RECEIVE before reception can take place. The power output (when fully modulated) is approximately ¼ of that on C.W. This applies to both R/T and M.C.W. and is the result of suppressor modulation, *not* of class C operation.

Frequency range switch

45. The ganged switches S_1, S_{2C} select the appropriate M.O. and P.A. tuning circuits for the different frequency ranges. The same coils and condensers are used for both BLUE ranges, so section N of S_1, short-circuits a portion of L_1 on Range 1 and S_{2C} connects L_{4C} in parallel with the P.A. coil L_4 to reduce the total inductance. On Range 2 the whole of L_1 is used and L_{4C} is switched out of circuit.

46. Resistances R_1, R_2 are connected between H.T.+ and earth on Range 4 (M.F.) by section O of S_1 in order to provide a parallel H.T. load and so limit the anode voltage on V_1, as the efficiency of the M.O. stage is considerably higher on the medium frequencies. In some transmitters a single vitreous resistance is used in place of the two resistors.

47. It will be seen that on Range 4 the anodes of V_2, V_3 are connected by S_{2C} to the anode tapping switch S_6, which enables any one of seventeen points of connection to the P.A. coil L_6 to be selected. On this range also S_{2C} connects across the P.A. feed meter, M_1, the system of variable shunts provided by resistances R_{19} to R_{23}.

Variable meter shunt

48. This transmitter is set up by adjusting the output circuit until the meter M_1 reads to a fixed point on its scale. The actual input represented by this reading is higher than is desirable on the M/F range, and consequently on these frequencies the meter is made to read higher by means of additional shunts, so that when its reading is reduced to the prescribed point on the scale, the input is in fact lower than it appears to be. In this way the value of R.F. voltage on the medium frequencies is kept within limits by the operator as part of his tuning procedure. The R.F. voltage depends upon the inductance in the aerial circuit and the current through it. The object of the shunt is to prevent the voltage developed exceeding 6,000, above which the insulation of fairleads, cables, etc., might begin to break down.

49. The value of shunt is selected by the switch S_8, which is ganged with the M.F. aerial coarse tuning switch S_7 and so arranged that the shunt resistance is increased concurrently with an increase in aerial inductance by switching in resistances R_{20} to R_{23} as S_7 is moved from tap 10 to tap 17. These are added in series with R_{19}, which is across the meter in all positions of S_7. The full scale deflection of the meter for the different values of aerial tap is shown in the following table:—

Aerial tap	*Full scale deflection (mA)*
1– 9	300
10–11	255
12–13	210
14–15	165
16–17	120

50. On the H.F. ranges R_{16} is the meter shunt and the full scale deflection of M_1 is 300 mA. Resistances R_{17} and R_{18} are in series with the meter on the H.F. and M.F. ranges respectively.

51. An aerial ammeter M_2 is in circuit on the YELLOW range. This meter is seen on the front panel in fig. 1. An external aerial ammeter (Stores Ref. 10A/12227) is used on the H.F. ranges in all aircraft installations.

Tuning and aerial matching devices

52. It will be seen in fig. 4 that the BLUE range P.A. tuning condenser, C_{15}, and the RED range P.A. tuning condenser C_{16} have a commutator arrangement which short-circuits part of the coils concerned during 180° rotation of the condenser vanes and permits the whole coil to be tuned during the remaining 180°. This greatly increases the tuning range available and enables resonant conditions to be obtained with widely differing aerial systems.

53. A cam on C_{16} breaks two switch contacts at the moment the commutator switch makes or breaks. These contacts are in series with the keying relay and so when they open have the same effect as if the key was momentarily raised. The cut-off bias developed across R_9 is therefore applied for an instant to the control grids of the valves and arcing of R.F. across the commutator switch contacts is avoided.

54. Two further switch contacts, ganged with S_1, are opened only when S_1 is in the Range 4 position, and short-circuit the YELLOW range coil L_6 except when it is actually in use, thus avoiding absorption effects on other frequency ranges.

55. On the RED range (Range 3) a three-point reversible socket X–N is interpolated between the aerial coil L_5 and earth. Its purpose is to enable highly resistive or reactive aerials to be satisfactorily loaded. The normal position of the socket is with the arrow (on the panel) pointing to N. In the reverse position a condenser of ·0003 μF (that is, $C_{30} + C_{31}$) is connected between the aerial end of the circuit and earth. In fig. 4 the condensers are shown in circuit.

Transmitters T.1154, T.1154A, B, J, N

56. Transmitters of these types provide three frequency ranges as shown in Table 1. The circuit diagram in fig. 5 applies to this series except that no R/T facilities are provided in the T.1154A. On the RED range two anode tapping points are provided for the P.A. valves. For working into normal aircraft aerials connection is made to tap No. 1, but if the aerial is very short it will be necessary to use tap No. 2. This adjustment is made at the time of installation and does not require to be altered. On early transmitters in this series the P.A. filament resistances R_{30}, R_{31} (see para. 38 (ii)) were switched in and out of circuit by cam-operated contacts on S_5. Later versions adopted the alternative arrangement shown inset in fig. 5. The frequency range switch S_2, ganged with S_1, consists of four sections worked by a common operating bar.

57. On the frequencies covered by Range 2 in this series trouble is not experienced with arcing at the commutator switch of C_{16} and the cam-operated contacts described in para. 53 are therefore omitted.

Transmitters T.1154D T.1154E

58. The transmitters T.1154D (R/T, C.W., and M.C.W.) and T.1154E (C.W. and M.C.W. only) differ from the T.1154 and T.1154A only in respect of the modified frequency coverage on Ranges 1 and 2 and in their application. They are used in multiple-channel transmitter mobile ground stations and are supplied with power from single-phase, 50 c/s mains through a rectifier type 26. As the transmitters are not interlocked with a receiver as in airborne installations, arrangements are made whereby the relay A/12 is held permanently to SEND.

59. The output from these transmitters is worked into either local or remote aerial systems. The remote system consists of a quarter-wave inclined aerial. The local system is, normally, a triatic supported array the arrangement of which provides for anchoring eight possible aerials. The circuit of the T.1154D is given in fig. 5. The circuit of the T.1154E is similar except that R/T is not provided.

Transmitter T.1154L

60. The transmitter T.1154L is designed for service in high-speed launches and covers the frequency ranges shown in Table 1. A circuit diagram is given in fig. 6. On Range 2A the P.A. tuning coil is the variometer L_4, with ten tappings for coarse aerial tuning selected by switch S_3, and nine anode tapping points selected by S_9. Otherwise the circuit is similar to the other transmitters having three frequency ranges.

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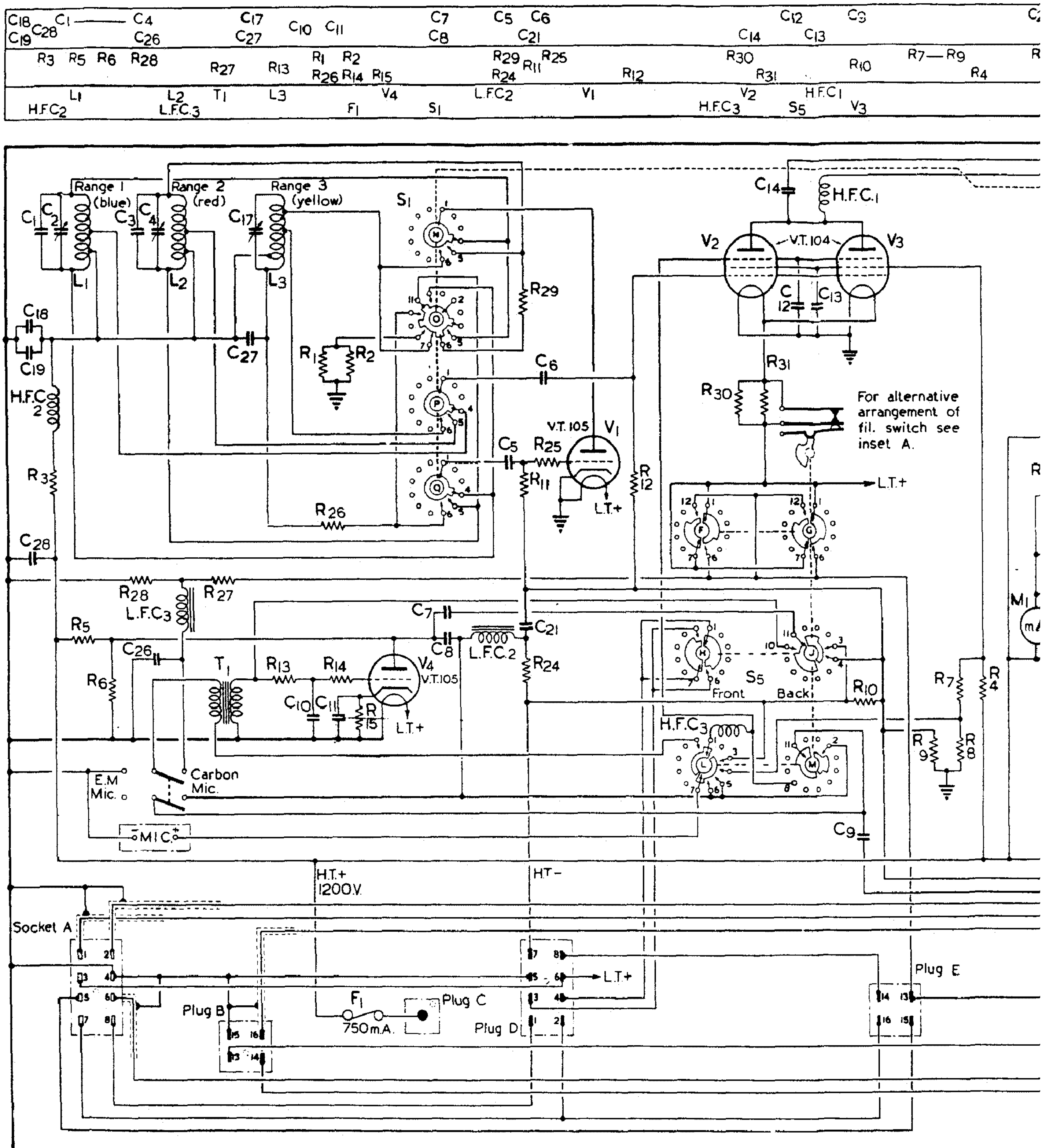
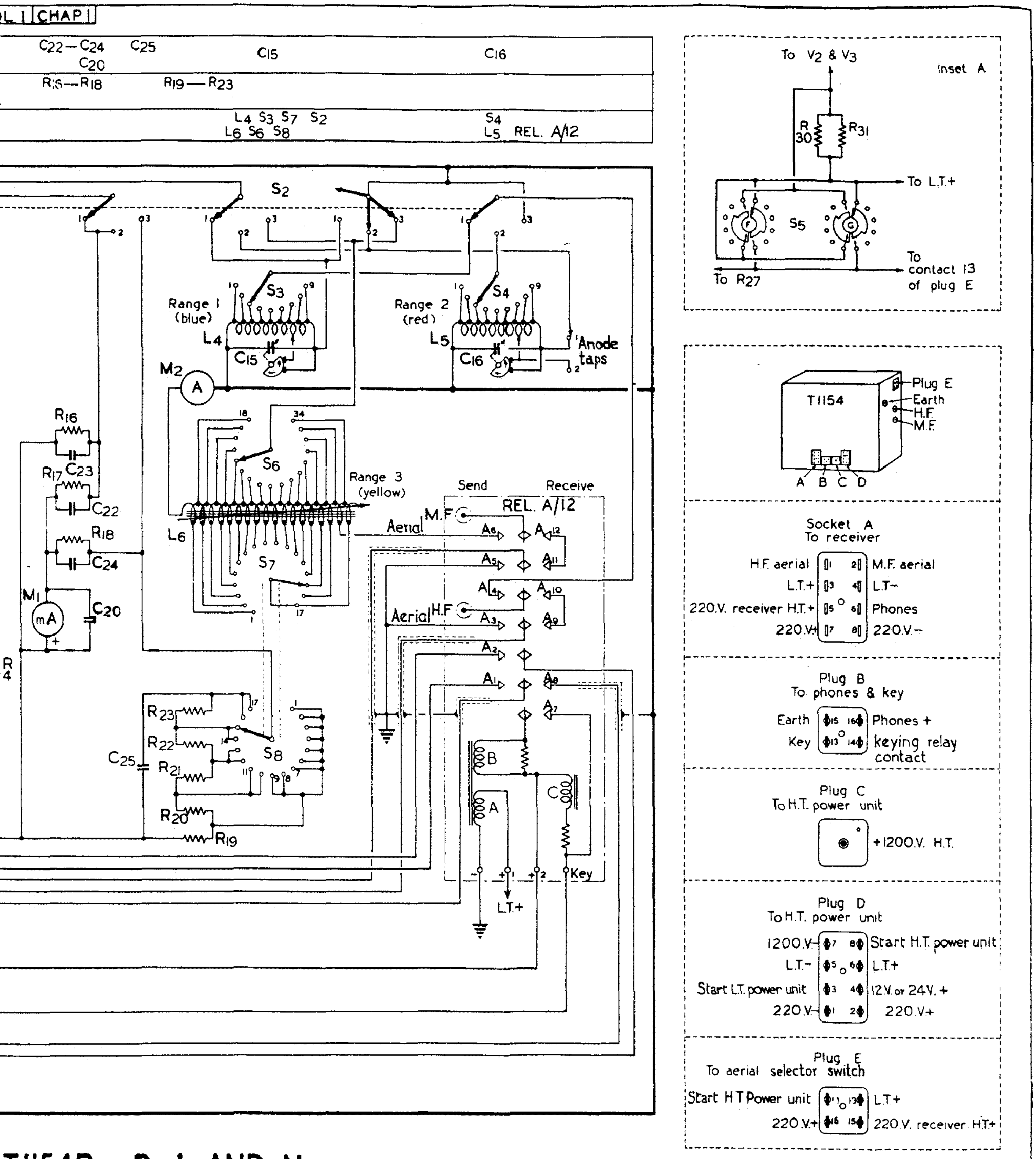


Note. S1 and S5 shown in extreme anti-clockwise position.
Socket & plugs as viewed from front of transmitter.

FIG. 5

CIRCUIT OF T1154, T115



T1154B, D, J, AND N

FIG. 5

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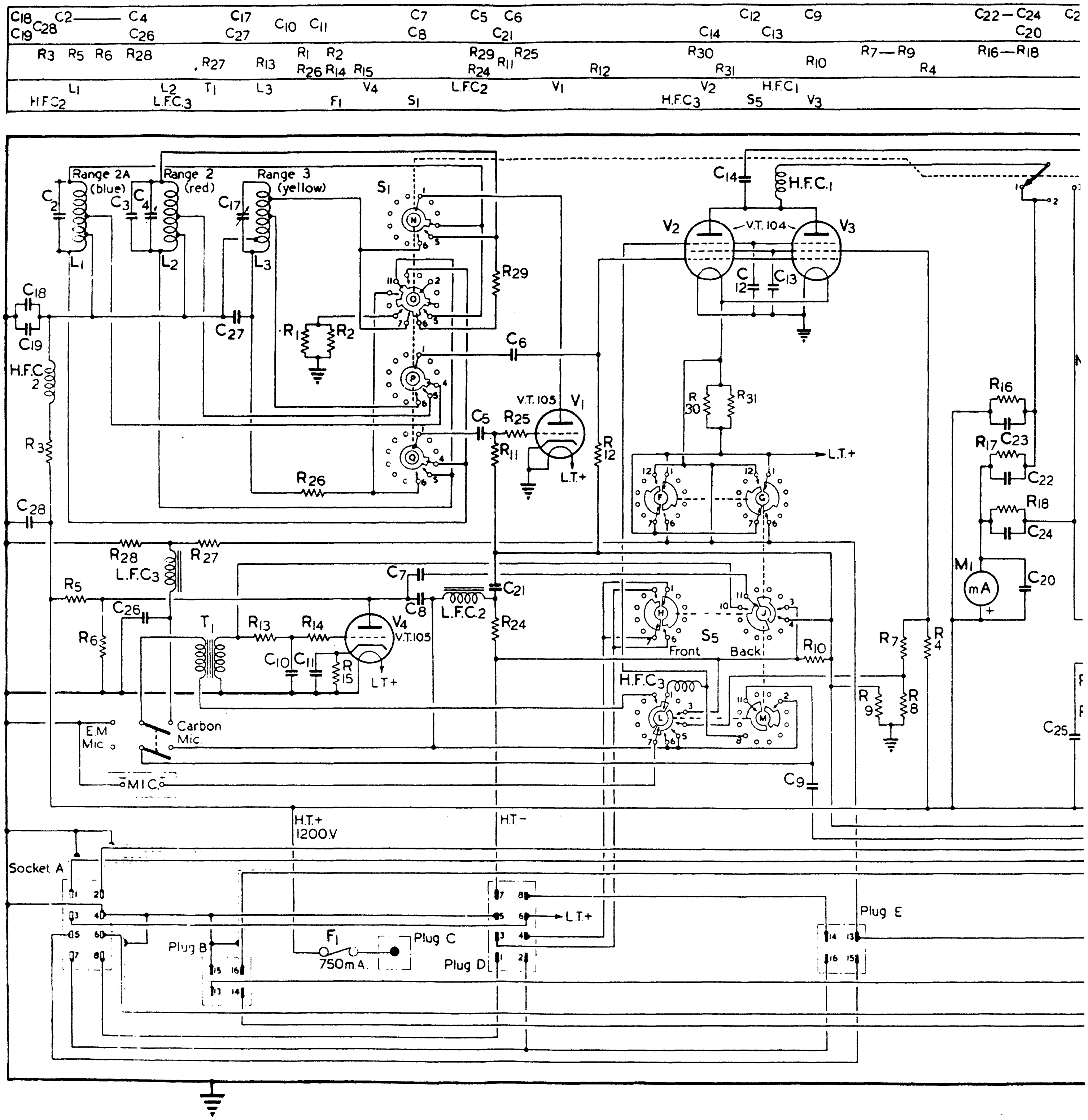
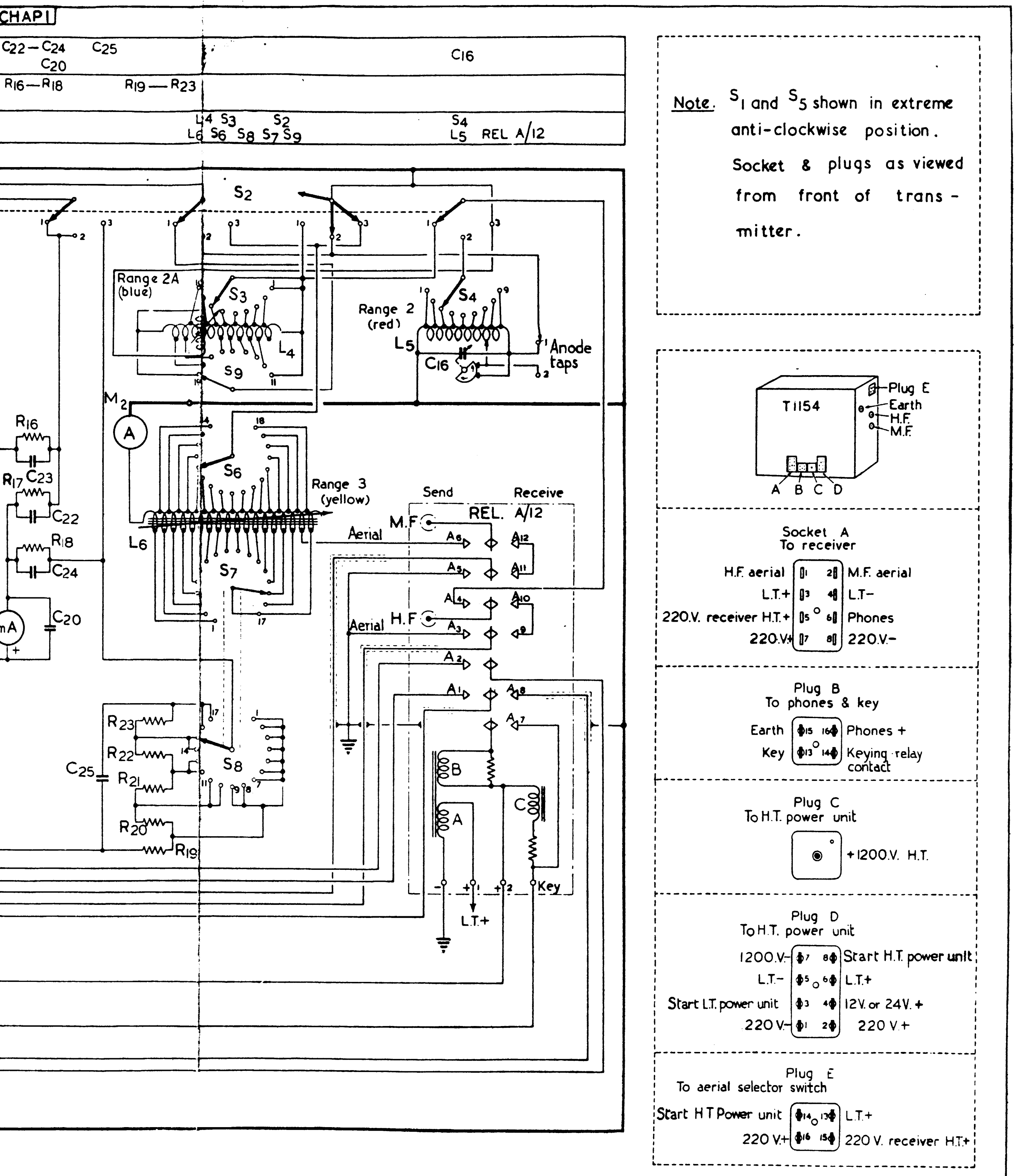


FIG. 6 CIRCUIT OF T1154L



CHAP I
C22—C24 C25
C20
C16
R16—R18 R19—R23
L4 S3 S2
L6 S6 S8 S7 S9
S4
L5 REL A/12
Note. S1 and S5 shown in extreme anti-clockwise position.
Socket & plugs as viewed from front of trans-mitter.
S2
Range 2A (blue)
S3
L4
S9
Range 2 (red)
S4
L5
C16
Anode taps
M2
A
R16
R17 C23
C22
R18
C24
C20
mA
L6
S6
S7
Range 3 (yellow)
Send
Receive
M.F.
REL. A/12
Aerial
H.F.
Aerial
R23
R22
C25
R21
S8
R20
R19
B
A
C
Key
L.T.+
T1154
Plug E
Earth
H.F.
M.F.
A B C D
Socket A
To receiver
H.F. aerial
M.F. aerial
L.T.+
L.T.-
220.V. receiver H.T.+
Phones
220.V+
220.V.-
Plug B
To phones & key
Earth
Phones +
Key
Keying relay contact
Plug C
To H.T. power unit
+1200.V. H.T.
Plug D
To H.T. power unit
1200.V.-
Start H.T. power unit
L.T.-
L.T.+
Start L.T. power unit
12V. or 24V. +
220 V.-
220 V.+
Plug E
To aerial selector switch
Start H T Power unit
L.T.+
220 V.+
220 V. receiver H.T.+

FIG. 6

Aerial selector switch, type J

61. The plugs marked H.F. and M.F. on the side of transmitter are connected by sockets and flexible leads to plugs similarly labelled on the aerial selector switch type J. The leads from the aerials themselves terminate in sockets which engage with the plugs on the switch marked FIXED AE. and TRAILING AE. It will be seen from fig. 8 that the switch has two sets of contacts, and five positions, marked NORMAL, H.F. ON TRAILING, M.F. ON FIXED, D/F, and EARTH. When the switch is at M.F. ON FIXED an external condenser, type 764 (80 $\mu\mu$F) is connected by the main contacts in parallel with the aerial tuning circuit to compensate for the smaller capacity of the fixed as compared with the trailing aerial. In the D/F position the switch connects an internal 25 $\mu\mu$F condenser in series with the fixed aerial, which is used for reception in these circumstances, and the pick-up of the long fixed aerial is brought approximately into line with that of the loop so that the two signals are about equal, thus getting the best heart-shape diagram for D/F.

62. Leads from pins 13 and 14 on transmitter plug E are taken via sockets to the switch. These carry the 6·3 volt supply for energising the H.T. power unit starting relay and it will be seen that this circuit is broken by the auxiliary contacts in the D/F and EARTH positions of the switch. With the switch at EARTH, both aerials are directly earthed at the switch and the connections to the transmitter and receiver are broken.

63. The 220-volt receiver H.T. supply also passes through the switch between contacts 15 and 16 of transmitter plug E. It is arranged that the receiver H.T. is interrupted if the receiver master switch is turned to one of the D/F positions while the type J switch is in any position other than D/F, as in all positions except D/F and EARTH the transmitter can be operated, and the visual indicator might be burned out by induction, or its needles damaged.

64. All the plug and socket connections to the switch are shown in the installation diagram, fig. 21, Chap. 2.

The aerial selector plug board

65. On a limited number of early installations, an aerial selector plug board is fitted instead of the aerial switching unit, type J. The connections of the plug board are shown in fig. 7. Changing over the sockets on the centre pair of plugs makes it possible to obtain M/F transmission on fixed aerial or H/F transmission on trailing aerial should either aerial become defective.

66. When the aerial plug board is used the socket, type 175 (Stores Ref. 10H/425), which engages with plug E on the transmitter, must have its pins 13 and 14 and pins 15 and 16 short-circuited in order to complete the input circuit to the H.T. power unit.

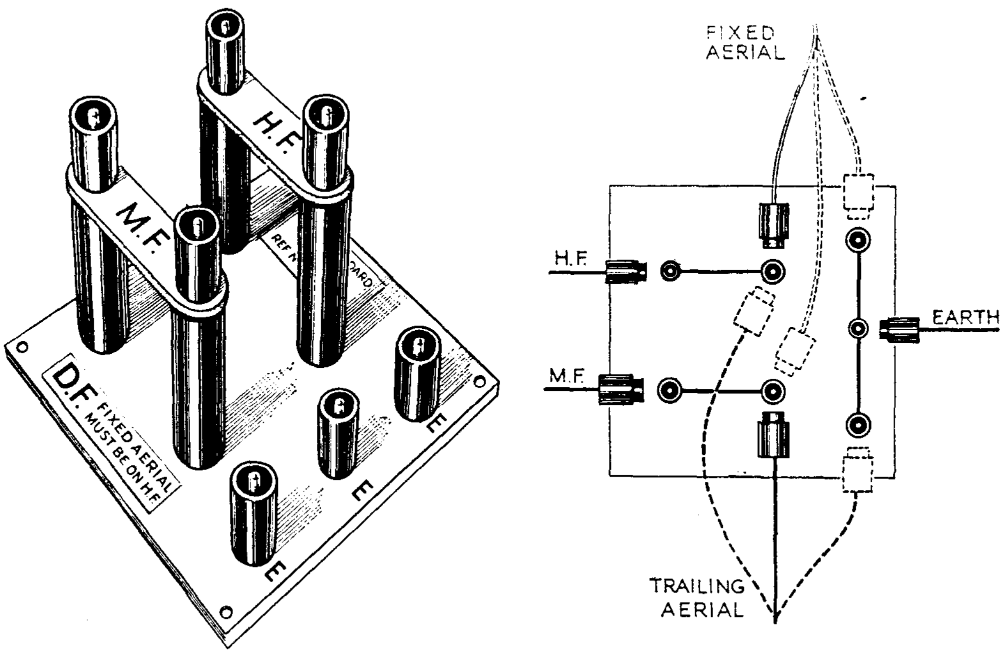


FIG. 7.—AERIAL PLUG BOARD

Power supply circuits

67. Although the power units are dealt with later in the chapter, two simplified diagrams. fig. 9 and 10, are included here to assist in tracing the switching circuits. The input from the aircraft,

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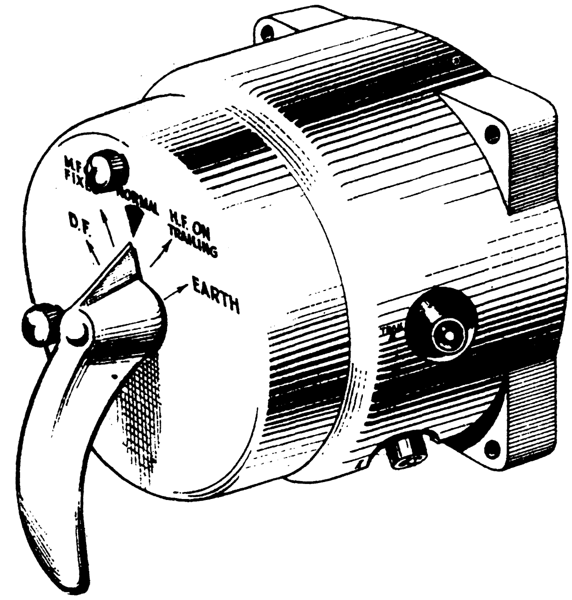
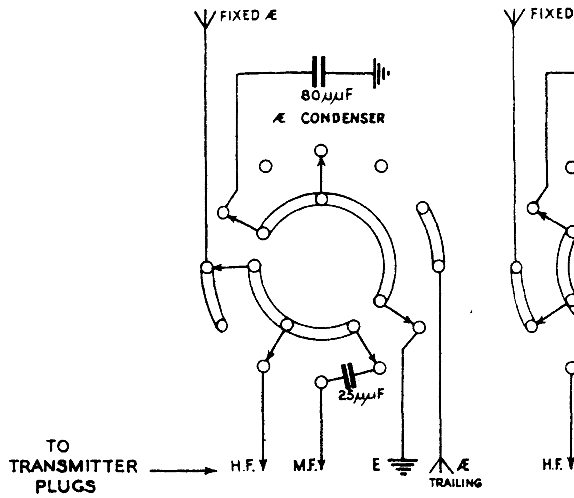
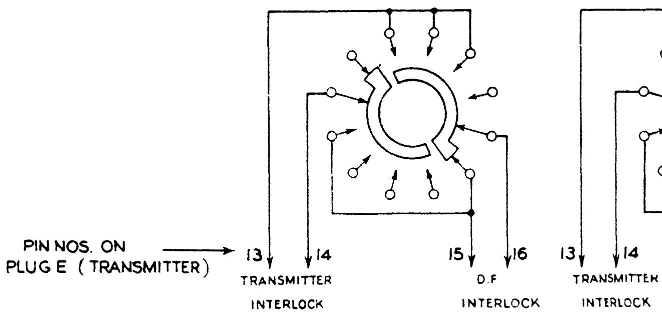




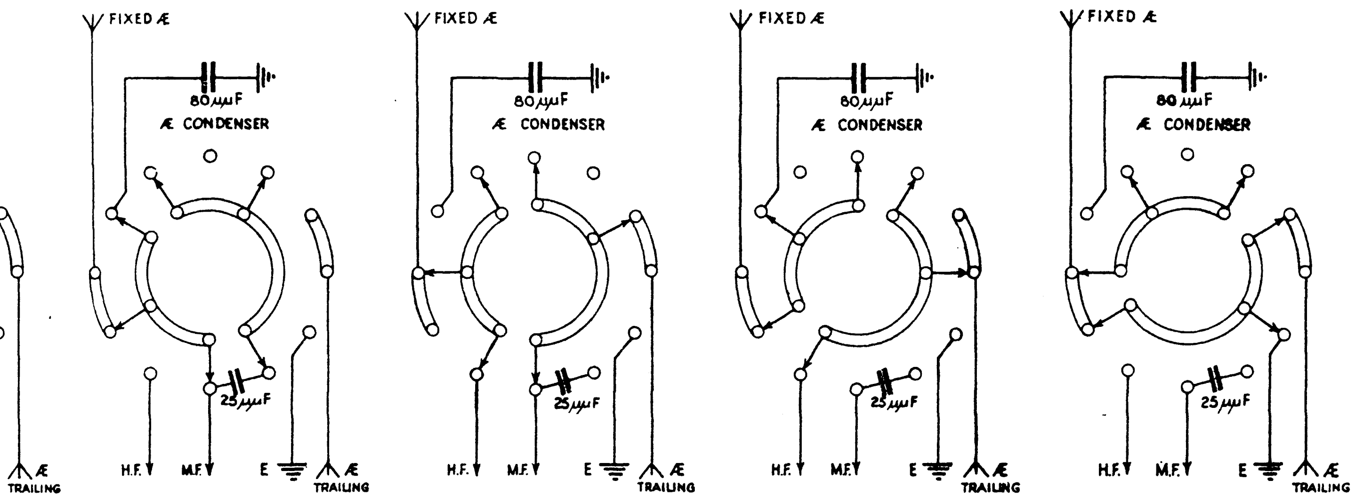


AERIAL SWITCHING UNIT, Type J
THEORETICAL CONNEXIONS

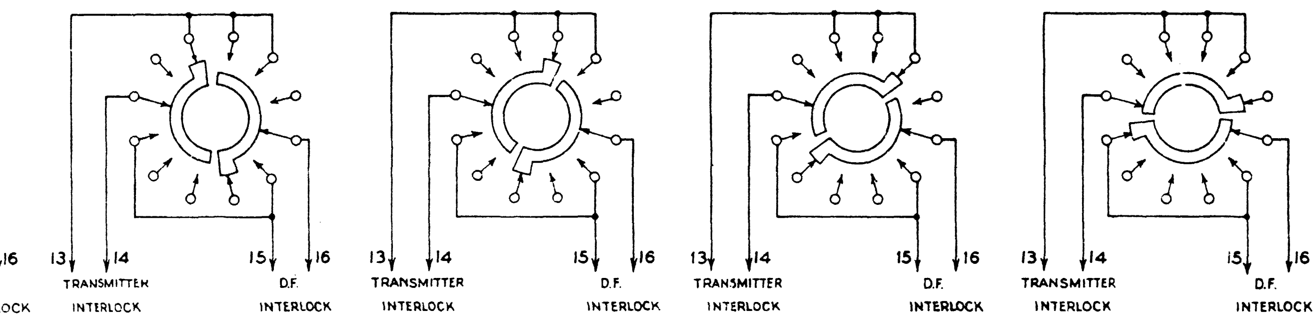
P

D.F. POSITION 1	M.F. POS
MAIN SWITCH	MAI
FIXED Æ TO H.F. & M.F.	FIXE Æ LOAI
AUXILIARY SWITCH	AUXIL
TRANSMITTER INTERLOCK OPEN CIRCUIT	TRANSM CLOSED
D.F. INTERLOCK CLOSED CIRCUIT	D.F. IN CIRCU

FIG. 8



POSITION OF MAIN SWITCH



POSITION OF AUXILIARY SWITCH GANGED TO MAIN SWITCH

M.F. ON FIXED
POSITION 2

MAIN SWITCH

FIXED Æ TO M.F. & Æ LOADING CONDENSER

AUXILIARY SWITCH

TRANSMITTER INTERLOCK CLOSED CIRCUIT

D.F. INTERLOCK OPEN CIRCUIT

NORMAL
POSITION 3

MAIN SWITCH

FIXED Æ TO H.F.
TRAILING Æ TO M.F.

AUXILIARY SWITCH

TRANSMITTER INTERLOCK CLOSED CIRCUIT

D.F. INTERLOCK OPEN CIRCUIT

H.F. ON TRAILING
POSITION 4

MAIN SWITCH

TRAILING Æ TO H.F.

AUXILIARY SWITCH

TRANSMITTER INTERLOCK CLOSED CIRCUIT

D.F. INTERLOCK OPEN CIRCUIT

EARTH
POSITION 5

MAIN SWITCH

FIXED & TRAILING Æ'S TO EARTH

AUXILIARY SWITCH

TRANSMITTER INTERLOCK OPEN CIRCUIT

D.F. INTERLOCK CLOSED CIRCUIT

FIG. 8

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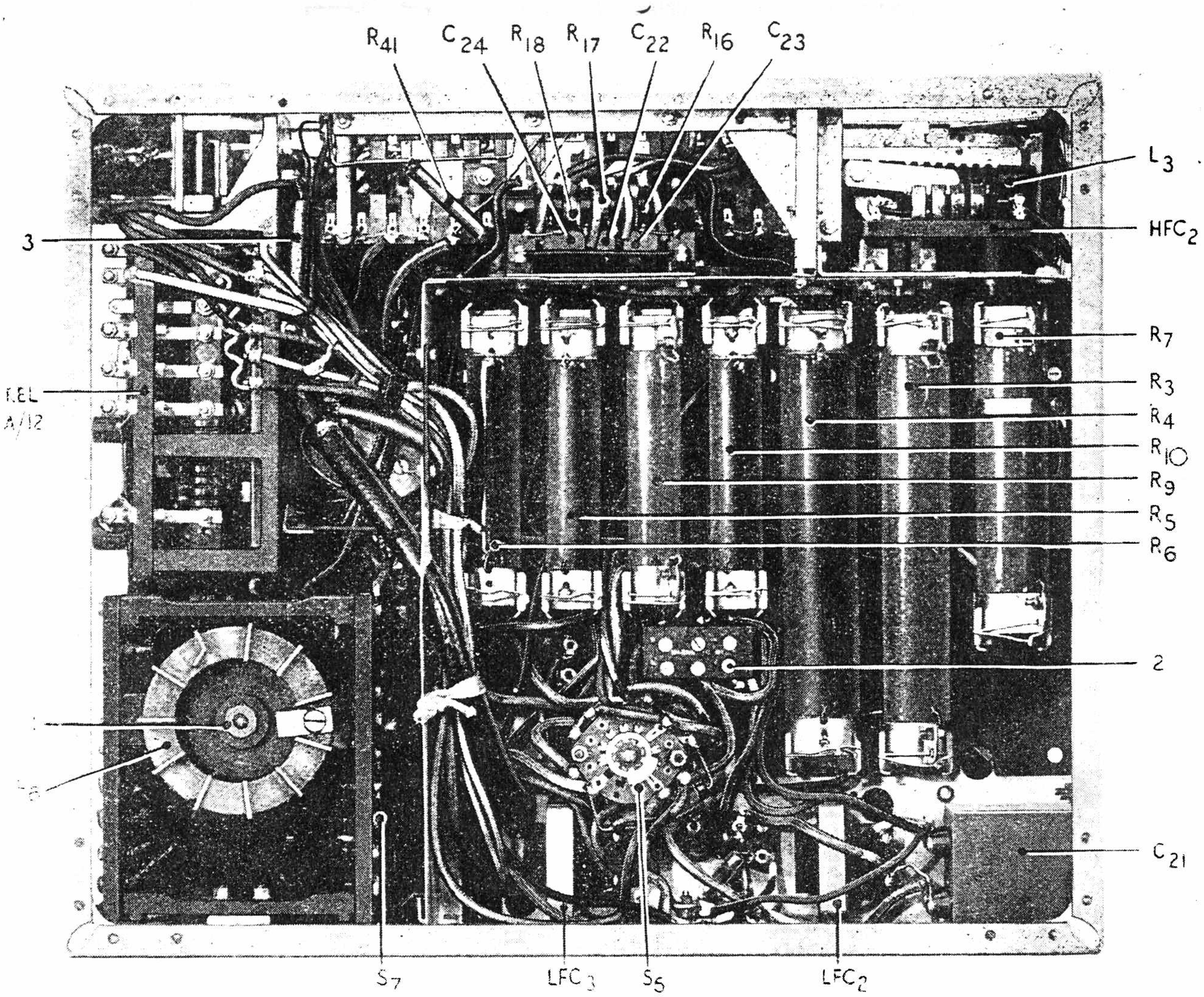
68. A view of a transmitter T.1154M is given in fig. 1. The cover over the valve compartment has been removed, showing the sidetone and modulator valve, V_4, on the left, and one of the P.A. valves, V_3, on the right. In transmitters T.1154, T.1154A, B, D, E, J, and N, the terminals for the alternative anode taps (see para. 56) are located at the top right-hand side of the valve compartment. The master oscillator valve, V_1, is behind V_4. This transmitter has the Uni-click mechanism for setting up to pre-set frequencies. One of the knobs for selecting the desired click-stop is indicated at (1). If a knob is turned to the FREE position none of the click-stops on the control concerned is operative.



1. Sliding core for fine tuning of L_6
2. Reversible plate for operation with carbon or E.M. microphones
3. Keying relay resistance

FIG. 11.—REAR VIEW OF T.1154M

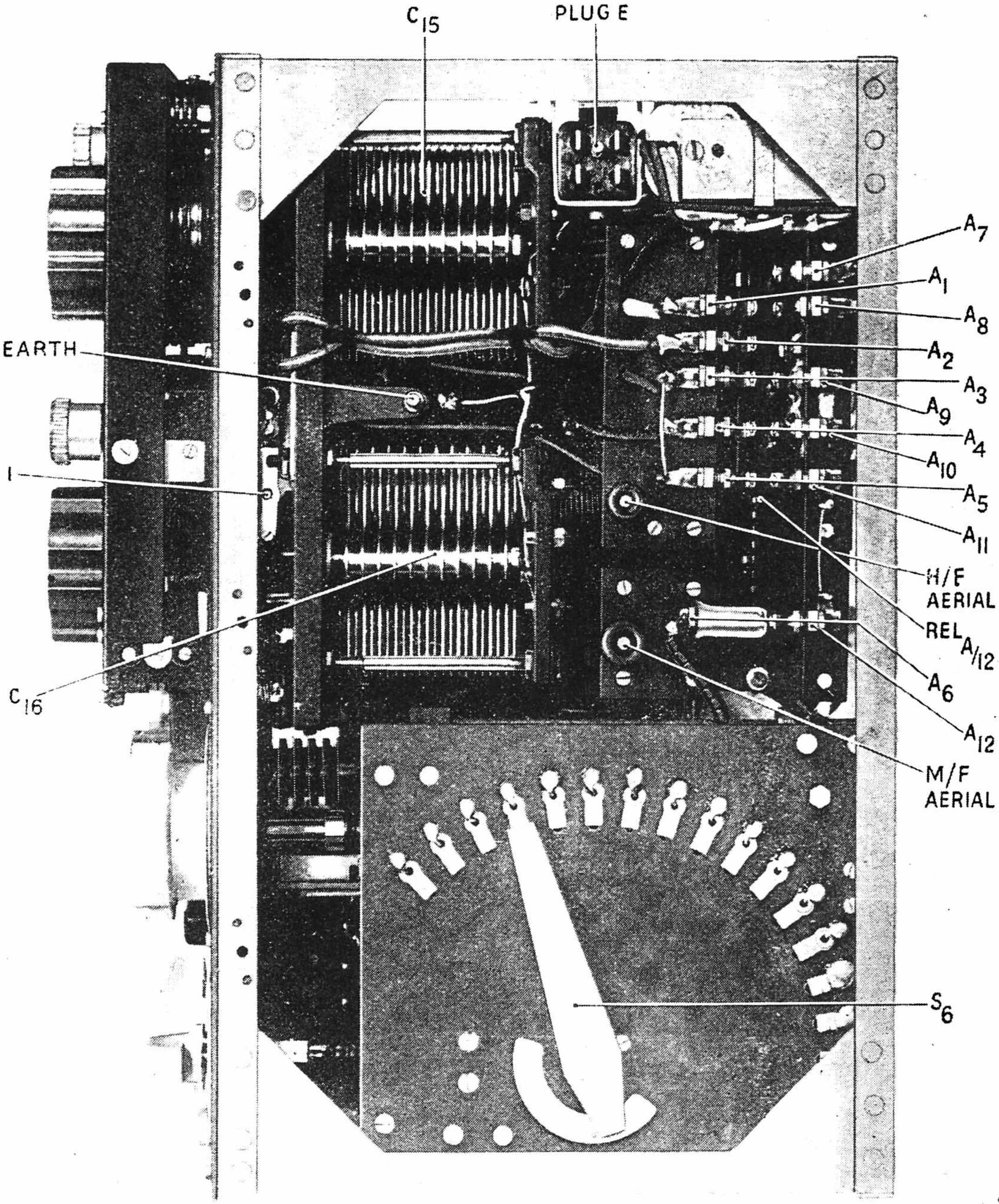
69. On the H.F. ranges a pre-set frequency can be varied by plus or minus 0·1 per cent. by means of the vernier controls for the M.O. condensers seen at (2) and (3).

70. Seven click-stops are provided on each M.O. range, lettered as follows. Ranges 1 and 2-A to G; Range 3, J to Q; Range 4, S to Y. Only on Ranges 1, 2, and 3, are the P.A. dials click, stopped, the lettering being the same as on the M.O. dials.

71. The various controls in the illustration are given the same references as are used in the circuit diagram, fig. 4, and their functions have already been dealt with in the general circuit description. Socket A and plugs B, C, and D at the front of the transmitter are indicated by their reference letters. The Jones plugs and sockets which engage therewith are kept in position by the retaining bar (4).

72. The sockets for the input from a carbon microphone or from an intercommunication amplifier are shown at (5). At (6) is seen the reversible plug which provides for the connection of condensers C_{30} and C_{31} between L_5 and earth as described in para. 55. When the plug is inserted as shown, with the letter N against the arrow marked on the panel, the condensers are out of circuit.

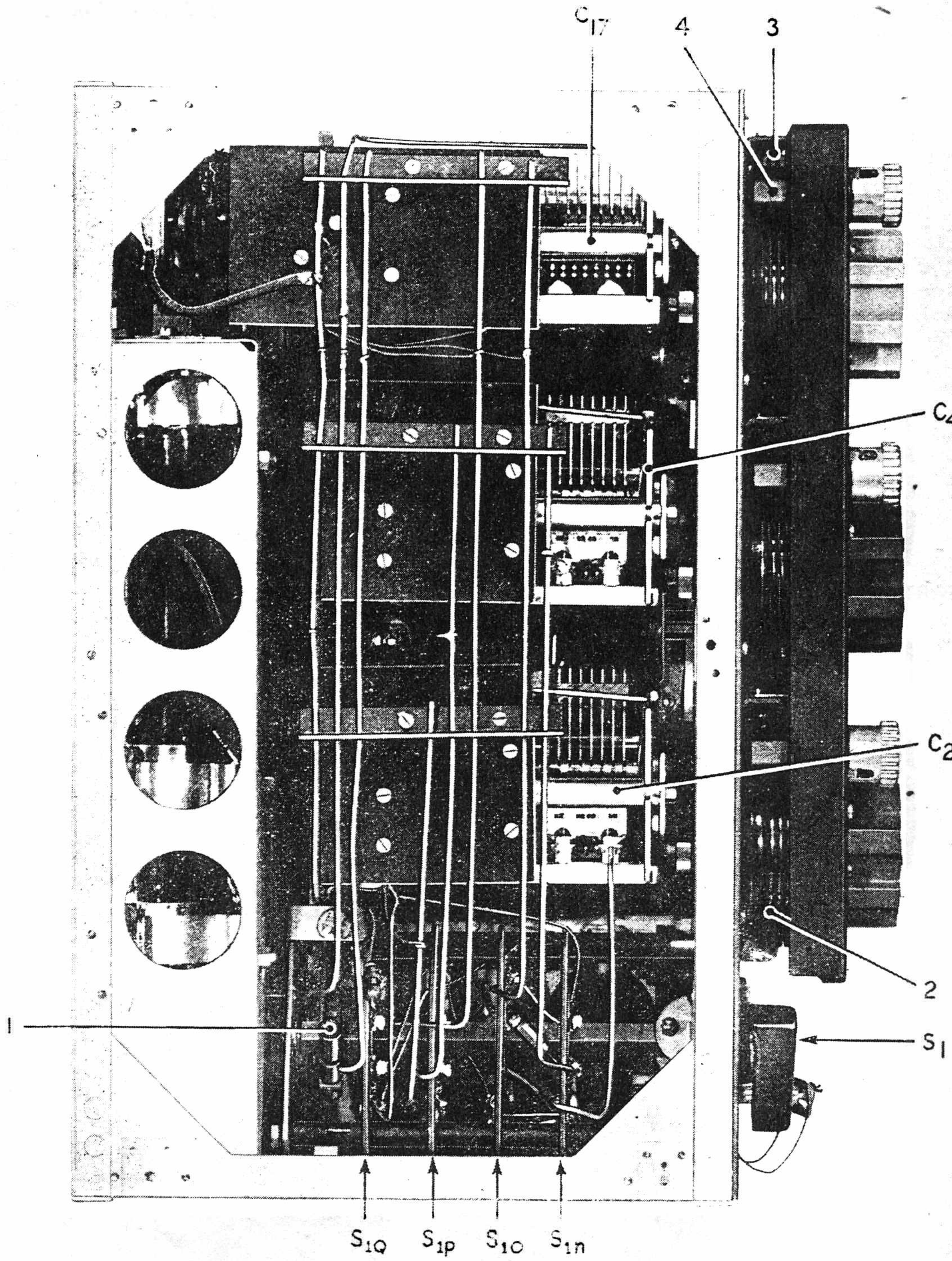
73. The fuse F_1 is of the glass tubular type and is rated at 750mA. Four spare fuses are carried in clips behind the cover of the valve compartment.



1. Contacts of cam-operated switch on C_{16}

FIG. 12.—T.1154M, KEYING RELAY AND OUTPUT END

74. Cylindrical screens (7) are fitted over the bases of both P.A. valves. The anode connectors to the P.A. valves are mounted on vertical spring-loaded rods (8). These rods pivot so that the connections can be swung clear of the top caps when the valves have to be removed. One of the connectors can be seen in place on the top cap of V_2 at (2) in the top view of the transmitter, fig. 14. The meter M_2 is the aerial ammeter and is in circuit on Range 4 (M F) only.



1. Operating link of frequency range switch
2. Click-rings of click-stop mechanism
3. Ends of click-stop selector levers
4. Click-stop selector cam

FIG. 13.—T.1154M, M.O. AND FREQUENCY SWITCH END

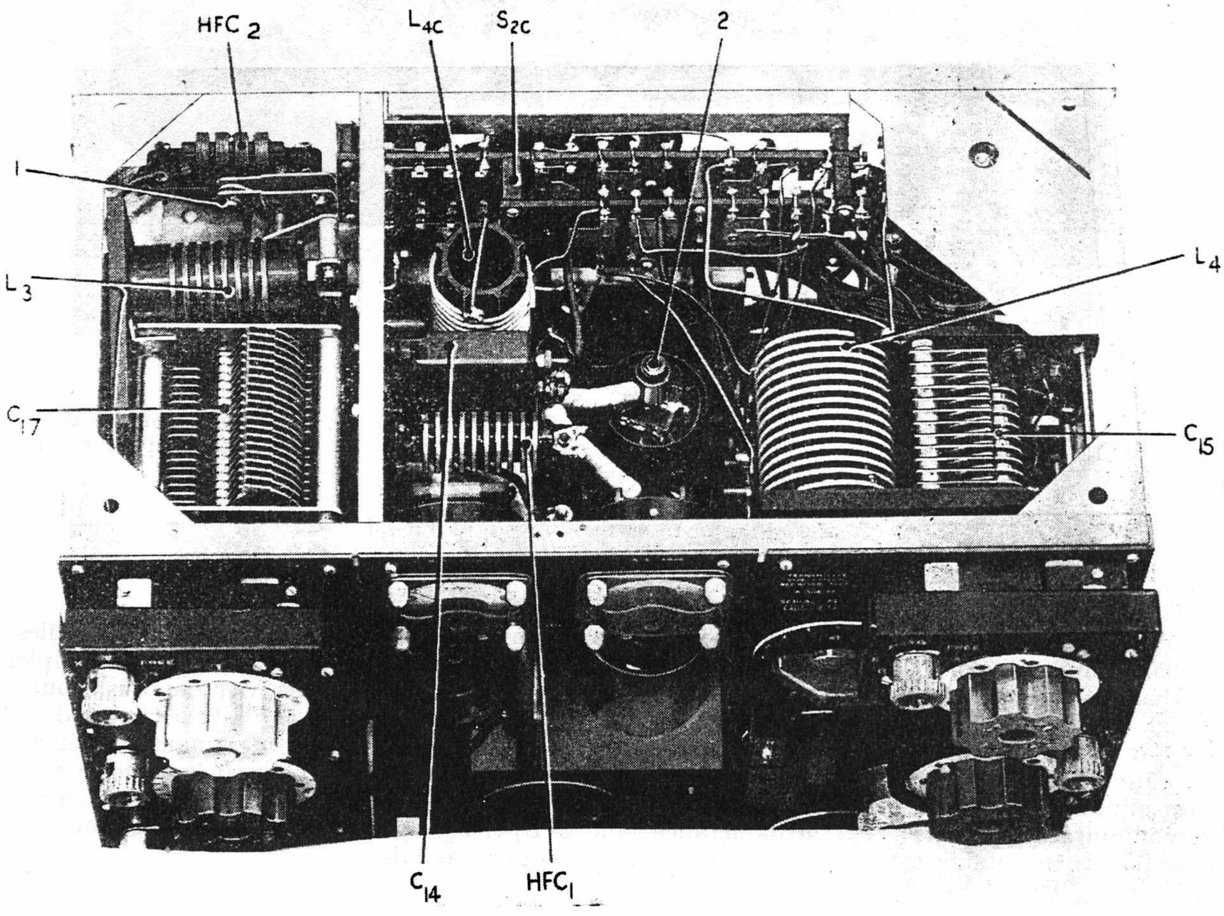
75. A rear view of the transmitter, removed from its case, is given in fig. 11. Some of the contacts of the frequency range switch, S_{2C}, can be seen at the top centre of the illustration behind the meter resistances R_{16}, R_{17}, R_{18} (see para. 50). The moving contacts of this switch are mounted on a bar that slides horizontally. The view of the relay A 12 shows the RECEIVE contacts. One of the two 1·5 ohm vitreous resistances associated with this relay is indicated by (3). Under the relay assembly is the Range 4 tuning coil, L_6, the sliding iron-dust core of which is seen at (1). Some of the contacts of the Range 4 aerial tapping switch S_7, can be seen on the right of the casing enclosing the coil.

76. The reversible plate for adapting the transmitter to be used with carbon or electro-magnetic microphones is shown at (2). It is reversed by removing the six fixing screws, and replacing it so that the engraving for the required microphone type is showing.

77. Another view of the relay A/12, showing all moving and fixed contacts, is given in the end view of the transmitter, fig. 12. The contacts are labelled in conformity with fig. 3. The aerial and earth plugs and plug E for the interlock connection to the aerial selector switch type J are also shown. The cam-operated contacts on C_{16} (see para. 53) can be seen at (1).

78. The other end view of the transmitter, fig. 13, shows the four wafers of the frequency range switch S_1. The operating link (1) of S_1, works the sliding switch S_{2C} at the top of the chassis through a system of cranks and rods. In this illustration some of the click rings of the click-stop mechanism are shown at (2). The ends of one set of the click-stop levers that engage with the rings to hold the dials in the selected positions are indicated by (3). A selector cam (see para. 91) is shown at (4). The vertical parallel wires in this illustration are connections between S_1 and the associated condensers and inductances for the four frequency ranges.

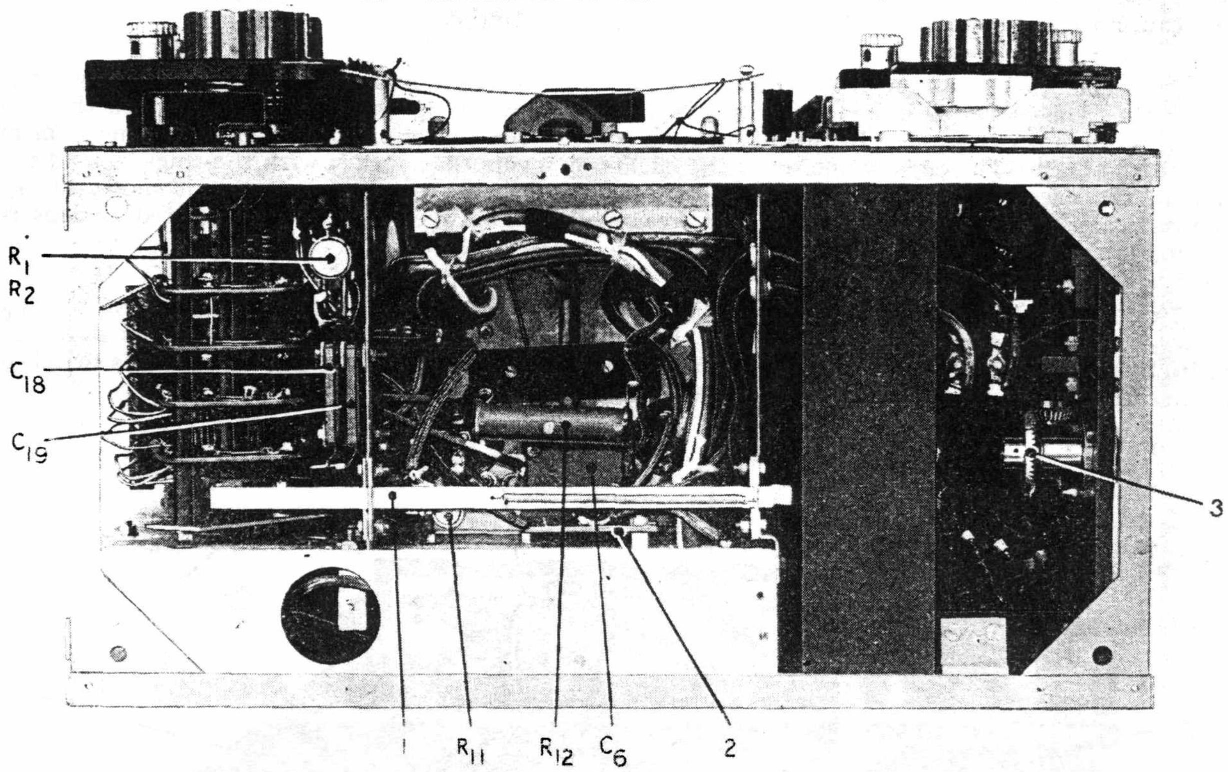
79. A view of the transmitter from the top is given in fig. 14. The whole of the switch S_{2C} is visible, together with one of the cranks (1) which operate it. An anode connector is shown in position on the top cap of the P.A. valve V_2 at (2). The view also shows the coil L_{4C} which is switched in parallel with L_1 to reduce the total P.A. tuning inductance on Range 1.



1. Operating crank for S_{2C} 2. Pivoted connector to P.A. valve anode cap

FIG. 14.—TOP VIEW OF T.1154M

80. In the underside view of the transmitter, fig. 15, the spring-loaded bar (1) carries the contact which short-circuits the Range 4 P.A. coil L_6 on the H.F. ranges. It is operated by a cam on S_1, which in this view is in the M.F. position, the contacts being broken. The P.A. valve filament resistances R_{30}, R_{31}, which may be either vitreous or wire wound, are carried on the panel (2). The contacts of the anode and aerial tapping switches S_6, S_7, are rotated by gearing, part of which is seen at (3).



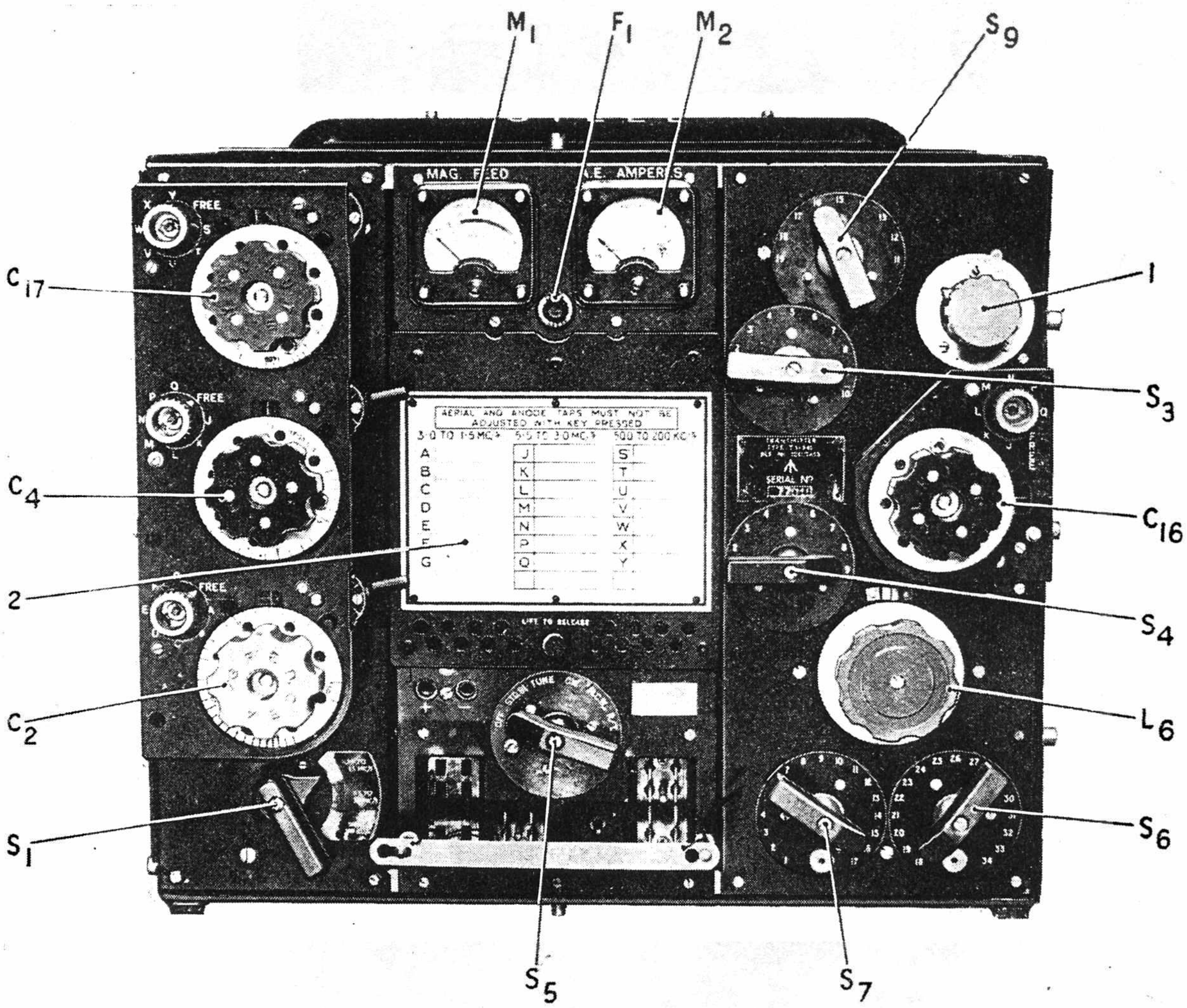
1. Short-circuiting bar for L_6
2. Mounting for P.A. valve filament resistances
3. Bevel drive of M.F range anode tapping switch

FIG. 15.—UNDERSIDE VIEW OF T.1154M

81. A semi-circular commutator switch having two switch brushes is fitted to the spindles of the condensers C_{15} and C_{16}. This commutator switch is so arranged that the condenser completes one-half revolution with the brush contacts open and the other half revolution with the brush contacts closed. When the brush contacts are closed, part of the inductance L_4 or L_5 is short-circuited. The angular setting of the commutator permits the condenser to sweep from maximum to minimum capacitance with the commutator brush contacts open. In the same manner the condenser sweeps from minimum to maximum capacitance with the contacts closed. As the opening and closing of the commutator contacts alters the inductance value of L_4 or L_5, a greater range of tuning is achieved. This affords the tuning margin for coupling to a diversity of aerials.

82. The drive (M.O.) and output (P.A.) units of the transmitter are removable as individual assemblies. The drive unit includes the three M.O. tuning condensers and their click-stop mechanisms, the associated inductances, and the frequency range switch, S_1. The output unit consists of a magnifier unit (P.A. tuning condensers and coils with click-stop mechanism and aerial tap switches, H.F. ranges), and a tuning unit (M.F. range iron-dust core coil, with aerial and anode tap switches). A list of the type and reference numbers of the units is given in the following table:—

Transmitter	*Drive unit Type*	*Stores Ref. 10D/*	*Output unit Type*	*Stores Ref. 10D/*
T.1154	2	117	2	108
T.1154A, B	7	521	8	12140
T.1154C	6	495	7	498
T.1154D	13	732	10	738
T.1154E	14	733	11	739
T.1154F	20	1910	23	1553
T.1154H	30	1973	34	1965
T.1154J	31	1974	35	1966
T.1154K	32	1975	36	1967
T.1154L	33	1976	37	1968
T.1154M	34	1977	38	1969
T.1154N	35	1978	39	1970



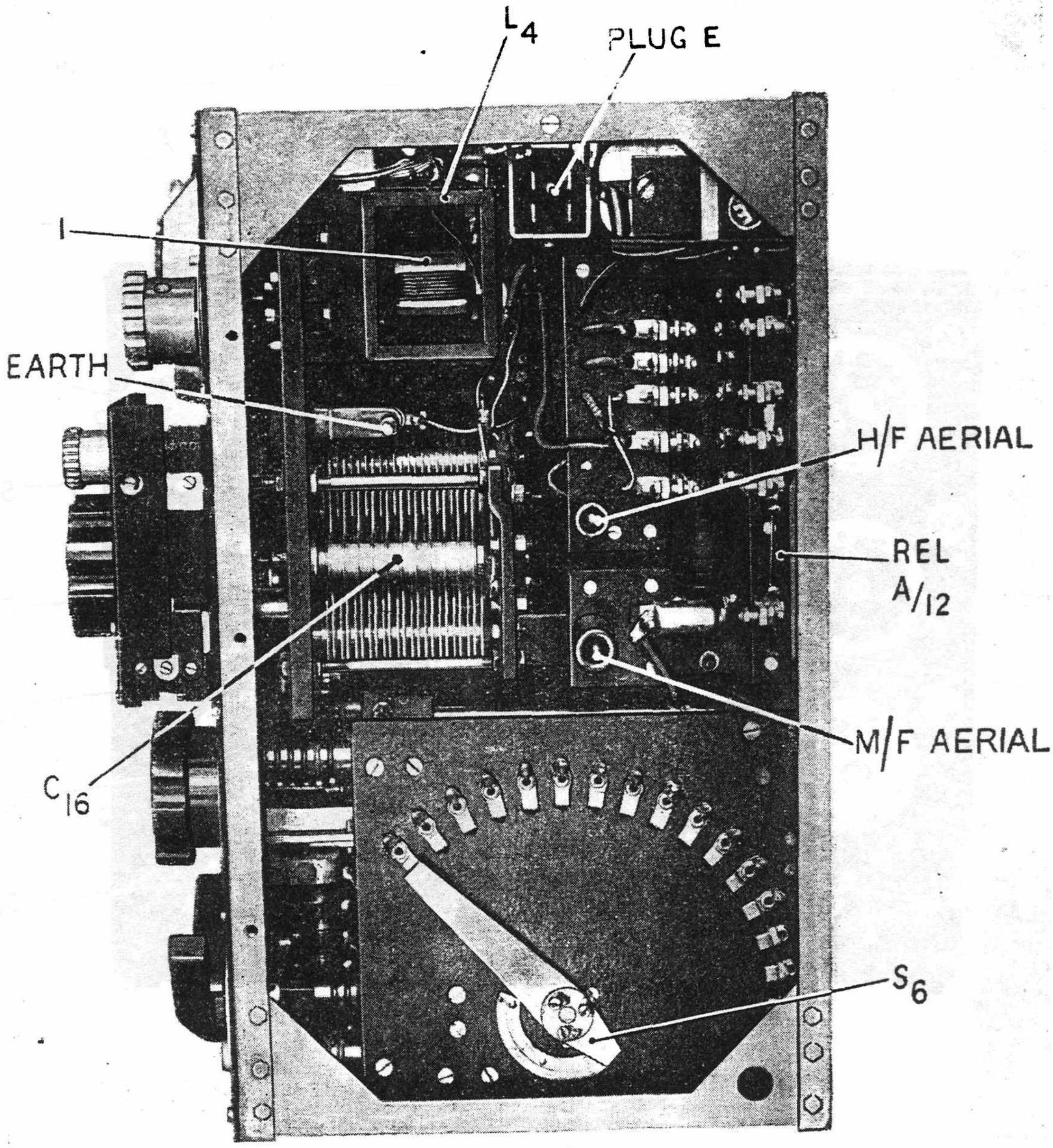
1. Variometer control, Range 2A
2. Cover of valve compartment, with calibration table

FIG. 16.—T.1154L, FRONT VIEW

83. Three views of a transmitter T.1154L are given in fig. 16 to 18. Fig. 16 shows the altered panel layout compared with the other transmitters in the series. The rotating coil of the variometer L_4 for Range 2A is controlled by the knob (1). Switches S_3 and S_9 are respectively the aerial and anode tap controls for this range. The cover plate (2) of the valve compartment carries the table for entering click-stopped frequencies and switch settings. This is similar on all transmitters, except that on those with the multi-click mechanism eight frequencies can be click-stopped on each range instead of seven. In the end view, fig. 17, the rotor (1) of the variometer L_4 is visible. Another view of the variometer is given in fig. 18. This transmitter has a ganged four-section toggle-operated frequency range switch similar to that fitted to transmitters T.1154, T.1154A, B, D, E, J, and N. The operating bar is shown at (1) in fig. 18.

Multi-click mechanism

84. Fig. 19 shows the multi-click type of click-stop mechanism fitted to the earlier types of transmitter (see Table 2). It is applied to the drive of the three M.O. tuning condensers and to the P.A. condensers for the H.F. ranges. The mechanism consists of eight split rings (click-rings) mounted behind the condenser knob, and able either to rotate with the knob or to remain free on the spindle. Eight notched, spring-loaded levers normally bear on top of the rings, and a lettered tab on each ring engages with the notch in its appropriate lever as the condenser is rotated, holding the spindle rigid until the knob is turned further. On the face of the condenser knob are eight screws, lettered to correspond with the rings. When a screw is tightened it causes its own ring to rotate with the condenser, and when slackened the knob can be rotated without the ring turning.

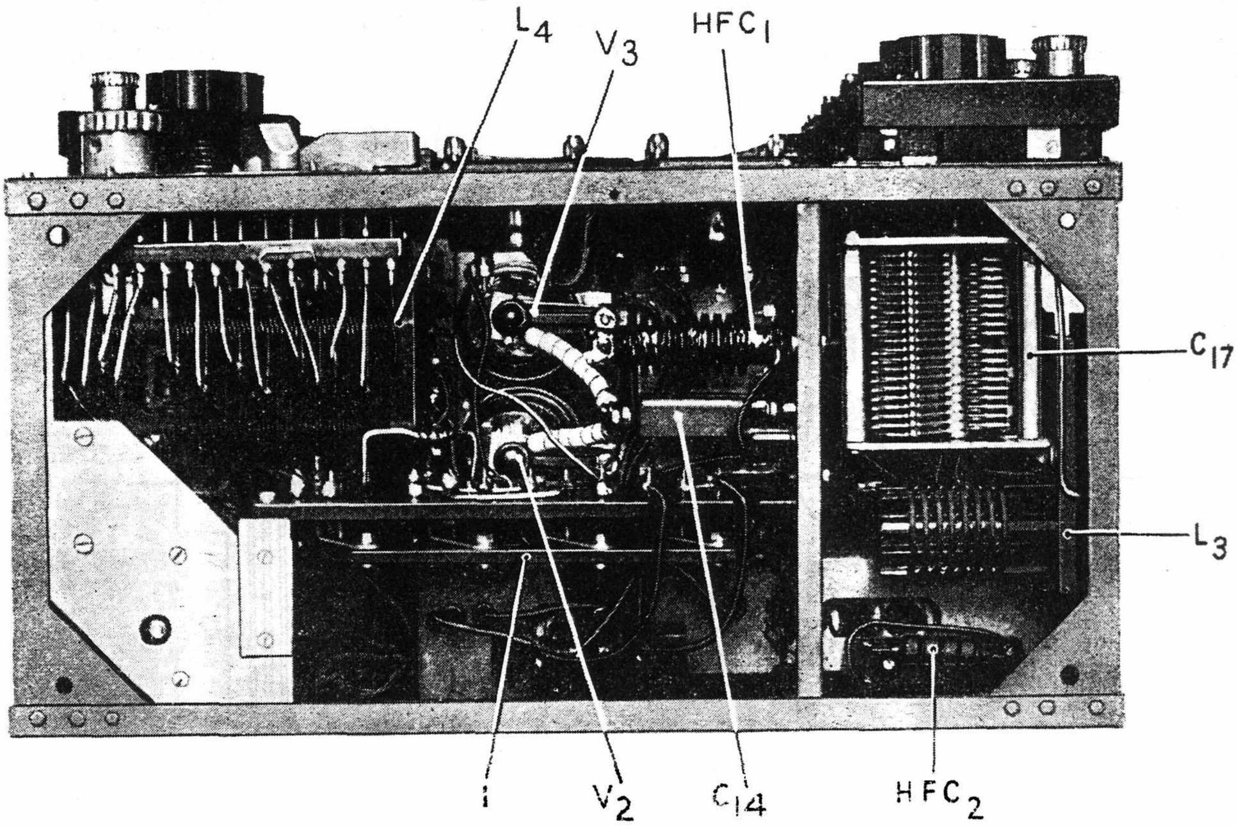


1. Rotor of P.A. tuning variometer, Range 2A

FIG. 17.—T.1154L, END VIEW SHOWING RANGE 2A VARIOMETER

85. A BLUE range condenser knob is shown in the figure. On this range the rings and their holding screws are lettered A to H as shown. On the RED range the lettering is J to R and on the YELLOW range S to Z.

86. To use the mechanism, a letter is chosen for the frequency it is desired to set up, and the condenser is rotated until the tab bearing the letter is felt to engage with the notch in its lever. The appropriate screw on the face of the condenser knob is then slackened, after which the condenser can be turned to tune to the required frequency without the click-ring moving. When this has been done the screw is tightened and subsequently every time this click-stop engages the condenser will be firmly held in the correct setting for the frequency chosen. An aperture in the cover over the mechanism enables the lettered tabs to be seen as they come into position under the notches in their levers.



1. Operating bar of four-section frequency range switch

FIG. 18.—T.1154L, TOP VIEW

87. A control knob is provided on each mechanism, operating a cam which will lift all the levers clear of the click-rings so that the condensers can be rotated freely. In this case a friction drive comes into action on the condenser spindle to prevent the condenser shifting off its setting due to vibration.

88. The click-stop mechanisms on the M.O. condensers for the H.F. ranges are provided with compensating handles to shift the slotted levers backwards and forwards. Any click-ring engaged with a lever is therefore slightly rotated and this provides a variation of frequency of about plus or minus 0·1 per cent.

Uni-click mechanism

89. The advantage of the Uni-click mechanism, fitted to the transmitters as shown in Table 2, is that only one click-stop is brought into action at a time on a given range. Like the Multi-click mechanism, it is provided on all M.O. tuning condensers and on the P.A. condensers for the H.F. ranges. It will be observed that only one click-stop mechanism is fitted on the P.A. side of the T.1154L (see fig. 16). This is because it is only on Range 2 of this transmitter that condenser tuning of the P.A. stage is used, Ranges 2A and 3 having variometer and permeability tuning respectively.

90. The construction of the mechanism is shown in fig. 20. It consists of two main assemblies, the click-lever assembly on the transmitter panel and the click-ring assembly on the control knobs.

91. The click-lever assembly consists of a cradle accommodating eight spring-loaded levers which ride on the periphery of a slotted octagonal cam. When the selector knob is turned to any one of its eight positions (seven are identified by letters and the eighth is labelled FREE) the cam rotates, and one lever at a time drops into its associated slot on the cam, the form of which prevents the remaining seven levers from dropping. Each of the seven front levers is notched; the eighth lever (at the back of the assembly) carries a cork-lined brake shoe and falls when the pointer of the selector knob is at FREE. On the compensating type of click-lever assembly (Stores Ref. No. 10D/973), a small compensating lever mounted in an eccentric bearing provides a means of moving the group of spring-loaded levers to and fro through a very small distance so that if the frequency of the transmitter has drifted slightly from that to which it was pre-set, the operator can make the small frequency correction necessary without interfering with the pre-set click-stop. This type is fitted to the M.O. control knobs of the H.F. ranges and permits a variation of frequency of about 0·1 per cent. On the non-compensating type (Stores Ref. No. 10D/974), as fitted to the P.A. controls this facility is not provided.

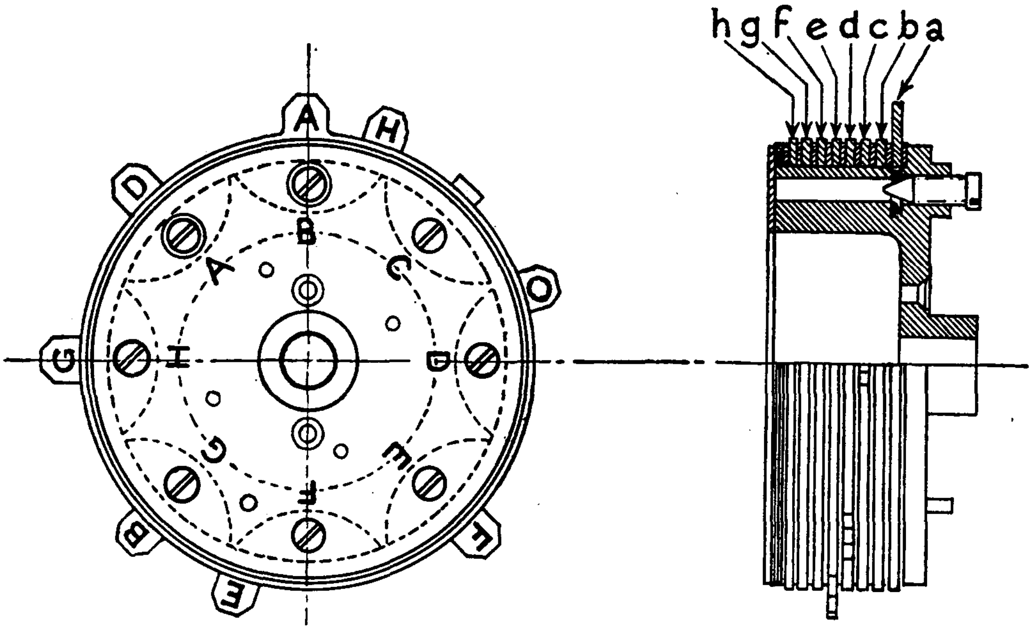


FIG. 19.—MULTI-CLICK MECHANISM

92. The click-ring assembly comprises seven separate rings, each having one projecting tooth shaped to fit into the notch on its associated selector lever. Locking screws, identified by letters embossed on the control knob, are provided, one for each ring. When a screw is tightened, the ring associated with it is held fast and rotates with the knob. Loosening the screw frees the ring and renders it independent of movements of the control knob. The ring controlled by each screw is positioned immediately below the lever which will fall when the selector knob pointer is turned to the corresponding letter; thus, when the selector knob points to G, the lever G will fall. If the screw G is then loosened the ring will be held in position and the knob can be turned to any required frequency without disturbing the ring; by tightening the screw this frequency is pre-set, as the tooth on the ring controlled by the screw G will always click into the same position when the selector knob is turned to G again.

VALVES AND POWER SUPPLIES

93. Two types of valve are used in the transmitter. The M.O. and modulator valves are type VT.105 (Stores Ref. 10E/216). These are non-metallised, indirectly-heated triodes, mounted on standard 5-pin bases. Valves with a ceramic base must always be used in the M.O. position. Some valves of the type have an ordinary moulded base and are eligible for use only in the modulator stage. The valves take 0·7 amp. heater current at 6 volts. The anode voltage rating is 250 V.

94. The power amplifier valves are directly-heated pentodes of type VT.104 (Stores Ref. 10E/215) taking 1·3 amp. filament current at 6 volts and rated at 1250 V. on the anode. They have a standard ceramic 5-pin base, and the anode connection is brought out to a top cap.

L.T. power units

95. Two rotary transformer power units provide the supplies for the transmitter and its associated receiver R.1155, and are available for either 12 V. or 24 V. input. They are known respectively as the L.T. power unit and the H.T. power unit, the former supplying also H.T. for the receiver. A list of the various types of L.T. power units is given below:—

Stores Ref.	*Type*	*Input (Nominal)*	*Input (Actual)*	*Rated Outputs (d.c.)*
10K/19	34	12 V.	10·3 V.	217 V. 110 mA., 7 V., 13 amps.
10K/61	34X	14 V.	14 V.	245 V. 110 mA., 8·1 V., 13 amps.
10K/13065	34A	12 V.	10·3 V.	217 V. 110 mA., 7 V., 13 amps.
10K/20	35	24 V.	18·5 V.	217 V. 110 mA., 7 V., 13 amps.
10K/13066	35A	24 V.	18·5 V.	217 V. 110 mA., 7 V., 13 amps.

96. The L.T. power units type 34 and 34X are now obsolete.

97. Types 34A and 35A are modifications of the original types 34 and 35 to permit of their use in aircraft where an additional R.1155, operated by the navigator, is installed. They incorporate an extra relay which interrupts the H.T. supply to the navigator's receiver when the transmitter H.T. power unit is started up. A modification to the H.T. power unit is also involved.

98. The L.T. power unit type 34X had an arrangement whereby a 2 V. 20 amp. hr. accumulator was switched into circuit to increase the input when the aircraft generator was off charge.

H.T. power units

99. The H.T. power units are listed below:—

Stores Ref.	*Type*	*Input (Nominal)*	*Input (Actual)*	*Rated outputs (d.c.)*
10K/17	32	12 V.	13·2 V.	1,200 V., 200 mA.
10K/13063	32A	12 V.	13·2 V.	1,200 V., 200 mA.
10K/1474	32B	12 V.	13·2 V.	1,200 V., 200 mA.
10K/18	33	24 V.	27·4 V.	1,230 V., 200 mA.
10K/13084	33A	24 V.	27·4 V.	1,230 V., 200 mA.
10K/1470	33B	24 V.	27·4 V.	1,230 V., 240 mA.

100. Power units type 32A and 33A are used in conjunction with the L.T. power units type 34A and 35A in aircraft with a navigator-operated R.1155. Types 32B and 33B are arranged so that when in operation 12 V. or 24 V. is applied to a relay which earths the aerial of the TR.9 or TR.1196 in the aircraft or marine craft.

101. A full description of all these power units, and of the modifications required to convert the basic types to the A or B varieties, is given in A.P.1186D, Vol. I, Sect. 8, Chap. 5.

Power supplies of ground installations

102. Transmitters type T.1154D and type T.1154E obtain the input to their power units from a rectifier type 26 (Stores Ref. 10D/745). This is a 230 V. 50 c/s instrument forming part of the tender, signals, type 309, which accommodates the mobile ground station T.1154D or E—R.1188.

103. When the T.1154-R.1155 installation is used on the ground for training purposes the input to the rotary power units may be obtained from 200-250 V. 50 c/s a.c. mains *via* a power unit type 115 (Stores Ref. 10K/351), with two 12-volt accumulators in series "floating" across it. Alternatively the rotary transformer power units can be dispensed with and the necessary d.c. inputs for transmitter and receiver derived direct from 200-250 V. 50 c/s mains *via* a power unit type 114 (Stores Ref. 10K/350). Both these power units are described in A.P.1186E, Vol. I, Sect. 6, Chap. 4.

INSTALLATION

104. A diagram of a typical T.1154/R.1155 installation is given in fig. 21, Chap. 2 of this publication. It will be seen that the transmitter is the main focal point for all the wiring. The connectors from the power units plug into the transmitter and so also do the two aerials, fixed and trailing, and the receiver inter-connection. The D/F circuits alone (loop and visual indicators) plug into the receiver. The transmitter is placed on top of, or to one side of, the receiver.

Resistance units, types 47, 52, 52A

105. Since the voltage of the aircraft accumulators will alter between charge and no-charge conditions a resistance cut-in arrangement is included in the positive lead from the aircraft accumulator to the L.T. power units, types 34, 34A, 35, or 35A. This compensates for the variation,

and maintains the L.T. output of the power unit between 6·5 and 7 volts. The resistance unit is included on the typical installation diagram, fig. 21, Chap. 2. The resistance is switched in and out of circuit by means of an auxiliary relay, type 219 (Stores Ref. 10F/493) on 12-volt systems, or by relay type 220 (Stores Ref. 10F/494) on 24-volt systems. The resistance unit type 47 is designed for 12-volt and the unit type 52 or 52A for 24-volt installations.

106. In the resistance type 52A, an additional resistance element, type 4773 (Stores Ref. 10W/16125) is connected between terminals 6 and 7 of the unit to improve the heater voltage regulation. There is no connection to terminal 7 in the type 52 unit, and the full resistance is in circuit with the lead to the generator on terminal 6.

107. It will be seen from para. 95 that the actual input of the L.T. power units used with 24-volt aircraft systems is only 18·5 volts. Part of the resistance type 52 or 52A is therefore always in circuit irrespective of whether the aircraft generator is charging or not.

108. With the leads connected to terminals 1 and 6 (or 1 and 7 on type 52A) the whole resistance is in circuit. This condition is not always required, and instructions for determining the correct terminal to which to connect the lead from the resistance to the L.T. power unit are given in para. 119.

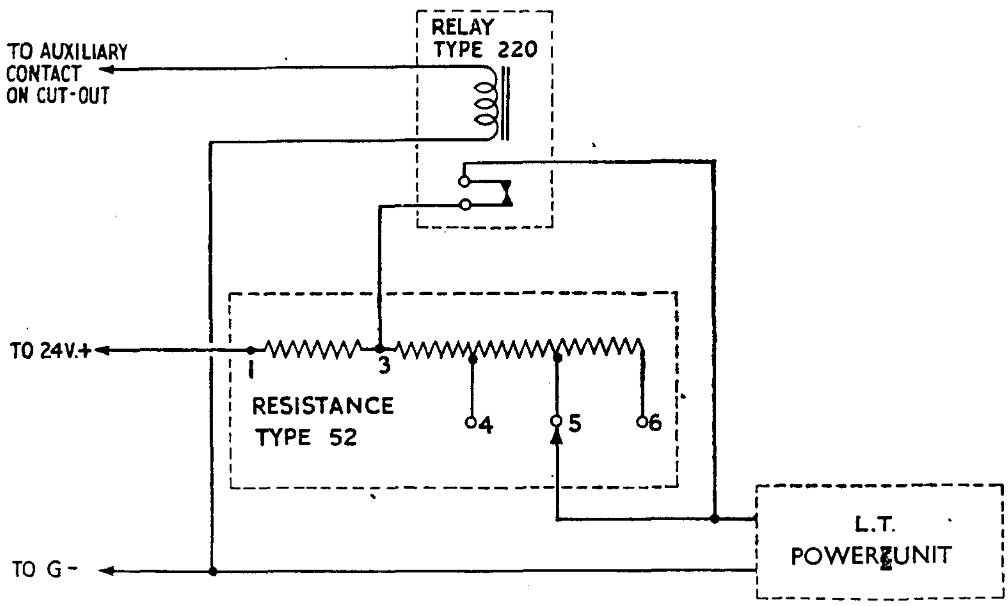


FIG. 21.—CONNECTIONS OF RESISTANCE, TYPE 52

109. A Londex relay type 219 (12-volt) or type 220 (24-volt) is connected across all or part of the resistance. When the aircraft accumulator is not charging, the relay contacts are closed and the part of the resistance across which the relay is connected is short-circuited. When the voltage of the aircraft generator rises sufficiently to close the cut-out and begin charging the accumulator, the relay is energised from an auxiliary contact on the cut-out so that its contacts break and the resistance is brought into circuit. A simplified diagram of this arrangement with the type 52 resistance is given in fig. 21. The relay is connected between terminal 3 of the resistance and the terminal from which the lead is taken to the input of the L.T. power unit (in this case terminal 5), so that the part of the resistance between terminals 1 and 3 is always in circuit. With the type 47 resistance, in 12-volt installations, the relay is connected across the whole of the portion of resistance in use.

110. On some early installations the relay was operated by a manual switch, the switch being closed by the operator in order to break the relay contacts when the aircraft generator was charging.

Connectors, plugs, and sockets

111. Details of the connections to the individual pins of the plugs and sockets on the transmitter are given in the insets to fig. 4 to 6. The types of connector between each plug and socket on the transmitter and the other items of equipment in the installation are given in the installation diagram and schedule in Chap. 2.

112. The connection from the microphone sockets on the transmitter is taken through a plug type 217 and a suitable length of Dumet 4 to the intercomm. panel of the aircraft. The earth connection consists of Uniflex 19 terminating at the transmitter in a socket type 135, and in a hook end at the earth terminal.

113. The transmitter may be back, table, or base mounted (depending upon the aircraft layout), using the mountings quoted in the installation schedule, Chap. 2, fig. 21.

114. Due to the heavy current taken by the apparatus, separate cables are used for the H.T. and the L.T. power units and these are taken to the aircraft main distribution panel. Each supply is separately fused. With a 12-volt system 70-amp. minimum fuses are used; in a 24-volt installation a 20-amp. fuse is used for the L.T. power unit and a 60-amp. for the H.T. power unit. The recommended supply cables are 37-amp. cable in the 12-volt and 19-amp. cable in the 24-volt installation. The supply leads need not be of metal-screened cable.

Type 47 and 52 resistance positioning

115. In the positive supply lead to the L.T. power unit is connected the variable pre-set resistance, type 47, type 52 or type 52A, mentioned in para. 105. This resistance should be positioned in the run of the wiring so that the length of leads is not thereby greatly increased. As the power dissipated by this resistance may be of the order of 100 watts it is essential to keep it away from anything that might be damaged by heat. It should be mounted vertically and in an open space so that air may freely circulate through it. Although once set the resistance does not require any further attention, on one aircraft of each type an adjustment of the tappings in the air is very desirable.

116. The function of this resistance is to maintain the input voltage to the L.T. power unit approximately constant whether the aircraft is on the ground or in the air with the battery on charge. There would normally be a difference of perhaps 4 volts between these two conditions and it has been found that this variation has a detrimental effect on the valve filaments. A certain section of the resistance is therefore inserted in circuit in the air.

Setting the resistance

117. With the type 47 resistance (12-volt) there is no resistance permanently in circuit and the necessary amount is switched in when the aircraft is airborne. With the type 52 or 52A resistance (24-volt) a certain part of the resistance is always in circuit. To determine the correct value of resistance to use it is advisable to make a test, first on the ground, and then in the air, with the aircraft main electrical generator delivering its normal voltage.

118. Assuming that the aircraft has a nominal 24-volt supply and that the resistance is a type 52, ensure that the positive input lead is taken to terminal 1 of the resistance. Arrange to measure the valve heater voltage of one of the transmitter valves by connecting a voltmeter across the pins. Connect the positive lead from the L.T. power unit to terminal 6 of the resistance so that all the resistance is in series with the L.T. power unit. Switch on the power unit by turning the master switch in the transmitter to STD.BI and measure the valve heater voltage. It will probably be around 5 volts, which is much too low. Bring the tapping down from 6 to 5 and so on until the valve heater voltage is somewhere between 6·5 and 7 volts. That tapping is the one to which one side of the relay connection (fig. 21) must be made. It is usually "3", so that the portion of resistance between 1 and 3 is always in circuit, on the ground or in the air. The aircraft accumulator should not be on charge during this test. The correct tapping for the lead from the power unit to the resistance must be ascertained in the air as below.

119. When the aircraft is airborne, and the engine-driven generator charging normally, again measure the valve heater voltage across the pins of one of the transmitter valves, beginning again with the lead from the L.T. power unit connected to terminal 6 on the resistance unit. The reading should be approximately 6·3 volts. If below this figure, the connection from the L.T. power unit will have to be made to terminal 5, or even to terminal 4 of the resistance. The actual value on resistance in circuit at the different tapping points on resistances type 47 and 52 are as shown below:—

Tap No.	*Type 47*	*Type 52*
3	0·10 ohms	0·38 ohms
4	0·11 ohms	0·695 ohms
5	0·12 ohms	0·715 ohms
6	0·13 ohms	0·735 ohms

External equipment

120. The aerial switching unit, type J, or aerial plug board, which is sometimes used in place of it, is positioned between the transmitter and the aerial lead-in points so that the "run" of the aerial leads is clean and short. It is easily accessible for operational purposes. Although some

few aircraft were fitted with plug boards upon delivery, selector switches are generally installed later. All leads, therefore, are made long enough to reach the appropriate sockets in the switch even though the switch is not fitted at the time.

121. With the aerial plug board in use, it is necessary to short-circuit the pins 13 and 14, 15 and 16 of the socket type 175, which engages with transmitter plug E. This is done by using a dummy socket appropriately wired.

122. The aerial ammeter (Chap. 2, fig. 21, item 128) supplied for use on the H.F. ranges is an external fitting and is positioned in the run of the H.F. aerial lead between the transmitter and the aerial switch or plug board. The lower fixing bolt for this ammeter is attached to a bracket of insulating material such as wood or plastic and not to the metal structure.

123. A small fixed condenser (Chap. 2, fig. 21, item 63) is supplied for use with the aerial selector switch only; its function is to load the fixed aerial for M.F. operation. This condenser need not be installed in an accessible position.

124. All aerial leads between the transmitter and the selector switch and between the switch and the aerial lead-in points are of stout, high-voltage cable such as Unispark 7 or an approved alternative. The run is kept as short as possible. These aerial leads are stood away from adjacent metal work, particularly sharp points and angles, not only to reduce losses but also to avoid the possibility of brush discharge and breakdown. A minimum spacing of 1½ in. between the conductor and the nearest metal work is aimed at but not always achieved. On medium frequencies the R.F. voltage between aerial terminals and earth may reach 6,000.

125. Fixed aerial lead-in insulators and trailing aerial fair-leads are installed with the possibility of the 6,000 volts in mind. The fixed aerial, though normally used for H.F., may be used for M.F. should the trailing aerial be lost.

OPERATION

126. The procedure on the H.F. ranges, except Range 2A of the T.1154L, will be considered first. Fig. 1 and 16 should be consulted for the positions of controls and meters.

127. Set switch S_1 to the frequency range required, and ensure that the aerial tapping switch for this range (S_3 or S_4) is on tap No. 1. All controls for a given range can be identified by being of the same colour. See that the Type J switch, if installed, is at NORMAL. With transmitters T.1154C, F, H, K, and M the three-point socket on the panel (see para. 72) should be inserted with the letter N against the arrow.

128. Turn the master switch, S_5, to STD.BI. The L.T. power unit will then start up, and transmitter and receiver valve filaments will glow. After a few seconds' pause, turn S_5 to TUNE, whereupon the H.T. power unit will start.

129. The M.O. condenser (C_2 or C_4) for the range in use must now be adjusted for the frequency required. The condenser dials are calibrated in frequencies, but the normal procedure in aircraft is to back-tune to the receiver R.1155, which will either have been tuned to the station with which it is desired to communicate, or set to the required frequency by means of its own calibrated dial.

130. Check that the control knob (1, fig. 1) of the click-stop mechanism for the range in use is at FREE. Press the key, and rotate the M.O. condenser until the magic eye tuning indicator on the receiver closes (displays minimum shadow). During this process the receiver master switch should be at OMNI., and the receiver volume control adjusted so that the magic eye just closes and reopens, without overlap, when the transmitter passes through the position of resonance.

131. When the eye closes, the operator should check the setting of the M.O. dial by its calibrated scale to ensure that it is not on a harmonic of the required frequency.

132. The M.O. stage being now set up, the P.A. stage is tuned by rotating C_{15} or C_{16} (with their click-stops at FREE) until a dip is observed on the meter M_1. If more than one dip occurs, the deepest dip indicates the correct tuning point. The two dips, if close together, are caused by the fact that there is some overlap between the frequency coverage of the P.A. tuned circuits with the commutator switches on the condensers open and closed. One combination of inductance and capacity, however, gives the greater efficiency and is indicated by the deeper dip. On some frequencies, of course, minor dips due to harmonics will be encountered. Remember that C_{15} and C_{16} rotate through a full 360°.

133. Raise the key, and move S_3 or S_4 to tap No. 2. Again adjust C_{15} or C_{16} for maximum dip. Continue this process, advancing S_3 or S_4 one tap at a time, until M_1 dips to just below the green line marked on its scale. The green line represents an input of 65 mA.

134. The aerial tap switches S_3 and S_4 must not be moved while the key is pressed, or arcing will occur at their contacts.

135. When tuning the P.A. on the RED range the reading of M_1 will momentarily fall to zero when the cam-operated contacts on C_{16} break (see para. 53). This must not be confused with a dip.

136. When the dip on M_1 has been loaded up approximately to the green line as described, the master switch S_5 is turned to C.W. On pressing the key, the pointer of M_1 should now rise to the beginning of the red sector of its scale (100mA) and aerial current should be indicated on the external aerial ammeter if fitted. The reading of this meter will vary widely with different aerials and is to be regarded merely as an indication that R.F. output is present.

137. Should M_1 exceed 115 mA with S_5 on C.W., the aerial tap switch must be turned back one position and the P.A. stage retuned.

Tuning T.1154L on range 2A

138. To tune the transmitter T.1154L on Range 2A the M.O. stage is set up as described in para. 126 to 131. Referring to fig. 16, the aerial tap switch, S_3, is placed on tap No. 10 and the anode tap switch, S_9, on tap No. 19. With the key pressed, rotate the variometer control (1) to find a dip. Reduce the setting of S_3 one tap at a time, lifting the key at each adjustment, and on each tap rotate the knob (1) until the setting of S_3 is found on which the deepest dip on M_1 is obtainable. Now reduce the setting of S_9 one tap at a time, rotating the variometer (1) and if necessary adjusting S_3 at each step as before until the meter M_1 dips only a trifle below the green mark on its scale. Switch S_9 must not be moved with the key depressed. The master switch, S_5, may then be turned to C.W., when the reading of M_1 will go up to approximately 100 mA on pressing the key.

Tuning procedure on M.F.

139. To tune all transmitters on the YELLOW range (M.F.), the frequency range switch S_1 is first turned to the appropriate position, and the anode and aerial tap switches, S_6, S_7, are set at taps No. 18 and 17 respectively. The procedure for switching on and for tuning the M.O. stage is the same as on the H.F. ranges.

140. With the transmitter master switch, S_5, on TUNE, press the key and rotate the control knob of L_6 to find a dip on M_1. Reduce the setting of S_7 one tap at a time, tuning with L_6 at each step, until the deepest dip is obtained.

141. The setting of S_6 is now increased one tap at a time, again pressing the key and rotating L_6 to find a dip at every adjustment, until M_1 dips to just below the green line on its scale. Move S_5 to C.W. and press the key. The reading of M_1 should now increase to approximately 100mA and aerial current should be indicated on M_2.

142. It will sometimes be found that on a given setting of S_6, the dip on M_1 is well below the green line, whereas on the next tapping higher, the dip is above the line. In these circumstances S_6 should be turned back to the position on which the dip was too deep, and the aerial switch S_7 should be advanced one tap (i.e. its setting reduced). A new dip will then be found when L_6 is rotated and the loading up procedure can again be proceeded with.

143. Switches S_6 and S_7 must never be moved while the key is pressed.

R/T and M.C.W. operation

144. The tuning procedure for R/T or M.C.W. operation is exactly the same as that already described, except that when M_1 has been loaded up to the green line, the master switch S_5 is turned to M.C.W. or to R/T, as required, instead of to C.W. The reading of M_1 will then remain approximately on the green line when the key is pressed (since the suppressor grids of V_2 and V_3 still have a negative bias) but will fluctuate when modulation takes place. The key must be depressed, or the pilot's shorting switch closed, the whole time R/T transmission is taking place.

Notes on use of click-stops

145. When a frequency is to be click-stopped, the letter to be used is selected first and the click-stop with that letter engaged as described in para. 84 onwards. It is more convenient to set up the click-stop with the highest letter on the range first (e.g. G or H on Range 1, according to whether the Uni-click or Multi-click mechanism is fitted). The vernier levers on the M.O. dials are set to the second position from the bottom. Slacken the appropriate screws on the face of the condenser dials so that the click-stop will remain engaged while the normal tuning procedure is carried out.

146. After tuning, tighten the screws again. Write the frequency allotted to the click stop chosen in pencil on the table on the cover of the valve compartment, together with the setting of the aerial and anode tap switches. On transmitters with the Multi-click mechanism, the click-stop letter should also be written on the scale behind the condenser knob, against the indicating pointer engraved on the cover over the mechanism. Unless this is done it is difficult for the operator to see when a desired click-stop is engaged, the lettered tabs on the click-rings being small, and visible only momentarily as they pass behind the aperture in the cover. With this mechanism, also, frequencies should not be click-stopped if separated by less than 25 kc/s. on the BLUE range, 10 kc/s. on the RED range, and 1 kc/s. on the YELLOW range. There is no restriction on spacing between frequencies when using the Uni-click mechanism.

147. If frequency settings alter due to temperature changes at height, the vernier levers on the M.O. dials (H.F. ranges only) are moved *upwards* to reduce frequency and *downwards* to increase frequency. A variation of about 0·1 per cent. is obtainable.

148. No click-stop facility is provided on the M.F. range output circuit tuning control, since M.F. operation is normally on the trailing aerial and setting-up must be carried out in flight.

Emergency working

149. If the normal aerial for the frequency required is not available, H.F. transmission on trailing aerial or M.F. on fixed can be carried out by turning the type J switch to the appropriate position, or shifting the plugs on the aerial plugboard. It will then be necessary to release the output circuit click-stop and re-tune.

150. When transmitting H.F. on trailing aerial with transmitters T.1154C, F, H, K, and M, better results will be obtained if the three-point socket labelled N–X on the panel is reversed so that the letter X is against the arrow.

Operating figures

151. Table 3 gives typical specimen figures of anode and total input currents to the transmitter, and aerial currents. It must be understood that the aerial currents will vary widely between different installations and are given only as a rough guide. The figures are for the T.1154M, but on the common frequencies are applicable to the other types.

TABLE 3

Typical performance figures

Freq.	*Ae tap*	*Anode tap*	*C.W.*			*M.C.W.*			*Remarks*
			Aerial amps.	*Anode mA*	*Total mA*	*Ae amps.*	*Anode mA*	*Total mA*	
16·7 Mc/s.	2	—	1·0	143	231	0·7	88	175	Range 1
10·0 Mc/s.	2	—	0·6	99	187	0·4	66	154	Range 1
6·5 Mc/s.	5	—	0·95	121	200	0·55	66	146	Range 2
5·0 Mc/s.	6	—	0·95	154	242	0·65	77	165	Range 2
3·5 Mc/s.	2	—	1·4	121	209	0·95	72	149	Range 3
2·5 Mc/s.	4	—	1·6	121	209	0·9	72	143	Range 3
500 kc/s.	1	30	1·55	116	200	1·0	70	155	Range 4
400 kc/s.	5	30	1·6	116	204	1·0	61	145	Range 4
300 kc/s.	9	29	1·6	120	208	1·0	61	145	Range 4
200 kc/s.	14	21	1·0	116	155	0·7	75	130	Range 4

Indications of meter M_1

152. Full-scale deflections of the meter M_1 on the M.F. ranges for various settings of the aerial tap switch, S_7, were given in para. 49. Some intermediate indications are shown in Table 4 since it is found that operators are often perturbed by the apparently high inputs recorded when tuning up on the M.F. range and are liable to hasten the process unduly.

TABLE 4
Feed meter readings

Meter division	*True current in mA*				
	Tap 1–9	*Tap* 10–11	*Tap* 12–13	*Tap* 14–15	*Tap* 16–17
$6\frac{1}{2}$	65	55	45·5	36	26
10	100	85	70	55	40
30	300	255	210	165	120

153. The green line on the scale is marked at $6\frac{1}{2}$ divisions and the red sector runs from 10 to 30 divisions. On taps 1 to 9 and on the H.F. ranges the meter calibrations show the true current taken by the P.A. valves.

154. When power supplies and valves are in order, the meter should read at least 200 mA if the transmitter is switched to the YELLOW range, switches S_6 and S_7 are on taps 18 and 17 respectively, and the key is pressed with the master switch at TUNE. The M.O. and P.A. circuits must not be in resonance for this test and it may be necessary to swing the control of L_6 to obtain the highest reading. In the circumstances described the indicated input of 200 mA represents an actual input of about 80 mA.

Airborne fault-finding

155. Finding and rectifying faults on this equipment must be considered from the points of view both of the aircrew wireless operator and the ground mechanic. These paragraphs are written to review some of the most common troubles experienced by operators, and all are capable of easy cure in the air if tackled with a good understanding of the equipment. Charts and tables of faults can never be a complete substitute for such an understanding.

156. Where a fault develops in the air which the operator is unable to remedy on account of his comparatively limited resources, he can do much towards its speedy rectification on the ground if his understanding of the equipment is such that he can report accurately on the symptoms and suggest where the trouble lies. The unsatisfactory statement that "the transmitter is u/s" must have wasted many man-hours among mechanics detailed to investigate faults, and it is essential that from their earliest acquaintance with the equipment operators should be thoroughly cross-examined as to the symptoms of the troubles they experience, and encouraged to attempt to localise the fault by a process of reasoning. The following list of common failures is addressed particularly to instructors.

No input

157. When this is reported, do not hesitate to satisfy yourself that the operator knows the difference between input and output. No reading on the external aerial ammeter for the H.F. ranges is sometimes reported in this way. When this point is cleared, ascertain whether the H.T. power unit rotary transformer was running. If not, was the type J switch in the D/F or EARTH positions, or was the cable between transmitter plug E and the type J switch disconnected at either end. (The socket under the switch may shake loose, and in some installations is hard to see). A less probable fault than the foregoing, but not to be overlooked by operators, is failure of the H.T. power unit input fuse on the aircraft electrical panel.

158. If the H.T. power unit *was* running, the cable from the power unit to transmitter plug C should have been checked at both ends, and then the transmitter fuse F_1. Spare fuses for F_1 are carried behind the cover of the valve compartment.

159. Operators must understand that the H.T. power unit will not start unless the L.T. power unit is running, but failure of the latter would normally be indicated by no receiver signals. If in doubt, the operator can look inside the transmitter valve compartment and see that the filaments are glowing normally.

160. Impress upon operators that disconnection of the screened cable linking the H.T. and L.T. power units will prevent *both* from running.

Input low and dip absent or sluggish

161. Operators must assure themselves that the aircraft charging system is working normally before beginning to change valves. If the reading of the voltmeter on the aircraft electrical panel

is normal, suspect the P.A. valves. If the filament of one is dim, remove it. Re-tune the transmitter using one valve. If both valves look normal, remove each valve in turn and see with which one the better input and dip is obtained. The faulty valve must *not* be replaced in the transmitter.

Note.—If the transmitter is used with one P.A. valve, this valve will be overloaded and must be removed on conclusion of the flight. Transmission should be limited to the minimum necessary for the safety of the aircraft.

High input, no dip

162. Operators must be trained to recognise the normal reading of M_1, when S_5 is at TUNE and the key is pressed (but the P.A. circuit is not in resonance). If this is slightly exceeded and no dip can be found, the M.O. valve, V_1, should be changed. It may be replaced by the modulator valve V_4, provided V_4 has a ceramic base. In these circumstances there will be no sidetone on C.W., and R/T and M.C.W. transmission will be impossible.

No dip

163. If interrogation of the operator does not elicit any amplifying symptoms, it may be suspected that the frequency range switch, S_1, was in the wrong position. When this trouble is reported on the M.F. range only, a likely cause is the operator's failure to remove the earthing plug at the trailing aerial winch.

Sharp dip, but transmitter will not load up

164. A disconnection between the transmitter and the aerial will cause the above symptom. On the H.F. ranges it may occur through the aerial plug vibrating loose on the transmitter, either of the sockets underneath the external aerial ammeter falling out, or either the H.F. or H.F. AERIAL sockets becoming disconnected at the type J switch.

No output

165. This is usually a manipulation failure, due to using too high a setting of the aerial tap switches (indicated by the needle of M_1 rising above the prescribed limits on C.W.) or to tuning up on the wrong dip. Operators sometimes overlook the fact, however, that there is a short-circuiting switch on the external aerial ammeter. This is operated by two press-buttons labelled SHORTED and IN CIRCUIT. If the SHORTED button is accidentally pressed, the ammeter will show no reading.

No sidetone

166. If no sidetone is heard with the transmitter master switch at TUNE and the key pressed the valve V_4 should be changed, assuming that the telephone circuit is known to be in order by signals being heard from the receiver when the key is raised.

No modulation

167. If sidetone is normal with key pressed on TUNE, the valve V_4 is in order. The operator should therefore check that the microphone plug is home in the sockets on front of the transmitter, that all plugs are secure on the aircraft intercomm. panel and that, if an amplifier type A.1134 or A.1134A is in use, the amplifier is switched on, and that the ABC switch on the amplifier is in position C. He must ensure that the reversible plate at the back of the transmitter is fitted with the wording CARBON or ELECTROMAGNETIC showing as appropriate.

GENERAL FAULT-FINDING AND SERVICING

168. The following instructions are more detailed than the operational hints already given and are intended for the use of mechanics working on the ground.

169. If the transmitter operates normally when connected up to the external supply used for ground testing it is almost certain that the trouble is due to the aircraft supply accumulator, the condition of which should be tested. This should give a minimum of 10·5 or 21 volts (according to the type fitted) on load. If, however, no results are obtained, a cursory examination should be made before removing the instrument from the aircraft in order to ascertain whether any obvious faults exist. Cables and plugs should be shaken from side to side so that the presence of broken connections or loose joints can be detected.

170. Next a new set of valves may be tried, after which, if no result is obtained, the aircraft fuses should be checked. If the fitting of a new set of valves is found to effect a cure, it is advisable that the old valves should be replaced one at a time in order to discover the actual valve (or valves) which is faulty.

Substitution tests

171. If the tests referred to have failed to produce any result it is suggested that the method of substitution should be tried next in order to determine the broad location of the fault. The instrument should be removed from the aircraft by slackening off the locking bolts at the back and lifting it off its shock-proof supports. Another instrument, known to be in working order, should now be fitted in its place, switched on and checked for normal operation in the usual way.

172. By this means it is reasonable to assume that if no results are obtained or the symptoms are the same as before, the trouble is due to some outside cause such as the power units or external wiring in the aircraft, etc., whilst if the transmitter functions in a proper manner the fault will lie in the instrument itself.

Trouble outside transmitter

Power units do not start

173. First of all the master switch of the transmitter should be placed in the STD.BI position, when the L.T. power unit should start up. This can be confirmed by placing the back of the hand on the top cover or listening for the slight hum made by the rotary transformer when it is running. If the unit fails to start the supply socket situated at one end should be withdrawn and the voltage across the two outside sockets measured on a testmeter type D or other suitable instrument, when a reading of 12 or 24 volts should be obtained.

174. Should, however, the meter show no reading the input cabling should be examined and tested. In order to do this the socket should be withdrawn from the unit and the other end of the cable disconnected from the aircraft supply. The ends of the two leads can then be checked for continuity by placing across them the testmeter type D or similar instrument. It should be observed that the centre contact is for earthing purposes only.

175. The input cabling to the H.T. unit may also be checked at the same time so as to avoid the necessity of having to do so at a later date. Apart from the continuity test of the leads, a check should also be made to ascertain whether the leads are shorting to the external screening of the cabling, by placing the meter across one end of each lead and the screening itself.

176. The foregoing remarks apply to the testing of all cables and leads in the aircraft installation. In a number of cases, however, it will be found that leads are too long for a meter to be conveniently connected across the two ends, and in these circumstances the screening can be used for the checking of continuity. One end of the lead to be tested should be connected direct to the screening and the meter placed across the other end and the screening, but before testing in this manner, a check must first be made in order to make sure that the lead is not shorting to the screening. An installation diagram is given in fig. 21, chap. 2, which will assist in tracing the relative positions of the cables.

177. If these tests reveal no defects, the L.T. power unit itself will have to be examined. First of all the cover should be removed after undoing the four securing screws on the top and, with the master switch set to STD.BI the double-contact relay situated under the input plugs may be closed manually by means of a piece of insulating material such as a pencil. If the unit now starts up a new relay can be fitted or the unit can be replaced by a new one and the faulty relay attended to at some more opportune moment.

178. Should no cure, however, be effected there is little more that can be done, other than the examination and cleaning of the commutator and carbon brushes, after which a new unit will have to be fitted if there is no improvement.

L.T. unit starts but not H.T. unit

179. If the L.T. unit starts up but the H.T. unit fails to do so when the master switch on the transmitter is set to TUNE, the cause of the trouble will probably lie in the starter relay, which is energised from the L.T. unit. This is situated underneath the input plug in the H.T. unit and, after removal of the cover, can be closed manually as described above. If the unit then starts, the leads in the two cables connecting the L.T. unit to the H.T. unit and from the plug P_2 of the H.T. unit to the transmitter plug D should be tested individually for continuity as already described. The switch, type J, should be in one of the three transmit positions, that is NORMAL, H.F. ON TRAILING or M.F. ON FIXED, and if correctly placed, then the leads in the four-way cable from it to the transmitter should be tested.

Power units start but no input to transmitter

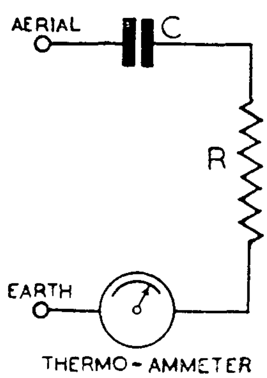
180. Should both the power units start up but the transmitter not operate, an examination for the presence of L.T. and/or H.T. can be made. The former may be checked by removing the valve cover on the front of the transmitter and observing whether the valve filaments glow, whilst the latter may be tested by measuring the voltage between a P.A. valve anode cap connector and the chassis, when a reading of approximately 1,200 volts should be obtained.

181. If one or both units appear to give no output, new ones should not be fitted until the leads between them and the transmitter have been checked for continuity as already described. It will be observed from fig. 9 and 10 that the L.T. unit is connected to the transmitter *via* the H.T. unit.

182. The absence of keying, as evidenced by a lack of sidetone in the telephones, indicates trouble in the key or its associated leads, which should be checked for continuity and good fitting in their socket block. The key itself may be examined for easy movement and cleanliness of the contacts, a new one being fitted if the old one is in any way suspected. These remarks also apply to the telephones and their leads, which are connected to the same socket block.

183. If radiation is taking place this will be indicated by the external ammeter on the two H.F. ranges, provided the IN CIRCUIT button is pressed. Should no results be obtained, the type J switch should be inspected. The control lever should be checked for ease of movement and the condition of the shrouded plugs should be examined. Owing to the robust construction of this switch it is unlikely to be the cause of much trouble unless it has sustained obvious damage, and therefore renewal should be effected only if further tests produce no result.

184. The aerial cables may be inspected next for damage, and for continuity and good fitting at the sockets which connect up to the type J switch after which the aerials themselves may be examined, particular attention being paid to the insulators. It is possible that the fault may be in the ammeter, which can be tested very rapidly by disconnecting its two leads and connecting a spare one temporarily in its place.



AERIAL No. 1 { C = 55 μμF. 1,000 VOLTS PEAK AT 10 TO 5·5 MC/S.
R = 60 OHMS. "BERKO" TYPE M.B.I. 100 WATTS.

AERIAL No. 2 { C = 100 μμF. 1,500 VOLTS PEAK AT 5·5 TO 3 MC/S.
R = 10 OHMS. "BERKO" TYPE M.B.I. 100 WATTS.

AERIAL No. 3 { C = 500 μμF. 10,000 VOLTS. PEAK AT 500 TO 200 KC/S
R = 20 OHMS.

AERIAL No. 4 { C = 200 μμF. 10,000 VOLTS PEAK AT 500 TO 200 KC/S
R = 10 OHMS.

FIG. 22.—DUMMY AERIAL CIRCUIT

Trouble inside transmitter

General

185. After removal from the aircraft the instrument should be withdrawn from its case by unscrewing the ten screws round the outside of the case, three on the right-hand side, five on the left-hand side, one on the top, and one on the bottom. The screws on the front panel do not hold the chassis to the case. An examination should first be made for any obvious faults, either mechanical or electrical, such as damaged variable condensers or inductances, broken connections, blistered resistances and "flash-over" marks on the chassis.

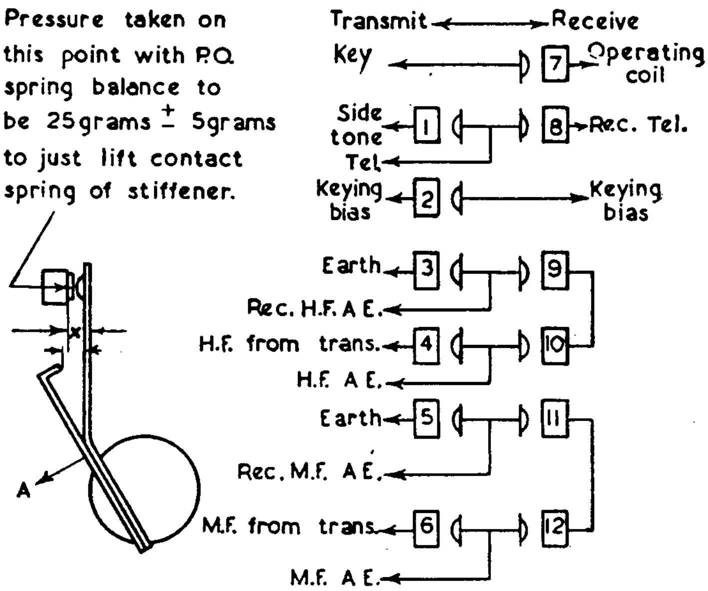
186. The transmitter should now be set up as though for operation in order that further tests may be conducted. Key, phones, L.T. and H.T. units should be connected up to their plugs and sockets. An appropriate dummy aerial should be connected across aerial and earth. If one is not available particulars for making up such a fitting are given in fig. 22. As a temporary measure an ordinary 60-watt lamp may be used on the two H.F. ranges. An aerial approximating to that on the aircraft can be used for final checking after repairs have been effected, but it is inadvisable to use this during testing owing to the wide field of radiation.

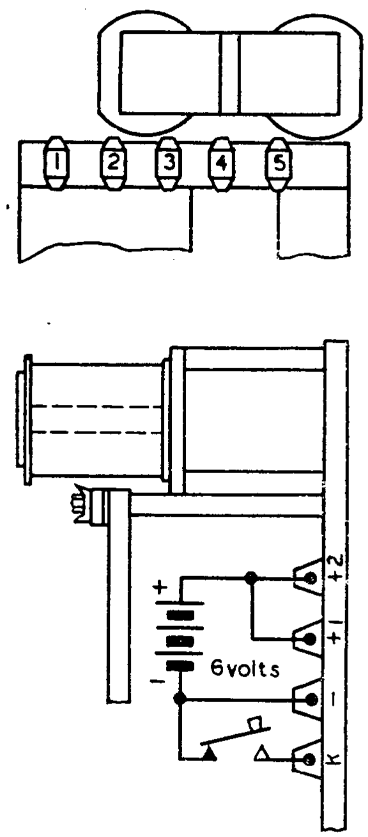
187. If the fuse blows repeatedly an examination should be made for a short-circuit between the main H.T. line and chassis. With the power units disconnected and a new fuse fitted a reading

of approximately 27,750 ohms should be obtained between the pin of the H.T. + plug, Plug C, and chassis on the two H.F. ranges; all resistances in the H.T. circuit such as R_3, R_4, R_5, and R_{23}, should be examined for a short-circuit to chassis or signs of overheating, which can be detected by browning or blistering. Condensers, such as C_{18}, C_{19}, C_{12} (only on M.C.W. and R.T.), C_{13}, C_{15}, and C_{16}, should be similarly checked, the easiest method in this case being that of disconnecting them (one end being sufficient except in the case of C_{15} and C_{16}) one by one from the circuit until the reading already given is obtained and the faulty component thus traced.

Transmitter not working on any range

188. If the transmitter is found to be inoperative on all ranges and the relay A/12 cannot be heard to click when the key is pressed, a thorough examination of the relay itself and all associated





CONTACT No.	CAP "X"
1	0·048 in. (18 C)
2	0·028 in. (22 C)
3	0·048 in. (18 C)
4	0·048 in. (18 C)
5	0·048 in. (18 C)
6	0·048 in. (18 C)
7	0·064 in. (16 C)
8	0·028 in. (22 C)
9	0·048 in. (18 C)
10	0·048 in. (18 C)
11	0·048 in. (18 C)
12	0·048 in. (18 C)

RELAY ADJUSTMENTS

Adjustments are to be made by setting the screw contacts Nos. 1–12 to the required positions as indicated. On no account must the stiffener strips A be bent to facilitate the adjustment. A suitable type of gauge can be made from a 3-in. length of piano wire of the correct diameter; bend the wire at 90° at $\frac{5}{16}$ in. from one end.

COIL TESTS

Coil A, terminals 3 and 4
Coil B, terminals 1 and 2
Coil C, terminals 2 and 5
Coil C, terminals 2 and K with series resistance

KEYING TEST

Connect battery and key as indicated.

FIG. 23.—ADJUSTMENT AND TESTS OF MAGNETIC RELAY TYPE 85 (KEYING RELAY)

connections should be made. The wires from the telephone and key plug, Plug B, to the relay should be carefully checked and the relay inspected for mechanical and electrical faults; particulars for gap adjustments and coil tests are given in fig. 23.

189. The relay spindle should swing absolutely freely in its bearings and roll from side to side under its own weight when the relay is tilted. All blade tips and stiffeners should be approximately in line and the pressure between them should be checked by means of a spring gauge (see fig. 23). This should be within the limits of 20 to 30 grams.

190. The coils should be tested for open circuits, the correct terminal test points for each coil being given in fig. 23. These terminal numbers are clearly marked on the relay itself. If any coil is found to have broken down a repair can be effected only if the break is at one of the ends, otherwise either a new coil or a complete relay unit will have to be fitted.

191. After carrying out repairs the resistance of the individual coils may be checked and the following figures should be obtained:—

Coil A between terminals 3 and 4 = $12{\cdot}045\Omega \pm 0{\cdot}6\Omega$
Coil B between terminals 1 and 2 = $1{\cdot}515\Omega \pm 0{\cdot}1\Omega$
Coil C between terminals 2 and 5 = $2{\cdot}1\Omega \pm 0{\cdot}1\Omega$

192. The response to keying may also be checked by connecting up a 6 volt supply as indicated in fig. 23.

193. If the relay operates but no reading is obtained on the feed meter M_1, the meter itself should first of all be checked, the simplest method being that of substitution. The presence of H.T. may next be ascertained by taking the voltage between the top caps of the output valves and chassis when a reading of approximately 1,200 should be obtained. A thorough inspection of the H.T. line should be made if there is no result.

194. All the large clip-in resistances R_3–R_7, R_9 and R_{10} at the back of the chassis should be tested; their correct values will be found by reference to the appendix of this chapter. The relay contact clearances should be checked in order to ascertain whether they conform to the particulars given in fig. 23, and if not should be adjusted accordingly. When replacing the resistances in their clips care should be taken to see that the 12,000 + 2,000 ohm one, R_7, on the right-hand side (looking at the back of the chassis) is correctly inserted, that is with the tap towards the top of the instrument.

195. If the relay operates and a reading is obtained on M_1 but there is an absence of tuning as indicated by the feed meter needle not dipping, a test should be made to find out whether the M.O. stage is working. The M.O. unit is mounted on the right-hand side of the transmitter when viewed from the back, and its operation can be checked by means of a R.F. indicator which can be made up quite simply. A single turn of stoutish covered wire (fairly stiff flex will do) of sufficient diameter to slip comfortably over the M.O. inductances L_1, L_2, or L_3, with a pilot lamp holder connected across the ends is required. This should be fixed to a strip of ebonite or other insulating material (even a piece of wood will answer the purpose) and a 3·5 volt bulb screwed into position in the holder. When this indicator is passed near or over the inductances, a glow from the lamp will show whether the stage is working.

196. If the M.O. is found to be inoperative the H.T. voltage may be checked at the anode pin of the valve holder V_1. This should vary from 160 approximately on 200 Bc/s to 240 approximately on 10 Mc/s with the master switch in the TUNE, M.C.W., or R/T position; in the C.W. position the readings will be slightly increased. If no readings are obtained the H.T. supply from plug C should be checked through R_3, the H.F. choke HFC_2, and the inductances L_1, L_2, and L_3. The wiring generally should be examined for loose connections, the resistances R_{25} and R_{11} tested and the condenser C_5 replaced by a new one.

197. All the wiring to the M.O. section of the range switch should be inspected and the switch itself examined for good contact and mechanical damage. In the case of serious trouble, the M.O. unit as a whole can be removed by undoing the seven screws on the front panel, and a new one fitted in its place. A list of M.O. units (drive units) appears in the appendix.

198. If the M.O. is functioning correctly but no output is obtainable, a thorough examination of the output wiring should be made, and the associated section of the range switch inspected. The grid leak R_{12} should be tested and the condenser C_6 replaced. The output inductances should be checked for short-circuited turns, particularly at tapping points, and the rotor vanes of the condensers C_{15} and C_{16} should be examined to see that they run true and are mid-way between the stator vanes. The commutator switch contacts on these two condensers should be checked for contact and also that they are functioning correctly relative to the rotors. The position should be such that a full sweep of the condenser is obtained with the contacts short-circuited or open.

Transmitter not working on one range

199. If the transmitter is found to be inoperative on one range only and the feed meter needle will not dip when tuning is attempted, a test should be made by means of the R.F. indicator referred to in para. 195, to ascertain whether the M.O. circuit of the particular range is working. If not, the M.O. circuit concerned may be generally examined, and in this respect it should be borne in mind that such items as the grid condenser and H.T. feed resistances need not be tested since they are common to all ranges, but the inductance and switch section of the particular range and the connections to them should be checked.

200. If the M.O. is functioning a thorough examination of the output circuit in question should be made. As in the previous paragraph, the remarks regarding components common to all three ranges applies, so that the investigation will consist mostly of an inspection of the range switch section concerned and its associated wiring.

201. If tuning can be effected, as indicated by the feed meter needle dipping, but the aerial will not load up, an inspection should be made of the aerial tap switch and inductance of the range affected. The output panel is on the left-hand side of the instrument, when viewed from the back, with Range 1 and 2 inductance L_4 at the top, Range 3 inductance L_5 in the middle, and the inductance L_6 of the M.F. range at the bottom. Like the M.O. unit, the output unit can, in the event of serious damage, be withdrawn from the main chassis by undoing the six fixing screws on the front panel and the screw holding the lug at the back, and a new one fitted in its place. A list of P.A. units (output units) appears at the end of the appendix.

Modulator trouble

202. Where there is no modulation on M.C.W., as indicated by an absence of sidetone in the telephones when the key is pressed, and no R/T, an examination of the modulator circuit in general will have to be made. This includes the anode resistance R_5 and the choke LFC_2 as well as the resistances R_{13} and R_{14}; and the condenser C_{10} should also be inspected.

203. If the transmitter is operating on M.C.W. but there is an absence of R/T, the trouble probably lies in the microphone circuit. The leads from the microphone to its socket in the front panel should be inspected and the windings of the microphone transformer T_1 should be tested for continuity. The microphone link plate at the back of the chassis should be examined to see that the fixings have not become loose and the plate slipped out of its correct position. When using carbon microphones, the polarizing voltage at the microphone sockets should be checked and a reading of 2 volts obtained. If no result is obtained the trouble will lie in the resistances R_{27} or R_{28}, the primary of T_1, or possibly in the microphone itself.

204. If M.C.W. and R/T are both operative but there is an absence of sidetone the condenser C_{21} should be replaced by a new one and an inspection of the associated wiring made. The wiring to the relay from plug B should be examined and also the adjustment of the relay contacts as explained in para. 189.

205. Should R/T be working but there is no M.C.W. or sidetone, a renewal of C_7 may be made and the associated wiring carefully checked including an examination of the resistance R_6 and switch contacts.

Point-to-point testing

206. Should the fault still remain reference may be made to the list of point-to-point tests given in the following table. These provide a check as to the correctness of the major part of the wiring, and can be applied not only as a test to an instrument in which repairs have been carried out, but also as a means of localising the trouble in a faulty transmitter. All annotations refer to those in the theoretical circuit diagrams.

TABLE 5

T.1154—Point-to-point Tests

Pin 4 Plug D to Pin 3 Plug D. All positions of S_5 except OFF	<0·05 Ω
Pin 4 Plug D to Earth. All positions	>5 megohms
Pin 6 Plug D to Pin 3 Socket A	<0·02 Ω
Pin 6 Plug D to keying relay + 1 terminal	<0·02 Ω
Pin 6 Plug D to + fils. V.T.105 valves. All switch positions	<0·02 Ω
Pin 6 Plug D to + fils. V.T.104 valves (except on STD.BI)	
Pin 6 Plug D to keying relay + 2 terminal } All switch positions except OFF and STD.BI	<0·03 Ω
Pin 6 Plug D to Pin 13 Plug E }	
Pin 5 Plug D to − fils. of valves and earth	<0·02 Ω
Pin 5 Plug D to Pin 4 Socket A	<0·02 Ω
Pin 8 Plug D to Pin 14 Plug E	<0·03 Ω
Pin 1 Plug D to Pin 8 Socket A	<0·02 Ω
Pin 2 Plug D to Pin 7 Socket A	<0·02 Ω
Pin 2 Plug D to Pin 16 Plug E	<0·03 Ω
Pin 15 Plug E to Pin 5 Socket A	<0·03 Ω

TABLE 5—*continued*

Pin 1 Socket A to H.F. aerial terminals, relay at RECEIVE ...	<2Ω
Pin 2 Socket A to M.F. aerial terminals, relay at RECEIVE ...	<2Ω
Pins 1 and 2 Socket A to earth, relay at SEND ...	<2Ω
Pin 6 Socket A to Pin 16 Plug B, relay at RECEIVE ...	<2Ω
Pin 7 Plug D to R_{24} ...	<0·02Ω
H.T. Plug C to feed meter M_1 ...	0·02Ω
H.T. Plug C to earth, Ranges 1 and 2 ...	27,750Ω
Anode M.O. Valve V.T.105 to H.T. Plug C, H.F. Ranges ...	50,000Ω
Anode M.O. Valve V.T.105 to H.T. Plug C, M.F. ...	25,000Ω
Anode M.O. Valve V.T.105 to earth, M.F. ...	19,000Ω
Cathode M.O. Valve V.T.105 to earth ...	0·02Ω
Grid M.O. Valve V.T.105 to earth ...	20,050Ω
Grid M.O. Valve V.T.105 to Pin 14 Plug B, relay at SEND ...	15,050Ω
Anode Mod. Valve V.T.105 to H.T. Plug C (R_6 removed) ...	75,000Ω
Cathode Mod. Valve V.T.105 to earth ...	820Ω
Grid Mod. Valve V.T.105 to earth ...	13,000Ω
Anode P.A. Valves V.T.104 to H.T. Plug C, Ranges 1, 2, and 3 ...	50Ω
Suppressor P.A. Valves V.T.104 to earth, TUNE ...	5,350Ω
Suppressor P.A. Valves V.T.104 to earth, C.W. ...	2,000Ω
Suppressor P.A. Valves V.T.104 to earth, M.C.W. ...	10,350Ω
Suppressor P.A. Valves V.T.104 to earth, R/T ...	10,350Ω
Suppressor P.A. Valves V.T.104 to Pin 7 Plug D, TUNE ...	70Ω
Suppressor P.A. Valves V.T.104 to Pin 7 Plug D, C.W. ...	7,000Ω
Suppressor P.A. Valves V.T.104 to Pin 7 Plug D, M.C.W. ...	5,000Ω
Suppressor P.A. Valves V.T.104 to Pin 7 Plug D, R/T ...	5,000Ω
Grid P.A. Valves V.T.104 to earth ...	25,000Ω
Grid P.A. Valves V.T.104 to Pin 7 Plug D, TUNE ...	20,350Ω
Grid P.A. Valves V.T.104 to Pin 7 Plug D, C.W. ...	20,000Ω
Grid P.A. Valves V.T.104 to Pin 7 Plug D, M.C.W. ...	20,350Ω
Grid P.A. Valves V.T.104 to Pin 7 Plug D, R/T ...	20,350Ω
Screens P.A. Valves V.T.104 to junction R_4 and R_7 ...	0·03Ω
Screens P.A. Valves V.T.104 to earth ...	14,000Ω
Screens P.A. Valves V.T.104 to H.T. Plug C ...	20,000Ω
Pin 7 Plug D to Pin 14 Plug B. All switch positions except C.W. Relay at SEND ...	350Ω
Pin 7 Plug D to Pin 14 Plug B, C.W., relay at SEND ...	<0·1Ω
Pin 16 Plug B to condenser C_9, relay at SEND ...	<0·5Ω
Pin 13 Plug B to KEY on keying relay...	<0·02Ω
Pin 15 Plug B to earth ...	<0·02Ω
Pin 14 Plug B to Pin 15, relay at SEND ...	5,000Ω
Pin (−) microphone socket to earth ...	<0·02Ω
Pin (+) microphone socket to earth, link at CARBON MICROPHONE, switch at R/T ...	25Ω
Pin (+) microphone to earth, link at E.M. MICROPHONE, switch at R/T ...	7Ω
Pin (+) microphone socket to Pin 6 Plug D, link at CARBON MICROPHONE, switch at R/T	29Ω
Across R_{27}, on OFF and STD.BI ...	10Ω
Junction R_{27} and R_{28} to Pin 6 Plug D on TUNE, C.W., M.C.W., and R/T ...	5·5Ω
C_6 to anode M.O. Valve V.T.105, M.F. Range ...	2·5Ω
C_6 to C_5, M.F. Range ...	510Ω
Across R_{29} on RED range ...	150Ω

Insulation resistance

207. The following test of insulation may be carried out, and a reading greater than 5 megohms should be obtained when 500 volts d.c. is applied between points named:—

Pin 7 Socket A and Pin 8 Socket A
Pin 5 Socket A and Pin 8 Socket A
Pin 7 Socket A and Frame
Pin 8 Socket A and Frame
Pin 5 Socket A and Frame
Pin 4 Plug D and Frame (Master switch in all positions).

208. A flash test of the H.T. wiring of the transmitter can also be made and should be carried out in the following manner:—

(i) All valves must be removed.
(ii) All large clip-in resistances at the back must be removed.
(iii) Apply 2,500 volts for one minute between H.T.+ pin, plug C, and chassis.

Mechanical inspection

209. Having rectified any fault it is suggested that a mechanical inspection should be made before replacing the instrument in the aircraft, and the following points should be checked.

(i) All joints are mechanically sound and properly soldered.
(ii) Moving controls do not foul the wiring, particularly the master switch and relay contacts.
(iii) All controls touch the stops provided on the panel at the extremes of their movement.
(iv) Click action on the switch knobs is not masked by friction to such an extent that the tapping points cannot be easily located by feel alone.
(v) Valves are pushed home in their holders and valve shields are tight on their bases.
(vi) Meter zero adjustments are correct.
(vii) All tuning knobs have smooth action throughout their range of movement.
(viii) Each click stop locates firmly and definitely with not less than 0·020 in. lift of the levers.
(ix) When the set screw of any particular click ring is released, the knob is free to rotate whilst the click ring remains stationary.
(x) Range switch has free movement and contacts are making satisfactorily
(xi) Large resistance clips are not loose on their panel and resistances are not loose in the clips.
(xii) The tap on the 14000Ω resistance, R_7, R_8, is not touching the side of the case and is not loose on the resistance.
(xiii) The corona shield on the relay is in position on the M.F. aerial contact.
(xiv) End play does not allow the edges of the relay armature to rub on the moulding and the armature is free enough to swing by its own weight when the transmitter is tilted.
(xv) All braided leads are securely fitted to prevent braiding touching other terminals.

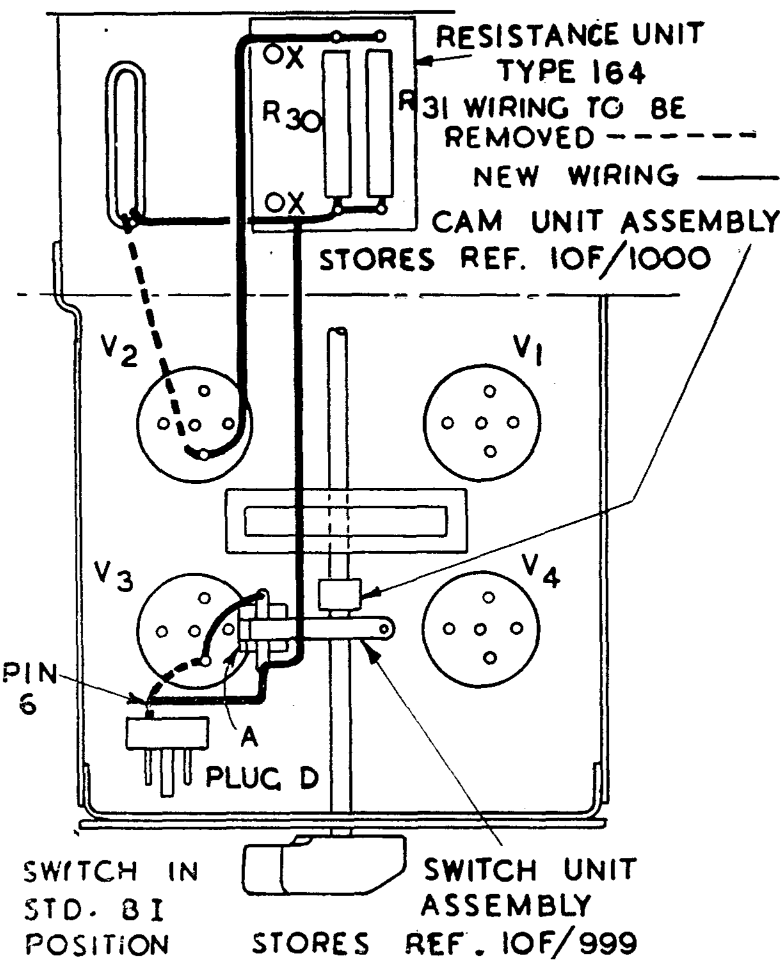


FIG. 24.—FITTING OF RESISTANCES R_{30} AND R_{31}

MODIFICATIONS TO TRANSMITTERS AND ASSOCIATED EQUIPMENT

Fitting of resistances R_{30}, R_{31}

210. Early transmitters in the T.1154 series were not provided with the parallel resistances R_{30}, R_{31}, which limit the current through the P.A. valve filaments when S_5 is at STD.BI. Later production models included these resistances, and modifications were made by the manufacturers to a wafer of S_5 to provide for their being switched into circuit on STD.BI only. This is the arrangement shown in fig. 4 and inset in fig. 5.

211. Instructions were also issued to enable units to add the resistances and the associated switching themselves, a cam-operated switch being supplied for fitting to the spindle of S_5, as shown in the main diagram of fig. 5. The components required are as follows:—

Resistance unit, type 164, Stores Ref. 10W/4606 (comprising resistances R_{30}, R_{31}).
Cam unit assembly, Stores Ref. 10F/1000.
Switch unit assembly, Stores Ref. 10F/999 (comprising the switch contacts operated by the cam unit assembly).

212. The procedure for carrying out the modification in C.W., M.C.W., and R/T transmitters is as follows. These instructions should be read in conjunction with fig. 24. They were promulgated in leaflet A.P.1186/A.162—W.

(i) Remove the valves from the transmitter.
(ii) Remove the transmitter from its case, placing it inverted on the bench with the panel to the front. Identify the valve holder compartment.

Mounting of filament resistances

(iii) Replace the two screws at "X" by two 6 B.A. × ⅜ in. cheese-head brass screws.
(iv) Fit the resistance unit, type 164, to these screws and secure by means of 6 B.A. washers and nuts. Coat the nuts and projecting ends of the screws with shellac varnish.

Mounting of filament switch

(v) Slacken off the screws of the cam unit assembly and separate the two parts. Place the cam unit on the switch rod as shown with the section containing the two screws underneath Tighten sufficiently to retain the unit on the switch rod.
(vi) Fit the switch unit assembly to the valve holder screw A. The switch unit assembly has a tapped hole to accommodate the screw which should be coated with shellac varnish before fitting.
(vii) Set S_5 to the position engraved STD.BI.
(viii) Slide the cam unit into position so that the indent in the switch arm blade engages centrally in the groove of the semi-circular cam. Tighten the fixing screws of the cam unit assembly, and coat with shellac varnish.
(ix) Rotate the switch handle and check that the contacts of the switch unit assembly are closed at all positions except STD.BI. It is also important to check that the contacts are open when the switch handle is rotated to the STD.BI position from either direction.

Modification to wiring of transmitter

(x) A lead connects from pin No. 6 of the 8-pin plug, type 212 (Stores Ref. 10H/438), to the positive heater socket of the adjacent V.T.104 valve holder V_3. Disconnect this lead at the valve holder pin and transfer it to the front spill of the switch unit assembly.
(xi) From this latter tag connect a length of No. 18 s.w.g. tinned copper wire encased in Grade E insulating tubing to one of the lower soldering tags of the resistance unit, type 164. This lead is to pass under any components on the way.
(xii) Solder an insulated lead between the heater socket referred to in sub-para. (x) and the free soldering tag of the switch assembly unit.
(xiii) In certain transmitters type T.1154B, a lead which passes through the elongated hole in the back of the compartment connects to a V.T.104 heater socket V_2 as shown. This lead is to be disconnected at the heater socket and re-connected to the lower soldering tag of the resistance unit, type 164.
(xiv) Connect a suitably insulated lead between the upper soldering tag of the resistance unit, type 164, and the V.T.104 heater socket V_2 as shown.
(xv) Replace the transmitter in its case and replace the valves and front panel.

Resistance R_7

213. Some issues of the resistance R_7, type 1046 (Stores Ref. 10W/1046) have the centre tapping clips of such a length that in certain circumstances of rotation of the resistance in its mounting the clip might touch the case of the transmitter.

214. Instructions for remedial measures have been issued in the leaflet A.P.1186/A.139—W. The modification consists in cutting off the surplus length of clip. Care should be taken not to fracture the porcelain tube and to ensure that the screw and nut securing the lead to this clip are still tight after the cutting operation.

M.F. range aerial tuning coil

215. In certain cases the rack-retaining pin on the iron core of the M/F range aerial tuning coil of the transmitter has become loose. This defect can be remedied in the manner described in the leaflet A.P.1186/A.140—W. The following is the sequence of operations:—

(i) Remove the screws on the top, bottom, and sides of the transmitter, securing the case to the transmitter. Withdraw the transmitter

(ii) Identify the M.F. aerial tuning coil control knob, shown as L_6 on fig. 1. Remove the control knob by unscrewing the single fixing screw at its centre.

(iii) Remove the core retaining strip screwed to the coil former and situated at the back of the transmitter, visible in fig. 11. On removing the fixing screw it may be found to be made from an insulating material; if this is so and it is damaged or broken, it is to be replaced by a 2 B.A. brass screw, cheese head, $\frac{3}{8}$ in. (Stores Ref. 28S/2066).

(iv) Turn the control spindle in a counter-clockwise direction until the rack is out of mesh with the skew gear wheel. Withdraw the core and rack from the back of the coil.

(v) Bind linen thread No. 40 (Stores Ref. 32B/456) tightly around the spindle over the pin securing the rack to the core. This should extend about $\frac{1}{16}$ in. on each side of the pin.

(vi) Cover the linen thread with bakelite or shellac varnish (shellac (Stores Ref. 33A/172) in methylated spirits).

(vii) Turn the control spindle until the driving pin at the front panel end is horizontal.

(viii) Engage the core and rack with the skew gear wheel. The rack will require guiding into position and this can be accomplished from the right-hand side of the transmitter. Turn the control spindle clockwise applying slight pressure to the core to ensure that the rack is drawn into mesh.

(ix) Replace the control knob and check to ensure that the core travels the whole length of the coil with a complete rotation of the control knob between stops. In the fully counter-clockwise position of the control knob, the core should be approximately $\frac{1}{32}$ in. below the back edge of the end of the coil former.

(x) Remove the control knob. If the core does not travel the whole length of the coil, rotate the knob 180 deg. and replace it.

(xi) Replace the core retaining strip.

(xii) Replace the transmitter in the case and secure with the screws previously removed.

Transmitter case screws

216. It has been found that the "coin-slot" 4 B.A. screws securing the transmitter to the case are apt, by continued use, to strip their threads. Units have been instructed in leaflet A.P.1186/A.142—W to replace at the first opportunity, any such stripped screws by the special replacement screws, case securing, coin-slot, $\frac{3}{16}$ in. Whit. (Stores Ref. 10D/590), demanded from the appropriate Maintenance Unit. Before fitting the new screws, the holes have to be tapped out to $\frac{3}{16}$ in. Whit.

Additional element for type 52 resistance

217. To improve heater voltage regulation, instructions have been given for units to connect a resistance type 4773 (Stores Ref. 10W/16125) across terminals 6 and 7 of the resistance unit type 52. Care should be taken to check that this cannot make contact with other elements in the resistance unit. The label on the unit should be amended to read "Resistance Unit Type 52A" (Stores Ref. 10W/16024).

Security of sockets

218. Sockets type 173 (Stores Ref. 10H/423) fitted with an early type of brass insert, are apt, under vibration, to fall out of engagement with the external aerial ammeter used on the H.F. ranges (Stores Ref. 10A/12227). Such inserts can be identified by the fact that they finish about $\frac{1}{4}$ in. short of the moulded socket body. They are to be replaced by new inserts (Stores Ref. 10H/1970). Access to the inserts is obtained by unscrewing the two moulded portions of the socket. The old ones are to be carefully unsweated from the cables and replaced by the new. The socket, when fitted with the new insert, should withstand a pull of 4 lb. as measured by a spring balance.

219. Early issues of sockets type 172 (Stores Ref. 10H/422), type 135 (Stores Ref. 10H/319), and type 136 (Stores Ref. 10H/320) were liable to fall out of the type J switch under vibration. If the pull required to remove them is less than 4 lb. as tested by a spring balance, the two parts of the moulded socket body are to be unscrewed and an additional spring (Stores Ref. 10H/1971) fitted over the existing one. To re-assemble the socket body it may be necessary to reamer out the central hole in the forepart of the moulded body to allow entry of the insert when fitted with the additional spring. The pull-off should again be tested, and if still unsatisfactory a new socket of the appropriate type demanded. Authority for the above modifications was given in leaflet A.P.1186/E.78—W.

Breakdown of milliammeter type D (T.1154C, F. H, K, and M)

220. Cases have occurred in service where the anode feed meter in the above transmitters has been burned out due to coupling existing between the external connecting leads and the Range 1 amplifier coil. The following procedure for re-positioning the leads was therefore promulgated in leaflet A.P.1186/A.199—W:—

(i) Withdraw the chassis from its case.

(ii) Remove the front cover of the valve compartment.

(iii) Identify the amplifier feed meter (M_1 in fig. 1).

(iv) From one terminal of the meter, a lead connects to the H.T. fuse. Disconnect this lead from the fuse.

(v) Remove the four meter securing screws and tilt the meter forward in order to simplify removal of the leads.

(vi) Remove and discard the lead which connects from one terminal of the meter to the junction of R_{17} and R_{18}.

(vii) Remove and discard the lead which connects from the fuse to R_{16}.

Note.—The condenser C_{20} is to remain connected across the meter M_1.

(viii) Connect one end of each of two leads of 22 s.w.g. tinned copper wire (Stores Ref. 5E/1781), encased in tubing, insulating H.T., grade D (Stores Ref. 5F/1796), to each terminal of the meter.

(ix) Re-mount the meter in its panel by means of its cover and its four screws.

(x) Re-connect the lead which was disconnected in operation (iv) to the H.T. fuse.

(xi) Pass the two leads connected to the meter in operation (viii) through the screening *via* the hole directly beneath the H.T. fuse into and along the roof of the compartment containing the V.T.105 valves. Pass the leads to the rear of this compartment and up through the space between C_{14} and the range switch, under the latter to R_{16}, R_{17}, and R_{18}.

Note.—The lead from the meter terminal which is connected to the H.T. fuse is to be connected to R_{16}; the remaining lead is to be connected to the junction of R_{17} and R_{18}.

(xii) Replace the valve compartment cover.

(xiii) Replace the chassis in its case.

Re-wiring of H.T. fuse

221. It has been found that greater protection can be given to transmitters of all types by transferring the H.T. fuse F_1 from the positive lead to the negative lead. To modify transmitters in which this alteration has not been carried out, the following procedure has been laid down in leaflet A.P.1186/A.197—W:—

(i) Remove the lead between pin 7 of plug D and R_{24} (5,100Ω or 4,700 Ω) in the resistance tray

(ii) Transfer the H.T. lead from plug C to pin 7 above, shortening as necessary.

(iii) Connect a lead of 18 s.w.g. tinned copper wire (Stores Ref. 5E/1779), encased in tubing, insulating, grade E (Stores Ref. 5F/1910) from plug C, through the slit in the side of the resistance tray to the bottom end of R_3 (50,000Ω) and R_4 (20,000Ω). Approx. 3 ft. of wire and tubing should be demanded.

(iv) Remove the lead between the end spill of the fuseholder and the milliammeter. Transfer any other leads from the same fuseholder spill to the milliammeter terminal.

(v) Connect an insulated lead (see para. (iii)) from the end spill of the fuseholder to the top end of R_{10} (350Ω). The lead will pass under HFC_1 and C_{14} and through the existing hole in the top of the resistance tray; a grommet should be fitted before passing the lead through the hole.

Replacement for resistances R_{11} and R_{12}

222. Should failures occur of the resistance type 1049 (R_{11}) or resistance type 1050 (R_{12}) instructions have been given in leaflet A.P.1186/A.183—W to replace them by the following components:—

Circuit Ref.	*Stores Ref.*	*Nomenclature*
R_{11}	10W/1916 ...	Resistance type 1916, 15,000Ω
R_{12}	10W/56 ...	Resistance type 563, 20,000Ω

APPENDIX 1

VALUES AND TYPES OF COMPONENTS

CONDENSERS

T.1154C

Annotation, fig. 4	Value	Type	Stores Ref. 10C/
C_2, C_4	11–135 μμF	3333	11062
C_5	·0002 μF	943	2038
C_6	·0002 μF	943	2038
C_7	50 μμF	944	2039
C_8	·5 μF	955	2053
C_9	·001 μF	897 or 1647	965 or 3381
C_{10}	·0002 μF	946 or 1593	2041 or 3279
C_{11}	·01 μF	188 or 1503	8496 or 3103
C_{12}	·004 μF	947	2043
C_{13}	·01 μF	188 or 1503	8496 or 3103
C_{14}	·004 μF	948	2043
C_{15}	7–205 μμF } Part of	magnifier unit, type 3	(10D/499)
C_{16}	7–205 μμF		
C_{17}	22·5–346 μμF	3332	11061
C_{18}	·005 μF	949	2044
C_{19}	·005 μF	949	2044
C_{20}	·004 μF	956 or 1502	2055 or 3102
C_{21}	·5 μF	955	2053
C_{22}	·0003 μF }	950 or 1501	2045 or 3101
C_{23}	·0003 μF		
C_{24}	·0003 μF		
C_{25}	·001 μF	1647	3381
C_{26}	2 μF	1031	2220
C_{27}	40 μμF	1648	3383
C_{30}	·0006 μF	1676	3415
C_{31}	·0006 μF	1676	3415
C_{32}	·004 μF	1505	3105

T.1154F, H, and K

Condensers are the same as in T.1154C with the following exceptions:—

Annotation, fig. 4	Value	Type	Stores Ref. 10C/
C_{10}	·0002 μF	178	8388
C_{15}, C_{16}	7–205 μμF Part of m	agnfier unit, type 6 (10	D/943) in T.1154F and K
C_{18}, C_{19}	·0045 μF	1504	3104
C_{25}	·0034 μF	1502	3102
C_{32}	·002 μF	3903	11199

T.1154M

Condensers are the same as in T.1154C with the following exceptions:—

Annotation, fig. 4	Value	Type	Stores Ref. 10C/
C_{10}	·0002 μF	178	8388
C_{18}, C_{19}	·0045 μF	3523	11554
C_{22}, C_{23}, C_{24}	·0003 μF	3712	12000
C_{25}	·001 μF	2195	4250
C_{27}	40 μμ F	2007	3938
C_{28}	·004 μF	1505	3105
C_{32}	·002 μF	3903	11199

T.1154, T.1154A, B, D, E, and J

Annotation, fig. 5	Value	Type	Stores Ref. 10C/
C_1	10 $\mu\mu$F	942	2018
C_2	11–135 $\mu\mu$F	3333	11062
C_3	6 $\mu\mu$F	976	2086
C_4	11–135 $\mu\mu$F	3333	11062
C_5	·0002 μF	943	2038
C_6	·0002 μF	943	2038
C_7	50 $\mu\mu$F	944	2039
C_8	·25 μF	955	2053
C_9	·001 μF	897 or 1647	965 or 3381
C_{10}	·0002 μF	946 or 1593	2041 or 3279
C_{11}	·01 μF	188 or 1503	8496 or 3103
C_{12}	·004 μF	947	2043
C_{13}	·01 μF	188 or 1503	8496 or 3103
C_{14}	·004 μF	948	2043
C_{15}	7–205 $\mu\mu$F	Part of magnifier unit, type 1 (10D/106) in T.1154; type 2 (10D/107) in T.1154A, B, J and L; type 4 (10D/736) in T.1154D; Type 5 (10D/737) in T.1154E; and type 7 (10D/2238) in T.1154N	
C_{16}	7–205 $\mu\mu$F		
C_{17}	22·5–346 $\mu\mu$F	3332	11061
C_{18}	·005 μF	949	2044
C_{19}	·005 μF	949	2044
C_{20}	·004 μF	956 or 1502	2055 or 3102
C_{21}	·5 μF	955	2053
C_{22}	·0003 μF	950 or 1501	2045 or 3101
C_{23}	·0003 μF		
C_{24}	·0003 μF		
C_{25}	·001 μF	1647	3381
C_{26}	2 μF	1031	2220
C_{27}	40 $\mu\mu$F	1648	3383
C_{28}	·004 μF	1505	3105

T.1154N

Condensers are the same as in T.1154, T.1154A, B, D, E, and J, with the following exceptions:—

Annotation, fig. 5	Value	Type	Stores Ref. 10C/
C_8	·5 μF	955	2053
C_9	·001 μF	2195	4250
C_{10}	·0002 μF	178	8388
C_{13}	·01 μF	3886	12343
C_{18}, C_{19}	·005 μF	3523	11554
C_{20}	·004 μF	750	518
C_{22}, C_{23}, C_{24}	·0003 μF	3712	12000
C_{25}	·001 μF	2195	4250
C_{27}	40 $\mu\mu$F	2007	3938

T.1154L

Condensers are the same as in T.1154, T.1154A, B, D, E, and J, with the following exceptions:—

Annotation, fig. 6	Value	Type	Stores Ref. 10C/
C_3	6 $\mu\mu$F	976	2086
C_8	·5 μF	955	2053
C_9	·001 μF	2195	4250
C_{10}	·0002 μF	178	8388
C_{13}	·01 μF	3886	12343
C_{18}, C_{19}	·005 μF	3523	11554
C_{20}	·004 μF	750	518
C_{22}, C_{23}, C_{24}	·0003 μF	3712	12000
C_{25}	·001 μF	2195	4250
C_{27}	40 $\mu\mu$F	2007	3938

T.1154C

Annotation in fig. 4	Value ohms	Type	Stores Ref. 10W/
R_1	51,000	868	677
R_2	51,000	868	677
or R_1 and R_2 (one resistance)	24,000	6119	6119
R_3	50,000	1043	1043
R_4	20,000	1044	1044
R_5, R_6	75,000	1045	1045
R_7, R_8	12,000 + 2,000	1046	1046
R_9	5,000	1047	1047
R_{10}	350	1048	1048
R_{11}	15,000	1049	1049
R_{12}	20,000	1050	1050
R_{13}	680	1053	1053
R_{14}	7,500	1051	1051
R_{15}	820	1052	1052
R_{16}–R_{18}	10 + 19·5 + 19·5	1056	1056
R_{19}–R_{23}	10+2·9+5·3+12·6+69·2	1055	1055
R_{24}	5,100 or 4,700	942 or 917	877 or 1872
R_{26}	510	868	677
R_{27}, R_{28}	10 + 6	1054 or 6833	1054 6833
R_{29}	150	1931	1931
R_{30}	1·5	8208	8208
R_{31}	1·5	8208	8208
R_{40}	100	1903	1903
R_{41}	1 M	95	7908

T.1154F, H, and K

Resistances are the same as in T.1154C with the following exceptions:—

Annotation in fig. 4	Value ohms	Type	Stores Ref. 10W/
R_1	50,000	1042	1042
R_2	51,000	7211	7211
or R_1 and R_2 (one resistance)	24,000 or 27,000	6119 6839	6119 6839
R_{11}	15,000	1916	1916
R_{12}	20,000	563	56
R_{24}	5,100	6106	6106
R_{26}	560	868	677
R_{29}	150	2875	9640
R_{40}	100	561	53

T.1154M

Resistances are the same as in T.1154C, with the following exceptions:—

Annotation in fig. 4	Value ohms	Type	Stores Ref. 10W/
R_1, R_2	50,000	1042	1042
or R_1 and R_2 (one resistance)	24,000 or 27,000	6119 6839	6119 6839
R_{11}	15,000	1916	1916
R_{12}	20,000	563	56
R_{24}	5,100	942	877
R_{26}	560	1106	1106
R_{29}	150	2875	9640
R_{30} and R_{31} (or may be two resistances of 1·5 ohms as in T.1154C)	·75	2008	8453
R_{40}	100	498	11635

.154A, B, D, E, and J

otation in fig. 5	Values ohms	Type	Stores Ref. 10W/
R_1, R_2	51,000 each	868	677
or R_1 and R_2 (one resistance)	24,000	6119	6119
R_3	50,000	1043	1043
R_4	20,000	1044	1044
R_5, R_6	75,000	1045	1045
R_7, R_8	12,000 + 2,000	1046	1046
R_9	5,000	1047	1047
R_{10}	350	1048	1048
R_{11}	15,000	1049	1049
R_{12}	20,000	1050	1050
R_{13}	680	1053	1053
R_{14}	7,500	1051	1051
R_{15}	820	1052	1052
R_{16}–R_{18}	10 + 19·5 + 19·5	1056	1056
R_{19}–R_{23}	10+2·9+5·3+12·6+69·2	1055	1055
R_{24}	5,100 or 4,700	942 or 917	877 or 1872
R_{25}	51	934	851
R_{26}	510	868	677
R_{27}, R_{28}	10 + 6	1054 or 6833	1054 6833
R_{29}	150	1931	1931
R_{30} and R_{31}	1·5	8208	8208

T.1154L and N

Resistances are the same as in the T.1154, T.1154A, B, D, E, and J, with the following exceptions:—

Annotation, fig. 5	Value ohms	Type	Stores Ref. 10W/
R_1, R_2	50,000 each	1042	1042
or R_1 and R_2 (one resistance)	24,000 or 27,000	6119 6834	6119 6834
R_4	20,000	306	9820
R_{11}	15,000	1916	1916
R_{12}	20,000	563	56
R_{26}	560	1106	1106
R_{29}	150	2875	9640
R_{30}, R_{31}	1·5 each	8208	8208
or R_{30} and R_{31} (one resistance)	·75	2008 or 2007	8453 8452

CHOKES, H.F. AND L.F.

T.1154B, D, F, H, J, K

Annotation in fig. 4 or 5	Value	Type	Stores Ref. 10C/
HFC_1	8·8mH	70	578
HFC_2	1·5mH	86	2054
HFC_3	15·5mH	200	3809
LFC_2	1H	49	582
LFC_3	·325H	71	2289

T.1154

Annotation in fig. 5	Value	Type	Stores
HFC_1	8·8mH	88	208.
HFC_2	1·5mH	86	2054
LFC_2	1·21 — ·99H	46	579
LFC_3	·8 — ·5H	48	581

T.1154A and E

Annotation in fig. 5	Value	Type	Stores Ref. 10C/
HFC_1	8·8mH	70	578
HFC_2	1·5mH	53	79
* LFC_1	·22H	47	580
LFC_2	1H	49	582

T.1154L and N

Annotation in fig. 5 or 6	Value	Type	Stores Ref. 10C/
HFC_1	8·8mH	70	578
HFC_2	1·5mH	53	79
LFC_2	1H	49	582
LFC_3	·325H	71	2289

T.1154C and M

Annotation in fig. 4	Value	Type	Stores Ref. 10C/
HFC_1	8·8mH	88	2087
HFC_2	1·5mH	53	79
LFC_2	1·21 — ·99H	46	579
LFC_3	·8 — ·5H	48	581

* Choke LFC_1 is fitted only in transmitters without R/T, and is connected between grid and cathode of the modulator valve, V_4, in place of the secondary of the microphone transformer.

DRIVE AND OUTPUT UNITS

Transmitter	Drive unit Type	Stores Ref. 10D/	Output unit Type	Stores Ref. 10D/
T.1154	2	117	2	108
T.1154A, B	7	521	8	12140
T.1154C	6	495	7	498
T.1154D	13	732	10	738
T.1154E	14	733	11	739
T.1154F	20	1910	23	1553
T.1154H	30	1973	34	1965
T.1154J	31	1974	35	1966
T.1154K	32	1975	36	1967
T.1154L	33	1976	37	1968
T.1154M	34	1977	38	1969
T.1154N	35	1978	39	1970

AMENDMENT RECORD CONTINUATION SHEET

Incorporation of an Amendment List in this publication is to be recorded by inserting the Amendment List number, signing in the appropriate column, and inserting the date of making the amendments.

A.L. No.	*Amendments made by*	*Date*
1 to 5	Incorporated in this reprint	September, 1947

A.L. No.	Amendments made by	Date
*		

*Another Amendment Record Continuation Sheet (R.A.F. Form 2094A) obtainable from APFS, Kidbrooke, will be required when this page is full. Order it now.

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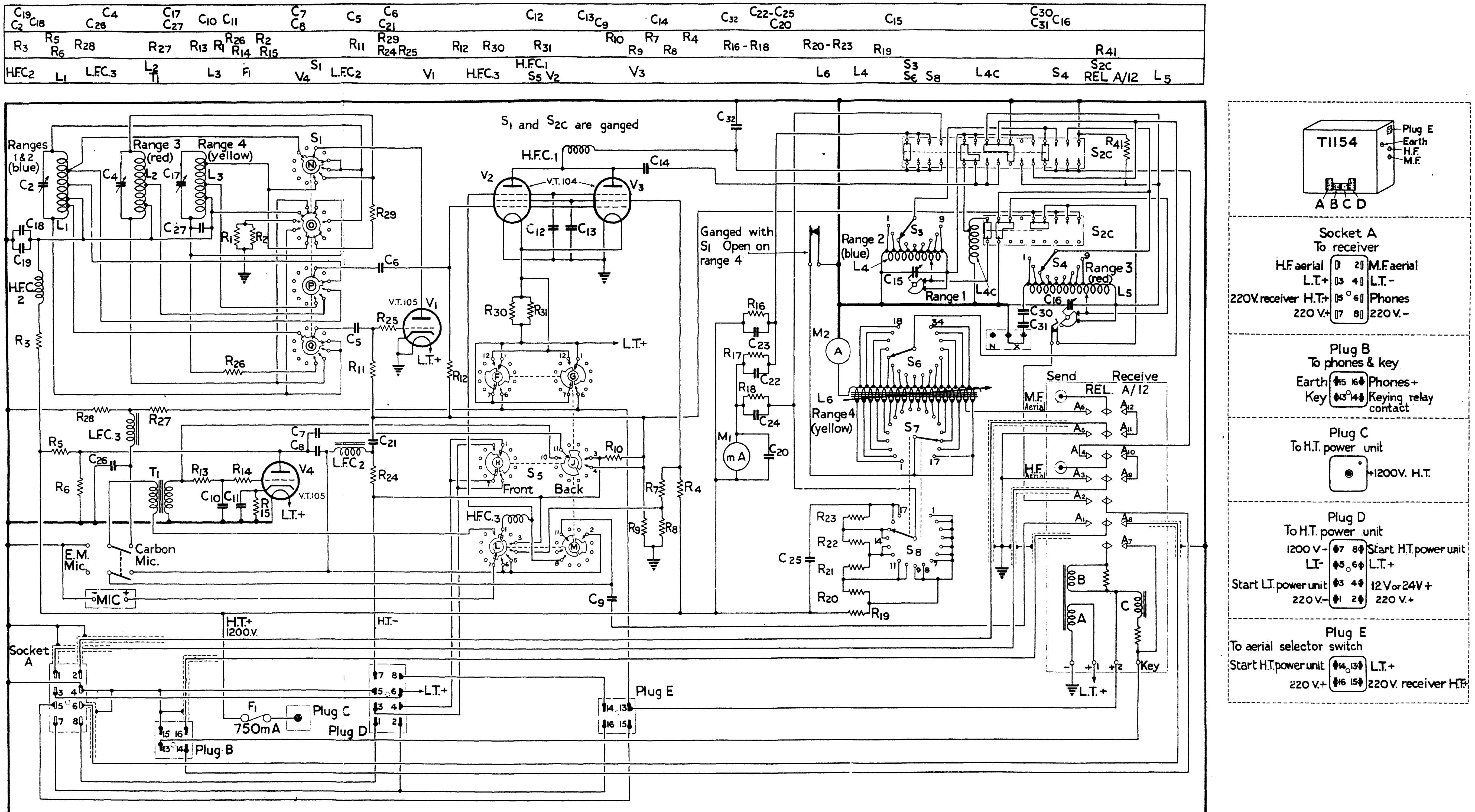

Note: S1 and S5 shown in extreme anti-clockwise position
Socket & plugs as viewed from front of transmitter.

FIG. 4

CIRCUIT OF T. 1154 C, F, H, K, & M

FIG. 4

To face para. 36

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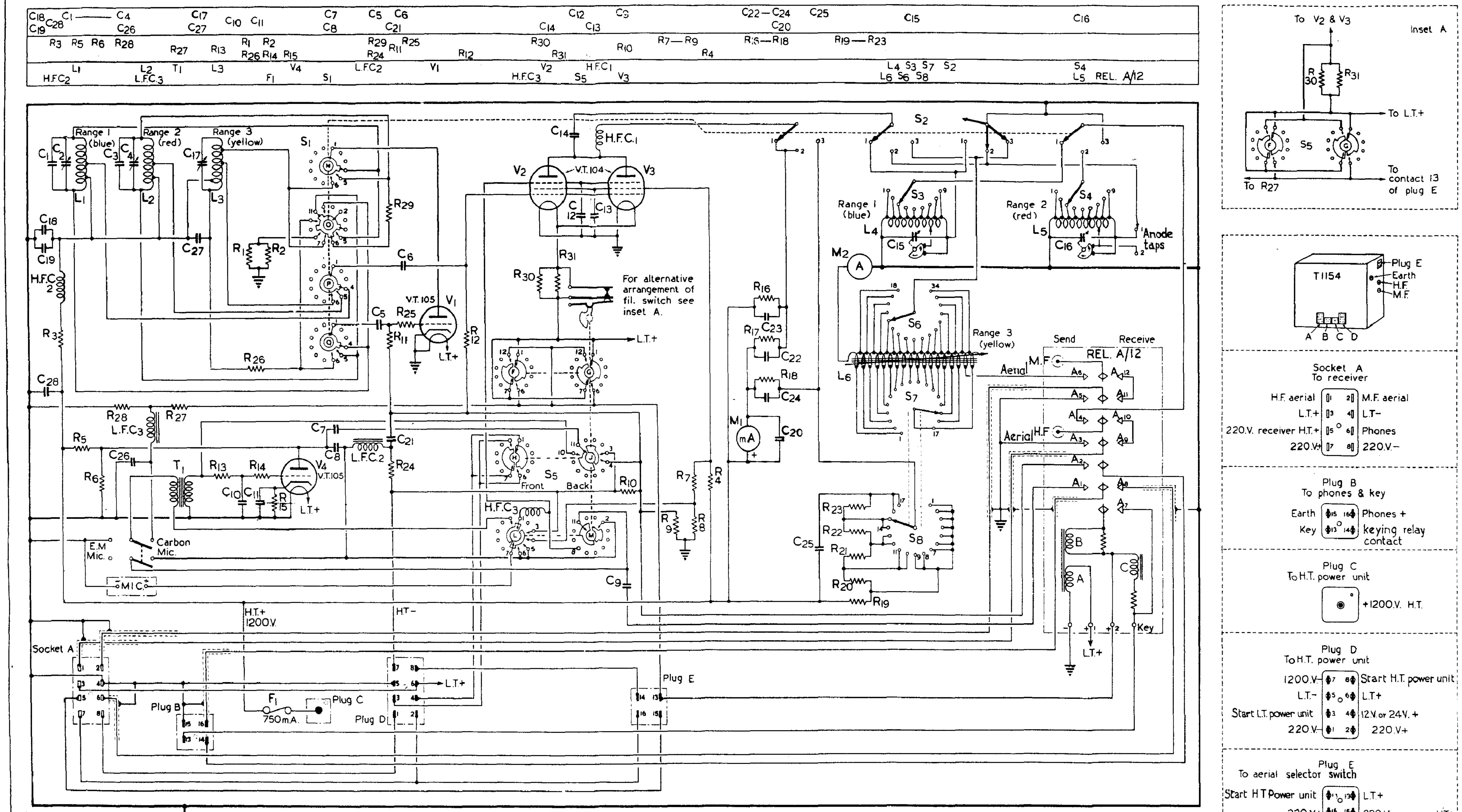

Note. S1 and S5 shown in extreme anti-clockwise position.
Socket & plugs as viewed from front of transmitter.

FIG. 5 CIRCUIT OF T1154, T1154B, D, J, AND N FIG. 5

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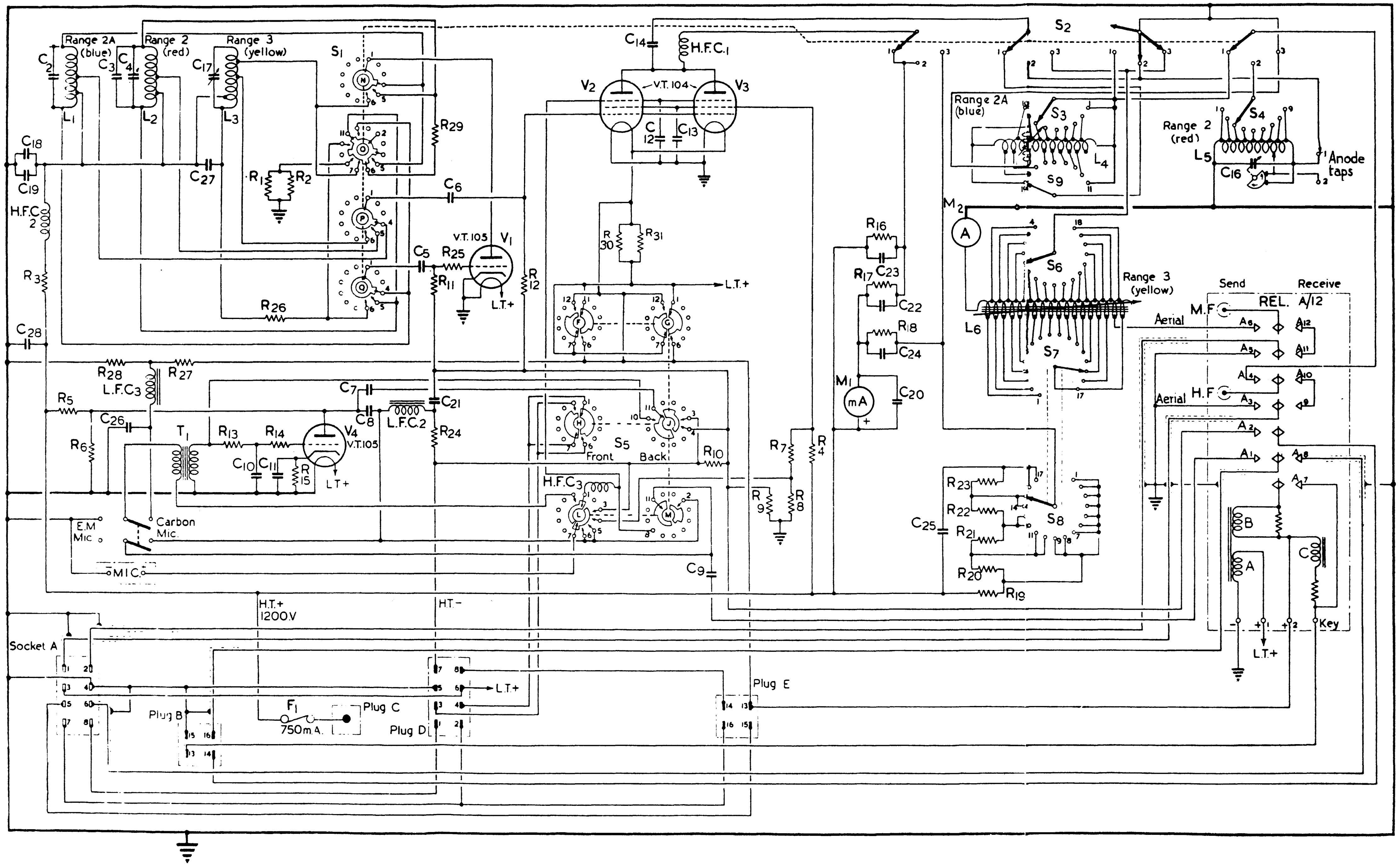
C18 C19 C28	C2—	C4 C26	C17 C27	C10	C11	C7 C8	C5	C6 C21	C14	C12	C13	C9	C22—C24 C20	C25			C16	
R3	R5 R6	R28	R27	R13	R1 R2 R26 R14 R15	R29 R24	R11 R25	R12	R30 R31	R10	R7—R9	R4	R16—R18	R19—R23				
H.F.C2	L1	L2 L.F.C.3	T1	L3	F1 V4	S1	L.F.C2	V1	H.F.C3 V2	S5 H.F.C1	V3		L4 L6 S3 S6	S8	S2 S7 S9		S4 L5	REL A/12

Note. S_1 and S_5 shown in extreme anti-clockwise position. Socket & plugs as viewed from front of transmitter.



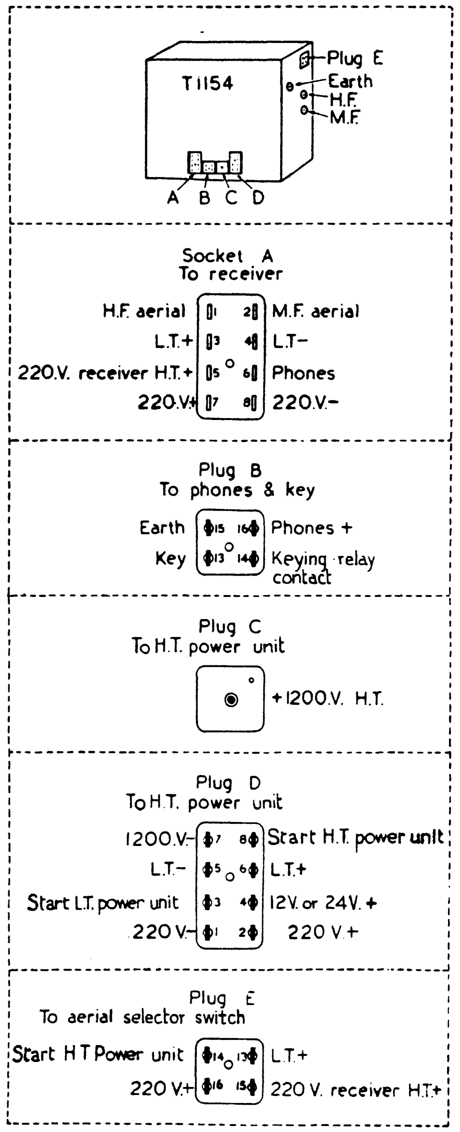


FIG. 6 CIRCUIT OF T1154L FIG. 6

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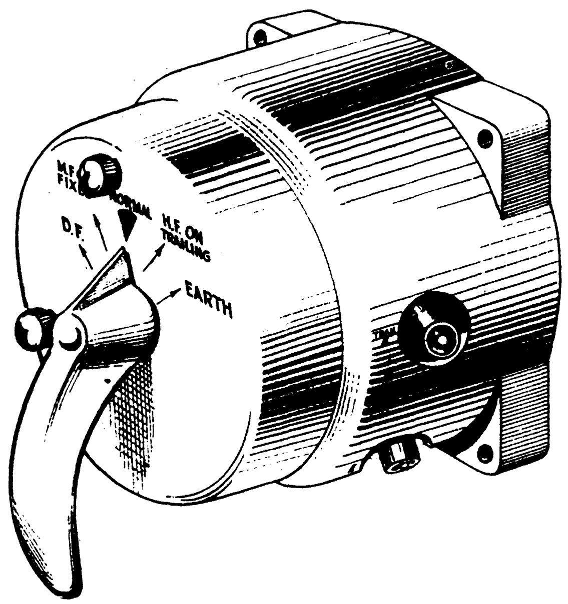
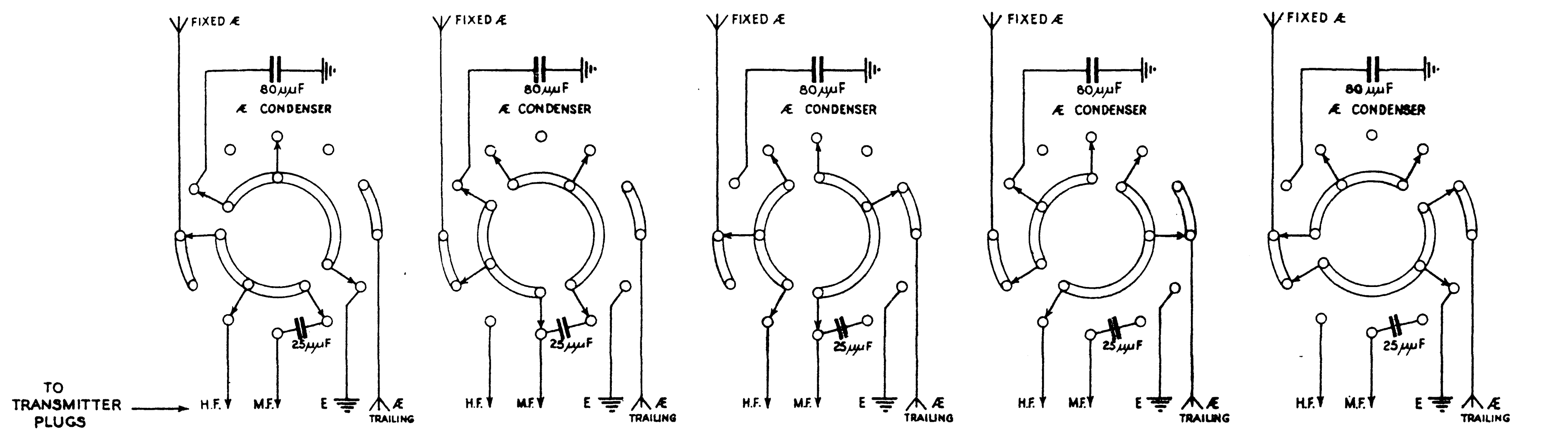
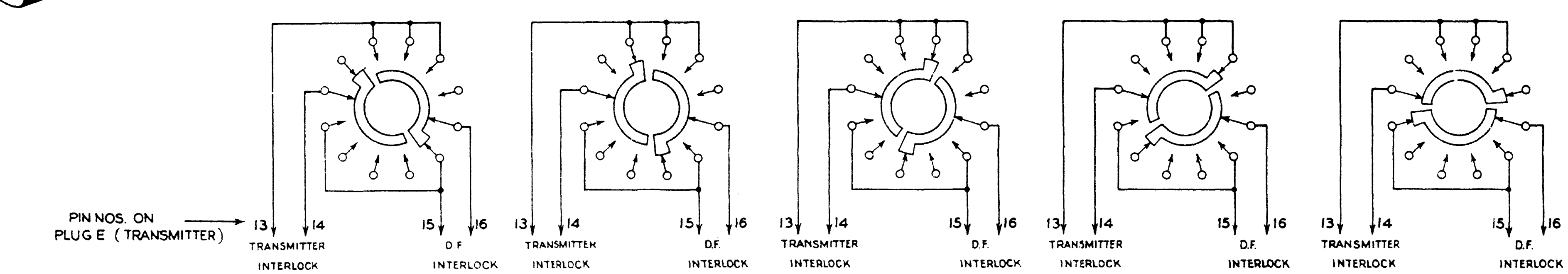




POSITION OF MAIN SWITCH



POSITION OF AUXILIARY SWITCH GANGED TO MAIN SWITCH

AERIAL SWITCHING UNIT, Type J
THEORETICAL CONNEXIONS

D.F. POSITION 1	M.F. ON FIXED POSITION 2	NORMAL POSITION 3	H.F. ON TRAILING POSITION 4	EARTH POSITION 5
MAIN SWITCH	MAIN SWITCH	MAIN SWITCH	MAIN SWITCH	MAIN SWITCH
FIXED Æ TO H.F. & M.F.	FIXED Æ TO M.F. & Æ LOADING CONDENSER	FIXED Æ TO H.F. TRAILING Æ TO M.F.	TRAILING Æ TO H.F.	FIXED & TRAILING Æ'S TO EARTH
AUXILIARY SWITCH	AUXILIARY SWITCH	AUXILIARY SWITCH	AUXILIARY SWITCH	AUXILIARY SWITCH
TRANSMITTER INTERLOCK OPEN CIRCUIT	TRANSMITTER INTERLOCK CLOSED CIRCUIT	TRANSMITTER INTERLOCK CLOSED CIRCUIT	TRANSMITTER INTERLOCK CLOSED CIRCUIT	TRANSMITTER INTERLOCK OPEN CIRCUIT
D.F. INTERLOCK CLOSED CIRCUIT	D.F. INTERLOCK OPEN CIRCUIT	D.F. INTERLOCK OPEN CIRCUIT	D.F. INTERLOCK OPEN CIRCUIT	D.F. INTERLOCK CLOSED CIRCUIT

FIG. 8

FIG. 8

REPRINT PP5014 M42902/73M/C 12/47 1600 C & P Gp. 959(4)