The VMARS Archive

VMARS is a not-for-profit organisation specialising in all types of vintage communications electronics. We maintain an archive of documentation to help our members understand, research, repair and enjoy their vintage radio equipment. Access by non-members is extended as a gesture of goodwill, but not as a right.

Rare documents are frequently provided free of charge by VMARS members, and all scanning and document processing is carried out on a voluntary basis. Accordingly, we do not expect others to profit from the hard work of volunteers, who give their time freely without charge.

This is a gentle reminder that the document attached to this notice is provided to you **for your personal use only**. This edition remains copyright of VMARS, and while you may sell or give your copy to someone else, this right does not extend to making further copies of this information, either to give or sell to others. This includes a prohibition on placing it on websites, or printing it for sale at rallies, boot fairs or similar public events. **If our goodwill is abused, then withdrawal of public access to our archive will be the result.**

Please refer anyone else wanting a copy back to VMARS – either to our website at http://www.vmars.org.uk/ or by email to the Archivist at archivist@vmarsmanuals.co.uk. If you want to know more about our copyright, please see the FAQ below.

FAQ on copyright of VMARS documents

Q How can you copyright a document that is already in the public domain?

A. *Plainly the original copyright of the content has expired, or we have obtained permission to copy them. What we copyright is our own edition of the document.*

Q. Surely your "own edition" is identical to the original document, so cannot be copyrighted?

A. *Our editions are **not** identical to the original document. You will find that full advantage has been taken of electronic publishing facilities, so pages are cleaned up where possible (rendering them better than originals in some cases!), and large diagrams are prepared for both on-screen viewing and for easy printing at A4 format.*

Q. Why do you not just give your manuals away, as so many do via the internet these days?

A. *We do make all our manuals available free of charge (in soft copy) to VMARS members. These members have already covered the costs of running the archive via their subscriptions. The only time members are charged for copies is when they request them on paper, in which case charges are restricted to the cost of paper, ink and postage.*

The VMARS archive is not a "shoe-string" operation. Money is spent on computing facilities to make copies available, and on shipping original documents securely (usually costing several pounds per shipment) to carry out the scanning. As members have already contributed to these costs, it is only reasonable that non-members should do likewise – and thus a very moderate charge is levied for copies provided to non-members. With typical commercial photocopying charges starting at 5 pence per A4 side, it will be evident that paying 4 pence for our equivalent on paper is excellent value (amounts current at Spring 2004). We also think "you get what you pay for" – we invite you to make the comparison and draw your own conclusions!

Despite the above, we will be making copies of essential technical information (circuit diagram, parts list, layout) freely available to all via our website from late 2004 onwards. This will be done to try and encourage and enable the maintenance of our remaining stock of vintage electronic equipment.

Guidance on using this electronic document

Acrobat Reader version

You need to view this document with Acrobat Reader **version 5.0** or later. It is possible that the document might open with an earlier version of the Acrobat Reader (thus allowing you to get this far!), but is also likely that some pages will not be shown correctly. You can upgrade your Acrobat Reader by direct download from the internet at http://www.adobe.com/products/acrobat/readermain.html or going to http://www.adobe.com/ and navigating from there.

Printing the document on A4 paper

You should note first that virtually all original documents are in double-sided format, i.e. printed on both sides of the paper. Accordingly, our copies are similarly double-sided., and the best results are obtained if the document is printed double-sided. You can print out on one side only, but you will find that you get a number of blank sheets (which can just be removed and reused), and where margins vary in width between left-hand and right-hand pages, there is a danger of the text disappearing into the binding of your printed copy.

This document is of fairly simple format in that it can be made to print out using an A4 format printer (this is the common paper size available in UK and Europe, which measures 29.7cm by 21.0cm). By "simple" I mean that there are no large diagrams on fold out sheets, which will require multiple A4 pages to print out at full size.

Original document sizes do vary a lot – from the small manuals, which approximate to A5 size (21.0 x 14.8 cm) up to the now obsolete foolscap size (21.6 x 33.0 cm). US documents tend to use their "letter" size paper (21.6 x 27.9 cm). All these sizes can be printed on A4 paper by simply getting Acrobat to shrink or enlarge the pages as necessary. This is done as follows:

1. Select "File – Print" or click on the printer icon. This will bring up the print dialog box.
2. Select the correct printer if necessary.
3. Select the pages you want to print – even if you want to print all of the document, you will probably not want to print this notice and help page, so start the printing at page 3.
4. In the "Page Handling" area, next to "Page Scaling", select "Fit to paper". The press "OK"

Printing the document on an US Letter format printer

Since A4 and US Letter sizes are similar, it is expected that this document should print satisfactorily on the latter format paper. This has not been tested however, and is not guaranteed. Follow the steps as for A4 printing, and make doubly sure that "Fit to paper" is selected (step 4).

Any other problems?

Please get in touch with me at archivist@vmarsmanuals.co.uk.

Richard Hankins, VMARS Archivist, Summer 2004

SECRET

March, 1941.

Reprinted August, 1943.

S.D. 0230 (1)

Copy No. 42

RECEIVER R.1147

(C50057)

The amendments promulgated in the under-mentioned Amendment Lists have been made in this publication.

Amendment List.		Amendments made by	Date.
Number.	Date.		

SECRET

S.D. 0230 (1)

Copy No. 42

RECEIVER R.1147

CONTENTS

LIST OF ILLUSTRATIONS

RECEIVER R.1147

INTRODUCTION

1. The receiver, type R.1147, has been designed to supersede the R.1110 previously employed in aircraft of the Fleet Air Arm for the reception of S.F. modulated V.H.F. homing signals from rotating beacon transmitters. The frequency coverage is from 180 to 220 Mc/s, and the signal range up to 100 miles when the aeroplane altitude permits of an optical radiation path. Provision is made for operation of the receiver either directly, or from one or two remote control positions. The remote control positions are equipped for on-off switching, tuning and volume control.

2. The circuit, which is of the superheterodyne type, employs seven valves, namely a pentode frequency changer with a triode beating oscillator, two pentode I.F. amplifiers operating at 25 Mc/s, a double-diode-triode acting as I.F. detector, heterodyne oscillator and A.F. detector, and two pentode valves acting as S.F. and A.F. amplifiers respectively.

3. The receiver is normally used with a quarter-wavelength fixed aerial, connected through a concentric feeder cable, though in an aeroplane previously fitted with a receiver, type R.1110, the existing aerial may continue to be used. The power supply is obtained from a power unit operating off a 12-volt or 24-volt aeroplane battery, and consuming 36 watts.

4. The dimensions of the receiver are approximately 11 in. by $9\frac{3}{4}$ in. by $6\frac{3}{8}$ in., and its weight is 9 lb. The power unit weighs 13 lb. and its dimensions are 11 in. by $9\frac{3}{4}$ in. by $6\frac{3}{8}$ in. The weight of the auxiliary equipment, including one or two remote control positions, is approximately 2 lb. or 4 lb. respectively, excluding cabling. A general view of the equipment is given in fig. 1.

GENERAL DESCRIPTION

5. The theoretical circuit diagram of the receiver is shown in fig. 2. The V.H.F. signals from the aerial/earth socket SK_1 are applied to the inductance L_1, which is inductively coupled to the grid inductance L_2, of the valve V_1. This coil, which is tuned by the split stator condenser C_2, has its centre tapping connected to earth through the inductance L_3 and the resistance R_1, which is by-passed by the condenser C_1. The plug P_1 is fitted for the connection of a suppressor unit if required.

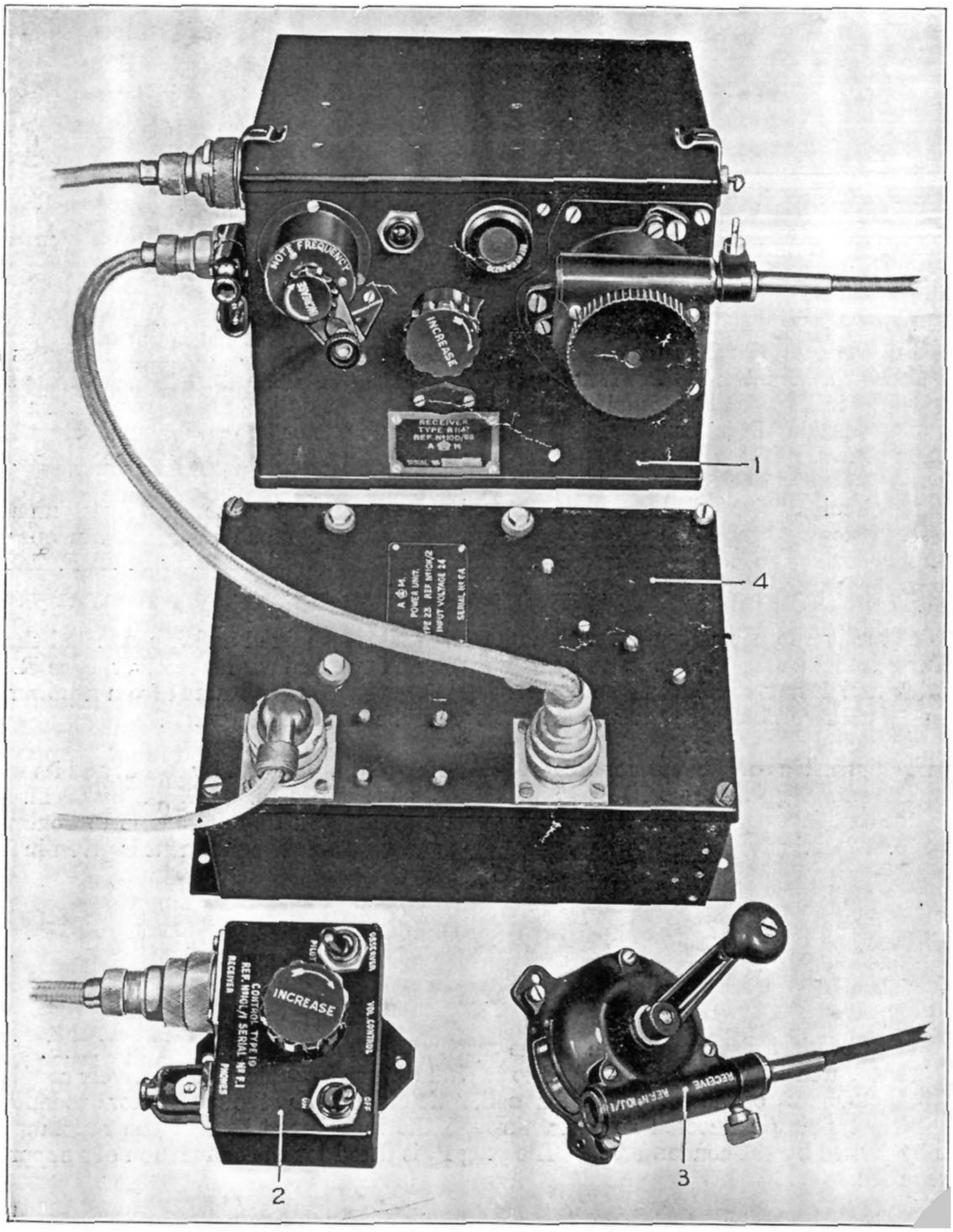


FIG. 1.—GENERAL VIEW OF EQUIPMENT.

6. The inductance L_3 is inductively coupled to the anode and grid inductances L_4 and L_5, of the series-fed split Hartley oscillator valve V_2. These latter inductances are tuned by the split stator condenser C_8, which is ganged to C_2. The condenser C_4 couples the grid and anode coils. The design of the condensers C_2 and C_8 and the inductances L_2, L_4 and L_5 is such as to ensure that at all positions of the tuning control, the oscillator frequency differs from that of the L.C. grid circuit of the valve V_1, by 25 Mc/s. The valve V_2 is provided with grid bias by the grid leak R_3, and the H.T. supply is obtained *via* the resistances R_4 and R_2, the condenser C_6 acting as R.F. by-pass.

7. The total input voltage to the grid of the valve V_1 thus consists of that due to the V.H.F. signal mixed with that due to the oscillator valve V_2. Inter-action between the aerial and the oscillator is prevented by maintaining the inductance L_2 exactly balanced to earth with reference to its centre tapping. This is achieved by the condenser C_3, whose capacitance is equal to the grid-earth capacitance of the valve V_1.

8. The valve V_1 acts as first detector or frequency changer, and is biassed by the cathode resistance R_7, by-passed by the condenser C_{12}. The anode circuit consists of the primary winding of the I.F. transformer T_1, tuned to the intermediate frequency, namely 25 Mc/s, by the condenser C_9. The H.T. is supplied to the anode circuit *via* the decoupling resistance R_6 by-passed by the condenser C_5, and to the screening grid, *via* the resistance R_5 and associated condenser C_7.

9. The secondary winding of the transformer T_1 is tuned by the condenser C_{13}, and the whole assembly constitutes a mutual inductance-coupled band-pass filter, with a band width of approximately 500 kc/s. The I.F. output of this circuit is connected to the grid of the first I.F. amplifier valve V_3. This valve is of the variable-mu type, and gain control is obtained by the variation of the grid bias. The grid return is led through a decoupling resistance R_8, by-passed by the condenser C_{14}, to the volume control line.

10. The cathode and the suppressor grid of the valve V_3 are earthed, and the screening grid, which is by-passed by the condenser C_{16}, is connected to a potentiometer, comprising the resistances R_9 and R_{10}. The anode circuit, which is supplied with H.T. through the resistance R_{11} by-passed by the condenser C_{15}, is loaded by the band-pass filter circuit consisting of the transformer T_2, whose primary and secondary windings are tuned by the condensers C_{17} and C_{19}, respectively.

11. The circuit of the second I.F. amplifier valve V_4, resembles that of V_3, being driven by the secondary winding of the transformer T_2, and biassed from the volume control line through the decoupling resistance R_{12}, by-passed by the condenser C_{20}. The supply circuits comprise the anode decoupling resistance R_{15} and condenser C_{21}, the screening grid potentiometer resistances R_{13} and R_{14} and the by-pass condenser C_{22}.

12. The anode circuit comprises the band-pass transformer T_3, tuned by the condensers C_{23} and C_{26} on the primary and secondary sides respectively, and the secondary load, consisting of the diode detector V_{5a} which forms part of the double-diode-triode valve V_5. This detector is loaded by the resistance R_{16}, and the output voltage, whose I.F. component is by-passed by the condenser C_{27}, is coupled through the condenser C_{32} to the control grid of the pentode valve V_6, the resistance R_{21} acting as grid leak.

13. The valve V_6 acts as an amplifier of the 20 kc/s modulation frequency, and is biassed by the cathode resistance R_{24}, by-passed by the condenser C_{36}; the screening grid, which is earthed by the condenser C_{33}, is supplied through the voltage dropping resistance R_{22}. The load in the anode circuit which is supplied with H.T. through the resistance R_{23}, by-passed by the condenser C_{34}, consists of the filter coil L_8, whose secondary winding is tuned to 20 kc/s by the fixed condenser C_{37} and the trimming condenser C_{35}.

14. The S.F. voltage developed across this tuned circuit is applied to the second diode V_{5c} of the valve V_5 through the inductance L_7, which is inductively coupled to the oscillator coil L_6 of the shunt-fed Hartley oscillator valve V_{5b} which also forms part of the valve V_5. The grid circuit is driven through the coupling condenser C_{31} and biassed by the grid leak resistance R_{18}. The anode circuit is tuned by the condenser C_{30}, the oscillation frequency being adjustable between the limits 20 kc/s and 23 kc/s by variation of the coil inductance produced by movement of the dust iron core, the stopper resistance R_{17} preventing parasitic oscillation. The H.T. supply which passes through the decoupling resistance R_{19} by-passed by the condenser C_{29}, is obtained *via* a plug P_2 which is used for disconnecting the oscillator if required for special purposes.

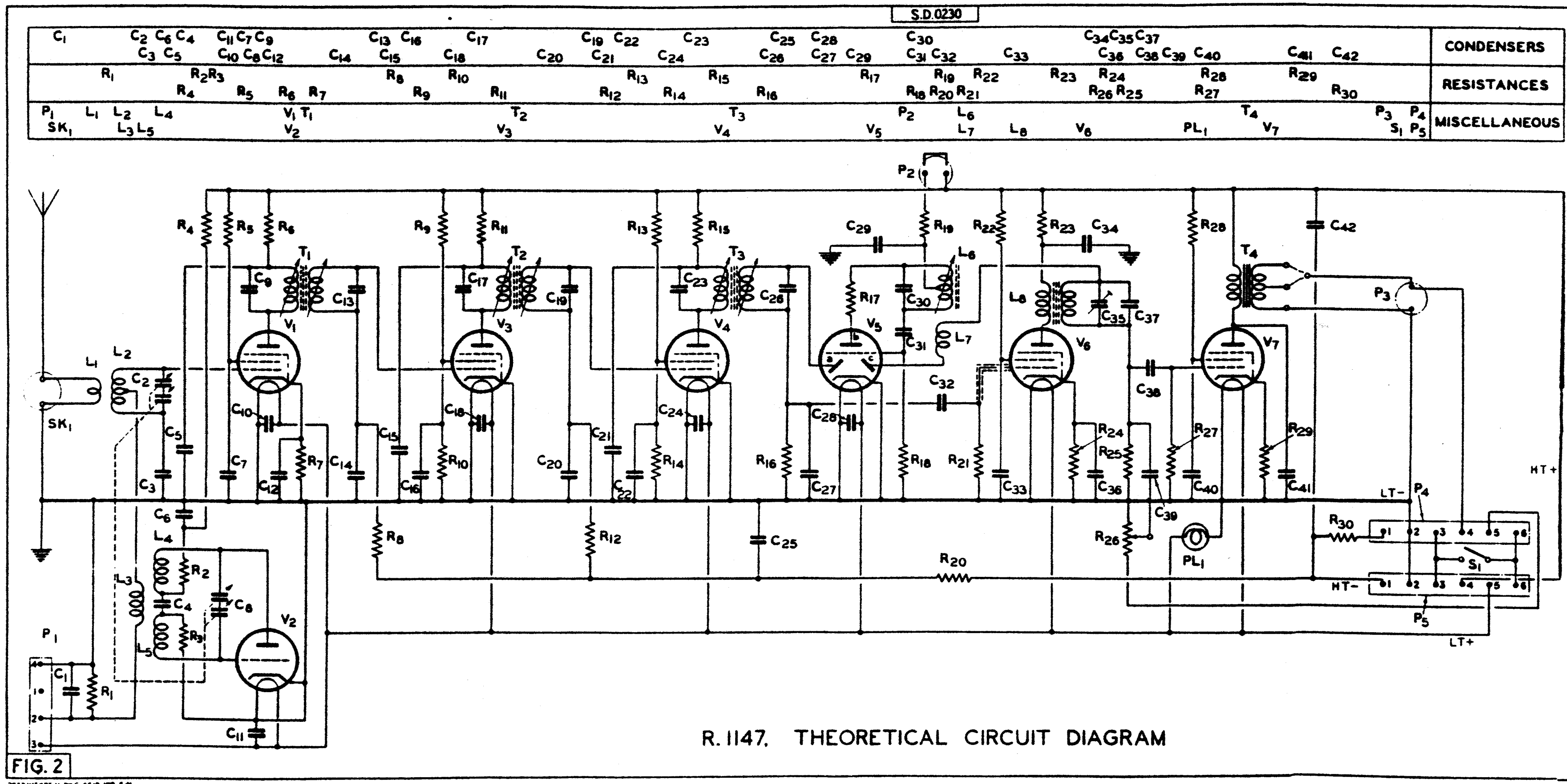
15. The output of the detector V_{5c} is of the heterodyne frequency, variable at will between the limits 0 and 3 kc/s, due to the difference of the frequencies of the S.F. modulation and S.F. oscillator. This A.F. detector output voltage is developed across the load resistance R_{25}, the S.F. component being by-passed by the condenser C_{39}, and is applied through the coupling condenser C_{38} to the grid of the pentode A.F. amplifier valve V_7, the resistance R_{27} acting as grid leak.

16. The valve V_7 is biassed by the cathode resistance R_{29}; the screening grid, which is earthed by the condenser C_{40}, is supplied through the voltage dropping resistance R_{28}. The transformer T_4 which provides the anode load, is fitted with the S.F. by-pass condenser C_{41}. It has a secondary winding which is tapped for matching either low resistance or high resistance phones. The selected tappings are connected to the plug P_3 in the receiver and to two terminals on the plug P_4, accommodating the connections to the remote control unit.

17. The heaters of the valves and the pilot lamp PL_1 are connected in parallel, one terminal of each being earthed and connected to terminal 2 of the supply plug P_5. The other heater terminal in each case is connected to terminal 5 of the plug P_5, the condensers C_{10}, C_{11}, C_{18}, C_{24} and C_{28} acting as by-passes for the heaters of the valves V_1 to V_5 respectively. The switch S_1, connected to terminals 3 and 6 of the plugs P_3 and P_4, serves to operate the starting relay Rel_1 in the power unit (*see* fig. 3).

18. Referring to fig. 3, it will be seen that the operation of either of the switches S_2 or S_4 will also complete the circuit of the relay Rel_1 from the aircraft battery, which is connected to the plug P_6, and thus complete the circuit from the battery, though the relay contacts and the chokes L_9 and L_{10}, which are by-passed by the condensers C_{43} and C_{45}, to the motor portion of the motor generator.

19. The L.T. output of the motor generator is connected to the receiver through the choke L_{14}, which is by-passed by the condenser C_{48}, the H.T. negative terminal being similarly connected through L_{12}, by-passed by C_{47}. The positive H.T. lead passes through a smoothing system comprising the A.F. choke L_{11} and the condensers C_{44} and C_{46}, and thence to the receiver through the R.F. choke L_{13}, which is by-passed by the condenser C_{49}.

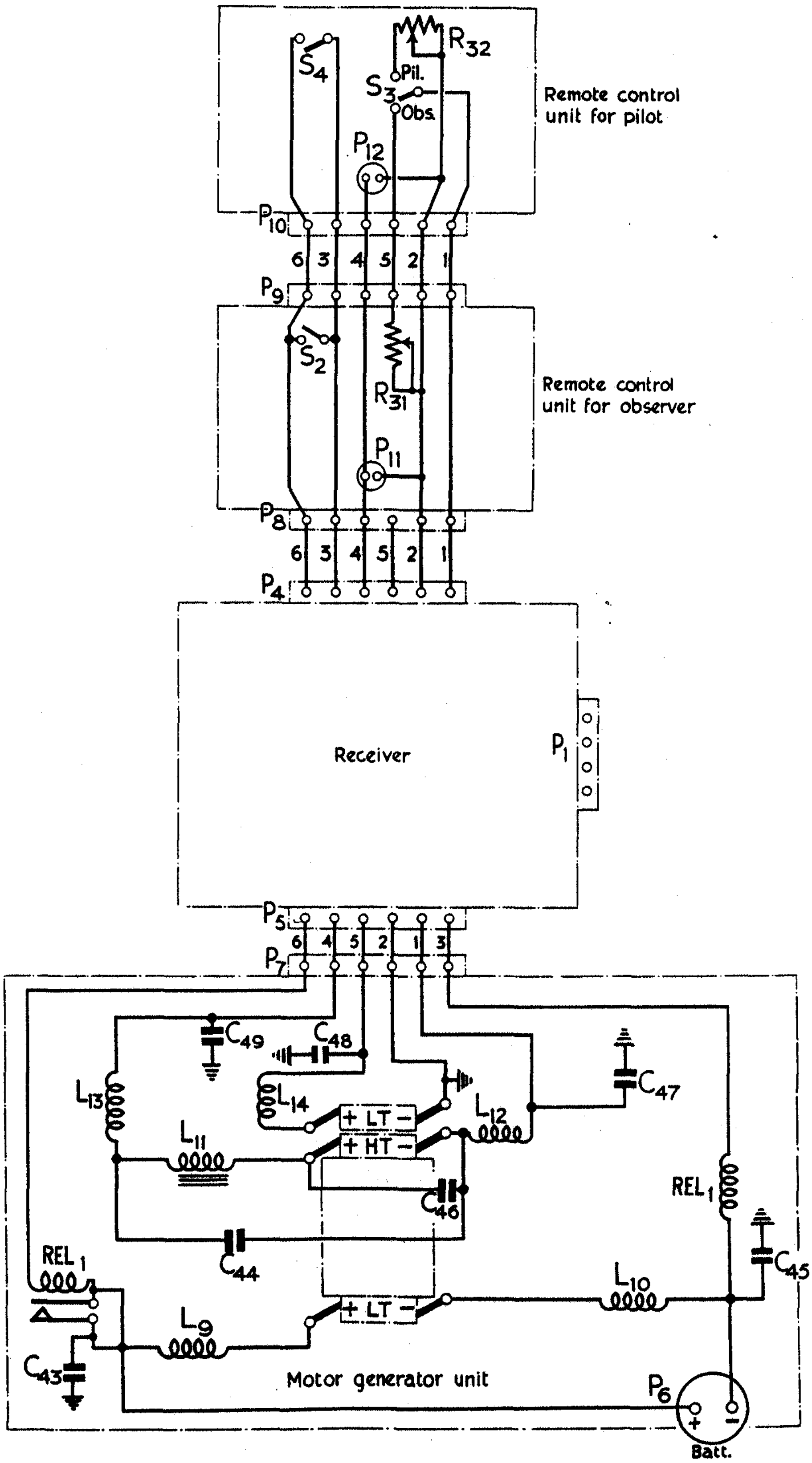


R. 1147. THEORETICAL CIRCUIT DIAGRAM

CONDENSERS		RESISTANCES	
C_1	50 μμF	R_1	0·5 M Ω
C_2	Variable	R_2	20,000 Ω
C_3	3·0 μμF	R_3	50,000 Ω
C_4	50 μμF	R_4	5,000 Ω
C_5	·002 μF	R_5	0·2 M Ω
C_6	·002 μF	R_6	5,000 Ω
C_7	·002 μF	R_7	10,000 Ω
C_8	Variable	R_8	0·1 M Ω
C_9	5·0 μμF	R_9	0·1 M Ω
C_{10}	50 μμF	R_{10}	0·2 M Ω
C_{11}	·002 μF	R_{11}	10,000 Ω
C_{12}	·002 μF	R_{12}	0·1 M Ω
C_{13}	5·0 μμF	R_{13}	0·1 M Ω
C_{14}	·002 μF	R_{14}	0·2 M Ω
C_{15}	·002 μF	R_{15}	10,000 Ω
C_{16}	·002 μF	R_{16}	0·1 M Ω
C_{17}	5·0 μμF	R_{17}	1,000 Ω
C_{18}	·002 μF	R_{18}	0·1 M Ω
C_{19}	5·0 μμF	R_{19}	30,000 Ω
C_{20}	·002 μF	R_{20}	0·5 M Ω
C_{21}	·002 μF	R_{21}	1·0 M Ω
C_{22}	·002 μF	R_{22}	0·1 M Ω
C_{23}	5·0 μμF	R_{23}	10,000 Ω
C_{24}	·002 μF	R_{24}	1,000 Ω
C_{25}	0·1 μF	R_{25}	1·0 M Ω
C_{26}	5·0 μμF	R_{26}	500 Ω Max.
C_{27}	50 μμF	R_{27}	2·0 M Ω
C_{28}	·002 μF	R_{28}	0·1 M Ω
C_{29}	·01 μF	R_{29}	300 Ω
C_{30}	·005 μF	R_{30}	100 Ω
C_{31}	500 μμF		
C_{32}	·001 μF		
C_{33}	·05 μF		
C_{34}	·25 μF		
C_{35}	·0.01 μF		
C_{36}	·25 μF		
C_{37}	·003 μF		
C_{38}	·002 μF		
C_{39}	500 μμF		
C_{40}	·25 μF		
C_{41}	·005 μF		
C_{42}	2·0 μF		

FIG. 2

S.D.0230



INTER-UNIT WIRING DIAGRAM

FIG.3 FIG.3

2927.WT47631/P&C C.4518. 150.5.41.
2927.

20. The incoming H.T. leads from the power unit are connected to terminals 1 and 4 of the plug P_5. Terminal 1, which is connected to the volume control line of the receiver through the decoupling resistance R_{20}, by-passed by the condenser C_{42}, is also connected to terminal 1 of the remote control plug P_4 through the resistance R_{30}. Terminal 1 of P_4 is normally connected through the remote control position to terminal 5 of P_4, thus establishing a path to earth for the H.T. negative return, through R_{30} and the variable resistance R_{26}, which acts as a volume control, the voltage drop across the resistances R_{30} and R_{26} being utilised to bias the valves V_3 and V_4.

21. The L.T. leads are connected to terminals 2 and 5 of P_5, the remaining terminals 3 and 6 of P_5 and P_6 being interconnected through the switch S_1, *see* fig. 2.

22. The H.T. — lead is connected through the choke L_{12}, by-passed by a condenser C_{47}, to the receiver volume control line, and thence, through the observer's remote control position, if fitted, to the switch S_3 in the pilot's remote control position. This switch enables the line to be connected to earth either through the pilot's volume control resistance R_{32} or to the observer's volume control resistance R_{31}. If the observer's remote control position is not fitted, the setting of the switch in the OBSERVER position connects the volume control on the receiver itself, which will in these circumstances be mounted in a position suitable for direct operation by the observer. The telephone sets, which are connected to the plugs P_{11} and P_{12}, are in parallel.

CONSTRUCTIONAL DETAILS

23. Referring to fig. 1, the receiver (1) is fitted in a metal case provided with a shock-absorbing mounting ; the hinged lids giving access to the two sides of the chassis are fixed by clips. The receiver is connected to the control unit (2) by six-core cable, and to the remote control tuner (3) by flexible shafting. The power unit (4) is connected to the receiver and to the aircraft battery.

24. An interior view of the topside of the receiver chassis is shown in fig. 4, the annotations mainly corresponding to those in fig. 2. At (1) is seen the tuning control for the S.F. oscillator, and the locking device (2). At (3) is a shading disc for varying the inductance of the coil L_4, and at (4) the screws for adjusting the dust iron cores of the I.F. transformers. These are locked by detent plates secured by spring washers. The lid, which is not seen in the illustration, is fitted with a sponge rubber pad for insulating the grid connections of the valves V_5, V_6 and V_7. The coupling (5) is fixed by screws to the shafts of the tuning panel of the variable condensers.

25. In the underside view of the chassis, fig. 5, the casing of the transformer T_1 is shown removed, exposing the coils (1) and the electrostatic screen (2) which separates them. The bracket (3) retains the fixing screw of the case. The tuning head is in three parts, the centre portion (4) which contains the scale, is fixed by three screws (5) and the upper portion (6), containing the cable entries, is fixed by the screws (7). The knob is held in position by a grub screw.

26. An interior view of the power unit is given in fig. 6, which is annotated in accordance with fig. 3. The components are mounted in the lid of the unit, which is fixed by four screws to the case. Bench wiring diagrams of the receiver and of the power unit are given in figs. 7 and 8 respectively.

VALVES AND POWER SUPPLY

27. The seven valves used in the receiver comprise three acorn pentode valves, type V.R.95, one being used as a frequency changer and two as I.F. amplifiers. An acorn triode valve, type V.R.59 acts as V.H.F. oscillator, a double-diode-triode valve, type V.R.55, as detector oscillator, and two pentodes, type V.R.56, as S.F. and A.F. amplifiers. The power supply, namely 1·2 amps. at 6·3 volts, and 20 mA at 200 volts, is obtained from the power unit, which consumes 3·0 amps. at 12 volts, or 1·5 amps. at 24 volts.

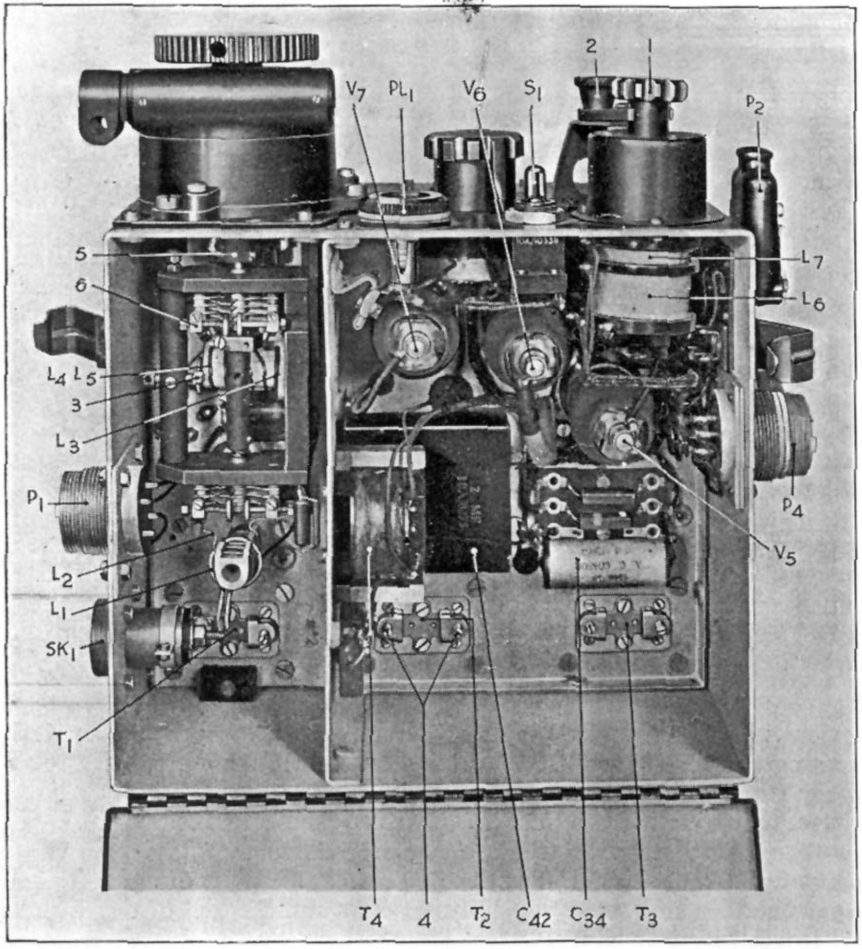


FIG. 4.—TOPSIDE OF RECEIVER CHASSIS

INSTALLATION

28. When installing the receiver, type R.1147, a position should, if possible, be selected near the observer's seat, giving access to the controls. The tuning head may be removed, after detaching the three screws retaining the centre position, and the coupling to the variable condenser shaft, and replaced in the position giving the observer the best view of the scale markings. The upper portion of the head may then be removed after detaching the knob, and replaced in the position giving the straightest run to the pilot's position, for the control cable.

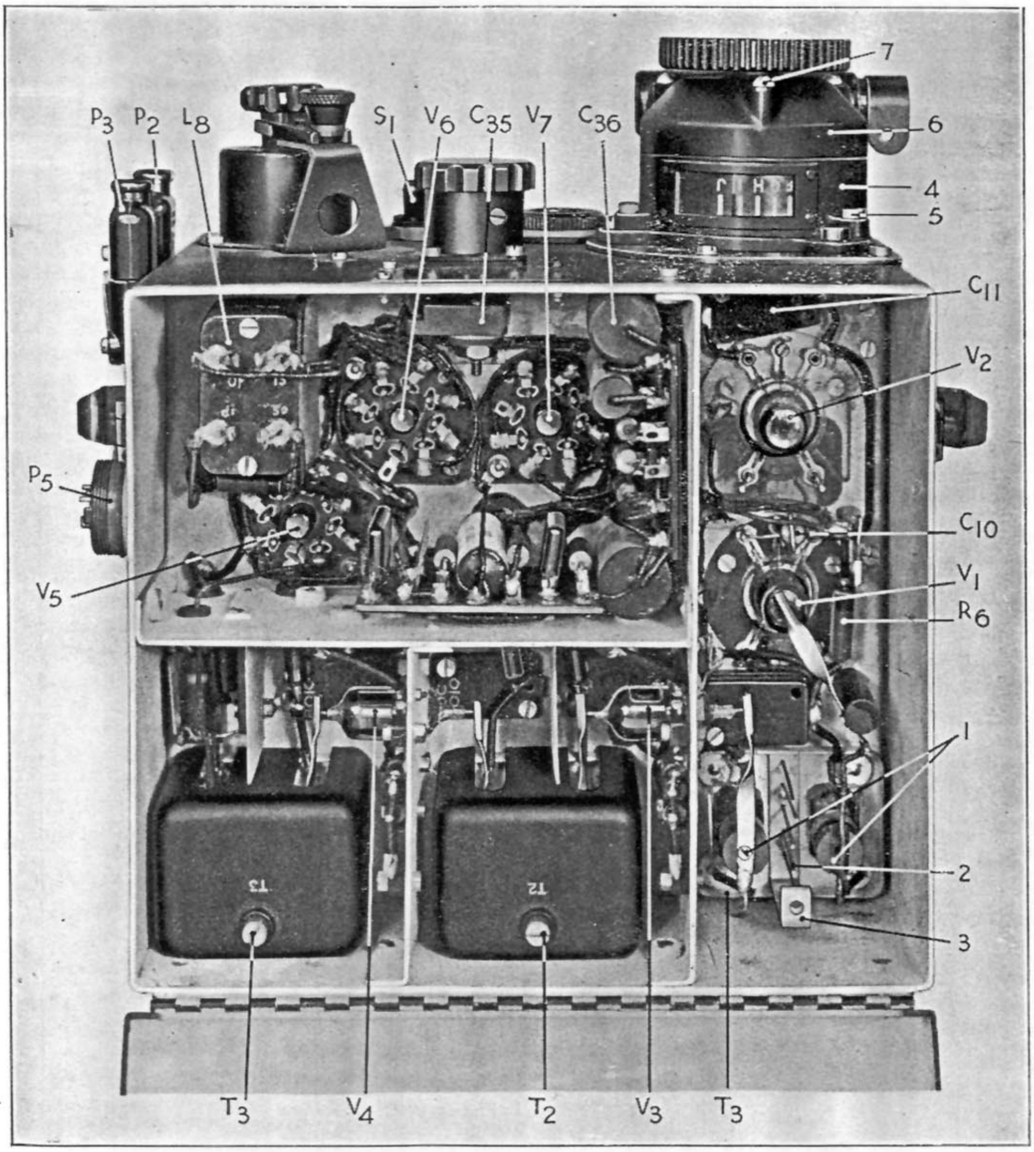


FIG. 5.—UNDERSIDE OF RECEIVER CHASSIS.

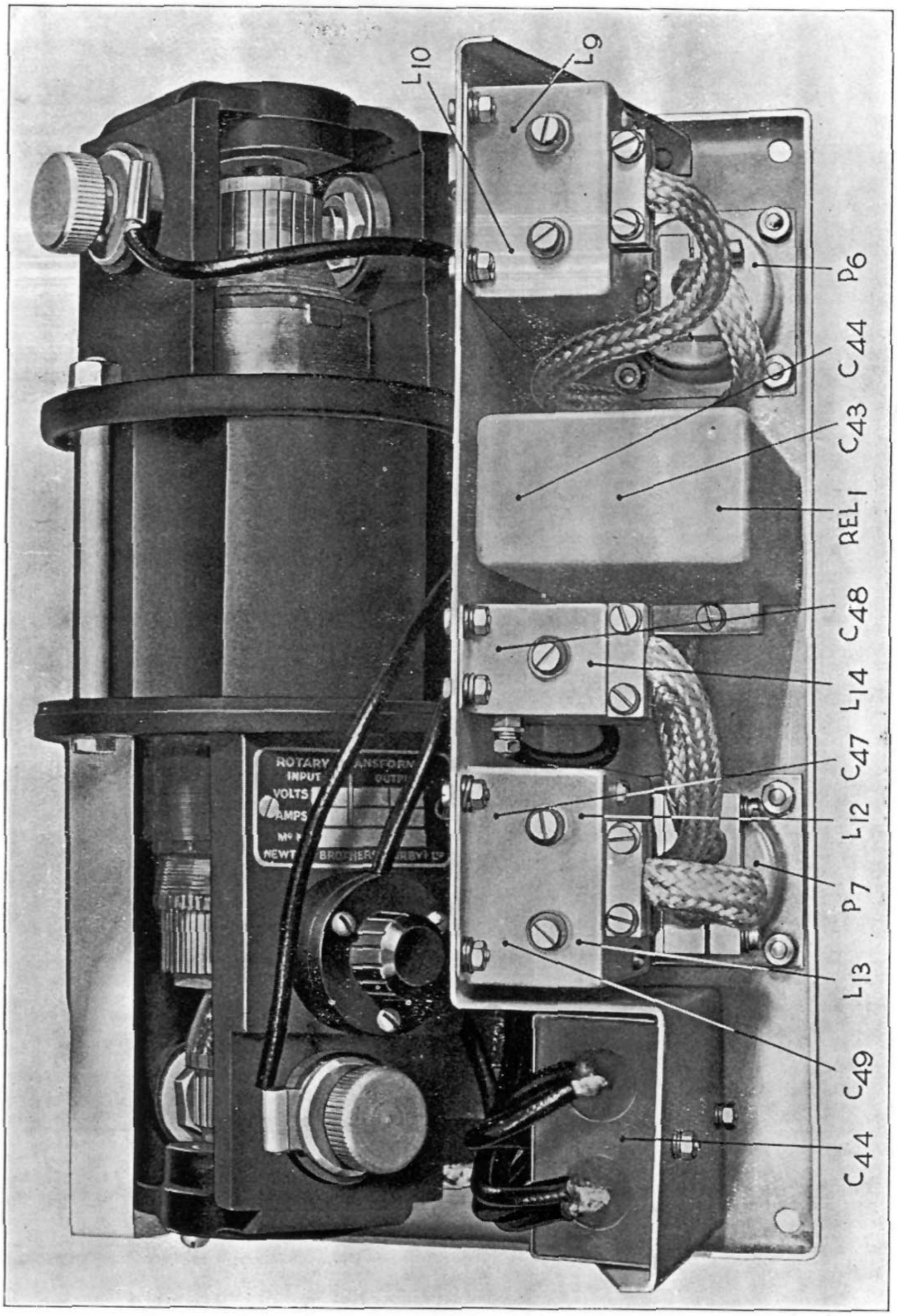


FIG. 6.—INTERIOR VIEW OF POWER UNIT.

29. If the scale portion of the tuning head is removed, the receiver must be tuned in to a transmitter, and the tuning head must be adjusted so that its scale marking corresponds to the transmitter frequency, before the coupling between the tuning head and the variable condenser spindle is locked in position. The screws of the coupling should then be fixed tightly in position, to avoid any slipping which would render the calibration scale useless.

30. Where there is no possibility of making the receiver controls accessible to the observer, it will be necessary to instal an additional controller, type H.1, and a control unit, type 20, in a position accessible to the observer. The upper portion of the tuning head of the receiver may need to be adjusted, but the scale portion may be left as fitted.

31. When installing the flexible control cable, the layout should be such that the minimum length of cabling is used, but at the same time any bends necessary must be as few in number, and of as large a radius, as possible. All remote tuning heads should be set up so as to give the best visibility of the scale, and the straightest cable run, as described previously. The casing should be securely fixed in position. Care must be taken that all the tuning dials are installed to give the same reading as that on the receiver, whose alignment was dealt with in an earlier paragraph.

32. The power unit may be installed in any convenient position adjacent to the aeroplane battery and to the receiver. It should be ensured that the marked voltage corresponds with that of the aeroplane battery. The sextomet cable interconnecting the receiver, the power unit and the remote control units, should then be installed. The remote control units should be installed as near as possible to the tuning heads. The inter-unit wiring is shown in fig. 3. When a remote control unit, type 20, is installed for the observer, terminal 5 of the receiver remote control plug is left unconnected leaving the volume control on the receiver inoperative. In other conditions, the receiver plug is connected directly to the pilot's remote control, similarly numbered plugs on both units being interconnected. The phones are terminated in sockets, type C, fitted into plugs, type C, on the receiver or remote control units.

33. The suppressor plug P_1 on the receiver will normally be capped off and left unconnected. Instructions will be promulgated later should it be deemed necessary to fit additional suppression equipment thereto.

34. The receivers are normally wired for high impedance phones; where low impedance phones are to be installed, the lead normally fitted to the centre terminal of the output transformer T_4 should be moved to terminal T_2. One socket, type C, should have its contacts internally short circuited, and should be inserted in the plug P_2 (HET.OSC.) on the receiver.

OPERATION

35. To set up the receiver before flight, the receiver should be switched on and, after the lapse of between 20 and 30 seconds, should be tuned to a nearby transmitter, preferably using the tuning control mounted on the receiver itself. A check should be made that the marking of the tuning dial corresponds to the channel letter of the transmission received. The volume should be adjusted to a suitable value by means of the volume control resistance R_{27}, and the pitch of the note regulated by means of the TONE control to approximately 1,000 c/s or to the frequency preferred by the operator. The receiver should then be switched off. This demands the use of the same switch at which the receiver was switched on.

36. About 30 seconds before putting the receiver into service, the equipment should be switched on by means of one of the switches mounted in the remote control units, or at the receiver itself. If a retractable aerial is fitted, this should be extended to the service position. The PILOT-OBSERVER switch in the pilot's remote control position should normally be set in the OBSERVER position unless for any reason the pilot wishes to operate the equipment.

37. The tuning control should then be set to the letter corresponding to the channel of the transmitter to be received. The width of the range lines on the tuning controls corresponds to the I.F. band width of the receiver, and signals should therefore be received provided the black cursor lines on the transparent windows of the tuning controls registers with any part of the orange line corresponding to the required channel.

38. The volume control should then be set to such a value that the phones are not overloaded when the signal reaches its maximum value. The use of the receiver for navigational purposes is dealt with in the appropriate publications.

39. When the receiver is in operation, signals will be heard in all the phones plugged into the sockets; the volume may be controlled either by the pilot or the observer according to the setting of the PILOT-OBSERVER switch at the pilot's control position.

40. When the receiver is no longer in use, the aerial should be retracted and the set switched off, using the switch previously employed to switch on.

PRECAUTIONS AND MAINTENANCE

41. The receiver should be left in good clean condition throughout. The plugs should periodically be cleaned with clean cloth, free from fluff and moistened with carbon tetrachloride. The interior should be freed from dust by blowing with clean, dry compressed air, and at the same time all valve connections should be cleaned with carbon tetrachloride as previously described. In cleaning the sockets, the liquid should be applied with a splinter of wood. The acorn valves and their mountings should be wiped with a clean, dry cloth to ensure that they are free from any traces of dirt, grease or moisture. The trimmers (6), fig. 4, should not be touched.

42. During cleaning, great care must be taken not to distort the coils and condensers in the circuits of the valves V_1 and V_2, especially the inductance adjusting device of the oscillator coil. Similar care is necessary to avoid any movement of the core adjustments of the I.F. transformers T_1, T_2 and T_3. The covers of these transformers should only be removed for cleaning purposes, and carefully replaced, to avoid disturbing any of the adjoining connections.

43. The plugs and sockets of the inter-unit wiring should be cleaned as described in a previous paragraph. The tuning heads and their flexible cables need little attention other than periodic lubrication with grease. The power unit should periodically be cleaned internally to remove carbon dust, which may be removed by blowing with compressed air and wiping with a clean, dry cloth. If the commutators are dirty, they may be cleaned with fine glass paper applied below the brushes and drawn to and fro over the commutator surface. After this operation, all dust resulting from the operation should be removed by blowing. The brushes should be inspected by unscrewing their caps. If worn, they should be renewed. Care must be taken that they slide freely in their mountings. If not, they should be slightly reduced in size by rubbing with fine glass paper. The condition of the springs should also be checked, to ensure that the brushes bear firmly on the commutator surface. The caps of the brush mountings should be fixed tightly in position, and the relay contacts should be cleaned with carbon tetrachloride,

44. If the receiver fails to function in a satisfactory manner, the output voltages of the power unit should be checked. If these are low, the battery voltage should be checked, and the power unit inspected as described in the preceding paragraph. The resistances of the chokes and the insulation resistances of the condensers should be checked if one of the two outputs of the generator is absent. Any choke showing a disconnection, or any short-circuited condenser, should be renewed. Failure of the motor generator to start may usually be traced to a fault in the starting relay or in the controlling switches.

45. If no signals are received, and the controls and supply voltages are in order, the anode currents of the valves may be checked by removing the valves one at a time, and noting the difference in the total anode current of the receiver as each valve is removed. A milliammeter may be connected between pins 1 and 5 of the plug P_4 for this purpose. Average values of the anode currents of the valves with the volume control set at MAX. are as follows: for V_1, 1·5 mA; for V_2, 3 mA; for V_3 and V_4, between 2 and 3 mA; for V_5 (triode portion), 3 mA; for V_6, 3 mA, and for V_7, 7 mA. If the anode current of any valve differs materially from the value stated, the valve should be renewed unless it is the valve V_3 or V_4 which is at fault. On no account should either of these valves be renewed, as this will affect the lining-up of the I.F. stages. When one of these valves is suspected of being faulty, the receiver should be forwarded to a maintenance depôt for re-alignment.

46. Complete failure of anode current in all the valves may be due to a disconnection in a volume control resistance. A test should be made with the PILOT–OBSERVER switch set in the other position, which effects a substitution of the component. If this change corrects matters, the suspected component should be renewed.

47. Anode current failure may be due to a short circuit in a condenser, or to a disconnection in the wiring, and if renewal of a valve in a suspected circuit fails to give correct operation, the wiring and components should be tested for continuity, reference being made to the bench wiring diagram, fig. 7, and to the component values given in the table on fig. 2. No attempt should be made to dismantle the receiver, and in the event of a fault developing which it is not possible to trace by means of a continuity test and an inspection of the wiring, the receiver should be renewed, and sent to a maintenance depôt for a thorough overhaul.

S.D.0230

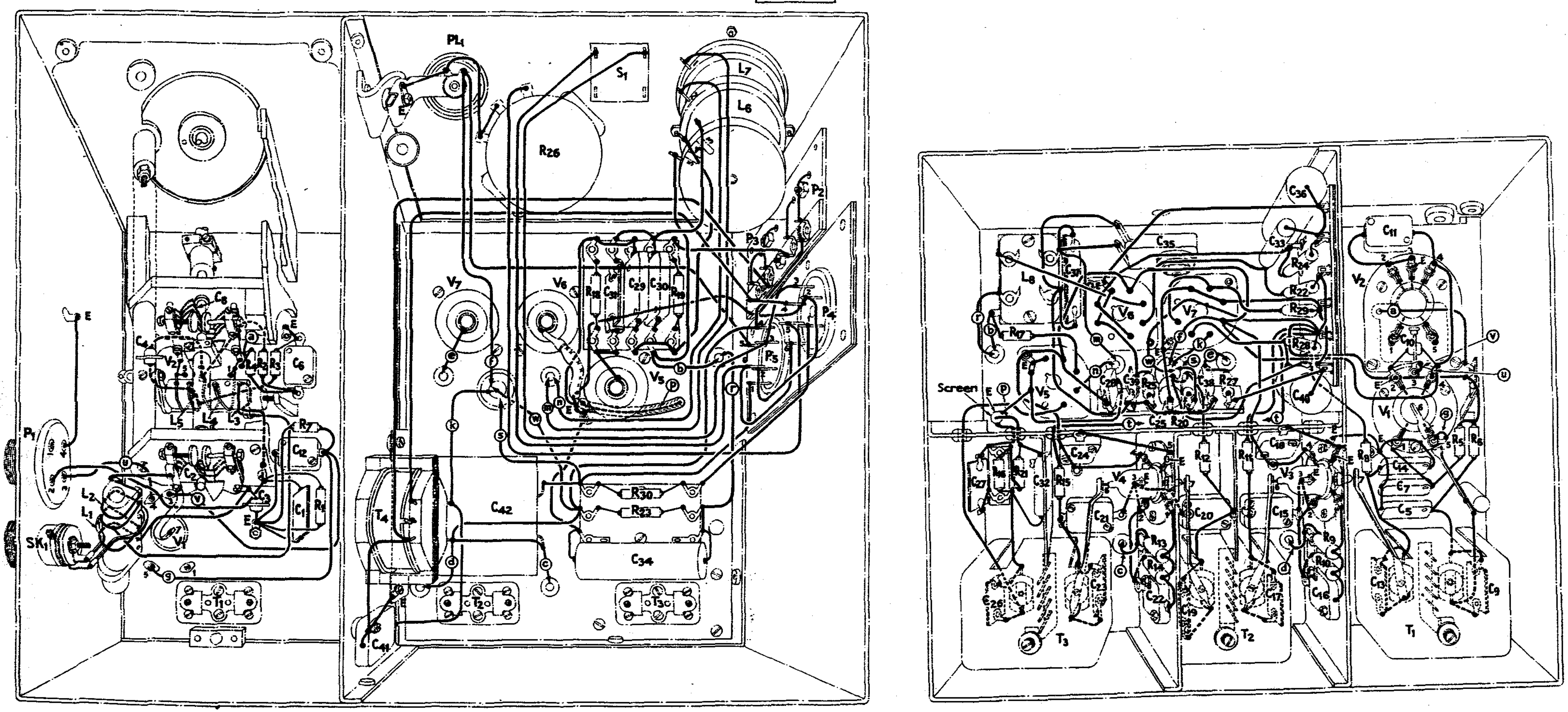
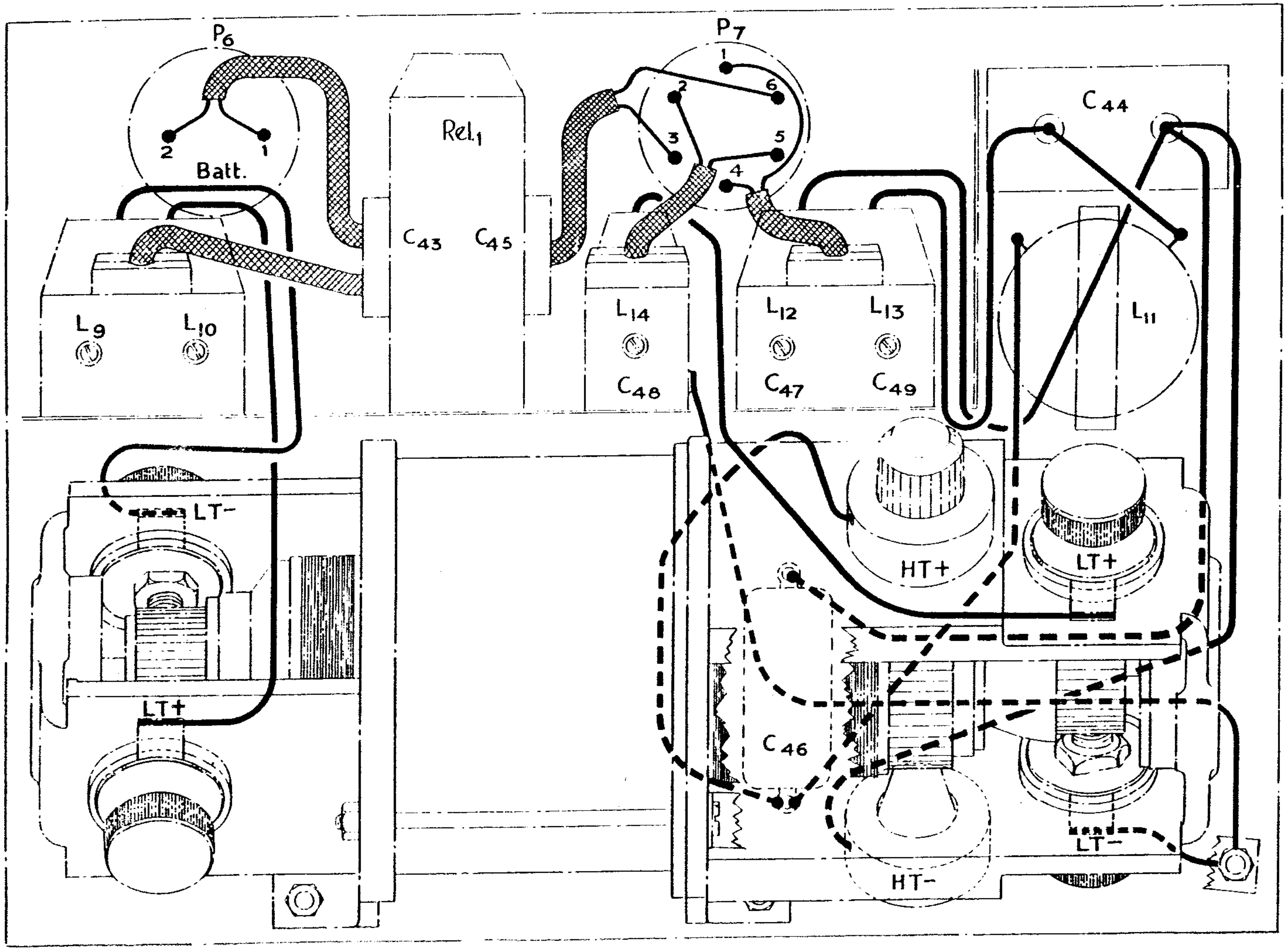


FIG.7 R.1147, BENCH WIRING DIAGRAM FIG.7

2927

S.D.0230



POWER UNIT TYPE 23, BENCH WIRING DIAGRAM

FIG. 8

FIG. 8

2927 Wt 4783/P1 C4518 150 5 41
2927

APPENDIX

NOMENCLATURE OF PARTS

The following list is issued for information only. When ordering spares for this receiver, the appropriate section of AIR PUBLICATION 1086 must be used.

Ref. No.	Nomenclature	Quantity		Remarks
10D/69	Receiver, type R.1147		Ref. in fig. 2	
	Principal components :—			
10A/11270	Cap, lamp, type 11	1		
	Condenser			
10C/7901	Type 120	1	C_{32}	0·001 μF
10C/7906	Type 125	1	C_{29}	0·01 μF
10C/8009	Type 132	1	C_{39}	500 μμF
10C/8010	Type 133	15	C_5, C_6, C_7, C_{11}, C_{12}, C_{14}, C_{15}, C_{16}, C_{18}, C_{20}, C_{21}, C_{22}, C_{24}, C_{28}, C_{38}	0·002 μF
10C/8275	Type 164	1	C_{42}	2·0 μF
10C/8382	Type 172	3	C_{34}, C_{36}, C_{40}	0·25 μF
10C/9629	Type 324	1	C_{33}	0·05 μF
10C/10164	Type 385	1	C_{30}	0·005 μF
10C/10165	Type 386	1	C_{25}	0·1 μF
10C/10301	Type 390	1	C_3	3 μμF fixed disc
10C/10568	Type 410	3	C_1, C_{10}, C_{27}	50 μμF fixed disc
10C/11485	Type 536	1	C_4	50 μμF silvered mica
10C/11694	Type 548	1	C_{37}	0·003 μF silvered mica
10C/625	Type 776	1	$C_2 + C_8$	2 gang, variable
10C/626	Type 777	1	C_{31}	500 μμF silvered mica
10C/627	Type 778	1	C_{35}	0·001 μF, MAX.
10C/964	Type 896	1	C_{41}	0·005 μF
10D/71	Head, tuning	1		
	Holder, valve			
10H/11579	Type 28	3		Octal for V_5, V_6, V_7
10H/341	Type 55	1		Trolitul, acorn type, for V_2
10H/342	Type 56	3		Paxolin, acorn type, for V_1, V_3, V_4
	Inductance			
10C/602	Type 36	1	L_1, L_2	
10C/603	Type 37	1	L_3, L_4, L_5	
10C/604	Type 38	1	L_6, L_7	
10C/661	Type 39	1	L_8	20 kc/s filter
10A/12797	Knob, type 73	1		
10A/11272	Lampholder, type 4	1		For pilot lamp
10A/9720	Mounting, type 6	4		
	Plug			
10H/391	Type W.198	1	P_1	4-point
10H/392	Type W.199	1	P_4	6-point
10H/393	Type W.200	1	P_5	6-point
5C/590	Type C	2	P_2, P_3	2-point

Ref. No.	Nomenclature	Quantity		Remarks
	Receiver, type R.1147—*contd.*		Ref. in fig. 2	
	Principal components—*contd.*			
	Resistance			
10C/9421	Type 261	1	R_{29}	300 ohms.
10C/10140	Type 368	1	R_{19}	30,000 ohms
10C/11678	Type 512	2	R_{17}, R_{24}	1,000 ohms
10C/11687	Type 521	1	R_3	50,000 ohms
10C/11691	Type 525	8	R_8, R_9, R_{12}, R_{13}, R_{16}, R_{18}, R_{22}, R_{28}	0·1 megohm
10C/11692	Type 526	3	R_5, R_{10}, R_{14}	0·2 megohm
10C/27	Type 544	4	R_7, R_{11}, R_{15}, R_{23}	10,000 ohms
10C/32	Type 549	1	R_2	20,000 ohms
10C/53	Type 561	1	R_{30}	100 ohms
10C/129	Type 597	2	R_1, R_{20}	0·5 megohm
10C/130	Type 598	2	R_{21}, R_{25}	1·0 megohm
10C/131	Type 599	1	R_{27}	2·0 megohms
10C/628	Type 847	1	R_{26}	500 ohms potentiometer
10H/160	Socket, type 86	1		S.P. screened
10F/10338	Switch, type 152	1		
10K/162	Transformer, type 285	1	T_4	L/F output
	Transformer unit			
10K/12173	Type 7	1	T_1	
	Fitted with:—			
	Condenser, type 781	2	C_9, C_{13}	5 μμF
10K/12174	Type 8	1	T_2	
	Fitted with:—			
	Condenser, type 781	2	C_{17}, C_{19}	5 μμF
10K/12175	Type 9	1	T_3	
	Fitted with:—			
	Condenser, type 781	2	C_{23}, C_{26}	5 μμF
	Accessories			
5C/430	Block, terminal, type B	6		
5E/1255	Cable, L.T. electric sextomet	As reqd.		For control unit.
10D/124	Case, transit	1		
	Control unit		Ref. in fig. 3	
10L/1	Type 19			Pilot's control
	Fitted with:—			
10A/12082	Knob, type 24	1		
	Plug			
10H/11290	Type 120	1	P_{12}	
10H/393	Type W.200	1	P_{10}	6-point
10C/628	Resistance, type 847	1	R_{32}	500 ohms potentiometer
10F/10338	Switch, type 152	2	S_3, S_4	
10L/2	Type 20		Ref. in fig. 3	Observer's control, if reqduire.
	Fitted with:—			
10A/12082	Knob, type 24	1		
	Plug			
5C/590	Type C	1	P_{11}	
10H/393	Type W.200	2	P_8, P_9	6-point
10C/628	Resistance, type 847	1	R_{31}	500 ohms potentiometer
10F/10338	Switch, type 152	1	S_2	
	Control, remote, type 6			
	Fitted with:—			
10J/3	Casing, type G.1	20 ft.		
10J/1	Controller, type G.1	1 or 2		According to number of remote control positions fitted
10J/5	End piece, casing	2 or 4		
10J/6	End piece, shafting	2 or 4		
10J/4	Shafting, type G.1	20 ft.		

Ref. No.	Nomenclature	Quantity		Remarks
	Receiver, type R.1147—*contd.*			
	Accessories—*contd.*			
5A/1428	Lamp, filament, 6 V. 0·24 W.	1		Pilot lamp
	Power unit			
10K/1	Type 22		Ref. in fig. 3	For 12-volt supply
	or			
10K/2	Type 23		Ref. in fig. 3	For 24-volt supply
	Fitted with:—			
10C/2098	Choke, L.F., type 60 ..	1	L_{11}	4 H.
	Condenser			
10C/7906	Type 125	1	C_{44}	0·01 μF
10C/8010	Type 133	5	C_{43}, C_{45}, C_{47}, C_{48}, C_{49}	0·002 μF
10C/9180	Type 281	1	C_{46}	2·0 μF
	Motor generator			
10K/39	Type 33	1		For power unit, type 22
	or			
10K/40	Type 34	1		For power unit, type 23
	Plug			
10H/389	Type W.196	1	P_6	2-point
10H/392	Type W.199	1	P_7	6-point
10F/301	Relay unit			
10F/301	Type 10	1	REL_1	For power unit, type 22
10F/302	Type 11	1	REL_1	For power unit, type 23
	Suppressor			
10A/12263	Type 13	2	$L_{12} + L_{13}$, $L_9 + L_{10}$	
10A/12264	Type 14	1	L_{14}	
	Rod, aerial			
10B/9881	Type 1	1		When already fitted
	or			
10B/168	Type 7	1		When already fitted
	or			
10B/438	Type 68	1		For new aircraft
	Socket			
5C/591	Type C	3 or 4		2-point
5C/599	Type G	1		
10H/625	Type 199	2 or 3		Micro-telephone
10H/407	Type W.153	1		
10H/408	Type W.154	1		
10H/411	Type W.157	2 or 4		
10H/744	Type W.218	1		
	Valve		Ref. in fig. 2	
10E/11401	Type V.R.55	1	V_5	E.B.C.33
10E/11402	Type V.R.56	2	V_6, V_7	E.F.36
10E/11452	Type V.R.59	1	V_2	H.A.2
10E/95	Type V.R.95	3	V_1, V_3, V_4	Z.A.2
6B/140	Watch, stop, Mk. 5B ..	1		

(C50057) 200 9/43