PYE WIRELESS SET 62

ORDERING OF SPARE PARTS

To avoid delays and possible errors in the supply of spare parts the reference numbers shown in the PARTS LIST at the end of this handbook should be quoted in all orders.

The right is reserved to alter the equipment described in this handbook in the light of future technical development.

TECHNICAL HANDBOOK AND PARTS LIST

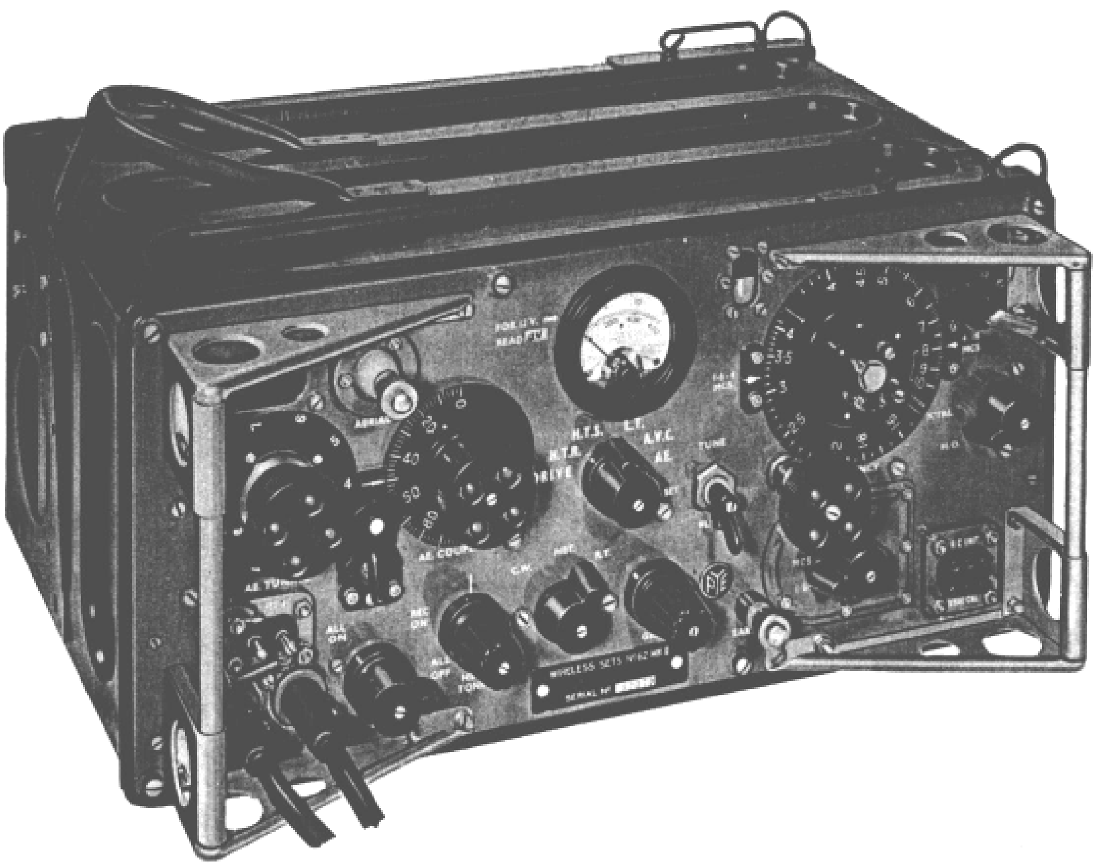
ISSUE 1

Part No. 202462

PYE TELECOMMUNICATIONS LTD · CAMBRIDGE · ENGLAND

CONTENTS

ILLUSTRATIONS



PYE WIRELESS SET 62

CHAPTER I

GENERAL DESCRIPTION

INTRODUCTION

The Pye Wireless Set 62 is a low power high frequency transceiver designed to operate from a 12 volt d.c. supply. It is intended for both military and civil purposes and may be used as a mobile or fixed station.

As a military equipment it has been adopted by the British Army for use in the following roles:-

Unarmoured vehicle station
Man-pack/animal-pack station
Fixed station

As a civil equipment it can be used as a general purpose, high frequency fixed or mobile station by police, oil companies, postal administrations and similar authorities. Operation of the equipment has been simplified to such an extent that operators need a minimum of instruction.

Facilities provided by the Wireless Set 62 are R/T and C. W. with provision for netting the operating frequency to a base station. Power for a crystal calibrator and an operator's lamp or remote control equipment can also be drawn from the equipment if required. A remote control unit is available providing inter-communication between the transceiver and control point, as well as remote operation of the Wireless Set 62 over a line or cable. Essential controls are luminised and a lamp can be supplied with a special ultra violet adaptor to enable the set to be used without illumination.

Two drop leads may be plugged into the equipment enabling two headsets and a morse key to be used at the same time.

The Wireless Set 62 is designed to work into rod aerials or into an end-fed horizontal wire aerial.

The equipment has a frequency coverage of 1.6 to 10.0 Mc/s divided into two bands 1.6 to 4.0 Mc/s and 4.0 to 10.0 Mc/s. In addition to normal tuning, a flick mechanism is incorporated for setting up on any two spot frequencies in the range 1.6 to 10.0 Mc/s. Both transmitter and receiver are tuned by the same controls and are automatically on the same frequency. The equipment is continuously tunable over the complete frequency range or can be crystal controlled on a spot frequency.

CONSTRUCTION

The Wireless Set 62 is housed in a steel case complete with carrying harness and front cover. It is both splash and rain-proof and will float supporting an additional weight of up to 20 lb. This fact renders it most dangerous for a man to attempt to swim with the equipment strapped to his back. All controls and connections are mounted on the front panel. The chassis is so designed that when removed from its case adequate mechanical protection is afforded to all vulnerable components.

FINISH

The external metal work is finished in Drab Olive and Dark Admiralty Grey. The equipment is tropicalised and the components have been chosen to ensure efficient operation in the extreme climatic conditions encountered in tropical and arctic regions.

BRIEF SPECIFICATION

Range of working

This varies with the length of aerial used. Using a 14 ft aerial, the approximate ranges under good conditions are:-

Stationary	C.W. 25 miles	R/T 15 miles
Mobile	C.W. 20 miles	R/T 11 miles

Power output

C.W. 0.78 to 1.1 watts depending on frequency
R/T 0.44 to 0.84 watts depending on frequency

Frequency range

The overall frequency range of 1.6 to 10.0 Mc/s is covered in two bands, 1.6 to 4.0 Mc/s and 4.0 to 10.0 Mc/s. The tuning range is dependent, however, on the length of aerial used. It should be noted that above 8.0 Mc/s there is a slightly reduced transmitter output on both M.O. and XTAL whilst at the same time the frequency accuracy is marginally below that from 1.6 to 8.0 Mc/s.

Power supply

The Wireless Set 62 operates from a 12 volt d.c. battery supply. The battery provides power for the valve heater circuits and the H.T. generator. The generator is a small rotary transformer which is housed with its associated components in a screened box and is mounted under the main chassis. A fan in the rotary transformer circulates air within the equipment generally.

Current consumption

The following table gives approximate figures of current consumption and working hours which may be obtained from each of the types of battery listed below when fully charged. These figures are given as a rough guide only and in practice there may be quite large differences depending upon the condition of the battery.

	Average Current	Approx. no. of working hrs for 12 volt battery		
		14Ah	22Ah	75Ah
Transmit R/T	4.6A	2.5	4.7	16.3
Transmit C.W.	5.0A	2.2	4.4	15
1:5 Transmit/Receive ratio	4.0A	3.2	5.5	18.7
Receive (ALL ON)	3.7A	3.6	5.9	20.3
Listening watch (REC. ON)	3.0A	4.5	7.6	25

Dimensions

$20\frac{1}{4}$" long x $10\frac{1}{4}$" high x $12\frac{3}{4}$" deep
(51.5 x 27 x 32 cm)

Weight

30 lb (13.5 kg)

CHAPTER II

ELECTRICAL SPECIFICATION & TECHNICAL DESCRIPTION

SPECIFICATION

RECEIVER

Audio output	Not less than 200mW at 1 kc/s.
Het. tone range	Between 2 and 5 kc/s.
IF sensitivity	The input required for an output of 50mW does not exceed 120µV.
Adjacent channel selectivity	Between 5 and 8 kc/s wide at -6dB. Average slope between -6 and -60dB not less than 5.8dB/kc.
Frequency calibration	The calibration error of the tuning dial does not exceed 0.5% between 1.6 and 8.0 Mc/s and 1% between 8.0 and 10.0 Mc/s.
Frequency coverage	1.6 to 4.0 and 4.0 to 10.0 Mc/s with an overlap of not less than 2% between the two bands.
Signal/noise ratio	At least 20dB for 3µV input modulated 30% at 400 cycles.

Second channel selectivity

Signal Freq. Mc/s	Second channel Freq. Mc/s	Second channel ratio dB
1.6	2.52	70
2.5	3.42	60
4.0	4.92	50
4.0	4.92	55
6.0	6.92	45
9.0	9.92	28

I.F. breakthrough	80dB down from 1.6 to 10.0 Mc/s.
L.F. Hum	With no signal input, the l.f.hum does not exceed 1.0µW.
Overall sensitivity	'L.F.' band: not worse than 3µV for 50mW output. 'H.F.' band: not worse than 6µV for 50mW output.
A.V.C. characteristic	Less than 14dB change in output from 50µV to 100mV.
Overall audio response	Within ± 2dB at 400 cycles and -13dB to -17dB at 3000 cycles - relative to 1000 cycles.

Valve complement

Circuit No.	Function	British	CV Type
V1A	R.F. amplifier	Mazda VP23	CV1331
V1B	Mixer	Mazda VP23	CV1331
V1C	Local oscillator	Mazda VP23	CV1331
V1D	1st I.F. amplifier	Mazda VP23	CV1331
V1E	2nd I.F. amplifier	Mazda VP23	CV1331
V2A	Detector & A.V.C.	Mazda HL23DD	CV1306
V3A	Output stage & sidetone amplifier	Mazda Pen 25	CV65

TRANSMITTER

R.F. Power output — C.W. 0.78 to 1.1 watts depending on frequency
R/T 0.44 to 0.84 watts depending on frequency

Modulator frequency response — Within +6dB and -3dB of the response at 1000 cycles for the frequency range 400 - 3000 cycles.

Frequency accuracy — Within 1 kc/s of the incoming signal when adjusted to zero beat on receive.

Valve complement

Circuit No.	Function	British	CV Type
V6A	Power amplifier	Mullard QV04-7	CV309
V5A	Buffer amplifier	Mullard EF50	CV1091
V4A	Sender mixer & BFO	Mullard ECH35	CV1347
V3B	Microphone amplifier	Mazda Pen 25	CV65

CIRCUIT DESCRIPTION

AERIAL CIRCUIT

Fig. 16

This circuit is common to both transmitter and receiver and consists of the variable capacitor C46 and the aerial tuning inductor L7. The inductor L7 has two contact wheels which short out part of the coil, thus preventing absorption at certain frequencies. The circuit forms a series tuned circuit for matching the aerial to the transceiver.

RECEIVER

Fig. 16

The receiver is a conventional superheterodyne covering the frequency range 1.6 - 10.0 Mc/s in two bands, 1.6 - 4.0 Mc/s and 4.0 - 10.0 Mc/s. An I.F. frequency of 460 kc/s is produced by tuning the local oscillator to a frequency 460 kc/s higher than that of the incoming signal. The equipment is tunable over the complete frequency range or can be crystal controlled on spot frequency.

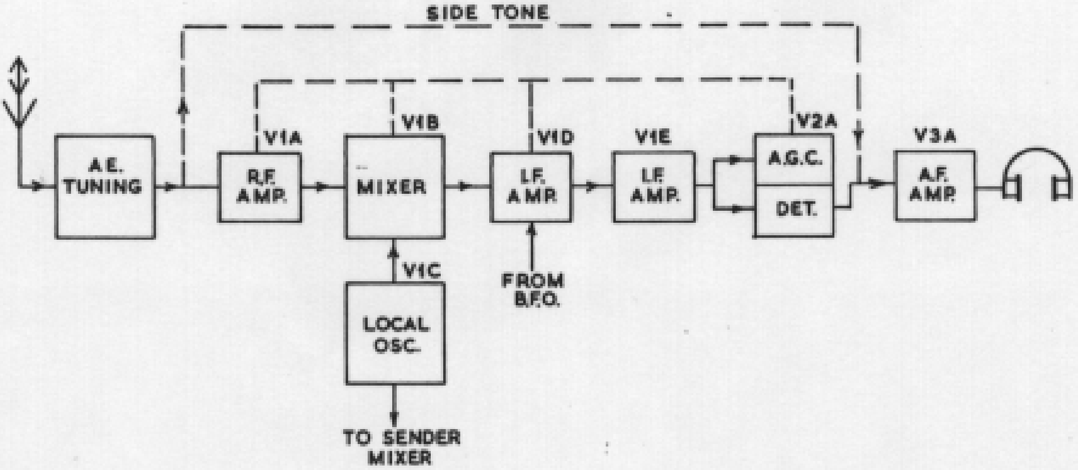


Fig. 1 Receiver Block Diagram

RF Amplifier (V1A)

This is a conventional pentode tuned anode amplifier with A.V.C. V1A has a series tuned input circuit comprising L7 (aerial tuning control) and C46 (aerial coupling control). The RF input is coupled by C1 to the grid of V1A, from which the output is fed via the tuned circuit (selected by SAa) and C8 to the grid of V1B. The tuned circuits selected by SAa are as follows:-

'H.F' band	L2A, C10A and C9
'L.F' band	L3A, C11A and C9

On 'receive', C3 decouples the earthy end of L1 so that the received signals are developed across L1 and not across R2 and R3. The series tuned input circuit is not disconnected on 'transmit' as it forms the output circuit of the P.A. stage V6A.

Local Oscillator (V1C)

The local oscillator (V1C) employs a pentode as a cathode coupled Hartley oscillator. It functions as a tuned grid oscillator, the tuned circuit being selected by SAc and SAd as follows:-

'H.F' band	L6A, C12B, C31, C32 and C23
'L.F' band	L5A, C12A, C26, C25 and C23

On the 'H.F' range (4.0 - 10.0 Mc/s) it has an additional feedback path via C20, SBb and L6B. This additional feedback path is switched out of circuit when crystal operation is used.

When SB is switched to 'XTAL' the oscillator functions as a Pierce Crystal oscillator, using the same tuned circuits as before.

The output of the oscillator is tapped off the filament and fed to the suppressor grid of the mixer V1B.

Mixer (V1B)

This stage employs a pentode. The outputs from the local oscillator and the RF amplifier are mixed in this stage to produce an intermediate frequency of 460 kc/s. The output from the mixer V1B is transformer coupled by T1, tuned to 460 kc/s, to the grid of the 1st IF stage V1D.

IF Amplifiers (V1D and V1E)

There are two stages of IF amplification employing pentodes. The signal appearing at the anode of V1D is transformer coupled by T2 to the second IF amplifier V1E for further amplification. The IF output from V1E is coupled by T3 to the detector section of V2A. The degree of amplification provided by these amplifiers is controlled by the A.V.C. voltage.

The output from the BFO is injected into the anode circuit of V1D for use on C.W. reception and netting.

Detector and A.V.C. (V2A)

These two functions are performed by the double-diode-triode V2A. The triode section is not used and is strapped to earth. One diode is used to provide an A.V.C. voltage via SDg to the IF and RF stages of the receiver. A small delay voltage developed across the filament and also across a portion of R40 is applied to this diode to prevent the A.V.C. action from reducing the gain when very weak signals are received. A.V.C. is used only when the set is switched to R/T.

The second diode is used as a detector, the output from which, subject to the setting of the GAIN control RV2, is fed to the grid of the output stage V3A.

When switched to C.W. or NET the above arrangements are modified. The A.V.C. diode is disconnected. The GAIN control RV2 is switched by SDf across the bias resistor R40 and the A.V.C. line to the slider of RV2 by SDh. RV2 then acts as an RF gain control, to the RF and IF stages.

AF Output (V3A)

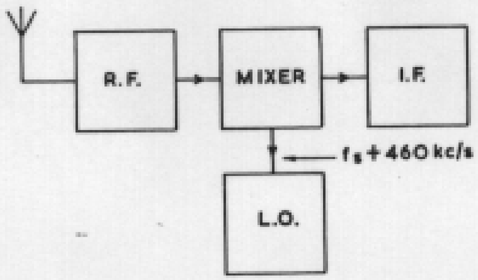
This stage is a conventional pentode AF amplifier. The input is fed via the GAIN control RV2 to the grid of V3A. After amplification the signal is transformer coupled by T5 to the headphone circuit via SKTAb. C44 is connected from the anode of V3A to earth for tone correction.

TRANSMITTER

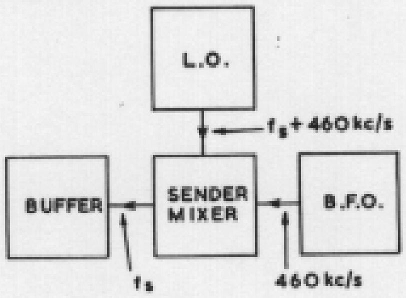
Fig. 16

The reconstitution principle used in the W.S. 62 provides that, in addition to using some common circuits, both the transmitter and receiver operate on the same frequency once the receiver has been netted to the incoming signal. The principle is briefly as follows:-

In a conventional superhet receiver the incoming signal is fed, together with the output of the local oscillator into a mixer valve. The resultant frequency is known as the intermediate frequency.



The carrier frequency for a transmitter working on the reconstitution principle is obtained by simply reversing the above procedure i.e. the IF (provided in this case by the BFO) is mixed with the local oscillator frequency in the sender-mixer stage V4A and produces a resultant frequency (carrier frequency) equal to the signal frequency.



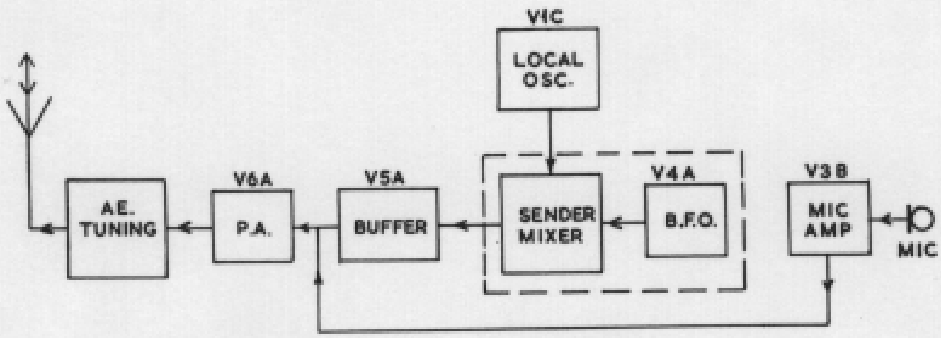


Fig. 2 Transmitter Block Diagram

Sender-Mixer & BFO (V4A)

A triode heptode is employed, the triode section as a BFO and the heptode section as a sender-mixer. The BFO is a tuned grid shunt-fed oscillator. The HET. TONE control RV1 is disconnected when switched to transmit, therefore the BFO operates continuously at 460 kc/s. The output from the BFO is internally fed to the third grid of the sender-mixer, whilst the output from the receiver local oscillator V1C is fed to the first grid of the sender-mixer, where it beats with the BFO output. The signal appearing at the anode of the sender-mixer is fed via the tuned circuit, which acts as the sender-mixer anode load, to the grid of the buffer amplifier V5A. The tuned circuits are selected by SAe as follows:-

'H.F' band	L2B, C10B and C54
'L.F' band	L3B, C11B and C54

Buffer Amplifier (V5A)

This stage employs a pentode, from which the output is taken via the anode tuned circuit (selected by SAf) to the grid of the power amplifier (V6A). The anode tuned circuits selected by SAf are:-

'H.F' range L2C, C10C and C51
'L.F' range L3C, C11C and C51

The buffer stage is designed to provide a more constant drive over the complete frequency range. This is achieved on the 4.0 to 10.0 Mc/s band by the use of a frequency-sensitive screen circuit together with the use of limiting in the grid circuit. There is no screen decoupling but C52 is shunted across the screen resistor R30 and this gives degeneration at the lower frequencies relative to the gain of the stage at the higher frequency end of the band. A similar effect is obtained on the 1.6 - 4.0 Mc/s band by switching C49 and R29 into the grid feed to the P.A. stage (V6A) by means of SAg. Here the drive circuit is made frequency sensitive with a gain characteristic rising towards the high end of the band.

The above measures tend to level the drive over the frequency range of the equipment and ensures that the modulation is reasonably undistorted.

Power Amplifier (V6A)

This stage employs a beam tetrode. The power amplifier is grid modulated by the output from the microphone amplifier V3B. No independent tuned circuit is provided for the P.A. stage and the aerial circuit comprising L7 and C46 constitutes the anode load. The output from V6A is capacity coupled by C47 to the aerial circuit providing the RF power output. Bias for this stage is obtained by the voltage drop across the bias resistor R40.

Microphone Amplifier (V3B)

The input from the microphone is fed via SKTAd, SKTAe and the microphone transformer T4 to the grid of the pentode amplifier V3B. The output is taken via C64 and the voltage appearing across the AF choke L15 is fed into the power amplifier grid circuit.

Side-Tone

On transmit, a fraction of the power amplifier output is fed to the grid of the RF amplifier V1A. Under transmit conditions the H.T. supply to V1A is disconnected and the stage acts as a diode between grid and filament. This diode serves as a de-modulator, a fraction of the resulting voltage developed across R3 is fed via C5 and R4 to the grid of the AF output stage V3A. It is then amplified and fed to the headphones as sidetone.

C.W. OPERATION

When switched to C.W. the morse key replaces the microphone pressel switch and operates the transmit/receive relay RLA in the normal manner. Therefore, when operating on C.W. it is possible to "listen through" during intervals in transmissions.

A portion of the output from the BFO is permanently coupled to the first IF stage via C59 for C.W. reception. The HET. TONE control RV1 varies the BFO frequency thus altering the pitch of received C.W. signals.

NETTING

Fig. 3

The set is provided with netting facilities to enable the receiver to be accurately tuned to the incoming signal. The circuit consists of an oscillator (BFO) operating at 460 kc/s. The receiver local oscillator output mixes with the incoming signal to produce an intermediate frequency of 460 kc/s. The output from the BFO is injected into the first IF amplifier to produce a beat note with the IF signal. The receiver can then be tuned for zero beat, in the headphones, to indicate that the receiver local oscillator frequency is equal to the incoming signal plus 460 kc/s.

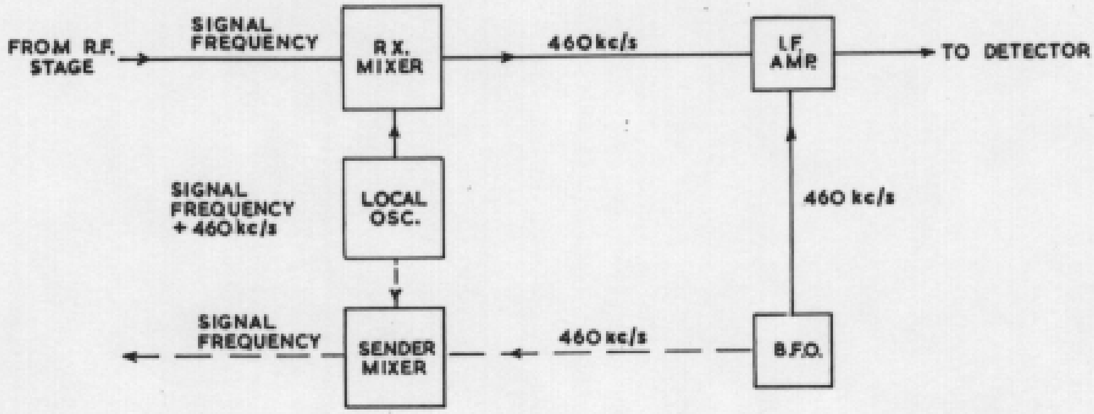


Fig. 3 Netting Circuit Block Diagram

HEATER CIRCUIT

Fig. 4

The heaters are connected in a series-parallel network across the 12V supply. Directly heated and indirectly heated valves are wired in separate circuits. Care must be taken when changing or testing a valve as removal of one valve may burn out the heaters of other valves due to excessive voltage being applied across them. It is therefore essential to switch off the equipment before replacing any valve.

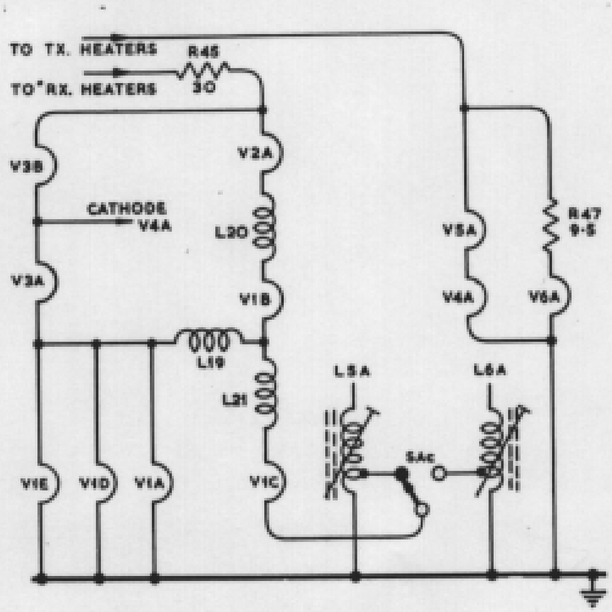


Fig. 4 Heater Circuit

TRANSMIT/RECEIVE SWITCHING

Fig. 5

On R/T the operation of the microphone pressel switch energises the transmit/receive relay RLA. On C.W. the morse key replaces the microphone pressel switch. V1B, V1C and V3A are permanently connected to the H.T. supply. RLA switches the set from 'receive' to 'transmit' as follows:-

RLA1 (a) earths the receiver H.T. line
(b) disconnects R21 from the local oscillator H.T. circuit.
(c) disconnects the slider of RV1 (on C.W. only) from earth via C62 and R37 thus maintaining L14 - C63 at 460 kc/s.

RLA2 disconnects the H.T. line from V1A, V1D, V1E and connects it to V6A, V5A, V4A and V3B.

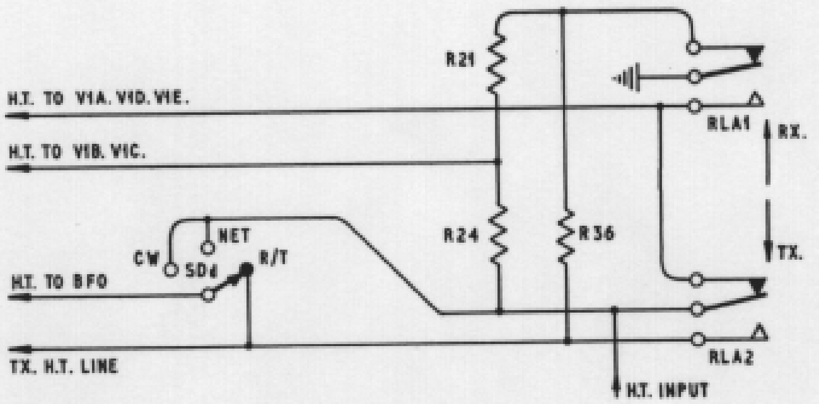


Fig. 5 Transmit/Receive Switching

POWER SUPPLY UNIT

The 12 volt d.c. input from the battery is connected to PLB and is controlled by the ON/OFF switch SC. The L.T. input is fed via the filter network C71, L18, C72 to the rotary transformer. The output from the rotary transformer is fed via a filter network and fuse FS1 to the transmit/receive relay changeover contacts RLA2. Contacts RLA2 determine whether the H.T. supply is fed to the transmitter or receiver circuits.

METERING

A meter is built into the transceiver and measures voltages at various points in the circuit. The required metering positions are selected by the rotary switch SE. The following table gives full details.

Switch position	Function	Typical Reading
1. DRIVE	Measures voltage across V6A cathode resistor R28. Meter reads in terms of cathode current. (Full scale deflection = 60mA)	1.6 - 4.0 Mc/s band: R/T 32mA, C.W. 45mA; 4.0 - 10.0 Mc/s band: R/T 28mA, C.W. 40mA
2. H.T.R.	Measures receiver H.T. voltage.	150V
3. H.T.S.	Measures transmitter H.T. voltage.	250V
4. L.T.	Measured at PLB. Indicates the state of the L.T. battery.	12V
5. A.V.C.	Measures a portion of the screen voltage of V1E. The A.V.C. bias, which depends on the strength of the received signal, reduces the current through V1E and causes the screen voltage to rise. This rise is an indication of signal strength and can be used to tune the receiver.	3.0-5.5V (with no signal)
6. AE CURRENT	Measures aerial current. A portion of the aerial current is transformer coupled by T6 to the bridge rectifier MR1. MR2 is included to decrease the sensitivity at higher currents and R27 is connected across TR6 to compensate for variations in rectifiers.	9-12V

CHAPTER III

AERIALS

MOBILE STATION

In a mobile station the W.S. 62 is normally used for ground wave working using vertical rod aerials, the length of which will be either 8 ft or 14 ft. In general, aerials shorter than 8 ft will only be tunable at the higher frequencies. The frequency range of the aerial tuning circuits will depend on the overall length of aerial used, including the length of wire connecting the aerial tuning unit to the aerial base. The normal tuning ranges of the aerials are as follows:-

8 ft rod	2.0 - 10.0 Mc/s
14 ft rod	1.9 - 10.0 Mc/s

FIXED STATION

The rod type aerials listed for mobile use or a 32 ft rod aerial (over a limited frequency range) may be used for ground wave fixed station working. It will be found, however, that a greater range will be obtained by using a 100 ft end-fed horizontal wire aerial for sky-wave working (see Fig. 7). This 100 ft wire aerial will radiate and receive ground waves as well. The normal tuning ranges of the aerials are as follows:-

32 ft rod	1.6 - 6.5 Mc/s
100 ft wire	1.6 -10.0 Mc/s

The wire aerial should consist of 100 ft of copper wire cut into four pieces, 25, 30, 20 and 25 ft in length respectively and then rejoined with a single link insulator between each piece. Each insulator may be bridged over by a flexible wire strap so that the effective length of the aerial can be made 25, 45, 70 or 100 ft to suit the frequency in use. One end of each strap is made captive to the end of an aerial section as shown in Fig. 7: the straps are identified respectively A, B and C. A two-link plastic insulator is fixed at the end of the aerial remote from the set, while another is fitted so that it can slide along the 25 ft section of the wire which is terminated by a small metal lug for connection to the W.S. 62 aerial terminal. The aerial may be supported in position by means of suitable lengths of cordage or wire attached to the outer link of each two-link insulator. It should be noted that at the higher frequencies the meter when switched to 'AE' may indicate a low current, even when working on C.W. This does not mean necessarily that the radiation is poor, but that the aerial is approaching a half wavelength long.

NOTE:-

For available aerials see 'Accessories List' at the end of this handbook.

CHAPTER IV

INSTALLATION

The information contained in this chapter describes very briefly the method of installation. It is not possible to give detailed installation instructions as these will differ in each type of installation. This chapter outlines the points to be observed when installing the W.S. 62. If any installation queries do occur they should be addressed to the makers or their representatives.

There are three main roles in which the W.S. 62 is used. The following notes give a general outline of the method of installation:-

1. VEHICLE STATION

The equipment may be installed in the vehicle itself or in a trailer towed by the vehicle.

(a) W.S. 62

Fix brackets to the side of the vehicle, at a suitable height, for the W.S. 62 to rest on. It will be found more convenient if a bench is fitted to these brackets and the W.S. 62 and its carrier are secured to the bench. If there is insufficient room to fit a bench the W.S.62 and its carrier may be mounted directly on to the brackets.

(b) Batteries

Bolt the batteries rigidly to the floor (on a carrier if possible). It is suggested that the most convenient position for fixing the batteries is directly beneath the set, under the bench.

(c) Aerial Base

Fix the aerial base to the side of the vehicle in a position as close to the W.S. 62 as possible.

(d) Connect (i) The aerial base to the aerial terminal on W.S. 62
(ii) Earth terminal on W.S. 62 to vehicle chassis
(iii) Batteries to the input socket on W.S. 62.

All leads should be kept as short as possible.

(e) Check that all the electrical equipment in the vehicle has been effectively suppressed.

After the installation has been completed, carry out the following checks:-

(a) Although the equipment has been thoroughly inspected before despatch from the factory, it is advisable to ensure that its serviceability has not since been impaired.

(b) Inspect all fittings, ensuring that all nuts and bolts are securely tightened. Check that the terminations of all connectors are firmly attached to the appropriate points.

(c) Carry out a thorough mechanical test of the installation. This can best be achieved by driving the vehicle for a few miles over fairly rough ground and afterwards checking that all brackets and other fittings are still firmly in position.

(d) Check the state of the batteries and if necessary re-charge.

(e) Conduct a normal routine test as described in 'Operating Instructions' on page 19.

NOTE:- The W.S. 62 and the batteries may be fitted on quick release mounts. This enables them to be lifted from the vehicle still mounted on their carriers and set up as a ground station.

2. MAN-PACK/ANIMAL-PACK STATION

Man-Pack

When used as a man-pack station it is arranged to transport the equipment in three loads, as follows:-

Load 1	W.S. 62
Load 2	Batteries
Load 3	Aerials and all spares

The W.S. 62 may be operated whilst still on a man's back but it is normal to dismount the equipment and use it as a ground station. When the set is operated whilst still on a man's back, a 4 ft or 8 ft aerial should be used.

(a) Fit the rod aerial into the aerial base so that the aerial is vertical and clamp in position by means of the knurled screw.

(b) Connect the man-pack aerial base to the aerial terminal of the set by the length of wire fastened to the aerial base.

(c) Connect the batteries.

The set is now ready for use.

When the equipment is used as a ground station a 14 ft aerial is normally used, but a 4 or 8 ft aerial may be used if more convenient. In this arrangement a counterpoise is normally used as an earth. The counterpoise should be connected to the set earth terminal and the leads spread radially from the set. The equipment should be connected as described in the above paragraph.

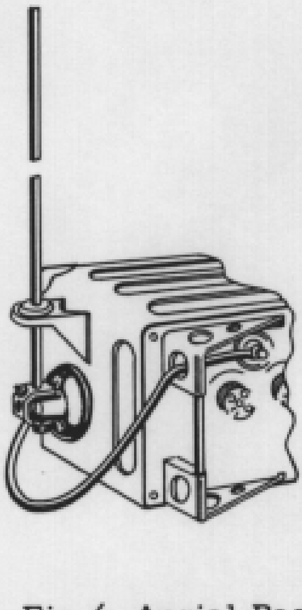


Fig. 6 Aerial Base

Animal-Pack

When used as an animal-pack station it is arranged to transport the equipment in two loads, as follows:-

Load 1	The W.S. 62 and batteries
Load 2	Battery charging set, aerials and spares.

The set can be operated whilst mounted on the animal or on the ground as described for 'Man-Pack' station.

3. FIXED STATION

When the W.S. 62 is to be used in one position for a period of time it can be set up as a fixed station. For ground wave working 8 ft, 14 ft, or 32 ft rod aerials may be used and for sky-wave working an end-fed 100 ft horizontal wire aerial.

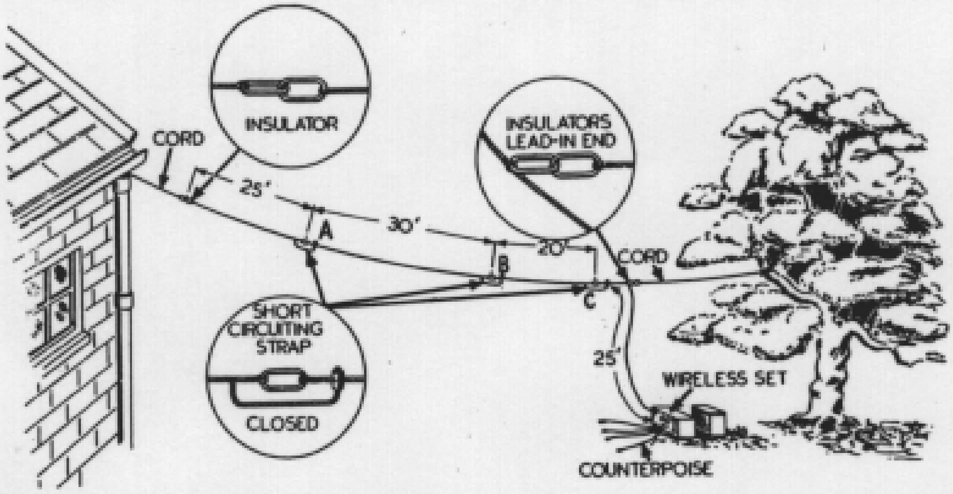


Fig. 7 Typical Fixed Station Aerial Arrangement

If it is frequently required to change the operating frequency of the equipment when the wire aerial is used, it is advised that the aerial support be mounted over a pulley to enable the aerial to be easily lowered for re-adjustment of the short-circuiting straps.

Before erecting the 100 ft aerial, set the three short-circuiting straps A, B and C to obtain an aerial length to suit the operating frequency. Now erect the aerial observing the following points:-

(a) The 'top' should be as nearly horizontal as possible and approximately 15 ft above the ground.

(b) Wherever possible the down lead should not be more than half the length of the horizontal top.

(c) The aerial should be erected ensuring that it does not come into contact with any obstruction.

Connect the lug at the free end of the 25 ft length of wire to the aerial terminal of the W.S. 62. A counterpoise is normally used as an earth with this station.

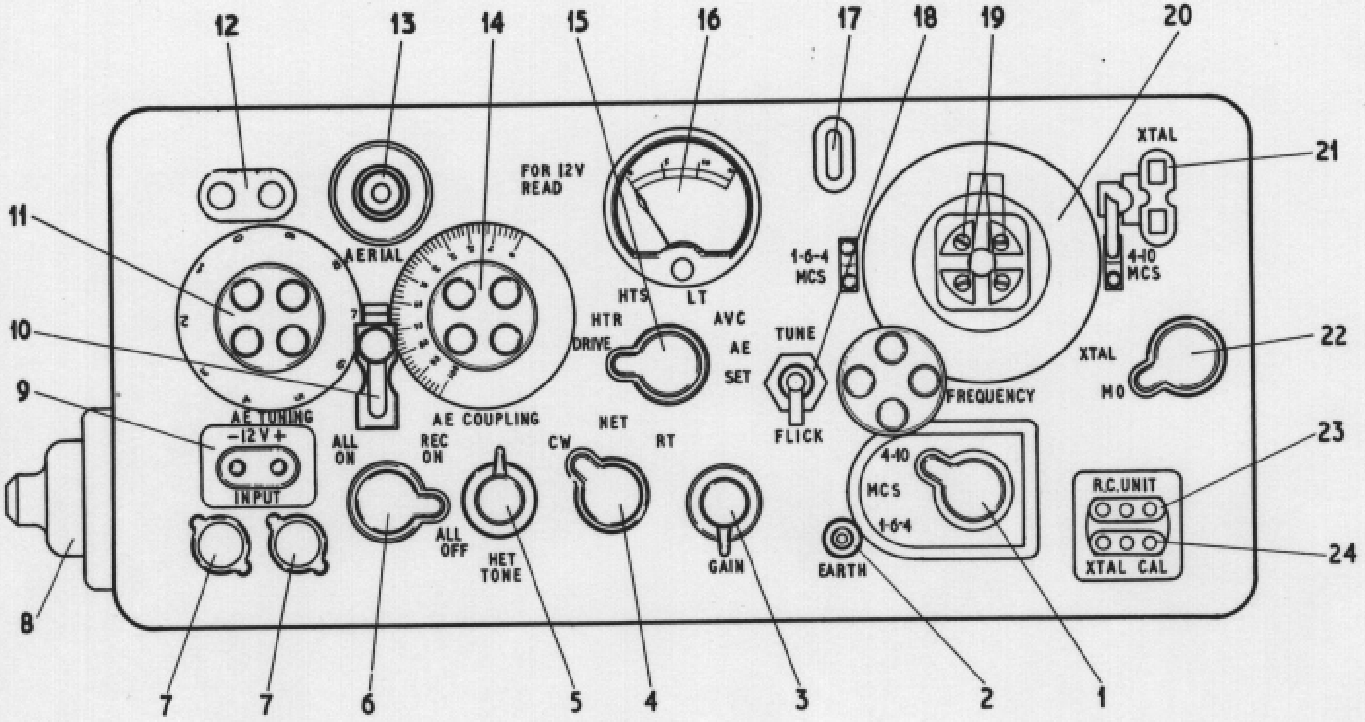


Fig. 8 FRONT PANEL CONTROLS

CHAPTER V

CONTROLS AND INTER - CONNECTIONS

Location Ref. (see Fig. 8)	Circuit Ref.	Component	Function
1	SA	RANGE SWITCH	Selects 1.6 - 4.0 Mc/s or 4.0 - 10.0 Mc/s.
2		EARTH TERMINAL	For bonding set to earth.
3	RV2	GAIN CONTROL	Receiver volume control.
4	SD	SYSTEM SWITCH	Selects R/T, NET or C. W. operation.
5	RV1	HET. TONE CONTROL	Adjusts pitch of C. W. beat note.
6	SC	ON/OFF SWITCH	Switches on receiver only or both receiver and transmitter.
7	SKTA	OUTPUT SOCKETS	These sockets are connected in parallel and enable 2 headsets and a morse key to be plugged in at the same time.
8		AERIAL BASE	For mounting rod aerials.
9	PLB	POWER INPUT PLUG	Power supply input point on the transceiver.
10		DIAL LOCK	Locks position of AERIAL TUNING CONTROL (11) and AERIAL COUPLING CONTROL (14).
11	L7	AERIAL TUNING CONTROL	Tunes aerial circuit.
12		TUNING INDICATOR	Indicates setting of aerial tuning control.

Location Ref. (see Fig. 8)	Circuit Ref.	Component	Function
13		AERIAL TERMINAL	Connects with aerial base or long wire aerial.
14		AERIAL COUPLING CONTROL	Controls coupling between aerial and set.
15	SE	METER SWITCH	Switches meter to indicate DRIVE, H. T. R., H. T. S., L. T., A. V. C., and aerial current.
16	M	METER	Indicates voltages selected by meter switch (15).
17		INDICATOR	Indicates spot frequencies.
18		TUNE/SET/FLICK SWITCH	Used when setting up set.
19		SCREWS FOR SETTING UP SPOT FREQUENCIES	
20		FREQUENCY CONTROL	Main frequency control.
21		XTAL SOCKET	For plugging in external crystal.
22	SB	M. O. /XTAL SWITCH	Selects either master oscillator or crystal operation.
23	SKTB/A	REMOTE CONTROL UNIT SOCKET	Supplies power for remote control unit.
24	SKTB/B	XTAL CALIBRATOR SOCKET.	Supplies power for crystal calibrator.

CHAPTER VI

OPERATING INSTRUCTIONS

NOTES:-

1. 'Luminous' screws used for frequency 'A' and Red screws for frequency 'B'.
2. The numbers shown in brackets in this chapter refer to Fig. 8.

1. Connect the equipment as follows:-

(a) The batteries to the power input plug (9) on the W.S. 62, using the connector provided.

(b) Plug the rod aerial (if used) into the aerial base (8) and secure in position by means of the knurled screw. (See Fig. 6).

(c) Connect the aerial base to the aerial terminal (13) if rod aerials are used. Connect the end of the aerial to the aerial terminal (13) when the 100 ft long wire aerial is used.

(d) Into each of the output sockets (7) plug in a headset and microphone assembly No. 10 and/or a morse key.

The equipment is now ready for use.

2. Note that the allotted frequencies are within the frequency range quoted for the aerial to be used as shown in the table below.

Aerial	Tuning Range
8 ft rod	2.0 - 10.0 Mc/s
14 ft rod	1.9 - 10.0 Mc/s
32 ft vertical	1.6 - 8.0 Mc/s
Long wire aerial	1.6 - 10.0 Mc/s

3. Switch the ON/OFF switch (6) to the ALL ON position and allow approximately two minutes for the valve heaters to warm up. The REC. ON position is only used for listening watch on R/T.

4. NETTING

When preparing to net, set the following controls to the position indicated and make adjustments as listed below:-

(a) M.O./XTAL switch (22) to M.O.

(b) Meter switch (15) to A.V.C.

(c) System switch (4) to R/T or C.W. depending on which system is being used.

(d) GAIN control (3) fully clockwise.

(e) Range switch (1) to the required range.

(f) TUNE/SET/FLICK switch (18) to FLICK.

(g) Turn the square knob on FREQUENCY control (20) until white indicator shows in blue window (17). Loosen the two 'lumin' screws (19) on the square knob one half turn only.

(h) TUNE/SET/FLICK switch (18) to SET.

(j) Set FREQUENCY control (20) to the required frequency.

(k) Unlock Dial Lock (10).

(l) Rotate AERIAL COUPLING control (14) and set it to the figure given in the appropriate table at the end of this chapter.

(m) Rotate AERIAL TUNING control (11) and set it to the figure given in the appropriate table at the end of this chapter.

<u>Now carry out the following netting procedure</u>:-

(a) Adjust FREQUENCY control (20) to obtain maximum signal.

(b) Set system switch (4) to NET.

(c) Adjust FREQUENCY control (20) for zero beat in phones, keeping the signal at strength R2 (comfortable listening level) by means of the GAIN control (3).

(d) Tighten the two 'lumin' screws (19) on the square knob of the FREQUENCY control (20).

(e) If there is a whistle present, loosen 'lumin' screws (19) again and repeat (c) and (d) until a satisfactory result is obtained.

<u>After netting is complete the final tuning procedure should be carried out</u>:-

(a) Set system switch (4) to C.W.

(b) Set GAIN control (3) fully clockwise.

(c) Set meter switch (15) to AE.

(d) Operate pressel switch or morse key.

(e) Adjust AERIAL TUNING control (11), on either side of the setting given in the appropriate table, for maximum meter reading.

(f) Make successive adjustments (about one scale division at a time) of the AERIAL COUPLING control (14) on either side of the setting given in the appropriate table. For each setting of the AERIAL COUPLING control (14), adjust the AERIAL TUNING control (10) to obtain maximum meter reading. The correct adjustment of these two controls will be that which produces the highest meter reading.

(g) Set the AERIAL COUPLING control (14) and AERIAL TUNING control (11) to the settings that gave the highest meter reading and lock in position.

(h) Release pressel switch or morse key.

(j) Set system switch (4) to required position.

5. The set is now ready for operation. On R/T, to transmit, press the pressel switch and speak into the microphone. To receive, release the pressel switch and listen in the headphones. On C.W. operating the morse key switches the set to transmit. When keying ceases, the set is automatically switched back to the receive condition. When receiving C.W. turn the HET. TONE control (5) to give a beat note of a comfortable listening level.

Section 4 above describes setting up a spot frequency using the 'lumin' controls. Should it be necessary to operate on two spot frequencies, the red controls may be set up in the same manner. The TUNE/SET/FLICK switch (18) <u>M U S T</u> always be in the SET position when the set is being netted. The FLICK position is used when rapid movement of the dial is required on setting to a spot frequency. The TUNE position is used for fine tuning. Aerial coupling and tuning dial readings are to be noted for both frequencies on logging chart at the end of this handbook.

On R/T, sidetone will be heard in the headphones when transmitting, but on C.W. only key clicks will be heard.

6. CRYSTAL OPERATION

The crystal used must have an operating frequency, 460 kc/s above the required frequency (i.e. if the required frequency is 4,400 kc/s, a crystal of 4,860 kc/s must be used). To operate the set on crystal control proceed as follows:-

(a) Insert the crystal into the XTAL socket (21) and secure in position with the retaining clip.

(b) Set M.O./XTAL switch (22) to XTAL.

(c) Set meter switch (15) to DRIVE.

(d) Set system switch (4) to C.W. and press pressel switch on handset.

(e) Tune FREQUENCY control (20) near the ordered frequency to obtain maximum meter deflection.

(f) Set AERIAL COUPLING control (14) to the position indicated in the appropriate table.

(g) Set meter switch (15) to AE.

(h) Adjust AERIAL COUPLING control (14) and AERIAL TUNING control (11) alternately as described in Section 4 to obtain maximum aerial current. Lock controls.

(j) Set system switch (4) to the required position.

7. The ON/OFF switch (6) in the REC. ON position switches off the transmitter valve heaters and is intended for use during long periods of receive when adequate notice is given before transmissions are required. The transmitter valve heaters take approximately two minutes to warm up. Before attempting to transmit the ON/OFF switch (6) must be switched to the ALL ON position. When standing by for C.W. signals the ALL ON position must be used.

8. The following tables give approximate settings for the AERIAL COUPLING control (14) and AERIAL TUNING control (11) on any aerial and frequency.

MAN-PACK STATION

A. 4 FT AERIAL

	Mobile								On Ground							
Freq. Mc/s	2	3	4 L.F	4 H.F	5	6	8	10	2	3	4 L.F	4 H.F	5	6	8	10
AE Coupling	90	34	18	17	12	6	0	0	62	33	18	18	11	7	0	0
AE Tuning	980	595	421	420	317	256	180	140	980	571	404	401	305	246	176	136

B. 8 FT AERIAL

	Mobile								On Ground							
Freq. Mc/s	2	3	4 L.F.	4 H.F	5	6	8	10	2	3	4 L.F.	4 H.F.	5	6	8	10
AE Coupling	45	28	18	17	11	3	0	0	49	35	19	19	13	7	0	0
AE Tuning	946	533	382	382	290	236	165	127	898	517	366	367	278	228	164	126

C. 14 FT AERIAL (These also apply to the Vehicle/Animal Station when on the ground)

On Ground

Freq. Mc/s	2	3	4 L.F	4 H.F	5	6	8	10
AE Coupling	51	34	17	17	10	5	0	0
AE Tuning	750	439	324	323	251	214	145	108

D. 100 FT AERIAL (These also apply to the Vehicle/Animal Station when on the ground)

On Ground

Freq. Mc/s	1.6	2.0	2.5	3.0	3.0	3.5	4.0	4.0	4.5	5.0	5.5
Aerial length(ft)	100	100	100	100	75	75	75	45	45	45	45
Straps open	-	-	-	-	A	A	A	AB	AB	AB	AB
Straps closed	ABC	ABC	ABC	ABC	BC	BC	BC	C	C	C	C
AE Coupling	45	30	20	10	25	10	0	11	6	0	0
AE Tuning	650	450	350	250	270	250	190	255	220	195	160

Freq. Mc/s	5.5	6.0	6.5	7.0	7.5	7.5	8.0	8.5	9.0	9.0	9.5	10.0
Aerial length(ft)	100	100	100	100	100	75	75	75	75	25	25	25
Straps open	-	-	-	-	-	A	A	A	A	ABC	ABC	ABC
Straps closed	ABC	ABC	ABC	ABC	ABC	BC	BC	BC	BC	-	-	-
AE Coupling	0	0	0	0	0	0	0	0	0	0	0	0
AE Tuning	250	205	165	135	100	180	155	135	105	100	90	80

VEHICLE STATION

E. 4 FT AERIAL

Mobile

Freq. Mc/s	2	3	4 L.F	4 H.F	5	6	8	10
AE Coupling	51	36	19	20	15	9	0	0
AE Tuning	950	537	385	380	287	234	169	129

F. 8 FT AERIAL

Mobile

Freq. Mc/s	1.8	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	9.0	10.0
AE Coupling	70	55	50	45	40	30	22	18	15	12	10	7	5	3	0	0
AE Tuning	960	850	640	480	390	340	290	250	230	200	180	160	150	140	125	115

G. 14 FT AERIAL

Mobile

Freq. Mc/s	1.7	2.0	2.5	3.0	3.5	4.0 L.F	4.0 H.F	4.5	5.0	5.5	6.0	6.5	7.0	8.0	9.0	10.0
AE Coupling	70	60	55	50	40	30	25	23	20	17	14	11	8	5	0	0
AE Tuning	920	720	530	420	330	290	300	250	225	200	180	160	150	130	110	100

H. 32 FT AERIAL (set retained in vehicle:-stationary)

Freq. Mc/s	1.6	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0
AE Coupling	73	70	60	50	43	30	23	18	13	8	4	0	0	0
AE Tuning	670	485	360	290	245	215	195	175	155	140	120	110	100	90

J. 100 FT AERIAL (set retained in vehicle:- stationary)

Freq. Mc/s	1.6	2.0	2.5	3.0	3.0	3.5	4.0 L.F	4.0 H.F	4.5	5.0	5.0	5.5	6.0
Aerial length(ft)	100	100	100	100	75	75	75	45	45	45	100	100	100
Straps open	-	-	-	-	A	A	A	AB	AB	AB	-	-	
Straps closed	ABC	ABC	ABC	ABC	BC	BC	BC	C	C	C	ABC	ABC	ABC
AE Coupling	60	50	40	20	35	20	8	20	12	6	0	0	0
AE Tuning	575	395	280	205	245	195	160	225	195	180	310	240	190

Cont.

Freq. Mc/s	6.5	7.0	7.0	7.5	8.0	8.5	9.0	9.0	9.5	10.0
Aerial length(ft)	100	100	75	75	75	75	75	25	25	25
Straps open	-	-	A	A	A	A	A	ABC	ABC	ABC
Straps closed	ABC	ABC	BC	BC	BC	BC	BC	-	-	-
AE Coupling	0	0	0	0	0	0	0	0	0	0
AE Tuning	155	120	190	160	140	125	105	90	65	50

CHAPTER VII

ALIGNMENT INSTRUCTIONS

Re-alignment is only necessary when the equipment fails to meet the performance figures quoted in the Electrical Specification (see pages 3 & 4). Normally this is after the equipment has been in use for a considerable period or when components which affect tuning are replaced. This chapter has been divided into sections and when re-aligning it is only necessary to carry out the instructions listed in the sections below.

Reason for Adjustment	Sections
IF stage re-alignment	1,2
BFO stage re-alignment	3
RF stage re-alignment	5
Receiver oscillator re-alignment	4,5
Sender-mixer and buffer amplifier re-alignment	6,4,2
Microphone amplifier (modulation) stage re-alignment	7
Meter replacement	8
Performance tests	9,10,11,12

INSTRUMENTS REQUIRED

1. Dummy Aerials
   - (a) Receiver — 60pF ±2% condenser in series with the 10Ω output impedance of the signal generator.
   - (b) Transmitter — 60pF ±2% condenser in series with a non-reactive 10Ω ±5% 10W resistor.
2. Output Meter — having an impedance of 150Ω and capable or measuring up to at least 1W.
3. Thermal Ammeter — 0 - 500mA full scale deflection.
4. Signal Generator — having an output impedance of 10Ω and covering up to 15.0 Mc/s.
5. Crystal Calibrator — Pye Crystal Calibrator No.10.
6. Beat Frequency Oscillator — having an output impedance of 600Ω. The following pad should be fitted between the output of the BFO and the equipment under test.

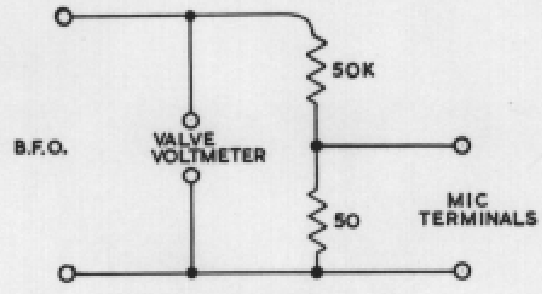


Fig.9 Attenuator Pad

7. Valve Voltmeter

8. Universal Test Meter — having a sensitivity of 500Ω/volt (Avometer Model 7 suitable).

9. Trimming Tool

10. Damping Device — consisting of a 0.1μF capacitor and 20kΩ resistor connected in series.

NOTES:-

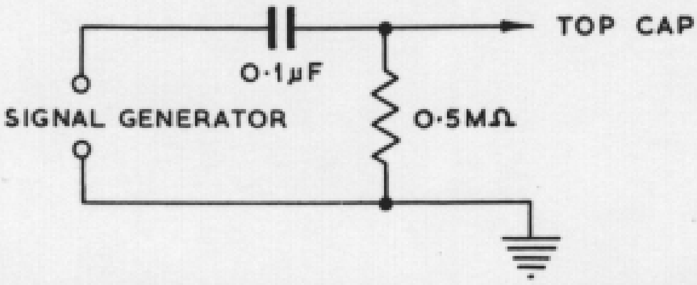
1. For all oscillator tests a dummy base coverplate should be used to simulate the effect on the coils of the actual base plate.
2. The signal generator should be checked periodically against a crystal calibrator at the frequencies used for oscillator alignment.

1. I.F. ALIGNMENT & SENSITIVITY

(a) Set system switch SD to R/T and switch SC to 'ALL ON'.

(b) Connect output meter to harness socket pins SKTAb and SKTAc (see Fig. 16).

(c) Connect the signal generator to the control grid (top cap) of VIE, as shown in diagram.



(d) Set signal generator to give a 400 c/s 30% modulated output at a carrier frequency of 460 kc/s.

(e) Trim secondary of T3 for maximum output. (Tuning slug on top of can).

(f) Trim primary of T3 for maximum output. (Tuning slug on underside of can).

(g) Repeat (c) to (f) connecting the signal generator, as in diagram above, to VID and trim T2 for maximum output.

(h) Connect the signal generator as shown in the diagram above, to VIB.

(j) Connect the damping device (0.1μF capacitor and 20kΩ resistor in series) across the primary of T1 (anode of V1B and junction of R8 and C16) and trim the secondary of T1 for maximum audio output. (Tuning slug on top of can).

(k) Transfer the damping device to the secondary of T1 (between grid of V1D and chassis) and tune the primary of T1 for maximum audio output. (Tuning slug on underside of can).

(l) Check that the sensitivity is better than 120μV for a 50mW output.

2. I.F. BANDWIDTH

(a) Connect signal generator to V1B and output meter as in Section 1 (b).

(b) Set the signal generator output to 100μV and tune to the centre of the I.F. response.

(c) Adjust GAIN control RV2 to give an output of 10mW.

(d) Increase a signal generator output to 200μV.

(e) Detune the signal generator on either side of resonance in turn to give an audio output of 10mW. The total bandwidth between these two points should be between 5 and 8 kc/s.

(f) Without disturbing the setting of GAIN control RV2, adjust the signal generator output to 100mV.

(g) Detune the signal generator on either side of resonance in turn to give an audio output of 10mW. The total bandwidth between these two points should not be greater than 28 kc/s.

3. <u>BFO ADJUSTMENT</u>

(a) Connect signal generator, as in Section 1.

(b) Tune the signal generator accurately to 460 kc/s, switch off modulation and adjust output to 100μV.

(c) Set system switch SD to NET and adjust L11 for zero beat in headphones. (L11 located on top of can).

(d) Set system switch to C. W. and check that zero beat occurs roughly in the central position of HET. TONE control. The range of audio tone produced by RV1 on either side of the centre line should be approximately 3 kc/s.

(e) Set system switch to R/T and adjust modulated input to give 20mW output.

(f) Switch modulation off and set system switch to C. W.

(g) Adjust HET. TONE control RV1 for maximum audio output.

(h) Adjust twisted wire condenser C59 for maximum audio output, (approximately 100mW).

(j) Re-seal C59.

(k) Repeat (b) and (c).

(l) Re-seal the core of L11.

4. <u>OSCILLATOR (V1C) ADJUSTMENTS</u>

<u>'H.F' Band</u> (4.0 - 10.0 Mc/s)

(a) Tune signal generator to 9.0 Mc/s, unmodulated, and feed a signal of 100 - 150μV between top cap of V1B and chassis.

(b) Set system switch SD to NET and receiver frequency dial to 9.0 Mc/s. Adjust C12B for zero beat in headphones. (C12B located on underside of chassis).

(c) Set signal generator and receiver frequency dial to 4 Mc/s. Adjust L6A for zero beat in headphones. (L6A located on top of chassis).

(d) Repeat (a) to (c) until calibration holds at both 9.0 and 4.0 Mc/s.

(e) Check calibration at 1 Mc/s intervals with the aid of a crystal calibrator. The error at each point should not exceed the following:-

Between 8 Mc/s and 10 Mc/s ±1%
Between 4 Mc/s and 8 Mc/s ±0.5%

(f) Re-seal C12B and the core stem of L6A.

'L.F' Band (1.6 - 4.0 Mc/s)

(a) Set signal generator to 4.0 Mc/s, unmodulated, and feed a signal of 100 - 150µV between top cap of V1B and chassis.

(b) Set system switch SD to NET and receiver frequency dial to 4.0 Mc/s 'L.F'. Adjust C12A for zero beat in headphones. (C12A located on underside of chassis).

(c) Set signal generator and receiver frequency dial to 1.7 Mc/s and adjust core of L5A for zero beat in headphones. (L5A located on top of chassis).

(d) Repeat (b) and (c) until calibration holds at both points.

(e) Check calibration at 1 Mc/s intervals with the aid of a crystal calibrator. The error at each point should not exceed ±0.5%.

(f) Re-seal C12A and the core stem of L5A.

5. RECEIVER RF ANODE CIRCUIT ADJUSTMENTS & OVERALL SENSITIVITY

'H.F' Band (4.0 - 10.0 Mc/s)

(a) Set signal generator to 9.0 Mc/s, modulated 30% at 400 c/s and connect it to the aerial terminal via the dummy aerial.

(b) Set system switch SD to R/T.

(c) Connect output meter across harness socket pins SKTAb and SKTAc.

(d) Tune receiver controls to signal generator. Adjust C10A (at the same time adjusting the main tuning condenser for maximum audio output. (C10A located on underside of chassis).

(e) Set the signal generator to 4.0 Mc/s and tune the receiver controls to the signal generator. Adjust L2A for maximum audio output. (L2A located on top of chassis).

(f) Repeat (d) and (e) until no further improvement in audio output is obtained.

(g) Check the overall sensitivity for 50mW receiver output at the following frequencies:- 4.0, 6.0 and 9.0 Mc/s. Aerial coupling control to be adjusted to the figure given in Table C in Operating Instructions'.

(h) The overall sensitivity should be better than 4μV at 9.0 and 6.0 Mc/s and 6μV at 4.0 Mc/s.

(j) Re-seal C10A and the core stem of L2A.

'L.F' Band (1.6 - 4.0 Mc/s)

(a) Set the signal generator to 4.0 Mc/s and tune the receiver controls to the signal generator.

(b) Adjust C11A for maximum audio output. (C11A located on underside of chassis).

(c) Set the signal generator to 1.7 Mc/s and tune the receiver controls to the signal generator.

(d) Adjust L3A for maximum audio output. (L3A located on top of chassis.)

(e) Repeat (a) to (d) until no further improvement in output is obtained.

(f) Check overall sensitivity for 50mW receiver output at the following frequencies:- 4.0, 2.5 and 1.7 Mc/s. Aerial coupling control to be adjusted to the figure given in Table C in 'Operating Instructions'.

(g) The overall sensitivity should be better than 3μV.

(h) Re-seal C11A and the core stem of L3A.

6. SENDER-MIXER & BUFFER AMPLIFIER CIRCUIT ADJUSTMENTS

'L.F' Band (1.6 - 4.0 Mc/s)

(a) Set range switch to 1.6 - 4.0 Mc/s and the frequency control to 4.0 Mc/s.

(b) Set ON/OFF switch to ALL ON, meter switch to DRIVE and M.O./XTAL switch to XTAL, but do not plug in the crystal.

(c) A reading on the built-in meter (cathode current of V6A) of approximately 26 - 28mA should be obtained.

(d) Set M.O./XTAL switch to M.O. and the frequency control to 3.5 Mc/s.

(e) Set C28A one turn from maximum. (C28A located on underside of chassis.)

(f) Adjust C11B and C11C for maximum drive, as indicated on meter. (C11B and C11C located on underside of chassis.)

(g) Set frequency control to 1.7 Mc/s.

(h) Adjust L3C for maximum drive, as indicated on meter (L3C located on top of chassis).

(j) Adjust L3B to minimum (anticlockwise). Rotate the core of L3B clockwise until the second peak is obtained on the meter. (L3B located on top of chassis).

(k) Set frequency control to 4.0 Mc/s and if necessary re-adjust C11B and C11C for maximum drive.

(l) Set frequency control to 1.7 Mc/s and re-adjust L3B and L3C for maximum drive.

(m) Check that the drive remains reasonably constant over the whole band. If it is found that the drive falls off rapidly between 3.5 and 3.0 Mc/s, C11B and C11C need re-adjusting.

(n) Re-seal C28A, C11B and C11C and the core stems of L3B and L3C.

Drive Reading Limits

C.W.	45mA	±5mA.	Variations over complete band ±8mA.
R/T	32mA	±4mA.	Variations over complete band ±7mA.

NOTE:- Any large decrease in DRIVE readings over the complete band indicates drive mis-alignment or faulty gang condenser.

'H.F' Band (4.0 - 10.0 Mc/s)

(a) Set range switch to 4.0 - 10.0 Mc/s and frequency control to 4.0 Mc/s.

(b) Adjust L2B and L2C for maximum drive, as shown on meter. (L2B and L2C located on top of chassis.)

(c) Set frequency control to 8.0 Mc/s.

(d) Set C28B to maximum (C28B located on underside of chassis).

(e) Adjust C10B for maximum drive, as indicated on meter. (C10B located on underside of chassis.)

(f) Adjust C10C in conjunction with C28B for maximum drive, as indicated on meter. (C10C and C28B located on underside of chassis.)

(g) Set frequency control to 4.0 Mc/s and re-adjust L2B and L2C for maximum drive.

(h) Set frequency control to 10.0 Mc/s and repeat (d) to (f).

(j) Re-seal C28B, C10B and C11C and core stems of L2B and L2C.

Drive Reading Limits

C.W.	40mA	±4mA.	Variations over the complete band ±7mA.
R/T	28mA	±3mA.	Variations over the complete band ±6mA.

NOTES:-

1. Any large decrease in the drive readings over the complete range indicate mis-alignment.

7. MODULATION CHARACTERISTICS

(a) Connect the dummy aerial to the aerial terminal.

(b) Connect the Beat Frequency Oscillator via the output pad (see Fig. 9) to the harness socket pins SKTAd and SKTAe.

(c) Set system switch SD to C. W. and tune transmitter to 4.0 Mc/s.

(d) Set system switch to R/T.

(e) Adjust the BFO modulation frequency to 1 kc/s.

(f) Loosely couple the Cathode Ray Oscilloscope to the dummy aerial and adjust the C.R.O. to display the modulation envelope.

(g) Note the unmodulated level as shown on C.R.O.

(h) Adjust the input level until the troughs of the displayed pattern just meet (i.e. 100% modulation). The input voltage should read between 5mV and 15mV and the peak RF voltage, as indicated on the C.R.O., should rise by more than 80% of its unmodulated value.

(j) Check that the envelope is reasonably free from apparent distortion.

(k) Check the input levels required to achieve 100% modulation at 400 c/s and 3 kc/s. These levels should be within +6dB and -3dB respectively of the level required at 1 kc/s.

8. METER CALIBRATION

L. T. (Measured in 'receive' conditions)

(a) With meter switch SE to 'L. T.' adjust input to set to 12 volts at input plug PLB.

(b) Note reading of meter. This reading should be 12 volts ±1 volt.

(c) Pencil this reading in the space provided on the front panel. (See Fig. 8).

H. T. R. (Measured in 'receive' conditions)

(a) With meter switch SE to H. T. R. measure accurately with the Universal Test Meter the voltage between 2nd IF transformer H. T. point and earth.

(b) Compare this reading with that indicated on the meter. The meter reading should be within ±10% of that obtained in (a).

H. T. S. (Measured in 'transmit' conditions)

(a) With meter switch SE to H. T. S. measure accurately with the Universal Test Meter the voltage across fuse FS1 and chassis.

(b) Compare this reading with that indicated on the meter. The meter reading should be within ±10% of that obtained in (a).

Aerial

(a) Connect the dummy aerial to the aerial terminal.

(b) Adjust the set to feed 350mA into the dummy aerial at 8.0 Mc/s.

(c) Set meter switch SE to AE.

(d) Adjust R44 until a reading of 10 volts is indicated on the built-in meter.

(e) Adjust the set to feed 350mA into the dummy aerial at 3.0 Mc/s.

(f) A reading of 12 volts ±2 volts should be obtained.

9. CRYSTAL SENSITIVITY

(a) Set switch SB to XTAL.

(b) Connect the signal generator set to 9.0 Mc/s to the aerial terminal via the dummy aerial.

(c) Set the receiver tuning dial to 9.0 Mc/s and plug a 9460 kc/s crystal into the socket provided on the front panel. Tune the signal generator to receiver without moving the receiver tuning dial and measure sensitivity for 50mW output. The figure obtained should not be greater than 5µV.

(d) Repeat (b) and (c) at 4.0 Mc/s 'H.F', 4.0 Mc/s 'L.F', 1.7 Mc/s and in each case a figure of not greater than 5µV should be obtained.

10. RECEIVER PERFORMANCE (C.W.)

(a) Set switch SB to M.O. and system switch SD to R/T.

(b) Connect signal generator set to 4.0 Mc/s, modulated 30% at 400 c/s, to aerial terminal via the dummy aerial.

(c) Tune receiver controls to signal generator and with the GAIN control RV2 at maximum (fully clockwise), adjust signal generator input for 20mW output.

(d) Remove modulation from signal generator, set system switch SD to C.W. and adjust HET. TONE control RV1 for maximum output at a frequency of approximately 1000 c/s.

(e) Note this output and calculate:

$$x = \frac{\text{C.W. audio output}}{\text{R/T audio output}}$$

The value of x (C.W. gain) should be not less than 3.

(f) Increase output from signal generator to lmV, reduce GAIN control and adjust HET. TONE control for maximum output at a frequency not greater than 1000 c/s. Verify that an output of at least 200mW can be obtained.

11. A.V.C. CHARACTERISTICS

(a) Set system switch SD to R/T.

(b) Apply a signal of 2μV at 4.0 Mc/s from the signal generator to the aerial terminal via the dummy aerial.

(c) Tune receiver controls to the signal generator.

(d) Increase the signal generator output to 100mV and adjust the GAIN control RV2 until the output meter reads 50mW.

(e) Reduce signal generator output to 50μV, an audio output of not less than 2mW should be obtained.

12. A.V.C. METER CHECK

(a) Set system switch SD to R/T and meter switch SE to A.V.C.

(b) With no signal applied and GAIN control RV2 at maximum the meter should read between 3 and 5.5 volts.

(c) Apply a signal of 20μV at 4.0 Mc/s from the signal generator via the dummy aerial to the aerial terminal.

(d) Tune receiver to signal generator and note an increase of at least 0.75V in the meter reading on that obtained in (b).

(e) Increase signal generator output slowly up to 100mV. Note that the meter reading shows a progressive increase and that there is one tuning peak only.

(f) Disconnect signal generator and set system switch SD to C.W.

(g) Turn GAIN control RV2 fully anti-clockwise. A reading of at least 9 volts should be indicated on meter.

CHAPTER VIII

M A I N T E N A N C E

OPERATOR'S SERVICING

To maintain the efficiency and increase the life of the equipment the following operator's servicing routine has been compiled.

Suggested Daily Routine

(a) Clean with soft cloth

1. All exposed controls and surfaces.
2. Joints in the rod aerials and the aerial base.
3. Plugs and sockets on the headgear assemblies.
4. All pins and contacts on plugs and sockets.
5. Battery terminals. After cleaning grease well with petroleum jelly.

(b) Inspect

1. All external connections. Check that they are firmly in position.
2. That cables are not frayed or badly worn.
3. That all control knobs are secure.
4. That the aerial base connections are sound.
5. That the front panel securing screws holding the equipment in its case are tight.
6. All headgear assemblies observing that the cables are not frayed or badly worn.

FUNCTIONAL TESTS

The following routine functional tests should be carried out monthly to ensure that the equipment is in good working order. Should any test in this section give unsatisfactory results, the matter should be reported immediately.

Because of the series parallel wiring of the valve filaments, a fault may have widespread effects on the set. For this reason A L W A Y S switch the set to 'ALL OFF' when replacing or removing a valve.

Batteries

(a) Clean the air vent in the cap of each cell in the batteries and check that the electrolyte covers the plates.

(b) Test the specific gravity of each cell, if any cell gives a reading below 1180 have the battery re-charged.

(c) Remove any corrosion from the terminals and apply a liberal coating of grease.

(d) Check that the straps between cells are tightly connected.

Receiver

(a) Set ON/OFF switch (6) to REC. ON, system switch (4) to R/T and XTAL/M.O. switch (22) to M.O.

(b) Set meter switch (15) to L.T., a meter reading of at least 11V should be obtained.

(c) Set meter switch (15) to H.T.R., a meter reading of approximately 140V should be obtained.

(d) With range switch (1) to 1.6 - 4.0 Mc/s, tune in to any strong R/T signal. If the noise level is higher than normal, disconnect the aerial and note if the noise persists. Repeat with range switch (1) set to 4.0 - 10.0 Mc/s. After disconnecting the aerial if the noise persists or if the H.T.R. or H.T.S. meter readings are erratic, the rotary transformer should be overhauled by a competent engineer. The rotary transformer should give at least 1000 hours service before this becomes necessary.

(e) Check that a smooth increase in volume is obtained by rotating the GAIN control (3).

(f) Set meter switch (15) to A.V.C. and check that the meter reading rises when the station is tuned correctly. The reading should be approximately 5V, rising when the signal is tuned in.

(g) Set ON/OFF switch (6) to ALL ON and system switch (4) to NET. Check that zero beat in the headphones is obtained when tuning into a signal.

(h) Set system switch (4) to C.W. and see that a beat note is obtained on C.W. signals. Check that the HET. TONE control (5) gives smooth variations of the pitch of the beat note.

Transmitter

(a) Set ON/OFF switch (6) to ALL ON and meter switch (15) to H.T.S. A reading of approximately 300V should be indicated on the meter.

(b) Set system switch (4) to C.W. and meter switch (15) to DRIVE. Operate pressel switch or morse key and check that a fairly constant drive reading is obtained over the complete frequency range. The drive reading should not vary more than between 8 and 12 volts over the complete frequency range.

(c) Set meter switch (15) to AE. Press morse key and tune the transmitter for maximum aerial current reading on the meter. Operate morse key and ensure that keying is satisfactory.

(d) Set system switch (4) to R/T. Operate the pressel switch and see that an aerial current meter reading is obtained. Speak into the microphone and check that sidetone is heard and that the meter reading fluctuates according to different speech levels.

MECHANIC'S SERVICING

MECHANICAL REPLACEMENTS & ADJUSTMENTS

1. Relay (RLA)

(a) Unsolder the connections and remove the two screws holding the relay to the chassis.

(b) See that the contacts and pole-piece are clean and that no iron dust has formed on the pole-piece. Check that the contacts make and break correctly without fouling the cam.

The following information will be found useful when adjusting or checking the relay:-

Contacts 1 & 3, 21 & 23	16 - 20 grams
2 & 22	8 - 12 grams
Armature travel	31 mils
Armature residual stud	12 mils
Operating current	70mA
Saturating current	100mA

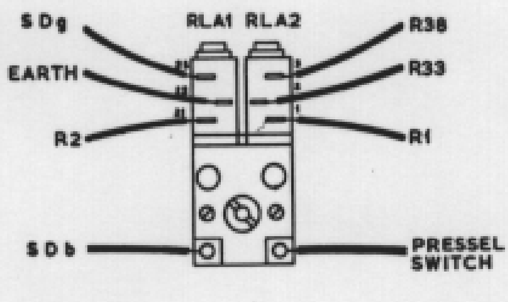


Fig.10 Relay Connections

2. Rotary Transformer

To gain access to the rotary transformer for changing brushes etc., carry out the following instructions.

(a) Remove the baseplate.

(b) Disconnect the rotary transformer connecting leads from the terminal block fitted to the side of the main chassis (see Fig. 10).

(c) Place the equipment on a bench, the right way up, and unscrew the two screws at the rear of the chassis, at the back of the aerial tuning inductance.

(d) The rotary transformer together with its associated components mounted in the screened case can now be removed from the main chassis as one unit.

(e) The rotary transformer is mounted on the bottom half of the screened case. Remove the remainder of the case by undoing the screws around the edge.

(f) Check that the rubber grommets used for suspension have not perished.

(g) Check both the L. T. and the H. T. brushes. It will be found that the L. T. brushes wear more rapidly than the H. T. brushes.

(h) When the brushes need replacing, it is also likely that the commutator will require skimming. Check to ascertain if this is so.

(j) Examine the armature bearings for wear and if any 'side-play' is present they should be renewed.

(k) Re-assemble in the reverse order.

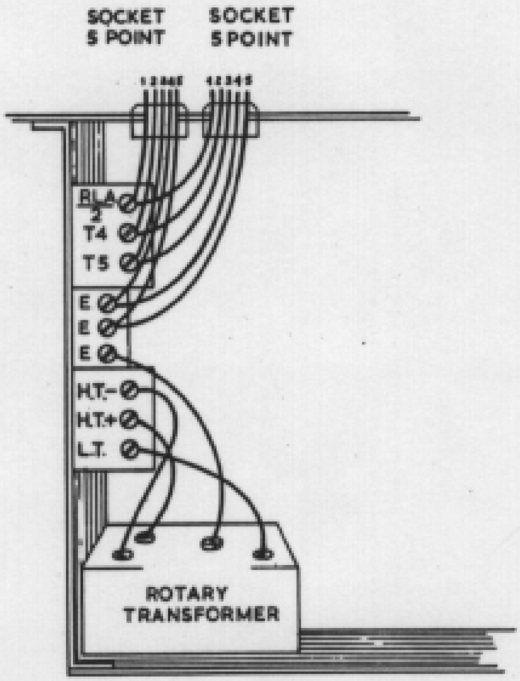


Fig. 11 Rotary Transformer Connections

3. Aerial Tuning Inductance L7

(a) Remove the aerial tuning knob and drive, by removing the knob and unscrewing the clutch screw (taking care not to lose the clutch spring).

(b) Remove the dial by unscrewing the two grub screws.

(c) Unsolder the connections to the aerial tuning inductance and fuse panel.

(d) Remove the tape holding the aerial lead to the frame.

(e) Remove the three screws holding the aerial tuning inductance frame to the chassis and lift out. To do this it will be necessary to move the RF transformer assembly.

(f) Re-assemble in the reverse order.

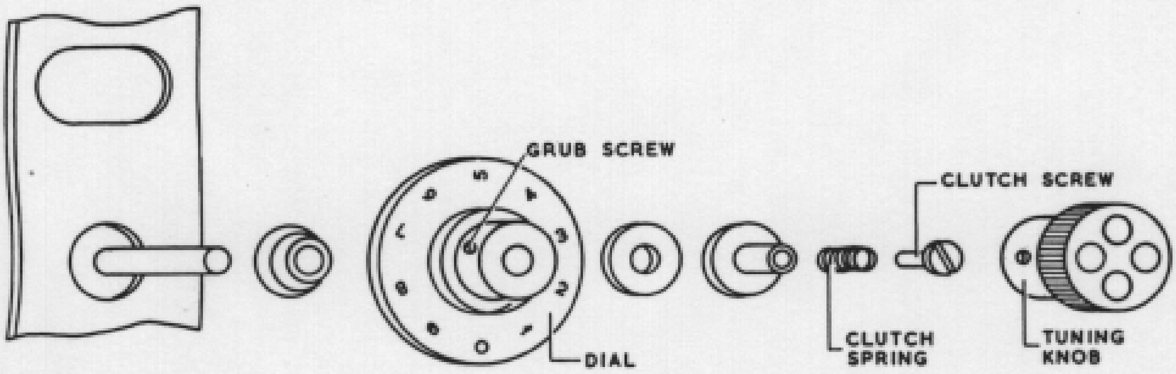


Fig. 12 Dismantling of Aerial Tuning Inductance

4. Frequency Range Switch (SA)

(a) Remove the knob by unscrewing the centre screw and loosening the grub screw at the side.

(b) Remove the knob and prise off the metal and neoprene shaft seals, and then detach the escutcheon by removing the fixing screws and nuts.

(c) Turn the set upside down and unscrew the two screws holding the click plate to its mounting frame.

(d) By rotating the click plate and pulling the shaft forward, the shaft and click plate can be detached. This will allow the switch wafers to be removed separately as required.

5. <u>System Switch (SD)</u>

(a) Remove the knob and shaft sealing washers as in paragraph 4 and unscrew the two screws holding the switch to the front panel.

(b) To remove the switch it will be necessary to unsolder the shorter lead before it can be withdrawn.

6. <u>RF Coils</u>

Remove an RF coil as follows:-

(a) Unsolder the connections to the coil.

(b) Remove the nut and shakeproof washer which holds the coil in position. (Located on top of chassis).

(c) Remove the coil complete with dust core and trimmer from the chassis.

7. <u>ON/OFF Switch (SC)</u>

(a) Remove the knob and the nut holding the gland to the panel.

(b) Remove the nut holding the switch mounting to chassis, disconnect the switch and lift out. To do this it may first be necessary to remove C28A. The separate switches can now be removed by undoing the fixing screws.

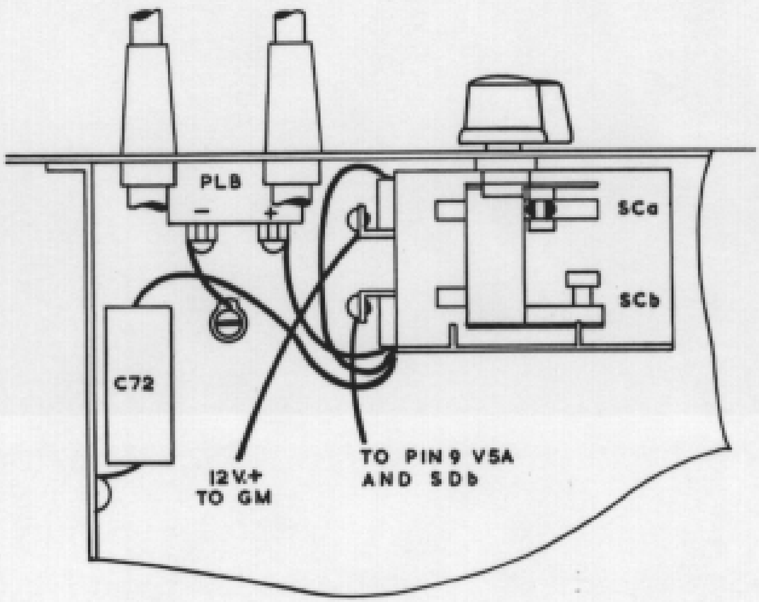


Fig. 13 ON/OFF Switch Connections

CHAPTER IX

FAULT FINDING

Symptom	Indication	Possible Fault	Action
1. On switching on, rotary transformer does not run.	(a) Low meter reading on L. T.	(i) Battery connector not properly plugged in or faulty.	(a) Check that all sockets are making good contact. (b) Replace leads.
		(ii) Batteries discharged or faulty.	(a) Replace or re-charge batteries.
	(b) Normal L. T. meter reading.	(i) Internal fault.	(a) Report.
2. Rotary transformer runs but no receiver output or transmitter sidetone audible in phones.	(a) Only L. T. reading on meter.	(i) Fuse blown	(a) Repair fuse. If fuse blows again, report.
	(b) Meter readings normal. Aerial current can be obtained on transmit (drive decreases on switching from M. O. to XTAL), & A. V. C. readings normal.	(i) Headset or leads faulty.	(a) Connect headset to the other drop lead. (b) Replace headset.
		(ii) Faulty AF valves	(a) Replace V2A & V3A.
		(iii) Faulty RF valve	(a) Replace V1A.
	(c) Aerial current cannot be obtained.	(i) Faulty local oscillator & some receiver valves.	(a) Replace V1A, V1C & V1D & if necessary V1B, V2A, V3A & V3B.
3. Receiver noise only can be heard with GAIN control at max. (fully clockwise).		(i) Faulty local oscillator valve.	(a) Replace V1C.
4. Set will not switch to transmit.		(i) Switch settings incorrect.	(a) Check that set is switched to ALL ON & that system switch is to R/T or C. W. & <u>not</u> NET.
5. No receiver output but transmitter gives normal aerial current & sidetone.	(a) A. V. C. meter reading high (should read between 3.0 & 5.5).	(i) Faulty 2nd IF valve	(a) Replace V1E. (b) If A. V. C. reading is now normal but set does not function proceed as for symptom (b) below.
	(b) All meter readings normal.	(i) Faulty 1st IF valve	(a) Replace V1D.
		(ii) Other receiver valves faulty.	(a) Replace valves in following order, V1B, V1A, V1E & V2A.

FAULT FINDING (Cont)

Symptom	Indication	Possible Fault	Action
6. Signal cannot be peaked by adjustment of aerial tuning controls.		(i) Aerial & earth connections faulty.	(a) Check that aerial and earth leads are connected. (b) See that joints in aerial are clean & fitting firmly. (c) Replace aerial and earth leads.
		(ii) Aerial tuning inductance carrier.	(a) Report.
7. Noise level excessively high even when aerial is disconnected.		(i) Rotary transformer faulty.	(a) Report.
8. No aerial current.	(a) All other meter readings normal, drive reading shows appreciable decrease on switching from M.O. to XTAL (no crystals in socket)	(i) Aerial and earth connections faulty.	(a) Repeat as in 6 above.
	(b) Very low or no DRIVE reading.	(i) Faulty P.A. valve	(a) Replace V6A.
	(c) Meter reads DRIVE but reading does not change on switching from M.O. to XTAL. Receiver functions normally on C.W.	(i) Faulty buffer amplifier valve.	(a) Replace V5A. (b) If transmitter output is still low replace sender-mixer valve (V4A) also.
	(d) As in (c) but no whistle can be obtained when a station is tuned in on receive C.W.	(i) Faulty BFO and sender-mixer valve.	(a) Replace V4A.
9. On speaking loudly into the microphone on R/T, no sidetone is audible.		(i) Aerial circuit not correctly tuned.	(a) Tune set using one of the standard aerials.
	(a) Aerial current does not vary with loud speech.	(i) Faulty microphone amplifier valve.	(a) Replace V3B.

CHAPTER X

TEST DATA

The figures quoted in the tables below were obtained under the following conditions:-

(a) GAIN control at maximum (fully clockwise).
(b) XTAL/M.O. switch to M.O.
(c) Range switch to 4.0 - 10.0 Mc/s.
(d) Frequency control to 6.0 Mc/s.
(e) ON/OFF switch to ALL ON.
(f) Meter switch to DRIVE.
(g) 12 volt as input plug.
(h) Measured on a meter having a sensitivity of 500 Ω/volt (Avo Model 7 suitable).
(j) Voltages above 50 volts measured on 400 volt range.

Voltages between 10 and 50 volts measured on 100 volt range.

RESISTANCE TABLE

Valve	Pin No.	Between Pin &	Receive	Transmit
V1A	1	Chassis	1.9	1.9
	2	H.T.	S/C	1.2k
	3	H.T.	100k	100k
	4	H.T.	220k	220k
	5	Chassis	S/C	S/C
	6	Chassis	S/C	S/C
	7	Chassis	2.9	2.9
	8	Chassis	S/C	S/C
	T.C	Chassis	R/T 700k C.W. &Net 105k	R/T 700k C.W. 105k
V1B	1	Chassis	7.7	7.7
	2	H.T.	33k	33k
	3	H.T.	40k	42k
	4	H.T.	63k	67k
	5	Chassis	0.05	0.05
	6	Chassis	S/C	S/C
	8	Chassis	5	5
	T.C	Chassis	470k	470k
V1C	1	Chassis	2.9	2.9
	2	Chassis	5.1	5.1
	3	H.T.	28k	30k
	4	H.T.	28k	30k
	5	Chassis	S/C	S/C
	6	Chassis	S/C	S/C
	7	H.T.	18k	18k
	8	Chassis	0.05	0.05
	T.C	Chassis	47k	47k
V1D	1	Chassis	1.9	1.9
	2	Chassis	7.8	7.8
	3	H.T.	33k	33k
	4	H.T.	220k	220k
	5	Chassis	S/C	S/C
	6	Chassis	S/C	S/C
	7	Chassis	7.9	7.9
	8	Chassis	S/C	S/C
	T.C	Chassis	R/T 600k C.W. & Net 100	R/T 600k C.W. 100
V1E	1	Chassis	1.9	1.9
	3	H.T.	33k	33k
	4	H.T.	80k	80k
	5	Chassis	S/C	S/C
	6	Chassis	S/C	S/C
	7	Chassis	3.3k *	3.3k *
	8	Chassis	S/C	S/C
	T.C.	Chassis	R/T 600k C.W. &Net 100	R/T 600k C.W. 100
V2A	1	Chassis	7.9	7.9
	2	Chassis	100	100
	3	H.T.	290k	280k
	4	Chassis	R/T 600k C.W. &Net 1M	R/T 600k C.W. 1M
	5	Chassis	570k	570k
	6	Chassis	S/C	S/C
	7	Chassis	R/T 600k C.W & Net 1M	R/T 600k C.W. 1M
	8	Chassis	4.8	4.8
	T.C	Chassis	28k	28k

Valve	Pin No.	Between Pin &	Receive	Transmit
V3A	1	Chassis	3.9	3.9
	2	Chassis	5.2	5.2
	3	H.T.	20.5k	20.5k
	4	H.T.	20k	20k
	5	Chassis	1M	1M
	6	Chassis	2M	2M
	7	Chassis	0.5	0.5
	8	Chassis	1.8	1.8
V3B	1	Chassis	2	2
	2	H.T.	5k	1.5k
	3	H.T.	5k	S/C
	4	H.T.	5k	S/C
	5	Chassis	S/C	S/C
	6	Chassis	4.2	4.2
	7	Chassis	R/T 2.3k C.W & Net 2k	R/T 2.3k C.W. 2k
	8	Chassis	S/C	S/C
	9	Chassis	S/C	S/C
V4A	1	Chassis	5	5
	2	Chassis	470k	470k
	3	H.T.	75k	68k
	4	H.T.	270k	270k
	5	Chassis	220k	220k
	6	H.T.	5k	S/C
	7	H.T	R/T 5k C.W & Net S/C	S/C
	8	Chassis	3.9	3.9
V5A	1	Chassis	S/C	S/C
	2	Chassis	0.5	0.5
	3	H.T.	10k	4.7k
	4	H.T.	105k	100k
	5	Chassis	3	3
	6	H.T.	R/T 155k C.W & Net 150k	150k
	7	Chassis	2	2
	8	Chassis	3.9	3.9
	T.C	Chassis	3.3k	3.3k
V6A	1	Chassis	2	2
	2	H.T.	105k	100k
	3	H.T.	5k	S/C
	4	Chassis	S/C	S/C
	5	Chassis	S/C	S/C
	6	Chassis	S/C	S/C
	7	Chassis	470k	470k
	8	Chassis	S/C	S/C
	9	Chassis	0.5	0.5

*Note:- Meter in all positions except A.V.C. When at A.V.C. resistance is 480Ω.

VOLTAGE & CURRENT TABLE

SWITCH POSITIONS		VOLTAGE				CURRENT(mA)			
Pressel Switch to:		Receive		Transmit		Receive		Transmit	
Switch SD to:		R. T.	Net & C. W.	R. T.	C. W.	R. T.	Net & C. W.	R. T.	C. W.
Valve	Pin No.								
V1A	1	2	2	2	2	50	50	50	50
	2	315	320	-	-	-	-	-	-
	3	100	.112	-	-	1.5	1.4	-	-
	4	60	75	-	-	0.6	0.5	-	-
	7	2	2	2	2	50	50	50	50
V1B	1	4	4	4	4	50	50	50	50
	2	115	135	-	-	-	-	-	-
	3	80	80	85	85	2	2	2	2
	4	80	80	85	85	0.85	0.85	0.85	0.85
	8	2	2	2	2	50	50	50	50
V1C	1	2	2	2	2	50	50	50	50
	2	2	2	2	2	-	-	-	-
	3	95	95	100	100	4	4	4	4
	4	95	95	100	100	4	4	4	4
	7	132	132	142	136	-	-	-	-
	8	-	-	-	-	50	50	50	50
V1D	1	2	2	2	2	50	50	50	50
	2	4	4	4	4	-	-	-	-
	3	115	135	-	-	1.7	1.6	-	-
	4	60	75	-	-	0.6	0.5	-	-
	7	4	4	4	4	-	-	-	-
	8	-	-	-	-	50	50	50	50
V1E	1	2	2	2	2	50	50	50	50
	3	115	135	-	-	1.7	1.6	-	-
	4	62	85	-	-	0.9	0.8	-	-
	7	0.3	0.4	-	-	-	-	-	-
V2A	1	4	4	4	4	50	50	50	50
	2	-3	-3	-5.5	-6.3	-	-	-	-
	3	-	-	97	95	-	-	0.35	0.35
	4	-	-	-3	0	-	-	-	-
	8	6	6	6	6	50	50	50	50
V3A	1	4	4	4	4	150	150	150	150
	2	6	6	6	6	-	-	-	-
	3	108	108	98	98	7.5	7.5	7	7
	4	112	112	103	103	2.5	2.5	2.3	2.3
	7	12	12	12	12	-	-	-	-
	8	2	2	2	2	150	150	150	150
V3B	1	6	6	6	6	600	600	600	600
	2	-	-	265	250	-	-	24	40
	3	-	-	265	250	-	-	-	-
	4	-	-	265	250	-	-	3.5	5
	6	-	-	0.2	0.25	-	-	27.5	45
	7	-	-	-38	-31	-	-	-	-
	9	-	-	-	-	600	600	600	600
V4A	1	6	6	6	6	150	150	150	150
	3	-	-	80	80	-	-	2.8	2.8
	4	-	-	95	95	-	-	0.3	0.3
	6	-	-	265	250	-	-	-	-
	7	315	315	270	250	-	-	-	-
	8	4	4	4	4	150	150	150	150
V5A	2	12	12	12	12	300	300	300	300
	3	-	-	270	250	-	-	2.8	2.6
	4	-	-	50	50	-	-	1	1
	6	-	90	90	90	-	1.5	1.5	1.5
	7	6	6	6	6	300	300	300	300
	8	4	4	4	4	-	1.5	5.3	5.1
V6A	1	6	6	6	6	300	300	300	300
	2	-	-	150	135	-	-	0.65	0.63
	3	-	-	280	265	-	-	5	5
	9	12	12	12	12	300	300	300	300

PARTS LISTS

AND

DIAGRAMS

TRANSCEIVER

CONDENSERS

Code	Value	Type	Voltage	Tolerance	Ref. No.
C1	90pF	Mica	350V	±10%	66715
C2	0.1μF	Tubular	350V	±20%	266353
C3	0.001μF	Mica	350V	±20%	66758
C4	0.1μF	Tubular	350V	±20%	266353
C5	0.005μF	Tubular	1kV	±20%	68390
C8	140pF	Mica	350V	± 5%	66301
C9	550pFmax.	Trimmer			80250
C10A	1.5-15pF	Trimmer			80139
C10B	1.5-15pF	Trimmer			80139
C10C	1.5-15pF	Trimmer			80139
C11A	3-50pF	Trimmer			80136
C11B	3-50pF	Trimmer			80136
C11C	3-50pF	Trimmer			80136
C12A	3-30pF	Trimmer			80234
C12B	3-30pF	Trimmer			80234
C13	5pF	Mica	350V	±20%	66240
C14	0.1μF	Tubular	350V	±20%	266353
C15	0.1μF	Tubular	350V	±20%	266353
C16	0.1μF	Tubular	350V	±20%	266353
C17	250pF	Mica	350V	± 2%	66297
C18	0.1μF	Tubular	350V	±20%	266353
C19	250pF	Mica	350V	± 2%	66297
C20	500pF	Mica	350V	±20%	66095
C21	10pF	Mica	350V	±20%	66005
C22	140pF	Mica	350V	± 5%	66301
C23	550pFmax.	Trimmer			80250
C24	15pF	Mica	350V	±20%	66247
C25	27pF	Tub. Ceramic	350V	±10%	66964
C26	1700pF	Mica	350V	±20%	66295
C27	0.1μF	Tubular	350V	±20%	266353
C28A	4.75pF	Trimmer			80127/A
C28B	4.75pF	Trimmer			80127/A
C29	250pF	Mica	350V	± 2%	66297
C30	0.1μF	Tubular	350V	±20%	266353
C31	3500pF	Mica	350V	± 2%	66296
C32	10pF	Tub. Ceramic	350V	±10%	66963
C33	0.1μF	Tubular	350V	±20%	266353
C34	250pF	Mica	350V	± 2%	66297
C35	0.1μF	Tubular	350V	±20%	266353
C36	410pF	Mica	350V	± 2%	66298
C37	100pF	Moulded Mica	350V	±20%	66096
C38	500pF	Moulded Mica	350V	±20%	66095
C39	410pF	Mica	350V	± 2%	
C40	0.005μF	Tubular	1kV	±20%	68390
C41	20pF	Mica	350V	±20%	66006
C42	100μF	Electrol.	6V	+50%) -20%)	67240
C43	2μF	Electrol.	350V	±20%	67230
C44	0.005μF	Tubular	1kV	±20%	68390
C45	0.001μF	Moulded Mica	350V	±20%	66758
C46	487pFmax.	Trimmer			80244
C47	0.004μF	Moulded Mica	750V	±15%	66109
C48	0.1μF	Tubular	350V	±20%	266353
C49	30pF	Mica		±10%	66717
C50	0.1μF	Tubular	350V	±20%	266353
C51	550pFmax.	Trimmer			80250
C52	20pF	Mica	350V	±20%	66006
C53	90pF	Mica	350V	±10%	66715
C54	550pFmax.	Trimmer			80250
C55	0.1μF	Tubular	350V	±20%	266353
C56	0.1μF	Tubular	350V	±20%	266353
C57	0.1μF	Tubular	350V	±20%	266353
C58	820pF	Mica	350V	± 2%	66300
C59		Twisted wire			
C60	90pF	Mica	350V	± 5%	66299
C61	0.001μF	Moulded Mica	350V	±20%	66758
C62	0.1μF	Tubular	350V	±20%	266353
C63	0.03μF	Tubular	500V	±10%	68391
C64	0.1μF	Tubular	350V	±20%	266353
C65	2μF	Electrol.	350V	±20%	67230
C66	8μF	Electrol.	550V	+50%) -20%)	67248
C67	8μF	Electrol.	75V	+50%) -20%)	67233
C68	0.1μF	Tubular	350V	±20%	68392
C69	0.1μF	Tubular	350V	±20%	68392
C70	0.005μF	Tubular	1kV	±20%	68390
C71	0.1μF	Tubular	350V	±20%	68392
C72	0.1μF	Tubular	350V	±20%	266353

RESISTORS

Code	Value	Type	Rating	Tolerance	Ref. No.
R1	220kΩ	Ceramic	½W	±20%	57068
R2	100kΩ	Ceramic	¼W	±20%	70743
R3	4.7kΩ	Ceramic	¼W	±20%	57062
R4	1MΩ	Ceramic	¼W	±20%	70723
R5	100kΩ	Ceramic	½W	±20%	70866
R6	470kΩ	Ceramic	½W	±20%	58209
R7	47kΩ	Ceramic	¼W	±20%	57044
R8	22kΩ	Ceramic	¼W	±20%	57060
R9	10kΩ	Ceramic	¼W	±20%	57052
R10	3.3kΩ	Ceramic	¼W	±20%	57005
R11	22Ω	Ceramic	¼W	±20%	57063
R12	47kΩ	Ceramic	¼W	±20%	57044
R13	33kΩ	Ceramic	¼W	±10%	57070
R14	47kΩ	Ceramic	¼W	±20%	57044
R15	470kΩ	Ceramic	¼W	±20%	58209
R16	3.3kΩ	Ceramic	¼W	±20%	57005
R17	100kΩ	Ceramic	¼W	±20%	70743
R18	470kΩ	Ceramic	¼W	±20%	58209
R19	100kΩ	Ceramic	¼W	±20%	70743
R20	1MΩ	Ceramic	¼W	±20%	70723
R21	100kΩ	Ceramic	¼W	±20%	70743
R22	1MΩ	Ceramic	¼W	±20%	70723
R23	1MΩ	Ceramic	¼W	±20%	70723
R24	20kΩ	Wirewound	12W	±10%	72439
R25	20kΩ	Wirewound	12W	±10%	72439
R26	1MΩ	Ceramic	¼W	±20%	70723
R27	33Ω	Ceramic	¼W	±10%	58012
R28	4.2Ω	Wirewound	1/10W	± 3%	89123
R29	22kΩ	Ceramic	¼W	±20%	57060
R30	100kΩ	Ceramic	¼W	±20%	70743
R31	470kΩ	Ceramic	¼W	±20%	58209
R32	100kΩ	Ceramic	½W	±20%	70866
R33	33kΩ	Ceramic	¼W	±20%	57066
R34	4.7kΩ	Ceramic	¼W	±20%	57062
R35	150kΩ	Ceramic	¼W	±10%	70749
R36	4.7kΩ	Ceramic	¼W	±20%	57062
R37	4.2Ω	Wirewound	1/10W	± 3%	89123
R38	68kΩ	Ceramic	1W	±20%	57069
R39	270kΩ	Ceramic	¼W	±10%	70896
R40	860Ω	Wirewound	10W	±20%	89037
R41	30kΩ	Meter Res.	½W	± 2%	64136
R42	1.2MΩ	Meter Res.	1W	± 5%	64120
R43	1.2MΩ	Meter Res.	½W	± 5%	64119
R44	550Ω	Wirewound			81345
R45	30Ω	Wirewound	6W	± 2%	89124
R46		NOT USED			
R47	9.5Ω		4W	± 5%	672215
RV1	20Ω	Potentiometer			81470
RV2	1MΩ	Potentiometer			81469

TRANSCEIVER (Cont)

Code	COILS & CHOKES	Ref. No.
L1	RF choke	79237
L2A	HF anode coil	78636
L2B	HF anode coil	78636
L2C	HF anode coil	78636
L3A	LF anode coil	78637
L3B	LF anode coil	78637
L3C	LF anode coil	78637
L5A	LF local oscillator coil	78635
L6A	HF local oscillator coil	78634
L6B	HF local oscillator coil	78634
L7	Aerial tuning coil	85483
L8	Meter choke	79237
L9	P.A. anode coil	79236
L10	RF choke	79237
L11	BFO coil (tuned winding)	78639
L12	BFO coil (coupling winding)	
L13	BFO coil (control winding)	
L14	Het. tone control coil	78638
L15	Modulation choke	79233
L16	RF choke	79237
L17	RF choke	79237
L18	L.T. RF choke	79245
L19	Filament coil	79235
L20	Filament coil	79235
L21	Filament coil	79235

TRANSFORMERS

T1	1st IF Transformer	77583
T2	2nd IF Transformer	77584
T3	3rd IF Transformer	77585
T4	Microphone Transformer	77590
T5	Output Transformer	77586
T6	Meter Transformer	77588

Code	VALVES		Ref. No.
V1A	VP23	CV1331	86166
V1B	VP23	CV1331	86166
V1C	VP23	CV1331	86166
V1D	VP23	CV1331	86166
V1E	VP23	CV1331	86166
V2A	HL23DD	CV1306	86167
V3A	Pen 25	CV65	86209
V3B	QV04-7	CV1510	86209
V4A	EF50	CV1091	86191
V5A	ECH35	CV1347	86097
V6A	Pen 25	CV65	86264

SWITCHES

SA	Range switch	83345
SB	Crystal/M.O switch	83346
SC	On/Off switch	83347
SD	System switch	85553
SE	Meter switch	83360

MISCELLANEOUS

MR1	Bridge Rectifier	64688
MR2	Selenium Rectifier	64689
RLA	Transmit/Receive Relay	57920
FS1	Fuse 250mA	90267
M	Meter	58149
SKTA	Handset Socket	
SKTB/A	Remote Control Unit Socket	88122
SKTB/B	Crystal Calibrator Socket	88122
PLB	Battery Input Plug	88123
MG	Rotary Transformer 11 watt	77595

ACCESSORIES

The following accessories are available on order:-

1. Microphone and Headgear Assembly No.10

Dimensions	7" x 7" x 4" (approx.)	(17.8cm x 17.8cm x 10.2cm)
Weight	1 lb 12 oz	(0.8 kg)

2. C.W. Key and Plug Assembly No.19

Dimensions	7" x 4" x 4"	(17.8cm x 10.2cm x 10.2cm)
Weight	1 lb 5 oz	(0.57 kg)

3. Remote Control Unit 'L' No.1 and 2

Dimensions	No.1	$4\frac{1}{4}$" x 11" x $2\frac{1}{2}$"	(11cm x 28cm x 6.4cm)
	No.2	$4\frac{1}{4}$" x 6" x $2\frac{1}{2}$"	(11cm x 15.3cm x 6.4cm)
Weight	No.1	7 lb	(3.2 kg)
	No.2	2 lb 6 oz	(1.15 kg)

4. Crystal Calibrator - Full details are given in a separate publication.

5. Operator's Lamp 6B (with optional ultra violet filter)

Dimensions	5" x 3" x 3"	(12.7cm x 7.6cm x 7.6cm)
Weight	6 oz	(0.2 kg)

6. Aerials

(a) 4 ft - 4 ft No.1 (b) 8 ft - 4 ft No.1 & 4 ft No.2 (c) 14 ft - 14 ft No.1
(d) 32 ft - 32 ft No.1 (e) 100 ft - 100 ft No.5

7. Accumulators

(a) 12V 14Ah	- Dimensions	$8\frac{3}{4}$" x $6\frac{1}{4}$" x 10"	(22.2cm x 15.9cm x 25.4cm)
	Weight	25 lb	(11.4 kg)
(b) 12V 22Ah	- Dimensions	$12\frac{1}{2}$" x $6\frac{1}{4}$" x 10"	(31.9cm x 15.9cm x 25.4cm)
	Weight	35 lb	(16 kg)
(c) 12V 75Ah	- Dimensions	$16\frac{3}{4}$" x 8" x 11"	(42.5cm x 20.3cm x 28cm)
	Weight	80 lb	(36.4 kg)

8. Charging Sets

(a) Petrol driven (lightweight) 80 watt No.1

Dimensions	$14\frac{1}{2}$" x $7\frac{3}{4}$" x $13\frac{3}{4}$"	(37cm x 19.7cm x 35cm)
Weight	45 lb (no petrol)	(20.4 kg)

(b) Pedal driven 60 watt

Dimensions	$23\frac{1}{2}$" x 12" x $10\frac{1}{2}$"	(59.7cm x 30.5cm x 26.7cm)
Weight	30 lb	(13.6 kg)

9. Case of Spare Valves No.4K

Dimensions	6" x 6" x $6\frac{1}{2}$"	(15.2cm x 14.2cm x 16.5cm)
Weight	5 lb	(2.3 kg)

LOGGING CHART Serial No. ....

Frequency	Aerial Coupling	Aerial Tuning	Frequency	Aerial Coupling	Aerial Tuning

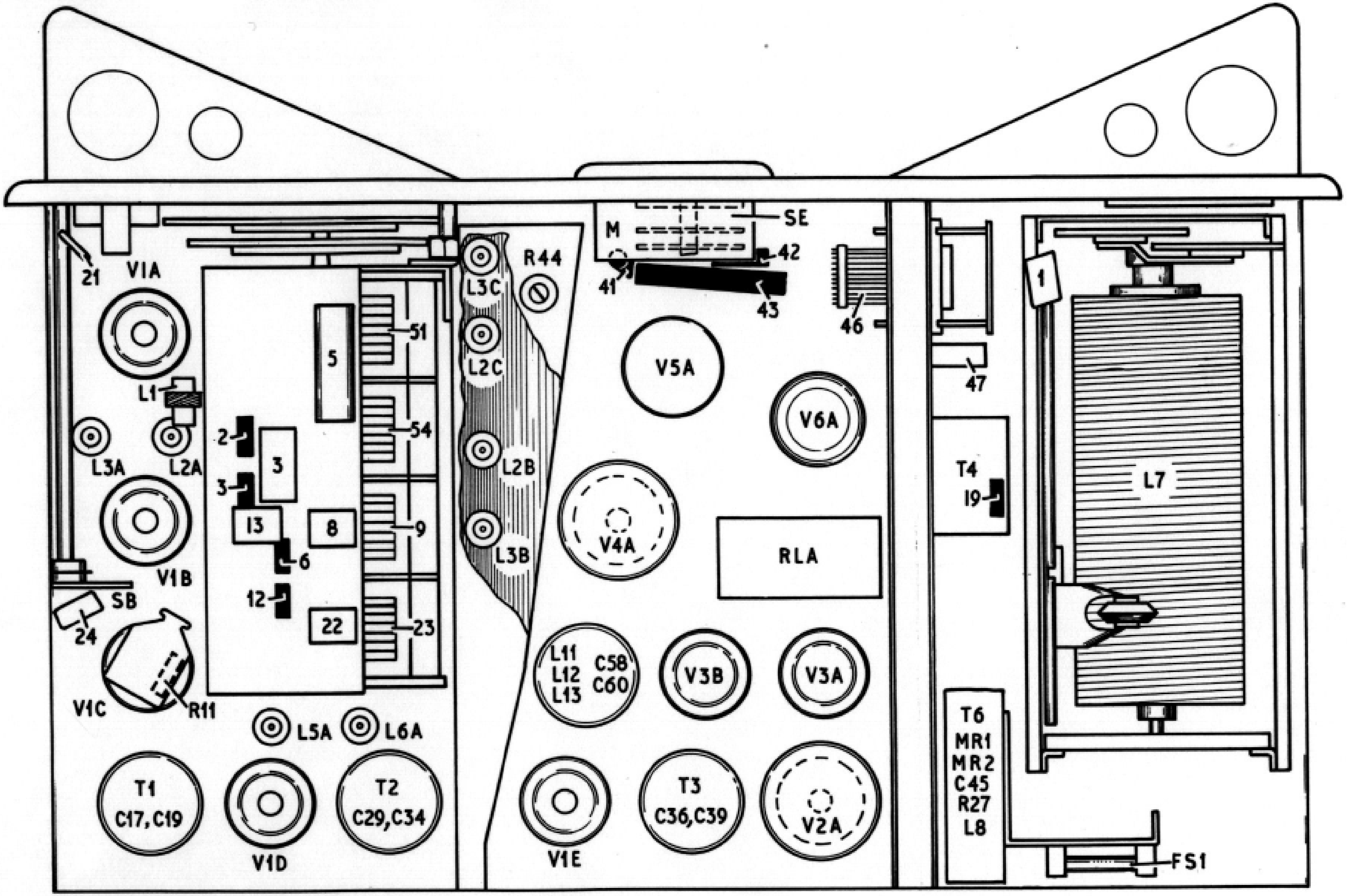


Fig. 14 TRANSCEIVER TOP CHASSIS LAYOUT

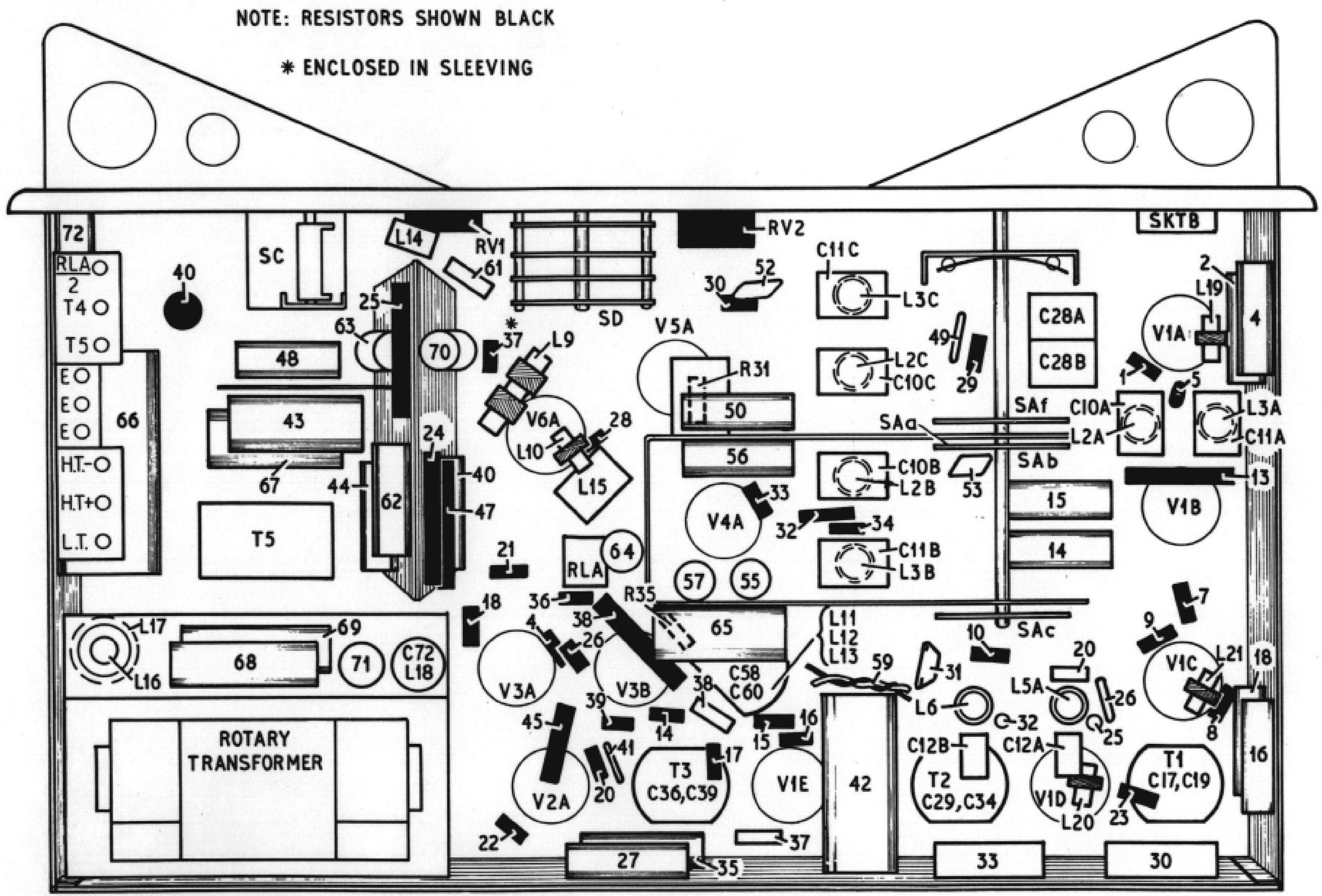


Fig.15 TRANSCEIVER UNDER CHASSIS LAYOUT

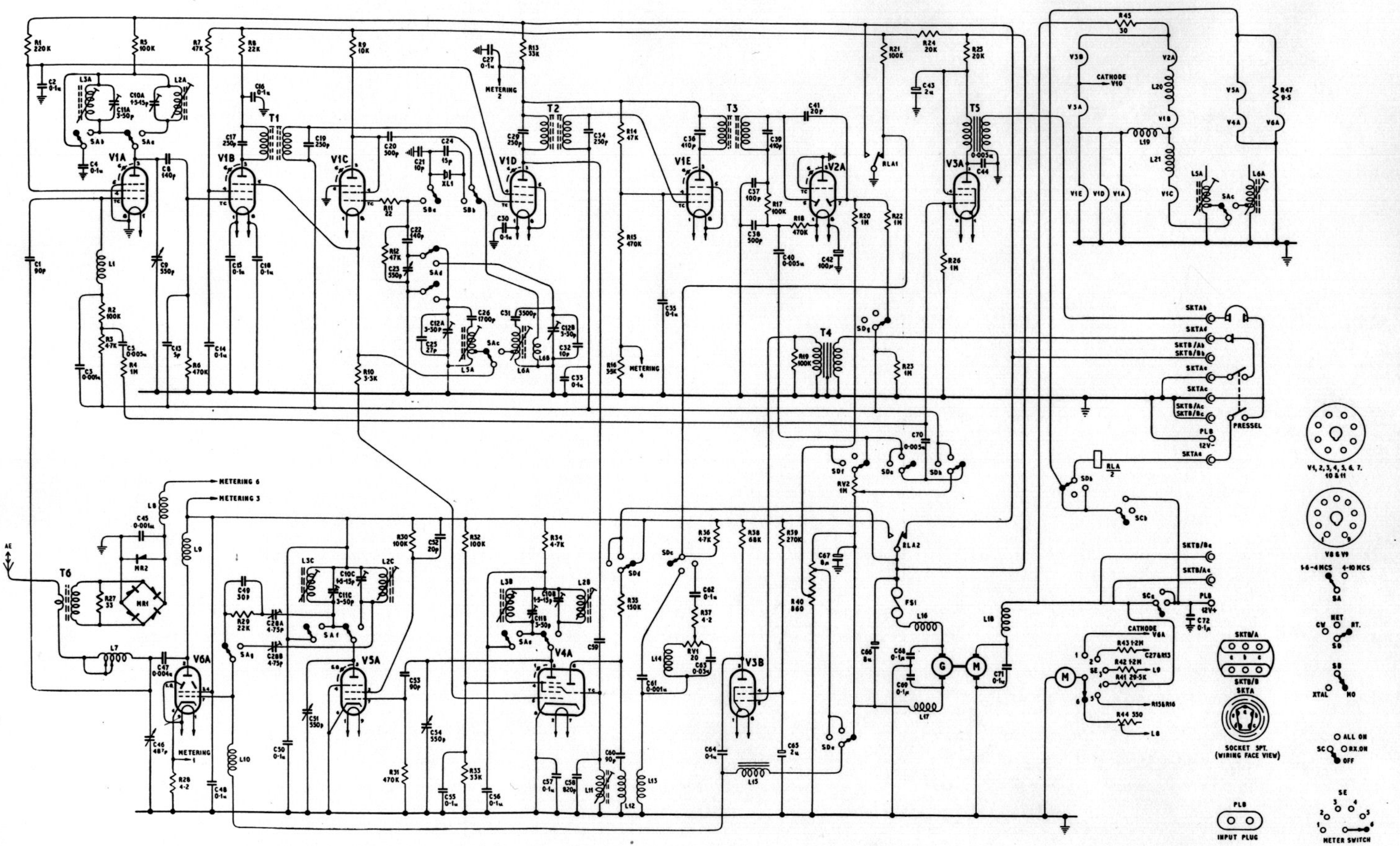


Fig. 16 TRANSCEIVER CIRCUIT DIAGRAM

LOGGING CHART Serial No. ....

Frequency	Aerial Coupling	Aerial Tuning	Frequency	Aerial Coupling	Aerial Tuning

SUPPLEMENT
to
PYE WIRELESS SET 62
TECHNICAL HANDBOOK (ISSUE 1).
TRANSISTOR POWER SUPPLY UNIT

INTRODUCTION

This supplement should be read in conjunction with the Technical Handbook for the Pye Wireless Set 62.

The transistor power supply unit for the Pye Wireless Set 62 is designed to operate from a 12 volt d.c. supply. It is a direct replacement for the rotary transformer power unit with which the standard equipment is issued, and results in a considerable reduction in battery consumption.

CONSTRUCTION

The complete unit is housed in a well ventilated metal case with the same overall dimensions as those of the rotary transformer power unit. When installed it is bolted directly to the chassis of the Wireless Set 62, the two securing screws being provided with adaptor washers to replace the rubber grommets on which the rotary transformer power unit is mounted.

TECHNICAL DESCRIPTION

The unit operates from a 12 volt d.c. battery supply and utilises two transistors, VT1 and VT2, in a push-pull d.c. converter circuit with saturable transformer core switching.

The operation of the converter is briefly as follows:-

At the beginning of the first cycle both transistors are equally biased by resistors R1 and R2 but one begins to conduct before the other. If VT1 commences to conduct first, current flows through the emitter to the collector until VT1 is in the bottomed condition i.e. the voltage appearing across terminals 1 and 2 of the transformer T1 is equal to the d.c. input voltage. At the same time the bias applied to the base of VT1 by terminals 5 and 6 of the feedback winding is increasing, tending to increase current flow still further until T1 is saturated. During this half-cycle terminal 4 is negative with respect to terminal 5, biasing VT2 well into the cut-off region. The frequency of operation is mainly determined by the primary inductance of T1 and the time taken to reach saturation is almost equal to half the period of the cycle.

When saturation is reached the transformer action of T1 ceases, with the result that the feedback voltage applied to VT1 is no longer capable of supplying the increasing bias required to maintain the emitter current. This causes a cumulative switch off of VT1. As the feedback voltage applied to the base of VT1 decreases, that applied to the base of VT2 increases, so that when VT1 is finally cut off, VT2 starts to conduct and commences the succeeding half cycle.
The frequency of operation of the converter is approximately 1.5kc/s.

The d.c. input is fed to the primary winding of T1 via a low pass filter L1, C3, which is designed to prevent hum generated by the convertor from entering the transceiver. The fixed bias resistors R1 and R2 are bypassed by capacitors C1 and C2 to reduce a.c. losses.

The secondary winding of T1 (terminals 7 and 8) is connected in a conventional full-wave bridge rectifier circuit employing silicon rectifiers MR1, MR2, MR3 and MR4. The h.t. output from the rectifier circuit is fed to the transceiver via a filter network comprising C4, L2, L3 and L4, of which L2 and L3 are r.f. chokes and L4 an a.f. choke.

T1 is a pot core type transformer, completely shielded to prevent undesirable coupling effects with the transceiver.

Current Consumption. (This paragraph replaces the corresponding paragraph on page 2 of the Handbook).

The following table gives approximate figures of current consumption and working hours which may be obtained from each of the types of battery listed below when fully charged. These figures are given as a rough guide only and in practice there may be quite large differences, depending upon the condition of the battery.

	Average Current	Approx. no. of working hrs for 12 volt battery		
		14Ah	22Ah	75Ah
Transmit R/T	2.7	5.1	8.1	27.7
Transmit C.W.	2.9	4.8	7.5	25.8
1:5 Transmit/Receive ratio	2.5	5.6	8.8	30
Receive (ALL ON)	2.12	6.6	10.3	35.3
Listening watch (REC. ON)	1.2	11.6	18.3	62.5

FITTING INSTRUCTIONS

1. Remove the base plate, which is secured by five screws underneath the chassis, four at the rear and two at the front.
2. Disconnect the rotary transformer connecting leads from the terminal block fitted to the side of the main chassis (see Fig. 11 - Page 36).
3. Unscrew the two 2 B.A. mounting screws on top of the chassis, at the back of the aerial tuning inductance.
4. The complete power unit, mounted in its screened case, may now be removed together with its shock absorbing pads.
5. Remove the rubber grommets, upon which the power unit was mounted, from the Wireless Set 62 chassis and ensure that when the transistor power unit is mounted the whole of its upper side will be in contact with the chassis.
6. Remove the two mounting screws and adaptor washers from the transistor power unit and place it on the Wireless Set 62 chassis so that the four lead-out wires are nearest to the terminal board in the Wireless Set 62.
7. Place the adaptor washers in the mounting holes on the upper side of the Wireless Set 62 chassis and bolt down the power unit. Seal the washers and bolt heads with bakelite varnish.
8. Connect the lead-out wires to the appropriate terminals on the terminal board. The connections use the same colour coding as for the rotary transformer power unit, i.e.

Red lead to H. T. +
Brown lead to H. T. -
White lead to L. T.
Black lead to E.

9. Replace the base plate.

TRANSISTOR SERVICING

1. Do not apply a soldering iron to the connecting leads for any length of time and use a heat shunt on the lead, e.g. grip the wire between the transistor and the joint with a pair of pliers.

2. Always observe the correct polarity when connecting up transistor circuits.

3. Transistors have a very low resistance and may be destroyed by the inadvertent application of quite low potentials. It should be noted that such potentials may exist between the terminals of a meter or other piece of test equipment, or between a soldering iron and earth.

Transistors are extremely robust when operated under the correct conditions. However, if transistor damage is suspected, continuity checks should be carried out as shown below. The ohmmeter should have an internal or external resistance of approximately 1kΩ in circuit.

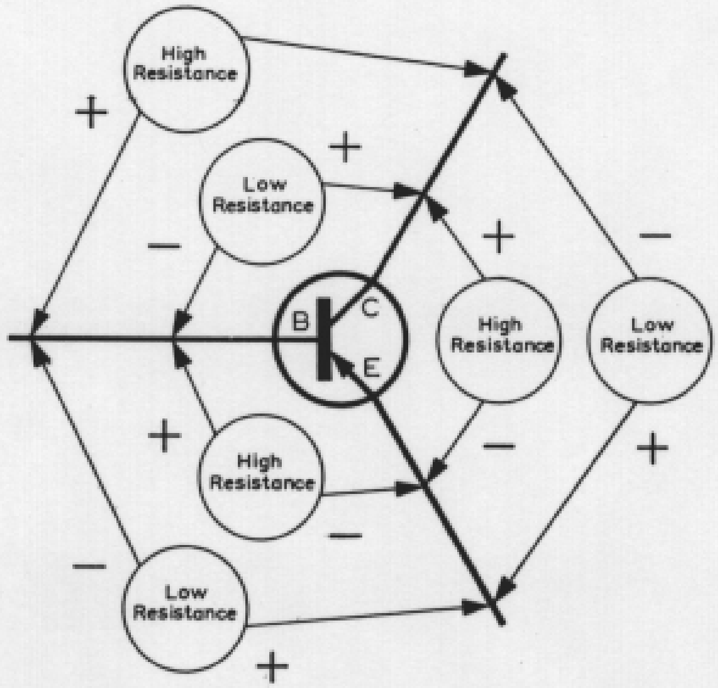


Fig. 1 Transistor Continuity Checks

If these results are not obtained, a replacement transistor should be fitted after investigation and rectification of the fault.

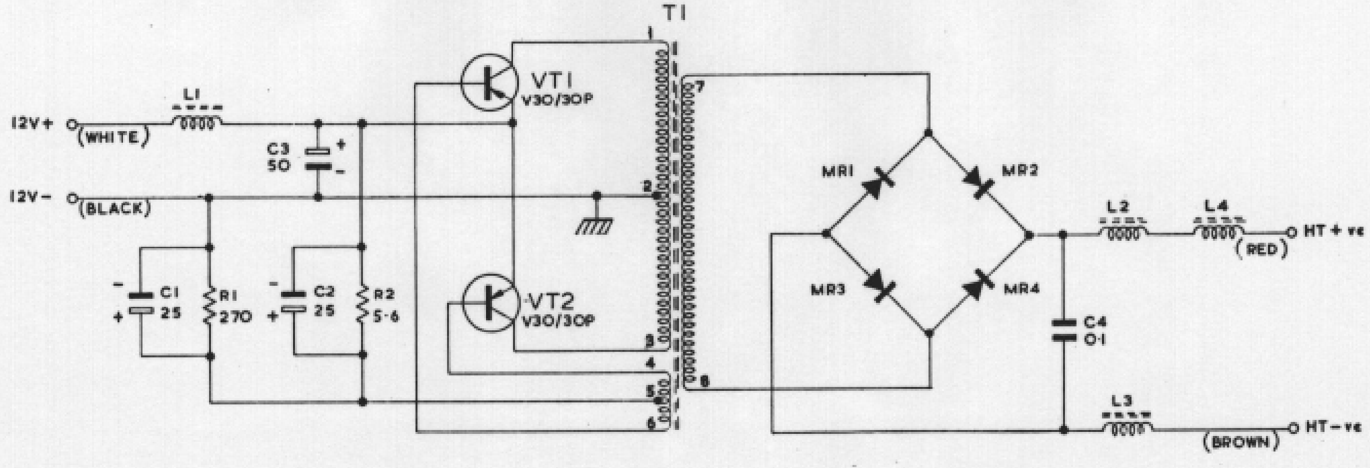


Fig. 2 Power Supply Unit Circuit Diagram

PARTS LIST

Code		CONDENSERS		Part No.
C1	25μF	Electrolytic	25V	266405
C2	25μF	Electrolytic	25V	266405
C3	50μF	Electrolytic	15V	266406
C4	0.1μF	Tubular	500V	669487
		RESISTORS		
R1	270Ω	Dubilier	B.T.A. ± 5%	671423
R2	5.6Ω	Dubilier	B.W.A. ± 5%	676700
		CHOKES		
L1	1mH			279748
L2	500μH			279747
L3	500μH			279747
L4	155mH			279760

Code		TRANSFORMER	Part No.
T1	Converter Transformer		277770
		RECTIFIERS	
MR1			709071
MR2			709071
MR3			709071
MR4			709071
		TRANSISTORS	
VT1	V30/30P		865112
VT2	V30/30P		865112

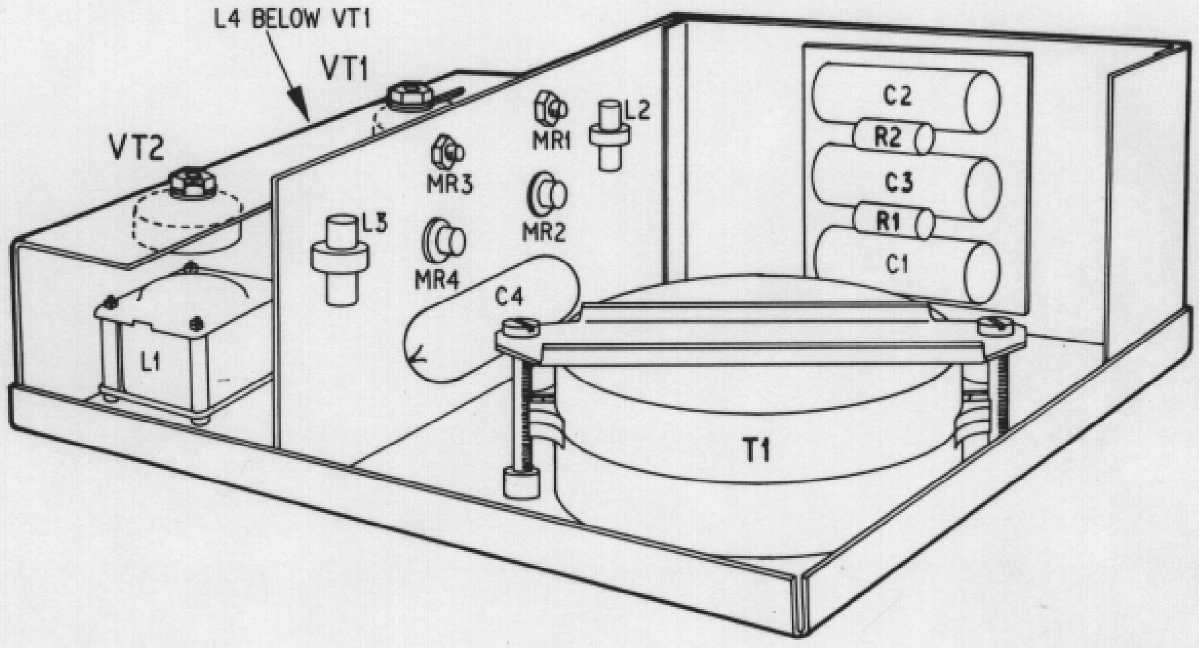


Fig. 3 Power Supply Unit Layout Diagram