W.O.
CODE No.
11197

RESTRICTED

The information given in this document is not to be communicated either directly or indirectly to the Press or to any person not authorised to receive it.

USER HANDBOOK

for

WIRELESS STATION No. C.42

WARNING.

The voltages employed in this equipment can be sufficiently high to endanger human life. Every reasonable precaution has been observed in design to safeguard operating personnel. The power must be switched off before handling connections or making internal adjustments. For first aid in case of electric shock, see the inside front cover of this handbook.

PUBLISHED UNDER THE AUTHORITY
OF THE SIGNAL OFFICER-IN-CHIEF
THE WAR OFFICE.

DECEMBER 1955

THE VOLTAGES USED IN THIS EQUIPMENT CAN BE LETHAL. THE EQUIPMENT HAS BEEN DESIGNED TO SAFEGUARD OPERATING PERSONNEL SO DO NOT TAMPER WITH INTERLOCKS OR GATE-SWITCHES. THE POWER MUST BE SWITCHED OFF BEFORE CHANGING VALVES OR MAKING INTERNAL ADJUSTMENTS.

FIRST AID IN CASE OF ELECTRIC SHOCK

1. ***SWITCH OFF.*** If this is not possible, ***PROTECT YOURSELF*** with dry Insulating material and pull the victim clear of the conductor.

DON'T TOUCH THE VICTIM WITH YOUR BARE HANDS until he is clear of the conductor, but ***DON'T WASTE TIME.***

2. *(a)* Lay patient face down with head to one side, arms bent and forehead on his hands, to keep mouth and nose clear. **See Fig. 1**

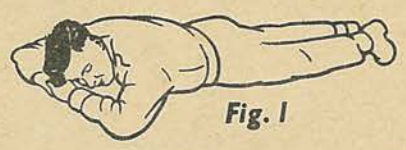

Fig. 1

(b) Give one or two firm thumps with flat of hand between his shoulders.

(c) Kneel at his head, one knee near the head and your other foot alongside the elbow. **See Fig. 2**

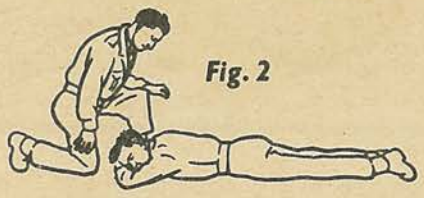

Fig. 2

(d) Place your hands on his shoulder blades with thumbs touching on the mid-line and fingers pointing towards his feet. **See Fig. 3**

Fig. 3

3. *(a)* Bend forward with arms straight and apply your weight lightly **See Fig. 4** counting "One, Two, Three" This movement takes 2½ seconds.

Fig. 4

(b) Release pressure gradually and slide your hands to grip him just above his elbows, counting "Four". **See Fig. 5**

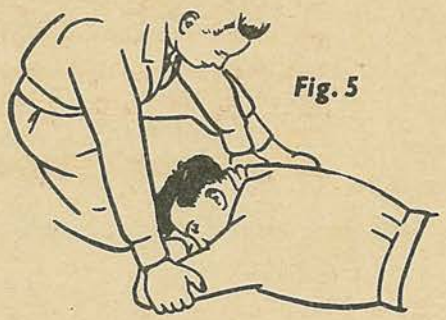

Fig. 5

(c) Draw his arms and shoulders towards you by leaning backwards with your arms straight till you feel resistance, but without lifting his chest off the ground, counting "Five, Six, Seven". This movement takes 2½ seconds. **See Fig. 6**

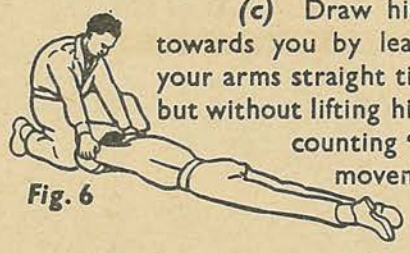

Fig. 6

(d) Lay his arms down and slide your hands on to the shoulder blades, counting "Eight".

4. ***Keep repeating paragraph 3 with rhythmic rocking nine times to the minute until breathing is re-established.***

5. When breathing is re-established, omit the back pressure and continue the arm raising and lowering alone, at the rate of 12 times to the minute, counting "One, Two, and Three" whilst raising and "Four, Five, and Six" whilst lowering.

6. While Artificial Respiration is being applied, have someone else:-

(a) Loosen patient's clothing. *(b)* ***SEND FOR DOCTOR.*** *(c)* Keep patient warm.

7. ***DO NOT GIVE LIQUIDS UNTIL PATIENT IS CONSCIOUS.***

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USER HANDBOOK

for

WIRELESS STATION No. C.42

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THE WAR OFFICE.

DECEMBER 1955

VHF Wireless Communications

VHF wireless signals differ from HF signals in three important respects.

Firstly, sky-wave working is not possible. Service VHF wireless sets are therefore designed for ground-wave working with vertical rod aerials. No attempt should be made to work sky-wave.

Secondly, VHF signals are more sensitive to screening by hills, buildings or other obstructions between the aerials of two sets trying to communicate, particularly if the obstruction is close in front of one or other of them.

The best possible condition for communication is therefore when the two sets are so sited that their aerials have an unobstructed line of sight between them. This will, however, seldom be possible, and will often be undesirable, for fear of inviting unwelcome enemy attention. The normal rule must be to keep back as far as possible from hills and similar obstructions, and to avoid sites close under such objects.

Thirdly, VHF signals are frequently reflected from objects such as buildings or broken ground in the neighbourhood of the receiver. Such reflections often improve signals, sometimes very greatly, provided that the right position to make use of them can be found. This position is, however, apt to be very critical and cannot be predicted.

It is therefore useless to try and select in advance a position which will make sure of such reflections. But if signals are poor it is always worth trying the effect of changes of position, even of a few feet, to see if it does improve signals.

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ASSOCIATED PUBLICATIONS

	Nomenclature	W.O. Code No.
*	Wireless Control Harness Type A (Interim version) ..	11194
	Wireless Control Harness Type A	
	Wireless Control Harness Type B	11195
*	Apparatus Loudspeaking No. 19 (Interim version) ..	11196
	Apparatus Loudspeaking No. 19	
	Wireless set C42 Training Station	11292
	Elevated Aerial 27 Ft.	

* These items of equipment were issued only with early models of Conqueror tank.

CONTENTS

ILLUSTRATIONS

LIST OF TABLES

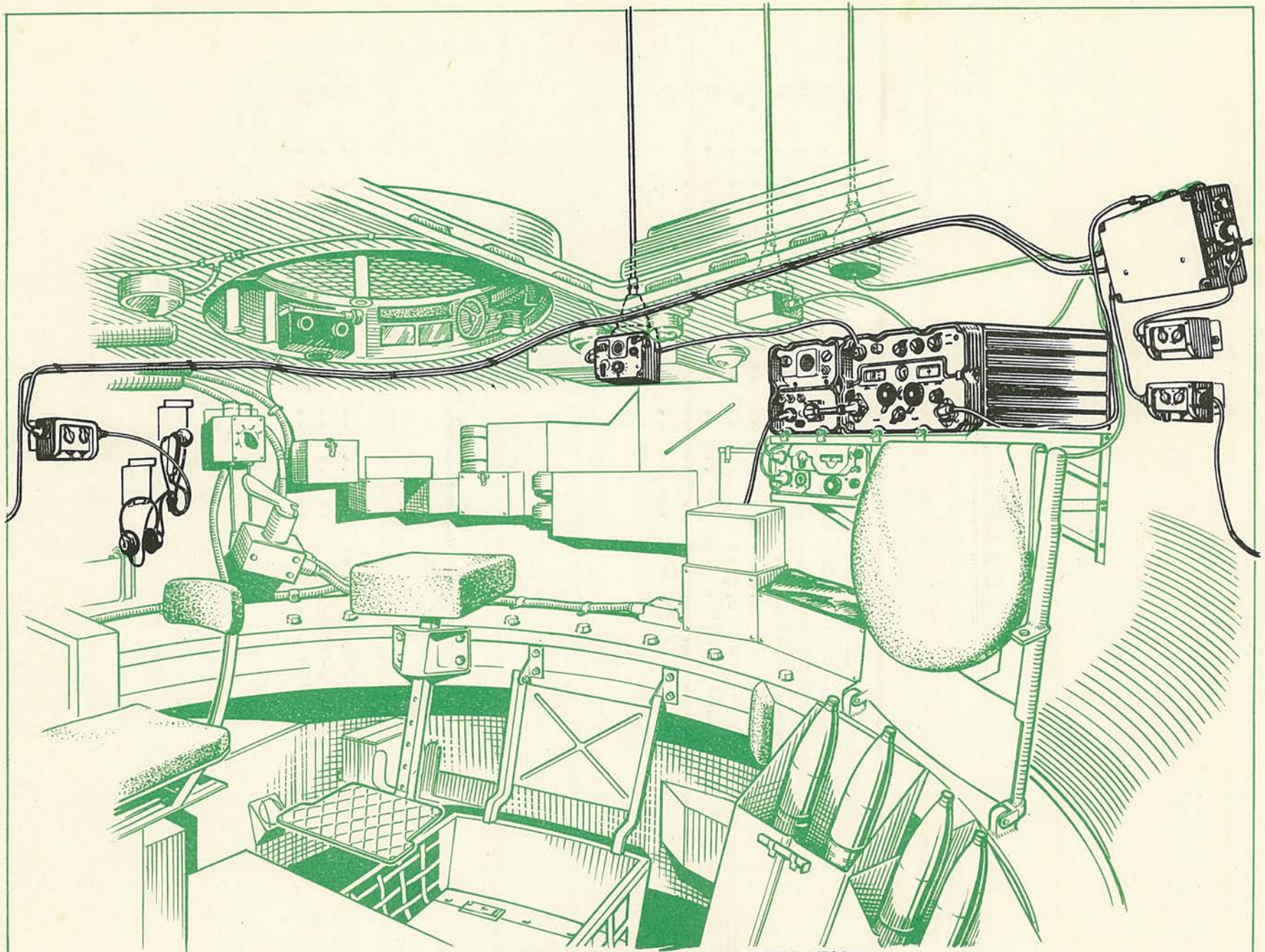
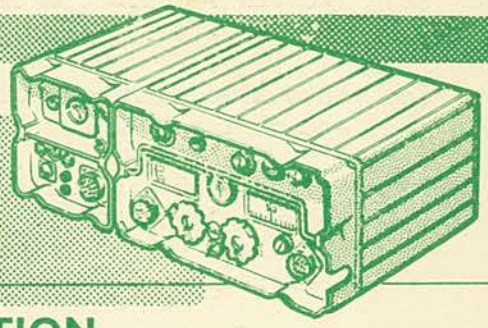


FIG. 1 TYPICAL W. S. C.42 INSTALLATION

Wireless Station C42

CHAPTER 1



GENERAL DESCRIPTION

Section 1. Purpose and Facilities

(1) The Wireless station C42 is a VHF, FM, RT set, for use in armoured fighting vehicles, and in other types of vehicles used by units of all arms other than RA. It will eventually replace the Wireless set No. 19, in vehicles where the latter has been used in a similar role.

(2) The complete equipment consists of three units, the wireless set itself, i.e. the sender/receiver, a power supply unit, which may be 24 volt or 12 volt, and an aerial tuning unit, together with the necessary connectors to connect them together.

(3) The equipment cannot be operated without a control harness. The necessary units of a Wireless Control Harness Type A or of a Wireless Control Harness Type B must therefore be provided in every installation which includes a wireless set C42. Details of these harnesses are given in separate User Handbooks - see page -iii-.

(4) The designations of the principal items of the equipment are as follows:

Wireless set	-	Wireless set C42
Power supply unit	-	Supply Unit Vibratory No. 12 24 volt input Supply Unit Vibratory No. 12 12 volt input
Aerial Tuning Unit	-	Aerial Tuning Unit No. 6.
Connectors	-	See Handbook for the particular installation

(5) The following facilities are provided:

(a) A crystal controlled calibrator is incorporated to provide accurate tuning of the receiver, and to do away with the necessity for "netting".

(b) The sender is tuned coincidentally with the receiver.

(c) Two transmission powers are available, one at approximately 15 watts, (HIGH) and the other, $\frac{1}{4}$ watt, (LOW).

(d) Automatic gain control of the modulation level compensates for different speech levels into the microphones.

(e) A "squelch" circuit in the receiver, prevents audio output reaching the headset except while signals are actually being received. This enables operators to listen for long periods without the fatigue caused by a high background noise level.

(f) An amplifier adequate for inter-communication purposes between all members of the crew of the vehicle.

(g) Automatic re-broadcast between the Wireless set C42 and any other set with a similar squelch circuit, controlled by switches in the harness system. (Available only when NOISE switch is set to OFF).

(h) A TRAFFIC/STANDBY switch on the Power Supply Unit, which switches off the sender valves at STANDBY and thus reduces power consumption

(j) A SIGNAL lamp illuminated by operation of the squelch circuit on receipt of signals.

NOTE: A handbook describing the associated control harness has been published separately as shown on page -iii-.

Section 2. Frequency Range

(1) The frequency range is from 36 Mc/s to 60 Mc/s, providing 241 channels at 100 kc/s spacing.

Section 3. Working Range

(1) When operating with another C42 set under normal conditions with both sets using standard 8 ft. rod aerials, the average range will be:

(a) Low Power 3 to 4 miles
(b) High Power 10 to 15 miles

(2) Using an elevated aerial at one station, with the other using an 8 ft. rod, these ranges should be increased by 25 per cent. With elevated aerials at both stations, the ranges should be increased by 50 per cent. The ranges quoted may however, vary greatly with the site, and should be used only as a very rough guide.

Section 4. Power supply and Consumption

(1) Power is supplied to the wireless set from a supply unit of which there are two types, designed to work from 24 and 12 volts DC respectively. (Supply units Vibratory No. 12, 24 or 12 volts DC input). In vehicle installations the supply unit takes its power through a two way connector (see Installation Handbook) either from the vehicle wiring, or from a separate wireless battery. Details of the wiring will be found in the appropriate user handbook for each installation.

(2) A voltage controlling device incorporated in the Harness system, and not in the PSU or Set, is arranged to switch the PSU to a low voltage tap when the battery voltage falls to 23.5 volts.

It will select the high voltage tap when a battery of 25.5 to 29.0 volts is connected, or the low voltage tapping when a battery of 20.7 to 25.5 volts is connected.

The voltage control will automatically adopt the high range irrespective of battery voltage, if the harness is not connected and switched on.

THE CONTROL HARNESS MUST THEREFORE ALWAYS BE SWITCHED ON WHEN THE WIRELESS SET IS IN USE. IF THIS NOT DONE, SIGNALS WILL BE POOR UNLESS SUPPLY BATTERY VOLTAGE IS HIGH.

(3) Power consumption is as follows:-

TABLE 1

Operating condition	Consumption	
	24 volts	12 volts
On Send (H.P.)	8 Amps	17.8 Amps
On Send (L.P.)	5.5 "	11.8 "
On Receive (Traffic)	4.6 "	10.8 "
On Receive (Standby)	3.7 "	7.8 "

Section 5. Aerials

(1) Only two types of aerial are available for use with the equipment:-

(a) An 8 ft. vertical rod aerial, consisting of two 4 ft. F Sections. All vehicle stations are equipped with this aerial. A longer or shorter aerial must NOT be used.

(b) An elevated aerial, mounted on a 27 ft. telescopic mast. This aerial gives greater range than the standard 8 ft. rod aerial and will be issued, in addition to the latter, to selected stations. It is separately described in its own user handbook (see page -iii-).

(2) In addition a simulator, aerial tuning unit (see section 6) which enables an aerial to be dispensed with is issued with Wireless set C42 Training Stations for use in indoor training.

ON NO ACCOUNT SHOULD THE EQUIPMENT BE OPERATED WITH ANY AERIAL OTHER THAN THOSE REFERRED TO ABOVE, WITH ANY PART OF THE AERIAL CIRCUIT DISCONNECTED, OR WITHOUT AN AERIAL (UNLESS A "SIMULATOR, AERIAL TUNING", IS IN USE), OR SERIOUS DAMAGE TO THE SENDER MAY RESULT.

(3) The standard 8 ft. rod aerial is mounted on an Aerial base No. 28 which is in turn mounted on the vehicle (see Fig. 2). The aerial base No. 28 must be so mounted in relation to the Aerial Tuning Unit (see Section 6) as to suit the particular vehicle. Both the Aerial Base No. 28 and the Aerial Tuning Unit must also be properly earthed to the vehicle chassis by earthing strips of the correct length to suit the vehicle.

Section 6. Aerial Tuning Unit

(1) The aerial tuning unit (ATU) is necessary to match the 8 ft. rod aerial to the wireless set.

(2) In installations where access to the ATU may be difficult, it can be adapted for remote control from a more convenient position.

(3) The ATU must never be used without its 8 ft. rod aerial. For indoor training, where no aerial is required, the ATU can be replaced by a Simulator, ATU, which incorporates a dummy aerial and enables the set to be operated with a range of a few yards.

(4) The Simulator, ATU, is identical in appearance to the ATU No. 6, except that its front panel is grey instead of Olive Drab.

Section 7. General Construction

(1) The two main units and the Aerial tuning unit are sealed in die-cast metal cases, which are completely water-tight.

(2) Air circulation to prevent overheating is provided by a fan fitted into the set. The fan can be heard when the set is switched on.

Section 8. Weights and Dimensions

(1) These are as follows:-

TABLE 2

Unit or Item	Length	Depth	Height	Weight
Set	14"	$14\frac{1}{4}$"	$8\frac{1}{2}$"	40 lb.
Power Supply Unit 24V	8"	$14\frac{1}{4}$"	$8\frac{1}{2}$"	40 lb.
Power supply Unit 12V	8"	$14\frac{1}{4}$"	$8\frac{1}{2}$"	40 lb.
Aerial Tuning Unit	$5\frac{3}{4}$"	6"	5"	6 lb.
Total	-	-	-	86 lb.

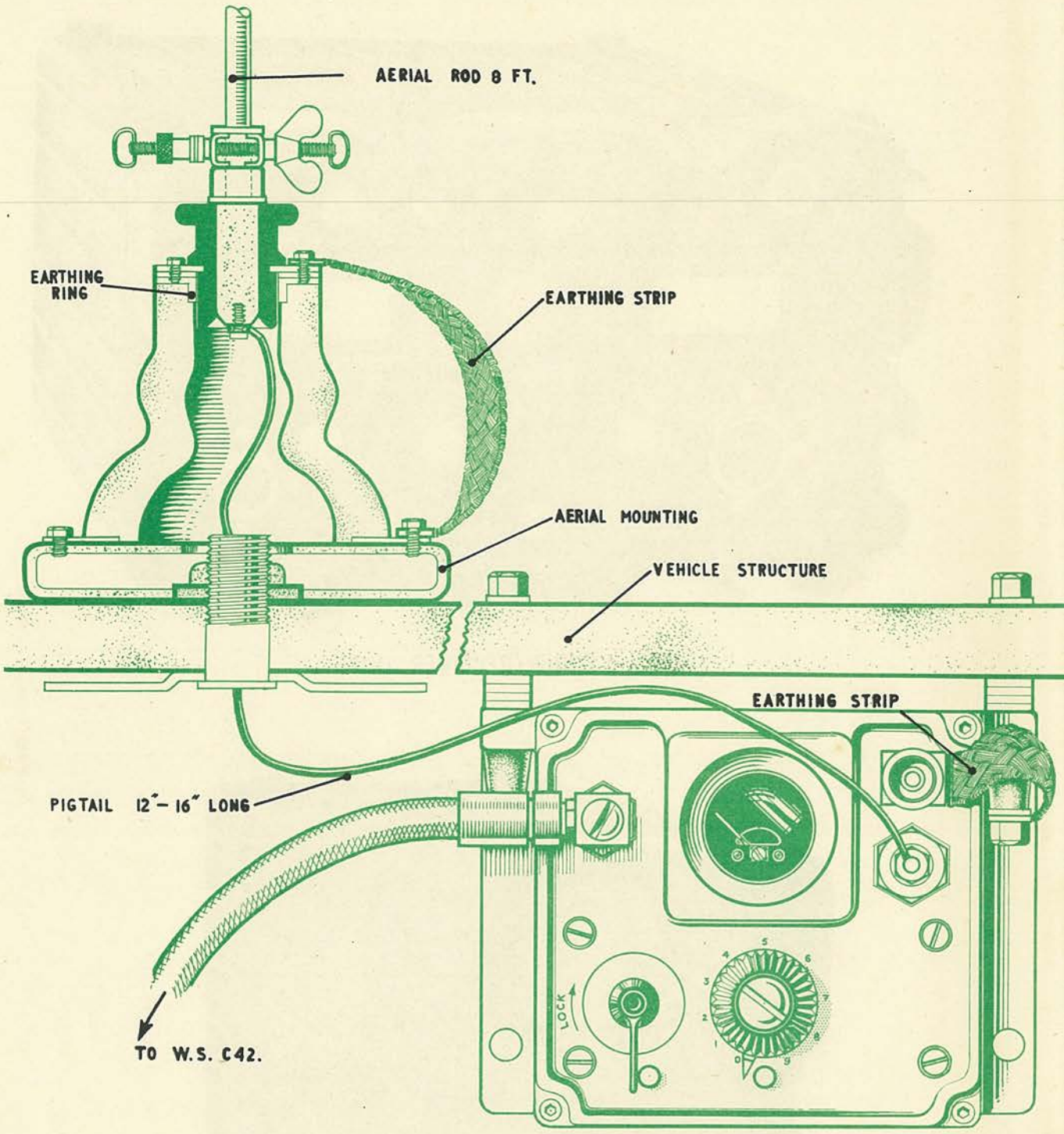


FIG. 2. AERIAL AND AERIAL TUNING UNIT

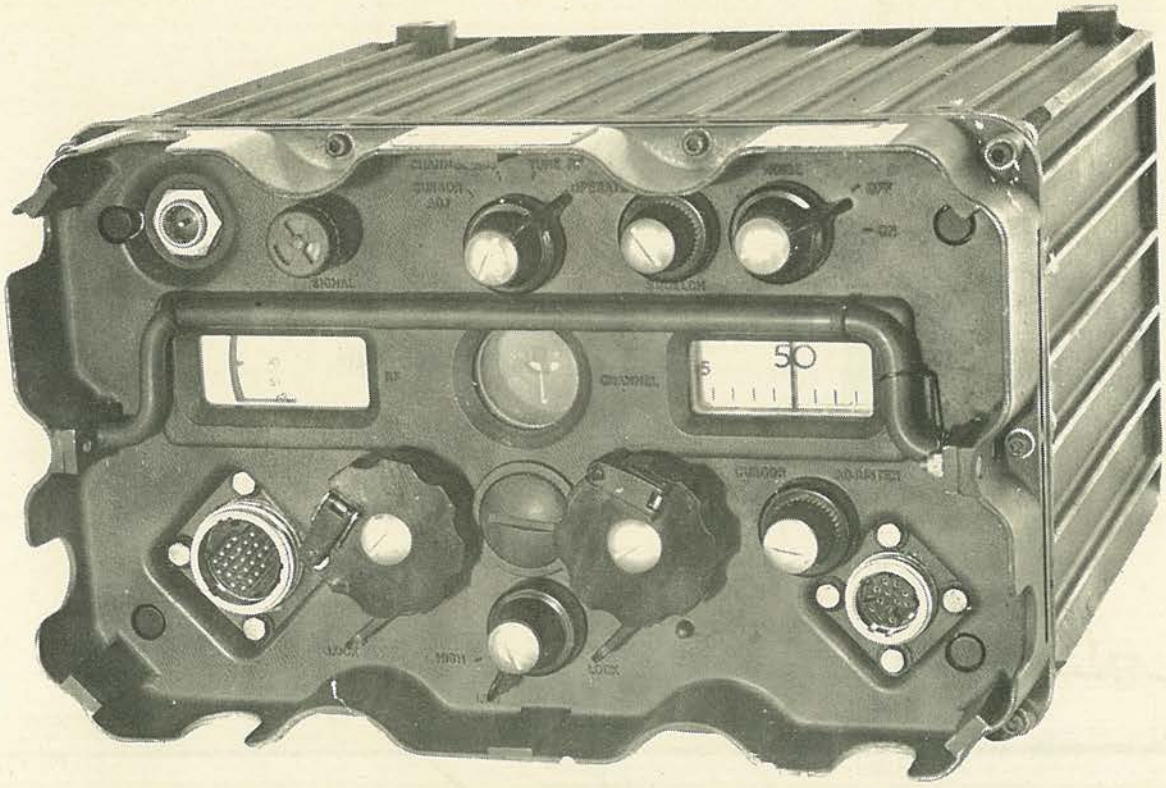


FIG.3 SENDER/RECEIVER UNIT

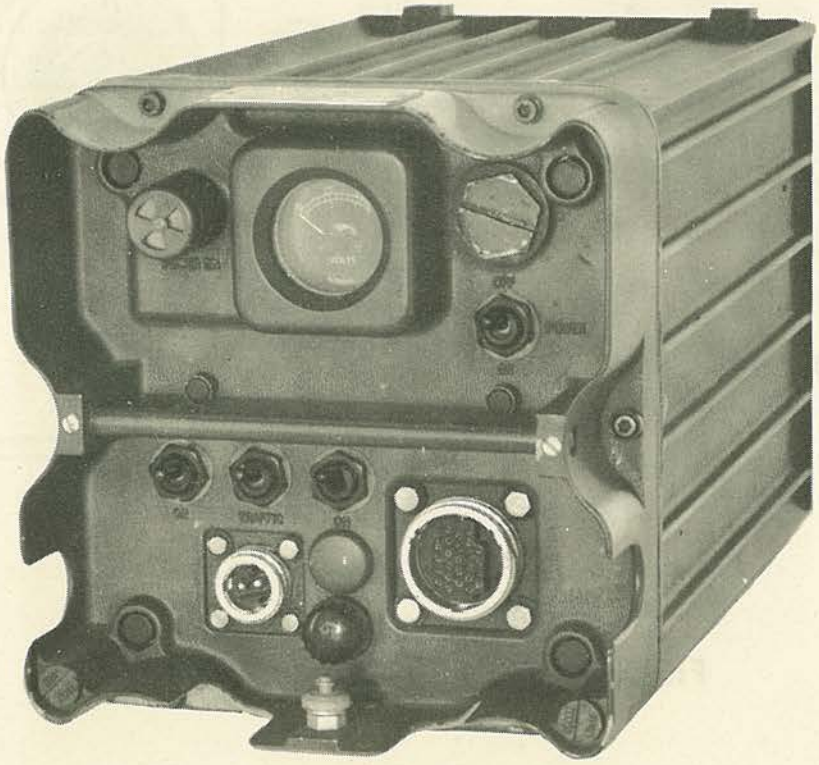
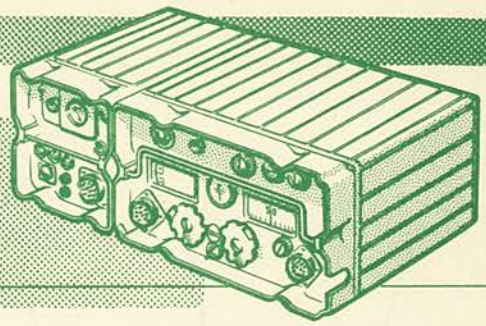


FIG.4 POWER SUPPLY UNIT

CHAPTER 2



OPERATION

WARNING.

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Section 9. Installation check

(1) The equipment will normally be received completely fitted, but it is advised that the following points are checked:

(a) That the free end of the pigtail, leading from the base of the rod, is connected to the aerial terminal of the ATU (See Fig. 2).

(b) That the earthing strips between the earthing ring of the aerial base and its mounting, and between the ATU and the vehicle structure, are in good order. (see Fig. 2).

(c) That the ATU is connected to the aerial plug on the set.

(d) That the PSU is connected to the set with the 25-way connector, (see Fig. 5).

(e) That the harness is connected to the 12-way socket situated in the lower right hand corner of the set.

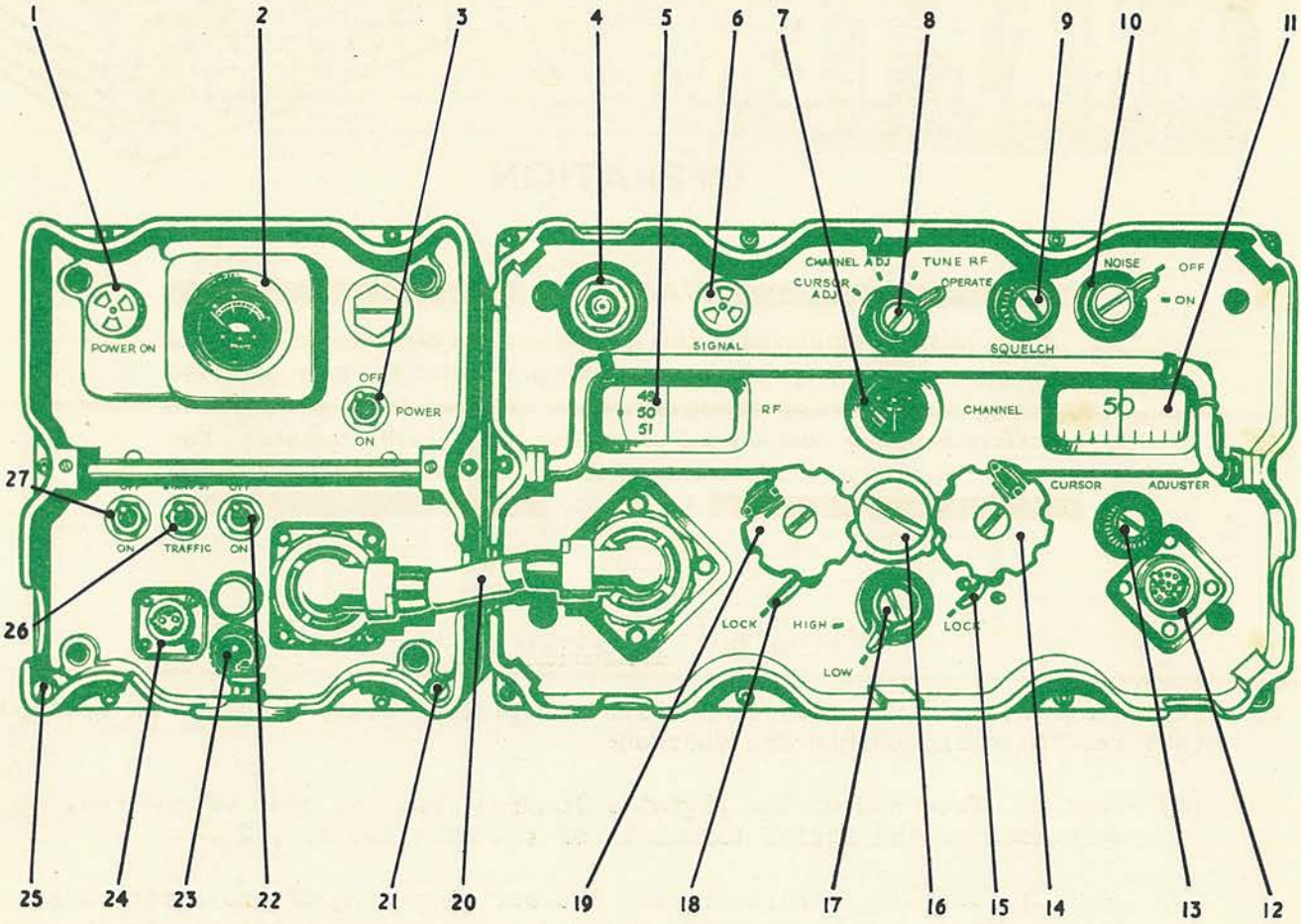
(f) That the PSU is connected to the battery via the 2-pin plug on the front panel, the power lead, and the power distribution panel.

(g) That all connectors are screwed down firmly, hand tight.

Section 10. Preliminary

(1) Fit the 8 ft. rod into the aerial base as shown in Fig. 2.

(2) Plug the headset into a socket on the control unit of the harness, and



KEY

1. POWER ON LAMP
2. BATTERY VOLTMETER
3. POWER ON-OFF
4. A.T.U. CONNECTOR PLUG
5. R.F. SCALE
6. SIGNAL LAMP
7. CENTRE ZERO METER
8. CALIBRATOR SWITCH
9. SQUELCH CONTROL
10. NOISE ON-OFF SWITCH
11. CHANNEL SCALE
12. HARNESS CONNECTOR SOCKET
13. CURSOR ADJUSTER
14. CHANNEL TUNING
15. LOCKING LEVER
16. DIAL LAMP (UNSCREW TO CHANGE)
17. HIGH/LOW POWER SWITCH
18. LOCKING LEVER
19. R.F. TUNING
20. CONNECTOR
21. SPARE FUSE
22. I/C ON-OFF
23. FUSE IN SUPPLY LINE
24. POWER SUPPLY CONNECTOR
25. SPARE FUSE
26. STAND BY TRAFFIC
27. WIRLESS SET ON-OFF

FIG. 5. CONTROLS

ascertain that the set selection switch on the control unit, is switched to the correct position for the set to be used.

(3) Switch the harness ON by the appropriate switch on the JD9 (Harness Type A), or J1 or J2 Box, (Harness Type B).

Section 11. Power Supply Unit

(1) Put the power ON/OFF switch, Fig. 5 (3), to ON; this should cause the "Power On" lamp, Fig. 5 (1), to glow. If it is too bright, turn the lamp cover in a clockwise direction.

(2) Put the IC ON/OFF switch, Fig. 5 (22) to ON, if the IC amplifier is to be used.

(3) Put the Wireless set ON/OFF switch, Fig. 5 (27) to ON.

(4) Put the STAND-BY/TRAFFIC switch, Fig. 5 (26), to TRAFFIC.

(5) Allow AT LEAST FIVE MINUTES before tuning, to enable the set to warm up. If time allows, a period up to 15 minutes is preferable.

Section 12. Tuning the Sender/receiver

(1) Set the Calibrator switch, Fig. 5 (8), to CURSOR ADJ. This controls the 2.0 Mc/s crystal calibration.

NOTE: The two dials and the centre zero meter are illuminated when the calibrator switch is at positions CURSOR ADJ., CHANNEL ADJ., and TUNE RF. The light is out when the switch is set to OPERATE.

(2) Unlock the RF and CHANNEL tuning knobs, Fig. 5 (14) and (19), by turning the locking levers, Fig. 5 (15) and (18), fully anticlockwise.

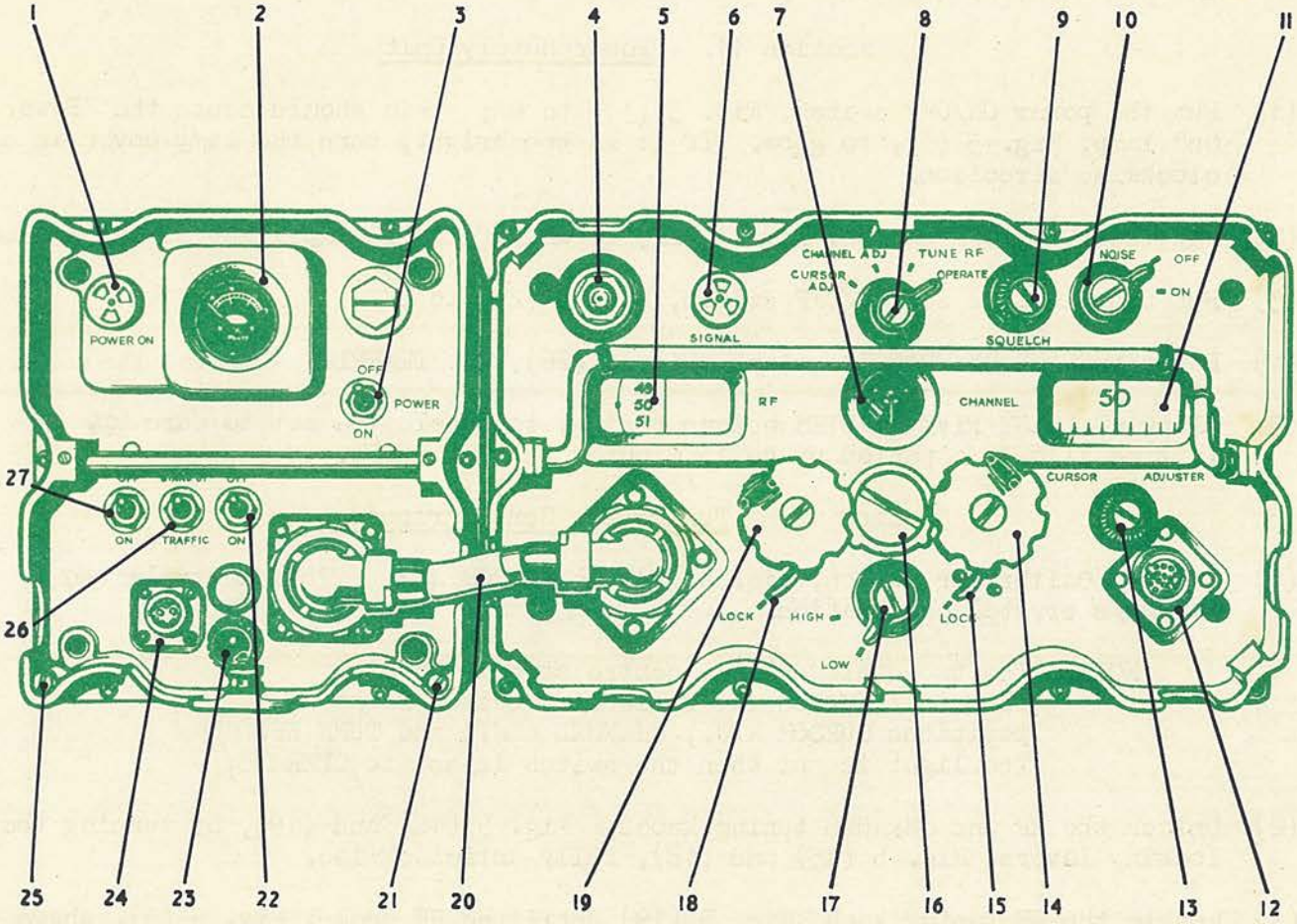
(3) Rotate the RF tuning knob, Fig. 5 (19) until the RF scale, Fig. 5 (5), shews approximately the required frequency.

(4) Rotate the CHANNEL tuning knob, Fig. 5 (14), until the CHANNEL scale, Fig. 5 (11) reads to the nearest even number of megacycles above or below the required frequency.

Example: -

Required frequency	Set Channel to
47.3 Mc/s	48 Mc/s
51.0 "	50 "
44.8 "	44 "
46.0 "	46 "

NOTE: In later models of the Wireless Set C42, the 2.0 Mc/s crystal calibrator may be changed to 1.0 Mc/s. In this event all directions referring to "whole even numbers of megacycles", should be read as "whole numbers of megacycles". A table of examples based on 1.0 Mc/s calibration points, is shewn below: -



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20. CONNECTOR
21. SPARE FUSE
22. I/C ON-OFF
23. FUSE IN SUPPLY LINE
24. POWER SUPPLY CONNECTOR
25. SPARE FUSE
26. STAND BY TRAFFIC
27. WIRLESS SET ON-OFF

FIG.5. CONTROLS

Example:-

Required frequency	Set Channel to
47.3 Mc/s	47.0 Mc/s
51.0 "	51.0 "
44.8 "	45.0 "
46.0 "	46.0 "

(5) Gently turn the CHANNEL tuning knob, Fig. 5 (14), until the meter pointer, Fig. 5 (7), reaches the centre zero mark, ensuring that in doing so the NEEDLE MOVES IN THE SAME DIRECTION AS THE CHANNEL SCALE OR THE TOP OF THE TUNING KNOB. If the movement of the needle towards the centre zero mark is in the opposite direction to that of the CHANNEL scale, the correct tuning point has not been found, and the knob should be rotated in the opposite direction.

(6) Rotate the CURSOR ADJ knob, Fig. 5 (13), until the cursor on the CHANNEL scale, Fig. 5 (11), is over the calibration line corresponding to the frequency chosen in Section 11, para. (4).

(7) Now rotate the CHANNEL tuning knob, Fig. 5 (14), until the CHANNEL scale, Fig. 5 (11), reads the required frequency.

(8) Turn the CALIBRATOR switch, Fig. 5 (8), to CHANNEL ADJ.

(9) Carefully adjust the CHANNEL tuning knob, Fig. 5 (14), until the centre zero meter, Fig. 5 (7), reads zero, ensuring that the meter pointer moves in the same direction as the CHANNEL scale, as in Section 11, para. (5). The reading of the CHANNEL scale should be within 1/3 channel of the exact frequency required. If it is not, start again at (1).

(10) Lock the CHANNEL tuning knob by fully turning the LOCK lever, Fig. 5 (15), in a clockwise direction.

(11) Turn the CALIBRATOR switch, Fig. 5 (8), to TUNE RF.

(12) Carefully adjust the RF tuning knob, Fig. 5 (19), until the centre zero meter, Fig. 5 (7), reads zero, ensuring that the meter pointer moves in the same direction as the top of the tuning knob.

(13) Lock the RF tuning knob by fully turning the LOCK lever, Fig. 5 (18), in a clockwise direction.

(14) Set the CALIBRATOR switch, Fig. 5 (8), to OPERATE.

Section 13. Aerial tuning unit (Fig. 6)

(1) Set the HIGH/LOW switch, Fig. 7 (17), to HIGH.

(2) Put on the headset and listen to make sure there is no incoming signal.

(3) Unlock the TUNE knob on the ATU by turning the lock lever fully anti-clockwise.

(4) Depress the switch on the headset microphone and rotate the TUNE knob until a maximum reading is obtained on the meter of the ATU. During this operation the set is sending. Do not send for longer than necessary.

(5) Release the pressel switch and re-lock the TUNE knob in this position.

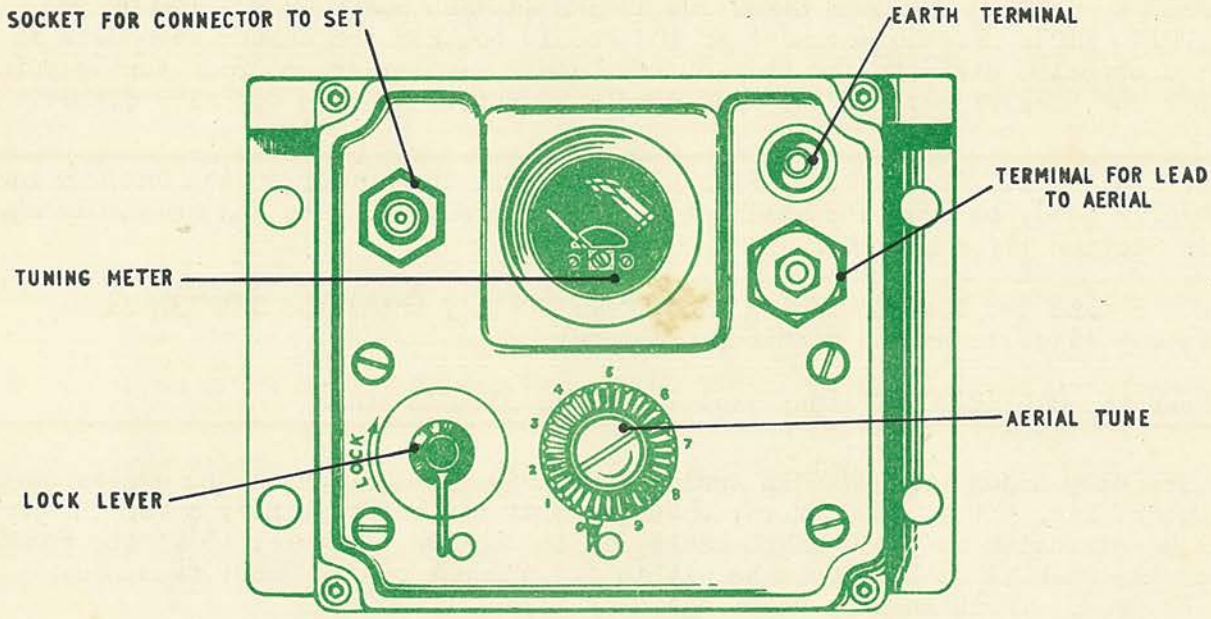


FIG. 6. AERIAL TUNING UNIT.

Section 14. Operating the Set

(1) Set the HIGH/LOW power switch, Fig. 7 (17), to HIGH or LOW as required. (The setting of this switch determines the transmitting power of the sender).

(2) Set the Squelch control, Fig. 7 (9), fully anti-clockwise.

(3) Turn the NOISE ON/OFF switch, Fig. 7 (10), to ON.

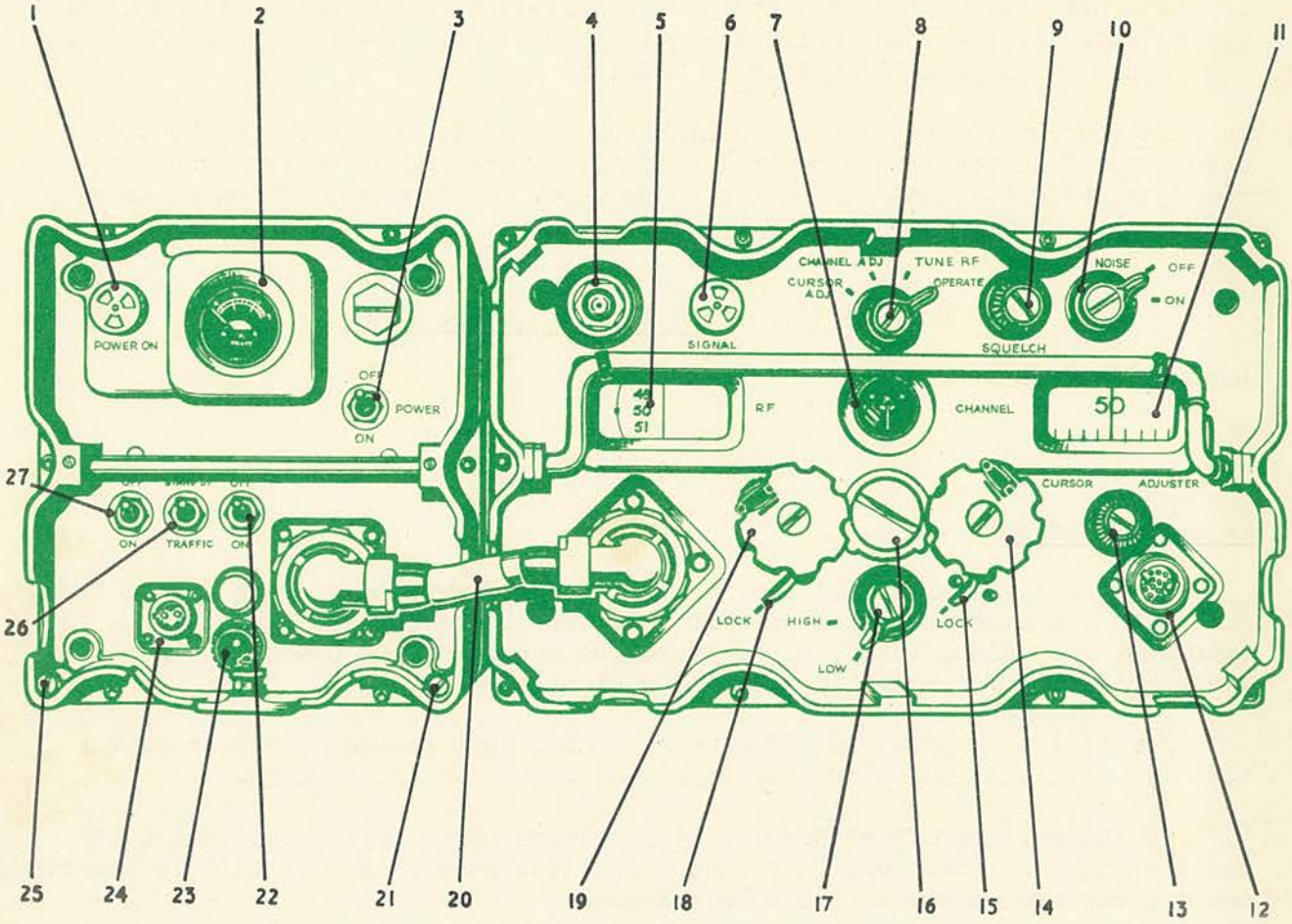
(4) Using a handset or headset, listen to ensure that there is no incoming signal.

(5) Rotate the SQUELCH control, Fig. 7 (9), clockwise until the SIGNAL lamp, Fig. 7 (6), lights, then turn the knob back until the SIGNAL lamp just goes out, and remains out without flickering.

(6) Set the NOISE ON/OFF switch, Fig. 7 (10), to OFF.

NOTE: It is intended that the squelch circuit should normally be kept in circuit. If however the noise muting is not required, set the NOISE ON/OFF switch, Fig. 7 (10), to ON.

(7) If the set is to be used for a listening watch only, set the STAND-BY/TRAFFIC switch, Fig. 7 (26), (on the PSU) to STAND-BY. This will reduce drain on the battery, but the sender will not operate from any of the headset switches. On resuming normal watch, set the STAND-BY TRAFFIC switch to TRAFFIC and allow a brief period for the sender to "warm up".



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17. HIGH/LOW POWER SWITCH
18. LOCKING LEVER
19. R.F. TUNING
20. CONNECTOR
21. SPARE FUSE
22. I/C ON-OFF
23. FUSE IN SUPPLY LINE
24. POWER SUPPLY CONNECTOR
25. SPARE FUSE
26. STAND BY TRAFFIC
27. WIRLESS SET ON-OFF

FIG.7. CONTROLS

Section 15. To Check Tuning

(1) The set tuning should be re-checked every ten to fifteen minutes during the first hour. After this period, an hourly check should be sufficient.

(2) To check the tuning, set the CALIBRATOR switch, Fig. 7 (8), to CHANNEL ADJ. If the centre zero meter does not show a central reading, unlock the CHANNEL tuning knob and re-adjust slightly until it does so. Re-lock the CHANNEL knob, and re-set the CALIBRATOR switch to OPERATE.

(3) To check the RF tuning, set the CALIBRATOR switch to TUNE RF. If the centre zero meter does not show a central reading, unlock the RF tuning knob, and re-adjust slightly until the meter reads zero. Re-lock the RF tuning knob, and re-set the CALIBRATOR switch to OPERATE.

Section 16. To Select a New Frequency

(1) Repeat Sections 12 and 13.

Section 17. Notes

(1) FM capture effect

With an FM wireless set such as the WS C42, unwanted signals from a transmitter on the same frequency as that to which the receiver is tuned, or a frequency very close to it, can capture the receiver, and compel it to accept its signals in preference to the wanted signals.

For this to happen the interfering sender must produce at the receiver aerial, a field strength greater than that of the wanted signals.

If the capture effect occurs, it is always worth trying the effect of small changes of position, in the hope that the wanted signals will be improved, and the unwanted capturing signals reduced.

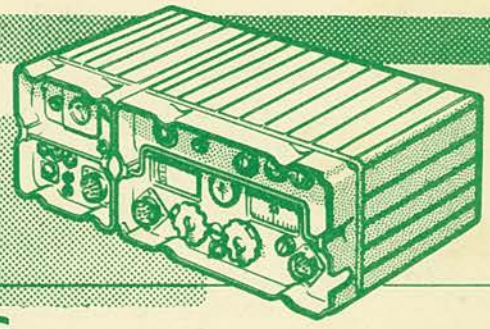
If this is ineffective, there is no cure except a complete change of frequency by the whole net, to another channel.

On no account should any attempt be made to get rid of the capture effect by small changes in the tuning of the set. This will only disrupt the working the stations own net, and possibly of other nets on adjacent channels.

(2) For siting VHF sets, see Page -ii-.

Wireless Station C42

CHAPTER 3



USER SERVICING

Section 18. General

(1) No equipment can be expected to work properly unless it is kept in first class condition by regular servicing, conscientiously carried out. This is the responsibility of the NCO or man who is in direct charge of the equipment, and responsible for its operation, NOT of workshop or repair staffs, though workshop personnel may be called upon to carry out certain servicing tasks.

(2) To guide the NCO or man responsible for servicing, and to ensure that it is carried out, it has been ruled that Signal equipment will be serviced on the task system, and that the completion of each task will be recorded on Army Form B.2661 - Unit Servicing Log.

(3) The Log is reproduced on page 26. Completion of servicing tasks will be recorded by initialling the spaces provided on the front of the form; all repairs and replacements will be recorded on the reverse. The form lasts 24 weeks and supplies can be obtained on indent in the normal way.

(4) The servicing tasks are listed in Section 19, and the frequency with which each task is carried out will be detailed by the Unit Commander concerned.

Section 19. Operators Servicing

(1) Servicing Tasks.

(a) Keep the equipment clean and dry; remove any dirt from the plugs and sockets, dials and control knobs.

(b) Check all controls, switches, etc. to ensure that they are functioning correctly.

(c) Examine all connectors for frayed ends, making sure that the braiding is well bonded to the cable plug or socket. If any connectors appear to be faulty, report to the Mechanic.

(2) Replacement of faulty components

(a) If the dial lamp is faulty, unscrew the holder and replace the bulb. The correct replacement is bulb type "F", 12.0 volts, 2.2 watts.

(b) To replace the "Power on" and "Signal" lamps, if faulty, unscrew the metal cover and insert a new bulb. The correct replacement is bulb type "F", 12.0 volts, 2.2 watts.

(c) Check the fuse(s) on the PSU by switching the power ON. Replace if defective with Fuse Type H.R.C. 10.0 amp.

The two fuses on the front panel of the 12 volt unit are in separate circuits. If the pilot lamp fails to light, the upper fuse may be defective, and if the meter fails to read, the lower fuse is probably defective. They are both of the same type as used in the 24 volt unit, and spares are carried in the same manner.

Section 20. Fault Location

TABLE 3

Symptom	Possible Fault	Remedy
(1) Set apparently dead	(a) Supply not switched on	(a) Switch ON.
	(b) Batteries low (Indicated by meter in PSU).	(b) Replace with fully charged batteries
	(c) Fuse blown	(c) Replace with new fuse
	(d) Internal fault in Set or PSU	(d) Report
(2) Set working but no signals	(a) Faulty headset or handset	(a) Change headset or handset
	(b) Aerial broken off	(b) Replace aerial
	(c) Incorrect tuning	(c) Re-tune
	(d) Internal fault	(d) Report
(3) Fuses repeatedly blowing	(a) Internal fault	(a) Report

NOTE: Spare fuses will be found in the PSU. (see Fig. 7)

Section 21. Mechanic's Servicing

(1) This section deals only with the initial servicing which may be carried out by the Radio Mechanic, at the vehicle, or other installation of the WS C42.

At this stage the Mechanic's initial servicing is confined to determining which part of the installation is faulty, and, where necessary, changing the faulty unit.

Any subsequent opening of sealed equipment which may be necessary, will be carried out at the Mechanic's repair vehicle in accordance with the appropriate EMER Tels. H443.

(a) Spares

Wireless Set C42	(Sender/Receiver)
Supply Unit Vibratory No. 12	(12 or 24V as appropriate)
Aerial Tuning Unit No. 6	-
Leads Aerial No. 2	(pigtail 1 ft., 1 ft. 2 ins., or 1 ft. 4 ins. as appropriate)
Connector Type (not yet designated)	(sender/receiver to ATU)
Inter-connector lead (25-way)	(PSU to Sender/Receiver)
Power lead, 12 or 24 volts	(PSU to battery)

(b) Test Gear

Instrument Testing Avo 8	(or normal headset in known working order.)
Receivers Headgear S.I. double, No.1A	
Microphones Hand S.I. No.1A	
Harness neckband snatch pattern No.1	
Lamps filament 6.0V 0.35W., MESC. clear	(or bulb type "J")
Harness box Type M.	

Section 22. Test Procedure

(1) Power Supply Unit

(a) Using the Avometer, measure the DC supply to the PSU. If there is no reading, check back along the supply wiring until the fault is located and repair the defect, or call the appropriate mechanic. (Note the supply voltage for later reference).

(b) Check the PSU fuse or fuses. If they have "blown", replace with 10 amp fuses of the correct type.

(c) Connect the M box to the output socket of the sender/receiver, and, referring to the voltage of the supply (para (a)) set the HIGH-LOW switch as appropriate:

	LOW	HIGH
12V PSU	10.3-12.3	12.3-14.5
24V PSU	20.7-24.5	24.5-29.0

(d) If the voltage control relay in the PSU is working correctly, the POWER ON lamp will vary in brilliancy as the HIGH-LOW switch on the M box is operated.

(e) Set the switches on the PSU as follows: POWER ON-OFF, IC ON-OFF, and WIRELESS SET ON-OFF, to ON, and the STANDBY-TRAFFIC switch to TRAFFIC.

(2) Sender/Receiver Unit

(a) Connect the Headset Type 1A to the SET socket of the M box.

(b) Listen for the vibrator noise in the PSU, and fan noise in the sender/receiver. If neither can be heard it is possible that a fault in the sender/receiver is causing fuse(s) to "blow" in the PSU.

(c) Sender Tests

(i) Carry out the tuning procedure as in Section 11 (Tuning the Sender/Receiver), choosing an even number of megacycles as the frequency.

(ii) Set POWER OUTPUT switch to LOW, and if wireless silence is in force, remove the coaxial connector at the sender/receiver, and test for RF output using the 6.0V 60mA bulb. (Pressel switch to SEND).

(a) On LOW POWER, hold the bulb with the centre contact touching the centre pin of the ATU CONNECTOR PLUG, and the brass base making contact with the shell of the same plug. The bulb should light with a medium glow.

NOTE: DURING THE FOLLOWING TEST THE SENDER SHOULD BE SWITCHED ON ONLY MOMENTARILY.

(b) On HIGH POWER, hold the metal base of the bulb in the fingers (or twist a piece of bare wire round the base and use as a handle) and touch the centre pin of the ATU CONNECTOR PLUG with the centre contact of the bulb. The bulb should light brilliantly.

(iii) Reset HIGH/LOW switch to LOW.

(iv) Check the AFC (automatic tuning control) circuits by tuning to either side of the RF scale setting. If the AFC circuits are normal, it will be possible to detune by approximately one and a half megacycles before the background noise rises to the "no signal" level.

If the AFC circuits are faulty however, the background noise will rise to the "no signal" level within approximately two hundred kilocycles of the original setting.

(v) Check for sidetone on Send; this test checks the modulator circuits.

(vi) If the sender fails any of the above conditions, the sender/receiver unit should be changed for a known good spare.

(vii) The coaxial connector can be checked by repeating the test in para (ii) (a) above. The test should be applied to the end of the connector after re-connecting it to the sender/receiver, and disconnecting it from the ATU.

(d) Receiver Tests

(i) Leave the coaxial connector disconnected.

(ii) Connect the Avometer to the terminals of the M box, and set it to the 1.0 mA DC range.

(iii) Carry out the tuning procedure as in Section 11 (Tuning the Sender/Receiver). The limiter grid current as shown by the Avometer should be approximately 0.7 mA on both CURSOR ADJ. and CHANNEL ADJ. positions of the CALIBRATOR SWITCH.

(iv) Turn CALIBRATOR switch to OPERATE, and NOISE ON/OFF to OFF.

(v) Check the "no signal" noise and the limiter grid current, which should be very roughly 40.0 μA.

(vi) Check the operation of the squelch circuit as follows:

(a) Rotate the SQUELCH CONTROL. If the circuit is normal the lamp should light, or, if already alight, should go out.

(b) De-tune the RF TUNING control with the CALIBRATOR switch to RF TUNE. The signal lamp, which should normally be ON, will extinguish.

(e) IC Amplifier Test

(i) Change the Headset Type 1A from the SET socket to the IC socket of the M box, and check that adequate sidetone volume is available.

(ii) If the set fails any of the tests in (c), (d) or (e), the sender/receiver unit should be changed for a known good spare.

(3) Aerial Tuning Unit

(a) Replace the coaxial connector, and re-check the tuning of the sender/receiver unit.

(b) Tune the ATU for maximum reading of the Avometer, which may then be switched to the 250 μA range.

(c) Note the Avometer reading obtained in the last paragraph, then detune the ATU to either side of the present setting. The limiter grid current should fall to approximately half the previous reading.

(d) Re-tune the ATU for maximum limiter grid current, then remove the aerial rod from its base. The grid current will change in value if the pigtail is NOT faulty.

(e) This proves the aerial system down to the ATU CONNECTOR PLUG. If the installation fails the test, the coaxial connector and the pigtail can be checked using the Avometer on Ω range. If both appear normal, the ATU should be changed.

In case the break in the pigtail is being held by the flexible rubber covering, a very slight tension applied to the pigtail during test, will pull the break open and register on the Avometer.

(4) General

(a) If wireless silence is not in force, the whole aerial system can be checked on transmit using the ATU TUNING METER as an indicator. If the meter reading is normal on send, the aerial, pigtail, ATU, and coaxial connector are all normal. An excessive meter reading may indicate a faulty pigtail, or a broken aerial.

(b) Repeated reports of weak reception may be made by the operator(s) of any one particular vehicle. If the fault persists after changing the sender/receiver, and everything else appears normal, then the mechanic should direct his attention to the noise generated by the electrical equipment of the vehicle or by PSU's of other equipment. If this is excessive, it can give an apparent effect of weak reception, and will be cured only by a general overhaul of the electrical and ignition systems.

(c) The tests outlined above eliminate all items of the installation except the harness, if therefore the fault still persists, by elimination it must be in the harness system.

(d) Finally, although the tests have been laid out in a certain order, it is not necessary for the mechanic to adhere to it rigidly.

The application of the tests is largely a matter of common sense, and correct interpretation of the operator's report.

Section 23. Technical Description

(1) Receiver

The receiver is a double superheterodyne. Referring to the block diagram (Fig. 8) RF signals are fed from the aerial to an RF amplifier stage and thence to a mixer valve. A separate crystal calibrated local oscillator is used. The output from the mixer to the 1st IF amplifier is 6 Mc/s. The output from this amplifier is fed to a second mixer, the oscillator of which is crystal controlled, and the frequency changed again; the second intermediate frequency is 2.4 Mc/s. There are two stages of IF amplification followed by two limiter stages. Demodulation takes place in a discriminator stage, from which AF signals are passed through an IF filter, de-emphasis circuit, and two stages of AF amplification to the headphones.

The muting section of the squelch circuit is effective only when the NOISE switch in the front panel is set to OFF.

When the switch is set to ON, the squelch relay contact which earths the output from the first AF amplifier, is disconnected.

When no signal is being received the noise output from the IF filter is passed to a squelch circuit. The squelch circuit comprises a noise amplifier, a detector, and a DC amplifier. The anode circuit of the noise amplifier valve is tuned to approximately 10 kc/s. The detector circuit cuts off the DC amplifier when noise of a level sufficient to overcome the detector delay voltage is passed to it. The level at which the valve cuts off is adjusted by means of a potentiometer control. This is the SQUELCH control on the front panel. A relay in the anode circuit of the DC amplifier, therefore remains inoperative whilst noise is present, i.e. when no signal is being received. In this condition the output from the 1st AF amplifier is earthed by means of relay contacts and nothing will be heard in the headphones. As soon as a signal is received however, the noise level drops and the DC amplifier conducts, the squelch relay operates, and allows the AF signal to reach the 2nd AF amplifier and headphones.

(2) Sender

The sender consists of a master oscillator, driver, and power amplifier, variably tuned over the range 36 to 60 Mc/s. The master oscillator is frequency modulated by a Ferrite reactor in the anode circuit of the modulator valve.

The input to the modulator valve is derived from a two stage amplifier, the gain of which is automatically controlled (A.M.C.) so that regardless of the input level to the microphone, the output will remain constant.

Two levels of RF output are available, controlled by a switch on the front panel. These are: LOW, approximately 0.25W, and HIGH, not less than 15W.

The sender is tuned coincidentally with the RF stage of the receiver.

(3) Automatic frequency control circuits

When the sender is being used, the receiver is still operative and receives the transmitted signal. This provides sidetone for the headphones which are connected to the receiver output, and also enables the receiver to be used as a frequency standard for the sender oscillator AFC circuits.

The AFC system controls the reactor stage, which is fed by the combined output from the wide-band 6.0 Mc/s discriminator, and the narrow-band 2.4 Mc/s discriminator.

When the sender is perfectly on tune there is no DC output from the discriminators, but should the oscillator deviate from the correct frequency, then DC voltages, positive or negative according to the direction of drift, are developed by the discriminators and fed into the reactor stage.

This will "pull" the oscillator back to the original frequency.

The DC output from the narrow band discriminator is applied to the modulator in series with the DC output of the wide band discriminator.

Frequency correction is mainly provided by the narrow band discriminator, and the wide band discriminator increases the effective range of the AFC system.

The wide band circuit also provides audio negative feedback to the reactor valve, thus helping to maintain constant deviation throughout the frequency range of the sender.

(4) Calibrating circuits

To facilitate setting the sender and receiver to correct frequencies, two crystal controlled calibrator circuits are provided. These are oscillators, working on 2,000 kc/s with harmonic output and a 100 kc/s with harmonic output.

The local oscillator (CHANNEL) scale is tuned, with the aid of the 2.0 Mc/s calibrator, to the nearest 2.0 Mc/s multiple of the required frequency. The scale is then corrected to this frequency by adjusting the cursor to the same mark.

The dial is then re-set to the actual frequency required, and accurately tuned using the 100 kc/s calibrator.

Initial setting up, using the 2.0 Mc/s calibrator, obviates the possibility of error which might arise through choosing an incorrect harmonic of the 100 kc/s calibrator.

(5) Intercommunication amplifier

This is a normal two-stage audio amplifier, resistance-capacity coupled, with negative feedback provided by resistive coupling between the two anode circuits.

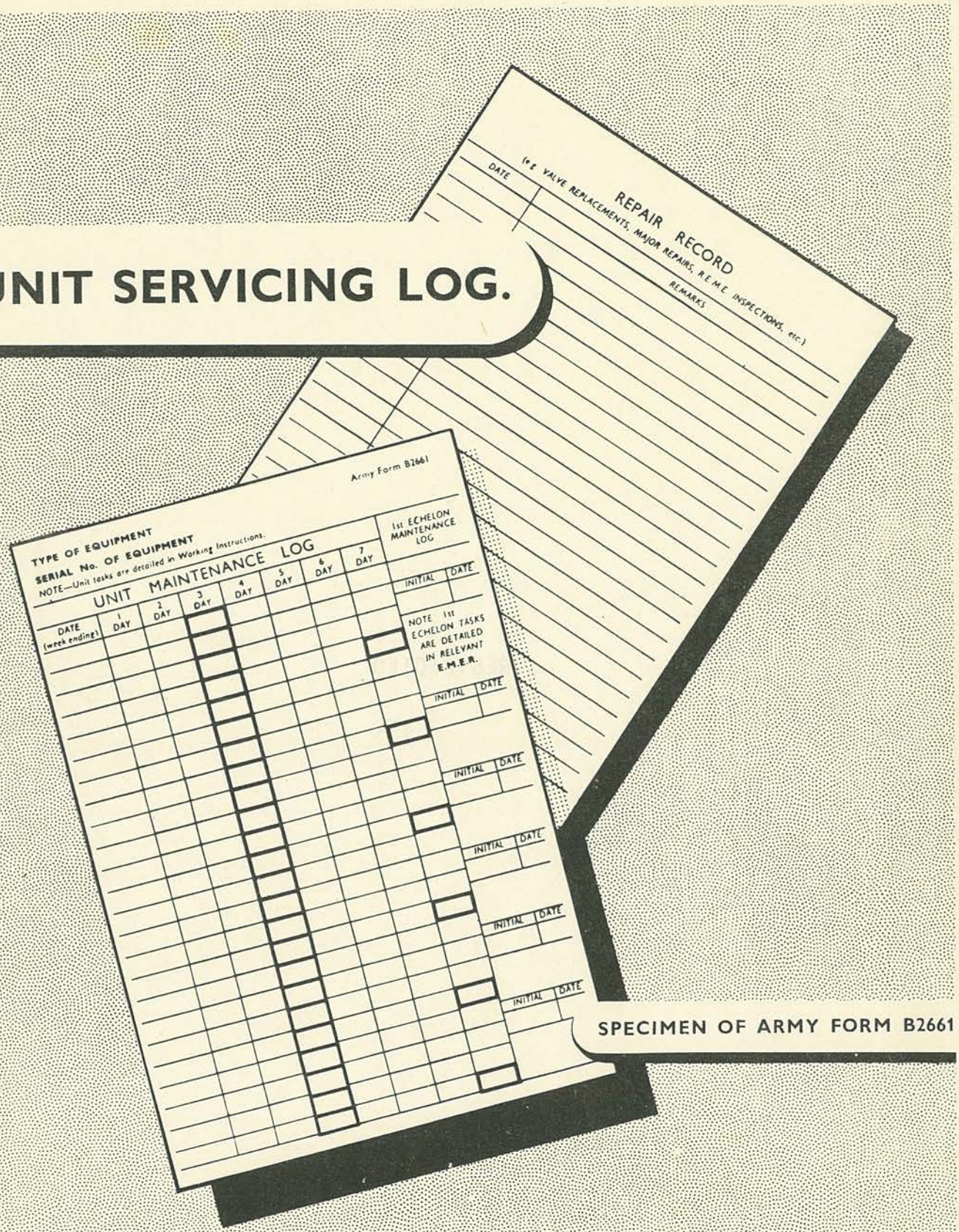
(6) 24-volts Power Supply unit

The Power Supply Unit is initially supplied from secondary batteries or a suitable alternative 24 volts DC supply.

A single vibrator is used for supplying both HT and LT. The vibrator is self-rectifying and the circuit is arranged to supply 175 volts for the receiver and sender, and 350 volts for the sender PA on high power. LT is obtained from the vibrator transformer. All the valves operate from 6.3 volts with the exception of the sender PA, which requires 12 volts.

To regulate the output voltage from the vibrator transformer, a relay in the PSU selects appropriate taps for either high or low voltage supplies. This relay is, in turn, controlled by a special voltage conscious relay in the harness system, which operates at 25.5 volts, and releases at 23.5 volts.

UNIT SERVICING LOG.



SPECIMEN OF ARMY FORM B2661

RESTRICTED

IMPROVEMENT OF SIGNAL EQUIPMENT

Do you think YOU can improve ANY Signals Equipment?

Can you suggest:

(a) An improvement in design or shape?
(b) A better method of installation, operating or servicing including the tools you use?
(c) Other equipments which might do the job better?

The War Office is interested in your ideas. Apply to your Troop Commander for details of the method whereby suggestions may be passed by YOU to the War Office.

War Office Memorandum to C.S.Os., reference 42540 (Signals 3 (c)) dated 30th March 1948 refers.

Suggestions from Other Arms of the Service will be welcomed but should be passed to the nearest Chief Signal Officer.

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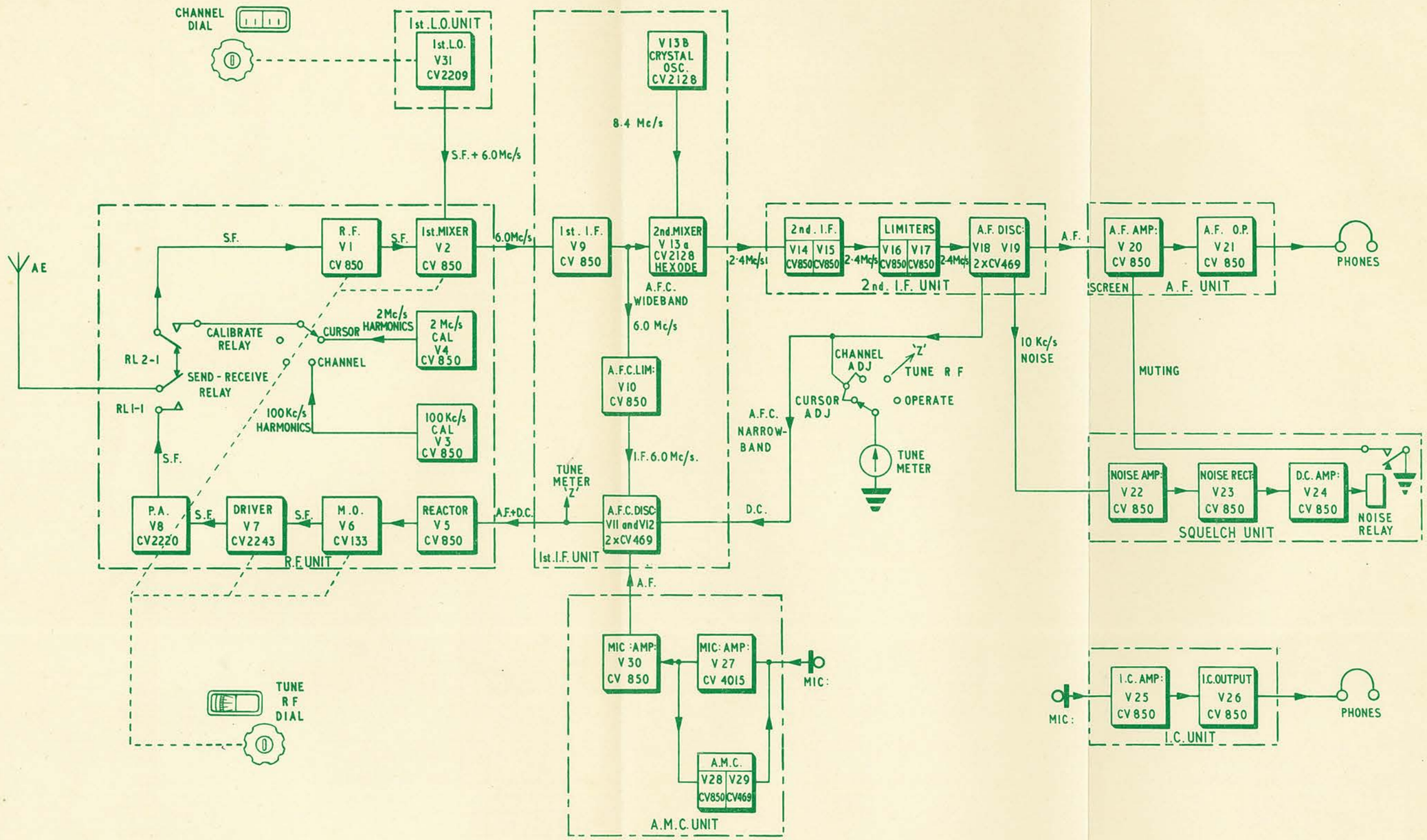

FIG. 8 BLOCK DIAGRAM OF C.42