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USER HANDBOOK
for
AMPLIFIER R.F. No2. MK. 3.(12 VOLT)

WARNING.

The voltages employed in this equipment are sufficiently high to endanger human life. The power **MUST** be switched off before changing valves or making internal adjustments. In case of electric shock see inside this cover.

MAY 1955

Produced by Direction of
Director of Signals,
The War Office,
Whitehall, S.W. 1.

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S Y N O P S I S

The Amplifier, R.F. No. 2 Mk. 3 (12 Volt) is used in conjunction with the W.S. No. 19, its purpose being to amplify the modulated R.F. carrier output of the set and thereby increase its working range.

Two frequency bands are available, viz. 2.1 Mc/s. to 4.5 Mc/s. and 4.5 Mc/s. to 7.5 Mc/s.

The H.T. power supply is from a rotary transformer situated in the amplifier case.

The total power consumption is 12 volts at 16 amps. when on SEND and 12 volts at 1 amp. on RECEIVE.

ASSOCIATED PUBLICATIONS

Wireless Set No. 19 Mk. 1, 2, 3 - Working Instructions
ZA 21575 (2nd Edition) W.O. Code No. 1055

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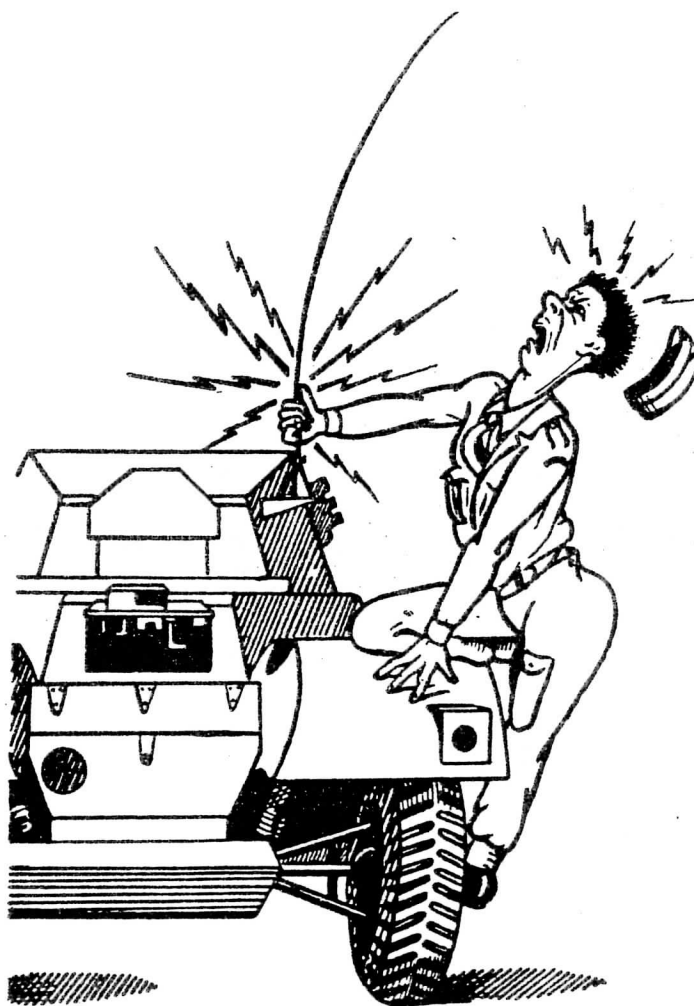
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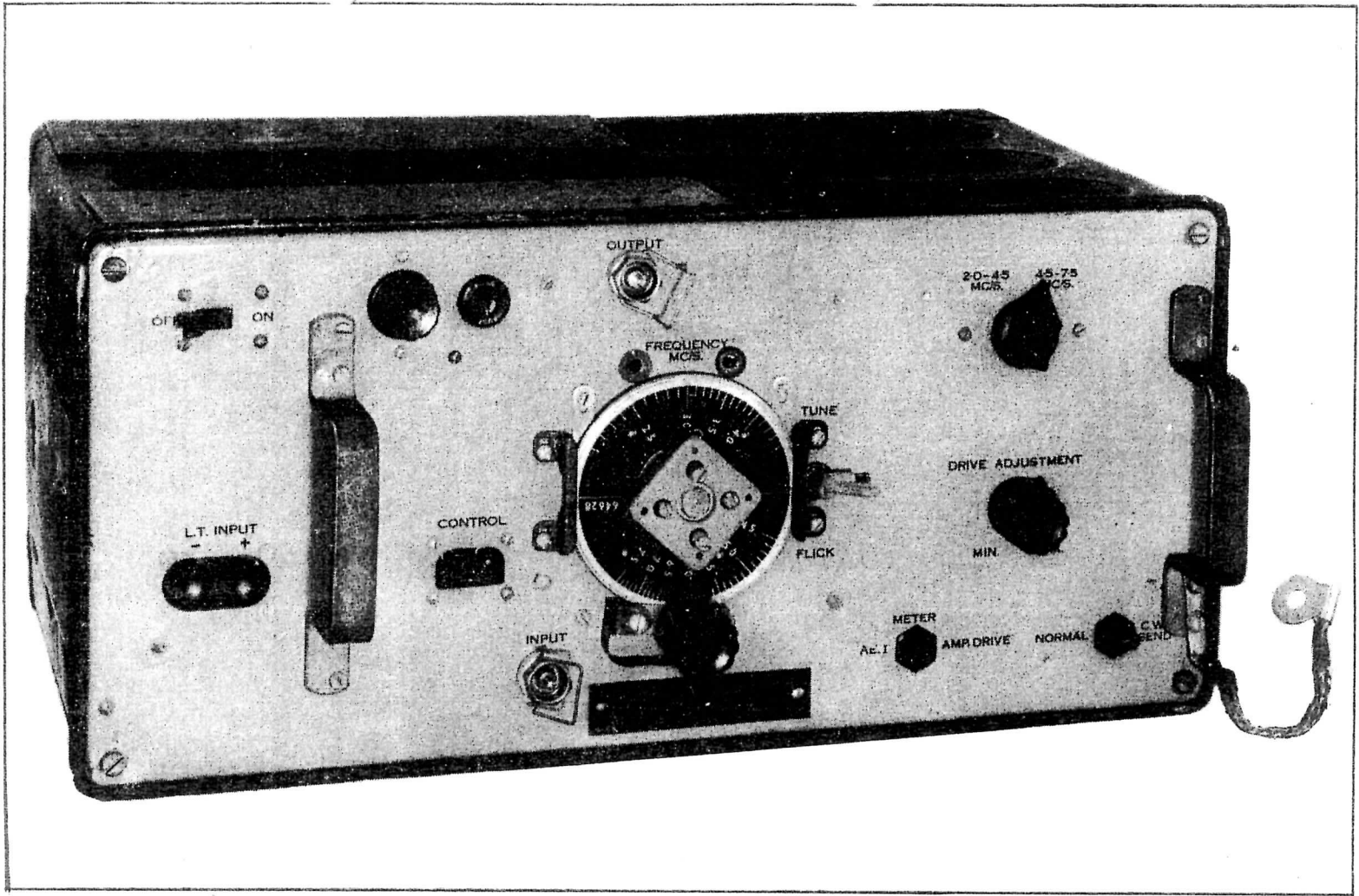
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SHOCK AND BURNS



Don't!

USE AERIALS AS HANDGRIPS



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AMPLIFIER R.F. NO. 2 MK 3 (12 VOLT)

USER HANDBOOK

for

AMPLIFIER, R.F. NO. 2 Mk. 3 (12 VOLT)

CHAPTER I GENERAL DESCRIPTION

1. Purpose and facilities

The Amplifier, R.F. No. 2 is intended for use with the Wireless Set No. 19, its purpose being to amplify the modulated R.F. carrier output of the set and so increase the distances that can be worked between stations.

The amplifier has been designed for automatic Send/Receive control from the Wireless Set No. 19 and apart from the additional controls used only when tuning, the operating procedure on RT and MCW is unchanged. For CW operation a separate amplifier "Send-Receive" switch is used.

The Wireless Set No. 19 operates normally as an L.P. set when the amplifier is switched OFF.

2. Frequency range

The frequency range, 2.1 Mc/s. to 7.5 Mc/s. is in two bands arranged to change over at 4.5 Mc/s. as on the Wireless Set No. 19.

Operation on 2 Mc/s. gives full gain under the following conditions only:-

- (a) With a specially selected Wireless Set No. 19 Mk. 2 or any Wireless Set No. 19 Mk. 3; and
- (b) An aerial not less than 16-20 ft. in length, the minimum length depending on the type of installation.

Operation between 7.5 and 8.0 Mc/s. gives full gain with a specially selected Wireless Set No. 19 Mk. 2 or Mk. 3 only.

The amplifier may be used between 2 and 2.1 Mc/s. and between 7.5 and 8 Mc/s. using any Wireless Set No. 19, but full gain will not be obtained as the 19 Set will be partially mistuned. Nevertheless, the range obtained will exceed that obtained when using the 19 Set alone.

3. Power supply

The H.T. supply of 650 volts at 110 mA. is obtained from a rotary

CHAPTER I - Section 3

transformer situated within the amplifier case. A fan mounted on the spindle of this machine draws cool air through the dust filter at the back of the box, thus enabling the R.F. Amplifier to be run continuously without overheating.

The power input requirement is 12 volts at approximately 16 amps. with the amplifier on "Send". On "Receive" the load is 1 amp. This load is additional to the current taken by the Wireless Set No. 19.

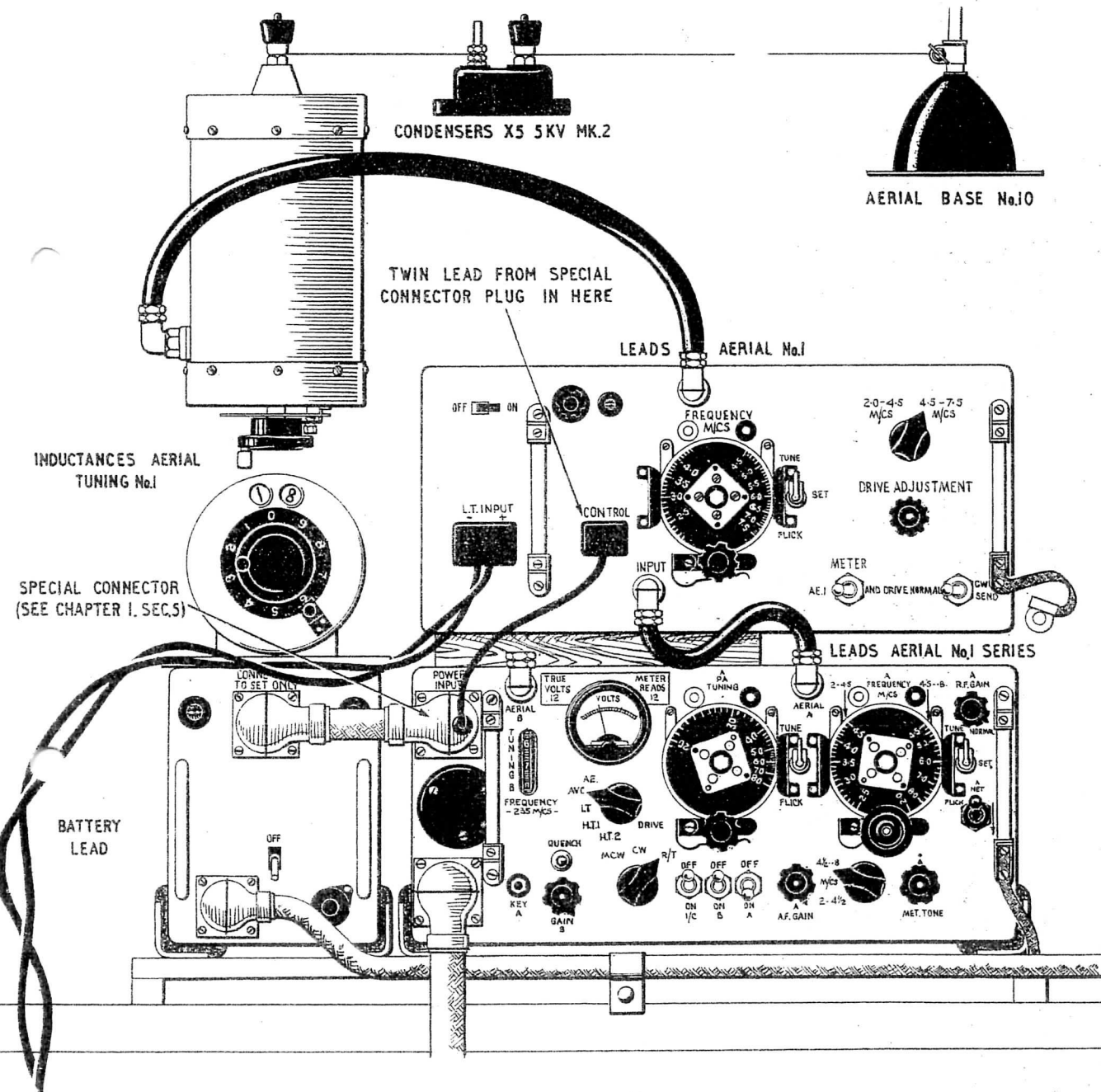


FIG.1 TYPICAL LAYOUT

4. Aerials

The aerial circuit is tuned by the aerial tuning inductance (Inductance, Aerial Tuning No. 1) which replaces the standard Wireless Set No. 19 Variometer. The variometer should never be used with the amplifier.

The minimum length of aerial that may be used is 12 ft. Longer lengths of rod aerial and inverted L wire aerials can be used as with Wireless Set No. 19 alone. Good insulation is essential at the aerial base and other high potential points. Particular attention should be given to the lead connecting the A.T.I. output terminal and the aerial base; it is important that this lead should be kept clear of all objects, especially metal fittings.

With some installations, aerials longer than 12 ft. will be necessary when working at frequencies of 2.0 to 2.3 Mc/s.

5. Installation

Fig. 1 shows a typical layout with an R.F. amplifier No. 2 mounted on top of the Wireless Set No. 19, but in some installations the amplifier has to be mounted on a separate carrier. Connectors of suitable length are supplied with each installation kit.

The amplifier send-receive relays are controlled on RF and MCW from the Wireless Set No. 19 via the twin lead which forms part of the special connector between power unit and set. This connector is supplied in three distinct types:

- (1) Connector 6-pt. No. 16 series for Wireless Set No. 19 Mk. 1 and Mk. 2, when used with Supply Unit No. 1 Mk. 1 or Mk. 1[#]
- (2) Connector 12-pt. No. 27 series for Wireless Set No. 19, Mk. 3, when used with Supply Unit No. 1 Mk. 3.
- (3) Connector 6/12-pt. No. 2 series for Wireless Set No. 19, Mk. 1 and Mk. 2, when used with Supply Unit No. 1, Mk. 3.

On CW, the amplifier is controlled by the NORMAL-CW SEND switch.

The earthing connection attached to the amplifier panel is used only with a separate carrier.

6. Controls

The various controls are given below and are shown in Fig. 2.

- (1) ON-OFF switch - supplies L.T. to valve heaters and control relays.
- (2) RANGE switch - selects the waveband required.
- (3) CW SEND switch - used on CW only - starts rotary transformer and cuts out automatic Send/Receive control.

- 4) METER SWITCH - enables Wireless Set No. 19 panel meter (with its meter switch set to AE) to read either aerial current or amplifier drive level.
- 5) FREQUENCY DIAL - tunes amplifier output circuit - has two flick positions.
- 6) DRIVE ADJUSTMENT - controls amplifier input.
- 7) AERIAL TUNING INDUCTANCE - figures in index windows indicate number of turns in circuit, therefore high number settings are required for low frequencies.

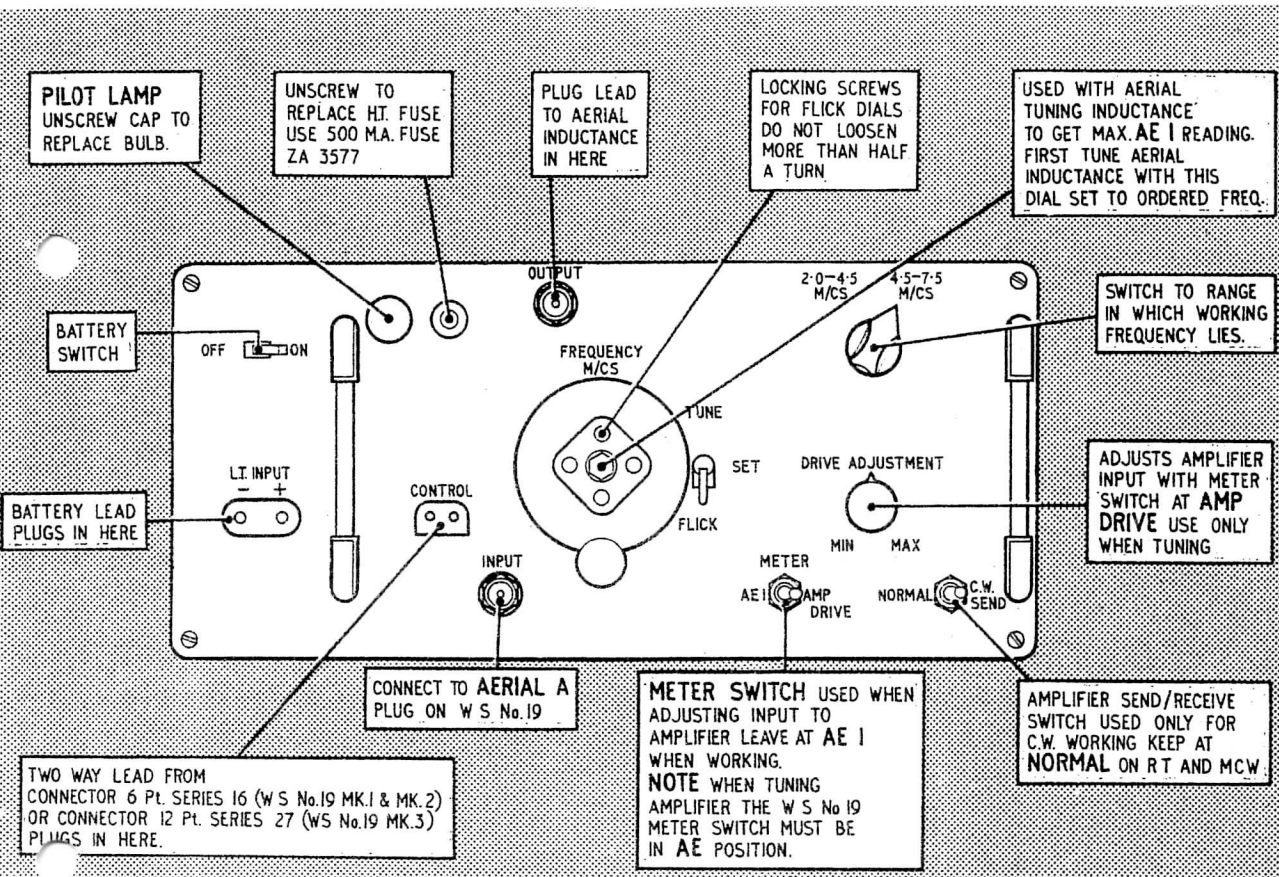


FIG. 2 CONTROLS AND CONNECTIONS

7. Weights and dimensions

Unit	Length (ins.)	Breadth (ins.)	Height (ins.)	Weight (lb.)
Amplifier	17½	14	9	45
A.T.I.	12½	5" diam.		5

WARNING

The voltages employed in this equipment are 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 making internal adjustments. For first aid in case of electric shock, see the inside front cover of this handbook.

8. Preliminary

- (1) See that the following connections are correctly made:-
- (a) "A" aerial plug on No. 19 Set to INPUT plug on amplifier.
 - (b) OUTPUT plug on amplifier to coaxial plug on aerial inductance.
 - (c) Aerial inductance to Aerial (12 ft. rod minimum).
 - (d) 2-pin L.T. INPUT plug to 12-volt battery.
 - (e) On the No. 19 Set H.P. station, there is a special Connector 6-point No. 16 between the 19 Set and its power supply unit. Connect 2-pin plug on Connector No. 16 to the 2-pin socket marked CONTROL on the amplifier. When using No. 19 Set Mk. 3, Connector 6-point No. 16 is replaced by Connector 12-point No. 27 or Connector 6/12 point No. 2 (see Section 5).

9. Operation

It is not possible to tune the amplifier on an incoming signal as in the case of the normal 19 Set sender. Therefore the amplifier cannot be tuned in harbour under conditions of wireless silence.

The L.P. portion (standard 19 Set) of a high power station will normally be netted in harbour, the amplifier being tuned up later using the drills detailed below:-

- (1) Prepare-to-tune drill (Not to be done under conditions of wireless silence).
- (a) Ensure at least 12 ft. of aerial is erected.
 - (b) Ensure amplifier OFF-ON switch is at OFF.
 - (c) Amplifier RANGE switch to correct range.
 - (d) Amplifier DRIVE ADJUSTMENT to minimum.

CHAPTER II - Section 9

- (e) NORMAL-CW SEND switch to NORMAL.
- (f) Amplifier METER SWITCH to AMP. DRIVE.
- (g) Engage amplifier FREQUENCY DIAL flick mechanism.
- (h) Set FREQUENCY DIAL to required frequency.
- (j) 19 Set meter switch to AE and unlock Aerial Tuning Inductance also 19A Set P.A. TUNING dial.
- (k) Put the MCW-CW-RT on the 19A Set to RT.
- (l) Press pressel switch and obtain maximum meter reading by adjustment of Aerial Inductance and 19A Set P.A. TUNING. Release pressel switch.
- (m) Switch amplifier OFF-ON switch to ON and allow 15 secs. for valves to warm up.

(2) Tuning drill

- (a) Switch to SEND by pressing pressel switch.
- (b) Set amplifier DRIVE ADJUSTMENT to give a 5-volt reading on the 19 Set meter.
- (c) Amplifier METER SWITCH to AE.
- (d) Switch 19A Set to CW and depress key.
- (e) Adjust Aerial Tuning Inductance for maximum meter reading.
- (f) Adjust amplifier FREQUENCY DIAL for maximum meter reading.
- (g) Repeat (e) and (f) to get best reading, lock both controls and turn to flick.
- (h) Amplifier OFF-ON switch to OFF.
- (j) Adjust 19A Set P.A. TUNING dial for maximum meter reading, lock and turn to flick and release key.
- (k) Amplifier OFF-ON switch to ON and allow 15 secs. for valves to warm up.
- (l) Amplifier METER SWITCH to AMP. DRIVE.
- (m) Switch 19 Set to RT.
- (n) Repeat (a) and (b) to correct any change in drive reading due to (e), (f) and (j).
- (o) Log the Aerial Tuning Inductance reading.

(3) For CW working only

Switch 19 Set system switch to CW, amplifier NORMAL-CW SEND switch to CW SEND and amplifier METER SWITCH to AE. Depress key and adjust amplifier drive to give maximum aerial current. Release key.

(4) Netting drills for Wireless Set No. 19 with Amplifier R.F. No. 2

(a) Netting in harbour.

(i) As for the No. 19 Set.

(ii) Just before making the first transmission, do the amplifier prepare-to-tune and tuning drills.

(b) Netting at a distance.

(i) Control station.

Set up on ordered frequency as for No. 19 Set, using a wavemeter if available.

Do amplifier prepare-to-tune and tuning drills. At netting time, send tuning call (60 secs.) and netting call (30 secs.). Wait a further 2 minutes to allow out-stations to carry out amplifier prepare-to-tune and tuning drills before asking for a report of signals.

(ii) Outstations.

Do prepare-to-net drill using Aerial Tuning Inductance in place of No. 19 Set variometer.

Do points 1 to 9 of No. 19 Set netting drill.

After netting signal (tuning call and netting call) ends carry out the amplifier prepare-to-tune and tuning drills.

N.B. - NEVER USE H.P. WHEN L.P. WILL DO.

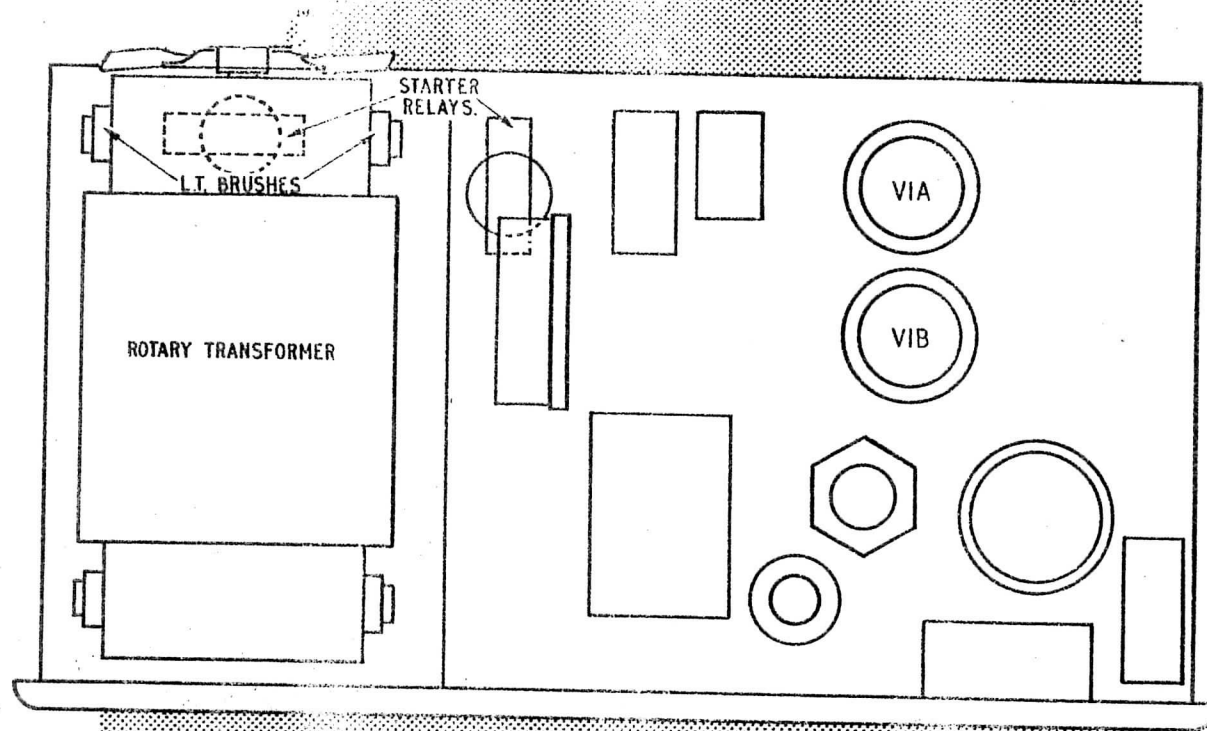


FIG. 3 POSITION OF COMPONENTS ON CHASSIS (TOPSIDE)

10. General

- (1) The Log sheet shown on page 16 has been designed as a means of recording completion of servicing tasks, repairs and inspections. It has been produced separately as Army Form B2661 - Unit Servicing Log, and covers a period of 24 weeks. The completed and current sheets will be kept in the pocket provided in the back cover of this publication. The form has been promulgated in Army Orders and may be obtained on indent in the normal manner.

The completion of servicing tasks will be recorded by initialling in the spaces provided. Minor repairs and replacements will be recorded on the reverse of Army Form B2661.

The following is a list of servicing tasks to be carried out by the Units. The frequency with which they will be carried out will be detailed by the Unit Commander. The tasks are laid down as suggestions to the Unit Commander and he may omit or add to them at his discretion. It is advised, however, that all these tasks be carried out especially in the case of new equipments.

- (2) The remarks under this heading in Wireless Set No. 19 Working Instructions, Part I, apply equally to Amplifiers, R.F. No. 2 Mk. 3. You **MUST** be able to do three things:
- (a) Test the amplifier to see that every part of it is working. Do this daily, whether or not the set is going to be used. The tests are described on page 11 under "Daily Servicing".
 - (b) Go over all external parts of the amplifier and its equipment, clean and check that controls run smoothly, and look for parts which are beginning to wear out or become undone. You will often be able to find trouble before it has become serious, and prevent a breakdown which might occur when the amplifier is in use. The paragraph on weekly servicing, page 11 tells you how to do this.
 - (c) Repair the more common faults which may occur in the field. Some rules to help you in this are given under "Running Repairs", page 11.

The **VITAL** thing is that you should find out and report anything wrong **AS SOON AS POSSIBLE** so that the radio mechanics can repair it **BEFORE THE BATTLE**; halfway through is **TOO LATE**, **SO IT DEPENDS ON YOU**.

11. Connecting up the amplifier and changing parts

Normally the amplifier will be ready for working when you first receive it, but you may have to disconnect various parts for cleaning and replacement - the kit for your amplifier includes spares for most removable parts. Do it this way:-

- (1) Connecting OUTPUT feeder. }
(2) Connecting INPUT feeder. }
(3) Connecting the power supply. } see Figs. 1 and 2.
(4) Connecting CONTROL lead. }
(5) Replacing H.T. fuse (see Fig. 2).
(6) Changing indicator bulb (see Fig. 2).
(7) Taking off the grille. } See W.S. No. 19 Working
(8) Taking the amplifier out of its case. } Instructions, Part I.
- (9) Changing valves. If the amplifier gives poor results it may be necessary to change valves; leave this to a Radio Mechanic whenever possible.
- (10) To change valves remove the amplifier from its case and refer to Fig. 3.
- (10) Remove air filter (see Fig. 4). Clean filter daily by knocking it out on its front edge.

See that the filter is re-inserted with the dirtier face outwards.

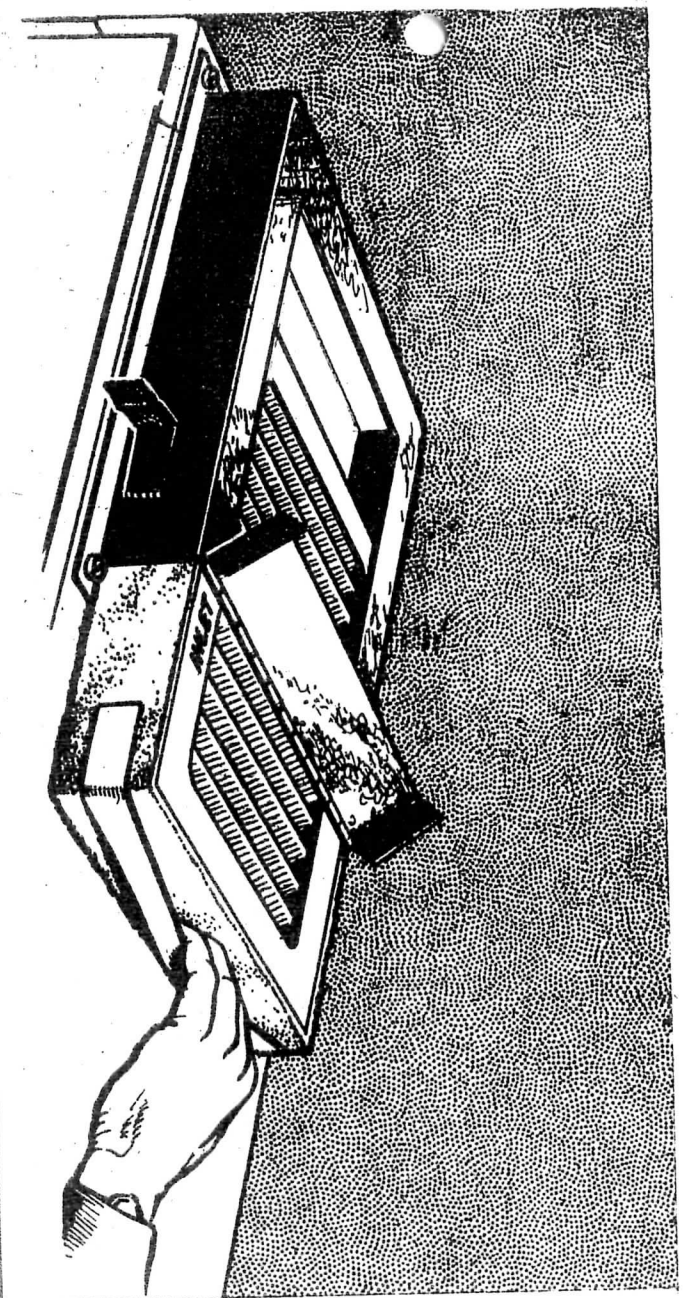


FIG. 4 REMOVING AIR FILTER

12. Daily Servicing

As already explained, the amplifier must be tested every time before it is used. Table I (page 12) shows how to test it. The tests should be done DAILY, even though the amplifier is not going to be used. They MUST be done in the order given. For instance, test 5 will not work unless you have just done 4. The tests must be done AFTER the daily tests on the Wireless Set No. 19 have been carried out and with the set switched on. The air filter must be cleaned daily (see Fig. 4).

13. Weekly Servicing

Every week without waiting to be told you should:-

- (1) Do your "Daily Servicing Tests" for the day (see page 12).
- (2) Clean the outside of the amplifier with a cloth to take off dirt and grease.
- (3) Clean exposed parts of aerial insulators and aerial condenser.
- (4) Try all the controls and see that they are neither jamming, nor turning so easily that their settings would alter through the shaking of the vehicle. See that no knobs are coming off their spindles. If they are, get the Radio Mechanic to tighten the "grub screws" which hold them on.
- (5) Check your kit; see that you have got all your spare parts and valves. Check that they are in working condition. There is a list on the lid of the spare parts box and spare valve case.
- (6) Report: (a) Any faults which you have found and cannot put right.
(b) Any missing pieces of kit.
- (7) Exchange any dud or faulty spares.

Your servicing is USELESS unless you take action as in (6) and (7) AT ONCE. DUD SPARES are WORSE THAN USELESS.

14. Monthly Servicing

This is NOT your job. Once a month a Radio Mechanic will inspect your set thoroughly and overhaul it where necessary.

15. Running repairs

If the amplifier works badly or stops working, try the cure for the particular failure as shown in Table II, page 13. When dealing with failure No. 5 in an emergency, change both valves together; if the amplifier is then O.K. you should change the valves singly at the earliest possible moment.

DO NOT put faulty valves back in the spare valve case, exchange them for sound ones as soon as possible and put the sound ones back in the case.

TABLE I - DAILY SERVICING TESTS

No.	Test	What should happen	What should NOT happen	What is likely to be wrong	What to do about it.
1.	Switch on amplifier battery switch	Red lamp on amplifier panel lights	1. Lamp does not light.	1. Lead from battery not plugged in.	Plug in - check connections.
				2. Battery not properly connected.	Correct if possible otherwise report.
			2. Test 2 O.K. but lamp does not light.	Bulb burnt out.	Replace bulb.
2.	Switch amplifier to CW SEND.	Machine runs normally.	Machine does not run or runs slowly.	Machine or relays faulty.	Report, or in an emergency open the set, check relays and L.T. brushes.
3.	Amplifier switched to NORMAL. Press pressel switch.	Machine runs	Machine does not start.	1. Lead not plugged into CONTROL plug on Amplifier.	Check connections.
				2. W.S. No. 19 H.T. + 2 fuse blown.	Check with panel meter and replace.
				3. Internal fault.	Report.
4.	Amplifier meter switch to AMP. DRIVE. Press pressel switch. Set Meter switch on W.S. No.19 to AE and all dials to the same frequency.	Panel meter reads. Reading varies with setting of DRIVE ADJUSTMENT knob.	1. Panel meter does not read.	1. No connection between W.S. No.19 AE and amplifier INPUT plugs	Check connections.
				2. W.S. No. 19 set faulty.	Check No. 19 set alone
			2. Panel meter reads but does not vary with drive adjustment	3. Internal fault.	Report.
5.	Amplifier meter switch to AE.I. Press pressel switch. Tune amplifier dial and A.T.I. for max. reading on meter.	Panel meter reads and controls work normally.	Panel meter does not read or reads very low.	1. Amplifier OUTPUT or arial connections faulty.	Check connections.
				2. Amplifier fuse blown.	Replace.
				3. Internal fault.	Report.

TABLE II - RUNNING REPAIRS

Failure	Possible cause	Possible cure
1. No aerial current. Machine does not run.	CONTROL or battery leads badly connected.	Do tests 1 to 3 of daily maintenance tests.
2. No aerial current. No AMP. DRIVE reading.	1. Faulty connection between No. 19 and amplifier INPUT. 2. W.S. No. 19 faulty	Check connections. Check No. 19 Set alone.
3. No aerial current. AMP. DRIVE reading correct.	1. Loose aerial connections. 2. Amplifier fuse blown.	Check connections. Replace.
4. Low aerial current. Machine runs slowly.	Starter relay not working.	DRIVE ADJUSTMENT too high. If on CW, switch amplifier to CW SEND before inserting key in W.S. No. 19.
5. Low aerial current. Machine runs normally.	1. V1 and V2. 2. Aerial insulation faulty.	Replace valves. Clean aerial base and insulators. Check that aerial leads are clear of fittings. Report.

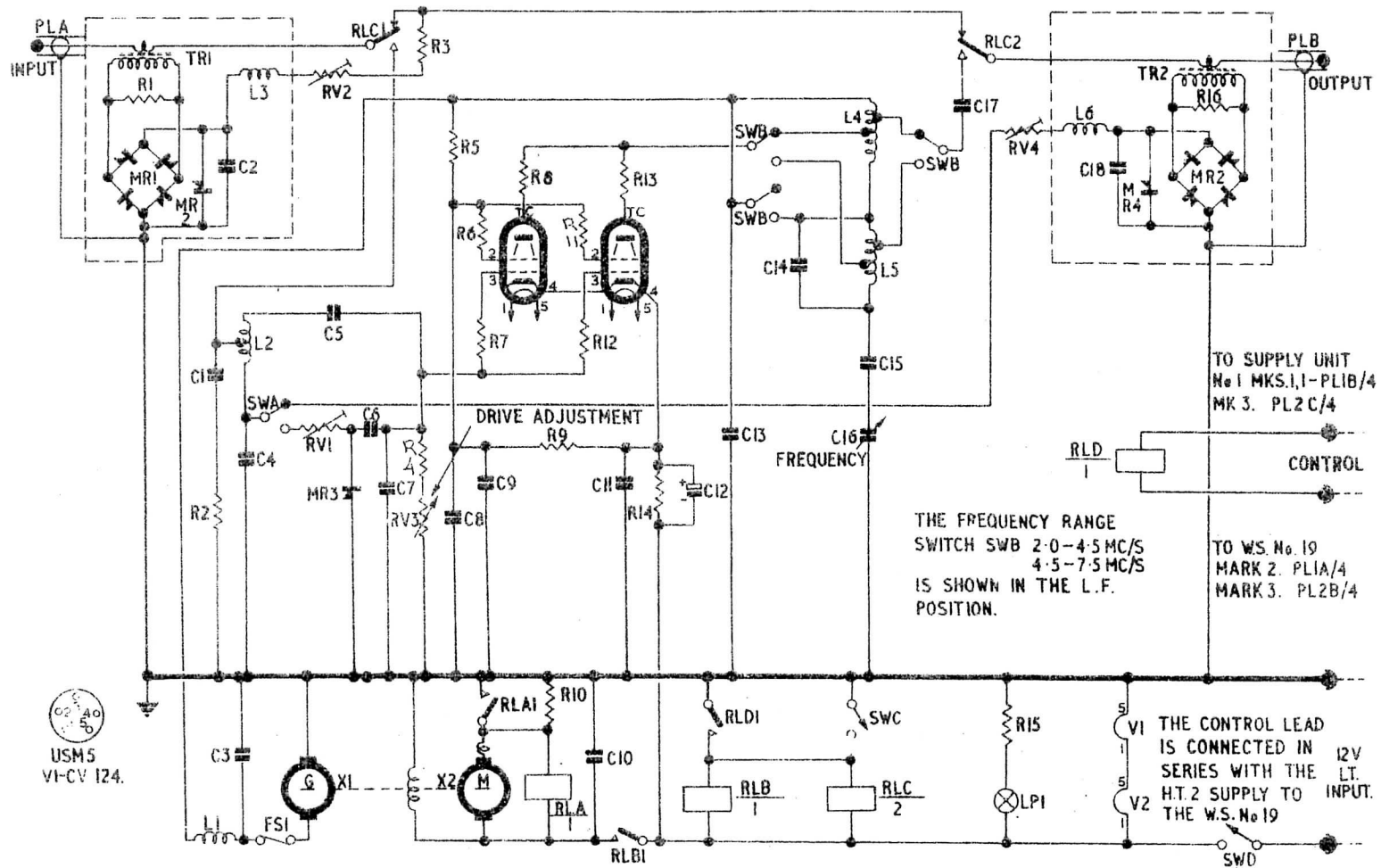


FIG.5 CIRCUIT DIAGRAM, AMPLIFIER R.F. No. 2. MK.3. (12 VOLT)

LIST OF COMPONENTS

Cct. Ref.	Value	Rating	Type	Cct. Ref.	Value	Rating	Type	Cct. Ref.	Value	Rating	Type
<u>RESISTORS</u>				<u>CAPACITORS (Contd.)</u>				<u>SWITCHES</u>			
R.1	33 ohms	1/4 W	Wire Wound	C.11	0.01 uF	350V	Moulded Silver Mica	SW.A			Meter AE.1/AMP. DRIVE Switch
R.2	12 "	3 "		C.12	25 "	25V	Electrolytic	SW.B			Frequency Range Switch
R.3	470 "	1/2 "		C.13	0.1 "	1000V	Tubular Paper	SW.C			CW SEND/NORMAL Switch
R.4	47 "	3 "		C.14	24 pF	2 1/2 kV		SW.D			ON/OFF Switch
R.5	33 K ohms	5 "		C.15	0.004 uF	2.2 kV	Moulded Silver Mica	<u>TRANSFORMERS</u>			
R.6	100 ohms	1/2 "		C.16	19-200 pF		Tank Capacitor	TR.1			Meter Transformer Coil
R.7	47 "	1/2 "		C.17	0.01 uF	2.2 kV	Moulded Silver Mica	TR.2			Meter Transformer Coil
R.8	47 "	1/2 "		C.18	0.001 "		" " "	<u>RECTIFIERS</u>			
R.9	33 K ohms	5 "		<u>VALVES</u>				MR.1			5mA Inst. Rect.
R.10	0.5 ohms			V.1			CV.124	MR.2			SH.1A Rectifier
R.11	100 "	1/2 "		V.2			"	MR.3			W.6 Westector
R.12	47 "	1/2 "		<u>INDUCTORS</u>				MR.4			SH.1A Rectifier
R.13	47 "	1/2 "		L.1			R.F. Filter Choke	MR.5			5mA Inst. Rect.
R.14	120 "	3 "		L.2			Input Transformer	<u>RELAYS</u>			
R.15	22 "	1/2 "	L.3			R.F. Choke	RLA/1	35 ohms			
<u>VARIABLE RESISTORS</u>				L.4			L.F. Tank Coil	RLB/1	35 "		
RV.1	50 K ohms		Variable	L.5			H.F. Tank Coil	RLC/2	200 ohms		
RV.2	750 ohms		"	L.6			R.F. Choke	RLD/1	500 "		
RV.3	250 "		"	<u>LAMPS</u>				<u>MISCELLANEOUS</u>			
RV.4	750 "		"	LP.1	12V		Bulbs 12 Volt F (Signal)	X.1	650 V		Generator
<u>CAPACITORS</u>				<u>FUSES</u>				X.2	11.5 V		Motor
C.1	250 pF		Moulded Silver Mica	FS.1			Cartridge				
C.2	0.001 uF		" " "								
C.3	0.1 "	1000V	Tubular Paper								
C.4	1200 pF	350V	Moulded Silver Mica								
C.5	0.01 uF	350V	Tubular Paper								
C.6	18 pF		Moulded Silver Mica								
C.7	100 "		" " "								
C.8	0.004 uF	2.2kV	" " "								
C.9	0.1 "	500V	Tubular Paper								
C.10	0.1 "	350V	" " "								

UNIT MAINTENANCE LOG

TYPE OF EQUIPMENT
Serial No. of Equipment or Working Instructions

MAINTENANCE LOG

DATE <small>(Week ending)</small>	UNIT							INITIAL DATE	NOTE IN TASKS SCHEDULED ARE DELAYED IN EMER.	INITIAL DATE	INITIAL DATE	INITIAL DATE
	1 DAY	2 DAY	3 DAY	4 DAY	5 DAY	6 DAY	7 DAY					
	■	■	■	■	■	■	■					
	■	■	■	■	■	■	■					
	■	■	■	■	■	■	■					
	■	■	■	■	■	■	■					
	■	■	■	■	■	■	■					
	■	■	■	■	■	■	■					
	■	■	■	■	■	■	■					
	■	■	■	■	■	■	■					
	■	■	■	■	■	■	■					

Army Form 8-54-1

REPAIR RECORD

DATE _____

REMARKS _____

MAJOR REPAIRS, A.C.M.E. INSPECTIONS, ETC.

DATE _____

REMARKS _____

MAJOR REPAIRS, A.C.M.E. INSPECTIONS, ETC.

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 maintenance 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.