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AMPLIFIERS R.F. No. 2
Mark I and Mark II

WORKING INSTRUCTIONS

NOTES

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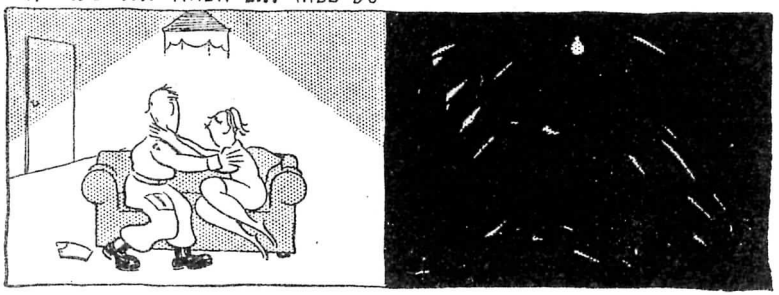

CHAPTER I

GENERAL DESCRIPTION

1. Purpose

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 a L.P. set when the amplifier is switched OFF.

2. Frequency

2·1 Mc/s to 7·5 Mc/s 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:—

(1) With a specially selected Wireless Set No. 19 Mk. II or any Wireless Set No. 19 Mk. III and

(2) 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. II or Mk. III 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 using the 19 Set alone.

3. Power supply

A self-contained rotary transformer is fitted. This generates approximately 600 volts at 240 mA for anode and screen supplies. On Amplifiers R.F. No. 2 Mk. II the rotary machine is fitted with a cooling fan and may be run continuously. Amplifiers R.F. No. 2 Mk. I have no cooling system and must not be continuously operated on "Send" for more than 15 minutes in each hour, or 20 minutes in the case of intermittent operation. This restriction does not apply to any Mk. I Amplifier modified to take the cooling fan, which is located in the bulge behind the generator compartment.

The power input requirement is 12 volts at approximately 24 amps. with the Amplifier on "Send." On "Receive" the load is 2·5 amps. This load is *additional* to the current taken by the Wireless Set No. 19.

An H.T. fuse of 500 mA is used and not a 250 mA fuse as in the Wireless Set No. 19.

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 RT 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 two distinct types:—

(1) *Connector 6-pt. No. 16* series for Wireless Set No. 19 Mk. I and Mk. II, when used with Supply Unit No. 1 Mk. I or Mk. II.

(2) *Connector 12-pt. No. 27* series for Wireless Set No. 19 Mk. III, when used with Supply Unit No. 1 Mk. III.

(3) *Connector 6/12-pt. No. 2* series for Wireless Set No. 19, Mk. I and Mk. II, when used with Supply Unit No. 1, Mk. III.

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

Study Fig. 2—in conjunction with the following:—

(1) ON-OFF switch—Supplies L.T. to valve heaters and control relays.

(2) RANGE switch—selects 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.

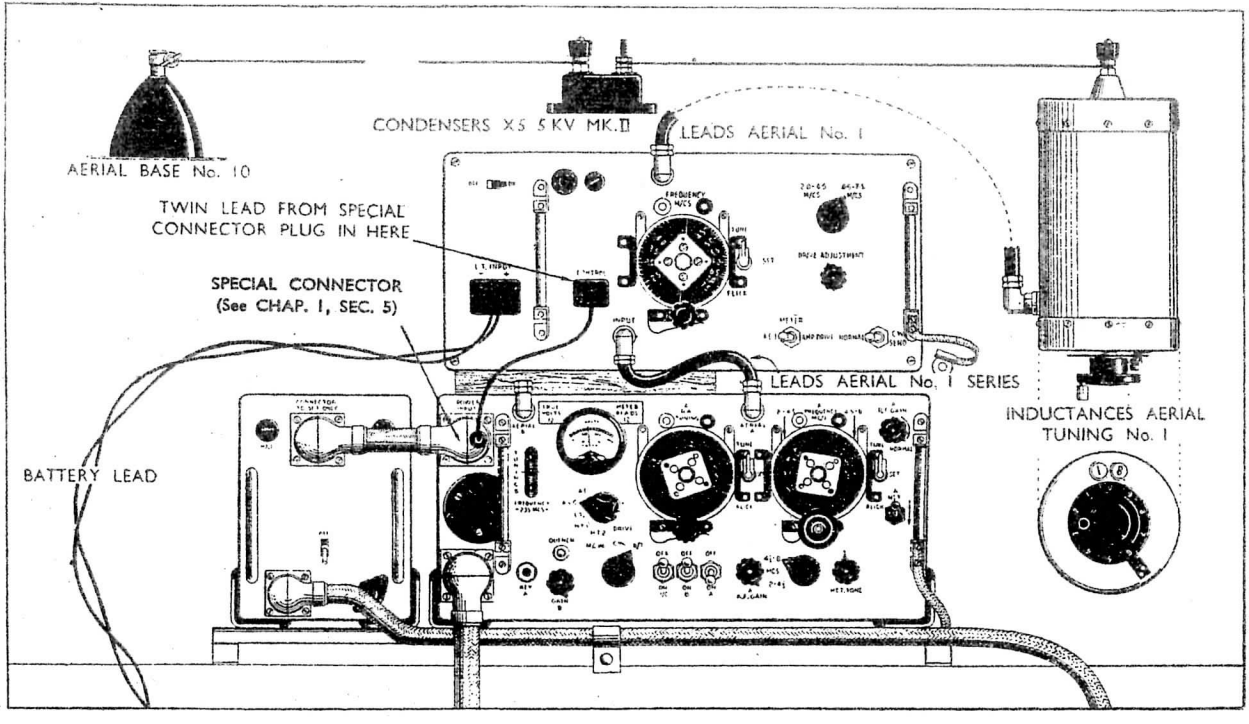

FIG. 1. TYPICAL LAYOUT

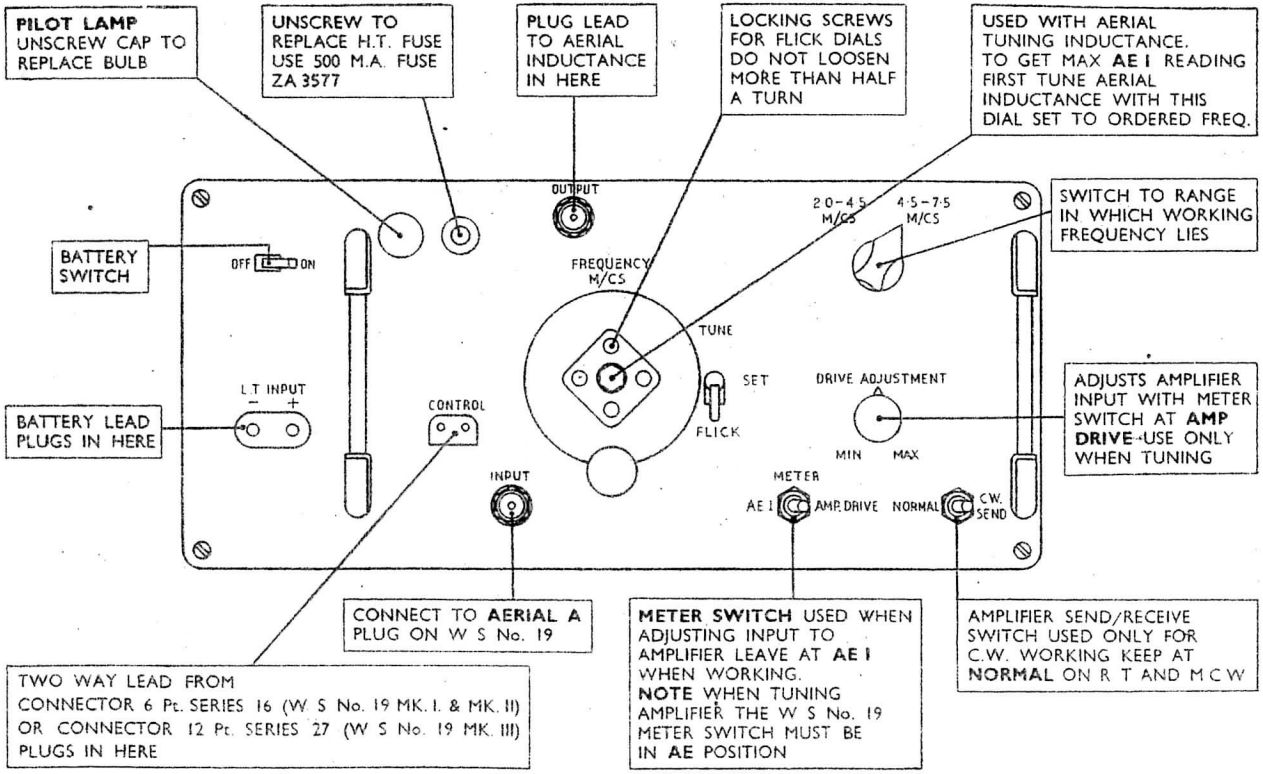

FIG. 2. CONTROLS AND CONNECTIONS

(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.

7. Weights and dimensions

Weight of amplifier in case .. .. .. 45 lbs.
Weight of Inductance Aerial Tuning No. 1 .. 5 lbs.
Overall dimension of amplifier including protecting grille:
17½ ins. long, 9 ins. high, 14 ins. deep
Overall length of Inductance Aerial Tuning No. 1: 12½ ins.
Diameter of case 5 ins.

CHAPTER II

INSTRUCTIONS FOR OPERATING

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. III, connector 6-point No. 16 is replaced by connector 12-point No. 27 or connector 6/12-pt. No. 2 (see Sec. 5).

(2) Set amplifier controls as follows:—
(*a*) RANGE switch to frequency range required.
(*b*) DRIVE ADJUSTMENT to minimum.
(*c*) METER SWITCH to AMP. DRIVE.
(*d*) CW SEND switch to NORMAL.
(*e*) Engage amplifier dial flick mechanism and set FREQUENCY DIAL to ordered frequency.

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 erected.

(*b*) Ensure amplifier OFF-ON switch is at OFF.

(*c*) Amplifier RANGE switch to correct range.

(*d*) Amplifier DRIVE ADJUSTMENT to minimum.

(*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 and 19 A Set P.A. TUNING dial.

(*k*) Press pressel switch and obtain maximum meter reading by adjustment of Aerial Inductance and 19 A Set P.A. TUNING.

(*l*) 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 6-volt reading on the 19 Set meter.

(*c*) Amplifier METER SWITCH to AE.

(*d*) Adjust Aerial Tuning Inductance for maximum meter reading.

(*e*) Adjust Amplifier FREQUENCY DIAL for maximum meter reading.

(*f*) Repeat (*d*) and (*e*) to get best reading, lock both controls and turn to flick.

(*g*) Amplifier OFF-ON switch to OFF.

(*h*) Adjust 19 A Set P.A. TUNING dial for maximum meter reading, lock and turn to flick.

(*j*) Amplifier OFF-ON switch to ON.

(*k*) Amplifier METER SWITCH to AMP. DRIVE.

(*l*) Repeat (*a*) and (*b*) to correct any change in drive reading due to (*d*), (*e*) and (*h*).

(*m*) Log Aerial Tuning Inductance reading.

(3) For CW working only.

Switch 19 Set system switch to CW and amplifier NORMAL —CW SEND switch to CW SEND and adjust amplifier drive to maximum. The amplifier drive must on no account be adjusted above 6 volts until completion of para. (2), (*a*) to (*m*) and then only for CW working.

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

(*a*) Netting in harbour.

(i) As for No. 19 Set.

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

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

CHAPTER III

MAINTENANCE AND TESTING

10. General

The remarks under this heading in Wireless Set No. 19 Working Instructions, Part I, apply equally to Amplifiers R.F. No. 2. You MUST be able to do three things:—

(1) 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 13 under "Daily Maintenance."

(2) 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 maintenance, page 12 tells you how to do this.

(3) Repair the more common faults which may occur in the field. Some rules to help you in this are given under "Running Repairs," page 14.

The VITAL thing is that you should find out and report anything wrong AS SOON AS POSSIBLE so that the instrument 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 meet 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.
(4) Connecting CONTROL lead.

} See Figs. 1 and 2.

(5) Replacing H.T. fuse (see Fig. 2).
(6) Changing indicator bulb (see Fig. 2).
(7) Taking off the grille.
(8) Taking the amplifier out of its case.

} See W.S. No. 19 Working Instructions, Part I.

(9) Changing valves. If the amplifier gives poor results it may be necessary to change valves; leave this to an electrician signals whenever possible.

To change valves remove the amplifier from its case and refer to Fig. 4.

(10) Removing air filter (see Fig. 3). Clean filter daily by knocking it out on its front edge.

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

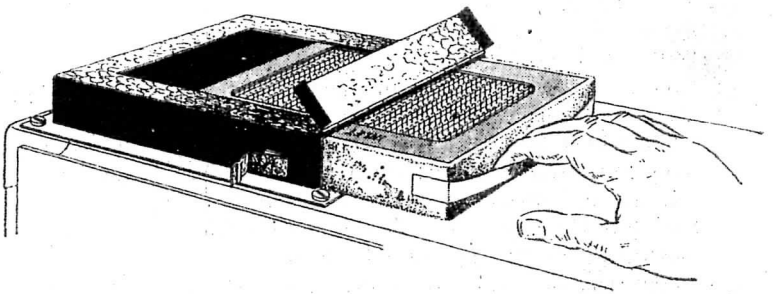

FIG. 3. REMOVING AIR FILTER

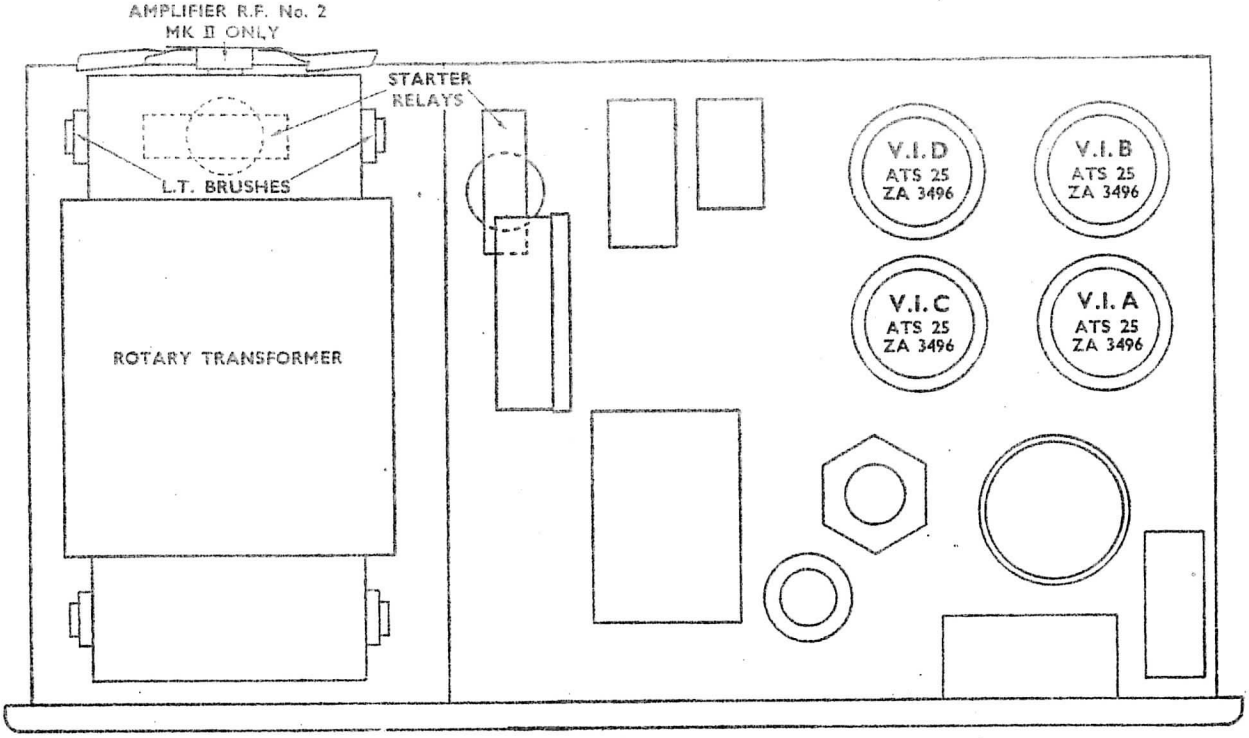

FIG. 4. POSITION OF VALVES

12. Daily maintenance

As already explained, the amplifier must be tested every time before it is used. Table I (p. 13) 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. 3).

13. Weekly maintenance

Every week without waiting to be told you should:—

(1) Do your "Daily Maintenance Tests" for the day (see page 13).
(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 electrician signals to tighten the "grub screws" which hold them on.
(5) Check 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 maintenance is USELESS unless you take action as in (6) and (7) AT ONCE. DUD SPARES are WORSE THAN USELESS.

14. Monthly maintenance

This is NOT your job. Once a month a R. Signals electrician 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 14. When dealing with failure No. 5 in an emergency, change all four valves together; if the amplifier is then O.K. you should go through the valves one by one 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 MAINTENANCE 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 C.W. SEND.	Machine runs normally.	Machine does not run or runs slowly.	Machine or relays faulty.	Report in emergency open 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 amp.	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. Panel meter reads but does not vary with drive adjustment.	2. W.S. No. 19 set faulty.	Check No. 19 set alone.
				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 aerial 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 set 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 C.W., switch amplifier to C.W. SEND before inserting key in W.S. No. 19.
5. Low aerial current. Machine runs normally.	1. V1 A–D. 2. Aerial insulation faulty.	Replace valves. Clean aerial base and insulators. Check that aerial leads are clear of fittings. Report.

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