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**WIRELESS
SENDER
No. 76**

WORKING INSTRUCTIONS

OAT, ZA 22702

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WIRELESS SENDER No. 76

General Description and Working Instructions

CHAPTER I—GENERAL DESCRIPTION

1. Purpose and facilities

The Wireless Sender No. 76 is a long range crystal controlled C.W. transmitter designed for use in conjunction with the Reception Set R.109A or B. A combination of these sets forms an easily transportable sending and receiving station for use over long distances.

2. Range

The sender will normally be used as a sky-wave sender (see Signals Training Pamphlet No. 2, Part 9).

3. Frequency range

The frequency band covered by the sender is 2-12 Mc/s in three switched ranges. There is provision for inserting six crystals for frequency control, any one of which may be selected by a switch. A calibration chart for the P.A. tuned circuit and AE tuning is attached to the front panel of the sender.

4. Power supplies and consumption

A Power Supply Unit No. 18 is fitted inside the sender case and this has a 12V/500V rotary transformer so that the sender may be operated from a 12 V. D.C. source. This supply is drawn from two Batteries, Secondary, Portable 6 V. 40 Ah. Mk. 1*. A special connector (Connector Plug No. 20) is provided so that the 6 V. supply for the receiver is drawn from the same source. Reference to Fig. 3 will show how this is accomplished.

Current drain by the power supply unit is approximately 3.5 amps with the key up, 8 amps with the key down and 0.9 amps at STANDBY.

The above power supply unit may be replaced by Supply Unit Rectifier No. 14 so that the sender may be operated from a 50 c/s single phase A.C. supply of between 100 and 250 V. A valve rectifier (type 5U4G) is used in this unit.

5. Mechanical details

(1) The sender is built on a steel chassis which fits into a steel case having a hinged lid for inspection purposes and metal carrying handles. The case is enclosed in a waterproof cover.

(2) The power supply unit is fitted at the rear of the sender chassis inside the case and is connected to the sender internally by means of two plug-in leads.

(3) Spare valves for the sender and the Supply Unit Rectifier No. 14 are carried in dummy holders on the appropriate chassis and adjacent to the working positions. Six spare bulbs 6 V.J. are housed inside and at the rear of the sender case.

The front panel (see Fig. 1) has the following controls and connecting points:—

CHAPTERS I and II—Sections 5-8

POWER SUPPLY—4-pin plug used for power input whether this be A.C. or D.C., the correct pins being located in each case by the connectors supplied.

REC. AE 80 OHMS terminal for connection to receiver AERIAL TAP 80 OHMS terminal.

SEND AE terminal—for connection to aerial.

EARTH terminal.

KEY jack.

PRESS TO TUNE button.

AE TUNING control.

CRYSTAL SELECTOR switch.

P.A. TUNING control.

FREQ. RANGE SWITCH—for P.A. tune circuit.

ON-OFF switch by which the power supply may be disconnected from supply unit.

STANDBY—NORMAL switch by which H.T. alone may be cut-off from the sender.

Also fitted to the front panel are:—

TUNING INDICATOR lamp—for P.A. circuit.

AE CURRENT meter.

The calibration chart.

6. Aerial

A 110 ft. wire aerial gives good radiation throughout the frequency band. When practicable a half-wavelength aerial gives good results but the length required may become too long at the lower frequencies. The station is normally equipped with 8 antennae rods D sections 3-ft. to form two 12-ft. masts for the aerial. If conditions allow the aerial should be raised higher than this to obtain better results.

A terminal is provided on the sender for connection to the aerial terminal on the receiver, matching at 80 ohms impedance.

7. Weight and dimensions

Weight of sender and Power Supply Unit No. 18 30 lbs.

Weight of sender and Supply Unit Rectifier No. 14 33 lbs.

Overall dimensions of sender case—12 $\frac{1}{2}$ -in. long x 8 $\frac{1}{4}$ -in. high x 12-in. deep.

CHAPTER II—OPERATION

8. Preliminary

NOTE: Crystals may be issued as three matched pairs so that in the event of a crystal break-down a similar crystal may be switched into use immediately.

(1) See that the OFF/ON switch is at OFF.

(2) Open the lid of the sender case and verify that all valves are in position. In the sender these should be four A.T.S. 25 valves (two working and two spares). See that the valve retaining devices and top cap connections are correct (see Fig. 2).

(3) When the Supply Unit Rectifier No. 14 is fitted, see that two 5U4G valves (1 working and 1 spare) are inserted in their holders. Adjust the taps on the power transformer so that the numbers on the taps add up to the voltage of the supply. Also check that the fuses on the unit are correctly wired to blow at 5 amps. (e.g. one strand of 38 S.W.G. copper wire).

Check that the five-pin plug on the lead from the supply unit is inserted in the socket on the sender chassis and that the 4-point on the lead from the back of the POWER SUPPLY plug on the panel is securely fitted to the plug on the top of the supply unit.

Check that the crystals for frequencies required are inserted in the sockets. For frequencies 6-12 Mc/s use crystals marked at half on frequencies. Note positions of crystals. A crystal in the nearest the front panel will be included in the circuit when the FREQUENCY SELECTOR switch is at position 6 and so on.

Remove the lid and place the sender on a table or other flat surface to the right of the receiver.

Check that a bulb 6 V.J. is fitted in the holder on the front panel of the TUNING INDICATOR, and that the meter on the port panel is plugged into its holder.

For operation from 12 V. D.C. connect the POWER SUPPLY to the receiver power input to the accumulators by means of the lead for Plug No. 20 (see Fig. 3).

For A.C. operation, the sender POWER SUPPLY plug must be connected to the A.C. supply by means of Connector, Twin, No. 196, and the receiver power supply arranged separately.

With the Connector Single No. 21A provided, connect the RECEPTACLE terminal to the corresponding aerial terminal on the sender (Fig. 3).

Insert the morse key into the key jack.

Complete receiver connections in accordance with its Working Instructions.

9. Aerial erection and earth connection

The aerial used will depend upon the frequency range and the other conditions. Generally, the higher the aerial the better the results. If a half-wavelength aerial is being used the length for a given frequency is given in Table I below, less about 5-10 per cent. according to the height above ground and distance from surrounding objects. This includes the lead-in.

TABLE I
HALF WAVELENGTHS IN FEET FOR 2-12 Mc/s

Frequency Mc/s	Length in feet	Frequency in-Mc/s	Length in feet
2	274	2.5	197
3	164	3.5	141
4	123	4.5	109
5	98	5.5	90
6	82	6.5	76
7	70	7.5	65
8	61	8.5	57
9	55	10	43
11	41		

- (2) Connect the aerial down lead to the sender SEND AE terminal.
- (3) Earth the sender to the carrier set or, failing this, to the receiver in the latter case, using Connector Single No. 21 C provided (Fig. 3).

10. Tuning and operation

NOTE (1) The crystals of the sender are worked at rather a high current and crystal breakdown is likely to occur if the precautions outlined below are not taken:—

- (i) Do not work the sender without an aerial or without the P.A. circuit tuned, and carry out the tuning as quickly as possible.
- (ii) Take care to get the sender properly tuned before keying for long periods.

NOTE (2) It may be difficult or impossible to tune the sender between 6 and 7.5 Mc/s.

- (1) Put the STAND BY—NORMAL switch to STANDBY, and put ON-OFF switch to ON. Wait for 1½ mins. before switching to NORMAL (operation (5) below).
- (2) Put CRYSTAL SELECTOR switch to appropriate setting for frequency required.
- (3) Set the FREQ. RANGE switch in accordance with the calibration chart on the front panel.
- (4) Adjust AE TUNING control to give a figure of 48 in the window above the control.
- (5) When 1½ mins. have elapsed since switching to ON put the STAND BY—NORMAL switch to NORMAL. The rotary transformer in the power supply unit should be heard to start.
- (6) Press the button PRESS TO TUNE and adjust the P.A. TUNING control to give maximum brightness in the TUNING INDICATOR lamp. The dial reading of the control should be approximately the same as given on the calibration chart on the front panel.
- (7) Release the button and press the morse key. Rotate the AE TUNING control until maximum deflection is obtained on the AE CURRENT meter.
- (8) Release the key. The aerial current should fall to zero and the sender is ready for operation.
- (9) Tune the receiver in accordance with its own working instructions.
- (10) During long listening periods, put the STAND BY—NORMAL switch to STANDBY and return it to NORMAL to send.

11. Changing frequency

- (1) Release morse key and put STAND BY—NORMAL switch to STANDBY.
- (2) If a crystal for the new frequency is plugged in the sender, reset the CRYSTAL SELECTOR switch to the appropriate position. Other-

APPENDIX A

LIST OF MAIN COMPONENTS

Wireless Sender No. 76

CHAPTERS II and III—Sections 11-15

wise remove an unwanted crystal from the sender and plug in the required crystal. Reset the CRYSTAL SELECTOR switch to the corresponding position.

(3) Reset the FREQ. RANGE switch if necessary.

(4) Adjust AE TUNING control to give a reading of 48 in the window above the control.

(5) Put the STAND BY—NORMAL switch to NORMAL and retune the P.A. and aerial stages as in sections 10 (6) and 10 (7) above.

12. Closing down

To close down, put the STAND BY—NORMAL switch to STAND BY and the ON—OFF switch to OFF. Switch off the receiver.

CHAPTER III—ROUTINE MAINTENANCE

13. General

(1) Keep the set as clean and dry as possible. Always keep the waterproof cover closed when the set is not in use.

(2) Check leads daily for sign of fraying, etc., and damaged plugs or sockets. See that corresponding plugs and sockets make good contact. Clean and/or open plug pins if necessary. This includes the two connectors inside the sender case.

(3) See that valves are intact and properly fitted.

(4) Report any deficiencies or damage to equipment.

14. Reception Set R.109A or B

Carry out the maintenance of this set as laid down in its Working Instructions.

15. Batteries

Battery maintenance should be in accordance with the instructions on the lid of the accumulators.

Component	Symbol	Value and Rating	Function	
Condensers	*CIA	0.05uF 600 V. D.C. working	V1A bias res. bypass.	
	*C1B	0.05uF 600 V. D.C. working	V1B bias res. bypass.	
	C2A	0.01uF 1000 V. D.C. working	V1B anode decoupling.	
	C2B	0.01uF 1000 V. D.C. working	V1B anode coupling.	
	C2C	0.01uF 1000 V. D.C. working	Output coupling.	
	C3A	0.002uF 600 V. D.C. working	V1B screen decoupling.	
	C3B	0.002uF 600 V. D.C. working	V1A screen decoupling.	
	C4A	0.0002uF 600 V. D.C. working	V1A—V1B coupling.	
	Var. Condenser	C5A	.160uF max.	Amp. tuning.
	Condenser	C8A	0.002uF 600 V. D.C. working (mica)	Crystal coupling.
Jack	J1A	Jacks Microphone No. 2	Key jack.	
Inductances	L1A	1500 m H.	V1A anode choke.	
	L1B	1500 m H.	V1B grid choke.	
	L1C	1500 m H.	V1B anode choke.	
	L2A		Amp. tuning, Range 2 and 3.	
	L3A		Amp. tuning, Range 1.	
	L4A	65uH.	Aerial coupling.	
	Meter	M1A	0-500 mA R.F.	Aerial current meter.
Lamp	PLA	6 V 0.06A (Bulb 6 V.J.)	Tuning indicator.	
Plug	PL1A	4 Pt. No. 7	External power input.	
Resistances	†R1A	220 ohms 2 watt	V1B cathode bias.	
	†R2A	470 ohms 2 watt	V1A cathode bias.	
	†R3A	47000 ohms 2 watt	V1A screen volts dropper.	
	R4A	47000 ohms ½ watt	V1A grid leak.	
	R5A	22000 ohms 1 watt	V1B grid leak.	
	R6A	47 ohms ½ watt	V1B grid stopper.	
	R6B	47 ohms ½ watt	V1B anode stopper.	
	R6C	47 ohms ½ watt	V1A anode stopper.	
	Relay	REL1A	75 ohm coil; 2 make, 1 break	Keying relay.
	Switches	S1A	Key 228	Press to tune.
S2A		S.p., on/off	Normal/standby.	
S2B		S.p., on/off	Power on/off.	
S3A		S.p., 6-way rotary	Crystal selector.	
S4A		4-pole, 3-way	Frequency range switch.	
Sockets	S01A	4 pt. No. 7	Input to power unit.	
	S02A	5 pt.	Power input to sender.	
Valves	V1A	A.T.S. 25	Oscillator.	
	V1B	A.T.S. 25	Amplifier.	
Crystals	X1A-F		Frequency control.	

* CIA, C1B. Some 0.1uF condensers may be used in early models.

† Resistances. In place of 2-watt resistances, two 1-watt resistances each of twice the value may be used in parallel.

Power Supply Unit No. 18 (ZA 21775)

Component	Symbol	Value and Rating	Function
Condensers	C2D	0.01uF 1000 V. D.C. working	H.T. suppression rotary trans.
	†C6A	0.01uF 350 V. D.C. (or higher) working	
	†C6B	0.01uF 350 V. D.C. (or higher) working	
Plugs	PL1B PL2A	4 pt. No. 7 5 pt.	Input. Output. Volts dropper. D.C. volts converter.
Resistance	R7A	3000 ohms 10 watt	
Rotary Transformer	T1A	12/500-V. D.C.	

† C6A, C6B 450 V. D.C. working condensers are used in early models.

Supply Unit Rectifier No. 14 (ZA 21774)

Component	Symbol	Value and Rating	Function
Condensers	C7A	2uF 800 V. D.C. working	H.T. smoothing.
Inductances	L5A	1 H 200 mA D.C.	H.T. smoothing.
	Fuses	F1A F1B	
Plugs	PL1C PL2B	4 pt. No. 7 5 pt.	Input plug. Output plug.
	Resistances	R1B R8A R9A	
Transformer	T2A	550-0-550 V. 12 V. 2.5-0-2.5 V.	Power transformer.
Valve	V2A	5U4G	Rectifier.

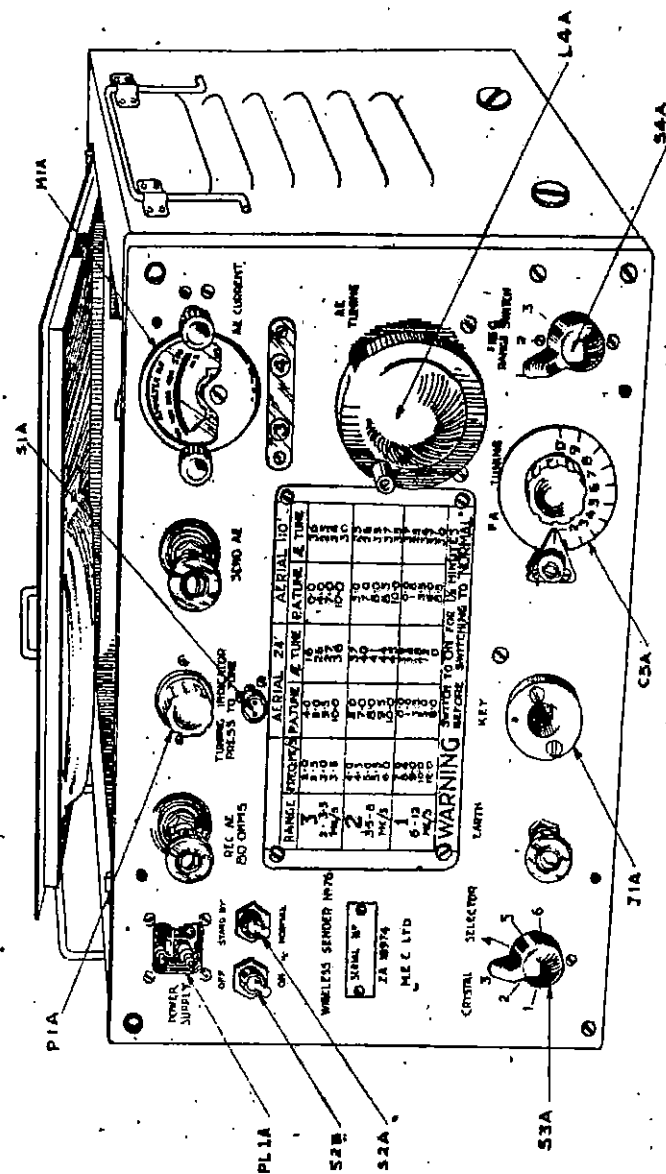


FIG. 1
WIRELESS SENDER NO. 76—FRONT VIEW

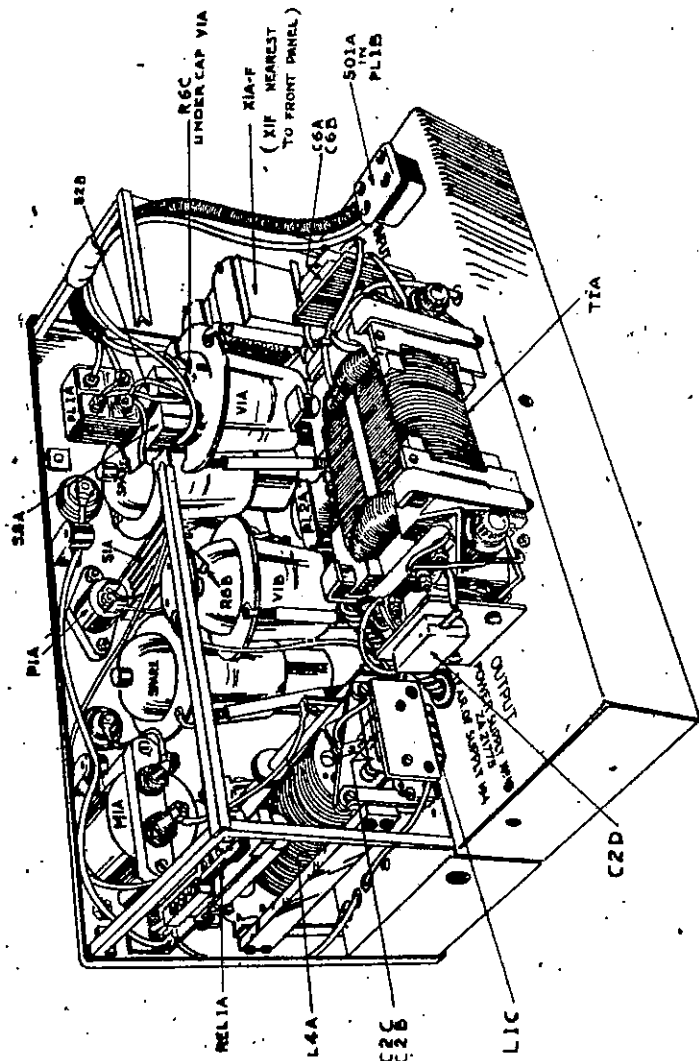


FIG. 2
WIRELESS SENDER NO. 76
AND POWER SUPPLY UNIT NO. 18
REAR VIEW

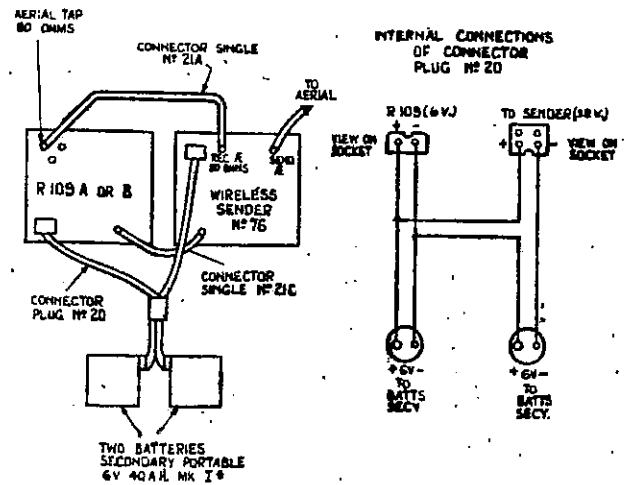


FIG. 3—CONNECTIONS TO SENDER AND RECEIVER FOR BATTERY WORKING

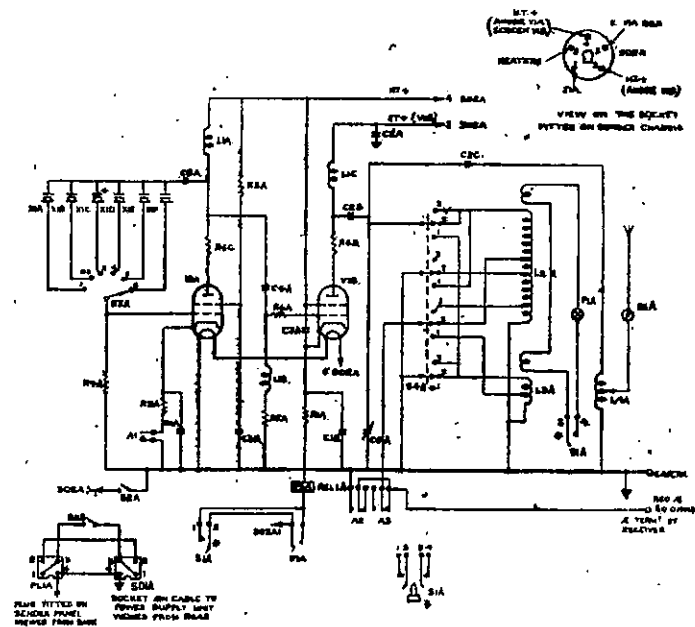


FIG. 4
WIRELESS SENDER NO. 76—CIRCUIT DIAGRAM

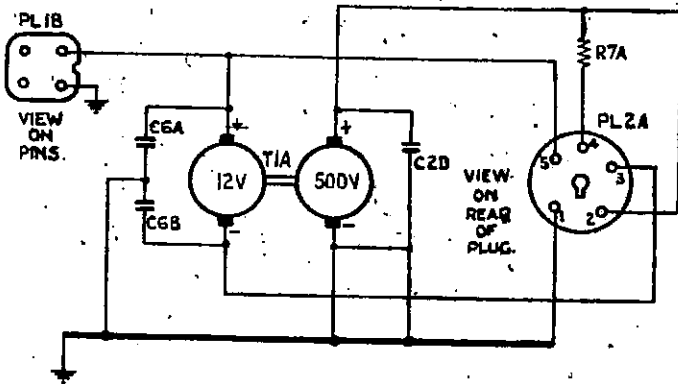


FIG. 5
POWER SUPPLY UNIT NO. 18
CIRCUIT DIAGRAM

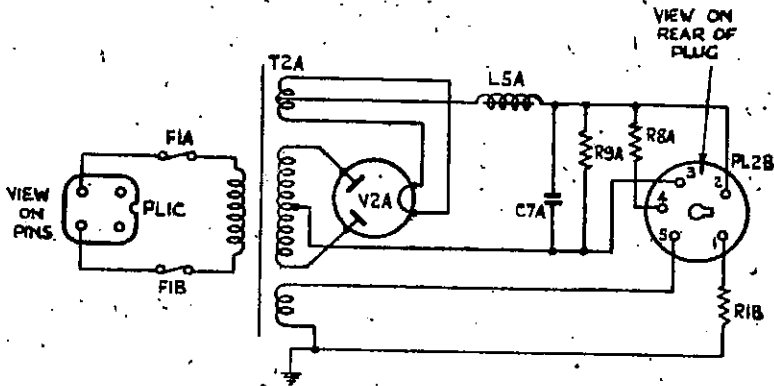


FIG. 6
SUPPLY UNIT RECTIFIER NO. 14
CIRCUIT DIAGRAM