



“His Master’s Voice”

SERVICE MANUAL

for

FOUR-VALVE PORTABLE RECEIVER

MODEL 600

TECHNICAL SPECIFICATION

LT AND HT SUPPLY may be obtained from any of the following sources:

- (1) Self-contained dry batteries
L.T.: One Ever-Ready 1.5-volt battery (Type P.R. 8).
H.T.: Two Ever-Ready 45-volt batteries (Type P.R. 45).
- (2) External dry batteries.
L.T.: One Ever-Ready 1.5-volt battery (Type X250).
H.T.: Two Ever-Ready 45-volt batteries (Type Superdyne or Heavy Duty).
- (3) External vibrator power unit with 2-volt accumulator.
- (4) External AC mains power unit.

CONSUMPTION	L.T.	H.T.
(1) Self-contained batteries	0.25 amp.	8.5 ma.
(2) External batteries	.. 0.25 ..	8.5 ..
(3) Vibrator power unit	.. 1.25 amps	
(4) A.C. mains power unit	19 watts	

SPEECH OUTPUT
200 milliwatts (plate circuit).

INTERMEDIATE FREQUENCY
457.5 kc.

WAVELENGTH RANGE
200-545 metres (1500-550 kc.).

DIMENSIONS	Height	Width	Depth
Receiver	11"	12 $\frac{1}{4}$ "	7 $\frac{1}{2}$ "
A.C. power unit ..	6 $\frac{3}{4}$ "	7 $\frac{1}{2}$ "	3 $\frac{1}{2}$ "
Vibrator power unit	6 $\frac{3}{4}$ "	9 $\frac{1}{2}$ "	3 $\frac{1}{2}$ "

WEIGHT	Net	Gross
Receiver, less batteries	.. 12 $\frac{1}{2}$ lbs.	15 lbs.
.. with batteries	.. 21 lbs.	23 $\frac{1}{2}$ lbs.
A.C. power unit 9 lbs.	9 $\frac{1}{2}$ lbs.
Vibrator power unit	.. 10 lbs.	11 lbs.

VALVES
1A7GT Converter.
1N5GT I.F.
1H5GT Demodulator, A.V.C. and 1st A.F.
1Q5GT Power.

LOUDSPEAKER
The speaker used is of the permanent magnet dynamic type. It is a 5-inch model, with a voice coil impedance of 3.6 ohms at 400 cycles.

CIRCUIT DESCRIPTION
(See Diagram, page 4.)
This model employs a 4-valve superheterodyne chassis, using a conventional pentagrid frequency changing circuit. This is followed by an intermediate frequency amplifier using a 1N5GT pentode, which is in turn followed by a 1H5GT using the diode as detector and the triode section as audio amplifier. The 1Q5GT beam tetrode power amplifier is resistance capacity coupled to this stage.

A.V.C. is applied through a filter circuit to the grids of the frequency changer and intermediate frequency amplifier valves.

Padding is effected by adjustment of the oscillator secondary inductance by means of an adjustable iron core, in conjunction with a fixed padding condenser.

The intermediate frequency transformers are permeability tuned, and employ Litz wound coils with sliding iron cores, the coupling being adjusted to give the best compromise between gain and selectivity.

The fixed condensers used are of titanium dioxide, silver coated, and possess exceptional stability.

Bias is obtained for the output valve through a resistor in the negative "B" battery lead, by-passed with an electrolytic condenser.

A resistor of 0.2 ohms is included in the receiver wiring, which, in conjunction with the resistance of the battery leads, reduces the 1.5-volt supply to the required 1.4 volts for the filament.

Provision is made for external connection of earphones by means of two pin-jacks which are connected to the output circuit of the power valve through an isolating condenser. The loop aerial is mounted on the cabinet back, flexible connections permitting the back to be detached from the cabinet when necessary.

Provision is also made for external aerial and earth connections by means of a low impedance primary coil coupled to the tuned loop.

POWER SUPPLY SWITCH
A 3-position switch recessed into the side of the cabinet permits of the receiver being operated from different sources of power.

Incorporated in the switch knob are two specially shaped keyways located in such a position relative to the adjacent octal plug that the switch must be rotated to the correct position before the appropriate power unit cable plug can be inserted; this ensures correct circuit connections for the power unit being used.

As a safety feature, a switch locking bracket is mounted on the cabinet back, so that access to the chassis cannot be obtained without first removing the external power unit plug from the receiver and turning the power supply switch to the "Ext. Batt. or Vib." position.

The functions performed by the switch in its different positions are:

"Vib. or Ext. Batt." Position
The valve filaments are parallel connected and the receiver LT+ and HT- leads are switched from the internal batteries to the vibrator power unit or external batteries according to which is connected.

"Int. Batt." Position
The valve filaments are parallel connected and the receiver LT- and HT- leads are switched to the internal batteries.

"AC Mains Unit" Position
The receiver LT- and HT- leads are switched from the internal batteries to the mains unit.

The valve filaments are series connected and an 84-ohm bleed resistor is bridged across the three 50 ma. filaments, in order to allow of a 100 ma. current through the filament chain.

Zero bias operation of the converter and I.F. valves for weak signals is retained by means of a special arrangement of the A.V.C. filter network. The effective value of the 750-ohm power valve bias resistor is reduced by means of a shunt resistor in order to compensate for the extra bias voltage introduced by the voltage drop across the three preceding valve filaments.

-tone control and on-off switch

This is a four-pole three-position switch with the following functions:

Off LT positive circuit open.
HT negative circuit open.

When receiver is vibrator or mains operated the vibrator or mains circuit is open.

On LT circuit closed.
HT circuit closed.

When receiver is vibrator or mains operated the vibrator or mains circuit is closed.

Bass As in last position, but audio-frequency top cut is introduced by means of a condenser across the power valve plate circuit.

VIBRATOR POWER UNIT

The circuit of the vibrator unit is indicated on page 5. This unit includes the vibrator cartridge, which is enclosed in a separate metal container so that it can be plugged into or removed from a socket located in the vibrator unit in a manner similar to a valve. The vibrator socket is arranged with a sponge rubber mounting to ensure a minimum of mechanical noise.

The remainder of the unit consists of the necessary transformers and filters.

The LT filter choke included is designed to have the correct resistance to enable the 1.4-volt filaments to be safely operated from a 2-volt accumulator.

Important Note.—It is essential that the resistance of the 5-amp. fuse in the vibrator positive LT circuit should not exceed 0.01 ohm, otherwise the performance will suffer. Use only Australux 5-amp. fuse, type IAG.

AC MAINS UNIT

This unit is designed to operate on AC mains supply voltages of from 200 to 260 volts at a periodicity of 40 to 60 cycles; the voltage tap panel inside the unit should be set as follows:

Voltage of A.C. supply.	Use tap designated.
200–220 volts	200
221–240 „	240
241–260 „	260

Note.—Due to heat being radiated by the rectifier valve, it is quite normal for the outside metal case to become warm during operation.

The A.C. mains unit essentially consists of a transformer with a tapped H.T. secondary connected to the elements of a 25Z6G valve, so that it functions as a twin half-wave rectifier.

The output from each rectifier is separately filtered, one supplying H.T. and the other L.T. voltage.

The 15-ohm resistor connected from LT— to HT— provides portion of the power valve grid bias, the remainder being obtained from the voltage drop across the three preceding filaments in the series connected filament chain. The 400 mfd. electrolytic condenser provides additional L.T. filtering for the 50 ma. valve filaments; it is brought into circuit when the power unit is plugged into the receiver.

Important

RECTIFIER REPLACEMENT

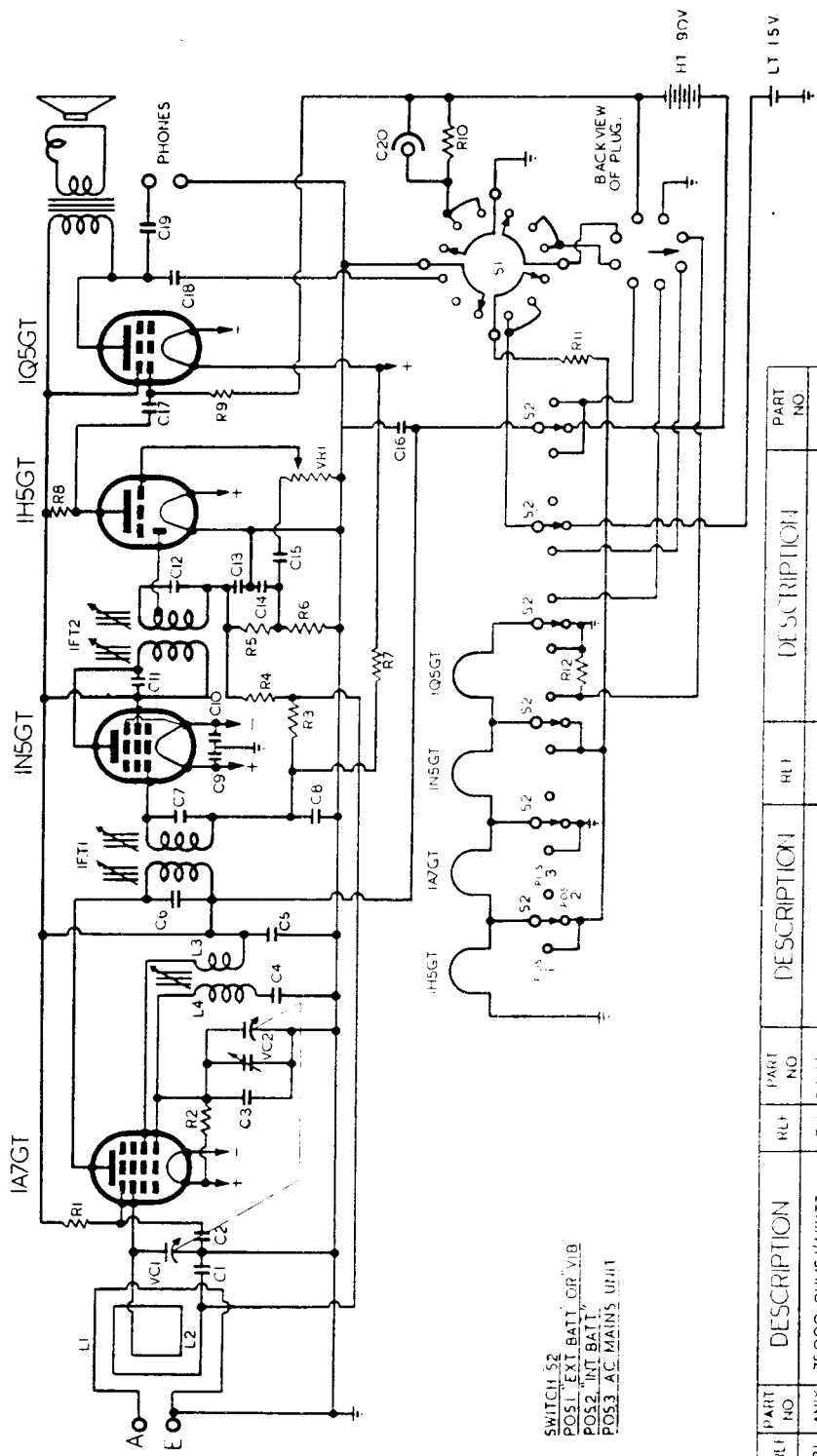
Should it become necessary to replace the 25Z6G valve, the following procedure should be carried out after replacement and before switching the receiver on:

- (1) Rotate switch mounted on transformer case to extreme anti-clockwise position.
- (2) Insert milliammeter in LT— circuit.
- (3) Switch on mains supply and, after checking that the mains voltage is normal for the mains transformer tap used, set switch to give correct LT current—within the limits of 95–100 ma.

This procedure compensates for the varying rectifying efficiency of different valves by introducing a series resistance in the LT rectifier circuit.

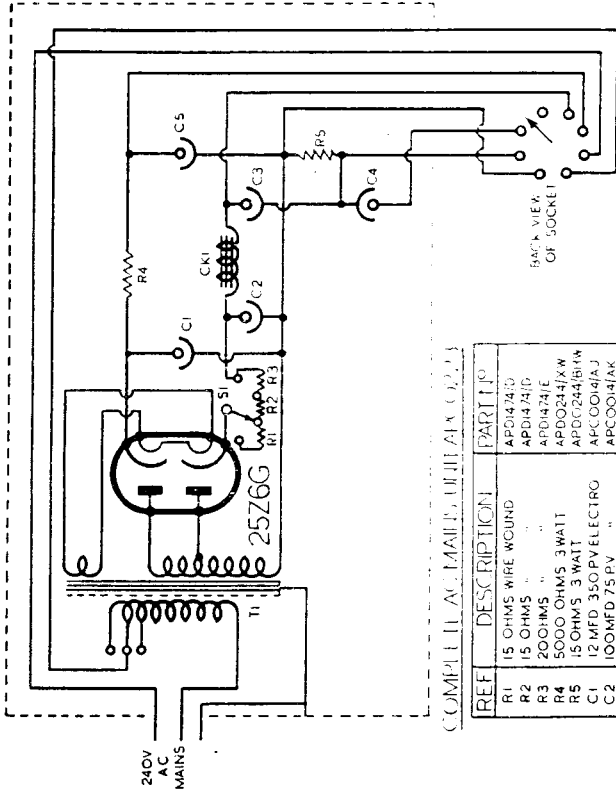
PRELIMINARY TESTS

- (1) If receiver is being operated from an external power unit, remove and replace with dry batteries to determine if fault lies in power unit and/or switching.
- (2) If battery operation is used, check connections and also battery voltages.
- (3) Check valves by replacing with good ones.
- (4) If the fault is still undiscovered, remove the chassis from the cabinet and compare voltages with the voltage table given on page 6.



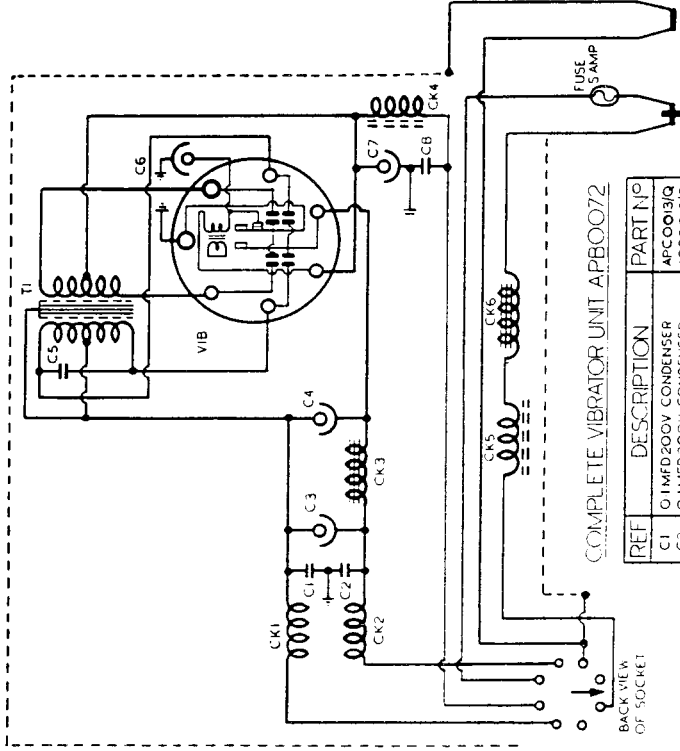
SWITCH S2
 POS1 EXT BATT OR VIB
 POS2 INT BATT
 POS3 AC MAINS UNIT

PART NO	DESCRIPTION	PART NO	DESCRIPTION	REL	DESCRIPTION	REL	DESCRIPTION	PART NO	DESCRIPTION
R1	ANX	7500 OHMS 1/4 WATT	0013/J	VC1 & VC2	2 GANG CONDENSER			APC024/I	
R2	LIX	20000 OHMS 1/4 WATT	0013/N	VR1	1 MEG OHM POTENTIOMETER			APDI486	
R3	AAK	2 MEG OHMS 1/4 WATT	0243/IM	S1	BATTERY & TONE CONTROL SWITCH			APDI552	
R4	GIX	1.5 MEG OHMS 1/4 WATT	0243/IB	S2	SWIRL SUPPLY SWITCH			APDI557	
R5	HIX	50000 OHMS 1/4 WATT	0013/Q	I1	L3 IF TRANSFORMER			APDI566	
R6	DIK	50000 OHMS 1/4 WATT	0243/IL	I2	L3 IF TRANSFORMER			APDI566	
R7	EGIX	4 MEG OHMS 1/4 WATT	0243/JA	I1, I2	2 IFT IF TRANSFORMER			APDI566	
R8	FIX	1 MEG OHMS 1/4 WATT	0013/K	LI & L2	AERIAL COIL			APDI562	
R9	PIX	1 MEG OHMS 1/4 WATT	0013/Q	L3 & L4	OSCILLATOR COIL			APC029/A	
R10	LCIX	250 OHMS 1/4 WATT	0013/Q		EXTERNAL BATTERY LEAD			APDI575	
R11	AC	0.2 OHMS 3 WATT	0243/BL						
R12	BEW	84 OHMS 3 WATT	0243/BE						
C1	VC1	2 GANG CONDENSER	0013/J						
C2	VC2	2 GANG CONDENSER	0013/N						
C3	VR1	1 MEG OHM POTENTIOMETER	0243/IM						
C4	S1	BATTERY & TONE CONTROL SWITCH	0243/IB						
C5	S2	SWIRL SUPPLY SWITCH	0013/Q						
C6	I1	L3 IF TRANSFORMER	0243/IL						
C7	I2	L3 IF TRANSFORMER	0243/JA						
C8	I1, I2	2 IFT IF TRANSFORMER	0013/K						
C9	LI & L2	AERIAL COIL	0013/Q						
C10	L3 & L4	OSCILLATOR COIL	0013/Q						
C11		EXTERNAL BATTERY LEAD	0243/BL						
C12			0243/BE						
C13			0243/AE						
C14			0013/N						
C15			0013/N						
C16			0013/N						
C17			0013/N						
C18			0013/N						
C19			0013/N						
C20			0013/N						
C21			0013/N						
C22			0013/N						



COMPLETE VIBRATOR UNIT AP0072

REF	DESCRIPTION	PART NO
R1	15 OHMS WIRE WOUND	APD1274/D
R2	15 OHMS "	APD1274/D
R3	200 OHMS "	APD1274/E
R4	5000 OHMS 3 WATT	APD0247/X W
R5	15 OHMS 3 WATT	APD0284/B/W
C1	12 MFD 350V ELECTRO	APC0014/J
C2	100 MFD 75 PV "	APC0014/K
C3	24 MFD 150 PV "	APC0014/M
C4	400 MFD 12 PV "	APC0014/N
C5	16 MFD 350 PV "	APC0014/L
CK1	LT CHOKE	APD1585
T1	MAINS TRANSFORMER	APD1238/A
S1	SWITCH	APD1238/A



COMPLETE VIBRATOR UNIT AP0072

REF	DESCRIPTION	PART NO
C1	0.1 MFD 200V CONDENSER	APC0013/Q
C2	0.1 MFD 200V CONDENSER	APC0013/Q
C3	74 MFD 150V ELECTRO COND	APC0014/M
C4	8 MFD 525 PV "	APC0014/M
C5	0.07 MFD 1000V CONDENSER	APC0013/B/F
C6	30 MFD 40V ELECTRO COND	APC0014/R
C7	400 MFD 12 PV "	APC0014/M
C8	0.1 MFD 200V CONDENSER	APC0013/Q
CK1	DOUBLE R.F. CHOKE	APD1607
CK2	HT CHOKE	APD1423
CK3	HT CHOKE	APD1423
CK4	R.F. CHOKE HT & VIBRATOR TRANS.	APD1604
CK5	R.F. CHOKE LT	APD1438
CK6	LT CHOKE	APD1606
VIB	OAK 2V SPLIT REED VIBRATOR	APD1414
	BATTERY LEAD	APD1609
	LEAD & SOCKET	APD1610

DISMANTLING

- (1) Set power supply switch to "Ext. Batt. or Vib." position.
- (2) Remove back panel from cabinet by unscrewing the two large knurled and slotted screws which are located at the top and bottom edges. (Note.—Facing the rear of the receiver, the right-hand end of the back panel must be withdrawn first.)
- (3) Disconnect and remove internal batteries.
- (4) Remove power supply switch plate by unscrewing the four screws securing it to the switch escutcheon.
- (5) Unsolder the green and brown speaker leads attached to the tag panel at the top right-hand edge of the chassis.
- (6) Unsolder the yellow and black "phone" leads attached to the external "phone" pin-jacks.
- (7) Unsolder the spaghetti covered bus-bar lead at the one-tag panel located at top left-hand edge of chassis.
- (8) Unsolder the spaghetti covered bus-bar lead attached to the top of the gang condenser.
- (9) Unsolder the black lead earthing the chassis at the "Earth" pin-jack.
- (10) Unscrew the two metal screws securing the carrying handle and remove.
- (11) Remove the dial escutcheon by unscrewing the four wood-screws securing it to the cabinet.
- (12) Loosen the two screws securing the dial drum to the condenser shaft.
- (13) Remove the wood-screws securing the top edge of the chassis to the cabinet top.
- (14) Unscrew the three metal screws holding the chassis to the front of the cabinet. (These are located at the corners of the chassis).
- (15) The chassis should now be free, except for the Volume Control and On-Off Switch knobs, which are a push-fit on their respective shafts. By withdrawing the chassis gently in a downward direction it may be removed from the cabinet.

VOLTAGE TABLES

The receiver should be tuned to a point of no reception. Values given are $\times 10^{10}$. All voltage readings are taken on the 250-volt scale of a 1000-ohms per volt meter. If a voltmeter of less than 1000 ohms per volt is utilised, allowance must be made for the voltage drop caused by the voltmeter.

RECEIVER USED WITH INTERNAL OR EXTERNAL DRY BATTERIES

	1A7GT	1N5GT	1H5GT	1Q5GT
Plate to chassis volts	83	83	16	81
Plate current (ma)	0.25	1.0	0.02	4.9
Osc. plate to chassis volts	83	—	—	—
Osc. plate current (ma)	1.1	—	—	—
Screen to chassis volts	32	83	—	83
Screen current (ma)	0.6	0.25	—	0.5
Filament volts	1.4	1.4	1.4	1.4
Bias volts	0	0	0	-6.5
Total HT current ma	8.6	—	—	—
Total LT current ma	250	—	—	—

RECEIVER USED WITH VIBRATOR POWER UNIT

	1A7GT	1N5GT	1H5GT	1Q5GT
Plate to chassis volts	90	90	17	87
Plate current (ma)	0.3	1.2	0.03	5.2
Osc. plate to chassis volts	90	—	—	—
Osc. plate current (ma)	1.2	—	—	—
Screen to chassis volts	35	90	—	90
Screen current (ma)	0.7	0.3	—	0.5
Filament volts	1.4	1.4	1.4	1.4
Bias volts	0	0	0	-7.0
Total HT current (ma)	9.4	—	—	—
Total LT current (ma)	250	—	—	—

RECEIVER USED WITH AC MAINS UNIT

	1A7GT	1N5GT	1H5GT	1Q5GT
Plate to chassis volts	105	105	20	100
Plate current (ma)	0.3	1.2	0.04	8.7
Osc. plate to chassis volts	105	—	—	—
Osc. plate current (ma)	1.4	—	—	—
Screen to chassis volts	41	105	—	105
Screen current (ma)	0.8	0.3	—	0.9
LT \pm to chassis volts	5.6	—	—	—
Bias volts	0	0	0	-6.0
Total HT current (ma)	13.6 ma	—	—	—
Total LT current (ma)	100 ma.	—	—	—

H. F. TESTS AND ADJUSTMENTS

Instability, insensitivity or poor selectivity indicate that the alignment of the tuned circuits is not correct. If a coil or other component associated with the R.F. or I.F. side of the receiver has been replaced or repaired, or if wiring has been disarranged, all circuits must be re-aligned.

To do this, the following apparatus is required:

An oscillator or signal generator capable of tuning to 1500 kc., 550 kc., and 457.5 kc., suitably screened and with an attenuator; and an output meter having a range of 0 to 2 volts A.C. approximately.

I.F. alignment should always precede R.F. alignment, and even if only one coil has been serviced, the whole of the realignment should be done in the order given. In carrying out the following operations, it is important that the output to the receiver from the oscillator should be kept low and progressively reduced as the circuits are brought into line, so that the reading on the output meter does not exceed about 0.5 volt.

I.F. ALIGNMENT

I.F. alignment can only be carried out with the receiver removed from the cabinet, in order to gain access to all the I.F. trimmer screws. After the chassis has been withdrawn from the cabinet, re-connect the speaker leads and join the 1A7GT grid to chassis through a 0.5 megohm resistor. The output meter may be connected either across the voice coil or in series with a condenser of approximately 0.002 mfd. across the external "phone" leads. Set the power supply switch to "Int. Batt." position and connect the internal battery leads to their respective batteries. Rotate the Volume Control fully clockwise and fully engage the vanes of the tuning condenser; connect the output leads of the signal generator to the grid cap of the 1A7GT valve through a 0.1 mfd. condenser and to the chassis.

Switch the receiver on.

- (1) Tune signal generator to exactly 457.5 kc.
- (2) Adjust the trimmer screws on the I.F. transformers (the top screw is the secondary and the bottom screw the primary in both transformers) for maximum deflection of the output meter. Continue this alignment on each transformer in turn until no greater output can be obtained.

(**Note.**—If trimmer screws are screwed in too far, it is possible to obtain a false peak due to coupling effects between the movable iron cores. Any trimmer which appears to require screwing too far in should be screwed out considerably and the true peak will then be found.)

R.F. ALIGNMENT

After aligning the I.F. transformers, the chassis should be fitted into the cabinet and the back panel, carrying the loop aerial, screwed into position.

IMPORTANT.—R.F. alignment must be carried out with the internal batteries in position inside the cabinet, otherwise the tuned loop will not track correctly.

Access to the oscillator padder trimmer screw and gang trimmers is obtained by removing the disc covering the circular hole in the back panel of the cabinet.

With controls set as for I.F. alignment, connect the signal generator output leads through a 400-ohm non-inductive resistor to external aerial and earth pin-jacks. Check that when the ganged condenser is fully meshed the pointer falls directly over the setting line marked "S" at the extreme right of the scale, and proceed as under:

- (1) Tune signal generator to 550 kc.
- (2) Rotate tuning control until pointer is exactly over the 550 kc. mark on scale, and by means of padding adjustment (brass screw to right of ganged condenser) align receiver so that 550 kc. signal is tuned in exactly on line.
- (3) Tune signal generator to 1500 kc.
- (4) Set pointer exactly over 1500 kc. point on scale and adjust oscillator trimmer (top trimmer on ganged condenser) until signal is correctly tuned in with the pointer on the 1500 kc. line.
- (5) Repeat operations (1) to (4) inclusive.
- (6) Note that any broadcast stations receivable are tuned in correctly on calibration.

The aerial circuit trimmer condenser will not ordinarily need adjustment; however, if after carrying out the foregoing alignment procedure the sensitivity of the receiver appears below normal, the effect may be tried of bending the trimmer blade towards or away from the condenser frame. The adjustment should be done with the receiver and generator tuned to 1500 kc., and is not critical.

NOTE.—If R.F. leakage is present in the signal generator, the tuned loop may pick up the signal direct instead of through the 400-ohm dummy aerial. Should this occur, remove the generator leads from the receiver, after first tuning the receiver to the generator frequency, and orientate the cabinet for minimum signal pick-up; then re-connect the generator leads and proceed with the alignment.

ADDITIONAL DATA

Any further service information desired can be obtained by addressing an inquiry to The Service Department, The Gramophone Co. Ltd., 2 Parramatta Road, Homebush, N.S.W.