



# **“His Master’s Voice”**

## **SERVICE MANUAL**

*for*

**FOUR VALVE**

**BROADCAST BAND A.C. RECEIVERS**

**Mantel Models 440 and 444**

# TECHNICAL SPECIFICATION

## VOLTAGE RANGE

200 to 250 volts, 40 to 50 cycles.

It is important that the receiver be operated at the correct voltage; the voltage taps on the mains transformer should be utilized as follows:

| Voltage of<br>A.C. Supply: | Use Tap<br>Designated: |
|----------------------------|------------------------|
| 200-230 volts              | 230                    |
| 231-250 ..                 | 250                    |

## CONSUMPTION

56 watts.

## WAVE-LENGTH RANGE

187.5 to 550 metres, or 1600 to 545 kilocycles.

## MAX. UNDISTORTED POWER OUTPUT

3.0 watts.

## DIMENSIONS

| Height | Width | Depth |
|--------|-------|-------|
| 15in.  | 11in. | 8in.  |

## WEIGHT

| Net                   | Gross   |
|-----------------------|---------|
| 18 $\frac{3}{4}$ lbs. | 23 lbs. |

## LOUDSPEAKER

These models use a 6in. cone speaker.

DC resistance of field, cold .. 1500 ohms.

DC resistance of voice coil .. 2.2 ..

400 cycle impedance of voice coil 2.4 ..

## VALVES

6A8G, 6G8G, EL3(N)G, 5Y3G.

## CIRCUIT DESCRIPTION

The 6A8G pentagrid converter is coupled to the aerial by means of an iron-cored Litz wire transformer, which gives improved gain and

selectivity. The converter is followed by a single stage high gain intermediate frequency amplifier utilising a 6G8G type amplifier tube.

The intermediate transformers are also of iron-cored Litz wire construction.

The primary and secondary of the first transformer are specially designed to give the order of gain and selectivity required.

The 6G8G tube, by means of its two diodes, also provides AVC bias both for itself and the converter, as well as the demodulation of the IF signal.

The audio output of this tube is resistance capacity coupled to a high-power sensitivity output pentode type EL3(N)G, which directly feeds the output transformer.

Power is supplied to the main circuits from a directly heated rectifier (Type 5Y3G), through the usual field coil filter employing 8 uf wet electrolytic condensers.

The oscillator plate and 6G8G screen grid are fed through a separate resistance capacity filter to further improve stability.

Padding of the oscillator tuned circuit is obtained by means of a variable inductance secondary and fixed padder condenser which minimises calibration drift due to variable padder shunts.

## A.V.C.

Referring to the circuit diagram on page 4, it may be seen that the AVC diode of the 6G8G is delayed by an amount corresponding to its cathode voltage above ground. This delay is about 4 volts negative with respect to cathode.

Only one half the total developed voltage is utilised for control purposes in order not to seriously limit the power output on weak signals.

## TONE CONTROL

The tone is controlled by a series resistor-condenser combination across the output transformer primary; the various values being selected by a 4-position switch.

# PRELIMINARY TESTS

The following tests should be made:

- (1) Unfiltered HT+ (terminal 4 on speaker socket) to chassis 339 volts.

If voltage is low, check line voltage to see that transformer is working from correct primary tap, also try replacing 5Y3G.

Also test filter condensers for leakages. Do tests 2 and 3.

- (2) Filtered HT (terminal 3 on speaker socket) to chassis 248 volts.

If voltage is low, check output filter condenser. Do test 3.

- (3) EL3(N)G plate current. Check voltage drop across output transformer primary (terminals 1 and 3 on speaker socket). This should be 11.5 volts. If high or low and voltages on

tests 1 and 2 are O.K., try replacing the EL3(N)G.

- (4) Check all valves for filament continuity and freedom from inter-electrode short circuits.
- (5) If fault still persists, compare voltages with table on page 3.

**Note.**—The foregoing tests can only be carried out after removal of chassis from cabinet. The speaker socket numbering will be found by consulting the diagram on page 4 and noting that the numbers given for the speaker plug are correct only when viewing socket from **inside the chassis**.

## IMPORTANT

All the above voltage tests should be made with a voltmeter having not less than 1000 ohms per volt of the full scale reading, and should then be within  $\pm 10\%$  of the specified values.

# DISMANTLING

## REMOVAL OF CHASSIS

- (1) Remove knobs.
- (2) Disconnect power plug and speaker plug.
- (3) Remove four fixing screws from underside of cabinet; the chassis is now free.

## REMOVAL OF LOUDSPEAKER

- (1) Remove 4-pin plug from back of chassis.

- (2) Remove four screws holding speaker chassis.  
(Also two screws from support bracket to cabinet in case of bakelite cabinet.)

## IMPORTANT

It is extremely important, when servicing, to make sure that the speaker is plugged into the chassis before switching on, otherwise serious damage may result.

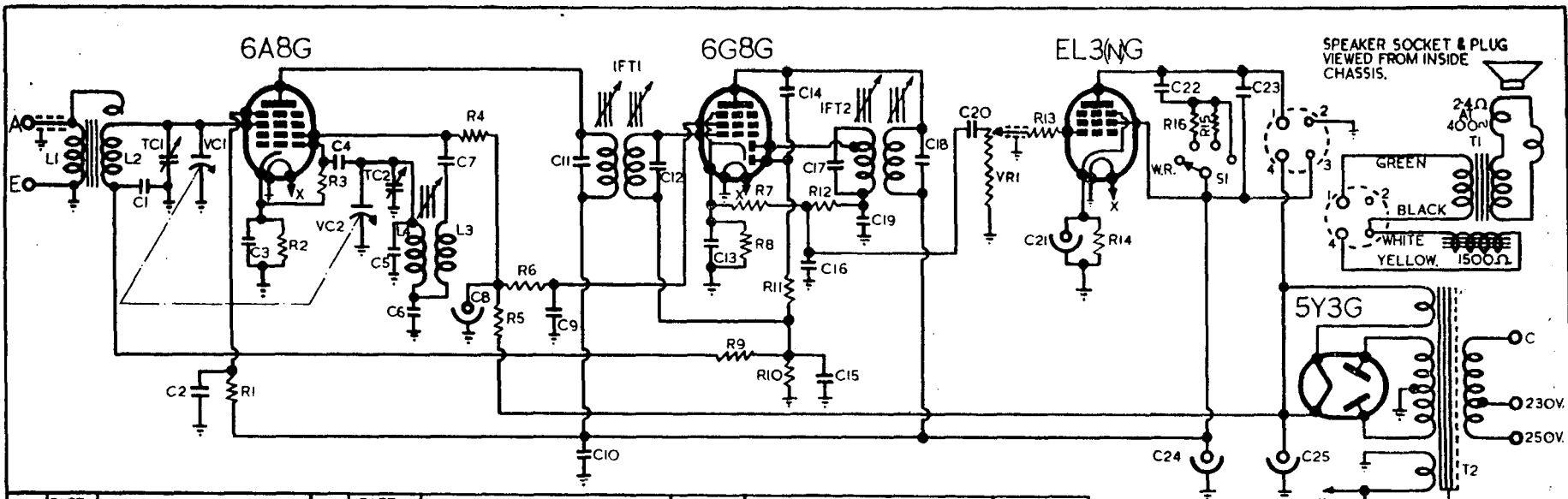
# VOLTAGE TABLE

Values given may vary  $\pm 10\%$  and are taken on 240-volt mains (250-volt primary tap). Receiver tuned to no signal point unless otherwise stated.

|                                  | VI<br>Amplr. Sect. | Osc.<br>Sect. | V2<br>(6G8G) | V3<br>(EL3(N)G) | V4<br>5Y3G |
|----------------------------------|--------------------|---------------|--------------|-----------------|------------|
| Plate to chassis volts .. .. .   | 248                | 116           | 248          | 236             | —          |
| Screen to chassis volts .. .. .  | 93*<br>92          | —<br>—        | 190*<br>131  | 262<br>248      | —<br>—     |
| Heaters .. .. .                  | —                  | 6.1           | 6.1          | 6.1             | 4.8        |
| Cathode to chassis volts .. .. . | -3.0               | —             | -4.1         | -5.4            | —          |

\*Tuned to strong local station.

|  |        |
|--|--------|
| Total HT current measured at terminal 4 of speaker socket .. .. .  | 52 ma  |
| VI oscillator anode current measured at Junction R4 & R5 .. .. .   | 2.7 ma |
| VI screen current measured at VI socket .. .. .                    | 5.2 ma |
| V2 screen current measured at V2 socket .. .. .                    | 2.1 ma |
| V3 screen current measured at screen terminal of V3 socket .. .. . | 3.6 ma |
| V3 plate current measured at terminal 1 of speaker socket .. .. .  | 33 ma  |



| REF | PART NO. | DESCRIPTION           | REF | PART NO. | DESCRIPTION                 | REF       | DESCRIPTION                 | PART NO.   |
|-----|----------|-----------------------|-----|----------|-----------------------------|-----------|-----------------------------|------------|
| R 1 | W3X      | 30,000 OHMS 1 WATT    | C 1 | 0013/M   | 0.05MFD 200V                | VC1&VC2   | 417MMFD 2 GANG CONDENSER    | APCO159    |
| R 2 | A1X      | 300 OHMS 1/4 WATT     | C 2 | 0013/E   | 0.1 MFD 400V                | VR1       | 1 MEGOHM POTENTIOMETER      | APD0877    |
| R 3 | H1X      | 50,000 OHMS 1/4 WATT  | C 3 | 0013/Q   | 0.1 MFD 200V                | IFT1      | DIAL LAMPS 6.3V. 0.15 AMP   | APD1693    |
| R 4 | AE4X     | 25,000 OHMS 2 WATT    | C 4 | 0243/BE  | 25MMFD                      | IFT2      | 1ST IF TRANSFORMER          | APD1694    |
| R 5 | W4X      | 30,000 OHMS 2 WATT    | C 5 | 0243/BA  | 20MMFD                      | T1        | 2ND IF TRANSFORMER          | APD1622    |
| R 6 | W3X      | 30,000 OHMS 1 WATT    | C 6 | 0243/BH  | 437MMFD                     | T2        | 6" SPEAKER                  | APD1502/B  |
| R 7 | N1X      | 250,000 OHMS 1/4 WATT | C 7 | 0013/N   | 0.01MFD 600V                | S1        | OUTPUT TRANSFORMER          | APD1432    |
| R 8 | U1X      | 400 OHMS 1/4 WATT     | C 8 | 0014/AF  | 8MFD 515P.V. ELECTRO. COND. |           | TONE MONITOR SWITCH         | APD1238    |
| R 9 | J1X      | 100,000 OHMS 1/4 WATT | C 9 | 0013/E   | 0.1 MFD 400V.               |           |                             |            |
| R10 | AA1X     | 2 MEGOHM 1/4 WATT     | C10 | 0013/C   | 0.25MFD 400V                | L1 & L2   | AERIAL COIL                 | APD1614    |
| R11 | AA1X     | 2 MEGOHM 1/4 WATT     | C11 | 0243/BL  | 100MMFD                     | L3 & L4   | OSCILLATOR COIL             | APC0085/LZ |
| R12 | F1X      | 10,000 OHMS 1/4 WATT  | C12 | 0243/AZ  | 50MMFD                      | TC1 & TC2 | AIR TRIMMER 1.5MMFD -18MMFD | APD0786    |
| R13 | H1X      | 50,000 OHMS 1/4 WATT  | C13 | 0013/Q   | 0.1 MFD 200V                |           |                             |            |
| R14 | YW       | 150 OHMS 3 WATT       | C14 | 0243/Q   | 50MMFD                      |           |                             |            |
| R15 | E1X      | 4,000 OHMS 1/4 WATT   | C15 | 0013/I   | 0.02 MFD 400V.              |           |                             |            |
| R16 | FIX      | 10,000 OHMS 1/4 WATT  | C16 | 0243/AE  | 100MMFD                     |           |                             |            |
|     |          |                       | C17 | 0243/BL  | 100MMFD                     |           |                             |            |
|     |          |                       | C18 | 0243/BL  | 100MMFD                     |           |                             |            |
|     |          |                       | C19 | 0243/O   | 250MMFD                     |           |                             |            |
|     |          |                       | C20 | 0013/N   | 0.01 MFD 600V               |           |                             |            |
|     |          |                       | C21 | 0014/F   | 25MFD 25V. ELECTRO. COND.   |           |                             |            |
|     |          |                       | C22 | 0013/G   | 0.05MFD 400V.               |           |                             |            |
|     |          |                       | C23 | 0013/AE  | 0.005MFD 600V.              |           |                             |            |
|     |          |                       | C24 | 0014/AF  | 8MFD 515P.V. ELECTRO. COND. |           |                             |            |
|     |          |                       | C25 | 0014/AF  | 8MFD 515P.V. ELECTRO. COND. |           |                             |            |

# RADIO FREQUENCY TESTS AND ADJUSTMENTS

Insensitivity or poor selectivity generally indicate mis-alignment of the tuned circuits.

In any case, where a component replacement has been made in either the IF or RF circuits of the receiver, or if the wiring has been disarranged, all circuits must be re-aligned.

To do this, the following equipment is required:

An oscillator or signal generator capable of tuning to 457.5 kc., 1500 kc., and 600 kc. An output meter should always be used to indicate when the circuits are tuned to resonance.

IF alignment should always precede RF 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 input 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 1.0 volt.

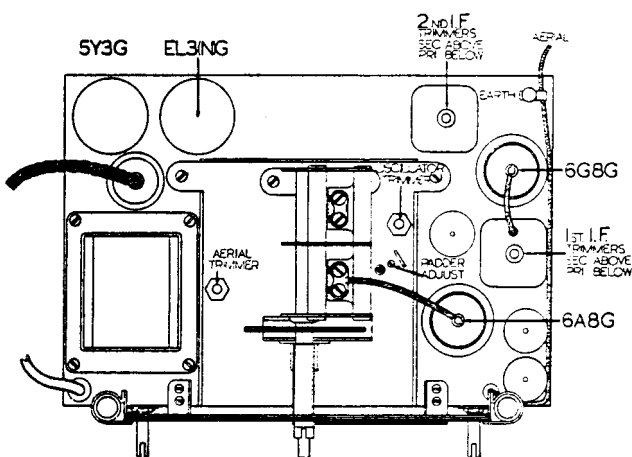
For alignment operations the output meter should be connected directly across the voice coil terminals on the speaker.

## IF ALIGNMENT

Rotate volume control fully clockwise and tone control fully anti-clockwise and fully engage the vanes of the ganged condenser. Connect the output leads of the signal generator to the grid of the 6A8G through a 0.1 mf. condenser and to the chassis. (Note: Do not disconnect the clip and lead from 6A8G grid.)

- (1) Tune signal generator to exactly 457.5 kc.
- (2) Adjust the trimmer screws on the IF transformers (the top screw is the secondary and the bottom 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.



## IMPORTANT

Do not use metal blade screwdriver for this purpose.

(Note.—If trimmer screws are screwed too far in, it is possible to obtain a false peak due to coupling effects between the moveable 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.)

## RF ALIGNMENT

With controls set as for IF alignment, connect the signal generator output leads through a standard dummy antenna of 200 MMF capacity to the aerial terminal (nearest front of chassis) on the 5-terminal strip in RF tuning compartment, and to chassis. Check that when the gang condenser is fully meshed the pointer falls directly over the line marked "S" at the extreme lower right of the scale.

- (1) Tune signal generator to 600 kc.
- (2) Rotate tuning knob until pointer is exactly over 600 kc. mark on scale, and by means of padding adjustment (brass screw to right of ganged condenser) align receiver so that the 600 kc. signal is tuned exactly on line.
- (3) Tune signal generator to 1500 kc.
- (4) Set pointer exactly over 1500 kc. point on scale and adjust oscillator trimmer (on **right-hand side** of ganged condenser) until signal is correctly tuned in with the pointer on the 1500 kc. line.
- (5) Adjust aerial trimmer (on **left-hand side** of ganged condenser) for maximum output meter reading.
- (6) Repeat operations 1 to 5 (inclusive). **This is important.** Note that any broadcast stations receivable are tuned in correctly on calibration.

**NOTE.**—The R.F. trimmers on these models are of plunger type with air dielectric, and possess exceptionally high stability and efficiency. A special adjusting tool can be obtained from the factory, incorporating a box spanner for the condenser lock nut and an adjusting hook for the plunger. After loosening the large lock nut at the top of the condenser, the adjusting hook is inserted in the hole which will be found in the top of the plunger, which can then be easily adjusted by moving up or down as required with a **slight** rotary movement. When adjustment is completed, tighten the lock nut securely.

## 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.