

# PHILCO SERVICE MANUAL

## HOME RADIO • MODEL 84

### AM-FM RADIOGRAMPHONE

FOR AC MAINS

### SPECIFICATION

#### Description

Printed circuit AM/FM radiogramophone designed for AC operation. A six-valve (including rectifier) superheterodyne circuit is employed covering Medium, Long and VHF waveranges. Rotary-type wavechange switching is employed and the receiver incorporates capacitance tuning on all waveranges with a combined AM/FM tuning control. Internal aerials are fitted with socket provision for external aerials to be connected if required. The On-Off switch is combined with a continuously variable tone control.

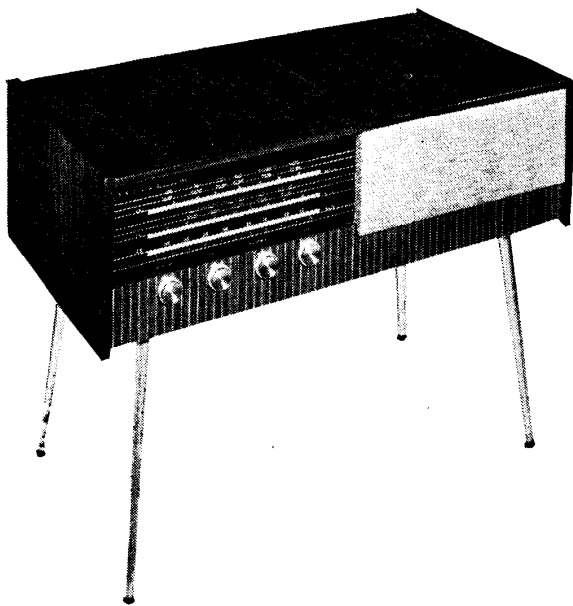
#### Mains Supply

AC mains, 200-250 volts, 50 cycles per second.

Power consumption

Radio: 50 watts approximately.

Gram: 65 watts approximately.



#### Output Power

2 Watts.

#### Waverange Coverage

Medium: 188—550 Metres.

Long: 1100—1920 Metres.

VHF/FM: 87.2—101 Mc/s.

#### Valves

- V1 **UCC85**—FM RF amplifier and mixer oscillator
- V2 **UCH81** { FM IF amplifier and FM audio amplifier  
AM frequency changer
- V3 **UF89**—AM/FM IF amplifier
- V4 **UABC80**—AM/FM detector, AGC and audio amplifier
- V5 **UL84**—Audio output
- V6 **UY85**—Half-wave rectifier

#### Record Changer

BSR Monarch UA14 fitted with turnover Monaural cartridge type TC8M, with sapphire styli TC8G (78) and TC8R (LP).

#### Loudspeaker

Permanent magnet, 8 inches  $\times$  5 inches elliptical. Speech coil impedance of 3  $\Omega$ . Extension sockets are provided.

#### Cabinet Dimensions

32 $\frac{3}{8}$  inches wide  $\times$  17 $\frac{5}{8}$  inches deep  $\times$  24 inches high including legs.

Service Inquiries to **BRITISH RADIO CORPORATION LTD. (Service Division)**

Eley's Estate, Angel Road, Edmonton, London, N.18 Tel. EDMonton 3060

# ALIGNMENT DATA

The chassis is directly connected to one side of the mains supply. Therefore, when connecting a signal generator into circuit, isolating capacitors of adequate working voltage must be used.

## AM CIRCUITS

Remove chassis from cabinet as described in "Access to the Chassis". Use the alignment scale printed along the edge of this page to identify the trim and pad marker holes to be found along the top edge of the scale reflector.

### IF Alignment

Switch the receiver to MW, turn tuning gang to minimum capacity and volume control to maximum. Inject a 470 Kc/s modulated signal via a 0.1 μF capacitor between the grid of V2 (tag 7 or 8 on printed board) and earth line (chassis) and adjust L17, L16, L15 and L14 for maximum output.

### RF Alignment

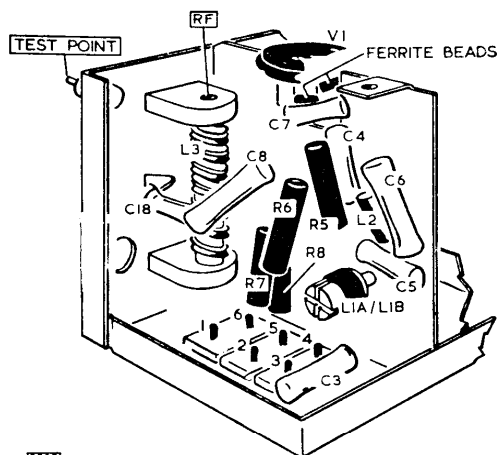
MW must be aligned first. Signals to be injected via a loop loosely coupled to the ferrite-rod aerial. With the tuning gang at maximum, set cursor to "Set Cursor" position.

| Range | Frequency | Cursor Position | Adjust  |
|-------|-----------|-----------------|---------|
| MW    | 580 Kc/s  | Pad Marker      | L10 L8* |
|       | 1400 Kc/s | Trim Marker     | C36 C23 |

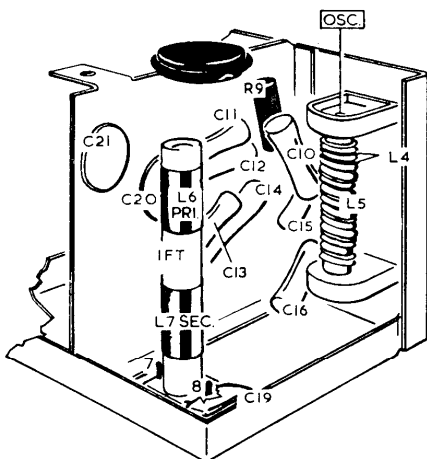
\* Adjust by sliding RING along aerial rod.

|    |          |                                     |         |
|----|----------|-------------------------------------|---------|
| LW | 220 Kc/s | Tune to Signal<br>Check Calibration | C38 L9† |
|----|----------|-------------------------------------|---------|

† Adjust by sliding COIL FORMER along aerial rod.



7500



MW TRIM  
1400 Kc/s

## FM CIRCUITS

### IF Alignment

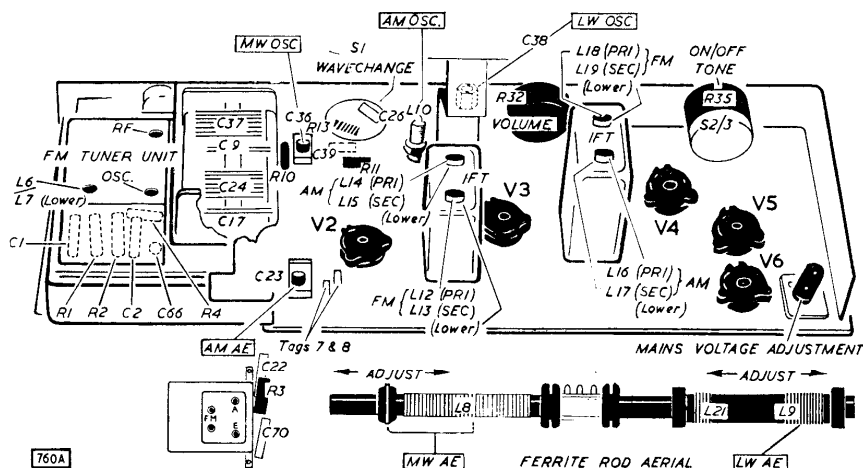
The following procedure is based on the use of a signal generator providing Band II coverage, also 10.7 Mc/s AM (30% modulated) and 10.7 Mc/s FM (25 Kc/s deviation) signals, at an output impedance of 75 Ω. Throughout alignment the signal input to the receiver should be adjusted to maintain an audio output of about 100mW.

- Switch the receiver to VHF and allow to warm up for at least ten minutes. Set the Volume control 90° back from maximum and the Tone control to maximum treble.
- Inject 10.7 Mc/s FM signal via 400pF capacitor between V2 grid (Tag 7 or 8 on printed board) and earth line (chassis) and adjust L18, L19, L13 and L12 for maximum output.
- AM Rejection Check
  - Switch generator to 10.7 Mc/s AM and tune L19 for minimum output.
  - Switch generator to 10.7 Mc/s FM and check that FM output has been retained.

Note: If maximum AM rejection does not coincide with maximum FM output, L19 should be tuned for maximum rejection at the expense of a slight reduction in FM output.
- Unscrew the core of L7 in the VHF tuner so that it protrudes from the former by approximately 3/8 in. This can be seen with unit cover in position.
- Inject 10.7 Mc/s FM signal to the tuner TEST POINT. Adjust L6 for maximum output and then peak L7.

### RF Alignment

- Adjust tuning control to set cursor to 91 Mc/s.
- Inject 91 Mc/s FM signal at the aerial sockets and tune in signal by adjusting L5. If two peaks occur within the tuning range, that obtained with the core nearest the coupling winding L4 at the top end of the former must be chosen.
- Adjust L3 for maximum audio output with core towards bottom of coil former.
- Check calibration over range.



760A

VHF/FM Tuner Unit and Main Chassis, showing trimming adjustments, etc., required for Alignment, and where practicable, components not shown on the printed board.

705A

## CIRCUIT DIAGRAM

Figures adjacent to valve electrodes denote valve pin connections.

Ringed figures show printed board connecting points.

Figures in rectangles indicate voltages measured with a 20,000 Ω/volt meter.

DC resistance readings are shown against inductances where these are 1 Ω or greater.

Components shown within the dash/dot lines are contained in the FM tuner unit.

## CIRCUIT NOTES

### V2 TRIODE SECTION

#### FM, operating as audio amplifier:

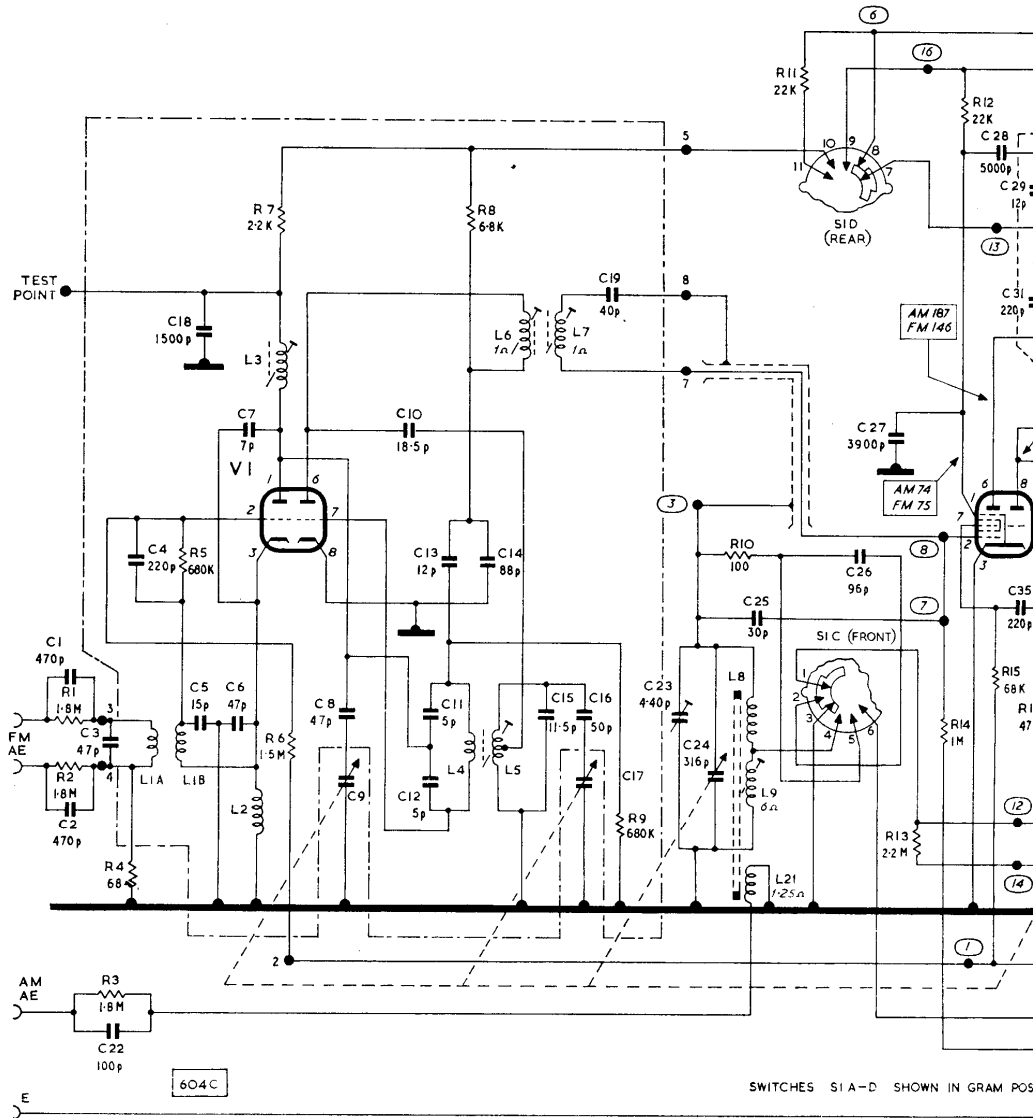
FM audio feed from **C50** through **R16** to triode grid. **C33** in anode circuit is earthed, short-circuiting oscillator feedback coil **L11** through **S1B** (Contacts 10 and 9), and functions as an RF bypass. The audio voltage developed across **R11** in series with **R18** which comprise the anode load, is applied through **R19**, **C40**, **S1A** (Contacts 5 and 2) to volume control **R32**.

**AM, operating as a tuned grid oscillator:** Oscillator grid leak **R16** is earthed through **S1C** (Contacts 1 and 3). and HT is fed via **S1D** (contacts 9 and 8) through **R18** to oscillator anode. As **S1B** (Contacts 10 and 9) are open circuited, feedback coil **L11** is coupled to the oscillator anode by **C33**. **C40** is disconnected from **R32** (volume control) by **S1A** (contacts 5 and 2) and **R32** connected through **S1A** (Contacts 2 and 3) into AM detector circuit.

### AUTOMATIC GAIN CONTROL

**FM—AM AGC line** is shorted out by **S1C** (Contacts 6 and 3) connecting **R27** to earth in parallel with **C72**. This provides grid current bias to **V2** and **V3** control grids. To improve control, the voltage across stabilising capacitor **C54** of the ratio detector circuit is also applied to **V1A** via **R6**, **V2** injector grid (pin 7) through **R15** and direct to **V3** suppressor grid (pin 9). A fraction of this voltage is also applied to **V2** and **V3** control grids by **R23**.

**AM—Conventional system** from diode load **R32** (volume control) through **S1A** (contacts 2 and 3), **R27** and **R14**.



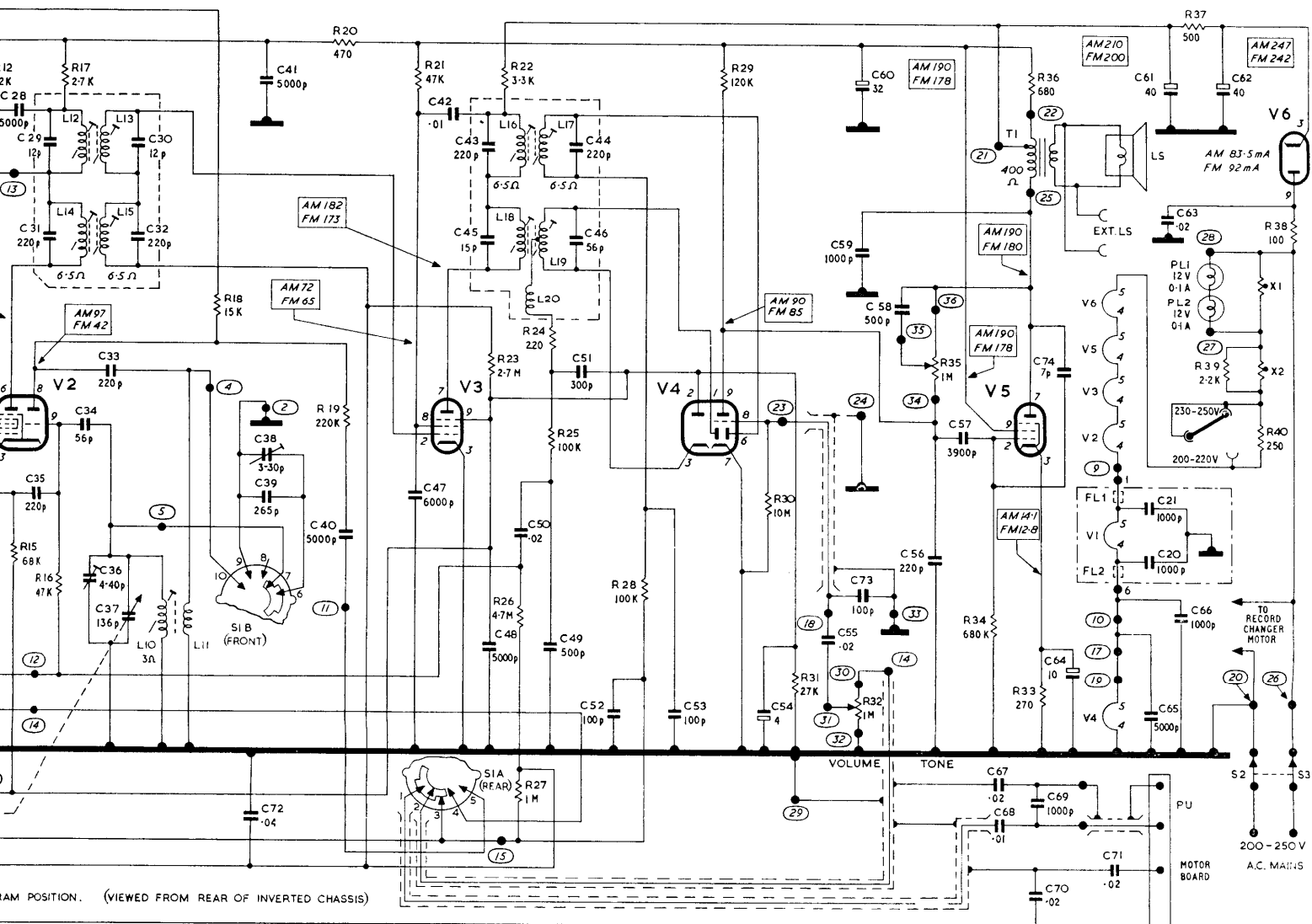
### ACCESS TO THE CHASSIS

#### Disconnect Mains Lead from Supply Point.

Remove both rear and bottom panels to gain access to the chassis for minor servicing operations.

To remove chassis entirely from the cabinet, proceed as follows:—

1. Detach aerial input and EXT LS panels, each held in place by two woodscrews.
2. Remove screws securing output transformer, and connection block, to floor of cabinet.
3. Disconnect leads to EXT LS panel from connection block and also mains leads to gram. motor switch from connection block on underside of motor board.
4. Unplug pick-up input leads from tag panel on underside of auto-mechanism baseplate.
5. Pull off front control knobs. (These are tightly fitted to eliminate the possibility of 'live' spindles becoming accidentally accessible to the user). Each knob may be removed with the aid of a length of stout cord placed



## SERVICE NOTES

around the knob boss and used as a puller. (When reassembling make sure that the knob is fully on, and securely fixed, to its spindle).

- Captive bolts and 4 BA nuts and washers secure the chassis to the front of the cabinet. Remove the nuts with a long box spanner and withdraw the chassis through the rear aperture.
- The tuning scale is fitted close up to the left-hand edge of the cabinet and is held in place by wood screws securing two brass clips, two adjustable brackets at the top and four protective foam rubber pads.

### Removal of motor board and loudspeaker

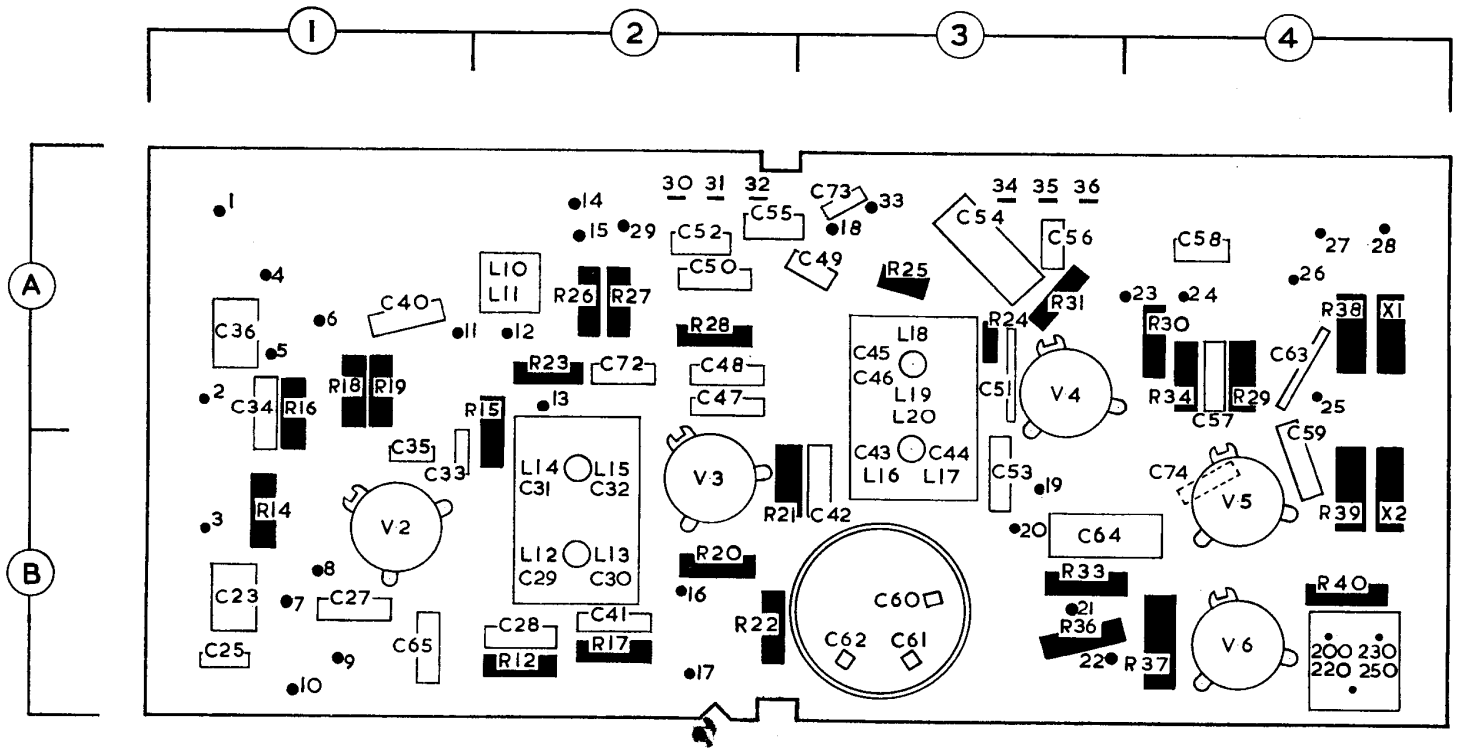
- Take out 3 screws and cup washers securing loudspeaker cover (located inside gram. compartment).
- Remove 4 screws and cup washers to free motor board which can now be lifted out.
- To withdraw loudspeaker unsolder leads from tag panel, remove four 4 BA fixing nuts and lift out.

## PRINTED PANEL SERVICING

When servicing the printed circuit panel, it must be remembered that excessive heat can loosen the bond between the copper conducting circuits and the insulating board. Special care must be exercised when soldering connections to the 'wiring' side of the panel. When replacing a resistor or capacitor, cut out the faulty component so that as much as possible of the original lead-out wires remain so that these may be used as connections to the new component, thus avoiding whenever possible, soldering to the printed conductors.

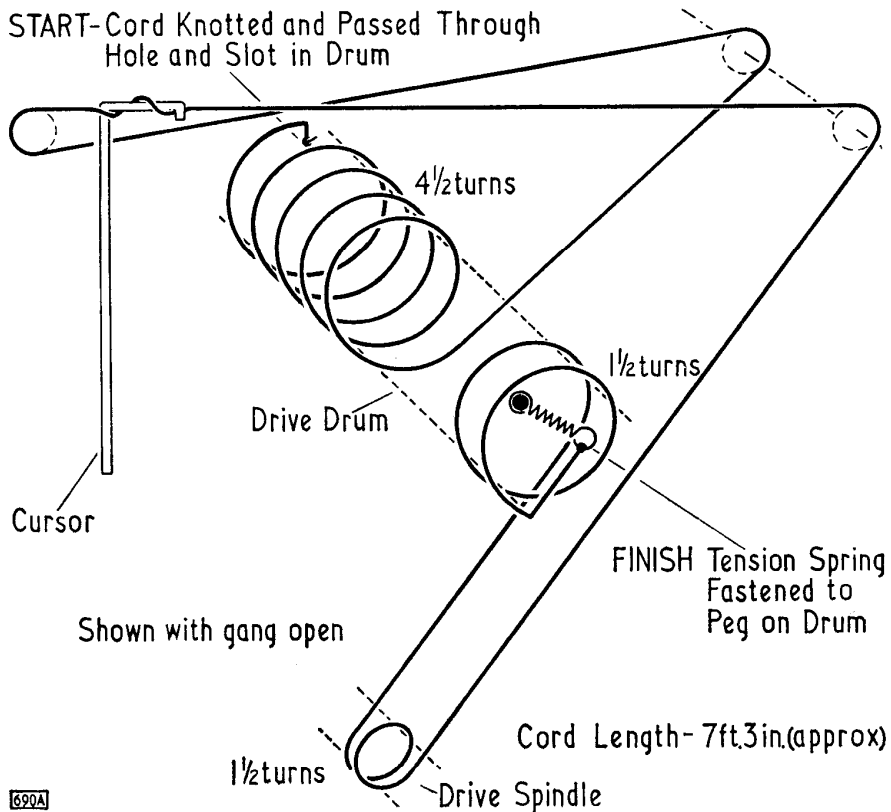
If a section of the printed conductor becomes damaged or fused, scrape off the damaged portion and restore the connection with a jumper wire on the component side of the panel. Whenever the necessity arises, however, to solder directly to a printed conductor, use a 60:40 resin-cored solder and make the joint as quickly as possible to avoid overheating. **Do not use a corrosive type flux.**

# PRINTED BOARD COMPONENT LOCATIONS



|          |        |        |          |        |        |        |          |        |
|----------|--------|--------|----------|--------|--------|--------|----------|--------|
| <b>R</b> | R12 B2 | R26 A2 | <b>C</b> | C23 B1 | C41 B2 | C55 A2 | <b>L</b> | L10 A2 |
|          | R14 B1 | R27 A2 | C25 B1   | C42 B3 | C56 A3 |        | L11 A2   |        |
|          | R15 A2 | R28 A2 | C27 B1   | C43 B3 | C57 A4 |        | L12 B2   |        |
|          | R16 A1 | R29 A4 | C28 B2   | C44 B3 | C58 A4 |        | L13 B2   |        |
|          | R17 B2 | R30 A4 | C29 B2   | C45 A3 | C59 B4 |        | L14 B2   |        |
|          | R18 A1 | R31 A3 | C30 B2   | C46 A3 | C60 B3 |        | L15 B2   |        |
|          | R19 A1 | R33 B3 | C31 B2   | C47 A2 | C61 B3 |        | L16 B3   |        |
|          | R20 B2 | R34 A4 | C32 B2   | C48 A2 | C62 B3 |        | L17 B3   |        |
|          | R21 B2 | R36 B3 | C33 B1   | C49 A3 | C63 A4 |        | L18 A3   |        |
|          | R22 B2 | R37 B4 | C34 A1   | C50 A2 | C64 B3 |        | L19 A3   |        |
|          | R23 A2 | R38 A4 | C35 B1   | C51 A3 | C65 B1 |        | L20 A3   |        |
|          | R24 A3 | R39 B4 | C36 A1   | C52 A2 | C72 A2 |        |          |        |
|          | R25 A3 | R40 B4 | C40 A1   | C53 B3 | C73 A3 |        |          |        |
|          |        |        |          | C54 A3 | C74 B4 |        |          |        |

## TUNING DRIVE



## CAPACITORS

All 350 Volt working, 20% tolerance unless otherwise stated.

| Ref. | Value    | Rating       | Function and Part No.                                |
|------|----------|--------------|--|
| C1   | 470pF    | 400V AC      | FM aerial isolating                                  |
| C2   | 470pF    | 400V AC      |  |
| C3   | 47pF     | 5%           | LIA tuning   |
| C4   | 220pF    |              | V1 grid coupling                                     |
| C5   | 15pF     | 5%           | LIB tuning and part VI neutralizing                  |
| C6   | 47pF     | 5%           |  |
| C7   | 7pF      | ±1/2pF       | Part VI neutralizing—C070H35                         |
| C8   | 47pF     | 5%           | VHF amplifier padder                                 |
| C9   | Variable |              | VHF amplifier tuning *                               |
| C10  | 18.5pF   | ±1/2pF       | Oscillator feedback coupling—<br>C185XH35<br>C050H35 |
| C11  | 5pF      | ±1/2pF       | Oscillator/mixer signal injection—<br>C050H35        |
| C12  | 5pF      | ±1/2pF       |  |
| C13  | 12pF     | 2 1/2%       | VI IF/mixer feedback                                 |
| C14  | 88pF     | 2 1/2%       |  |
| C15  | 11.5pF   | 2 1/2%       | Part oscillator tuning                               |
| C16  | 50pF     | 5%           | Oscillator padder                                    |
| C17  | Variable |              | Oscillator tuning *                                  |
| C18  | 1500pF   |              | V1 HT decoupling                                     |
| C19  | 40pF     | 5%           | Part L7 tuning                                       |
| C20  | 1000pF   | +80—20% 500V | VI heater decoupling                                 |
| C21  | 1000pF   | +80—20% 500V |  |
| C22  | 100pF    |              | AM aerial isolating                                  |
| C23  | 4.40pF   | Pre-set      | MW aerial trimmer—25547                              |
| C24  | Variable |              | Aerial tuning *                                      |
| C25  | 30pF     | 5%           | Part L7 tuning                                       |
| C26  | 96pF     | 2%           | LW aerial tuning                                     |
| C27  | 3900pF   |              | V2 SG decoupling                                     |
| C28  | 5000pF   | 500V         | V2 heptode neutralizing                              |
| C29  | 12pF     | 5%           | L12 tuning   |
| C30  | 12pF     | 5%           | L13 tuning   |
| C31  | 220pF    | 2%           | L14 tuning   |
| C32  | 220pF    | 2%           | L15 tuning   |
| C33  | 220pF    |              | V2 oscillator anode coupling                         |
| C34  | 56pF     | 500V         | V2 oscillator grid coupling                          |
| C35  | 220pF    |              | V2 oscillator output coupling                        |
| C36  | 4.40pF   | Pre-set      | MW oscillator trimmer—25547                          |
| C37  | Variable |              | AM oscillator tuning *                               |
| C38  | 3.30pF   | Pre-set      | LW oscillator trimmer—13937                          |
| C39  | 265pF    | 2%           | LW oscillator tuning                                 |
| C40  | 5000pF   | 500V         | V2 triode output coupling                            |
| C41  | 5000pF   | 500V         | V1, V2 HT decoupling                                 |
| C42  | .01μF    | 500V         | V3 neutralizing                                      |
| C43  | 220pF    | 2%           | L16 tuning   |
| C44  | 220pF    | 2%           | L17 tuning   |
| C45  | 15pF     | 5%           | L18 tuning   |
| C46  | 56pF     | 5%           | L19 tuning   |
| C47  | 6000pF   | 500V         | V3 SG decoupling                                     |
| C48  | 5000pF   | 500V         | V3 suppressor grid decoupling                        |
| C49  | 500pF    |              | FM IF by-pass and de-emphasis                        |
| C50  | .02μF    | 150V         | Audio coupling to V2 (FM)                            |
| C51  | 300pF    | 5%           | FM IF bypass   |
| C52  | 100pF    | 500V         | AM IF filter   |
| C53  | 100pF    | 500V         |  |
| C54  | 4μF      | Elec         | Ratio detector stabilizing—13210                     |
| C55  | .02μF    | 150V         | V4 grid coupling                                     |
| C56  | 220pF    |              | RF bypass  |
| C57  | 3900pF   | 500V         | V5 grid coupling                                     |
| C58  | 500pF    |              | Part tone control                                    |
| C59  | 1000pF   | 400V AC      | Tone correction and RF bypass                        |
| C60  | 32μF     |              | HT smoothing†  |
| C61  | 40μF     | 275V         | HT smoothing†  |
| C62  | 40μF     |              | HT reservoir†  |
| C63  | .02μF    | 350V AC      | Mains RF bypass                                      |
| C64  | 10μF     | 25V          | V5 cathode bypass—13222/6                            |
| C65  | 5000pF   | 500V         | Heater RF bypass                                     |
| C66  | 1000pF   | +80—20% 500V |  |
| C67  | .02μF    | 350V AC      | PU isolating   |
| C68  | .01μF    | 400V AC      | PU isolating   |
| C69  | 1000pF   |              | PU correction  |
| C70  | .02μF    | 350V AC      | Earth isolating                                      |
| C71  | .02μF    | 350V AC      | Motor earth isolating                                |
| C72  | .04μF    | 150V         | AM AGC decoupling FM limiting                        |
| C73  | 100pF    |              | IF bypass  |
| C74  | 7pF      |              | V5 negative feedback                                 |

\* Tuning Gang Part No. 25703.

† Part No. 13237/8.

## MISCELLANEOUS

| Ref.    | Description                             | Part No. |
|---------|---|----------|
| FL1/FL2 | Ferrite beads                           | 34759    |
| LS      | Loudspeaker (3 Ω impedance)             | 16012/17 |
| PL1/PL2 | Pilot lamp 12V, 0.1A                    | 33774    |
| S1A-D   | Wavechange switch                       | 33983    |
| S2/S3   | Mains on/off switch (combined with R35) | 25560/1  |
| S4      | Loudspeaker muting switch               | 4230     |
| X1/X2   | Thermistor, Varite V1010                | 4558/7   |

## RESISTORS

All 20%, 1/4 watt carbon unless otherwise stated.

| Ref. | Value  | Tol.          | Rating | Function and Part No.                           |
|------|--------|---------------|--------|---|
| R1   | 1.8M Ω |               |        | FM aerial discharge                             |
| R2   | 1.8M Ω |               |        |   |
| R3   | 1.8M Ω |               |        |   |
| R4   | 68 Ω   |               |        | AM aerial discharge                             |
| R5   | 680K Ω | 10%           |        | FM aerial load                                  |
| R6   | 1.5M Ω | 10%           |        | V1 grid leak                                    |
| R7   | 2.2K Ω |               |        | V1 AGC feed                                     |
| R8   | 6.8K Ω |               |        | V1 HT feed                                      |
| R9   | 680K Ω | 10%           |        |   |
| R10  | 100 Ω  |               |        | V1 grid leak                                    |
| R11  | 22K Ω  | 10%           |        | RF damping                                      |
| R12  | 22K Ω  | 10%           |        | Part V2 triode anode load (FM)                  |
| R13  | 2.2M Ω | 10%           |        | V2 SG feed                                      |
| R14  | 1M Ω   |               |        | V2 neg. feedback (FM only)                      |
| R15  | 68K Ω  | 10%           |        | V2 heptode grid leak                            |
| R16  | 47K Ω  | 10%           |        | V2 heptode AGC feed (FM)                        |
| R17  | 2.7K Ω | 10%           |        | Oscillator grid leak (AM) and grid stopper (FM) |
| R18  | 15K Ω  | 10%           |        | V2 neutralizing                                 |
| R19  | 220K Ω |               |        | V2 triode anode load                            |
| R20  | 470 Ω  |               |        | V2 triode anode coupling (FM)                   |
| R21  | 47K Ω  | 10%           |        | V1/V2 HT feed                                   |
| R22  | 3.3K Ω |               |        | V3 SG feed                                      |
| R23  | 2.7M Ω |               |        | V3 neutralizing                                 |
| R24  | 220 Ω  | 10%           |        | V3 FM AGC feed                                  |
| R25  | 100K Ω |               |        | Ratio det. tertiary series                      |
| R26  | 4.7M Ω |               |        | FM IF filter                                    |
| R27  | 1M Ω   |               |        | Part FM AGC                                     |
| R28  | 100K Ω |               |        | AM AGC feed                                     |
| R29  | 120K Ω | 10%           |        | AM IF filter                                    |
| R30  | 10M Ω  |               |        | V4 triode anode load                            |
| R31  | 27K Ω  |               |        | V4 grid leak                                    |
| R32  | 1M Ω   |               |        | Ratio detector load                             |
| R33  | 270 Ω  | Log. Pot. 10% | 1/2W   | Volume control—25559/1                          |
| R34  | 680K Ω |               |        | V5 cathode bias                                 |
| R35  | 1M Ω   | Lin. Pot.     |        | V5 grid leak                                    |
| R36  | 680 Ω  | 10%           | 1/2W   | Tone control—25560/1                            |
| R37  | 500 Ω  | 5%            | 3W     | HT smoothing                                    |
| R38  | 100 Ω  | 5%            | 5W     |   |
| R39  | 2.2K Ω | 10%           | 1/2W   | HT surge limiter                                |
| R40  | 250 Ω  | 5%            | 3W     | X2 shunt  |
|      |        |               |        | Mains dropper                                   |

## INDUCTORS AND TRANSFORMERS

| Ref.           | Function                              | Part No. |
|----------------|---------------------------------------|----------|
| L1A }<br>L1B } | VHF aerial input transformer          | 29232    |
| L2             | RF choke                              | 29280    |
| L3             | VHF amplifier tuning                  | 25835    |
| L4             | VHF oscillator feedback               | 29230    |
| L5             | VHF oscillator tuning                 |          |
| L6 }<br>L7 }   | 1st FM IF transformer                 | 29233    |
| L8 }<br>L9 }   | MW } Ferrite rod aerial<br>LW }       | 29276    |
| L10            | MW and LW oscillator tuning           | 25829    |
| L11            | MW and LW oscillator feedback         |          |
| L12 }<br>L13 } | 2nd FM IF transformer                 | 25834    |
| L14 }<br>L15 } | 1st AM IF transformer                 |          |
| L16 }<br>L17 } | 2nd AM IF transformer                 | 25810    |
| L18 }<br>L19 } | Ratio detector transformer            |          |
| L20 }          |                                       |          |
| L21            | AM aerial coupling ferrite-rod aerial |          |
| T1             | Audio output transformer              | 25486    |

## SPARE PARTS LIST

| Description                                   | Part No. |
|---|----------|
| Aerial socket panel assy. ...                 | 33571    |
| Cabinet ...                                   | 50184/D  |
| Cabinet back cover ...                        | 50181    |
| Cabinet bottom cover ...                      | 50184/1  |
| Cabinet gram compartment cover ...            | 50184/2  |
| Control knobs (3) (Clip 47409) ...            | 50153    |
| Control knob-wavechange (clip 47409) ...      | 50153/1  |
| Cursor ...                                    | 25950/1  |
| Drive Cord (spring 10486) ...                 | 33963    |
| Drive drum (spring clip 37309) ...            | 32563    |
| FM aerial plug ...                            | 9291     |
| Lampholder ...                                | 13318    |
| Mains Voltage Selector ...                    | 25960    |
| Scale ...                                     | 50185    |
| Scale diffuser (stud 45999, spring 25697) ... | 32528    |

The manufacturers reserve the right to vary specifications or use alternative materials as may be deemed necessary or desirable at any time.

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UCC85

UCH81

UF89

UABC80

UL84

UY85

