



H.M.V. 1639 SERIES

a.m.-f.m. stereo radiograms

MODELS 1639, 1643, 1645 (H.M.V.) and 604RG (Ferguson) are similar 3-band 7-valve a.m.-f.m. stereo radiograms. Models 1640, 1642 (H.M.V.) and RG87 (Marconiphone) are basically the same except that they do not have a tuning indicator. All sets have 6 watts (radio) or 2½ watts per channel (gram) output, via 8 in. speakers.

CIRCUIT DETAILS

On a.m., the signal input is fed via aerial circuit and wavechange switching to the frequent changer V2, the resultant i.f. output being coupled via L14/L15 to the i.f. amplifier V3. The transformer L18/L19 couples the V3 output to the diode of V3 for demodulation.

R15, with C42, forms an i.f. filter. The d.c. component developed across the diode load R44 is fed via R13, decoupled by C39, as a.g.c. to V2 and V3. When switched to f.m., the detector and a.g.c. circuits are rendered inoperative by S3A and S4A. The audio signal is fed to volume control R20 via C43, S1B, S2A and tone control C46/R18.

A.F. Stages

V6A and B form a self balancing paraphase amplifier, providing two anti-phase outputs of equal amplitude to drive the output stage, by feeding part of the V6A output to the V6B grid via C52, R25, S1A and C55. R28 is a feedback resistor to ensure balance of the V6A and V6B outputs.

V7 and V8 operate in an unconventional Class A push-pull circuit, biased

RELEASE DATES AND ORIGINAL PRICES

| |
|---|
| 1639: August, 1959. 85 gns. (£67 11s. 5d., plus tax) |
| 1640: August, 1959. 65 gns. (£51 13s. 5d., plus tax) |
| 1642: May, 1960. 67 gns. (£52 12s. 5d., plus tax) |
| 1643: August, 1960. 82 gns. (£65 3s. 9d., plus tax) |
| 1645: May, 1961. 75 gns. (£59 12s. 5d., plus tax) |
| 604RG: August, 1959. 73 gns. (£58 0s. 8d., plus tax) |
| RG87: August, 1960. 69 gns. (£54 13s. 7d., plus tax) |

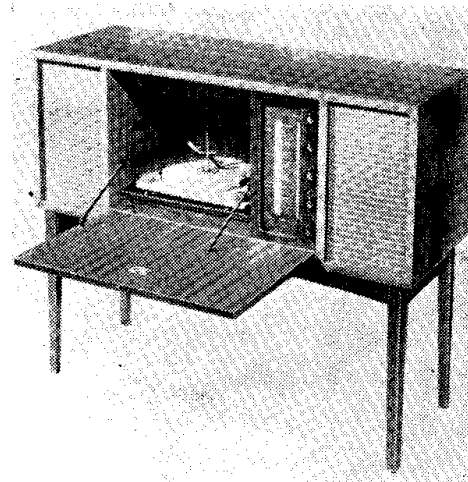
by the voltage developed across R41 in the h.t. negative return circuit. Although the audio signals developed in the output transformer primaries are in anti-phase, the secondaries are connected so that the combined outputs to the speakers are additive.

Any even-harmonic distortion produced in the output stage is in the same phase relationship in each primary winding and therefore, due to the connection of the secondaries, the even harmonics are cancelled out. Negative feedback is applied to V6A grid via R23 and a tone correcting network C50, C21.

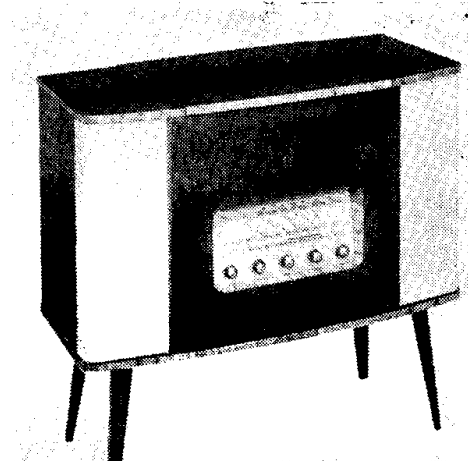
Record Reproduction

When switched for record reproduction, the audio stages form two separate and identical amplifiers, one for each stereo channel. The separate signals from the pickup are fed to the left- and right-hand channel amplifiers via R37 and R38 and are balanced by R36.

The left-hand channel signal is applied to V6B grid via volume and tone control networks and C55, the output being coupled to V8 via C53. V8 drives T2 which feeds LS2, the left-hand channel speaker. Negative feedback is applied to V6B from the T2 secondary via R31



Model 1640



Model 1642

and tone correction network R34, C56.

The right-hand channel amplifier is identical in operation except that the pickup input is fed to the volume (R20) and tone (R18) controls via S1B and S2A. Feedback from T1 is via R23, R21, C50.

F.M. Operation

On f.m. operation, V1A functions as a combined grid-cathode injection r.f. amplifier, the secondary of the input transformer L2 is centre tapped to the chassis by means of C2, C5, dividing the signal input between grid and cathode. L3 is an r.f. choke, providing a high impedance between cathode and chassis for the r.f. signal and a low impedance to the steady valve current.

This is a compromise between the earthed grid and earthed cathode methods of operation and provides a higher input impedance than obtained

(Continued on page 2)

SERVICE SNAPS

H.M.V. 1639 SERIES

Valves: Two EL84, one EB91, EM81, EBF89, ECC83, ECC85, ECH81.

Mains Rectifier:

Pilot Lamps: Two at 6.5V, 0.3A.

Volume Controls: 1MΩ + 1MΩ, ganged.

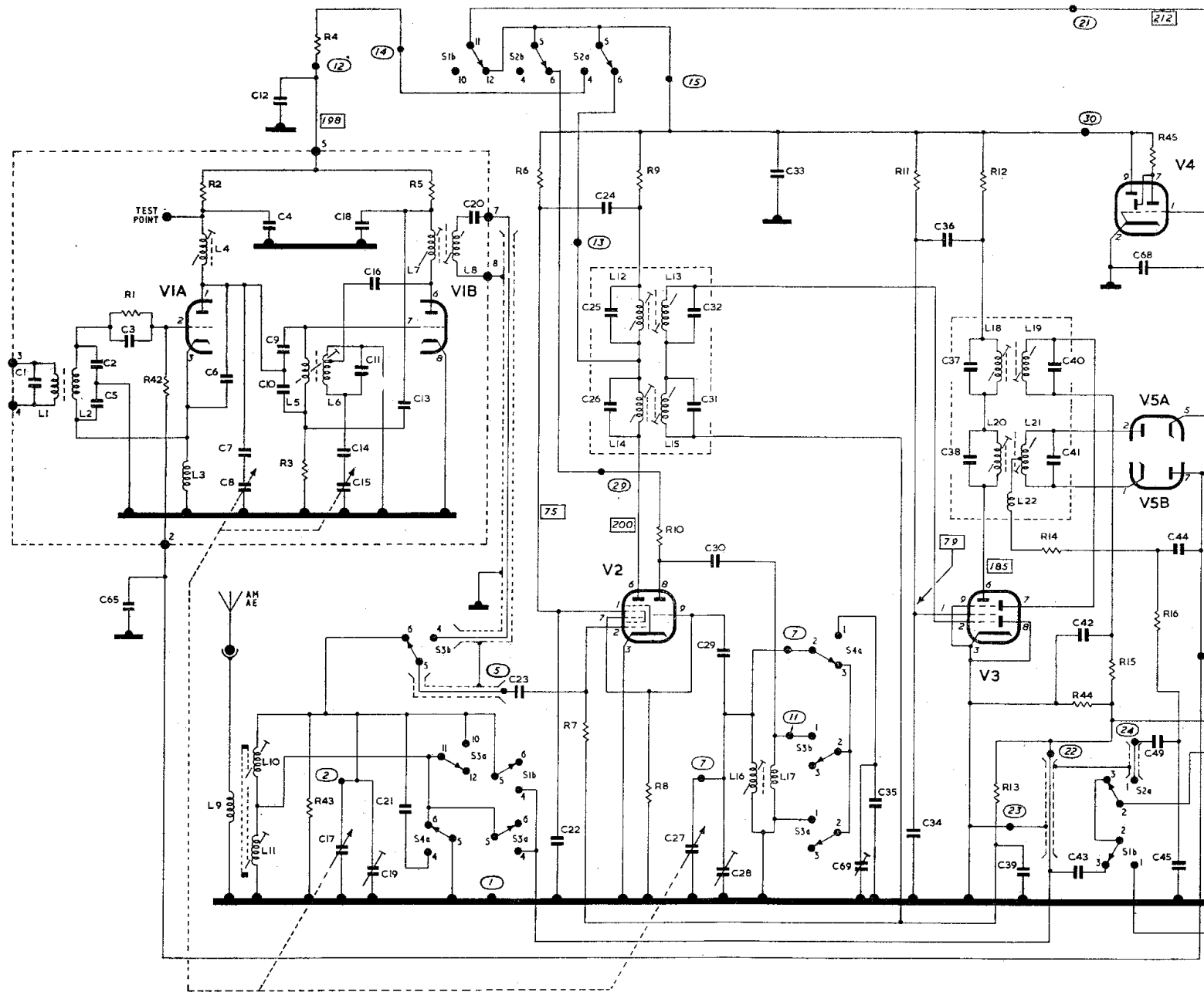
Tone Controls: 1MΩ + 1MΩ, ganged.

Balance Control: 1.5MΩ.

I.F.: FM—10.7 Mc/s. AM—470 kc/s.

Electrolytics: 4μF, 100V; 50+50+100μF, 275V.

Mains Input: 200-250V a.c. only.



Circuit diagram of the HMV 1639, 1643, 1645 and Ferguson 604RG. Slight differences in other models are described on this page. Figures shown in rectangles are voltage readings using a 20,000Ω/V meter. Ringed figures indicate tag connections on the printed circuit board.

CIRCUIT DETAILS —continued

with the earthed grid method and simplifies neutralisation, which is effected by C6.

V1A output is fed to C9, C10, the signal injection point for the self-oscillating mixer V1B, and the null point of a bridge formed by C9, C10, C13 and C18 in series. At this point, oscillator voltage is negligible, reducing the possibility of oscillator radiation to the aerial circuit via the grid-anode capacitance of V1A.

Additive mixing takes place at the V1B grid and the 10.7 Mc/s signal selected in the anode by L7. A small amount of positive feedback is provided by V13, to offset the effect of oscillator circuits which tend to shunt L7. The output is fed via L8 and S3B to the grid

of V2A which now operates as an i.f. amplifier, the triode section being rendered inoperative.

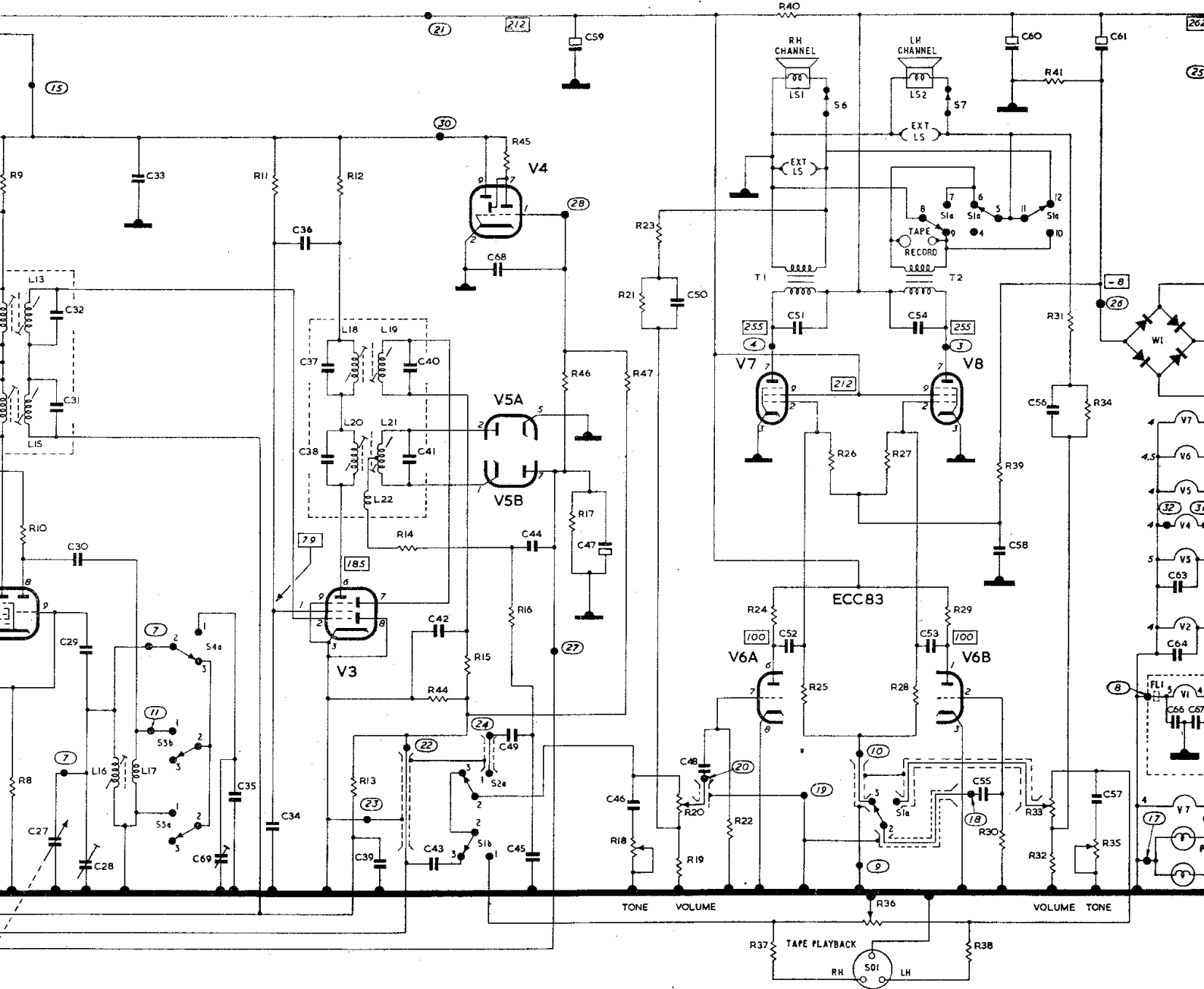
The V2B output is coupled via L12/L13 to the second i.f. amplifier V3, the anode circuit of which contains the ratio detector transformer L20, L21, L22, this feeding the two diode sections of the ratio detector V5.

The tertiary winding L22 provides the necessary coupling to inject the primary voltage into the secondary circuit with the correct phase relationship, while matching the low impedance of the diodes to the high impedance of the i.f. amplifier.

R16 and C45 form a de-emphasis network and i.f. filter and the demodulated signal is coupled to the audio stages via C49, S2A and the tone and volume control networks.

COMPONENT LIST

| | | | |
|-------------------|-------------|--------------------|-------------|
| Resistors: | R33 | 1MΩ, log. | |
| R1 | 680kΩ | R34 | 2.7kΩ |
| R2 | 2.2kΩ | R35 | 1MΩ, A/log. |
| R3 | 680kΩ | R36 | 1.5MΩ, lin. |
| R4 | 1.5kΩ | R37 | 390kΩ |
| R5 | 6.8kΩ | R38 | 390kΩ |
| R6 | 33kΩ | R39 | 560kΩ |
| R7 | 2.2MΩ | R40 | 1.2kΩ, 3W |
| R8 | 47kΩ | R41 | 100Ω, 1W |
| R9 | 2.7kΩ | R42 | 1.5MΩ |
| R10 | 27kΩ | R43 | 470kΩ |
| R11 | 47kΩ | R44 | 330kΩ |
| R12 | 3.3kΩ | R45 | 470kΩ |
| R13 | 2.2MΩ | R46 | 6.8MΩ |
| R14 | 220Ω | R47 | 2.2MΩ |
| R15 | 100kΩ | | |
| R16 | 100kΩ | Capacitors: | |
| R17 | 27kΩ | C1 | 47pF |
| R18 | 1MΩ, A/log. | C2 | 15pF |
| R19 | 47Ω | C3 | 220pF |
| R20 | 1MΩ, log. | C4 | 0.0015μF |
| R21 | 2.7kΩ | C5 | 47pF |
| R22 | 6.8MΩ | C6 | 7pF |
| R23 | 680Ω | C7 | 47pF |
| R24 | 220kΩ | C8 | V1A tuning |
| R25 | 1MΩ | C9 | 5pF |
| R26 | 680kΩ | C10 | 5pF |
| R27 | 680kΩ | C11 | 11.5pF |
| R28 | 1MΩ | C12 | 0.01μF |
| R29 | 220kΩ | C13 | 12pF |
| R30 | 6.8MΩ | C14 | 50pF |
| R31 | 680Ω | C15 | V1B tuning |
| R32 | 47Ω | | |



...ferences in other readings using a circuit board.

...tes as an i.f. section being

...coupled via amplifier V3, contains the r L20, L21, diode sections

...provides the t the primary y circuit with nship, while ance of the nce of the i.f.

...emphasis net-demodulated io stages via and volume

COMPONENT LIST

Resistors:

| | |
|-----|-------------|
| R1 | 680kΩ |
| R2 | 2.2kΩ |
| R3 | 680kΩ |
| R4 | 1.5kΩ |
| R5 | 6.8kΩ |
| R6 | 33kΩ |
| R7 | 2.2MΩ |
| R8 | 47kΩ |
| R9 | 2.7kΩ |
| R10 | 27kΩ |
| R11 | 47kΩ |
| R12 | 3.3kΩ |
| R13 | 2.2MΩ |
| R14 | 220Ω |
| R15 | 100kΩ |
| R16 | 100kΩ |
| R17 | 27kΩ |
| R18 | 1MΩ, A/log. |
| R19 | 47Ω |
| R20 | 1MΩ, log. |
| R21 | 2.7kΩ |
| R22 | 6.8MΩ |
| R23 | 680Ω |
| R24 | 220kΩ |
| R25 | 1MΩ |
| R26 | 680kΩ |
| R27 | 680kΩ |
| R28 | 1MΩ |
| R29 | 220kΩ |
| R30 | 6.8MΩ |
| R31 | 680Ω |
| R32 | 47Ω |

| | |
|-----|-------------|
| R33 | 1MΩ, log. |
| R34 | 2.7kΩ |
| R35 | 1MΩ, A/log. |
| R36 | 1.5MΩ, lin. |
| R37 | 390kΩ |
| R38 | 390kΩ |
| R39 | 560kΩ |
| R40 | 1.2kΩ, 3W |
| R41 | 100Ω, 1W |
| R42 | 1.5MΩ |
| R43 | 470kΩ |
| R44 | 330kΩ |
| R45 | 470kΩ |
| R46 | 6.8MΩ |
| R47 | 2.2MΩ |

Capacitors:

| | |
|-----|------------|
| C1 | 47pF |
| C2 | 15pF |
| C3 | 220pF |
| C4 | 0.0015μF |
| C5 | 47pF |
| C6 | 7pF |
| C7 | 47pF |
| C8 | V1A tuning |
| C9 | 5pF |
| C10 | 5pF |
| C11 | 11.5pF |
| C12 | 0.01μF |
| C13 | 12pF |
| C14 | 50pF |
| C15 | V1B tuning |

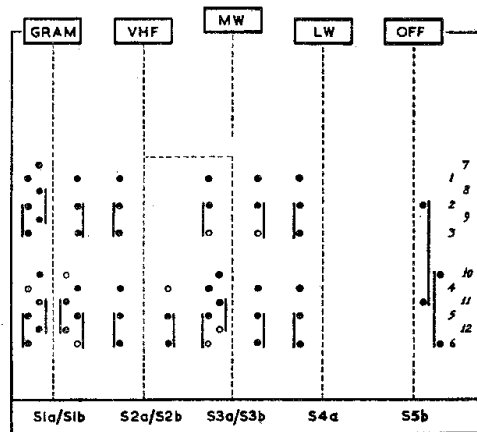
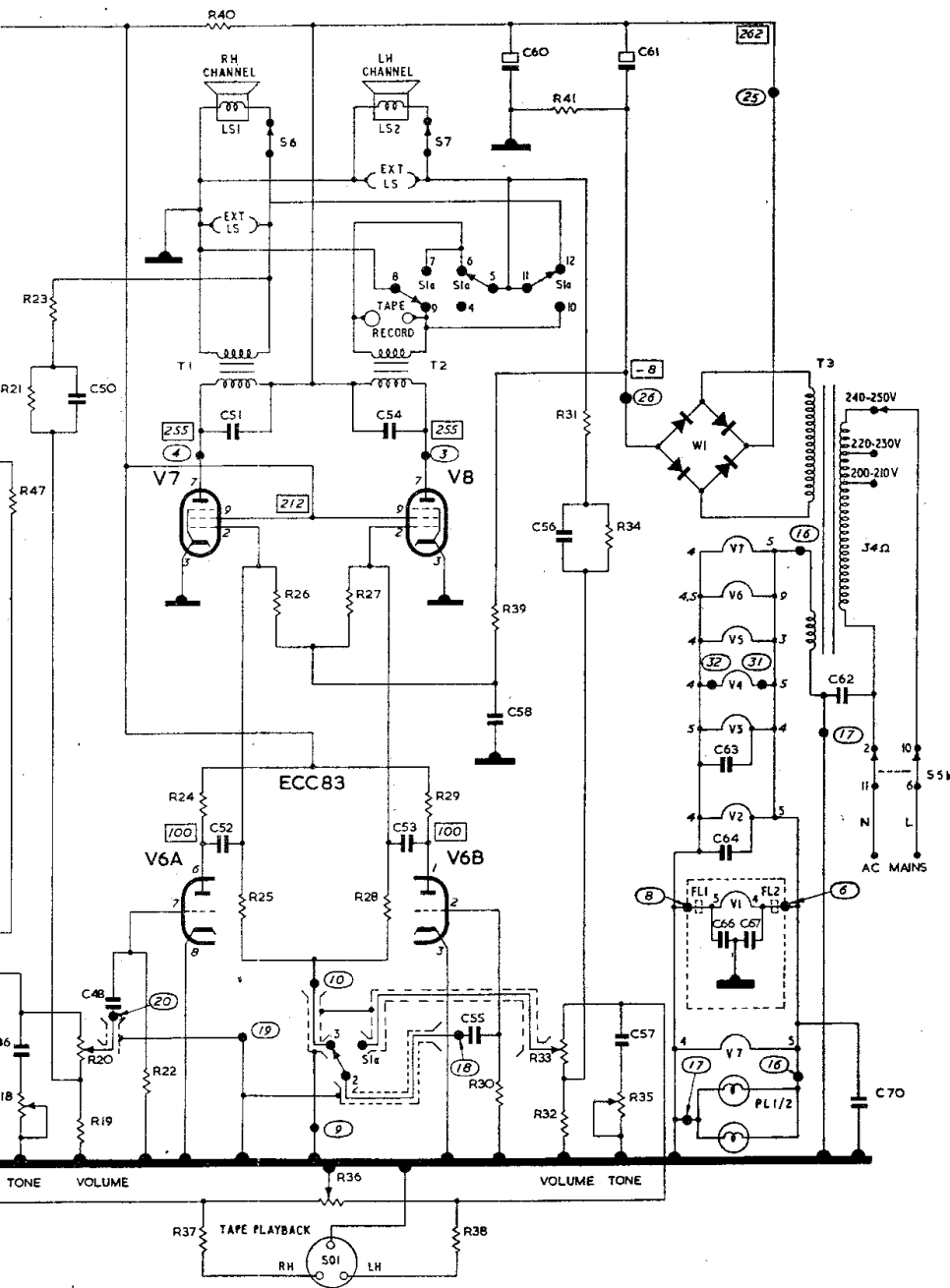
| | |
|-----|--------------|
| C16 | 18.5pF |
| C17 | Mixer tuning |
| C18 | 88pF |
| C19 | 4.40pF |
| C20 | 100pF |
| C21 | 140pF |
| C22 | 0.003μF |
| C23 | 220pF |
| C24 | 0.005μF |
| C25 | 12pF |
| C26 | 220pF |
| C27 | V2B tuning |
| C28 | 4.40pF |
| C29 | 220pF |
| C30 | 220pF |
| C31 | 220pF |
| C32 | 12pF |
| C33 | 0.02μF |
| C34 | 0.0039μF |
| C35 | 315pF |
| C36 | 0.01μF |
| C37 | 220pF |
| C38 | 15pF |
| C39 | 0.04μF |
| C40 | 220pF |
| C41 | 56pF |
| C42 | 100pF |
| C43 | 0.002μF |
| C44 | 300pF |
| C45 | 100pF |
| C46 | 0.002μF |
| C47 | 4μF, 100V |
| C48 | 0.04μF |
| C49 | 0.02μF |
| C50 | 1μF |

| | |
|-----|------------|
| C51 | 0.0018μF |
| C52 | 0.01μF |
| C53 | 0.01μF |
| C54 | 0.0018μF |
| C55 | 0.04μF |
| C56 | 1μF |
| C57 | 0.002μF |
| C58 | 0.5μF |
| C59 | 50μF, 275V |
| C60 | 50μF, 275V |

| | |
|-----|-------------|
| C61 | 100μF, 275V |
| C62 | 0.02μF |
| C63 | 0.005μF |
| C64 | 0.01μF |
| C65 | 0.01μF |
| C66 | 0.001μF |
| C67 | 0.001μF |
| C68 | 0.01μF |
| C69 | 3-30pF |
| C70 | 0.01μF |

RECORD CHANGERS

| | |
|-------------------|---------------------------------------|
| H.M.V. 1639: | .. Garrard RC121 Mk. 73/1B cartridge. |
| H.M.V. 1640 | .. Replacement stylus S... |
| H.M.V. 1642 | .. B.S.R. UA14 with TC... |
| H.M.V. 1645 | .. Replacement stylii T... |
| Marconiphone RG87 | .. i.p.) and TC8G (7... |
| H.M.V. 1643: | .. Garrard RC209 with... |
| Ferguson 604RG | .. Replacement stylus S... |
| | .. B.S.R. UA12 with TC... |



Piano-key switching diagram for modes 1639, 1643, 1645 and 604RG, shown in m.w. position as viewed from rear of upright chassis. The v.h.f. key operates S2A/B; and S3A/B; the m.w. merely resets S1, S2, S3 and S4 to their neutral positions.

CIRCUIT VARIATIONS

In early models C69 was not fitted and C35 was 346pF. C51 and C54 were 0.002μF in some early sets.

Models 1640, 1642 and RG87 have the same basic circuit except that there is no tuning indicator V4 fitted; R45, R46, R47 and C68 are not included. R44 is replaced by a 100pF capacitor. Also, an extra position on the wave-change switch is used to switch out the tone correcting network R21/C50 on a.m. operation.

DISMANTLING

Remove f.m. aerial plug and external aerial and earth connections. Remove cabinet back. (In Model 1640 only, pull off control knobs.) From underside of chassis, unscrew four chassis-fixing bolts (the nuts are riveted to the chassis and cannot be removed).

Unscrew two mains transformer retaining nuts and free transformer. Disconnect leads to internal speaker and f.m. aerial panel (two self-tapping screws). Release ferrite rod aerial, remove tape playback-record panel (two self-tapping screws).

Free mains terminal block (one Phillips self-tapping screw) and release mains lead from block to record changer. Unsolder pickup leads on record changer.

The chassis is then free and may be removed from the cabinet complete with mains transformer, f.m. aerial panel and tap playback-record panel.

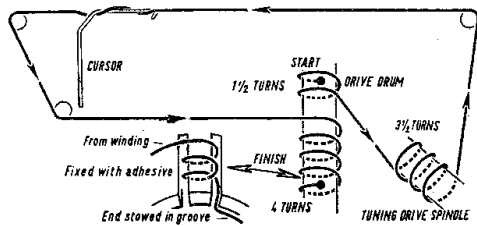
- 18.5pF Mixer tuning
- 88pF
- 4-40pF
- 100pF
- 140pF
- 0.003μF
- 220pF
- 0.005μF
- 12pF
- 220pF
- Y2B tuning
- 4-40pF
- 220pF
- 220pF
- 220pF
- 12pF
- 0.02μF
- 0.0039μF
- 315pF
- 0.01μF
- 220pF
- 15pF
- 0.04μF
- 220pF
- 56pF
- 100pF
- 0.002μF
- 300pF
- 100pF
- 0.002μF
- 4μF, 100V
- 0.04μF
- 0.02μF
- 1μF

| | | | |
|-----|------------|-----|-------------|
| C51 | 0.0018μF | C61 | 100μF, 275V |
| C52 | 0.01μF | C62 | 0.02μF |
| C53 | 0.01μF | C63 | 0.005μF |
| C54 | 0.0018μF | C64 | 0.01μF |
| C55 | 0.04μF | C65 | 0.01μF |
| C56 | 1μF | C66 | 0.001μF |
| C57 | 0.002μF | C67 | 0.001μF |
| C58 | 0.5μF | C68 | 0.01μF |
| C59 | 50μF, 275V | C69 | 3-30pF |
| C60 | 50μF, 275V | C70 | 0.01μF |

| | | |
|---------|----|-------|
| Valves: | V1 | ECC85 |
| | V2 | ECH81 |
| | V3 | EBF89 |
| | V4 | EM81 |
| | V5 | EB91 |
| | V6 | ECC83 |
| | V7 | EL84 |
| | V8 | EL84 |

RECORD CHANGERS

| | | |
|-------------------|----|---|
| H.M.V. 1639: | .. | Garrard RC121 Mk. II with Acos 73/1B cartridge. Replacement stylus SS73. |
| H.M.V. 1640 | .. | B.S.R. UA8 with TC8S cartridge. Replacement stylii TC8RS (stereo l.p.) and TC8G (78 r.p.m.). |
| H.M.V. 1642 | .. | B.S.R. UA14 with TC8S cartridge. |
| H.M.V. 1645 | .. | Replacement stylii TC8RS (stereo l.p.) and TC8G (78 r.p.m.). |
| Marconiphone RG87 | .. | |
| H.M.V. 1643: | .. | Garrard RC209 with Acos 73/1B cartridge. Replacement stylus SS73. |
| Ferguson 604RG | .. | B.S.R. UA12 with TC8S cartridge. |



DRIVE CORD DIAGRAM

Drive cord system used on all models. In the Marconiphone model RG87 there are only 2½ turns on the drive spindle.

Alignment Procedure

Where more than one peak is obtained in trimming, the outer peak is the correct one. A hexagonal trimming tool is required for alignment. Where two coil adjustments are located in the same former, the shape of the hexagonal trimming tool allows for both cores to be adjusted independently from the top.

F.M. ALIGNMENT

I.F. Circuits

The following procedure is based in the use of a signal generator providing Band II coverage, also 10.7 Mc/s a.m. and 10.7 Mc/s f.m. (25 kc/s deviation). Throughout alignment signal input should be adjusted to maintain an audio output of about 100mW.

Switch to v.h.f., set volume control 90-deg. back from maximum and tone control to maximum treble. Inject 10.7 Mc/s f.m. via 400pF capacitor to grid of V2 and trim L20, L21, L13 and L12 for maximum output.

A.M. rejection check: Inject 10.7 Mc/s a.m. and trim L21 for minimum output. Inject 10.7 Mc/s f.m. and check that f.m. output has been retained. If maximum a.m. rejection does not coincide with maximum f.m. output, trim L21 for maximum rejection at the expense of a slight reduction in f.m. output.

Unscrew the core of L8 in the f.m. tuner unit so that it protrudes from the former by about $\frac{3}{8}$ in. Inject 10.7 Mc/s f.m. to the tuner test point and trim L7 for maximum output; then peak L8.

R.F. Circuits

Check that the cursor coincides with the edge of the scale opening when the tuning gang is fully closed. Adjust tuning control to set cursor to 91 Mc/s on scale.

Inject 91 Mc/s f.m. at the aerial socket and tune in signal by adjusting L6; if two peaks are obtained the one obtained with the core nearest the top of the former is the correct one.

Trim L4 for maximum audio output with the core towards the bottom of the former. Check calibration over the range.

A. M. ALIGNMENT

I.F. Circuits

Switch to m.w., turn gang to minimum capacitance position and volume control to maximum. Inject 470 kc/s modulated via 0.01µF capacitor to V2 grid and trim L19, L18, L15 and L14 for maximum output.

R.F. Circuits

The m.w. band must be aligned first. Signals (30 per cent modulated) should be injected via a loop loosely coupled to

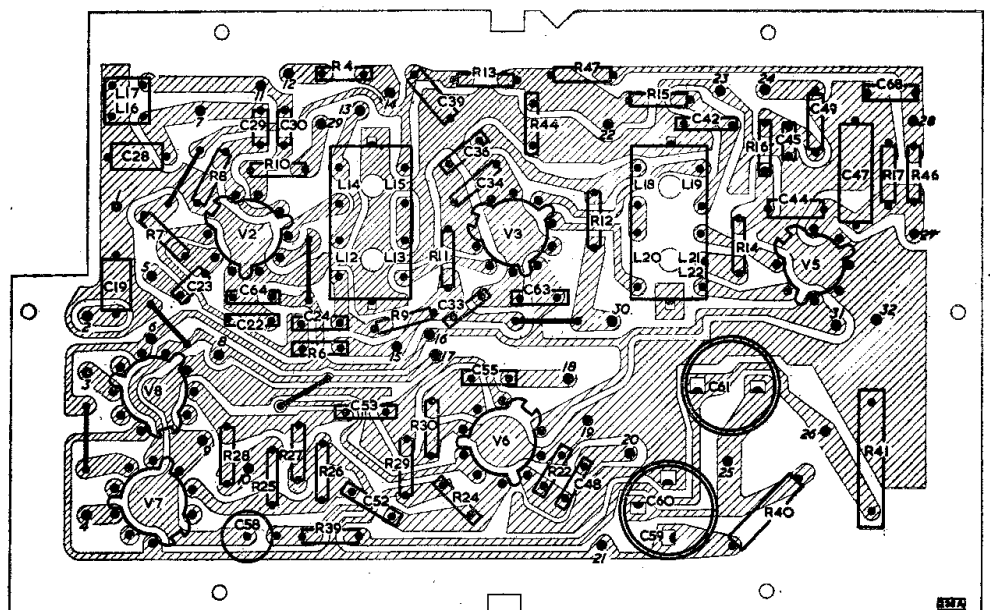
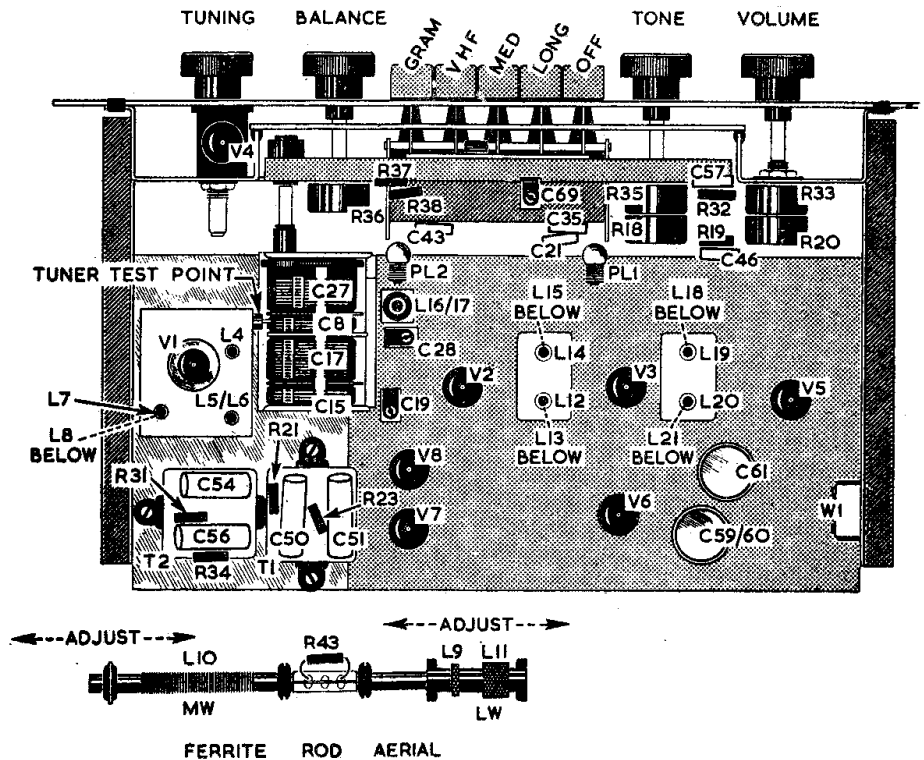
the ferrite rod aerial. With the tuning gang at maximum, set the cursor to the right-hand edge of the scale opening. Padding and trimming markers are provided on m.w., and a calibration check point on l.w.

Inject 580 kc/s, set cursor to Pad marker and trim L16 for maximum output, then adjust L10 by sliding ring along aerial rod for maximum output. Re-tune signal generator to 1460 kc/s,

set cursor to Trim marker and trim C28 and C19 for maximum output.

Switch to l.w., inject 220 kc/s, tune receiver to signal and adjust C69 and L11 by sliding coil former along aerial rod, for maximum output. Check calibration.

Note: In Schedule A receivers, an adjustable l.w. oscillator trimmer is not fitted and L11 only is adjusted for maximum output.



Above-chassis and below-chassis views showing the location of components and position of coils and trimmers for alignment. These diagrams apply to models 1639, 1643, 1645 and 604RG. The layout for other models is nearly the same; component numbers apply to all models.