

"TRADER" SERVICE SHEET  
**1348**

# EKCO A320

## A.M./F.M. Table Receiver

**T**HE Ekco A320 is a five-valve, plus rectifier, A.M./F.M. superhet designed to operate from A.C. mains only of 200-250V, 50c/s, using a double-wound mains transformer. Waveband ranges are 86-100Mc/s (F.M.); 182-545m (M.W.) and 1,200-2,000m (L.W.). Total mains consumption is 54W. It is fitted with a ferrite rod internal aerial for A.M. reception and an internal dipole built in to the cabinet for F.M. reception, while provision is made for the connection of external aerials and a gramophone pick-up.

Release date and original price: September, 1957; £18 17s 8d. Purchase tax extra.

### CIRCUIT DESCRIPTION

Tuned A.M. aerial circuits **L8, C18, C19** (M.W.) and **L8, L9, C17, C18** and **C19** (L.W.) precede triode-heptode A.M. frequency changer valve **V2**. External aerial is coupled via **C14** and **C15**. **L8** and **L9** are mounted at opposite ends of a ferrite rod to form an internal aerial.

Parallel-fed triode oscillator is tuned by **L10, C23, C24, C25** and **C28** (M.W.) and by **L10, C23, C24, C25, C26, C27** and **C28** (L.W.). **C24** and **C26** are parallel trimming capacitors for M.W. and L.W. respectively. **C28** is employed as a series tracking capacitor on both bands. Reaction coupling by **C29, L11**.

Second A.M. valve **V3** is a variable- $\mu$  R.F. pentode operating as intermediate frequency amplifier with tuned transformer couplings **C32, L14, L15, C33** and **C40, L19, L20, C41**.

### A.M. intermediate frequency 470kc/s

Diode A.M. signal detector is part of triple-diode-triode valve **V4**. Audio frequency component in its rectified output is filtered, by **C42, R17, C46** and developed across load resistor **R21** and passed via **S14, C49**, volume control **R22** and **C50** to the control grid of **V4d**.

The D.C. potential developed across **R21** is fed back via decoupling circuit **R19, C43** to **V2** and **V3**, giving automatic gain control. Provision is made for

the connection of a gramophone pick-up across the volume control **R22** via **C49**.

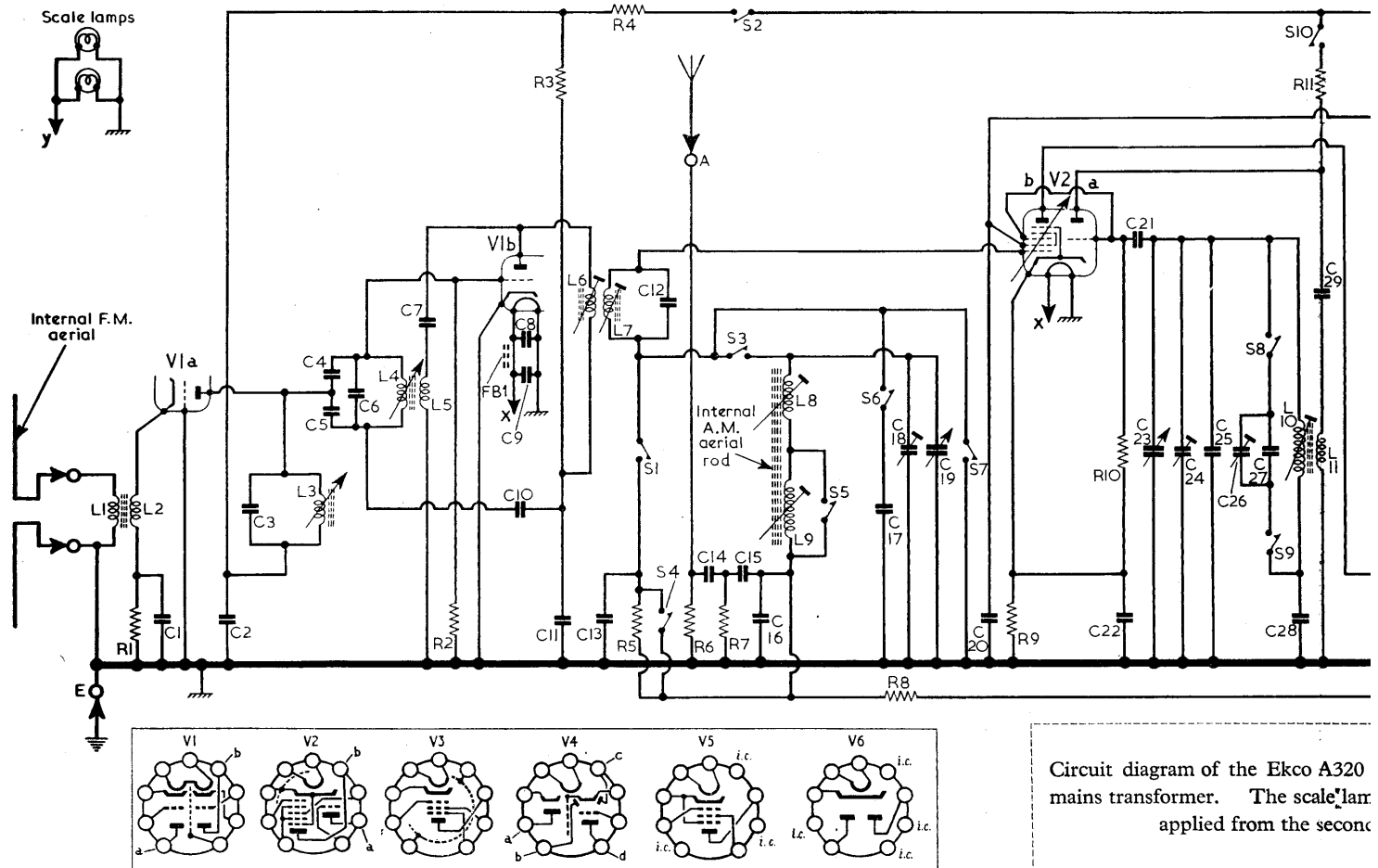
Resistance-capacitance coupling by **R24, R25** and **C52** to the control grid of pentode output valve **V5**. Tone control by **R26, C53**. Tone correction by negative feed-back via **R30, R31, R22** and **C50**.

H.T. current is supplied by full-wave rectifying valve **V6**. Smoothing by **C56, R29** and **C55**.

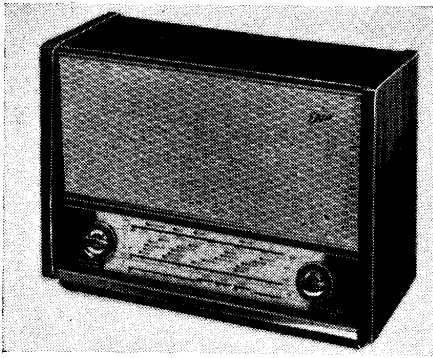
### Operation on F.M.

75 $\Omega$  co-axial or 300 $\Omega$  twin aerial input via transformer **L1, L2** to the earthed grid R.F. amplifier valve, section a of **V1**. Output of **V1a** is developed across **L3, C3** and coupled via **C4, C5** to **V1b**.

**V1b** is employed as a self-oscillating mixer with reaction coupling by **C7, L5** to the oscillator tuned circuit comprising **C4, C5, C6** and **L4**. Permeability tuning is employed in the R.F. and oscillator circuits, the cores of **L3** and **L4** being ganged and connected via a drive cord and pulley to the spindle of the A.M. ganged tuning capacitor.



Circuit diagram of the Ekco A320 mains transformer. The scale lamp applied from the second



The Ekco A320 receiver.

V2b and V3 are employed as F.M. intermediate frequency amplifiers with tuned transformer couplings L6, L7; L12, L13; and L16, L17, L18.

F.M. intermediate frequency 10.7Mc/s

Diode sections a and b of V4 are employed in a ratio detector circuit. A.F. output is developed across capacitive load C39, and fed via de-emphasis circuit R16, C45 and S13, C49 to volume control R22. From R22 the audio signal route is the same as described for A.M. operation. The negative voltage developed across the D.C. load circuit C48, R20 is fed back to the suppressor grid of V3, giving automatic gain control.

**Capacitors**

|     |         |    |
|-----|---------|----|
| C1  | 0.001μF | J5 |
| C2  | 0.001μF | J5 |
| C3  | 3pF     | J5 |
| C4  | 6pF     | J5 |
| C5  | 6pF     | J5 |
| C6  | 20pF    | J5 |
| C7  | 20pF    | J5 |
| C8  | 0.001μF | J5 |
| C9  | 0.01μF  | J5 |
| C10 | 12pF    | J5 |
| C11 | 100pF   | J5 |
| C12 | 15pF    | J5 |
| C13 | 0.001μF | H3 |
| C14 | 0.01μF  | B2 |
| C15 | 0.01μF  | B2 |
| C16 | 4,700pF | B2 |
| C17 | 130pF   | H3 |
| C18 | 30pF    | B2 |
| C19 | —       | B2 |
| C20 | 0.01μF  | H4 |
| C21 | 82pF    | H4 |
| C22 | 0.04μF  | H4 |
| C23 | —       | B1 |
| C24 | 30pF    | B1 |
| C25 | 10pF    | H4 |
| C26 | 435pF   | H4 |
| C27 | 435pF   | H4 |
| C28 | 495pF   | H4 |
| C29 | 200pF   | H4 |
| C30 | 10pF    | A2 |
| C31 | 15pF    | A2 |
| C32 | 100pF   | A2 |
| C33 | 100pF   | A2 |
| C34 | 0.1μF   | G4 |
| C35 | 0.04μF  | G4 |
| C36 | 0.01μF  | G4 |
| C37 | 15pF    | B2 |
| C38 | 22pF    | B2 |
| C39 | 220pF   | G4 |
| C40 | 350pF   | B2 |
| C41 | 350pF   | B2 |
| C42 | 220pF   | G4 |
| C43 | 0.04μF  | H4 |

|     |         |    |
|-----|---------|----|
| C44 | 0.01μF  | H4 |
| C45 | 500pF   | G4 |
| C46 | 220pF   | G4 |
| C47 | 0.01μF  | G4 |
| C48 | 2μF     | G4 |
| C49 | 0.01μF  | E3 |
| C50 | 0.01μF  | G4 |
| C51 | 220pF   | G4 |
| C52 | 0.01μF  | F4 |
| C53 | 0.003μF | E3 |
| C54 | 8μF     | E4 |
| C55 | 50μF    | C2 |
| C56 | 50μF    | C2 |
| C57 | 50μF    | F4 |

**Resistors**

|     |       |    |
|-----|-------|----|
| R1  | 220Ω  | J5 |
| R2  | 1MΩ   | J5 |
| R3  | 4.7kΩ | A1 |
| R4  | 1.5kΩ | A2 |
| R5  | 220kΩ | H3 |
| R6  | 1.5MΩ | B2 |
| R7  | 3.3kΩ | B2 |
| R8  | 470kΩ | B2 |
| R9  | 150Ω  | H4 |
| R10 | 47kΩ  | H4 |
| R11 | 56kΩ  | H4 |
| R12 | 18kΩ  | G4 |
| R13 | 180Ω  | G4 |
| R14 | 2.2kΩ | G4 |
| R15 | 82Ω   | G4 |
| R16 | 47kΩ  | G4 |
| R17 | 47kΩ  | G4 |
| R18 | 150Ω  | G4 |
| R19 | 2.2MΩ | G4 |
| R20 | 47kΩ  | G4 |
| R21 | 220kΩ | H3 |
| R22 | 820kΩ | E3 |
| R23 | 10MΩ  | G4 |
| R24 | 220kΩ | F4 |
| R25 | 150kΩ | G4 |
| R26 | 820kΩ | E3 |
| R27 | 4.7kΩ | F4 |
| R28 | 150Ω  | F4 |

|     |      |    |
|-----|------|----|
| R29 | 820Ω | F3 |
| R30 | 220Ω | F3 |
| R31 | 10Ω  | F3 |

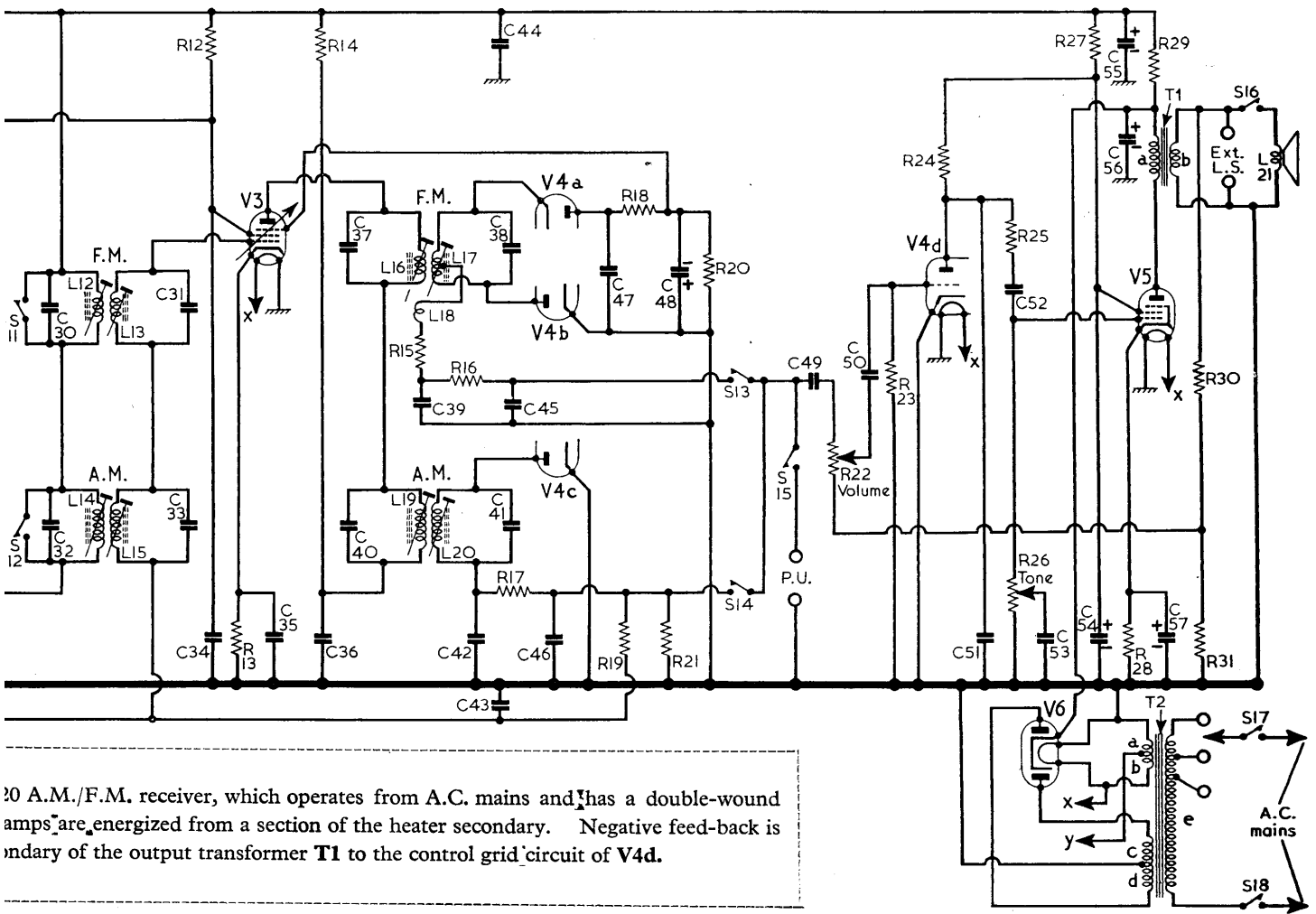
**Coils\***

|     |      |    |
|-----|------|----|
| L1  | —    | J5 |
| L2  | —    | J5 |
| L3  | —    | J5 |
| L4  | —    | J5 |
| L5  | —    | J5 |
| L6  | —    | J5 |
| L7  | —    | J5 |
| L8  | —    | B2 |
| L9  | 7.0  | C2 |
| L10 | 2.0  | H4 |
| L11 | 1.0  | H4 |
| L12 | —    | A2 |
| L13 | —    | A2 |
| L14 | 10.0 | A2 |
| L15 | 10.0 | A2 |
| L16 | —    | B2 |
| L17 | —    | B2 |
| L18 | —    | B2 |
| L19 | 5.0  | B2 |
| L20 | 6.0  | B2 |
| L21 | 2.5  | —  |

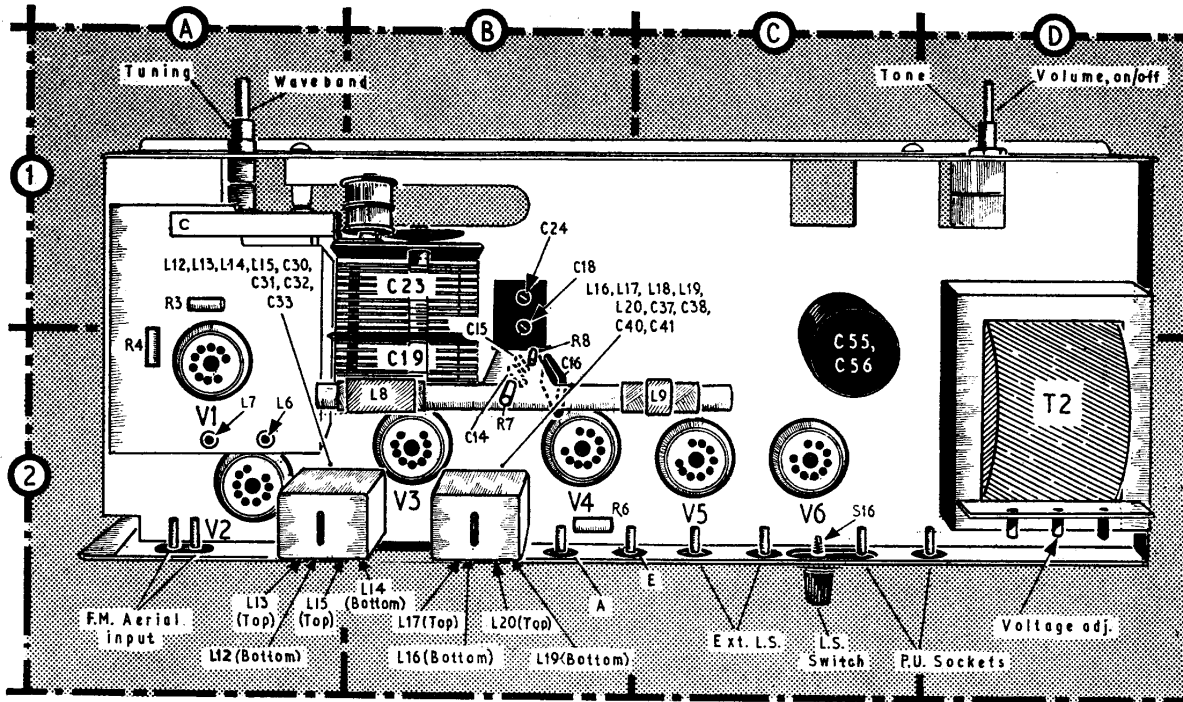
**Miscellaneous\***

|          |                |
|----------|----------------|
| T1       | { a 400.0 } F3 |
|          | { b — } F3     |
| T2       | { a — } D2     |
|          | { b 110.0 } D2 |
|          | { c 110.0 } D2 |
|          | { d 30.0 } D2  |
| FB1      | — J5           |
| S1-S15   | — H3           |
| S16      | — C2           |
| S17, S18 | — E3           |

\* Approximate D.C. resistance in ohms.



20 A.M./F.M. receiver, which operates from A.C. mains and has a double-wound amp's are energized from a section of the heater secondary. Negative feed-back is inductive of the output transformer T1 to the control grid circuit of V4d.



Right: Sketch of the tuning drive system, drawn as seen when viewed from the front with the gang at maximum.

Left: Plan view of the chassis, with the V.H.F. tuner on the left. C26, which in our chassis was on the underside, may be fitted in location B1, next to C24.

**CIRCUIT ALIGNMENT**

**Equipment Required.**—A.M./F.M. signal generator, modulated 30 per cent at 400c/s for A.M., and unmodulated for F.M.; an output meter; a 20,000-ohms-per-volt meter, two matched 220kΩ carbon resistors; and an insulated trimming tool for core adjustments.

Check that with the gang at minimum the F.M. tuner carriage is  $\frac{1}{8}$  inch

from fully open, and adjust if necessary by rotating the drive collar on the gang shaft. Also check that with the gang at minimum capacitance the cursor coincides with the datum line at the right-hand end of the L.W. scale.

L8 and L9 are ferrite rod tuned and should be adjusted for maximum output by sliding their formers along the ferrite rod and securing them to the rod with an adhesive after alignment.

**A.M. Alignment**

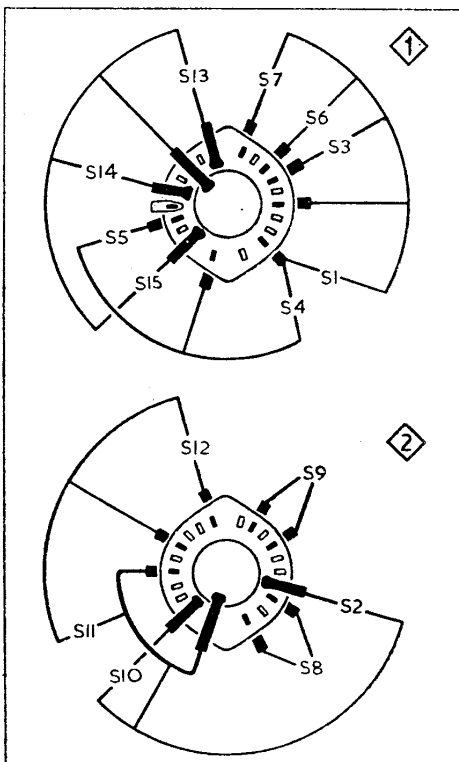
- 1.—Connect the output meter across external speaker sockets.
- 2.—Switch receiver to M.W. and tune it to 550m. Turn volume control to maximum. Connect signal generator to the control grid (pin 2) of V3 and chassis. Feed in a 470kc/s signal and adjust L20 (B2), L19 (B2), L15 (A2) and L14 (A2) in that order for maximum output, reducing the generator output as the circuits are brought into line.
- 3.—Tune receiver to 500m. Connect signal generator via dummy aerial to the A.M. aerial and earth sockets. Feed in a 600kc/s signal and adjust L10 (H4) for maximum output.
- 4.—Tune receiver to 200m, feed in a 1,500kc/s signal and adjust C24 (B1) and C18 (B2) for maximum output.
- 5.—Tune receiver to 425m, feed in a 700kc/s signal and adjust the position of L8 (B2) for maximum output.

- 6.—Switch receiver to L.W., and tune it to 1,400m. Feed in a 214.3kc/s signal and adjust C26 (H4) and L9 (C2) for maximum output.

**F.M. Alignment**

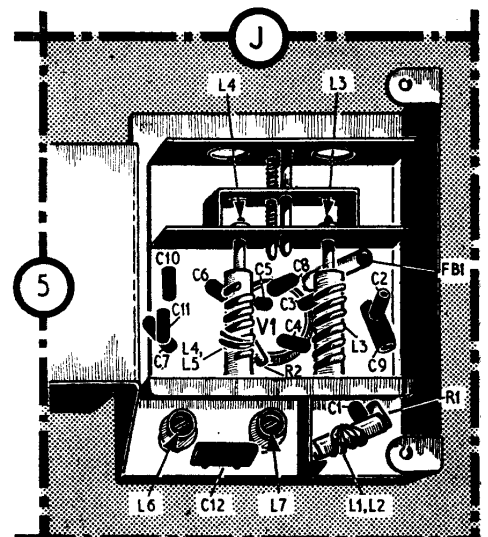
- 1.—Switch receiver to F.M. and tune it to the low frequency end of the scale. Turn volume and tone controls fully clockwise. Connect the two 220kΩ matched resistors in series across R20 (G4). Connect 20,000 ohms/volt output meter between the junction of the two 220kΩ resistors and chassis. Connect signal generator to the control grid (pin 2) of V3 and chassis. Feed in a 10.7Mc/s C.W. signal (not modulated) and adjust L16 (B2) for maximum output.
- 2.—Connect output meter between the junction of the two 220kΩ resistors and the junction of R15 (G4) and C39 (G4) and adjust L17 (B2) for zero output. L17 should be tunable from a maximum in one direction to a maximum in the other direction. The correct

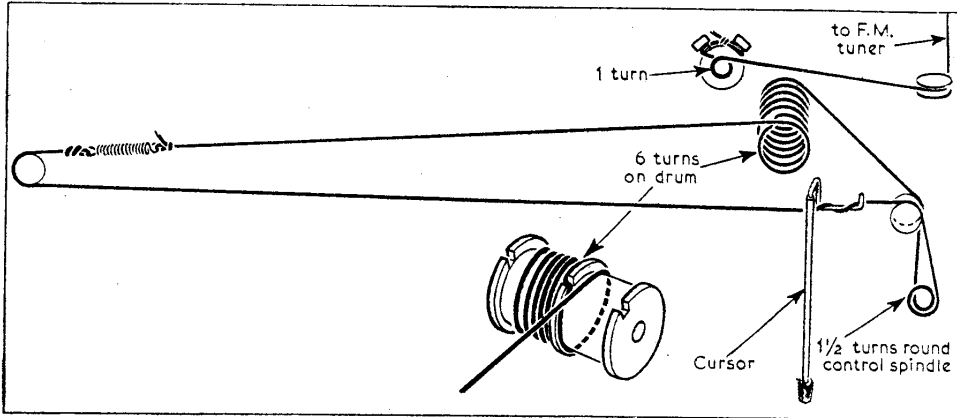
**Waveband Switch Diagrams**



Diagrams of the two switch units, as seen from the rear. The associated table is in the next column.

| Switches | F.M. | M.W. | L.W. | Gram. |
|----------|------|------|------|-------|
| S1       | C    | —    | —    | —     |
| S2       | C    | —    | —    | —     |
| S3       | —    | C    | C    | —     |
| S4       | —    | —    | —    | C     |
| S5       | —    | C    | —    | C     |
| S6       | —    | —    | —    | C     |
| S7       | —    | —    | —    | C     |
| S8       | —    | —    | —    | C     |
| S9       | —    | —    | —    | C     |
| S10      | —    | C    | C    | C     |
| S11      | —    | C    | C    | C     |
| S12      | C    | C    | —    | —     |
| S13      | C    | —    | —    | —     |
| S14      | —    | C    | C    | —     |
| S15      | —    | —    | —    | C     |





tuning point is the zero position between the two peaks.

- 3.—Connect output meter across C39 (G4). Connect signal generator to control grid (pin 2) of V2 and chassis. Feed in a 10.7Mc/s signal and adjust L13 (A2) and L12 (A2) for maximum output. Retune L16 (B2) if necessary.
- 4.—Connect signal generator to the junction of R3 (A1) and R4 (A1) via a 0.001 $\mu$ F H.T. isolating capacitor. Feed in a 10.7Mc/s signal and adjust L6 (A2) and L7 (A2) for maximum output.
- 5.—Tune receiver to 91Mc/s. Connect signal generator to the F.M. aerial sockets and feed in a 91Mc/s signal, unmodulated. Adjust L4 (J5) and L3 (J5) for maximum output.

**GENERAL NOTES**

**Switches.**—S1-S15 are the waveband and radio/gram switches, ganged in two rotary units beneath the chassis. The units are indicated in our underside view of the chassis, where they are identified by the numbers 1 and 2 in diamond surrounds, and shown in detail in col. 1, where they are drawn as seen when viewed in the direction of the arrows in the underchassis illustration.

The associated table shows the switch positions for the four control settings, starting from the fully anti-clockwise

position of the control knob. A dash indicates open and C closed.

**A.M. Drive Cord.**—A length of nylon cord of approximately 47 inches is required, which should be run as shown at the head of this column, where it is drawn as seen when viewed from the front of the chassis with the gang at maximum capacitance. In this position the slots in the double drive drum should be approximately 45 degrees from the vertical position, at about 10 o'clock.

Attach the cord spring to one end of the new cord and temporarily anchor the other end of the spring to the unused earthing lug situated above the chassis near the volume control. Pass the cord one turn clockwise round the front section of the double drive drum, then through the slot in the central fin and then five turns clockwise round the rear section of the drum. Pass the cord over the rear plastics pulley, then 1 1/2 turns anti-clockwise round the tuning knob spindle, back over the front plastics pulley and clockwise round the plastics pulley at the other end of the chassis. Release the spring from its temporary anchor position and tie the free end of the cord to the free end of the spring so that the spring is under slight tension. Seal the knots with adhesive and fit the cursor.

**F.M. Drive Cord.**—Replacement of this tuning drive necessitates the complete removal of the F.M. tuner unit and the F.M. circuits will require re-alignment after the tuning unit drive cord has been replaced.

A length of nylon cord of approximately 10 inches is required together with a brass eyelet. To remove F.M. unit, disconnect the leads

and bonding braid, release the pointer drive and remove four screws from beneath the tuner chassis. Remove the screening cover (four 6 B.A. cheese head screws).

Make a half-inch loop in one end of the cord and seal the knot with an adhesive. Hold the cord taut and make a mark 6 1/2 in from the end overall. Press the tuner unit carriage forward against the tension of the spring and thread the free end of the cord through the central hole in the front of the unit then through the corresponding holes in the carriage bracket and the insulated panel. The eyelet should now be threaded on to the cord so that the shank faces the front of the unit. Tie a small knot at the 6 1/2 in mark, seal with adhesive, and pull the cord so that this knot is slightly imbedded into the eyelet and the shank of the latter enters the hole in the insulated panel. Release the carriage and ensure that it is free to travel to the full extent of the guides. Apply a trace of light grease to the guides if necessary. Replace the screening cover and reassemble the tuning unit on to the receiver chassis. Pass the looped cord round the plastics pulley and then one turn anti-clockwise round the gang spindle. Then pass it round one screw on the collar on the gang spindle, and loop it on to the second screw, as shown in the sketch.

**Scale Lamps.**—These are two 6.5V, 0.3A lamps with a clear spherical bulb and an M.E.S. base.

**VALVE ANALYSIS**

Valve voltages and currents given in the table below are derived from the manufacturers' service information. Voltages were measured with a Model 8 Avometer, chassis being the negative connection in every case. The receiver was tuned to the low frequency end of the scale with no signal input.

| Valve      | Anode            |      | Screen |     | Cath. |      |
|------------|------------------|------|--------|-----|-------|------|
|            | V                | mA   | V      | mA  | V     | mA   |
| V1a ECC85  | 208              | 9.3  | —      | —   | —     | —    |
| V1b ECC85  | 182              | 5.6  | —      | —   | —     | —    |
| V2a ECH81  | 74               | 2.9  | —      | —   | —     | —    |
| V2b ECH81  | 251              | 2.3  | 96     | 6.2 | 1.8   | 11.5 |
|            | 230              | 7.3  | 103    | 4.5 | 1.8   | 11.8 |
| V3 EF89    | 225              | 6.9  | 96     | 2.1 | 1.78  | 8.5  |
|            | 213              | 7.4  | 103    | 2.3 | 1.9   | 9.1  |
| V4d EABC80 | 78               | 0.7  | —      | —   | —     | —    |
|            | 75               | 0.6  | —      | —   | —     | —    |
| V5 EL84    | 255              | 43.0 | 225    | 4.6 | 6.8   | 47.6 |
| V6 EZ80    | 248              | 39.0 | 207    | 4.1 | 6.2   | 43.0 |
|            | 245 <sup>1</sup> | —    | —      | —   | —     | —    |

\*Set switched to A.M.  
 †Set switched to F.M.  
<sup>1</sup>Each anode A.C.

**Right:** Underside view of the chassis. The tuning capacitor, C26 (H4), may be located on the top of the chassis alongside C24 (B1).

**Left:** Under view of the tuner unit. In the upper half is seen the bracket by which the cores of L3, L4 are ganged for permeability tuning. Setting of the individual cores is done through the holes in screen and bracket.

