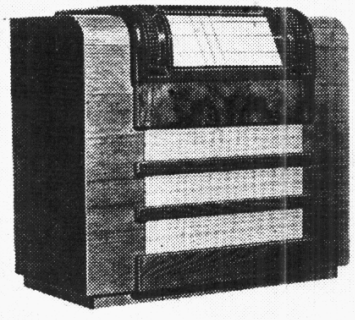
*Supplement to The Wireless & Electrical Trader, February 12, 1944*

"TRADER" SERVICE SHEET 659

# EKCO AW98

## 4-BAND AC SUPERHET

REVISED ISSUE OF SERVICE SHEET No. 308



FOUR wavebands, including a television sound channel, are provided in the Ekco AW98, the SW range being 16-50 m.

The receiver is a 4-valve (plus rectifier) superhet, designed for 200-250 V, 40-80 c/s AC mains. There is provision for a gramophone pick-up and an external speaker.

*Release date and original price: August, 1937; £16 5s. 6d.*

### CIRCUIT DESCRIPTION

Aerial input on MW and LW via coupling condenser **C2** (MW) and **L2** (LW) to inductively coupled band-pass filter. Primary coils **L3, L4** are tuned by **C36;** secondary coils **L9, L10** by **C42.** On **LW** aerial circuit is shunted by IF filter **L1, C3.** Image suppression by **C38.**

On television sound, referred to as "TS", and SW bands, input is via **S1** and coupling coil **L5** (TS) or **S2** and **L6** (SW) to single tuned circuits **L7, C42** (TS) or **L8, C42** (SW). Provision is made for connection of a dipole aerial at socket **A** and the unmarked socket immediately below it. Socket **E** should be connected to earth.

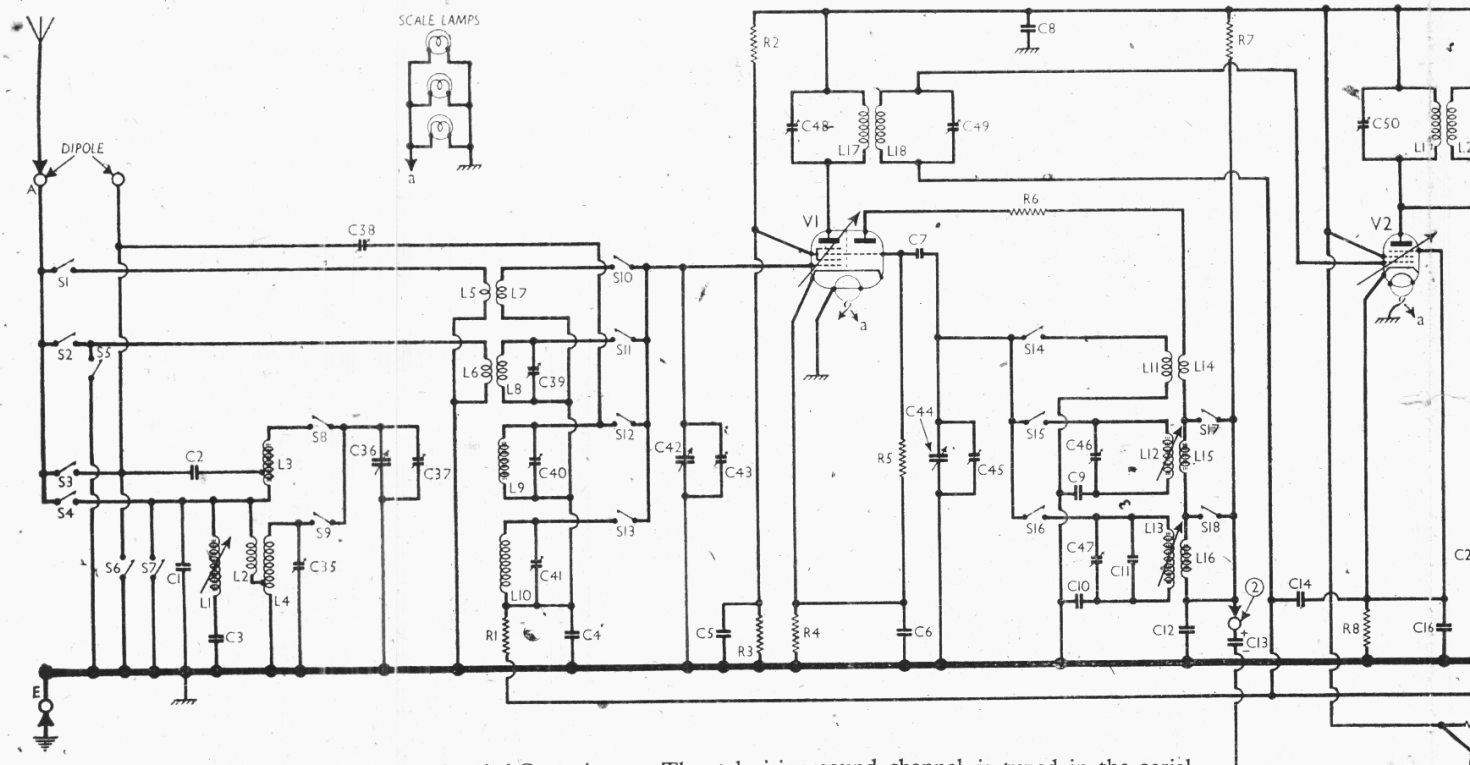
First valve **(V1, Mullard metallised TH4A)** is a triode hexode operating as frequency changer with internal coupling. Triode oscillator grid coils **L11** (TS and SW), **L12** (MW) and **L13** (LW) are tuned by **C44;** parallel trimming by **C45** (SW), **C46** (MW) and **C11, C47** (LW); series tracking by **C9** (MW) and **C10** (LW), and adjustable iron cores in both cases. Reaction by coils **L14** (TS and SW), **L15** (MW) and **L16** (LW), which are connected in series, **S17** (SW) and **S18** (MW) shorting those which are not required.

Second valve **(V2, Ekco metallised VP41** or **Mullard VP4B)** is a variable-mu RF pentode operating as intermediate frequency amplifier with tuned-primary, tuned-secondary transformer couplings **C48, L17, L18, C49** and **C50, L19, L20, C51.**

**Intermediate frequency 126.5 kc/s.**

Diode second detector is part of double diode triode valve **(V3, Ekco metallised DT41** or **Mullard TDD4).** Audio frequency component in rectified output is developed across load resistor **R12** and passed via AF coupling condenser **C17** and manual volume control **R10** to CG of triode section, which operates as AF amplifier. Variable tone control by RC filter **C19, R11** between CG and chassis. Fixed tone correction by **C18** between **C17** and CG. IF filtering by **C20, C21** and **R9** in diode circuit, and **C23** in triode anode circuit. Provision for connection of gramophone PU across **R10.**

Tuning indicator **(T.I., Mullard TV4)** obtains its operating potential from




Circuit diagram of the Ekco AW98 4-band AC receiver. The television sound channel is tuned in the aerial circuit by **L7, C42,** but in the oscillator circuit a harmonic of the SW band circuit is used. Arrows and circles indicate throughout the diagram the points of interconnection between the receiver chassis and the power unit (1 to 9), and between the speaker and the power unit (10 to 12). Diagrams of the plugs, as viewed from the free ends of the pins, are inset beneath the circuit.

potential divider **R13, R14** via decoupling circuit **R15, C34.**

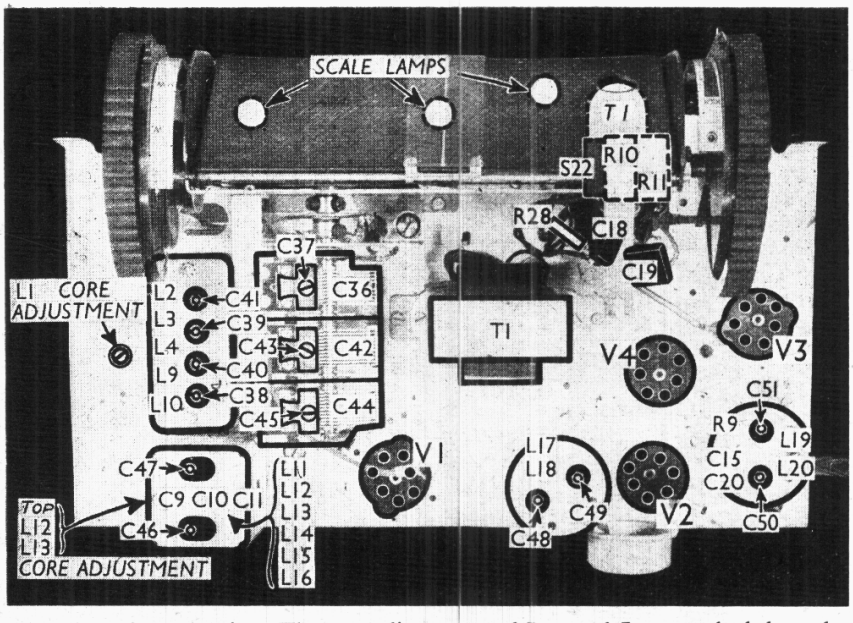
Second diode of **V3,** fed from **V2** anode via **C15,** provides DC potential which is developed across load resistor **R19** and fed back through decoupling circuits as GB to FC and IF valves, giving automatic volume control. As **R19** is returned to **V3** cathode, AVC is undelayed.

Resistance-capacity coupling by **R18** in anode circuit and, in series from **V3** anode to chassis, **C25, R21, R22, R23,** between **V3** triode and pentode output valve **(V4, Ekco OP41** or **Mullard Pen428).**

At this stage negative feed-back is introduced. Signals developed in the second secondary winding of **T2** are fed back to **V4** control grid circuit, where they are developed across **R26, C27,** which components are in series with the control grid circuit. On SW, they are short-circuited by **S20,** eliminating the feed-back signal. On TS, **S19** closes, considerably reducing the coupling ratio between **V3** and **V4.**

Fixed tone correction in anode circuit of **V4** by **C28.** Provision for connection of low impedance external speaker across part of secondary of **T1.** Total secondary output is fed via whistle filter **L21, C30, L22, L23, C31,** to internal speaker speech coil circuit. Switch **S21** permits speech coil circuit to be broken.

HT current is supplied by IHC full-wave rectifying valve **(V5, Mullard IW4/350).** Smoothing by speaker field **L26** (in negative HT lead) and electrolytic condensers **C32, C33.** HT circuit RF filtering by **C8.**

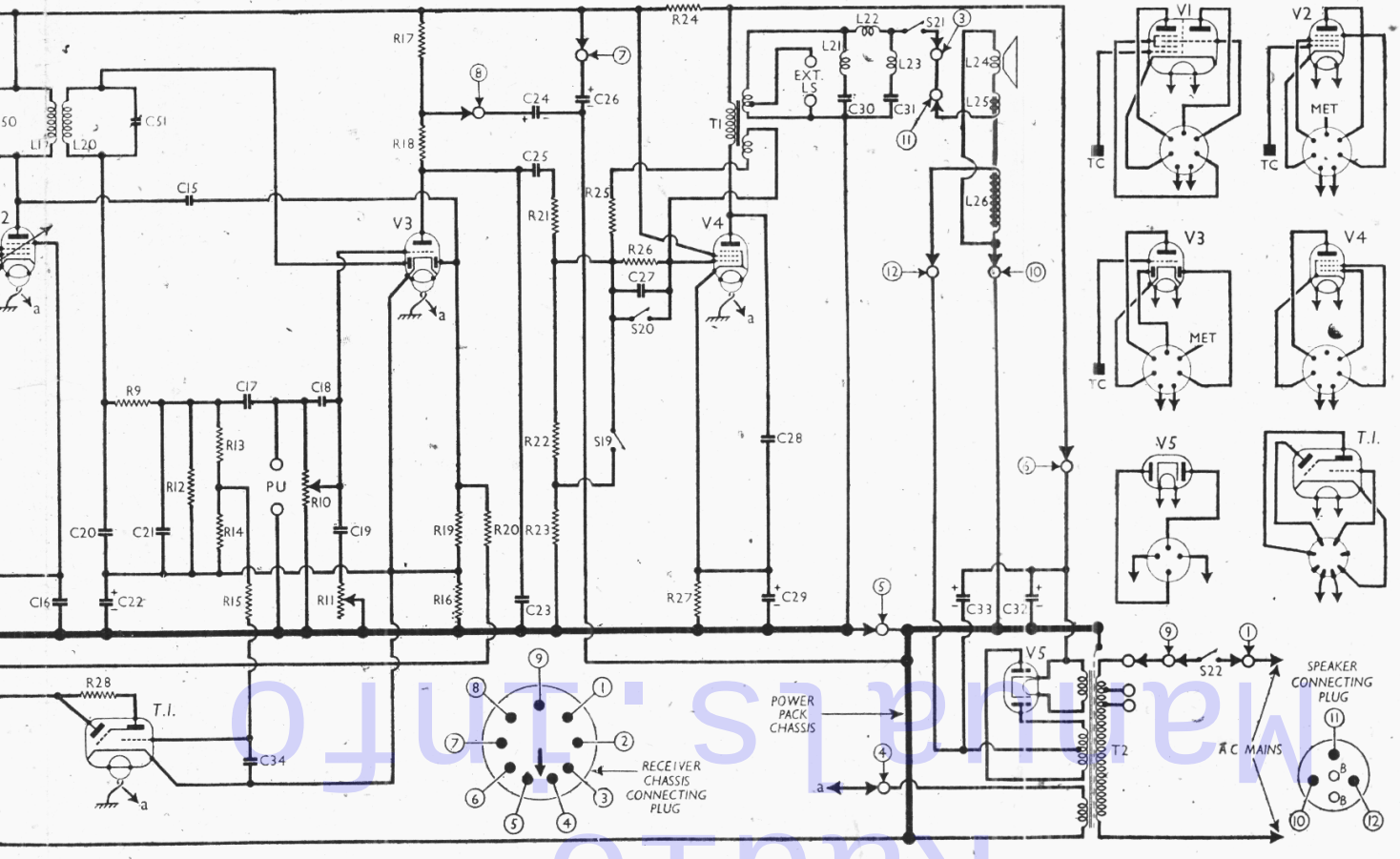


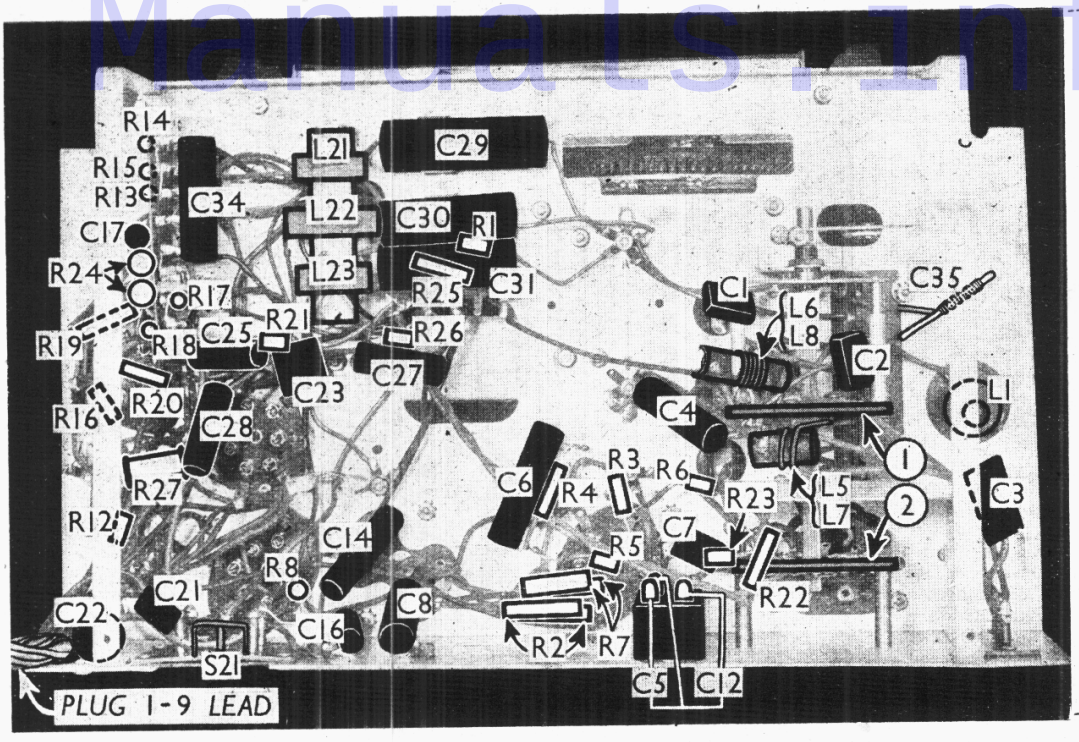

Plan view of the chassis. The core adjustments of **L12** and **L13,** reached through the side of the can, are approximately indicated. **L1** adjustment is seen through a hole in the chassis deck.

## DISMANTLING THE SET

**Removing Receiver Chassis.**—Remove two screws (with washers) holding the back of the chassis to chassis platform; remove two round-head wood screws holding the front of the chassis to the front of the cabinet; remove two screws (with lock-washers) holding the scale assembly to the top of the cabinet; withdraw the receiver chassis plug from its socket on the power unit, remove two screws (with lock-washers) holding the chassis platform to the back of the cabinet, withdraw

*(Continued on col. 3 overleaf)*






Under-chassis view. **C35** is a small semi-variable condenser, made up of wire. The adjustment for **L1** is reached through a hole in the chassis deck. The television sound and SW band coils **L5, L7** and **L6–L8**, are supported by their leads on the waveband switch units. These switch units are indicated by numbered arrows whose directions show how they are viewed in the detailed diagrams in col. 5 opposite.

## COMPONENTS AND VALUES

| | CONDENSERS | Value (μF) |
|---|---|---|
| C1 | Aerial capacity swamp | 0·001 |
| C2 | Aerial MW coupling | 0·001 |
| C3 | Aerial IF filter tuning | 0·00015 |
| C4 | V1 hex. CG decoupling | 0·04 |
| C5 | V1 SG decoupling | 0·1 |
| C6 | V1 cathode by-pass | 0·1 |
| C7 | V1 osc. CG condenser | 0·00005 |
| C8 | HT circuit RF by-pass | 0·1 |
| C9‡ | Osc. circuit MW tracker | 0.002 |
| C10 | Osc. circuit LW tracker | 0·0008 |
| C11 | Osc. LW fixed trimmer | 0·00006 |
| C12 | V1 osc. anode RF by-pass | 0·1 |
| C13* | V1 osc. anode decoupling | 2.0 |
| C14 | V2 CG decoupling | 0·04 |
| C15 | Coupling to V3 AVC diode | 0·000015 |
| C16 | V2 cathode by-pass | 0·1 |
| C17 | AF coupling to V3 triode | 0·01 |
| C18 | Fixed tone corrector | 0·00006 |
| C19 | Part variable tone control | 0·002 |
| C20 | IF by-pass condensers | 0·0002 |
| C21 | IF by-pass condensers | 0·0002 |
| C22* | V3 cathode by-pass | 25·0 |
| C23 | IF by-pass | 0·0003 |
| C24* | V3 triode anode decoupling | 2·0 |
| C25 | V3 triode to V4 coupling | 0·01 |
| C26* | Part HT smoothing | 4·0 |
| C27‡ | Part feed-back coupling | 0·02 |
| C28 | Fixed tone corrector | 0·004 |
| C29* | V4 cathode by-pass | 50·0 |
| C30 | Parts of whistle filter | 0·2 |
| C31 | Parts of whistle filter | 0·2 |
| C32* | HT smoothing condensers | 8·0 |
| C33* | HT smoothing condensers | 8·0 |
| C34 | T.I. CG decoupling | 0·1 |
| C35‡ | B-P pri. LW trimmer | — |
| C36‡ | Band-pass pri. tuning | — |
| C37‡ | B-P pri. MW trimmer | — |
| C38‡ | Image suppressor | — |
| C39‡ | Aerial SW trimmer | — |
| C40‡ | B-P sec. MW trimmer | — |
| C41‡ | B-P sec. LW trimmer | — |
| C42‡ | Band-pass sec. tuning | — |
| C43‡ | Aerial TS trimmer | — |
| C44‡ | Oscillator circuit tuning | — |
| C45‡ | Osc. circuit SW trimmer | — |
| C46‡ | Osc. circuit MW trimmer | — |
| C47‡ | Osc. circuit LW trimmer | — |
| C48‡ | 1st IF trans. pri. tuning | — |
| C49‡ | 1st IF trans. sec. tuning | — |
| C50‡ | 2nd IF trans. pri. tuning | — |
| C51‡ | 2nd IF trans. sec. tuning | — |

* Electrolytic. † Variable. ‡ Pre-set.

| | RESISTORS | Values (ohms) |
|---|---|---|
| R1 | V1 hex CG decoupling | 250,000 |
| R2 | V1 SG HT potential divider | 12,500* |
| R3 | V1 SG HT potential divider | 25,000 |
| R4 | V1 fixed GB resistor | 250 |
| R5 | V1 osc. CG resistor | 25,000 |
| R6 | V1 osc. anode stabiliser | 200 |
| R7 | V1 osc. anode HT feed | 20,000† |
| R8 | V2 fixed GB resistor | 300 |
| R9 | IF stopper | 100,000 |
| R10 | Manual volume control | 1,000,000 |
| R11 | Variable tone control | 1,500,000 |
| R12 | V3 signal diode load | 250,000 |
| R13 | T.I. feed potential divider | 1,000,000 |
| R14 | T.I. feed potential divider | 750,000 |
| R15 | T.I. CG decoupling | 500,000 |
| R16 | V3 GB resistor | 2,000 |
| R17 | V3 triode anode decoupling | 10,000 |
| R18 | V3 triode anode load | 100,000 |
| R19 | V3 AVC diode load | 750,000 |
| R20 | AVC line decoupling | 1,000,000 |
| R21 | V4 CG resistors | 50,000 |
| R22 | V4 CG resistors | 500,000 |
| R23 | V4 CG resistors | 40,000 |
| R24 | HT smoothing resistor | 1,500§ |
| R25 | Negative feed-back coupling resistors | 4,000 |
| R26 | Negative feed-back coupling resistors | 20,000 |
| R27 | V4 GB resistor | 200 |
| R28 | T.I. anode HT feed | 2,000,000 |

* Two 25,000 Ω in parallel.
† Two 40,000 Ω in parallel.
§ Two 750 Ω in series.

| | OTHER COMPONENTS | Approx. Values (ohms) |
|---|---|---|
| L1 | Aerial IF filter coil | 40·0 |
| L2 | Aerial LW coupling coil | 40·0* |
| L3 | Band-pass primary coils | 2·5 |
| L4 | Band-pass primary coils | 30·0 |
| L5 | Aerial TS coupling coil | Very low |
| L6 | Aerial SW coupling coil | 0·4 |
| L7 | Aerial TS tuning coil | Very low |
| L8 | Aerial SW tuning coil | 0·05 |
| L9 | Band-pass secondary tuning coils | 2·5 |
| L10 | Band-pass secondary tuning coils | 27·0 |
| L11 | Oscillator TS and SW tuning coil | 0·05 |
| L12 | Osc. MW tuning coil | 3·0 |
| L13 | Osc. LW tuning coil | 9·0 |
| L14 | Osc. TS and SW reaction | 0·4 |
| L15 | Oscillator MW reaction | 0·6 |

(*Continued next col.*)

* Including part of L4, from tap to chassis.

| | OTHER COMPONENTS (*Continued*) | Approx. Values (ohms) |
|---|---|---|
| L16 | Oscillator LW reaction | 2·0 |
| L17 | 1st IF trans. Pri. | 80·0 |
| L18 | 1st IF trans. Sec. | 80·0 |
| L19 | 2nd IF trans. Pri. | 80·0 |
| L20 | 2nd IF trans. Sec. | 80·0 |
| L21 | Parts of whistle filter | 2·5 |
| L22 | Parts of whistle filter | 5·5 |
| L23 | Parts of whistle filter | 2·5 |
| L24 | Speaker speech coil | 24·0 |
| L25 | Hum neutralising coil | 0·7 |
| L26 | Speaker field coil | 750·0 |
| T1 | Output trans. Pri. | 170·0 |
| T1 | Output trans. Sec. | 2·6 |
| T1 | Output trans. Tert. | 48·0 |
| T2 | Mains trans Pri., total | 23·0 |
| T2 | Mains trans Heater sec. | 0·05 |
| T2 | Mains trans Rect. heat. sec. | 0·1 |
| T2 | Mains trans HT sec., total | 375·0 |
| S1-S20 | Waveband switches | — |
| S21 | Internal speaker switch | — |
| S22 | Mains switch, ganged R10 | — |

### Dismantling the Set.—

(*Continued from overleaf*)

the platform and drop back the chassis. The chassis may now be withdrawn.

**Removing Speaker.**—Remove the chassis as previously described, and withdraw the speaker plug from its socket on the power unit; slacken the four clamps (held by nuts with lock-washers) and swivel them out of the way. *When replacing*, the terminal panel should be at the top.

**Removing Power Unit.**—Withdraw the two connecting plugs to chassis and speaker; remove four screws (with washers and lock-washers) holding the unit to the base of the cabinet; remove the chassis platform (two screws, with lock-washers).

If the receiver chassis is now supported with the left hand, the power unit may be withdrawn and the chassis platform replaced.

## VALVE ANALYSIS

Voltages and currents in the table (col. 4) are those measured in our receiver when it was operating on mains of 227 V, using the 220-230 V tapping on the mains transformer. The receiver was tuned to the lowest wavelength on the medium band and the volume control was at maximum, but there was no signal input.

Voltages were measured on the 400 V scale of a model 7 Universal Avometer, chassis being negative.

| Valve | Anode Voltage (V) | Anode Current (mA) | Screen Voltage (V) | Screen Current (mA) |
|---|---|---|---|---|
| V1 TH4A | 233 | 3·8 | 101 | 7.1 |
| | Oscillator | | | |
| | 95 | 7·1 | | |
| V2 VP41 | 233 | 12.0 | 233 | 5·2 |
| V3 DT41 | 100 | 1·1 | — | — |
| V4 OP41 | 295 | 59·0 | 233 | 6·6 |
| V5 IW4/350 | 265† | — | — | — |
| T.I. TV4 | 20 | 0·1 | — | — |
| | Target | | | |
| | 233 | 0·5 | | |

† Each anode, AC.

## GENERAL NOTES

**Switches.—S1-S20** are the waveband switches, in two rotary units beneath the chassis, indicated in our under-chassis view, and shown in detail in the diagrams in column 5, where they are as seen looking at the underside of the chassis, in the directions of the arrows in the under-chassis view.

The table (col. 5) gives the switch positions for the four control settings, starting from the fully anti-clockwise position of the switch spindle. A dash indicates open, and **C**, closed.

**S21** is the internal speaker switch, which is mounted at the rear of the chassis near the external speaker sockets, and controlled by a small milled knob.

**S22** is the QMB mains switch, ganged with the volume control **R10.**

**Scale Lamps.**—These are three Ever Ready MES types, rated at 6.2 V, 0.3 A. They can be reached by hinging the scale upwards.

**External Speaker.**—Two sockets are provided at the rear of the chassis for a low impedance (4Ω) external speaker. The internal speaker can be muted by unscrewing **S21.**

**Condensers C13, C24, C26, C32.**—These are four dry electrolytic condensers in a single carton beneath the power unit chassis, with a common negative (black) lead. The positive leads are : green, **C13** (2 μF, 250 V peak); blue, **C24** (2 μF, 500 V peak); yellow, **C26** (4 μF, 500 V peak); red, **C32** (8 μF, 500 V peak).

**Condenser C33.**—This is an 8 μF, 525 V, peak, wet electrolytic, in a tubular metal can, mounted on the power unit chassis. The can is negative, but is insulated from chassis.

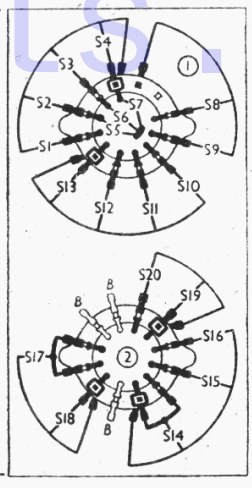
**Condensers C5, C12.**—These are two 0.1 μF paper condensers in a metal-cased unit at the inside of the rear of the chassis. The tag nearest the chassis deck is common to both condensers. The other connection of each goes to one of the two tags numbered in the under-chassis view.

**Condensers C11, C35.**—These are small condensers formed of wires spiralled over insulated wires. **C11** is inside the oscillator coil unit, while **C35** is beneath the chassis near the switch units. The latter is adjustable by sliding the spiralled winding over the straight wire.

**Chassis Divergencies.—R2** in our chassis was composed of two 25,000 Ω resistors connected in parallel. In other chassis it may be one 12,500 Ω resistor. The same applies to **R7,** which may be one 20,000 Ω resistor instead of two 40,000 Ω types in parallel.

## Switch Table and Diagrams

*Right.* Diagrams of the two switch units, drawn as seen when viewed in the directions of the arrows in the under-chassis view opposite. *Below.* Table giving the switch positions for the four control settings.




| Switch | LW | MW | SW | TS |
|---|---|---|---|---|
| S1 | — | — | — | C |
| S2 | — | — | C | — |
| S3 | — | C | — | — |
| S4 | C | — | — | — |
| S5 | — | — | — | C |
| S6 | — | — | C | C |
| S7 | — | C | C | — |
| S8 | — | C | — | — |
| S9 | C | — | — | — |
| S10 | — | — | — | C |
| S11 | — | — | C | — |
| S12 | — | C | — | — |
| S13 | C | — | — | — |
| S14 | — | — | C | C |
| S15 | — | C | — | — |
| S16 | C | — | — | — |
| S17 | — | — | C | C |
| S18 | — | C | — | — |
| S19 | — | — | — | C |
| S20 | — | — | C | — |

**Plug and Socket Connectors.**—The speaker is connected to the power unit chassis by a 5-pin plug and socket arrangement, of which only three pins and sockets are used.

The main chassis is connected to the power unit by a 9-pin plug and socket arrangement, all nine being used.

Diagrams of both plugs, drawn as seen from the free ends of the pins, are inset at the bottom of the circuit diagram overleaf, where the pins are numbered. Also the points of intersection between the receiver chassis and power unit (numbered 1 to 9) and the speaker and power unit (numbered 10 to 12) are indicated by arrows and circles in the circuit diagram. In every case the circle is on the power unit side of a connection, while the chassis or speaker is on the arrow side. The sockets are seen, numbered from their upper side, in our view of the power unit.

## CIRCUIT ALIGNMENT

**IF Stages.**—Connect signal generator to **E** socket, and via a 0.02 μF condenser to control grid (top cap) of **V1,** leaving existing clip in position. Switch set to LW, turn gang to maximum, feed in a 126.5 kc/s (2,372 m) signal, and adjust **C48, C49, C50** and **C51** for maximum output.

**RF and Oscillator Stages.**—Connect signal generator to **A** and **E** sockets, via a suitable dummy aerial. See that cursor line covers the 550 m mark when gang is at maximum. Volume control should be at maximum during alignment.

**SW and TS.**—Switch set to SW, tune to 18 Mc/s on scale, and fully unscrew **C45.** Feed in an 18 Mc/s (16.67 m) signal, and screw in **C45** slowly. Two peaks will be found, of which the first reached is the correct one. Adjust **C45** accurately to this.

Switch set to TS, feed in a 20.75 Mc/s (14.45 m) signal at full generator output (its second harmonic being 41.5 Mc/s) and adjust **C43** for maximum output.

Switch to SW, feed in a 15 Mc/s signal, tune to 15 Mc/s on scale, and adjust **C39** for maximum output.

**MW.**—Switch set to MW, tune to 200 m on scale, and fully unscrew **C46.** Feed in a 200 m (1,500 kc/s) signal, and screw in **C46** slowly, adjusting it accurately to the first peak reached. Tune to 250 m on scale, feed in a 250 m (1,200 kc/s) signal, and adjust **C40** and **C37** for maximum output. Tune to 500 m on scale, feed in a 500 m (600 kc/s) signal, and adjust iron core of **L12** for maximum output, while rocking the gang for optimum results. Repeat the adjustments at 200, 250 and 500 m.

**LW.**—Switch set to LW, tune to 1,100 m on scale, feed in a 1,100 m (272.5 kc/s) signal, and adjust **C47, C41** and **C35** for maximum output. **C35** is adjusted by sliding the spiralled wire on the insulating sleeve over the straight wire.

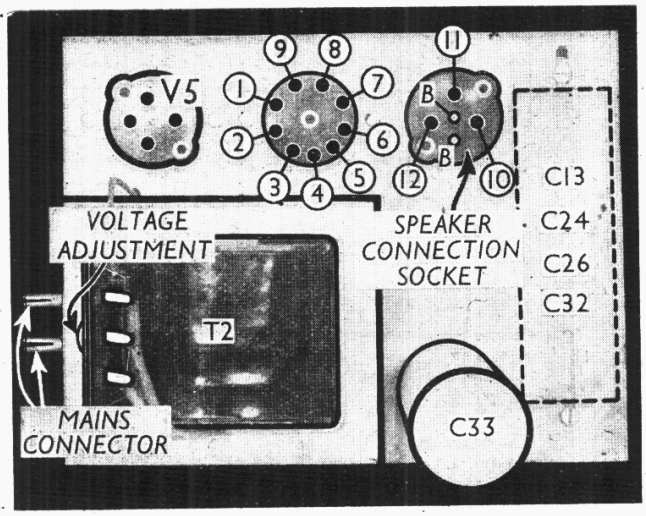
Tune to 1,700 m on scale, feed in a 1,700 m (176.5 kc/s) signal, and adjust core of **L13** for maximum output, while rocking the gang.

**IF Filter.**—Leaving set tuned to 1,700 m, feed in a 126.5 kc/s (2,372 m) signal at full generator output, and adjust core of **L1** for *minimum* output. Reduce generator output, and adjust to 272.5 kc/s. Tune to 1,100 m on scale, and repeat LW alignment as above.

Switch set to MW, feed in a 1,000 kc/s (300 m) signal at full generator output. Tune receiver to image of generator frequency (about 400 m) and adjust **C38** for *minimum* output.

Tune to 250 m, feed in a 250 m (1,200 kc/s) signal, and re-adjust **C40** for maximum output.

Plan view of the power unit. The two connecting sockets are numbered to agree with those in the circuit diagram, but as seen from above. The electrolytic block is beneath the chassis.

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