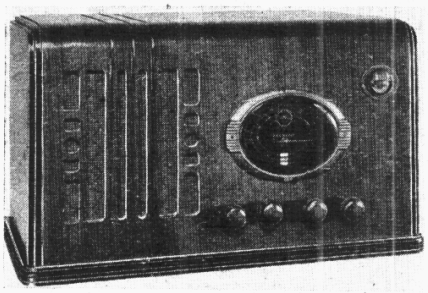
*Supplement to The Wireless & Electrical Trader, April 10, 1943*

"TRADER" SERVICE SHEET 615

# BELMONT 800, 845

## AC/DC SUPERHETS



The Belmont 845 receiver.

THE Belmont 800 and 845 receivers are two 6-valve (plus rectifier) 3-band superhets designed to operate from AC or DC mains of 100-260 V, 40-100 C/S in the case of AC. Both are table models and employ the same chassis, but this *Service Sheet* was prepared from a model 845.

The chassis is fitted with a cathode ray tuning indicator tube, and the tuning scale includes a coloured waveband indicator and a vernier pointer-setting dial. Except for the tuning indicator, all the original valves were of the metal type, but they may all be replaced with glass types.

The chassis is basically designed so as to operate from 100 V mains, but resistances, including a "line cord," are provided for operation from 200-260 V mains.

*Release dates and original prices*: 800, *June*, 1937, £14 3s. 6d.; 845, *August*, 1936, £13 13s.

### CIRCUIT DESCRIPTION

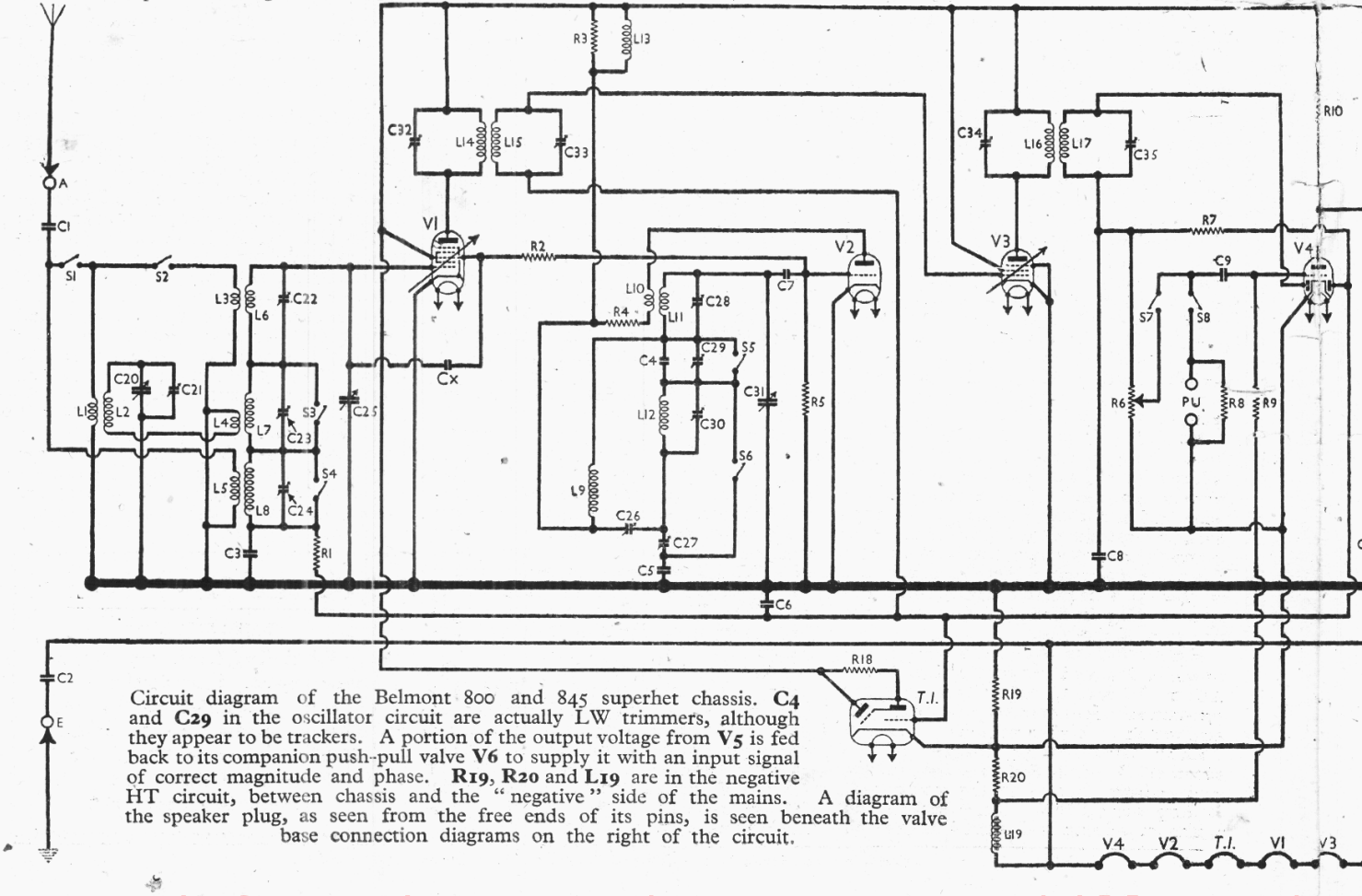
Aerial input on MW is via isolating condenser **C1**, switch **S1** and coupling coil **L1** to inductively coupled band-pass filter. Primary coil **L2** is tuned by **C20**; secondary coil **L7** is tuned by **C25**. Coupling by coil **L4**, which really constitutes a portion of **L2**, wound close to **L7**.

On SW, **S1** and **S2** close, and input is via **C1** and coupling coil **L3** to single tuned circuit **L6, C25**. On LW, **S1** and **S2** are open, and input is via **C1** and coupling coil **L5** to single tuned circuit **L8, C25**. Actually, **L6, L7, L8** are connected in series and are all in circuit on LW, but the effect of **L6** and **L7** on LW is not very considerable. On MW, **S4** short-circuits **L8**, and on SW, **S3** and **S4** short-circuit **L7** and **L8**. The LW coil **L5** is permanently across the aerial circuit, and both **L5** and **L1** are across it on MW. On SW, **L3, L1** and **L5** are all connected across the aerial circuit.

First valve **(V1, Ken-Rad metal 6L7)** is heptode operating as mixer, working in conjunction with separate triode oscillator **(V2, Ken-Rad metal 6C5)** as frequency changer, with direct coupling via stopper resistance **R2** between **V2** control grid and **V1** injector grid. A very small capacitative coupling **Cx** is provided between **V1** control and injector grids to neutralise "pulling" effects.

**V2** control grid coils **L11** (SW), **L12** (MW) and **L9** (LW) are tuned by **C31**. Parallel trimming by **C28** (SW), **C30** (MW) and **C4, C29** (LW). Series tracking by **C5** (SW), when **S5** and **S6** are closed; by **C27** and **C5** (MW), when **S5** is closed; and by **C26, C27** and **C5** (LW), when all switches are open.

The arrangement of the circuits is unusual, particularly with regard to the position of the LW trimmers, but it will be seen that on SW and MW, with **S5** closed, it follows normal practice except




Circuit diagram of the Belmont 800 and 845 superhet chassis. **C4** and **C29** in the oscillator circuit are actually LW trimmers, although they appear to be trackers. A portion of the output voltage from **V5** is fed back to its companion push-pull valve **V6** to supply it with an input signal of correct magnitude and phase. **R19, R20** and **L19** are in the negative HT circuit, between chassis and the "negative" side of the mains. A diagram of the speaker plug, as seen from the free ends of its pins, is seen beneath the valve base connection diagrams on the right of the circuit.

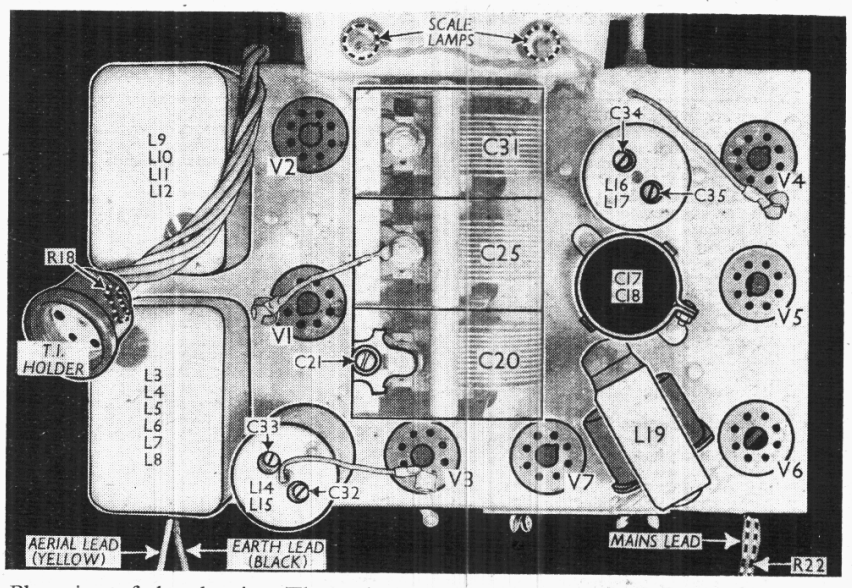
that **L9** and **C26** shunt **L12** on MW, which effect can be allowed for in the design. On LW, **C4, C29** can be considered as being connected across **L9, C26** in the usual manner if the small effect of **L12, C30** is allowed for.

Reaction coupling from anode is developed on all bands across the common impedance of the tracking condensers in the grid and anode circuits, but this effect is small on SW, and additional coupling is provided by the reaction coil **L10.** A choke coil **L13** is connected across the HT feed resistance **R3** to isolate the circuit from the HT positive line.

Third valve **(V3, Ken-Rad metal 6K7)** is a variable-mu RF pentode operating as intermediate frequency amplifier with tuned-primary, tuned-secondary transformer couplings **C32, L14, L15, C33** and **C34, L16, L17, C35.**

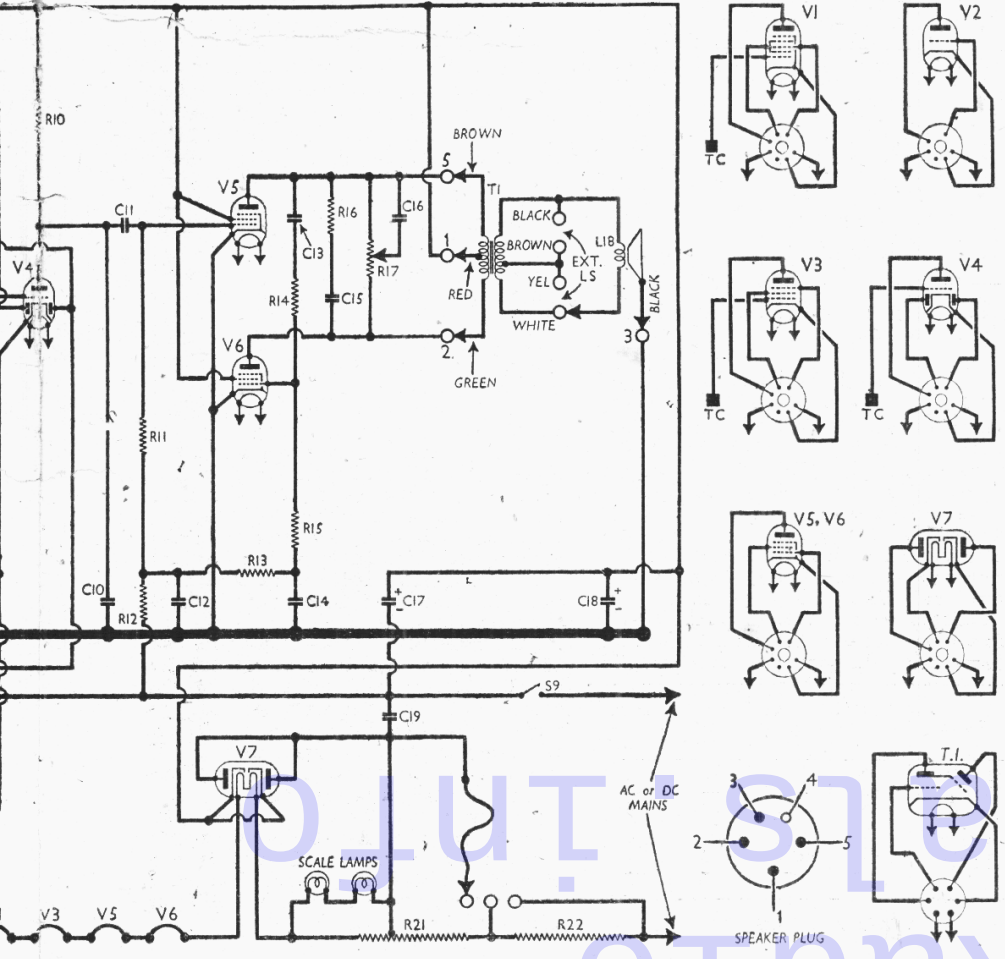
**Intermediate frequency 465 KC/S.**

Diode second detector is part of double diode triode valve **(V4, Ken-Rad metal 6Q7).** Audio frequency component in rectified output is developed across manual volume control **R6,** which also operates as load resistance, and passed via switch **S7,** AF coupling condenser **C9** and CG resistance **R9** to control grid of triode section, which operates as AF amplifier. IF filtering by **C8** in diode circuit and **C10** in triode anode circuit. Provision for connection of a gramophone pick-up, with which an external volume control is required, between **C9** and cathode, the sockets being shunted by **R8.**




Plan view of the chassis. The scale lamps are inside the tuning scale assembly.

DC potential developed across **R6** is tapped off and fed back via **R7** and other decoupling components as GB to mixer and IF valves, giving automatic volume control. Second diode of **V4** is strapped to the AVC line. AVC line potential is also used as control voltage for cathode ray tuning indicator **(T.I., Ken-Rad 6G5).**




Resistance-capacity coupling by **R10, C11** and **R11** between **V4** and input valve **(V5, Ken-Rad metal 25A6)** of the output stage which comprises two pentodes in push-pull. Output voltages from **V5** anode appear across the potential divider **C13, R14, R15, C14,** and part of the potential is tapped off at the junction of **R14** and **R15,** giving a step-down ratio equal to the gain of **V5,** and applied to the control grid of the second output valve **(V6, Ken-Rad metal 25A6).** Fixed tone correction by **R16, C15** between anodes. Variable tone control by **R17, C16** also between anodes. Provision for connection of low impedance external speaker across secondary of internal speaker input transformer **T1,** while internal speaker may be muted by withdrawing a plug.

Four sockets are provided from tappings on **T1** secondary, and they bear the colours indicated in the circuit diagram. Matching might be facilitated by connecting an external speaker to black and brown, yellow and white or black and white, according to the impedance, while better overall matching may be obtained by shifting the internal speaker plug to yellow while using an external speaker.

When the receiver is operating with AC mains, HT current is supplied by indirectly heated rectifying valve **(V7, Ken-Rad 25Z6),** whose two sections are connected in parallel to act as a half-wave rectifier. Smoothing is effected by iron-cored choke **L19,** in negative HT lead to chassis, and electrolytic condensers **C17, C18.** The earth lead, which is isolated from mains by condenser **C2,** is returned directly to HT negative, not to chassis.

Valve heaters, together with scale lamps and ballast resistances **R21, R22,** which are used only for voltage adjustment purposes, are connected in series across mains input.

GB potentials for tuning indicator, **V4** triode and **V5, V6,** and fixed GB for **V1** and **V3,** are obtained from drop along **L19, R20** and **R19** in negative HT lead to chassis, that for **V4** and **V3** being fed via **R6, R7** and the AVC line.

## COMPONENTS AND VALUES

| | CONDENSERS | Values (μF) |
|---|---|---|
| C1 | Aerial isolating condenser | 0·01 |
| C2 | Earth isolating condenser | 0·01 |
| C3 | V1 CG decoupling ... | 0·05 |
| C4 | Osc. LW fixed trimmer | 0·00004 |
| C5 | Osc. circ. SW tracker ... | 0·003 |
| C6 | AVC line decoupling ... | 0·02 |
| C7 | V2 CG condenser ... | 0·00005 |
| C8 | IF by-pass ... ... | 0·00025 |
| C9 | V4 triode CG condenser | 0·01 |
| C10 | IF by-pass ... ... | 0·00025 |
| C11 | V4 triode to V5 coupling | 0·01 |
| C12 | V5 CG decoupling ... | 0·25 |
| C13 | V5 to V6 coupling ... | 0·01 |
| C14 | V6 CG decoupling ... | 0·1 |
| C15 | Part fixed tone corrector | 0·003 |
| C16 | Part variable tone control ... ... ... | 0·01 |
| C17* | HT smoothing condensers ... ... ... | 26·0 |
| C18* | | 26·0 |
| C19 | Mains RF by-pass ... | 0·1 |
| C20† | Band-pass pri. tuning ... | — |
| C21‡ | B-P pri. trimmer ... | — |
| C22‡ | Aerial circ. SW trimmer | — |
| C23‡ | B-P sec. trimmer ... | — |
| C24‡ | Aerial circ. LW trimmer | — |
| C25† | SW and LW aerial and band-pass sec. tuning | — |
| C26‡ | Osc. circuit LW tracker | 0·0003 |
| C27‡ | Osc. circuit MW tracker | 0·000565 |
| C28‡ | Osc. circuit SW trimmer | — |
| C29‡ | Osc. circuit LW trimmer | — |
| C30‡ | Osc. circuit MW trimmer | — |
| C31† | Oscillator circuit tuning | — |
| C32‡ | 1st IF trans. pri. tuning | — |
| C33‡ | 1st IF trans. sec. tuning | — |
| C34‡ | 2nd IF trans. pri. tuning | — |
| C35‡ | 2nd IF trans. sec. tuning | — |
| Cx | Small neutralising coupling ... ... ... | Very low |

* Electrolytic. † Variable. ‡ Pre-set.

| | RESISTANCES | Values (ohms) |
|---|---|---|
| R1 | V1 CG decoupling ... | 100,000 |
| R2 | V1 injector grid stopper ... | 100 |
| R3 | V2 anode HT feed ... | 50,000 |
| R4 | Osc. SW reaction stabiliser ... ... ... | 50 |
| R5 | V2 CG resistance ... | 50,000 |
| R6 | Manual volume control; V4 diode load ... | 1,000,000 |
| R7 | AVC line decoupling ... | 3,000,000 |
| R8 | Pick-up shunt ... ... | 100,000 |
| R9 | V4 triode CG resistance | 3,000,000 |
| R10 | V4 triode anode load ... | 150,000 |
| R11 | V5 CG resistance ... | 500,000 |
| R12 | V5 CG decoupling ... | 250,000 |
| R13 | V6 CG decoupling ... | 250,000 |
| R14 | V5 to V6 coupling potential divider resistances | 500,000 |
| R15 | | 75,000 |
| R16 | Part fixed tone corrector | 10,000 |
| R17 | Variable tone control ... | 300,000 |
| R18 | T.I. anode HT feed ... | 1,000,000 |
| R19 | Auto GB resistances ... | 50 |
| R20 | | 20 |
| R21 | 260V heater circuit ballast ... ... ... | 140* |
| R22 | 220V heater circuit ballast ... ... ... | 250 |

* Tapped at 40 Ω from V7 heater to shunt scale lamps.

| | OTHER COMPONENTS | Approx. Values (ohms) |
|---|---|---|
| L1 | Aerial MW coupling coil ... | 37·0 |
| L2 | Band-pass pri. coil ... | 4·0 |
| L3 | Aerial SW coupling coil ... | 0·7 |
| L4 | Band-pass coupling coil ... | 0·4 |
| L5 | Aerial LW coupling coil ... | 85·0 |
| L6 | Aerial SW tuning coil ... | Very low |
| L7 | Band-pass sec. coil ... | 4·0 |
| L8 | Aerial LW tuning coil ... | 16·0 |
| L9 | Osc. LW tuning coil ... | 22·0 |
| L10 | Oscillator SW reaction ... | 50·0 |
| L11 | Osc. SW tuning coil ... | Very low |
| L12 | Osc. MW tuning coil ... | 12·0 |
| L18 | V2 anode HT feed choke | 26·0 |
| L14 | 1st IF trans. Pri. ... | 9·0 |
| L15 | Sec. ... | 70·0 |
| L16 | 2nd IF trans. Pri. ... | 9·0 |
| L17 | Sec. ... | 70·0 |
| L18 | Speaker speech coil ... | 4·5 |
| L19 | HT smoothing choke ... | 250·0 |
| T1 | Speaker input trans. Pri., total | 490·0 |
| | Sec., total | 0·5 |
| S1-S6 | Waveband switches ... | — |
| S7, S8 | Radio/gram switches ... | — |
| S9 | Mains switch, ganged R6 | — |

## DISMANTLING THE SET

**Removing Chassis.**—Remove the four control knobs (pull off); slacken the fly-nut beneath the tuning indicator holder, draw it towards the rear, and lift out the valve from its clip; remove the four screws (with large metal washers) holding the chassis to the bottom of the cabinet. The chassis may now be withdrawn from the cabinet, and if the plug at the front right-hand corner is withdrawn from its socket, the chassis may be removed altogether. *When replacing*, the tuning indicator should be adjusted in its runner so that its target can be seen conveniently from the front of the receiver, then tighten the fly-nut.

**Removing Speaker.**—Remove the chassis, and remove the four large wood screws holding the speaker to the sub-baffle. The speaker may then be freed from the chassis by withdrawing its connecting plug.

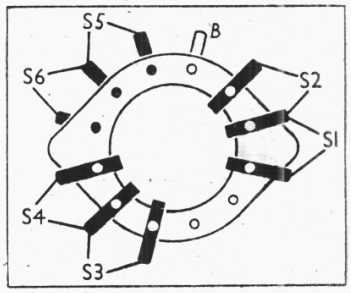



Diagram of the **S1–S6** switch unit. It is drawn as seen when viewed from the rear of the underside of the chassis.

*When replacing*, the transformer should be at the bottom.

## VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating on DC mains of 211 V. The mains voltage adjustment plug was in the 220 V socket.

The receiver was tuned to the lowest wavelength on the MW band, and the volume control was at maximum, but there was no signal input, the aerial and earth leads being joined together.

Voltages were measured on the 400 V scale of a model 7 Universal Avometer, chassis being the negative connection. No readings can be given for the tuning indicator, and access to the inside of the holder is difficult. The target voltage would, of course, be 93 V; the anode voltage, and target and anode currents, would be very low.

| Valve | Anode Voltage (V) | Anode Current (mA) | Screen Voltage (V) | Screen Current (mA) |
|---|---|---|---|---|
| V1 6L7 | 93 | 3·4 | 93 | 3·8 |
| V2 6C5 | 93 | 3·0 | — | — |
| V3 6K7 | 93 | 5·2 | 93 | 1·5 |
| V4 6Q7 | 46 | 0·32 | — | — |
| V5 25A6 | 87 | 20·0 | 93 | 3·4 |
| V6 25A6 | 87 | 20·0 | 93 | 3·4 |
| V7 25Z6 | 93† | — | — | — |

† Cathode to chassis, DC.

## GENERAL NOTES

**Switches.—S1-S6** are the waveband switches, in a single rotary unit beneath the chassis. The unit is indicated in our under-chassis view, and shown in detail in the diagram in col. 1, where it is drawn as seen when viewed from the rear of the underside of the chassis. The table below gives the switch positions for the three control settings, starting from the fully anti-clockwise position of the control. A dash indicates open, and **C**, closed.

**S7, S8** are the radio/gram change-over switches in a single two-position QMB toggle switch mounted on the rear chassis member, just above the pick-up sockets.

### Switch Table

| Switch | LW | MW | SW |
|---|---|---|---|
| S1 | — | C | C |
| S2 | — | — | C |
| S3 | — | — | C |
| S4 | — | C | C |
| S5 | — | C | C |
| S6 | — | — | C |

**S9** is the QMB mains switch, ganged with the volume control **R6.**

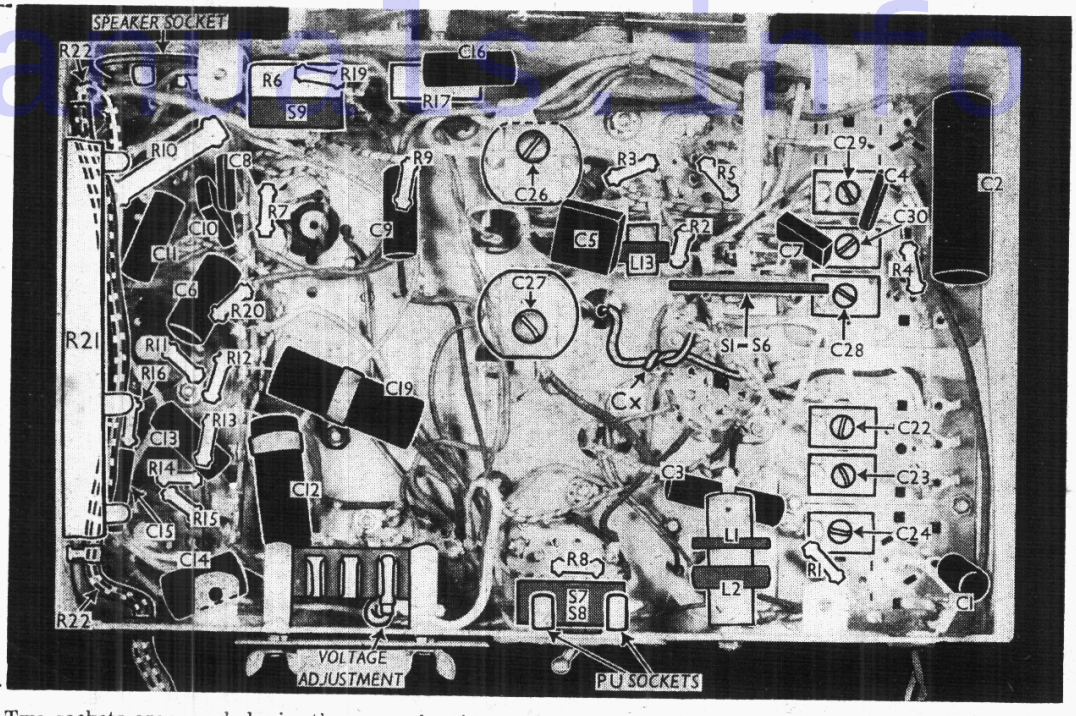
**Coils.**—The aerial and oscillator coils **L3-L8** and **L9-L12,** but excluding **L1, L2,** are mounted on the chassis deck and screened by two rectangular metal covers. **L1, L2** are separately mounted on an unscreened former beneath the chassis. The oscillator choke **L13** is mounted beneath the chassis between the waveband switch unit and the tracking condensers.

The IF transformers **L14, L15** and **L16, L17** are in two further screened units on the chassis deck with their associated trimmers. **L19** is also mounted on the chassis deck.

**Scale Lamps.**—These are two Tung-Sol lamps, with SBC holders and, in our chassis, spherical bulbs. They are rated at 6-8 V, and ours were marked T51. They are suspended in rubber grommets so that they project downwards into the inside of the enclosed scale assembly, and to reach ours it was necessary to remove the scale panel. This entailed removing the retaining screw and pointer and seven press studs (which can be pushed from the rear). If tubular bulbs were used they could be withdrawn from above without removing the scale.

**Condensers C17, C18.**—These are two 26 μF electrolytics in a single tubular metal container held by a clip to the chassis deck. Replacements need only be rated at 150-200 V working, as the receiver is designed to operate from 100 V mains. It should be noted that they have a common positive connection.

**Condenser Cx.**—This is a small neutralising capacity between the control grid and injector grid of **V1.** It consists of a piece of insulated wire, attached to pin 5 of **V1** socket, wrapped round the lead from **C25** about two turns.




Under-chassis view. The waveband switch unit **S1-S6** is indicated here and shown in detail in the diagram in col. 1 opposite. **Cx**, just below it, consists of twisted wires. **R21**, on the left chassis member, is a metal-cased "Muter" strip. Its three connecting tags are seen. **R22** is in the mains lead. The speaker socket is indicated at the top left-hand corner.

**Gramophone Pick-up.**—Two sockets are provided for this at the rear of the cabinet, but an external volume control is required for gramophone operation. As radio/gram switching is provided the pick-up may be left permanently connected.

**External Speaker.**—Four sockets are provided on the speaker transformer **T1**, and, as indicated in the circuit diagram overleaf, one of them accepts a plug attached to one end of the speech coil **L18**. The makers' manual does not explain the function of these sockets, but an external speaker could be connected to them. A speaker of about 8 Ω impedance could be connected to the black and white sockets, and the internal speaker could if desired be muted by withdrawing its plug. A speaker of about 5 Ω could be connected to black and brown, or one of about 3 Ω to yellow and white. Good overall matching might be obtained if an external speaker were joined to black and brown, with the internal speaker plug transferred to yellow.

**Speaker Connections.**—The speaker leads are terminated at a five-pin plug which is inserted in a socket on the front chassis member. The connections are identified in our circuit diagram by numbers corresponding with those of the plug whose diagram appears inset just beneath the valve diagrams. Pin 4 is blank, but is used as a bearer on the socket. The speaker plug is drawn as seen from the free ends of the pins.

**Mains Voltage Adjustment.**—The receiver is designed to operate from 100 V AC or DC mains, but voltage dropping resistances are provided to permit the application of higher voltages. **R21** is a "muter" strip resistor, designed to drop about 40 V, while **R22** is a flexible line cord resistor, located in the mains lead, to drop about 100 V. Three sockets and a plug on a flying lead, accessible through a hole in the rear chassis member but normally covered by a metal plate, thus permit adjustment for 110 V, 220 and 260 mains. These are mean values, the ranges of two of them : 190-240 V and 240-280 V, being stamped on the rear of the chassis, just over the sockets; the low voltage socket is unmarked, but when it is in use, **R22** and most of **R21** are short-circuited, the part left in circuit acting as a scale lamp shunt.

## CIRCUIT ALIGNMENT

**IF Stages.**—Switch set to MW, tune to 214 m on scale, and turn the volume control to maximum. Connect signal generator via a 0.1 μF condenser to control grid (top cap) of **V3** and chassis. Feed in a 465 KC/S (645.16 m) signal, and adjust **C35** and **C34** for maximum output. Transfer signal generator lead from **V3** to control grid (top cap) of **V1** and adjust **C33** and **C32** for maximum output. Then readjust **C34** and **C35** if necessary.

**RF and Oscillator Stages.**—With the gang at minimum and maximum, the pointer should cover the unnumbered horizontal lines at both ends of the three scales. The pointer can be adjusted if the small knurled retaining screw at its centre is slackened. Transfer signal generator leads to the aerial and earth leads, via a suitable dummy aerial; this may consist of a 0.1 μF condenser in series with a 400 Ω resistance for the SW band, and of a 0.0002 μF condenser in series with a 20 Ω resistance for the MW and LW bands.

**SW.**—Switch set to SW, and turn the gang to minimum capacity. Feed in a 16.5 m (18.2 MC/S) signal, and adjust **C28** for maximum output, taking care that the peak involving the lesser trimmer capacity is selected. Feed in a 17.6 m (17 MC/S) signal, tune it in, and adjust **C22** for maximum output. Check calibration and sensitivity at 50 m (6 MC/S).

**MW.**—Switch set to MW, and turn the gang to minimum capacity. Feed in a 187 m (1,600 KC/S) signal, and adjust **C30** for maximum output. Feed in a 214 m (1,400 KC/S) signal, tune it in, and adjust **C23**, then **C21**, for maximum output. Feed in a 500 m (600 KC/S) signal, tune it in, and adjust **C27** for maximum output while rocking the gang for optimum results.

Readjust **C30** at 187 m, and **C23, C21** at 214 m, in turn, until no improvement can be obtained, and then check the sensitivity at 300 m (1,000 KC/S).

**LW.**—Switch set to LW, and turn the gang to minimum capacity. Feed in an 860 m (350 KC/S) signal, and adjust **C29** for maximum output. Feed in a 925 m (325 KC/S) signal, tune it in, and adjust **C24** for maximum output. Feed in a 2,000 m (150 KC/S) signal, tune it in, and adjust **C26** for maximum output while rocking the gang for optimum results. Readjust **C29** at 860 m, and **C24** at 925 m, until no further improvement can be obtained.

Now repeat the whole of the MW procedure as previously outlined, and then repeat the LW adjustments. The two circuits are somewhat interdependent, and each must be checked after any adjustment to the other.

## Service Sheet Index

### CORRECTION

**Will dealers please note that on some copies of the latest Index (December 29, 1942) the *Service Sheet* number of the Mullard MUS24 is given as 97, the figure "3" having dropped out. The number is actually 397.**

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