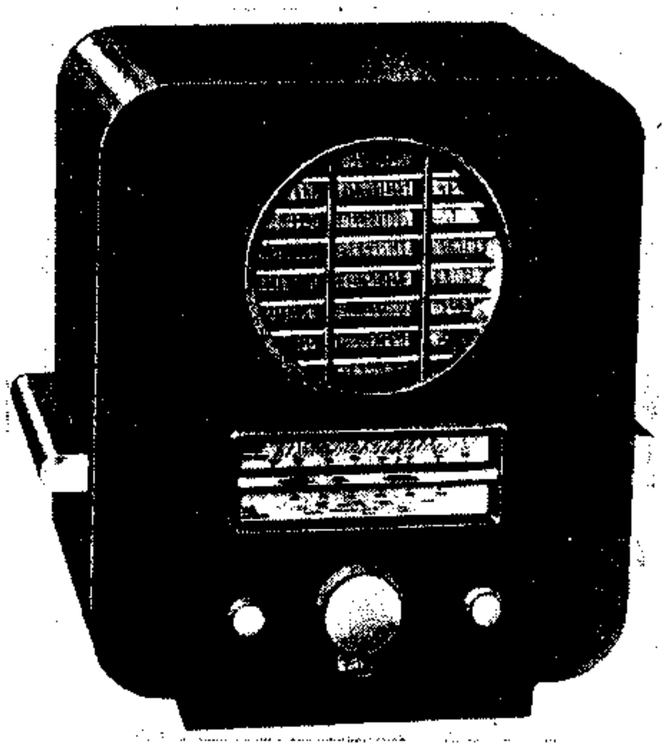
Supplement to The Wireless & Electrical Trader, March 24, 1945

EKCO B74

BATTERY SUPERHET



The Ekco B74 superhet in the black and chromium cabinet. The seven-barred speaker grill is removable.

AN unusual feature of the Ekco B74 is that the gramophone pick-up is fed into the aerial circuit, so that the volume control operates on radio and gram. The receiver is a 5-valve, 2-band battery operated superhet with class B output.

Its cabinet is a plastic moulding available in walnut or black and chromium finish.

Release date.: 1933.

Original prices: Walnut, £13 13s.; *black and chromium,* £14 14s., *complete with batteries.*

CIRCUIT DESCRIPTION

Aerial input is developed across potentiometer **R3,** which shunts the aerial circuit and acts as input control, and passed via its slider, series capacitor **C1,** coupling coil **L1** (MW) and tapping on **L3** (LW), to inductively coupled band-pass filter.

Primary coils **L2** (MW) and **L3** (LW) are tuned by **C16;** secondary coils **L4, L5** are tuned by **C18.** Coupling is effected by mutual inductance between primary and secondary circuits. **R2, S1** constitute a local/distant device, **R2** shunting the aerial circuit heavily when **S1** is closed for local reception. Image suppression by **C15,** via **S4,** which closes only on MW.

First valve **(V1, Cossor 215SG** or **Mullard PM12)** is a screened RF tetrode operating as frequency changer with filament (cathode) coupling. Oscillator circuit tuning coils **L10** (MW) and **L11** (LW) are tuned by **C21.** Parallel trimming by **C22** (MW); series tracking by specially shaped vanes of **C21** (MW) and series trackers **C4, C20** (LW). The tuned circuit is coupled via IF transformer primary trimmer **C23** to **V1** anode. Cathode reaction coupling is effected by filament circuit coils **L6, L7, L8, L9.**

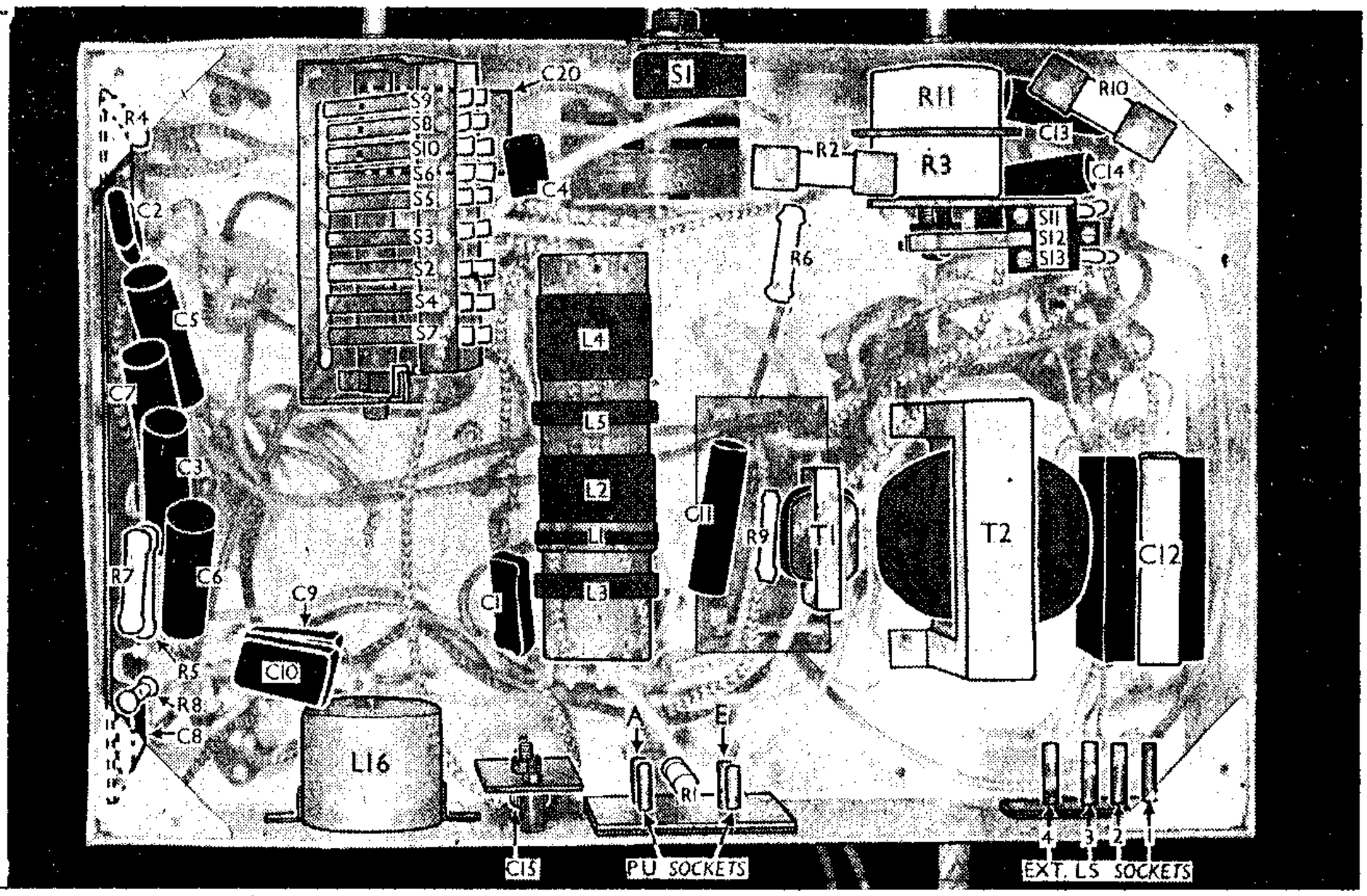
Second valve **(V2, Cossor 220VS** or **Mullard PM12M)** is a variable-mu RF tetrode which operates as intermediate frequency amplifier, with tuned-primary, tuned-secondary transformer couplings **C23, L12, L13, C24** and **C25, L14, L15, C26.**

Intermediate frequency 110 kc/s.

The second detector is a triode valve **(V3, Cossor metallised 210HF** or **Mullard PM1HL),** operating on the grid leak system with **R8** and **C8, R8** being returned to the positive side of the filament. IF filtering by **C9, L16, C10** in anode circuit.

Parallel-fed transformer AF coupling by **R9, C11** and **T1** between **V3** and triode driver valve **(V4, Cossor 210LF** or **Mullard PM2DX),** which drives a double-triode push-pull output valve **(V5, Cossor 220B** or **Mazda PD220)** via the push-pull transformer **T2. V5** anodes are connected to the output transformer **T3** via a three-pin plug and socket device, and provision is made by means of a duplicate socket for connecting a high impedance external speaker.

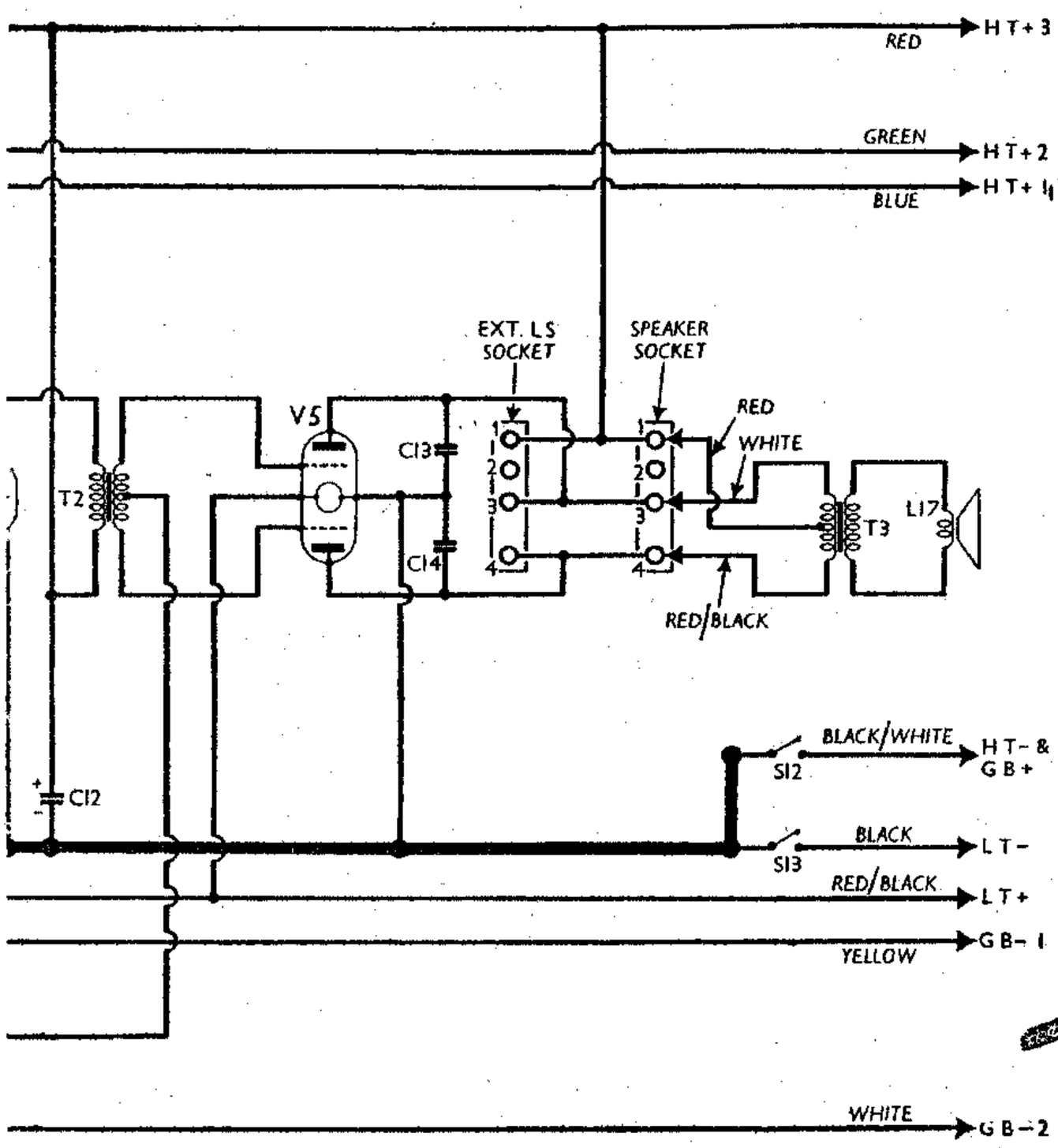
Circuit diagram of the Ekco B74 battery superhet. **R3,** the aerial input potentiometer, and **R11,** the gain control for **V2,** are ganged. Gramophone pick-up connections are fed in to **R3,** which operates then as pick-up volume control, and thus to **V3** control grid via **S8. S7** closes on gram to mute radio. The green and blue HT leads may be transposed. The speaker socket positions are numbered to agree with those in the plan view overleaf; a sketch of the speaker plug appears beneath the circuit diagram.

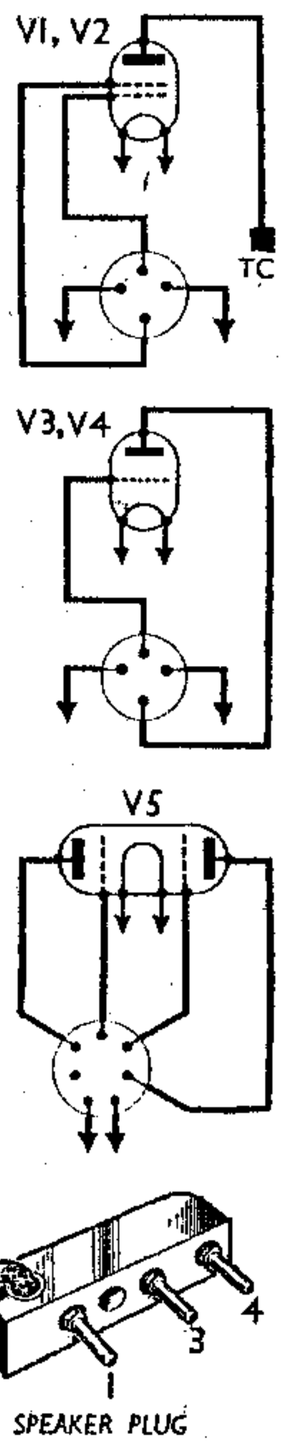


Under-chassis view. The waveband switches are all individually identified. The battery switch unit **S11, S12, S13** is indicated here and shown in detail in the sketch in col. 5 overleaf. **C20** is almost obscured here by the waveband switch unit. **R2** and **R10** are wire-wound resistors. **R5** and **R10** may be omitted from early chassis.

GB potential for **V5** is obtained from the potential divider comprising a potentiometer **R11** and a wire-wound resistor **R10** connected across the GB section of the HT battery. GB for **V4** is obtained from a tapping directly on to the GB section. Variable GB for the gain control of **V2** is obtained from the slider of **R11,** and as **R3** and **R11** are ganged to form a combined gain control, signal input to **V1** and the gain of **V2** increase or decrease together as the control is turned.

Provision is made for the connection of a gramophone pick-up across the aerial input control potentiometer **R3,** via input limiting resistor **R1.** When the switch control is turned to the gramophone position, **S7** closes to mute radio, and **S8** closes to connect the slider of **R3** to the control grid circuit of **V3.** The pick-up should be disconnected for radio operation, and **S1** must be in the "distant" position for pick-up operation.





COMPONENTS AND VALUES

	RESISTORS	Values (ohms)
R1	Pick-up series resistor ...	9,000
R2	Local/distant resistor ...	20
R3	Gain control	10,000
R4	V1 CG resistor	2,000,000
R5	V1 anode decoupling ...	4,000
R6	V2 CG decoupling ...	250,000
R7	V2 anode decoupling ...	2,000
R8	V3 grid leak	250,000
R9	V3 anode load	50,000
R10	V5 GB resistor	70
R11	V2 gain control	1,000

	CAPACITORS	Values (μF)
C1	Aerial series coupling ...	0·001
C2	V1 CG capacitor ...	0·0001
C3	V1 anode decoupling ...	0·1
C4	Osc. LW fixed tracker ...	0·00075
C5	V2 CG decoupling ...	0·1
C6	V2 anode decoupling ...	0·1
C7	V2 SG decoupling ...	0·1
C8	V3 CG capacitor ...	0·004
C9, C10	IF by-pass capacitors ...	0·001, 0·001
C11	AF coupling to T1 ...	0·1
C12*	HT circuit reservoir ...	9·0
C13, C14	Fixed tone correctors	0·01, 0·01
C15‡	Image suppressor ...	—
C16†	Band-pass pri. tuning ...	0·0005
C17‡	B-P pri. MW trimmer ...	—
C18†	Band-pass sec. tuning ...	0·0005
C19‡	B-P sec. MW trimmer ...	—
C20‡	Osc. circ. LW tracker ...	—
C21†	Oscillator circuit tuning	0·0004
C22‡	Osc. circ. MW trimmer...	—
C23‡	1st IF trans. pri. tuning	—
C24‡	1st IF trans. sec. tuning	—
C25‡	2nd IF trans. pri. tuning	—
C26‡	2nd IF trans. sec. tuning	—

* Electrolytic. † Variable. ‡ Pre-set.

	OTHER COMPONENTS		Approx. Values (ohms)
L1	Aerial coupling coil	...	2·5
L2	Band-pass primary coils	...	4·0
L3	Band-pass primary coils	...	15.0
L4	Band-pass secondary coils	...	4·0
L5	Band-pass secondary coils	...	15·0
L6	Filament (cathode) oscillator reaction coupling coils	... ...	Very low
L7			
L8			
L9			
L10	Osc. MW tuning coil	...	9·0
L11	Osc. LW tuning coil	...	10·0
L12	1st IF trans. Pri.	...	110·0
L13	1st IF trans. Sec.	...	110·0
L14	2nd IF trans. Pri.	...	110·0
L15	2nd IF trans. Sec.	...	110·0
L16	IF filter choke	... ...	300·0
L17	Speaker speech coil	...	2·0
T1	Intervalve trans. Pri.	...	500·0
	Intervalve trans. Sec.	...	2,700·0
T2	Driver trans. Pri.	...	1,100·0
	Driver trans. Sec., total		520·0
T3	Speaker input trans. Pri., total		760·0
	Speaker input trans. Sec.	...	0·2
S1	Local/distant switch	...	—
S2–S6	Waveband switches	...	—
S7	Radio muting switch	...	—
S8	Gram PU switch	...	—
S9, S10	Scale lamp switches	...	—
S11	GB circuit switch	...	—
S12	HT circuit switch	...	—
S13	LT circuit switch	...	—

DISMANTLING THE SET

Removing Chassis.—Remove the two small control knobs (one recessed grub screw each) and the large one (two recessed grub screws);

remove the back cover (seven round-head set screws with washers), the batteries and the battery shelf (sliding fit);

withdraw the non-reversible speaker plug from its socket on the chassis deck;

lay the receiver down on its back, and remove the four 4BA set screws (with washers) holding the chassis to the curved edges at the bottom of the cabinet, and lift the cabinet away.

Chassis will now be free, but before access can be had to its underside, the sheet metal screening plate covering the bottom must be removed (two 4BA set screws).

When replacing, the screen fixing screws go into the two holes, diagonally opposite each other across the screen near the corners, on the *longer* sides of the plate; those on the shorter sides take the chassis fixing screws.

The shelf should be replaced with the large wooden block, which acts as a stop for the accumulator, at the front on the underside of the shelf. Do not omit to pass the HT battery cable through the slot on the left.

Removing Speaker.—Withdraw the connecting plug from its socket on the chassis deck and remove the four nuts (with lock-washers) holding the speaker to the sub-baffle.

When replacing, the transformer should be on the right.

VALVE ANALYSIS

Valve voltages and currents given in the table below are those quoted by the makers for average conditions when the receiver is operating from a battery whose HT section is 130 V with the volume control at maximum, while tuned to 200 m.

Voltages were measured on a high resistance voltmeter whose negative lead was connected to chassis.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 215SG	120	1·5	63	1·0
V2 220VS	120	4·0	75	1·5
V3 210HF	45	1·5	—	—
V4 PM2DX	125	3·0	—	—
V5 220B	125†	1·0†	—	—

† Each anode, quiescent.

GENERAL NOTES

Switches.—S1 is the toggle-operated QMB local/distant switch, mounted at the front of the chassis. It closes for "local" reception, and opens for "distant."

S2-S6 are the waveband switches, **S7, S8** are the radio muting and gramophone pick-up switches, and **S9, S10** are the scale lamp switches, all ganged in a barrel-operated spring-leaf assembly beneath the chassis. The unit is indicated in our under-chassis view, where the switches are all identified. The table below gives the switch positions for the three control settings, starting from the MW position of the control, which is continuously rotatable, and turning clockwise. A dash indicates open, and **C** closed.

Switch Table

Switch	MW	LW	Gram
S2	C	—	—
S3	C	—	—
S4	C	—	—
S5	C	—	—
S6	C	—	—
S7	—	—	C
S8	—	—	C
S9	—	C	—
S10	C	—	—

S11, S12 and **S13** are the three battery circuit switches, in a jack-switch type of assembly mounted on the rear end of the volume control assembly but operated by notched disc instead of a plug. The disc is ganged with the volume control, and the switches open at the minimum position of the control. The four connecting tags are identified in the sketch in col. 5.

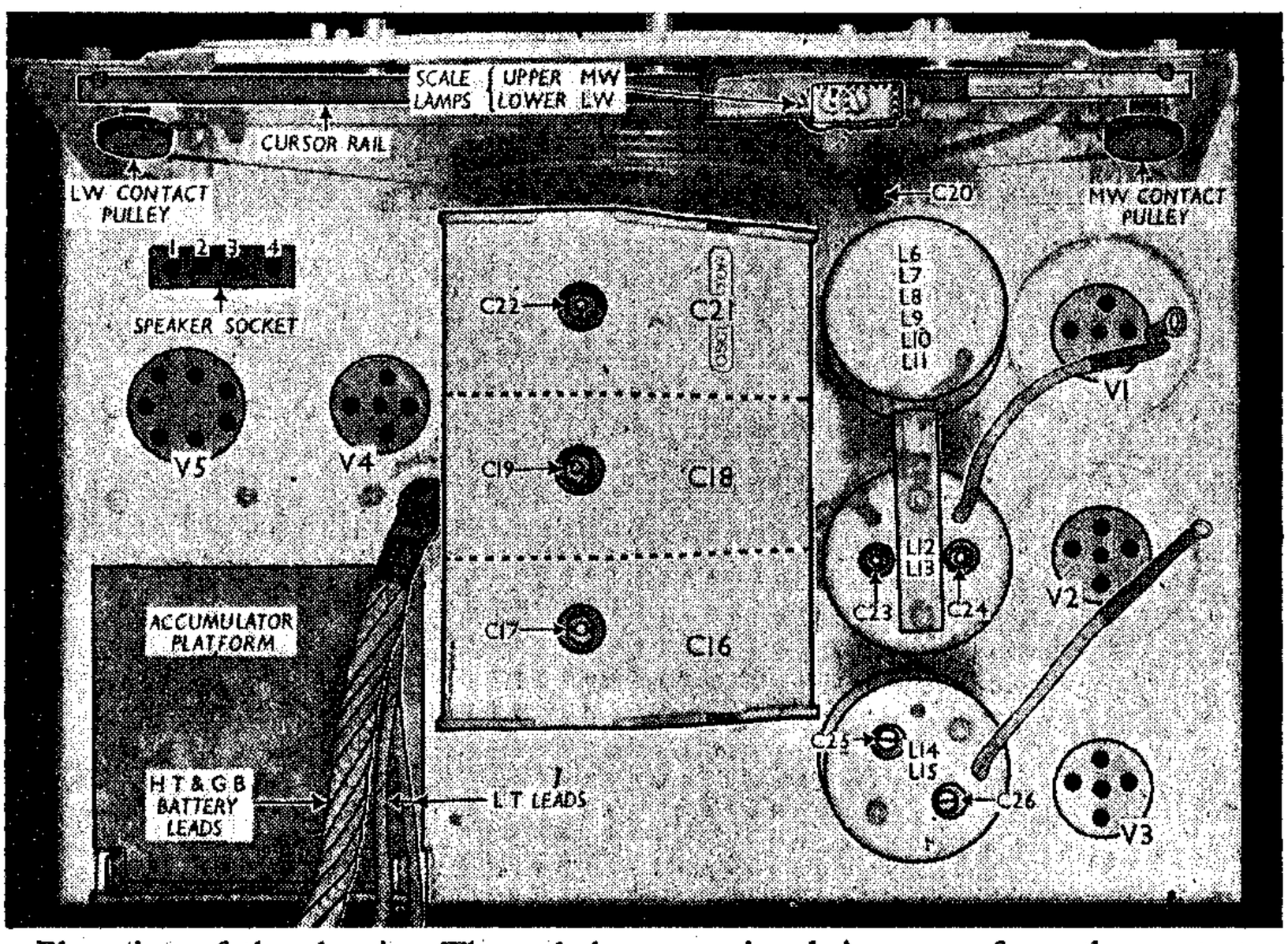
Coils.—L1-L5 are the aerial coupling and band-pass coils, wound on a common unscreened tubular former beneath the chassis.

The oscillator coils **L6-L11** are in a screened unit on the chassis deck. Those in **V1** filament have very low resistance values, but nevertheless, the DC voltage drop along them may be sufficient to stop the valve from oscillating except when working from a freshly charged accumulator if the valve is in poor condition.

The IF transformers **L12, L13** and **L14, L15** are in two further screened units on the chassis deck, with their associated trimmers, while the IF filter choke **L16** is in a screened container beneath the chassis deck. Note that the first IF transformer primary trimmer **C23** is connected in series between **V1** anode and the oscillator circuit, where it acts as a coupling. The lead from its free end emerges from its screening can through a hole at the top and is connected to a tag on a panel carried on top of the can. There it is joined by a lead from **L10**, which emerges from the top of the oscillator can, and another lead from **C21.**

Scale Cursor Lamps.—These are two lamps with clear spherical bulbs and MES bases, rated at 2.5 V, 0.2 A. The makers' part number for them is 3434. They are mounted on the cursor carrier, which slides along a rail behind the tuning scale, a cursor line on the carrier throwing a shadow-line on the screen. The two lamps are connected in series across the 2 V filament circuit, but the LW (lower scale) lamp is short circuited on MW by switch **S10,** and the MW lamp is short-circuited by **S9** on LW. On gram, both lamps light dimly, as both switches are open.

The lamps pick up their energising current from the two contact pulleys at either



Plan view of the chassis. The scale lamps receive their current from the contact pulleys and cursor rail, seen behind the scale, via conducting drive cords. The pin numbers of the speaker socket are indicated.

end of the scale assembly, as indicated in our plan view, one pulley being insulated from chassis, and current passes to them from the pulleys via the two cursor drive cords, which are made of stranded wire and are therefore conductors. The junction between the two lamps is taken via sliding contacts to the cursor rail, which is insulated from chassis but connected to the junction of **S9** and **S10.**

Speaker Connector.—The speaker lead is terminated in a three-pin plug, a fourth position being vacant, and a sketch inset with the circuit overleaf shows the pin numbers which agree with those in the diagram, where the speaker lead colours are also indicated.

The socket, which has four pin positions, is mounted on the chassis deck and is shown in our plan view, where the numbers are repeated.

External Speaker.—A second speaker socket, a replica of that on the chassis deck, is provided on the rear chassis member for the connection of a high-impedance (about 12,000 Ω) external speaker. If the transformer is of the normal type its primary should be connected to pins **3** and **4,** but if it is of the push-pull type, its centre tap should go to Pin **1,** and its outers to pins **3** and **4.** In this case, the internal speaker may be muted by withdrawing its connecting plug.

Speaker Grill.—The circular speaker aperture escutcheon is a plastic moulding, made as a separate piece from the cabinet, and it can be removed by turning its rim a few degrees anti-clockwise, as seen from the front, and lifting out, as it is held in position by a bayonet fixing.

This provides a convenient means of access to the inside of the speaker cone and gap without removing the speaker. It is also useful if it is desired to fit a new piece of fabric behind the bars, the material being held in place by an expanding ring inside the rear of the escutcheon moulding.

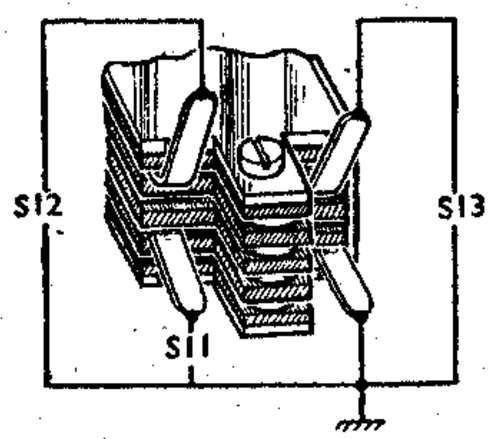
Capacitor C12.—This is the electrolytic HT reservoir capacitor, in a waxed cardboard rectangular container beneath the chassis. Originally, the value of this unit was 8 μF, but in some chassis, as in our sample, the capacitance may be 9 μF, comprising an 8 μF and a 1 μF unit in the same block. Our sample was rated at 220 V peak.

Resistors R2, R10.—These are two wire-wound units mounted close to the volume control beneath the chassis. **R10** was not fitted in early chassis.

Chassis Divergencies.—As was mentioned previously, **C12** may be 8 μF or 9 μF, and **R10** may be omitted.

In early chassis, **R10** was not fitted. The centre-tapping of **T2** secondary then went to chassis, but it was found that generally **V5** worked better with a little grid bias than with none, so **R10** was inserted between **R11** and **S11,** and **T2** secondary tapping was taken to the junction of **R10** and **R11** as shown in our circuit diagram. The measured value of **R10** in our chassis was about 70 Ω, but it might be somewhat higher than this in other chassis.

The makers' diagram omits **R5,** which was also a later modification. Where this modification is made, **C3** acts with **R5** to form a decoupling circuit. Where **R5** is not fitted, however, **C3** is connected between **V1** screen and chassis.



Sketch showing the connecting tags of the battery switch unit **S11, S12, S13.** The contact spring-leaves are operated by a cam disc on the gain control spindle.

Batteries.—HT battery voltage, 130 V plus 9 V GB, with a common HT negative and GB positive tapping. The LT is a 2 V accumulator cell. The makers' part numbers for the original batteries is: HT, D3361; LT, C3656.

Battery Leads and Voltages.—Black lead, spade tag, LT negative; Red/black lead, spade tag, LT positive 2 V. Black/white lead, black plug, HT negative and GB positive; yellow lead and plug, GB negative 1, −4.5 V; white lead and plug, GB negative 2, −9 V; blue (or green) lead and plug, HT positive 1, 63 V; green (or blue) lead and plug, HT positive 2, 72 V; red lead and plug, HT positive 3, 130 V.

CIRCUIT ALIGNMENT

IF Stages.—Connect signal generator leads to **A** and **E** sockets, switch set to LW, turn the gang to maximum capacitance and the volume control to maximum. Switch **S1** should be set to "distant."

Feed in a 110 kc/s (2,727 m) signal, and adjust **C26, C25, C24** and **C23** for maximum output, reducing input as circuits come into line. If no signal can be detected, connect the signal generator leads first to **V2** control grid and chassis, and adjust **C26** and **C25;** then transfer the leads to **V1** control grid and chassis, and adjust **C24** and **C23.** After preliminary adjustment, transfer leads to **A** and **E** sockets and recheck.

RF and Oscillator Stages.—With the gang at minimum and maximum the cursor line should be about an equal distance from the ends of the scale. It may be adjusted if the two fixing screws in the cord line drum boss are slackened.

Leave **S1** and the signal generator connections as described for IF stages, but insert a dummy aerial or a 0.0002 μF capacitor in series with the aerial connection.

MW.—Switch set to MW, tune to 200 m on scale, feed in a 200 m (1,500 kc/s) signal, and adjust **C22** for maximum output. Tune to 250 m on scale, feed in a 250 m (1,200 kc/s) signal, and adjust **C19** and **C17** for maximum output. **C19** will usually be nearly at its minimum position.

Feed in a 500 m (600 kc/s) signal, and tune it in. If the calibration now reads too high, slacken off **C22** slightly, feed in a 250 m (1,200 kc/s) signal, tune it in, and adjust the cursor for correct calibration, readjusting **C19** and **C17.** If the calibration reads too low, screw up **C26** slightly, then proceed as before. Repeat until no improvement results.

LW.—Switch set to LW, tune to 1,800 m on scale, feed in an 1,800 m (166.5 kc/s) signal, and adjust **C20** for maximum output. Check calibration at 1,200 m (250 kc/s), and if incorrect, readjust **C20** to divide the error between the two settings.

Image Suppressor.—This was arranged to operate originally at 479 m, but the relative powers and frequencies of transmitters have since been modified considerably, and their sites may have been changed, so that the original adjustment may not be effective.

If image interference is experienced, therefore, it may be minimised by tuning the receiver to the frequency at which the interference is evident, and adjusting **C15** for minimum interference, using the speaker as an indicator.

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