

"TRADER" SERVICE SHEET

648

REVISED ISSUE OF
SERVICE SHEET No. 263



The Ekco AW88 table model, in the walnut finish cabinet.

EKCO AW88

C88 CONSOLE and RG109 RADIOGRAM

SPIN-WHEEL tuning, provision for connecting a dipole aerial and a special waveband for the reception of the sound channel accompanying television transmissions (for use only in districts within a few miles radius of the transmitting station) are salient features in the Ekco AW88, a 4-valve (plus rectifier) 4-band superhet designed for AC mains of 200-250 V, 40-80 c/s. The SW range is 16-50 m.

Other features include negative feedback from a special secondary winding on the output transformer, provision for a gramophone pick-up and an external speaker, and a whistle filter in the output circuit.

An identical chassis is fitted in the C88 console, while the differences in the RG109, the radiogram version, are described under "Radiogram Modifications" overleaf. This *Service Sheet*, therefore, covers all three models, but it was prepared from an AW88 table model.

Release date: 1937 (all models)
Original prices: AW88, walnut finish, £13 2s. 6d.; black and ivory finish, £13 10s.; C88, £16 16s.; RG109, £25 14s. 6d.

CIRCUIT DESCRIPTION

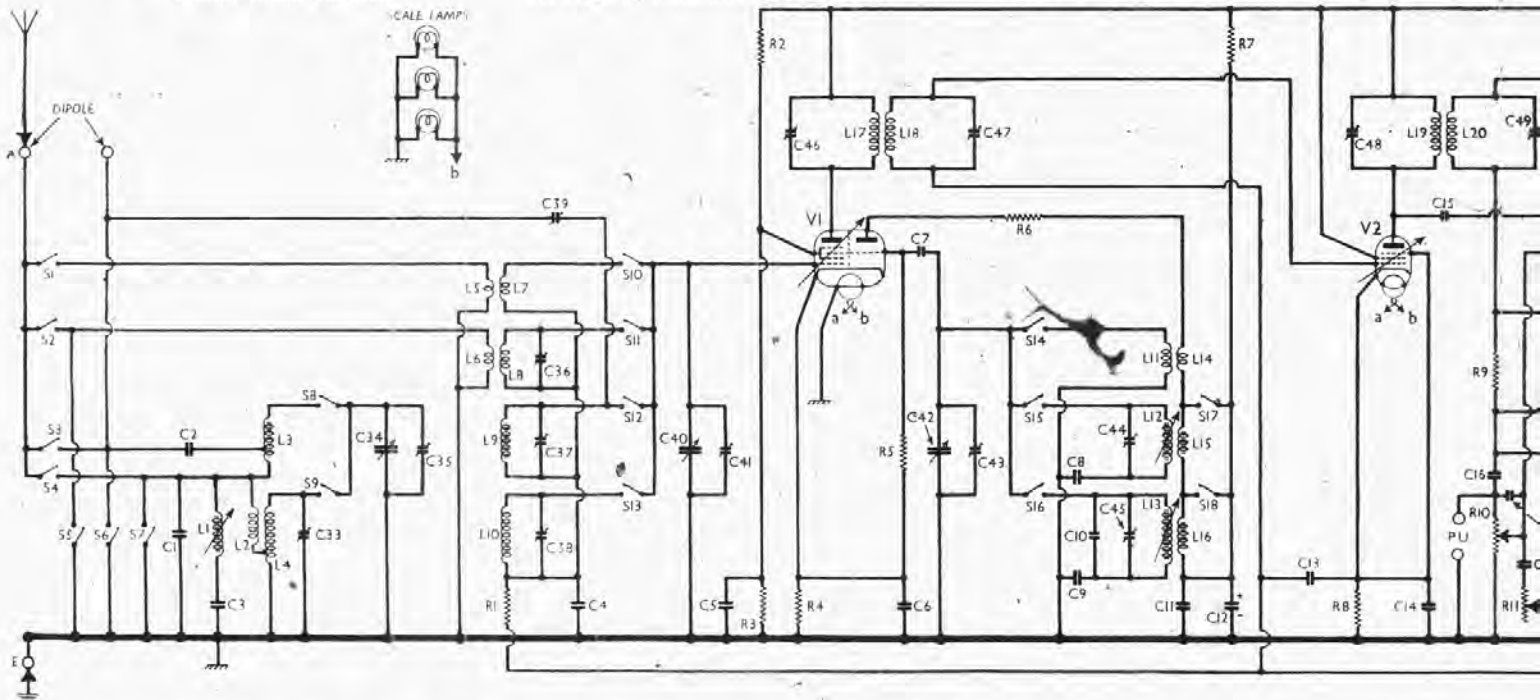
Aerial input, from socket **A**, is on MW via coupling condenser **C2**, and on LW via

coupling coil **L2**, to inductively coupled band-pass filter. Primary coils **L3**, **L4** are tuned by **C34**; secondary coils **L9**, **L10** by **C40**. On LW, aerial circuit is shunted by IF filter **L1** and **C3**. Image suppression by **C39**.

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**, **C40** (TS) or **L8**, **C40** (SW). If an ordinary aerial is used, it should be connected to socket **A**. If a dipole is used, its leads go to the socket "A" and the unmarked socket immediately below. Socket "E" should be connected to earth.

Tuned circuits are connected via selector switches **S10** (TS), **S11** (SW), **S12** (MW) and **S13** (LW) to CG of first valve (**V1**, Mullard metallised **TH4A**), 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 **C42**; parallel trimming by **C43** (SW), **C44** (MW) and **C10**, **C45** (LW); series tracking by **C8** (fixed—MW), **C9** (fixed—LW) and adjustable iron-dust cores in both cases. Reaction by coils **L14** (TS and SW), **L15** (MW) and **L16** (LW).

No separate oscillator circuit is provided for the television sound band, a



Circuit diagram of the Ekco AW88 AC superhet. There are in all four wavebands, including one for the television sound channel. This **C40** in the aerial circuit, but in the oscillator circuit a harmonic of the SW band circuit is used. **L1**, **C3** form an IF filter in the LW band circuit. **R18-R21** form a step-down coupling between **V3** triode and **V4**, and their coupling ratio is varied on di by the action of switches **S19**, **S20**. A negative feed-back circuit is fed from a second secondary winding on the output transformer **T1** to on the TS, MW and LW bands, but it is short-circuited on SW by **S21**. **C28**, **C29** and **L21-L23** form a whistle filter in the speech

harmonic of the SW band serving the purpose.

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 C46, L17, L18, C47 and C48, L19, L20, C49.

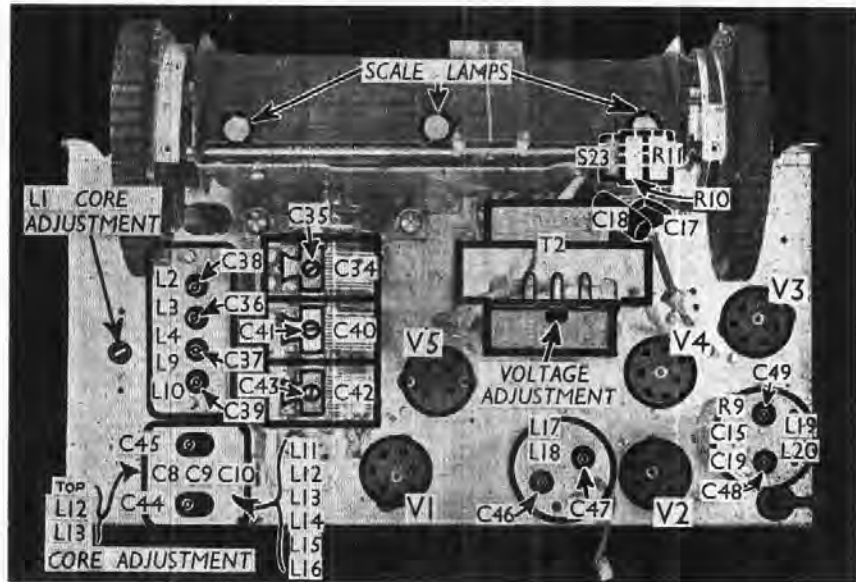
Intermediate frequency 126.5 kc/s.

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 C16 and manual volume control R10 to CG of triode section, which operates as AF amplifier.

IF filtering by R9, C19 and C20. High-note compensation by C17, connected between C16 and triode CG. Variable tone control by RC filter C18, R11 between CG and chassis. Provision for connection of gramophone pick-up across R10.

Second diode of V3, fed via C15 from V2 anode, provides DC potential which is developed across load resistor R16 and fed back through decoupling circuits as GB to FC and IF valves, giving automatic volume control.

Resistance-capacity coupling by R15 in anode circuit and, in series from V3 anode to chassis, C23, R18, R19, R20 and R21, between V3 triode and pentode output valve (V4, Ekco OP42 or Mullard PenA4). At this stage gain and tone modifications and a negative feed-back system are introduced. The CG is fed via



Plan view of the chassis. All the pre-set condenser and coil adjustments, with the exception of C33, are indicated here. The position of C33 is indicated in the under-chassis view overleaf.

R23 (with C24 in parallel) from the junction of R18 and R19, at which point is also connected the common of switches S19, which short-circuits R19 on MW and LW; S20, which short-circuits R19, R20 on TS; and S21, which short-circuits R23, C24, thus rendering feed-back inoperative,

on SW. The feed-back is fed via resistors R22 on one side and R24 on the other from a tertiary winding on the output transformer T1 to either end of R23; R24 is by-passed by C25.

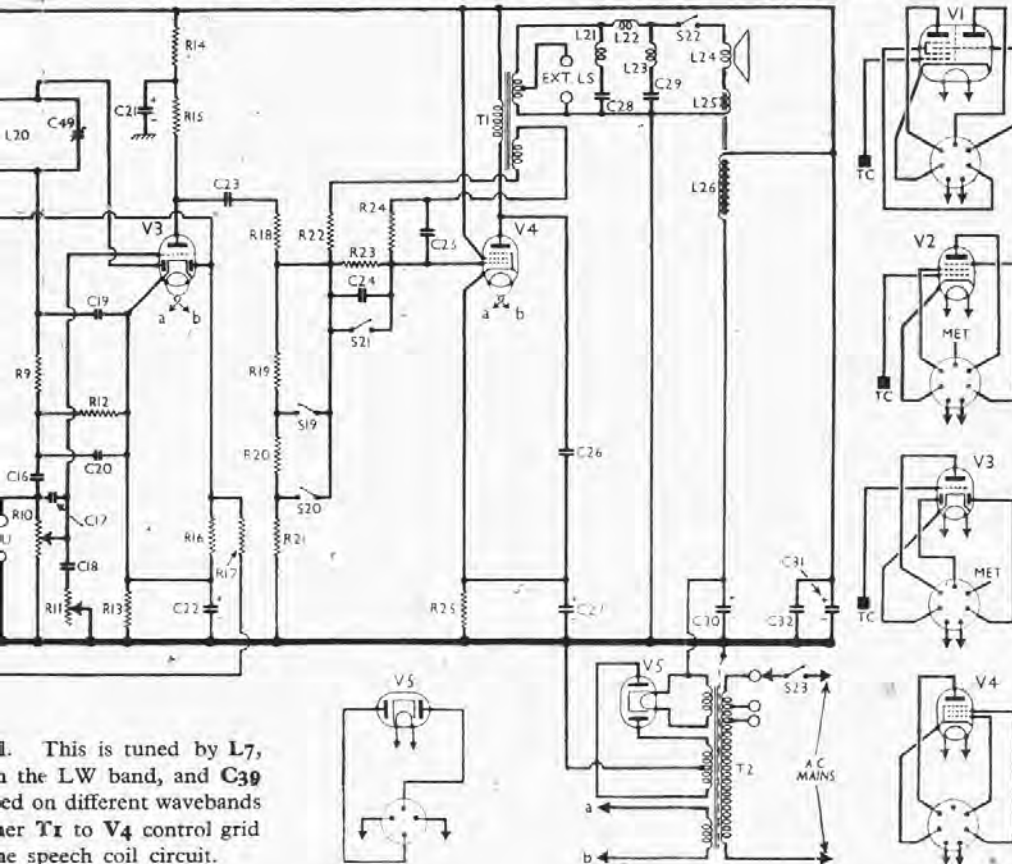
Fixed tone correction in anode circuit of V4 by C26 to cathode. Provision for connection of low-impedance external speaker across part of secondary of T1. Total secondary output is fed to speech and hum neutralising coils L24, L25 via whistle filter circuit comprising coils and condensers L21, C28, L22, L23, C29. Switch S22 permits speech coil circuit to be broken, thus muting internal speaker.

HT current is supplied by IHC full-wave rectifying valve (V5, Mullard 1W4/350). Smoothing by speaker field L26 and dry electrolytic condensers C30, C31. HT circuit RF filtering by C32.

COMPONENTS AND VALUES

RESISTORS		Values (ohms)
R1	V1 hex. CG decoupling ...	250,000
R2	V1 SG pot. divider ...	*12,500
R3		25,000
R4		V1 fixed GB resistor ...
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 ...	500,000
R10	Manual volume control ...	1,000,000
R11	Variable tone control ...	1,500,000
R12	V3 signal diode load ...	100,000
R13	V3 GB resistor ...	2,000
R14	V3 triode anode decoupling ...	15,000
R15	V3 triode anode load ...	50,000
R16	V3 AVC diode load ...	750,000
R17	AVC line decoupling ...	1,000,000
R18	V4 CG resistors ...	75,000
R19		100,000
R20		250,000
R21		25,000
R22		Part feed-back feed ...
R23	Feed-back coupling resistor ...	20,000
R24	Part feed-back feed ...	50,000
R25	V4 GB resistor ...	120

* Two 25,000 Ω in parallel in our chassis.
 † Two 40,000 Ω in parallel in our chassis.



1. This is tuned by L7, in the LW band, and C39 on different wavebands. The speech coil circuit is fed via transformer Tr to V4 control grid.

CONDENSERS		Values (μ F)
C1	Aerial capacity swamp	0.001
C2	Aerial MW coupling	0.001
C3	Aerial IF filter tuning	0.00015
C4	V1 hexode 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	Osc. circuit MW tracker	0.002
C9	Osc. circuit LW tracker	0.0008
C10	Osc. circuit fixed trimmer	0.00002
C11	V1 osc. anode RF by-pass	0.1
C12*	V1 osc. anode decoupling	2.0
C13	V2 CG decoupling	0.04
C14	V2 cathode by-pass	0.1
C15	Coupling to V3 AVC diode	0.000015
C16	AF coupling to V3 triode	0.01
C17	High-note compensator	0.00006
C18	Part variable tone control	0.004
C19	} IF by-pass condensers	0.0002
C20		0.0002
C21*	V3 triode anode decoupling	2.0
C22*	V3 cathode by-pass	50.0
C23	V3 triode to V4 AF coupling	0.01
C24	Parts of feed-back coupling	0.008
C25	Fixed tone corrector	0.1
C26	V4 cathode by-pass	0.004
C27*	Parts of whistle filter	50.0
C28	HT smoothing condensers	0.2
C29	HT smoothing condensers	0.2
C30*	HT smoothing condensers	8.0
C31*	HT smoothing condensers	12.0
C32	HT circuit RF by-pass	0.1
C33†	B-P pri. LW trimmer	—
C34†	Band-pass pri. tuning	—
C35†	B-P pri. MW trimmer	—
C36†	Aerial SW trimmer	—
C37†	B-P sec. MW trimmer	—
C38†	B-P sec. LW trimmer	—
C39†	Image suppressor	—
C40†	Band-pass sec. tuning	—
C41†	Aerial TS trimmer	—
C42†	Oscillator circuit tuning	—
C43†	Osc. circuit SW trimmer	—
C44†	Osc. circuit MW trimmer	—
C45†	Osc. circuit LW trimmer	—
C46†	1st IF trans. pri. tuning	—
C47†	1st IF trans. sec. tuning	—
C48†	2nd IF trans. pri. tuning	—
C49†	2nd IF trans. sec. tuning	—

* Electrolytic. † Variable. ‡ Pre-set.

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		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		27.0
L11	Oscillator TS and SW tuning coil	0.05
L12	Oscillator MW tuning coil	3.0
L13	Oscillator LW tuning coil	9.0
L14	Oscillator TS and SW reaction	0.4
L15	Oscillator MW reaction	0.6
L16	Oscillator LW reaction	2.0
L17	} 1st IF trans. { Pri. ...	80.0
L18		{ Sec. ...
L19	} 2nd IF trans. { Pri. ...	80.0
L20		{ Sec. ...
L21	} Parts of whistle filter	2.5
L22		5.5
L23		2.5
L24		24.0
L25	Speaker speech coil	0.7
L26	Speaker field coil	1,250.0
T1	Output trans. { Pri. ...	350.0
	{ Sec. ...	4.0
	{ Tert. ...	40.0
	{ Total ...	35.0
T2	Mains { Heater sec. ...	0.05
	{ Rect. heat. sec. ...	0.1
	{ HT, sec., total ...	550.0
S1-S21	Waveband switches	—
S22	Internal speaker switch	—
S23	Mains switch, ganged R10	—

* Including part of L4, from tap to chassis.

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating on mains of 225 V, using the 220-230 V tapping on the mains transformer. 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.

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

If, as in our case, V2 should become unstable when measurements are being made of its anode current, it can be stabilised by connecting a non-inductive condenser of about 0.1 μ F from grid (top cap) to chassis.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 TH4A	240	4.1	103	7.0
	Oscillator			
	105	7.0		
V2VP41	240	12.0	240	4.6
V3 DT41	105	1.7	—	—
V4 OP42	225	39.0	240	5.2
V5 1W4/350	335†	—	—	—

† Each anode, A.C.

DISMANTLING THE SET

Removing Speaker.—The speaker must be removed before it is possible to remove the chassis.

Unsolder from the terminal panel on the speaker the leads connecting it to chassis;

Slacken the nuts holding the four clamps to the speaker rim, and lift out the speaker.

When replacing, the terminal panel should point towards the bottom left-hand corner of the cabinet.

The leads should be connected as follows, numbering the tags from bottom to top: 1, red; 2, brown; 3, yellow; 4, red.

Removing Chassis.—Remove the speaker as explained above;

remove the two screws (with lock-washers) holding the scale assembly brackets to the top of the cabinet;

remove the four screws (with lock-washers) holding the front and rear of the chassis to the cabinet;

from the back supports remove two screws (with lock-washers) holding

them to the chassis, and four screws (with lock-washers) holding them to the cabinet;

remove the two clamps (nuts and lock-washers) holding the front of the chassis to the sub-baffle.

If the rear is tilted upwards, the chassis may now be withdrawn.

GENERAL NOTES

Switches.—S1-S21 are the waveband switches, in two rotary units, beneath the chassis. They are indicated in our under-chassis view, and shown in detail in the diagrams (col. 2). The table below shows 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.

Switch	LW.	MW	SW.	TS
S1	—	—	—	C
S2	—	—	—	C
S3	—	—	—	—
S4	—	—	—	—
S5	C	—	—	—
S6	—	—	—	—
S7	—	—	—	—
S8	—	—	—	—
S9	—	—	—	—
S10	—	—	—	—
S11	—	—	—	—
S12	—	—	—	—
S13	—	—	—	—
S14	—	—	—	—
S15	—	—	—	—
S16	—	—	—	—
S17	—	—	—	—
S18	—	—	—	—
S19	—	—	—	—
S20	—	—	—	—
S21	—	—	—	—

S22 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. When this is unscrewed, the internal speaker speech coil circuit is broken, thus muting the speaker.

S23 is the QMB mains switch, ganged with the volume control R10.

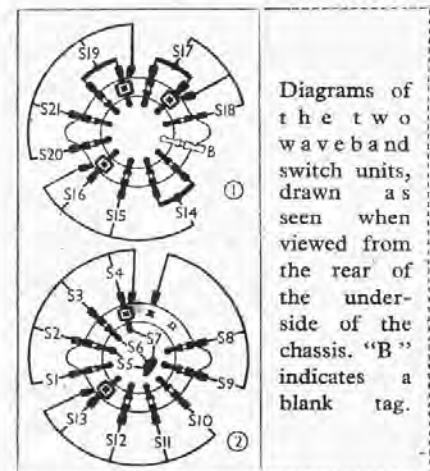
Coils.—L1 is mounted beneath the chassis, and has an adjustable iron core, reached through a hole in the chassis deck. L2, L3, L4, L9, L10 and L11-L16 are in two screened units on the chassis deck. The first of these units contains four trimmers reached through holes in the top of the can. The second contains two trimmers (reached through holes in the top of the can) and the three fixed condensers C8-C10, while the cores of L12 and L13 are adjustable through holes in one side of the can. L5, L7 and L6, L8 are on small tubular formers, supported directly on their switch units beneath the chassis.

L17, L18 and L19, L20 are the IF transformers in two further screened units on the chassis deck. They contain their associated trimmers, while the second also includes R9, C15 and C19.

The filter coils L21-L23 are on a single former beneath the chassis, and are unscreened.

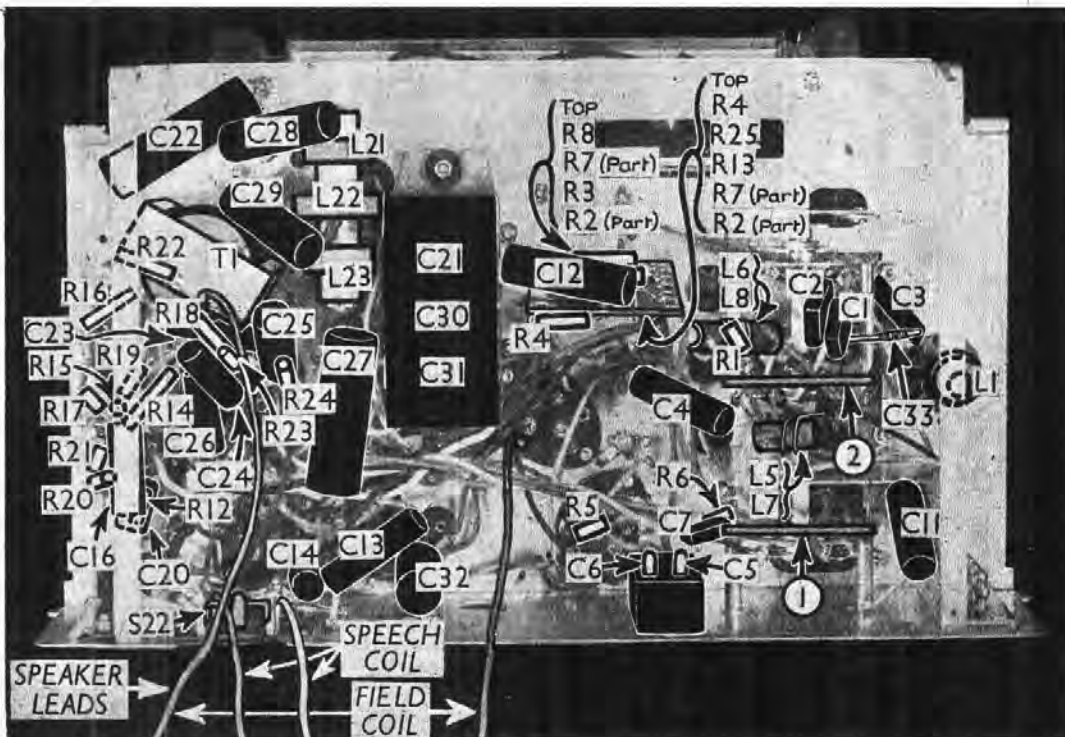
Scale Lamps.—These are three Osram MES types, rated at 6.2 V, 0.3 A.

Gramophone Pick-up.—Two sockets are provided at the rear of the chassis for the connection of a gramophone pick-up.



Diagrams of the two waveband switch units, drawn as seen when viewed from the rear of the chassis. "B" indicates a blank tag.

Under-chassis view. The switch units are indicated, and are identified by numbers to agree with the diagrams in col. 2. C33 is just above them. In the centre is a vertical assembly, the components on each side of which are numbered from top to bottom as seen in this view. R2 and R7 each have a part on either side of the assembly.



There is no gramophone position on the waveband switch control, but the makers suggest in their manual that, if the output with a given pick-up is insufficient, the control should be turned to the SW setting. S19 and S20 are then open, and maximum gain is obtained in the coupling between V3 triode and V4.

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 S22.

Condensers C21, C30, C31.—These are three dry electrolytics in a single carton beneath the chassis, with a common negative (black) lead. The yellow lead is the positive of C21 (2 μF), the blue lead is the positive of C30 (8 μF), and the red lead is the positive of C31 (12 μF). The makers' diagram shows C12 also in this block, but in our chassis it is a separate tubular 2 μF unit.

Condensers C5, C6.—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 shown numbered in the under-chassis view.

Condensers C10, C33.—These are small condensers formed of wires spiralled over insulated wires. C10 is inside the oscillator coil unit, while C33 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.

In some cases the C18, R11 connections may be the reverse of those shown in our diagram, C18 being connected between R11 and chassis.

R24 and C25 may not be fitted on some chassis.

RADIOGRAM MODIFICATIONS

The differences in the RG109 radiogram include a five-position switch (with a gram setting), and an extra switch unit. The pick-up has a 30,000 Ω resistor in parallel with it. In the gram position of the switch, the pick-up is connected between chassis and C16 and C17 (as in our diagram), but on radio it is disconnected. Our gram, also, the top of L3 is earthed, and certain other connections are broken, including the HT supply to the hexode portion of V1.

CIRCUIT ALIGNMENT

IF Stages.—Connect signal generator to E socket, and via a 0.02 μF condenser to grid (top cap) of V1, leaving existing cap in position. Switch set to LW, turn gang to maximum, feed in a 126.5 kc/s (2,372 m) signal, and adjust C46, C47, C48 and C49 for maximum output.

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

TS.—Connect signal generator to A and E sockets, and feed in an 18 Mc/s (16.66 m) signal. Switch set to SW, and tune to 18 Mc/s on scale. Fully unscrew C43, then screw it in slowly. Two peaks will be obtained, of which the first reached is correct. Adjust to this accurately.

Feed in a 20.75 Mc/s (14.3 m) signal (its second harmonic being 41.5 Mc/s), at full generator output. Then switch to TS and adjust C41 for maximum output.

SW.—Switch to SW, feed in a 15 Mc/s (20 m) signal, tune to 15 Mc/s on scale, and adjust C36 for maximum output.

MW.—Switch set to MW, tune to 200 m on scale, and feed in a 200 m (1,500 kc/s) signal. Fully unscrew C44 and then screw it in slowly, adjusting accurately to the first peak reached. Tune to 250 m on scale, feed in a 250 m (1,200 kc/s) signal, and adjust C37 and C35 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 C45, C38 and C33 for maximum output. C33 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 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.

Image Rejector.—Switch set to MW, feed in a 1,000 kc/s signal at full generator output. Tune receiver to image of generator frequency (about 400 m) and adjust C39 for minimum output.

Tune to 250 m, feed in a 1,200 kc/s signal, and readjust C37 for maximum output.