Supplement to The Wireless & Electrical Trader, November 20, 1943

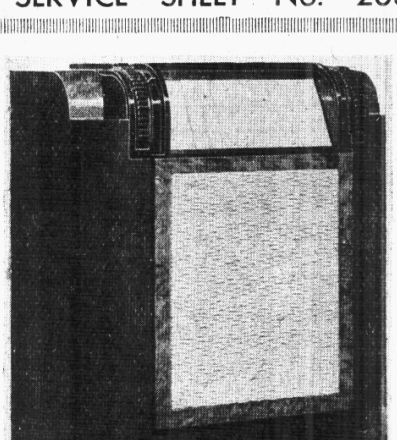
"TRADER" SERVICE SHEET

648

REVISED ISSUE OF SERVICE SHEET No. 263

EKCO AW88

C88 CONSOLE and RG109 RADIOGRAM



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

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 feed-back 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 2*s.* 6*d.*; *black and ivory finish,* £13 10*s.*; *C88,* £16 16*s.*; *RG109,* £25 14*s.* 6*d.*

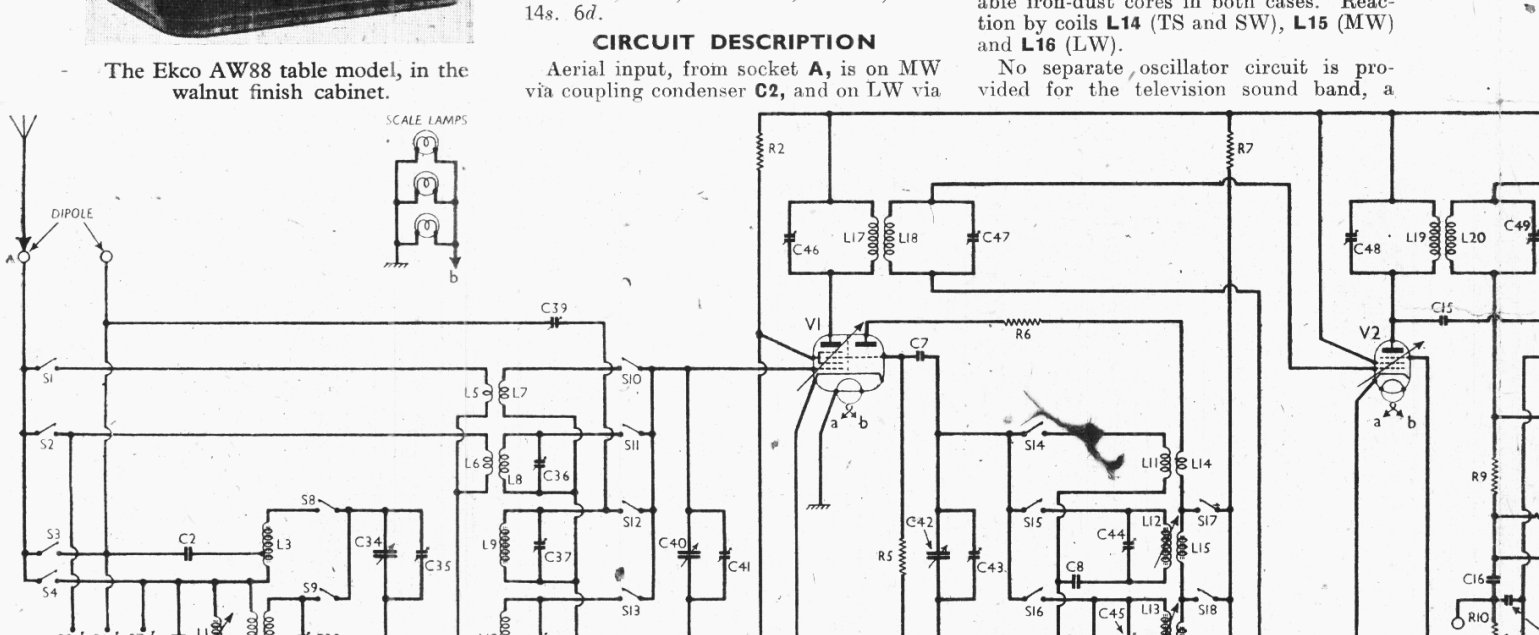
CIRCUIT DESCRIPTION

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 suppresses the image signal on MW. **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** t 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.**

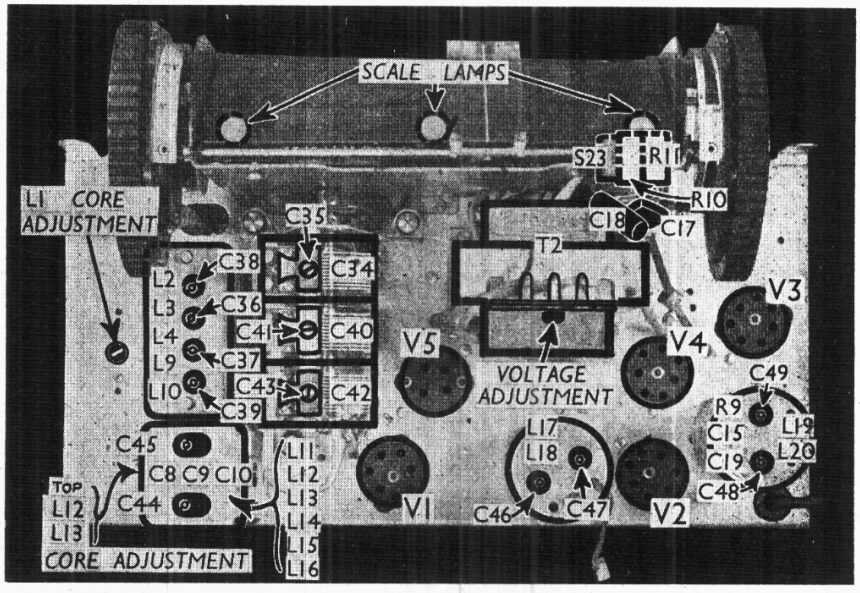
Intermediate frequency 126.5 kc/s.

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

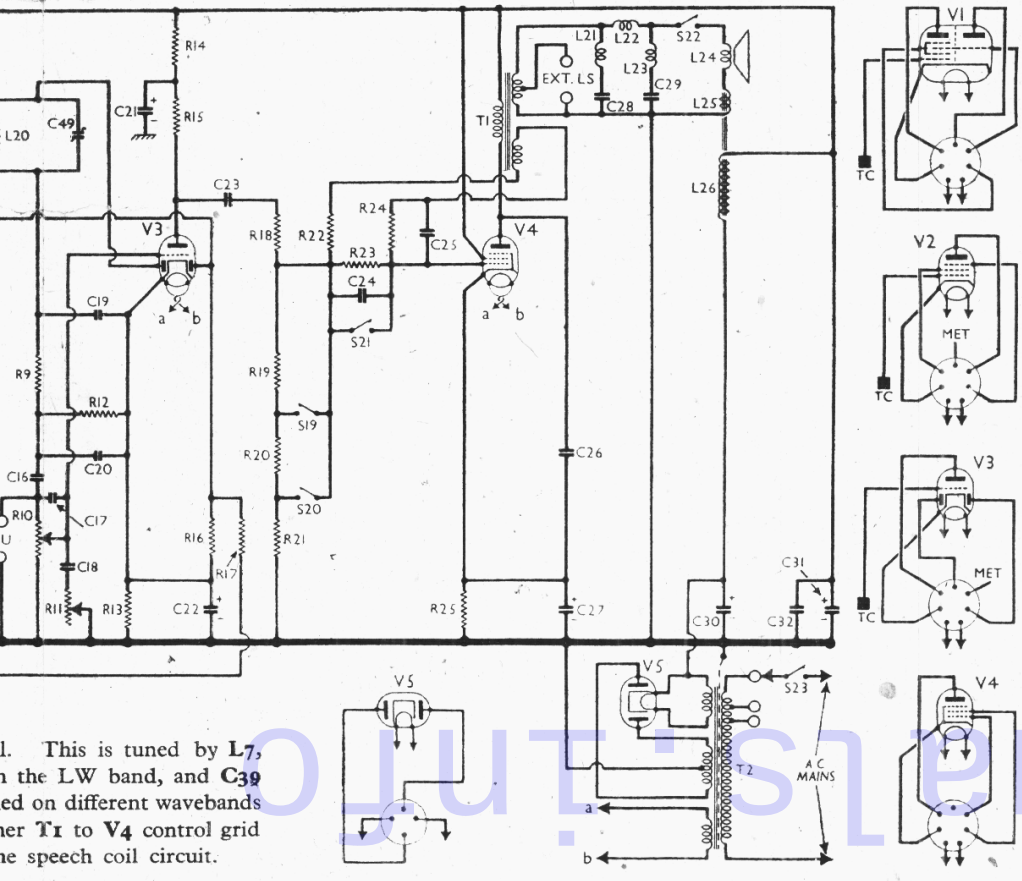


Plan view of the chassis. All the pre-set condenser and coil adjustments, with the exception of **C33,** are indicated here. The position of **C33** is is indicated in the under-chassis view overleaf.

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 IW4/350).** Smoothing by speaker field **L26** and dry electrolytic condensers **C30, C31.** HT circuit RF filtering by **C32.**



l. This is tuned by **L7,** n the LW band, and **C39** ed on different wavebands ner **T1** to **V4** control grid ne speech coil circuit.

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 ...	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	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		75,000
R19	V4 CG resistors	100,000
R20		250,000
R21		25,000
R22	Part feed-back feed ...	32,000
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.

	CONDENSERS	Values (μF)
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, C20	IF by-pass condensers ...	0·0002, 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, C25	Parts of feed-back coupling	0·008, 0·1
C26	Fixed tone corrector ...	0·004
C27*	V4 cathode by-pass ...	50·0
C28, C29	Parts of whistle filter ...	0·2, 0·2
C30*, C31*	HT smoothing condensers	8·0, 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, L4	Band-pass primary coils ...	2·5, 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, L10	Band-pass secondary tuning coils	2·5, 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	1st IF trans. Sec. ...	80·0
L19	2nd IF trans. Pri. ...	80·0
L20	2nd IF trans. Sec. ...	80·0
L21, L22, L23	Parts of whistle filter ...	2·5, 5·5, 2·5
L24	Speaker speech coil ...	24·0
L25	Hum neutralising coil ...	0·7
L26	Speaker field coil ...	1,250·0
T1	Output trans. Pri. ...	350·0
	Output trans. Sec. ...	4·0
	Output trans. Tert. ...	40·0
T2	Mains trans. Pri., Total ...	35·0
	Mains trans. Heater sec. ...	0·05
	Mains trans. Rect. heat. sec.	0·1
	Mains trans. 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 μF 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 IW4/350	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;

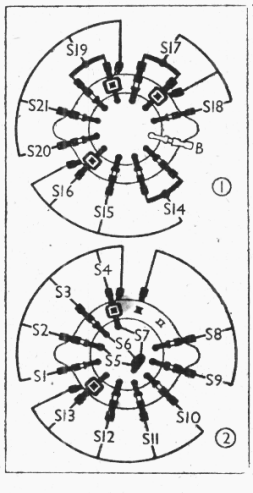
remove the two screws (with lock-washers) holding the scale assembly brackets to the top of the cabinet;

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.



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

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	—	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	C	—	—
S20	—	—	—	C
S21	—	—	C	—

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.**

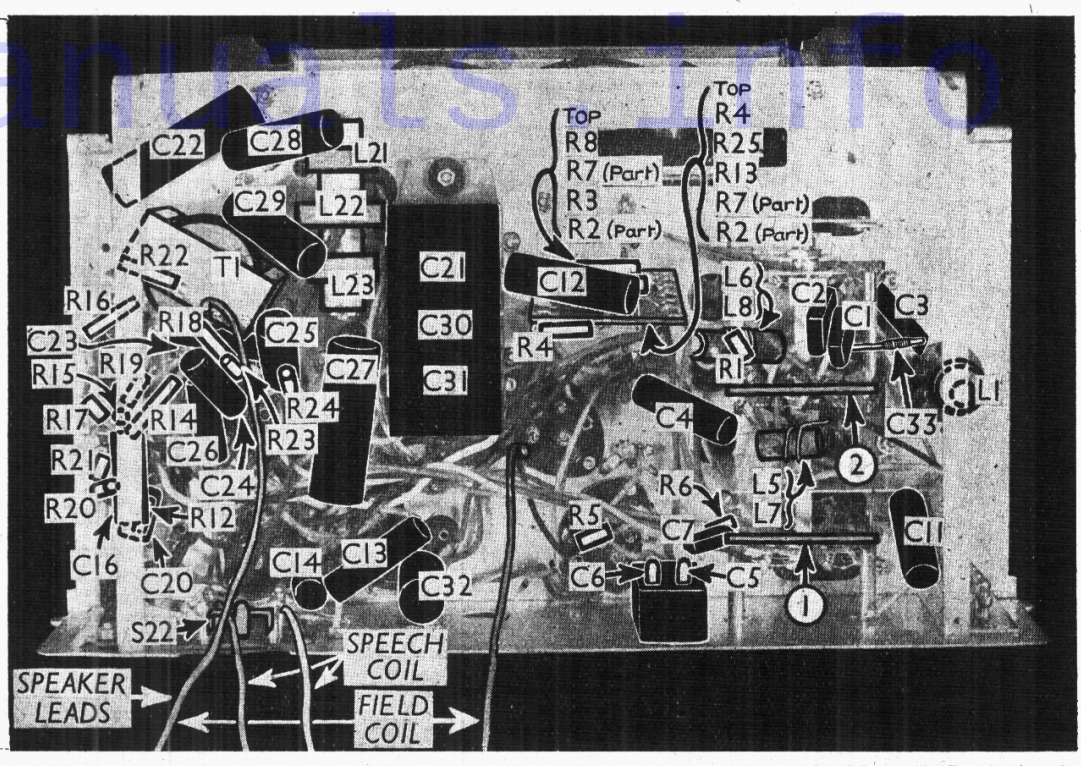
Coils.—**L1** is mounted beneath the chassis, and has an adjustable iron core, reached through a hole in the chassis deck. **L2, L3, L4, L9, L10** and **L11-L16** are in two screened units on the chassis deck. The first of these units contains four trimmers reached through holes in the top of the can. 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.



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. On 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.

Printed in Great Britain by The Cornwall Press Ltd., Paris Garden, London, S.E.1