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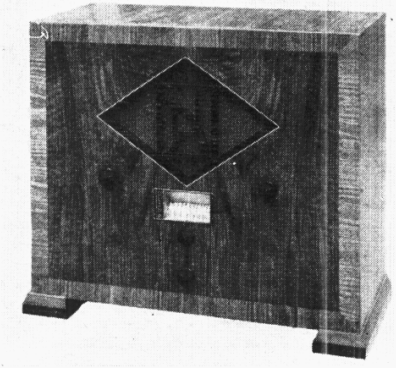
"TRADER" SERVICE SHEET 623

ULTRA PANTHER AC SUPERHET



The Ultra Panther table model.

THREE tuned IF transformers with two IF amplifying valves are included in the Ultra Panther AC Superhet, a 6-valve (plus metal rectifier) receiver designed for use with AC mains of 200-250 V, 40-100 C/S.

The full title, including "AC" and "Superhet," is necessary to identify the model, because there is a DC version, and there was previously a TRF model, both of which were styled "Panther."

Automatic volume control is not provided, but three valves are controlled by the manual gain control. A triode valve operates as a separate oscillator, and provision is made for the connection of a gramophone pick-up and an external speaker.

A similar chassis is employed in the Panther consolette, and models were available for mains of 100-130 V, 40-100 C/S.

Release date and original prices : Table model, 1934, £19 19s. ; *Consolette model*, 1934, £24 3s.

CIRCUIT DESCRIPTION

Aerial input via coupling coil **L1** and (on MW) switch **S2** to inductively coupled band-pass filter. Primary coils **L2** (MW) and **L3** (LW) are tuned by **C23;** secondary coils **L5** (MW) and **L6** (LW) are tuned by **C25.** Coupling by mutual inductance of primary and secondary windings. **L4** imposes on **L5** a load to balance that imposed on **L2** by **L1,** for tracking purposes.

First valve **(V1, Mazda AC/SGVM)** is a variable-mu RF tetrode operating as mixer with cathode injector coupling via **L7** from separate triode oscillator valve **(V2, Mazda metallised AC/HL).**

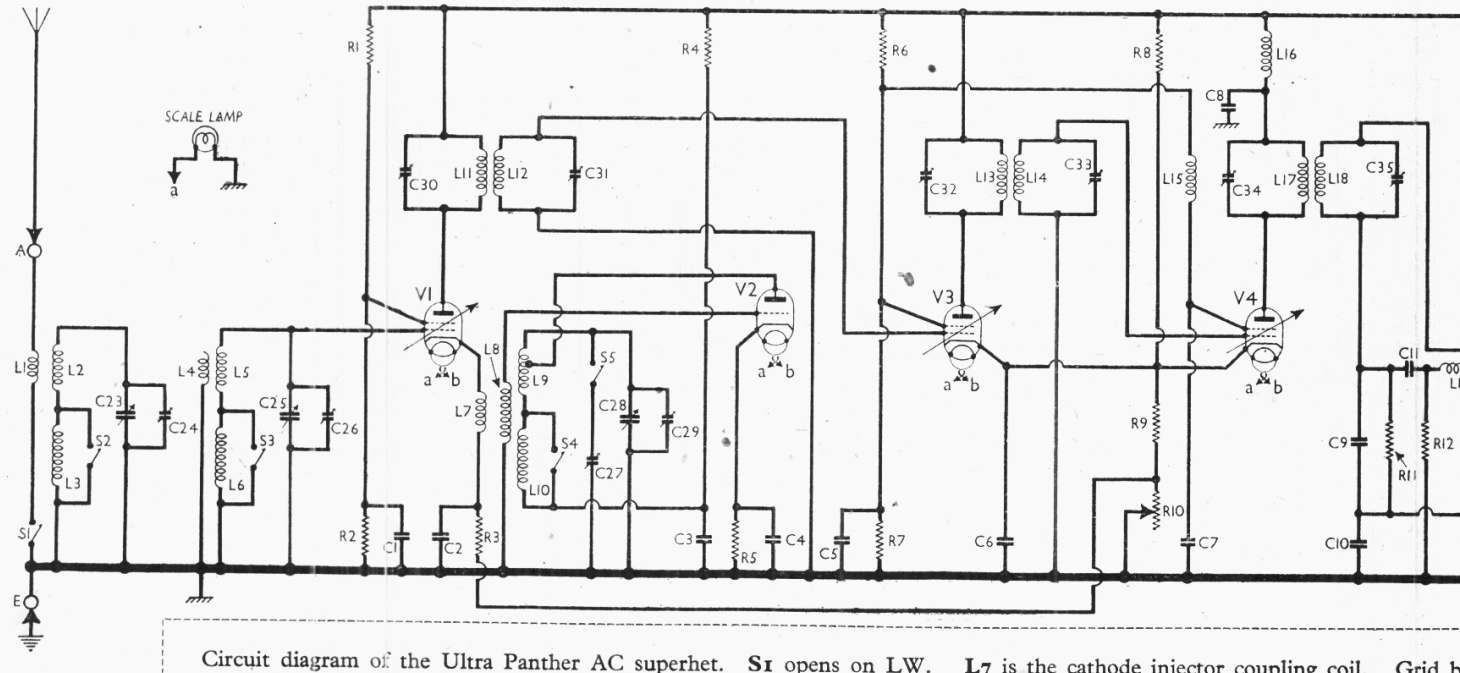
V2 control grid coils **L9** (MW) and **L10** (LW) are tuned by **C28.** Parallel trimming by **C29** (MW) and **C27** (LW); tracking by specially shaped plates of **C28,** the oscillator section of the gang. **C27** is switched into circuit on LW by the closing of **S5.** Reaction from anode is applied via coupling coil **L8.**

Third valve **(V3, Mazda AC/SGVM)** and fourth valve **(V4, Mazda AC/SGVM)** are variable-mu RF tetrodes operating as intermediate frequency amplifiers with tuned-primary, tuned-secondary transformer couplings **C30, L11, L12, C31; C32, L13, L14, C33;** and **C34, L17, L18, C35.**

Intermediate Frequency 456 KC/S.

The screen grid of **V3** is fed from a potential divider comprising resistances **R6** and **R7; V4** screen is fed from the same point via a decoupling choke **L15. V3** and **V4** cathodes are returned to a common point on the potential divider comprising resistances **R8, R9** and **R10,**

The appearance of the consolette.



Circuit diagram of the Ultra Panther AC superhet. **S1** opens on LW. **L7** is the cathode injector coupling coil. Grid b and **V4** are obtained from the potentiometer **R8, R9, R10 ; R10** being the variable gain control. AVC is not provided, the sec left unconnected. Pick-up switching is included, and provision is made for the connection of an external speaker. **R1** control. A local/distant switch may be fitted on the cabinet in some cases ; in the circuit it would be in series with

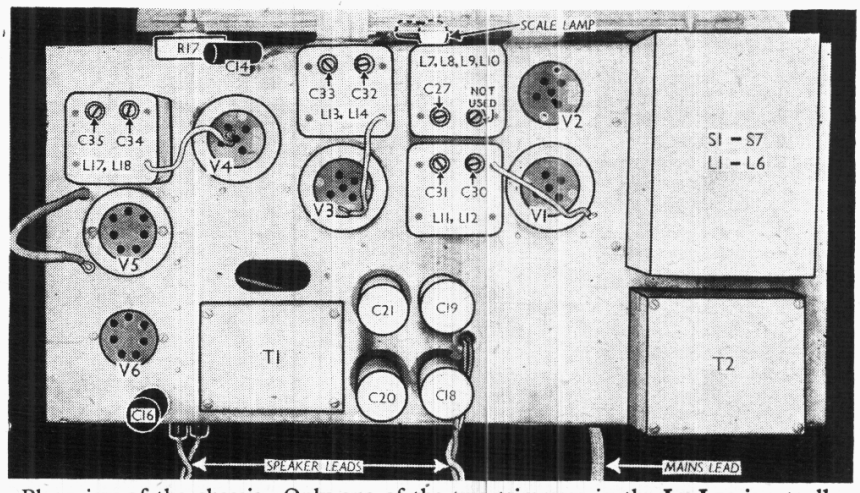
which are connected across the HT circuit, **R10** being a variable resistance.

V1 cathode is returned via a fixed minimum GB limiting resistance **R3** to the junction of **R9** and **R10,** the latter acting as gain control for **V1, V3** and **V4,** but having a greater effect on **V1** than on the two IF valves.

Diode second detector is part of double diode triode valve **(V5, Mazda AC/HL/DD).** Audio frequency component in rectified output is developed across load resistance **R11** and passed via AF coupling condenser **C11,** IF rejector choke **L19** and switch **S6** to CG of triode section, which operates as AF amplifier. The design does not include automatic volume control, and the second diode of **V5** is left unconnected.

If filtering by **C9** and **L19** in diode circuit, and by **C12** in triode anode circuit. Provision for connection of a gramophone pick-up in triode CG circuit via **S7,** which closes when the waveband control is turned to the gram position, while **S6** opens to mute radio. The pick-up sockets are shunted by **R13,** so that the control grid will not become open-circuited if switched to gram while the pick-up is not connected.

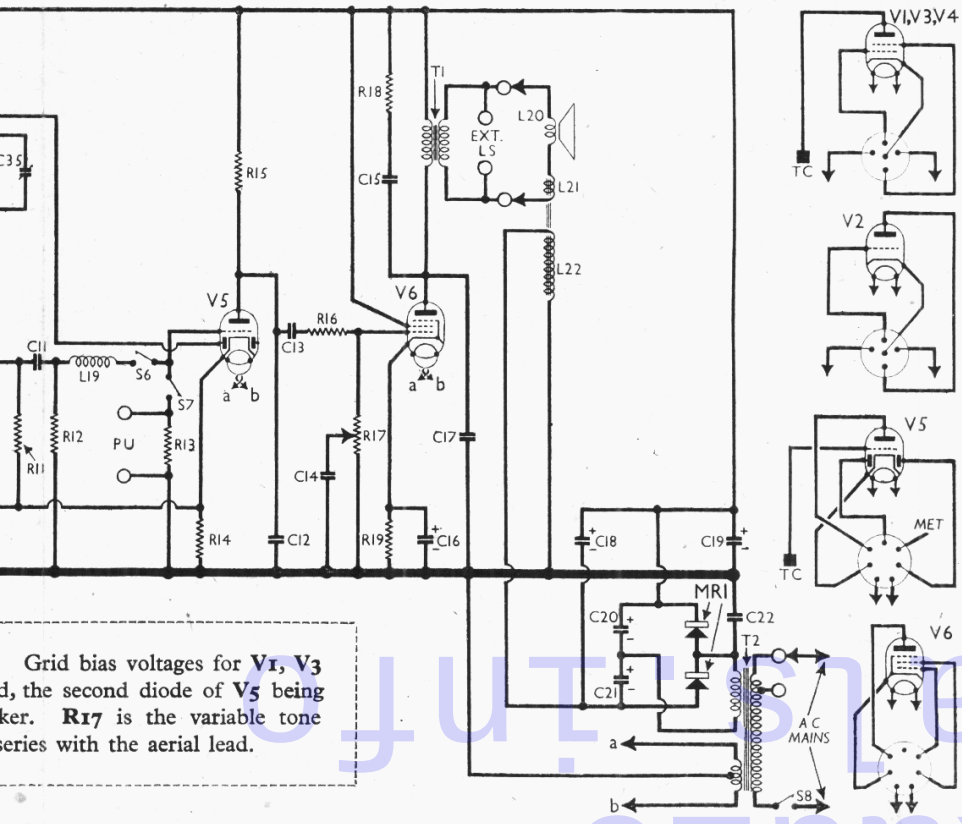
Resistance-capacity coupling by **R15, C13** and **R17** between **V5** triode and pentode output valve **(V6, Mazda AC/Pen). R17** is a variable potentiometer operating as tone control; **C14** is connected between its slider and one end of its element, and this combination forms a potential divider with **R16,** operating as a step-down coupling to **V6.** When the slider is near the chassis end of **R17,** the coupling ratio is practically the same at all frequencies, but as the slider is raised, the ratio varies with frequency, giving deeper tone.



Plan view of the chassis. Only one of the two trimmers in the **L7-L10** is actually used. A sketch of the switch and coil unit, with cover removed, appears overleaf.

Fixed tone correction by **R18, C15** in anode circuit, returned to HT positive line, and by **C17,** also in anode circuit but returned to chassis. Provision by means of two pairs of sockets for the connection of a low impedance external speaker, the internal speaker being connected to one pair of sockets. Either speaker may be connected or muted according to whether its plugs are inserted in or withdrawn from their sockets.

HT current is supplied by voltage-doubling metal rectifier **(MR1, Westinghouse HT8** or **HT16),** with electrolytic condensers **C20, C21.** Smoothing by speaker field **L22** and electrolytic condensers **C18, C19, L22** being in the negative HT lead to chassis. Mains RF filtering by **C22.**



Grid bias voltages for **V1, V3** d, the second diode of **V5** being ker. **R17** is the variable tone eries with the aerial lead.

COMPONENTS AND VALUES

	RESISTANCES	Values (ohms)
R1	V1 SG HT feed potential divider	40,000
R2		25,000
R3	V1 fixed GB resistance ...	750
R4	V2 anode HT feed ...	15,000
R5	V2 GB resistance... ...	1,000
R6	V3, V4 SG's H.T feed potential divider ...	40,000
R7		25,000
R8	V3, V4 GB potential divider	75,000
R9		950
R10	V1, V3, V4, gain control ...	10,000
R11	V5 signal diode load ...	500,000
R12	V5 triode CG resistance ...	2,000,000
R13	PU shunt	100,000
R14	V5 GB resistance... ...	1,000
R15	V5 triode anode load ...	50,000
R16	Part variable tone control	100,000
R17	Variable tone control ...	500,000
R18	Part tone corrector ...	15,000
R19	V6 GB resistance... ...	415

	CONDENSERS	Values (μF)
C1	V1 SG decoupling ...	0·1
C2	V1 cathode by-pass ...	0·1
C3	V2 anode decoupling ...	0·1
C4	V2 cathode by-pass ...	0·01
C5	V3 SG decoupling ...	0·1
C6	V3, V4 cathodes by-pass...	0·1
C7	V4 SG decoupling ...	0·1
C8	V4 anode decoupling ...	0·1
C9	IF by-pass	0·0001
C10	V5 cathode by-pass ...	0·1
C11	AF coupling to V5 triode	0·01
C12	IF by-pass	0·001
C13	V5 triode to V6 coupling...	0·01
C14	Part variable tone control	0·002
C15	Part tone corrector ...	0·01
C16*	V6 cathode by-pass ...	25·0
C17	Part tone corrector ...	0·001
C18*	HT smoothing condensers	8·0
C19*		8·0
C20	Voltage doubler con-	4·0
C21	densers	4·0
C22	Mains RF by-pass ...	0·01
C23†	Band-pass pri. tuning ...	—
C24‡	B-P pri. MW trimmer ...	—
C25†	Band-pass sec. tuning ...	—
C26‡	B-P sec. MW trimmer ...	—
C27‡	Osc. circ. LW trimmer ...	—
C28†	Oscillator circuit tuning...	—
C29‡	Osc. circ. MW trimmer ...	—
C30‡	1st IF trans. pri. tuning...	—
C31‡	1st IF trans. sec. tuning...	—
C32‡	2nd IF trans. pri. tuning...	—
C33‡	2nd IF trans. sec. tuning...	—
C34‡	3rd IF trans. pri. tuning...	—
C35‡	3rd IF trans. sec. tuning...	—

* Electrolytic. † Variable. ‡ Pre-set.

OTHER COMPONENTS			Approx. Values (ohms)
L1	Aerial coupling coil	...	1·5
L2	Band-pass primary coils	...	4·5
L3			10·5
L4	B-P sec. loading coil	...	1·5
L5	Band-pass secondary coils	...	4·5
L6			10·5
L7	Cathode injector coil	...	0·75
L8	Oscillator reaction coupling	...	4·5
L9	Osc. MW tuning coil, total	...	8·5
L10	Osc. LW tuning coil	...	3·2
L11	1st IF trans. Pri.	...	5·25
L12	1st IF trans. Sec.	...	5·25
L13	2nd IF trans. Pri.	...	5·25
L14	2nd IF trans. Sec.	...	5·25
L15	V4 SG decoupling choke	...	60·0
L16	V4 anode decoupling choke	...	60·0
L17	3rd IF trans. Pri.	...	5·25
L18	3rd IF trans. Sec.	...	5·25
L19	IF rejector choke	...	55·0
L20	Speaker speech coil	...	4·0
L21	Hum neutralising coil	...	0·2
L22	Speaker field coil	...	1,400·0
T1	Output trans. Pri.	...	200·0
	Output trans. Sec.	...	0·4
T2	Mains trans. Pri., total	...	31·0
	Mains trans. Heater sec.	...	0·1
	Mains trans. HT sec.	...	66·0
S1-S5	Waveband switches	...	—
S6,S7	Radio/gram switches	...	—
S8	Mains switch, ganged R10		—

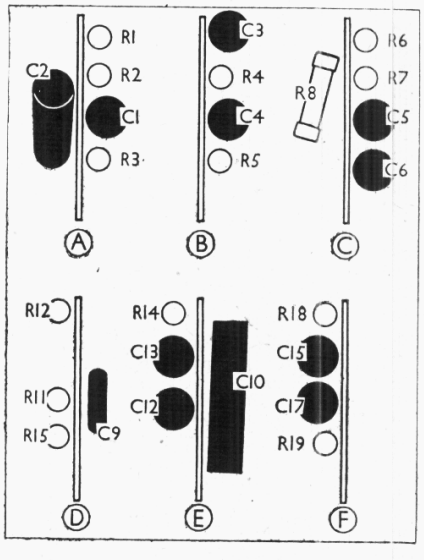
DISMANTLING THE SET

Removing Chassis.—Remove the upper centre (tuning control) knob (pull off), and the three remaining knobs (recessed grub-screws) from the front of the cabinet;

withdraw the internal speaker speech coil plugs from their sockets at the rear of the chassis;

remove the four bolts (with metal and rubber washers) holding the chassis to the bottom of the cabinet.

The chassis may now be withdrawn to the extent of the speaker leads, which is sufficient for normal purposes if it is stood on its control spindles. The internal speaker plugs can be reinserted if desired so that the set may be operated.



Drawings showing the end-on views of the six vertical assemblies indicated in the under-chassis view opposite, where arrows show the directions in which the assemblies are viewed here.

To free chassis entirely, unsolder the field coil leads from the connecting panel on the speaker and unsolder the speech coil leads or withdraw its plugs.

When replacing, two long sponge-rubber strips should be inserted between the chassis and the cabinet, one running along the front edge and one along the rear edge of the chassis;

the large sheet-metal screen should then be laid on the rubber strips, so that it is in contact with the chassis, its holes corresponding with the chassis fixing bolt holes. Four locating lugs in the corners of the plate facilitate its correct positioning.

When refitting the chassis bolts, a thick rubber washer, with a large metal washer either side of it, should be slipped on to each bolt before it is inserted in the fixing holes, and the bolts should be screwed up tight. The bolts should be inserted in the four holes at the corners of the chassis: the other two holes (one at each end) take transit bolts only.

The arrangement of the connecting leads on the connecting panel is as follows, numbering the tags from left to right when viewed from the rear:

1, black lead with white tracer;
2, one green lead with brown tracer;
3, second green lead with brown tracer;
4, no external connection;
5, red lead.

Removing Speaker.—Unsolder the connecting leads;

remove the nuts (with lock-washers) from the four bolts holding the speaker to the sub-baffle.

When replacing, the connecting panel should be at the top, and the leads should be connected as described above.

VALVE ANALYSIS

Valve voltages given in the tables below are those quoted by the makers. No record of currents is available, and we were unable to carry out measurements in the laboratory as in this instance our chassis was not equipped with valves. Cathode/chassis voltages are quoted, however, and total currents for **V2, V5** and **V6** could be computed from these; in the case of **V1, V3** and **V4** this would be difficult as the cathodes are returned via a common circuit.

In Table I are given the anode screen and cathode voltages for all six valves with the gain control at minimum; while in Table II are given the values when the gain control is at maximum. The unsmoothed voltage across the rectifier, *i.e.*, from positive of **C20** to negative of **C21,** should be not less than 350 V DC.

Voltages were originally measured on the 300 V scale of a 1,000 ohms-per-volt meter whose negative lead was connected to chassis; the receiver was connected to mains of 220 V.

Table I

(Gain control at minimum)

Valve	Anode Voltage (V)	Screen Voltage (V)	Cathode Voltage (V)
V1 AC/SGVM	295	107	37
V2 AC/HL	205	—	7
V3 AC/SGVM	295	112	40
V4 AC/SGVM	295	112	40
V5 AC/HL/DD	163	—	2
V6 AC/Pen	305	292	18·5

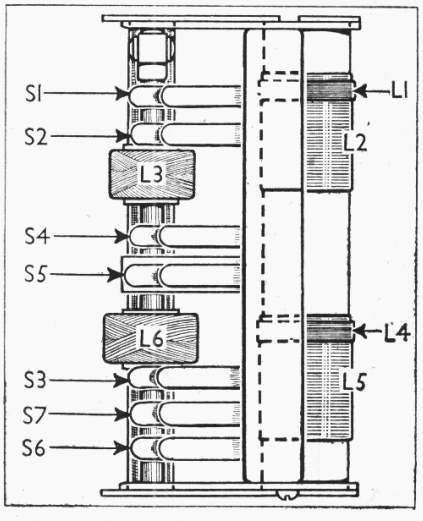
Table II

(Gain control at maximum)

Valve	Anode Voltage (V)	Screen Voltage (V)	Cathode Voltage (V)
V1 AC/SGVM	265	92	9
V2 AC/HL	180	—	7
V3 AC/SGVM	265	92	9
V4 AC/SGVM	265	92	9
V5 AC/HL/DD	143	—	2
V6 AC/Pen	270	260	16·5

GENERAL NOTES

Switches.—S1-S5 are the waveband switches, and **S6, S7** the radio/gram change-over switches in a leaf-type ganged unit mounted on the chassis deck. The band-pass coils are in the same unit. The position of the unit, which is covered by a metal screen, is indicated in our plan view of the chassis, and a diagram showing the unit in detail in the same position but with the cover removed (four self-tapping screws) appears above.

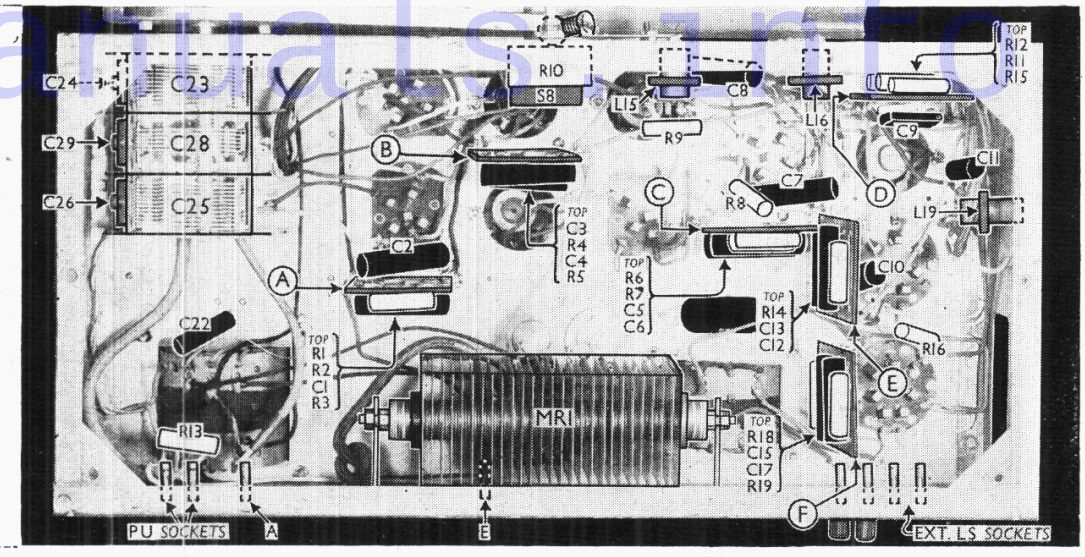


Sketch showing the internal assembly of the switch and coil unit, as seen when the cover is removed. It is drawn in the same position as it adopts in our plan view overleaf.

The table (col. 4) gives the switch positions for the three control settings, starting from the fourth (blank) position and turning the control knob clockwise. A dash indicates open, and **C,** closed. Three coloured dots on the edge of the knob indicate the position of the control: red, MW; black (or blue), LW; white, gram; the indicating spot being uppermost in the significant position.

S8 is the QMB mains switch, ganged with the gain control **R10.**

An additional switch for local/distant control was fitted on the cabinet in a few early models, but it was not present in our sample. Where it is found, it will be connected in series with the aerial lead, open circuiting it in the "distant" position.



Under-chassis view. **MR1** is the metal rectifier. The components contained in the six vertical assemblies are indicated as they occur in sequence from top to bottom with the chassis inverted, but they are shown more clearly in the drawing at the foot of col. 1 opposite.

Coils.—All the aerial and band-pass coils **L1-L6** are contained in the same unit as the waveband switches, described under "Switches" and shown in detail in the drawing in col. 3. The MW coils **L1, L2** and **L4, L5** are on one former, so as to provide coupling, and the LW coils **L3, L6** are on another.

The oscillator coils are in a separate screened unit on the chassis deck, at the side of **V2,** with the LW trimmer **C27.** A second pre-set condenser in the same unit is unconnected, and is not used, as indicated in our plan view.

The three IF transformers **L11, L12; L13, L14;** and **L17, L18** are in three further screened units on the chassis deck with their associated trimmers, while the three IF chokes **L15, L16** and **L18** are mounted on the vertical members beneath the chassis.

Scale Lamp.—This has a large spherical bulb and an MES base. A suitable replacement would be one rated at 3.5-6.3 V, 0.3 A. The lamp is fitted to the front member of the chassis by a pair of bolts and a mounting bracket, and is connected across one half of the heater secondary of **T2.** The bulb is between the tuning spindle and the back of the scale.

To remove the lamp it is necessary first to remove the chassis and then take off the two nuts holding the bracket.

Condensers C18, C19, C20, C21.—These are four TCC wet electrolytics in separate metal tubular containers mounted on the chassis deck. **C18, C19,** on the right in our plan view, are the HT smoothing condensers, and are rated at 8 μF, 440 V DC working, each; **C20, C21,** on the left, are the voltage-doubler condensers associated with the metal rectifier, and are rated at 4 μF each. The cases of all four form the negative connections, and it should be noted that, with the exception of **C19,** all the cases are insulated from chassis.

Condenser C16.—This is a TCC type CW electrolytic rated at 25 μF, 25 V DC working. It is mounted vertically on the chassis deck.

External Speaker.—Two pairs of sockets, each marked "LS," are fitted on an insulating panel at the rear of the chassis. One pair accepts the plugs from the internal speaker, and the other those from a low impedance (6-8 Ω) external speaker. Either speaker may be muted by the withdrawal of its plugs, or the two may be operated together.

Component Assemblies.—Most of the small components beneath the chassis are mounted in groups on insulated panels which are suspended vertically from the underside of the chassis deck. There are six such assemblies, and the individual components on each are indicated in our under-chassis view by a list of their numbers in the same sequence as the components occur, starting from the top and reading down. It must be pointed out that "top" at the head of each list, means the top of the assembly when the chassis is inverted; this is actually the bottom when the chassis stands on its base.

This is useful for quick reference, but the positions of the components are shown more clearly in the six diagrams in column 1, where the assemblies are drawn as seen when viewed from one end. Each assembly is identified by a letter (A to F), the letters being repeated in the plan view. In the plan view, also, the arrows from the letters in circles indicate the directions in which the assemblies are viewed in the diagrams.

Chassis Divergencies.—Condensers **C8, C12** and **C22** were not shown in the makers' circuit diagram, but were present in our chassis. Conversely, a local/distant switch was shown in the diagram, but was not present in our chassis. The switch, which was fitted on the cabinet, was used only on a few early models.

Switch Table

Switch	MW	LW	Gram
51	C	—	—
52	C	—	—
53	C	—	C
54	C	—	—
55	—	C	—
56	C	C	—
57	—	—	C

CIRCUIT ALIGNMENT

IF Stages.—Remove **V2** from its socket, so that the oscillator circuit cannot function. Connect signal generator across **L11** (the best method of doing this is to connect one lead to chassis and the other to the anode (top cap) of **V1** via a 0.1 μF condenser).

Feed in a 456 KC/S (657.9 m) signal, and adjust **C35, C34, C33, C32, C31** and **C30** in that order for maximum output. Replace **V2** in its socket.

RF and Oscillator Stages.—Transfer signal generator leads via a suitable dummy aerial to **A** and **E** sockets. If a local/distant switch is fitted, it may be set at "Distant" if the signal is then satisfactory; otherwise set it at "Local."

With the gang at maximum, the position of the sliding scale should be such that the pointer coincides with the unnumbered black line at the left-hand end of the scale. The scale can be adjusted if the nut on the draw-bolt at extreme left end of the scale strip is slackened, when the metal rod attached to the phosphor bronze driving band can be slid in and out of the draw-bolt.

MW.—Switch set to MW, tune to 200 m on scale, feed in a 200 m (1,500 KC/S) signal, and adjust **C29,** then **C24,** for maximum output.

If a new oscillator coil unit has been fitted, check at 300 m (1,000 KC/S), 375 m (800 KC/S), 450 m (666 KC/S) and 525 m (572 KC/S) in turn and carefully adjust the split sections of the outer plates of the rotor of **C28.**

Feed in a 500 m (600 KC/S) signal, tune to 500 m on scale, and adjust **C26** for maximum output.

LW.—Switch set to LW, tune to 1,500 m on scale, feed in a 1,500 m (200 KC/S) signal, and adjust **C27** for maximum output. Check this adjustment at 1,300 m (230 KC/S) and 1,800 m (166.6 KC/S).

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