

DECCA 99, 110 AND 120

SHORT-WAVE ranges of 12-35 (referred to below as S.W.1) and 35-100 m. (S.W.2) are covered by the Decca 99 5-valve (plus rectifier) A.C. 4-band superhet. The receiver is suitable for mains of 195-255 V., 50-60 C/S, and has provision for both a gramophone pick-up and an extension speaker.

An identical chassis is fitted in the 110 radiogram and the 120 automatic radiogram, but this *Service Sheet* was prepared on a 99 table model.

CIRCUIT DESCRIPTION

Aerial input via coupling coils **L1** (S.W.1), **L2** (S.W.2), **L3** (M.W.) and **L4** (L.W.) to single-tuned circuits **L5**, **C35** (S.W.1), **L6**, **C35** (S.W.2), **L7**, **C35** (M.W.) and **L8**, **C35** (L.W.), which precede variable-mu pentode R.F. amplifier (**V1**, Mullard metallised **VP4B**).

Tuned-secondary transformer coupling by **L9**, **L13**, **C40** (S.W.1), **L10**, **L14**, **C40** (S.W.2), **L11**, **L15**, **C40** (M.W.) and **L12**, **L16**, **C40** (L.W.) between **V1** and triode hexode valve (**V2**, Mazda metallised **AC/TH1** or Mullard **TH4A**) which operates as frequency changer with internal coupling. Triode anode coils **L21** (S.W.1), **L22** (S.W.2), **L23** (M.W.) and **L24** (L.W.) are tuned by **C47**; parallel trimming by **C41** (S.W.1), **C42** (S.W.2), **C13**, **C43** (M.W.) and **C14**, **C44** (L.W.); series tracking by **C11** (S.W.1), **C12** (S.W.2), **C15**, **C45** (M.W.) and **C46** (L.W.). Reaction by grid coils **L17** (S.W.1), **L18** (S.W.2), **L19** (M.W.) and **L20** (L.W.).

Third valve (**V3**, Mullard metallised **VP4B**) is a variable-mu R.F. pentode operating on radio as intermediate

double diode valve (**V4**, Mullard metallised **2D4A**). Audio frequency component in rectified output is developed across load resistance **R16** and fed via I.F. stopper **R15**, switch **S29**, A.F. coupling condenser **C24** and manual volume control **R20** to C.G. of pentode output valve (**V5**, Mazda **AC4 Pen**). Fixed tone correction by **C26** and variable tone control by **C27** and **R24** in anode circuit. Provision for connection of high impedance external speaker across primary of **T1**.

For gramophone operation **V3** is used as an A.F. amplifier. Connection for the pick-up is provided in the form of a pair of sockets in the grid circuit of **V3**; when the control switch is turned to "Gram" position **S29** opens, muting radio and **S30** closes, connecting **V3** anode to the grid circuit of **V5** via resistance capacity coupling comprising **R14**, **C24** and **R20**.

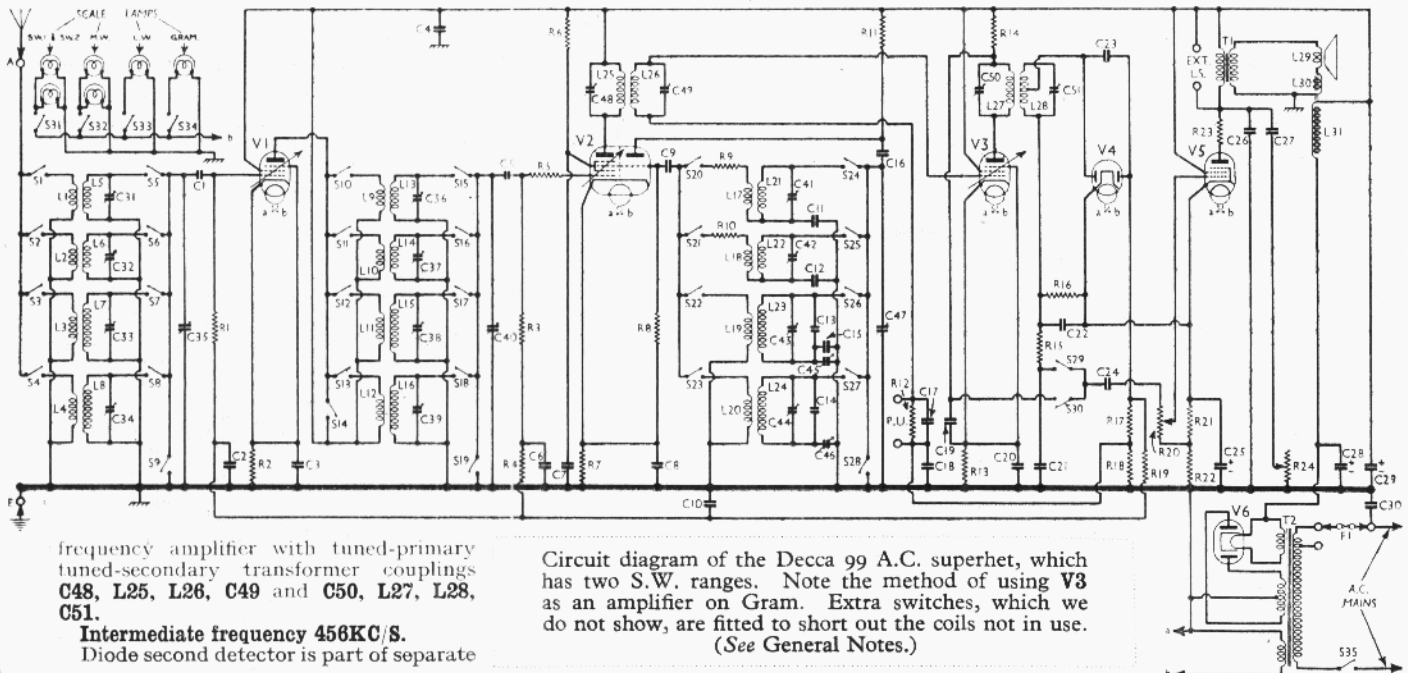
Second diode of **V4**, fed from tapping on **L28** via **C23**, provides D.C. potentials which are developed across load resistances **R17**, **R18** and fed back through decoupling circuits as G.B. to R.F., F.C. and I.F. valves, giving automatic volume control.

H.T. current is supplied by I.H.C. full-wave rectifying valve (**V6**, Mullard **IW4/350** or Brimar **R2**). Smoothing by speaker field **L31** and condensers **C28**, **C29**. H.T. circuit R.F. filtering by **C4**. Mains R.F. filtering by **C30**. Fuse **F1**, in the form of a two-pin plug, provides voltage adjustment bridge and protects the mains circuit from damage in case of breakdown.

COMPONENTS AND VALUES

RESISTANCES		Values (ohms)
R1	V1 C.G. resistance	500,000
R2	V1 fixed G.B. resistance	200
R3	V2 C.G. resistance	500,000
R4	V2 hex. C.G. decoupling	250,000
R5	V2 hex. C.G. stabiliser	50
R6	V2 S.G. H.T. feed	15,000
R7	V2 fixed G.B. resistance	200
R8	V2 osc. C.G. resistance	50,000
R9	Osc. circuit S.W.1 stabiliser	40
R10	Osc. circuit S.W.2 stabiliser	150
R11	V2 osc. anode H.T. feed	30,000
R12	Gram. pick-up shunt	50,000
R13	V3 fixed G.B. resistance	200
R14	V3 anode A.F. load (gram.)	5,000
R15	I.F. stopper	70,000
R16	V4 signal diode load	300,000
R17	V4 A.V.C. diode load resistances	500,000
R18	"	300,000
R19	A.V.C. line decoupling	300,000
R20	Manual volume control	500,000
R21	V5 G.B. and A.V.C. delay voltage resistances	105
R22	"	140
R23	V5 anode stabiliser	150
R24	Variable tone control	500,000

CONDENSERS		Values (µF)
C1	V1 C.G. condenser	0.00005
C2	V1 C.G. decoupling	0.1
C3	V1 cathode by-pass	0.1
C4	H.T. circuit R.F. by-pass	0.5
C5	V2 hexode C.G. condenser	0.00005
C6	V2 hexode C.G. decoupling	0.1
C7	V2 S.G. decoupling	0.1
C8	V2 cathode by-pass	0.1
C9	V2 osc. C.G. condenser	0.0002
C10	A.V.C. line decoupling	0.02
C11	Osc. circuit S.W.1 tracker	0.005
C12	Osc. circuit S.W.2 tracker	0.002
C13	Osc. circ. M.W. fixed trimmer	0.00025
C14	Osc. circ. L.W. fixed trimmer	0.00005
C15	Osc. circ. M.W. fixed tracker	0.0003
C16	V2 osc. anode coupling	0.0001



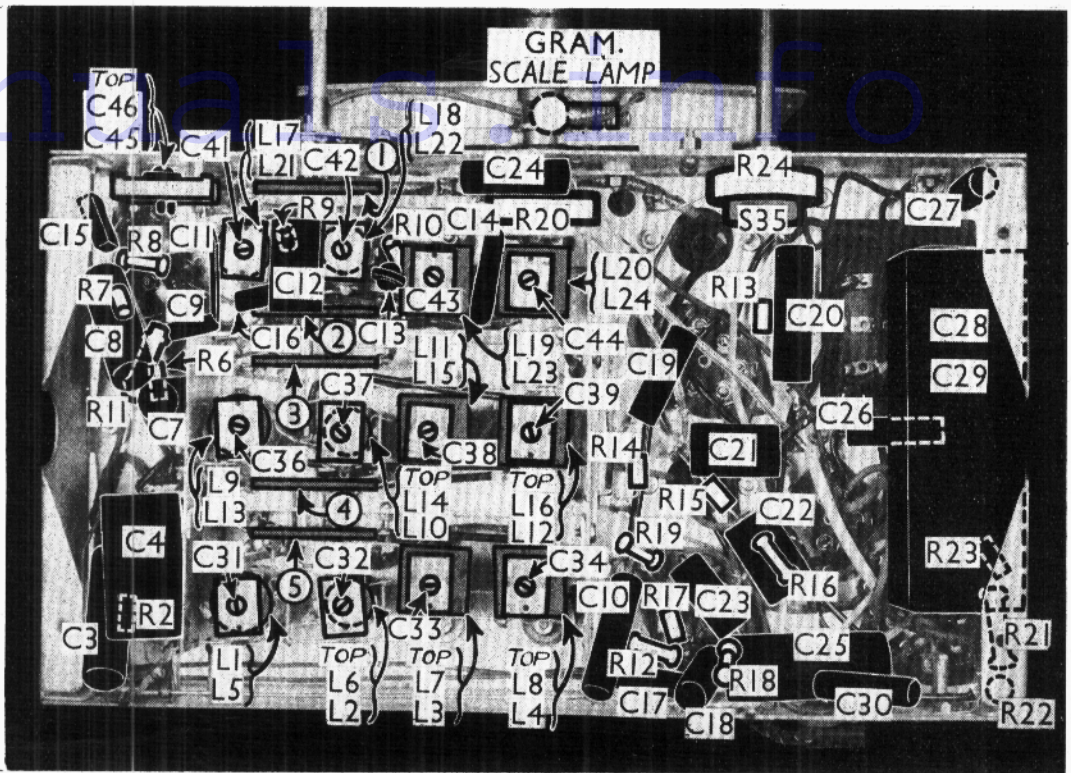
frequency amplifier with tuned-primary tuned-secondary transformer couplings **C48**, **L25**, **L26**, **C49** and **C50**, **L27**, **L28**, **C51**.

Intermediate frequency 456KC/S.
Diode second detector is part of separate

Circuit diagram of the Decca 99 A.C. superhet, which has two S.W. ranges. Note the method of using **V3** as an amplifier on Gram. Extra switches, which we do not show, are fitted to short out the coils not in use. (See General Notes.)

Manual

Under-chassis view. All the R.F. and oscillator coils are in pairs on twelve units, each unit having a trimmer at its end. C45 and C46 are the M.W. and L.W. trackers.



CONDENSERS (Continued)	Values (μ F)
C17	Pick-up circuit R.F. by-pass .. 0.006
C18	V ₃ C.G. decoupling .. 0.02
C19	V ₃ anode R.F. by-pass .. 0.006
C20	V ₃ cathode by-pass .. 0.1
C21	V ₃ cathode by-pass .. 0.0001
C22	I.F. by-passes .. 0.0001
C23	Coupling to V ₄ A.V.C. diode .. 0.0001
C24	A.F. coupling to V ₅ .. 0.02
C25*	V ₅ cathode by-pass .. 50.0
C26	Fixed tone corrector .. 0.001
C27	Part of variable tone control .. 0.02
C28*	H.T. smoothing .. 8.0
C29*	H.T. smoothing .. 16.0
C30	Mains circuit R.F. by-pass .. 0.006
C31†	Aerial S.W.1. trimmer ..
C32†	Aerial S.W.2 trimmer ..
C33†	Aerial M.W. trimmer ..
C34†	Aerial L.W. trimmer ..
C35†	Aerial circuit tuning ..
C36†	R.F. trans. S.W.1 trimmer ..
C37†	R.F. trans. S.W.2 trimmer ..
C38†	R.F. trans. M.W. trimmer ..
C39†	R.F. trans. L.W. trimmer ..
C40†	R.F. trans. sec. tuning ..
C41†	Osc. circuit S.W.1 trimmer ..
C42†	Osc. circuit S.W.2 trimmer ..
C43†	Osc. circuit M.W. trimmer ..
C44†	Osc. circuit L.W. trimmer ..
C45†	Osc. circuit M.W. tracker ..
C46†	Osc. circuit L.W. tracker ..
C47†	Oscillator circuit tuning ..
C48†	1st I.F. trans. pri. tuning ..
C49†	1st I.F. trans. sec. tuning ..
C50†	2nd I.F. trans. pri. tuning ..
C51†	2nd I.F. trans. sec. tuning ..

* Electrolytic. † Variable. ‡ Pre-set.

OTHER COMPONENTS (Continued)	Approx. Values (ohms)
L10	R.F. trans. S.W.2 primary .. 1.2
L11	R.F. trans. M.W. primary .. 0.6
L12	R.F. trans. L.W. primary .. 2.7
L13	R.F. trans. S.W.1 secondary .. Very low
L14	R.F. trans. S.W.2 secondary .. 0.1
L15	R.F. trans. M.W. secondary .. 3.0
L16	R.F. trans. L.W. secondary .. 15.5
L17	Oscillator S.W.1 grid reaction .. 0.3
L18	Oscillator S.W.2 grid reaction .. 0.7
L19	Oscillator M.W. grid reaction .. 0.6
L20	Oscillator L.W. grid reaction .. 7.2
L21	Oscillator S.W.1 tuning coil .. Very low
L22	Oscillator S.W.2 tuning coil .. 0.1
L23	Oscillator M.W. tuning coil .. 2.0
L24	Oscillator L.W. tuning coil .. 4.8
L25	1st I.F. trans. Pri. .. 7.0
L26	1st I.F. trans. Sec. .. 7.0
L27	2nd I.F. trans. Pri. .. 7.0
L28	2nd I.F. trans. Sec., total .. 7.0
L29	Speaker speech coil .. 1.5
L30	Hum neutralising coil .. 0.3
L31	Speaker field coil .. 1,500.0
T1	Speaker input trans. Pri. .. 400.0
	trans. Sec. .. 0.5
	Pri., total .. 30.0
T2	Mains Heater sec. .. 0.1
	trans. Rect. heat. sec. .. 0.15
	H.T. sec., total .. 525.0
F1	Mains circuit fuse ..
Sr-28	Waveband switches ..
S29-30	Radio-gram. change switches ..
S31-34	Scale lamp switches ..
S35	Mains switch, ganged R24 ..

DISMANTLING THE SET

A detachable bottom is fitted to the cabinet and upon removal (eight countersunk-head wood screws) gives access to most of the components beneath the chassis.

Removing Chassis.—If it should be necessary to remove the chassis from the cabinet, remove the three small control knobs (recessed grub screws) and the large tuning knob (pull off). Now remove the four bolts (with washers and lock washers) holding the chassis to the bottom

of the cabinet, when, by lifting the back upwards, the chassis can be withdrawn to the extent of the speaker leads, which is sufficient for normal purposes.

To free the chassis entirely, unsolder the speaker leads, and when replacing, connect the leads as follows, numbering the tags from bottom to top:—1, blue; 2, black; 4, red; 3 and 5, no external connection.

Removing Speaker.—To remove the speaker, remove the nuts and lock washers from the six screws holding it to the sub-baffle. When replacing, see that the transformer is on the left.

VALVE ANALYSIS

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 VP4B	200	7.4	200	2.6
V2 AC/TH1	200	6.6	93	2.5
	78	3.1		
V3 VP4B	160	5.9	200	2.6
V4 2D4A	—	—	—	—
V5 AC/4Pen	170	47.0	200	9.3
V6 IW4/350	320†	—	—	—

† Each anode, A.C.

Valve voltages and currents given in the table above are those measured in our receiver when it was operating on mains of 220 V, using the 220 V tapping on the mains transformer. The receiver was tuned to the lowest wavelength on the medium 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 V2 should become unstable, as in our case, when its anode current is being

Continued overleaf

OTHER COMPONENTS	Approx. Values (ohms)
L1	Aerial S.W.1 coupling .. 0.25
L2	Aerial S.W.2 coupling .. 0.6
L3	Aerial M.W. coupling .. 14.5
L4	Aerial L.W. coupling .. 75.0
L5	Aerial S.W.1 tuning coil .. 0.1
L6	Aerial S.W.2 tuning coil .. 0.2
L7	Aerial M.W. tuning coil .. 3.0
L8	Aerial L.W. tuning coil .. 16.0
L9	R.F. trans. S.W.1 primary .. 0.2

DECCA 99—Continued

measured, it can be stabilised by connecting a non-inductive condenser of about 0.1 μ F from grid (top cap) to chassis.

GENERAL NOTES

Switches.—S1-S34 are the waveband, pick-up and scale lamp switches, which are in five ganged rotary units beneath the chassis. In addition to these thirty-four switches, which appear on the sides of the units seen looking from the rear of the underside of the chassis, there are about twenty further switches, mounted on the reverse sides of the units, which we do not show, either in the switch diagrams on this page, which are as seen looking from the rear of the chassis, or in the circuit diagram.

The extra switches are not fundamental ones, and are merely used to short circuit the coils not in use.

The table (col. 2) gives the switch positions for the five control settings, starting from fully anti-clockwise. A dash indicates open, and C closed.

S35 is the Q.M.B. mains switch, ganged with the tone control R24.

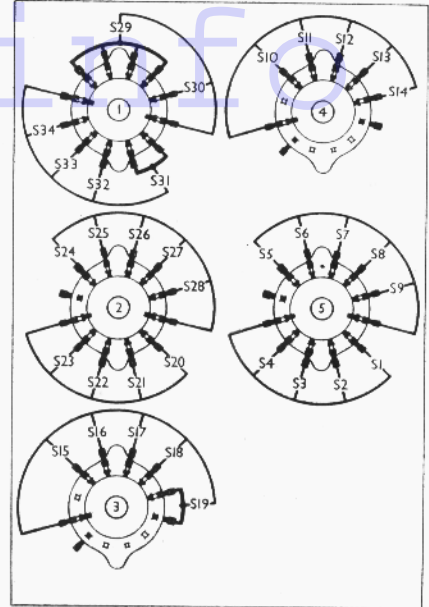
Coils.—All the coils, except those forming the I.F. transformers, are in twelve units beneath the chassis, each unit comprising a tubular or cylindrical former carrying two coils, with a trimmer at its end.

The I.F. transformers L25, L26 and L27, L28 are in two screened units on the chassis deck, with their trimmers.

Scale Lamps.—There are six of these in all, two of which light on both S.W. bands, two for M.W., one for L.W. and one for gram. They are switched by

TABLE AND DIAGRAM OF SWITCH UNITS

Switch	Gram.	L.W.	M.W.	S.W.2	S.W.1
S1	—	—	—	—	C
S2	—	—	—	C	—
S3	—	—	C	—	—
S4	—	C	—	—	—
S5	—	—	—	C	—
S6	—	—	—	C	—
S7	—	—	C	—	—
S8	—	C	—	—	—
S9	C	—	—	—	—
S10	—	—	—	C	—
S11	—	—	—	C	—
S12	—	—	C	—	—
S13	—	C	—	—	—
S14	C	—	—	—	—
S15	—	—	—	C	—
S16	—	—	—	C	—
S17	—	—	C	—	—
S18	—	C	—	—	—
S19	C	—	—	—	—
S20	—	—	—	—	C
S21	—	—	—	C	—
S22	—	—	C	—	—
S23	—	C	—	—	—
S24	—	—	—	—	C
S25	—	—	—	C	—
S26	—	—	C	—	—
S27	—	C	—	—	—
S28	C	—	—	—	—
S29	C	C	C	C	C
S30	C	—	—	—	—
S31	—	—	—	C	—
S32	—	—	—	C	—
S33	—	C	—	—	—
S34	C	—	—	—	—



Switch diagram, showing only the switches seen from the rear of the underside of the chassis. Those on the reverse sides of the units are omitted. (See General Notes.)

S31-S34 in the ganged switch assembly. All the lamps are M.E.S. types, rated at 6.0 V, 0.3 A.

Fuse F1.—This is a plug-in type, and is used as a mains voltage adjusting link. The wire fuse itself is replaceable, and should be rated at 1 or 2 A.

External Speaker.—Two sockets are provided at the rear of the chassis for a high impedance (9,000 Ω) external speaker.

Condensers C28, C29.—These are two dry electrolytics in a single carton beneath the chassis, having a common negative (black) lead. The yellow lead is the positive of C28 (8 μ F) and the red

the positive connection of C29 (16 μ F).

CIRCUIT ALIGNMENT

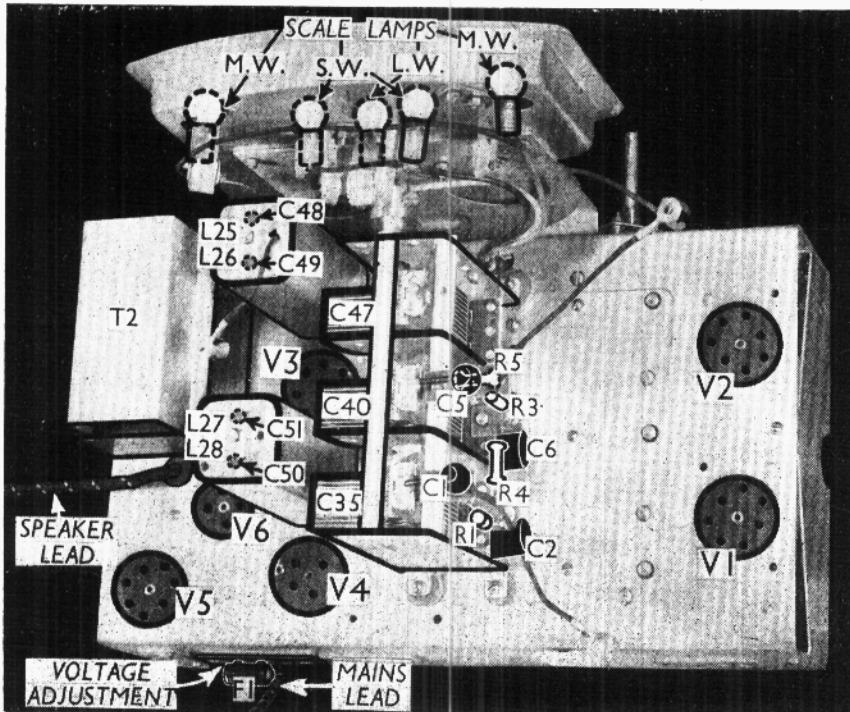
I.F. Stages.—Short C47 (front section of gang) to chassis. Connect signal generator to control grid (top cap) of V2 and chassis, and feed in a 456 KC/S signal. Turn volume control of receiver to maximum and, keeping input low to avoid A.V.C. action, adjust C51, C50, C49 and C48 in turn for maximum output. Remove short from C47.

R.F. and Oscillator Stages.—M.W.—Connect signal generator to A and E sockets, with a dummy aerial or 0.0002 μ F fixed condenser in series with aerial lead. Switch set to M.W., and tune to 200 m. on scale. Feed in a 200 m. (1,500 KC/S) signal, and adjust C43, then C38 and C33, for maximum output. Feed in a 550 m. (544 KC/S) signal, tune it in, and adjust C45 for maximum output, while rocking the gang for optimum results. Repeat the 200 m. and 550 m. adjustments.

L.W.—Switch set to L.W., tune to 1,000 m. on scale, and feed in a 1,000 m. (300 KC/S) signal. Adjust C44, then C39 and C34, for maximum output. Feed in a 2,000 m. (150 KC/S) signal, tune it in, and adjust C46 for maximum output, while rocking the gang. Repeat the 1,000 m. and 2,000 m. adjustments.

S.W.2.—Switch set to S.W.2 (35-100 m.), tune to 36 m. on scale, and feed in a 36 m. (8.33 MC/S) signal. Adjust C42, then C37 and C32 for maximum output. Now, while rocking the gang slightly, make final adjustments to these trimmers to ensure maximum gain.

S.W.1.—Switch set to S.W.1 (12-35 m.), tune to 12.5 m. on scale, and feed in a 12.5 m. (24 MC/S) signal. Adjust C41, then C36 and C31 for maximum output. Finally, while rocking the gang slightly, make final adjustments of these trimmers to ensure maximum gain.



Plan view of the chassis, taken so as to show clearly the small components to the right of the gang condenser.