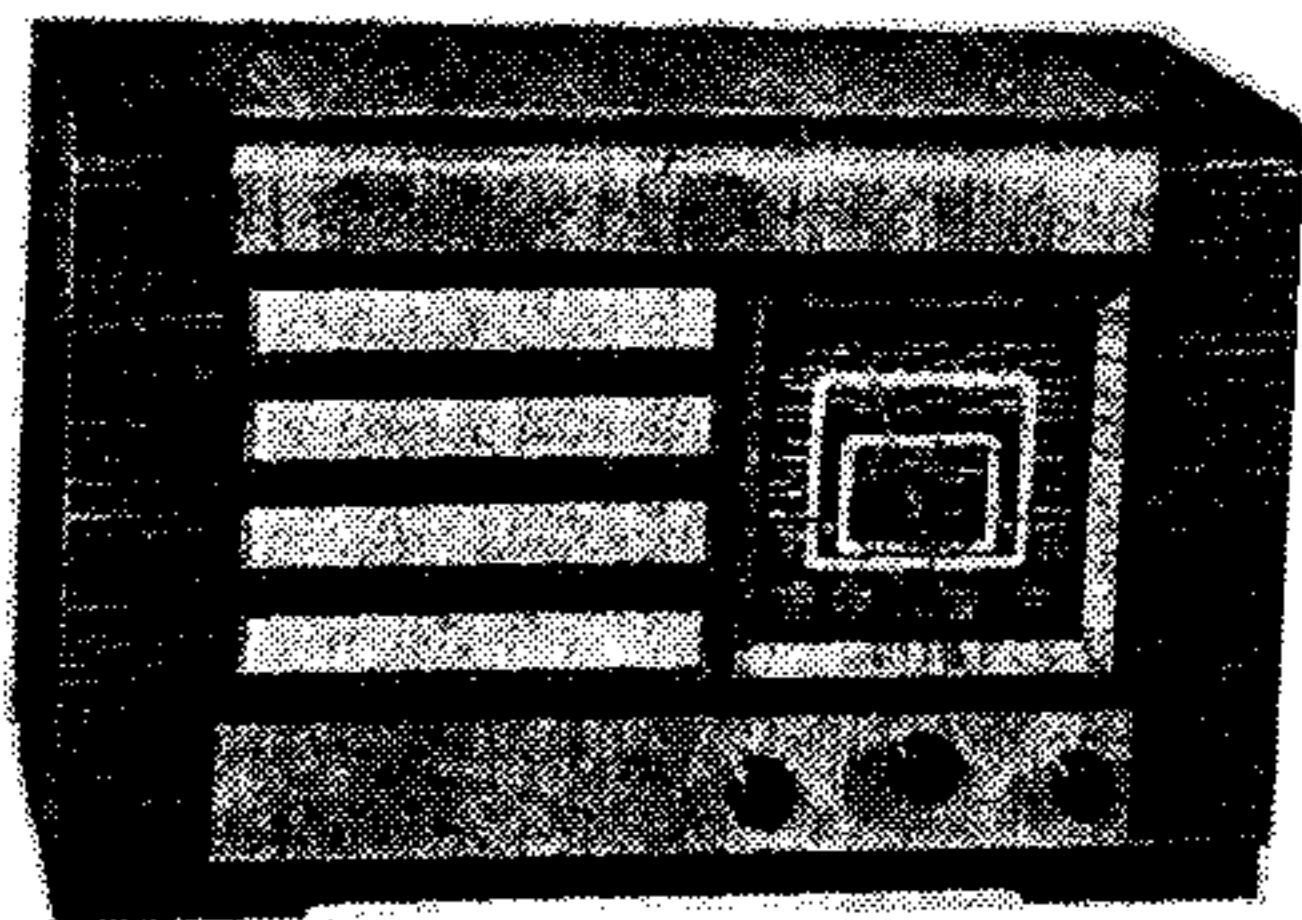
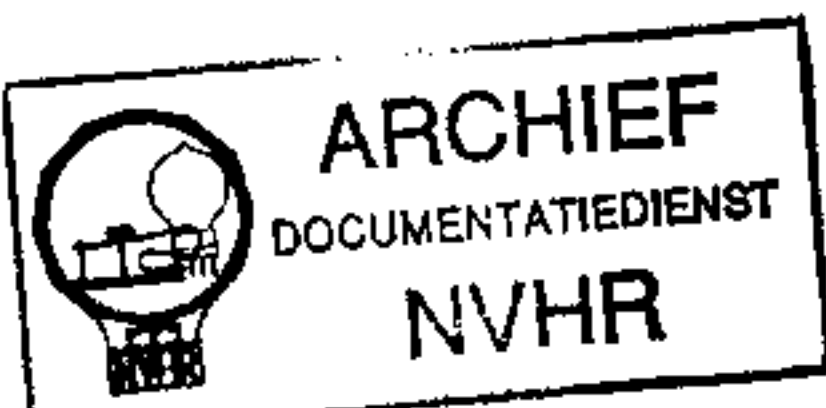


Ned. Ver. v. Historie v/d Radio

FERGUSON 901, 901U

TABLE, CONSOLE AND RADIOGRAM MODELS



The Ferguson 901 and 901 U table model.

THE Ferguson 901 series of models includes table, console and radiogram versions, all using the same 3-band 4-valve (plus valve rectifier) AC superhet chassis. The 901U series is similar, but for AC/DC mains.

The main chassis in each case is almost identical, except for the heater and scale lamp wiring. A separate power and output chassis is used, and this differs in the two series.

The speaker in the AC models is an energised type, while in the AC/DC models it is a permanent magnet type.

In this *Service Sheet* both series are included, with separate diagrams and chassis illustrations for the AC/DC versions. Six models are therefore covered, and their divergencies fully explained.

Release date: All models, Aug., 1939.

CIRCUIT DESCRIPTION

With the exception of three modifications, the receiver chassis in the AC/DC model is similar to that used in the AC model. The modifications are: the valve heaters and scale lamps are wired in series instead of in parallel; a resistance R19 is shunted across the scale lamps; and a condenser C37 is inserted in the earth lead (shown dotted in circuit diagram) to isolate the mains.

Descriptions of the AC and AC/DC power and output units follow that of the receiver chassis.

Receiver Chassis.—Aerial input on SW is via series condenser C1 and coupling condenser C3 to single tuned circuit L3, C25.

When the receiver is switched to

LW, S3 closes, but S2 and S4 are open, and input is via aerial circuit choke, LW coupling circuit L2, C2 and S3 to single tuned circuit L5, C25.

On MW, when S3 opens and S2 and S4 close, input is via S2, L5 and S4 to single tuned circuit L4, C25. Coil L5 operates as MW coupling coil. The aerial circuit choke L1 is permanently connected across the aerial circuit.

First valve (V1, Mullard ECH3) is a triode heptode operating as frequency changer with internal coupling. Triode oscillator anode coils L7 (SW), L8 (MW) and L9 (LW) are tuned by C32; parallel trimming by C29 (SW), C30 (MW) and C31 (LW); series tracking by C8, C26 (SW), C27 (MW) and C28 (LW). Reaction coupling by impedance of trackers, which are common to grid and anode circuits, supplemented on SW band by reaction coil L6.

Second valve (V2, Mullard EF9) is a variable-mu RF pentode operating as intermediate frequency amplifier with tuned-primary, tuned-secondary transformer couplings C33, L10, L11, C34 and C35, L12, L13, C36.

Intermediate frequency 470 KC/S.

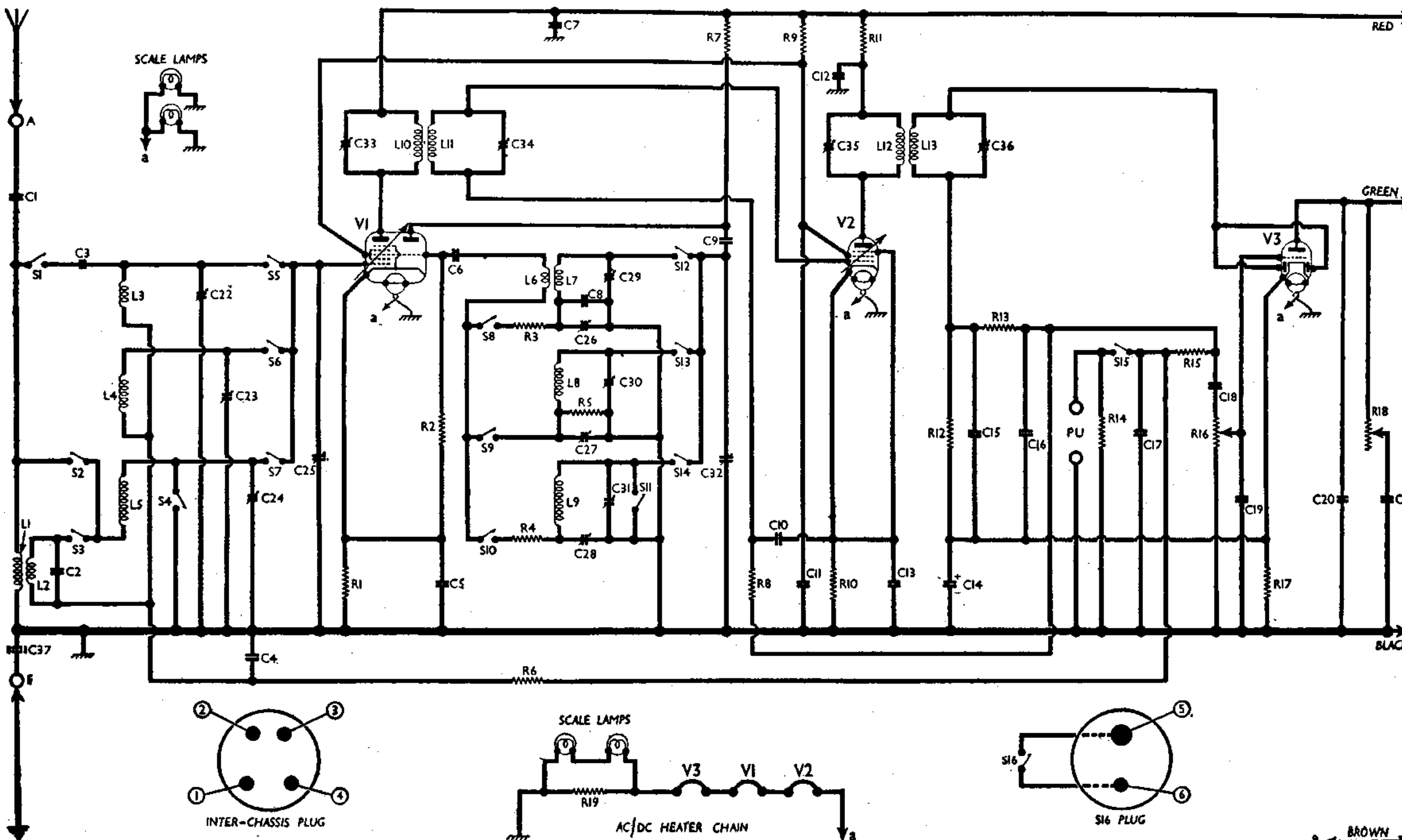


Diagram of the main chassis of all 901 models. The AC/DC heater chain for the 901 U is inset beneath the circuit. C37 and R19 occur in the 901 U models only.

Diode second detector is part of double diode triode valve (V3, Mullard EBC3) in which the two diode anodes are strapped together. Audio frequency component in rectified output is developed across load resistance R12 and passed via R13, AF coupling condenser C18 and manual volume control R16 to CG of triode section, which operates as AF amplifier.

IF filtering by C15, R13 and C16 in diode circuit, C19 in triode grid circuit, and C20 in triode anode circuit. Variable tone control by R18 and C21 in triode anode circuit.

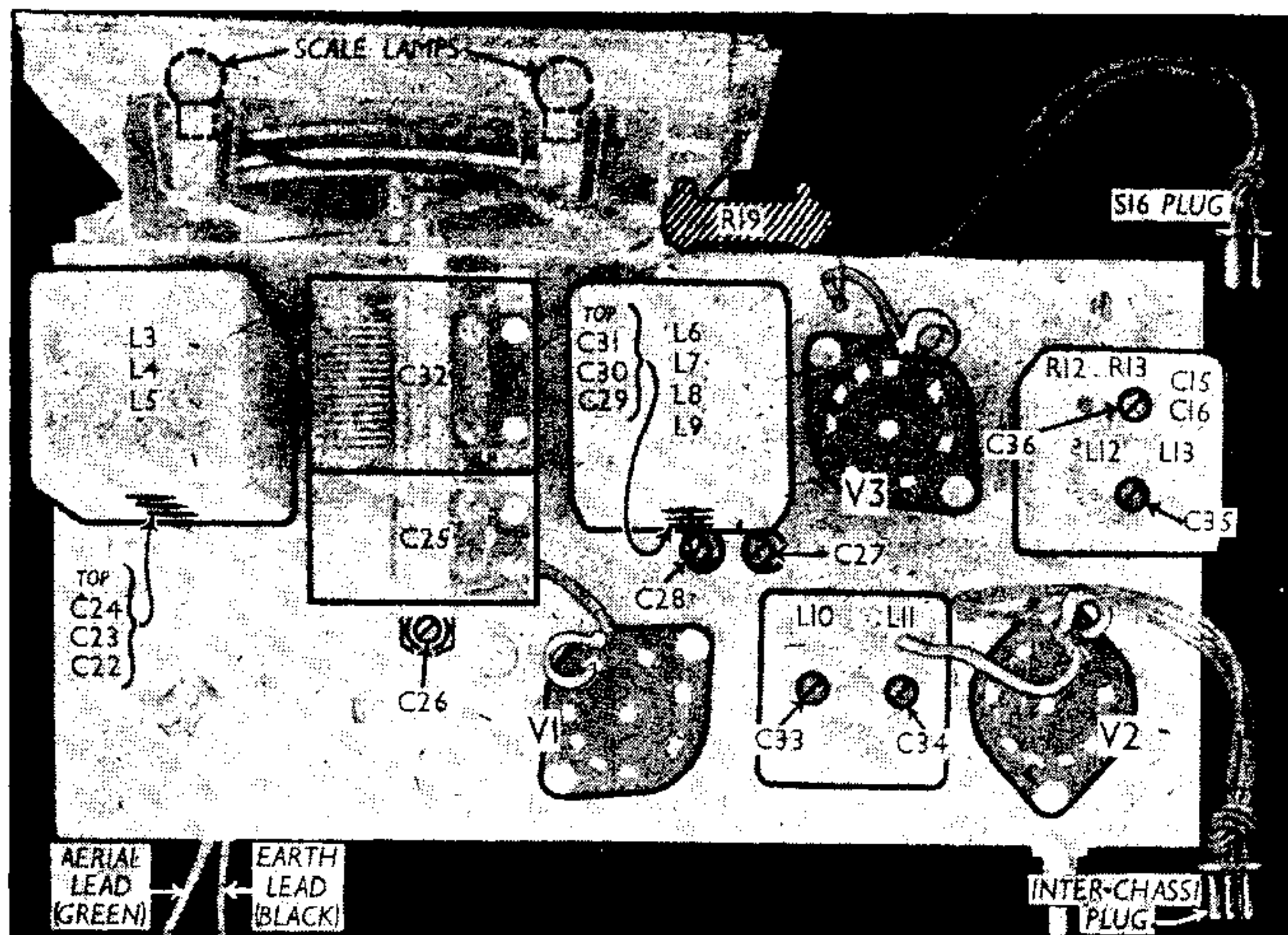
Provision for connection of gramophone pick-up via S15, R15 and C18 across R16.

DC potential developed across R12 is fed back via R13 and R15 as GB to FC and IF valves, giving AVC.

Power and Output Unit (AC).—Resistance-capacity coupling by R101, C101 and R102 between V3 triode and beam tetrode output valve (V101, Mullard 6V6G). Fixed tone correction by C102 in anode circuit. Provision for high impedance external speaker.

HT current is supplied by full-wave rectifying valve (V102, Mullard 5Y3G). Smoothing by speaker field L103 and electrolytic condensers C104 and C105.

Power and Output Unit (AC/DC).—Resistance-capacity coupling by R201, C201 and potential divider R202, R203 between V3 triode and pentode output valve (V201, Mullard CL4). Fixed tone correction by C202 in anode circuit.



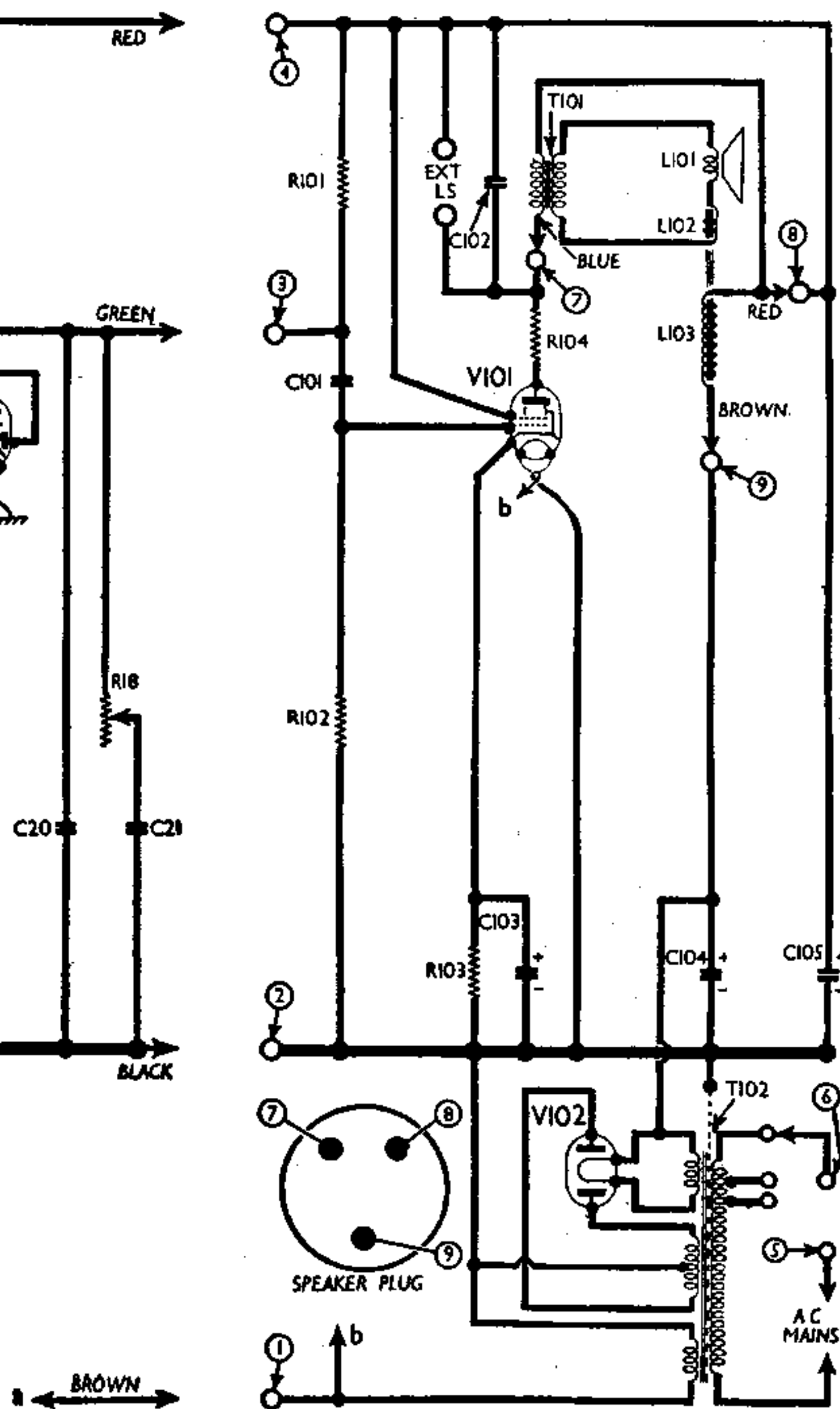
Plan view of the main chassis of both models.

Provision for connection of high impedance external speaker.

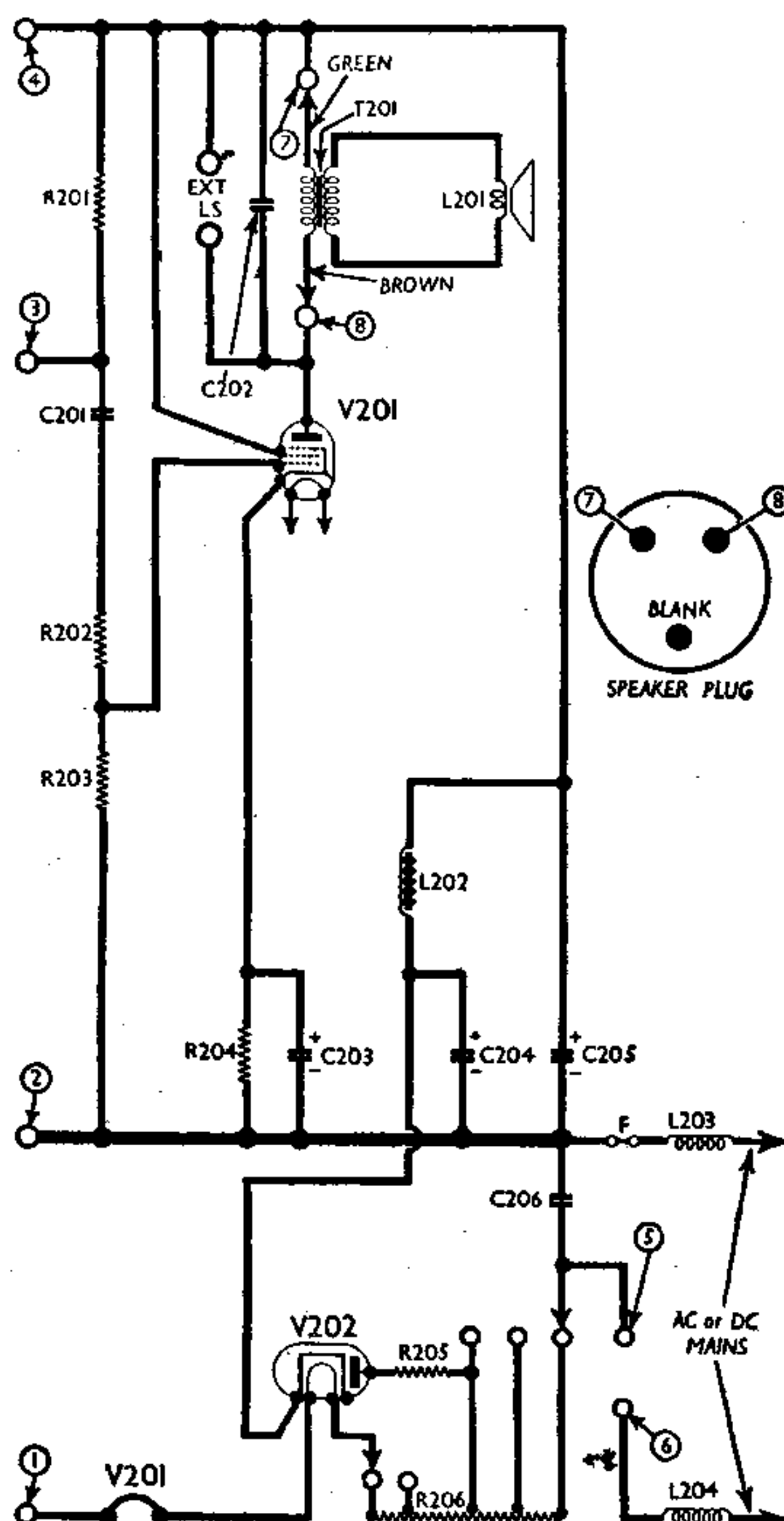
When the receiver is used with AC mains, HT current is supplied by IHC half-wave rectifying valve (V202, Mullard CY1), which with DC mains behaves as a low resistance. Smoothing

is effected by iron-cored choke L202 and dry electrolytic condensers C204 and C205.

Valve heaters of both the power and output unit and the receiver chassis, together with the scale lamps and ballast resistance R206, are connected in series across mains input. Filter circuit comprising air-cored chokes L203 and L204 and condenser C206 suppresses mains borne interference, while fuse F affords protection against accidental short-circuit.



The AC power and output unit diagram.



The AC/DC power and output unit diagram.

DISMANTLING THE SET

The receiver consists of two units: the receiver chassis, and the power and output unit. The two units and the speaker are interconnected by plugs and sockets which are not interchangeable.

Removing Receiver Chassis.—Remove the three control knobs (pull-off) and the four bolts (with claw washers and lock washers) holding the chassis to the bottom of the cabinet. Then withdraw from the power and output unit the two plugs connecting it to the receiver chassis, when the latter may be withdrawn.

When replacing, place a felt washer on each control spindle between the knob and the cabinet.

Removing Power and Output Unit.—Withdraw the two plugs referred to above and a third connecting the speaker to the unit, then remove the two bolts (with washers and lock washers) holding the unit to the bottom of the cabinet, when the unit may be withdrawn.

When replacing, note that the square claw washer goes on to the front fixing bolt, and the round one on the rear bolt, where a recess is made in the cabinet to accommodate it.

Removing Speaker.—Withdraw the speaker plug from the power and output unit, and remove the four nuts holding the speaker to the sub-baffle, and, when replacing, place the speaker so that the transformer is at the top.

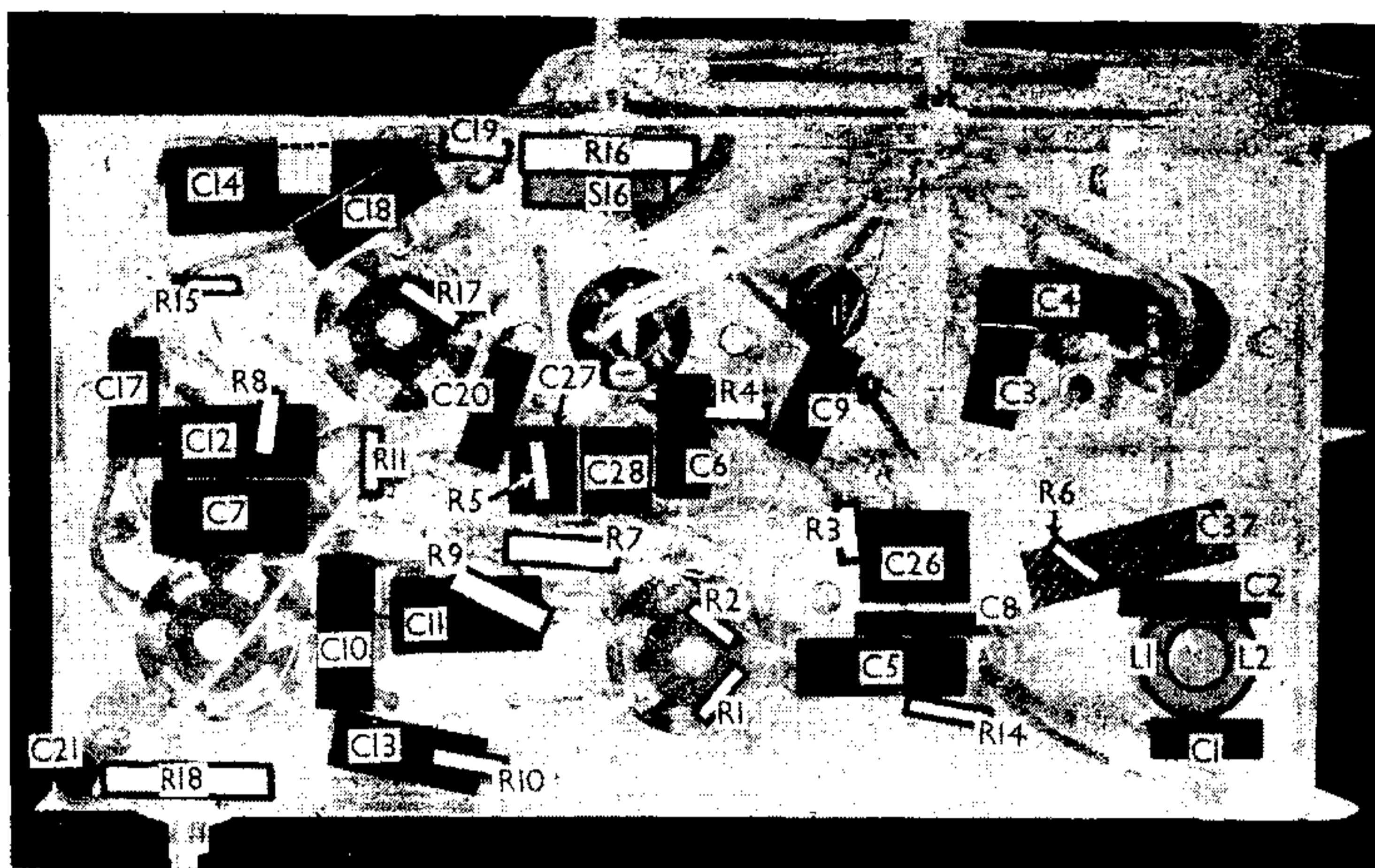
COMPONENTS AND VALUES

RESISTANCES		Values (ohms)
R1	V1 fixed GB resistance ...	500
R2	V1 osc. CG resistance ...	50,000
R3	Osc. SW reaction damping ...	22
R4	Osc. circuit MW damping ...	5,000
R5	Osc. LW reaction damping ...	5,000
R6	V1 heptode CG decoupling ...	500,000
R7	V1 osc. anode HT feed ...	25,000
R8	V2 CG decoupling ...	500,000
R9	V1, V2 SG'S HT feed ...	50,000
R10	V2 fixed GB resistance ...	500
R11	V2 anode HT feed ...	1,000
R12	V3 signal diode load ...	500,000
R13	IF stopper ...	25,000
R14	PU shunt ...	50,000
R15	AVC line decoupling ...	100,000
R16	Manual volume control ...	500,000
R17	V3 triode GB resistance ...	2,500
R18	Variable tone control ...	100,000
R19	Scale lamps shunt (AC/DC model only) ...	200
AC MODEL		
R101	V3 triode anode load ...	250,000
R102	V101 CG resistance ...	500,000
R103	V101 GB resistance ...	300
R104	V101 anode stabiliser ...	100
AC/DC MODEL		
R201	V3 triode anode load ...	250,000
R202	V201 CG input potential divider ...	100,000
R203	V201 GB resistance ...	250,000
R204	V201 GB resistance ...	300
R205	V202 anode surge limiter ...	100
R206	Heater circuit ballast, total ...	830*

*Tapped at 30 O, 630 O, 730 O and 830 O from V202 heater-end.

CONDENSERS		Values (µF)
C1	Aerial series condenser ...	0.0001
C2	Part LW aerial coupling ...	0.002
C3	Aerial SW coupling condenser ...	0.00001
C4	V1 heptode CG decoupling ...	0.1
C5	V1 cathode by-pass ...	0.1
C6	V1 osc. CG condenser ...	0.0001
C7	HT circuit RF by-pass ...	0.1
C8	Osc. circuit SW fixed tracker ...	0.002
C9	V1 osc. anode coupling ...	0.0001
C10	V2 CG decoupling ...	0.1
C11	V1, V2 SG's decoupling ...	0.1
C12	V2 anode decoupling ...	0.1
C13	V2 cathode by-pass ...	0.1
C14*	V3 cathode by-pass ...	25.0
C15	IF by-pass condensers ...	0.0001
C16	IF by-pass condensers ...	0.0001
C17	IF by-pass condensers ...	0.0002
C18	AF coupling to V3 triode ...	0.01
C19	IF by-pass condensers ...	0.0001
C20	IF by-pass condensers ...	0.0002
C21	Part of variable tone control ...	0.01
C22†	Aerial circuit SW trimmer ...	—
C23†	Aerial circuit MW trimmer ...	—
C24†	Aerial circuit LW trimmer ...	—
C25†	Aerial circuit tuning ...	—
C26†	Osc. circuit SW tracker ...	—
C27†	Osc. circuit MW tracker ...	—
C28†	Osc. circuit LW tracker ...	—
C29†	Osc. circuit SW trimmer ...	—
C30†	Osc. circuit MW trimmer ...	—
C31†	Osc. circuit LW trimmer ...	—
C32†	Oscillator circuit tuning ...	—
C33†	1st IF trans. pri. tuning ...	—
C34†	1st IF trans. sec. tuning ...	—
C35†	2nd IF trans. pri. tuning ...	—
C36†	2nd IF trans. sec. tuning ...	—
C37	Earth isolating condenser (AC/DC model only) ...	0.1
AC MODEL		
C101	V3 triode to V101 AF coupling ...	0.01
C102	Fixed tone corrector ...	0.001
C103*	V101 cathode by-pass ...	25.0
C104*	HT smoothing condensers ...	16.0
C105*	HT smoothing condensers ...	8.0
AC/DC MODEL		
C201	V3 triode to V201 AF coupling ...	0.01
C202	Fixed tone corrector ...	0.001
C203*	V201 cathode by-pass ...	25.0
C204*	HT smoothing condensers ...	16.0
C205*	HT smoothing condensers ...	16.0
C206	Mains RF by-pass ...	0.1

* Electrolytic. † Variable. ‡ Pre-set.



Underneath view of the main chassis of AC and AC/DC models. The two switch units are controlled by the centre spindle. The unit nearest the front of the chassis is numbered 1, and that nearest the rear of the chassis is numbered 2, in the diagrams in column 4.

OTHER COMPONENTS		Approx. Values (ohms)
L1	Aerial circuit choke ...	224.0
L2	Aerial LW coupling coil ...	13.0
L3	Aerial SW tuning coil ...	Very low
L4	Aerial MW tuning coil ...	4.2
L5	Aerial LW tuning coil ...	26.5
L6	Oscillator SW reaction ...	0.5
L7	Osc. circuit SW tuning coil ...	Very low
L8	Osc. circuit MW tuning coil ...	4.7
L9	Osc. circuit LW tuning coil ...	19.3
L10	1st IF trans. Pri. ...	16.5
L11	trans. Sec. ...	16.5
L12	2nd IF trans. Pri. ...	16.5
L13	trans. Sec. ...	16.5
S1-S14	Waveband switches ...	—
S15	Gram PU switch ...	—
S16	Mains switch, ganged R16 ...	—
AC MODEL		
L101	Speaker speech coil ...	2.2
L102	Hum neutralising coil ...	0.15
L103	Speaker field coil ...	1,500.0
T101	Speaker input trans. (Pri. ...)	620.0
	Sec. ...	0.3
	Pri., total ...	38.0
	Heater sec. ...	0.2
	Rect. heat. sec. ...	0.2
	H.T. sec., total ...	410.0
AC/DC MODEL		
L201	Speaker speech coil ...	2.2
L202	HT smoothing choke ...	300.0
L203	Mains filter chokes ...	3.5
L204	Mains filter chokes ...	3.5
T201	Speaker input trans. (Pri. ...)	620.0
	Sec. ...	0.3
F	Mains circuit fuse, 5A ...	—

VALVE ANALYSIS

Valve voltages and currents given in the table (col. 3) are those measured in our receiver when it was operating on AC mains of 233 V, using the 220-230 V tapping on the mains transformer in the case of the AC model and the 230 V tapping on the mains resistance in the case of the AC/DC model. 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.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
AC MODEL				
V1 ECH3	258	2.2	95	1.0
	Oscillator	4.8		
V2 EF9	252	5.7	95	1.8
V3 EBC3	53	1.0	—	—
V101 6V6G	226	41.0	258	3.3
V102 5Y3G	335*	—	—	—
AC/DC MODEL				
V1 ECH3	202	2.0	77	0.8
	Oscillator	3.0		
V2 EF9	198	4.3	77	1.3
V3 EBC3	45	0.6	—	—
V201 CL4	186	26.0	202	4.5
V202 CY1†	—	—	—	—

* Each anode, AC.
† Cathode to chassis 215 V, DC.

GENERAL NOTES

In the preparation of this Service Sheet the main chassis, which is almost identical in both AC and AC/DC models, has been dealt with separately, while the AC and AC/DC power and output units are also separately treated.

Note that components in the main chassis are numbered normally; those in the AC unit are numbered from 101 upwards; and those in the AC/DC unit are numbered from 201 upwards.

Switches.—S1—S14 are the waveband switches, and S15 the gram. switch, in two rotary units beneath the chassis. They are shown in detail in the diagrams in col. 4, where they are drawn as seen looking from the rear of the underside of the chassis. The table (col. 5) gives the switch positions for the four control settings, starting from fully anti-clockwise. A dash indicates open, and C, closed.

S16 is the QMB mains switch, ganged with the volume control R16. Its leads terminate in a 2-pin plug, fitting into a socket in the power and output chassis.

Coils.—L1, L2 are in an unshielded unit beneath the chassis. L3-L5,

L6-L9; L10, L11 and L12, L13 are in four screened units on the chassis deck.

Scale Lamps.—These are two National Union type N51 bulbs, with miniature bayonet cap bases. They are in parallel in the AC model, and in series, shunted by R19, in the AC/DC model.

External Speaker.—Two sockets are provided on the deck of the power and output unit for a high impedance (5,000) external speaker.

Smoothing Condensers.—In the case of the AC model, C104 and C105 are two dry electrolytics in a single metal can mounted on the deck of the power and output unit. The can is the common negative; the red spotted tag is the positive of C104 (16 μ F) and the plain tag is the positive of C105 (8 μ F).

In the AC/DC model, the condensers C204 and C205 are in a single unit mounted horizontally beneath the deck of the power and output unit. Both condensers are rated at 16 μ F in this case. The can is negative; the red tag is the positive of C204 and the plain tag the positive of C205.

Chassis and Speaker Connections.—The inter-connections between the two chassis, and the speaker, are carried out by various plugs and sockets.

The main chassis is connected to the power and output unit by a 4-pin plug and socket. A diagram of the plug, viewed from the free ends of the pins, is beneath the circuit diagram. The pins are numbered 1 to 4, and the connec-

tion points indicated in the circuit.

The mains switch S16 is in the main chassis, but is connected to the other chassis by a 2-pin plug and socket. This plug is also shown beneath the main circuit diagram; the pins being numbered 5 and 6.

The speaker is connected to the power and output unit by a 3-pin plug and socket. This is shown associated with the separate circuit diagrams of the power and output units. In the AC model, all three pins are used (7-9), while in the AC/DC model only two pins are used (7 and 8), the third being blank.

Heater Wiring.—This differs in the two models. The main circuit diagram indicates the AC (parallel) wiring. Inset beneath it is a diagram of the series heater chain for the first three valves of the AC/DC model (the remaining two heaters being shown in the separate diagram of the AC/DC power and output unit).

Resistance R206.—This ballast resistance is in the AC/DC power and output unit only. It is of the vitreous enamelled wire-wound type. At the upper end it has three mains voltage tapplings; at the lower end there are two tapplings, of which the bottom one is always used in the 901 (5-valve) models. The other tapping is for use with 904 (7-valve) chassis only.

Chassis Divergencies.—A large number of minor differences in component values, etc., were found in our models, compared with the makers' information. None of them are serious, and they will not be mentioned in detail here. The values we give are those found in our models.

Condensers C15, C16, C36.—These are inside the second IF transformer, and are all contained in a multiple unit built up with C36, the trimmer, as a basis. Four connection tags emerge from the unit. One is the top end of C36, the next the junction of C36 and C15, the next the junction of C15 and C16, and the last the top end of C16.

Resistance R19.—This is the scale lamp shunt, which is only used in the AC/DC model. It is shown dotted in the plan view of the main chassis.

Condenser C37.—The earth isolating condenser is only used in the AC/DC model. It is shown dotted in the circuit.

CIRCUIT ALIGNMENT

IF Stages.—Switch set to MW and turn gang to maximum. Remove top cap connector of V1 and connect a 500,000 resistance between the connector and the top cap of the valve. Connect signal generator, via a 0.00025 μ F condenser, between top cap of V1 and earth lead. Feed in a 470 KC/S signal, and adjust C36, C35, C34 and C33 in turn for maximum output. Repeat these adjustments.

RF and Oscillator Stages.—With gang at maximum, pointer should be horizontal. Connect signal generator, via a dummy aerial, to A and E leads.

SW.—Switch set to SW, tune to 16 MC/S on scale, feed in a 16 MC/S (18.75 m) signal, and adjust C29 for maximum output, using the peak involving the lesser trimmer capacity. Then adjust C22 for maximum output. Feed in a 6 MC/S (50 m) signal, tune it in, and adjust C26 for maximum output, while rocking the gang for optimum results. Repeat the 16 MC/S adjustments.

MW.—Switch set to MW, tune to 214 m on scale, feed in a 214 m (1,400 KC/S) signal, and adjust C30, then C23, for maximum output. Feed in a 500 m (600 KC/S) signal, tune it in, and adjust C27 for maximum output, while rocking the gang for optimum results. Repeat the 214 m adjustments.

LW.—Switch set to LW, tune to 1,250 m on scale, feed in a 1,250 m (240 KC/S) signal, and adjust C31, then C24, for maximum output. Feed in a 2,000 m (150 KC/S) signal, tune it in, and adjust C28 for maximum output, while rocking the gang for optimum results. Repeat the 1,250 m adjustments.

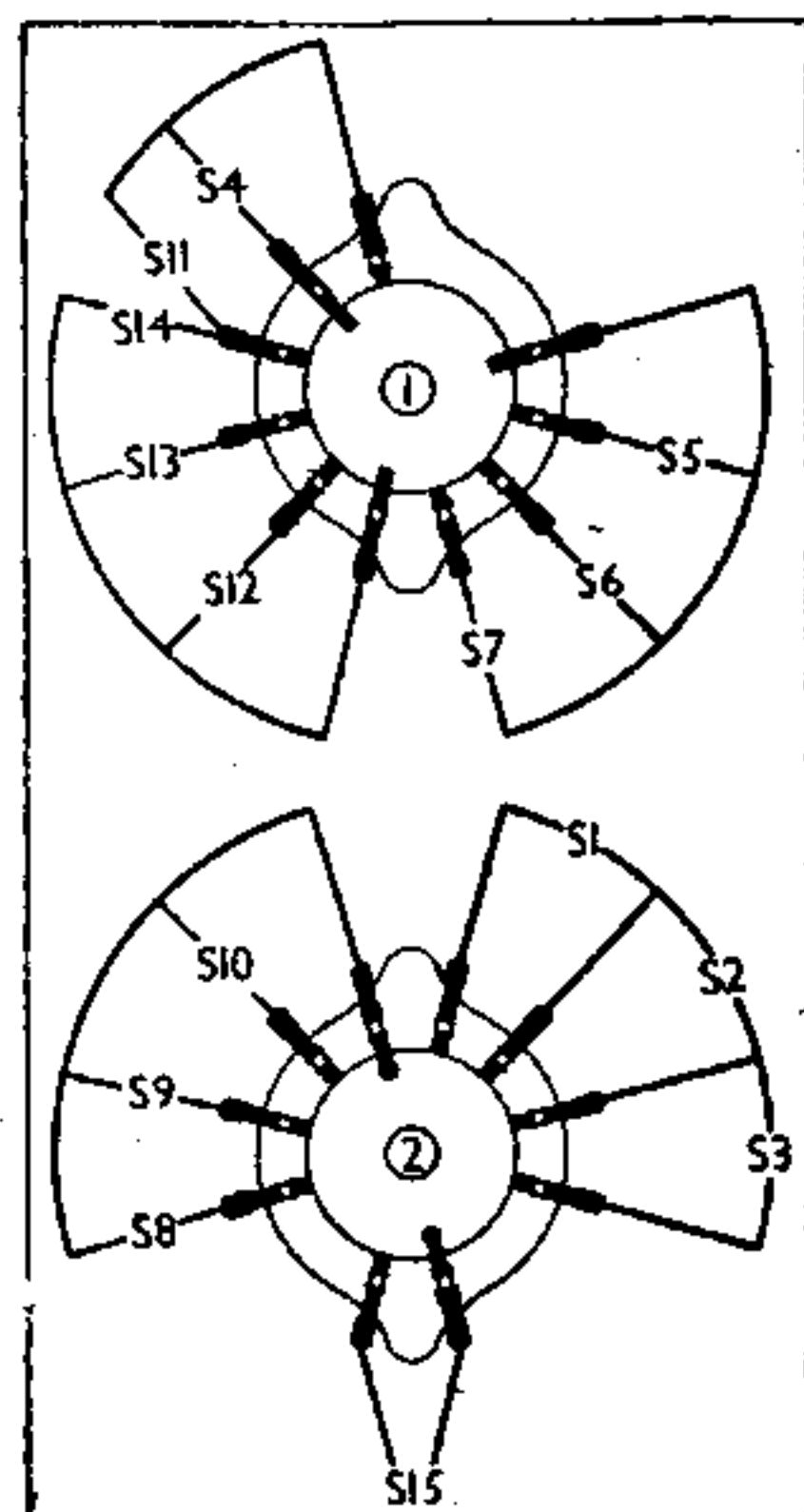
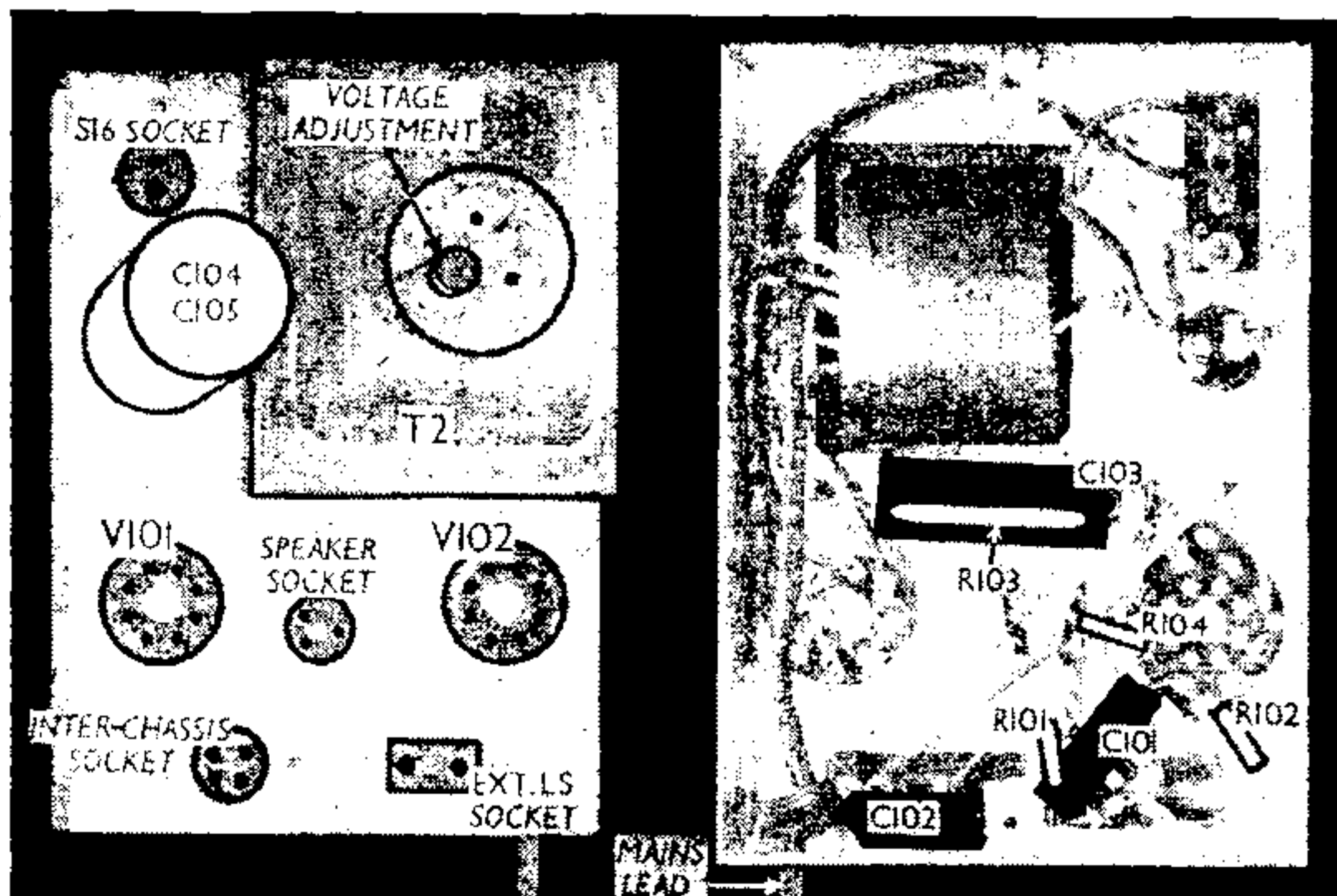


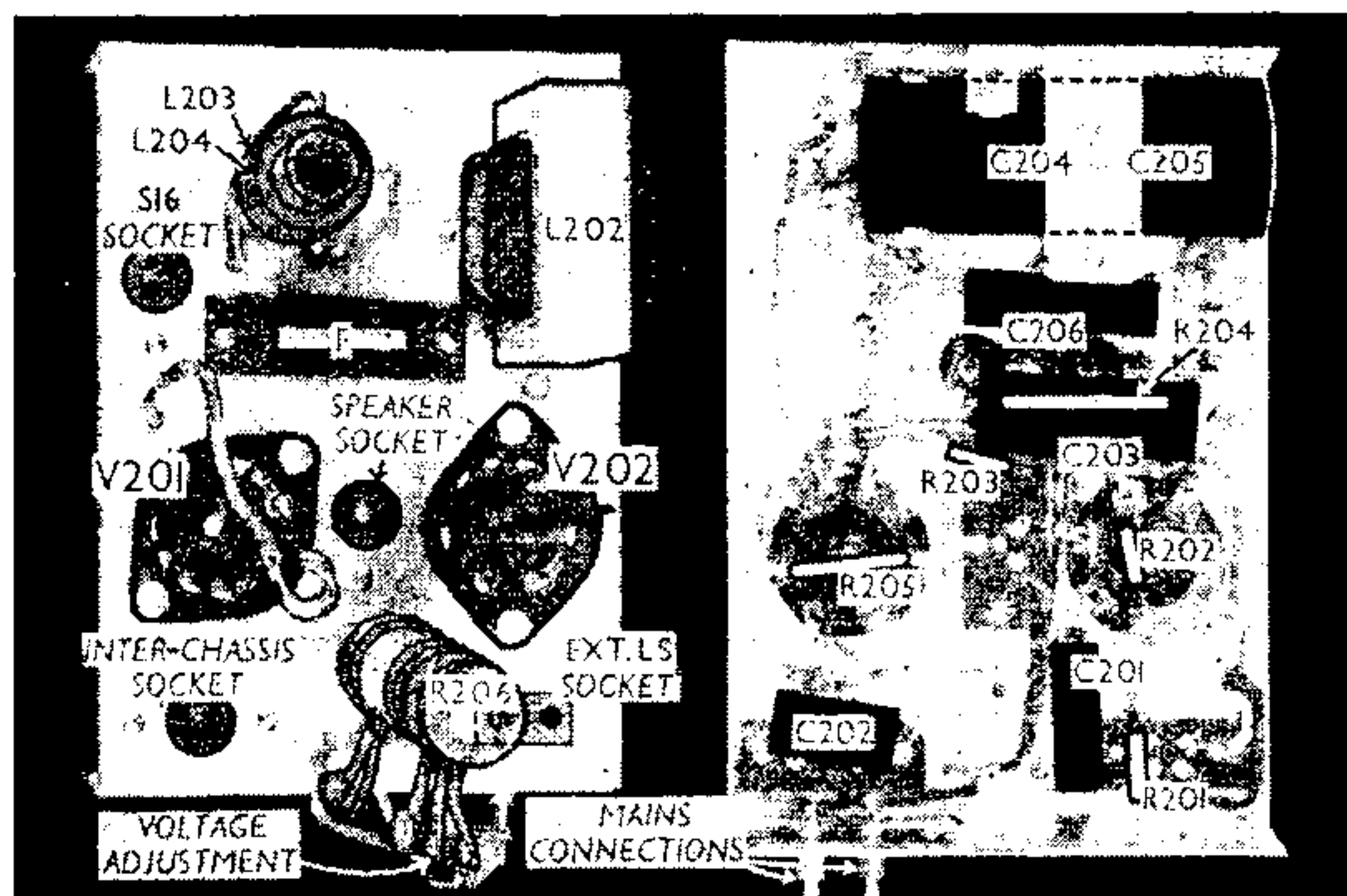
Diagram of the SI-S15 switch units, as seen from the rear of the underside of the chassis.

SWITCH TABLE

SWITCH	GRAM.	LW	MW	SW
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	—	—	—



Plan and under views of the AC unit.



Plan and under views of the AC/DC unit.