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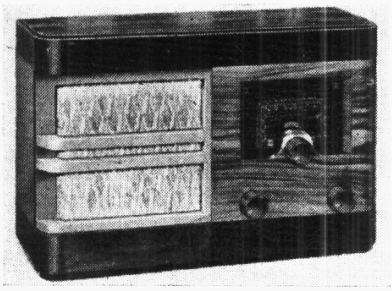
576

DECCA AW3, AW3P, AWD47 AND BRUNSWICK AW47



The Decca AW3 receiver.

A DOUBLE-DIODE RF pentode, with variable-mu characteristics in the pentode section, is used in a reflex circuit in the Decca AW3 to provide IF amplification, signal detection, AVC and AF amplification.

The receiver is a 3-valve (plus rectifier) 3-band transportable superhet, designed to operate from AC or DC mains of 200-250 V, 40-100 C/S in the case of AC. The SW range is 16-50 m.

Self-contained MW and LW frame aerials are fitted to the back of the cabinet, and the pick-up from them may be used for SW operation. Sockets are also provided for the connection of an external aerial and an earth, and for a gramophone pick-up of the crystal type.

The Decca AW3P is a similar receiver but is fitted in a portable carrying case with a carrying handle.

The Decca AWD47 and Brunswick AW47 are table radiograms, equipped with crystal pick-ups. They employ an identical type of chassis, but gram switching is fitted on the motor board.

Release date, all models: 1940.

CIRCUIT DESCRIPTION

On MW and LW, input is from tuned frame aerial **L2** (MW), **L3** (LW) and **C27** to triode hexode valve **(V1, Osram X65),** which operates as frequency changer with internal coupling. Two sockets are provided on the frame aerial assembly for the connection of an external aerial and an earth, and when they are used, coupling is effected via **L1,** which consists of a few turns of wire in the MW frame winding. The sockets are isolated from chassis by **C2.**

On SW, input from external aerial is via **L1** and the SW coupling coil **L4** to single tuned circuit **L5, C27.** The frame aerial can be used if desired for SW reception, when the pick-up from the frame aerial is transferred to **L4** via **L1.** It should be noted that in this instance the SW circuit is shown in the circuit diagram beneath the MW and LW circuit, as otherwise the input circuit would have appeared rather complicated.

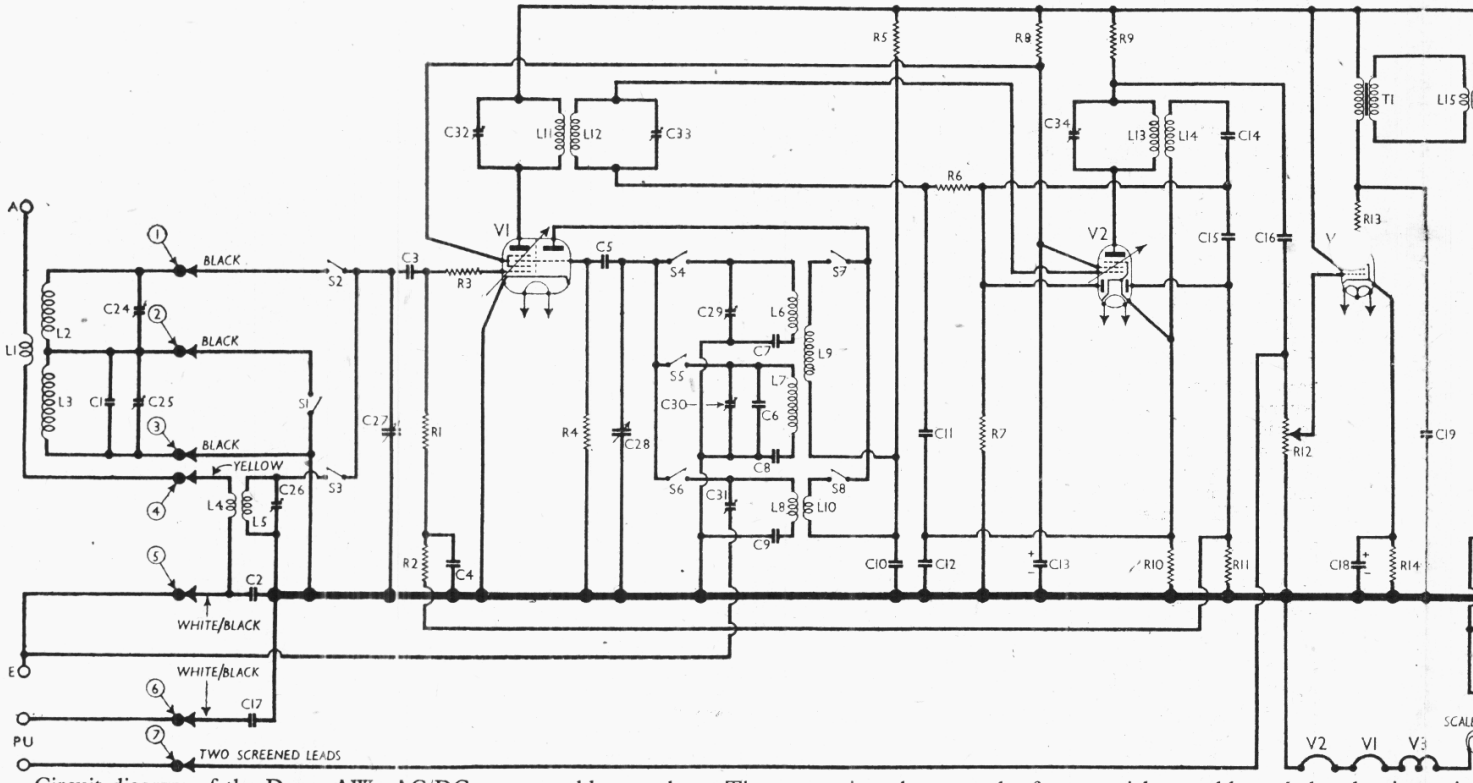
V1 triode oscillator control grid circuit coils **L6** (MW), **L7** (LW) and **L8** (SW) are tuned by **C28.** Parallel trimming by **C29** (MW), **C6, C30** (LW) and **C31** (SW); series tracking by **C7** (MW), **C8** (LW) and **C9** (SW). It will be observed that the SW circuit is again beneath the MW and LW circuits in order to agree with the aerial circuit arrangements. Reaction from anode is via coils **L9** (MW and LW) and **L10** (SW).

Second valve **(V2, Brimar 6B8G)** is a double diode variable-mu RF pentode operating in a reflex circuit as intermediate frequency amplifier, signal detector, AVC rectifier and AF amplifier.

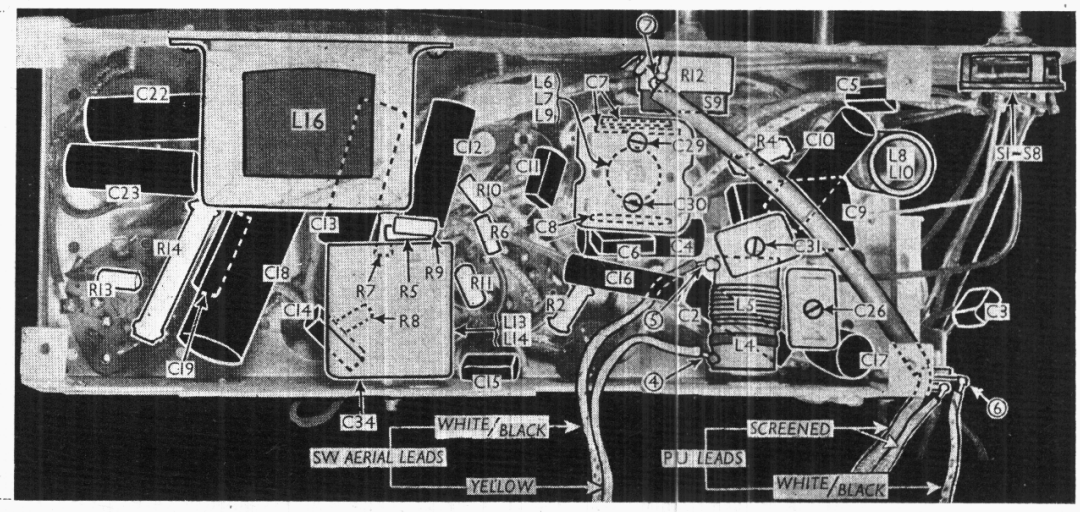
IF signals in **V1** hexode output are applied to **V2** pentode control grid circuit via a tuned-primary, tuned-secondary transformer, **C32, L11, L12, C33,** and the IF output from **V2** pentode is developed across a tuned-primary transformer **C34, L13, L14.**

Intermediate frequency 380 KC/S.

The output from **L14** is applied via **C14** to the signal diode of **V2;** the audio frequency component in the rectified output is developed across load resistance **R7**



Circuit diagram of the Decca AW3 AC/DC transportable superhet. The connections between the frame aerial assembly and the chassis are in to the left of the dots is mounted on the frame assembly. Connection No. 7 consists of two screened leads from the chassis to one pick-up unusual and rather complicated, as the valve operates as IF amplifier, signal diode, AVC diode, and reflex AF amplifier. Note that the SW cir



Under - chassis view. In several cases components are hidden, and are indicated by broken lines. Some of the leads to the frame assembly are shown, and they are traced to their connecting tags. A detailed diagram of the **S1-S8** switch diagram appears in Col. 4 overleaf.

and passed via coupling resistance **R6** and transformer secondary **L12** to CG of pentode section, which operates as reflex AF amplifier, with **R9** as its AF load resistance. IF filtering by **R6, C11.** As there is DC continuity between the signal diode anode and the pentode control grid, the DC potential developed across **R7** is applied as GB to the pentode section of the valve, providing automatic volume control in this stage.

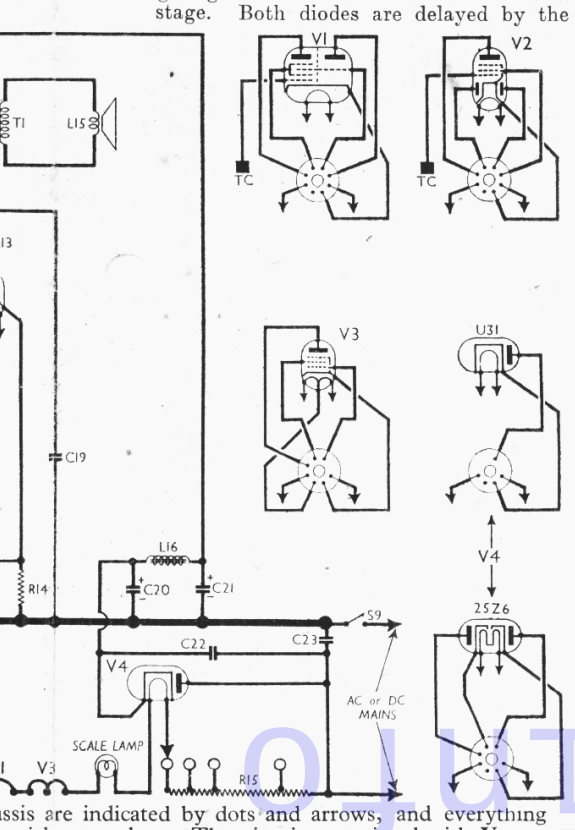
Second diode of **V2,** fed from **L14** via **C14** and **C15,** provides a further DC potential which is developed across load resistance **R11** and fed back through a decoupling circuit as GB to the FC valve, giving automatic volume control for that stage. Both diodes are delayed by the voltage drop along **R10** in **V2** cathode lead to chassis.

Resistance-capacity coupling by **R9, C16** and the manual volume control **R12** between **V2** pentode and pentode output valve **(V3, Osram KT35C** or **KT33C).** Fixed tone correction by **C19** in anode circuit.

Provision is made for the connection of a gramophone pick-up across **R12,** and the earthy lead is returned to chassis via an isolating condenser **C17.** As the sockets are mounted on the frame aerial assembly, they are shown in the circuit diagram in this position, the connecting points between them being indicated by dots and arrow-heads which are in line with the other five frame aerial/chassis connecting points.

When the receiver is operated from AC mains, HT current is supplied by an indirectly-heated half-wave rectifying valve **(V4, Osram U31** or **Brimar 25Z6)** which, with DC mains behaves as a low resistance. Smoothing is effected by an iron-cored choke **L16** and dry electrolytic condensers **C20** and **C21.** If the Brimar **25Z6** is fitted, its two halves are connected in parallel to operate as a half-wave rectifier.

Valve heaters, together with scale lamp (which is at high AC potential from chassis) and heater circuit ballast resistance **R15,** are connected in series across the mains input circuit. Mains circuit RF filtering by **C22** and **C23.**



ssis are indicated by dots and arrows, and everything e pick-up socket. The circuits associated with **V2** are he SW circuits are beneath the MW and LW circuits.

COMPONENTS AND VALUES

	RESISTANCES	Values (ohms)
R1	V1 CG hex. resistance ...	470,000
R2	V1 CG hex. decoupling ...	470,000
R3	V1 grid stopper	40
R4	V1 osc. CG resistance ...	47,000
R5	V1 osc. anode HT feed ...	47,000
R6	AF coupling to V2 pentode	2,000,000
R7	V2 signal diode load ...	470,000
R8	V1, V2 SG's HT feed ...	120,000
R9	V2 pentode AF load ...	47,000
R10	V2 fixed GB resistance ...	300
R11	V2 AVC diode load ...	470,000
R12	Manual volume control ...	500,000
R13	V3 anode stopper ...	100
R14	V3 GB resistance... ...	140
R15	Heater circuit ballast ...	570*

* Tapped at 70 O + 70 O + 310 O + 120 O from V4 heater end. Tap at 310 O not used.

	CONDENSERS	Values (μF)
C1	Frame aerial LW fixed trimmer	0·000025
C2	Earth isolating condenser	0·01
C3	V1 hex. CG condenser ...	0·0001
C4	V1 hex. CG decoupling...	0·02
C5	V1 osc. CG condenser ...	0·0001
C6	Osc. circ. LW fixed trimmer	0·00015
C7	Osc, circ. MW tracker ...	0·000785§
C8	Osc. circ. LW tracker ...	0·0003855
C9	Osc. circ. SW tracker ...	0·004
C10	V1 osc. anode decoupling	0·1
C11	IF by-pass	0·0002
C12	V2 cathode by-pass ...	0·1
C13*	V1, V2 SG's decoupling	8·0
C14	Coupling to V2 signal diode	0·0002
C15	Coupling to V2 AVC diode	0·0001
C16	V2 pentode to V3 AF coupling	0·001
C17	PU isolating condenser...	0·02
C18*	V3 cathode by-pass ...	50·0
C19	Fixed tone corrector ...	0·001
C20*	HT smoothing condensers	32·0
C21*	HT smoothing condensers	32·0
C22	Mains RF by-pass condensers	0·02
C23	Mains RF by-pass condensers	0·02
C24‡	Frame aerial MW trimmer	—
C25‡	Frame aerial LW trimmer	—¶
C26‡	Aerial circ. SW trimmer	—
C27†	Aerial tuning condenser	—
C28†	Oscillator circuit tuning	—
C29‡	Osc. circ. MW trimmer...	—
C30‡	Osc. circ. LW trimmer ...	—
C31‡	Osc. circ. SW trimmer ...	—
C32‡	1st IF trans. pri. tuning	—
C33‡	1st IF trans. sec. tuning	—
C34‡	2nd IF trans. pri. tuning	—

* Electrolytic. † Variable. ‡ Pre-set.
§ 0·000685 μF + 0·0001 μF connected in parallel.
¶ Two trimmers connected in parallel.

	OTHER COMPONENTS	Approx. Values (ohms)
L1	External aerial coupling	0·4
L2	Frame aerial windings ...	2·3
L3	Frame aerial windings ...	5·5
L4	Aerial SW coupling coil	2·4
L5	Aerial SW tuning coil ...	Very low
L6	Osc. circ. MW tuning ...	2·4
L7	Osc. circ. LW tuning ...	5·2
L8	Osc. circ. SW tuning ...	Very low
L9	Osc. MW and LW reaction	7·2
L10	Osc. SW reaction ...	0·4
L11	1st IF trans. Pri. ...	8·5
L12	1st IF trans. Sec. ...	10·0
L13	2nd IF trans. Pri. ...	19·0
L14	2nd IF trans. Sec. ...	6·0
L15	Speaker speech coil ...	2·5
L16	HT smoothing choke ...	400·0
T1	Speaker input trans. Pri. ...	330·0
	trans. Sec. ...	1·0
S1-S8	Waveband switches ...	—
S9	Mains switch, ganged R12	—

VALVE ANALYSIS

Valve voltages and currents given in the table below are approximate values only, and have been computed from a list of voltages supplied by the makers and average currents as published by valve manufacturers. All voltages are as measured from chassis.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 X65	210	2·0	50	1·0
	Oscillator			
	80	2·5		
V2 6B8G	50	3·0	50	0·75
V3 KT35C	195	50·0	210	9·0
V4 U31	250†	—	—	—

† Cathode to chassis, DC.

DISMANTLING THE SET

The cabinet is fitted with a detachable bottom, upon removal of which (8 countersunk-head wood screws) access may be gained to the trimmers and other components beneath the chassis.

Removing Chassis.—Remove the three control knobs (recessed grub screws) from the front of the cabinet;

remove the back cover (swivelled clips) on the inside of which are the frame aerial windings;

withdraw the scale lamp holder from its bracket at the front of the cabinet;

remove the cleat (two wood screws) holding the mains lead to the base of the cabinet;

remove the four set screws (with lock-washers and cupped washers) holding the chassis to the bottom of the cabinet, when the chassis and speaker, with the frame aerials attached by its leads, may be withdrawn together.

To free the frame aerials from the chassis, unsolder from the frame the eight interconnecting leads.

When replacing the frame assembly, connect the leads as follows:

White/black lead from **L4** to **E** socket on frame (5);

yellow lead from **L4** to insulated tag near **E** socket (4);

two screened leads to lower pick-up socket (7), soldering the screening to the anchor tag on the lower MW frame batten;

white/black lead from **C17** to upper pick-up socket (6);

black lead from chassis tag on gang frame to lower tag of trimmer **C25** (3);

black lead from second tag from top on connecting panel on gang to lower tag of trimmer **C24** (2);

black lead from third tag on panel to upper tag of **C24** (1).

These connecting points are indicated in the circuit diagram and the frame aerial illustration, and the points at which the leads are terminated at their chassis ends are indicated in the chassis illustrations. Each connection is given a number in a circle, and the numbers are repeated in parenthesis in the foregoing instructions.

GENERAL NOTES

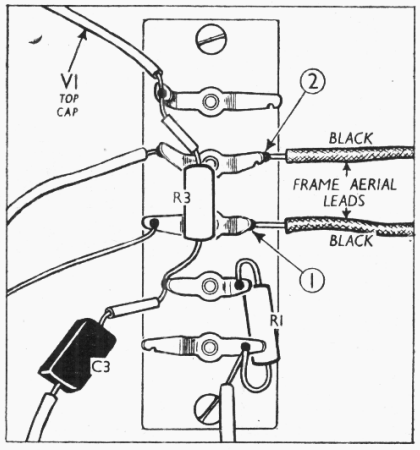
Switches.—**S1-S8** are the waveband switches, in a single rotary unit fitted to the front member beneath the chassis. The unit is indicated in our under-chassis view, and shown in detail in the diagram in col. 4, where it is drawn as seen when viewed in the direction of the arrow in the under-chassis view. The table in col. 3 gives the switch positions for the three control settings, starting from the fully anti-clockwise position of the control. A dash indicates open, and **C**, closed.

S9 is the QMB mains switch, ganged with the volume control **R12.**

Frame Aerial Assembly.—The frame aerial windings are mounted on wooden battens fitted inside the back cover of the cabinet. The LW winding **L3** and the external aerial coupling coil **L1** are wound on the small frame; the MW winding **L2** is on the large frame. The arrangement can be seen in the illustration of the assembly in cols. 5 and 6, where the external aerial, earth and pick-up sockets are indicated, together with a group of trimmer condensers and the connecting points for the leads from the chassis.

The connecting leads are not colour-coded throughout, but the connecting points are numbered in this view and in the circuit diagram, and the leads from the chassis are clearly shown in the two chassis illustrations. Here they are traced to their respective terminations, which in turn are numbered to agree with the circuit diagram, so that colour coding is not really necessary.

Two screened leads will be found connected to the high potential pick-up lead, although they join together there. This is because the same chassis is used for the radiogram, where switching is introduced at the ends of these leads.



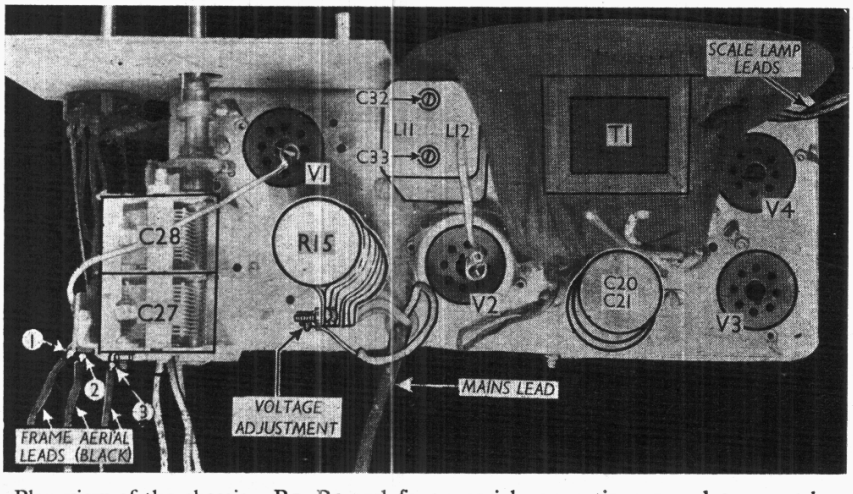
Sketch showing the connecting panel mounted on the side of C27 section of the gang.

Scale Lamp.—This is an Osram MES type, rated at 6.5 V, 0.3 A. Its holder is fitted with a spring clip which fits on to a bracket mounted on the front of the cabinet, just above the tuning scale.

Gramophone Pick-up.—Two sockets are provided on the frame aerial assembly for the connection of a gramophone pick-up, which should be of the crystal type. The upper (low-potential) socket is connected to chassis via an isolating condenser **C17.** If a magnetic pick-up only is available, it should be connected to the sockets via an input transformer with a suitable step-up ratio. See Radiograms, col. 5.

External Speaker.—There is no provision for this, but one of the low impedance (4-6 Ω) type could be connected across the speech coil circuit of the internal speaker, as this is isolated from chassis. In such a case, care should be taken to see that the extension leads are well insulated inside the chassis, and it would be advisable to earth one of them externally.

Condensers C20, C21.—These are two 32 μF dry electrolytics in a Hunts "Minipack" metal tubular container mounted on the chassis deck. The case forms the common negative connection. The positive connections are brought out to soldering tags which project into the under-



Plan view of the chassis. R1, R3 and frame aerial connections 1 and 2 cannot be seen here, but are indicated in the sketch of the connecting panel in Col. 3.

Switch Table

Switch	SW	MW	LW
S1	—	C	—
S2	—	C	C
S3	C	—	—
S4	—	C	—
S5	—	—	C
S6	C	—	—
S7	—	C	C
S8	C	—	—

chassis compartment. The red coded tag is the positive of the reservoir condenser **C20,** as indicated on the label, and should be connected to pin 8 of **V4** holder; the green tag is the positive of **C21,** and is rated at 350 V peak.

Resistance R15.—This is the heater circuit ballast resistance. At the bottom end it is connected to one side of mains, and at the top there are three voltage adjustment tappings for the connection of the flying lead from **V4** heater. Near the bottom is a fifth tag, which is not used in this receiver.

Condensers C1, C24, C25.—These are the frame aerial trimmers seen mounted in a group in the top right-hand corner of our frame aerial assembly illustration. **C24** is a single trimmer, and **C25** consists of two trimmers connected in parallel. **C1** is a small fixed condenser connected in parallel across **C25.**

Condensers C2, C17.—These two are two mains isolating condensers. **C2** isolates the earth socket, and is rated at 2,000 V AC; **C17** isolates the low potential pick-up lead, and is rated at 3,000 V DC test.

Chassis Divergences.—The values given in our component tables are those of the components found in our chassis, but some of these may be different in other chassis. All the resistances quoted at 47,000 O and 470,000 O in our tables were given as 50,000 O and 500,000 O in the makers' diagram.

C8 was quoted in the makers' diagram as 821 $\mu\mu$F (0.000821 μF), whereas in our chassis it was 785 $\mu\mu$F (0.000785 μF) and consisted of a 685 $\mu\mu$F and a 100 $\mu\mu$F connected in parallel. Similarly, **C9** was given as 0.006 μF, and was found to be 0.004 μF in our chassis. These values are very critical, and it is important that replacements should be of the same value as was originally fitted, even where the original was different from our value or the makers'. The tolerances of such condensers are in the neighbourhood of ± 1 per cent., and if an incorrect value is used the tracking will not hold.

C29 and **C30** were shown in the makers' diagram connected directly across their respective coils, whereas in our chassis they were returned to chassis. Again it is important that the original arrangement should be used; any change will upset the tracking.

Rectifier V4.—This may be an Osram U31, as in our chassis, or a Brimar 25Z6. The latter is of the voltage-doubler type, with separate anodes and cathodes, and where it is used the two anode pins should be joined together, as should also the two cathode pins. When the holder is thus wired, either type of valve can be used as a direct replacement for the other. If the 25Z6 is used to replace a U31, the holder should be wired so that the two halves are in parallel, as otherwise, although the valve would work, only one half of it would be in operation.

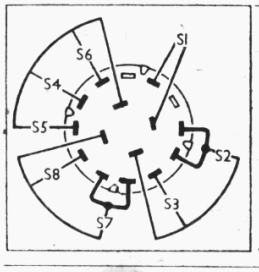
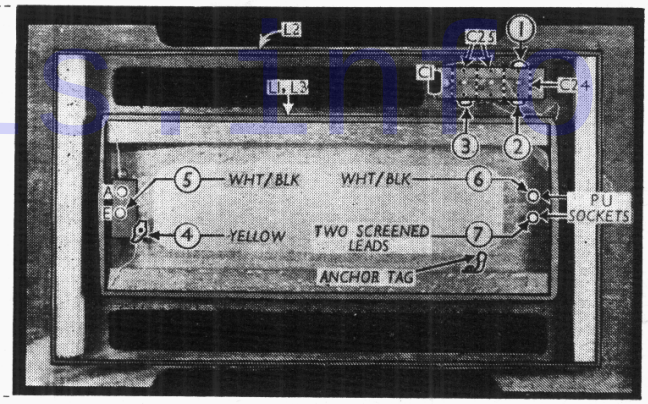


Diagram of the switch unit, as seen from the rear of the underside of the chassis.



The frame aerial assembly, viewed from the inside or "front." The connecting points of all the connecting leads from chassis are indicated. **C25** consists of two trimmers connected in parallel.

It is advisable to include a resistance of 100 O in each anode lead to the 25Z6, as otherwise the surge current may damage the valve. The resistance should be rated at 1 watt. These resistances will already be fitted in chassis that were originally supplied with a 25Z6 valve. In other chassis, a single 100 O resistance may be found in series with the lead to pin 5, but there was none in our chassis.

The base connections of both types of valve are included in our base diagrams on the right of the circuit diagram.

CIRCUIT ALIGNMENT

IF Stages.—Connect signal generator via a 0.0002 μF condenser to **A** and **E** sockets, switch the receiver to MW, turn the gang to minimum, and the volume control to maximum. Feed in a 380 KC/S (790 m) signal, and adjust **C34, C33** and **C32** in turn for maximum output.

RF and Oscillator Stages.—With the gang at maximum or minimum, the pointer should be horizontal. The signal generator should be connected as indicated for IF alignment.

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. Check at 300 m (1,000 KC/S) and 500 m (600 KC/S).

LW.—Switch set to LW, tune to 1,000 m on scale, feed in a 1,000 m (300 KC/S) signal, and adjust **C30,** then **C25,** for maximum output. As **C25** consists of two condensers, one should be set to maximum or minimum, according to the capacity required, and the adjustment should then be carried out on the other. Check calibration at 1,500 m (200 KC/S) and 2,000 m (150 KC/S).

SW.—Switch set to SW, tune to 16 m on scale, feed in a 16 m (18.75 KC/S) signal, and adjust **C31,** then **C26,** for maximum output. Check calibration at 30 m (10 MC/S) and 50 m (6 MC/S).

Finally, readjust **C24** and **C25** while receiving a broadcast transmission, using the self-contained aerials only.

Decca AWD47 and Brunswick AW47 Radiograms

The radiogram versions employ a similar chassis to that used in the AW3, but it is then housed in a table-type radiogram cabinet. In order to accommodate 12-inch records, a slot is cut in the back in line with the lid hinge.

The two screened pick-up leads are terminated at a single-pole change-over switch, so that in the gram position the junction of **C16** and the volume control **R12** is broken, and the top of **R12** is taken instead to one side of the pick-up. The switch is mounted on the motor board.

The pick-up used is a Collara piezo-electric model, and replacements should be of the piezo-electric type. If these are not available, however, the magnetic type can be used, but it must be a high impedance model (about 6,000 O), and must be connected via a suitable input transformer with a step-up ratio of 1 to 3.

Three types of Collara gramophone motors have been used in these models: two for use on AC mains only, and one for universal operation. In the universal models, a type U36 motor is used, and it is necessary to adjust it for AC or DC operation. Where the AC motor is used, the receiver is intended for use only on AC mains, although it could be used on DC mains if the gramophone motor were not used. In such cases it would be advisable to disconnect the motor entirely for safety's sake.

In early AC models, the type AC40 motor was used, but in later models this was replaced by model AC37.

The appearance of the Decca AWD47 and Brunswick AW47 table radiograms.

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