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540

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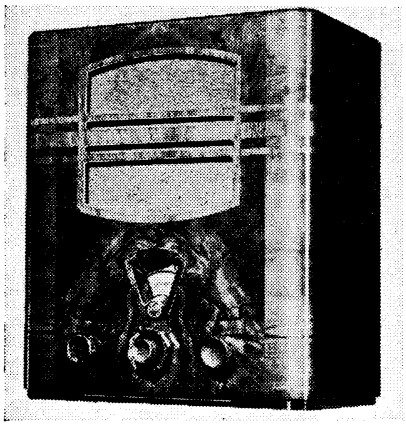
PHILIPS 588A

538A and 580A



The appearance of the Philips 588A superhet.

THE Philips 588A receiver is a 5-valve (plus rectifier) 2-band superhet, designed to operate from AC mains of 100-250 V, 40-100 C/S.

The mains transformer primary is made up in three sections, and is described under "General Notes." The valve sequence includes a separate diode valve, which is followed by an RF pentode AF amplifier and a directly heated pentode output valve.

The model 538A radiogramophone version of the 588A employs practically the same chassis as that in the 588A. The differences are described under "Radiogram Modifications."

The 580A is basically similar in design, but is somewhat simplified and employs resistance smoothing. The differences are described under "Model 580A Modifications."

Release dates: 538A, 588A, 1934; 580A, 1935.

CIRCUIT DESCRIPTION

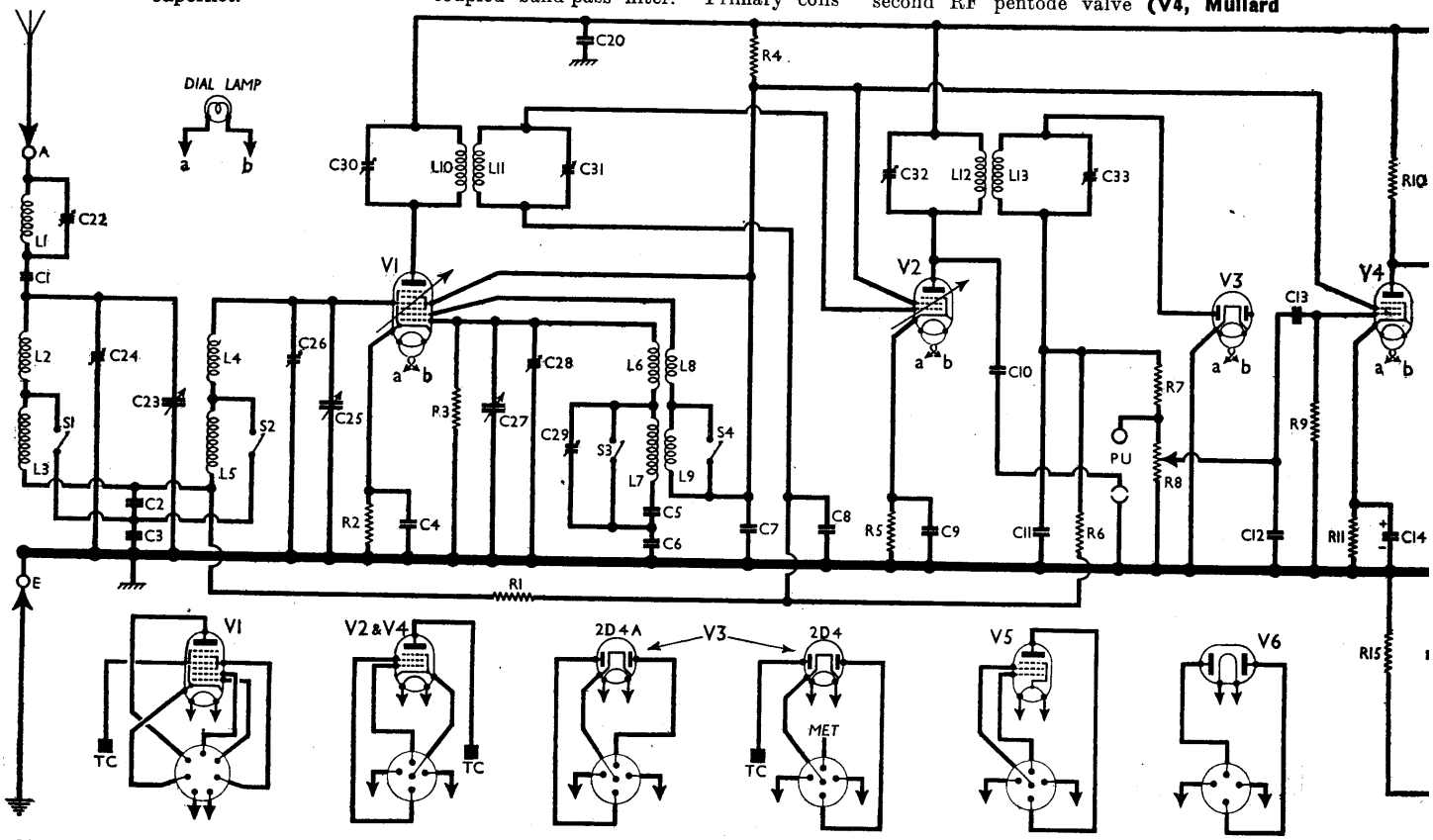
Aerial input via IF rejector circuit **L1, C22** and series condenser **C1** to capacity coupled band-pass filter. Primary coils **L2** (MW) and **L3** (LW) are tuned by **C23**; secondary coils **L4** (MW) and **L5** (LW) are tuned by **C25**; coupling by common impedance of **C3** (MW), with **C2** in series (LW), in primary and secondary circuits.

First valve **(V1, Mullard metallised FC4)** is a heptode operating as frequency changer with electron coupling. Oscillator grid coils **L6** (MW) and **L7** (LW) are tuned by **C27.** Parallel trimming by **C28** (MW) and **C29** (LW); series tracking by **C6** (MW) and **C5** (LW). Reaction from anode via coils **L8** (MW) and **L9** (LW).

Second valve **(V2, Mullard metallised VP4A)** is a variable-mu RF pentode operating as intermediate frequency amplifier with tuned-primary, tuned-secondary transformer couplings **C30, L10, L11, C31** and **C32, L12, L13, C33.**

Intermediate frequency 115 KC/S.

Diode second detector is part of double diode valve **(V3, Mullard metallised 2D4),** only one diode of which is used. Audio frequency component in rectified output is developed across the manual volume control **R8,** which also operates as load resistance, and passed via AF coupling condenser **C13** to control grid of a second RF pentode valve **(V4, Mullard**



Circuit diagram of the Philips 588A superhet. **L1, C22** form the IF rejector circuit. One diode only is used of the separate diode second as AF amplifier, which is followed by a step-down coupling to **V5.** **R15** is the GB resistance for **V5.** **C10** is the radio muting dev pick-up plug enters the split socket. The differences in the 538A radiogram are described in col. 4 overleaf. The differences in the 580A table r

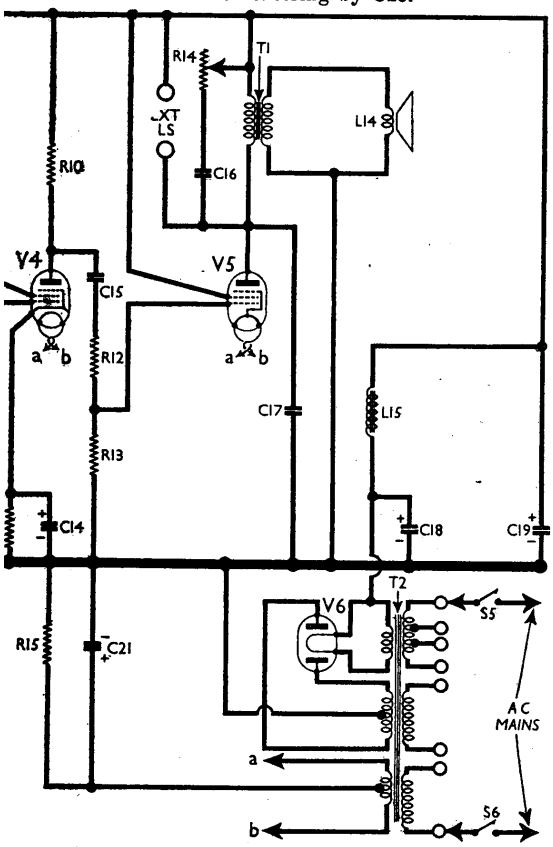
metallised SP4) which operates as AF amplifier. IF filtering by **C11, R7** and **C12.**

Provision for connection of a gramophone pick-up by sockets across **R8.** One of the sockets is split, and one side of it is connected to chassis; the other side, which is insulated from the first, is connected via the HT blocking condenser **C10** to **V2** anode, so that when the pick-up plug is inserted, the two halves of the split socket are connected together and **C10** is thus connected to chassis, short-circuiting the output from **V2** anode and muting radio.

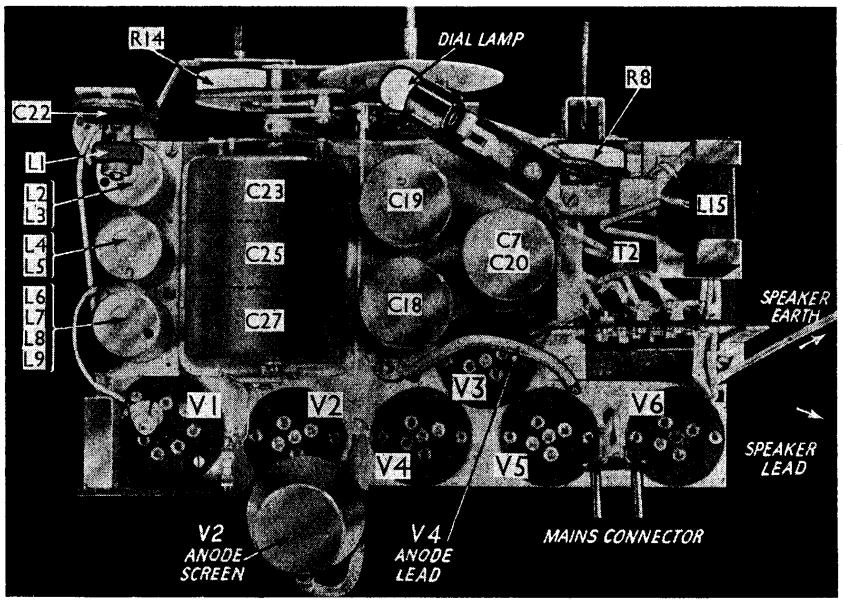
DC potential developed across **R7, R8** is tapped off and fed back through decoupling circuits as GB to FC and IF valves, giving automatic volume control.

Resistance-capacity coupling by **R10, C15** and potential divider **R12, R13** between **V4** and directly-heated filament pentode output valve **(V5, Mullard PM24M).** Fixed tone correction by **C17** in anode circuit. Variable tone control by **R14, C16,** also in anode circuit. Provision for connection of high impedance external speaker in anode circuit. GB for **V5** is obtained automatically from drop resulting from its cathode current flowing through **R15,** which is connected between **T2** heater secondary centre-tap and chassis, and is by-passed by **C21.**

HT current is supplied by full-wave rectifying valve **(V6, Philips 1821).** Smoothing by iron-cored choke **L15** and electrolytic condensers **C18, C19.** HT circuit RF filtering by **C20.**



second detector valve **V3.** **V4** is a pentode operating ting device, which operates automatically when the A table model are described in cols. 5 and 6 overleaf.



Plan view of the chassis. The IF rejector **L1, C22** is mounted on bracket above the chassis deck. All the RF and oscillator coil units are indicated here, but the trimmers are shown in the under-chassis view overleaf.

COMPONENTS AND VALUES

	RESISTANCES	Values (ohms)
R1	AVC line decoupling ...	10,000
R2	V1 fixed GB resistance ...	200
R3	V1 osc. CG resistance ...	50,000
R4	SG's and V1 osc. HT feed	32,000
R5	V2 fixed GB resistance ...	640
R6	AVC line decoupling ...	1,000,000
R7	IF stopper	50,000
R8	Manual volume control ...	500,000
R9	V4 CG resistance... ...	1,000,000
R10	V4 anode load	320,000
R11	V4 GB resistance... ...	6,400
R12	V5 feed potential divider	640,000
R13		500,000
R14	Variable tone control ...	50,000
R15	V5 GB resistance... ...	800

	CONDENSERS	Values (μF)
C1	Aerial series condenser ...	0·000025
C2	Band-pass coupling con-	0·025
C3	densers	0·025
C4	V1 cathode by-pass ...	0·05
C5	Osc. circ. LW tracker ...	0·00093
C6	Osc. circ. MW tracker ...	0·00181
C7	SG's and V1 osc. anode decoupling	1·0
C8	V2 CG decoupling ...	0·1
C9	V2 cathode by-pass ...	0·1
C10	Radio muting condenser...	0·01
C11	IF by-pass condensers ...	0·0001
C12		0·0002
C13	AF coupling to V4 ...	0·01
C14*	V4 cathode by-pass ...	25·0
C15	V4 to V5 AF coupling ...	0·01
C16	Part variable tone control	0·032
C17	Fixed tone corrector ...	0·002
C18*	HT smoothing condensers	32·0
C19*		32·0
C20	HT circuit RF by-pass ...	0·5
C21*	V5 cathode by-pass ...	25·0
C22‡	IF rejector tuning ...	0·000145
C23†	Band-pass pri. tuning ...	0·00043
C24‡	B-P pri. MW trimmer ...	0·000055
C25†	Band-pass sec. tuning ...	0·00043
C26‡	B-P sec. MW trimmer ...	0·000055
C27†	Oscillator circuit tuning...	0·00043
C28‡	Osc. circ. MW trimmer ...	0·000055
C29‡	Osc. circ. LW trimmer ...	0·000055
C30‡	1st IF trans. pri. tuning...	0·000145
C31‡	1st IF trans. sec. tuning...	0·000145
C32‡	2nd IF trans. pri. tuning...	0·000145
C33‡	2nd IF trans. sec.tuning...	0·000145

* Electrolytic. † Variable. ‡ Pre-set.

	OTHER COMPONENTS	Approx. Values (ohms)
L1	Aerial IF rejector coil ...	127·0
L2	Band-pass primary coils ...	3·9
L3		36·8
L4	Band-pass secondary coils	3·9
L5		36·8
L6	Osc. circ. MW tuning coil...	9·75
L7	Osc. circ. LW tuning coil...	27·4
L8	Osc. MW reaction coil ...	4·1
L9	Osc. LW reaction coil ...	10·7
L10	1st IF trans. Pri. ...	135·0
L11	Sec. ...	135·0
L12	2nd IF trans. Pri. ...	135·0
L13	Sec. ...	135·0
L14	Speaker speech coil ...	4·5
L15	HT smoothing choke ...	450·0
T1	Speaker input trans. Pri. ...	550·0
	Sec. ...	0·7
T2	Mains trans. Pri., total ...	73·0
	Heater sec. ...	0·1
	Rect. heat. sec. ...	0·2
	HT sec., total ...	500·0
S1-S4	Waveband switches ...	—
S5, S6	Mains switches	—

VALVE ANALYSIS

Valve voltages and currents given in the table below are average values computed from information given by the makers.

Voltages should be measured with a high resistance voltmeter whose negative lead is connected to chassis. There should be no signal input and, unless the meter is connected at points of low potential, it may be necessary in some cases to connect a 0.1 μF condenser between the grid of valve under test and chassis.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 FC4	245	0·9	70	3·0
	Oscillator			
	70	1·5		
V2 VP4A	245	1·5	70	0·5
V3 2D4	—	—	—	—
V4 SP4	160	0·35	'70	0·14
V5 PM24M	210	24·0	245	4·5
V6 1821	225†	—	—	—

† Each anode, AC.

DISMANTLING THE SET

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

unsolder the earthing lead from the tag on the speaker, and free the speaker leads from the cleats inside the cabinet;

remove the four screws holding the chassis to the bottom of the cabinet.

Chassis may now be withdrawn to the extent of the speaker leads, which is sufficient for most purposes.

To free chassis entirely, unsolder from the speaker transformer the leads connecting it to chassis.

When replacing, see that the rubber bushes, steel washers and brass distance pieces are in position before inserting the chassis, and do not omit to replace the spring contact strip on one of the screws to make contact between the chassis and the metallised screening foil which lines part of the cabinet.

Removing Speaker.—Unsolder the connecting leads, and remove the three clamps held in position by nuts and bolts.

When replacing, the transformer should be on the right.

GENERAL NOTES

Switches.—S1-S4 are the waveband switches, in a single rotary unit mounted horizontally beneath the chassis. its position is indicated in our under-chassis view, and the unit is shown in detail in the sketch in column 2, where it is drawn as seen when viewed from beneath the chassis. These switches are all closed on MW, and open on LW.

S5, S6 are the mains circuit switches, in a separate rotary unit, also mounted horizontally beneath the chassis. The two switch units are linked together and operated via a lever by a single control.

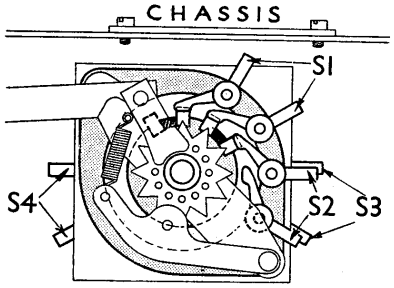


Diagram of the waveband switch unit, as seen in the under-chassis view below.

Coils.—The RF and oscillator coils **L2-L9** are in three screened units on the chassis deck. If one of the units is found to be faulty, it should be replaced by a new unit, since these cannot be dismantled without damaging the container. All three units can be freed if the metal clamping plate holding them to the chassis is removed, and the faulty unit can be removed after unsoldering its connections. The clamping plate is held in position by four screws, one of which has a nut and an earthing tag on it.

L1 is the aerial IF rejector coil, mounted unscreened with its tuning condenser **C22** on a bracket at the front of the chassis deck.

The IF transformers **L10, L11** and **L12, L13** are in two screened units, like the **L2-L9** units, mounted by metal bands beneath the chassis deck. The HT smoothing choke **L15** is mounted at one of the front corners of the chassis deck.

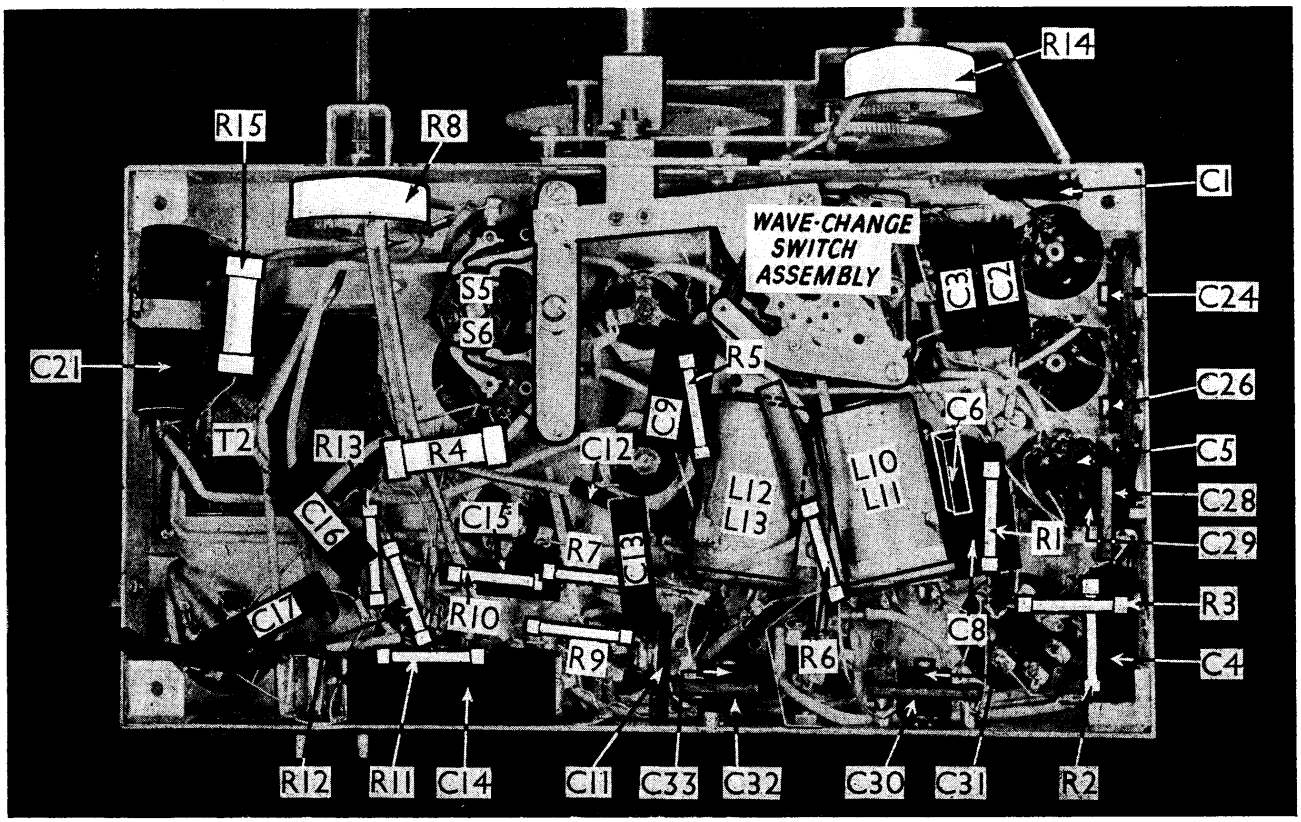
Dial Lamp.—This is 6 V, 3 W car-type bulb, with a centre-contact SBC base.

Gramophone Pick-up.—Two sockets are provided at the rear of the chassis for connection of a gramophone pick-up, and radio is automatically muted when the pick-up plug is inserted in the sockets. The muting condenser **C10** associated with these sockets is indicated in our circuit diagram, but it is not shown in the chassis illustrations because the muting circuit was not fitted in our chassis; it was, however, included in later chassis.

External Speaker.—Two sockets are provided at the rear of the chassis for a high-impedance (7,000-10,000 O) external speaker.

Transformer T2.—The mains transformer **T2** has a special primary winding, wound in three sections as shown in the circuit diagram. The two lower sections in the diagram are each wound for approximately 100 V, and the top section for about 50 V. Roughly speaking, the two untapped sections are connected in series for mains of, say, 200 V, and in parallel for mains of, say, 100 V. The tapped winding is added to them in various ways to suit odd voltages about the approximate voltages quoted.

The adjustment of the winding to suit the mains voltage is carried out according to the code diagram supplied with the re-



Under-chassis view. The waveband switch unit is indicated here, and shown in detail in the diagram above.

ceiver. The voltage settings available are : 103, 111, 118, 127, 135, 143, 155, 196, 210, 225, 240 and 250.

The code diagram is a pink circular disk which can be swivelled round on its central fixing rivet, which holds it to the back cover of the receiver. On the face of the disk are twelve patterns showing the link positions between the eleven fixed terminals on the adjustment panel, with the corresponding mean voltage rating marked beside each.

The disk is reproduced in actual size in the diagram in column 6. Each pattern is coded with a black dot, which should be on the *left* when setting the adjustment, as it is on the actual panel.

On the reverse of the disk, the voltage range of each setting is printed so that it is seen through a hole in the back cover, and after readjustment of the setting, the disk should be rotated until the appropriate range registers with the aperture.

Chassis Divergencies.—Apart from the omission of **C10** in some chassis, other divergencies may be found. **R4** may be made up of two 64,000 ohm 1 watt resistances connected in parallel, instead of a single 32,000 ohm 2 watt resistance, as in our chassis. Also, the value of the tone control **R14** may be 64,000 ohms, or 80,000 ohms in some chassis.

RADIOGRAM MODIFICATIONS

Model 538A is the radiogramophone version of the Philips 588A table receiver. It employs the same chassis, with modifications incorporated to permit the pick-up to be switched in and out of circuit.

This is done by adding a fourth position to the waveband control, so that no additional control is required. Three additional switch contacts are involved : a common contact, and two outer contacts.

Electrically, the connection between **R7** and **R6** is broken, and the common contact is joined to the top of **R7.** One of the outer contacts goes to the top of **R6,** and the other to one end of the pick-up output circuit, the other end of which goes to chassis.

When the control is in one of the radio positions, **R6** and **R7** are joined together as before; when the control is turned to "gram," the other contact connects one end of the pick-up to the top of **R7,** while the first contact becomes open-circuited, so that radio is muted and the pick-up output is connected across **R7** and **R8.**

C10 is, of course, omitted as it is no longer necessary. **R7** becomes 320,000 O, but the values of **R6** and **R8** remain unaltered. Another addition is the gramophone motor whose leads, in series with a single-pole motor switch, are connected across one of the untapped sections of the primary of the mains transformer **T2.**

CIRCUIT ALIGNMENT

IF Stages.—Switch set to LW, turn gang to minimum and volume control to maximum. Connect an earth lead to the receiver, and short-circuit **R3** to put the oscillator out of action. Damping shunts consisting of 10,000 O resistances must be connected across the primaries while the secondaries are trimmed, and *vice versa.* The shunts could, if more convenient, be connected between the high potential end of each coil and chassis, via a 0.1 μF condenser.

Connect signal generator via a 0.0002 μF condenser to control grid (top cap) of **V1** and chassis. Feed in a 115 KC/S (2608.7 m) signal, connect shunts across **L10** and **L13,** and adjust **C31** (with a screwdriver) and **C32** (with a spanner) for maximum output. Transfer shunts to **L11** and **L12,** and adjust **C30** (with a spanner) and **C33** (with a screwdriver) for maximum output. Remove shunts and the short-circuit across **R3.**

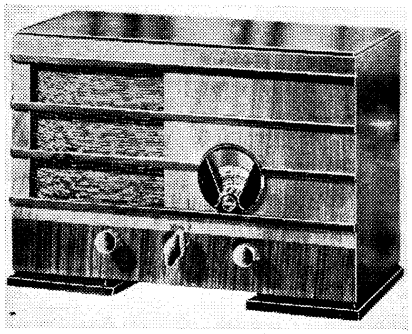
MW.—Switch set to MW, leaving signal generator connected as before, and connect a 10,000 O shunt across **L10.** Adjust **C28** until its vanes are 1 mm apart, feed in a 225 m (1,395 KC/S) signal, tune it is in, and adjust **C28** for maximum output.

Without disturbing gang setting, transfer signal generator leads to **A** and **E** sockets, feed in a 225 m signal, and adjust **C24** and **C26** for maximum output reading.

LW.—Switch set to LW, short-circuit **R3,** and feed in a 900 m (333.3 KC/S) signal. As the IF stages will not respond to this frequency, a separate receiver must be employed at this stage; its aerial socket must be connected via a condenser of about 0.000025 μF to the pentode anode of **V1,** and the output meter must be transferred to its output. Tune the separate receiver accurately to 900 m, then tune in the 900 m signal on the receiver under test. Transfer output meter to output of receiver under test, remove short-circuit from **R3,** disconnect separate receiver, and adjust **C29** for maximum output. Feed in a strong 115 KC/S (2608.7 m) signal, and adjust **C22** for *minimum* output.

Switch set to MW, feed in a 350 m (857 KC/S) signal, tune it in, and if necessary adjust the *scale* in its holder to the correct indication.

MODEL 580A MODIFICATIONS



The Philips 580A receiver.

THE Philips 580A is 6-valve 2-band AC superhet employing a design basically similar to that of the 588A. The main differences are that the HT smoothing choke **L15** is replaced by a resistance, that the split gramophone pick-up socket and the radio muting condenser **C10** are omitted, as they were in the early issues of the 588A, that **V3** is a Mullard 2D4A instead of a 2D4, and that the variable tone control is omitted.

The difference between the 2D4 and 2D4A valves is shown in the valve base diagrams beneath the circuit diagram, where two diagrams are given for **V3.** It will be seen that, whereas the 2D4A has a normal arrangement, the 2D4, although it is similar in every other respect, has a top-cap connector for the signal diode, and uses the discarded base pin as the metallising connection. In the 580A, the second diode, instead of being left unconnected, is strapped to the cathode.

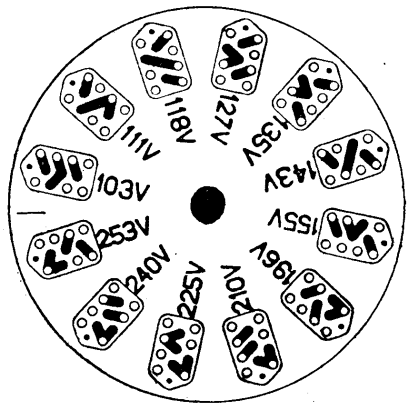
The HT smoothing resistance value is 2,500 O, and it is connected in place of the smoothing choke **L15.** Since the DC resistance of **L15** is only about one-fifth of the value of the resistor, the HT voltage readings in the 580A will be a little lower than those given for the 588A. The resistor itself is placed beneath the chassis, between the two switch units.

The tone control is omitted altogether in the 580A, and the fixed tone corrector **C17** is connected in its place across the primary winding of the speaker input transformer **T1.** The value remains unchanged.

In our 580A chassis, a 1,000,000 O fixed resistance was connected across **R8.** Some of the resistances in the 580A have values different from those in the 588A. **R5** may be 2,000 O instead of 640 O; **R7** is 250,000 O instead of 50,000 O; and **R15** is 640 O instead of 800 O.

Of the condensers in the 580A, **C7** is 0.5 μF instead of 1.0 μF, and **C20** is 1.0 μF instead of 0.5 μF; but they are still in the same container, so that their connections are transposed.

The appearance of the two receivers is very different : the 580A is housed in a horizontal cabinet, which is small compared with the 588A. An illustration showing the appearance of the 580A is given in the preceding column, while another, at the head of col. 1 overleaf, shows the appearance of the 588A.



Actual size reproduction of the voltage adjustment indicator disk. On the reverse is printed the range of each setting.

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