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"TRADER" SERVICE SHEET

680

PHILIPS 472A

SUPERINDUCTANCE AC RECEIVER

The Philips 472A.

FOUR variably-tuned signal frequency circuits are employed in the Philips 472A, a 5-valve (plus rectifier) TRF "Superinductance" receiver designed for operation from AC mains of 100-250 V., 40-100 c/s.

An almost identical chassis is employed in the Philips 577A receiver, the difference being explained under "577A Modifications" overleaf. This *Service Sheet*, however, was actually prepared from a 472A receiver.

Release dates and original prices: 472A, 1934, £15 15*s*.; 577A, 1935, £13 13*s*.

CIRCUIT DESCRIPTION

Aerial input is via series condenser **C2** and chokes **L1** (MW) and **L2** (LW) to tappings on primary windings of capacity coupled band-pass filter. Primary coils **L3, L4** are tuned by **C33**; secondaries **L5, L6** by **C36**; coupling by common impedance of **C5** (MW), plus **C4** (LW), in primary and secondary circuits.

R1, C1 shunt the aerial circuit on both bands. Mains aerial coupling via **C3, S1** directly to aerial socket **A** is effective so long as no aerial is connected, but when the aerial plug is inserted, **S1** automatically opens.

First valve **(V1, Mullard metallised VP4A** (5-pin)**)** is a variable-mu RF pentode operating as signal frequency amplifier with tuned-secondary RF transformer coupling by **L7, L8, L9** and **C39** to a second valve of the same type **(V2, Mullard metallised VP4A** (5-pin)**),** which in turn is tuned-secondary RF transformer coupled by **L10, L11, L12** and **C42** to a separate double diode detector valve **(V3, Mullard metallised 2D4A** or **2D4),** one diode of which is not used.

SG and GB potentials for **V1** and **V2** are obtained from an HT potential divider **R4, R5, R6** and **R7,** the last of which is variable and is driven by the tuning control drive to level the gain over the band in use by suitably adjusting the GB of **V1** and **V2,** the GB increasing as the wavelength is reduced. Minimum GB potentials are imposed by the drop across **R9** (for **V1**) and **R12** (for **V2**). On MW, **S5** closes, short-circuiting **R6** and reducing the standing GB value.

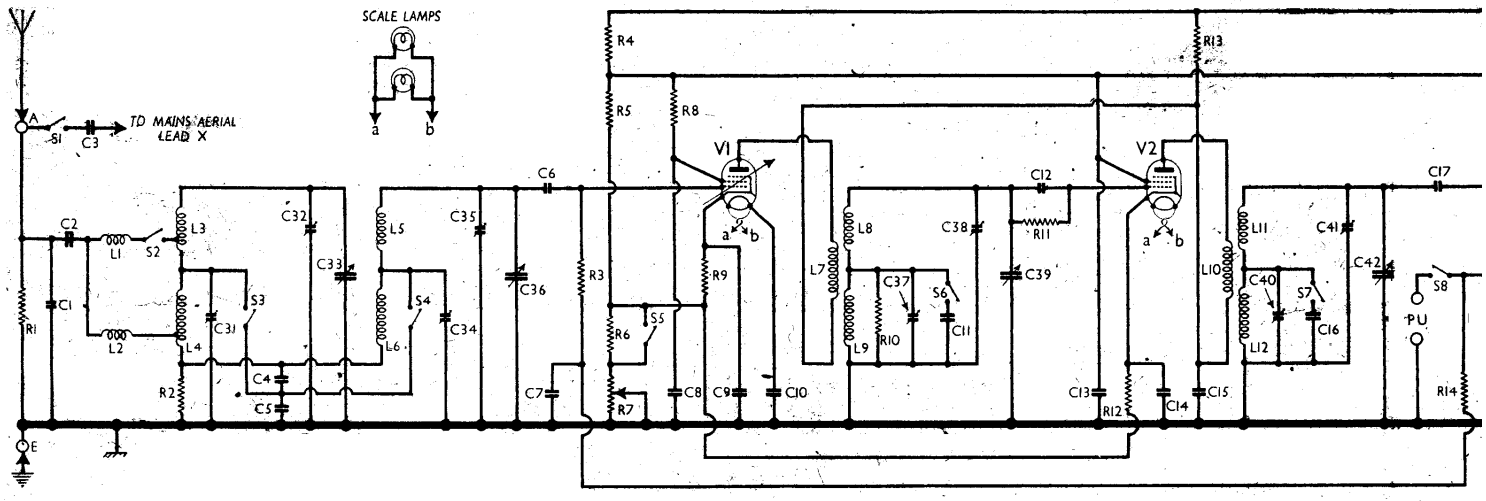
Audio frequency component in rectified output from **V3** is developed across **R15** and the manual volume control **R16,** which also operates as load resistor, and passed via AF coupling condenser **C18** to CG of a third RF pentode **(V4, Mullard metallised SP4)** which operates as AF amplifier.

DC potential appearing across **R16** is tapped off and fed back via decoupling circuit **R14, C7** to **V1,** giving automatic volume control. Provision for the connection of a gramophone pick-up by sockets connected via **S8** across **R16, S8** closing and **S9** opening when the control is turned to the gram position.

Resistance-capacity coupling by **R21, C24** and **R22** between **V4** and pentode output valve **(V5, Mullard Pen4VA).** Fixed tone correction by **C27** and variable tone control by **R25, C26** in anode circuit. Provision is also made in the anode circuit for connecting a high impedance external speaker, while switch **S10** in the speech coil circuit permits the internal speaker to be muted.

RF filtering is progressively applied through several stages: **C19** in **V4** CG circuit, **C22** in **V4** anode circuit, and **R23, C25, R24** in **V5** CG circuit, followed by the grid/cathode capacity of **V5.**

HT current is supplied by full-wave rectifying valve **(V6, Philips 1821** or **Mullard DW2).** Smoothing by iron-cored choke **L14,** in HT negative lead, and electrolytic condensers **C28, C29.** Mains input filter chokes **L15, L16** suppress RF interference.



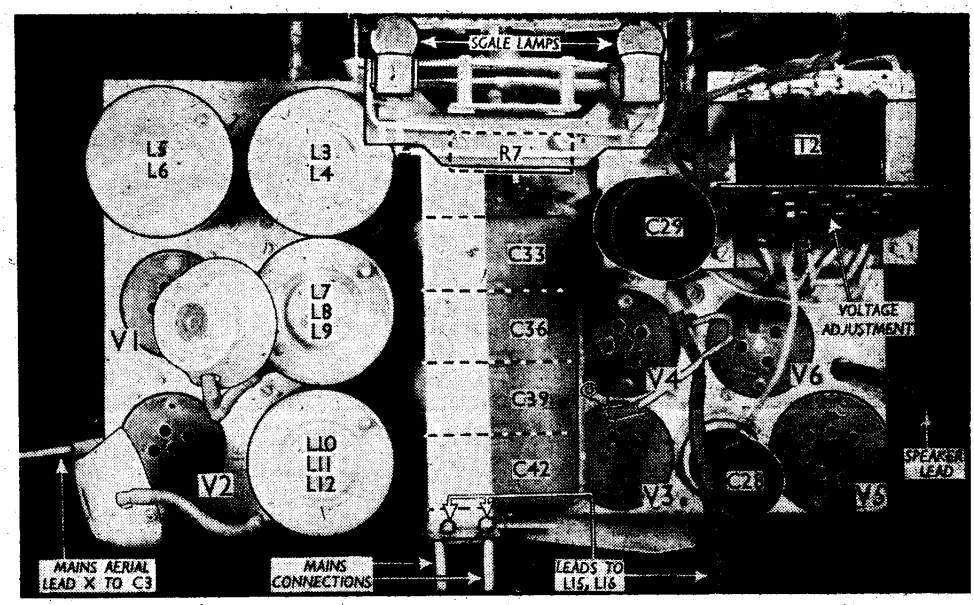
Circuit diagram of the Philips 472A TRF "Superinductance" AC receiver. Several features are concerned only with maintaining constant sensitivity and selectivity throughout the two wavebands employed. These include the two aerial series coupling chokes **L1, L2,** with **C1, C2,** a variable resistor **R7,** which is ganged with the tuning control drive, and the switch **S5,** which closes on MW to short-circuit **R6.** In this connection also, **V1** and **V2** cathodes are returned a common point on the HT potential divider **R4–R7.**

GB potential for **V5** is obtained from the junction of **R26** and **R27**, which form a potential divider across **L14**. The CG circuit is adequately decoupled by an electrolytic condenser **C30**.

COMPONENTS AND VALUES

	CONDENSERS	Values (μF)
C1	Aerial circuit shunt ...	0·00008
C2	Aerial series condenser ...	0·0005
C3	Mains aerial coupling ...	0·0005
C4	Band-pass coupling condensers ...	0·025
C5		0·032
C6	V1 CG condenser ...	0·000025
C7	V1 CG decoupling ...	0·1
C8	V1 SG decoupling ...	0·1
C9	V1 cathode by-pass ...	0·05
C10	Heater RF by-pass ...	0·1
C11	1st RF trans. LW shunt	0·025
C12	V2 CG condenser ...	0·000025
C13	V2 SG decoupling ...	0·1
C14	V2 cathode by-pass ...	0·05
C15	V1, V2 anodes decoupling	0·1
C16	2nd RF trans. LW shunt	0·025
C17	V3 diode coupling ...	0·000007
C18	AF coupling to V4 ...	0·01
C19	RF by-pass	0·00032
C20	V4 SG decoupling ...	0·1
C21	V4 anode decoupling ...	0·1
C22	RF by-pass	0·00025
C23*	V4 cathode by-pass ...	25·0
C24	V4 to V5 AF coupling ...	0·01
C25	RF by-pass	0·0001
C26	Part variable tone control	0·032
C27	Fixed tone corrector ...	0·002
C28*	HT smoothing condensers	32·0
C29*		32·0
C30*	V5 CG decoupling ...	25·0
C31‡	B-P pri. LW trimmer ...	0·000027
C32‡	B-P pri. MW trimmer ...	0·000027
C33†	Band-pass pri. tuning ...	0·00043
C34‡	B-P sec. LW trimmer ...	0·000027
C35‡	B-P sec. MW trimmer ...	0·000027
C36†	Band-pass sec. tuning ...	0·00043
C37‡	1st RF trans. LW trimmer	0·000027
C38‡	1st RF trans. MW trimmer	0·000027
C39†	1st RF trans. sec. tuning	0·00043
C40‡	2nd RF trans. LW trimmer	0·000027
C41‡	2nd RF trans. MW trimmer	0·000027
C42†	2nd RF trans. sec. tuning	0·00043

* Electrolytic. † Variable. ‡ Pre-set.



Plan view of the chassis. **R7** is mounted behind the tuning scale assembly. The connections to the filter coils **L15, L16** are indicated in the centre foreground, while the mains aerial connection to **C3** (lead **X**) is shown emerging from one end of the chassis, on the left.

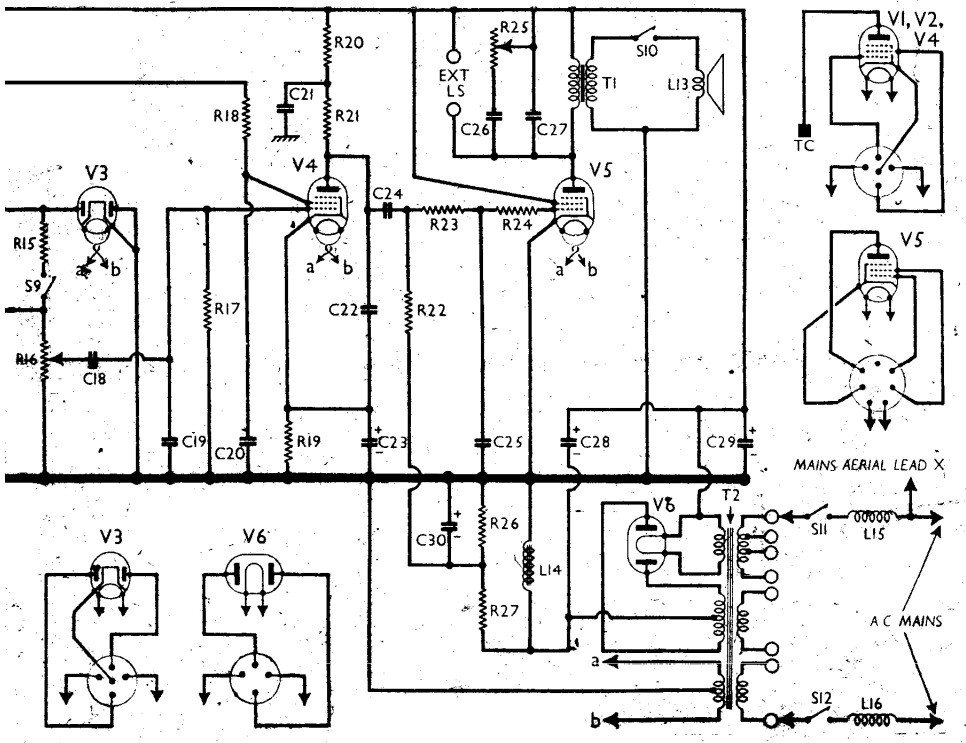
	RESISTORS	Values (ohms)
R1	Aerial circuit shunt ...	32,000
R2	B-P coupling resistor ...	3,200
R3	V1 CG resistor	1,000,000
R4	V1, V2, V4 SG and V1, V2 GB potential divider	32,000*
R5		32,000
R6		160
R7		680
R8	V1 SG decoupling ...	1,000
R9	V1 fixed GB resistor ...	500
R10	1st RF trans. LW damping	320,000
R11	V2 CG resistor	1,600,000
R12	V2 fixed GB resistor ...	500
R13	V1, V2 anodes HT feed ...	1,000
R14	AVC line decoupling ...	1,000,000
R15	V3 signal diode load and manual volume control	320,000
R16		500,000

(*continued next column*)

* Made up of two 64,000 resistors in parallel.

	RESISTORS (*continued*)	Values (ohms)
R17	V4 CG resistor	1,000,000
R18	V4 SG HT feed	640,000
R19	V4 GB resistor	4,000
R20	V4 anode decoupling ...	100,000
R21	V4 anode load	200,000
R22	V5 CG resistor	500,000
R23	RF filter resistors ...	100,000
R24		1,000
R25	Variable tone control ...	50,000
R26	V5 GB potential divider	64,000
R27		16,000

	OTHER COMPONENTS	Approx. Values (ohms)
L1	Aerial series chokes ...	33·0
L2		119·0
L3	Band-pass primary coils ...	3·2
L4		26·3
L5	Band-pass secondary coils	3·15
L6		24·0
L7	1st RF transformer pri. ...	62·0
L8	1st RF trans. sec. coils ...	3·2
L9		25·0
L10	2nd RF transformer pri. ...	62·0
L11	2nd RF trans. sec. coils ...	3·2
L12		25·0
L13	Speaker speech coil ...	5·0
L14	HT smoothing choke ...	500.0
L15	Mains RF filter chokes ...	5·0
L16		5·0
T1	Speaker input trans. Pri. ...	650·0
	Sec. ...	1·2
T2	Mains trans. Pri., total ...	40.0
	Heater sec. ...	very low
	Rect. heat. sec.	0.1
	HT sec., total	320.0
S1	Mains aerial switch ...	—
S2–S7	Waveband switches ...	—
S8, S9	Radio/gram. switches ...	—
S10	Int. speaker switch ...	—
S11,S12	Mains switches	—



VALVE ANALYSIS

Valve voltages and currents in the table overleaf are approximate averages of those quoted by the makers, and should provide a reliable guide.

Voltage readings were taken with a high resistance meter whose negative lead was connected to chassis. The receiver was tuned to the lowest wavelength on

the MW band; at other positions **V1** and **V2** readings may vary considerably.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 VP4A	245	0·75	100	0·34
V2 VP4A	245	1·0	100	0·47
V3 2D4A	—	—	—	—
V4 SP4	170	0·25	30	0·1
V5 Pen4VA	220	34·0	250	4·0
V6 1821	235†	—	—	—

† Each anode, AC.

DISMANTLING THE SET

Removing Chassis.—Remove the three small control knobs (one recessed grub screw each) and the large (switch control) knob (two recessed grub screws) from the front of the cabinet;

unsolder from the upper pair of tags on the mains input filter unit in top left-hand corner of cabinet the two leads emerging from the cable which goes to the mains transformer;

unsolder from the condenser tag inside one end of the same unit the screened lead from chassis, and free the lead from two cleats on the side of the cabinet;

unsolder from the tags on the mains connecting panel at rear of chassis the two leads in the cable coming from the filter unit;

Unsolder from the speaker transformer the three leads connecting it to chassis, and free their cable from the cleat on the side of the cabinet;

withdraw the scale plate from its slot at the top of the moulded escutcheon (in front of cabinet), and remove the four screws (with metal washers, rubber grommets and metal distance-pieces) holding the chassis to the bottom of the cabinet.

When replacing, the green speaker lead goes to the front tag on the right-hand side of the transformer (viewed from the rear), and the red one to the rear tag. The black lead goes to the earthing tag on the casing.

Take care that the springy earthing strip is properly fitted to one of the chassis bolts, so that it makes contact to the chassis and the metal foil on the floor of the cabinet.

Replace the largest control knob first, then the smallest one, concentrically with it.

Removing Speaker.—Unsolder the leads from chassis, and two further leads from the speaker switch at the top of the cabinet, then slacken the nuts on the three clamps holding the speaker to the sub-baffle.

When replacing, the transformer should be on the right. The leads should be connected as described earlier.

GENERAL NOTES

Switches.—**S1** is the mains aerial switch, operated automatically by inserting or withdrawing the aerial connecting plug. When the plug is inserted, a cranked lever which enters the socket is moved, so that the far end of it, which is sandwiched between the contacts of **S1,** leaves them, thus opening the switch. As the lever is spring loaded, **S1** closes again when the plug is withdrawn.

S2-S7 are the waveband switches, and **S8, S9** are the radio/gram change switches, ganged in three rotary units beneath the chassis. These are indicated in our under-chassis view, where arrows show the direction in which they are viewed in the diagrams in col. 3, which show the units in detail.

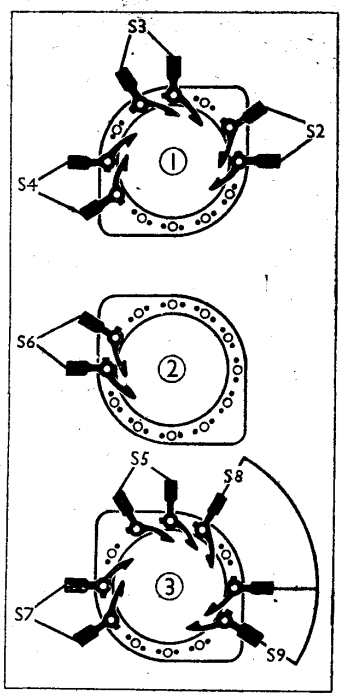
S2-S7 all close on MW, and **S6** also closes in the gram position, but otherwise they all open in the remaining three switch positions. **S8** closes only on gram, and **S9** only on MW and LW. An "incidental" switch occurs between the outer tag of **S8** and one tag of **S5.** It closes only in the "Off" position of the control, and effectively joins the upper pick-up socket to the junction of **R9** and **R12.** It is not shown as a switch in our circuit diagram.

S10 is the internal speaker switch, mounted in the top of the cabinet so that the rotary control knob projects from the rear of the cabinet. **S10** is open in the clockwise position of the control knob.

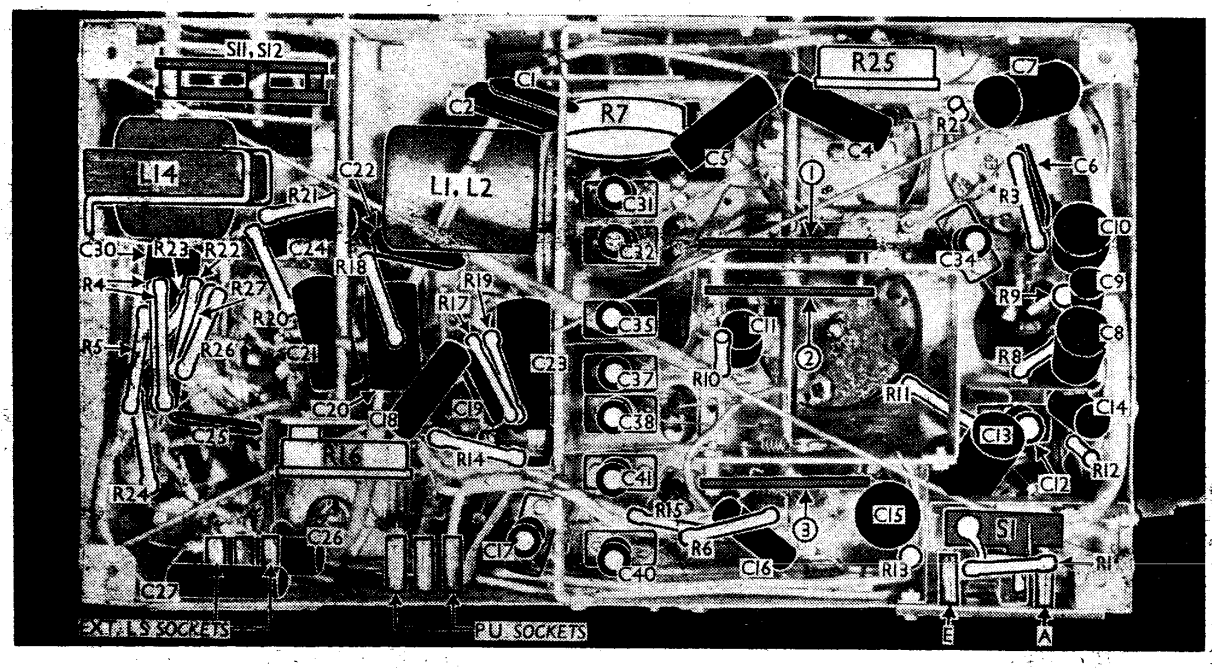
S11, S12 are the mains circuit switches, link operated from the main switch control. They are situated in the upper left-hand corner in our under-chassis view.

Coils.—**L1, L2** are in a screening container beneath the chassis All the tuning coils **L3, L4; L5, L6;** the RF transformers **L7-L9** and **L10-L12,** are of the "Super-inductance" type, in four screened units on the chassis deck. The HT smoothing choke **L14** is mounted beneath the chassis deck.

Switch Diagrams



Diagrams of the three waveband switch units, drawn as seen when viewed in the directions of the arrows in the under-chassis view below and numbered to correspond with them.



Under-chassis view. **S1** opens automatically when the aerial plug is inserted in its socket. The three waveband switch units are all indicated here, and shown in detail in the diagrams in col. 3 above.

The mains RF filter chokes **L15, L16** are mounted unscreened inside the top of the cabinet, and do not appear in our chassis illustrations. The same applies to **C3,** the mains aerial coupling condenser, which is mounted inside the **L15, L16** unit.

The connections to these components are, however, indicated.

L3, L4; L5, L6 and the RF transformer tuning coils **L8, L9** and **L11, L12** are wound with Litzendraht wire on glass formers. Their four screening containers are solidly sealed with solder, and the coils are of very low loss and carefully matched. Great care should be exercised if work becomes necessary on the coil units themselves, and unless it is absolutely necessary, they should not be disturbed at all. It would be a difficult matter to match them again accurately in the service workshop.

Scale Lamps.—These are two Philips type 8046 lamps, which have single-contact SBC bases and clear spherical bulbs. They are mounted on a fibre bracket which can be withdrawn upon the removal of a single knurled screw. Our samples were rated at 6V, 3 W.

External Speaker.—Two sockets (the outer pair) are provided at the rear of the chassis for a high impedance (about 6,000 Ω) external speaker. The centre socket on the panel is not used.

Mains Voltage Adjustment.—The mains transformer **T2** is provided with a specially designed set of primary windings which can be interconnected to accommodate any AC mains voltages between 103 V and 253 V. The interconnections are effected by adjusting four links in various positions between eleven screw terminals on the voltage adjustment panel which is mounted on the mains transformer.

The patterns for the twelve different settings are shown on a pink circular paper disc attached to the back cover of the receiver, and in case the disc should have been lost, we reproduce this side of it at the foot of col. 5.

On the reverse side of the disc are shown the voltage ranges for each setting, and after adjustment the disc should be swivelled round so that the correct range is seen through the aperture in the back cover. The appropriate range backs immediately upon its corresponding diagram.

Condensers C28, C29.—These are two wet electrolytics in separate tubular metal containers mounted on the chassis deck. Both are rated at 32 μF, 320 V. It should be noted that the case of **C28,** which is the negative connection, is insulated from chassis.

Trimmer Condensers.—**C31, C32, C34, C35, C37, C38, C40** and **C41** are a special type of pre-set trimmer condenser. This consists of two concentric brass tubes, one of which, the outer, can be slid along the other. Normally, the outer tube is sealed in position by paint or sealing wax, but it may be moved, if eased gently, for readjustment. After adjustment it should be sealed again with a dab of paint.

Constant Sensitivity Control R4.—This is a variable resistor mechanically coupled to the tuning drive and situated just behind the scale panel. It operates in such a manner as to reduce the gain of **V1** and **V2** as the wavelength decreases, thus maintaining more or less constant sensitivity over the waveband.

Replaceable Scale.—The transparent scale panel is calibrated in metres for both wavebands, but a translucent scale plate is inserted behind it bearing station names. This may be replaced by a new one if it becomes out of date. It is inserted through a slot in the top of the escutcheon moulding, and can be removed or replaced from the front of the cabinet. It must be removed before the chassis can be withdrawn.

CIRCUIT ALIGNMENT

The adjustment of the special trimmers is best carried out with the aid of a special tool supplied by the makers, but a forked lever, which will engage the outer tube of the trimmers and so permit a controlled up and down movement, can be made to serve. Connect signal generator to **A** and **E** sockets (with aerial plug inserted) via a 0.0002 μF condenser.

MW.—Switch set to MW, and adjust the drive plate (the metal plate fixed to the front of the chassis through which the pointer spindle passes) in its central position, after loosening the four fixing screws, then tighten the two upper screws.

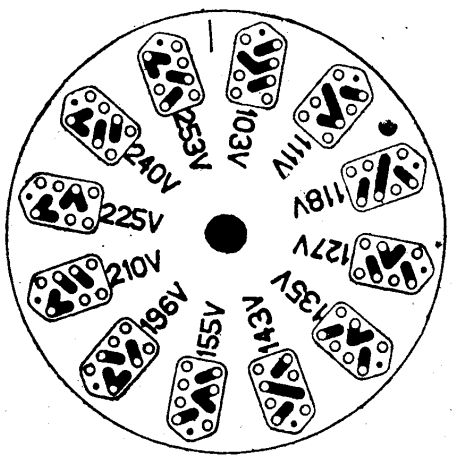
Tune to 225 m on scale, feed in a 225 m (1,333 kc/s) signal, and adjust **C32, C35, C38** and **C41** for maximum output. Feed in a 500 m (600 kc/s) signal and tune it in. If the pointer gives too high a reading, slacken the two upper screws, move the drive plate upwards and tighten the screws. If the reading is low, move the plate downwards.

Return to 225 m, and if necessary adjust pointer for correct calibration, then return to 500 m and readjust the plate. Repeat until no adjustment is necessary.

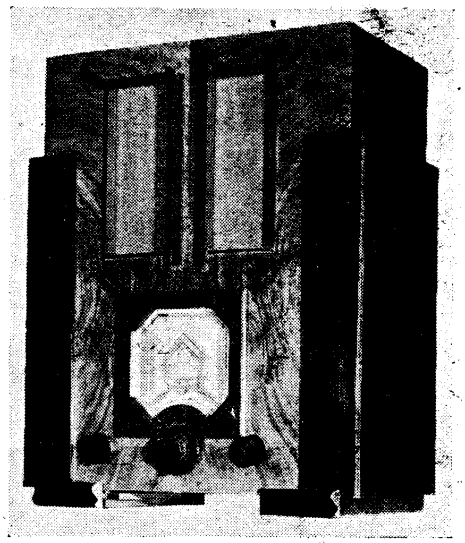
Feed in a 350 m (857 kc/s) signal, and tune it in. If the reading is low, loosen drive plate and move it to the right a little; or if the reading is high, move the plate to the left. The plate must also be shifted in the direction of the groove in the gang drive fork, otherwise the readings at 225 m and 500 m will deviate too far.

Return to 225 m, and readjust the pointer for correct calibration, then return to 350 m, and repeat the drive plate adjustments if necessary. Return to 500 m, and if calibration is out, loosen the top right-hand screw only and adjust the drive plate round the top left-hand screw. Tighten top right screw, check calibration again at all three points, and then tighten the two lower screws.

LW.—Switch set to LW, tune to 1,000 m on scale, feed in a 1,000 m (300 kc/s) signal, and adjust **C31, C34, C37** and **C40** for maximum output. Finally, reseal all trimmers.



Actual size reproduction of one side of the mains voltage adjustment indicator disc. On the reverse side is printed the range of each setting.



The appearance of the Philips 577A "Superinductance" receiver.

577A MODIFICATIONS

An almost identical chassis is employed in the two receivers, but in the 577A the mains RF filter coils **L15, L16** are omitted, so that the two cables to them will not be present. **C3,** therefore, is fitted on the chassis, suspended on its wires from the mains switch unit beneath the chassis deck.

Another difference is the inclusion of a 100 Ω fixed resistor between the variable tone control **R25** and its condenser **C26.** Also, several instances occur where component values differ somewhat from those in the 472A. Examples include **R8** and **R13,** which are both 500 Ω in the 577A as against 1,000 Ω in the 472A; and **R18** is 1,000,000 Ω, instead of 640,000 Ω.

In some samples of 577A chassis, the trimmer **C32** may consist of two pre-set units instead of one, and in such cases one of them would be adjusted to maximum capacity, final trimming being carried out on the other.

The appearance of the 577A can be seen from the photograph above. Its tuning scale is a little different from that of the 472A, but it can be pushed out of the escutcheon with the fingers, whereas in the 472A it is pulled out.

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