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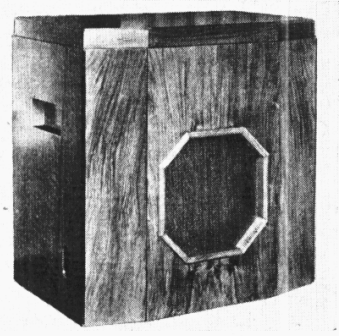
"TRADER" SERVICE SHEET

570

PYE SP/AC

TRANSPORTABLE AC SUPERHET



THE Pye SP/AC receiver is a 4-valve (plus metal rectifier) 2-band AC transportable superhet, designed to operate from mains of 200-250 V, 40-100 C/S.

A meter-type tuning indicator, operated by the anode current of two valves, is provided, as are also sockets for a gramophone pick-up and an external speaker.

Release date: 1934.

CIRCUIT DESCRIPTION

Tuned frame aerial input **L2, L3, C31** to a variable-mu RF pentode valve **(V1, Mazda metallised AC/VP1),** which operates as signal frequency amplifier. Provision for connection of an external aerial and earth via coupling coil **L1,** which is wound on the aerial winding frame.

Tuned RF coupling via **L4, C5** by **L5, L6, C34** between **V1** and triode-pentode valve **(V2, Mazda metallised AC/TP),** which operates as frequency changer with cathode injection coupling. Triode oscillator anode coils **L8** (MW) and **L9** (LW) are tuned by **C37.** Parallel trimming by **C36** (MW) and **C35** (LW); tracking by specially shaped vanes of **C37.** Reaction coupling by coil **L7** in cathode circuit.

Third valve **(V3, Mazda metallised AC/VP1)** is a second variable-mu RF pentode, operating this time as intermediate frequency amplifier with tuned-primary, tuned-secondary transformer couplings **C38, L10, L11, C39** and **C40, L12, L13, C41.**

Intermediate frequency 127 KC/S.

Diode second detector is part of double diode output pentode valve **(V4, Mazda AC2/PenDD).** Audio frequency component in rectified output is developed across load resistance **R18** and passed via AF coupling condenser **C22,** manual volume control **R19** and grid stopper **R21** to control grid of pentode section, which provides the sole AF amplification on radio.

IF filtering by **C17,** iron-dust cored choke **L14** and **C21.** Variable tone control by **C23, R20** in pentode anode circuit, and fixed tone correction by **C24,** also in anode circuit. Provision for connection of low impedance external speaker by sockets across the secondary winding of the output transformer **T1,** while the internal speaker can be muted if desired by opening switch **S13,** which is operated when the external speaker connecting plug is pushed fully home.

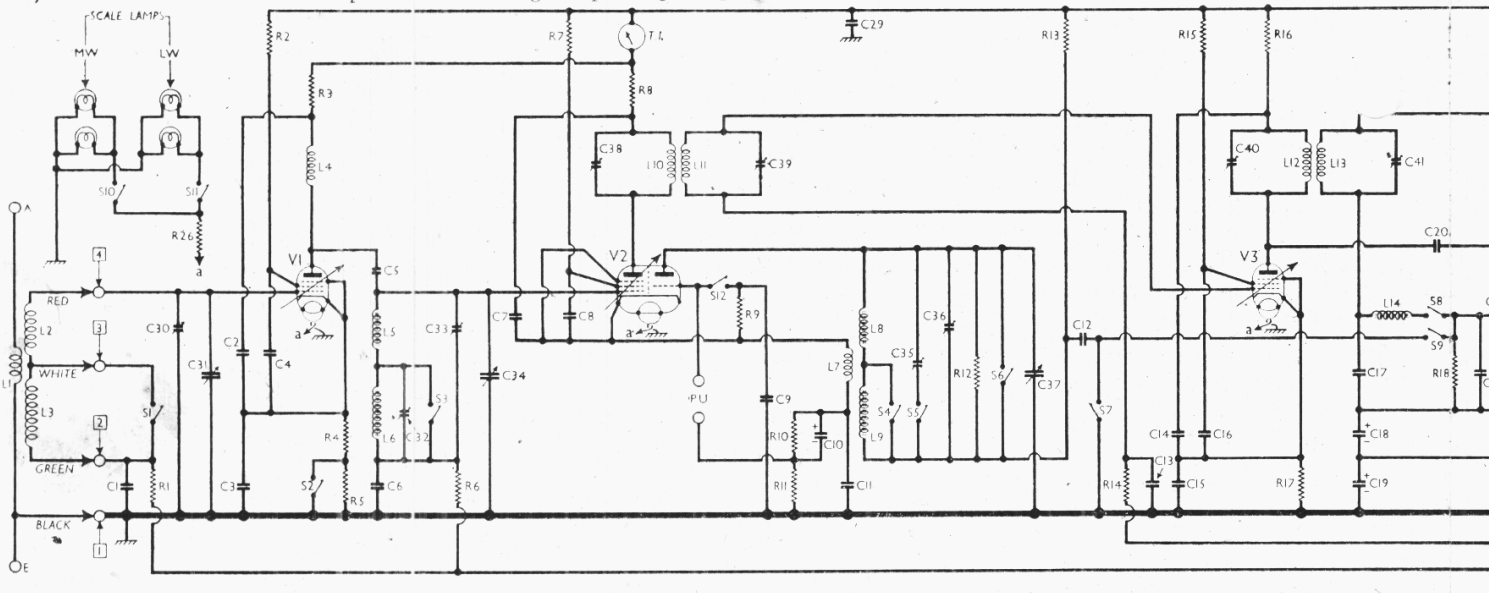
For gramophone pick-up operation, **V2** triode is converted by switching into an AF amplifier. **S12,** which is operated by the pick-up connecting plug, opens when the plug is inserted, and the grid circuit is returned via the pick-up to the junction of **R10, R11,** so that the grid bias voltage is modified. The pick-up circuit must, therefore, provide a continuous DC path between the pick-up sockets.

When the waveband switch control is turned to the gram position, **S2** opens to increase the grid bias applied to **V1, S6** closes to mute the oscillator circuit, **S8** opens to prevent radio break-through, and **S7** opens and **S9** closes, so that **C12,** which operated on radio as the oscillator anode decoupling condenser, becomes an AF coupling condenser.

R13 operates as the triode anode load resistance, and the pick-up signal developed in the triode anode circuit is passed via **C12, C22** and **R19** to **V4** pentode. The impedance of the oscillator coils **L8, L9** is negligible at audio frequencies.

Second diode of **V4,** fed from **V3** anode via **C20,** provides DC potentials which are developed across load resistances **R24, R25** and fed back through decoupling circuits as GB to RF, FC and IF valves, giving automatic volume control. Delay voltage, together with GB for triode section, is obtained from the drop along resistances **R22, R23** in **V4** cathode lead to chassis.

The changing value of anode current through **V1** and **V2** pentode, which obtain their HT supply from a common source, with change of AVC line potential, is



Circuit diagram of the Pye SP/AC transportable superhet. The connections to the frame aerial and the power unit are colour coded and numbered in squares to agree with those in the chassis illustrations overleaf and the dismantling instructions, while the speaker connections are colour coded and numbered in circles. A diagram of the speaker plug, viewed from the free ends of its pins, appears beneath the circuit diagram. The white lead runs from the power unit to the receiver chassis, and then from the chassis to the speaker plug.

used to operate a meter-type tuning indicator **T.I.**

HT current is supplied by Westinghouse metal rectifier **MR1** connected to operate as a voltage doubler with dry electrolytic condensers **C27** and **C28.** Smoothing by speaker field **L17** and wet electrolytic condensers **C25** and **C26.**

VALVE ANALYSIS

Valve voltages and currents given in the table below are those quoted in the makers' manual. They are based on the assumption that the receiver is connected to mains of 235 V, using the 216-235 V tapping on the mains transformer, with the receiver switched to the MW band, but with no signal input. Voltages should be measured on a suitable scale of a high-resistance meter; the negative lead of the meter should be connected to cathode of valve under test.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 AC/VP1	184	5·3	170	1·3
V2 AC/TP	235	3·7	188	1·7
	Oscillator			
	62	1·7		
V3 AC/VP1	246	5·0	212	1·4
V4 AC/2Pen DD	206	30·0	233	6·8

The output from the rectifier should be 365 V, DC, measured between terminals 6 and 8 at the rear of the power unit.

DISMANTLING THE SET

In all, the receiver comprises four units: the receiver chassis, the power unit, the speaker assembly and the frame aerial, and these can only be removed in the order described in the following.

Removing Power Unit.—Free from their terminal screws at bottom rear of the unit the four leads emerging from the cable from the receiver chassis;

remove from the same position the cleat (two set screws) holding the cable.

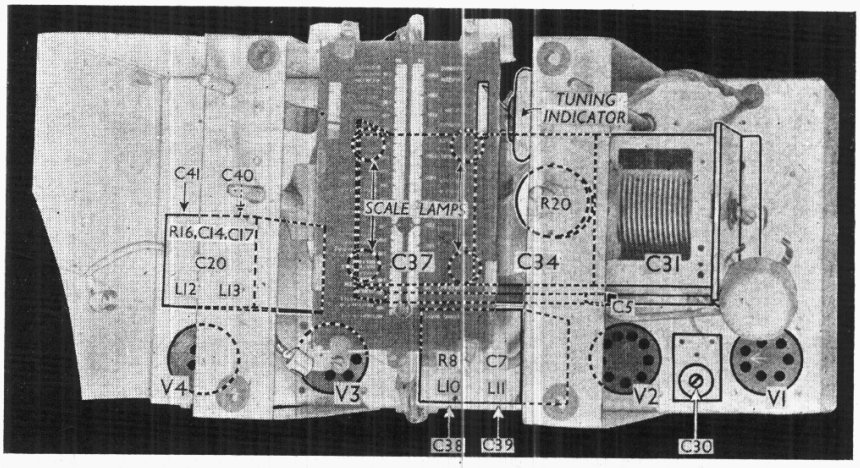
lay the receiver face-down on some soft material, and remove the four cheese-head bolts (with metal washers) from the bottom of the cabinet.

The unit may now be withdrawn, right-hand foremost, care being taken to avoid damage to the mains switch.

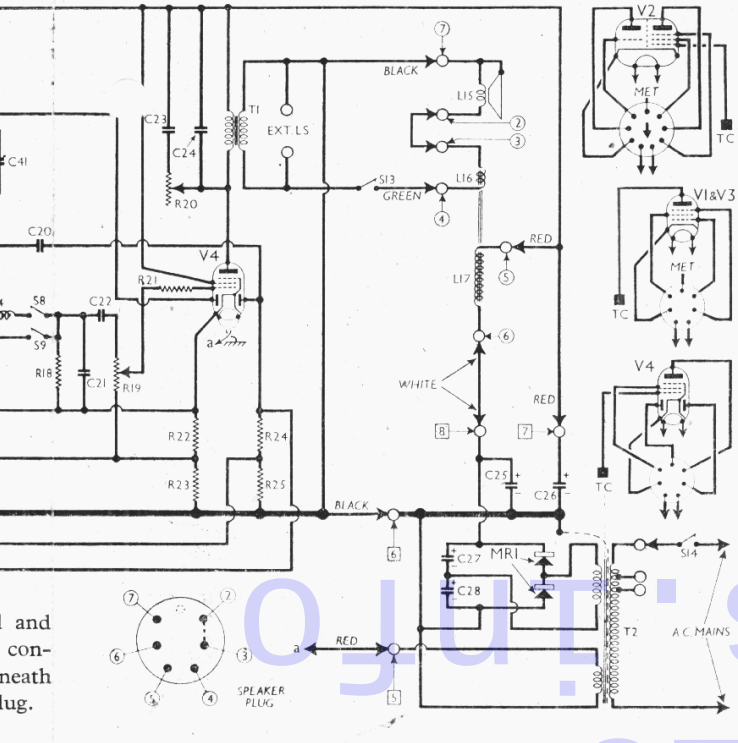
When replacing, connect the four leads as indicated in our illustration of the unit overleaf, as follows:

(5) thick red braided lead;
(6) thick black braided lead;
(7) thin red rubber lead;
(8) thin white rubber lead.

Access may be gained to the interior of the unit if the perforated metal cover is gently eased off, after removing the four short cheese-head set screws at the ends of the unit.



Plan view of the chassis. Two sections of the gang are hidden beneath the superstructure. Both of the IF transformer units contain other associated components.



Removing Receiver Chassis.—After removing the power unit as described above, remove the wood screws (with metal washers and rubber grommets) holding the lugs below the front chassis member to the two wooden fillets at the front of the cabinet;

withdraw the speaker plug from its socket at the bottom of the speaker assembly;

with the receiver still lying face-down, free from the screw terminals on the connecting strip, on the right beneath the chassis, the four leads from the frame aerial. A half-turn of each screw is sufficient;

from the batten immediately beneath the lid hinge at the rear of the cabinet remove three countersunk-head wood screws;

by holding open the "V" spring, and opening the lid, release the lid stay from the spring;

remove seven instrument-head wood screws from the edges of the wooden escutcheon board covering the receiver, but *do not* remove the four large-headed screws close to the escutcheon itself.

The chassis may now be withdrawn through the top of the cabinet, care being taken to avoid damage to the frame aerial windings.

If it is desired to detach the escutcheon board from the chassis, the four large-headed screws (with nuts, cupped washers and rubber grommets) may now be removed.

When replacing Chassis, first refit the escutcheon board.

Connect the frame aerial leads as follows, numbering the terminals beneath the chassis from *front* to *rear*:

(1) black;
(2) green;
(3) white;
(4) red.

After removing the chassis, either the speaker or the frame aerial can be removed.

Removing Speaker.—Remove the three brass fixing nuts.

When replacing, the connecting socket should be at the bottom.

Removing Frame Aerial. — Disconnect from the external aerial and earth sockets the three rubber covered leads, and remove the three round-head wood screws holding the chassis to the front of the cabinet. Take great care not to damage or even disturb the windings in any way.

When replacing, the connecting panel should be on the right, near the external aerial panel.

Connect the lower red lead to the upper (aerial) external socket, and the two black leads (without spade tags) to the lower (earth) socket.

COMPONENTS AND VALUES

	CONDENSERS	Values (μF)
C1	V1 CG decoupling ...	0·5
C2	V1 anode decoupling ...	0·1
C3	V1 cathode by-pass ...	0·1
C4	V1 SG decoupling ...	0·1
C5	V1 to V2 RF coupling ...	0·0000025
C6	V2 pent. CG decoupling	0·1
C7	V2 pent. anode decoupling	0·1
C8	V2 SG decoupling ...	0·1
C9	V2 osc. CG condenser ...	0·002
C10*	V2 cathode AF by-pass...	25·0
C11	V2 cathode RF by-pass...	0·1
C12	V2 osc. anode decoupling (radio); V2 triode to V4 AF coupling (gram)	0·1
C13	V3 CG decoupling ...	0·1
C14	V3 anode decoupling ...	0·1
C15	V3 cathode by-pass ...	0·1
C16	V3 SG decoupling ...	0·1
C17	IF by-pass	0·0001
C18*	V4 cathode by-pass condensers	50·0
C19*		25·0
C20	Coupling to V4 AVC diode	0·0002
C21	IF by-pass	0·0002
C22	AF coupling to V4 ...	0·01
C23	Part variable tone control	0·025
C24	Fixed tone corrector ...	0·001
C25*	HT smoothing condensers	7·0
C26*		16·0
C27*	Voltage doubler condensers	4·0
C28*		4·0
C29	HT circuit RF by-pass...	0·25
C30‡	Frame aerial MW trimmer	—
C31†	Frame aerial tuning ...	—
C32‡	RF circuit LW trimmer	—
C33‡	RF circuit MW trimmer	—
C34†	RF circuit tuning ...	—
C35‡	Osc. circ. LW trimmer...	—
C36‡	Osc. circ. MW trimmer...	—
C37†	Oscillator circuit tuning	—
C38‡	1st IF trans. pri. tuning	—
C39‡	1st IF trans. sec. tuning	—
C40‡	2nd IF trans. pri. tuning	—
C41‡	2nd IF trans. sec. tuning	—

* Electrolytic. † Variable. ‡ Pre-set.

	RESISTANCES	Values (ohms)
R1	V1 CG decoupling ...	500,000
R2	V1 SG HT feed	50,000
R3	V1 anode HT feed ...	10,000
R4	V1 fixed GB resistances...	500
R5		3,000
R6	V2 pent. CG decoupling...	500,000
R7	V2 SG HT feed	25,000
R8	V2 pent. anode HT feed...	2,000
R9	V2 osc. CG resistance ...	100,000
R10	V2 GB resistance (gram.)	250
R11	V2 fixed GB (radio) ...	750
R12	Oscillator circuit damping	40,000
R13	V2 osc. anode HT feed ...	100,000
R14	V3 CG decoupling ...	500,000
R15	V3 SG HT feed	25,000
R16	V3 anode HT feed ...	2,000
R17	V3 fixed GB resistance ...	500
R18	V4 signal diode load ...	250,000
R19	Manual volume control ...	250,000
R20	Variable tone control ...	25,000
R21	V4 pent. grid stopper ...	25,000
R22	V4 pentode GB and AVC delay resistances ...	140
R23		750
R24	V4 AVC diode load resistances	500,000
R25		250,000
R26	Scale lamps ballast ...	3

	OTHER COMPONENTS	Approx. Values (ohms)
L1	Ext. aerial frame coupling	0·17
L2	Frame aerial tuning coils	1·8
L3		20·0
L4	V1 anode RF choke ...	530·0
L5	RF circuit tuning coils ...	1·54
L6		4·5
L7	Oscillator reaction coil ...	0·7
L8	Osc. circ. MW tuning coil	1·3
L9	Osc. circ. LW tuning coil	4·7
L10	1st IF trans. Pri. ...	42·0
L11	Sec. ...	42·0
L12	2nd IF trans. Pri. ...	42·0
L13	Sec. ...	42·0
L14	IF filter choke	660·0
L15	Speaker speech coil ...	1·23
L16	Hum neutralising coil ...	0·2
L17	Speaker field coil ...	1,650·0
T1	Output trans. Pri ...	740·0
	Sec. ...	0·31
T2	Mains trans. Pri., total ...	30·0
	Heater sec. ...	0·13
	HT sec. ...	31·0
T.I.	Tuning meter winding ...	1,000·0
S1-S6	Waveband switches ...	—
S7-S9	Radio/gram change switches	—
S10, S11	Scale lamp switches ...	—
S12	Pick-up jack-switch ...	—
S13	Speaker jack-switch ...	—
S14	Mains switch	—

GENERAL NOTES

Switches.—S1-S6 are the waveband switches, **S7-S9** the radio/gram change-over switches, and **S10, S11** the scale lamp switches, in three ganged units disposed along the length of front of the underside of the chassis. They are operated by a brass rod, which is supported by the side members of the chassis and two brackets. The control spindle is mounted at right angles to the rod, and the action is transmitted via wide-toothed sprockets.

The switches consist of flat metal springs against which contact bars attached to the brass rod press in the closed positions with a long wiping motion, so that the contacts remain clean indefinitely.

The whole assembly is indicated in our under-chassis view, where the switches are individually identified. The table (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.

S12 is the jack-type gramophone pick-up switch, associated with the pick-up sockets and operated by inserting the pick-up plug. To use a pick-up the plug must be inserted, and the waveband control must be turned to the gram position, but on reverting to radio operation, the pick-up plug must be withdrawn to permit **S12** to close. If the plug is only partially withdrawn, although **S12** will close, the GB applied to **V2** pentode will be incorrect.

S13 is another jack-type switch, like **S12,** but associated with the external speaker sockets. When the external speaker plug is fully inserted, **S13** opens and mutes the internal speaker. If the plug is only partly inserted, however, **S13** remains closed, and both speakers operate.

S14 is the QMB mains switch, fitted at one end of the power unit.

Frame Aerial.—This is wound on moulded supports on an aluminium frame fitted to the front of the cabinet. The windings are terminated at a six-way connecting panel, mounted on the metal frame. Two leads from the panel go to the external aerial and earth sockets. The four remaining leads form the connections to the chassis, where they are connected to four screw terminals, on a panel indicated in our underchassis view.

The white, red, green and black leads with spade tags are attached to tags 1, 2, 3 and 6 on the panel on the frame; their connections at the receiver end are indicated in the circuit diagram, the underchassis view and under "Dismantling the Set." Tag 4 is blank, and the red lead and black lead (without a spade tag) from tags 5 and 6 go to the external aerial and earth sockets respectively.

Coils.—The remaining RF and oscillator coils **L5-L9** are in two screened units beneath the chassis, while the IF transformers **L10, L11** and **L12, L13** are in two screened units on the chassis deck.

Switch Table

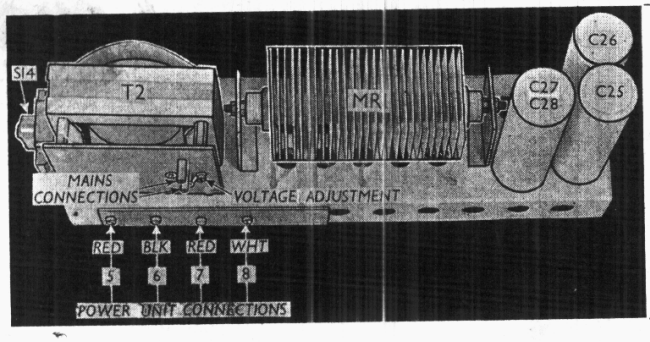
Switch	LW	MW	Gram
S1	—	C	—
S2	—	C	—
S3	—	C	—
S4	—	C	—
S5	C	—	—
S6	—	—	C
S7	C	C	—
S8	C	C	—
S9	—	—	C
S10	—	C	—
S11	C	—	—

All units contain their associated trimmers, and the IF units contain several other components in addition.

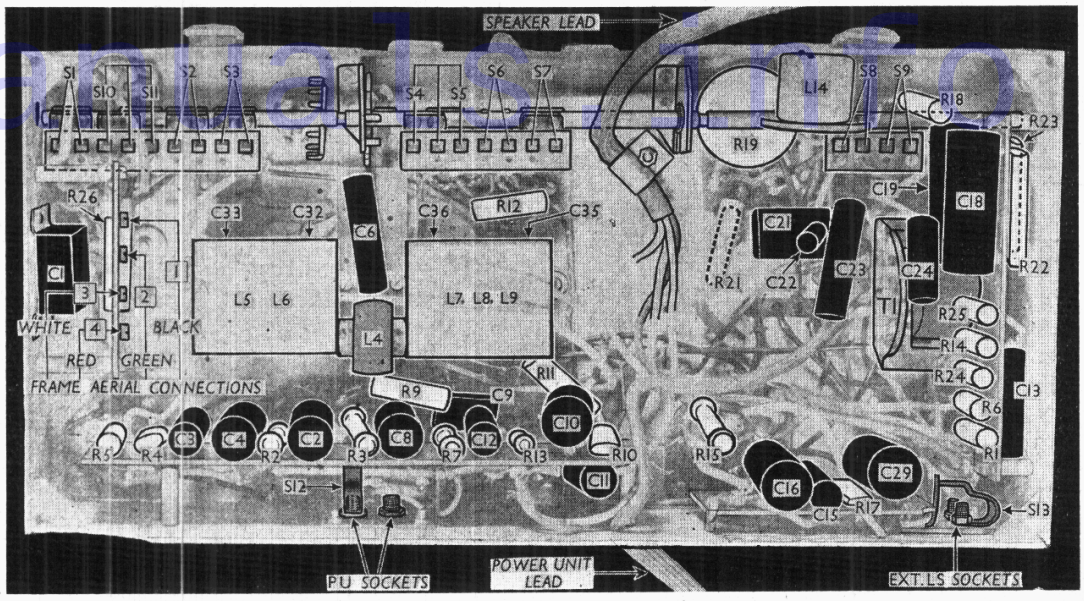
V1 anode RF choke **L4** is situated between the **L5, L6** and **L7-L9** units, while the IF filter coil **L14** is fitted to the front member, in a screening container.

Scale Lamps.—These are four Osram MES types, rated at 4 V, 0.3 A. They are energised in pairs, according to the waveband employed, via switches **S10, S11** and ballast resistance **R26.** The four lamps are mounted on a large bracket which fits beneath the tuning scale, and the whole scale lamp assembly can be withdrawn for lamp replacement purposes after a single fly-nut is unscrewed from its threaded rod, which is fixed to the top of the gang assembly between the **C31** and **C34** sections. A bush prevents the nut from being separated from the scale lamp bracket, so that it cannot be lost.

External Speaker.—Two sockets are provided at the rear of the chassis for a low impedance (1.5-2.5 O) external speaker. With the sockets is associated a jack-type switch **S13,** whose action is described under "Switches."



The power unit, viewed from the rear. Its output terminals are colour coded and numbered to agree with the circuit diagram overleaf.



Under-chassis view. The frame aerial terminals, indicated on the connecting panel on the left, are numbered in square surrounds and colour coded to agree with those in the circuit diagram overleaf. The speaker plug is attached to the end of the speaker lead, which is seen running off the top of the illustration. The lead to the power unit (running off at the bottom) goes to the terminals shown in the illustration on the opposite page.

Condensers C25, C26.—These are two TCC wet electrolytics in tubular metal containers, mounted on the separate power unit. **C25** is rated at 7 μF, 460 V working, 500 V peak; **C26** is rated at 16 μF, 440 V working, 460 V peak. In each case the can forms the negative connection.

Condensers C27, C28.—These are two dry electrolytics, in a single metal container, mounted beside **C25, C26.** They are rated at 4 μF, 500 V peak working each, and are isolated from the case. The black lead emerging from the base is the negative of **C28,** the red lead is the positive of **C27,** and the yellow lead is the junction of the positive of **C28** and negative of **C27,** since the two condensers are connected in series. No indication of the connections is given on the can.

CHASSIS DIVERGENCIES

The HT circuit RF by-pass condenser **C29** was not shown in the makers' diagram. **C12** may be 0.05 μF.

According to the makers' notes, the signal diode load resistance **R18,** which in our diagram is shown connected to **V4** cathode, may be returned instead to the junction of **R22** and **R23,** applying a negative bias potential to the diode, so that a fixed degree of inter-station noise suppression is obtained.

In later chassis, this arrangement is replaced by a variable muting control, and it is suggested that, in cases where circumstances render it advisable, the modification should be made by the dealer. The procedure is as follows :

Remove **R23** altogether, and replace it with a variable potentiometer of 500 Ω and a 250 Ω fixed resistance, connecting the top end of the fixed element of the potentiometer to the bottom end of **R22,** and the 250 Ω resistance between the bottom end of the fixed element of the potentiometer and chassis.

Disconnect the lower end of **R18** from **V4** cathode, and connect it instead to the slider of the potentiometer.

It is suggested that the potentiometer, which forms the mute control, should be fitted to the escutcheon board, the centre of its spindle being 1⅞ inches from the left-hand edge of the board, when viewed from the front, on a line 4 inches back from the straight portion of the front edge of the board. The leads should consist of flexible wire.

In practice, the control is adjusted by tuning to a point at which no signal is received, so that interference noises are at a maximum, and the mute control is then adjusted to a point at which the noise is suppressed, when there should be no interference at any point on the scale.

At the same time, of course, all signals of a strength up to that of the local interference level are also suppressed, so that only stations whose field strength locally exceeds that of the interference level are received.

CIRCUIT ALIGNMENT

IF Stages.—While the secondary tuning condenser of an IF transformer is being adjusted, a damping resistance of 20,000 Ω must be connected across the primary, and it must be transferred to the secondary while the primary condenser is being adjusted. On each transformer small tags are provided on each tuning condenser, and the resistance may be conveniently attached by means of clips to these.

Insert the pick-up plug fully in its sockets to open **S12** and mute the oscillator, and turn the volume control to maximum. Connect the signal generator via a 0.002 μF condenser to the control grid (top cap) of **V2** and chassis. Feed in a 127 KC/S (2,362.2 m) signal, connect the damping resistance to the tags of **C38,** and, using an insulated tool, adjust **C39** for maximum output; transfer damping resistance to **C39,** and adjust **C38** for maximum output. Transfer damping resistance to **C40,** and adjust **C41** for maximum output; transfer damping resistance to **C41,** and adjust **C40** for maximum output. Withdraw the pick-up plug.

RF and Oscillator Stages.—With the gang at maximum, the pointer should coincide with the indentations in the "H" marks at the high wavelength ends of the scale. If it does not, see that scale glass fits squarely in its clamps. If a small amount of correction is then required, it can be obtained by slackening the three screws in the pointer drive drum, when the slotted holes permit a small amount of movement. If a greater amount of movement is required, it can be obtained by releasing the screw holding the drum boss to the gang spindle.

The frame aerial must be removed from the cabinet and connected to the chassis, which is, of course, also removed from the cabinet. Connect signal generator to a coupling coil, whose proximity to the frame aerial can be varied. At first, this coil should be closely coupled to the frame, but it should be moved farther away as the circuits come into line; throughout the adjustments, the tuning indicator should indicate minimum signal.

MW.—Switch set to MW, turn the gang to minimum, feed in a 196 m (1,530 KC/S) signal, and adjust **C36** for maximum output. If two peaks are found, select that involving the lesser trimmer capacity. Then adjust **C33** for maximum output. Feed in a 500 m (600 KC/S) signal and tune it in. If the final setting is 15-20 m low on the scale, it is fairly certain that **C36** has been set on the wrong peak. Repeat the 196 m adjustments.

LW.—Switch set to LW, with gang still set at minimum, feed in a 775 m (388 KC/S) signal, and adjust **C35,** then **C32,** for maximum output. Tune to 846 m on scale, feed in an 846 m (355 KC/S) signal, and readjust **C35** for maximum output, this time selecting the peak involving the *greater* trimmer capacity if two peaks are found; but do not disturb **C32.**

Finally, replace frame aerial and chassis in the cabinet and adjust **C30** on a broadcast signal for maximum output. The setting will not be critical, but it should be close to minimum capacity.

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