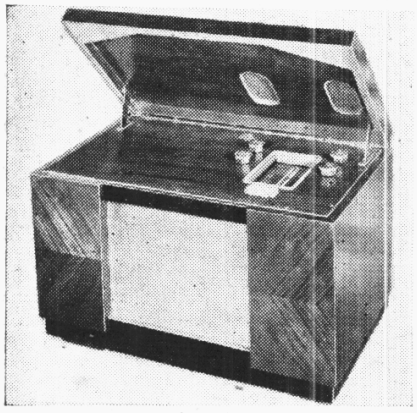
Supplement to The Wireless & Electrical Trader, September 27, 1941

"TRADER" SERVICE SHEET 537

PYE SE/U AC/DC SUPERHET



AN RF amplifier and a double diode output pentode are used in the Pye SE/U, a 4-valve (plus metal rectifier) 2-band superhet designed for operation from AC or DC mains of 200-250 V, 40-100 C/S in the case of AC.

Provision is made for the connection of a gramophone pick-up, and the triode section of the frequency changer is then used as an AF amplifier. A muting control operates as a noise suppressor by biasing up the signal diode.

Release date : 1935.

CIRCUIT DESCRIPTION

Aerial input is developed across condensers **C1, C2,** which form a potential divider, and passed from their junction via series chokes **L1** (MW) and **L3** (LW) and coupling coils **L4, L5** to single tuned circuits **L6, C38** (MW) and **L7, C38** (LW), which precede variable-mu RF pentode valve **(V1, Mazda metallised VP1321)** operating as signal frequency amplifier.

The series coils **L1, L3** are fitted to render a level response over the two wavebands covered, and to prevent MW breakthrough on the LW band. A third coil **L2,** which is included in **V1** cathode circuit and is coupled to **L1, L3,** suppresses second channel signals.

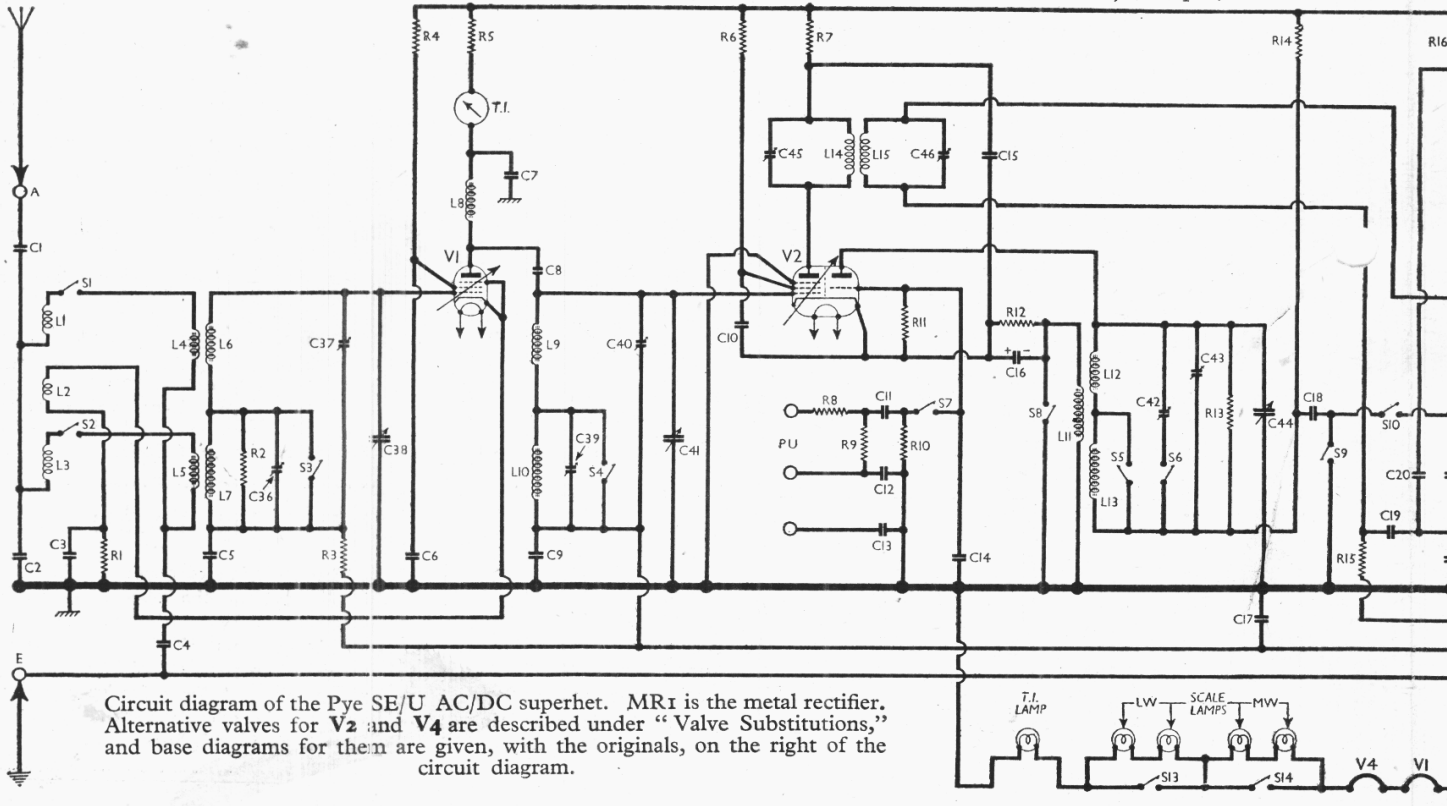
Choke-capacity RF coupling via **L8, C8** between **V1** and pentode section of second valve **(V2, Mazda metallised TP2620),** whose control grid circuit **L9** (MW), plus **L10** (LW), is tuned by **C41.** Triode oscillator anode coils **L12** (MW), plus **L13** (LW), are tuned by **C44.** Parallel trimming by **C43** (MW) and **C42** (LW); tracking by specially shaped vanes of **C44.** Reaction coupling by **L11** in cathode circuit, whose common impedance in triode and pentode section current paths establishes the mixer coupling. Fixed GB potential for pentode section is obtained from drop along **R12,** which is by-passed by electrolytic condenser **C16,** in high-potential end of the circuit.

Third valve **(V3, Mazda metallised VP1321)** is a second variable-mu RP pentode, operating this time as intermediate frequency amplifier with tuned-primary, tuned-secondary transformer couplings **C45, L14, L15, C46** and **C47, L16, L17, C48.**

Intermediate frequency 127KC/S.

Diode second detector is part of double diode pentode output valve **(V4, Mazda PenDD4020).** Audio frequency component in rectified output is developed across load resistance **R19** and passed via AF coupling condenser **C26,** manual volume control **R20** and grid stopper **R21** to control grid of pentode section. IF filtering by iron-dust cored choke **L18** and condensers **C24, C25.** Interstation noise suppression is achieved by applying a delay voltage, obtained from drop along **R23** and tapped off via its slider, which can be adjusted by the "Mute" control on the receiver to a point at which all signals up to the strength of the local noise level are suppessed; **R24** limits the travel in this direction, while at the other extreme, the delay is reduced to a minimum imposed by the drop across **R22,** which provides grid bias for the pentode section of the valve.

For gramophone pick-up operation, the triode section of **V1** is converted by switching into an AF amplifier. **S7, S8** and **S10** close, and **S9, S11** open, and the



Circuit diagram of the Pye SE/U AC/DC superhet. MR1 is the metal rectifier. Alternative valves for **V2** and **V4** are described under "Valve Substitutions," and base diagrams for them are given, with the originals, on the right of the circuit diagram.

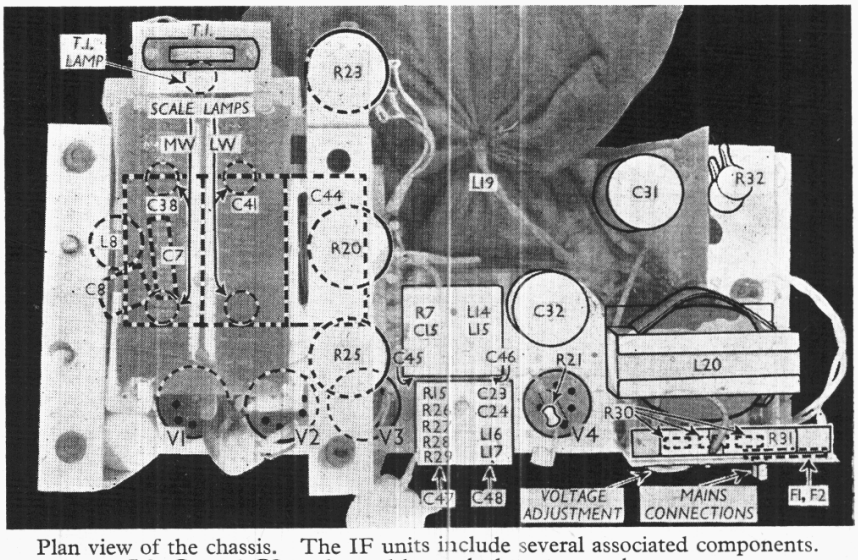
pick-up input is fed into the resistance network formed by **R8, R9,** the signal across **R9** then passing via the isolating condensers **C11, C12.** It is then developed across **R10** and conveyed via **S7** to **V2** triode control grid. GB potential is obtained from the junction of **R10** and **R11,** which form a potential divider across **R12.**

The signal appears in amplified form across **R14,** which becomes the anode circuit load, and is passed via **C18** which, on radio, is returned via **S9** to chassis as a decoupling condenser, to **S10, R20,** and so to the control grid of **V4** pentode section. **L12** and **L13** remain in circuit, but their impedance is negligible at audio frequencies.

Second diode of **V4,** fed from **V3** anode via **C23,** provides DC potentials which are developed across load resistances **R26, R27** and **R28** and fed back through decoupling circuits as GB to RF, FC and IF valves, giving automatic volume control. Delay voltage is obtained from drop along resistances **R22, R23** and **R24** in cathode lead to chassis. The changing value of the anode current of **V1** with change of AVC line potential is used to operate the tuning indicator **T.I.**

Variable tone control by **R25, C27** in **V4** pentode anode circuit. Provision for connection of low impedance external speaker across secondary of output transformer **T1. S12,** which opens automatically when the external speaker plug is pushed fully home, mutes the internal speaker if so desired.

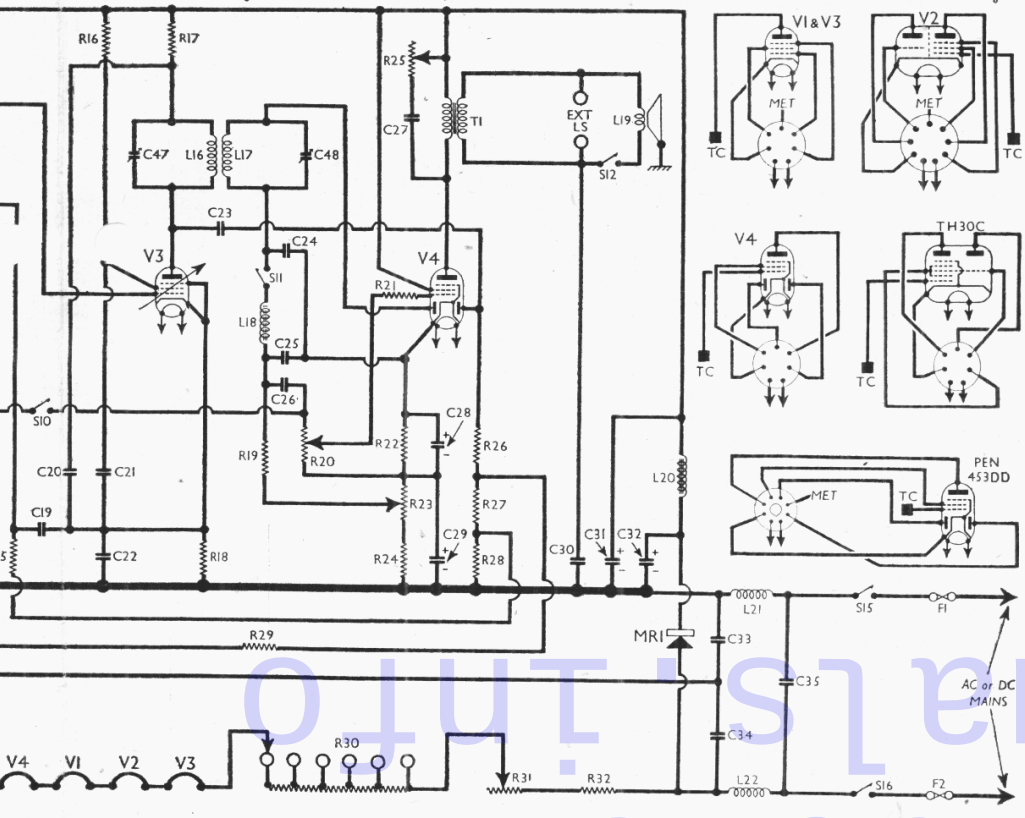
When the receiver is used with AC mains, HT current is supplied by metal rectifier **MR1** which, with DC mains, behaves as a low resistance. Smoothing is effected by iron-cored choke **L20** and electrolytic condensers **C31, C32.**



Plan view of the chassis. The IF units include several associated components. **L8, C7** and **C8** are located beneath the gang condenser.

Valve heaters, together with scale and indicator lamps and ballast resistances **R30, R31, R32,** are connected in series across mains input. **R30** provides a coarse adjustment of heater current, and **R31** a fine adjustment, which should be made with an ammeter in circuit to obtain the requisite 0.2A heater current. **R32** is the main heater circuit ballast, without adjustment. A filter circuit comprising air-cored chokes **L21, L22** and condensers **C33, C34** and **C35** suppresses mains borne interference, while fuses **F1, F2** afford protection against accidental short-circuit. The earth socket is connected to the junction of filter condensers **C33** and **C34.**

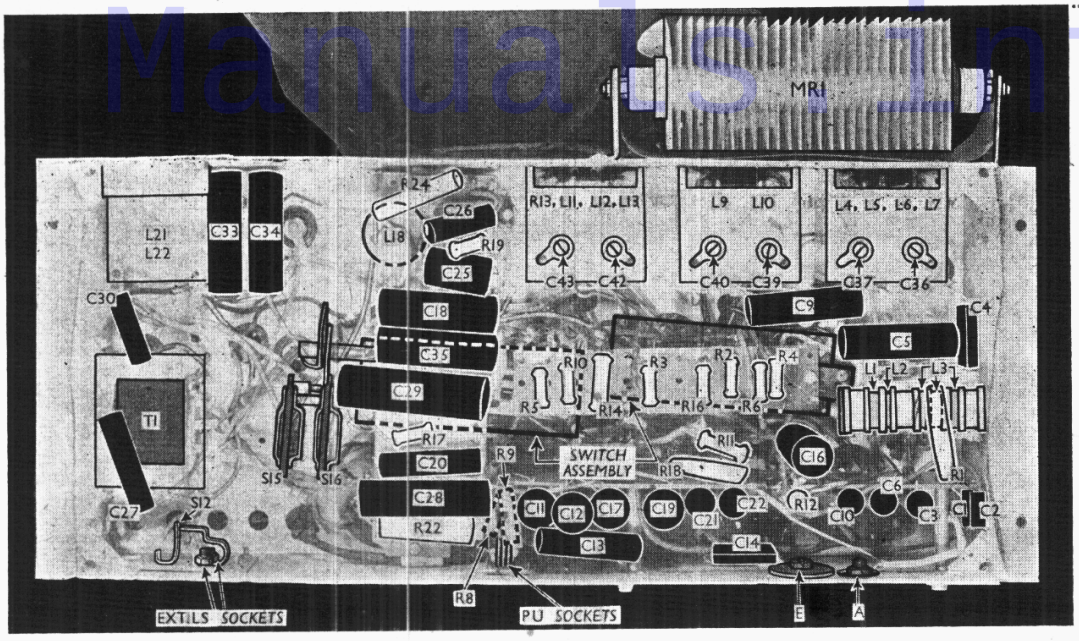
The five scale and indicator lamps are connected in series, and the unwanted lamps are short-circuited by **S13** or **S14,** according to which band is in use. The tuning indicator lamp is in circuit in all positions of the control.



COMPONENTS AND VALUES

	CONDENSERS	Values (μF)
C1	Aerial coupling condensers	0·0001
C2	Aerial coupling condensers	0·0001
C3	V1 cathode by-pass ...	0·1
C4	Earth isolating condenser	0·002
C5	V1 CG decoupling ...	0·25
C6	V1 SG decoupling ...	0·1
C7	V1 anode decoupling ...	0·1
C8	V1 to V2 RF coupling ...	0·000025
C9	V2 pent. CG decoupling ...	0·25
C10	V2 SG decoupling ...	0·1
C11	Pick-up isolating condensers	0·25
C12	Pick-up isolating condensers	0·25
C13	Pick-up isolating condensers	0·1
C14	V2 osc. CG shunt	0·0002
C15	V2 pent. anode decoupling	0·1
C16*	V2 cathode by-pass ...	25·0
C17	AVC line decoupling ...	0·25
C18	V2 osc. anode decoupling (radio); AF coupling ('gram)	0·25
C19	V3 CG decoupling ...	0·25
C20	V3 anode decoupling ...	0·1
C21	V3 SG decoupling ...	0·1
C22	V3 GB decoupling ...	0·1
C23	Coupling to V4 AVC diode	0·0002
C24	IF by-pass condensers ...	0·0001
C25	IF by-pass condensers ...	0·0001
C26	AF coupling to V4 pent.	0·01
C27	Part variable tone control	0·025
C28*	V4 cathode by-pass condensers	50·0
C29*	V4 cathode by-pass condensers	20·0
C30	Speaker isolating condenser	0·01
C31*	HT smoothing condensers	24·0
C32*	HT smoothing condensers	8·0
C33	Parts of mains input filter circuit	0·025
C34	Parts of mains input filter circuit	0·025
C35	Parts of mains input filter circuit	0·025
C36‡	Aerial circuit LW trimmer	—
C37‡	Aerial circuit MW trimmer	—
C38†	Aerial circuit tuning ...	—
C39‡	RF coupling LW trimmer	—
C40‡	RF coupling MW trimmer	—
C41†	RF coupling tuning ...	—
C42‡	Osc. circuit LW trimmer ...	—
C43‡	Osc. circuit MW trimmer	—
C44†	Oscillator circuit tuning	—
C45‡	1st IF trans. pri. tuning ...	—
C46‡	1st IF trans. sec. tuning ...	—
C47‡	2nd IF trans. pri. tuning ...	—
C48‡	2nd IF trans. sec. tuning	—

* Electrolytic. † Variable. ‡ Pre-set.



Under - chassis view. The position of the switch assembly is indicated here, and is shown in detail in the sketch, drawn in the same perspective, in cols. 4 and 5. All the RF and oscillator tuning coils are in the three screened units mounted on the front member of the chassis with their associated trimmers. MR1 is the metal rectifier.

	RESISTANCES	Values (ohms)
R1	V1 fixed GB resistance ...	500
R2	Aerial LW damping ...	25,000
R3	V1 CG decoupling ...	500,000
R4	V1 SG HT feed	50,000
R5	V1 anode HT feed ...	5,000
R6	V2 SG HT feed	25,000
R7	V2 pent. anode HT feed...	2,000
R8	Pick-up input resistances	50,000
R9		50,000
R10		250,000
R11	V2 osc. CG resistance ...	100,000
R12	V2 fixed GB resistance ...	1,000
R13	Oscillator circuit damping	40,000
R14	V2 osc. anode HT feed ...	100,000
R15	V3 CG decoupling ...	500,000
R16	V3 SG HT feed	25,000
R17	V3 anode HT feed ...	2,000
R18	V3 fixed GB resistance ...	500
R19	V4 signal diode load ...	250,000
R20	Manual volume control ...	250,000
R21	V4 pentode grid stopper...	25,000
R22	V4 pentode GB; signal	150
R23	diode delay; and AVC	500
R24	delay resistances ...	250
R25	Variable tone control ...	25,000
R26	AVC diode load resistances	250,000
R27		500,000
R28		250,000
R29	AVC line decoupling ...	500,000
R30	Heater circuit ballast re-	250*
R31	sistances	100†
R32		450

* Tapped at each end and at every 50 ohms.
† With slider adjustment.

	OTHER COMPONENTS	Approx. Values (ohms)
L1	Aerial MW series choke	100·0
L2	2nd channel suppressor	0·27
L3	Aerial LW series choke	23·4
L4	Aerial MW coupling coil	0·6
L5	Aerial LW coupling coil	1·4
L6	Aerial MW tuning coil...	1·5
L7	Aerial LW tuning coil...	16·0
L8	V1 anode RF choke ...	700·0
L9	RF MW tuning coil ...	1·5
L10	RF LW tuning coil ...	16·0
L11	Oscillator reatcion coil	0·3
L12	Osc. circ. MW tuning coil	1·5
L13	Osc. circ. LW tuning coil	4·7
L14	1st IF trans. Pri. ...	41·0
L15	Sec. ...	41·0
L16	2nd IF trans. Pri. ...	41·0
L17	Sec. ...	41·0
L18	IF filter choke	700·0

(*Continued next column.*)

	OTHER COMPONENTS (*Continued.*)	Approx. Values (ohms)
L19	Speaker speech coil ...	1·23
L20	HT smoothing choke ...	210·0
L21	Mains input filter chokes	2·0
L22		2·0
T1	Output trans. Pri. ...	700·0
	Sec. ...	0·3
F1, F2	Mains circuit fuses ...	—
T.I.	Tuning meter winding...	4,000·0
S1-S6	Waveband switches ...	—
S7-S11	Radio/gram change switches	—
S12	Internal speaker switch	—
S13, S14	Scale lamp switches ...	—
S15, S16	Mains circuit switches...	—

VALVE ANALYSIS

Valve voltages and currents given in the table below have been taken from the makers' manual. Measurements were made while the receiver was connected to AC mains of 200v., with no signal input, and voltages were measured with the negative meter lead connected to the cathode of the valve in question. In the cases of **V1** and **V3**, a 0.25 μF condenser was connected between anode and chassis, and for **V2**, between control grid and chassis.

Valve	Anode Voltage (V)	Anode current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 VP1321	160	3·6	150	0·8
V2 TP2620	190	3·5	163	1·2
	Oscillator			
	73	1·2		
V3 VP1321	190	4·4	164	1·5
V4 Pen DD 4020	152	29·0	175	6·3

DISMANTLING THE SET

Removing Chassis.—Remove the back cover from the cabinet;

remove from the batten at the top rear of the cabinet the three countersunk-head wood screws;

close the lid of the cabinet, and insert two blocks of wood between the arms of the "V" shaped tension springs, inside the cabinet, supporting the lid stays; pull the springs towards the rear, and lift the lid until the stays clear the top of the cabinet, taking care not to lose the rollers at the tops of the springs.

Next, remove the five control knobs (pull-off) from the top of the receiver, and remove the seven countersunk-head wood screws holding the wooden escutcheon panel to the top of the cabinet;

remove the four cheese-head bolts (with metal washers) from *beneath* the cabinet, when the complete receiver can be lifted out of the cabinet by grasping **L20** core and one of the control spindle brackets.

GENERAL NOTES

Switches.—S1-S6 are the waveband switches, **S7-S11** the radio/gram change switches, and **S13, S14** the scale lamp switches, in an assembly lying diagonally across the underside of the chassis deck. For the greater part of its length it is hidden from view by component mounting panels, although its position is indicated by broken lines in our underchassis view. A separate diagram showing the assembly in detail appears in cols. 4 and 5, where the individual switches are indicated. The assembly is viewed in this diagram in the same aspect as it is indicated in our underchassis view. The table below gives the switch positions for the three operating control settings, starting from the fully anti-clockwise position of the control. A dash indicates open, and **C,** closed.

S15, S16 are the QMB mains switches, operated by waveband control spindle.

Switch Table

Switch	LW	MW	Gram
S1	—	C	—
S2	C	—	—
S3	—	C	—
S4	—	C	—
S5	—	C	—
S6	C	—	—
S7	—	—	C
S8	—	—	C
S9	C	C	—
S10	—	—	C
S11	C	C	—
S13	—	C	C
S14	C	—	—

S12 is the internal speaker muting switch. It is a jack-type switch, and opens only when the external speaker plug is pushed fully home, so that both or either of the speakers can be operated at one time.

Scale and Indicator Lamps.—These are five Osram MES types, with small spherical bulbs, rated at 4V, 0.3A. They are all connected in series, but those not required are short-circuited by switches **S13, S14,** according to the position of the waveband control. The tuning indicator lamp is in circuit in all positions of the control. The five lamps are mounted in a single assembly beneath the timing scale. The whole assembly can be withdrawn for replacement purposes, if the single fixing nut, facing the rear of the chassis, is unscrewed.

Pick-up Sockets.—Three sockets are provided at the rear of the chassis for connection of a gramophone pick up. Two of them accept the output from the pick-up, and the third (bottom) one is for the screening lead. All three sockets are isolated from chassis. The operation of the pick-up amplifier is explained under "Circuit Description."

External Speaker.—Two sockets are provided at the rear of the chassis for a low impedance (1.5-4 O) external speaker. With the sockets is associated a switch **S12,** which opens automatically when the external speaker plug is pushed fully home, muting the internal speaker.

Condensers C31, C32.—These are two dry electrolytics in tubular metal containers. **C31** is rated at 24 μF, 350 V DC working. **C32** is rated at 8 μF, 500 V peak. **C31** has a single (positive) terminal, the case being the negative connection. **C32** has two connecting leads, the positive being red.

Resistances R30, R31, R32.—Altogether, these form the total heater circuit ballast resistance. **R30** is split up into five 50 O sections, with a tapping at each end of each section, and is the coarse voltage adjustment; **R31** is an additional 100 O section provided with a clip which can be slid along its length for fine adjustment, after an ammeter has been inserted in series with the heater circuit, so that the current can be adjusted exactly to 0.2 A. The meter must be AC or DC according to the kind of supply to which the receiver is connected, and can conveniently be inserted between the flexible voltage adjustment lead and the appropriate voltage tapping on the panel.

R32 provides the balance of the ballast loading, and is a separate unit. **R30** and **R31** are mounted on the voltage adjustment panel at the rear of the chassis, and **R32** is mounted on a metal screen near the front of the chassis deck.

Fuses F1, F2.—These consist of small bakelised strips, with a hollow rivet at each end; the fuse wire is clamped under the rivets, which act as terminals. The fuses are fitted between the mains connecting prongs and two screws on the mains input panel. 1A or 2A fuse wire could be used as a replacement.

CIRCUIT ALIGNMENT

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

Connect a 0.25μF condenser across **C44,** turn the volume control to maximum, and the "Mute" control fully anti-clockwise. Connect signal generator via a 0.002 μF condenser to control grid (top cap) of **V2** and the earth socket. Feed in a 127 KC/S (2,362.2 m) signal, connect the damping resistance to the tags of **C45,** and, using an insulated tool, adjust **C46** for maximum output; transfer damping resistance to **C46,** and adjust **C45** for maximum output. Transfer damping resistance to **C47,** and adjust **C48** for maximum output; transfer damping resistance to **C48,** and adjust **C47** for maximum output. Remove the 0.25 μF condenser and damping resistance.

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 scales. If it does not, see that the scale glass fits squarely in its clamps. If a small amount of correction is required, it can be obtained by slackening the three screws in the pointer drive drum, when the slotted holes permit a certain amount of movement. If a greater amount is required, it can be obtained by releasing the screw holding the drum boss to the gang spindle. Transfer signal generator leads to **A** and **E** sockets, via a suitable dummy aerial, and turn gang to minimum. Leave volume and muting controls as set previously.

MW.—Switch set to MW, feed in a 196 m (1,530 KC/S) signal, and adjust **C43** for maximum output. If two peaks are found, select that involving the lesser trimmer capacity. Then adjust **C40** and **C37** for maximum output. Repeat these adjustments. Tune to 500 m on scale, feed in a 500 m (600 KC/S) signal, and check calibration. If incorrect, readjust **C43,** and return to 196 m adjustments.

LW.—Switch set to LW, and turn gang to minimum. Feed in a 775 m (388 KC/S) signal, and adjust **C42,** then **C39** and **C36** for maximum output. Feed in an 846 m (355 KC/S) signal, and readjust **C42** for maximum output, using the peak requiring the *greater* trimmer capacity if two peaks are found.

VALVE SUBSTITUTIONS

If difficulty is experienced in obtaining replacement valves of the original types for **V2** and **V4,** other types can be substituted, although some modification will be required to accommodate them.

There are several valves that can be used to replace the TP2620. Pye Radio recommended the Mullard TH4B to replace the AC/TP (See *Service Sheet* 505), and as the equivalent AC/DC valves are TP2620 and TH30C, the latter could be used in the SE/U. The modifications required are not extensive, and consist of replacing the valveholder with a 7-pin type, and connecting all the leads originally connected to the suppressor, metallising and cathode pins to the cathode pin on the TH30C.

If a screened top-cap connector is used, as it is in the SE/U, it must be insulated so as not to come into contact with the metallising and short-circuit the cathode circuit. A better method in the SE/U would be to scrape away a circle of the metallising round the bottom of the glass portion of the valve, so as to disconnect it from the cathode, and permit the claws on the cap to earth the metallising, which would otherwise be at some RF potential above chassis.

An article under "Service Short-cuts" in the March 15, 1941, issue of The Trader described a method of mounting a Mullard FC13 on an old AC/TP base, making an otherwise straightforward change-over, which was said to be very successful.

The Mazda octal valve TH233 can be used as a substitute, as can all the AC/DC versions of recommended AC substitutes.

A suitable replacement valve for the PenDD4020 is the Mazda octal Pen453DD, although no doubt other valves, such as Mullard Pen40DD and CL4 (side contact) could be used if desired.

For the benefit of those adopting the makers' recommendation, the base diagram of the Mullard TH30C is included with those of the original valves beside the circuit diagram overleaf, together with that of the Pen453DD.

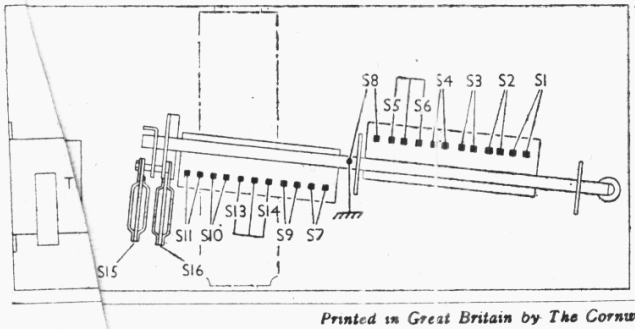


Diagram of the switch assembly, showing its position in the underside of the chassis. It is drawn as seen in the underchassis view in cols. 1–3.

APPEAL FOR INSTRUMENTS

The attention of service engineers is directed to the appeal by the Government for multi-range measuring instruments of the Avo class, published on page 147 of *The Trader* this week. A form for your convenience in offering instruments is inset loose in this issue.

Printed in Great Britain by The Cornwall Press Ltd., Paris Garden, London, S.E.1