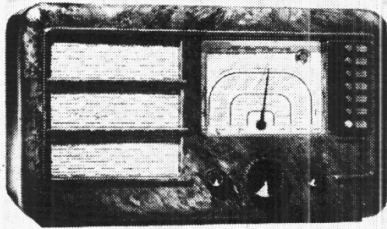


"TRADER" SERVICE SHEET

739

EKCO PB179

PRESS-BUTTON AC SUPERHET



PRESS-BUTTON automatic tuning for four MW and two LW stations is provided in the Ekco PB179, a 3-valve (plus rectifier) 3-band superhet designed for AC mains of 200-250 V, 40-100 c/s. The SW range is 16-52 m.

Release date and original price: June, 1938; Walnut finish, £11 Os. 6d.; Black and chromium, £11 11s.

CIRCUIT DESCRIPTION

For manual operation, aerial input on MW and LW from the two alternative sockets SA (for short aeriels) and LA (for long aeriels) is via L5 and coupling coil L2 to mixed-coupled band-pass filter. Primary coils L3 (MW) and L4 (LW) are

tuned by C39; secondary coils L7 and L8 are tuned by C44.

On SW, input is via coupling coil L5 to single-tuned circuit L6, C44. Aerial IF filter L1, C1 is in circuit on all bands.

First valve (V1, Ekco metallised TX41) is a triode heptode operating as frequency changer with internal coupling. Triode oscillator grid coils L9 (SW), L10 (MW) and L11 (LW) are tuned by C47. Parallel trimming by C46 (SW), C48 (MW) and C49 (LW); series tracking by C12 (SW), C14 (MW) and C15 (LW). These trackers are all fixed, but adjustments may be made on MW and LW by variable dust-iron cores.

Reaction coupling from anode is by L12 (SW) via S22, R6 and S13; by L13 (MW) via S22, R6, L12, R7 and S12; and by L14 (LW) by the same route as before but with S12 open.

Second valve (V2, Ekco metallised VP41 or Mullard VP4B) is a variable-mu RF pentode operating as intermediate frequency amplifier with tuned-primary, tuned-secondary transformer couplings C8, L23, L24, L25, C9 and C21, L26, L27, L28, C22. L24 and L27 are couplings.

Intermediate frequency 480 kc/s.

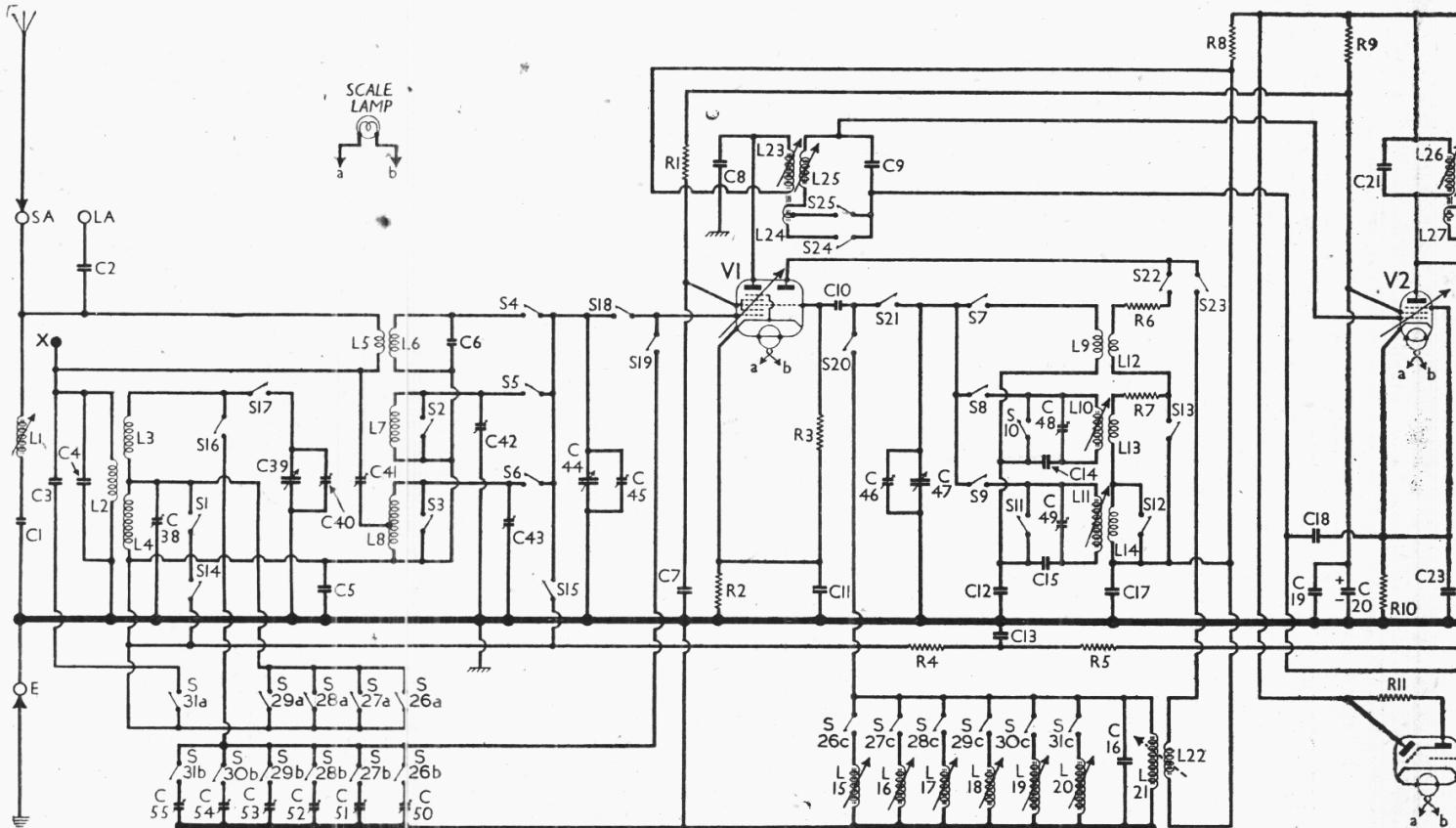
For automatic press-button tuning operation, which is applicable only to MW

and LW, band-pass coupling is dispensed with, the primary coils L3, L4 being used as single-tuned aerial circuit coils. These are tuned by the four pre-set capacitors C50-C53 for MW stations, or by C54 or C55 for the two LW stations, the appropriate trimmer being selected by one of the switches S26b-S31b according to which button is pressed.

Actually, three switches are controlled by each press-button, and these all bear the same number in our circuit diagram, suffix letters a, b and c distinguishing one switch from another. All three switches close when their button is pressed, and all switches associated with other press-buttons open.

The a switches on the four MW buttons (S26a-S29a) short-circuit L4; while of those on the two LW buttons, S30a is not used and is omitted from our circuit diagram, and S31a connects C3 across the aerial circuit.

The b switches connect up the appropriate aerial circuit tuning capacitor across L3, L4; while the c switches operate in the oscillator circuit, connecting the appropriate tuning coil across the master oscillator coil L21. These tuning coils, L15-L18 (MW) and L19-L20 (LW) have pre-set dust-iron core adjustments. S26c-



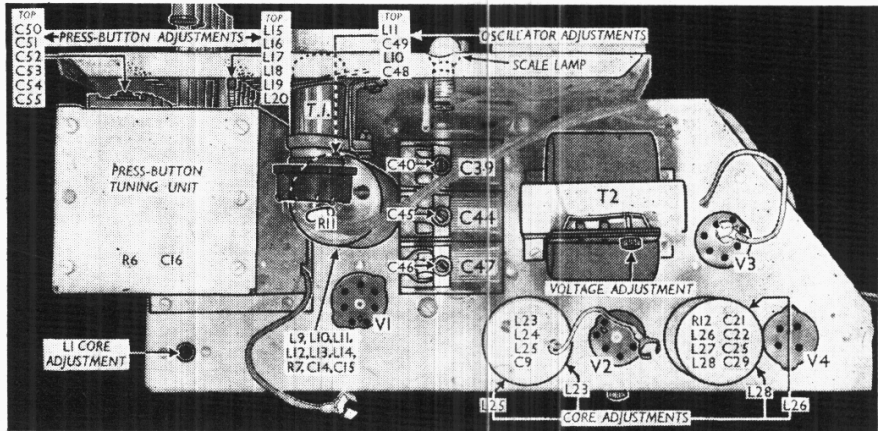
S29c bring the MW coils into circuit, and **S30c** and **S31c** bring in the LW coils.

The change-over from manual to automatic operation is effected by six pairs of switches **S14**, **S15** - **S24**, **S25**, each pair forming a single-pole, double-throw switch. In the manual position, **S14**, **S17**, **S18**, **S21**, **S22** and **S25** close, so that **S1** short-circuits **L4** on MW band; the manually tuned circuits associated with **C44** and **C47** are connected to their respective control grids on **V1**; and the oscillator anode is connected to the manual reaction coils.

In the automatic position, these switches open, and **S15**, **S16**, **S19**, **S20**, **S23** and **S24** close. **S15** now short-circuits **C44**, **S16** connects the pre-set trimmer bank across **L3**, **L4** while **S19** connects it to **V1** heptode control grid, and the oscillator triode anode and grid are connected via **S20** and **S23** to a master oscillator circuit **C16**, **L21**, **L22**. The action of **S24**, **S25** is to modify the normal coupling efficiency.

Diode second detector is part of double diode output pentode valve (**V3**, Ekco **DO42** or Mullard **Pen 4DD**). Audio frequency component in rectified output is developed across load resistor **R15** and passed via AF coupling capacitor **C30** and manual volume control **R16** to control grid of pentode section.

IF filtering by **C25**, **R12**, **C26** in diode circuit, and by **R18** in control grid circuit. High-note emphasis by **C31** between top of **R16** and slider. Provision for connection of gramophone pick-up virtually across **R16**. DC potential developed across **R15** appears also across the potential divider **R13**, **R14**, and that across **R14** is tapped off and applied as



Plan view of the chassis. The press-button is shown in detail overleaf.

control voltage to cathode ray tuning indicator (**T.I.**, Mullard **TV4**).

Provision is made for the connection of a low-impedance external speaker across the speech coil secondary of the output transformer **T1**. A second secondary winding on this transformer provides negative feed-back voltages. These are developed across the filter circuit **R20**, **R17**, **C32** and fed via **R17**, **C32** into the low potential end of **V3** CG circuit.

Second diode of **V3**, fed from **V2** anode via **C29**, provides DC potentials which are developed across load resistors **R23**, **R24** and fed back through decoupling circuits as GB to FC and IF valves, giving automatic volume control. Delay voltage, together with GB for pentode section, is obtained from the drop along resistors

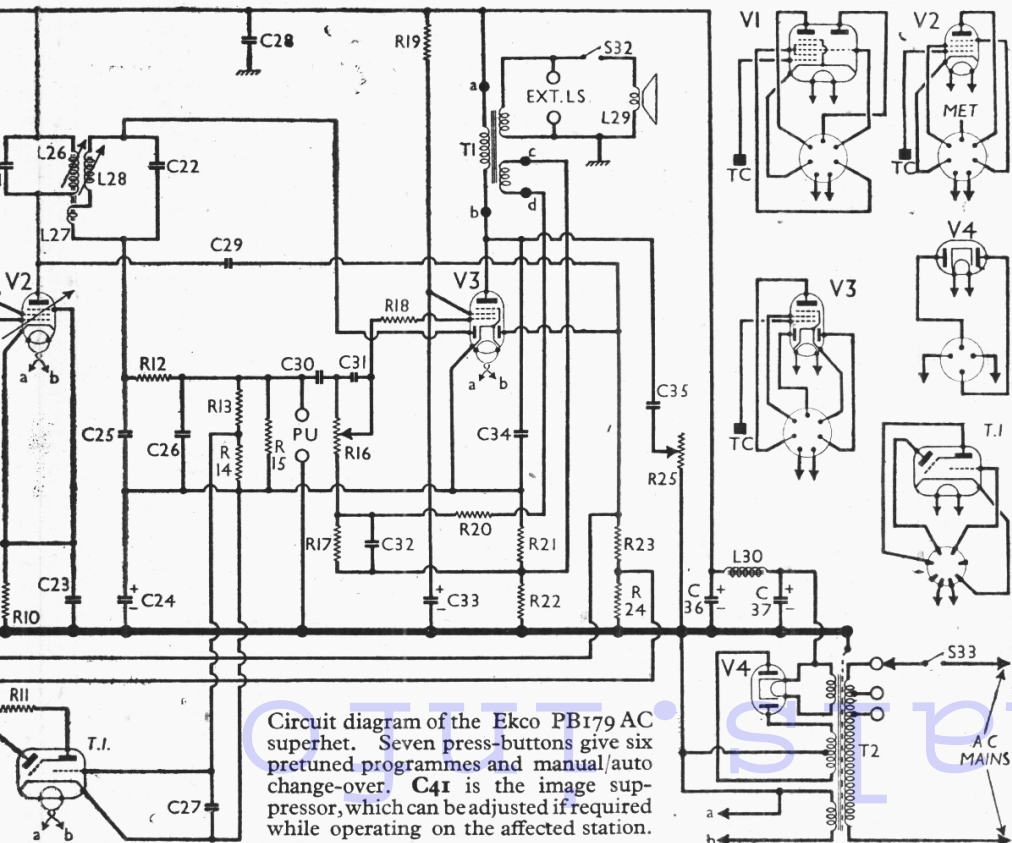
R21, **R22** in **V3** cathode lead to chassis. Fixed tone correction by **C34**, and variable tone control by **C35**, **R25**, in pentode anode circuit.

HT current is supplied by IHC full-wave rectifying valve (**V4**, Ekco **R41** or Mullard **DW4/350**). Smoothing by iron-cored choke **L30** and electrolytic capacitors **C36**, **C37**.

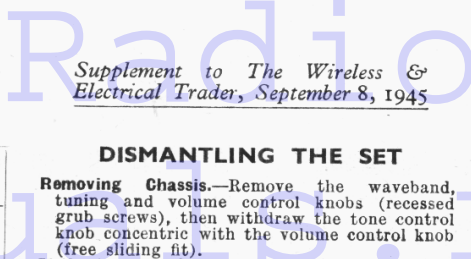
COMPONENTS AND VALUES

CAPACITORS		Values (μF)
C1	IF filter tuning ...	0.00004
C2	LA series coupling ...	0.0005
C3	Aerial circuit ...	0.0018
C4	Aerial circuit shunt ...	0.0002
C5	Part B-P coupling ...	0.06
C6	Aerial circ. SW trimmer...	—
C7	V1 SG decoupling ...	0.04
C8	1st IF transformer tuning {	0.00014
C9	capacitors ...	0.00014
C10	V1 osc. CG capacitor ...	0.000035
C11	V1 cathode by-pass ...	0.1
C12	Osc. circ. SW tracker ...	0.0075
C13	AVC line decoupling ...	0.01
C14	Osc. circ. MW tracker ...	0.00068
C15	Osc. circ. LW tracker ...	0.000305
C16	Master oscillator tuning...	0.00028
C17	V1 anodes' decoupling ...	0.04
C18	V2 CG decoupling ...	0.04
C19	V1, V2 SG's decoupling {	0.1
C20	capacitors ...	2.0
C21	2nd IF transformer tuning {	0.00014
C22	capacitors ...	0.00014
C23	V2 cathode by-pass ...	0.1
C24	V3 cathode by-pass ...	25.0
C25	IF by-pass capacitors ...	0.00014
C26	T.I. CG decoupling ...	0.0001
C27	HT circuit RF by-pass ...	0.05
C28	AVC diode coupling ...	0.1
C29	AVC line decoupling ...	0.000015
C30	AF coupling to V3 pent. ...	0.004
C31	High-note boost ...	0.00004
C32	Feed-back coupling ...	0.1
C33*	V3 SG decoupling ...	1.0
C34	Fixed tone corrector ...	0.0025
C35	Part of tone control ...	0.05
C36*	HT smoothing capacitors {	12.0
C37*	capacitors ...	8.0
C38†	B-P pri. LW trimmer ...	—
C39†	Band-pass pri. tuning ...	—
C40†	B-P pr. MW trimmer ...	—
C41†	Image rejector ...	—
C42†	B-P sec. MW trimmer ...	—
C43†	B-P sec. MW trimmer ...	—
C44†	B-P sec. and aerial SW tuning ...	—
C45†	Aerial SW trimmer ...	—
C46†	Osc. circ. SW trimmer ...	—
C47†	Oscillator circuit tuning...	—
C48†	Osc. circ. MM trimmer ...	—
C49†	Osc. circ. LW trimmer ...	—
C50†	—	—
C51†	—	—
C52†	—	—
C53†	Press-button aerial circuit tuning trimmers ...	—
C54†	—	—
C55†	—	—

* Electrolytic. † Variable. ‡ Pre-set.



Circuit diagram of the Ekco PB179 AC superhet. Seven press-buttons give six pretuned programmes and manual/auto change-over. **C41** is the image suppressor, which can be adjusted if required while operating on the affected station.



RESISTORS		Values (ohms)
R1	V1 SG HT feed	300
R2	V1 fixed GB resistor	100
R3	V1 osc. CG resistor	100,000
R4	AVC line decoupling resistors	250,000
R5	...	1,000,000
R6	...	100
R7	Osc. reaction stabilisers	1,500
R8	V1 anode's HT feed	300
R9	V1, V2 SG's HT feed	5,000
R10	V2 fixed GB resistor	75
R11	T.L. anode HT feed	2,000,000
R12	IF stopper	50,000
R13	T.L. CG feed potential divider	6,000,000
R14	...	1,000,000
R15	V3 signal diode load	750,000
R16	Manual volume control	850,000
R17	Feed-back coupling	10,000
R18	V3 pent. grid stopper	10,000
R19	V3 SG HT feed	1,000
R20	Feed-back coupling	50,000
R21	V3 GB and AVC delay resistors	120
R22	...	200
R23	V3 AVC diode load resistors	500,000
R24	...	500,000
R25	Variable tone control	20,000

DISMANTLING THE SET

Removing Chassis.—Remove the waveband, tuning and volume control knobs (recessed grub screws), then withdraw the tone control knob concentric with the volume control knob (free sliding fit).

If the four round-head set-screws (with washers) holding the chassis to the wooden baseboard are now removed, the chassis may be withdrawn to the extent of the speaker leads, which is sufficient for normal purposes.

To free chassis entirely, unsolder from the two tags on the speaker the leads connecting them to the chassis.

Removing Speaker.—Slacken the nuts on the four bolts on the sub-baffle holding the clamps to the speaker rim, and swivel the clamps. When replacing, the two connecting tags should be on the upper side.

GENERAL NOTES

Switches.—There are three sets of switch assemblies in this receiver: one for manually operated waveband switching; one, operated by the white press-button, for the change-over from manual to automatic tuning and vice versa; and a third, the switch unit associated directly with the press-buttons.

The first assembly comprises S1-S13, the waveband switches, ganged in two rotary units beneath the chassis. These are numbered 1 and 2 in our under-chassis view, where arrows show the direction in which they are viewed in the diagrams which show them in detail in col. 5. 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.

The second assembly is a double-sided single unit containing S14-S25. It is mounted inside the press-button unit assembly on the chassis deck. The S14-S25 unit has two positions only: manual or automatic tuning, and is operated by the white press-button beneath the six station buttons. When the white button is pressed, the unit turns to the manual position, and S14, S17, S18, S21, S22 and S25 close, while the others open; when a station button is pressed, the unit turns to the automatic tuning position, and S15, S16, S19, S20, S23 and S24 close, and the others open.

The unit is indicated in our sketch of the press-button unit in col. 2, where the numbers 3 and 4 in circles identify the two sides of the unit. Arrows show the directions in which they are viewed in the diagrams in col. 5, where a separate diagram shows each side in detail.

The third assembly consists of those switches controlled directly by the station buttons, and located at the remote ends of their plungers inside the press-button unit. Three switches are controlled by each button, and all three close when the button is pressed. All three bear the same switch number: S26, S27, S28, S29, S30 and S31 for the six buttons, but each has a lettered suffix, a, b or c, to distinguish it from the other two. There is, however, no S30a, as what would be this switch is unused. The switches are all identified in our interior sketch of the press-button tuning unit in col. 2.

Coils.—The aerial and band-pass coils L2-L4 and L7, L8 are wound on a common former beneath the chassis, the SW unit L5, L6 being mounted on a panel at one end of it.

The oscillator circuit coils L9-L14 for manual operation are in a screened unit on the chassis deck, together with C14, C15, C48, C49 and R7. Trimmer and coil adjustments are accessible through holes in the front of the can, as indicated in our plan view. Holes are provided in the scale backing plate to give access to these adjustments, but the scale must be removed first. For alignment purposes, the makers provide a paper dummy scale, with holes marked in it for these adjustments, to replace the regular scale.

The automatic oscillator coils are six permeability types in a vertical row inside the front plate of the press-button unit, their adjustment screws projecting forwards so that they are accessible from the front of the receiver, a special key being provided to fit them. This key is normally housed in a socket specially provided for it near the bottom of the press-button panel. L15-L18 are MW coils, and L19, L20 are LW coils.

L21, L22 form a master oscillator circuit for automatic tuning, the frequency of operation being determined by the permeability tuning coils just mentioned, one of these being connected across L21 for automatic operation.

L23-L25 and L26-L28 are the two intermediate frequency transformers, in two screened units on the chassis deck, the second containing several other components. In each case the primary and secondary coils are mounted mutually at right-angles, coupling being effected by a special winding in series with the secondary interwound with the primary. These are L24 and L27. This coupling is modified, in the case of the first transformer, for automatic operation by switches S24, S25.

In each transformer the tuning capacitors are fixed, adjustments being made by the screwed dust-iron cores. Cases have been met in which very marked lack of sensitivity has been cured by the replacement of the tuning capacitors by four new ones.

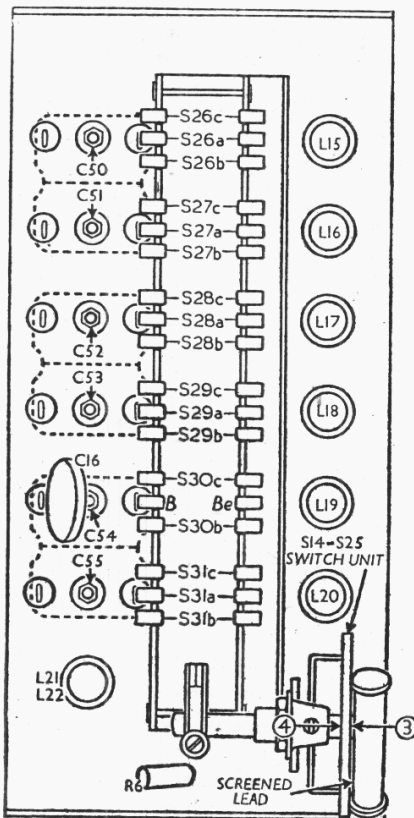
Output Transformer T1.—This is equipped with a second secondary winding for the provision of negative feed-back voltage, and it is of the utmost importance that the phase rela-

OTHER COMPONENTS		Approx. Values (ohms)
L1	Aerial IF filter coil	17-0
L2	Aerial coupling coil	10-0
L3	B-P pri. MW coil	2-75
L4	B-P pri. LW coil	20-0
L5	Aerial SW coupling coil	0-3
L6	Aerial SW tuning coil	Very low
L7	B-P sec. MW coil	2-75
L8	B-P sec. LW coil	23-0
L9	Osc. SW tuning coil	Very low
L10	Osc. MW tuning coil	2-0
L11	Osc. LW tuning coil	2-8
L12	Osc. SW reaction coil	0-5
L13	Osc. MW reaction coil	1-0
L14	Osc. LW reaction coil	1-0
L15	...	1-6
L16	...	2-0
L17	Oscillator circuit press-button tuning coils	3-4
L18	...	4-2
L19	...	4-75
L20	...	5-5
L21	Press-button circuit master oscillator coils	8-5
L22	...	1-4
L23	1st IF Pri	4-5
L24	trans Coupling	5-0
L25	Sec.	total
L26	2nd IF Pri	4-5
L27	trans Coupling	total
L28	Sec.	5-5
L29	Speaker speech coil	3-0
L30	HT smoothing choke	550-0
T1	Output Pri.	330-0
	trans. Spkr. sec.	0-4
	F-B sec.	43-0
T2	Mains Pri., total	35-0
	Heater sec.	0-1
	Trans. Rect. heat. sec.	0-1
	HT sec., total	430-0
S1-S13	Waveband switches	—
S14-S25	Auto/manual change-over switches	—
S26 a, b, c, to S31 a, b, c	Press-button tuning switches	—

VALVE ANALYSIS

Valve voltages and currents given in the table below are those quoted in the makers' manual. Voltages were measured with a voltmeter whose resistance was 1,000 ohms per volt and whose negative lead was connected to chassis. No voltage for V4 is quoted, but the voltage between either anode and chassis should be about 300 V, AC.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 TX41	250	3-1	180	8-2
	230	5-7		
V2 VP41	250	12-0	180	5-3
V3 DO42	250	39-0	250	4-8

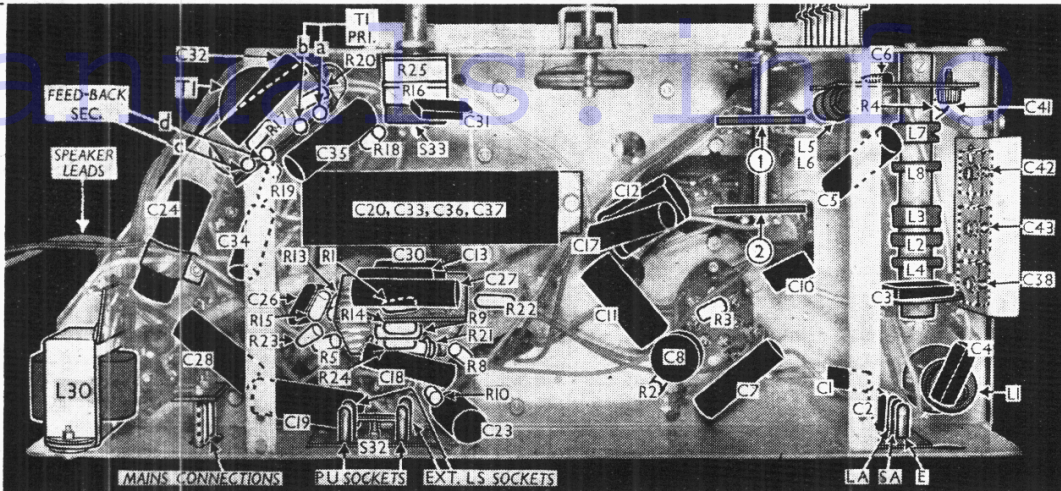


Interior view of the press-button unit as seen from the rear after removing cover.

Switch Table

Switch	LW	MW	SW
S1	—	C	—
S2	—	C	—
S3	—	C	—
S4	—	C	—
S5	—	C	—
S6	C	—	—
S7	—	C	—
S8	—	C	—
S9	C	—	—
S10	—	—	—
S11	—	C	—
S12	—	C	—
S13	—	—	C

Under - chassis view. The component assembly just below the electrolytic block has been tilted in two directions to show its two sides. Code letters identify the tags of T1 primary and feed - back secondary. The waveband switch units 1 and 2 are shown in detail in the diagrams in col. 5 below.



relationship between the primary winding and this secondary winding is correct. If it is reversed, continuous oscillation will result. The four connecting tags to these two windings are mounted on a terminal strip on the transformer. These are clearly indicated in our under-chassis view, where they are lettered a, b, c, d to agree with similar markings in the circuit diagram. If tag b goes to V3 pentode anode, and tag c to the junction of R21 and R22, the direction of the coupling will be correct.

External Speaker.—Two sockets are provided at the rear of the chassis for the connection of a low-impedance (40) external speaker. The thumb-screw switch S32 permits the internal speaker to be muted if desired.

Scale Lamp.—This is an MES type lamp, with a large clear spherical bulb, rated at 6.2 V, 0.3 A.

Chassis Divergencies.—The normal intermediate frequency for this receiver is 480 kc/s, but in receivers sold for use within 40 miles of Washford Cross, Droitwich, Westerglen and Burghhead transmitters, the IF was adjusted at 465 kc/s to avoid possible troublesome whistles.

In the Midland area, such receivers, if fitted with a Mullard TH4B valve as V1, have a small coil added in series with L4, in the low potential end, and by shunting C3 across L4, the two together eliminate a whistle on the Luxemburg programme.

The fact that a TH4B may be fitted in some samples does not mean that this is interchangeable with the TX41. The makers state specifically that it is not.

In some chassis R18 may be omitted, and C8 may be located inside the L23-L25 unit and connected directly across L23; it was shown so in the makers' information. C6 was not shown there at all, but was present in our sample. The makers say that the value of R4 may lie anywhere between 100,000 Ω and 250,000 Ω .

PRESS-BUTTON UNIT

All the components belonging strictly to the press-button tuning system are enclosed in a rectangular container mounted on the chassis deck. From the front of this the press-buttons and automatic tuning pre-set adjustments project. These are indicated in our plan view.

An interior view of this assembly as seen from the rear after removing the three-sided cover (nine cheese-head screws with lock-washers) is shown in the sketch in col. 2, where the press-button-operated switches S26a, b, c to S31a, b, c are identified along the vertical centre-line. The remaining components are disposed along either side of this, pre-set coils on the right, and pre-set capacitors (fitted outside) indicated on the left by dotted outlines, the master oscillator unit L21, L22, C16 being in line with these.

The manual/auto change-over switch unit S14-S25 is seen in the bottom right-hand corner, where it is indicated by the numbers 3 and 4 to identify the respective sides concerned in the diagrams in col. 5. The tubular object lying across the 3 side of the unit is a special low-capacitance screened lead carrying the connecting lead from S18 across the face of the unit.

The tag mark X on the 4 side of the unit plays no part in the switch action, but carries a screened lead from the top of L2 as indicated

in the circuit diagram. Its purpose is obscure, but it is obviously provided for some special function not normally required in this model.

A special key, consisting of an ivory box spanner, for the adjustment of the pre-set oscillator coils is kept normally in a holder in the front of the press-button unit, just at the side of the white (manual) button.

Setting Buttons.—Numbering the buttons from top to bottom, 1, 2, 3 and 4 are the MW, and 5, 6 the LW buttons. The adjustments are ranged either side of the press buttons, the appropriate oscillator adjustment being on the left, and that of the aerial on the right, of the button. Their ranges are as follows: 1, 200-307 m; 2, 261-391 m; 3, 267-449 m; 4, 342-559 m; 5, 1,130-1,640 m; 6, 1,430-1,986 m.

Access is gained to these adjustments by re-

button on which the adjustment is to be made, and adjust the oscillator coil core on its left until the same programme is received. Now adjust the aerial trimmer on the right of the button. Press the white button, check the station, then return to the station button, and finally adjust left, then right, adjustments, using the tuning indicator to indicate correct resonant point.

CIRCUIT ALIGNMENT

IF Stages.—Switch set to MW, tune to 500 m on scale, turn the volume control to maximum and the tone control to "high" (clockwise). Connect signal generator leads via a 0.02 μ F capacitor to control grid (top cap) of V1 and chassis, leaving the existing connector also in place.

Feed in a 480 kc/s (625 m) (or 465 kc/s (645.16 m) see "Chassis Divergencies") signal, and adjust the cores of L25, L26, L25 and L23, in that order, for maximum output. Then repeat these adjustments.

IF Filter.—Transfer signal generator leads to SA and E sockets, omitting the capacitor. Feed in a signal at intermediate frequency, unscrew core of L1, then screw it up to the position of maximum dip (minimum output), neglecting a small dip which occurs with the core about central in the coil. On the correct position the coil is, as a rule, distinctly off centre.

RF and Oscillator Stages.—With the gang at maximum, the pointer should be horizontal. For correction it may be slid round its spindle.

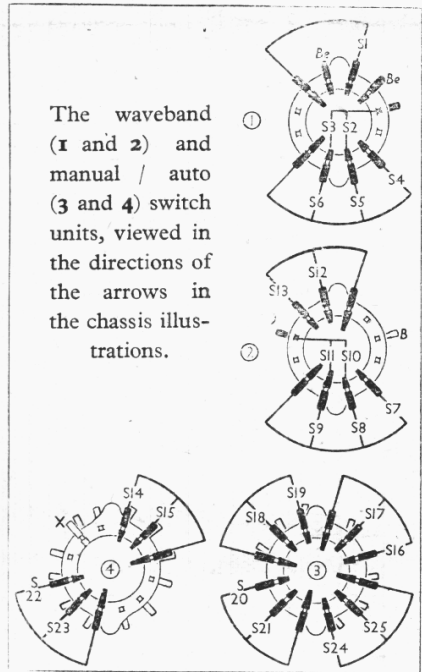
To gain access to the oscillator adjustments, the cardboard scale must be prised off its metal back-plate, to which it is held by glue spots, with press-studs at the corners, after removing the pointer (sliding fit). Holes in the back-plate then permit access to the coil can. But as an accurately calibrated scale is required for these adjustments, the makers issue with their manual a dummy paper scale with the adjustment holes marked for punching.

The reverse side of the paper is gummed, and it should be stuck on a light cardboard support before use, and the appropriate holes then punched, together with those for the press-studs and tuning indicator. Great care must be used to ensure that this scale is correctly positioned; otherwise, calibration will be inaccurate when the original scale is replaced.

SW.—Switch set to SW, feed in a 17 Mc/s (17.65 m) signal, tune it in, and adjust C46 until maximum output coincides with correct calibration. Then adjust C45 for maximum output and check calibration at 6 Mc/s (50 m).

MW.—Switch set to MW, tune to 200 m on scale, feed in a 200 m 1,500 kc/s signal, and adjust C48 for maximum output. Tune to 250 m on scale, feed in a 250 m (1,200 kc/s) signal, and adjust C42 and C40 for maximum output. Feed in a 500 m (600 kc/s) signal, tune it in, and adjust the core of L10 for correct calibration. Repeat all MW adjustments.

LW.—Switch set to LW, tune to 1,300 m on scale, feed in a 1,300 m (231 kc/s) signal, and adjust C49 for maximum output. Then adjust C43 and C38 for maximum output. Tune to 1,700 m on scale, feed in a 1,700 m (176.5 kc/s) signal, and adjust core of L11 for correct calibration at maximum output. Repeat the LW adjustments.



The waveband (1 and 2) and manual / auto (3 and 4) switch units, viewed in the directions of the arrows in the chassis illustrations.

moving the escutcheon plate (spring fit) on the front of the cabinet. It is important that no pressure against or force in turning should be used in making adjustments. The tool should be held lightly between finger and thumb. If a signal generator is used, it should be connected to the SA and E sockets; and final adjustment should then be carried out on the actual transmission.

First press the white button and tune in the required programme manually. Then press the