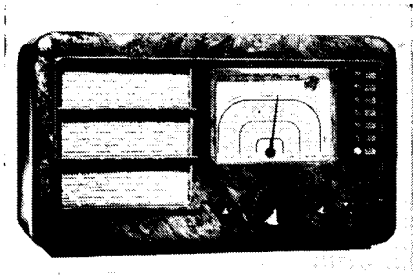
Supplement to The Wireless & Electrical Trader, April 20, 1946

"TRADER" SERVICE SHEET

766

EKCO PBU179

PRESS-BUTTON A.C./D.C. SUPERHET



PRESS-BUTTON tuning for six stations is provided in the Ekco PBU179. The receiver is a 3-valve (plus rectifier) 3-band superhet designed to operate from A.C. or D.C. mains of 200-250V, 40-100 c/s in the case of AC. The S.W. range is 16-52m. The plastic cabinet is available in walnut or black and chromium finish.

Release date and original prices : June, 1938; walnut finish, £11 11s; black and chromium, £12 1s 6d.

CIRCUIT DESCRIPTION

For manual operation, aerial input on M.W. and L.W. from the two alternative sockets **SA** (for short aerials) and **LA** (for long aerials) is via **L5** and coupling coil **L2** to mixed-coupled band-pass filter. Primary coils **L3** (M.W.) and **L4** (L.W.) are tuned by **C44**; secondary coils **L7** and **L8** are tuned by **C49.**

On S.W., input is via coupling coil **L5** to single-tuned circuit **L6, C49.** Aerial I.F. filter **L1, C3** is in circuit on all bands.

First valve **(V1, Mullard metallised TH30C)** is a triode-heptode operating as frequency changer with internal coupling. Triode oscillator grid coils **L9** (S.W.), **L10** (M.W.) and **L11** (L.W.) are tuned by **C52.** Parallel trimming by **C51** (S.W.), **C53** (M.W.) and **C54** (L.W.); series tracking by **C17** (S.W.), **C18** (M.W.) and **C19** (L.W.).

Reaction coupling from anode is by **L12** (S.W.) via **S23(M), R7** and **S14**; by **L13** (M.W.) via **S23(M), R7, L12, R8** and **S13**; and by **L14** (L.W.) by the same route again, but with **S13** open.

Second valve **(V2, Ekco metallised VPU1)** is a variable-mu R.F. pentode operating as intermediate frequency amplifier with tuned-primary, tuned-secondary transformer couplings, **C12, L23, L24, L25, C13** and **C26, L26, L27, L28, C27.** **Intermediate frequency 480 kc/s.**

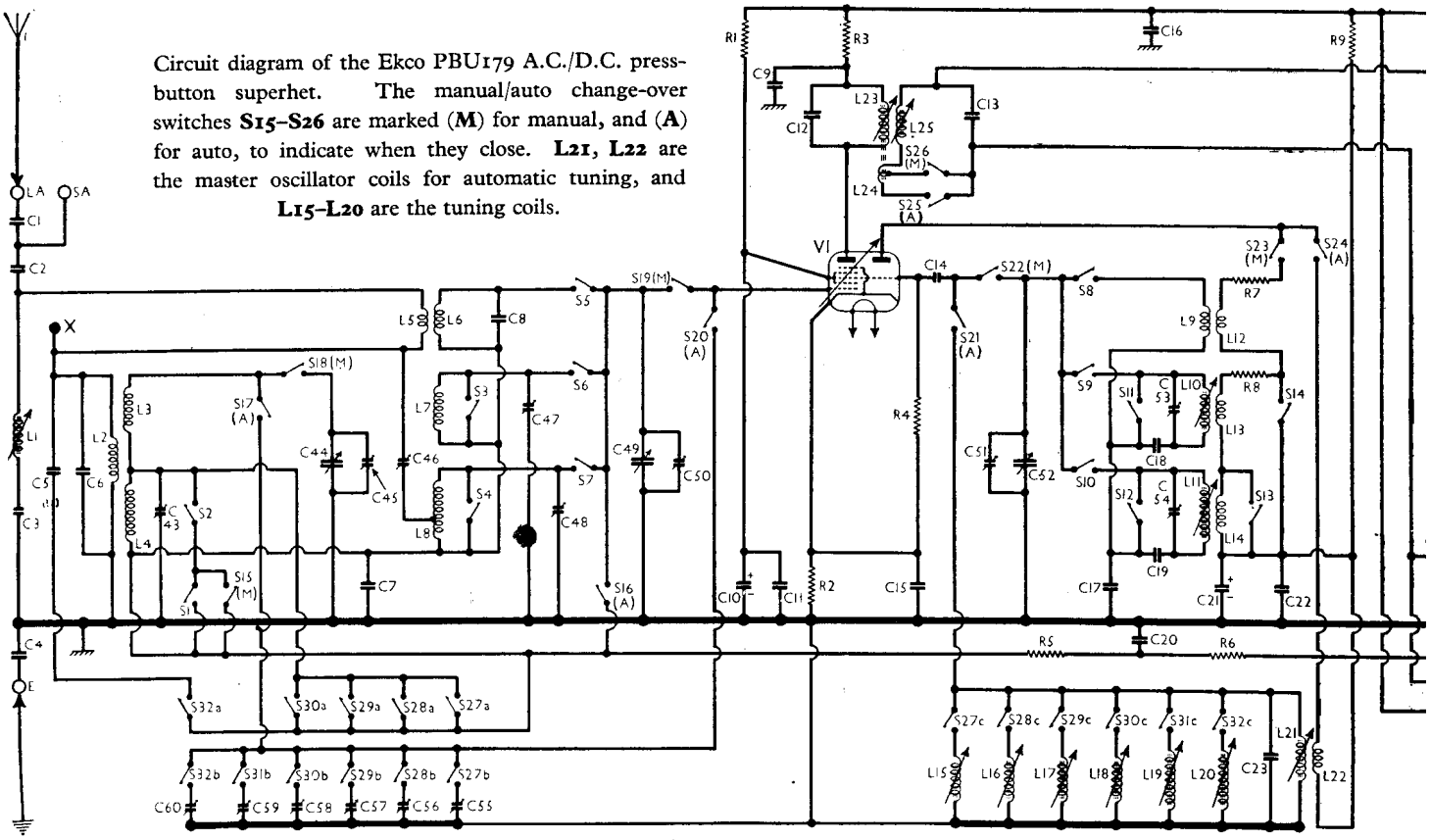
For automatic press-button tuning operation, which is applicable only to M.W. and L.W., band-pass coupling is dispensed with, the primary coils **L3, L4** being used as single-tuned aerial circuit coils. These are tuned by the four pre-set capacitors **C55-C58** for M.W. stations, or by **C59** or **C60** for the two L.W. stations, the appropriate trimmer being selected by one of the switches **S27b-S32b** 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 M.W. buttons **S27a-S30a** short-circuit **L4**; while of those on the two L.W. buttons, **S31a** is not used and is omitted from our circuit diagram, and **S32a** connects **C5** 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** (M.W.) and **L19-L20** (L.W.) have pre-set dust-iron core adjustments. **S27c-S30c** bring the M.W. coils into circuit and **S31c** and **S32c** bring in the L.W. coils.

The manual/automatic change-over is effected by six pairs of switches **S15(M),**



Circuit diagram of the Ekco PBU179 A.C./D.C. press-button superhet. The manual/auto change-over switches **S15–S26** are marked (**M**) for manual, and (**A**) for auto, to indicate when they close. **L21, L22** are the master oscillator coils for automatic tuning, and **L15–L20** are the tuning coils.

S16(A)—S25(A), S26(M). Each pair forms a single pole, double-throw switch and all six pairs are ganged to operate together, the **(M)** switches closing when the manual (knob tuning) button is pressed, and the **(A)** switches closing when any auto press-button is pressed. One pair of these switches modifies the coupling between the windings of the first I.F. transformer **L23, L25.**

Diode second detector is part of double diode output pentode valve **(V3, Mazda PenDD4021).** Audio frequency component in rectified output is developed across load resistor **R16** and passed via A.F. coupling capacitor **C34** and manual volume control **R17** to pentode section.

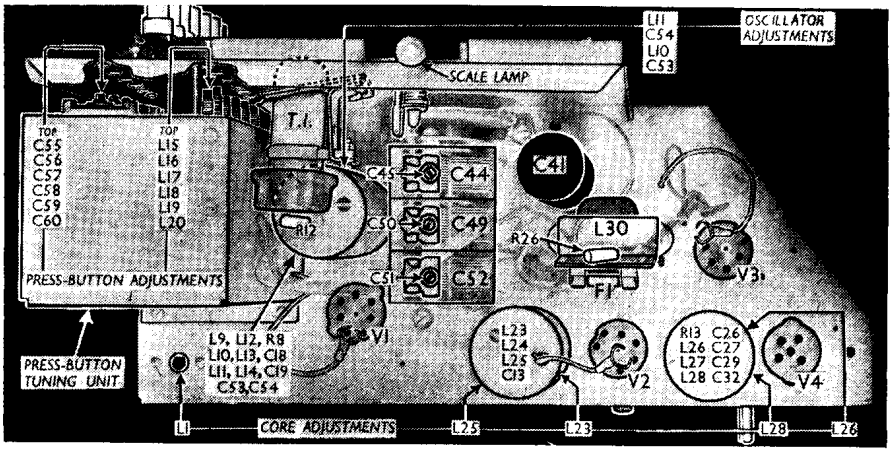
I.F. filtering by **C29, R13, C30.** High-note emphasis by **C35** between top of **R17** and its slider. D.C. potential developed across **R16** appears also across the potential divider **R14, R15,** from the lower section of which it is tapped off and applied as control voltage to cathode ray tuning indicator **(T.I. Mullard EM3).**

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, R18, R36** and fed into the low potential end of **V3** C.G. circuit.

Second diode of **V3,** fed from **V2** anode via **C32,** provides D.C. potentials which are developed across load resistors **R23, R24** and fed back through decoupling circuits as G.B. to F.C. and I.F. valves, giving automatic volume control. Delay voltage, together with G.B. for pentode section, is obtained from the drop along resistors **R21, R22** in **V3** cathode lead.

When the receiver is operated from A.C. mains, H.T. current is supplied by half wave rectifying valve **(V4, Cossor 40SUA),** which, with D.C. mains, behaves as a low resistance. Smoothing is effected by iron-cored choke **L30** and electrolytic capacitors **C40, C41.**

Valve heaters, together with adjustable ballast resistor **R28,** are connected in series across mains input, while a filter circuit comprising chokes **L31, L32** and capacitor **C42** suppresses mains-borne interference. **C42** and the speaker speech coil circuit are returned not to chassis but to the **E** socket.



Plan view of the chassis. **C23, R7, C55–C60, L15–L22, S15–S26** and **S27–S32 a, b, c** are all housed in the press-button tuning unit as shown overleaf.

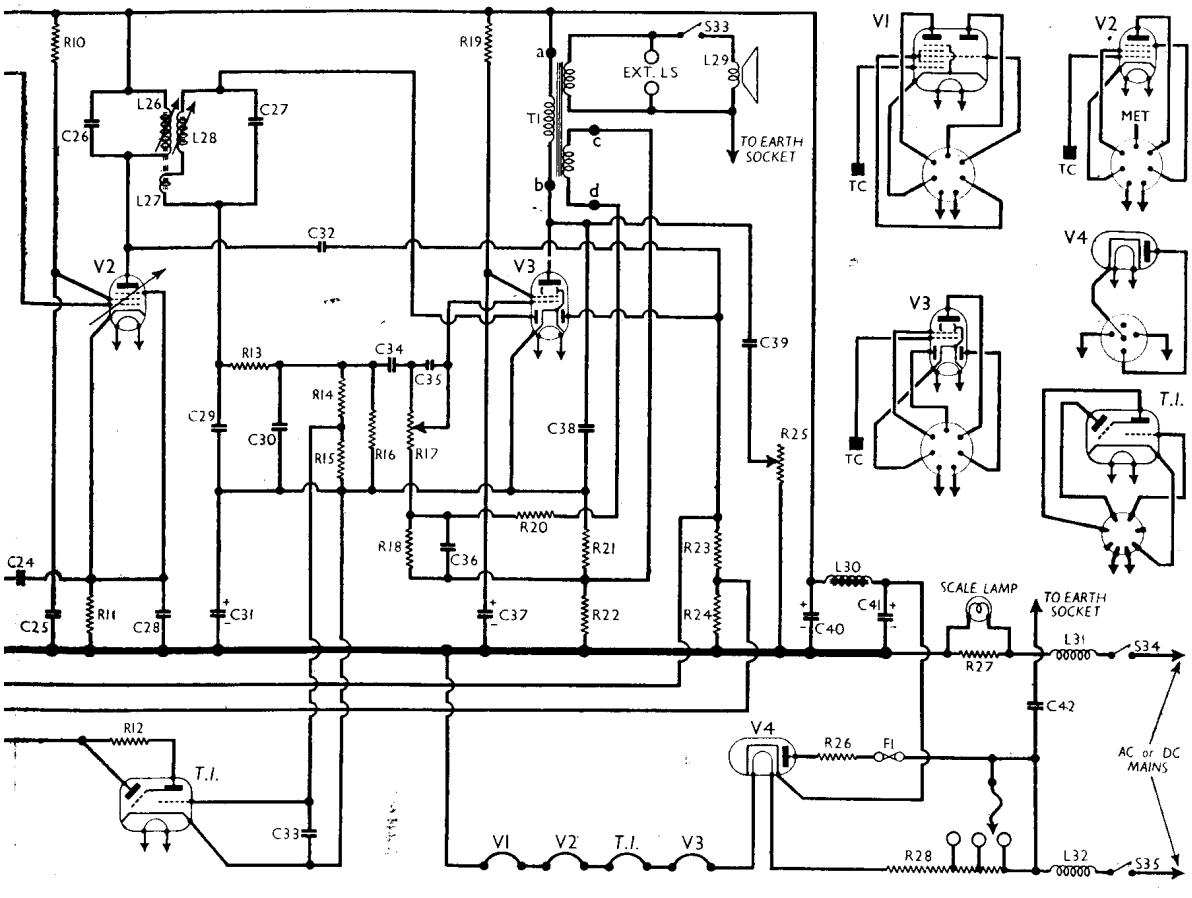
VALVE ANALYSIS

Valve voltages and currents given in the table below are those quoted in the makers' manual.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 TH30C	165 Oscillator 140	2·35 5·8	95	6·5
V2 VPU1	170	9·6	167	4·0
V3 Pen DD 4021	155	53·0	160	9·0
V4 40SUA	†	—	—	—

† Cathode to chassis, 215 V, D.C.

Voltages were measured with a voltmeter whose resistance was 1,000 ohms per volt and whose negative lead was connected to chassis. The total HT current is given as 90mA.



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); remove the two wooden strips (two woodscrews each).

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 and mains resistor 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, and remove the two screws holding the mains resistor to base of the cabinet.

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.

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COMPONENTS AND VALUES

	CAPACITORS	Values (μF)
C1	Long aerial series ...	0·001
C2	Aerial isolator	0·001
C3	Aerial I.F. filter tuning...	0·00004
C4	Earth isolator	0·1
C5	Heterodyne filter	0·0018
C6	Aerial circuit shunt ...	0·0002
C7	Band-pass coupling ...	0·06 ‡
C8	Aerial fixed S.W. trimmer	—
C9	V1 hept. anode decoupling	0·04
C10*	V1 S.G. decoupling ...	2·0
C11		0·04
C12	1st I.F. transformer tuning	0·00014
C13	capacitors	0·00014
C14	V1 osc. C.G. capacitor ...	0·000025
C15	V1 cathode by-pass ...	0·1
C16	H.T. circuit R.F. by-pass	0·1
C17	Osc. circ. S.W. tracker ...	0·0075
C18	Osc. circ. M.W. tracker...	0·00068
C19	Osc. circ. L.W. tracker ...	0·000305
C20	A.V.C. line decoupling ...	0·01
C21*	V1 osc. anode decoupling	2·0
C22		0·01
C23	Master oscillator tuning...	0·00028
C24	V2 C.G. decoupling ...	0·04
C25	V2 S.G. decoupling ...	0·1
C26	2nd I.F. transformer tun-	0·00014
C27	ing capacitors	0·00014
C28	V2 cathode by-pass ...	0·1
C29	I.F. by-pass capacitors...	0·00014
C30		0·0001
C31*	V3 cathode by-pass ...	25·0
C32	V3 A.V.C. diode coupling	0·000015
C33	T.I. C.G. decoupling ...	0·05
C34	A.F. coupling to V3 pent.	0·004
C35	Treble boost capacitor ...	0·00004
C36	Part feed-back coupling...	0·1
C37*	V3 S.G. decoupling ...	8·0
C38	Fixed tone corrector ...	0·0025
C39	Part variable tone control	0·05
C40	H.T. smoothing capacitors	24·0
C41		8·0
C42	Mains R.F. by-pass ...	0·1
C43‡	B.-P. pri. L.W. trimmer...	—
C44†	Band-pass pri. tuning ...	—
C45‡	B.-P. pri. M.W. trimmer	—
C46‡	Image rejector	—
C47‡	B.-P. sec. M.W. trimmer	—
C48‡	B.-P. sec. L.W. trimmer...	—
C49†	B.-P. sec. and S.W. tuning	—
C50‡	Aerial S.W. trimmer ...	—
C51‡	Osc. circ. S.W. trimmer...	—
C52†	Oscillator circuit tuning...	—
C53‡	Osc. circ. M.W. trimmer...	—
C54‡	Osc. circ. L.W. trimmer...	—
C55‡	Aerial circuit press-button tuning trimmers ...	—
C56‡		—
C57‡		—
C58‡		—
C59‡		—
C60‡		—

* Electrolytic. † Variable. ‡ Pre-set.

	RESISTORS	Values (ohms)
R1	V1 S.G. H.T. feed ...	11,500
R2	V1 fixed G.B. resistor ...	200
R3	V1 hept. anode decoupling	300
R4	V1 osc. C.G. resistor ...	100,000
R5	A.V.C. line decoupling re-	250,000
R6	sistors	1,000,000
R7	Osc. reaction stabilisers ...	140
R8		1,500
R9	V1 osc. anode H.T. feed...	5,000
R10	V2 S.G. H.T. feed ...	300
R11	V2 fixed G.B. resistor ...	120
R12	T.I. anode H.T. feed ...	1,000,000
R13	I.F. stopper	50,000
R14	T.I. C.G. feed potential	5,000,000
R15	divider	2,000,000
R16	V3 signal diode load ...	750,000
R17	Manual volume control ...	850,000
R18	Part feed-back coupling...	10,000
R19	V3 S.G. H.T. feed ...	1,000
R20	Part feed-back coupling...	50,000
R21	V3 pentode G.B. and	120
R22	A.V.C. delay resistors...	200
R23	V3 A.V.C. diode load	500,000
R24	resistors	500,000
R25	Variable tone control ...	20,000
R26	V4 anode surge limiter ...	50
R27	Scale lamp shunt... ...	50
R28	Heater ballast resistor ...	500*

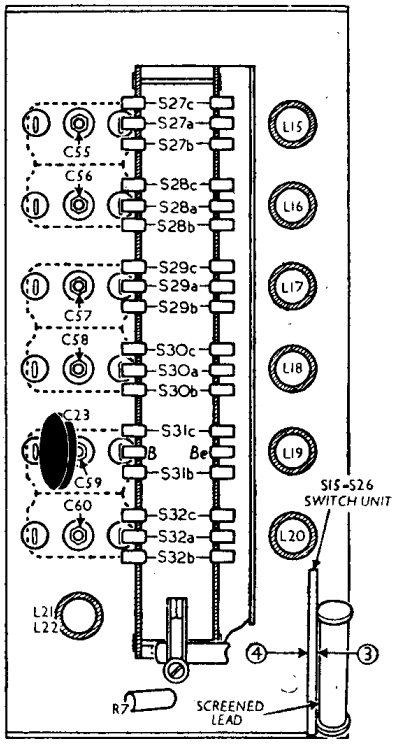
Tapped at 300Ω + 100Ω + 100Ω from V4 heater.

	OTHER COMPONENTS	Approx. Values (ohms)
L1	Aerial I.F. filter coil ...	13·0
L2	Aerial coupling coil ...	8·0
L3	Band-pass primary coils	2·5
L4		20·0
L5	Aerial S.W. coupling coil	0·3
L6	Aerial S.W. tuning coil...	Very low
L7	Band-pass secondary	2·5
L8	coils	22·0
L9	Osc. S.W. tuning coil ...	Very low
L10	Osc. M.W. tuning coil...	2·0
L11	Osc. L.W. tuning coil ...	3·0
L12	Osc. S.W. reaction ...	0·5
L13	Osc. M.W. reaction ...	1·0
L14	Osc. L.W. reaction ...	1·5
L15	Oscillator circuit press-button tuning coils ...	1·7
L16		2·0
L17		3·0
L18		3·5
L19		4·2
L20		5·2
L21	Master oscillator coils...	8·0
L22		1·5
L23	1st I.F. trans. Pri ... ... Link ... Sec. } total	4·5
L24		
L25		5·0
L26	2nd I.F. trans. Pri. ... ... Link ... Sec. } total...	4·5
L27		
L28		5·5
L29	Speaker speech coil ...	3·0
L30	H.T. smoothing choke...	410·0
L31	Mains filter chokes ...	2·5
L32		2·5
T1	Output trans. Pri. ... ... Spkr. sec. ... F.-B. sec. ...	240·0
		0·5
		25·0
S1-S14	Waveband switches ...	—
S15-S26	Manual/auto change-over switches	—
S27a, b, c to S32a, b, c	Press-button tuning switches	—
F1	0·5A fuse	—

GENERAL NOTES

Switches.—There are three sets of switch assemblies in this receiver: one for manually operated waveband switching; one, operated by the black 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-S14**, 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 below 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.



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

Switch Table

Switch	LW	MW	SW
S1	C	—	C
S2	—	C	—
S3	—	—	C
S4	—	C	C
S5	—	—	C
S6	—	C	—
S7	C	—	—
S8	—	—	C
S9	—	C	—
S10	C	—	—
S11	—	—	C
S12	—	C	C
S13	—	C	C
S14	—	—	C

The second assembly is a double-sided single rotary unit containing switches **S15-S26.** It is mounted inside the press-button tuning unit on the chassis deck, and has two positions only: Manual (when the black button is pushed in) and automatic (when the black button is released by the depression of another button).

The switches in this unit that close for manual operation are shown in our circuit diagram with a letter "**M**" in parenthesis as a suffix to their numbers, while those that close for automatic operation are followed by "**A**" in parenthesis. This performs the dual function of distinguishing these switches from the waveband switches and indicating how they operate.

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 number: **S27, S28, S29, S30, S31** and **S32** 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 **S31a,** 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 S.W. unit **L5, L6** being mounted on a panel at one end of it.

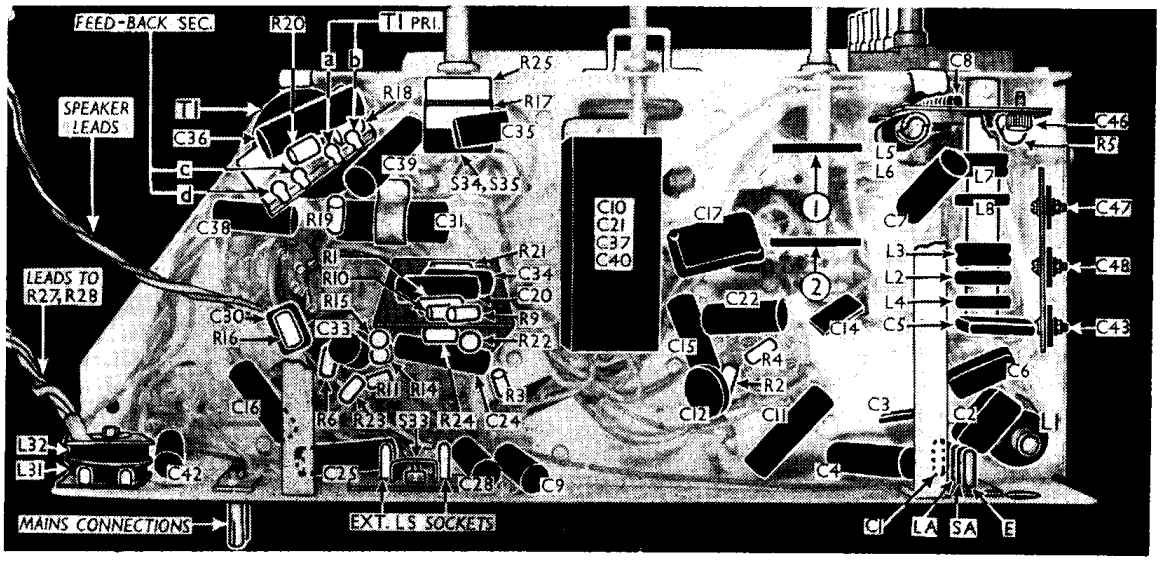
The oscillator circuit coils **L9-L14** for manual operation are in a screened unit on the chassis deck, together with trimmer and coil adjustments, accessible through holes in the front of the can, as indicated in our plan view. Holes are provided in the scale backing plate to give access to these adjustments, 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 tuning 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 M.W. coils, and **L19, L20** are L.W. coils.

L21, L22 form with **C23** 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 **S25(A), S26(M).**

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



Under-chassis view. Both sides of the small component assembly near the centre have been tilted artificially to show their contents. The tags on top of **T1** are identified by letters. Diagrams of the waveband switch units (marked **1** and **2**) are shown below in col. 5 as seen in the direction of the arrows.

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 important that the phase relationship between the primary winding and the circuit associated with 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** goes 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 (4Ω) external speaker. The thumb-screw switch permits the internal speaker to be muted if desired.

Scale Lamp.—This is an M.E.S. 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 Burghead transmitters, the I.F. was adjusted at 465 kc/s to avoid possible troublesome whistles.

In the Midland area, such receivers have a small coil added in series with **L4,** in the low potential end, and by shunting **C5** across **L2** the two together eliminate a whistle on the Luxemburg programme.

In some chassis **C12** may be located inside the **L23-L25** unit and connected directly across **L23. C8** was not shown inthe makers' information, but was present in our sample. The makers say that the value of **R5** may lie anywhere between 100,000 Ω and 250,000 Ω.

C51 may be omitted from the gang in some cases; and **R26** and **F1** may be mutually transposed, the fuse being connected directly to **V4** anode.

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 (ten cheese-head screws with lock-washers) is shown in the sketch in col. 2, where the press-button-operated switches **S27a, b, c,** to **S32a, 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, C23** being in line with these.

The manual/auto change-over switch unit **S15-S26** 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 this switch unit is a special low-capacitance screened lead carrying the connecting lead from **S19** across the face of the unit.

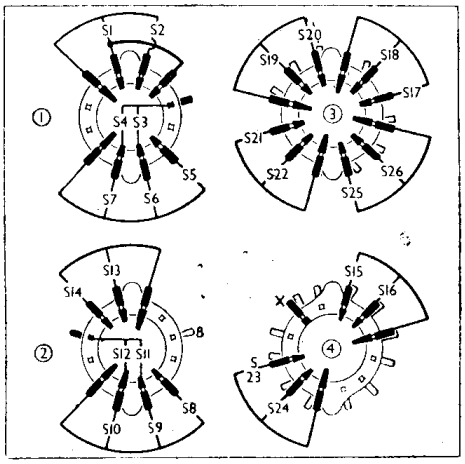
The tag marked **X** on the **4** side of the unit plays no part in the switch action, but carries a screened lead from the top of **L2** as indicated in the circuit diagram. Its purpose is not quite clear, but it is obviously provided for some special function not normally required in this model.

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 bottom (manual) button.

Setting Buttons.—Numbering the buttons from top to bottom, 1, 2, 3 and 4 are the M.W., and 5, 6 the L.W. 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 when viewed from the front. Their ranges are as follows: 1, 200-307 m; 2, 261-391 m; 3, 267-450 m; 4, 342-560 m; 5, 1,130-1,640 m; 6, 1,430-1,986 m.

Access is gained to these adjustments by removing 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 black button and tune in the required programme manually. Then press the 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 black button, check the station, then return to the station button, and finally adjust left, then right, adjustments, using the tuning indicator to indcate correct resonant point.



Diagrams of the waveband (1 and 2) and manual/auto (3 and 4) switch units.

In no case should any attempt be made to adjust the core of **L21.** Where this is believed to require adjustment, the complete automatic tuning assembly should be removed from the chassis and returned to the makers.

CIRCUIT ALIGNMENT

IF Stages.—Switch set to M.W., 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 uF 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 **L28, L26, L25** and **L23,** in that order, for maximum output. Then repeat these adjustments.

If excessive hum is encountered, reverse the mains lead to ensure that chassis is connected to the earthed side of the mains (if A.C.).

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.

S.W.—Switch set to S.W., feed in a 17 Mc/s (17.65 m) signal, tune it in, and adjust **C51** until maximum output coincides with correct calibration. Then adjust **C50** for maximum output and check calibration at 6 Mc/s (50 m).

M.W.— Switch set to M.W., tune to 200 m on scale, feed in a 200 m (1,500 kc/s) signal, and adjust **C53** for maximum output. Tune to 250 m on scale, feed in a 250 m (1,200 kc/s), signal, and adjust **C47** and **C45** 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 M.W. adjustments.

L.W.—Switch set to L.W., tune to 1,300 m on scale, feed in a 1,300 m (231 kc/s) signal, and adjust **C54** for maximum output. Then adjust **C48** and **C43** 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 L.W. adjustments.

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