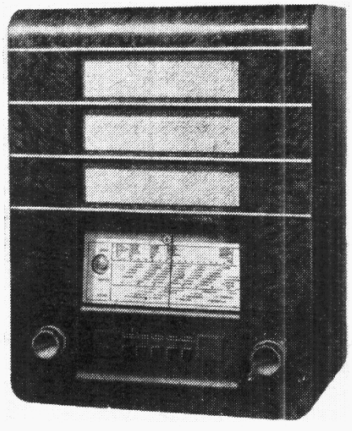
Supplement to The Wireless & Electrical Trader, September 21, 1946

"TRADER" SERVICE SHEET

786

EKCO A21

PRESS-BUTTON A.C. SUPERHET



FIVE pre-set press-buttons for three M.W. and two L.W. stations are provided in the Ekco A21. The set is a 5-valve (plus rectifier), 3-band superhet designed for A.C. mains of 200-250v, 50-100 c/s. The S.W. range is 16.7-51m.

Release date and original price: November, 1945: £16 16s plus £3 12s 3d. purchase tax.

CIRCUIT DESCRIPTION

Aerial input is via coupling coils **L2** (S.W.), **L3** (M.W.) and **L4** (L.W.) to single-tuned circuits comprising iron-dust cored coils **L5** (S.W.), **L6** (M.W.) and **L7** (L.W.), tuned manually by **C37.** I.F. filtering by **C1, L1** across aerial circuit.

For automatic tuning, **C37** is replaced by pre-set trimmer type capacitors **C45, C46, C47** (M.W.) and **C43, C44** (L.W.). Selection is achieved by press-button switches **S1a, b** to **S5a, b, x.**

These switches are coded with suffix letters to indicate their functions. They are arranged in groups, and two groups are controlled by each press-button, one group belonging to the aerial circuit and one to the oscillator circuit.

All the switches in the two groups belonging to a given press-button bear the same number, the individual switches in each group being identified by the suffix letter. If the suffix is **a, b** or **c,** the switch closes when its button is pressed; if the suffix is **x** or **y,** the switch opens when its button is pressed. Thus, if the right-hand button is pressed, **S5a, S5b** and **S5c** close, while **S5x** and **S5y** open; and **C47** and **L24** are brought into circuit, tuning the aerial and oscillator circuits to a M.W. station.

First valve **(V1, Mullard metallised ECH35)** is a triode-hexode operating as frequency changer with internal coupling. For manual operation, triode oscillator grid coils **L8** (S.W.), **L9** (M.W.) and **L10** (L.W.) are tuned by **C40.** Parallel trimming by **C39** (S.W.), **C41** (M.W.) and **C13, C42** (L.W.); series tracking by **C11** (S.W.), **C12** (M.W.) and **C14** (L.W.). Reaction coupling from anode by coils **L11** (S.W.), **L12** (M.W.) and **L13** (L.W.).

For automatic tuning, all the foregoing tuning circuits are disconnected and are replaced via **S15** and **S25** by a master oscillator unit **C16, L25, L26. L25** is shunted by one of the iron-dust cored pre-set coils **L22, L23, L24** (M.W.) or **L20, L21** (L.W.), selection being determined by switches **S1c** to **S5c, y,** as explained

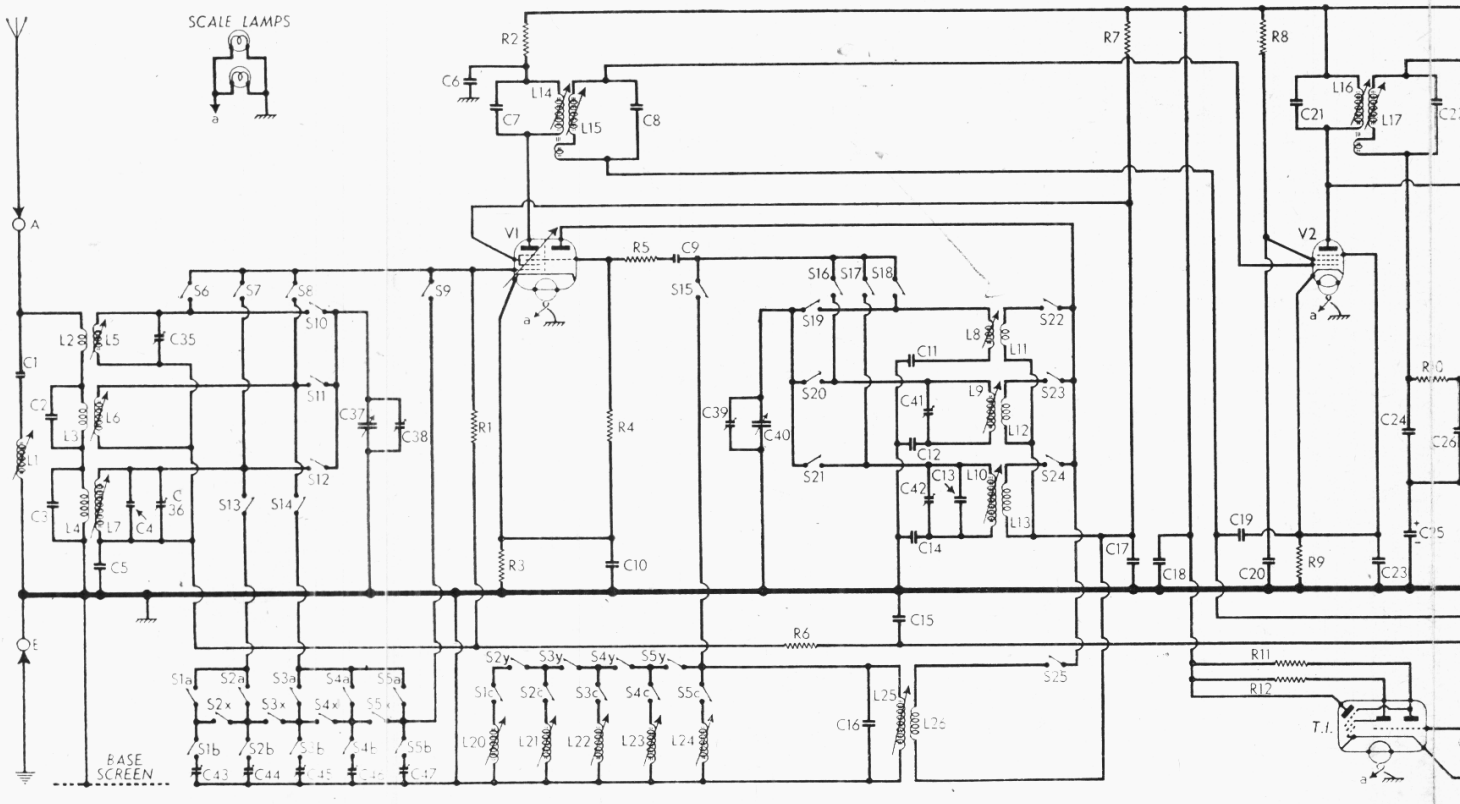
The change-over from manual to automatic tuning, and vice versa is performed at a fourth position on the waveband control when **S9, S13** and **S14** in the aerial circuit and **S15, S25** in the oscillator circuit, close, and all the other waveband switches open.

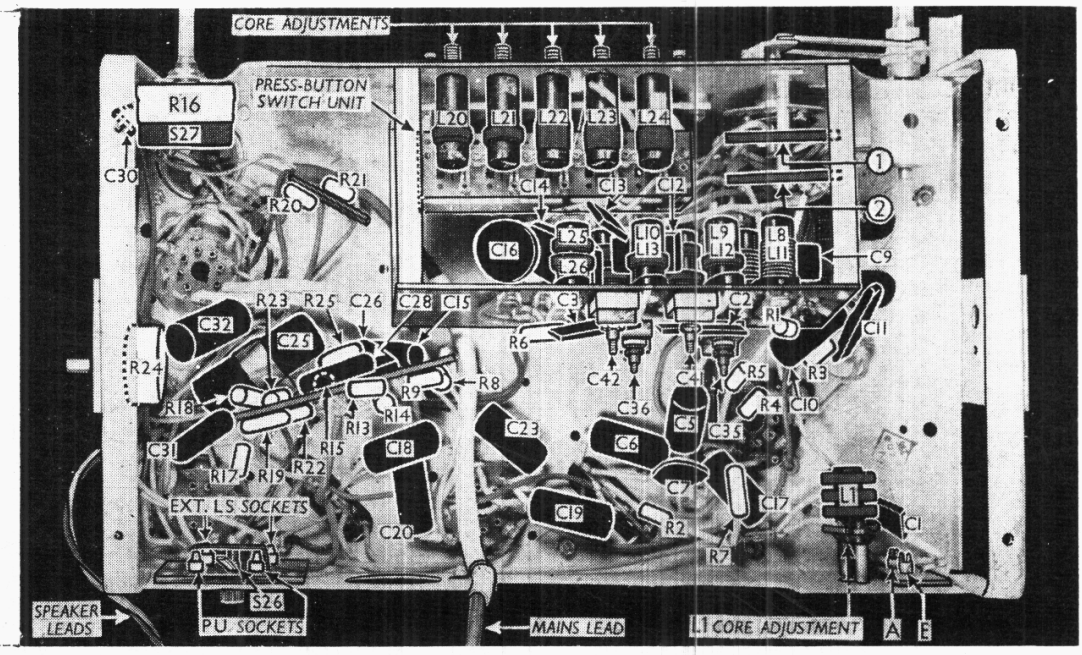
Second valve **(V2, Mullard metallised EF39)** is a variable-mu R.F. pentode operating as intermediate frequency amplifier with tuned-primary, tuned-secondary transformer couplings.

Intermediate frequency 477 kc/s.

Diode second detector is part of double diode output pentode valve **(V3, Mullard EBL31).** Audio frequency component in rectified output is developed across load resistor **R15** and passed via coupling capacitor **C28** and manual volume control **R16** to control grid of pentode section.

I.F. filtering by **C24, R10, C26.** High note compensation by **C30** between the





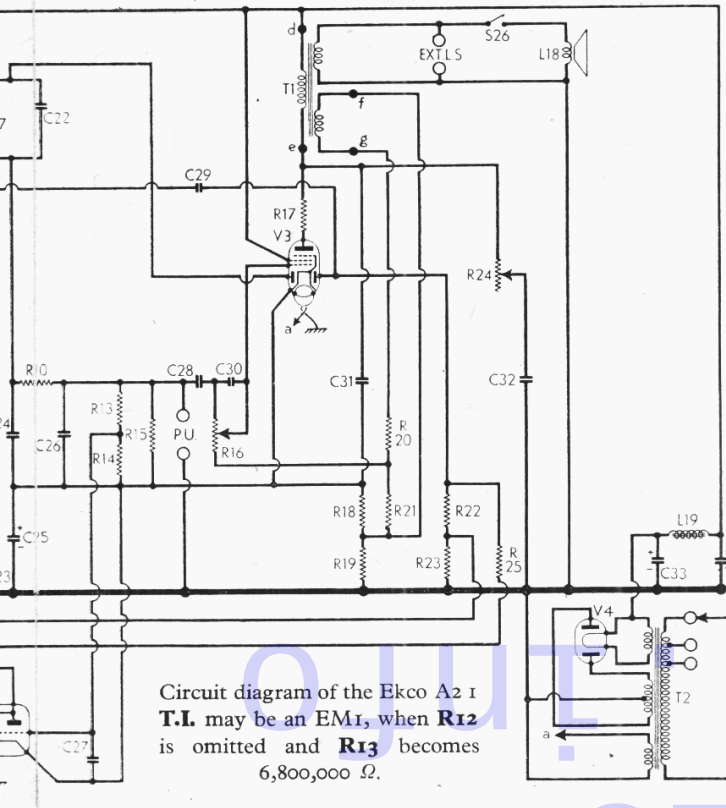
Under-chassis view. The waveband switch units (**1** and **2** in circles) and the press-button switch unit are indicated in the tuning assembly, which can be removed as is explained overleaf. All these units are shown in illustrations overleaf, the reverse side of the tuning assembly being given to show components not visible in this illustration.

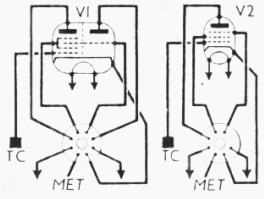
top of **R16** and its slider. D.C. potential developed across **R15** appears also across the potential divider **R13, R14,** from the lower section of which it is tapped off and applied as control voltage to cathode ray tuning inductor **(T.I., Mullard EM34).**

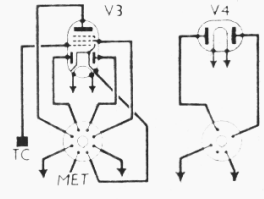
Second diode of **V3,** fed from **V2** anode via **C29,** provides D.C. potentials which are developed across load resistors **R22, R23** and fed back through decoupling circuits as G.B. to F.C. and I.F. valves, giving automatic volume control. Delay voltage, together with G.B. for pentode section, is obtained from the drop along resistors **R18, R19** in **V3** cathode circuit.

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 which are developed across the potential divider **R20, R21** and fed into the low potential end of **V3** C.G. circuit. Fixed tone correction by **C31,** and variable tone control by **R24** and **C32** in pentode anode circuit.

H.T. current is supplied by full-wave rectifying valve **(V4, Mullard AZ31).** Smoothing by iron-cored choke **L19** and electrolytic capacitors **C33, C34.**







Circuit diagram of the Ekco A21 **T.I.** may be an EM1, when **R12** is omitted and **R13** becomes 6,800,000 Ω.

COMPONENTS AND VALUES

	CAPACITORS	Values (μF)
C1	Aerial I.F. filter tuning ...	0·000039
C2	Aerial M.W. shunt ...	0·00033
C3	Aerial L.W. shunt ...	0·00082
C4	Aerial L.W. fixed trimmer	0·000082
C5	V1 hex. C.G. decoupling...	0·1
C6	V1 hex. anode decoupling	0·1
C7	1st I.F. transformer fixed	0·00015
C8	1st I.F. transformer tuning capacitors ...	0·00015
C9	V1 osc. C.G. capacitor ...	0·000068
C10	V1 cathode by-pass ...	0·1
C11	Osc. circ. S.W. tracker ...	0·0039
C12	Osc. circ. M.W. tracker ...	0·00056
C13	Osc. L.W. fixed trimmer...	0·0002
C14	Osc. circ. L.W. tracker ...	0·00033
C15	A.V.C. line decoupling ...	0·02
C16	Master oscillator tuning...	0·00027
C17	V1 osc. anode and S.G. decoupling	0·1
C18	H.T. circuit R.F. by-pass	0·1
C19	V2 C.G. decoupling ...	0·05
C20	V2 S.G. decoupling ...	0·1
C21	2nd I.F. transformer fixed	0·00015
C22	2nd I.F. transformer tuning capacitors ...	0·00015
C23	V2 cathode by-pass ...	0·1
C24	I.F. by-pass capacitor ...	0·00012
C25*	V3 cathode by-pass ...	50·0
C26	I.F. by-pass capacitor ...	0·0001
C27	T.I. C.G. decoupling ...	0·1
C28	A.F. coupling to V3 pent.	0·02
C29	V3 A.V.C. diode coupling	0·000015
C30	Treble boost capacitor ...	0·000039
C31	Fixed tone corrector ...	0·0025
C32	Part variable tone control	0·04
C33*	H.T. smoothing capacitors	8·0
C34*	H.T. smoothing capacitors	16·0
C35‡	Aerial S.W. trimmer ...	—
C36‡	Aerial L.W. trimmer ...	—
C37†	Aerial circuit tuning ...	—
C38‡	Aerial M.W. trimmer ...	—
C39‡	Osc. circ. S.W. trimmer...	—
C40†	Oscillator circuit tuning...	—
C41‡	Osc. circ. M.W. trimmer...	—
C42‡	Osc. circ. L.W. trimmer...	—
C43‡	Aerial circuit press-button tuning trimmers ...	0·00044
C44‡		0·00027
C45‡		0·00055
C46‡		0·0004
C47‡		0·00013

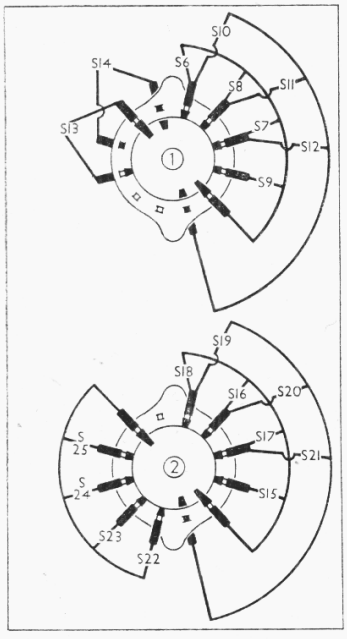
* Electrolytic. † Variable. ‡ Pre-set.

	RESISTORS	Values (ohms)
R1	V1 hex. C.G. resistor ...	1,800,000
R2	V1 hex. anode decoupling	1,500
R3	V1 fixed G.B. resistor ...	220
R4	V1 osc. C.G. resistor ...	47,000
R5	V1 osc. C.G. stabiliser ...	220
R6	A.V.C. line decoupling ...	100,000
R7	V1 osc. anode and SG.. H.T. feed	27,000
R8	V2 S.G. H.T. feed ...	68,000
R9	V2 fixed G.B. resistor ...	220
R10	I.F. stopper	47,000
R11	T.I anode load resistors...	6,800,000
R12	T.I anode load resistors...	1,500,000
R13	T.I C.G. feed potential	1,000,000
R14	T.I C.G. feed potential divider	1,000,000
R15	V3 signal diode load ...	680,000
R16	Manual volume control ...	1,000,000
R17	V3 pent. anode stopper...	47
R18	V3 pent. G.B. and A.V.C.	150
R19	V3 pent. G.B. and A.V.C. delay resistors	180
R20	Feed-back coupling	47,000
R21	Feed-back coupling potential divider ...	12,000
R22	V3 A.V.C. diode load	560,000
R23	V3 A.V.C. diode load resistors	470,000
R24	Variable tone control ...	20,000
R25	A.V.C. line decoupling ...	1,000,000

	OTHER COMPONENTS	Approx. Values (ohms)
L1	Aerial I.F. filter coil ...	15·0
L2	Aerial coupling coils ...	0·1
L3	Aerial coupling coils ...	9·5
L4	Aerial coupling coils ...	33·0
L5	Aerial S.W. tuning coil ...	very low
L6	Aerial M.W. tuning coil ...	2·0
L7	Aerial L.W. tuning coil ...	23·0
L8	Osc. S.W. tuning coil ...	very low
L9	Osc. M.W. tuning coil ...	2·5
L10	Osc. L.W. tuning coil ...	3·5
L11	Osc. S.W. reaction coil ...	0·25
L12	Osc. M.W. reaction coil ...	0·4
L13	Osc. L.W. reaction coil ...	0·6
L14	1st I.F. trans. Pri. ...	5·0
L15	1st I.F. trans. Sec. ...	5·0
L16	2nd I.F. trans. Pri.	5·0
L17	2nd I.F. trans. Sec. ...	5·0
L18	Speaker speech coil ...	2·6
L19	H.T. smoothing choke ...	700·0
L20	Oscillator circuit press-button tuning coils ...	6·4
L21	Oscillator circuit press-button tuning coils ...	5·7
L22	Oscillator circuit press-button tuning coils ...	4·5
L23	Oscillator circuit press-button tuning coils ...	3·6
L24	Oscillator circuit press-button tuning coils ...	2·0
L25	Master oscillator coils ...	8·5
L26	Master oscillator coils ...	5·0
T1	Output trans. Pri.	350·0
	Output trans. Spkr. sec.	0·5
	Output trans. F.-B. sec.	42·0
T2	Mains trans. Pri., total ...	45·0
	Mains trans. Heater sec. ...	0·1
	Mains trans. Rect. heat. sec.	0·2
	Mains trans. H.T. sec., total	760·0
S1a, b, to S5a, b, x	Aerial circuit press-button switches	—
S1c, to S5c, y	Oscillator circuit press-button switches ...	—
S6-S25	Waveband switches ...	—
S26	Int. speaker switch ...	—
S27	Mains switch, ganged R16	—

DISMANTLING THE SET

Removing Chassis.—Remove the three control knobs (recessed grub-screws); remove the wavechange knob retaining spring from its spindle (taking care not to lose it) and slide off the wave-change knob; remove the four cheese-head fixing bolts holding the chassis to the bottom of the cabinet;

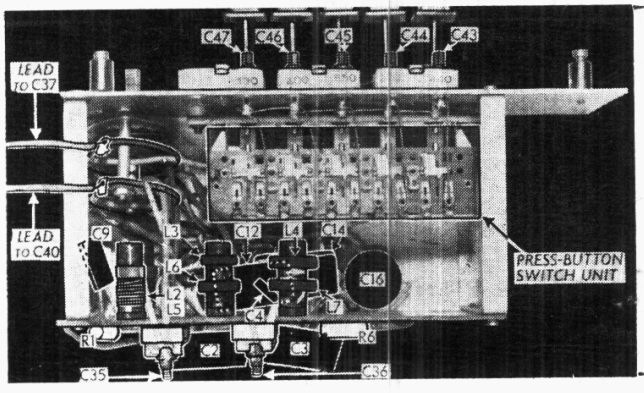


Diagrams of the waveband and manual/auto change switch units, drawn as seen from the rear of an inverted chassis.

the chassis may now be withdrawn to the extent of the speaker leads, which is sufficient for normal purposes.

Removing Speaker.—Loosen the four nuts on the speaker retaining clamps; support the speaker with one hand, and swivel the clamps out of the way with the other. *When replacing*, the connecting panel should be on the right.

Removing Tuning Assembly.—Unsolder from the gang the two leads emerging from holes in the chassis deck beneath it; inverting the chassis, unsolder from the connecting panel on the rear of the tuning assembly the remaining nine leads connecting it to the chassis. These are indicated in our sketch in cols. 5 and 6; turn the waveband switch fully anti-clockwise and slacken the grub-screw in the link on the waveband switch spindle; turn the waveband switch fully clockwise and remove the two cheese-head fixing screws holding the assembly to the front chassis member, taking care not to lose the spacing collars. *When replacing*, do not omit to thread the gang leads through the respective holes in the chassis deck, and to engage the waveband switch spindle in the coupling link; connect the nine leads to the rear panel as indicated in our sketch of the assembly.



The reverse side of the tuning assembly, which faces the underside of the chassis deck. Several components seen here are not visible in our under-chassis view overleaf. A rear view appears at the foot of Col. 6.

VALVE ANALYSIS

Valve voltages and currents given in the table below are those quoted in the maker's manual. Voltages were measured with a meter having an internal resistance of 1,000 ohms per volt, whose negative lead was connected to chassis. The total H.T. current is given as 58 mA.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 ECH35	250	3·6	100	2·9
	Oscillator			
	100	3·3		
V2 EF39	255	7·5	104	2·3
V3 EBL31	240	34·7	255	3·3
V4 AZ31	295†	—	—	—
T.I. EM34	—*	0·04	(Pin 3)	—
	—*	0·16	(Pin 6)	—
	Target			
	255	1·5	(Pin 5)	—

* No appreciable reading † Each anode, A.C.

GENERAL NOTES

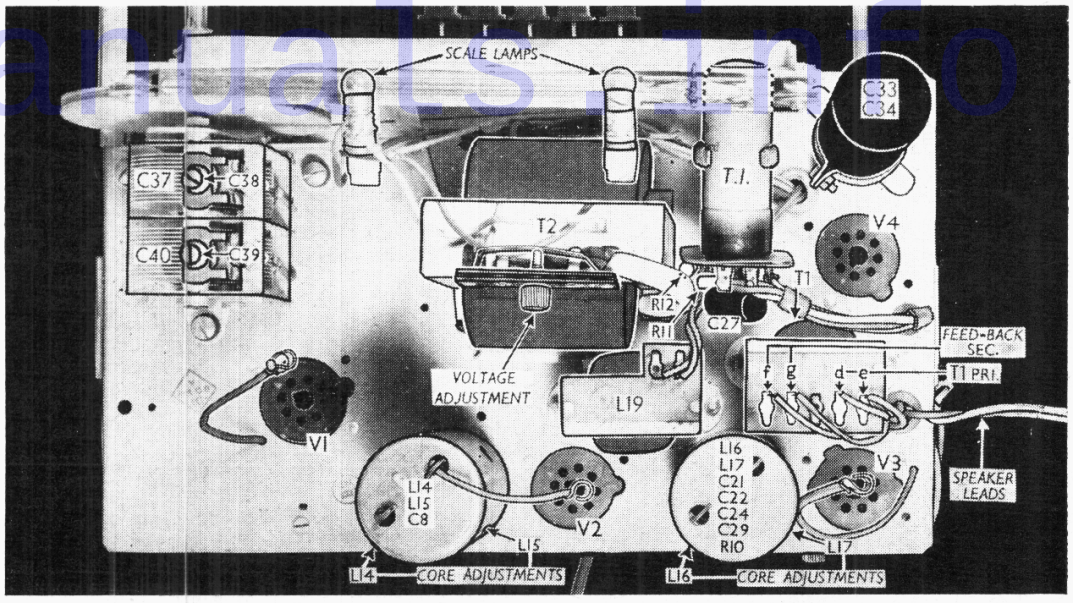
Tuning Assembly.—All the waveband and press-button switches, coils and trimmers are mounted on a removable assembly which is fitted beneath the chassis deck. The assembly is indicated in our under-chassis view, where only one side of it can be seen, and shown in cols. 1 and 2 below, where the other side is seen. Its rear panel is shown in the sketch in col. 6, where the various trimming adjustments are identified. Instructions for removing the assembly are given under "Dismantling the Set."

Switches.—S1-S5 are the press-button switches, all mounted on the press-button unit. They are arranged in groups, all the switches in one group being associated with one press-button and all bearing the same number. Of these, as explained under "Circuit Description," the individual switches each bear a suffix letter **a, b** or **c** to indicate that it closes when its button is pressed; or **x** or **y** to indicate that it opens. Both sides of the switch unit are shown in the diagrams in col. 4.

S6-S25 are the waveband and manual/auto change-over switches, ganged in two rotary units in the tuning assembly beneath the chassis. These are indicated in our chassis illustrations, and shown in detail in the diagrams in col. 2, where they are drawn as seen when viewed from the rear of an inverted chassis.

The table below gives the switch positions for the four control settings, start-

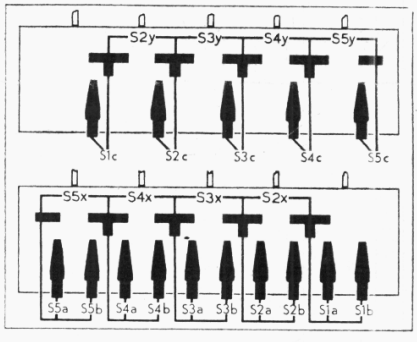
Switch	Auto	L.W.	M.W.	S.W.
S6	—	—	—	c
S7	—	c	—	—
S8	—	—	c	—
S9	c	—	—	—
S10	—	—	—	c
S11	—	—	c	—
S12	—	c	—	—
S13	c	—	—	—
S14	c	—	—	—
S15	c	—	—	—
S16	—	—	c	—
S17	—	c	—	—
S18	—	—	—	c
S19	—	—	—	c
S20	—	—	c	—
S21	—	c	—	—
S22	—	—	—	c
S23	—	—	c	—
S24	—	c	—	—
S25	c	—	—	—



Plan view of the chassis. **T.I.** is an EM34 but it may be an EM1. When it is, **R12** is omitted, and **R13** becomes 6,800,000 Ω. The primary and feed-back secondary tags are identified on **T1** to agree with the circuit diagram overleaf.

ing from the fully anti-clockwise position of the control knob. A dash indicates open, and **C,** closed.

S26 is the screw-type internal speaker muting switch. It opens when unscrewed. **S27** is the Q.M.B. mains switch, ganged with the volume control **R16.**



Both sides of the press-button switch unit, as seen from the rear. *Above*, the side seen in our under-chassis view overleaf; *below*, the upper side, facing the chassis deck.

Scale Lamps.—These are two M.E.S. type lamps rated at 6.5 V, 0.35 A.

External Speaker.—Two sockets are provided at the rear of the chassis for a low-impedance (about 3 Ω) external speaker. The internal speaker may be muted by unscrewing **S26.**

Drive Cord Replacement

The centre of a 46in length of cord should first be tied by a clove hitch knot to the top of the cursor. With the gang at maximum, adjust the drive drum so that the gap in its rim is at about 4 o'clock, when viewed from the front, and hold the cursor steady so that it covers the vertical lines at the high-wavelength ends of the S.W. and M.W. scales.

Now pass the right-hand cord length over the right-hand pulley on the scale assembly, downwards to the groove in the control spindle, glancing the groove on the rim of the drive drum in passing, and round the control spindle one and a half times in a clockwise direction; then take it up the groove on the left of the drive drum and round it, through the gap in the rim, and tie off on a small eyelet which hooks to the end of the tension spring.

Take the left-hand length of cord over the left-hand pulley on the scale, then down diagonally to the drive drum, under it and up along its groove in an anti-clockwise direction to the gap, through the gap and tie off on another eyelet, which hooks on to the spring with the first eyelet.

The cursor should take up the position given previously when the gang is at maximum. When the gang is at minimum, the pointer should cover the vertical lines at the other ends of the scales. It can be adjusted within small limits by freeing the drum on the gang spindle and turning the drum.

CIRCUIT ALIGNMENT

I.F. Stages.—Connect signal generator leads via a 0.01μF capacitor to control grid (top cap) of **V1** and chassis, turn the volume and tone controls fully clockwise and tune to 560 m on scale. Feed in a 477 kc/s (628.93 m) signal, and adjust the cores of **L14, L15, L16** and **L17** in turn for maximum output.

I.F. Filter.—Transfer signal generator leads to **A** and **E** sockets, via a suitable dummy aerial. Feed in a 477 kc/s signal, and adjust the core of **L1** for minimum output.

R.F. and Oscillator Stages.—With the gang at maximum, the pointer should cover the line terminating the M.W. scale at 560 m. It may be adjusted if the fixing screws in the drive wheel bush are slackened.

Before commencing M.W. alignment, switch set to S.W., feed in a 20 m (15 Mc/s) signal tune it in, and adjust **C39** to obtain correct calibration. To check accuracy of setting find the image at 21.4 m. If it does not appear re-adjust **C39** until signal and image appear in their correct positions.

M.W.—Switch set to M.W., tune to 250 m on scale, feed in a 250 m (1,200 kc/s) signal, and adjust **C41** for maximum output. Feed in a 500 m (600 kc/s) signal, tune it in, and adjust the core of **L9** for maximum output. Readjust trimmer and coil in turn until calibration is correct. Tune to 230 m on scale, feed in a 230 m (1,304 kc/s) signal, and adjust **C38** for maximum output.

S.W.—Having already adjusted the oscillator circuit as explained earlier, switch set to S.W., tune to 20 m on scale, feed in a 20 m (15 mc/s) signal, and adjust **C35** for maximum output.

L.W.—Switch set to L.W., tune to 1,300 m on scale, feed in a 1,300 m (230.8 kc/s) signal, and adjust **C42,** then **C36,** for maximum output. Tune to 1,700 m on scale, feed in a 1,700 m (176.5 kc/s) signal, and adjust the core of **L10** to correct calibration, then the core of **L7** for maximum output, and repeat these adjustments until no improvement can be obtained.

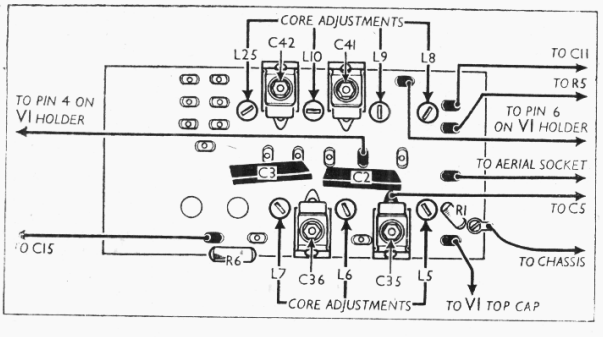
Press-Button Setting

Remove the escutcheon surrounding the press-buttons (two screws) at the front of the cabinet, exposing the adjusting screws above and below the button plungers. Numbering the buttons from left to right, their ranges are: 1, 1,430-1,986 m; 2, 1,160-1,640 m; 3, 342-560 m; 4, 267-450 m; 5, 200-308 m.

Having selected the button to be reset, tune in the required station manually to identify it (or feed in the correct signal from a signal generator to **A** and **E** sockets), turn the wave-band switch to the auto position (white dot), unscrew the lower adjustment as far as it will go without the use of force, using the double-ended tool provided with the receiver.

Now depress the button, and screw up the lower adjustment again slowly until the signal is heard, then adjust the upper and lower adjustments in turn for maximum output, using the tuning indicator as an output meter.

When the adjustments are completed, slide the appropriate station label into its slot, and replace the trimming tool in the clip provided for it on the back cover of the receiver.



Sketch showing the connecting panel at the rear of the tuning assembly, showing the connecting points for the nine leads. It is drawn as seen in an inverted chassis.

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