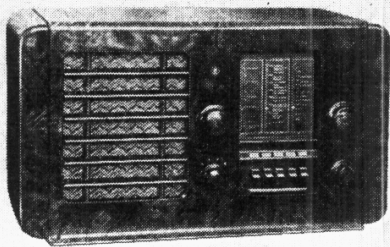


"TRADER" SERVICE SHEET

827

EKCO U49

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



PRESS-BUTTON tuning for five stations is a feature of the Ekco U49, a 4-valve (plus rectifier) 3-band superhet designed to operate from A.C. or D.C. mains of 200-250 V, 40-100 c/s in the case of A.C. The S.W. range is 15-50 m, and there is provision for the reception of the television sound programme.

Release date and original price: July, 1947; £23 2s, plus £4 19s 4d purchase tax.

CIRCUIT DESCRIPTION

Aerial input is via coupling coils **L2** (S.W.), **L3** (M.W.) and **L4** (L.W.) to single-tuned circuits **L5** (S.W.), **L6** (M.W.) and **L7** (L.W.), tuned manually by **C50**.

Provision is made for reception of the television sound channel (T.S.), which is tuned by **L8, C9** in the aerial circuit and coupled via **L2, L5** to the aerial. A second harmonic is used in the oscillator circuit, the receiver being tuned to 14.62 m.

For automatic tuning, **C50** is replaced by pre-set trimmer type capacitors **C57, C58, C59** (M.W.) and **C55, C56** (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, and are arranged in groups. Two groups are controlled by each press-button, one belonging to the aerial circuit and one to the oscillator.

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, c** or **d**, the switch closes when its button is pressed; if the suffix is **x**, the switch opens. When the button is released (by pressing another button) its **a, b, c, d** switches open, and its **x** switch closes.

First valve (**V1, Mullard metallized CCH35**) is a triode-hexode operating as frequency changer with internal coupling. For manual operation, triode oscillator anode coils **L12** (S.W.), **L13** (M.W.) and **L14** (L.W.) are tuned by **C54**. Parallel trimming by **C51** (S.W.), **C17, C52** (M.W.) and **C18, C53** (L.W.); series tracking by **C16** (S.W.), **C19** (M.W.) and **C20** (L.W.).

For automatic tuning, all the foregoing circuits are disconnected and replaced, via **S20** and **S26**, by one of the iron-dust cored pre-set coils **L23** to **L27**, which are tuned by fixed capacitors **C22, C23** in series, selection being determined by switches **S1c, d** to **S5c, d** as explained previously.

The change-over from manual to automatic tuning is performed at a fourth position on the waveband control, when **S11, S15** and **S16** in the aerial circuit, and **S20, S26** in the oscillator circuit, close, and all other waveband switches open.

Second valve (**V2, Mullard metallized EF39**) is a variable-mu R.F. pentode operating as I.F. amplifier.

Intermediate frequency 460 kc/s.

Diode second detector is part of double diode triode valve (**V3, Mullard metallized EBC33**). Audio-frequency component in rectified output is developed across load resistor **R15** and passed via A.F. coupling capacitor **C34** and manual volume control **R18** to C.G. of triode section, which oper-

ates as A.F. amplifier. I.F. filtering by **C30, R14** and **C31** in diode circuit, **R17** in triode C.G. circuit, and **C37** in triode anode circuit.

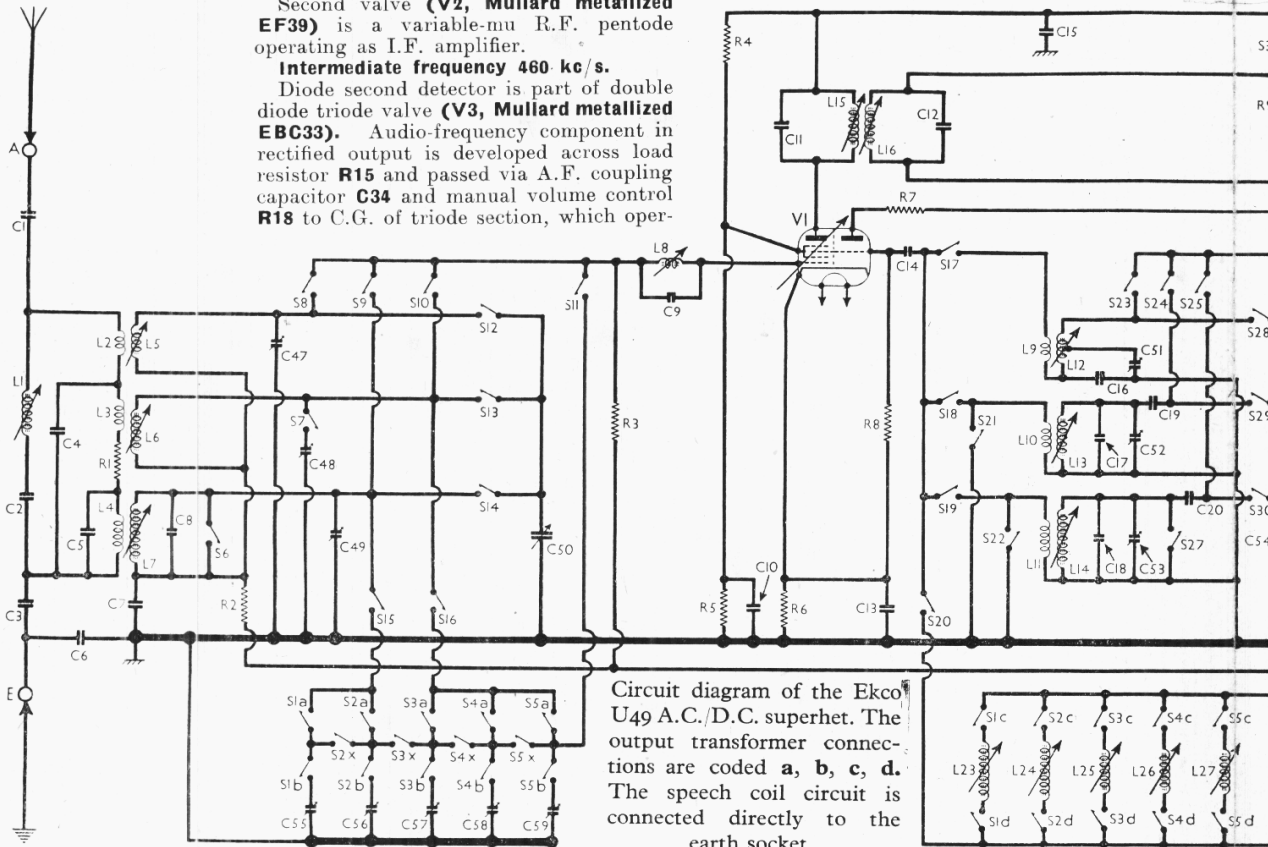
Second diode of **V3**, fed from **V2** anode via **C33**, provides D.C. potential which is developed across load resistors **R24, R25**, and used for A.V.C. purposes.

Resistance-capacitance coupling by **R22, C38** and **R27**, via I.F. stopper **R26**, between **V3** triode and pentode output valve (**V4, Mullard CL33**). Fixed tone correction in pentode anode circuit by **C39**, and provision for connection of low impedance external speaker across the speech coil secondary of **T1**. A further winding on this transformer provides output voltages which are stepped down by the potential divider network of **R32, R33** and **R19**, and those appearing across **R19** are fed back in negative phase to **V3** triode grid circuit.

Four-position tone control by **C35, R16** and **S32, S33** in **V3** triode grid circuit, and by **R35, S35** and **S36, S34, R34, C41** in the negative feed-back circuit.

When the receiver is operated from A.C. mains, H.T. current is supplied by I.H.C. half-wave rectifying valve (**V5, Mullard CY31**), which, with D.C. mains, behaves as a low resistance.

Valve heaters, together with adjustable ballast resistor **R28** and scale lamps, are



Circuit diagram of the Ekco U49 A.C./D.C. superhet. The output transformer connections are coded **a, b, c, d**. The speech coil circuit is connected directly to the earth socket.

connected in series across mains input, while a filter circuit, comprising chokes **L21, L22** and capacitors **C43, C44** suppresses mains-borne interference.

COMPONENTS AND VALUES

RESISTORS		Values (ohms)
R1	Aerial damping ...	330
R2	V1 hex. C.G. decoupling ...	100,000
R3	V1 hex. C.G. resistor ...	4,700,000
R4	V1 S.G. H.T. potential divider ...	33,000
R5	V1 S.G. H.T. potential divider ...	33,000
R6	V1 fixed G.B. resistor ...	270
R7	V1 osc. anode stabiliser ...	15
R8	V1 osc. C.G. resistor ...	47,000
R9	V1 osc. anode H.T. feed resistors ...	47,000
R10	V2 S.G. H.T. feed ...	100,000
R11	V2 H.T. decoupling ...	2,200
R12	V2 fixed G.B. resistor ...	330
R13	L.F. stopper ...	47,000
R14	V3 signal diode load ...	220,000
R15	Tone control resistor ...	68,000
R16	L.F. stopper ...	220,000
R17	Manual volume control ...	1,000,000
R18	Feedback coupling resistor ...	680
R19	V3 fixed G.B. resistor ...	1,000
R20	V3 triode H.T. decoupling ...	10,000
R21	V3 triode anode load ...	47,000
R22	A.V.C. line decoupling ...	1,500,000
R23	V3 A.V.C. diode load resistors ...	220,000
R24	V3 A.V.C. diode load resistors ...	1,500,000
R25	L.F. stopper ...	47,000
R26	V4 C.G. resistor ...	220,000
R27	Heater ballast resistor ...	783
R28*	V5 surge limiter ...	47
R29	V4 G.B. resistor ...	150
R30	V4 anode stopper ...	100
R31	Part feed-back potential divider ...	15,000
R32	Part feed-back potential divider ...	47,000
R33	Tone control resistors ...	330
R34	Tone control resistors ...	47,000
R35	Scale lamp shunt ...	209
R36	Scale lamp shunt ...	209

* Tapped at 583 Ω + 100 Ω + 100 Ω from V5 heater.

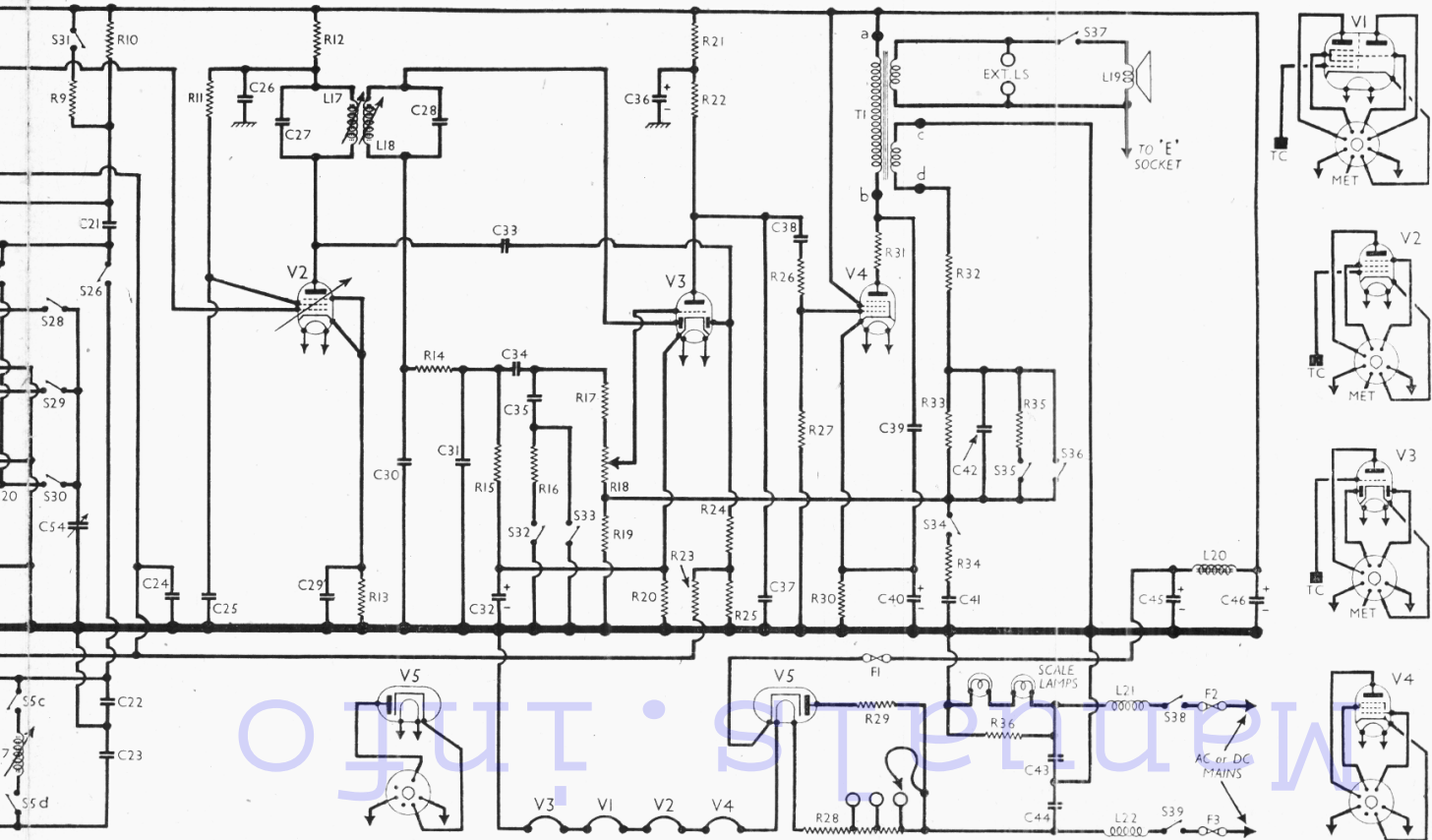
CAPACITORS		Values (μ F)
C1	Aerial isolator ...	0-0025
C2	Aerial I.F. filter tuning ...	0-00015
C3	Earth isolator ...	0-1
C4	Aerial M.W. shunt ...	0-00047
C5	Aerial L.W. shunt ...	0-00082
C6	Earth isolator ...	0-1
C7	V1 hex. C.G. decoupling ...	0-05
C8	Aerial L.W. fixed trimmer	0-000015
C9	T.S. channel tuning capacitor ...	0-00002
C10	V1 S.G. decoupling ...	0-1
C11	1st I.F. transformer fixed tuning capacitors ...	0-00015
C12	1st I.F. transformer fixed tuning capacitors ...	0-00015
C13	V1 cathode by-pass ...	0-1
C14	V1 osc. C.G. capacitor ...	0-000047
C15	H.T. circuit R.F. by-pass ...	0-1
C16	Osc. circ. S.W. tracker ...	0-0047
C17	Osc. M.W. fixed trimmer ...	0-000015
C18	Osc. L.W. fixed trimmer ...	0-000082
C19	Osc. circ. M.W. tracker ...	0-0006
C20	Osc. circ. L.W. tracker ...	0-00024
C21	V1 osc. anode coupling ...	0-0001
C22	Osc. circuit auto-tuning capacitors ...	0-00082
C23	Osc. circuit auto-tuning capacitors ...	0-00033
C24	V2 C.G. decoupling ...	0-05
C25	V2 S.G. decoupling ...	0-1
C26	V2 H.T. feed decoupling ...	0-1
C27	2nd I.F. transformer fixed tuning capacitors ...	0-0001
C28	2nd I.F. transformer fixed tuning capacitors ...	0-00022
C29	V2 cathode by-pass ...	0-1
C30	I.F. by-pass capacitors ...	0-0001
C31	I.F. by-pass capacitors ...	0-0001
C32*	V3 cathode by-pass ...	25-0
C33	V3 A.V.C. diode coupling ...	0-0001
C34	A.F. coupling to V3 C.G. ...	0-02
C35	Tone control capacitor ...	0-002
C36*	V3 triode H.T. decoupling ...	4-0
C37	L.F. by-pass capacitor ...	0-0003
C38	A.F. coupling to V4 C.G. ...	0-05
C39	Fixed tone corrector ...	0-0025
C40*	V4 cathode by-pass ...	25-0
C41	Tone control capacitors ...	0-25
C42	Tone control capacitors ...	0-1
C43	Mains R.F. by-pass capacitors ...	0-1
C44	Mains R.F. by-pass capacitors ...	0-1

* Electrolytic.

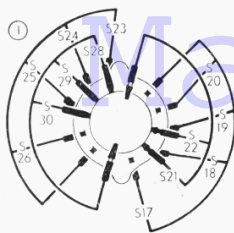
CAPACITORS (continued)		Values (μ F)
C45*	H.T. smoothing capacitors	8-0
C46*	H.T. smoothing capacitors	24-0
C47†	Aerial S.W. trimmer ...	—
C48†	Aerial M.W. trimmer ...	—
C49†	Aerial L.W. trimmer ...	—
C50†	Aerial circuit tuning ...	—
C51†	Osc. circ. S.W. trimmer ...	—
C52†	Osc. circ. M.W. trimmer ...	—
C53†	Osc. circ. L.W. trimmer ...	—
C54†	Oscillator circuit tuning ...	—
C55‡	Aerial circuit press-button tuning trimmers	0-00055
C56‡	Aerial circuit press-button tuning trimmers	0-00027
C57‡	Aerial circuit press-button tuning trimmers	—
C58‡	Aerial circuit press-button tuning trimmers	—
C59‡	Aerial circuit press-button tuning trimmers	—

* Electrolytic † Variable. ‡ Pre-set.

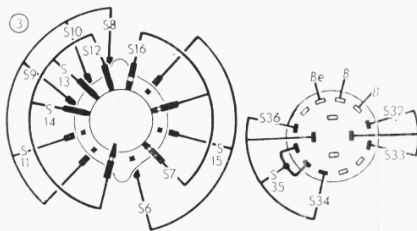
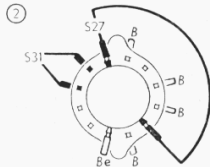
OTHER COMPONENTS		Approx. Values (ohms)
L1	Aerial I.F. filter coil ...	7-9
L2	Aerial S.W. coupling coil ...	0-14
L3	Aerial M.W. coupling coil ...	9-6
L4	Aerial L.W. coupling coil ...	31-0
L5	Aerial S.W. tuning coil ...	0-04
L6	Aerial M.W. tuning coil ...	4-5
L7	Aerial L.W. tuning coil ...	23-0
L8	T.S. channel coil ...	0-03
L9	Osc. S.W. reaction coil ...	0-18
L10	Osc. M.W. reaction coil ...	1-0
L11	Osc. L.W. reaction coil ...	4-4
L12	Osc. S.W. tuning coil ...	0-05
L13	Osc. M.W. tuning coil ...	2-4
L14	Osc. L.W. tuning coil ...	4-5
L15	1st I.F. trans. { Pri. ...	8-1
L16	1st I.F. trans. { Sec. ...	8-1
L17	2nd I.F. trans. { Pri. ...	14-0
L18	2nd I.F. trans. { Sec. ...	6-5
L19	Speaker speech coil ...	2-5
L20	H.T. smoothing choke ...	340-0
L21	Mains R.F. filter chokes ...	1-5
L22	Mains R.F. filter chokes ...	1-5
L23	Mains R.F. filter chokes ...	3-6
L24	Oscillator circuit press-button tuning coils ...	3-6
L25	Oscillator circuit press-button tuning coils ...	3-8
L26	Oscillator circuit press-button tuning coils ...	3-3
L27	Oscillator circuit press-button tuning coils ...	1-7



Radio



Diagrams of the three waveband (left) and the tone control (right) switch units, as seen from the rear of an inverted chassis. The associated table is on the right, near the foot of col. 3.



the 220-230 V tapping on the heater ballast resistor. Voltages were measured on the 400 V scale of a model 7 Universal Avometer, chassis being the negative connection.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 CCH35	180	0.9	55	1.7
	67	2.1		
V2 EF39	168	3.6	52	1.0
V3 EBC33	72	1.5		
V4 CL33	170	40.0	180	5.2
V5 CY31†	—	—	—	—

† Cathode to chassis, 200 V, D.C.

DISMANTLING THE SET

Removing Chassis.—Remove the four control knobs (recessed grub screws); from the underside of the cabinet remove the four self-threading screws securing the plastic chassis bolt covers to the underside of the cabinet; remove the four 2BA cheese-head bolts which are now exposed, and slide out the chassis to the extent of the speaker leads. **When replacing,** do not omit to cover the heads of the exposed control knob grub screws with a suitable insulating compound.

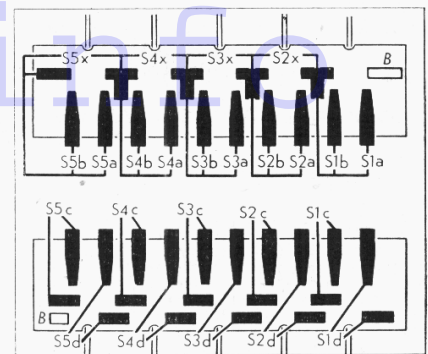
Removing Speaker.—Loosen the nuts of the four speaker retaining clamps; support the speaker with one hand, and swivel the clamps out of the way with the other. **When replacing,** the connecting panel should be at the bottom.

GENERAL NOTES

Switches.—S1a, b, c, d to S5a, b, c, d and x are the automatic tuning switches, operated by the five press-buttons. They are on the two sides of the press-button switch unit, which is indicated in our under-chassis view and shown in detail in the diagrams (col. 3), where the upper diagram shows the side seen in our photograph, and the lower one the other side as it is seen when the unit is freed and turned over on its connecting leads.

The unit is freed by removing the three nuts and bolts (with spacing collars) holding it to the front chassis member, but the outer L.W. press-button knob must be removed (by heating plunger stem with a soldering iron) before the unit can be extracted. The action of the switches is explained under "Circuit Description."

S6-S31 are the waveband and manual/auto change-over switches, ganged in three rotary units beneath the chassis. These are indicated in our under-chassis view and the separate illustration of the coil assembly, and they are shown in detail in the diagrams in col. 1, where they are drawn as seen from the rear of an inverted chassis. The table below gives the switch positions for the four control settings, starting from the fully anti-clockwise position of the



Diagrams showing both sides of the press-button switch unit. Above, as seen in our under-chassis view; below, as seen when the unit is unbolted and turned over on its leads.

control knob. A dash indicates open, and C, closed.

S32-S36 are the tone control switches, ganged in a single rotary four-position unit beneath the chassis, indicated in our under-chassis view and shown in detail in the diagram inset with the waveband switch units in col. 1. This unit also is viewed from the rear of an inverted chassis. In position 1 (fully anti-clockwise, deep tone) S33 and S36 close; in position 2, S32 and S35 close; in position 3, S35 closes; and in position 4, S34 closes. Otherwise they are open.

Coils.—All the R.F. and oscillator tuning coils (L1-L14) for manual tuning are in eight small iron-cored units in a vertical assembly forming one end of the under-chassis compartment, with their trimming capacitors and other associated components.

This assembly is shown in a separate photograph beside our under-chassis illustration, where it takes up approximately the position that it would adopt if it were hinged at the chassis deck and let down like a flap. The assembly can be removed if necessary, but coil replacements can be made without disturbing it.

The oscillator circuit coils L21-L25 for automatic operation are mounted directly on the

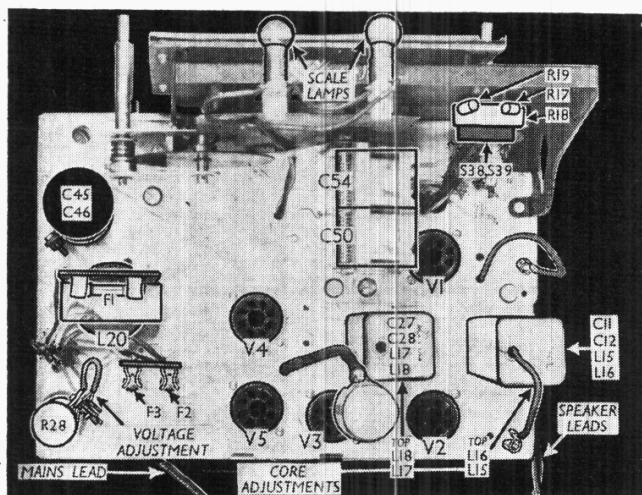
OTHER COMPONENTS (continued)		Approx. Values (ohms)
T1	Output trans { Pri. 250.0 Spkr. sec. 0.4 F.B. sec. 28.0	
S1a, b, to S5a, b, x	Aerial circuit press-button switches	—
S1c, d to S5c, d	Oscillator circuit press-button switches	—
S6-S31	Waveband switches	—
S32-S36	Tone control switches	—
S37	Int. speaker switch	—
S38, S39	Mains switches, ganged R18	—
F1	H.T. circuit fuse, 0.5 A	—
F2, F3	Mains fuses ...1.0 A	—

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating on A.C. mains of 230 V, using

Switch Table

Switch	S.W.	M.W.	L.W.	Auto.
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	—
S26	—	—	—	C
S27	C	C	—	—
S28	C	—	—	—
S29	—	C	—	—
S30	—	—	C	—
S31	C	—	—	—

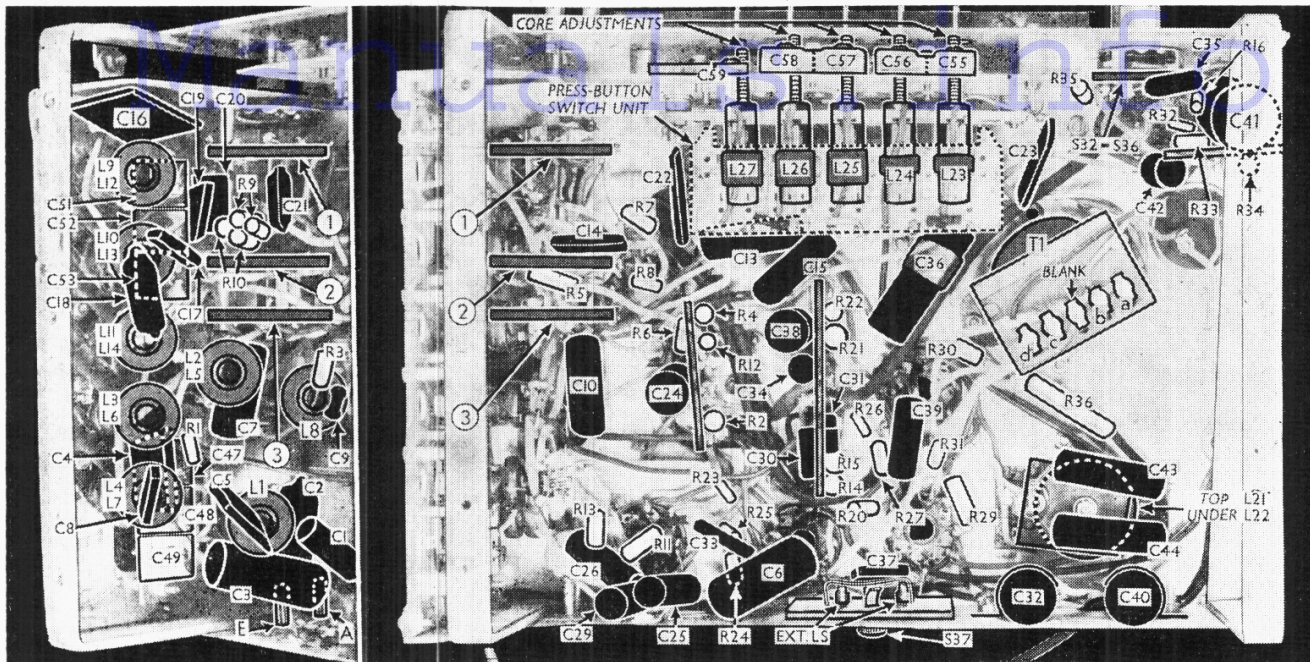


Plan view of the chassis. Fuse F1 is on a panel mounted on top of L20, while fuses F2 and F3 are on another panel mounted on the chassis deck. S38 and S39 form a single unit with the volume control R18.

press-button switch unit assembly, together with the associated pre-set capacitors. Their adjustments are indicated in our under-chassis view.

Scale Lamps.—These are two M.E.S. type lamps, with large clear spherical bulbs, rated at 12 V, 2.4 W (200 mA). They are shunted by a wire-wound resistor of 200Ω (R36).

External Speaker.—Two sockets are provided at the rear of the chassis for a low impedance (about 30Ω) external speaker. A screw-type switch S37 is provided with them to mute the internal speaker, one side of the speech coil



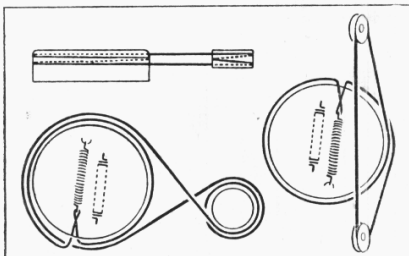
Under-chassis view, with a separate view (left) of the coil assembly when seen from the remote end of the chassis, looking over the output transformer T1. The four lettered tags on T1 agree with the markings a, b, c, d in the circuit diagram overleaf. The speech coil connections are brought out as a pair of flexible leads.

circuit being connected directly to the earth socket E.

Fuses F1, F2, F3.—F1 is the H.T. circuit fuse in the cathode lead of V5. It is a standard 1 1/2 in cartridge type, rated at 500 mA, mounted on a panel at L20. F2, F3 are mains input fuses, rated at 1 A each, and mounted on a panel near L20 on the chassis deck. They are 1 in long.

DRIVE WIRE REPLACEMENT

Two wire drives are used in this system: the gang drive, and the pointer drive. The sketches below show the course taken by each drive. The length of the gang drive wire is quoted by the makers as 24 1/4 in and the length of its tension spring 1 in when contracted; the length of the pointer drive wire is given as 23 1/2 in and its spring as 1 1/2 in contracted. Replacement



Diagrams of the two wire drive systems, as seen from the front. Left, gang drive (with plan view above it); right, pointer drive.

wires can be obtained from the makers, part numbers B32417/2 and B32417/1 respectively.

To obtain access to the rear of the drum, remove the light excluding plate (three set-screws) first withdrawing the scale lamps.

To obtain access to the front of the drum, remove the glass scale panel (four phosphor-bronze clamps with rubber liners held by four set-screws); turn the gang to maximum, and remove the four set-screws holding the black sprayed scale backing plate behind the glass, lowering it about an inch so that the scale

cursor-bar pointers pass through holes provided for them at the tops of the vertical slots.

With the gang at maximum, the drum should take up the position shown in the sketches. When fitting the wire, care should be taken not to kink it. When replacing the scale glass, the pointers should coincide with the top calibration marks at the high-wavelength ends of the scales. See that the glass rests squarely on the felt base provided; see that the felt spacers are in position on the backing plate; and ensure that the rubber liners are in position where the clamps grip the edges of the glass.

CIRCUIT ALIGNMENT

I.F. Stages.—Switch set to M.W., turn gang and volume control to maximum, connect signal generator via a 0.1 μF capacitor in each lead, to control grid (top cap) of V1 and chassis, feed in a 460 kc/s (652.1 m) signal, and adjust the cores of L18, L17, L16 and L15 in that order for maximum output.

I.F. Filter.—Transfer signal generator leads to A and E sockets, discarding the 0.1 μF capacitor, feed in a 460 kc/s signal, and adjust the core of L1 for minimum output.

R.F. and Oscillator Stages.—With the gang at maximum, the pointers should coincide with top calibration marks at the high wavelength ends of the scales. They may be adjusted by slackening the wire clamp (two set-screws) on the rear of the cursor carrier, and sliding the carrier up or down the drive wire. Access is permitted to the carrier if the metal light excluder plate is removed (three set-screws).

All trimmers involved in the following adjustments are grouped on the outer side of the coil assembly which forms one end of the chassis, facing the speaker chamber. These adjustments are identified in the sketch (col. 6), which shows this end of the chassis as seen while in the cabinet, from the rear, after removal of the guard strip.

S.W.—Switch set to S.W., tune to 20 m on scale, feed in a 20 m (15 Mc/s) signal, and adjust C51, then C47, for maximum output. If two positions are found for C51, use that involving the lesser trimmer capacitance. Tune to 50 m on scale, feed in a 50 m (6 Mc/s) signal and adjust the cores of L12 and L5 for maximum output. Repeat these adjustments until no improvement can be obtained.

T.S.—Tune to 14.62 m on scale, feed in a 41.5 Mc/s (7.23 m) signal, and adjust L8 for maxi-

mum output. A 75 Ω dummy load should be shunted across the signal generator leads. If a suitable signal generator is not available, L8 may be adjusted on the transmitted television sound signal.

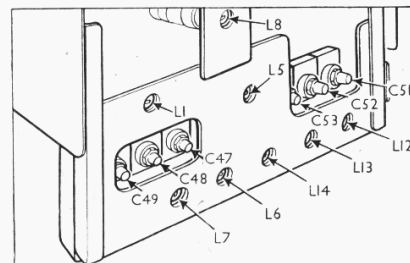
M.W.—Switch set to M.W., tune to 250 m on scale, feed in a 250 m (1,200 kc/s) signal, and adjust C52, then C48 for maximum output. Tune to 500 m on scale, feed in a 500 m (600 kc/s) signal, and adjust the cores of L13 and L6 for maximum output. Repeat these adjustments until no improvement can be obtained.

L.W.—Switch set to L.W., tune 1,000 m on scale, feed in a 1,000 m (300 kc/s) signal, and adjust C53, then C49 for maximum output. Tune to 1,800 m on scale, feed in a 1,800 m (166 kc/s) signal, and adjust the cores of L14 and L7 for maximum output. Repeat these adjustments until no improvement can be obtained.

Press-Button Setting

Numbering the press-buttons from left to right as seen from the front, the range of each is as follows: 1, 200-308 m; 2, 283-448 m; 3, 342-560 m; 4, 1,160-1,580 m; 5, 1,430-1,986 m.

To set any button, remove the press-button escutcheon (two set-screws) from front of cabinet, and switch set to auto. Press the appropriate button, and adjust the upper screw (oscillator coil core), then the lower (aerial) trimmer, preferably using the desired transmission as the signal. Bear in mind that the chassis is "live" to the mains.



Sketch showing the positions of the various trimmers, as seen from the rear of the speaker chamber.