

JOY'S RADIO SERVICE  
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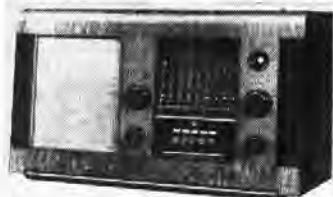
Supplement to The Wireless & Electrical Trader, November 15, 1947

"TRADER" SERVICE SHEET

837

# EKCO A28

## 9-Band & P.B. Superhet



**B**AND-SPREAD tuning on seven S.W. bands, a television channel, M.W. and L.W., are provided on the Ekco A28, a four-valve (plus rectifier) A.C. superhet designed for mains of 200-250V, 40-80 c/s.

A tenth position on the band switch control brings in press-button tuning. S.W. ranges are in 13m, 16m, 19m, 25m, 31m, 41m and 49m bands (bands 1-7). The television channel is accommodated on band 1. A cathode-ray tuning indicator is fitted. Tone control is associated with the negative feed-back system. Release date and original price: August, 1946; £29 8s plus £6 6s 5d p.t., increased December, 1946, to £31 10s plus £6 15s 6d p.t.

### CIRCUIT DESCRIPTION

On M.W. and L.W., aerial is inductively coupled to single-tuned circuits L4 (M.W.) and L5 (L.W.), tuned manually by C46, which precede triode-hexode valve (V1, Mullard metallized EGH35), operating as frequency changer with internal coupling. Triode oscillator anode coils L16 (M.W.) and L17 (L.W.) are tuned by C51.

For automatic tuning in the aerial circuit, C46 is replaced by pre-set trimmer type capacitors C52-C56, selection being achieved by press-button switches S1a, b to S5a, b, x, which are coded in accordance with our normal practice. In the oscillator circuit the P.B. master coil L38 is shunted by one of the pre-set iron-cored coils L33-L37, tuned by C13, and selected by switches S1c to S5c, y.

On S.W., band 7, L12 (aerial) and L24 (oscillator) are permeability tuned by ganged (iron-

dust cores, C46 and C51 being disconnected. For the remaining six S.W. bands the appropriate coils are shunted across L12 and L24, which then become ganged master tuning coils.

The television sound channel (T.S.) is tuned by L13, C6 in the aerial circuit, and a second harmonic is used in the oscillator circuit, the receiver being tuned to approximately 13.90m.

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

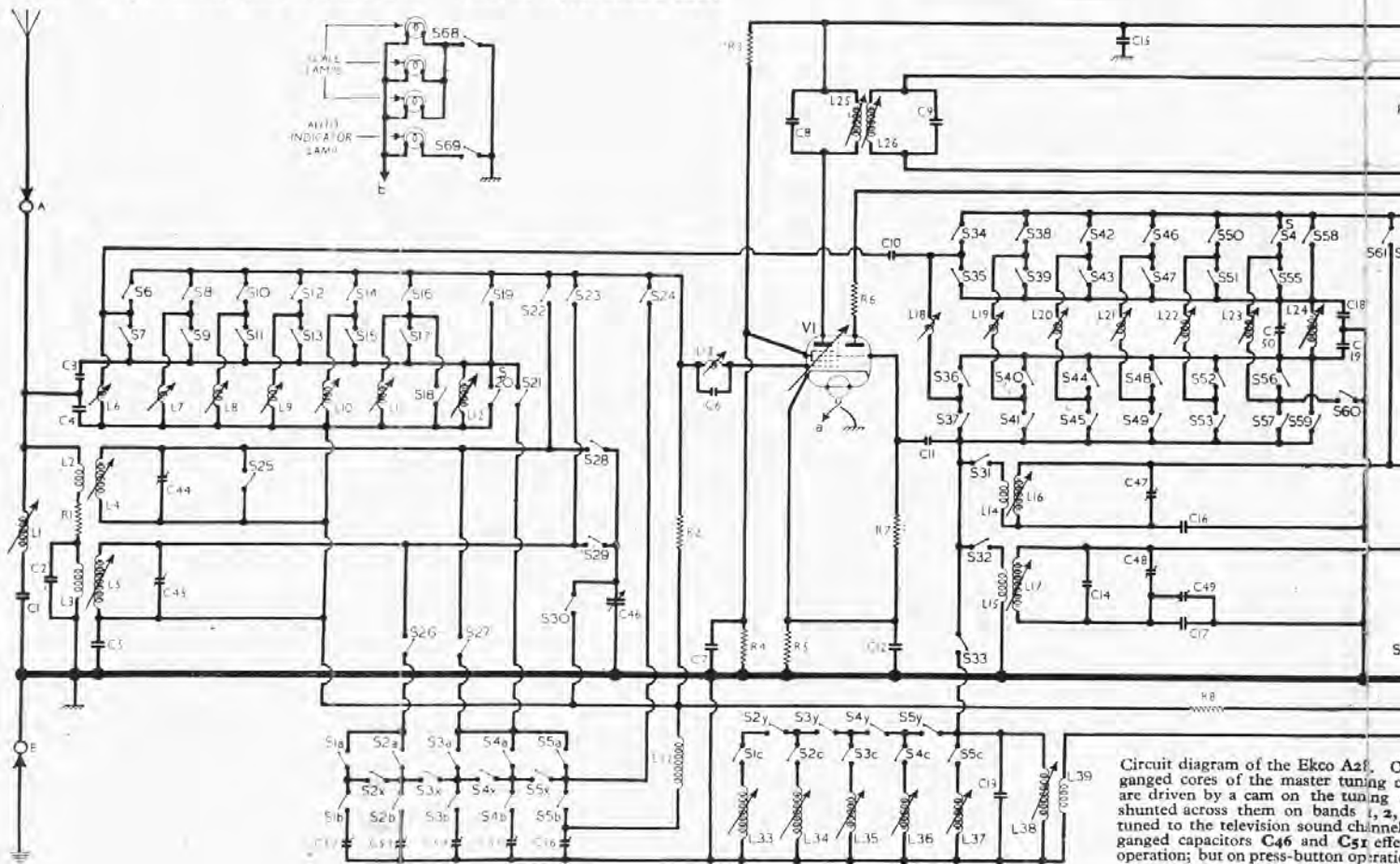
Intermediate frequency 460 kc/s. Diode second detector is part of double diode triode valve (V3, Mullard EBC33), the second diode of which provides A.V.C. voltages.

Resistance capacitance coupling is employed between V3 triode and pentode output valve (V4, Mullard EL33). Voltages developed across the feed-back winding 1, g, of the output transformer T1, are fed back to V3 triode grid circuit via the manual tone control R34.

H.T. current is supplied by full-wave rectifying valve (V5, Mullard AZ31).

### COMPONENTS AND VALUES

RESISTORS	Values (ohms)	Location
R1	Aerial damping ...	330 L10
R2	V1 hex. C.G. ...	4,700,000 L12
R3	V1 S.G. H.T. poten- f	33,000 H7
R4	tial divider ...	33,000 G7
R5	V1 fixed G.B. ...	270 H7
R6	Osc. stabiliser ...	15 G6
R7	V1 osc. C.G. ...	47,000 G7
R8	A.V.C. decoupling ...	100,000 H8
R9	V1 osc. anode H.T. f	47,000 M12
R10	feed ...	47,000 M12
R11	V2 S.G. feed ...	100,000 G9
R12	V2 fixed G.B. ...	330 G8
R13	V2 H.T. decoup. ...	2,200 H7
R14	T.I. triode anode f	1,500,000 A2
R15	load resistors ...	6,800,000 A2
R16	T.I. C.G. feed ...	3,300,000 H8
R17	I.F. stopper ...	47,000 I8
R18	V3 sig. diode load ...	220,000 I8
R19	Part. tone corrector ...	220,000 J5
R20	Volume control ...	1,000,000 J5
R21	I.F. stopper ...	1,000,000 C3
R22	A.V.C. decoupling ...	1,500,000 H8
R23	V3 G.B. and A.V.C. delay ...	1,000 I8
R24	V3 anode load ...	47,000 H7
R25	V3 A.V.C. diode load ...	220,000 H9
R26	V4 C.G. ...	1,500,000 H9
R27	V4 C.G. ...	220,000 I8
R28	H.T. potential f	10,000 H7
R29	divider ...	68,000 G9
R30	V4 S.G. stopper ...	100 I7
R31	V4 C.G. stopper ...	47,000 I8
R32	V4 G.B. ...	150 I7
R33	V4 anode stopper ...	100 I8
R34	Tone control ...	500,000 E2
R35	Part. feed - back ...	15,000 J9
R36	potential divider ...	47,000 E2
R37	potential divider ...	470 J5



Circuit diagram of the Ekco A28. Ganged cores of the master tuning coils are driven by a cam on the tuning dial, shunted across them on bands 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100. The television sound channel ganged capacitors C46 and C51 effect operation; but on press-button operation tuning devices shown beneath.

CAPACITORS		Values (μF)	Location
C1	I.F. filter tuning ...	0-00015	L12
C2	Aerial L.W. shunt ...	0-00082	L10
C3	Aerial S.W. coup- ing ...	0-000068	L12
C4	...	0-00047	L12
C5	V1 hex. C.G. decoup. ...	0-05	G7
C6	T.S. tuning ...	0-00002	G8
C7	V1 S.G. decoup. ...	0-1	G7
C8	1st I.F. transformer tuning ...	0-00015	D3
C9	...	0-00015	D3
C10	Neutralising ...	0-000001	M12
C11	V1 osc. C.G. ...	0-000047	G6
C12	V1 cath. by-pass ...	0-1	H6
C13	P.B. osc. tuning ...	0-00027	G6
C14	L.W. fixed trim. ...	0-00006	M10
C15	H.T. R.F. by-pass ...	0-1	H7
C16	M.W. tracker ...	0-00056	M10
C17	L.W. fixed track. ...	0-00019	M10
C18	Osc. S.W. fixed tun- ing ...	0-00015	M12
C19	...	0-00015	M12
C20	Osc. anode coup. ...	0-0001	M12
C21	V2 C.G. decoup. ...	0-05	H8
C22	V2 S.G. decoup. ...	0-1	G9
C23	V2 H.T. decoup. ...	0-1	G9
C24	2nd I.F. transformer tuning ...	0-00001	D3
C25	...	0-00022	D3
C26	V2 cath. by-pass ...	0-1	G9
C27	T.I. C.G. decoup. ...	0-01	A2
C28	...	0-0001	H8
C29	I.F. by-passes ...	0-0001	H8
C30*	V3 cath. by-pass ...	25-0	K7
C31	A.V.C. coupling ...	0-000015	H8
C32	A.F. coupling ...	0-02	I7
C33	"Top" boost ...	0-0001	K5
C34	I.F. by-pass ...	0-00005	G3
C35*	A.F. coupling ...	0-05	H9
C36*	V3 H.T. decoupling ...	4-0	H9
C37	Tone corrector ...	0-0025	I8
C38*	V4 cath. by-pass ...	25-0	K7
C39	Het. filter tuning ...	0-005	K8
C40	Part variable tonef control ...	0-002	K5
C41	(Continued next col.)	0-1	E2

\* Electrolytic.

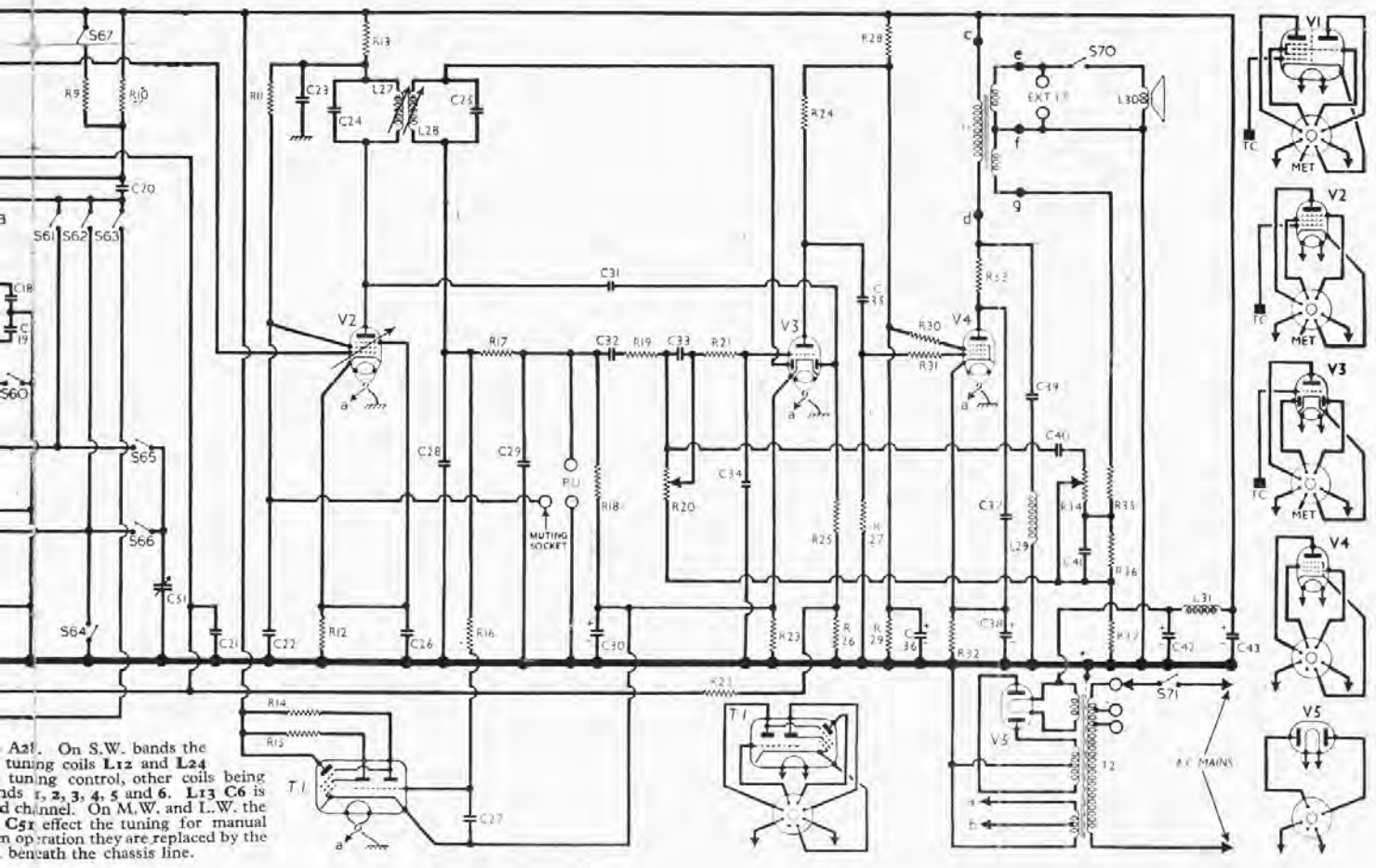
CAPACITORS (continued)		Values (μF)	Location
C42*	} H.T. smoothing ...	8-0	A2
C43*		16-0	A2
C44†	Aerial M.W. trim. ...	—	L10
C45†	Aerial L.W. trim. ...	—	L10
C46†	Aerial tuning ...	—	C3
C47†	Osc. M.W. trim. ...	—	M10
C48†	Osc. L.W. trim. ...	—	M10
C49†	Osc. L.W. track. ...	—	L10
C50†	Osc. S.W. trim. ...	—	M10
C51†	Osc. tuning ...	—	C2
C52†	} Aerial circuit pres- s- button tuning- trimmers ...	0-00055	I5
C53†		0-00027	I5
C54†		0-00055	H5
C55†		0-00027	H5
C56†		0-00013	H5

\* Electrolytic. † Variable. ‡ Pre-set.

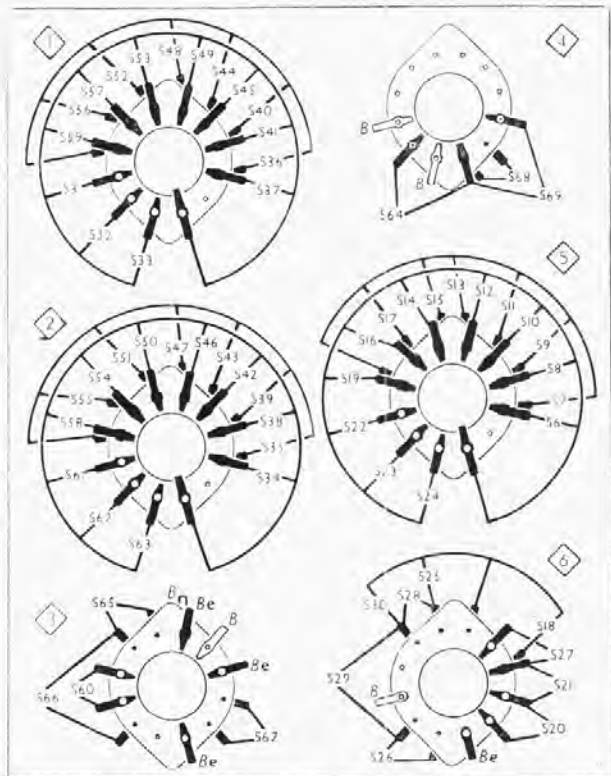
OTHER COMPONENTS		Approx. Values (ohms)	Location
L1	I.F. filter coil ...	8-0	L12
L2	} Aerial coupling coils ...	0-5	L10
L3		32-0	L10
L4	} Aerial tuning coils ...	4-5	L10
L5		26-0	L10
L6	Aerial S.W.1 coil ...	Very low	L11
L7	Aerial S.W.2 coil ...	Very low	L11
L8	Aerial S.W.3 coil ...	Very low	L11
L9	Aerial S.W.4 coil ...	Very low	L11
L10	Aerial S.W.5 coil ...	0-1	L11
L11	Aerial S.W.6 coil ...	0-2	L11
L12	Aerial band-spread master coil ...	0-8	D2
L13	T.S. tuning coil ...	Very low	G8
L14	} Osc. reaction coils ...	1-0	M10
L15		2-5	M10
L16		2-2	M10
L17		4-5	M10

(Continued next col.)

OTHER COMPONENTS (Continued)		Approx. Values (ohms)	Location
L18	Osc. S.W.1 coil ...	Very low	M11
L19	Osc. S.W.2 coil ...	Very low	M11
L20	Osc. S.W.3 coil ...	Very low	M11
L21	Osc. S.W.4 coil ...	Very low	M11
L22	Osc. S.W.5 coil ...	0-1	M11
L23	Osc. S.W.6 coil ...	0-2	M11
L24	Osc. band-spread master coil ...	0-7	D2
L25	} 1st I.F. trans. { Pri. Sec. ...	9-0	D3
L26		9-0	D3
L27	} 2nd I.F. { Pri. Sec. ...	14-0	D3
L28		7-0	D3
L29	Het. filter coil ...	215-0	K9
L30	Speech coil ...	2-0	—
L31	I.T. choke ...	620-0	J7
L32	} Osc. circuit pres- s- button tuning coils ...	16-0	G6
L33		6-5	I6
L34		5-5	I6
L35		3-5	H0
L36		3-5	H6
L37		1-8	H6
L38		P.B. master osc. coils ...	9-0
L39	} Output trans. { Pri. Spkr. sec. F.B. sec. ...	3-0	G6
T1		394-0	J9
T1		0-3	J9
T2	} Mains trans. { Pri. total Heat sec. Rect. heat. sec. H.T. sec. total ...	42-0	B4
T2		43-0	B4
T2		Very low	B4
S1a, b	} Aerial press-button switches ...	580-0	B4
S5a, b, x		—	—
S1c, to S6, y		—	—
S6-S69		—	—
S70		—	—
S71	Oscillator pres- s- button switches	—	—
S70	Waveband switches	—	—
S70	Int. speaker switch	—	19
S71	Mains switch, ganged R20	—	K6



A28. On S.W. bands the tuning coils L12 and L24 tuning control, other coils being bands 1, 2, 3, 4, 5 and 6. L13 C6 is a fixed channel. On M.W. and L.W. the C37 effect the tuning for manual operation they are replaced by the ... beneath the chassis line.



**VALVE ANALYSIS**

Valve voltages and currents given in the table below are those measured in our receiver when it was operating on mains of 230 V. 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 ECH35	280	1.7	94	1.9
	Oscillator			
V2 EF39	91	3.2	94	1.5
	261			
V3 EBC33	89	1.7		
V4 EL33	267	26.0	190	2.9
V5 AZ31	30.3+			
	12	0.04 (Pin 3)		
T.I. EM34	32	0.18 (Pin 6)		
	28	1.5 (Pin 5)		

† Each anode, A.C.

Above: Diagrams of the six waveband switch units, viewed over the A and E sockets. Right: the associated switch table, in which band it is represented by S.W.1, etc. M.W. is band 8, and L.W. band 9.

Switch	S.W.1	S.W.2	S.W.3	S.W.4	S.W.5	S.W.6	S.W.7	M.W.	L.W.	Aut
S86										
S87	CC									
S88		CC								
S89			CC							
S10				CC						
S11					CC					
S12						CC				
S13				CC						
S14					CC					
S15						CC				
S16							CC			
S17								CC		
S18									CC	
S19										CC
S20										
S21										
S22										
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**DISMANTLING THE SET**

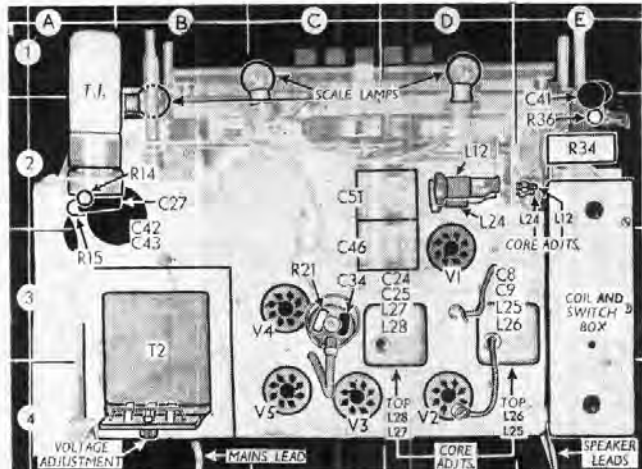
**Removing Chassis.**—Remove the four control knobs (grub screws and felt washers); from the rear of cabinet remove the two round-head wood screws securing the heat deflector plate close to T2;

slide out the T1 valve from its retaining clamp;

remove the four 2 B.A. cheese-head screws securing the chassis to the base of the cabinet, and slide out the chassis to the extent of the speaker leads.

**Removing Speaker.**—Loosen the nuts of the four speaker-retaining clamps, and lift out speaker.

When replacing, the connecting panel should be at the top.



Plan view of the chassis. The ganged inductive tuner L12, L24 is driven by a cam on the spindle of the capacitive gang C46, C51. R21, C34 are in the top cap connector of V3. The top of the coil unit is seen in col. 4.

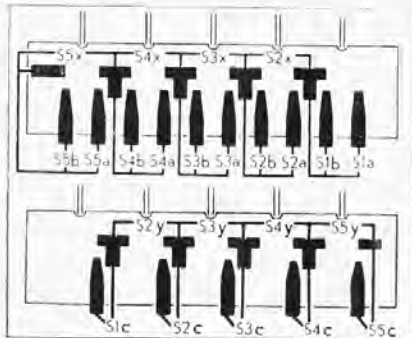
**GENERAL NOTES**

**Switches.**—The first group of switches S1-S5 comprises all the switches in the press-button unit, coded with suffixes a, b, x, etc. This was fully explained in Service Sheet 786 on the Ekco A21. The press-buttons cannot be operated unless the main waveband control is at the "auto" position (fully clockwise), as a sliding link holds the latch-bar at the "release".

The unit may be freed if the left-hand button is pulled off its plunger (heated by a soldering iron) and the fixing screws are removed, when it may be turned over for inspection. When replacing, it is important to ensure that the latch-bar release link engages the edge of the cam on the waveband switch spindle. Diagrams are shown in col. 4.

The second group consists of S6-S69. These are the waveband switches, in a ten-position rotary assembly containing six units, located at the bottom of the coil and switch box in whose illustration (col. 4) the units are identified by numbers in diamonds.

The units are shown in detail in the diagrams in col. 1, and the associated table is in cols. 2 and 3 beside them. In the table, a dash indicates open, and C closed. In the tenth



Diagrams of both sides of the P.B. switch unit. Above, as seen in our under-chassis view; below, as seen when turned over on its leads.

(fully clockwise) position, the press-button system is brought into circuit.

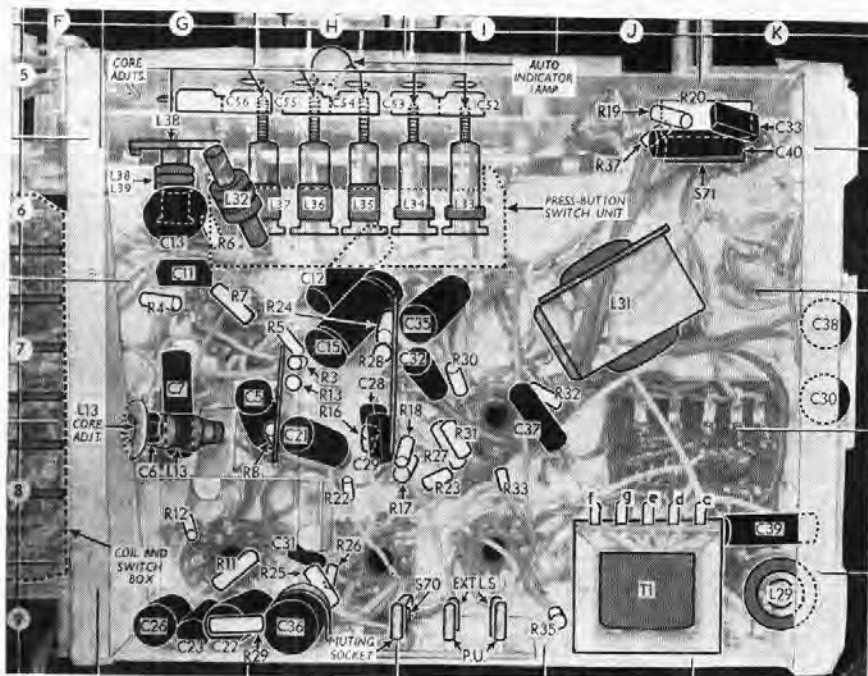
The remaining two switches are the socket muting switch S70 and the mains switch S71, the latter being ganged with R20.

**Coils.**—The positions of all components are indicated by location references in the tables. All the press-button coils are grouped round the P.B. unit. With the exception of the television sound channel coil L13 and the I.F. transformers, all remaining tuning coils are in the coil and switch box, which is shown in the separate illustration below, viewed from the end of a chassis standing upright.

**External Speaker.**—Two sockets are provided at the rear of the chassis for a low impedance (3-4Ω) external speaker. Switch S70 is provided to unites the internal speaker if desired.

**Muting Socket.**—This is provided for muting radio when using a gramophone pick-up. Muting is effected by connecting this socket to chassis.

**Scale and Indicator Lamps.**—These are four Osram lamps, with large spherical bulbs and M.E.S. bases, rated at 6.2 V, 0.3 A. The auto indicator lamp has a frosted bulb, but the others are clear.



Under-chassis view, with the base of the coil and switch box just visible on the left. The tags of T1 are lettered to agree with the circuit diagram overleaf. The P.B. coils are shown "through" the P.B. switch unit, which is indicated by a dotted outline. Diagrams of this unit appear on the left, in col. 4.

**CIRCUIT ALIGNMENT**

**I.F. Stages.**—Switch set to M.W. (band 8), turn gang and volume control to maximum, connect signal generator, via an 0.1μF capacitor in live lead, to control grid (top cap) of V1 and chassis, feed in a 400 kc/s (652.1m) signal, and adjust the cores of L28, L27, L26 and L25 (location reference D3) in that order for maximum output.

**P.B. Circuit.**—The specified wavelength coverage of each oscillator press-button coil is dependent upon accurate setting of the core adjustment of the P.B. master coil L38. Switch to band 10, release all buttons, feed in a 312.5m (960 kc/s) signal, and adjust the core of L38 (G6) for maximum output.

**I.F. Filter.**—Transfer signal generator leads to A and E sockets, via a suitable dummy aerial, feed in a 400 kc/s signal, and adjust the core of L1 (L12) for minimum output.

**R.F. and Oscillator Stages.**—With the gang at maximum the pointers should coincide with the orange-coloured horizontal line at the top of the scales. They may be adjusted by removing the metal light excluding plate (three set-screws) and slackening the drive-wire clamp (two set-screws) at the rear of the pointer carriage.

**M.W.**—With set switched to M.W. (band 8) tune to 250m on scale, feed in a 250m (1,200 kc/s) signal and adjust C47 (M10) for maximum output. Tune to 230m on scale, feed in a 230m (1,304 kc/s) signal, and adjust C44 (L10) for maximum output. Tune to 500m on scale, feed in a 500m (600 kc/s) signal and adjust the cores of L16 (M10) and L4 (L10) for maximum output. Repeat adjustments until no improvement results.

**L.W.**—Switch set to L.W. (band 9), tune to 1,000m on scale, feed in a 1,000m (300 kc/s) signal, and adjust C48 and C45 (M10, L10) for maximum output. Tune to 1,400m on scale, feed in a 1,400m (214 kc/s) signal, and adjust the core of L17 (M10) for maximum output. Tune to 1,800m on scale, feed in a 1,800m (166 kc/s) signal, and adjust C49 (L10) and the core of L5 (L10) for maximum output. Repeat adjustments until no improvement results.

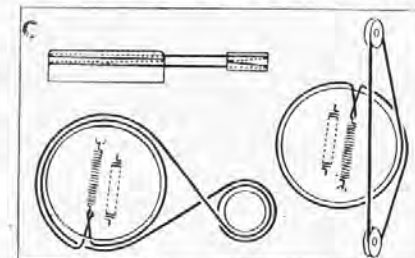
**Band-spread S.W. Bands.**—The following table gives the procedure for the seven S.W. bands, the adjustment in each case consisting only of setting receiver and signal generator scales correctly and then adjusting the appropriate coil cores. In no circumstances must C50 be disturbed unless it is known to be out of adjustment, when it is essential that L24 is temporarily replaced by a standard 13.25μH

inductance. Otherwise the L/C ratio of L24, C50 will be upset, and as they form a master circuit, all the S.W. bands will be out of track with their scales. On all S.W. bands, where two peaks are found, use the lower frequency one.

Receiver		Sig. Gen.		Adjustment	
Band	Scale Setting (m)	Wave-length (m)	Frequency (Mc/s)	Cores	Location
7	48.0	48.0	6.3	L24, L12	D2, D2
6	41.2	41.2	7.25	L23, L11	M11, L11
5	31.0	31.0	9.7	L22, L10	M11, L11
4	25.2	25.2	11.9	L21, L9	M11, L11
3	19.7	19.7	15.2	L20, L8	M11, L11
2	16.82	16.82	17.8	L19, L7	M11, L11
1	13.95	13.95	21.5	L18, L6	M11, L11
1	T.S.	7.23	41.5	L13	G8

**DRIVE CORD REPLACEMENT**

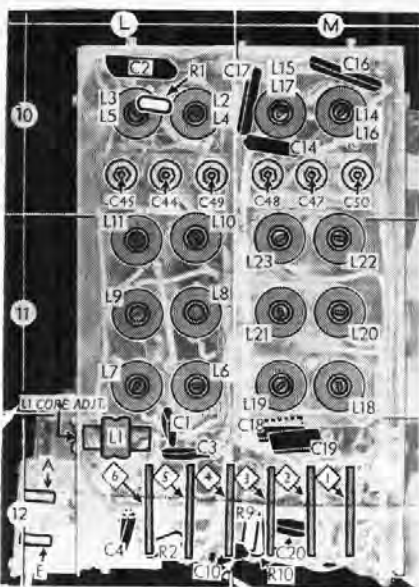
Two drive wires are used, one for the gang drive and one for the pointer. The former is 26ins. long (part No. B32417) and the latter 23ins. (part No. 32417/1). Replacements are supplied by the makers, looped ready to fit. Their



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

courses are shown in the diagrams above, where they are viewed from the front with the gang at maximum.

Replacement instructions are very much as in other Ekco receivers, and a full description may be found in Service Sheets 827 and 802.



Side view of the coil and switch box, with coverplate removed. Each coil unit has an adjustable core. C50, at the end of the row of capacitive trimmers, should not be disturbed. The waveband switch units (bottom) are shown in detail in col. 1.