#### "TRADER" SERVICE SHEET

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

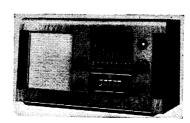
CIRCUST DESCRIPTION

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 ECH35), 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 irondust 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-

# EKCO

# 9-Band & P.B. Superhet



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 18.99m. Second valve (**V2**, **Mullard metallized EF39**) is a variable-mu R.F. pentode operating as I.F. amplifier.

a variable-mu R.F. pentode operating as I.F. amplifier.

Intermediate frequency 460 kc/s.

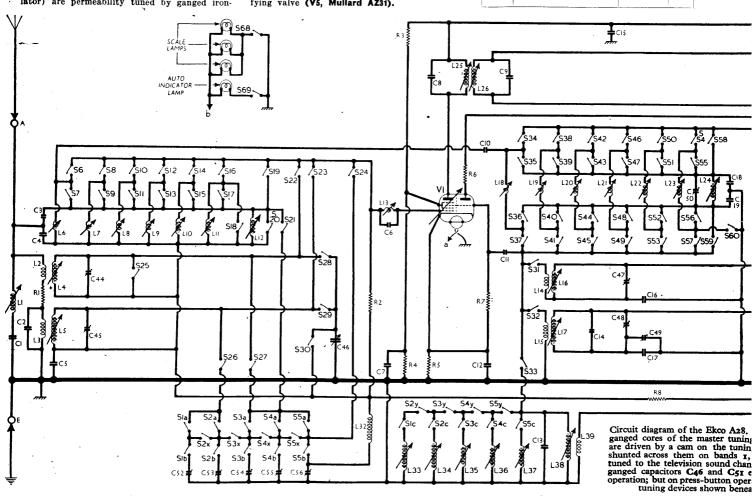
Diode second detector is part of double diode triode valve (V3, Mullard EBG33), the second diode of which provides A.V.C. voltages.

Resistance capacitance coupling is employed between V3 triode and pentode output valve (V4, Mullard EL33). Voltages developed across the feed-back winding f, 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)		
R1	Aerial damping	330	·L10
R2	V1 hex. C.G	4,700,000	L12
R3	V1 hex. C.G V1 S.G. H.T. poten- tial divider	33,000	H7
R4	fial 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.	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	1,500,000	A2
R15	f load resistors }	6,800,000	A2
R16	T.I. C.G. feed	3,300,000	H8
R17	I.F. stopper	47,000	18
R18	V3 sig. diode load	220,000	18
R19	Part. tone corrector	220,000	J5
R20	Volume control	1,000,000	J5
R21	I.F. stopper	1,000,000	C3
R22 R23	A.V.C. decoupling	1,500,000	H8
RZ3	V3 G.B. and A.V.C.	1 000	To
R24	V3 anode load	1,000 47,000	18 H7
R25		47,000	H <sub>9</sub>
R26	A.V.C. diode load	220,000 1,500,000	H9
R27		220,000	18
R28	V4 C.G H.T. potential { divider {	10,000	H7
R29	divider	68,000	G9
R30	V4 S.G. stopper	100	17
R31	V4 C.G. stopper	47,000	18
R32	V4 G.B	150	17
R33	V4 anode stopper	100	Is
R34	Tone control	500,000	E2
R35	1	15,000	J9
R36	Part feed - back	47,000	E2
R37	potential divider	470	J5



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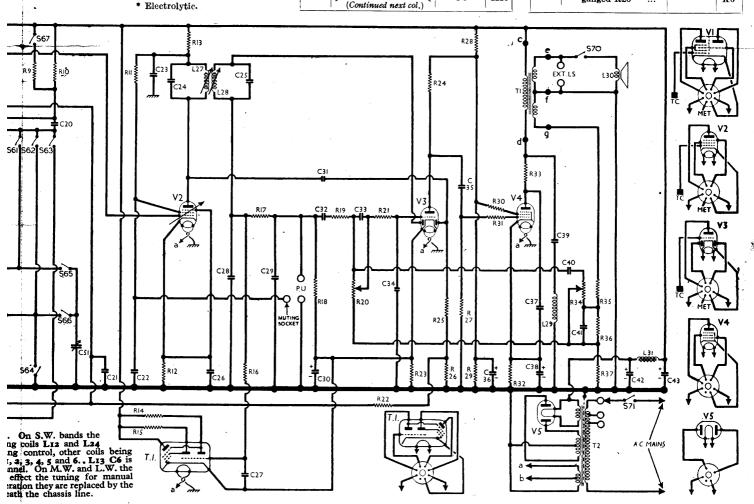
	CAPACITORS	Values (μF)	
C1	I.F. filter tuning	0.00015	L12
C2	Aerial L.W. shunt	0.00082	L10
C3	Aerial S.W. coup-	0.000068	Liž
C4	} ling {	0.00047	L12
C5	V1 hex. C.G. decoup.	0.05	G7
Č6	T.S. tuning	0.00002	Ğ8
Č7	V1 S.G. decoup	0.1	Ğ7
Č8	lst I.F. transformer	0.00015	Ď3
Č9	tuning	0.00015	D3
Č10	Neutralising	0.000001	M12
čii	V1 osc. C.G	0.000047	G6
Č12	V1 cath. by-pass	0.1	H6
Č13	P.B. osc. tuning	0.00027	G6
C14	L.W. fixed trim	0.00027	M10
C15	H.T. R.F. by-pass	0.0000	H7
C16	M.W. tracker	0.00056	M10
C17		0.00030	M10
C18	L.W. fixed track  Osc. S.W. fixed tun- ing		
	Jose. S. w. nxed tun-	0.00015	M12
C19	J ang   (	0.00015	M12
C20	Osc. anode coup	0.0001	M12
C21	V2 C.G. decoup	0.05	H8
C22	V2 S.G. decoup V2 H.T. decoup	0.1	G9
C23	V2 H.T. decoup	0.1	G9
C24	\ 2nd I.F. transformer \	0.0001	D3
C25	} tuning {	0.00022	D3
C26	V2 cath. by-pass	0.1	G9
C27	T.I. C.G. decoup	0.01	A2
C28	}I.F. by-passes {	0.0001	H8
C29	fire 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	17
C33	"Top" boost	0.0001	K5
C34	I.F. by-pass	0.00005	C3
C35	A.F. coupling	0.05	17
C36*	V3 H.T. decoupling	4.0	H9
C37	Tone corrector	0.0025	18
C38*	V4 cath. by-pass	25.0	<b>K</b> 7
C39	Het. filter tuning	0.005	K8
C40	Part variable tone	0.002	K5
C41	control	0.1	E2
~	(Continued next col.)	V.1	112

	CAPACITORS (continued)	$\begin{array}{c} { m Values} \\ { m (}\mu{ m F}{ m )} \end{array}$	Loca- tion
C42*	}H.T. smoothing {	8.0	A2
C43*	Tr. smooming }	16.0	A2
C441	Aerial M.W. trim		L10
C451	Aerial L.W. trim		L10
C46+	Aerial tuning		C3
Č47±	Osc. M.W. trim		M10
C48†	Osc. L.W. trim		M10
249₹	Osc. L.W. track	· _	L10
C50±	Occ C W Anter		M10
251+	One America		C2
0521	Osc. tuning	0.00055	
053i	Apple 1 street to 1	0.00027	15
	Aerial circuit press-		15
254‡	} button tuning{	0.00055	H5
255‡	trimmers	0.00027	H5
256‡	· []	0.00013	G5

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

ОТЕ	IER COMPONENTS	Approx. Values (ohms)	Loca- tion
L1 L2 L3 L4 L5 L6 L7 L8 L9 L10 L11 L12	I.F. filter coil Aerial coupling { coils	8·0 9·5 32·0 4·5 26·0 Very low Very low Very low 0·1 0·2 0·8 Very low	L12 L10 L10 L10 L10 L11 L11 L11 L11 L11 L11
L15 L16 L17	Osc. tuning coils (Continued next col.)	2·5 2·2 4·5	M10 M10 M10

ОТІ	HER COMPONENTS (Continued)	Approx. Values (ohms)	Loca- tion
L18 L19	Osc. S.W.1 coil Osc. S.W.2 coil	Very low Very low	M11 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	<b>0</b> ⋅1	M11
L23	Osc. S.W.6 coil	0.2	M11
L24	Osc. band-spread		
1	master coil	0.7	D2
L25	Pri.	9.0	$\overline{\mathbf{D3}}$
L26	1st I.F. trans.      Sec.	9.0	$\tilde{\mathbf{D}}$ 3
L27	2nd I.F. ( Pri	14·0	$\tilde{\mathbf{D}}$ 3
L28	trans. Sec	7.ŏ	D3
L29	Het. filter coil	215·0	K9
L30	Speech coil	2.0	IX o
L31	H.T. choke	620.0	J7
L32	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	16.0	G6
L33	11	6.5	-16
L34	Osc. circuit press-	5.5	16
L35	button tuning	3.5	H6
L36	1	3·5	H6
L37	cons	3·3 1·8	
L38	P.B. master osc.	9.0	H6
L39		9.0	G6 G6
Toa	coils \		
T1	Output Spri	334.0	19
11	trong \ Spkr. sec.	0.3	J9
	(r.b. sec.	42.0	<b>J</b> 9
1	Pri., total	43.0	B4
T2	Mains   Heat sec., Rect. heat.	Very low	B4
1,2		0.1	D.4
1		0.1	B4
	H.T. sec.,	F00.0	D.
010 h	total	580-0	B4
S1a, b	A 7 44		
to .	Aerial press-button		1
S5a, b,	switches		-
X	3 0		İ
S1c, to	Oscillator press-		
S5c, y	button_switches	_	_
S6-S69			
870	Int. speaker switch	_	19
S71	Mains switch,		
1	ganged R20	_	K6
			1



**EKCO** A28

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S6 S7 S8 S9

\$10 \$11 \$12

\$15 \$16 \$17

S20 \$21 \$22

\$23 \$24 \$25

\$26 \$27

\$28 \$29

\$30 \$31 \$32

S33 S34

S35 S36 S37 S38 S39

\$40 \$41 \$42 \$43 \$44 \$45 \$46 \$47

S50 S51 S52

\$53 \$54

S55 S56 S57 S58 S59

860 S61 S62

863

865

\$66 \$67

868

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S.W.2 S.W.3

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S.W.1

S.W.4 S.W.5

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S.W.6 S.W.7 M.W.

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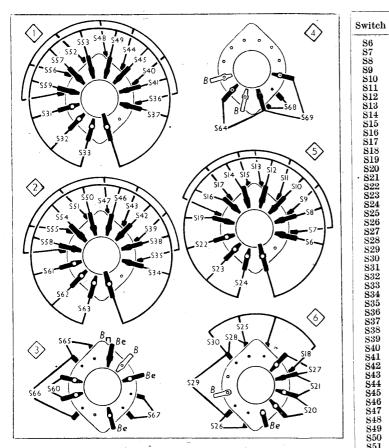
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#### **VALVE ANALYSIS**

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 Current (mA)
	(280	1.7)		
V1 ECH35		llator }	94	1.9
*** ****	(91	3.2	0.4	
V2 EF39	261	4.1	94	1.5
V3 EBC33	89	1.7		
V4 EL33	267	26.0	190	2.9
V5 AZ31	303†			_
·	( 12		(Pin 3)	
	32	0.18(	Pin 6)	
T.I. EM34	) Tar	get	. (	_
	280		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 I is represented by S.W.I., etc. M.W. is band 8, and L.W. band 9.

Above: Diagrams

### 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;

R34 124 L24 CORE ZTLO COIL AND SWITCH BOX L26

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

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.

four speaker-retaining clamps, and nit our speaker.

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

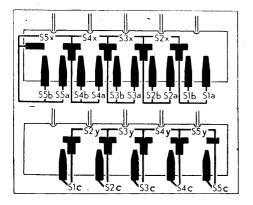
#### **GENERAL NOTES**

Switches.—The first group of switches \$1-85 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 \$6-\$69. These are the waveband switches, in a ten-position rotary assembly containing six units, located at the bettom 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 speaker muting switch \$70 and the mains switch \$71, the latter being ganged with R20.

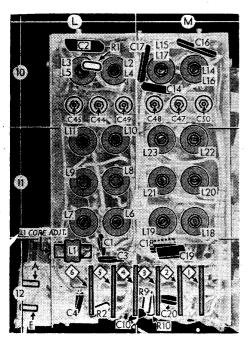
Coils.—The positions of all components are indicated by location references in the tables. All the press-button coils are grouped round the P.B. unit. With the exception of the television sound channel coil L13 and the I.F. transformers, all remaining tuning coils are in the coil and switch box, which 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 (3-40) external speaker. Switch \$70 is provided to units the internal speaker if desired.

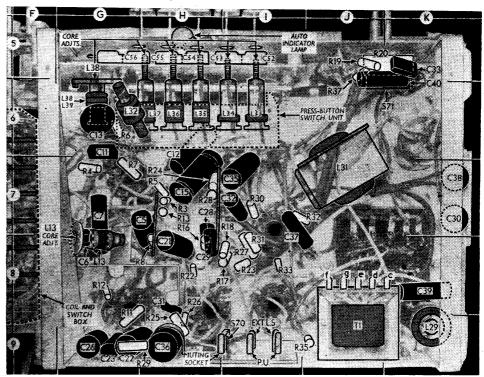
Muting Socket.—This is provided for muting Ladio when using a gramophone pick-up Muting is effected by connecting this socket to chassis.

Scale and Indicator Lamps.—These are four

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.



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 capacitative trimmers, should not be disturbed. The waveband switch units (bottom) are shown in the control of the in detail in col. 1.



Under-chassis view, with the base of the coil and switch box just visible on the left. The tags of T<sub>I</sub> 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 460 kc/s (652.1m) signal, and adjust the cores of L28, L27, L26 and L25 (location reference D3) in that order for maximum output. mum output.

(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.

1.F. Filter.—Transfer signal generator leads to A and E sockets, via a suitable dummy aerial, feed in a 460 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 (hand 8)

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 an 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.

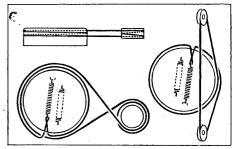
Band-spread S.W. Bands.—The following table gives the procedure for the seven S.W. bands, the adjustment in each case consisting only of setting receiver and signal generator scales correctly and then adjusting the appropriate coil cores. In no circumstances must C50 be disturbed unless it is known to be out of adjustment, when it is essential that L24 is temporarily replaced by a standard 13.28µH

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 of the control of t

Receiver		Sig. Gen.		Adjustment	
Band	Scale Setting (m)	Wave- length .(m)		Cores	Loca- tion
7	48.0	48.0	6.3	L24, L12	D2, D2
$\frac{6}{5}$	$\frac{41 \cdot 2}{31 \cdot 0}$	$\frac{41 \cdot 2}{31 \cdot 0}$	$7.25 \\ 9.7$	L23, L11 L22, L10	M11, L1:
$\frac{4}{3}$	25.2	25.2	11.9	L21, L9	M11, L11
$\frac{3}{2}$	$19.7 \\ 16.82$	$\begin{array}{c} 19.7 \\ 16.82 \end{array}$	$\substack{15\cdot2\\17\cdot8}$	L20, L8	M11, L11 M11, L11
1 .	13.95	13.95	21.5	L18, L6	M11, L11
1	T.S.	7.23	41.5	Lĺ3	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 234ins. (part No. 232417/1). 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.