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# EKCO

# MODEL EX 402

SERVICE DEPT., E. K. COLE LTD., ESSEX, ENGLAND.

Telephone: Southend 49491.

Cables: Ekco, Southend-on-Sea.

NOT TO BE COPIED.

**GENERAL DESCRIPTION:** Model EX402 is a 5 wave-band 8 valve (including rectifier and tuning indicator), superheterodyne receiver for use on 100/135 volt or 200/250 volt A.C. 50/100 cycle mains.

**VALVES** (Philips or Mullard): V1—E.F.8 (R.F. Amplifier), V2—E.C.H.2 (frequency changer), V3—E.F.9 (I.F. amplifier), V4—E.B.C.3 (2nd detector—A.V.C.—L.F. amplifier), V5 and V6—E.L.3 (push-pull power amplifiers), V7—A.Z.1 (full wave rectifier), M.E.—E.M.1 (tuning indicator).

**WAVE RANGES:** Band 1—30 to 13.5 Mcs., Band 2—13.5 to 6.1 Mcs., Band 3—6.1 to 3.1 Mcs., Band 4—2,000 to 1050 Kcs., Band 5—1050 to 530 Kcs.

**INTERMEDIATE FREQUENCY:** 480 Kcs.

**MAINS CONSUMPTION:** 77.6 watts (345 MA with 225 volt input).

**DIAL LAMPS:** 6.5 volt .35 amp. type (A5767).

It is important that lower rated lamps are not used as supply is 6.3 volts R.M.S.

**CIRCUIT DETAILS:** Aerial input is H.F. transformer coupled to V1, the amplified output of which is similarly coupled to V2 control grid.

The oscillator circuit is of straightforward design using the triode section of V2 and generates a frequency 480 Kcs. out of track with the aerial signal frequency. The I.F. output of V1 is transformer coupled to V3, amplified and again transformer coupled to the demodulator diode of V4. (Variable coupling is included in the design of the first I.F. Transformer which permits wider frequency response when switched to "LOCAL.") After rectification the L.F. component of the signal is coupled by C21 VR1 to V4 for amplification. V4 anode output is coupled by C20 to the push-pull input transformer T2. (Should the need arise to replace this transformer, care should be taken to ensure its correct connection and to facilitate this a red spot has been placed on the primary side so that positioning should not be misunderstood. This is clearly shown in the diagrams and for further assistance the wiring code is also given).

A.V.C. voltage is developed by transferring a small percentage of the signal to a diode of V4, the rectified output of which is applied to the grid circuits of V1, V2 and V3.

The output of the power amplifier valves is transformer coupled to a permanent magnet speaker, a low pass filter L37, C51 being shunted across the primary winding.

Provision is made for external loudspeakers and should

one only be required, the same type as fitted in the receiver is recommended. The sockets are connected across the O.P. Transformer secondary (the impedance being 3 to 4 ohms), in series with which is the speaker silencing switch S2.

**CIRCUIT ALIGNMENT:** *This operation must only be carried out in conjunction with a service oscillator of known accuracy. To ensure reliable results the calibration and output levels of service oscillators should be checked frequently, and in any event not less often than once every six months. The "on-load" voltage of batteries of battery driven oscillators should be regularly measured, and new batteries fitted as soon as the voltage falls below the rated pressure.*

**I.F. ALIGNMENT:** Fully mesh the gang, switch to Band 5, turn volume control to maximum, then inject a 480 Kcs. signal between chassis and the grid of V2, using a series .02 mfd. condenser in the latter lead. The existing grid lead of V2 should be left in place. Connect output meter to EXT.L.S. sockets then adjust the service oscillator output to give suitable meter reading.

Adjust all four I.F. cores for maximum output.

**CALIBRATION:** (1) With the gang still fully meshed, adjust the pointer if necessary to coincide with the line terminating low frequency end of the 49 metre band of Band 2. (2) Switch to Band 1, adjust receiver and service oscillator to 30 Mcs., then connect S.O. by means of a dummy aerial to A and E of receiver. Adjust C44 osc. trimmer for calibration. Tune set and S.O. to 25 Mcs. then adjust R.F. trimmers C34, C39 for maximum output. Tune set and S.O. to 15 Mcs. and reset calibration by adjusting osc. core A.

(3) Switch to Band 2. Adjust osc. trimmer C45 at 13 Mcs., then R.F. trimmers C35, C40 at 12 Mcs. Adjust calibration at 6.5 Mcs. by resetting osc. core B.

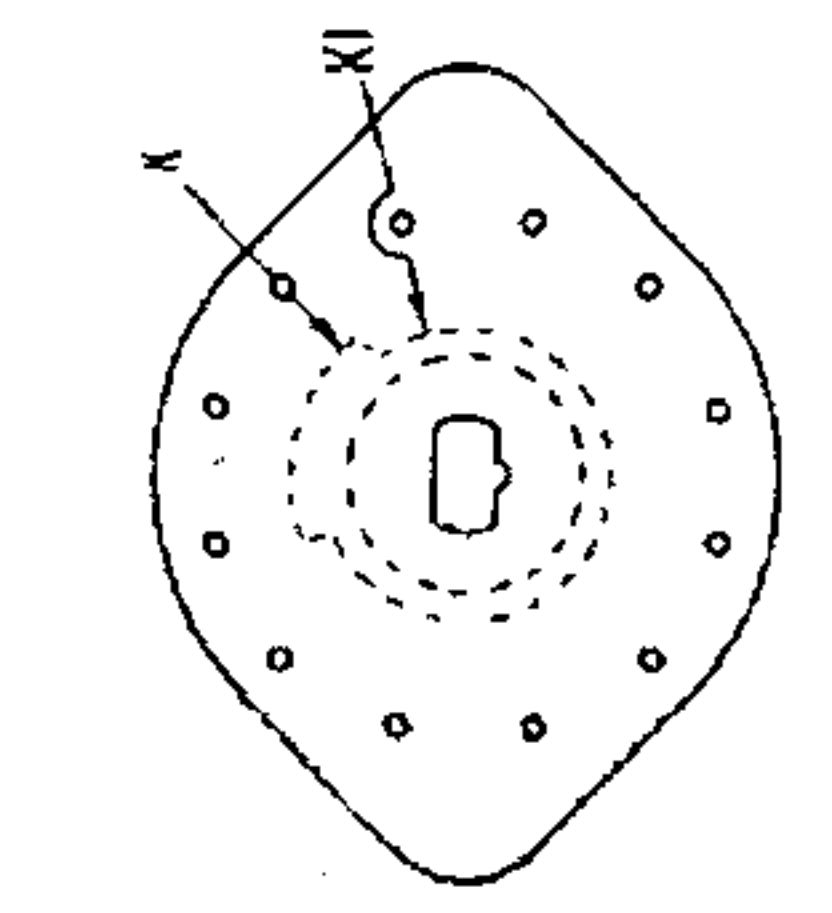
(4) Switch to Band 3. Adjust osc. trimmer C46 at 5.8 Mcs., then R.F. trimmers C36, C41 at 5 Mcs. Adjust calibration at 3.5 Mcs. by resetting osc. core C.

(5) Switch to Band 4. Adjust osc. trimmer C47 at 2 Mcs., then R.F. trimmers C37, C42 at 1.7 Mcs. Adjust calibration at 1.2 Mcs. by adjusting osc. core D.

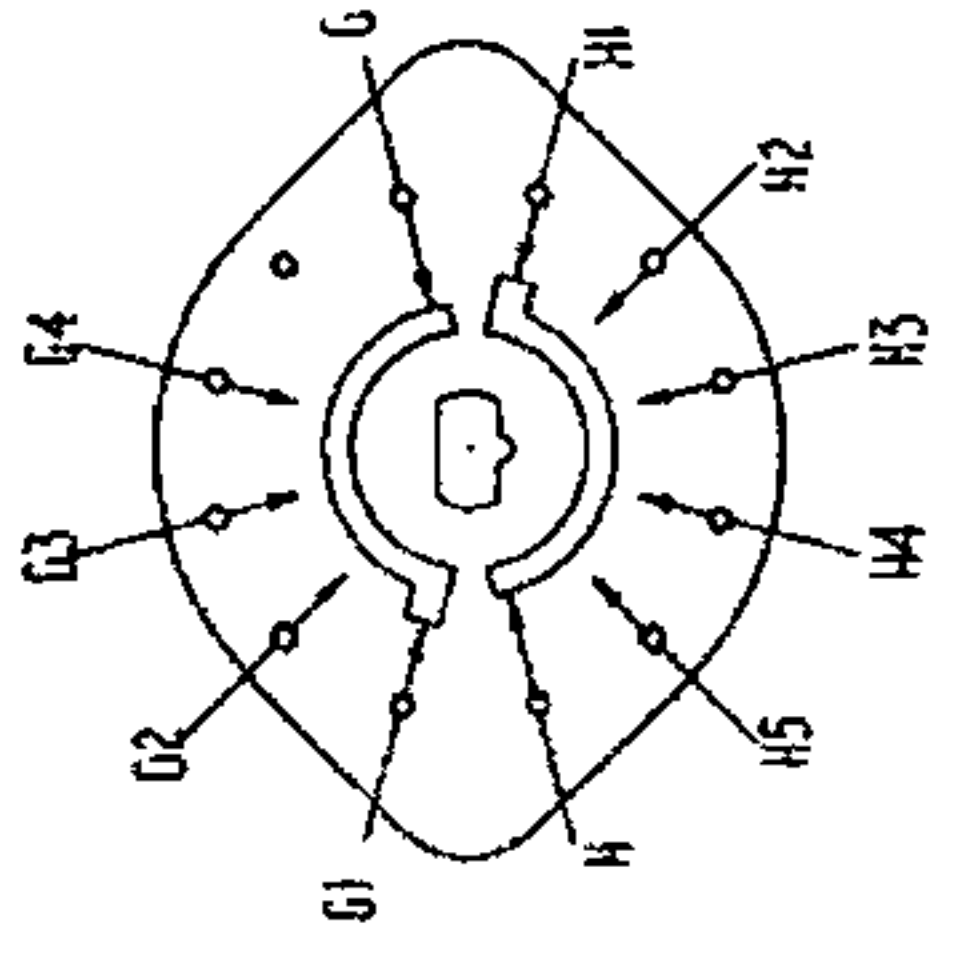
(6) Switch to Band 5. Adjust osc. trimmer C48 at 1.06 Mcs., then R.F. trimmers C38, C43 at 1 MC. Adjust calibration at 0.6 Mcs. by resetting osc. core E.

**NOTE:** It is advisable to repeat the adjustments of each band in order to obtain the best settings where good sensitivity coincides with reasonably accurate calibration.

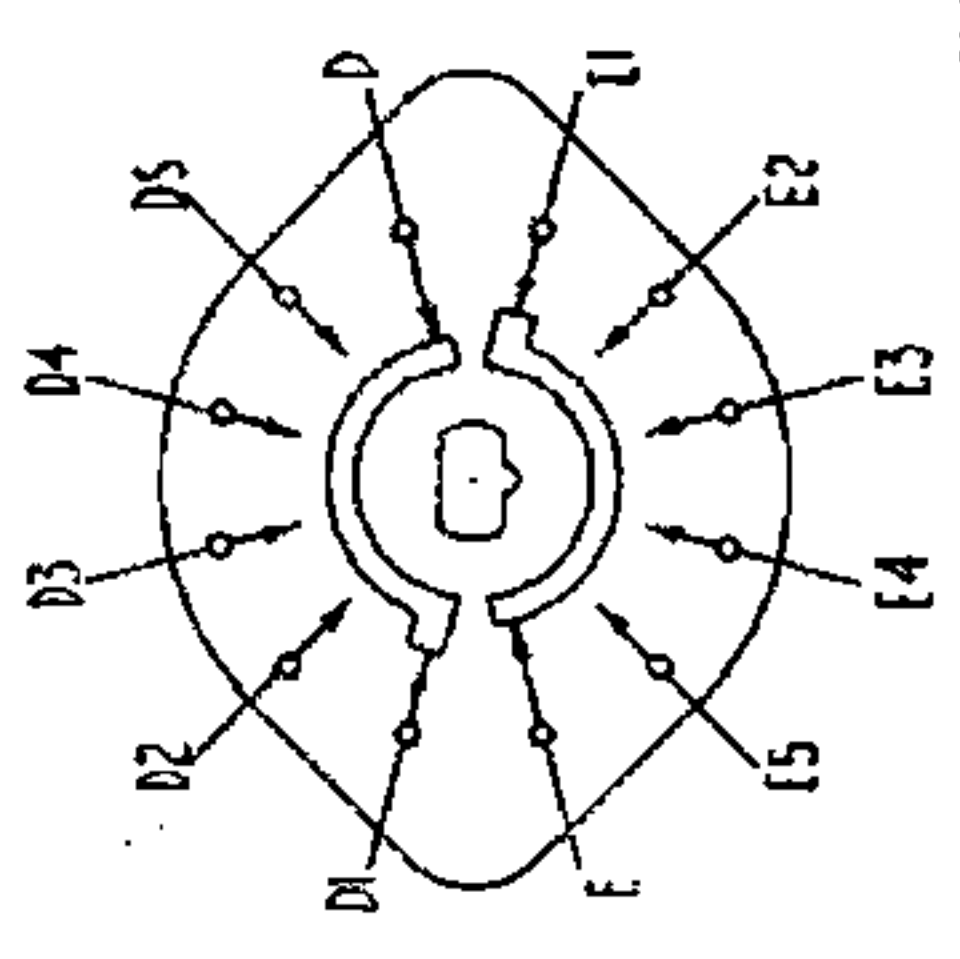
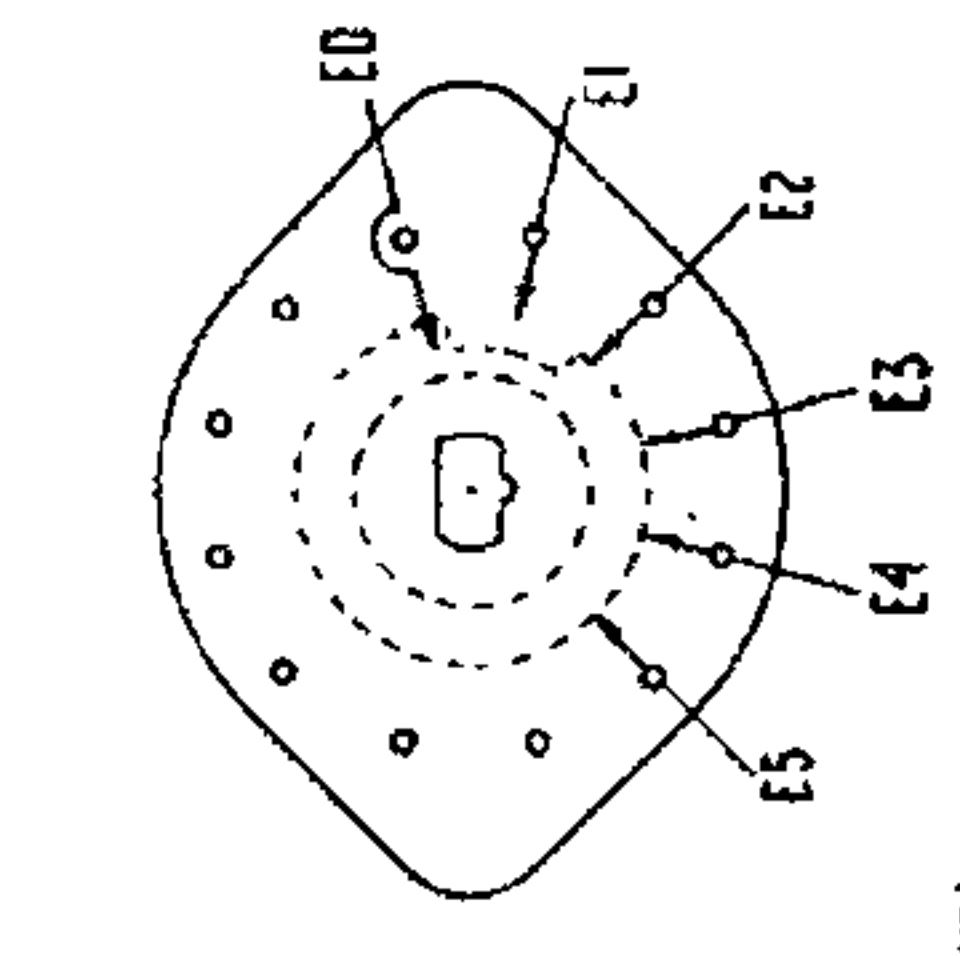
SWITCH SHOWN IN BAND 1 POSITION



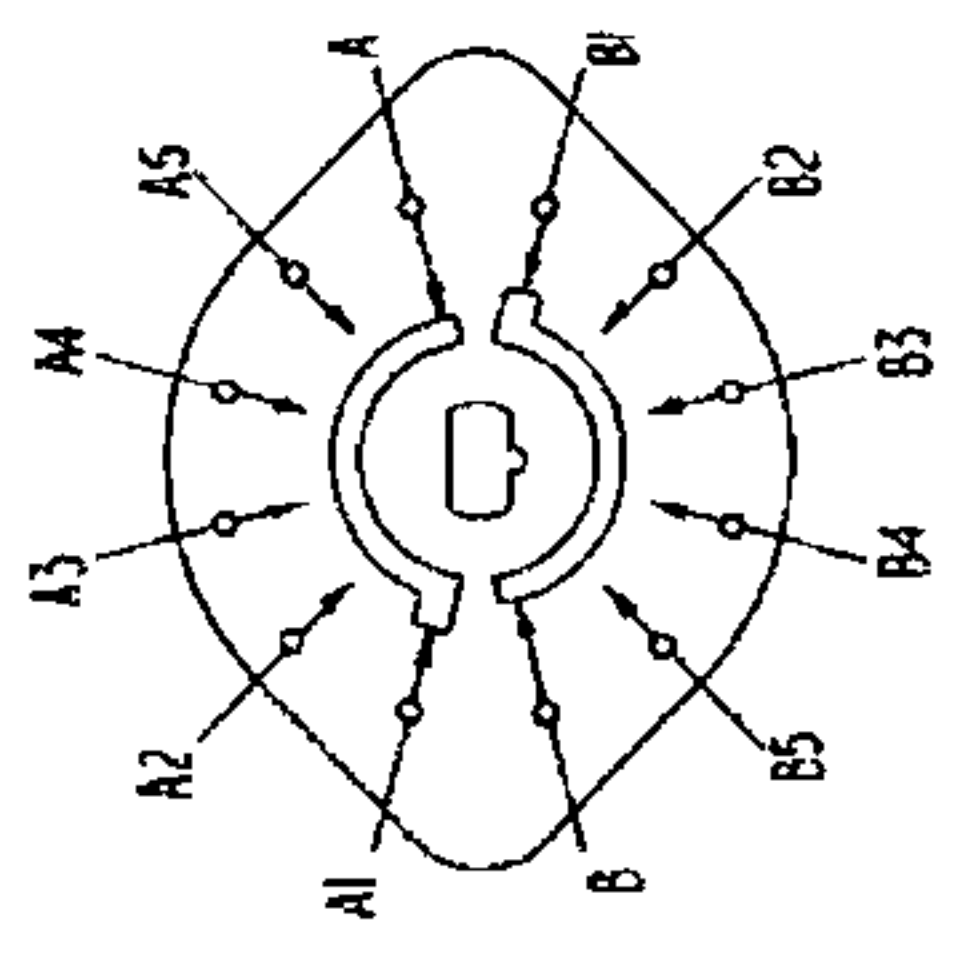
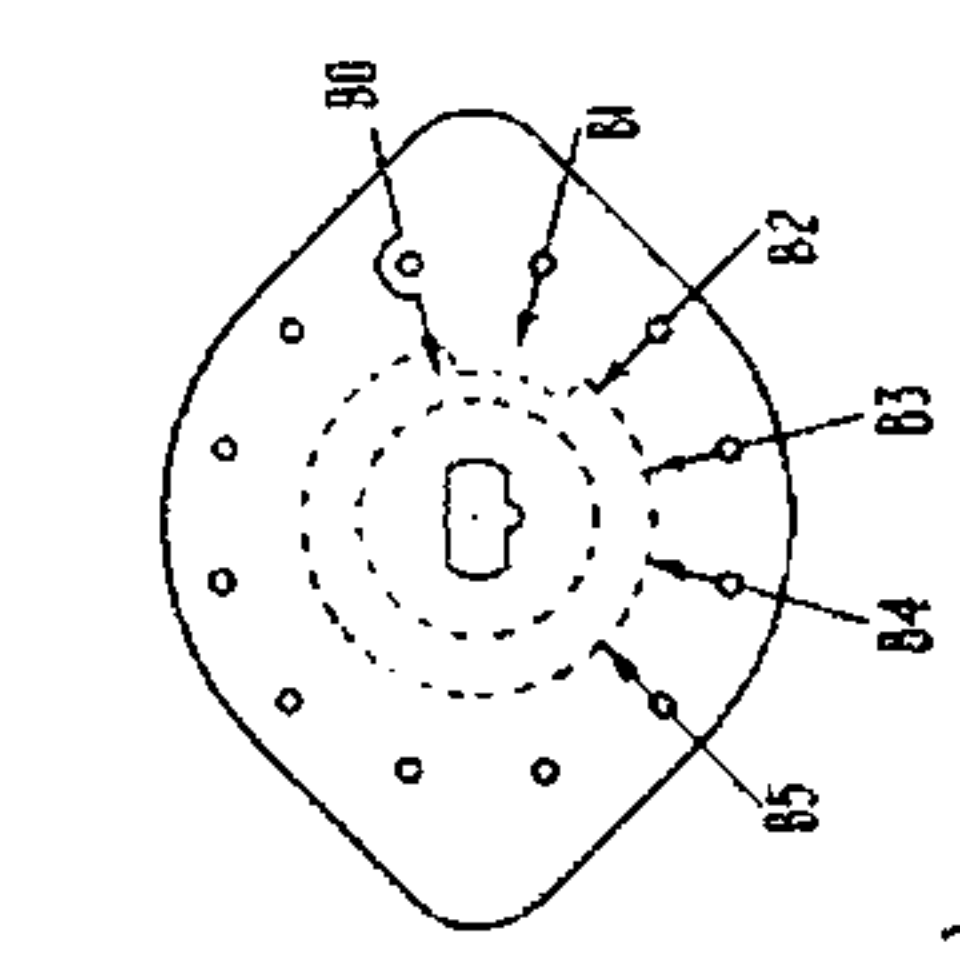
OSCILLATOR WAFER (W3)



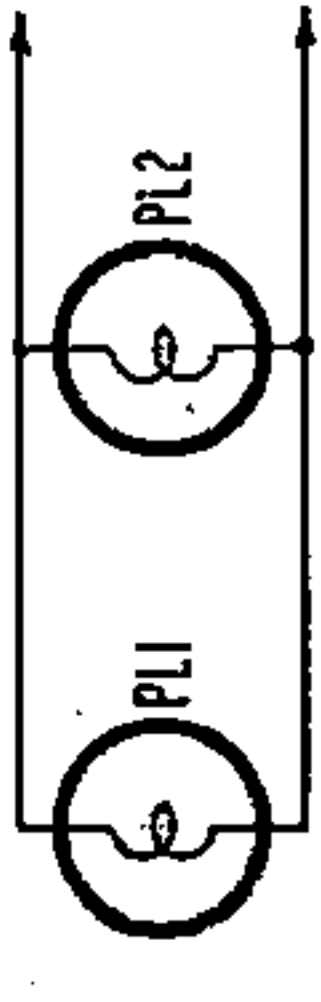
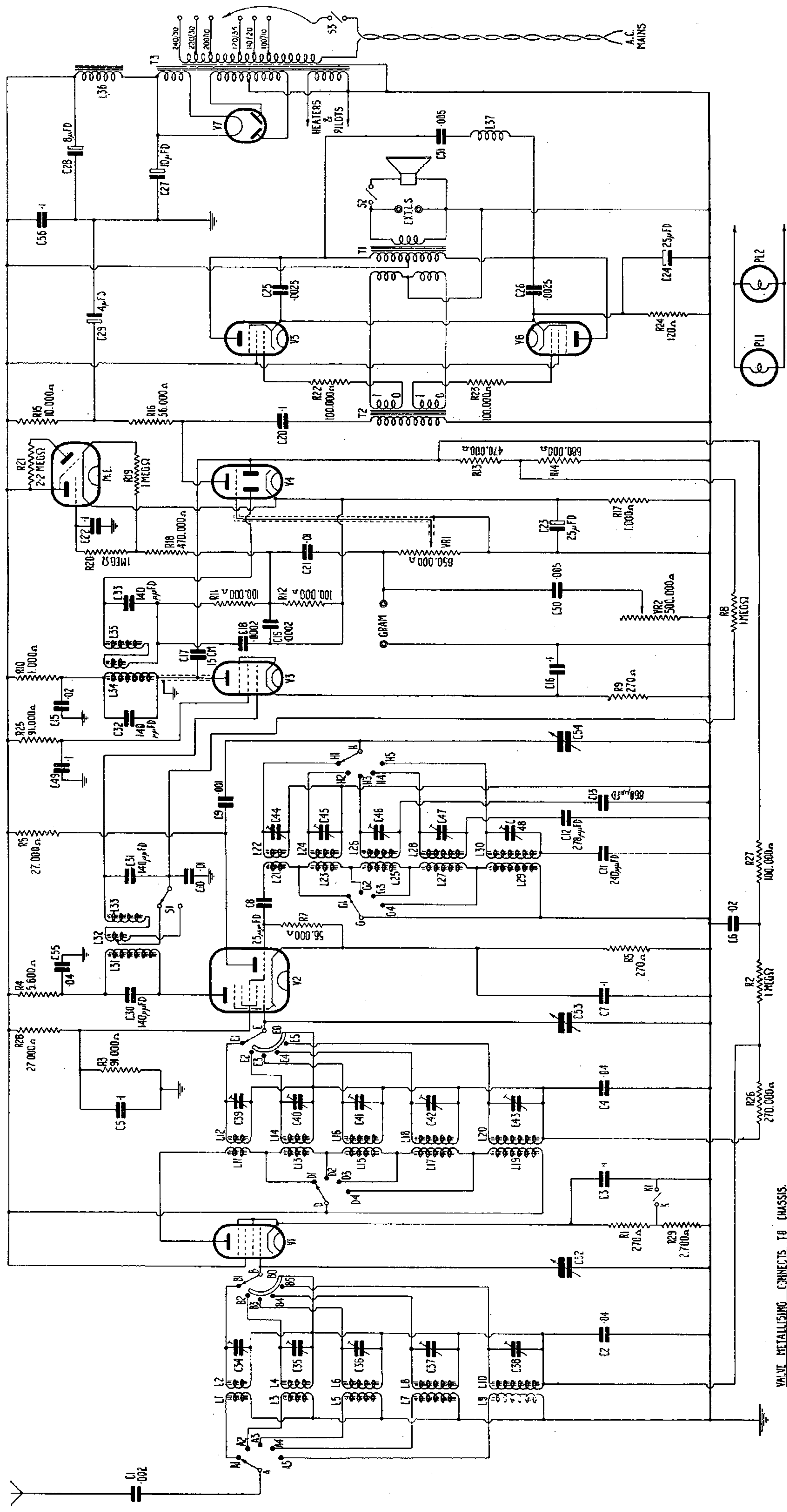
ANODE WAFER (W2)



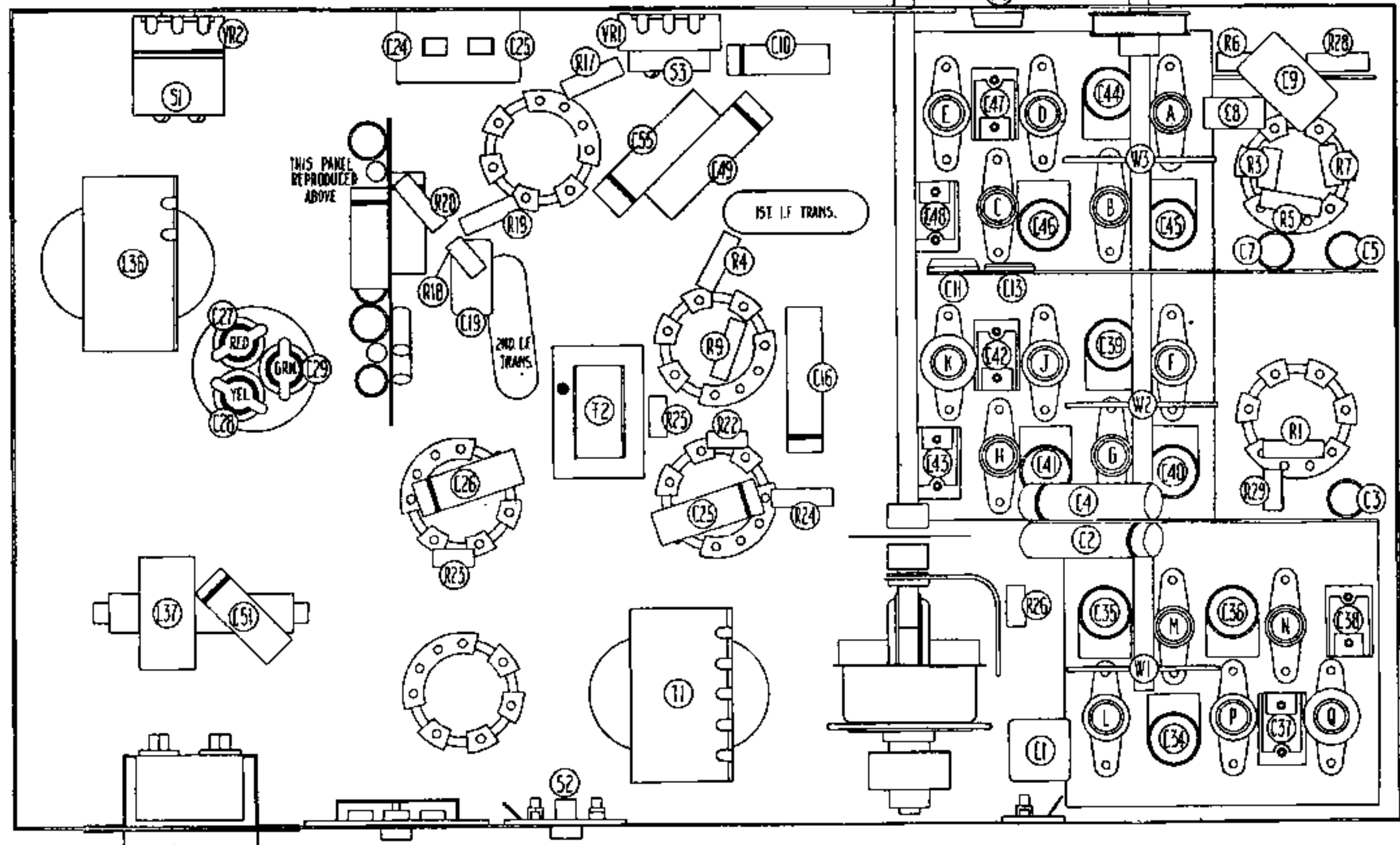
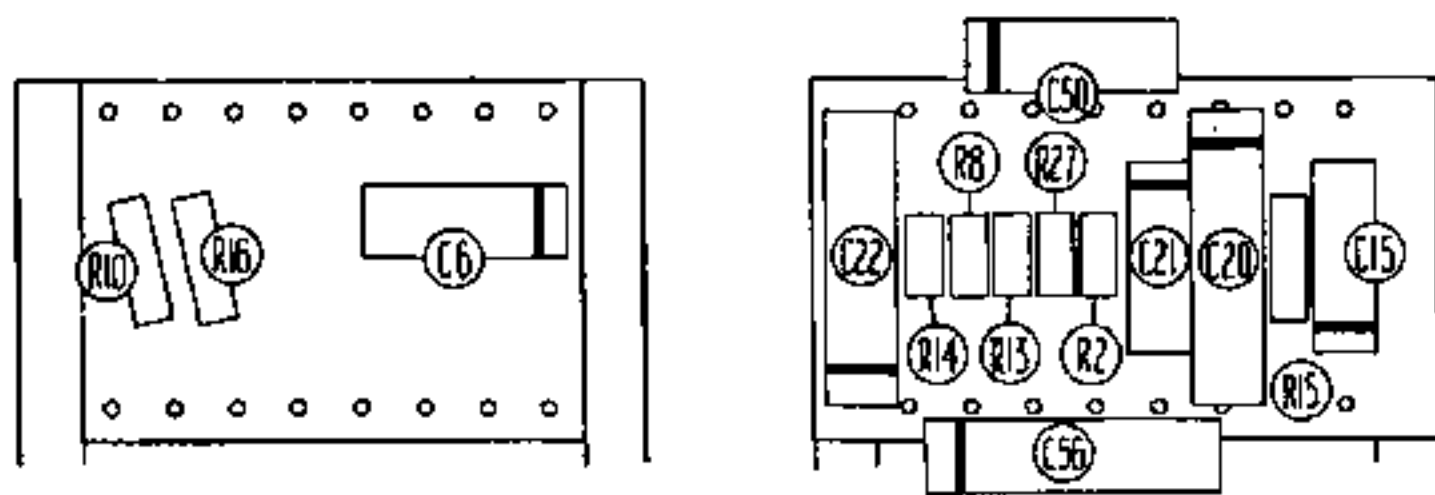
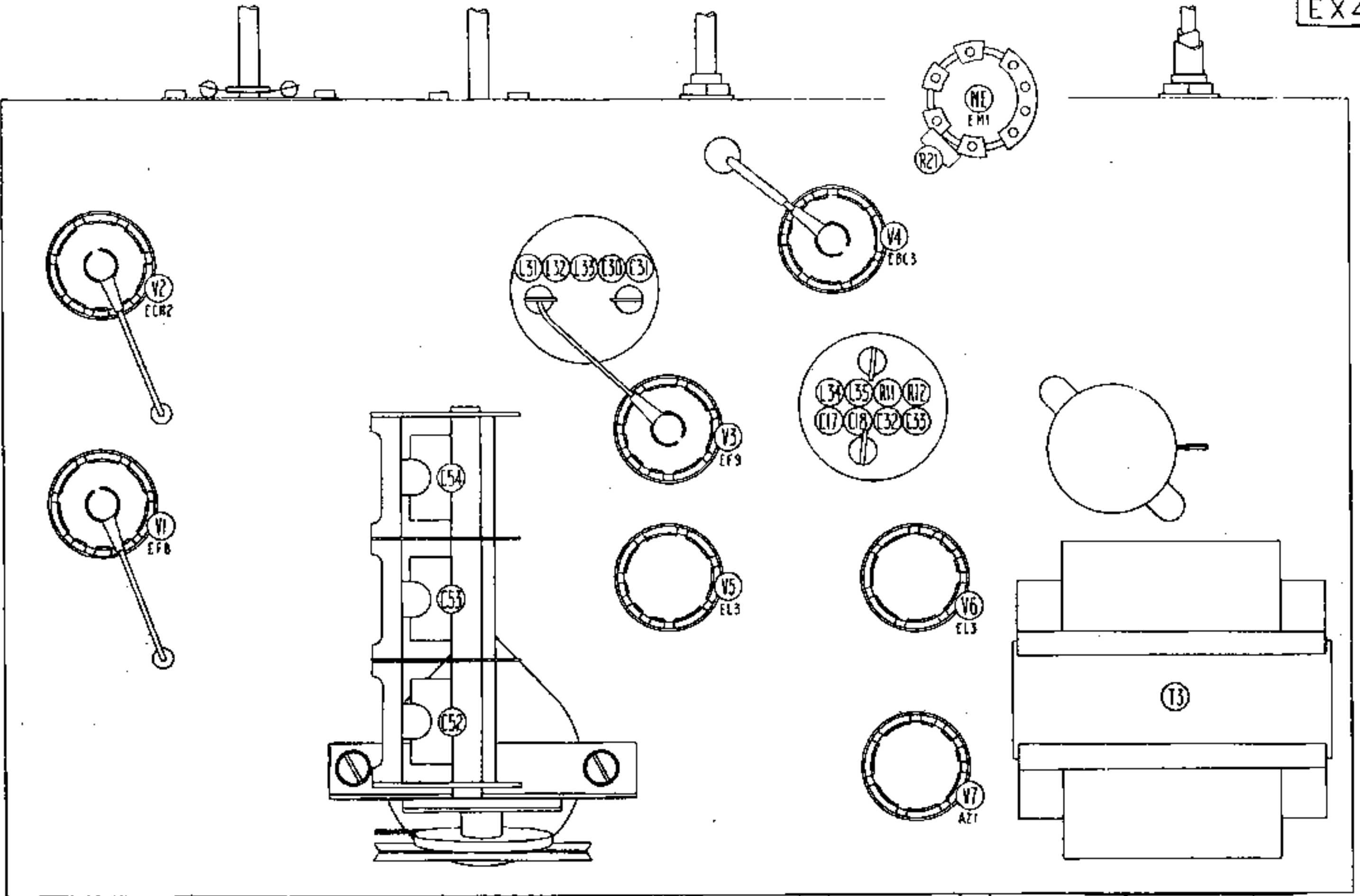
AERIAL WAFER (W1)



DIRECTION OF ROTATION FOR ALL WAFERS



VALVE METALLISING CONNECTS TO CHASSIS



DATA OF WIREWOUND COMPONENTS

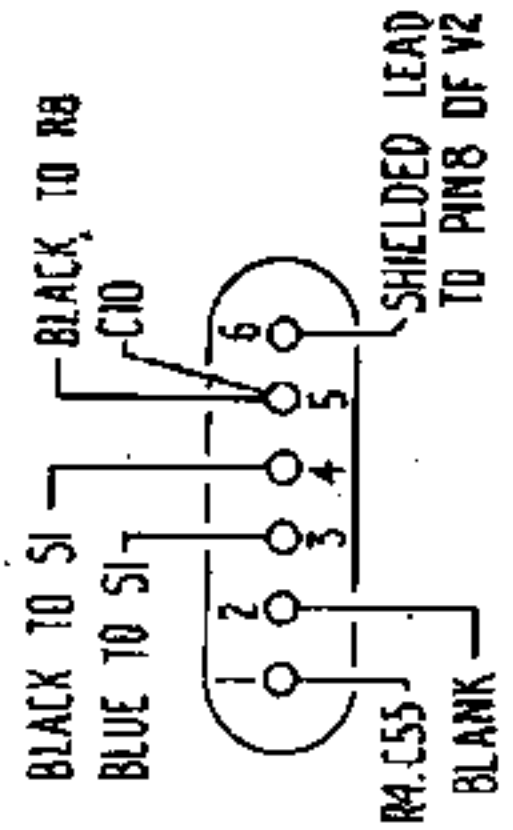
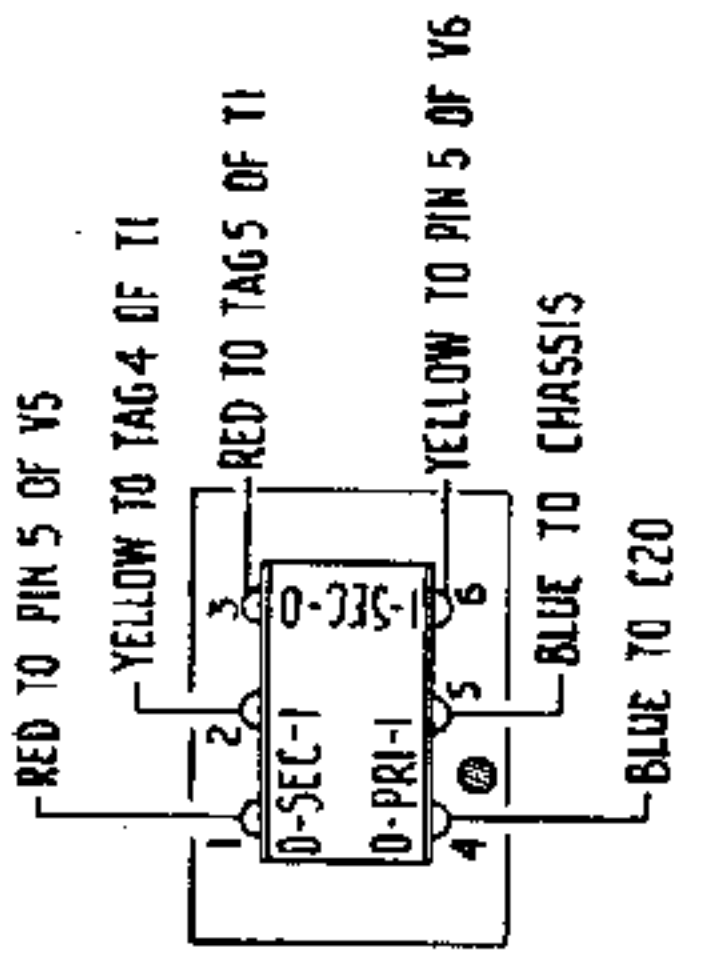
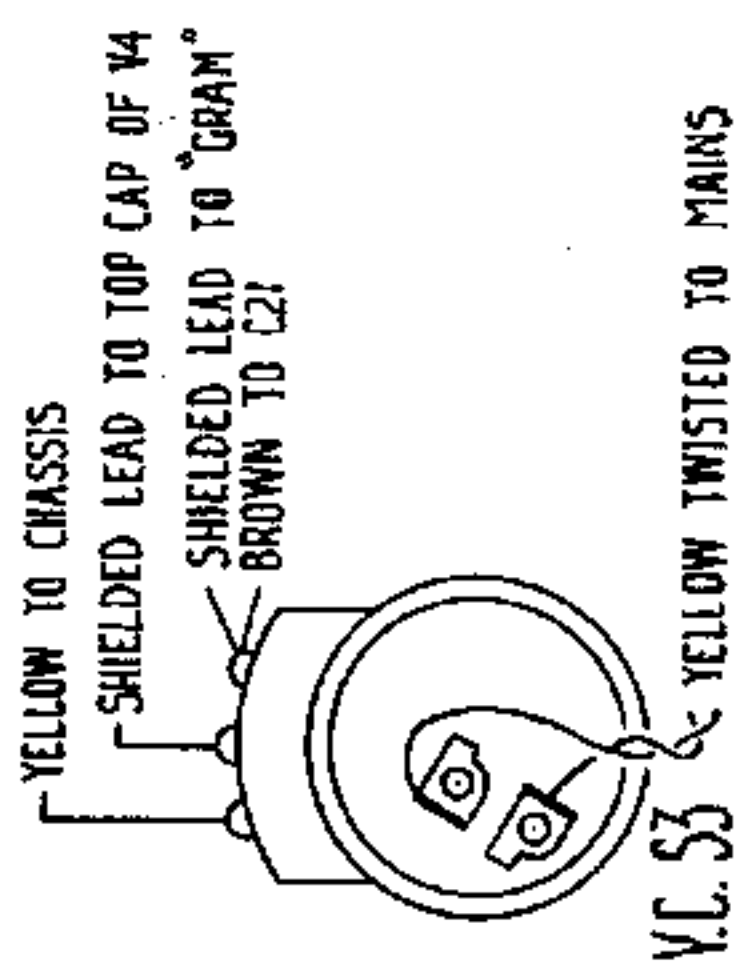
L. NO.	WAVEBAND	D.C. RES. Ω	MEASURE BETWEEN
1	1	.5	C1 & CHASSIS
3	2	.7	" "
5	3	1	" "
7	4	1.2	" "
9	5	1.8	" "
2	1	.1	C52 & C2
4	2	.2	" "
6	3	.4	" "
8	4	1.5	" "
10	5	3.5	" "
11	1	.2	H.T.+ & PIN 8 OF V1
11+13	2	.6	" "
11+13+15	3	1	" "
11+13+15+17	4	1.4	" "
11+13+15+17+19	5	1.7	" "
12	1	.1	C53 & C4
14	2	.2	" "
16	3	.4	" "
18	4	1.5	" "
20	5	3.5	" "
21	1	.2	C8 & CHASSIS
21+23	2	.4	" "
21+23+25	3	1.1	" "
21+23+25+27	4	2	" "
21+23+25+27+29	5	3.3	" "
22	1	.2	C54 & "
24	2	.2	" "
26	3	.3	" C13
28	4	2	" C12
30	5	3.5	" C11
31	5	5	R4 & PIN 8 OF V2
32+33	5	5	TOP CAP OF V3 & C10 (SI AT LOCAL)
34	5	5	R10 & PIN 8 OF V3
35	5	5	ACROSS C33 (2ND I.F. CAN REMOVED)
36	450		L36 TAGS
37	82		L37 TAGS

WINDING	RES. Ω	MEASURE BETWEEN
PRI-1	210	TAGS 1 & 3
PRI-2	260	" 2 & 3
SEC	BELOW 1	EXT'L.S. SOCKETS (WITH S2 OPEN)
TERT-1	11	TAG 4 & CHASSIS
TERT-2	11	" 5 & "
PRI	800	TAGS 4 & 5
SEC-1	1000	" 1 & 2
SEC-2	1150	" 3 & 6
PRI-TOTAL	16	MAINS PINS (S3 CLOSED, TAP AT 250)
H.T.	170	PIN 8 OF V7 & CHASSIS
SEC	180	" 5 " & "

VOLTAGE & CURRENT READINGS

V. NO.	PIN	VOLTS	M.A.
1	4	CATHODE (SW)	.75
	4	" (PW)	8.3
	7	S.G.	255
	8	ANODE	255
2	4	CATHODE	3.7
	5	OSC. ANODE	120
	7	S.G.	75
	8	HEP. ANODE	240
3	4	CATHODE	2.2
	7	S.G.	92
	8	ANODE	252
4	4	CATHODE	2.9
	8	ANODE	120
	8	ANODE	252
5	7	S.G.	255
	4	CATHODES	7.2
	4	COMMON	60
6	7	S.G.	255
	8	ANODE	252
7	5	ANODE	295 RMS
	8	ANODE	295 RMS
	4	CATHODE	SEE V4
M.E.	7	TARGET	252
	8	ANODE	42.5
			.23

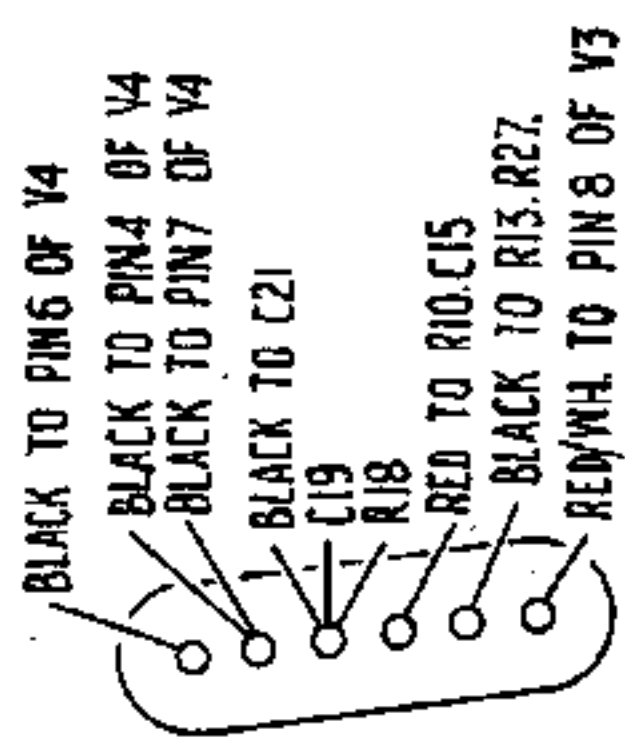
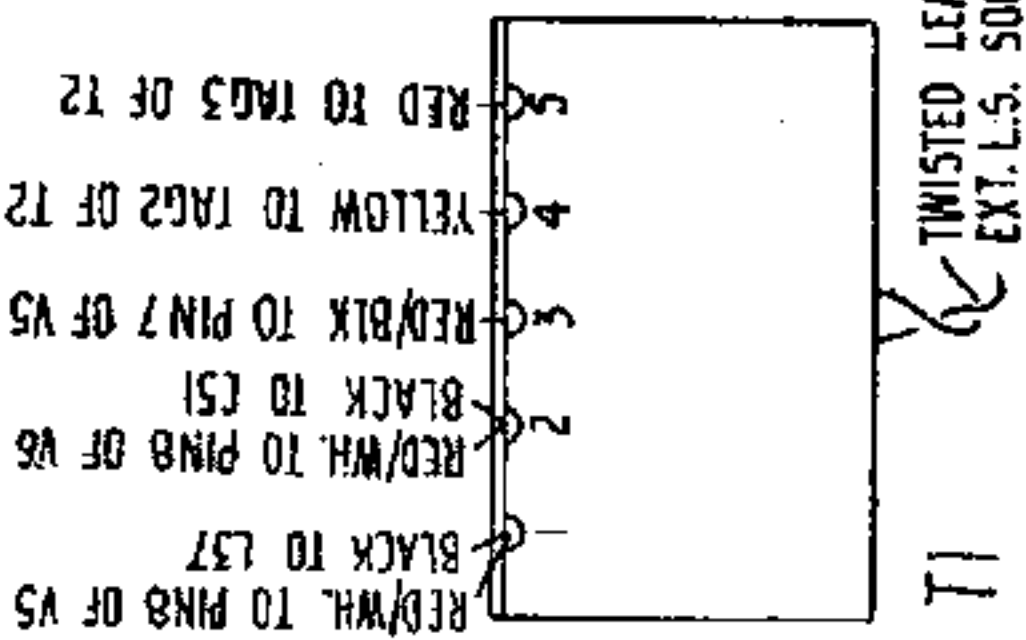
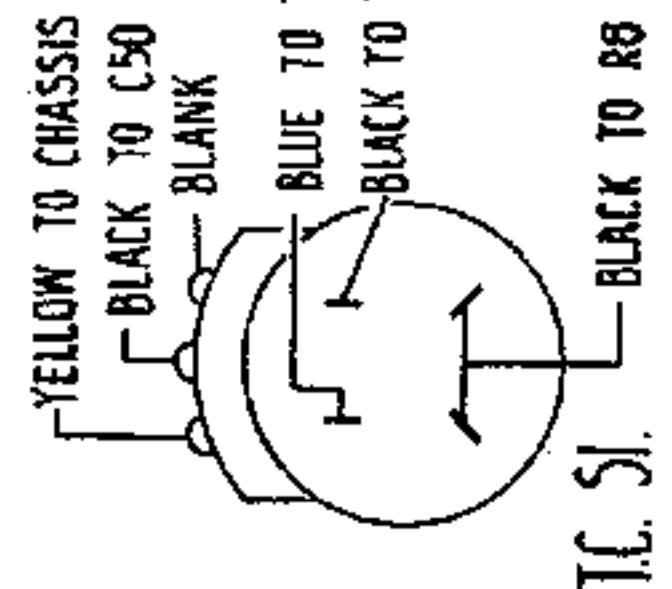
EXCEPT WHERE OTHERWISE STATED, READINGS TAKEN WITH RECEIVER TUNED TO 1,000 KCS., NO SIGNAL INPUT. CHASSIS AS NEGATIVE. USE HIGH RESISTANCE V/METER.



1ST. I.F. TRANS.

2ND. I.F. TRANS.

TAG CONNECTIONS.





PRICE LIST.

MISCELLANEOUS.

<i>Description.</i>	<i>Part No.</i>	<i>Price</i>	<i>Description.</i>	<i>Part No.</i>	<i>Price</i>
Back Cover ... ..	E10416		Coil Assembly—1st I.F. Trans.	SA266	
Cabinet ... ..	DP2472		Coil Assembly—2nd I.F. Trans.	SA366	
Coil Assembly—H.F. Unit ...	SA364		Coil Assembly—Low Pass Filter	DP2468	
Coil Assembly—Aerial Band 1 (L1, 2) ... ..	DP2480		Choke—L.F. ... ..	SA363	
Coil Assembly—Aerial Band 2 (L3, 4) ... ..	DP2481		Knob—Fidelity ... ..	DP1899	
Coil Assembly—Aerial Band 3 (L5, 6) ... ..	DP2482		Knob—Tone Control ... ..	C8892	
Coil Assembly—Aerial Band 4 (L7, 8) ... ..	DP2483		Knob—Tuning ... ..	DP2090	
Coil Assembly—Aerial Band 5 (L9, 10) ... ..	DP2484		Knob—Volume Control or Wave Change ... ..	DP2091	
Coil Assembly—Anode Band 1 (L11, 12) ... ..	DP2480/1		Loudspeaker ... ..	D10423	
Coil Assembly—Anode Band 2 (L13, 14) ... ..	DP2481/1		Mains Lead ... ..	DP2366	
Coil Assembly—Anode Band 3 (L15, 16) ... ..	DP2482/1		Pilot Lamp ... ..	A5767	
Coil Assembly—Anode Band 4 (L17, 18) ... ..	DP2483/1		Pilot Lamp Holder ... ..	A6227/1	
Coil Assembly—Anode Band 5 (L19, 20) ... ..	DP2484/1		Pointer ... ..	A10438	
Coil Assembly—Osc. Band 1 (L21, 22) ... ..	DP2480/2		Pointer Spindle ... ..	A10285	
Coil Assembly—Osc. Band 2 (L23, 24) ... ..	DP2481/2		Scale ... ..	E10367	
Coil Assembly—Osc. Band 3 (L25, 26) ... ..	DP2482/2		Tone Control and Fidelity Switch	C10369	
Coil Assembly—Osc. Band 4 (L27, 28) ... ..	DP2483/2		Transformer—Intervalve ...	DP2495	
Coil Assembly—Osc. Band 5 (L29, 30) ... ..	DP2484/2		Transformer—Mains ... ..	SA365	
			Transformer—Output ... ..	SA362	
			Universal Coupling ... ..	DP1484	
			Valve Holder—Type E8 ... ..	A4126	
			Volume Control & Mains Switch	C10218/1	
			Wave Change Switch—Aer. Wafer ... ..	B10371	
			Wave Change Switch—Anode Wafer ... ..	B10371	
			Wave Change Switch—Osc. Wafer ... ..	B10370	
			Wave Change Switch Spindle...	B10374	
			Waveband Indicator ... ..	B10364	
			Window ... ..	B9069	

CONDENSERS.

<i>Description.</i>	<i>Part No.</i>	<i>Price</i>	<i>Description.</i>	<i>Part No.</i>	<i>Price</i>
C1 ... .002 mfd. ... ..	A8992		C20 ... .1 mfd. ... ..	B10383	
C2 ... .04 mfd. ... ..	B10436		C21 ... .01 mfd. ... ..	B10384	
C3 ... .1 mfd. ... ..	B10383		C22 ... .1 mfd. ... ..	B10383	
C4 ... .04 mfd. ... ..	B10436		C23, 24 25+25 mfd. ... ..	C10360	
C5 ... .1 mfd. ... ..	B10383		C25 ... .0025 mfd. ... ..	B10389	
C6 ... .02 mfd. ... ..	B10385		C26 ... .0025 mfd. ... ..	B10389	
C7 ... .1 mfd. ... ..	B10383		C27, 28, 29 10-8-4 mfd. ... ..	C10207	
C8 ... 25 mmfd. ... ..	B8865		C30 ... 140 mmfd. ... ..	B8734 or B8735	
C9 ... .001 mmfd. ... ..	A5273		C31 ... 140 mmfd. ... ..		
C10 ... .01 mfd. ... ..	B10384		C32 ... 140 mmfd. ... ..		
C11 ... 240 mmfd. ... ..	B10571		C33 ... 140 mmfd. ... ..		
C12 ... 278 mmfd. ... ..	B10571		C49 ... .1 mfd. ... ..	B10383	
C13 ... 860 mmfd. ... ..	B10571		C50 ... .005 mfd. ... ..	B10570	
C15 ... .02 mfd. ... ..	B10385		C51 ... .005 mfd. ... ..	B10429	
C16 ... .1 mfd. ... ..	B10383		C52, 53, 24 Gang Condenser ...	C10279	
C17 ... 15 cms. ... ..	A5422		C55 ... .04 mfd. ... ..	B10436	
C18 ... .0002 mfd. ... ..	A6516		C56 ... .1 mfd. ... ..	B10383	
C19 ... .0002 mfd. ... ..	A6516				

Price List continued on page 6.

PRICE LIST (contd)

TRIMMERS.

<i>Description.</i>			<i>Part No.</i>	<i>Price</i>	<i>Description.</i>			<i>Part No.</i>	<i>Price</i>
C34, 35, 36, 39, 40, 41, 44, 45, 46.					C37, 38, 42, 43, 47, C48.	All			
All 4-17 p.f.	...	...	B10061		4-40 p.f.	...	...	B10249	

RESISTORS.

<i>Description.</i>			<i>Part No.</i>	<i>Price</i>	<i>Description.</i>			<i>Part No.</i>	<i>Price</i>
R1	...	270 ohms	...	55/9	R16	...	56,000 ohms	...	83/8
R2	...	1 megohm	...	31/9	R17	...	1,000 ohms	...	62/8
R3	...	91,000 ohms	...	206/8	R18	...	470,000 ohms	...	29/9
R4	...	5,600 ohms	...	71/8	R19	...	1 megohm	...	31/9
R5	...	270 ohms	...	55/8	R20	...	1 megohm	...	31/9
R6	...	27,000 ohms	...	193/8	R21	...	2.2 megohms	...	33/9
R7	...	56,000 ohms	...	83/9	R22	...	100,000 ohms	...	86/9
R8	...	1 megohm	...	31/9	R23	...	100,000 ohms	...	86/9
R9	...	270 ohms	...	55/8	R24	...	120 ohms	...	137/8
R10	...	1,000 ohms	...	62/8	R25	...	91,000 ohms	...	206/9
R11	...	100,000 ohms	...	86/9	R26	...	270,000 ohms	...	91/9
R12	...	100,000 ohms	...	86/9	R27	...	100,000 ohms	...	86/9
R13	...	470,000 ohms	...	29/9	R28	...	27,000 ohms	...	193/8
R14	...	680,000 ohms	...	30/9	R29	...	2,700 ohms	...	67/9
R15	...	10,000 ohms	...	74/8					