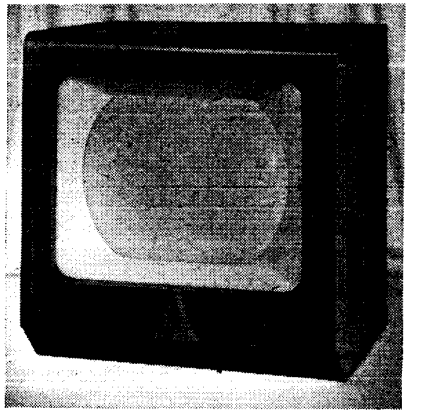
COSSOR 927

Seventeen-valve five-channel television receiver with 12in. grey screen CRT. Housed in walnut table cabinet. Suitable for 200-250V AC 50c/s or DC. Made by A. C. Cossor Ltd., Cossor House, Highbury Grove, London, N5.



THE receiver is a superhet operating on lower sideband of vision carrier. A built-in aerial attenuator is provided for use in high signal strength areas and vision interference and sound noise suppression circuits are incorporated. The receiver is constructed on a double-deck chassis with the vision and sound channel circuits, excepting sound output amplifier, on the lower chassis. This chassis is detachable, being held in place by a self-tapping screw at each side, and is coupled to main chassis by multi-plug and a single wander socket.

Mains consumption is approximately 150W.

Aerial input circuit is for use with 80ohm co-axial feeder which is coupled to receiver through isolating components C1 C2 and R1. Outer screen of feeder is connected direct to earthing screw. Two input sockets are provided—one feeding the aerial signal through an attenuator formed by R2 R3 R4.

Aerial signal, either direct or attenuated, is fed by C2 to aerial coupling transformer RFT1 in grid of RF amplifier V1. Gain of V1 is controlled, with that of first vision IF amplifier V3, by **Contrast** control R73 in their common cathode circuit. Signal at anode V1 is developed across L2 and coupled by C6 to grid of frequency changer V2.

Frequency-changer is V2 operated as a combined oscillator and mixer with oscillatory circuit L3 C7 C8, tuned to 10.1 mc/s below sound carrier, inserted in screen feed. RF and oscillator signals are mixed to produce, across L4A L5A in the anode circuit, a vision IF of 13.6mc/s and a sound IF of 10.1mc/s. Wide bandwidth to cover both sound and vision frequencies is ensured by damping resistor R11.

Vision channel consists of two IF amplifiers V3 V4, signal rectifier V5A, interference limiter W1, and video amplifier V6. Bandpass transformer coupling is employed between frequency changer, IF amplifier and signal rectifier, wide bandwidth being maintained by damping resistors R13 R16 R17 R18.

Sound on vision rejection at 10.1mc/s is given by sound channel input circuit L4B C12, and by L8 C19 in cathode V4. Adjacent channel rejection at 15.1mc/s is provided by L6B C15 inductively coupled to L6A in anode V3.

Video signal is fed through IF filter coil L10 on to R26 and passes through R25 and anti-flutter filter R27 C22 R28 to grid of video amplifier V6. Amplified video signal across anode load R70, located on main chassis, is coupled to cathode of CRT.

Interference limiter is rectifier W1 connected in series with R23 C21 between top of grid load V6 and chassis, with its cathode biased positively through R24 from **Picture Interference Limiter** control R22. Normally, R22 is adjusted so that with peak white signal the rectifier is just cut-off. When an interference pulse greater in amplitude than peak white appears the rectifier conducts and short circuits the pulse to chassis through C21.

Sound channel consists of two IF amplifiers V7 V8, signal rectifier V9A, AVC diode V5B, noise suppressor V9B, and audio output amplifier V16.

Sound signal of 10.1mc/s is obtained from anode of frequency-changer V2 by L4B C12 and fed, with AVC voltages, to grid of first sound IF amplifier V7. Bandpass transformer coupling is employed between V7 and second IF amplifier V8, and between V8 and cathode of signal rectifier diode V9A.

Rectified audio signal across R36 C31 is fed by C30 through series noise suppressor diode V9B and thence passed through interconnecting plug and socket to C60 and **Volume Control** R74 in grid of pentode sound output amplifier V16 on main chassis. Audio output from V16 is transformer coupled by OP1 to a 6½in. PM speaker.

AVC voltages, derived from rectified audio signal on R36 C31, are fed through R37, decoupled by C29, and applied through L4B to grid of first sound IF amplifier V7. Diode V5B which is biased from HT through R35 and shunted across C29 prevents AVC line going positive.

Noise suppressor is diode V9B which is held conducting by positive anode bias from HT through R38. The time constant of R39 C32 in its cathode circuit is such that voltage across the network follows that of the audio signal fed to its anode by C30. When a large amplitude high-frequency interference pulse is passed by C30, then anode V9B is driven negative and, due to comparatively long time constant of R39 C32, the cathode is unable to follow and the diode cuts off.

Sync separator. Video signal at anode of V6 is fed by C39 to grid of sync separator V10. Positive going sync pulses drive the valve into grid current and the resultant bias on C39 places video portion of waveform beyond cut off, thus only sync pulses appear at anode. Line sync pulses are taken from anode and fed through C50 R55 to grid V12A, one of the triodes employed in multi-vibrator line-scan oscillator.

Frame sync pulses are integrated on R44 C41 and applied through interlace rectifier W2 to grid of second triode V11A of frame scan multivibrator oscillator.

Frame scan is generated by a multivibrator oscillator formed by cross coupling between triodes V10B V11A. Variation of V10B grid circuit resistance by R43 gives **Frame Hold** and adjustment of V10B HT voltage by R65 gives **Picture Height** control.

Frame amplifier. Waveform developed on C43 is fed through C49 R53 to grid of pentode frame amplifier V11B. Variation of anode to grid negative feedback by C47 gives control of **Vertical Linearity.** Amplified scan voltage at anode V11B is auto-transformer coupled by FT1 to frame deflector coils L16.

Line scan is generated by a cathode-coupled multivibrator oscillator formed by two sections of V12, the pentode section having its screen strapped to anode and operating as a triode. Adjustment of coupling capacity between anode V12A and grid V12B by C51 gives **Horizontal Hold** control.

Line amplifier. Waveform at anode V12B is fed by C52 through stopper R63 to grid of pentode line amplifier V13. Output is transformer fed by coupled secondaries L18 L20 of LT1 to line deflector coils L21. **Width** of scan is controlled by tappings on L18, the adjustment being by plug S7.

Efficiency diode. First portion of line scan is provided by conduction of V14 when its anode is driven positive on second half-cycle of surge oscillation set up in LT1 when V13 is cut off at end of previous line scan. Linearity at commencement of scan is controlled by adjustment of inductance of series coil L14 damped by R69 C58. Linearity of remainder of scan is adjusted by L13 which couples the two sections of output secondary of LT1.

Additional HT for anode of line amplifier V13, first anode of CRT, and anode of frame multi-vibrator triode V10B is provided by charge built up on C57 by rectification, by V14, of flyback surge voltages set up in LT1 when V13 is cut off.

Voltage on C57 is smoothed by R67 R68 C55.

EHT of approximately 8kV for final anode of CRT is provided by V14 which rectifies high surge voltage developed across primary L17 and its overwind of LT1 when line amplifier V13 is cut-off. EHT is fed direct to anode of CRT, the capacity between inner and outer coatings of which provides smoothing.

HT is provided by indirectly-heated half-wave rectifier V17. Its anode voltage is obtained from the input mains via R81 on 200-210V and through droppers R80 and R79 R80 on 215-230 and 235-250V supplies respectively. On 200-210V DC mains, rectifier and dropper resistor are shorted out by voltage adjusting plug S3. Choke-capacity smoothing is by L25 C64 C65. Reservoir smoothing capacitor C65 should be rated to handle 500mA ripple current.

Heaters of valves, excepting EHT rectifier V15, are series connected and obtain their current from the input mains through thermal surge limiter R85, shunted by R86, ballast resistor R84 and dropper R82 R83. On 215-230 and 200-210V input R82 and R82 R83 respectively are shorted out by voltage adjusting plug S4.

Mains input is fitted with 1A fuse in each lead and with filter capacitor C66. S5 S6 which are operated by sound volume control spindle are bridged by static leak resistors R87 R88. R87 R88 are quench resistors.

CRT is a 12in. Cossor 121K tetrode with permanent magnet focusing. Video signal is fed to its cathode whilst **Brightness** is controlled by adjustment of grid bias by R72.

MODIFICATIONS

First releases of this receiver differed slightly from the circuit as follows:—

1K resistor inserted in HT line between R20 R22 to reduce line voltage of V1 to V4; R49 changed to 1M resistor and R91 deleted; R58 changed to 180K. Screen resistor R65 of V13 connected to HT line; R89 R90 C68 deleted and junction L13 L20 taken to HT line; R67 R68 changed to 220K each.

Pin 7 of output socket connected to HT line.

A 220pF silver mica capacitor was strapped across C51 in first fifty sets only.

ADJUSTMENTS

Ion Trap. Rotate the ion trap assembly to obtain maximum picture brightness (reducing the Brightness control setting to prevent over brightness), at the same time moving the ion trap slowly in an axial direction, i.e. fore and aft along the neck of the tube.

If shadows appear at picture corners it may mean that the ion trap has been set incorrectly.

After adjustment of the ion trap, it may be necessary to re-adjust the focus magnet and centralise the picture.

TEST SPECIFICATION

1. Input signal at vision carrier frequency required to give a change of 1mA in video anode load must not exceed 70 microvolts on any channel at the aerial input.
2. Input signal at sound carrier frequency modulated 30 per cent. at 400c/s required to give an output 200mW into 3ohms across secondary of sound output transformer should not exceed 15 microvolts on any channel.
3. Sound channel rejection: greater than 40dB (see note below).
4. Adjacent sound channel rejection: greater than 40dB.
5. Vision carrier to be between 6dB ± 1dB down relative to response at 1mc/s from carrier.
6. Curve to be flat within ± 1dB between 0.5mc/s and 2.25mc/s from carrier.
7. Frequency at which response falls to the same value as carrier to be at least 2.5mc/s below carrier.
8. IF rejection (13mc/s measured on vision channel): greater than 45dB.

Note: In measuring sound channel rejection on the London channel, a lower figure than 40dB is obtained. This is due to a spurious frequency produced in the mixer valve by the large input signal which is used in the conventional method of measurement. Consequently on the London channel the rejection should be measured at the mixer grid using the intermediate frequencies.

9. Range of contrast control: greater than 40dB.

ALIGNMENT INSTRUCTION

Instruments required are: Cossor Tele-Check model 1320I standard oscillograph such as Cossor model 1039 or 339B, calibrated signal generator and non-metallic trimming too, of the screw-driver type.

Wax sealing the dust iron cores may be softened by using a heated grub-screwdriver.

As receiver chassis is connected to one side of mains, care should be taken to see that mains plug is inserted so that chassis is connected to neutral side of mains.

Tele-Check output lead should terminate in an 82ohm resistor, except when connection is made to aerial socket, and a 47,000ohm ½W resistor should be fitted in series with "live" lead of oscillograph at receiver end of leads so that resistor acts as an RF stopper and assists in reducing feedback.

Care should be taken in keeping the input and output leads to strip as far apart as possible as otherwise some interaction may take place causing an error in shape of response curve.

In all instances where two positions of a core are found which satisfy the trimming requirements then position nearer trimming end of coil is the correct one. For short coils the correct position is that nearer chassis.

The following points should be observed in carrying out the alignment: Picture interference limiter should be set in minimum position; gain should be set so that peak signal at diode is about 2½V; marker signals should be no larger than required to give a frequency indication.

Connect oscillograph across R26, inject a signal sweeping between 9 and 15mc/s from Tele-Check into control grid of V4. Adjust L9 (top and bottom cores) until curve shown in Fig. 1 is obtained on oscillograph.

Inject a modulated signal at 10.1mc/s to grid V2, and adjust L8 and L4 (top core) until minimum amplitude of trace is obtained. Receiver gain and signal level should be increased as required to maintain a suitable visual trace.

Inject a modulated signal at 15.1mc/s to grid V2 and adjust L6 (top core) for minimum output. Transfer oscillograph across R39 and feed in 10.1mc/s modulated signal to grid of V2. Adjust L11 and L12 for maximum.

Connect oscillograph across R26 and inject a signal from Tele-Check to grid V3. Adjust L6 (bottom core) and L7 for response curve shown in Fig. 2.

Inject Tele-Check signal to grid of V2 and adjust L4 (bottom core) and L5 for response curve shown in Fig. 5.

Inject a modulated signal of the required sound channel frequency into aerial input socket and adjust L3 for maximum signal across R39.

Note: If the frequency is being changed by any considerable amount, it may be necessary to readjust core of L2 in order to maintain oscillation. This can be done by setting cores to approximately the same mechanical position. A guide is given on oscillator core to enable it to be roughly set to correct frequency.

Feed a signal from Tele-Check using frequency band required and adjust L1 and L2 to give response shown in Fig. 4. Finally check oscillator setting.

An alternative method of alignment where a visual method is not available is as follows.

Connect an Avometer on 10mA range between HT and anode of video amplifier V6. Decouple anode V6 to chassis by means of small capacitor (about 3,000pF).

IF Alignment. Connect signal generator, terminated with 82ohms, to grid V2. Feed in a signal of 10.1mc/s and adjust top core of L4 and L8 for minimum anode current in V6, adjusting gain and input signal as required.

Feed in a signal of 15.1mc/s and adjust top core of L6 for minimum anode current. Reduce gain of RF strip to a minimum.

Feed in a signal of 12.5mc/s, connect a 330ohm ¼W resistor across R18 and increase signal until a current of about 5 to 6mA is obtained. Tune top core of L9 for maximum current. Transfer the 330ohms to secondary of L9 and adjust input to give about 6mA anode current. Tune bottom core of L9 for maximum current. Note that tuning of these cores will be fairly flat and that care should be taken in setting for maximum current.

Transfer the 300ohms across R16, set generator to 12mc/s and adjust input to give a standing current of about 8mA. Adjust L7 for maximum current. Transfer the 300ohms across R17 and adjust bottom core of L6 for maximum current.

Transfer the 300ohms across R11 and tune L5 for maximum current.

Transfer the 300ohms across R13 and tune L4 (bottom core) for maximum current.

Feed in a modulated signal of 10.1mc/s and adjust L11, L12 to give maximum sound output into an output meter connected across sound output transformer.

In carrying out this make sure that signal is kept sufficiently small to prevent AVC from operating.

RF Alignment. Tune oscillator to approximate position for required channel by setting oscillator core L3 against scale. Set L1 and L2 to approximately same position.

Feed a modulated signal at appropriate sound frequency into aerial and adjust core of L3 for maximum sound output.

Feed a signal at the frequencies given in table below and adjust L1 and L2 for maximum anode current in anode V6. Note that tuning of L1 is very flat and that core should be set to middle of the range over which output is flat.

Finally recheck oscillator tuning.

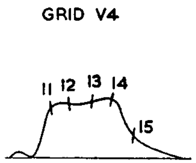


Fig. 1

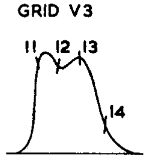


Fig. 2

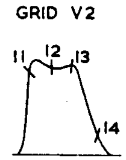


Fig. 3

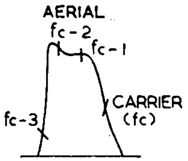
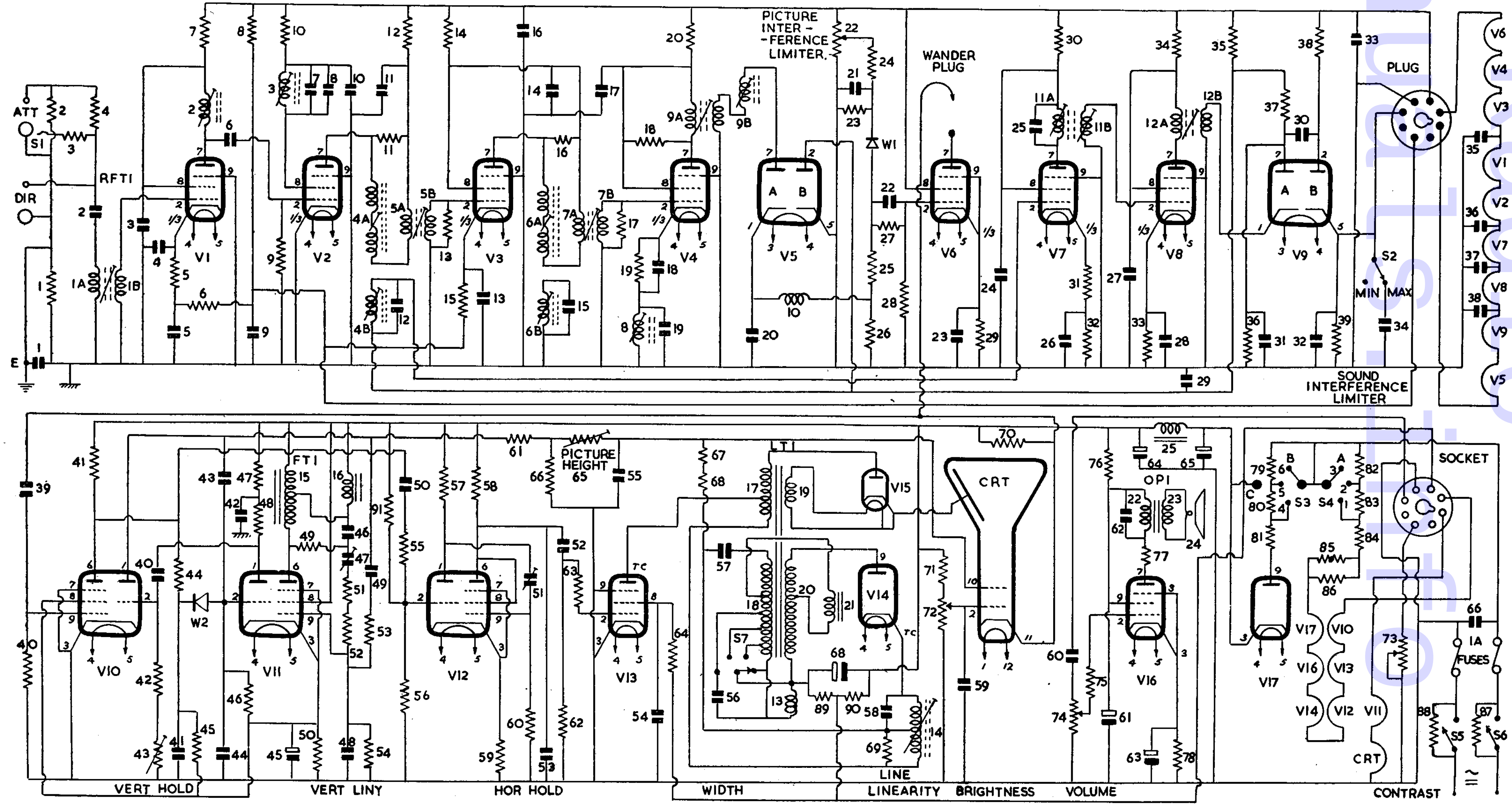


Fig. 4

Channel	*Align L1 at*	*Align L2 at*
1	44.5mc/s	44mc/s
2	51.25mc/s	50.75mc/s
3	56.25mc/s	55.75mc/s
4	61.25mc/s	60.75mc/s
5	66.25mc/s	65.75mc/s



RESISTORS

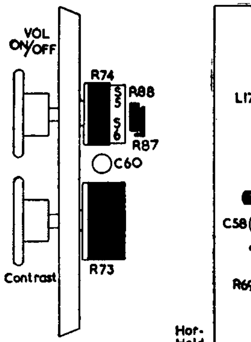
R	Ohms	Watts
1	1M	¼
2	82	¼
3	82	¼
4	1K	¼
5	68	¼
6	82	¼
7	4.7K	½
8	100K	½
9	68K	¼
10	33K	¼
11	8.2K	¼
12	4.7K	½
13	4.7K	¼
14	4.7K	¼
15	150	¼
16	8.2K	¼
17	4.7K	¼
18	22K	¼
19	150	¼
20	4.7K	½
21	No Component	
22	250K Potr.	
23	120K	¼
24	1.5M	¼
25	1K	¼
26	4.7K	¼
27	2.2M	¼
28	2.2M	¼
29	560	¼
30	10K	½
31	33	¼
32	220	¼
33	220	¼
34	10K	½
35	4.7M	¼
36	100K	¼
37	470K	¼
38	1M	¼
39	2.2M	¼
40	470K	¼
41	470K	¼
42	270K	¼
43	500K Potr.	
44	39K	¼
45	8.2K	¼
46	2.7K	¼
47	3.3K	¼
48	22K	¼
49	900K	¼
50	560	¼
51	8.2M	¼
52	6.8M	¼
53	2.2M	¼
54	2.2M	¼
55	47K	¼
56	1K	¼
57	47K	¼
58	270K	¼
59	1K	¼
60	270K (2 x 470K)	½ HS
61	1.8M	¼
62	470K	¼
63	1K	¼
64	2.2K	1
65	2M Potr.	
66	3.3M	¼
67	100K	½
68	100K	½
69	1K	½
70	10K	1
71	68K	¼
72	250K Potr.	
73	2K WW Potr.	
74	500K Potr. (with DP switch)	
75	10K	¼
76	680	2
77	47	¼
78	390	½
79	30 } WW Dropper	
80	30 } WW Dropper	
81	40 WW	5
82	55 } WW Dropper	
83	55 } WW Dropper	
84	127 } WW Dropper	
85	Thermistor	
86	500 WW	5
87	1M	¼
88	1M	¼
89	100	¼
90	100	¼
91	100K	½

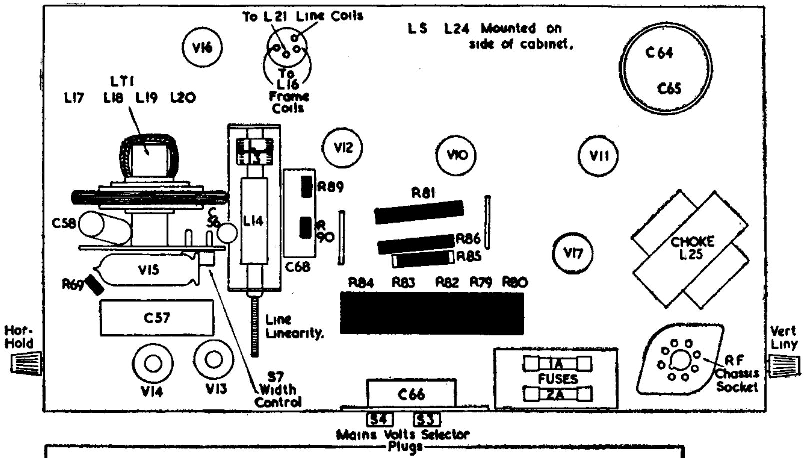
CAPACITORS

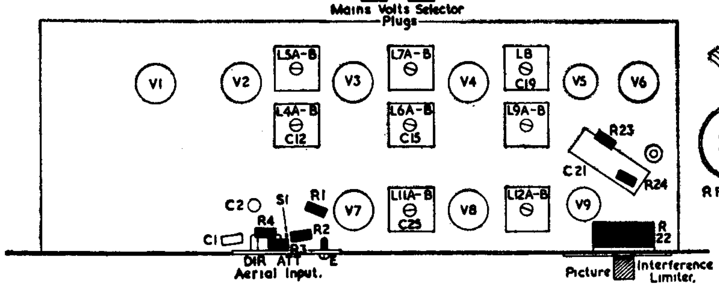
C	Capacity	Type
1	1000pF	Tub. Ceramic
2	100pF	Tub. Ceramic
3	.003	Tub. 350V
4	15pF	Silver Mica
5	.005	Tub. 350V
6	100pF	Tub. Ceramic
7	10pF	Tub. Ceramic
8	27pF	Silver Mica
9	.003	Tub. 350V
10	.003	Tub. 350V
11	.003	Tub. 350V
12	47pF	Silver Mica
13	.003	Tub. 350V
14	.003	Tub. 350V
15	18pF	Silver Mica
16	.003	Tub. 350V
17	.003	Tub. 350V
18	.003	Tub. 350V
19	1000pF	Silver Mica
20	5pF	Tub Ceramic
21	.1	Tub. 350V
22	.05	Tub. 250V
23	470pF	Silver Mica
24	.003	Tub. 350V
25	33pF	Silver Mica
26	.003	Tub. 350V
27	.003	Tub. 350V
28	.003	Tub. 350V
29	.1	Tub. 350V
30	.01	Tub. 150V
31	33pF	Silver Mica
32	220pF	Silver Mica
33	.003	Tub. 350V
34	.002	Tub. 350V
35	.003	Tub. 350V
36	.003	Tub. 350V
37	.003	Tub. 350V
38	.003	Tub. 350V
39	.1	Tub. 350V
40	.02	Tub. 500V
41	.001	Tub. 350V
42	.1	Tub. 350V
43	.05	Tub. 500V
44	.002	Tub. 1000V
45	100	Electrolytic 25V
46	720pF	Silver Mica
47	1000pF	Variable
48	220pF	Silver Mica
49	.1	Tub. 350V
50	20 or 22pF	Silver Mica
51	450pF	Variable
52	.01	Tubular 500V
53	560pF	Silver Mica
54	330pF	Silver Mica
55	.1	Tubular 350V
56	.01	Tubular 500V
57	.5	Tubular 350V
58	.1	Tubular 350V
59	.1	Tubular 350
60	.02	Tubular 500V
61	8	Electrolytic 275V
62	.01	Tubular 1000V
63	25	Electrolytic 25V
64	250	Electrolytic 275V
65	60	Electrolytic 275V
66	.1	Tubular 500V
67	No Component	
68	25	Electrolytic 25V

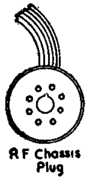
INDUCTORS

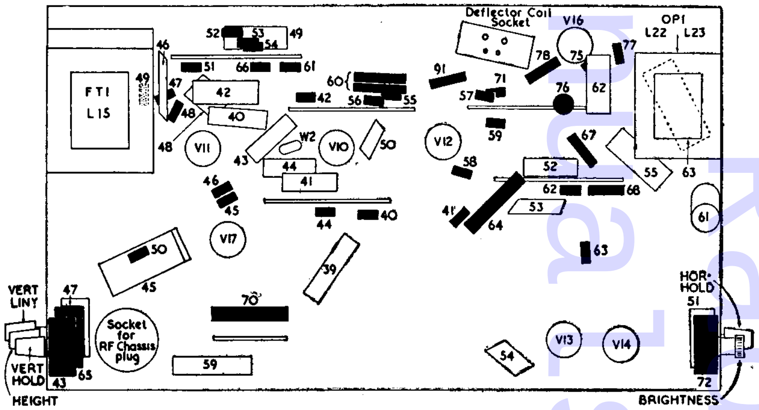
L	Ohms
1-3	Very low
4A	1.5
B	Very low
5A	.5
B	.5
6A	1.5
B	Very low
7A	.5
B	.5
8	Very low
9A	1.25
B	1.5
10	7.5
11A	Very low
11B	Very low
12A	.5
B	.5
13	3
14	5.5
15	1100 Tapped 16
16	50
17	345 Tapped 45
18	5
19	Very low
20	210 Tapped 1.5
21	7.5
22	375
23	.5
24	2.75
25	85

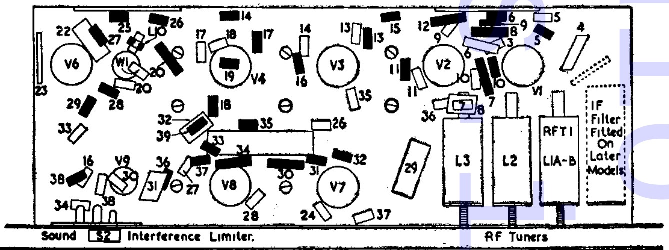


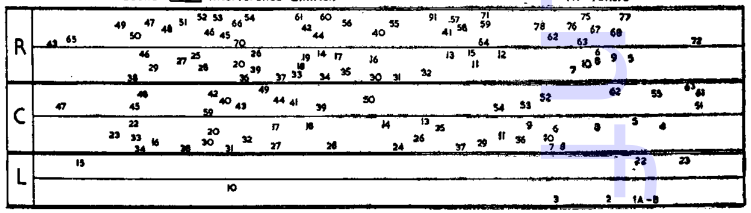


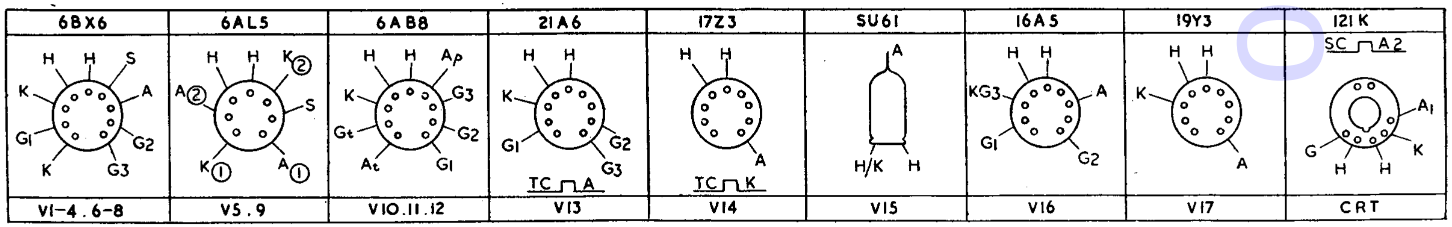












VOLTAGE READINGS

V	Type	A	G2	K
1	6BX6	170	170	1.6–5
2	6BX6	140	85	0
3	6BX6	175	175	1.3
4	6BX6	110	110	1.6–5
5A	6AL5	—	—	—
5B	6AL5	—	—	—
6	6BX6	140	180	3.2
7	6BX6	130	160	1.5
8	6BX6	115	115	1.5
9A	6AL5	—	—	—
9B	6AL5	30	—	30
10A	6AB8	20	10	0
10B	6AB8	25	—	0
11A	6AB8	70	—	10
11B	6AB8	170	180	10
12A	6AB8	60	—	3
12B	6AB8	50	50	3
13	21A6	—	150	0
14	17Z3	180	—	400
15	SU61	—	—	8kV
16	16A5	150	160	12
17	19Y3	200 RMS	—	200V
CRT	121K	8kV	280	180

Total HT current = 165mA.