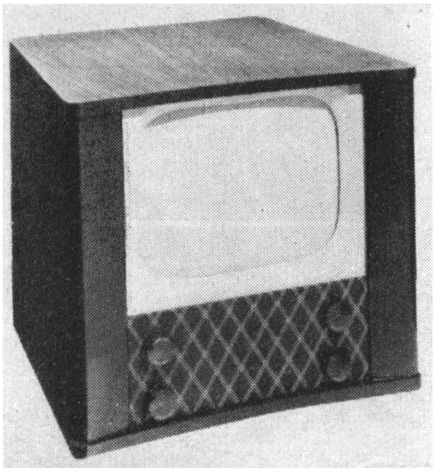
Test Report

ACE ASTRA Mk II (Model 553)
television receiver

TV52 ACE ASTRA Mk II

A CONVENTIONAL type of single sideband superheterodyne circuit, incorporating 15 valves, is used in the Ace Astra Mark II table television receiver, in which provision is made for easy adjustment to any one of the B.B.C. channels in Band I by means of a single tuning control. A 14in. rectangular cathode-ray tube is used, and the receiver is fitted in an attractive cabinet of contemporary design.



This receiver (also known as Model V553) operates on a.c. mains supplies of 200–250V at 50 c/s only, but since an auto-transformer is used for the heater supplies, the chassis is live, and the usual precautions must be taken to avoid damage to the receiver or test equipment, and the risk of electric shock.

This model should not be mistaken for its predecessor, the Mark I model, as there are a number of important differences in circuit design, layout, and cabinet, although the latter is similar in appearance. In the Mark I design, the cabinet was in two pieces, the upper section being removable for servicing; in the Mark II design, the cabinet is of the more usual type where the chassis, with c.r.t. may be removed from the rear, and it may be easily identified since a fibre back is fitted.

The manufacturers are Ace Radio, Ltd., Tower Works, Tower Road, London, N.W.10 (telephone: WILlesden 3902/5). The Astra Mark II was released in April, 1953, and the retail price is £49 8s. 10d., plus £15 13s. 2d., purchase tax.

SERVICE SNAPS OF THE ACE ASTRA MARK II (MODEL V553)

Valves: Five 8D3 (or Z77); three N78; two 6AL5, one 12AT7; one 12AU7; one 6CD6; one 6U4; one R12 (or 6W2).

Intermediate Frequency: Sound: 9.8 Mc/s. Vision: (mid-band) 12 Mc/s.

C.R.T.: Brimar 14KP4A or C14BM.

Main Controls: Volume on/off, 250kΩ (d.p.d.t.); contrast, 5kΩ; brilliance, 100kΩ; focus 500Ω, wire-wound.

Aerial feeder: 80 ohms, coaxial.

E.H.T.: 13kV.

Mains supply: 200–250V, a.c. only. (*Live chassis.*)

CIRCUIT DETAILS

R.F. and Frequency Changer Stages

In this receiver, the aerial, r.f., and oscillator coil tuning cores are ganged together so that a single tuning control can be used to change from one channel to another; each circuit, however, can be individually adjusted when required, and in fact the aerial and r.f. circuits will usually receive final adjustment when the B.B.C. signal has been tuned in.

The vision and sound r.f. signals received by the television aerial are fed in to the aerial circuit via a coaxial feeder of 80-ohm impedance, terminated in a two-pin non-reversible plug. From the aerial sockets they pass via the isolating capacitor C1 into the tapped aerial-matching and i.f. rejection coil L1, which is in parallel with the main aerial tuning coil L2. From here the signals are applied to the grid of the r.f. amplifier V1 (8D3), whose gain may be varied by means of the contrast control, which also controls the gain of the first i.f. stage V3.

Amplified vision and sound r.f. signals developed across the anode tuned circuit L3 are fed to the double-triode frequency changer V2 (12AT7) which is connected in a conventional first detector/separate oscillator circuit, the frequency of the oscillator stage being determined by the tuned circuit comprising L4/C10. (C10 now consists of two capacitors, one of them being a 15pF negative temperature coefficient type to reduce frequency drift when warming-up.)

Vision I.F. Stages

Combined vision and sound i.f. signals appearing at the anode of V2 are amplified by V3 (8D3) and are then separated, the sound i.f. signals being fed via C27 to the sound i.f. stage V8. Vision i.f. signals at the mid-band frequency of 12 Mc/s (in common with most present-day superheterodyne television receivers this set uses the single sideband adjacent to the sound channel) are fed into the following stage by means of the i.f. transformer composed of L7/L8. As mentioned above, the gain of both V3 and V1 is controlled by the variable cathode resistor R12 which has the effect of varying the control and supressor grid voltages on these valves. The h.t. feed to V1, V2 and V3 is decoupled by R13/C4.

Another 8D3 (V4) is used in the second vision i.f. stage, which is coupled to the vision demodulator (or second detector) V5A (half of a 6AL5) by the i.f. transformer L10/L11. A parallel-tuned circuit consisting of L9/C14 in the cathode circuit of V4 introduces negative feedback at the sound i.f. and therefore provides effective sound-on-vision suppression.

The three vision i.f. transformers L5/6, L7/8 and L10/L11 are over-coupled in order to provide bandpass characteristics, and are damped by means of the resistors R3, R7, R8, R15, R16, and additional damping is required when aligning to avoid pulling.

Video Stages

The positive-going video signals developed across the second detector load R18 are directly coupled to the grid of the video amplifier V6(N78) in order to retain the d.c. component of the vision signal, and the anode of this valve is also directly connected to the cathode of the c.r.t. for the same reason.

The coil L12 serves the dual purpose of improving the high-frequency response and rejecting i.f. signals, further high-frequency correction being provided by L13. In order that the heater-cathode voltage of the cathode-ray tube is kept within its specifications, the resistors R23/R25 form a potential divider between V4 anode and chassis, while the capacitor C20 ensures that the video modulation is not unduly affected.

A fixed amount of vision interference suppression is provided by the diode V5B (half of a 6AL5) which is connected across R19. Since the video signals at the anode of V6 are negative-going, impulsive interference signals cause the diode to conduct, thereby effectively connecting the capacitor C16 to the anode of V6 via the small value resistor R20. This circuit tends to follow the modulation of the video signals, due to the long time constant, so that it is effective on dark as well as bright picture levels, but the effectiveness may vary with different valves in V6 position.

Sound Stages

Sound i.f. signals at 9.8 Mc/s are fed into the first tuned circuit consisting of L14/C25, and then to the grid of the first sound i.f. stage V8 (8D3) where they are amplified and passed to the sound detector V9A (part of a 6AL5). Audio signals developed across the load resistor R34 are then fed through the sound interference suppressor stage V9B, which is a series-limiter type of circuit in which the diode is normally conducting.

An impulsive interference signal, however, drives the anode of V9B negatively faster than the time constants of the circuit permit the cathode to follow, so that the valve is cut-off. The valve commences to conduct, however, at the conclusion of the interference pulse which is of very short duration, and thus the nuisance value of the interference pulses is much reduced. The anode potential for V9B is obtained from the h.t. line via R35 in the usual way. From the cathode of the noise limiter stage the sound signals are fed via a simple r.c. filter to the volume control R38.

In early models (prior to August, 1953) the slider of the volume control was connected to the grid of the sound output valve V10 (N78), but subsequent models were modified as shown in the circuit diagram. Here the slider of R38 is connected to the bottom end of L14, and V8 is now used as a reflexed audio amplifier.

In the early models, V8 screen was connected directly to the h.t. line, and the bottom end of L4 was connected to chassis; in the later version, the load resistor R67 is connected in series with the h.t. supply, so that a.f. signals developed at the screen of V8 can be fed through C60 to the grid of V10. R65/C57 provide decoupling for the reflexed stage, and C58, C59 are additional i.f. by-pass capacitors.

In cases where a complaint of low volume is received with an early model, this reflex modification can be carried out, but the sound noise suppression may be slightly less efficient, since interference pulses are present (at i.f.) at the grid of V8.

Sync Separator Stage

Negative-going video signals, obtained at the junction R21/L13 in the anode of V6 are fed to the grid of the sync separator valve V7 (8D3), which is operated under limiting conditions, high values of anode and screen resistors being used.

The sync pulses are positive-going since they correspond to zero carrier output at the transmitter, and they are of sufficient amplitude when the valve is operated under these conditions to cause the valve to be driven into grid current, thus charging C18 negatively so that the valve is cut-off for the remainder (*i.e.*, picture signal) of the cycle. Thus, negative-going synchronising pulses only appear at the anode and screen circuits of V7.

R26/C19/R61 form a differentiating network for sharpening up the line sync pulses, which are then applied to the grid of the line oscillator valve V13. R28/R29/C21 form an integrating network so that the long frame pulses build up to a greater amplitude across C21 than do the short line pulses, these latter being further attenuated by reason of the value of the integrating capacitor C21. These frame sync pulses are fed via C42 to the grid of the frame oscillator stage of V11.

Frame Time-Base

A cathode-coupled multi-vibrator oscillator circuit incorporating V11 (12AU7) is used, and the frequency is primarily determined by the time constant of C43/R46/R47, R47 being the frame-hold control. The sawtooth waveform developed across C45 is fed to the grid of the frame output valve V12 (N78). The frame scanning coils are supplied through the substantial frame output transformer T3, damping resistors of 470 ohms being connected across the scanning coils to reduce the possibility of ringing.

The frame linearity is good on this receiver for the following reasons; the charging capacitor C45 is charged from the " boosted " h.t. line so that the rate of charge remains substantially constant; the capacitor is also connected in series with the cathode resistor of V12, which is not by-passed, so that a degree of negative feedback is obtained, while additional negative feedback is provided by C47/R54 and the frame linearity control network R52/R53.

The voltage appearing across the cathode resistor of V12 is also applied to the grid of the c.r.t. (together with the brilliance control potential obtained from the brilliance control R31) to provide flyback suppression, which is desirable during bright picture levels.

Line Time-Base

A single-valve line time-base circuit is used in which the line-output transformer provides the feedback voltage which maintains the line output valve V13 (6CD6) in a state of oscillation, the circuit being of the well-known blocking oscillator variety.

In this circuit V13 is periodically switched on and off, but due to the inductance of the transformer and the line scanning coils, the anode current is only permitted to rise gradually, the first part of the rise being substantially linear. The frequency of oscillation is determined initially by the line-hold control R62, which varies the time constants of the grid circuit, line sync pulses being fed into the grid of V13.

In common with most current line time-bases, an efficiency diode V14(6U4) is connected in this circuit. This valve conducts during the flyback, thus providing the necessary damping, and continues to conduct for about half of the sweep, the current through T2 steadily rising and producing the required field in the line scanning coils. V14, in conducting, charges C48, which is connected to the h.t. line, and thus provides a boosted h.t. point from which the c.r.t. first anode, the charging circuit of V11B, and the line oscillator stage all derive their h.t. supply. The steadily rising current through T2 and V14 is fed to the line scanning coils, the capacitor C50 being connected to balance the capacities across the scanning coils.

C14 ceases to conduct at the moment that V13 begins to conduct, the changeover occurring smoothly at the centre of the trace, velocity changes being kept to a minimum by careful design and layout. Width is controlled by L19 which varies the loading across part of T2.

During the fly-back the back-e.m.f. set-up across the main transformer winding scanning coils, etc., is stepped up by the auto-transformer coupled e.h.t. winding and rectified by V15 (R12), the resultant e.h.t. being applied to the anode side-cap of the c.r.t. (the e.h.t. is about 12kV).

Power Supply

A half-wave metal rectifier, fed from the 250 volt tap on the mains transformer T1, is used to provide the h.t. for this television receiver, smoothing being effected by means of the high capacity electrolytic capacitors C52-C55 inclusive, in conjunction with the choke L23 and the focus coil L22. The current through the focus coil can be adjusted for optimum focus by means of the wire-wound control R64.

All the valve heaters are connected in parallel (with the exception of the e.h.t. rectifier which is fed from the line output transformer T2), and are supplied by the 6.3 volt winding on the mains transformer. This 6.3 volt supply, as well as the h.t. supply, is available at a pair of sockets at the rear of the chassis (the chassis itself providing the return path) in order that a pre-amplifier can be fitted in fringe areas if desired.

The " boosted h.t." line (see line time-base description) supplies the line time-base, frame oscillator, and the c.r.t. first anode.

WARNING.—*One side of the mains supply is directly connected to the chassis via the mains switch associated with the volume control, and in consequence, every precaution must be taken to avoid electric shock, and/or damage to the receiver or test equipment.*

FOCUS COIL ADJUSTMENTS

Focus adjustments are normally made by means of the focus control at the front of the receiver, but the focus coil can be moved an appreciable amount by means of the three adjusting finger-nuts, which also provide the means for centralising the picture in the mask. Additional focusing adjustments can be made if necessary by moving the entire bracket and focus coil and scanning coil assembly backwards or forwards, and this may be done after slackening the six screws shown on the underneath view of the chassis. A rubber grommet in the front of the bracket supports the c.r.t. and this may stick to the tube.

MODIFICATIONS

Some sets are fitted with C14BM cathode-ray tubes. Part of the oscillator tuning capacity C10 is 15pF, type N750K. R39, in series with MR1, may not be fitted. R52 may be 47K ohms. The reflexed audio stage modification is fully described in the text, and the component positions are shown in the layout diagram.

Alignment Procedure

Channel Selection

Set the calibrated scale on the tuning unit to the appropriate channel (L: London. N: Northern, *i.e.*, Holme Moss. S: Scottish, *i.e.*, Kirk o' Shotts. M: Midland, *i.e.*, Sutton Coldfield. W: Wenvoe). Then adjust the tuning unit control for maximum volume. Finally, adjust L1, L2 and L3 for the best quality picture, preferably on the B.B.C. test card "C"; the tuning of these circuits is quite flat, but it will usually be worth while to make sure that the oscillator is still tuned for maximum volume.

Circuit Alignment

The i.f. stages are accurately aligned at the factory during manufacture, and should not normally need realignment. However, providing that an accurately calibrated signal generator is available, these stages may be aligned in the following manner. A damping unit consisting of a 500-ohm resistor in series with a 0.1μF capacitor will also be required.

Connect an a.f. output meter across the loudspeaker sockets, and a d.c. meter (preferably a valve voltmeter, but in any case it should be a high impedance type) between the grid of the video output valve V6, pin 1, and chassis.

Proceed as follows:—

Sound I.F. Stage

Connect the signal generator to the grid of V2 (pin 7).

Tune signal generator to 9.8 Mc/s (modulated).

Adjust L14, L15 and L16 for maximum audio output.

Sound Rejector

With signal generator tuned to 9.8 Mc/s, switch off modulation.

Adjust signal generator output so that the d.c. meter reading is approximately 2 volts.

Adjust L9, for minimum d.c. meter reading.

Vision I.F. Stages

For these adjustments set the contrast control about a quarter of a turn back from fully clockwise.

Connect signal generator to V4 grid (pin 1), and tune to 12 Mc/s (unmodulated). Adjust output for approximately 2 volts on the d.c. meter.

Connect damping unit between V4 anode (pin 5) and chassis.

Adjust L11 for maximum d.c. meter reading.

Connect damping unit to V5 diode (pin 2), and similarly adjust L10.

Connect signal generator to V3 grid (pin 1), still tuned to 12 Mc/s, and reduce output as required to keep the d.c. meter reading about 2 volts.

Connect damping unit between V3 anode (pin 5) and chassis.

Adjust L8 for maximum d.c. meter reading.

Connect damping unit to V4 grid (pin 1), and similarly adjust L7.

Connect signal generator to V2 grid (pin 7), still tuned to 12 Mc/s, and reduce output as required to keep the d.c. meter reading about 2 volts.

Connect damping unit between V2 anode (pin 1) and chassis.

Adjust L6 for maximum d.c. meter reading.

Connect damping unit to V3 grid (pin 1), and similarly adjust L5.

Remove damping unit, and tune signal generator through 11 to 13 Mc/s. The d.c. meter reading should show a fairly even response over this range, with a small dip in the centre. Slight readjustment should be made, if necessary, so that the output is equal at 11 and 13 Mc/s.

R.F. Stages

Connect signal generator to aerial sockets, and tune aerial unit to required channel on calibration scale. Tune signal generator to sound frequency (modulated) and adjust L4 for maximum sound output.

Tune signal generator to vision frequency (unmodulated) and adjust L1, L2, and L3 for maximum d.c. meter reading. Remove meter and signal generator. Now connect aerial and proceed as described in "Channel Selection."

SERVICING NOTES

Removing the chassis

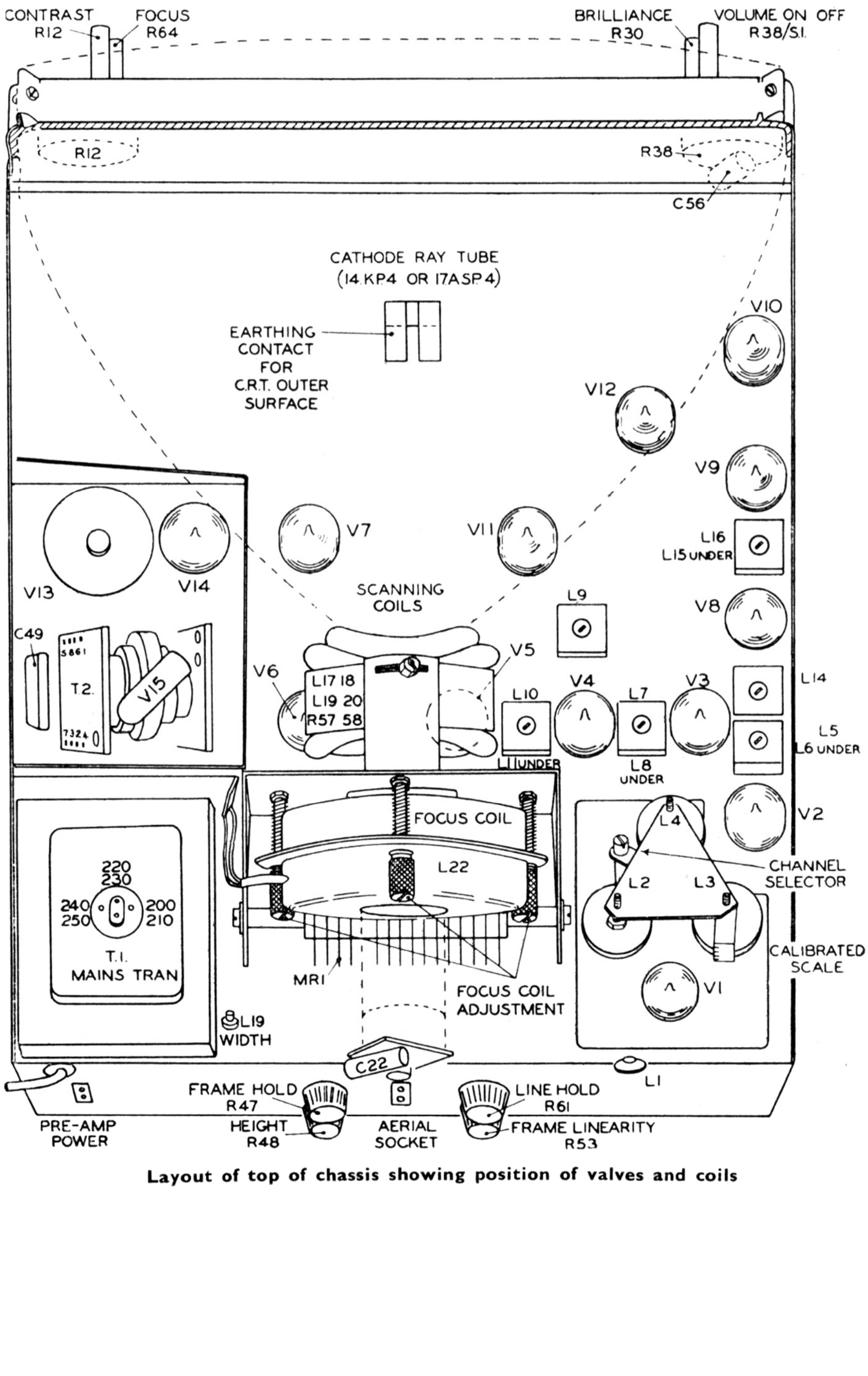
(*This may seldom be necessary as most of the components are completely accessible through the cabinet base servicing aperture.*)

First remove the fibre back, and then take off the four front control knobs after slackening their grub screws. Then remove the two small woodscrews securing the rear of the chassis to the base of the cabinet, and partly withdraw the chassis. After taking out the loudspeaker plug, the chassis can be removed, but as the upper side of the c.r.t. is very close to the inside edge of the cabinet, this operation should be done carefully.

When replacing the chassis, insert the front edge of the chassis into the rear of the cabinet, fit the loudspeaker plug into its sockets, and ease the chassis forward, taking care that the speaker leads are not trapped between the front edge of the chassis, and the aperture in the base of the cabinet. Then ensure that the front edges of the chassis side flanges fit under the two clips of the front of the cabinet before replacing the two wood screws.

Line Time-Base Screen

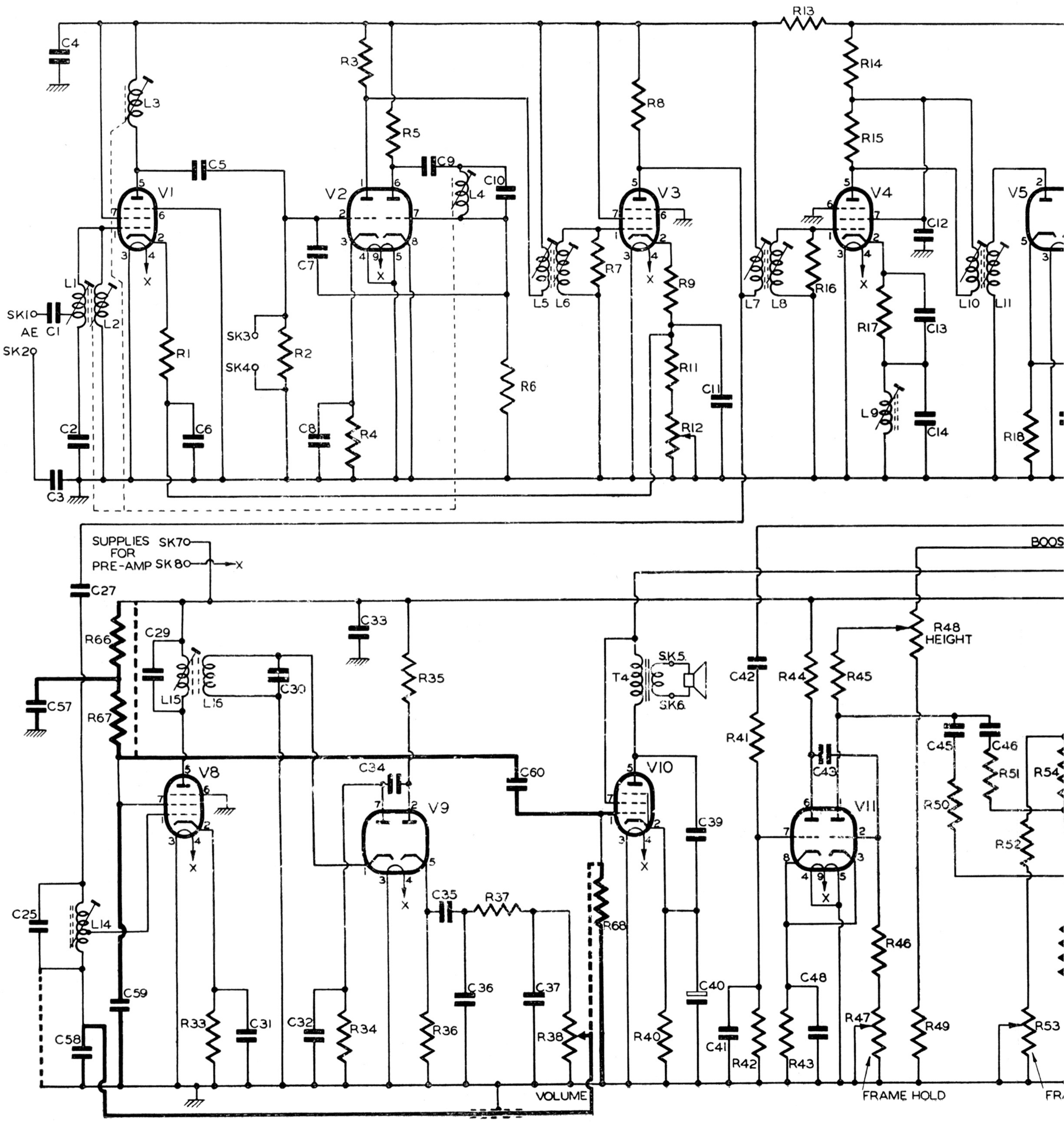
This perforated metal screen is secured to the chassis by one nut and screw only, the chassis should not be rested on this screen, therefore, without additional support.



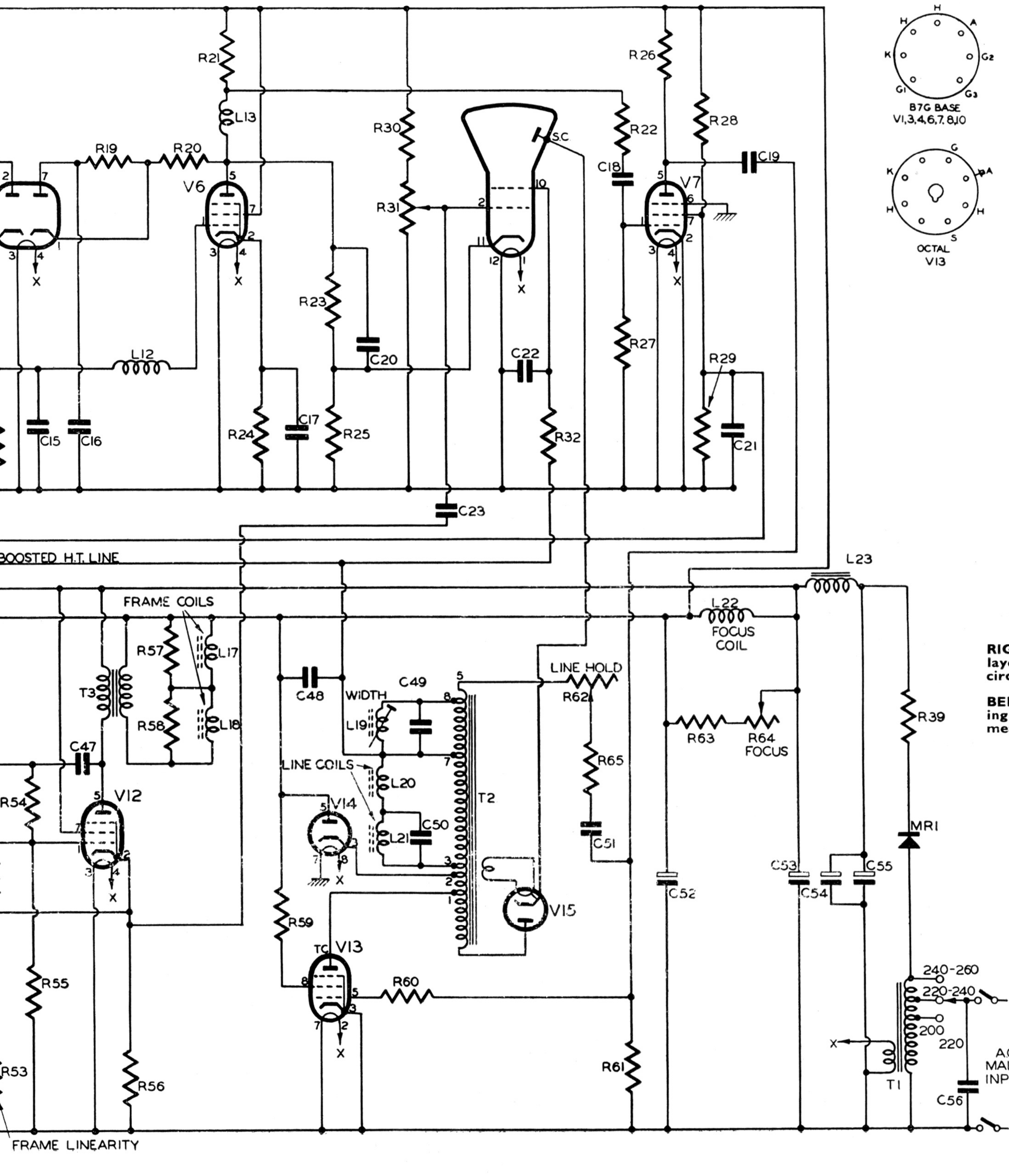
Layout of top of chassis showing position of valves and coils

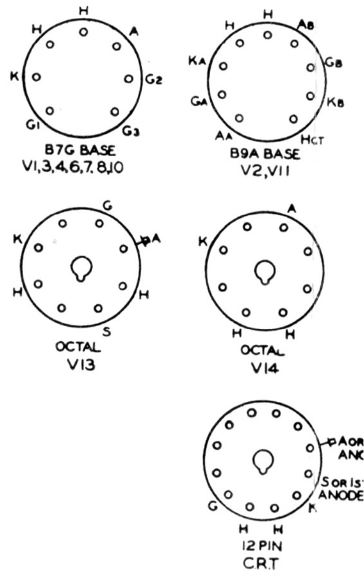
Issued with British Radio and Television, May, 1954

Circuit of the ACE ASTRA Mark II (Model



el 553) television receiver





RIGHT : Component layout for reflex sound circuit modification.

BELOW : Table showing valve voltages, etc. measured on test.

No.	T
V1	8D
V2A	12A
V2B	
V3	8D
V4	8D
V5B	6A
V6	N7
V7	8D
V8	8D
V9B	6A
V10	N7
V11A	12A
V11B	
V12	N7
V13	6C
V14	6U
V15	R12
CRT	14K C

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Voltages we
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COMPONENT LIST

Inductances

		Ohms
L1	Aerial matching coil	—
L2	Aerial tuning coil	—
L3	R.F. tuning coil	—
L4	Oscillator tuning coil	—
L5	First i.f.t. primary	1
L6	,, ,, secondary	.75
L7	Second i.f.t. primary	1
L8	,, ,, secondary	.75
L9	Sound rejector	.5
L10	Third i.f.t. primary	1
L11	,, ,, secondary	1
L12	I.F. choke	5
L13	Video correction	4.5
L14	Sound i.f. input coil	—
L15	Sound i.f.t. primary	1.5
L16	,, ,, secondary	1.5
L17	Frame scanning coil	16.5
L18	,, ,, ,,	16.5
L19	Width control	61
L20	Line scanning coils	3.5
L21	,, ,, ,,	3.5
L22	Focus coil	750
L23	Smoothing choke	80
T1	Mains transformer (pri.)	31
	,, ,, (L.T. sec.)	—
T2	Line scan transformer (e.h.t.) winding)	250
	,, ,, (tags 1–2)	8.5
	,, ,, ,, (,, 2–3)	8.5
	,, ,, ,, (,, 3–7)	8
	,, ,, ,, (,, 7–8)	3.5
	,, ,, ,, (,, 8–5)	6.5
T3	Frame scan transformer (pri.)	900
	,, ,, ,, (sec.)	—
T4	Sound output transformer (pri.)	600
	,, ,, ,, (sec.)	—

Resistors

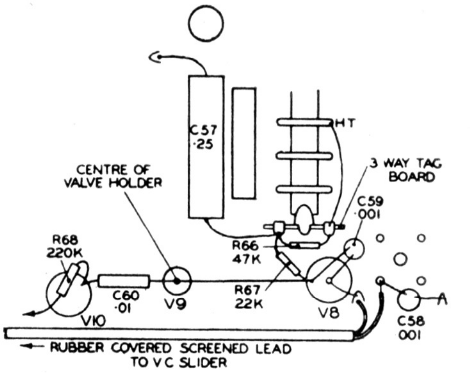
Value in ohms

R1	32
R2	22k
R3	680
R4	680
R5	10k
R6	47k
R7	4.7k
R8	10k
R9	32
R11	100
R12	5k *contrast*
R13	1k
R14	1k
R15	10k
R16	4.7k
R17	150
R18	4.7k
R19	2M
R20	150
R21	4.7k, 2W
R22	10k
R23	100k
R24	220k
R25	100k
R26	100k
R27	1M
R28	200k
R29	22k
R30	100k
R31	100k *brill.*
R32	100k
R33	150
R34	100k
R35	2M
R36	2M
R37	47k
R38	250k *volume*
R39	25Ω w/w
R40	220
R41	22k
R42	100k
R43	4.7k
R44	200k
R45	470k
R46	470k
R47	1M *frame hold*
R48	2M *height*
R49	470k
R50	6.8k
R51	220k
R52	68k
R53	100k *frame lin.*
R54	3M
R55	2M
R56	220
R57	470
R58	470
R59	4.7k 1W
R60	47
R61	470k
R62	100k *line hold*
R63	500
R64	500 *focus*
R65	220k
R66	47k
R67	22k
R68	220k

Capacitors

C1	0.001μF
C2	350pF
C3	0.001μF
C4	0.01μF
C5	100pF
C6	0.01μF
C7	10pF
C8	0.001μF
C9	100pF
C10	55pF
C11	0.01μF
C12	0.01μF
C13	0.01μF
C14	500pF
C15	10pF
C16	0.05μF
C17	0.001μF
C18	0.05μF
C19	10pF
C20	0.25μF
C21	0.05μF
C22	0.01μF
C23	0.01μF
C25	47pF
C27	5pF
C29	10pF
C30	15pF
C31	0.01μF
C32	47pF
C33	0.01μF
C34	0.01μF
C35	0.01μF
C36	500pF
C37	500pF
C39	0.01μF
C40	50μF *elec.*
C41	0.001μF
C42	0.001μF
C43	0.005μF
C44	0.1μF
C45	0.1μF
C46	0.25μF
C47	0.1μF
C48	0.1μF
C49	0.002μF
C50	47pF
C51	500pF
C52	100μF *elec.*
C53	100μF *elec.*
C54	60μF *elec.*
C55	60μF *elec.*
C56	0.01μF

Notes: *R39 may not be fitted. R52 may be 47k. C10 may be 40pF + 15pF, the 15pF capacitor type being N750K.*



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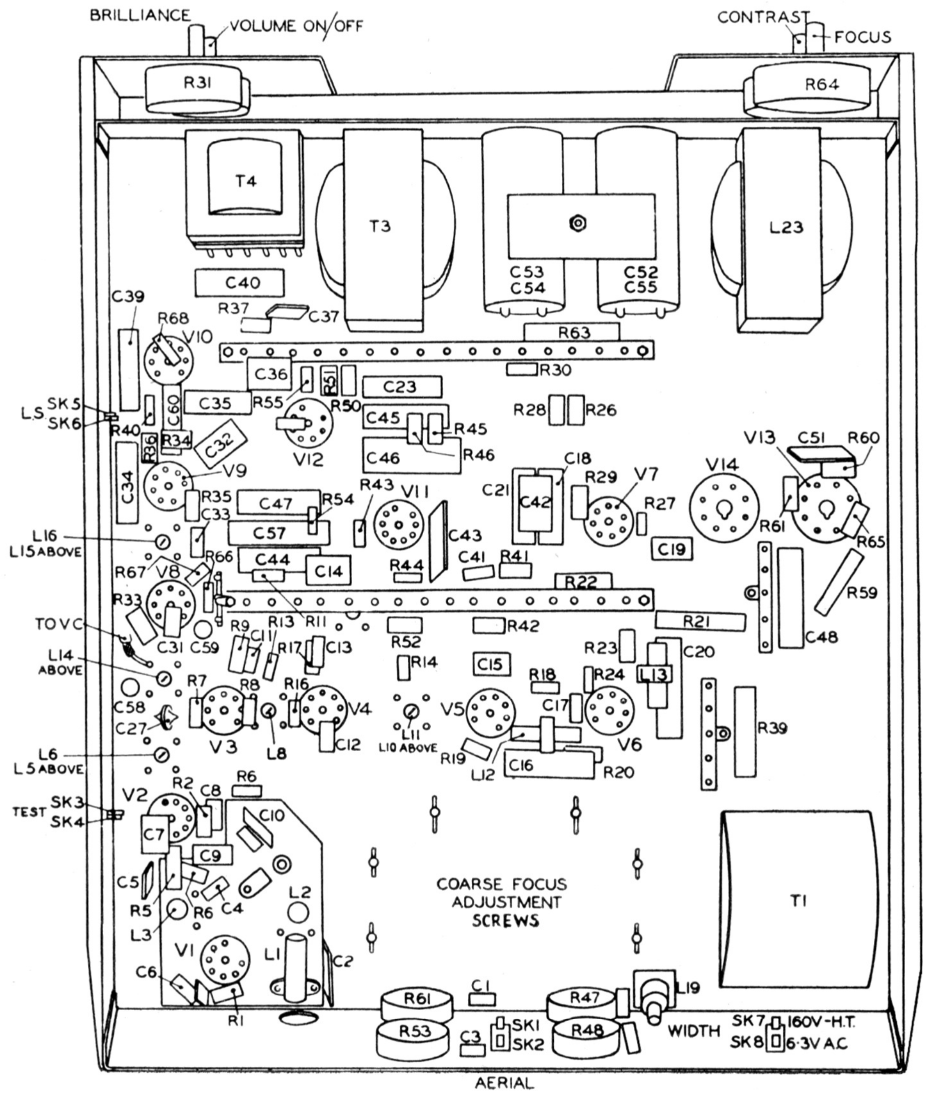
Type	Anode	Screen	Cathode	Remarks
8D3 or Z77	140	140	1.25–2.5	
12AT7	140	—	2	
	90	—	0	
8D3 or Z77	140	140	1.25–2.5	
8D3 or Z77	150	150	1	
6AL5	(37)	—	(62)	Normal picture
N78	(62)	160	(5.2)	Normal picture
	90	160	3.5	No signal
8D3 or Z77	105	15	0	No signal
	(133)	15	0	Normal picture
8D3 or Z77	160	160	1.25	Unmodified
	160	70	1	Modified
6AL5	52	—	52	
N78	205	220	4.5	
12AU7	40	—	1.7	
	10–60	—	1.7	
N78	200	220	5	
6CD6		115	0	
6U4	160	—		
R12 or 6W2		—	13kV	
14KP4 or C14BM	13kV	200	55	Grid 0–72

...ted h.t. line—300V; Unsmoothed h.t.—250V; Voltage across ...—225V; Total h.t. current of set—240mA.

...ges were measured with an Avometer Model 8 (20,000 ohms/volt), ...trols at normal settings, and set operating under no signal conditions, ...here otherwise stated. Variations of up to 10% are to be expected ...different receivers.



COMPONENT LIST

Resistors

	Value in ohms
R1	32
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R4	680
R5	10k
R6	47k
R7	4.7k
R8	10k
R9	32
R11	100
R12	5k *contrast*
R13	1k
R14	1k
R15	10k
R16	4.7k
R17	150
R18	4.7k
R19	2M
R20	150
R21	4.7k, 2W
R22	10k
R23	100k
R24	220k
R25	100k
R26	100k
R27	1M
R28	200k
R29	22k
R30	100k
R31	100k *brill.*
R32	100k
R33	150
R34	100k
R35	2M
R36	2M
R37	47k
R38	250k *volume*
R39	25Ω w/w
R40	220
R41	22k
R42	100k
R43	4.7k
R44	200k
R45	470k
R46	470k
R47	1M *frame hold*
R48	2M *height*
R49	470k
R50	6.8k
R51	220k
R52	68k
R53	100k *frame lin.*
R54	3M
R55	2M
R56	220
R57	470
R58	470
R59	4.7k 1W
R60	47
R61	470k
R62	100k *line hold*
R63	500
R64	500 *focus*
R65	220k
R66	47k
R67	22k
R68	220k

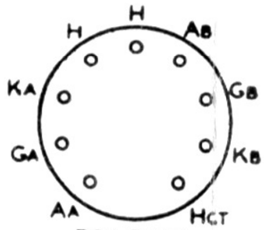
Capacitors

C1	0.001µF
C2	350pF
C3	0.001µF
C4	0.01µF
C5	100pF
C6	0.01µF
C7	10pF
C8	0.001µF
C9	100pF
C10	55pF
C11	0.01µF
C12	0.01µF
C13	0.01µF
C14	500pF
C15	10pF
C16	0.05µF
C17	0.001µF
C18	0.05µF
C19	10pF
C20	0.25µF
C21	0.05µF
C22	0.01µF
C23	0.01µF
C25	47pF
C27	5pF
C29	10pF
C30	15pF
C31	0.01µF
C32	47pF
C33	0.01µF
C34	0.01µF
C35	0.01µF
C36	500pF
C37	500pF
C39	0.01µF
C40	50µF *elec.*
C41	0.001µF
C42	0.001µF
C43	0.005µF
C44	0.1µF
C45	0.1µF
C46	0.25µF
C47	0.1µF
C48	0.1µF
C49	0.002µF
C50	47pF
C51	500pF
C52	100µF *elec.*
C53	100µF *elec.*
C54	60µF *elec.*
C55	60µF *elec.*
C56	0.01µF

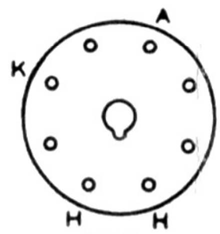
Notes: *R39 may not be fitted. R52 may be 47k. C10 may be 40pF + 15pF, the 15pF capacitor type being N750K.*

Inductances

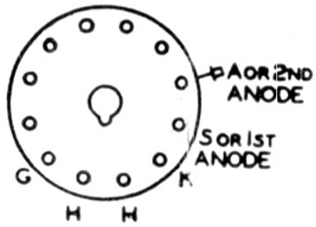
		Ohms
L1	Aerial matching coil	—
L2	Aerial tuning coil	—
L3	R.F. tuning coil	—
L4	Oscillator tuning coil	—
L5	First i.f.t. primary	1
L6	,, ,, secondary	.75
L7	Second i.f.t. primary	1
L8	,, ,, secondary	.75
L9	Sound rejector	.5
L10	Third i.f.t. primary	1
L11	,, ,, secondary	1
L12	I.F. choke	5
L13	Video correction	4.5
L14	Sound i.f. input coil	—
L15	Sound i.f.t. primary	1.5
L16	,, ,, secondary	1.5
L17	Frame scanning coil	16.5
L18	,, ,, ,,	16.5
L19	Width control	61
L20	Line scanning coils	3.5
L21	,, ,, ,,	3.5
L22	Focus coil	750
L23	Smoothing choke	80
T1	Mains transformer (pri.)	31
	,, ,, (L.T. sec.)	—
T2	Line scan transformer (e.h.t. winding)	250
	,, ,, (tags 1–2)	8.5
	,, ,, ,, (,, 2–3)	8.5
	,, ,, ,, (,, 3–7)	8
	,, ,, ,, (,, 7–8)	3.5
	,, ,, ,, (,, 8–5)	6.5
T3	Frame scan transformer (pri.)	900
	,, ,, ,, (sec.)	—
T4	Sound output transformer (pri.)	600
	,, ,, ,, (sec.)	—



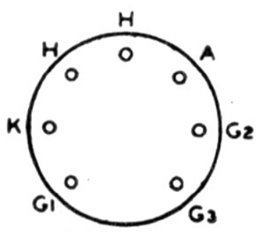
B9A BASE
V2, V11



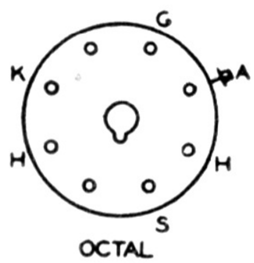
OCTAL
V14



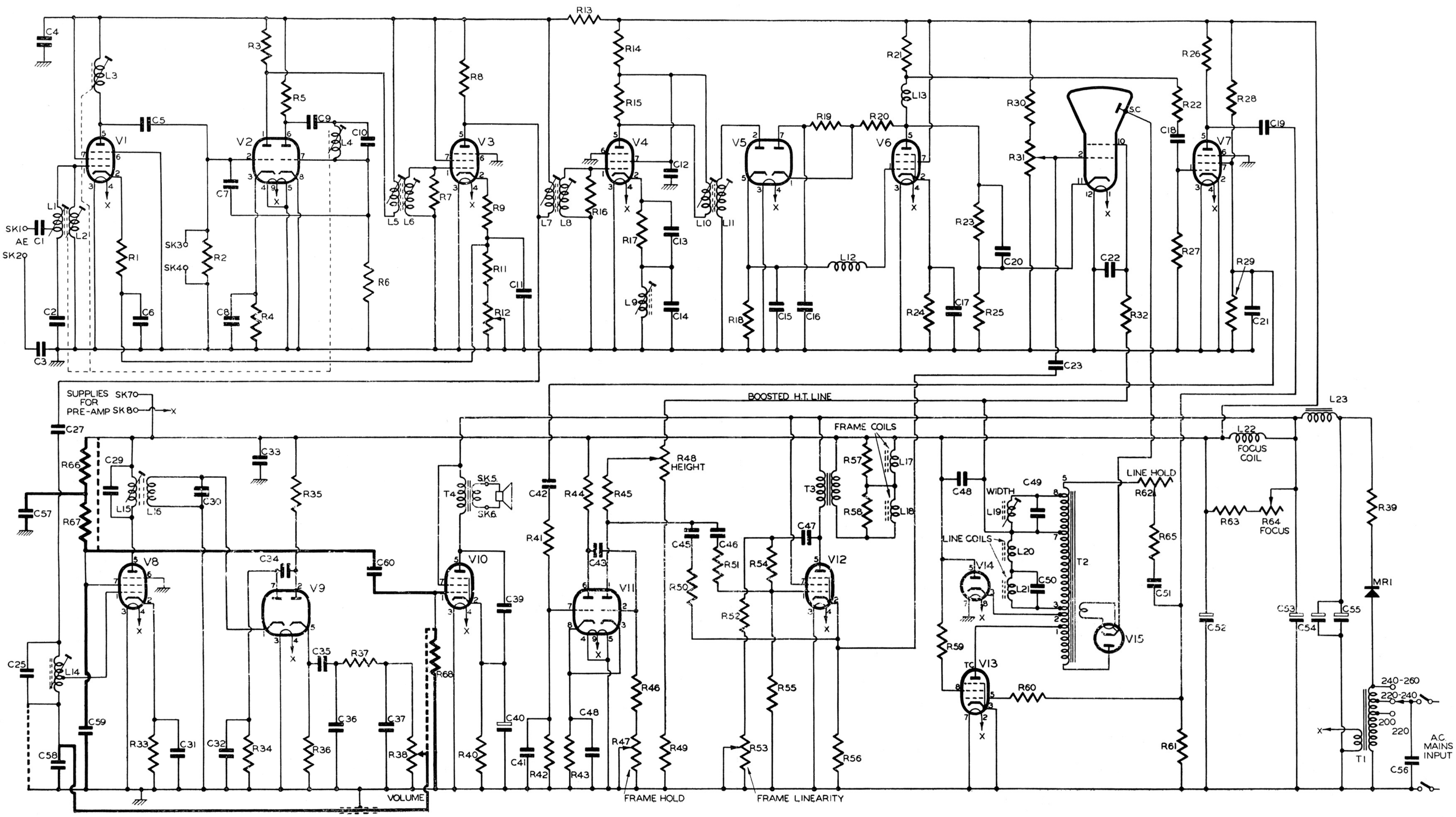
12 PIN
C.R.T.



B7G BASE
V1, 3, 4, 6, 7, 8, 10



OCTAL
V13


SK1
AE
SK2
SUPPLIES FOR PRE-AMP
SK7
SK8
BOOSTED H.T. LINE
FRAME COILS
HEIGHT
WIDTH
LINE COILS
LINE HOLD
FOCUS COIL
FOCUS
VOLUME
FRAME HOLD
FRAME LINEARITY
240-260
220-240
200
220
A.C. MAINS INPUT