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# "HIS MASTER'S VOICE" SERVICE MANUAL

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**TELEVISION RECEIVER**

**CHASSIS TYPE M2**

•

THE GRAMOPHONE COMPANY LIMITED

*(Incorporated in England)*

HOMEBUSH - NEW SOUTH WALES

•

PART No. 682-8421

# TV RECEIVER — CHASSIS TYPE M2

## SPECIFICATION

### POWER SUPPLY:

200, 230, 240V. A.C., 50 cycles per second.

### CONSUMPTION:

180 Watts.

### CARRIER FREQUENCIES:

<i>Channel</i>	<i>Vision Carrier</i>	<i>Sound Carrier</i>
1.	50.25 mc/s	55.75 mc/s
2.	64.25	69.75
3.	86.25	91.75
4.	133.25	138.75
5.	140.25	145.75
6.	175.25	180.75
7.	182.25	187.75
8.	189.25	194.75
9.	196.25	201.75
10.	210.25	215.75

### AERIAL INPUT:

Built-in antenna and provision for 300 ohm balanced twin feeder. Provision also for plug-in attenuator.

### INTERMEDIATE FREQUENCIES:

Vision I.F. — Carrier ..... 36.0 mc/s.  
Sound I.F. — Carrier ..... 30.5 mc/s.

### FUSE TYPES:

Mains — 1 amp.  
H.T.1. — 1.5 amp.  
H.T.2 — 250 mA.

### VALVE COMPLEMENT:

V1	6ES8	R.F. Amplifier
V2	6BL8	Frequency Changer
V3	6BY7	1st IF Amplifier
V4	6BX6	2nd IF Amplifier
V5	6BX6	3rd IF Amplifier
V6	6DX8	Video Amplifier and Blocking Oscillator
V7	6CS6	Noise Gated Sync. Separator
V8	6U8	Limiter and Gated A.G.C.
V9	6BM8	Audio Amplifier and Audio Output
V10	6CW5	Vertical Output

V11	12AU7A	Horizontal Multivibrator
V12	6CM5	Horizontal Output
V13	6AL3	Damping Diode
V14	1S2	E.H.T. Rectifier
MR1	0A90	Vision Detector
MR2	0A210	Mains Rectifier
MR3	0A210	Mains Rectifier
MR4	0A79	Ratio Detector
MR5	0A79	Ratio Detector
MR6	0A81	Phase Discriminator
MR7	0A81	Phase Discriminator
MR8	M3	Clamping Diode
C.R.T.		AW53-88 Picture Tube or 21DAP4 Picture Tube

## CAUTION

The normal B+ voltages in this receiver are dangerous. Use extreme caution when servicing this receiver. The high voltage at the picture tube anode (16,000 volts) will give an unpleasant shock but does not supply enough current to give a fatal burn or shock. However, secondary human reactions to otherwise harmless shocks have been known to cause injury.

Always discharge the picture tube anode to the chassis before handling the tube.

The picture tube is highly evacuated and if broken it will violently expel glass fragments. When handling the picture tube, always wear goggles.

## SUMMARY OF FEATURES

Fourteen valves and eight metal rectifiers, 110° aluminised electrostatic focus picture tube.

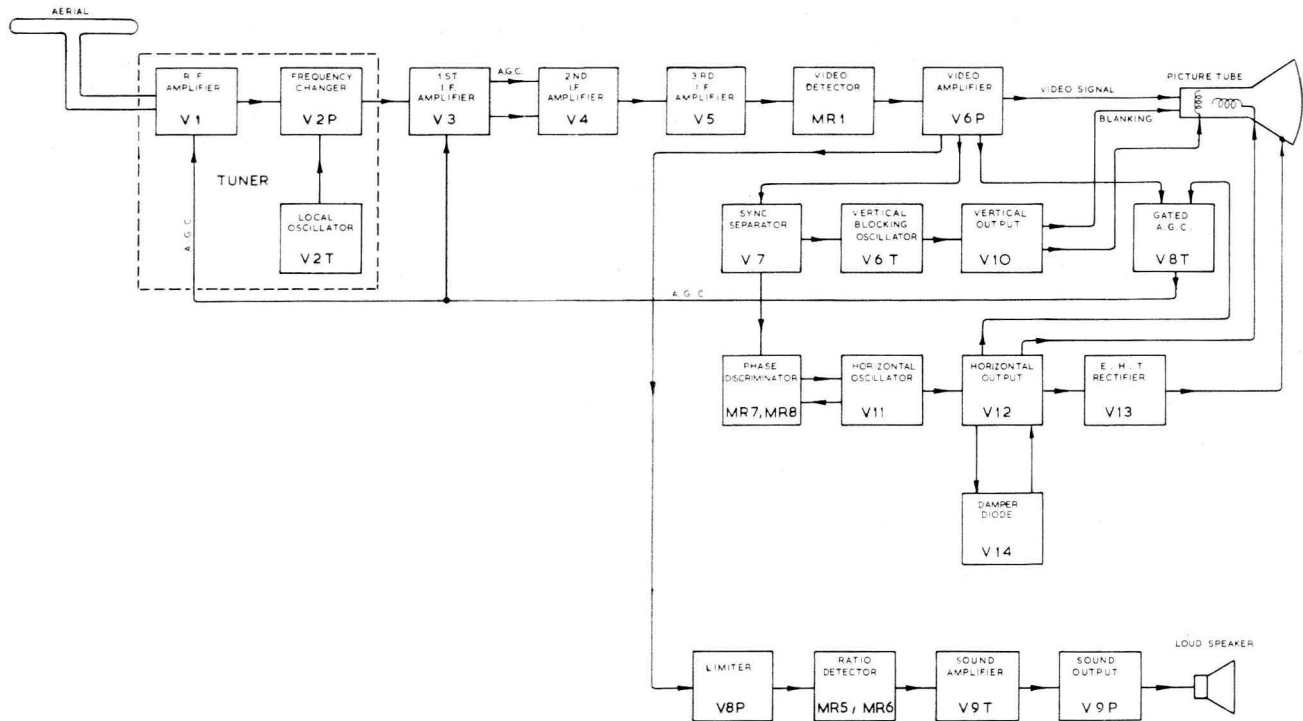


FIG. 1

### CIRCUIT FEATURES

1. Turret tuner has facilities for individual exact alignment of oscillator on each channel through the front of the receiver.

2. The three-stage I.F. Amplifier gives high sensitivity consistent with wide bandwidth and good definition.

3. Linear phase treatment of the I.F. response ensures best possible definition with freedom from overshoots or smearing, allowing non-critical fine tuning control.

4. The overall frequency response of the system is within 6 db from DC up to 4.7 megacycles per second.

5. DC coupling from the video detector through to the picture tube ensures that a true black is retained and that all shades retain their true relationship to black. This prevents fading to grey instead of down to black, and gives accurate portrayal of night-time scenes.

6. Time-gated A.G.C. gives immunity from the effects of impulse noise and has fast action to cope with rapid fading from "aircraft flutter." A variable delay on the tuner is provided to maintain full R.F. gain on weak to moderate signals, thus minimising frequency converter noise. This delay can be adjusted for best results when the receiver is first installed.

7. A noise-gated sync. separator is employed, giving protection to synchronising in the presence of impulse interference.

8. A ratio detector, preceded by limiter, is used in the F.M. sound section to ensure that impulse noise and intercarrier "buzz" are eliminated even in low signal areas and during severe interference.

9. The sound amplifier with ample feedback gives excellent quality sound with ample power. A compensated volume control maintains tonal balance at all volume settings.

10. The Vertical Deflection Amplifier has current feedback to maintain consistent deflection current in coils rather than constant voltage across them. As a result, the height does not shrink as the deflection coils warm up and their resistance increases. This transformer method of feedback gives excellent interlace.

11. The Horizontal Hold circuit is a multi-vibrator employing a stabilising coil in the oscillator anode circuit and this, together with the cathode coupling employed, gives a stable oscillator virtually unaffected by large H.T. variations. This stability, together with a good pull-in range, render a front Horizontal Hold control unnecessary and a preset control is provided on the back of the receiver.

12. The Horizontal Deflection circuit uses a linearity control which can be adjusted for an indication on a multimeter. This has the advantage that it can be adjusted in the absence of a transmitted test pattern.

13. Vertical Flyback Blanking eliminates any vertical retrace lines.

14. A minimum number of controls necessary for operation are provided.

15. Dustproof seal around picture tube to eliminate dust which is otherwise attracted to the picture tube by static charge.

16. THERMISTOR PROTECTION is provided to guard against high tension surge when switching on.

17. Silicon Junction Diodes are used in a voltage doubler full-wave power supply. These diodes are noted for their robustness, economy of wasted heater power and high surge rating. Since

they have no heated cathode, they cannot be damaged by operation on low mains input, as is the case with a valve rectifier.

18. Transformer coupled focussing of the picture is employed to give good overall edge-to-edge focus of the raster. A true focus is maintained right into the corners of the C.R.T.

19. A hinged, vertical chassis, giving ease of service to the whole of the receiver, has been incorporated in this model. Any repair or replacement can now be made without removing the chassis from its cabinet, thus saving valuable service time and enabling the serviceman to make almost any repair in the home. It is also possible to withdraw the receiver from the cabinet and it is then still a complete working unit and can be operated as such on the workshop bench.

20. A REMOTE CONTROL facility is available whereby sound volume and picture contrast can be controlled at distances up to 25 feet from the receiver.

## CIRCUIT DESCRIPTION

### R.F. INPUT

The input to the turret tuner is to a centre tapped transformer which presents an impedance of 300 ohms.

R.F. amplification is achieved with a type 6ES8, double triode (V1), in a cascode circuit. The two sections of this stage are connected in series for DC. The grounded cathode input section is neutralized and is also controllable by A.G.C. from the mains chassis. Because of the series DC connection of the two portions, A.G.C. voltage to one section also effects control on the other section.

Coupling between the two sections of the cascode is direct and the coil between the two maintains amplification on the high frequency channels.

Inductive coupling is used between the cascode and mixer. V2, a type 6BL8, combined triode-pentode, is used as oscillator and mixer. The oscillator is a Colpitts circuit operating above signal frequency. Injection to the mixer input is by inductive coupling. The fine tuning capacitor is capacitively coupled to the oscillator coil by a contact lug on the coil former. Adjustment on each channel is provided by means of a screwed slug in each oscillator coil, this slug being accessible through a hole in the front plate of the tuner when the fine tuning capacitor is in an approximate mid-position.

The fine tuning capacitor takes the form of a specially - shaped ceramic wafer which turns between two fixed metal plates.

The intermediate frequency output of the tuner (vision 36.0 Mc/s, sound 30.5 Mc/s) is coupled to the I.F. channel of the main chassis through a secondary winding on the I.F. coil L7.

The heater circuit is filtered by a Ferroxcube bead through which a heater wire is passed. The bead concentrates the field around the wire, increasing its self-inductance so that it acts as a choke.

### I.F. AMPLIFIER

The tuner I.F. output is coupled to the grid of the first I.F. Amplifier V3 and tuned by coil L9 with stray capacities. There are three I.F. amplifying stages, the first two are "stacked" as far as DC is concerned, i.e., they operate in series with V4 above V3. This does not influence their R.F. operation in any way but does save H.T. current. A.G.C. voltage applied to V3 also controls V4, since the same current flows through both valves.

V5 is coupled to the video detector MR1 by inductive coupling.

Trap circuits L11, L12 and L15 are coupled to the I.F. coils L10, IFT1 and IFT2. The first attenuates the sound carrier 30.5 Mc/s., the second attenuates the adjacent vision carrier 29.0 Mc/s., and the third attenuates the adjacent sound carrier 37.5 Mc/s.

V3 and V4 have small unbypassed cathode resistors R15 and R21 to minimise detuning of their grid circuits when A.G.C. bias is applied.



## VIDEO AMPLIFIER

The detected video output of the germanium diode MR1 is amplified in the pentode section of V6. L20, L21 and L22 are peaking chokes which maintain the high frequency components of the vision signal fed to the picture tubes. The 5.5 Mc/s component is removed by the combined transformer and trap, IFT4.

## INTERCARRIER SOUND

The frequency modulated 5.5 Mc/s component is taken from the Video Amplifier anode via the transformer IFT4 to the Limiter grid. A short time constant in this grid gives improved impulse noise operation of this Limiter.

Output from the limiter is demodulated by the ratio detector, MR5, MR6, to provide the audio signal which passes through the volume control to be amplified in the driver triode and output pentode sections of V9. Feedback is applied via both triode and pentode cathodes.

A margin of sound gain is provided so that the full 2 watts output is obtained from sound signals which are not fully modulated. Moreover, the sound output stage has controlled overload characteristic which enables that, when overdriven, it does not "paralyse" but merely clips the peaks and so remains comparatively free from audible distortion.

## SYNC. SEPARATOR

A combined Horizontal and Vertical sync. separator including noise gating is employed (V7). Video signal with sync. tips positive is applied to the control grid, G3, from the Video Amplifier anode. At the same time, video signal with sync. tips negative is applied at the noise gating grid, G1, from the Video Amplifier grid. Grid leak bias on this valve ensures that it will only conduct on sync. tips and consequently no picture information will appear on its output. The video signal at its noise gating grid is fed via the potentiometer R41, R42, and is so arranged that the negative excursion of the signal will not affect the current through the sync. separator. However, when a noise pulse, which will sit more negative than the sync. tips occurs, then the current through the valve is cut off and the anode voltage will rise to H.T. Suitable time constants in the grid of the sync. separator (G3) prevent blocking of the grid immediately following strong noise pulses so that synchronising signals are restored immediately following the cutting off of the valve by the gating grid.

## GATED A.G.C.

Video signals with sync. tips positive are fed from the Video Amplifier anode to the grid of the A.G.C. valve (V8 triode section) and the valve is biased so that it will only conduct on sync. tips. During line flyback, a positive pulse is applied to its anode via C46, and the valve

will conduct when this pulse at its anode and a sync. tip at its grid coincide. The valve cannot, therefore, conduct in the period between sync. pulses and is thus immune to noise pulses appearing in the period between sync. pulses.

The current through the valves will depend on the height of the sync. pulses at its grid and the height of these sync. pulses is adjusted by the contrast control. The cathode of the A.G.C. valve is held at about 50 volts and is set by the divider network R58, RV3, RV4, R59. C48 smoothes the voltage at the cathode. Operation of the slider of RV3, the Contrast Control, will vary the bias applied to the grid of the A.G.C. valve and so increase or decrease the height of sync. tips in respect to the fixed cathode volts. Increasing the height of the sync. tips will cause the valve to conduct harder and will produce more A.G.C. volts, reducing the gain of the receiver and decreasing the voltage available to drive the C.R.T. cathode. Decreasing the height of sync. tips will reduce the conduction of the A.G.C. valve, thus producing less A.G.C. volts, increase the gain of the receiver and increase the volts available to drive the C.R.T. cathode. Increasing the height of the sync. tips therefore reduces the contrast, and decreasing the height of the sync. tips will increase the contrast.

The voltage developed at the anode of the A.G.C. valve is applied across the divider R52, RV2, and the divider R49, R50 and R51. The clamping diode, MR3, is connected across R51, R52 and RV2, and then earthed. The ratio of Tuner A.G.C. voltage to I.F. A.G.C. voltage is important and the ratio can be adjusted by means of RV2. If the ratio is too small then, even on large signals, the tuner will be biased back and the I.F. amplifier will be operating at an unnecessarily large gain and converter noise will be evident in the picture. If the ratio is too large, then no controlling bias will be applied to the tuner and it will be held at the clamping voltage and all control will be made in the I.F. amplifiers. This can cause severe overloading of the I.F. amplifier. It is essential that the A.G.C. control be adjusted for optimum operation when the set is initially installed.

## VERTICAL DEFLECTION CIRCUITS

Vertical sync. pulses from the sync. separator fed via the integrator are used to synchronise the blocking oscillator comprised of transformer T3 and triode portion of V6. "Height" is varied by adjustment of the D.C. potential fed to the blocking oscillator anode and "Vertical Hold" is adjusted by varying the time constant of the blocking oscillator grid circuit. The Vertical Hold control RV7 is returned to the slider of the Height Control potentiometer RV6 so that the blocking oscillator frequency is unaffected when Height is adjusted. This makes the Vertical Hold almost independent of Height Adjustment.

## INSTALLATION

The receiver is shipped from the factory with the picture tube installed and all controls pre-adjusted for normal operation. It should only be necessary to ensure that the mains tapping is correctly adjusted for the mains voltage existing in the particular area and a suitable aerial connected to the aerial input terminals. In very strong signal areas it may be necessary to use an attenuator in the aerial lead to avoid overloading the receiver. The various operating controls should be checked for proper operation, and their use demonstrated to the purchaser as described in the installation manual. It is necessary to remove the back of the cabinet to gain access to the mains adjustment.

### PICTURE SHIFT

Small shifts in position of picture may occur due to the effect of the earth's magnetic field in different locations. The picture may be re-centred by rotating the two shift magnets on the tube neck behind the deflection yoke.

Rotate the centring magnet assembly to shift the picture in the required direction, and move one of the magnets with respect to the other to change the strength of the field and hence the amount of picture shift.

The vertical chassis of this receiver has been especially designed to make servicing as easy as possible. All valves, test points and major components are accessible to the serviceman when the cabinet back is removed. All other components may be serviced by swinging the chassis out so that all of the receiver is accessible.

To do this, remove the E.H.T. lead from the plastic strap under the top of the cabinet; slacken off the screws on the right-hand side of the chassis and remove the clamp. Note that one of these screws is intended as a factory transit screw only, and need not necessarily be replaced. Remove the screw from under mains transformer. This is also a transit screw and need not necessarily be replaced.

### REMOVAL OF CABINET

Remove the cabinet back by undoing the nine securing screws (two are underneath).

Disconnect the tuner lead from the antenna bracket by withdrawing the lead pins from the antenna socket.

Disconnect the speaker leads.

Pull off the four small knobs from the front of the receiver. Undo the grub screw on the contrast spindle and remove the brass collar. Set the Channel Selector knob to channel 5. Flex the black plastic cover back with a screwdriver at the channel 7 position and undo the securing screw. Pull off both the Channel Selector and Fine Tuning knobs.

### PICTURE TILT

If the picture is not square with the edges of the mask, the deflection coils should be rotated until the picture is squared up. It may be necessary after this operation to centre the picture by means of the shift magnets.

### A.G.C.

The A.G.C. control should be adjusted when the receiver is installed. The procedure is to turn the control to the maximum anti-clockwise position, then observing the picture, advance the control until the noise or "snow" in the picture is no longer reduced. The receiver should then be checked on all channels to ensure that no overloading is evident, which may be due to the control being adjusted too far in a clockwise position, and that the minimum noise condition has been achieved for all signals.

### FUSES

Three fuses are provided, one in the mains circuit and two in the H.T. circuits. Ensure that they are replaced with similar types.

## SERVICING

The chassis, pivoting about the left-hand side, may be swung out to an angle of approximately forty degrees.

In order to swing it out further than this, disconnect the yoke and E.H.T. anode lead.

To secure the chassis, reconnect any disconnected leads and replace the screw below the power transformer before the retaining clamp and its screws are replaced.

If the repair or replacement cannot be made without removing the chassis from the cabinet, the receiver can be withdrawn as a complete working unit and can be operated as such on the workshop bench.

## DISMANTLING

Remove the two screws that secure the top of the picture tube clamp to the cabinet.

Remove six screws that secure the cabinet to the wooden base board.

Remove the cabinet.

### REMOVAL OF PICTURE TUBE SCREEN

Once the cabinet has been removed, the front screen may be removed by undoing the four corner screws.

The covering material of the cabinet is washable vinyl, and if necessary may be cleaned with a damp cloth. The clear, protective picture tube screen and plastic moulded front may also be cleaned with a soft, damp cloth, but avoid the

use of chemical and abrasive cleaners. Do not use any preparation normally sold as window cleaning or furniture polishing agents, as these generally prove harmful to those materials.

#### REMOVAL OF DEFLECTION YOKE

First remove the picture tube socket. Loosen the clamp fixing screw. Remove the yoke plug from the back of the E.H.T. cage and slide the yoke from the picture tube neck.

#### REPLACEMENT OF DEFLECTION YOKE

Carefully slide the yoke over the neck of the picture tube. Rotate the yoke so that the fixing screw on the band around the yoke assembly is at the top, and push the yoke firmly against the flare of the picture tube. Do not tighten the retaining screw at the back of the yoke assembly until the set is operating and the picture is squared up.

#### REMOVAL OF PICTURE TUBE

Having removed the chassis and picture tube assembly, remove the spring which rests against the aquadag coating on the rear of the picture tube. Undo the top and bottom screws that secure the clamping ring to the picture tube.

Lift the tube out carefully by supporting it around the mounting ring.

N.B.: The picture tube should be carefully handled and never placed face down on a bench. Always ensure that it is placed on a soft, clean surface, such as felt, so that the face does not become scratched. Whenever possible, keep tubes in the original manufacturer's carton.

#### REPLACEMENT OF CHASSIS ASSEMBLY

First clean the tube face and the inside surface of the protective screen. Replace the rubber dust sealing ring around the picture tube face. Slide the chassis into the cabinet, ensuring that the spindles of the front controls locate in their holes. Push the chassis forward until the picture tube seats against the mask, replace the two screws securing the picture tube clamp bracket to the front of the cabinet and the two screws that secure the chassis base board to the shelf.

Reconnect the antenna and speaker.

Replace the brass collar on the Contrast spindle and tighten the grub screw with the collar sitting free of the cabinet.

Push on the four small control knobs.

Replace the Fine Tuning knob. Set the Channel Selector knob to channel five. Flex the black plastic cover back with a screwdriver and tighten the securing screw at the channel seven position.

Replace the cabinet back panel.

### ADJUSTMENTS

#### HORIZONTAL LINEARITY

A typical multimeter employing a 100 ohm 1 mA full scale deflection meter, when on 100 mA range, has a total resistance of 1 ohm. If such a meter is connected between V12 pin 8 and earth it will indicate half the current flowing in the cathode of V12.

The Horizontal Linearity control should be adjusted to reduce the current in V12 to a minimum.

#### HORIZONTAL HOLD

Disconnect sync. pulses by removing V7, the sync. separator valve, and adjust the "Horizontal" Hold Control until the picture just "floats" or locks weakly, then replace V7.

If any adjustment has been made to L23 or if C81 or R97 has been replaced, remove V7 as above, shortcircuit L23 and adjust the Horizontal Hold control for a weak, or floating, lock. Remove short across L23 and adjust core of L23 for a weak or floating lock. Replace V7.

#### CONTRAST RANGE

Turn Contrast control to its maximum clockwise position and adjust RV4 to give sync. tips at the video amplifier anode at +190 volts read on a DC coupled oscilloscope.

### VISION I.F. ALIGNMENT

#### GENERAL NOTES

To align the vision I.F., a sweep generator and a marker generator, both covering the range 28.5 to 38.5 Mc/s are required, together with a display unit. The marker generator may be a signal generator and the display unit a C.R.O. These instruments should be inter-connected as described in the instructions supplied with the sweep generator. The sweep generator should be terminated with a resistor equal to its output impedance and connected to the receiver as suggested in Fig. 2.

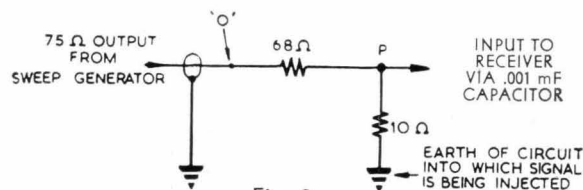


Fig. 2.

If there is inadequate output from this arrangement, the point "O" may be connected to the receiver instead of the point "P."

# I.F. RESPONSES

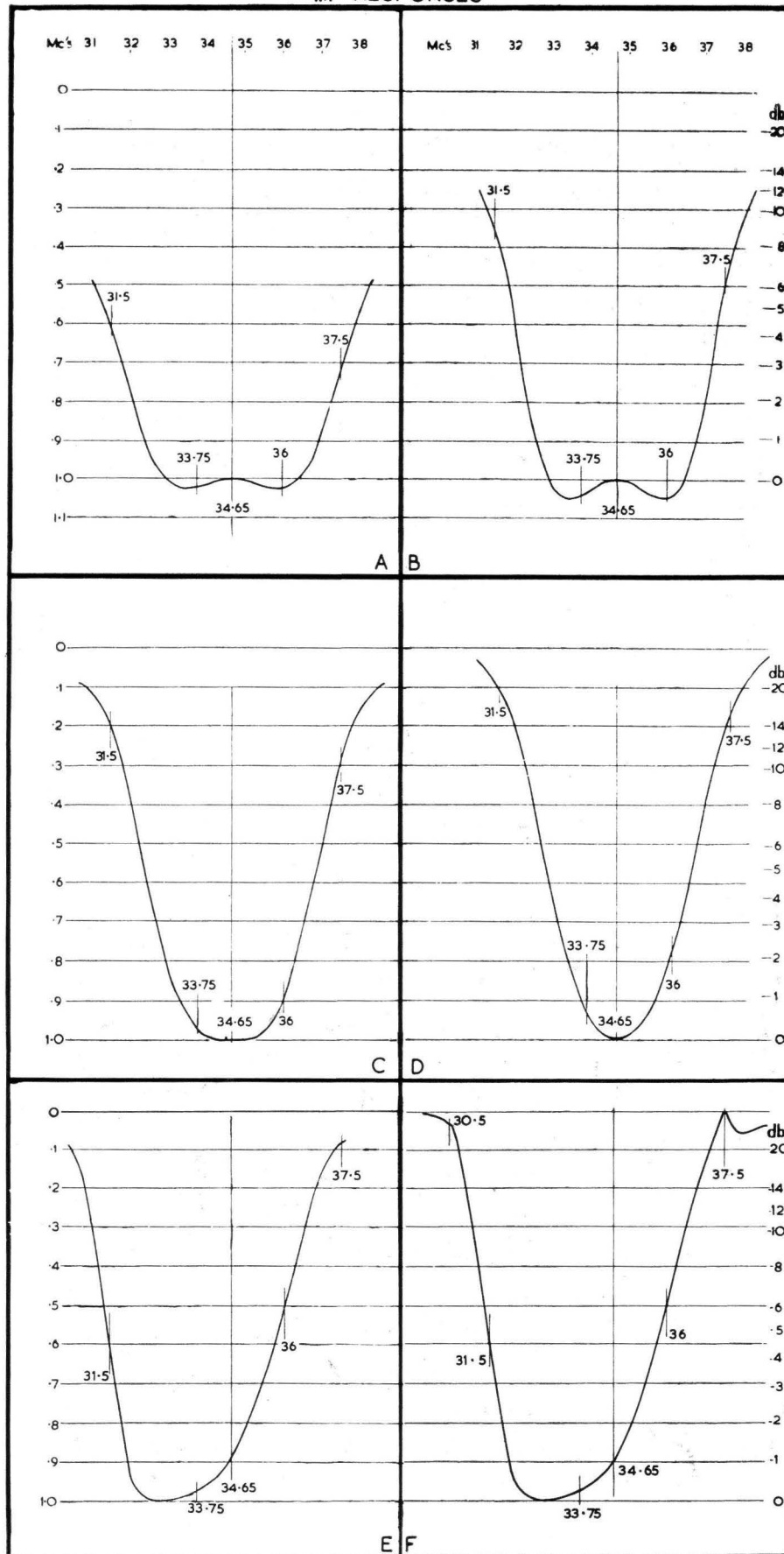


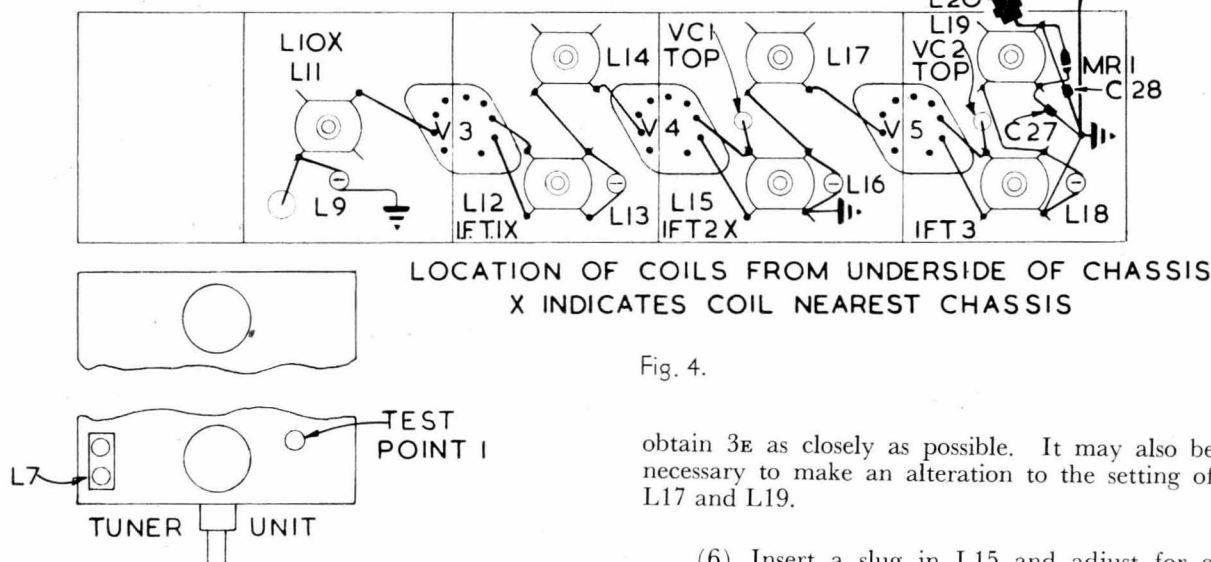
Fig. 3 — Oscilloscope Patterns obtained with Sweep Oscillator Input.

Before commencing alignment, remove the slugs from L11, L12 and L15 and wind the slugs in IFT1 and IFT2 so that they are set flush with the chassis. Turn the two trimmers VC1 and

VC2 so they are at their minimum capacity position (i.e.,  $\frac{1}{16}$ " of the thread should be visible above the chassis). Connect a —6V. bias across C44. Connect the input to the display unit between the junction of L20 and R26, and earth. Throughout the alignment, the display unit should be adjusted to present a reasonable amplitude display from a signal 2.5V. peak to peak, and the output from the I.F. strip should be maintained at that level by varying the output from the sweep generator.

## ALIGNMENT

(1) Connect the sweep output between the grid (Pin 2) of V5 and earth. Adjust the slug of IFT3 to peak the response at 34.65 Mc/s, with the slug in the position nearest the chassis. Adjust the slug in L19 to give a symmetrical response with the slug in the position furthest from the chassis. Vary both L19 and IFT3 to obtain the response as shown in Fig. 3A.



with the slug in the position furthest from the chassis. Use both IFT1 and L14 to obtain the response as shown in Fig. 3c.

(4) Remove the sweep generator from V3 and connect it to test point I on the tuner (adjacent to V2). Switch the tuner to position 12. Adjust the slug in L7 to give the maximum response at 34.65 Mc/s. Adjust the slug in L10 to the position nearest the chassis which peaks the response at 34.65 Mc/s, and then using L7 and L10, obtain the response as shown in Fig. 3d.

(5) Increase the capacity of VC1 so that the peak of the response (34.65 Mc/s marker) falls through 1.5 db on the display unit, and then increase the capacity of VC2 so that the peak of the response (34.65 Mc/s marker) falls through another 1.5 db. Vary both VC1 and VC2 to

Fig. 4.

obtain 3E as closely as possible. It may also be necessary to make an alteration to the setting of L17 and L19.

(2) Remove the sweep generator from V5 and connect it to the grid of V4 (Pin 2). Peak the response at 34.65 Mc/s with the slug of IFT2 in the position nearest the chassis. Adjust the slug of L17 to give a symmetrical response with the slug in the position furthest from the chassis. Using both L17 and IFT2, obtain the response as shown in Fig. 3B.

(3) Remove the sweep generator from V4 and connect it to the grid of V3 (Pin 2). With IFT1 peak the response at 34.65 Mc/s making sure that the slug is in the position closest to the chassis. Adjust L14 for a symmetrical response

(6) Insert a slug in L15 and adjust for a minimum response at 37.5 Mc/s. Insert a slug into L11 and adjust to set the 30.5 Mc/s marker in the middle of the step created by this coil. Insert a slug in L12 and adjust for minimum response at 29 Mc/s.

(7) Make any final adjustment that may be necessary to obtain the final response as shown in Fig. 3F.

*Note:* L9, L13, L16 and L18 are coupling coils for factory adjustment, and should not be disturbed.

## SOUND I.F. ALIGNMENT

The following equipment is necessary to carry out this procedure:

- (i) A C.W. Oscillator accurately tuned to 5.5 Mc/s by a crystal controlled reference.
- (ii) A 20,000 ohm / volt meter (Model 8AVO or similar type).
- (iii) A D.C. V.T.V.M.
- (iv) A peak-to-peak detector as shown.

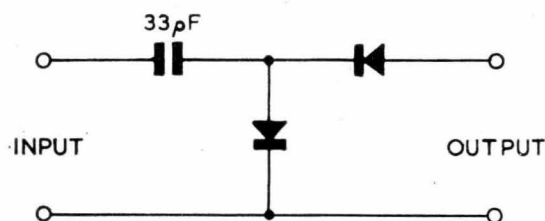


Fig. 5 — Peak-to-Peak Detector.

### 5.5 MC/S NULL TRAP (IFT4)

IFT4 is a combined null trap and transformer, working at 5.5 Mc/s. When tuned in the factory, both primary and secondary cores are tuned together to give a zero output at 5.5 Mc/s at the video grid, and a maximum transfer to the intercarrier amplifier. This can only be done accurately with a sweep oscillator and a suitable display having a high gain at 5.5 Mc/s. Once set, however, it should not need retuning unless quite large circuit alterations have been made.

Should it be necessary to retune IFT4, the following procedure should be adopted:

- (1) Inject 5.5 Mc/s at approximately 100 mV between the junction R26 and R27 and earth (disconnecting the grid peaking choke, L20).
- (2) Connect the input of the peak-to-peak detector illustrated to C.R.T. cathode, pin 7. Connect the output of the peak-to-peak detector to a 20,000 ohm/volt meter on the 50 micro-amp range.
- (3) Adjust primary core of IFT4 (nearest chassis to give zero reading on meter.  
If IFT4 is replaced, it is necessary to adjust both cores to give a zero reading at 5.5 Mc/s.
- (4) Withdraw both cores from former. Screw in primary core (nearest chassis) to give a minimum reading.
- (5) Screw in secondary core until meter reading rises slightly and then adjust primary core until a new minimum is obtained.
- (6) Repeat adjustment of primary and secondary cores until meter reads zero.

### RATIO TRANSFORMER (IFT5)

Connect oscillator as in (1) above. Adjust secondary core (nearest chassis) so that a positive or negative reading is obtained on a DC V.T.V.M. between the junction of R64 and R65 and earth. Adjust primary core (top of coil) so that this reading shows a maximum. Then adjust secondary core so that this reading is zero volts. This procedure may be used on a signal from a transmission.



# PARTS LIST — CHASSIS M2

## RESISTORS

Ref.	Part No.	Position	Description	Ref.	Part No.	Position	Description
R13	740-0032	V10	2.2K ohms $\pm$ 10% BTS	R65	740-0112	J4	27K ohms $\pm$ 10% BTS
R14	740-0612	V11	10K ohms $\pm$ 20% BTS	R66	740-0122	J4	47K ohms $\pm$ 10% BTS
R15	740-0483	V9	56 ohms $\pm$ 10% $\frac{1}{2}$ Watt Morg.	R67	740-0702	TB	56K ohms $\pm$ 10% BTS
R16	740-0653	W9	100 ohms $\pm$ 10% $\frac{1}{2}$ Watt Morg.	R68	742-0492	N11	68K ohms $\pm$ 10% BTA
R17	740-0112	W8	27K ohms $\pm$ 10% BTS	R69	742-0132	E9	220K ohms $\pm$ 10% BTA
R18	740-0252	V7	1.5K ohms $\pm$ 10% BTS	R70	740-0062	F9	3.9K ohms $\pm$ 10% BTS
R19	742-0142	W7	270K ohms $\pm$ 10% BTA	R71	740-1052	F8	330K ohms $\pm$ 20% BTS
R20	742-0142	W8	270K ohms $\pm$ 10% BTA	R72	740-1062	F8	680K ohms $\pm$ 20% BTS
R21	740-0483	V7	56 ohms $\pm$ 10% $\frac{1}{2}$ Watt Morg.	R73	749-0261	F13	680 ohms $\pm$ 20% BTB
R22	740-0273	W6	150 ohms $\pm$ 10% $\frac{1}{2}$ Watt Morg.	R74	742-0823	E8	270 ohms $\pm$ 10% 1 Watt Morg.
R23	740-0052	V4	3.3K ohms $\pm$ 10% BTS	R75	749-0272	F5	270K ohms $\pm$ 10% BTB
R24		W4	150 ohms—Part of CR1	R76	742-0092	S9	47K ohms $\pm$ 10% BTA
R25	742-0712	W3	2.2K ohms $\pm$ 20% BTA	R77	740-0122	R2	47K ohms $\pm$ 10% BTS
R26	740-0043	T2	2.7K ohms $\pm$ 10% $\frac{1}{2}$ Watt Morganite	R78	740-0082	R7	10K ohms $\pm$ 10% BTS
R27	740-0322	T4	1.2K ohms $\pm$ 10% BTS	R79	740-0082	R7	10K ohms $\pm$ 10% BTS
R28	749-0242	T5	1.8K ohms $\pm$ 10% BTB	R80	740-0082	S6	10K ohms $\pm$ 10% BTS
R29	749-0242	S5	1.8K ohms $\pm$ 10% BTB	R81	742-0172	T10	470K ohms $\pm$ 10% BTA
R30	740-0773	S4	39 ohms $\pm$ 10% $\frac{1}{2}$ Watt Morg.	R82	740-0082	T11	10K ohms $\pm$ 10% BTS
R32	742-0162	F12	390K ohms $\pm$ 10% BTA	R83	740-0232	S11	39K ohms $\pm$ 10% BTS
R33	740-0782	TB	120K ohms $\pm$ 10% BTS	R84	742-0512	M14	2.2K ohms $\pm$ 10% BTA
R34	740-0622	R14	470K ohms $\pm$ 20% BTS	R85	740-0202	S10	2.2 Megohm $\pm$ 10% BTS
R35	740-0732	N13	12K ohms $\pm$ 10% BTS	R86	740-0582	R9	47K ohms $\pm$ 20% BTS
R36	740-0272	YK	150 ohms $\pm$ 10% BTS	R87	740-0302	R12	1.8K ohms $\pm$ 10% BTS
R37	740-0272	YK	150 ohms $\pm$ 10% BTS	R88	742-0972	M14	560 ohms $\pm$ 10% BTA
R38	750-0291	D13	250 ohms $\pm$ 5% 5 Watt Wire Wound	R89	742-0972	M14	560 ohms $\pm$ 10% BTA
R39	749-0141	F12	1K ohms $\pm$ 20% BTB	R90	742-0972	S8	560 ohms $\pm$ 10% BTA
R40	749-0252	C11	12K ohms $\pm$ 10% BTB	R91	742-0972	S8	560 ohms $\pm$ 10% BTA
R41	740-0122	S3	47K ohms $\pm$ 10% BTS	R92	740-1033	N14	10 ohms $\pm$ 10% $\frac{1}{2}$ Watt Morg.
R42	740-0112	S3	27K ohms $\pm$ 10% BTS	R93	740-1033	P14	10 ohms $\pm$ 10% $\frac{1}{2}$ Watt Morg.
R43	742-0772	T3	3.9 Megohm $\pm$ 10% BTA	R94	740-0172	M1	270K ohms $\pm$ 10% BTS
R44	740-0862	R3	18K ohms $\pm$ 10% BTS	R95	740-0392	M2	330K ohms $\pm$ 10% BTS
R45	740-0162	S2	220K ohms $\pm$ 10% BTS	R96	740-0182	K2	470K ohms $\pm$ 10% BTS
R46	740-0202	S2	2.2 Megohm $\pm$ 10% BTS	R97	740-0112	N1	27K ohms $\pm$ 10% BTS
R47	742-0122	P2	150K ohms $\pm$ 10% BTA	R98	740-0102	K2	22K ohms $\pm$ 10% BTS
R48	749-0232	P2	27K ohms $\pm$ 10% BTB	R99	742-0042	J1	15K ohms $\pm$ 10% BTA
R49	742-0772	M3	3.9 Megohm $\pm$ 10% BTA	R100	740-0302	J2	1.8K ohms $\pm$ 10% BTS
R50	742-0772	L4	3.9 Megohm $\pm$ 10% BTA	R101	740-0702	J2	56K ohms $\pm$ 10% BTS
R51	740-0312	L5	1.2 Megohm $\pm$ 10% BTS	R102	740-0112	M2	27K ohms $\pm$ 10% BTS
R52	740-0722	N5	1.5 Megohm $\pm$ 10% BTS	R103	740-0122	K3	47K ohms $\pm$ 10% BTS
R53	740-0782	N4	120K ohms $\pm$ 10% BTS	R104	740-0182	G1	470K ohms $\pm$ 10% BTS
R54	740-0702	N4	56K ohms $\pm$ 10% BTS	R105	750-0181	E2	2.7K ohms $\pm$ 10% 5 Watt Wire Wound
R55	740-0162	M12	220K ohms $\pm$ 10% BTS	R106	740-0571	G1	1K ohm $\pm$ 20% BTS
R56	742-0982	M3	1.2 Megohm $\pm$ 10% BTA	R107	745-0242	G2	1 ohm $\pm$ 10% BW $\frac{1}{2}$
R57	740-0782	N3	120K ohms $\pm$ 10% BTS	R108	742-0982	D2	1.2 Megohm $\pm$ 10% BTA
R58	742-0082	N3	39K ohms $\pm$ 10% BTA	R109	742-0982	E5	1.2 Megohm $\pm$ 10% BTA
R59	740-0082	TB	10K ohms $\pm$ 10% BTS	R110	740-0492	E2	1.5 Megohm $\pm$ 20% BTS
R60	740-0122	N4	47K ohms $\pm$ 10% BTS	R112	742-0022	LSA	4.7K ohms $\pm$ 10% BTA
R61	749-0052	L12	47K ohms $\pm$ 20% BTB	RT1	752-0021	B11	Brimistor CZ4
R62	740-0032	L3	2.2K ohms $\pm$ 10% BTS	VDR1	750-0281	N14	Voltage Dependent Resistor — Type E298GD/A260—Blue Spot.
R63	740-0102	J4	22K ohms $\pm$ 10% BTS				
R64	740-0112	J4	27K ohms $\pm$ 10% BTS	CR1	753-0001	W4	150 ohm/1500 pF R.C. Unit

## CAPACITORS

Ref.	Part No.	Position	Description	Ref.	Part No.	Position	Description
C14	273-0591	V11	68 pF $\pm$ 2 $\frac{1}{2}$ % Silver Mica M.S.	C32	279-4541	P14	.0022 Mfd. $\pm$ 10% Paper Tubular 400V. Wkg.
C15	271-0031	V10	.0033 Mfd. $\pm$ 100% —0% Ceramic Disc 500V. Wkg.	C33	279-4581	P14	.0047 Mfd. $\pm$ 10% Paper Tubular 400V. Wkg.
C16	271-0031	W10	.0033 Mfd. $\pm$ 100% —0% Ceramic Disc 500V. Wkg.	C34	271-0371	YK	120 pF $\pm$ 5% Ceramic Tube 1KV NPO
C17	271-0031	U10	.0033 Mfd. $\pm$ 100% —0% Ceramic Disc 500V. Wkg.	C35	271-0361	YK	91 pF $\pm$ 2% Ceramic Tube 3KV NPO
C18	271-0031	W9	.0033 Mfd. $\pm$ 100% —0% Ceramic Disc 500V. Wkg.	C36	271-0371	YK	120 pF $\pm$ 5% Ceramic Tube 1KV NPO
C19	273-0591	W8	68 pF $\pm$ 2 $\frac{1}{2}$ % Silver Mica M.S.	C37	269-0521	F13	100 Mfd. Electrolytic (Insulated) 150V. Wkg.
C20	271-0031	W8	.0033 Mfd. $\pm$ 100% —0% Ceramic Disc 500V. Wkg.	C38	269-0531	F15	100 Mfd. Electrolytic (Uninsulated) 150V. Wkg.
C21	271-0321	W8	.001 Mfd. $\pm$ 80% —20% Ceramic Disc 500V. Wkg.	C39	269-0511	D12	80 Mfd. Electrolytic 300V. Wkg. (With C40)
C22	271-0321	W6	.001 Mfd. $\pm$ 80% —20% Ceramic Disc 500V. Wkg.	C40	269-0511	D12	40 Mfd. Electrolytic 300V. Wkg. (With C39)
C23	273-0591	W5	68 pF $\pm$ 2 $\frac{1}{2}$ % Silver Mica M.S.	C41	279-4661	S2	.022 Mfd. $\pm$ 10% Paper Tubular 400V. Wkg.
C24	271-0031	V4	.0033 Mfd. $\pm$ 100% —0% Ceramic Disc 500V. Wkg.	C42	280-1791	S3	220 pF $\pm$ 10% Plastic Tubular 600V. Wkg.
C25		W4	.0015 Mfd.—Part of CR1	C43	279-1741	R1	.1 Mfd. $\pm$ 20% Paper Tubular 400V. Wkg.
C26	271-0321	W3	.001 Mfd. $\pm$ 80% —20% Ceramic Disc 500V. Wkg.	C44	279-1161	R8	.22 Mfd. $\pm$ 20% Paper Tubular 200V. Wkg.
C27	271-0151	V1	6.8 pF $\pm$ $\frac{1}{2}$ pF Ceramic Tube NPO	C45	279-1161	TB	.22 Mfd. $\pm$ 20% Paper Tubular 200V. Wkg.
C28	271-0131	U1	8.2 pF $\pm$ $\frac{1}{2}$ pF Ceramic Tube NPO	C46	271-0231	LSA	68 pF $\pm$ 10% Ceramic Disc 3KV N750
C29	271-0221	P5	2.2 pF $\pm$ $\frac{1}{2}$ pF Ceramic Bead NPO	C47	271-0031	M3	.0033 Mfd. $\pm$ 100% —0% Ceramic Disc 500V. Wkg.
C30	271-0311	P4	27 pF $\pm$ 5% Ceramic Tube NPO				
C31	269-0211	J13	8 Mfd. Electrolytic Pigtail ET2D 300V. Wkg.				

# PARTS LIST — CHASSIS M2

## CAPACITORS — *continued*

Ref.	Part No.	Position	Description	Ref.	Part No.	Position	Description
C48	279-1161	M2	.22 Mfd. $\pm$ 20% Paper Tubular 200V. Wkg.	C70	279-4721	T10	.068 Mfd. $\pm$ 10% Paper Tubular 400V. Wkg. (U.C.C.)
C49	271-0351	N5	33 pF $\pm$ 1 pF Ceramic Tubular NPO	C71	279-4621	R10	.01 Mfd. $\pm$ 10% Paper Tubular 400V. Wkg.
C50	271-0031	L4	.0033 Mfd. $\pm$ 100% —0% Ceramic Disc 500V. Wkg.	C72	269-0481	K15	24 Mfd. Electrolytic EDT6 300V. Wkg. With C74)
C51	273-0561		10 pF $\pm$ 10% Type I.F.	C73	279-4161	S12	.22 Mfd. $\pm$ 10% Paper Tubular 200V. Wkg.
C52	271-0031	L3	.0033 Mfd. $\pm$ 100% —0% Ceramic Disc 500V. Wkg.	C74	269-0481	K15	24 Mfd. Electrolytic EDT6 300V. Wkg. (With C72)
C53	273-0331		100 pF $\pm$ 5% Type I.F.	C75	269-0221	S8	25 Mfd. Electrolytic ET1B 25V. Wkg.
C54	280-1501	J5	100 pF $\pm$ 5% Plastic Tubular 600V. Wkg.	C76	273-0921	M1	68 pF $\pm$ 10% Silver Mica M.S.
C55	280-1501	K5	100 pF $\pm$ 5% Plastic Tubular 600V. Wkg.	C77	273-1031	P1	47 pF $\pm$ 1 pF Silver Mica M.S.
C56	269-0371	J4	10 Mfd. Electrolytic ET1B 25V. Wkg.	C78	280-1891	K2	.0015 Mfd. $\pm$ 10% Plastic Tubular 600V. Wkg.
C57	280-1851	J5	680 pF $\pm$ 10% Plastic Tubular 600V. Wkg.	C79	280-1001	M2	.001 Mfd. $\pm$ 10% Plastic Tubular 400V. Wkg.
C58	279-1001	H4	.01 Mfd. $\pm$ 10% Paper Tubular 200V. Wkg.	C80	279-1581	L2	.0047 Mfd. $\pm$ 20% Paper Tubular 400V. Wkg.
C59	279-4001	TB	.01 Mfd. $\pm$ 10% Paper Tubular 200V. Wkg.	C81	280-0061	J1	.0033 Mfd. $\pm$ 5% Plastic Tubular 200V. Wkg.
C60	269-0371	E9	10 Mfd. Electrolytic ET1B 25V. Wkg.	C82	280-1751	K2	100 pF $\pm$ 10% Plastic Tubular 600V. Wkg.
C61	279-1641	F8	.015 Mfd. $\pm$ 20% Paper Tubular 400V. Wkg.	C83	279-0561	K2	.5 Mfd. $\pm$ 25% Metallised Paper 200V. Wkg.
C62	269-0061	J14	16 Mfd. Electrolytic ET4D 300V. Wkg.	C84	280-1861	J2	820 pF $\pm$ 10% Plastic Tubular 600V. Wkg.
C63	269-0221	E8	25 Mfd. Electrolytic ET1B 25V. Wkg.	C85	271-0311	K3	27 pF $\pm$ 5% Ceramic Tubular
C64	279-4661	E3	.022 Mfd. $\pm$ 10% Paper Tubular 400V. Wkg.	C86	280-1781	J2	180 pF $\pm$ 10% Plastic Tubular 600V. Wkg.
C65	279-0281	S8	1 Mfd. $\pm$ 25% Metallised Paper 200V. Wkg.	C87	279-4581	H2	.0047 Mfd. $\pm$ 10% Paper Tubular 400V. Wkg.
C66	279-1701	R5	.047 Mfd. $\pm$ 20% Paper Tubular 400V. Wkg.	C88	271-0341	LSA	150 pF $\pm$ 10% Ceramic Disc 5KV N750
C67	279-4541	R6	.0022 Mfd. $\pm$ 10% Paper Tubular 400V. Wkg.	C89	279-1781	D3	.22 Mfd. $\pm$ 10% Paper Tubular 400V. Wkg.
C68	279-4541	S9	.0022 Mfd. $\pm$ 10% Paper Tubular 400V. Wkg.	C90	279-5201	E5	.047 Mfd. $\pm$ 10% Paper Tubular 600V. Wkg.
C69	279-4541	S6	.0022 Mfd. $\pm$ 10% Paper Tubular 400V. Wkg.	C91	279-5201	D5	.047 Mfd. $\pm$ 10% Paper Tubular 600V. Wkg.
				C92	279-4081	LSA	.047 Mfd. $\pm$ 10% Paper Tubular 200V. Wkg.

## COILS

Ref.	Part No.	Position	Description	Ref.	Part No.	Position	Description
L9	259-0981	W10	Tuner Coupling Trimmer	L18	259-0671	W2	3rd I.F. Coupling
L10 )	259-0941	V10	1st I.F. Grid and Sound Trap	L19	259-0931	U2	Detector Input
L11 )				L20	259-0951	U2	Peaking Choke (Grid)
L12		W8	29 mc/s Trap (on IFT1)—Part of 906-0231	L21	259-0961	R4	Peaking Choke (Shunt)
L13	259-0671	W7	1st I.F. Coupling	L22	259-0971	N4	Peaking Choke (Series)
L14	259-0931	U7	2nd I.F. Grid	L23	259-0991	M2R	Stabilising Coil
L15		W5	37.5 mc/s Trap—Part of 906-0241	L24	259-0042	LSA	Coil—Anti-Parasitic
L16	259-0671	W4	2nd I.F. Coupling	L25	259-0921	G6R	Width Coil
L17	259-0931	U5	3rd I.F. Grid	L26	259-0042	LSA	Coil—Anti-Parasitic
				L27	259-0921	F6	Linearity Coil
				L28	259-0042	C3	Coil—Anti-Parasitic

## MISCELLANEOUS

Ref.	Part No.	Position	Description	Ref.	Part No.	Position	Description
RV1	677-0641	TB	500K Curve A Type Q (Brightness)	RV9	677-0631	J10	50K Curve A Type PTU (Horizontal Hold)
RV2	677-0671	P6	500K Curve A Type PTU (A.G.C.)	VC1	281-0131	V5	Capacitor Trimmer
RV3	677-0601	TB	25K Curve A Type Q (Contrast)	VC2	281-0131	V3	Capacitor Trimmer
RV4	677-0611	TB	50K Curve C Type EC (Contrast Range)	IFT1	906-0231	W8	Transformer—I.F. Vision
RV5	677-0621	TB	1 Megohm Tapped 500K Curve A with PPD.P. Switch (Volume)	IFT2	906-0241	W5	Transformer—I.F. Vision
RV6	677-0631	N10	50K Curve A Type PTU (Height)	IFT3	906-0251	W2	Transformer—I.F. Vision
RV7	677-0641	TB	500K Curve A Type Q (Vert. Hold)	IFT4	906-0261	P4	Transformer—Sound Take-off and 5.5 mc/s Trap
RV8	677-0511	S11	10K Curve A Type EC (Vert. Linearity)	IFT5	906-0101	K4	Transformer—Ratio
				T1	904-0251	L14R	Transformer—Power
				T2	905-0301	B10R	Transformer—Audio Output
				T3	908-0321	T8R	Transformer—Blocking Osc.
				T4	905-0291	U15R	Transformer—Vertical Output
				T5	908-0183	S14	Transformer—Vert. Feedback
				T6	908-0341	D4R	Transformer—Horiz. Output
				T7	908-0331	A4	Transformer—Focus



## PARTS LIST — CHASSIS M2

### MISCELLANEOUS — *continued*

Ref.	Part No.	Position	Description	Ref.	Part No.	Position	Description
CH1	232-0122	C15	Choke 1.5 H 300 mA	V1	932-1161	TB	6ES8 Valve
MR1	932-0971	U1	Diode 9A90	V2	932-0501	TB	6BL8 Valve
MR2	932-1071	F14	Diode 0A210	V3	932-0881	V9	6BY7 Valve
MR3	932-1071	F15	Diode 0A210	V4	932-0521	V6	6BX6 Valve
MR4	932-0991	K5	Selenium Diode M3	V5	932-0521	V4	6BX6 Valve
MR5	932-0601	J5	Diode 20A79	V6	932-1081	R2	6DX8 Valve
MR6	932-0601	K5	Diode 20A79	V7	932-1091	M4	6CS6 Valve
MR7	932-0791	M1	Diode 0A81	V8	932-1101	S5	6U8 Valve
MR8	932-0791	M2	Diode 0A81	V9	932-0511	F8	6BM8 Valve
CRT	932-1121		AW53-88 or AWV21DAP4 21in. Picture Tube	V10	932-1111	S10	6CW5 Valve
FS1	431-0071		Fuse, 1 Amp.	V11	932-0481	J2	12AU7 Valve
FS2	431-0081	E10	Fuse, 1.5 Amp.	V12	932-0531	G2	6CM5 Valve
FS3	431-0031	B16	Fuse, 250 mA	V13	932-0771	B6	1S2 Valve
				V14	932-1151	B2	6AL3 Valve

#### ABBREVIATIONS:

LSA: indicates component in Line Output Assembly.  
 TB: indicates component on Tuner Bracket.  
 YK: indicates component on Yoke Assembly.  
 Suffix R: indicates component on reverse side of chassis.

THE GRAMOPHONE COMPANY LIMITED

*(Incorporated in England)*

2 PARRAMATTA ROAD, HOMEBUSH, N.S.W.

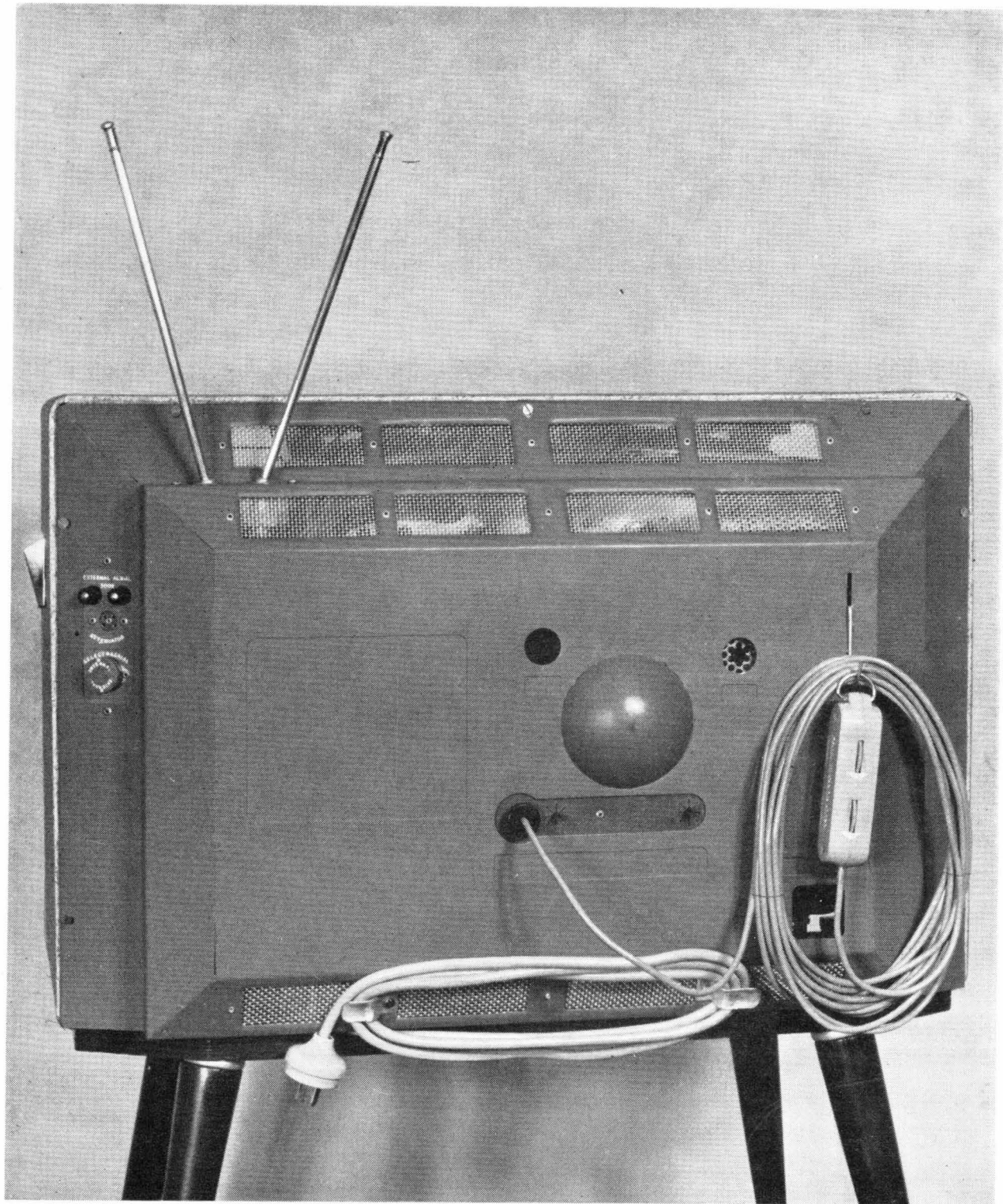
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H. CLARK PTY. LTD.

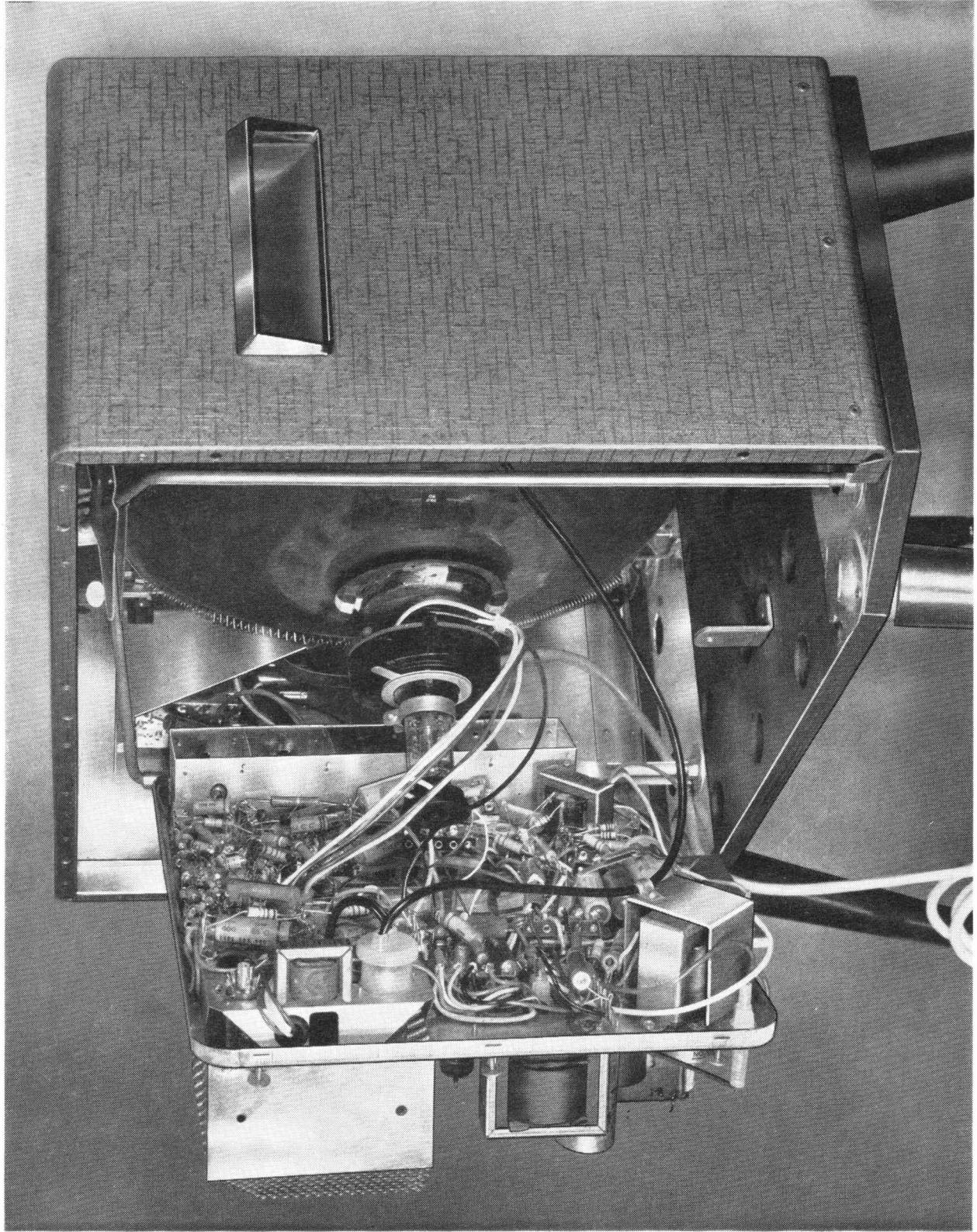
*Printers*

CAMPERDOWN - N.S.W.

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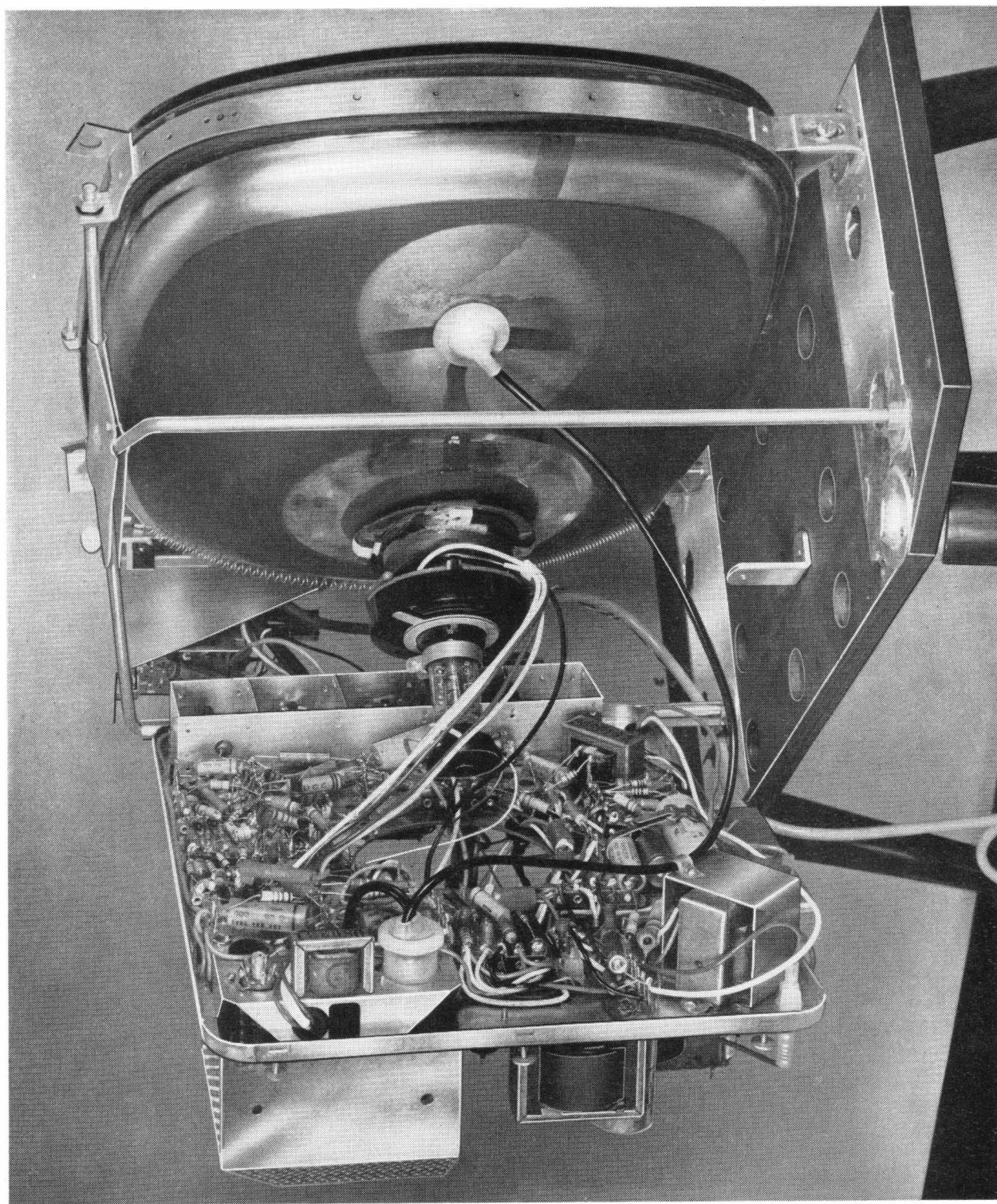


REAR VIEW OF CABINET

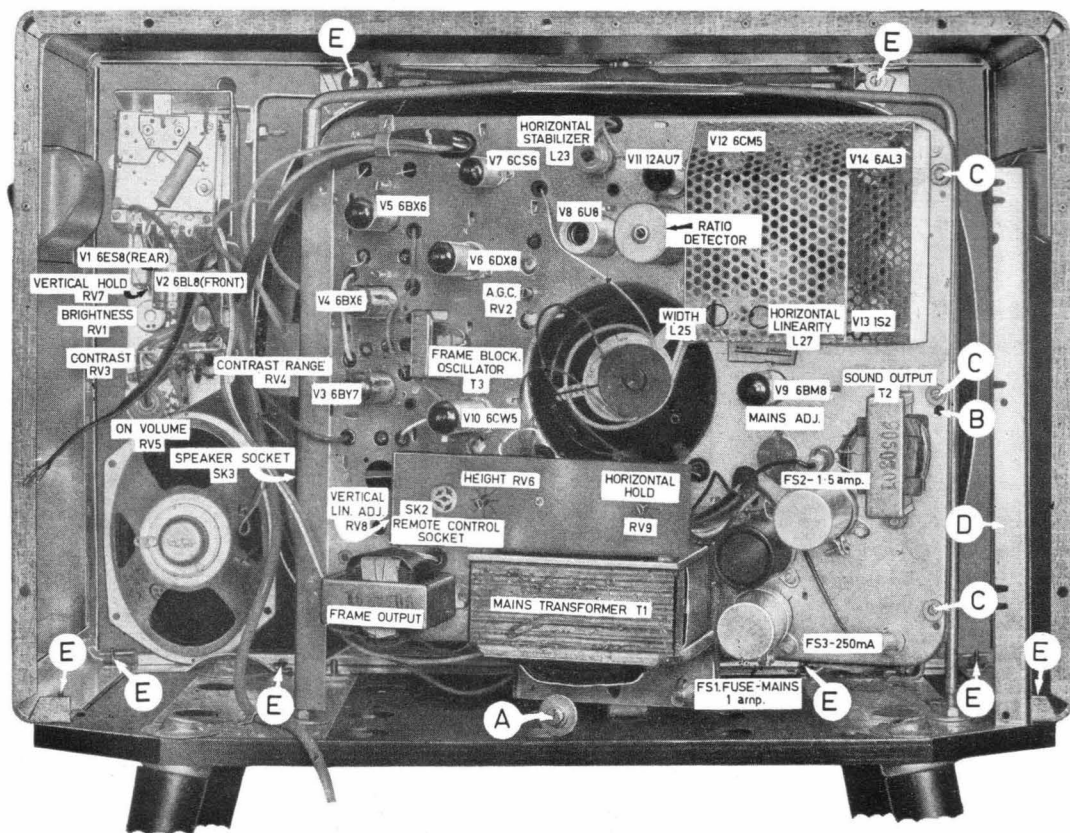


CHASSIS SWUNG OPEN FOR SERVICING IN CABINET



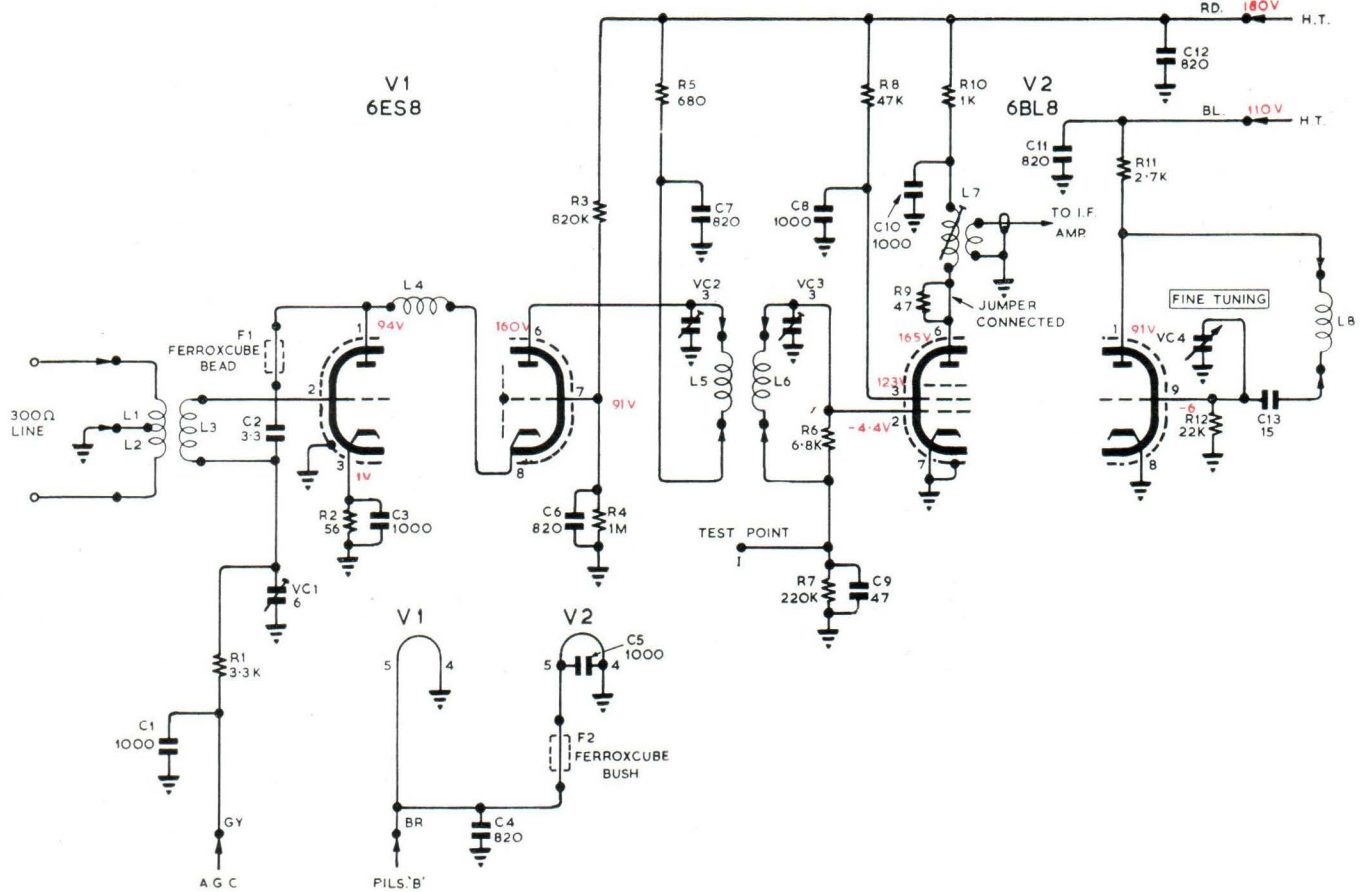


CHASSIS ASSEMBLY REMOVED FROM CABINET

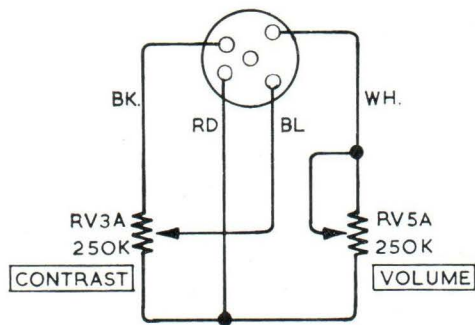


REAR VIEW OF CHASSIS

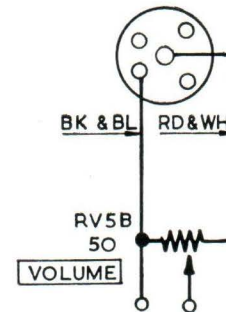
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## REMOTE CONTROL



## HEARING AID CONTROL

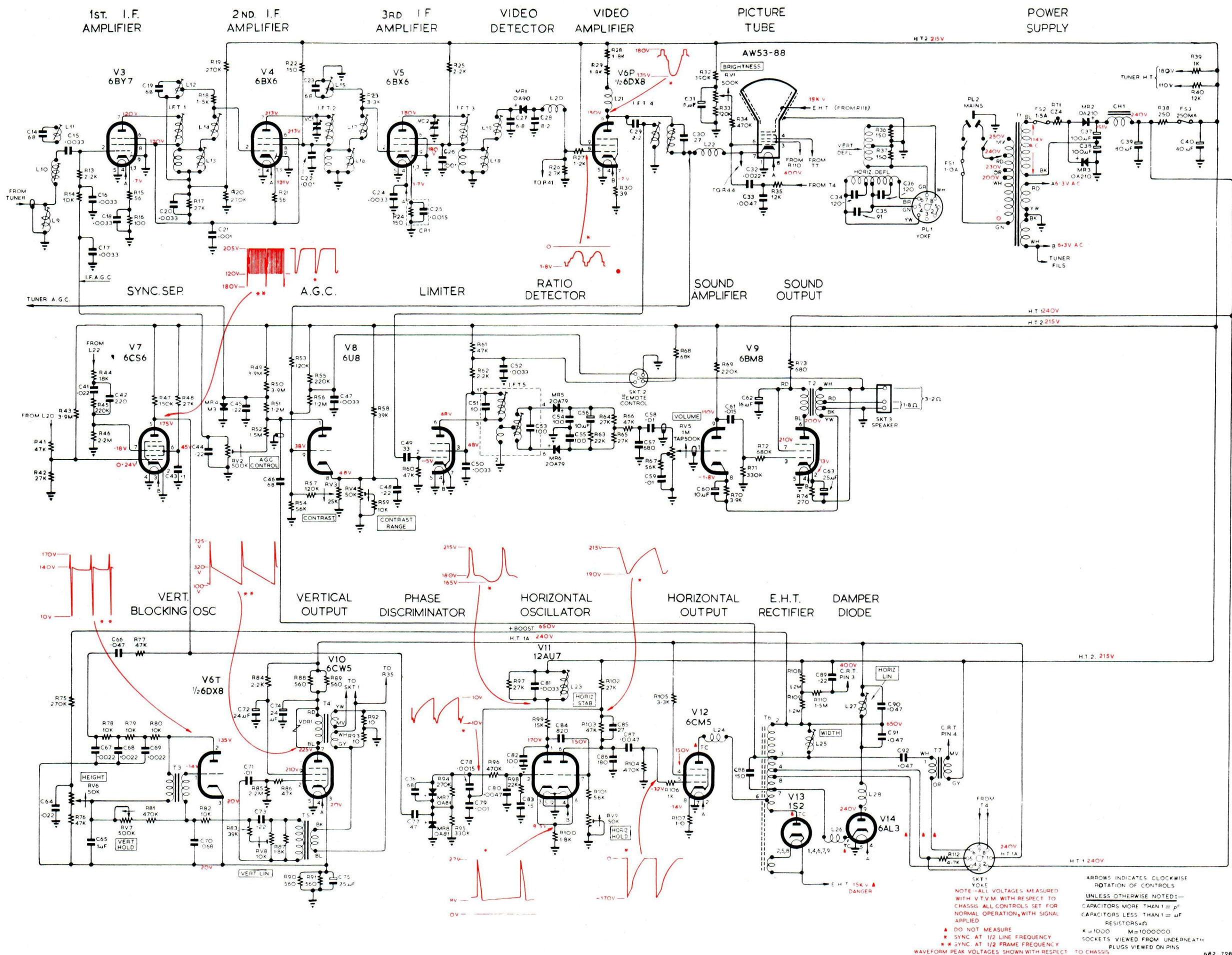


## CORRECTIONS TO CIRCUIT DIAGRAM

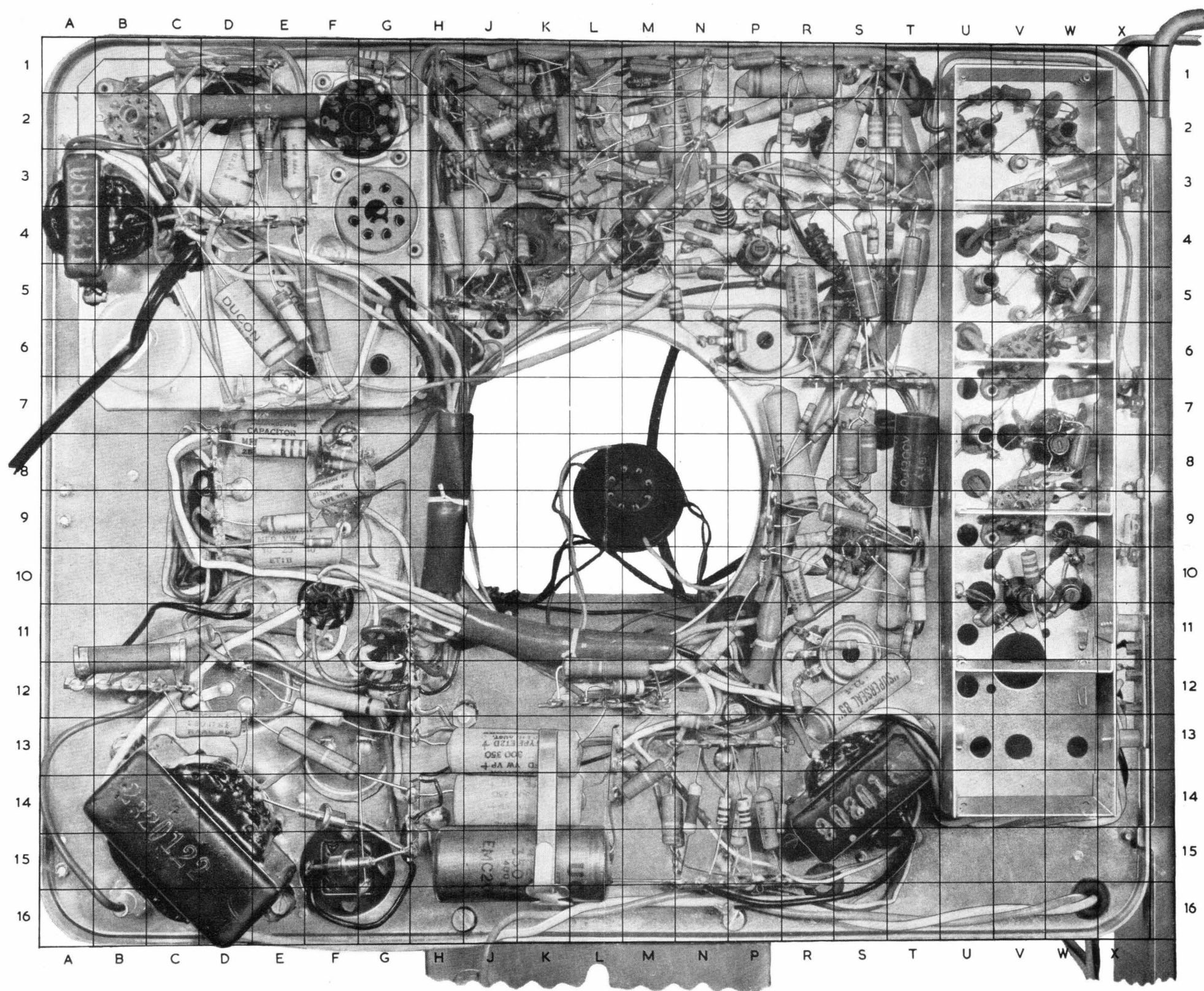
R105 now 2.7K and connected to H.T.2.  
C88 now connected between Pins 2 and 8.



## "H·M·V" CHASSIS TYPE M2







COMPONENT LOCATION DIAGRAM