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For Trade Use Only

"HIS MASTER'S VOICE"

SERVICE MANUAL

for

TELEVISION RECEIVER

CHASSIS TYPE F5

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THE GRAMOPHONE COMPANY LIMITED
(Incorporated in England)
2 PARRAMATTA ROAD, HOMEBUSH, N.S.W.

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Part No. 682-7631

TV Receiver — Chassis Type F5

SPECIFICATION

POWER SUPPLY:

200, 230, 240, 250 Volts A.C., 50 cycles per second.

CONSUMPTION:

230 watts.

CARRIER FREQUENCIES:

Channel	*Vision Carrier*	*Sound Carrier*
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:

Provision for 300 ohm balanced twin feeder.

INTERMEDIATE FREQUENCIES:

Vision I.F. — Carrier .... 36.0 mc/s.

Sound I.F. — Carrier .... 30.5 mc/s.

FUSE TYPES:

2 amp — Mains.

500 mA — H.T.1.

250 mA — H.T.2.

VALVE COMPLEMENT

V1	6CW7	R.F. Amplifier	V15	6BM8	Audio Amplifiers and Audio Output
V2	6BL8	Frequency Changer	V16	6BM8	
V3	6BY7	1st I.F. Amplifier	V17	6BM8	Blocking Oscillator and Vertical Output
V4	6BX6	2nd I.F. Amplifier			
V5	6BX6	3rd I.F. Amplifier	V18	6BX6	Reactance Valve
V6	6BX6	4th I.F. Amplifier	V19	6AL5	Phase Discriminator
V7	6CK6	Video Amplifier	V20	6BL8	Horizontal Osc. and Horizontal Drive
V8	5AS4	Power Rectifier			
V9	5AS4	Power Rectifier	V21	6CM5	Horizontal Output
V10	6BL8	Gated A.G.C. and Noise Inverter	V22	1S2	E.H.T. Rectifier
			V23	6R3	Damping Diode
V11	6CS6	Vertical Sync. Separator and Horizontal Sync. Separator	MR1	0A90	Vision Detector
			MR2	0A81 or 0A91	Clamping Diode
V12	6BX6	Intercarrier Amp.	MR3	M3	Clamping Diode
V13	6BX6	Limiter	C.R.T.	21ALP4-A or AW53-80	Picture Tube
V14	6AL5	Ratio Detector			

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

23 valves and three metal rectifiers.

90° aluminised, electrostatic focus picture tube, type 21ALP4-A or AW53-80.

Exact 4 : 3 aspect ratio to avoid cutting off picture information by overscanning—important with film titles.

Laminated, tinted safety glass screen for maximum protection against implosion and to reduce reflections.

Metal - foil screening of some cabinets to minimise interference with nearly radio receivers.

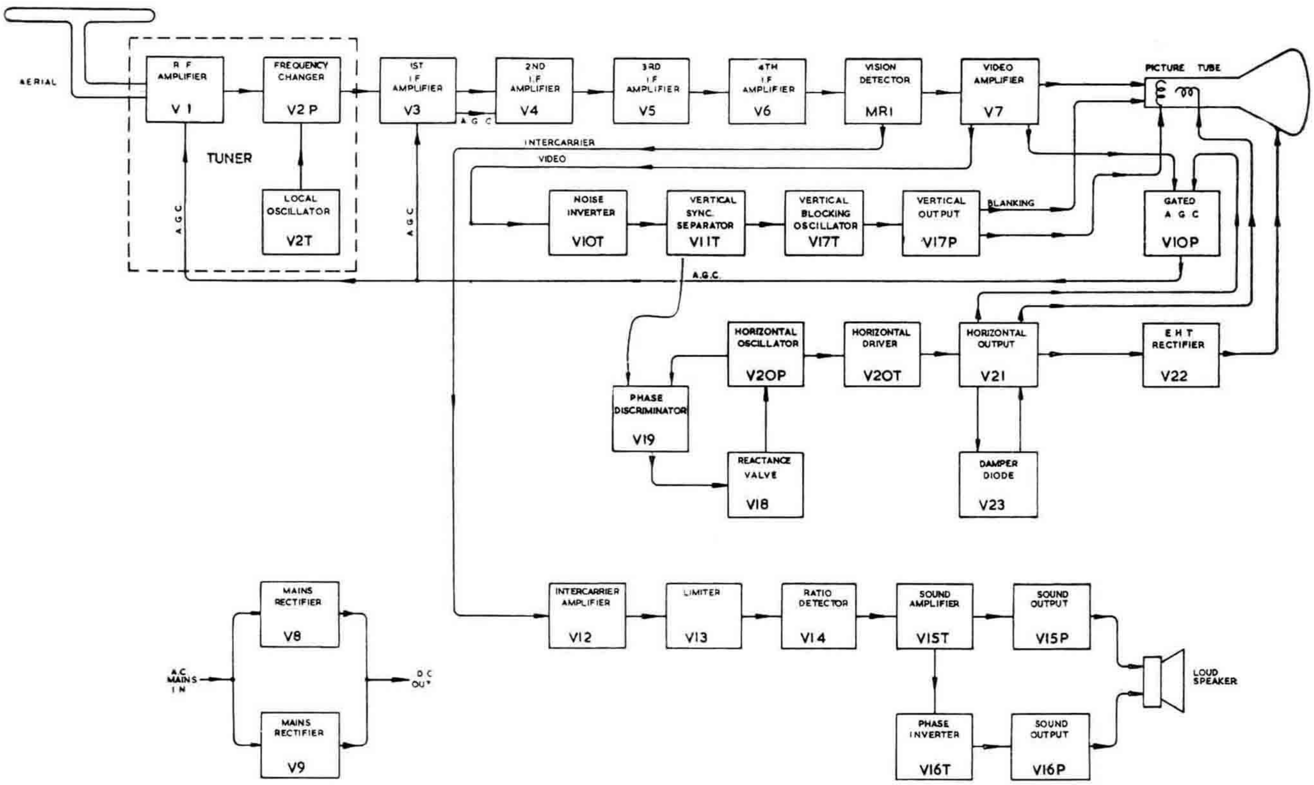


FIG 1

CIRCUIT FEATURES

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

(2) A four-stage I.F. Amplifier gives high sensitivity consistent with wide bandwidth and good definition.

(3) Phase-linear treatment of the I.F. phase response ensures best possible definition with freedom from overshoots or smear and is entirely non-critical with respect to fine tuning. No critical tuning adjustment is needed to obtain a picture free of smear or overshoots.

(4) Overall frequency response of the system is within 6 db from D.C. up to 4.7 megacycles per second.

(5) D.C. coupling from the video detector through the video amplifier to the picture tube ensures that true scene black is retained and all shades have their true relationship to black. This ensures correct reproduction of special effects such as night-time scenes and shots against a dark background.

(6) Time gated A.G.C. gives immunity from effects of impulse noise and has fast action to cope with rapid fading from "aircraft flutter." Variable delay on the tuner A.G.C. maintains full R.F. stage gain on weak to moderate signals to minimise frequency converter noise, and can be adjusted for best results when the receiver is installed.

(7) A noise inverter and a noise gated sync. separator are employed to give protection to synchronising in the presence of impulse interference.

(8) Both amplitude limiter and ratio detector are used to ensure that impulse noise and "sync. buzz" on the 5.5 mc/s intercarrier are effectively eliminated even in areas of low signal strength and severe interference.

(9) The push - pull sound amplifier with ample feedback gives excellent quality and a reserve power for handling the "hi-fi" F.M. sound that can be transmitted. 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 also eliminates the need for a vertical linearity control since it is practically independent of wide component tolerances. It also gives excellent interlace.

(11) The Horizontal Hold circuit is a balanced diode discriminator type of phase comparator with a sine-wave oscillator and has sufficient pull-in range to render unnecessary a hold control on the front of the receiver.

(12) Horizontal Linearity is controlled by variable inductance which can be adjusted for an indication on a multimeter connected to a test point. This can be done with any transmitted picture. Test card is needed only to make a small, final adjustment for optimum performance.

(13) Vertical Flyback Blanking eliminates any vertical retrace lines.

(14) Vertical Linearity is adjusted by a potentiometer on the front panel for optimum performance.

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

(16) Minimum number of controls necessary for operation.

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

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

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

CIRCUIT DESCRIPTION

R.F. INPUT

The input to the turret tuner is to a centre tapped transformer which presents an impedance of 300 ohms. In series with each leg of the input is a fixed-tuned video I.F. trap circuit tuned to 36.0 Mc/s. Shunted across the input is a variable sound I.F. trap circuit tuned to 30.5 Mc/s.

R.F. amplification is achieved with a type 6CW7, double triode (V1), in a cascode circuit. The two sections of this stage are connected in series for D.C. The grounded cathode input section is neatralized and is also controllable by A.G.C. from the main chassis. Because of the series D.C. 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 L9 on the I.F. coil L8.

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.

An improved tuner is used on later production and circuit differences are shown on circuit diagram.

I.F. AMPLIFIER

The tuner I.F. output is coupled to the grid of the first I.F. Amplifier V3 and tuned by coil L16 with stray capacities. There are four I.F. amplifying stages, the first two are "stacked" as far as D.C. is concerned, i.e., they operate in series with V4 above V3.

This does not influence their R.F. operation, but since the same current flows through both valves, A.G.C. voltage applied to V3 controls V4 also.

V5 is coupled to V6, and V6 to the video detector MR1 by inductive coupling. Trimming inductances L16A, L19 and L21 are adjusted in the factory for accurate coupling between stages.

Trap circuits L15 and L17 are coupled to I.F. coils L16 and L18. The former attenuates the sound carrier 30.5 Mc/s; the latter attenuates the adjacent-channel sound carrier 37.5 Mc/s.

V3 and V4 have small unbypassed cathode resistors R17 and R22 to minimise detuning of their grid circuits when A.G.C. bias is applied.

VIDEO AMPLIFIER

The detected video output from the germanium diode MR1 is fed through IFT5 which, in conjunction with R30 and C37A, forms a 5.5 Mc/s null trap, and is amplified by V7. L22, L23 and L24 are peaking chokes which maintain the high frequency components of the vision signal fed to the cathode of the picture tube.

INTERCARRIER AMPLIFIER AND SOUND OUTPUT

The frequency modulated 5.5 Mc/s component from the video detector is applied via the transformer IFT5 to the intercarrier amplifier V12. A single tuned circuit couples V12 to the limiter V13.

Output from the limiter is demodulated by ratio detector V14 to provide the audio signal which passes through the tone control network and volume control and is amplified by the triode section V15, phase inverter (V16 triode) and the push-pull power output pair (V15 and V16 pentodes). Feedback is applied via the pentode cathodes and also via V15 triode cathode.

The tone control provides normal flat response at mid position. Full anti-clockwise rotation cuts high frequencies, as may be needed when excessive sibilance or high frequency noise is transmitted. Full clockwise rotation cuts low frequencies. This facility may be needed in "live" reverberent locations such as halls or schools, or when low frequency noise such as hum is transmitted.

A margin of sound gain is provided so that the full 6 watts output is obtained from sound signals which are not fully modulated. Moreover, the sound output stage has a controlled overload characteristic which ensures that, when overdriven, it does not "paralyse" but merely clips the peaks and so remains comparatively free from audible distortion.

SYNC. SEPARATORS

A combined Horizontal and Vertical sync. separator including noise gating is employed (V11). A Video signal with sync. tips positive is applied to the control grid, G3, from the Video Amplifier anode. At the same time a video signal with the sync. tips negative is applied to 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 in its output. The video signal at its noise gating grid is fed via the potentiometer R65, R66, 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) are protected by the operation of the Noise Inverter V10 thus preventing blocking of the grid immediately following strong noise pulses, so that the synchronising signals are restored immediately following the cutting off of the valve by the gating grid.

NOISE INVERTER

Anode current in the triode section of V10 is normally cut off by the steady bias between its grid and cathode. Video signal with sync. tips positive is fed to the grid of this valve from the video amplifier and the valve is biased so that under normal conditions this signal will not drive it into conduction. However, if impulse interference with amplitude greater than sync. pulse height is present, the valve will conduct during the interfering pulse and amplified, inverted interference pulses will appear at the valve anode. Since the anode load R62 of this valve is also in the path through which video signal is fed to the sync. separator, the interfering pulses cancel out across this resistor. Thus the video signal fed to the sync. separator is freed from the effects of impulse interference.

GATED A.G.C.

The same video waveform that feeds the noise inverter, feeds the grid of the A.G.C. amplifier (V10 pentode). The polarity of this waveform is with sync. tips positive, and the valve is biased so that it can conduct only during sync. pulses. However, it will conduct only if there is also a positive potential at its anode. This is supplied as a positive-going pulse during line flyback from the line output transformer T8, via C46. Thus the valve cannot conduct on impulse interference occurring between line sync. pulses and the A.G.C. operation is freed from the effects of impulse interefrence.

The current through the A.G.C. valve, which charges C46, depends upon the height of the sync. pulses and the setting of the Contrast control. The resulting mean D.C. (negative) voltage at C46 is fed to the first I.F. amplifier V3 via the potential divider R51A, RV2 and R48, smoothed by C44. RV2 controls the ratio of I.F. and R.F. A.G.C. voltage. The cathode of the A.G.C. valve is returned to a potential of approximately + 50 volts, which is set by the divider network R52, R53, and the contrast resistor network.

The Contrast control RV5 operates in the following manner. A D.C. voltage from the moving arm is applied to the A.G.C. valve grid via R56 and R60, together with a proportion of the video output voltage via R59. The A.G.C. valve has a grid base of —2V., which is small compared with the +50V. potential between its cathode and earth. Thus so long as any A.G.C. voltage is produced, the voltage between the grid of V10 and earth during conduction on sync. tips, remains substantially constant (+48 to +49 volts).

A.G.C. voltage is also applied to the R.F. amplifier from the junction of R50 and R51, smoothed by C45. The junction of these two resistors is clamped to a small negative potential by the clamping diode, MR3, and not until the anode of V10 falls to a value fixed by the H.T. voltage divided by the ratio of R49 and R50 to R51 does this point become unclamped. A "delayed" bias is therefore provided to the R.F. stage, ensuring that maximum R.F. stage gain is available with low signal levels to minimise noise from the frequency converter.

The division ratio of the voltage divider supplying I.F. bias is important. If the ratio is too small, the tuner will start to receive bias before converter noise has disappeared from the picture. As a result, noise will be visible even at high signal levels. If the ratio is too large, an excessive degree of control will be demanded of the I.F. amplifier before the tuner starts to receive bias. This can cause overloading of the I.F. amplifier. Therefore, the ratio should be adjusted for optimum when the receiver is installed, by RV2.

VERTICAL DEFLECTION CIRCUITS

Vertical sync. pulses from the sync. separator via the integrator are used to synchronise the blocking oscillator comprised of transformer T3 and triode portion of V17. 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 RV10 is returned to the slider of the Height control potentiometer RV9 so that the blocking oscillator frequency is unaffected when Height is adjusted. This makes the Vertical Hold almost independent of Height adjustment.

The pentode section of V17 is the vertical output stage. The sawtooth waveform from the blocking oscillator is applied to the grid of the output amplifier and a sawtooth current waveform appears in the vertical output transformer T4.

A feedback voltage is developed across R114, R115, from the current in the deflection coils. This voltage is stepped up to the input grid of the frame output valve. A control potentiometer, RV11, is provided across the feedback transformer secondary for factory adjustment of linearity.

HORIZONTAL OSCILLATOR AND AUTOMATIC PHASE CONTROL

Automatic frequency and phase control is obtained by means of a sine wave type of "flywheel" circuit. Incoming horizontal sync. pulses from the horizontal sync. separator are fed via transformer T6 (damped by diode MR2) into the discriminator V19 where they are compared in phase with a sine waveform taken from the horizontal oscillator transformer T7. In this circuit the sync. pulse is applied in the same phase to both diodes of the discriminator. From the oscillator a balanced winding on the transformer feeds equal and opposite sine-wave voltages to the cathodes of the diodes. These pulse and sine waveforms are added together and detected by the diodes so that the voltage developed across R119 is equal to the peak negative voltage applied to the top diode and is negative with respect to the centre tap of the sine wave winding. Similarly, the voltage across R120 is equal to the peak negative voltage applied to the bottom diode and is negative with respect to the centre tap of the winding.

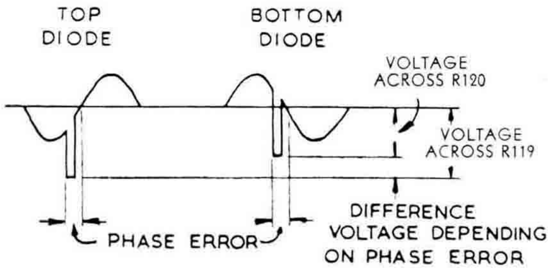
Since the two peak rectified voltages are in the same sense, negative with respect to the transformer centre tap, the discriminator output voltage, taken across the two load resistors R119 and R120, will be their difference.

Fig. 2 shows how the sine wave applied to the diodes in opposite sense and the pulse applied in the same sense are added together.

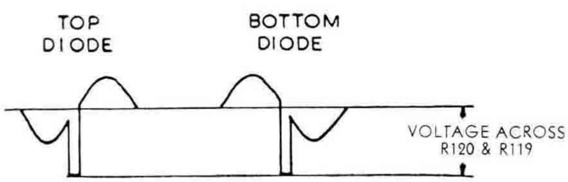
In Fig. 2 (*a*) there is a phase error between the incoming sync. pulse and the receiver horizontal oscillator, the sync. pulse arriving before the sine-wave crosses the zero axis. Then the voltage across R119 is greater than the voltage across R120, and the discriminator output (the difference between the above two voltages) is negative with respect to the bottom of the discriminator. If the phase error had been in the opposite sense, i.e., the sync. pulse arriving *after* the sine-wave had crossed the zero axis, the discriminator output would be in the opposite direction, i.e., positive with respect to the bottom of the discriminator. When the phase error is zero, as Fig. 2 (*b*), the voltages across R119 and R120 are equal and the resulting output is zero.

The discriminator output is connected in series with a fixed negative bias voltage derived from the Horizontal Hold potentiometer which taps off part of the grid leak bias developed in the horizontal driver grid circuit. Thus the D.C. voltage on the reactance valve (V18) grid is that of the fixed bias when there is zero phase error, more negative when the sync. pulse leads in phase and less negative when the sync. pulse lags.

The reactance valve V18 is essentially a capacitance shunted across the oscillator tank circuit. The effective value of its capacitance is varied by the control bias on its grid, developed by the discriminator, and is varied in such a direction as to correct for any change of phase which develops a correcting voltage.



(a) WAVEFORMS APPLIED TO PHASE DISCRIMINATOR DIODES WITH PHASE ERROR.



(b) WAVEFORMS APPLIED TO PHASE DISCRIMINATOR PHASE ERROR ZERO.

Fig. 2

HORIZONTAL REFLECTION CIRCUITS

Negative voltage pulses from the anode of the horizontal oscillator (V20 pentode) are applied via a differentiating circuit of which the Horizontal Drive control RV12 is a variable element to the Horizontal Driver valve (V20 triode). RV12 serves to adjust the amount of differentiation and hence the time at which the Horizontal Output valve is driven "on" as required below.

The horizontal driver valve (V20 triode) produces a negative pulse output which is timed to cut off the horizontal output valve V21 at end of a scan. When V21 is cut off sharply, the magnetic field that has been established in the horizontal output transformer during the scan collapses and the oscillatory circuit comprised of the transformer inductance and stray capacitances tends to "ring." However, after one-half cycle of oscillation the damping diode V23 starts to conduct. During the "flyback" time the magnetic energy has established itself in the reverse direction, and the picture tube spot has returned to the left-hand side of the screen.

When the damping diode conducts it permits current to flow at a controlled rate through part of the transformer. This current, passed by the auto-transformer into the deflection coils, forms the initial part of the horizontal scan. As the damper ceases to conduct the line output valve takes over and supplies the necessary current to complete the scan, at which point a further negative pulse on the grid of V21 starts the cycle over again.

The shape of the current waveform, which should be essentially sawtooth, is controlled by the Linearity control L31 in conjunction with C107 and C109.

During flyback a high voltage pulse is produced at the anode of the E.H.T. rectifier V22, which is peak-rectified, and then smoothed by the capacitance between inner and outer bulb coatings of the picture tube, and supplies E.H.T. of approximately 16,000 volts.

Energy recovered by the damping diode produces a boosted H.T. voltage of 560 volts which is used, if required, for focus voltage and also is divided down to 400 volts for supplying the G2 electrode voltage of the picture tube.

The sawtooth scanning current in the primary of focus transformer T9 produces in the secondary a larfeg parabolic voltage waveform, which is fed directly to the focus electrode of the C.R.T. The cold end of the secondary is connected to the potentiometer RV14, which can be adjusted to give good overall focus.

REMOTE CONTROL

By plugging into socket SK4, the octal socket in the rear of the chassis, volume and contrast can be controlled from the Remote Control Unit.

The remote volume control RV8A adds a variable resistance across the supply voltage of the sound limiter. Since this control can only *reduce* volume, the main volume control should be set for the maximum volume desired.

The remote contrast control RV5A feeds a variable D.C. voltage into the contrast control chain R59, R60 and R56. It varies contrast either side of a middle (normal) value which is set by the main contrast control.

Note that connection of the Remote Control Unit does not affect operation of the normal receiver volume and contrast controls.

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 mans adjustment panel.

PICTURE SHIFT

Small shifts in position of picture may occur due to the effects 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.

PICTURE TILT

If the picture is not square with the edges of the mask, the deflection coils should be rotated by pushing the lever which emerges from the slot in the top of the yoke assembly until the picture is squared up. It may be necessary after this operation to centre the picture by means of the shift magnets.

ION TRAP

If ion trap adjustment is necessary, set brightness control at normal brightness or if no raster is evident at all set brightness control at the centre of its range. Check that ion trap magnet is placed on the neck of the tube in the region of the bend in the gun. Rotate magnet around the tube neck and move it backwards or forwards along the neck until the position for maximum brightness of raster is obtained. Readjust brightness setting if necessary to keep raster brightness at that of a reasonably bright picture, but not excessively so.

Check also that the position found for the magnet by the above procedure produces good overall focus.

It is most important that the ion trap be accurately set because misadjustment not only produces astigmatism, but can damage the picture tube.

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.

DISMANTLING

REMOVAL OF CHASSIS

Disconnect the receiver from the mains supply and remove the aerial connection.

Remove the two screws securing the back cover of the receiver to the cross rail on which the chassis sits. Ease back the mains interlock socket so that it comes from of the chassis and, while holding the socket free, slide the cover downwards in its guide grooves until the top edge is free of its cabinet groove. The cover may then be eased out by bowing it down the centre until the edges are free of the cabinet grooves.

Disconnect the picture tube socket, E.H.T. connector, deflection yoke plug and speaker plug.

Remove all four knobs from front of the set.

Remove four bolts securing chassis to the cabinet shelf.

The chassis may then be withdrawn from the cabinet.

REMOVAL OF DEFLECTION YOKE

First slide the ion trap and picture shift magnets from the picture tube neck.

The deflection yoke may be removed by loosening the four yoke securing screws, lifting them out of the slots in the brackets and then pulling the yoke assembly back off the picture tube.

REMOVAL OF PICTURE TUBE

Having removed the chassis and yoke assembly, lay the cabinet on its face and undo four screws securing the picture tube clamping ring to the cabinet and the mounting brackets.

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 PICTURE TUBE

First, clean the tube face and the inside surface of the protective glass screen. Stretch the rubber dust-sealing ring around the four spigots moulded into the mask.

Place the tube in position on the mask, and secure with two bottom screws and then two top screws. The top screws should be tightened only until face of tube seats against mask. Prise dust-sealing ring off the spigots until it flicks into position around the mask.

REPLACEMENT OF DEFLECTION YOKE

Slide the yoke assembly over the neck of the picture tube, taking care that the picture tube base does not damage the yoke. Check that the four hard rubber spacers are in position between the rim of the yoke assembly and the picture tube, replace the four securing straps, and screw up tight. Replace the picture centring magnets and the ion trap magnet.

REPLACEMENT OF CHASSIS

Slide chassis into cabinet, ensuring that the extension spindles on the pre-set controls locate in their guides. Push chassis forward until it comes against a stop, and replace the four screws securing the chassis to the shelf.

Replace loudspeaker plug, deflection yoke connector, picture tube socket and E.H.T. Lead.

Replace knobs.

Replace the cabinet back panel and ease home the mains interlock plug. Ensure that this is properly aligned with the pins on the chassis before pushing it home. Do not force it on.

Replace two screws securing the back panel.

IMPORTANT: Before replacing back on receiver, the ion trap must be adjusted in accordance with instructions. Do not operate the receiver for any length of time with the ion trap misadjusted.

ADJUSTMENTS

PICTURE TUBE FOCUS

The parabolic voltage on the focus electrode G4 of the picture tube is obtained from the focus transformer T9, the cold end of which is taken to the focus control RV14, which is adjusted to give overall picture tube focus.

NOISE INVERTER CONTROL

Operation of the noise inverter is controlled by the bias at the G1 of V10T. A potentiometer RV6 is provided to allow accurate setting of this bias. An oscilloscope should be connected to the anode of the noise inverter valve and the potentiometer adjusted until clipping of the sync. tips at the noise inverter anode is just visible. Care must be taken in setting this control since if too much clipping is carried out, due to mis-setting this control, then sync. separation can be affected or even "lock-out" may be produced.

VERTICAL LINEARITY

Vertical linearity is adjusted by potentiometer RV11 for optimum performance when viewing a test card.

HORIZONTAL LINEARITY

Connect a multimeter, set to read 100 mA full scale deflection, between test point V and chassis. Tune to a transmission, and with the picture in lock, adjust the linearity control L31 for minimum current reading. Final adjustment should be made viewing a test card. The reading on the multimeter will then rise slightly above minimum.

HORIZONTAL DRIVE

Tune to a transmission and, with the picture in lock, adjust the Horizontal Drive control RV12 until a white vertical stripe appears near the centre of the picture. Then adjust this control again until the white stripe just disappears. This control reacts slightly with the Horizontal Hold control. Hence, after adjustment of horizontal drive, the Horizontal Hold control should be reset.

HORIZONTAL HOLD

The Horizontal Hold control RV13 is reset in the following manner. This is necessary especially when the Reactance Valve V18 is replaced.

Disconnect sync. pulses by removing the Sync. Separator valve V11, and adjust the Horizontal Hold control until the picture just "floats" or locks weakly. Then replace V11.

The *cathode* (pin 1) of the reactance valve V18 should read +0.4 volts.

In general, the core of T7, which is adjusted in the factory, should not need to be reset. However, adjustment will be needed if T7 or C95 is replaced, and also, at times, if components are replaced in the reactance valve or line oscillator circuits.

50V ADJUST AND CONTRAST RANGE

(1) Turn the Contrast control maximum clockwise and adjust the "50V Adjust" preset control until sync. tips read 200V D.C. on a direct coupled oscilloscope. If such an oscilloscope is not available, adjust for a sufficiently strong maximum contrast.

(2) Turn Contrast Control maximum anticlockwise (minimum contrast) and adjust Contrast Range preset control to give minimum desirable picture.

The purpose of the Contrast Range preset adjustment is to ensure that when the Contrast control is turned to minimum, the picture cannot be "whited out," so that the receiver would appear inoperative to the customer.

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 below.

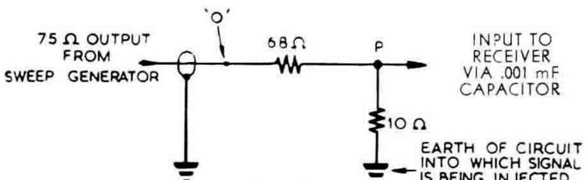


Fig. 4

If there is inadequate output from this arrangement for alignment of the final I.F. stage, the point *O* may be connected to the receiver instead of the point *P* shown.

Before commencing alignment, remove the cores from L15, L17 and L18. Turn the two trimmers, VC1 and VC2 to their minimum capacitance position, i.e., $\frac{7}{16}''$ of thread on the screw should be visible above the chassis. Connect —6V. bias across C44. Connect the input to the display unit between the grid of V7 and earth. Throughout 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.

At all times, the level of the sweep generator output must be kept low enough to avoid overload of the final I.F. Amplifier. The resulting flattening of the displayed sweep waveform can cause faulty alignment. At the same time, the vision detector MR1 may be damaged.

ALIGNMENT

(1) Connect the sweep output between the grid of V6 and earth. Adjust the core of L20 to peak the response at 34.65 Mc/s, with the core in the position closest to the chassis. Adjust the core in IFT4 to give a symmetrical response with the core in the position furthest from the chassis, and then vary both to obtain the response shown in *A* (Fig. 6).

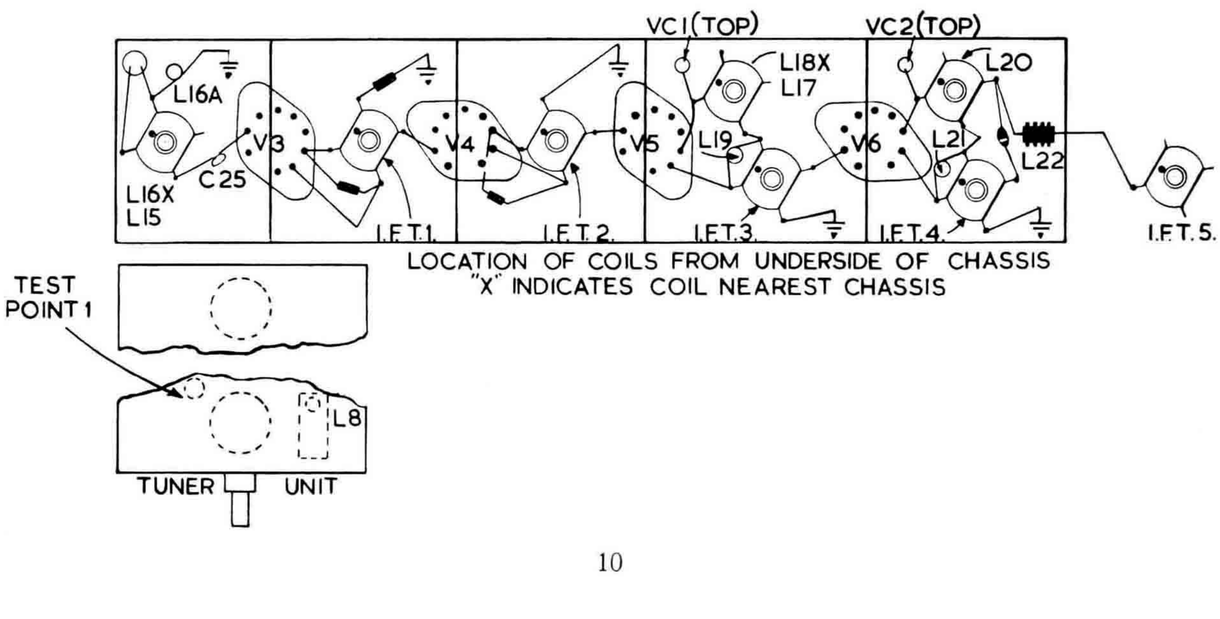
(2) Remove the sweep generator output from the grid of V6 and re-connect it to the grid of V5. Insert a core in L18 and peak the response at 34.65 Mc/s with the core in the position closest to the chassis. Adjust the core of IFT3 to give a symmetrical response with the core in the position furthest from the chassis, and then vary both to obtain the response shown in *B*.

(3) Remove the sweep generator output from the grid of V6 and re-connect it to the junction of C25 and L16. Adjust the core of IFT2 to make the output maximum possible at 33.5 Mc/s with the core in the position closest to the chassis, adjust the core in IFT1 to give the maximum possible output at 36.0 Mc/s with the core in the position closest to the chassis, and then using both cores, obtain the response shown in *C*.

(4) Remove the sweep generator output from the junction of C25 and L16 and connect it to the test point 1 on the turret. Switch the turret to position 12. Adjust the core in L8 to give the maximum response at 34.65 Mc/s. Adjust the core in L16 to the position nearest the chassis which peaks at 34.65 Mc/s, and then using both L8 and L16 cores, obtain the response shown in *D*.

(5) Increase capacity of VC1 so that the peak response falls about $1\frac{1}{2}$ db. and then adjust VC2 to make the peak response fall a further $1\frac{1}{2}$ db. Vary both to obtain *E* as closely as possible and, if necessary, make an alteration to the setting of IFT4.

(6) Insert a core into L17 and adjust for minimum response at 37.5 Mc/s. Insert a core into L15 and adjust to set the 30.5 Mc/s marker in the middle of the step created by this coil.



LOCATION OF COILS FROM UNDERSIDE OF CHASSIS
"X" INDICATES COIL NEAREST CHASSIS

(7) Make any small, final adjustments that may prove necessary to obtain the end result shown in *F*.

Note that L16A, L19 and L21 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:

(1) A C.W. Oscillator accurately tuned to 5.5 Mc/s by a crystal - controlled reference.

(2) A 20,000 ohms/volt meter (Model 8 A.V.O. or similar type).

(3) A D.C. V.T.V.M.

(4) A peak-to-peak detector as shown.

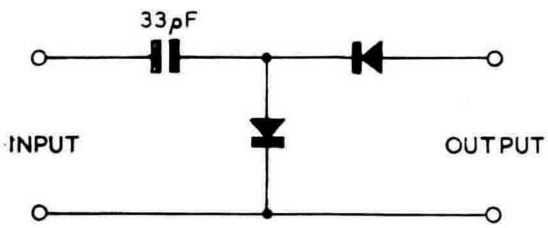


Fig. 5 — Peak-to-Peak Detector.

5.5 MC/S. NULL TRAP (IFT4)

IFT5 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 swept 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. Only the primary core should be retuned as the secondary core (nearest chassis) is sealed in the factory.

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

(1) Inject 5.5 Mc/s C.W. at approximately 100 mV between L22 and earth (disconnecting L22 from C37 and MR1).

(2) Connect the input of the peak-to-peak detector illustrated to C.R.T. Pin 11. Connect output of peak - to - peak detector to 20,000 ohm/volt meter on 50 micro-amps. range.

(3) Adjust primary core of IFT5 to give zero reading on meter. NOTE: Do not move secondary core.

If IFT5 is replaced, a similar method is used, but adjustment of both primary and secondary cores is necessary. Set up as in (1) and (2) above, and proceed as follows:

(3) Withdraw both cores to end of former, and then screw in primary core until a minimum reading is obtained on meter.

(4) Screw in secondary core until meter reading increases slightly.

(5) Screw out primary core until meter reading reaches new minimum.

(6) Repeat (3) and (4) until a *zero* reading is obtained.

(7) Seal secondary coil.

SOUND I.F.

(1) Connect the output of the C.W. Oscillator between grid (Pin 2) of V12 and earth and tune the core of L25 amplifier anode coil to obtain maximum negative reading across the 10K. metering resistor, R75, measured with a D.C. V.T.V.M.

(2) Using the same input, connect V.T.V.M. between junction of R80 and R81, and earth. Set the cores of IFT6, ratio transformer, until they are ⅜" from ends of former. Rotate top (primary) core of IFT6 one turn in either direction. Continue tuning core in the direction that increases the positive reading, until a maximum is obtained. Screw in bottom (secondary) core of IFT6 so that the reading becomes more positive and then falls rapidly through zero to a negative potential. Carefully adjust core so that the meter reads exactly zero volts.

I.F. RESPONSES

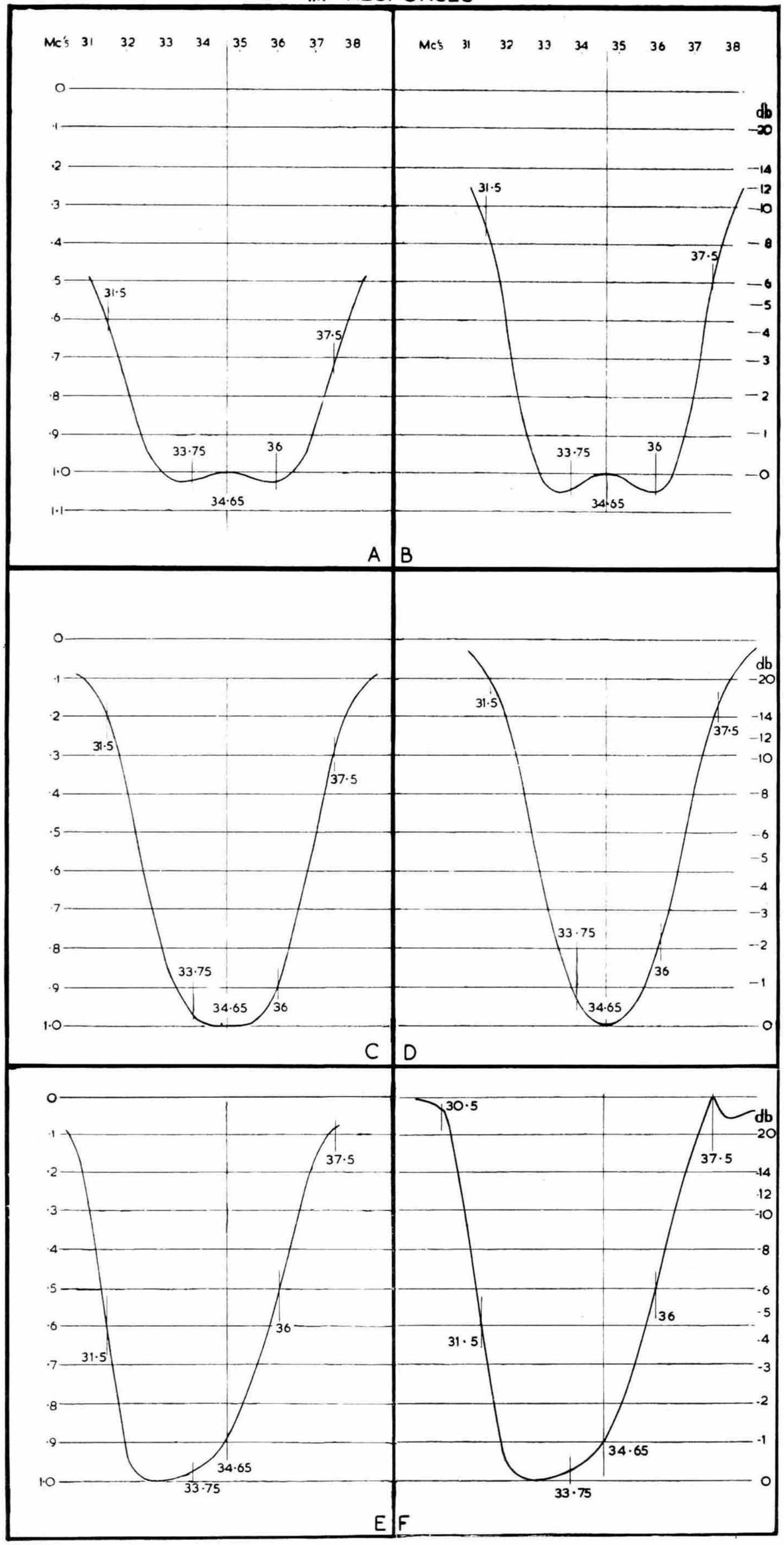


Fig. 6 — Oscilloscope Patterns Obtained with Sweep Oscillator Input.

PARTS LIST — CHASSIS F5

RESISTORS

REF.	PART No.	DESCRIPTION
R15	740-0032	2.2K ohms ± 10% BTS
R16	740-0612	10K ohms ± 20% BTS
R17	740-0483	56 ohms ± 10% ½ W. Morganite
R17a	740-0653	100 ohms ± 10% ½ W. Morganite
R18	740-0032	2.2K ohms ± 10% BTS
R19	742-0142	270K ohms ± 10% BTA
R20	742-0142	270K ohms ± 10% BTA
R21	740-0112	27K ohms ± 10% BTS
R22	740-0483	56 ohms ± 10% ½ W. Morganite
R23	740-0693	150 ohms ± 20% ½ W. Morganite
R24	740-0302	1.8K ohms ± 10% BTS
R25	740-0273	150 ohms ± 10% BTS
R25a	742-0712	2.2 ohms ± 20% BTA
R27	740-0052	3.3K ohms ± 10% BTS
R28	740-0572	1K ohm ± 20% BTS
R29	740-0572	1K ohm ± 20% BTS
R30	740-0043	2.7K ohms ± 10% ½ W. Morganite
R31	740-0322	1.2K ohms ± 10% BTS
R32	740-0382	6.8K ohms ± 10% BTS
R33	749-0191	680 ohms ± 10% BTB
R34	749-0191	680 ohms ± 10% BTB
R35	749-0191	680 ohms ± 10% BTB
R36	749-0191	680 ohms ± 10% BTB
R37	740-0483	56 ohms ± 10% ½ W. Morganite
R39	740-0622	470K ohms ± 20% BTS
R40	740-0732	12K ohms ± 10% BTS
R41	740-0262	560 ohms ± 10% BTS
R42	740-0262	560 ohms ± 10% BTS
R43	746-0201	3.9 ohms ± 20% BW½
R45	742-0062	27K ohms ± 10% BTA
R45a	742-0962	5.6K ohms ± 10% BTA
R46	742-0712	2.2K ohms ± 20% BTA
R47	742-0712	2.2K ohms ± 20% BTA
R48	740-0583	47K ohms ± 10% BTS
R49	742-0772	3.9 Megohms ± 10% BTA
R50	742-0222	4.7 Megohms ± 10% BTA
R51	742-0192	1 Megohm ± 10% BTA
R51a	742-0172	470K ohms ± 10% BTA
R52	742-0762	12K ohms ± 10% BTA
R53	742-0432	18K ohms ± 10% BTA
R54	740-0862	18K ohms ± 10% BTS
R55a	740-0072	4.7K ohms ± 10% BTS
R55b	740-0072	4.7K ohms ± 10% BTS
R56	740-0732	12K ohms ± 10% BTS
R56a	742-0492	68K ohms ± 10% BTA
R57	742-0522	820K ohms ± 10% BTA
R58	742-0132	220K ohms ± 10% BTA
R59	740-0782	120K ohms ± 10% BTS
R60	740-0522	220K ohms ± 20% BTS
R61	740-0822	10K ohms ± 10% BTS
R62	740-0822	33K ohms ± 20% BTS
R63	740-0202	2.2M ohms ± 10% BTS
R64	740-0312	1.2M ohms ± 10% BTS
R65	740-0122	47K ohms ± 10% BTS
R66	740-0112	27K ohms ± 10% BTS
R67	740-0162	220K ohms ± 10% BTS
R68	740-0232	27K ohms ± 10% BTB
R69	740-0152	150K ohms ± 10% BTS
R70	740-0773	39 ohms ± 10% ½ W. Morganite
R71	740-0273	150 ohms ± 10% ½ W. Morganite
R72	740-0572	1K ohm ± 10% BTS
R72a	740-0622	470K ohms ± 20% BTS
R73	740-0142	100K ohms ± 10% BTS
R74	740-0122	47K ohms ± 10% BTS
R75	740-0082	10K ohms ± 10% BTS
R77	749-0051	47K ohms ± 20% BTB
R78	740-0742	2.2K ohms ± 20% BTS
R79	740-0102	22K ohms ± 10% BTS
R80	740-0092	15K ohms ± 10% BTS
R81	740-0092	15K ohms ± 10% BTS
R82	740-0122	47K ohms ± 10% BTS
R83	740-0102	22K ohms ± 10% BTS
R84	740-0122	47K ohms ± 10% BTS
R85	740-0702	56K ohms ± 10% BTS
R86	742-0122	150K ohms ± 10% BTA
R87	742-0122	150K ohms ± 10% BTA
R88	740-0252	1.5K ohms ± 10% BTS
R89	740-0242	33K ohms ± 10% BTS
R90	740-0112	27K ohms ± 10% BTS
R91	740-0362	390K ohms ± 10% BTS
R92	740-0182	470K ohms ± 10% BTS
R93	740-0182	470K ohms ± 10% BTS
R94	740-0182	470K ohms ± 10% BTS
R95	742-0502	390 ohms ± 10% BTA
R96	742-0502	390 ohms ± 10% BTA
R97	748-0102	470 ohms ± 10% BW1
R98	748-0102	470 ohms ± 10% BW1
R99	749-0221	220K ohms ± 10% BTB
R100	742-0072	33K ohms ± 10% BTA
R101	740-0082	10K ohms ± 10% BTS
R102	740-0082	10K ohms ± 10% BTS
R103	740-0082	10K ohms ± 10% BTS
R104	742-0172	470K ohms ± 10% BTA
R105	740-0082	10K ohms ± 10% BTS
R106	740-0232	39K ohms ± 10% BTS
R107	740-0302	1.8K ohms ± 10% BTS
R108	740-0202	2.2 Megohms ± 10% BTS
R109	740-0512	100K ohms ± 20% BTS
R110	742-0752	10K ohms ± 20% BTA
R111	742-0752	10K ohms ± 20% BTA
R112	749-0191	680 ohms ± 10% BTB
R113	742-0313	330 ohms ± 10% BTA
R114	740-1043	27 ohms ± 10% ½ W. Morganite
R115	740-1043	27 ohms ± 10% ½ W. Morganite
R116	740-0652	100 ohms ± 10% BTS
R117	740-0382	6.8K ohms ± 10% BTS
R118	740-0842	820K ohms ± 10% BTS
R118a	742-0962	5.6K ohms ± 10% BTA
R119	742-0582	120K ohms ± 10% BTA
R120	742-0582	120K ohms ± 10% BTA
R121	742-0432	18K ohms ± 10% BTA
R122	740-0612	10K ohms ± 20% BTS
R123	740-0182	470K ohms ± 10% BTS
R124	740-0142	100K ohms ± 10% BTS
R125	742-0492	68K ohms ± 10% BTA
R126	740-0122	47K ohms ± 10% BTS
R127	740-0392	330K ohms ± 10% BTS
R128	740-0822	33K ohms ± 20% BTS
R129	740-0152	150K ohms ± 10% BTS
R130	740-0142	100K ohms ± 10% BTS
R131	740-0382	10K ohms ± 10% BTS
R132	742-0392	47K ohms ± 20% BTA
R133	742-0172	470K ohms ± 10% BTA
R134	742-0432	18K ohms ± 10% BTA
R135	740-0572	1K ohm ± 20% BTS
R136	750-0231	4.7K ohms ± 10% 5 W. W.W.
R137	746-0182	1.0 ohm ± 20% BW½
R138	742-0132	220K ohms ± 10% BTA
R139	742-0122	150K ohms ± 10% BTA
R140	740-0492	1.5 Megohms ± 20% BTS
R141	740-0582	47K ohms ± 20% BTS
R142	742-0492	68K ohms ± 10% BTA
R143	742-0022	4.7K ohms ± 10% BTA

CAPACITORS

REF.	PART No.	DESCRIPTION
C24	273-0591	68 pF ± 2½% Silver Mica M.S.
C25	271-0031	.0033 Mfd. + 100% — 0% Ceramic Disc 500V Wkg.
C28	271-0031	.0033 Mfd. + 100% — 0% Ceramic Disc 500V Wkg.
C26	271-0031	.0033 Mfd. + 100% — 0% Ceramic Disc 500V Wkg.
C26a	271-0031	.0033 Mfd. + 100% — 0% Ceramic Disc 500V Wkg.
C27	271-0031	.0033 Mfd. + 100% — 0% Ceramic Disc 500V Wkg.
C29	271-0031	.0033 Mfd. + 100% — 0% Ceramic Disc 500V Wkg.
C30	271-0031	.0033 Mfd. + 100% — 0% Ceramic Disc 500V Wkg.
C31	273-0591	68 pF ± 2½% Silver Mica M.S.
C32	271-0031	.0033 Mfd. + 100% — 0% Ceramic Disc 500V Wkg.
C33	271-0031	.0033 Mfd. + 100% — 0% Ceramic Disc 500V Wkg.
C34	280-1311	.0033 Mfd. ± 20% 400V W. Plastic Tubular DFB418
C35	271-0031	.0033 Mfd. + 100% — 0% Ceramic Disc 500V Wkg.
C36	271-0151	6.8 pF ± ¼ pF Tubular Ceramic NPO
C37	271-0131	8.2 pF ± ¼ pF Tubular Ceramic NPO
C37a	271-0131	8.2 pF ± ¼ pF Tubular Ceramic NPO
C38	280-0541	.0022 Mfd. ± 20% 200V W. Plastic Tubular DFB216
C39	279-4581	.0047 Mfd. ± 10% 400V W. Paper Tubular
C40	269-0511	40 Mfd. 300V W. Electrolytic (With C42)
C41	269-0441	200 Mfd. 250V W. Electrolytic (With C43)
C42	269-0511	80 Mfd. 300V W. Electrolytic (With C40)

PARTS LIST — CHASSIS F5

CAPACITORS — *continued*

REF.	PART No.	DESCRIPTION
C43	269-0441	100 Mfd. 250V W. Electrolytic (With C41)
C44	279-1161	.22 Mfd. ± 20% 200V W. Paper Tubular
C45	279-1161	.22 Mfd. ± 20% 200V W. Paper Tubular
C46	271-0231	68 pF ± 10% Ceramic 3KV N750
C47	279-1161	.22 Mfd. ± 20% 200V W. Paper Tubular
C48	271-0221	2.2 pF ± ¼ pF Bead NPO
C49	280-1311	.0033 Mfd. ± 20% 400V W. Plastic Tubular DFB418
C50	279-4661	.022 Mfd. ± 10% 400V W. Paper Tubular
C51	280-1811	330 pF ± 10% 600V W. Styroseal
C52	279-1701	.047 Mfd. ± 20% 400V W. Paper Tubular
C54	526-2991	Lead—Capacitor 1.5 pF.
C55	280-0291	.0022 Mfd. ± 10% 200V W. Plastic Tubular DFB216
C56	271-0281	.022 Mfd. ± 20% 100V W. CDT. Ceramic Disc
C58	279-1621	.01 Mfd. ± 10% 400V W. Paper Tubular
C59	273-0561	10 pF ± 10% I.F. Type
C60	271-0151	6.8 pF ± ¼ pF Ceramic Tubular NPO
C61	271-0271	.0022 Mfd. ± 20% CRT Style B Ceramic Tubular
C62	273-0561	10 pF ± 10% I.F. Type
C63	271-0031	.0033 Mfd. ± 100% — 0% Ceramic Disc 500V Wkg.
C65	273-0331	100 pF ± 10% I.F. Type
C66	280-1501	100 pF ± 5% 600V W. Plastic Tubular DFB600
C67	280-1501	100 pF ± 5% 600V W. Plastic Tubular DFB600
C68	269-0371	10 Mfd. 40 P.V. Electrolytic
C69	279-4021	.015 Mfd. ± 10% 200V W. Paper Tubular
C70	280-0311	.0033 Mfd. ± 10% 200V W. Plastic Tubular DFB218
C71	280-1851	680 pF ± 10% 600V W. Plastic Tubular DFB610
C72	279-4001	.01 Mfd. ± 10% 200V W. Paper Tubular
C73	280-1751	100 pF ± 10% 600V W. Plastic Tubular DFB600
C74	280-1371	.01 Mfd. ± 20% 400V W. Plastic Tubular
C75	280-1371	.01 Mfd. ± 20% 400V W. Plastic Tubular
C76	269-0221	25 Mfd. 40 P.V. Electrolytic
C77	269-0221	25 Mfd. 40 P.V. Electrolytic
C78	269-0511	40 Mfd. 300V W. Electrolytic (With C86)
C79	279-1741	.1 Mfd. ± 20% 400V W. Paper Tubular
C80	279-4541	.0022 Mfd. ± 10% 400V W. Paper Tubular DFB216
C81	279-0281	1 Mfd. ± 25% 200V W. Metallised Paper
C82	279-4541	.0022 Mfd. ± 10% 400V W. Paper Tubular DFB216
C83	279-4541	.0022 Mfd. ± 10% 400V W. Paper Tubular DFB216
C84	279-4721	.068 Mfd. ± 10% 400V W. Paper Tubular
C85	279-1161	0.22 Mfd. ± 10% 200V W. Paper Tubular
C86	269-0511	80 Mfd. 300V W. Electrolytic (With C78)
C87	279-1661	.022 Mfd. ± 20% 400V W. Paper Tubular
C88	279-4701	.047 Mfd. ± 10% 400V W. Paper Tubular
C89	269-0361	100 Mfd. 40 P.V. Electrolytic
C90	280-1751	100 pF ± 10% 600V W. Plastic Tubular DFB600
C90a	279-0281	1 Mfd. ± 25% 200V W. Metallised Paper
C91	279-0551	2.0 Mfd. ± 25% 200V W. Metallised Paper
C91a	179-1121	.1 Mfd. ± 20% 200V W. Paper Tubular
C92a	279-1121	.1 Mfd. ± 20% 200V W. Paper Tubular
C92b	271-0311	27 pF ± 10% Tubular Ceramic NPO
C93	280-0331	.0047 Mfd. ± 10% 200V W. Plastic Tubular DFB220
C94	280-0331	.0047 Mfd. ± 10% 200V W. Plastic Tubular DFB220
C95	280-0841	.0056 Mfd. ± 5% 400V W. Plastic Tubular DFB421
C96	279-1121	.1 Mfd. ± 20% 200V W. Paper Tubular
C97	280-1851	680 pF ± 10% 600V W. Plastic Tubular DFB610
C99	273-0541	47 pF ± 10% Silver Mica M.S.
C100	280-1411	.022 Mfd. ± 20% 400V W. Plastic Tubular
C101	279-1581	.0047 Mfd. ± 20% 400V W. Paper Tubular
C102	280-1411	.022 Mfd. ± 20% 400V W. Plastic Tubular
C103	279-1121	.1 Mfd. ± 20% 200V W. Paper Tubular
C104	279-5081	.0047 Mfd. ± 10% 600V W. Paper Tubular
C105	279-1781	.22 Mfd. ± 20% 400V W. Paper Tubular
C106	279-2161	.022 Mfd. ± 20% 600V W. Paper Tubular
C107	279-5201	.047 Mfd. ± 10% 600V W. Paper Tubular
C108	279-4121	.1 Mfd. ± 10% 200V W. Paper Tubular
C109	279-5221	.068 Mfd. ± 20% 600V W. Paper Tubular
CR1	753-0001	Resistive Capacitive Coupled Unit 150 ohms/1K5 Mfd.

COILS

REF.	PART No.	DESCRIPTION
L15, L16	259-0811	1st I.F. Grid and Trap
L16a	259-0671	Coupling Trimmer
L17, L18	259-0691	3rd I.F. Anode and Trap
L19	259-0671	Coupling Trimmer
L20	259-0611	4th I.F. Anode
L21	259-0671	Coupling Trimmer
L22	259-0741	Video Peaking (Grid)
L23	259-0771	Video Peaking (Shunt)
L24	259-0022	Video Peaking (Series)
L25	259-0031	Sound I.F. Coupling
L26, L27	232-0151	Filament Choke
L28	259-0623	Width Coil
L29, L30	259-0042	Coil Anti-Parasitic
L31	259-0862	Horizontal Linearity
L32	259-0042	Coil Anti-Parasitic

MISCELLANEOUS

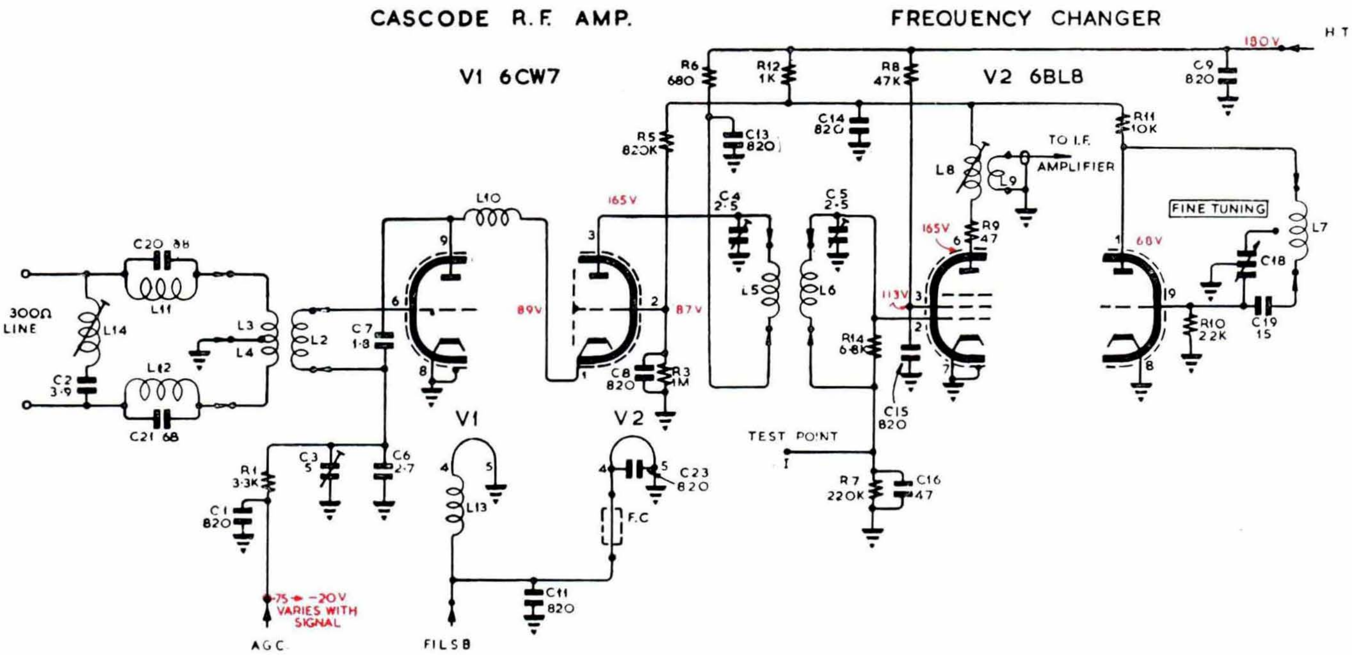
REF.	PART No.	DESCRIPTION
RV1	677-0351	500,000 ohms Curve A (Brightness)
RV2	677-0421	500,000 ohms Curve A E.C. (A.G.C.)
RV3	677-0171	25,000 ohms Curve A E.C. (50V Adjust)
RV4	677-0511	10,000 ohms Curve A E.C. (Contrast Range)
RV5	677-0332	10,000 ohms Curve A (With VR8) (Contrast)
RV6	677-0171	25,000 ohms Curve A E.C. (Noise Inverter Adjustment)

PARTS LIST — CHASSIS F5

MISCELLANEOUS — *continued*

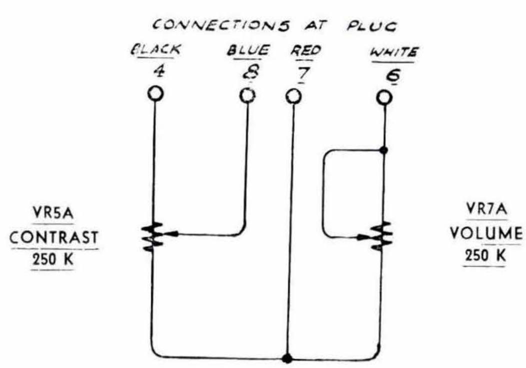
REF.	PART No.	DESCRIPTION
RV7	677-0373	500K ohms (Tone)
RV8	677-0332	1 Megohm Tap. 500,000 ohms Curve A (With VR5) (Volume)
RV9	677-0363	50,000 ohms Curve A (Height)
RV10	677-0352	500,000 ohms Curve A (Vert. Hold)
RV12	677-0341	250,000 ohms Curve A E.C. (Hor. Drive)
RV11	677-0511	10,000 ohms Curve A E.C. (Frame Linearity)
RV13	677-0471	25,000 ohms Curve A E.C. (Hor. Hold)
RV14	677-0681	2.5 Megohms (Focus)
VC1	281-0131	Capacitor Trimmer
VC2	281-0131	Capacitor Trimmer
IFT1	906-0152	Transformer I.F.
IFT2	906-0152	Transformer I.F.
IFT3	906-0162	Transformer I.F.
IFT4	906-0171	Transformer I.F.
IFT5	906-0182	Transformer I.F. and Trap
IFT6	906-0101	Transformer I.F. (Ratio Det.)
T1	904-0261	Transformer Power
T2	905-0201	Transformer Audio
T3	908-0052	Transformer Blocking Oscillator
T4	905-0222	Transformer Vertical Output
T5	908-0351	Transformer Vertical Feedback
T6	908-0111	Transformer Sync. Coupling
T7	908-0191	Transformer Hor. Oscillator
T8	908-0311	Transformer Hor. Output

REF.	PART No.	DESCRIPTION
T9	908-0331	Transformer Focus
CH1	232-0122	Choke 1.5H 300 mA
CH2	232-0211	Choke 5.0H 100 mA
MR1	932-0971	Diode OA90
MR2	932-0791	Diode OA81
MR3	932-0991	Diode M3
V3	932-0881	6BY7 Valve
V4	932-0521	6BX6 Valve
V5	932-0521	6BX6 Valve
V6	632-0521	6BX6 Valve
V7	932-0661	6CK6 Valve
V8	932-0981	5AS4 Valve
V9	932-0981	5AS4 Valve
V10	932-0501	6BL8 Valve
V11	932-1091	6CS6 Valve
V12	932-0521	6BX6 Valve
V13	932-0521	6BX6 Valve
V14	932-0491	6AL5 Valve
V15	932-0511	6BM8 Valve
V16	932-0511	6BM8 Valve
V17	932-0511	6BM8 Valve
V18	932-0521	6BX6 Valve
V19	932-0491	6AL5 Valve
V20	932-0501	6BL8 Valve
V21	932-0531	6CM5 Valve
V22	932-0771	1S2 Valve
V23	932-0561	6R3 Valve
CRT	932-0671	21ALP4-A 21in. Picture Tube
	or 932-0871	AW53-80 21in. Picture Tube
	224-0971	Tuner Assembly NT3001



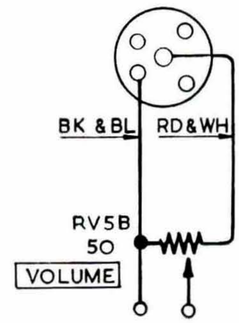
CIRCUIT DIAGRAM. TUNER TYPE AT 7580. USED IN EARLY F5 PRODUCTION

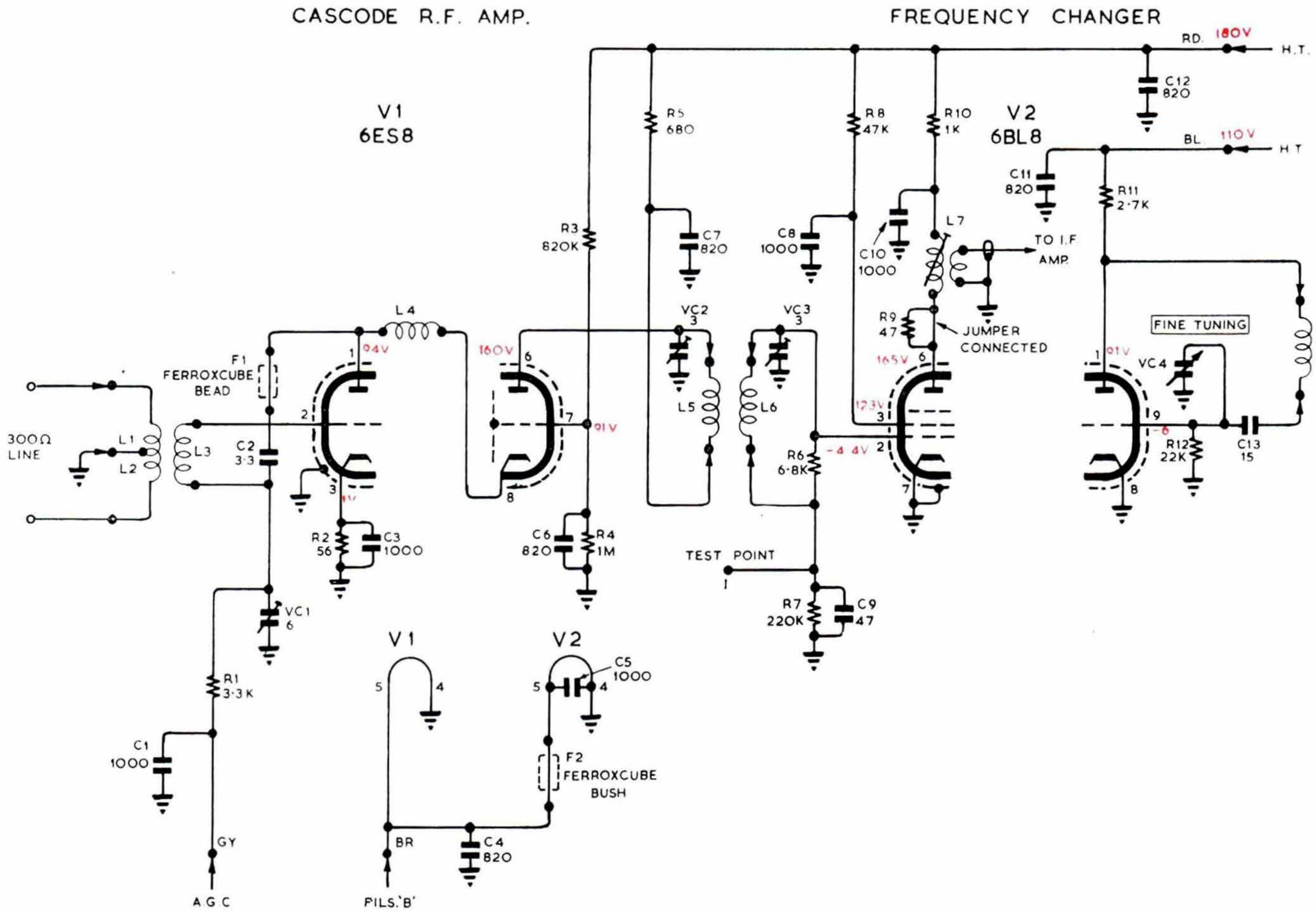
REMOTE CONTROL



CIRCUIT DIAGRAM.

HEARING AID CONTROL





CIRCUIT DIAGRAM. TUNER PHILIPS NT 3001 USED IN JUNE, 1959, AND LATER PRODUCTION.

MODIFICATIONS

When the Philips NT 3001 Tuner is used, the following circuit modifications apply:

L16A — deleted.

C103 — deleted.

R134 — deleted.

R133 — connected to earth.

MR3 — positive plate connected to earth.

The 110 v. HT line of the tuner is fed from HT2 via a 12K ohms 2 Watt resistor.

Note—R137, 4.7K connected to Pin 5 of SK1 should read R143, 4.7K.

VOLTAGE TABLE — CHASSIS F5

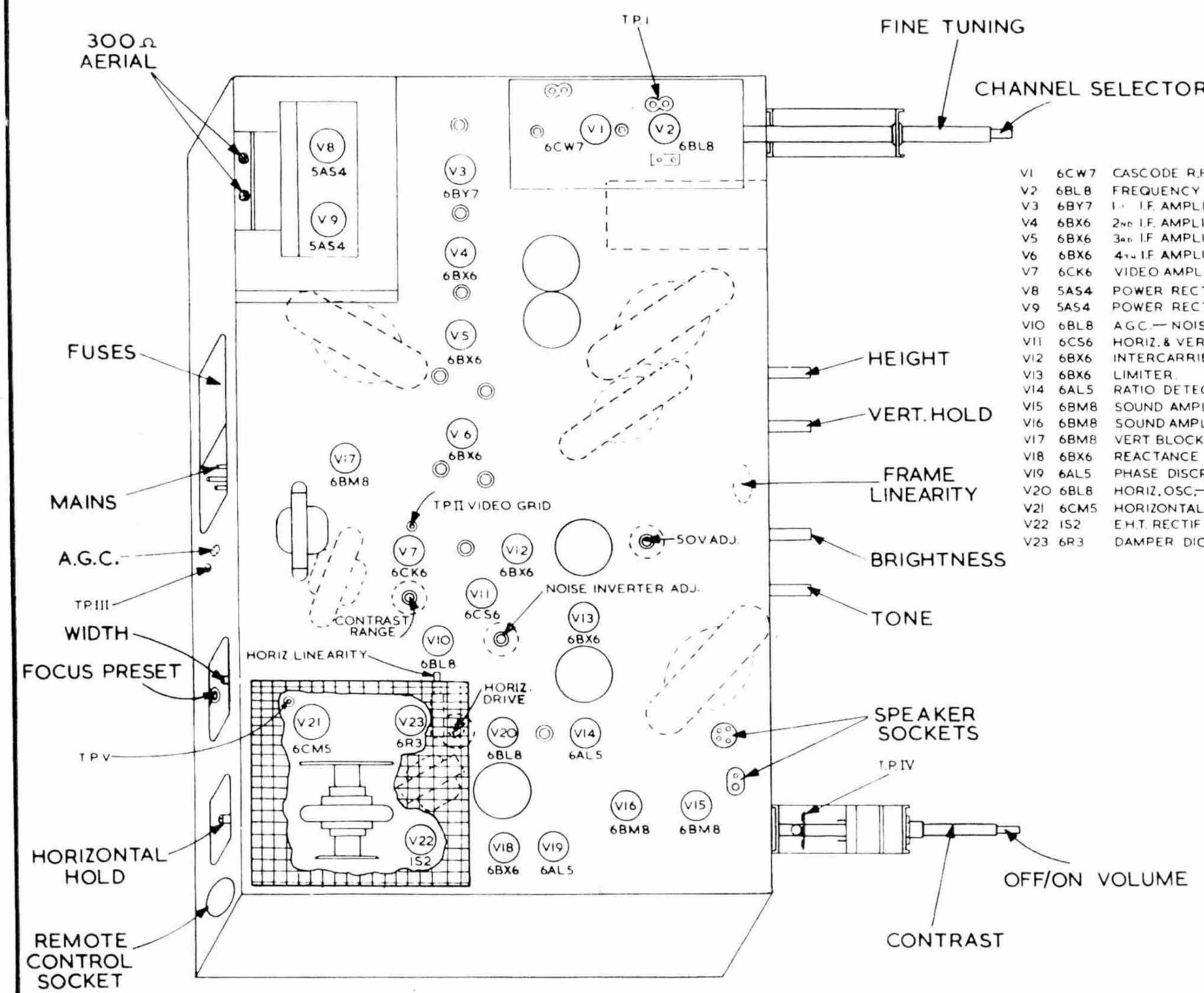
All D.C. Measurements are taken with a Vacuum-Tube Voltmeter. A.C. Measurement taken with AVO Model 7.

VALVE No.	FUNCTION	TYPE	PENTODE SECTION				TRIODE SECTION			REMARKS
			ANODE	G2	CATHODE	G1	ANODE	CATHODE	G1	
1	R.F. Amplifier	6CW7	165	—	89	87	89	-0.75	0	Both Sections are Triodes.
2	Frequency Changer	6BL8	165	113	0	-2.5†	68	0	-4†	†This is Min. Negative Voltage.
3	1st I.F. Amplifier	6BY7	102	102	1.5	0	—	—	—	
4	2nd I.F. Amplifier	6BX6	203	203	103	102	—	—	—	
5	3rd I.F. Amplifier	6BX6	180	180	1.9	0	—	—	—	
6	4th I.F. Amplifier	6BX6	180	180	1.9	0	—	—	—	
7	Video Amplifier	6CK6	140	230	1.8	-3.1	—	—	—	
8	Power Rectifier	5AS4	255v. AC	—	245	—	—	—	—	Diode.
9	Power Rectifier	5AS4	255v. AC	—	245	—	—	—	—	Diode.
10	AGC and Noise Inverter	6BL8	—	115	50	39	140	50	31.5	Pentode Anode Fed with Line Pulse
11	Sync. Separator	6CS6	120	50	0	-20	—	—	—	
12	Intercarrier Amplifier	6BX6	201	201	0.8	-1.1	—	—	—	
13	Limiter	6BX6	75	75	0	-1.1	—	—	—	
14	Ratio Detector	6AL5	0	—	4.5	—	-4.5	0	—	Both Sections are Diodes.
15	Sound Output and Amplifier	6BM8	210	215	17	0	120	1.7	0	
16	Sound Output and Amplifier	6BM8	210	215	17	0	120	1.7	0	
17	Vertical Output and Oscillator	6BM8	185	197	16	0	125	16	-13	
18	Reactance Valve	6BX6	185	110	0.4	-1.0	—	—	—	
19	Phase Discriminator	6AL5	-1.0	—	—	—	1.0	—	—	Both Sections are Diodes.
20	Horizontal Oscillator and Drive	6BL8	120	120	0	-21	150	0	-18	
21	Horizontal Output	6CM5	*	130	0.1	-50	—	—	—	*High Voltage. Do Not Measure.
22	E.H.T. Rectifier	1S2	*	—	16KV	—	—	—	—	*High Voltage. Do Not Measure.
23	Damping Diode	6R3	230	—	*	—	—	—	—	*High Voltage. Do Not Measure.
CRT	Picture Tube	AW53-80 or 21ALP4-A	ANODE	G2	CATHODE	G1	G4			
			16KV	360	140	0-120	230 — 530			

HT1: 230V.
HT2: 205V.
HT3: 110V.
Boost HT: 560V.
Filaments 6.3V A.C. and 5V A.C. for Rectifiers
Current through Fuse (2 Amp) 1 Amp.
Current through Fuse (500 mA) 265 mA.
Current through Fuse (250 mA) 110 mA.

Conditions of Measurement:

Brightness — Normal.
Width and Height — Normal.
Contrast — Maximum.
Line Hold set to give 0.4V across R117a.
Tuner Aerial Terminals short circuit Switched to Channel 5.



V1	6CW7	CASCODE R.F. AMPLIFIER.
V2	6BL8	FREQUENCY CHANGER
V3	6BY7	1ST I.F. AMPLIFIER.
V4	6BX6	2ND I.F. AMPLIFIER.
V5	6BX6	3RD I.F. AMPLIFIER
V6	6BX6	4TH I.F. AMPLIFIER
V7	6CK6	VIDEO AMPLIFIER.
V8	5AS4	POWER RECTIFIER
V9	5AS4	POWER RECTIFIER.
V10	6BL8	A.G.C. — NOISE INVERTER.
V11	6CS6	HORIZ. & VERT. SYNC. SEPARATOR.
V12	6BX6	INTERCARRIER AMPLIFIER.
V13	6BX6	LIMITER.
V14	6AL5	RATIO DETECTOR
V15	6BM8	SOUND AMPLIFIER–SOUND OUTPUT.
V16	6BM8	SOUND AMPLIFIER–SOUND OUTPUT.
V17	6BM8	VERT. BLOCK OSC.–VERT. OUTPUT.
V18	6BX6	REACTANCE VALVE.
V19	6AL5	PHASE DISCRIMINATOR.
V20	6BL8	HORIZ. OSC.–HORIZ. DRIVE.
V21	6CM5	HORIZONTAL OUTPUT.
V22	1S2	E.H.T. RECTIFIER.
V23	6R3	DAMPER DIODE.

682–7591

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"H·M·V" CHASSIS TYPE F5