Private and Confidential

For Trade Use Only

"HIS MASTER'S VOICE"

SERVICE MANUAL

for

TELEVISION RECEIVER

CHASSIS TYPE F2

■

THE GRAMOPHONE COMPANY LIMITED

(Incorporated in England)

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

Part No. 682-6161

TV RECEIVER — CHASSIS TYPE F2

SPECIFICATION

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

CONSUMPTION:
195 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.
250 mA. — H.T.
500 mA. — H.T.

VALVE COMPLEMENT

V1	6CW7	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	6CK6	Video Amplifier
V7	5AS4	Power Rectifier
V8	5AS4	Power Rectifier
V9	6BL8	Gated A.G.C. and Noise Inverter
V10	6BL8	Vertical Sync. Separator and Horizontal Sync. Separator
V11	6BX6	Intercarrier Amp.
V12	6BX6	Limiter
V13	6AL5	Ratio Detector
V14	6BM8	Audio Amplifier and Audio Output
V15	6BM8	Blocking Oscillator & Vertical Output
V16	6BX6	Reactance Valve
V17	6AL5	Phase Discriminator
V18	6BL8	Horizontal Osc. and Horizontal Drive
V19	6CM5	Horizontal Output
V20	1S2	E.H.T. Rectifier
V21	6R3	Damping Diode
MR1	0A70	Vision Detector
MR2	0A81	Clamping Diode
MR3	M3	Clamping Diode
C.R.T.	21ALP4-A	Picture Tube
or	AW53-80	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

21 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.

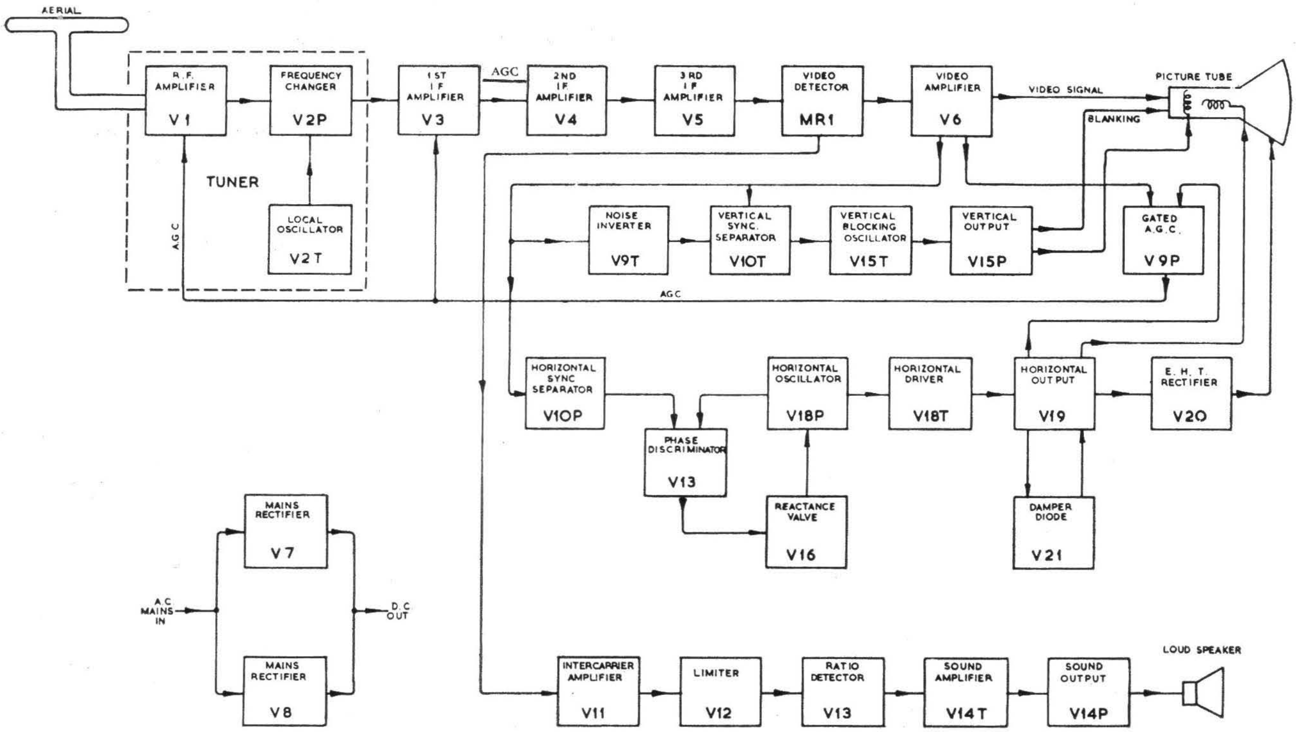


FIG 1

CIRCUIT FEATURES

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

(2) A three-stage I.F. Amplifier gives good 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 3 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) 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 protects the synchronising circuits from impulse interference. The receiver "holds" well in conditions of severe interference.

(8) Separate vertical and horizontal sync. separators ensure maximum efficiency of separation and positive synchronisation of horizontal and vertical oscillators.

(9) 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.

(10) The sound amplifier with ample feedback gives excellent quality and ample power to handle the "hi-fi" F.M. sound that can be transmitted. A compensated volume control maintains tonal balance at all volume settings.

(11) 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.

(12) 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.

(13) The Horizontal Deflection circuit uses a linearity coil 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.

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

(15) Minimum number of controls necessary for operation.

(16) 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. UNIT

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 neutralized 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.

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 three 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 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 L15 and L19 are coupled to I.F. coils L16 and L20. 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 IFT4 which, in conjunction with R28 and C37, forms a 5.5 Mc/s null trap, and is amplified by V6. L24, L25, and L26 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 IFT4 to the intercarrier amplifier V11. A single tuned circuit couples V11 to the limiter V12.

Output from the limiter is demodulated by the ratio detector V13 to provide the audio signal which passes through the tone control network and the volume control and is amplified by the triode and output pentode sections of V14. Feedback is applied via both triode and pentode cathodes.

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 2 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

Separate vertical and horizontal sync. separators are employed (V10 triode and pentode sections). Video signal with sync. tips positive is taken from the video amplifier anode and applied to the grids of both sections of V10. Differentiation in C53 and R65 occurs in the pentode grid. Grid leak bias on these valves ensures that they conduct only on sync. tips and hence the sync. output at their anodes is free of picture information. Since differentiation has occurred at the grid of the pentode section, its output is essentially horizontal sync. pulses only. The triode section output is followed by a three-stage integrator and only vertical sync. pulses pass out of this circuit.

NOISE INVERTER

Anode current in the triode section of V9 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 of this valve (R61) is also in the path through which video signal is fed to the vertical sync. separator then the interfering pulses cancel out across this resistor and the vertical sync. separator thereby has good immunity to the effects of impulse noise.

GATED A.G.C.

The same video waveform that feeds the noise inverter is fed to the grid of the A.G.C. amplifier (Pentode section V9). The polarity of this waveform is with sync. tips positive, and the valve is biased so that it can conduct during sync. pulses. However, it can only do this if there is a positive pulse applied to its anode via C47 from the line output transformer during line flyback. This overcomes the possibility of the valve conducting on impulse interference occurring during the period between line sync. pulses, and makes the A.G.C. operation immune to impulse interference.

The current through the valve depends upon the height of the sync. pulses and the setting of the contrast control. The current pulses flow from the chassis via R50, VR2 and R49 to the anode of the valve. C46 smoothes the voltage developed across R50 and VR2, which is the A.G.C. bias for the I.F. valve V3. VR2 controls the ratio of I.F. and R.F. A.G.C. The cathode of the A.G.C. valve is returned to + 50V. This voltage is set by a divider network consisting of R51, R52, R53, R57, VR3 and VR5.

The grid voltage is obtained from the CONTRAST control tap on the cathode chain and is applied to the A.G.C. valve grid via R54 and R56. Because the A.G.C. valve has a small grid base (about —2V.) compared with the voltage from its cathode to earth (+50V.), the voltage from its grid to earth during conduction remains substantially constant (+ 48 to 49 volts) as long as any A.G.C. voltage is produced. Thus an increase of voltage at its grid due to the CONTRAST control produces an equal *decrease* of grid voltage due to sync. tips from the video output. In this way the CONTRAST control voltage sets the video output voltage, by automatic control of the A.G.C. voltage and hence I.F. gain. At the same time, the CONTRAST control varies the bias of the noise inverter grid so that sync tips. are always held just below cut-off independent of the height of the video signal. VR4 is a pre-set adjustment of the range of the contrast control.

With a normal picture displayed on the screen, VR3 is adjusted to set the A.G.C. cathode bias at +50V.

A.G.C. voltage is also applied to the R.F. amplifier from the junction of R47 and R48. This latter resistor, together with C45, forms a smoothing filter for the pulses appearing at V9 anode. The junction of these two resistors is clamped to earth potential by the clamping diode MR3, and not until the anode of V9 falls to a value fixed by the H.T. voltage divided by the ratio of R46 and R47 to R48 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, using VR2.

VERTICAL DEFLECTION CIRCUITS

Vertical sync. pulses from the sync. separator via the integrator are used to synchronise the blocking oscillator comprised of transformer TR3 and triode portion of V15. "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 VR9 is returned to the slider of the Height Control potentiometer VR8 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 V15 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 TR4.

A feedback voltage is developed across R108 *A* and *B* from the current in the deflection coils. This voltage is stepped up to the input grid of the frame output valve. A tapped resistor, R107 *A, B* and *C*, is provided in series with the feedback transformer primary 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 TR6 (damped by diode MR2) into the discriminator V17, where they are compared in phase with a sine waveform taken from the horizontal oscillator transformer TR7. 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 R111 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 R112 is equal to the peak negative voltage applied to the bottom diode and is negative with respect to the centre tap of the winding.

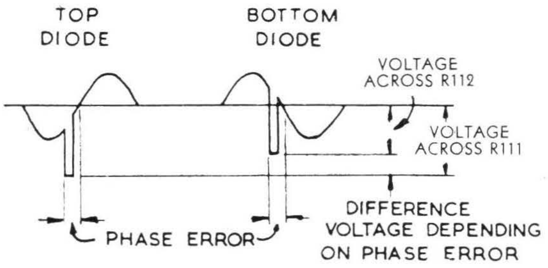
Since the two peak rectified voltages are in the same sense, negative with respect to the transformer centre tap, the discriminator output voltage, taken across the two load resistors R111 and R112 will be their difference.

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.

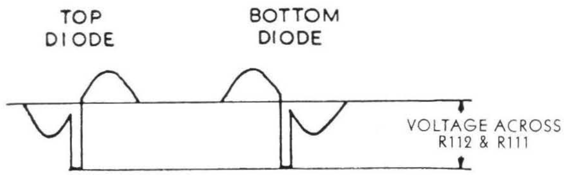
In Fig. 2 (*a*) there is a phase error between the incoming sync. pulse and the receiver horizontal oscillator, the sync. pulse arriving before the sinewave across the zero axis. Then the voltage across R111 is greater than the voltage across R112 and the discriminator output (the difference between 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 in Fig. 2 (*b*), the voltages across R111 and R112 are equal and the resulting output is zero.

The discriminator output is connected in series with a fixed negative bias voltage of approximately —3.4 volts 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 (V16) grid is approximately —3.4 volts 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 V16 is essentially a capacitance shunted across the oscillator tank circuit and 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 DEFLECTION CIRCUITS

Negative voltage pulses from the anode of the horizontal oscillator (V18 pentode) are applied via a differentiating circuit of which VR10, the Horizontal Drive control, is a variable element to the Horizontal Driver valve (V18 triode). VR10 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 (V18 triode) produces a negative pulse output which is timed to cut off the horizontal output valve V19 at end of a scan. When V19 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 V21 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 V19 starts the cycle over again.

During flyback a high voltage pulse is produced at the anode of the E.H.T. rectifier V20, 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 640 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.

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 VR7A 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 VR5A feeds a variable D.C. voltage into the contrast control chain R55, R56 and R54. 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 mains adjustment panel.

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.

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.

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 main interlock socket so that it comes free 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 knobs from the 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 remove the picture tube socket, and slide the ion trap from the picture tube neck.

Loosen the screw on the clamp fixing the yoke to the picture tube neck, remove the yoke plug from the E.H.T. cage, and the earthing spring from the yoke, and slide the yoke from the picture tube neck.

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

Carefully slide the yoke over the neck of the picture tube. Rotate the yoke so that the fixing screw on the band round 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. Replace 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 voltage on G4, the focus electrode of the picture tube, is set in the factory for best overall focus by connecting the focus lead to either pin 8 (0 volts), pin 2 (225 volts) on SK5, or tag 1 (640 volts) on TR8. This should be checked and, if necessary, reset when the picture tube is replaced.

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 test point *V* and earth it will indicate half the current flowing in the cathode of V19.

The Horizontal Linearity control should be adjusted to reduce the current in V19 to a minimum.

HORIZONTAL DRIVE

First check the setting of the horizontal linearity control. Then with the meter still connected, adjust the drive control to set the current in V19 to 110 mA. The reading on the typical multimeter should then be 55 mA.

After setting the horizontal drive control, the horizontal hold control setting should be checked.

HORIZONTAL HOLD

Disconnect sync. pulses by removing V10, the sync. separator valve, and adjust the "Horizontal Hold" control until the picture just "floats" or locks weakly, then replace V10.

Should the reactance valve V16, or the oscillator valve V18 be replaced, the horizontal hold control should be reset. The voltage on the test point *IV* should be found to be within the range —3 to —3.6 volts. If this is not so, it should be set at —3.4 volts, using the horizontal hold control, V10 removed, and the core of the oscillator transformer TR7 adjusted for the weak or floating lock. V10 should then be replaced.

50V. ADJUST

Connect a multimeter switched to 300V. range between test point *VI* and earth. With a normal picture displayed, adjust VR3 to give a reading of +50 volts.

CONTRAST RANGE

Check the setting of "50V. Adjust" control. Turn the contrast control to its maximum anti-clockwise position and adjust VR4 to give a light under-contrasted picture.

VISION I.F. ALIGNMENT

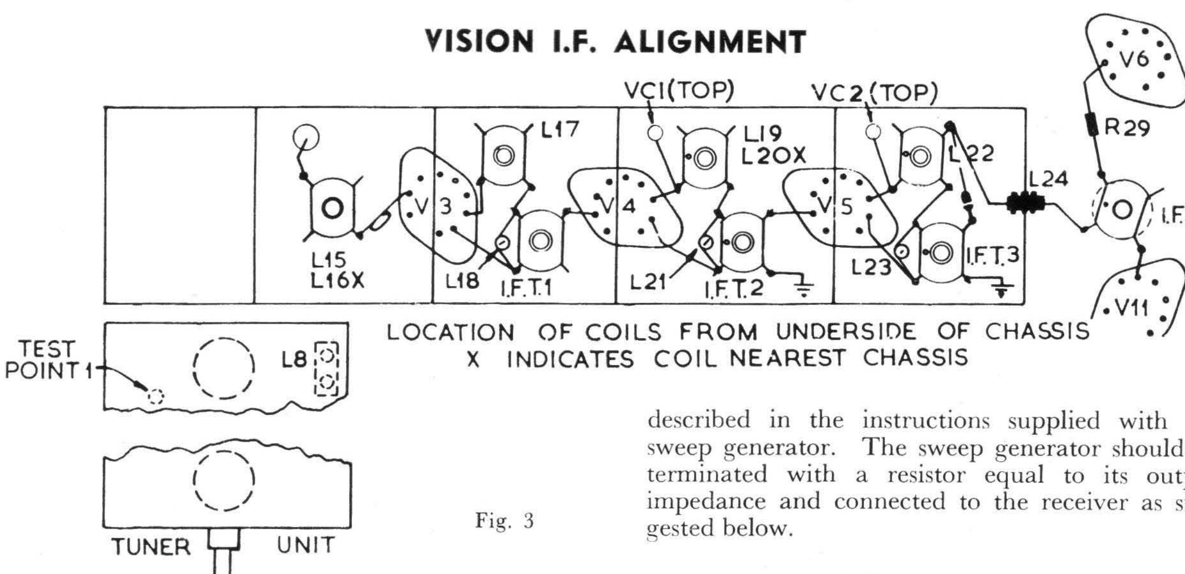


Fig. 3

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.

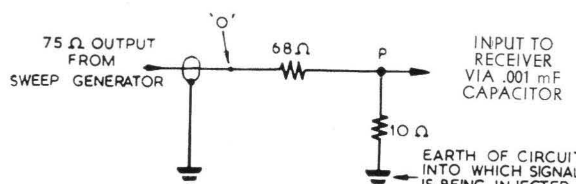


Fig. 4

I.F. RESPONSES

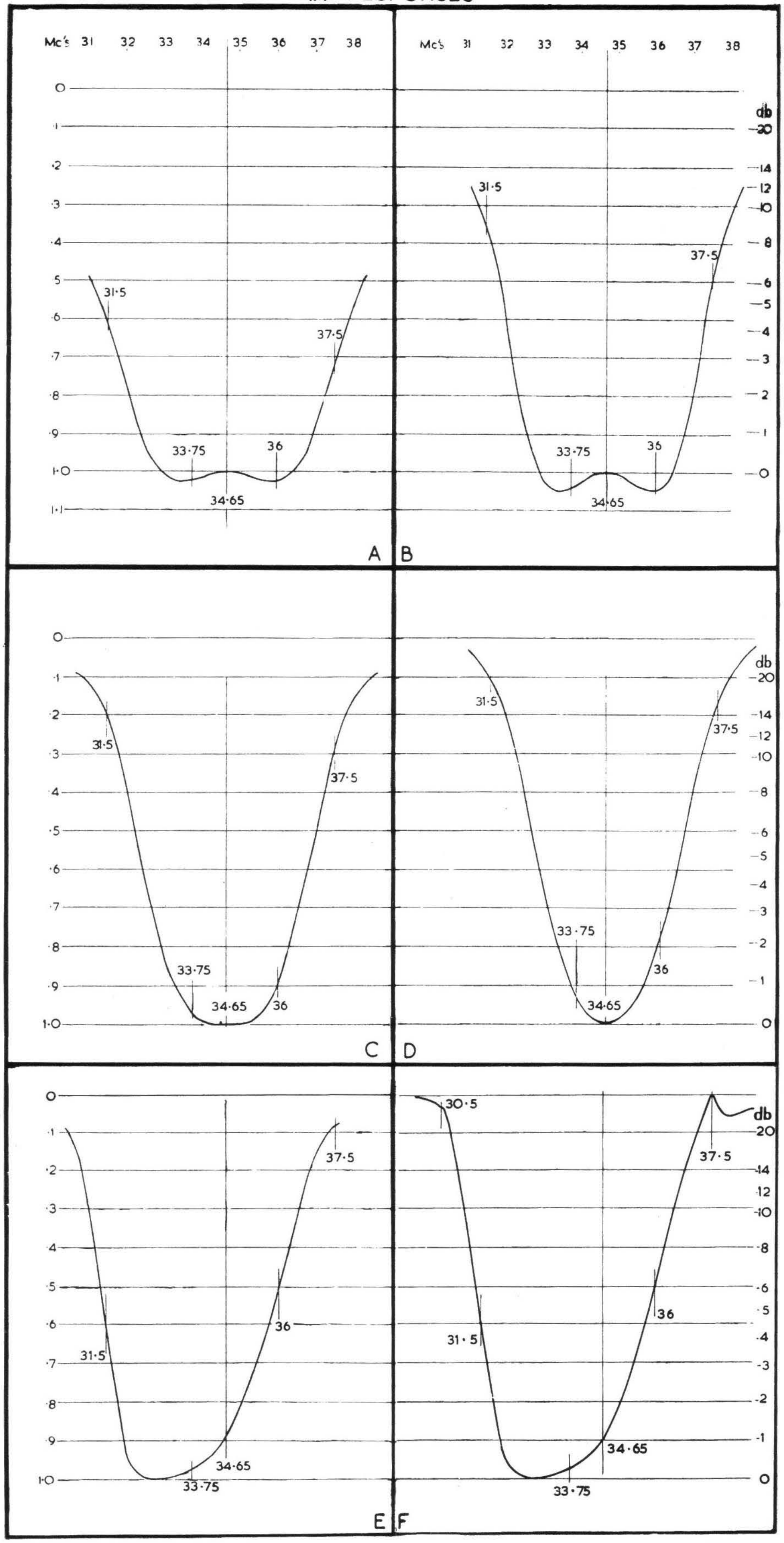


Fig. 5 — Oscilloscope Patterns Obtained with Sweep Oscillator Input.

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

Before commencing alignment, remove the slugs from L15 and L19 and wind the slugs in L17 and L20 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., $\frac{7}{16}''$ of the thread should be visible above the chassis). Connect a —6V. bias across C46. Connect the input to the display unit between the junction of L24 and the sound trap, 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 L22 to peak the response at 34.65 Mc/s, with the slug in the position nearest the chassis. Adjust the slug in IFT3 to give a symmetrical response with the slug in the position furthest from the chassis. Vary both L22 and IFT3 to obtain the response as shown in Fig 5A.

(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 L20 in the position nearest the chassis. Adjust the slug of IFT2 to give a symmetrical response with the slug in the position furthest from the chassis. Using both L20 and IFT2, obtain the response as shown in Fig. 5B.

(3) Remove the sweep generator from V4 and connect it to the grid of V3 (Pin 2). With L17 peak the response at 34.65 Mc/s making sure that the slug is in the position closest to the chassis. Adjust IFT1 for a symmetrical response with the slug in the position furthest from the chassis. Use both IFT1 and L17 to obtain the response as shown in Fig. 5C.

(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 L8 to give the maximum response at 34.65 Mc/s. Adjust the slug in L16 to the position nearest the chassis which peaks the response at 34.65 Mc/s, and then using L8 and L16, obtain the response as shown in Fig. 5D.

(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 obtain 5E as closely as possible. It may also be necessary to make an alteration to the setting of IFT2.

(6) Insert a slug in L19 and adjust for a minimum response at 37.5 Mc/s. Insert a slug into L15 and adjust to set the 30.5 Mc/s marker in the middle of the step created by this coil.

(7) Make any final adjustment that may be necessary to obtain the final response as shown in Fig. 5F.

Note: L16A, L18, L21, and L23 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 8 AVO or similar type).

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

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

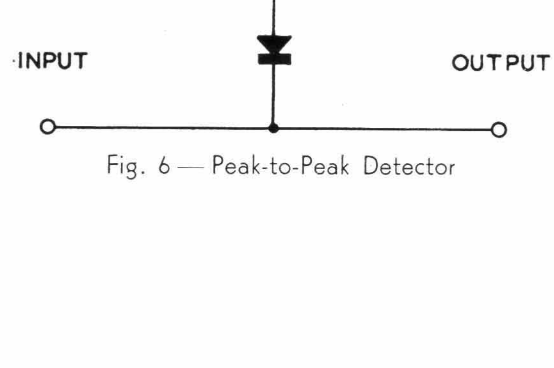


Fig. 6 — Peak-to-Peak Detector

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 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 L24 and earth (disconnecting L24 from C36 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 IFT4 to give zero reading on meter. *Note*: Do not move secondary core.

If IFT4 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 core.

SOUND I.F.

(1) Connect the output of the C.W. Oscillator between grid (Pin 2) of V11 and earth, and tune the core of L27 amplifier anode coil to obtain maximum negative reading across the 10-K 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 R81, and earth. Set the cores of IFT5, ratio transformer, until they are $\frac{3}{8}''$ from ends of former. Rotate top (primary) core of IFT5 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 IFT5 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.

MODIFICATIONS

Some receivers incorporated two paralleled 22 ohm resistors in the lead to the power transformer primary. They are situated on a tag panel mounted near the underside of the tuner. A label marked *DANGER* is fixed to the underside of the tuner to draw the attention of service engineers to the presence of the supply mains on the panel.

In the event of a replacement power transformer (Part No. 904-0212) being fitted, these resistors are not required. The transformer should therefore be connected as shown in the circuit diagram, and the resistors omitted.

During production the horizontal output transformer, TR8 was modified. The modified transformer can be identified by the metal panel on one side of the core. The original transformer employed two bakelite panels to clamp the core, whereas the later transformer has one bakelite and one metal panel. The numbers on the panel were changed as follows:

Lead from:	Connected to Tag Number: Original Transformer	Connected to Tag Number: Modified Transformer
C103	1	1
SK5 Pin 6	2	2
SK5 Pin 5	7	3
SK5 Pin 4	3	4
L31	4	5
V19 Top Cap	5	6

VOLTAGE TABLE

All D.C. measurements are made with a vacuum-tube Voltmeter. All A.C. measurements are made with an AVO Model 7 or similar Multimeter.
Nominal Mains Voltage.

VALVE No.	FUNCTION	TYPE	PENTODE SECTION				TRIODE SECTION			COMMENTS
			Anode	G2	K	G1	Anode	K	G1	
1	R.F. Amplifier	6CW7	165	—	89	87	89	0	0	Both sections are triodes.
2	Frequency Changer	6BL8	165	113	0	-2.5*	68	0	-4*	*This is minimum negative voltage
3	1st I.F. Amplifier	6BY7	103	103	0.8	0	—	—	—	
4	2nd I.F. Amplifier	6BX6	203	203	104	103	—	—	—	
5	3rd I.F. Amplifier	6BX6	175	175	2.2	0	—	—	—	
6	Video Amplifier	6CK6	110	235	2.6	-0.5	—	—	—	
7	Power Rectifier	5AS4	253V A.C.	—	252*	—	—	—	—	*Directly heated diode 5VAC between pin 2 and 8.
8	Power Rectifier	5AS4	253V A.C.	—	252*	—	—	—	—	*Directly heated diode 5VAC between pin 2 and 8.
9	A.G.C. and Noise Inverter	6BL8	0	115	50	34	110	50	27	
10	Vert. and Hor. Sync. Separator	6BL8	125	50	0	-4	30	0	-4	
11	Intercarrier Amplifier	6BX6	190	190	2.3	0	—	—	—	
12	Limiter	6BX6	50	50	0	-1	—	—	—	
13	Ratio Detector	6AL5	-2.3 (Pin 7)	—	—	—	—	+2.3 (Pin 5)	—	
14	Sound Output and Amplifier	6BM8	190	202	13	0	—	—	—	
15	Vertical Output and Oscillator	6BM8	190	205	15	0	120	15	-15	
16	Reactance Valve	6BX6	205	175	0	-3.0	—	—	—	
17	Phase Discriminator	6AL5	-3.4 (Pin 7)	—	—	—	-3.3 (Pin 2)	—	—	
18	Horizontal Oscillator and Drive	6BL8	120	110	0	-20	150	0	-20	
19	Horizontal Output	6CM5	★	140	0.1	-50	—	—	—	★High Voltage. Do not measure.
20	E.H.T. Rectifier	1S2	★	—	16KV	—	—	—	—	★High Voltage. Do not measure.
21	Damper Diode	6R3	235	—	★	—	—	—	—	★High Voltage. Do not measure.
			Anode	G2	K	G1	G4			
C.R.T.	Picture Tube	AW53-80 or 21ALP4-A	16KV	420	110	*0-110	†0,235 or 645V.			*Varies with brightness control. †Depends on focus setting.

HT1: 235.
HT2: 205.
HT3: 175.
Boost HT: 645.
Reactance Bias: -3.4.
Filaments: 6.3V. A.C.
Current through Fuses:

- **FS1 (2 A): 940 mA A.C.**
- **FS2 (500 mA): 230 mA D.C.**
- **FS3 (250 mA): 125 mA D.C.**

Condition of Measurement.
Brightness Optional.
Width and Height Normal.
Contrast Maximum.
Tuner, no signal aerial short circuited and switched to channel 5.
No remote control unit.
All pre-set adjustments accurately set.

F2 PARTS LIST

RESISTORS

REF.	PART No.	DESCRIPTION
R15	740-0032	2,200 ohms ± 10% BTS
R16	740-0612	10,000 ohms ± 20% BTS
R17	740-0483	56 ohms ± 10% ½ Watt Morganite
R18	742-0142	270,000 ohms ± 10% BTA
R19	742-0142	270,000 ohms ± 10% BTA
R20	740-0252	1,500 ohms ± 10% BTS
R21	740-0112	27,000 ohms ± 10% BTS
R22	740-0483	56 ohms ± 10% ½ Watt Morganite
R23	740-0273	150 ohms ± 10% ½ Watt Morganite
R24	740-0052	3,300 ohms ± 10% BTS
R26	740-0572	1,000 ohms ± 20% BTS
R27	740-0572	1,000 ohms ± 20% BTS
R28	740-0043	2,700 ohms ± 10% ½ Watt Morganite
R29	740-0322	1,200 ohms ± 10% BTS
R30	740-0382	6,800 ohms ± 10% BTS
R31	749-0191	680 ohms ± 10% BTB
R32	749-0191	680 ohms ± 10% BTB
R33	749-0191	680 ohms ± 10% BTB
R34	749-0191	680 ohms ± 10% BTB
R35	740-0483	56 ohms ± 10% ½ Watt Morganite
R36	740-0162	220,000 ohms ± 10% BTS
R37	740-0622	470,000 ohms ± 20% BTS
R38	740-0262	560 ohms ± 10% BTS
R39	740-0262	560 ohms ± 10% BTS
R40	740-0732	12,000 ohms ± 10% BTS
R42	746-0202	3.9 ohms ± 20% BW½
R43	742-0752	10,000 ohms ± 20% BTA
R44	742-0712	2,200 ohms ± 20% BTA
R45	742-0712	2,200 ohms ± 20% BTA
R46	742-0772	3.9 Megohms ± 10% BTA
R47	742-0222	4.7 Megohms ± 10% BTA
R48	742-0192	1 Megohm ± 10% BTA
R49	742-0172	470,000 ohms ± 10% BTA
R50	740-0122	47,000 ohms ± 10% BTS
R51	742-0432	18,000 ohms ± 10% BTA
R52	742-0762	12,000 ohms ± 10% BTA
R53	740-0862	18,000 ohms ± 10% BTS
R54	740-0242	33,000 ohms ± 10% BTS
R55	740-0782	120,000 ohms ± 10% BTS
R56	740-0082	10,000 ohms ± 10% BTS
R57	740-0082	10,000 ohms ± 10% BTS
R58	742-0102	82,000 ohms ± 10% BTA
R59	742-0522	820,000 ohms ± 10% BTA
R60	740-0162	220,000 ohms ± 10% BTS
R61	740-0822	33,000 ohms ± 20% BTS
R62	740-0202	2.2 Megohms ± 10% BTS
R63	740-0732	12,000 ohms ± 10% BTS
R64	740-0242	33,000 ohms ± 10% BTS
R65	740-0202	2.2 Megohms ± 10% BTS
R66	742-0162	390,000 ohms ± 10% BTA
R67	742-0092	47,000 ohms ± 10% BTA
R68	740-0092	15,000 ohms ± 10% BTS
R70	740-0773	39 ohms ± 10% ½ Watt Morganite
R71	740-0273	150 ohms ± 10% ½ Watt Morganite
R72	740-0572	1,000 ohms ± 20% BTS
R73	740-0142	100,000 ohms ± 10% BTS
R73a	740-0622	470,000 ohms ± 20% BTS
R74	740-0582	47,000 ohms ± 20% BTS
R75	740-0612	10,000 ohms ± 20% BTS
R77	742-0492	68,000 ohms ± 10% BTA
R78	740-0742	2,200 ohms ± 20% BTS
R79	740-0102	22,000 ohms ± 10% BTS
R80	740-0092	15,000 ohms ± 10% BTS
R81	740-0092	15,000 ohms ± 10% BTS
R82	740-0122	47,000 ohms ± 10% BTS
R83	740-0102	22,000 ohms ± 10% BTS
R84	740-0122	47,000 ohms ± 10% BTS
R85	740-0702	56,000 ohms ± 10% BTS
R86	742-0452	220,000 ohms ± 20% BTA
R87	740-0052	3,300 ohms ± 10% BTS
R88	740-0622	470,000 ohms ± 20% BTS
R89	740-0622	470,000 ohms ± 20% BTS
R90	749-0191	680 ohms ± 10% BTB
R92	748-0062	270 ohms ± 10% BW1
R93	742-0252	10,000 ohms ± 10% BTA
R94	742-0092	47,000 ohms ± 10% BTA
R95	740-0082	10,000 ohms ± 10% BTS
R96	740-0082	10,000 ohms ± 10% BTS
R97	740-0082	10,000 ohms ± 10% BTS
R98	742-0172	470,000 ohms ± 10% BTA
R99	740-0142	100,000 ohms ± 10% BTS
R100	740-0072	4,700 ohms ± 10% BTS
R101	740-0122	47,000 ohms ± 10% BTS
R102	740-0202	2.2 Megohms ± 10% BTS
R103	742-0752	10,000 ohms ± 20% BTA
R103a	742-0752	10,000 ohms ± 20% BTA
R104	740-0522	220,000 ohms ± 20% BTS
R105	749-0191	680 ohms ± 10% BTB
R106	742-0313	330 ohms ± 10% 1 Watt Morganite
R107a	750-0201	1.2 ohms)
R107b	750-0201	2.4 ohms)
R107c	750-0201	4.8 ohms) Resistor Strip
R108	750-0201	2.0 ohms)
R108a	750-0201	2.0 ohms)
R109	740-0732	12,000 ohms ± 10% BTS
R110	740-0532	1 Megohm ± 20% BTS
R111	742-0582	120,000 ohms ± 10% BTA
R112	742-0582	120,000 ohms ± 10% BTA
R113	749-0081	22,000 ohms ± 20% BTB
R114	740-0612	10,000 ohms ± 20% BTS
R115	740-0182	470,000 ohms ± 10% BTS
R116	740-0142	100,000 ohms ± 10% BTS
R117	742-0492	68,000 ohms ± 10% BTA
R118	740-0122	47,000 ohms ± 10 %BTS
R119	740-0152	150,000 ohms ± 10% BTS
R120	740-0512	100,000 ohms ± 20% BTS
R121	740-0392	330,000 ohms ± 10% BTS
R122	740-0142	100,000 ohms ± 10% BTS
R123	740-0242	33,000 ohms ± 10% BTS
R124	742-0392	47,000 ohms ± 20% BTA
R125	742-0172	470,000 ohms ± 10% BTA
R126	742-0432	18,000 ohms ± 10% BTA
R127	740-0572	1,000 ohms ± 20% BTS
R128a	749-0151	10,000 ohms ± 20% BTB
R128b	749-0151	10,000 ohms ± 20% BTB
R128c	749-0151	10,000 ohms ± 20% BTB
R129	746-0242	1.0 ohm ± 10% BW½
R130	742-0913	100 ohms ± 10% 1 Watt Morganite
R131	742-0402	150,000 ohms ± 20% BTA
R132	742-0452	220,000 ohms ± 20% BTA
R133	742-0792	68,000 ohms ± 10% BTA
R134	740-0492	1.5 Megohms ± 20% BTS
RT1	752-0011	CZ6Brimistor
RT2	752-0011	CZ6Brimistor

CAPACITORS

REF.	PART No.	DESCRIPTION
C24	273-0591	68 pF ± 1 pF Silver Mica M.S.
C25	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.
C28	271-0031	.0033 Mfd. +100% −0% Ceramic Disc 500V. Wkg.
C29	271-0031	.0033 Mfd. +100% −0% Ceramic Disc 500V. Wkg.
C30	273-0591	68 pF ± 1 pF Silver Mica M.S.
C31	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% Plastic Tubular 400 V.W.
C35	271-0151	6.8 pF ± ¼ pF Ceramic Tubular NPO
C36	271-0131	8.2 pF ± ¼ pF Ceramic Tubular NPO
C37	271-0131	8.2 pF ± ¼ pF Ceramic Tubular NPO
C38	280-0541	.0022 Mfd. ± 20% Plastic Tubular 200 V.W.
C39	279-4581	.0047 Mfd. ± 10% Paper Tubular 400 V.W.
C41	269-0401	40 Mfd. Electrolytic 250 V.W. (With C43)

F2 PARTS LIST

CAPACITORS — *continued*

REF.	PART No.	DESCRIPTION
C42	269-0441	200 Mfd. Electrolytic 250 V.W. (With C44)
C43	269-0401	80 Mfd. Electrolytic 250 V.W. (With C41)
C44	269-0441	100 Mfd. Electrolytic 250 V.W. (With C42)
C45	279-1161	0.22 Mfd. ± 20% Paper Tubular 200 V.W.
C46	279-1161	0.22 Mfd. ± 20% Paper Tubular 200 V.W.
C47	271-0231	68 pF ± 10% Ceramic Tubular 3KV N750
C48	279-1161	0.22 Mfd. ± 20% Paper Tubular 200 V.W.
C49	271-0221	2.2 pF ± ¼ pF Bead NPO
C50	280-1311	.0033 Mfd. ± 20% Plastic Tubular 400 V.W.
C51	279-4661	.022 Mfd. ± 10% Paper Tubular 400 V.W.
C52	271-0221	2.2 pF ± ¼ pF Bead NPO
C53	280-1791	220 pF ± 10% Plastic Tubular 600 V.W.
C54	279-1121	0.1 Mfd. ± 20% Paper Tubular 200 V.W.
C57	271-0031	.0033 Mfd. +100% −0% Ceramic Disc 500V. Wkg.
C58	271-0271	.0022 uF ± 20% Ceramic Tubular Type CTR, Style B, K2,000
C59	273-0561	10 pF ± 10% I.F. Type
C60	271-0151	6.8 pF ± ¼ pF Ceramic Tubular NPO
C60a	271-0031	.0033 Mfd +100% −0% Ceramic Disc 500V. Wkg.
C61	271-0271	.0022 uF ± 20% Ceramic Tubular Type CTR, Style B, K2,000
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 ± 5% I.F. Type
C66	280-1501	100 pF ± 5% Plastic Tubular 600 V.W.
C67	280-1501	100 pF ± 5% Plastic Tubular 600 V.W.
C68	269-0371	10 Mfd. Electrolytic 40 P.V.
C69	279-4021	.015 Mfd. ± 10% Paper Tubular 200 V.W.
C70	280-0311	.0033 Mfd. ± 10% Plastic Tubular 200 V.W.
C71	280-1851	680 pF ± 10% Plastic Tubular 600 V.W.
C72	279-4001	.01 Mfd. ± 10% Faper Tubular 200 V.W.
C73	269-0371	10 Mfd. Electrolytic 40 P.V.
C74	279-1621	.01 Mfd. ± 20% Paper Tubular 400 V.W.
C75	269-0401	40 Mfd. Electrolytic 250 V.W. (With C86)
C76	269-0221	25 Mfd. Electrolytic 40 P.V.
C77	269-0211	8 Mfd. Electrolytic 350 P.V.
C78	279-1541	.0022 Mfd. ± 20% Paper Tubular 400 V.W.
C79	279-1541	.0022 Mfd. ± 20% Paper Tubular 400 V.W.
C80	279-1541	.0022 Mfd. ± 20% Paper Tubular 400 V.W.
C81	279-0281	1 Mfd. ± 25% Metalised Paper 200 V.W.
C82	279-4721	.068 Mfd. ± 10% Paper Tubular 400 V.W. U.C.C.
C83	279-1161	0.22 Mfd. ± 20% Paper Tubular 200 V.W.
C84	279-1661	.022 Mfd. ± 20% Paper Tubular 400 V.W.
C85	279-4741	0.1 Mfd. ± 10% Paper Tubular 400 V.W.
C86	269-0401	80 Mfd. Electrolytic 250 V.W. (With C75)
C87	269-0361	100 Mfd. Electrolytic 40 P.V.
C88	280-1791	220 pF ± 10% Plastic Tubular 600 V.W.
C89	279-0281	1.0 Mfd. ± 25% Metalised Paper 200 V.W.
C90	273-0821	33 pF ± 5% Silver Mica M.S.
C91	280-0331	.0047 Mfd. ± 10% Plastic Tubular 200 V.W.
C92	280-0331	.0047 Mfd. ± 10% Plastic Tubular 200 V.W.
C93	280-0821	.0039 Mfd. ± 5% Plastic Tubular 400 V.W.
C94	279-1121	0.1 Mfd. ± 20% Paper Tubular 200 V.W.
C95	280-1851	680 pF ± 10% Plastic Tubular 600 V.W.
C96	273-0541	47 pF ± 10% Silver Mica M.S.
C97	279-1661	.022 Mfd. ± 20% Paper Tubular 400 V.W.
C98	279-1121	0.1 Mfd. ± 20% Paper Tubular 200 V.W.
C99	279-1581	.0047 Mfd. ± 20% Paper Tubular 400 V.W.
C100	279-1661	.022 Mfd. ± 20% Paper Tubular 200 V.W.
C101	279-1121	0.1 Mfd. ± 20% Paper Tubular 200 V.W.
C102	280-2911	.0022 Mfd. ± 20% Plastic Tubular 1,000 V.W.
C103	279-5201	.047 Mfd. ± 10% Paper Tubular 600 V.W.
C104	279-1781	0.22 Mfd. ± 20% Paper Tubular 400 V.W.
C105	279-5201	.047 Mfd. ± 10% Paper Tubular 600 V.W.

COILS

REF.	PART No.	DESCRIPTION
L15, L16	259-0811	1st I.F. Grid and Trap
L16a	259-0671	Tuner Coupling
L17	259-0611	1st I.F. Anode
L18	259-0671	1st I.F. Coupling
L19, L20	259-0691	2nd I.F. Anode and Trap
L21	259-0671	2nd I.F. Coupling
L22	259-0611	3rd I.F. Anode
L23	259-0671	3rd I.F. Coupling
L24	259-0741	Video Peaking (Grid)
L25	259-0022	Video Peaking (Shunt)
L26	259-0771	Video Peaking (Series)
L27	259-0031	I.F. Sound Coupling
L28	232-0151	Filament Choke
L29	232-0151	Filament Choke
L30	259-0871	Width Coil
L31	259-0042	Anti-Parasitic Choke
L32	259-0042	Anti-Parasitic Choke
L33	259-0861	Linearity Coil

MISCELLANEOUS

REF.	PART No.	DESCRIPTION
VR1	677-0351	500,000 ohms Curve 'A' (Brightness)
VR2	677-0421	500,000 ohms Curve 'A' E.C. (A.G.C.)
VR3	677-0171	25,000 ohms Curve 'A' E.C. (50V. Adj.)
VR4	677-0341	250,000 ohms Curve 'A' E.C. (Contrast Range)
VR5	677-0331	10,000 ohms Curve 'A' (Contrast)
VR6	677-0372	500,000 ohms Curve 'C' (Tone)
VR7	677-0331	1 Megohm Tapped 500,000 ohms Curve 'A' (Vol.)
VR8	677-0362	50,000 ohms Curve 'A' (Height)
VR9	677-0351	500,000 ohms Curve 'A' (Vert. Hold)

F2 PARTS LIST

MISCELLANEOUS — *continued*

REF.	PART No.	DESCRIPTION	REF.	PART No.	DESCRIPTION
VR10	677-0341	250,000 ohms Curve 'A' (Hor. Drive)	CR1	753-0001	150 ohms/1K5 uF. Resistive Capacitive Coupled Unit
VR11	677-0471	25,000 ohms Curve 'A' (Hor. Hold)	V3	932-0881	6BY7 Valve
			V4	932-0521	6BX6 Valve
VC1	281-0131	Capacitor Trimmer	V5	932-0521	6BX6 Valve
VC2	281-0131	Capacitor Trimmer	V6	932-0661	6CK6 Valve
IFT1	906-0191	Transformer—I.F.	V7	932-0981	5AS4 Valve
IFT2	906-0162	Transformer—I.F.	V8	932-0981	5AS4 Valve
IFT3	906-0171	Transformer—I.F.	V9	932-0501	6BL8 Valve
IFT4	906-0181	Transformer—I.F.	V10	932-0501	6BL8 Valve
IFT5	906-0101	Transformer—I.F.	V11	932-0521	6BX6 Valve
TR1	904-0212	Transformer—Power	V12	932-0521	6BX6 Valve
TR2	905-0231	Transformer—Audio Output	V13	932-0491	6AL5 Valve
TR3	908-0052	Transformer—Blocking Oscillator	V14	932-0511	6BM8 Valve
TR4	905-0221	Transformer—Frame Output	V15	932-0511	6BM8 Valve
TR5	908-0182	Transformer—Vertical Feedback	V16	932-0521	6BX6 Valve
TR6	908-0111	Transformer—Sync. Coupling	V17	932-0491	6AL5 Valve
TR7	908-0191	Transformer—Horizonal Oscillator	V18	932-0501	6BL8 Valve
TR8	908-0271	Transformer—Horizontal Output	V19	932-0531	6CM5 Valve
CK1	232-0122	Choke 1.5H 300 mA.	V20	932-0771	1S2 Valve
CK2	232-0211	Choke	V21	932-0561	6R3 Valve
MR1	932-0971	Diode 0A90	C.R.T.	932-0871	AW53-80—21-inch Picture Tube
MR2	932-0791	Diode 0A81	or	932-0671	21ALP4-A—21-inch Picture Tube
MR3	932-0991	Diode M3		224-0721	Tuner Assembly
				259-0831	Deflection Yoke Assembly

THE GRAMOPHONE COMPANY LIMITED
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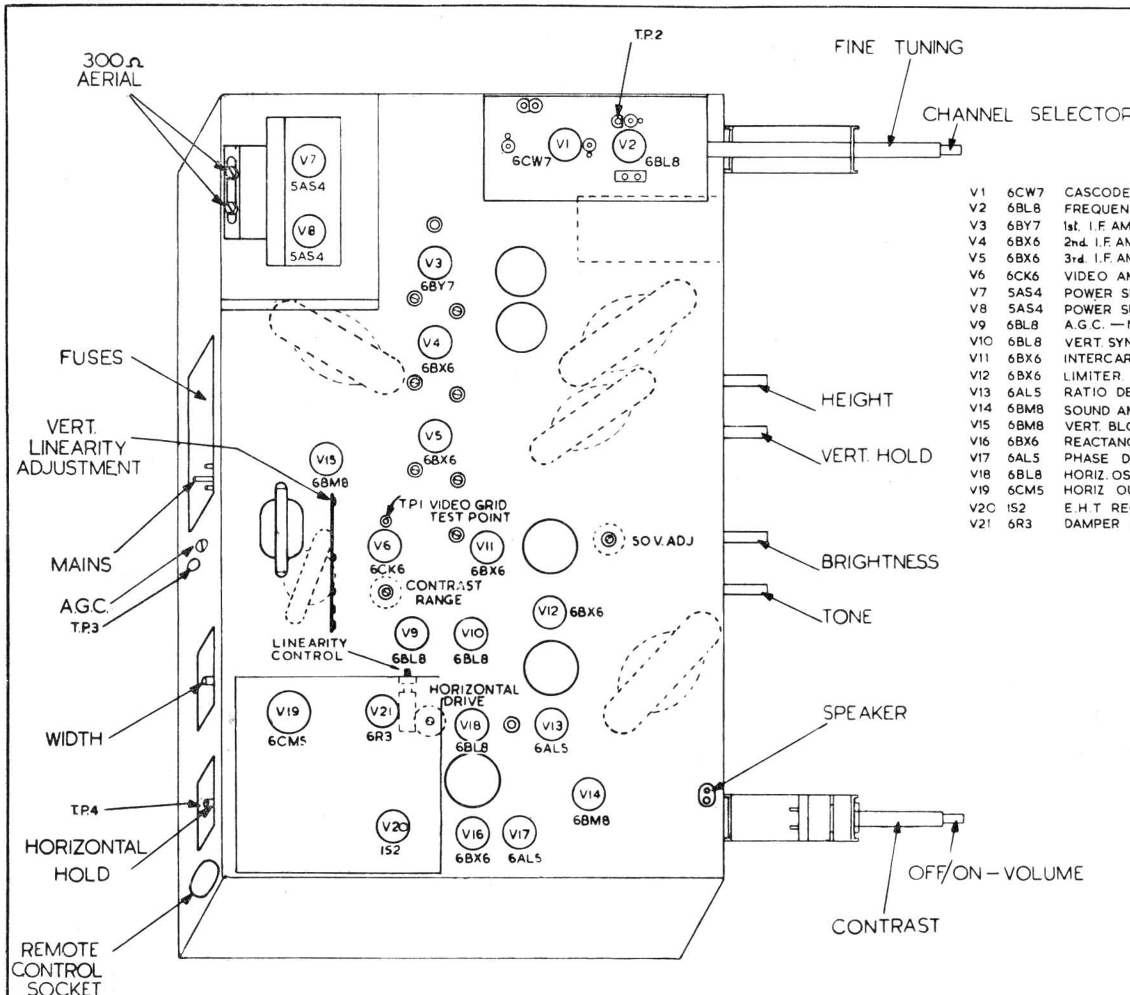
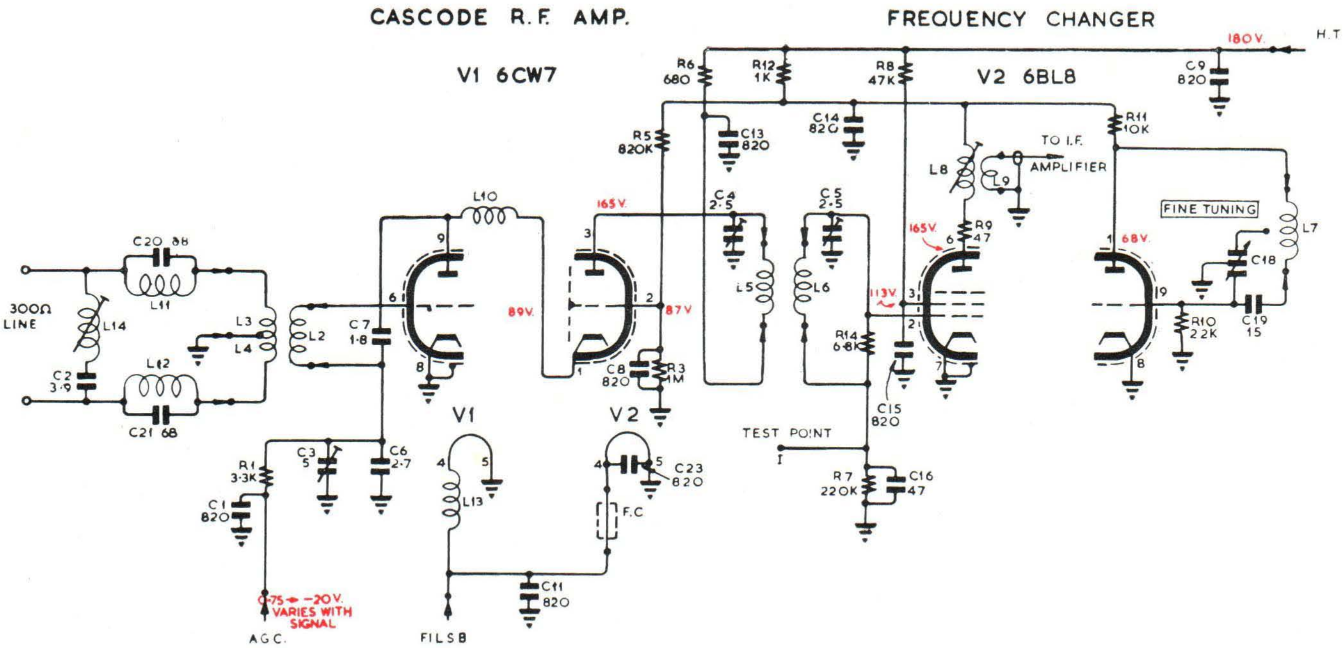


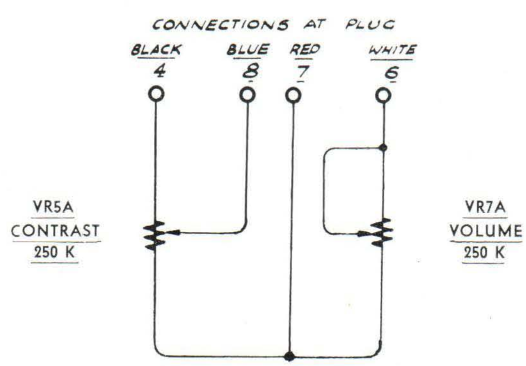
V1	6CW7	CASCODE R.F. AMPLIFIER
V2	6BL8	FREQUENCY CHANGER
V3	6BY7	1st. I.F. AMPLIFIER
V4	6BX6	2nd. I.F. AMPLIFIER
V5	6BX6	3rd. I.F. AMPLIFIER.
V6	6CK6	VIDEO AMPLIFIER
V7	5AS4	POWER SUPPLY
V8	5AS4	POWER SUPPLY.
V9	6BL8	A.G.C. — NOISE INVERTER
V10	6BL8	VERT. SYNC. SEP — HORIZ SYNC. SEP
V11	6BX6	INTERCARRIER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

682-6192



CIRCUIT DIAGRAM — TUNER

REMOTE CONTROL



CIRCUIT DIAGRAM.

"H·M·V" CHASSIS TYPE F2