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"HIS MASTER'S VOICE"

SERVICE MANUAL

for

TELEVISION RECEIVER

CHASSIS TYPES

PA - PB - PC - PD - PE

■

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INTRODUCTION

This combined service manual is intended to give the serviceman, within the one cover, a complete coverage of all of the present series of "H.M.V" 110-degree receivers and provide him with all of the necessary information for servicing these receivers. It is anticipated that by combining this information, that would normally be written in separate manuals, that a more complete understanding of the variations in circuitry between these receivers will result, and that servicing will thus be simplified.

It will be seen that the basic chassis may be divided into 15- or 16-valve receivers; that the method of mounting is divided into a console, lowboy or consolette type receivers; and that the remote control facility is confined to 16-valve receivers. Aerial selection switching is standard on all R/control models.

The receivers covered in this manual are:

Chassis Type	*No. of Valves*	*Picture Tube*	*Style of Receiver*	*Remote Control*
PA	16	23-inch	Console	Yes
PB	16	23-inch	Horizontal Console (Lowboy)	Yes
PC	15	23-inch	Consolette	No
PD	15	23-inch	Horizontal Console (Lowboy)	No
PE	15	23-inch	Consolette	No

CAUTION

The normal B+ voltages in these receivers are dangerous. Use extreme caution when servicing. 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 or to its aquadag coating 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.

SPECIFICATIONS

POWER SUPPLY:

200, 230, 240, 250 volts, A.C., 50 c.p.s.

CONSUMPTION:

15-valve receivers — 175 watts.
16-valve receivers — 180 watts.

AERIAL INPUT:

300 ohms balanced.
Consolette receivers have provision for a plug-in attenuator.

INTERMEDIATE FREQUENCIES

Vision carrier — 36.875 Mc/s.
Sound carrier — 31.375 Mc/s.

FUSES:

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

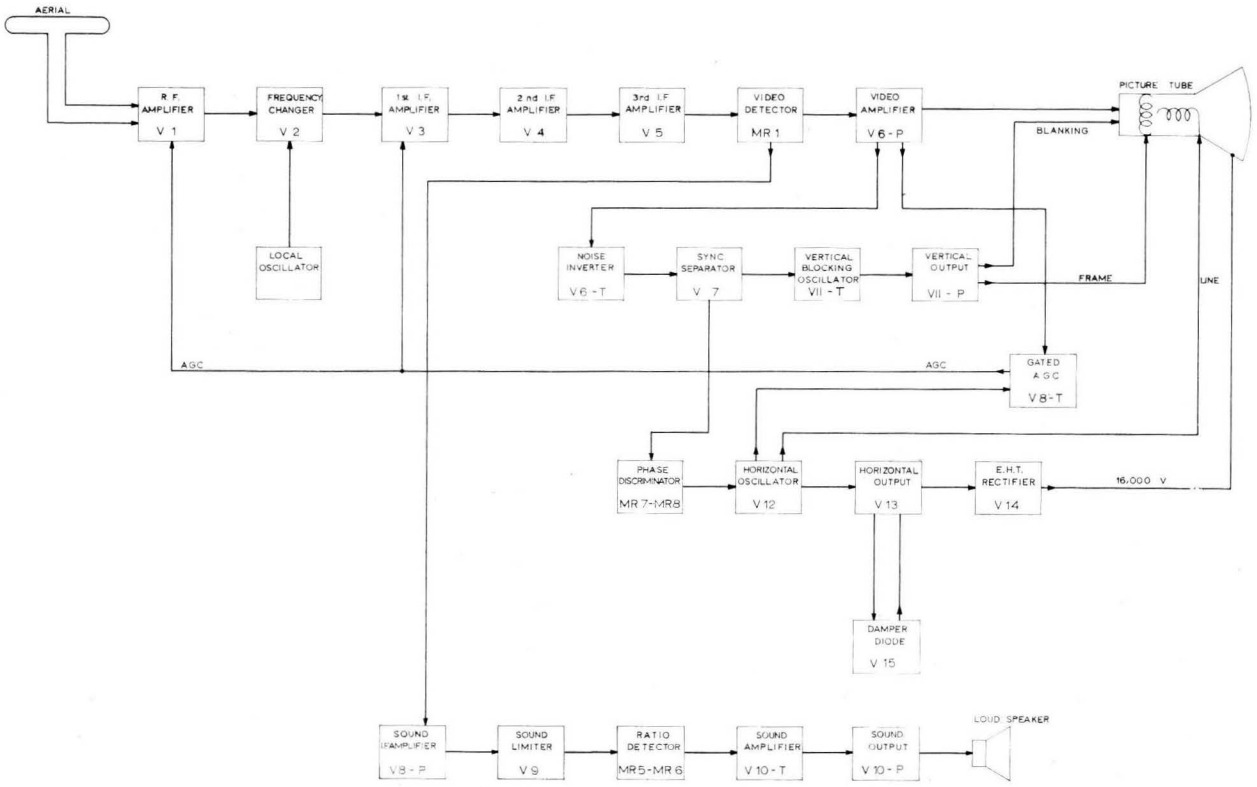
VALVE COMPLEMENTS

15-VALVE RECEIVERS — PC, PD, PE

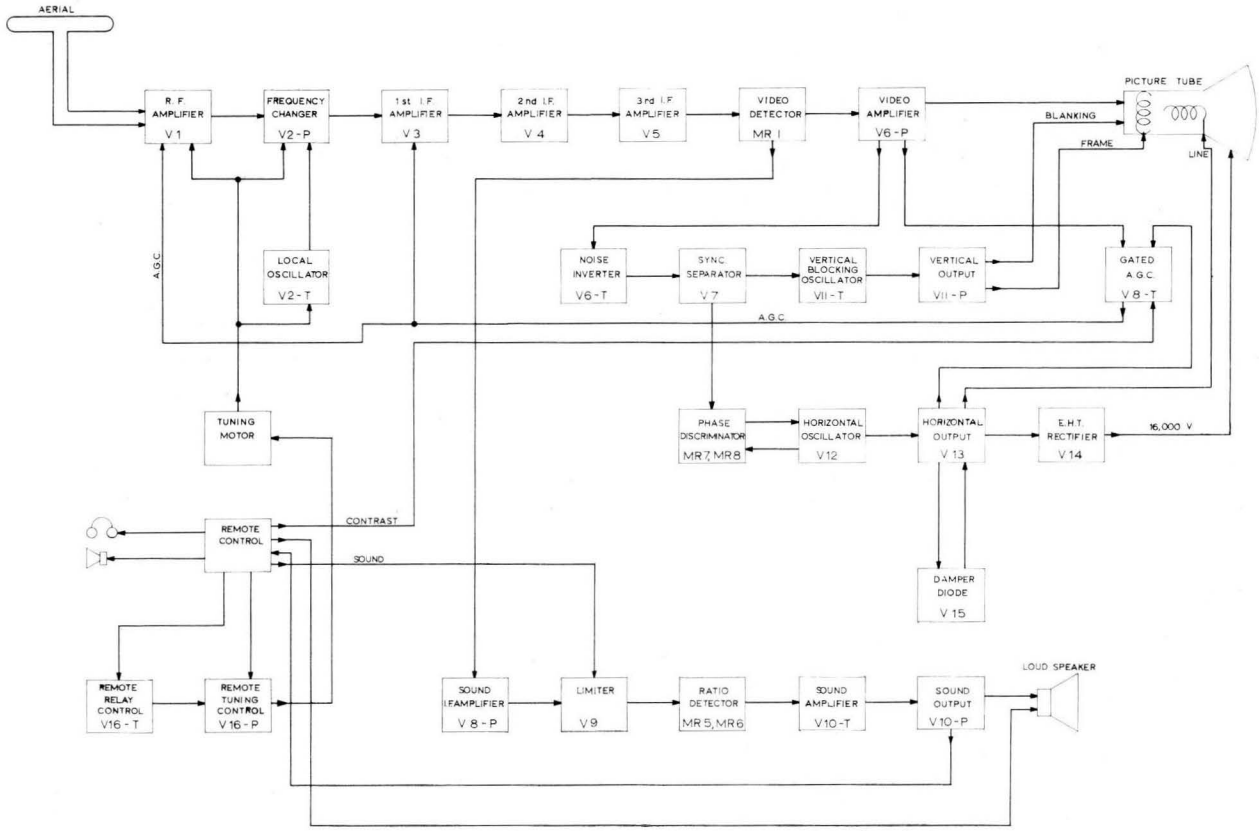
V1	6ES8	R.F. Amplifiers.
V2	6BL8	Frequency Changer
V3	6EH7	1st I.F. Amplifier
V4	6EJ7	2nd I.F. Amplifier
V5	6EJ7	3rd I.F. Amplifier
V6	6DX8	Video Amplifier and Noise Inverter
V7	6DT6	Noise Gated Sync. Separator (Later production uses 6CS6)
V8	6U8	Sound I.F. Amplifier and Gated A.G.C.
V9	6AU6	Sound Limiter.
V10	6GW8	Audio Driver and Audio Output
V11	6BM8	Blocking Oscillator and Vertical Output
V12	12AU7	Horizontal Multivibrator
V13	6CM5	Horizontal Output
V14	1S2	EHT Rectifier
V15	6AL3	Damping Diode
MR1	0A80	Vision Detector
MR2	0A210	Mains Rectifier
MR3	0A210	Mains Rectifier
MR4	M3	Clamping Diode
MR5	0A79	Ratio Detector
MR6	0A79	Ratio Detector
MR7	0A81	Phase Discriminator
MR8	0A81	Phase Discriminator

16-VALVE RECEIVERS — PA, PB

V1	6ES8	R.F. Amplifier
V2	6BL8	Frequency Changer
V3	6EH7	1st I.F. Amplifier
V4	6EJ7	2nd I.F. Amplifier
V5	6EJ7	3rd I.F. Amplifier
V6	6DX8	Video Amplifier and Noise Inverter
V7	6DT6	Noise Gated Sync. Separator (Later prodution uses 6CS6)
V8	6U8	Sound I.F. Amplifier and Gated A.G.C.
V9	6AU6	Sound Limiter
V10	6GW8	Audio Driver and Output
V11	6BM8	Blocking Oscillator and Vertical Output
V12	12AU7	Horizontal Multivibrator
V13	6CM5	Horizontal Output
V14	1S2	EHT Rectifier
V15	6AL3	Damping Diode
V16	6BL8	Remote Control Amp. and Relay Operating
MR1	0A80	Vision Detector
MR2	0A210	Mains Rectifiers
MR3	0A210	Mains Rectifiers
MR4	M3	Clamping Diode
MR5	0A79	Ratio Detector
MR6	0A79	Ratio Detector
MR7	0A81	Phase Discriminator
MR8	0A81	Phase Discriminator
MR9		Bias Rectifier
MR10		Power Rectifiers for Remote Control
MR11		
MR12		
MR13		
MR14		Bias Rectifier



BLOCK DIAGRAM — 15-VALVE CIRCUITS



BLOCK DIAGRAM — 16-VALVE CIRCUITS

SUMMARY OF FEATURES

These features are common to both types of receivers, unless otherwise stated.

1. The turret tuner has facilities for individual exact alignment, on each channel, of the oscillator tuning so that the fine tuning control range may be limited, thus avoiding gross mistuning.

2. Linear phase treatment of the IF response ensures the best possible definition with freedom from overshoot or smearing, allowing non-critical fine tuning control.

3. The overall frequency response of the system is within 6 db from D.C. up to 4.7 Mc/s.

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

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

6. A noise inverter is used, before the sync. separator, giving protection to the input circuit of the sync. separator in the presence of impulse noise, preventing paralysis of the sync. separator action following large bursts of impulse noise.

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

A variable tone control is fitted and frequency response can be adjusted from full and normal to attenuated high and low frequencies simultaneously. This system is used rather than accentuated or attenuated bass or treble, so that the intelligibility of the signal in "fringe" conditions will be retained.

Commencing with S/N 00290 in chassis type PA/PB, a modification was made to increase the bass-boost by a frequency conscious feedback circuit and to slightly attenuate the high frequency response.

8. The horizontal hold circuit is a multivibrator employing a stabilising coil in the oscillator anode circuit and this, together with the cathode coupling employed, gives a stable oscillator virtually unaffected by large HT variations. This stability, together with an adequate pull-in range, renders a front horizontal hold control unnecessary. A pre-set control is provided on the back of the receiver.

9. A linearity control of the horizontal deflection circuit that can be adjusted by an indication on a multimeter gives the advantage that the linearity can be set without the need for a transmitted test pattern.

10. Vertical retrace lines are eliminated by Vertical Flyback Blanking.

11. Dustproof seal around picture tube to eliminate dust which would, otherwise, be attracted by static charge. (Models using unbonded face picture tubes only).

12. The user controls are reduced to the minimum necessary to ensure correct operation, which is made as simple as possible. There are no interacting controls, and since the receiver is completely DC coupled then the Brightness control will vary the light output of the picture tube and the Contrast control will vary the depth of shades without any interaction between them.

13. Silicon Junction Diodes are used in a voltage doubler full-wave power supply. These diodes are noted for their robustness, economy of power and high surge rating. Since they have no heated cathode they cannot be damaged by operation on low mains voltage as is the case with valve rectifiers. Thermistor protection is included in the power supply on all models, to ensure that diodes and electrolytic condensers are not subject to large surges when first switching on the receiver.

14. The chassis is hinged and can be swung out in such a manner that almost any repair can be made in the home without removing the whole chassis from the cabinet. It is also possible to remove the whole receiver, complete with the picture tube, from the cabinet in one piece as a complete working unit, and can be operated as such on the workshop bench.

15. A noise-gated sync. separator is used to give the best synchronisation obtainable, necessary for receivers operating under "fringe" conditions.

16. To keep impulse interference to a minimum in the audio output and when operating under adverse conditions, a sound amplifier is included before the sound limiter. This gives a substantial increase in gain and gives virtually noise-free sound, even under extreme "fringe" conditions.

17. Current feedback to keep a constant deflection current in the coils is used in the vertical deflection circuit. This feature holds the height constant as the deflection coils warm up.

18. Transformer-coupled focusing is employed to ensure good overall edge-to-edge focus. Degradation of definition due to change in spot shape across the tube is thus obviated.

19. Full Remote Control facilities are provided in the 16-valve, type PA-PB receivers.

The receiver may be switched "on" or "off" from a remote location; channel selection and adjustment of contrast and sound can also be made. The speaker system may be transferred

from the receiver cabinet to the remote control unit and volume adjusted accordingly.

Facilities are also provided in the remote control unit for connection of hearing aids with and without local or remote speakers plus control of volume in the hearing aid.

Muting of the sound and picture is carried out whenever channels are changed.

With the remote control unit connected to the receiver, normal functioning of the manual controls on the receiver still exist.

20. In models PA and PB, facilities have been provided for the automatic switching of up to four different types of aerials, depending on frequency and transmission modes, to the aerial terminals on the tuner, by means of the multi-aerial connector block and the wafer switches on the channel changing mechanism.

CIRCUIT DESCRIPTION

R.F. INPUT

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

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

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

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

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

The intermediate frequency output of the tuner (vision 36.875 Mc/s., sound 31.375 Mc/s.) is coupled to the IF channel of the main chassis through a secondary winding on the IF coil L7.

The heater circuit is filtered by a Ferrocube 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 IF output is coupled to the grid of the first IF Amplifier V3 and tuned by coil L9 with stray capacities. There are three IF amplifying stages and AGC voltage is applied to V3.

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

Trap circuits L11, L12 and L15 are coupled to the IF coils L10, IFT1 and IFT2. The first attentuates the sound carrier 31.375 Mc/s. and the second attenuates the adjacent vision carrier 29.875 Mc/s. The third trap attenuates the adjacent sound carrier 38.375 Mc/s.

V3 has a small unbypassed cathode resistor R15, to minimise detuning of the grid circuit with varying input levels.

VIDEO AMPLIFIER

The detected video output of the germanium diode MR1 is amplified in the pentode section of V6. L20, L21, L22 and L23 are peaking chokes which maintain the high frequency components of the vision signal fed to the picture tube. The 5.5 Mc/s. component is removed by the combined transformer and trap, IFT4.

INTERCARRIER SOUND

The output of IFT4 is fed to the Sound IF amplifier, V8. The output from the limiter is demodulated by the ratio detector, 2-0A79, to provide the audio signal which passes through the volume control to be amplifier in the driver triode and output pentode sections of the Audio Output valve. Feedback is applied in both audio circuits.

A full margin of sound gain is provided so that 1.65 watts undistorted output is obtained from sound signals which are not fully modulated. Moreover, the sound output stage has a controlled overload charactertistic which does not "paralyse" but merely clips the peaks and so remains comparatively free from audible distortion.

NOISE INVERTER

The anode load of the noise inverter is formed by the resistor coupling the sync. separator to the video output. The valve is biased such that it cannot conduct on the positive sync. tips. However, noise pulses appearing more positive at its grid will drive the valve into conduction, causing current to flow and a voltage drop across this resistor. Consequently a noise pulse will appear less positive, at the anode of the noise inverter, than a sync. tip and the sync. separator will not conduct on the noise pulse since the pulse will now fall outside of the sync. separator's grid base.

NOISE-GATED SYNC. SEPARATOR

Video signal, with sync. tips positive, is applied to the suppressor grid of a 6DT6 (or 6CS6) from the output of the video amplilfier. At the same time, video signal with sync. tips negative, is applied to the control grid of this valve, via the potentiometer R46, R47 and is so arranged that the negative excursion of the signal will not affect the current through the sync. separator valve. However, when a noise pulse, which will sit more negative than the sync. tips, occurs at the control grid, then the current through the valve is cut off and the anode voltage will rise to HT, giving no spurious sync. output. Double protection is thus afforded by the Noise Inverter and the Noise-gated Sync. Separator.

NOTE: V7, 6DT6, was changed to 6CS6 with better sync. separation.

GATED A.G.C.

Video signals with sync. tips positive are fed from the Video Amplifier anode to the grid of the AGC valve, and the valve is biased so that it will only conduct on sync. tips. During line flyback, a positive pulse is applied to its anode via the 68 pfd coupling capacitor and the valve will conduct when this pulse at its anode and a sync. tip at its grid coincide. The valve cannot, therefore, conduct in the period between sync. pulses and is thus immune to noise pulses appearing in the period between sync. pulses.

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

The ratio of I.F. A.G.C. voltage to Tuner A.G.C. voltage is important and the ratio can be adjusted by means of RV3. If the ratio is too small then, even on large signals, the tuner will be biased back and the I.F. amplifier will be operating at an unnecessarily large gain and converter noise will be evident in the picture. If the ratio is too large, then no controlling bias will be applied to the tuner and it will be held at the clamping voltage and all control will be made in the I.F. amplifiers. This can cause severe overloading of the I.F. amplifier.

VERTICAL DEFLECTION CIRCUITS

Vertical sync. pulses from the sync. separator are used to synchronise the blocking oscillator, T3, and the triode portion of the valve. "Height" is adjusted by varying the DC potential fed to the blocking oscillator anode and "Vertical Hold" is adjusted by varying the time constant of the blocking oscillator grid circuit. 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. A feedback voltage is developed across R99, R100, from the current in the deflection coils. This voltage is stepped up to the input grid of the vertical output valve. A potentiometer, RV9, is provided for adjustment of linearity.

HORIZONTAL OSCILLATOR AND AUTOMATIC PHASE CONTROL

Automatic frequency and phase control is obtained by means of a DC controlled, cathode-coupled, stabilised multivibrator controlled by a germanium diode phase discriminator.

Sync. pulses from the sync. separator are fed into the centre of the discriminator and a sawtooth waveform from the multivibrator output is fed across the diode loads.

Since the negative going sync. pulse is fed to the diode cathodes and the diodes are effectively in parallel, then the discriminator output will be zero volts. The sawtooth is not of sufficient amplitude to cause the diodes to conduct, due to the bias caused by the coupling capacitor, so that the DC components of the sawtooth (average AC) is zero volts. Neither the sawtooth nor the sync. pulses can cause a bias voltage to be developed across the discriminator but that part of the sawtooth that occurs at the instant of the sync. pulses will have an affect on the bias voltage produced. If the sync. pulse occurs in the centre of the sawtooth, then the output is zero volts, and if it occurs before the retrace passes through its zero axis then the oscillator is running slow and the output voltage will be negative. The reverse will be the case if the oscillator is running fast.

The frequency of the Horizontal Multivibrator is controlled by the DC output of the discriminator. If the output voltage of the discriminator is positive it causes the cathode voltage to rise, lengthening the discharge time of the coupling capacitor to the second triode and slows down the firing rate of the multivibrator. A negative output from the discriminator will have the reverse effect.

HORIZONTAL DEFLECTION CIRCUITS

The horizontal driver valve produces a negative pulse output which is timed to cut off the horizontal output valve at the end of a scan.

When cut off sharply, the magnetic field that has been established in the horizontal output trans-

former 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 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 starts the cycle over again.

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

Energy recovered by the damping diode produces a boosted HT voltage of 830 volts, which is divided down to 560 volts for supplying the G2 electrode voltage of the picture tube.

The sawtooth scanning current in the primary winding of the focus transformer, T7, produces in the secondary, a large parabolic voltage waveform which is fed direct to the focus electrode of the CRT and the cold end of the secondary is connected to a suitable voltage to give good overall focus.

REMOTE CONTROL

(16-valve receivers only)

The remote control unit is connected to the receiver by fitting a small 9-pin plug (PL3), into the socket (SKT-3), at the rear of the chassis. With mains power connected and the receiver mains switch "on," the receiver may be switched "on" or "off" by the slide switch on the side of the remote handpiece which completes the circuit of the bridge rectifier, MR10-11-12-13, via a lamp in the handpiece. Power is supplied to RLB relay which closes, "making" contacts B1 and completing the receiver mains transformer primary, and contacts B2 which earths the resistor network in the picture tube grid.

Closing the receiver mains switch supplies power to the remote unit mains transformer, T8, which in turn supplies a bias voltage to V16-T (6BL8) via MR9 and C105. This bias cuts off the plate current of the triode. A tap taken from T8 supplies an AC voltage to the transformers T9 and T10, "indexing transformers." Under normal operating conditions an equal AC voltage is supplied to the grid and cathode of the pentode section of V16 (6BL8), via switches SB and SC, which are connected to the taps on the indexing transformers. The control under these conditions is "at rest."

OPERATING SEQUENCE

After selection of the appropriate channel by the remote control switch, if the "mute-start" push-button in the handpiece is operated, the following steps take place:

PSA-1	makes and shorts the limiter HT to earth, muting the sound.
PSA-2	makes and shorts the cathode of V16-T to earth, causing heavy current to flow in the plate circuit which operates relay RLA.
	When relay RLA operates:
Contacts A1	close and supply power to the channel changing motor.
Contacts A2	close and short-circuit B1 contacts in the "hold" position.
Contacts A3	close and short the limiter HT to earth.
Contacts A4	close and short the cathode of V16-T to earth in the "hold" position.
Contacts A5	close and short the picture tube grid to earth via R33A, muting the picture.

All actions occur simultaneously.

Since an unequal voltage is appearing at the grid of V16-P to that appearing at the cathode as selected by the channel selector switch in the handpiece, the difference voltage is amplified by V16-P and fed back to the grid of V16-T via C107. This AC voltage is rectified by MR14 and its polarity is such that it cancels the bias already supplied by MR9/C105 combination, and causes heavy current to flow in V16-T and holds the relay RLA in operating condition until the voltage is reduced to zero after the grid of V16-P is adjusted to the same voltage as the cathode by switch SB.

Simultaneously with the application of "bucking" bias to V16-T grid, the grid is shorted to earth by the switch MSB which is can-operated by the movement of the channel switching motor. This is a sensing device and stops the channel switching motor as it opens at the selected channel and since there will be no "bucking" bias applied to the grid of V16-T at that point, the relay RLA ceases to operate and the 'A' contacts open. The contacts of MSB open at each channel position but since heavy "bucking" bias still exists on the grid of V16-T the motor will continue until the selected position has been reached.

When the relay RLA ceases to operate:

Contacts A5 open—picture appears on screen.

Contacts A4 open—short and "bucking" bias removed from V16-T grid. Normal "at rest" "cut off" bias is restored.

Contacts A3 open—Limiter HT is restored and sound is heard.

Contacts A2 open and remove the short on B1 contacts.

Contacts A1 open and remove AC power from channel selector motor.

All actions occur simultaneously.

When the "on-off" switch in the handpiece is switched "off" relay RLB operates and opens contacts B2 which remove the earth from the picture tube grid voltage divider, immediately placing a high positive voltage on the grid and preventing a bright spot to appear on the screen, and contacts B1 which remove power from the receiver mains transformer.

A pin in the centre of PL3 which inserted in SKT3 open-circuits two leaf switches MSA-1 and MSA-2, on the main chassis. MSA-1 connects a 100 ohms load resistor across the rectifier M10-11-12-13 and represents the PLP load when the remote handpiece is disconnected. MSA-2 completes the speaker voice coil circuit when the remote handpiece is disconnected. (Channel selection cannot be achieved until the valves have reached operating temperature).

Under the above conditions, a small amount of power (approx. 1 watt) is still consumed by the transformer T8 until the receiver mains switch is operated to isolate the complete unit.

Volume of the receiver may be adjusted at the handpiece for both local and remote speakers by variation of the limiter HT by RV-15 control.

Two sockets are available on the side of the remote handpiece for hearing aid plugs. Insertion of the hearing aid plug into SKT-4 with the "local remote" speaker switch in the remote position, removes sound from the speaker and supplies sound to the hearing aid only. In both cases the hearing aid sound may be controlled by the hearing aid volume control.

For the remote handpiece controls to be fully effective, the receiver volume and contrast controls should be well advanced. If these controls are so set, removal of the remote control plug PL3, will not disturb the contrast or sound when the receiver is operating normally.

INSTALLATION

The receiver is shipped from the factory with the picture tube installed and all controls pre-adjusted for normal operation. For chassis type PC-PD-PE, 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 terminals.

For chassis type PA-PB it will be necessary to unpack the remote control unit and fit the plug into the socket at the rear of the cabinet. All adjustments can then be made from the remote control unit after the various controls have been set on the receiver front.

In the case where more than one aerial is intended or installed for reception from diverse directions or from different types of transmissions, It will be necessary to connect the 300-ohm ribbon leads from the multi-connector block at the rear of the set, to the lugs on the rotary switch for the appropriate channel.

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 plug or aerial connections to the switch.

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.

A.G.C.

The A.G.C. control is normally preset in the factory but if it is necessary to adjust it at any time 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 HT circuits. Ensure that they are replaced with similar types.

NOISE INVERTER

The cathode bias of the noise inverter can be adjusted on installation (if necessary) by means of a pre-set control on the rear panel of the receiver. Tune to the strongest signal and turn contrast control to maximum. Turn the Noise Inverter control in an anti-clockwise direction until the picture tends to go out of lock. Turn control slightly clockwise so that picture returns to lock. Check that receiver locks quickly on all channels when changing channels.

SERVICING

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

To do this, remove the EHT lead from its support; slacken off the screws on the right-hand side of the chassis and remove the clamp. Note that one of these screws is intended as a factory transit screw only, and need not necessarily be replaced. Remove screw from below mains transformer. This is also a transit screw and need not necessarily be replaced. The chassis, pivoting about the left-hand side, may be swung out to an angle of approximately 40 degrees.

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

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

DISMANTLING

CHASSIS TYPES PA, PB AND PD

REMOVAL OF CHASSIS ASSEMBLY

Remove the bottom screws securing the back cover of the receiver to the cabinet. Ease the back cover down until the top edge is free of the cabinet groove. Withdraw the cover straight back over the picture tube neck.

WARNING: Be careful not to drop the cover on to the neck of the picture tube when the bottom screws are removed.

Pull off the four small knobs from the front of the receiver. Undo the grub screw and remove the brass collar on the contrast spindle. Set the Channel Selector knob to channel 5. Flex the black plastic cover back with a screwdriver at the channel 7 position. Undo the securing screw at this position and pull off both the Channel Selector and the Fine Tuning knobs. (Both knobs may be removed when the securing screw is only partly unscrewed.

Disconnect the speaker lead plug at the right-hand side of the chassis.

Remove two bolts that secure the base board to the cabinet shelf.

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

Remove the thumb screw on the Tuner bracket supported from the block at the side of the Tuner Assembly (Chassis type PA-PB only).

Slacken off two screws on the antenna bracket. Slide the bracket toward the rear of the cabinet in its guide grooves and remove the bracket from the cabinet.

The chassis and picture tube may then be withdrawn from the cabinet.

DISMANTLING

CHASSIS TYPES PC, PE IN CABINETS TYPE 96 AND 98

REMOVAL OF CABINET

Remove the cabinet back by undoing the seven securing screws.

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

Disconnect the speaker leads.

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

screw. Pull off both the Channel Selector and Fine Tuning knobs. (Both knobs may be removed when the securing screw is only partly unscrewed).

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

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

Remove the cabinet.

REMOVAL OF PICTURE TUBE SCREEN

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

The clear, protective picture tube screen and plastic-moulded front may be cleaned with a soft, damp cloth, but avoid the use of chemical and abrasive cleaners. Do not use any preparation normally sold as window cleaning or furniture polishing agents, as these generally prove harmful to those materials.

If the plastic becomes scratched or accidentally marked by a fly-spray, the marks may be removed by polishing gently with a soft cloth moistened with Wattyl or Dupol Cabinet Burnisher. Very deep scratches should be removed first with Water Rubbing Compound and then finished off with Burnisher.

DEFLECTION YOKE

First remove the picture tube socket. Loosen the clamp-fixing screws on the rear of the yoke assembly, remove the yoke plug from the socket on the rear of the EHT assembly and slide yoke over neck of tube. When replacing yoke, do not use force and do not tighten clamping screws until set has been operated and picture is squared up.

REMOVAL OF PICTURE TUBE

Having removed the chassis and picture tube assembly, remove the spring which rests against the aquadag coating on the rear of the picture tube. Undo the top and bottom screws that secure the clamping ring to the picture tube on 21-inch receivers, or slacken the retaining nut on 23-inch receivers. 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 manufacturers' carton.

ADJUSTMENTS

HORIZONTAL LINEARITY

A typical multimeter employing a 100 ohm 1 mA fullscale deflection meter, when on 100 mA range, has a total resistance of 1 ohm. If such a meter is connected from pin 8 of the Horizontal Output valve to earth, *i.e.*, across the 1 ohm metering resistor, it will indicate half of the current flowing in the cathode of the valve. The Horizontal Linearity control should be adjusted to reduce this current to a minimum.

HORIZONTAL HOLD

Disconnect sync. pulses by removing the sync. separator valve, 6DT6, V7 (6CS6, later production). Short circuit the Horizontal Stabilising coil. Adjust the Horizontal Hold control so that the picture "floats" or locks weakly. Remove the short across the stabilising coil and adjust the core of this coil so that the picture again floats or locks weakly. Replace the sync. separator valve.

CONTRAST RANGE

Turn the Contrast Control to its maximum clockwise position and adjust the Contrast Range control to give sync. tips at 190 volts at the Video anode, read on a DC coupled oscilloscope.

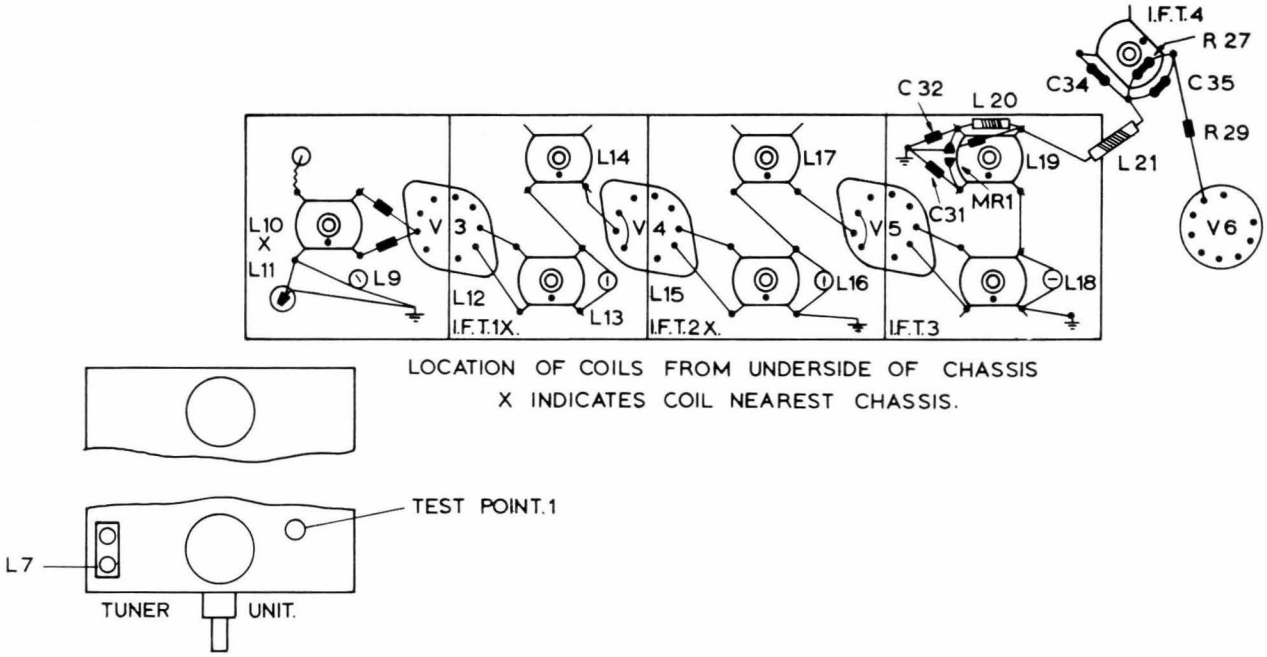
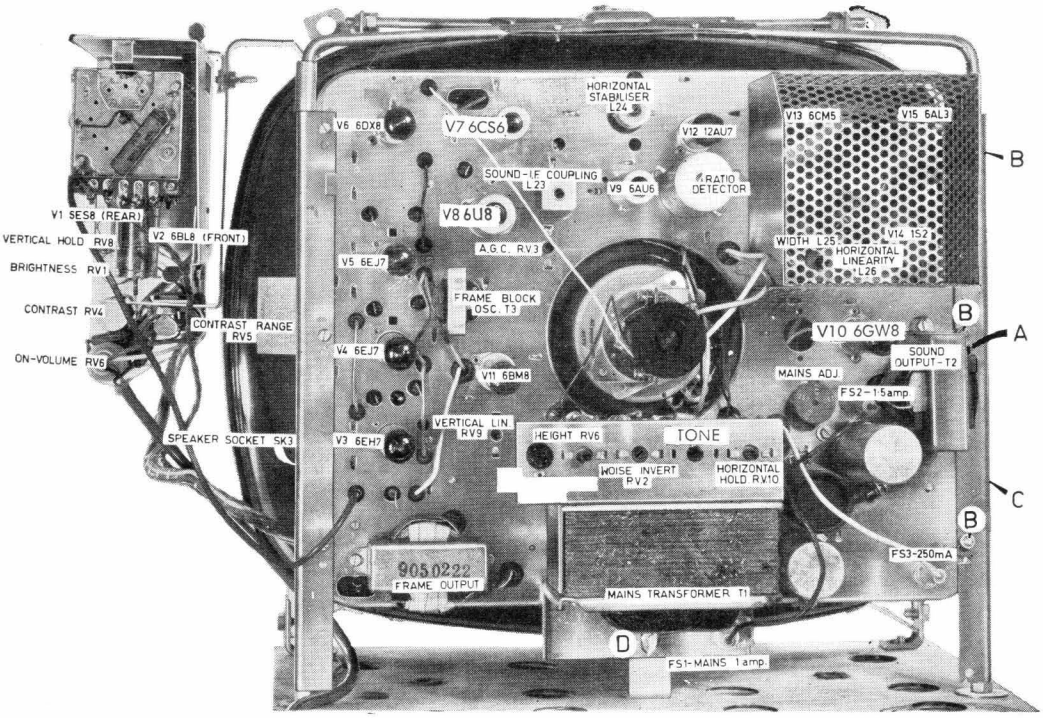
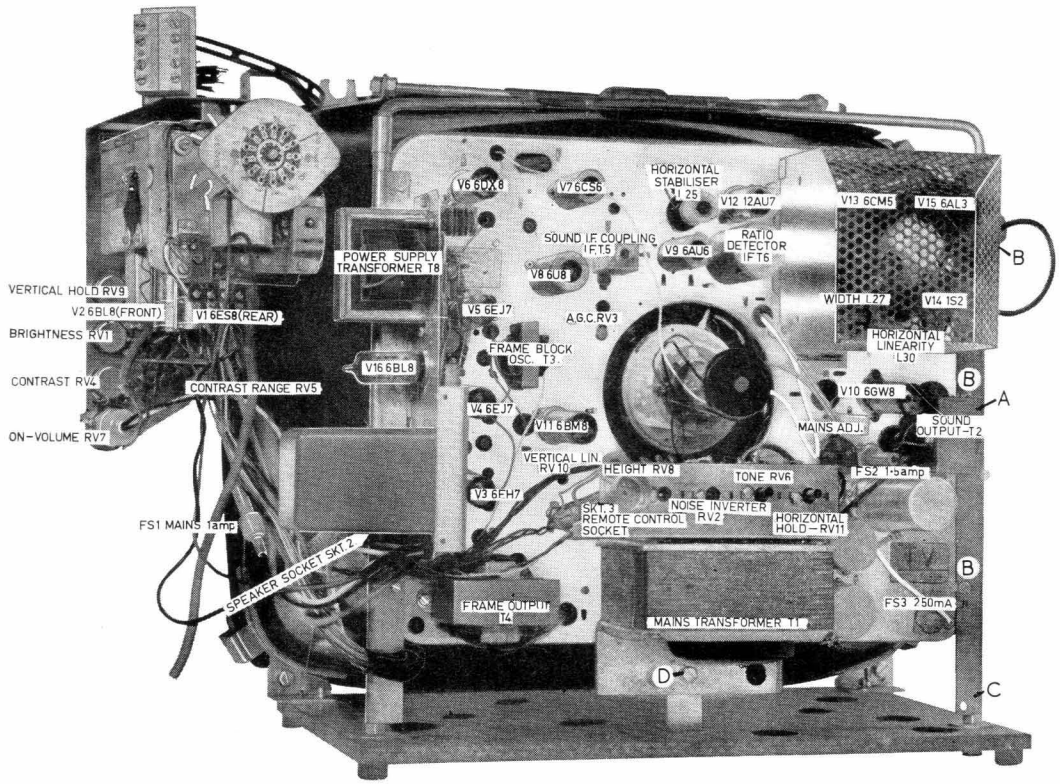


FIG. 2



REAR VIEW — 15-VALVE CHASSIS



REAR VIEW — 16-VALVE CHASSIS

ALIGNMENT

VISION I.F.

To align the vision IF 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 interconnected 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 shown in Figure 3.

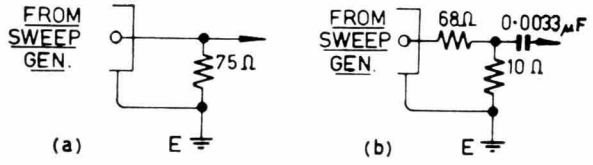


FIG. 3.

Coils L9, L13, L16, L18 adjust the bandwidth of the coupling circuits and are adjusted and sealed in the factory. It should only be necessary to adjust these on realignment if IF transformers or coils have been replaced in the circuit.

Before commencing alignment, remove slugs from L11, L12 and L15, and screws the slugs of IFT1 and IFT2 to set flush with the chassis.

Connect a bias supply of —6 volts across the IF A.G.C. Connect the display unit across R28. Throughout the alignment the display unit should be adjusted to present a reasonable amplitude display from a signal 2.5 volts peak-to-peak, and the output from the IF strip should be maintained at that level by varying the output from the sweep generator.

Because of the high gain of the receivers, care should be taken to ensure that all components replaced are on short leads and are placed in exactly the same position as the original part. Care must also be taken to prevent feedback in interconnecting leads of alignment equipment.

The following procedure must be followed step by step, and do not proceed to the next step until sure that each response has been accurately obtained.

(1) Connect the sweep via input as in 3a to pin 2 of V5. Adjust the slugs in IFT3 (slug in position nearest the chassis) and L19 (slug in position farthest from chassis) to achieve a response as shown in Fig. 5A.

(2) Remove sweep from V5 pin 2 and connect through a terminating pad as in Fig. 3B to pin 2 of V4. Adjust the slugs of IFT2 (slug in position nearest chassis) and L17 to achieve the response shown in Fig. 5 B.

(3) Remove the sweep from V4 and connect, through the same terminating pad, to V3 pin 2. Adjust the response, with the slugs of IFT1 (slug nearest chassis) and L14 (slug farthest from chassis) to that shown in Fig. 5C..

(4) Remove the sweep from V3 and connect to the tuner through Test Point 1, using the same terminating pad. Adjust L10 (with slug nearest chassis) and L7 to produce final response as shown by Fig. 5D.

NOTE: The correct final response will be obtained only if each stage is accurately aligned. It may therefore be necessary to slightly readjust coils other than L11 and L7, on the final alignment, to produce the response shown in Fig. 5D, exactly.

(5) Insert slugs with retaining rubber, into L11, L12 and L15. Set L11 to 31.375 Mc/s., L12 to 29.875 Mc/s., and L15 to 38.375 Mc/s. (Fig. 5E).

(6) Check overall response and adjust if necessary. Also, check stability by removing the bias and adjusting the input accordingly. The response should remain substantially unchanged.

SOUND I.F. ALIGNMENT

The following equipment is necessary to carry out this precdure:

(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 DC V.T.V.M.

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

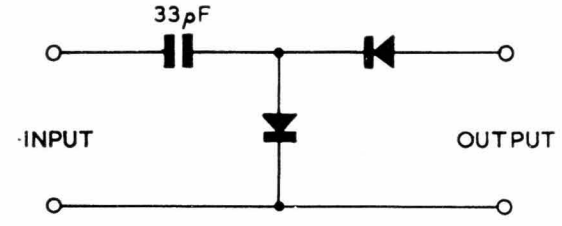


FIG 4: Peak-to-Peak Detector.

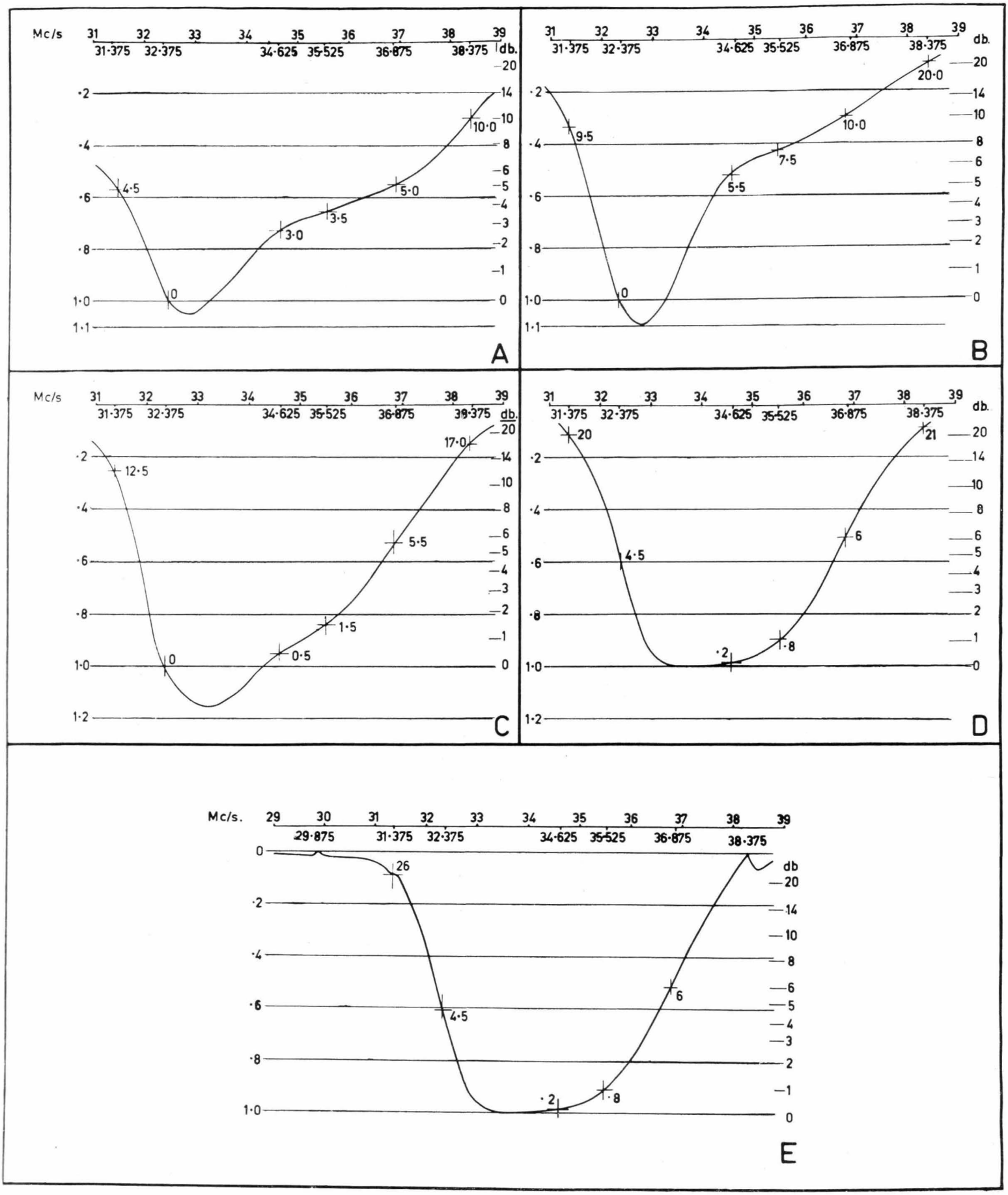

Mc/s
31 32 33 34 35 36 37 38 39
31·375 32·375 34·625 35·525 36·875 38·375
db.
20 14 10 8 6 5 4 3 2 1 0
·2 ·4 ·6 ·8 1·0 1·1
4·5 0 3·0 3·5 5·0 10·0
A
9·5 0 5·5 7·5 10·0 20·0
B
12·5 0 0·5 1·5 5·5 17·0
C
20 14·5 ·2 1·8 6 21
D
Mc/s.
29 30 31 32 33 34 35 36 37 38 39
29·875 31·375 32·375 34·625 35·525 36·875 38·375
db
0 ·2 ·4 ·6 ·8 1·0
26 4·5 ·2 ·8 6
E

FIG. 5.

5.5 Mc/s NULL TRAP (IFT4)

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

Should it be necessary to re-tune IFT4, the following procedure should be adopted:

(1) Inject 5.5 Mc/s. at approximately 100 mV between the junction L20 and L21 and earth (disconnecting the grid peaking choke, L20).

(2) Connect the input of the peak-to-peak detector illustrated to CRT cathode, pin 7. Connect the output of the peak-to-peak detector to a 20,000 ohm/volt meter on the 50 micro-amp range.

(3) Adjust primary core of IFT4 (nearest chassis) to give zero reading on meter. If IFT4 is replaced, it is necessary to adjust both cores to give a zero reading at 5.5 Mc/s.

(4) Withdraw both cores from former. Screw in primary core (nearest chassis) to give a minimum reading.

(5) Screw in secondary core until meter reading rises slightly and then adjust primary core until a new minimum is obtained.

(6) Repeat adjustment of primary and secondary cores until meter reads zero.

SOUND IF AMPLIFIER (IFT5)

With the oscillator connected as in (1) above and a VTVM connected across R70, adjust both primary and secondary cores in IFT5 for maximum response (Negative). This adjustment may be carried out using an "air" signal substituting for the oscillator.

RATIO DETECTOR TRANSFORMER (IFT6)

With the oscillator connected as above, adjust the secondary core (nearest chassis) so that a positive or negative reading is obtained on a DC VTVM connected between the junction of the diode load resistors and earth. Adjust the primary (top of coil) so that this reading shows a maximum. Then adjust the secondary core so that this reading is zero volts. This adjustment may also be carried out using an "air" signal as previously.

PICTURE TUBE REPLACEMENT

Chassis		*Replacement Tube Type*
PA	Bonded Face	23HP4, 23CRP4.
PB		23WP4, AW59-30, 23MP4-K, AW59-90, 23MP4-J.
PC	Bonded Face	23HP4 ,23CRP4.
PD) PE)		23WP4, AW59-30, AW59-90, 23MP4-K, 23MP4-J.

PARTS LIST ... MODELS PA, PB

RESISTORS

REF.	PART No.	DESCRIPTION
R13	740-0252	1.5K ohms ± 10% ½ W.
R14	740-0032	2.2K ohms ± 10% ½ W.
R15	740-0983	22 ohms ± 10% ½ W. Morganite
R16	740-0653	100 ohms ± 10% ½ W. Morganite
R17	742-0712	2.2K ohms ± 20% 1 W.
R18	740-0412	820 ohms ± 10% ½ W.
R19	740-0273	150 ohms ± 10% ½ W. Morganite
R20	742-0712	2.2K ohms ± 20% 1 W.
R21	740-0032	2.2K ohms ± 10% ½ W.
R22	740-0273	150 ohms ± 10% ½ W. Morganite
R23	742-1012	3.3K ohms ± 20% 1 W.
R24	742-1012	3.3K ohms ± 20% 1 W.
R25	740-0292	270 ohms ± 10% ½ W.
R25a	742-0992	300K ohms ± 5% 1 W
R26	740-1152	3K ohms ± 5% ½ W.
R27	740-0242	33K ohms ± 10% ½ W.
R28	740-0043	2.7K ohms ± 10% ½ W. Morganite
R29	740-0022	1K ohm ± 10% ½ W.
R30	750-0472	3.6K ohms ± 5% 4 W. Metox.
R31	740-0653	100 ohms ± 10% ½ W. Morganite
R32	742-0162	390K ohms ± 10% 1 W.
R32a	742-0132	220K ohms ± 10% 1 W.
R33a	742-0712	2.2K ohms ± 20% 1 W.
R34	740-0622	470K ohms ± 20% ½ W.
R35	740-0732	12K ohms ± 10% ½ W.
R36	740-0142	100K ohms ± 10% ½ W.
R37	750-0291	250 ohms ± 5% 5 W. Cemcoat
R38	749-0142	1K ohm ± 20% 2 W.
R39	749-0252	12K ohms ± 10% 2 W.
R40	740-0142	100K ohms ± 10% ½ W.
R41	740-0162	220K ohms ± 10% ½ W.
R42	740-0162	220K ohms ± 10% ½ W.
R43	740-0242	33K ohms ± 10% ½ W.
R44	740-0162	220K ohms ± 10% ½ W.
R45	740-0822	33K ohms ± 20% ½ W.
R46	740-0122	47K ohms ± 10% ½ W.
R47	740-0112	27K ohms ± 10% ½ W.
R48	742-0772	3.9M ohms ± 10% 1 W.
R49	740-0202	2.2M ohms ± 10% ½ W.
R50	742-0102	82K ohms ± 10% 1 W.
R51	749-0022	15K ohms ± 10% 2 W.
R51a	742-0052	22K ohms ± 10% 1 W.
R52	742-0202	1.5M ohms ± 10% 1 W.
R53	742-0772	3.9M ohms ± 10% 1 W.
R54	742-0772	3.9M ohms ± 10% 1 W.
R55	742-0892	2.2M ohms ± 10% 1 W.
R56	742-0772	3.9M ohms ± 10% 1 W.
R57	740-0502	15K ohms ± 20% ½ W.
R58	740-0782	120K ohms ± 10% ½ W.
R58a	740-0142	100K ohms ± 10% ½ W.
R59	740-0702	56K ohms ± 10% ½ W.
R59a	740-0222	180K ohms ± 10% ½ W.
R60	740-0782	120K ohms ± 10% ½ W.
R60a	749-0022	15K ohms ± 10% 2 W.
R61	740-0792	8.2K ohms ± 10% ½ W.
R62	740-0252	1.5K ohms ± 10% ½ W.
R63	740-0082	10K ohms ± 10% ½ W.
R64	740-0112	27K ohms ± 10% ½ W.
R65	740-0242	33K ohms ± 10% ½ W.
R66	740-0273	150 ohms ± 10% ½ W. Morganite
R67	740-0572	1K ohm ± 20% ½ W.
R68	740-0142	100K ohms ± 10% ½ W.
R69	740-0242	33K ohms ± 10% ½ W.
R70	740-0082	10K ohms ± 10% ½ W.
R71	749-0052	47K ohms ± 20% 2 W.
R71a	740-0062	3.9K ohms ± 10% ½ W.
R71b	740-0032	2.2K ohms ± 10% ½ W.
R72	740-0112	27K ohms ± 10% ½ W.
R73	740-0112	27K ohms ± 10% ½ W.
R74	740-0122	47K ohms ± 10% ½ W.
R75	740-0082	10K ohms ± 10% ½ W.
R76	740-0082	10K ohms ± 10% ½ W.
R77	740-0702	56K ohms ± 10% ½ W.
R77a	740-0152	150K ohms ± 10% ½ W.
R77b	740-0152	150K ohms ± 10% ½ W.
R78	740-0052	3.3K ohms ± 10% ½ W.
R78a	740-0292	270 ohms ± 10% ½ W.
R79	742-0132	220K ohms ± 10% 1 W.
R79a	740-0092	15K ohms ± 10% ½ W.
R80	740-1052	330K ohms ± 20% ½ W.
R81	740-1062	680K ohms ± 20% ½ W.
R82	740-0052	3.3K ohms ± 10% ½ W.
R83	750-0532	470 ohms ± 10% 5 W. PW5
R83a	740-0082	10K ohms ± 10% ½ W.
R84	740-0663	82 ohms ± 10% ½ W. Morganite
R85	742-0112	100K ohms ± 10% 1 W.
R86	740-0112	27K ohms ± 10% ½ W.
R87	740-0082	10K ohms ± 10% ½ W.
R88	740-0082	10K ohms ± 10% ½ W.
R89	740-0122	47K ohms ± 10% ½ W.
R89a	742-0172	470K ohms ± 10% 1 W.
R90	740-0082	10K ohms ± 10% ½ W.
R91	740-0082	10K ohms ± 10% ½ W.
R92	742-0022	4.7K ohms ± 10% 1 W.
R93	740-0232	39K ohms ± 10% ½ W.
R94	740-0202	2.2M ohms ± 10% ½ W.
R95	740-0582	47K ohms ± 20% ½ W.
R96	740-0302	1.8K ohms, ± 10% ½ W.
R97	750-0482	1K ohm ± 5% 4 W. Metox.
R98	742-0823	270 ohms ± 10% 1 W. Morganite
R99	740-1043	27 ohms ± 10% ½ W. Morganite
R100	740-1043	27 ohms ± 10% ½ W. Morganite
R101	740-0172	270K ohms ± 10% ½ W.
R102	740-0392	330K ohms ± 10% ½ W.
R103	740-0043	2.7K ohms ± 10% ½ W. Morganite
R104	740-0182	470K ohms ± 10% ½ W.
R105	740-0142	100K ohms ± 10% ½ W.
R106	740-0102	22K ohms ± 10% ½ W.
R107	742-0042	15K ohms ± 10% 1 W.
R108	742-0472	1.8K ohms ± 10% 1 W.
R109	740-0702	56K ohms ± 10% ½ W.
R110	740-0112	27K ohms ± 10% ½ W.
R111	742-0092	47K ohms ± 10% 1 W.
R112	742-0172	470K ohms ± 10% 1 W.
R113	740-0572	1K ohm ± 20% ½ W.
R114	750-0362	2.7K ohms ± 10% 5W. PW5
R115	746-0242	1 ohm ± 10% BW½ W/W
R116	742-0262	2.7K ohms ± 10% 1 W.
R117	742-0492	68K ohms ± 10% 1 W.
R118	742-0112	100K ohms ± 10% 1 W.
R119	Part of 908-0382	1.5 ohm Wire Resistor
R120	740-0492	1.5M ohm ± 20% ½ W.
R120a	740-0582	47K ohms ± 20% ½ W.
R120b	740-0653	100 ohms ± 10% ½ W. Morganite
R121	740-0022	1K ohm ± 10% ½ W.
R122	742-1043	220 ohms ± 10% 1 W. Morganite
R123	740-1062	680K ohms ± 20% ½ W.
R124	740-0542	150K ohms ± 20% ½ W.
R124a	740-0542	150K ohms ± 20% ½ W.
R125	740-1052	330K ohms ± 20% ½ W.
R126	740-0532	1M ohm ± 20% ½ W.
R127	742-0412	100K ohms ± 20% 1 W.
R128	740-0022	1K ohm ± 10% ½ W.
R129	742-0092	47K ohms ± 10% 1 W.
R130	750-0522	82 ohms ± 10% 5 W. PW5
R131	742-0342	330K ohms ± 20% 1 W.
R133	740-0252	1.5K ohms ± 10% ½ W.

CAPACITORS

REF.	PART No.	DESCRIPTION
C14	273-0591	68 pF. ± 2½% Mica
C15	271-0031	.0033 uF. + 100% - 0% 500V. Ceramic Disc
C16	271-0031	.0033 uF. + 100% - 0% 500V. Ceramic Disc
C17	271-0031	.0033 uF. + 100% - 0% 500V. Ceramic Disc
C18	271-0031	.0033 uF. + 100% - 0% 500V. Ceramic Disc
C19	271-0031	.0033 uF. + 100% - 0% 500V. Ceramic Disc
C20	273-0591	68 pF. ± 2½% Mica
C21	271-0591	.0027 uF. ± 20% K2000 Style Ceramic Disc
C22	271-0031	.0033 uF. + 100% - 0% 500V. Ceramic Disc
C23	271-0031	.0033 uF. + 100% - 0% 500V. Ceramic Disc
C24	271-0591	.0027 uF. ± 20% K2000 Style Ceramic Disc
C25	273-0591	68 pF. ± 2½% Mica
C26	271-0031	.0033 uF. + 100% - 0% 500V. Ceramic Disc
C27	271-0031	.0033 uF. + 100% - 0% 500V. Ceramic Disc
C28	271-0031	.0033 uF. + 100% - 0% 500V. Ceramic Disc
C29	271-0591	.0027 uF. ± 20% K2000 Style Ceramic Disc
C30	271-0621	.001 uF. Feed Thru Ducon CAC100
C31	271-0471	6.8 pF. ± ¼ pF. Disc. NPO. Ceramic
C32	271-0131	8.2 pF. ± ¾ pF. Disc. NPO. Ceramic
C33	271-0181	15 pF. ± ½ pF. Tube. NPO. Ceramic
C34	271-0691	3.9 pF. ± ¼pF. Disc. NPO. Ceramic
C35	271-0311	27 pF. ± 5% Tube. NPO. Ceramic
C36a	269-0771	2 uF. 300 VW ETIX Electrolytic
C37	279-4701	.047 uF. ± 10% 400 VW Paper

PARTS LIST ... MODELS PA, PB

CAPACITORS — *continued*

REF.	PART No.	DESCRIPTION
C38	282-0541	.0022 uF. ± 10% 400V. Polyester
C39	282-0661	.022 uF. ± 10% 400V. Polyester
C40	269-0521	100 uF. 150 VW Insulated Electro type EMG1014 SFE
C41	269-0521	100 uF. 150 VW. Insulated Electro type EMG1014 SFE
C42)		80 uF. (40 uF. + 80 uF. 300 VW
)	269-0511	(Electrolytic
C43)		40 uF. (Type EMG4830 Ducon
C44	269-0611	4 uF. 300 VW Electro type ET2D
C45	279-4661	.022 uF. ± 10% 400 VW. Paper
C46	280-1791	220 pF. ± 10% 600V. Styroseal
C47	273-0921	68 pF. ± 10% M.S. Mica
C48	279-1741	.1 uF. ± 20% 400 VW. Paper
C49	279-1161	.22 uF. ± 20% 200 VW. Paper
C50	279-0281	1 uF. ± 25% 200V. Metallised Paper
C51	271-0231	68 pF. ± 10% 3 KV N750. Ceramic Disc
C51a	271-0031	.0033 uF. + 100% - 0% 500V. Ceramic Disc
C52	279-1161	.22 uF. ± 20% 200 VW. Paper
C53	271-0701	1 pF. ± ¾ pF. Ceramic Bead NPO
C54	282-0541	.0022 uF. ± 10% 400V. Polyester
C55	271-0031	.0033 uF. + 100% - 0% 500V. Ceramic Disc
C55a	282-0541	.0022 uF. ± 10% 400V. Polyester
C56	279-1621	.01 uF. ± 20% 400 VW. Paper
C57	271-0681	12 pF. ± 5% Ceramic Disc. NPO Part of 906-0382.
C58	271-0681	12 pF. ± 5% Ceramic Disc. NPO Part of 906-0382.
C59	271-0471	6.8 pF. ± ¾ pF. Ceramic Disc NPO.
C59a	271-0031	.0033 uF. + 100% - 0% 500V. Ceramic Disc
C60	282-0531	.0018 uF. ± 10% 400V. Polyester
C61a	271-0501	470 pF. ± 10% 3KVW Ceramic Disc
C61	271-0801	10 pF. ± 5% Ceramic Disc NPO.
C62	271-0771	100 pF. ± 5% Ceramic Disc NPO.
C63	280-1501	100 pF. ± 5% 600V. Styroseal
C64	280-1501	100 pF. ± 5% 600V. Styroseal C61-4: All part of 906-0323
C65	282-0501	.001 uF. ± 10% 400V. Polyester
C66	269-0781	4 uF. 25 VW. Electrolytic Type ET1X
C67	282-0581	.0047 uF. ± 10% 400V. Polyester
C68	280-1841	560 pF. ± 10% 600V. Styroseal
C69	279-4001	.01 uF. ± 10% 200 VW. Paper
C69a	269-0701	10 uF. 12 VW. Electrolytic type ES1203
C69b	269-0611	4 uF. 300 VW. Electrolytic type ET2D.
C70	279-1641	.015 uF ± 20% 400 VW. Paper
C71	271-0181	15 pF. ± ½ pF. Ceramic Tube NPO.
C72	269-0061	16 uF. 300 VW. Electro type ET4D.
C72a	282-0321	.47 uF. ± 10% 125 VW. Polyester
C73	269-0221	25 uF. 25 VW. Electro type ET1B.
C74	279-1661	.022 uF. ± 20% 400 VW. Paper
C75	279-1701	.047 uF. ± 20% 400 VW. Paper
C76	282-0541	.0022 uF. ± 10% 400V. Polyester
C77	279-0281	1 uF. ± 25% 200 VW. Metallised Paper
C78	282-0541	.0022 uF. ± 10% 400V. Polyester
C79	282-0541	.0022 uF. ± 10% 400V. Polyester
C80	282-0721	.068 uF. ± 10% 400V. Polyester
C81	279-4621	.01 uF. ± 10% 400V. Paper
C82	269-0481	24 uF. + 24 uF. 350 VW. Electro type EDT6G
C83	279-4161	.22 uF. ± 10% 200 VW. Paper
C84		Part of 269-0481 with C82
C85	269-0361	100 uF. 25 VW Electrolytic Type ESK
C86	273-1051	82 pF. ± 10% M.S. Mica
C87	273-1031	47 pF. ± 1 pF. Mica
C88	282-0521	.0015 uF. ± 10% 400V. Polyester
C89	282-0501	.001 uF. ± 10% 400V. Polyester
C90	282-0581	.0047 uF. ± 10% 400V. Polyester
C91	280-1751	100 pF. ± 10% 600V. Styroseal
C92	279-0561	.5 uF. ± 25% 200 VW. Metallised Paper
C93	282-0561	.0033 uF. ± 10% 400V. Polyester
C94	280-1851	680 pF. ± 10% 600V. Styroseal
C95	271-0481	82 pF. ± 5% Ceramic Tube NPO.
C96	280-1781	180 pF. ± 10% 600V. Styroseal
C97	279-1581	.0047 uF. ± 20% 400VW. Paper
C98		Part of 908-0382 — 82 pF.
C99	279-2161	.022 uF ± 20% 600 VW. Paper
C100		Part of 908-0382—150 pF. if required
C101	279-5771	.22 uF. ± 10% 1000 VW. Paper
C102	279-5771	.22 uF. ± 10% 1000 VW. Paper
C103	279-5701	.047 uF. ± 10% 1000 VW. Paper
C104	279-4161	.22 uF. ± 10% 200 VW. Paper
C104a	271-0781	.035 uF. 2KVW Ceramic Double Disc
C105	269-0761	25 uF. 50 VW. Electro U.C.C. Type EFB20
C106	279-1081	.047 uF. ± 20% 200 VW. Paper
C106a	279-1081	.047 uF. ± 20% 200 VW. Paper
C107	279-1741	.1 uF. ± 20% 400 VW. Paper
C108	279-1741	.1 uF. ± 20% 400 VW. Paper
C109	269-0691	100 uF. 12 VW. Electrolytic Ducon Type ES1209.

COILS

REF.	PART No.	DESCRIPTION
L9	259-0672	Coil, Tuner Coupling Trim
L10)	259-0941	Coil, 1st I.F. Grid and 31.375
L11)		Mc/s Trap
L12		Part of 906-0232 — 29.875 Mc/s Trap (on IFT1)
L13	259-0672	Coil, 1st I.F. Coupling
L14	259-1061	Coil, 2nd I.F. Grid
L15		Part of 906-0281 — 38.375 Mc/s Trap (on IFT2)
L16	259-0672	Coil, 2nd I.F. Coupling
L17	259-1061	Coil, 3rd I.F. Grid
L18	259-0672	Coil, 3rd I.F. Coupling
L19	259-0931	Coil, Detector Input
L20	259-0954	Coil, Grid Peaking Choke
L21	259-0954	Coil, Grid Peaking Choke
L22	259-1082	Coil, Peaking—Shunt
L23	259-1092	Coil, Peaking—Series
L25	259-0993	Coil, Horizontal Stabiliser
L26	259-0044	Coil, Anti-Parasitic
L27	259-0903	Coil, Width
L28	259-0044	Coil, Anti-Parasitic
L29	259-0044	Coil, Anti-Parasitic
L30	259-0923	Coil, Horizontal Linearity

POTENTIOMETERS

REF.	PART No.	DESCRIPTION
RV1	677-0641	500K ohms Curve A, Type Q — Brightness
RV2	677-0171	25K Curve A, Type EC — Noise Inverter
RV3	677-0911	1M Curve A, Type EC—A.G.C.
RV4	677-0601	25K Curve A, Type Q—Contrast
RV5	677-0611	50K Curve C, Type EC—Contrast Range
RV6	677-1001	1M Reversed C, Type PTU—Tone
RV7	677-0621	1M Tapped 500K, Curve A with DPPP—Switch, Volume
RV8	677-0921	50K Curve A, Type EC—Height
RV9	677-0641	500K Curve A, Type Q—Vertical Hold
RV10	677-0511	10K Curve A, Type EC—Vertical Linearity
RV11	677-0631	50K Curve A, Type PTU—Horizontal Hold
RV12	677-0891	2 Megohm ± 20% Focus
RV13	677-0971	1.5K Curve F—Hearing Aid Volume
R14	677-0981	250K Curve A—Remote Contrast
RV15	677-1011	250K Curve G—Remote Volume

PARTS LIST ... MODELS PA, PB

TRANSFORMERS

REF.	PART No.	DESCRIPTION	REF.	PART No.	DESCRIPTION
IFT1	906-0232	Vision IFT	T3	908-0321	Blocking Oscillator Transformer
IFT2	906-0281	Vision IFT	T4	905-0226	Vertical Output Transformer
IFT3	906-0252	Vision IFT	T5	908-0352	Vertical Feedback Transformer
IFT4	906-0263	Vision IFT	T6	908-0382	Horizontal Output Transformer
IFT5	906-0382	Sound IFT	T7	908-0393	Focus Transformer
IFT6	906-0323	Ratio Discriminator Transformer	T8	904-0331	Power Supply Transformer
T1	904-0254	Mains Transformer	T9	908-0571	Indexing Transformer
T2	905-0462	Audio Output Transformer	T10	908-0571	Indexing Transformer

VALVES

REF.	PART No.	DESCRIPTION	REF.	PART No.	DESCRIPTION
V1	932-1161	6ES8 — R.F. Amplifier	V10	932-1771	6GW8 — Audio Driver and Output
V2	932-0501	6BL8 — Frequency Changer	V11	932-0511	6BM8 — Blocking Oscillator and Vertical Output
V3	932-1211	6EH7 — 1st I.F. Amplifier			
V4	932-1221	6EJ7 — 2nd I.F. Amplifier	V12	932-0481	12AU7 — Horizontal Multivibrator
V5	932-1221	6EJ7 — 3rd I.F. Amplifier	V13	932-0531	6CM5 — Horizontal Output
V6	932-1081	6DX8 — Video Amplifier and Noise Inverter	V14	932-0771	1S2 — EHT Rectifier
			V15	932-1151	6AL3 — Damping Diode
V7	932-1091	6CS6 — Sync. Separator	V16	932-0501	6BL8 — Remote Control
V8	932-1101	6U8—Sound IF Amplifier and AGC	PLP	932-1791	12V. 2W. Lamp, Philips, 12829
V9	932-0441	6AU6 — Limiter			

DIODES

REF.	PART No.	DESCRIPTION	REF.	PART No.	DESCRIPTION
MR1	932-1541	Diode OA80	MR9	932-0791	Diode OA81
MR2	932-1071)	Diode OA210, IN1763 or IN2094	MR10)		
MR3	932-1071)		MR11)		
MR4	932-0991	Diode M3	)	932-1811	Rectifier, STC Type B420-1-1.
MR5)	932-0601	Diodes 2OA79	MR12)		
MR6)			MR13)		
MR7	932-0791	Diode OA81	MR14	932-1801	Diode, Type Q3/3.
MR8	932-0791	Diode OA81			

MISCELLANEOUS

REF.	PART No.	DESCRIPTION	REF.	PART No.	DESCRIPTION
ON MAIN CHASSIS:				855-0481	Switch—crank-operated
CH1	232-0124	Choke 300 mA.		954-0261	Geneva wheel assembly
RT1	752-0061	Thermistor CZ11		244-0771	Circlip, SCO1960/17/0, Geneva wheel retaining
VDR1	750-0281	Voltage Dependent Resistor, Type E298GD/A260 (Blue Spot)		855-0461	1-pole 13-position switch wafer—Indexing switch
FS1	431-0071	Fuse, 1 amp.		855-0501	1-pole 13-position switch wafer—Aerial selector
FS2	431-0081	Fuse, 1.5 amp.		664-1741	Front bearing plate assembly
FS3	431-0031	Fuse, 250 mA.		306-0131	Tuner coupling—driving
RLA	735-0012	Relay STC BPO3000, 6000 ohms, 5-pole, normally open		306-0121	Tuner coupling—driven
				263-0061	Collar—driven tuner coupling
RLB	735-0002	Relay, STC BPO3000, 250 ohms, 2-pole, normally open	**ON REMOTE CONTROL HANDPIECE:**		
				190-2501	Cabinet Back
	294-0961	Relay Cover		244-0491	Circlip, ASCO/8169/17/0
Yoke	259-1051	Yoke for PA and PB		814-0961	Captive 4BA Screw. Held by 244-0491
CRT	932-1591	23HP4) PA			
	932-1591	23CRP4)		190-2491	Cabinet Front
	932-1261	23WP4)		794-1301	Scale—Channel Indicator
	932-1261	23MP4-K)		664-1701	Plate—Scale Backing
	932-1261	AW59-30) PB		372-0181	Disc—Channel Indicator
	932-1621	AW59-90)		517-1631	Knob—Pre-selector
	932-1621	23MP4-J)		840-0731	Spring—Pre-selector Knob
ON PRE-SET BRACKET ASSEMBLY:				517-1641	Knob—Channel Selector
Remote Control Socket Components				517-1891	Knob
	291-0181	Tags, Carr Fastener, 556-1-22		794-1261	Scale—Hearing Aid Volume
	498-1221	Centre Wafer, 690-15-23		794-1271	Scale—Picture
	498-1231	Bottom Wafer, 690-15-24		794-1281	Scale—Volume
	498-1641	Top Wafer		453-1291	Speaker Grille
	820-1341	Shield ST49—9-pin valve socket, skirt only		661-0231	Grille Backing Strip
				831-1391	Speaker, 2-inch MSP, Type 2HB, 15 ohms.
	855-0471	DPST leaf switch.		757-0181	Speaker Mounting Rubber Ring
ON TUNER CHASSIS:				824-0841	Hearing Aid Socket
	577-0091	Motor, 240V.		831-1331	Hearing Aid Earpiece, 15 ohms, with lead and plug
	306-0111	Clutch—driving dog		855-0441	Switch, ON-OFF, MSP.77
	306-0101	Clutch—driven dog		855-0441	Switch, Internal/External Speaker, MSP77
	837-0531	Spindle—driven dog and pinion mounting		855-0451	Switch, Channel Selector — Oak CK14
	447-0051	Pinion		852-0221	Handset Support
	664-1731	Rear bearing plate assembly		770-0361	Anti-Skid Rubber Balls
		Plate plus bearing plus driven dog plus spindle plus pinion above		961-0761	25ft. 9-Core Beige Cable
				826-0001	Sleeve
	447-0061	Idler gear		668-0581	Plug—9-pin, XLM9/UTPI
	447-0071	Crank driving gear		294-0971	Cover—9-pin plug, 10B
	654-0621	Crank with pin			
	263-0051	Crank pin collar			
	244-0811	Circlip, SCO1916, crankpin collar retaining			

PARTS LIST ... MODELS PC, PD, PE

RESISTORS

REF.	PART No.	DESCRIPTION
R13	740-0252	1.5K ohms ± 10% ½ W
R14	740-0032	2.2K ohms ± 10% ½ W.
R15	740-0983	22 ohms ± 10% ½ W. Morganite
R16	740-0653	100 ohms ± 10% ½ W. Morganite
R17	742-0712	2.2K ohms ± 20% 1 W.
R18	740-0412	820 ohms ± 10% ½ W.
R19	740-0273	150 ohms ± 10% ½ W. Morganite
R20	742-0712	2.2K ohms ± 20% 1 W.
R21	740-0032	2.2K ohms ± 10% ½ W.
R22	740-0273	150 ohms ± 10% ½ W. Morganite
R23	742-1012	3.3K ohms ± 20% 1 W.
R24	742-1012	3.3K ohms ± 20% 1 W.
R25	740-0292	270 ohms ± 10% ½ W.
R25a	742-0992	300K ohms ± 5% 1 W.
R26	740-1152	3K ohms ± 5% ½ W.
R27	740-0242	33K ohms ± 10% ½ W.
R28	740-0043	2.7K ohms ± 10% ½ W. Morganite
R29	740-0022	1K ohm ± 10% ½ W.
R30	750-0472	3.6K ohms ± 5% 4 W. Metox
R31	740-0653	100 ohms ± 10% ½ W. Morganite
R32	742-0162	390K ohms ± 10% 1 W.
R33	740-0122	47K ohms ± 10% ½ W.
R34	740-0622	470K ohms ± 20% ½ W.
R35	740-0732	12K ohms ± 10% ½ W.
R36	740-0142	100K ohms ± 10% ½ W.
R37	750-0291	250 ohms ± 5% 5 W. Cemcoat
R38	749-0142	1K ohm ± 20% 2 W.
R39	749-0252	12K ohms ± 10% 2 W.
R40	740-0142	100K ohms ± 10% ½ W.
R41	740-0162	220K ohms ± 10% ½ W.
R42	740-0162	220K ohms ± 10% ½ W.
R43	740-0242	33K ohms ± 10% ½ W.
R44	740-0162	220K ohms ± 10% ½ W.
R45	740-0822	33K ohms ± 20% ½ W.
R46	740-0122	47K ohms ± 10% ½ W.
R47	740-0112	27K ohms ± 10% ½ W.
R48	742-0772	3.9M ohms ± 10% 1 W.
R49	740-0202	2.2M ohms ± 10% ½ W.
R50	742-0102	82K ohms ± 10% 1 W.
R51	749-0022	15K ohms ± 10% 2 W.
R51a	742-0052	22K ohms ± 10% 1 W.
R52	742-0202	1.5M ohms ± 10% 1 W.
R53	742-0772	3.9M ohms ± 10% 1 W.
R54	742-0772	3.9M ohms ± 10% 1 W.
R55	742-0892	2.2M ohms ± 10% 1 W.
R56	742-0772	3.9M ohms ± 10% 1 W.
R57	740-0502	15K ohms ± 20% ½ W.
R58	740-0782	120K ohms ± 10% ½ W.
R59	740-0702	56K ohms ± 10% ½ W.
R60	740-0782	120K ohms ± 10% ½ W.
R61	749-0182	22K ohms ± 10% 2 W.
R62	740-0252	1.5K ohms ± 10% ½ W.
R63	740-0082	10K ohms ± 10% ½ W.
R64	740-0112	27K ohms ± 10% ½ W.
R65	740-0242	33K ohms ± 10% ½ W.
R66	740-0273	150 ohms ± 10% ½ W. Morganite
R67	740-0572	1K ohm ± 20% ½ W.
R68	740-0142	100K ohms ± 10% ½ W.
R69	740-0242	33K ohms ± 10% ½ W.
R70	740-0082	10K ohms ± 10% ½ W.
R71	749-0052	47K ohms ± 10% 1 W.
R72	740-0112	27K ohms ± 10% ½ W.
R73	740-0112	27K ohms ± 10% ½ W.
R74	740-0122	47K ohms ± 10% ½ W.
R75	740-0082	10K ohms ± 10% ½ W.
R76	740-0082	10K ohms ± 10% ½ W.
R77	740-0702	56K ohms ± 10% ½ W.
R78	740-0052	3.3K ohms ± 10% ½ W.
R79	742-0132	220K ohms ± 10% 1 W.
R80	740-1052	330K ohms ± 20% ½ W.
R81	740-1062	680K ohms ± 20% ½ W.
R82	740-0862	18K ohms ± 10% ½ W.
R83	750-0332	680 ohms ± 10% 5 W. PW5
R84	740-0663	82 ohms ± 10% ½ W. Morganite
R85	742-0112	100K ohms ± 10% 1 W.
R86	740-0112	27K ohms ± 10% ½ W.
R87	740-0082	10K ohms ± 10% ½ W.
R88	740-0082	10K ohms ± 10% ½ W.
R89	740-0122	47K ohms ± 10% ½ W.
R89a	742-0172	470K ohms ± 10% 1 W.
R90	740-0082	10K ohms ± 10% ½ W.
R91	740-0082	10K ohms ± 10% ½ W.
R92	742-0022	4.7K ohms ± 10% 1 W.
R93	740-0232	39K ohms ± 10% ½ W.
R94	740-0202	2.2M ohms ± 10% ½ W.
R95	740-0582	47K ohms ± 20% ½ W.
R96	740-0302	1.8K ohms ± 10% ½ W.
R97	750-0482	1K ohm ± 5% 4 W. Metox
R98	742-0823	270 ohms ± 10% 1 W. Morganite
R99	740-1043	27 ohms ± 10% ½ W. Morganite
R100	740-1043	27 ohms ± 10% ½ W. Morganite
R101	740-0172	270K ohms ± 10% ½ W.
R102	740-0392	330K ohms ± 10% ½ W.
R103	740-0043	2.7K ohms ± 10% ½ W. Morganite
R104	740-0182	470K ohms ± 10% ½ W.
R105	740-0142	100K ohms ± 10%, ½ W.
R106	740-0102	22K ohms ± 10% ½ W.
R107	742-0042	15K ohms ± 10% 1 W.
R108	742-0472	1.8K ohms ± 10% 1 W.
R109	740-0702	56K ohms ± 10% ½ W.
R110	740-0112	27K ohms ± 10% ½ W.
R111	742-0092	47K ohms ± 10% 1 W.
R112	742-0172	470K ohms ± 10% 1 W.
R113	740-0572	1K ohm ± 20% ½ W.
R114	750-0362	2.7K ohms ± 10% 5 W., PW5.
R115	746-0242	1 ohm ± 10% BW½, W/W
R116	742-0012	1.2K ohms ± 10% 1 W.
R117	742-0492	68K ohms ± 10% 1 W.
R118	742-0112	100K ohms ± 10% 1 W.
R119	Part of 908-0561	1.5 ohm Wire Resistor
R120	740-0491	1.5M ohm ± 20% ½ W.

CAPACITORS

REF.	PART No.	DESCRIPTION
C14	273-0591	68 pF. ± 2½% Mica
C15	271-0031	.0033 uF. + 100% - 0% 500V. Ceramic Disc
C16	271-0031	.0033 uF. + 100% - 0% 500V. Ceramic Disc
C17	271-0031	.0033 uF. + 100% - 0% 500V. Ceramic Disc
C18	271-0031	.0033 uF. + 100% - 0% 500V. Ceramic Disc
C19	271-0031	.0033 uF. + 100% - 0% 500V. Ceramic Disc
C20	273-0591	68 pF. ± 2½% Mica
C21	271-0591	.0027 uF. 20% K 2000 Style Ceramic Disc
C22	271-0031	.0033 uF. + 100% - 0% 500V. Ceramic Disc
C23	271-0031	.0033 uF. + 100% - 0% 500V. Ceramic Disc
C24	271-0591	.0027 uF. 20% K 2000 Style Ceramic Disc
C25	273-0591	68 pF. ± 2½% Mica
C26	271-0031	.0033 uF. + 100% - 0% 500V. Ceramic Disc
C27	271-0031	.0033 uF. + 100% - 0% 500V. Ceramic Disc
C28	271-0031	.0033 uF. + 100% - 0% 500V. Ceramic Disc
C29	271-0591	.0027 uF. 20% K 2000 Style Ceramic Disc
C30	271-0621	.001 uF. Feed Thru Ducon CAC 100
C31	271-0471	6.8 pF ± ½ pF. Disc NPO Ceramic
C32	271-0131	8.2 pF. ± ¼ pF. Tube NPO Ceramic
C33	271-0181	15 pF. ± ½ pF. Tube NPO Ceramic
C34	271-0691	3.9 pF. ± ¼ pF. Disc NPO Ceramic
C35	271-0311	27 pF. ± 5% Tube NPO Ceramic
C36	269-0211	8 uF. 300 V.W. Electro Type ET2D
C37	279-4701	.047 uF ± 10% 400 V.W. Paper
C38	282-0541	.0022 uF. ± 10% 400V. Poyester
C39	282-0661	.022 uF. ± 10% 400V. Polyester
C40	269-0521	100 uF. 150 V.W. Insulated Electro Type EMG1014 SFE
C41	269-0521	100 uF. 150 V.W. Insulated Electro Type EMG1014 SFE
C42) C43)	269-0511	80 uF. (40 uF. + 80 uF. 300 VW (Electrolytic 40 uF. (Type EMG4830 Ducon
C44	269-0611	4 uF. 300 V.W. Electrolytic Type ET2D
C45	279-4661	.022 uF. ± 10% 400 V.W. Paper
C46	280-1791	220 pF. ± 10% 600V. Styroseal
C47	273-0921	68 pF. ± 10% MS Mica
C48	279-1741	.1 uF. ± 20% 400 V.W. Paper
C49	279-1161	.22 uF ± 20% 200 V.W. Paper
C50	279-0281	1 uF. ± 25% 200V. Metallised Paper
C51	271-0231	68 pF. ± 10% 3KV N750 Ceramic Disc
C52	279-1161	.22 uF ± 20% 200 V.W. Paper
C53-	271-0701	1 pF. ± ¼ pF. Ceramic Bead NPO
C54	282-0541	.0022 uF ± 10% 400V. Polyester
C55	271-0031	.0033 uF. + 100% - 0% 500V. Ceramic Disc
C55a	282-0541	.0022 uF ± 10% 400V. Polyester
C56	279-1621	.01 uF. ± 20% 400 V.W. Paper
C57	271-0681	12 pF. ± 5% Ceramic Disc NPO (Part of 906-0382)
C58	271-0681	12 pF. ± 5% Ceramic Disc NPO (Part of 906-0382)

PARTS LIST ... MODELS PC, PD, PE

CAPACITORS — *continued*

REF.	PART No.	DESCRIPTION
C59	271-0471	6.8 pF. ± ¼ pF. Ceramic Disc NPO
C60	282-0531	.0018 uF. ± 10% 400V. Polyester
C61	271-0801	10 pF. ± 5% Ceramic Disc NPO (Part of 906-0323)
C62	271-0771	100 pF. ± 5% Ceramic Disc NPO (Part of 906-0323)
C63	280-1501	100 pF. ± 5% 600 V. Styroseal (Part of 906-0323)
C64	280-1501	100 pF. ± 5% 600 V. Styroseal (Part of 906-0323)
C65	280-1851	680 pF. ± 10% 600V. Styroseal
C66	269-0371	10 uF. 25 V.W. Electrolytic Type ET1X.
C67	279-4001	.01 uF. ± 10% 200 V.W. Paper
C68	280-1791	220 pF. ± 10% 600V. Styroseal
C69	279-4001	.01 uF. ± 10% 200 V.W. Paper
C70	279-1641	.015 uF. ± 20% 400 V.W. Paper
C71	271-0181	15 pF ± ½ pF. Ceramic Tube NPO
C72	269-0061	16 uF. 300 V.W. Electro Type ET4D
C73	269-0221	25 uF. 25 V.W. Electro Type ET1B.
C74	279-1661	.022 uF. ± 20% 400 V.W. Paper
C75	279-1701	.047 uF ± 20% 400 V.W. Paper
C76	282-0541	.0022 uF. ± 10% 400V. Polyester
C77	279-0281	1 uF. ± 25% 200 VW. Metallised Paper
C78	282-0541	.0022 uF. ± 10% 400V. Polyester
C79	282-0541	.0022 uF. ± 10% 400V. Polyester
C80	282-0721	.068 uF. ± 10% 400V. Polyester
C81	279-4621	.01 uF. ± 10% 400V. Paper
C82	269-0481	24 uF. + 24 uF 350 V.W. Electro Type EDTG
C83	279-4161	.22 uF. ± 10% 200V. Paper
C84		Part of 269-0481 with C82.
C85	269-0361	100 uF. 25 V.W. Electrolytic Type ESK
C86	273-1051	82 pF. ± 10% MS Mica
C87	273-1031	47 pF. ± 1 pF. Mica
C88	282-0521	.0015 uF. ± 10% 400V. Polyester
C89	282-0501	.001 uF ± 10% 400V. Polyester
C90	282-0581	.0047 uF. ± 10% 400V. Polyester
C91	280-1751	100 pF. ± 10% 600V. Styroseal
C92	279-0561	.5 uF. ± 25% 200 VW. Metallised Paper
C93	282-0561	.0033 uF. ± 10% 400V. Polyester
C94	280-1851	680 pF. ± 10% 600V. Styroseal
C95	271-0481	82 pF. ± 5% Ceramic Tube NPO
C96	280-1781	180 pF. ± 10% 600V. Styrseal
C97	279-1581	.0047 uF. ± 20% 400 V.W. Paper
C98		Part of 908-0561—82 pF. Ceramic Tube
C99	279-2161	.022 uF. ± 20% 600 V.W. Paper
C100		Part of 908-0561—270 pF. Ceramic Tube
C101	279-5771	.22 uF. ± 10% 1000 VW. Paper
C102	279-5771	.22 uF. ± 10% 1000 VW. Paper
C103	279-5701	.047 uF. ± 10% 1000 V.W. Paper
C104	279-4131	.12 uF. ± 10% 200 V.W. Paper

COILS

REF.	PART No.	DESCRIPTION
L9	259-0672	Tuner Coupling Trimmer Coil
L10)		1st I.F. Grid Coil and 31.375 Mc/s
)	259-0941	Trap
L11)		
L12		Part of 906-0232 — 29.875 Mc/s Trap (On IFT1)
L13	259-0672	1st I.F. Coupling Coil
L14	259-1061	2nd I.F. Grid Coil
L15		Part of 906-0281 — 38.375 Mc/s Trap (On IFT2)
L16	259-0672	2nd I.F. Coupling Coil
L17	259-1061	3rd I.F. Grid Coil
L18	259-0672	3rd I.F. Coupling Coil
L19	259-0931	Detector Input Coil
L20	259-0954	Grid Peaking Choke
L21	259-0954	Grid Peaking Choke
L22	259-1082	Peaking Coil—Shunt
L23	259-1092	Peaking Coil—Series
L25	259-0993	Horizontal Stabiliser Coil
L26	259-0044	Anti-Parasitic Coil
L27	259-0903	Width Coil
L28	259-0044	Anti-Parasitic Coil
L29	259-0044	Anti-Parasitic Coil
L30	259-0923	Horizontal Linearity Coil

POTENTIOMETERS

REF.	PART No.	DESCRIPTION
RV1	677-0641	500K ohms Curve A Type Q — Brightness
RV2	677-0171	25K ohms Curve A Type EC — Noise Inverter
RV3	677-0911	1M ohms Curve A Type EC — AGC
RV4	677-0601	25K ohms Curve A Type Q — Contrast
RV5	677-0611	50K ohms Curve C Type EC — Contrast Range
RV6	677-0801	250K ohms Curve A Type PTU — Tone
RV7	677-0621	1M ohm Tapped 500K Curve A with DPPP—Swith. Volume
RV8	677-0921	50K ohms Curve A Type EC — Height
RV9	677-0641	500K ohms Curve A Type Q — Vertical Hold
RV10	677-0511	10K ohms Curve A Type EC — Vertical Linearity
RV11	677-0631	50K ohms Curve A Type PTU — Horizontal Hold
RV12	677-0891	2 Megohm ± 20% — Focus

TRANSFORMERS

REF.	PART No.	DESCRIPTION
IFT1	906-0232	Vision I.F.T.
IFT2	906-0281	Vision I.F.T.
IFT3	906-0252	Vision I.F.T.
IFT4	906-0263	Vision I.F.T.
IFT5	906-0382	Sound I.F.T.
IFT6	906-0323	Ratio Discriminator Transformer
T1	904-0254	Mains Transformer
T2	905-0462	Audio Output Transformer
T3	908-0321	Blocking Oscillator Transformer
T4	905-0226	Vertical Output Transformer
T5	908-0355	Vertical Feedback Transformer
T6	908-0561	Horizontal Output Transformer, MSP 43211. See Note *
T7	908-0393	Focus Transformer

VALVES

REF.	PART No.	DESCRIPTION
V1	932-1161	6ES8 — R.F. Amplifier
V2	932-0501	6BL8 — Frequency Changer
V3	932-1211	6EH7 — 1st I.F. Amplifier
V4	932-1221	6EJ7 — 2nd I.F. Amplifier
V5	932-1221	6EJ7 — 3rd I.F. Amplifier
V6	932-1081	6DX8 — Video Amplifier and Noise Inverter
V7	932-1091	6CS6 — Sync. Separator
V8	932-1101	6U8—Sound I.F. Amplifier and AGC
V9	932-0441	6AU6 — Limiter
V10	932-1771	6GW8 — Audio Driver and Audio Output
V11	932-0511	6BM8 — Blocking Oscillator and Vertical Output
V12	932-4811	12AU7 — Horizontal Multivibrator
V13	932-0531	6CM5 — Horizontal Output
V14	932-0771	1S2 — E.H.T. Rectifier
V15	932-1151	6AL3 — Damping Diode

PARTS LIST ... MODELS PC, PD, PE

DIODES

REF.	PART No.	DESCRIPTION	REF.	PART No.	DESCRIPTION
MR1	932-1541	0A80	MR5)	932-0601	20A79
MR2	932-1071)	0A210, 1N1763 or 1N2094	MR6)		
MR3	932-1071)		MR7	932-0791	0A81
MR4	932-0991	M3	MR8	932-0791	0A81

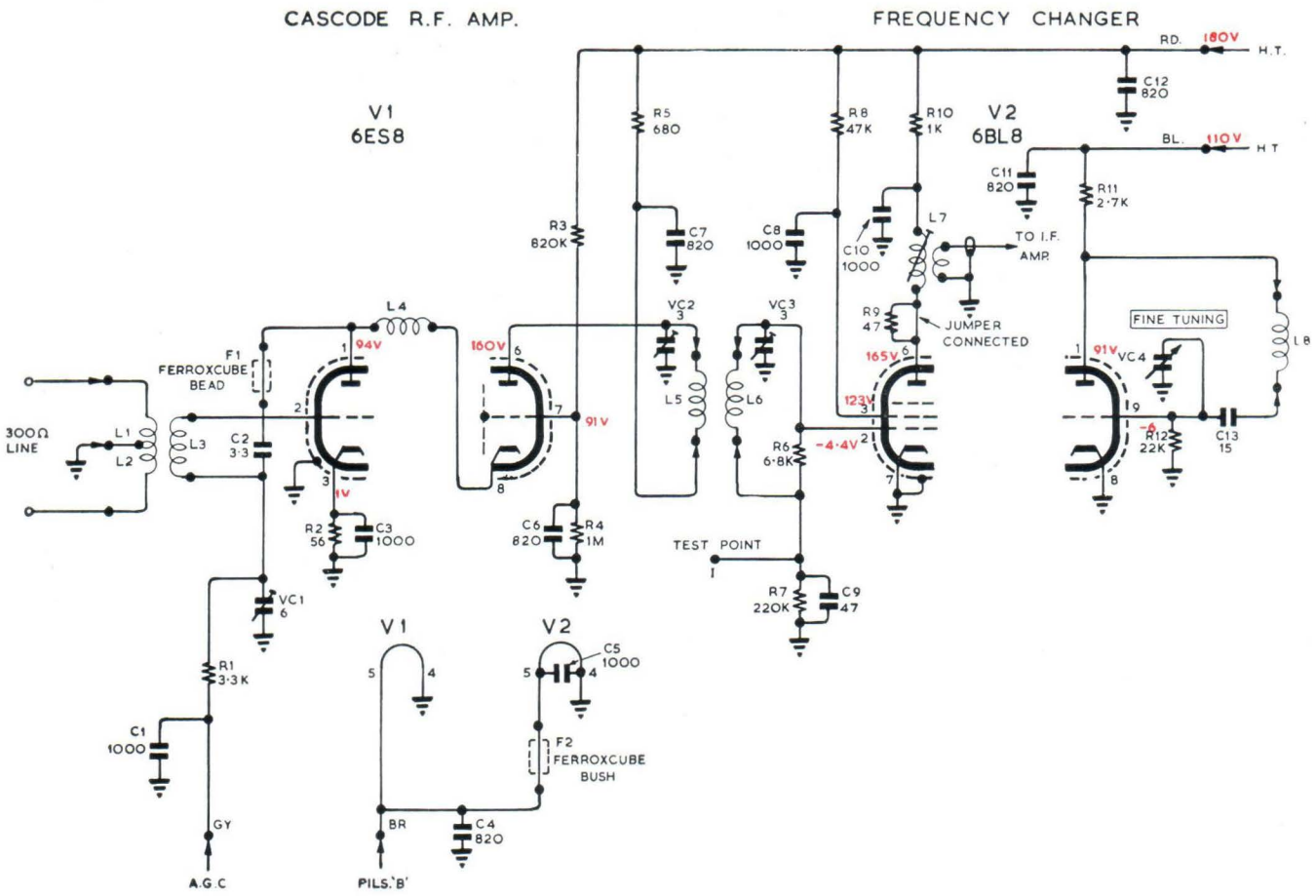
MISCELLANEOUS

REF.	PART No.	DESCRIPTION	REF.	PART No.	DESCRIPTION
CH1	232-0124	Choke, 300 mA		259-1161	MSP 42309 Yoke for PC
RT1	752-0061	Brimister, CZ11	CRT	932-1591	23HP4) PC
VDR1	750-0281	Voltage Dependent Resistor, Type E298GD/A260 (Blue Spot)		932-1591	23CRP4)
FS1	431-0071	Fuse, 1 A.		932-1261	23WP4)
FS2	431-0081	Fuse, 1.5 A.		932-1261	23MP4-K) PD
FS3	431-0031	Fuse, 250 mA.		932-1261	AW59-30)
Yoke	259-1161	MSP 42309 Yoke for PE. See Note*		932-1621	AW59-90) PE
	259-1161	MSP 42309 Yoke for PD		932-1621	23MP4-J)

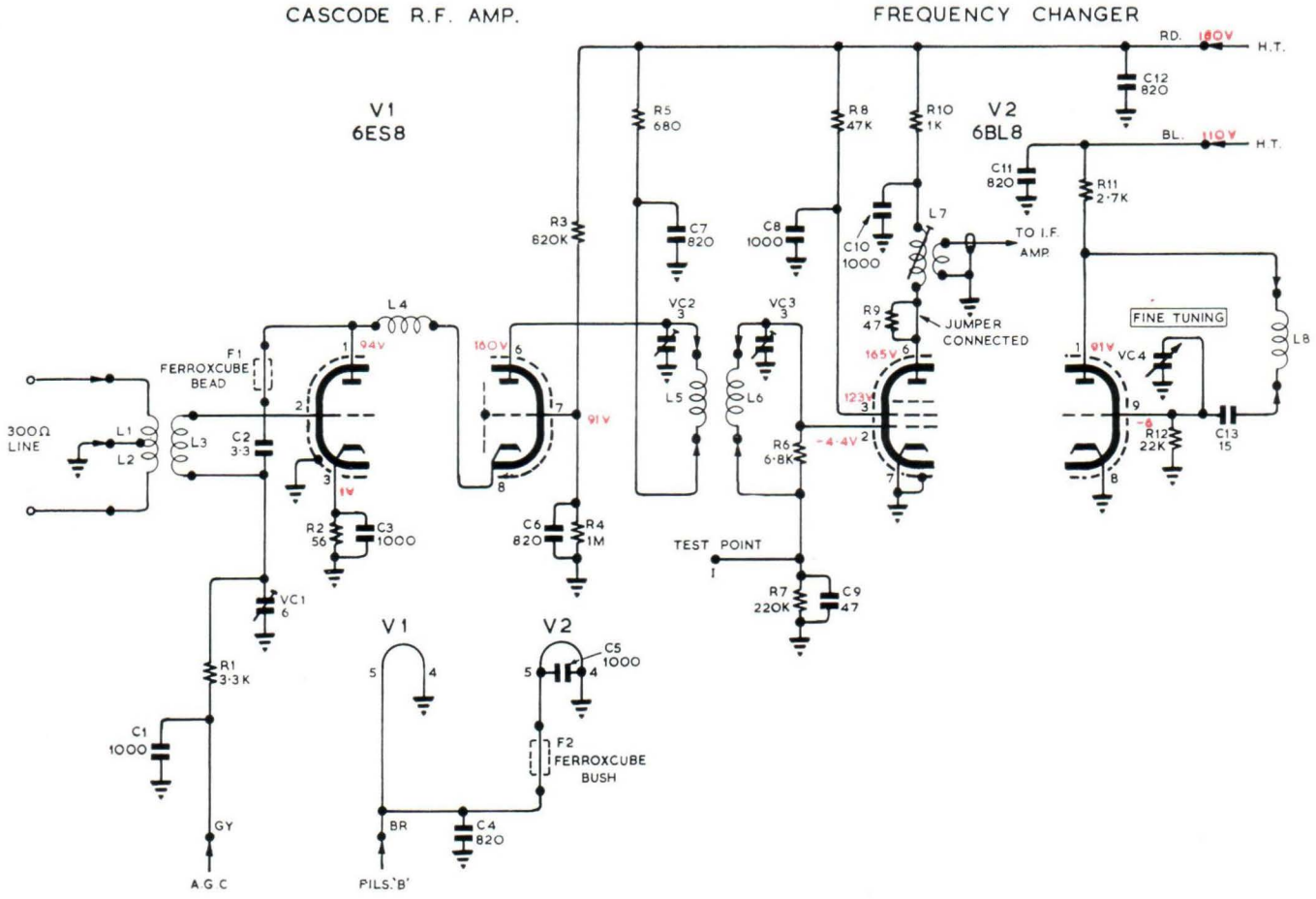
* **NOTE:** As from serial number 08000, **PE Chassis** deflection components were changed from MSP to Philips. Parts now become:

C104	279-4161	.22 uF ± 10% 200 V.W. Paper Tubular Capacitor.
T6	908-0382	Horizontal Output Transformer, Philips AT 2016T/92 or NT 3101.
	498-1613	1S2 Heater Lead Insulator
Yoke	259-1051	Philips AT 1009T/93 or AT 1009T/96.
	498-1621	Yoke Insulator.

H. CLARK PTY. LTD.
PRINTERS
CAMPERDOWN, N.S.W.



"H.M.V" CHASSIS TYPE PC, PD & PE



"H.M.V" CHASSIS TYPE PA & PB

"H.M.V" CHASSIS TYPE PC, PD & PE

IST. I.F. AMPLIFIER
2ND. I.F. AMPLIFIER
3RD. I.F. AMPLIFIER
VIDEO DETECTOR
VIDEO AMPLIFIER
PICTURE TUBE
POWER SUPPLY
NOISE INVERTER
SYNC. SEP.
A.G.C.
SOUND I.F. AMPLIFIER
LIMITER
RATIO DETECTOR
SOUND AMPLIFIER
SOUND OUTPUT
VERT. BLOCKING OSC.
VERTICAL OUTPUT
PHASE DISCRIMINATOR
HORIZONTAL OSCILLATOR
HORIZONTAL OUTPUT
E H T RECTIFIER
DAMPER DIODE

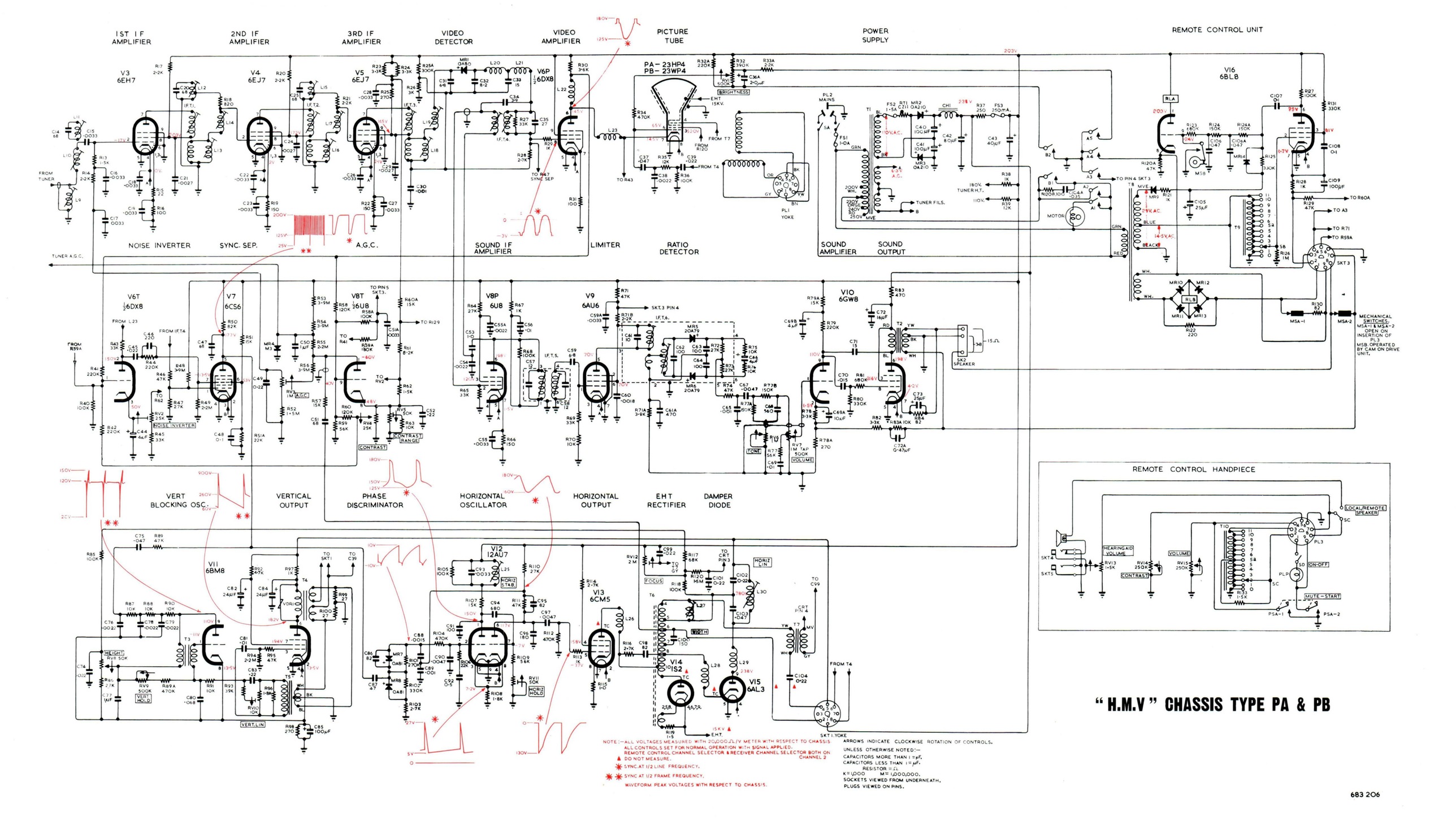
V3 6EH7
V4 6EJ7
V5 6EJ7
V6P ½6DX8
V6T ½6DX8
V7 6CS6
V8T ½6U8
V8P ½6U8
V9 6AU6
V10 6GW8
V11 6BM8
V12 12AU7
V13 6CM5
V14 IS2
V15 6AL3

23HP4 - PC
23WP4 - PD, PE

TUNER A.G.C.
FROM TUNER
TUNER H.T.
TUNER FILS
SK2 SPEAKER
SKT1 YOKE
FROM T4
FROM T7
FROM R12C
TO R43
TO SYNC SEP
TO R47
TO RV2
TO SKT1
TO C39
TO C99
TO 17 GY
E.H.T. 15 KV.
NOISE INVERTER
CONTRAST
CONTRAST RANGE
A.G.C.
VERT. HOLD
VERT. LIN.
HEIGHT
HORIZ. STAB
HORIZ. HOLD
FOCUS
WIDTH
HORIZ. LIN.
TONE
VOLUME
USED ON PC ONLY

NOTE :—ALL VOLTAGES MEASURED WITH 20,000Ω/V METER WITH RESPECT TO CHASSIS.
ALL CONTROLS SET FOR NORMAL OPERATION WITH SIGNAL APPLIED.
REMOTE CONTROL CHANNEL SELECTOR & RECEIVER CHANNEL SELECTOR BOTH ON CHANNEL 2
▲ DO NOT MEASURE.
✱ SYNC. AT 1/2 LINE FREQUENCY.
✱✱ SYNC AT 1/2 FRAME FREQUENCY.
WAVEFORM PEAK VOLTAGES WITH RESPECT TO CHASSIS.

ARROWS INDICATE CLOCKWISE ROTATION OF CONTROLS.
UNLESS OTHERWISE NOTED :—
CAPACITORS MORE THAN 1 = pF.
CAPACITORS LESS THAN 1 = µF.
RESISTORS = Ω.
K = 1,000 M = 1,000,000.
SOCKETS VIEWED FROM UNDERNEATH.
PLUGS VIEWED ON PINS.


1ST I F AMPLIFIER
2ND IF AMPLIFIER
3RD IF AMPLIFIER
VIDEO DETECTOR
VIDEO AMPLIFIER
PICTURE TUBE
POWER SUPPLY
REMOTE CONTROL UNIT
V3 6EH7
V4 6EJ7
V5 6EJ7
V6P ½6DX8
PA-23HP4 PB-23WP4
V16 6BL8
NOISE INVERTER
SYNC. SEP.
A.G.C.
SOUND IF AMPLIFIER
LIMITER
RATIO DETECTOR
SOUND AMPLIFIER
SOUND OUTPUT
V6T ½6DX8
V7 6CS6
V8T ½6U8
V8P 6U8
V9 6AU6
V10 6GW8
VERT BLOCKING OSC.
VERTICAL OUTPUT
PHASE DISCRIMINATOR
HORIZONTAL OSCILLATOR
HORIZONTAL OUTPUT
EHT RECTIFIER
DAMPER DIODE
V11 6BM8
V12 12AU7
V13 6CM5
V14 IS2
V15 6AL3
REMOTE CONTROL HANDPIECE
"H.M.V" CHASSIS TYPE PA & PB
683 206