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For Trade Use Only

"HIS MASTER'S VOICE"

SERVICE MANUAL

for

CHASSIS TYPES

PF - PG - PH - PJ - PK

TELEVISION RECEIVERS

■

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■

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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*
PF	16	23-inch	Console	Yes
PG	16	23-inch	Horizontal Console (Lowboy)	Yes
PH	15	23-inch	Consolette	No
PJ	15	23-inch	Horizontal Console (Lowboy)	No
PK	15	23-inch	Wooden or Metal Wrap 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 — 1.5 amp.
H.T.1 — 1.5 amp.
H.T.2 — 250 mA.

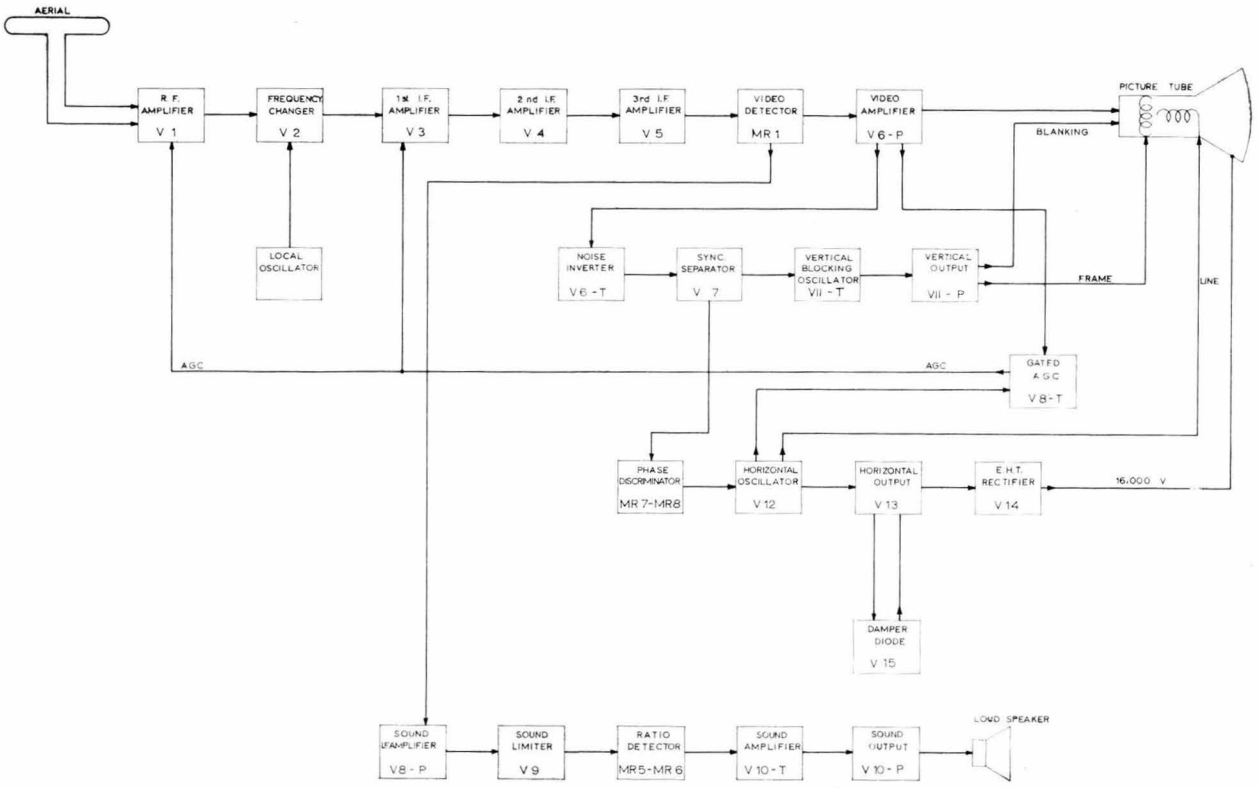
VALVE COMPLEMENTS

15-VALVE RECEIVERS — PH, PJ, PK.

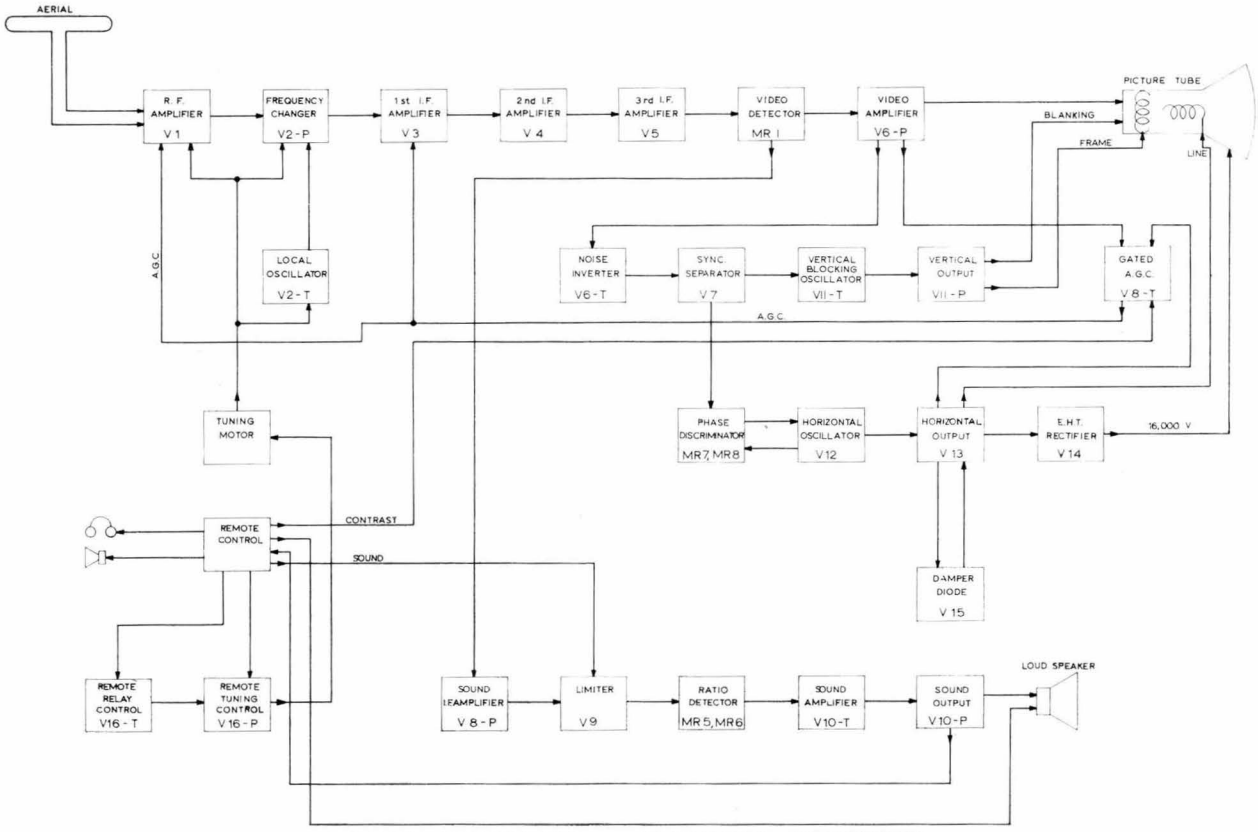
V1	6ES8	R.F. Amplifiers.
V2	6HG8	Frequency Changer
V3	6BY7	1st I.F. Amplifier
V4	6BX6	2nd I.F. Amplifier
V5	6EJ7	3rd I.F. Amplifier
V6	6DX8	Video Amplifier and Noise Inverter
V7	6CS6	Noise Gated Sync. Separator
V8	6U8	Sound I.F. Amplifier and Gated A.G.C.
V9	6AU6	Sound Limiter.
V10	6GW8	Audio Driver 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 — PF, PG.

V1	6ES8	R.F. Amplifier
V2	6HG8	Frequency Changer
V3	6BY7	1st I.F. Amplifier
V4	6BX6	2nd I.F. Amplifier
V5	6EJ7	3rd I.F. Amplifier
V6	6DX8	Video Amplifier and Noise Inverter
V7	6CS6	Noise Gated Sync. Separator
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 use of the fine tuning control may be unnecessary.

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.

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 I.F. 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 PF-PG 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 PF and PG, 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 6HG8, 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 variable capacitor is connected directly across the oscillator inductance. The condenser is spring loaded at one end and adjustment of range is determined by a range determining screw located on the front end of the tuner.

Adjustment on each channel is provided by means of an adjustable screw operating a cam to vary the fine tuning capacitor. The adjustable screw is varied by depressing the fine tuning knob, located within the channel selector knob, and rotating it in either direction. The extent of rotation is approx. 3 to 4 complete turns.

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 condenser C10, .001uF.

The heater circuit is filtered by a Ferrite 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 via the bottom end of the coil L21. 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 L22, L24 and L27 are coupled to the IF coils L21, L23 and L26. 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 R23, 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. L31, L32, L33 and L34 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 amplified 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 6CS6 from the output of the video amplifier. At the same time, video signal with sync. tips negative, is applied to the control grid of this valve, via the potentiometer R69, R70 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.

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 R134, R135, from the current in the deflection coils. This voltage is stepped up to the input grid of the vertical output valve. A potentiometer, RV10 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 C53. 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 R45, 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 C56. This AC voltage is rectified by MR14 and its polarity is such that it cancels the bias already supplied by MR9/C53 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 cam-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 82 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 PH - PJ - PK, 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 PF - PG 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 60 degrees. By disconnecting EHT, yoke and picture tube leads, the chassis may be swung out to a greater angle thus enabling better access to the underside for inspection or repair.

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 PF, PG, PH, PJ.

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 collar on the contrast spindle. Pull off the channel selector and fine tuner knobs together. The fine tuner knob may be removed from inside the channel selector knob by gentle tapping if it becomes tight.

Remove the thumb screw from the T nut holding the tuner chassis to the cabinet side support block. (Chassis PF and PG only) Disconnect the speaker lead plug at the left hand side of the chassis (from rear). Remove two bolts that secure the base board to the cabinet shelf.

Remove two screws that secure the top of the picture tube clamp bracket to the top inside front rail of the cabinet. Slacken off the 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 TYPE PK IN CABINETS 96 AND 99

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. Pull off both the Channel Selector and Fine Tuning knobs.

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. Slacken the nut at the side of the tube, securing the retaining strap and ease the tube out carefully, meanwhile supporting it around the mounting ring. In the case of bonded face tubes, the rubber mounts may be eased over the ears at the tube face corners and then the tube may be carefully withdrawn from the strap.

NOTE: The tubes are heavy and particular care in handling is necessary. It is recommended that protective goggles, apron and gloves be worn by personnel handling picture tubes to prevent personal injury should an implosion occur due to mishandling. 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.

During the course of production of these receivers, the Company reserves the right, without notice, to make any modifications or improvements in design which may be necessary to meet prevailing conditions.

Information concerning changes, which are likely to be of benefit to retailers and servicemen, will be notified as far as possible by issuing a Technical Data Sheet.

Any further service information may be obtained by addressing an inquiry to "The Service Division", E.M.I. (Australia) Limited, 575-577 Parramatta Road, Leichhardt (Tel. LM 0291).

ADJUSTMENTS

HORIZONTAL LINEARITY

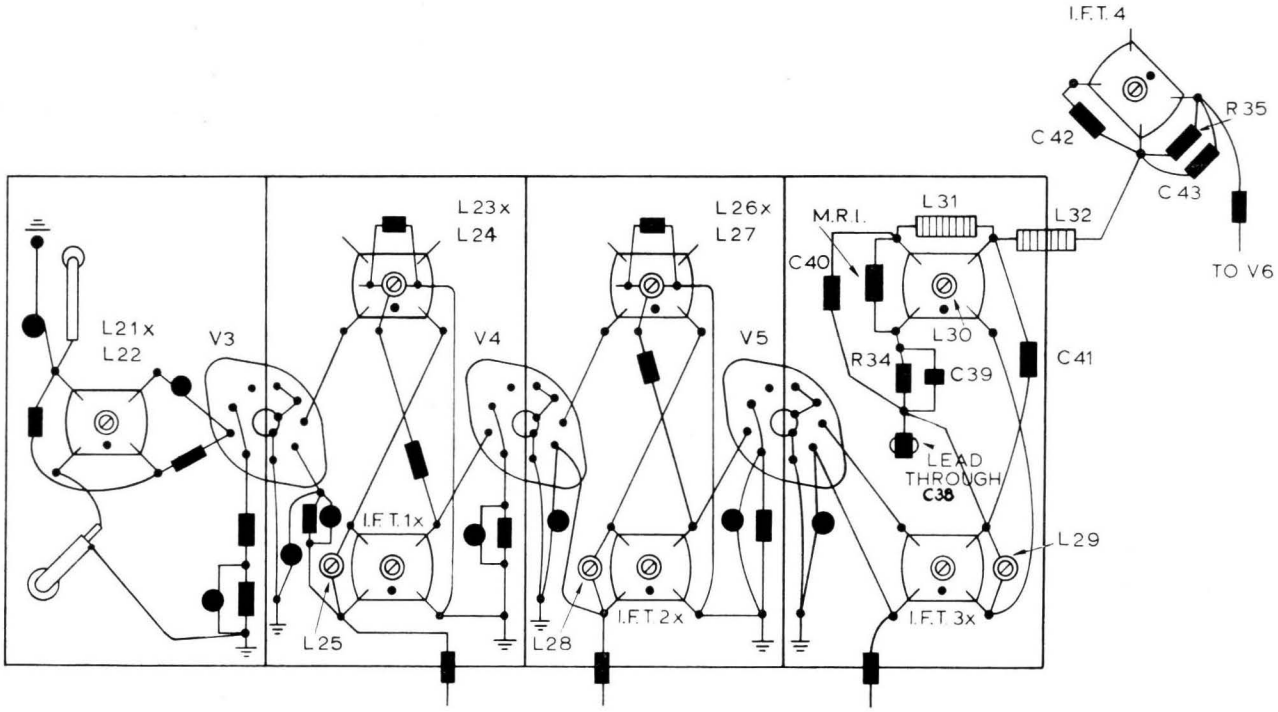
A typical multimeter employing a 100 ohm 1 mA fullscale deflection meter, when on 100 mA range, has a total resistance of 1 ohm. If such a meter is connected from pin 8 of the Horizontal Output valve to earth, *i.e.*, across the 1 ohm metering resistor, it will indicate half of the current flowing in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

HORIZONTAL HOLD

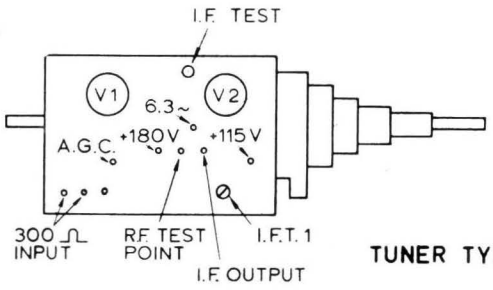
Disconnect sync. pulses by removing the sync. separator valve, V7, 6CS6. Short circuit the Horizontal Stablising coil. Adjust the Horizontal hold control so that the picture "floats" or locks weakly. Remove the short across the stabilising coil and adjust the core of this coil so that the picture again 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.

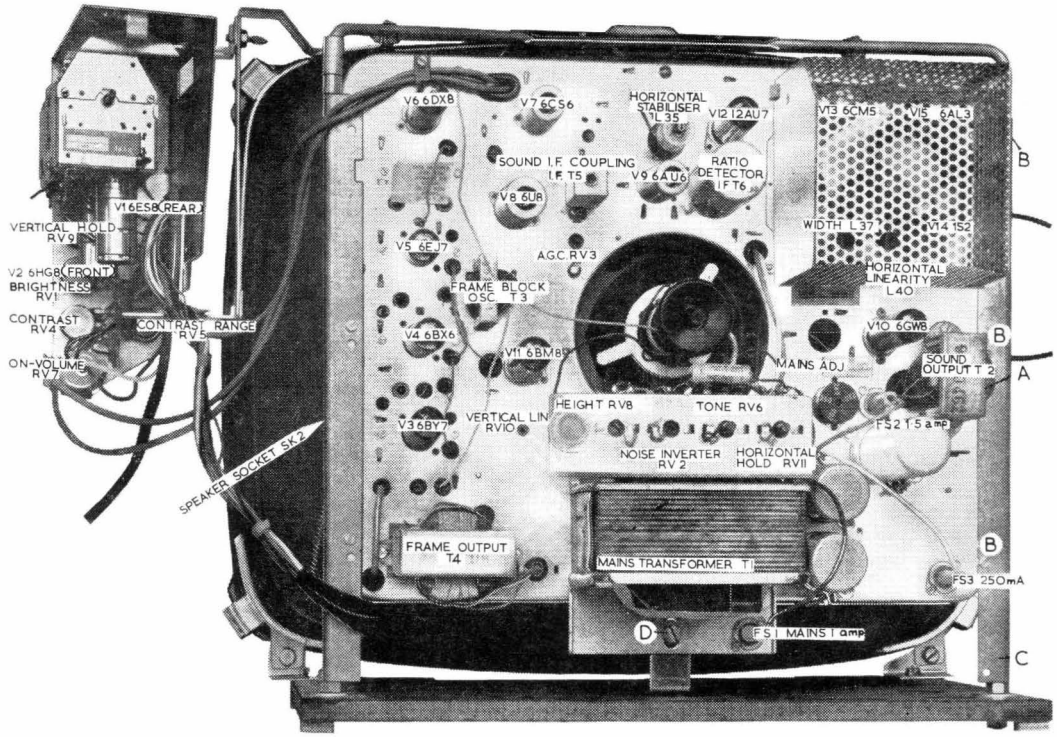


LOCATION OF COILS FROM UNDERSIDE OF CHASSIS
X INDICATES COIL NEAREST CHASSIS

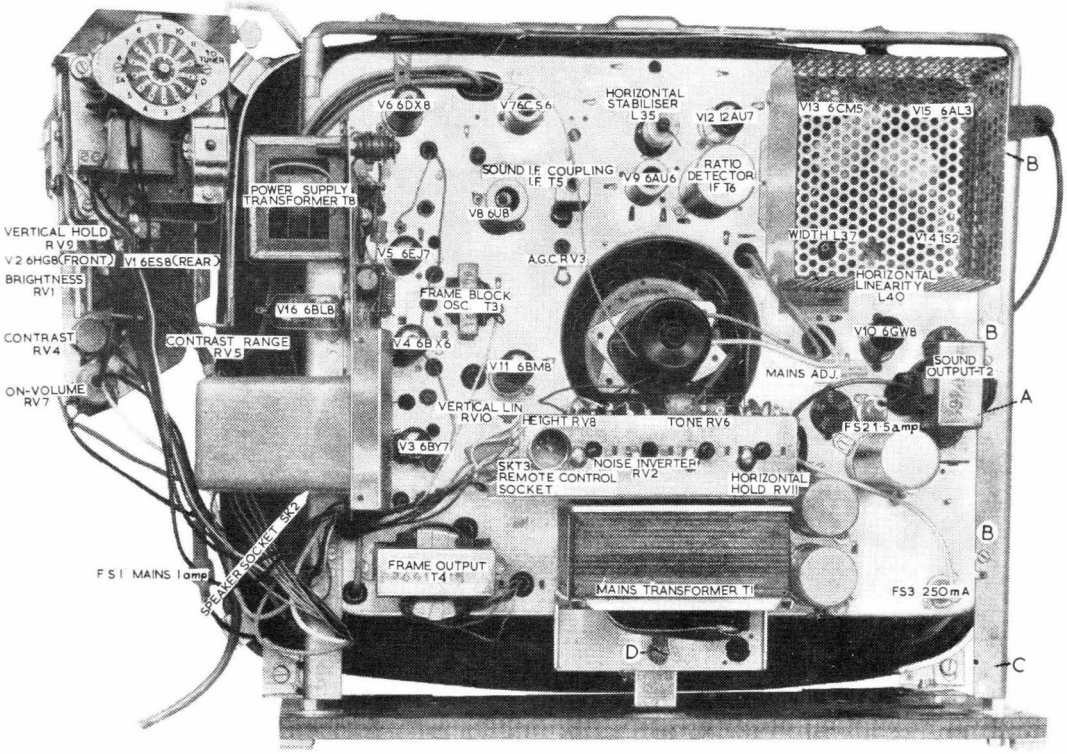


TUNER TYPE NT 3009

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.

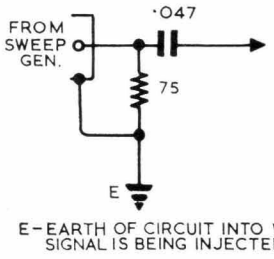


FIG. 3.

Coils L25, L28 and L29 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 L22, L24 and L27 and screw the slugs of IFT1 and IFT2 to sit flush with the chassis.

Connect a bias supply of —6 volts across the IF A.G.C. Connect the display unit across R36. 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 3 to pin 2 of V5. Adjust the slugs in IFT3 (slug in position nearest the chassis) and L30 (slug in position farthest from chassis) to achieve a response as shown in Fig. 5A.

(2) Remove sweep from V5 pin 2 and using the same terminating pad, connect to pin 2 of V4. Adjust the slugs of IFT2 (slug in position nearest chassis) and L26 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 L23 (slug nearest chassis) to that shown in Fig. 5C..

(4) Remove the sweep from V3 and connect to the tuner through Test Point 1, (I.F. alignment) using the same terminating pad with probe. Adjust L21 (with slug nearest chassis) and L10 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 L21 and L10, on the final alignment, to produce the response shown in Fig. 5D, exactly.

(5) Insert slugs with retaining rubber, into L22, L24 and L27. Set L22 to 31.375 Mc/s., L24 to 29.875 Mc/s., and L27 to 38. 375 Mc/s. (Fig. 5D).

(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.

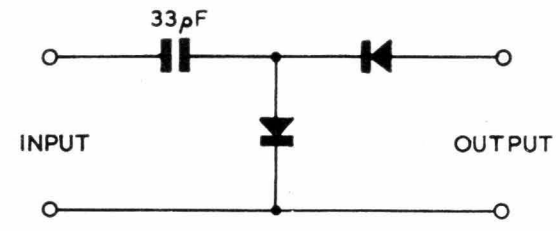


FIG 4: Peak-to-Peak Detector.

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 L31 and L32 and earth (disconnecting the grid peaking choke, L31).

(2) Connect the input of the peak-to-peak detector illustrated (Fig. 4) 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 R97, 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*
PF	Bonded Face	23HP4, 23CRP4.
PG		23WP4, AW59-30, 23MP4-K, AW59-90, 23MP4-J, 2351B, 2354B, 23ARP4.
PH	Bonded Face	23HP4 ,23CRP4.
PJ) PK)		23WP4, AW59-30, AW59-90, 23MP4-K, 23MP4-J, 2351B, 2354B, 23ARP4.

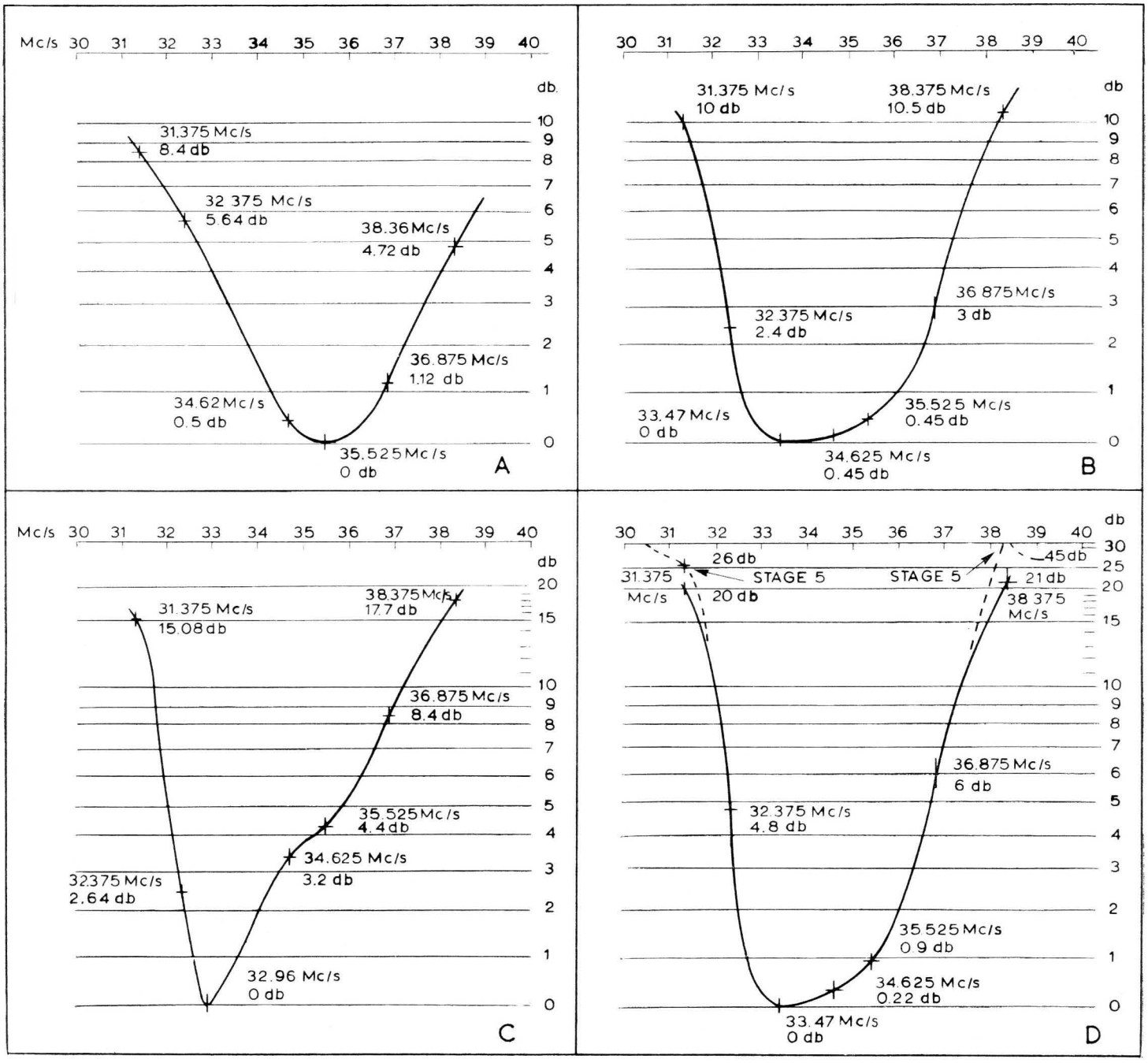

Mc/s 30 31 32 33 34 35 36 37 38 39 40
db
10 9 8 7 6 5 4 3 2 1 0
31.375 Mc/s
8.4 db
32 375 Mc/s
5.64 db
38.36 Mc/s
4.72 db
36.875 Mc/s
1.12 db
34.62 Mc/s
0.5 db
35.525 Mc/s
0 db
A
31.375 Mc/s
10 db
38.375 Mc/s
10.5 db
36.875 Mc/s
3 db
32.375 Mc/s
2.4 db
35.525 Mc/s
0.45 db
33.47 Mc/s
0 db
34.625 Mc/s
0.45 db
B
Mc/s 30 31 32 33 34 35 36 37 38 39 40
db
20 15 10 9 8 7 6 5 4 3 2 1 0
31.375 Mc/s
15.08 db
38.375 Mc/s
17.7 db
36.875 Mc/s
8.4 db
35.525 Mc/s
4.4 db
34.625 Mc/s
3.2 db
32.375 Mc/s
2.64 db
32.96 Mc/s
0 db
C
30 31 32 33 34 35 36 37 38 39 40
db
30 25 20 15 10 9 8 7 6 5 4 3 2 1 0
26 db
31.375
Mc/s
20 db
STAGE 5
STAGE 5
45 db
21 db
38.375
Mc/s
36.875 Mc/s
6 db
32.375 Mc/s
4.8 db
35.525 Mc/s
0.9 db
34.625 Mc/s
0.22 db
33.47 Mc/s
0 db
D

FIG. 5.

PARTS LIST ... MODELS PF, PG

RESISTORS

REF.	PART No.	DESCRIPTION
R21	740-0302	1.8K ohms ± 10% ½ W.
R22	740-0032	2.2K ohms ± 10% ½ W.
R23	740-0482	56 ohms ± 10% ½ W.
R24	740-0653	100 ohms ± 10% ½ W. Morganite
R24a	742-0712	2.2 K ohms ± 20% 1 W.
R25	740-0702	56K ohms ± 10% ½ W.
R26	740-0062	3.9K ohms ± 10% ½ W.
R27	740-0273	150 ohms ± 10% ½ W. Morganite
R28	742-0712	2.2K ohms ± 20% 1 W.
R29	740-0062	3.9K ohms ± 10% ½ W.
R30	740-0273	150 ohms ± 10% ½ W. Morganite
R31	742-1012	3.3K ohms ± 20% 1 W.
R32	740-0292	270 ohms ± 10% ½ W.
R33	742-1012	3.3K ohms ± 20% 1 W.
R34	740-0792	8.2K ohms ± 10% ½ W.
R35	740-0242	33K ohms± 10% ½ W.
R36	740-0043	2.7K ohms ± 10% ½ W. Morganite
R37	740-0022	1K ohms ± 10% ½ W.
R38	750-0472	3.6K ohms ± 5% 4 W. Metox
R39	740-0653	100 ohms ± 10% ½ W. Morganite
R40	740-0622	470K ohms ± 20% ½ W.
R41	740-0732	12K ohms ± 10% ½ W.
R42	740-0142	100K ohms ± 10% ½ W.
R43	742-0132	220K ohms ± 10% 1 W.
R44	742-0162	390K ohms ± 10% 1 W.
R45	742-0712	2.2K ohms ± 20% 1 W.
R45a	750-0541	2.7 ohms special wire wound
R46	750-0291	250 ohms ± 5% 5 W. Cemcoat
R47	749-0142	1K ohms ± 20% 2 W.
R48	749-0252	12K ohms ± 10% 2 W.
R49	740-0112	27K ohms ± 10% ½W.
R50	740-0653	100 ohms ± 10% ½ W. Morganite
R51	740-0582	47K ohms ± 20% ½ W.
R52	740-0022	1K ohms ± 10% ½ W.
R53	742-1043	220 ohms ± 10% 1 W.
R54	740-1062	680K ohms ± 20% ½ W.
R55	740-0542	150K ohms ± 20% ½ W.
R56	740-0542	150K ohms ± 20% ½ W.
R57	740-1052	330K ohms ± 20% ½ W.
R58	740-0532	1M ohms ± 20% ½ W.
R59	742-0412	100K ohms ± 20% 1 W.
R60	740-0022	1K ohms ± 10% ½ W.
R61	742-0092	47K ohms ± 10% 1 W.
R62	740-0522	82 ohms ± 10% 5 W. PW 5.
R63	742-0342	330K ohms ± 20% 1 W.
R63a	740-0142	100K ohms ± 10% ½ W.
R64	740-0162	220K ohms ± 10% ½ W.
R65	740-0162	220K ohms ± 10% ½ W.
R66	740-0242	33K ohms ± 10% ½ W.
R67	740-0162	220K ohms ± 10% ½ W.
R68	740-0822	33K ohms ± 20% ½ W.
R69	740-0122	47K ohms ± 10% ½ W.
R70	740-0112	27K ohms ± 10% ½ W.
R71	742-0772	3.9M ohms ± 10% 1W.
R72	740-0202	2.2M ohms ± 10% ½ W.
R73	742-0102	82K ohms ± 10% 1 W.
R74	749-0022	15K ohms ± 10% 2 W.
R75	742-0052	22K ohms ± 10% 1 W.
R76	742-0172	470K ohms ± 10% 1 W.
R77	742-0772	3.9M ohms ± 10% 1 W.
R78	742-0772	3.9M ohms ± 10% 1 W.
R79	742-0892	2.2M ohms ± 10% 1 W.
R80	742-0192	1M ohms ± 10% 1 W.
R81	740-0502	15K ohms ± 20% ½ W.
R82	740-0782	120K ohms ± 10% ½ W.
R83	740-0702	56K ohms ± 10% ½ W.
R84	740-0782	120K ohms ± 10% ½ W.
R85	740-0142	100K ohms ± 10% ½ W.
R86	740-0222	180K ohms ± 10% ½ W.
R87	749-0022	15K ohms ± 10% 2 W.
R88	740-0792	8.2K ohms ± 10% ½ W.
R89	740-0252	1.5K ohms ± 10% ½ W.
R90	740-0082	10K ohms ± 10% ½ W.
R91	740-0112	27K ohms ± 10% ½ W.
R92	740-0242	33K ohms ± 10% ½ W.
R93	740-0273	150 ohms ± 10% ½ W. Morganite
R94	740-0572	1K ohms ± 20% ½ W.
R95	740-0142	100K ohms ± 10% ½ W.
R96	740-0242	33K ohms ± 10% ½ W.
R97	740-0082	10K ohms ± 10% ½ W.
R98	749-0052	47K ohms ± 20% 2 W.
R99	740-0032	2.2K ohms ± 10% ½ W.
R99a	740-0022	1K ohms ± 10% ½ W.
R100	740-0062	3.9K ohms ± 10% ½ W.
R101	740-0112	27K ohms ± 10% ½ W.
R102	740-0112	27K ohms ± 10% ½ W.
R103	740-0122	47K ohms ± 10% ½ W.
R104	740-0082	10K ohms ± 10% ½ W.
R105	740-0082	10K ohms ± 10% ½ W.
R106	740-0152	150K ohms ± 10% ½ W.
R107	740-0152	150K ohms ± 10% ½ W.
R108	740-0702	56K ohms ± 10% ½ W.
R109	740-0092	15K ohms ± 10% ½ W.
R110	742-0132	220K ohms ± 10% 1 W.
R111	740-0052	3.3K ohms ± 10% ½ W.
R112	740-0292	270 ohms ± 10% ½ W.
R113	740-1052	330K ohms ± 20% ½ W.
R114	740-1062	680K ohms ± 20% ½ W.
R115	740-0052	3.3K ohms ± 10% ½ W.
R116	750-0532	470 ohms ± 10% 5 W. PW 5.
R117	740-0082	10K ohms ± 10% ½ W.
R118	740-0663	82 ohms ± 10% ½ W. Morganite
R119	742-0112	100K ohms ± 10% 1 W.
R120	740-0112	27K ohms ± 10% ½ W.
R121	740-0082	10K ohms ± 10% ½ W.
R122	740-0082	10K ohms ± 10% ½ W.
R123	740-0122	47K ohms ± 10% ½ W.
R124	740-0082	10K ohms ± 10% ½ W.
R125	742-0172	470K ohms ± 10% 1 W.
R126	740-0082	10K ohms ± 10% ½ W.
R127	740-0232	39K ohms ± 10% ½ W.
R128	742-0022	4.7K ohms ± 10% 1 W.
R129	740-0202	2.2M ohms ± 10% ½ W.
R130	740-0582	47K ohms ± 20% ½ W.
R131	740-0302	1.8K ohms ± 10% ½ W.
R132	750-0482	1K ohms ± 5% 4 W. Metox
R133	742-0823	270 ohms ± 10% 1 W. Morganite
R134	740-1043	27 ohms ± 10% ½ W. Morganite
R135	740-1043	27 ohms ± 10% ½ W. Morganite
R136	740-0172	270K ohms ± 10% ½ W.
R137	740-0392	330K ohms ± 10% ½ W.
R138	740-0043	2.7K ohms ± 10% ½ W. Morganite
R139	740-0182	470K ohms ± 10% ½ W.
R140	740-0142	100K ohms ± 10% ½ W.
R141	740-0102	22K ohms ± 10% ½ W.
R142	742-0042	15K ohms ± 10% 1 W.
R143	742-0472	1.8K ohms ± 10% 1 W.
R144	740-0702	56K ohms ± 10% ½ W.
R145	740-0112	27K ohms ± 10% ½ W.
R146	742-0092	47K ohms ± 10% 1 W.
R147	742-0172	470 ohms ± 10% 1 W.
R148	740-0572	1K ohms ± 20% ½ W.
R149	750-0362	2.7K ohms ± 10% 5 W. PW 5.
R150	746-0242	1 ohm ± 10% BW ½ W/W.
R151	742-0262	2.7K ohms ± 10% 1 W.
R152	Part of 908-0382	1.5 ohms wire resistor.
R153	742-0492	68K ohms ± 10% 1 W.
R154	742-0112	100K ohms ± 10% 1 W.
R155	740-0492	1.5M ohms ± 20% ½ W.
R156	740-0252	1.5K ohms ± 10% ½ W.

CAPACITORS

REF.	PART No.	DESCRIPTION
C21	273-0591	68 pF. ± 2½% Mica.
C22	271-0031	.0033 uF. + 100% - 0% 500V. Ceramic Disc.
C23	271-0031	.0033 uF. + 100% - 0% 500V. Ceramic Disc.
C24	271-0031	.0033 uF. + 100% - 0% 500V. Ceramic Disc.
C25	271-0031	.0033 uF. + 100% - 0% 500V. Ceramic Disc.
C26	271-0731	.047 uF. + 80% - 20% Disc B Red Cap.
C27	271-0281	.022 uF. + 100% - 0% 100V. Ceramic Disc.
C28	271-0591	.0027 uF. ± 20% K2000 Style Ceramic Disc.
C29	273-0591	68 pF. ± 2½% Mica.
C30	271-0031	.0033 uF. + 100% - 0% 500V. Ceramic Disc.
C31	271-0731	.047 uF. + 80% - 20% Disc B Red Cap.
C32	271-0591	.0027 uF. ± 20% K2000 Style Ceramic Disc.
C33	273-0591	68 pF. ± 2½% Mica.
C34	271-0031	.0033 uF. + 100% - 0% 500V. Ceramic Disc.
C35	271-0731	.047 uF. + 80% - 20% Disc B Red Cap.
C36	271-0031	.0033 uF. + 100% - 0% 500V. Ceramic Disc.
C37	271-0591	.0027 uF. ± 20% K2000 Style Ceramic Disc.
C38	271-0621	1000 pF. Feed Thru Ducon CAC 100
C39	271-0121	5.6 pF. ± ¼ pF. Ceramic Tube NPO
C40	271-0131	8.2 pF. ± ¼ pF. Ceramic Tube NPO
C41	271-0181	15 pF. ± ½ pF. Ceramic Tube NPO

PARTS LIST ... MODELS PF, PG

CAPACITORS — *continued*

REF.	PART No.	DESCRIPTION
C42	271-0691	3.9 pF. ± ¼ pF. Ceramic Disc NPO
C43	271-0311	27 pF. ± 5% Ceramic Tube NPO
C44	279-1701	.047 uF. ± 20% 400V.W. Paper
C45	282-0541	.022 uF. ± 10% 400V. Polyester
C46	282-0661	.022 uF. ± 10% 400V. Polyester
C47	269-0771	2 uF. 300 VW Electrolytic Type ET1X
C48	269-0521	100 uF. 150 V.W. Insulated Electro Type EMG1014 SFE
C49	269-0521	100 uF. 150 V.W. Insulated Electro Type EMG1014 SFE
C50) C51)	269-0511	80 uF. + 40 uF. 300 V.W. Electro Ducon Type EMC4830
C51a	271-0111	.001 uF. CDS Hi-K K1200 Ceramic Disc
C51b	271-0111	.001 uF. CDS Hi-K K1200 Ceramic Disc
C52	271-0781	.035 uF. 2KVW Ceramic Double Disc
C53	269-0761	25 uF. 50 VW Electro UCC Type EFB20
C54	279-1081	.047 uF. ± 20% 200 V.W. Paper
C55	279-1081	.047 uF. ± 20% 200 V.W. Paper
C56	279-1741	.1 uF. ± 20% 400 V.W. Paper
C57	279-1741	.1 uF. ± 20% 400 V.W. Paper
C58	269-0691	100 uF. 12 V.W. Electro Ducon Type ES1209
C59	279-4661	.022 uF. ± 10% 400 V.W. Paper
C60	269-0611	4 uF. 300 V.W. Electro TypeET2D
C61	280-1791	220 pF. ± 10% 600V. Styroseal
C62	273-0921	68 pF. ± 10% M.S. Mica
C63	279-1741	.1 uF. ± 20% 400 V.W. Paper
C64	279-1161	.22 uF. ± 20% 200 V.W. Paper
C64a	271-0111	.001 uF. CDS Hi-K K1200 Ceramic Disc
C65	279-0281	1 uF. ± 25% 200 V.W. Metalized Paper
C66	271-0231	68 pF. ± 10% 3KV N750 Ceramic Disc
C67	271-0031	.0033 uF. + 100% - 0% 500V. Ceramic Disc
C68	279-1161	.22 uF. ± 20% 200 V.W. Paper
C69	271-0701	1 pF. ± ¼ pF. Ceramic Bead NPO
C70	282-0541	.0022 uF. ± 10% 400V. Polyester
C71	282-0541	.0022 uF. ± 10% 400V. Polyester
C72	271-0031	.0033 uF. + 100% - 0% 500V. Ceramic Disc
C73	279-1621	.01 uF. ± 20% 400 V.W. Paper
C74	271-0681	12 pF. ± 5% Ceramic Disc NPO
C75	271-0471	6.8 pF. ± ¼ pF. Ceramic Disc NPO
C76	271-0681	12 pF. ± 5% Ceramic Disc NPO
C77	271-0031	.0033 uF. + 100% - 0% 500V. Ceramic Disc
C78	271-0591	.0027 uF. ± 20% K2000 Style Ceramic Disc
C78a	271-0591	.0027 uF. ± 20% K2000 Style Ceramic Disc
C79	271-0801	10 pF. ± 5% Ceramic Disc NPO
C80	271-0501	470 pF. Ceramic Disc
C81	271-0771	100 pF. ± 5% Ceramic Disc NPO
C82	280-1501	100 pF. ± 5% 600V. Styroseal
C83	280-1501	100 pF. ± 5% 600V. Styroseal
C84	282-0501	.001 uF. ± 10% 400V. Polyester
C85	269-0781	4 uF. 25 V.W. Electro Type ET1X
C86	282-0581	.0047 uF. ± 10% 400V. Polyester
C87	280-1841	560 pF. ± 10% 600V. Styroseal
C88	279-4001	.01 uF. ± 10% 200 V.W. Paper
C89	269-0611	4 uF. 300 V.W. Electro Type ET2D
C90	269-0701	10 uF. 12V.W. Electro Type ES1203
C91	279-1641	.015 uF. ± 20% 400 V.W. Paper
C92	271-0181	15 pF. ± ½ pF. Ceramic Tube NPO
C93	269-0061	16 uF. 300 V.W. Electro Type ET4D
C94	282-0321	.47 uF. ± 10% 125 V.W. Polyester
C95	269-0221	25 uF. 25 V.W. Electro Type ET1B
C96	279-1661	.022 uF. ± 20% 400 V.W Paper
C97	279-4701	.047 uF. ± 10% 400 V.W. Paper
C98	282-0541	.0022 uF. ± 10% 400V. Polyester
C99	279-0281	1 uF. ± 25% 200 V.W. Metalized Paper
C100	282-0541	.0022 uF. ± 10% 400V. Polyester
C101	282-0541	.0022 uF. ± 10% 400V. Polyester
C102	282-0721	.068 uF. ± 10% 400V. Polyester
C103	269-0481	24 uF. 350 V.W. Electro Type EDT6G with C106
C104	279-4621	.01 uF. ± 10% 400 V.W. Paper
C105	279-4161	.22 uF. ± 10% 200 V.W. Paper
C106	269-0481	24 uF. 350 V.W. Electro Type EDT6G with C103
C107	269-0361	100 uF. 25 V.W. Electro Type ESK
C108	273-1051	82 pF. ± 10% M.S. Mica
C109	273-1031	47 pF. ± 1 pF. Mica
C110	282-0521	.0015 uF. ± 10% 400V. Polyester
C111	282-0501	.001 uF. ± 10% 400V. Polyester
C112	282-0581	.0047 uF. ± 10% 400V. Polyester
C113	282-0561	.0033 uF. ± 10% 400V. Polyester
C114	280-1751	100 pF. ± 10% 600V. Styroseal
C115	279-0561	.5 uF. ± 25% 200 V.W. Metalized Paper
C116	280-1851	680 pF. ± 10% 600V. Styroseal
C117	271-0481	82 pF. ± 5% Ceramic Tube NPO
C118	280-1781	180 pF. ± 10% 600V. Styroseal
C119	279-1581	.0047 uF. ± 20% 400 V.W. Paper
C120	Part of 908-0382	82 pF. Ceramic Tube
C121	279-2161	.022 uF ± 20% 600 V.W. Paper
C122	Part of 908-0382	150 pF. Ceramic Tube
C123	279-5771	.22 uF. ± 10% 1000 V.W. Paper
C124	279-5771	.22 uF. ± 10% 1000 V.W. Paper
C125	279-5701	.047 uF. ± 10% 1000 V.W. Paper
C126	279-4161	.22 uF. ± 10% 200 V.W. Paper

COILS

REF.	PART No.	DESCRIPTION
L21) L22)	259-1191	1st I.F. Grid Coil 31.375 Mc/s. Trap
L23) L24)	259-1171	1st I.F. Anode Coil 29.875 Mc/s Trap
L25	259-0672	1st I.F. Coupling Coil
L26) L27)	259-1181	2nd I.F. Anode Coil 38.375 Mc/s Trap
L28	259-0672	2nd I.F. Coupling Coil
L29	259-0672	3rd I.F. Coupling Coil
L30	259-0931	Detector Input Coil
L31	259-0954	Grid Peaking Choke
L32	259-0954	Grid Peaking Choke
L33	259-1082	Peaking Coil, Shunt
L34	259-1092	Peaking Coil, Series
L35	259-0993	Horizontal Stabiliser Coil
L36	259-0044	Anti-Parasitic Coil
L37	259-0903	Width Coil
L38	259-0044	Anti-Parasitic Coil
L39	259-0044	Anti-Parasitic Coil
L40	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 — A.G.C.
RV4	677-0601	25K ohms Curve A, Type Q — Contrast
RV5	677-0611	50K Curve C, Type EC—Contrast Range
RV6	677-1001	1M ohms Reversed C, Type PTU—Tone
RV7	677-0621	1M ohms Tapped 500K Curve A with DPPP—Switch, 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 Megohms ± 25% — Focus
RV13	677-0971	1.5K ohms CurveF, Hearing Aid Volume
RV14	677-0981	250K ohms Curve A, Remote Contrast
RV15	677-1011	250K ohms Curve G, Remote Volume

PARTS LIST ... MODELS PF, PG

TRANSFORMERS

REF.	PART No.	DESCRIPTION	REF.	PART No.	DESCRIPTION
IFT1	906-0451	Vision IFT	T3	908-0321	Blocking Oscillator Transformer
IFT2	906-0451	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	932-1921	6HG8 — Frequency Changer	V11	932-0511	6BM8— Blocking Oscillator and Vertical Output
V3	932-0881	6BY7 — 1st I.F. Amplifier	V12	932-0481	12AU7 — Horizontal Multivibrator
V4	932-0521	6BX6 — 2nd I.F. Amplifier	V13	932-0531	6CM5 — Horizontal Output
V5	932-1221	6EJ7 — 3rd I.F. Amplifier	V14	932-0771	1S2 — EHT Rectifier
V6	932-1081	6DX8 — Video Amplifier and Noise Inverter	V15	932-1151	6AL3 — Damping Diode
V7	932-1091	6CS6 — Sync. Separator	V16	932-0501	6BL8 — Remote Control
V8	932-1101	6U8—Sound I.F. Amplifier and AGC	PLP	932-1791	12V. 2W. Philips, 12829
V9	932-0441	6AU6 — Limiter		932-1851	6V. 3W. Festoon Lamp, Philips, 6849 or Lucas, 255

DIODES

REF.	PART No.	DESCRIPTION	REF.	PART No.	DESCRIPTION
MR1	932-1541	Diode OA80	MR9	932-0791	Diode OA81
MR2) MR3)	932-1071	Diode OA210, 1N1763 or 1N2094	MR10)	932-1811	Rectifier STC Type B420-1-1.
MR4	932-0991	Diode M3	MR11) MR12) MR13)		
MR5) MR6)	932-0601	Diodes 20A79			
MR7	932-0791	Diode OA81	MR14	932-1801	Diode Type Q3/3.
MR8	932-0791	Diode OA81			

MISCELLANEOUS

REF.	PART No.	DESCRIPTION
CH1	232-0124	Choke 300 mA.
RT1	752-0061	Brimister CZ11
VDR1	750-0281	Voltage Dependent Resistor Type E298GD/A260 (Blue Spot)
FS1	431-0071	Fuse 1 amp.
FS2	431-0081	Fuse 1.5 amp.
FS3	431-0031	Fuse 250 mA.
RLA	735-0012	Relay STC BPO3000, 6000 ohms, 5-pole normally open
RLB	735-0002	Relay STC BPO3000, 250 ohms 2-pole normally open
	294-0961	Relay Cover
Yoke	259-1051	Philips AT1009/93 or AT1009/96
CRT	932-1591	23HP4) PF
	932-1591	23CRP4)
	932-1261	AW59-30-K)
	932-1261	23WP4)
	932-1261	23MP4-K)
	932-1261	2351B) PG
	932-1261	23ARP4)
	932-1621	AW59-90)
	932-1621	23MP4-J)
	932-1621	2354B)
ON PRE-SET BRACKET ASSEMBLY:		
Remote Control Socket Components		
	291-0181	Tags, Carr Fastener, 556-1-22
	498-1221	Centre Wafer, 690-15-23
	498-1231	Bottom Wafer, 690-15-24
	498-1641	Top Wafer
	820-1361	Shield No. 95—9-pin valve socket, skirt only
	855-0471	DPST Leaf Switch
ON TUNER CHASSIS:		
	577-0111	Motor 240V.
	306-0111	Clutch—driving dog
	306-0101	Clutch—driven dog
	837-0531	Spindle—driven dog and pinion mounting
	447-0051	Pinion
	664-1731	Rear bearing plate assembly
		Plate with bearing plus driven dog plus spindle plus pinion above
	447-0061	Idler gear
	447-0071	Crank driving gear
	654-0622	Crank with pin
	263-0051	Crank pin collar
	244-0811	Circlip, SCO1916, crankpin collar retaining
	855-0481	Switch—crank-operated
	954-0271	Geneva wheel assembly—14 position
	244-0771	Circlip, SCO1960/17/0, Geneva wheel assy. retaining
	855-0531	1-pole 14-position switch wafer—indexing switch
	855-0541	1-pole 14-position switch wafer—aerial selector
	664-1801	Front bearing plate assembly
	306-0131	Tuner coupling—driving
	306-0121	Tuner coupling—driven
	263-0061	Collar—driven tuner coupling
Tuner	224-1511	Philips NT3009
ON REMOTE CONTROL HANDPIECE:		
	190-2501	Cabinet Back
	244-0491	Circlip ASCO/8169/17/0
	814-0961	Captive 4BA screw. Held by 244-0491
	190-2491	Cabinet Front
	794-1301	Scale—Channel Indicator
	664-1701	Plate—Scale Backing
	372-0181	Disc—Channel Indicator
	517-1631	Knob—Pre-selector
	840-0731	Spring—Pre-selector Knob
	517-1641	Knob—Channel Selector
	517-1891	Knob
	794-1261	Scale—Hearing Aid Volume
	794-1271	Scale—Picture
	794-1281	Scale—Volume
	453-1291	Speaker Grille
	661-0231	Grille Backing Strip
	831-1391	Speaker 2-inch MSP, Type 2HB, 15 ohms
	757-0181	Speaker Mounting Rubber Ring
	824-0841	Hearing Aid Socket
	831-1331	Hearing Aid Earpiece 15 ohms, with lead and plug
	855-0441	Switch ON/OFF MSP.77
	855-0441	Switch Internal/External Speaker, MSP.77
	855-0451	Switch Channel Selector — Oak CK14
	852-0221	Handset Support
	770-0361	Anti-Skid Rubber Balls
	961-0761	25ft. 9-Core Beige Cable
	826-0001	Sleeve
	668-0581	Plug—9-pin, XLM9/UTP1
	294-0971	Cover—9-pin plug 10B

PARTS LIST ... MODELS PH, PJ, PK

RESISTORS

REF.	PART No	DESCRIPTION
R21	740-0302	1.8K ohms± 10% ½ W.
R22	740-0032	2.2K ohms± 10% ½ W.
R23	740-0482	56 ohms ± 10% ½ W.
R24	740-0653	100 ohms ± 10% ½ W. Morganite
R24a	742-0712	2.2K ohms ± 20% 1 W.
R25	740-0702	56K ohms ± 10% ½ W.
R26	740-0062	3.9K ohms ± 10% ½ W.
R27	740-0273	150 ohms ± 10% ½ W. Morganite
R28	742-0712	2.2K ohms ± 20% 1 W.
R29	740-0062	3.9K ohms ± 10% ½ W.
R30	740-0273	150 ohms ± 10% ½ W. Morganite
R31	740-1012	3.3K ohms ± 20% 1 W.
R32	740-0292	270 ohms ± 10% ½ W.
R33	742-1012	3.3K ohms ± 20% 1 W.
R34	740-0792	8.2K ohms ± 10% ½ W.
R35	740-0242	33K ohms ± 10% ½ W.
R36	740-0043	2.7K ohms ± 10% ½ W. Morganite
R37	740-0022	1K ohms ± 10% ½ W.
R38	750-0472	3.6K ohms ± 5% 4 W. Metox
R39	740-0653	100 ohms ± 10% ½ W. Morganite
R40	740-0622	470K ohms ± 20% ½ W.
R41	740-0732	12K ohms ± 10% ½ W.
R42	740-0142	100K ohms ± 10% ½ W.
R43	742-0162	390K ohms ± 10% 1 W.
R44	740-0122	47K ohms ± 10% ½ W.
R45	750-0541	2.7 ohms Special Wire Wound
R46	750-0291	250 ohms ± 5% 5 W. Cemcoat
R47	749-0142	1K ohms ± 20% 2 W.
R48	740-0252	12K ohms ± 10% 2 W.
R49	740-0112	27K ohms ± 10% ½ W.
R50	740-0142	100K ohms ± 10% ½ W.
R51	740-0162	220K ohms ± 10% ½W.
R52	740-0162	220K ohms ± 10% ½W.
R53	740-0242	33K ohms ± 10% ½ W.
R54	740-0162	220K ohms ± 10% ½ W.
R55	740-0822	33K ohms ± 20% ½ W.
R56	740-0122	47K ohms ± 10% ½ W.
R57	740-0112	27K ohms ± 10% ½ W.
R58	742-0772	3.9M ohms ± 10% 1 W.
R59	740-0202	2.2M ohms ± 10% ½ W.
R60	742-0102	82K ohms ± 10% 1 W.
R61	749-0022	15K ohms ± 10% 2 W.
R62	742-0052	22K ohms ± 10% 1 W.
R63	742-0172	470K ohms ± 10% 1 W.
R64	742-0772	3.9M ohms ± 10% 1 W.
R65	742-0772	3.9M ohms ± 10% 1 W.
R66	742-0892	2.2M ohms ± 10% 1 W.
R67	742-0192	1M ohms ± 10% 1 W.
R68	740-0502	15K ohms ± 20% ½ W.
R69	740-0782	120K ohms ± 10% ½ W.
R70	740-0702	56K ohms ± 10% ½ W.
R71	740-0782	120K ohms ± 10% ½ W.
R72	749-0182	22K ohms ± 10% 2 W.
R73	740-0252	1.5K ohms ± 10% ½ W.
R74	740-0082	10K ohms ± 10% ½ W.
R75	740-0112	27K ohms ± 10% ½ W.
R76	740-0242	33K ohms ± 10% ½ W.
R77	740-0273	150 ohms ± 10% ½ W. Morganite
R78	740-0572	1K ohms ± 20% ½ W.
R79	740-0142	100K ohms ± 10% ½ W.
R80	740-0242	33K ohms ± 10% ½ W.
R81	740-0082	10K ohms ± 10% ½ W.
R82	742-0092	47K ohms ± 10% 1 W.
R83	740-0022	1K ohms ± 10% ½ W.

REF.	PART No.	DESCRIPTION
R84	740-0062	3.9K ohms ± 10% ½ W.
R85	740-0112	27K ohms ± 10% ½ W.
R86	740-0112	27K ohms ± 10% ½ W.
R87	740-0122	47K ohms ± 10% ½ W.
R88	740-0082	10K ohms ± 10% ½ W.
R89	740-0082	10K ohms ± 10% ½ W.
R90	740-0152	150K ohms ± 10% ½ W.
R91	740-0152	150K ohms ± 10% ½ W.
R92	740-0702	56K ohms ± 10% ½ W.
R93	740-0092	15K ohms ± 10% ½ W.
R94	742-0132	220K ohms ± 10% 1 W.
R95	740-0052	3.3K ohms ± 10% ½ W.
R96	740-0292	270K ohms ± 10% ½ W.
R97	740-1052	330K ohms ± 20% ½ W.
R98	740-1062	680K ohms ± 20% ½ W.
R99	740-0052	3.3K ohms ± 10% ½ W.
R100	750-0532	470 ohms ± 10% 5 W. PW5
R101	740-0663	82 ohms ± 10% ½ W. Morganite
R102	742-0112	100K ohms ± 10% 1 W.
R103	740-0112	27K ohms ± 10% ½ W.
R104	740-0082	10K ohms ± 10% ½ W.
R105	740-0082	10K ohms ± 10% ½ W.
R106	740-0122	47K ohms ± 10% ½ W.
R107	740-0082	10K ohms ± 10% ½ W.
R108	742-0172	470K ohms ± 10% 1 W.
R109	740-0082	10K ohms ± 10% ½ W.
R110	740-0232	39K ohms ± 10% ½ W.
R111	742-0022	4.7K ohms ± 10% 1 W.
R112	740-0202	2.2M ohms ± 10% ½ W.
R113	740-0582	47K ohms ± 20% ½ W.
R114	740-0302	1.8K ohms ± 10% ½ W.
R115	750-0482	1K ohms ± 5% 4 W. Metox
R116	742-0823	270 ohms ± 10% 1 W. Morganite
R117	740-1043	27 ohms ± 10% ½ W. Morganite
R118	740-1043	27 ohms ± 10% ½ W. Morganite
R119	740-0172	270K ohms ± 10% ½ W.
R120	740-0392	330K ohms ± 10% ½ W.
R121	740-0043	2.7K ohms ± 10% ½ W. Morganite
R122	740-0182	470K ohms ± 10% ½ W.
R123	740-0142	100K ohms ± 10% ½ W.
R124	740-0102	22K ohms ± 10% ½ W.
R125	742-0042	15K ohms ± 10% 1 W.
R126	742-0472	1.8K ohms ± 10% 1 W.
R127	740-0702	56K ohms ± 10% ½ W.
R128	740-0112	27K ohms ± 10% ½ W.
R129	742-0092	47K ohms ± 10% 1 W.
R130	742-0172	470K ohms ± 10% 1 W.
R131	740-0572	1K ohms ± 20% ½ W.
R132	750-0362	2.7K ohms ± 10% 5 W. PW5
R133	746-0242	1 ohm ± 10% BW½ W/W
R134	742-0262	2.7K ohms ± 10% 1 W.
R135	Part of 908-0382	1.5 ohms Wire Resistor
R136	742-0492	68K ohms ± 10% 1 W.
R137	742-0112	100K ohms ± 10% 1 W.
R138	740-0492	1.5M ohms ± 20% ½ W.

Above parts list is for chassis having Philips Deflection Components.
Where MSP Deflection Components are used, the following substitutions are made.

R139	742-0012	1.2K ohms ± 10% 1 W. for R134
R140	Part of 908-0561	1.5 ohms Wire Resistor for R135

CAPACITORS

REF.	PART No.	DESCRIPTION
C21	273-0591	68 pF. ± 2½% Mica
C22	271-0031	.0033 uF. + 100% - 0% 500V. Ceramic Disc
C23	271-0031	.0033 uF. + 100% - 0% 500V. Ceramic Disc
C24	271-0031	.0033 uF. + 100% - 0% 500V. Ceramic Disc
C25	271-0031	.0033 uF. + 100% - 0% 500V. Ceramic Disc
C26	271-0731	.047 uF. + 80% - 20% Disc 'B' Red Cap
C27	271-0281	.022 uF. + 100% - 0% 100V. Ceramic Disc
C28	271-0591	.0027 uF. ± 20% K2000 Style Ceramic Disc
C29	273-0591	68 pF. ± 2½% Mica
C30	271-0031	.0033 uF. + 100% - 0% 500V. Ceramic Disc
C31	271-0731	.047 uF. + 80% - 20% Disc 'B' Red Cap
C32	271-0591	.0027 uF. ± 20% K2000 Style Ceramic Disc
C33	273-0591	68 pF. ± 2½% Mica
C34	271-0031	.0033 uF. + 100% - 0% 500V. Ceramic Disc
C35	271-0731	.047 uF. + 80% - 20% Disc 'B' Red Cap

REF.	PART No.	DESCRIPTION
C36	271-0031	.0033 uF. + 100% - 0% 500V. Ceramic Disc
C37	271-0591	.0027 uF. ± 20% K2000 Style Ceramic Disc
C38	271-0621	1000 pF. Feed Thru Ducon CAC 100
C39	271-0121	5.6 pF. ± ¼ pF. Ceramic Tube NPO
C40	271-0131	8.2 pF. ± ¼ pF. Ceramic Tube NPO
C41	271-0181	15 pF. ± ½ pF. Ceramic Tube NPO
C42	271-0691	3.9 pF. ± ¼ pF. Ceramic Disc NPO
C43	271-0311	27 pF. ± 5% Ceramic Tube NPO
C44	279-1701	.047 uF. ± 20% 400 V.W. Paper
C45	282-0541	.0022 uF. ± 10% 400V. Polyester
C46	282-0661	.022 uF. ± 10% 400V. Polyester
C47	269-0211	8 uF. 300 V.W. Electro Type ET2D
C48	269-0521	100 uF. 150 V.W. Insulated Electro Type EMG1014 SFE
C49	269-0521	100 uF. 150 V.W. Insulated Electro Type EMG1014 SFE
C50) C51)	269-0511	80 uF. + 40 uF. 300 V.W. Electro Ducon Type EMC4830
C52	271-0111	1000 pF. CDS Hi-K K1200 Ceramic Disc
C53	271-0111	1000 pF. CDS Hi-K K1200 Ceramic Disc
C54	279-4661	.022 uF. ± 10% 400 V.W. Paper
C55	269-0611	4 uF. 300 V.W. Electro Type ET2D

PARTS LIST ... MODELS PH, PJ, PK

CAPACITORS — *continued*

REF.	PART No.	DESCRIPTION
C56	280-1791	220 pF. ± 10% 600V. Styroseal
C57	273-0921	68 pF. ± 10% MS Mica
C58	279-1741	.1 uF. ± 20% 400 V.W. Paper
C59	279-1161	.22 uF. ± 20% 200 V.W. Paper
C60	271-0111	1000 pF. CDS Hi-K K1200 Ceramic Disc
C61	279-0281	1 uF. ± 25% 200 V.W. Metalized Paper
C62	271-0231	68 pF. ± 10% 3K V.W. N750 Ceramic Disc
C63	279-1161	.22 uF. ± 20% 200 V.W. Paper
C64	271-0701	1 pF. ± ¼ pF. Ceramic Bead NPO
C65	282-0541	.0022 uF. ± 10% 400V. Polyester
C66	282-0541	.0022 uF. ± 10% 400V. Polyester
C67	271-0031	.0033 uF. + 100% - 0% 500V. Ceramic Disc
C68	279-1621	.01 uF. ± 20% 400 V.W. Paper
C69	271-0681	12 pF. ± 5% Ceramic Disc NPO
C70	271-0471	6.8 pF. ± ¼ pF. Ceramic Disc NPO
C71	271-0681	12 pF. ± 5% Ceramic Disc NPO
C72	271-0591	.0027 uF. ± 20% K2000 Style Ceramic Disc
C73	271-0591	.0027 uF. ± 20% K2000 Style Ceramic Disc
C74	271-0801	10 pF. ± 5% Ceramic Disc NPO
C75	271-0501	470 pF. K2000 Ceramic Disc
C76	271-0771	100 pF. ± 5% Ceramic Disc NPO
C77	280-1501	100 pF. ± 5% 600V. Styroseal
C78	280-1501	100 pF. ± 5% 600V. Styroseal
C79	282-0501	.001 uF. ± 10% 400V. Polyester
C80	269-0781	4 uF. 25 V.W. Electro Type ET1X
C81	282-0581	.0047 uF. ± 10% 400V. Polyester
C82	280-1841	560 pF. ± 10% 600V. Styroseal
C83	279-4001	.01 uF. ± 10% 200 V.W. Paper
C84	269-0611	4 uF. 300 V.W. Electro Type ET2D
C85	269-0701	10 uF. 12 V.W. Electro Type ES1203
C86	279-1641	.015 uF. ± 20% 400 V.W. Paper
C87	271-0181	15 pF. ± ½ pF. Ceramic Tube NPO
C88	269-0061	16 uF. 300 V.W. Electro Type ET4D
C89	269-0221	25 uF 25 V.W. Electro Type ET1B
C90	279-1661	.022 uF. ± 20% 400 V.W. Paper
C91	282-0541	.0022 uF. ± 10% 400V. Polyester
C92	279-0281	1 uF. ± 25% 200 V.W. Metalized Paper
C93	279-4701	.047 uF. ± 10% 400 V.W. Paper
C94	282-0541	.0022 uF. ± 10% 400V. Polyester
C95	282-0541	.0022 uF. ± 10% 400V. Polyester
C96	282-0721	.068 uF. ± 10% 400V. Polyester
C97	269-0481	24 uF. 350 V.W. Electro Type EDT6G with C100
C98	279-4621	.01 uF. ± 10% 400 V.W. Paper
C99	279-4161	.22 uF. ± 10% 200 V.W. Paper
C100	269-0481	24 uF. 350 V.W. Electro Type EDT6G with C97
C101	269-0361	100 uF. 25 V.W. Electro Type ESK
C102	273-1051	82 pF. ± 10% MS Mica
C103	273-1031	47 pF. ± 1 pF. Mica
C104	282-0521	.0015 uF. ± 10% 400V. Polyester
C105	282-0501	.001 uF. ± 10% 400V. Polyester
C106	282-0581	.0047 uF. ± 10% 400V. Polyester
C107	280-1751	100 pF. ± 10% 600V. Styroseal
C108	279-0561	.5 uF. ± 25% 200 V.W. Metalized Paper
C109	282-0561	.0033 uF. ± 10% 400V. Polyester
C110	280-1851	680 pF. ± 10% 600V. Styroseal
C111	271-0481	82 pF. ± 5% Ceramic Tube NPO
C112	280-1781	180 pF. ± 10% 600V. Styroseal
C113	279-1581	.0047 uF. ± 20% 400 V.W. Paper
C114	Part of 908-0382	82 pF. Ceramic Tube
C115	279-2161	.022 uF. ± 20% 600 V.W. Paper
C116	Part of 908-0382	150 pF. Ceramic Tube
C117	279-5771	.22 uF. ± 10% 1000 V.W. Paper
C118	279-5771	.22 uF. ± 10% 1000 V.W. Paper
C119	279-5701	.047 uF. ± 10% 1000 V.W. Paper
C120	279-4161	.22 uF. ± 10% 200 V.W. Paper

Above parts list is for chassis having Philips Deflection Components.

Where MSP Deflection Components are used, the following substitutions are made.

C121	Part of 908-0561	68 pF. Ceramic Tube for C114
C122	Part of 908-0561	270 pF. Ceramic Tube for C116
C123	279-4131	.12 uF. ± 10% 200V. Paper for C120

COILS

REF.	PART No.	DESCRIPTION
L21) L22)	259-1191	1st I.F. Grid Coil 31.375 Mc/s. Trap
L23) L24)	259-1171	1st I.F. Anode Coil 29.875 Mc/s. Trap
L25	259-0672	1st I.F. Coupling Coil
L26) L27)	259-1181	2nd I.F. Anode Coil 38.375 Mc/s. Trap
L28	259-0672	2nd I.F. Coupling Coil
L29	259-0672	3rd I.F. Coupling Coil
L30	259-0931	Detector Input Coil
L31	259-0954	Grid Peaking Choke
L32	259-0954	Grid Peaking Choke
L33	259-1082	Peaking Coil—Shunt
L34	259-1092	Peaking Coil—Series
L35	259-0993	Horizontal Stabliser Coil
L36	259-0044	Anti-Parasitic Coil
L37	259-0903	Width Coil
L38	259-0044	Anti-Parasitic Coil
L39	259-0044	Anti-Parasitic Coil
L40	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	677-1001	1M ohms Reversed C Type PTU — Tone
RV7	677-0621	1M ohm Tapped 500K Curve A with DPPP—Switch, 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	2M ohms ± 25% — Focus

TRANSFORMERS

REF.	PART No.	DESCRIPTION
IFT1	906-0451	Vision IFT
IFT2	906-0451	Vision IFT
IFT3	906-0252	Vision IFT
IFT4	906-0263	Vision IFT
IFT5	906-0382	Sound IFT
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	908-0382	Horizontal Output Transformer Philips AT2016T/92 or NT3101
or T6	908-0561	Horizontal Output Transformer MSP 43211
T7	908-0393	Focus Transformer

PARTS LIST ... MODELS PH, PJ, PK

VALVES

REF.	PART No.	DESCRIPTION	REF.	PART No.	DESCRIPTION
V1	932-1161	6ES8—R.F. Amplifier	V10	932-1771	6GW8—Audio Driver and Audio Output
V2	932-1921	6HG8—Frequency Changer			
V3	932-0881	6BY7—1st I.F. Amplifier	V11	932-0511	6BM8—Blocking Oscillator and Vertical Output
V4	932-0521	6BX6—2nd I.F Amplifier			
V5	932-1221	6EJ7—3rd I.F. Amplifier	V12	932-4811	12AU7—Horizontal Multivibrator
V6	932-1081	6DX8—Video Amplifier and Noise Inverter	V13	932-0531	6CM5—Horizontal Output
			V14	932-0771	1S2—E.H.T. Rectifier
V7	932-1091	6CS6—Sync. Separator	V15	932-1151	6AL3—Damping Diode
V8	932-1101	6U8—Sound I.F. Amplifier and AGC		932-1851	6V. 3W. Festoon Lamp Philips 6849 or Lucas, 255
V9	932-0441	6AU6—Limiter			

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		932-1261	AW59-30-K)
RT1	752-0061	Brimister, CZ11		932-1261	23WP4)
VDR1	750-0281	Voltage Dependent Resistor, Type E298GD/A260 (Blue Spot)		932-1261	23MP4-K)
				932-1261	2351B) PJ-PK
FS1	431-0071	Fuse, 1 A.		932-1261	23ARP4)
FS2	431-0081	Fuse, 1.5 A.		932-1621	AW59-90)
FS3	431-0031	Fuse, 250 mA.		932-1621	23MP4-J)
Yoke	259-1051	Philips AT1009T/93 or AT1009T/96		932-1621	2354B)
or	259-1161	MSP 42309	Tuner	224-1511	Philips, NT3009
CRT	932-1591	23HP4) PH			
	932-1591	23CRP4)			

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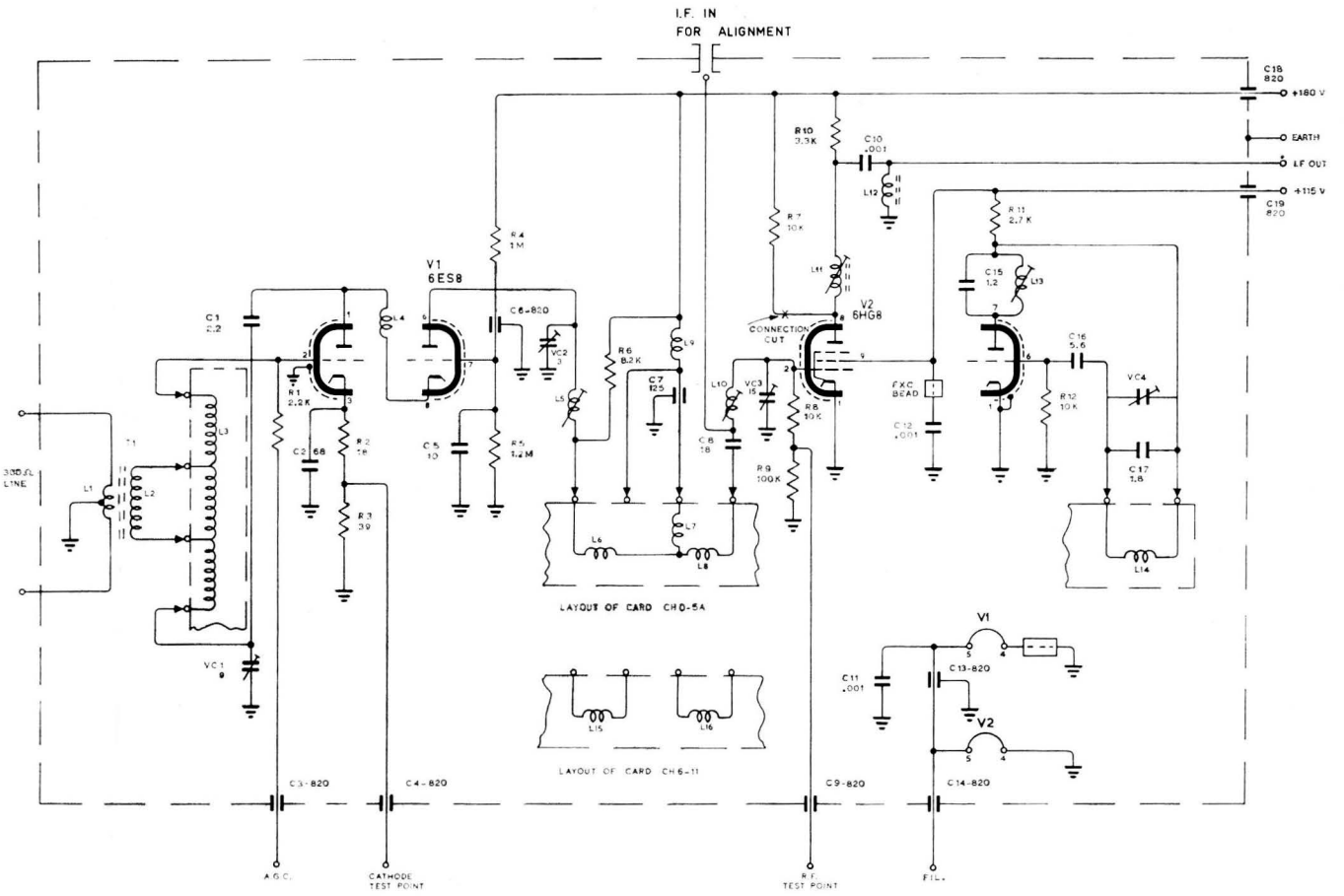

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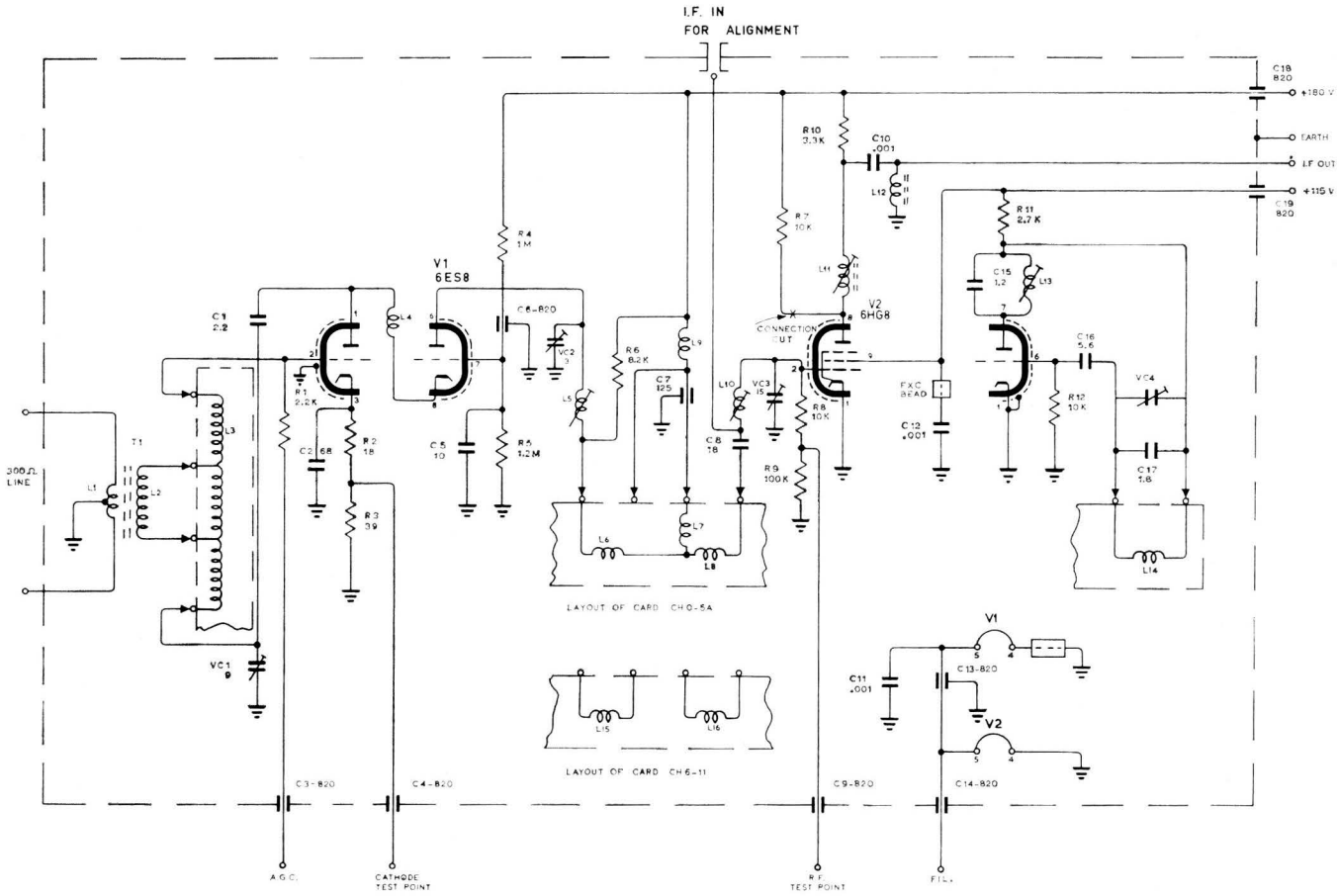
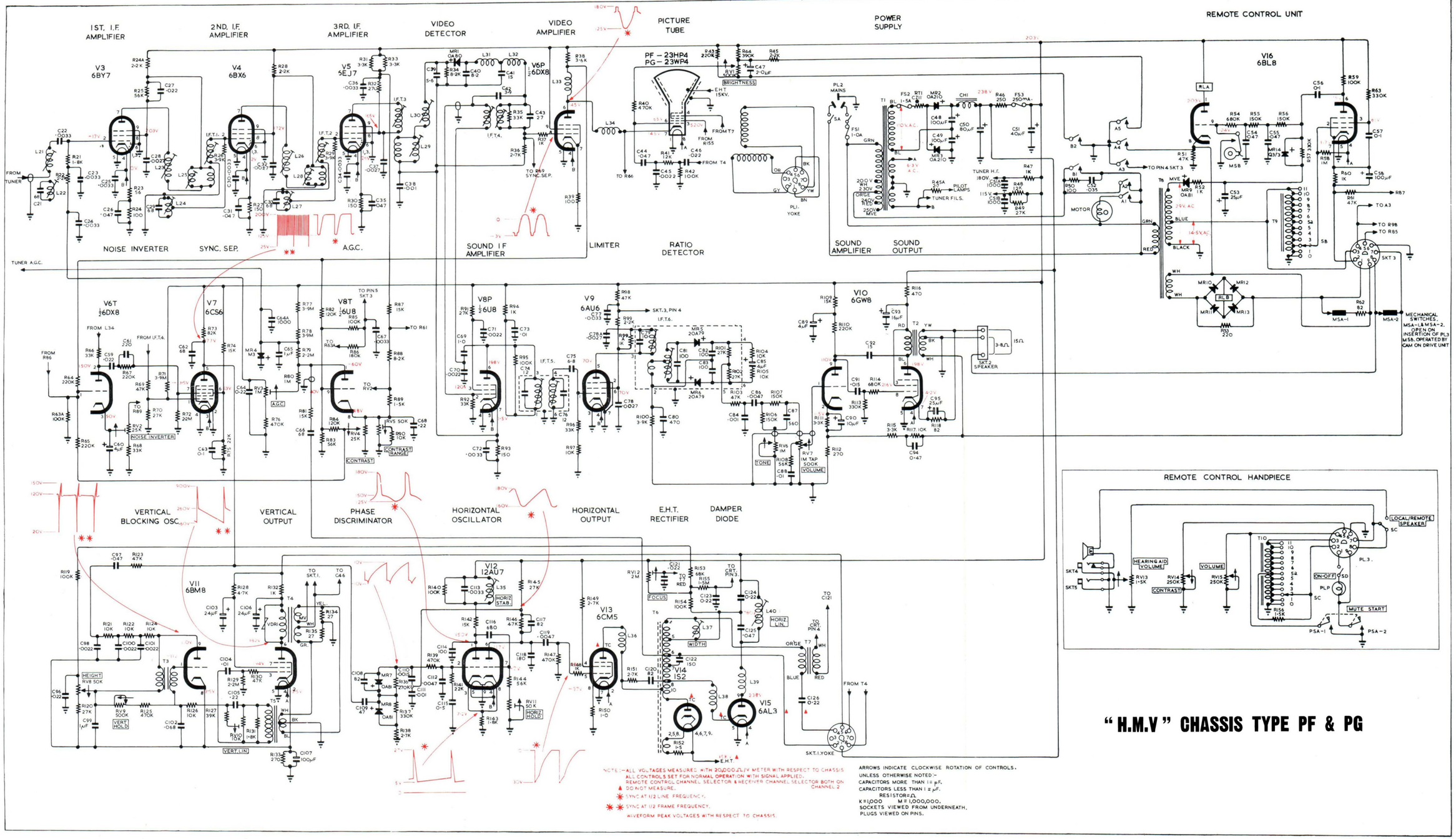
"H.M.V" CHASSIS TYPE PF & PG



TUNER TYPE NT3009

"H.M.V" CHASSIS TYPE PH, PJ & PK



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 μF.
CAPACITORS LESS THAN 1 μF.
RESISTOR Ω.
K=1,000 M=1,000,000.
SOCKETS VIEWED FROM UNDERNEATH.
PLUGS VIEWED ON PINS.

"H.M.V" CHASSIS TYPE PH, PJ & PK