T21 SERIES

SERVICE DATA

ISSUE 2

CIRCUIT DESCRIPTION

VISION IF AMPLIFIER

The vision IF amplifier consists of three stages of amplification, using three overcoupled bandpass transformers and a single tuned transformer as the inter-stage coupling circuits. The coupling and bandwidth of these circuits is arranged so as to give an overall phase linear response about the vision carrier.

The detector transformer L.5 is overcoupled and damped so that its response is nearly flat over the passband as shown in figure 6. This ensures that the impedance presented to the diode detector is substantially constant (and low in value) over the video band.

This is preceded by a similarly coupled and damped transformer L.4 to give the composite curve shown in figure 7. The damping was made heavy so as to make the coil easier to duplicate in production. The tilt shown in figure 7 is due to a small amount of mixed coupling in L.4.

The first IF transformer is tuned to the centre frequency and gives the response shown in figure 8 when added to the other circuits.

The tuner coupling is by means of a bottom capacitively coupled circuit formed by the mixer anode coil, the input coil L.2 and the coupling capacitor C.2. The connecting cable also forms an important part of this circuit, effectively adding more capacitance across C.2. The two coils are overcoupled and aligned to give the overall response curve shown in figure 9. The mixer anode is series damped by R.1 and the input coil by R.5 so that they have approximately equal Q.

The sound IF is attenuated by L.2A to provide the necessary differences in sound and vision carrier levels and further traps are provided in L.1 and L.3A which attenuate the adjacent sound and vision carriers respectively.

The first IF amplifier V.3 is a remote cut off type and is AGC controlled. L.2C forms a filter to prevent any line pulse appearing on the grid of this valve.

The network C.13, R.14 is included to prevent the last IF amplifier and the detector diode from being overloaded when the set is first switched on and the AGC is inoperative.

VIDEO DETECTOR

A germanium diode D.2 is used to demodulate the vision IF and to mix the sound and vision carriers to provide the 5.5 mc/s sound IF signal. The diode load R.19 and charge capacitor C.18 are made low in value to ensure wideband demodulation and to provide sufficient 5.5 mc/s output.

VIDEO AMPLIFIER

The video amplifier consists of one stage of amplification using V6P. The composite video waveform from the video detector is fed to the video amplifier grid via L5C, L5D and L6 which act as series peaking coils, as well as IF chokes. and compensate the HF end of the video spectrum. The video amplifier has a low anode load to ensure wideband response and is further compensated by L7 and L17B. The low frequency compensation is provided by the cathode circuit bypass C19 which gives an overall flat response to 5 mc/s.

The 5.5 mc/s sound signal is stopped from reaching the picture tube by the sound trap L17A.

Contrast control is made possible by R66, R20 and R18 which give a variable positive voltage on the grid of the video amplifier and thus reduce or increase the gain via the AGC valve, which is DC coupled to the video amplifier and responds to the change in anode voltage. R18 prevents any DC current from flowing in the diode D2 and C16 bypasses this for the video waveform. Such a small value is possible because of the high impedance of the video amplifier grid circuit and causes no loss in low frequency response so long as the video amplifier does not draw grid current. This is ensured by the cathode biassing resistor R23.

ALIGNMENT PROCEDURE

Equipment Necessary:

1. AM signal generator covering the range 25 - 230 mc/s with an output of 100 mV and a termination resistance of 75 ohms.
2. Wobbulator with a sweep width of 10 mc/s and a centre frequency of 31 mc/s.
3. An oscilloscope connected as shown in figure 2, with provision for external sweep.
4. A variable negative bias voltage of 0 - 9 volts.

Procedure:

1. (a) Disconnect the red oscillator HT lead to the tuner and switch the tuner to Channel 10. This is important, as the low band channels upset the overall IF response.
   (b) Turn the AGC, contrast and noise suppressor fully anti-clockwise.
   (c) Connect the CRO as shown in figure 2 to the junction of L6 and R21. The filter network shown eliminates any instability caused by connection of the CRO.
   (d) Connect the bias voltage to the junction of R79 and R80 positive lead to the chassis.
2. **Set the wobbulator with markers at 31.5, 34 and 36 mc/s to the centre** frequency of 34 mc/s and full output (0.5 volts peak) and connect it to the grid of V5P.
   Align the detector coil L5A and L5B to give the bandpass shown in figure 6. Check the alignment by moving each core slightly until the curve responds symmetrically.
3. Connect the wobbulator to the grid of V4P and reduce the output of the wobbulator to obtain 2 volts output from the detector. Align L4A and L4B to give the bandpass shown in figure 7. Check the alignment as before until the curve varies symmetrically.
4. Connect the wobbulator to the grid of V3 via an 0.001 uF ceramic capacitor (so as not to short the bias). Adjust the bias voltage to -6 volts and set the wobbulator to give 2 V output at the detector. Tune L3 (bottom core) to give the bandpass of figure 8.
5. Connect the wobbulator to the tuner test point and set the output as before. Adjust the mixer anode coil and L2B (bottom slug) to obtain the response of figure 9. The curve will not be obtained if the traps are not on frequency.
6. (a) Remove the wobbulator and connect the signal generator to the tuner test point.
   (b) With the frequency at 37.5 mc/s and 30% AM align L1 to give minimum output.
   (c) With the frequency at 30.5 mc/s and 30% AM align L2B (top core) for minimum output.

   NOTE - The bias may have to be reduced to obtain sufficient output at these frequencies.
7. Repeat steps 2-6 as a cross check to obtain the overall IF curve of figure 9.
8. Remove the bias and check that regenerative spikes do not appear on the bandpass and that the shape does not change appreciably.

VISION IF PERFORMANCE FIGURES

Measurements taken on a TF.1066 signal generator, giving 100 mV rms at 0dB when terminated 75 ohms:

Sensitivities taken on 34 mc/s for 2 V DC output at junction of L6 and R21:

Rejection figures taken in respect to 34 mc/s:

Sensitivity at 1st IF grid and zero bias:	40 - 46 dB
Sensitivity at tuner test point:	23 dB

This figure is included as a guide only, as there is a large loss from the test point to the mixer grid and the figure is not a true indication of IF sensitivity.

Rejection Figures:

37.5 mc/s (Adjacent sound)	36 dB
30.5 mc/s (co-sound)	24 - 28 dB

OVERALL SENSITIVITY CHECK

1. Apply shorting links across R79 and C1 to ensure that the IF and tuner bias voltages will be zero.
2. Connect a high impedance voltmeter (20,000 volt) between the junction of L6 and R21 and chassis, positive lead to chassis.

The sensitivity figures given below are for 2 volts DC read on the voltmeter. These figures will only apply when the generator is correctly matched to the tuner and a suitable matching network is shown in figure 1.

The dB figures only apply when the above matching device is used and when 0dB on the generator attenuator equals 100 mV. The voltage figures given are the actual voltages across the tuner input :

Channel	Frequency	Input
2	66.5 mc/s	76 dB 8 µV
7	184.5 mc/s	74 dB 10 µV
9	198.5 mc/s	74 dB 10 µV

SOUND IF AMPLIFIER

The sound IF amplifier and detector consist of one stage of amplification using V7P as a neutralised pentode limiter followed by the 6DT6 locked quadrature grid oscillator as the FM discriminator.

The 5.5 mc/s sound signal is taken off after the video amplifier using the series/parallel tuned circuit formed by C20, C21 and L8. This was the most efficient take off system tried, as the gain of the video amplifier is added to that of the sound, and the sound take off capacitor C20 is not very critical and was chosen as a compromise between gain and bandwidth. Too low a value reduces the gain unnecessarily, whilst too large a value damps the sound take off coil and allows the higher video frequencies to pass into the limiter grid. The size of the tuning capacitor C21 and the grid stopper R26 was chosen to eliminate harmonic radiation from the limiter grid which appeared on Channel 2 as a beat pattern.

The amplifier V7P is neutralised by C25 and C23 and acts both as a grid and plate limiter at levels about 50 mV at the video amplifier grid. This was done to prevent overloading of the 6DT6 syntector which acts as a much more efficient limiter than the pentode at lower levels. The limiter is coupled to the syntector by means of the double tuned transformer L.9.

OPERATION OF THE SYNTECTOR

In this form of detector, a voltage is induced across the tuned circuit in the suppressor grid by means of electron coupling from the control grid. At resonance the tuned circuit is resistive and the voltage across it is 90° out of phase with the control grid voltage. This is caused by the electron coupling, which acts as a small negative capacitor connected between grid and suppressor, causing an almost entirely capacitive current to flow in the tuned circuit at G3. These two voltages both act on the anode current and give rise to the relations shown in figure 5.

As the frequency of the input changes, the tuned circuit in G3 is no longer resistive and the phase of the voltage on G3 changes either side of 90° and thus increases or decreases the anode current as shown in figure 5. Thus the anode current becomes a function of input frequency and the circuit acts as an FM discriminator.

HIGH LEVEL OPERATION

At high input levels, the circuit behaves as described above and the FM input to the syntector is injected via L9A and L9B. The signal at the grid is in the order of 4 volts P-P and the grid acts as an AM detector with the un-bypassed cathode resistor acting as a diode load, across which is developed an audio voltage. This causes degeneration at audio frequencies and further reduces any AM component in the output.

LOW LEVEL OPERATION

At low input levels the circuit oscillates in a type of tuned plate-tuned grid manner, with the suppressor acting as the oscillator plate. This does not affect the operation of the detector, however, as the voltages on G1 and G3 remain much the same as before, and the frequency of the oscillator locks to the frequency of the input. The oscillator will follow the FM signal as it varies so long as the amplitude of the input is above a certain critical level known as the minimum locking level, and this level is proportional to deviation. Below this level the oscillator no longer locks to the input and becomes free running at a frequency mainly determined by L9B.

So long as the oscillatory voltage on G1 is large compared with the input signal, the anode current is independent of the signal amplitude and the AM rejection is high. Poor AM rejection at low levels is mainly caused by overcoupling in L9, which damps L9B and reduces the oscillator voltage on G1. This also causes large frequency drifts and results in reduced sensitivity.

GENERAL NOTES

In the anode circuit, R35 acts as filter for any 5.5 mc/s which might radiate from the audio amplifier connecting leads, and R33 is the audio load. The screen voltage does not materially affect the operation of the syntector and the screen bleed resistor R32 is included to stabilise the screen voltage sufficiently to obviate the need for an electrolytic bypass.

SOUND AMPLIFIER PROCEDURE

Equipment Required:

(a) AM/FM Signal Generator
Frequency 5.5 mc/s with a maximum error of 2 Kc/s
Output variable up to 100 mV
Deviation ±50 Kc/s at 1 Kc/s
AM 30% at 1 Kc/s

(b) Audio Oscilloscope

Alignment Procedure:

1. Turn the AGC, contrast, noise suppressor and brightness controls fully anti-clockwise.
2. Connect the signal generator to the junction of L6, R20 and R21.
3. Connect the oscilloscope to the junction of C.29 and C31.
4. Set the signal generator to FM, ±50 Kc/s and 100 mV output. Tune L10 for maximum output and linearity.

NOTE - (a) L10 must be adjusted at high levels so that the 6DT6 is not oscillating and the only circuit affecting the detection is L10. It may be necessary to adjust L9A and L9B roughly at this stage if a pure sinewave output cannot be obtained by adjusting L10.
(b) There are two tuning points for L10, the correct one being further into the coil. The incorrect tuning point gives slightly distorted output and poor AM rejection which will result in background buzz on the sound.

5. When L10 has been correctly adjusted, reduce the output of the generator until the sinewave becomes distorted. Adjust L9B (top core) and L9B (bottom core) until the sinewave is restored to its original shape.
   Again reduce the input and repeat these adjustments until no further improvement can be made.
6. Adjust L8 to clear distortion, decreasing generator output as before, until maximum sensitivity is obtained.
7. Re-adjust L9A and L9B if necessary.

NOTE - At the minimum input level, the sinewave should distort symmetrically on both peaks. If the distortion occurs asymmetrically, then either L10 or L9A is out of adjustment. L10 must not be adjusted at low inputs.

PERFORMANCE FIGURES

1. With the generator set to ±50 Kc/s deviation, the generator output should not be more than 600 uV to obtain undistorted audio output.
2. With the generator set to ±50 Kc/s deviation and maximum output, the peak to peak audio voltage at the junction of C29 and C31 should be 50 volts.
3. With the generator switched to AM ±30% the audio voltage should not rise above 1 volt peak to peak.
4. With the generator connected to the grid of V7P and set at ±50 Kc/s deviation, the generator output should not be more than 15 mV to obtain undistorted audio output.

SOUND TRAP ALIGNMENT

Equipment Required:

1. A switched generator to provide 5.5 mc/s and 1 mc/s at equal levels and 1 volt output.
2. Demodulator probe and indicator as shown in figure 4

Procedure:

1. (a) Turn contrast, AGC, brightness and noise suppressor controls fully anti-clockwise.
   (b) Connect demodulator to pin 7 on picture tube and earth.
   (c) Connect the generator to the junction of L6 and R21.
2. Switch to 5.5 mc/s and full output and tune L17A for minimum output. Note the output obtained.
3. Reduce the output of the generator by 26 dB and note that the indicated output is lower than when the generator is switched to 1.0 mc/s.

AUTOMATIC GAIN CONTROL

A composite video signal with noise interference removed by the noise suppressor action, is fed via R83 to the grid of the Automatic Gain Control (AGC) valve V10T. Positive 600 v. flyback pulses from the horizontal scan transformer are fed to V10T anode. Due to the finite anode-to-grid capacity (approximately 3 pF) undesirable positive pulses would appear on the grid and are therefore neutralised by negative pulses applied via C48 (3 pF) to the grid of the same valve.

A negative voltage, dependent upon the coincidence of the anode and grid signals and upon the amplitude of the video waveform is developed at the anode of V10T. This voltage is used to control the gain of the RF and IF amplifiers, keeping the video amplifier output constant, irrespective of the signal strength fluctuations at the aerial terminals of the receiver.

A two stage integrating filter network is provided for the negative voltage prior to its application to the RF cascode valve and the grid of the first IF valve. This filter removes the low frequency modulation which may be present at the anode of V10T when the horizontal oscillator is non-synchronous. If no provision is made to remove this modulation, its amplified form (via IF and video amplifiers) may seriously overload the synchronising separator, giving rise to a sync. "lock out" condition.

The AGC controlled first IF stage is a frame grid variable µ valve, operating under "sliding screen" conditions. The screen voltage varies from 50 to 200 volts, depending upon signal strength, thereby extending the effective grid base and providing an improved signal handling capacity. The cathode compensation maintains constant input impedance.

In the case of the tuner, a delay voltage is provided by a 12 M-ohm resistor (R7) connected to HT3 and the suppressor grid of V3 with an M3 diode connected in parallel. Since the AGC valve V10T can develop very large negative voltage, only about a quarter of it (R79, R80) is used for the IF amplifier, thereby permitting a higher than usual delay voltage on the tuner. It is of the order of 50 volts and once overcome, the tuner gain decreases very rapidly with the IF gain remaining approximately constant. This enables the receiver to handle signal from 10 µV to 200 mV without any cross modulation effects.

SYNCHRONISING PULSE SEPARATOR, NOISE SUPPRESSOR AND SYNCHRONISING PHASE SPLITTER

The video signal from V6P is fed to the grid of the synchronising pulse separator V6T, via R76, C43 and C42. The video signal is also fed to the grid of the noise suppressor V7T which is normally held just below cutoff by adjustment of the noise suppressor control R74. When noise pulses appear on the video waveform, V7T will conduct and develop across R76 a voltage in opposition to that fed direct from the video amplifier V6P. The negative synchronising pulses from V6T anode are fed via C40 into the grid of the synchronising phase splitter V9T. Positive and negative line pulses for the horizontal AFC circuit are derived from the anode and cathode respectively of the phase splitter via C57 and C62.

The negative pulse for the vertical oscillator is derived from the cathode of the phase splitter, via an integrating network and an interlace diode D.3.

NOISE SUPPRESSOR CONTROL SETTING

With a strong signal and no disturbing interference present, the noise suppressor is best turned off, i.e., hard anti-clockwise, viewing the receiver from the back.

If there is impulsive interference present, upsetting the vertical and horizontal holds, then the noise suppressor should be brought into operation by adjusting R74 clockwise, slowly, until the picture is displaced to the left and thrown out of synchronism. The control should then be backed off slightly (approximately ⅛ of a turn) and the picture will lock in firmly. This procedure should be carried out with the contrast control R66 approximately in the middle of its range.

In fringe area, this adjustment should be carried out with the strongest signal available, so that the AGC is still exercising the control over the receiver. If this adjustment is made under extremely weak signal conditions, sync. inversion may take place when the signal strength rises to the level at which the AGC assumes full control.

VERTICAL SCAN TIMEBASE

The vertical scan circuit consists of V9T - the oscillator, V4T - the discharge valve and V9P - the output stage, working into T1 which is the vertical output transformer.

The oscillator valve is triggered off by the leading edge of the negative frame synchronising pulse derived from the cathode of the synchronising phase splitter. A sawtooth waveform is built up at the anode of the discharge valve V4T in conjunction with R49 and C36 shaping network. This sawtooth is applied to the grid of the output stage V9P via C33. Vertical linearity is controlled by varying the cathode bias in the output stage V9P by adjusting R47. Vertical scan size is controlled by varying the drive waveform amplitude to the grid of the output stage, by adjusting R55. Vertical hold is also a DC control, arranged in the grid of the discharge valve by means of R50. The screen tap on T1 is chosen for the output stage to operate in the most favourable vertical linearity range. The damping effect of the screen feedback reduces the pulse voltage developed at the anode of V9P by adjusting the flyback time to the correct value with regard to the transmitted waveform.

A special feature of the vertical scan circuit is an inclusion of a temperature dependent resistor, R40, intended to maintain a constant picture height over a wide temperature range. As the vertical deflection coils warm up, their resistance increases thereby causing a loss of scan. At the same time, R40, being in close contact with the T1 windings, decreases in resistance thereby increasing the drive to the output pentode and hence the height. R40 is shunted by R39 for a better match of the compensating characteristic.

FLYBACK SUPPRESSION

The scanning beam is suppressed during the vertical and horizontal flyback periods by applying to the picture tube grid negative pulses derived from the vertical output and horizontal output transformers, via suitable RC networks.

HORIZONTAL SCAN TIMEBASE

Horizontal sync. pulses in anti-phase are derived from the synchronising phase splitter V9T and applied to the discriminator diodes D6. The reference waveform is obtained by shaping the voltage waveform, tapped from the horizontal output transformer with an RC network consisting of R110, C59, C58 and R88. The reference is then applied to the junction of D6 selenium diodes. Because of the slight asymmetry in the reference waveform, the control voltage is taken from the point somewhat displaced from the centre of the D6 load, consisting of R89 and R90. The amplitude and sense of the control voltage depend on the relative phase of sync. pulses and reference waveform. The control voltage is filtered and applied to the grid of V11T which is a reactance valve. This valve controls the free running frequency of the horizontal oscillator V11P which is a sinewave oscillator and the centre frequency is adjusted by varying the core position of L14.

When synchronising occurs, the discriminator and the reactance valve keep the oscillator at the correct frequency.

A suitable waveform developed in the anode circuit of V11P is used to drive the horizontal scan output stage V12. This stage employs T4 - a high efficiency output transformer with low loss ferrite cores. Direct current flows in opposite directions through the two windings of T4 connected by C76. The DC fluxes created by each winding cancel out, thus desaturating the core and allowing a higher performance of the smaller cross-section of core utilised.

A high pulse voltage which is present at V12 anode during the flyback period is stepped up by an auto winding on T4 and is rectified by V14 to provide EHT for the picture tube. V14 heater voltage is derived from an additional winding on T4. The EHT voltage is smoothed by the capacity between the internal and external coatings on the picture tube, the external coating being connected to ground.

The efficiency diode V13 "damps out" shock oscillation in the horizontal scan output transformer and the bias voltage developed is used as additional HT for the vertical discharge valve V9T, the horizontal scan output valve V12 and the picture tube V15.

Width adjustment is achieved by varying the point at which the tuning capacitors C80 and C81 are tapped across the horizontal scan transformer winding.

R108 is a **fusible** resistor introduced into the circuit to protect the horizontal output stage components in the event of oscillator failure with a subsequent loss of drive.

RECOMMENDED PROCEDURE FOR SETTING UP THE HORIZONTAL OSCILLATOR

The equipment required for this setting is an avometer or a VTVM with a DC voltage scale, pair of shorting leads and a plastic screw driver.

Procedure:

1. With the receiver switched on, and allowed to warm up for at least 20 minutes, the avometer positive terminal is connected to the cathode (pin 7 and 8) of the horizontal oscillator and the negative terminal is returned to ground. 0-25 volts DC range is the most suitable for this procedure.
2. The junction of R63 and R64 is shorted to ground. The reference voltage is removed by shorting the junction of R88, C58 and C59 to the chassis.
3. The oscillator should now be free running and the core in the L14 is adjusted until the frequency is correct and the picture is almost stable.
4. Removing either of the shorts described under (2) should make very little difference to the picture stability horizontally. An ⅛th of a turn of L14 should bring the oscillator back to the same frequency in either case.
5. Both shorts are now removed and the picture should look in firmly with the cathode voltage reading approximately 10.5 v on the avometer.

To check the pull-in range, the core of L14 is rotated clockwise until the picture falls out of synchronism. This condition can be accelerated by switching channels. The core is then returned slowly until the picture locks in. The voltage reading is noted (approximately 8 v) and the pull-in frequency is estimated by counting the number of frames (3 or 4) visible on the screen just before the lock-in occurs.

The core is then rotated anti-clockwise and the procedure is repeated. The voltage on the cathode should be in the vicinity of 13 V when the lock-in occurs and the number of frames should again be 3 or 4, constituting a fairly symmetrical pull in range of approximately 200 c/s on either side of the correct setting of the L14.

FOCUS

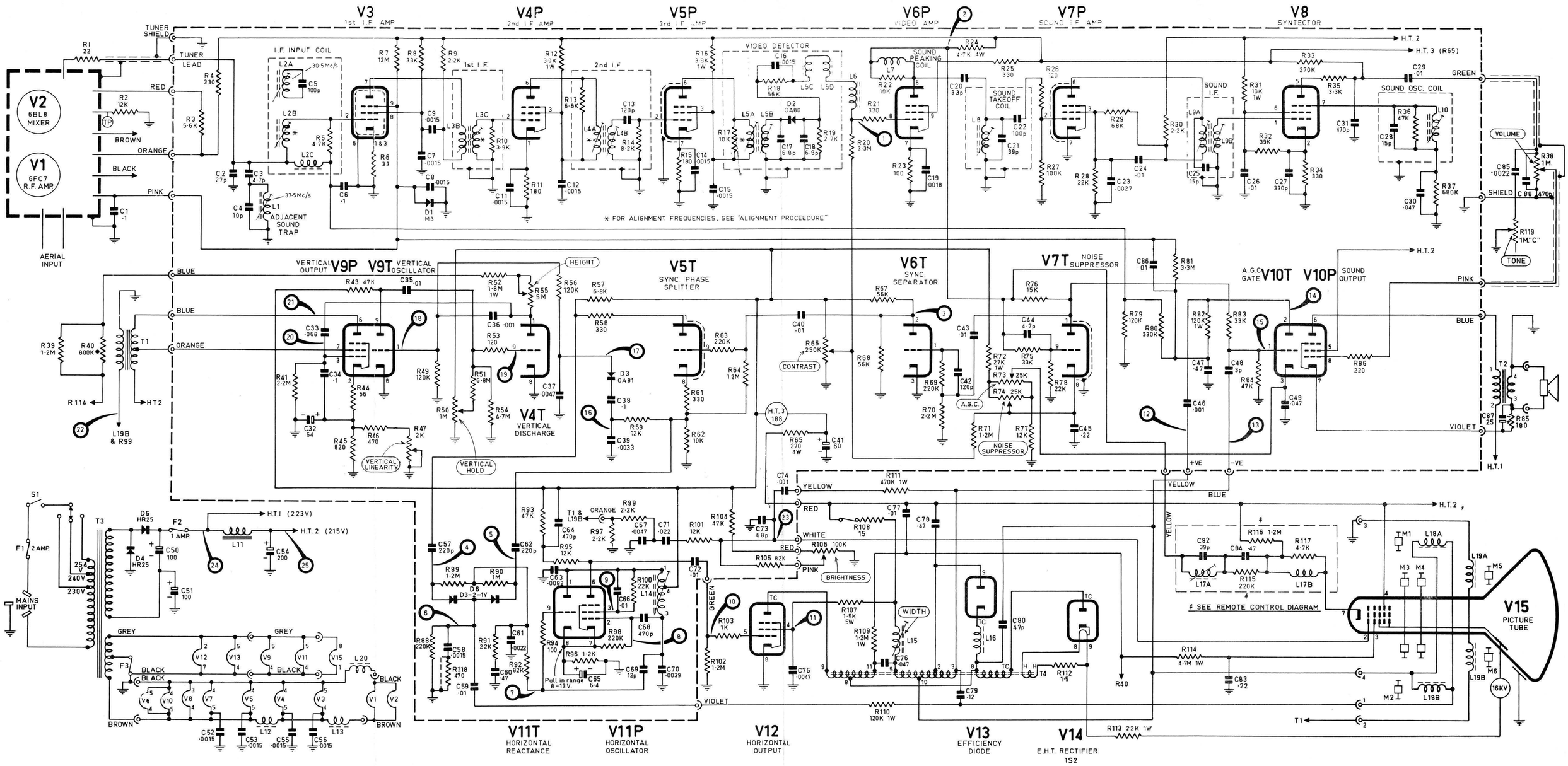
Electron beam focussing is achieved by varying the voltage on pin 4 of the picture tube. Adjustments are made by varying the connection of the focussing lead to either HT2 (pin 5, picture tube) boosted rail voltage, or the chassis. Connections can be made at the picture tube base and are optimised in the factory. Readjustment may be needed when the tube is replaced.

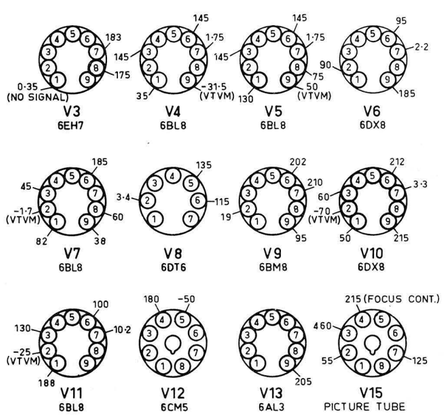
Centring of the picture on the screen is effected by means of the two magnets M3 and M4, which are rotatable about the neck of the tube independently of each other, the position of the picture depending upon the combined magnetic fields of both magnets.

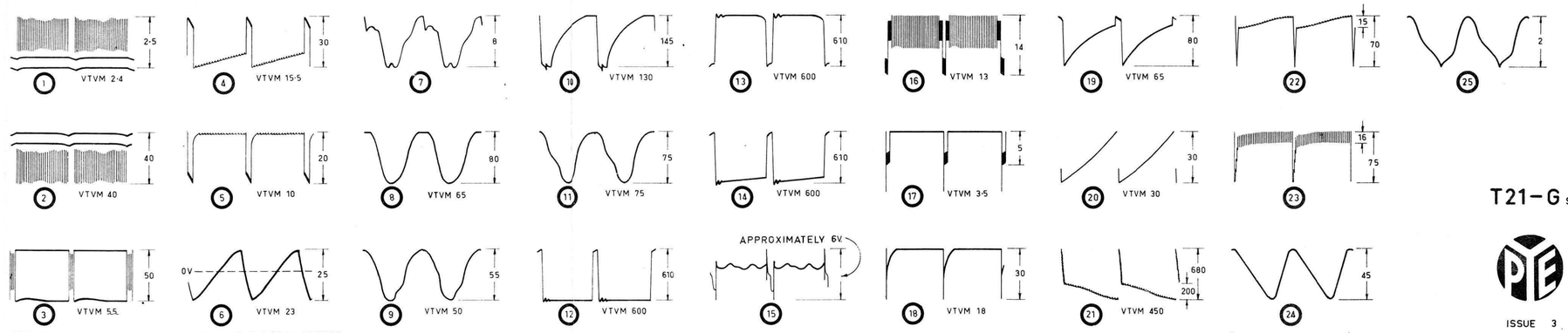
POWER SUPPLIES

Three Mains Voltage selection positions are the feature of the primary winding. In the secondary, the HT is obtained by means of two silicon diode rectifiers, D4 and D5, in a voltage doubler circuit and is smoothed by L11 and C54. The valve heaters are in two sections with the valves in each section connected in parallel. The active and the earthy lead of each heater chain are twisted together with the earthy lead in each section independently returned to the transformer, thereby preventing any undesirable hum currents flowing in the chassis.

Fuse F1 in the power input circuit, protects the receiver in the event of overload. F2 is fitted in the HT supply lead. F3, the heater chain fuse, protects heater wiring in the event of a short circuit in the heater distribution. If F3 becomes open circuit, during normal receiver operation, heaters may still operate, but an out of balance heater voltage will occur between the two heater chains.







TEST CONDITIONS:
11. ALL CONTROLS SET TO GIVE NORMAL PICTURE.
22. TO ACHIEVE GIVEN SYNC AND VIDEO VOLTAGES, THE CONTRAST CONTROL SHOULD BE SET TO GIVE 40 VOLTS P-P AT THE OUTPUT OF THE VIDEO AMPLIFIER.
33. SIGNAL STRENGTH ADJUSTED SO THAT A.G.C. VOLTAGE ON THE TUNER IS ZERO.

NOTE:- THIS WAVEFORM IS TAKEN WITH 6EH7 REMOVED.

WAVEFORM MEASUREMENTS MADE ON HIGH IMPEDANCE C.R.O. (TEKTRONIX. 10 MΩ / 14pF.)
V.T.V.M P-P VOLTAGE MEASUREMENTS MADE ON VOLTOHMIST 1A56074.

T21-G SERIES

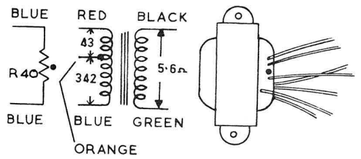
PYE

ISSUE 3

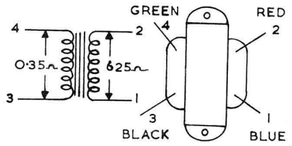
T 21 SERIES

ISSUE 2

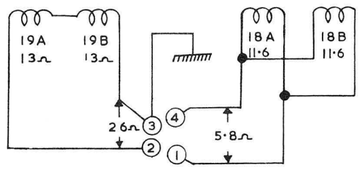
T1 VERTICAL OUTPUT TRANSFORMER.



T2 SOUND OUTPUT TRANSFORMER.

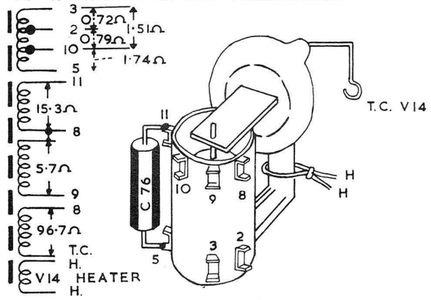


DEFLECTION COIL AND PLUG.



L11	H.T. SMOOTHING CHOKE.	28Ω
L14	HORIZONTAL OSCILLATOR COIL.	34·1Ω 1-3, 8·9Ω 1-4, 25·2Ω 4-3.
L15	INJECTION CHOKE.	35Ω

T4 HORIZONTAL OUTPUT TRANSFORMER



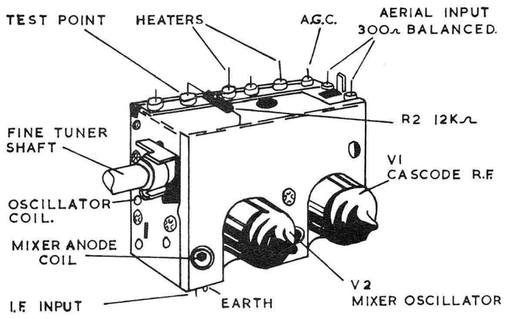


FIG. 1 TUNER MATCHING NETWORK

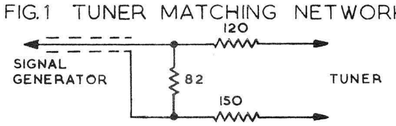


FIG. 2 METHOD OF CONNECTING C.R.O FOR I.F. ALIGNMENT

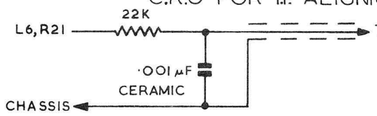


FIG. 3 METHOD OF CONNECTING MARKER TO WOBBULATOR

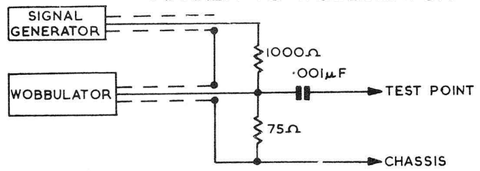


FIG. 4 DEMODULATOR PROBE

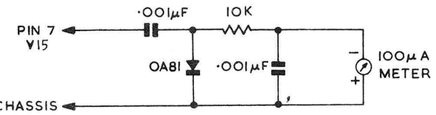
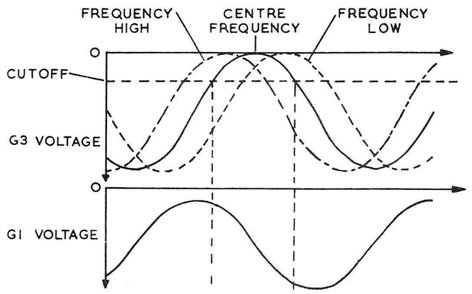
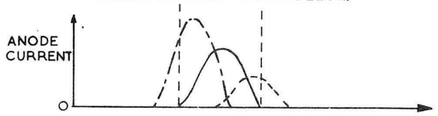


FIG. 5 PHASE RELATIONS IN THE SYNTECTOR



THE TWO VOLTAGES ON G1 AND G3 RESULT IN THE ANODE CURRENT SHOWN BELOW.



AS THE INPUT FREQUENCY VARIES, THE PHASE OF THE VOLTAGE ON G3 CHANGES AND THE ANODE CURRENT VARIES IN ACCORDANCE WITH THE NEW EFFECTIVE G1 VOLTAGE.

VISION I.F. AMPLIFIER RESPONSE CURVES

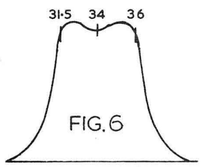


FIG. 6

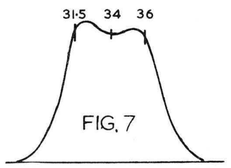


FIG. 7

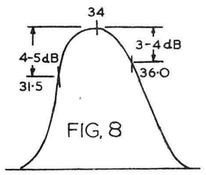


FIG. 8

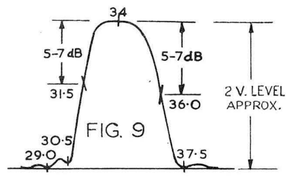
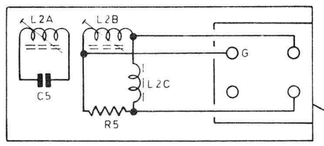
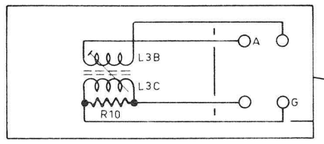
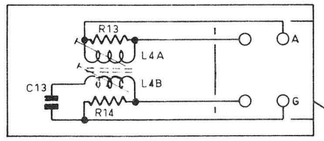
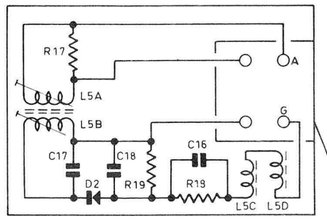


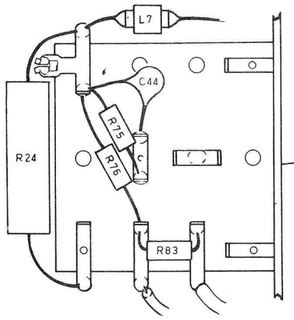
FIG. 9

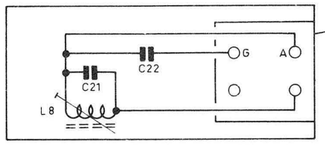


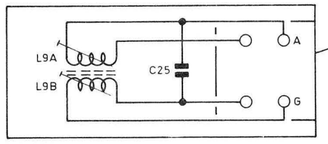


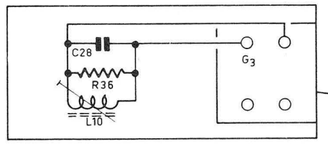


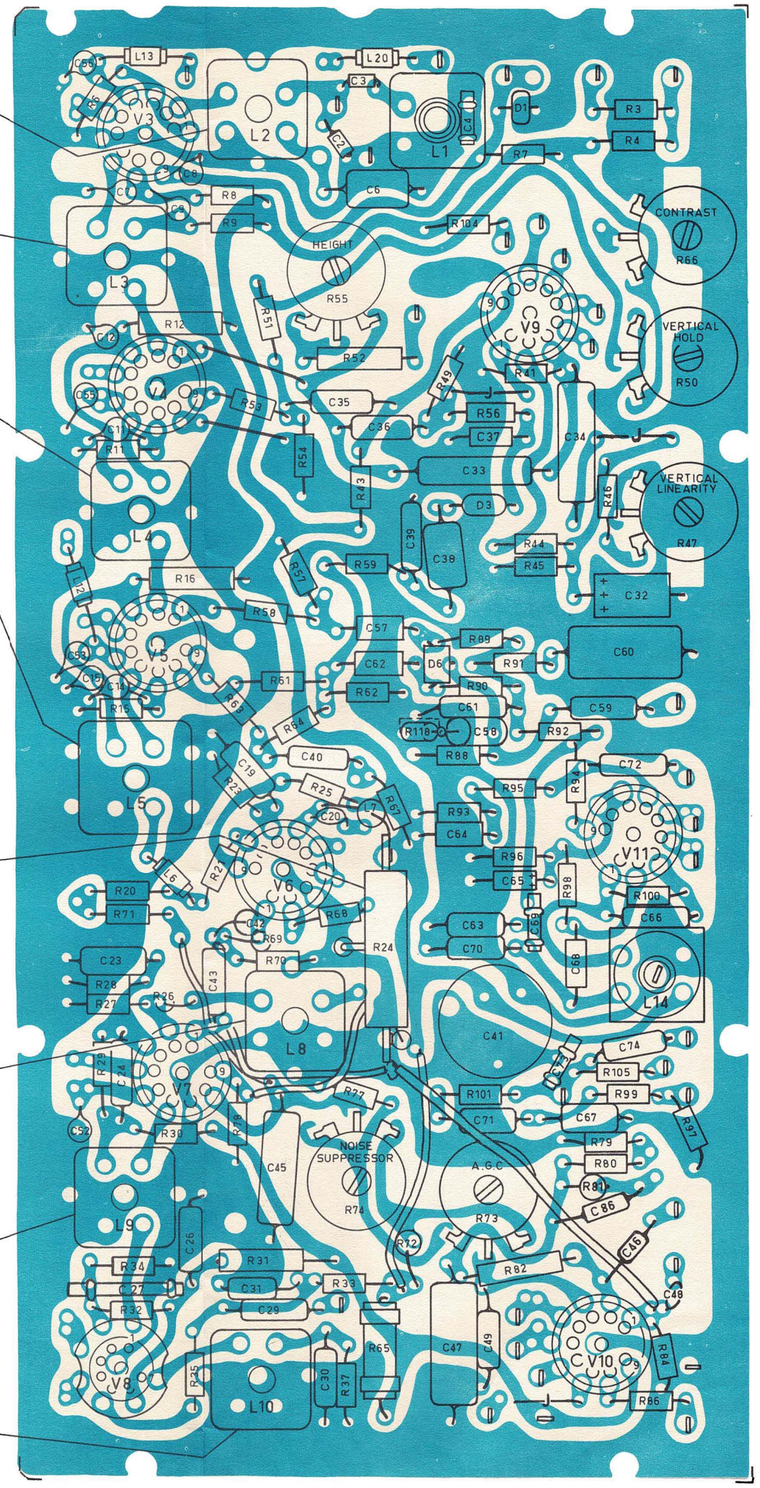












NOTE:- THE NUMBERS PRINTED ON THE ACTUAL PRINTED WIRING BOARD ARE FOR PRODUCTION PURPOSES ONLY, AND DO NOT REFER TO THE NUMBERS SHOWN ON THIS DRAWING OR ON THE CIRCUIT DIAGRAM.

RESISTORS

Code No.	Value in Ohms.	±% Tol.	Watts	Part No.
R1	22	10	½	EBJ-072M
R2	12K	20	½	EBJ-028M
R3	5.6K	10	½	EBJ-075M
R4	330	20	½	EBJ-046M
R5(inL2)	4.7K	10	½	EBJ-106M
R6	33	10	½	EBJ-192M
R7	12M	10	½	EBJ-190M
R8	33K	10	½	EBJ-049M
R9	2.2K	20	½	EBJ-109M
R10(inL3)	3.9K	10	½	EBJ-097M
R11	180	10	½	EBJ-100M
R12	3.9K	10	1	EBH-253M
R13(inL4)	6.8K	10	½	EBJ-103M
R14(inL4)	8.2K	10	½	EBJ-054M
R15	180	10	½	EBJ-100M
R16	3.9K	10	1	EBH-253M
R17(inL5)	10K	10	½	EBJ-034M
R18 (inL5)	56K	10	½	EBJ-083M
R19(inL5)	2.7K	10	½	EBJ-048M
R20	3.3M	10	½	EBJ-183M
R21	330	10	½	EBJ-066M
R22(inL7)	10K	20	½	EBJ-063M
R23	100	5	½	EBJ-067M
R24	4.7K	10	4	EBK-082
R25	330	20	½	EBJ-046M
R26	120	20	½	EBJ-008M
R27	100K	10	½	EBJ-042M
R28	22K	10	½	EBJ-017M
R29	68K	10	½	EBJ-003M
R30	2.2K	20	½	EBJ-109M
R31	10K	10	1	EBH-257M
R32	39K	10	½	EBJ-013M
R33	270K	20	½	EBJ-132M
R34	330	10	½	EBJ-066M
R35	3.3K	20	½	EBJ-127M
R36(inL10)	47K	20	½	EBJ-027M
R37	680K	20	½	EBJ-071M
R38	1M	-Volume		EBL-119
R39	1.2M	10	½	EBJ-026M
R40(inT1)	800K	25 at 25°C.		EBK-078
R41	2.2M	20	½	EBJ-004M
R42				
R43	47K	10	½	EBJ-030M
R44	56	10	½	EBJ-124M
R45	820	10	½	EBJ-188M
R46	470	10	½	EBJ-021M
R47	2K	-Vertical linearity		EBL-118
R48				
R49	120K	10	½	EBJ-029M
R50	IM	-Vertical hold		EBL-109
R51	6.8M	10	½	EBJ-175M
R52	1.8M	10	1	EBH-285M
R53	120	20	½	EBJ-008M
R54	4.7M	10	½	EBJ-018M
R55	5M	- Height		EBL-138
R56	120K	10	½	EBJ-029M
R57	6.8K	5	½	EBJ-177M
R58	330	20	½	EBJ-046M
R59	12K	10	½	EBJ-047M
R60				
R61	330	20	½	EBJ-046M
R62	10K	5	½	EBJ-086M
R63	220K	20	½	EBJ-036M
R64	1.2M	20	½	EBJ-130M
R65	270	10	4	EBK-083
R66	250K	-Contrast		EBL-107
R67	56K	10	½	EBJ-083M
R68	56K	10	½	EBJ-083M

RESISTORS

Code No.	Value in Ohms.	±% Tol.	Watts	Part No.
R69	220K	20	½	EBJ-036M
R70	2.2M	20	½	EBJ-004M
R71	1.2M	10	½	EBJ-026M
R72	27K	10	1	EBH-209M
R73	25K	-A.G.C.		EBL-105
R74	25K	-Noise suppressor		EBL-105
R75	33K	10	½	EBJ-049M
R76	15K	10	½	EBJ-016M
R77	12K	10	½	EBJ-047M
R78	22K	10	½	EBJ-017M
R79	120K	10	½	EBJ-029M
R80	330K	10	½	EBJ-098M
R81	3.3M	10	½	EBJ-183M
R82	120K	20	1	EBH-260M
R83	33K	10	½	EBJ-049M
R84	47K	10	½	EBJ-030M
R85	180	5	½	EBJ-184M
R86	220	20	½	EBJ-101M
R87	2x68	10	7	EBK-070
R88	220K	20	½	EBJ-036M
R89	1.2M	5	½	EBJ-181M
R90	1.0M	5	½	EBJ-189M
R91	22K	10	½	EBJ-017M
R92	82K	10	½	EBJ-019M
R93	47K	10	½	EBJ-030M
R94	100	20	½	EBJ-042M
R95	12K	10	½	EBJ-047M
R96	1.2K	10	½	EBJ-094M
R97	2.2K	20	½	EBJ-109M
R98	220K	20	½	EBJ-036M
R99	2.2K	10	½	EBJ-037M
R100	22K	20	½	EBJ-044M
R101	12K	10	½	EBJ-047M
R102	1.2M	10	½	EBJ-026M
R103	1K	20	½	EBJ-002M
R104	47K	20	½	EBJ-027M
R105	82K	20	½	EBJ-031M
R106	100K	- Brightness		EBL-119
R107	1.5K	10	5	EBK-071
R108	15	10	½	EBJ-200M
R109	1.2M	10	1	EBH-261M
R110	120K	10	1	EBH-265M
R111	470K	10	1	EBH-215M
R112(inT4)	1.5	10	½	EBK-058
R113(inT4)	22K	20	1	EBH-247D
R114	4.7M	20	1	EBH-272M
R115	220K	20	½	EBJ-036M
R116	1.2M	20	½	EBJ-130M
R117(inL17B)	4.7K	20	½	EBJ-001M
R118	470	20	½	EBJ-006M
R119	1M	Tone		EBL-085

VARIATIONS OF CONTROL COMBINATIONS

CIRCUIT SERIES.	MODEL	VOL. R38.	BRIGHTNESS R106	TONE R119	SWI ON POT.	CONC. POTS
T21-1A	501P	EBL-110	EBL-110	--	EBL-110	R38,R106
T21-1B etc.	501P	EBL-119	EBL-119	--	EBL-119	R38,R106
T21-2B etc.	501F 501F/1	EBL-120	EBL-045	EBL-085	EBL-120	--
T21-4C etc.	601X 601D	EBL-123	EBL-124	EBL-123	EBL-123	R38,R119
T21-5C etc.	501A/1	EBL-075	EBL-045	EBL-075	EBL-075	R38,R119

CAPACITORS

Code No.	Value in mfd's	±%Tol.	D.C.W.V.	Part No.
C1	.1	10	125	EBA-526
C2	27p	10	500	EBE-074
C3	4.7p	.5p	500	EBE-034
C4(inL1)	10p	10	500	EBE-051P
C5(inL2)	100p	10	600	EBA-507
C6	.1	10	125	EBA-526
C7	.0015	+50-20	500	EBE-068P
C8	.0015	+50-20	500	EBE-068P
C9	.0015	+50-20	500	EBE-068P
C10				
C11	.0015	+50-20	500	EBE-068P
C12	.0015	+50-20	500	EBE-068P
C13(inL4)	120p	20	500	EBE-062P
C14	.0015	+50-20	500	EBE-068P
C15	.0015	+50-20	500	EBE-068P
C16(inL5)	.0015	+50-20	500	EBE-068P
C17(inL5)	6.8p	.5p	500	EBE-059P
C18(inL5)	6.8p	.5p	500	EBE-059P
C19	.0018	10	400	EBA-548
C20	3.3p	.25p	500	EBE-060
C21(inL8)	39p	10	500	EBE-046P
C22(inL8)	100p	10	500	EBE-072P
C23	.0027	10	400	EBA-550
C24	.01	10	400	EBA-523
C25(in L9)	15p	10	500	EBE-041P
C26	.01	10	400	EBA-523
C27	330p	10	500	EBE-073P
C28(inL10)	15P	10	500	EBE-041P
C29	.01	10	400	EBA-523
C30	.047	10	125	EBA-533
C31	470p	10	600	EBA-510
C32	64	+50-10	25	EBA-085
C33	.068	10	400	EBA-528
C34	.1	10	400	EBA-525
C35	.01	10	400	EBA-523
C36	.001	10	400	EBA-529
C37	.0047	10	400	EBA-532
C38	.1	10	125	EBA-526
C39	.0033	10	400	EBA-546
C40	.01	10	400	EBA-523
C41	60	+50-10	200	EBA-104
C42	120p	20	600	EBA-503
C43	.01	10	400	EBA-523
C44	4.7p	.5p	500	EBE-034P
C45	.22	10	125	EBA-537
C46	.001	10	400	EBA-529
C47	.47	10	125	EBA-531
C48	3p	.25p	500	EBE-063
C49	.047	10	125	EBA-533
C50	100	+50-10	200	EBA-076
C51	100	+50-10	200	EBA-076-1
C52	.0015	+50-20	500	EBE-068P
C53	.0015	+50-20	500	EBE-068P
C54	200	+50-10	300	EBA-078
C55	.0015	+50-20	500	EBE-068P
C56	.0015	+50-20	500	EBE-068P
C57	220p	5	600	EBA-508
C58	.0015	10	400	EBA-530
C59	.01	10	400	EBA-523
C60	.47	10	125	EBA-531
C61	.0022	10	400	EBA-527
C62	220p	5	600	EBA-508
C63	.0082	10	400	EBA-541
C64	470p	10	600	EBA-510
C65	6.4	+50-10	25	EBA-084
C66	.01	10	125	EBA-539
C67	.0047	10	400	EBA-532
C68	470p	10	600	EBA-510

CAPACITORS

Code No.	Value in mfd's	±%Tol.	D.C.W.V.	Part No.
C69	12p	10	500	EBE-066P
C70	.0039	10	400	EBA-540
C71	.022	10	400	EBA-545
C72	.01	10	400	EBA-523
C73	68p	10	500	EBA-069P
C74	.001	10	400	EBA-529
C75	.0047	10	400	EBA-532
C76	.047	20	1000	EBA-461
C77	.01	10	400	EBA-523
C78	.47	10	125	EBA-531
C79	.12	10	400	EBA-549
C80	47p	10	5000	EBF-217
C81				
C82(inL17A)	39p	10	500	EBE-046P
C83	.22	20	600	EBA-501
C84	.47	10	125	EBA-531
C85	.002	10	400	EBA-527
C86	.01	10	400	EBA-523
C87	25	+50-10	4	EBA-106
C88	470p	10	600	EBA-510

INDUCTANCES

Code No.	Description	Part No.
L1	Coil-Adjacent Sound Trap	EAC-308
L2A&B	Coil- I.F. Input	EAC-309
L2C	Choke - I.F.	EAC-212
L3 R&C	Coil- 1st.I.F.	EAC-329
L4A&B	Coil- 2nd.I.F.	EAC-316
L5A&B	Coil- Video Detector	EAC-320
L5C	Coil- Channel No. 9	EAC-255
L5D	Choke- I.F.	EAC-212
L6	Choke- I.F.	EAC-212-1
L7	Coil- Sound Peaking	EAC-311
L8	Coil- Sound Take off	EAC-307
L9A&B	Coil- Sound I.F.	EAC-321
L10	Coil- Sound Quad. Osc,	EAC-313
L11	Choke- Smoothing	EAC-014
L12	Choke- Heater	EAC-314
L13	Choke- Heater	EAC-314
L14	Coil- Horizontal Osc.	EAC-303
L15	Control - Width	EAC-333
L16	Choke- I.F.	EAF-199
L17A	Coil- Sound Trap	EAC-306
L17B	Coil- Anode Series	EAC-312
L18A&B	Coils- Horizontal Yoke)	EAF-229
L19A&B	Coils- Vertical Yoke)	
L20	Choke- Heater	EAC-314

MISCELLANEOUS

Code No.	Description	Part No.
S1	Switch-ganged to R38	EBL-119
F1	Fuse - 2 amp.	EBQ-010
F2	Fuse - 1 amp.	EBQ-011
F3	Fuse - 34 S.W.G. tinned copperwire	
M1	Magnet-Horizontal Correction	ECG-708
M2	Magnet-Horizontal Correction	ECG-708
M3	Magnet - Shift	ECG-714
M4	Magnet - Shift	ECG-714
M5	Magnet -Vertical Correction	ECG-710
M6	Magnet -Vertical Correction	ECG-710

TRANSFORMERS

Code No.	Description	Part No.
T1	Vertical Output	EAB-126
T2	Sound Output	EAB-106
T3	Mains	EAB-123
T4	Horizontal Output	EAF-267