Addison TELEVISION

SERIES 618, 618R, 621, 621R

SERVICE and PARTS MANUAL

MODELS

1782SE 1782SR

2182HR 2182SS

2782SR 2782SS

3782FR

4182HR 4782HR

1123SE

ADDISONS LIMITED

HALIFAX • MONTREAL • TORONTO • WINNIPEG • CALGARY • VANCOUVER

Form 618—2M-4-53—R.P.

NOTES

618, 618R, 621, 621R SERIES CHASSIS

GENERAL

The above series television chassis is basically a universal receiver adaptable to various rectangular picture tubes and may incorporate a broadcast band radio tuner. The television portion contains a total of 21 tubes in a superheterodyne circuit with built-in power supply. The radio tuner contains two additional tubes, and in conjunction with a portion of the television circuit operates as a five-tube superheterodyne receiver. A number of new and unusual design features have been incorporated and will be described in detail.

The following controls are provided: Channel Selector combined with Fine Tuning; Off-on switch, Volume control combined with Picture control (Contrast). On sets where Radio tuner is incorporated, the Vertical Hold and Horizontal Hold controls are combined, and a Radio, Phono, T.V. switch combined with radio tuning shaft employed. On sets without radio tuner the Horizontal Hold control and Vertical Hold control are separate. All supplementary controls are readily available on the rear apron of the chassis.

Service data covering record changers is not included in this manual.

A newly designed built-in television antenna is provided. It is a dipole with open triangular shaped end sections mounted on the sides of the cabinet, for improved low channel performance. Where signals are strong and free of reflection, the built-in antenna may be used successfully. Orienting the cabinet or moving it slightly may improve reception. The built-in antenna must be disconnected when an external antenna is used.

In receivers with a radio tuner a low impedance loop antenna is supplied. Sets of this type should be oriented for best television and radio results. An external radio antenna may be connected through the External Antenna jack on the rear apron of the chassis.

Other features include: Gated Automatic Gain Control for constant contrast in the face of strong fading, reduction of aircraft flutter, and reduction of noise; Automatic Black Level control, eliminates the need for a brightness control; Intercarrier Sound, for synchronous tuning of both picture and sound; Stagger tuned I.F. system using bifilar wound coils for simplified alignment; Automatic Self Regulating Power supply; Permanent magnet Concert Speaker; Automatic Frequency control; Self Regulating Separator, electronically limits impulse noise and all electrical disturbances from the transmitted video signal, thus preventing picture movement, jitter, flop-over, etc.; Permanent Magnetic Focus and Positioning; Negative Feedback for true sound reproduction; Automatic Self-Adjusting control of picture width and linearity, requiring no manual control over a very wide range of line voltages; Television circuits use no power when radio or phono is operating; Ingenious circuiting adds only a tuning control in the radio position; Additional noise reducing circuits, and many others.

RADIO TUNER

In T.V. models designated by the suffix "R" a radio tuner has been incorporated. This tuner chassis is located centrally behind the front apron of the main T.V. chassis. Tube replacement is made possible through an opening cut in the cabinet chassis shelf just below the tuner chassis. Octal tubes are used to further facilitate tube replacement.

The tuner chassis incorporated a 6SA7 as oscillator-mixer in a conventional circuit. The intermediate frequency of 455 kc. is applied to a 6SK7 I.F. amplifier. These tubes are both controlled by A.V.C. voltage from the second detector. Two unused diodes in the 6AT6 1st audio tube located on the main T.V. chassis, are used in the second detector circuit.

The Audio channel using a 6AT6 and a 6AS5 tube is common to radio, phono and T.V. thus providing five-tube, transformer-operated radio reception with the addition of only two tubes.

Filament, and "B" supply loads are switched by the T.V.-phono-radio switch thus maintaining a reasonably constant operating condition.

The radio has been designed to operate on its own built-in, lo-impedance loop antenna, however a connector is provided on the rear chassis apron to accept an external antenna where needed.

SPECIFICATIONS

Chan. No.	Channel Frequency	Picture Carrier	Sound Carrier	R.F. Osc. Frequency	Chan. No.	Channel Frequency	Picture Carrier	Sound Carrier	R.F. Osc. Frequency
2	54–60	55.25	59.75	81	8	180–186	181.25	185.75	207
3	60–66	61.25	65.75	87	9	186–192	187.25	191.75	213
4	66–72	67.25	71.75	93	10	192–198	193.25	197.75	219
5	76–82	77.25	81.75	103	11	198–204	199.25	203.75	225
6	82–88	83.25	87.75	109	12	204–210	205.25	209.75	231
7	174–180	175.25	179.75	201	13	210–216	211.25	215.75	237

I.F. Frequencies: Picture Carrier - 25.75 MC.; Sound Carrier - 21.25 MC.

TUBE COMPLEMENT

Tube	Function	Tube	Function
6BQ7	R.F. Amp. (Used in Cascode Tuner)	12AU7	Sync. Clipper and Inverter
6J6	Oscillator and Mixer	6J5	Vertical Oscillator
6CB6	1st I.F. Amplifier	6V6G.T.	Vertical Output
6CB6	2nd I.F. Amplifier	6SN7G.T.	Horizontal Oscillator and A.F.C.
6CB6	3rd I.F. Amplifier	6BQ6G.T.	Horizontal Output
6AH6	Video Amplifier	6W4G.T.	Damper
6AU6	Sound Driver	1B3G.T.	Hi-Volt Rectifier
6AL5	Ratio Detector	5U4G	Lo-Volt Rectifier
6AS5	Audio Output	17BP4A	Picture Tube
6AU6	Sync. Separator	*21BP4A	Picture Tube
6AT6	1st Audio Amplifier	*6SA7	Radio Converter
6AU6	Gated A.G.G.	*6SK7	Radio I.F. Amplifier

Power Frequency: Shown on Serial Plate. * — When Required.

POWER REQUIREMENTS: 117 Volts A.C. 200 watts.

Radio tuning range: 535 kc. - 1620 kc.

Radio Intermediate Frequency: 455 kc.

T.V. Fine tuning range:
Low band ± .5 mc. average.
High band ± 1.6 mc. average.

Loud Speaker:
Permanent magnet.

Audio Power Output:
2 watt, 5% distortion.

Band width:
Antenna Input to picture tube 3.25 mc. at 6 DB.
Ratio Detector, 200 kc. peak to peak.

Deflection:
Horizontal and Vertical — Magnetic.

Focus: Magnetic.

Scanning: 525 Lines interlaced:
Horizontal Frequency — 15,750 CPS.
Vertical Frequency — 60 CPS.
Frame Frequency — 30 CPS.

CIRCUIT DESCRIPTION

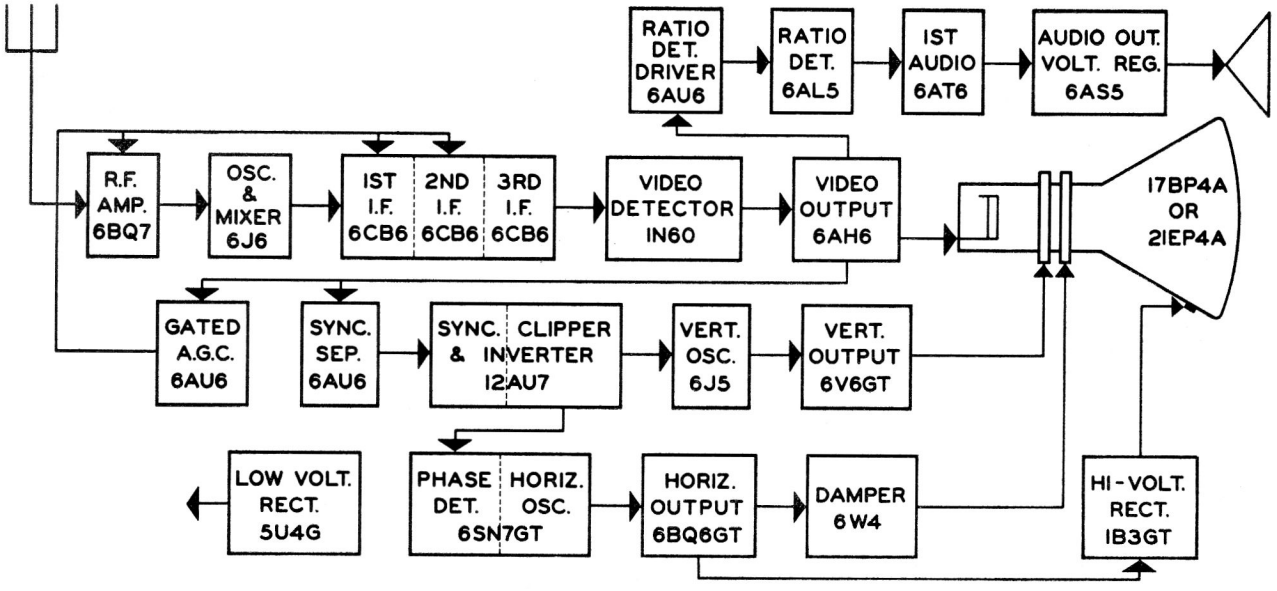


Figure 1

R.F. SYSTEM:

The R.F. tuner is a 12-channel, high efficiency cascode type turret unit, incorporating a 6BQ7 or 6BK7 R.F. stage and a 6J6 oscillator-mixer.

The circuit is designed to accommodate a 300 ohm balanced input. The signal is fed to the individual, removable antenna transformers and inductively coupled to the input of the cascode R.F. amplifier. The output of the R.F. amplifier is inductively coupled to the mixer section of the 6J6 tube and the oscillator voltage is injected simultaneously. Again, individual, removable coils are used for each channel. After mixing has taken place, the output I.F. voltage appears across the 1st I.F. coil, while a wave trap attenuates the sound I.F. carrier to the desired 26 DB. below the video carrier level.

I.F. SYSTEM:

A quadruple stagger tuned 3-stage amplifier with crystal detector output comprises the I.F. system. Quadruple stagger tuning is used to achieve the necessary gain for the desired bandwidth of 3.25 mc. at the 6 DB. point on the selectivity curve. A unique feature is the design of the I.F. transformers. These are bifilar wound, (two windings interwound), approximating unity coupling and giving the effect of a single tuned coil. A number of advantages are derived from this arrangement. Improved filtering of all plate and grid returns is achieved through the return of all by-pass condensers to the same ground as the associated cathode. With the bifilar winding the time constant in each grid circuit is kept to a low value and there is no charging of the grid circuit by heavy noise pulses, allowing the picture information to be continuously transmitted through the I.F. system. Amplification is supplied by three 6CB6 type tubes. Unbypassed, wire wound, cathode resistors, are employed in the first and second stages to supply bias and negative feedback thus minimizing the variation in input capacity with A.G.C. voltage changes and maintaining constant bandwidth with varying signals. The design of the I.F. system is such as to provide an essentially flat topped overall response curve with the picture barrier at 25.75 mc., 6 DB. down from the peak response, and the sound carrier at 21.25 mc., approximately 32 DB. down from the peak response.

Note: In common with all high frequency receivers, performance may be greatly impaired by altering lead dress or the location of ground connections. Therefore the receiver should not be changed from its original design when making service replacements.

DETECTOR:

A 1N60 or 1N64 crystal is used as the video detector. This is a high efficiency unit, especially designed for this service, and together with the peaking coils develops all the video components plus a 4.5 mc. beat note which contains the audio modulation, across a 4700 ohm load resistor which also acts as the grid resistor for the video amplifier.

VIDEO SYSTEM:

The video amplifier is a 6AH6 tube with associated wide band low pass filters. Since this tube has very high transconductance and low output capacity, it supplies sufficient voltage to fully modulate the picture tube over a very wide band of frequencies. Picture contrast and background illumination is controlled by varying the screen voltage of the 6AH6. It will be noted that the peaking coils are shunted with resistors. These are to damp out transients which tend to accentuate picture sharpness, but affect contrast adversely. The video signal is taken off the plate circuit and coupled to the cathode of the picture tube through a .05 Mfd. condenser shunted by a 180,000 ohm resistor. The coupling condenser serves to transfer the video information to the picture tube while the resistor completes a direct connection to maintain the video information at the proper level with respect to the blanking pulses, thus achieving D.C. restoration and automatic black level control. The grid of the picture tube is connected to the arm of the Brilliance control. This sets the bias for the picture tube, and, once set, requires no further adjustment.

AUTOMATIC GAIN CONTROL SYSTEM:

The A.G.C. system is the most efficient yet devised to maintain the picture and audio signals constant, even under the most adverse fading conditions. Thus, with aircraft passing overhead a great variation in signal strength takes place as the plane approaches the antenna and again as it leaves. This variation takes place at a very fast rate, and ordinary A.G.C. systems cannot follow the signal variations. Also, due to the long time constant of ordinary A.G.C. systems, they contribute much more noise to the received signals.

The gated A.G.C. system used in these models overcomes the above mentioned defects. Some of the composite video signal is taken off at the junction of the video amplifier load resistors and fed directly into the grid of the 6AU6 A.G.C. tube through a 47,000 ohm isolating resistor. The cathode of this tube is returned to the +150 volt point; the same point which supplies the video amplifier plate, therefore the bias on the A.G.C. tube is determined by the voltage difference across the 1800 ohm load resistor, which in turn depends on the plate current requirements of the video amplifier. The plate is not supplied from a D.C. source. Instead, a positive going pulse voltage derived from the Horizontal Output transformer is applied to the plate. This pulse voltage has a very short duration, only a few microseconds, and coincides with the arrival of the horizontal synchronized pulses on the grid, causing the tube to draw current during the synchronizing intervals only, providing the picture is horizontally synchronized. The fact that the A.G.C. tube only draws current for approximately 5 microseconds accounts for the elimination of most of the noise normally contributed by ordinary A.G.C. circuits, and since the lowest frequency component to be filtered out is 15,750 cycles per second, only short time constant filtering need be used, allowing A.G.C. action to take place at high speed. The corresponding D.C. Voltage used to automatically control the gain of the R.F.

and I.F. stages is developed across the filter network consisting of a 220,000 ohm resistor, a 150,000 ohm resistor, and a .5 Mfd. condenser, and its magnitude depends on the magnitude of the horizontal synchronized pulses applied to the grid of the 6AU6 from the 1800 ohm video load resistor.

SOUND SYSTEM:

Intercarrier sound is used in these models. By this method the 4.5 mc. beat produced at the video detector from the picture and sound carrier, is utilized. The sound carrier has been sufficiently attenuated by the wave trap at the tuner and the resultant 4.5 mc. beat produced by the detector is reasonably constant in amplitude, frequency modulated at the sound frequency rate, and contains no appreciable amplitude modulation (picture modulation) components.

The sound system consists of a 6AU6 driver, a 6AL5 ratio detector, 6AT6 1st audio amplifier and a 6AS5 power output stage. The 4.5 mc. signal is derived from a 4.5 mc. wavetrap in the plate circuit of the video amplifier. It consists of a 2.2 Mmfd. condenser in series with an adjustable coil, which when tuned to 4.5 mc. effectively attenuates this signal and keeps it off the picture tube. The grid of the driver tube is fed from a tap on the wavetrap coil to keep the impedance in the grid circuit low enough to eliminate instability due to plate-grid feedback. In addition, loading of the video circuit is avoided when the driver draws grid current upon application of a 4.5 mc. signal. Limiting action is obtained in the grid as well as the plate circuit, which with the screen, operates at a low D.C. potential. The driver tube is connected between +300 volts and +150 volts as part of a voltage regulation system. The R.C. filter network between the cathode and +150 volts prevents the 4.5 mc. signal from getting on the +150 volt string.

A conventional ratio detector circuit follows the driver stage. The 33 ohm resistor in series with the coupling link of the transformer stabilizes the impedance presented by the diodes of the 6AL5. If this resistor were deleted, the variation in impedance between individual diodes would reduce the ability of the detector to reject amplitude modulation. The audio derived from the ratio detector is applied across the volume control, the arm of which is connected to the triode grid of the 6AT6. This triode is a conventional audio amplifier of the hi. mu. type. Negative feedback is provided by a resistive network connected between the voice coil of the loudspeaker and the cathode of the 6AT6 tube, to reduce distortion.

SYNCHRONIZING SYSTEM:

The Composite video signal is applied to the grid of the 6AU6 synchronizing separator tube, from the plate of the 6AH6 Video Amplifier through a 15,000 ohm isolating resistor and a .05 Mfd. coupling condenser. Clipping and limiting of the synchronized pulses is accomplished in both grid and plate circuits of the 6AU6. Clipping of the synchronized pulses from the composite video signal takes places because the tube develops its own bias at the clipping level, which is never attained by the video signal. The plate is operated at a low potential and the resultant limiting action keeps the output synchronized level constant even though the input level varies. Horizontal and Vertical synchronized pulses are taken off the plate of the 6AU6, and coupled to an additional amplifying, limiting, and phase inverting circuit, involving a 12AU7 double triode, to prevent random noise from triggering the horizontal blocking oscillator. Vertical synchronized pulses are fed to the integrating network from the plate circuit of the inverter stage while the horizontal synchronized pulses are taken off the cathode of the inverter stage to the 6SN7GT control tube.

VERTICAL DEFLECTION SYSTEM:

The vertical deflection system consists of a free running multivibrator which is locked into synchronism by the vertical triggering pulses. The output of the multivibrator is fed into the vertical deflection coils without the use of further amplification. The 6J5 tube and a 6V6GT tube, triode connected, are employed in this service.

For a discussion of the circuit operation, it will be assumed that no triggering pulses are present. Then, after the circuit operation is understood in the untriggered state, the effect of the triggering pulses upon operation will be discussed.

For any linear magnetic deflection system, the waveform of voltage across the deflection coils is as shown in Figure 2, where A is the trace time, and B is the retrace time.

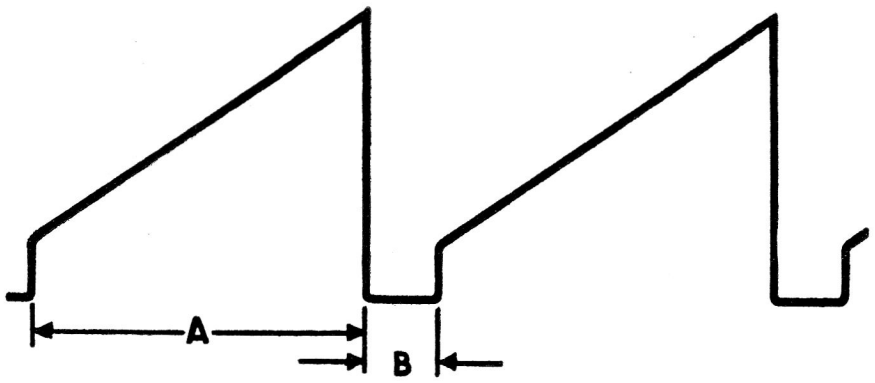


Figure 2

The procedure for obtaining this waveform is as follows: If the circuit is thought of as starting from a static condition where the 6J5 and 6V6GT are conducting it can be seen by the schematic diagram, Figure 21, that the circuit is very unstable and will readily break into oscillation, for, if the 6V6GT should have a slight increase of plate current due to "shot effect", "thermal-agitation" or any of many other possible reasons, its plate voltage would decrease causing the grid of the 6J5 to be driven in a negative direction. This would, in turn, decrease the plate current of the 6J5 causing the plate voltage to increase. Now the grid of the 6V6GT would be driven positive, further increasing its plate current. This process is cumulative, and the 6J5 is driven into cut-off almost instantly. This cut-off period is determined by the constant of the coupling network. When the coupling condensers discharge sufficiently to allow the 6J5 to start conducting, the 6V6GT is driven into cut-off almost instantly. When the 6V6GT again begins to conduct, the cycle is repeated. The circuit constants are so adjusted that the waveform from grid to ground of the 6J5 appears in Figure 3.

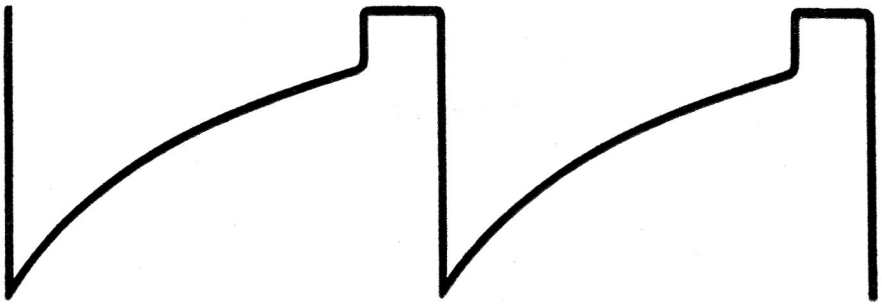


Figure 3

During the cut-off period of the 6J5, the waveform at its plate tried to rise to the B + voltage, but the integrating circuit formed by the .05 Mfd. condenser (item 175) and the 8200 ohm resistor (item 86) causes the plate voltage waveform to appear as in Figure 4.

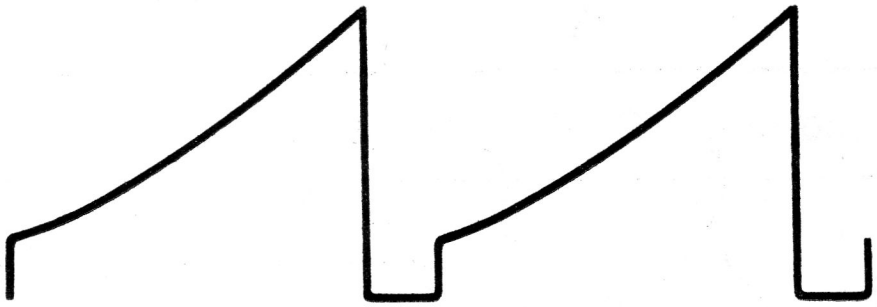


Figure 4

This waveform is fed to the grid of the 6V6GT which is conducting and capable of amplifying during the trace time. The waveform appearing between plate and ground of the 6V6GT is shown in Figure 5.

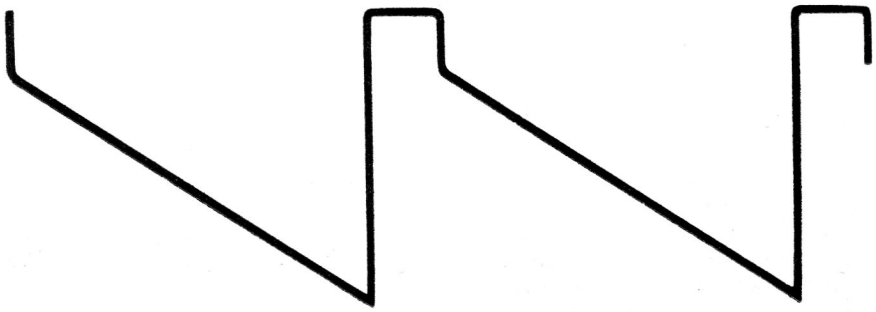


Figure 5

The effect of the synchronizing pulses can now be discussed. The synchronizing pulses appear at the grid of the 6V6GT with a negative polarity. Here they are amplified and fed to the grid of the 6J5 as positive pulses, due to the 180° phase inversion which takes place when a signal is amplified by a tube. The effect is shown in Figure 6, which represents the voltage waveform appearing at the grid of the 6J5.

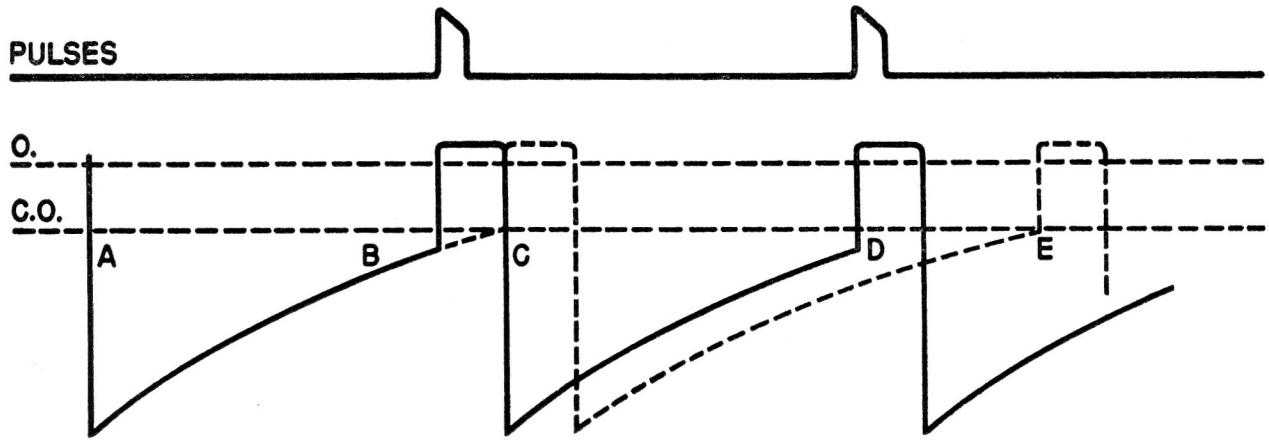


Figure 6

Without synchronizing pulses the 6J5 would start to conduct at C and E in their respective cycles; but with synchronizing pulses the grid is driven far enough positive at B and D to cause the 6J5 to conduct and thereby lock the trace in step with the synchronizing pulses.

Vertical holding is obtained by varying the Vertical Hold Control (item 30), which varies the unsynchronized cut-off period of the 6J5. When the resistance is increased, the cut-off period is increased and vice versa.

Figure 7 shows that with the synchronizing pulse as shown, no synchronized action will occur if item 30 is made too large. Similarly, synchronized action will take place on every other cycle if item 30 is made sufficiently small. This explains why, with too little "Hold", erratic operation takes place, and with too much "Hold" a double image is sometimes observed.

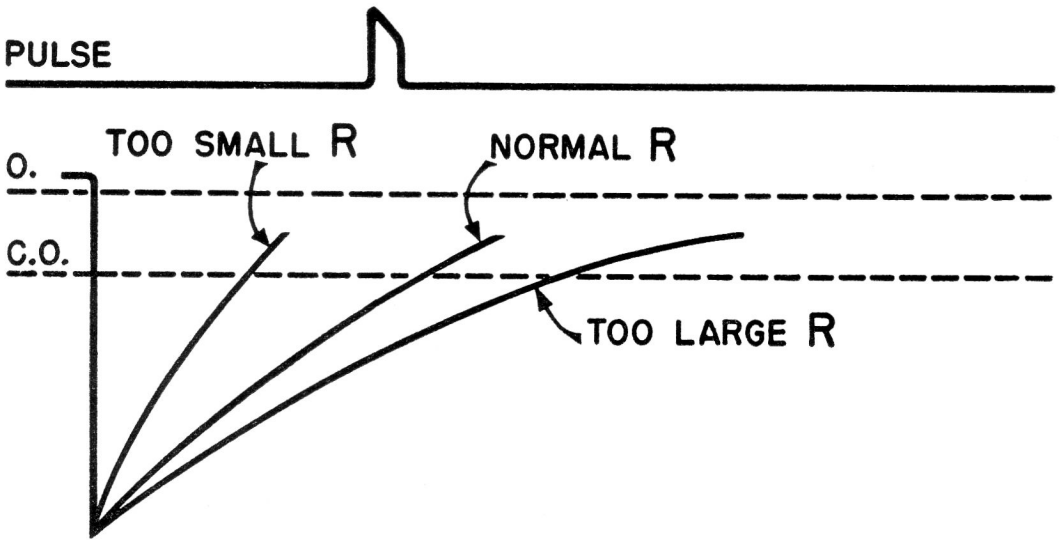


Figure 7

The Vertical sweep system used in this receiver is much less likely to be triggered by noise pulses because the coupling circuit between the 6V6GT and the 6J5 consists of two R-C networks in cascade instead of the usual single network. Cascade coupling circuits cause the grid voltage curve of the 6J5 to cross the cut-off point at a much steeper angle: See Figure 8.

It will be noticed that resistors (item 90) 27,000 ohm and (item 88) 3300 ohm are effectively across vertical deflection coils and will provide damping action during the retrace period.

Height control is obtained by varying the "vertical height" control (item 31) which alters the plate load resistance of the 6J5 which varies the magnitude of the waveform applied to the 6V6GT.

"Vertical Linearity" control (item 32) shifts the operating point of the 6V6GT up and down its dynamic curve by varying the bias applied to the grid.

Note: Vertical Height, Linearity and Hold Controls interact with each other. Therefore they will all have to be adjusted together for the best test pattern.

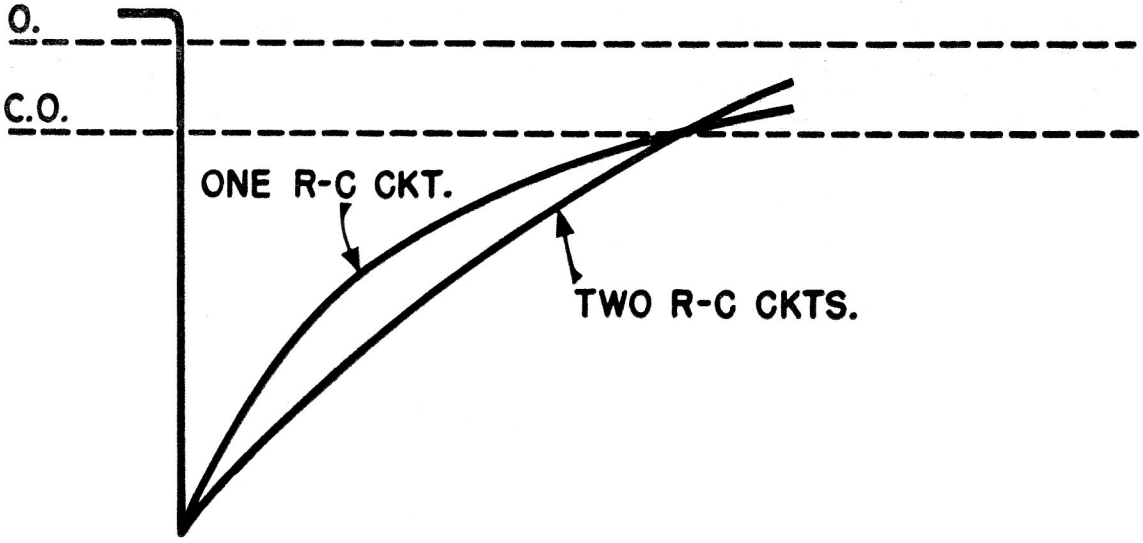


Figure 8

HORIZONTAL DEFLECTION SYSTEM:

The horizontal sweep system consists of a Blocking Oscillator and Phase Detector (6SN7GT), and a Horizontal Output amplifier (6BQ6GT). The blocking rate of the oscillator, which employs one triode of the 6SN7GT tube, is determined by the amount of resistance and capacity in the circuit. The other triode of the 6SN7GT is used as a pulse width type of phase detector to keep the blocking oscillator in step with the synchronizing pulses. The discussion of circuit operation will first be considered for the unsynchronized state.

The free running frequency of the blocking oscillator is lower than the frequency of the incoming synchronizing pulses. This is necessary in order that the synchronizing pulses may cause the oscillator to block at a somewhat higher rate than its free running frequency. In common with all oscillators a feed back of energy from plate to grid must occur. A transformer (item 13) is employed for this purpose. Any change of plate current will induce a voltage in the grid circuit, which will act to aid this change. A positive voltage is induced in the grid circuit through the transformer and as the grid becomes more positive, more plate current flows, resulting in the grid becoming positive very rapidly and causing electrons to flow and pile up on the 180 Mmfd. condenser (item 191) until a sufficiently large negative charge is developed and the oscillator blocks out. This charge leaks off the condenser through the high resistance in the circuit until the condenser is almost discharged, the tube again starts to draw plate current and the whole process repeats itself. The rate at which the charge leaks off is determined by the R-C time constant which is adjusted so that the frequency is slightly lower than 15,750 cycles per second.

The combination of the 500 Mmfd. condenser (item 193) and 470,000 ohm resistor (item 122) forms the saw-tooth waveform required to drive the 6BQ6GT Horizontal output tube. The "Horizontal Drive" control (item 35) controls the amplitude and linearity of the saw-tooth waveform and after amplification by the 6BQ6GT, a saw-tooth current is produced in the Horizontal Deflection coils.

A negative pulse taken from terminal No. 7 of the Horizontal output transformer (item 24) and fed through a .05 Mfd. condenser (item 197), a 4,700 ohm resistor (item 127) and a 2,700 ohm resistor (item 126) to the unbypassed screen grid of the 6BQ6GT, drives the screen negative and tends to smooth out any oscillation or ringing effect not entirely eliminated by the Damper tube (6W4). A feature of this circuit is the use of synchronized wave stabilization of the blocking oscillator. This is accomplished through the employment of a tuned circuit in the plate of the blocking oscillator, consisting of the Horizontal Stabilizing Coil (item 14) .006 Mfd. Condenser (item 192). This arrangement makes the oscillator very stable and relatively immune to triggering by random noise pulses. Grid and plate waveforms of the blocking oscillator are shown in Figures 9 and 10 respectively.

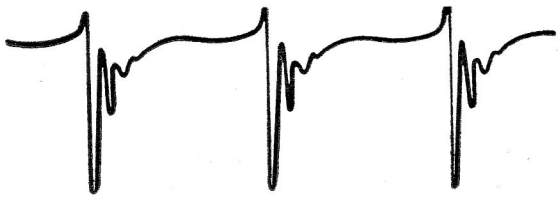


Figure 9

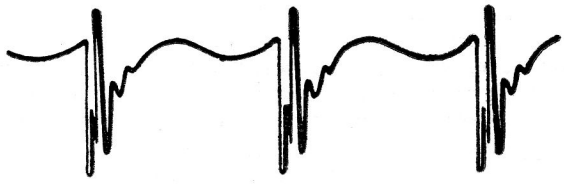


Figure 10

AUTOMATIC FREQUENCY CONTROL OF THE HORIZONTAL OSCILLATOR:

Automatic Control of the frequency of the Horizontal oscillator is obtained by the use of the second triode of the 6SN7GT as a phase detector. The signal applied to the grid of this tube is a composite one, made up of the 3 waveforms shown in Figure 11.

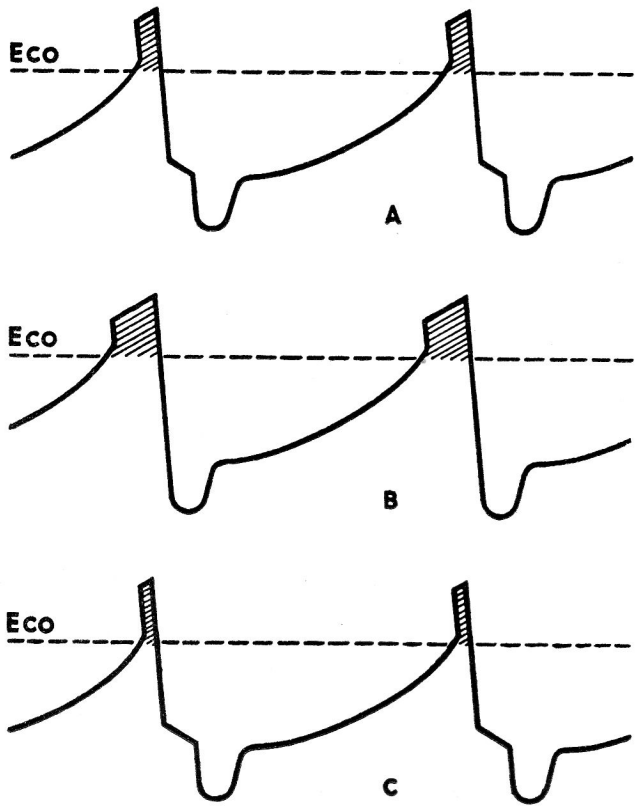


Figure 12

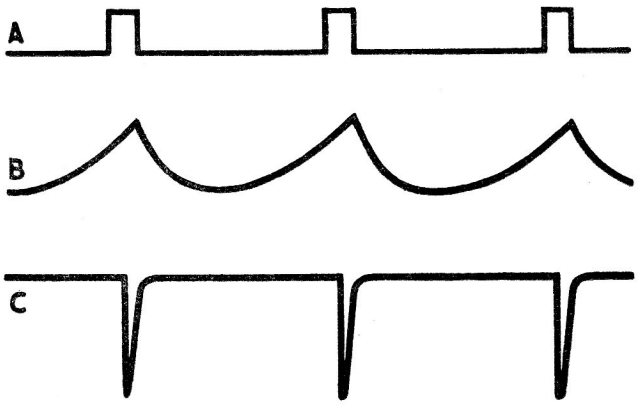


Figure 11

"A" is the incoming synchronizing pulse and is fed through a 125 Mmfd. condenser (item 186) from the 12AU7 inverter to the grid of the control tube. "B" is a sample of the saw-tooth obtained from the horizontal oscillator and fed through a 150,000 ohm resistor (item 121) to the control tube grid.

"C" is a negative pulse taken from the horizontal output transformer and fed to the control tube grid through a 560,000 ohm resistor (item 130) and a 4.7 Mmfd. condenser (item 200).

The composite waveform on the control tube grid is shown in Figure 12.

When the control tube draws current, a D.C. voltage is developed across the cathode resistors (item 113) 180,000 ohms, (item 115) 100,000 ohms, and the filter network consisting of (item 189) .02 Mfd., (item 190) .2 Mfd., and (item 112) 8,200 ohms. It should be noted that the 100,000 ohm resistor is also part of the resistance in the grid circuit of the blocking oscillator. The grid of the control tube is negatively biased because of the connection of a 3.3 meg-ohm resistor (item 116) back to the oscillator grid. With the application of the composite waveform, the control tube starts to draw current because the bias has been overcome by the positive portion of the composite wave (shaded portions in Figure 12). This current, flowing through the cathode resistors, develops a voltage across them. "A" in Figure 12 shows the normally synchronized condition. Now, should the oscillator drift lower in frequency, the synchronizing pulses sitting on top of the composite waveform will appear further down the slope of the saw-tooth as shown at B, Figure 12. The tube will draw current for a longer period of time and a large positive voltage will be developed across the cathode resistors (item 115) and (item 113). Since resistor (item 115) is also in the grid circuit of the blocking oscillator, bias will be reduced and the frequency will be increased. Conversely, should the oscillator drift high in frequency, C, Figure 12, the correction voltage will be reduced and the oscillator frequency will be reduced. The Horizontal Lock Control (item 36) varies the amplitude of the composite waveform and is normally set ⅛ to ¼ turn from right tight. If this trimmer is backed off too far, Horizontal holding will be erratic and the picture will jerk into sychronization. If it is right tight, the holding range will be shortened. Horizontal frequency is roughly set by the Horizontal Frequency Control, an adjustable core in the oscillator transformer. The fine frequency adjustment is made by the Horizontal Hold Control on the front panel.

Proper adjustment of the Horizontal Stabilizing Coil is very important. With an oscilloscope connected to the junction between the horizontal oscillator transformer (item 13) and the Horizontal stabilizing coil (item 14), and ground, adjust the stabilizing coil for the correct waveform, Figure 13.

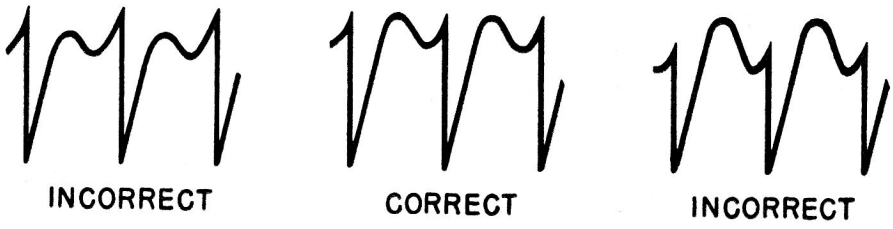


Figure 13

While making this adjustment the receiver must be operating and the picture synchronized. If the picture goes out of synchronization, resynchronize it before continuing the adjustment. In order to reproduce the waveform faithfully the scope must have a wide band vertical amplfier.

High Voltage for the picture tube is supplied by the Horizontal Output transformer, and the circuit is conventional in design. Arcing or corona discharge should be immediately investigated and is most easily seen in a darkened room.

The high voltage section is completely screened off and shielded. The removable cover contains an interlock connector which automatically opens the A.C. line when the cover is removed.

POWER SUPPLY SYSTEM:

The power supply is contained on the rear right section of the main chassis. The design is conventional, using a power transformer, full wave rectifier, choke, and two section filter condenser. An outlet is provided on the rear apron of the chassis. In sets having a radio tuner this outlet can be used to plug in a phono motor. This outlet can be used for any electrical attachment (not exceeding 200 watts) in sets not having a radio tuner.

The unique voltage regulating properties of this set is illustrated in Figure 14 below.

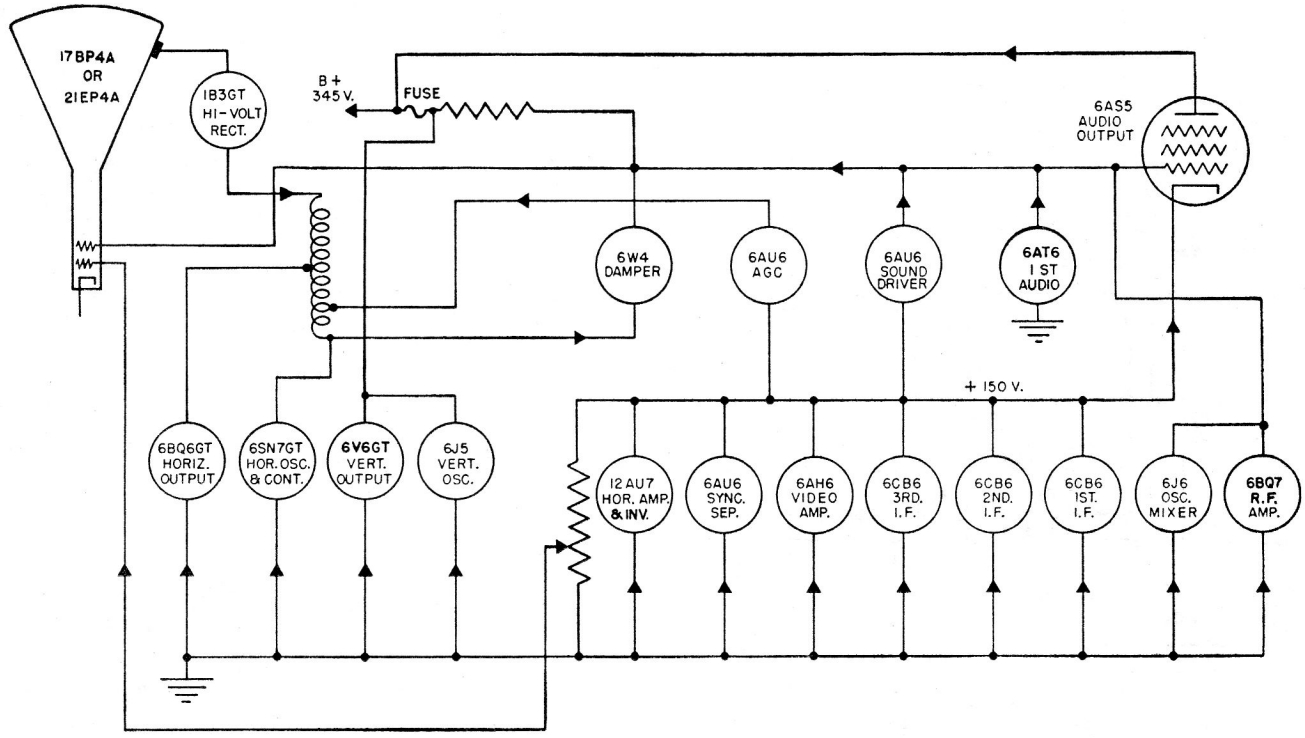


Figure 14

The 6AS5 power amplifier and 6AU6 sound driver, in series with the I.F. amplifiers, serve as voltage regulators to maintain a relatively constant +150 volt source. When the current through the I.F. Amplifiers changes (due to A.G.C., etc.), the cathode voltage on the 6AS5 and 6AU6 varies accordingly. This causes the impedance of these tubes to change, and the voltage drop across them is maintained approximately constant.

ION TRAP ADJUSTMENT:

Reduce the contrast and raise the brightness to a point where a blank raster is visible on the picture tube. Rotate ion trap while moving it backward and forward until the brightest raster is obtained.

Caution: Never adjust the ion trap to eliminate neck shadow, as this may injure the picture tube.

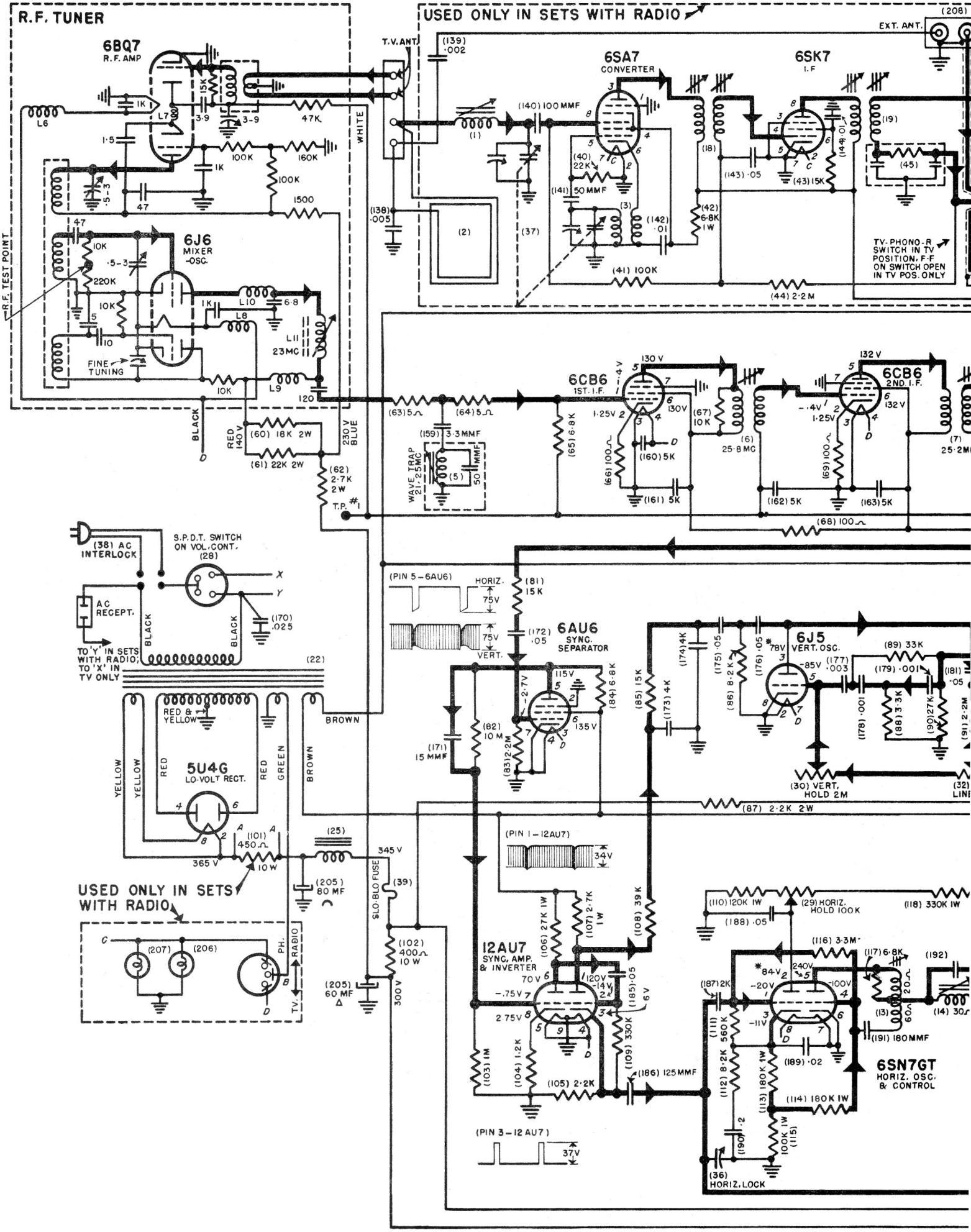
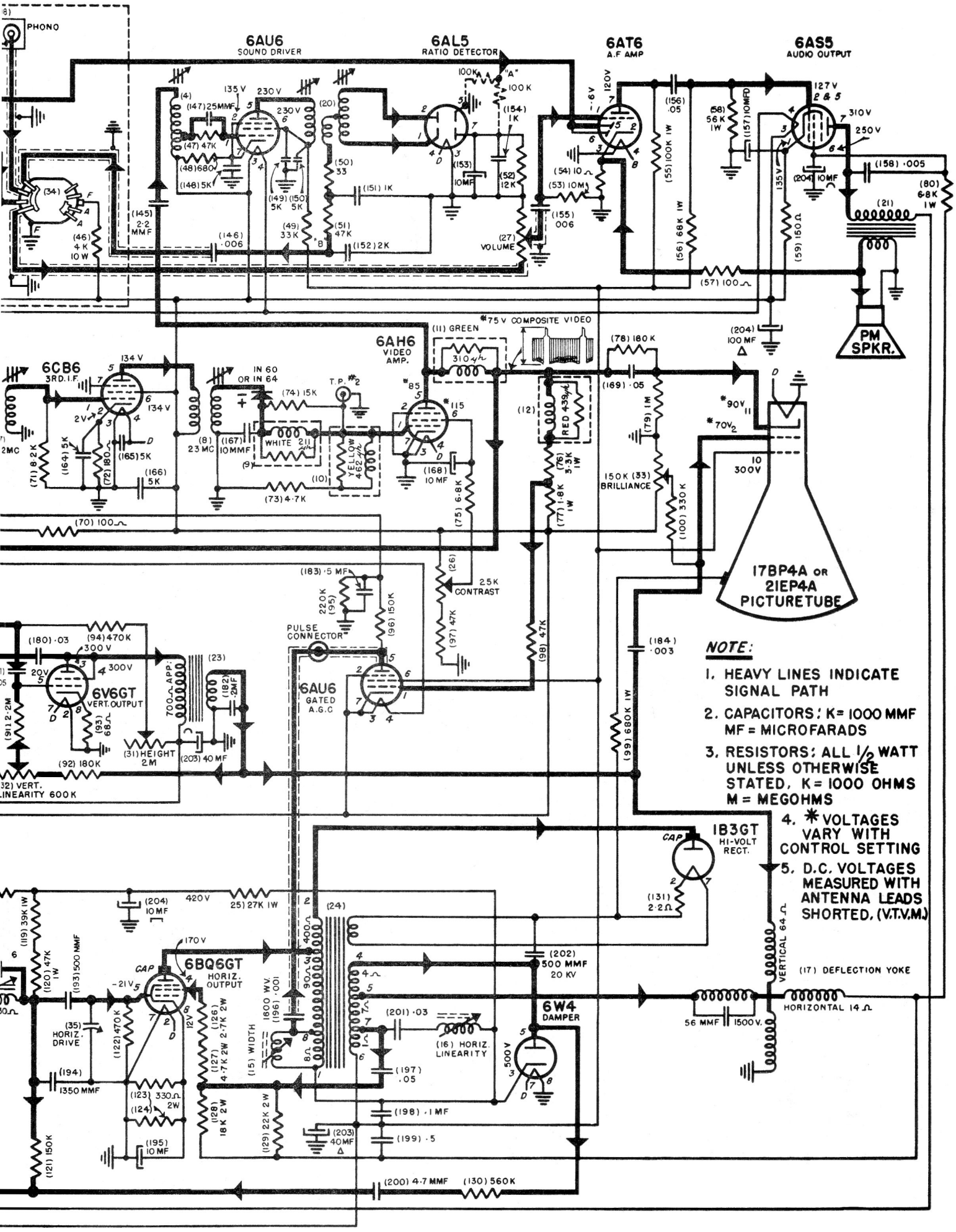

R.F. TUNER
6BQ7
R.F. AMP
6J6
MIXER -OSC.
FINE TUNING
R.F. TEST POINT
T.V. ANT.
WHITE
BLACK
RED 140 V
230 V BLUE
(60) 18K 2W
(61) 22K 2W
(62) 2·7K 2W
T.P. #1
USED ONLY IN SETS WITH RADIO
EXT. ANT.
(208)
6SA7
CONVERTER
6SK7
I.F.
(139) ·002
(140) 100 MMF
(141) 50 MMF
(142) ·01
(143) ·05
(43) 15K
(144) ·01
(42) 6·8K 1W
(41) 100K
(44) 2·2M
TV-PHONO-R SWITCH IN TV POSITION, F-F ON SWITCH OPEN IN TV POS. ONLY
(138) ·005
(37)
6CB6
1ST. I.F.
6CB6
2ND I.F.
130 V
132 V
(63) 5
(64) 5
(159) 3·3MMF
WAVE TRAP 21·25 MC
50 MMF
(65) 6·8K
(66) 100
(67) 10K
(160) 5K
(161) 5K
(6) 25·8 MC
(69) 100
(162) 5K
(163) 5K
(7) 25·2M
(68) 100
(38) AC INTERLOCK
S.P.D.T. SWITCH ON VOL. CONT. (28)
AC RECEPT.
TO 'Y' IN SETS WITH RADIO; TO 'X' IN TV ONLY
(170) ·025
(22)
(PIN 5 – 6AU6)
HORIZ. 75V
VERT. 75V
(81) 15K
(172) ·05
6AU6
SYNC. SEPARATOR
115V
135V
(84) 6·8K
(82) 10 M
(171) 15 MMF
(83) 2·2M
(85) 15K
(173) 4K
(174) 4K
(175) ·05
(86) 8·2K
(176) ·05
6J5
VERT. OSC.
78V
-85V
(177) ·003
(89) 33K
(179) ·001
(178) ·001
(88) 3·3K
(90) 27K
(181) ·05
(91) 2·2M
(30) VERT. HOLD 2M
(32) LINE
(87) 2·2K 2W
RED & YELLOW
5U4G
LO-VOLT RECT.
YELLOW
YELLOW
RED
RED
GREEN
BROWN
BROWN
(101) 450Ω
10 W
365 V
345 V
(25)
(205) 80 MF
SLO-BLO FUSE
(39)
(102) 400Ω 10 W
(205) 60 MF Δ
300 V
USED ONLY IN SETS WITH RADIO
(207)
(206)
PH.
RADIO
TV
(PIN 1 – 12AU7)
34V
12AU7
SYNC. AMP. & INVERTER
70 V
-·75 V
2·75 V
120V
-14 V
6V
(106) 27K 1W
(107) 2·7K 1W
(108) 39K
(185) ·05
(109) 330K
(103) 1M
(104) 1·2K
(105) 2·2K
(186) 125 MMF
(PIN 3 – 12AU7)
37V
(110) 120K 1W
(188) ·05
(29) HORIZ. HOLD 100K
(118) 330K 1W
(116) 3·3M
(117) 6·8K
(192)
(187) 2K
84 V
240V
-20V
-100V
-11V
(111) 560K
(112) 8·2K
(113) 180K 1W
(114) 180K 1W
(189) ·02
(191) 180 MMF
6SN7GT
HORIZ. OSC. & CONTROL
(190) ·2
100K 1W (115)
(36) HORIZ. LOCK

Figure 21


PHONO
6AU6
SOUND DRIVER
6AL5
RATIO DETECTOR
6AT6
A.F AMP
6AS5
AUDIO OUTPUT
6AH6
VIDEO AMP.
6CB6
3RD.I.F.
6V6GT
VERT. OUTPUT
6AU6
GATED A.G.C
6BQ6GT
HORIZ. OUTPUT
6W4
DAMPER
1B3GT
HI-VOLT RECT.
PM SPKR.
17BP4A OR 21EP4A PICTURETUBE
2.5K CONTRAST
150K (33) BRILLIANCE
PULSE CONNECTOR
(31) HEIGHT 2M
(32) VERT. LINEARITY 600K
(16) HORIZ. LINEARITY
(15) WIDTH
(35) HORIZ. DRIVE
(17) DEFLECTION YOKE
VERTICAL 64Ω
HORIZONTAL 14Ω
*75 V COMPOSITE VIDEO
IN 60 OR IN 64
WHITE 21μh
YELLOW 462μh
RED 439μh
NOTE:
1. HEAVY LINES INDICATE SIGNAL PATH
2. CAPACITORS: K= 1000 MMF MF = MICROFARADS
3. RESISTORS: ALL 1/2 WATT UNLESS OTHERWISE STATED, K= 1000 OHMS M = MEGOHMS
4. * VOLTAGES VARY WITH CONTROL SETTING
5. D.C. VOLTAGES MEASURED WITH ANTENNA LEADS SHORTED, (V.T.V.M.)

FOCALIZER ADJUSTMENT:

The focalized unit should be located centrally around the neck of the pix tube, this is done by loosening two (2) nuts on the back of the focalizer unit (left and right side of the picture tube neck). This will allow centering the focalizer unit vertically around the neck of the pix tube. Loosen two (2) wing nuts which secure the focalizer brackets to the yoke support (one wing nut on each side of the yoke support). This will allow centering the focalizer unit horizontally around the neck of the pix tube, also adjustment forward or backward. The focalizer unit should be spaced about ⅜ inch from the deflection yoke. Centering the test pattern on the face of the pix tube is done by moving the screw which protrudes from the rear of the focalizer unit. This adjustment permits shifting the test pattern in any direction.

Focusing the picture is done by turning the large screw adjustment on the back of the focalizer unit with a non-ferrous (not iron or steel) screwdriver for sharpest picture detail.

BRILLIANCE ADJUSTMENT:

With a strong picture signal being received, the contrast set at a low point, adjust the Brilliance control for pleasing contrast. Any setting of the contrast control should now produce a picture with proper contrast, and no further adjustment of the Brilliance control should be necessary.

PICTURE WIDTH CONTROL:

If picture width adjustment is required due to low or high line voltage conditions, a width coil is provided and located behind the 5U4G rectifier tube.

HORIZONTAL LINEARITY ADJUSTMENT:

A horizontal linearity coil adjustment has been incorporated in these models and is to be found on top of and to the rear of the T.V. chassis spacer plate. This adjustment having been made at the factory should require no further attention. If however it is felt that further adjustment is required it should be made while viewing a test pattern.

It will be noted that two positions can be reached which will give good linearity, one with the iron core well into the coil, the other with it backed out of the coil. Closer observation will show this latter adjustment to have poorer linearity at the edges of the raster, therefore the first position of the iron core is the proper one and should be used.

REMOVAL AND INSTALLATION OF PICTURE TUBE — 17″:

Caution: Be sure power cord is removed from receptacle. Wear goggles and gloves any time the picture tube is to be handled.

1. Remove the high voltage lead from the socket on the pix tube.
2. Remove the tube socket from the base of the picture tube.
3. Remove the ion trap from the neck of the picture tube.
4. Loosen the screws on either side of the picture tube at the front.
5. Grasp the rim of the picture tube and gently pull it forward from its mounting. Do not allow the tube to rest on its neck or base, and do not attempt to carry or handle it by the neck. Do not scratch the glass while handling.
6. To replace the tube, reverse the above procedure, noting the ion trap instructions.

REMOVAL AND INSTALLATION OF PICTURE TUBE — 21″:

Caution: Be sure power cord is removed from receptacle. Wear goggles and gloves any time the picture tube is to be handled.

1. Remove hi-voltage lead from socket on picture tube.
2. Remove tube socket from base of picture tube.
3. Remove ion trap from neck of tube.
4. Remove tube grounding braid from T.V. chassis.
5. Disconnect deflection yoke connector.
6. With T.V. chassis removed from the cabinet remove wood screws holding picture tube shelf to the top of the cabinet. After sliding out the two wood spacer strips, the tube shelf can be slipped from the cabinet.
7. After loosening two (2) screws at the side, and one (1) screw on the top of the picture tube, grasp the rim of the tube and gently pull it forward from the yoke. Do not allow the tube to rest on its neck and at no time should it be handled or carried by the neck.
8. When installing a new picture tube be sure it is firmly in place and properly supported with the deflection yoke removed. When properly supported the yoke should slide into its mounting without binding on the neck of the picture tube.
9. To complete the tube replacement reverse the above procedure, noting the ion trap instructions.

Note: Defective picture tubes should be stored away in cartons until they are disposed of.

ALIGNMENT PROCEDURE

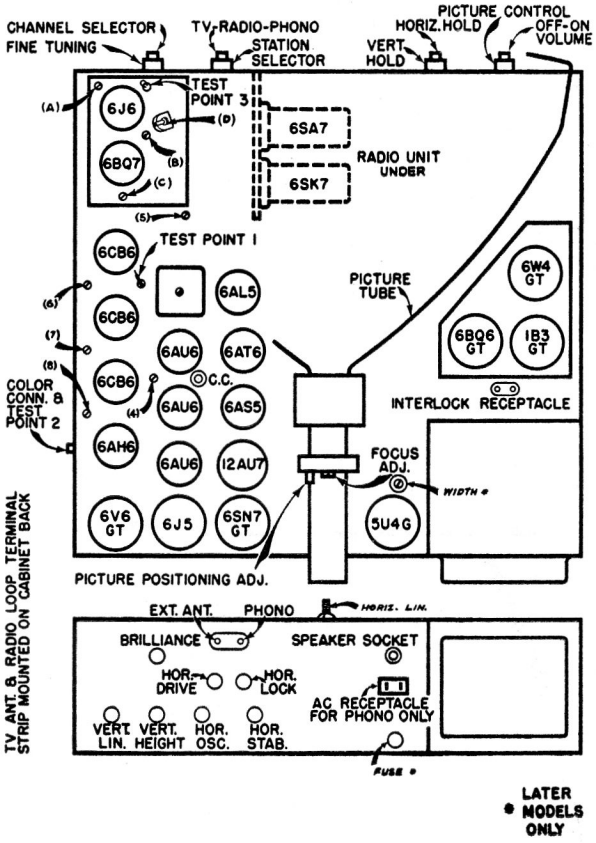


Figure 15

GENERAL:

Before attempting to align R.F., I.F., or Sound circuits, try to make absolutely sure that alignment is necessary. The alignment and test points are shown in **Figure 15 above.**

TEST EQUIPMENT:

The following equipment is **essential** for proper alignment:

1. A Signal generator capable of delivering signals from 4 to 30 mc. with good accuracy and at least .1 volts output.
2. A Vacuum tube Voltmeter. A 20,000 ohm per volt meter will do as a substitute but the vacuum tube voltmeter is preferred.
3. A 3 Volt battery (two 1.5 volt batteries connected in series).

In addition to the above, the following is desirable but not essential:

4. A sweep generator with accurate markers. This generator should be capable of large output with good linearity, and cover all the television channels, the I.F. band, and the 4.5 mc. sound channel.
5. An oscilloscope with wide band vertical amplifier and good vertical gain.
6. A resistive pad to match the signal generator output to the 300 ohm antenna input.

A pad that will work well with most generators may be made using **carbon** resistors as shown in Figure 16.

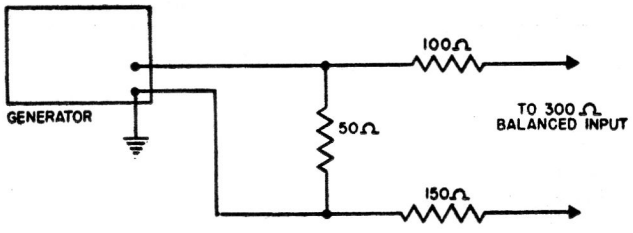


Fig. 16

R.F. AND MIXER ALIGNMENT:

The alignment of the R.F. and mixer circuits is only possible if a sweep generator and oscilloscope are available. Normally, these circuits do not require alignment and should be left alone.

1. Set channel selector switch to channel 12.
2. Connect oscilloscope through 10,000 ohms to test point 3 (wire loop on top of tuner), and ground.
3. Connect bias battery (1.5 or 3 volts) to test point 1 and ground. (Negative terminal to test point, positive to ground.)
4. Set Fine tuning control at approximately midpoint of its range.
5. Feed sweep generator into antenna terminals, sweeping channel 12. Use pad illustrated in Figure 16, if necessary.
6. Adjust (A), (B), and (C) on tuner for the response curve shown in Figure 17.
7. Check all channels. Markers should automatically fall in on the peaks shown.

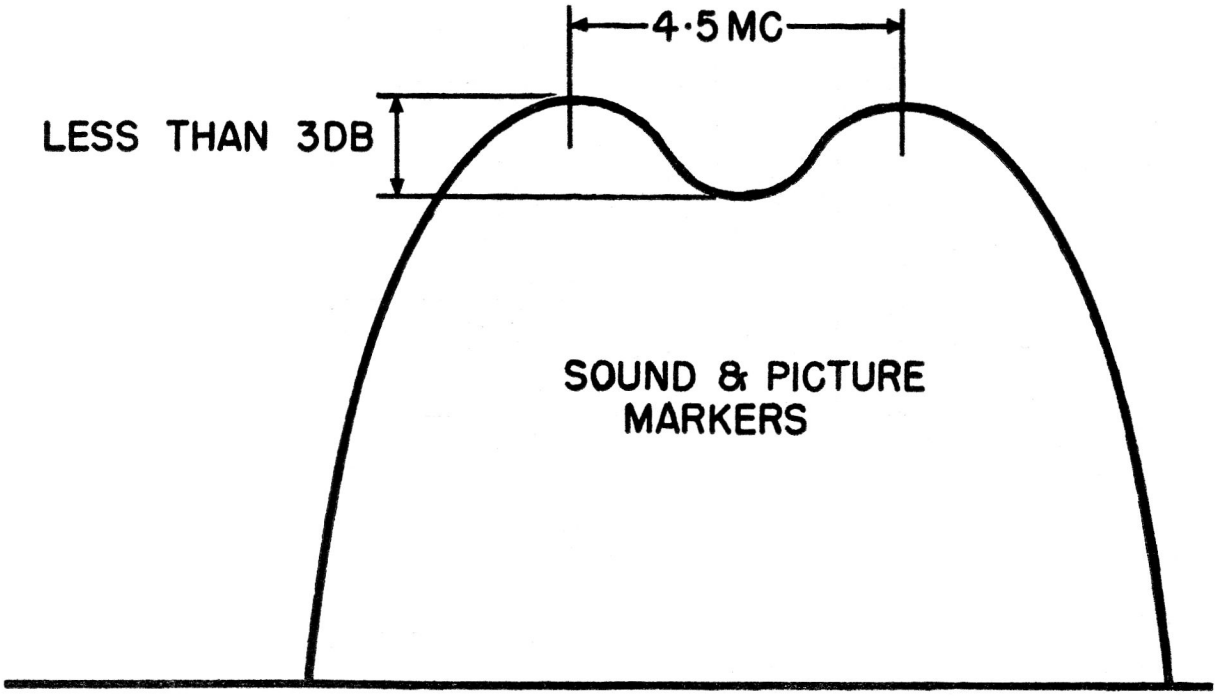


Figure 17

OSCILLATOR ALIGNMENT:

1. Connect A.M. signal generator to one antenna terminal and ground.
2. Set generator to sound carrier frequency for channel required.
3. Connect bias battery to test point 1 and ground, as before.
4. Connect Vacuum tube Voltmeter to the D.C. output of the ratio detector, as in step 2 of Sound Alignment.
5. Turn station selector to channel required.
6. Centre Fine Tuning Control.
7. Adjust the oscillator coil slug for zero reading using a non-metallic screwdriver. The slug is reached through a hole in the front apron of the chassis, just above and to the right of the Fine Tuning shaft.

I.F. ALIGNMENT:

1. Raise the shield from the 6J6 oscillator-mixer tube so that it is not grounded.
2. Connect signal generator output to the ungrounded shield. Connect low side to ground. (No pad is required.)
3. Connect 3 Volt bias battery between test point 1 and ground. (Negative to test point.)
4. Turn Contrast Control fully clockwise.
5. Set vacuum tube voltmeter to read negative D.C. volts on a low range, and connect between test point 2 and ground.
6. Use only enough signal to give a reading of approximately 1 volt and proceed according to the following chart, Figure 18:

Set Generator	Connect V.T.V.M.	Adjust	Remarks
23 mc.	Test point 2 and ground	"D"	Tune for maximum output
25.8 mc.	Test point 2 and ground	6	Tune for maximum output
25.2 mc.	Test point 2 and ground	7	Tune for maximum output
23 mc.	Test point 2 and ground	8	Tune for maximum output
21.25 mc.	Test point 2 and ground	5	Tune for minimum output

Figure 18

7. Repeat the procedure to insure accurate alignment.

If a sweep generator and oscilloscope are available the curve in Figure 19 should be obtained.

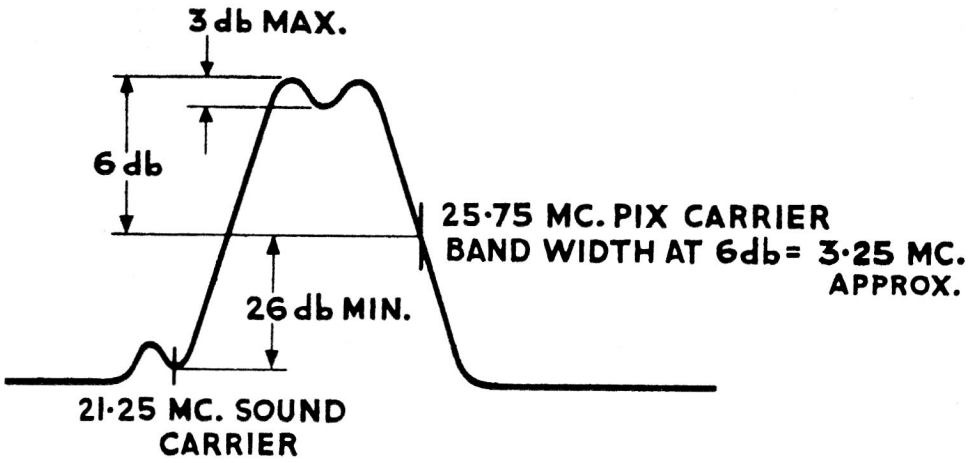


Figure 19

SOUND ALIGNMENT:

The sound channel alignment may be carried out using an A.M. signal generator and a vacuum tube voltmeter. Sound test point A is created by connecting two 100,000 ohm resistors across the D.C. output of the ratio detector as shown in dashed lines on the schematic diagram, Figure 21. Sound test point B is located at the junction of condenser (item 146), condenser (item 152) and resistor (item 51). Proceed as shown in the following chart, Figure 20:

Connect Generator	Set Generator	Connect V.T.V.M.	Adjust	Remarks
Test point 2 and ground	4.5 mc/s	3 V.A.C. cathode pix tube	4	Tune for min. dip
Test point 2 and ground	4.5 mc/s	Sound test pt. "A" and ground	20 bottom	Tune for max. and repeat
Test point 2 and ground	4.5 mc/s	Probe to sound test point "B" Common to sound test pt. "A"	20 top	Tune for zero reading at crossover

Figure 20

Ref. No.	Part No.	Description	Models
	1N60 or 1N64	Germanium Rectifier	All
	11-10	Pilot Lite Bulb No. 47 Brown Bead	All RS.
	11-14	Pilot Lite Bulb No. 44 Blue Bead	All RS.
	12-10	Socket — Moulded Octal	All
	12-19	Socket — A.C. Receptacle (Interlock)	All
	12-21	Socket — Miniature Wafer 7 Pin	All
	12-26	Socket — Octal Wafer	All
	12-28	Socket — Miniature Wafer 9 Pin	All
	12-32	Socket — Assy. Hi-Voltage	All
	12-16	Socket — Hi-voltage }	All
	12-38	Socket — Wafer 7 Pin }	All
206	12-45	Socket — Pilot Lite	All RS.
207	12-46	Socket — Pilot Lite	All RS.
	12-50	Socket — Connector	All RS.
	12-51	Socket — Connector	All RS.
	12-61	Socket — Picture Tube	All 17"
	12-62	Socket — Picture Tube	All 21"
	12-63	Fuse Holder	All
	13-10	Terminal Strip — 4 Lug	All
	13-18B	Connector (Colour and Speaker)	All
	13-21	Connector Male	All
	13-31	Terminal Strip — 2 Lug	All
	13-32	Terminal Strip — 1 Lug	All
	13-33	Terminal Strip — 5 Lug	All
	13-34	Terminal Strip — 10 Lug	All
	13-40	Terminal Strip — 7 Lug	All
	13-41	Terminal Strip — 4 Lug	All
	13-42	Terminal Strip — 6 Lug	All
	13-44	Terminal Strip — 2 Lug	All
	13-46	Terminal Strip	All
	19-27	Tuning Sleeve	All RS.
	21-46	Retaining Ring	All RS.
18-19	23-13	Transformer — I.F.	All RS.
25	23-21	Filter Choke	All
21	23-28	Transformer — Audio O.P.	All
23	23-33	Transformer — Vertical O.P.	All
22	23-36A	Transformer — Power 25 Cycle	All
22	23-36B	Transformer — Power 60 Cycle	All
24	23-43	Transformer — Horiz. O.P. Hi-Volt	All
	25-13	A.C. Power Receptacle	All
31	27-27	Control — Vert. Height 2 Meg. ¼ W.	All
32	27-28	Control — Vert. Line 600 K. ¼ W.	All
33	27-31	Control — Brilliance	All
34	27-47	Switch — Radio-Phono-T.V.	All RS.
26-27-28	27-48	Control — Dual Off-On Vol. { 25 K. ½ W. } { 5 Meg. ¼ W. }	All
30	27-49	Control — Dual Horiz. and Vert. Hold	All RS.
29	27-50	Control — Horiz. Hold 100 K. ¼ W.	All T.V. Only
30	27-51	Control — Vert. Hold 2 Meg. ¼ W.	All T.V. Only
	28-21	Tube Clamp (5U4G)	All
	28-26	"Mini-Shield" (Base Clip)	All
4	29-17	Coil — I.F. Sound	All
20	29-23	Coil — Ratio Detector	All
13	29-24	Coil — Assy. Syn. Horiz. Osc.	All
6	29-37	Coil — 1st I.F.	All
7	29-38	Coil — 2nd I.F.	All
8	29-39	Coil — O.P. I.F.	All
17	29-44	Deflection Yoke	17"
17	29-68	Deflection Yoke	21"

T.V. CHASSIS SERVICE PARTS

3	29-55	Coil — Oscillator	RS. Only
1	29-56	Coil — Antenna	RS. Only
5	29-57	Coil — Sound Trap (Cascode Tuner)	All
14	29-56	Coil — Stabilizing	All
10	29-60	Coil — Shunt I.P. Peaking	All
9	29-61	Coil — Series I.P. Peaking	All
12	29-62	Coil — Shunt O.P. Peaking	All
11	29-63	Coil — Series O.P. Peaking	All
16	29-64	Coil — Linearity Control	All
15*	29-66	Coil — Width Control	All
		Please Note: — * Width coil not used on first sets.	
39	32-12	Slo-Blo Fuse	All
	32-13	Fuse, Type 3AG, 3 Amps.	All
	40-74	Yoke Adpt. Bracket	All
	40-93	Hi-Volt Box Cover Assy.	All
	40-137	Yoke Mtg. Support Assy.	17" Only
	40-156	Cascode Tuner	All
	40-189	Yoke Mtg. Support Assy.	21" Only
	40-212	Hi-Volt Stand-Off Assy.	All
	41-28	Pic. Tube Mtg. Support	17" Only
	41-29	Pic. Tube Mtg. Support	21" Only
	43-20	Dial Glass	All RS.

T.V. CHASSIS SERVICE PARTS (Continued)

Ref. No.	Part No.	Description	Models
	44–15	Rubber Grommet	All RS.
	44–17	Rubber Grommet	All
	45–17	Dial Pointer	All RS.
	46–10	Dial Cord 36"	All RS.
	47–10	Dial Cord Spring	All RS.
	47–22	Grounding Spring	All
	53–19	Hi-Volt Trans. Shield	All
	69–12	Palnut C.P.	All
	70–13	Speednut	All RS.
	82–17	Dial Glass Spacers	All RS.
	87–22	Anode Connector	All
208	87–17	Antenna Phono Connector	All RS.
	88–12	Ion Trap	All
	88–14	Magnet (Anti-Pin Cushion)	21" Only
	91–46	Hood Assy.	17" Only
	91–54	Mtg. Bracket	All
	91–61	Yoke Adaptor Brkt. R.H.	All
	91–62	Yoke Bracket Brace	17" Only
	91–63	Yoke Mtg. Support R.H.	All
	91–64	Yoke Mtg. Support L.H.	All
	91–67	Yoke Adaptor Brkt. L.H.	All
	91–70	Base Plate	All
	91–72	Yoke Brkt. Side Brace	21" Only
	91–73	Yoke Brkt. Brace	21" Only
	91–85	Hold Down Strap	21" Only
	91–93	Phono Plate	T.V. Only
	91–120	Tube Straps — Sides	21" Only
	93–29	Plug Button	All

RESISTORS

102	14–16	400	Ohms 10W. 10% (W.W.)	All
46	14–17	4,000	Ohms 10W. 10% (W.W.)	All RS.
101	14–18	450	Ohms 10W. 10% (W.W.)	All RS.
90	14–20	27,000	Ohms ½W. 5%	All
131	14–21	2.2 Meg.	Ohms ½W. 10%	All RS.
53–64	14C0502	5	Ohms ½W. 20%	All
54	14C1002	10	Ohms ½W. 20%	All
57–68–70	14C1012	100	Ohms ½W. 20%	All
67	14C1031	10,000	Ohms ½W. 10%	All
41	14C1042	100,000	Ohms ½W. 20%	All RS.
79–103	14C1051	1 Meg.	Ohms ½W. 10%	All RS.
82	14C1061	10 Meg.	Ohms ½W. 10%	All RS.
53	14C1062	10 Meg.	Ohms ½W. 20%	All RS.
104	14C1221	1,200	Ohms ½W. 10%	All RS.
52	14C1231	12,000	Ohms ½W. 10%	All RS.
81–85	14C1531	15,000	Ohms ½W. 10%	All RS.
43–74	14C1532	15,000	Ohms ½W. 20%	All RS.
96–121	14C1542	150,000	Ohms ½W. 20%	All RS.
72	14C1812	180	Ohms ½W. 20%	All RS.
78–92	14C1841	180,000	Ohms ½W. 10%	All RS.
105	14C2221	2,200	Ohms ½W. 10%	All RS.
40	14C2232	22,000	Ohms ½W. 20%	All RS.
95	14C2241	220,000	Ohms ½W. 10%	All RS.
44–83–91	14C2252	2.2 Meg.	Ohms ½W. 20%	All RS.
50	14C3302	33	Ohms ½W. 20%	All RS.
88	14C3321	3,300	Ohms ½W. 10%	All RS.
49–89	14C3332	33,000	Ohms ½W. 10%	All RS.
109	14C3341	330,000	Ohms ½W. 10%	All RS.
100	14C3342	330,000	Ohms ½W. 20%	All RS.
116	14C3351	3.3 Meg.	Ohms ½W. 10%	All RS.
108	14C3931	39,000	Ohms ½W. 10%	All RS.
73	14C4721	4,700	Ohms ½W. 10%	All
47–51–97–98	14C4732	47,000	Ohms ½W. 20%	All
94–122	14C4742	470,000	Ohms ½W. 20%	All
111–130	14C5641	560,000	Ohms ½W. 10%	All
93	14C6801	68	Ohms ½W. 10%	All
48	14C6812	680	Ohms ½W. 20%	All
65–84–117	14C6821	6,800	Ohms ½W. 10%	All
75	14C6822	6,800	Ohms ½W. 20%	All
71–86–112	14C8221	8,200	Ohms ½W. 10%	All
55–115	14D1041	100,000	Ohms 1W. 10%	All
110	14D1241	120,000	Ohms 1W. 10%	All
77	14D1821	1,800	Ohms 1W. 10%	All
113–114	14D1841	180,000	Ohms 1W. 10%	All
107	14D2721	2,700	Ohms 1W. 10%	All
106–125	14D2731	27,000	Ohms 1W. 10%	All
76	14D3321	3,300	Ohms 1W. 10%	All
118	14D3341	330,000	Ohms 1W. 10%	All
119	14D3931	39,000	Ohms 1W. 10%	All
120	14D4731	47,000	Ohms 1W. 10%	All
58	14D5631	56,000	Ohms 1W. 10%	All

RESISTORS

Ref. No.	Part No.	Description	Models
42–80	14D6821	6,800 Ohms 1W. 10%	All
56	14D6831	68,000 Ohms 1W. 10%	All
99	14D6842	680,000 Ohms 1W. 20%	All
66–128	14E1831	18,000 Ohms 2W. 10%	All
87	14E2222	2,200 Ohms 2W. 20%	All
61–129	14E2231	22,000 Ohms 2W. 10%	All
62	14E2721	2,700 Ohms 2W. 10%	All
123–124	13E3311	330 Ohms 2W. 10%	All
126–127	14E4721	4,700 Ohms 2W. 10%	All
66–69	14G1011	100 Ohms ½W. 10% W.W.	All
66–69	14G1211	120 Ohms ½W. 10% W.W.	All
59	14G1511	150 Ohms ½W. 10% W.W.	All

CONDENSERS

35–36	15–14	Trimmer Condenser	RS. Only
37	15–25	Gang Condenser 2 Sec.	RS. Only
191	16–3	Mica Cond. 180 Mmfd. 500 V. 5%	All
167	16–4	Mica Cond. 10 Mmfd. 500 V. 20%	All
194	16–5	Mica Cond. 1,350 Mmfd. 500 V. 5%	All
140	16–7	Mica Cond. 100 Mmfd. 500 V. 20%	RS. Only
141	16–8	Mica Cond. 50 Mmfd. 500 V. 20%	RS. Only
193	16–9	Mica Cond. 500 Mmfd. 500 V. 20%	All
171	16–12	Capristor	RS. Only
157–168	18–23	Tubular Cond. 10 Mfd. 200 W.V.	All
153–195	18–24	Tubular Cond. 10 Mfd. 50 W.V.	All
204	18–25	Elect. Cond. 100 Mfd. 200 V.	All
204	18–25	Elect. Cond. 10 Mfd. 450 V.	All
204	18–25	Elect. Cond. 10 Mfd. 450 V.	All
203	18–26	Elect. Cond. 40 Mfd. 450 V.	All
203	18–26	Elect. Cond. 40 Mfd. 450 V.	All
205	18–27	Elect. Cond. 80 Mfd. 450 V.	All
205	18–27	Elect. Cond. 60 Mfd. 450 V.	All
152–187	83–5	Tub. Cer. Cond. 2,000 Mmfd. 500 V. 20%	All
151–154	83–6	Tub. Cer. Cond. 1,000 Mmfd. 500 V. 20%	All
148–49–50–160 to 166	83–10	Disc. Cer. Cond. 5,000 Mmfd. 500 V. 20%	All
173–174	83–20	Tub. Cer. Cond. 4,000 Mmfd. 500 V. 20%	All
186	83–22	Disc. Cer. Cond. 125 Mmfd. 500 V. 20%	All
147	83–24	Tub. Cer. Cond. 25 Mmfd. 500 V. 20%	All
202	83–26	Ceramic Cond. 500 Mmfd. 20,000 W.V.	All
145	84–11	Spec. Mica Cond. 2.2 Mmfd. 500 V.	All
200	84–13	Spec. Mica Cond. 4.7 Mmfd. 500 V.	All
159	84–14	Spec. Mica Cond. 3.3 Mmfd. 500 V. +20%–0%	All
143	96B12	Paper Tubular Cond. .05 Mfd. 200 W.V.	RS. Only
182–190	96B15	Paper Tubular Cond. .2 Mfd. 200 W.V.	All
183–199	96B17	Paper Tubular Cond. .5 Mfd. 200 W.V.	All
142–144	96C7	Paper Tubular Cond. .01 Mfd. 400 W.V.	RS. Only
189	96C9	Paper Tubular Cond. .02 Mfd. 400 W.V.	All
156–69–72–175–85–97	96C12	Paper Tubular Cond. .05 Mfd. 400 W.V.	All
178–179	96D1	Paper Tubular Cond. .001 Mfd. 600 W.V.	All
139	96D2	Paper Tubular Cond. .002 Mfd. 600 W.V.	RS. Only
177–184	96D3	Paper Tubular Cond. .003 Mfd. 600 W.V.	All
138–158	96D4	Paper Tubular Cond. .005 Mfd. 600 W.V.	All
146–55–92	96D5	Paper Tubular Cond. .006 Mfd. 600 W.V.	All
170	96D10	Paper Tubular Cond. .025 Mfd. 600 W.V.	All
180–201	96D11	Paper Tubular Cond. .03 Mfd. 600 W.V.	All
176–81–88	96D12	Paper Tubular Cond. .05 Mfd. 600 W.V.	All
198	96D13	Paper Tubular Cond. .1 Mfd. 600 W.V.	All
196	96F1	Paper Tubular Cond. .001 Mfd. 1600 W.V.	All

TUBES

	1B3GT	Tube — All
	5U4G	Tube — All
	6AH6	Tube — All
	6AL5	Tube — All
	6AS5	Tube — All
	6AT6	Tube — All
	6AU6	Tube — All
	6BQ6GT	Tube — All
	6CB6	Tube — All
	6J5	Tube — All
	6SA7	Tube — RS. Only
	6SK7	Tube — RS. Only
	6SN7	Tube — All
	6V6GT	Tube — All
	6W4GT	Tube — All
	12AU7	Tube — All
	17BP4A	Tube — 17″ Only
	21EP4A	Tube — 21″ Only
	6BK7 or 6BQ7	Tube, Tuner — All
	6J6	Tube, Tuner — All

TELEVISION ACCESSORIES

Ref. No.	Part No.	Description	Models
	13-21	Ant. Phono and Speaker Connector	All
38	20-14	Line Cord and Plug	All
	21-32	T.V. Aerial Wire (No. 20 Solid 60")	All
	24-10	Speaker 10" P.M.	RS. Only
	24-15	Speaker 10" P.M.	2782-2182SS
	24-18	Speaker 6" x 4" Oval P.M.	1782SE-SR-1123SE
	24-22	Speaker 9" x 6" Oval P.M.	4782HR
	26-18	Cabt. Glide (Onward No. 3)	3782FR
	26-35	Cabt. Glide (Onward No. 4)	2782SS-SR-4782HR
	26-37	Cabt. Glide (Onward No. 1)	2182SS-HR-3782FR-4182HR
	26-42	Spec. Washer No. 10 (Ch. to Cabt.)	All
	28-12	Cable Clamp	3782FR-4182HR-4782HR
	30-19A	Addison Decal — Gold	3782FR-2182SS-1123SE
	30-19B	Addison Decal — Brown	2182HR-4182HR-1123SE
	30-20A	Record Drawer Decal — Gold	3782FR-1123SE
	30-20B	Record Drawer Decal — Brown	3782FR-1123SE
	30-113	Medallion	All
	34-62	Instruction Booklet	All
	36-11	Felt Pad	All
	36-13	Felt Ring	All
	38-11	Radio Cover Screen	RS. Only
	38-12	Ventilation Screen	All
	44-13	Rubber Bumper	3782FR
	44-16	Rubber Bumper	3782FR
	48-15	Pilot Lite Socket	3782FR-4782HR-2182HR-4182HR
	49-14	Antenna 3 Cord Par Insulated	RS. Only
	51-39A	Knob — Channel Sel. Wal. and Mah.	All
	51-39C	Knob — Channel Sel. Bleach	All
	51-42	Knob — Picture Gilt	All
	51-41	Knob — Fine Tuning Gilt	All
	51-45A	Knob — Hold Control Wal. and Mah.	1782SE-2782SS-2182SS
	51-45C	Knob — Hold Control Bleach	1782SE-2782SS-2182SS
	51-46A	Knob — T.V.-Radio-Phono Wal. and Mah.	RS. Only
	51-46C	Knob — T.V.-Radio-Phono Bleach	RS. Only
	51-47	Knob — Radio Tuning Gilt	RS. Only
	51-52	Door Pull B. Br. No. 4432 H	4782HR
	51-57	Door Pull B. Br. No. 2796 S	3782FR-2182HR
	51-58	Trim Plate B. Br.	4782HR
	51-59	Door Pull Brass Ant. No. 5477 H	4182HR
	51-62A	Knob — On-Off Vol. Wal. and Mah.	All
	51-62C	Knob — On-Off Vol. Bleach	All
	51-63	Knob — Vert. Hold Gilt	RS. Only
	51-64A	Knob — Horiz. Hold Wal. and Mah.	RS. Only
	51-64C	Knob — Horiz. Hold Bleach	RS. Only
	56-22	Cylindrical Mask	21" Only
	56-24	Spherical Mask	17" Only
	56-25	Escutcheon	1782-2782SR"3782FR-4782-2182HR-4182HR
	58-25	Cabinet Back	3782FR
	58-26	Cabinet Back	3782FR
	58-29	Cabinet Back	1782SE-1782SR
	58-30	Cabinet Back	2782SS-2782SR
	58-31	Cabinet Back	4782HR
	58-32	Cabinet Back	2182SS-HR-1123SE
	58-34	Cabinet Back	4182HR
	64-13	Tri-O-Matic Changer 60 Cycle	3782FR-4782HR-4182HR
	64-14	Tri-O-Matic Changer 25 Cycle	3782FR-4782HR-4182HR
	70-20	Glass Ret. Clip	All
	71-14	Ext. Tooth Washer No. 6	All
		No. 6 x ½" R.H. Socket Screw	All
	73-13	Cabinet Glass	2782SS-2782SR
	73-14	Cabinet Glass	1782SE-SR-3782FR-4782HR
	73-15	Cabinet Glass	All 21"
	75-16A	Addison Decal — Gold	1123SE-2782SS-SR-4782HR
	75-16B	Addison Decal — Brown	1123SE-2782SS-SR-4782HR
	75-39B	Addison Decal — Bleach	1123SE-1782SE-2782SS-2182SS
	75-40B	Addison Decal Vert. Hold — Bleach	1782SE-2782SS-2182SS
	91-27	Pilot Lite Bracket	RS. Only
	91-44	Adaptors 45 R.P.M.	3782FR-4782HR-4182HR
	93-18	Bullet Catch and Strike	RS. Only
	93-23A	Bronze Hinge	RS. Only
	93-23B	Brass Hinge	RS. Only
	93-26	Pilot Lite Jewell	RS. Only
	93-27	Cabinet Back Cup 2" Dp.	17" Only
	93-38	Cabinet Back Cup 4" Dp.	21" Only
	93-37	Caster	All Consoles
	93-39	Drawer Slides	4182HR
	93-40	Drawer Slides	4782HR
	97B	Plastic Grip Connector	3782FR-4782HR-4182HR
		No. 10 x 1¼" Socket Hd. Screw	All

TELEVISION CRATING AND PACKING

Ref. No.	Part No.	Description	Models
	42-16	Wax Paper	All
	42-40	Packing Pad	All
	76-98	Front to Back Filler	3782FR
	76-99	Side to Side Filler	3782FR
	76-100	Crate Assy.	3782FR
	76-105	Carton and Fillers Assy.	1782SE-1782SR
	76-109	Carton and Fillers Assy.	4782HR
	76-114	Carton and Fillers Assy.	2782SS-2782SR
	76-119	Carton and Fillers Assy.	2182SS
	76-120	Carton and Fillers Assy.	2182HR
	76-121	Crate Assy.	4182HR
	76-134	Front to Back Filler	4182HR
	76-135	Side to Side Filler	4182HR
	76-142	Carton and Fillers Assy.	1123SE