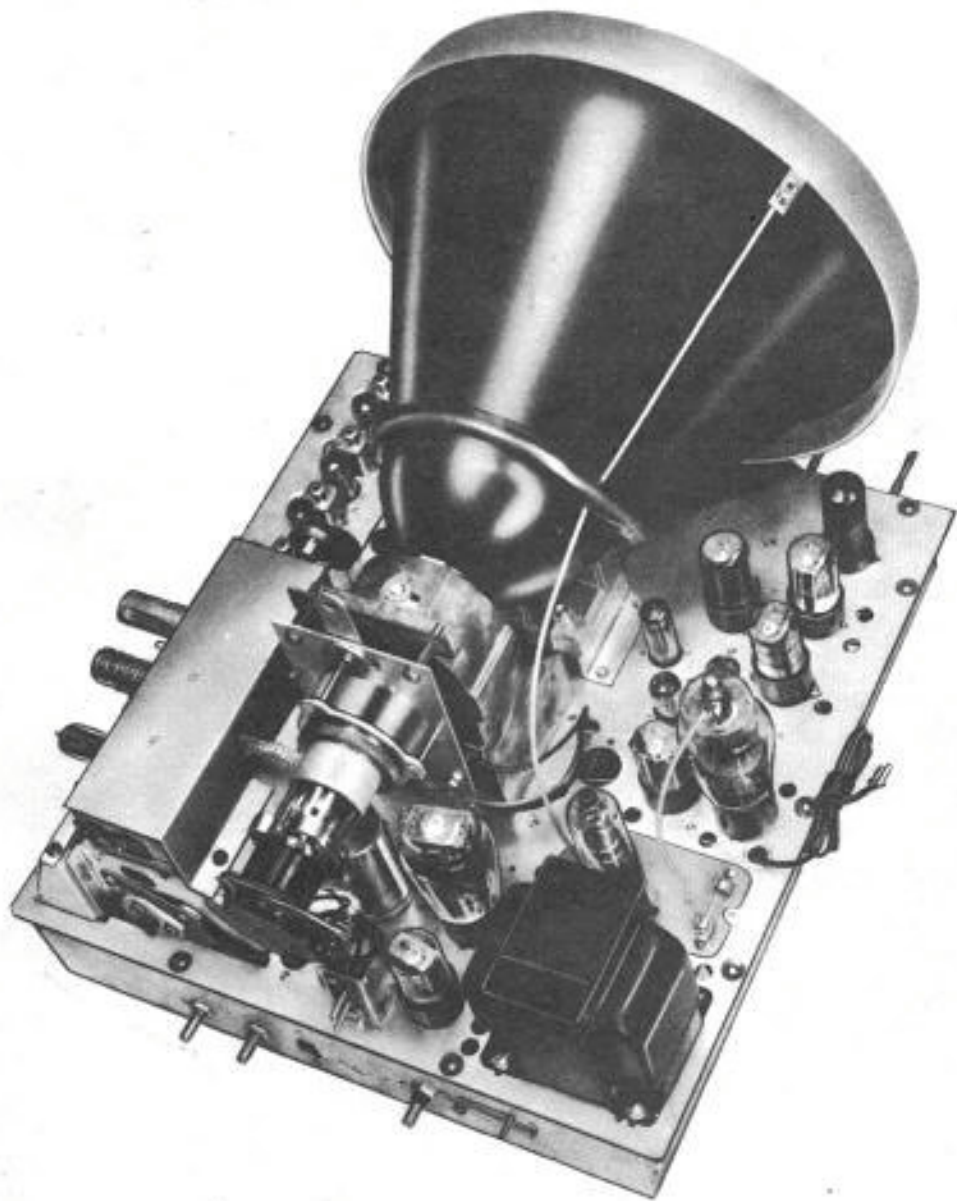


SERVICE MANUAL



ZENITH
REG. U. S. PAT. OFF.

1950 — 23G22/23, 24G22/23/24/25 SERIES

TELEVISION RECEIVERS

ZENITH RADIO CORPORATION
6001 DICKENS AVENUE • CHICAGO 39, ILLINOIS

GENERAL DESCRIPTION

ZENITH TELEVISION RECEIVERS

The 23G22/24G22 series of direct view television receivers have many outstanding features. These include the new revolutionary Gated Beam Limiter-Detector tube, a Turret Tuner with replaceable channel strips and a main chassis construction which incorporates the use of inter-changeable sub-chassis.

In addition, provisions are made for reception, under present standards, of the new ultra high frequencies by the simple addition of ultra high frequency channel strips as required.

As is the case with all Zenith TV receivers in the past, this receiver is provided with connectors for easy addition of phonevision.

For the convenience of the serviceman, a built-in oscillator adjustment wrench and easily accessible test points are provided for use during alignment and test of the receiver.

Zenith television receivers are being manufactured with the new Glare-Ban "Black" tubes. These tubes are constructed with a special glass containing certain metallic oxides which reduce halations and provide much better contrast.

<u>MODEL NO.</u>	<u>NAME</u>	<u>SCREEN</u>	<u>TV CHASSIS</u>	<u>RADIO CHASSIS</u>	<u>TYPE OF SET</u>
G2322	Claridge	"B"	23G22	None	Table-Brown Pyroxylin
G2340	Endear	"B"	23G22	None	Console-Walnut
G2340R	Saratoga	"B"	23G22	None	Console-Mahogany
G2441	Endow	"C"	24G24	None	Console-Walnut
G2441R	Lexington	"C"	24G22/24	None	Console-Mahogany
G2442E	Waldorf	"C"	24G22/24	None	Console-Blonde
G2442R	Mayfair	"C"	24G22/24	None	Console-Mahogany
G2846R	Graemere	"B"	23G22	None	Console-Mahogany
G2448R	Warwick	"C"	24G22/24	None	Console-Mahogany
G2353E	Biltmore	"B"	23G22	None	Console-Blonde
G2957	Endue	"B"	23G23	6G20	Radio-Phono TV-Walnut
G2957R	Riviera	"B"	23G23	6G20	Radio-Phono TV-Mahog.
G2958R	Regent	"B"	23G23	6G20	Radio-Phono TV-Mahog.
G3059R	Sheraton	"C"	24G23/25	6G20	Radio-Phono TV-Mahog.
G3062	Classic	"C"	24G23/25	6G20	Radio-Phono TV-Walnut

Power Consumption - 275 Watts

Power Supply - 110 V 60 Cycles AC

Antenna Impedance
Balanced 300 Ohms

Audio Output - Undistorted 2.0 Watts
Maximum 4 Watts

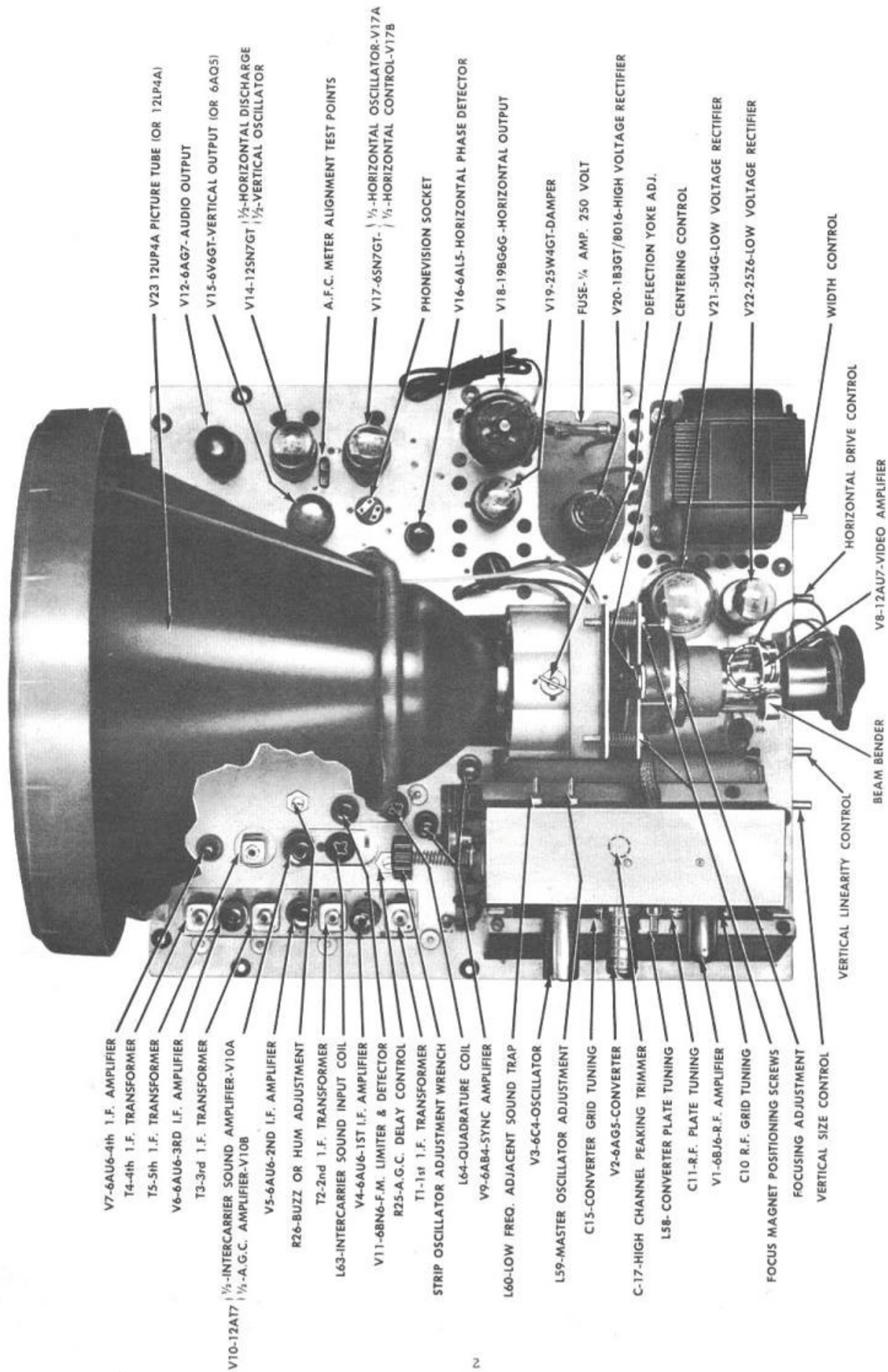


Fig. 1 Top View Zenith Television Receiver.

GENERAL

With a few exceptions, the 23G22, 23G23, 24G22, 24G23, 24G24 and 24G25 chassis used in Zenith television receivers are basically alike. Procedures followed in alignment and all major adjustments are the same. However, some small differences exist in minor adjustments such as focus and picture centering. All "B" screen chassis use a mechanical means of centering and focus. The "C" screen chassis, on the other hand, utilize electrical controls to perform these functions.

The small differences in chassis are as follows:

23G22 — Basic "B" screen chassis with mechanical centering and focus.

23G23 — Same as 23G22 with cable provided for the attachment of 6G20 radio chassis.

24G22 — Same as 23G22 except for the "C" screen picture tube, electrical focus and centering and an additional horizontal sweep output tube to provide for the wider deflection angle of the "C" screen.

24G23 — Same as 24G22 with cable provided for the attachment of 6G20 radio chassis.

24G24 — Same as 24G22 except for the utilization of a separate small chassis for the low voltage power supply and audio output tube.

24G25 — Same as 24G24 with cable provided for the attachment of 6G20 radio chassis.

The suffix letter "Z" following the chassis number indicates that a glass picture tube is used.

All chassis are constructed of a top plate and a wrap-around base. The two sections are insulated from each other and are interconnected with only a 100 K resistor. All electrical circuits including the AC line return to the top chassis plate only. **DO NOT CONNECT SHIELDED TRANSMISSION LINES, COAXIAL CABLES OR ANY GROUNDS TO THE CHASSIS.** Always use a 200 MMFD 900V AC test capacitor between the transmission line shield and chassis.

The service man should bear in mind when testing the receiver to use a 300 to 500 watt isolation transformer and to **CONNECT TEST EQUIPMENT COMMON LEADS TO THE TOP CHASSIS PLATE AND NOT THE WRAP-AROUND BASE.**

When testing the 23G23, 24G23 and 24G25 chassis without the 6G20 radio chassis, pins 5 and 6 on the inter-connecting cable must be temporarily connected together in order to apply AC power to the TV receiver.

TUBE COMPLEMENT

23G22-23 Television Chassis

Symbol	Tube	Function
V 1	6BJ6	RF Amplifier
V 2	6AG5	Converter
V 3	6C4	RF Oscillator
V 4	6AU6	1st Video IF Amplifier
V 5	6AU6	2nd Video IF Amplifier

V 6	6AU6	3rd Video IF Amplifier
V 7	6AU6	4th Video IF Amplifier
V 8	12AU7	Video Amplifier
V 9	1/2 12AT7 or 6AB4	Sync Amplifier
V 10	12AT7	1/2 Intercarrier Sound Amplifier V 10A.
V 11	6BN6	1/2 AGC Amplifier - V 10B.
V 12	6AG7	Sound Limiter & Detector
V 13	6BN6	Audio Output
V 14	12SN7GT	Sync Separator
V 15	6V6GT or 6AQ5	1/2 Vertical Oscillator - V 13A.
V 16	6AL5	1/2 Horizontal Discharge - V 13B Vertical Output
V 17	12SN7GT	Phase Detector
V 18	19BG6G	1/2 Horizontal Oscillator V 16A.
V 19	25W4	1/2 Horizontal Control Tube. V 16B.
V 20	1B3GT/8016	Horizontal Output
V 21	5U4	Damper
V 22	25Z6GT	High Voltage Rectifier
V 23	12UP4A	Low Voltage Rectifier
		Picture Tube

The second detector is a 1N64 germanium crystal diode.

TUBE COMPLEMENT

24G22-23-24-25 Television Chassis

Symbol	Tube	Function
V 1	6BJ6	RF Amplifier
V 2	6AG5	Converter
V 3	6C4	RF Oscillator
V 4	6AU6	1st Video IF Amplifier
V 5	6AU6	2nd Video IF Amplifier
V 6	6AU6	3rd Video IF Amplifier
V 7	6AU6	4th Video IF Amplifier
V 8	12AU7	Video Amplifier
V 9	6AB4	Sync Amplifier
V 10	12AT7	1/2 Intercarrier Sound Amplifier V 10A.
V 11	6BN6	1/2 AGC Amplifier - V 10B.
V 12	6AG7	Sound Limiter & Detector.
V 13	6BN6	Audio Output
V 14	12SN7GT	Sync Separator
V 15	6V6GT	1/2 Vertical Oscillator - V 14A
V 16	6AL5	1/2 Horizontal Discharge V 14B.
V 17	12SN7GT	Phase Detector
V 18	25BQ6GT	1/2 Horizontal Oscillator - V 17A
V 19	25BQ6GT	1/2 Horizontal Control Tube V 17B.
V 20	25W4	Horizontal Output
V 21	1B3GT/8016	Horizontal Output
V 22	5U4	Damper
V 23	25Z6GT	High Voltage Rectifier
V 24	16EP4A	Low Voltage Rectifier
		Picture Tube

The second detector is a 1N64 germanium crystal diode.

CONTROLS AND FUNCTIONS

Location of the various receiver controls is shown in Fig. 2. After the receiver has been properly adjusted, the serviceman should remove the Horizontal Hold, Brightness, Fine Tuning, Vertical Hold, and Contrast Control knobs and re-position them so that the white dot stamped on the outer edge of the knobs face upward. (As in Fig. 2). This will aid the customer in resetting the controls should they be accidentally moved out of position. A brief description of each control follows:

CHANNEL SELECTOR SWITCH: Switches into operating position the pre-tuned RF strip for reception of the particular channel desired.

FINE TUNING CONTROL: Provides a means of varying the frequency of the local oscillator to compensate for any frequency deviation which may result from tube and circuit variations. In operating this control it will be found that the range of clearest sound is quite broad. Proper setting is the point where the best picture is obtained within the range of clearest sound.

VERTICAL HOLD CONTROL: Provides a means of changing the cathode resistance of the vertical oscillator to synchronize the vertical sweep with the transmitted sync pulses. Improper adjustment of this control will cause the picture to "roll" in a vertical direction.

BRIGHTNESS CONTROL: Controls the grid bias of the picture tube to afford control of picture brilliance. Must be operated in conjunction with the Contrast Control for maximum picture clarity.

CONTRAST CONTROL: This control is in the cathode circuit of the 12AU7 second video amplifier. By regulating the bias of the tube it controls, the amplitude of the video signal going to the grid of the picture tube.

PICTURE CONTROL SWITCH: The Picture Control Switch changes the magnitude of the sweep voltage into the vertical deflection coils thereby allowing the choice of either a Giant Circle or "conventional" picture.

HORIZONTAL HOLD CONTROL: The Horizontal Hold Control in conjunction with C72 is used to pre-set the horizontal oscillator to a frequency approaching that of the sync pulses from the transmitter.

HEIGHT CONTROL: The Height or Vertical Size Control together with R55 and R22 form the plate load of the vertical oscillator. It is used in conjunction with the vertical linearity control to adjust the size of the picture vertically.

VERTICAL LINEARITY CONTROL: The Vertical Linearity Control is in the cathode circuit of the vertical output tube and is used to shift the operating point of the tube so that the sweep is amplified along the portion of the plate current curve which results in a linear output.

HORIZONTAL DRIVE CONTROL: Regulates the magnitude of the horizontal sweep voltage applied to the grid of the horizontal output tube.

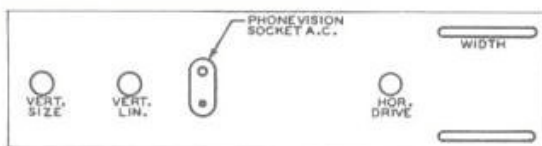
WIDTH CONTROL: A variable inductance (L76) shunted across a portion of the secondary winding of the horizontal output transformer T10. Varying this shunt inductance changes the magnitude of the sweep voltage across the horizontal deflection coils thus causing the picture to widen or narrow accordingly.

HORIZONTAL FREQUENCY ADJUSTMENT: Provides a means of regulating the horizontal oscillator so that it is in the proper frequency relationship with the transmitted horizontal sync pulses.

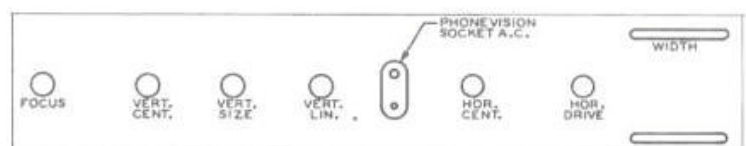
FOCUS CONTROL: (23G22 & 23) A mechanical shunt which regulates the flux density of the ring type permanent magnet to effect proper focus.

FOCUS CONTROL: (24G22 & 23) A combination electro-permanent magnet is used. Focus is accomplished electrically by adjustment of the Focus Control at the rear of the chassis.

CENTERING CONTROLS: (24G22 & 23) The vertical and horizontal centering of the picture is adjusted individually by the use of centering voltages applied to the horizontal and vertical deflection coils.



REAR VIEW OF 23G22/23 CHASSIS



REAR VIEW OF 24G22 to 24G25 CHASSIS

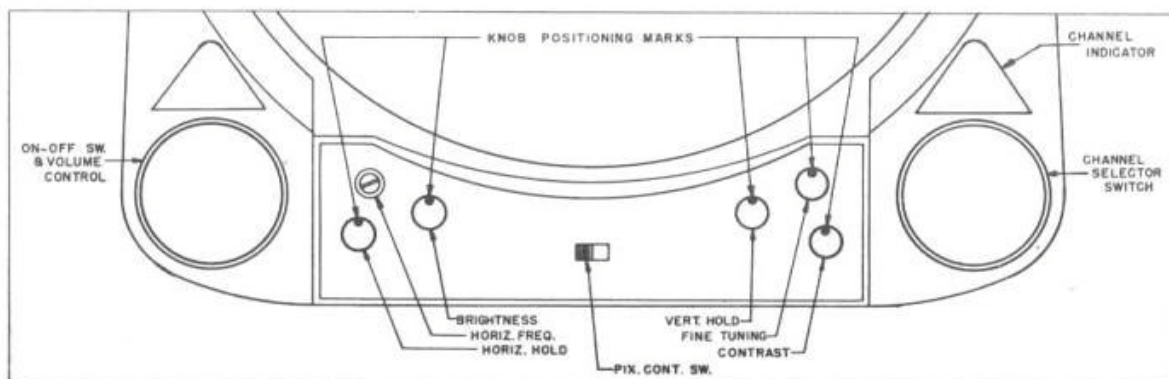
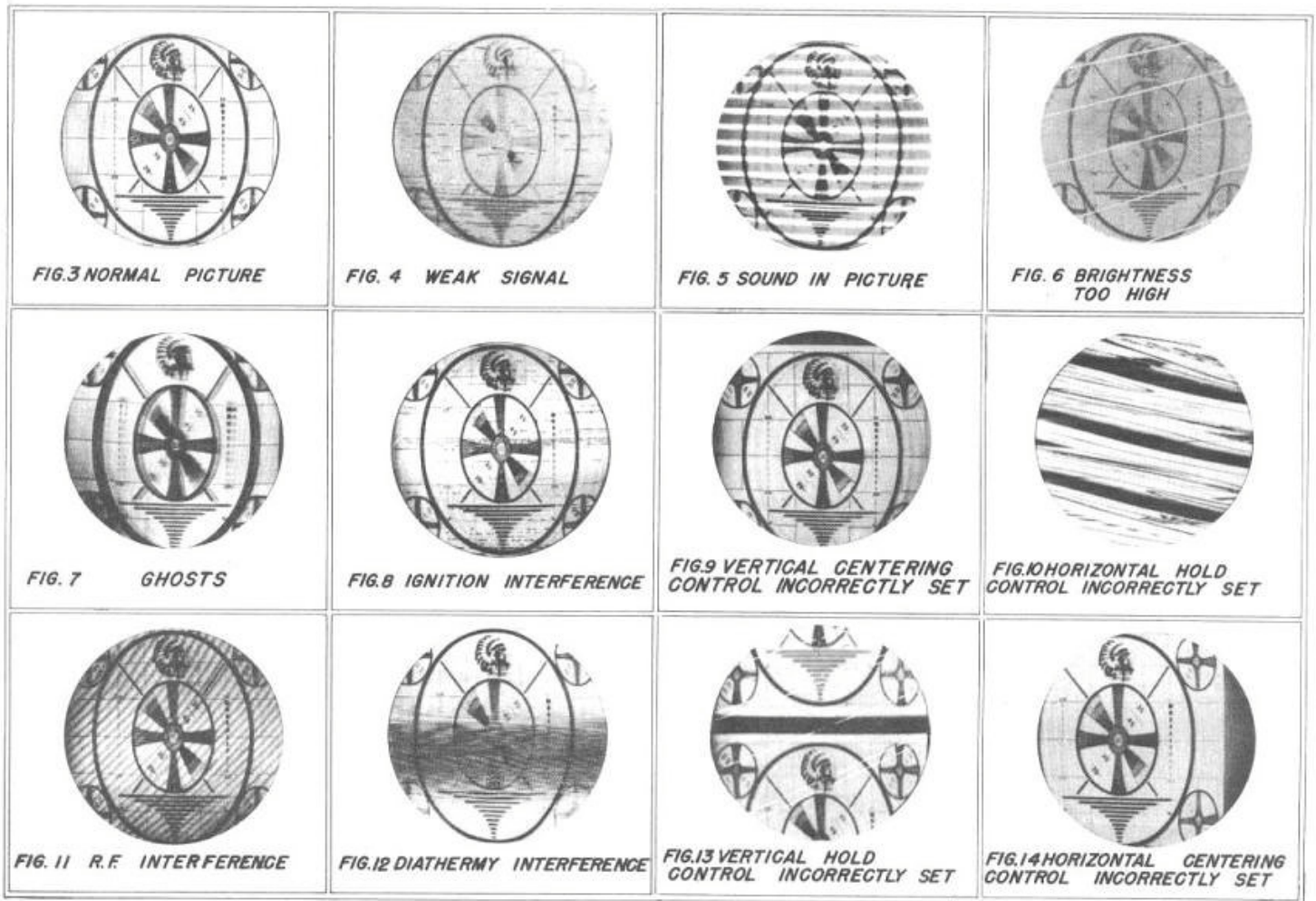


Fig. 2 Controls.

TEST PATTERNS



CHANNEL	FREQ BAND	PICTURE CARRIER	SOUND CARRIER	RECEIVER LOCAL OSCILLATOR
1				
2	54-60-MC	55.25 MC	59.75 MC	101 MC
3	60-66	61.25	65.75	107
4	66-72	67.25	71.75	113
5	76-82	77.25	81.75	123
6	82-88	83.25	87.75	129
7	174-180	175.25	179.75	132.5
8	180-186	181.25	185.75	138.5
9	186-192	187.25	191.75	144.5
10	192-198	193.25	197.75	150.5
11	198-204	199.25	203.75	156.5
12	204-210	205.25	209.75	162.5
13	210-216	211.25	215.75	168.5

Fig. 15 Television Channels and Corresponding Receiver Oscillator Frequencies.

CIRCUIT DESCRIPTION

THE RF SHELF

The RF shelf consists of a 6BJ6 RF amplifier V1, 6AG5 converter V2 and a 6C4 oscillator V3. The oscillator frequency can be changed approximately 1 Mc by the off-set tuning slugs which are attached to the fine tuning shaft. The master oscillator tank L59 is a complete circuit in itself. It is shunted by the inductance on each channel strip so that the proper frequency of oscillation for the particular channel in use results. The oscillator operates above the incoming frequency on the low channels (2-6) and below on the high channels (7-13). The master oscillator is adjusted at the factory and adjustments should not be attempted unless a defective part is replaced or the unit has been tampered with. The adjacent low channel sound trap L60 is used to eliminate sound interference from the adjoining lower frequency channel.

THE TURRET TUNER

The design of the turret tuner provides an excellent method of obtaining self guiding, self wiping positive grip contacts. The stationary contacts are a part of the RF shelf. Guides are provided which properly position the strip contacts prior to their entry into the stationary assembly. The design allows easy replacement of channel strips. When a strip is replaced it should be mechanically aligned with the female contacts in the RF shelf.

THE 6BN6 GATED BEAM FM SOUND LIMITER-DETECTOR

In order to understand the operation of the new Zenith development, the Gated Beam FM Limiter-Detector, a few fundamentals should be reviewed.

It has long been known that an ordinary converter tube may be used as a detector for frequency modulated signals if the received signal is applied to both control grids in a manner so that the two grids are substantially in quadrature and that their relative phase varies with frequency. It was also known that a signal applied to the first grid of a converter tube automatically produces a quadrature voltage on the second grid, through space charge coupling, if the second grid is also tuned to the frequency of the input signal.

FM detectors based on this principle, using converter tubes, are not satisfactory because the first grid of a converter tube has no limiter properties of its own. On the other hand, the new Gated Beam Limiter-Detector not only serves as an FM detector, but has excellent limiting characteristics as well.

Study of Fig.16 shows that the new tube is highly unconventional in structural design as its operation is based on electron-optical principles.

The rectangular cathode is surrounded on three sides by a grounded focusing electrode and faces a positive accelerator plate on its only open side. Electrons emerging from the cathode are shaped into a compact sheet-like beam which is projected against the limiter grid through the narrow slot in the accelerator.

The limiter grid acts like a gate. With zero or a positive potential applied, it passes the beam; with a negative potential of a few volts or more on the grid, the beam is stopped, the electrons turn around, diverge like a fountain falling back on the accelerator.

If a sine-wave signal of 1 volt RMS or more is applied to the limiter grid, the beam is alternately passed and stopped, so that the beam current behind the input grid has the form of a square wave. As long as the input signal remains over 1 volt RMS, variations in its strength does not affect the intensity of this square wave; in other words, limiting takes place right at the first grid.

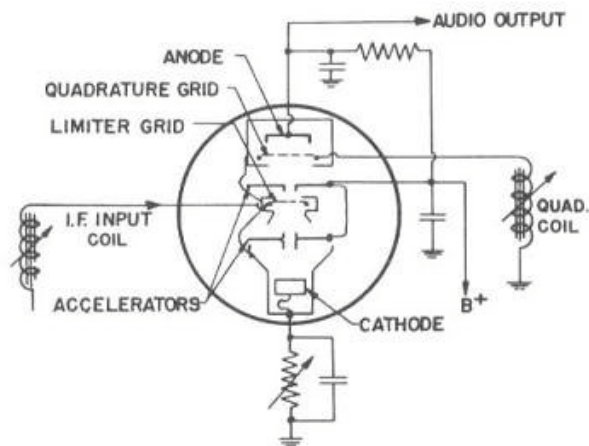


Fig. 16 6BN6 Gated Beam Limiter-Detector.

In normal operation, the limiter grid is biased two or three volts negative with respect to the cathode. Input signals may easily be five or ten volts, so that the limiter grid is strongly positive during part of each cycle. The grid current, however, is limited to a few tenths of a milliamper by the design of the tube, so that this type of operation does not produce objectionable damping of the input circuit. Leaving the limiter grid, the beam passes through the second accelerator — a somewhat wider slot covered with a screen — and is projected against the quadrature grid. The quadrature grid is tuned to the signal frequency and driven by space charge coupling. The anode is placed behind the quadrature grid and a positive potential is applied to it.

Fig. 16 shows the circuit of the new Gated Beam Limiter-Detector. A 4.5 Mc IF signal, between one and perhaps fifty volts, is applied to the limiter grid and for one-half of each cycle the electron beam is passed and projected upon the quadrature grid. The periodic variations of the space charge in front of this grid (space charge coupling) produce about five volts across its tuned circuit. The quadrature grid clips the leading portion from each half-cycle pulse and passes on to the anode periodic pulses of current about one-quarter cycle in length. Modulation of the signal frequency affects the phase displacement between the half-cycle electron stream and the voltage produced on the quadrature grid causing corresponding variations in the length of the anode current pulses. The plate load resistor is by-passed for IF; but the DC voltage drop across this resistor is proportional to the pulse length and is, therefore, a direct function of the original modulation.

IF AMPLIFIER

The 40 Mc IF amplifier uses four 6AU6 tubes and a 1N64 germanium diode crystal detector. The transformers consist of bifilar windings with a single slug which tunes both primary and secondary inductances. Because intercarrier sound is used, both

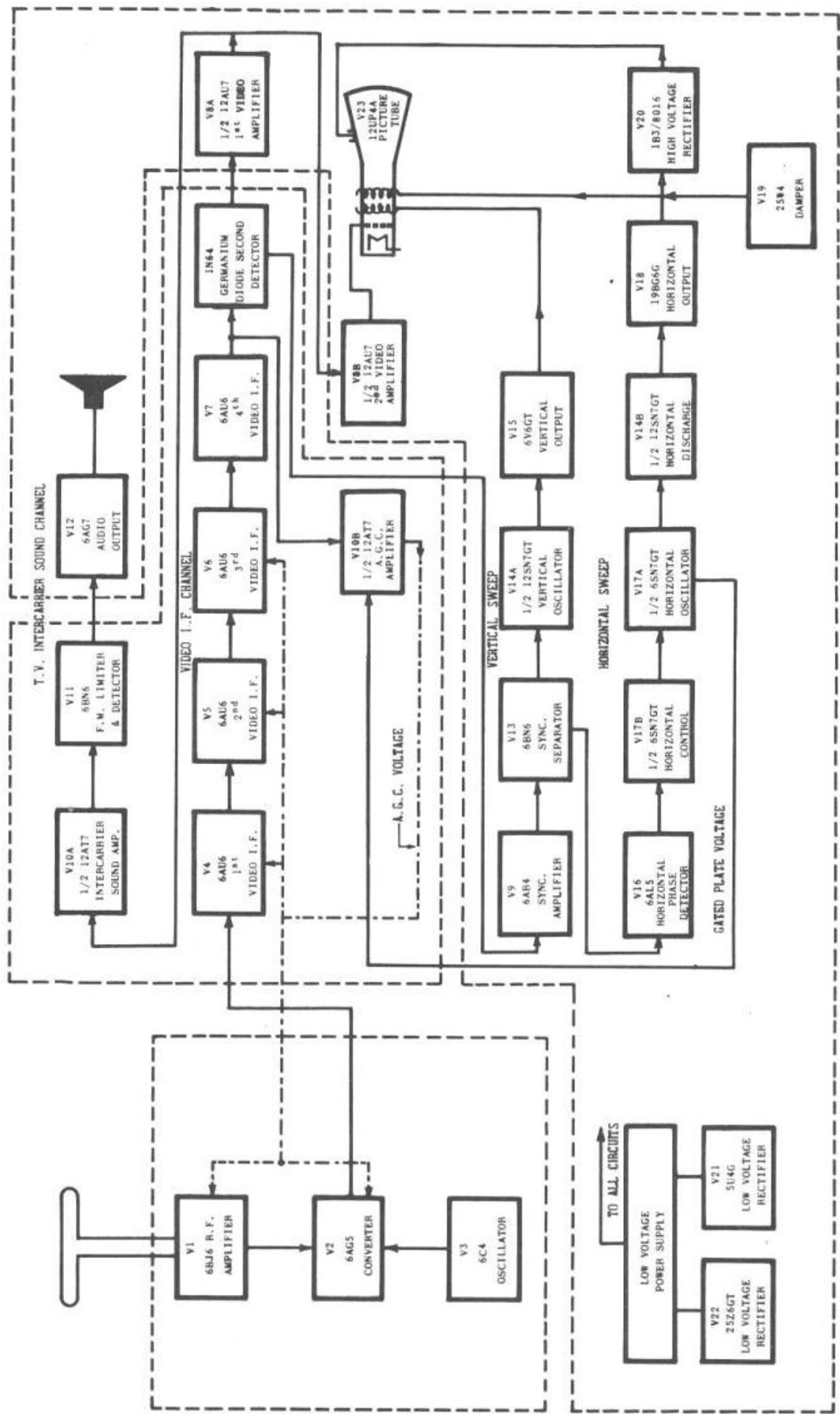


Fig. 17 Block Diagram.

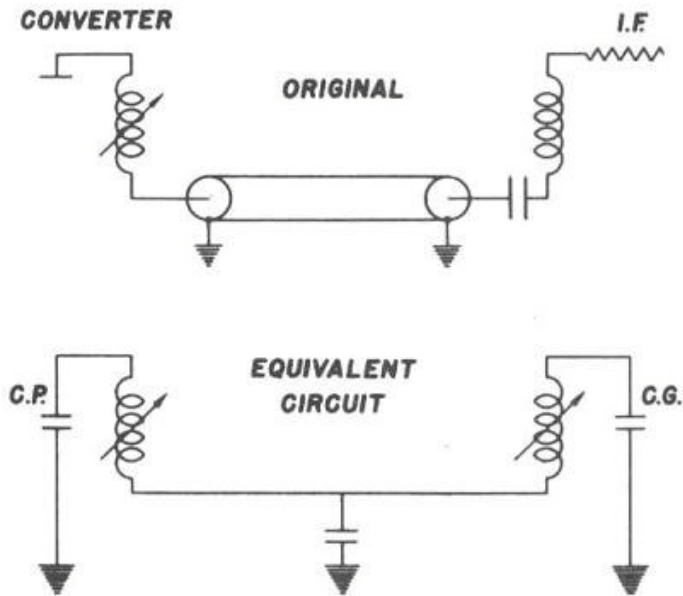


Fig. 18 Converter Coupling Into The IF.

the video and sound carriers pass through the IF amplifier. The video IF carrier is placed 2X down on the response curve and the sound carrier 20X down. Fig. 18 shows the method of coupling the converter into the 1st IF. It can be seen that the cable capacity is common to the converter plate and the 1st IF grid by virtue of the inherent inter-electrode and stray capacities.

INTERCARRIER SOUND

The video and sound carrier frequencies are 4.5 Mc apart. When these carrier frequencies beat, a 4.5 Mc difference frequency is produced which contains the original sound modulation. This 4.5 Mc IF is taken from the plate of the 12AU7 1st video amplifier V8A by the take-off coil L78, amplified by the 12AT7 intercarrier sound amplifier V10A and applied to the grid of the 6BN6 Gated Beam Limiter-Detector tube where limiting and detection occurs. The output from the detector is fed to the grid of the 6AG7 power amplifier tube and reproduced by the speaker.

GATED AGC

The purpose of the automatic gain control is to feed back a negative voltage, proportional to the strength of the received signal, to the grids of the RF-IF amplifier tubes in order to automatically control their amplification. It is for this reason that strong signals do not overload the receiver because they cause the development of a considerable feedback voltage which reduces the sensitivity of the receiver. On the contrary, very little feedback voltage is developed by weak signals and as a result the receiver operates at its maximum sensitivity.

With ordinary AVC circuits, such as used in broadcast receivers, the average of the rectified signal voltage is taken from the detector and fed back to the RF-IF grids. With a television receiver it is impossible to use the average signal because the amplitude is constantly changing with picture content. However, the components in a composite video signal which do have a relatively constant amplitude are the sync pulses. These are maintained at a level approximately 20 to 25% above the blanking and video

level (See fig. 19) Therefore, it is the sync pulses which are used to control the gain of television receivers.

Ordinary methods of AGC have certain disadvantages which have been overcome by using the gated system. If the automatic gain control is not gated, it remains open to noise impulses which can have an amplitude as great, and in some cases, greater than the sync pulses. The average voltage developed by these noise pulses creates a false AGC voltage where the noise rather than the signal can be the controlling factor. Another disadvantage in conventional circuits is the long time constant which must be used. The long time constant prevents the AGC from following rapid changes in the amplitude of the received signal and undesirable effects such as picture "breathing" result.

An IF signal (before detection) is applied to the grid of the AGC amplifier V10B through a 200 MMFD capacitor C26. The intensity of this alternating voltage is proportional to the strength of the received signal and causes plate current conduction of V10B during its positive half cycles.

The plate voltage for the AGC amplifier is a 15.75 Kc pulse taken from the horizontal oscillator V17A. Since the frequency of the plate voltage is the same as the horizontal sync pulses (15.75 Kc) V10B can only conduct (open gate condition) during the time of the sync pulses and is non-conductive (gate closed) during the relatively long period of time between pulses when noise could develop a false AGC voltage.

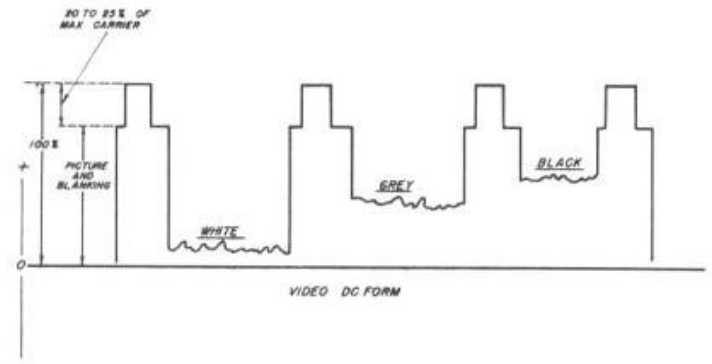


Fig. 19 Composite Video Signal.

During plate current conduction of V10B, a DC voltage is developed across the plate load resistor R53, in a manner similar to a half wave rectifier. The magnitude of this voltage depends on the IF input voltage which is applied to the grid of the AGC amplifier V10B. The period of conduction and delay is determined by the setting of the AGC delay control R25. The developed AGC voltage, is filtered by the RC filter R28, C33, C56 and fed back to the RF-IF grids.

The primary advantages of the gated AGC system is the relative immunity to noise, and the fact that short time constants are used which enable the AGC to follow much faster changes in amplitude such as those developed by airplane reflections, etc.

SYNC SEPARATOR CIRCUIT

The purpose of the sync separator circuit is to strip the vertical and horizontal sync pulses from the composite video signal. These pulses are then applied to their respective sweep circuits for triggering.

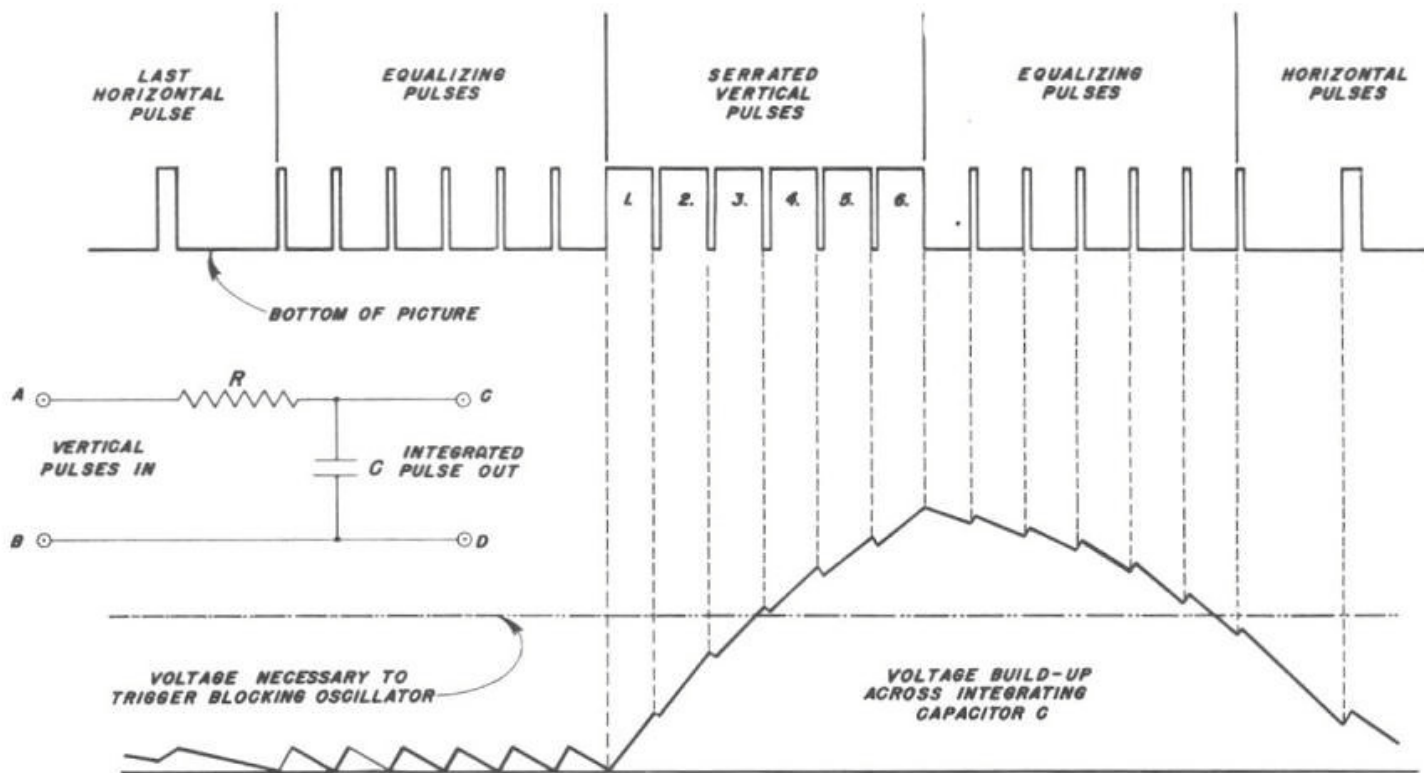


Fig. 20 The Effect of Vertical Synchronizing Pulses on the Integrator.

The composite video signal from the IN64 detector is fed to the grid of the 6AB4 sync amplifier (V9) where it is amplified and coupled to the grid of the 6BN6 sync separator V13. The sync pulses, which are more positive than the picture component (See Fig.19), drive the grid of the 6BN6 and produce a step function in the plate current which results in clipping the top of the pulses and noise. The lower amplitude picture component does not have sufficient drive to produce plate current flow and does not appear in the output. The clipping and slicing action of the 6BN6 tube results in a sync pulse output relatively free from picture and noise.

THE VIDEO AMPLIFIER

The output from the video detector ranges in frequency from 30 cycles to approximately 4 Mc. Since the output is very low, it must be amplified by the video amplifier without appreciable loss to the higher video frequencies. The high frequency response of a video amplifier is limited by the impedance which the inter-electrode and stray capacities of tubes and circuits produce. Since the capacitive reactance decreases as the frequency increases, the higher frequencies could be relatively "shorted out" unless the effect of the undesirable capacities is removed. This is accomplished by inserting peaking coils L61, L65, L67, L68 and L69 to cancel the effect of the distributed capacities. The peaking coils form a resonant circuit in which the capacitive reactance is cancelled by the inductive reactance. In addition to the peaking coils, the plate load resistors are of low value so that their impedance at the highest video frequencies is approximately that introduced by the stray capacities. Use of peaking coils and low plate load resistors allows the video amplifier to have a reasonably flat frequency response to 4 Mc.

VERTICAL BLANKING CIRCUIT

A blanking circuit which eliminates the vertical retrace lines is incorporated in these receivers. The sweep voltage is taken from the plate of the vertical output tube V15, shaped into a sharp positive pulse and applied to the cathode of the picture tube. This pulse blanks out the picture tube during the retrace period.

THE VERTICAL SWEEP

The purpose of the vertical sweep is to gradually move the electron beam from the top of the picture tube to the bottom as it is swept from left to right by the horizontal sweep. It requires approximately 15,500 microseconds for the beam to move from the top of the picture tube to the bottom and approximately 1,166 microseconds to again return to the top and unblank for the next field. This period of time is the retrace and is blanked out. The frequency of the vertical sweep is 60 cycles. Because the 15.75 Kc horizontal triggering must never stop, even during the vertical retrace, the vertical pulses are serrated so that they continue triggering the horizontal oscillator. Since the horizontal sweep continues, the beam does not go directly from the bottom of the picture tube to the top during the retrace. It is zig-zagged back to the top by action of the horizontal sweep. Six equalizing pulses precede and follow the serrated vertical pulse. These stabilize the circuits before and after the vertical sync pulse and make interlacing practical. The circuits must be arranged so that the oscillator is triggered solely by the vertical synchronizing pulses and not from any other source such as noise, etc.

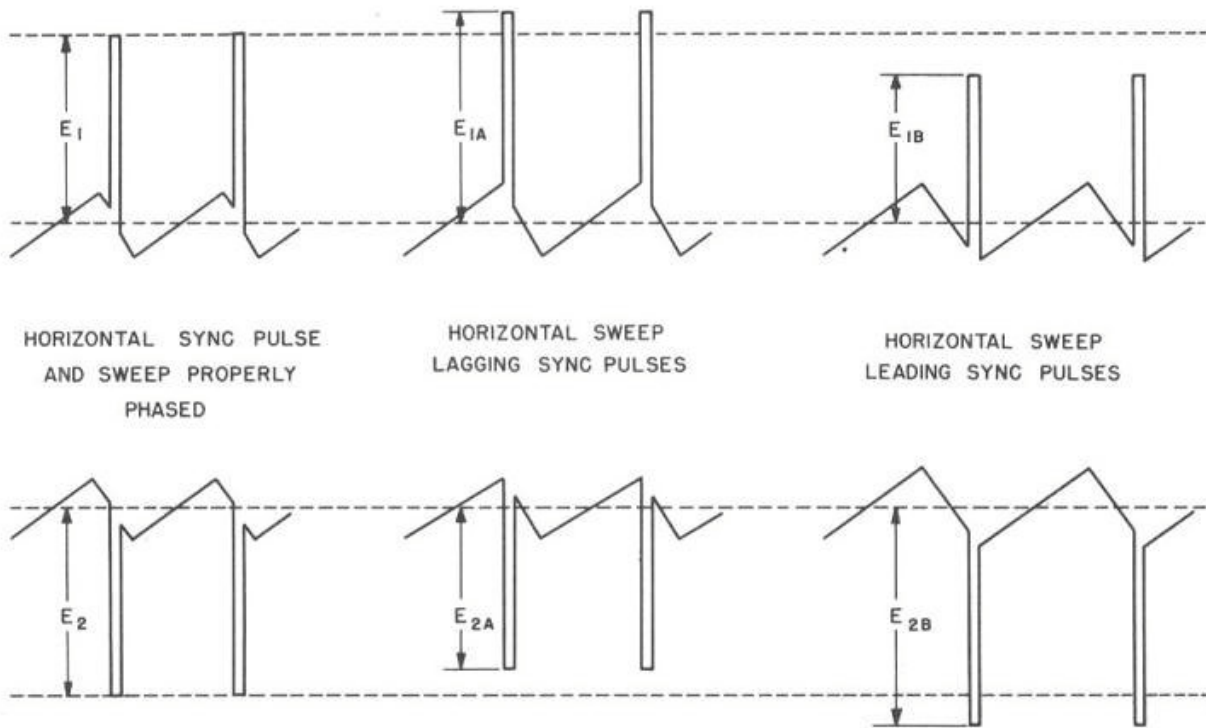


Fig. 21 Combined 15.75 Kc. Sync Pulse and Sweep Voltage Applied to the Phase Detector Plates.

Both the horizontal and vertical pulses enter the integrator A2. Because of the long time constant in the integrating circuit, the short duration horizontal sync and vertical equalizing pulses have very little effect on developing a charge across the integrator (See fig. 20). The slight charge that does develop leaks off during the comparatively long interval of time between pulses and for all practical purposes, has no effect. The serrated vertical pulse, on the other hand, has a time duration of approximately 190 microseconds and very little time interval between pulses. Each pulse charges the integrating capacitor to a higher potential until the voltage becomes high enough, and properly shaped, to trigger the blocking oscillator.

The vertical saw-tooth voltage is developed across the .01 MFD vertical charge discharge capacitor C62. When plate current cut-off occurs, there is no appreciable voltage drop across the plate load resistor, which consists of the HEIGHT CONTROL R95 and 3.3 Megohm series resistor R57. Because there is very little voltage drop, the capacitor charges to nearly full plate potential in approximately 15,500 microseconds. This is the sweep portion of the saw-tooth voltage. When the vertical sync pulse causes the vertical oscillator tube to conduct again, the capacitor discharges through the internal resistance of V14A. This is the retrace and occurs in approximately 1,166 microseconds. The 33K resistor R49, in series with the charge discharge capacitor, shapes the voltage so that it will have a combination of saw-tooth and pulse which is necessary to produce a saw-tooth current through the

deflection coils (See fig. 22). The 6V6GT-G serves as one leg of multivibrator and as the vertical amplifier which develops the relatively high current for deflecting the beam.

Because the impedance of the vertical deflection coils is high at the 15.75 Kc horizontal frequency, two 560 ohm damping resistors R61, are shunted with the windings to prevent interaction between

the two sweep voltages.

The 5,000 ohm VERTICAL LINEARITY CONTROL R58, shifts the operating point of the tube so that the sweep is amplified along that portion of the plate current curve which results in a linear output.

HORIZONTAL SWEEP

The purpose of the combined horizontal sweep circuits is to develop a saw-tooth current through the horizontal deflection coils which develops a magnetic field that moves the electron beam horizontally across the picture tube screen. The saw-tooth voltage originates in the plate circuit of the 12SN7GT horizontal discharge tube V14B. Although the horizontal tube could normally be triggered by noise as well as sync pulses, the sweep is designed so that the frequency, which is unaffected by noise, is the controlling factor.

The frequency control circuit consists of a 6SN7GT 15.75 Kc horizontal oscillator V17A, a 6AL5 phase detector V16 and a 6SN7GT horizontal control tube V17B.

In order to maintain horizontal synchronization, the 15.75 Kc horizontal oscillator must be properly phased with the transmitted synchronizing pulses. In order to accomplish proper phasing, the use of a horizontal control tube and a phase detector is required.

The phase detector compares the transmitted sync pulses with the sweep voltage which is removed from the secondary of the horizontal sweep transformer T10. Fig. 21 shows the combined sync pulse and sweep voltages which are applied to the plates of the phase detector.

It can be seen that when the sync and sweep voltages are in phase,

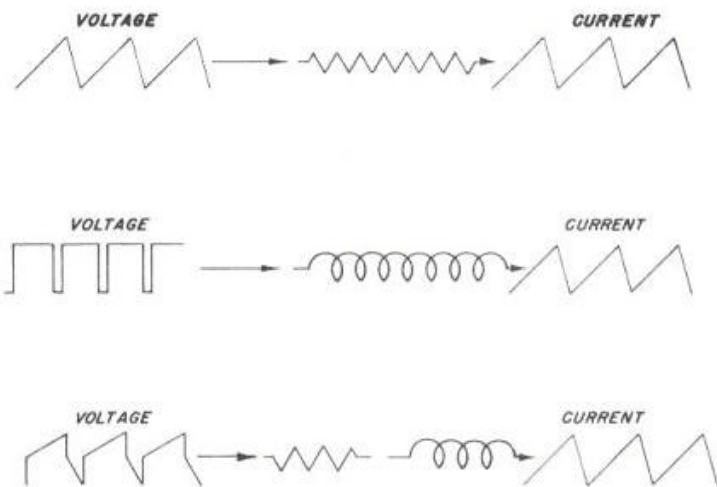


Fig. 22 Type of Voltage Necessary to Produce Saw-Tooth Current Through a Resistance, Inductance and the Combination of Resistance and Inductance.

E1 and E2 are equal in amplitude and each diode in the 6AL5 tube conducts equally. This results in equal DC voltages of opposite polarity developed across the load resistors R67 and the resultant voltage applied to the grid of the horizontal control tube is zero. When the horizontal sweep lags the sync pulses, E1A is greater in amplitude than E2A and the top diode conducts more current resulting in a negative difference voltage applied to the grid of the horizontal control tube which increases the frequency of oscillation. Conversely when the horizontal sweep leads the sync pulses, E2B is greater than E1B and the bottom diode conducts more current which results in a positive difference voltage which lowers the frequency of the horizontal oscillator.

The horizontal control tube functions as a variable resistance which is in series with capacitor C60. This series combination shunts the horizontal oscillator coil L75 and is used to shift the oscillator frequency in the same manner as is done by the combination of C72 and the Horizontal Hold Control. The resistance of the horizontal control tube, however, is automatically controlled by the difference voltage from the phase detector which is applied to its control grid. A more negative voltage increases the tube resistance and the frequency of oscillation while a more

positive voltage lowers the frequency. In either case, the frequency of the horizontal oscillator is corrected so that it remains in the proper phase relationship with the transmitted synchronizing pulses where voltage E1 is equal to E2.

The Horizontal Hold Control R70, is used to adjust the oscillator frequency to approximately that of the sync pulses after which the phase detector and the Horizontal Control tube assume control.

The output from the plate of the horizontal oscillator is a flat topped wave which is differentiated for triggering the discharge tube. A saw-tooth voltage is developed by charging and discharging the 680 MMFD capacitor C77. The capacitor charges when the grid of the V14A becomes highly negative cutting off plate current flow. Since the tube does not draw plate current when cut off, there is no appreciable voltage drop across the 560 K ohm plate load resistor R76 and capacitor C77 charges to approximately full plate potential. It is the linear charge of this capacitor which produces the trace portion of the saw-tooth voltage. When the positive half of the pulse appears at the grid, V14B conducts heavily and C77 discharges through it. The charge of the capacitor is the trace, and the discharge is the retrace.

Study of fig.22 shows the type of pulses necessary to produce a saw-tooth current through an inductance. The voltage and current through a resistance are in phase and a saw-tooth voltage is necessary to produce a saw-tooth current. Since an inductance has inherent resistance, the voltage wave form must be a combination of saw-tooth and pulse to produce a saw-tooth current through the deflection coils. This wave is formed by the 4700 ohm resistor R5 which is in series with the charge discharge capacitor C77 and the 25,000 ohm Horizontal Drive Control R74.

HIGH VOLTAGE POWER SUPPLY

The 10,000 volt DC supply for the second anode of the picture tube is developed by the 19BG6 horizontal sweep amplifier V18, and its associated output transformer and high voltage rectifier. The power supply is the kick-back type in which the high voltage is developed during the 7 microsecond retrace of the horizontal sweep when the deflection coil current suddenly collapses.

The saw-tooth current which produces the sweep, flows for approximately 53 microseconds. This is the approximate time required to move the beam from the left to the right side of the pic-

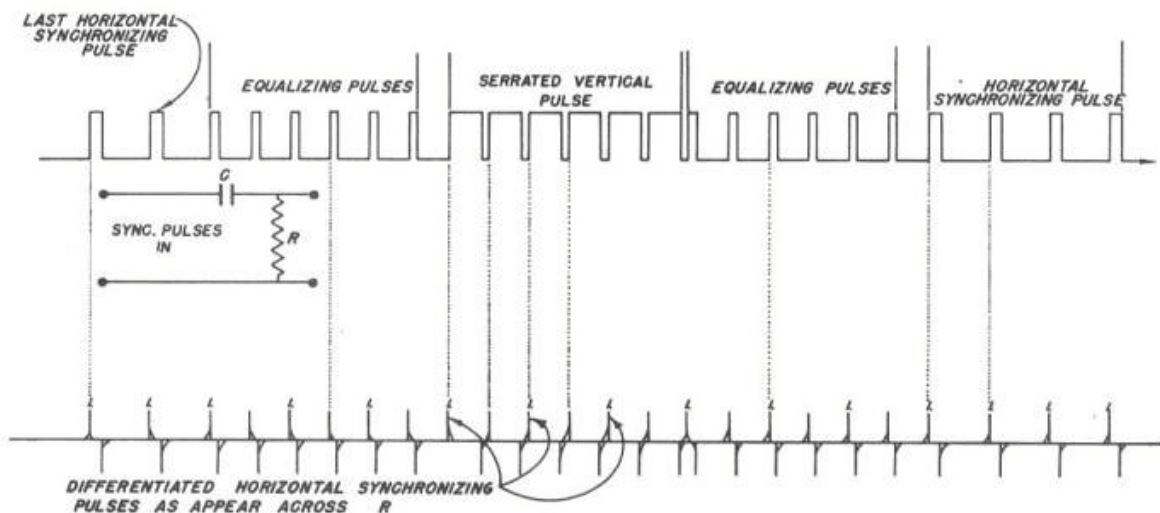


Fig. 23 Horizontal Sweep Triggered by the Vertical Sync Pulse During the Vertical Retrace Period.

ture tube. After the sweep reaches the right side of the tube, the current suddenly collapses and this sudden collapse of current through the deflection coils, generates a voltage which is "kicked back" into the output transformer and stepped up.

A two turn low voltage winding supplies filament current for the 1B3GT high voltage rectifier V20, where rectification develops the 10,000 volts DC for the second anode of the picture tube. Because of the 15.75 Kc frequency, very little filtering is necessary. The 500 MMFD 12 Kv capacitor, the 470,000 ohm resistor and the capacity formed by the picture tube metal cone and chassis adequately filters the high voltage.

When servicing the high voltage power supply, extreme care must be exercised to avoid contact with the second anode high potential. A well insulated vacuum tube voltmeter, which has a 10 Kv range, or higher, may be used to measure the high potential. Failure in any section of the 15.75 Kc horizontal sweep circuit may cause the supply to be inoperative. If the difficulty is not obvious, circuit tracing should begin at the 6SN7GT horizontal oscillator V17A, through the 12SN7GT horizontal discharge tube V14B, and the 19BG6G horizontal amplifier. The 19BG6G plate voltage must be measured at terminal 4 on T10. Do not measure the voltage at the plate of the tube because the voltage at this point is extremely high due to the inductive build-up through the transformer. The 25W4 damping tube V19, adds an additional 125 volts to the plate voltage of the 19BG6G horizontal amplifier. Failure of this tube will also cause the high voltage to be inoperative.

THE DAMPING TUBE

The linear rise of current through the horizontal deflection coils moves the electron beam from the left to the right side of the picture tube in approximately 53 microseconds. The current must then return to its starting value in approximately 7 microseconds. The sudden collapse of current through an inductance during the retrace produces an oscillatory condition (See fig.24). This oscillating condition would destroy the linearity of the sweep and must be removed by the damping tube V19. When the plate of the damping tube becomes more positive than the cathode, conduction occurs which loads the circuit and prevents the undesirable oscillation. As a result of the conduction, a DC potential of approximately 125 volts is developed and stored in the .22 MFD capacitor C81. This voltage is added to the plate voltage of the 19BG6G horizontal amplifier and raises its potential from 360 to 485 volts for greater output and better performance.

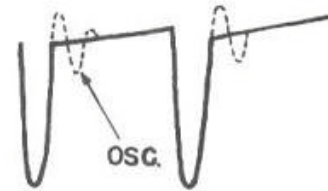


Fig. 24 Undesirable Oscillation Removed By Damping Tube.

THE BEAM BENDER

The electron gun of a picture tube emits both electrons and ions. The ions are much heavier than the electrons and if allowed to bombard the picture tube fluorescent screen, damage in the form of a burn could occur. To prevent this condition, the electron gun of these tubes is slightly bent so that the ion and electron stream is directed at the neck rather than at the screen of the tube. The beam bender, which is a permanent magnet fitted around the neck of the tube, bends the electrons back into their proper axis so that they strike the screen. The heavier ions are not affected by the magnetic field and do not reach the screen.

The beam bender has an identifying arrow stamped on it. When it is installed, the arrow must point towards the face of the picture tube. On a double ring type beam bender the air gaps should be 180° out and the heavier ring must be nearest the picture tube

socket. (See fig.29). To make the adjustment, move and rotate the beam bender along the neck of the tube until the brightest picture with least shadow appears. It may be necessary to readjust the focus and intensity controls during the adjustment.

WIDTH CONTROL

The horizontal output voltage appears between terminals 1 and 3 on the output transformer T10. A portion of the secondary winding is shunted by a variable inductance L76 which is the width control. Varying the position of the slug changes the shunt inductance and results in changing the magnitude of sweep voltage across the horizontal deflection coils. As the shunt inductance increases, the output voltage increases and the pattern widens horizontally. When the slug is removed from the coil, the shunt inductance is at minimum and the voltage and pattern width is minimum.

ADJUSTMENTS AND ALIGNMENT

During alignment and when making AGC adjustments, peak output voltage at the detector must be measured. Any oscilloscope can be calibrated as follows:

Momentarily connect a 3V battery across the vertical input of the scope and observe the instantaneous deflection on the screen. This deflection represents a 3V peak voltage and a mark should be made at this point and at the base reference line. The scope vertical gain control must also be noted so that the control can always be returned to the same position for the 3V range. It must be remembered that only a momentary flicker will be noted on the scope when the battery voltage is applied during the calibration process. The battery must not be connected for a length of time which would charge the scope input capacitor as this would result in an incorrect calibration. Always short out the scope input leads before each contact to the battery is made.

AGC ADJUSTMENTS

Connect the calibrated oscilloscope to test point "C" (pin 2 of the 12AU7 video amplifier). This test point is on top of the chassis near the 12AU7 tube. Select the strongest TV signal and observe the detector output on the scope. Adjust the AGC Delay Control R25 for a 3.5V peak output. In extreme fringe areas it will be impossible to obtain a 3.5V indication on any signal, and the AGC Delay Control should be adjusted for best signal with least noise.

AFC ADJUSTMENT

Because the range of the Horizontal Hold has been increased, these receivers may not stay in horizontal sync when switching from channel to channel unless the control is near its electrical center.

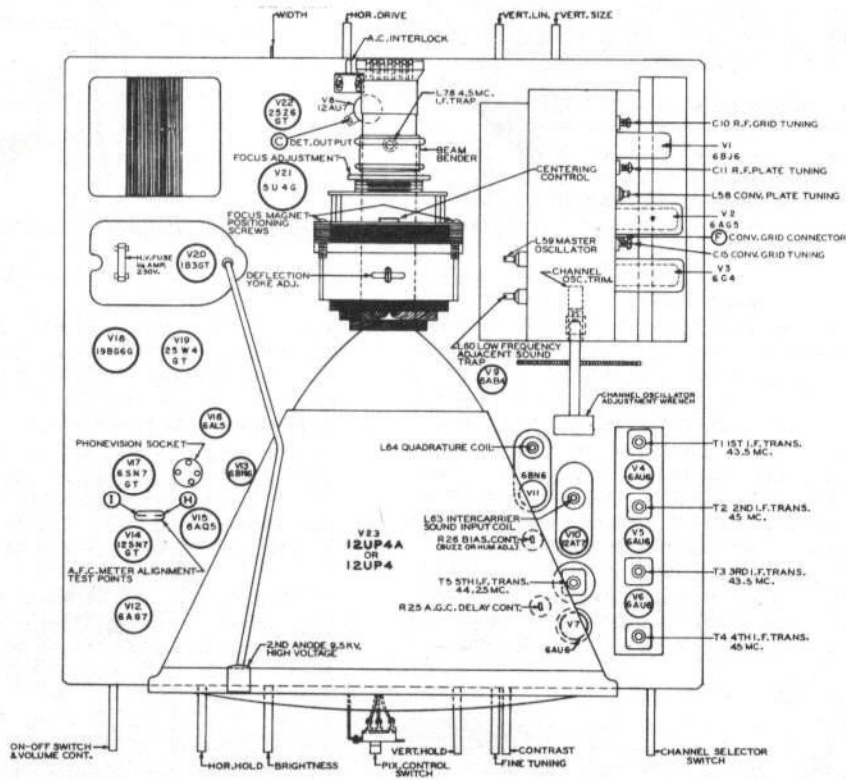


Fig. 25 Tube and Trimmer Layout 23G22/23 Chassis.

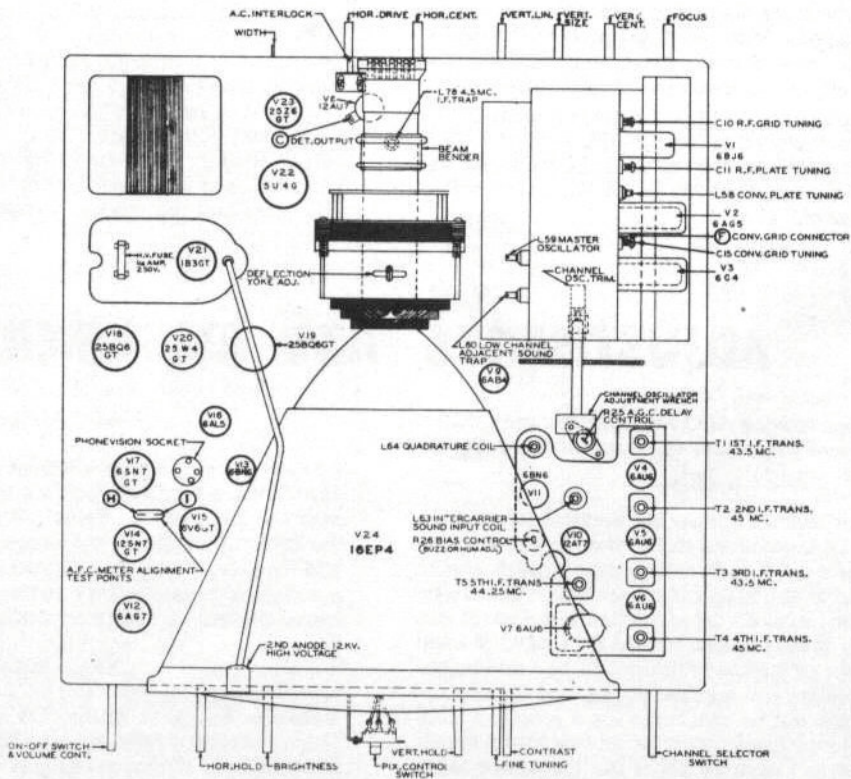


Fig. 26 Tube and Trimmer Layout 24G22/23 Chassis.

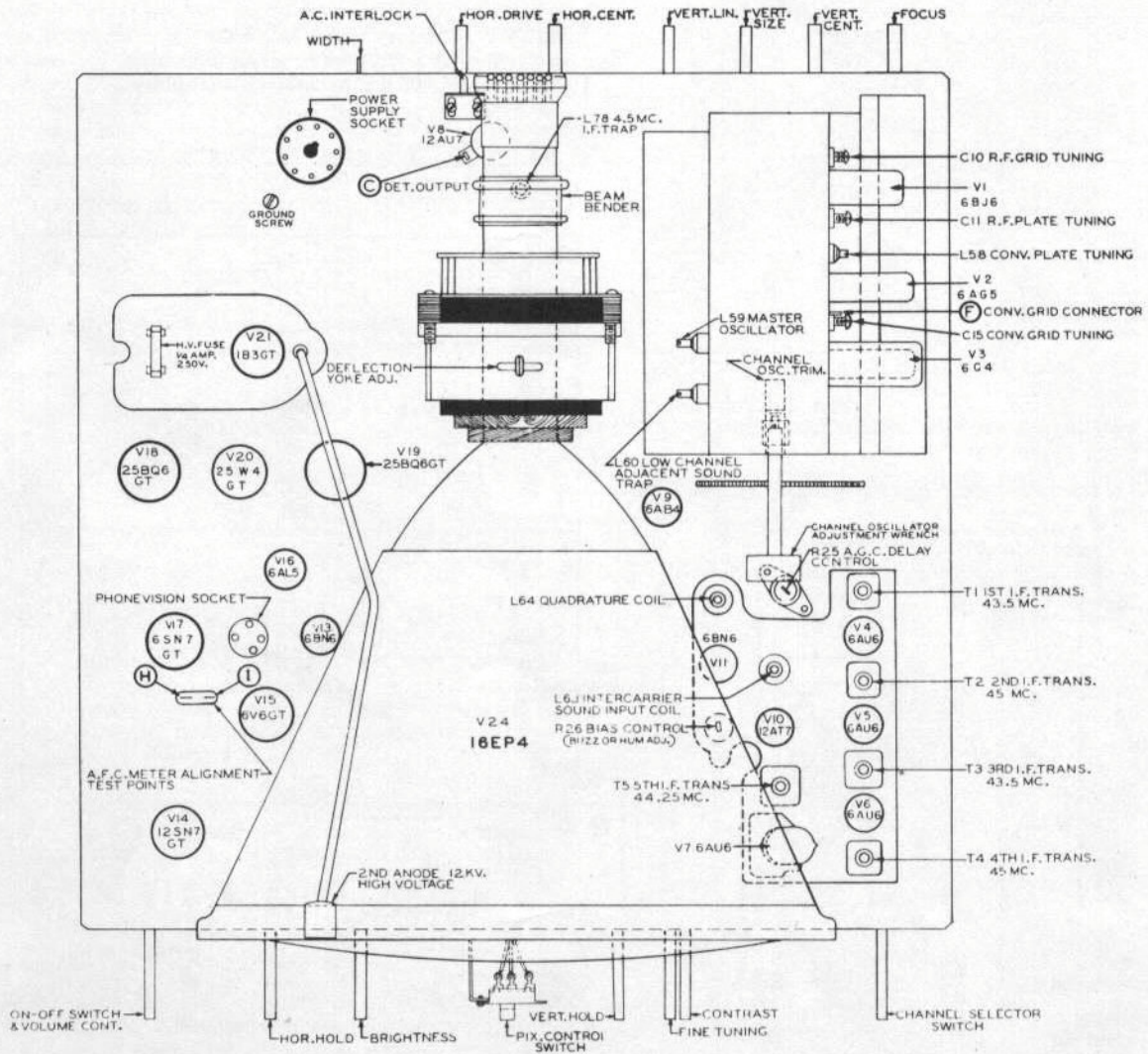
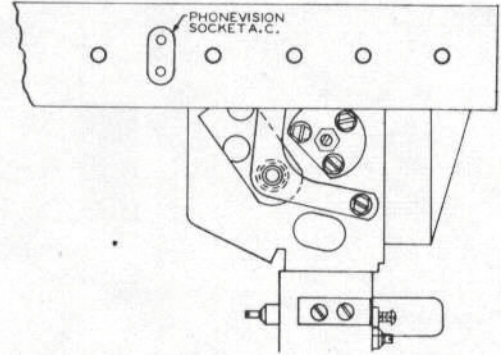
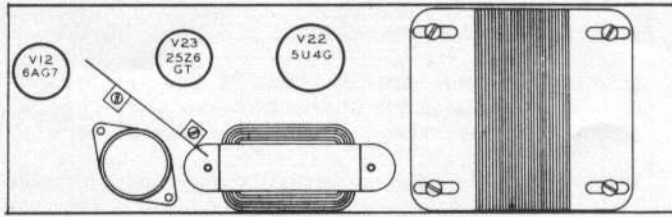


Fig. 27 Tube and Trimmer Layout 24G24/25 Chassis.



TEST EQUIPMENT AND GENERAL ALIGNMENT INFORMATION

In order to make satisfactory IF and RF alignment and to reproduce the response curves illustrated in this manual special care must be exercised when setting up the test equipment.

Fig. 28 shows the recommended method of connecting the test equipment. A bond should be connected between each unit and to the receiver under test. In order to prevent damage to the Mega-Sweep crystal, always connect this common bond lead to the receiver chassis before the output cable connections are made to the receiver alignment points.

Special care must be exercised to make cable No. 1 as shown. No ground lead should be used. Hook the capacitor to the alignment point and lay the coaxial connector on the chassis for the ground connection.

The 3V bias battery which is necessary to apply a fixed bias during alignment should have leads with clips for easy connection between the bias string and top chassis.

See page 33 for special test equipment.

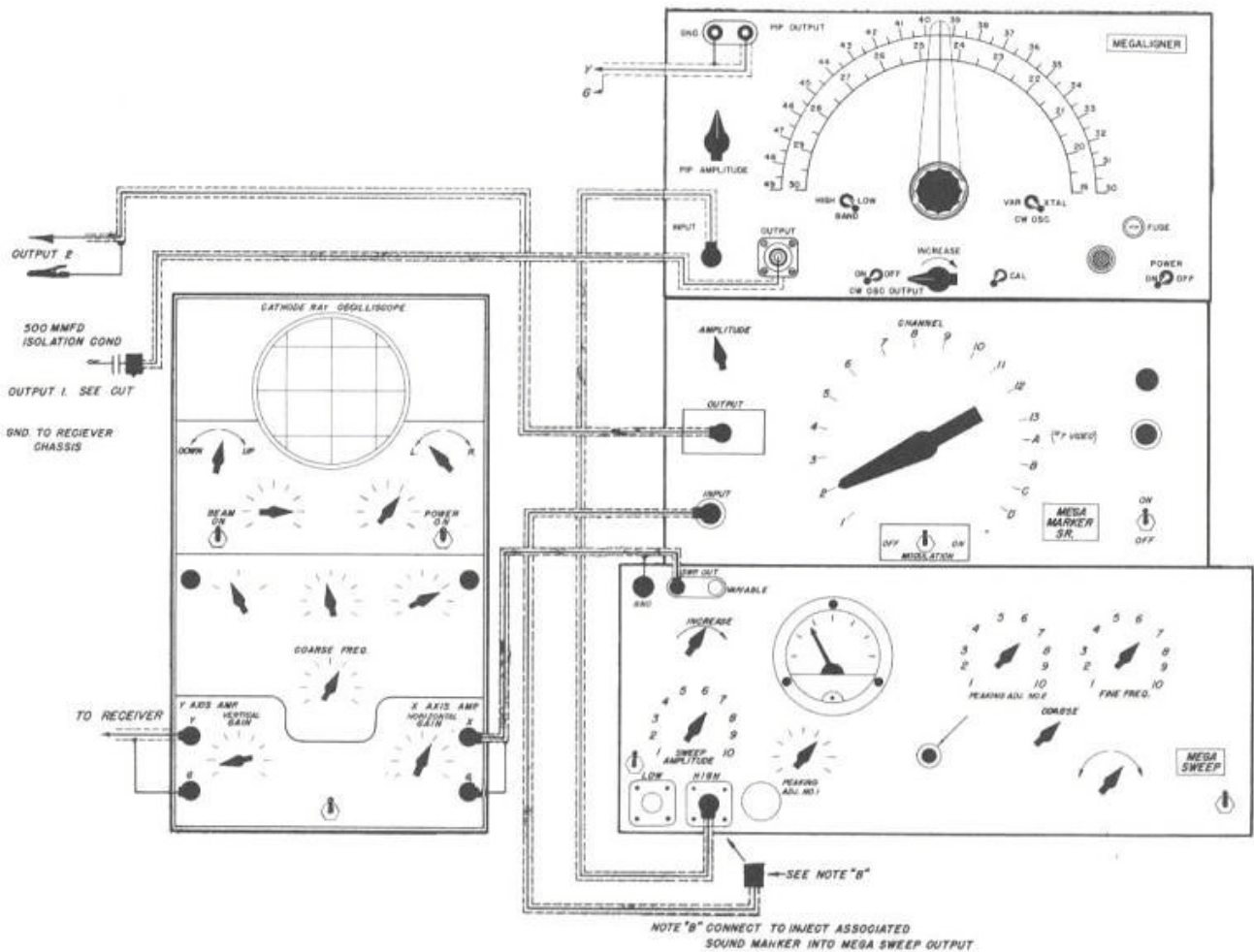


Fig. 28 Test Equipment and Connectors.

To adjust the AFC use a zero center meter set to the 10 V range. An ordinary VTVM may also be used by setting the pointer to mid-scale or flipping the polarity switch during adjustment. Connect the common lead of the VTVM to the AFC terminal "I" and the "hot" lead to terminal "H". (Be certain that the meter case is not grounded to the chassis). Rotate the Horizontal Hold control from one extremity to the other while adjusting L75 for an equal swing of opposite polarity on the VTVM. The Horizontal Hold Control should be permanently set for best "bulls eye" action near this zero midpoint.

Never use the Horizontal Hold control for centering the picture.

BULLS EYE TUNER ADJUSTMENT

With an inter-carrier receiver of this type, a meter cannot be used to indicate oscillator resonance. Two methods may be used for aligning the strip oscillators; one is to observe a test pattern on a station, and adjust for the best picture within the range of best sound. If the wedges on the test pattern are closely observed it will be noticed that tuning to one side of resonance produces a faded, washed-out picture with the spacings between the wedge lines fogged. Tuning in the opposite direction will cause the spaces between the lines to clear up. Tuning beyond this point will produce a wormy appearance. The wormy effect is due to sound getting into the picture. Correct adjustment is a point just prior to the wormy appearance. Before adjusting be sure the Fine Tuning control is set in the center of its range.

FOCUS AND CENTERING ADJUSTMENTS

On the 24G22-24 TV receivers, focus and centering of the picture is accomplished by the use of screwdriver adjustments at the rear of the chassis.

Unlike the 24G22-24 receivers, the focus and centering system in the 23G22-23 receivers incorporates a permanent magnet with mechanical adjustments which regulate the density and position of the magnetic field.

The centering control lever positions the magnetic field and is used to center the picture both vertically and horizontally.

Focusing is accomplished by turning the brass focus adjustment shunt ring. The position of this ring regulates the density of the magnetic field which is parallel to the electron beam in the picture tube. As long as this parallel condition exists, the magnetic field is not cut by the electrons. When the electrons diverge from the parallel path, the magnetic field is cut and it forces the electron stream back into the proper axis.

An improperly adjusted focus and centering assembly causes the electron beam to hit the neck rather than the screen of the picture tube, causing the outer extremities of the tube to be shadowed.

The complete focus, centering and beam bender adjustments are as follows:

1. Adjust the magnet positioning screws (See fig.29) until the assembly is approximately 1/8 inch from the deflection yoke with the neck of the picture tube centered inside the focus shunt ring.
2. Set the centering lever so that its locking screw is approximately centered vertically and horizontally inside the slot.
3. Adjust the beam bender for a full raster of maximum brightness.
4. Adjust the focus shunt ring for sharpest focus of the picture.

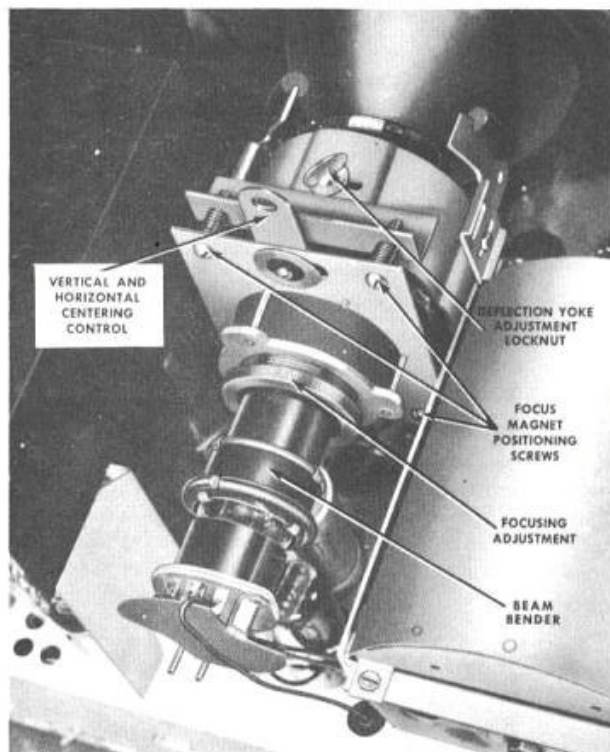


Fig. 29 Mechanical Focus and Centering Adjustments.

5. With the centering lever, center the picture vertically and horizontally. It will be noted that the up-down movement of the lever moves the picture horizontally while the left-right movement moves the picture vertically.

If it is impossible to get a full raster free from shadows, readjustment of the magnet positioning screws may be necessary.

IF ALIGNMENT

When aligning the 40 Mc IF, it is of utmost importance to keep the sweep generator connections as short as possible. Clip the negative lead of a 3V battery to test point "A" and the positive lead to top chassis. The oscilloscope should be connected to terminal "C". During alignment keep output from the sweep generator at a level which develops approximately 3V peak output at the detector.

After the bias and scope connections are made, proceed as follows:

1. Feed the Mega-Sweep signal to point "D" (pin 5 of the 6AU6 3rd video IF) and adjust T5 until the 44.25 Mc peak appears symmetrically between the 43.5 and 45 Mc markers. See Fig.30 .

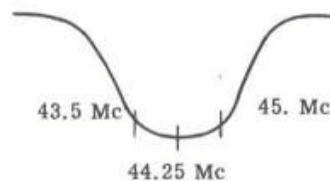


Fig. 30

2. Connect the sweep generator to point "E" (pin 1 of the 6AU6 2nd IF) and adjust T4 at 45 Mc and T3 at 43.5 Mc until a symmetrical curve shown in Fig. 31 is obtained.

The 43.5 and 45 Mc markers should fall slightly inside the peaks. It may be necessary to readjust T3 or T4, or both if the peaks do not increase approximately the same when T5 is rocked. After the peaks are checked, T5 should be adjusted for symmetry. See Fig. 31.

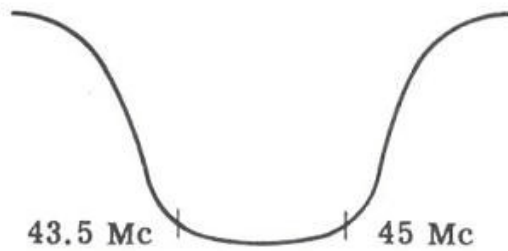


Fig. 31

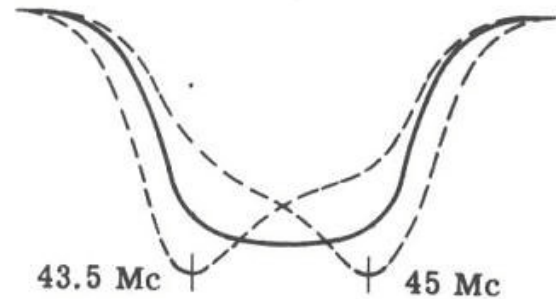


Fig. 32

If T3 and T4 are properly adjusted, rocking adjustment T5 from one side to the other should increase the amplitude of the 43.5 Mc and 45 Mc peaks as indicated in Fig. 32.

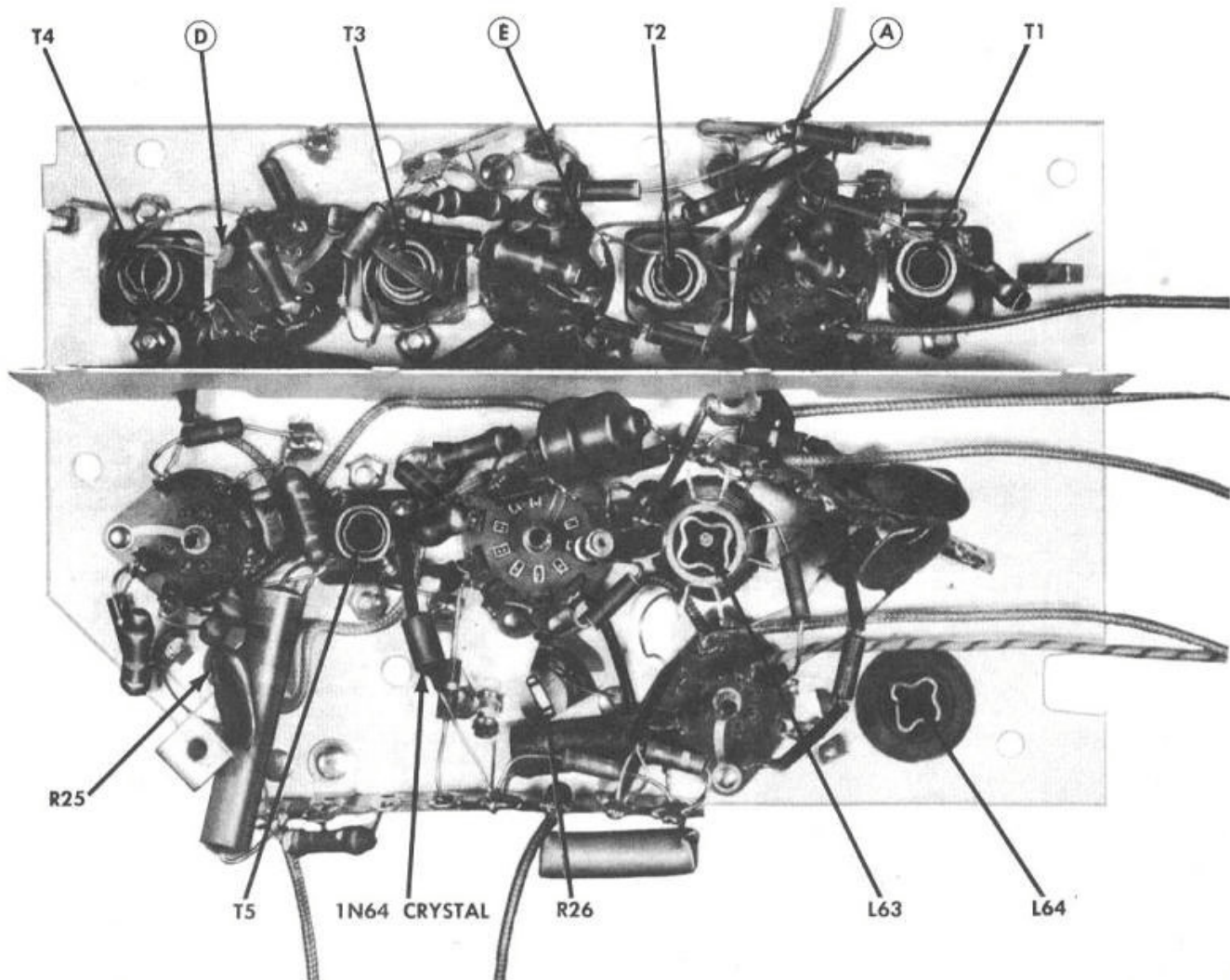


Fig. 33 Video and Sound IF Sub-Chassis.

3. Feed the sweep generator to the converter grid (terminal "F"). This terminal is near the 6AG5 converter tube. Adjust T2 at 45 Mc and T1 and L58 at 43.5 Mc until a symmetrical overall response curve shown in Fig. 34 is obtained. The 42.75 Mc and 45.75 Mc carrier frequencies should fall at the 50% point on the response curve. A slight readjustment of one or more IF transformers may be necessary if the overall response curve is not similar to the one shown in Fig. 34.

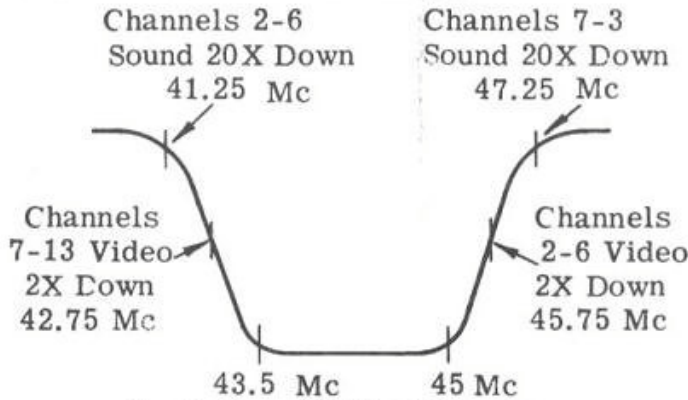


Fig. 34. Over-All Video IF Response.

Inject a 47.25 marker and adjust trap L60 for minimum indication on the scope or on a VTVM connected to the video detector.

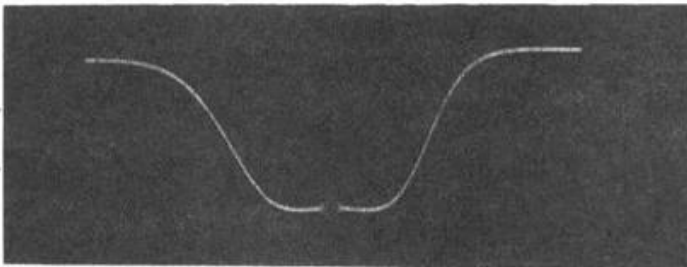


Fig. 35. Unretouched Photograph of Over-All IF Response With 44.25 Mc Marker.

INTER-CARRIER SOUND ALIGNMENT

Tune in a tone modulated TV signal and adjust the quadrature coil L64 for best sound. Insert a step attenuator between the antenna and receiver and reduce the received signal to a level where hiss is heard with the sound. Adjust the sound take-off coil L78, input coil L63 and buzz control R26 for cleanest sound and least buzz. During any of the adjustments, the hiss may disappear. If this occurs, the input signal must be further reduced so that the hiss never disappears during alignment.

In some cases, it may be difficult to attenuate the signal to a level below the limiting point of the Gated Beam Detector and the adjustments can be made as follows:

1. Connect an oscilloscope to point "B" (See Fig. 40) and feed a 4.5 Mc frequency modulated signal through a 500 MMFD isolation capacitor to point "C". Turn the receiver volume control fully counter-clockwise and adjust the sweep generator for an "S" curve, similar to a discriminator response, on the oscilloscope screen.

2. Increase the sweep output for maximum indication on the oscilloscope and then back off the attenuator until a drop in the amplitude of the response curve is noted. When this drop in amplitude is noted, it is an indication that the Gated Beam Detector is not limiting.

3. Adjust L78 for maximum response. With a 68-7 wrench in the core of L63 and a screwdriver in the potentiometer R26, adjust the two simultaneously for maximum amplitude and best linearity of the "S" curve, being careful that with an increase in amplitude the Gated Beam Detector does not re-enter its limiting range.

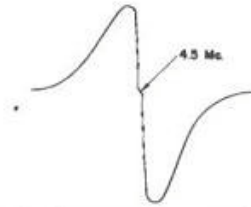


Fig. 36. Intercarrier Sound Response.

It will be noted that the negative leg of the "S" curve is approximately twice as long as the positive leg and that the adjustment of L63 causes the positive leg to broaden. Proper adjustment is indicated when the "S" curve is of maximum amplitude and the top portion of the curve is at its narrowest point.

4. Inject a 4.5 Mc marker into the sweep and adjust the quadrature coil L64 until the marker falls at the base reference line (See Fig. 36).

Because the response curve is not linear, care must be exercised when adjusting the quadrature coil to place the 4.5 Mc marker at the base reference line. The reference line can be easily found by reducing the oscilloscope horizontal amplification until a single vertical line is seen, the break in the line is the reference point.

After the sound channel has been aligned, a check should be made on a TV station. A slight readjustment of the buzz control R26 and the quadrature coil L64 may be necessary.

MASTER OSCILLATOR ALIGNMENT

The 6C4 master oscillator operates above the incoming frequency on the low channels (2-6) and below on the high channels (7-13). Slug L59 is used to pre-set the master oscillator on channel 7 (Channel 7 strip does not have an oscillator adjustment).

The master oscillator adjustment is to be made only if resonance cannot be obtained with the strip oscillator adjustment wrench when the fine tuning control is in its center position (open end of pulley on the RF shelf facing up) and after it has been determined that the channel strip itself is not at fault.

Although it is possible to get the L59 master oscillator by tuning in a station and alternately adjust the master and strip oscillator adjustments until proper tuning results, the use of the Mega-Sweep and Mega-Marker Sr. is preferred. The Mega-Marker Sr. is provided with crystals for the sound carrier frequencies of all 12 existing channels. The sound carrier frequencies can be used in adjusting the master oscillators, however, it is recommended that the Mega-Marker Sr. be equipped with a crystal for the picture carrier frequencies for channel 7 (175.25 Mc). This crystal may be inserted into one of the extra positions and adjustments made as follows:

1. Connect the negative lead of a 3V battery to point "A" (See Fig. 33) and the positive lead to top chassis.

2. Feed output #2 (See Fig. 28) through a S-15369 matching transformer to the antenna terminals of the receiver.

3. Set the channel selector to channel 7 and turn the fine tuning control until the open end of the pulley on the RF shelf shaft faces upward.

4. Adjust the Mega-Sweep for an RF response curve (See Fig. 37). Set the Mega-Marker Sr. on channel 7 and observe the picture marker on the response curve. Adjust L59 until the channel 7 picture marker falls at approximately 50% down on the response curve.

TURRET TUNER AND RF SHELF ALIGNMENT

The adjustments on the RF shelf are made at the factory and normally do not require readjustment unless the unit has been tampered with. If adjustment is necessary it is made as follows:

1. Connect the negative lead of a 3 V bias supply to point "A" (See Fig. 33) and the positive lead to chassis. Connect the oscilloscope between terminal "C" and chassis.
2. Feed the output of the Mega-Sweep through a S-15369 matching transformer to the antenna terminals of the receivers.
3. Adjust the Mega-Sweep and check the RF response curve (See Fig. 37) on each channel. If all the response curves are tilted approximately the same amount, first check the IF response to see that it has a reasonably flat top (See Fig. 34) before an attempt is made to adjust the RF trimmers. If the IF response is correct, set the channel selector switch to channel 4 and adjust the RF grid (C10), RF plate (C11), converter grid (C15) for symmetry and amplitude.
4. If the receiver sensitivity is satisfactory on the low channels (2 to 6) and is down on the high channels, remove the RF shelf cover and adjust the high channel peaking trimmer (C17) for maximum sensitivity with band pass. It must be remembered that the removal of the cover detunes the converter plate coil and that the converter must be adjusted with the cover off and readjusted after the cover is put on.

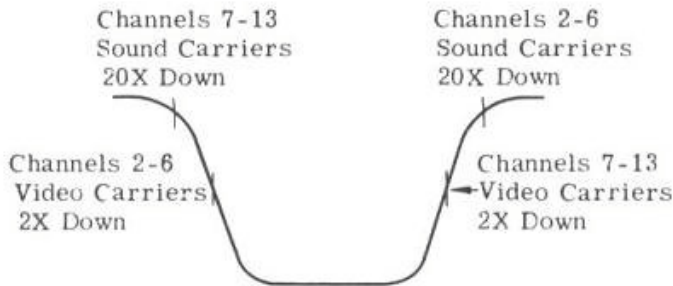


Fig. 37 RF Response.

In adjusting the master oscillator on the sound carrier frequency for channel 7, the above procedure is followed, with the exception that the sound marker is placed at approximately 20 times down on the response curve.

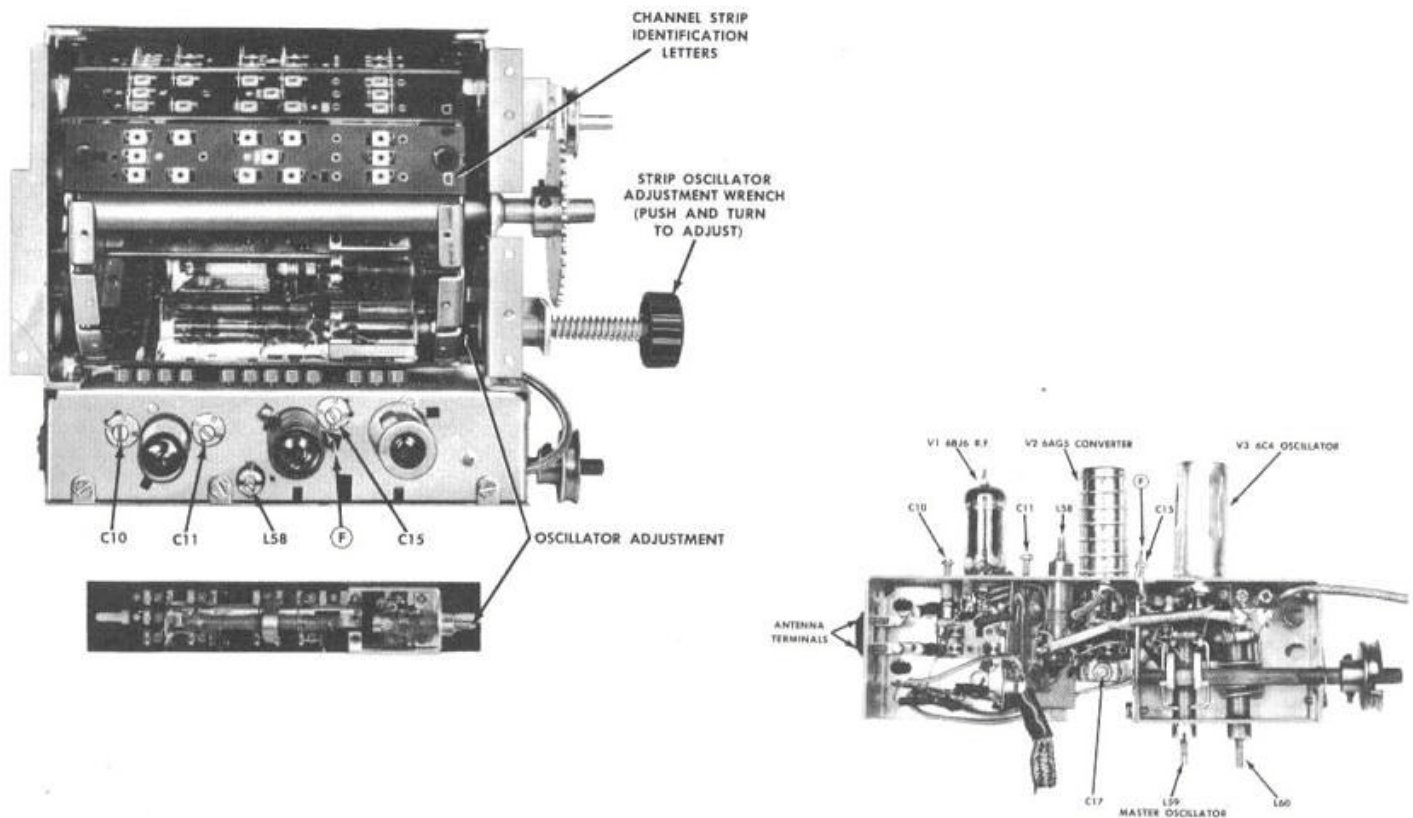


Fig. 38 Turret Tuner and RF Shelf.

NUMERICAL PARTS LIST

FOR FURTHER INFORMATION REFER TO
CIRCUIT LEGEND

MAIN CHASSIS				Diag. No.	Part No.	Description	Suggested List Price	
Diag. No.	Part No.	Description	Suggested List Price					
	12-1690	Turret Mtg. Brkt.	.10	C59	22-2166	.15 Mfd. (Molded)	200V	.45
	19-166	Coil Mtg. Clip (used on S-16571)	.06	C56	22-2167	.22 Mfd. (Molded)	200V	.45
	19-175	Coil Mtg. Clip (used on S-16556)	.06		24-527	Turret Cover		.25
	19-181	Coil Mtg. Clip (used on S-16186)	.06		34-183	Turret Drive Gear		.25
	19-192	Anode Lead Clip	.15		34-201	Indicator Gear		.50
C33	22-3	.01 Mfd. Ceramic (Disc)	500V .26		54-108	3/8-32x9/16" Hex Palnut Cad. (7 used on controls)		.01
C36	22-4	.004 Mfd. Ceramic "	500V .26		54-139	3/8-32x9/16" Hex Palnut Type 9N Cad. (used on 63-2072)		.008
C67	22-365	100 Mmfd. (Molded) (Mica)	500V .20		58-188	Two Prong Plug (used on S-16238)		.08
C75	22-470	150 Mmfd. (Molded) (Mica)	500V .20		58-190	Four Prong Adapter Plug		.15
C60	22-1138	470 Mmfd. (Molded) (Mica)	500V .20	R89	63-972	15K ohm 1W		
C72	22-1461	220 Mmfd. (Molded) (Mica)	500V .26	R19	63-1198	10K ohm 2W 20% Ins. Res.		.36
C31	22-1761	50 Mmfd. Ceramic	500V .20	R71	63-1398	33K ohm 1W 10% Ins. Res.		.24
C65	22-1775	.047 Mfd.	400V .26	R64	63-1484	8200 ohm		
C55	22-1777	.1 Mfd. (Molded)	200V .26	R87	63-1535	3300 ohm 5W Ins. Zipohm		.43
C71	22-1778	.047 Mfd. (Molded)	200V .26	R92	63-1576	8200 ohm 1W 10% Ins. Res.		.24
C66	22-1780	.0033 Mfd.	400V .20					
C37	22-1782	.0047 Mfd. (Molded)	600V .26					
C73	22-1803	.0022 Mfd. (Molded)	400V .26	R79	63-1578	150 ohm 2W 10% Ins. Res.		.33
C58	22-1809	.01 Mfd.	200V .20	R85	63-1669	Hor. Center Cont.		1.81
C82	22-1831	56 Mmfd. (Molded) (used on 95-1217)	500V .26	R58	63-1674	Vertical Linearity Control		1.20
				R74	63-1675	Horizontal Drive Control		1.20
C63	22-1841	.1 Mfd. (Molded)	600V .45	R84	63-1684	10K ohm 10W 10% Ins. Res.		.70
C62	22-1843	.01 Mfd. (Molded)	600V .26	R3	63-1740	82 ohm 1/2 W 10% Ins. Res.		.21
C54	22-1844	.047 Mfd. (Molded)	600V .35	R14	63-1743	100 ohm 1/2 W 10% Ins. Res.		.21
C52, C88	22-1845	.022 Mfd. (Molded)	600V .26	R9	63-1744	100 ohm 1/2 W 20% Ins. Res.		.21
C76	22-1846	.01 Mfd. (Molded)	400V .20	R73	63-1751	150 ohm 1/2 W 20% Ins. Res.		.21
C70	22-1847	.0047 Mfd. (Molded)	200V .26	R60	63-1761	270 ohm 1/2 W 10% Ins. Res.		.21
C79	22-1851	.001 Mfd. (Molded)	1000V .26					
C22	22-1876	.47 Mmfd. (Molded)	500V .35	R61	63-1775	560 ohm 1/2 W 10% Ins. Res. (used on 95-1217)		.21
C57	22-1888	.001 Mfd. (Ceramic)	500V .26	R27	63-1778	680 ohm 1/2 W 10% Ins. Res.		.21
C77	22-2034	680 Mmfd. (Molded)	500V .35	R66	63-1800	2200 ohm 1/2 W 20% Ins. Res.		.21
C69	22-2071	.022 Mfd. (Molded)	200V .26	R37	63-1803	2700 ohm 1/2 W 10% Ins. Res.		.21
C83	22-2098	.47 Mfd. (Molded)	200V .65	R38	63-1806	3300 ohm 1/2 W 10% Ins. Res.		.21
C84	22-2120	500 Mmfd (Molded) (Special)	10,000V 1.75	R72	63-1807	3300 ohm 1/2 W 20% Ins. Res.		.21
C64	22-1880	.0012 Mfd.	600V .26	R5	63-1813	4700 ohm 1/2 W 10% Ins. Res.		.21
C50	22-2103	20 Mfd. Electro	300V	R91	63-1821	6800 ohm 1/2 W		.21
C38AD)				R17	63-1824	8200 ohm 1/2 W 10% Ins. Res.		.21
C38BD)	22-2121	Elect. Cond. 20 Mfd. 450V 20 Mfd.		R48	63-1831	12K ohm 1/2 W 10% Ins. Res.		.21
C38CD)		450V 40 Mfd. 450V 40 Mfd. 25V	3.70	R16	63-1834	15K ohm 1/2 W 10% Ins. Res.		.21
C38DD)				R73	63-1838	18K ohm 1/2 W. 10% Ins. Res.		.21
C42AD)				R43	63-1841	22K ohm 1/2 W. 10% Ins. Res.		.21
C42BD)	22-2122	Elect. Cond. 15 Mfd. 475V 15 Mfd. 475V		R69	63-1845	27K ohm 1/2 W 10% Ins. Res.		.21
C42CD)		40 Mfd. 50V 80 Mfd. 300V	4.00	R49	63-1848	33K ohm 1/2 W 10% Ins. Res.		.21
C42DD)				R8	63-1855	47K ohm 1/2 W 10% Ins. Res.		.21
C46AD)				R75	63-1859	56K ohm 1/2 W 10% Ins. Res.		.21
C46BD)	22-2123	Elect. Cond. 20 Mfd. 450V 25 Mfd.		R22	63-1862	68K ohm 1/2 W 10% Ins. Res.		.21
C46CD)		475V 40 Mfd. 300V 100 Mfd. 50V	4.00	R23	63-1863	68K ohm 1/2 W 20% Ins. Res.		.21
C46DD)				R53	63-1869	100K ohm 1/2 W 10% Ins. Res.		.21
C61	22-2128	.001 Mfd. (Molded)	600V .26	R30, R90	63-1870	100K ohm 1/2 W 20% Ins. Res.		.21
C13	22-2143	470 Mmfd. (Ceramic)	500V .26	R68	63-1873	120K ohm 1/2 W 10% Ins. Res.		.21
C81	22-2145	.22 Mfd. (Molded)	200V .45	R65	63-1876	150K ohm 1/2 W 10% Ins. Res.		.21
C53	22-2157	.0033 Mfd. (Molded)	200V .26	R63	63-1880	180K ohm 1/2 W		.21
C80	22-2159	.33 Mfd. (Molded)	200V .60	R28	63-1884	220K ohm 1/2 W 20% Ins. Res.		.21
C85	22-2160	27 Mmfd. (Mica)	1000V .26	R45	63-1887	270K ohm 1/2 W 10% Ins. Res.		.21
C78	22-2161	.022 Mfd.	200V .26	R54	63-1890	330K ohm 1/2 W 10% Ins. Res.		.21
C68	22-2162	130 Mmfd. (Mica)	500V .26	R77	63-1898	470K ohm 1/2 W 20% Ins. Res.		.21
C74	22-2163	1000 Mmfd. (Mica)	500V .45	R76	63-1901	560K ohm 1/2 W 10% Ins. Res.		.21
C86AB				R47	63-1904	680K ohm 1/2 W 10% Ins. Res.		.21
C86BB	22-2164	500 Mfd. Electro	3V	R62	63-1908	820K ohm 1/2 W		.21

MAIN CHASSIS (CONT'D)

Diag. No.	Part No.	Description	Suggested List Price	Diag. No.	Part No.	Description	Suggested List Price
					95-1227	Output Trans.	2.80
R67	63-1911	1 Megohm 1/2 W 10% Ins. Res.	.21		100-105	Neon Light Bulb	.11
R2	63-1912	1 Megohm 1/2 W 20% Ins. Res.	.21		112-88	8-32 Thumb Screw	.06
R50	63-1919	1.5 Megohm 1/2 W 20% Ins. Res.	.21		112-758	#4-40x1/4 R.H.S.T. Screw Shakeproof (used on S-16236)	.02
R57	63-1932	3.3 Megohm 1/2 W 10% Ins. Res.	.21		113-8	6-32x1/4 Hex.Hd. Sl. M.S. Steel Internal Shakeproof (used on S-16556)	1.70C
R51	63-1936	3.9 Megohm 1/2 W 10% Ins. Res.	.21		113-9	8-32x1/4 Hex.Hd. Sl. M.S. Steel Shakeproof (9 used)	.02
R55	63-1939	4.7 Megohm 1/2 W 10% Ins. Res.	.21		114-45	#8x3/8 Hex. Hd. S.T. Screw (2 ea. used S-16237 & S-16602)	1.10C
R59	63-1967	1500 ohm 1W 10% Ins. Res.	.24		114-201	#8x5/16 Hex. Hd. Sl. S.T. Screw (18 used)	.75C
R83	63-1973	100 ohm 2 W 10% Ins. Res.	.21		114-332	10-32x1" Hex. Hd. S.T. Screw (2 used on S-16606)	.03
R33	63-1975	12K ohm 1 W 10% Ins. Res.	.24		125-26	Rubber Grommet (2 used on 78-709)	.025
R44	63-1980	8200 ohm 2 W 5% Ins. Res.	.50		126-636	Pilot Light Shield	.05
R32	63-2023	3500 ohm 10 W 10% Ins. Res.	.80		136-16	Fuse	.15
R56	63-2036	Vertical Size Control	1.20		149-77	Iron Core & Insert (used on S-16556)	.20
R29	63-2072	Vol. Control & Switch	1.81		149-85	Iron Core	.10
R42	63-2073	Contrast Control	1.20		149-91	Iron Core & Screw (used on S-16186)	.10
R46,R70	63-2074	Horizontal Intensity & Vertical Hold Control	1.20		149-98	Iron Core & Screw (used on S-16571)	.40
R80	63-2076	3.3 ohm W. W. 1/2 W 20% Ins. Res.	.21		188-131	Retaining Ring (used on S-16528)	.07
R34	63-2077	400 ohm W. W. 5 W. 10% Ins. Res.	.43		188-135	Corona Ring	.15
R35	63-2095	Candohm	.70		196-136	Plastic Gasket	2.50
R36	63-2096	Candohm	.75		199-124	Focus Coil Sleeve	.02
R86	63-2098	Vertical Center Control			S-15617	Turret Drive Gear & Bushing Assy.	.35
R88	63-2099	Focus Control			L62,L68	Peaking Coil Assy.	.35
R39AB)	63-2102	25K ohm 3 W			S-16011	P.M. Focus & Centering Assy.	5.50
R39BB)		150 ohm 15 W			S-16020	Beam Bender Unit (or S-16200)	1.95
R81AB)	63-2103	200 ohm 3 W			S-16025	Beam Bender Unit (or S-16200)	1.95
R81BB)		200 ohm 3 W			S-16186	Horiz. Osc. Coil Assy.	.90
R13	63-2105	15K ohm W. W. 3 W. 10% Ins. Res.	.60		S-16202	Video I.F. Strip Assy. (Complete)	40.50
R52	63-2107	200K Vertical Hold Control			S-16203	RF Shelf & Turret Assy. (Complete)	65.00
	73-114	8-32x5/16" Slab Hd. Hd. Set Screw		L75	S-16204	Horizontal Sweep Trans. Assy.	12.00
		Cuppoint (10 used)	.02				
	76-573	Extension Shaft	.50				
	78-709	Octal Tube Socket	.20	T10			
P1	78-813	9 Prong Socket					
	78-755	Octal Tube Socket	.18		S-16207	Deflection Yoke Mtg. Brkt. Assy.	.85
	78-781	Miniature Tube Socket	.20		S-16208	Anode Clip & Wire Assy.	.25
	78-807	Miniature Tube Socket	.15		S-16210	C. R. Tube Socket & Wire Assy.	.70
	78-834	Octal Tube Socket	.25		S-16211	Fuse Mtg. Strip Assy.	.70
	78-860	Two Contact Socket	.15		S-16213	Indicator Drum Assy.	.90
	78-873	Dial Light Socket & Wire	.50		S-16235	Indicator Gear & shaft Assy.	.60
	78-874	Octal Tube Socket	.20		S-16236	Picture Control Switch & Wire Assy.	.75
	78-875	C. R. Tube Socket	.40		S-16237	Gasket Reinforcing Brkt. Assy.	.10
	78-876	Noval Miniature Tube Socket	.25		S-16238	A.C. Plug & Brkt. Assy.	.15
	80-709	Tube Plate Connector Spring (2 used)	.07		L69,L85	Peaking Coil Assy.	.75
	80-731	Width Control Tension Spring	.07		W1	Interconnecting Cable	
	80-744	P. M. Focus Mtg. Spring (4 used on S16597)	.02	L67	S-16355	Peaking Coil Assy.	.60
		C. R. Tube Tie Down Spring	.40		S-16528	Shaft Gear & Coupling Assy.	.85
S1	85-476	Picture Control Switch	.40	L73,L83	S-16556	Horiz. Size Control Assy.	.80
A2	87-1	Integrator Unit	.26	T13	S-16566	Horizontal Sweep Transformer	
	93-525	Fibre Washer (2 used on 78-709)	.65C	L70	S-16571	Picture Control Coil Assy.	1.80
	93-1032	Bakelite Washer (2 used on S-16602)	.01		S-16598	Coupling & Set Screw Assy.	.25
		Extruded Bakelite Washer (2 used on S-16602)	.02		S-16602	Fire Shield Assy.	.45
	94-700	Shaft Coupling Bushing	.20		S-16606	C.R.T. Support Brkt. Assy.	.75
T8	95-1112	Vertical Output Transformer	4.50	L78	S-16652	Sound Trap Coil Assy.	.55
T6	95-1167	Output Transformer	2.75	L71	INT9	1/2 Vert. Deflection Coil	95-1217
L66	95-1170	Filter Choke	2.00	L72	INT9	1/2 Vert. Deflection Coil	
T7	95-1197	Auto Trans.	11.50	L73	INT9	1/2 Hor. Deflection Coil	
T12	95-1198	Deflection Yoke		L74	INT9	1/2 Hor. Deflection Coil	
T9	95-1217	Deflection Coil	9.50	L79	INT12	1/2 Vert. Deflection Coil	95-1198
T11	95-1219	Vertical Output Trans.		L80	INT12	1/2 Vert. Deflection Coil	
L77	95-1220	Focus Coil		L81	INT12	1/2 Hor. Deflection Coil	
	95-1226	Vertical Output Trans.	3.25	L82	INT12	1/2 Hor. Deflection Coil	

MAIN CHASSIS (CONT'D)

Diag. No.	Part No.	Description	Suggested List Price
TUBES			
	1 - 12UP4A	1 - 25Z6GT	
	1 - 6AG7	1 - 6U6GT	
	1 - 12AU7	1 - 5U4G	
	1 - 6BN6	1 - 6AL5	
	1 - 12SN7GT	1 - 19BG6	
	1 - 1B3GT-8016	1 - 25W4	
	1 - 6SN7GT	1 - 6AB4	
RF SHELF ASSEMBLY			
	19-166	Coil Mtg. Clip (1 ea. used S-16263 S-16501 - S-16265)	.06
C21	22-	20 Mmf. Cer.	500V
C9	22-5	110 Mmf. Ceramic (Disc) (or 22-1669)	500V .26
C22	22-1876	47 Mmf. Ceramic	500V .35
C18	22-1891	2.5 Mmf. Ceramic	500V .35
C3	22-1951	4.5 Mmf. Ceramic	500V .35
C19	22-2051	6 Mmf. Ceramic	500V .35
	22-2091	Trimmer Capacitor	.25
C10, C11	22-2093	Trimmer Capacitor	.20
C15			
C12	22-2130	10 Mmf. Ceramic	500V .26
C13	22-2143	470 Mmf. Ceramic	500V .26
C20	22-2155	26 Mmf. Ceramic	500V .30
C17	22-2203	10-25 Mmf Trimmer	
	22-2204	20 Mmf. Ceramic	500V .35
C14A)			
C14B)			
C16A)	27-138	Silver Mica Disc	.05
C16B)			
	52-545	Shielded Lead	.20
	22-2207	4.5 Mmf. Ceramic	500V .30
	52-554	Shielded Lead	.10
	54-293	Lock Nut - Tinnerman (3 used)	.03
	57-1542	Spark Plate	.02
R3	63-1740	82 ohm 1/2 W 10% Ins. Res.	.21
R9	63-1744	100 ohm 1/2 W 20% Ins. Res.	.21
R6	63-1785	1000 ohm 1/2 W 10% Ins. Res.	.21
R11	63-1786	1000 ohm 1/2 W 20% Ins. Res.	.21
R5	63-1813	4700 ohm 1/2 W 10% Ins. Res.	.21
R4	63-1827	10K ohm 1/2 W 10% Ins. Res.	.21
R10	63-1835	15K ohm 1/2 W 20% Ins. Res.	.21
R8	63-1855	47K ohm 1/2 W 10% Ins. Res.	.21
R2	63-1912	1 Megohm 1/2 W 20% Ins. Res.	.21
	63-1913	3.3 Megohm 1/2 W 20% Ins. Res.	.21
R7	63-1933	3.3 Megohm 1/2 W Ins. Res.	.21
	78-807	Miniature Tube Socket	.15
	78-857	Miniature Tube Socket	.80
	78-863	Miniature Tube Socket	.20
	80-736	Shaft Tension Spring	.08
	112-770	Spark Plate Mtg. Screw	.03
	126-553	Tube Shield	.11
	126-622	Tube Shield	.15
	126-623	RF Shelf Shield (Internal)	.02
	149-75	Iron Core & Screw	.20
	149-92	Iron Core & Screw	.15
	149-97	Iron Core & Screw	.10
	S-16240	RF Shelf Assy. (Complete)	25.00
L58	S-16263	Converter Plate Coil Assy.	.50
L59	S-16265	Osc. Coil Assy.	.40
L60	S-16501	Trap Coil Assy.	.45
	S-16651	Tuning Shaft & Cam Assy.	.80

RF SHELF ASSY (CONT'D)

Diag. No.	Part No.	Description	Suggested List Price
TUBES			
		1 - 6BJ6 - 6AG5 - 6C4	
TURRET TUNER ASSEMBLY			
C2	22-1879	Slug Tuned Trimmer Cond. (1 ea. used S-16332-33-34-35)	.45
C6	22-1892	7 Mmf. Ceramic (used on S-16336) 500V	.26
C1	22-1894	8 Mmf. Ceramic (used on S-16332) 500V	.35
C3	22-1951	4.5 Mmf. Ceramic (used on S-16333) 500V	.35
C4	22-2139	2.0 Mmf. Ceramic (used on S-16334) 500V	.35
C5	22-2205	21 Mmf. Ceramic (used on S-16335) 500V	.35
C7	22-2206	24 Mmf. Ceramic (1 ea. used on S-16343 & S-16342) 500V	.35
	46-779	Adjusting Wrench Knob & Set Screw	.20
	56-263	Groove Pin - Type #1 1/8" dia. x 1/4 lg.	.02
	57-1428	Bearing Plate	.10
	57-1497	Adjusting Plate	.10
R1	63-1820	6800 ohm Carbon 1/2 W 10% Res. (1 ea. used on S-16332 & 33)	.21
	68-12	Adjusting Wrench	.15
	73-114	8-32x5/16 Slab Hd. Set Screw (2 ea. used S-15024 & S-16589)	.012
	73-122	Special Set Screw (used on S-16214)	.03
	80-402	Drive Cord Tension Spring	.03
	80-697	Adjusting Wrench Return Spring	.02
	80-743	Index Spring	.10
	113-8	#6-32x1/4 Hex. Hd. Sl. M.S. Steel (3 used)	1.70C
	113-9	8-32x 1/4 Hex Hd. Sl. M.S. Steel Shakeproof Lockwasher (12 used)	.02
	126-596	RF Shelf Shield	.55
	184-14	Steel Ball 1/8" Dia. (9 used)	.01
	184-15	Steel Ball 5/32 Dia.	.015
	184-16	Steel Ball 1/2 Dia.	.15
	188-131	Retaining Ring (used on S-16199)	.07
	S-15024	Gear & Bushing Assy.	.60
	S-16016	Index Spring & Bushing Assy.	.20
	S-16197	Turret Tuner Housing Assy.	1.25
	S-16199	Pulley & Shaft Assy.	.15
	S-16214	Turret Tuner Assy. (Mechanical)	5.50
	S-16218	Drive Cord & Eyelet Assy.	.05
ST-2	S-16332	Channel Strip Assy. #2	3.25
ST-3	S-16333	Channel Strip Assy. #3	3.25
ST-4	S-16334	Channel Strip Assy. #4	3.25
ST-5	S-16335	Channel Strip Assy. #5	3.25
ST-6	S-16336	Channel Strip Assy. #6	3.25
ST-7	S-16337	Channel Strip Assy. #7	3.25
ST-8	S-16338	Channel Strip Assy. #8	3.25
ST-9	S-16339	Channel Strip Assy. #9	3.25
ST-10	S-16340	Channel Strip Assy. #10	3.25
ST-11	S-16341	Channel Strip Assy. #11	3.25
ST-12	S-16342	Channel Strip Assy. #12	3.25
ST-13	S-16343	Channel Strip Assy. #13	3.25
	S-16589	Pulley & Set Screw Assy.	.35

VIDEO IF STRIP ASSEMBLY

VIDEO IF STRIP ASSEMBLY (CONT'D)

Diag. No.	Part No.	Description	Suggested List Price
	19-175	Coil Mtg. Clip	.06
C33	22-3	.01 Mfd. Ceramic (Disc)	500V .26
C36	22-4	.004 Mfd. Ceramic (Disc) (or 22-1706)	500V .26
C30	22-1705	30 Mmfd. Ceramic	500V .20
C31	22-1761	50 Mmfd Ceramic	500V .20
C27	22-1874	7 Mmfd Ceramic	500V .26
C35	22-1886	.001 Mfd. Ceramic	500V .35
C51	22-1953	10 Mmfd. Ceramic	500V .35
C26	22-2054	200 Mmfd. Ceramic	500V .26
C34	22-2106	10 Mmfd.	500V .30
C25	22-2133	500 Mmfd Ceramic	500V .35
C28	22-2134	15 Mmfd. Ceramic	500V .20
C13	22-2143	470 Mmfd. Ceramic	500V .26
C29	22-2144	150 Mmfd. Ceramic	500V .26
R19	63-1198	10K ohm 2 W 10% Ins. Res.	.36
R25	63-1690	Delay Control	.60
R14	63-1743	100 ohm 1/2 W 10% Ins. Res.	.21
R18	63-1764	330 ohm 1/2 W 10% Ins. Res.	.21
R15	63-1772	470 ohm 1/2 W 20% Ins. Res.	.21
R27	63-1778	680 ohm 1/2 W 10% Ins. Res.	.21
R6	63-1785	1000 ohm 1/2 W. 10% Ins. Res.	.21
R11	63-1786	1000 ohm 1/2 W 20% Ins. Res.	.21
R21	63-1809	3900 ohm 1/2 W 5% Ins. Res.	.21
R1	63-1820	6800 ohm 1/2 W 10% Ins. Res.	.21
R17	63-1824	8200 Ohm 1/2 W 10% Ins. Res.	.21
R4	63-1827	10K ohm 1/2 W 10% Ins. Res.	.21
R16	63-1834	15K ohm 1/2 W 10% Ins. Res.	.21
R43	63-1841	22K ohm 1/2 W 10% Ins. Res.	.21
R20	63-1842	22K ohm 1/2 W	.21
R22	63-1862	68K ohm 1/2 W 10% Ins. Res.	.21
R23	63-1863	68K ohm 1/2 W 20% Ins. Res.	.21
R24	63-1866	82K ohm 1/2 W 10% Ins. Res.	.21
R28	63-1884	220K ohm 1/2 W 20% Ins. Res.	.21
R2	63-1912	1 Megohm 1/2 W 20% Ins. Res.	.21
R26	63-2050	Bias Control	.50
	78-788	Miniature Tube Socket	.35
	78-807	Miniature Tube Socket	.15
	94-538	Tuning Slug Insert (1 ea. used on S-16012 - & S-16013)	.07
	94-706	Tuning Slug Insert (1 ea. used on S-16274-5-6)	.10
A-1	103-1	Crystal Diode (1N64)	.07
	125-69	Rubber Grommet (2 used)	.07
	149-71	Iron Core (1 ea. used S-15058 & S-16273)	.10
	149-96	Iron Core (1 ea. used S-16274 & S-16276)	.10
	149-89	Iron Core (1 ea. used S-16012 & S-16013)	.10
	149-96	Iron Core (1 ea. used S-16275 S-16604 & S-16605)	.10
L61	S-15058	Peaking Coil Assy.	.30
L65	S-15128	B+ Choke Coil Assy.	.25
L64	S-16013	Quadrature Coil Assy.	.45
	S-16273	Choke Coil Assy.	.45
T1	S-16274	1st Video IF Trans. Assy.	.75
T2	S-16275	2nd Video IF Trans. Assy.	.75
T5	S-16276	5th Video IF Trans. Assy.	.75
T3	S-16604	3rd Video IF Trans. Assy.	.75
T4	S-16605	4th Video IF Trans. Assy.	.75
L63	S-16656	Intercarrier Sound IF Coil Assy.	.65

Diag. No.	Part No.	Description	Suggested List Price
		TUBES	
		4 - 6AU6	
		1 - 6BN6	
		1 - 12AT7	

24G24 CHASSIS
MAIN CHASSIS

Parts same as 23G22 except for following:

	56-283	Gasket Retaining Pin 1/8" Dia. X 3/4" lg. Red. Fibre (2 used on 196-137)	.03
R95	63-2110	Vertical Size Control	1.20
R85	63-2112	Horizontal Centering Control	1.81
	78-883	Nine Contact Socket	.20
	80-802	Retaining Spring (Used on S-16752)	.06
	83-1746	Corona Insulating Strip	.15
	94-717	Spacer Bushing (4 used on 95-1219)	.03
	126-630	Fire Shield	.30
	149-89	Iron Core (Used on S-16652)	.10
	149-101	Iron Core & Spring (Used on S-16752)	.35
	199-129	Peaking Coil Sleeve (S-16356)	.005
	199-130	Peaking Coil Sleeve (S-16011)	.005
	199-131	Coil Sleeve	.005
	S-16752	Horiz. Size Control Assy.	.75
	S-16802	Anode Clip & Wire Assy.	.15
C64	22-1880	.0012 Mfd. 600V	.26
C84	22-1832	500 Mmfd. Special (Molded)15,000V	2.25
	22-2171	20 Mfd. Elect. Condenser 300V	1.50
R1	63-1820	6800 Ohm 1/2W 10% Ins. Res.	.21
	80-795	Corona Spring	.08
	80-800	C. R. Tube Retaining Spring (2 used)	.15
T7	95-1216	Auto Transformer	17.50
L84	95-1218	Filter Choke	3.00
	114-310	#8x5/16" Hex Washer Hd. S.T.Screw (2 used on S -16766)	.04
	149-88	Iron Core & Insert (Used on S16565)	.40
	166-50	Rubber Bumper (2 used on ea. S16425)	.10
	196-137	Plastic Gasket	3.50
	S15728	Beam Bender Unit	1.95
	S-16425	Support Brkt. & Bumper Assy.	.20
	S-16559	Deflection Yoke Mtg. Brkt. Assy.	.90
	S-16560	Gasket Reinforcing Brkt. Assy.	.55
	S-16561	AC Plug & Brkt. Assy.	.20
	S-16565	Horizontal Size Control Assy.	1.00
	S-16648	C.R. Tube Socket & Wire Assy.	.25
	S-16725	Video IF Strip Assy.	43.00
	S-16766	C.R. Tube Support Brkt. Assy. (or S-16720)	.75

TUBES

1 - 16EP4A	1 - 25W4GT
1 - 12AU7	1 - 25Z6GT
2 - 25BQ6GT	1 - 6V6GT

VIDEO IF STRIP ASSEMBLY

S-16725	Video IF Strip Assy.(Complete)	43.00
S-16738	Intercarrier Sound IF Coil Assy.	.75

24G24 CHASSIS (cont'd)

CABINET PARTS G-2322R (CONT'D)

Diag. No.	Part No.	Description	Suggested List Price
POWER SUPPLY			
17-107		Cable Clamp (3 used)	.01
22-1775		.047 Mfd. (Molded)	400V .26
22-1782		.0047 Mfd. (Molded)	600V .26
22-2214		Elect. Cond. 20-20-40 Mfd.	450V --
		40 Mfd.	25V 4.65
54-42		#10-32 X 5/16" X 3/32 Hex Nut	
		Steel (4 used 95-1232)	.01
58-172		Nine Prong Plug	.30
63-1740		82 Ohm 1/2W 10% Ins. Res.	.21
63-1975		12K Ohm 1W 10% Ins. Res.	.24
63-2023		3500 Ohm W.W. 10W 10% Ins. Res.	.80
78-274		Elect. Cond. Socket	.03
78-755		Octal Tube Socket (3 used)	.18
93-127		#10 Int. Shakeproof Lockwasher	
		(4 used on 95-1232)	.43C
95-1218		Filter Choke	3.00
95-1227		Output Trans.	2.80
95-1232		Power Trans. (or 95-1216)	17.50
114-43		#10-32 X 3/8" Hex. Sl. Washer Hd.	
		M.S. (4 used on 95-1232)	.72C
114-297		#6 X 1/4" Hex.Hd. Sl. S.T. (2 used	
		on 126-604)	.01
126-604		Heat Shield	.20
S-16795		Power Supply Assy. (Complete)	41.25
S-16798		Cable Assy.	1.55

TUBES

- 1 - 6AG7
- 1 - 5U4G
- 1 - 25Z6GT

CABINET PARTS G-2322

SP1	17-105	Glass Retaining Clamp	.07
	22-2169	Trimmer Cond. (2 used on antenna)	.30
	24-532	Control Cover	2.75
	46-771	Control Knob (Vertical Hold, Contrast, Brightness, Horiz. Hold & Fine Tuning) (5 used)	.10
	46-846	Channel Selector Knob	.30
	46-847	Vol. Control & On-Off Switch Knob	.30
	46-848	Antenna Tuning Knob	.10
	49-624	12" P.M. Speaker used in Models G2958 G2957 G3059 & G3062	13.00
	49-679	5-1/4" PM Speaker	6.00
		208-679 Cone & Voice Coil	1.73
	57-1481	Esc. Clamping Plate (3 used)	.02
	57-1606	Escutcheon	8.00
	57-1608	Picture Control Plate	.02
	70-86	#6x5/8" Washer Hd. Wood Screw	
		Steel Stat. Br. (6 used on back)	.60C
	70-137	#6x1/2" Phill. R.H.W.S. Steel-Stat. Bronze (2 used on back)	.01
	70-154	#6x7/8" Phill Rd. Washer Hd. W.S. Steel Blued (used S-16678)	.015
	72-87	#6x5/8" Phill. Flat. Hd. W.S. Steel Stat. Br. (2 used on Esc.)	.01
	74-58	Ventilating Screen	1.30
	76-585	Tuning Shaft (used on antenna)	.03
	76-586	Coupling Shaft (used on antenna)	1.00

Diag. No.	Part No.	Description	Suggested List Price
	78-787	Two Contact A.C. Socket	.10
	80-771	Grounding Spring	.07
	80-791	Knob Spring (used on 46-848)	.02
	93-35	.032x.144x3/8" Steel washer N.P. (used on 80-771)	.25C
	112-758	#4-40x1/4" R.H.S.T. Screw Cad. Shakeproof (used on 57-1608)	.02
	114-80	1/4-20x1 3/8" Hex Washer Hd. M.S. Steel (4 used on chassis Mtg.)	.048
	114-341	#6x3/8" Hex Hd. S.T. Screw Shakeproof Type #3 (used on 80-771)	.01
	188-132	Trim Ring (2 used on esc)	.25
	192-122	Protective Glass	7.00
	196-118	Gasket (Glass)	.40
	202-764	Instruction Book	.25
	S-16677	Cabinet Back Assy.	6.75
	S-16678	TV Cabinet Antenna Assy.	3.15

CABINET PARTS - G-2353E

	17-105	Glass Retaining Clamp	.07
	22-2169	Trimmer Cond. (2 used on antenna)	.30
	24-446	A.C. Line Cord Plug Cover	.15
	24-536	Control Cover	2.75
	46-752	Control Knob (Vertical Hold, Contrast, Brightness, Horiz. Fine Tuning) (5 used)	.15
	46-832	Channel Selector Knob	.30
	46-833	Vol. Control & On-Off Switch Knob	.30
	46-842	Antenna Tuning Knob	.10
SP1	49-670	7 1/2" PM Speaker	8.00
		208-670 Cone & Voice Coil	2.63
	57-1481	Esc. Clamping Plate	.02
	57-1627	Escutcheon	8.00
	57-1608	Picture Control Plate	.02
	70-86	#6x5/8" Washer Hd. Wood Screw	
		Stat. Br. (6 used on back mtg.)	.60C
	70-137	#6x1/2" Phill. R.H.W.S. Steel Stat. Br. (2 used)	.01
	70-154	#6x7/8" Phill. Rd. Hd. Blued (4 used on S-16588)	.01
	72-87	#6x5/8" Phill. Flat. Hd. Wood Screw Stat. Bronze (or 72-85) (used on Esc.)	.01
	74-58	Ventilating Screen	1.30
	76-585	Tuning Shaft (used on antenna)	.03
	76-586	Coupling Shaft (used on antenna)	1.00
	78-787	Two Contact Socket (used on S-16220)	.10
	80-771	Grounding Spring	.07
	80-791	Knob Spring (used on 46-842)	.02
	112-758	#4-40x1/4" R.H.S.T. Shakeproof (used on 57-1608)	.02
	114-80	#-20X 1 3/8" Hex. Washer Hd. M.S. (4 used on chassis mtg.)	.048
	114-341	#6x3/8" Hex. Hd. S. T. Shakeproof (used on 80-771)	.015
	165-13	Glide (4 used)	.02
	188-132	Trim Ring (2 used)	.25
	192-122	Protective Glass	7.00
	196-118	Gasket (Glass)	.40
	202-764	Instruction Book	.25
	S-16220	Cabinet Back Assy. (Complete)	7.50
	S-16588	TV Cabinet Antenna Assy.	4.00

CABINET PARTS G-2346R

CABINET PARTS G-2340R (CONT'D)

Diag. No.	Part No.	Description	Suggested List Price
	17-105	Glass Retaining Clamp	.07
	22-2169	Trimmer Cond. (2 used on antenna)	.30
	24-446	A.C. Line Cord Plug Cover	.15
	24-532	Control Cover	2.75
	46-771	Control Knob (Vertical Hold, Contrast, Brightness Horiz. Hold, Fine Tuning) (5 used)	.10
	46-846	Channel Selector Knob	.30
	46-847	Vol. Control & On-Off Switch Knob	.30
	46-848	Antenna Tuning Knob	.10
SP-1	49-649	10" PM Speaker	11.75
	208-649	Cone & Voice Coil	3.41
	57-1481	Esc. Clamping Plate (3 used)	.02
	57-1606	Escutcheon	8.00
	57-1608	Picture Control Plate	.02
	70-86	#6x5/8" Washer Hd. Wood Screw Stat. Bronze (6 used to Mt. Back)	.60C
	70-137	#6x1/2" Phill. R.H.W.S. Stat.Br.(Steel) (2 used on back)	.01
	70-154	#6x7/8" Phill. Washer Hd. Blued (4 used on S -16588)	.015
	72-87	#6x5/8" Phill. Fl. Hd. Wood Screw Stat. Bronze (or 72-85) (2 used on esc.)	.017
	74-58	Ventilating Screen	1.30
	76-585	Tuning Shaft (used on antenna)	.03
	76-586	Coupling Shaft (used on antenna)	1.00
	78-787	Two Contact Socket (used on back)	.10
	80-771	Grounding Spring	.07
	80-791	Knob Spring (used on 46-848)	.02
	112-758	#4-40x1/4" R.H.S.T. Shakeproof (used on 57-1608)	.02
	114-80	1/4-20x 1 3/8" Hex Washer Hd. M.S. (4 used on chassis mtg.)	.048
	114-341	#6x3/8" Hex. Hd. S.T. Shakeproof (used on 80-771)	.015
	165-13	Glider (4 used)	.02
	188-132	Trim Ring (2 used)	.25
	192-122	Protective Glass	7.00
	196-118	Gasket (Glass)	.40
	202-764	Instruction Book	.25
	S-16220	Cabinet Back Assy. (Complete)	7.50
	S-16588	TV Cabinet Antenna Assy.	4.00

G2340 - G2340R CABINET PARTS

	17-105	Glass Retaining Clamp (4 used)	.07
	22-2169	Trimmer Cond. (2 used on antenna)	.30
	24-446	AC Line Cord & Plug Cover	.15
	24-532	Control Cover	2.75
	46-771	Control Knob (Vertical Hold, Contrast, Brightness, Horiz. Fine Tuning) (5 used)	.10
	46-846	Channel Selector Knob	.30
	46-847	Vol. Control & On-Off Switch Knob	.30
	46-848	Antenna Tuning Knob	.10
SP-1	49-670	7 1/2" PM Speaker	8.00
	208-670	Cone & Voice Coil Assy.	2.63

Diag. No.	Part No.	Description	Suggested List Price
	57-1481	Esc. Clamping Plate (3 used)	.02
	57-1606	Escutcheon	8.00
	57-1608	Picture Control Plate	.02
	70-86	#6x5/8" Washer Hd. Wood Screw Stat. Br. (6 used to mt. back.)	.60C
	70-137	#6x1/2" Phill. R.H.W.S. Stat. Br. (2 used on back)	.01
	70-154	#6x7/8" Phill. Washer Hd. Blued (4 used on S-16588)	.015
	72-87	#6x5/8" Phill. Fl. Hd. Wood Screw Stat. Bronze (or 72-85) (2 used on 57-1606)	.017
	74-58	Ventilating Screen	1.30
	76-585	Tuning Shaft (used on antenna)	.03
	76-586	Coupling Shaft (used on antenna)	1.00
	78-787	Two Contact Socket (used on back)	.10
	80-771	Grounding Spring	.07
	80-791	Knob Spring (used on 46-848)	.02
	93-35	.032x .144x 3/8" Steel Washer (used on 80-771)	.25C
	112-758	#4-40x 1/8" F.H.S.T. Screw Cad. Shakeproof (used on 57-1608)	.02
	114-80	1/4-20x 1 3/8" Hex Washer Hd. M.S. Steel (4 used on chassis mtg.)	.048
	114-341	#6x3/8" Hex. Hd. S.T. Screw - Cad. Pl. (used on 80-771)	.015
	165-13	Glides (4 used)	.02
	188-132	Trim Ring (2 used)	.25
	192-122	Protective Glass	7.00
	196-118	Gasket (Glass)	.40
	202-764	Instruction Book	.25
	S-16220	Cabinet Back Assy. (Complete)	7.50
	S-16588	TV Cabinet Antenna Assy.	4.00

G2442R CABINET PARTS

	17-105	Glass Retaining Clamp (4 used)	.07
	19-196	Clip - Tinnerman (2 used on 188-134)	.03
	24-532	Control Cover	2.75
	40-90	Cabinet Hinge (2 used)	4.00
	46-771	Control Knob (Vertical Hold-Contrast-Brightness-Horizontal Hold Fine Tuning) (5 used)	.10
	46-846	Channel Selector Knob	.30
	46-847	Vol. Control & On-Off Switch Knob	.30
	46-848	Antenna Tuning Knob	.10
	49-649	10" PM Speaker	11.75
	208-649	Cone & Voice Coil	3.41
	54-282	Prestole Nut (3 used on 188-133)	.01
	57-1481	Esc. Clamping Plate (3 used)	.02
	57-1608	Picture Control Plate	.02
	57-1612	Escutcheon	7.50
	57-1620	Clamping Plate	.03
	70-86	#6 X 5/8" Washer Hd. Wood Screw Steel St at. Bronze (6 used on S-16567)	.60C
	70-137	#6 X 1/2" Phill.R.H.W.S. Steel Stat. Bronze. (2 used on S-16567)	.01
	70-153	#5 X 1/4" R.H.W.S. Steel Cad. (2 used 57-1620)	.01
	70-154	#6 X 7/8" Phill. Round Washer Hd. W.S. Steel Blued (4 used on S-16588)	.02

CABINET PARTS G2442R (CONT'D)

Diag. No.	Part No.	Description	Suggested List Price
74-58		Ventilating Screen	1.30
80-771		Grounding Spring	.07
80-791		Knob Spring (Antenna Tuning Knob)	.02
112-758		#4-40 X 1/4" R.H.S.T. Screw Cad. (used on 57-1608)	.02
114-80		1/4-20 X 1-3/8" Hex Washer Hd. M.S. Steel Cad. (4 used chassis mtg.)	.05
165-9		Glider (4 used)	.03
166-55		Tack Bumpers (2 used)	.03
188-133		Trim Ring	.35
188-134		Trim Ring	.40
192-130		Protective Glass	8.00
196-138		Gasket (Glass)	.45
202-787		Inst. Book	.20
S-16567		Cabinet Back Assy. (Complete)	7.50
S-16588		TV Cabinet Antenna Assy.	4.00

G2442E CABINET PARTS

17-105		Glass Retaining Clamp (4 used)	.07
19-196		Clip - Tinnerman (2 used on 188-134)	.03
24-536		Control Cover	2.75
40-89		Door Hinge (2 used)	5.00
46-752		Control Knob (5 used)	.15
46-832		Channel Selector Knob	.30
46-833		Volume Control Knob	.30
46-842		Antenna Control Knob	.03
49-649		10" PM Speaker	11.75
		208-649 Cone & Voice Coil	3.41
54-282		Prestole Nut (3 used on 188-133)	.01
57-1481		Esc. Clamping Plate (3 used)	.02
57-1608		Picture Control Plate	.02
57-1612		Escutcheon	7.50
57-1620		Clamping Plate	.03
70-86		#6 X 5/8" Washer Hd. Wood Screw Steel Stat. Bronze (6 used on S-16567)	.60C
70-137		#6 X 1/2" Phill. R.H.W.S. Steel Stat. Bronze (2 used on S-16567)	.01
70-153		#5 X 1/4" R.H.W.S. Steel Cad. (2 used 57-1620)	.01
70-154		#6 X 7/8" Phill. Round Washer Hd. W. S. Steel Blued (4 used on S-16588)	.02
74-58		Ventilating Screen	1.30
80-771		Grounding Spring	.07
80-791		Knob Spring (Antenna Tuning Knob)	.02
112-758		#4-40 X 1/4" R.H.S.T. Screw Cad. (used on 57-1608)	.02
114-80		1/4-20 X 1-3/8" Hex. Washer Hd. M.S. Steel Cad. (4 used chassis Mtg.)	.05
165-9		Glider (4 used)	.03
166-57		Tack Bumper	.03
188-133		Trim Ring	.35
188-134		Trim Ring	.40
192-130		Protective Glass	8.00
196-138		Gasket (Glass)	.45
202-787		Inst. Book	.20
S-16567		Cabinet Back Assy. (Complete)	7.50
S-16588		TV Cabinet Antenna Assy.	4.00

G2448R CABINET PARTS

Part No.	Description	Suggested List Price
17-105	Glass Retaining Clamp	.07
19-196	Clip (2 used on 188-134)	.03
24-532	Control Cover	2.75
46-771	Control Knob (Vertical Hold-Contrast-Brightness Horiz. Hold Fine Tuning (5 used)	.10
46-846	Channel Selector Knob	.30
46-847	Vol. Control & On-Off Switch Knob	.30
46-848	Antenna Tuning Knob	.10
49-649	10" PM Speaker	11.75
	208-649 Cone & Voice Coil	3.41
54-282	Prestole Nut (3 used 188-133)	.01
57-1481	Esc. Clamping Plate (3 used)	.02
57-1608	Picture Control Plate	.02
57-1612	Escutcheon	7.50
57-1620	Clamping Plate	.03
70-86	#6 X 5/8" Washer Hd. Wood Screw Steel Stat. Bronze (6 used on S-16567)	.60C
70-137	#6 X 1/2" Phill. R.H. W.S. Steel Stat. Bronze (2 used on S-16567)	.01
70-153	#5 X 1/4" R.H.W.S. Steel-Cad (2 used on 57-1620)	.01
70-154	#6 X 7/8" Phill. Rd. Washer Hd. W.S. Steel Blued (4 used S-16588)	.02
74-58	Ventilating Screen	1.30
80-771	Grounding Spring	.07
80-791	Knob Spring (Antenna Tuning Knob)	.02
112-758	#4-40 X 1/4" R.H.S.T. Screw Cad. Pl. (used on 57-1608)	.02
114-80	1/4-20 X 1-3/8" Hex. Washer Hd. M.S. Steel-Cad. Pl. (4 used on Chassis Mtg.)	.05
165-13	Glider (4 used)	.02
166-55	Tack Bumper (2 used)	.03
188-133	Trim Ring	.35
188-134	Trim Ring	.40
192-130	Protective Glass	8.00
196-138	Gasket (Glass)	.45
202-787	Instruction Book	.20
S-16567	Cabinet Back Assy. (Complete)	7.50
S-16588	TV Cabinet Antenna Assy.	4.00

G2441 - G2441R CABINET PARTS

17-105	Glass Retaining Clamp (4 used)	.07
19-196	Clip-Tinnerman (2 used on 188-134)	.03
24-532	Control Cover	2.75
46-771	Control Knob (Vertical Hold-Contrast-Brightness Horiz. Hold-Fine Tuning (5 used)	.10
46-846	Channel Selector Knob	.30
46-847	Vol. Control & On-Off Switch Knob	.30
46-848	Antenna Tuning Knob	.10
49-649	10" PM Speaker	11.75
	208-649 Cone & Voice Coil	3.41
54-282	Prestole Nut (3 used on 188-133)	.01
57-1481	Esc. Clamping Plate (3 used)	.02
57-1608	Picture Control Plate	.02
57-1612	Escutcheon	7.50
57-1620	Clamping Plate	.03
70-86	#6 X 5/8" Washer Hd. Wood Screw Steel Stat. Bronze (6 used on S-16743)	.60C

CABINET PARTS G2441R (CONT'D)

Part No.	Description	Suggested List Price
70-137	#6 X 1/2" Phill.R.H.W.S. Steel Stat- Bronze (2 used on 3-16743)	.01
70-153	#5 X 1/4" R.H.W.S. Steel Cad. (2 used on 57-1620)	.01
70-154	#6 X 7/8" Phill. Rd. Washer Hd. Steel Blued (4 used on 3-16588)	.02
74-58	Ventilating Screen	1.30
80-771	Grounding Spring	.07
80-791	Knob Spring	.02
112-758	#4-40 X 1/4" R.H.S.T. Screw (Used on 57-1608)	.02
114-80	1/4-20 X 1-3/8" Hex Washer Hd. M.S. Steel (4 used on Chassis Mtg.)	.05
165-13	Glider (4 used)	.02
188-133	Trim Ring	.35
188-134	Trim Ring	.40
192-130	Protective Glass	8.00
196-138	Gasket (Glass)	.45
202-787	Instruction Book	.20
S-16588	TV Cabinet Antenna Assy.	4.00
S-16743	Cabinet Back Assy. (Complete)	1.50

G3059R CABINET PARTS

2-170	Cabinet Back (Phono)	1.15
17-105	Glass Retaining Clamp (4 used)	.07
19-9	Cable Clamp	.03
19-196	Clip-Tinnerman (2 used on 188-134)	.03
24-532	Control Cover (TV)	2.75
26-429	Dial Scale	.65
46-538	Tuning & Vol. Control Knob	.10
46-718	Band Switch & Radio TV Switch Knob	.15
46-771	Control Knob (Vert. Hold-Contrast -Brightness-Horiz. Hold Fine Tun- ing (5 used)	.10
46-831	Tone Control Knob	.10
46-846	Channel Selector Knob	.30
46-847	Volume Control Knob	.30
46-848	Antenna Tuning Knob	.10
49-624	12" PM Speaker	13.00
	208-624 Cone & Voice Coil	4.60
54-282	Prestole Nut (3 used on 188-133)	.01
54-303	Speed Nut-Tinnerman (5 used on Esc.)	.01
57-1481	Esc. Clamping Plate	.02
57-1591	Escutcheon (Radio)	4.50
57-1608	Picture Control Plate	.02
57-1612	Escutcheon (TV)	7.50
57-1613	Emblem Plate	.20
57-1620	Clamping Plate	.03
70-3	#5 X 1/2" R.H.W.S. Steel N;P. (used on 19-9)	.85C
70-86	#6 X 5/8" Washer Hd. Wood Screw Stat. Bronze (17 Used to Mt. Backs)	.60C
70-137	#6 X 1/2 Phill. R.H. Wood Screw Stat. Bronze (2 used on 3-16576)	.01
70-153	#5 X 1/4 R.H.W.S. Steel (2 used on 57-1620)	.01
70-154	#6 X 7/8 Phill. R.W.Hd. Blued (4 used on S-16588)	.02
72-87	#6 X 5/8" Phill. Flat H.W. Screw Stat. Bronze (2 used on Esc.)	.02

G3059R CABINET PARTS (CONT'D)

Part No.	Description	Suggested List Price
80-604	Hinge Spring (2 used)	.15
80-771	Ground Spring	.07
80-791	Knob Spring (Ant. Tuning Knob)	.02
83-1698	Rubber Channel Strip	.20
83-1701	Radio Chassis Insulating Strip	.50
93-968	.046 X .171 X 1/2" Steel Washer Cad. (2 used Esc. Mtg.)	.01
97-293	Radio Chassis Mtg. Insulating Stud (3 used)	.18
112-745	4-40 X 1/4" F.H. St. Cad. (8 used on esc. Mtg.)	.01
112-758	4-40 X 1/2" R.H.S.T. Screw Cad. (used on 57-1608)	.02
114-80	1/4-20 X 1-3/8" Hex. Washer Hd. M.S. Cad. (4 used to Mt. TV Chassis)	.05
114-148	#10 X 7/8" Hex. Washer Hd. S.T. Cad. (3 used to Mt. Radio Chassis)	1.20C
114-313	#8 X 1/2" Hex.Hd. Sl. S.T. Cad. (7 used to mt. esc.)	.02
165-9	Metal Glide (2 used)	.03
165-14	Metal Glide (2 used)	.03
166-55	Tack Bumper (2 used)	.03
188-54	Knob Clamping Ring (1 used on ea. 46-538)	.02
188-133	Trim Ring	.35
188-134	Trim Ring	.40
192-130	Protective Glass (TV)	8.00
196-135	Dust Gasket (Radio)	.55
196-138	Gasket (TV Glass)	.45
202-697	FM Instruction Book	.10
202-787	Instruction Book (TV)	.20
202-767	Instruction Book (Radio Phono)	.30
S-14025	Three Speed InterMixer Record Changer	
S-15536	Record Changer Compt. Hinge Brkt. & Link Assy. (2 used)	.50
S-15780	Cobra Tone Arm Cartridge Assy.	3.50
S-16196	Record Changer Mtg. Frame & Arm Assy.	8.00
S-16359	Wavemagnet Assy.	1.10
S-16419	Record Adapter Plug & Envelope Assy	.60
S-16576	Cabinet Back Assy. (TV)	8.00
S-16578	Cabinet Back Assy. (Radio)	4.00
S-16588	TV Cabinet Antenna Assy.	4.00

G2958R CABINET PARTS

2-163	Cabinet Back (Phono Section)	1.15
17-105	Glass Retaining Clamp (4 used)	.07
19-9	Cable Clip	.03
24-532	Control Cover (TV)	2.75
26-429	Dial Scale & Glass (FM Band)	.65
46-538	Tuning & Vol. Control Knob (2 Used)	.10
46-655	Door Pull	.70
46-718	Band Switch & Radio - TV Switch Knob (2 used)	.15
46-771	Cont. Knob (Vert. Hold-Contrast Brightness-Horiz. Hold-Fine Tuning (5 used)	.10
46-831	Tone Control Knob	.10
46-846	Channel Selector Knob	.30
46-847	Vol. Control Knob (TV)	.30
46-848	Antenna Tuning Knob	.10
49-624	12" PM Speaker	13.00

G2958R CABINET PARTS (CONT'D)

Part No.	Description	Suggested List Price
	208-624 Cone & Voice Coil	4.60
54-303	Speed Nut (5 used on esc.)	.01
57-1481	Esc. Clamping Plate (5 used)	.02
57-1591	Esc. (Radio)	4.50
57-1606	Esc. (TV)	8.00
57-1608	Picture Control Plate	.02
57-1613	Emblem Plate	.20
70-3	#5 X 1/2" R.H.W.S. Steel N.P. (used on 19-9)	.85C
70-86	#6 X 5/8" Washer Hd. Wood Screw Steel Stat. Bronze (17 used to mt. backs)	.60C
70-137	#6 X 1/2" Phill. R.H. Wood Screw Steel (2 used on S-16329)	.01
70-154	#6 X 7/8" Phill. Rd. Washer Hd. W.S. Steel Blued (4 used on S-16588)	.02
72-87	#6 X 5/8" Flt. Hd. Wood Stat. Bronze (2 used on esc.)	.02
80-604	Hinge Spring (2 used)	.15
80-771	Grounding Spring	.07
80-791	Knob Spring (Antenna Tuning Knob)	.02
83-1698	Rubber Channel Strip	.20
83-1701	Radio Chassis Insulating Strip	.50
93-968	.046 X .171 X 1/2" Steel Washer Cad. (2 used on esc. mtg.)	.01
97-293	Radio Chassis Mtg. Ins. Stud (3 used)	.18
112-745	4-40 X 1/4" Flat Hd. S.T. Screw (8 used on esc. mtg.)	.01
112-758	4-40 X 1/4" R.H.S.T. Screw Cad. (used on 57-1608)	.02
114-80	1/4-20 X 1/38" Hex. Washer Hd. M.S. Steel (4 used to Mt. TV Chassis)	.05
114-148	#10 X 7/8" Hex. Washer Hd. S.T. (3 used to Mt. Radio Chassis)	1.20C
114-313	#8 X 1/2" Hex. Hd. Sl. S.T. (7 used to Mt. Esc.)	.02
165-9	Metal Glide (2 used)	.03
165-14	Metal Glide (2 used)	.03
166-55	Tack Bumper (2 used)	.03
188-54	Knob Clamping Ring (1 used on ea. 46-538)	.02
188-32	Knob Trim Ring (2 used)	1.03C
192-122	Protective Glass (TV)	7.00
196-118	Gasket (TV Glass)	.40
196-135	Dust Gasket (Radio)	.55
202-697	FM Instruction Book	.10
202-704	Instruction Book (TV)	.20
202-767	Instruction Book (Radio Phono)	.30
S-14025	Three Speed Intermixer Record Changer	--
S-15536	Record Changer Compt. Hinge Brkt. & Link Assy. (2 used)	.50
S-15780	Cobra Tone Arm Cartridge	3.50
S-16196	Record Changer Mtg. Frame & Arm Assy.	8.00
S-16329	Cabinet Back Assy. (TV Section)	6.50
S-16358	Cabinet Back Assy. (Radio Section)	3.25
S-16359	Wavemagnet Assy.	1.10
S-16419	Record Adapter Plug & Envelope Assy	.60
S-16588	TV Cabinet Antenna Assy.	4.00

DIAL ASSEMBLY PARTS FOR 6G20 CHASSIS

Part No.	Description	Suggested List Price
54-292	Speed Nut (Used on 94-671)	.01
59-233	Dial Pointer	.15
76-578	Tuning Control Shaft	.10
78-872	Dial Light Socket & Wire	.35
80-69	Dial Cord Spring	.05
80-402	Dial Cord Spring (3 used)	.03
80-746	Pulley Retaining Spring	.02
80-801	Tuner Arm Tension Spring	.08
94-671	Pointer Pulley Bushing	.10
100-97	Pilot Light Bulb	.25
114-297	#6 X 1/4" Hex. Hd. Sl. S.T. Screw (2 used on S-16351)	.01
148-122	Tuner Arm	.20
S-16281	Pointer & Pulley Assy.	.30
S-16346	Dial Cord & Eyelet Assy. (Long)	.06
S-16349	Pulley & Shaft Assy.	.25
S-16350	Pulley & Bushing Assy.	.20
S-16351	Dial Scale & Brkt. Assy.	.70
S-16740	Dial Cord & Eyelet Assy. (Short)	.05
G2957 - G2957R CABINET PARTS		
2-163	Cabinet Back (Phono Section)	1.15
17-105	Glass Retaining Clamp (4 used)	.07
19-9	Cable Clip	.03
24-532	Control Cover (TV)	2.75
26-429	Dial Scale & Glass (FM Band)	.65
46-538	Tuning & Vol. Control Knob (2 used)	.10
46-718	Band Switch & Radio - TV Switch Knob (2 used)	.15
46-771	Cont. Knob (Vert. Hold-Contrast-Brightness-Horiz. Hold Fine Tuning (5 used)	.10
46-831	Tone Control Knob	.10
46-846	Channel Selector Knob	.30
46-847	Vol. Control Knob (TV)	.30
46-848	Antenna Tuning Knob	.10
49-624	12" PM Speaker	13.00
54-303	208-624 Cone & Voice Coil	4.60
57-1481	Speed Nut (5 used on esc.)	.01
57-1591	Esc. Clamping Plate (5 used)	.02
57-1591	Esc. (Radio)	4.50
57-1606	Esc. (TV)	8.00
57-1608	Picture Control Plate	.02
57-1613	Emblem Plate	.20
70-3	#5 X 1/2" R.H.W.S. Steel N.P. (used on 19-9)	.85C
70-86	#6 X 5/8" Washer Hd. Wood Screw Steel Stat. Bronze (17 used to mt. backs)	.60C
70-137	#6 X 1/2" Phill. R.H. Wood Screw Steel Stat. Bronze (2 used on S-16329)	.01
70-154	#6 X 7/8" Phill. Rd. Washer Hd. W.S. Steel Blued (4 used on S-16588)	.02
72-87	#6 X 5/8" Flt. Hd. Wood Stat. Bronze (2 used on esc.)	.02
80-604	Hinge Spring (2 used)	.15
80-771	Grounding Spring	.07
80-791	Knob Spring (Antenna Tuning Knob)	.02
83-1698	Rubber Channel Strip	.20
83-1701	Radio Chassis Insulating Strip	.50

G2957R CABINET PARTS (CONT'D)

Part No.	Description	Suggested List Price
93-968	.046 X .171 X 1/2" Steel Washer Cad. (2 used on esc. Mtg.)	.01
97-293	Radio Chassis Mtg. Ins. Stud (3 used)	.18
112-745	4-40 X 1/4" Flat Hd. S.T. Screw (8 used on esc. mtg.)	.01
112-758	4-40 X 1/4" R.H.S.T. Screw Cad. (used on 57-1608)	.02
114-80	1/4-20 X 1/38" Hex. Washer Hd. M.S. Steel (4 used to mt. TV Chassis)	.05
114-148	#10 X 7/8" Hex Washer Hd. S.T. (3 used to mt. radio chassis)	1.20C
114-313	#8 X 1/2" Hex. Hd. Sl. S.T. (7 used to mt. esc.)	.02
165-9	Metal Glide (2 used)	.03
165-14	Metal Glide (2 used)	.03
166-55	Tack Bumper (2 used)	.03
188-54	Knob Clamping Ring (1 used on ea. 46-538)	.02
188-32	Knob Trim Ring (2 used)	1.03C
192-122	Protective Glass (TV)	7.00
196-118	Gasket (TV Glass)	.40
196-135	Dust Gasket (Radio)	.55
202-697	FM Instruction Book	.10
202-704	Instruction Book (TV)	.20
202-767	Instruction Book (Radio-Phono)	.30
S-14025	Three Speed Intermixer Record Changer	--
S-15536	Record Changer Compt. Hinge Brkt. & Link Assy. (2 used)	.50
S-15780	Cobra Tone Arm Cartridge	3.50
S-16196	Record Changer Mtg. Frame & Arm Assy.	8.00
S-16329	Cabinet Back Assy. (TV Section)	6.50
S-16359	Wavemagnet Assy.	1.10
S-16419	Record Adapter Plug & Envelope Assy.	.60
S-16544	Cabinet Back Assy. (Radio Section)	4.00
S-16588	TV Cabinet Antenna Assy.	4.00

G3062 CABINET PARTS

2-164	Cabinet Back (Phono)	.65
17-105	Glass Retaining Clamp (4 used)	.07
19-9	Cable Clamp	.03
19-196	Clip-Tinnerman (2 used on 188-134)	.03
24-532	Control Cover (TV)	2.75
26-429	Dial Scale	.65
46-538	Tuning & Vol. Control Knob	.10
46-655	Door Pull	.70
46-718	Band Switch & Radio TV Switch Knob	.15
46-771	Control Knob (Vert. Hold-Contrast-Brightness-Horiz. Hold-Fine Tuning (5 used)	.10
46-831	Tone Control Knob	.10
46-846	Channel Selector Knob	.30
46-847	Volume Control Knob	.30
46-848	Antenna Tuning Knob	.10
49-624	12" PM Speaker	13.00
	208-624 Cone & Voice Coil	4.60
54-282	Prestole Nut (3 used on 188-133)	.01
54-303	Speed Nut-Tinnerman (5 used on esc.)	.01
57-1481	Esc. Clamping Plate	.02

G3062 CABINET PARTS (CONT'D)

Part No.	Description	Suggested List Price
57-1591	Escutcheon (Radio)	4.50
57-1608	Picture Control Plate	.02
57-1612	Escutcheon (TV)	7.50
57-1613	Emblem Plate	.20
57-1620	Clamping Plate	.03
70-3	#5 X 1/2" R.H.W.S. Steel N.P. (used on 19-9)	.85C
70-86	#6 X 5/8" Washer Hd. Wood Screw Stat. Bronze (17 used to mt. backs)	.60C
70-137	#6 X 1/2 Phill. R.H. Wood Screw Stat. Bronze (2 used on S-16576)	.01
70-153	#5 X 1/4 R.H.W.S. Steel (2 used on 57-1620)	.01
70-154	#6 X 7/8 Phill.R.W. Hd. Blued (4 used on S-16588)	.02
72-87	#6 X 5/8" Phill. Flat H. W. Screw Stat. Bronze (2 used on esc.)	.02
80-604	Hinge Spring (2 used)	.15
80-771	Ground Spring	.07
80-791	Knob Spring (Ant. Tuning Knob)	.02
83-1698	Rubber Channel Strip	.20
83-1701	Radio Chassis Insulating Strip	.50
93-968	.046 X .171 X 1/2" Steel Washer Cad. (2 used esc. mtg.)	.01
97-293	Radio Chassis Mtg. Insulating Stud (3 used)	.18
112-745	4-40 X 1/4" F.H.St. Cad. (8 used on esc. n.t.g.)	.01
112-758	4-40 X 1/2" R.H.S.T. Screw Cad. (used on 57-1608)	.02
114-80	1/4-20 X 1-3/8" Hex. Washer Hd. M.S. Cad. (4 used to mt. TV chassis)	.05
114-148	#10 X 7/8" Hex Washer Hd. S.T. Cad. (3 used to mt. radio chassis)	1.20C
114-313	#8 X 1/2" Hex Hd. Sl. S.T. Cad. (7 used to mt. esc.)	.02
165-13	Metal Glide (4 used)	.02
188-54	Knob Clamping Ring (1 used on ea. 46-538)	.02
188-133	Trim Ring	.35
188-134	Trim Ring	.40
192-130	Protective Glass (TV)	8.00
196-135	Dust Gasket (Radio)	.55
196-138	Gasket (TV Glass)	.45
202-697	FM Instruction Book	.10
202-787	Instruction Book (TV)	.20
202-767	Instruction Book (Radio-Phono)	.30
S-14025	Three Speed Intermixer Record Changer	--
S-15536	Record Changer Compt. Hinge Brkt. & Link Assy. (2 used)	.50
S-15780	Cobra Tone Arm Cartridge Assy.	3.50
S-16196	Record Changer Mtg. Frame & Arm Assy.	8.00
S-16358	Cabinet Back Assy. (Radio)	3.25
S-16359	Wavemagnet Assy.	1.10
S-16419	Record Adapter Plug & Envelope Assy.	.60
S-16576	Cabinet Back Assy. (TV)	8.00
S-16588	TV Cabinet Antenna Assy.	4.00

23G23(Z) Chassis
Model G2958R

23G23(Z) Chassis is the same as 23G23 Chassis except for the following:

OMIT:

19-192 Anode Clips
80-745 C.R. Tube Tie Down Spring
S-16208 Anode Clip & Wire Assy.
12UP4A Picture Tube

ADD:

15-82	Cap & Insulator	.10
19-177	Anode Clip	.15
19-197	Spring Retaining Clip (2 used)	.09
63-1870	100K Ohm 1/2W 20% Ins. Res.	.21
78-813	Nine Contact Socket	.30
80-686	C.R. Tube Grounding Spring	.15
80-800	C.R. Tube Retaining Spring (2 used)	.15
83-1745	C.R. Tube Spacer Strip	.10
83-1757	Rubber Strip (or reworked 94-653)	.15
114-201	#8 X 5/16" Hex Hd Sl. Self Tapping Screw Type C Cad. Pl. (2 used on S-16425)	.75C
166-50	Rubber Bumper (4 used)	.10
S-16355	Interconnecting Cable Assy.	2.50
S-16425	Support Brkt. & Bumper Assy. (2 used)	.20
S-16721	Anode Clip & Wire Assy.	.25
12LP4A	Picture Tube	

23G22(Z) Chassis
Model G2340R

23G22(Z) Chassis is the same as 23G22 Chassis except for the following:

OMIT:

19-192 Anode Clip
80-745 C.R. Tube Tie Down Spring
S-16208 Anode Clip & Wire Assy.
12UP4A Picture Tube

ADD:

19-177	Anode Clip	.15
19-197	Spring Retaining Clip	.09
80-686	C.R. Tube Grounding Spring	.15
80-800	C.R. Tube Retaining Spring (2 used)	.15
83-1745	C.R. Tube Spacer Strip	.10
83-1757	Rubber Strip (or reworked 94-653)	.15
114-201	#8 X 5/16" Hex Hd. Sl. S.T. Screw Type C Cad. Pl. (2 used on S-16425)	.75C
166-50	Rubber Bumper (4 used)	.10
S-16425	Support Brkt. & Bumper Assy.	.20
S-16721	Anode Clip & Wire Assy.	.25
12LP4A	Picture Tube	

SPECIAL TEST EQUIPMENT FOR TV

68-7	Alignment Wrench	.30
68-13	Alignment Tool	.75
68-14	Tuning Wand	1.00
68-17	Adjustment Wrench for Master Oscillator and Sound Trap Adjustments on RF Shelf	
68-18	12" Insulated Screwdriver for Hum and AGC Adjustments.	
68-19	Nylon Alignment Wrench	
95-1234	250 Watt Isolation Transformer.	
S-15369	Generator Test Unit	5.50
S-15371	Coupling Ring	.55
S-15521	AC Test Cord for TV Chassis	1.50
S-15627	Balance Transformer (Antenna)	5.50
S-15729	Balance Transformer (Receiver)	5.50.

Prices shown are suggested list prices and are subject to change without notice.

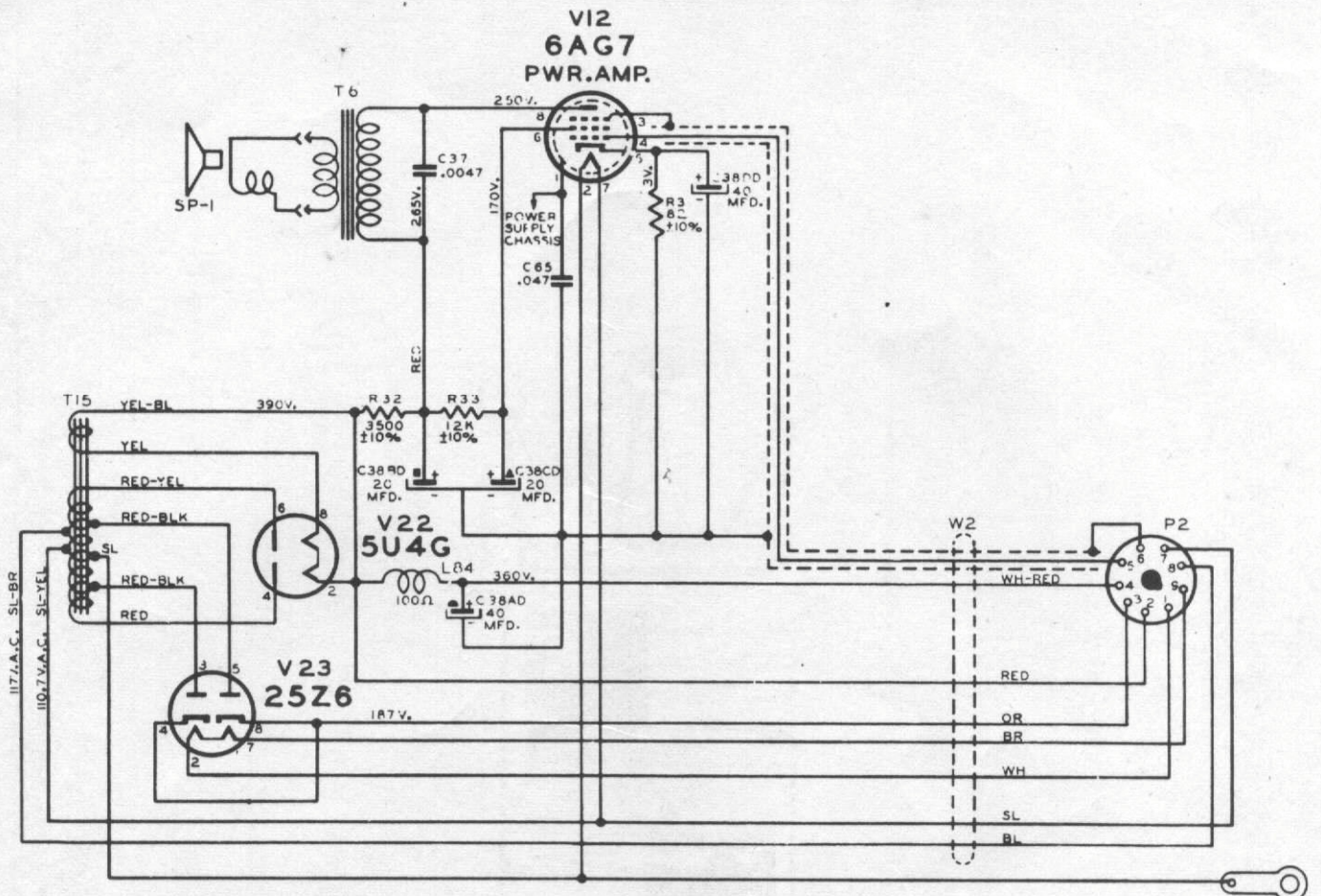


Fig. 44. Power Supply for 24G24/25 Chassis.

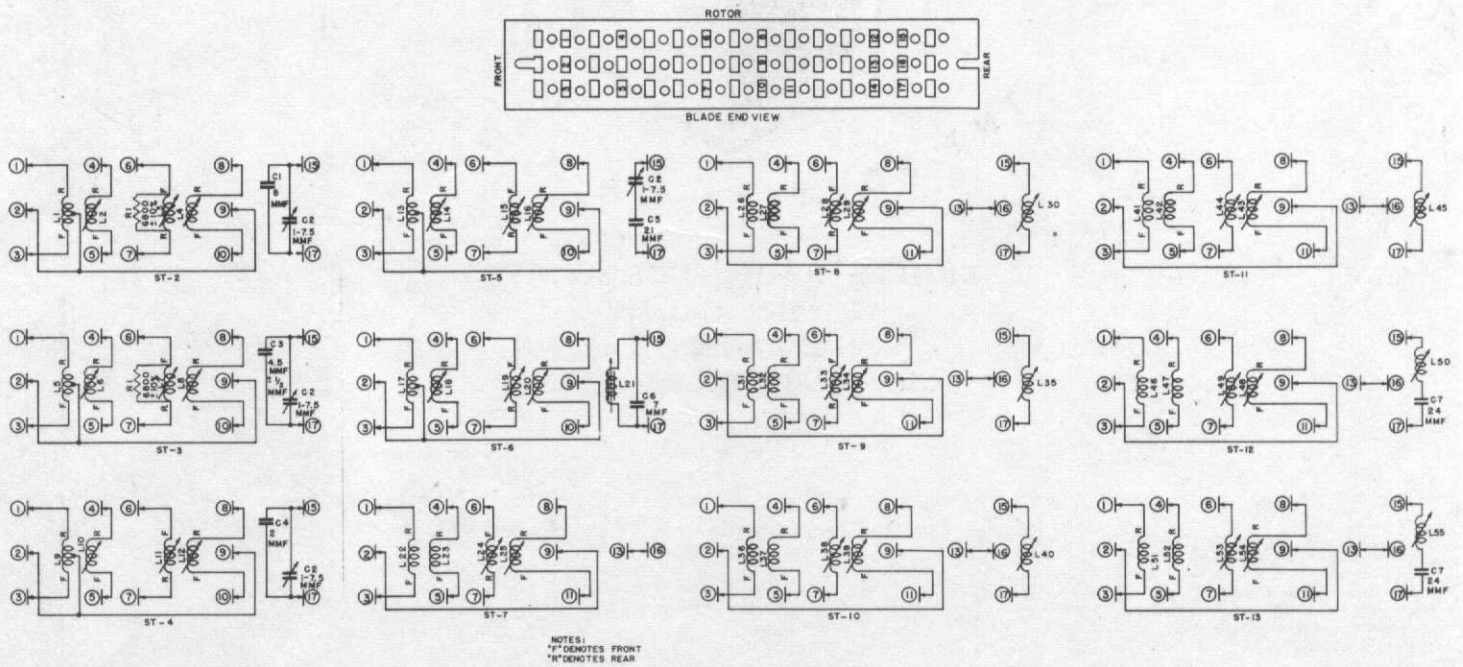
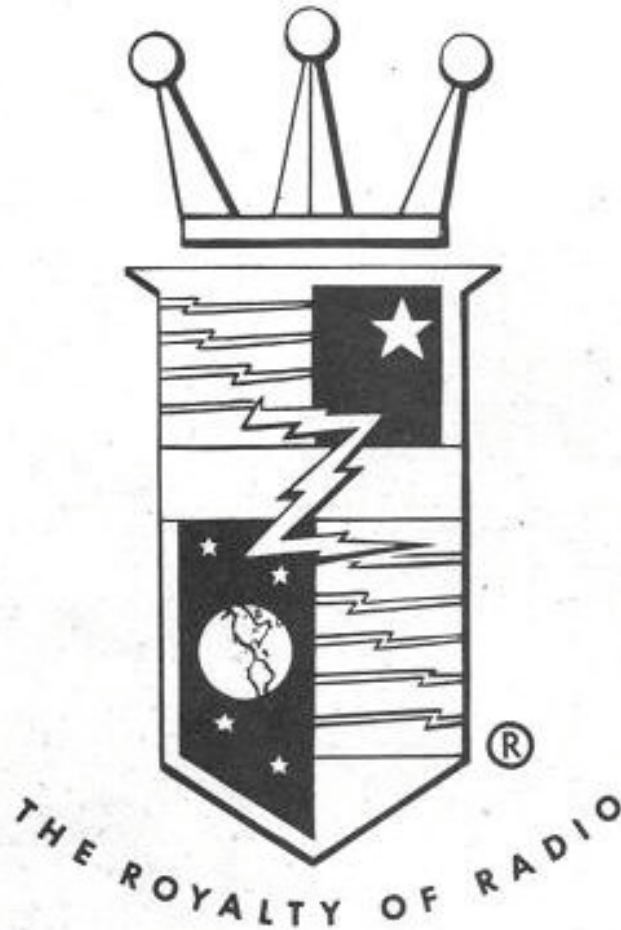


Fig. 45. Channel Strips.



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