W. A. Manville

COPY NO. 27

Model 5B
Color Television Receiver

359

DEVELOPMENTAL COLOR TELEVISION RECEIVER MODEL 5B

PRELIMINARY SERVICE DATA

PREPARED BY RCA SERVICE CO., INC.
FOR
RADIO CORPORATION OF AMERICA
RCA VICTOR DIVISION
CAMDEN, N.J., U.S.A.

GENERAL DESCRIPTION

The Model 5B is a developmental color television receiver, capable of reception of either black and white or color programs. The receiver employs the RCA shadow mask, three gun, directly viewed, 15 inch glass envelope type Tricolor Kinescope.

The receiver features: 12 channel VHF coverage plus any 4 UHF channels desired; intercarrier FM sound system; high level second detector operation for maximum linearity; stabilized horizontal AFC; electrostatic convergence and focus with dynamic modulation of the convergence and focus anodes; crystal controlled AFC color synchronization; low level color demodulation employing quadrature techniques; kinescope grid drive with D.C. restoration. and a color "killer" circuit to disable the color channel during black and white reception.

Additional features include: a removable top panel to facilitate servicing and adjustment, and the location of most of the functional controls at the receiver front. These controls are located under the tilt-down control cover or behind the removable panel directly below the control cover.

ELECTRICAL AND MECHANICAL SPECIFICATIONS

PICTURE SIZE . Approx. 100 sq. ins. on a C-73599 Kinescope

TELEVISION R-F FREQUENCY RANGE

Any of 70 UHF channels .... 470 mc. to 890 mc.
Any of 12 VHF channels, 54 mc. to 88 mc., 174 mc. to 216 mc.

INTERMEDIATE FREQUENCIES

Picture I-F Carrier Frequency .... 45.75 mc.
Sound I-F Carrier Frequency .... 41.25 mc.
Color Sub-Carrier Frequency .... 42.17 mc.

POWER RATING .... 115 V. A.C., 60 Cy., 475 watts

AUDIO POWER OUTPUT RATING .... 3 watts max.

SWEEP DEFLECTION .... Magnetic

FOCUS .... Electrostatic

CONVERGENCE .... Electrostatic

ANTENNA INPUT IMPEDANCE

UHF—300 ohms balanced.
VHF—300 ohms balanced.

RCA TUBE COMPLEMENT

Tube Used	Function
(1) RCA 6BQ7A	R-F Amplifier (VHF Only)
(2) RCA 6AF4	R-F Oscillator
(3) RCA 6U8	I-F Amplifier
A K3E Crystal is used as a mixer	
(4) RCA 6CB6	1st Picture I-F Amplifier
(5) RCA 6CB6	2nd Picture I-F Amplifier
(6) RCA 6CB6	3rd Picture I-F Amplifier
(7) RCA 6AN8	4th Picture I-F Amplifier and Killer
(8) RCA 6CL6	5th Picture I-F Amplifier
A 1N60 is used as the picture 2nd Detector	
(9) RCA 6CL6	1st Video Amplifier
(10) RCA 6AN8	2nd Video Amplifier and "Q" Phase Splitter
A 1N60 is used as the Sound Detector	
(11) RCA 6AU6	1st Sound I-F Amplifier
(12) RCA 6AU6	Driver
(13) RCA 6AL5	Ratio Detector
(14) RCA 6AV6	1st Audio Amplifier
(15) RCA 6AQ5	Audio Output
(16) RCA 12AT7	Vertical Sync. Separator and Sync. Output
(17) RCA 12BH7	Vertical Oscillator and Vertical Output
(18) RCA 12AU7	Vertical Convergence Amplifier
(19) RCA 6AN8	Horiz. Sync. Separator and AGC
(20) RCA 6SN7GT	Horiz. Sweep Oscillator and Control
(21) RCA 6CD6	Horiz. Sweep Output
(22) RCA 6AU4GT	Damper
(23) RCA 1X2B	Focus Rectifier
(24) RCA 3A3	High Voltage Rectifier
(25) RCA 6BD4	Shunt Regulator
(26) RCA 6AN8	Band Pass Amplifier and Keyer
(27) RCA 5915	"Q" Demodulator
(28) RCA 6AN8	Burst Amplifier and Phase Detector
(29) RCA 6AN8	3.58 MC Osc. and Reactance
(30) RCA 6AN8	Quadrature 3.58 MC Amplifier and Phase Detector
(31) RCA 5915	"I" Demodulator
(32) RCA 6AN8	"I" Amplifier and "I" Phase Splitter
(33) RCA 12BH7	Green Adder and Output
(34) RCA 12BH7	Blue Adder and Output
(35) RCA 12BH7	Red Adder and Output
(36) RCA 6BC7	Green, Blue and Red D.C. Restorers
(37) RCA C73599	Tricolor Kinescope

Two selenium rectifiers are used for Low Voltage rectification.

First Edition—First Printing 12-22-53

ELECTRICAL AND MECHANICAL SPECIFICATIONS (Continued)

SCANNING .... Interlaced, 525 line

HORIZONTAL SCANNING FREQUENCY .... 15,750 cps

VERTICAL SCANNING FREQUENCY .... 60 cps

FRAME FREQUENCY (Picture Repetition Rate) . 30 cps

OPERATING CONTROLS (FRONT)

Channel Selector / Fine Tuning	Dual Control Knobs
Brightness / Sound Volume and On-Off Switch	Dual Control Knobs
Picture Horizontal Hold / Picture Vertical Hold	Dual Control (Knurled)
Contrast	Single Control Knob
Hue	Single Control Knob
Color Saturation	Single Control Knob
Tone	Single Control Knob

(LEFT SIDE)

Convergence	Upper Control Knob
Focus	Lower Control Knob

NON-OPERATING CONTROLS (REAR)

Purifying	Single Control
Field Neutralizing	Single Control
High Voltage	Screwdriver Adjustment
Width	Screwdriver Adjustment
Horizontal Linearity	Screwdriver Adjustment
Horizontal Centering	Single Control
Vertical Centering	Single Control

NON-OPERATING CONTROLS (FRONT)

Vert. Converg. Amplitude	Screwdriver Adjustment
Vert. Converg. Shape	Screwdriver Adjustment
Blue Background	Screwdriver Adjustment
Green Background	Screwdriver Adjustment
(Behind removable panel)	
Height	Screwdriver Adjustment
Vert. Linearity	Screwdriver Adjustment
Video Blue Gain	Screwdriver Adjustment
Video Green Gain	Screwdriver Adjustment
Horiz. Converg. Amplitude	Screwdriver Adjustment
Horiz. Converg. Phase	Screwdriver Adjustment
Blue Screen	Screwdriver Adjustment
Green Screen	Screwdriver Adjustment
Red Screen	Screwdriver Adjustment
AGC	Screwdriver Adjustment
Sound Level	Screwdriver Adjustment

NON-OPERATING CONTROLS (TOP OF CHASSIS)

AFC Balance	Single Control
"I" Gain	Single Control
Horizontal Drive	Single Control
Horiz. Locking Range	Screwdriver Adjustment
Horiz. Convergence	Screwdriver Adjustment
Tuner IF Trap	Screwdriver Adjustment
FM Trap	Screwdriver (on Antenna lead)

(UNDER CHASSIS)

Sound Reject	Screwdriver Adjustment

HIGH VOLTAGE WARNING

OPERATION OF THIS RECEIVER OUTSIDE THE CABINET OR WITH THE COVERS REMOVED, INVOLVES A SHOCK HAZARD FROM THE RECEIVER POWER SUPPLIES. WORK ON THE RECEIVER SHOULD NOT BE ATTEMPTED BY ANYONE WHO IS NOT THOROUGHLY FAMILIAR WITH THE PRECAUTIONS NECESSARY WHEN WORKING ON HIGH VOLTAGE EQUIPMENT. DO NOT OPERATE THE RECEIVER WITH THE HIGH VOLTAGE COMPARTMENT SHIELD REMOVED. INSURE THAT THE GROUND SPRING BETWEEN THE CHASSIS AND THE KINESCOPE SHIELD IS MAKING CONTACT BEFORE TURNING THE RECEIVER ON.

KINESCOPE HANDLING PRECAUTIONS

DO NOT REMOVE THE RECEIVER CHASSIS, INSTALL, REMOVE OR HANDLE THE KINESCOPE IN ANY MANNER UNLESS SHATTERPROOF GOGGLES ARE WORN. PEOPLE NOT SO EQUIPPED SHOULD BE KEPT AWAY WHILE HANDLING KINESCOPES. KEEP THE KINESCOPE AWAY FROM THE BODY WHILE HANDLING.

The kinescope bulb encloses a high vacuum and, due to its large surface area, is subjected to considerable air pressure. For this reason, the kinescope must be handled with more care than ordinary receiving tubes.

The large end of the kinescope bulb—particularly that part at the rim of the viewing surface—must not be struck, scratched or subjected to more than moderate pressure at any time. During service if the tube sticks or fails to slip smoothly into its socket, or deflecting yoke, investigate and remove the cause of the trouble. Do not force the tube. All RCA replacement kinescopes are shipped in special cartons and should be left in the cartons until ready for installation in the receiver.

INTRODUCTION

It is advisable that the reader be familiar with principles of black and white television explained in recent standard textbooks in order to properly understand the receiver circuits and their functions. Such a knowledge is assumed for the purpose of this publication. The discussions which follow will not describe in detail the operation of circuits which have been used in previous receivers and should be well known.

In general, the detailed discussions will apply only to the features in the compatible color television receiver, which are different from those found in conventional black and white television receivers.

For ease of understanding the operation of the new circuits in the receiver, a block diagram is shown in figure 1.

Throughout this publication references to new terms will be apparent. Typical terms which will be encountered in color television servicing are listed below with brief definitions.

ADDER—Tube in matrix section which combines "Y", "I" and "Q" signals (see below), before amplification and application to kinescope grids.

BURST—Portion of the composite color video signal used to establish color synchronization. Approximately 8 cycles of the 3.58 mc. sub-carrier frequency, transmitted immediately following horizontal sync pulse. Appears on the "back porch" of the horizontal blanking pedestal.

CHROMINANCE—Hue and Saturation (color) information. "I" and "Q" signals.

COLOR KILLER—Prevents operation of Chrominance channels ("I" and "Q" channels) when no burst (color sync) is being received. When color killer operates, kinescope will show a black and white picture.

CONVERGENCE—The point at which the three electron beams pass through a given opening in the aperture mask so that each beam excites only its respective phosphor dot. Beam from red gun excites red dot, beam from blue gun excites blue dot, beam from green gun excites green dot.

Note: Do not confuse with focus.

FOCUS—Focus occurs when the focal point (smallest beam diameter) of the electron beam or beams is adjusted to fall at the plane of the phosphor dots.

HUE—Redness, blueness, yellowness of colors.

LUMINANCE—Brightness information, similar to information used as video signal in black and white television.

MATRIX—Section of receiver where "Y", "I" and "Q" are combined.

NTSC—National Television System Committee.

PRIMARY COLORS—As used in color television green, red and blue, which when combined in the proportions 59% green, 30% red and 11% blue, produce white.

Note: All colors do not appear the same to all observers. For this reason color can best be described as the reaction of the eye to a light stimulus causing a conscious sensation.

PURITY—Freedom from dilution with other hues.

QUADRATURE PHASE—90° out of phase. As—one signal in phase, another signal 90° out of phase with first signal.

SATURATION—Distinguishing strong colors from pale colors of the same hue—such as red from pink, light blue from dark blue, etc.

SIGNAL "I"—In-phase detected Chrominance signal (Hue and Saturation).

SIGNAL "Q"—Quadrature phase-detected Chrominance signal (Hue and Saturation).

SIGNAL "Y"—Signal containing brightness information.

SUB-CARRIER—A carrier appearing in the pass-band separate from the picture and sound carriers. In the compatible color television receiver located 3.58 mc. away from the picture carrier.

TUNER UNIT—The Tuner Unit is a KRK-12C UHF-VHF Tuner and is designed for 12-channel VHF coverage and 4-channel UHF coverage, although any combination of 16 VHF and/or UHF channels may be used. This coverage is made possible by tuned inserts which are placed within a drum assembly in the tuner. Four different types of inserts, marked "A", "B", "C" and "D", are used to cover channels 2 through 4, 5 and 6, 7 through 10, and 11 through 13, respectively. Three different types of inserts, marked "G", "H" and "J", are used to cover channels 14 through 52, 53 through 68, and 69 through 83, respectively. Channel selection is performed by rotating the drum assembly to the position where the tuned insert for that channel is connected into the tuner circuits.

The stages in the KRK-12C include an R-F amplifier (V1) for VHF signals which uses a type 6BQ7A in a driven grounded-grid amplifier circuit. Tuned circuits at the input and output of the amplifier stage are mounted on each VHF insert. A triple-tuned pre-selector circuit, which precedes the mixer stage, is mounted on each UHF insert. The secondary of either the R-F amplifier plate circuit or the pre-selector circuit forms the tuned input circuit of the mixer stage. A type K3E silicon crystal diode (CR1) is used in the mixer circuit for either VHF or UHF operation. The VHF oscillator voltage is injected into the mixer circuit capacitively on channels 2 through 6 and inductively on channels 7 through 13. The UHF oscillator voltage is injected into the mixer circuit through an adjustable inductance.

The oscillator stage (V2) uses a type 6AF4 in a modified Colpitts circuit and provides oscillator signals at a fundamental frequency for all VHF and UHF channels. A fine tuning control permits vernier adjustment of the local oscillator frequency.

The first I-F amplifier stage (V3) following the mixer stage uses a type 6U8 in a triode-pentode circuit with a low noise, grounded-grid input and a driven-pentode output. The I-F output of the tuner is at 41 mc.

PICTURE I-F CHANNEL—The picture I-F amplifier is designed for a 45.75 mc. picture carrier, a 42.17 mc. color sub-carrier, and a 41.25 mc. sound carrier. The I-F amplifier consists of seven stages (including the two stages in the tuner unit). Three 6CB6's, one-half 6AN8, and one 6CL6 are used.

In order to reduce cross-modulation, the sound carrier is attenuated as soon as possible in the I-F amplifier by the Sound Level control 1R166 in the grid circuit of the first picture I-F amplifier V109 (6CB6). The output of V109 uses a bridged-T, m-derived, bandpass circuit with rejection traps for adjacent picture (39.75 mc.) and adjacent sound (47.25 mc.).

The second, third, and fourth picture I-F amplifiers (V110, V111, and V112A) form a staggered, triple-tuned circuit with the second and fourth stages tuned, respectively, to the high and low frequency sides of the bandpass. The third stage is tuned to approximately the center of the band.

The fifth picture I-F amplifier (V113) uses a bridged-T, m-derived, bandpass circuit and a mutually coupled absorption trap. The rejection traps are tuned for accompanying sound (41.25 mc.) and adjacent sound (47.25 mc.).

The picture second detector 1CR102 uses a 1N60 crystal diode.

DEFLECTION SYNCHRONIZATION—Sync signal is obtained from the plate circuit of the first video amplifier V114 and is DC coupled to the grid of the horizontal sync separator V117 (6AN8-triode section), and AC coupled to the grid of the vertical sync separator V118B (12AT7). Horizontal and vertical sync are added in the grid circuit of V118A (12AT7) which serves the functions of sync amplifier and clipper. Variable clipping with signal strength is obtained by returning the grid resistor of the sync amplifier to the third picture I-F screen grid. Improved vertical noise immunity is obtained by coupling negative noise pulses from the screen of the fifth picture I-F amplifier into the grid of the vertical sync separator. The output of the sync amplifier is used for both horizontal and vertical sync information. Vertical sync is coupled through a printed integrator circuit for proper shaping before it is applied to the vertical oscillator grid. Horizontal sync is capacitively coupled to the horizontal oscillator control grid.

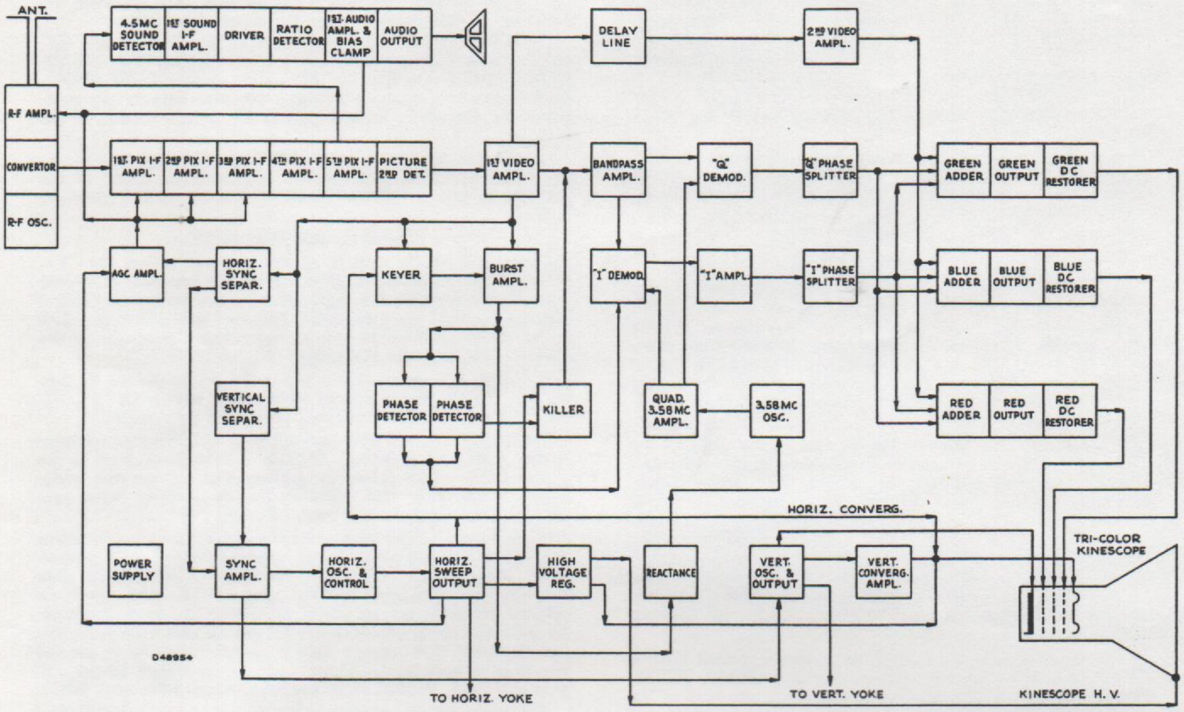


Figure 1—Receiver Block Diagram

AGC—The AGC amplifier V117B (6AN8-pentode section) derives its control voltage from the cathode of the horizontal sync separator. The control voltage acts as a bias on the AGC amplifier and is varied in amplitude with the AGC Control 1R139B. Plate voltage for the amplifier is obtained from the horizontal kickback pulse taken from the high voltage transformer 3T117. Negative bias voltage is obtained by charging the plate capacitor 2C133 and is applied to the first, second, and third picture I-F and the R-F amplifier grids. The diodes of V104 serve as a clamp on the R-F bias which delays the rise of R-F bias for improved signal-to-noise ratio.

HORIZONTAL DEFLECTION AND HIGH VOLTAGE—The horizontal oscillator and control V127 (6SN7-GT) is a "synchroguide" circuit, the output of which is used to drive the horizontal output V126 (6CD6). Fixed bias is supplied to the horizontal output and is used to protect the circuit against damage through failure of the horizontal drive signal.

The ultor voltage is supplied by the high-voltage rectifier V121 (3A3) which rectifies the kickback pulses. Regulation of the high voltage is effected by the shunt regulator V120 (6BD6). Bias on V120 and thus high voltage output is controlled by the high-voltage adjust control 3R254. In order to keep the convergence voltage a fixed part of the ultor voltage, the DC convergence control 3R254 is used as part of the high-voltage bleeder.

The focus voltage is produced by the focus rectifier V124 (1X2B). Plate voltage for V124 is taken from a tap on the high-voltage transformer. The focus control 3R259, part of the rectifier bleeder network, supplies an adjustable DC voltage to the focus electrodes.

Two separate windings on the high-voltage transformer provide kickback voltages for "killer" bias rectification, bandpass keying, burst keying, and horizontal dynamic convergence excitation. Taps on the high-voltage secondary, supply deflection pulses to the horizontal deflection coils. Electrical centering is provided by the horizontal centering control 3R261 which applies an adjustable DC voltage across the horizontal deflection coils.

VERTICAL DEFLECTION—The vertical oscillator and output V128 (12BH7) incorporates a blocking oscillator circuit, the output of which is amplified in the output stage, which in turn drives the vertical deflection coils through the vertical output transformer 1T121. Electrical centering is provided through the vertical centering control 2R104 which applies an adjustable DC voltage across the vertical deflection coils.

SOUND I-F AND AUDIO CHANNEL—The sound information is taken off at the plate of the fifth picture I-F amplifier and is detected by 1CR101, a 1N60 crystal diode. The resultant 4.5 mc. sound I-F signal is coupled through the first sound I-F amplifier V101 (6AU6) and the driver V102 (6AU6) before it is applied to the ratio detector V103 (6AL5). The audio output of V103 is amplified by the first audio amplifier V104 (6AV6) and the audio output stage V105 (6AQ5) before it is applied to the speaker. The volume control 1R124B and the tone control 1R126 are connected into the first audio amplifier stage.

VIDEO

The video section of the receiver incorporates three separate functions. The luminance, or brightness channel, the chrominance, or color channel and a function called matrixing which combines the two channels.

The luminance channel (luminance is designated by the symbol "Y") can be compared with the video section of a black and white television receiver since it deals only with information denoting the brightness values in the picture. It amplifies the brightness (black to white) information to a level satisfactory for application to the kinescope, the difference being that the information is applied through the matrix instead of directly to the kinescope.

The chrominance channel recovers the information contained in the color sub-carrier sidebands. Two independent signals are recovered from the color sub-carrier by a process known as "synchronous detection in phase quadrature". These signals are called the "I", or in-phase signal, and the "Q" or quadrature phase (90° out of phase) signal.

In accordance with N.T.S.C. signal specifications the "I" channel passes information in a bandwidth limited to 1.5 mc. and the "Q" channel passes information in a bandwidth limited to .5 mc. ("I" and "Q" channel bandwidths are referenced to the color sub-carrier frequency). Band limiting, which is done to prevent cross-modulation, makes necessary a delay time between the "Y", "I" and "Q" signals so that they arrive simultaneously at the matrix for processing before application to the kinescope.

The matrix combines pre-determined proportions of "Y", "I" and "Q" information into simultaneous green, red and blue signals for application to the kinescope grids (**Note**: "Y", "I" and "Q" are *not* symbols for green, red and blue. Their proper designations are noted above).

LUMINANCE CHANNEL

The first video amplifier, a 6CL6, has both positive and negative video output polarities. Any sound present in the video signal is attenuated by a 4.5 mc. trap (2L108, 2C184) in the cathode output circuit. To prevent chrominance information from combining with luminance information before entering the matrix a 3.58 mc. color sub-carrier frequency trap (2L140, 2C188) is located in the plate circuit of the 6CL6 first video amplifier.

The sync and wideband video present at the plate of the 6CL6 provide the "Y" channel signal, burst (color sync), and horizontal and vertical sync information. "Y" information is fed through the delay line (2TD101) to a potentiometer in the grid circuit of the second video amplifier V115A (6AN8 pentode section). This potentiometer (2R210) is mechanically ganged with the potentiometer (2R204) in the grid circuit of V116A (6AN8 pentode section) the bandpass amplifier, and acts as the picture (contrast) control, maintaining a constant ratio between luminance and chrominance for all contrast settings.

Burst (color sync) is removed by a tuned circuit (2L141, 2C186) coupled to the color sub-carrier trap (2L140, 2C188). Sync information (horizontal and vertical) is removed at the junction of 2R207 and 2R206 and is fed to the horizontal and vertical sync separators V117B (6AN8, triode) and V118B (½ 12AT7).

The second video amplifier V115A (6AN8 pentode section) amplifies the "Y" (brightness) information to a level suitable for application to the matrix section.

CHROMINANCE CHANNEL

The signal removed from the cathode of V114, the first video amplifier, is fed to the grid of V116A (6AN8, pentode section), the bandpass amplifier, which removes the low frequency components of the signal with the bandpass filter (2T126) and retains the region of the color sub-carrier and its sidebands. The bandpass filter terminates in a control (2R317) which is used to vary the saturation of color (brilliant red, pale red, deep red) by controlling the chroma voltage input to the "I" and "Q" demodulators.

The bandpass amplifier operates only during the burst interval during which time it is keyed by a negative pulse derived from horizontal deflection (Terminal "E" on HV transformer 3T117) applied to the screen of V116A.

When no burst is present (black and white picture reception), the color-killer tube V112B (6AN8, triode section) conducts, and biases the grid of the bandpass amplifier to cut-off. This prevents signal information from entering the matrix circuits, via the "I" and "Q" demodulator circuits, and insures that only "Y" (brightness) information reaches the kinescope grids.

During burst the color-killer does not conduct, since it is held at cut-off by the negative DC voltage developed by the burst phase-detector (V130B).

Demodulation (detection) of the chroma signal ("I" and "Q") is accomplished by the synchronous detectors V132 (5915) and V133 (5915) operating in quadrature. With the demodulators operating in quadrature the "I" signal is detected in phase with the color sub-carrier and the "Q" signal is detected 90° out of phase from the color sub-carrier.

The detected "I" signal appears at the plate of V132 ("I" demodulator) and is fed through the band-limiting filter 2T123 to the "I" amplifier V134A (6AN8, pentode section) then to the "I" phase splitter V134B (6AN8, triode section) which supplies positive and negative "I" signals required in the matrix section. The band-limiting filter also provides the time delay required to match "Q" signal time delay.

The detected "Q" signal appears at the plate of the "Q" demodulator V133 and through a band-limiting filter (2L122, 2C266, 2L123) is fed to the "Q" phase splitter V115B (6AN8, triode section) where positive and negative signals are present at the output for application to the matrix section of the receiver.

The proper amplitude ratio of "I" to "Q" signals is maintained by adjustment of the "I" gain control 2R361 in the cathode of the "I" signal amplifier V134A (6AN8, pentode section).

MATRIX AND OUTPUT

The matrix is the section of the receiver where the "Y", "I" and "Q" signals are mixed in proper proportions to provide outputs suitable for application to the kinescope control elements so that the brightness, hue and saturation of colors in the transmitted scene will be reproduced properly on the viewing screen of the kinescope.

The signal proportions are fed to the adder stages V135A, V136A, V137A, through fixed resistances, where the "Y", "I" and "Q" signals are combined in correct proportion.

Negative feedback from the cathodes of the output sections of the 12BH7 tubes V135B, V136B, V137B, is applied to the grids of the adder tubes for stabilization, to prevent undesirable color shift. The resulting low impedance input provides effective isolation of "Y", "I" and "Q".

Since the operation of the kinescope requires specific ratios of drive to produce a black and white picture (proper proportions of green, red and blue produce white) overall gain controls are provided for the green and blue channels (4R228 for the green channel, 5R330 for the blue channel). No gain control is provided for the red channel, because the red phosphor dots require maximum excitation to cause the phosphor to emit light. DC restoration is provided by the outputs of V138A, V138B, V138C, a triple-diode tube, type 6BC7.

The plate return circuits of the DC restorers are adjusted to maintain proper tracking of the three kinescope grid bias values throughout the range of the master brightness control (1R124A).

COLOR SYNCHRONIZATION

The color synchronizing channel consists of a "keyer" tube V116B (6AN8, triode section), a burst amplifier stage V129A (6AN8, pentode section), a phase detector V129B and V130B (6AN8, triode sections), a reactance control tube V131A (6AN8, pentode section), a quartz crystal oscillator operating at 3.58 mc. V131B (6AN8, triode section) and a quadrature amplifier V130A (6AN8, pentode section).

To provide color synchronization information in the N.T.S.C. type signal, a "burst" of approximately 8 cycles of the color sub-carrier frequency is transmitted immediately following each horizontal sync pulse in the composite color video signal. This "burst" is used as phase reference information, after separation from the composite color video signal, and serves to establish the proper phase relationship between the transmitted signal and the local 3.58 mc. sub-carrier. Since the sub-carrier is not transmitted it is necessary to generate a local sub-carrier of proper frequency and phase. The sub-carrier is generated by a (quartz) crystal controlled oscillator (V131B). A reactance tube (V131A) is used to maintain exact control of the crystal oscillator frequency.

The reactance tube is controlled by a signal from the phase detector (V129B and V130B) which is proportional to the difference in phase between the transmitted burst and the local 3.58 mc. crystal oscillator output.

The burst amplifier stage operates from the signal supplied from an inductance (2L141) which is coupled to the first video amplifier plate (V114). A trimmer capacitor (2C186) is used as the hue control (redness, blueness, greenness).

The keyer tube V129A, is driven by a pulse from the horizontal output transformer (Terminal "F" 3T117) and with its cathode connected to the cathode of V129A, the burst amplifier, provides automatic keying level adjustment.

The phase detector V129B and V130B, uses the triode sections of the 6AN8's as diodes, to compare the phase of the incoming burst signal with the phase of the 3.58 mc. c.w. signal from the crystal oscillator V131B. This signal is obtained from one output of the quadrature amplifier output transformer (Terminal "A" 2T125).

The crystal oscillator V131B, operates as a cathode follower and drives the quadrature 3.58 mc. amplifier V130A, from a tap on the oscillator output transformer (Terminal "B" 2T128).

A plate circuit output (Terminal "F" 2T125) provides "Q" c.w. signal to the "Q" demodulator V133. The 3.58 mc. reference signal which is supplied to the phase detector also provides "I" c.w. to the "I" demodulator V132.

TRICOLOR KINESCOPE

The type C-73599 tricolor kinescope, as used in this receiver, is a directly-viewed picture tube capable of producing either a full color or a black and white picture 11½ inches wide and 8⅝ inches high with rounded sides.

Three electron guns are mounted at the base end of the tube with their axial centers parallel to the central axis of the tube and spaced 120° apart with respect to each other.

At the viewing end of the tube is an assembly consisting of an aperture mask, the phosphor dot viewing screen and a decorative mask. This assembly is enclosed within the glass tube envelope.

The focus electrode potential is adjusted so that the beam from each of the three electron guns comes to focus at the phosphor dot viewing screen.

By means of a convergence electrode all three beams are made to converge as they pass through the openings in the aperture mask.

The tricolor phosphor dot plate (the viewing screen) has printed on its rear surface an orderly array of small, closely spaced phosphor dots, arranged in triangular groups of three which are called "trios". Each trio consists of a green light-emitting dot, a red light-emitting dot and a blue light-emitting dot.

The phosphor dot plate has approximately 195,000 dot trios or a total of 585,000 dots. Aluminization of the surface, after the dot trios have been printed, effectively increases the light output from the viewing screen and eliminates the need for an ion trap.

The aperture mask, a thin metal plate positioned a short distance behind the phosphor dot plate, contains round holes equal in number to and centered with respect to the dot trios (one hole for each dot trio).

A mumetal shield is placed around the glass bell end of the tube envelope to prevent stray magnetic fields from affecting tube operation.

Another mumetal shield, positioned around the neck of the tube, prevents extraneous magnetic fields from interfering with the low velocity beams in the neck section. It also supports the beam-positioning magnets which are spaced 120° apart to correspond with the positions of the electron guns in the neck of the tube. The beam-positioning magnets are adjustable to provide accurate positioning of their associated beams in a direction perpendicular to the change in beam direction produced by the electrostatic convergence element in the kinescope.

The purifying coil is made adjustable to provide accurate alignment of the axes of the three beams so that their common axis coincides with the axis of the kinescope. As a result, when the beams are focused, converged and deflected, they approach each hole in the aperture mask at the proper angle to strike the centers of their respective color dots and produce color purity.

The field-neutralizing coil placed around the faceplate end of the kinescope produces a uniform magnetic field which can be varied to neutralize extraneous magnetic fields which may cause displacement of the beams from their color centers.

The high-voltage (ultor) connection is part of the peripheral faceplate-tube envelope seal.

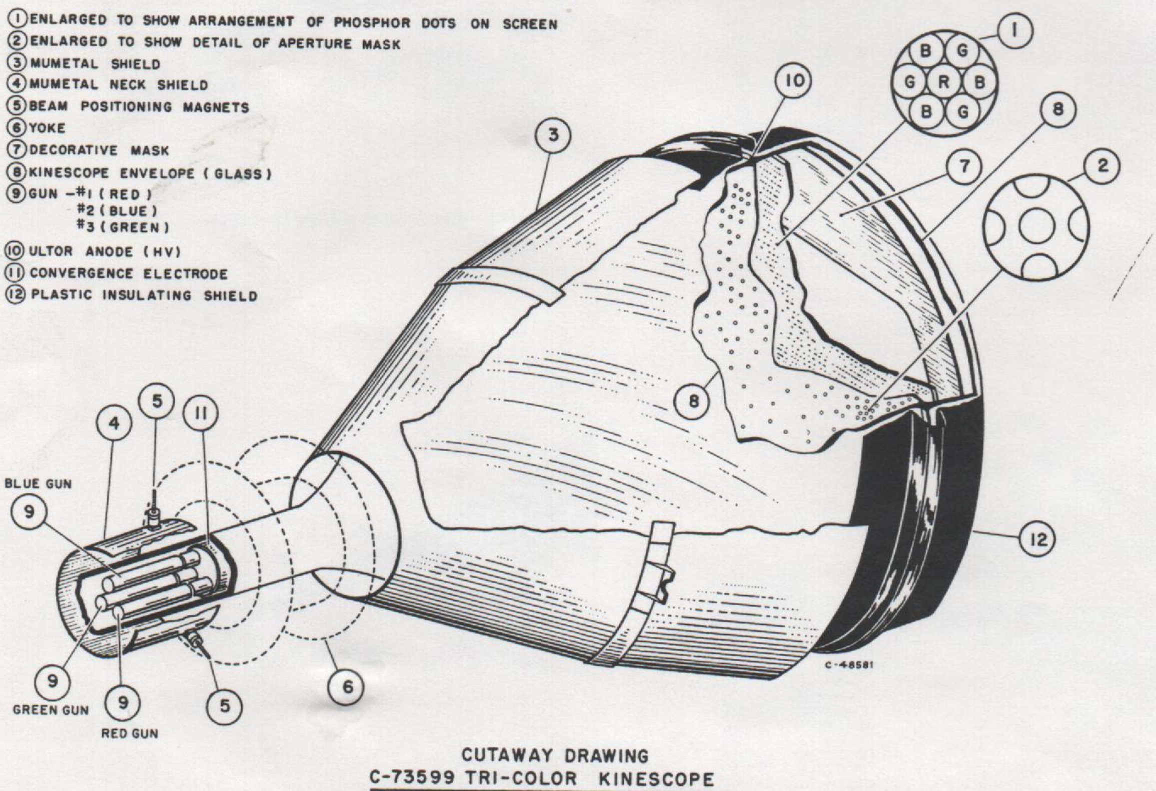


Figure 2—Tricolor Kinescope

DC (STATIC) CONVERGENCE

Converging the three beams at the center of the face of the tube is accomplished by adjusting the DC convergence control (3R254) for the best super-positioning of the beams. The three beam-positioning magnets are adjusted individually to correct inaccuracies which may result due to mechanical mis-alignment of the electron guns.

DYNAMIC CONVERGENCE

Because the aperture mask and the phosphor dot screen are flat, the beam must travel a greater distance from the center of deflection as it scans the edges of the screen than it does when scanning the center of the screen.

If the DC convergence voltage, which was required to achieve center convergence, remained unchanged, the three beams when scanning the edges of the screen, would become mis-converged and the result would be color fringing at the edges of the picture. To correct this condition the DC potential on the convergence electrode is modulated in such a manner as to produce a larger convergence electrode voltage as the deflection angle increases (as the edges of the picture are scanned more DC convergence voltage is applied). The same condition also exists with respect to focus.

The vertical dynamic convergence amplifier circuit (using a 12AU7-V119) combines, shapes and amplifies the parabola and saw-tooth waveforms, derived from the vertical deflection circuit. They are then combined with the sinewave horizontal waveform, which is derived from the two series tuned circuits, 1L138 and 3L139 connected to the horizontal kickback (terminal "E" of 3T117). This combined waveform is used for modulation of the DC convergence voltage applied to the kinescope.

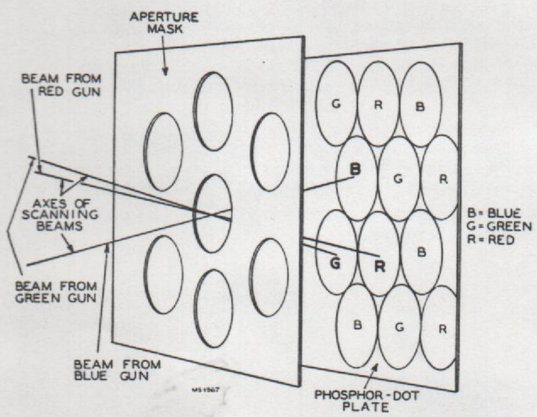


Figure 3—Convergence

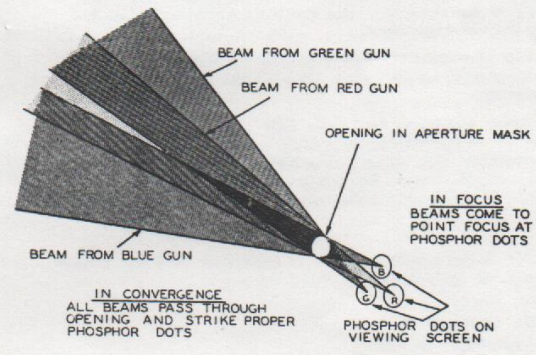


Figure 4—Beams in Focus and Convergence

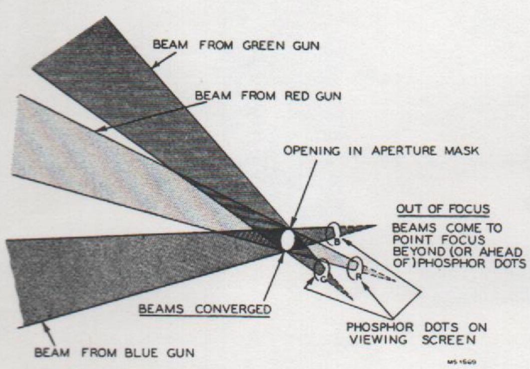


Figure 5—Beams in Convergence and Out of Focus

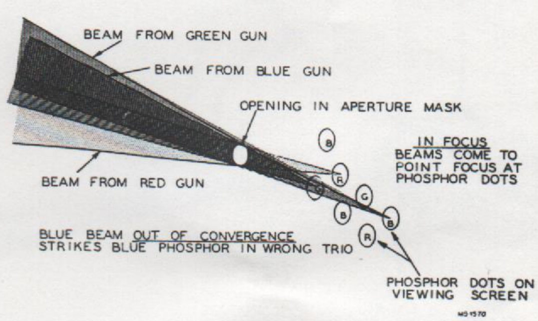


Figure 6—Beams in Focus and Out of Convergence

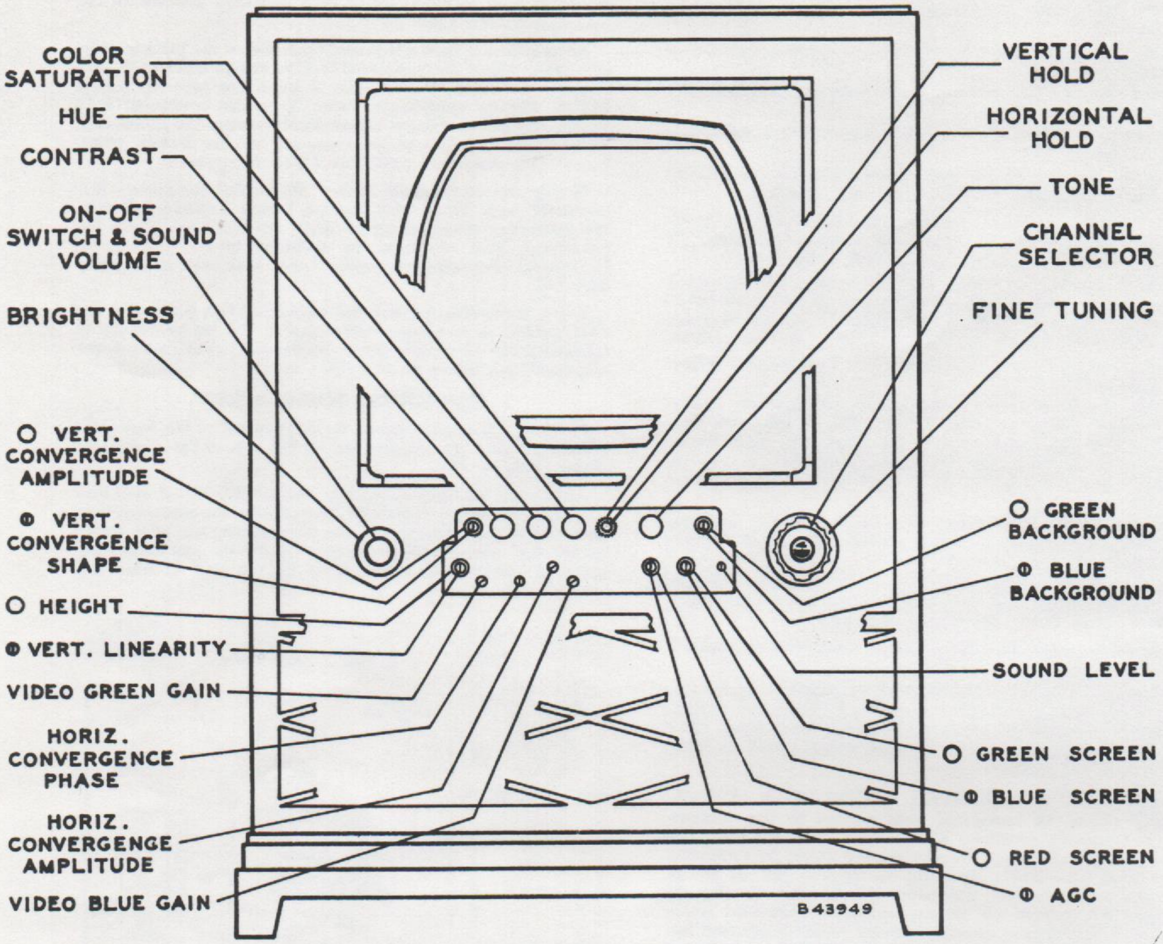


Figure 7—Operating Controls and Front Adjustments

OPERATING INSTRUCTIONS

The following adjustments are necessary when turning the receiver on for the first time.

BLACK and WHITE RECEPTION

1. Turn the receiver "ON" and advance the SOUND VOLUME control to approximately mid-position.
2. Set the CHANNEL SELECTOR to the desired channel.
3. Adjust the FINE TUNING control for best sound fidelity and the SOUND VOLUME for suitable volume.
4. Turn the BRIGHTNESS control fully counter-clockwise then clockwise until a light pattern appears on the screen.
5. Adjust the VERTICAL HOLD control until the pattern stops vertical movement.
6. Adjust the HORIZONTAL HOLD control until a picture is obtained and centered.
7. Turn the BRIGHTNESS control counter-clockwise until the raster just disappears.
8. Adjust the CONTRAST control for suitable picture contrast.
9. Should color fringes appear on large objects, adjust the CONVERGENCE control (top control on left side of cabinet) for minimum fringes at the center of the picture.
10. Adjust the FOCUS control (lower control on left side of cabinet) for clearest picture detail.
11. Adjust the TONE control for the desired tonal quality.
12. In switching from one channel to another, it may be necessary to repeat steps numbers 3 and 9.
13. When the receiver is turned on again after an idle period, it should not be necessary to repeat the adjustments if the position of the controls have not been changed. If any adjustment is necessary, steps 3, 9 and 10 are generally sufficient.

COLOR RECEPTION

1. Adjust the receiver for a black and white picture as outlined above, with the fine tuning control advanced to its most clockwise position where most detailed picture is obtained.
2. Set the CHANNEL SELECTOR to the desired channel broadcasting a color program.
3. Adjust the COLOR SATURATION control approximately one-quarter turn from its maximum counter-clockwise position.
4. Carefully advance the FINE TUNING control clockwise until the picture just begins to disappear, then counter-clockwise, slowly, to the position where sound bars just disappear from the picture and color is in the picture.
5. Adjust the COLOR SATURATION control for the desired saturation or strength of color.
6. Adjust the HUE control for hue quality of the picture (redness, blueness)—to achieve the most pleasing flesh tones or color of some familiar object.

UNPACKING.—These receivers are shipped complete in cardboard cartons. The kinescope is shipped in place in the receiver.

Take the receiver out of the carton and remove all packing material.

Make sure that all tubes are in place and are firmly seated in their sockets.

Check to see that the kinescope high voltage connector is in place.

Plug the power cord into the 115 volt a-c power source and turn the receiver power switch to the "on" position.

Connect the antenna transmission line to the receiver.

Adjust the receiver, as outlined in the "OPERATING INSTRUCTIONS", for a black and white picture.

If the Horizontal Oscillator and AGC system are operating properly, it should be possible to sync the picture at this point. However, if the AGC control is misadjusted, and the receiver is overloading, it may be impossible to sync the picture.

If the receiver is overloading it will be necessary to adjust the AGC control.

Remove the metal control cover box and the snap-in cabinet panel below the cover box. To do this, remove the four knobs under the control cover by grasping each firmly to pull out. Remove the two round-head screws holding the cover box in place. Carefully slide the cover box assembly outward.

Grasp the top of the removable cabinet panel and pull the panel away from its snap mounts. The front service adjustments will now be accessible.

Turn the AGC control counterclockwise until the receiver operates normally and the picture can be synchronized. (Refer to figure 7 for adjustment location.)

It should be noted here that only the adjustment of the AGC control should be made at this time.

Adjustment of the other controls accessible under the removable panel should be made only after an understanding of their functions has been acquired. The proper adjustment of each control is explained in later sections of this publication.

CHECK OF HORIZONTAL OSCILLATOR ALIGNMENT.—Turn the horizontal hold control to the extreme counter-clockwise position. The picture should remain in horizontal sync. Momentarily remove the signal by switching off channel then back. Normally the picture will be out of sync. Turn the control clockwise slowly. The number of diagonal black bars will be gradually reduced and when only 2 or 3 bars sloping downward to the left are obtained, the picture will pull into sync upon slight additional clockwise rotation of the control. Pull-in should occur before the control has been turned 70 degrees from the extreme counter-clockwise position. The picture should remain in sync for approximately 90 degrees of additional clockwise rotation of the control. At the extreme clockwise position, the picture should remain in sync and should not show a black bar in the picture.

If the receiver passes the above checks and the picture is normal and stable, the horizontal oscillator is properly aligned. Skip "Alignment of Horizontal Oscillator" and proceed with "Centering Adjustment."

ALIGNMENT OF HORIZONTAL OSCILLATOR.—If in the above check the receiver failed to hold sync with the hold control at the extreme counter-clockwise position or failed to hold sync over 90 degrees of clockwise rotation of the control from the pull-in point, it will be necessary to make the following adjustments.

Horizontal Frequency Adjustment.—Turn the horizontal hold control to the extreme clockwise position. Tune in a television station and adjust the horizontal frequency adjustment 2T119 (top), refer to figure 39, until the picture is just out of sync and the horizontal blanking appears as a vertical or diagonal black bar in the raster. Then turn the 2T119 core until the bar moves out of the picture leaving it in sync.

Horizontal Locking Range Adjustment.—Set the horizontal hold control, 1R283B under front control cover, to the full counter-clockwise position. Momentarily remove the signal by switching off channel then back. The picture should fall out of sync with the diagonal lines sloping down to the left. Slowly turn the horizontal hold control clockwise and note the least number of diagonal bars obtained just before the picture pulls into sync.

If more than 2 bars are present just before the picture pulls into sync, adjust the horizontal locking range trimmer 2C237 slightly clockwise. If less than 2 bars are present, adjust 2C237 slightly counter-clockwise. Turn the horizontal hold control counter-clockwise, momentarily remove the signal and recheck the number of bars present at the pull-in point. Repeat this procedure until 2 or 3 bars are present.

Repeat the adjustments under "Horizontal Frequency Adjustment" and "Horizontal Locking Range Adjustment" until the conditions specified under each are fulfilled. When the horizontal hold operates as outlined under "Check of Horizontal Oscillator Alignment" the oscillator is properly adjusted.

If it is impossible to sync the picture at this point and the AGC system is in proper adjustment it will be necessary to adjust the Horizontal Oscillator by the method outlined in the alignment procedure on page 20.

CENTERING ADJUSTMENT

Centering is accomplished by adjustment of the two electrical centering controls located on the rear of the chassis as shown in figure 8.

Adjust the vertical centering control 2R104A-B and the horizontal centering control 3R261 to center the picture within the mask of the kinescope. If the picture does not fully cover the masked area of the kinescope, adjust the positioning for equal distribution of blank area at top and bottom and at each side.

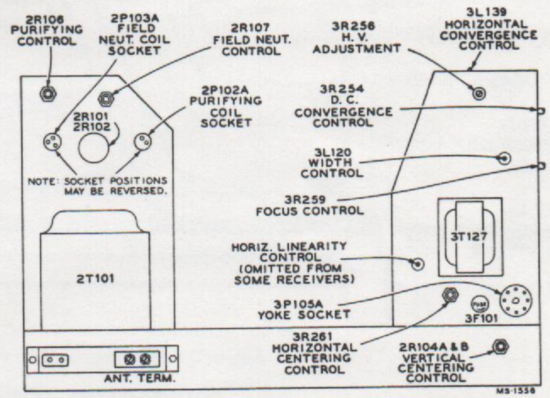


Figure 8—Rear Chassis Adjustments

WIDTH AND HORIZONTAL DRIVE ADJUSTMENTS

Pre-set the Horizontal Drive Control 2R266 on top of the receiver chassis (refer to figure 39), to the point where the white fold-over line just disappears from the picture.

Adjust the Width Control 3L120 on the rear of the HV compartment, as shown in figure 8, to overscan the masking area by approximately one-quarter inch at each side.

Advance the Horizontal Drive Control 2R266 to as high a position as possible without white fold-over appearing in the picture.

If it is impossible to fill the mask by the above adjustments, it will be necessary to follow the procedure outlined under HV ADJUSTMENT on page 20 of the "ALIGNMENT PROCEDURE."

HEIGHT AND VERTICAL LINEARITY ADJUSTMENTS.—Adjust the height control 1R282A and the Vertical Linearity Control 1R282B (controls under cabinet front panel —see figure 7), until the picture or test pattern is symmetrical from top to bottom. Make the final adjustment to overscan the mask by one-quarter inch at both top and bottom. Recheck the horizontal and vertical centering for correct positioning of the picture with respect to the mask.

CHECK OF R-F OSCILLATOR ADJUSTMENTS

Tune in all available UHF and VHF stations to see if the receiver r-f oscillator is adjusted to the proper frequency on all channels. Set the fine tuning control to the center of its range. Adjust the oscillator core for each channel to obtain maximum audio output without distortion. The location of the adjustment is the same for all channels (see figure 9).

The insert in the operating position can be determined by a stamping on the insert drum. This stamping is visible through the channel indicator apertures as shown in figure 9.

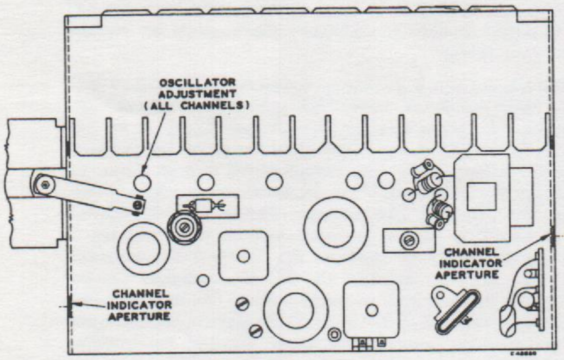


Figure 9—KRK12C Oscillator Adjustments

FOCUS AND CONVERGENCE

Re-check the picture for proper focus and convergence as outlined under "OPERATING INSTRUCTIONS" on page 8.

Proper operation of the receiver for both black and white and color reception should be obtained upon completion of the preceding adjustments. If the receiver does not function properly at this point, it will be necessary to perform the complete SET-UP PROCEDURE outlined below.

SET-UP PROCEDURE

Prior to making any picture adjustments, it is essential to have 19,500 volts applied to the ultor anode of the kinescope (see HIGH VOLTAGE ADJUSTMENT under ALIGNMENT PROCEDURE on page 20). A conventional black and white test pattern is useful for making initial adjustments. A dot pattern should be provided for purity and convergence adjustments.

INITIAL ADJUSTMENTS.—With a conventional black and white test pattern or picture tuned in, the Focus Control 3R259 (bottom control on the left side of the cabinet) should be adjusted for best definition. The Convergence Control 3R253 (top control on the left side of the cabinet) should be adjusted for the best convergence of the dot pattern in the center of the picture. Best convergence is obtained when there is minimum color fringing around each group of dots.

At this point it is necessary to adjust the horizontal oscillator and to make the conventional adjustments of height, vertical linearity, horizontal linearity, width, drive, and electrical centering if such adjustments are found necessary. Refer to the INSTALLATION INSTRUCTIONS which cover these adjustments.

COLOR PURITY ADJUSTMENTS.—Turn the Contrast Control 2R204/2R210 to minimum (fully counter-clockwise). Refer to figures 8, 10 and 39 for the location of all adjustments. Turn the Brightness Control 1R124A to an average brightness position. Any color impurity will best be seen on a red display (blue and green screens, turned down). Therefore, set the Red Screen Control 1R139A to its maximum position. Set the Blue Screen Control 1R155B and the Green Screen Control 1R155A to their minimum positions (fully counter-clockwise).

To produce a small central area on the raster on which purity adjustments can be observed, the deflection yoke is moved approximately one inch toward the rear of the kinescope until a multi-color raster is seen. This is done by loosening the wing nuts at each side of the yoke cradle and sliding the yoke and cradle to the rear. (Refer to figure 10.) In this position the red area appears to cover, at the center of the raster, about one-third of the total raster area. With this arrangement, a minimum of purity coil correction will be necessary. The purifying coil and the purifying current control 2R106 are now adjusted alternately to give the best red rendition at the center area of the raster. The coil is adjusted by grasping the edge at the front of the neck shield and rotating it about the neck. **CAUTION: There are high voltage pulses at exposed terminal points on the deflection yoke ahead of the purifying coil.** The Purifying Control 2R106 is adjusted to give more or less coil current which causes more or less of a shift of the position of the red field. The final position of the control should be as near as possible to the extreme counter-clockwise position, so that minimum current will flow through the coil. A lower value of current will produce a weaker magnetic field, which has, therefore, less inter-action with other magnetic fields about the kinescope.

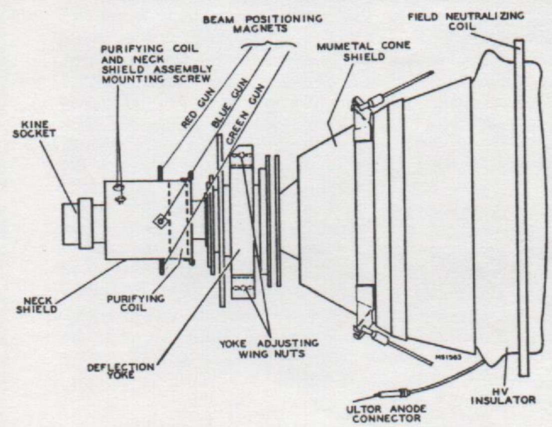


Figure 10—Convergence and Purity Adjustments

Advance the deflection yoke forward until an all red raster is produced. Adjust the field neutralizing control 2R107, to give best raster edge purity. Since the adjustment of the deflection yoke may affect purity, a slight readjustment of the purifying coil and control may be necessary. Also, purifying coil adjustments will affect centering. If necessary, re-set the centering controls. In general, if good red field purity is obtained, green and blue fields will be satisfactory. To check the green field, turn the Red Screen Control 1R139A to minimum and advance the Green Screen Control 1R155A to maximum. Note the green field purity. Next, turn the Green Screen Control 1R155A to minimum and advance the Blue Screen Control 1R155B to maximum. Note the blue field purity. If either the green or blue or both fields are not satisfactory, a compromise must be reached for all three fields on the setting of the purity adjustments. Slight readjustments may be necessary to give best simultaneous red, green, and blue fields.

Turn up all three screen controls to give the best grey-to-white raster. This should occur for all positions of the brightness control. If color shading occurs in one or more hues, either the screen controls for those hues must be turned down or those which do not give shading must be turned up.

DC CONVERGENCE ADJUSTMENTS.—The dot signal generator should be connected to the terminal board on top of the chassis, at the end of Delay Line 2TD101 near V115.

To do this, connect the "horizontal lead" from the dot generator to the green lead from pin 2 of yoke plug, 3P105B, at its termination on the right side of the yoke, at the 1200 ohm resistor.

Connect the "vertical lead" from the dot generator to pin 19 of the kinescope socket at the 2700 ohm resistor. (Or wrap the lead around the top of V128, the vertical oscillator tube).

Connect the "ground lead" to the receiver chassis and the "output lead" to the Delay Line 2TD101, at the terminal board end near V115.

Adjust the DC Convergence Control (top knob on left side of cabinet) until the three dots appear separately and in a triangular arrangement in the center of the raster. (The dot triangle may be inverted by adjusting the DC Convergence Control from one extreme to the other.) If necessary, readjust the focus control. If each dot group does not form a small equilateral triangle, as shown in figure 11, it will be necessary to adjust the beam positioning magnets on the neck of the kinescope. Carefully note which of the three dots (red, green or blue) appears to be out of line. Then, adjust the beam positioning magnet, corresponding to that color, to correct the position of that dot. Adjustment is made by loosening the knurled nut which locks the magnet in position. Each magnet is slotted for screwdriver adjustment. Some knowledge of the effect of each magnet adjustment will be helpful. As shown in figure 11, the dots with "R", "G", and "B" inscribed denote the position of the red, green, and blue dots. The dashed lines indicate the direction of dot movement produced when the DC Convergence Control is adjusted. All three dots move simultaneously. The solid lines represent the direction of dot movement when the associated beam positioning magnet is adjusted. Each magnet has a slight effect on the two beams other than the one it is designed to control. It is essential, therefore, to use the minimum amount of magnet adjustment to correct each dot position. Minimum adjustment will also cause the least amount of de-focusing. This means that the magnet adjustment should be set to the point nearest the extreme counter-clockwise position where correct beam positioning is obtained.

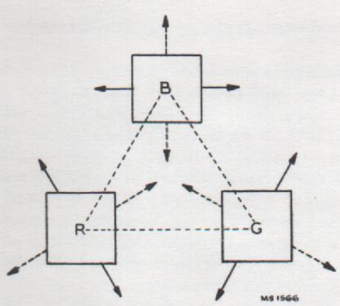


Figure 11—Dot Convergence Pattern

If it appears that only one dot is out of line and the associated magnet does not have the range of adjustment to correct the dot position, it is possible to alter the range of the adjustment by removing the magnet from the neck shield, turning it end-for-end, and re-inserting it in the neck shield. One end of each magnet is color coded in red. Each magnet is slotted at both ends so that adjustment can be made with either end projecting through the shield. If a single dot position cannot be corrected by reversing the magnet, return the magnet to its original position. Then correct the position of the opposite two dots with respect to the first dot by adjusting the magnets associated with those dots.

When the equilateral triangle is obtained, it will be possible to obtain satisfactory convergence of the three dots by adjusting the DC Convergence Control. Complete convergence is obtained at the center of the raster when the three dots are superimposed to give a single white dot with no color fringing around the edge of the white dot.

DYNAMIC-CONVERGENCE ADJUSTMENTS—Although the same amplifier circuit applies both dynamic focus and dynamic convergence voltages to the kinescope, when the dynamic convergence adjustment is correct, the dynamic focus is satisfactory also. In adjusting dynamic convergence, it will be helpful to frequently vary the DC Convergence Control for optimum convergence on various parts of the screen.

With the dot signal generator connected to the Delay Line at the terminal board near V115, adjust the Vertical Convergence Amplitude Control 1R248A (see figure 7) so that dots along a vertical center line show the same dot displacement at the top, center, and bottom of the picture. Then, readjust the Focus Control. If the displacement is not the same, adjust the Vertical Convergence Shape Control 1R248B (see figure 7) to obtain the most uniform displacement. It may be necessary to readjust the Vertical Convergence Amplitude Control. Readjust the DC Convergence Control so that the vertical line converges. Keep the dots in focus. Slight re-adjustment of the Vertical Amplitude and Shaping controls may be necessary to obtain the best top-to-bottom convergence.

The next step is to adjust the horizontal dynamic convergence. Advance the Horizontal Convergence Amplitude Control 1R238 (see figure 7) so that dots along a horizontal center line show the same displacement at right, center, and left areas of the picture. If the displacement is not the same, adjust the Horizontal Phase Control 1L138 to obtain the most uniform displacement. A slight re-adjustment of the amplitude control may be required. Re-adjust the DC Convergence Control so that the horizontal line converges. Keep the dots in focus. Slight re-adjustment of the horizontal amplitude and phase controls may be necessary to obtain the best side-to-side convergence.

The picture should now be converged over its entire area. If any area does not appear to be converged, and it can be converged by re-adjusting the DC Convergence Control, the dynamic convergence adjustments are not at optimum setting. Touch-up adjustments should be made after it is determined what correction is needed.

LOWLIGHT, MID-RANGE, AND HIGHLIGHT ADJUSTMENTS—At this point, color purity and convergence adjustments must be completed. Connect an antenna to the receiver and tune the receiver for reception of a black and white program. If this is not available, a black and white test pattern signal can be used. See figure 7 for adjustment locations.

Turn the Color Saturation Control and Contrast Control to the minimum positions (maximum counter-clockwise). Set the Brightness Control to near its maximum position (clockwise direction). Adjust the Red, Green, and Blue Screen Controls alternately for a light grey or low-brightness white picture.

Turn the Contrast Control clockwise to about the mid-position. Adjust the Green Video Gain and Blue Video Gain controls to produce a satisfactory white picture. Then, turn the Brightness Control down (counter-clockwise) to where a picture is just visible. Adjust the Green Background and Blue Background controls for a grey picture.

The procedure in the two preceding paragraphs should be repeated until satisfactory grey-to-white pictures are seen in all positions of the Brightness and Contrast Controls.

CHASSIS TOP VIEW

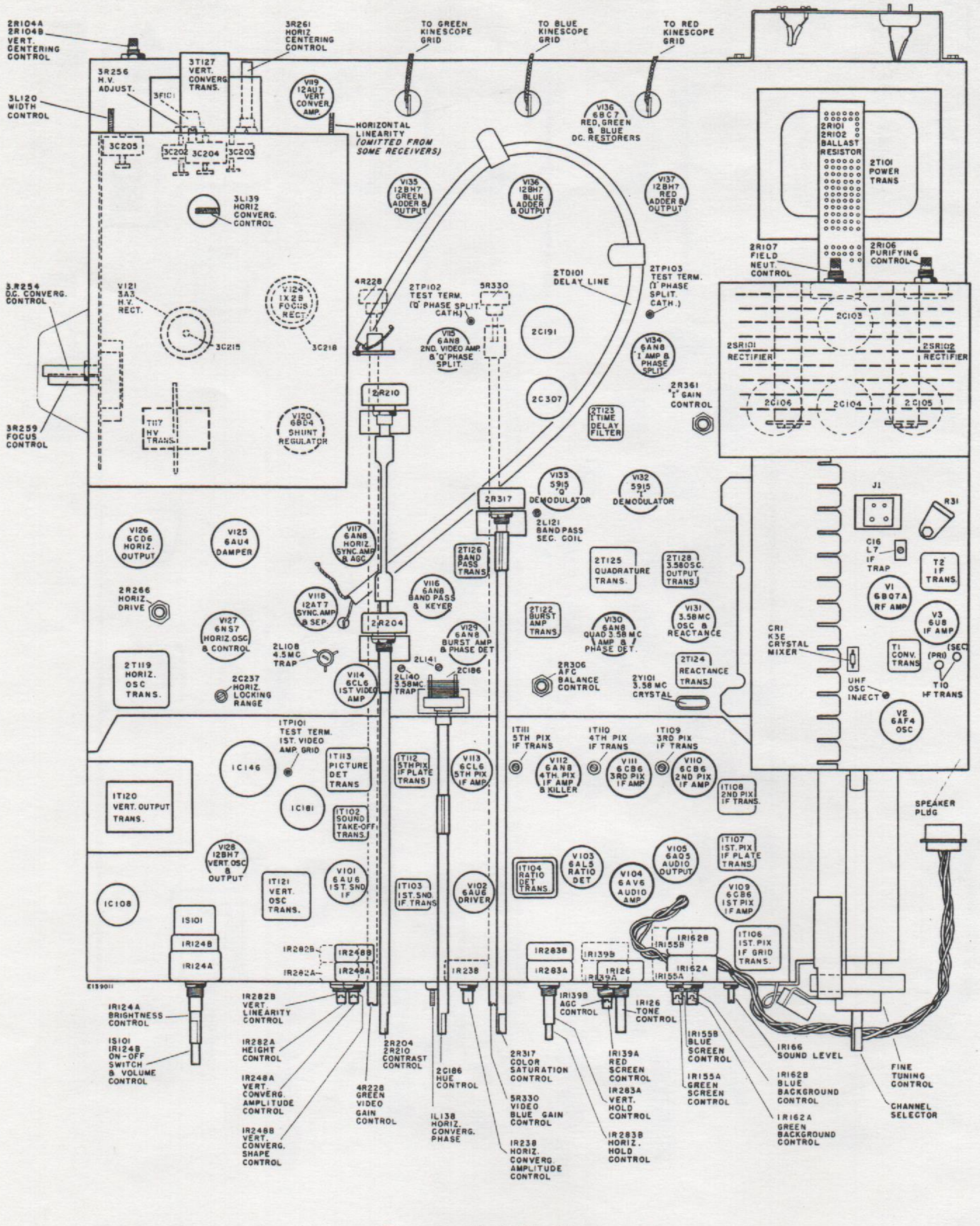


Figure 12—Chassis Top View

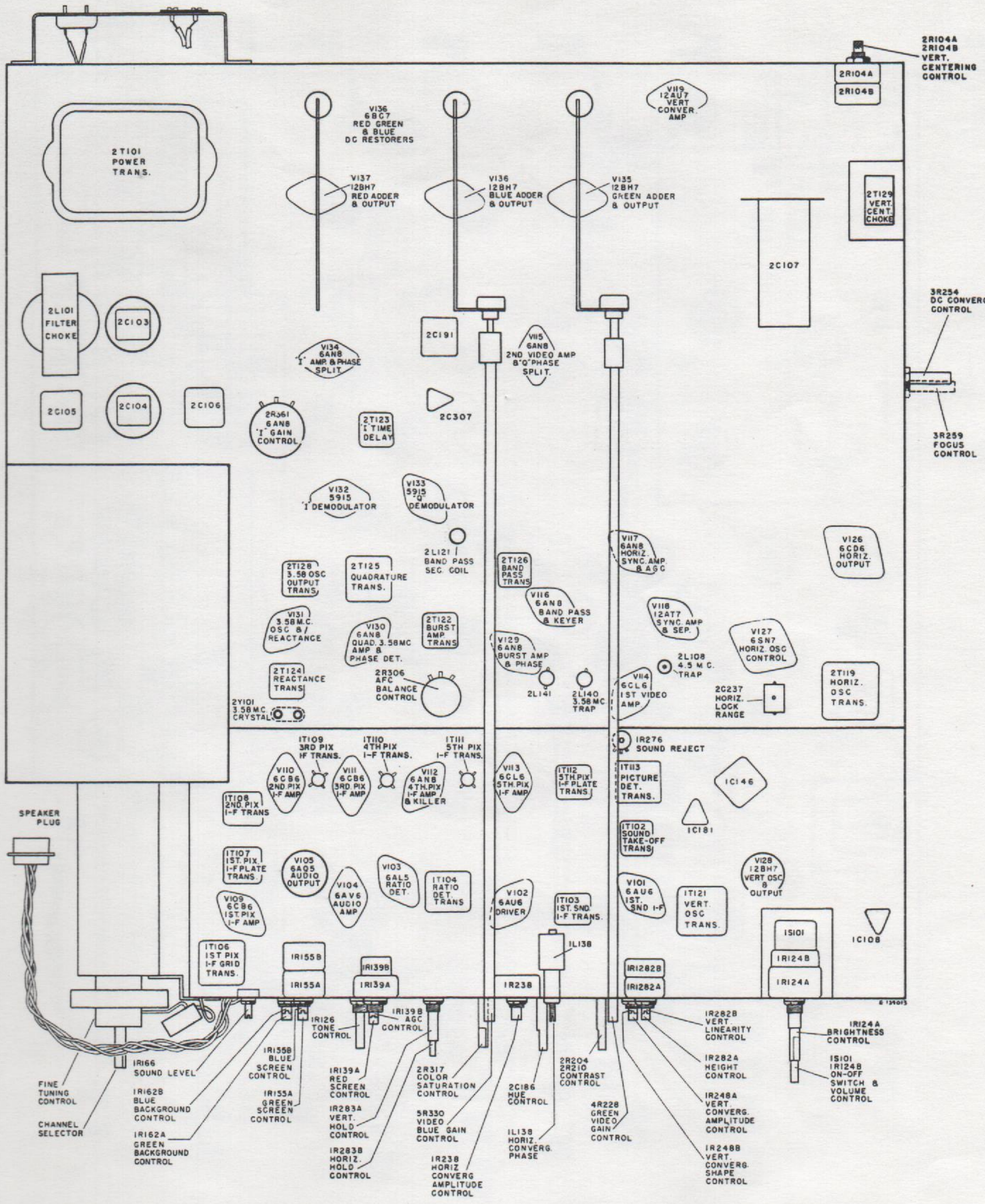


Figure 13—Chassis Bottom View

TEST EQUIPMENT—To properly service these receivers, the following test equipment, or its equivalent, may be employed.

VHF Sweep Generator meeting the following requirements:

(RCA WR59A—Modified for Video Sweep)

(a) Frequency Ranges

0 to 5 mc. Video Sweep
35 to 90 mc., 1 mc. to 12 mc. sweep width
170 to 225 mc., 12 mc. sweep width

(b) Output adjustable with at least .1 volt maximum.

(c) Output constant on all ranges.

(d) "Flat" output on all attenuator positions.

VHF Signal Generator to provide the following frequencies with crystal accuracy:

(RCA WR39C)

(a) Intermediate frequencies

4.5 mc., 39.25 mc., 41.25 mc., 42.17 mc., 43.5 mc., 45.75 mc., 47.25 mc.

(b) Radio frequencies

Channel Number	Picture Carrier Freq. Mc.	Sound Carrier Freq. Mc.	Receiver R-F Osc. Freq. Mc.
2	55.25	59.75	101
3	61.25	65.75	107
4	67.25	71.75	113
5	77.25	81.75	123
6	83.25	87.75	129
7	175.25	179.75	221
8	181.25	185.75	227
9	187.25	191.75	233
10	193.25	197.75	239
11	199.25	203.75	245
12	205.25	209.75	251
13	211.25	215.75	257

(c) Output of these ranges should be adjustable and at least .1 volt maximum.

VHF Heterodyne Frequency Meter with crystal calibrator if the signal generator is not crystal controlled.

UHF Sweep Generator with a frequency range of 470 mc. to 890 mc. RCA Types 40A or 41A or their equivalent.

UHF Signal Generator to provide the following frequencies with crystal accuracy if RCA Type 41A is used.

Channel Number	Picture Carrier Freq. Mc.	Sound Carrier Freq. Mc.	Receiver R-F Osc. Freq. Mc.
14	471.25	475.75	517
15	477.25	481.75	523
16	483.25	487.75	529
17	489.25	493.75	535
18	495.25	499.75	541
19	501.25	505.75	547
20	507.25	511.75	553
21	513.25	517.75	559
22	519.25	523.75	565
23	525.25	529.75	571
24	531.25	535.75	577
25	537.25	541.75	583
26	543.25	547.75	589
27	549.25	553.75	595
28	555.25	559.75	601
29	561.25	565.75	607
30	567.25	571.75	613
31	573.25	577.75	619
32	579.25	583.75	625
33	585.25	589.75	631
34	591.25	595.75	637
35	597.25	601.75	643
36	603.25	607.75	649
37	609.25	613.75	655
38	615.25	619.75	661
39	621.25	625.75	667
40	627.25	631.75	673
41	633.25	637.75	679
42	639.25	643.75	685
43	645.25	649.75	691
44	651.25	655.75	697
45	657.25	661.75	703
46	663.25	667.75	709
47	669.25	673.75	715
48	675.25	679.75	721
49	681.25	685.75	727
50	687.25	691.75	733
51	693.25	697.75	739
52	699.25	703.75	745
53	705.25	709.75	751
54	711.25	715.75	757
55	717.25	721.75	763
56	723.25	727.75	769
57	729.25	733.75	775
58	735.25	739.75	781
59	741.25	745.75	787
60	747.25	751.75	793
61	753.25	757.75	799
62	759.25	763.75	805
63	765.25	769.75	811
64	771.25	775.75	817
65	777.25	781.75	823
66	783.25	787.75	829
67	789.25	793.75	835
68	795.25	799.75	841
69	801.25	805.75	847
70	807.25	811.75	853
71	813.25	817.75	859
72	819.25	823.75	865
73	825.25	829.75	871
74	831.25	835.75	877
75	837.25	841.75	883
76	843.25	847.75	889
77	849.25	853.75	895
78	855.25	859.75	901
79	861.25	865.75	907
80	867.25	871.75	913
81	873.25	877.75	919
82	879.25	883.75	925
83	885.25	889.75	931

Cathode Ray Oscilloscope—An oscilloscope with a sensitivity of 1 millivolt per inch is required. A suitable preamplifier may be employed with oscilloscopes of lesser sensitivity.

Electronic Voltmeter—A voltmeter with a 1.5 volt DC scale is required. RCA Senior "VoltOhmyst" (with Diode Probe and HV Probe) or its equivalent.

"Megapix" (Kay Electric), or Equivalent—i.e. Crystal Diode Modulator Probe and RCA WR39C Crystal Calibrator.

Video Sweep Generator—Sweep Generator with a range of 0 to 5 mc. having internal markers.

Sound Attenuator Pad—Refer to figure 22 under Alignment Procedure.

VHF Attenuator Pad—Refer to figure 24 under Alignment Procedure.

IF Load and Detector Block—Refer to figure 19 under Alignment Procedure.

Tuner Unit Input Head—Refer to figure 18 under Alignment Procedure. This item is absolutely necessary for proper receiver alignment.

Wide Band Oscilloscope—"Tektronix" or its equivalent.

Simplified Color Bar Generator—See alternate method of alignment under Alignment Procedure sections on page 22.

AC-DC Voltmeter—"Simpson Model 260" with a 1N34 crystal.

Absorption Type Video Marker Box—Marker Box to provide the following frequencies and adjusted to crystal accuracy on these frequencies:

0.5 mc.; 1.5 mc.; 2.5 mc.; 3.58 mc. and 4.5 mc.

The Horizontal Deflection Circuit should be disabled by removing fuse 3F101 when performing the alignment of the Sound IF, Picture RF and IF, and Video sections of the receiver. This is done to prevent horizontal pulse interference on the oscilloscope.

SOUND IF ALIGNMENT

Connect the VHF signal generator to terminal "C" of 1T102, the SOUND TAKE-OFF TRANSFORMER, and to ground.

Connect the "VoltOhmyst" to the junction of 1R118 and 1R120, at pin 2 of V103 RATIO DETECTOR, and to ground.

Set the signal generator to 4.5 mc with maximum output and adjust 1T102 (top and bottom) and 1T103 (top and bottom), SOUND TAKE-OFF and SOUND IF TRANSFORMERS, for maximum indication on the "VoltOhmyst".

Tune the primary of the RATIO DETECTOR TRANSFORMER 1T104 (top), for maximum DC output on the "VoltOhmyst". Adjust the signal level from the signal generator for —12 volts on the "VoltOhmyst" when finally peaked. This is approximately the operating level of the ratio detector for average signals.

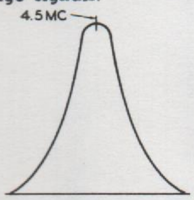


Figure 14
Sound IF
Response

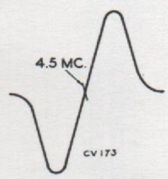


Figure 15
Ratio Det.
Response

Connect the "VoltOhmyst" to the junction of 1R119 and 1C120, ratio detector output, and to ground.

Tune 1T104 (bottom), ratio detector secondary, for zero DC on the "VoltOhmyst".

Repeat the adjustments of 1T104 (top) for maximum DC and 1T104 (bottom) for zero DC making final adjustment with the input from the signal generator adjusted to produce —12 volts on the "VoltOhmyst" at the junction of 1R118 and 1R120.

Connect a 1500 ohm resistor across terminals "B" and "C", the primary of 1T103 SOUND IF TRANSFORMER, and using the same signal output from the generator readjust 1T103 (bottom) for maximum indication on the "VoltOhmyst". Change the 1500 loading resistor to terminals "A" and "D" of 1T103 and adjust 1T103 (top) for maximum indication on the meter.

Remove the resistor, signal generator and "VoltOhmyst" from the circuit.

PICTURE IF TRANSFORMER ALIGNMENT AND TRAP ADJUSTMENTS

Connect the oscilloscope, in series with a preamplifier if required, to test point 1TP101 at the output of the picture second detector.

Connect the VHF signal generator to the grid of the 5TH PICTURE IF AMPLIFIER, pin 2 of V113, and to ground. Modulate the signal generator to provide an indication on the oscilloscope.

With a short jumper, ground the grid of the 4TH PICTURE IF AMPLIFIER, pin 8 of V112A.

Set the VHF signal generator to 47.25 mc and tune 1T112 (top), 5TH PICTURE IF PLATE TRANSFORMER, for minimum indication on the oscilloscope. (Refer to figure 39.)

Set the signal generator to 41.25 mc and tune 1T113 (top), PICTURE SECOND DETECTOR TRANSFORMER, for minimum indication on the oscilloscope.

Disconnect the signal generator and the oscilloscope preamplifier, if used, and reconnect the oscilloscope to 1TP101 as before.

Connect the VHF sweep generator, using the shortest leads possible, to the grid of the 5th picture IF amplifier, pin 2 of V113, and to ground. Set the sweep generator for maximum output or six (6) volts peak on the oscilloscope, whichever is the lowest.

Couple the signal generator loosely to the grid of the 5TH PICTURE IF AMPLIFIER in order to obtain markers.

Adjust 1T112 (bottom), 5TH PICTURE IF PLATE TRANSFORMER, (see figure 40), and 1T113 (bottom), PICTURE SECOND DETECTOR TRANSFORMER, for maximum gain and curve shape as shown in figure 16. While observing the curve shape on the oscilloscope, adjust 1R276, the SOUND REJECTION CONTROL at 1T113, for maximum rejection at 41.25 mc.

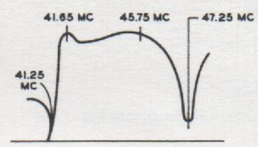


Figure 16
5th Picture
IF Response

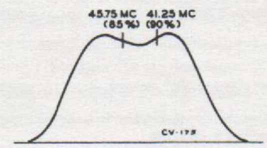


Figure 17
T1 and T10 Tuner
IF Response

Remove the sweep and signal generators, oscilloscope and the jumper shorting pin 8 of V112A.

The balance of the picture IF adjustments will be performed with the sweep or signal generators connected to the front terminal of CR1, the K3E crystal mixer, of the KRK12C tuner. Extremely short leads must be employed in connecting to the crystal mixer and in grounding to the tuner case in order to obtain reliable response curves. An "Input Head" has been designed for this purpose and should be employed to achieve proper alignment of the receiver. This "Input Head" is shown in figure 18.

Connect the signal generator to the front terminal of the crystal mixer, CR1, employing the "Input Head" mentioned above.

Obtain three 7.5 volt batteries capable of withstanding appreciable current drain and connect two of the batteries in series making a 15 volt bias supply. Connect the ends of a 1000 ohm potentiometer across the battery combination. Connect a second potentiometer across the ends of the single 7.5 volt battery. Connect the positive terminal of the 7.5 volt bias box to the chassis and the potentiometer arm to the junction of 1R178 and 1C169 (at 1T109—3rd pix IF transformer). Adjust bias box for —6 volts DC at the junction point.

With a short jumper ground the junction of 2R133 and 2R134 in the plate circuit of V117A, the AGC amplifier.

Connect the "VoltOhmyst" between test point 1TP101 and terminal "E" of 1T113, the PICTURE 2ND DETECTOR TRANSFORMER.

Set the signal generator to each of the following frequencies and peak the specified adjustment for maximum indication on the "VoltOhmyst", reduce the generator output if necessary to maintain a —6 volt level on the "VoltOhmyst", with —6 volts of IF bias at the junction of 1R178 and 1C169.

44.9 mc.	1T109 (top)
42.1 mc.	1T110 (top)
41.3 mc.	1T111 (top)

Remove the signal generator, "VoltOhmyst" and the bias box used to provide bias for alignment.

Connect the VHF sweep generator to the front terminal of the crystal mixer CR1, employing the "Input Head" as before. Clip a 56 ohm composition resistor between terminals "C" and "D" of T2, the IF TRANSFORMER on the KRK12C tuner.

Connect the "Detector" lead from the "IF Test Block" shown in figure 19, to test point TP2 on top of the tuner. Connect the oscilloscope to the "Oscilloscope" terminals on the "IF Test Block".

Couple the VHF signal generator loosely to the grid of the 1st picture IF Amplifier in order to obtain markers.

Adjust T10, primary and secondary, for maximum gain and curve shape as shown in figure 17. Use .3 volts peak to peak on the oscilloscope during adjustment.

Remove the 56 ohm load resistor, "IF Test Block", oscilloscope and the sweep and signal generators.

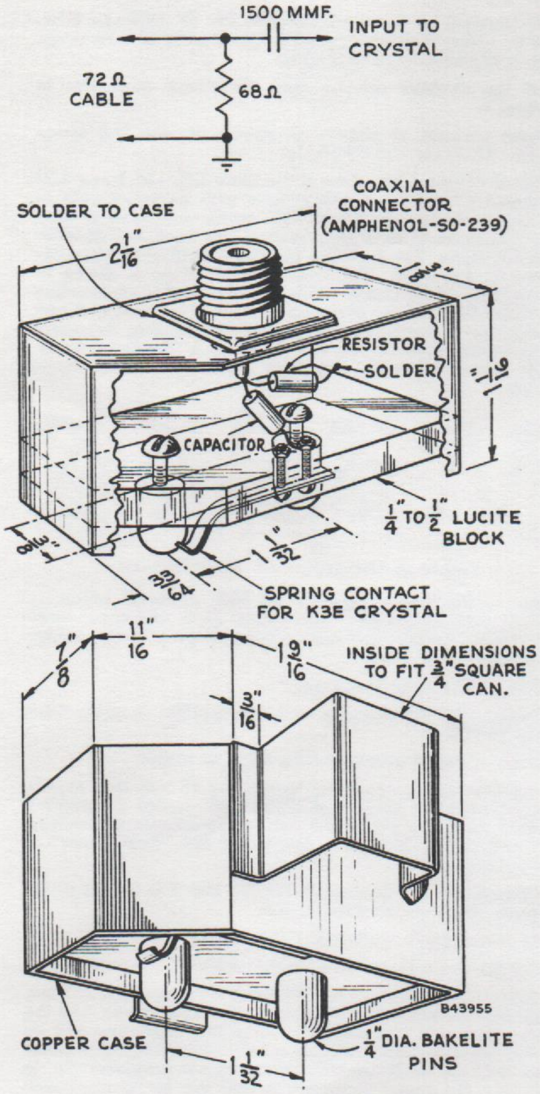


Figure 18—KRK12C Input Head

Connect the load leads from the "IF Test Block" to pin 5 of V110 and pin 5 of V111, plates of the second and third picture IF amplifiers.

Ground the IF AGC buss at the junction of 1R178 and 1C169, at 1T109, 3rd picture IF transformer.

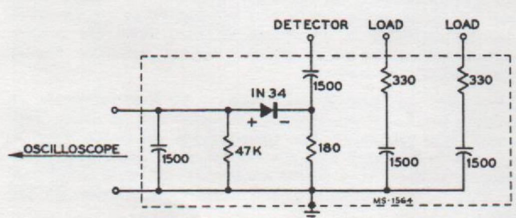


Figure 19—IF Test Block

Connect the "Detector" lead from the "IF Test Block" to the plate of the first picture IF amplifier, pin 5 of V109 and the oscilloscope, through the preamplifier if required, to the "Oscilloscope" terminals of the "IF Test Block". (Refer to figure 19.)

Connect the VHF signal generator, using the "Input Head", to the front terminal of the crystal mixer CR1. Set the signal generator to 41.25 mc and modulate the generator for indication on the oscilloscope.

Adjust 1T106 (top), 1ST PICTURE IF GRID TRANSFORMER, for minimum response on the oscilloscope at 41.25 mc.

Remove the VHF signal generator and connect the VHF sweep generator, using the "Input Head", to CR1.

Remove the oscilloscope and the preamplifier from the "IF Test Block" and reconnect the oscilloscope, without the preamplifier, to the "Oscilloscope" terminals of the "IF Test Block". Couple the VHF signal generator loosely to 1st picture IF amplifier grid in order to obtain markers.

Adjust 1T106 (bottom), 1ST PICTURE IF GRID TRANSFORMER, and T2, IF TRANSFORMER on the KRK12C tuner, for maximum gain and curve shape as shown in figure 20. Use 3 volts peak-to-peak on the oscilloscope. While observing the response on the oscilloscope, set 1R166, the SOUND LEVEL CONTROL located at terminal "D" of 1T106, for maximum rejection at 41.25 mc. See figure 20.

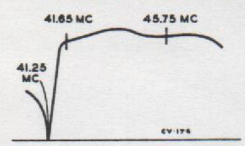


Figure 20—T2 and 1T106 Response from CR1

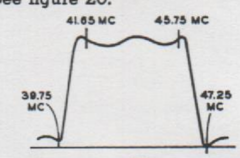


Figure 21—1T107 and 1T108 Response from CR1

Disconnect the VHF signal generator and the VHF sweep generator. Insert the preamplifier, if needed with the oscilloscope used, in series with the oscilloscope connected to the "IF Test Block".

Connect the sound attenuator pad, shown in figure 22, in series with the VHF signal generator to the front terminal of CR1, using the "Input Head". Use internal modulation of the VHF signal generator and set the generator to 43.0 mc. Note the output level on the oscilloscope at 43.0 mc. Remove the attenuator pad and reconnect the signal generator to CR1. Set the signal generator to 41.25 mc and readjust 1T106 (top) for minimum response.

Turn 1R166, SOUND LEVEL CONTROL, counter-clockwise from its maximum attenuation position just obtained, to achieve the same output indication on the oscilloscope as that obtained previously at 43.0 mc with the attenuator pad.

Disconnect the "Detector" lead of the "IF Test Block" from pin 5 of V109 and reconnect it to pin 5 of V110, 2ND PICTURE IF AMPLIFIER.

Connect the "Load" leads from the "IF Test Block" to pin 5 of V111 and pin 6 of V112A, plates of the 3rd and 4th picture IF amplifiers. Leave the oscilloscope and preamplifier connected to the "Oscilloscope" terminals of the "IF Test Block". Leave the signal generator connected to CR1.

Adjust 1T107 (top), 1ST PICTURE IF PLATE TRANSFORMER, for minimum response at 39.75 mc. Adjust 1T108 (top), 2ND PICTURE IF GRID TRANSFORMER, for minimum response at 47.25 mc.

Remove the jumper from the junction of 1R178 and 1C169 and connect the negative terminal of the 15 volt bias box to this point. Adjust the bias potentiometer to read —6 volts DC at the junction of 1R178 and 1C169. With the jumper, short the junction of 2R133 and 2R134, in the plate circuit of V117A AGC Amplifier, to ground.

Remove the signal generator from CR1, and connect the sweep generator to CR1 using the "Input Head". Remove the oscilloscope preamplifier and reconnect the oscilloscope directly to the "Oscilloscope" terminals of the "IF Test Block".

Couple the signal generator loosely to the 1st picture IF amplifier grid in order to obtain markers.

Adjust 1T107 (bottom), 1ST PICTURE IF PLATE TRANSFORMER, and 1T108 (bottom), 2ND PICTURE IF GRID TRANSFORMER, for maximum gain and curve shape as shown in figure 21.

Remove the "IF Test Block" and the oscilloscope.

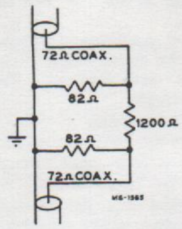


Figure 22—Sound Attenuator Pad

OVER-ALL IF ALIGNMENT

Change the IF bias at the junction of 1R178 and 1C169 to read —9 volts DC on the "VoltOhmyst".

Connect the oscilloscope to test point 1TP101, at picture second detector output, and calibrate the oscilloscope to read 6 volts peak to peak.

Connect the sweep generator, using the "Input Head", to the front terminal of the crystal mixer CR1.

Couple the signal generator loosely to 1st picture IF amplifier grid in order to obtain markers.

Retouch 1T109, 1T110 and 1T111, 3rd, 4th and 5th picture IF transformers, for maximum gain and overall curve shape as shown in figure 23. It is important that the overall response conforms to curve shape as shown, with the markers placed exactly as indicated.

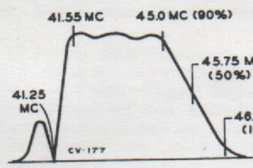


Figure 23—Overall IF Response

KRK12C TUNER ALIGNMENT

TUNER VHF ALIGNMENT—Connect the VHF sweep generator to the antenna terminals. In order to prevent coupling reaction from the sweep generator, it is advisable to employ a resistance pad between the antenna terminals and the generator. Figure 24 shows three different resistance pads for use with sweep generators with 50 ohm co-ax output, 72 ohm co-ax output or 300 ohm balanced output. Choose the pad to match the output impedance of the particular sweep generator employed.

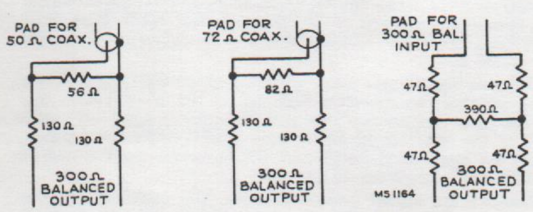


Figure 24—Sweep Attenuator Pads

Couple the VHF signal generator loosely to the antenna terminals. Connect the oscilloscope through the preamplifier, if needed with oscilloscope used, to test point TP1. Connect the potentiometer arm of the 7.5 volt bias supply to the AGC terminal on the tuner and ground the battery positive terminal to the tuner case. Adjust the bias potentiometer to produce —2.0 volts of bias as measured by the "VoltOhmyst" at the AGC terminal on the tuner. Remove V2, RF oscillator tube, from its socket. This is required because of RF-IF interaction when a crystal is used as a mixer.

Set the channel selector and the sweep generator to channel 2.

Insert markers of channel 2 picture carrier and sound carrier, 55.25 mc and 59.75 mc.

Adjust antenna T6, r-f amplifier plate L29 and mixer L30 adjustments for a symmetrical curve with maximum gain at the center of the pass band. The curves will have a deep valley because of no crystal loading and nonlinear detector characteristics. The limits for the 100% response points are shown in figure 25. The proper curve shape is shown in figure 25(b). (Refer to note on page 22 for detailed explanation of adjustments.) If the bandwidth is out of tolerance, it can usually be corrected by redressing the coupling capacitor of the double tuned circuit, C40 on insert A. Maximum bandwidth occurs when the capacitor is centered in the insert chamber.

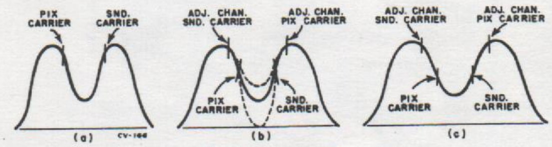


Figure 25—KRK12C VHF Insert Response

Repeat the above steps for all VHF channels adjusting the appropriate antenna, r-f amplifier plate and mixer slugs for a symmetrical curve with maximum gain at the center of the pass band.

Turn off the sweep generator.

Remove the oscilloscope and preamplifier if used, from test point TP1.

Replace the RF oscillator tube V2 in its socket.

Connect the potentiometer arm of the 15 volt bias supply to the junction of 1R178 and 1C169, and ground the positive battery terminal. Adjust the bias potentiometer to produce —9 volts of I-F bias as indicated on the "VoltOhmyst" at the junction point.

Connect the oscilloscope to 1TP101. Use 3 to 5 volts peak-to-peak output on the oscilloscope.

Turn the channel selector to channel 13.

Set the fine tuning control to the center of its range.

Adjust the oscillator slug L22 to proper frequency, 257 mc. This may be done in several ways. The easiest way and the way which will be recommended in this procedure will be to use the signal generator as a heterodyne frequency meter and beat the oscillator against the signal generator. To do this tune the signal generator to 257 mc (or to one-fourth the oscillator frequency, 64.25 mc) with crystal accuracy. Insert one end of a piece of insulated wire into the tuner through either of the two holes next to the oscillator tube on the right front top corner of the tuner. Be careful that the wire does not touch any of the tuned circuits as it may cause the frequency of the oscillator to shift. Connect the other end of the wire to the "r-f in" terminal of the signal generator. Adjust L22 oscillator slug to obtain an audio beat with the signal generator.

Turn on the sweep generator and set to channel 13. Adjust T1 for maximum gain on the oscilloscope. Adjust mixer tank circuit L21 for maximum gain and flat-topped curve. Recheck T1 for maximum gain at center of band with the proper response. Maximum gain and flat-topped response should be obtained simultaneously.

Adjust the oscillator to frequency on all VHF channels by switching the receiver and signal generator to each VHF channel and adjusting the appropriate oscillator slug to obtain an audio beat with the signal generator. Adjust the appropriate mixer slug where necessary to obtain maximum gain and proper curve shape as explained above. Do not readjust T1.

Adjust the tunable I-F Trap C16-L7. To do this connect the signal generator to the fixed I-F Trap C2-L2 at the end opposite the antenna terminal plug. Set the signal generator to 43.5 mc and adjust the output of the signal generator to obtain sufficient indication on the oscilloscope. Tune the I-F Trap C16-L7 for minimum indication on the oscilloscope.

Remove the signal generator and the oscilloscope.

TUNER UHF ALIGNMENT.—To align the UHF inserts:

Remove the R-F oscillator tube V2 from its socket.

Connect the potentiometer arm of the 7.5 volt bias supply to the AGC terminal on the tuner and ground the battery positive terminal to the tuner case. Adjust the bias potentiometer to produce —2.0 volts of bias, as measured by the "VoltOhmyst" at the AGC terminal on the tuner. With a short jumper, ground the junction of 2R133 and 2R134, in the plate circuit of V117A.

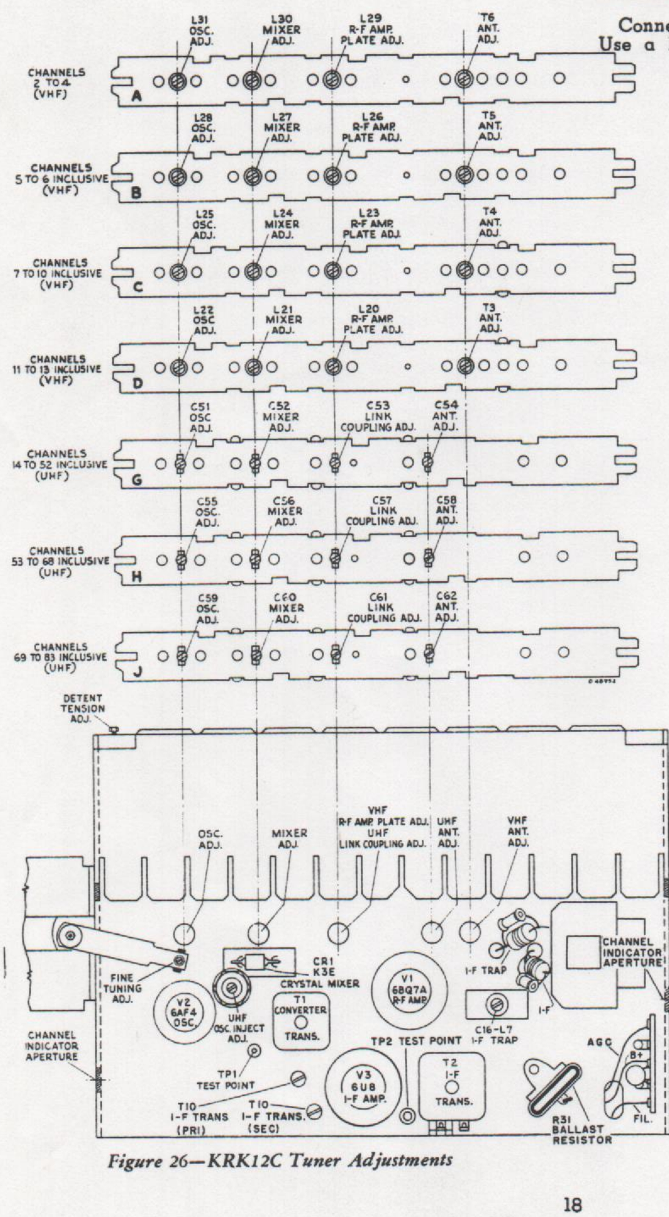


Figure 26—KRK12C Tuner Adjustments

Connect the potentiometer arm of the 15 volt bias supply to the junction point of 1R178 and 1C169, and ground the positive battery terminal. Adjust the bias potentiometer to produce —9 volts of I-F bias as indicated on the "VoltOhmyst" at the junction point.

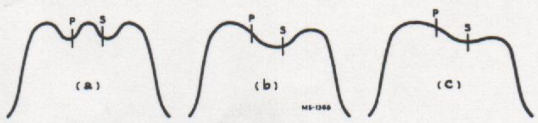


Figure 27—KRK12C UHF Insert Responses

Connect the oscilloscope, through the preamplifier if needed with oscilloscope used, to test point TP1.

Connect the UHF sweep generator to the antenna terminals. Use a 10DB attenuator pad to assure proper alignment.

Connect the UHF signal generator loosely to the antenna terminals.

Set the channel selector to the desired channel and the sweep generator to sweep the frequency of the insert being used.

Insert markers of the picture carrier and sound carrier frequencies for the desired channel (see Table on page 14).

Adjust the UHF antenna, link coupling and mixer adjustments for a symmetrical curve, with maximum gain centered about the pass band.

The responses are shown in figure 27. The curve shape will usually vary from figure 27(a) to figure 27(c) going higher in frequency; however any of these responses are acceptable.

Repeat the above steps for all UHF inserts used, adjusting the appropriate antenna, link coupling and mixer slugs for a symmetrical curve with maximum gain centered about the pass band.

Remove the oscilloscope and preamplifier, if used from test point TP1.

Replace the RF oscillator tube V2 in its socket.

Connect the oscilloscope to test point 1TP101. Use 6 volts peak-to-peak on the oscilloscope.

Turn the channel selector to the lowest UHF channel to be used, and set the fine tuning control to the center of its range.

Adjust the oscillator core to proper frequency. To do this, connect the VHF signal generator to test point TP1 with the shortest leads possible. Insert a 45.75 mc marker from the VHF generator.

Set the UHF sweep generator to sweep the desired channel, and observe the output on the oscilloscope. If the sweep generator is not sweeping the correct frequency range, it may be necessary to readjust the sweep in order to place the 45.75 mc marker on the response curve as in Figure 23.

Set the UHF marker generator to the picture carrier of the channel insert being adjusted and connect to test point TP1.

Adjust the oscillator core until the markers for 45.75 mc and the picture carrier coincide on the sweep pattern on the oscilloscope.

Adjust the mixer core for maximum gain with proper wave shape.

Connect the "VoltOhmyst" to test point TP1, using 1.5 volt DC scale.

Set the oscillator injection adjustment to read .1 volt on the "VoltOhmyst".

Repeat the above steps for all UHF inserts adjusting the oscillator injection control only if the reading on the "VoltOhmyst" exceeds .3 volts. Adjust as necessary to read .3 volts or less at TP1.

Remove all the test equipment employed for tuner alignment.

VIDEO TRAP ADJUSTMENT

Short the grid, pin 2 of V113, 5TH PICTURE IF AMPLIFIER, with a short jumper to ground.

Ground the junction of 2R310 and 2C259, in the plate circuit of V112B Killer, with a short jumper.

Connect the VHF signal generator to the grid of the 1st Video Amplifier, pin 2 of V114, and set the generator to 4.5 mc with internal modulation of the generator.

Connect the oscilloscope, using the oscilloscope diode probe, to the plate of the Band Pass Amplifier, pin 6 of V116A.

Turn the ganged contrast control 2R204/2R210 to the maximum clockwise position.

Adjust 2L108, the 4.5 mc trap in the cathode circuit of V114, 1st Video Amplifier, for minimum 4.5 mc indication on the oscilloscope.

Remove the two jumpers, the oscilloscope and the signal generator.

(NTSC Color Bar Signal Being Received)

Connect the wide band oscilloscope to the kinescope grids at the terminals on the rear of the chassis and adjust 2L140, the 3.58 mc trap for minimum color sub-carrier indication in the video signal.

(Alternate Method without NTSC Signal and Wide Band Oscilloscope)

Disconnect the lead to pin 2 of V114, the 1st Video Amplifier Grid at the tube socket. This will prevent noise from the second detector appearing on the oscilloscope presentations to be observed.

Connect the sweep generator, in series with the absorption type video marker box, to the grid of the 1st Video Amplifier. Set for Video Sweep; i.e. 0-5 mc.

Connect the oscilloscope, using the diode probe, to the junction of 2L112, 2R216 and 4R224 (plate circuit of V115A—2nd Video Amplifier) at the peaking coil 2L112.

Increase the sweep output to raise the 3.58 mc. portion of the trace on the oscilloscope above the base line.

Adjust 2L140, the 3.58 mc. trap to coincide with the 3.58 mc marker from the marker box. See figure 28.

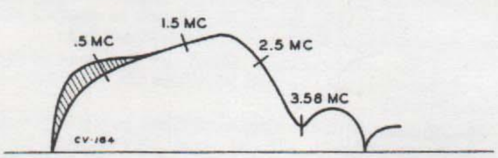


Figure 28—3.58 MC Trap Adjustment

At this point it is advisable to check for proper overall response to kinescope grids and "I" and "Q" channel responses. (*Although* these circuits are not adjustable their proper operation can be determined by observing their responses.)

Disable the 3.58 mc. oscillator, V131 B, by removing 2Y101, the 3.58 mc. crystal.

Connect the oscilloscope, using the diode probe, to each of the kinescope grids and check the response. Reduce the output of the sweep generator to prevent *over load.* The response should correspond to the curve shown in figure 29.

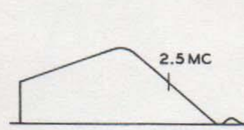


Figure 29—Overall Response at Kine Grids

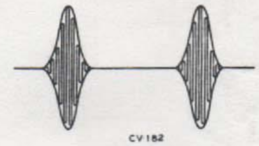


Figure 30—Burst

Move the oscilloscope and diode probe to the test point 2TP103 at the "I" Phase Splitter cathode.

Connect the sweep generator to the "I" Demodulator grid, pin 1 of V132, and move the oscilloscope and diode probe to test point 2TP102, at the "Q" Phase Splitter cathode.

Check the "I" channel response for proper wave shape as shown in figure 31.

Figure 31—"I" and "Q" Channel Responses

Connect the sweep generator to the "Q" Demodulator grid, pin 1 of V133. Check the "Q" channel response as shown in figure 31.

Replace 2Y101, the 3.58 mc. crystal. Remove the sweep generator and marker box and the oscilloscope and diode probe. Restore the connection to pin 2 of V114.

1ST VIDEO AMPLIFIER AND BAND PASS AMPLIFIER ALIGNMENT

(Using "Megapix")

Set the channel selector to channel 4.

Connect the potentiometer arm of the 7.5 volt bias supply to the junction of 1R132 and 1C128, at pins 5 and 6 of V104 1st Audio Amplifier and RF Bias clamp, and ground the positive terminal of the bias supply to the chassis. Set the potentiometer to read −2.0 volts DC on the "VoltOhmyst" at the junction of 1R132 and 1C128.

Connect the potentiometer arm of the 15 volt bias supply to the IF bias buss at the junction of 1R178 and 1C169, and ground the positive terminal of the bias supply to the chassis. Set the potentiometer to read −9.0 volts DC on the "VoltOhmyst" at the junction of 1R178 and 1C169.

Short the terminals of 2L108, the 4.5 mc trap in the cathode circuit of V114, to each other.

Connect the oscilloscope, using the oscilloscope diode probe, to pin 1 of V114, the 1st Video Amplifier.

Connect the "Megapix" to the antenna terminals and set to channel 4. With zero modulation, adjust the output for 3 volts on the "VoltOhmyst" between test point 1TP101, and terminal "E" of 1T113, the second detector transformer.

Modulate with video sweep being careful not to overload.

Couple the VHF signal generator loosely to the 1st picture IF Amplifier grid, and adjust for a 45.75 mc marker.

Adjust the fine tuning control to obtain a beat pattern on the oscilloscope. This sets the oscillator exactly on frequency.

Remove the marker generator from 1st pix IF Amplifier grid.

The response on the oscilloscope should correspond to that shown in figure 32.

Disconnect the oscilloscope and diode probe from pin 1 of V114 and reconnect the oscilloscope, using the diode probe, to pin 2 of V133, the "Q" Demodulator.

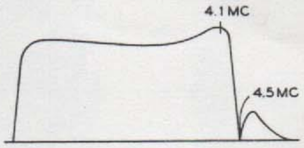


Figure 32—
Overall Response
1st Video

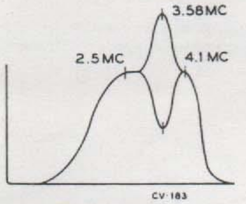


Figure 33—
Overall Band Pass
Response

Remove the short across 2L108 the 4.5 mc trap, at pin 1 of V114.

With a short jumper, ground the junction of 2R310 and 2C259 in the plate circuit of the killer V112B.

Turn the ganged contrast control 2R204/2R210, to its maximum clockwise position.

Adjust 2T126 (top and bottom), the Band Pass Transformer and 2L121 (top), the Band Pass Secondary Coil, for maximum gain and curve shape as shown in figure 33.

NOTE: When using a video sweep generator without internal markers, the VHF signal generator may be employed by loosely coupling to the IF Amplifier and inserting the appropriate IF markers.

Remove the test equipment employed in the preceding adjustments. Replace the fuse 3F101.

(Alternate Method without using "Megapix")

Disconnect the lead to pin 2 of V114, 1st VIDEO AMPLIFIER GRID, at the tube socket. Connect the sweep generator to pin 2 of V114, in series with the absorption marker box. Set the generator for Video Sweep; i.e. 0-5 mc. Connect the oscilloscope, using diode probe, to pin 1 of V133, grid of the "Q" Demodulator.

Turn the Contrast control 2R204/2R210 and the Color Saturation control 2R317 to their maximum clockwise position.

Adjust the Band Pass Transformer 21T126 (top and bottom) and 2L121 (top) the Band Pass Secondary Coil, for maximum gain and curve shape as shown in figure 33.

Remove all test equipment. Restore the connection to pin 2 of V114. Replace the fuse 3F101.

HORIZONTAL OSCILLATOR ADJUSTMENT

The proper functioning of those circuits employing horizontal pulse voltages in their operation, are dependent on the adjustment of the Horizontal Oscillator (and Horizontal Deflection) circuit. Also, proper adjustment of these circuits, establishes the proper DC current drain for the receiver. Therefore, care should be taken to assure correct circuit adjustment as outlined below.

Tune in a station and synchronize the picture with the horizontal hold control 1R283B.

Preset the horizontal drive control 2R266, on top of the receiver chassis, to the point where the white foldover just disappears from the raster. Set the horizontal locking range trimmer 2C237, on top of the receiver chassis, one-quarter turn from tight. Set the width control 3L120, on the rear of the H.V. compartment, with the adjusting screw approximately two-thirds of the way out.

Set the horizontal hold control 1R283B at the center of its range.

Adjust the horizontal frequency core 2T119 (top), if necessary, to bring the picture into sync horizontally.

Connect the oscilloscope to terminal "C" of 2T119 under the chassis. Adjust waveform 2T119 (bottom) for proper wave shape as shown in figure 34.

Adjust the waveform adjustment core of 2T119 until the two peaks are at the same height. During this adjustment, the picture must be kept in sync by readjusting the hold control if necessary.

This adjustment is very important for correct operation of the circuit. If the broad peak of the wave on the oscilloscope is lower than the sharp peak, the noise immunity becomes poorer, the stabilizing effect of the tuned circuit is reduced and drift of the oscillator becomes more serious. On the other hand, if the broad peak is higher than the sharp peak, the oscillator is over-stabilized, the pull-in range becomes inadequate and the broad peak can cause double triggering of the oscillator when the hold control approaches the clockwise position.

Remove the oscilloscope upon completion of this adjustment.

Set the horizontal hold control to the full counter-clockwise position. Momentarily remove the signal by switching off channel then back. The picture may remain in sync. If so turn the frequency core of 2T119 (top) slightly and momentarily switch off channel. Repeat until the picture falls out of sync with the diagonal lines sloping down to the left. Slowly turn the horizontal hold control clockwise and note the least number of diagonal bars obtained just before the picture pulls into sync.

If more than 3 bars are present just before the picture pulls into sync. adjust the horizontal locking range trimmer 2C237 slightly clockwise. If less than 2 bars are present, adjust 2C237 slightly counter-clockwise. Turn the horizontal hold control counter-clockwise, momentarily remove the signal and recheck the number of bars present at the pull-in point. Repeat this procedure until 2 or 3 bars are present.

Turn the horizontal hold control to the maximum clockwise position. Adjust the frequency core 2T119 (top) so that the diagonal bar sloping down to the right appears on the screen and then reverse the direction of adjustment so that bar just moves off the screen leaving the picture in synchronization.

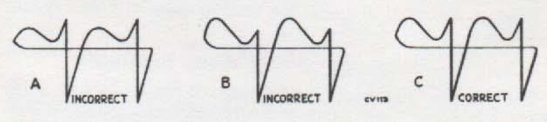


Figure 34—Horizontal Oscillator Waveforms

H.V. ADJUSTMENT

Turn both the ganged contrast control 2R204/2R210 and the brightness control 1R124A fully counter-clockwise.

Fasten a short length of HV anode lead to the HV probe of the "VoltOhmyst" and set the "VoltOhmyst" for a 20 KV reading.

Fasten the other end of the short HV anode lead to the corona cup on the base of V121 the HV rectifier. This point is accessible through the hole provided on top of the H.V. compartment for adjustment of 3L139, the Horizontal Dynamic Convergence Adjustment.

Set the H.V. adjustment 3R256, on the rear of the HV compartment, to produce a reading of 19.5 KV on the "VoltOhmyst".

Turn the contrast control 2R204/2R210 and the brightness control 1R124A clockwise until a picture is obtained on the kinescope.

Adjust the focus control 3R259 (lower control on left side of chassis) for best kinescope focus. Adjust the convergence control 3R254 (upper control on left side of chassis) for best convergence in the center area of the kinescope.

Adjust the width control 3L120, on the rear of the HV compartment, to horizontally overscan the viewing area by one-half inch.

Set the horizontal drive control 2R266 on top of the chassis as high as possible without white foldover appearing in the raster.

Re-check the operation of the horizontal hold control (1R283B) to assure that the operation is still proper as previously determined by horizontal oscillator adjustment.

NOTE: To check the performance of the HV circuit, a reading should be taken of V120 the 6BD4 regulator current. Insert a meter in the cathode circuit of the 6BD4. A reading of at least 600 microamperes should be obtained with 19.5 KV of Ultor Anode voltage.

Replacement of the fuse 3F101 should be made only with a 250 MA Type AG fuse.

Adjust the height (1R282A) and the vertical linearity (1R282B) for vertical linearity of the picture making the final adjustments to provide vertical overscan of the viewing area by one-half inch.

Remove all test equipment used in the preceding adjustments.

COLOR AFC ALIGNMENT

An NTSC color bar signal should be tuned in on the receiver for AFC alignment.

Connect the "VoltOhmyst" in series with a calibrated RF Probe (or the Wide Band Oscilloscope) to terminal "C" of 2T128, the 3.58 mc oscillator transformer. (A "Simpson" meter in series with a 1N34 crystal may be used here. Read 2.5 volts DC.)

Adjust 2T128 (top) to read 5 volts peak-to-peak on the "VoltOhmyst" or the oscilloscope.

Ground the grid of the burst amplifier, pin 8 of V129 A, with a short jumper.

Connect the "VoltOhmyst" to pins 1-2 of the phase detector V130B.

Adjust the quadrature transformer 2T125 (top), for minimum DC reading on the "VoltOhmyst", then adjust 2T125 (bottom) for maximum DC reading on the "VoltOhmyst".

Remove the jumper shorting the grid (pin 8) of the burst amplifier V129A and set the HUE control to the center of its range.

Adjust 2L141 (top) and the burst amplifier transformer 2T122 (bottom) for maximum DC on the "VoltOhmyst". The burst amplifier transformer 2T122 will tune very broadly and seem to have a flat top. Adjust 2T122 for the maximum reading at the approximate center of the flat top.

NOTE: The Burst signal should be observed at this point. To do this, connect the wideband oscilloscope to pins 1-2 of the phase detector V130B. Check the burst signal, it should conform to figure 30. Remove the oscilloscope.

Ground the junction of 2L130, 2R340 and 2C275 (in the grid circuit of V131A reactance tube).

Connect the "VoltOhmyst" to pins 1-2 of V130B phase detector and carefully adjust 2T124 (top), Reactance Transformer, for zero beat on the output, which may be observed by a slow swing of the "VoltOhmyst". (Observation may also be made on an oscilloscope or on the kinescope grid.)

Remove the short to ground at the junction of 2L130, 2R340 and 2C275 and connect the "VoltOhmyst" to this point.

Shunt the 3.58 mc crystal 2Y101 with a 15 mmf. capacitor.

Adjust the AFC Balance Control 2R306 on top of the receiver chassis for zero reading on the "VoltOhmyst".

Remove the 15 mmf. capacitor shunting the crystal 2Y101 and disconnect the "VoltOhmyst".

DYNAMIC CONVERGENCE CIRCUIT ALIGNMENT

HORIZONTAL—Clip the oscilloscope probe on the insulated lead to pin 13 of the kinescope socket.

Connect a clip lead to the same lead to pin 13 of the Kinescope socket to supply a triggering signal for the oscilloscope.

Turn the vertical convergence amplitude control 1R248A fully counter-clockwise. Set the vertical convergence shape control 1R248B to the center of its range. Turn the horizontal convergence amplitude control 1R238 fully clockwise.

Adjust the horizontal convergence phase control, 1L138 on the front panel of the chassis, for maximum sine wave output on the oscilloscope, as shown in figure 35.

Turn the horizontal convergence amplitude control 1R238 fully counter-clockwise. Adjust the horizontal dynamic convergence adjustment 3L139 on top of the HV compartment for correct phasing of minimum waveform.

The horizontal pulse will appear on top of the sine wave as shown in figure 35.

Turn the horizontal convergence amplitude control 1R238 to its maximum clockwise position and adjust the horizontal convergence phase control 1L138 for correct phasing as above. See figure 35.

Return the horizontal convergence amplitude control 1R238 to its full counter-clockwise position.

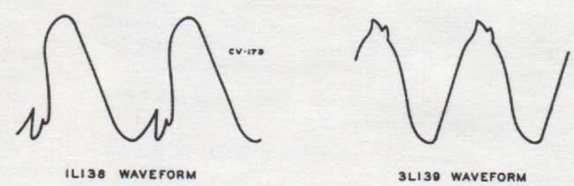


Figure 35—Horizontal Dynamic Convergence Waveforms

VERTICAL—Connect the oscilloscope to the output plate of the vertical convergence amplifier, pin 1 of V119. Adjust the vertical convergence amplitude control 1R248A and the vertical convergence shape control 1R248B for the wave shape shown in figure 36(b).

The amplitude control varies the amplitude of the parabola from 0 to 200 volts peak to peak. The shape control varies the amount of negative or positive sawtooth to the parabola. Make the final adjustment to conform to the waveform in figure 36(b).

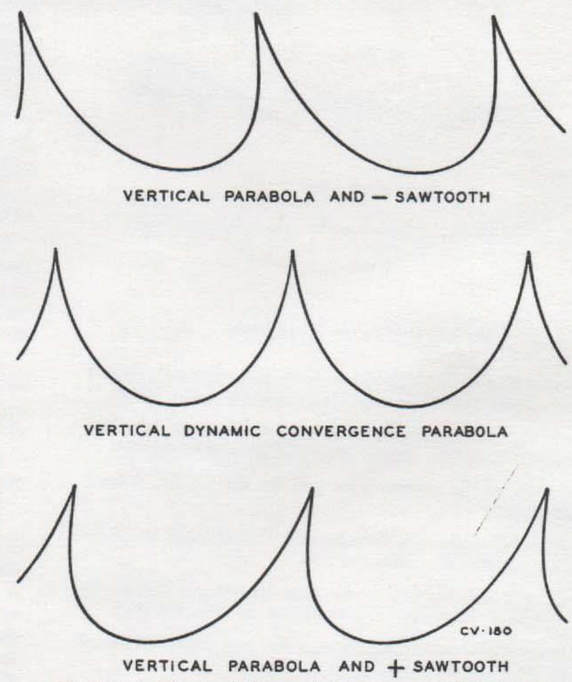


Figure 36—Vertical Dynamic Convergence Waveform

Clip the oscilloscope probe on the insulated lead to pin 13 of the kinescope. The waveform obtained should conform to that shown in figure 37.

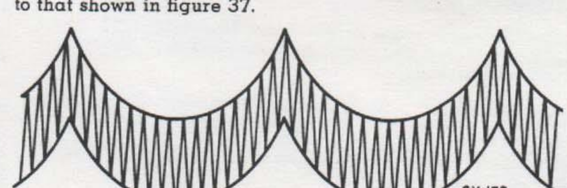


Figure 37—Composite Dynamic Convergence Parabola

Return the vertical convergence amplitude control to minimum.

Disconnect the oscilloscope from the kinescope convergence lead.

ALIGNMENT PROCEDURE

MATRIX ALIGNMENT

(NTSC Color Bar Signal)

The matrixing adjustment should be made only after the completion of the receiver alignment and H.V. Adjustment are completed, with the receiver tuned for an NTSC color bar signal from the station (or provided from another source).

Adjust the contrast control 2R204/2R210 and the Color Saturation control 2R317 to mid-range.

Connect the oscilloscope to test point 2TP103, at the "I" Phase Splitter cathode.

Trigger the Oscilloscope at the horizontal sweep rate by clipping the lead from the oscilloscope to the insulated lead coming from pin 8 of the yoke plug 3P105B.

The signal on the oscilloscope will be the +"I" signal. (See figure 38.)

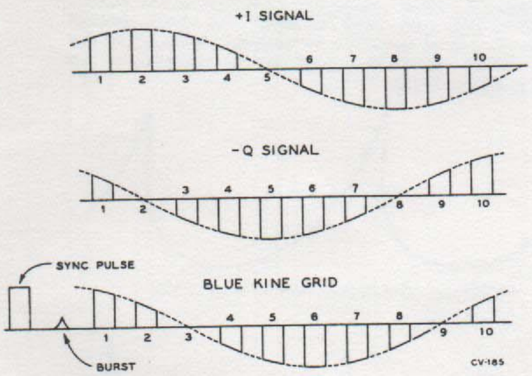


Figure 38—Matrix Waveforms

Adjust the Hue control 2C186, for correct waveform, which will be the point where the "Q" bar is on the "Zero" axis.

Change the oscilloscope to test point 2TP102, at the "Q" Phase Splitter cathode, trigger the oscilloscope as before.

The signal on the oscilloscope will be the —"Q" signal. (See figure 38.)

Adjust the Quadrature transformer (2T125 top) to place the "I" bar on the zero axis.

Connect the oscilloscope to the blue kinescope grid at the terminal on the rear edge of the chassis. (See figure 39.)

Adjust the Color Saturation control for best cancellation of the green and yellow bars. (Zero base line.)

Adjust the "I" Gain Control for best cancellation of Red.

Repeat the adjustment for green, yellow and red to achieve best cancellation.

Connect the oscilloscope to the green kinescope grid, at rear chassis terminal, and check the cancellation of the red, magenta and blue bars.

Connect the oscilloscope to the red kinescope grid and check the cancellation of the green, blue and cyan bars.

Repeat the matrixing adjustments until the best overall cancellation is obtained.

(Alternate Method for Matrix Alignment Employing Simplified Color Bar Generator)

Turn the color bar generator "on", and connect the "VoltOhmyst" to the metering terminals. Set the metering switch to the "3.58" position and adjust the 3.58 amplitude control for a 1.5 volt reading on the "VoltOhmyst". Set the metering switch to the "sync" position and adjust the sync amplitude control for a reading of 1.5 volts on the "VoltOhmyst" from the metering terminals.

Connect the output of the color bar generator to the receiver input terminals. Turn the channel selector to channel 3 or 4 (whichever crystal has been supplied with the generator) and adjust the "Horizontal Frequency" control of the generator until the bar pattern synchronizes on the kinescope.

Adjust the Fine Tuning control until the picture on the oscilloscope shows no sound interference. Advance the Color Saturation control 2R317, until color appears in the bar pattern. If the width and horizontal drive controls are properly adjusted (as explained in Installation Instructions) 10 color bars will be seen on the kinescope.

Connect the oscilloscope to test point 2TP103, "I" Phase Splitter cathode, the signal on the oscilloscope will be the +"I" signal. (See figure 38.)

Adjust the Hue control, 2C186, until the 5th bar from "Burst" is at the zero axis.

Connect the oscilloscope to 2TP102, "Q" Phase Splitter cathode, and check the pattern. This will be the —"Q" signal on the oscilloscope. The 2nd and 8th bars from burst should be at the zero axis. If not, adjust 2T125 (top) Quadrature Transformer, to bring the 2nd and 8th bars to the zero axis.

Connect the oscilloscope to the blue kinescope grid, pin 18, at the terminal at the rear of the chassis. (See figure 38.) Adjust the Color Saturation control to make the 6th bar the same amplitude as the sync pulse (in the opposite polarity).

Adjust the "I" Gain control until the 3rd and 9th bars are at the zero axis.

Move the oscilloscope to the red kinescope grid, pin 3, at the terminal at the chassis rear. The pattern on the oscilloscope should show the 9th bar to be approximately one-half the height of the sync pulse, the 6th bar should be at the zero axis.

Move the oscilloscope to the green kinescope grid, pin 8, at the terminal at the chassis rear. The pattern should show the 4th bar to be approximately one-third the height of the sync pulse and the 7th bar should be at the zero axis.

Remove all test equipment upon completion of the matrixing alignment.

NOTE ON KRK12C TUNER ALIGNMENT.—The use of a crystal mixer in the KRK12C Tuner makes it necessary to observe the insert responses with the oscillator disabled. This is due to undesirable r-f/i-f interaction if the oscillator was allowed to operate during alignment. Therefore, the responses shown in figure 25 are not a strictly true representation of the insert band pass during actual operation. When an insert is aligned, using an oscilloscope to observe the response, the curve shown in figure 25(b) will be the correct response for reference. In actual operation, the band pass will be such that the sound and picture carriers will be at the tips of the curve. The adjacent channel picture and sound carriers will be in the valleys at each side. Care should be taken not to exceed the limits shown in figures 25(a) and 25(c).

The valley, in the center of the response curve, may vary from 0 to 50% above the base line for VHF inserts. Adjust the output level of the sweep generator to prevent excessive signal input to the tuner. Excessive signal input will be indicated by the valley rising above the 50% level, particularly on the higher VHF channels.

Oscillator injection voltage is not adjusted on VHF inserts. A check may indicate variations from .08 to .3 volts at TP1 but such readings should not be interpreted as an indication of trouble. On UHF channels, however, the injection voltage should be adjusted to fall within the specified limits.

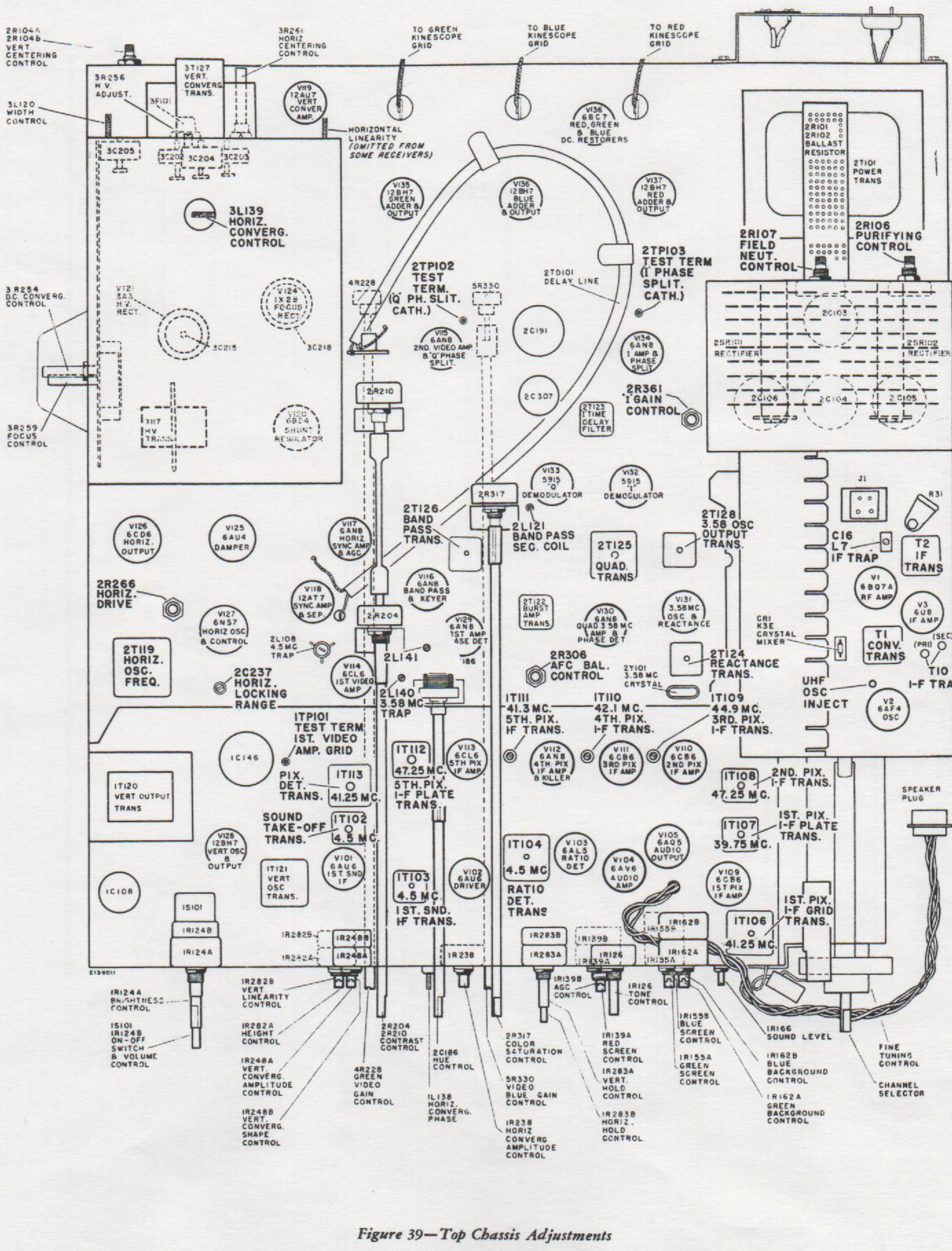


Figure 39—Top Chassis Adjustments

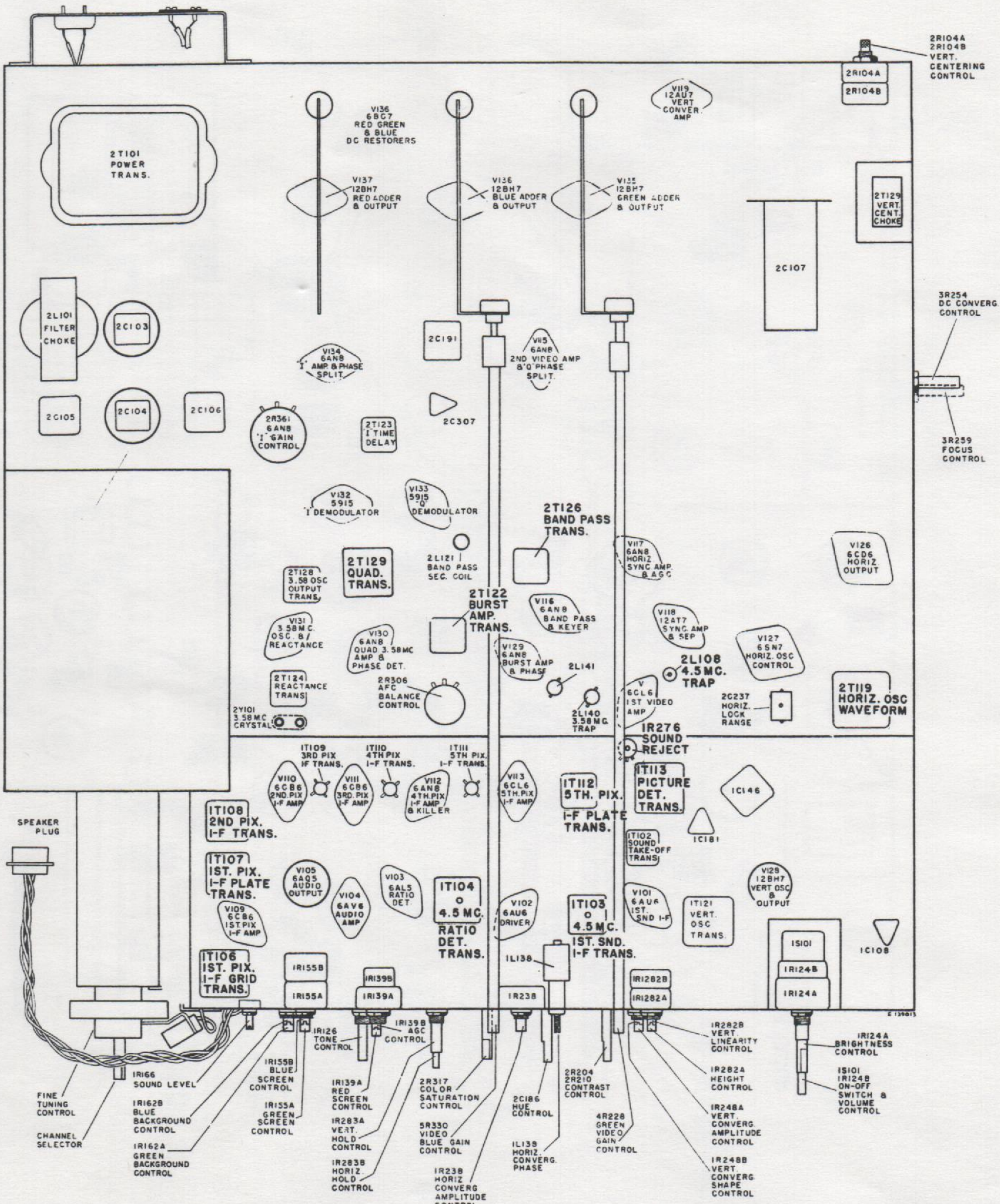


Figure 40—Bottom Chassis Adjustments

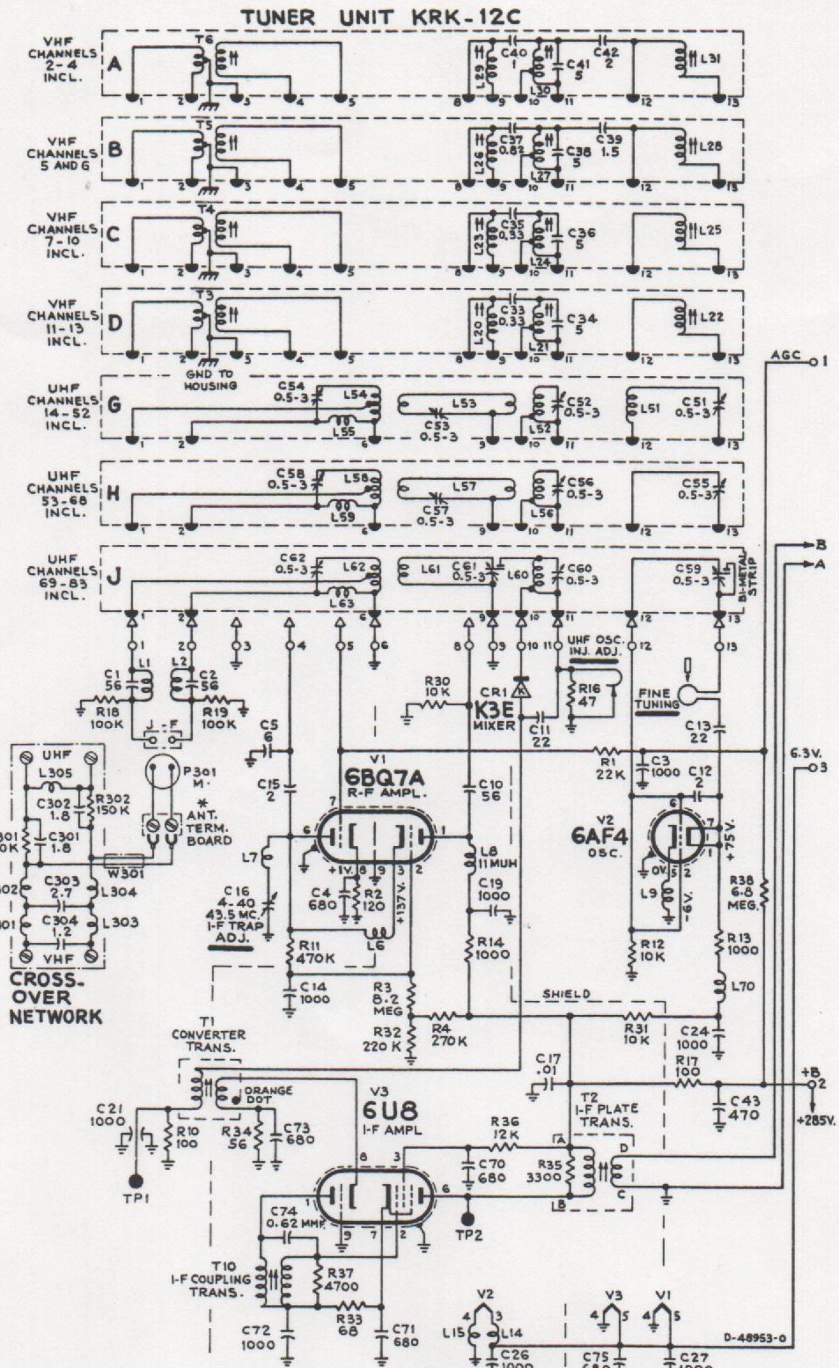
VOLTAGE CHART

The following measurements represent the following conditions. A 500 microvolt black and white test pattern signal was fed into the receiver, the picture synchronized and the AGC control properly adjusted. Voltages shown are read with a type WV97A senior "VoltOhmyst" between the indicated terminal and chassis ground and with the receiver operating on 117 volts, 60 cycles, a-c.

Tube No.	Tube Type	Function	Operating Condition	E. Plate		E. Screen		E. Cathode		E. Grid		I Plate (ma.)	I Screen (ma.)	Notes on Measurements
				Pin No.	Volts	Pin No.	Volts	Pin No.	Volts	Pin No.	Volts			
V101	6AU6	1st Sound I-F Amp.	500 Mu. V. Signal	5	169	6	165	7	1.12	1	—	—	—	At min. volume
V102	6AU6	Driver	500 Mu. V. Signal	5	300	6	55	7	0.2	1	—0.6	—	—	At min. volume
V103	6AL5	Ratio Detector	500 Mu. V. Signal	7	—	—	—	1	—	—	—	—	—	At min. volume
V104	6AV6	1st Audio Amplifier	500 Mu. V. Signal	7	84	—	—	2	0	1	—0.8	—	—	—
V105	6AQ5	Audio Output	500 Mu. V. Signal	5	290	6	290	2	18	7	—	—	—	—
V109	6CB6	1st Pix I-F Amplifier	500 Mu. V. Signal	5	280	6	280	2	0.12	1	—7.7	—	—	—
V110	6CB6	2nd Pix I-F Amplifier	500 Mu. V. Signal	5	270	6	270	2	0.18	1	—7.2	—	—	—
V111	6CB6	3rd Pix I-F Amplifier	500 Mu. V. Signal	5	220	6	220	2	0.47	1	—3.8	—	—	—
V112A	6AN8	4th Pix I-F Amplifier	500 Mu. V. Signal	6	136	7	136	9	2.25	8	—	—	—	—
V112B	6AN8	Killer	500 Mu. V. Signal	1	0	—	—	3	0	2	—22.5	—	—	—
V113	6CL6	5th Pix I-F Amplifier	500 Mu. V. Signal	6	210	3-8	210	1	4.7	2	—	—	—	—
V114	6CL6	1st Video Amplifier	500 Mu. V. Signal	6	198	3-8	128	1	2.93	2	1.5	—	—	—
V115A	6AN8	2nd Video Amplifier	500 Mu. V. Signal	6	134	7	142	9	20	8	11.2	—	—	—
V115B	6AN8	"Q" Phase Splitter	500 Mu. V. Signal	1	129	—	20	3	16	2	—	—	—	—
V116A	6AN8	Band Pass Amplifier	500 Mu. V. Signal	6	212	7	103	9	1.58	8	—	—	—	—
V116B	6AN8	Keyer	500 Mu. V. Signal	1	106	—	—	3	23.6	2	20	—	—	—
V117A	6AN8	AGC Amplifier	500 Mu. V. Signal	6	—38.5	7	380	9	291	8	285	—	—	CAUTION
V117B	6AN8	Hor. Sync. Separator	500 Mu. V. Signal	1	380	—	—	3	245	2	195	—	—	Heater at +285 V.
V118A	12AT7	Sync. Amplifier	500 Mu. V. Signal	6	57	—	—	8	0	7	—1.07	—	—	—
V118B	12AT7	Vert. Sync. Separator	500 Mu. V. Signal	1	80	—	—	3	0	2	—25	—	—	—
V119	12AU7	Vert. Con-verg. Amp.	500 Mu. V. Signal	6	195	—	—	8	9.3	7	—	—	—	—
			500 Mu. V. Signal	1	385	—	—	3	20	2	—	—	—	—
V120	6BD4	Shunt Regulator	500 Mu. V. Signal	Cap	19,500	—	—	1-8	390	5	—	—	—	Heater at +285 V.
V121	3A3	H.V. Rectifier	500 Mu. V. Signal	Cap	*	—	—	7	19,500	—	—	—	—	*H.V. Pulse present
V124	1X2B	Focus Rectifier	500 Mu. V. Signal	Cap	*	—	—	1	4,500	—	—	—	—	*H.V. Pulse present
V125	6AU4GT	Damper	500 Mu. V. Signal	5	380	—	—	3	*680	—	—	—	—	*At B boost

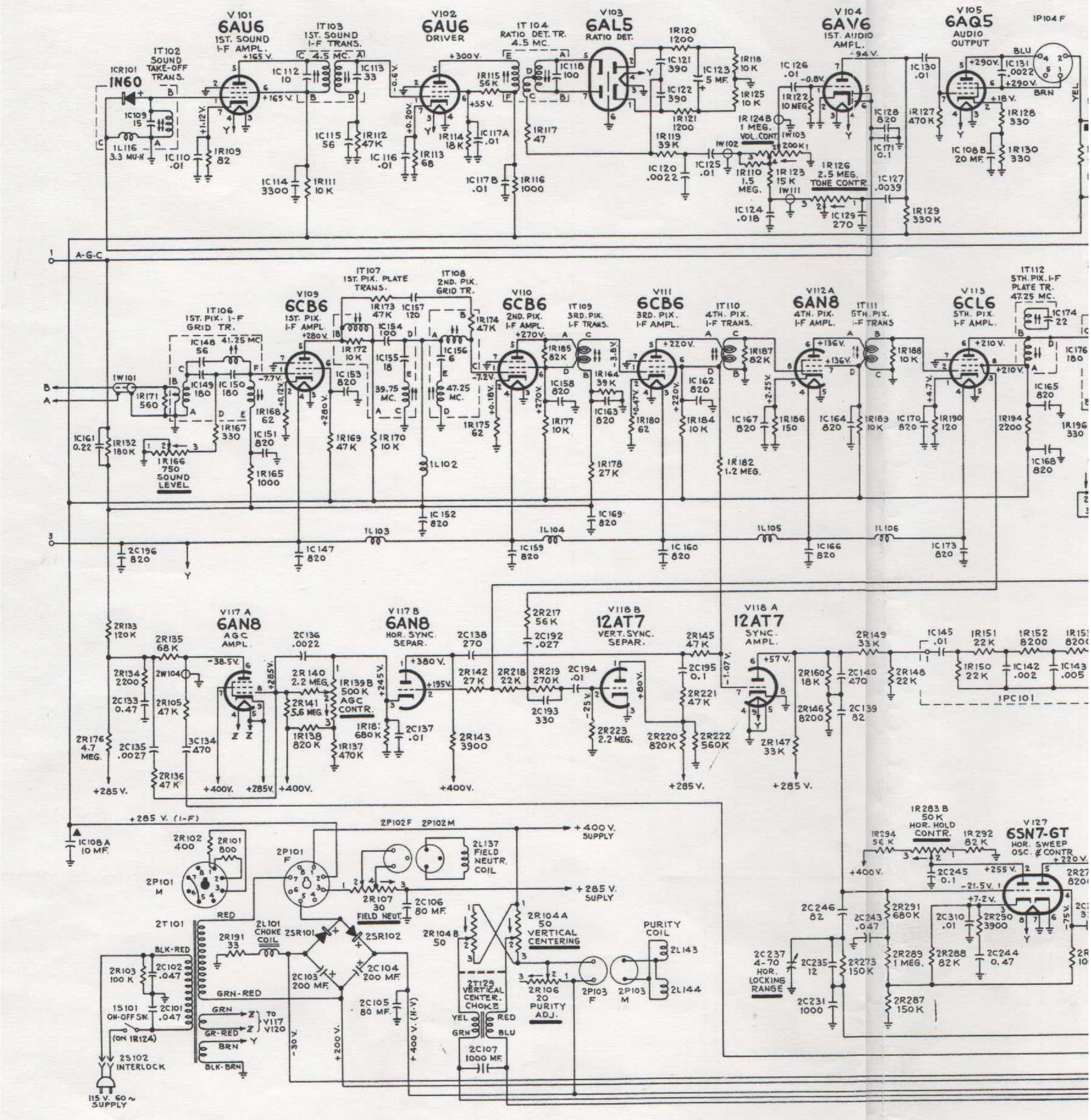
Tube No.	Tube Type	Function	Operating Condition	E. Plate Pin No.	E. Plate Volts	E. Screen Pin No.	E. Screen Volts	E. Cathode Pin No.	E. Cathode Volts	E. Grid Pin No.	E. Grid Volts	I Plate (ma.)	I Screen (ma.)	Notes on Measurements
V126	6CD6	Horizontal Output	500 Mu. V. Signal	Cap	—	8	155	3	0	5	—40	—	—	—
V127	6SN7	Horizontal Oscillator	500 Mu. V. Signal	5	220	—	—	6	0	4	—75	—	—	—
V127	6SN7	Horizontal Osc. Control	500 Mu. V. Signal	2	255	—	—	3	7.2	1	—21.5	—	—	—
V128	12BH7	Vertical Oscillator	500 Mu. V. Signal	1	94	—	—	3	0	2	—25	—	—	—
V128	12BH7	Vertical Output	500 Mu. V. Signal	6	255	—	—	8	6.9	7	—2.5	—	—	—
V129A	6AN8	Burst Amplifier	500 Mu. V. Signal	6	280	7	290	9	23.5	8	0	—	—	—
V129B	6AN8	Phase Detector	500 Mu. V. Signal	1	—	—	—	3	47.5	2	—	—	—	—
V130A	6AN8	Quad. 3.58 MC. Amp.	500 Mu. V. Signal	6	192	7	118	9	2.45	8	—	—	—	—
V130B	6AN8	Phase Detector	500 Mu. V. Signal	1	—48	—	—	3	—	2	—48	—	—	—
V131A	6AN8	Reactance	500 Mu. V. Signal	6	285	7	85	9	2.9	8	—0.75	—	—	—
V131B	6AN8	3.58 MC. Oscillator	500 Mu. V. Signal	1	97	—	—	3	—	2	—14.5	—	—	—
V132	5915	"I" Demodulator	500 Mu. V. Signal	5	205	6	78	2	1.22	1&7	—	—	—	—
V133	5915	"Q" Demodulator	500 Mu. V. Signal	6	220	6	78	2	1.22	1&7	—	—	—	—
V134A	6AN8	"I" Amplifier	500 Mu. V. Signal	6	170	7	128	9	5.0	8	3.25	—	—	—
V134B	6AN8	"I" Phase Splitter	500 Mu. V. Signal	1	185	—	—	3	37	2	31	—	—	—
V135A	12BH7	Green Adder	500 Mu. V. Signal	6	162	—	—	8	7.5	7	3.0	—	—	—
V135B	12BH7	Green Output	500 Mu. V. Signal	1	215	—	—	3	6.6	2	0.08	—	—	—
V136A	12BH7	Blue Adder	500 Mu. V. Signal	6	160	—	—	8	7.5	7	3.0	—	—	—
V136B	12BH7	Blue Output	500 Mu. V. Signal	1	215	—	—	3	6.8	2	0.08	—	—	—
V137A	12BH7	Red Adder	500 Mu. V. Signal	6	168	—	—	8	7.5	7	2.8	—	—	—
V137B	12BH7	Red Output	500 Mu. V. Signal	1	215	—	—	3	6.8	2	0.08	—	—	—
V138A	6BC7	Green D.C. Restorer	500 Mu. V. Signal	8	44	—	—	9	80	—	—	—	—	—
V138B	6BC7	Blue D.C. Restorer	500 Mu. V. Signal	6	42	—	—	7	83	—	—	—	—	—
V138C	6BC7	Red D.C. Restorer	500 Mu. V. Signal	2	17	—	—	1	84	—	—	—	—	—
V139	C73599	Kinescope	500 Mu. V. Signal	Ultor Anode	19,500	—	—	—	—	—	—	—	—	—

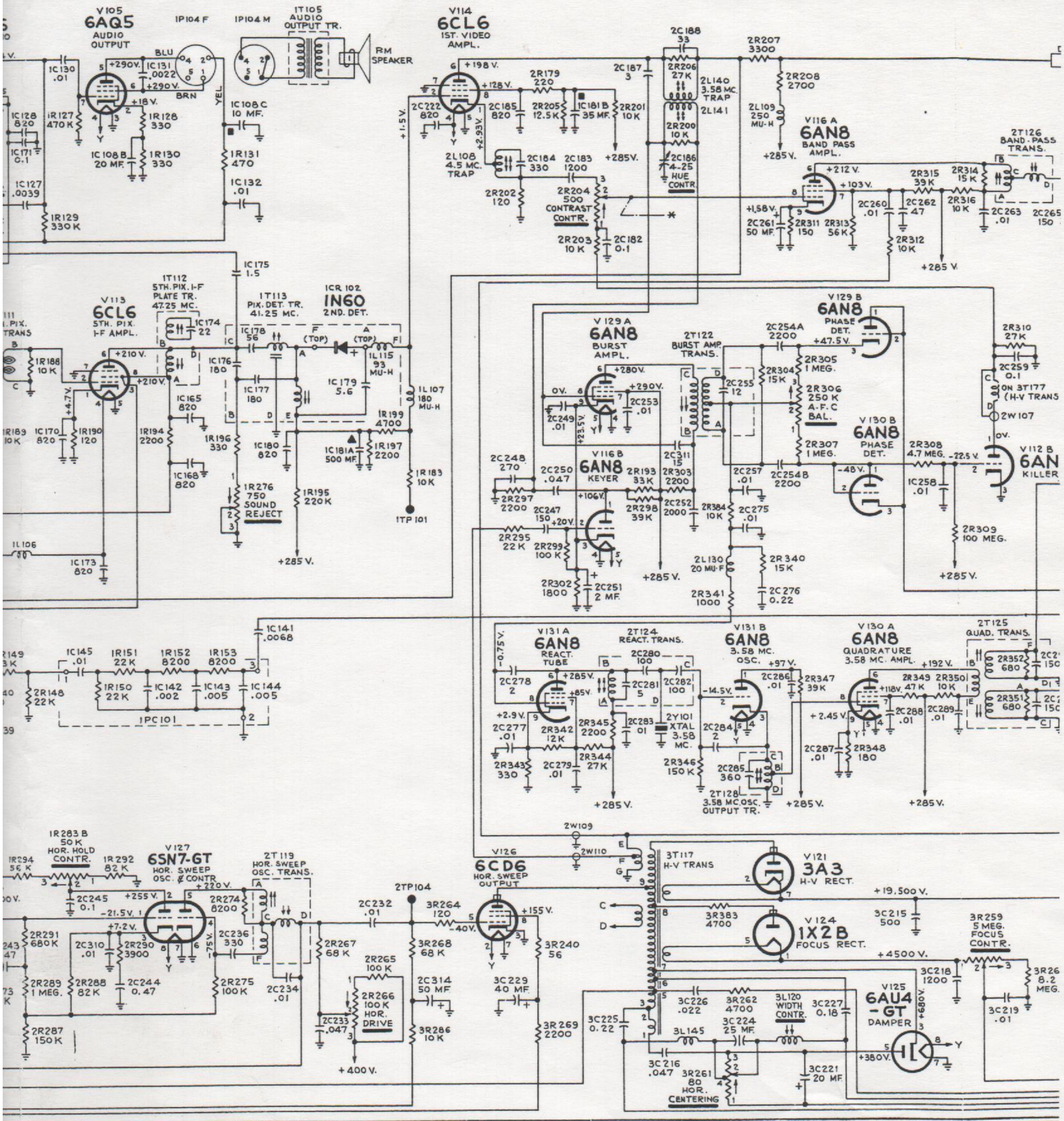
TUNER SCHEMATIC



* NOTE:
WHEN USING CROSS-OVER NETWORK, CONNECT UHF AND VHF ANTENNA TRANSMISSION LINES TO RESPECTIVE TERMINALS.
WHEN CROSS-OVER NETWORK IS NOT USED; DISCONNECT W301 AND CONNECT UHF, VHF OR COMBINATION UHF-VHF ANTENNA TRANSMISSION LINE TO ANTENNA TERMINAL BOARD.

Figure 41—KRK12C Schematic Diagram


V101
6AU6
1ST. SOUND I-F AMPL.
1T102 SOUND TAKE-OFF TRANS.
1CR101
1N60
1T103 1ST. SOUND I-F TRANS.
4.5 MC.
V102
6AU6
DRIVER
1T104 RATIO DET. TR. 4.5 MC.
V103
6AL5
RATIO DET.
V104
6AV6
1ST. AUDIO AMPL.
V105
6AQ5
AUDIO OUTPUT
1P104 F
1L116 3.3 MU-H
1R124B 1 MEG. VOL. CONT.
1R126 2.5 MEG. TONE CONTR.
A-G-C
1T106 1ST. PIX. I-F GRID TR.
V109
6CB6
1ST. PIX. I-F AMPL.
1T107 1ST. PIX. PLATE TRANS.
1T108 2ND. PIX. GRID TR.
V110
6CB6
2ND. PIX. I-F AMPL.
1T109 3RD. PIX. I-F TRANS.
V111
6CB6
3RD. PIX. I-F AMPL.
1T110 4TH. PIX. I-F TRANS.
V112 A
6AN8
4TH. PIX. I-F AMPL.
1T111 5TH. PIX. I-F TRANS
V113
6CL6
5TH. PIX. I-F AMPL.
1T112 5TH. PIX. I-F PLATE TR. 47.25 MC.
1R166 750 SOUND LEVEL
V117 A
6AN8
AGC AMPL.
V117 B
6AN8
HOR. SYNC. SEPAR.
2R139B 500 K AGC CONTR.
V118 B
12AT7
VERT. SYNC. SEPAR.
V118 A
12AT7
SYNC. AMPL.
1PC101
+285 V. (I-F)
+400 V. SUPPLY
+285 V. SUPLY
2P102F 2P102M
2L137 FIELD NEUTR. COIL
2R107 30 FIELD NEUT.
2T101
2L101 CHOKE COIL
2SR101
2SR102
2R104A 50 VERTICAL CENTERING
2R104B 50
PURITY COIL
2L143
2L144
2R106 20 PURITY ADJ.
2T129 VERTICAL CENTER. CHOKE
1S101 ON-OFF SW.
(ON 1R124)
2S102 INTERLOCK
115 V. 60~ SUPPLY
TO V117 V120
1R283 B 50 K HOR. HOLD CONTR.
V127
6SN7-GT
HOR. SWEEP OSC. & CONTR
2C237 4-70 HOR. LOCKING RANGE



All capacitance values less than 1 in FM and above 1 in MMF unless otherwise noted. All resistance values in ohms. K=1000.

Direction of arrows at controls indicates clockwise rotation.

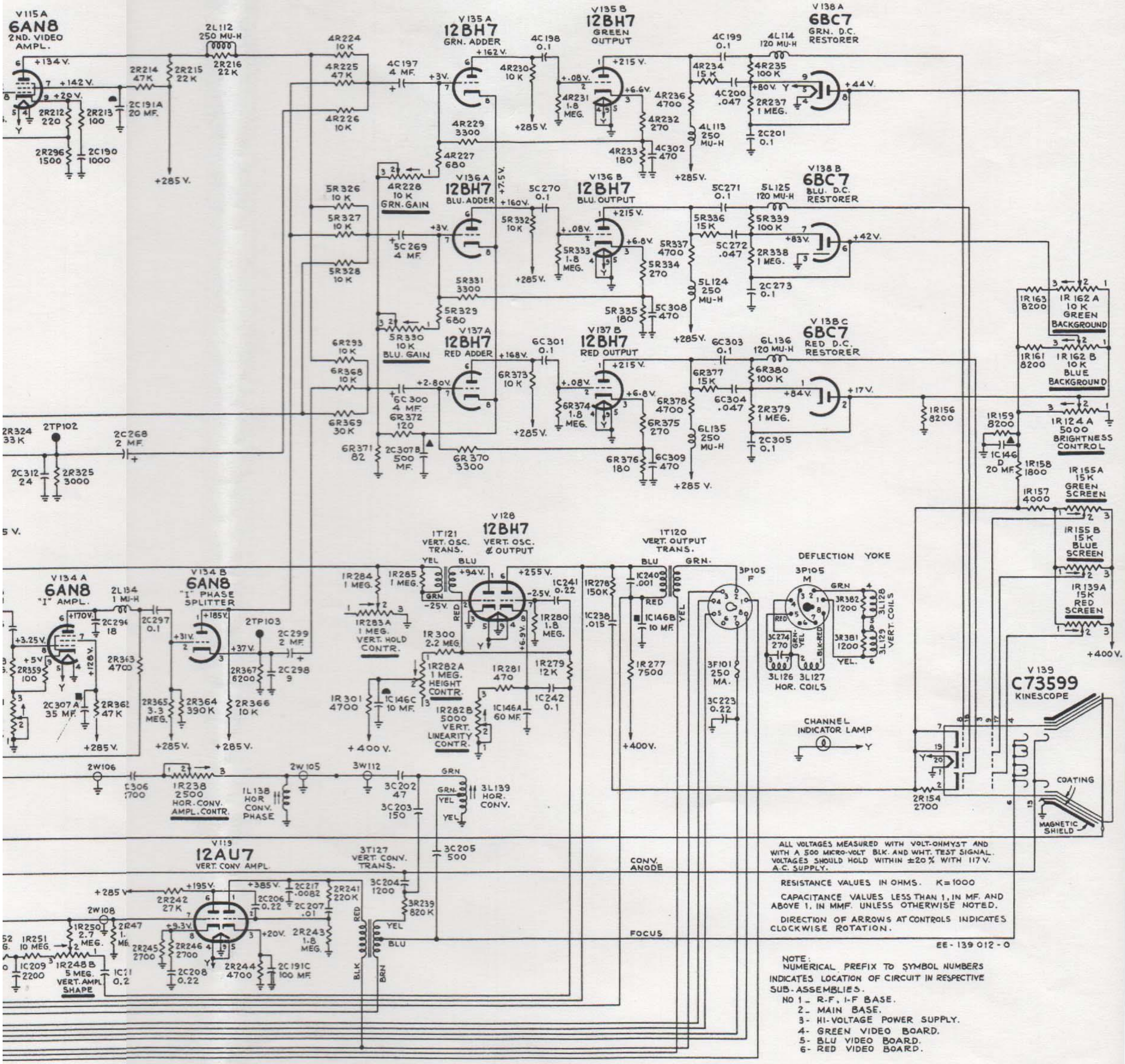


Figure 42—Circu Diagra