

● CBS-COLUMBIA

COLOR TELEVISION RECEIVER

PRELIMINARY SERVICE DATA

MODEL 205



CBS-Columbia

a Division of

the Columbia Broadcasting System

3400 Forty-Seventh Avenue

Long Island City 1, N. Y.

Specifications

Picture Tube

Type CBS Hytron 19VP22
Dimensions 19-inch round, all glass. Viewing area 205 square inches

Tube Complement

Operating Controls

Station Selector, Fine and UHF Tuning, Vertical and Horizontal Hold, Contrast, Volume, Tone, Chroma and Hue

Power Rating

Source 105-120 volts 60-cycle AC
Consumption 500 Watts

Number of Tubes

41 tubes plus 3 rectifiers, 2 selenium rectifiers and 3 crystal diodes

Ant. Input Impedance

VHF 300 ohms balanced
UHF 300 ohms balanced

Frequency Range

Channels 2 through 82

Intermediate Frequencies

Video IF 45.75 mc
Sound IF 41.25 mc
Sound Inter-carrier Freq. 4.5 mc
Color Subcarrier Freq. 42.17 mc
Adjacent Channel Sound Trap Freq. 39.75 mc
Adjacent Channel Video Trap Freq. 47.25 mc
Accompanying Channel Sound for less than 10% distortion 41.25 mc

Crt High Voltage

26 kv adjusted

Loudspeakers

Size Two, 6½ in x 9¼ in. speakers
Voice Coil 3.2 ohms at 400 cycles

Focus

Electrostatic

Deflection

Electromagnetic

Convergence

Static PM Magnetic
Dynamic Electromagnetic

Cabinet Dimensions

Model	Width	Height	Depth
205C1 Console	34¼"	42-11/16"	26-1/16"
205C2 Console w/Doors	34¼"	42-11/16"	26-15/16"

Symbol	Type	Function
V1	6BZ7	RF Amplifier
V2	6N8	Mixer and Oscillator
V3	6AF4	UHF Oscillator
V4	6CB6	1st IF
V5	6BC6	2nd IF
V6	6BC6	3rd IF
V7	6CB6	4th IF
V8	6CL6	5th IF
V9	6AU6	Sound IF Amplifier
V10	6AU6	Driver
V11	6AL5	Ratio Detector
V12	6AU6	Audio Amplifier
V13	6AQ5	Audio Output
V14	6CL5	1st Video Amplifier
V15	6AN8	2nd Video Amplifier—Q Phase Splitter
V16	6AN8	Band Pass Amp.—Color Killer
V17	6CB6	Burst Amplifier
V18	6AL5	Phase Det.
V19	6AN8	Reactance Tube—3.58 mc Oscillator
V20	12AT7	Horizontal Phase Splitter
V21	6AN8	I Amplifier—AGC Clamp
V22	6BY6	Q Demodulator
V23	6BY6	I Demodulator
V24	6AN8	I Amplifier—I Phase Splitter
V25	12BH7	Green Adder—Green Output
V26	12BH7	Blue Adder—Blue Output
V27	12BH7	Red Adder—Red Output
V28	6BC7	Green Red Blue DC Restorers
V29	6AN8	AGC Amp—Horiz. Sync Separator
V31	12AT7	Vert. Sync Separator—Sync Clipper
V32	6BL7	Vert. Oscillator—Vert. Output
V33	6AL5	Horizontal Phase Det.
V34	12AU7	Horizontal Oscillator
V35	6CU6	Horizontal Output
V36	6AU4	Damper
V37	3A3	HV Rectifier
V38	3A3	HV Rectifier
V39	3A3	HV Rectifier
V40	6BD4	HV Regulator
V41	6BL7	Convergence sawtooth Gen-Blue conv. Output
V42	6BL7	Green conv. Output—Conv. Cathode Follower
V43	6BL7	Pulse Shaper—Red. Conv. Output
V44	19VP22	Colorion CRT
V46	6CU6	Horizontal Output

Warning — High Voltage

POTENTIALS AS HIGH AS 26,000 VOLTS ARE PRESENT WHEN THIS RECEIVER IS OPERATING. OPERATION OF THE RECEIVER OUTSIDE THE CABINET OR WITH 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.

General

The CBS-Columbia Model 205 is an 82 channel VHF-UHF color television receiver employing a CBS-Hytron 19-inch round, direct-viewing Colortron. The receiver utilizes 44 tubes, 2 selenium rectifiers and 3 crystal diodes.

Features of the receiver include: 205 square-inch picture, CBS-Columbia "360" Full-Fidelity sound system, wide-band color reproduction, regulated high-voltage supply, five-stage picture i-f amplification, stabilized horizontal and vertical sweep circuits, 3.58-mc crystal oscillator with afc, slide-out color tube mount, dual-chassis construction, and conveniently located service controls.

Installation

Antenna

The antenna requirements for color reception are somewhat more critical than for black-and-white reception. In general, outdoor antennas are preferred. The antenna used must have a flat response over the frequency range of the color channel being received, and the transmission line must be properly matched to the antenna and the receiver input (300 ohms).

Antenna orientation is more critical. Some antenna positions may provide black-and-white reception but no color reception. The antenna should be oriented for best color reception while receiving a color program. Where several stations are received from different directions an antenna rotator may be required.

Multiple antenna installations, particularly those employing distribution amplifier systems, may not provide satisfactory color reception. If such an installation is to be used, modification of the system may be required.

Many TV boosters do not have sufficient bandwidth for color reception. If a booster is to be used it should be checked to insure adequate results.

An antenna specially designed for color reception is available from your CBS-Columbia Distributor.

Unpacking

The receiver and the color picture tube assembly are shipped in separate cartons. All controls are adjusted and the components on the neck of the picture tube are properly positioned at the factory. To avoid the need for complete adjustment of the receiver, the controls and the CRT components should not be disturbed during the unpacking and installation of the receiver.

The following procedure should be used to prepare the receiver for operation:

1. Remove the receiver and picture tube assembly from their cartons.
2. Remove the cabinet back cover.
3. Remove the staples fastening the CRT cup to the cabinet shelf.
4. Insert the rear end of the cup into the large hole in the back cover, from the front side of the cover. Tap the front edge of the cup with a mallet until it snaps into place.
5. Remove the four bolts fastening the picture-tube assembly to its shipping pallet and discard the pallet.
6. Slide the picture tube assembly carefully into place on the cabinet shelf and position it so that the picture-tube screen is properly centered and flush against the mask.
7. Insert the four bolts removed in step 5 through the slots in the picture-tube mounting board into the holes in the cabinet shelf, and tighten.
8. Insert the Field Neutralizing, Yoke, and Convergence Assembly plugs into their sockets on the deflection chassis. Connect the CRT high-voltage Connector to the deflection chassis high-voltage lead, insert the Video Output plug into its socket on the signal chassis, and fasten the CRT socket to the base of the picture tube.

Initial Adjustment

After the receiver has been unpacked and installed, an initial check of performance should be made to determine whether or not the receiver requires adjustment. The room lighting should be subdued during the performance check.

The following procedure should be used:

1. Connect an antenna to the receiver and apply power.
2. Turn the set on and tune to the channel which provides the strongest signal available.
3. If overload occurs, adjust the AGC control. The customer control panel must be removed to provide access to the AGC control. Removal of the panel is described in steps 4 and 5 of the paragraph on Service Controls.
4. Check the action of the HORIZONTAL HOLD control and adjust the AFC (front of deflection chassis, Fig. 2) if required.
5. Check the size, linearity, and centering, and adjust if necessary.
6. If a drive line (bright vertical line near center of picture) is observed, turn the HORIZONTAL DRIVE control fully clockwise, then counterclockwise until the line just disappears.
7. Adjust the BRIGHTNESS and CONTRAST controls for a normal picture, then rotate the BRIGHTNESS control throughout its range. If variation in picture size is noted at normal brightness settings, perform the High-Voltage Adjustment procedure.
Note: The picture size should remain constant over most of the BRIGHTNESS control range. Loss of regulation, (indicated by a sudden increase in picture size) near maximum brightness setting, is normal. The BRIGHTNESS should always be operated within the range of regulation.
8. Adjust the BRIGHTNESS and CONTRAST controls for a normal picture. If two or three severely misregistered color images are observed, adjust the Static Convergence Magnets as described in steps 1 and 2 of the Convergence procedure.
9. Turn the CONTRAST control fully counterclockwise and the BRIGHTNESS control fully clockwise. The raster should be a uniform dim neutral gray without signs of color contamination.
10. If the entire screen shows a uniform coloring, other than neutral gray, adjust the SCREEN controls (Fig. 2) as described in steps 2, 3 and 4 of the paragraph on White Adjustment.
11. If only portions of the screen show coloring in step 9, turn the CONTRAST, BLUE SCREEN and GREEN SCREEN controls fully counterclockwise and the BRIGHTNESS control fully clockwise. Set the RED SCREEN control for a barely visible red raster and adjust the FIELD NEUTRALIZING control for a pure red raster without signs of color impurity. If a pure red raster cannot be obtained, perform the Purity Adjustment Procedure.
12. Perform the White Adjustment procedure.

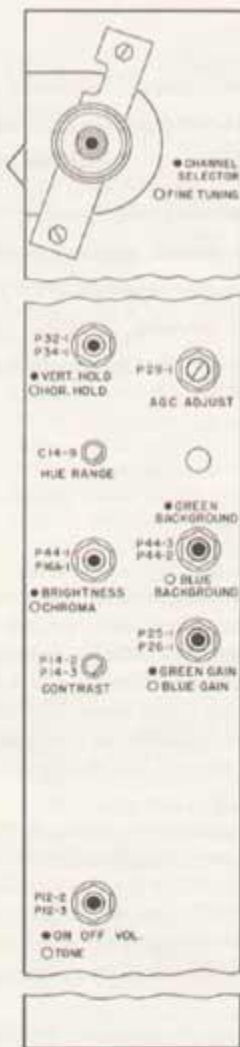


Fig. 1—Signal chassis front controls.

13. Adjust the BRIGHTNESS and CONTRAST controls for a normal picture. If severe misregistration is observed near the edges of the picture, perform the complete Convergence procedure.
14. Tune to a station transmitting a color signal, or a black-and-white signal with a color stripe. The color stripe is a narrow vertical bar (yellowish-green in color) appearing at the left and right edges of the picture. To synchronize the color circuits when receiving the stripe adjust the AFC control (Fig. 2) so that the picture moves to the left, placing the left-hand stripe in the horizontal blanking interval.
15. Adjust the HUE and CHROMA controls for proper hue and saturation.

Service Controls

Access to the service controls and adjustments may be obtained as follows:

1. Remove the cabinet rear cover.
2. Remove the two large bolts located at the upper right and left hand corners of the cabinet back.
3. Pull the cabinet top back about two inches, toward the rear of the cabinet, and lift it off the cabinet.

Note: The receiver is provided with a Top Interlock, located directly above the customer controls. To operate the receiver with the top off, remove the a-c plug from the deflection chassis and apply power directly to the chassis using a space line cord.

Equipment Required

1. High-Voltage Meter with a full-scale range of at least 50 KV.
2. White Dot Generator. The generator should supply round dots approximately $\frac{1}{8}$ " in diameter on a 19-inch cool CRT. The Hickock 650C is a suitable instrument.
3. Off-the-air test pattern, or a linearity bar or cross hatch generator. Most dot generators supply a suitable crosshatch pattern.
4. T-Connector for insertion in the high-voltage lead when making measurements.

High-Voltage Adjustment

1. Turn the set off, open the CRT High-Voltage Connector, ("L" in Fig. 3) and insert a T-Connector in the lead.

Caution: To avoid an electrical shock ground the high voltage before touching the lead.

2. Connect a High-Voltage Meter (50 kv range) to the T-Connector.
3. Turn the BRIGHTNESS and CONTRAST controls fully counterclockwise and turn the set on.
4. After allowing sufficient time for the set to warm-up, adjust the HIGH-VOLTAGE REGULATOR control (rear of deflection chassis) for a meter reading of 26 kv.
5. Turn the BRIGHTNESS control up to a high

4. Remove all front panel knobs.

5. Using a thin screwdriver, unfasten the two clips holding the customer control panel in place and pull the panel away from the cabinet. The clips are located at the bottoms of the holes through which the Channel Selector and Off-On Volume control shafts project.

6. Locate the recessed finger grips on the bottom of the board running across the lower edge of the cabinet front. If the board is held in place by a screw, remove the screw.

7. Grasp the board with both hands and pull it firmly away from the cabinet.

Color Tube Adjustment Procedure

level and note the variation in high-voltage. The voltage should not drop more than 500 volts up to the point where loss of regulation occurs. If the BRIGHTNESS is advanced excessively loss of regulation, indicated by marked picture blooming, will occur. The brightness should always be operated within the range of regulation.

6. Turn the set off and disconnect the High-Voltage Meter.

Color Purity Adjustment

1. Connect a Dot Generator to the receiver antenna terminals.
2. Turn the set on and adjust the FINE TUNING, BRIGHTNESS, CONTRAST and FOCUS controls for a clearly visible dot display.

Note: The room lighting should be subdued during the balance of the procedure. Set the BRIGHTNESS and CONTRAST controls at the lowest levels that give a clearly visible dot pattern.

3. Adjust the RED, GREEN and BLUE SCREEN controls to make the red, green and blue dots on the CRT screen approximately the same size.

4. Check the physical positioning of the Yoke, Convergence Coil Assembly, Purity Magnet (or coil) and the Blue Beam Corrector. The correct positioning of these components is shown in Fig. 3.

Note: If the above components are not properly



Fig. 2—Deflection chassis front controls.

positioned it may be impossible to set up the CRT correctly.

5. Adjust the Red, Green and Blue Static Convergence Magnets (Fig. 3) and the Blue Beam Corrector ("S" in Fig. 3) to converge (superimpose) the group of dots, (a red, a green and a blue dot) located nearest the center of the screen. See Fig. 4B for adjustment procedure.

6. Turn the CONTRAST control and the GREEN and BLUE SCREEN controls fully counterclockwise, and turn the BRIGHTNESS and RED SCREEN controls fully clockwise.

7. Set the FIELD NEUTRALIZING control at mid-position.

8. Loosen the Yoke Positioning Screws ("N" in Fig. 3) and slide the Deflection Yoke back toward the base of the CRT as far as possible without

touching the Convergence Coil Assembly.

9. Rotate the Purity Magnet (or coil) around the neck of the tube, increasing the field strength in steps, until a large pure red area is obtained in the center of the screen. Disregard the size of the area—adjust for the purest possible red in the center of the screen.

Note: If the receiver uses a Purity Magnet, the field strength is increased by separating the tabs (H in Fig. 3) on the magnet. If a Purity Coil is used the field strength is increased by turning the Purity control clockwise. Use the weakest field that provides satisfactory results.

10. Slide the Deflection Yoke slowly forward on the neck of the tube until the largest uniform red field is obtained on the CRT screen. Lock the Yoke in position.

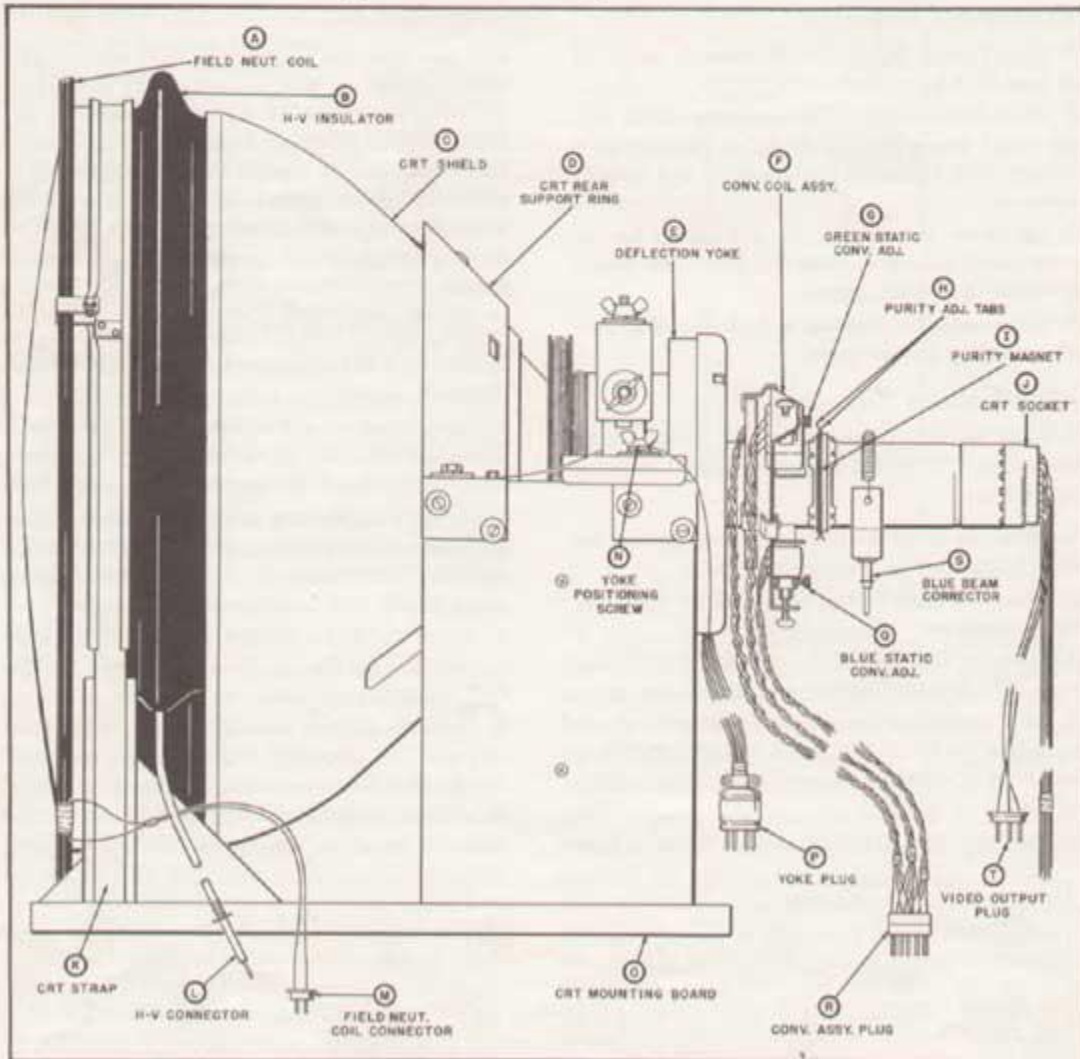


Fig. 3—Picture tube assembly.

Note: The rear surface of the Yoke should be perpendicular to the neck of the CRT, and the space between the inner surface of the Yoke and the tube neck should be uniform at all points.

11. If a completely uniform red field is not obtained in the previous step, readjust the Purity Magnet (or coil) slightly. If color contamination still exists at the edges of the screen, adjust the FIELD NEUTRALIZING control to minimize it.

Note: If satisfactory purity cannot be obtained the yoke may be moved slightly out of alignment with the CRT neck to minimize contamination. This should be done only when good purity cannot be obtained as previously described.

12. Turn the RED SCREEN control fully counterclockwise and the GREEN SCREEN control fully clockwise. A uniform green field should be obtained over the entire face of the CRT.

13. Turn the GREEN SCREEN control fully counterclockwise and the BLUE SCREEN control fully clockwise. A uniform blue field should be obtained over the entire face of the CRT.

Note: If neck shadow, due to improper Yoke positioning, or serious color contamination is noted in steps, 13, 14 or 15, repeat the purity adjustment from step 9.

14. Turn the BLUE SCREEN control fully counterclockwise and the RED SCREEN control clockwise until a barely visible red raster is obtained.

15. Turn up the GREEN SCREEN control until the raster turns yellow.

16. Turn up the BLUE SCREEN control until the raster turns a neutral gray (low-brightness white).

Size and Linearity

1. Connect an antenna to the receiver and tune in a station transmitting a test pattern. If a test pattern is not available a suitable bar or crosshatch generator is required for the steps that follow.

2. Adjust the CONTRAST and BRIGHTNESS controls in the normal manner for a black-and-white picture. Disregard any color fringing or contamination in the picture.

3. Adjust the HEIGHT, VERTICAL LINEARITY, and VERTICAL CENTERING controls to provide a linear picture that extends no more than $\frac{1}{4}$ inch above and below the mask opening.

4. Adjust the WIDTH, HORIZONTAL CENTERING and HORIZONTAL LINEARITY controls to provide a linear picture that extends no more than $\frac{1}{4}$ inch beyond the left and right hand edges of the mask opening.

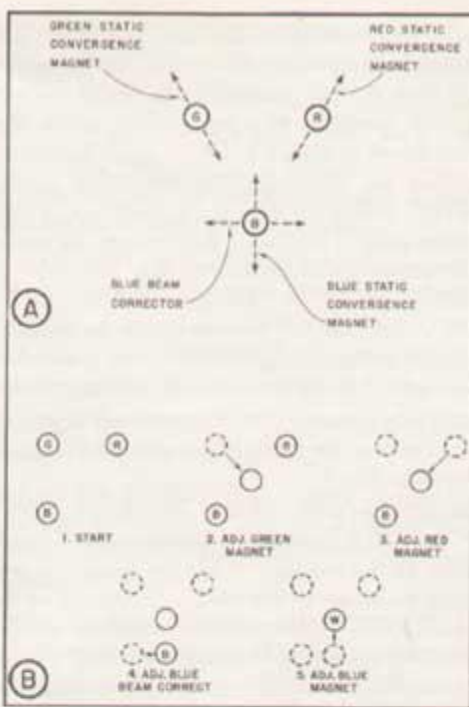


Fig. 4—(A) Motions of the color dots produced by adjustment of the Red, Green, and Blue Static Convergence Magnets. (B) Procedure for converging group of dots using the Static Convergence Magnets and Blue Beam Corrector.

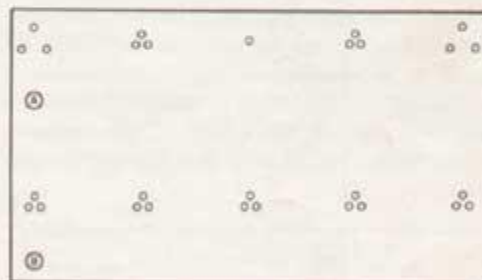


Fig. 5—Dots along horizontal through center of screen, (A) before adjustment of HORIZONTAL PARABOLA and TILT controls and, (B) after proper adjustment of HORIZONTAL PARABOLA and TILT controls.

Convergence Adjustments

1. Connect a Dot Generator to the receiver and adjust the BRIGHTNESS and CONTRAST CONTROLS for a low brightness dot display.

2. Adjust the Red, Green, and Blue Static Convergence Magnets and the Blue Beam Corrector (neck of CRT, Fig. 3) until the group of dots nearest the center of the screen is converged (see Fig. 4B) and forms a single white dot.

Note: The objective in this step and those that follow is to position all of the dots on the screen in the form of small equilateral triangles of uniform size, each consisting of a red, a green and a blue dot, as shown in Figs. 5 and 6.

3. Adjust the RED, GREEN and BLUE HORIZONTAL PARABOLA controls until all of the triangles along a horizontal line through the center of the screen are as uniform in size and shape as possible (see Fig. 5). Adjustment of the HORIZONTAL PARABOLA controls causes the triangles at the left and right edges of the screen to decrease in size and those in the center to increase in size.

Note: The movement of the dots produced by adjustment of each of the PARABOLA and TILT controls is shown in Fig. 7.

4. Adjust the RED, GREEN and BLUE HORIZONTAL TILT controls to eliminate any nonuniformity in the triangles along the horizontal line through the center of the screen. Adjustment of the HORIZONTAL TILT controls increases or decreases the sizes of the triangles at either side of the raster. They have little effect at the center of the screen. After completion of this step, adjust the Red, Green and Blue Static Convergence Magnets to provide approximately 1/16 inch spacing between the dots in each triangular group along the horizontal line.

5. Adjust the RED, GREEN and BLUE VERTICAL PARABOLA controls until all of the triangles along a vertical line through the center of the picture are as uniform in size as possible (see Fig. 6). Adjustment of the VERTICAL PARABOLA controls causes the triangles at the top and bottom of the screen to decrease in size and those in the center to increase in size.

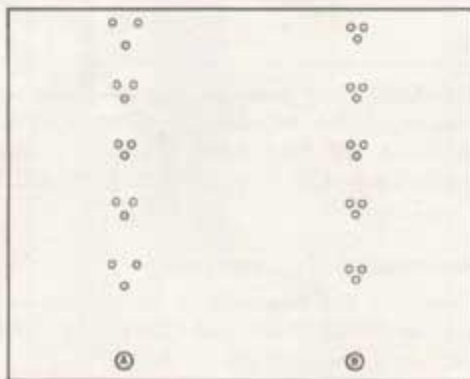


Fig. 6—Dots along vertical line through center of screen, (A) before adjustment of VERTICAL PARABOLA and TILT controls and, (B) after proper adjustment of VERTICAL PARABOLA and TILT controls.



Fig. 7—Motions of colored dots caused by adjustment of PARABOLA and TILT controls. Dotted lines indicate effect of counterclockwise rotation, solid lines indicate effect of clockwise rotation. Effects of PARABOLA controls are shown for rotation from full counterclockwise to full clockwise positions.

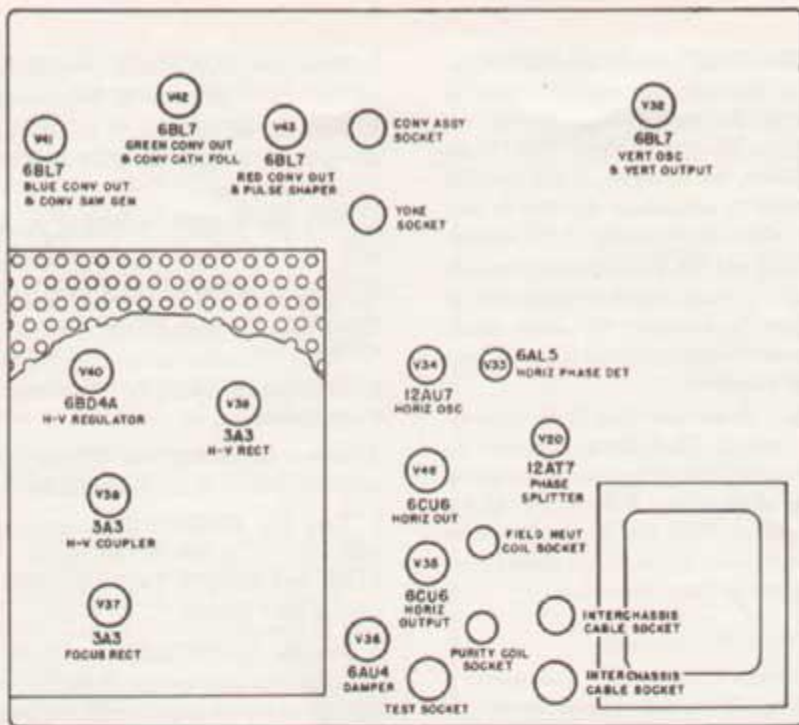
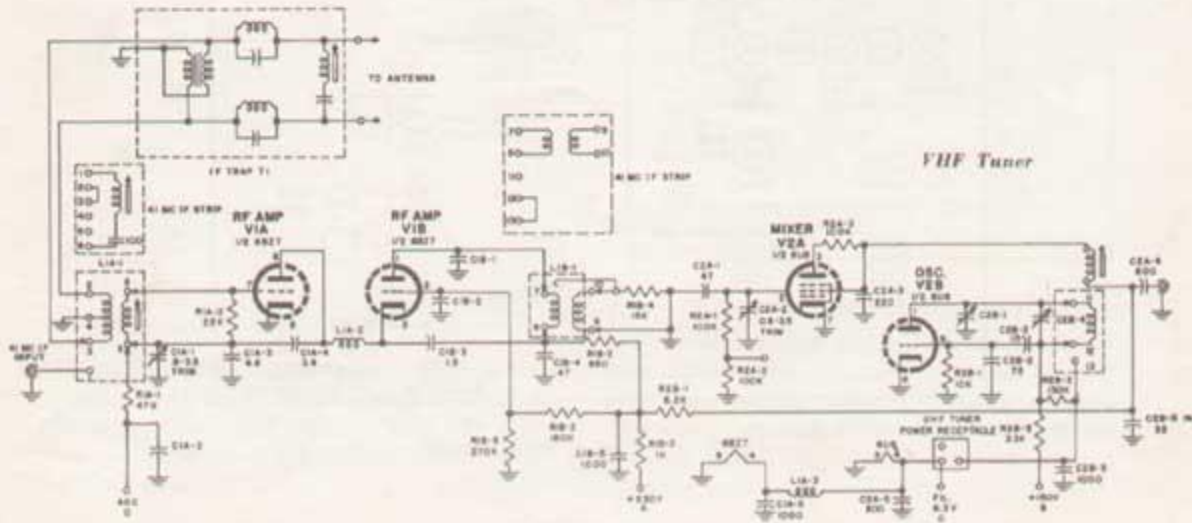
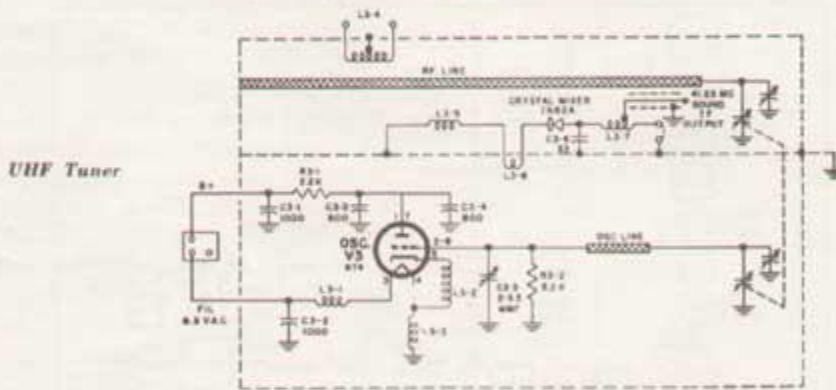
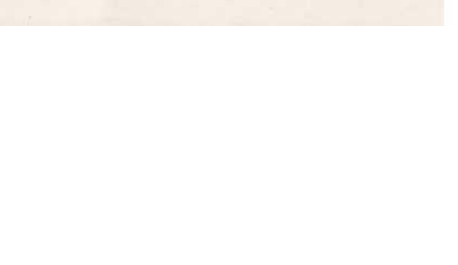
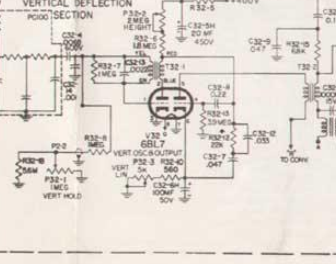
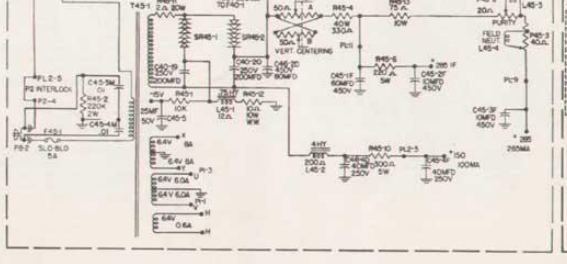
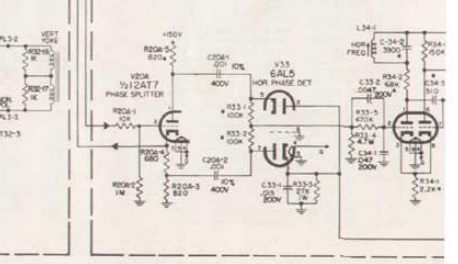
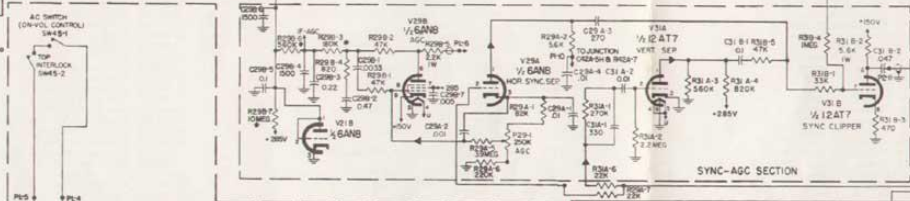
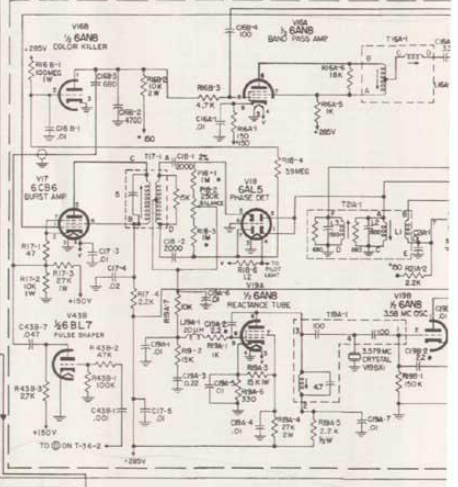
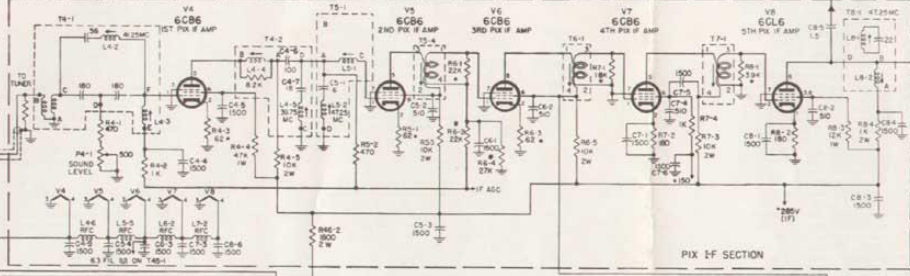
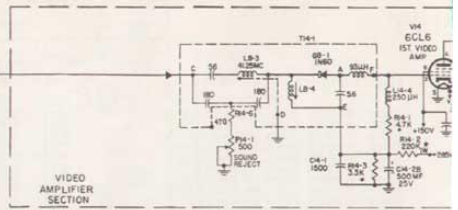
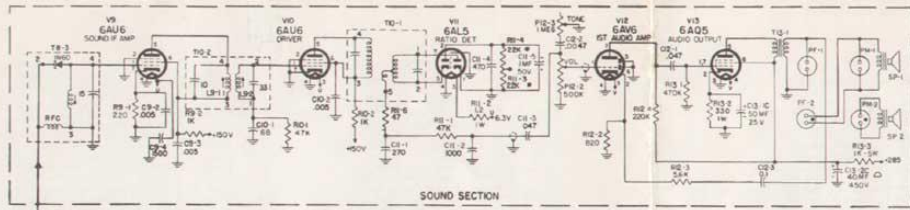
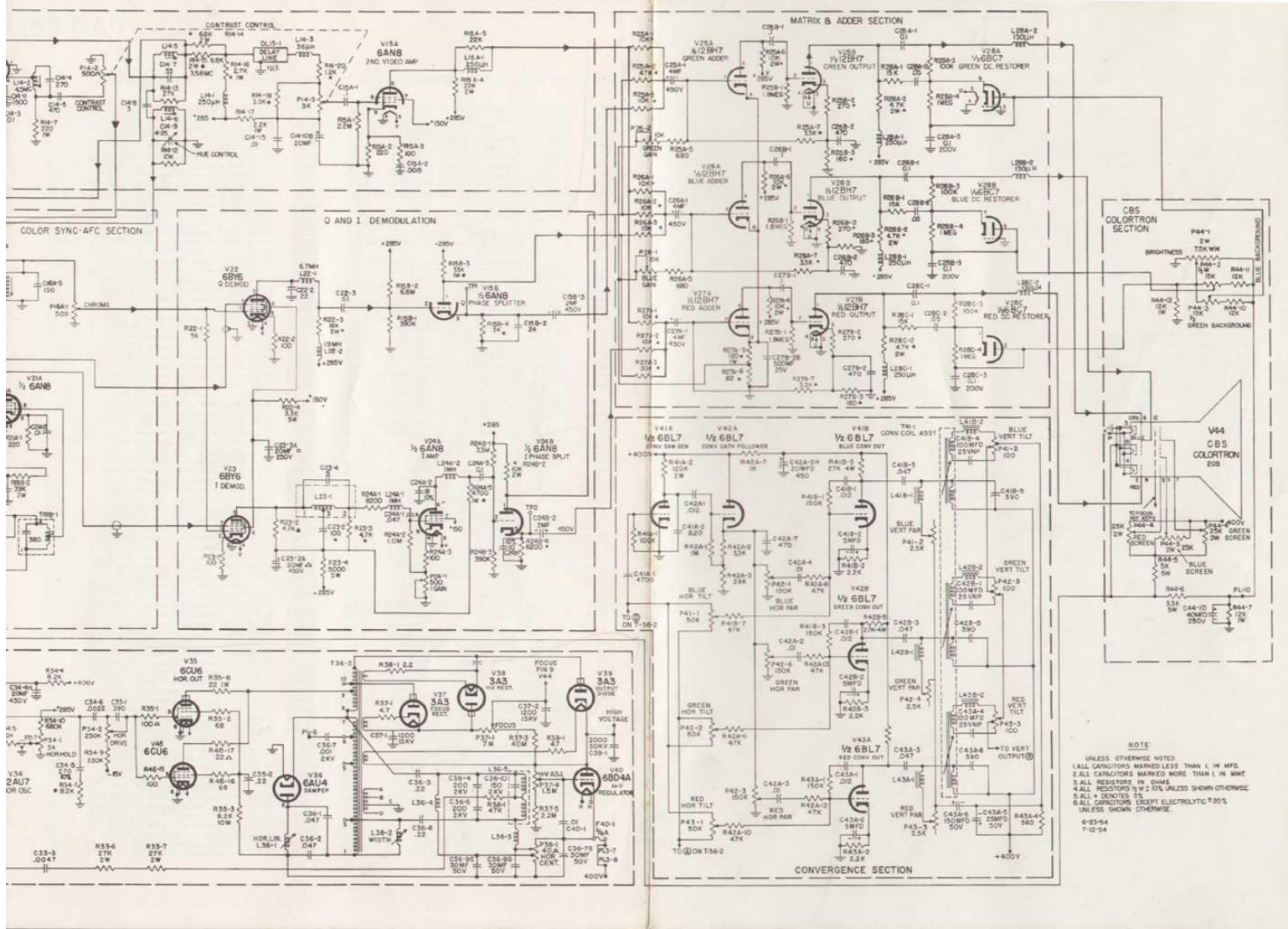


Fig. 9—Top view of deflection chassis







NOTE
 1. ALL CAPACITORS MARKED LESS THAN 1 IN MFG.
 2. ALL CAPACITORS MARKED MORE THAN 1 IN MFG.
 3. ALL RESISTORS IN OHMS UNLESS SHOWN OTHERWISE.
 4. ALL RESISTORS IN W 2% UNLESS SHOWN OTHERWISE.
 5. ALL CAPACITORS EXCEPT ELECTROLYTIC 50% UNLESS SHOWN OTHERWISE.
 6-23-54
 7-12-54