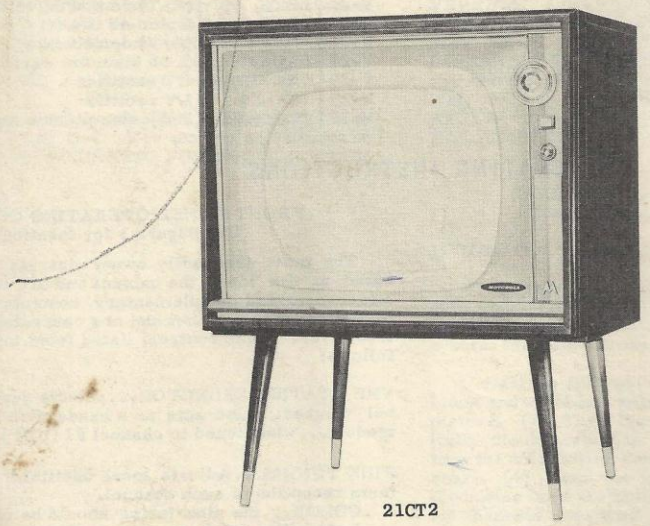
MOTOROLA Service Manual

TELEVISION

CHASSIS
TS-905

MODELS
21CT2 SERIES

THIS MANUAL SUPERSEDES PRELIMINARY SERVICE MANUAL, PART NUMBER 68P738095)



21CT2

GENERAL INFORMATION

CHASSIS DESCRIPTION

The TS-905 series of Motorola color receivers utilize 29 circuit tubes plus the 21AXP22A color picture tube. The receiver contains three crystals as follows: video detector, sound detector (4.5 Mc IF separation) and 3.58 color oscillator. The "Y" version chassis incorporates a separate UHF tuner for operation on channels 14 thru 83. All models are compatible for black/white and color reception.

The receiver utilizes three separate chassis coded as follows: The main chassis, containing all signal and sweep circuits, is labeled the TS-905. The convergence chassis, containing all dynamic convergence controls, is labeled the CONV-905. The power supply chassis is labeled the PS-905. Information on the method of coding individual chassis changes is given in the "TV Chassis Coding System".

All chassis are of the conventionally wired type (no printed circuits). The main chassis is vertically mounted to provide top to bottom control positions. The low voltage power supply is mounted to the floor of the receiver compartment, while the convergence chassis is located in the upper right-hand side of the cabinet (as viewed from the rear of the receiver). The convergence chassis is detachable from the receiver cabinet and may be held or secured in a position allowing direct viewing of the picture screen for convergence adjustments.

CHASSIS BREAKDOWN CHART

Chassis	VHF Tuner	UHF Tuner
TS-905	VTT-83	-
TS-905Y	VTT-83Y	TT-87

RECEIVER MODEL BREAKDOWN CHART

Model	Description	TV Chassis
21CT2B	Table, Swedish Oak: masonite;with detachable console height legs	TS-905
Y21CT2B	Table, Swedish Oak: masonite;with detachable console height legs	TS-905Y
21CT2M	Table, dawn mahogany: masonite; with detachable console height legs	TS-905
Y21CT2M	Table, dawn mahogany: masonite; with detachable console height legs	TS-905Y

ELECTRICAL SPECIFICATIONS

POWER RATING - Source: 105-120 volts, 60 cycle AC
TS-905 310 watts

INTERMEDIATE FREQUENCIES -

Intercarrier IF: Video 45.75 Mc; Audio 41.25 Mc
Audio IF: 4.5 Mc
Number of tubes: 29 plus picture tube
(30 in UHF models)

TUNER RANGE: TS-905 channels 2 thru 13
TS-905Y channels 2 thru 83

TUNER INPUT IMPEDANCE - VHF & UHF 300 ohms balanced

FUSES - Entire B+ distribution system; 2 amp (E-902) wired under power supply chassis or plug-in type located on power supply chassis edge (in later models). See Production Change section.

Horizontal output and damper: 3/8 amp (E-501) plug-in type on top of chassis, located adjacent to the high voltage cage.

MOTOROLA INC. 4545 WEST AUGUSTA BLVD. · CHICAGO 51, ILLINOIS

Part No. 68P742541 Price 60 Cents Printed in U.S.A.

TUBE COMPLEMENT

Ref. No.	Tube	Function
V-1	6BC8	Cascode RF amplifier
V-2	6U8	Mixer-oscillator
V-3	6BZ6	1st video IF amplifier
V-4	6BZ6	2nd video IF amplifier
V-5	6CB6	3rd video IF amplifier
V-6	6CB6	4th video IF amplifier
V-7	6AN8	1st audio IF & sync amplifier
V-8	6AU6	2nd audio IF
V-9	6BV8	Ratio detector & 1st audio amplifier
V-10	6AQ5	Audio output
V-11	6AU8	1st video amplifier & sync separator
V-12	12BY7A	2nd video amplifier
V-13	6CG7	Gated AGC & pulse amplifier
V-14	6SN7GTB	Horizontal phase detector & vertical blocking oscillator
V-15	6CM6	Vertical output
V-16	6SN7GTB	Horizontal oscillator
V-17	6CB5A	Horizontal output
V-18	6AU4GTA	Damper
V-19	1V2	Focus rectifier
V-20	3A3	HV rectifier
V-21	6BK4	HV regulator
V-22	6AU8	Chroma amplifier & color killer
V-23	6BH8	Bandpass cathode follower & burst amplifier
V-24	6BV8	(R-Y) demodulator & output
V-25	6BV8	Color AFC & (G-Y) output
V-26	6BV8	(B-Y) demodulator & output
V-27	6AU8	3.58 Mc color oscillator & reactance
V-28	5U4-GB	LV rectifier
V-29	5U4-GB	LV rectifier
V-30	21AXP22A	Tri-color picture tube

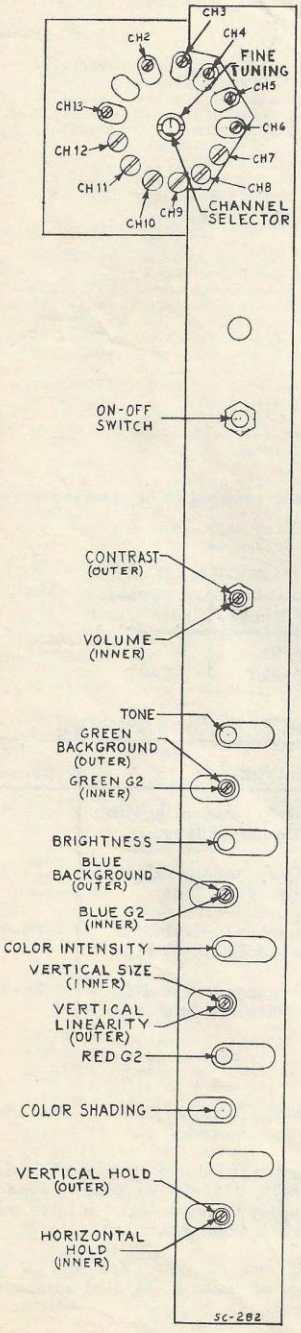


FIGURE 1.
FRONT PANEL CONTROL

OPERATING INSTRUCTIONS

FRONT PANEL OPERATING CONTROLS
(Use Figure 1 for locations)

The most frequently owner-operated controls are located at the top of the cabinet and are fully exposed: The owner-operated supplementary controls are located near the bottom of the cabinet and are concealed by a hinged control cover. These controls listed from top to bottom are as follows:

VHF STATION SELECTOR...selects desired station channel number. Also acts as a bandswitch for UHF-equipped models...when tuned to channel #1 (UHF).

FINE TUNING...Adjusts local oscillator of tuner for optimum reception of each channel.

COLOR...the fine tuning should be more carefully adjusted for color programs than on black/white: The color information may be completely removed if not adjusted properly.

UHF...the fine tuning control becomes the main tuning control when the VHF tuner is switched to UHF (channel #1) on UHF-equipped models. Correct tuning is for best picture detail consistent with proper sound and sync conditions.

VOLUME...Adjusts sound output of sound system.

CONTRAST...Adjusts the gain of the video amplifier and is equivalent to a conventional black/white contrast control.

TONE...Adjusts treble to bass response of sound system.

BRIGHTNESS. Adjusts beam currents of all picture tube guns simultaneously and is equivalent to the BRIGHTNESS control of a conventional black/white receiver. To set.... turn clockwise until picture screen is lighted. Readjust later in conjunction with CONTRAST to get desired brightness of picture and proper value of picture tones. Never keep the brightness control turned higher than necessary.

COLOR INTENSITY...Adjusts the gain of the color (chroma) system and the relative brightness of the color information, on the picture tube screen, to the black and white information. After correct adjustment of the COLOR KILLER control (back panel), it is usually not necessary to change the setting of the color intensity when changing from monochrome to color pictures. However, on black and white viewing, the color intensity control may be turned "off" (fully counterclockwise) if additional attenuation of the color system is desired. Also, it may be necessary to readjust the color intensity to compensate for different color signal levels.

COLOR SHADING...Adjusts the phase of the local color oscillator (3.58 Mc) and the hue or tint of the reproduced colors. The correct adjustment is for most natural or pleasing flesh tones, or for some object having familiar coloring (such as a blue sky, or water, etc.).

VERTICAL HOLD...This control is used for stopping vertical movement of the picture (rolling up or down). The correct adjustment is approximately in the center of the picture lock-in range.

HORIZONTAL HOLD... This control is to lock-in the picture horizontally and requires adjustment if the picture has a tendency to move across the screen horizontally or appears as a series of sloping lines. This adjustment is very broad and should be set to the center of the range in which the picture remains locked-in or stationary. (ALSO SEE HORIZONTAL OSCILLATOR ADJUSTMENT IN "REAR PANEL CONTROL" INFORMATION).

FRONT PANEL SERVICE CONTROLS (located under the "well" See Figure 1 for locations).

A group of service adjustment controls (serviceman only) are located underneath the metal "well" holding the hinged cover of the supplementary controls. To gain access to these controls remove the two screws holding the supplementary control "well" and remove the entire well.

Green G-2, green background (G-1), blue G-2, blue background (G-1) and red G-2. For proper adjustment of these controls refer to "ADJUSTING FOR WHITE SCREEN CONDITIONS".

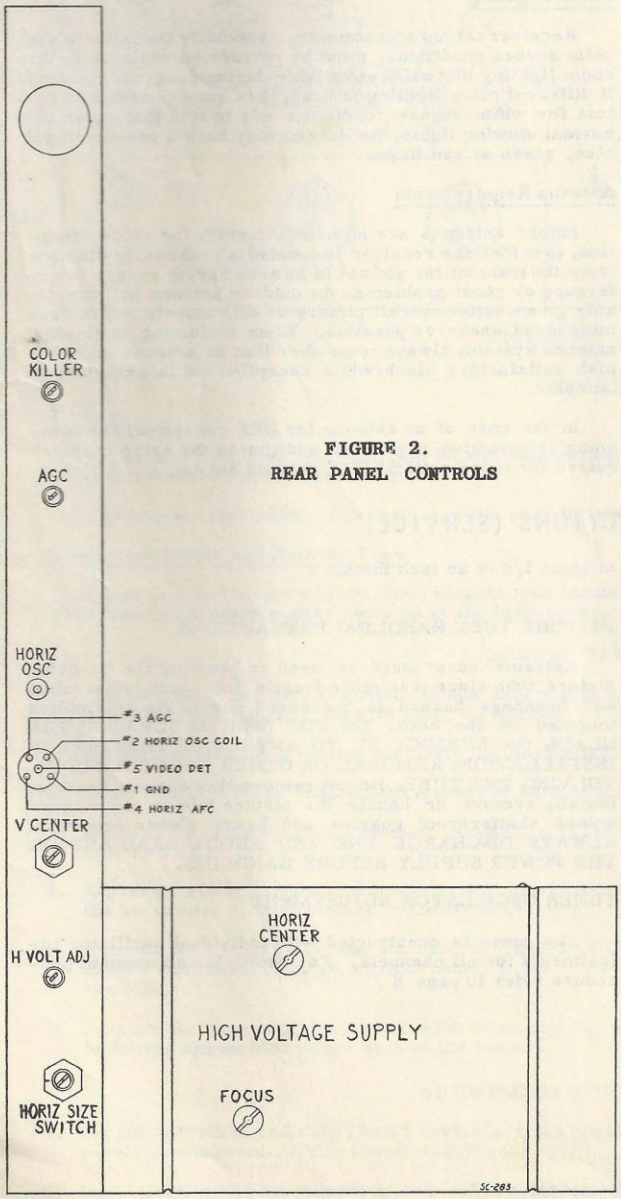


FIGURE 2.
REAR PANEL CONTROLS

VERTICAL SIZE AND VERTICAL LINEARITY... These two controls have an effect on the picture tube in the vertical direction. The vertical size control adjusts the height of the picture and requires adjustment if the picture is too large or too small from top to bottom.

The vertical linearity control adjusts the stretching or squeezing of the top portion of the picture as compared to the lower portion of the picture. This can give the effect of egg-shaped circles (flattened at top or bottom) on the screen.

Adjustment... Adjust the VERTICAL SIZE control until the picture fills the screen from top to bottom. Adjust the VERTICAL LINEARITY control for most evenly balanced picture from top to bottom. Adjustment of the VERTICAL SIZE control may require a readjustment of the VERTICAL LINEARITY control and vice-versa. If the picture should roll during these adjustments, reset the vertical hold control. NOTE: ADJUSTMENT OF THESE CONTROLS CAN AFFECT COLOR CONVERGENCE. ALWAYS CHECK AFTER ADJUSTMENT.

REAR PANEL CONTROL ADJUSTMENTS
(See Figure 2 for control locations)

1. THE COLOR KILLER

This control adjusts the operating conditions of the circuit which automatically shuts off the color system during black/white reception and automatically restores the color system for color broadcasts.

Adjust as follows: (1) Tune in a station transmitting in black and white and adjust front panel controls for a normal picture. (2) Turn the color intensity control to maximum (fully clockwise). (3) Working at the rear of the receiver, turn the color killer control fully clockwise (as viewed from rear). (4) Turn the color killer control slowly counterclockwise until the color interference disappears. (5) Try all channels and adjust control to remove interference from all channels... never use a color broadcast for this adjustment.

2. THE AGC CONTROL

This control sets the AGC system for optimum operation in practically any signal area encountered. Turning the control clockwise (as viewed from rear) sets the receiver for weak signal operation: counterclockwise rotation adjusts for strong signal areas. An incorrect setting may give poor picture quality, instability, or a buzzing sound in the speaker. Adjust for clearest and most stable picture from all channels.

3. HORIZONTAL OSC ADJUSTMENT

Refer to the section "HORIZONTAL OSCILLATOR ADJUSTMENT".

4. SERVICE TEST RECEPTACLE... See Figure 2 for location and connections.

5. VERTICAL CENTERING CONTROL

Adjusts the vertical centering of all three rasters (red, green and blue) simultaneously. Extensive adjustment may require convergence touch-up.

6. HV ADJUSTMENT

This adjustments sets the proper operating point of the regulator tube to supply proper voltage to the picture tube. After adjustment, check focus, horizontal and vertical size and convergence. USE ALL HIGH VOLTAGE SHOCK PRECAUTION TECHNIQUES TO AVOID SHOCK, PHYSICAL INJURY AND/OR DAMAGE TO EQUIPMENT.

To adjust... Set the BRIGHTNESS and CONTRAST controls (front panel) to minimum and the HORIZONTAL SIZE SWITCH (rear panel) for maximum picture width. TURN RECEIVER "OFF" AND ALLOW SUFFICIENT TIME FOR THE SYSTEM TO DISCHARGE. Connect the meter between the high voltage cable and ground in any convenient manner (you may use a "T" connector or any similar method). Keep the picture tube ultor anode connected during the measurement. Adjust the HIGH VOLTAGE REGULATOR control (rear panel) for a reading of 20,000 volts. After adjustment return all other receiver controls to normal operating positions.

7. HORIZONTAL SIZE

Adjusts the horizontal size of all three rasters (red, green and blue) simultaneously. Always check convergence after readjustment.

8. HORIZONTAL CENTERING

Centers the three rasters (red, green and blue) simultaneously. Always check convergence after readjustment.

9. FOCUS

Controls the focus and beam size of all three beams simultaneously and is equivalent to a conventional black/white focus control. Always check convergence after readjustment.

INSTALLATION INSTRUCTIONS (GENERAL)

The receiver is shipped completely assembled and adjusted: Under ideal conditions it should be necessary only to unpack the receiver, connect the antenna and apply power. However, under actual conditions the installation may be quite a bit more complex due to the following reasons:

1. Misadjusted operating and/or service controls due to vibration and shock in shipment.

2. Movement and/or misadjustment of picture tube neck components due to shipment.

3. Possible magnetization of metal parts of the receiver or picture tube retaining components affecting purity and convergence.

4. The possible need for repair or re-orientation of the old antenna... or even the need for a completely new antenna installation.

PRE-INSTALLATION CHECKS

Before delivering the receiver to the set owner, the set should be unpacked and checked for obvious damage to the cabinet, safety-glass-screen and other exposed parts. Remove the back cover and inspect the chassis and picture tube for proper and secure installation. Check picture tube component parts placement and the entire receiver for loose or broken items. Replace back cover and make a "live" power check of the receiver. NOTE: Refrain from adjusting the focus, centering, linearity, size, purity or convergence controls at this time, since the permanent location of the receiver can have some effect on the receiver's operation. Keep in mind that there can be some interaction between the size, centering and linearity controls and convergence. Therefore, adjustments on these controls should be minimized unless a complete convergence procedure is contemplated.

Locating the Receiver

Before any attempt is made to erect an antenna or to install lead-in wires, the permanent location of the receiver should be established with the set owner. Once the receiver is installed (including convergence touch-up adjustments) it is desirable to keep the receiver in this location. While the effect of external magnetic fields has been drastically reduced, the effects of receiver displacement must still be considered. The set owner should be advised on the necessity of keeping the receiver in the original installed position... and to keep any cabinet movements or jarring to a minimum when cleaning around the receiver.

Room Lighting

Receiver set-up adjustments, especially those for white color screen conditions, must be performed while using the room lighting that will be available during program viewing. If different color lighting is used, it is quite possible to adjust for white screen conditions only to find that under the normal viewing lights, the screen may have a pre-dominant blue, green or red tinge.

Antenna Requirements

Indoor antennas are often satisfactory for color reception, provided the receiver is located a reasonable distance from the transmitter and not in an area having severe interference or ghost problems. An outdoor antenna will invariably give a better overall picture on all channels and is recommended whenever possible. When evaluating an existing antenna system, always remember that an antenna may furnish satisfactory black/white reception but fail completely on color.

In the case of an antenna for UHF reception, the foregoing information applies in addition to the extra care required for more critical UHF antenna set-up.

INSTALLATION INSTRUCTIONS (SERVICE)

HIGH VOLTAGE WARNING

Lethal voltages are present in this receiver. Use all necessary techniques to avoid shock, physical injury or damage to testing equipment. Keep in mind that a severe shock can be incurred without making physical contact with high voltage sources. Keep at least three inches away from high voltage points. Shock hazard is also present at the junction of the metal cone and metal-to-glass seal at the front edge of the picture tube.

X-RAY WARNING

Soft X-rays are radiated from the screen of the picture tube which are usually absorbed by the safety glass screen: Operation of the receiver without the safety glass screen results in a danger area immediately in front of the central screen area. Exposure within this area for a prolonged period of time can cause physical injury. When the anticipated, or required, exposure involves an extended time period, always provide an X-ray absorbing shield in front of the tube. This shield should be a pane of glass or plastic at least 1/4 of an inch thick.

PICTURE TUBE HANDLING PRECAUTIONS

Extreme care must be used in handling the tri-color picture tube since it is more fragile than black/white tubes and breakage hazard is increased due to the assemblies mounted on the neck. DO NOT NICK OR SCRATCH THE GLASS, OR SUBJECT IT TO ANY UNDUE PRESSURE IN INSTALLATION, REMOVAL OR OTHER PROCEDURES INVOLVING THE TUBE. Do not remove the receiver chassis, install, remove or handle the picture tube in any manner unless shatterproof goggles and heavy gloves are worn. ALWAYS DISCHARGE THE 2ND ANODE LEAD AND/OR THE POWER SUPPLY BEFORE HANDLING.

TUNER OSCILLATOR ADJUSTMENT

The tuner is constructed with individual oscillator adjustments for all channels. For oscillator adjustment procedure refer to page 8 .

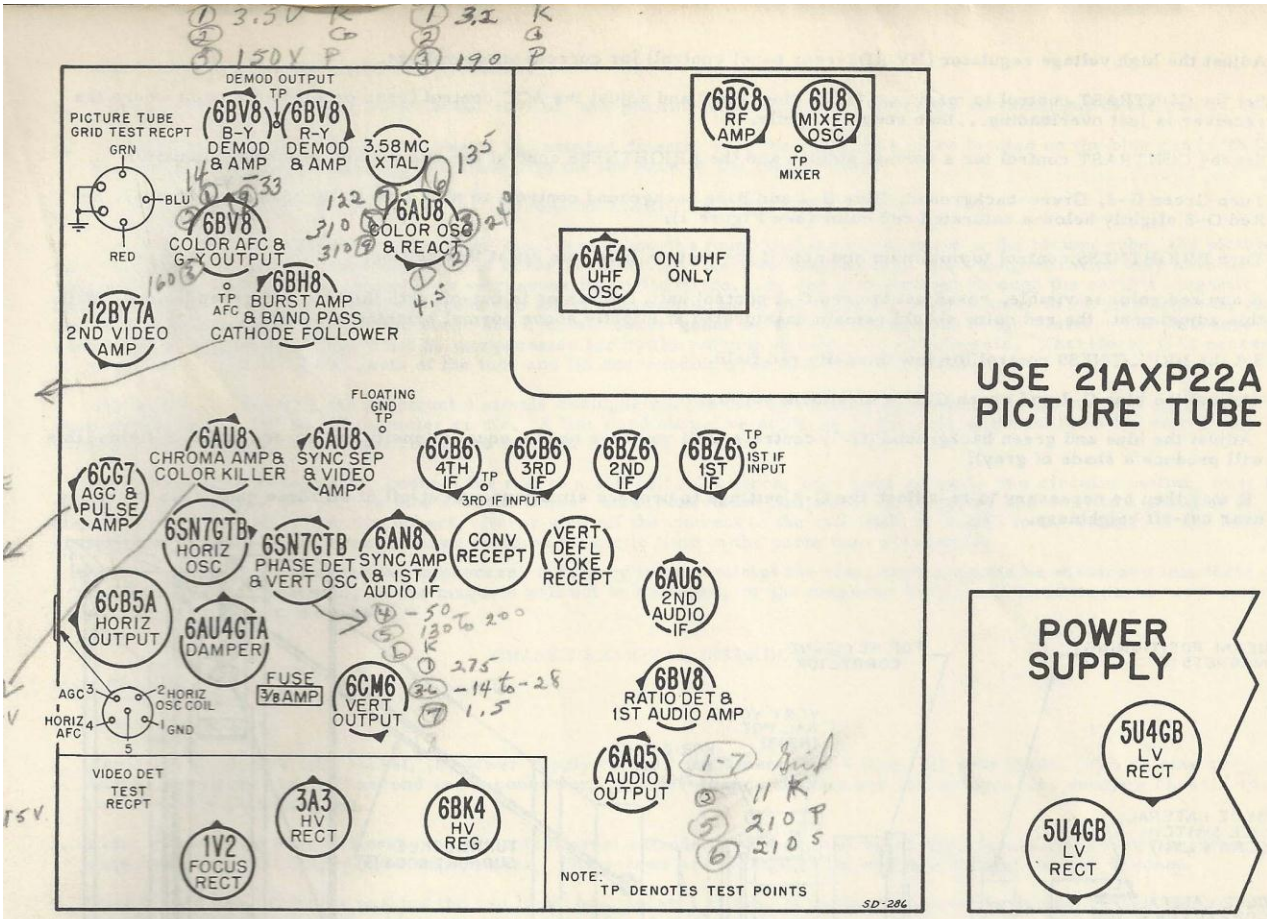


FIGURE 3. TOP VIEW OF CHASSIS

FUSE REPLACEMENT

B+ System

This fuse is a 2 ampere, pig-tail type located underneath the power supply sub-chassis in early models. The sub-chassis must be removed for fuse replacement.

In later models (PS-905B), this fuse is of the plug-in type located at the right-hand side of the sub-chassis.

Horizontal Output and Damper Fuse

This fuse is a 3/8 ampere (slow blow) plug-in type located to the rear of the main chassis adjacent to the high voltage cage. This fuse is accessible after removal of the back cover.

HORIZONTAL OSCILLATOR ALIGNMENT

The HORIZONTAL HOLD control should have a sync range of approximately 30 degrees. If the control is too critical, adjust HORIZONTAL OSCILLATOR COIL as follows:

1. Set all controls for a normal picture. Set line voltage to approximately 117 volts with variac.
2. Short HORIZ AFC to ground with a piece of wire at pin #4 of the SERVICE TEST RECEPTACLE (see Figure 3).
3. Connect a .1 mfd 600 volt capacitor across L-501 (HORIZ OSC COIL) by using pins #2 and #1 of the SERVICE TEST RECEPTACLE.
4. Adjust HORIZ HOLD control (front panel, under lid) to the point where the picture almost remains stationary...as far as the horizontal sync of picture is concerned.
5. Remove the .1 mfd capacitor shunting the HORIZ OSC COIL and without turning the horizontal hold control, adjust the HORIZ OSC COIL (located on rear panel) to the center of the range in which the picture almost remains in sync horizontally.
6. Remove the wire shorting HORIZ AFC to ground and adjust the HORIZONTAL HOLD control (front panel) so that no fold-over appears on either side of the raster.

ADJUSTMENT FOR WHITE SCREEN CONDITIONS

1. Set BRIGHTNESS and CONTRAST controls (front panel Fig. 1) for a normal picture. Set the CHROMA control (front panel) to minimum...fully counterclockwise.
2. If possible, avoid adjustment of vertical and horizontal hold, size, linearity and centering as they affect convergence.

3. Adjust the high voltage regulator (HV ADJ-rear panel control) for correct anode voltage.

4. Set the CONTRAST control to maximum (fully clockwise) and adjust the AGC control (rear panel) to the point where the receiver is just overloading...then reduce slightly.

5. Set the CONTRAST control for a normal picture and the BRIGHTNESS control for slightly above normal intensity.

6. Turn Green G-2, Green-background, Blue G-2 and Blue background controls to minimum (fully counterclockwise). Set Red G-2 slightly below a saturated red color (see Figure 1).

7. Turn BRIGHTNESS control to minimum and note if the picture tube cuts off at this setting.

8. If any red color is visible, re-adjust the red G-2 control until the raster is cut-off with the blue and green beams. With this adjustment, the red color should remain unsaturated at slightly above normal brightness settings.

9. Set the BRIGHTNESS control for low intensity red field.

10. Adjust the blue G-2 and green G-2 to maximum setting.

11. Adjust the blue and green background (G-1) controls until you have nearly equal intensity red, green and blue fields (this will produce a shade of gray).

12. It may then be necessary to re-adjust the G-2 settings to produce simultaneous cut-off of all three guns when operating near cut-off brightness.

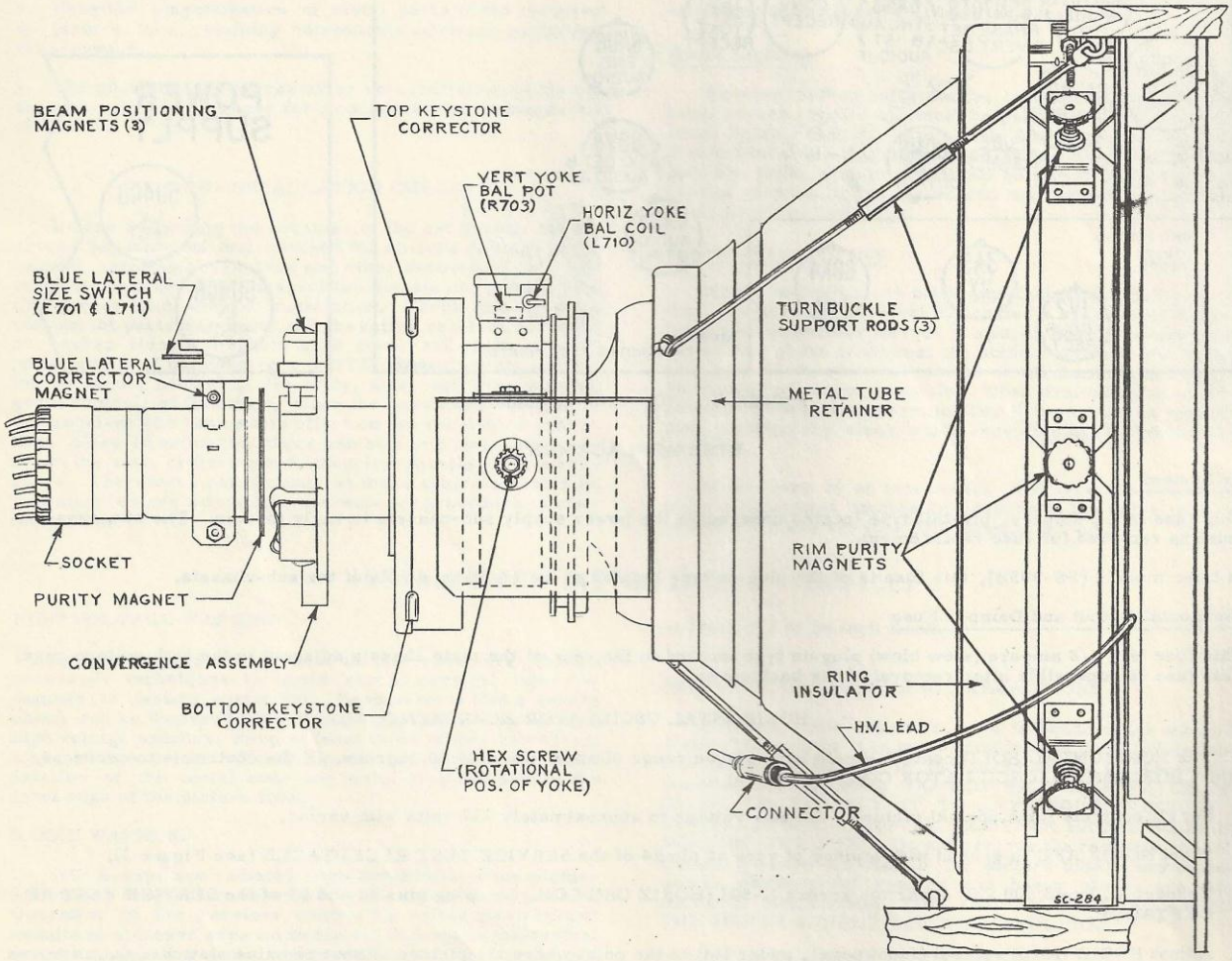


FIGURE 4. PICTURE TUBE ASSEMBLY

PLACEMENT OF PICTURE TUBE NECK COMPONENTS

1. The yoke is closest to the picture tube flare and is positioned for best edge purity compromise between the three color fields.

2. The rear edge of the convergence assembly (which is located behind the yoke) should be positioned 1/8" ahead of the rear edge of the picture tube convergence pole pieces. This places the convergence assembly directly over the three convergence pole pieces inside the tube neck. The convergence assembly should be rotated so that the blue coil (assembly retaining clamp bolt downward and centered) is up and vertically centered ...or radially centered on internal pole pieces. The blue convergence coil can be readily identified by its blue color coded leads...the other two convergence coils are

also coded with the appropriate color wires.

3. The purity ring should be located to the rear of, and positioned directly over the cross sectional gap of the gun barrel.

4. The blue lateral corrector device should be centered directly over the extra pole piece located on the blue gun (with the blue lateral size switch upward) and closest to the the base of the picture tube.

DEMAGNETIZING THE PICTURE TUBE

During the intial installation of the color receiver, it may be found that the metal parts of the picture tube, the picture tube retaining brackets or other metal parts of the receiver have become magnetized. Such magnetization may have occurred due to the receiver's exposure to extraneous magnetic fields...or due to movement through the earth's magnetic field in shipment. These magnetized areas can affect the positioning of the three electron beams, in varying degrees, and thus introduce defects in the purity, static and dynamic convergence as well as distortions of the raster. The influence of such random field patterns could not be compensated for by the normal picture tube adjustments. Therefore, it is necessary to make certain that all metal parts of the tube and its surrounding area are free of these fields.

The service technician can construct a simple demagnetization coil by winding approximately 425 turns of number 20 enameled wire in a 12" to 14" diameter circle. A line cord should be soldered to the ends of the coil and the entire coil carefully taped to protect the user from line voltage.

To demagnetize metal parts, connect the coil to a 110 volt AC source, then pass the coil, in a circular motion, over the entire surface area of the picture tube several times: slowly move the coil out of the receiver and away to a distance of about eight or ten feet...then disconnect. Never shut off the current to the coil while it is still in the vicinity of the tube since this may result in an even stronger residual magnetic field in the parts than previously.

NOTE: Before the de-magnetization process, it is very important that the rim purity magnets be withdrawn into their cups (minimum strength position), so the magnets will not be damaged, or the magnetic field from these magnets "set" into the metal parts of the picture tube.

CHASSIS REMOVAL INSTRUCTIONS

Main Chassis

1. Remove back cover

2. Remove: (a) picture tube socket, (b) power supply cable, (c) filament lead & plug, (d) yoke leads, (e) blue size switch lead at hi voltage cage, (f) second anode connector, (g) convergence chassis and coil cables; also unscrew chassis-to-power supply grounding lug.

3. Place receiver on edge of workbench so control panel extends beyond edge of bench and remove two screws securing chassis to long "U" shaped mounting bracket. The screws are located at the extreme ends of the "U" bracket.

4. Open hinged cabinet top by pushing the two long rods, located at rear of cabinet top near the cabinet hinges, toward the rear of cabinet. Then rest cabinet top on support arm at side of cabinet.

5. Remove screws securing the two "L" shaped brackets (one at top and the other at rear of chassis) to the cabinet, also remove the screws securing the top "L" bracket to the chassis.

6. Remove chassis toward rear of cabinet.

Convergence Sub-chassis

1. Open hinged cabinet top and loosen convergence sub-chassis mounting screws.

2. Make certain all cables associated with this sub-chassis are removed.

3. Remove convergence sub-chassis by lifting chassis "up and out".

Power Supply Sub-chassis

1. Remove four chassis mounting screws.

2. Make certain all cables associated with this sub-chassis are removed.

3. Remove power supply sub-chassis from cabinet.

PICTURE TUBE REPLACEMENT

1. It will greatly facilitate matters if all the chassis are removed first to create tube withdrawal space (see Chassis Removal Instructions).

2. Place receiver cabinet with the picture tube mask down on a padded bench.

3. Remove the three suspension rods holding the picture tube to the cabinet.

4. Open lid (reach in from back of cabinet and push the two top corner rods to the rear as far as possible) and loosen the bolt in metal band which supports the rim purity magnets.

5. Remove the blue lateral device (located closest to the picture tube socket), purity ring and the convergence device.

6. Remove the tube, yoke bracket assembly and tube shield (all picture tube leads, socket and etc., should have been previously removed as in step #1).

7. Replace tube and reassemble in reverse order given above.

NOTE: Use the blue gun (identified by extra pole piece) to indicate the top and vertical axis of the tube.

REMOVAL OF SAFETY GLASS FOR CLEANING

See page 31 for glass removal instructions of new models.

The picture tube is under great pressure, and can implode with violence. Do not strike or scratch the screen while the glass is removed.

NOTE: The color receiver should be turned "off" for a length of time sufficient to discharge the high voltage system. If the glass is removed before this period of time, there is shock hazard present at the edges of the picture tube screen. While this charge is not lethal in itself, unexpected muscular reaction could cause physical injury.

TO REMOVE SAFETY GLASS

1. Remove the channel selector and fine tuning knobs. Knobs are held by friction only and may be pulled off by pressure straight out from the cabinet.
2. Remove two (2) Phillips head screws holding circular insert (the circular insert is located under the knobs that were removed in step #1).
3. Remove the five (5) Phillips head screws holding metal molding trim at bottom of the safety glass.
4. Remove the four (4) hex head screws holding metal glass retainer at bottom of the safety glass.
5. Remove the five (5) Phillips head screws securing metal molding trim at top of the safety glass (hold glass during removal of last screw so glass will not fall out).
6. Grasp safety glass at right-hand edge and move outward until glass clears cabinet. Then slide glass towards right-hand side. Grasp safety glass at right and left-hand edges and remove from cabinet. Place glass in a safe place.

When replacing safety glass, make sure flexible molding is on top, bottom and left-hand edges of the safety glass before installation. Follow removal steps in reverse order.

TUNER LOCAL OSCILLATOR ADJUSTMENTS

The tuner has provision for individual channel oscillator adjustment by means of screws which may be reached from the front of the cabinet. To gain access to the oscillator adjustments...remove the fine tuning and channel selector knobs (see Figure 1).

PROCEDURE

1. After receiver has had a few minutes of warm-up time, switch tuner to highest numbered channel available in the area. Observe receiver for proper reception of sound and picture (may be performed on either black/white or color broadcasts). If station is not received properly within the limits of the fine tuning control range, it will be necessary to adjust the correspondingly numbered oscillator screw located under the channel dial scale and fine tuner knob. Use FRONT PANEL CONTROL illustration for location of screws.
2. Fine tuner must be at mid-position to adjust the oscillator screw. This position is correct when channel number holes #2 and #13 are open (open to the extent that an alignment tool can be inserted to adjust them).
3. Use a non-metallic screwdriver or alignment tool. Do not turn oscillator screw counterclockwise to extent of disengagement from tuner. To insure that the screw is within the range of its threads...tighten the screw (clockwise) until it stops, then turn counterclockwise until the station appears. The maximum number of safe counterclockwise turns from the stop are:

7-turns for channels:	5-turns for channels:
13	12
6	11
5	10
4	9
3	8
2	7

4. Switch tuner to the next lower channel number available in the area. If station is not received properly...adjust oscillator slug of this channel using the procedure outlined in steps #2 and #3.
5. Repeat step #4 for the remainder of the channels. Always adjust channels in descending order, otherwise tuner will be severely misaligned.

STATIC CONVERGENCE PROCEDURE

1. Remove the back cover of the receiver.
2. After removal of the back cover, the top of the cabinet may be opened on its hinges. To lift cabinet top, reach into receiver from the rear and pull the metal rods located on the left and right-hand sides (near the frame of the top) towards the rear of the cabinet. When the rods are far enough out the rear of the receiver to be disengaged from the front of the cabinet, the cabinet top may then be opened from the front edge. A small arm on the right-hand side of the cabinet (looking at receiver from front) may be raised to hold the top in position.
3. Disconnect small chassis (located in upper right-hand corner, when looking from rear) from the convergence circuits by removing the octal plug from the small chassis. This removes the effect of the dynamic convergence system and its control settings.
4. Apply power to the receiver and allow a few minutes of warm-up time.
5. Inject a white cross hatch or dot pattern into the receiver and adjust the FINE TUNING control for best definition of the pattern.

6. Adjust the BRIGHTNESS and CONTRAST controls (front panel) to their normal level.

7. Adjust the FOCUS control (rear panel) for sharpest focus.

8. Adjust the AGC control (rear panel) by rotating it clockwise until the receiver overloads (with max contrast setting) then turn counterclockwise about 1/8 turn.

9. Using a cross hatch pattern, vertically de-center the raster and note which color field is off convergence. Any one field may be displaced by as much as a whole line (horizontally or vertically) and would be difficult to detect if the above procedure were not used. Then adjust the red and green beam positioning magnets (beams are moved diagonally) and the blue beam positioning magnet (blue beam moves vertically only) and the blue lateral corrector magnet moves beam horizontally only for rough convergence. The static convergence magnets are the circular discs located on the top of the convergence assembly cores. The blue lateral corrector magnet is located in the blue dynamic horizontal size switch positioned near the base of the tube and over the blue lateral pole piece. The corrector magnet is adjusted by rotating the paper tubing adjacent to the tube neck.

10. Turn receiver off and allow time for discharge of high voltage. Check high voltage in accordance with procedure given in "REAR PANEL CONTROLS" section.

11. Adjust the VERTICAL SIZE and VERTICAL LINEARITY controls (located on front panel) and the HORIZONTAL SIZE CONTROL (located on the rear panel) for a linear raster of the proper size.

12. Adjust the HORIZONTAL CENTERING and the VERTICAL CENTERING controls (located on the rear panel) for proper positioning of the dot or cross hatch pattern.

13. TURN THE RECEIVER "OFF"...then loosen the two screws that secure the yoke mounting bracket to the rear picture tube support. Pull the deflection yoke towards the rear of the tube as far as possible.

14. Remove the green and blue grid (G-1) leads from their receptacles on the main chassis and plug them into the ground receptacles provided.

15. TURN THE RECEIVER "ON"...and rotate the red G-2 control (located under the "well" of the front panel) fully clockwise. Keep the CONTRAST control as low as possible and the BRIGHTNESS control set for normal brightness.

CENTER PURITY

16. Tune the receiver to a blank channel so no pattern is visible on screen.

17. Position the purity magnet rings (located on the neck of the picture tube, between the convergence assembly and the blue lateral positioning magnet) so the tabs are together and producing no magnetic field from the purity device. Rotating the two rings of the purity device together, as a unit, should have no effect on the raster.

18. Separate the red tabs of the purity device a small amount to produce a weak magnetic field. Rotate the purity device as a unit to obtain greatest area of red field...that is centered in the raster. Continue the process of adjusting the strength and direction of rotation of the purity device until a red field of maximum area has been obtained.

19. Move yoke forward to find best edge purity of the red raster. Tighten yoke screws after locating this position.

20. Adjust the rim magnets, located on the rim of the picture tube, for best red purity along the outer areas and edges of the screen. The field strength of the rim purity magnets may be adjusted independently of the magnet polarity by pulling or pushing them in or out the holder...the screw mechanism will allow slippage. The magnet polarity as well as the strength may then be varied by rotation of the knob.

21. When the red purity has been adjusted for best red field, check the purity of the green and blue fields individually by replacing the appropriate grid lead into its correct pin receptacle and keeping the unwanted guns turned off by grounding their grid leads. Make any necessary compromise setting of the purity device required to obtain best purity on all three (red, green and blue) fields.

EDGE PURITY

22. Insert the lead of the red gun into the red gun receptacle of the grid lead socket and plug the blue and green guns into the grounding receptacle pins.

23. Loosen the screws holding the yoke and slide the yoke forward or backward along the tube neck to find the best possible position for edge purity and overall purity.

24. Adjust rim purity magnets for best edge purity.

25. Check the blue and green fields individually for best purity by grounding the other two unwanted guns and by moving the yoke along the tube neck.

26. In the final positioning of the yoke and rim purity magnets, the individual red, blue and green fields should be pure over the largest possible screen area.

27. Re-insert the red, blue and green grid (G-1) leads into the proper receptacle hole, for normal operation.

28. Adjust the CONTRAST control to near maximum and the BRIGHTNESS control for a low brightness raster.

29. Adjust the red, green and blue G-2 (front panel, under "well") controls for a neutral or gray raster.

30. Adjust the rim magnets to remove any color shading that appears at the extreme edges of the screen. Adjust magnets by sliding them towards the picture tube and rotating them for best purity at all points around the edges of the screen. Upon completion of this adjustment, the raster over the entire screen area should be a uniform neutral gray.

CORRECTIONS FOR YOKE IMPERFECTIONS

The following adjustments are unique Motorola additions to the TS-905 color receiver circuitry for purposes of nullifying imperfections in the deflection yoke. Many of these adjustments are completely new to the color receiver in-

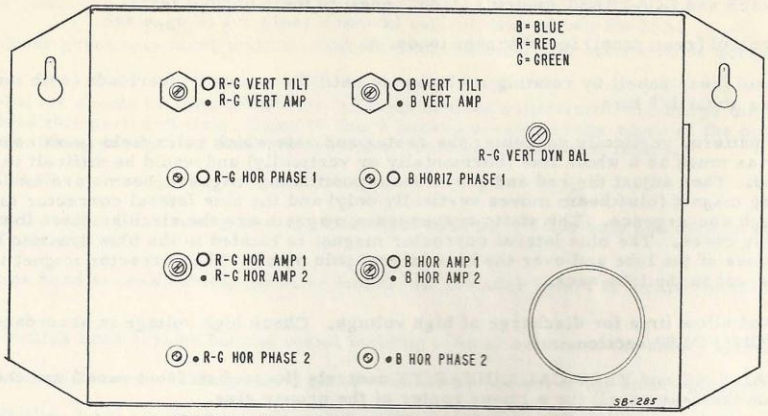


FIGURE 5. CONVERGENCE CONSOLE CHASSIS

dustry. Therefore, it is necessary to follow specific procedure rather then depend on any generalized convergence information that may have been published previously.

1. The convergence assembly should be disconnected by unplugging at the convergence chassis during the following procedure. Make sure that the position of the deflection yoke is secure from the preceding purity procedure.

2. Set all receiver controls for a normal picture with optimum resolution of a cross hatch pattern.

3. Converge the pattern at the center of the screen, using the red, green and blue BEAM POSITIONING MAGNETS (circular discs on the convergence assembly) and the BLUE LATERAL CORRECTOR MAGNET.

4. Observe the red and green horizontal lines (produced by the generator) at the center of the screen. Adjust the HORIZONTAL YOKE BALANCE COIL (located on the deflection yoke) until the red and green horizontal lines are either superimposed or are equally spaced with respect to each other from left to right over the center of the screen (see Figure 8).

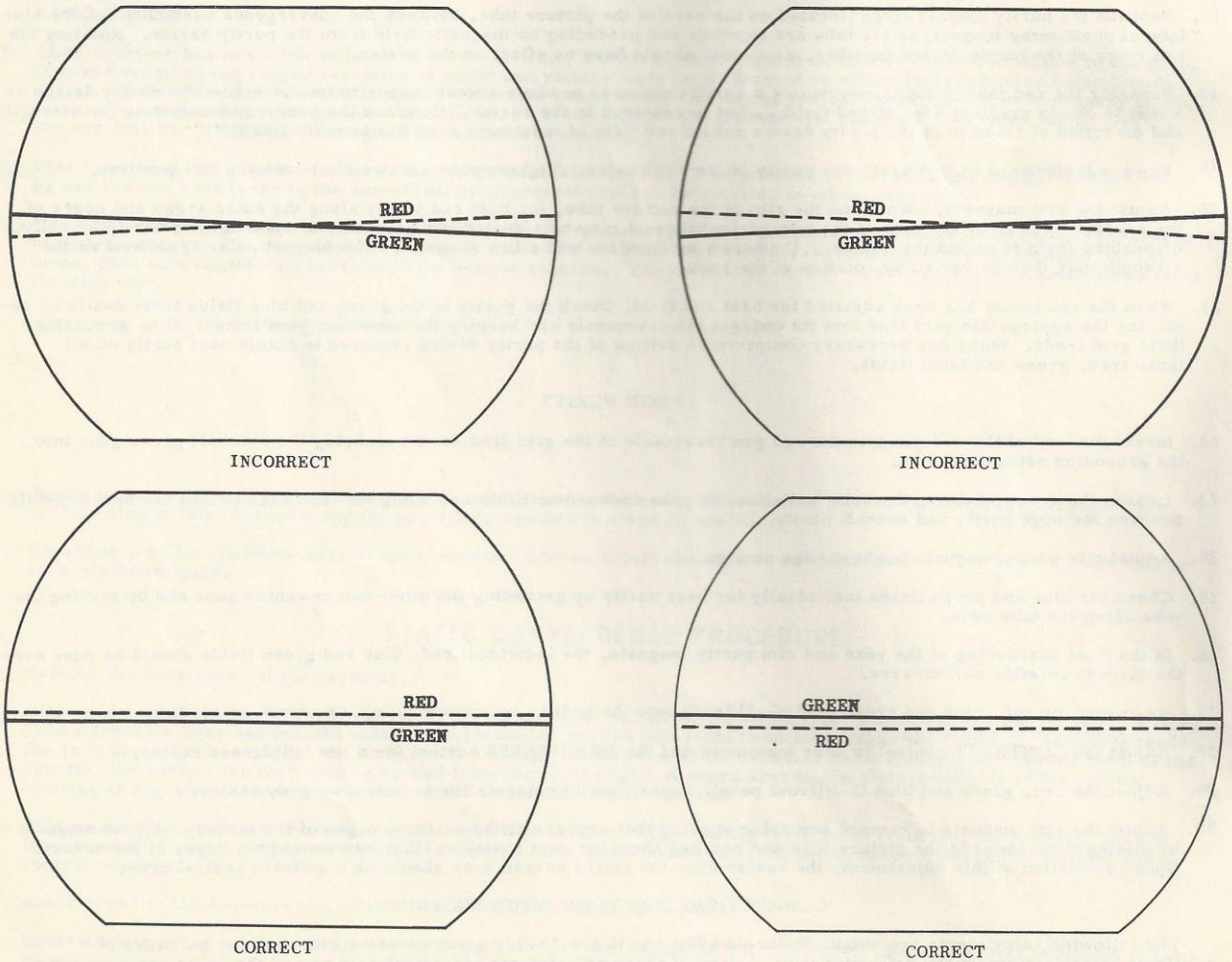
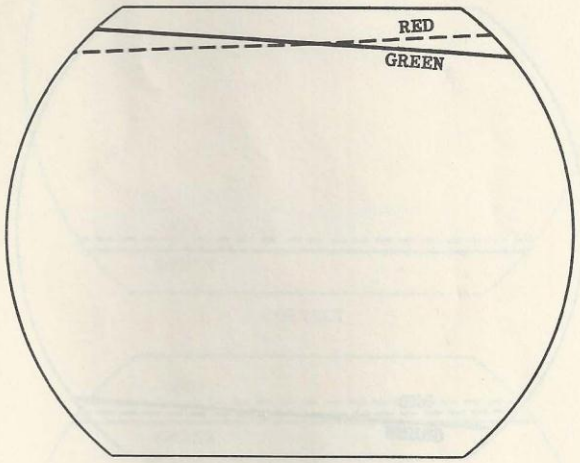


FIGURE 8. HORIZONTAL YOKE BALANCE COIL ADJUSTMENT



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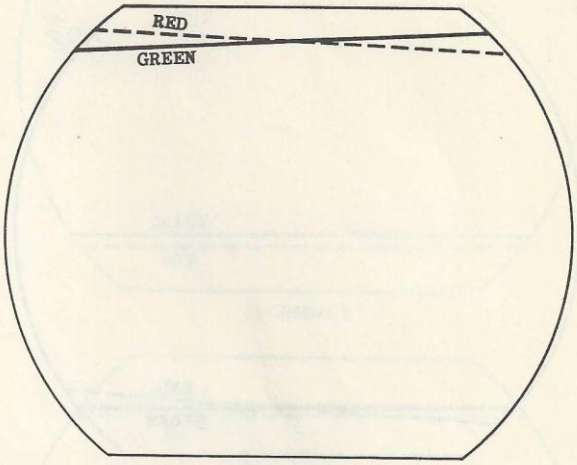

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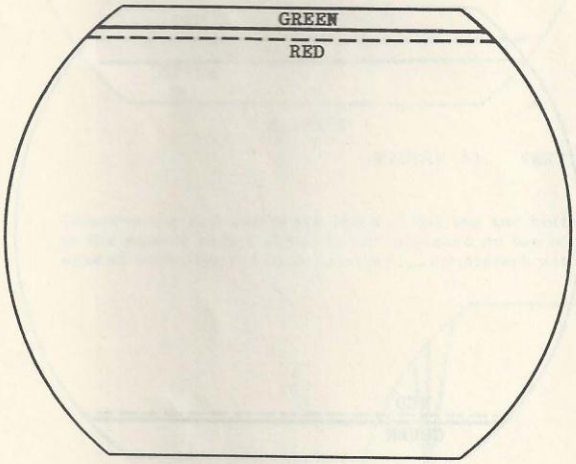
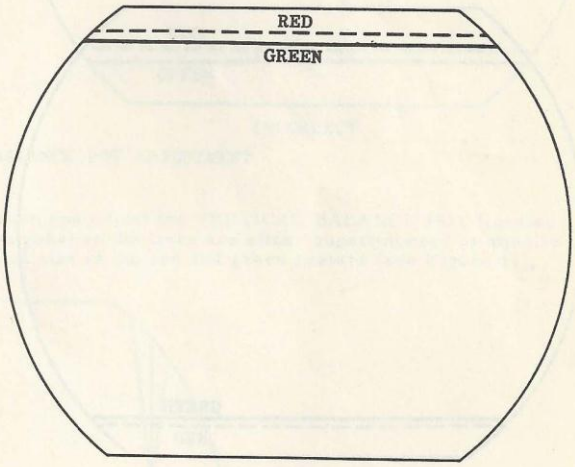


CORRECT



CORRECT

FIGURE 9. TOP KEYSTONE CORRECTOR ADJUSTMENT

5. Observe the red and green horizontal lines at the top of the screen and adjust the top HORIZONTAL KEYSTONE CORRECTOR (located on the top right-hand side of the deflection yoke...as viewed from rear of receiver) so the lines are either superimposed or are equally spaced with respect to each other from left to right (see Figure 9).

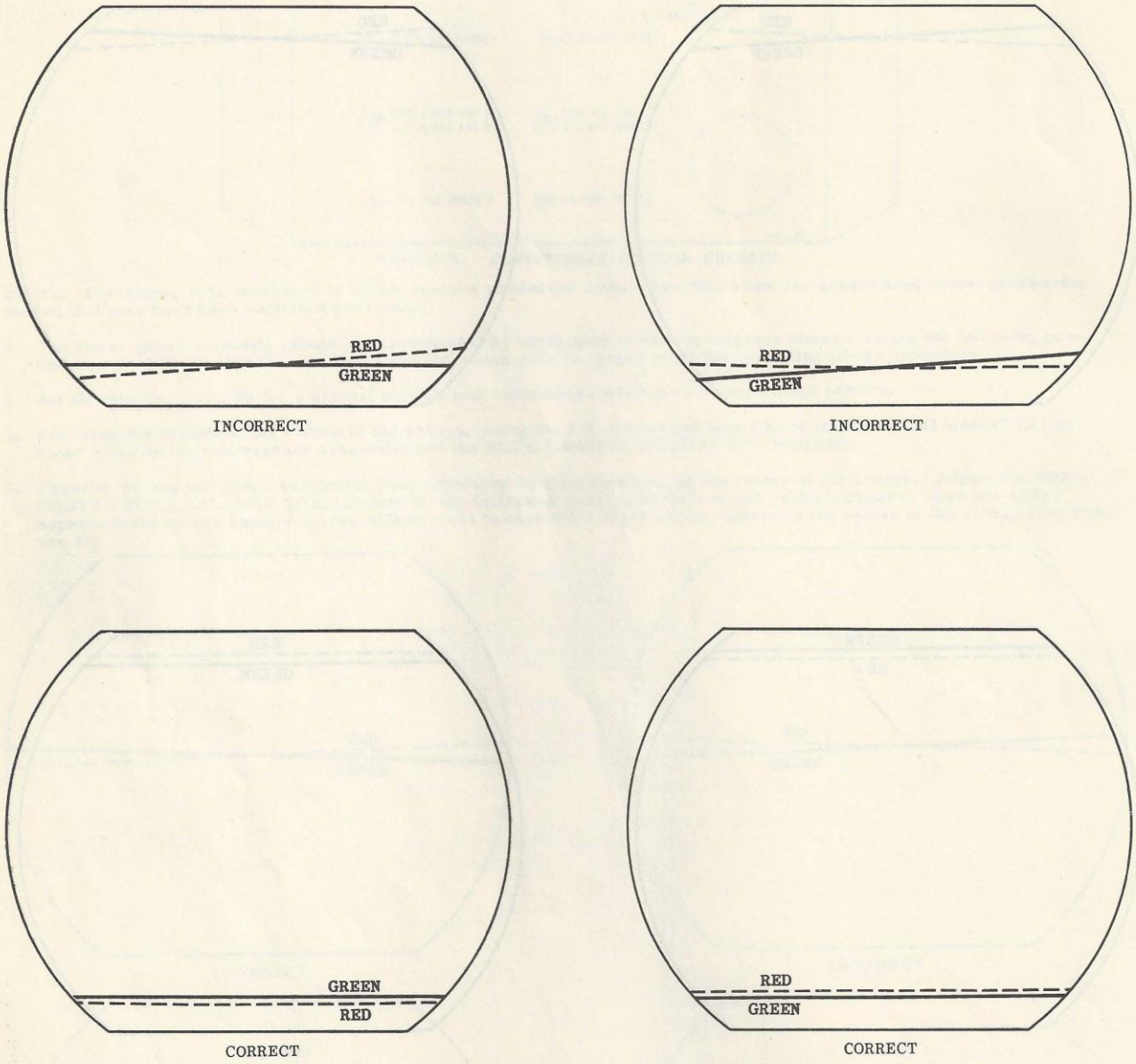


FIGURE 10. BOTTOM KEYSTONE CORRECTOR ADJUSTMENT

6. Observe the red and green horizontal lines at the bottom of the screen and adjust the BOTTOM HORIZONTAL KEYSTONE CORRECTOR (located on the bottom, right-hand side of the deflection yoke...as viewed from rear of receiver) so the lines are either superimposed or are equally spaced with respect to each other from left to right (see Figure 10).

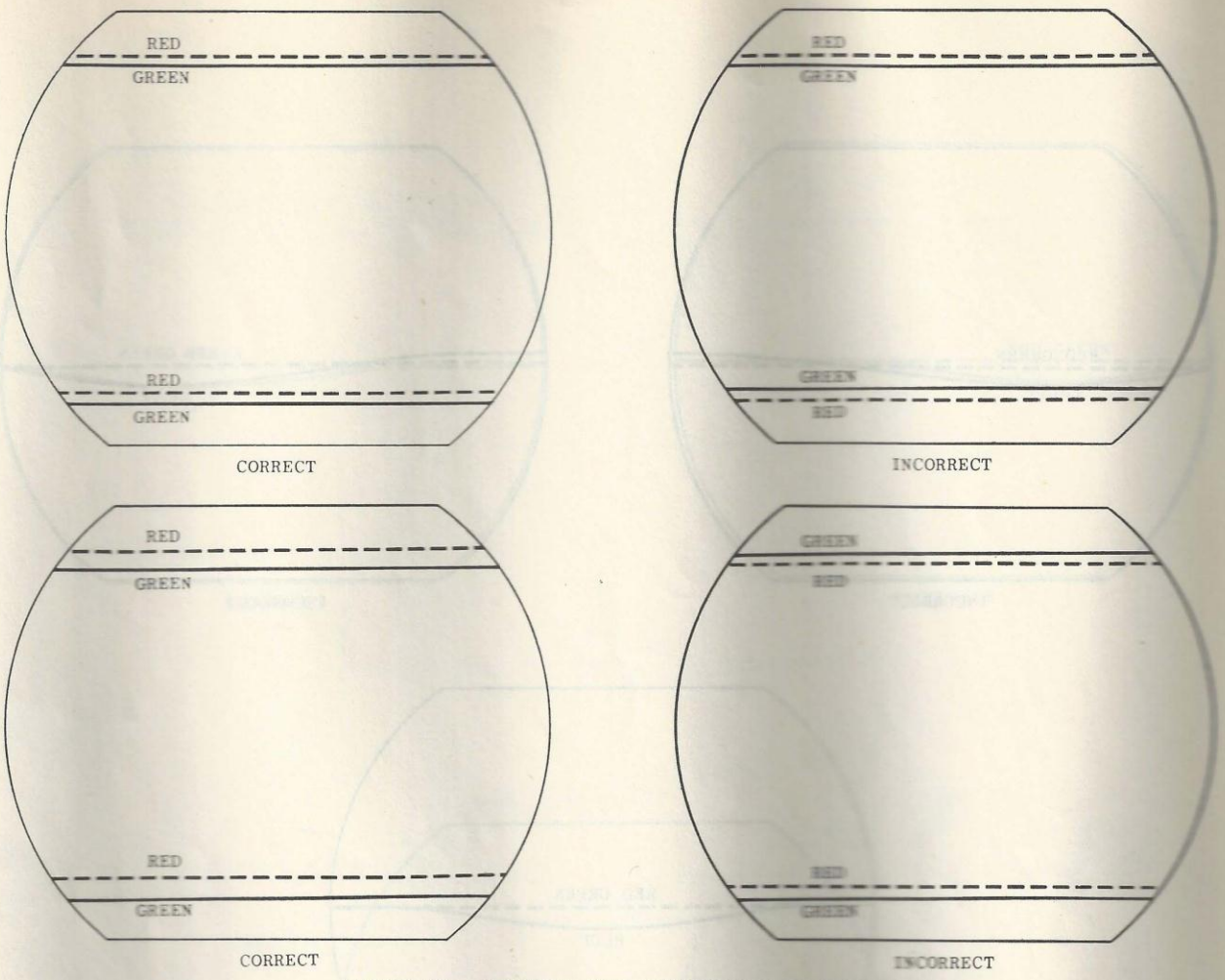


FIGURE 11. VERTICAL YOKE BALANCE POT ADJUSTMENT

7. Observe the red and green lines at the top and bottom of the screen and adjust the VERTICAL BALANCE POT (located in the square metal shield "can" mounted on top of the deflection yoke) so the lines are either superimposed or equally spaced with respect to each other...consistent with equal vertical size of the red and green rasters (see Figure 11).

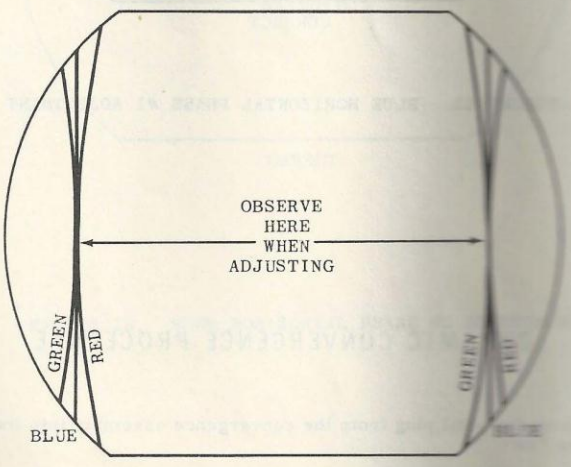


FIGURE 11A BLUE DYNAMIC HORIZONTAL SIZE SWITCH ADJUSTMENT

8. Observe the vertical lines at the left and right-hand edges of the raster. Adjust the BLUE LATERAL SIZE SWITCH (located on top of the blue lateral corrector magnet) so the blue vertical lines are spaced between the red and green lines at both edges of the raster (see Figure 11A).

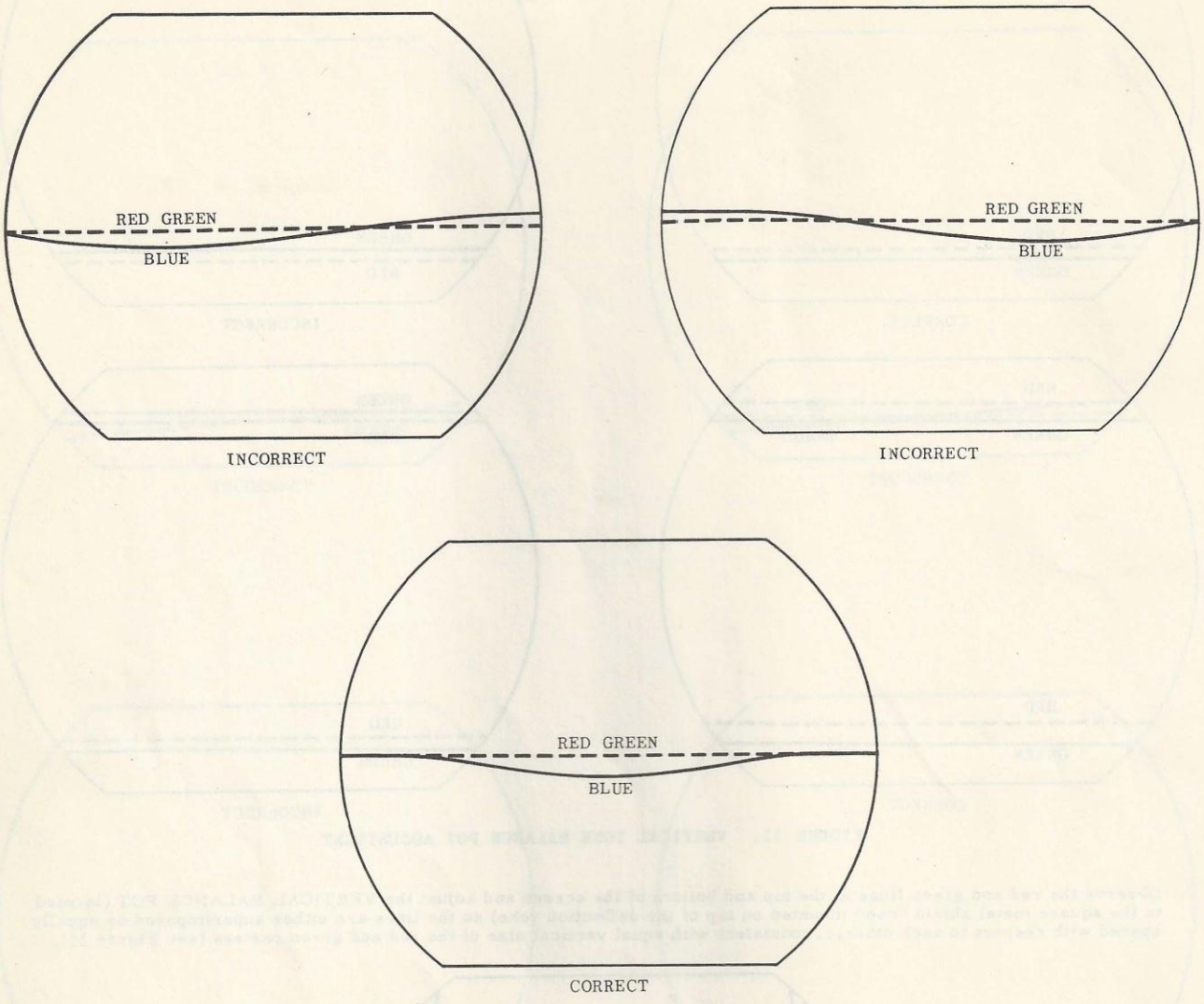


FIGURE 12. BLUE HORIZONTAL PHASE #1 ADJUSTMENT

DYNAMIC CONVERGENCE PROCEDURE

1. Turn the receiver "off" and insert the octal plug from the convergence assembly into its receptacle on the convergence sub chassis. Turn the receiver "on".

2. Turn the BLUE HORIZONTAL AMPLITUDE #1 control to maximum (fully clockwise), and the BLUE HORIZONTAL AMPLITUDE #2 control to minimum (fully counterclockwise). Maintain focus throughout the convergence procedure.

3. Observe one blue horizontal line at the center of the screen and adjust the BLUE HORIZONTAL PHASE #1 coil (located on the convergence chassis) for maximum displacement (separation) of the blue line with respect to the red and green lines over the central area of the screen (see Figure 12).

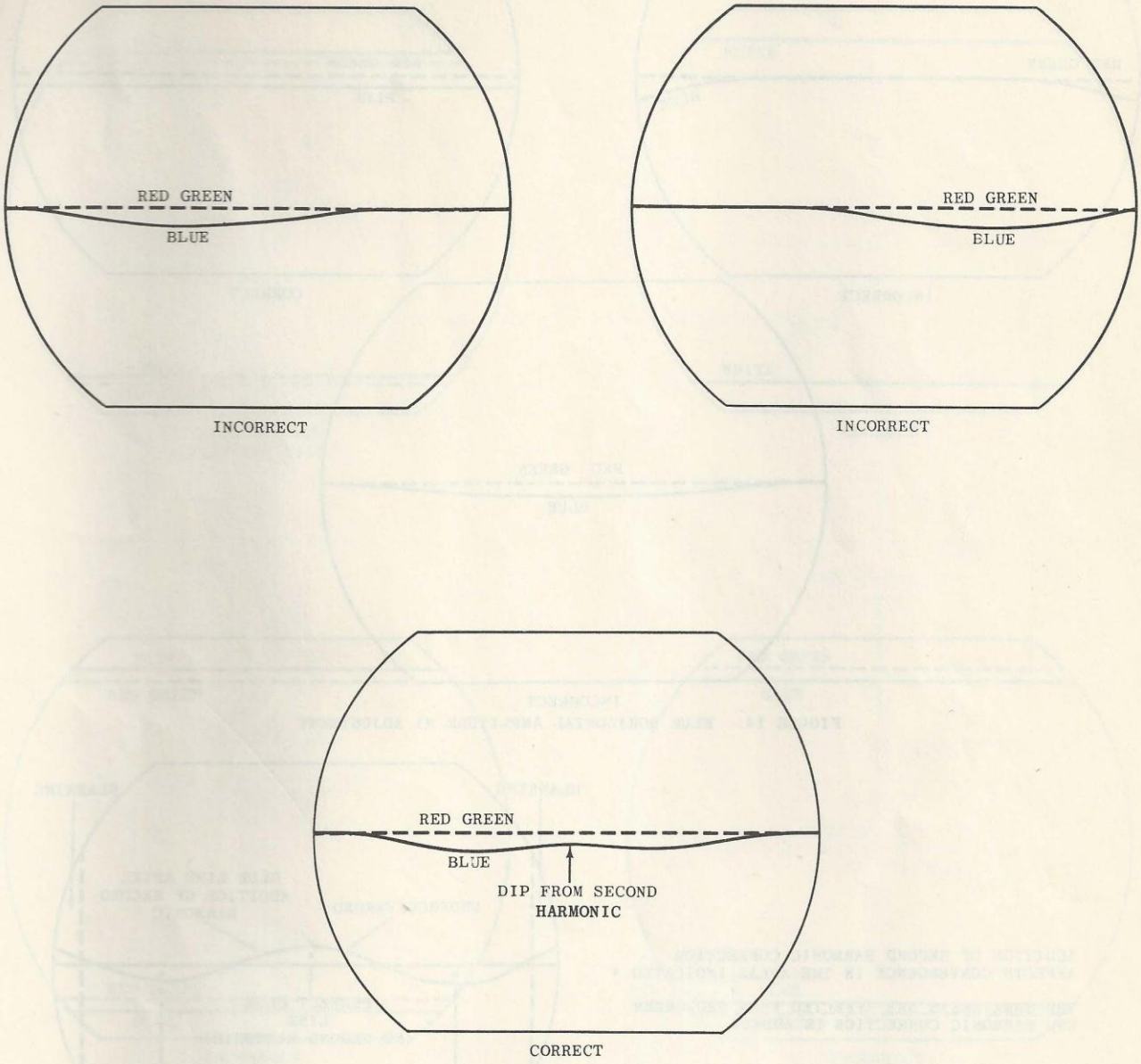


FIGURE 13. BLUE HORIZONTAL PHASE #2 ADJUSTMENT

4. Turn the BLUE HORIZONTAL AMPLITUDE #2 control (convergence chassis) to maximum (fully clockwise) then adjust the BLUE HORIZONTAL PHASE #2 coil (convergence chassis) for minimum displacement (separation) of the center blue line with respect to the red and green lines (see Figure 13).

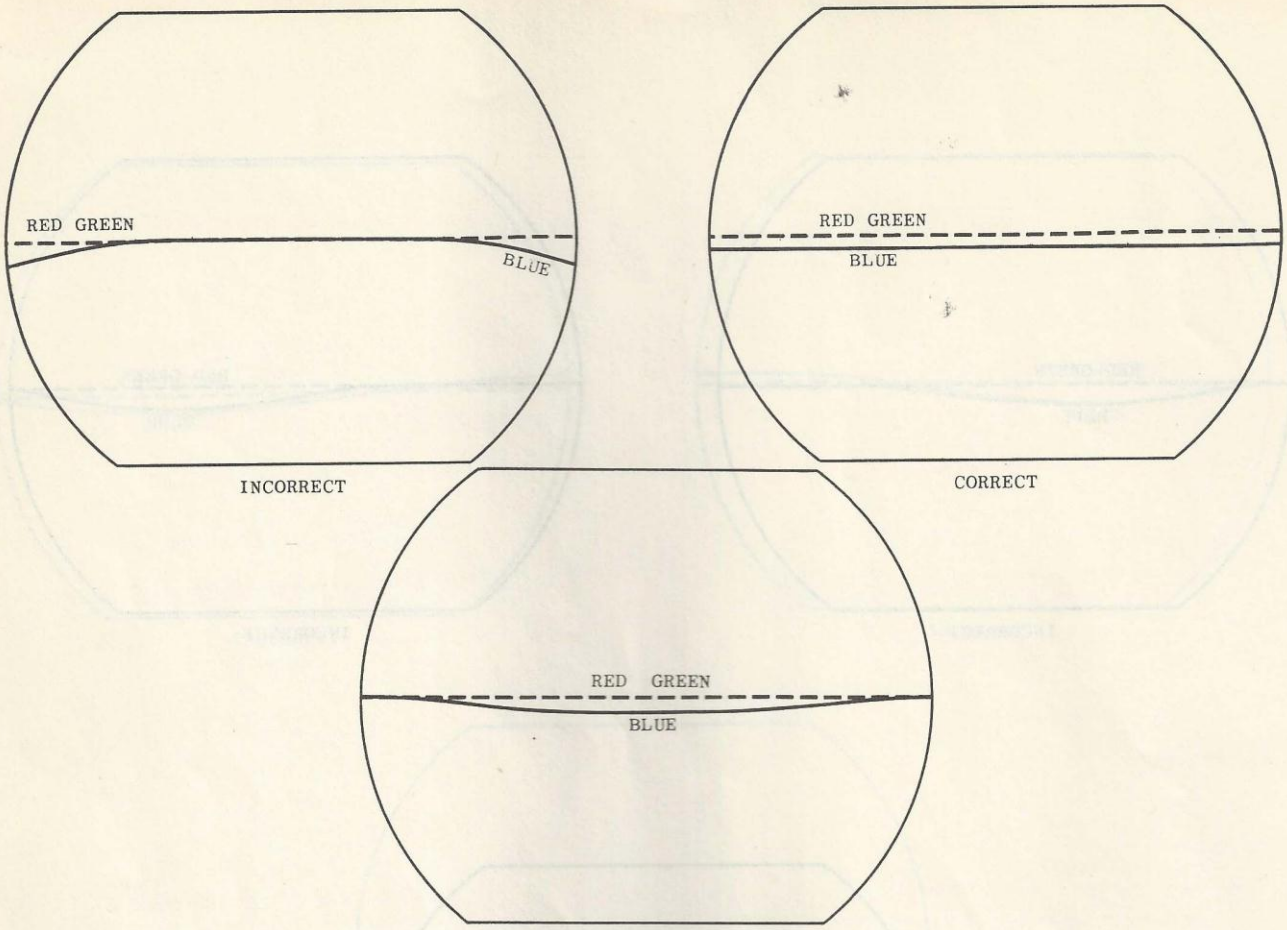


FIGURE 14. BLUE HORIZONTAL AMPLITUDE #1 ADJUSTMENT

ADDITION OF SECOND HARMONIC CORRECTION AFFECTS CONVERGENCE IN THE AREAS INDICATED.*

THE SAME AREAS ARE AFFECTED WHEN RED-GREEN 2ND HARMONIC CORRECTION IS ADDED.

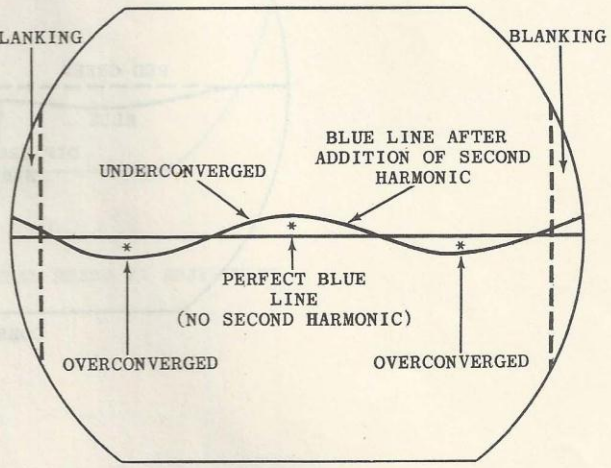


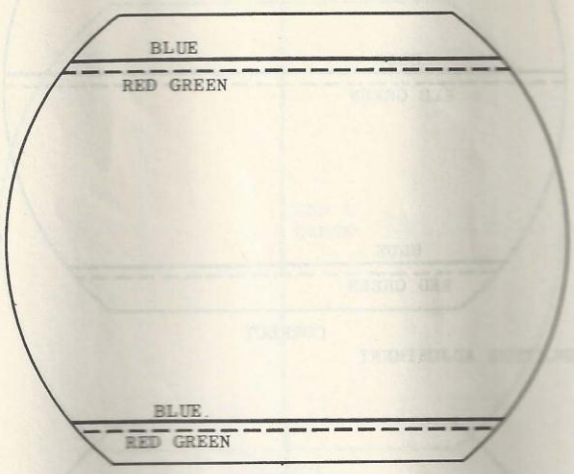
FIGURE 15. AFFECT OF SECOND HARMONIC CONTROL ON CONVERGENCE

5. Turn the BLUE HORIZONTAL AMPLITUDE #2 control (convergence chassis) to minimum (fully counterclockwise).

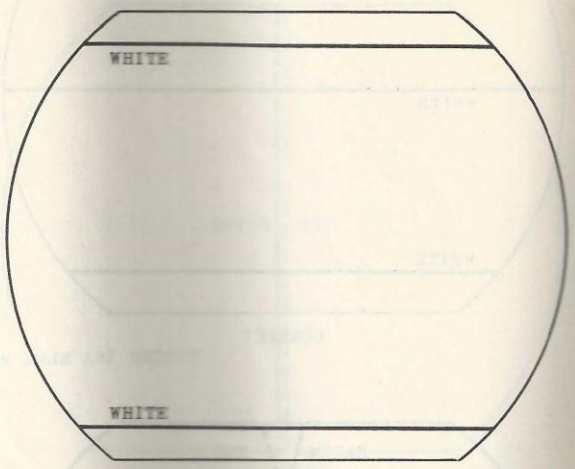
6. Turn the BLUE HORIZONTAL AMPLITUDE #1 control (convergence chassis) counterclockwise and adjust until the center, horizontal, blue line is parallel to the red and green lines. Re-converge the pattern at the center of the screen by use of the BEAM POSITIONING and BLUE LATERAL CORRECTOR magnets. Re-check the setting of the BLUE HORIZONTAL AMPLITUDE #1 and BLUE PHASE #1 controls for best convergence of the blue line with respect to the red and green lines across the center of the screen (see Figure 14).

7. If any points along the blue center horizontal line are not converged, adjust the BLUE HORIZONTAL AMPLITUDE #2 and the BLUE HORIZONTAL PHASE #2 for optimum convergence.

NOTE: There is some re-adjustment required between the BLUE HORIZONTAL AMPLITUDE #2 and the BLUE HORIZONTAL AMPLITUDE #1 controls due to some necessary interaction. An increase in HORIZONTAL AMPLITUDE #2 dynamic convergence waveform will require an increase of HORIZONTAL AMPLITUDE #1 control. The HORIZONTAL AMPLITUDE #2 controls (red/green and blue) will affect the convergence at the points of addition between the fundamental and second harmonic frequencies---edge, 1/4 inch from either side and at center (see Figure 15).



CORRECT BLUE
VERTICAL TILT



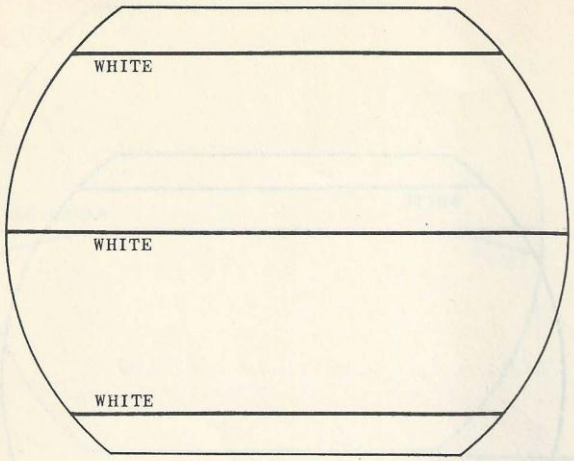
CORRECT

INCORRECT

INCORRECT

FIGURE 16 BLUE VERTICAL TILT ADJUSTMENT

8. Turn the BLUE VERTICAL AMPLITUDE to minimum (fully counterclockwise) and adjust the BLUE VERTICAL TILT control for either superimposure or equal separation of the blue line with respect to the red and green lines...at the top and bottom of the screen (see Figure 16).



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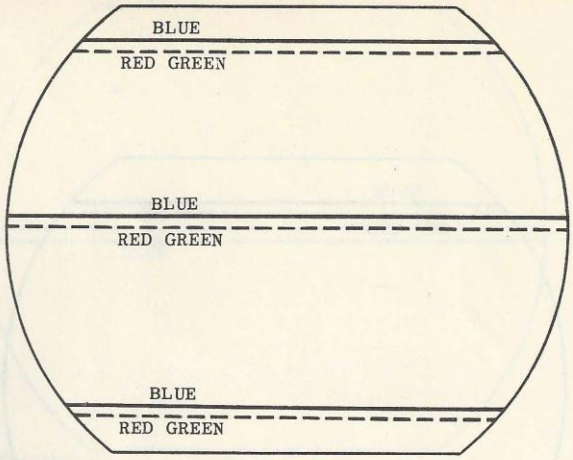

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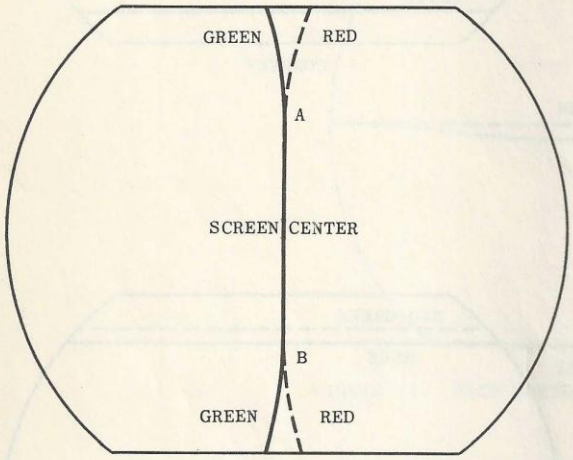
FIGURE 16A BLUE VERTICAL AMPLITUDE ADJUSTMENT



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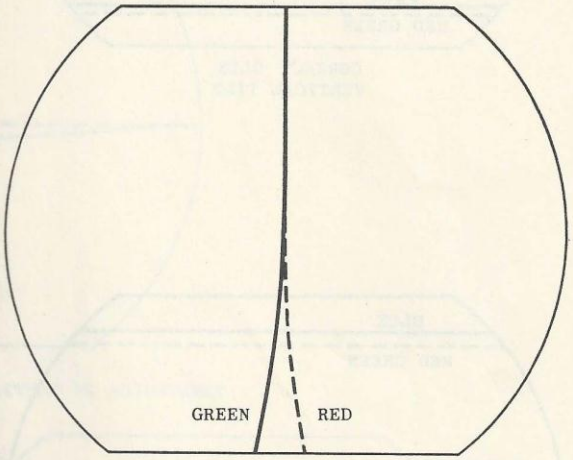

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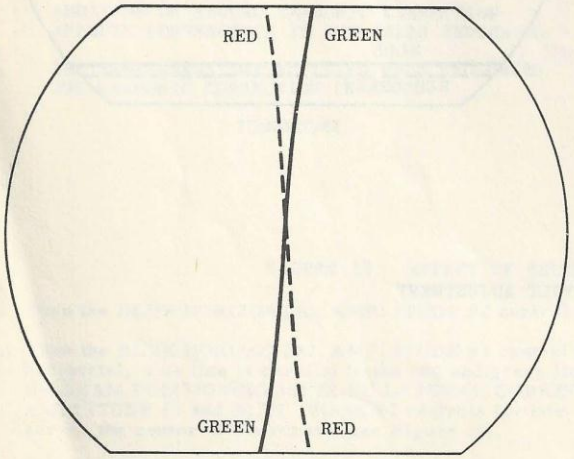
IF POINTS A & B ARE EQUAL DISTANCE FROM CENTER THE SEPARATION OF THE RED & GREEN LINES SHOULD BE EQUAL AT A & B



INCORRECT

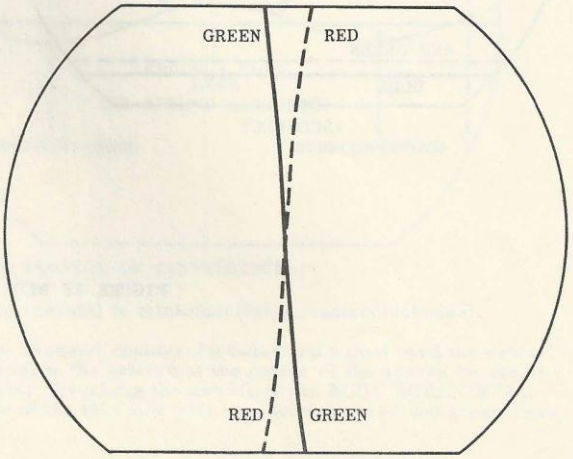


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FIGURE 17. R-G VERTICAL TILT CONTROL ADJUSTMENT

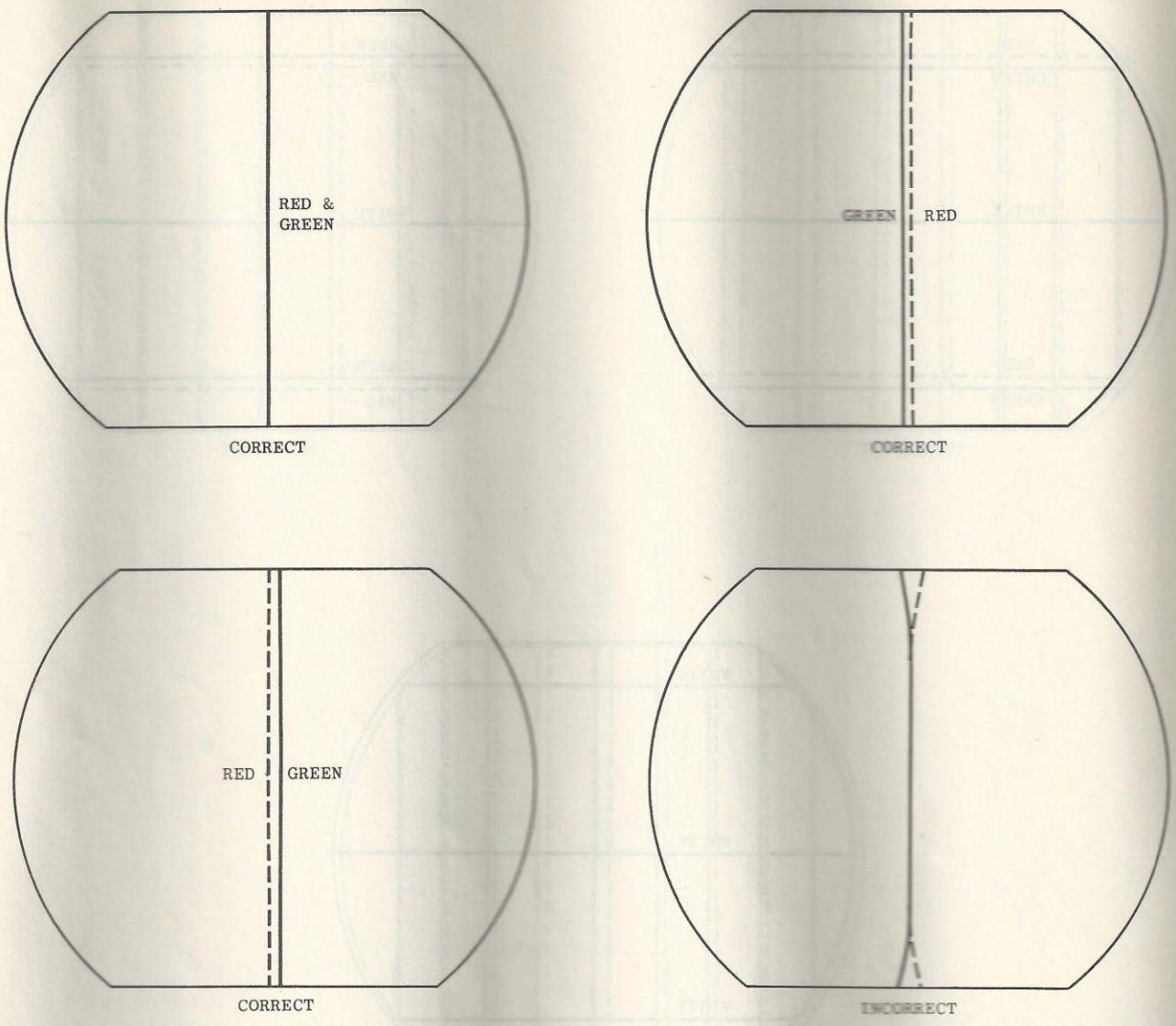


FIGURE 17A. R-G VERTICAL AMPLITUDE CONTROL ADJUSTMENT

9. Observe the blue horizontal line at the center of the screen and adjust the BLUE VERTICAL AMPLITUDE control for superimposure or equal spacing of the blue line with respect to the red and green lines from the top to the bottom of the screen. (see Figure 16A)

10. Remove the blue grid lead from its receptacle (main chassis) and ground into ground pin of receptacle.

11. Rotate the red-green vertical amplitude control (console chassis) to its maximum counterclockwise position. Converge the red and green rasters at the center of the screen by adjusting the red and green BEAM POSITIONING MAGNETS on neck of CRT. Observe the red and green vertical lines through the center of the screen. Adjust the red-green vertical tilt control for symmetrical separation of the red line with respect to green, at the top and bottom of the screen (Figure 17).

12. Observe the red and green vertical lines through the screen center and adjust the red-green vertical amplitude control (console chassis) until the red and green lines are superimposed from top to bottom of the raster or until they are equally spaced in relation to each other (Figure 17A). Re-adjust the red and green beam positioning magnets for center convergence. Recheck and re-adjust, if necessary, the red-green vertical tilt and amplitude controls for optimum convergence of the center vertical line at all points through the screen center.

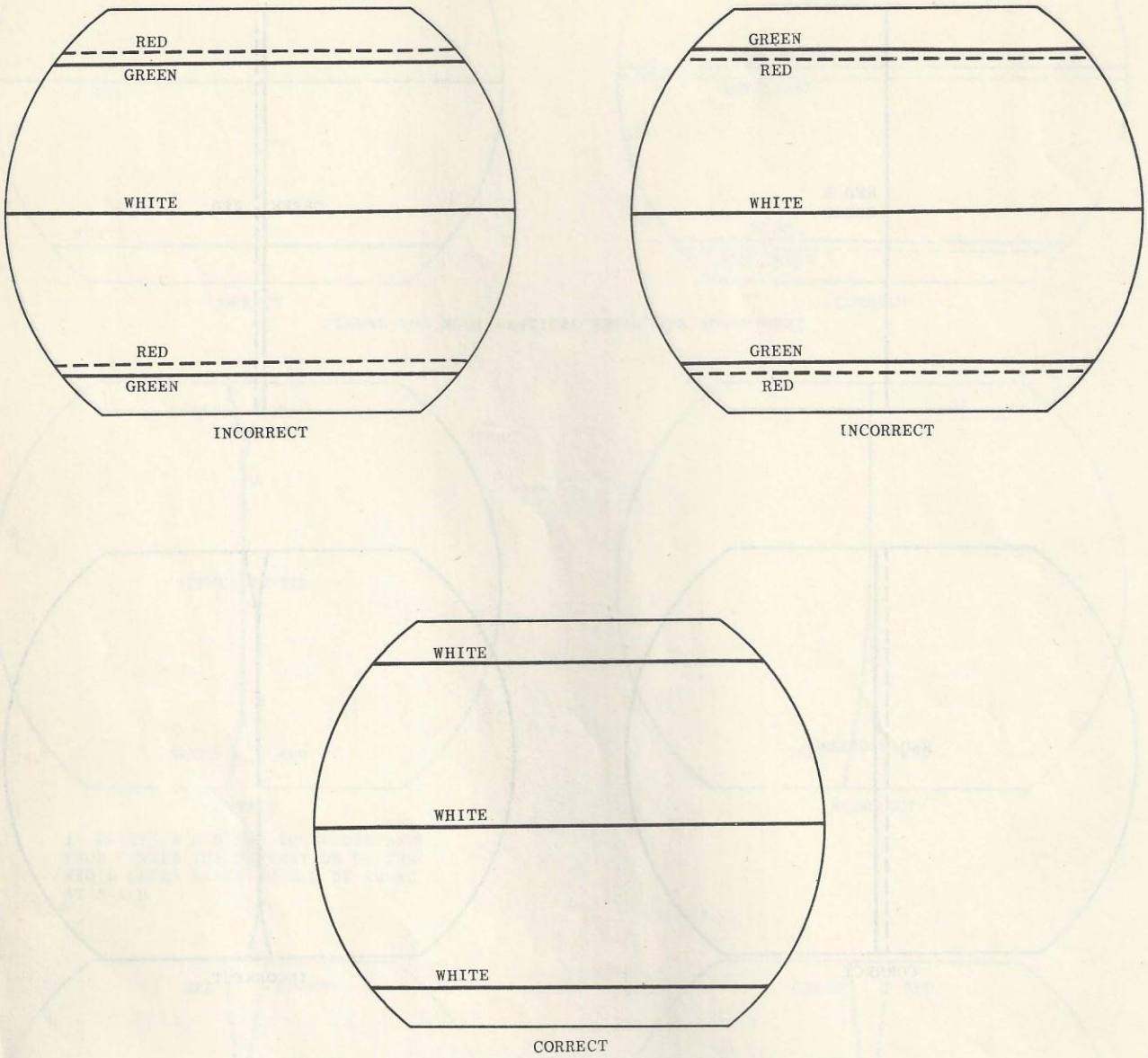


FIGURE 18. R-G VERTICAL DYNAMIC BALANCE POT ADJUSTMENT

13. Observe the red and green horizontal lines at the top and bottom of the screen. Adjust the red-green vertical dynamic balance pot (located on convergence chassis) until the red and green lines at the top and bottom of the screen are superimposed. Reconverge center if necessary (Figure 18).

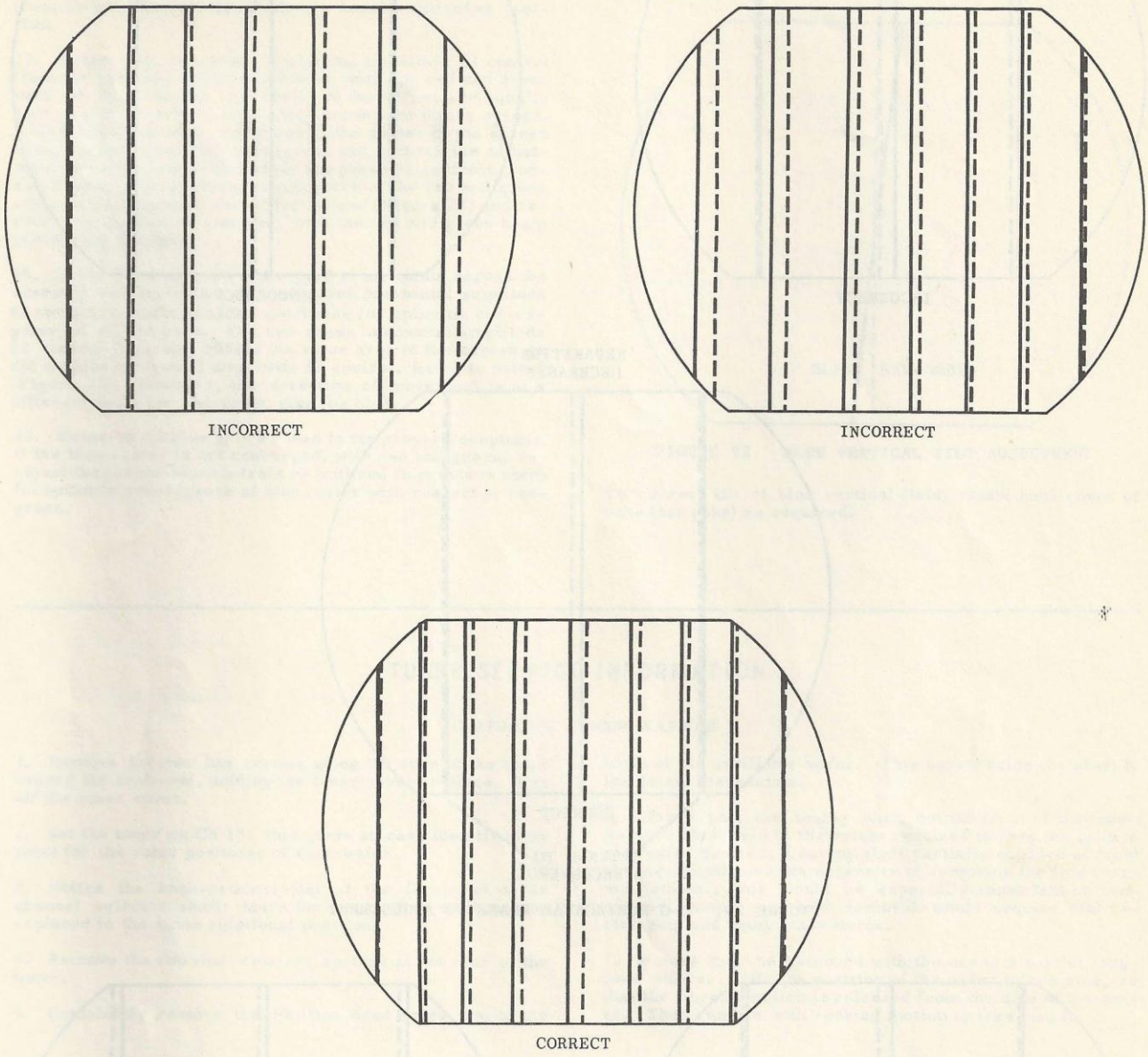
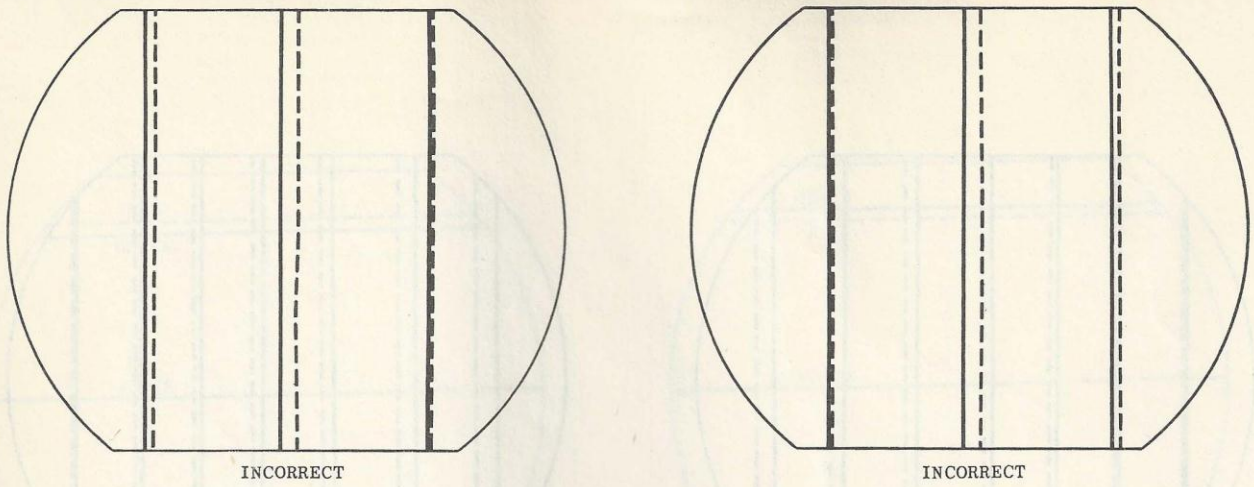


FIGURE 19. R-G HORIZONTAL PHASE #1 ADJUSTMENT

14. Rotate the red-green horizontal amplitude #1 control (console chassis) to its maximum clockwise position. Rotate the red-green horizontal amplitude #2 control, to its maximum counterclockwise position.

15. Adjust the red-green horizontal phase #1 coil (console chassis) for maximum separation of the vertical bars at the center of the screen (Figure 19).



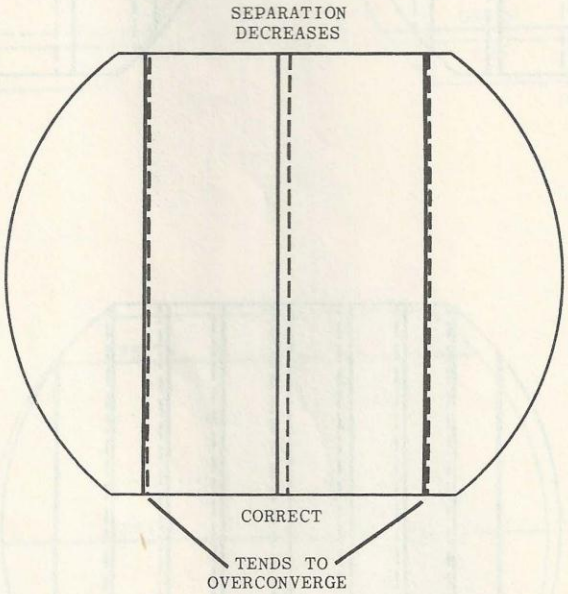


FIGURE 20. R-G HORIZONTAL PHASE #2 ADJUSTMENT

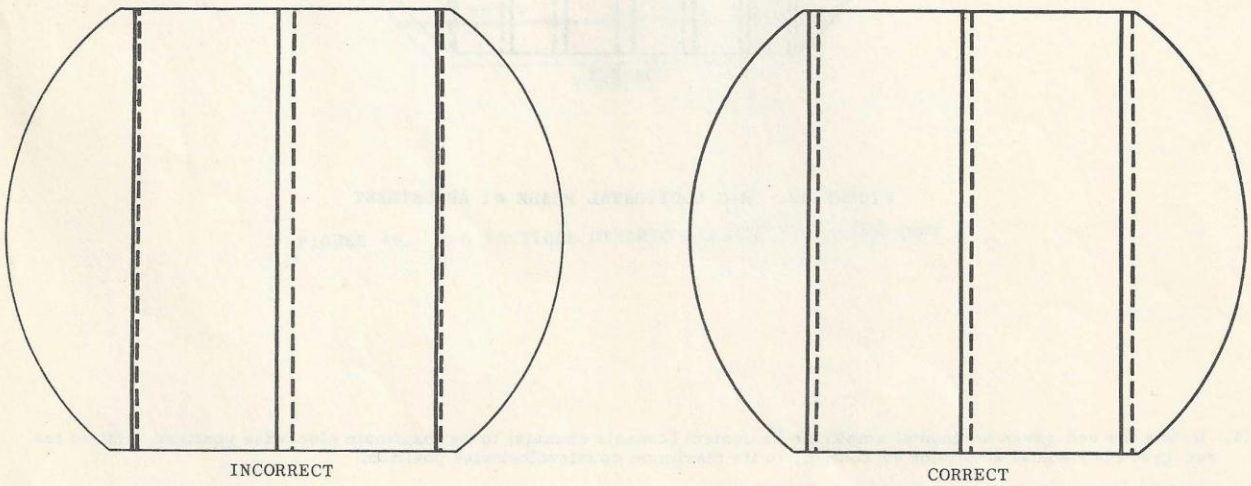


FIGURE 21. R-G HORIZONTAL AMPLITUDE #1 ADJUSTMENT

16. Rotate the red-green horizontal amplitude #2 control (console chassis) to its maximum clockwise position. Adjust the red-green horizontal phase #2 control (console) for minimum displacement of the red and green vertical bars at the center of the screen (Figure 20).

17. Rotate the red-green horizontal amplitude #2 control (console chassis) to its maximum counterclockwise position.

18. Rotate the red-green horizontal amplitude #1 control (console chassis) counterclockwise until the red and green vertical bars across the center of the screen are equally spaced with respect to each other across the entire screen. Reconverge the red and green at the center of the screen using the beam positioning magnets and recheck the adjustment of the horizontal amplitude and phase #1 controls (console chassis) for optimum convergence of the red and green vertical bars across the entire screen (Figure 21) and reconverge the screen's center, with the red and green beam positioning magnet.

19. If the bars are not converged at all points across the screen's center, rotate the red-green horizontal amplitude #2 control (console chassis) clockwise for optimum convergence of all the bars. The red-green horizontal amplitude #2 control (console) affects the same area of the screen as did the blue horizontal amplitude #2 control. Refer to note 1 (Figure 20). However, the direction of movement is at a different angle for red-green than for blue.

20. Reinsert the blue grid #1 lead in its proper receptacle. If the blue raster is not converged, with red and green, readjust the proper blue controls as outlined in previous steps for optimum convergence of blue raster with respect to red-green.

21. Recheck the center convergence and very carefully adjust the beam positioning magnets and the blue lateral correction magnet for optimum center convergence. Study the screen carefully. If there are any areas which are not in convergence, then a compromise adjustment should be made for optimum convergence of the areas around the center of the screen.

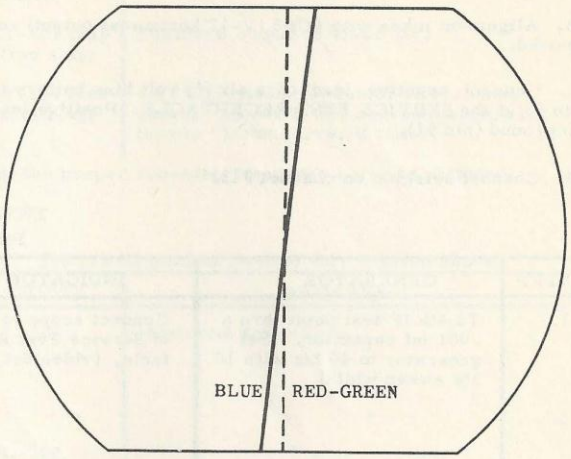


FIGURE 22. BLUE VERTICAL TILT ADJUSTMENT

To correct tilt of blue vertical field, rotate back cover of yoke (not yoke) as required.

TUNER SERVICE INFORMATION

TO REMOVE TUNER WAFERS

1. Remove the two hex screws along the edge of the tuner toward the knob-end, holding the tuner cover in place. Pry off the tuner cover.

2. Set the tuner on Ch 13: this gives an easy identification point for the rotor positions of each wafer.

3. Notice the knob-retainer-flat at the front end of the channel selector shaft: Mark the tuning shaft so it may be replaced in the same rotational position.

4. Remove the two shaft retainer springs at the rear of the tuner.

5. Completely remove the Phillips head screw just to the front of the oscillator wafer. This screw holds the shaft to the detent mechanism.

6. Slowly pull the tuning shaft out the front of the tuner: Remove shaft only to the extent required to free the particular wafer desired. Leaving shaft partially engaged at front of tuner eliminates the necessity of removing the fine tuner mechanism...this would be especially important on UHF models, since complete removal would require dial restringing and many other items.

7. Wafers may be removed with the use of a pair of long-nose pliers. Shift the position of the wafer to one side, so that the fibre extension is released from the side of the tuner. Then remove with rocking motion to free plugs.

TO REPLACE TUNER WAFERS

1. See that all wafer rotor contacts are on same channel (13). The small identifying notch in the shaft-opening of each wafer will aid in locating position.

2. Replace wafers in correct position in tuner.

3. Determine correct rotational position of tuning shaft (from previous marking) and insert shaft through wafers.

4. Lock tuning shaft into position with the two rear retainer springs: Tighten Phillips head screw at front of tuner.

5. Replace tuner cover and tuner cover screws.

6. Check all channels making required alignment adjustments (see tuner alignment).

ALIGNMENT

VIDEO IF ALIGNMENT

Test Equipment and Connections

A. Maintain line voltage at 117 volts by use of variac.

B. Alignment made with 6CB5 (V-17 horizontal output) removed.

C. Connect negative lead of a six (6) volt bias battery to pin #3 of the SERVICE TEST RECEPTACLE: Positive lead to ground (pin #1).

D. Channel selector on channel #13.

E. Disable tuner oscillator by shorting grid (pin #9 of V-2) to ground through hole provided in tuner base.

F. Connect 2K, 100 watt voltage normalizing resistor from B+++ bus to chassis at any convenient point.

G. Refer to Video IF Alignment Detail (Figure 23) for the following procedure.

NOTE: Reference numbers for this alignment are based on schematic 73E741902-BR. Some coils resonate at two core positions. Use the outer end core settings, unless otherwise stated.

PROCEDURE

STEP	GENERATOR	INDICATOR	ADJUST	REMARKS
1.	To 4th IF test point thru a .001 mf capacitor. (Set generator to 44 Mc with 10 Mc sweep width).	Connect scope to pin #5 of Service Test Receptacle, (video det TP)	T-106 trap (top slug)	Minimum output at 41.25 Mc.
2.	"	"	T-105 (bottom slug)	45.75 Mc marker at 10% down from knee of curve.
3.	"	"	T-106 (bottom slug)	41.85 Mc marker at corner of curve. (Curve must have a 30% tilt ±5%).
4.	To 1st IF test point thru a .001 mf capacitor. (Set generator to 44 Mc with 10 Mc sweep width).	"	T-102 trap (top slug)	Minimum output at 47.25 Mc.
5.	"	"	T-103 trap (top slug)	Minimum output at 39.75 Mc.
6.	"	"	T-102 (bottom slug)	45.75 Mc marker at 30% point on curve.
7.	"	"	T-103 (bottom slug)	41.85 Mc marker at knee of curve. (Not more than 10% down from peak). Curve should have a 10% tilt.
8.	"	"	T-104	Flat response curve. (A 10% tilt is allowable).

Video IF alignment continued on next page

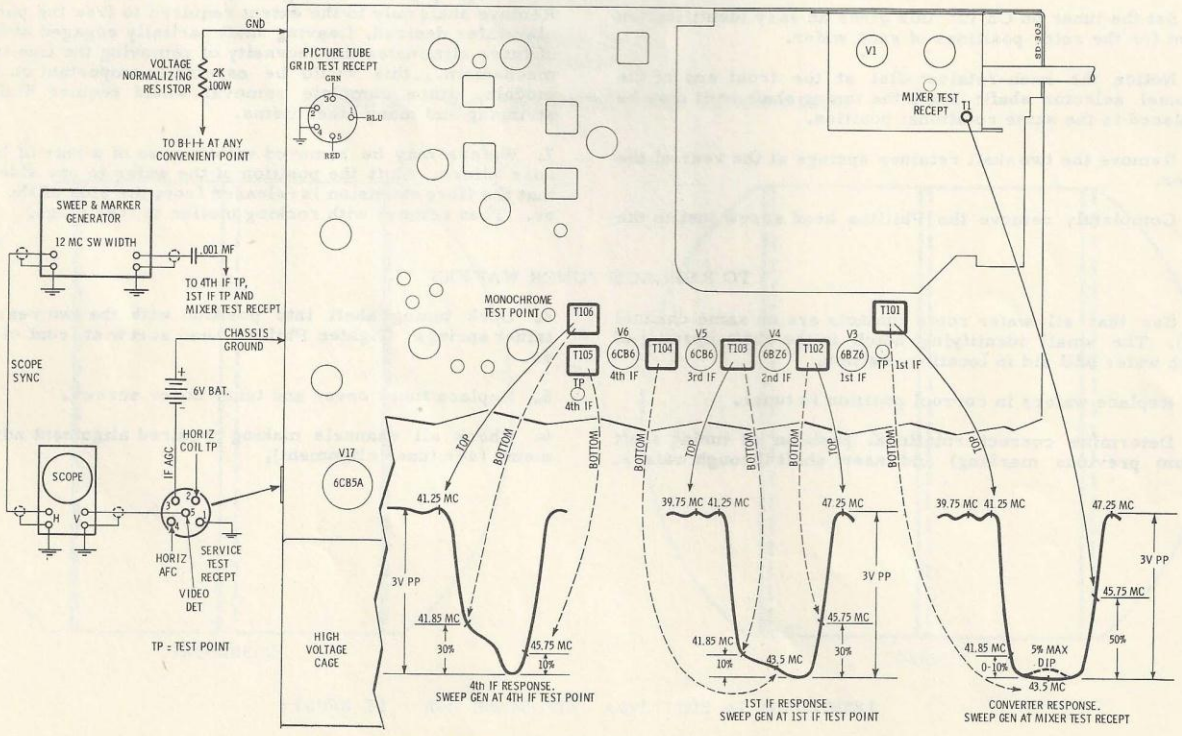


FIGURE 23. VIDEO IF AND MIXER ALIGNMENT DETAIL

Video IF alignment continued

STEP	GENERATOR	INDICATOR	ADJUST	REMARKS
9.	Mixer test receptacle thru a .001 mf capacitor. (Set generator to 44 Mc with 10 Mc sweep width).	Connect scope to pin #5 of SERVICE TEST RECEPTACLE (video Det TP)	T-1 (converter primary on tuner)	45.75 Mc marker set at 50% point on curve.
10.	"	"	T-101 trap (top slug)	Minimum output at 41.25 Mc.
11.	"	"	T-101 (bottom slug)	43.5 Mc marker at center of response curve. Adjust T-104 approximately ±1/2 turn to "jack" curve, if tilted.

NOTE: If necessary, slightly retune any preceding coil until the proper converter response curve is obtained.

SOUND ALIGNMENT
PROCEDURE

Refer to sound alignment detail (Fig. 24). See pre-alignment steps A thru G given above.

STEP	GENERATOR	INDICATOR	ADJUST	REMARKS
12.	Connect to plate side of E-101 (sound crystal) in series with a .001 mf capacitor. Set generator to 4.5 Mc.	VTVM between pin #7 of V-9 (point "A") and chassis ground. (Locate point "A" from schematic.)	L-301	Maximum deflection.
13.	"	"	L-302	"
14.	"	"	T-303 (bottom slug)	"
15.	"	VTVM between point "B" and chassis	T-303 (top slug)	Zero voltage reading.

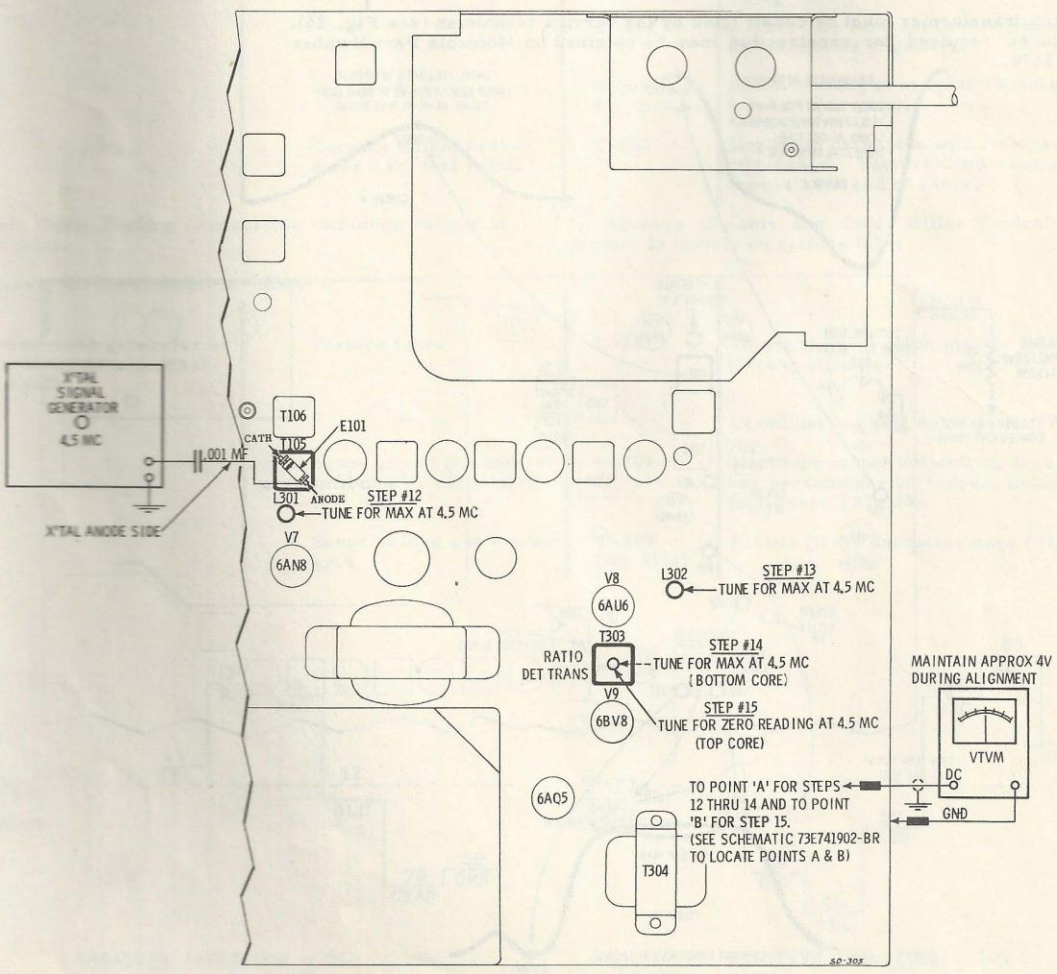


FIGURE 24. SOUND ALIGNMENT DETAIL

BANDPASS (COLOR CHANNEL) ALIGNMENT

A. Tune receiver to a blank channel. Disconnect antenna and short terminals.

B. Remove the 6CB5 horizontal output (V-17) from its socket and connect a 2000 ohm, 100 watt voltage normalizing resistor from B+++ to chassis at any convenient point.

C. Connect the negative lead of a 6 volt battery to the junction of R-801 and R-802 (grid circuit of V-22A, chroma amp). Connect the remaining lead to chassis.

D. Remove the 3.58 Mc crystal from its socket and short across socket terminals.

E. Remove video detector crystal (E-102).

F. Refer to Chroma Alignment Detail for the following procedure (Fig. 25).

PROCEDURE

STEP	GENERATOR	INDICATOR	ADJUST	REMARKS
1.	Connect to pin #2 of V-23A thru a .001 mf capacitor. (Set generator to 5 Mc with 10 Mc sweep width.)	Scope to (R-Y) test point.	T-801	Maximum output at 3.58 Mc. (Do not retune later). See Curve "A".
2.	Thru isolation transformer* to 4th IF (T-106). Generator at 5 Mc & 10 Mc sweep width.	"	L-117	Minimum output at 4.5 Mc. See Curve "B".
3.	"	"	L-803	2.8 Mc marker at knee of curve. See Curve "B".
4.	"	"	L-802	Minimum tilt at high end of curve. See Curve "B".
5.	"	"	L-801	For flat response. See Curve "B".
6.	"	Scope thru detector. (See Fig. 27) to picture tube cathodes.	L-120	3.58 Mc marker for minimum output. Contrast at minimum (fully counterclockwise). See Curve "C".

*Isolation transformer must be constructed by the service technician (see Fig. 26). The cores required for construction may be obtained on Motorola Part Number 76A743676.

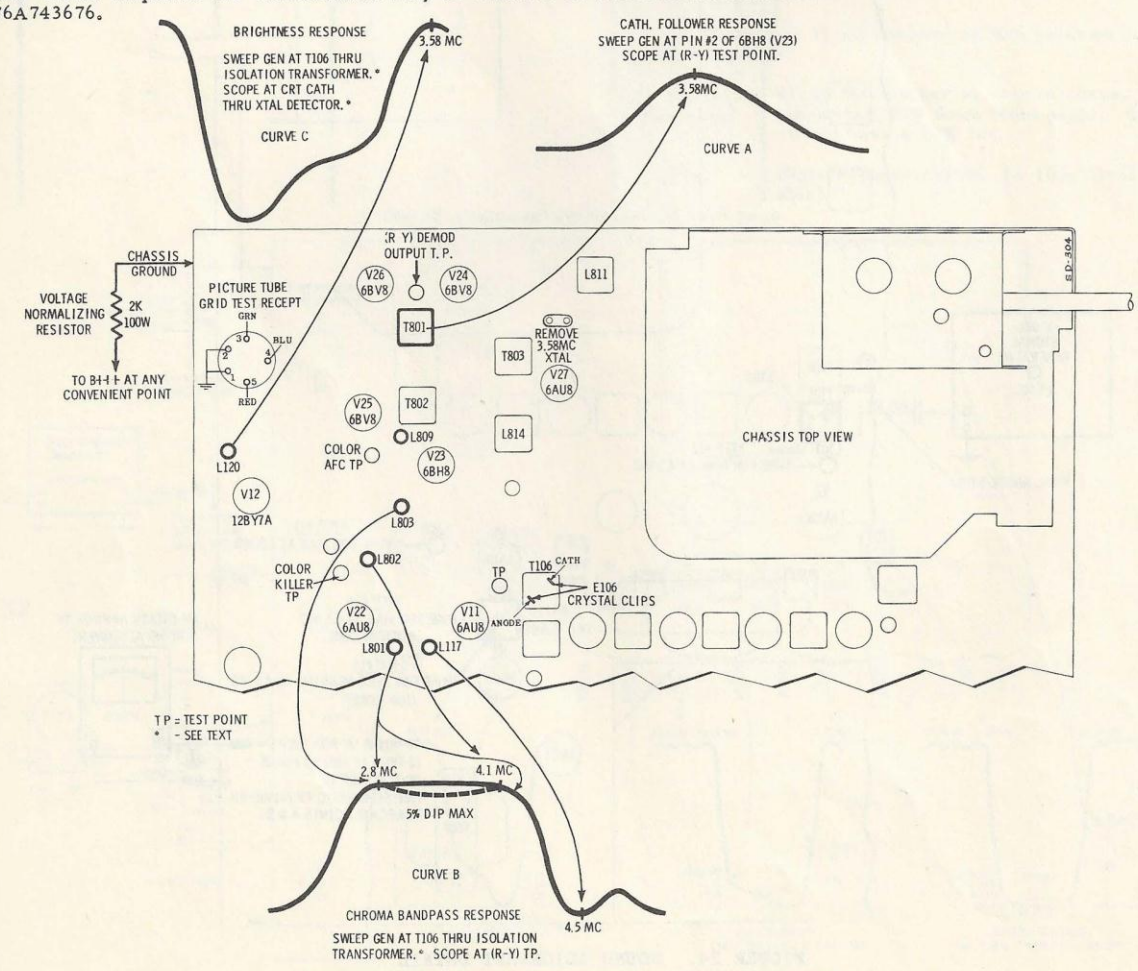


FIGURE 25. CHROMA BANDPASS ALIGNMENT DETAIL

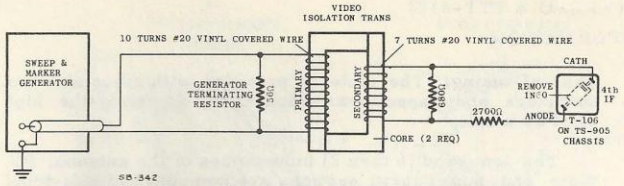


FIGURE 26. ISOLATION TRANSFORMER DETAIL

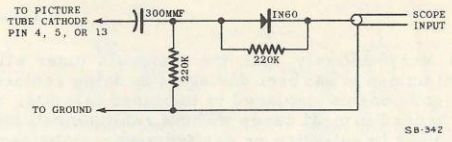


FIGURE 27. OSCILLOSCOPE DEMODULATOR PROBE

COLOR AFC ALIGNMENT

A. Allow approximately 15 minutes of warm-up time before aligning.

B. Refer to Chroma Alignment Detail for coil and test point locations (Fig. 25).

C. Set color intensity control to minimum (fully counter-clockwise) and color shading to mid-range.

D. Set color killer control to maximum (fully clockwise).

E. Remove the burst amplifier tube from its socket.

F. Careful adjustment of the color oscillator coil is required (steps #1 and #5). Incorrect tuning can render the oscillator unstable or completely inoperative. To restart oscillator, turn slug in opposite direction to that which caused the oscillator to become inoperative.

PROCEDURE

STEP	GENERATOR	INDICATOR	ADJUST	REMARKS
1.	Use color broadcast.	Connect VTVM to (R-Y) test point.	L-814	Maximum deflection. (Begin tuning with slug near bottom of can).
2.	"	"	T-803 (bottom slug)	"
3.	"	"	T-803 (top slug)	Minimum deflection. (Begin with slug near top of can).
4.	"	"	Repeat step #2, then...	
5.	"	"	L-814	Adjust one turn out toward bottom of can for oscillator stability.
6.	"	"	Repeat step #3, then...	Meter reading of at least 15 volts should be noted at this point.
7.	"	Connect VTVM to the color AFC test point.	T-802	Maximum deflection with color shading at mid-range. Then re-adjust for equal readings at each end of range.

G. Re-set Color Shading Control for minimum voltage at AFC test point.

H. Re-insert the burst amplifier tube.

I. Advance Chroma and Color Killer Control until color picture is visible on picture tube.

8.	Color bar generator at antenna or broadcast signal.	Picture tube.	L-811	Adjust to bring color picture into sync. (Strong signal).
9.	"	"	"	Re-adjust for best color sync. (Weak signal).
10.	"	Scope at red gun control grid and VTVM at AFC test point.	L-809	Maximum meter deflection, then for proper bar percentages on scope. Color shading at mid-range (Fig 28).
11.	"	Scope at blue gun control grid	T-803 (top slug)	Proper (B-Y) bar percentage (Fig. 28).

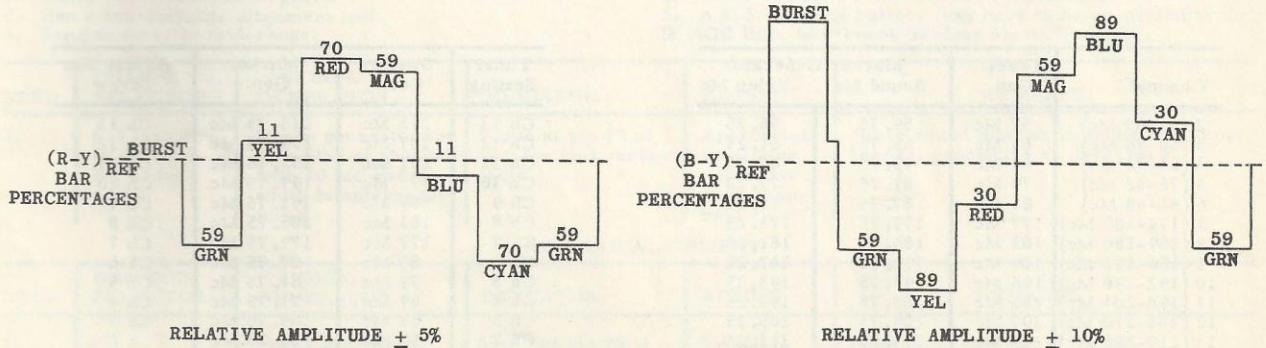


FIGURE 28. BAR PERCENTAGES

TUNER ALIGNMENT (VTT-83 & VTT-83Y)

GENERAL INFORMATION

It is very unlikely that the Motorola tuner will need alignment unless it has been damaged, is being replaced, or has had components replaced in the tuned circuits. Tubes may be changed in most cases without realignment, but care must be used in selection or realignment may be required.

The tuner operates by adding antenna, RF and oscillator coil sections consecutively for each lower channel. When the tuner is switched to the lowest channel, all coils of any one section (antenna, RF or oscillator) will be series connected. For this reason, alignment must start at the highest channel and each adjustment properly completed before the next lower channel adjustment is attempted.

The high band (7 thru 13) inductances of the antenna, RF plate and mixer grid sections are formed by a stamped metal plate that is precision cut to give correct individual channel tuning. The plate is provided with adjustable end inductors and capacitors which allow adjusting the high band as a unit.

The low band (6 thru 2) inductances of the antenna, RF plate and mixer grid sections are composed of individual coil sections which may be adjusted by stretching or compressing the coil turns...the appropriate channel coil must be adjusted while on channel.

The oscillator inductances are provided with screw adjustments on all channels: the screws may be reached from the front of the tuner.

These tuners are provided with removable wafers for ease of servicing and replacement purposes (See page 23).

RF ALIGNMENT

PRELIMINARY OPERATIONS

1. Remove the yoke plug from its socket.
2. Connect a 2K (100W) resistor from B+++ to chassis.
3. Short the RF AGC bus to chassis.
4. Remove the tuner cover.
5. See Tuner Alignment Detail (Figures 29 & 31).
6. Maintain 1.5V peak-to-peak during procedure.

PROCEDURE

STEP	CHANNEL SELECTOR	SIGNAL GENERATOR	INDICATOR	ADJUST	REMARKS
1.	#2	At antenna terminals set to channel with 15 Mc sweep width	Scope to mixer test receptacle thru 47K resistor	L-4 (L-2 in Y chassis)	Clockwise rotation until it's effect is below channel #2.
2.	#6	"	"	L-3	Expand coil turns until it's effect is above channel #6.
3.	"	"	"	C-10 & C-16	Set to mid-range. (Screw is half-way between the tuner chassis & outside plate.)
4.	"	"	"	L-10	Set half-way into coil.
5.	#13	"	"	"	Adjust for maximum amplitude & response shown in channels 7-13 curves.
6.	#7	"	"	C-10 & C-16	Adjust for response shown in channels 7-13 curves. (Repeat steps #5 & #6, as necessary.)
NOTE: In the following low channel alignment procedure (6 thru 2), it is imperative that for each channel, the RF plate (L-12) and mixer grid coils (L-13) be aligned, first for correct marker positions, then the antenna coils (L-6) for proper tilt and maximum gain.					
7.	#6	At antenna terminals set to channel with 15 Mc sweep width	Scope to mixer test receptacle thru 47K resistor	(a) L-12 (b) L-13 (c) L-6	(a) Proper markers (b) Proper markers (c) Proper tilt and maximum gain
8.	"	"	"	L-3 FM trap (Expand or compress turns.)	Adjust until it just starts to pull down the marker on sound side of curve.
9.	#5 thru #2 in descending order	"	"	Same as step #7.	Same as step #7.

Channel	Sweep Gen	Marker Generator Sound Mc	Marker Generator Video Mc
2 (54-60 Mc)	57 Mc	59.75	55.25
3 (60-66 Mc)	63 Mc	65.75	61.25
4 (66-72 Mc)	69 Mc	71.75	67.25
5 (76-82 Mc)	79 Mc	81.75	77.25
6 (82-88 Mc)	85 Mc	87.75	83.25
7 (174-180 Mc)	177 Mc	179.75	175.25
8 (189-186 Mc)	183 Mc	185.75	181.25
9 (186-192 Mc)	189 Mc	191.75	187.25
10 (192-198 Mc)	195 Mc	197.75	193.25
11 (198-204 Mc)	201 Mc	203.75	199.25
12 (204-210 Mc)	207 Mc	209.75	205.25
13 (210-216 Mc)	213 Mc	215.75	211.25

FIGURE 29. CHANNEL CHART

Tuner Setting	Sweep Gen	Marker Gen	Adjust Osc Screw
Ch 13	213 Mc	215.75 Mc	Ch 13
Ch 12	207 Mc	209.75 Mc	Ch 12
Ch 11	201 Mc	203.75 Mc	Ch 11
Ch 10	195 Mc	197.75 Mc	Ch 10
Ch 9	189 Mc	191.75 Mc	Ch 9
Ch 8	183 Mc	185.75 Mc	Ch 8
Ch 7	177 Mc	179.75 Mc	Ch 7
Ch 6	85 Mc	87.75 Mc	Ch 6
Ch 5	79 Mc	81.75 Mc	Ch 5
Ch 4	69 Mc	71.75 Mc	Ch 4
Ch 3	63 Mc	65.75 Mc	Ch 3
Ch 2	57 Mc	59.75 Mc	Ch 2

FIGURE 30. OSCILLATOR ALIGNMENT CHART

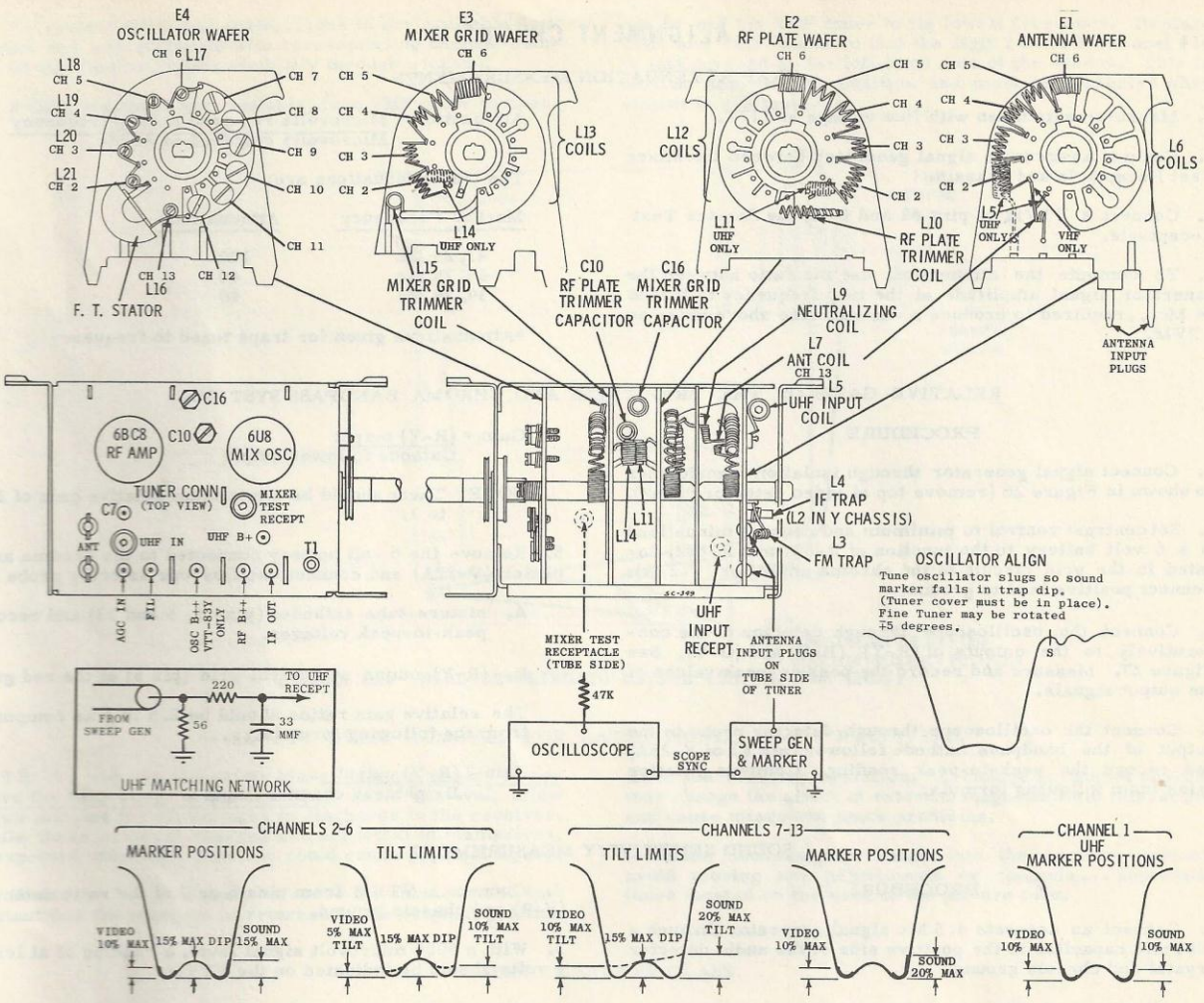


FIGURE 31. TUNER ALIGNMENT DETAIL

UHF INPUT ALIGNMENT

NOTE: A. Unplug the UHF cable plug from the VHF tuner. B. See UHF curve.

PROCEDURE

STEP	CHANNEL SELECTOR	SIGNAL GENERATOR	INDICATOR	ADJUST	REMARKS
1.	UHF (channel #1)	Sweep generator, 44 Mc & 10 Mc sweep width to UHF input receptacle thru network shown in Fig. 31.	Scope at mixer test receptacle thru 47K resistor.	(a) L-11 (b) L-14 (c) L-5	(a) Proper markers (b) Proper markers (c) Proper tilt and maximum gain

OSCILLATOR ALIGNMENT

PRE-ALIGNMENT INSTRUCTIONS

1. Tuner cover must be in place.
2. Use a non-metallic alignment tool.
3. Set fine tuner to mid-range.
4. Refer to Fig. 30 for marker frequencies.
5. A 4.5 volt bias battery may have to be connected to the IF AGC line, to prevent serious curve limiting.

STEP	CHANNEL SELECTOR	SIGNAL GENERATOR	INDICATOR	ADJUST	REMARKS
1.	#13 thru #2 in descending order.	Sweep generator set to center of channel with 10 Mc sweep width to antenna terminals.	Scope at pin #5 of service test receptacle.	Appropriate oscillator screw for each channel.	Place sound marker in sound trap dip. (Repeat procedure as necessary).

44MC TRAP ALIGNMENT

STEP	CHANNEL SELECTOR	SIGNAL GENERATOR	INDICATOR	ADJUST	REMARKS
1.	#2	Sweep generator, 44 Mc & 10 Mc sweep width to antenna terminals.	Scope at pin #5 of service test receptacle.	L-4 (L-2 in Y chassis).	Minimum response at 44 Mc.

ALIGNMENT CHECKS

TRAP ATTENUATION MEASUREMENTS

1. Measurements taken with line voltage at 117V.

2. Connect an accurate signal generator between the Mixer Test Receptacle and chassis.

3. Connect a VTVM to pins #1 and #5 of the Service Test Receptacle.

4. To compute the attenuation, use the ratio between the generator signal amplitude at the trap frequency to that at 44 Mc...required to produce a one volt rise above noise on VTVM.

$$\text{Attenuation} = \frac{\text{Microvolts required at trap frequency}}{\text{Microvolts required at 44 Mc}}$$

The trap attenuations are:

Marker Frequency	Attenuation*
41.25 Mc	100
45.75 Mc	40
39.75 Mc	40

*Attenuations given for traps tuned to frequency

RELATIVE GAINS OF THE BRIGHTNESS AND CHROMA BANDPASS SYSTEMS

PROCEDURE

1. Connect signal generator through isolation transformer as shown in Figure 26 (remove top of video detector "can").

2. Set contrast control to minimum and connect minus lead of a 6 volt battery to the junction of R-801 and R-802, located in the grid circuit of the chroma amplifier (V-22A). Connect positive lead to ground.

3. Connect the oscilloscope through detector probe consecutively to the outputs of (R-Y), (B-Y) and (G-Y). See Figure 27. Measure and record the peak-to-peak values of the output signals.

4. Connect the oscilloscope through detector probe to the output of the bandpass cathode follower (pin #1 of V-23A) and record the peak-to-peak reading. Compute relative gains from following formula:

$$\text{Gain} = \frac{\text{(R-Y) output}}{\text{Cathode follower output}}$$

NOTE: There should be a minimum relative gain of 2.5 to 1.

5. Remove the 6 volt battery connected to the chroma amplifier (V-22A) and connect oscilloscope detector probe to:

A. picture tube cathodes (pins 4, 5 and 13) and record peak-to-peak voltages.

B. (R-Y) output at control grid (pin 6) of the red gun.

The relative gain ratios should be 2.5 to 1 as computed from the following formula.....

$$\text{Gain} = \frac{\text{(R-Y) output}}{\text{Brightness channel output}}$$

SOUND SENSITIVITY MEASUREMENT

PROCEDURE

1. Connect an accurate 4.5 Mc signal generator through a .001 mfd capacitor to the positive side of the audio detector crystal and chassis ground.

2. Connect a VTVM from pins 6 or 7 of the ratio detector (V-9) and chassis ground.

3. With a 5000 microvolt signal level, a reading of at least 4 volts should be indicated on the VTVM.

OVERALL SENSITIVITY MEASUREMENTS

For the sensitivity measurement, the receiver was checked in a screened room using a Measurements Corp. Model 80 signal generator connected to the antenna terminals through a 100 ohm resistor in the "hot" lead and a 150 ohm resistor in the ground lead.

A 30% modulated signal is fed in at the center of each channel with the fine tuning control adjusted for maximum.

Connect a calibrated oscilloscope from the picture tube cathodes (pins 4, 5 and 13) to ground.

Set the CONTRAST control to maximum.

Sensitivity is that reading in microvolts required to produce 20 volts peak-to-peak at the picture tube's cathode, and should read as follows:

Channels 2 thru 6 .....20 microvolts
Channels 7 thru 13 .....25 microvolts

****

MIXER GRID SENSITIVITY

1. Feed signal generator directly into the mixer grid (pin 2 of V-2).

2. Connect VTVM across video detector load using pins 1 and 5 of the Service Test Receptacle.

3. Connect a wire jumper from the monochrome TP to chassis.

4. Sensitivity at 44 Mc should be less than 100 microvolts for a 1 volt rise above noise....on the VTVM.

5. Sensitivity at 45.75 Mc shall be less than 200 microvolts for a 1 volt rise above noise on the VTVM. This measurement is made with the VTVM connected from the output side of the sound crystal to ground. (Remove the sound detector "can" cover of T-105.)

SERVICE NOTES

TO REPLACE UHF DIAL CORD

1. Remove the receiver from the cabinet (refer to disassembly instructions page 7).

2. For convenience, remove the VHF and UHF tuners from the chassis as a unit. Do not disconnect the wiring. To gain sufficient lead length, release leads from chassis clamps.

3. Use factory replacement dial cord (Motorola Part No. 1V740308) or any suitable dial cord 27-1/2 inches long from end to end including the securing loops.

4. Turn UHF tuner so tuning stubs are at maximum length. Set DIAL DRIVE PULLEY so "notch" is upward.

5. String dial cord as shown in illustration (Fig. 32).

6. Check mechanical operation of tuners. If satisfactory.. replace tuners in chassis.

7. Check electrical operation of tuners. If satisfactory... replace chassis in cabinet.

8. To replace UHF dial scale...tune in any available UHF station and replace scale with corresponding channel number at the top (for proper visibility through window).

9. If UHF station is not available, turn VHF tuner to channel #1 and the UHF tuner to its lowest frequency. Replace UHF and VHF knobs so that the digit 1 of UHF channel #14 is just covered by the left-hand side of the window. This is only an approximate position and must be corrected when station is available.

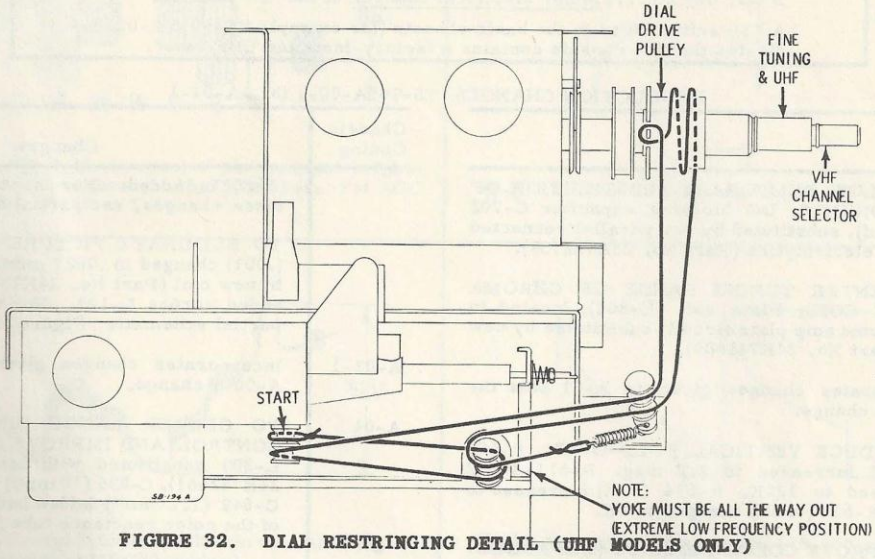


FIGURE 32. DIAL RESTRINGING DETAIL (UHF MODELS ONLY)

SAFETY GLASS REMOVAL FOR LATER MODEL TS-905 RECEIVERS.

NOTE: To remove the safety glass, it is necessary to remove the back cover of the receiver. After removal, allow a few minutes for all voltages to discharge in the receiver. While these residual charges are not lethal in themselves, unexpected muscular reaction could cause physical injury.

Should it be necessary to move the cabinet, it is important that the receiver is returned to the original position after the cleaning operation. A change in cabinet position may change the affect of external magnetic field interaction and cause misconvergence problems.

When necessary to reach into the receiver cabinet, avoid moving any adjustments or controls... especially those located on the neck of the picture tube.

TO REMOVE SAFETY GLASS

1. Remove the power cord of the receiver from the house outlet.

2. Observe the position of the cabinet so it may be returned to this position later...then move the cabinet so the back cover may be removed. Remove cover by removing screws around the edges.

3. Remove the channel selector and fine tuning knobs. Knobs are held by friction only and may be pulled off by pressure straight out from the cabinet.

4. Remove two (2) Phillips head screws holding circular insert (the circular insert is located under the knobs that were removed in step #3).

5. Remove the five (5) Phillips head screws holding the bullet-shaped molding trim at the bottom of safety glass.

NOTE: Screws #1 and #4, as counted from left to right-hand side (facing front of cabinet), extend through the cabinet and are secured on the inside of the cabinet by a nut. To remove these screws, it will be necessary to reach inside the cabinet (from the rear) and keep these nuts from turning or falling into the bottom of the set.

CAUTION: Avoid moving any adjustments or controls.... especially those located on the neck of the picture tube.

6. Remove bullet-shaped molding, then remove the four (4) hex head screws exposed by removal. Remove the flat metal strip holding glass at bottom of cabinet.

7. Remove the five (5) Phillips head screws securing metal molding trim at the top of the safety glass (hold glass during removal so glass will not fall out).

8. Grasp safety glass at right-hand edge and move outward until glass clears cabinet...then slide glass towards right-hand side. Grasp safety glass at right and left-hand edges and remove from cabinet. Place glass in a safe place.

When replacing safety glass, make sure flexible molding is in position at top, bottom and left-hand edges of the glass before installation. Follow removal steps in reverse order and be sure to replace the two nuts on screws #1 and #4 removed under step 5.

PRODUCTION CHANGES

TV CHASSIS CODING SYSTEM FOR TS-905 RECEIVERS

The TS-905 color receiver consists of three separate chassis...the main chassis, the power supply chassis and the convergence control chassis. Since production changes may be made on any one of the chassis without necessarily affecting the other two, each chassis has been assigned a separate coding system as follows: Main chassis...TS-905; power supply chassis...PS-905; convergence chassis.... CONV-905. Production changes on the main chassis will utilize the system given in chart form below. Production changes on either the power supply or convergence chassis will be indicated by the suffix A, B, C, etc.

MAIN CHASSIS CODING SYSTEM

TS-905A-00..... The original basic chassis
A-01, 02, etc.... Minor electrical revisions of the "A" chassis
A-01-0, A-02-1.. Temporary deviations from minor electrical revisions
B-00..... First major revision of the original chassis
B-01, 02, etc.... Minor electrical changes of the "B" chassis.

A "Y" suffix added to the basic chassis (for example TS-905YA-00) indicates that the chassis contains a factory-installed UHF tuner.

PRODUCTION CHANGES TS-905A-00-1 thru A-04-1

Chassis Coding	Changes
A-00-1	TO ALLOW TEMPORARY SUBSTITUTION OF COMPONENTS: DC blocking capacitor C-702 (1000 mf), substituted by two parallel connected 450 mf electrolytics (Part No. 23A732739).
A-01	TO CENTER TUNING RANGE OF CHROMA PLATE COIL: Plate coil (L-802), located in the chroma amp plate circuit, substituted by new coil (Part No. 24K741609).
A-01-1	Incorporates changes given in A-01 plus the A-00-1 change.
A-02	TO REDUCE VERTICAL FOLD-OVER: R-608 (1 meg) increased to 2.2 meg. R-611 (100K) increased to 120K. R-614 (33K) increased to 39K. R-616 (6.8K) changed to 1K. TO IMPROVE COLOR FIDELITY (REPRODUCTION OF FLESH TONES): C-813 (680 mmf) changed to .001 mf. R-815 (1K) changed to 680 ohms.
A-02-1	Incorporates changes given in A-02 plus the A-00-1 change.
A-03	TO REDUCE BLOOMING: R-138 (contrast) and R-139 (brightness) re-wired. R-140 (470 ohms) and R-142 (33K) are removed. R-146 (56K) is added. For specific information on these changes, see partial schematic, Fig. 34. TO ELIMINATE PICTURE SMEARING: C-135 (.001) changed to .0027 mmf. L-121 substituted by new coil (Part No. 24K736963). R-147 (22K) added across L-121. For wiring changes, see partial schematic, Figure 33.
A-03-1	Incorporates changes given in A-03 plus the A-00-1 change.
A-04	TO CENTER RANGE OF COLOR SHADING CONTROL AND IMPROVE COLOR SYNC: Coil L-809 substituted with new coil (Part Number 24K742661). C-835 (10 mmf) changed to 22 mmf. C-849 (1.2 mmf) added between pins #2 and #3 of the color reactance tube (V-27).
A-04-1	Incorporates changes given in A-03 plus the A-00-1 change.
PS-905B	TO FACILITATE FUSE REPLACEMENT IN POWER SUPPLY CHASSIS: Fuse holder (Part No. 9B742694) is added. The location of this holder is on the right-hand side of the power supply chassis. Fuse E-902 (2 amp pigtail type) changed to a 2 amp lock-in type fuse (Part No. 65A742693).

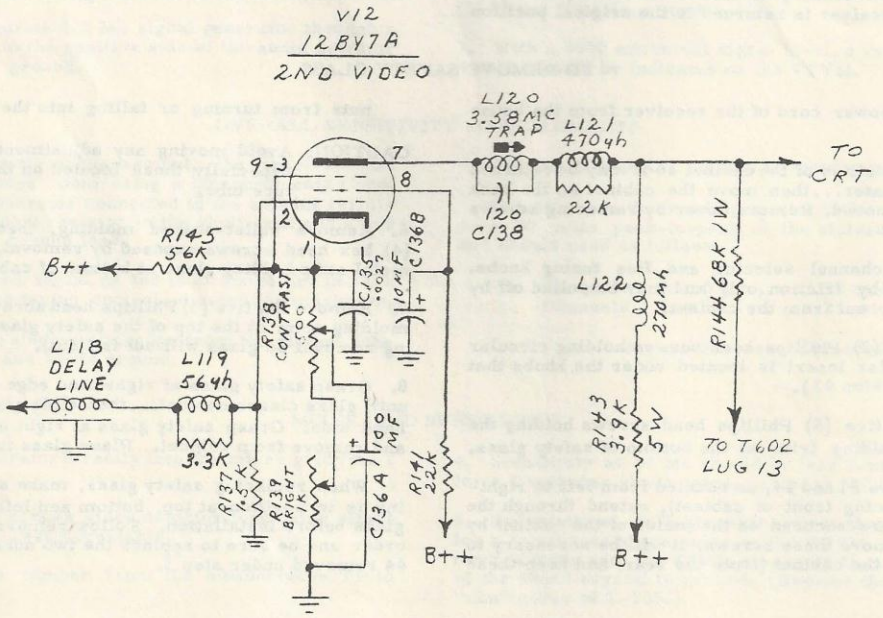


FIGURE 33. PRODUCTION CHANGE A-03

WAVEFORM DATA

1. Waveforms taken with a typical color bar generator connected to the antenna terminals of a properly operating receiver.

2. Color bar sequence from left to right: green, yellow, red, magenta, blue, cyan and green.

3. Waveforms taken with a wide band oscilloscope (4.5 Mc), and low capacity probe.

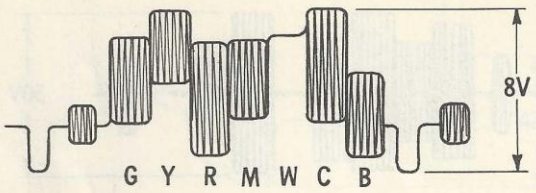
4. Waveforms taken from point indicated to chassis.

5. Line voltage: 117V AC.

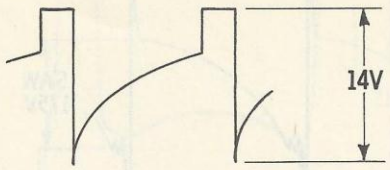
6. Color intensity control set for normal saturation.

7. Color shading control set for proper color difference signals at the picture tube grids.

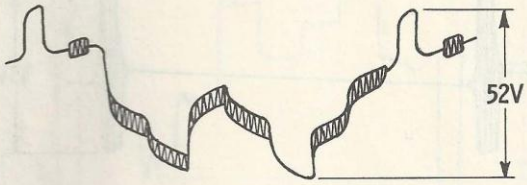
REFER TO PAGE 32 FOR WAVEFORM DATA.



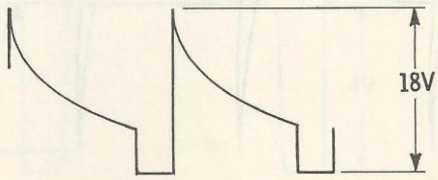
W-1 Monochrome T.P. composite chroma and brightness signal. Frequency: 15,750 cycles. Set AGC control for 10VPP at T.P.



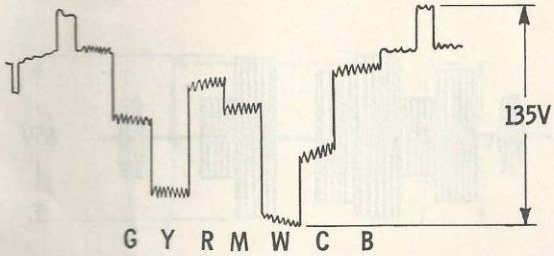
W-6 Horizontal sync signal (15,750 cycles).



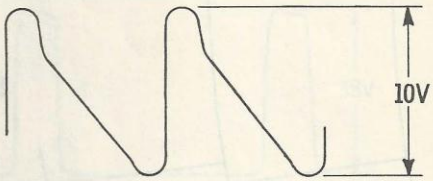
W-2 First video amplifier composite chroma and brightness output signal (15,750 cycles).



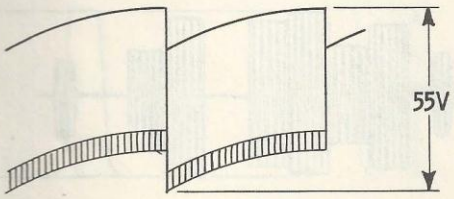
W-7 Horizontal sync signal (15,750 cycles).



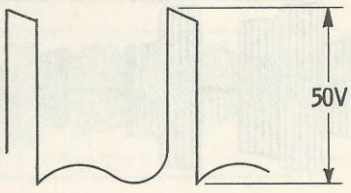
W-3 Brightness signal at picture tube cathodes (15,750 cycles). Brightness and contrast controls at maximum (clockwise).



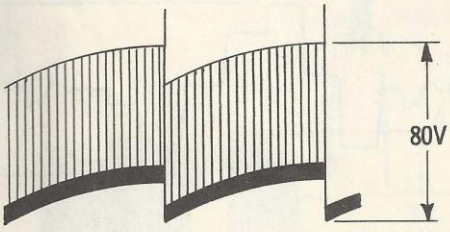
W-8 Integrated sawtooth from horizontal feedback pulse (15,750 cycles).



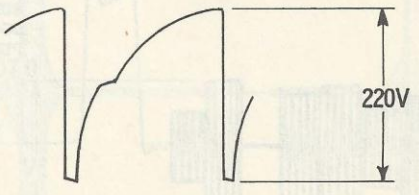
W-4 Vertical sync signal (60 cycles).



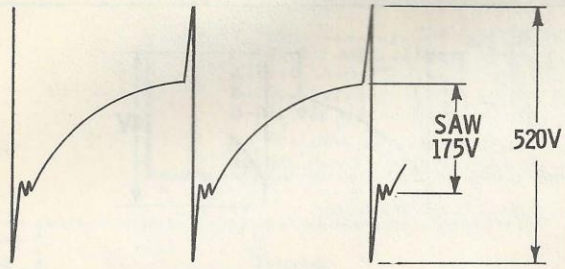
W-9 Horizontal discharge tube grid-waveform (15,750 cycles).



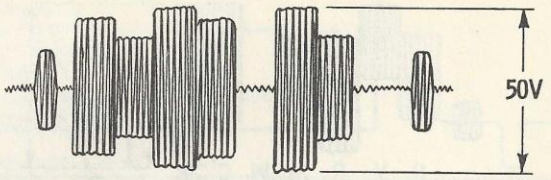
W-5 Vertical sync signal (60 cycles).



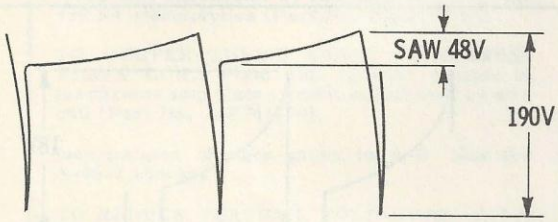
W-10 Horizontal output tube drive pulse (15,750 cycles).



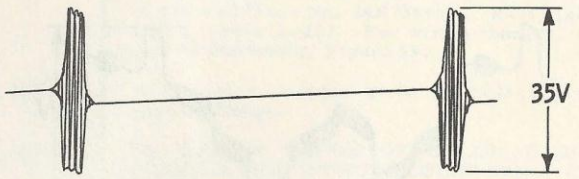
W-11 Vertical blocking oscillator grid waveform (60 cycles).



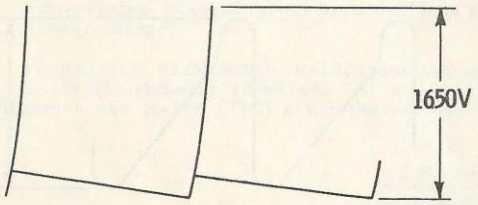
W-16 Composite chroma signal (15,750 cycles). Color intensity at maximum (clockwise).



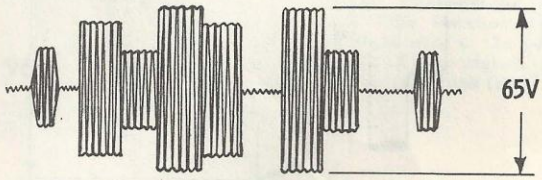
W-12 Vertical output tube drive pulse (60 cycles).



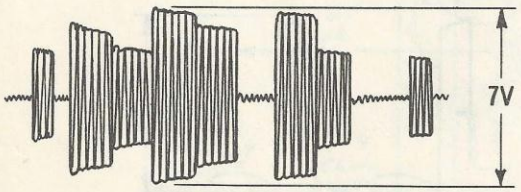
W-17 Chroma amplifier burst output signal (15,750 cycles). Color intensity at minimum (fully counterclockwise).



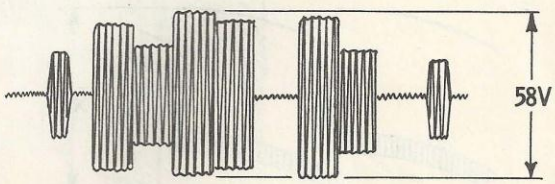
W-13 Vertical output sweep waveform (60 cycles).



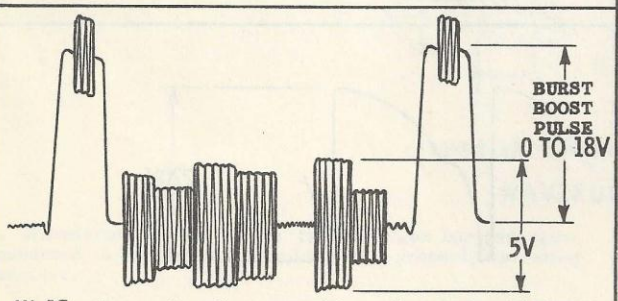
W-18 Composite chroma signal (15,750 cycles).



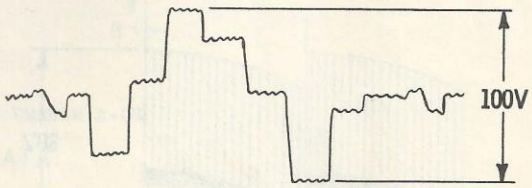
W-14 Composite chroma signal (15,750 cycles).



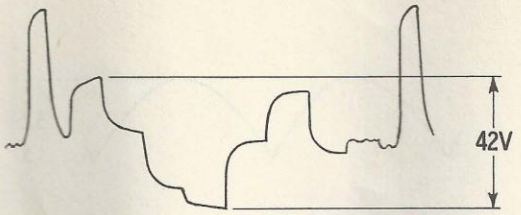
W-19 Demodulator input; composite chroma drive signal (15,750 cycles).



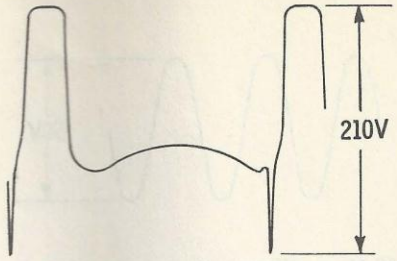
W-15 Composite chroma and burst boost signal (15,750 cycles).



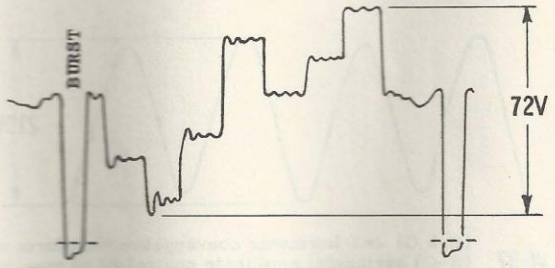
W-20 (R-Y) driving signal (15,750 cycles). (R-Y) amplifier gain approx. 7.5 times.



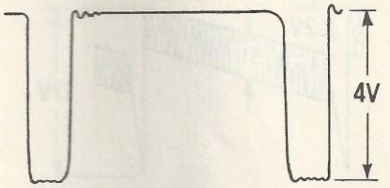
W-21 (G-Y) driving signal (15,750 cycles), gain (G-Y) amplifier approximately 10 times.



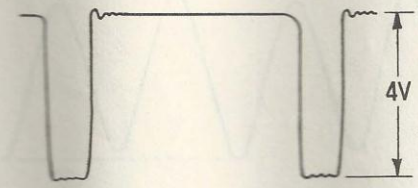
W-26 Burst amplifier keying pulse (15,750 cycles).



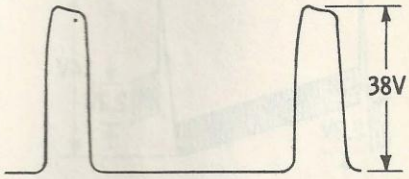
W-22 (B-Y) driving signal (15,750 cycles), gain (B-Y) amplifier approximately 11 times.



W-27 Pulse amplifier output pulse (15,750 cycles).

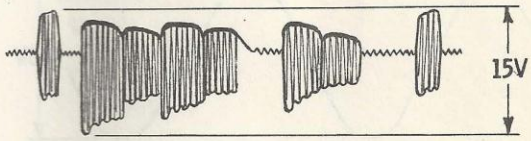


W-23 Color killer input pulse (15,750 cycles).

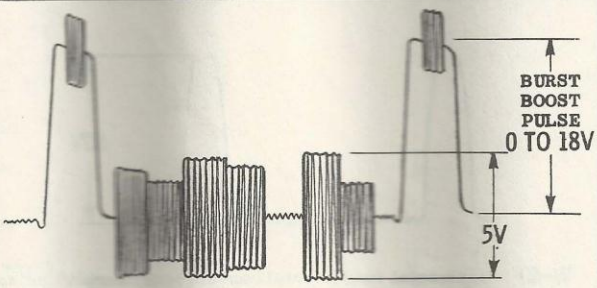


W-28 Pulse amplifier cathode pulse (15,750 cycles).

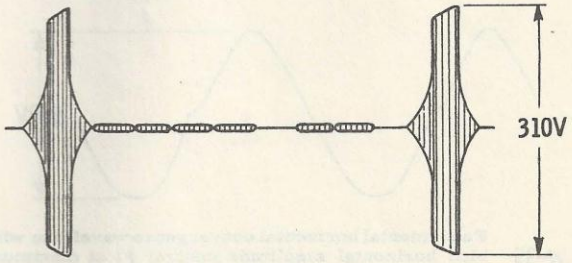
W-24 Set color killer control fully clockwise (for "on" operation). Re-adjust control to proper point for remainder of waveforms.



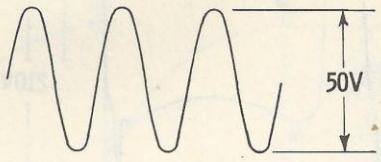
W-29 Burst amplifier input signal (15,750 cycles).



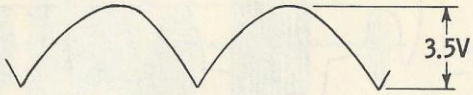
W-25 Color killer output pulse (15,750 cycles).



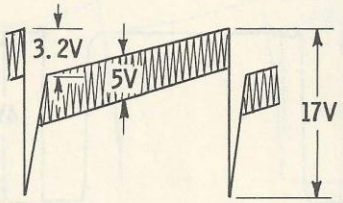
W-30 Amplified burst signal (15,750 cycles).



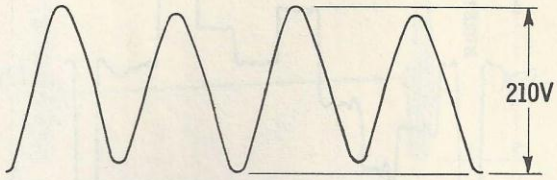
W-31 3.58 Mc oscillator output waveform.



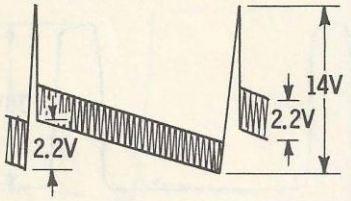
W-36 Vertical Parabola convergence waveform (60 cycles).



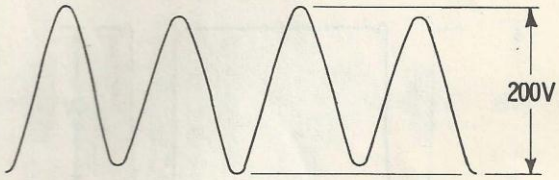
W-32 Vertical tilt convergence sawtooth waveform (60 cycles).



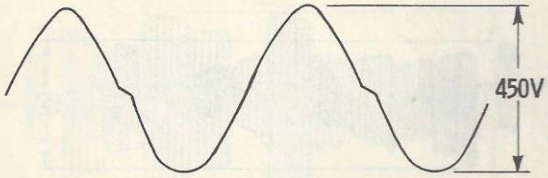
W-37 (R & G) 2nd harmonic convergence waveform with (R-G) horizontal amplitude control #2 at maximum (fully clockwise - 31,500 cycles).



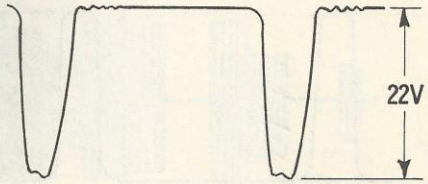
W-33 Vertical tilt convergence sawtooth waveform (60 cycles).



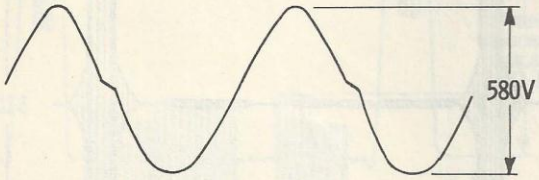
W-38 Second harmonic horizontal convergence waveform with blue horizontal amplitude control #2 at maximum (fully clockwise - 31,500 cycles).



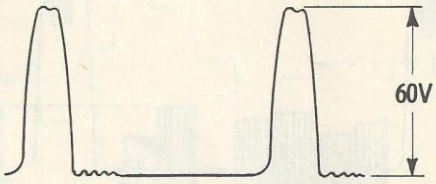
W-34 (R & G) fundamental horizontal convergence waveform with (R-G) horizontal amplitude control #1 at maximum (fully clockwise - 15,750 cycles).



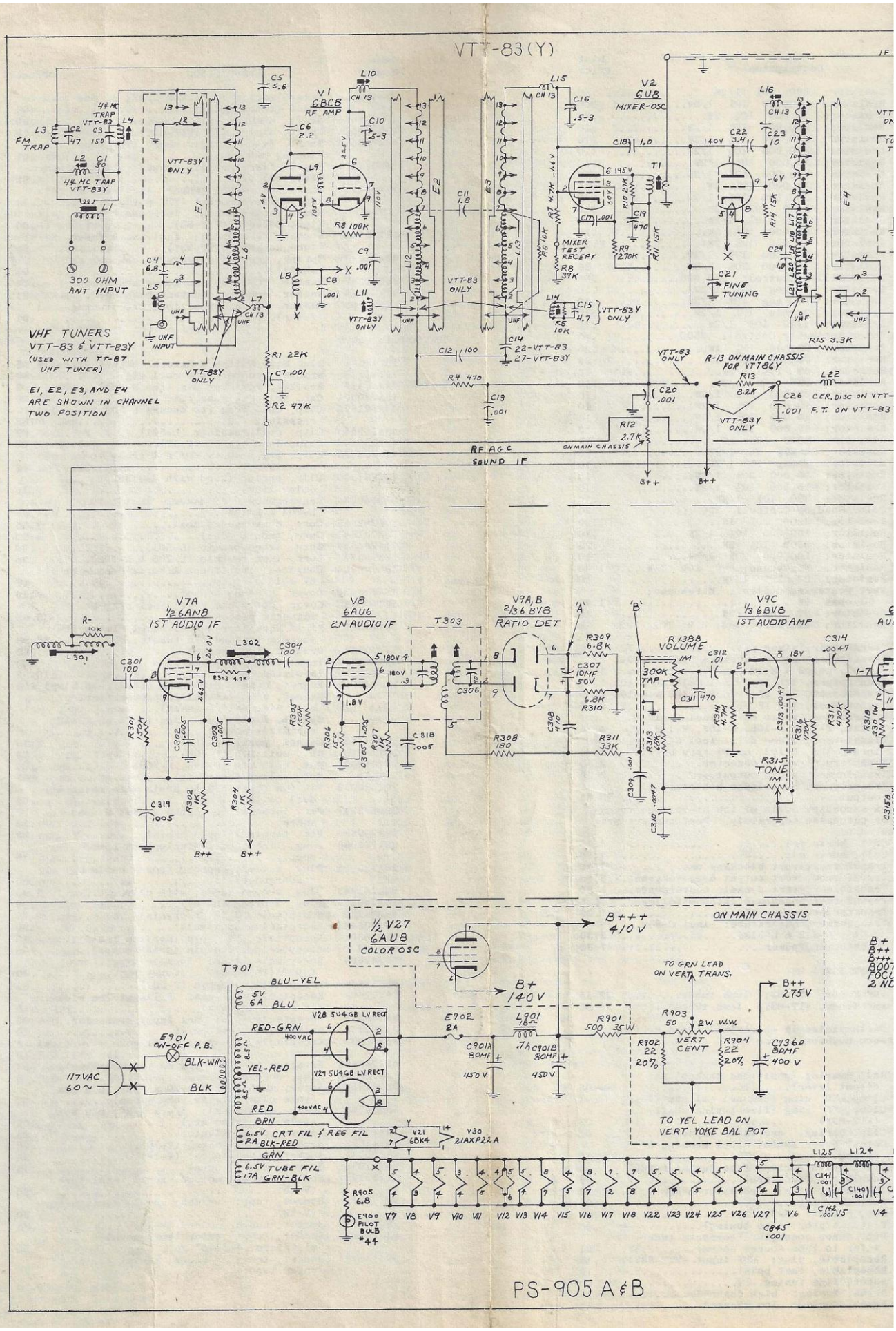
W-39 Horizontal 2nd harmonic convergence "supply" pulse (15,750 cycles).

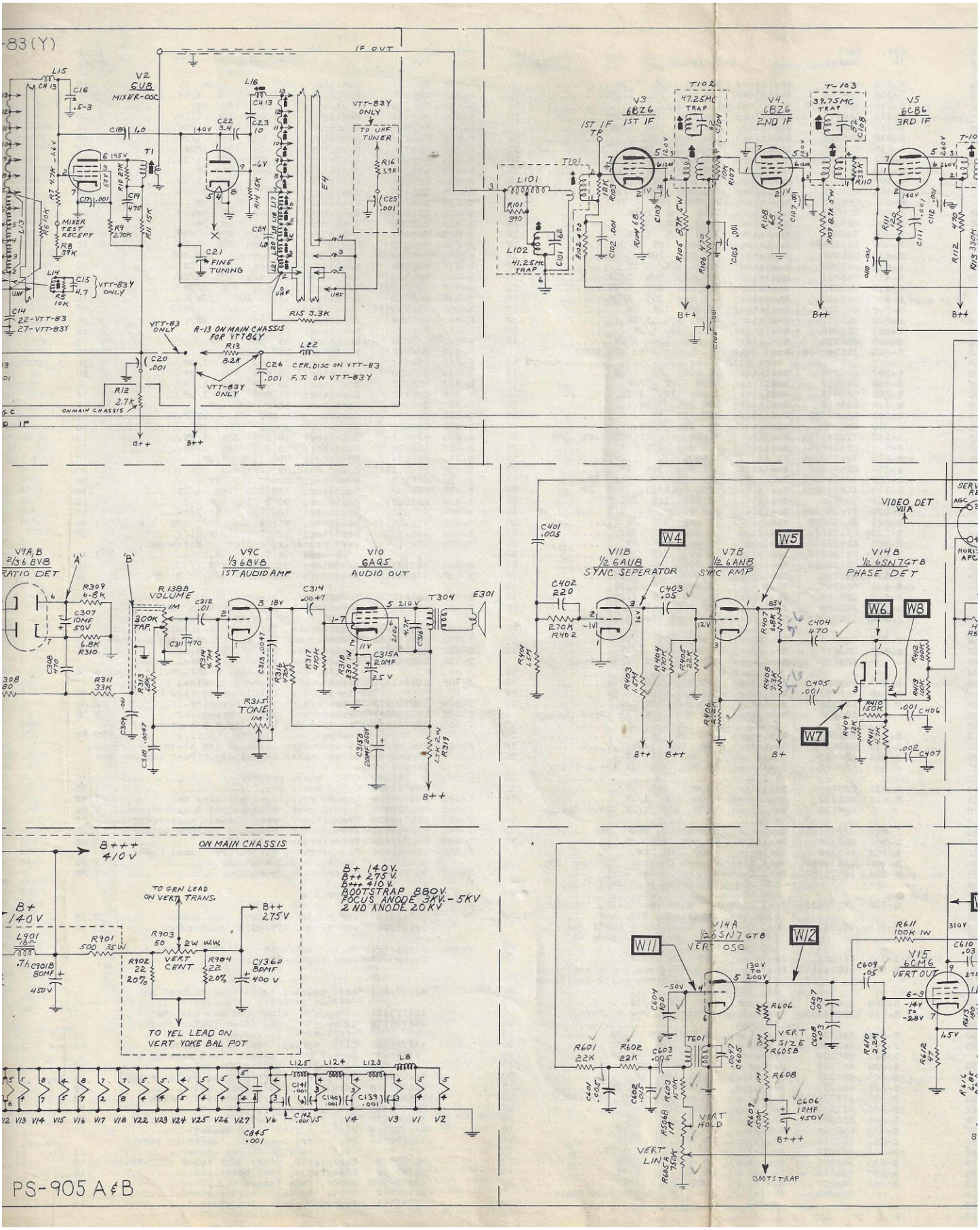


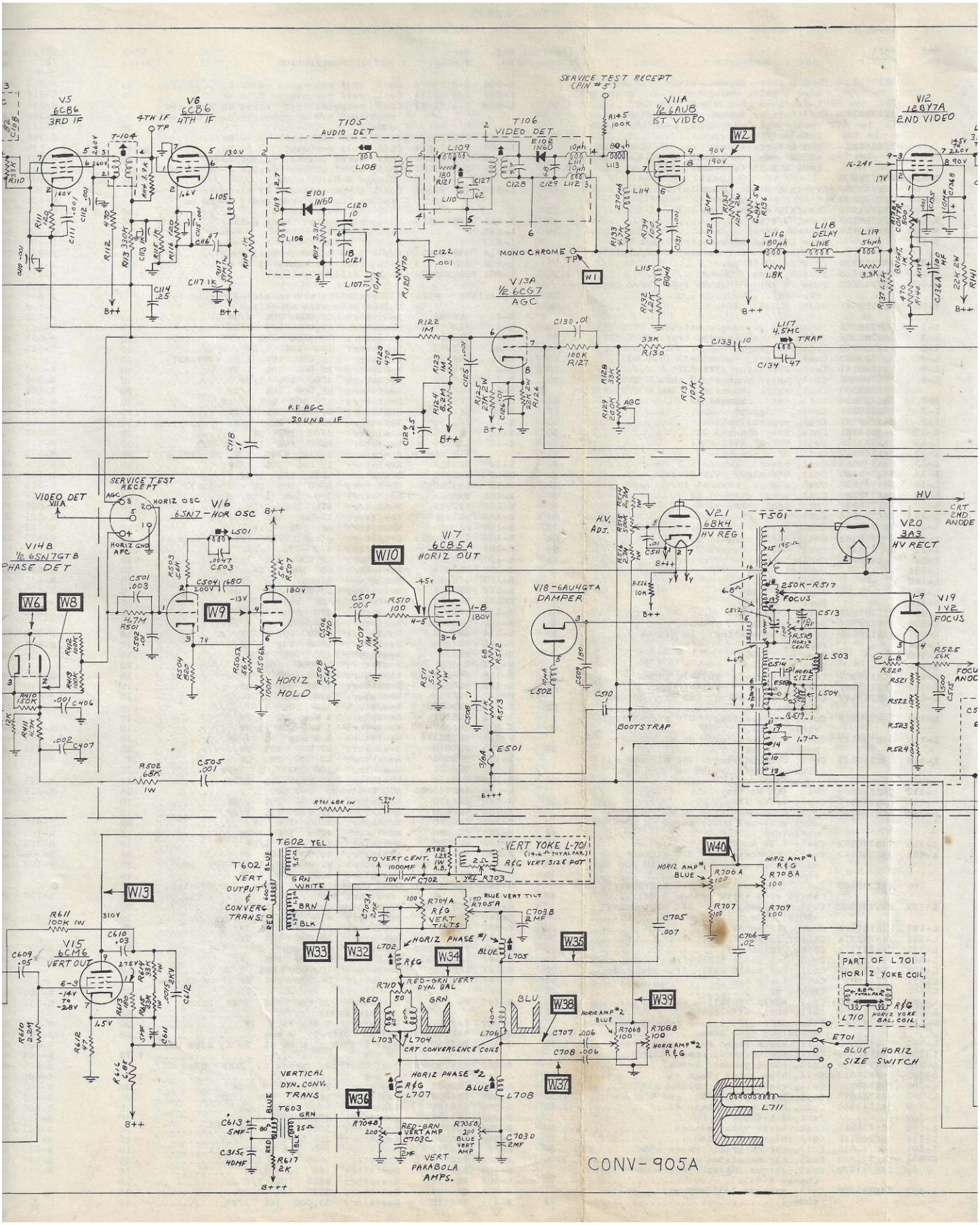
W-35 Fundamental horizontal convergence waveform with blue horizontal amplitude control #1 at maximum (fully clockwise - 15,750 cycles).

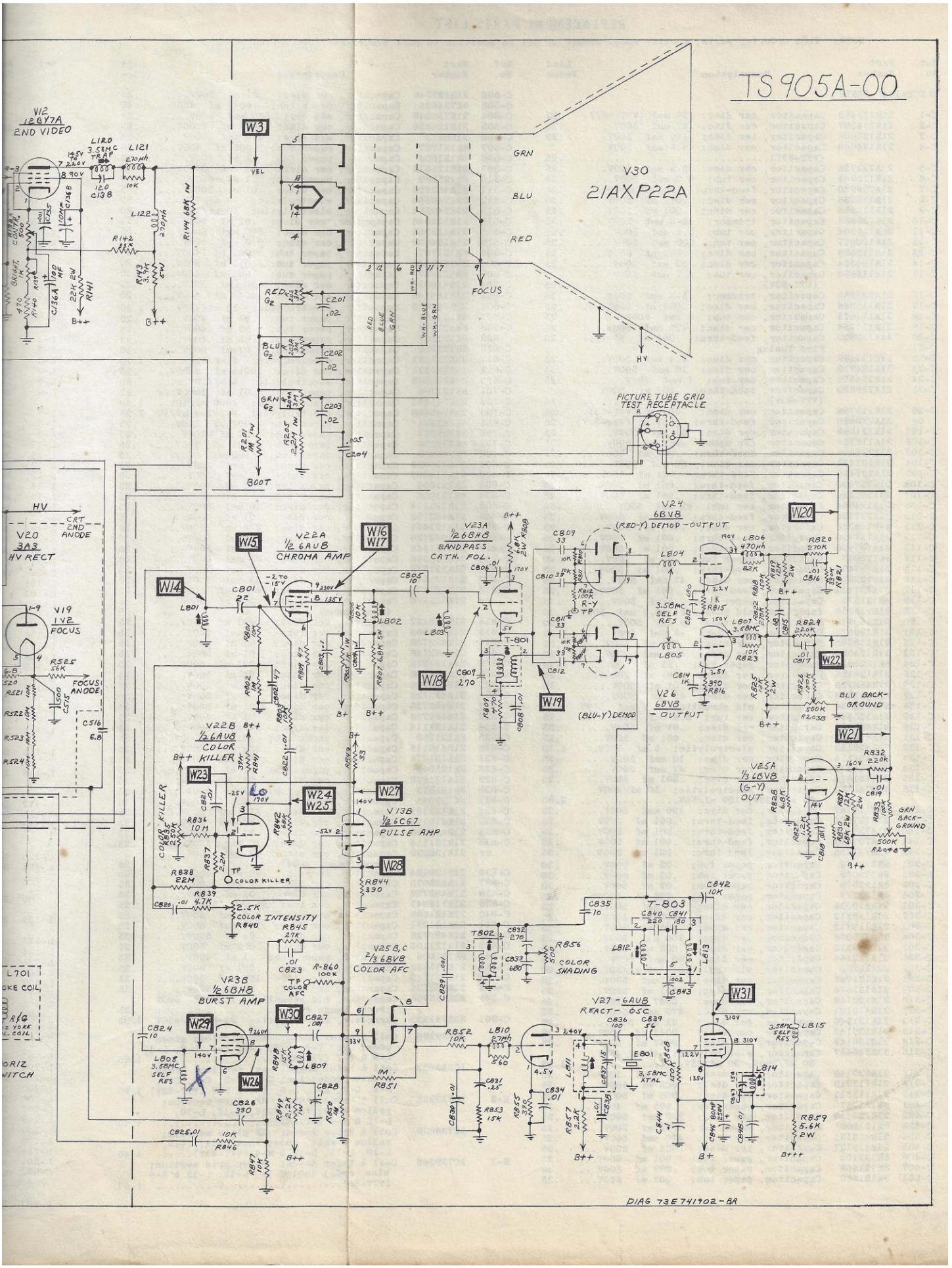


W-40 Horizontal fundamental convergence "supply" pulse (15,750 cycles).


VTT-83(Y)
VHF TUNERS
VTT-83 & VTT-83Y
(USED WITH TT-87 UHF TUNER)
E1, E2, E3, AND E4 ARE SHOWN IN CHANNEL TWO POSITION
300 OHM ANT INPUT
VTT-83Y ONLY
V1 6BC8 RF AMP
V2 6U8 MIXER-OSC
MIXER TEST RECEPT
FINE TUNING
R-13 ON MAIN CHASSIS FOR VTT86Y
CER. DISC ON VTT-83 F.T. ON VTT-83
RF AGC
SOUND IF
V7A 1/2 6AN8 1ST AUDIO IF
V8 6AU6 2N AUDIO IF
T303
V9A,B 2/3 6V8 RATIO DET
R138B VOLUME
V9C 1/3 6BV8 1ST AUDIO AMP
R-TONE
V27 1/2 6AU8 COLOR OSC
ON MAIN CHASSIS
B+++ 410V
B+ 140V
B++ 275V
T901
E901 ON-OFF P.B.
117VAC 60~
V28 5U4GB LV RECT
V29 5U4GB LV RECT
V21 6BK4
V30 21AXP22A
TO GRN LEAD ON VERT TRANS.
TO YEL LEAD ON VERT YOKE BAL POT
VERT CENT
E900 PILOT BULB #44
PS-905 A & B


-83(Y)
IF OUT
V2 6U8 MIXER-OSC
V3 6BZ6 1ST IF
V4 6BZ6 2ND IF
V5 6CB6 3RD IF
T102 47.25MC TRAP
T-103 39.75MC TRAP
T101
L101
L102 41.25MC TRAP
1ST IF TP
VTT-83Y ONLY
TO UNF TUNER
MIXER TEST RECEPT
FINE TUNING
R-13 ON MAIN CHASSIS FOR VTT84Y
CER. DISC ON VTT-83 F.T. ON VTT-83Y
ON MAIN CHASSIS
B++
V9A,B 2/3 6V8 RATIO DET
V9C 1/3 6BV8 1ST AUDIO AMP
V10 6AQ5 AUDIO OUT
R1388 VOLUME
300K TAP.
R311 33K
R315 TONE 1M
T304
E301
V11B 1/2 6AU8 SYNC SEPERATOR
V7B 1/2 6AN8 SYNC AMP
V14B 1/2 6SN7GTB PHASE DET
VIDEO DET V11A
W4
W5
W6
W7
W8
B+ 140V.
B++ 275V.
B+++ 410V.
BOOTSTRAP 880V.
FOCUS ANODE 3KV.- 5KV
2 ND ANODE 20KV
B+++ 410V
TO GRN LEAD ON VERT. TRANS.
B+ 140V
B++ 275V
R903 50 2W W.W. VERT CENT
R902 22 20%
R904 22 20%
C1360 80MF 400 V
TO YEL LEAD ON VERT YOKE BAL POT
V14A 1/2 6SN7 GTB VERT OSC
W11
W12
V15 6CM6 VERT OUT
VERT SIZE R605B
VERT HOLD R605A
VERT LIN
BOOTSTRAP
PS-905 A&B


V5 6CB6 3RD IF
V6 6CB6 4TH IF
4TH IF TP
T-104
T105 AUDIO DET
T106 VIDEO DET
SERVICE TEST RECEPT (PIN #5)
V11A 1/2 6AU8 1ST VIDEO
V12 12GY7A 2ND VIDEO
W2
MONOCHROME TP
W1
V13A 1/2 6CG7 AGC
L118 DELAY LINE
L117 4.5MC TRAP
RF AGC
SOUND IF
SERVICE TEST RECEPT
VIDEO DET V11A
V14B 1/2 6SN7GTB PHASE DET
V16 6SN7 - HOR OSC
HORIZ OSC
HORIZ GND AFC
HORIZ HOLD
V17 6CB5A HORIZ OUT
W10
V18 - 6AU4GTA DAMPER
BOOTSTRAP
HV
CRT 2ND ANODE
V21 6BK4 HV REG
H.V. ADJ.
T501
V20 3A3 HV RECT
FOCUS
V19 1V2 FOCUS
W6
W8
W9
W13
W33
W32
W34
W35
W40
W36
W37
W38
W39
T602 VERT OUTPUT & CONVERG TRANS
V15 6CM6 VERT OUT
VERT YOKE L-701
TO VERT CENT.
R&G VERT SIZE POT
HORIZ PHASE #1
HORIZ AMP #1 R&G
RED-GRN VERT DYN. BAL
CRT CONVERGENCE COILS
HORIZ PHASE #2
HORIZ AMP #2 R&G
PART OF L701 HORIZ YOKE COIL
L710 HORIZ YOKE BAL. COIL
E701 BLUE HORIZ SIZE SWITCH
L711
VERTICAL DYN. CONV. TRANS
T603
VERT PARABOLA AMPS.
CONV-905A


TS 905A-00
V12 12GY7A 2ND VIDEO
V30 21AXP22A
GRN
BLU
RED
FOCUS
HV
PICTURE TUBE GRID TEST RECEPTACLE
BOOT
V20 3A3 HV RECT
CRT 2ND ANODE
V19 1V2 FOCUS
FOCUS ANODE
V22A 1/2 6AU8 CHROMA AMP
V22B 1/2 6AU8 COLOR KILLER
V23A 1/2 6BH8 BAND PASS CATH. FOL.
V23B 1/2 6BH8 BURST AMP
V24 6BV8 (RED-Y) DEMOD - OUTPUT
V26 6BV8 - OUTPUT (BLU-Y) DEMOD
V25A 1/3 6BV8 (G-Y) OUT
V25B,C 2/3 6BV8 COLOR AFC
V27 - 6AU8 REACT - 65C
V13B 1/2 6C67 PULSE AMP
3.58MC TRAP
3.58MC SELF RES
3.58MC XTAL
COLOR INTENSITY R840
COLOR SHADING
BLU BACK-GROUND
GRN BACK-GROUND
DIAG 73E741902-BR

REPLACEMENT PARTS LIST

NOTE: When ordering parts, specify model number of set in addition to part number and description of part.

Ref. No.	Part Number	Description	List Price
ELECTRICAL PARTS			
C-1	21R125450	Capacitor, cer disc: 30 mmf (VTT-83Y).	.25
C-2	21R114207	Capacitor, cer disc: 47 mmf 500V.....	.25
C-3	21R124608	Capacitor, cer disc: 150 mmf 500V....	.25
C-4	21R124609	Capacitor, cer disc: 6.8 mmf 500V (VTT-83Y).....	.25
C-5	21A732738	Capacitor, cer disc: 5.6 mmf 500V....	.25
C-6	21R115948	Capacitor, cer tub: 2.2 mmf 500V.....	.25
C-7	21A739920	Capacitor, feed-thru: .001 mf 500V...	.25
C-8	21R115386	Capacitor, cer disc: .001 mf 500V....	.25
C-9	21R115386	Capacitor, cer disc: .001 mf 500V....	.25
C-10	21K735985	Capacitor, trimmer: .5-3 mmf 500V....	.35
C-11	21R115961	Capacitor, cer tub: 1.8 mmf 500V.....	.25
C-12	21R120577	Capacitor, cer tub: 100 mmf 500V.....	.25
C-13	21R115386	Capacitor, cer disc: .001 mf 500V....	.25
C-14	21R124554	Capacitor, cer disc: 22 mmf 500V.....	.25
C-15	21R115954	Capacitor, cer tub: 4.7 mmf 500V (VTT-83Y).....	.25
C-16	21K735985	Capacitor, trimmer: .5-3 mmf 500V....	.35
C-17	21R115386	Capacitor, cer disc: .001 mf 500V....	.25
C-18	21R114071	Capacitor, cer tub: 1 mmf 500V.....	.25
C-19	21R114554	Capacitor, cer disc: 470 mmf 500V....	.25
C-20	21A739920	Capacitor, feed-thru: .001 mf 500V...	.25
C-21	-	Fine Tuning	
C-22	21R124489	Capacitor, cer disc: 3.4 mmf 500V....	.25
C-23	21R124710	Capacitor, cer disc: 10 mmf 500V.....	.25
C-24	21R124552	Capacitor, cer tub: 1 mmf 500V.....	.25
C-25	21A739920	Capacitor, feed-thru: .001 mf 500V (VTT-83Y).....	.25
C-26	21R115386	Capacitor, cer disc: .001 mf (VTT-83).	.25
or	21A739920	Capacitor, feed-thru: .001 mf (VTT-83Y)	.25
C-101	21R121598	Capacitor, cer disc: 62 mmf 500V.....	.25
C-102	21A115386	Capacitor, cer disc: .001 mf 500V....	.25
C-103	21A737426	Capacitor, feed-thru: .001 mf 500V...	.25
C-104	21R121471	Capacitor, cer disc: 62 mmf 500V.....	.25
C-105	21A737426	Capacitor, feed-thru: .001 mf 500V...	.25
C-106	21A737426	Capacitor, feed-thru: .001 mf 500V...	.25
C-107	21A737426	Capacitor, feed-thru: .001 mf 500V...	.25
C-108	21R124904	Capacitor, cer tub: 82 mmf 500V.....	.30
C-110	21R737426	Capacitor, feed-thru: .001 mf 500V...	.25
C-111	21R115386	Capacitor, cer disc: .001 mf 500V....	.25
C-112	21A737426	Capacitor, feed-thru: .001 mf 500V...	.25
C-113	21A737426	Capacitor, feed-thru: .001 mf 500V...	.25
C-114	8K122045	Capacitor, paper tub: .25 mf 100V....	.40
C-115	21A737426	Capacitor, feed-thru: .001 mf 500V...	.25
C-116	21R122822	Capacitor, cer disc: 47 mmf 500V.....	.25
C-117	21A737426	Capacitor, feed-thru: .001 mf 500V...	.25
C-118	8R121573	Capacitor, paper tub: .1 mf 200V.....	.25
C-119	21R115950	Capacitor, mld phenolic: 2.7 mmf 500V	.25
C-120	21R120548	Capacitor, cer tub: 10 mmf 500V.....	.50
C-121	21R120578	Capacitor, cer disc: 18 mmf 500V.....	.25
C-122	21R115386	Capacitor, cer disc: .001 mf 500V....	.25
C-123	21R114554	Capacitor, cer disc: 470 mmf 500V....	.25
C-124	8K122045	Capacitor, paper tub: .25 mf 100V....	.40
C-125	21R124456	Capacitor, cer disc: .001 mf 2000V...	.25
C-126	21R482726	Capacitor, cer disc: .01 mf 500V.....	.35
C-127	21R121598	Capacitor, cer disc: 62 mmf 500V.....	.25
C-128	*21R115984	Capacitor, mld phenolic: 4.7 mmf 500V	.25
C-129	21R120546	Capacitor, cer tub: 6.8 mmf 500V.....	.25
C-130	21R482726	Capacitor, cer disc: .01 mf 500V.....	.35
C-131	21R410127	Capacitor, cer disc: .001 mf 500V....	.25
C-132	23K739132	Capacitor, electrolytic: 5 mf 300V...	1.10
C-133	21R121114	Capacitor, cer disc: 10 mmf 500V.....	.25
C-134	21R114207	Capacitor, cer disc: 47 mmf 500V.....	.25
C-135	21A121678	Capacitor, cer disc: .001 mf 500V....	.25
C-136	23B740462	Capacitor, electrolytic: 10 mf/400V, 80 mf/250V, 100 mf/50V.....	2.85
C-138	21R114167	Capacitor, cer disc: 120 mmf 500V....	.25
C-139	21A737426	Capacitor, feed-thru: .001 mf 500V...	.25
C-140	21A737426	Capacitor, feed-thru: .001 mf 500V...	.25
C-141	21A737426	Capacitor, feed-thru: .001 mf 500V...	.25
C-142	21A737426	Capacitor, feed-thru: .001 mf 500V...	.25
C-201	8R122079	Capacitor, paper tub: .02 mf 600V....	.30
C-202	8R122079	Capacitor, paper tub: .02 mf 600V....	.30
C-203	8R122079	Capacitor, paper tub: .02 mf 600V....	.30
C-204	8R121777	Capacitor, paper tub: .005 mf 1000V..	.35
C-301	21R410036	Capacitor, cer disc: 100 mmf 500V....	.25
C-302	21R115312	Capacitor, cer disc: .005 mf 500V....	.25
C-303	21R115312	Capacitor, cer disc: .005 mf 500V....	.25
C-304	21R410036	Capacitor, cer disc: 100 mmf 500V....	.25
C-305	21R115312	Capacitor, cer disc: .005 mf 500V....	.25
C-306	21A122464	Capacitor, cer disc: 90 mmf 500V.....	.25
C-307	23A90205	Capacitor, electrolytic: 10 mf/50V....	1.00
C-308	21K121797	Capacitor, cer disc: 470 mmf 500V....	.25
C-309	21A121678	Capacitor, cer disc: .001 mf 500V....	.25
C-310	21R120149	Capacitor, cer disc: .0047 mf 500V...	.25
C-311	21R410121	Capacitor, cer disc: 470 mmf 500V....	.25
C-312	21R121946	Capacitor, cer disc: .01 mf 500V.....	.25
C-313	21R120149	Capacitor, cer disc: .0047 mf 500V...	.25
C-314	21R120149	Capacitor, cer disc: .0047 mf 500V...	.25
C-315	23B740457	Capacitor, electrolytic: 40 mf/450V, 20 mf/250V, 20 mf/25V.....	1.95
C-316	21R120149	Capacitor, cer disc: .0047 mf 500V...	.25
C-318	21R115312	Capacitor, cer disc: .005 mf 500V....	.25
C-319	21R115312	Capacitor, cer disc: .005 mf 500V....	.25
C-401	8R121787	Capacitor, paper tub: .005 mf 400V...	.30
C-402	21K122420	Capacitor, cer disc: 220 mmf 500V....	.25
C-403	8R121005	Capacitor, paper tub: .05 mf 200V....	.25
C-404	21R410121	Capacitor, cer disc: 470 mmf 500V....	.25
C-405	21R410127	Capacitor, cer disc: .001 mf 500V....	.25
C-406	8R122103	Capacitor, paper tub: .001 mf 600V...	.25
C-407	8R121568	Capacitor, paper tub: .002 mf 600V...	.30
C-501	8R121569	Capacitor, paper tub: .003 mf 600V...	.35
C-502	21R121946	Capacitor, cer disc: .01 mf 500V.....	.25
C-503	8K734634	Capacitor, paper tub: .0047 mf 400V..	.40
C-504	21K736046	Capacitor, mld cer: 680 mmf 500V.....	.25
C-505	21R124456	Capacitor, cer disc: .001 mf 2000V...	.25
C-506	21R6673	Capacitor, mld mica: 470 mmf 500V....	.30
C-507	8R121787	Capacitor, paper tub: .005 mf 400V...	.30
C-508	8R121006	Capacitor, paper tub: .1 mf 400V.....	.25
C-509	21R125513	Capacitor, cer disc: 180 mmf 5000V...	.45
C-510	8R121869	Capacitor, paper tub: .1 mf 600V.....	.30
C-511	21R482726	Capacitor, cer disc: .01 mf 500V.....	.35
C-512	23K740554	Capacitor, electrolytic: 10 mf/15V....	.90
C-513	23K740554	Capacitor, electrolytic: 10 mf/15V....	.90
C-514	21R121946	Capapcitor, cer disc: .01 mf 500V....	.25
C-515	21R125368	Capacitor, cer disc: 500 mmf 6000V...	.55
C-516	21R124609	Capacitor, cer disc: 6.8 mmf 500V....	.25
C-601	8R121787	Capacitor, paper tub: .005 mf 400V...	.30
C-602	8R122256	Capacitor, paper tub: .015 mf 200V...	.20
C-603	8R121787	Capacitor, paper tub: .005 mf 400V...	.30
C-604	21R410036	Capacitor, cer disc: 100 mmf 500V....	.25
C-605	21R120149	Capacitor, cer disc: .0047 mf 500V...	.25
C-606	23B702450	Capacitor, electrolytic: 10 mf/450V...	1.30
C-607	8R121574	Capacitor, paper tub: .03 mf 400V....	.25
C-608	8R121574	Capacitor, paper tub: .03 mf 400V....	.25
C-609	8R121567	Capacitor, paper tub: .05 mf 400V....	.25
C-610	8R122262	Capacitor, paper tub: .03 mf 600V....	.30
C-611	23K739132	Capacitor, electrolytic: 5 mf/300V....	1.10
C-612	21R124121	Capacitor, cer disc: .0015 mf 2000V..	.25
C-613	23A740568	Capacitor, electrolytic: 5 mf/10V.....	.90
C-701	8R121790	Capacitor, paper tub: .01 mf 1000V...	.35
C-702	23K741491	Capacitor, electrolytic: 1000 mf/10V..	1.90
C-703	23B740456	Capacitor, electrolytic: 2-2-2-2 mf/10V	2.25
C-705	8K741231	Capacitor, paper tub: .007 mf 200V...	.25
C-706	8K739257	Capacitor, paper tub: .02 mf 200V....	.25
C-707	8K739258	Capacitor, paper tub: .006 mf 200V...	.25
C-708	8K739258	Capacitor, paper tub: .006 mf 200V...	.25
C-801	21R120539	Capacitor, cer disc: 22 mmf 500V.....	.25
C-802	21R114207	Capacitor, cer disc: 47 mmf 500V.....	.25
C-803	8R121006	Capacitor, paper tub: .1 mf 400V.....	.25
C-804	8R121006	Capacitor, paper tub: .1 mf 400V.....	.25
C-805	21R121114	Capacitor, cer disc: 10 mmf 500V.....	.25
C-806	21R482726	Capacitor, cer disc: .01 mf 500V.....	.35
C-807	21R121481	Capacitor, cer disc: 270 mmf 500V....	.25
C-808	21R482726	Capacitor, cer disc: .01 mf 500V.....	.35
C-809	21R121548	Capacitor, cer disc: 33 mmf 500V.....	.25
C-810	21R121548	Capacitor, cer disc: 33 mmf 500V.....	.25
C-811	21R121548	Capacitor, cer disc: 33 mmf 500V.....	.25
C-812	21R121548	Capacitor, cer disc: 33 mmf 500V.....	.25
C-813	21K125371	Capacitor, cer disc: 680 mmf 500V....	.25
or	21K121678	Capacitor, cer disc: .001 mf 500V (Prod Change A-02).....	.25
C-814	21R410127	Capacitor, cer disc: .001 mf 500V....	.25
C-815	21R115965	Capacitor, cer tub: .68 mmf 500V.....	.25
C-816	21R482726	Capacitor, cer disc: .01 mf 500V.....	.35
C-817	21R482726	Capacitor, cer disc: .01 mf 500V.....	.35
C-818	21A121678	Capacitor, cer disc: .001 mf 500V....	.25
C-819	21R482726	Capacitor, cer disc: .01 mf 500V.....	.35
C-820	21R482726	Capacitor, cer disc: .01 mf 500V.....	.35
C-821	21R482726	Capacitor, cer disc: .01 mf 500V.....	.35
C-822	21R482726	Capacitor, cer disc: .01 mf 500V.....	.35
C-823	21R482726	Capacitor, cer disc: .01 mf 500V.....	.35
C-824	21R121114	Capacitor, cer disc: 10 mmf 500V.....	.25
C-825	8R121790	Capacitor, paper tub: .01 mf 1000V...	.35
C-826	21R410118	Capacitor, cer disc: 330 mmf 500V....	.25
C-827	21A121678	Capacitor, cer disc: .001 mf 500V....	.25
C-828	8R121006	Capacitor, paper tub: .1 mf 400V.....	.25
C-829	21A121678	Capacitor, cer disc: .001 mf 500V....	.25
C-830	8R121573	Capacitor, paper tub: .1 mf 200V.....	.25
C-831	8K122045	Capacitor, paper tub: .25 mf 100V....	.40
C-832	21R121481	Capacitor, cer disc: 270 mmf 500V....	.25
C-833	21R410124	Capacitor, cer disc: 680 mmf 500V....	.25
C-834	21R482726	Capacitor, cer disc: .01 mf 500V.....	.35
C-835	21R121114	Capacitor, cer disc: 10 mmf 500V.....	.25
or	21R120539	Capacitor, cer disc: 22 mmf 500V (Prod Change A-04).....	.25
C-836	21R120124	Capacitor, cer tub: 100 mmf 500V.....	.25
C-837	21R125075	Capacitor, cer disc: 15 mmf 500V.....	.25
C-838	21R482726	Capacitor, cer disc: .01 mf 500V.....	.35
C-839	21R115641	Capacitor, cer tub: 56 mmf 500V.....	.25
C-840	21K121698	Capacitor, cer disc: 220 mmf 500V....	.25
C-841	21R121251	Capacitor, cer disc: 180 mmf 500V....	.25
C-842	21R482726	Capacitor, cer disc: .01 mf 500V.....	.35
C-843	21R121106	Capacitor, cer disc: .002 mf 500V....	.25
C-844	8R121006	Capacitor, paper tub: .1 mf 400V.....	.25
C-845	21R115386	Capacitor, cer disc: .001 mf 500V....	.25
C-847	21R121740	Capacitor, cer disc: 150 mmf 500V....	.25
C-848	21R482726	Capacitor, cer disc: .01 mf 500V.....	.35
C-849	21R115958	Capacitor, mld phenolic: 1.2 mmf 500V (Prod Change A-04).....	.25
C-901	23B741233	Capacitor, electrolytic: 80-80 mf/450V	3.05
E-1	1C739266	Coil & Wafer Assem: ant section; green code; incl C-2, C-3, C-5, L-1, L-3, L-4, L-6 & L-7 (VTT-83).....	1.65
	1C738632	Coil & Wafer Assem: ant section; green & white code; incl C-1, C-2, C-4, C-5, L-1, L-2, L-3, L-5, L-6 & L-7 (VTT-83Y)	1.90
E-2	1C739264	Coil & Wafer Assem: RF plate section; yellow code; incl C-11, C-12, L-10, L-12 & R-4 (VTT-83).....	1.40
	1C738630	Coil & Wafer Assem: RF plate section; yellow & white code; incl C-11, C-12, L-10, L-11, L-12 & R-4 (VTT-83Y).....	1.40
E-3	1C739265	Coil & Wafer Assem: mixer grid section; blue code; incl C-14, L-13, L-15 & R-6 (VTT-83).....	1.40

Ref. No.	Part Number	Description	List Price
	1C738631	Coil & Wafer Assem: mixer grid section; blue & white code; incl C-14, C-15, L-13, L-14, L-15, R-5 & R-6 (VTT-83Y)	1.40
E-4	1K738928	Coil & Wafer Assem: osc section; red code; incl C-23, C-24, L-16 thru L-22 & R-15 (VTT-83)	2.70
	1C738633	Coil & Wafer Assem: osc section; red & white code; incl C-25, C-26, L-16 thru L-22 & R-15 (VTT-83Y)	2.70
E-101	48C739300		
or	48K741280	Crystal, diode (plug-in)	.75
E-102	48C739300		
or	48K741280	Crystal, diode (plug-in)	.75
E-501	65K739192	Fuse, 3/8 amp	.40
E-502	40A740359	Switch, horiz size	1.30
E-701	-	Blue Lateral Size Switch (Part of 1C740556 - not furnished separately)	
E-801	48B732230	Crystal, 3.58 Mc	7.70
E-901	40B739693	Switch, push: On-off	1.20
E-902	65A742693	Fuse, 2 amp: lock-in type (Prod Change PS-905B)	.25
E-903	65X10867	Bulb, pilot: #44	.20
L-1	24B740572	Coil, ant impedance matching (VTT-83)	.60
L-2	24B742202	Coil, IF trap (series trap) (VTT-83Y)	.25
L-3	24A739910	Coil, FM trap	.05
L-4	24B739500	Coil, IF trap (parallel) (VTT-83)	.30
L-5	24A740141	Coil, UHF input (VTT-83Y)	.10
L-6	24C740040	Coil, ant: channels 2 thru 6 (VTT-83)	.20
	24K742360	Coil, ant: channels 2 thru 6 (VTT-83Y)	
L-7	24K739634	Coil, ant: channel 13	.05
L-8	24K730391	Choke, filament	.15
L-9	24A739397	Coil, neutralization	.05
L-10	24A739361	Coil, RF: channel 13	.10
L-11	24A741459	Coil, UHF-RF (VTT-83Y)	.10
L-12	24K740042	Coil, RF: channels 2 thru 6	.15
L-13	24K740041	Coil, mixer: channels 2 thru 6	.20
L-14	24A741460	Coil, UHF-mixer (VTT-83Y)	.10
L-15	24A741232	Coil, mixer: channel 13	.05
L-16	24K739386	Coil, osc: channel 13	.05
L-17	24K739385	Coil, osc: channel 6	.05
L-18	24K739384	Coil, osc: channel 5	.04
L-19	24C739381	Coil, osc: channel 4	.04
L-20	24K739382	Coil, osc: channel 3	.04
L-21	24C739381	Coil, osc: channel 2	.04
L-22	24A739380	Choke, osc	.15
L-101	-	Part of T-101	
L-102	-	Part of T-101	
L-103	-	Part of T-102	
L-104	-	Part of T-103	
L-105	24K737829	Coil, frame lock	.35
L-106	24R125367	Coil, resonant: yel-blu code	.35
L-107	24R119889	Coil, compensating: 10 microhenry	.20
L-108	-	Part of T-105	
L-109	-	Part of T-106	
L-110	-	Part of T-106	
L-111	24R125367	Coil, resonant: yel-blu code	.35
L-112	24R125367	Coil, resonant: yel-blu code	.35
L-113	24K737447	Coil, compensating: 80 microhenry; brn-yel code	.55
L-114	24K736008	Coil, compensating: 270 microhenry; violet code	.05
L-115	24K737447	Coil, compensating: 80 microhenry; brn-yel code	.55
L-116	24K740642	Coil, compensating: 180 microhenry; pink-yel code; wound on 1800 ohm resistor	.40
L-117	24B740553	Coil, 4.5 Mc trap	
L-118	24B739071	Coil, delay line	4.55
L-119	24K740546	Coil, compensating: 56 microhenry; dark gray-yel code; wound on 3300 ohm resistor	.40
L-120	24B740553	Coil, 3.58 Mc trap	.60
L-121	24K740643	Coil, compensating: 270 microhenry; violet-yel code; wound on 10,000 ohm resistor	.40
or	24K736963	Coil, compensating: 470 microhenry; white code (Prod Change A-03)	.45
L-122	24K736008	Coil, compensating: 270 microhenry; violet code	.05
L-123	24A721274	Choke, filament	.10
L-124	24A721274	Choke, filament	.10
L-125	24A721274	Choke, filament	.10
L-301	24B739448	Coil, lst audio take-off: violet code	1.00
L-302	24K739447	Coil, 2nd audio take-off: red code	1.00
L-501	1V741392	Coil, horiz osc	2.95
L-502	24K740416	Choke, RF	.40
L-503	25B741323	Coil, horiz isolation choke	3.75
L-504	24B741359	Coil, horiz size choke	.85
L-701	24K741467	Yoke, defl: 70°; incl rear cover assem & control case assem	34.55
L-702	24B738673	Coil, horiz phase #1: red & green	1.50
L-703	24K740936	Coil, convergence: red	
L-704	24K742715	Coil, convergence: green	
L-705	24B738673	Coil, blue horiz phase #1	1.50
L-706	24K740935	Coil, convergence: blue	
L-707	24B738673	Coil, horiz phase #2: red & green	1.50
L-708	24K741406	Coil, blue horiz phase #2	1.65
L-709	-	Part of L-701	
L-710	24B739269	Coil, horiz yoke balance	1.40
L-711	24K742718	Coil, blue horiz size	3.35
L-801	24K741610	Coil, chroma grid: green code	.80
L-802	24K741610	Coil, chroma plate: green code	.80
or	24K741609	Coil, chroma plate: yellow code (Prod Change A-01)	.75
L-803	24K741609	Coil, cathode follower grid: yellow code	.75
L-804	24B738674	Coil, self resonant: 3.58 Mc	.45
L-805	24B738674	Coil, self resonant: 3.58 Mc	.45
L-806	24K741492	Coil, compensating: wound on 8200 ohm resistor; 470 microhenry; dark blu-yel code	.40
L-807	24B738674	Coil, self resonant: 3.58 Mc	.45
L-808	24B738674	Coil, self resonant: 3.58 Mc	.45
L-809	24K741609	Coil, burst plate: yellow code	.75
or	24K742661	Coil, burst plate: orange code (Prod Change A-04)	.85
L-810	24K740545	Coil, compensating: 27 microhenry; yellow (orange)-red code; wound on 560 ohm resistor	.40
L-811	24B741405	Coil, reactance: incl C-837	1.35
L-812	-	Part of T-803	
L-813	-	Part of T-803	
L-814	24B741403	Coil, 3.58 Mc osc: incl C-847	1.25
L-815	24B738674	Coil, self resonant: 3.58 Mc	.45
L-901	*25K739239	Choke, filter	3.15
		Resistors - Note: All resistors are insulated carbon type unless otherwise specified	
R-1	6R6028	Resistor: 22,000 20% 1/2W	.10
R-2	6R6056	Resistor: 47,000 20% 1/2W	.10
R-3	6R6075	Resistor: 100,000 20% 1/2W	.10
R-4	6R3949	Resistor: 470 20% 1/2W	.10
R-5	6R6320	Resistor: 10,000 10% 1/2W (VTT-83Y)	.10
R-6	6R6320	Resistor: 10,000 10% 1/2W	.10
R-7	6R6039	Resistor: 4700 20% 1/2W	.10
R-8	6R6487	Resistor: 39,000 10% 1/2W	.10
R-9	6R6414	Resistor: 270,000 10% 1/2W	.10
R-10	6K121300	Resistor: 27,000 10% 1/2W	.10
R-11	6R2119	Resistor: 15,000 20% 1/2W	.10
R-12	6K124681	Resistor: 2700 10% 2W	.25
R-13	6R5610	Resistor: 8200 10% 1W (VTT-83)	.20
	17K738283	Resistor: Glass; 8200 10% 3W (VTT-83Y)	.30
R-14	6R2119	Resistor: 15,000 20% 1/2W	.10
R-15	6R5581	Resistor: 3300 10% 1/2W	.10
R-16	6R476012	Resistor: 3900 10% 2W (VTT-83Y)	.25
R-101	6R5554	Resistor: 390 10% 1/2W	.10
R-102	6R3949	Resistor: 470 20% 1/2W	.10
R-103	6K124680	Resistor: 12,000 10% 1/2W	.10
R-104	6R2039	Resistor: 68 10% 1/2W	.10
R-105	17K740257	Resistor: Glass; 8700 10% 4W	.40
R-106	6R3949	Resistor: 470 20% 1/2W	.10
R-107	6R6320	Resistor: 10,000 10% 1/2W	.10
R-108	6R2039	Resistor: 68 10% 1/2W	.10
R-109	17K740257	Resistor: Glass; 8700 10% 4W	.40
R-110	6R6410	Resistor: 33,000 10% 1/2W	.10
R-111	6R5551	Resistor: 120 10% 1/2W	.10
R-112	6R3949	Resistor: 470 20% 1/2W	.10
R-113	6R400067	Resistor: 330,000 5% 1/2W	.10
R-114	6R5659	Resistor: 3900 10% 1/2W	.10
R-115	6R6229	Resistor: 1000 10% 1/2W	.10
R-116	6R5551	Resistor: 120 10% 1/2W	.10
R-117	6R5588	Resistor: 39,000 10% 1W	.20
R-118	6R6229	Resistor: 1000 10% 1/2W	.10
R-119	6R5581	Resistor: 3300 10% 1/2W	.10
R-120	6R3949	Resistor: 470 20% 1/2W	.10
R-121	6R5660	Resistor: 180 10% 1/2W	.10
R-122	6R5587	Resistor: 1 meg 5% 1/2W	.10
R-123	6R5587	Resistor: 1 meg 5% 1/2W	.10
R-124	6R114114	Resistor: 8.2 meg 5% 1/2W	.10
R-125	6R2013	Resistor: 27,000 10% 2W	.25
R-126	6R2098	Resistor: 22,000 10% 2W	.25
R-127	6R6031	Resistor: 100,000 10% 1/2W	.10
R-128	6R6410	Resistor: 33,000 10% 1/2W	.10
R-129	18B740993	AGC Control: 200,000	.65
R-130	6R6410	Resistor: 33,000 10% 1/2W	.10
R-131	6R6320	Resistor: 10,000 10% 1/2W	.10
R-132	6R5770	Resistor: 1200 10% 1W	.20
R-133	6R6080	Resistor: 4700 10% 1/2W	.10
R-134	6R6326	Resistor: 100 10% 1/2W	.10
R-135	6R5766	Resistor: 12,000 10% 2W	.25
R-136	17K739135	Resistor: Wirewound; 6800 10% 5W	.35
R-137	6R6038	Resistor: 1500 10% 1/2W	.10
R-138	18K740997	Dual Control: vol 1 meg, 300,000 tap, contrast 500	1.85
R-139	18B740989	Brightness Control: 1000	.90
R-140	6R5593	Resistor: 470 10% 1W	.20
R-141	6R2098	Resistor: 22,000 10% 2W	.25
R-142	6R5768	Resistor: 33,000 10% 2W	.25
R-143	17K740259	Resistor: Wirewound; 3900 10% 5W	.35
R-144	6K124481	Resistor: 68,000 10% 1W	.20
R-145	6R6075	Resistor: 100,000 20% 1/2W	.10
R-146	6K124686	Resistor: 56,000 10% 2W (Prod Change A-03)	.25
R-147	6R6397	Resistor: 22,000 10% 1/2W (Prod Change A-03)	.10
R-201	6R5767	Resistor: 1 meg 10% 1W	.20
R-202	18K740994	Red G2 Control: 3 meg	.60
R-203	18K740988	Dual Control: blue G1, 500K; blue G2, 3 meg	1.70
R-204	18K740988	Dual Control: green G1, 500K; blue G2, 3 meg	1.70
R-205	6R2011	Resistor: 2.2 meg 10% 1W	.20
R-301	6R6398	Resistor: 150,000 10% 1/2W	.10
R-302	6R6301	Resistor: 1000 20% 1/2W	.10
R-303	6K121847	Resistor: 4700 10% 1/2W	.10
R-304	6R6301	Resistor: 1000 20% 1/2W	.10
R-305	6R6398	Resistor: 150,000 10% 1/2W	.10
R-306	6R6373	Resistor: 150 10% 1/2W	.10
R-307	6R6301	Resistor: 1000 20% 1/2W	.10
R-308	6R5660	Resistor: 180 10% 1/2W	.10
R-309	6R6428	Resistor: 6800 10% 1/2W	.10
R-310	6R6428	Resistor: 6800 10% 1/2W	.10
R-311	6R6410	Resistor: 33,000 10% 1/2W	.10

Ref. No.	Part Number	Description	List Price
R-313	6R6074	Resistor: 68,000 10% 1/2W.....	.10
R-314	6R6446	Resistor: 4.7 meg 10% 1/2W.....	.10
R-315	18K740990	Tone Control: 1 meg.....	.75
R-316	6R6377	Resistor: 470,000 10% 1/2W.....	.10
R-317	6R6377	Resistor: 470,000 10% 1/2W.....	.10
R-318	6R6254	Resistor: 330 10% 1W.....	.20
R-319	6R2005	Resistor: 1500 10% 2W.....	.25
R-401	6R6460	Resistor: 1.5 meg 10% 1/2W.....	.10
R-402	6R6414	Resistor: 270,000 10% 1/2W.....	.10
R-403	6R6460	Resistor: 1.5 meg 10% 1/2W.....	.10
R-404	6R6377	Resistor: 470,000 10% 1/2W.....	.10
R-405	6R6397	Resistor: 22,000 10% 1/2W.....	.10
R-406	6R6069	Resistor: 2200 10% 1/2W.....	.10
R-407	6R5691	Resistor: 6800 10% 1W.....	.20
R-408	6R5581	Resistor: 3300 10% 1/2W.....	.10
R-409	6K124680	Resistor: 12,000 10% 1/2W.....	.10
R-410	6R6398	Resistor: 150,000 10% 1/2W.....	.10
R-411	6R6080	Resistor: 4700 10% 1/2W.....	.10
R-412	6R6031	Resistor: 100,000 10% 1/2W.....	.10
R-413	6R6075	Resistor: 100,000 20% 1/2W.....	.10
R-501	6R2122	Resistor: 4.7 meg 20% 1/2W.....	.10
R-502	6R6236	Resistor: 68,000 10% 1W.....	.20
R-503	6R6117	Resistor: 5600 10% 1/2W.....	.10
R-504	6R6269	Resistor: 820 10% 1/2W.....	.10
R-505	6R6378	Resistor: 56,000 10% 1/2W.....	.10
R-506	18B740986	Dual Control: horiz hold 100,000; vert hold 1 meg.....	1.80
R-507	6R6378	Resistor: 56,000 10% 1/2W.....	.10
R-508	6R6117	Resistor: 5600 10% 1/2W.....	.10
R-509	6R6046	Resistor: 1 meg 10% 1/2W.....	.10
R-510	6R6018	Resistor: 100 20% 1/2W.....	.10
R-511	6A488139	Resistor: 5.6 5% 1W.....	.20
R-512	6R6007	Resistor: 68 20% 1/2W.....	.10
R-513	17K741731	Resistor: Wirewound; 11,000 10% 10W.	.35
R-514	6R488057	Resistor: 2.7 meg 10% 1W.....	.20
R-515	18K740995	HV Adj: 500,000.....	.60
R-516	6R488057	Resistor: 2.7 meg 10% 1W.....	.20
R-517	18A740962	Focus Control: 250,000 ohms 1W.....	1.15
R-518	18A740961	Horiz Centering Control: 100 1W.....	.80
R-519	6R6299	Resistor: 10,000 10% 2W.....	.25
R-520	17K484269	Resistor: Mld Wirewound; 6.8 10% 1/2W	.25
R-521	6R125078	Resistor: 10 meg 20% 2W.....	.25
R-522	6R125078	Resistor: 10 meg 20% 2W.....	.25
R-523	6R125078	Resistor: 10 meg 20% 2W.....	.25
R-524	6R125078	Resistor: 10 meg 20% 2W.....	.25
R-525	6K124686	Resistor: 56,000 10% 2W.....	.25
R-526	6R6320	Resistor: 10,000 10% 1/2W.....	.10
R-601	6R6397	Resistor: 22,000 10% 1/2W.....	.10
R-602	6R6397	Resistor: 22,000 10% 1/2W.....	.10
R-603	6R6398	Resistor: 150,000 10% 1/2W.....	.10
R-605	18K740987	Dual Control: vert size 3 meg; vert lin 750,000.....	1.70
R-606	6R6046	Resistor: 1 meg 10% 1/2W.....	.10
R-608	6R6046	Resistor: 1 meg 10% 1/2W.....	.10
	6R6433	Resistor: 2.2 meg 10% 1/2W (Prod Change A-02).....	.10
R-609	6R6398	Resistor: 150,000 10% 1/2W.....	.10
R-610	6R6433	Resistor: 2.2 meg 10% 1/2W.....	.10
R-611	6R6328	Resistor: 100,000 10% 1W.....	.20
	6R5698	Resistor: 120,000 10% 1W (Prod Change A-02).....	.20
R-612	6R5583	Resistor: 47 10% 1W.....	.20
R-613	6R5660	Resistor: 180 10% 1/2W.....	.10
R-614	6R6400	Resistor: 33,000 10% 1W.....	.20
	6R5588	Resistor: 39,000 10% 1W (Prod Change A-02).....	.20
R-615	6R6400	Resistor: 33,000 10% 1W.....	.20
R-616	6R6428	Resistor: 6800 10% 1/2W.....	.10
	6R6229	Resistor: 1000 10% 1/2W (Prod Change A-02).....	.10
R-617	17K741850	Resistor: Wirewound; 2000 10% 3.5W..	.35
R-701	6R6236	Resistor: 68,000 10% 1W.....	.20
R-702	6R5770	Resistor: 1200 10% 1W.....	.20
R-703	18K740531	Vert Yoke Balance Control: 2 ohms 1W.	.50
R-704	18B741526	Dual Control: red-green vert tilt, 100 ohms; red-green vert amplitude, 200 ohms.....	1.70
R-705	18B741526	Dual Control: blue vert tilt, 100 ohms; blue vert amplitude, 200 ohms.....	1.70
R-706	18B741513	Dual Control: blue horiz amplitude #1, 100 ohms; blue horiz amplitude #2, 100 ohms.....	.40
R-707	6R6326	Resistor: 100 10% 1/2W.....	.10
R-708	18B741513	Dual Control: red-green horiz amplitude #1, 100 ohms; red-green horiz amplitude #2, 100 ohms.....	.40
R-709	6R6326	Resistor: 100 10% 1/2W.....	.10
R-710	18A740530	Dyn Balance Control: red & green; 50 ohms.....	.50
R-801	6R6320	Resistor: 10,000 10% 1/2W.....	.10
R-802	6R6046	Resistor: 1 meg 10% 1/2W.....	.10
R-803	6R6320	Resistor: 10,000 10% 1/2W.....	.10
R-804	6R5550	Resistor: 47 10% 1/2W.....	.10
R-805	6R6327	Resistor: 1000 10% 1W.....	.20
R-806	6R6320	Resistor: 10,000 10% 1/2W.....	.10
R-807	17K739135	Resistor: Wirewound; 6800 10% 5W....	.35
R-808	6K122012	Resistor: 6800 10% 2W.....	.25
R-809	6R6090	Resistor: 470 10% 1/2W.....	.10
R-810	6R5556	Resistor: 10,000 5% 1/2W.....	.10
R-811	6R5556	Resistor: 10,000 5% 1/2W.....	.10
R-812	6R6075	Resistor: 100,000 20% 1/2W.....	.10
R-813	6R5556	Resistor: 10,000 5% 1/2W.....	.10
R-814	6R5556	Resistor: 10,000 5% 1/2W.....	.10
R-815	6R6229	Resistor: 1000 10% 1/2W.....	.25
	6R6040	Resistor: 680 10% 1/2W (Prod Change A-02).....	.10
R-816	6R5554	Resistor: 390 10% 1/2W.....	.10
R-818	6R6398	Resistor: 150,000 10% 1/2W.....	.10
R-819	6R5766	Resistor: 12,000 10% 2W.....	.25
R-820	6R6414	Resistor: 270,000 10% 1/2W.....	.10
R-821	6R2096	Resistor: 330,000 10% 1/2W.....	.10
R-822	6R6414	Resistor: 270,000 10% 1/2W.....	.10
R-823	6R6320	Resistor: 10,000 10% 1/2W.....	.10
R-824	6R6407	Resistor: 220,000 10% 1/2W.....	.10
R-825	6R5766	Resistor: 12,000 10% 2W.....	.25
R-826	6R6075	Resistor: 100,000 20% 1/2W.....	.10
R-828	6R6428	Resistor: 6800 10% 1/2W.....	.10
R-829	6R6393	Resistor: 1200 10% 1/2W.....	.10
R-830	6K125469	Resistor: 68,000 10% 2W.....	.25
R-831	6R5766	Resistor: 12,000 10% 2W.....	.25
R-832	6R6407	Resistor: 220,000 10% 1/2W.....	.10
R-833	6R6075	Resistor: 100,000 20% 1/2W.....	.10
R-835	18K740996	Color Killer Control: 250,000.....	.65
R-836	6R2109	Resistor: 10 meg 20% 1/2W.....	.10
R-837	6R6433	Resistor: 2.2 meg 10% 1/2W.....	.10
R-838	6R488158	Resistor: 22 meg 10% 1/2W.....	.10
R-839	6R6080	Resistor: 4700 10% 1/2W.....	.10
R-840	18K740991	Color Intensity Control: 2500.....	.75
R-841	6R5588	Resistor: 39,000 10% 1W.....	.20
R-842	6R6236	Resistor: 68,000 10% 1W.....	.20
R-843	6R2036	Resistor: 33 10% 1/2W.....	.10
R-844	6R6022	Resistor: 330 10% 1/2W.....	.10
R-845	6R6434	Resistor: 27,000 10% 1/2W.....	.10
R-846	6R6320	Resistor: 10,000 10% 1/2W.....	.10
R-847	6R6320	Resistor: 10,000 10% 1/2W.....	.10
R-848	6R6477	Resistor: 15,000 10% 1/2W.....	.10
R-849	6R6409	Resistor: 2200 10% 1W.....	.10
R-850	6R5587	Resistor: 1 meg 5% 1/2W.....	.10
R-851	6R5587	Resistor: 1 meg 5% 1/2W.....	.10
R-852	6R6054	Resistor: 10,000 20% 1/2W.....	.10
R-853	6R6477	Resistor: 15,000 10% 1/2W.....	.10
R-855	6R5554	Resistor: 390 10% 1/2W.....	.10
R-856	18A741145	Color Shading Control: 500.....	.90
R-857	6R6409	Resistor: 2200 10% 1W.....	.20
R-858	6R6398	Resistor: 150,000 10% 1/2W.....	.10
R-859	6K122361	Resistor: 5600 10% 2W.....	.25
R-860	6R6031	Resistor: 100,000 20% 1/2W.....	.10
R-901	17R124571	Resistor: Wirewound; 500 10% 35W....	1.40
R-902	6R118246	Resistor: 22 20% 1/2W.....	.10
R-903	18B740992	Vert Centering Control: Wirewound; 50 ohms 2W.....	1.40
R-904	6R118246	Resistor: 22 20% 1/2W.....	.10
R-905	17K484269	Resistor: Mld Wirewound; 6.8 10% 1/2W	.25
T-1	24B741732	Transformer, mixer pri.....	.95
T-101	24B741417	Transformer, sec convertor: incl C-101, L-101, L-102 & R-101.....	3.20
T-102	24B740980	Transformer, 1st IF: incl C-104 & L-103	1.85
T-103	24B740982	Transformer, 2nd IF: incl C-108 & L-104	2.05
T-104	24B740984	Transformer, 3rd IF.....	1.20
T-105	24B741408	Transformer, audio det: incl C-119, C-120, E-101, L-106, L-107, R-119.....	4.55
T-106	24B741410	Transformer, video det: incl C-127 thru C-129, E-102, L-109 thru L-111...	5.65
T-303	24B736673	Transformer, ratio detector.....	2.30
T-304	25C738847	Transformer, audio output.....	2.30
T-501	24D741542	Transformer, hi-voltage & horizontal output.....	20.55
NOTE:		The primary & secondary coils of the hi-voltage transformer can be purchased separately. Part numbers are listed below.	
	24C741540	Coil, horiz pri.....	3.15
	24B741361	Coil, horiz sec.....	2.80
T-601	25B730179	Transformer, vert blocking osc.....	1.70
T-602	25C739256	Transformer, vert output & convergence.	3.65
T-603	25B740330	Transformer, vert dynamic convergence..	1.90
T-801	24B741402	Transformer, bandpass cathode follower.	1.25
T-802	24B741402	Transformer, color AFC.....	1.25
T-803	24B741404	Transformer, quadrature: incl C-840, C-841, L-812 & L-813.....	2.30
T-901	25C738671	Transformer, power.....	27.30

VHF TUNERS VTT-83 & VTT-83Y

1V741746	VHF Tuner, VTT-83: less tubes.....	22.15
1V741750	VHF Tuner, VTT-83Y: less tubes.....	24.35

Note: Electrical Parts listed in electrical parts section under reference numbers 1 thru 50.

43K471634	Ball Bearing (positions channel sel detent lever).....	.05
42A722125	Clamp, "U" ring (channel sel shaft)....	.01
42A738740	Clamp, "U" ring (fine tuning shaft) (VTT-83Y).....	.02
42A739900	Clip, spring: osc wafer support.....	.01
1V738893	Detent Lever Assem: incl bushing & spring.....	.15
49A738621	Disc, drive (drives fine tuning rotor).	.05
14A733350	Insulator, feed-thru.....	.05
14K741259	Insulator, mica: osc wafer assem.....	.10
2K738742	Nut, coil mtg.....	.03
2S400482	Nut, palnut: 6-32.....	.01
64A738624	Plate, stator (fine tuning).....	.05
29K738709	Pin, tuner connector (connects tuner wafer to tube socket assem).....	.01
9K592170	Receptacle, plug: UHF input (VTT-83Y).	.15
9A722758	Receptacle, test point.....	.10
49A738622	Rotor, fine tuning.....	.03
3K741260	Screw, tuning: high channel.....	.15
3K741261	Screw, tuning: low channel.....	.15

Ref. No.	Part Number	Description	List Price
	3S9650	Screw, machine: 6-32 x 3/4"; sl rnd head (trimmer cap)	.01
	47B738660	Shaft, channel sel	.60
	47B739821	Shaft, dial scale (VTT-83Y)	.10
	47A738634	Shaft, fine tuning: short (for fine tuning rotor)	.01
	1V738856	Shaft, fine tuning: assem; incl disc (VTT-83)	.95
	1V740164	Shaft & Sprocket Assem: incl disc & UHF drive sprocket (VTT-83Y)	.80
	1C738780	Socket, tube assem: incl ins & tuner tube sockets (VTT-83)	.90
	1K738781	Socket, tube assem: incl ins & tuner tube sockets (VTT-83Y)	.90
	41A738627	Spring, grounding (secures channel sel shaft)	.01
	4K731287	Washer, "C": detent lever assem	.04
	4K738745	Washer, spacer: (detent bushing)	.01
	4K740908	Washer, spring (positions fine tuning rotor)	.01
MECHANICAL PARTS			
	1C740556	Blue Size Switch & Lateral Magnet Assem	6.05
	7K742716	Bracket, convergence coil mtg	1.50
	7A740479	Bracket, resistor mtg (for R-901)	.03
	15A740901	Cap, volt reg tube	2.20
	42A621671	Clip, coil form (to secure L-504 to chassis)	.03
	42A76244	Clip, coil retainer (L-501)	.02
	42K738670	Clip, lead & grid (V-17)	.20
	42B733793	Clip, mtg (mounts coils & trans to chassis)	.02
	42A731846	Clip, spring (used with 24B739255 delay line)	.10
	*24C740934	Convergence Coil Assem: incl L-703, L-704 & L-706	14.55
	76K742712	Core, convergence coil	1.25
	76K741541	Core, iron (T-501)	1.90
	46A780344	Core, iron-ceramic (L-501)	.20
	46K731847	Core, iron-ceramic (L-705 & L-708)	.25
	58A740904	Coupling, ins (focus & horiz cent - on HV shield)	.05
	15A736230	Cover, HV tube socket	.10
	1V740603	Cover, defl yoke rear; incl ring & magnetic plates	5.65
	1D740647	Field Equalizer Assem: incl rim purity magnets (around pic tube)	26.90
	5A790684	Grommet, tube socket	.02
	14K712339	Insulator, cont; bakelite	.05
	14K740905	Insulator, pic tube	10.30
	59K742713	Magnet, beam positioning (red-green-blue)	.50
	-	Magnet, blue lateral corrector (part of blue size switch assem)	
	-	Magnet, field equalizing (part of field equalizer assem)	
	59A734620	Magnet, purity device	2.15
	2C720979	Nut, coil mtg (L-809)	.03
	2K701692	Nut, coil mtg (L-705, L-708)	.04
	2S7051	Nut, palnut (cont mtg)	.01
	29K730036	Pin (on dynamic blue horiz size assem & defl coil)	.05
	29A732247	Pin, terminal (pic tube socket & lead assem)	.10
	29A739899	Pin, terminal (spkr cable)	.02
	28A736068	Plug, line cord (interlock on power supply)	.10
	28A732701	Plug, molded; 8-prong (power cable & convergence)	.30
	28B741843	Plug, second anode; with clip	1.95
	28A740555	Plug, 2-prong (L-701)	.05
	9B738270	Receptacle, 3.58 Mc crystal	.10
	9K740898	Receptacle, high volt	.90
	9K730388	Receptacle, five-pin (service test)	.15
	9A6729	Receptacle, five-pin (grid recept)	.20
	*9B742694	Receptacle, fuse: lock-in type (for E-902)(PS-905B)	.30
	9A721858	Receptacle, one-pin (T-501)	.05
	9A702469	Receptacle, one-pin: filament (on side of power chassis)	.10
	9A739825	Receptacle, pin: ant input connector	.02
	9A722758	Receptacle, test point	.10
	9A740903	Receptacle, two-pin: defl yoke - vertical section	.10
	42A740899	Retainer, shaft (retains ins coupling)	.03
	42A736266	Ring, corona	.10
	3S121856	Screw, machine: 1/4-20 x 1/2"; pln hex (yoke clamp mtg to yoke assem)	.02
	3S124683	Screw, sheetmetal: 1/4 x 1/2"; pln hex (filament trans mtg)	.02
	37A739278	Sleeve, pilot light	.25
	9A711678	Socket, tube: octal (V-16)	.20
	9A730031	Socket, tube: octal (V-18)	.25
	9A701065	Socket, tube: octal	.15
	9K739191	Socket, tube: molded; noval, miniature (V-15)	.30
	9K741613	Socket, tube: molded; noval, miniature (V-19)	.30
	9B736057	Socket, tube: molded (V-20)	.75
	9R119883	Socket, tube: wafer type; noval, miniature, 1-5/16" Mc	.20
	9R119872	Socket, tube: 7-prong; miniature, 1" Mc, wafer type	.20
	9R119873	Socket, tube: 7-prong; miniature, 1-5/16" Mc, wafer type	.15
	9R121765	Socket, tube: noval; miniature, 1-1/8" Mc, wafer type	.15
	9B740560	Socket, pic tube: 14 pins, 12 leads	5.00
	9K741833	Socket, pilot light: incl brkt & leads	.35
	43A741234	Spacer, tube socket (V-20)	.05
	41B737717	Spring, clip (T-501)	.02
	41K742711	Spring, coil retainer (convergence coil assem)	.20
	41K742714	Spring, magnet retainer (on field equalizer)	.20
	31A737466	Strip, fuse mtg	.20
	29A620057	Terminal, ant	.02
	4K730095	Washer, shoulder; fibre (cont mtg)	.01
MODELS 21CT2B, M, Y21CT2B & M CABINET PARTS			
	1V741486	Back Cover: with line cord; less pic tube rear cover (21CT2B & M)	4.50
	1V741495	Back Cover: with line cord; less pic tube rear cover (Y21CT2B & M)	4.75
	35A790097	Bumper, rubber (cab feet)	.05
	38B739014	Button, push: front (On-off)	.20
	38K739018	Button, push: rear (On-off)(clear)	.05
	16K741151	Cabinet, table model: masonite; Swedish oak; less bezel assem (21CT2B & Y)	***
	16E741150	Cabinet, table model: masonite; dawn mahogany; less bezel assem (21CT2M & Y)	***
	13D740930	Case, Cover & Medallion Assem (suppl cont)	5.75
	42A702803	Clamp, pic tube window	.01
	42A741281	Clamp, "U" ring (lid rod locking)	.02
	42A740947	Clip, retaining (pushbutton)	.02
	42K740907	Clip, speed (nameplate mtg)	.01
	42A737798	Clip, spring (grounding)	.02
	30B738152	Cord, line	.85
	15K740929	Cover, suppl cont; less medallion	1.75
	15K741148	Cover, pic tube rear	.65
	13D740925	Escutcheon, horiz (bot)(21CT2B & Y)	4.30
	13K741525	Escutcheon, horiz (bot)(21CT2M & Y)	5.30
	32K740958	Gasket, rubber window (top & bot)	.25
	55K741152	Hinge, lid: brass	.50
	36B738701	Knob, contrast	.15
	36C740756	Knob, fine tuning	.80
	36B730229	Knob, tone, brightness, color intensity & color shading	.10
	36B738678	Knob, vol cont	.30
	36K740976	Knob, VHF channel sel (21CT2B & M)	2.15
	36C740975	Knob, VHF channel sel (Y21CT2B & M)	2.90
	16K742110	Leg, cabinet: limed oak (when used as a floor model)(21CT2B & Y)	***
	16K742111	Leg, cabinet: red-brown mahogany (when used as a floor model)(21CT2M & Y)	***
	13F740677	Mask, decorative pic tube (mounts to tube support mask)	12.30
	13K635350	Medallion (on suppl cont cover)	.20
	33B738603	Nameplate	.65
	2A740623	Nut, spring (on LH mask mtg brkt)	.04
	2A537226	Nut, spring (on RH mask mtg brkt)	.03
	2A740354	Nut, turnbuckle	.05
	13B740918	Overlay, channel sel knob (behind fine tuning knob)	.50
	13D740116	Overlay, RH side (less supplementary cont case & cover)	5.00
	22K740938	Pin, hinge (suppl cont cover)	.05
	34C738715	Scale, UHF dial (Y21CT2B & M)	.65
	3K791033	Screw, spkr: brass (21CT2B & Y)	.02
	3K791035	Screw, spkr: stat bronze (21CT2M & Y)	.02
	3S7302	Screw, machine: 10-32 x 3/8"; pln hex (yoke mtg brkt to tube mtg brkt)	.01
	3S125173	Screw, sheetmetal: #4 x 3/8"; Phillips rnd; antique copper (bot esc mtg) (21CT2M & Y)	.02
	3S125416	Screw, sheetmetal: #4 x 3/8"; Phillips rnd; brass (bot esc mtg)(21CT2B & Y)	.03
	3S125119	Screw, sheetmetal: #6 x 1/4"; Phillips flat head; brass (sel knob overlay mtg)	.02
	3S125116	Screw, sheetmetal: #6 x 5/16"; sl pan; brass (suppl cont case mtg)	.01
	3S121111	Screw, wood: #6 x 3/8"; Phillips rnd head; brass (glass retaining strip - top)	.02
	3S8176	Screw, sheetmetal: #10 x 3/8"; pln hex head (brkt to chassis mtg)	.01
	3S124692	Screw, sheetmetal: #10 x 1-1/2"; sl hex head (power supply mtg to cab & chassis mtg brkt to cab)	.02
	15B740932	Shell, pushbutton	1.10
	50K740265	Speaker, 8" PM; 3.2 ohm VC	7.00**
	41A739372	Spring, compression (pushbutton)	.01
	41K740940	Spring, hinge (suppl cont cover)	.01
	64B740923	Strip, decorative: glass retaining (bot)	.10
	64B740927	Strip, decorative: glass retaining (top)	1.80
	42B739268	Terminal, ant (on back cover)	.10
	32K740959	Trim, ornamental: LH; tenite; 19-7/8" long	.40
	4K733232	Washer, leg mtg	.35
	61D740931	Window, pic tube: clear	16.65

PRICES SUBJECT TO CHANGE WITHOUT NOTICE
*New Item, Appears in any List for First Time
**Plus Federal Excise Tax at Current Rate
***Prices Furnished Upon Request