CAUTION:
Before servicing this chassis, it is important that the service person read the "SAFETY PRECAUTIONS" and "PRODUCT SAFETY NOTICE" contained in this manual.

SPECIFICATIONS

- **Power Input**: AC 120V, 60Hz
- **Power Usage**: 300W
- **Frequency Range**:
  - VHF 54 ~ 470MHz
  - UHF 470 ~ 806MHz
- **Antenna Input**:
  - VHF/UHF 75Ω unbalanced
  - 2 - NTSC
  - 1 - ATV/QAM
- **CRT Size**:
  - 7 inches
  - 9 inches [WS-73909 only]
- **High Voltage**: 32.0kV (at 0A)
- **Speaker**:
  - [WS-55859]: 5" round type, full range 2 pcs. (8Ω 10W)
  - [WS-65869]: 6" round type, full range 2 pcs. (8Ω 10W)
  - [WS-55909 / WS-65909 / WS-73909]: 5" round type, full range 2 pcs. (8Ω 10W)
  - [WS-55909 / WS-65909 / WS-73909]: 2" round type, tweeter 2 pcs. (8Ω 10W)
- **Weight**:
  - [WS-55859]: 250 lbs
  - [WS-55909]: 256 lbs
  - [WS-65869]: 326 lbs
  - [WS-65909]: 348 lbs
  - [WS-73909]: 405 lbs

- **Cabinet Dimensions**:
  - [Model] (H)x(W)x(D)
  - [WS-55859]: 50.3"x50.6"x27.8"
  - [WS-55909]: 51.4"x46.9"x28.1"
  - [WS-65869]: 61.9"x59.9"x28.1"
  - [WS-65909]: 61.5"x58.2"x28.3"
  - [WS-73909]: 65.7"x65.2"x29.8"

- **Input Level**:
  - VIDEO IN JACK (RCA Type)
    - 1.0Vp-p 75Ω unbalanced
  - AUDIO IN JACK (RCA Type)
    - -4.7dBm 43kΩ unbalanced
  - S-VIDEO IN JACK (Y/C separate type)
    - Y: 1.0 Vp-p C: 0.286Vp-p (BURST)
    - 75Ω unbalanced
  - COMP Y, Cr, Cb (RCA Type)
    - Y: 1.0 Vp-p Cr, Cb: 700mVp-p
    - ATV Y(G), Pr(R), Pb(B), H, V
    - Y: 1.0 Vp-p with sync 75Ω (BNC)
    - Pr, Pb: 700mV 75Ω
    - H, V: 3.0Vp-p 75Ω
  - VGA / R, G, B, V/H (15 pin D)

- **Output Level**:
  - VIDEO OUT JACK (RCA Type)
    - 1.0Vp-p 75Ω unbalanced
  - AUDIO OUT JACK (RCA Type)
    - -4.7dBm 4.7kΩ unbalanced

- **Digital Interface**:
  - IEEE-1394 I/O Jacks
  - AC-3 Digital Audio Output

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INTRODUCTION

This service manual provides service instructions for PTV Models WS-55859 and WS-65869 which use the V19 chassis, and PTV Models WS-55909, WS-65909, and WS-73909 which use the V19+ chassis. Service personnel should read this manual thoroughly before servicing these chassis.

This service manual includes:
1. Assembly and disassembly instructions for the front and rear cabinet components.
2. Servicing of the Lenticular Screen and Fresnel Lens.
3. Servicing printed circuit boards (PCBs).
4. CRT replacement procedure.
5. Electrical adjustments.
6. Chip parts replacement procedures.
7. Circuit path diagrams.

The parts list section of this service manual includes:
1. Cabinet and screen parts.
2. Electrical parts.

Schematic and block diagrams of the above listed models are included in this service manual for better understanding of the circuitry. PCB drawings are also included for easy location of parts and test points.

PRODUCT SAFETY NOTICE

Many electrical and mechanical parts in television receivers have special safety related characteristics. These characteristics are often not evident from visual inspection nor can the protection afforded by them necessarily be obtained by using replacement components rated for higher voltage, wattage, etc.

Replacement parts which have special safety characteristics are identified in this service manual.

Electrical components having such features are identified by shading on the schematic diagram and by bold type in the parts list of this service manual. The replacement for any safety part should be identical in value and characteristics.
SAFETY PRECAUTIONS

NOTICE: Observe all cautions and safety related notes located inside the receiver cabinet and on the receiver chassis.

WARNING:
1. Operation of this receiver outside the cabinet or with the cover removed presents a shock hazard from the receiver’s power supplies. Work on the receiver should not be attempted by anyone who is not thoroughly familiar with the precautions necessary when working on high voltage equipment.
2. Do not install, remove or handle the picture tubes in any manner unless shatterproof goggles are worn. People not so equipped should be kept away while the picture tube is being handled. Keep the picture tube away from the body while handling.
3. When service is required, observe the original lead dress. Extra precaution should be taken to assure correct lead dress in the high voltage area. Where a short-circuit has occurred, replace those components that indicate evidence of overheating.

X-Radiation warning
The surface of the cathode ray tubes (CRTs) may generate X-Radiation, so take proper precautions when servicing. It is recommended that a lead apron be used for shielding while handling the CRT. Use this method if possible.

When replacing the CRTs, use only the designated replacement part since it is a critical component with regard to X-Radiation. High voltage must be set as prescribed under the section titled Electrical Adjustments.

Leakage current check
Before returning the receiver to the customer, it is recommended that leakage current be measured according to the following methods.

1. Cold Check
   With the alternating current (AC) plug removed from the AC source, place a jumper across the two AC plug prongs. Connect one lead of an ohm meter to the AC plug and touch the other lead to each exposed metal part (i.e. antennas, handle bracket, metal cabinet, screw heads, metal overlay, control shafts, etc.), particularly any exposed metal part that has a return path to the chassis. The resistance of the exposed metal parts having a return path to the chassis should be a minimum of 1 Mega Ohm. Any resistance below this value indicates an abnormal condition and requires corrective action.

2. Hot Check ... Use the circuit shown below to perform the hot check test.
   1. Keep switch S1 open and connect the receiver to the measuring circuit. Immediately after connection, and with the switching devices of the receiver in their operating positions, measure the leakage current for both positions of switch S2.
   2. Close switch S1, energizing the receiver. Immediately after closing switch S1, and with the switching devices of the receiver in their operating positions, measure the leakage current for both positions of switch S2. Repeat the current measurements of items 1 and 2 after the receiver has reached thermal stabilization. The leakage current must not exceed 0.5 milliampere (mA).
CABINET DISASSEMBLY (FRONT VIEW)

WS-55859

*Refer to the Parts List for Part Numbers

1a. **Front Cabinet Disassembly**

1. Remove the Speaker Grille by pulling forward.
2. Remove the Board Front by removing 4 screws (a).
3. Remove the 4 screws (b) holding the Screen Assembly.
4. Lift the Screen Assembly up and away from the cabinet.
1b. Front Cabinet Disassembly
1. Remove the Speaker Grille by pulling forward.
2. Remove the Board Front by removing screws (b)
3. Remove the Control Panel by removing two screws (a).
4. Remove the four screws (b) holding the Screen Assembly.
5. Lift the Screen Assembly up and away from the cabinet.
CABINET DISASSEMBLY (FRONT VIEW)

WS-55909 / WS-65909 / WS-73909

*Refer to the Parts List for Part Numbers

1c. Front Cabinet Disassembly
1. Remove the Speaker Grille by pulling forward.
2. Remove 2 screws (a) to remove the Control Panel.
3. Remove the Board Front by removing 4 screws (b).
4. Remove the 4 screws (c) holding the Screen Assembly.
5. Lift the Screen Assembly up and away from the cabinet.
2b. Rear Cabinet Disassembly
1. Remove screws (a) holding the Back Board.
2. Remove the 4 screws (b) holding each Board Shelf.
3. Remove the 4 screws (c) securing the Light Box Assembly.
4. Slide the Light Box out the rear of the Cabinet.
SERVICING THE LENTICULAR SCREEN AND FRESNEL LENS

CAUTION:  Wear gloves when handling the Lenticular Screen and Fresnel Lens.  This prevents cuts and finger prints.  **Do not place Fresnel Lens in the sun.**  This may cause fire and heat related injuries.

WS-55859
1a. Lenticular Screen and Fresnel Lens Removal

1. Remove the screen assembly shown in the Cabinet Disassembly procedure.
2. Remove the screws (a) securing the Screen Holder.
3. Slide the Lenticular Screen and Fresnel Lens from the Screen Frame.

**Note:** When separating the Lenticular Screen from the Fresnel Lens, use caution while prying the Screen and Lens apart. Use a slot type screw drive, and remove the pressure sensitive double sided tape.

[Diagram of Lenticular Screen and Fresnel Lens with label 'a']

SCREEN HOLDER
SERVICING THE LENTICULAR SCREEN AND FRESNEL LENS

CAUTION: Wear gloves when handling the Lenticular Screen and Fresnel Lens. This prevents cuts and finger prints. Do not place Fresnel Lens in the sun. This may cause fire and heat related injuries.

WS-55909 / WS-65869 / WS-65909 / WS-73909
1b. Lenticular Screen and Fresnel Lens Removal

1. Remove the screen assembly shown in the Cabinet Disassembly procedure.
2. Remove the Screen Frame top section by removing 4 screws (a).
3. Carefully grasp the Lenticular Screen and Fresnel Lens combination and pull upward and out of the Screen Frame Assembly.

Note: When separating the Lenticular Screen from the Fresnel Lens, use caution while prying the Screen and Lens apart. Use a slot type screw drive, and remove the pressure sensitive double sided tape.
SERVICING THE LENTICULAR SCREEN AND FRESNEL LENS

2. Lenticular Screen and Fresnel Lens Installation.

   Note: Store the Lenticular Screen and Fresnel Lens in a cool dry place. High humidity may deform the Lenticular Screen and Fresnel Lens.

1. Apply double coated tape (Part # LENS-TAPE) along the top front edge of the Fresnel Lens as shown below. Refer to the Table below for proper tape length.
2. Place the Fresnel Lens on top of the Lenticular Screen and apply pressure at the top edge to bond them together as shown below.

<table>
<thead>
<tr>
<th>Model</th>
<th>Screen Size</th>
<th>Tape Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>WS-55859</td>
<td>55&quot;</td>
<td>47.8&quot;</td>
</tr>
<tr>
<td>WS-55909</td>
<td>55&quot;</td>
<td>47.8&quot;</td>
</tr>
<tr>
<td>WS-65869</td>
<td>65&quot;</td>
<td>56.5&quot;</td>
</tr>
<tr>
<td>WS-65909</td>
<td>65&quot;</td>
<td>56.5&quot;</td>
</tr>
<tr>
<td>WS-73909</td>
<td>73&quot;</td>
<td>63.5&quot;</td>
</tr>
</tbody>
</table>
SERVICING THE DIAMONDSHIELD™

1. **DiamondShield™ Removal Procedure**
   
The location of the DiamondShield™ molding clips varies between models, top and bottom, or sides. Use the appropriate disassembly procedure given below.

   **Note:** Wear gloves when handling the DiamondShield™ to prevent finger prints.

   **Top & Bottom Molding Clips**
   
   1. Gently insert a small screwdriver between the DiamondShield™ and one end of the clip to pry the clip loose.

   2. Remove both clips by pulling them toward you.

   3. Carefully insert a small screwdriver into the gap at the top/center point of the Shield and pull the Shield slightly away from the unit. Place your hands at the points shown and gently bow the Shield toward you and remove from the unit. Then re-install the two clips.

   **Side Molding Clips**
   
   1. Gently insert a small screwdriver between the DiamondShield™ and one end of the clip to pry the clip loose.

   2. Remove both clips by pulling them toward you.

   3. Carefully insert a small screwdriver into the gap at the side/center point of the Shield and pull the Shield slightly away from the unit. Place your hands at the points shown and gently bow the Shield toward you and remove from the unit. Then re-install the two clips.

2. **DiamondShield™ Installation Procedure**
   
   *(See the Parts List for DiamondShield™ part numbers)*

   To install the DiamondShieldTM, reverse the above Removal Procedure.
**Main Chassis Removal**

![Diagram of chassis removal](image)

**Chassis and DM Module Removal**

The chassis and DM Module can be removed as a single unit.

1. Undo the cable wire ties to the Front Panel, Speakers, CRTs, etc.
2. Remove 3 screws (a) securing the Main Chassis.
3. Unlatch the two chassis locks on the front of the chassis.
4. Slide the Chassis and DM Module out the rear of the unit.
5. Tilt upward to access the bottom of the main chassis.

**NOTE:** If the chassis cannot be removed with the DM Module, due to insufficient cable length:

1. Perform Step 1 through 3 above.
2. Remove 3 screws (b).
3. Slide the chassis only out the rear of the unit.
PCB Locations

Main Components Location
DM Module Main Components Location
CRT REPLACEMENT

1. Removal of the CRT

Caution! High voltage should be completely discharged prior to CRT removal. Since the CRTs receive high voltage from the HV Block, discharge by shorting the open end of the respective high voltage cable to chassis ground.

Note: Refer to the Cabinet Disassembly Procedures when performing steps 1 through 4.

1. Remove the Speaker Grille, Front Board, and Screen Assy.
2. Remove the Back Board.
3. Remove the Anode Lead Wire from the CR Block.
4. Remove the PCB-CRT.
5. Remove 4 hex-screws "a" retaining the Optical Unit. [Figure 5-1]
6. Remove 4 screws "b" retaining the Lens.

Note: DO NOT loosen the RED screws. Doing so will break the seal between the C-Element and the # 6 Lens, causing leakage of the CRT Coolant.

7. Remove 4 screws "c" retaining the CRT. [Figure 5-2]
8. Remove the Deflection Yoke from the neck of the CRT. [Figure 5-7]

---

Figure 5-1

![Diagram showing parts labeled: Optical Unit, Lens (B), Lens (C), Lens (R)]

Figure 5-2

![Diagram showing parts labeled: DO NOT REMOVE, DO NOT REMOVE, DO NOT REMOVE]

Note: The 4 spring-loaded screws shown in Fig 5-2 and labeled as "DO NOT REMOVE", should not be loosened under any circumstance. Doing so will break the seal between the CRT and the CRT-Spacer, causing leakage of the CRT Coolant.
2. Installation of the CRT

**Note:** The replacement CRT is supplied as an assembly comprised of the CRT and the Inner Lens with the space between them filled with ethylene glycol. Care should be taken during handling and installation to prevent shock from disrupting the seal or alignment between the CRT and Inner Lens. [Figure 5-3]

![Figure 5-3](image)

**Note:** The CRT fixing screws should not be loosened nor should they be removed. [Figure 5-4]

![Figure 5-4](image)

1. Carefully position the replacement CRT and fasten in place using 4 screws "d". [Figure 5-6]

![Figure 5-5](image)
2. Install the Deflection Yoke on the CRT neck. [Figure 5-7]
3. Install the Lens that was removed in steps 8 and 9 of Removal Of The CRT. [Figures 5-1 and 5-2]
   a) Position the Lens so that the Label faces the direction shown in Figure 5-8.
   b) Install the mounting screws. [Figure 5-1]
4. Connect the PCB-CRT.
5. Insert the Optical Unit into the Light Box Assembly.
6. Insert the Anode Lead Wire into the Flyback Transformer.
7. Re-clamp the Lead Wire in its original position.

Adjustment procedures after replacing the CRT(s)
- CRT Cut Off / White Balance Adjustment
- Static Convergence Adjustment
- Dynamic Convergence Adjustment
ELECTRICAL ADJUSTMENTS

Note: Perform only the adjustments required. Do not attempt an alignment if proper equipment is not available.

Test Equipment
- Oscilloscope (Unless otherwise specified, use 10:1 probes)
- Signal Generator (both SD and HD capable)
- Frequency Counter
- Direct Current Voltmeter
- Direct Current Power Supply
- Multiplex Audio Signal Generator
- Direct Current Ampere Meter

Test Signal

A. Monoscope Signal

Note: If you do not have a monoscope signal source, connect the unit to a VCR and play a Monoscope "alignment tape.
(* Part Number: 859C568060)

B. Color Bar Signal

Use the color bar signal shown below, unless otherwise specified in this manual.

Split-Field Color Bars (100% window)
Initial Setup

A. Option Menu Setup

Follow the steps below for the initial set-up:
1. Select the "MENU" display by pressing the "MENU" button once.
2. Press the number buttons "0", "1", "7", "0" in sequence to select the "OPTION MENU" display.
3. Press the "ADJUST" button to select "INITIAL."
4. Press "ENTER."

NOTE: At this time channel 3 is automatically selected.

B. Default Settings

<table>
<thead>
<tr>
<th>SET UP</th>
<th>MAIN MENU DEFAULT SETTINGS</th>
<th>Audio Settings</th>
<th>Video Settings</th>
<th>PIP/POP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clock Time</td>
<td>N/A</td>
<td>Volume: 30%</td>
<td>Contrast: 100%</td>
<td>Source: Ant A Ch 3</td>
</tr>
<tr>
<td>Set Day</td>
<td>N/A</td>
<td>Bass: 50%</td>
<td>Brightness: 50%</td>
<td>Antenna: Lower Right</td>
</tr>
<tr>
<td><strong>CAPTIONS</strong></td>
<td></td>
<td>Treble: 50%</td>
<td>Sharpness: 50%</td>
<td>POP: Right Half</td>
</tr>
<tr>
<td>Closed Captions</td>
<td>With Mute</td>
<td>Balance: 50%</td>
<td>Color: 50%</td>
<td>Format: Stretched</td>
</tr>
<tr>
<td>CC Background</td>
<td>Gray</td>
<td>Surround: Off</td>
<td>Tint: 50%</td>
<td>PIP/POP Format: Dble. Window</td>
</tr>
<tr>
<td>Digital Channel Guide</td>
<td>On</td>
<td>Listen to: Stereo</td>
<td>Color Temp.: High</td>
<td></td>
</tr>
<tr>
<td>V-CHIP PARENT LOCK</td>
<td></td>
<td>Level Sound: Off</td>
<td>Video Noise: Standard</td>
<td></td>
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<tr>
<td>V-CHIP</td>
<td>Off</td>
<td>TV Speakers: On</td>
<td>Image Type: Video</td>
<td></td>
</tr>
<tr>
<td>V-Chip Start Time</td>
<td>12:00 PM</td>
<td>V-CHIP Stop Time</td>
<td>Video Mute: On</td>
<td></td>
</tr>
<tr>
<td>Lock by Time</td>
<td>Off</td>
<td>Unlock Time</td>
<td>Black Enhancement: On</td>
<td></td>
</tr>
<tr>
<td>Front Button Lock</td>
<td>Off</td>
<td>N/A</td>
<td></td>
<td></td>
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<td>Timer</td>
<td>Off</td>
<td>Daylight Savings</td>
<td></td>
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<td>Everyday</td>
<td>Device</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Set Time</td>
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<td>Ant A</td>
<td></td>
<td></td>
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<tr>
<td>Device</td>
<td>Ant-A</td>
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A/V RESET DEFAULT SETTINGS (By Input)

<table>
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<tr>
<th>A/V Memory</th>
<th>Ant A/B</th>
<th>Ant DTV</th>
<th>Inp-DTV</th>
<th>INPUTS 1/2/3/4/5</th>
<th>Component 1/2</th>
<th>VGA</th>
<th>1394 1/2/3</th>
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<tbody>
<tr>
<td>Brightness</td>
<td>Center</td>
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<td>Center</td>
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<td>Center</td>
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<td>Tint</td>
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<td>Center</td>
<td>Center</td>
<td>Center</td>
<td>Center</td>
</tr>
<tr>
<td>Color Temp.</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Video Noise</td>
<td>Standard</td>
<td>N/A</td>
<td>Standard</td>
<td>Standard</td>
<td>Standard</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Image Type</td>
<td>Video</td>
<td>N/A</td>
<td>Video</td>
<td>Video</td>
<td>Video</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Bass</td>
<td>Center</td>
<td>Center</td>
<td>Center</td>
<td>Center</td>
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<tr>
<td>Balance</td>
<td>Center</td>
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<td>Center</td>
<td>Center</td>
<td>Center</td>
<td>Center</td>
</tr>
<tr>
<td>Surround</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>Listen To</td>
<td>Stereo</td>
<td>English</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Level Sound</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
</tr>
</tbody>
</table>
C. **A/V Memory**

Each of the external inputs has its' own Audio/Video Memory. A change in an A/V setting at a specific input is stored in memory for that specific input.

**A/V Reset**
1. The front panel AV Reset button initializes all A/V Memories.
2. The AV Reset in the user's menu initializes only the selected input's A/V Memory.

**LED Indicator Diagnostics**

The “Power ON LED” provides an indication of the sets operation, and the possible cause of a malfunction.

1. **Initial Control Circuitry Check**

   Immediately after the TV is connected to an AC power source:

<table>
<thead>
<tr>
<th>LED Indications</th>
<th>Conditions</th>
<th>Probable Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>After AC is applied</td>
<td>Standby Power Supply or TV µPC not running</td>
</tr>
<tr>
<td>Fast Blink for 70 sec.</td>
<td>After AC is applied</td>
<td>Normal - DM µPC is booting up</td>
</tr>
<tr>
<td>Fast Blink (doesn't stop)</td>
<td>After AC is applied</td>
<td>TV µPC is running, but DM failed to boot up</td>
</tr>
<tr>
<td>Slow Blink</td>
<td>Set is Off</td>
<td>Normal - Timer is set for Automatic Turn ON</td>
</tr>
</tbody>
</table>

2. **Error Code Operational Check**

   Pressing the front panel “DEVICE” and “MENU” buttons at the same time, and holding for 5 seconds, activates the Error Code Mode. The LED flashes denoting a two digit Error Code, or indicating no problem has occurred since the last initialization.

   **Note:** The front panel buttons must used, NOT those on the Remote Control.

   - The number of flashes indicates the value of the MSD (tens digit) of the Error Code.
   - The flashing then pauses for approximately 1/2 second.
   - The LED then flashes indicating the value of the LSD (ones digit) of the Error Code.
   - The Error Code is repeated a total of 5 times.

   **Example:** If the Error Code is “24”, the LED will flash two times, pause, and then flash four times.

3. **Error Codes**

   The Error Code designations indicating a malfunction, or no malfunction, are listed below:

<table>
<thead>
<tr>
<th>Error Code</th>
<th>Probable Cause</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>Normal Operation - No Error Detected</td>
</tr>
<tr>
<td>21</td>
<td>X-Ray Protect</td>
</tr>
<tr>
<td>22</td>
<td>Short Protect</td>
</tr>
<tr>
<td>23</td>
<td>Loss of Horizontal Deflection</td>
</tr>
<tr>
<td>24</td>
<td>Loss of Vertical Deflection</td>
</tr>
</tbody>
</table>

**Remote Control Operational Modes**

There are two Remote Hand Unit Operational Modes, “Standard” and “NetCommand™”. The Remote is initially in the “Standard” mode. The “NetCommand™” mode is used when controlling Home Theater devices using NetCommand™. To change the Remote Operational Mode:

- Set the Remote to the TV Layer
- Point the Remote away from the TV.
- To change to “Netcommand™" ... Hold the “Power” button and press “9-3-5” in sequence.
- To change to “Standard” ... Hold the “Power” button and press “0-0-0” in sequence.
Circuit Adjustment Mode

Most of the adjustments can only be performed using the remote hand unit. Many of the adjustments must be performed in both the 480i and 1080i modes. Video/Color adjustments must be performed in the 480i and 1080i modes, and data must be preset in the 480P (DVD) and VGA modes.

**Note:** Set the Remote Operational Mode to “NetCommand TM”. (Hold the “Power” button and press “9-3-5” in sequence.) This slows the remote’s response and makes adjustments easier. When adjustments are complete, set the Remote to its’ original Operational Mode.

A. Activating the Circuit Adjustment Mode

The current signal source determines if the activated Adjustment Mode is 480i or 1080i.

1. Select the signal source (480i or 1080i).
2. Press the “MENU” button on a remote hand unit.
3. Press the number buttons “0”, “1”, “5”, “7” in sequence. The screen will change to the Adjustment Mode.

**Note:** Repeat steps 1 and 2 if the circuit adjustment mode does not appear on screen.

<table>
<thead>
<tr>
<th>CHASSIS</th>
<th>V19</th>
</tr>
</thead>
<tbody>
<tr>
<td>MODE</td>
<td>0</td>
</tr>
<tr>
<td>ADJ ITEM</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>SCT</td>
</tr>
<tr>
<td></td>
<td>42</td>
</tr>
<tr>
<td></td>
<td>480i</td>
</tr>
</tbody>
</table>

B. Selection of Adjustment Functions and Adjustment Items

To select an adjustment item in the circuit adjustment mode, first select the adjustment function that includes the specific adjustment item to be selected. Then select the adjustment item. Refer to the following pages for the listing of adjustment functions and adjustment items.

1. Press the “AUDIO” button on a remote hand unit to select an adjustment function. Each time the button is pressed, the Function changes in the following sequence:

   - VC
   - AUD
   - JNGL
   - MNTS
   - SNTS

2. Press the “VIDEO” button to select a specific Adjustment Item. The Item number increases each time the “VIDEO” button is pressed.

C. Changing Data

After selecting an adjustment Item, use the “ADJUST UP/DOWN” button to change data.

- Press “ADJUST DOWN” to decrease the data value.
- Press “ADJUST UP” to increase the data value.

D. Saving Adjustment Data

Press “ENTER” to save adjustment data in memory. The character display turns red for approximately one second in this step.

**Note:** If the circuit adjustment mode is terminated without pressing “ENTER”, changes in adjustment data are not saved.
**E. Terminating the Circuit Adjustment Mode**
Press the "MENU" button on the remote hand unit twice to terminate the adjustment mode.

**Note:** The circuit adjustment mode can also be terminated by turning power OFF.

**F. Toggle Between Reception Modes**
Pressing "3" when in the Adjustment Mode VC Function toggles between 480i, 480p, 1080i and VGA. However data changes are not automatically saved. Press “ENTER” to save data before pressing “3”.

**On Screen Display Position Adjust Mode**
**Activation**
1. Select 480i or 1080i source.
2. Press MENU-0-1-8-8

**Convergence Adjustment Mode**
The Convergence mode is used to perform raster geometry correction, and convergence adjustments. These adjustments must be made in both the SD (NTSC) and HD modes.

**Note:** Before activating the Convergence mode, turn “Video Mute” Off. The internal crosshatch pattern will not be displayed with “Video Mute” On, only a blue background is displayed.

**A. Convergence Mode Activation**
1. Press MENU-0-1-5-9
2. When the Convergence Mode is activated, this display appears on a Green Crosshatch.

**B. Selecting the HD or SD Mode**
1. Select the Signal Source before entering the Convergence Mode, either an NTSC or HD source.

2. Enter the Convergence Mode
   - If the signal source is NTSC, the SD mode is activated.
   - If the signal source is HD, the HD mode is activated.

3. Activating the HD mode when no HD signal is available
   - Press the “DEVICE” button.
   - Use the “UP-DOWN-RIGHT-LEFT” direction buttons to select the ANT-DTV, then press “ENTER”.
   - Press “MENU-0-1-5-9-5” in sequence to activate the Coarse Green HD Convergence mode.

**C. Convergence Mode Functions**
In the Convergence Mode there are three main Functions (Categories).
- Pressing “6” activates CONV MISC
- Pressing “5” activates COARSE CONV
- Pressing “4” activates FINE CONV

**D. CONV MISC (Press 6)**
This mode is used to preset data values controlling the Convergence Generator, and to perform the HV Regulation adjustment.
1. Use the VIDEO button to select an item.
2. Use the ADJUST buttons to change data.

**NOTE:** When Item “1 HVOL” is selected the screen goes black except for the data display. This occurs since a black screen is required when making the HV Regulation adjustment.
E. COARSE CONV (Press 5)
There are four Sub Functions in the Coarse mode, COARSE GREEN, COARSE RED, COARSE BLUE and DF.

- COARSE GREEN .... used to make Coarse Raster Geometry Adjustments.
- COARSE RED ... used to make Coarse Red Convergence Adjustments.
- COARSE BLUE ... used to make Coarse Blue Convergence Adjustments.
- DF ... used to preset data values controlling the Dynamic Beam Focus circuit drive signal.

1. Use AUDIO button to select a Sub Function
2. Use the VIDEO button to select an Adjustment Item.
3. Use the ADJUST buttons to change data.

F. FINE CONV (Press 4)
Sub Functions
This mode is used to perform Fine Raster Correction, and Fine Red and Blue Convergence Adjustments. There are three Sub Adjustment Functions, selected with the AUDIO button:

- FINE GREEN .... a Green Crosshatch is displayed, to make Fine Raster Corrections.
- FINE RED .... a White Crosshatch is displayed, to make Fine Red Convergence Adjustments.
- FINE BLUE .... a White Crosshatch is displayed, to make Fine Blue Convergence Adjustments.

Cursor
In the Fine mode a Cursor is added to the Crosshatch. The ENTER button toggles the Cursor between two modes:

- MOVE (blinking Cursor) .... use the ADJUST buttons to select any of 64 points on the Crosshatch.
- ADJUST (Non blinking Cursor) .... the ADJUST buttons adjust the active color at the current Cursor position, horizontally or vertically.

Display
The on-screen display changes in the Fine mode, as shown at the right. The display shows the vertical and horizontal data for the current Cursor Position, and the horizontal and vertical coordinates for that position.

G. Saving Data and Exiting the Convergence Mode
Press MENU twice to exit the Convergence mode, data is automatically saved.
E2PROM Replacement

IC7A01 stores some adjustment data. After replacing the IC, set the data to the values given in the following tables. If good performance is not obtained, perform the Adjustments Procedures given in the Notes column.

List of Adjustment Items.

<table>
<thead>
<tr>
<th>VC Function Display</th>
<th>Adjustment Description</th>
<th>Data Range</th>
<th>Initial Data</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO.</td>
<td>Abbrev.</td>
<td></td>
<td>480i</td>
<td>480p</td>
</tr>
<tr>
<td>1</td>
<td>SCT</td>
<td>Picture Gain (H-Temp)</td>
<td>0-63</td>
<td>42</td>
</tr>
<tr>
<td>2</td>
<td>SBRT</td>
<td>Sub Brightness (H-Temp)</td>
<td>0-63</td>
<td>25</td>
</tr>
<tr>
<td>3</td>
<td>SCOL</td>
<td>Sub Color (H-Temp)</td>
<td>0-15</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>STIN</td>
<td>Sub Tint</td>
<td>0-15</td>
<td>7</td>
</tr>
<tr>
<td>5</td>
<td>SCON</td>
<td>Sub Contrast (H-Temp)</td>
<td>0-15</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>RDRH</td>
<td>R-Drive (high)</td>
<td>0-63</td>
<td>25</td>
</tr>
<tr>
<td>7</td>
<td>GDR</td>
<td>G-Drive</td>
<td>0-63</td>
<td>35</td>
</tr>
<tr>
<td>8</td>
<td>BDRH</td>
<td>B-Drive (high)</td>
<td>0-63</td>
<td>20</td>
</tr>
<tr>
<td>9</td>
<td>CTRH</td>
<td>R-Cutoff (high)</td>
<td>0-63</td>
<td>55</td>
</tr>
<tr>
<td>10</td>
<td>CTGH</td>
<td>G-Cutoff (high)</td>
<td>0-63</td>
<td>55</td>
</tr>
<tr>
<td>11</td>
<td>CTBH</td>
<td>B-Cutoff (high)</td>
<td>0-63</td>
<td>20</td>
</tr>
<tr>
<td>12</td>
<td>RDLR</td>
<td>R-Drive (low)</td>
<td>0-63</td>
<td>30</td>
</tr>
<tr>
<td>13</td>
<td>BDLR</td>
<td>B-Drive (low)</td>
<td>0-63</td>
<td>20</td>
</tr>
<tr>
<td>14</td>
<td>CTRL</td>
<td>R-Cutoff (low)</td>
<td>0-63</td>
<td>20</td>
</tr>
<tr>
<td>15</td>
<td>CTGL</td>
<td>G-Cutoff (low)</td>
<td>0-63</td>
<td>55</td>
</tr>
<tr>
<td>16</td>
<td>CTBL</td>
<td>B-Cutoff (low)</td>
<td>0-63</td>
<td>15</td>
</tr>
<tr>
<td>17</td>
<td>SCTL</td>
<td>Picture Gain (L-Temp)</td>
<td>0-63</td>
<td>42</td>
</tr>
<tr>
<td>18</td>
<td>SBRL</td>
<td>Sub Brightness (L-Temp)</td>
<td>0-63</td>
<td>25</td>
</tr>
<tr>
<td>19</td>
<td>SCLL</td>
<td>Sub Color (L-Temp)</td>
<td>0-15</td>
<td>2</td>
</tr>
<tr>
<td>20</td>
<td>SCNL</td>
<td>Color Gain (L-Temp)</td>
<td>0-15</td>
<td>2</td>
</tr>
<tr>
<td>23</td>
<td>COL</td>
<td>Color Gain</td>
<td>0-63</td>
<td>31</td>
</tr>
<tr>
<td>56</td>
<td>VM</td>
<td>VM level</td>
<td>0-3</td>
<td>2</td>
</tr>
<tr>
<td>60</td>
<td>CRO1</td>
<td>CR Offset 1</td>
<td>0-15</td>
<td>10</td>
</tr>
<tr>
<td>61</td>
<td>CBO1</td>
<td>CB Offset 1</td>
<td>0-15</td>
<td>10</td>
</tr>
<tr>
<td>64</td>
<td>R-YR</td>
<td>R-Y gain of R-Y</td>
<td>0-15</td>
<td>7</td>
</tr>
<tr>
<td>65</td>
<td>R-YB</td>
<td>R-Y gain of B-Y</td>
<td>0-15</td>
<td>2</td>
</tr>
<tr>
<td>66</td>
<td>G-YR</td>
<td>G-Y gain of R-Y</td>
<td>0-15</td>
<td>8</td>
</tr>
<tr>
<td>67</td>
<td>G-YB</td>
<td>G-Y gain of b-y</td>
<td>0-15</td>
<td>11</td>
</tr>
<tr>
<td>72</td>
<td>AG-1</td>
<td>White Aging, On/Off</td>
<td>0-1</td>
<td>1</td>
</tr>
</tbody>
</table>

JNGL Function (Jungle)

<table>
<thead>
<tr>
<th>JNGL Function Display</th>
<th>Adjustment Description</th>
<th>Data Range</th>
<th>55&quot; Data</th>
<th>65&quot; Data</th>
<th>73&quot; Data</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item #</td>
<td>Abbrev.</td>
<td></td>
<td>1080i</td>
<td>480i</td>
<td>1080i</td>
<td>480i</td>
</tr>
<tr>
<td>1</td>
<td>HWID</td>
<td>Horizontal Width</td>
<td>0-63</td>
<td>33</td>
<td>33</td>
<td>33</td>
</tr>
<tr>
<td>2</td>
<td>HKEY</td>
<td>Horizontal Keystone</td>
<td>0-63</td>
<td>31</td>
<td>31</td>
<td>31</td>
</tr>
<tr>
<td>3</td>
<td>EWPT</td>
<td>EW-PCC on top</td>
<td>0-63</td>
<td>22</td>
<td>22</td>
<td>22</td>
</tr>
<tr>
<td>4</td>
<td>EWCT</td>
<td>Corner Pin (top)</td>
<td>0-63</td>
<td>31</td>
<td>28</td>
<td>31</td>
</tr>
<tr>
<td>5</td>
<td>EWPB</td>
<td>EW-PCC on bottom</td>
<td>0-63</td>
<td>27</td>
<td>31</td>
<td>27</td>
</tr>
<tr>
<td>6</td>
<td>EWCB</td>
<td>Corner Pin (bottom)</td>
<td>0-63</td>
<td>31</td>
<td>31</td>
<td>31</td>
</tr>
<tr>
<td>7</td>
<td>VHGT</td>
<td>Vertical Height</td>
<td>0-63</td>
<td>25</td>
<td>27</td>
<td>25</td>
</tr>
<tr>
<td>8</td>
<td>VLIN</td>
<td>Vertical Linearity</td>
<td>0-15</td>
<td>9</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>9</td>
<td>VSCN</td>
<td>Vertical S-Correction</td>
<td>0-15</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>10</td>
<td>VLNT</td>
<td>Vertical Lin. (Top)</td>
<td>0-15</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>11</td>
<td>VLNH</td>
<td>Vertical Lin. (Bottom)</td>
<td>0-15</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>14</td>
<td>H-POS</td>
<td>Horizontal Position</td>
<td>0-63</td>
<td>31</td>
<td>37</td>
<td>30</td>
</tr>
<tr>
<td>20</td>
<td>V-POS</td>
<td>Vertical Position</td>
<td>0-63</td>
<td>31</td>
<td>37</td>
<td>30</td>
</tr>
</tbody>
</table>
### MNTS Function (Main Decoder)

<table>
<thead>
<tr>
<th>Item #</th>
<th>Abbrev.</th>
<th>Description</th>
<th>Data Range</th>
<th>Initial Data</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TNTM</td>
<td>Main Tint</td>
<td>0~63</td>
<td>27</td>
<td>29</td>
</tr>
<tr>
<td>2</td>
<td>COLM</td>
<td>Main Color</td>
<td>0~63</td>
<td>19</td>
<td>19</td>
</tr>
<tr>
<td>3</td>
<td>YDRM</td>
<td>Main Gain Control</td>
<td>0~31</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>4</td>
<td>VPDM</td>
<td>Pr Pedestal Adjustment</td>
<td>0~15</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>5</td>
<td>UPDM</td>
<td>Pb Pedestal Adjustment</td>
<td>0~15</td>
<td>7</td>
<td>7</td>
</tr>
</tbody>
</table>

### SNTS Function (Sub Decoder)

<table>
<thead>
<tr>
<th>Item #</th>
<th>Abbrev.</th>
<th>Description</th>
<th>Data Range</th>
<th>Initial Data</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TNTS</td>
<td>Sub Tint</td>
<td>0~63</td>
<td>29</td>
<td>Preset</td>
</tr>
<tr>
<td>2</td>
<td>COLS</td>
<td>Sub Color</td>
<td>0~63</td>
<td>27</td>
<td>&quot;</td>
</tr>
<tr>
<td>3</td>
<td>YDRS</td>
<td>Sub Gain Control</td>
<td>0~31</td>
<td>12</td>
<td>Sub Y Level</td>
</tr>
<tr>
<td>4</td>
<td>VPDS</td>
<td>Pr Pedestal Adjustment</td>
<td>0~15</td>
<td>7</td>
<td>&quot;</td>
</tr>
<tr>
<td>5</td>
<td>UPDS</td>
<td>Pb Pedestal Adjustment</td>
<td>0~15</td>
<td>7</td>
<td>&quot;</td>
</tr>
</tbody>
</table>

### AUDIO Function

<table>
<thead>
<tr>
<th>Item #</th>
<th>Abbrev.</th>
<th>Description</th>
<th>Data Range</th>
<th>Initial Data</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>INP</td>
<td>Input Level Alignment</td>
<td>0~15</td>
<td>8</td>
<td>Input Level</td>
</tr>
<tr>
<td>2</td>
<td>WDE</td>
<td>Wideband Separator Align.</td>
<td>0~31</td>
<td>3</td>
<td>Separation</td>
</tr>
<tr>
<td>3</td>
<td>SPC</td>
<td>Spectral Separator Align.</td>
<td>0~31</td>
<td>3</td>
<td>&quot;</td>
</tr>
</tbody>
</table>

### OSD Horizontal Centering

<table>
<thead>
<tr>
<th>Abbrev.</th>
<th>Description</th>
<th>Data Range</th>
<th>Initial Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>OSDHD</td>
<td>HD OSD Horizontal Position</td>
<td>0~960</td>
<td>122</td>
</tr>
<tr>
<td>OSDSD</td>
<td>SD OSC Horizontal Position</td>
<td>0~960</td>
<td>120</td>
</tr>
</tbody>
</table>

### DYNAMIC FOCUS

<table>
<thead>
<tr>
<th>Item Number</th>
<th>Abbrev.</th>
<th>Description</th>
<th>Data SD&amp;HD</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>DFH</td>
<td>Dynamic Focus Horizontal</td>
<td>-300</td>
</tr>
<tr>
<td>1</td>
<td>DFV</td>
<td>Dynamic Focus Vertical</td>
<td>-100</td>
</tr>
</tbody>
</table>

### CONV MISC

<table>
<thead>
<tr>
<th>Item Number</th>
<th>Abbrev.</th>
<th>Name</th>
<th>Data SD</th>
<th>Data HD</th>
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* Do not change "1 HVOL" if it has been previously set.
**CONV GREEN Items**

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*HSTA and VSTA must not exceed ±200

**CONV RED Items**

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*HSTA and VSTA must not exceed ±200

**CONV BLUE Items**

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*HSTA and VSTA must not exceed ±200
Adjustment Test Point Location

**Test Points**

- DT pin 3 - HV Adjust
- DT pin 6 - Ground
- DT pin 7 - 12 Volts
- DT pin 8 - ACL
- EA pin 1 - Sub Picture (Y)
- EA pin 15 - Main Picture (Y)
- EB pin 5 - POP (Cr)
- ST pin 12 - Left Audio
- ST pin 16 - Right Audio
- TP6(R, G or B) - CRT Cathode

**PCB-SIGNAL (Component Side)**

**PCB-MAIN (Component Side)**

**PCB-Terminal (rear)**

**PCB-CRT(R),(G)or(B)**
[Audio Circuit]
1. MCS Input Level

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<th>Measuring Instrument</th>
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<td>Input Signal</td>
<td>RF Stereo 300 Hz modulation</td>
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<td>Input Terminal</td>
<td>RF Input</td>
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**Purpose:** Check the input signal level to the MCS circuit

**Symptom:** Distorted sound during a stereo broadcast.

1. Supply an RF MCS signal to the Ant A input, 300 Hz at 100% modulation (25 kHz deviation) for right and left channels.
2. Connect the oscilloscope to connector ST pin 16 (Right Audio).
3. Enter the Adjustment Mode and select the Audio Function.
4. Verify that the Audio Function items are set to the data values given in the table below.
5. Set the data for Item “1 INP” for 1.56 Vp-p 0.06V.
6. Connect the oscilloscope to connector ST pin 12 (Left Audio).
7. Confirm that the left audio level at pin 12 of the ST connector is 1.56 Vp-p 0.06V.

**Note:** Adjustment 2 (Stereo Separation) must be performed after this adjustment

---

[Audio Circuit]
2. Separation

<table>
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<td>RF Stereo</td>
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<td>Input Terminal</td>
<td>RF Input</td>
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</table>

**Purpose** Check stereo separation

**Symptom** Poor stereo separation

**Note:** This adjustment must follow Adjustment 1 (Input Level)

1. Supply a RF Stereo Signal (dual tone stereo) to the Ant. A input.
   - Left Channel = 300 Hz modulation
   - Right Channel = no modulation
2. Connect the oscilloscope to connector ST pin 16 (Right Audio).
3. Enter the Adjustment Mode and select the Audio Function.
4. Set the data for Item “3 WDE” for minimum Right Audio signal.
5. Change the modulation frequency to 3kHz.
6. Adjust the data for Item “4 SPC” for minimum Right Audio signal.
### [HV Circuit]
#### 3. HV Regulation

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<tr>
<td>Input Signal</td>
<td>Video Signal Monoscope</td>
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<tr>
<td>Input Terminal</td>
<td>Video Input</td>
</tr>
</tbody>
</table>

**Purpose:** To set the CRT Anode voltage.

**Symptom:** Dark Picture

**Note:** This adjustment must be rechecked following Adjustment 9 CRT Cutoff.

1. Supply a video monoscope signal.
2. Send Contrast to maximum, and Brightness to mid position.
3. Connect a DC volt meter between pins 3 and 6 of the DT connector.
   (Positive lead to pin 3)
4. Activate the Conv-Misc Mode.
5. Select item “1 HVOL” (screen goes black).
6. Adjust item “1 HVOL” for 15.4V ±0.1V on the meter.
7. Save data and exit the Conv-Misc mode.
8. Confirm that the voltage does not change more than 0.15V.

**Note:** This adjustment must be performed if E2RESET or Convergence E2RESET are activated.

#### CONVERGENCE MODE

- Activate ........ MENU-0-1-5-9
- Misc. ...................... "6"
- Coarse ......................... "5"
- Fine ......................... "4"
- Color (R,G or B)....... AUDIO
- Item No.............. VIDEO
- Adjust/Move........ ADJUST
- Cursor Toggle........ ENTER
- Save & Exit ........ MENU (twice)

### [Video Circuit]
#### 4. Main/Sub Y Level

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<td>Input Signal</td>
<td>Color Bars</td>
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<tr>
<td>Input Terminal</td>
<td>Video Input</td>
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</table>

**Purpose:** To set picture luminance

**Symptom:** Excess or insufficient brightness.

1. Supply a color bar signal to a Video Input (not an RF input).
2. Select the color bar signal for both the main and sub pictures.
3. Connect the oscilloscope to connector EA pin 15.
4. Activate the Adjustment Mode
5. Select item “3 YDRM” in the MNTS function.
6. Adjust the data for 0.7 Vp-p max. - 0.67 Vp-p min. at EA pin 15.
   (If it cannot be adjusted within this range, set to the lower value)
7. Move the oscilloscope to EA pin 1.
8. Select item “3 YDRS” in the Sub Matrix function.
9. Adjust the data to equal the MAIN-Y Gain (+0.01V - 0.04V).

#### CIRCUIT ADJUST MODE

- Activate ........ MENU-0-1-5-7
- Function .................. AUDIO
- Item No .............. VIDEO
- Adjust Data ........ ADJUST
- Save Data ........ ENTER
- Exit ........ MENU (twice)
### Video Circuit
#### 5. Side by Side Sub Picture Tint

| Measuring Instrument | ----- |
| Test Point           | ----- |
| Ext. Trigger         | ----- |
| Measuring Range      | ----- |
| Input Signal         | NTSC  |
| Input Terminal       | Video |

**Purpose:** To match the sub picture color to that of the main picture.

**Symptom:** Main and sub pictures colors differ.

1. Supply an NTSC signal to an External Video Input.
2. Select the NTSC signal as the source for both the main and sub pictures.
3. Activate Side by Side POP
4. Activate the Adjustment mode.
5. Select Item “1 TNTS” in the SNTS Function.
6. Adjust data to match the sub picture color to that of the main picture.
   (If “1 TNTS” range is short, adjust Items “4 VPDS” and “5 UPDS”)

---

#### Circuit Adjust Mode

Activate …….. MENU-0-1-5-7
Function .............AUDIO
Item No. .............VIDEO
Adjust Data ..........ADJUST
Save Data ..........ENTER
Exit .............MENU (twice)

---

#### 6. Side by Side Sub Color

| Measuring Instrument | Oscilloscope |
| Test Point           | EB connector pin 5 |
| Ext. Trigger         | ----- |
| Measuring Range      | 200mV/div 20µsec/div |
| Input Signal         | Color Bars |
| Input Terminal       | Video Input |

**Purpose** To set the sub picture color level.

**Symptom:** Main and sub pictures color levels differs.

**Note:** Let the set run for at least one minute before making this adjustment.

1. Supply a color bar signal.
2. Select the color bar signal as the source for both the main and sub picture.
3. Connect an oscilloscope to pin 5 of the EB connector.
4. Activate the Side by Side mode.
5. Activate the Service Mode
6. Select Item “2 COLS” in the SNTS function.
7. Adjust data so the amplitude of the Sub signal equals that of the main signal.

---

#### Circuit Adjust Mode

Activate …….. MENU-0-1-5-7
Function .............AUDIO
Item No. .............VIDEO
Adjust Data ..........ADJUST
Save Data ..........ENTER
Exit .............MENU (twice)
[CRT Circuit]

**7. CRT Cutoff**

<table>
<thead>
<tr>
<th>Purpose:</th>
<th>To set the cutoff point for all three CRTs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symptom:</td>
<td>Monochrome has a color tint, or incorrect brightness.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Measuring Instrument</th>
<th>Oscilloscope</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Point</td>
<td>TP6R, TP6G, TP6B</td>
</tr>
<tr>
<td>Ext. Trigger</td>
<td>------</td>
</tr>
<tr>
<td>Measuring Range</td>
<td>50V/Div. 2msec/Div.</td>
</tr>
<tr>
<td>Input Signal</td>
<td>None</td>
</tr>
<tr>
<td>Input Terminal</td>
<td>Video Input</td>
</tr>
</tbody>
</table>

**Note:** Use the Expand mode (full screen)

1. Select an External Input with no signal.
2. Enter the Adjustment Mode, VC Function.
3. Press “1”, automatically blanks the screen and sets COL to 0.
4. Set the data to the values given in the table below.
5. Connect the oscilloscope to TP6R.
6. Adjust the Red Screen VR so the black level is 190V, as shown below, or 198.5V ±1VDC using an DC Voltmeter.
7. Repeat Steps 4 and 5 to set the Blue and Green Screen VRs, using TP6G and TP6B.

**Note:** White Balance must be performed after this adjustment.

| Cutoff Preset VC Data |
| --- | --- | --- |
| Item | Abbr | Data |
| 1 | SCT | 42 |
| 2 | SBRT | 25 |
| 5 | SCON | 3 |
| 6 | RDRH | 25 |
| 7 | GDR | 35 |
| 8 | BDRH | 25 |
| 9 | CRTH | 20 |
| 10 | CTGH | 55 |
| 11 | CTBH | 20 |

---

[CRT Circuit]

**8. White Balance (NTSC)**

<table>
<thead>
<tr>
<th>Purpose</th>
<th>To set the CRTs white level in the NTSC mode.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symptom:</td>
<td>Monochrome has a color tint.</td>
</tr>
</tbody>
</table>

**Note:** Use the “FORMAT” button to activate the Expand mode (full screen).

1. Supply a full White Raster Signal
2. Activate the Service Mode, VC function.
3. Set the data for Item “23 COL” to 0.
4. Adjust Items “6 RDRH” and “8 BDRH” for optimum white at the center of the screen.
5. Reduce the input luminance level to 30%.
6. Adjust Items “9 CTRH” and “11 CTBH” for optimum white.
7. Insert a Milliammeter in series with each CRT Cathode. The maximum allowable current for each CRT is given in the table below.
8. Set the white raster to 100% and adjust Items “12 RDRL” and “13 BDRL” for optimum white at the center of the screen.
9. Reduce the luminance level to 30%.
10. Adjust Item “14 CTRL” and “16 CTBL” for optimum white.
11. Set the data for Item “23 COL” back to 31.

**CIRCUIT ADJUST MODE**

Activate .......... MENU-0-1-5-7
Function ...............AUDIO
Item No. .............. VIDEO
Adjust Data ............ ADJUST
Save Data ............. ENTER
Exit ................. MENU (twice)

| Maximum CRT Current |
| --- | --- | --- |
| | 55° & 65° CURRENT | 73° CURRENT |
| RED | 580 uA | 900 uA |
| GREEN | 580 uA | 900 uA |
| BLUE | 580 uA | 900 uA |
### [CRT Circuit]
#### 9. White Balance (HD)

| Purpose | To set the CRTs white level in the HD mode. |
| Symptom | Monochrome pictures have a color tint. |

| Measuring Instrument | ----- |
| Test Point | ----- |
| Ext. Trigger | ----- |
| Measuring Range | ----- |
| Input Signal | HD White Raster |
| Input Terminal | DTV Inputs |

1. Supply an HD Full White Raster signal to the DTV Inputs.
2. Select the DTV Inputs (Input button).
3. Activate the Adjustment mode, VC Function.
4. Set Item “23 COL” to 0.
5. Adjust Items “6 RDRH” and “8 BDRH” for optimum white at the center of the screen.
6. Reduce the input signal luminance to 30%.
7. Adjust Items “9 CTRH” and “11 CTBH” for optimum white.
8. Set the data for Item “23 COL” back to 31.

#### CIRCUIT ADJUST MODE
Activate ........ MENU-0-1-5-7
Function .................AUDIO
Item No. ....................VIDEO
Adjust Data ...........ADJUST
Save Data ..........ENTER
Exit ...............MENU (twice)

### [CRT Circuit]
#### 10. Cb, Cr Offset

| Purpose | To set Cb and Cr color signal level. |
| Symptom | Incorrect colors. |

| Measuring Instrument | ----- |
| Test Point | ----- |
| Ext. Trigger | ----- |
| Measuring Range | ----- |
| Input Signal | White Raster (HD&NTSC) |
| Input Terminal | Video & DTV Inputs |

1. Supply an NTSC White Raster (30% luminance) signal to a Video Input.
2. Activate the Adjust Mode, VC Function.
3. Set Item “23 COL” data to 63.
4. Adjust Items “60 CRO1” and “61 CBO1” for optimum white.
5. Set Item “23 COL” data to 31.
6. Save data and Exit the Service Mode.

#### CIRCUIT ADJUST MODE
Activate ........ MENU-0-1-5-7
Function .................AUDIO
Item No. ....................VIDEO
Adjust Data ...........ADJUST
Save Data ..........ENTER
Exit ...............MENU (twice)
[Video Circuit]

**11. Black Level**

**Purpose:** To set the black level of the picture.

**Symptom:** Excess or insufficient brightness.

| Measuring Instrument | ----- |
| Test Point           | ----- |
| Ext. Trigger         | ----- |
| Measuring Range      | ----- |
| Input Signal         | Monoscope |
| Input Terminal       | Video Input |

1. Supply a Monoscope signal to a Video Input.
2. Activate the Adjust Mode, VC Function.
3. Adjust Item “2 SBRT” so the 0% and 10% black levels on the gradation scale are the same.
4. Press ENTER to save data.
7. Exit the Service Mode.

---

[Video Circuit]

**12. Sub Contrast**

**Purpose:** To set overall beam current to its’ optimum level.

**Symptom:** Excess or insufficient contrast.

| Measuring Instrument | DC ma meter |
| Test Point           | DT connector pins 7 & 8 |
| Ext. Trigger         | ----- |
| Measuring Range      | ----- |
| Input Signal         | Grayscale |
| Input Terminal       | RF Input |

**Note:** Activate the Expand mode (full screen).

1. Supply a Grayscale signal to a RF Input.
2. Activate the Adjust Mode, VC Function.
3. Select Item “1 SCT”, signal level automatically reduces.
4. Connect a 3ma DC meter between DT connector pins 7 and 8. Positive lead to pin 7.
5. Adjust Item “1 SCT” for 615μA ±10μA (645μa ±10μa on the WS-73909).
6. Remove the meter.
7. Save data and Exit the Service Mode.
[Focus Circuit]

**13. Dynamic Focus Preset**

**Purpose:** To improve edge focus.

**Symptom:** Poor focus at the edges of the screen.

<table>
<thead>
<tr>
<th>Measuring Instrument</th>
<th>-----</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Point</td>
<td>-----</td>
</tr>
<tr>
<td>Ext. Trigger</td>
<td>-----</td>
</tr>
<tr>
<td>Measuring Range</td>
<td>-----</td>
</tr>
<tr>
<td>Input Signal</td>
<td>Monoscope</td>
</tr>
<tr>
<td>Input Terminal</td>
<td>Video Input</td>
</tr>
</tbody>
</table>

**CONVERGENCE MODE**

Activate ............MENU-0-1-5-9
Misc. ......................."6"
Coarse .................."5"
Fine .........................."4"
Color (R,G or B)....AUDIO
Item No....................VIDEO
Adjust/Move...........ADJUST
Cursor Toggle.........ENTER
Save & Exit.........MENU (twice)

**DF**
(MENU-0-1-5-9-5)

<table>
<thead>
<tr>
<th>Item</th>
<th>Abbr.</th>
<th>Data</th>
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<tbody>
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<td>DFH</td>
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<tr>
<td>1</td>
<td>DFV</td>
<td>-100</td>
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</table>

**CONV MISC**
(MENU-0-1-5-9-6)

<table>
<thead>
<tr>
<th>Item</th>
<th>Abbr.</th>
<th>Data</th>
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</thead>
<tbody>
<tr>
<td>9</td>
<td>DPHS</td>
<td>0</td>
</tr>
<tr>
<td>10</td>
<td>DOFS</td>
<td>63</td>
</tr>
</tbody>
</table>

[Video Circuit]

**14. Lens Focus**

**Purpose** To set the Lens position for optimum focus.

**Symptom:** Poor focus

<table>
<thead>
<tr>
<th>Measuring Instrument</th>
<th>-----</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Point</td>
<td>-----</td>
</tr>
<tr>
<td>Ext. Trigger</td>
<td>-----</td>
</tr>
<tr>
<td>Measuring Range</td>
<td>-----</td>
</tr>
<tr>
<td>Input Signal</td>
<td>Monoscope</td>
</tr>
<tr>
<td>Input Terminal</td>
<td>Video Input</td>
</tr>
</tbody>
</table>

**Note:** This adjustment must be done before Electrostatic Focus. Perform this adjustment for RED, GREEN, and BLUE monochrome pictures.

1. Supply a VIDEO signal (Monoscope).
2. Cover the Red and Blue Lens (producing a green raster).
3. Adjust the Green Lens for best focus at the center of the Monoscope pattern.

**Note:** Attach a white paper to the screen center. During adjustment, observe the picture on the screen from inside for easier adjustment.

4. Repeat Steps 2 and 3 for the Red and Blue monochrome pictures.
[CRT Circuit]
15. Electrostatic Focus & (Alignment Magnet)

| Measuring Instrument | ----- |
| Test Point           | ----- |
| Ext. Trigger         | ----- |
| Measuring Range      | ----- |
| Input Signal         | Monoscope & Crosshatch |
| Input Terminal       | Video Input |

Purpose: To set electrostatic focus to the optimum point.
Symptom: Poor focus.

Note: This adjustment must be performed after the Sub Contrast adjustment.

Alignment Magnet Adjustment (WS-55909, WS-65909 and WS-73909 Only)
This adjustment must be performed before Static Focus Adjustment
1. Supply a Crosshatch with Center Dot signal to a Video Input.
2. Select a Green raster using the table below.
3. Roughly adjust Green Focus VR.
4. Rotate Green Focus VR CCW so the center dot is about 10mm diameter.
5. Adjust the Green 4 Pole Magnet for the roundest center dot.
6. Set the Green Focus VR for optimum focus.
7. Repeat the procedure with a Red raster and adjust the Red 4 Pole Magnet.
8. Use silicon to lock the magnets in place.

Static Focus Adjustment (All Models)
1. Supply a Monoscope signal to a Video Input
2. Activate A/V Reset
3. Select Red, Green or Blue rasters using the table below.
4. Set the Red, Green and Blue Focus VRs for optimum focus at the top center of the picture.

**Raster Color Selection**

<table>
<thead>
<tr>
<th>Color Raster</th>
<th>Activation Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red</td>
<td>MENU-0-1-5-9-1</td>
</tr>
<tr>
<td>Green</td>
<td>MENU-0-1-5-9-2</td>
</tr>
<tr>
<td>Blue</td>
<td>MENU-0-1-5-9-3</td>
</tr>
</tbody>
</table>

[On Screen Display]
16. Character Position

| Measuring Instrument | ----- |
| Test Point           | ----- |
| Ext. Trigger         | ----- |
| Measuring Range      | ----- |
| Input Signal         | Video Signal (HD/NTSC) |
| Input Terminal       | ANT-A/DTV |

Purpose: To position the character display horizontally.
Symptom: Incorrect display position

1. Supply an NTSC signal to Ant-A and select Ant-A as the source.
2. Enter the OSD Position Mode, press "MENU-0-1-8-8".
3. Adjust "OSDSD" to center the OSD horizontally.
4. Press "MENU" to save data and exit the mode.
5. Supply a HD signal to the DTV inputs and select the DTV Inputs as the source.
6. Enter the OSD Position Mode, press "MENU-0-1-8-8".
7. Adjust "OSDHD" to center the OSD horizontally.
8. Press "MENU" to save data and exit the mode.
[Conv/Def]  
17. Geometry Preset

Purpose: To preset data controlling raster geometry  
Symptom: Raster distortion.

Note: This procedure is usually only necessary if an E2PROM is replaced in the TV Control, DM or Convergence circuits.

Procedure
In the Circuit Adjustment and Coarse Convergence Modes pre-set the data to the values given in the Tables below.

### CIRCUIT ADJUST MODE
Activate ... MENU-0-1-5-7
Function ............ AUDIO
Item No. ............ VIDEO
Adjust Data ........ ADJUST
Save Data ........ ENTER
Exit ............... MENU (twice)

### CONVERGENCE MODE
Activate ........ MENU-0-1-5-9
Misc. ............... "6"
Coarse ................ "5"
Fine .................. "4"
Color (R,G or B)........ AUDIO
Item No. .......... VIDEO
Adjust/Move ........ ADJUST
Cursor Toggle ....... ENTER
Save & Exit ....... MENU (twice)

### DEFJ JUNLE (MENU-0-1-5-7)

<table>
<thead>
<tr>
<th>Item #</th>
<th>Abbrev.</th>
<th>55°&amp;65° Data</th>
<th>73° Data</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>NTSC</td>
<td>HD</td>
</tr>
<tr>
<td>1</td>
<td>HWID</td>
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<td>33</td>
</tr>
<tr>
<td>2</td>
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<td>31</td>
<td>31</td>
</tr>
<tr>
<td>3</td>
<td>EWPT</td>
<td>22</td>
<td>22</td>
</tr>
<tr>
<td>5</td>
<td>EWPB</td>
<td>31</td>
<td>27</td>
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<td>7</td>
<td>VHGT</td>
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<td>13</td>
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<td>VSCN</td>
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<tr>
<td>20</td>
<td>VPOS</td>
<td>31</td>
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</tbody>
</table>

### CONV GREEN (MENU-0-1-5-9-5)

<table>
<thead>
<tr>
<th>Item #</th>
<th>Abbrev.</th>
<th>55° Data</th>
<th>65° Data</th>
<th>73° Data</th>
</tr>
</thead>
<tbody>
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<td></td>
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<td>11</td>
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</table>

### CONV BLUE (MENU-0-1-5-9)

<table>
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<tr>
<th>Item #</th>
<th>Abbrev.</th>
<th>55° Data</th>
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### CONV RED (MENU-0-1-5-9-5)

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<th>Abbrev.</th>
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<th>65° Data</th>
<th>73° Data</th>
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<tbody>
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## [Deflection Circuit]

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<thead>
<tr>
<th>18: Deflection Geometry Height &amp; Width Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Purpose:</strong> To set the height, width and linearity of the raster.</td>
</tr>
<tr>
<td><strong>Symptom:</strong> Incorrect height, width and/or linearity.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Measuring Instrument</th>
<th>-----</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Point</td>
<td>-----</td>
</tr>
<tr>
<td>Ext. Trigger</td>
<td>-----</td>
</tr>
<tr>
<td>Measuring Range</td>
<td>-----</td>
</tr>
<tr>
<td>Input Signal</td>
<td>Monoscope (NTSC &amp; HD)</td>
</tr>
<tr>
<td>Input Terminal</td>
<td>Video &amp; DTV Inputs</td>
</tr>
</tbody>
</table>

### Preliminary:
1. **DO NOT** change the initial values for "#8 VLIN" in the Defl. Jungle Function.
2. **DO NOT** exceed the following VHGT adjustment ranges:
   - NTSC ... from -4 to +10
   - HD ... from -10 TO +5

### NTSC Mode
1. Supply an NTSC Monoscope signal to a Video Input.
2. Select the Monoscope as the signal source.
3. Activate the Adjustment Mode, JNGL Function.
4. Select and adjust each of the following items.
   - "7 VHGT" ... so the vertical marker sum = 4
   - "1 HWD" ... so the horizontal marker sum = 7
5. Save data and Exit the Service Mode.

### HD Mode
1. Supply an HD Monoscope signal to the DTV HD Inputs.
2. Select the DTV Inputs as the signal source (Input button)
4. Select and adjust each of the following items.
   - "7 VHGT" ... so the vertical marker sum = 2
   - "1 HWD" ... so the horizontal marker sum = 5
5. Save data and Exit the Service Mode.

---

**CIRCUIT ADJUST MODE**

Activate .......... MENU-0-1-5-7
Function ............... AUDIO
Item No. ............. VIDEO
Adjust Data .......... ADJUST
Save Data .......... ENTER
Exit ............... MENU (twice)
[Convergence Circuit]

19. Convergence Geometry Adjustment

| Purpose: | To set the Convergence circuit geometry adjustments. |
| Symptom: | Raster distortion at the top, bottom or sides of the picture. |

| Measuring Instrument | ——— |
| Test Point | ——— |
| Ext. Trigger | ——— |
| Measuring Range | ——— |
| Input Signal | NTSC = None |
| Input Terminal | HD = HD sync |
| | Video & DTV Inputs |

**Note:** Deflection Circuit Geometry must be performed before this adjustment.

**NTSC mode**
1. Select a Video Input with no signal.
2. Activate the Convergence Mode, Coarse Green.
3. Adjust the Coarse Green Items shown below for straight crosshatch lines.
4. Select the Fine Green Mode, a Cursor is displayed on the crosshatch.
5. Use the Cursor to adjust for straight crosshatch lines.
6. Exit the Convergence Mode.

**HD mode**
1. Supply horizontal and vertical HD sync to the DTV Inputs and select the DTV inputs as the source.
**Note:** If an HD signal is not available, select Ant-DTV, with no signal, as the source.
2. Enter the Convergence Mode, Coarse Green.
3. Repeat NTSC Steps 3 through 6 in the HD mode.

---

**CONVERGENCE MODE**
Activate .......MENU-0-1-5-9
Misc. .................. "6"
Coarse...................... "5"
Fine ..................... "4"
Color (R,G or B)..... AUDIO
Item No................. VIDEO
Adjust/Move........ADJUST
Cursor Toggle.........ENTER
Save & Exit ..........MENU (twice)

---

**COARSE GREEN ADJUSTMENTS**

2. Skew
3. Tilt
5. Hlin
8. Spcc

7. Hkey
8. Tbpc
9. Vkey
11. Vlin
### Purpose:
To converge red, green and blue at the center of the screen

### Symptom:
Color edging over the entire picture.

### Preliminary
Degauss the shield cover and bracket unit of the CRT assembly and chassis.
**DO NOT** degauss the CPM Assemblies.

### HD mode
1. Supply an HD Monoscope signal to the DTV Inputs.
2. Select the DTV Inputs as the signal source (Input button).
3. Enter the Convergence Coarse mode.
4. Set the data for the “HSTA” and “VSTA” items to:
   - GREEN: HSTA = 0
   - RED: HSTA = 50
   - BLUE: HSTA = -50
   - VSTA = 0
5. In the Coarse Green mode:
   - Center the Green Raster using the Green Centering Magnet.
   - Rotate the Green Deflection Yoke to correct any tilt.
6. In the Coarse Red mode, use the Red Centering Magnet to converge red on the green at the center of screen. Correct any red tilt with the Red Deflection Yoke.
7. In the Coarse Blue mode, repeat Step 6 using the Blue Centering magnet and the Blue Deflection Yoke.
8. Exit the Convergence mode.

### SD mode
1. Supply an NTSC Monoscope signal to a Video Input.
2. Select the Monoscope as the signal source (Input button).
3. Enter the Convergence Coarse Green mode.
4. Confirm that the Green Raster is centered.

### CONVERGENCE MODE
- Activate ........MENU-0-1-5-9
- Misc. ...................."6"
- Coarse..................."5"
- Fine ....................."4"
- Color (R,G or B)......AUDIO
- Item No..............VIDEO
- Adjust/Move.........ADJUST
- Cursor Toggle........ENTER
- Save & Exit .....MENU (twice)
## 21. Coarse Convergence

### Purpose:
To converge red and blue on green at the edges of the screen.

### Symptom:
Color edging at the top, bottom and sides of the screen.

<table>
<thead>
<tr>
<th>Measuring Instrument</th>
<th>-----</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Point</td>
<td>-----</td>
</tr>
<tr>
<td>Ext. Trigger</td>
<td>-----</td>
</tr>
<tr>
<td>Measuring Range</td>
<td>-----</td>
</tr>
<tr>
<td>Input Signal</td>
<td>NTSC -- None</td>
</tr>
<tr>
<td></td>
<td>HD -- HD sync</td>
</tr>
<tr>
<td>Input Terminal</td>
<td>Video &amp; HD Inputs</td>
</tr>
</tbody>
</table>

### SD mode
1. Select an External Input with no signal.
2. Activate the Convergence Mode, Coarse Red.
3. Adjust the Items shown below to converge the red on the green.
4. Select Coarse Blue mode.
5. Adjust the Items shown below to converge the blue on the green.

**Note:** If center convergence shifts, use red and blue Items "0 HSTA" and "1 VSTA" to correct the shift.
6. Exit the Convergence Mode.

### HD mode
1. Supply horizontal and vertical HD sync to the DTV Inputs and select the DTV inputs as the source.

**Note:** If an HD signal is not available, select Ant-DTV, with no signal, as the source.
2. Repeat SD Steps 2 through 5 in the HD mode.
3. Exit the Convergence mode.

### CONVERGENCE MODE
- Activate ........MENU-0-1-5-9
- Misc. ...................... "6"
- Coarse ...................... "5"
- Fine ......................... "4"
- Color (R,G or B) .......... AUDIO
- Item No. ...................... VIDEO
- Adjust/Move ............... ADJUST
- Cursor Toggle ............... ENTER
- Save & Exit ............... MENU (twice)

### COARSE CONVERGENCE RED & BLUE ADJUSTMENTS

<table>
<thead>
<tr>
<th>0 HSTA*</th>
<th>1 VSTA*</th>
<th>2 SKEW</th>
<th>3 TILT</th>
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<table>
<thead>
<tr>
<th>4 HLIN</th>
<th>5 HWID</th>
<th>8 VKEY</th>
<th>7 VVID</th>
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</table>

<table>
<thead>
<tr>
<th>6 VLIN</th>
<th>9 TBPC</th>
<th>10 HSWW</th>
</tr>
</thead>
</table>

* Data should not exceed ±100
### Purpose:
To converge red, green and blue at the edges of the screen

### Symptom:
Color edging at the edges of the picture.

<table>
<thead>
<tr>
<th>Measuring Instrument</th>
<th>-----</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Point</td>
<td>-----</td>
</tr>
<tr>
<td>Ext. Trigger</td>
<td>-----</td>
</tr>
<tr>
<td>Measuring Range</td>
<td>-----</td>
</tr>
<tr>
<td>Input Signal</td>
<td>NTSC -- None HD -- HD sync</td>
</tr>
<tr>
<td>Input Terminal</td>
<td>Video &amp; DTV Inputs</td>
</tr>
</tbody>
</table>

#### SD Fine Adjustment
1. Select an External Input, no signal.
3. Use the Cursor to converge red on the green.
4. Select the Fine Blue mode.
5. Use the Cursor to converge blue on the green.
6. Exit the Convergence mode.

#### HD Fine Adjustment
1. Supply an HD signal (sync only) to the DTV inputs and select DTV with the “Audio” button.
   **Note:** *If an HD signal is not available, select Ant-DTV, with no signal, as the source.*
2. Repeat SD Fine Adjustment Steps 2 through 6, in the HD mode.

---

**CONVERGENCE MODE**
- Activate .......MENU-0-1-5-9
- Misc. ...................."6"
- Coarse...................."5"
- Fine ......................"4"
- Color (R,G or B)......AUDIO
- Item No..................VIDEO
- Adjust/Move..........ADJUST
- Cursor Toggle........ENTER
- Save & Exit.....MENU (twice)
CHIP PARTS REPLACEMENT

Some resistors, shorting jumpers (0 Ohm resistors), ceramic capacitors, transistors and diodes are chip parts. The following precautions should be taken when replacing these parts.

Cautions:
1. Use a fine tipped, well insulated soldering iron (approximately 30 watts), and tweezers.
2. Melt the solder and remove the chip parts carefully so as not to tear the copper foil from the printed circuit board.
3. Discard removed chips; do not reuse them.
4. Do not apply heat for more than 3 (three) seconds to new chip parts.
5. Avoid using a rubbing stroke when soldering.
6. Take care not to scratch, or damage the chip parts when soldering.
7. Supplementary cementing is not required.

Chip Parts Removal (Resistors, Capacitors, etc.)
1. Grasp the part with tweezers. Melt the solder at both sides alternately, and remove one side of the part with a twisting motion.
2. Melt the solder at the other side and remove the part.

Chip Parts Removal (Transistors)
1. Melt the solder of one lead and lift the side of that lead upward.
2. Simultaneously melt the solder of the other two leads and lift the part from the PCB.

Replacement
1. Presolder the contact points on the circuit pattern.
2. Press the part downward with tweezers and apply the soldering iron as shown.
REPLACEMENT PARTS

Parts Ordering
To expedite delivery of replacement parts orders, specify the following:
1. Model Number/Serial Number
2. Part Number and description
3. Quantity

Note: Unless complete information is supplied, delay in processing of orders will result.

Critical and Warranty Parts Designation

Critical Electrical Components are indicated by Bold Type in the Parts List, and in the schematic diagrams by shading.

Warranty Return Parts are indicated in the Parts List with an (*).

Parts Tolerance Codes
Refer to the following chart for tolerance characteristics of electrical components.

<table>
<thead>
<tr>
<th>MARK</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>F</th>
<th>G</th>
<th>J</th>
<th>K</th>
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</thead>
<tbody>
<tr>
<td>Tolerance %</td>
<td>± 0.1</td>
<td>± 0.25</td>
<td>± 0.5</td>
<td>± 1</td>
<td>± 2</td>
<td>± 5</td>
<td>± 10</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>MARK</th>
<th>M</th>
<th>N</th>
<th>V</th>
<th>X</th>
<th>Z</th>
<th>P</th>
<th>Q</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tolerance %</td>
<td>± 20</td>
<td>± 30</td>
<td>± 10</td>
<td>± 40</td>
<td>± 80</td>
<td>± 100</td>
<td>± 30</td>
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</table>

<table>
<thead>
<tr>
<th>MARK</th>
<th>M</th>
<th>N</th>
<th>V</th>
<th>X</th>
<th>Z</th>
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</thead>
<tbody>
<tr>
<td>Tolerance (pF)</td>
<td>± 0.1</td>
<td>± 0.25</td>
<td>± 0.5</td>
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<td>± 2</td>
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</table>
QUICK REFERENCE FOR COMMON REPLACEMENT PARTS

CRT ASSEMBLIES

<table>
<thead>
<tr>
<th>MODEL</th>
<th>ASSY-CRT-RED</th>
<th>ASSY-CRT-GREEN</th>
<th>ASSY-CRT-BLUE</th>
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<tbody>
<tr>
<td>WS-55859</td>
<td>251C213040</td>
<td>251C213050</td>
<td>251C213060</td>
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<td>251C214020</td>
<td>251C214030</td>
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<td>251C213080</td>
<td>251C213090</td>
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</tr>
</tbody>
</table>

REMOTE CONTROL

290P106010  REMOTE CONTROL

HIGH VOLTAGE / DEFLECTION COMPONENTS

- Q5A31  261P071010  HORIZ-OUT 2SC5418 RL
- Q5A51  261P082010  HV-OUT 2SK2771-O1R
- T5A51  334P278010  TRANS-FLYBACK
- 920P016010  HV-BLOCK
- 129P059050  VR-FOCUS
- 338P046030  SVM COIL - G&B  All
- 330P276010  DEFL-YOKE
- 453B035030  CAP-ANODE-SHORT-RED  WS-73909
- 453B035040  CAP ANODE-LONG-G&B  WS-73909

MISCELLANEOUS

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<tr>
<th>MODEL</th>
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<th>LENTICULAR SCREEN</th>
<th>FRESNEL LENS</th>
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<tr>
<th>Ref #</th>
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### INTEGRATED CIRCUITS

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<td>IC2A00</td>
<td>270P870010 IC - CXXA151Q</td>
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<td>IC2C00</td>
<td>275P496010 IC-CMOS - UPD64082GF-38A</td>
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<td>272P379020 IC - LM1811MX (NSC)</td>
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<td>270P623010 IC - CXXA2069Q</td>
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### TRANSISTORS

**TR-COMP Type (Listed by Generic Number)**

<table>
<thead>
<tr>
<th>Type</th>
<th>Part No.</th>
<th>Description</th>
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</thead>
<tbody>
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<tr>
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<td>2SA1037K-R</td>
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SCREEN ASSEMBLY PARTS (Figure 1)

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Figure 1: Screen Assembly Parts
### SCREEN ASSEMBLY PARTS (Figure 2)

**WS-55909 (Figure 2)**
- (1) 491P103010 SCREEN-LENTICULAR
- (2) 491P104010 LENS-FRESNEL
- (3) 622D746080 CLIP-SCREEN-SIDES
- (4) 711C029040 FRAME-SCREEN-TOP - 55"
- (5) 711C029050 FRAME-SCREEN-SIDES - 55"
- (6) 711C029060 FRAME-SCREEN-BOTTOM - 55"
- (7) 768C065010 CAP-CORNER
- (8) 760D635010 DIAMOND SHIELD

**WS-65909 (Figure 2)**
- (1) 491P105010 SCREEN-LENTICULAR
- (2) 491P106010 LENS-FRESNEL
- (3) 622D746020 CLIP-SCREEN-SIDES
- (4) 711C026040 FRAME-SCREEN-TOP - 65"
- (5) 711C026050 FRAME-SCREEN-SIDES - 65"
- (6) 711C026060 FRAME-SCREEN-BOTTOM - 65"
- (7) 768C065010 CAP-CORNER
- (8) 760D635020 DIAMOND SHIELD
- (8) 802B816010 SCREEN PAD

**WS-73909 (Figure 2)**
- (1) 491P085020 SCREEN-LENTICULAR
- (2) 491P086020 LENS-FRESNEL
- (3) 622D746010 CLIP-SCREEN-SIDES
- (4) 711C029070 FRAME-SCREEN-TOP - 73"
- (5) 711C029080 FRAME-SCREEN-SIDES - 73"
- (6) 711C029090 FRAME-SCREEN-BOTTOM - 73"
- (7) 768C065010 CAP-CORNER
- (8) 760D635030 AR DIAMOND SHIELD

---

**Figure 2: Screen Assembly Parts**
DM POWER
SUPPLY

PCB PWR

DM POWER

VCC
UGATE
IC9B00
PWM
PHASE
LGATE
FB

D4 D3 D2 D1
Q9B00
UPPER MOSFET
S3 S2 S1

GATE

F9B00
DM 5V

D4 D3 D2 D1
Q9B01
LOWER MOSFET
S3 S2 S1

GATE

T9B00
DM 3.3V