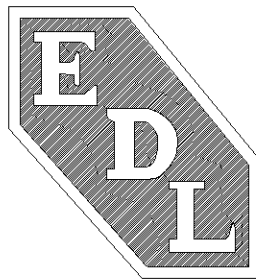


MODEL 5127 MASTERSYNC COLOR VIDEO MONITOR



OPERATION AND MAINTENANCE MANUAL

EDL Displays, Inc.
1300 Research Park Drive
Dayton, Ohio 45432
(937) 429-7423
www.edldisplays.com

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TABLE OF CONTENTS

| | |
|---------------------------------|-----------|
| INTRODUCTION | 1 |
| GENERAL INFORMATION | 2 |
| VIDEO BANDWIDTH | 2 |
| AUTOMATIC SYNC ADAPTATION | 2 |
| EASE OF ADJUSTMENT | 2 |
| RELIABILITY | 2 |
| MODULAR CONSTRUCTION | 2 |
| CONFIGURATION CONTROL | 2 |
| MAINTAINABILITY | 3 |
| LOOP THRU OPERATION | 3 |
| SPECIFICATIONS | 4 |
| POWER REQUIREMENT | 4 |
| DEFLECTION | 4 |
| CRT | 5 |
| VIDEO | 5 |
| USER ADJUSTMENTS | 6 |
| PHYSICAL AND ENVIRONMENTAL | 7 |
| OTHER FEATURES | 7 |
| WARRANTY | 7 |
| MANUAL | 7 |
| INSTALLATION | 8 |
| GENERAL | 8 |
| UNPACKING | 8 |
| AC POWER CONNECTION | 8 |
| SIGNAL INPUT CONNECTIONS | 10 |
| OPERATION | 12 |
| CALIBRATION PROCEDURES | 14 |

| | |
|---|-----------|
| VERTICAL POSITION ADJUSTMENT | 14 |
| VERTICAL SIZE ADJUSTMENT | 14 |
| HORIZONTAL POSITION ADJUSTMENT | 14 |
| HORIZONTAL SIZE ADJUSTMENT | 15 |
| TRAPEZOID ADJUSTMENT | 15 |
| HORIZONTAL PINCUSHION ADJUSTMENT | 15 |
| HORIZONTAL PINCUSHION PHASE ADJUSTMENT | 15 |
| HORIZONTAL CONVERGENCE PHASE ADJUSTMENT | 15 |
| REMOTE CONTROL OPERATION | 17 |
| MICROPROCESSOR BOARD LIGHT AND DIP SWITCH DEFINITIONS | 20 |
| LIGHT DEFINITIONS | 20 |
| DIP SWITCH SETTING DEFINITIONS | 20 |
| MAINTAINABILITY | 21 |
| REPLACEABLE ITEMS | 21 |
| ORGANIZATIONAL LEVEL TROUBLESHOOTING | 21 |
| MAINTENANCE - ADJUSTMENTS AND TROUBLESHOOTING | 23 |
| <hr/> | |
| FAULT ISOLATION/TROUBLE SHOOTING | 23 |
| VIDEO AMPLIFIER BOARD REPLACEMENT | 25 |
| DEFLECTION BOARD REPLACEMENT | 26 |
| MIPRCS LOGIC CONTROL BOARD REPLACEMENT | 27 |
| LOW VOLTAGE POWER SUPPLY REPLACEMENT | 28 |
| HIGH VOLTAGE POWER SUPPLY REPLACEMENT | 30 |
| VERTICAL DEFLECTION BOARD REPLACEMENT | 32 |
| HIGH VOLTAGE POWER SUPPLY ALIGNMENT PROCEDURE | 33 |
| ANODE AND G2 VOLTAGE ADJUSTMENT PROCEDURE | 34 |
| FOCUS VOLTAGE ADJUSTMENT PROCEDURE | 35 |
| VIDEO AMPLIFIER ALIGNMENT PROCEDURE | 36 |
| CATHODE RAY TUBE REPLACEMENT | 39 |

LIST OF ILLUSTRATIONS

| | |
|--|----|
| FIGURE 1: MODEL 5127 OUTLINE DRAWING AND FRONT PANEL CONTROLS..... | 9 |
| FIGURE 2: MODEL 5127 REAR PANEL SIGNAL INPUT CONNECTIONS..... | 11 |
| FIGURE 3: CALIBRATION FLOW CHART | 16 |
| FIGURE 4: ORGANIZATIONAL LEVEL TROUBLESHOOTING FLOW CHART | 24 |

LIST OF TABLES

| | |
|---|----|
| TABLE 1: CONTROL FUNCTIONS IN OPERATIONAL AND CALIBRATE MODE..... | 13 |
| TABLE 2: LIST OF ORGANIZATIONAL LEVEL REPLACEABLE ITEMS | 21 |

INTRODUCTION

This technical manual contains operation and maintenance instructions for the EDL Model 5127 MasterSync Video Monitors. The Model 5127 is a high quality, high performance, high resolution color monitor. It is unique in its ability to automatically synchronize and display virtually any RGB video format. This feature makes it very useful as a communications monitor when integrated with a video switch system.

This manual should be carefully reviewed before attempting to operate the Model 5127. A thorough understanding of the control functions is required for proper set up and operation of the monitor.

To achieve the best results from the Model 5127, please follow the procedures in the order given below:

1. Review the Operation and Maintenance Manual.
2. Determine the operating system format and the system signal input cabling required.
3. Follow the guide in this manual when attaching system input cabling.
4. If customized calibration is required, follow the calibration procedures in this manual.

When corresponding with EDL relative to this equipment, please include the model number and serial number of the monitor in question.

GENERAL INFORMATION

VERY HIGH RESOLUTION

The Model 5127 Color monitor is the largest high resolution monitor available. The dynamically focused and dynamically converged .37mm dot pitch cathode ray tube provides the sharpest large screen image available on resolutions up to and including 1600 x 1280.

VIDEO BANDWIDTH

The video bandwidth of 140MHz supports resolutions up to 1600 x 1280 @ 60 Hz NI.

AUTOMATIC SYNC ADAPTATION

The Model 5127 monitor will automatically sync and display any RGB video format within its operating frequency range. It will automatically accommodate five (5), four (4) and three (3) cable signal formats in that order of priority.

EASE OF ADJUSTMENT

All controls that may be necessary to adjust in the field are accessible either at the front or rear panel, or with hand held remote control.

RELIABILITY

The monitor is designed with reliability as paramount in importance. Reliability is accomplished by using high quality parts and assuring that these parts are operating at less than their intended stress levels. All devices which must dissipate heat are mounted on the rear panel heat sinks. This allows for convection cooling of the monitor.

MODULAR CONSTRUCTION

The monitor is constructed around a card cage configuration. All circuitry is in the form of plug-in modules which plug into and from the rear panel of the unit.

CONFIGURATION CONTROL

Any changes to the monitor design must be form, fit, and function to previous revisions. The replaceable modules in the units delivered today are backward compatible into the first EDL Displays products shipped in January 1990.

MAINTAINABILITY

All circuitry within the monitor is contained in functional replaceable modules such as deflection output, control, video amplifiers (3), and power supplies. A defective module can be detected by simple tests and the monitor can be repaired by replacing the module. This may eliminate the need for a field service representative or shipment of the monitor back to the factory.

Since the majority of the replaceable modules in the Model 5127 are the same as other EDL Displays products, sparing and personnel training are greatly simplified.

LOOP THRU OPERATION

Loop thru operation is provided by a HI-LO impedance switch selection. This allows the use of the monitor with other devices on the output of the raster engine or video switch.

SPECIFICATIONS

EDL DISPLAYS MODEL 5127 MASTERSYNC MONITOR SPECIFICATIONS

POWER REQUIREMENT

AC POWER: Input voltage 90-138 v.a.c. or 180-276 v.a.c. switch selectable inside the monitor, 47 to 63 Hz. Power Consumption 200 Watts maximum.

DEFLECTION

SCAN RATE RANGES: 15 to 90 kHz horizontal, 40 to 120 Hz non-interlaced and 20-60 Hz interlaced vertical. Automatic selection to match input video format.

RETRACE TIME: Maximum of 3.0 microseconds horizontal and 400 microseconds vertical.

HORIZONTAL AND VERTICAL SYNC: Automatic detection and selection of composite (3 wire) separate video and mixed sync (4 wire) and separate video, vertical and horizontal sync (5 wire). Polarity: Negative only for three wire operation. Positive or negative for four and five wire operation. Separate sync inputs are ECL and TTL compatible 1.0 to 4.0 volts peak-to-peak.

LINEARITY: Horizontal and vertical nonlinearity (when measured using the EIA Standard Ball Chart Method or equivalent) is better than $\pm 1\%$ of raster height.

RASTER SIZE REGULATION: Raster size change caused by changes in CRT beam current from 0-100% APL (approximately 0 to 200 Microamps) will be less than 0.5%.

GEOMETRIC DISTORTION: No point on the raster (i.e., pixel) is displaced from its proper position by more than $\pm 1\%$ of raster height within an 11 inch circle and no more than $\pm 1.5\%$ elsewhere.

MISCONVERGENCE: Within a centrally located circle of six inch diameter will be less than 0.25mm and elsewhere will be less than 0.6mm when measured as the worse case between any two colors.

CRT

SCREEN SIZE AND TYPE: The Model 5127 has a 27 inch diagonal, 0.37mm shadow mask, precision inline gun (PIL), burst protection, inner magnetic shield, 90 degree deflection type cathode ray tube with a P22 short persistence dot type black matrix phosphor. Fifty-two percent (52%) transmissivity anti-glare panel is standard.

WARM UP TIME: Proper display of picture within 30 seconds, however the monitor may require a maximum of 5 minutes to meet the brightness specifications contained herein.

RESOLUTION AND DISPLAY SIZE: 1600H X 1200V with a maximum display area of 19.24" wide by 15.0" high. Interlaced or non-interlaced operation is supported.

VIDEO

BRIGHTNESS: Nominal 40fL (into the anti-reflective Panel) with 21fL out the panel.

COLORIMETRY: D9300 white - adjustable to other standards.

FREQUENCY AND PULSE RESPONSE (20fL):

| | |
|----------------------|----------------------------|
| Bandwidth @ -3.0 dB; | 1.0Hz to 140 MHz |
| Flatness @ +0.5 dB; | 10HZ to 120 MHz |
| Rise/Fall Time: | 3.0 nsec |
| Overshoot: | Less than 10% |
| Tilt: | Less than 5% of full scale |

SIGNAL INPUT IMPEDANCE:

| | |
|----------------------|------------------|
| Resistance @ Low-Z: | 75 Ω + 5% |
| Resistance @ High-Z: | > 20k Ω |
| Capacitance: | 8 pF (nominal) |

SIGNAL INPUT LEVEL (AC COUPLED):

| | |
|----------------|-----------------------------------|
| Composite: | 1.0 Vp-p Nominal (0.7 - 1.4 Vp-p) |
| Non-Composite: | 0.7 Vp-p Nominal (0.5 - 1.0 Vp-p) |

SYNC SIGNAL (COMPOSITE ON GREEN):

| | |
|-------------|---|
| Back Porch: | 1.2 μ sec minimum |
| Level: | 0.3 Vp-p Nominal (0.2-0.4 Vp-p) |
| Width: | 1.0 μ sec Nominal (0.5-3.0 μ sec) |
| Polarity: | Negative |

SYNC INPUT:

Separate or mixed: 1.0 V to 4.0 V p-p nominal - positive or negative polarity.

SYNC TIMING REQUIREMENT:

HORIZONTAL

Sync Pulse > 1.0 μ s
Back Porch > 1.2 μ s
Front Porch > 0

VERTICAL

Sync Pulse \geq 25 μ s
Back Porch \geq 375 μ s
Front Porch \geq 0

DC OUTPUT RESTORER (BLANKING):

Stability Black level within 1% of peak luminance at any APL from 10% to 90%.
Range: +55 V to +65 V (Adjustable)

INPUT CONNECTIONS: Coaxial BNC with selectable 75 Ω or high impedance termination.

USER ADJUSTMENTS

EXTERNAL: RGB Video - Gain and black level.

CALIBRATION MODE: Common adjustment for all minor alignment needs including: vertical position, vertical size, horizontal position, horizontal size, trapezoid, horizontal pincushion phase, vertical pincushion phase, and horizontal convergence phase for twenty one different video formats.

REMOTE CONTROL: Common adjustment for alignment settings. Including all geometry and convergence adjustments as well as video levels.

PHYSICAL AND ENVIRONMENTAL

MECHANICAL: Rugged chassis construction with rear panel accessible functional modules. Like modules interchangeable unit to unit.

TEMPERATURE 0 to 50 degrees centigrade operating. -40 to +85 degrees centigrade non-operating.

HUMIDITY: 5 - 95 percent non-condensing.

ALTITUDE: 3000 meters (10,000 ft) operating and 12,000 meters (40,000 ft) non-operating.

DIMENSIONS: Overall enclosure is 25" wide by 21" high by 24.44" deep.

WEIGHT: 130 lbs. **CAUTION!** The monitor is awkward and requires two persons for safe handling.

OTHER FEATURES

MASTERSYNC: Automatic detection and alignment to twenty one different video formats. The video formats may have totally different timing specifications even though they may be closely spaced.

DEGAUSS: Automatic degauss at power on with manual degauss switch provided on front; minimum time between degauss operations is ten minutes.

SWEEP FAILURE DETECTION: High voltage disabled with either horizontal or vertical sweep loss.

CONTROLS: Power on/off, contrast/calibration, brightness and manual degauss/calibration provided on front of the monitor.

WARRANTY

One year parts and labor at EDL Displays, Inc.

MANUAL

One supplied with each unit which includes:

Installation
Operation
Maintenance

INSTALLATION

GENERAL

This section describes the installation of the monitor. The monitor is pre-aligned at the factory to user input requirements. However, there may still be the need for some minor adjustments to be made. Those procedures will be provided later in the adjustment section.

UNPACKING

Before unpacking, the carton should be inspected for shipping damage. The carton should be carefully opened and the monitor removed. The monitor should then be carefully inspected for shipping damage. If damage has occurred, the shipping carton and all packing materials should be saved for possible inspection by the shipping company. The shipping company should be notified at this time.

AC POWER CONNECTION

Before connecting the monitor, determine the AC power that is to be used and that the monitor is configured properly for that voltage. The voltage of the monitor may be changed at the power supply module accessible from the rear of the unit. The power supply must be removed for access to the voltage select switch.

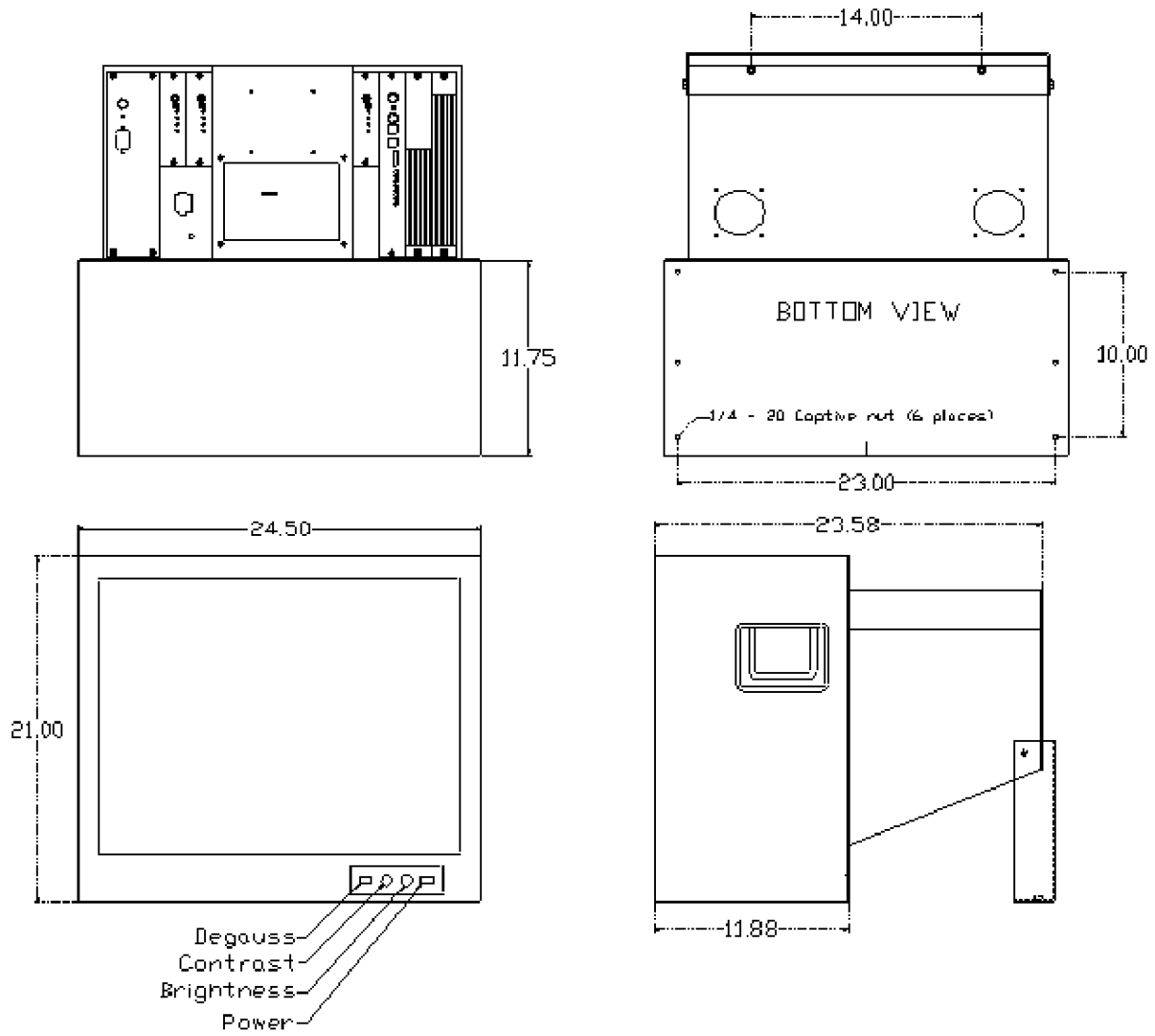


Figure 1: MODEL 5127 OUTLINE DRAWING AND FRONT PANEL CONTROLS

SIGNAL INPUT CONNECTIONS

See Figure 5-1 for location of rear panel signal input connections.

The Model 5127 Master Sync Monitor will automatically adapt to the user's synchronization system format. Three formats are supported. These are:

1. Red, Green, Blue video signals with composite sync on green (three cable hookup).
2. Red, Green, Blue video signals with separate mixed sync signal (four cable hookup).
3. Red, Green, Blue video signals with separate vertical and horizontal sync signals (five cable hookup).

The video inputs may be adjusted to accommodate from 0.7 to 1.4 volts peak-to-peak video signal levels. Any DC offset on the signal is eliminated by AC coupling and DC restoration at the video amplifier during the back porch portion of the video signal.

The external sync inputs can accommodate from 1.0 to 4.0 volts peak-to-peak signals without any adjustments. These inputs are AC coupled and DC restored by the monitor before thresholding occurs. These inputs may be either positive or negative polarity and need not be the same.

All five signal inputs may be switched from 75Ω to high impedance $20k\Omega$ for "loop-thru" operation. User-supplied BNC "T" adapters must be used to connect the additional devices between the raster engine and the final device on the line. Because of the very high performance of the devices involved, extreme care must be taken by following these guidelines.

1. The raster engine must be at the beginning of the transmission line. BNC "T" adapters must not be used at the raster engine.
2. All devices must be set for high impedance input except for the last device on the transmission line.
3. The last device on the transmission line must have a 75Ω termination impedance and not have BNC "T" adapters at its connectors unless used for the terminators.
4. All cables must be 75Ω impedance and as short as possible and the three colors must be the same length

NOTE: These aforementioned rules are not unique to the Model 5127 monitors. They must be followed to assure proper operation of these high performance devices regardless of their manufacture.

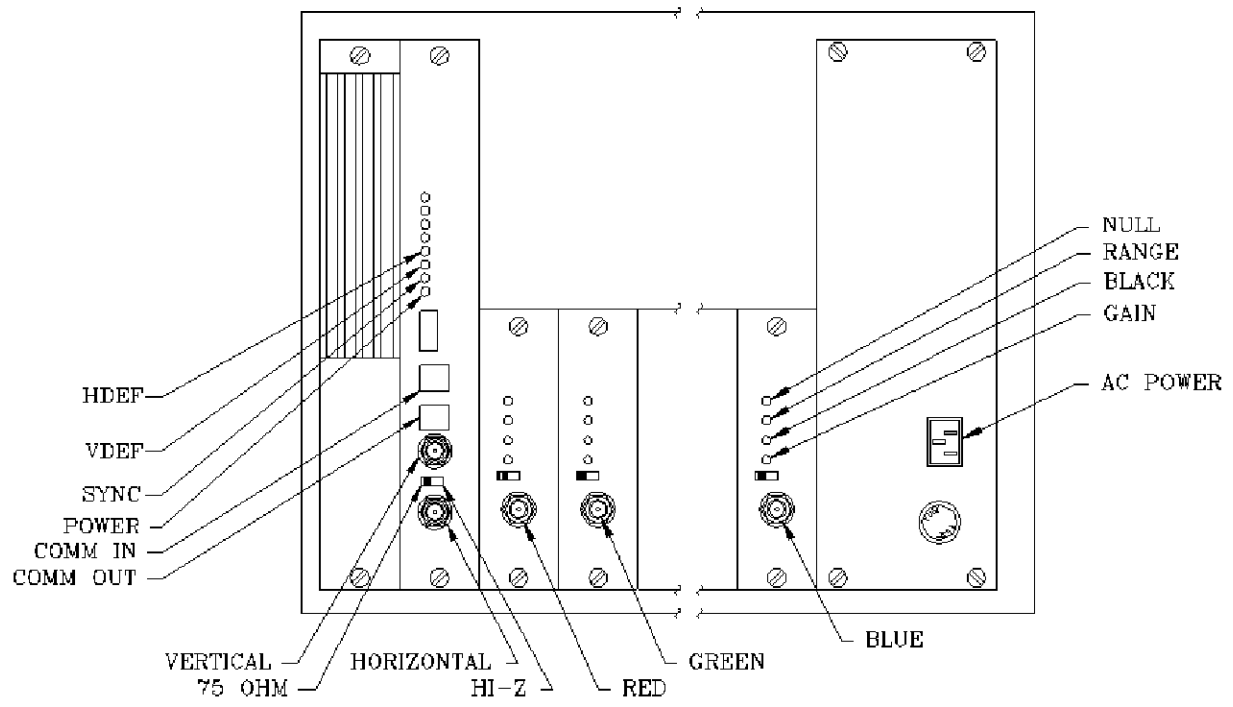


Figure 2: MODEL 5127 REAR PANEL SIGNAL INPUT CONNECTIONS

OPERATION

The method of operation of the Model 5127 is similar to ordinary monitors with respect to power, brightness, contrast and degauss. However, it does have an additional mode called "Calibrate". The "Calibrate" mode permits the user to program an internal microprocessor to memorize alignment parameters for 21 different video formats. The front panel controls have dual functions. Table 6-1 is a summary of the front panel controls and their functions in the "Operational" and "Calibrate" modes.

The front panel controls include:

1. Power
2. Brightness
3. Contrast/Calibrate
4. Degauss/CAL

CONTROL FUNCTIONS

| CONTROL NAME | OPERATIONAL MODE | CALIBRATE MODES (Normal and Extended) |
|--|---|---|
| POWER SWITCH (Alternate Action) | 1. Controls primary AC power to the monitor. | Same as Operational |
| BRIGHTNESS (Rotary Potentiometer) | 1. Adjusts background (or Black Level) relative to the operating environment. | Same as Operational |
| Contrast/ CALIBRATE (Dual, Rotary Potentiometer) | 1. Adjust Gain Of video Amplifiers | Establishes custom memory values for: 1. Vertical position 2. Vertical size 3. Horizontal position 4. Horizontal Size 5. Horizontal Trapezoid 6. Horizontal Pincushion Phase 7. Vertical Pincushion Phase 8. Horizontal Convergence Phase |
| DEGAUSS/CAL (Dual function Momentary Switch) | 1. Manually Degausses Monitor (when pressed and released for <1 sec.) | 1. Initiates Entry into and exit from calibrate mode. 2. Steps the monitor through a programmed sequence of sub modes. 3. Erases Custom Memory. |

Table 1: CONTROL FUNCTIONS IN OPERATIONAL AND CALIBRATE MODE

CALIBRATION PROCEDURES

CAUTION

DO NOT REMOVE OR INSERT MODULES OR SUB-ASSEMBLIES WITH POWER APPLIED. DOING SO MAY RESULT IN EXTENSIVE DAMAGE TO ELECTRICAL COMPONENTS.

MEMORY FULL: The monitor will indicate that the custom format storage area in non-volatile memory cannot accept the new format by blanking the screen twice.

MEMORY ERASE: Pressing and holding the Degauss/CAL switch for 30 to 60 seconds will completely erase the entire custom area of memory.

NOTE: When the monitor is placed in the Calibrate Mode a definite programmed sequence of calibration steps must be followed.

TO CALIBRATE: Press the degauss button and hold for five seconds.

VERTICAL POSITION ADJUSTMENT

Adjust the vertical position by rotating the contrast control slowly until the control "locks on" and then set the desired position. Note: The Model 5127 differs from the 6115 and 6119 Monitors in that it has very little range to this adjustment. This adjustment should be carefully adjusted to position the center of the image at the center of the phosphor.

To advance to the vertical size adjustment mode, press and release the Degauss/CAL switch.

VERTICAL SIZE ADJUSTMENT

Adjust the vertical size by rotating the contrast control slowly until the control "locks on" and then set the vertical size as desired. Note: The Model 5127 differs from the 6115 and 6119 Monitors in that it has very little range to this adjustment. This adjustment should be carefully adjusted to position the bottom edge of the image about one-half inch from the bottom of the phosphor.

To advance to the horizontal position adjustment mode, press and release the Degauss/CAL switch.

HORIZONTAL POSITION ADJUSTMENT

Adjust the horizontal position by rotating the contrast control slowly until the control "locks on" and then set the desired horizontal position.

To advance to the horizontal size adjustment mode, press and release the degauss/mode switch.

HORIZONTAL SIZE ADJUSTMENT

Adjust the horizontal size by rotating the contrast control slowly until the control "locks on" and then set the horizontal size to the desired value.

To advance to the horizontal trap mode press and release the degauss/mode switch.

TRAPEZOID ADJUSTMENT

Make the trapezoid adjustment by rotating the contrast control slowly until the control "locks on" and then set the control to eliminate the trapezoidal effect.

To advance to the pincushion adjustment mode, press and release the Degauss/CAL switch.

HORIZONTAL PINCUSHION ADJUSTMENT

Make the pincushion adjustment by rotating the contrast control slowly until the control "locks on" and then set the control to eliminate any pincushion effect.

To advance to the horizontal pincushion phase mode, press and release the Degauss/CAL switch.

HORIZONTAL PINCUSHION PHASE ADJUSTMENT

Make the horizontal pincushion phase adjustment by rotating the contrast control slowly until the control "locks on" and then set the control to the desired adjustment.

To advance to the vertical pincushion phase adjustment, press and release the Degauss/CAL switch.

THE FOLLOWING CONVERGENCE ADJUSTMENT IS BEST MADE WITH A TEST PATTERN OR ANY SCREEN THAT HAS SINGLE PIXEL VERTICAL AND HORIZONTAL WHITE LINES ON A BLACK BACKGROUND. IF WORKING IN WINDOWS, THIS CAN BE DONE AS A WINDOWS WALLPAPER.

HORIZONTAL CONVERGENCE PHASE ADJUSTMENT

Make the horizontal convergence phase adjustment by rotating the contrast control slowly until the control "locks on" and then set the control to the desired adjustment.

Care must be taken to watch the right and left sides of the screen since this adjustment affects all the screen but in different ways

To exit the calibration sequence and store the above adjustments, press and release the Degauss/CAL switch.

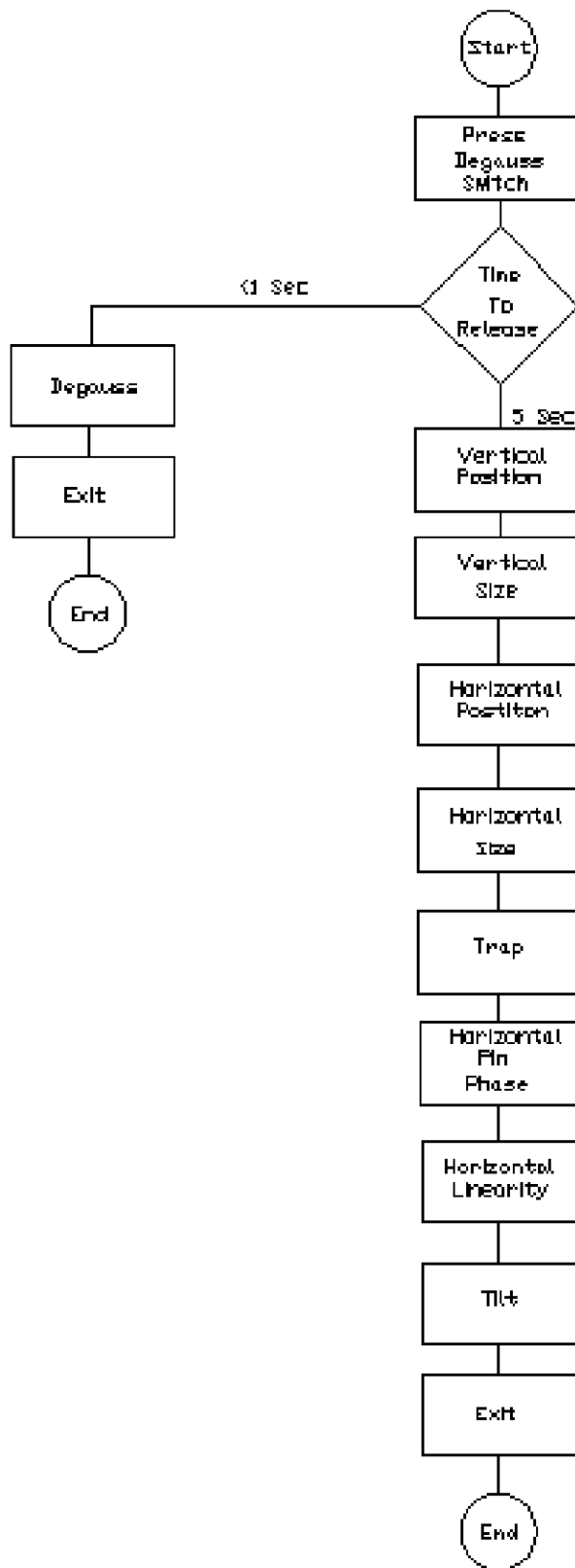


Figure 3: CALIBRATION FLOW CHART

REMOTE CONTROL OPERATION

Adjustments to the monitor may be made from the monitor remote control. The remote control includes a membrane keypad with a Liquid Crystal Display (LCD). The remote control panel provides monitor select, color balance, geometry and control level information all on the LCD. Monitor adjustment parameters are detailed in Table 1.1. To enter adjustment mode press the key of the monitor desired (in single monitor systems this is #1). Then press the key of the desired adjustment. Press the large up and down arrows for coarse adjustments and the small arrows for fine adjustments. The results of the adjustments are stored in temporary memory until they are saved by pressing F2 from the main menu at which time they are stored in permanent memory.








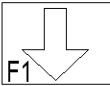
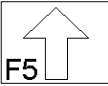
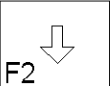


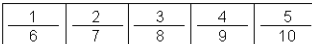
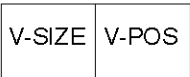
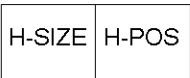









| | | | | |
|--|---|---|---|---|
| F1 ↓ | F2 ↓ | ENTER F3 | F4 ↑ | F5 ↑ |
| 1 | 2 | 3 | 4 | 5 |
| 6 | 7 | 8 | 9 | 10 |
| V-SIZE | V-POS | VERT RETRACE | H-SIZE | H-POS |
|  |  | V-PIN SHAPE |  |  |
| VERT FOCUS |  |  |  | HORZ FOCUS |
| V CONV STAT | H CONV MAG | H CONV PHASE | H CONV STAT | H FOCUS SHAPE |
| ALL GAIN | R GAIN | G GAIN | B GAIN | DEFAULT |
| ALL BLACK | R BLACK | G BLACK | B BLACK | CTRL |
| MAINT | STATUS SLEEP | DE- GAUSS | ENTER | SHIFT |

Figure 1 Hand-Held Remote Control Keypad

Remote Adjustment Controls

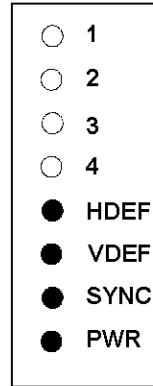
| KEY(S) | FUNCTION |
|---|--|
|   | Course adjustment of selected function; decrease or increase |
|   | Fine adjustment of selected function; decrease or increase. “F2” function also saves all parameters in monitor memory. |
|  | Enters the selected value in temporary memory and returns display to selection menu. |
|  | Monitor select buttons. Default value is 1 through 5; 6 through 10 may be selected using the “Shift” key. |
|  | Adjusts vertical screen size (from top down) and vertical position. |
|  | Adjusts horizontal screen size and horizontal position. |
|  | Adjusts compression of horizontal lines in the top half of the screen. Minor effect. |
|  | Affects the flatness of the top horizontal line. |
|  | “VPIN_MAG” bows all horizontal lines but the center out or in. |
|  | “VPIN_CENT” bows all horizontal lines (including center) up or down. |
|  | “VPIN_PHASE” slants all horizontal lines but the center away/toward each other. |
|  | “HPIN” barrels or pincushions (bows) all vertical lines but the center. |
|  | “HTRAP” slants all vertical lines but the center away/toward each other. |
|  | “TILT” rotates the screen clockwise or counter-clockwise about the center. |
|  | “HTILT” slants all vertical lines relative to horizontal lines. |

| | |
|--|---|
| <div style="display: inline-block; border: 1px solid black; padding: 2px; margin-right: 10px;">VERT FOCUS</div> <div style="display: inline-block; border: 1px solid black; padding: 2px;">HORZ FOCUS</div> | Vertical focus adjusts focus from center to top; horizontal focus from center to sides. |
| <div style="display: inline-block; border: 1px solid black; padding: 2px;">H FOCUS SHAPE</div> | Equalizes focus on left and right sides of the screen. |
| <div style="display: inline-block; border: 1px solid black; padding: 2px;">V CONV STAT</div> | Adjusts the overall convergence of the <i>horizontal</i> R,G,B lines. |
| <div style="display: inline-block; border: 1px solid black; padding: 2px;">H CONV MAG</div> | Adjusts the R,G,B convergence of the center <i>vertical</i> lines relative to outer lines. |
| <div style="display: inline-block; border: 1px solid black; padding: 2px;">H CONV PHASE</div> | Adjusts the R,G,B convergence of the left edge <i>vertical</i> lines relative to the right. |
| <div style="display: inline-block; border: 1px solid black; padding: 2px;">H CONV STAT</div> | Adjusts the overall R,G,B convergence of <i>vertical</i> lines across the entire screen. |
| <div style="display: inline-block; border: 1px solid black; padding: 2px; margin-right: 5px;">ALL GAIN</div> <div style="display: inline-block; border: 1px solid black; padding: 2px; margin-right: 5px;">R GAIN</div> <div style="display: inline-block; border: 1px solid black; padding: 2px; margin-right: 5px;">G GAIN</div> <div style="display: inline-block; border: 1px solid black; padding: 2px;">B GAIN</div> | Adjusts gain/contrast level of all colors (“ALL”) or each individual color. |
| <div style="display: inline-block; border: 1px solid black; padding: 2px; margin-right: 5px;">ALL BLACK</div> <div style="display: inline-block; border: 1px solid black; padding: 2px; margin-right: 5px;">R BLACK</div> <div style="display: inline-block; border: 1px solid black; padding: 2px; margin-right: 5px;">G BLACK</div> <div style="display: inline-block; border: 1px solid black; padding: 2px;">B BLACK</div> | Adjusts brightness/black level of all colors (“ALL”) or each individual color. |
| <div style="display: inline-block; border: 1px solid black; padding: 2px;">MAINT</div> | Enters the maintenance mode of the monitor. <i>For EDL technicians only.</i> |
| <div style="display: inline-block; border: 1px solid black; padding: 2px;">DE- GAUSS</div> | Energizes the coil around the monitor tube to demagnetize the screen. |
| <div style="display: inline-block; border: 1px solid black; padding: 2px;">ENTER</div> | Mimics the function of the “ENTER/F3” button at the top center of remote. |
| <div style="display: inline-block; border: 1px solid black; padding: 2px;">SHIFT</div> | Allows for selection of monitors # 6-10. |
| <div style="display: inline-block; border: 1px solid black; padding: 2px; margin-right: 10px;">DEFAULT</div> <div style="display: inline-block; border: 1px solid black; padding: 2px; margin-right: 10px;">CTRL</div> <div style="display: inline-block; border: 1px solid black; padding: 2px;">STATUS SLEEP</div> | Nonfunctional; reserved for future use. |

MICROPROCESSOR BOARD LIGHT AND DIP SWITCH DEFINITIONS

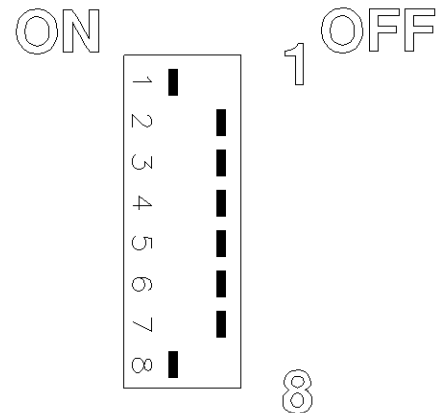
LIGHT DEFINITIONS

| Light | Meaning (When On) |
|-------|-------------------|
| 1 | None |
| 2 | None |
| 3 | None |
| 4 | None |
| H | H DEFL ON |
| V | V DEFL ON |
| SYNC | SYNC ON |
| PWR | POWER ON |



DIP SWITCH SETTING DEFINITIONS

| Switch | Label | Function |
|--------|-----------|-------------------------------------|
| 1 | None | Monitor Address - 1 |
| 2 | None | Monitor Address - 2 |
| 3 | None | Monitor Address - 4 |
| 4 | None | Monitor Address - 8 |
| 5 | ERASEMEM | HI = Erase MEMORY at Power On |
| 6 | ENACALBUT | LO = Enable Front Panel Controls |
| 7 | ENAHREN | LO = Enable Horizontal Defl. |
| 8 | ENREM | HI = Apply external power to remote |



MAINTENANCE - ORGANIZATIONAL LEVEL

MAINTAINABILITY

All circuitry within the monitor is contained in functional replaceable modules such as deflection output, control, video amplifiers (3) and power supplies. The maintenance described in this section is limited to on-line corrective maintenance requiring no special tools or test equipment. This maintenance will consist of isolating the fault to a particular module or pair of modules and then replacement of the defective module. Generally no calibration will be required after replacement of a defective module unless the MIPRCS Logic Control Board is replaced.

REPLACEABLE ITEMS

Only the following items or modules are considered replaceable at the organizational level:

| RI | RI DESCRIPTION | QTY | PART NO. |
|----|---------------------------|-----|--------------|
| 1 | Video Amplifier Boards | 3 | 6119-0105-03 |
| 2 | Deflection Board | 1 | 6119-0101-03 |
| 3 | MIPRCS Logic Control Bd. | 1 | 6119-0102-03 |
| 4 | Low Voltage Power Supply | 1 | 6119-0106-03 |
| 5 | High Voltage Power Supply | 1 | 6127-0107-03 |
| 6 | Vertical Deflection Board | 1 | 6127-0112-03 |
| 7 | Cathode Ray Tube Assembly | 1 | 6127-0108-03 |
| 8 | Vertical Processor Board | 1 | 6127-0113-03 |

Table 2: LIST OF ORGANIZATIONAL LEVEL REPLACEABLE ITEMS

ORGANIZATIONAL LEVEL TROUBLESHOOTING

The Organizational Level Troubleshooting flow chart that follows assumes the following:

1. A stable signal source is selected and all signal cables are functioning properly.

Note: The Model 5127 Monitor is a precision display device that requires good quality video signals for proper operation. If the monitor determines that the input video signal is unstable, it will not display an image.

2. Only one failure at a time.

3. Normal operation has the MIPRCS Logic Control Board "SYNC" light on and the "HV Disable" is off.

MAINTENANCE - ADJUSTMENTS AND TROUBLESHOOTING

FAULT ISOLATION/TROUBLE SHOOTING

Most problems in the Model 5127 video monitors can be isolated to a single module or pair of modules by careful observation and interpretation of the display presentation, the LEDs on the rear panel and various mechanical items. Generally, most problems are manifested by either a display presentation which is incorrect or no display at all. By referring to a troubleshooting flow diagram an experienced technician should be able to make an effective repair. The following procedure assumes that there is only one problem and not a situation compounded by multiple faults.

PROCEDURE:

1. Observe the display presentation and the fault indicators located on the MIPRCS Logic Control Board.
2. Verify that all rear panel signal input coaxial BNC and a/c power connections are correct and secure.
3. Verify that all front controls (Power, Brightness, Contrast/Calibrate, Degauss/CAL) mechanically function properly and approximate their normal operating conditions.
4. Verify proper calibration before troubleshooting.
5. Using the observations in step 1, consult the troubleshooting flow diagram (FIG. 8-1) to isolate the problem to a module or modules.
6. Replace the appropriate module or modules following the procedures given below for each module. As a precaution both the monitor and the maintenance person should be grounded during any module replacement.

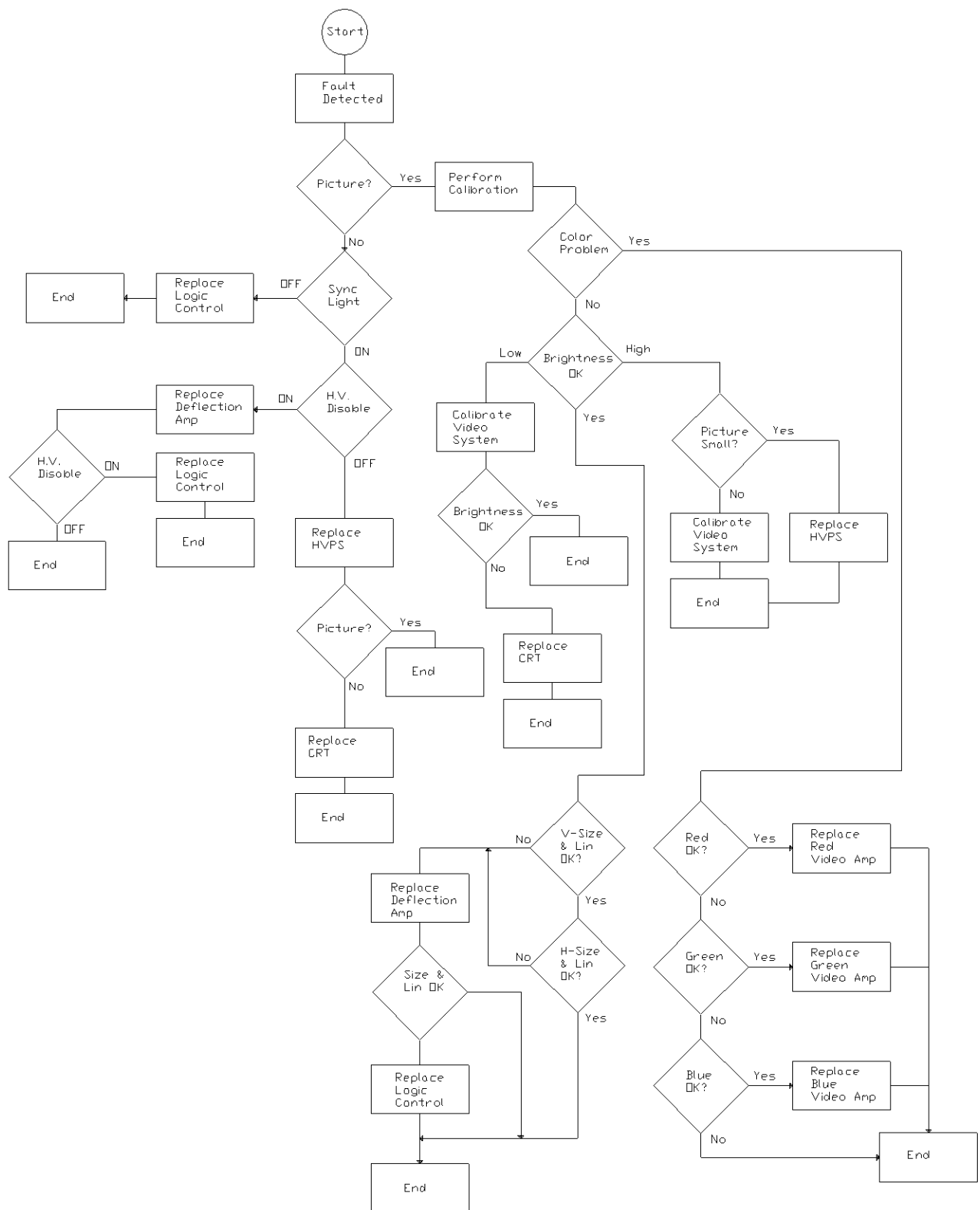


Figure 4: ORGANIZATIONAL LEVEL TROUBLESHOOTING FLOW CHART

VIDEO AMPLIFIER BOARD REPLACEMENT

(Red, Green and Blue) P/N 6119-0105-03

- Tools Required:
1. Screwdriver, common, straight slot.
 2. Adjustment tool, insulated 1/8" straight slot.

REPLACEMENT PROCEDURE

1. Turn AC power OFF at the front panel.
2. Disconnect the monitor AC power cord.
3. Disconnect the coaxial cable on the Video Amplifier Board being replaced.
4. Unscrew the two captive screws on the Video Amplifier Board.
5. Remove the Video Amplifier Board; inspect, as a precaution, the connector for bent pins, and inspect the mating connector on the Mother Board for damage.
6. Note the position of the adjustment pots in the defective Video Amplifier Board.
7. If the defective amplifier had been operating properly prior to the failure, then using a small screwdriver, position The Black and Gain adjustments in the replacement amplifier to match its counterpart in the defective amplifier. CAUTION: The Range and Null adjustments should not be changed except during the Video Amplifier Calibration Procedure.
8. Carefully insert the replacement Video Amplifier Board in its slot making sure the connector is properly aligned with the mating connector on the Mother Board.
9. Tighten the two captive screws to seat the module and complete the connection to the Mother Board.
10. Connect the coaxial input cable and AC power cord.
11. Apply AC power and input signals and check the display for proper operation.
12. Optimum picture quality may be attained by performing the Video Amplifier Alignment Procedure of this manual.

DEFLECTION BOARD REPLACEMENT

P/N 6119-0101-03

Tools Required: 1. Screwdriver, common, straight slot.

REPLACEMENT PROCEDURE

1. Turn AC power OFF at the front panel.
2. Disconnect the monitor AC power cord.
3. Unscrew the two captive screws on the Deflection Board.
4. Remove the Deflection Board from its slot. As a precaution, inspect the module connector and the Mother Board mating connector for damage.
5. Check and replace, if necessary, F1 the 1 amp fuse, part number 251001. Retry Deflection Board. If the monitor remains inoperative, proceed to Step 6.
6. Carefully insert the replacement deflection module in its slot making sure the module connector is properly aligned with its mating connector on the Mother Board.
7. Tighten the two captive screws to seat the module and complete the connection to the Mother Board.
8. Connect the AC power cord.
9. Apply AC power and input signals and check the display for proper operation.

MIPRCS LOGIC CONTROL BOARD REPLACEMENT

P/N 6119-0102-03

Tools Required: 1. Screwdriver, common, straight slot.

REPLACEMENT PROCEDURE

1. Turn AC power OFF at front panel.
2. Disconnect the monitor AC power cord and the H&V BNC cables on the MIPRCS Logic Control Board.
3. Unscrew the two captive screws on the MIPRCS Logic Control Board.
4. Remove the MIPRCS Logic Control Board from its slot. As a precaution, inspect the module connector and the Mother Board mating connector for damage.
5. Verify the firmware revision on the replacement board and set SW-3 on 6119-0106-03 Low Voltage Power Supply according to its replacement procedure. Install the replacement board.
6. Tighten the two captive screws to seat the MIPRCS Logic Control Board and complete the connection to the Mother Board.
7. Connect the H&V BNC cables to their appropriate connectors and connect the AC power cord.
8. Apply AC power and input signals and check the display for proper operation.

LOW VOLTAGE POWER SUPPLY REPLACEMENT

P/N 6119-0106-03

Revision B or higher may be used.

Tools Required: 1. Screwdriver, common, straight slot.

REPLACEMENT PROCEDURE

1. Turn AC power OFF at front panel.
2. Disconnect the monitor AC power cord.
3. Unscrew the four captive screws on the Low Voltage Power Supply (LVPS).
4. Remove the Low Voltage Power Supply from its slot; At this time, inspect the Power Supply Module connector for damage and check for blown fuses. Verify that the 115V/230V switch is set correctly. If there are any blown fuses, replace with the proper fuse and proceed to step 5. If the required AC input voltage is 115 AC and the switch was set to the 230V AC position, set the switch to the required 115V AC position and proceed to step 5. If the required voltage is 230V AC and the switch was set to 115V AC with power applied, Do Not Retry the Supply. Fuses: F1 -Buss Little Fuse MDV-3 315003, F2-1A Buss Little Fuse GFA-1 251001.

NOTE: Low Voltage Power Supply voltages are set at the factory - Do Not Adjust or attempt to adjust the voltage control pots. Check programmable dip-switch SW3 for proper setting. For Rev K Firmware and above:

| | | | |
|--------------|--------------|--------------|--------------|
| <u>SW3-1</u> | <u>SW3-2</u> | <u>SW3-3</u> | <u>SW3-4</u> |
| OFF | ON | OFF | ON |

For Firmware revisions G1 and below the DIP switch setting is:

| | | | |
|--------------|--------------|--------------|--------------|
| <u>SW3-1</u> | <u>SW3-2</u> | <u>SW3-3</u> | <u>SW3-4</u> |
| OFF | ON | ON | ON |

5. Carefully insert the Low Voltage Power Supply into its slot making sure the connector is properly aligned with the Mother Board mating connector. Check the following on the good supply before installing:
 - a. Good fuses in F1 & F2.
 - b. SW4 (115/230V AC switch) set for proper voltage (115V AC).
 - c. SW3 (B+/ext. control switch) set for multi-sync operation.
6. Tighten the four captive screws to seat the Low Voltage Power Supply.
7. Connect the AC power cord to the monitor.
8. Apply AC power and input signals and check the display for proper operation.

9. If a power supply has been re-tried after replacing a blown fuse or correcting a switch setting and the fault is not corrected, follow the above procedure and replace the Power Supply with a known good spare supply. If the fault still persists, submit the monitor to shop maintenance for evaluation.

HIGH VOLTAGE POWER SUPPLY REPLACEMENT

P/N 6127-0107-03

- Tools Required:
1. Screwdriver, straight slot
 2. Screwdriver, Phillips #2
 3. Nut driver, 1/4"
 4. Insulated lead wire 12-15 inches long (No. 18-20) with alligator clips on both ends.

Replacing the High Voltage Power Supply involves contact with dangerous high voltage elements. Follow instructions carefully and observe all safety precautions!

All efforts should be made to isolate the fault to the High Voltage Power Supply (HVPS) before beginning replacement.

Before replacing the HVPS consider the following:

1. All BNC signal input connections on the rear panel have been checked for proper connection and the signal source is operating properly.
2. Front panel controls have not been inadvertently set to produce a no raster condition.
3. HV disable and sync lights have been properly interpreted.
4. Low Voltage Power Supply (LVPS) has been replaced (the LVPS develops the input voltage for the HVPS).
5. When the monitor is turned on there is normally a high voltage "crackle" sound as the high voltage builds up to 27 KV. If there is an audible "crackle" at turn on, the 27 KV is present.
6. If the monitor is functioning but out of focus, the HVPS focus control may need a simple adjustment. Refer to the High Voltage Power Supply Alignment Procedure.
7. The CRT filaments are visibly lighted through the top rear of the cabinet.

REPLACEMENT PROCEDURE

1. Turn AC power OFF at the front panel.
2. Disconnect the monitor AC power cord and all five coaxial cables on the rear panel.
3. Wait twenty minutes for voltages to discharge.
4. Remove the enclosure by removing 22 screws and sliding the enclosure to the rear.

CAUTION! High lethal voltages could be present at the CRT anode - follow procedure carefully.

5. Connect chassis to earth ground.

6. Attach one end of a 12-15 inch clip lead to the metal shaft of a screwdriver which has a well insulated handle. (Do not use wooden handle screwdrivers.)
7. Connect the other end of the clip lead to the metal chassis of the monitor such that the tip of the screwdriver can reach the HV anode lead on the CRT.
8. While holding only the insulated handle of the grounded screwdriver, carefully slide the tip of the metal blade under the rubber cover of the CRT anode lead and make contact with the metal electrode for at least five seconds. Repeat if necessary until arcing no longer occurs.
9. Remove the anode connection from the CRT.
10. Disconnect the focus leads.
11. Disconnect the HVPS power input connector at the HVPS.
12. Remove the four 6-32 nuts and washers on the mounting studs of the HVPS and remove the supply.
13. Install the new supply using the four washers and 6-32 nuts and tighten securely.
14. Connect the power input lead, focus lead, and the CRT anode connector. Make sure the anode lead rubber boot is securely in place and not damaged.
15. Check that all wiring and leads are properly dressed and that there is not conflict with screws, covers, etc.
16. Replace the enclosure with the screws provided.
17. Connect all BNC signal cables and the AC power cable to the monitor.
18. Apply AC input power and input signals and check display for proper operation.

VERTICAL DEFLECTION BOARD REPLACEMENT

P/N 6127-0112-03

Tools Required: 1. Screwdriver, common, straight slot.

REPLACEMENT PROCEDURE

1. Turn AC power OFF at the front panel.
2. Disconnect the monitor AC power cord.
3. Unscrew the two captive screws on the Vertical Deflection Board.
4. Remove the Vertical Deflection Board from its slot. As a precaution, inspect the module connector and the Mother Board mating connector for damage.
5. Carefully insert the replacement deflection module in its slot making sure the module connector is properly aligned with its mating connector on the Mother Board.
6. Tighten the two captive screws to seat the module and complete the connection to the Mother Board.
7. Connect the AC power cord.
8. Apply AC power and input signals and check the display for proper operation.

HIGH VOLTAGE POWER SUPPLY ALIGNMENT PROCEDURE

The Model 6127-0107-03 High Voltage Power Supply has five output voltages of which four are adjustable.

- 27,000 Volts (Anode Voltage)
- 7,000 Volts (Focus 1 Voltage)
- 7,000 Volts (Focus 2 Voltage)
- 650 Volts (Grid 2 Voltage)

The anode and G2 Voltages should be factory preset to their respective values. However, the focus voltage must always be adjusted when either the CRT or the High Voltage Power Supply are replaced.

EQUIPMENT REQUIRED:

1. Astro Designs VG809 test pattern generator or equivalent and cables.
2. FLUKE Model 27 Multimeter with FLUKE 80K-40/1000 MegOhm High Voltage Probe or equivalent equipment.
3. 1/8 inch insulated flat point adjustment tool.

ANODE AND G2 VOLTAGE ADJUSTMENT PROCEDURE

1. This procedure requires removal of unit enclosure.
2. Connect three equal length BNC cables from the video generator or test source RGB analog outputs to the Model 5127 RGB video inputs respectively.
3. Display a color bar or gray scale pattern if possible.
4. Connect the voltmeter negative lead to the monitor chassis. CAREFULLY slip the High Voltage Probe tip under the rubber insulator cap at the CRT anode connector shown in figure 1-1.
5. If necessary, insert the adjustment tool in the small hole on the top of the High Voltage Power Supply near the power connector and adjust for a reading of 27 Volts (27,000 Volts Actual) on the multimeter.
6. To adjust the grid 2 voltage CAREFULLY insert the tip of the High Voltage Probe into pin 9 of the High Voltage Power Supply power connector. **Caution:** Ordinary voltmeter probes will result in inaccurate readings due to their loading.
7. If necessary adjust the G2 potentiometer for a reading of +0.65 Volts (650 Volts Actual) on the multimeter.
8. After adjusting anode voltage it will be necessary to adjust focus voltage.

EQUIPMENT REQUIRED:

1. Astro Designs VG809 test pattern generator or any high performance video source that provides single pixel line or character widths.
2. Insulated 1/4" straight screwdriver or adjustment tool.
3. BNC cables as required.

FOCUS VOLTAGE ADJUSTMENT PROCEDURE

1. This procedure requires removal of unit enclosure.
2. Connect three equal length BNC cables from the video generator test source RGB analog outputs to the Model 5127 RGB video inputs respectively.
3. Display a pattern such as dots or characters.
4. Observe "sharpness" of image at several locations on the screen.
5. With the insulated tool, adjust the "focus 1" pot on the top of the High Voltage Power Supply for the best sharpness of vertical lines at the right and left edges. Next, adjust the "focus 2" pot for best focus of horizontal lines near the center of the screen. Keep changing the two adjustments until uniform focus across the screen is achieved.
6. Should it be necessary to verify or adjust the anode voltage and/or the G2 voltage the High Voltage Power Supply Procedure in this manual applies:

VIDEO AMPLIFIER ALIGNMENT PROCEDURE

EQUIPMENT REQUIRED:

1. Astro Designs VG 809 test pattern generator or equivalent.
2. Minolta TV2150 Colorimeter or equivalent.
3. BNC cables as required.

The Model 5127 Video Amplifiers provide state-of-the-art in design and performance. They provide for control of:

1. Contrast (Gain)
2. Brightness (Black level)
3. Color tracking
4. Automatic Gain Control

MINIMAL ALIGNMENT PROCEDURE

There may be the need to "touch-up" the Video Amplifiers to the video system. Only the Black level and Gain controls should be adjusted in this manner.

1. The Black level control should be adjusted first for color balance on the black or known dark gray portion of an image.
2. Then the Gain adjusted for color balance on a high brightness white portion of the image.
3. Always adjust Black level before Gain.

Video Amplifier alignment should not be necessary unless replacement of the following occurs.

1. Cathode Ray Tube (CRT)
2. High Voltage Power Supply
3. Video Amplifier Module

Should the CRT be replaced, a complete procedure is necessary and will be presented here first. Replacement of either the High Voltage Power Supply or one or more Video Amplifier Module requires only a partial procedure which follows later.

PARTIAL PROCEDURE

Replacement of a Video Amplifier Module may only require the adjustment of the replaced modules Black level and Gain pots.

The Black level may be adjusted on the replaced module by:

1. Set the Video generator for 20% amplitude flat white field.
2. Set Brightness and Contrast controls fully clockwise (CW).

3. Adjust Black level for 4% brightness on corresponding color.
4. Set Video generator for 100% flat field.
5. Adjust Gain pot for 125% brightness on the corresponding color.
6. Repeat above procedure until both values are correct.

FULL PROCEDURE

1. PRE-ALIGNMENT

- a. Adjust the range, Gain and Black level post full CCW.
- b. Adjust null pot for mid-range.
- c. Warm-up unit for at least 30 minutes.
- d. Adjust Brightness and Contrast pot full CW.
- e. Set generator for 20% flat white field.
- f. Adjust sub-brightness pot so that the Minolta registers the hottest gun at 4%.
- g. Adjust the two remaining Black Level pots so that the Minolta registers 4%.

2. COLOR COORDINATE AND LUMINOUS ALIGNMENT

- a. Set color-bar level on generator to 100%.
- b. Adjust all gain pots until a reading of 125% is observed on the TV-2130.
- c. Set color-bar level on generator to 20%.
- d. Adjust the G1 pot on Mother Board until a reading of 4% is obtained on the hot gun.
- e. Adjust Black level pots on the two remaining amps until 4% is observed on the Minolta TV-2130.
- f. Repeat the above steps until all three video amps match at 125% and at 4%.
- g. Reset generator to color-bar level of 100%.

3. COLOR TRACKING ALIGNMENT

- a. Ensure that brightness and contrast controls are completely CW.
- b. Note luminous level for one gun (approximate 125%).

- c. Adjust range pot completely CW.
- d. Adjust null pot until luminous level reads exactly the same as in Step B.
- e. Adjust range pot completely CCW and then CW to ensure that the luminous level remains the same.
- f. Adjust range pot full CCW.
- g. Repeat steps A thru F for other two guns.
- h. Adjust brightness control completely CCW.
- i. Note the highest luminous level and adjust the other two range pots until the three RGB levels are the same.
- j. Check for color coordinates at maximum brightness and at minimum brightness to ensure proper alignment:

Maximum X Deviation = 0.006 CIE (Min to Max)

Maximum Y Deviation = 0.006 CIE (Min to Max)

CATHODE RAY TUBE REPLACEMENT

(P/N 6127-0108-03)

- Tools Required:
1. Screwdriver, Phillips #2
 2. Allen wrench, 3/16 inch
 3. Insulated lead wire 15 inches long (18 to 20ga.) with clips on ends

All efforts should be made to isolate the fault to the Cathode Ray Tube (CRT) before beginning replacement.

CAUTION! Replacing the Cathode Ray Tube involves contact with dangerous high voltage elements. Follow instructions carefully and observe all safety precautions!

Before replacing the CRT consider the following:

1. All BNC signal input connections on the rear panel have been checked for proper connection and the signal source is operating properly.
2. Front panel controls have not been inadvertently set to produce a no-raster condition.
3. HV disable and SYNC indicators have been properly interpreted.
4. Low Voltage Power Supply (LVPS) has been replaced (the LVPS provides the input voltage for the HVPS).

REPLACEMENT PROCEDURE

CAUTION! Lethal Voltages could be present at the CRT connectors. Follow procedure carefully.

1. Turn Off AC power at the front panel.
2. Disconnect the monitor AC power cord and all five coaxial cables on the rear panel.
3. Wait twenty minutes for voltages to discharge.
4. Remove all rear panel plug-in modules.
5. Remove the rear enclosure by removing the 22 screws and lifting the cover off.
6. Connect the chassis to earth ground.
7. Attach one end of a clip lead to the metal chassis of the monitor such that the other end can reach the HV anode connector on the CRT.
8. Attach the other end of the clip lead to the metal shaft of the screwdriver.

9. While holding only the insulated handle of the grounded screwdriver, carefully slide the tip of the metal blade under the rubber cover of the CRT anode lead boot and make contact with the metal electrode for at least five seconds. Repeat if necessary until arcing no longer occurs.
10. Remove the anode connection from the CRT.
11. Disconnect the CRT connector board from the CRT base connector.
12. Disconnect four pin Molex connector S8 (on end of Mother Board next to HVPS) and remove wires and pins from pins 1 and 2. This is accomplished by using a sharp object in the back of the connector body to release the pin to slide out.
13. Place monitor face down on table.
14. Remove the seven screws mounting the front bezel to the chassis.
15. Carefully remove the chassis back from bezel.
16. Once removed, the chassis will remain attached to the bezel by the front panel controls assembly. Remove the four screws securing the control assembly to the bezel with the Phillips screwdriver.
17. The four hex head screws mounting the CRT to the chassis should now be removed with a 3/16 inch Allen wrench. Lift the chassis away from the CRT taking care not to bump the neck of the CRT. The neck area is the most vulnerable area of the CRT.
18. Position the replacement CRT on its face plate on a soft surface.
19. If the CRT has the degauss coil already installed on the CRT body, proceed to the next step. If it does not, then attach the degauss coil from the old CRT to the new one with new pads and tie wraps. Super Glue is a good adhesive for this purpose.
20. Carefully position the CRT into the bezel and install the four Allen head mounting screws. Make sure the chassis and CRT are square with one another since this affects the alignment of the video image with the bezel.
21. Install the front panel control assembly to the bezel.
22. Install the chassis assembly onto the bezel assembly and secure with the seven Phillips head screw.
23. Place the monitor in an upright position.
24. Attach the CRT base connector assembly to the CRT.
25. Connect the anode lead to the CRT anode button on top the CRT.
26. Install the two degauss coil leads into four pin connector S8 with the white lead in pin 1.
27. Install the modules into the chassis.

28. At this time perform the VIDEO AMPLIFIER ALIGNMENT PROCEDURE contained in the Model 5127 Operation and Maintenance Manual.
29. Replace the rear cover and secure with 22 Phillips head screws.
30. Pat yourself on the back and take the rest of the day off.