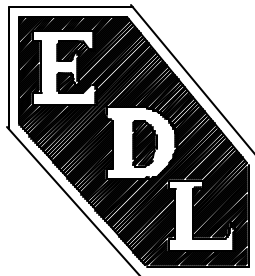


MODEL 6115, 6116, 6119 & 6120 MASTERSYNC COLOR VIDEO MONITOR



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	3
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	8
MANUAL	8

INSTALLATION	9
GENERAL	9
UNPACKING	9
AC POWER CONNECTION	9
MECHANICAL INSTALLATION	9
OPTIONAL RACK MOUNT	9
SIGNAL INPUT CONNECTIONS	15
OPERATION	18
CALIBRATION PROCEDURES 1	20
VERTICAL POSITION ADJUSTMENT	20
VERTICAL SIZE ADJUSTMENT	20
HORIZONTAL POSITION ADJUSTMENT	20
HORIZONTAL SIZE ADJUSTMENT	21
TRAPEZOID ADJUSTMENT	21
PINCUSHION ADJUSTMENT	21
CALIBRATION PROCEDURES 2	22
CONTRAST ADJUSTMENT	22
VERTICAL POSITION ADJUSTMENT	22
VERTICAL SIZE ADJUSTMENT	23
HORIZONTAL POSITION ADJUSTMENT	23
HORIZONTAL SIZE ADJUSTMENT	23
HORIZONTAL LINEARITY ADJUSTMENT	23
TRAPEZOID ADJUSTMENT	23
PINCUSHION ADJUSTMENT	24

MAINTENANCE, ADJUSTMENTS AND TROUBLESHOOTING	26
FAULT ISOLATION/TROUBLE SHOOTING	26
MAINTAINABILITY	26
REPLACEABLE ITEMS	26
ORGANIZATIONAL LEVEL TROUBLESHOOTING	27
VIDEO AMPLIFIER BOARD REPLACEMENT	29
DEFLECTION BOARD REPLACEMENT	30
MICROPROCESSOR BOARD REPLACEMENT	31
LOW VOLTAGE POWER SUPPLY REPLACEMENT	32
HIGH VOLTAGE POWER SUPPLY REPLACEMENT	33
HIGH VOLTAGE POWER SUPPLY ALIGNMENT PROCEDURE	34
ANODE AND G2 VOLTAGE ADJUSTMENT PROCEDURE	36
FOCUS VOLTAGE ADJUSTMENT PROCEDURE	37
VIDEO AMPLIFIER ALIGNMENT PROCEDURE	38
CATHODE RAY TUBE REPLACEMENT	41
APPENDIX A	44
LIST OF ACRONYMS	44

LIST OF ILLUSTRATIONS

FIGURE 1: MODEL 6115 & 6116 OUTLINE DRAWING.....	10
FIGURE 2: MODEL 6119-8 OUTLINE DRAWING.....	11
FIGURE 3: MODEL 6119 OUTLINE DRAWING.....	12
FIGURE 4 MODEL 6120 OUTLINE DRAWING.....	13
FIGURE 5: 110/220 SWITCH LOCATION.....	14
FIGURE 6: 6120 REARPANEL SIGNAL INPUT CONNECTIONS.....	17
FIGURE 7: CALIBRATION 1 FLOW CHART.....	25
FIGURE 8: ORGANIZATIONAL LEVEL TROUBLESHOOTING FLOW CHART.....	28

LIST OF TABLES

TABLE 1: CONTROL FUNCTIONS IN OPERATIONAL AND CALIBRATE MODE.....	19
TABLE 2: LIST OF ORGANIZATIONAL LEVEL REPLACEABLE ITEMS.....	27

INTRODUCTION

This technical manual contains operation and maintenance instructions for the **EDL Model 6115, 6116, 6119 and 6120 MasterSync Video Monitors**. These models are high quality, high performance, high resolution color monitors. They are unique in their ability to automatically synchronize and display virtually any video format. This feature makes it very useful as a communications monitor when integrated with a video switch system as well as Windows applications.

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

To achieve the best results from these models 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. Follow the guide in this manual when attaching system input cabling.
3. If customized calibration is required, follow the calibration procedures in this manual.

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

GENERAL INFORMATION

VERY HIGH RESOLUTION

EDL Displays Color Monitors have the highest resolutions available. The dynamically focused 0.28mm dot pitch (0.25 for Model 6120)cathode ray tubes provide the sharpest images available with resolutions up to and including 1600 x 1280 for 6119 & 6120 (1280 x 1024 for Models 6115 and 6116).

VIDEO BANDWIDTH

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

AUTOMATIC SYNC ADAPTATION

These monitors 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.

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 eliminating the need for potentially unreliable fans.

MODULAR CONSTRUCTION

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

CONFIGURATION CONTROL

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

MAINTAINABILITY

All circuitry within the monitor is contained in functional replaceable modules such as deflection output, microprocessor 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.

An important benefit of these plug-in replaceable modules is the very short Mean-Time-To-Repair (MTTR).

Since the replaceable modules are the same as used in 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 MODEL 6115, 6116, 6119 & 6120 MASTERSYNC MONITOR SPECIFICATIONS

DEFLECTION

SCAN RATE RANGES: Horizontal scan rates from 15 to 90 kHz, 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 $\pm 1\%$ 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 1% of raster height within a 9 inch circle (Model 6115 & 6116) and within an 11 inch circle (Model 6119 & 6120) and no more than 1.5% elsewhere.

MISCONVERGENCE: Within a centrally located circle of six inch diameter misconvergence will be less than 0.2mm and elsewhere will be less than 0.4mm when measured as the worse case between any two colors.

POWER REQUIREMENT

A.C. POWER: Input voltage 90-132 v.a.c. or 180-264 v.a.c. switch selectable inside the monitor, 47 to 63 Hz. Power Consumption 150 Watts maximum.

CRT

SCREEN SIZE AND TYPE: (Model 6115 & Model 6116) 16 inch diagonal, 0.28mm shadow mask, precision inline DAF gun (PIL), burst protection, inner magnetic shield, 90 degree deflection type tube with a P22 short persistence dot type black matrix phosphor. Fifty-two percent (52%) transmissivity anti-glare panel standard.

(Model 6119) 19-inch diagonal, 0.32mm shadow mask, precision inline gun (PIL), burst protection, inner magnetic shield, 90 degree deflection type tube with a P22 short persistence dot type black matrix phosphor. Forty one percent (41%) transmissivity anti-glare panel standard.

(Models 6119-7 & 6119-8) 19-inch diagonal, 0.28mm shadow mask, precision inline DAF gun (PIL), burst protection, inner magnetic shield, 90 degree deflection type tube with a P22 short persistence dot type black matrix phosphor. Fifty-two percent (52%) transmissivity anti-glare panel standard.

(Model 6120) 21-inch 20-inch viewable diagonal, 0.25mm shadow mask, DAF gun, burst protection, inner magnetic shield, 90 degree deflection with P22 short persistence dot type black matrix phosphor. The shadow mask in Advanced Invar. The 52% transmissivity anti-glare filter is integral to the flat-square screen.

WARM UP TIME: A maximum of 5 minutes for the monitor to meet the specifications contained herein.

RESOLUTION AND DISPLAY SIZE: Models 6115 & 6116 have 1280H X 1024V resolution with a maximum display area of 12.8" (32.5 cm) wide by 9.6" (24.4 cm) high. Models 6119-7 & 6119-8 has 1600H X 1280V resolution with a maximum display area of 15.7" (39.9 cm) wide by 11.7" (29.6 cm) high. Model 6119 has 1280 X 1024 resolution with a maximum display area of 15.7" (39.9 cm) wide by 11.7" (29.6 cm) high. The Model 6120 has 1600 X 1280 resolution with a maximum display area of 16.0" (406.4mm.) wide by 12.0" (304.8mm.) high.

VIDEO

BRIGHTNESS: Nominal 35 foot-Lamberts.

COLORIMETRY: D9300 white-adjustable to other standards.

FREQUENCY AND PULSE RESPONSE (20 fL):

Bandwidth @ -3.0 dB;	1.0Hz to 140 MHz
Flatness @ ± 0.5 dB;	10HZ to 120 MHz
Rise/Fall Time:	3.0 nsec

SIGNAL INPUT IMPEDANCE:

Resistance @ Low-Z:	75 OHM \pm 5%
Resistance @ High-Z:	> 20k OHM
Capacitance:	8 pF (nominal) @ 2 MHz

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 uSec minimum
Level:	0.3 Vp-p Nominal (0.2-0.4 Vp-p)
Width:	1.0 uSec Nominal (0.5-3.0 uSec)
Polarity:	Negative

SYNC INPUT:

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

HORIZONTAL	
Sync Pulse	$\geq 1.0 \text{ u s}$
Back Porch	$\geq 1.2 \text{ u s}$
Front Porch	≥ 0

VERTICAL	
Sync Pulse	$\geq 25 \text{ u s}$
Back Porch	$\geq 375 \text{ u s}$
Front Porch	≥ 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 OHM or high impedance termination.

USER ADJUSTMENTS

EXTERNAL: RGB Video - Gain and black level.

CALIBRATION MODE: Front panel adjustment for all minor alignment needs including: vertical position, vertical size, horizontal position, horizontal size, trapezoid, and pincushion for a minimum of twenty one different video formats.

PHYSICAL AND ENVIRONMENTAL

MECHANICAL: Rugged steel 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 13,000 meters (30,000 ft) non-operating.

DIMENSIONS: Model 6115/6116: 15.38" (39.07 cm) wide by 14" (35.57 cm) high by 17.75" (45.09 cm) deep.

Model 6119: Overall when mounted in plastic enclosure 18.5" (46.99 cm) wide by 16.4" (44.66 cm) high by 21.6" (54.86 cm) deep.

Model 6119-8 Rack Mount: Overall 19" (48.26 cm) wide by 15.75" (40.01 cm) high by 21.5" (54.61 cm) deep.

Model 6120: Overall 19.3" wide by 15.5" high by 19.1" deep.

WEIGHT: Model 6115/6116: 58 lbs (26 Kg). Model 6119 83 lbs (37 Kgs)
Model 6120 62 lbs (28.2 Kgs.).

CAUTION! These monitors are awkward and require two people for safe handling.

OTHER FEATURES

MASTER SYNC: Automatic detection and alignment to a maximum of twenty-one different video formats. The video formats may have totally different timing specifications.

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 DeGauss/Mode provided on front of the monitor.

WARRANTY

One year parts and labor at EDL Displays, Inc.

MANUAL

One copy 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 Calibration Procedures 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 and EDL Displays should be notified at this time.

AC POWER CONNECTION

Before connecting the monitor, determine what a.c. power is to be used and make sure that the monitor is configured properly for that voltage. **NOTE:** The power setting upon shipment is 110 volts unless otherwise requested by the customer. 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 (see figure 4).

MECHANICAL INSTALLATION

The 6119 monitor is designed to be mounted and secured in place on any flat surface by four 10-32 X 1/2 inch screws into the bottom panel. See figure 3 for the hole pattern required. (Model 6119 only)

OPTIONAL RACK MOUNT

As an option, the Model 6119-8 is provided with an all steel chassis and bezel assembly. This option includes heavy duty slides and requires only 15.75 inches of panel space.

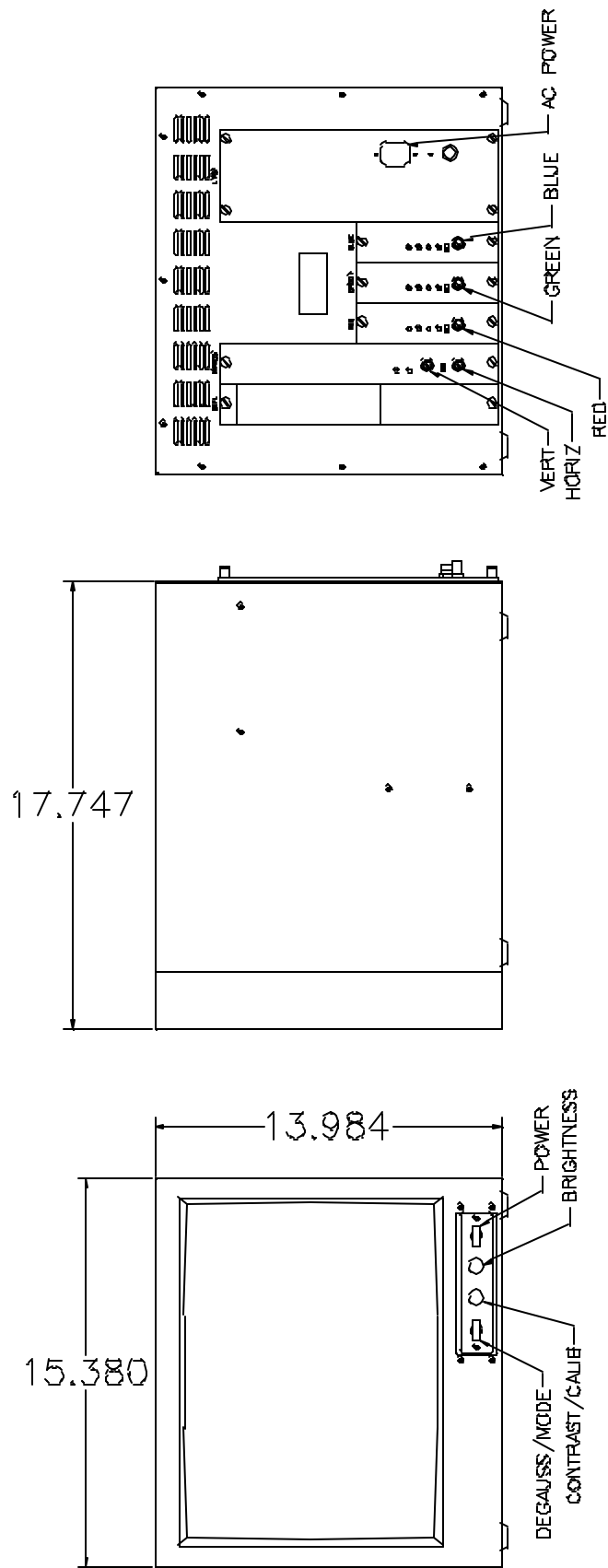


Figure 1: MODEL 6115 & 6116 OUTLINE DRAWING

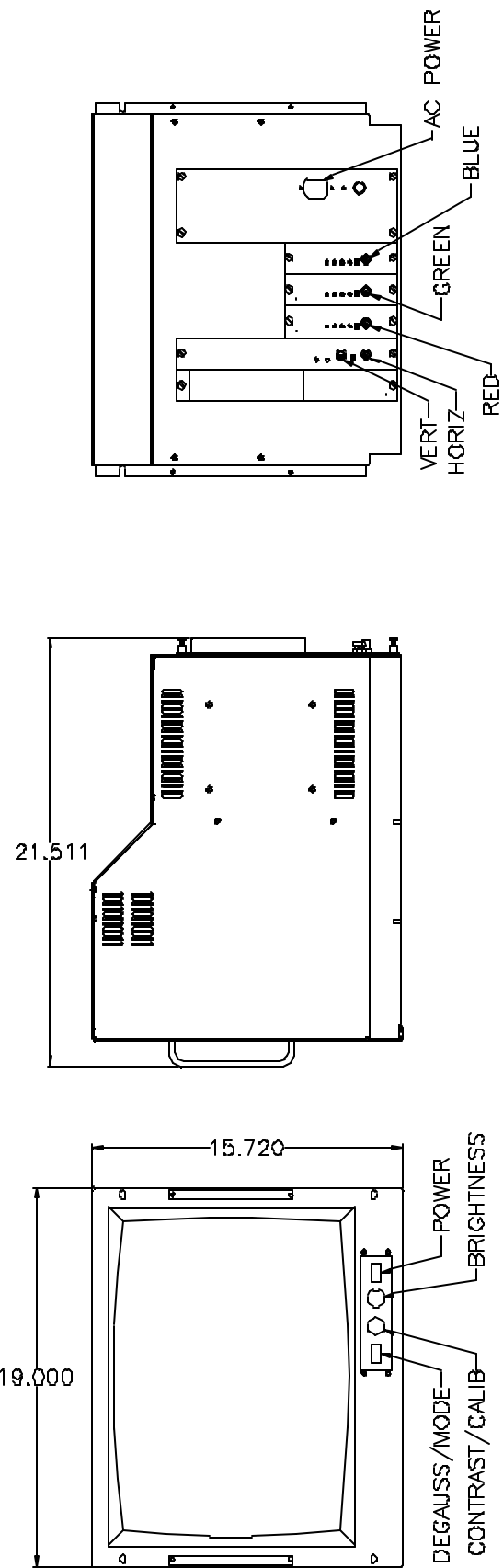


Figure 2: MODEL 6119-8 OUTLINE DRAWING

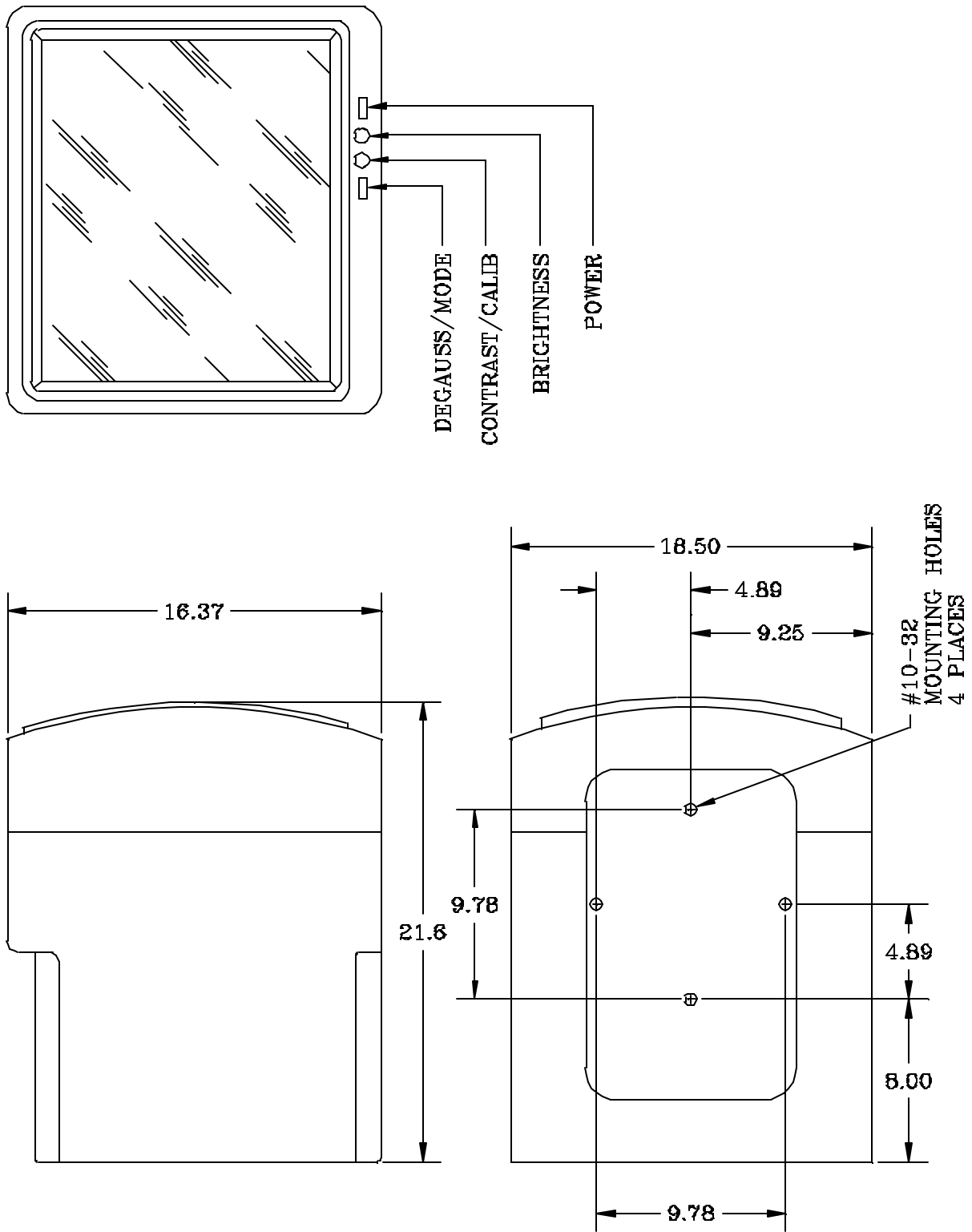


Figure 3: MODEL 6119 OUTLINE DRAWING

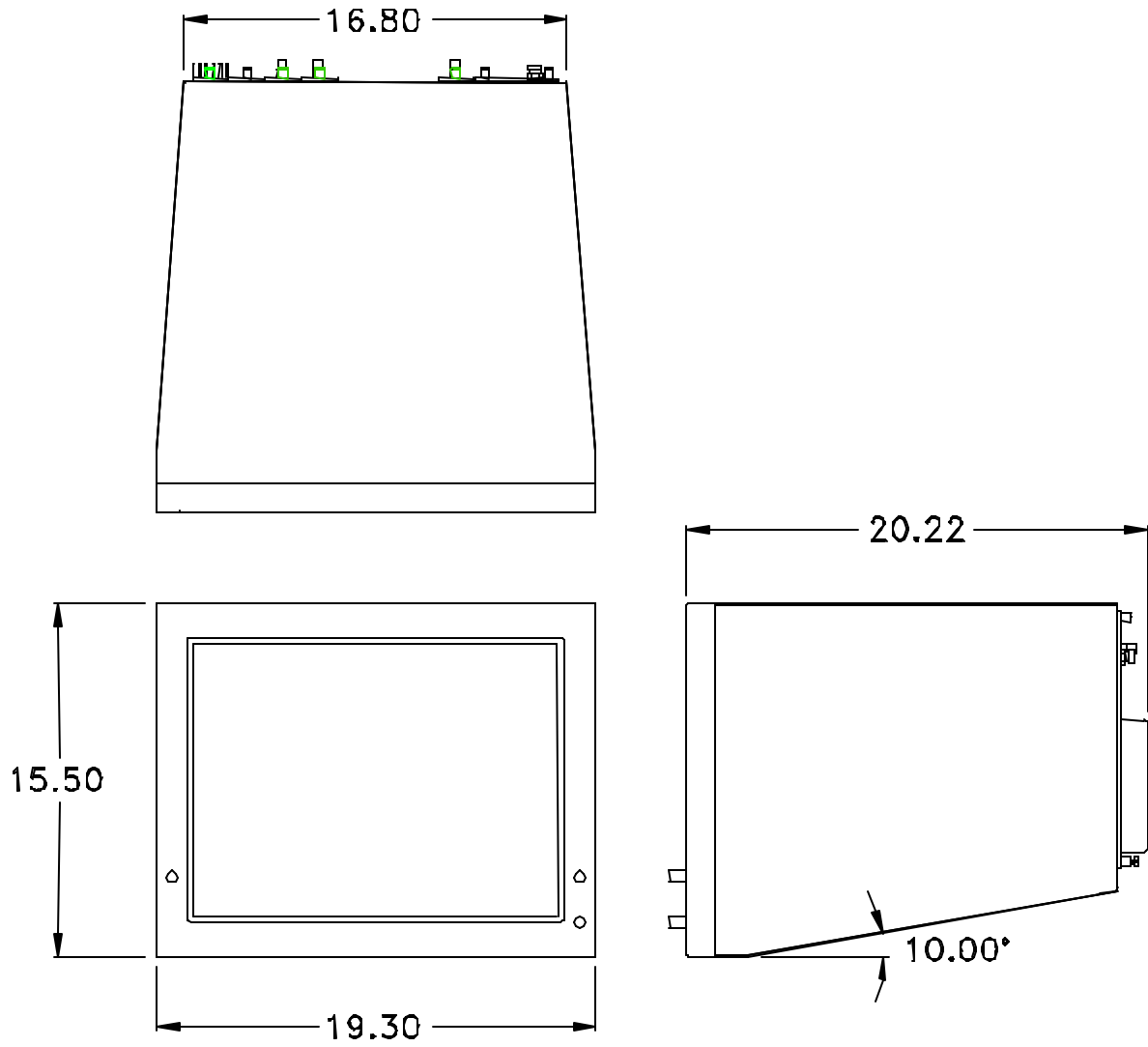


Figure 4 Model 6120 Outline Drawing

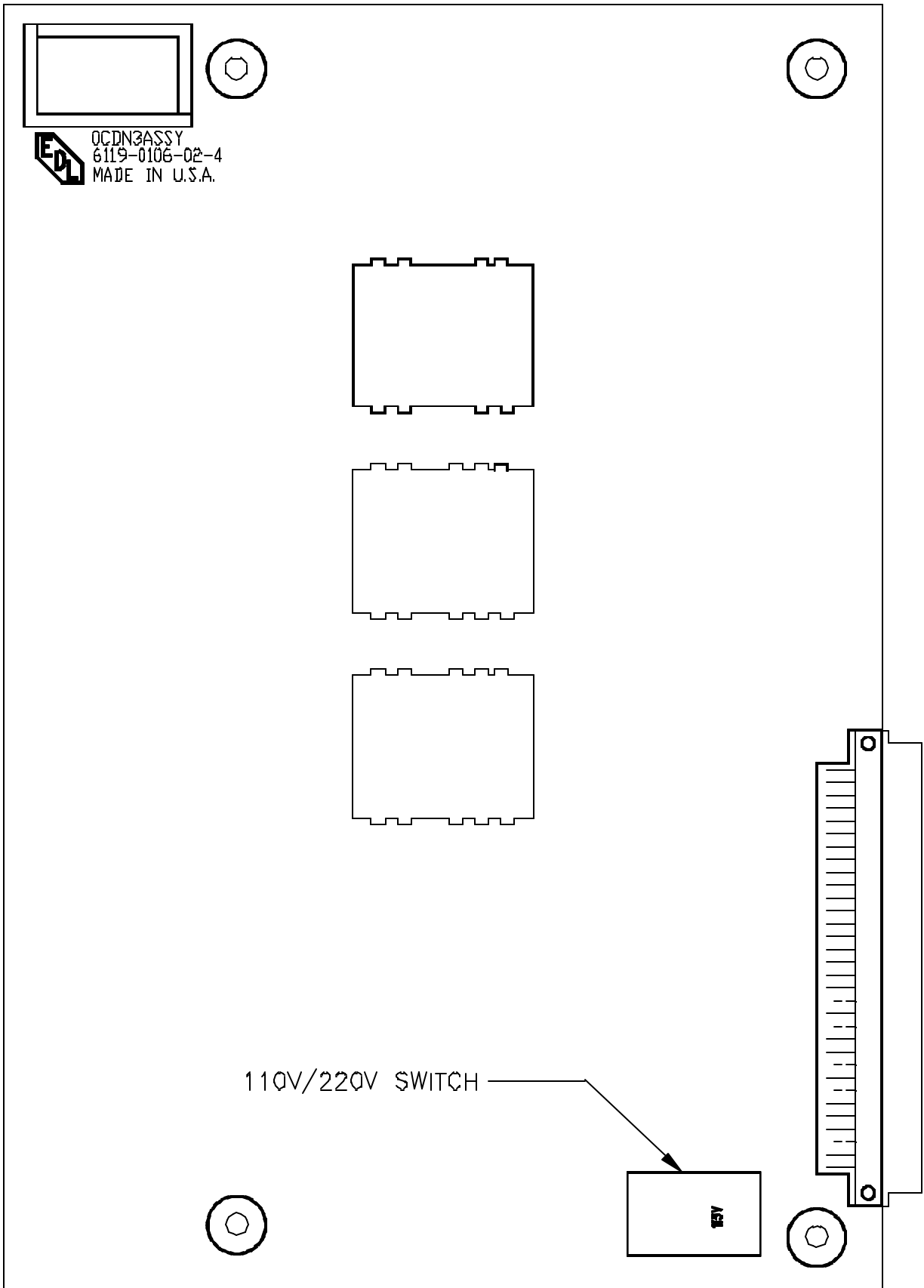


Figure 5: 110/220 SWITCH LOCATION

SIGNAL INPUT CONNECTIONS

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

The Model 6115, Model 6116 and 6119 Master Sync Monitors 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).

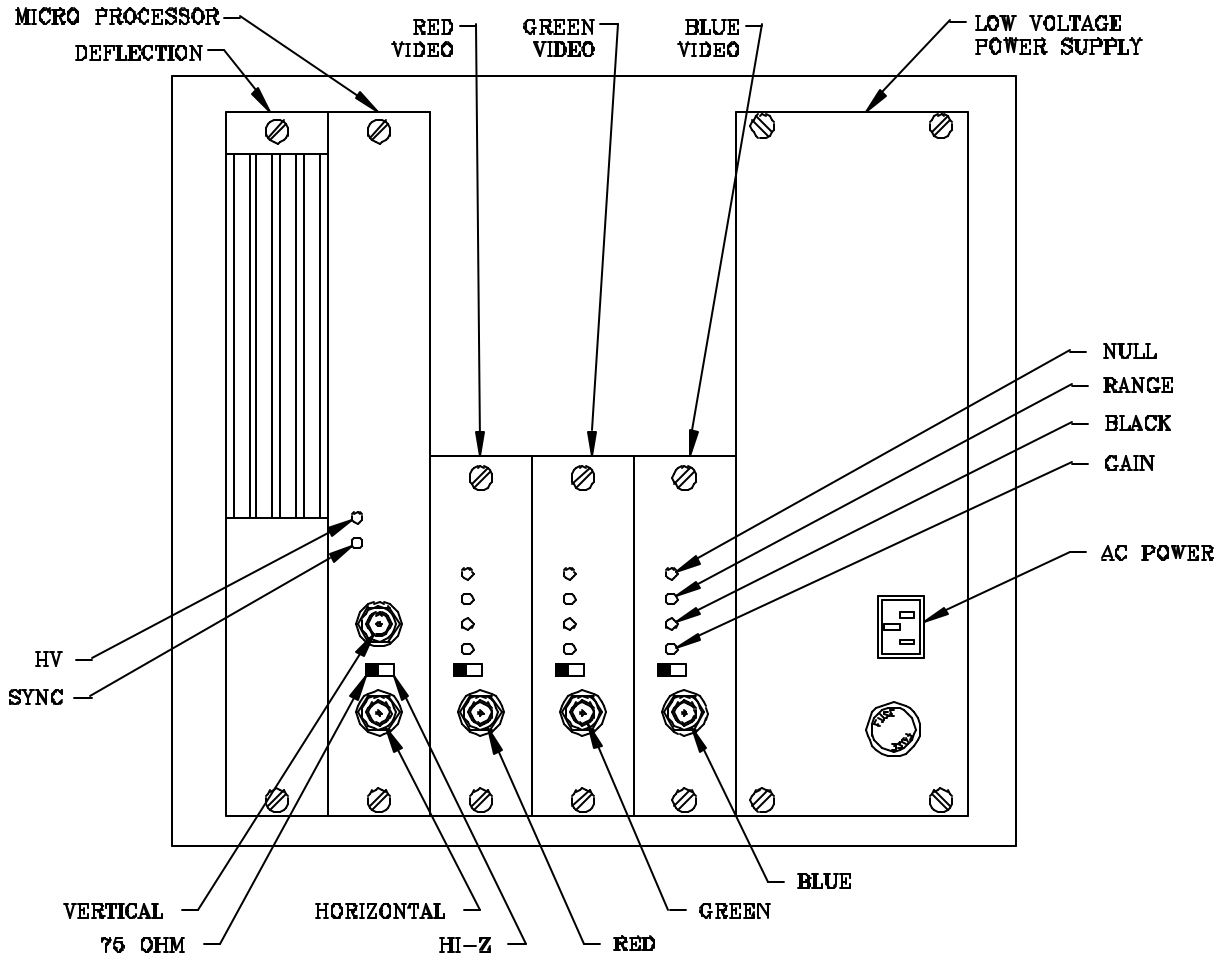
The video inputs may be adjusted to accommodate from 0.7 to 1.4 volts peak to peak video signal levels. Any d.c. offset on the signal is eliminated by a.c. coupling and d.c. restoration at the video amplifier during the back porch portion of the video signal.

The external sync inputs can accommodate from 1.0 to 4.0 volts peak to peak signals without any adjustments. These inputs are a.c. coupled and d.c. 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 75 Ohm to high impedance (20 kilohm) 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 75 Ohm termination impedance and not have BNC "T" adapters at its connectors unless used for the terminators.
4. All cables must be 75 Ohm impedance and as short as possible (for most signal sources cable length should not exceed 10 feet).

NOTE: These aforementioned rules are not unique to the Model 6115, 6116 and 6119 monitors. They must be followed to assure proper operation of these high performance devices regardless of their manufacture.



6119 & 6115 Rear Panel Signal Input Connections

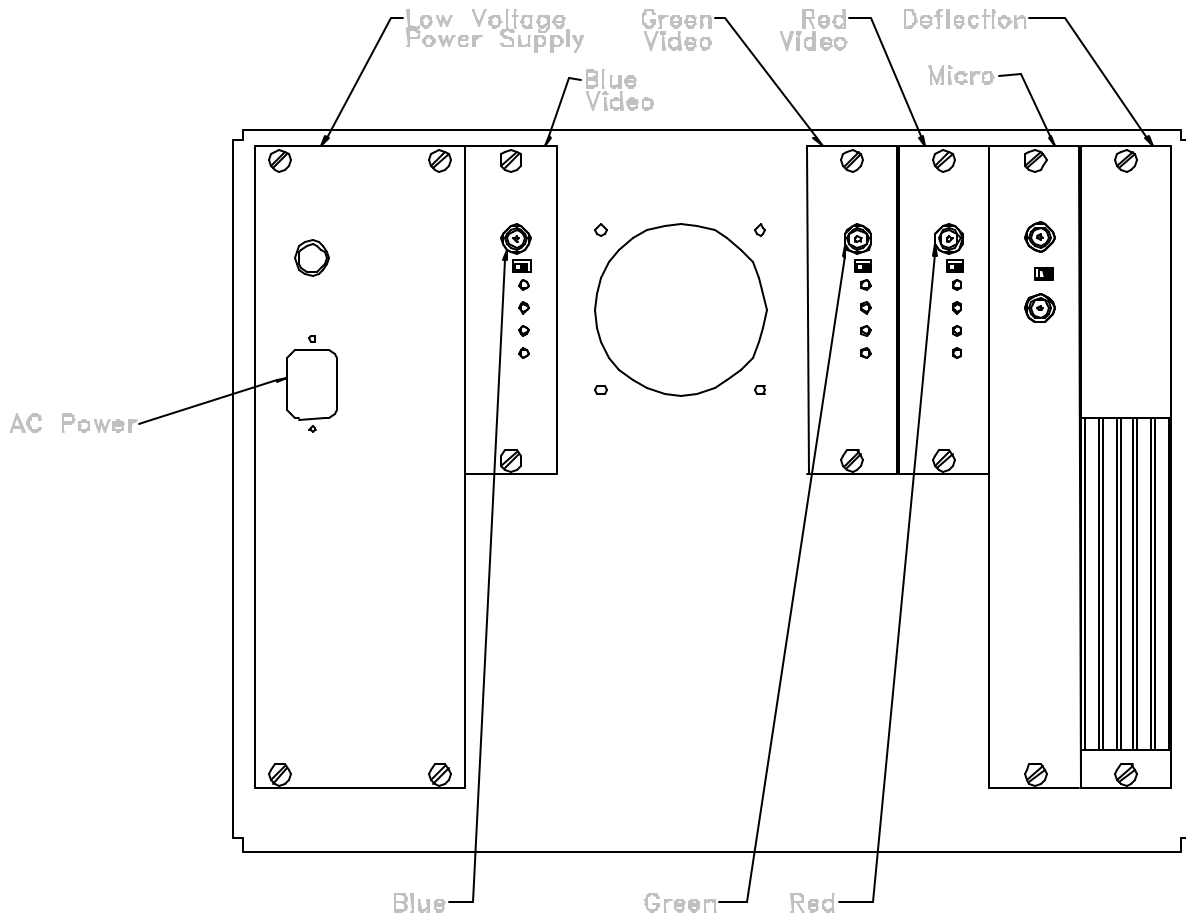


Figure 6: 6120 RearPanel Signal Input Connections

OPERATION

The method of operation of the Models 6115, 6116, 6119, & 6120 is similar to ordinary monitors with respect to power, brightness, contrast and deGauss. However, they do 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 newer products have a shorter Calibrate sequence caused by a firmware Revision R and above. Any firmware below Revision R will have the longer sequence.

Two of the front panel controls have dual functions. Table 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/Mode

CONTROL NAME	OPERATIONAL MODE	CALIBRATE MODE
POWER SWITCH (Alternate Action)	1. Controls primary a.c. 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 function, Rotary Potentiometer)	1. Adjust Gain Of video Amplifiers	Establishes custom memory values for: 1. Contrast* 2. Vertical Position 3. Vertical Size 4. Horizontal Position 5. Horizontal Size 6. Horizontal Linearity* 7. Horizontal Trapezoid 8. Horizontal Pincushion Must be performed in this Sequence. * Not included in Rev R and above
DEGAUSS/MODE (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 1

(FIRMWARE REVISION R AND ABOVE)

CAUTION

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

NOTES: **MEMORY ERASE** - Pressing and holding the DeGauss/Mode switch for 30 seconds or longer will completely erase the entire custom area of memory.

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 when the calibrate mode is initiated.

Apply power and input signals and allow the monitor to warm up for five minutes.

NOTE: When the monitor is placed in the Calibrate Mode a definite programmed sequence of calibration steps must be followed. Refer to Table 1 for the sequence.

To enter the calibration mode, press and hold the DeGauss button 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.

To advance to the vertical size adjustment mode, press and release the DeGauss/Mode 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.

To advance to the horizontal position adjustment mode, press and release the DeGauss/Mode 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 trapezoid adjustment 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/Mode switch.

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 exit the calibration mode, press and release the DeGauss/Mode switch.

CALIBRATION PROCEDURES 2

(FIRMWARE REVISION P AND BELOW)

CAUTION

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

NOTES: **MEMORY ERASE** - Pressing and holding the DeGauss/Mode switch for 30 seconds or longer will completely erase the entire custom area of memory.

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 when either the normal or extended calibrate mode is initiated.

EXTENDED CAL. MODE - When sw1-4 is in the on position the monitor is in "extended cal mode", this provides access to pincushion and trapezoid adjustments. When sw1-4 is in the off position normal cal mode denies access to pin and trap.

Apply power and input signals and allow the monitor to warm up for five minutes.

NOTE: When the monitor is placed in the Calibrate Mode a definite programmed sequence of calibration steps must be followed. Refer to Table 1 for the sequence.

To enter the calibration mode, press and hold the DeGauss button for five seconds.

CONTRAST ADJUSTMENT

The monitor will indicate that it is in the contrast adjustment by momentarily reducing the image intensity and then returning it back to the original or stored value.

Adjust the contrast by rotating the contrast control slowly until the control "locks on" and then set for the desired picture intensity. Normally this will be left at fully clockwise or maximum gain.

To advance to the Vertical Position adjustment mode, press and release the DeGauss/Mode switch.

VERTICAL POSITION ADJUSTMENT

The monitor will indicate that it is in the vertical position mode by momentarily shifting the image down and then back to the original or stored position.

Adjust the vertical position by rotating the contrast control slowly until the control "locks

on" and then set the desired position.

To advance to the vertical size adjustment mode, press and release the DeGauss/Mode switch.

VERTICAL SIZE ADJUSTMENT

The monitor will indicate that it is in the vertical size mode by momentarily decreasing the vertical size and then returning it back to its original or stored position.

Adjust the vertical size by rotating the contrast control slowly until the control "locks on" and then set the vertical size as desired.

To advance to the horizontal position adjustment mode, press and release the DeGauss/Mode switch.

HORIZONTAL POSITION ADJUSTMENT

The monitor will indicate that it is in the horizontal position mode by momentarily shifting the entire video image to the right and then back to the original or stored position.

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

The monitor will indicate that it is in the horizontal size mode by momentarily decreasing the horizontal video image size and then returning to the original or stored size.

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 linearity adjustment mode, press and release the DeGauss/Mode switch.

HORIZONTAL LINEARITY ADJUSTMENT

The monitor will indicate that it is in the horizontal linearity adjustment by momentarily altering linearity at the left side of the screen and then returning to the original or stored value. If a video image is available that facilitates this adjustment such as a grid pattern or some other known geometric shape, then adjust for proper linearity at the left side of the screen. Otherwise, proceed to the next adjustment.

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

TRAPEZOID ADJUSTMENT

The monitor will indicate that it is in the trapezoid mode by briefly displaying a trapezoidal video outline and then returning to the original setting.

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/Mode switch.

PINCUSHION ADJUSTMENT

The monitor will indicate that it is in the pincushion mode by briefly distorting or pincushioning the top and bottom of the screen toward the center and then returning to the original setting.

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 exit the extended calibration mode, press and release the DeGauss/Mode switch.

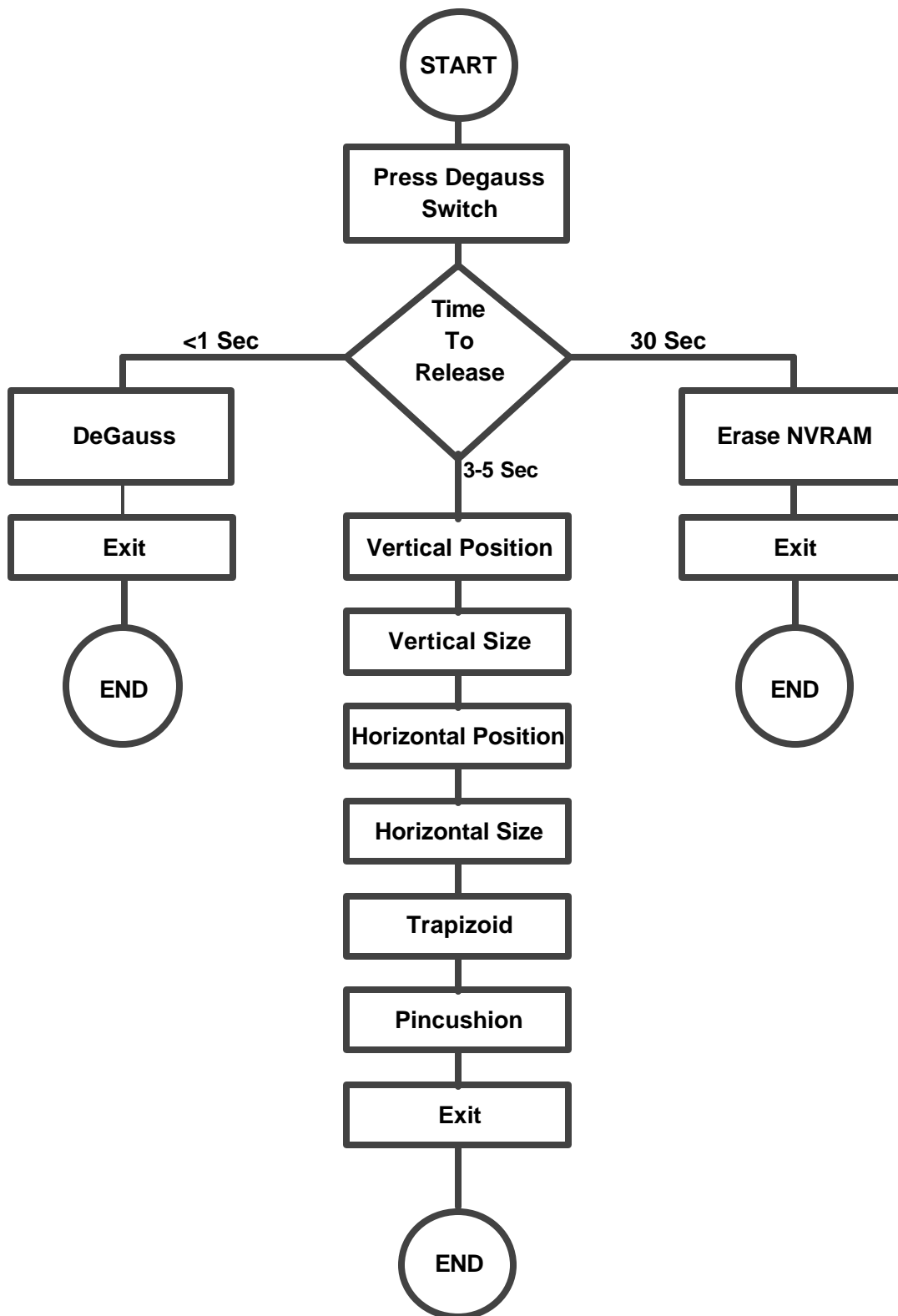


Figure 7: CALIBRATION 1 FLOW CHART

MAINTENANCE, ADJUSTMENTS AND TROUBLESHOOTING

FAULT ISOLATION/TROUBLE SHOOTING

Most problems in the Model 6115, 6116, 6119, & 6120 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 Microprocessor 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/Mode) 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. 7) to isolate the problem to a module or modules.
6. **Remove power from unit.**
7. 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.

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 Logic Control Board is replaced.

REPLACEABLE ITEMS

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

RI	RI DESCRIPTION	QTY
1	Video Amplifier Boards	3
2	Deflection Board	1
3	Microprocessor Board	1
4	Low Voltage Power Supply	1
5	High Voltage Power Supply	1
6	F2-1A Buss Little Fuse GFA-1 251001	1
7	F1-3A Buss Little Fuse MDV-3 315003	1

Table 2: LIST OF ORGANIZATIONAL LEVEL REPLACEABLE ITEMS.

ORGANIZATIONAL LEVEL TROUBLESHOOTING

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

1. A signal source and signal cables are functioning properly.
2. Only one failure at a time.
3. Normal operation has the Microprocessor Board "SYNC" light on and the "HV Disable" is off.

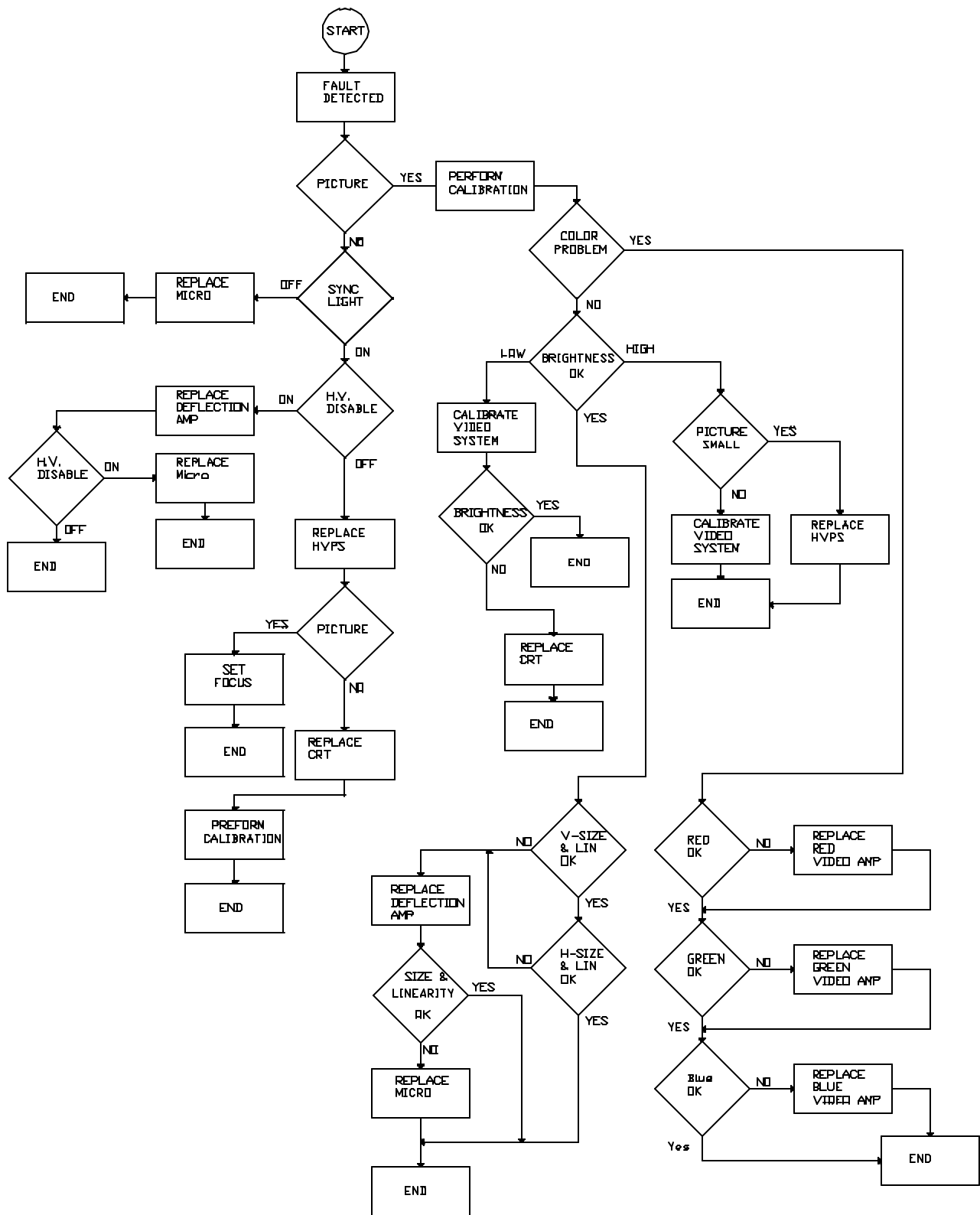


Figure 8: ORGANIZATIONAL LEVEL TROUBLESHOOTING FLOW CHART

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 a.c. power OFF at the front panel.
2. Disconnect the monitor a.c. 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 Alignment 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 a.c. power cord.
11. Apply a.c. 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.

DEFLECTION BOARD REPLACEMENT

P/N 6119-0101-03

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

REPLACEMENT PROCEDURE

1. Turn a.c. power OFF at the front panel.
2. Disconnect the monitor a.c. 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 a.c. power cord.
9. Apply a.c. power and input signals and check the display for proper operation.

MICROPROCESSOR BOARD REPLACEMENT

P/N 6119-0102-03

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

REPLACEMENT PROCEDURE

1. Turn a.c. power OFF at front panel.
2. Disconnect the monitor a.c. power cord and the H&V BNC cables on the Logic Control Board.
3. Unscrew the two captive screws on the Logic Control Board.
4. Remove the Microprocessor Board from its slot. As a precaution, inspect the module connector and the Mother Board mating connector for damage.
5. Carefully insert the replacement Microprocessor Board into its slot making sure the connector is properly aligned with the mating connector on the Mother Board.
6. Tighten the two captive screws to seat the 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 a.c. power cord.
8. Apply a.c. power and input signals and check the display for proper operation.

NOTE:

When the microprocessor module is replaced all user programmed calibration parameters will need to be reestablished.

LOW VOLTAGE POWER SUPPLY REPLACEMENT

P/N 6119-0106-03

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

REPLACEMENT PROCEDURE

1. Turn a.c. power OFF at front panel.
2. Disconnect the monitor a.c. 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 a.c. input voltage is 115 a.c. and the switch was set to the 230V a.c. position, set the switch to the required 115V a.c. position and proceed to step 5. If the required voltage is 230V a.c. and the switch was set to 115V a.c. 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	OFF

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 a.c. switch) set for proper voltage (115V a.c.).
 - 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 a.c. power cord to the monitor.
8. Apply a.c. 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 6119-0107-03

- 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 25 KV. If there is an audible "crackle" at turn on, the 25 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 a.c. power OFF at the front panel.
2. Disconnect the monitor a.c. power cord and all coaxial cables on the rear panel.
3. Wait twenty minutes for voltages to discharge.
4. Remove the enclosure by removing four screws and sliding the enclosure to the rear. (Model 6119 only)
 - 4a. Remove the #6-32 x 3/8 FH screws and remove top cover. (Model 6115 & 6116 only)

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

procedure carefully.

5. Remove the top metal shield.
6. Connect chassis to earth ground.
7. 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.)
8. 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.
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 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 focus lead.
12. Disconnect the HVPS power input connector at the HVPS.
13. Remove the four 6-32 nuts and washers on the mounting studs of the HVPS and remove the supply. (Model 6119 only)
- 13a Remove the four 6 x 32 x 3/8 FH screws. Remove HVPS assembly. Remove the four #6 locknuts and four #6 flat washers. Separate Power Supply Bracket from HVPS. (Models 6115 & 6116)
14. Install the new supply using the four washers and 6-32 nuts and tighten securely.
- 14a Repeat step #13 in reverse order. (Models 6115 & 6116)
15. 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.
16. Check that all wiring and leads are properly dressed and that there is not conflict with screws, covers, etc.
17. Perform High Voltage Power Supply Alignment Procedure.
18. Replace top metal shield.
19. Replace the enclosure.
20. Connect all BNC signal cables and the a.c. power cable to the monitor.
21. Apply a.c. input power and input signals and check display for proper operation.

HIGH VOLTAGE POWER SUPPLY ALIGNMENT PROCEDURE

The Model 6115-01, Model 6116-01 and Model 6119-01 High Voltage Power Supply has four output voltages of which three are adjustable.

1. 25,000 Volts (Anode Voltage)
2. 7,000 Volts (Focus Voltage)
3. 450 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.

ANODE AND G2 VOLTAGE ADJUSTMENT PROCEDURE

EQUIPMENT REQUIRED:

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

PROCEDURE:

1. This procedure requires removal of unit enclosure or top cover.
2. Connect three equal length BNC cables from the video generator or test source RGB analog outputs to the Model 6119 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.
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 25 Volts (25,000 Volts Actual) on the multimeter.
6. To adjust the G2 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 +0.45 Volts (450 Volts Actual) on the multimeter.
8. After adjusting anode voltage it will be necessary to adjust focus voltage.

FOCUS VOLTAGE ADJUSTMENT PROCEDURE

EQUIPMENT REQUIRED:

1. Astro Designs VG809 or equivalent that provides single pixel line or character widths.
2. Insulated 1/4" straight screwdriver or adjustment tool.
3. BNC cables as required.

PROCEDURE:

1. This procedure requires removal of unit enclosure or top cover.
2. Connect three equal length BNC cables from the video generator or test source RGB analog outputs to the Model 6115, Model 6116 or Model 6119 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" pot on the top of the High Voltage Power Supply for the best "average" sharpness across the screen. Since the Model 6115, Model 6116 and Model 6119 does not have dynamic focus, it is not possible to get a uniform sharpness of image across the screen. The variation is so slight that an acceptable compromise is easily attained.
6. Should it be necessary to verify or adjust the anode voltage and/or the G2 voltage the procedure in the Anode And G2 Voltage Adjustment Procedure section.

VIDEO AMPLIFIER ALIGNMENT PROCEDURE

The Model 6115, 6116 and 6119 Video Amplifiers provide start-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 later. Replacement of either the High Voltage Power Supply or one or more Video Amplifier Module requires only a partial procedure which will be presented here first.

EQUIPMENT REQUIRED:

1. Astro Designs VG 809 test pattern generator or equivalent.
2. Minolta TV2130 Colorimeter or equivalent.
3. BNC cables as required.
4. Insulated 1/4" straight screwdriver or adjustment tool.

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 front panel Brightness and Contrast controls fully CW.

3. Adjust BLACK level for 2% brightness on corresponding color.
4. Set Video generator for 100% flat field.
5. Adjust GAIN pot for 100% brightness on the corresponding color.

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 front panel Brightness and Contrast pot full CW.
 - e. Set generator for 20% flat white field.
 - f. Adjust sub-brightness pot on Mother Board so that the Minolta registers the hottest gun at 2%.
 - g. Adjust the two remaining BLACK Level pots so that the Minolta registers 2%.
2. COLOR COORDINATE AND LUMINOUS ALIGNMENT
 - a. Set color-bar level on VG809 to 255.
 - b. Adjust all GAIN pots until a reading of 100% is observed on the TV-2130.
 - c. Set color-bar level on VG809 to 51.
 - d. Adjust the G1 pot on Mother Board until a reading of 20% is obtained on the hot gun.
 - e. Adjust BLACK level pots on the two remaining amps until 2% is observed on the TV-2130.
 - f. Repeat the above steps until all three video amps match at 100% and at 2%.
 - g. Set VG809 to color-bar level of 255.
3. COLOR TRACKING ALIGNMENT
 - a. Ensure that front panel Brightness and Contrast controls are completely CW.
 - b. Note luminous level for one gun (approximate 100%).
 - 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 6119-0108-03)

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

CAUTION! Replacing the Cathode Ray Tube 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 Cathode Ray Tube (CRT) before beginning replacement.

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

1. Turn Off a.c. power at the front panel.
2. Disconnect the monitor a.c. power cord and all 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 four screw and sliding the enclosure to the rear. If you choose to place the monitor on its face to accomplish this, make sure the working surface is soft to avoid scratching the CRT face plate and the plastic bezel.

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

6. Remove the top metal shield.
7. Connect the chassis to earth ground.
8. 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.

9. Attach the other end of the clip lead to the metal shaft of the screwdriver.
10. 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.
11. Remove the anode connection from the CRT.
12. Disconnect the CRT connector board from the CRT base connector.

CAUTION! The monitor must be in the normal upright position for the following steps. It may help to have a 3/4 inch block of wood beneath the monitor as far forward as possible to take the weight of the monitor off the bezel. Care should be taken because the center of gravity is near the front of the monitor and it has a tendency to tip forward.

13. 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.
14. Remove the four screws mounting the front bezel to the metal chassis.
15. Carefully remove the bezel forward from the chassis. This is easier said than done. However, careful manipulation will have a successful conclusion.
16. Once removed, the bezel will remain attached to the monitor chassis by the front panel controls assembly. Remove the two 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 chassis assembly around the CRT 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. Place the monitor in an upright position with the block of wood underneath.
22. Install the front panel control assembly to the plastic bezel. Position the assembly such that the controls move freely within the plastic before tightening screws.
23. Install the bezel assembly onto the chassis assembly and secure with the four Phillips head screws.

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 6115, 6116 & 6119 Operation and Maintenance Manual.
29. Replace the perforated metal shield top cover onto the chassis.
30. Place the monitor on its face on a soft surface and install the rear plastic cover. Secure with four Phillips head screws.
31. Pat yourself on the back and take the rest of the day off.

APPENDIX A

LIST OF ACRONYMS

LVPS	Low Voltage Power Supply
HVPS	High Voltage Power Supply
CRT	Cathode Ray Tube
G1	Grid 1
G2	Grid 2
SYNC	Synchronization Pulse
RGB VIDEO	Red, Green & Blue Video