

Installation and Service

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MODEL 1200
DIGITAL PRODUCTION SWITCHER

Customer Service Information

Address

Mail:
P.O. Box 1114
Grass Valley, CA 95945

Shipping Only:
400 Providence Mine Rd
Nevada City, CA 95959

Telephone

Tektronix, North America: (800) 547-8949

Tektronix, UK: 44-1628-403699

Tektronix, Hong Kong: 852-2593-5500

Tektronix, Brazil: 55 11 3741-8417

Tektronix, Mexico: 52 5 666-6333

Elsewhere: Distributor or sales office from whom equipment was purchased

Fax: (916) 478-3181

Note that as of November 1, 1997 the FAX number changes to (530) 478-3181

E-Mail: gvgservice@tek.com

Tektronix World Wide Web


<http://www.tek.com>

Related Publications

1200 Manual Set	TP0713
Quick Reference Guide	TP0714
Installation & Service	TP0715
Operation Manual	TP0716

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Tektronix, Inc., Video and Networking Division, P.O. Box 1114 Grass Valley, California 95945 U.S.A. □
Telephone (916) 478-3160



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Important Safeguards and Regulatory Notices

Information on the following pages provides important safety guidelines for both Operator and Service Personnel. Specific warnings and cautions will be found throughout the manual where they apply, but may not appear here. Please read and follow the important safety information, noting especially those instructions related to risk of fire, electric shock or injury to persons.



WARNING

Any instructions in this manual that require opening the equipment cover or enclosure are for use by qualified service personnel only. To reduce the risk of electric shock, do not perform any servicing other than that contained in the operating instructions unless you are qualified to do so.

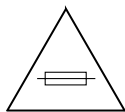
Symbols and Their Meanings



The lightning flash with arrowhead symbol, within an equilateral triangle, alerts the user to the presence of “dangerous voltage” within the product’s enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.



The exclamation point within an equilateral triangle alerts the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.



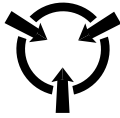
The fuse symbol indicates that the fuse referenced in text must be replaced with one having the ratings indicated.



This symbol represents an internal protective grounding terminal. Such a terminal must be connected to earth ground prior to making any other connections to the equipment.



This symbol represents an external protective grounding terminal. Such a terminal may be connected to earth ground as a supplement to an internal grounding terminal.



CAUTION

This equipment contains static sensitive components. Use anti-static grounding equipment whenever handling or servicing modules and components. When circuit modules are removed from the frame, place them on a flat static controlled surface. Failure to follow this precaution can result in component damage due to electrostatic discharge.

Warnings

- Heed all warnings on the unit and in the operating instructions.
- Do not use this product in or near water.
- Disconnect AC power before installing any options.
- This product is grounded through the grounding conductor of the power cord. To avoid electrical shock, plug the power cord into a properly wired receptacle before connecting the product inputs or outputs.
- Route power cords and other cables so that they are not likely to be damaged.
- Disconnect power before cleaning. Do not use liquid or aerosol cleaners; use only a damp cloth.
- Dangerous voltages exist at several points in this product. To avoid personal injury, refer all servicing to qualified personnel.
- Do not wear hand jewelry or watches when troubleshooting high current circuits, such as the power supplies.
- During installation, do not use the door handles or front panels to lift the equipment as they may open abruptly and injure you.
- To avoid fire hazard, use only the specified correct type, voltage and current rating as referenced in this service manual.
- To avoid explosion, do not operate this product in an explosive atmosphere unless it has been specifically certified for such operation.
- Have qualified personnel perform safety checks after any completed service.
- To avoid electrical shock hazard, do not open covers or access doors. Dangerous voltages are present even with the AC power switch in the OFF position.

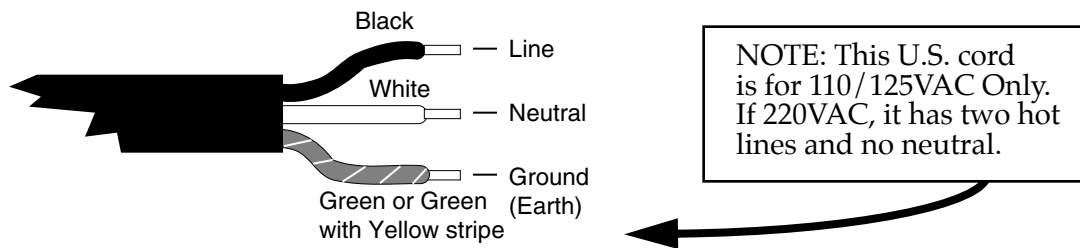
Cautions

- To prevent damage to equipment when replacing fuses, locate and correct the trouble that caused the fuse to blow before applying power.
- Verify that all power supply lights are off before removing the power supply or servicing equipment.
- Use only specified replacement parts.
- Follow static precautions at all times when handling this equipment.
- Leave the back of the frame clear for air exhaust cooling and to allow room for cabling. Slots and openings in the cabinet are provided for ventilation. Do not block them.
- The front door is part of fire enclosure and should be kept closed during normal operation.
- To prevent damage to this equipment read the instructions in this document for proper input voltage range selection.
- Circuit boards in this product are densely populated with surface mount and ASIC components. Special tools and techniques are required to safely and effectively troubleshoot and repair modules that use SMT or ASIC components. For this reason, service and repair of GVG products incorporating surface mount technology are supported only on a module exchange basis. Customers should not attempt to troubleshoot or repair modules that contain SMT components. GVG assumes no liability for damage caused by unauthorized repairs. This applies to both in- and out-of-warranty products.

North American Power Supply Cords

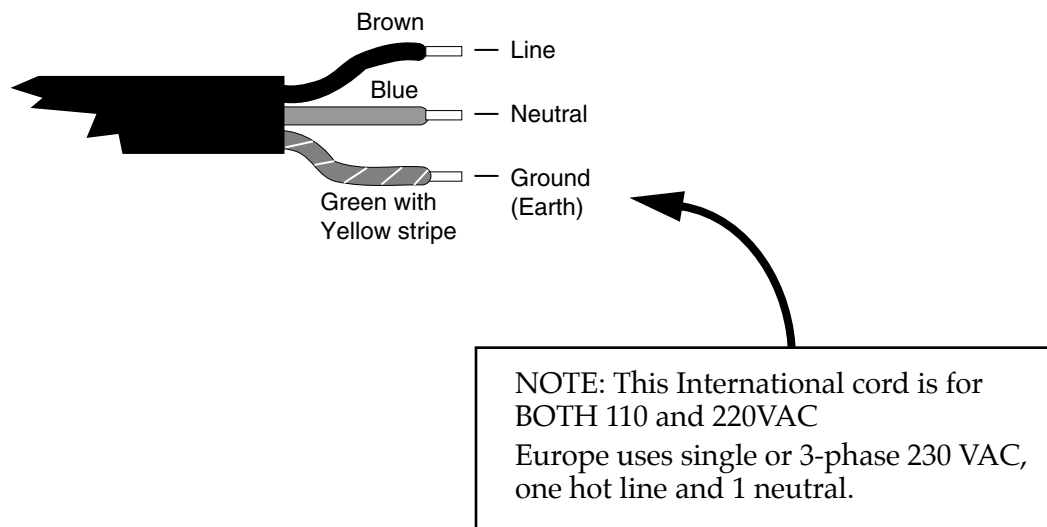
Each power cord for this equipment is supplied with a molded grounding plug at one end and a molded grounding connector (IEC 320-C13) at the other end. Conductors are color coded white (neutral), black (line), and green or green/yellow (ground).

Operation of this equipment at voltages exceeding 130 VAC will require power supply cords which comply with NEMA configurations.



International Power Supply Cord

Each power cord for this equipment is supplied with a molded grounding connector (IEC 320-C13) at one end and stripped leads (50/5 mm) at the other end. Conductors are CEE color coded, light blue (neutral), brown (line) and green/yellow (ground). Other IEC 320 C-13 type power supply cords can be used if they comply with the safety regulations of the country in which they are installed.



EMC Regulatory Notice

Federal Communications Commission (FCC) Part 15 Information

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference.
- (2) This device must accept any interference received including interference that may cause undesirable operations.

5389/336/EEC EMC Directive

EN500081-1

EN55022

WARNING

This is a Class A product. In a domestic environment this product may cause radio interference, in which case the user may be required to take adequate measures.

1

System Overview

Introduction

Welcome to the Model 1200 Service manual. This manual will help you become familiar with the Model 1200 Component Digital Production Switcher, install it in your facility, and maintain it in good operating condition. In order to get the most out of this manual, we suggest you follow these steps:

- Read this section to gain an overview of the system and its components.
- Read Section 2–Installation completely. Then return to the beginning of the section and follow the instructions step by step to set up the switcher in your studio.
- Skim Section 3–Functional Description to gain a deeper understanding of the overall design of the system.
- Read Section 4–Maintenance to become familiar with routine maintenance requirements and the diagnostic tools available to you.

Section Contents

This section of the Service manual contains the following information:

- Model 1200 Physical Description—page 1–2
- Model 1200 Features and Options—page 1–3
- Model 1200 Functional Overview—page 1–6
- Model 1200 System Specifications—pages 1-8 through 1-12

Model 1200 Physical Description

The Model 1200 Switcher (Figure 1-1) consists of two main assemblies: the Control Panel and the Signal Processor Frame. The frame contains the input/output options (back of frame), the video and key processing boards, the system control processor, and the frame power supply. A single data cable connects the panel to the frame.

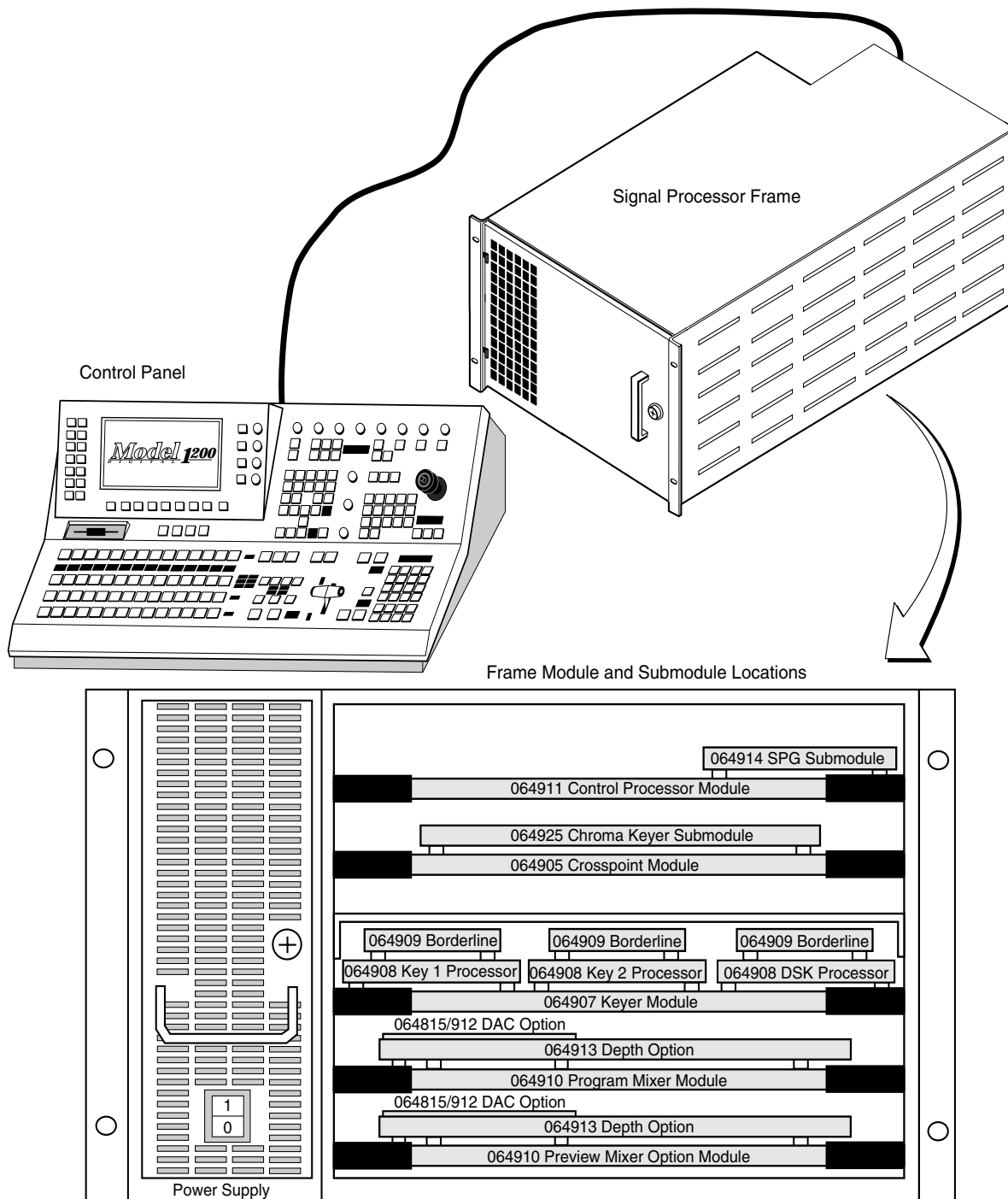


Figure 1-1. Main Assemblies of the Model 1200 Digital Production Switcher

Model 1200 Features and Options

The Model 1200 Component Digital Production Switcher carries forward the legacy of the industry-standard Model 100/110. Yet the Model 1200 is a powerful advance over its analog predecessor, both because of many new features and because of the tremendous advantage of digital video. Features of the Model 1200 are listed on the following pages.

Inputs

- Up to 16 optional component digital video or key inputs.
- Inputs come in parallel or serial pairs and consist of submodules that plug into the back of the frame and are secured by screws.
- Autotiming automatically times each input for 525 or 625 line to match an External Reference. There is no timing adjustment if inputs fall within a range of $\pm 24 \mu s$ (336 clocks).
- Inputs may be custom-mapped to crosspoints using the menu system.
- Inputs can be set for 8 or 10 bits, shaped or unshaped video, key, key with depth, or the video input can be assigned to a key.
- Processing amplifier can be adjusted and remembered for each crosspoint column.

Effects System

- Ten-bit component digital format for unparalleled signal quality and virtually unlimited effects layering.
- Ten Crosspoint Switching Buses: Program Background, Preset Background, Key 1 Source and Fill, Key 2 Source and Fill, DSK Source and Fill, Auxiliary 1, and Auxiliary 2.
- Transitions include cut, lever arm, key out, fade to black, and frame-accurate effects and downstream keyer auto transitions
- Wipe/mask system includes patterns adjustable for H and V multiples, position, aspect, matte edge color, width, softness, rotation, symmetry, and modulation.
- Many internal mattes: background matte, matte fill for each keyer, matte for each Borderline mode, wipe edge matte, preset pattern edge matte, and mattes generated by specific crosspoints when enabled using the terminal.
- Program Mixer is standard. Preview Mixer is optional.

Keyers

- One effects keyer and one downstream keyer (DSK) standard. A second effects keyer is optional.
- Each keyer is a self-contained submodule that mounts on the Keyer Board. Keyers can be swapped for troubleshooting.
- Each keyer creates luminance, linear, and preset pattern keys from any Key Bus input. Keys can be split (separate source and fill crosspoints).
- One Chroma Keyer option submodule mounts on the Crosspoint Board and can be assigned to any of the three keyers. Can create a chroma key from any Key Bus input and includes its own adjustable force box mask.
- Effects backgrounds and keys can be transitioned on or off separately or simultaneously.
- Separate DSK controls include cut, frame-accurate automatic mix, and frame-accurate to black.
- Keys can be inverted and masked, and key layers can be adjusted for layer opacity and edge softness.
- Selectable priority (which effects key layer appears over the other).
- Effects Send enables flying switcher luminance/linear keys, chroma keys, and preset patterns over switcher backgrounds using an external DPM. (Effects Send / Aux Output option required.)
- Z-Key™ Depth option submodule mounts on Program or Preview Mixer Board and allows keying from Graphics Factory or Kaleidoscope depth inputs. Depth is adjustable.
- Optional Borderline® Key Edger submodule mounts on each keyer submodule and adds borders, drop shadows, outlines, or extrusions to key effects. Up to three options may be installed (one per keyer).

Interfacing

- A single interconnecting cable carries data between the frame and the control panel.
- Ports may be programmed for various protocols, baud rates, etc.
- Contact-closure GPI interface includes 8 inputs for external triggering of switcher operations and 8 outputs for switcher triggering of other devices. GPI Outputs can be synchronized with switcher transitions. All GPIs, inputs and outputs, are programmable to be activated from a wide range of switcher events.
- Sixteen tally relay outputs corresponding to the 16 video/key inputs.
- Optional Satellite Auxiliary Bus Control Panel can be installed at a remote location for remote control of Auxiliary Buses.

E-MEM Effects Memory System

- Twenty panel-operated E-MEM[®] registers store and recall effects and transitions.
- Storage of auto transitions as well as effects in a single register. Effect is recalled first, followed by the specified transition(s).
- Built-in floppy drive saves E-MEM register contents and switcher configuration data to floppy disk. Also allows easy loading of software updates from floppy disks.

Outputs

- All outputs are optional. Digital output options consist of submodules that plug into the back of the frame and are secured by screws. Analog output options use existing BNCs on the back of the frame.
- Optional parallel digital or serial digital video outputs may include PGM 1, PGM 2, PGM KEY 1, PGM KEY 2, PVW, CLEAN FEED, AUX OUT 1 (SEND 1), and AUX OUT 2 (SEND 2). Submodules containing the output circuits and connectors plug into slots in the back of the frame.
- Optional Analog Output submodules for the Program and Preview Mixers deliver PGM and PVW component analog outputs to existing frame BNC connectors. Outputs can be set by the user for YUV, RGB, or Y/R-Y/B-Y format.
- PGM output delay relative to reference input is 63 μ s, nominal.

Miscellaneous

- A keyboard is required to assign Signal and Crosspoint names and to access the menu diagnostics. Use either a keyboard acquired from Grass Valley (Marquardt Mini Board Keyboard #EA2452) or a standard PC/AT keyboard. The keyboard requires an adaptor (CA4216) which is included with the Model 1200.
- Optional look-ahead preview system consists of a Preview Mixer Board that installs in the bottom slot in the front of the frame.
- A built-in power supply resides inside the frame. No mounting or interconnection is required. The power supply provides D.C. power to the frame. It provides .99 Power Factor Correction in compliance with European requirements; prevents peaks from tripping circuit breakers and reduces harmonics.
- A power supply resides inside the control panel.
- Automatic 525/625 standard selection based on reference input.

Model 1200 Functional Overview

The Model 1200 architecture (Figure 1-2) consists of a single mix/effects system with two keyers and a downstream keyer. Video inputs selected on the background crosspoint buses enter a pair of program and preview mixers. Video and key inputs selected on the key crosspoint bus are first processed in the keyer circuits.

If effects send mode is off, the keyer outputs go directly to the mixers, and any aux bus selections go directly to the aux outputs. If effects send mode is on, the source and fill outputs of one of the keyers are routed via the aux bus outputs to a DPM.

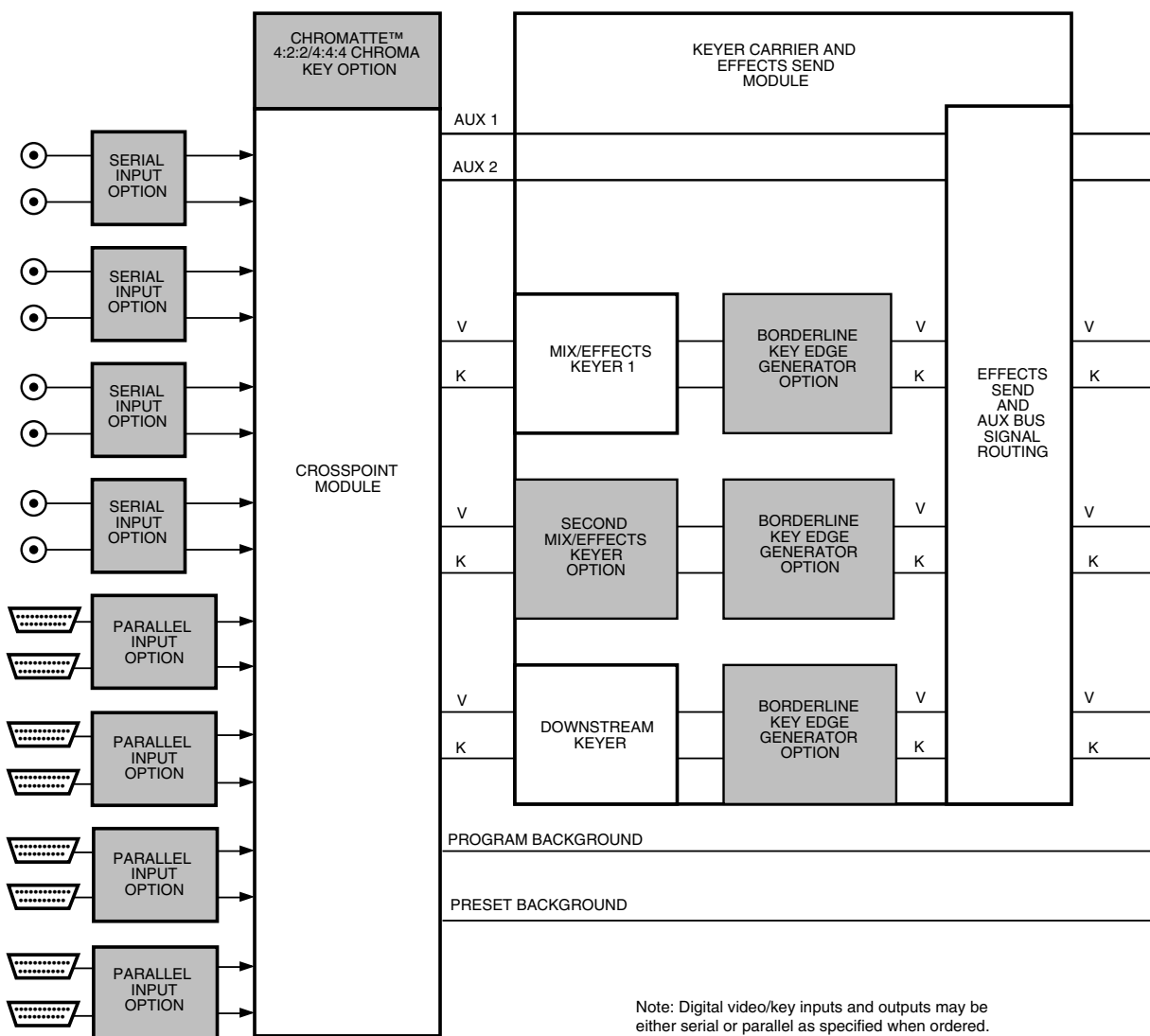
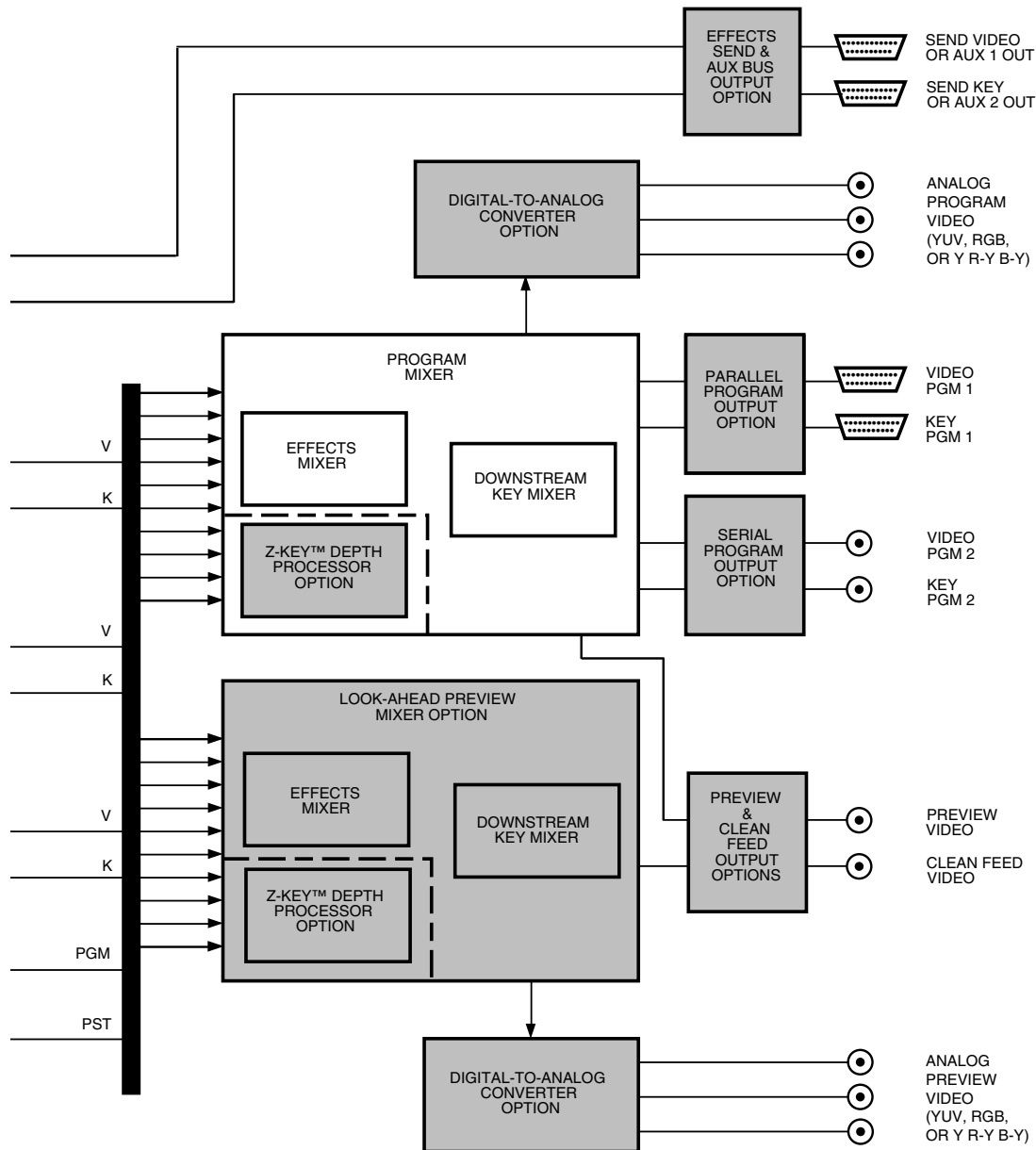


Figure 1-2. Model 1200 Simplified Functional Block Diagram

The aux buses automatically select the manipulated key and fill inputs returning from the DPM and apply them to the corresponding mixer.

The mixers multiply the processed background and key signals to produce mixed effects video. The effects video enters the downstream key mixers where the DSK signal is mixed over the effects layer. The final output signals then pass through output processing to the various analog, serial component digital, and parallel component digital outputs.



Model 1200 System Specifications

Model 1200 specifications are listed in Table 1-1. The specifications for the Model 1200 are subject to change without notice.

Table 1-1. Model 1200 System Specifications

Parameter	Value
Environmental Characteristics	
Operating Ambient Temperature Range	0 - 40° C (32 - 104° F)
Ambient Temperature for Specifications	20 - 30° C (68 - 86° F)
Relative Humidity	95% Maximum (Non-Condensing)
Frame Mechanical Specifications	
Depth	24.8 inches (630 mm)
Width	Std 19 inches (483 mm)
Height	10.25 inches (260 mm)
Rack Units	6
Weight	80 lbs. (36.3 kg)
Control Panel Mechanical Specifications	
Depth	17.42 inches (443 mm)
Width	29.00 inches (260 mm)
Height	10.66 inches (260 mm)
Weight	48 lbs. (21.8 kg)
Frame Power Specifications	
Power	400 Watts Maximum 99PFC
Voltage	100-240 VAC autoranging
Frequency	50-60 Hz

Table 1-1. Model 1200 System Specifications - (continued)

Parameter	Value
Control Power Specifications	
Power	200 Watts Maximum
Voltage	90-135 VAC & 180-265 VAC (Manual)
Frequency	50-60 Hz
Analog External Reference Input Video	
Input Type	Analog 525 lines, 60 Hz vertical rate or Analog 625 lines, 50 Hz vertical rate
Impedance	75 ohms, BNC, Bridging
Input Signal Level	1 volt pp with sync and burst
Return Loss	> 36 db to 5 MHz
Parallel Digital Input Characteristics	
Inputs Per Module	2
Connector	25 Pin Female D Type with Screw Locks
Input Impedance	110 ohms \pm 10%, terminating
Autotiming Range	\pm 24 μ S
Maximum Cable Length Without External Equalization	15 Meters (50 feet)
Number Of Bits	10 or 8 (Selectable)
Auxiliary Data	Auxiliary data is blanked
Serial Digital Input Characteristics	
Inputs Per Module	2 (two) 75 ohm BNC
Return Loss	> 15 dB 5MHz to 270 MHz
Autotiming Range	\pm 24 μ S
Maximum Cable Length Without External Equalization	300 Meters (984 feet) using Belden 8281
Number Of Bits	10
Auxiliary Data	Auxiliary data is blanked

Table 1-1. Model 1200 System Specifications - (continued)

Parameter	Value
Analog CAV Output Characteristics	
Number Of Outputs	1 PGM, 1 PVW (both optional)
Luminance	1.0 Volt pp with sync
Color Difference	350 mV pp bipolar
DC On Output Blanking Level	< 50 mV
Output Return Loss	> 40 dB to 5 MHz
Output Y/C Timing Error	< 10 ns
Number Of Outputs	3
Number Of Outputs	1 PGM, 1 PVW (both optional)
Parallel Digital Output Characteristics	
Number Of Outputs Per Module	2
Connector	25 Pin Female D Type with Screw Locks.
Output Impedance	110 ohms \pm 10%
Output Amplitude	800 mV pp, terminated
DC Level On Output	< 50 mV
Number Of Bits	8 or 10 bits (Selectable)
Maximum Cable Length	15 meters (50 feet)
Auxiliary Data	Auxiliary data is blanked

Table 1-1. Model 1200 System Specifications - (continued)

Parameter	Value
Serial Digital Output Characteristics	
Outputs Per Module	2 (two) 75 ohm BNC
Return Loss	> 15 dB 5MHz to 270 MHz
Output Amplitude	800 mV pp terminated
DC Level On Output	< 50 mV
Rise and Fall Time	Between 0.75 ns and 1.5 ns
Maximum Cable Length	300 meters (984 feet) using Belden 8281
Number Of Bits	10 bits
Aux Data	Auxiliary data is blanked
Video System Characteristics (Analog Out)	
Frequency Response	4 x 3 Aspect: 0.2 dB to 5.5 MHz, -60 dB above 8.0 MHz 16 x 9 Aspect: 0.2 dB to 7 MHz, -60 dB above 10.5 MHz
Group Delay Error	± 6 ns to 5 MHz
Field Rate Tilt	< 0.25%
K Factor (2t Pulse)	< 0.25%
K Factor (Bar)	< 0.25%
K Factor (Pulse to Bar)	< 0.25%
Signal/P-P Noise Ratio	> 60 dB unweighted, 5 MHz bandwidth
Line Time Non Linearity	< 0.5%
Gain Stability	1%
Y/C Delay	± 5 ns
Crosstalk	> 50 dB

Table 1-1. Model 1200 System Specifications - (continued)

Parameter	Value
Serial Digital Output Characteristics	
Maximum Number Of Inputs	16, parallel or serial digital
Blanking Width	10.222 microseconds (525 line) 10.666 microseconds (625 line)
Number Of Quantization Bits	10 minimum
Mix Tracking Error	1 LSB
Linearity During Mix	Linearity Is Not Affected By Mix
Frequency Response During Mix	Response Is Not Affected By Mix
Path Length	63 microseconds, nominal
Rounding Method (Digital Only)	Adaptive Bit Reduction™ (Patent Pending)

2 *Installation*

Introduction

This section describes the installation and setup of a Model 1200 Digital Switcher. The following main topics are discussed:

- Unpacking—page 2-2
- Information Required Before Installation—page 2-2
- Control Panel Installation—page 2-4
- Signal Processor Frame Installation—page 2-6
- Cable Routing—page 2-7
- Cabling Connections—page 2-8
- AC Power Connection and System Powerup—page 2-16
- System Setup—page 2-19
- Option Installation—page 2-34
- Analog Output Option Installation—page 2-36

Unpacking

The Model 1200 is packaged in several boxes:

- One containing the Signal Processor Frame
- One containing the Control Panel
- One containing the panel cable, power cord, pushbutton lens chips, keyboard adaptor cable, and instruction manuals

Check the contents of each box against the packing slip to ensure that you received everything that you ordered. If anything is missing or damaged, contact your supplier immediately.

Information Required Before Installation

Required Tools and Supplies

The following tools and supplies are required but not supplied:

- A standard PC/ AT keyboard or a keyboard acquired from Grass Valley (Marquardt Mini Board Keyboard #EA2452). The keyboard requires an adaptor (CA4216) which is included with the Model 1200.
- Assorted Screwdrivers: Flat-blade, Phillips, and T10 TORX (optional)
- Nutdriver and assorted sockets
- Drill and 5/32" or 4 mm bit for drilling holes to mount the panel
- Ten #6 screws, nuts, and washers for securing the panel to the desk
- Four #6-32 machine screws, nuts, and washers for securing the rear mounting brackets to the panel
- Four #6 screws, nuts, and washers for securing the rear mounting brackets to the desk
- Four suitable screws and nylon washers for securing the frame in the rack
- A mechanical lifting device or two or more people to lift the frame
- Video cables: serial 75 ohm BNC cables and parallel component digital video cables with male 25-pin D connectors
- Connectors and wiring: Male 25-pin D connectors, male 9-pin D connectors, plus wire and sheathing for assembling data cables

Summary of Installation Specifications

Helpful specifications are summarized below. For additional specifications, refer to the end of Section 1–System Overview.

- **Frame Dimensions:** 24.8" (630 mm) deep, 19" (483 mm) wide, 10.25" (260 mm) high.
- **Panel Dimensions:** 17.42" (443 mm) deep, 29.00" (736 mm) wide, 10.66" (271 mm) high.
- **Frame Power:** 400 Watts maximum, 100–240 Vac autoranging, 50–60 Hz.
- **Panel Power:** 200 Watts maximum, 90-135 & 180-265 Vac manual setting, 50–60 Hz.
- **Input Autotiming Range:** ± 24 microseconds (336 clocks).
- **Output Delay:** 63 microseconds relative to inputs (nominal).

Safety Requirements

To prevent injury or equipment damage, please read and follow the safety precautions listed below.



WARNING

The fully configured Model 1200 Signal Processor Frame weighs about 80 lbs (36 kg). Use appropriate equipment to support it during installation.



WARNING

To help protect users against electric shock, ensure that the Signal Processor Frame power supply is connected to earth ground via the ground wire provided in the AC power input cord.

CAUTION

To prevent static damage to sensitive electronic components, protect the Model 1200 Digital Switcher from static discharge: Touch the Frame before you remove any modules. This helps ensure that any potential difference between your body and the frame is dissipated. If you handle the modules or make any repairs to them, use a grounding strap, grounded mat, and grounded equipment.

Control Panel Installation

The control panel consists of a single unit which you can place on a desktop as shown in Figure 2-1 or flush mount in a console as shown in Figure 2-2. Be sure to leave room behind the panel for making cable connections and above the panel for opening the lid.

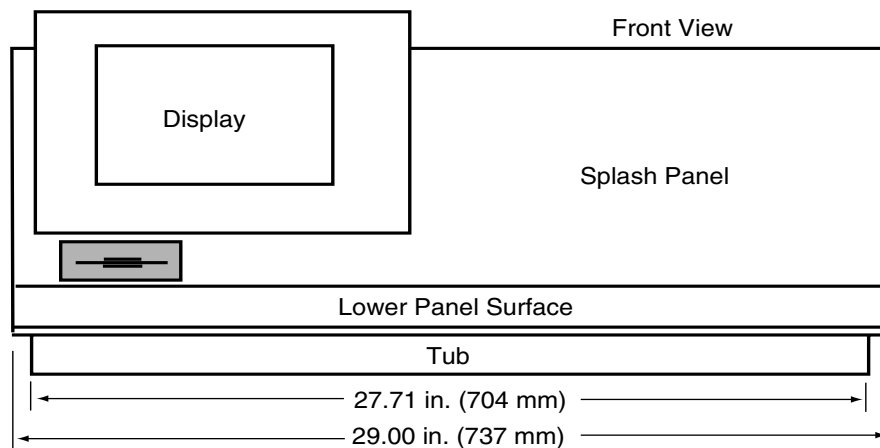
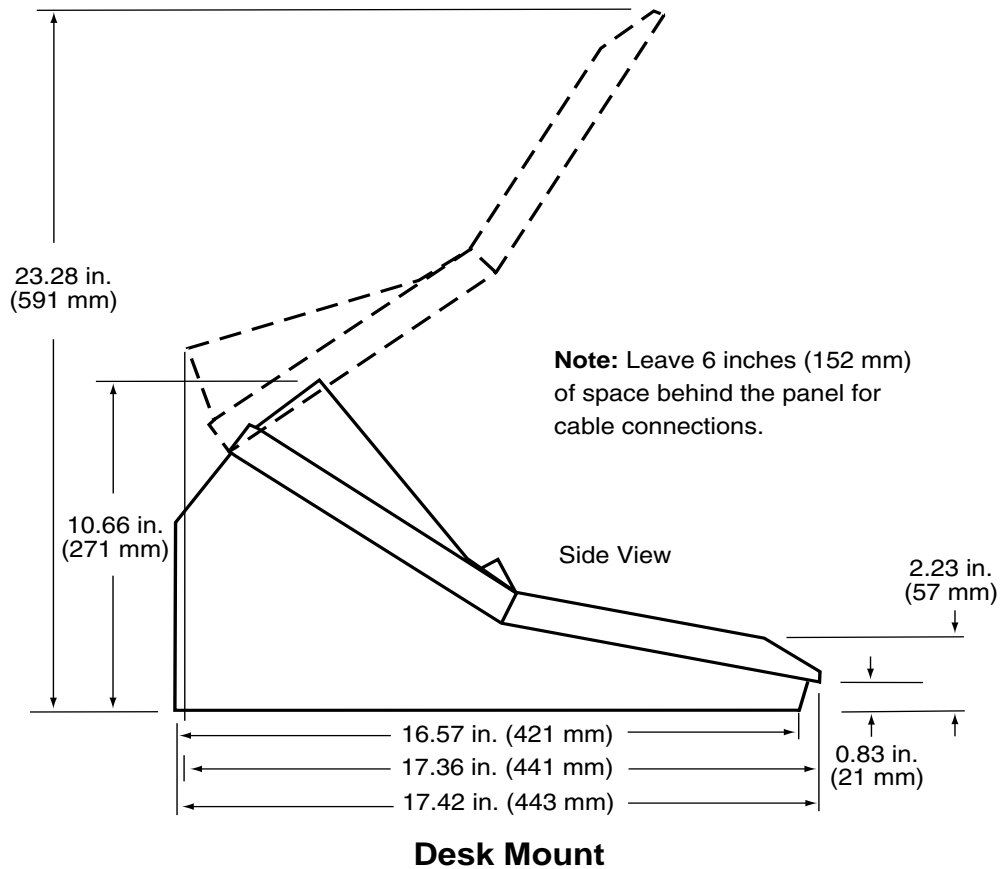
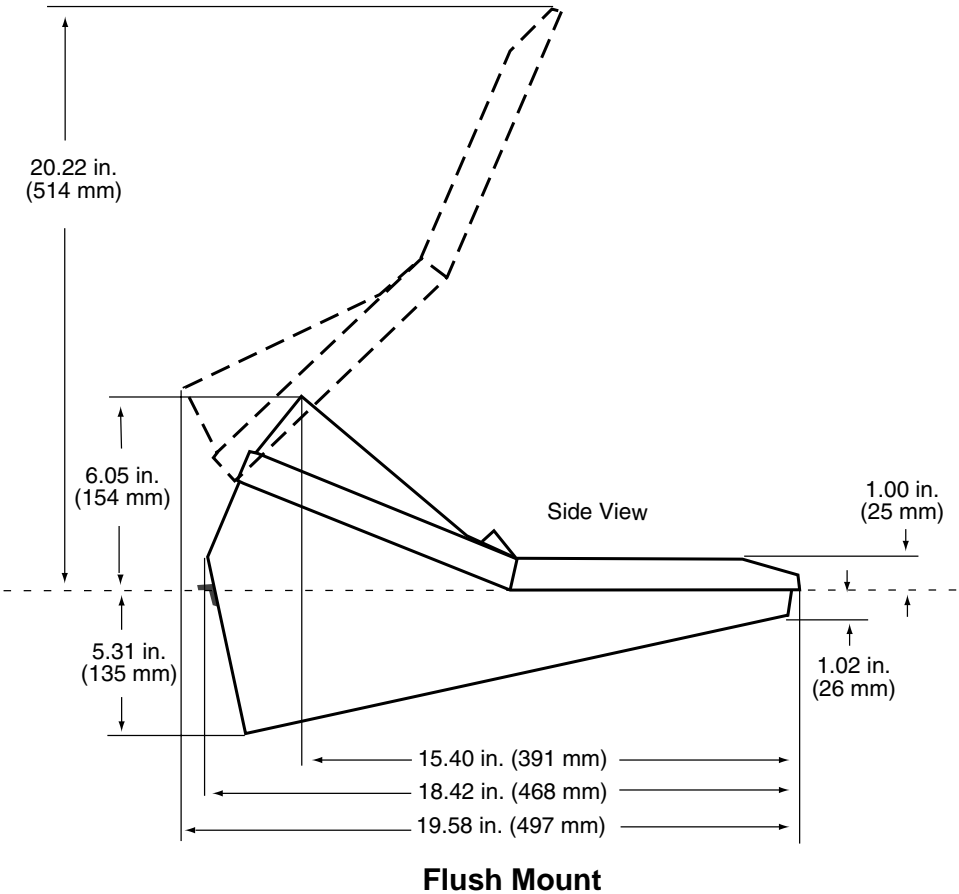


Figure 2-1. Control Panel Dimensions



Important: Install the mounting brackets on the rear of the panel using four #6-32 screws. Secure the brackets to the desk using four #6 wood screws. The mounting flange at the front is not capable of supporting the entire panel.

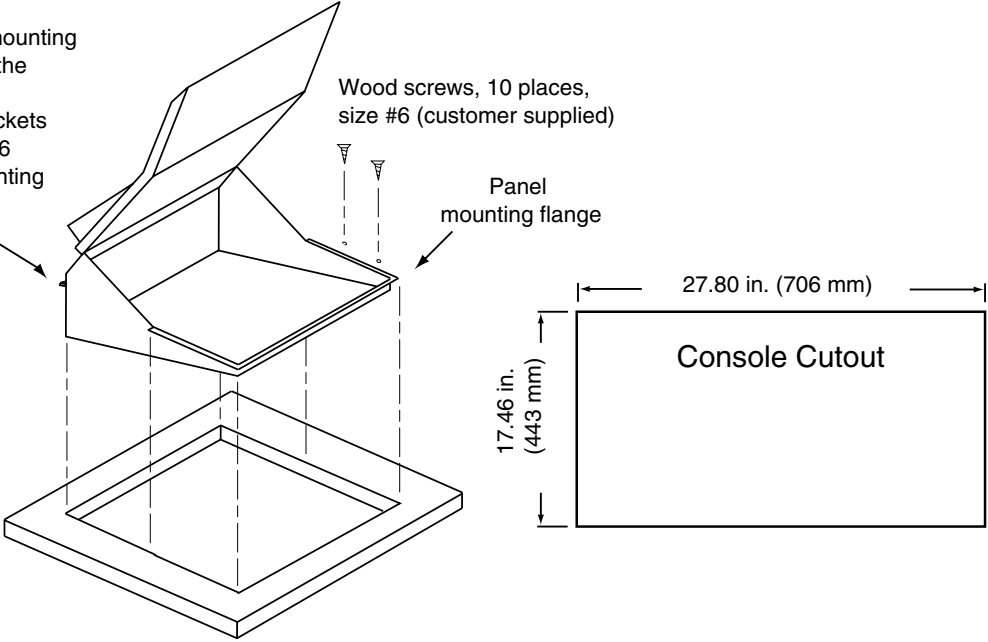


Figure 2-2. Dimensions for Flush-Mounting the Panel in a Console

Signal Processor Frame Installation

The Signal Processor Frame (assembly 094900) mounts in a standard 19-inch wide equipment rack and requires 6 rack units of vertical space. Install the frame into the rack from the front, and secure it at the front edges with screws and nylon washers (not supplied) and at the back with the supplied rear support plate and bracket. Refer to Figure 2-3 for details.

NOTE: Leave about 36 inches (914 mm) of open space in front and 18" (457 mm) or more behind the equipment rack to allow use of module extenders and to provide easy access to cables. Also leave open space at the sides for cooling air flow.

WARNING

The frame is heavy (about 80 lbs, 36 kg). To prevent injury, use a mechanical lifting device to lift the frame into position. Also secure the equipment rack to the floor to prevent it from toppling when the frame is installed.

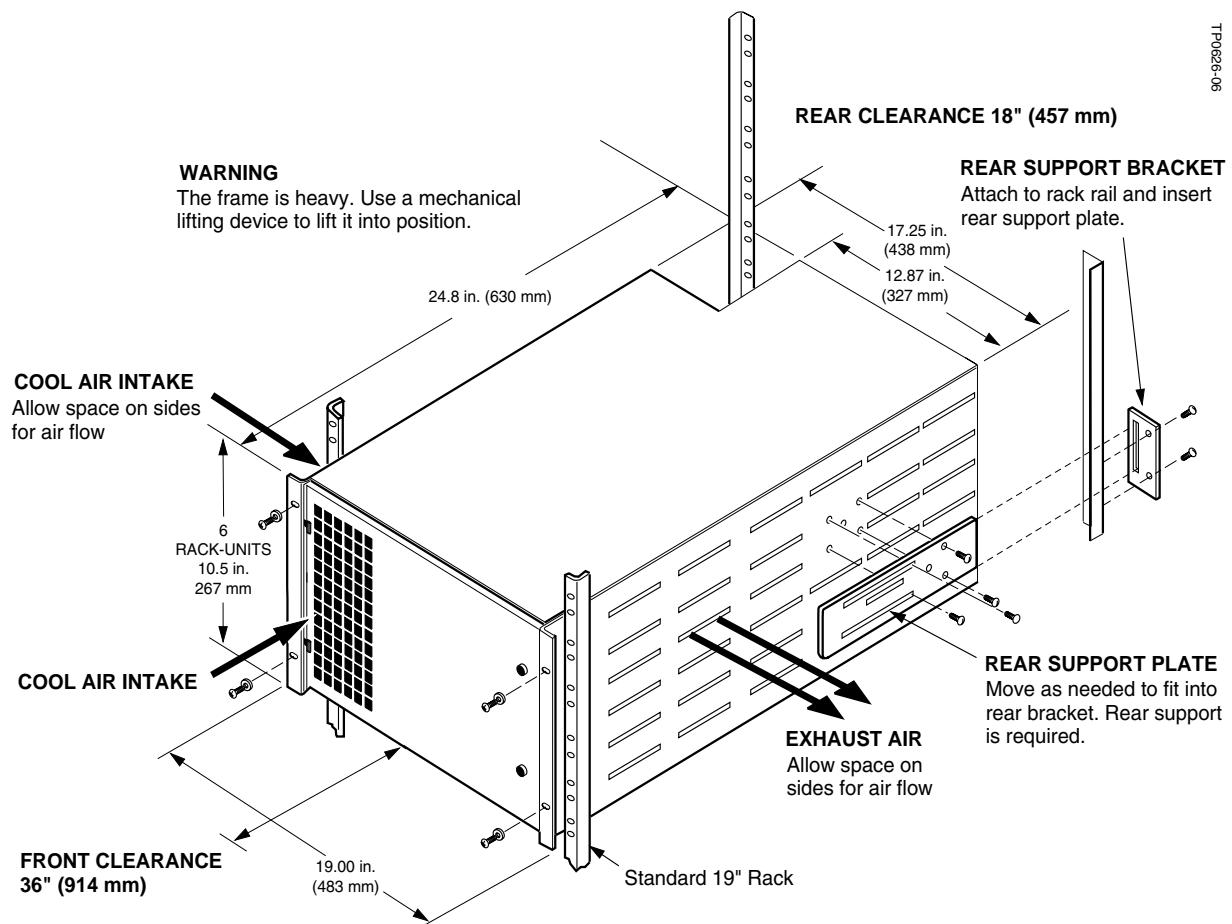


Figure 2-3. Installing the Signal Processor Frame in a Standard 19-inch Rack

Cable Routing

To ensure that the switcher complies with electromagnetic interference specifications, you must bundle the digital video and key input/output cables together and route them along the rack rails away from the analog video and data cables as shown in Figure 2-4.

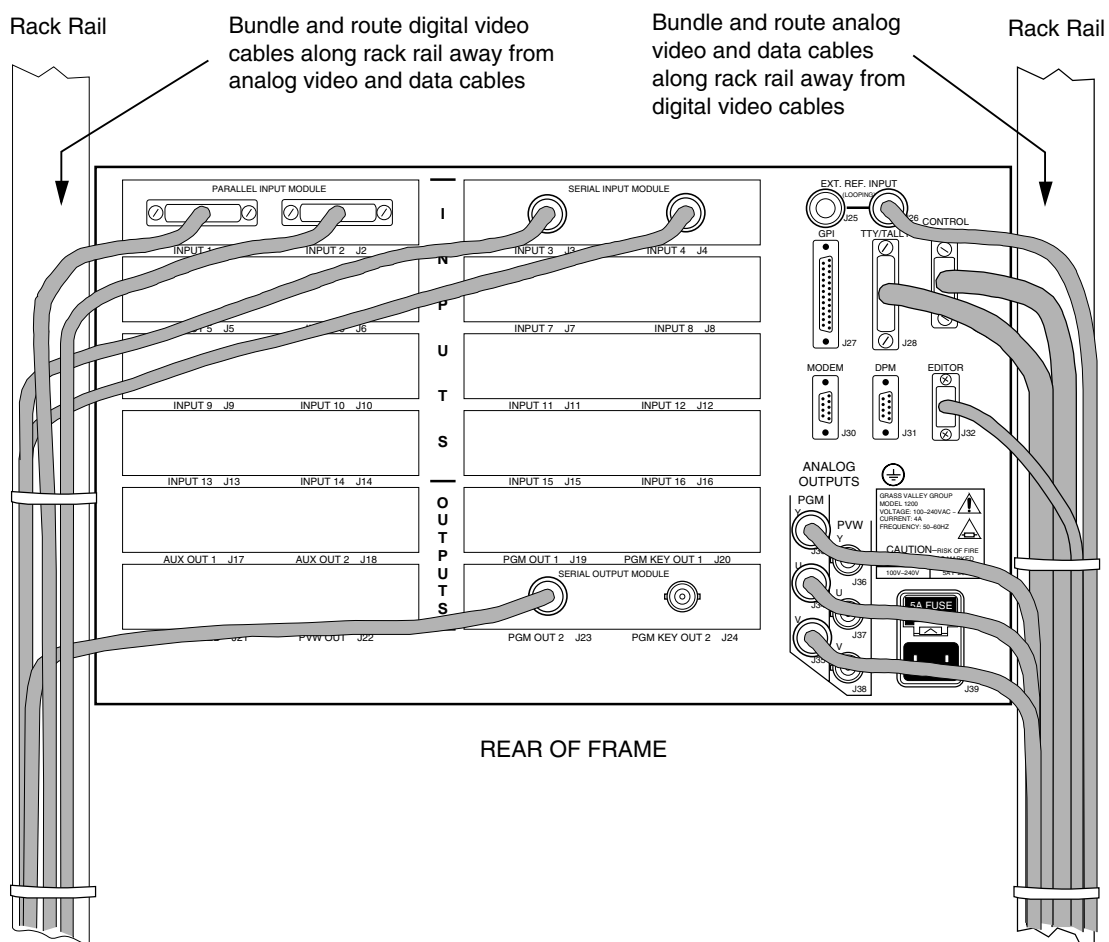


Figure 2-4. Proper Routing of Cables to the Frame

Cable Connections

Refer to Figure 2-5 and Figure 2-6 while following the instructions on page 2-10 through page 2-14, which explains how to cable the required connections for a Model 1200.

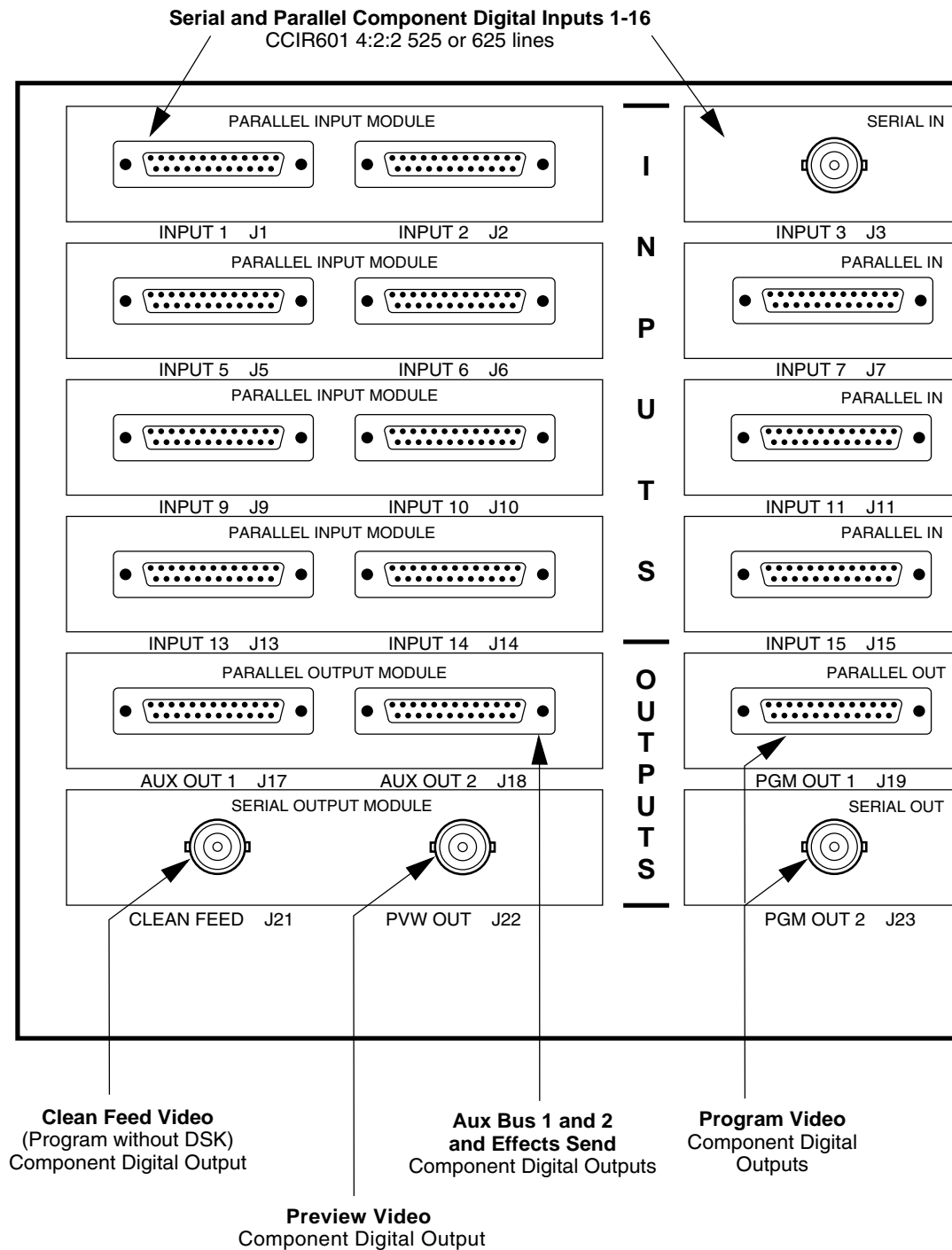
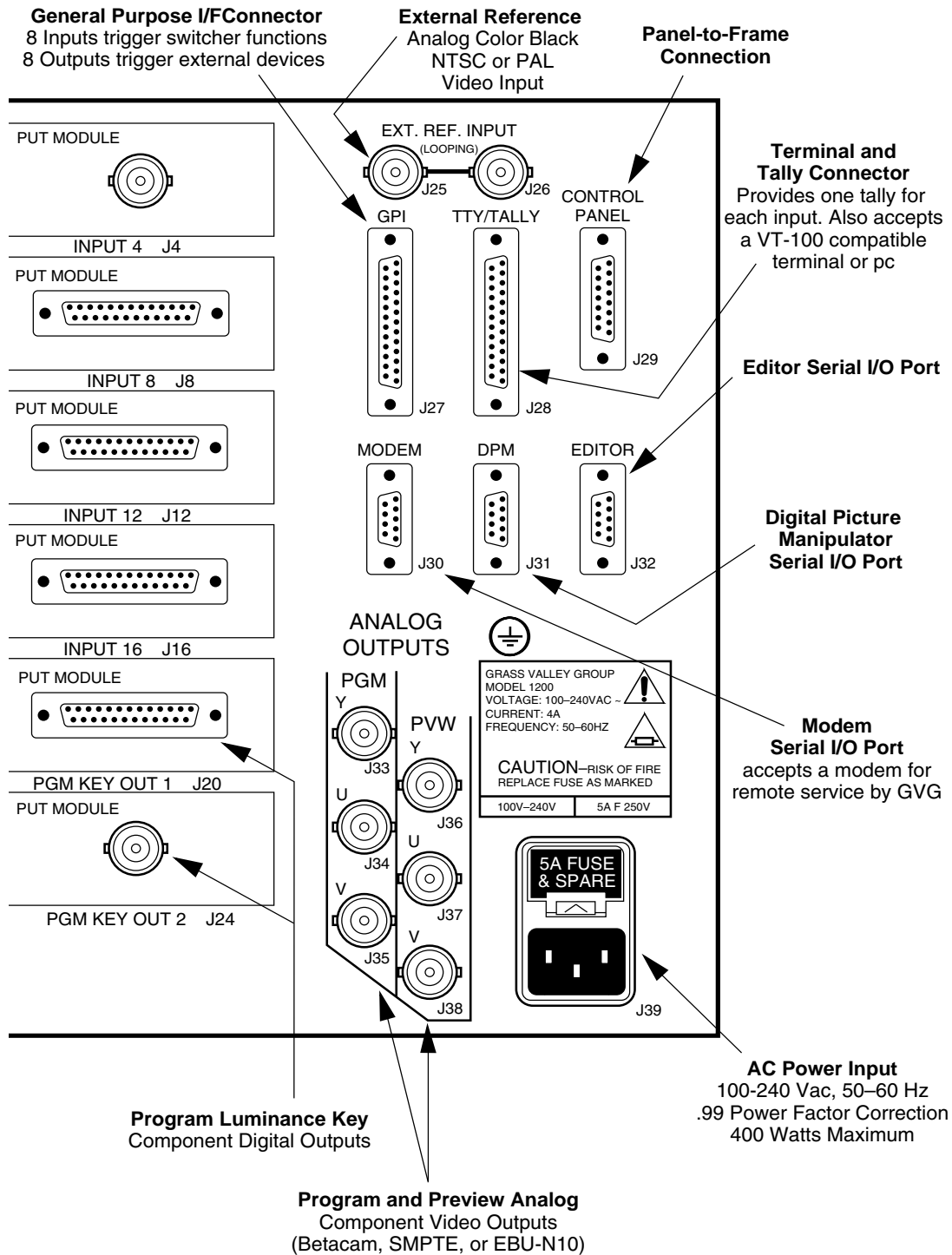


Figure 2-5. Model 1200 Frame Backplane



Control Panel J1 to Frame J29

Connect the supplied panel-to-frame control cable (assembly 054000) from panel connector J1 (see Figure 2-6) to frame connector J29. If installing a DPM-100/700 also, don't mix up the control cables because equipment damage can result.

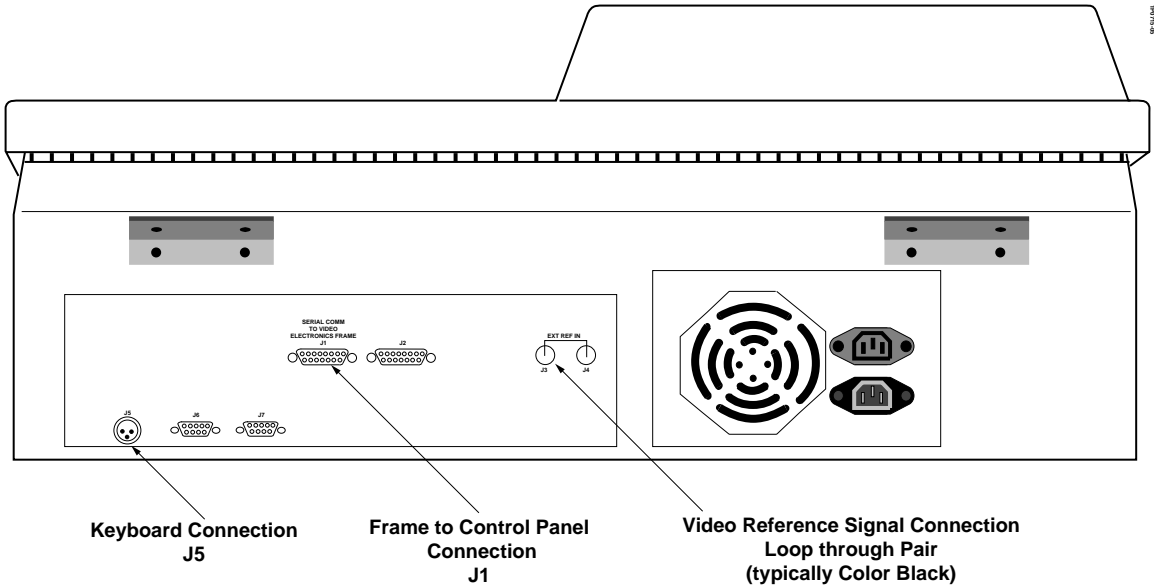


Figure 2-6. Rear of Control Panel

External Reference Input to Frame J25/J26 and Panel J3/J4

Connect a reference source of analog color black video to frame connector J25. Then connect a cable from frame connector J26 to panel connector J3 to loop the reference to the panel. Loop the reference from panel connector J4 to another destination or terminate J4 with a 75-ohm precision termination.

The External Reference Input serves as the timing reference for all video and key inputs to the switcher. The switcher senses the line rate (525 or 625) and timing of the reference, and then sets the system for that line rate and automatically times the inputs to match the reference.

Timing of the reference and the input timing window of the video inputs can be adjusted together in the menus. This allows switcher output timing to vary as needed to match other equipment in your system.

Digital Video and Key Inputs J1–J16

Digital video/key inputs J1–J16 conform to CCIR 601 4:2:2 component digital video standards and may be either serial or parallel, depending on which input options have been ordered.

Input signals may be either 525 or 625 lines but must match the line rate of the External Reference Input in order to function. All inputs are autotimed and do not require timing adjustment as long as they fall within a range of ± 24 microseconds. Inputs can be mapped to crosspoint columns, manually adjusted for timing, and set for 8 or 10 bits using the Configuration sub-menus. Refer to instructions on setting up the control panel configuration later in this section for details.

Video and Key Outputs J17–J24 and J33–J38

Connect the video and key outputs to any desired destinations. Output delay is approximately 63 μ s relative to the inputs. Digital outputs conform to CCIR 601 4:2:2 component digital video standards and may be either serial or parallel, depending on which output options have been ordered. All outputs match the line rate of the reference input (525 or 625). Because outputs are optional, some outputs mentioned here may not be present in your system.

Program (PGM) Output

The Program Output is the main signal output of the switcher. There may be up to three identical Program outputs: PGM OUT 1 J19 (parallel digital), PGM OUT 2 J23 (serial digital), and PGM ANALOG OUTPUTS J33–J35 (analog component).

Program Key Output

The Program Key Output is a luminance key signal derived from the Program video output. There may be up to two identical Program Key outputs: PGM KEY OUT 1 J20 (parallel digital) and PGM KEY OUT 2 J24 (serial digital).

Preview (PVW) Output

The Preview Output, which is available only if the Preview Mixer and a Preview Output option are installed, shows what the switcher output will look like after the next transition occurs. Up to two identical outputs are available: PVW OUT J22 (serial digital) and PVW ANALOG OUTPUT J36–J38 (analog component).

Clean Feed Output

The Clean Feed Output J21 (serial digital) consists of PGM video minus the downstream key.

Aux Bus/Effects Send Outputs

AUX OUT 1 J17 and AUX OUT 2 J18 provide outputs (parallel digital) for Aux Buses 1 and 2, respectively, if the Aux Output option is installed. When Effects Send mode is selected, J17 provides the Effects Send Key Output, and J18 provides the Effects Send Fill Video Output.

Serial Ports J28, J30, J31, J32

The 9-pin serial interface ports may be used interchangeably for connection to a number of serial devices as explained below. Cables and connectors are not supplied, except for the Satellite Aux Panel.

For details about how to set the communication standard, protocol, and baud rate for each port, see the instructions for setting serial port jumpers and for using the terminal to set up serial ports later in this section.

Modem Connection

A modem typically connects to port J30 but can be connected to any port except J29. The communication settings are RS-232, Modem protocol, 9600 baud, 8 bits, 1 stop bit, no parity.

Editor Connection

An editor typically connects to J32 but can be connected to any port except J28. For a Grass Valley editor, use a standard serial cable and set the port for RS-422, Grass Valley 1200 Protocol, 38.4K baud, 8 bits, 1 stop bit, odd parity.

DPM Connection

A DPM typically connects to port J31 but can be connected to any port except J28. For a DPM-100/700, use a null modem cable and set the port for RS-422, DPM Protocol, 38.4K baud, 8 bits, 1 stop bit, odd parity.

Satellite Auxiliary Panel Connection

The Satellite Aux Panel option can connect to any port except J28. Use the control cable that comes with the option and set the port for RS-422, 200/1200 Aux Protocol, 9600 baud, 8 bits, 1 stop bit, no parity. See the end of this section for additional satellite panel installation details.

Serial Port Jumper Settings

1. Remove the Control Processor module from the frame.
2. Locate the three sets of jumpers near the back left corner of the module.
3. Set the jumpers for the RS-232 or RS-422 communication standard as required by equipment connected to the serial ports. The jumpers are labeled to indicate which ports they control (Figure 2-7). Note that TTY port J28 does not have a jumper because it is RS-232 only.
4. Return the module to the frame.

Jumpers shown in factory default positions. Change jumper settings as required by the equipment connected to each serial port.

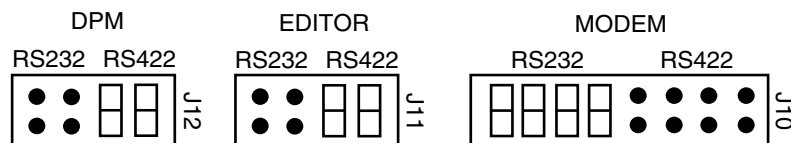


Figure 2-7. Serial Port Jumpers on the Control Processor Module

GPI J27 and Tally J28

GPI (General Purpose Interface) connector J27 (shown in Figure 2-8) provides 8 input relay closures to a common and 8 output relay closures to a common. The outputs allow remote triggering of external devices (such as triggering a credit roll on a character generator). The inputs allow remote triggering of a variety of switcher functions including transitions, E-MEM recalls, Aux Bus Tally Back, and crosspoint map switching.

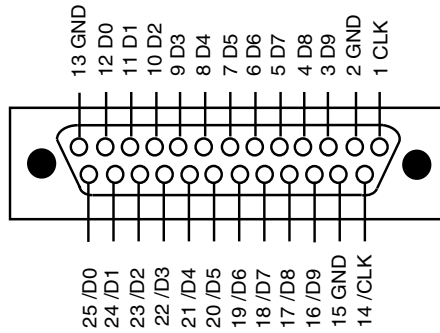
Using the GPI Inputs and GPI Outputs menus, you can assign which switcher functions are controlled by the GPI inputs and you can assign which switcher events will trigger GPI output relay closures. Input relays require at least a 2-field closure to common, and outputs provide at least a 2-field closure to common.

Tally connector J28 provides 16 tally relay closures to a common input corresponding to the 16 video/key inputs. These are typically used to light camera tally lamps when the associated switcher input goes on air.

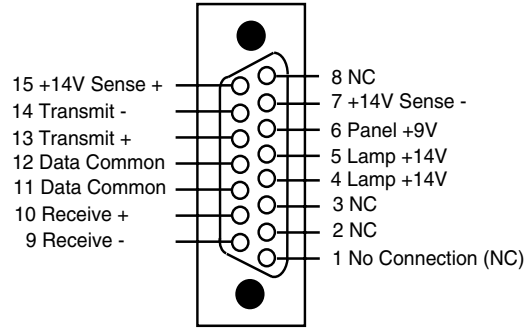
CAUTION

GPI and Tally relay maximum ratings are 28 volts, 100 mA, resistive load. To prevent relay damage, do not exceed these ratings.

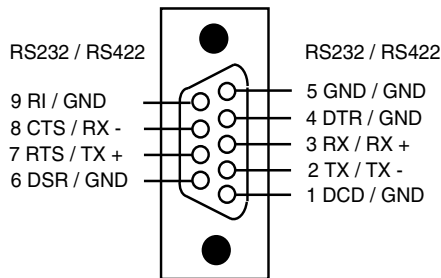
Parallel Component Digital Video Input/Output



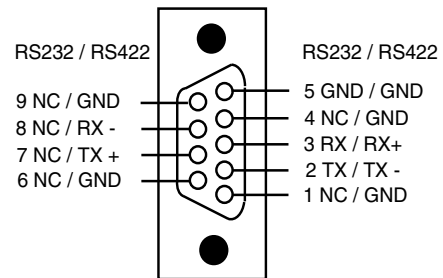
Control Panel J29 Female 15-pin D



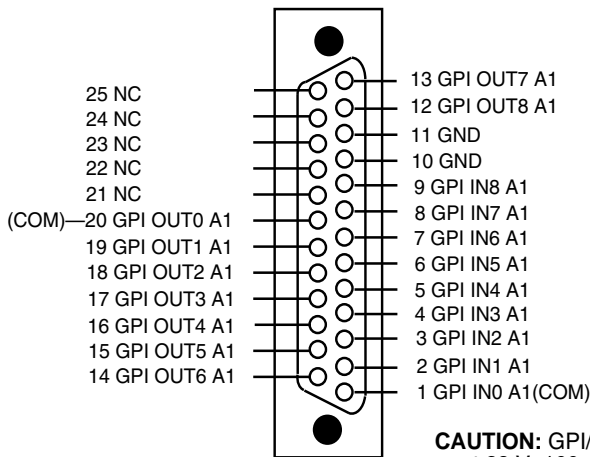
Modem J30 Female 9-pin D



DPM J31 & Editor J32 Female 9-pin D

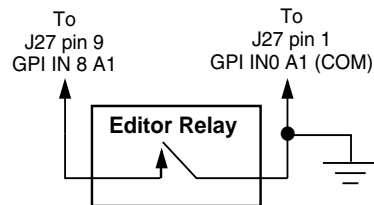
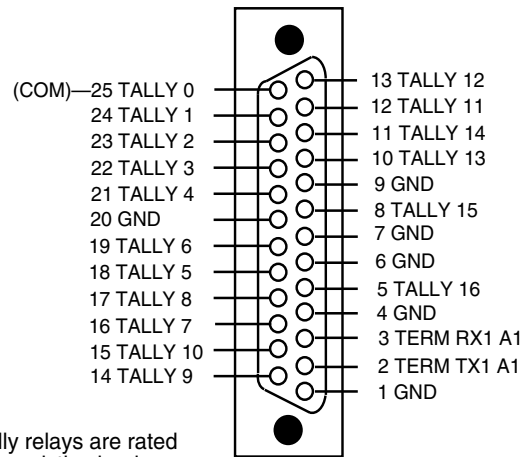


GPI J27 Female 25-pin D

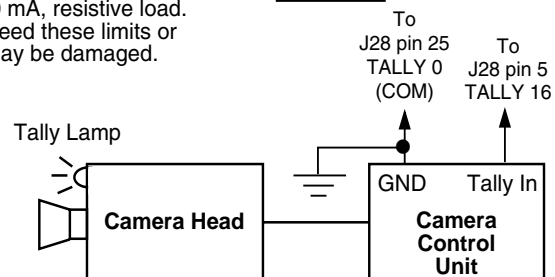


CAUTION: GPI/Tally relays are rated at 28 V, 100 mA, resistive load. Do not exceed these limits or relays may be damaged.

TTY/Tally J28 Female 25-pin D



GPI Input Connection Example
Editor relay closes and triggers switcher GPI input



Tally and GPI Output Connection Example
Switcher functions trigger tally/GPI relay closures, which in turn can trigger events in external devices.

Figure 2-8. Model 1200 Connector Pinouts

AC Power Connection and System Powerup

1. Plug the switcher frame power cord into the back of the Model 1200 frame at AC LINE IN connector J39 (Figure 2-9). Connect the other end of the cord to an AC power source between 100 and 240 volts, 50–60 Hz.
2. Connect the control panel power cord to an AC power source. Determine whether the power source is either within 90-135 Vac or 180-265 Vac and set the manual switch located by the control panel plug to the proper setting. Connect the other end of the cord into the back of the Model 1200 control panel.

WARNING

To prevent danger of electric shock, ensure that the power connector center conductor connects to a proper earth ground.

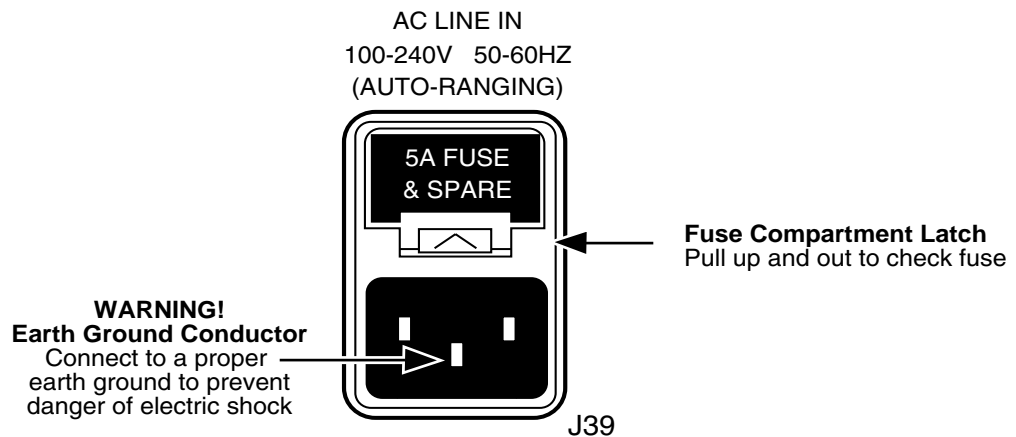


Figure 2-9. AC LINE IN Connector J39

3. Verify that all cabling is clear of cooling fans and that there are no loose tools or other metal objects near power supply buses or connections.
4. Check that all Modules and Interconnect Adapters are seated firmly in the frame.
5. Verify that the Control Panel and Signal Processor Frame AC power cords are properly connected.

6. Raise the Control Panel and set the power supply switch to 1 (ON). See Figure 2-10.

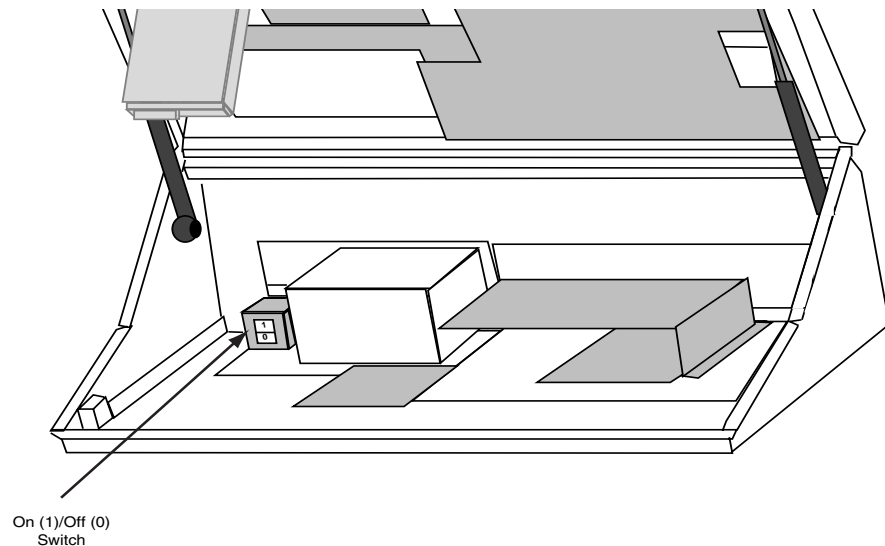


Figure 2-10. Control Panel Power Switch

7. Set the power switch inside the frame front cover to the 1 (ON) position. The following LEDs on the front of the frame modules should light:
 - Control Processor Module — DS1 Green +5V
 - SPG Module (on Control Proc) — DS1 525 Green or DS2 625 Green.
 - Crosspoint Module — DS1 Green +5V
 - Keyer Module — DS1 Green +5V, DS2 Green +5VA
 - Mixer Module — DS1 Green +5V, DS2 Green -5.2V

NOTE: To meet RF/EMI specifications and to ensure proper cooling, the door on the front of the Signal Processor must be closed.

Maintenance personnel should be familiar with the Control Panel and its usage. For information and reference, see the Model 1200 Operation Manual.

8. In the event of a problem, refer to the Troubleshooting section of this manual. If you are unable to resolve the problem using the Troubleshooting information, contact your equipment supplier for warranty service.

NOTE: When the Model 1200 is powered up the system software installed at the factory will automatically load. If there are any problems with the software, please refer to Software Installation or Upgrade in the Maintenance section of this manual.

Restart

If the system becomes confused or locks up, you can restart it as explained below. The effect you were working on will be lost, but E-MEM contents and configuration files will remain intact.

1. Press the **[MISC]** menu button in the upper left corner of the control panel (see Figure 2-11). Then press the **[CLEAR WORK BUFFER]** soft button in the Miscellaneous Menu to clear the panel.

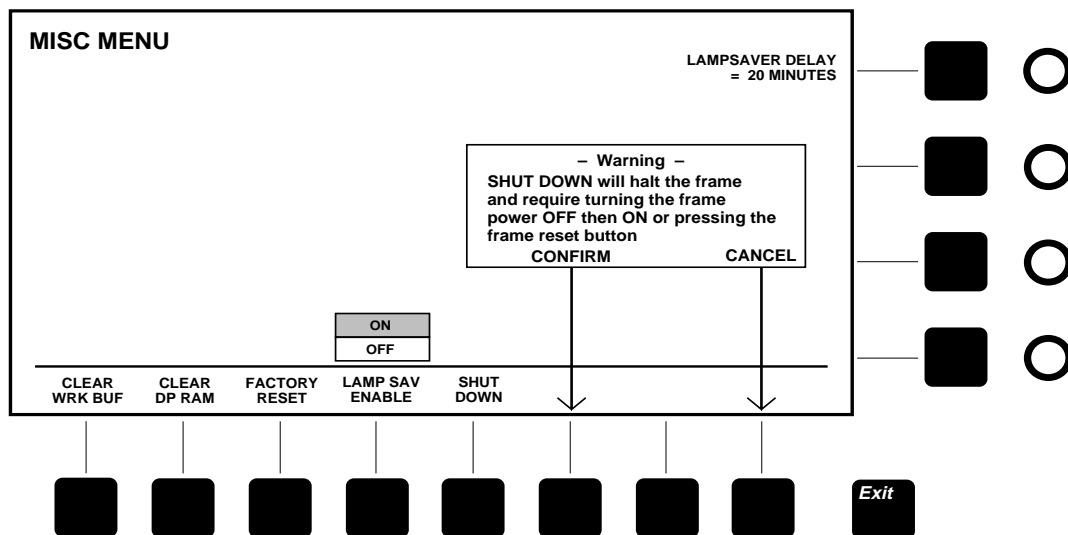


Figure 2-11. Miscellaneous Menu

2. If clearing the panel didn't help, press the **RESET** switch on the Control Processor module (064911) inside the switcher frame.
3. Finally, if neither of the above steps resolves the problem, turn the frame and panel power switches off and on again.

LampSaver Panel Sleep Mode

Note that the switcher includes a “sleep” mode called LampSaver, which is intended to extend pushbutton lamp life-span. When the switcher is idle for an extended period (adjustable) all button lamps turn off. To wake up the switcher, press any button or turn any knob. For details about the LampSaver mode, see the description of the Miscellaneous menu in Section 3 of the Operation manual.

System Setup

The following procedures allow you to configure the 1200 system to your installation. Using the Configuration menus in the menu display, you can assign sources to the crosspoints, configure the inputs, set output levels, adjust system timing, and set other system parameters. These menu items are accessed through the Configuration menu (Figure 2-12) on the Menu Display subpanel.

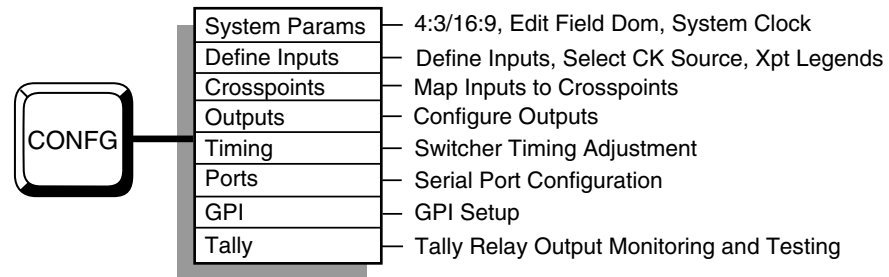


Figure 2-12. 1200 Configuration Menu Tree

Menu Pushbuttons and Knobs

The display panel includes pushbuttons and knobs that work interactively with the display menus to control the switcher:

- The white menu “hot buttons” at the left of the display activate the top level menus.
- The black buttons and knobs surrounding the display are “soft” buttons and knobs that change function with each menu. Labels displayed along the bottom and right edges of each menu indicate the functions of the soft controls. The “>” display symbol indicates a lower level menu that you can view when you press the associated soft button.
- The [EXIT] button takes you up one menu level.

Configuration Menu

The Configuration menu (Figure 2-13) and its sub-menus allow you to set up the switcher to meet your requirements. To begin the setup process, press the **[CONFIG]** button next to the menu display to bring up the Configuration menu, which includes the following sub-menus and functions:

[SYSTEM PARAMS>] —4:3/16:9 Picture Aspect, Edit Field Dominance, and System Clock.

[DEFINE INPUTS>] —Define Inputs, Chroma Key Sources, and Crosspoint Legends.

[XPT MAP] —Map physical inputs to crosspoints.

[OUTPUTS>] —Configure Outputs.

[TIMING>] —Switcher Timing.

[PORTS>] —Serial Port Configuration.

[GPI>]—GPI Input and Output Setup.

[TALLY>]—Tally Relay Setup.

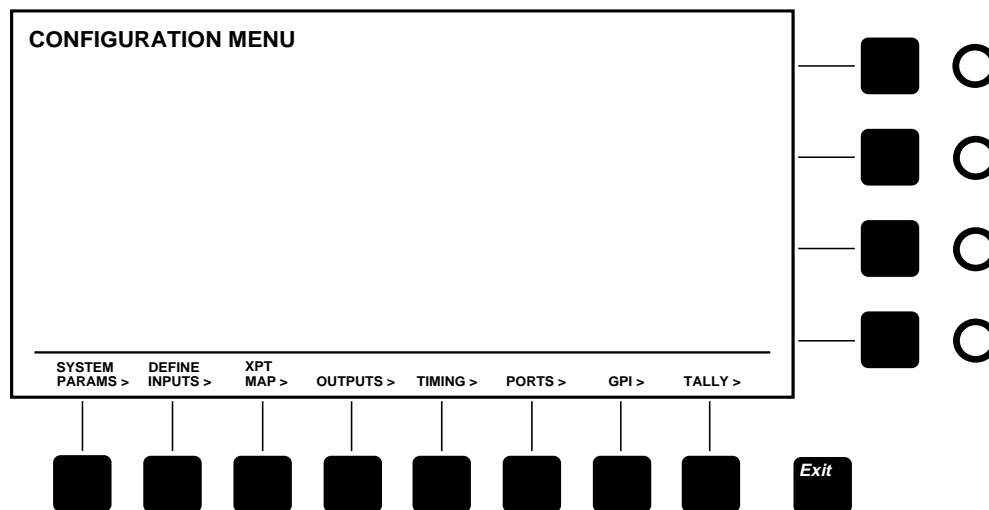


Figure 2-13. Configuration Menu

System Parameters Menu

Use the System Parameters menu (Figure 2-14) as explained below to set the aspect ratio (ratio of television picture width to height), to set the field dominance for use with an editor, and to set the system clock.

1. Press the **[SYSTEM PARAMS>]** soft button to display the System Parameters menu.
2. Use the **[VIDEO ASPECT]** soft button to highlight the selection that reads **4:3**. Press the button to switch between **4:3** and **16:9**.
3. If appropriate, change the Field Dominance using the **[EDITOR FLD DOM]** soft button. Setting Field Dominance to **ODD** or **EVEN** helps ensure that edits always take place during a particular color field to prevent color shifts. Some editing systems may require a particular selection; see your editor manual for details. The default is **BOTH** fields.
4. Set the date by selecting **DATE** with the **[SELECT]** soft button and turning the soft knobs to select the appropriate **(YEAR)**, **(MONTH)**, and **(DAY)**. When the date is correct, confirm it using the **[CONFIRM DATE]** soft button.
5. Set the time by selecting **TIME** with the **[SELECT]** soft button (see Figure 2-14) and turning the soft knobs to select the appropriate **(HOURS)**, **(MINUTES)**, and **(SECONDS)**. When the time is correct, confirm it using the **[CONFIRM TIME]** soft button.

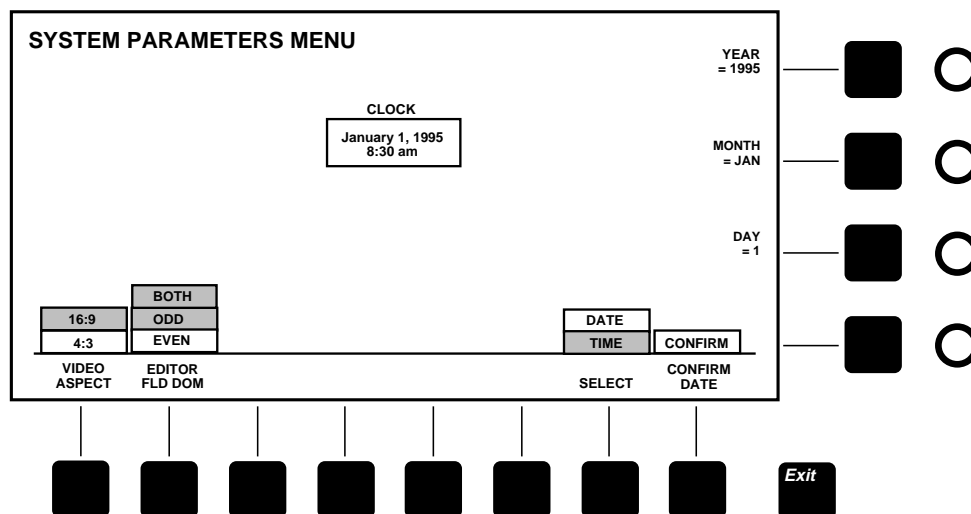


Figure 2-14. \System Parameters Menu

Define Inputs Menu

From the Configuration menu select **[INPUTS>]** to display the Define Inputs menu (Figure 2-15). This menu is typically configured during switcher installation. However, you may want to change configurations for different types of production sessions. The Inputs menu allows you to do the following:

- Give each physical input a descriptive name which is carried forward into several other menu levels.
- Attach characteristics to each physical input, such as bit resolution of the source, identification of the signal type, and association of key cutters with fills. The signal type tells the switcher whether the input is to be treated as video, shaped video, key, or key with depth.
- Designate a video/key pair as the return inputs in systems where an effects send and return will be used. This information is needed by the switcher for automatic switching of the effects loop.
- Select 4:2:2 chroma key inputs or full-bandwidth 4:4:4 chroma key inputs. Two physical inputs are needed to accommodate a full-bandwidth chroma key signal. The Inputs/4:4:4 CK Sources sub-menu designates those two physical inputs.
- Associate a four-character legend with each physical input. These legends appear in the Inputs menus and also in the LED displays that may be installed between the Key and Aux crosspoint pushbutton rows.

Define Inputs

Using the Inputs menu, define each input as follows:

1. Select a Physical Input using the **(PHYSICAL INPUT)** soft knob. The physical input numbers are the same as the jack numbers on the back of the electronics frame.
2. Assign an Auto Select key input to a video fill input using the **(AUTO SEL KEY SRC)** soft knob. Auto Select provides automatic selection of the associated key input when you select the fill input on the Key crosspoint bus.
3. Enter a Signal Name by pressing the **[CLEAR NAME]** soft button, typing a name on the keyboard, and pressing the **[ENTER NAME]** soft button.
4. Using the **[BITS]** soft button, identify the input as either an 8 or 10 bit signal.
5. Using the **[TYPE SELECT]** soft button, identify the input type: **DEPTH** (depth key signal from a digital picture manipulator), **KEY**, **SHAPED** (video shaped by a key), or **VIDEO** (unshaped).

- Assign the Effects Return Flag to a video and a key source by highlighting them and pressing **[EFX RTN FLAG]** soft button. This identifies that video/key input pair as the Effects Send signals returning from a Digital Picture Manipulator. When Effects Send is on, the switcher will automatically select these inputs.

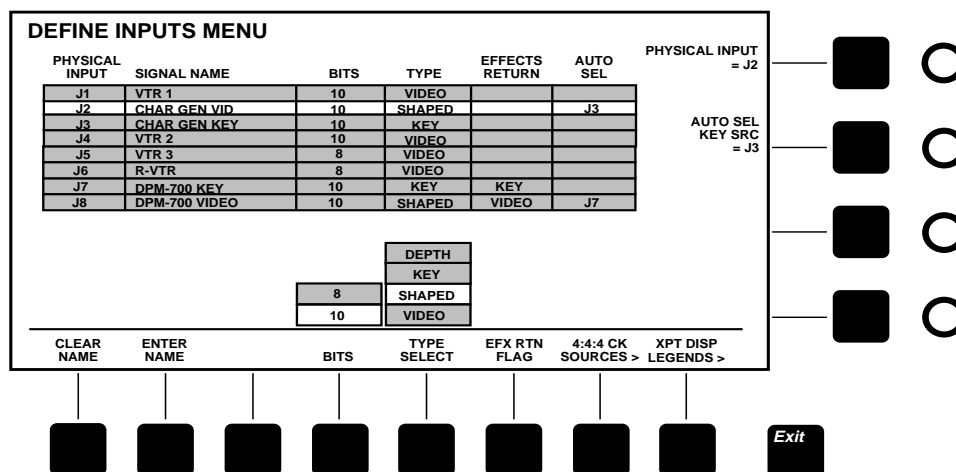


Figure 2-15. Define Inputs Menu

Chroma Key Sources Menu

Display the 4:4:4 Chroma Key Sources menu by selecting **[4:4:4 CK SOURCES>]** from the Define Inputs menu (Figure 2-16).

To assign a 4:4:4 video fill to the Chroma Keyer, use the soft knobs:

- Select the Physical Input source for channel A by using the **(4:4:4 CK CHANNEL A)** soft knob.
- Select the Physical Input source for channel B by using the **(4:4:4 CK CHANNEL B)** soft knob.

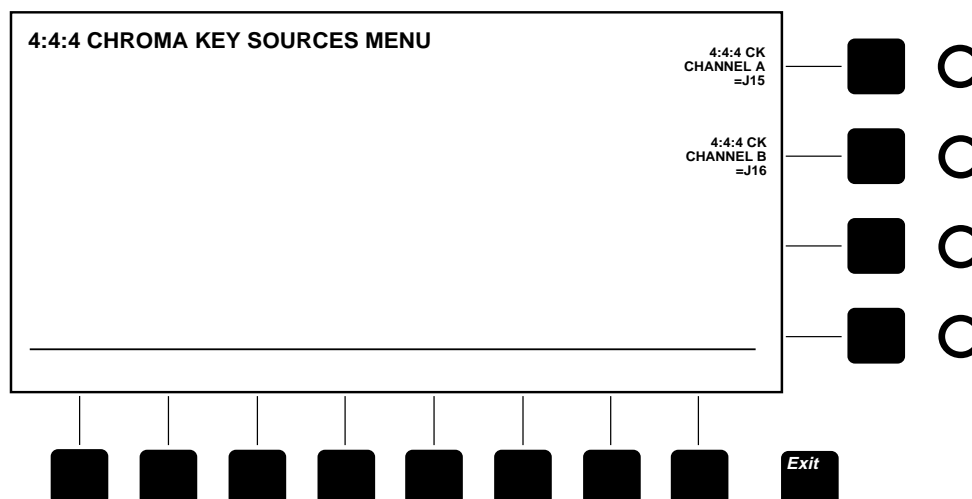


Figure 2-16. 4:4:4 Chroma Key Sources Menu

Crosspoint Display Legends Menu

Display the Crosspoint Display Legend menu by selecting [XPT DISP LEGENDS>] from the Define Inputs menu (Figure 2-17). This menu allows you to assign a unique name (up to 4 characters) to each physical input. The name will display above the crosspoint column to which that physical input is mapped.

1. Use the (PHYSICAL INPUT) soft knob to select a Physical Input. The Signal Name column displays the descriptive name of the selected Physical Input. (Signal Name is created in the Define Inputs menu.)
2. To enter a new Local Name for the highlighted physical input, press the [CLEAR LOCAL] soft button, type a descriptive name using the keyboard, and press the [ENTER LOCAL] soft button.

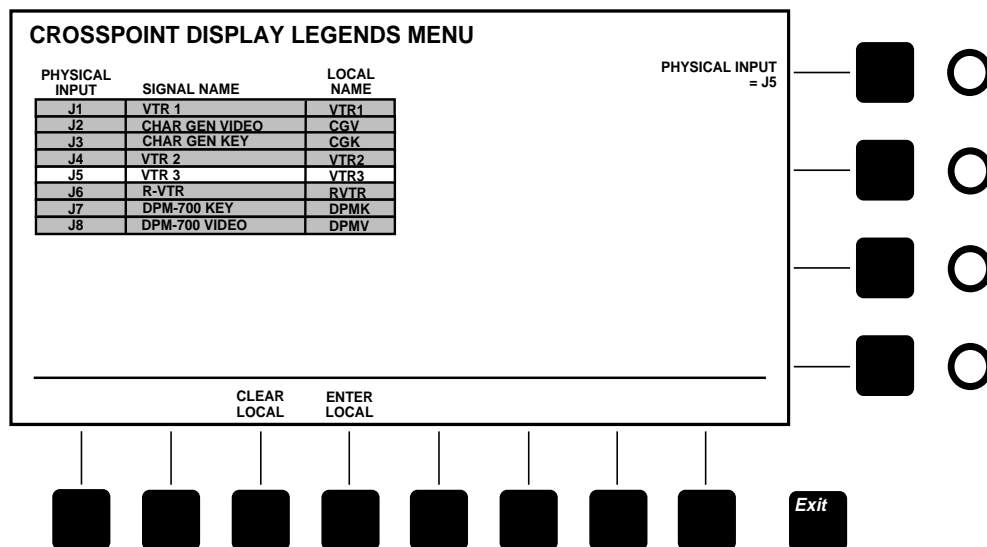


Figure 2-17. Crosspoint Display Legends Menu

Crosspoint Map Menu

The Crosspoint Map menu (Figure 2-18) is selected by pressing the [CONFIG] button and then the [XPT MAP>] button.

1. Set the [[XPT MAP SELECT] soft button to the **NORMAL** or **ALTERNATE** crosspoint map. Using this function, you can define two completely different crosspoint maps and switch between them as desired. If you plan to use only one map, select **NORMAL**.
2. Use the (XPT) soft knob to select the crosspoint to be highlighted.
3. Use the (PHYSICAL INPUT) soft knob to assign a Physical Input to the highlighted crosspoint. The Signal Name column will display the descriptive name of the selected Physical Input. (Signal Name is created in the Define Inputs menu.)

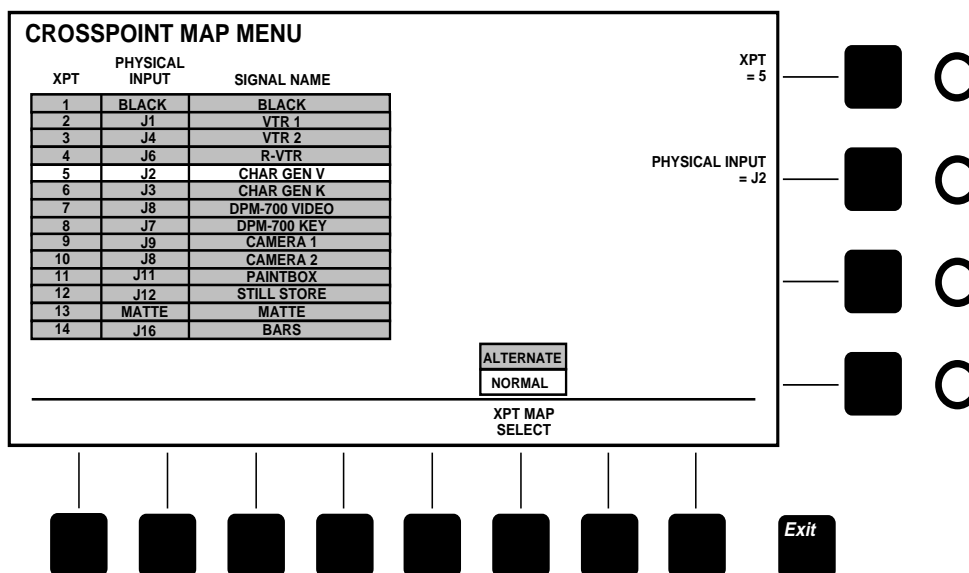


Figure 2-18. Crosspoint Map Menu

Outputs Menu

From the Configuration menu, select **[OUTPUTS>]** to display the Outputs menu (Figure 2-19). This menu allows you to set up signal formats for Model 1200 outputs.

1. Use the **(OUTPUT)** soft knob to highlight the name of the output to be configured.
2. Use the **[BITS RES]** soft button to select either 8 or 10 bits to match the bit resolution of your output destination.
3. Use the **[SHAPING]** soft button to turn shaping **ON** or **OFF** for that output. Shaping **ON** produces a video output shaped by the key signal and matted over black. (Shaping for the Program and Preview DAC outputs follows the Program 1/2 or Clean Feed output shaping selection.)
4. Use **[SIGNAL SOURCE]** to select either **CLEAN** (clean feed; video with no key) or **PROGRAM** (video with key).

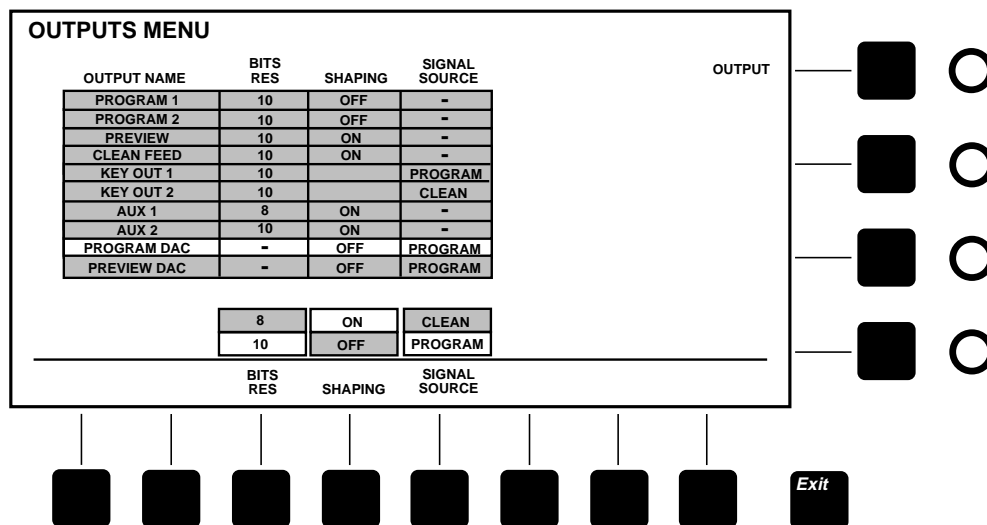


Figure 2-19. Outputs Menu

Timing Menu

Input timing is automatic; however, you can adjust the overall timing manually in the Timing menu (Figure 2-20) to ensure that auto-timing captures all inputs. When you make this adjustment, you are advancing or delaying the Reference input, which causes a corresponding movement of the auto-timing capture window for the primary inputs and also causes a corresponding movement of the switcher outputs.

To adjust the overall timing, use the **[COARSE]** soft knob to set a rough timing value, then adjust the **[REF TIMING (FINE)]** soft knob to fine tune the timing. The maximum timing range is ± 330 clocks (a clock equals 69.84 nanoseconds).

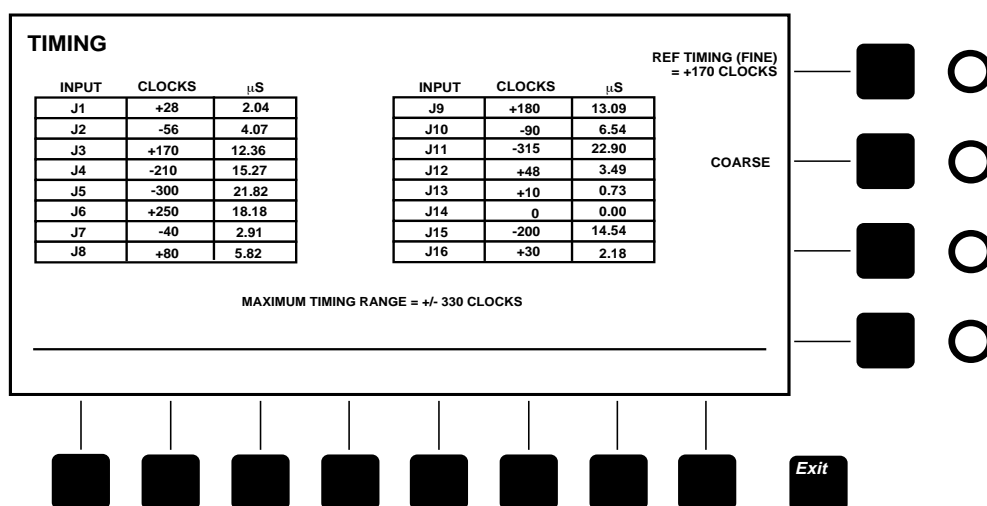


Figure 2-20. Timing Menu

Ports Menu

The Ports Configuration menu (Figure 2-21) is displayed by pressing the **[CONFIG]** button on the main subpanel and then the **[PORTS>]** soft button.

1. Use the **(PORT)** soft knob to highlight the port you wish to configure. (Ports are listed in the left-most display column.)
2. Use the **(PROTOCOL)** soft knob to select the protocol for the port. Protocol settings for typical equipment are listed below:
 - PANEL PORT** —Already set for **1200 PNL** protocol (RS-422, address 30H, 38400 baud, 8 bits, 1 stop bit, odd parity). Cannot be changed.
 - TERMINAL (TTY) PORT** —Use **TERMINAL** protocol (RS-232, 9600 baud, 8 bits, 1 stop bit, no parity).
 - MODEM PORT** —Use **MODEM** protocol (RS-232, 2400 baud, 8 bits, 1 stop bit, no parity).
 - DPM-100/700 PORT** —Use **DPM** protocol (RS-422, address 30H, 38.4 Kbaud, 8 bits, 1 stop bit, odd parity).
 - EDITOR PORT** —Use **GRASS VALLEY PRODUCTS 1200** (address 30H). Communication is RS-422, 38.4Kbaud, 8 bits, 1 stop bit, odd parity. You may also use **110** or **200** switcher protocol if your editor does not have a 1200 interface, but functionality will be reduced.
 - AUX SATELLITE PANEL PORT** —Use **200** or **1200 AUX** protocol (RS-422, 9600 baud, 8 bits, 1 stop bit, no parity). Any available port may be used for the Aux Satellite Panel.
3. The **[FACTORY DEFAULT]** soft button resets the selected port to its factory-assigned protocol.
4. If assigning a particular protocol does not yield the correct communication parameters, you may highlight and change those parameters individually. Use the **[ADDRESS]** and **[BAUD RATE]** soft knobs and the **[BITS]**, **[PARITY]**, and **[STOP BITS]** menu buttons.

GPI Menus

The GPI Inputs menu (Figure 2-22) is displayed when you press the **[CONFIG]** top menu button followed by the **[GPI>]** soft button. From this menu, you can view the GPI Inputs or access the GPI Outputs menu (Figure 2-23). Together, these two menus allow you to assign, view, and test the 8 GPI inputs and 8 GPI outputs.

GPI inputs are trigger signals that come from external equipment (via the GPI connector at the back of the frame) and start a specified event in the switcher, such as an auto transition. GPI outputs are trigger signals generated by switcher events that go out via the GPI connector to external devices to cause them to take some action. You can assign events to the GPI Inputs or Outputs as follows:

1. Display the GPI Input or Output menu.
2. Change the event assigned to a GPI using the **(SELECT GPI INPUT/OUTPUT)** soft knob to highlight the desired input or output.
3. Use the **(SELECT EVENT)** soft knob to assign an event to the highlighted GPI.

Two events deserve special mention. The **ALTERNATE XPT MAP** selection allows you to use a GPI input to switch between two different crosspoint maps stored in the Input Map menu. This can be convenient when you have two different uses for the switcher, for example, a live news show and off-line post production. The **AUX BUS TALLY BACK** selection uses the GPI as an input condition that the switcher detects in order to tally the selected aux bus crosspoint. This permits an external DPM to tally the aux buses when aux bus video is on air at the DPM. Aux tallyback can be turned on and off in the Tally menu.

The **[TEST]** soft button in the GPI Outputs menu, when set to **ON**, cycles through each output, closing its relay for approximately 1/2 second. This allows you to check whether your GPI connections are working properly. When finished testing, set the **[TEST]** button to **OFF**.

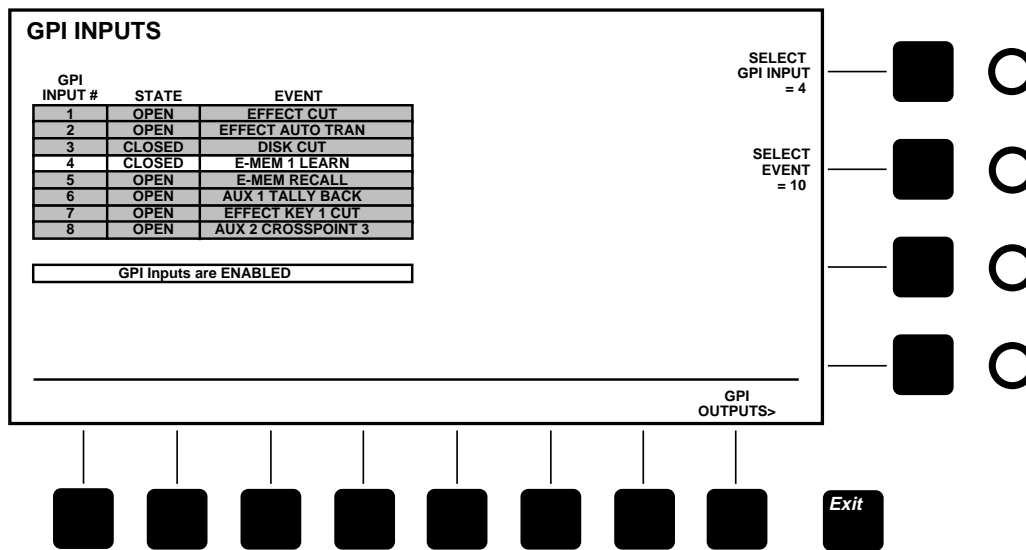


Figure 2-22. GPI Inputs Menu

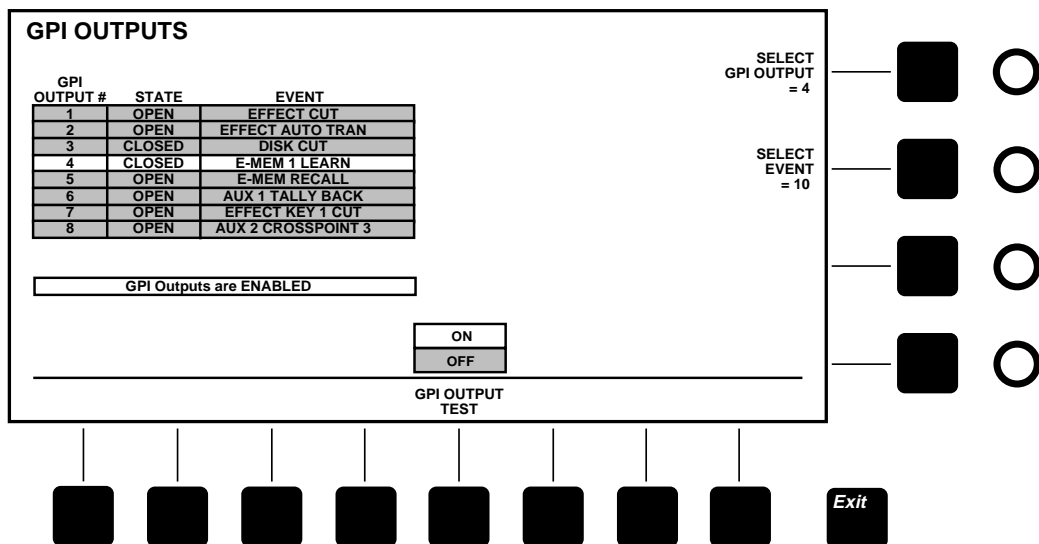


Figure 2-23. GPI Output Menu

Tally Menu

The Tally menu (Figure 2-24) allows you to test and observe the switcher's tally outputs to determine whether your connections to external devices are working. This menu also includes an **AUX TLY BACK** (Aux Bus Tally Back) **ON/OFF** selection. When **ON**, this feature allows use of a GPI to tally Aux Bus 1 whenever the effects send fill crosspoint is tallied and Aux Bus 2 whenever the effects send source crosspoint is tallied. This provides tally back for an external DPM without requiring a tally back input from the DPM. To use this feature, it must be enabled in the Tally menu and assigned as an event to a GPI input in the GPI Inputs menu.

The Tally menu displays a table listing the 16 physical inputs along with the signal name for each input. If a physical input is currently being high-tallied, that physical input will be highlighted in the table.

To test a tally output, select the desired input on the PGM bus and watch the Tally menu display to see that the selected input highlights. To test all of the tally outputs, set the **[TALLY TEST]** soft button to the **ON** position; this cycles each output on for about 1/2 second. When finished testing, set the **[TALLY TEST]** button to **OFF**.

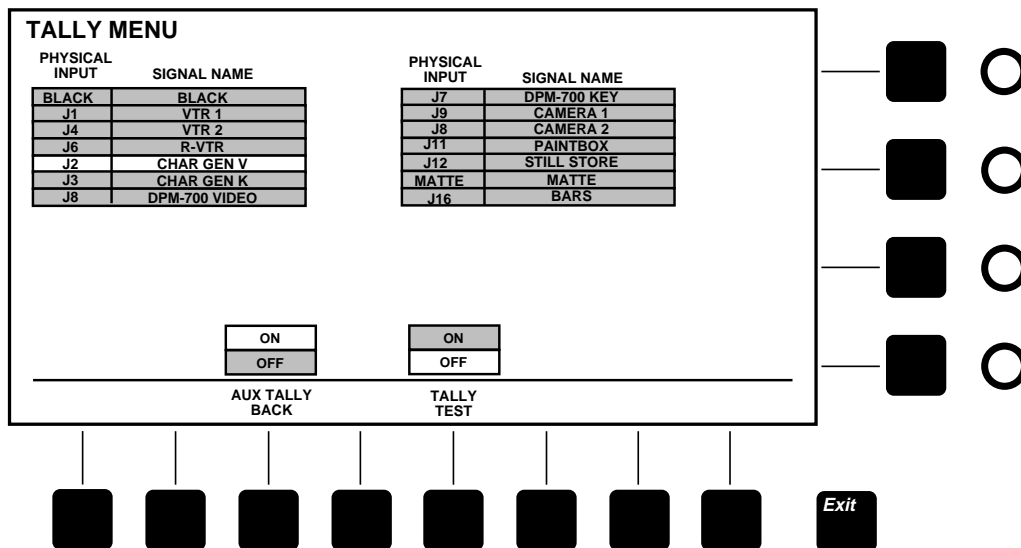


Figure 2-24. Tally Menu

Installing Panel Pushbutton Lens Chips

After assigning inputs to crosspoints, you can install the supplied lens chips (button labels) in the crosspoint pushbuttons. To remove a pushbutton lens, grasp the pushbutton lens firmly with your fingers and pull the lens off of the button. Then install the lens chip on top of the pushbutton and push the lens back into place. See Figure 2-25 for details.

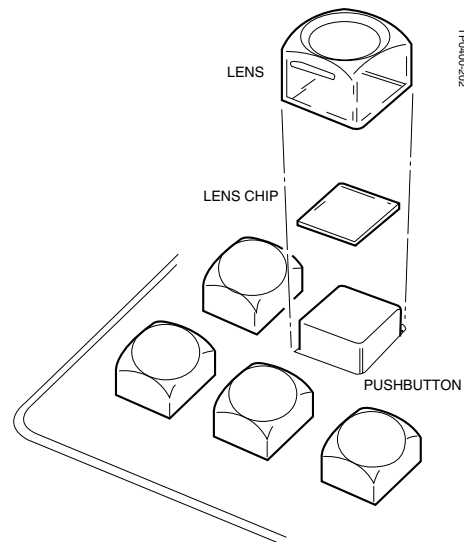


Figure 2-25. Pushbutton Lens Chip Installation

Option Installation

Options ordered with the switcher are installed and fully tested at the factory and require no installation. However, if you order options at a later time, you can use the instructions that follow to help you install them. After installing the option(s), refer to the previous pages for setup instructions.

Each option consists of a submodule that mates with a motherboard via 50-pin header connectors. Screws at the corners of the option submodule secure it in place.

Figure 2-26 shows how to mount the options, and Figure 2-27 shows the locations of the submodule options on the main modules.

Special instructions for Analog Output (DAC: Digital-to-Analog) option installation and the Satellite Aux Panel installation are given on the following pages.

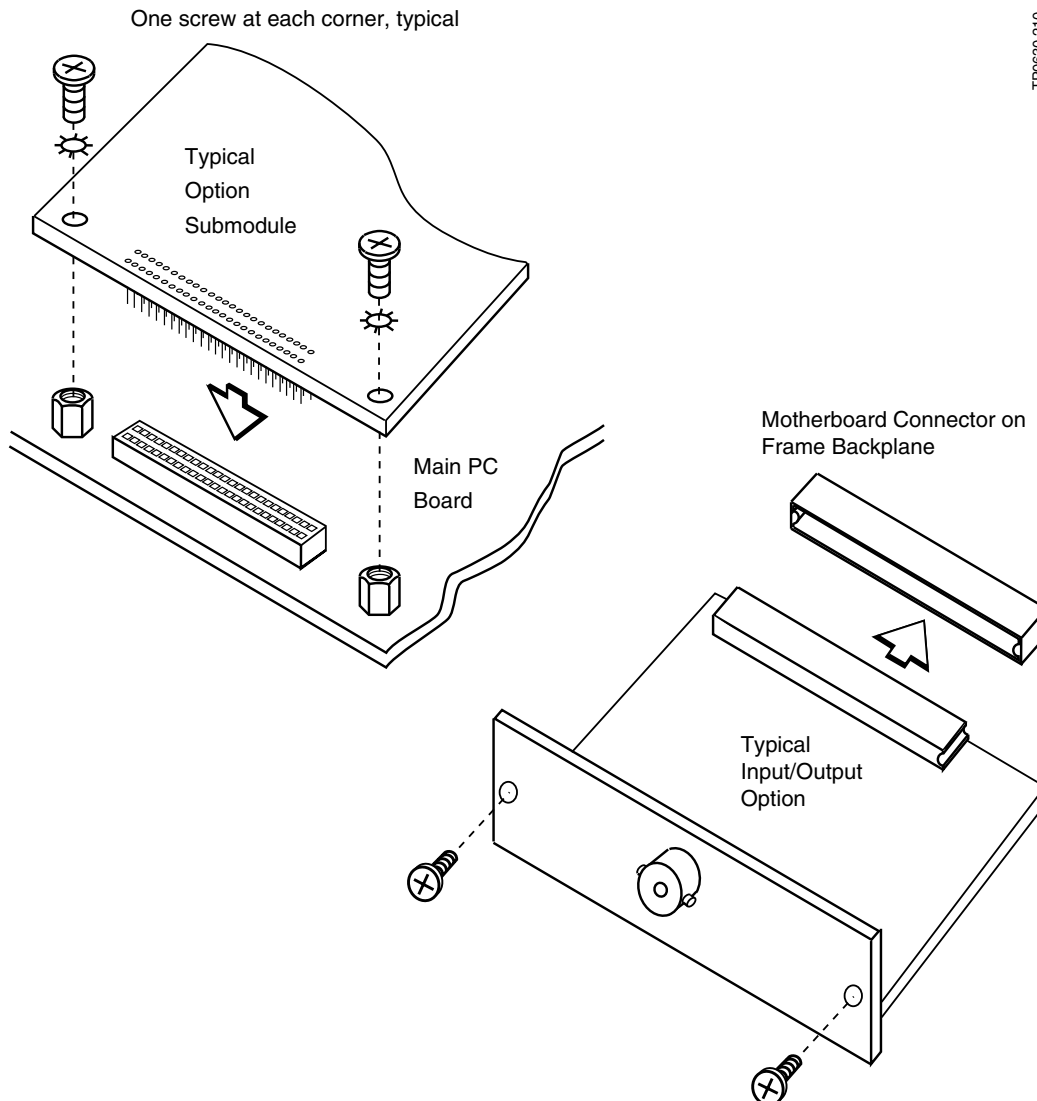


Figure 2-26. Typical Installation of Submodule and Input/Output Options

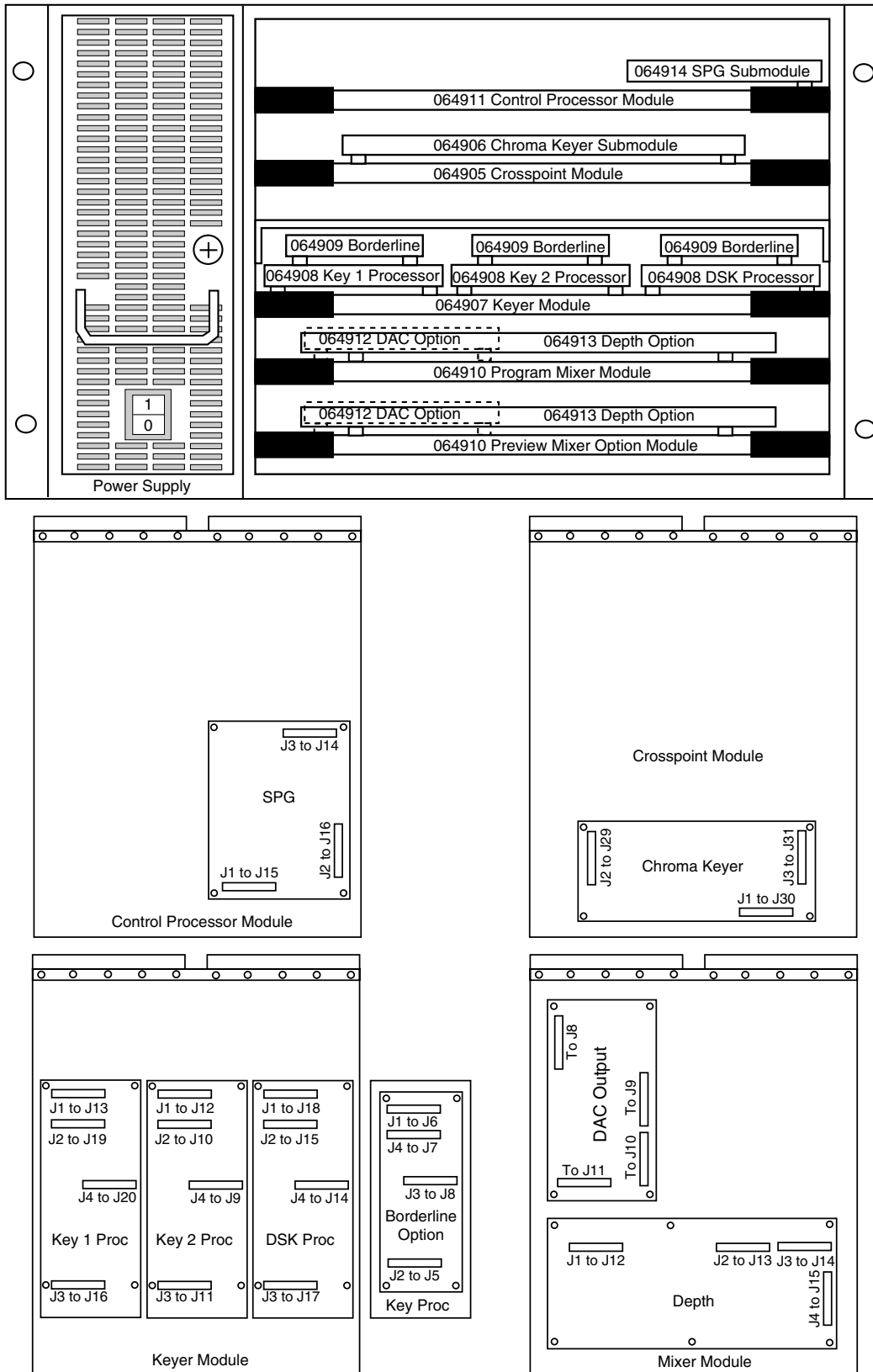


Figure 2-27. Locations of Submodule Options on Main Modules

Analog Output Option Installation

Installation of the Analog Output (DAC: Digital-to-Analog) option consists of the following steps, which are explained in detail on the following pages:

- Mounting the option mezzanine boards on the Program or Preview Mixer module.
- Setting jumpers for the desired video output format and other parameters (if necessary).
- Fine-tuning analog output signal gain (if necessary).
- Selecting whether you want the Analog Output to output Program or Program Clean Feed video (Preview or Preview Clean Feed for a Preview Analog Output).

Installing the Option Modules

The Analog Output Option consists of two mezzanine boards: the 064912 Analog Output Support module and the 064815 Analog Output module. Install these mezzanines as explained below.

1. Remove the Program or Preview 064910 Mixer module from the switcher frame and place it on an anti-static mat where you can work on it.
2. Install the assembled option mezzanine boards onto the 064910 Mixer module, matching up the connectors on the Analog Output Option Support board to the connectors on the Mixer. See Figure 2-28 for details.
3. Insert the supplied screws through the bottom of the Mixer module into the four spacers that hold the Analog Output option assembly in place. Tighten the screws gently to secure the option.

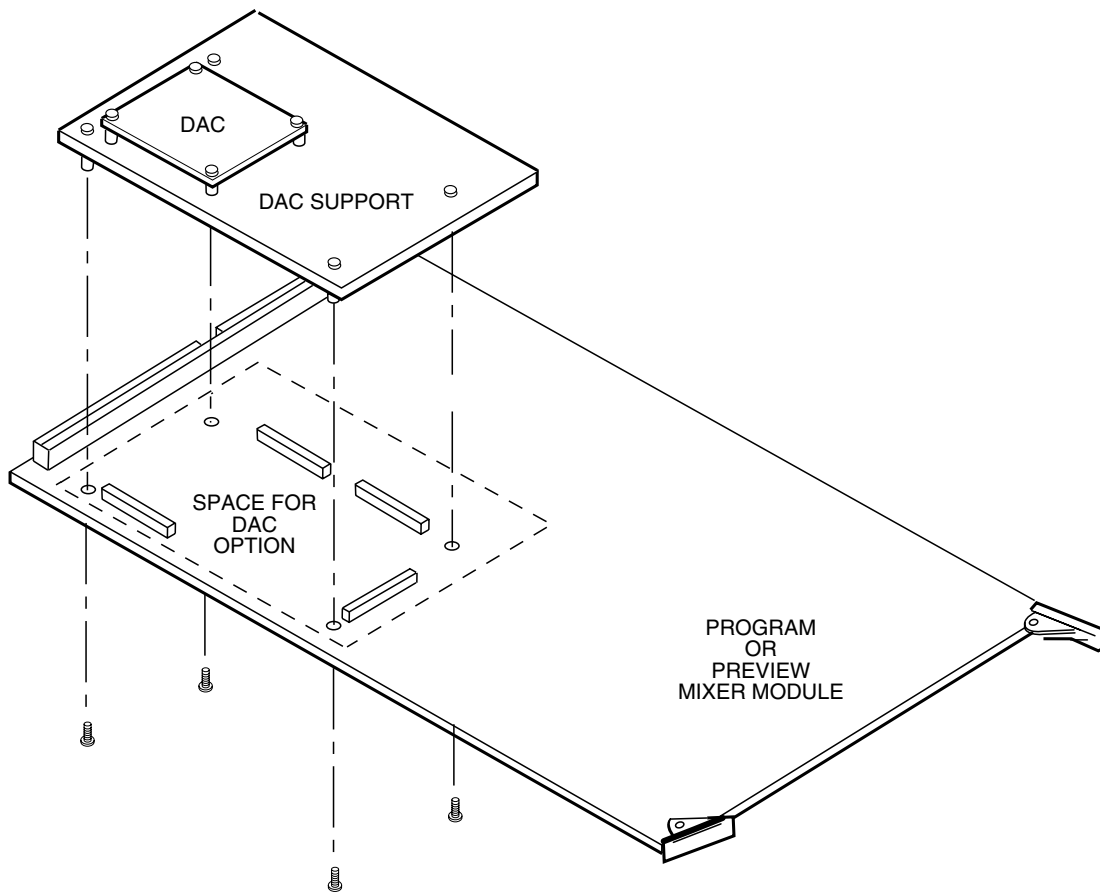


Figure 2-28. Installing the Analog Output Option (DAC) Modules

Setting Analog Output Option Jumpers

The Analog Output Option leaves the factory set to produce the following analog output signal parameters:

- RGB
- 0.700V peak signal level
- No Setup
- RP125 narrow blanking

To change any of these parameters, follow the steps given below:

Blanking Width and Video Setup

1. On the 064912 Analog Output Support board (the larger mezzanine board), set jumper J6 for the blanking width that you want on the analog output: *RS-170* or *RP-125*.

When the jumper is set to RS-170 (wide blanking), blanking edges follow RS-170 specifications for 60 Hz systems or follow the CCIR 470-2 recommendation for 50 Hz systems. When set to RP-125, blanking is active from end of active video (EAV) to start of active video (SAV), inclusive, as described in SMPTE RP-125.

2. On the 064912 Analog Output Support board (the larger mezzanine board), set jumper J7 for the appropriate setup level on the analog output: *Setup* (54 mV) or *No Setup*. See Table 2-1 for the setup requirements of various video formats.

Video Format

1. Remove the 064815 Analog Output mezzanine board (the small mezzanine on top) from the 064912 Analog Output Support mezzanine board. This entails removing four (4) screws around the perimeter of the Analog Output board and gently pulling the board straight up. When you have removed the 064815 Analog Output mezzanine board, turn it over to view the component side.
2. Locate jumpers J5, J6, J9, and J11 on the Analog Output board and set all four jumpers to either *a* for Color Difference format, or *b* for RGB format. See Table 2-1 for details.
3. Locate jumpers J4, J8, and J10 on the Analog Output board. Refer to Table 2-1, and set each jumper to the desired analog output format. Note that some formats require installing two jumpers on J8 and J10. Extra jumpers are stored in an inactive socket, J7. If you are changing to a format that uses one jumper at J8 and J10, store the extra jumpers at J7. If you lose a jumper, you can make a suitable substitute from a short piece of 24 gauge solid tinned copper wire.
4. Carefully reinstall the Analog Output board onto the Analog Output Support board, making sure all connector pins match up with their sockets correctly so that no pins become bent. Secure the Analog Output board using the four screws that you removed earlier.

Table 2-1. Analog Output Option Jumper Settings

Format Selection	J7 Analog Output Support Setup	J5, J6, J9, J11 Analog Output Format	J4 (Y) Analog Output Format	J8 (R-Y) Analog Output Format	J10 (B-Y) Analog Output Format
EBU/SMPTE	No Setup	a	a	b	c
RGB .714 v	No Setup	b	b	b & d	b & d
RGB .714 v	Setup	b	c	d	a & d
RGB .700 v	No Setup	b	a	a & d	b & d
MII 50 Hz	No Setup	a	a	c	c
MII 60 Hz	No Setup	a	a	c	e
MII 60 Hz	Setup	a	c	c	e
Beta 50 Hz	No Setup	a	a	d	d
Beta 60 Hz	No Setup	a	b	d	d
Beta 60 Hz	Setup	a	c	d	d

5. Press the **[Conf]** button on the main subpanel and then the **[OUTPUTS>]** soft button to display the Outputs menu. Use the **[SIGNAL SOURCE]** soft button to select whether you want the Analog Output to provide a Program Output or a Program Clean Feed Output. If the Analog Output is mounted on the Preview Mixer, the choices are Preview Output or Preview Clean Feed Output. (Clean feed video consists of Program or Preview video without the downstream key.)

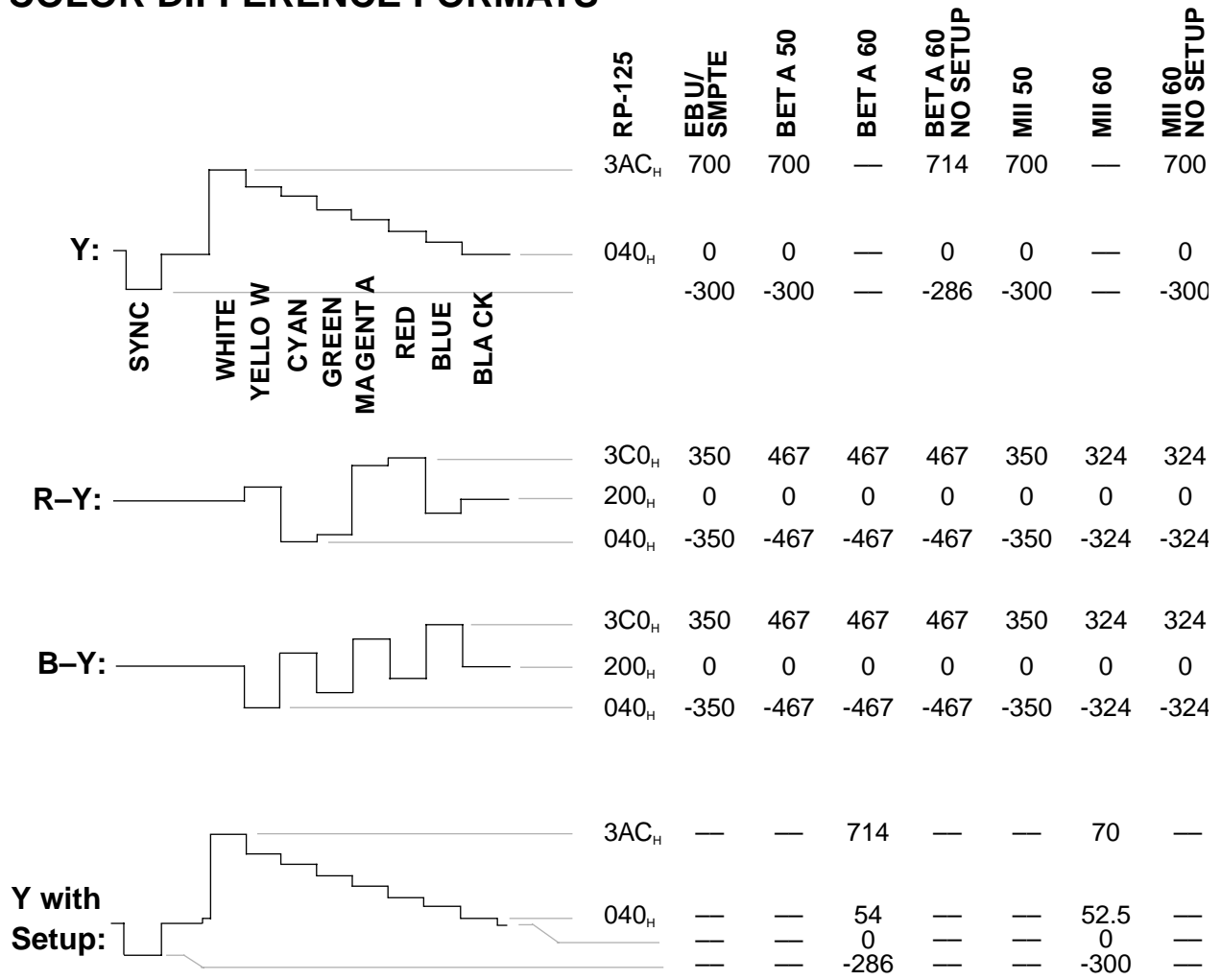
Adjusting Analog Output Gain

The format selection jumpers provide a convenient way to select signal levels that are accurate enough for most monitoring purposes. However, if your application demands precise signal levels, you may need to adjust signal gain using the gain adjustments on the Analog Output mezzanine board:

1. Place the Mixer module on the Module Extender, and select 100% Color Bars as the Program and Preview switcher output.
2. Connect a waveform monitor or oscilloscope to the analog output BNCs on the back of the frame. Terminate the scope or monitor inputs with 75 Ohms.
3. Observe the analog output on the scope or monitor and adjust the Y, R-Y, and B-Y gain controls on the Analog Output board to match the waveform to the desired signal levels shown in Figure 2-29 for color difference signals or Figure 2-30 for RGB signals. The gain adjustment trim pots are accessible through holes in the back of the 064815 Analog Output mezzanine board with the mezzanines installed on the Mixer module.

NOTE: *In RGB formats, the gain controls are somewhat interactive. For best results, adjust Y gain while observing the green output so that the white color bar achieves the specified level. Then observe the red output and adjust R-Y gain for equal level bars having red content; similarly, observe blue output and adjust B-Y gain for equal level bars.*

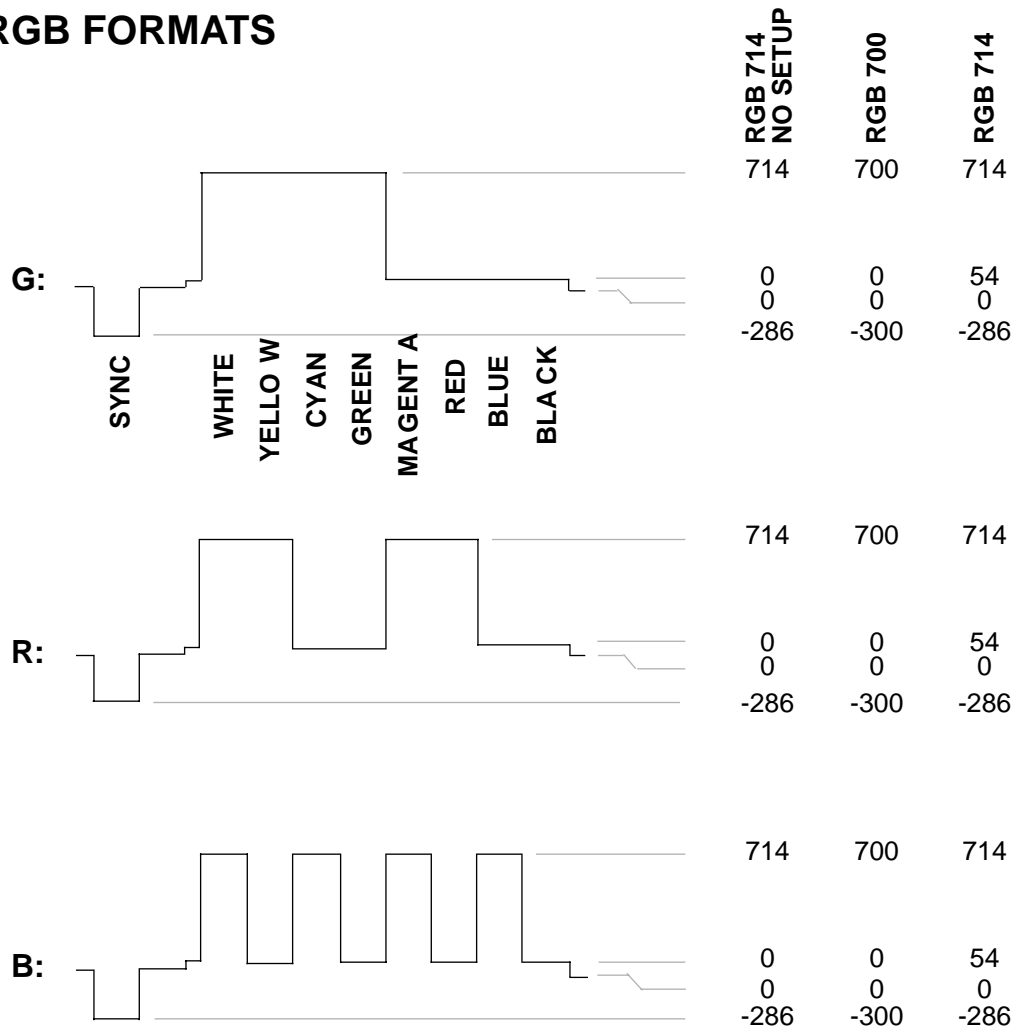
COLOR DIFFERENCE FORMATS



NOTE: All voltage levels are in millivolts.

Figure 2-29. Color Difference Standard Signal Levels

RGB FORMATS



NOTE: All voltage levels are in millivolts.

Figure 2-30. RGB Signal Level Standards

Satellite Auxiliary Bus Control Panel Option

The Satellite Auxiliary Bus Panel provides remote control of the switcher's auxiliary buses. See Figure 2-31 and the text below for installation.

1. Install the Satellite Panel in the rack or console. See the figure for dimensions.
2. Connect Satellite port J2 to any switcher serial port using the cable supplied with the panel.
3. Set the port jumpers on the switcher Control Processor Module for RS-422. Using the Port Configuration menu, set the Aux Satellite Panel protocol (9600 baud, 8 bits, 1 stop bit, no parity). These settings match the port to the fixed requirements of the Satellite Panel.
4. Select 120 Vac or 230 Vac on the satellite power supply transformer. Then connect the transformer to J1 on the Satellite Panel and to your AC source.

CAUTION

To prevent damage to the Satellite Panel, be sure to set the power transformer for 120 Vac or 230 Vac before you connect the transformer to the panel.

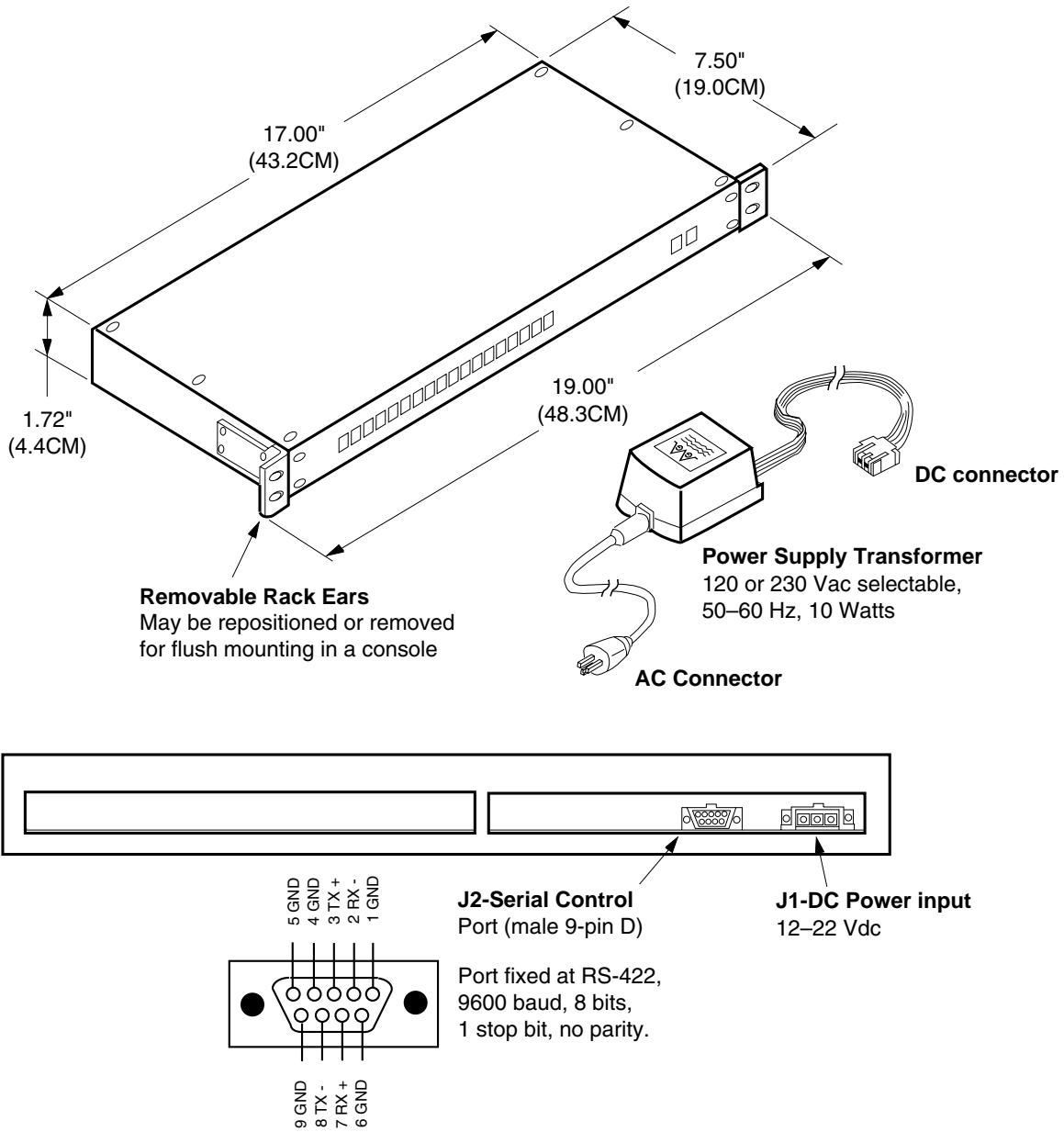


Figure 2-31. Satellite Aux Bus Control Panel Installation

3

Functional Description

Introduction

This section describes the internal architecture of the Model 1200 Switcher.

The following main topics are discussed:

- System Overview—page 3-2
- Frame Modules—page 3-10
- Control Panel—page 3-38

System Overview

As you read the overview, please refer to Figure 3-1.

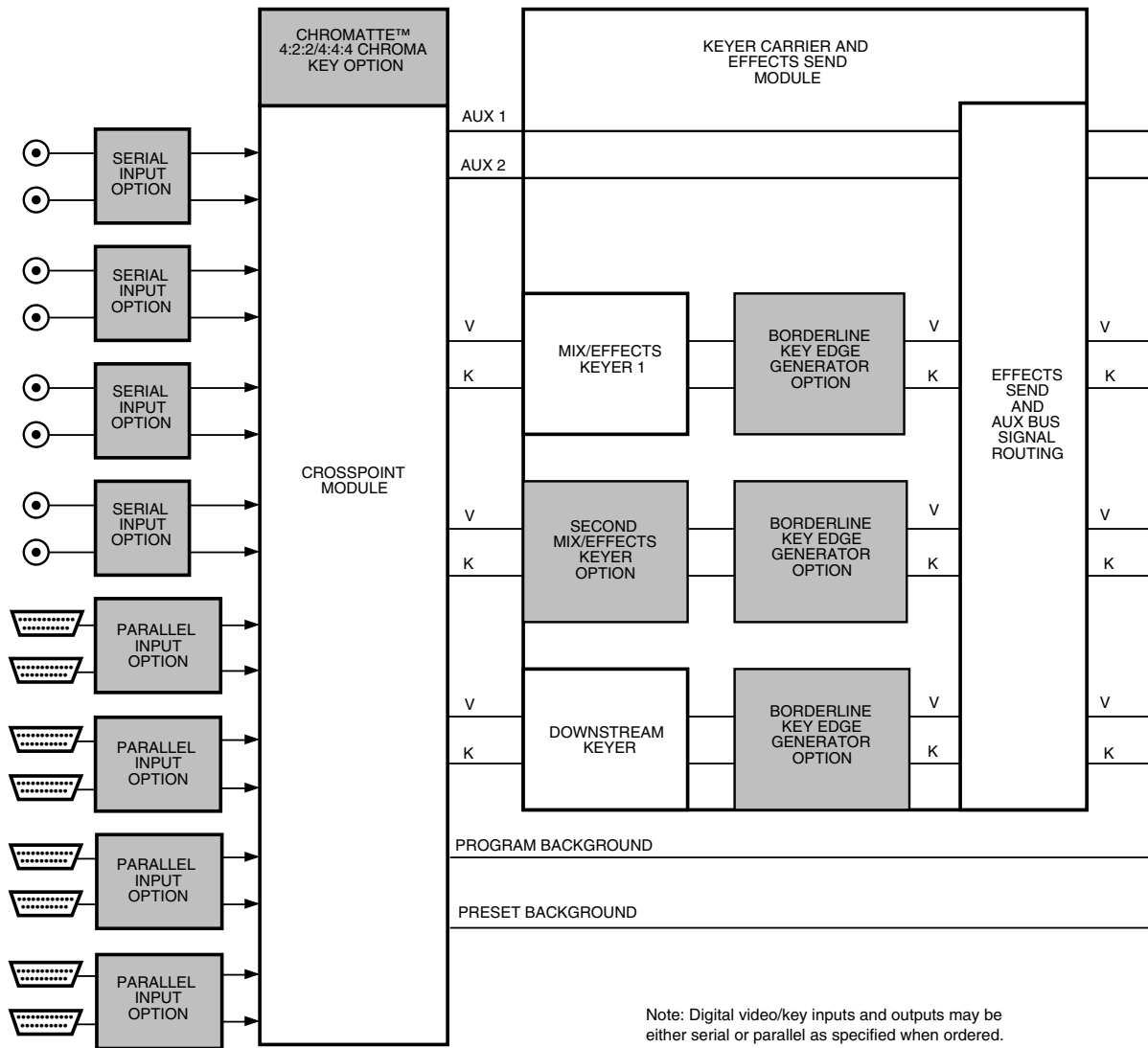
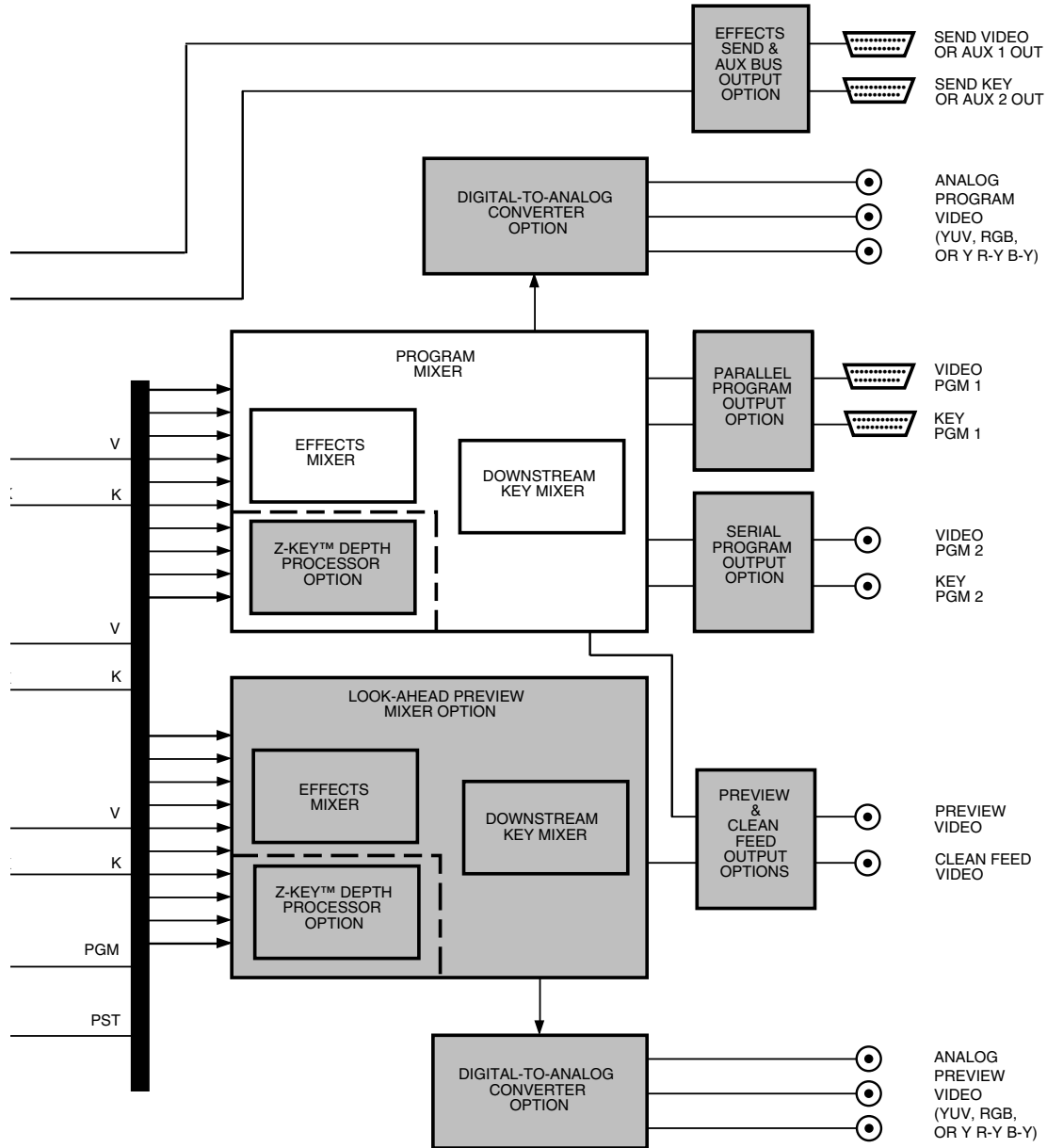


Figure 3-1. System Overview



Service Philosophy

Because of the surface mount parts, specialized PALS, and multipurpose parts used in the Model 1200, troubleshooting and field repair of the individual printed circuit modules is not practical. This section is designed to help you determine which module in the Model 1200 may be at fault in the event of a problem. You should then contact your equipment supplier or Grass Valley Products Customer Support for module replacement or repair.

Power Distribution

The Model 1200 Signal Processor Frame contains an enclosed power supply which provides all power for the frame. The power supply has been designed for easy removal and replacement in case of a problem. A second power supply in the control panel supplies panel power. Power supply characteristics are as follows:

Frame Input Voltage

- 100 to 240 volts, 50 to 60 Hz. Autoranging and power factor corrected

Output Voltages

- To Signal Processor Frame: +5.0 Volts, -5.2 Volts
- To Fan: +12 Volts

Control Panel Input Voltage: 90 to 135 volts or 180 to 265 volts, 50 to 60 Hz.
Manual setting of voltage range.

Output Voltages

- To Control Panel: -12.0 Volts, -5.0 Volts, +5.0 Volts, +12.0 Volts

Video Signals

Standard System

The Model 1200 uses a 10-bit parallel digital component signal internally with serial digital video converters at input and output. The signal is split into luminance and chrominance channels. If the input signal is 8 bits, the extra two bits are internally forced low.

The Standard Model 1200 system consists of a control panel, a signal processor frame and an interconnect cable. With the standard system the video takes the following paths (see Figure 3-1 on page 3-2):

Input Modules—Each input goes through a Serial or Parallel Input Module where the signal is converted to the TTL level parallel video that is required by the Model 1200. The clock is also stripped off for timing the video.

Crosspoint Module—After going through the Input Module the video is sent to the Crosspoint Module. The Crosspoint Module has several functions:

- Timing all the inputs
- Splitting the inputs into luminance and chrominance (video) or key and depth (keys)
- Connecting inputs to the internal buses
- Generating mattes
- Interfacing to the Chroma Keyer Submodule option

First the signal enters the auto timing circuit which times all the inputs and splits the signals into luminance and chrominance. The video then enters the main crosspoint matrix which assigns each input to a particular input pushbutton on the control panel. The matrix also connects the inputs to the appropriate internal bus. Each crosspoint also has a matte generator built in.

Keyer Module—If the selected video is a key or aux bus, the video is transferred to the Keyer Module. The Keyer Module does the following:

- Interfaces to the Key Processor Submodule
- Does the Effects Send
- Creates control signals for the wipes (wipe solid generator)

The Effects Send circuit can send the selected video and key from the key process to the aux bus outputs to a DPM. The modified signals are then reentered into primary inputs and routed to the mixer circuit. This allows a DPM to be inserted into the signal path between the Key Proc and the Mixer.

Key Processor Submodule—The standard system has a Key Processor Submodule for Key 1 and the DSK. The Key Processor Submodule uses the key source and the key fill video to create a key cutter and video fill that are put over the background video in the mixer.

Program Mixer Module— The Mixer Module does the following:

- Combines the video signals, the key signals, and the wipe solid signal to create the program video
- Interfaces to the Depth Processor Submodule option
- Interfaces to Analog Output (DAC) option

The Program Mixer Module uses the video signals, key signals, and the wipe control signals from the Keyer Module to create a video with all the requested elements. A composite key signal is also created and sent to the output. These signals enter the optional output module for conversion to either a serial or parallel digital video signal.

Options

Input and Output Modules—The Input and Output Modules are required to operate the system but have been made optional to allow the user to select either the serial or parallel version. These options convert the signal levels between the ECL levels of the external signal and the TTL signals used internally in the system. The Serial Input Module also converts the signal between serial and parallel. The Input modules strip the clock off the input signal for timing. The Output Modules reassemble the clock and data.

Chroma Keyer—The Chroma Keyer option mounts on the Crosspoint Module. This submodule creates the chroma key and key fill from any selected Key Bus input. The chroma key and key fill are sent to the Keyer Module where they are handled the same as any other key. The chroma key can be sent to any of the three keyers.

Second M/E Keyer—A second M/E keyer is available optionally. It is identical to the other two keyers and allows a third key to be placed on the video.

Borderline—A Borderline option can be mounted on each of the Keyer Modules. The Borderline modifies the timing of the key and inserts a border or shadow on the key.

Preview Mixer—The Look Ahead Preview Mixer option operates identically to the Program Mixer and provides preview video outputs.

Depth Submodule—The Depth Submodule mounts on the Program or Preview Mixer and processes depth inputs to create depth keys.

Analog Output —The Analog Output options for the Program and Preview outputs convert the digital video outputs into a component analog video signal for driving a monitor.

Control Signals

The control signals begin in the control panel. The pushbuttons and potentiometers of the control panel are scanned and any change in the status of the controls is noted by the panel controller. If the signal is an analog one (i.e. potentiometers), it is digitized and sent along with the digital signals (i.e. pushbuttons), to the Control Processor Module in the signal processor frame.

The Control Processor Module interprets these signals and sends each of the modules in the signal processing frame the correct signal to do the requested operation. Information which is programmed in the system (e.g. which input is assigned to which pushbutton) is stored on the Control Processor Module and is called upon to interpret the information from the control panel.

Each module and submodule tells the CPU that it is installed and what version number it is. The CPU writes control values only to modules that are installed.

Timing Signals

In the Model 1200, all timing signals are generated in the Sync Pulse Generator Submodule. This submodule plugs into the Control Processor Module. The timing signals are sent to the Control Processor Module where they go through fanout and distribution to the various video modules. Each video module uses them to generate the clocks needed by that module. All video signals are reclocked periodically to avoid video jitter.

Processing Amplifiers

Every video output bus has a Proc Amp (processing amplifier). These can be used for adjusting the gain, offset, and hue of the video. The settings of the Proc Amps are determined by the settings associated with the particular input being used on that bus. If a new input is selected for that bus, the settings for that Proc Amp automatically change to the settings associated with the new input. Proc amp settings are stored on the Control Processor Module.

Scaling

All of the key, video, and control signals must go “from black to white” when the signals are sent outside the switcher. Internally the signals are scaled down. Each place where these signals are sent outside there is a Scaling circuit to modify the signals appropriately.

Shaped and Unshaped Video

Shaped video is video that has been multiplied by a key signal to create a partial-raster image that is matted over black. A good example of shaped video is the fill video output of some character generators, which consists of characters on a black matte. Typically, the shaped fill video is also accompanied by a matching key signal that may be used in a keyer to cut a hole in background video into which the already-shaped fill video may be inserted.

The 1200 configuration menus ask you to identify video inputs as shaped or unshaped because the switcher handles those two types of fill video signals differently. For keying with shaped fill video, the keyer multiplies only the background video with the key signal to cut a hole in the background, and then adds the already-shaped fill video into the hole. For fill video that is not already shaped, the keyer first multiplies both the background and the fill video with the key to cut a hole in the background and shape the fill to match the hole. Then the background video and the fill video are added together to create the finished key.

If you incorrectly identify the type of fill video in the Define Inputs configuration menu, selecting shaped when you should select unshaped or vice versa, your keys will have dark lines at the edges or other artifacts. Changing the video type in the Define Inputs configuration menu will correct the problem.

Internal Accuracy

The outputs of the Model 1200 system are 10 bit precision. In order to provide this precision, internal processes for arithmetic operations significantly exceed 10 bits.

When the video enters the Model 1200, it is split into luminance and chrominance, each running at 13.5 MHz. The luminance is carried down one bus at the full 13.5 MHz. The Chrominance is carried in alternating bytes (R-Y, B-Y, R-Y) with each of the chrominance alternating bytes carried at a 6.75 MHz rate. The key and depth information is carried in the same way. The key is carried at full rate; the depth information, which is 20 bits wide, alternates between the MSB and the LSB.

On the Chroma Keyer Submodule, the chrominance signal is split. The clock rate is then upsampled to its full 13.5 MHz rate on each bus. This is done by creating new bytes between each of the existing bytes by averaging between the last byte and the next byte.

16 X 9

The Model 1200 can handle 16 X 9 video. The digital video 16 X 9 signal is handled the same as 4 X 3 video. For 16 X 9, the Model 1200 must have the setup reflect that input. The system can not handle 4 X 3 and 16 X 9 video at the same time. When the setup is changed, it changes the counters and the clock frequency on the Sync Pulse Module. The clock frequencies listed in this manual are for standard 4 X 3 digital video.

Frame Modules

Power Supply

The frame Power Supply Module is a switching power supply that generates the following voltages:

Table 3-1. Power Supply Module

Voltage	Current	Use
+5 Volts	60 Amps	Frame, I/O Modules
-5.2 Volts	12 Amps	I/O Modules
+9 Volts	1 Amp	not used with Model 1200
+15 Volts	2 Amp	not used with Model 1200
+12 Volts	0.5 Amps	Fan

The input voltage can be 100 to 240 Volts, 50 to 60 cycles. The power supply is autoranging and power factor corrected.

The power supply along with the fan is enclosed in a removable sled to make it easy to exchange broken power supplies. The power supply is not designed to be user serviceable.

The Control Panel has a separate Power Supply, refer to the Control Panel section titled, Power Supply on page 3–10.

Control Processor Module

The Control Processor Module (Figure 3-2) has overall control of the system. All of the control and interface functions originate here. There are two microprocessors and associated circuitry on the module.

The 68302 I/O processor handles the following:

- The system boot
- The operating system
- The external interface
- The watchdog timer

The 68020 state processor handles the following:

- The reading and writing between the control panel and the signal processor frame
- Calculations necessary to do the video functions
- Reading system configuration

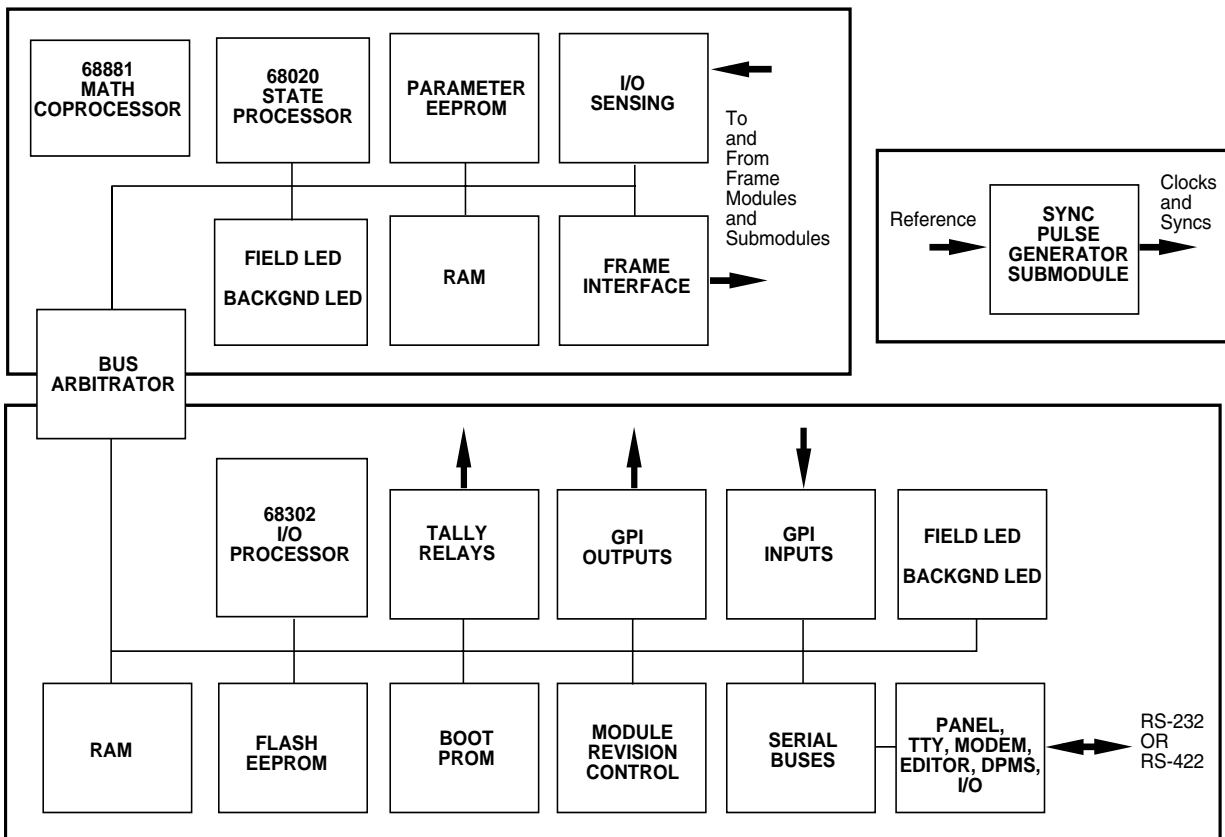


Figure 3-2. Control Processor Module Block Diagram

System Boot

On a power up or a reset the reset line on the 68302 is pulsed low while the reset line on the 68020 is held low. The 68302 then boots from the boot PROM. The first step in the boot is for the processor to run diagnostics checks. It checks its own RAM, the 68020 RAM, and does a check of the peripherals on both processors.

If any of the diagnostics fail, LED DS9 will light and the system will hang up in a loop trying to access the failed location. This allows easy troubleshooting of errors. If the boot is interrupted by pressing the space bar the system then goes into a mode which allows access to a low level debugger or the loading of a new operating system.

After the diagnostics run, the 68302 looks for an operating system in the flash EEPROM. If a system is found, the system is transferred to the RAM of both processors; then the Model 1200 boots from RAM.

The field LEDs are on during the vertical interval while that processor is reading and writing. The Background LEDs are on while that processor is doing background tasks. Since the background tasks take up most of the processor time, the Background LEDs will be on bright and the field LEDs will be on dim.

When there is activity on any of the serial ports LED DS8 will flash. In addition, there are ten LEDs which indicate activity on particular serial ports by flashing whenever there is transmitted or received data on that serial port.

The parameter EEPROM for the 68020 contains the setup items that do not change much, such as the UART setups, default inputs, default matte settings, and default proc amp settings. These settings are loaded into RAM at bootup.

The Control Processor Module also contains all of the clock fanouts for the Sync Pulse Submodule.

The 68302 can read and write to the 68020 RAM using the bus arbitration circuit.

The Control Panel contains an RDY/EPC-31 Motherboard which communicates with the control processor in the frame through the I/O board.

Sync Pulse Submodule

The Sync Pulse Generator Submodule (Figure 3-3) does the following:

- Determines the television standard of the reference input (525, 625)
- Automatically switches the Model 1200 to the correct standard
- Has the system clock which is locked to the input reference
- Generates the timing clocks for the other modules
- Generates sync for the other modules
- Has the system delay adjust

There are two main circuits on the Sync Pulse Generator Module, one for creating sync signals from the reference video and one for generating clocks from a phase-locked oscillator. H sync from the sync generator circuit is compared to an H sync created by counting down the clock. The phase difference between these two signals is used to adjust the clock frequency so that the clock remains locked to the input reference.

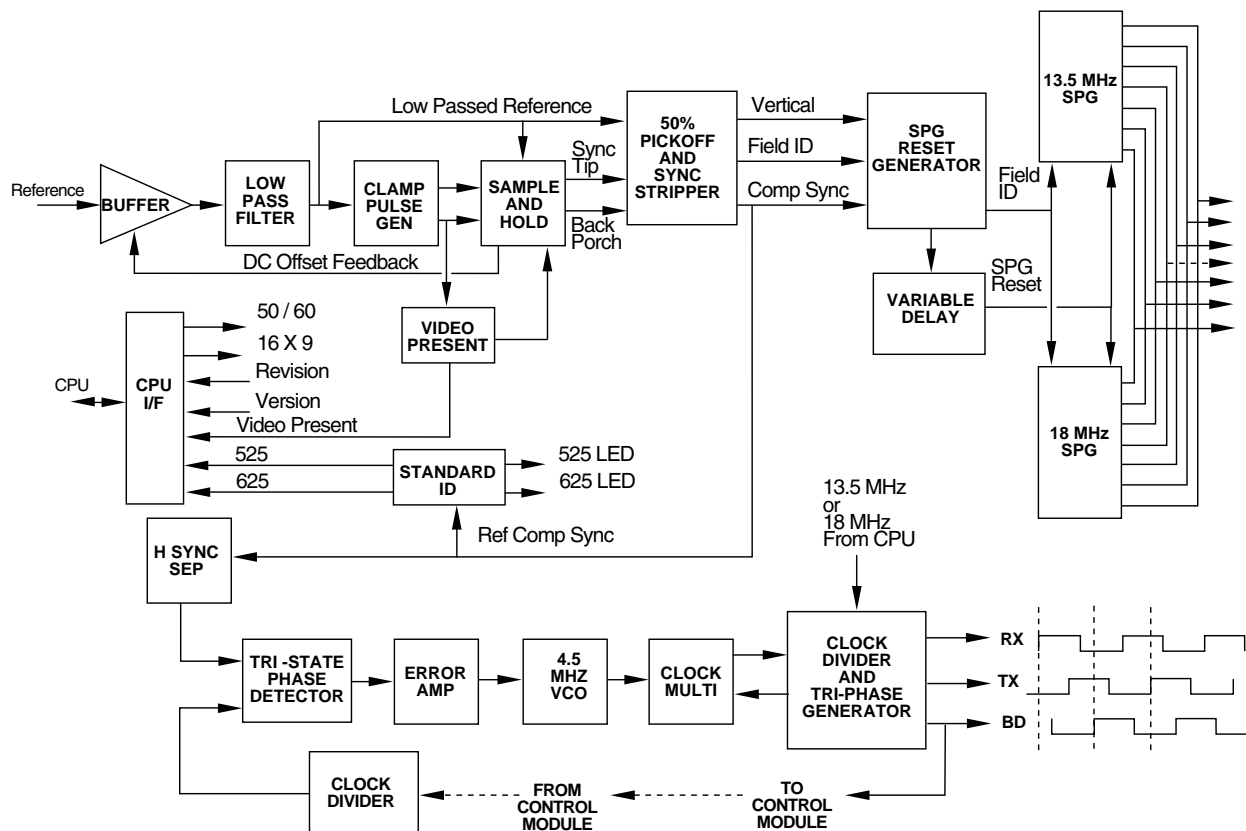


Figure 3-3. Sync Pulse Submodule

Sync Pulse Generator Circuit

The reference black signal is first buffered and low pass filtered to remove the subcarrier. From the resulting signal the clamp pulse generator creates burst flag and sync. Signals from the clamp generator are then used as control signals on a sample and hold.

The sample and hold has the low pass reference video on its inputs. When the clamp pulse generator outputs sync, the sample and hold outputs a DC level equal to the video during sync (sync tip) on one output. When the clamp pulse generator outputs burst flag, the sample and hold outputs a DC level equal to the video during back porch on another output. The two signals are averaged to create the sync slicer (50% of sync). The back porch level is sent to the input buffer to set the input back porch to ground.

Burst flag is also used to create a video presence signal which keeps the clamp loop working when there is no video present. This signal is also fed back to the Control Processor Module.

The Reference low pass video and the 50% of sync level are sent to a comparator which strips sync off the input reference to create composite sync. The composite sync is sent to three places: a sync separator, a standard ID circuit, and a reset generator. The sync separator generates H sync. This H sync is sent to the phase detector which locks the clock to the input reference video. The standard ID circuit decides whether the reference is 525 or 625 line video. The reset generator circuit generates vertical sync (reset) and a field ID pulse which time the sync pulse generators. There are programmable delays in the reset path to allow adjustment of system timing.

The sync pulse generators and many of the counters are duplicated in the Sync Pulse Generator Submodule.

Clock Pulse Generator

Clock generation starts with a 4.5 MHz VCO. The output of the VCO is sent to a multiplier/divider circuit which multiplies the clock frequency and then divides it down to either 13.5 MHz or 18 MHz. This clock is then split into 3 phases for TX (transmit clock), BD (board clock), and RX (receive clock). These clocks are sent off the Sync Pulse Generator Submodule to the Control Processor Module, which has all of the clock fanouts.

Some of the clocks re-enter the Clock Pulse Generator Submodule. One of the reentered clocks is sent to a counter which divides the clock down to an H rate. This H signal is compared with the H signal generated by the sync pulse generator. An error signal is sent back to the Clock generator to correct for any timing error between the two H signals.

Input Modules

Each of the Input Modules contains the circuitry for two serial or parallel inputs. Both circuits in one module are identical. The circuits convert from the ECL level signal on the cable to the TTL levels that are used in the Model 1200. The video or key goes from the Input Module into the Crosspoint Module.

Serial Input Module

The Serial Input Module (Figure 3-4) has two circuits. The first converts from serial to parallel video and the second converts from ECL to TTL signal levels. The output of the Serial Input Module is a TTL version of Parallel video. The clock is stripped off the serial signal and sent to the Crosspoint Module.

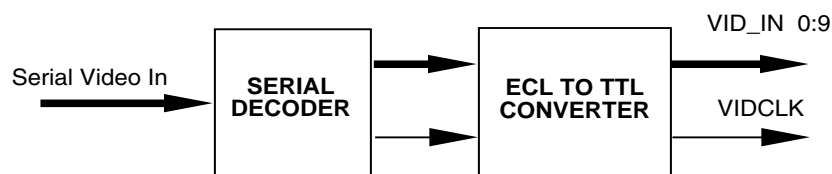


Figure 3-4. Serial Input Module

Parallel Input Module

The Parallel Input Module (Figure 3-5) converts the signal from ECL to TTL and then runs the signal through a latch to align all of the bits. The clock is sent to the Crosspoint Module.

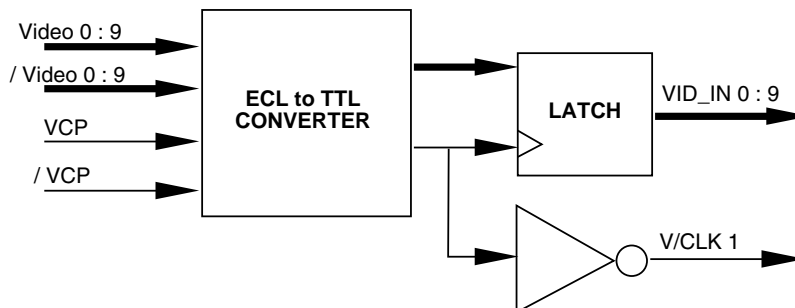


Figure 3-5. Parallel Input Module

Crosspoint Module

Autotiming and Chrominance/Luminance Split

On the Crosspoint Module (Figure 3-6) the video first enters a circuit which auto-times all of the input signals to the reference black signal then splits the signal into luminance and chrominance signals. The key signals are handled the same way except that they are split into key and depth.

Auto-timing is done by locating the horizontal interval of the video signal and comparing it to H Blanking generated from the input reference black. This data is sent to the Control Processor Module which then sends delay data to a variable delay. The variable delay uses the data to delay the signal so that all of the video sources are timed.

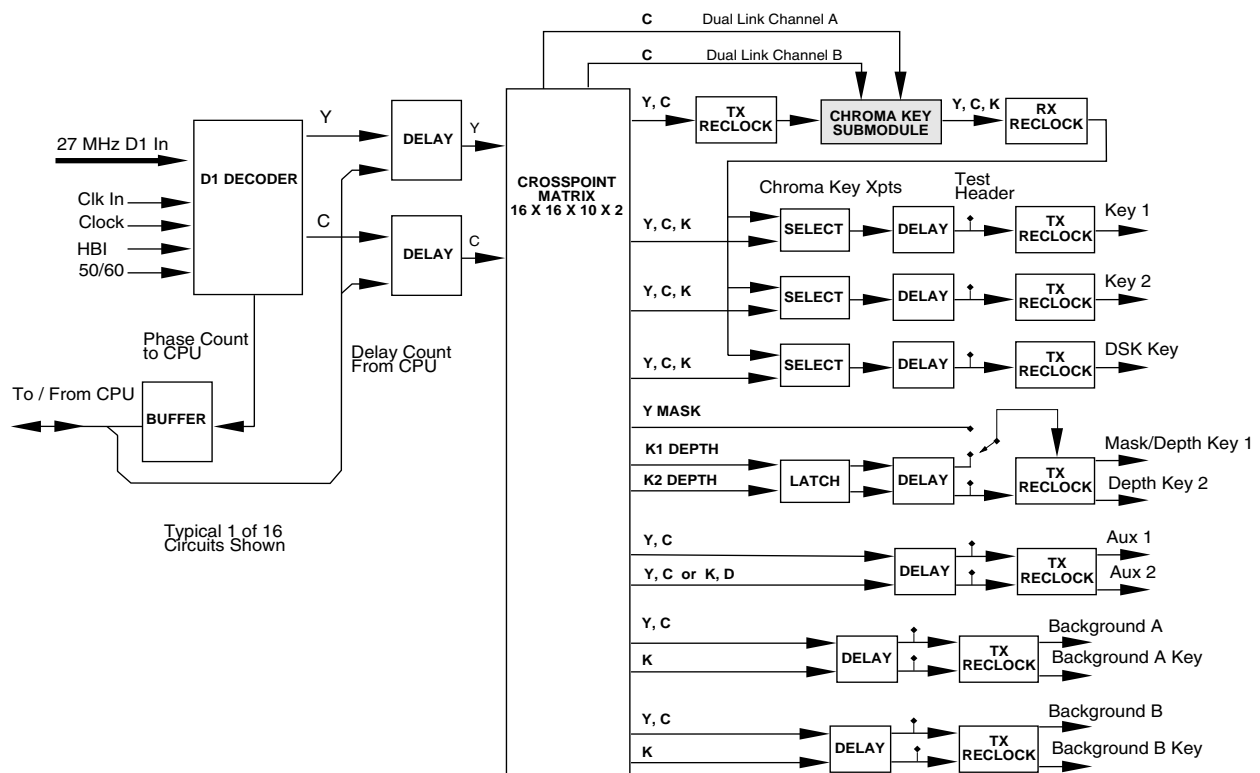


Figure 3-6. Crosspoint Module

Crosspoint Matrix

The Crosspoint Matrix (Figure 3-6) consists of 16 inputs by 16 outputs by 10 bits repeated twice, once for luminance and once for chrominance. Not all of the available outputs are used.

The crosspoint matrix is designed so that any of the inputs can be connected to any of the outputs without limits. To accomplish this, all 16 zero bits (from the 16 inputs) go into one crosspoint, all of the one bits go into the next crosspoint, and so on for all of the crosspoints. Then if input one is mapped to output seven in the mapping menu, each of the 20 crosspoints connects input one to output seven. This connects each of the 10 luminance bits and each of the 10 chrominance bits from pin 1 input to pin seven output. The outputs of the crosspoints are then reorganized into video buses.

The Output buses for the Y (luminance) crosspoints are the following:

- Luminance for Background A and B (2 buses)
- Key and Luminance for Key 1, Key 2, and DSK (6 buses)
- Luminance for Aux 1 and Aux 2 (2 buses)
- Luminance for Chroma Key (1 bus)

The Output buses for the C (chrominance) crosspoints are the following:

- Chrominance for Background A and B (2 buses)
- Chrominance for Key 1, Key 2, and DSK (3 buses)
- Mask/Depth for Key 1 and Depth for Key 2 (2 buses)
- Chrominance for Aux 1 and Aux 2 (2 buses)
- Chrominance for Chroma Key (1 bus)

One crosspoint in the matrix takes the output of the Chroma Keyer Submodule and can place it on any or all of the three key buses.

The crosspoints can create a matte for each output. They do this by simply generating the bits required to create a given color.

The Crosspoint Module includes delays on all of the buses so all signals can be timed to arrive at their destination simultaneously. This compensates for the various delays through the system.

Chroma Keyer Submodule

The crosspoint module sources four buses to the chroma keyer (see Figure 3-7 on page 3-20). Two of these carry Y and C signals in standard decoded 4:2:2 format. The other two carry odd and even chroma samples from a full bandwidth 4:4:4 chroma key source. For normal operation of the switcher, the full bandwidth buses are not used—the 4:2:2 chrominance signal is upsampled and substituted for the full bandwidth buses. The upsampling or interpolation is followed by a switch that allows normal or full bandwidth operation. The signal after the switch has U and V samples occurring at 13.5 MHz rate.

These U and V signals describe the chroma content of the input signal. The Hue Correlation circuits compare the chroma content to a reference hue to produce a signal that describes how closely the input signal color is to the reference hue. The closer the hue in the input signal is to the reference hue, the larger the response is at the output of the Hue Correlation circuit (if the reference hue is blue, the output signal will be greatest in the blue areas of the input signal).

Other functions associated with the Hue Correlation circuit are the Aperture Control and the Fringe Control. The Aperture Control determines how sensitive the circuit is to color matching. As aperture is decreased, the circuit requires tighter matching in the hue for the same response. The Fringe Control causes the Hue Correlation circuit to respond to areas in the input scene that have little or no chroma.

The two Hue Correlation circuits on the 1200 chroma keyer are called background and foreground. The Background Hue Correlation circuit is used for background color suppression and for generation of the chroma key signal. The Foreground Hue Correlation circuit affects colors in the foreground that have been polluted by the background. The signal output from the foreground circuit is used only for foreground color suppression and has no effect on the generation of the key signal.

The output of the Background Hue Correlation circuit goes to a multiplier where it can be multiplied to zero by the force mask signal coming from the soft box mask generator. A zero level signal represents no response and results in no suppression or key generation, a "blue" part of the scene is preserved. After the multiplier, the signal can be processed for noise suppression. The noise suppression is done using a circuit with a coring function that measures the level and if the level does not exceed a set level the output does not respond. Low level noise does not cause suppression or key generation.

The signal then goes to background suppression. This is done by shaping a matte signal with the signal from the correlation circuit. The shaped matte signal (generally the same color as the background) is subtracted from the chroma keyer input signal. The color background is suppressed to black.

Key generation is done by scaling the signal from the Background Hue Correlation circuit using a variable gain comparator. The scaled output is now a suitable multiplier control signal, is used for coring, and sent to the key size, position, and softness circuit before going to the keyer module.

The Foreground Hue Correlation circuit output also goes through a force mask multiplier. The force mask multiplier can be controlled independently for foreground and background processing by way of switches. The foreground output signal then goes to a difference circuit that prevents suppression in the foreground from duplicating suppression in the background.

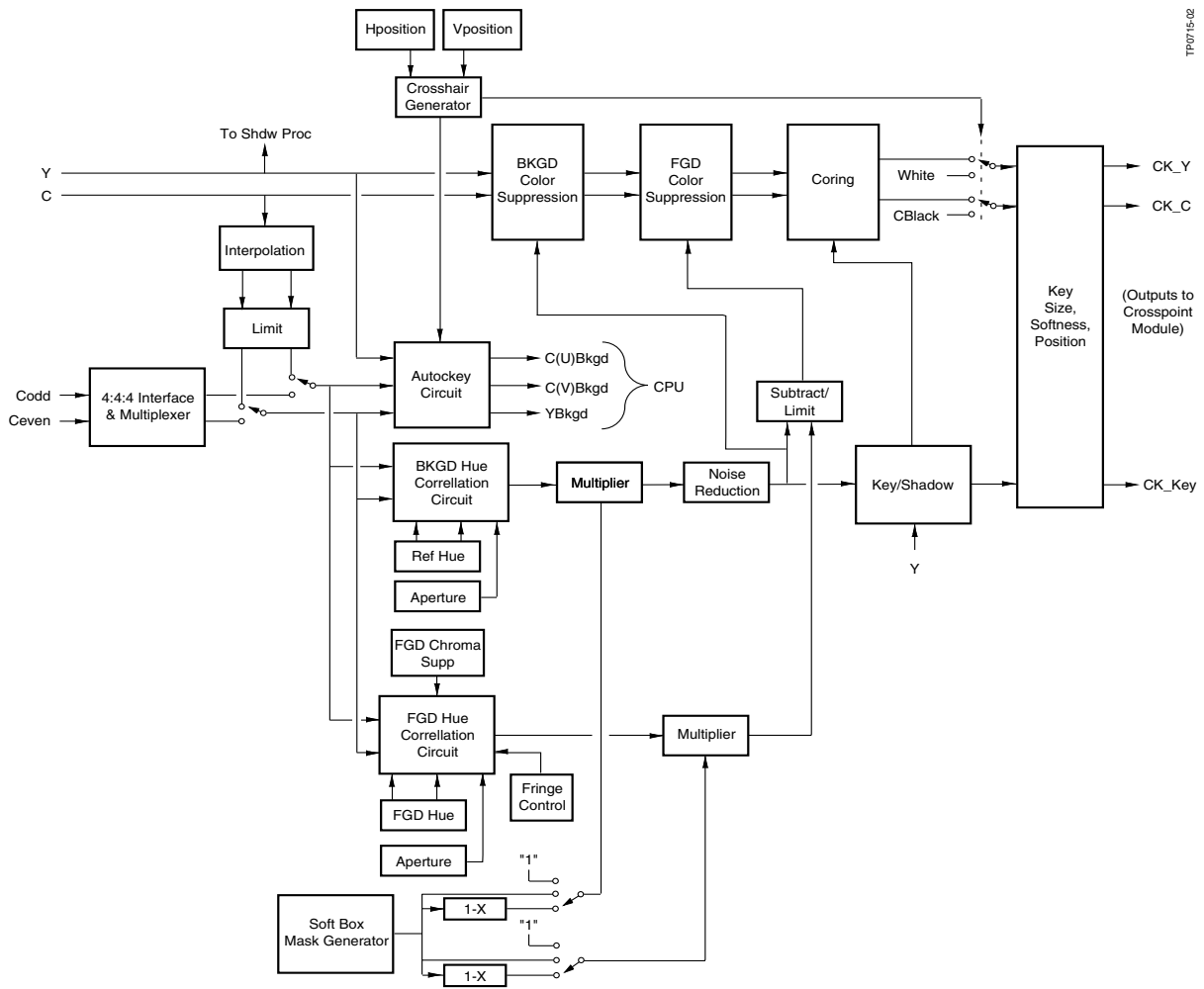
The coring circuit removes noise in the video path by forcing the signal to black when the signal is less than a set level. This process is further qualified by the key signal, which must be non-zero to cause noise suppression.

The AutoCKey circuit works in conjunction with the crosshair generator and the cursor insertion switches. These circuits control the autoselection of the chroma keyer. The crosshair generator inserts a cursor signal into the video path. The cursor is positioned by the control panel joystick. The cursor generator also produces a strobe used by the AutoCKey circuit to capture luminance and chrominance data at the location identified by the cursor. The captured data is read by the 1200 CPU for each field and used to calculate the reference hue, luma suppression level, VGC clip and gain, and shadow clip level. The operator can select an area of the scene using the cursor and cause the system to set up a chroma key based on the video in that area.

The 1200 chroma keyer also has the ability to add a luminance-based shadow to the chroma key. The luminance Y signal is processed in a variable gain comparator to generate a shadow control signal that is combined with the key signal in the NAM. The video outside the key is suppressed to black causing the shadow part of the new background signal to be attenuated.

The key size, position, and softness circuit uses vertical and horizontal filters to reposition, resize and soften key edges. This circuit is composed of field and line delays, filter circuits, and motion detection. When vertical processing is not used, most of the circuitry is bypassed.

The outputs of the chroma keyer are chroma key Y, chroma key C, and the chroma key signal. The output signals then return to the crosspoint module to be routed to one of the three keyers in the system.



TP0715-02

Figure 3-7. Chroma Keyer Submodule

Keyer Module

The Keyer Module (Figure 3-8) contains the Effects Send crosspoints, proc amps, and Wipe Pattern Generator. The Keyer Module also holds the Key Processor Submodules and the Borderline Submodules.

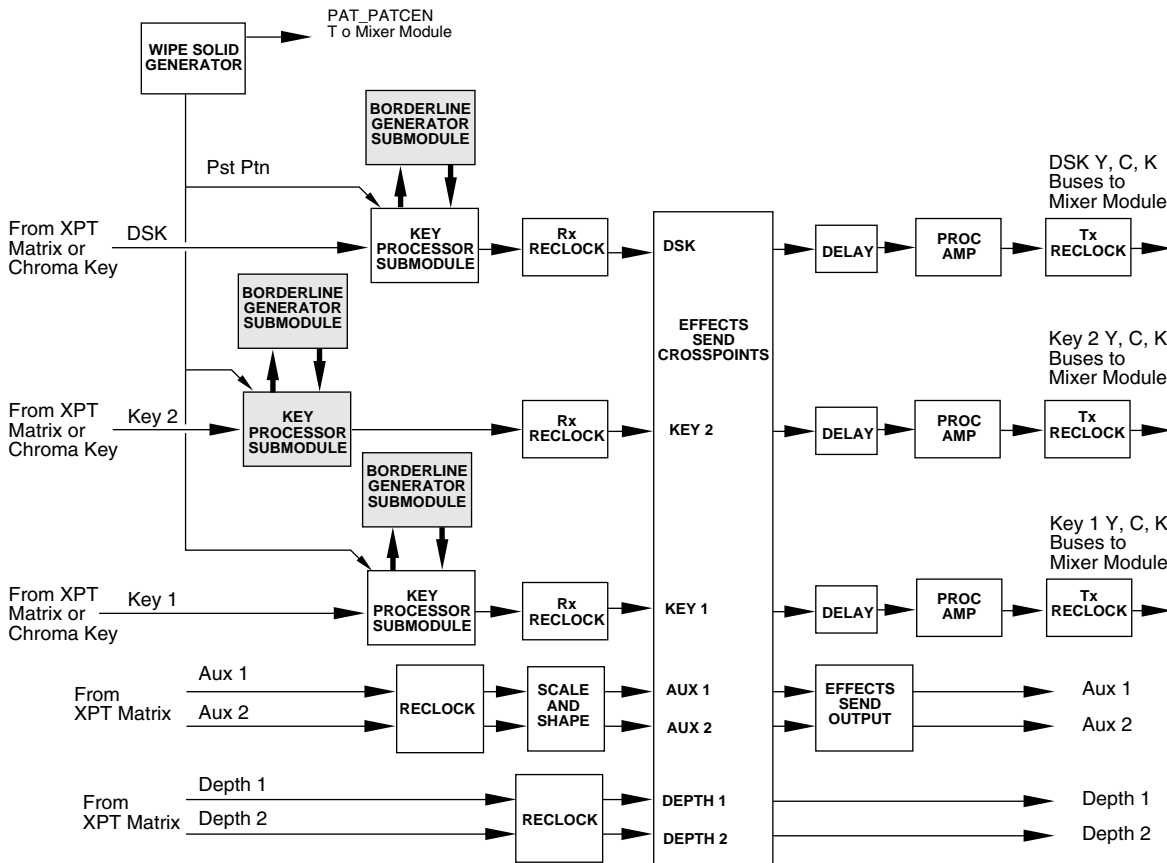


Figure 3-8. Keyer Module

Effects Send Crosspoints

The Effects Send crosspoints constitute a crosspoint matrix which has all of the Key Buses, Aux Bus 1, Aux Bus 2, and the key depth buses as inputs and outputs. This crosspoint matrix will allow any of the three keys and fills to be placed on the Aux 1 and Aux 2 output buses, which can be connected to a DPM for manipulation of the key. The signal returning to the Model 1200 from the DPM re-enters on one of the primary inputs and is routed to the effects send crosspoints on the Aux 1 and Aux 2 input buses. The effects send crosspoints place this signal on any of the key output buses.

Wipe Pattern Generator

The Wipe Pattern Generator (Figure 3-9) produces a single wipe pattern output which is used two places:

- A 16-bit signal is sent to the Mixer Module for wipe transitions
- A 10-bit signal which has been Clip and Gain adjusted goes to each of the Key Processor Submodules to create the Preset Pattern Key

The Wipe Waveform Generator creates digital horizontal and vertical ramps. From these ramps the Wipe Solid Generator creates the various wipe patterns by modifying them according to various mathematical formulas. Counters divide the horizontal and vertical ramps into segments to produce pattern multiplication. The pattern outputs consist of a full 16-bit signal which is sent to the Wipe Module to be used for wipe transitions and a 10-bit version which is sent through a proc amp to the Preset Pattern Generator on the Keyer Module.

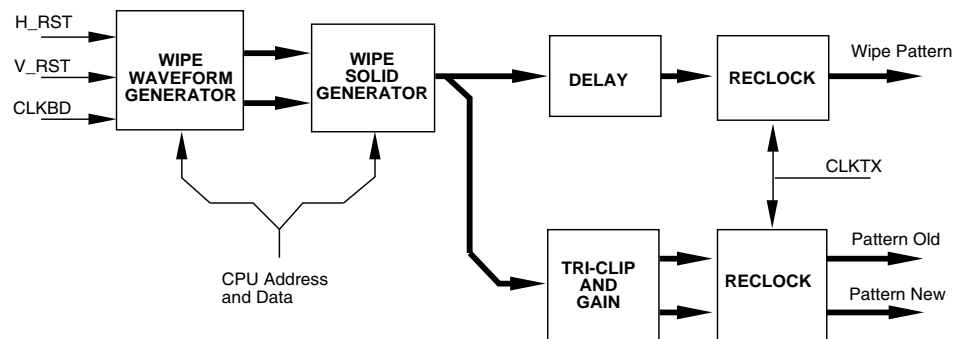


Figure 3-9. Wipe Pattern Generator

Effects Send Output

This circuit converts the effects send signals from the switcher's internal format to standard digital video.

Key Processor Submodule

The Key Processor Submodule (Figure 3-10) generates the following signals:

- Preset pattern key with or without border
- Luminance key with or without mask
- Linear key with or without mask

The functions of some Key Processor circuits change according to the type of key being generated. Luminance and linear keys are handled identically except for Tri Clip and Gain settings. The Additive Mixer and its input from the Select circuit are used in the following ways:

- Lum key, unmasked, unshaped video: shape video with key
- Lum Key, unmasked, shaped video: not used
- Lum Key, masked, unshaped video: shape video using masked key
- Lum Key, masked, shaped video: unshape video during mask
- Preset Pattern Key: Pattern New is used to shape the video

Pattern Old and Pattern New are used to generate the preset pattern key. Pattern Old is also used to create a mask on non-preset pattern keys. The Borderline option and its associated Tx reclocks and selects are used to put a border or shadow on any of the keys.

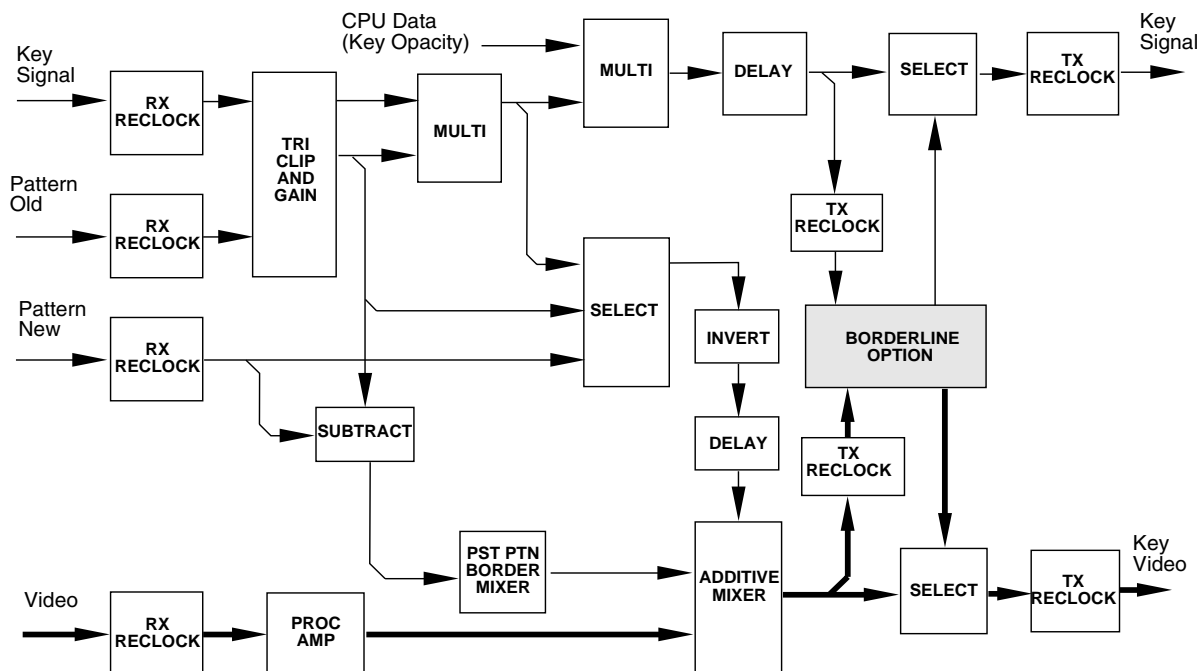


Figure 3-10. Key Processor Submodule

Preset Pattern Keys

Pattern New is the outer edge of the new video and Pattern Old is the inside edge of the old video. The space between (if any) is the border. The positions of these signals are determined by the Keyer Module.

The Pattern Old signal passes through the Tri Clip and Gain circuit and gets selected by the multiplier. The key opacity multiplier uses data from the CPU to determine how opaque the key signal should be. The key signal is then delayed, and if the Borderline is not used, the signal is sent to the Mixer Module. If the Borderline is used, the signal is sent to the Borderline Submodule where the key is modified. The signal is then sent to the Mixer Module. Pattern Old is also selected by the Select circuit and sent to the additive mixer where it is used to shape the video.

The preset pattern border is created by subtracting the Pattern Old and Pattern New signals. The resulting signal enters the Preset Pattern Border Mix circuit which creates the border matte. The border then goes to the Additive Mixer.

The video signal is first sent through a Proc Amp before going to the Additive Mixer.

The Additive Mixer combines the video and border using the Pattern Old signal to create the video with the border inserted. The video signal is then sent to the Mixer Module if the Borderline is not used. If the Borderline is used, then the video goes through the Borderline Submodule before it is sent to the Wipe Module.

Luminance, Linear, and Chroma Keys

The Key signal and the Pattern Old signal enter the Clip and Gain circuit. If there is no mask applied to the key, only the Key signal exits the Clip and Gain. If there is a mask applied to the key, both the Key and the Pattern Old exit. The multiplier then multiplies the Key and Pattern Old to produce the masked key.

The masked Key signal enters a multiplier with opacity data from the CPU to give the key the desired opacity. If there is no Borderline, the signal is delayed and sent out to the Mixer Module. If Borderline is selected, the signal is sent to the Borderline circuit and then out to the Mixer Module.

The signals being sent to the Additive Mixer depend on several factors. See the previous page for details.

The video first passes through a Proc Amp and is then applied to the Additive Mixer where the key and video are combined. If the Borderline Submodule is used, the video passes through the Borderline Submodule before it is sent to the Mixer Module.

A Chroma Key is handled the same as a Linear Key.

Borderline Submodule

A Borderline Submodule option (Figure 3-11) can be mounted on each of the Key Processor Submodules. The purpose of the Borderline is to expand the key horizontally and/or vertically to put a border or shadow around it.

The Horizontal Key Stretch circuit will, under the control of the CPU, delay the key one pixel and then do a Non Additive Mix (NAM) between the original signal and the delayed signal. This process is repeated until the key is widened enough for the required border. At the same time the Vertical Key Stretch is widening the key vertically.

The stretched key is sent to a NAM. At the same time the key is sent to the adjustable 3 line delay where the key is delayed the required number of lines and pixels. The delayed key signal is also sent to the NAM. The output of the NAM is the difference between the delayed key and the stretched key, which is the border.

The border is sent to the Border Opacity Mixer which, under the control of the CPU, sets the opacity of the border. The border signal then is sent to both the Border Mixer and the Combiner circuit. The Combiner circuit combines the key signal and the border signal and outputs the resultant key signal.

The key video goes through a delay and into the Border Mixer. The Matte Generator generates the border matte which is sent to the border Mixer. The Border Mixer then combines these signals with the output from the border opacity mixer to create a key video with border.

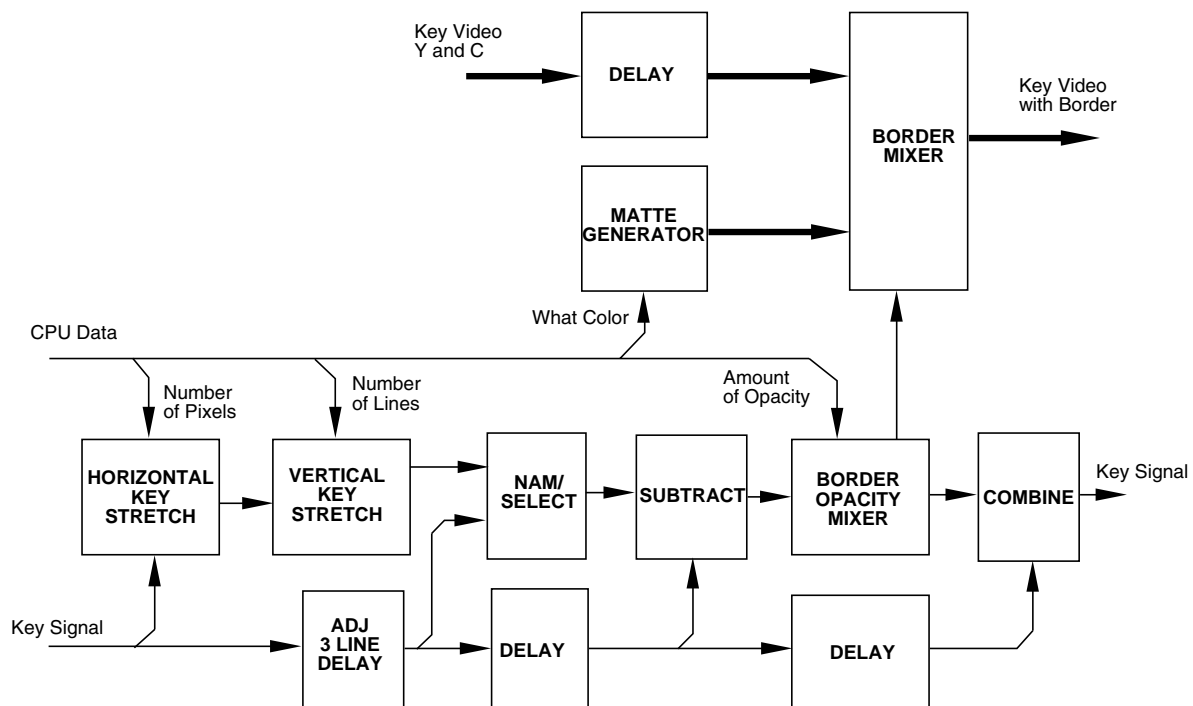


Figure 3-11. Borderline Submodule

Program Mixer Module

The Program Mixer Module (Figure 3-12):

- Generates the Clean Feed Out
- Generates the Program Out
- Processes the depth information
- Has the Transition Generator

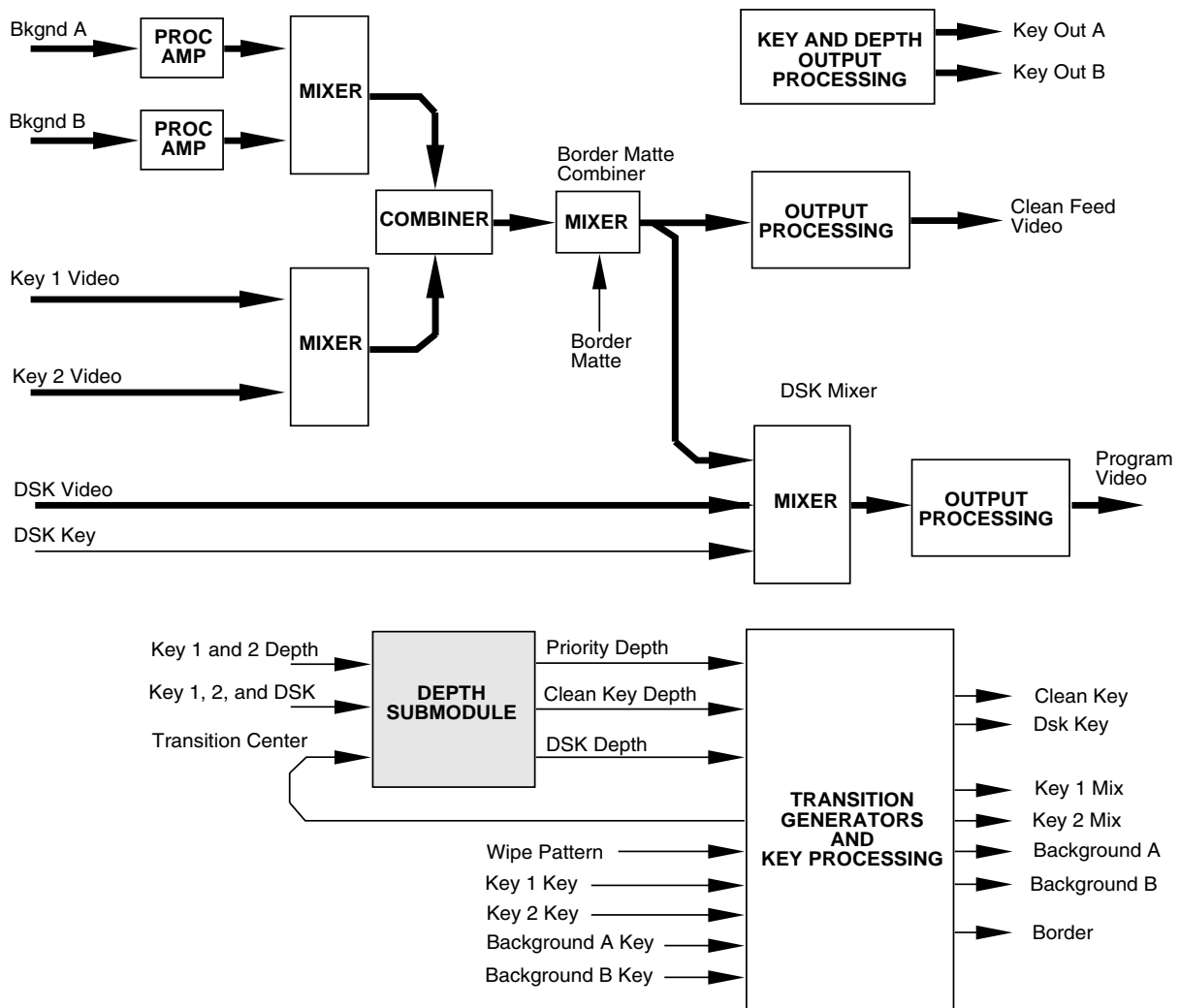


Figure 3-12. Program Mixer Module

Clean Feed Out

A and B Backgrounds enter into the Program Mixer Module from the Crosspoint Module (see Figure 3-13). They each go through a Proc Amp and then enter a Mixer circuit. The Mixer circuits use the Background A and Background B Control signals to determine how much of each signal will feed the Background Combiner circuit.

The Key 1 and Key 2 video go through buffers (the proc amps for the keys are on the Key Processor Submodule). The mixer circuits then use the Key 1 and Key 2 Control signals to determine how much of each signal will go into the Key Combiner circuit.

The outputs of the Key Combiner and the Background Combiner circuits enter another Combiner circuit. There, the background video is combined with the key video signal.

The results of all of these operations are kept at full accuracy until reaching the limit and round circuit, which does two things: it rounds the results to ten bits and prevents an overflow or underflow condition.

The final mixer combines the background and key signal with the border control signal to create the Clean Feed Signal. This signal is sent both to the DSK and to the Clean Feed Output. The Clean Feed Output is delayed and unshaped if necessary before being sent to the output.

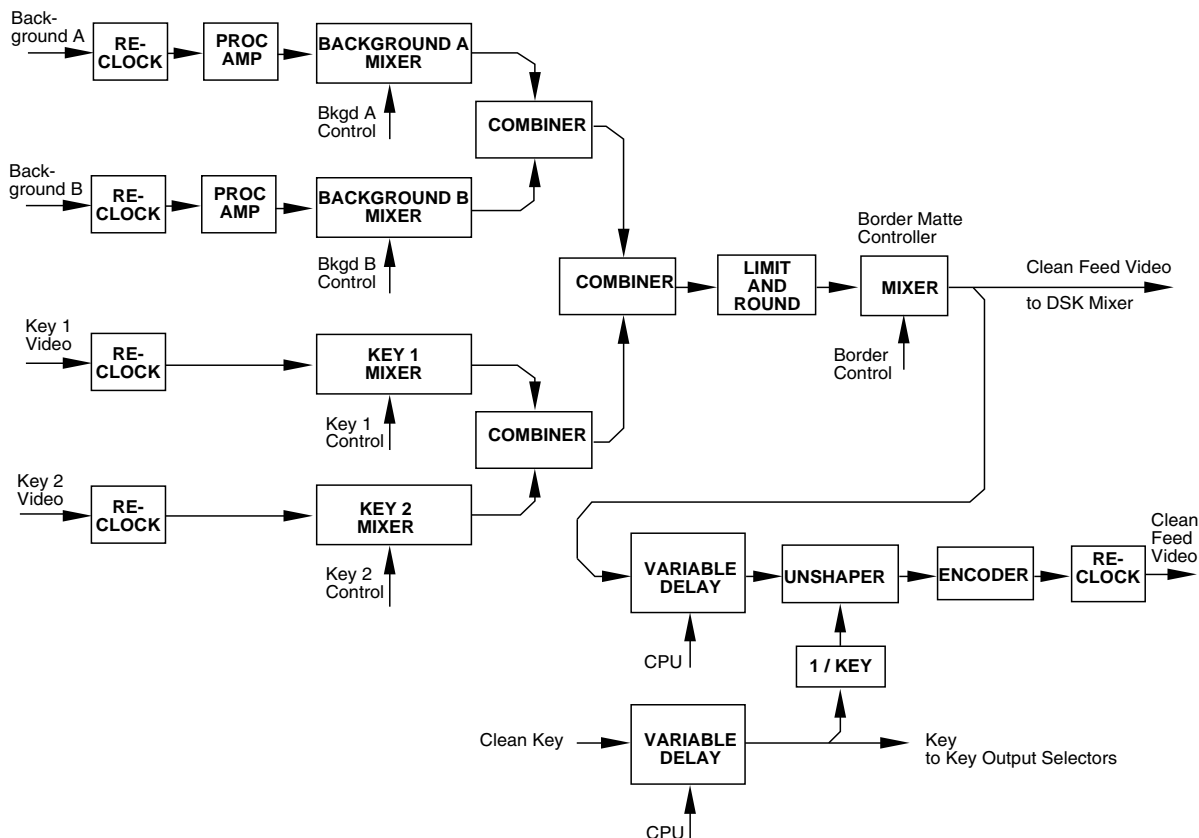


Figure 3-13. Clean Feed Out

DSK

The DSK Video Mix Multiplier (Figure 3-14) takes the DSK video and the data from the CPU to mix the DSK fill signal on and off. The DSK Key Mix Multiplier does the same for the DSK Key. The Video Mixer takes the DSK Fill, the Clean Feed Video, and the DSK Key to create the Program Video signal. The DSK video then goes through the Fade To Black Multiplier, the Unshaper, and the Encoder to the output.

The Clean Key signal (Key 1 and Key 2 combined) is combined with the DSK Key in the Additive Mixer. This creates a composite key which is available as an output if black is chosen as the background.

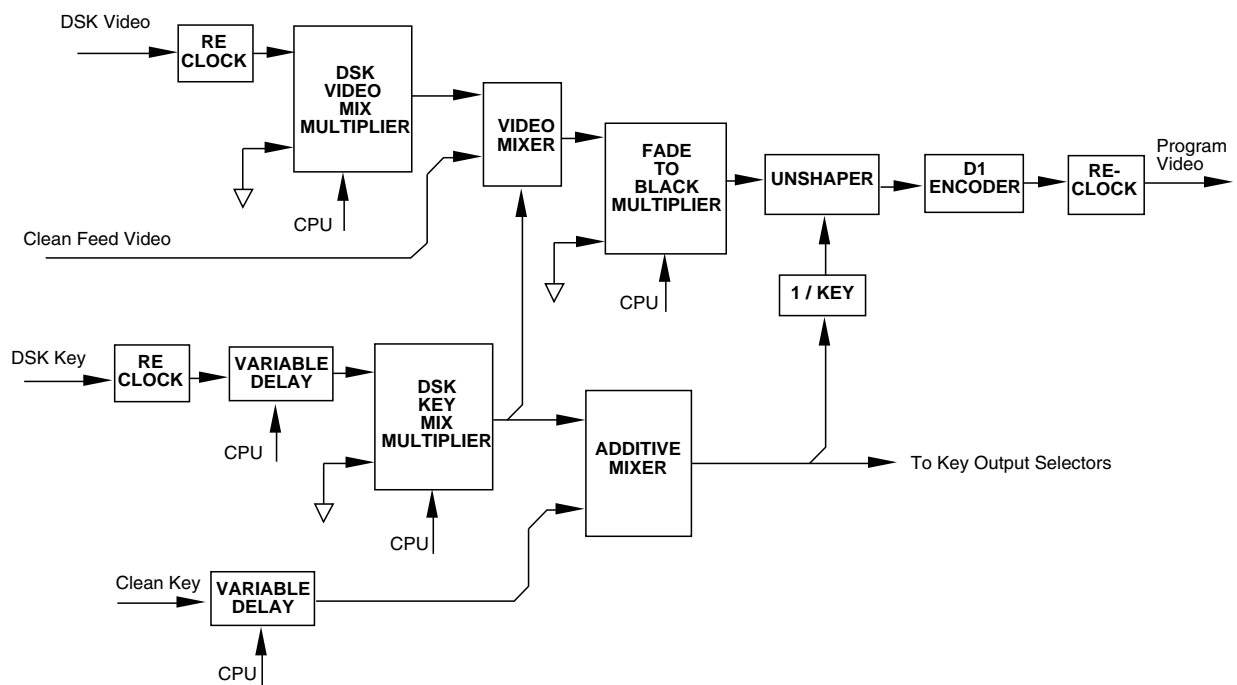


Figure 3-14. DSK

Key and Depth Output Processing

The Clean Key and the DSK Key (Figure 3-15) are converted from control level signals to video level signals in the mixers. The selectors will allow either of the key and depth inputs to be put on either or both of the key outputs. The encoder multiplexes the key and depth signals into one signal.

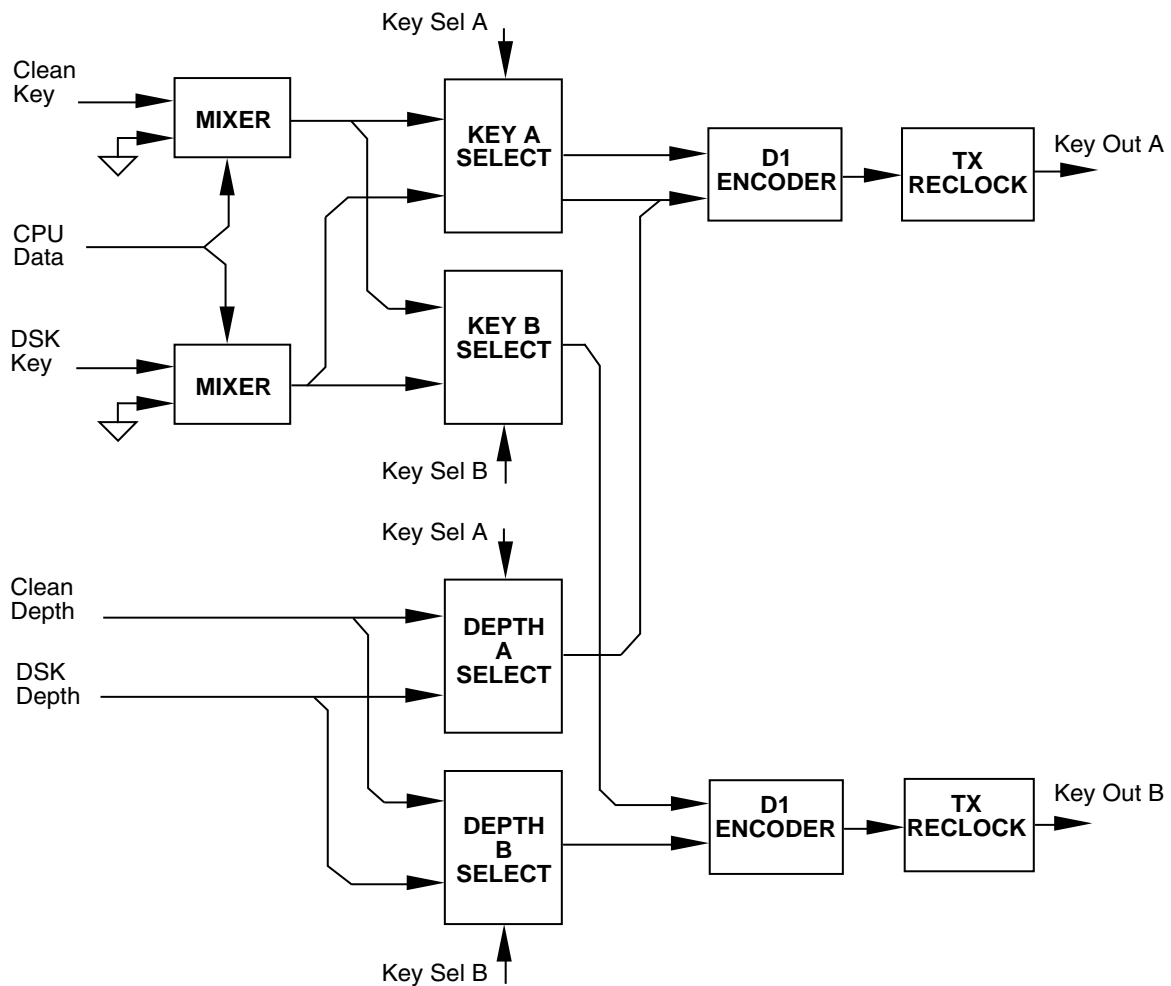


Figure 3-15. Key and Depth Output Processing

Transition Generators

The Transition Generator (Figure 3-16) creates the control signals for each of the mixers.

The T1 and T2 (Transition Old and Transition New) are created by the Clip and Gain from the Wipe Pattern. Pattern Old is the outer edge of the old video. Pattern New is the inner edge of the new video. The space between the two (if any) is the border. T1 and T2 go to all of the Transition Generators where they are used to determine the location of the wipe.

To create a control signal for a particular video the Transition Generator must have information on that layer and any layer above it. The Key 1 Transition Generator has inputs for the Key 1 and Key 2. If Key 1 is in front of Key 2, the Key 2 input will be ignored. If Key 2 is over Key 1, the Key 1 Transition Generator will only output a signal where Key 2 is not hiding Key 1. This is determined by the Priority Depth Signal.

There are two outputs from the Transition Generator: the Key 1 Transition Signal and a Summation Output which has that Transition Signal and any previous transition. So the Key 1 Summation is entered into the Key 2 Transition Generator and the Key 2 Summation is entered into the Background A Transition Generator.

The Key 2 Transition Generator is identical to the Key 1 Transition Generator except that the Key 1 Summation is entered into the Key 2 Transition Generator.

Background A is considered to be over Background B and both keys are over both backgrounds. Considering this, the Background A Transition Generator requires Background A, Key 2 and Key 1. The Background B Transition Generator requires Background B, Background A, Key 2, and Key 1 as inputs. Each of the transition controls goes to the appropriate mixer.

Since the border transition will vary depending on which key is on top there are two Border Transition Generators: one generator with Key 1 on top and the other with Key 2 on top. The Border Mixer uses the Depth Signal to determine which of the transition controls to send to the output.

The Key Summation also goes into both Border Transition Generators and a mixer decides which of these should be the Clean Key output. The Clean Key output is a composite of all keys except the DSK. If both backgrounds and the border between the backgrounds are all black, then the Clean Key is a composite key (less DSK).

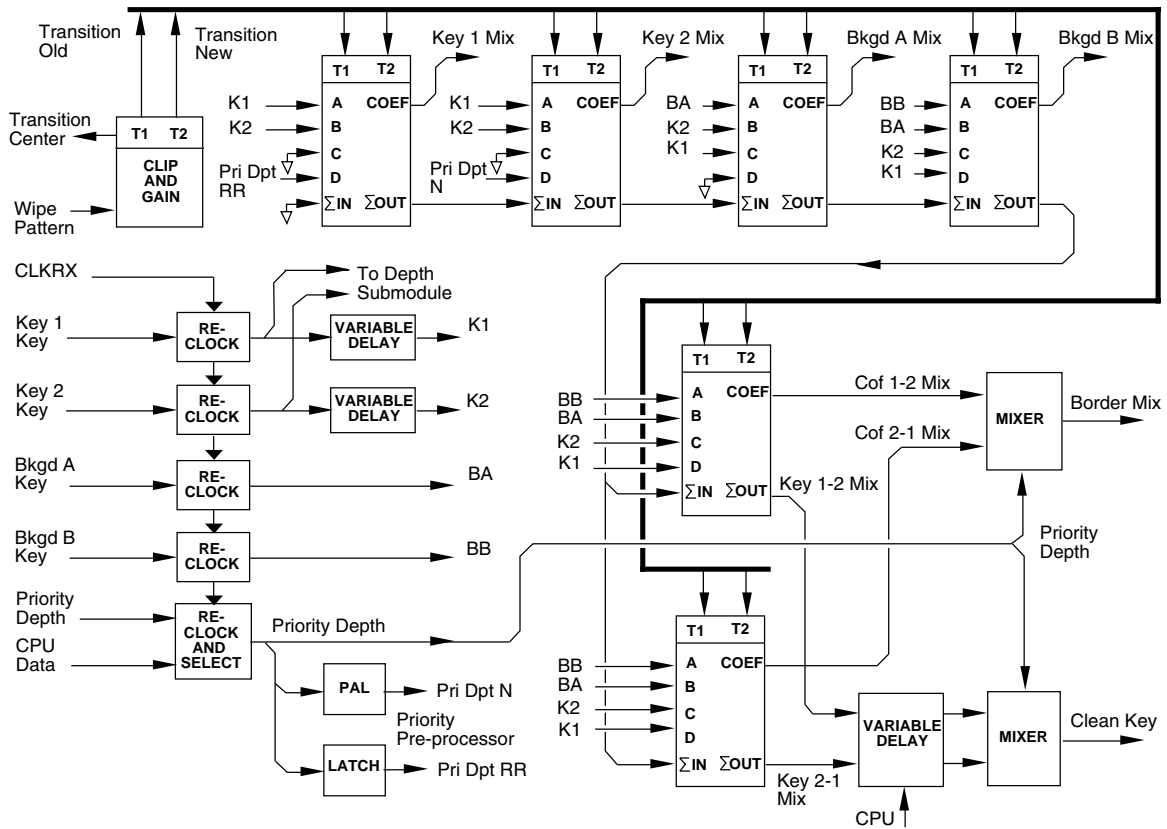


Figure 3-16. Transition Generators

Depth Submodule

The Depth Demultiplexer (Figure 3-17) takes the ten-bit wide two-byte depth signal and converts it to a 20-bit wide single byte. Since the signal is still being clocked at half rate, the Depth Interpolation will add a byte between each of the existing bytes by averaging between the two existing bytes. The Offset Adder allows the Key Depth to be changed from the Control Panel by adding an offset to the Depth Signal. This is done to both Key 1 and Key 2 depth.

The signal from both keys is sent to the Priority Depth Generator which uses the Depth Signals to decide which key is on the top. The Clip and Gain circuit after the Priority Depth Generator determines whether the intersection of the two keys is soft or hard.

The Key 1, Key 2, and DSK Keys all go through a Clip and Gain. This circuit decides whether or not the key appears based on the Clip and Gain settings and key opacity. The Depth Shaper sets the key depth to zero where the key is not on. The depths of the two M/E Keys are then sent to a NAM that decides which key is the highest layer and sends that key to its output. The signal is multiplexed and delayed as necessary and sent out as Clean Feed Depth.

The Program (DSK) Depth is done in a similar manner by sending the output of the Key 1, Key 2 NAM to another NAM along with the DSK Depth. The DSK depth is set to full foreground when the DSK is on and zero when the DSK is off. The output of this NAM is the depth of the highest key on the DSK.

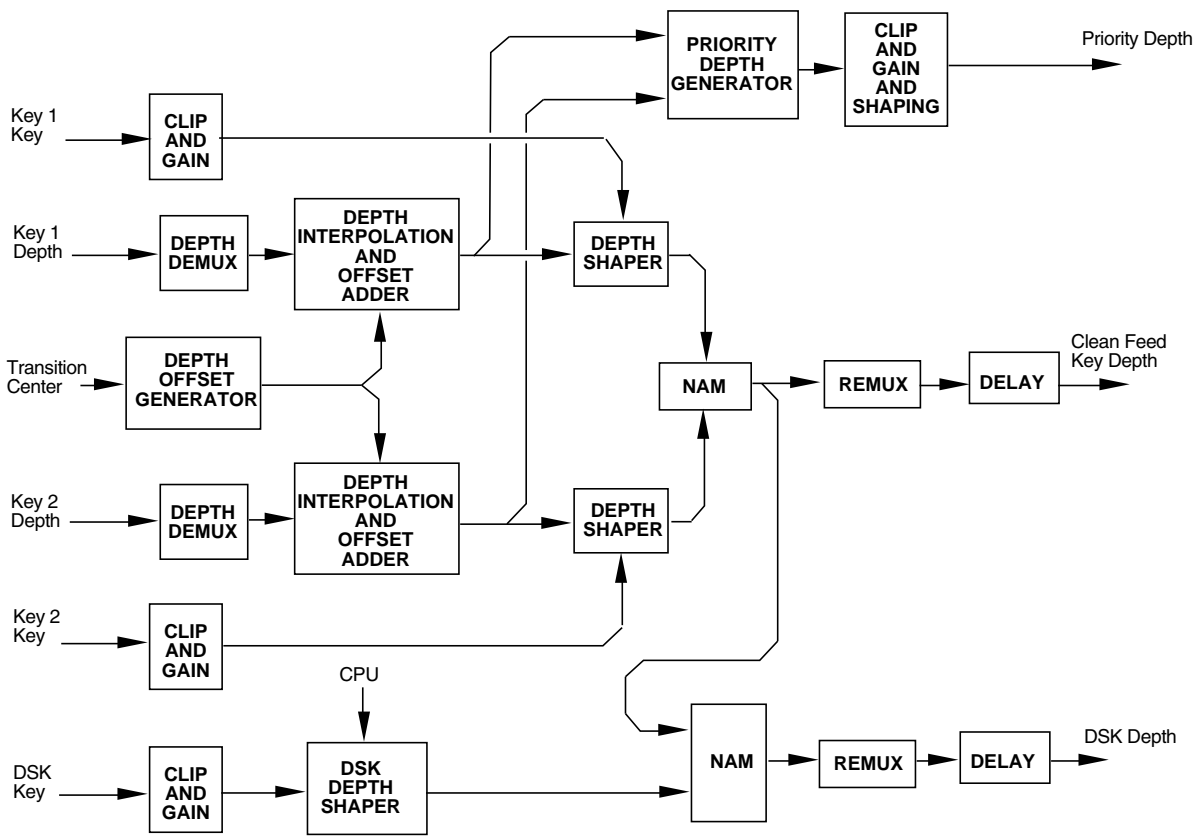


Figure 3-17. Key Depth

Analog Output Option (DAC) Submodule

The Analog Output (DAC: Digital-to-Analog Converter) option consists of the 064912 DAC Support board and the 064815 DAC board. The Support board prepares the video signal for conversion and also provides decoding and latching of the clock and control signals used by the DAC. The DAC board does the digital-to-analog signal conversion.

064912 DAC Support Board

The DAC Support board (Figure 3-18) selects between the switcher's internal digital Program and Clean Feed video signals and delays, blanks, and up-converts the selected signal to an 8:8:8 format. The upconversion provides superior frequency response and group delay characteristics with a minimum of adjustments. In addition, the board generates timing pulses and control signals and filters the analog power supply voltages to minimize digital noise. The Support board supplies the processed video to the 064815 DAC board for digital to analog conversion.

Under control of the switcher's control data bus, latch ICs U23, U8, U24, and U4 select either the Clean Feed or the Program digital video signal for processing and routing to the DAC board. Delay ICs U7 and U3 introduce variable delays to the Y and C components of the video signal to ensure that the analog output aligns with reference video. ASIC U11 mixes between the video signal and black in order to add blanking to the video.

Following signal selection and processing, five half-band filter ASICs, U1, U2, U5, U6, and U9, interpolate the luma and chroma components of the video signal to double clock rate (27 MHz or 36 MHz). The luminance component passes through a fixed delay (U10) to maintain it in time with the chroma components. The cosited chroma component is separated into U and V components by clocking the first chip in each path (U2 and U6) with chroma clocks that are opposite in phase. After leaving the filter ASICs, the luma and chroma components exit the Support board and enter the DAC board.

The Support board derives clocks and control data from system clock and control signals. IC U15 fans out the system clock, and PAL IC U18 sets correct chroma phase for the clocks. A clock doubler consisting of U19 and associated components provides the 27 MHz or 36 MHz clocks required by the filter ASICs. IC U12 delays system sync blanking to align it with the video signal, and ICs U16 and U17 create sync, blanking, and clamp pulses from the system blanking signals. Jumpers allow the user to specify blanking width and presence or absence of setup. ICs U21, U14, U20, U22, and U25 latch control signals from the system data bus to provide control of circuits on the Support and DAC boards.

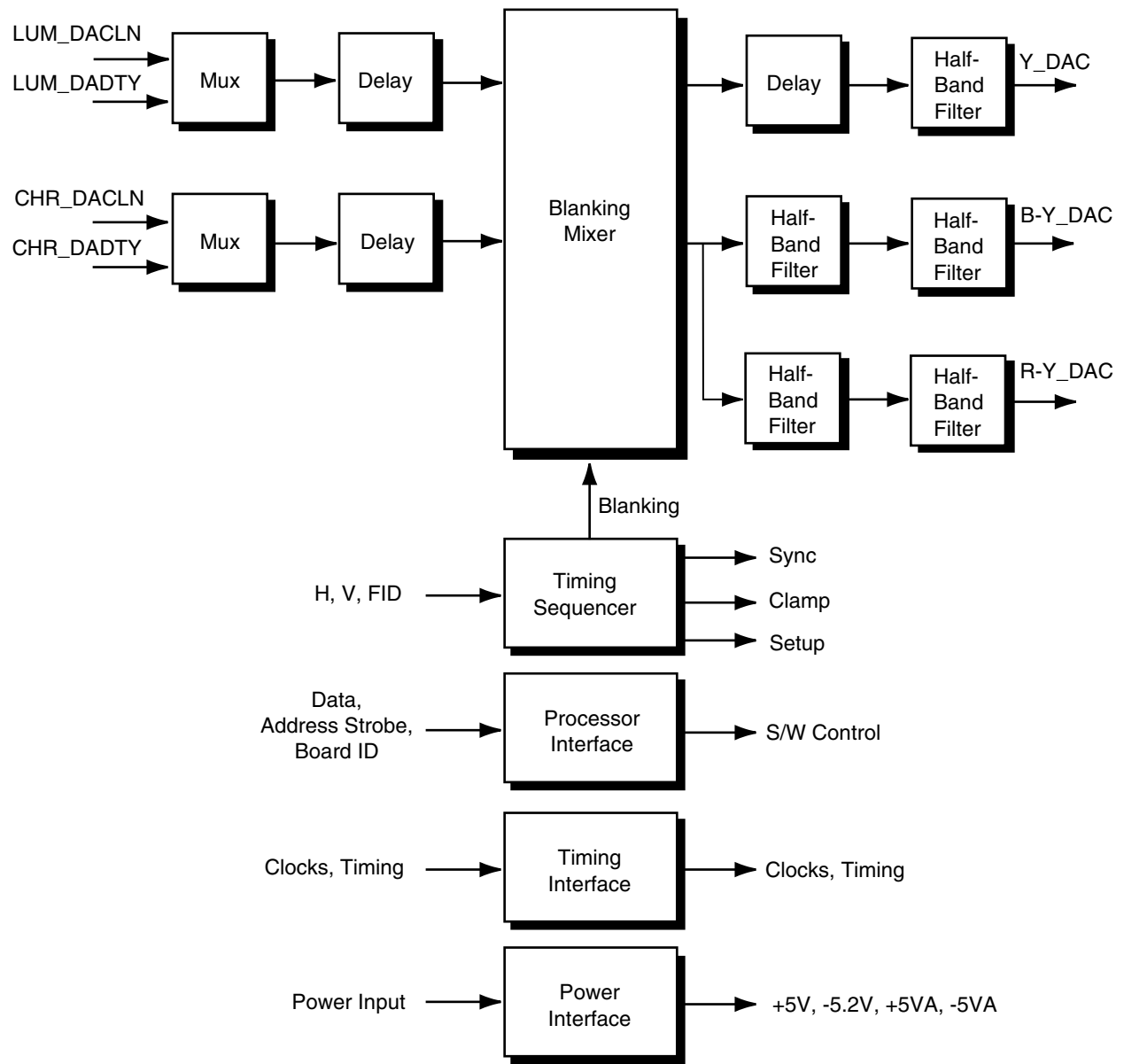


Figure 3-18. DAC Support Board Block Diagram

064815 DAC Board

The DAC board (Figure 3-19) receives an 8:8:8 digital video signal from the DAC Support board and converts the signal to component analog video. The converted signal drives the 75 ohm analog outputs at the back of the switcher frame.

Y, R-Y, and B-Y channels of the digital signal to be converted enter the DAC board and feed three parallel digital to analog converters, U2, U9, and U14. These converters change the video into analog, and associated passive components provide low pass filtering of the signals as well as gain and equalization adjustments. Jumpers associated with the DAC ICs allow the user to select the appropriate setup and signal levels for the desired analog format.

The analog components enter clamp circuits, such as U7, U8, and U3 for the Y channel, where the signals are clamped to ground during back porch. Output drivers U12, U17, and U5 and associated components scale the analog video components to produce color difference or RGB outputs for driving the analog BNC connectors on the back of the frame. Jumpers J5, J6, J8, and J10 select the scaling components to be used, thereby determining whether the output will be color difference (jumper position A) or RGB (jumper position B). The analog output signal passes to the BNC outputs via the DAC Support board, the Mixer module, and the rear motherboard.

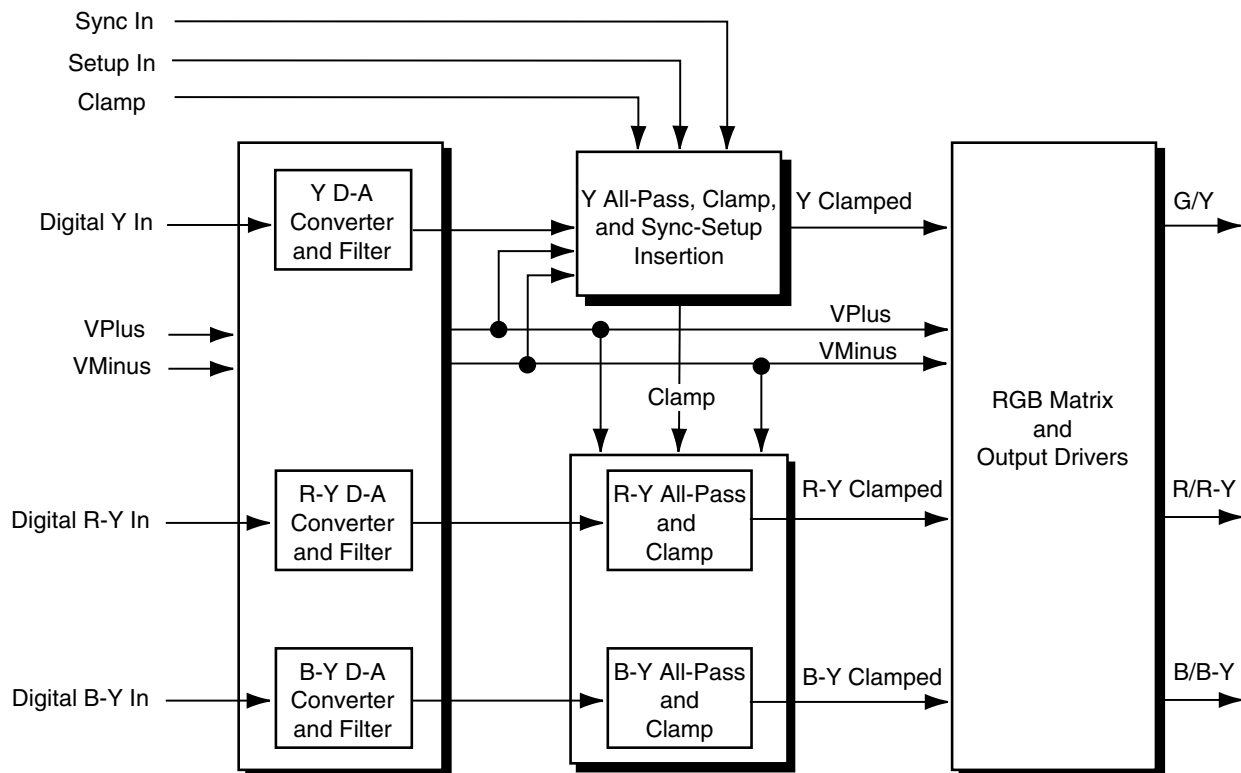


Figure 3-19. DAC Board Block Diagram

Preview Mixer Module

The Preview Mixer Module and all the submodules on the module are identical to the Program Mixer Module.

Output Modules

The Output Modules (Figure 3-20) have two functions. They combine the video and the video clock, and they convert the video from the TTL internal signal to the ECL digital video on the output. The Serial Output Module also converts from the parallel internal signals to the serial video output.

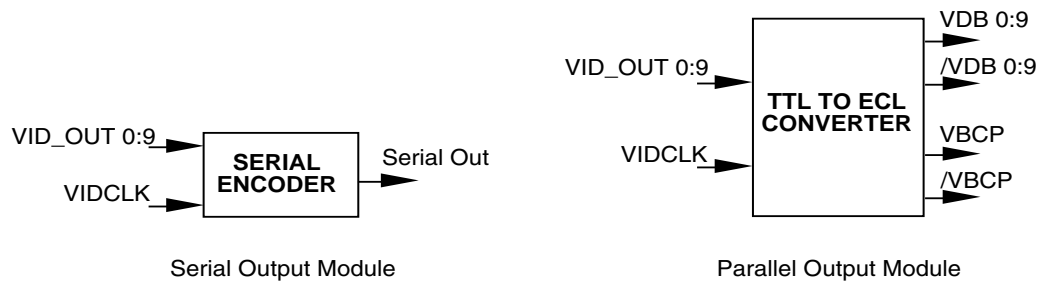


Figure 3-20. Output Modules

Control Panel

Power Supply

The Panel Power Supply Module is a switching power supply which generates the following voltages to the Control Panel, refer to Table 3-2.

Table 3-2. Panel Voltages and Current

Voltage	Current
-12 Volts	0.5 Amp
-5 Volts	0.5 Amp
-5 Volts	20 Amps
+12 Volts	0.5 Amp

The input voltage can be 90 to 135 or 180 to 265 Volts (manually set), 50 to 60 cycles.

The power supply is easy to replace and is not designed to be user serviceable.

Control Panel Overview

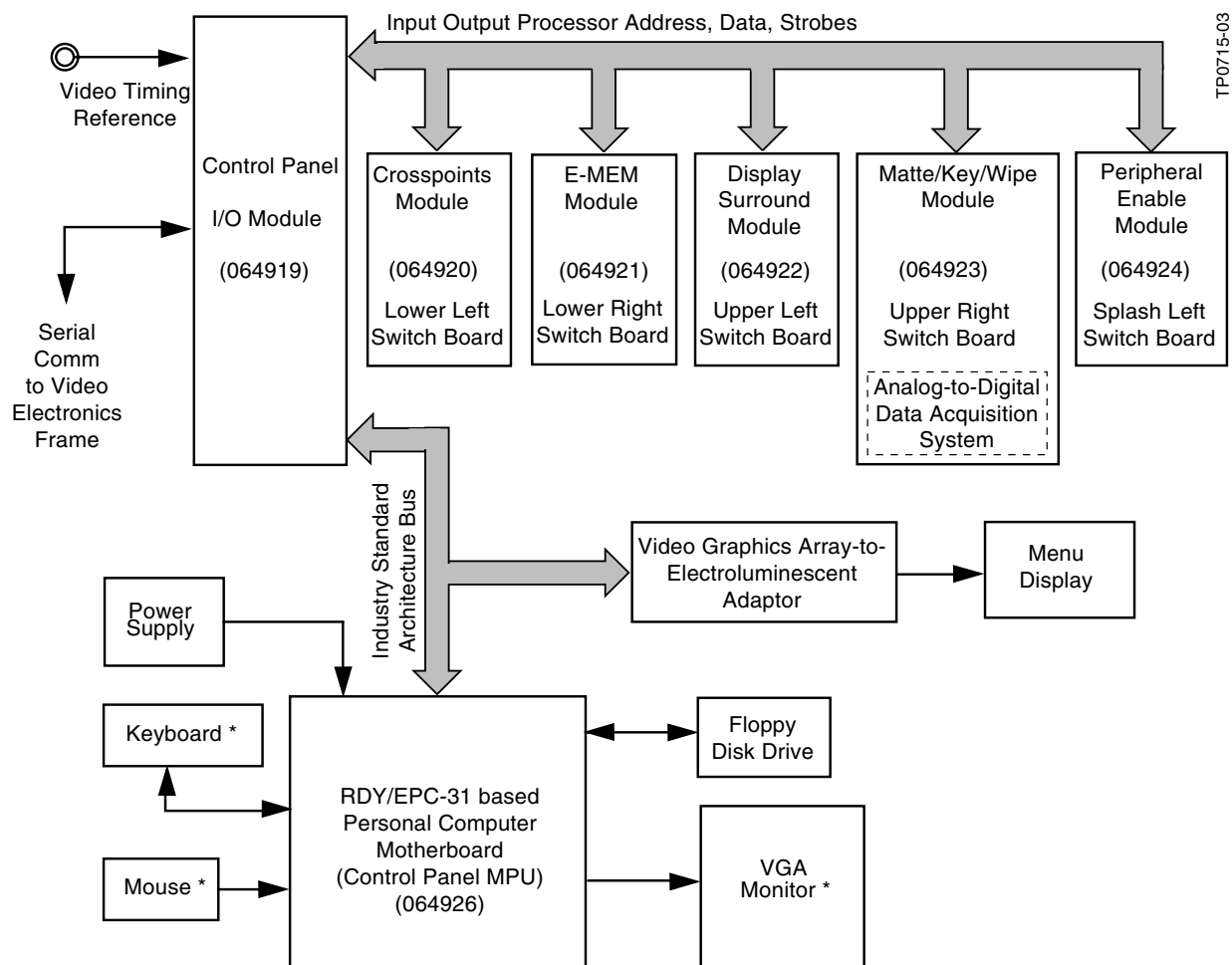
The Model 1200 Control Panel (Figure 3-21) contains five circuit boards which hold the pushbutton switches, controls, lamps, the switch and control encoding logic, and the lamp decoding logic. When pushbuttons are pressed and knobs are turned on the panel, the resulting voltage changes are encoded by the switch and control encoding logic.

Switching operations are relayed by a complete RDY/EPC-31 PC hardware set, which acts as the Control Panel MPU (064926). The Control Panel MPU communicates with the control panel modules through an Industry Standard Architecture (ISA) bus using the I/O expansion board (064919).

Control Panel Modules

The Model 1200 Control Panel contains seven module assemblies: the Control Panel I/O module (064919), the Control Panel MPU module (064926), the Crosspoints module (064920), the E-MEM module (064921), the Display Surround module (064922), the Matte/Key/Wipe module (064923) with a circuit of Analog-to-Digital Data Acquisition System, the Peripheral Enable module (064924), and the Flat Panel Display Driver (Electroluminescent Adaptor). The Control Panel I/O board routes all messages between the modules, the MPU, and the frame control processor.

Address decoding is contained on the Crosspoints, E-MEM, and Matte/Key/Wipe modules. The Display Surround and Peripheral Enable modules are too small to handle address decoding, so their address decoding is done on the Crosspoints module. Panel analog inputs (lever arm, joystick, and all rotary controls) are handled by the Analog-to-Digital Data Acquisition system circuit located on the Matte/Key/Wipe module.



* Customer-supplied and optional

Figure 3-21. Panel Overview

Panel Scanning

The Control Processor and the Control Panel MPU buses are linked by a serial data connection. Refer to Figure 3-22.

1. At the beginning of each TV field, the I/O board sends a video sync signal to the control panel MPU generating an interrupt.
2. The interrupt causes the MPU to scan the panel pushbuttons, controls, and menus looking for changes that have occurred since the previous interrupt. This scanning is done by sending signals through the I/O board.
3. The MPU will analyze the collected data and send a message to the frame control processor using the serial chips on the I/O board.
4. The frame control processor analyses the switcher state based on the message from the MPU. The frame control processor will determine what action is needed to update the switcher lights, buttons, or menu text and sends a message to the MPU.
5. The MPU analyses the message from the frame control processor and identifies which addresses need to be modified to complete the switcher change.
6. The MPU sends a message to the I/O board to update the switcher state, which will turn the various lamps and displays on or off.

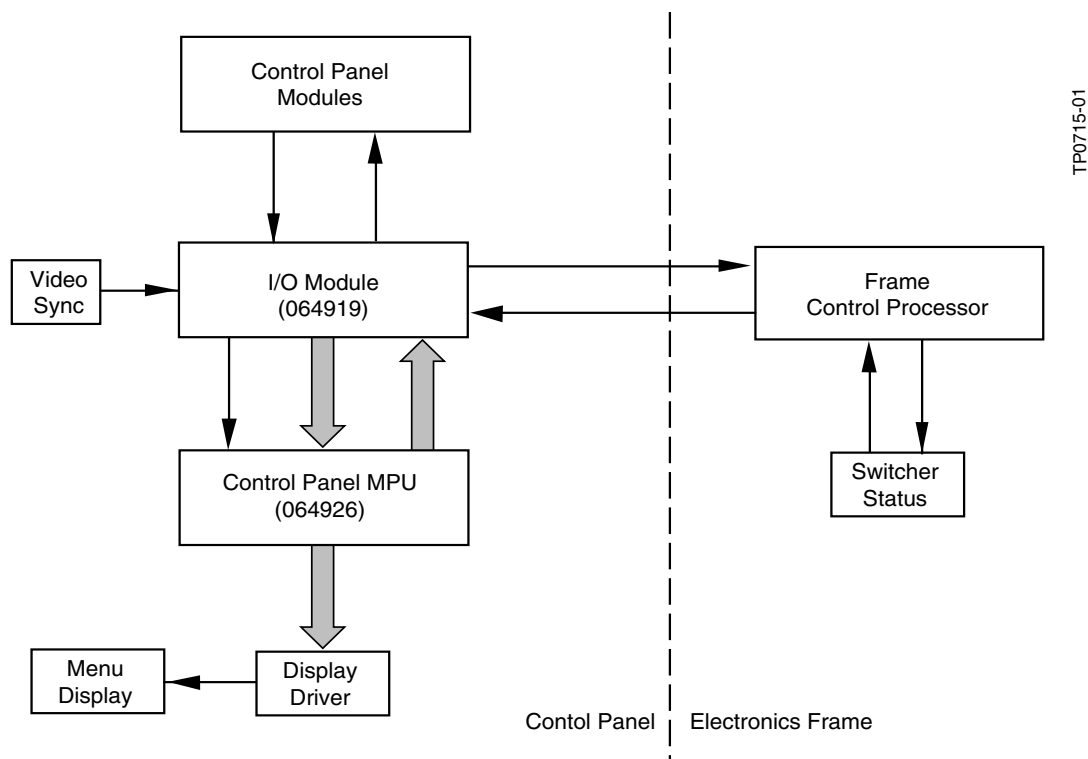


Figure 3-22. Panel Keyboard Scanning.

4

Maintenance

Introduction

This section explains the maintenance of a Model 1200 Digital Switcher. The following main topics are discussed:

- Overview—page 4-2
- Servicing Precautions—page 4-2
- Servicing Procedures—page 4-4
- Routine Maintenance—page 4-5
- Circuit Module Replacement—page 4-8
- Lever Arm Adjustment—page 4-11
- Software Installation or Upgrade—page 4-13
- System Power Down Procedure—page 4-16
- System Restart after Power-Surge— page 4-17

Overview

NOTE: *Torx-head screws are used in the manufacture of many mechanical components on this equipment. You should have a set of Torx-head screwdrivers (including sizes T-10 through T-30) available before attempting any mechanical disassembly and reassembly operations.*

Servicing Precautions

CAUTION

Do not operate the signal processor frame with its doors open for an extended period of time. Failure to observe this precaution may result in overheating of components.

Powering Down

Most maintenance operations on the Model 1200 switching system recommend that you to turn equipment power off before making repairs to or removing circuit modules and assemblies. Refer to System Power Down Procedure text on page 4-16 of this manual.

WARNING

Unless specifically directed to do otherwise by a maintenance procedure, turn power off before removing or repairing any circuit module or assembly in this system.

Before working on any power supply assembly, turn off the power and disconnect the power cord from the AC power source.

NOTE: *When power to the signal processor frame is turned off, all data stored in volatile Dynamic Random Access Memory (DRAM) is lost. E-MEM data will be retained since it is stored in battery-backed Static Random Access Memory (SRAM), which can retain data for several years without power.*

Removing any of the mezzanine modules from the Controller module results in complete data loss from the battery-backed SRAM on the submodule removed. This occurs because the batteries supplying power to the submodule are located on the main Controller circuit module and not on the submodule.

Removing Circuit Modules

All of the video processing and control processing in the system takes place on circuit modules in the Signal Processor Frame and Control Panel. The locations of these modules are illustrated in the appropriate portions of this section.

CAUTION

When removing circuit modules from the frame place them on a flat static controlled surface. Failure to follow this precaution can result in component damage due to electrostatic discharge.

Two circuit module extenders are provided with the system. One is for use with I/O modules (top or bottom bay). The second is for use with M/E modules (middle bay). The extender modules allow operation of the system while providing access to test points and adjustments that would be inaccessible with the module seated normally.

CAUTION

If a circuit module in the Signal Processor frame is removed or reinstalled while the power is on, it is unlikely that permanent damage will occur to the module or system. Microprocessor messages, however, may become scrambled. This may result in system errors and improper operation. If these problems occur, the only sure way to restore proper operation is to turn power to the frame OFF and then back ON again. The power-up sequence will re-synchronize the microprocessors.

Repairing Circuit Modules

Model 1200 circuit modules are not designed to be repaired in the field. Failed modules should be replaced.

Multi-layer circuit board and surface-mount manufacturing techniques have been used in many of the circuit modules. Specialized equipment and training are required to properly repair these modules.

CAUTION

Do not attempt component-level field repair on these circuit modules. Use of improper tools or equipment to repair multi-layer and surface-mount circuit modules could result in potentially expensive damage to your system.

Servicing Procedures

The following servicing procedures provide procedures for removal and replacement of typical types of components and assemblies. Detailed procedures are provided only where a component or module is unique or requires special handling, tools, or test equipment.

Repairing Power Supplies

Grass Valley Products does not recommend or support field repair of Model 1200 power supplies. Failed power supplies should be replaced.

WARNING

Remove all rings and other jewelry when you are working on equipment that is powered up. Hazardous currents are present in the power supplies, on the backplane, and on circuit modules. Failure to follow this precaution could result in severe shock and other injury.

Only qualified service personnel should work on the Control Panel and Frame power supply assemblies. Failure to observe this precaution could result in severe shock or potentially expensive damage to your equipment.

Power Supply Configurations

The standard power supply configuration of the Model 1200 is a single supply chassis for the Signal Processor Frame and single supply chassis for the Control Panel. The power supply chassis are separately connected to AC source power and each chassis supplies independent voltage/current buses.

Routine Maintenance

Fan Filters

The fan filters in the frame power supply need to be cleaned periodically by vacuuming them from the outside. These filters are located behind the slots in the lower front and lower front left side of the frame power supply. Frequency of cleaning depends on the amount of dirt and dust in the environment. To ensure proper equipment cooling, which prevents heat-related failures, check the filters frequently and keep them clean.

Fuse Replacement

The system contains the following fuses:

- AC Connector 5A 3A (F) 3AG
- Frame Power supply (AC) 10A (F) 3AG
 (-5V) 15A (F) 3AG
 (+15V) 3A (F) Mini Fuse
 (+9V) 3A (F) Mini Fuse
- Modules: (+5V) 30A 3AG.

NOTE: *The Keyer Module has two fuses, one for the module and one for the submodules.*

You can verify that the module fuses are intact by checking that the DC power LEDs on the front of the frame modules are lit. The LEDs to check are listed under the Status Indicator heading later in this section.

Turn off power and remove the power cord from the Model 1200 before touching or removing any frame modules to access fuses.

Pushbutton Lamp Replacement

During normal operation, the buttons on the Control Panel light up to indicate their activated state. If a lamp in any button fails to light when it should, it should be replaced. The lamp bulb (#7382) is removed by carefully pulling the button cap up out of the panel, then pulling the bulb out of the Switch. See Figure 4-1.

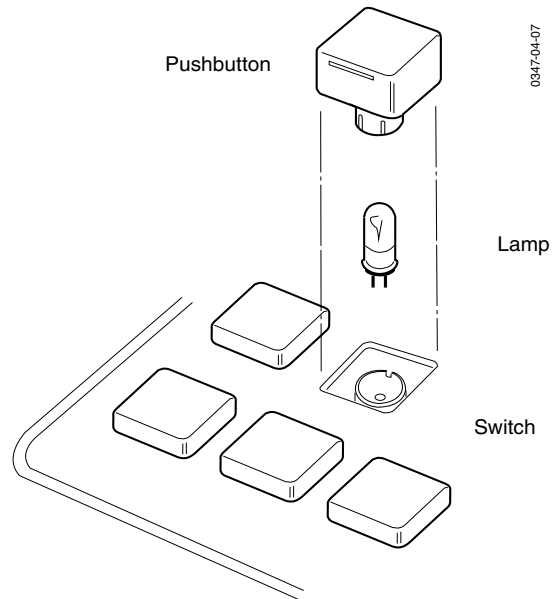


Figure 4-1. Control Panel Lamp Replacement

Using the Module Extender

The 064917 Extender enables you to extend modules outside the frame so that you can probe circuits and test points while they are powered up. Figure 4-2 shows how to use the Extender.

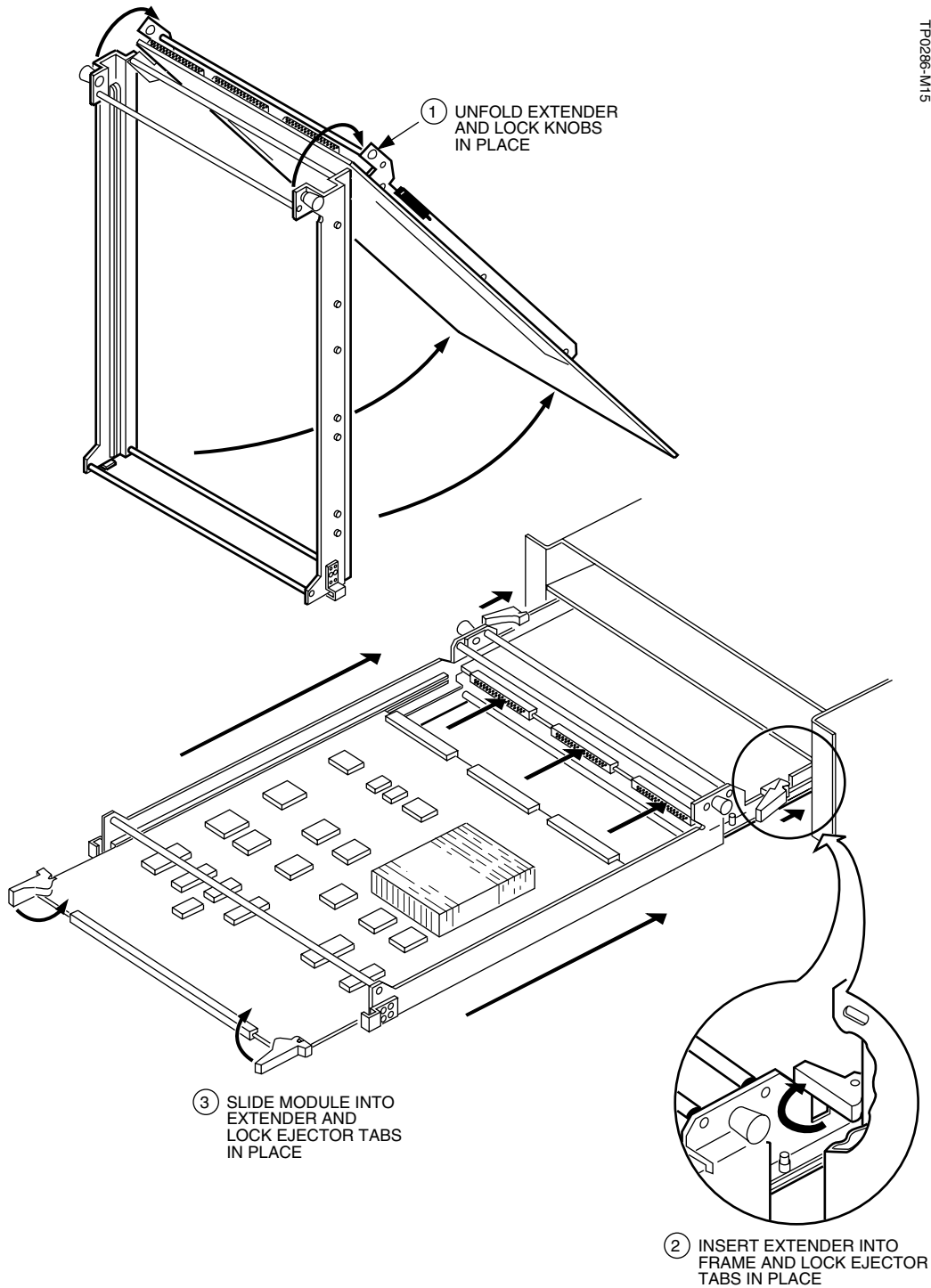


Figure 4-2. Using the Module Extender

Circuit Module Replacement

Repairing Circuit Modules

Model 1200 circuit modules are not designed to be repaired in the field. Faulty modules should be replaced.

Multi-layer and surface-mount printed circuit manufacturing techniques have been used in the manufacture of many of these circuit modules. Specialized equipment and training are required to properly repair these modules.

Static Charges

Many of the integrated circuits used in this equipment may be damaged by static discharge. Damage caused by static discharge may not show up immediately. Instead, it may result in reduced life span of the component which may result in earlier than expected failure of the module.

CAUTION

To avoid damage to circuitry caused by electro-static discharge, use approved anti-static techniques (i.e. wrist straps and anti-static mat) whenever handling circuit modules.

Control Panel Modules

The locations of Control Panel module boards are illustrated in Figure 4-3.

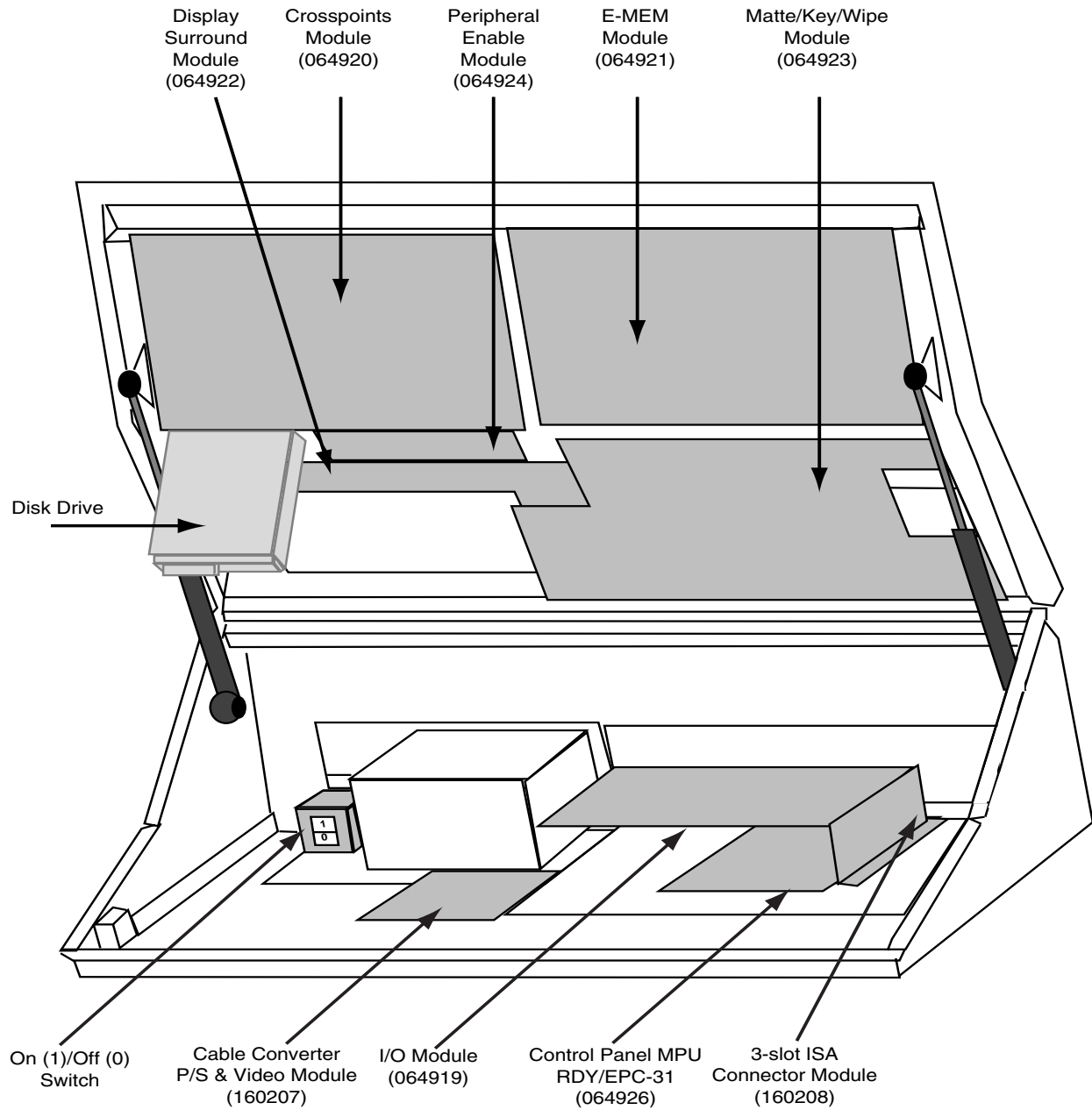


Figure 4-3. Control Panel Module Board Locations

To remove a circuit board assembly from the Control Panel, proceed as follows:

1. Turn off the AC power at the switch located on the power supply enclosure inside the Control Panel.
2. Unplug the AC line cord from the AC source or the control panel. The AC line cord is located at the rear of the Control Panel.
3. On the Model 1200 Control Panel remove any control knobs, that would interfere with removal of the assembly.

NOTE: *It is not necessary to remove the joystick/positioner nor the lever arm T-handle to change circuit boards.*

4. Open the Control Panel and locate the board to be replaced.
5. Disconnect any cables or wiring that may be attached to the board being removed.

CAUTION

Use care when removing cables or wiring to prevent the bending of connector pins or damage to cable assemblies. Damage of this type can result in improper operation or further damage to other circuit modules.

CAUTION

Use caution when handling or removing circuit boards. Due to their size and weight and because of their multi-layer and surface-mount construction they may be damaged by improper handling. When removed from their mounting, circuit boards should be placed on a flat, non-conductive, and non-static surface.

6. While supporting the board, remove all retaining screws and carefully lift the board out of the Control Panel.
7. To replace or reinstall a circuit module, reverse the steps of the previous procedure.

Lever Arm Adjustment

To adjust the Lever Arm:

1. Open the control panel and locate the Matte/Key/Wipe module (064923) inside the control panel (see Figure 4-4). Center the R604 (Offset) and the R605 (Gain) pots.
2. On the I/O board (064919), turn the rotary switch to 1.

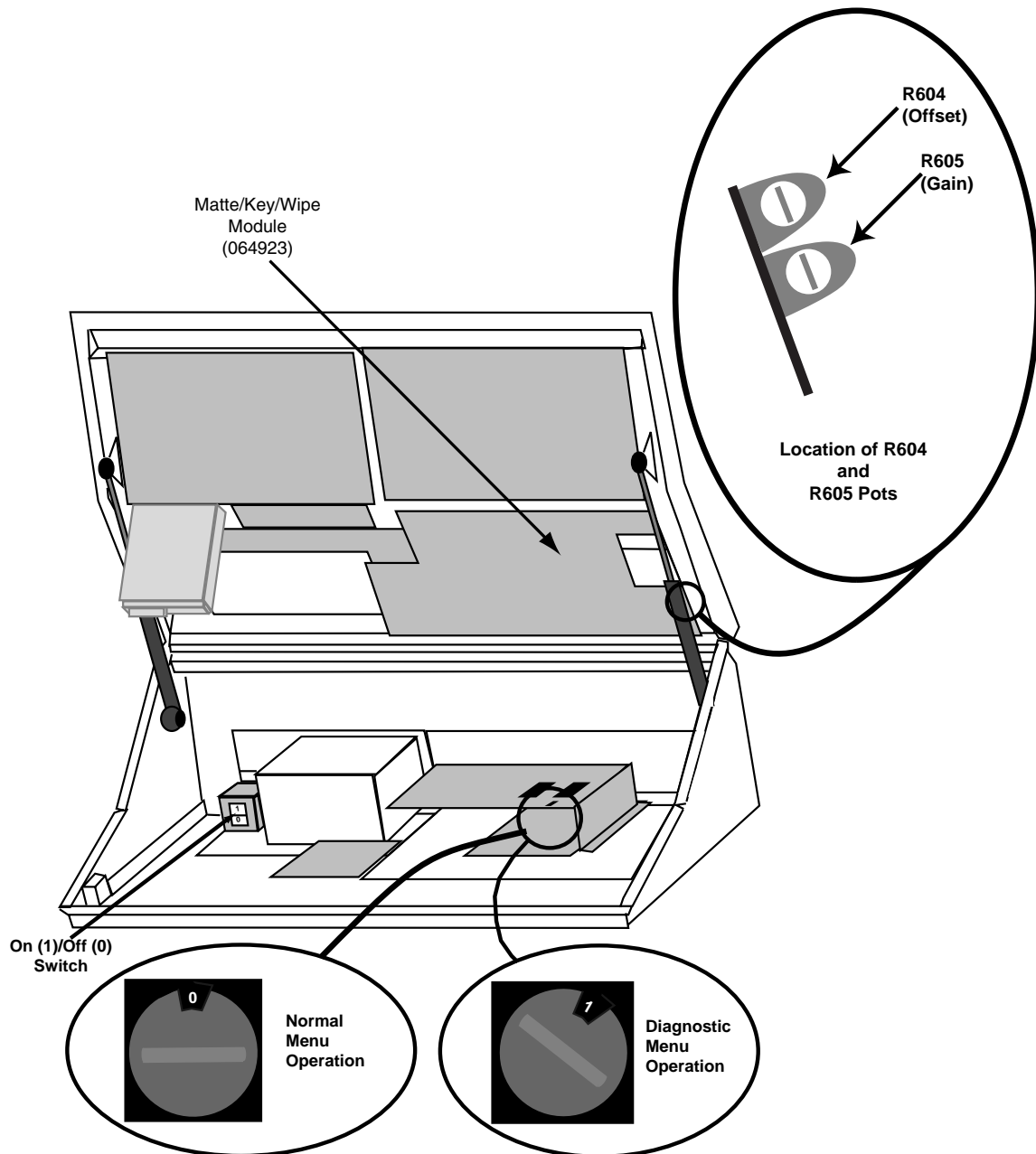


Figure 4-4. Lever Arm Adjustment

- The diagnostic menu will immediately appear on the screen. Enter the letter **C** using the keyboard to access the Leverarm and Joystick test menu (see Figure 4-5).

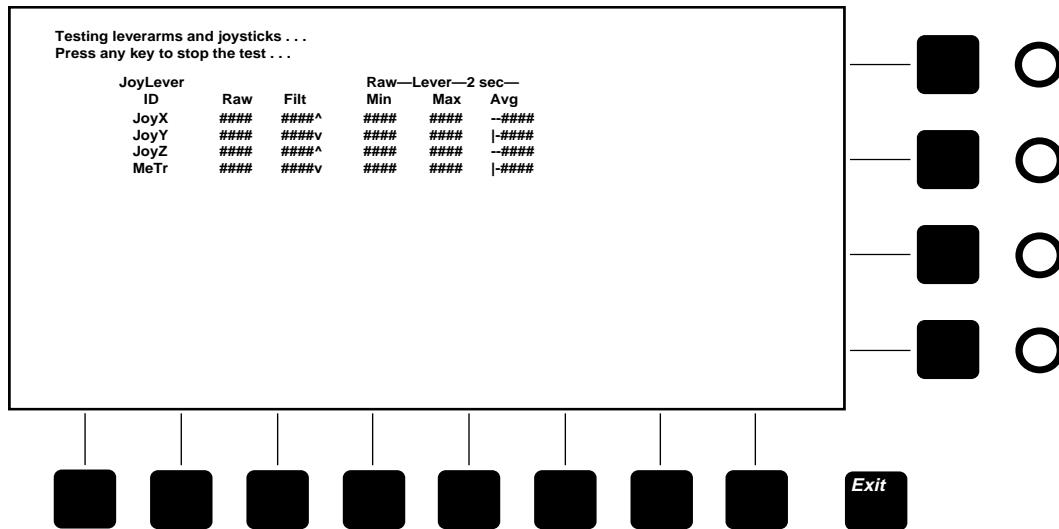
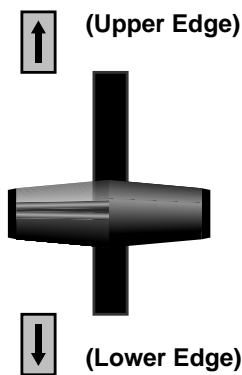


Figure 4-5. Lever Arm Adjustment Diagnostic Menu



- Move the lever arm on the front of the control panel to the lower edge of the slot.
- Adjust the R604 and R605 pots until the menu display shows approximately **2EA** (Hexcode) under the **Avg** column.
- Move the lever arm to the upper edge of the slot.
- Adjust the R604 and R605 pots until the menu display shows approximately **D20** (Hexcode) under the **Avg** column.

NOTE: The R604 and R605 pots interact with each other. It may be necessary to repeat the adjustments until the **Avg** reads approximately **2EA** when the lever arm is in the lower edge position and **D20** when the lever arm is in the upper edge position.

- Turn the rotary switch, on the I/O board, to the 0 position for normal operation.
- Reboot the control panel using the On/Off switch.
- Use the R604 and R605 pots to fine adjust the lever arm arrows to extinguish approximately 1/8" from the lower and upper edges.

Software Installation or Upgrade

The following procedure is to be used when reinstalling the system software or to upgrade the system software to a new version.

Saving E-MEM Data to Diskette

Before you install new software in the Model 1200, save any E-MEM files created during your operation. Refer to the Operation Manual's Disk menu text for the save-to-disk procedure.

After completing the software installation, re-load the E-MEM files into the switcher. Old E-MEM files (E-MEMs saved using previous software versions) should be updated with each new software release.

To do so, load your old E-MEM files into your Switcher (updated with the latest software release) and resave the E-MEMs to a *new* disk, thereby updating the E-MEMs to the latest release. Make note of the software version with which the E-MEM files were saved; write this information on the disk for future reference. The software version number is crucial should you need to return your E-MEMs to a previous software release level.

Normally you would retain the previous version of the E-MEM files in case you decide to revert to a previous software version, because E-MEMs are forward-compatible only. However, after installing FM2535-00 and updating your system to v3.0 software, your system hardware *will not* be backward compatible. Therefore, do not attempt to re-install v2.1 software in your Model 1200 switcher.

Loading Software From Diskette

NOTE: Before beginning this procedure, save all current E-MEM effects and Switcher setups to disk as this procedure erases all current E-MEMs and setups in memory.

1. Open the control panel and locate the I/O board (064919). Refer to Figure 4-6.

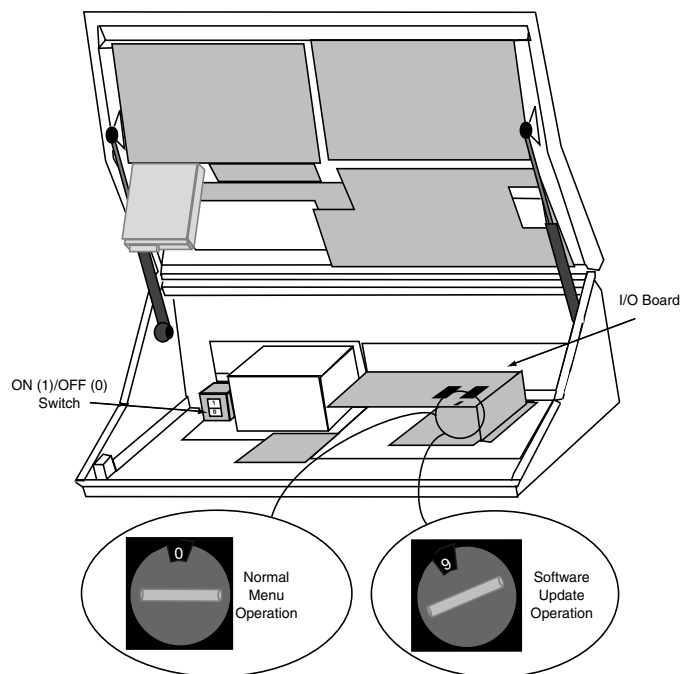


Figure 4-6. Accessing the Software Installation Mode

2. Insert the control panel software diskette (labeled 153309) into the disk drive.
3. Open the lid and turn OFF the control panel power using the ON/OFF switch.
4. On the I/O board, turn the rotary switch to 9 (nine). See Figure 4-6.

5. Return power to the control panel using the ON/OFF switch, and the system begins loading the floppy drive's software disk.
6. Observe the Menu display. A series of messages appear before you have to do anything else.

When the download is complete (after about 4 minutes), the screen indicates the control panel download is done and instructs you to install the Frame software diskette. Remove the first diskette from the drive.

7. Place the second diskette with the Frame software (part labeled 153310) into the disk drive. Once again turn OFF power to the control panel, wait five seconds, and turn it back ON to start the download. When this download is done, remove the second diskette.
8. This completes the software download procedure.
9. Open the control panel, turn the rotary switch to the Ø (zero) position for normal operation, and restart the control panel by using the ON/OFF switch.

System Power Down Procedure

The following procedure is to be used when removing power from the system.

1. Press **MISC** main menu button.
2. Select **[SHUT DOWN]** .

System warns that shut down halts the frame and requires you to turn the power OFF and then ON, or press the frame's reset button (see Figure 4-7).

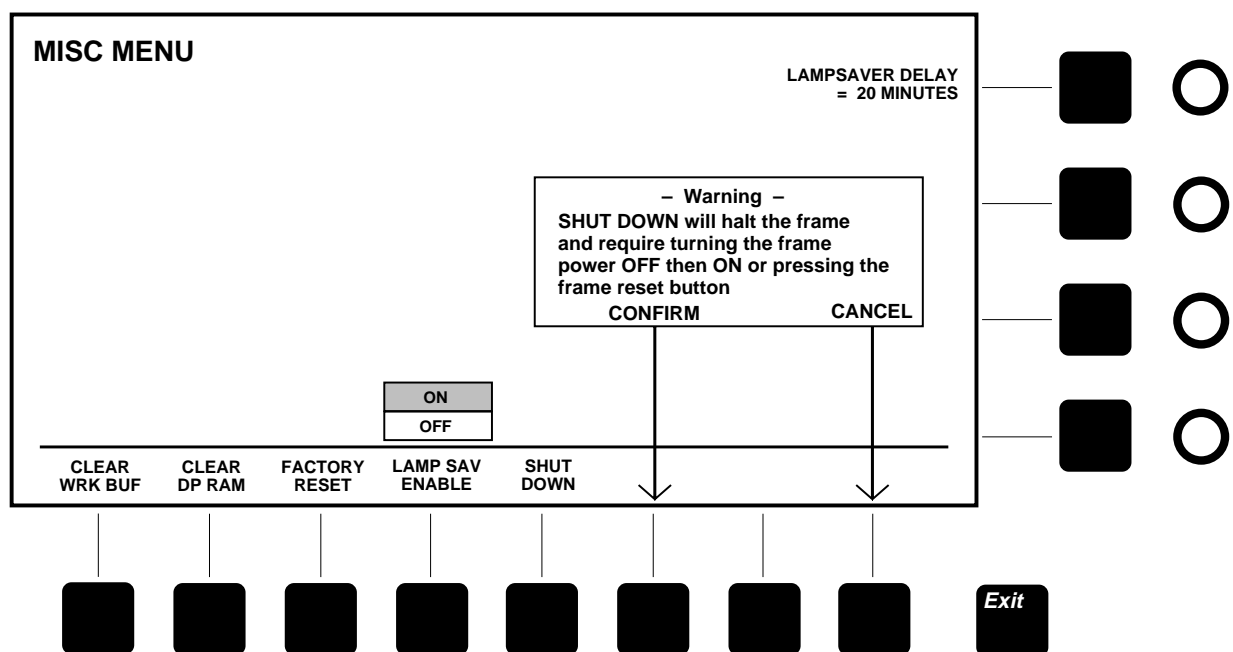


Figure 4-7. MISC Menu with Safe Power Shut Down Selected

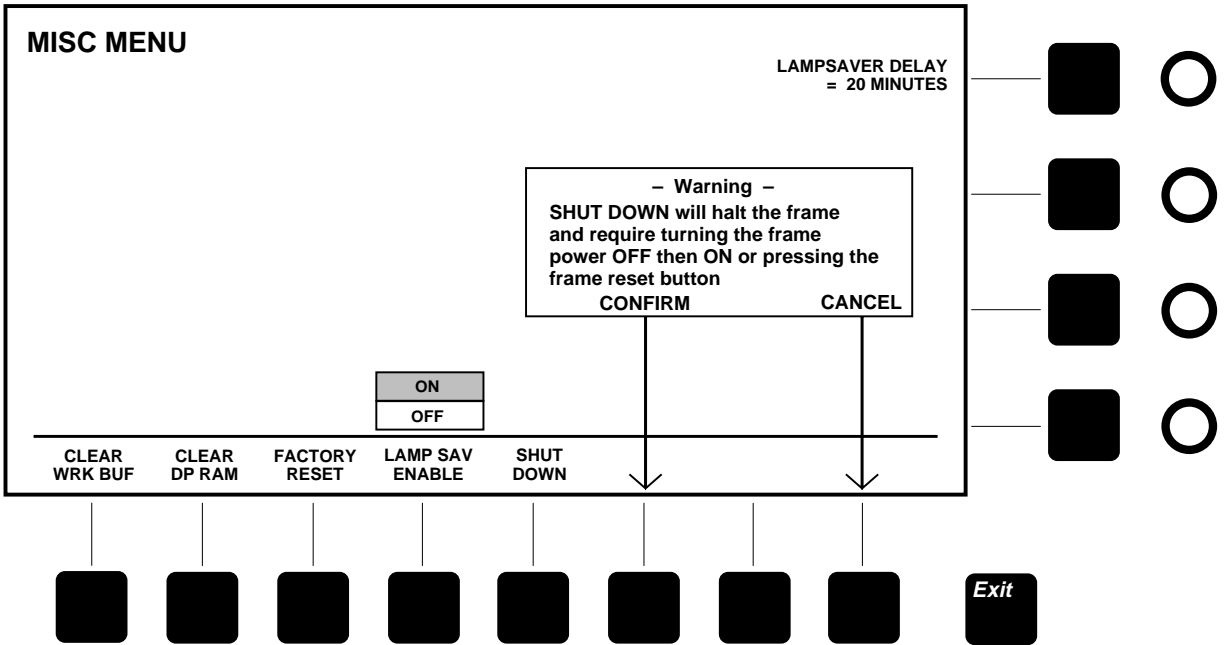
It is now safe to remove AC power from the system, and re-power at a later time.

NOTE: If you do not use this power down procedure before removing your system's AC power, you may expect to see corrupted memory and unstable system operation upon switcher restart.

System Restart after Power-Serge

If you should suffer a power surge, follow these steps to restart your system:

1. With the Model 1200 signal processor frame and control panel powered up, press **MISC** menu button.



2. The screen displays the **MISC MENU** . Select **CLEAR DP RAM** .
3. The system asks whether to **CONFIRM** or **CANCEL** . Select **CONFIRM** .
4. The Model 1200 frame begins clearing the frame Dual Ported RAM, and for approximately 10 seconds, the screen displays **CLEAR DPRAM is in progress...**

The screen then displays **DPRAM has been cleared.** Wait 5 seconds for the frame to transmit the new Switcher configuration to the 1200 control panel.

5. From the **MISC** menu, select the **FACTORY RESET** function.
6. The system asks whether to **CONFIRM** or **CANCEL** . Select **CONFIRM**.
7. The 1200 system begins resetting the Model 1200 frame back to factory default settings, and for approximately 18 seconds, the screen displays **FACTORY RESET is in progress...**

The screen then displays **Factory reset completed**. Wait 5 seconds for the frame to transmit the new switcher configuration to the control panel.

8. You may now power down the Model 1200 control panel and signal processor frame.
9. Open the control panel and locate the I/O board (064919). Refer to Figure 4-8.

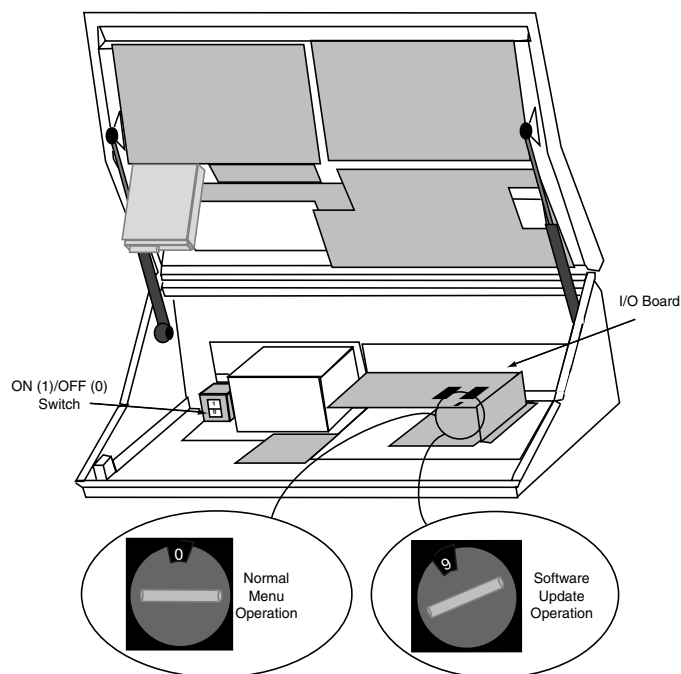


Figure 4-8. Accessing the Software Installation Mode

10. Reload your current E-MEM and configuration files.

5 *Diagnostics and Troubleshooting*

Introduction

This section of the manual provides information to assist you in isolating faults that may occur in the Control Panel or Signal Processing Frame. For safety, service should only be performed by qualified personnel. The following main topics are discussed:

- Overview—page 5-2
- General Troubleshooting—page 5-3
- Detailed Troubleshooting—page 5-6
- Exchanging Modules—page 5-9
- Menu Diagnostics—page 5-10

Overview

WARNING

To avoid electrical shock hazard, do not open covers or access doors. Dangerous voltages are present even with the AC power switch in the OFF position. All servicing should be performed by qualified service personnel, only.

CAUTION

Do not operate the Model 1200 system with the Signal Processing Frame doors or covers open or removed for an extended period, as overheating may occur.

In order to avoid loss of data, be sure to read the Service Precautions and Removing Circuit Modules precautions at the beginning of the Maintenance section of this manual before performing any maintenance procedure on this system.

Multi-layer printed circuit manufacturing techniques have been used in the manufacture of many of these circuit modules. Specialized equipment and training are required to properly repair them. Attempting to repair circuit modules rather than replacing them, as recommended, can result in potentially expensive damage that is not covered under warranty.

General Troubleshooting

Because of the specialized PALS, surface-mount parts, and multipurpose parts in the Model 1200, circuit-level troubleshooting and repair of printed circuit modules in the field is not practical. This section is designed to help you isolate a problem to a particular circuit module. You should then contact your equipment supplier or Grass Valley Products Customer Support to have the module replaced or repaired.

The following troubleshooting steps are presented in the order in which you should do them, beginning with general steps and proceeding to more specific checks and tests.

Check Control Panel Settings

If a particular operation or function does not work, verify that all the settings on the control panel are correct. See the Operation manual for complete operation instructions.

Check Setup

Use the Configuration menus to check the setup of the Model 1200. If you want to reset the system to factory default setup, use the **[FACTORY RESET]** soft button in the System Parameters menu. If there is a problem with communications, check the jumpers on the Control Processor Module (see Section 2).

Reset Microprocessor

If the system appears to be “frozen” or operating strangely, press the RESET button on the front of the frame Control Processor Module.

To reset the RAM on the Control Panel, press the **[Misc]** button on the Main Menu Subpanel.

The **[FACTORY RESET]** , **[CLEAR DP RAM]** , and **[CLEAR WORKING BUFFER]** soft buttons are used to clear the RAM.

Factory Reset—Clears Engineering settings, Configuration, Input Mapping, all E-MEMs, the Current Working Buffer, and returns the RAM to the settings as they were when shipped from the factory.

Clear DP RAM—Clears the current working buffer and any E-MEMs.

Clear Working Buffer—Clears all buttons and knobs on the Control Panel and returns them to their default settings.

Perform Visual Checks

Carefully check all of the equipment. Verify that all of the modules in the Signal Processor frame are plugged in. Verify that all of the cables are connected properly. Check the function of all of the other equipment hooked up to the Model 1200 for proper function.

Check Status Indicators

Verify that all of the status indicators are giving the proper indications as explained under the headings that follow.

DC Power Indicators

When power is on, the following LEDs on the front of the frame modules will remain on to indicate presence of DC power on the modules:

- Control Processor Module: DS1 Green +5V
- Crosspoint Module: DS1 Green +5V
- Keyer Module: DS1 Green +5V, DS2 Green +5VA
- Mixer Module: DS1 Green +5V, DS2 Green -5.2V

If any of these LEDs is off, the DC fuse on the module or in the power supply may be blown. If all of these LEDs are off, the AC fuses in the power supply or AC connector may be blown.

Bootup Diagnostic Indicators

Use the power switch inside the front of the frame to turn power off and on again. As the system boots up from power off, only the 68302 I/O Processor is running. The first thing this processor does is perform diagnostic checks of the system. As it does the checks, different LEDs on the front of the frame modules will light:

- Background LED lights during check of 68302 RAM.
- Field LED lights during check of 68020 RAM.
- DS8 flashes briefly during checks of system bus, I/O ports, etc.
- DS9 lights to indicate an error. Any LEDs that were on before the error was found will remain on, indicating the problem area, and the system will hang up in a loop trying to access the location that failed. To locate the exact problem area, trigger an oscilloscope on the write strobe to the LED driver and check what area the system was trying to read or write to. You can also use the CPU Diagnostics and Data Delivery Protocol Diagnostics later in this section to further check the CPU and I/O ports.

Program Loading Indicators

If the system passes all bootup tests, the LEDs listed above will turn off. The 68302 then checks for a system program in the flash EEPROM. If there is a system program, it is loaded into the RAM of both processors and both processors start running from their RAM. The 68020 RAM is downloaded first. During this process the following LEDs will flash briefly:

- Background LED lights during program download (executable code).
- Field LED lights during downloading of constants and variables.

Normal Operation Indicators

After the bootup process is finished and the system program is loaded into the RAM, the system pauses for a second and then starts normal operation running from RAM. The LEDs for both processors start operation at this time. Now the LEDs have the following meaning:

- Field LEDs light during panel scanning and hardware read/write. These are generally lit dimly most or all of the time.
- Background LEDs light during background tasks. These are generally lit brightly most or all of the time.
- DS8 flashes on a serial port interrupt. This indicates activity on one of the five serial ports and can be used to check that serial port communication is occurring.
- Ten serial port LEDs flash to indicate read or write activity on a specific port. The LED designations are the same as the names of the port connectors on the frame rear panel. If you are attempting to read or write into a port and the appropriate LEDs do not light, there is probably a hardware problem in the sending/receiving device, the Model 1200 serial drivers, serial port configuration jumpers, or the interconnecting cable. If there is a UART setup error, the LEDs should still operate properly.
- SPG Module DS1 (525 lines) or DS2 (625 lines) lights constantly to indicate that the system is locked to the External Reference Input. If neither LED is lit, the system is not genlocked; check that the external reference signal is present.

Detailed Troubleshooting

If the previous general troubleshooting steps did not highlight the problem, the following Trouble Trees of symptoms and probable causes may help (see Figure 5-1, Figure 5-2, and Figure 5-3 on page 5–8).

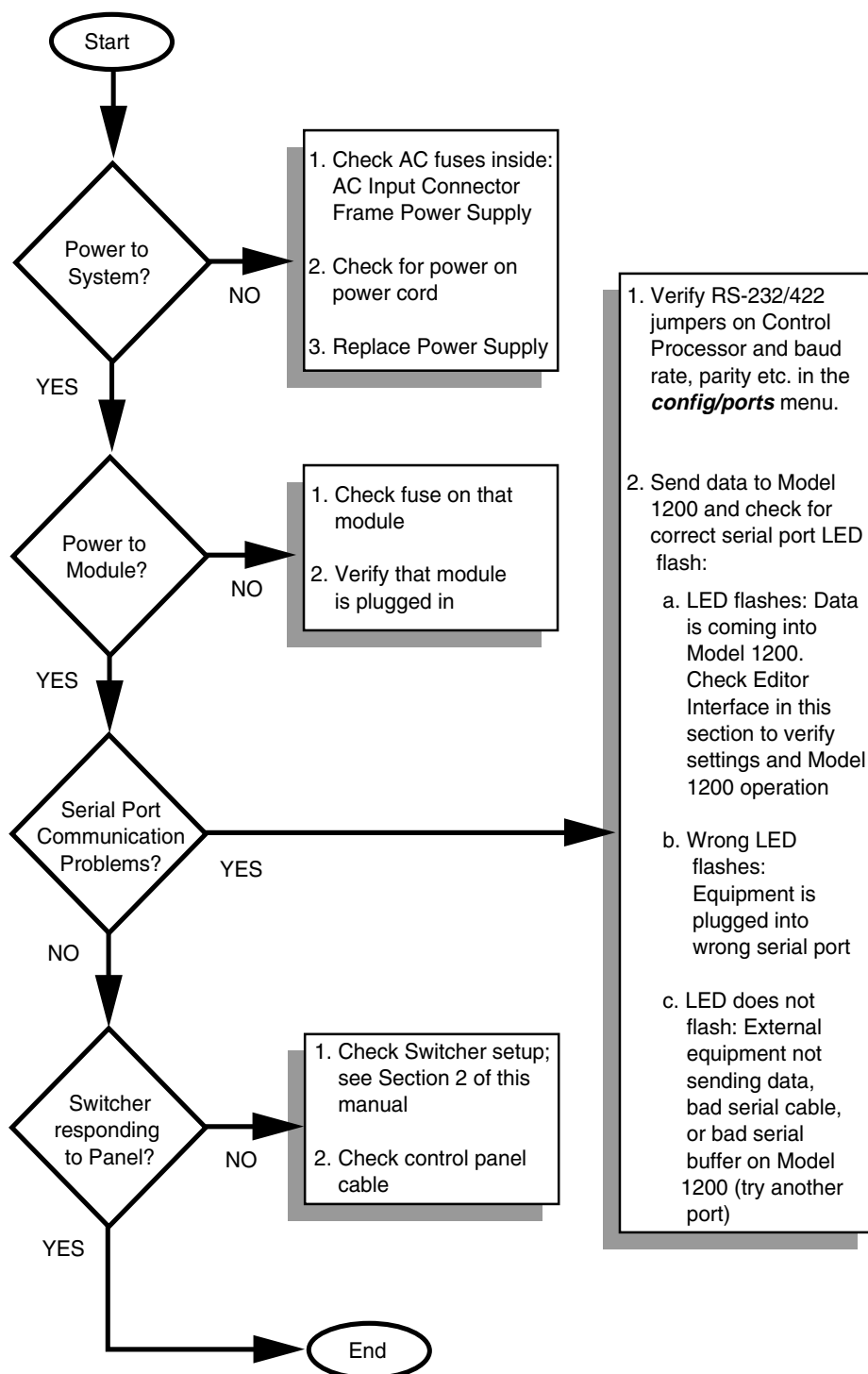


Figure 5-1. Trouble Tree—Communications

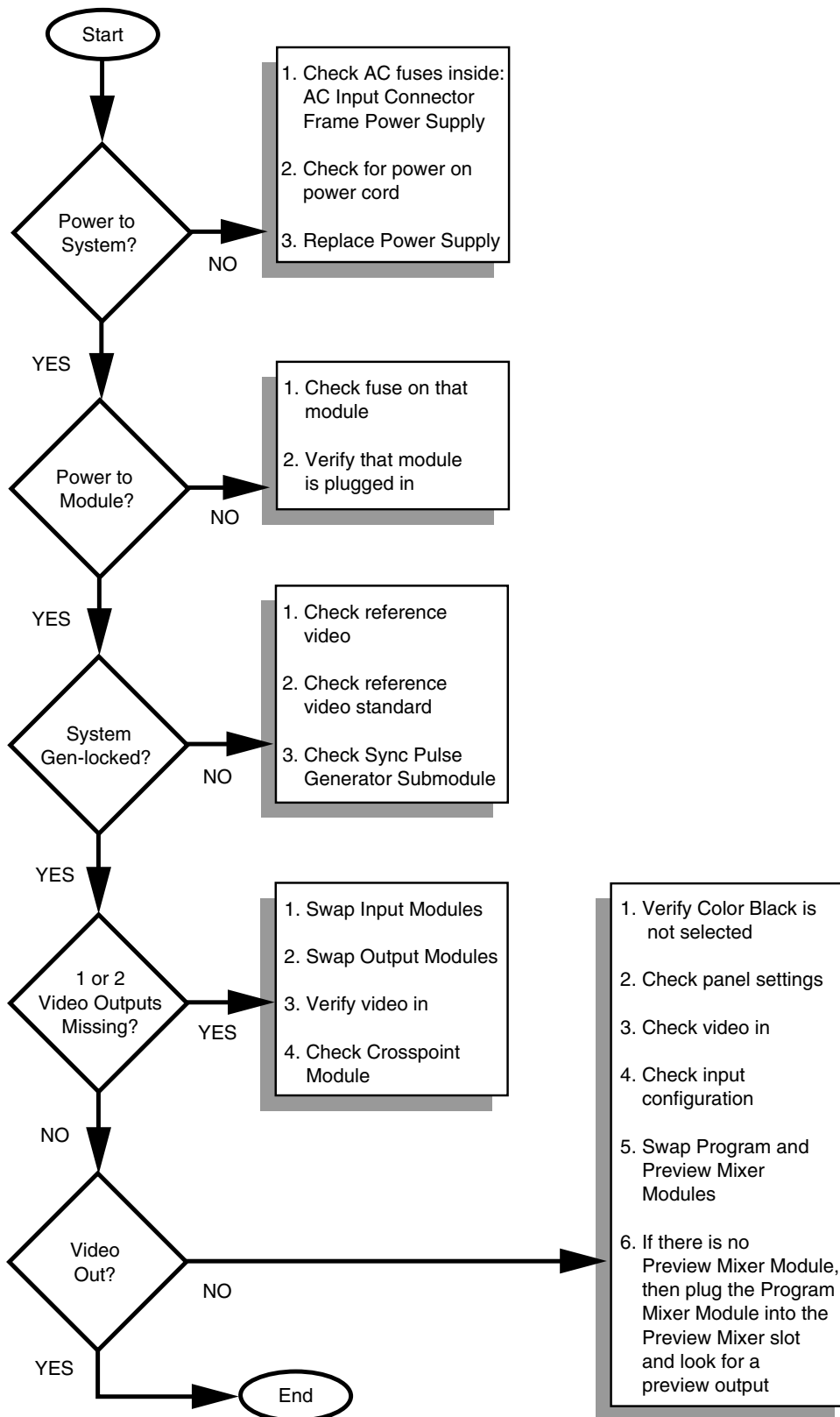


Figure 5-2. Trouble Tree—Video

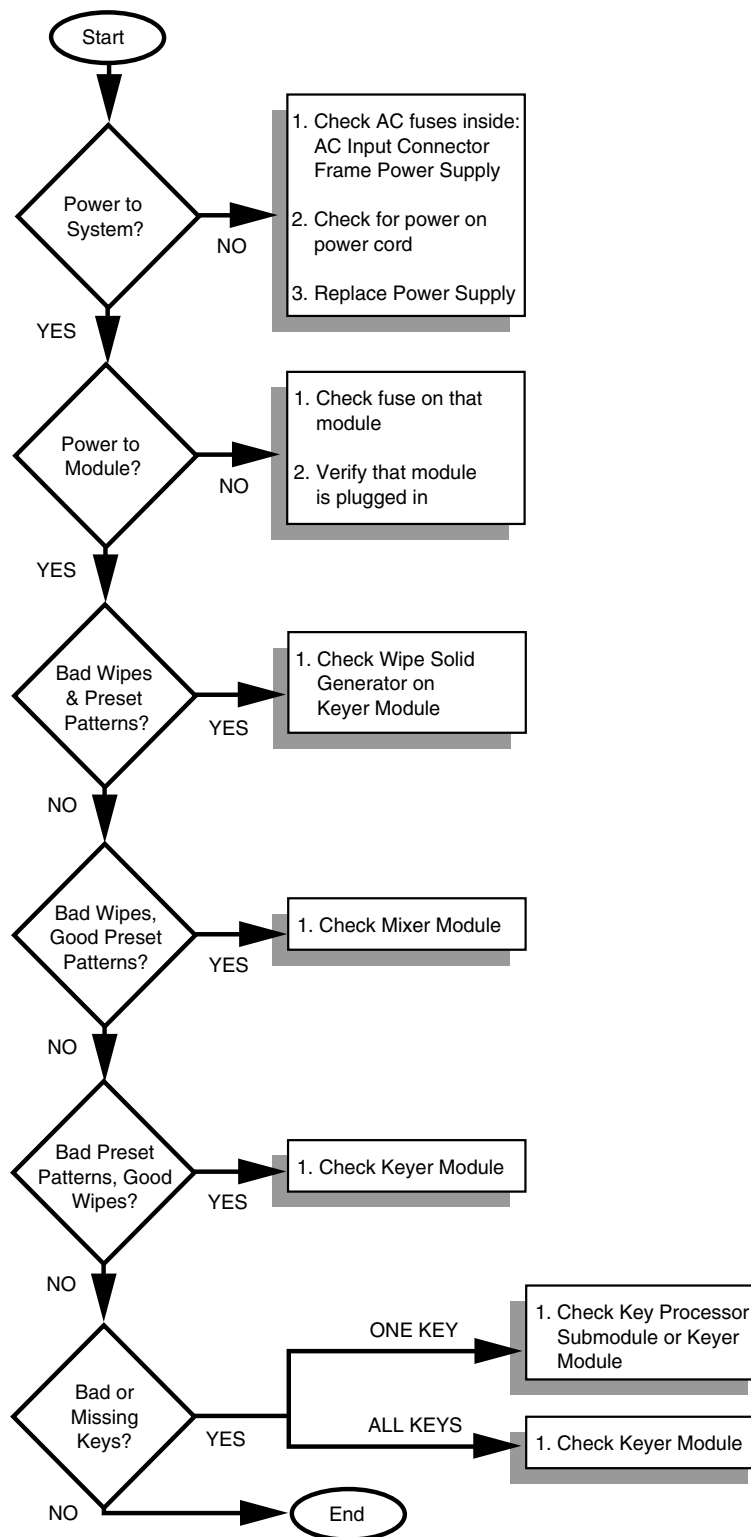


Figure 5-3. Trouble Tree—Miscellaneous

NOTE: After trying the steps outlined in the Trouble Trees if you are still having problems contact Grass Valley for further instructions.

Exchanging Modules

If you suspect that a particular frame module is faulty, you may be able to test it by exchanging it with another frame module. The following frame modules are interchangeable:

- The Program Mixer Module and the Preview Mixer Module
- The Program Depth Submodule and the Preview Depth Submodule
- Any of the Keyer Submodules on the Keyer Carrier Module
- Any of the Borderline Submodules on the Keyer Submodules
- Any of the Video Input modules
- Any of the Video Output modules

Menu Diagnostics

The software that runs in the Model 1200 control panel can be placed in a diagnostic mode. The diagnostic menu contains a list of tests that can be run to determine items such as whether lamps are burned out or knobs or buttons are not functioning properly.

NOTE: A keyboard and a keyboard adaptor are required to use the diagnostic menu functions.

Accessing the Diagnostic Menu

1. Open the control panel and locate the I/O board (064919).
2. On the I/O board, turn the rotary switch to 1 (see Figure 5-4).

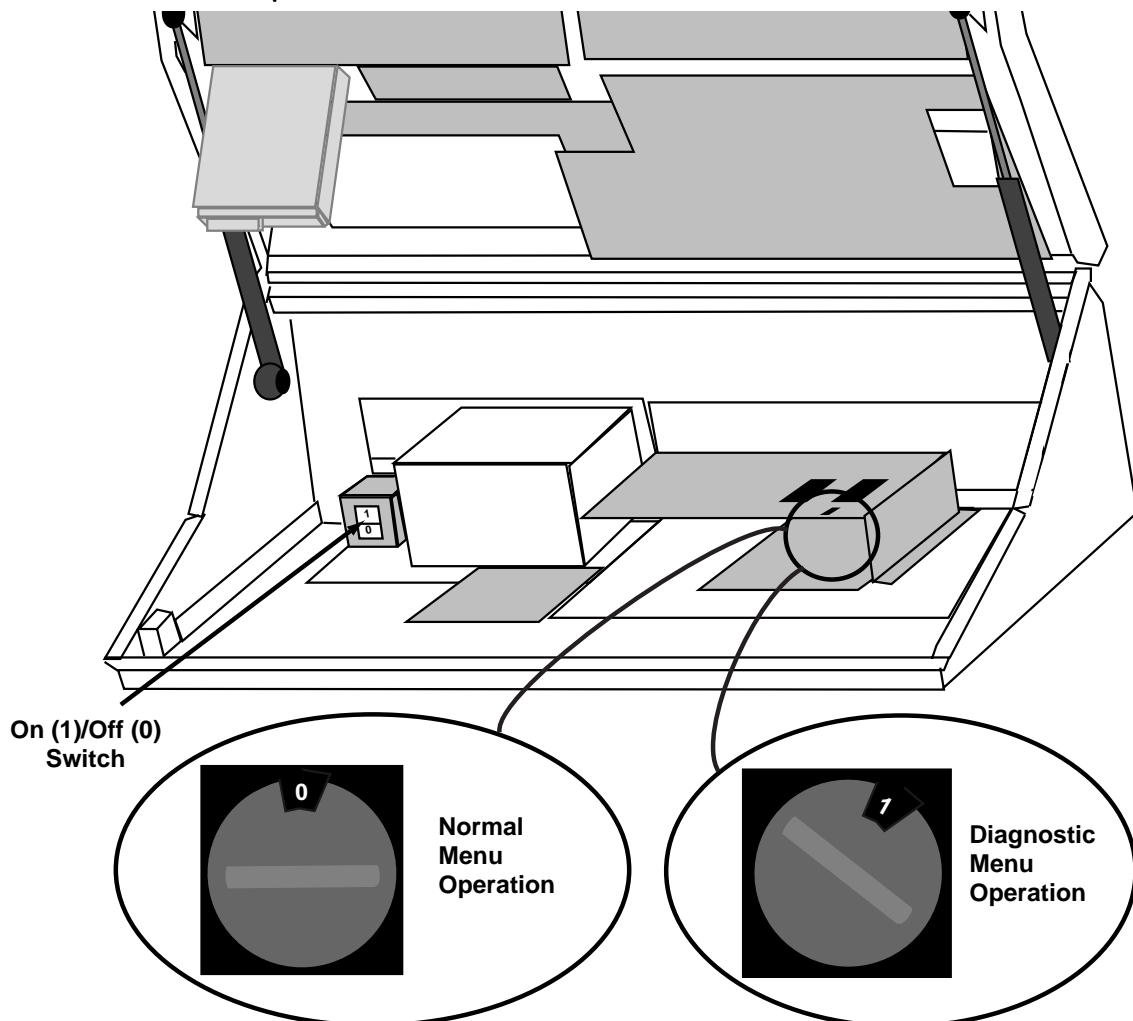


Figure 5-4. Accessing the Diagnostic Menu

3. The diagnostic menu will immediately appear on the screen (see Figure 5-5).

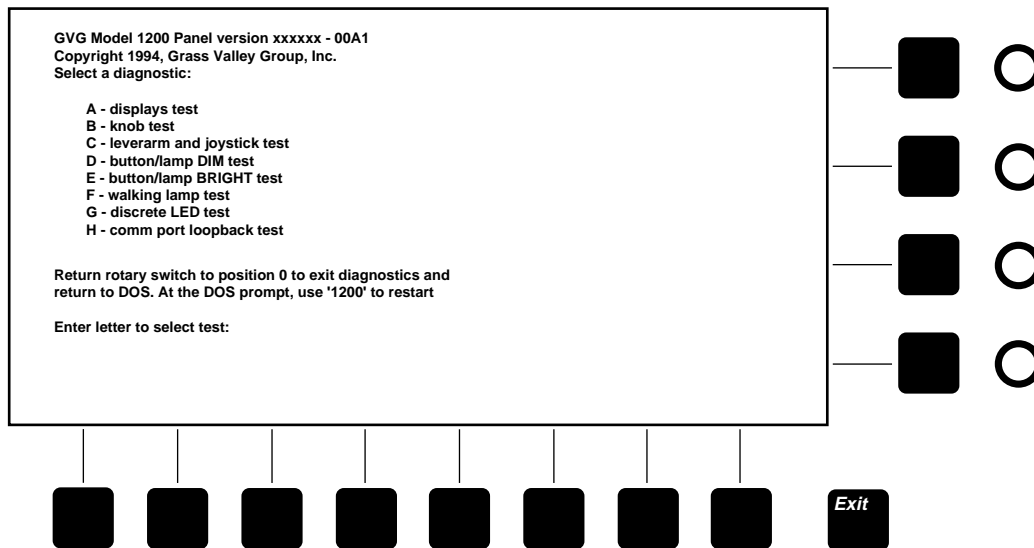


Figure 5-5. Diagnostic Menu

4. Enter the letter on the keyboard for the selected test and press Enter.

Diagnostic Tests

There are eight diagnostic tests designed to check the functionality of the control panel components. These tests send a series of commands to the panel causing either a physical reaction such as lighting each panel lamp in sequential order or a menu display reaction such as showing a hexcode value.

Any diagnostic test can be terminated by pressing any key on the keyboard, returning the system to the diagnostic menu.

Displays Test

Selecting **[A - displays test]** from the Diagnostic menu causes the alpha and numeric displays to cycle through the range of characters used by the display. The rate the displays change can be adjusted using any knob.

The purpose of this test is to determine whether the complete range of characters are being displayed for each type of display.

While running the displays test the Diagnostic menu screen will appear as in Figure 5-6. To stop the test, press any key on the keyboard.

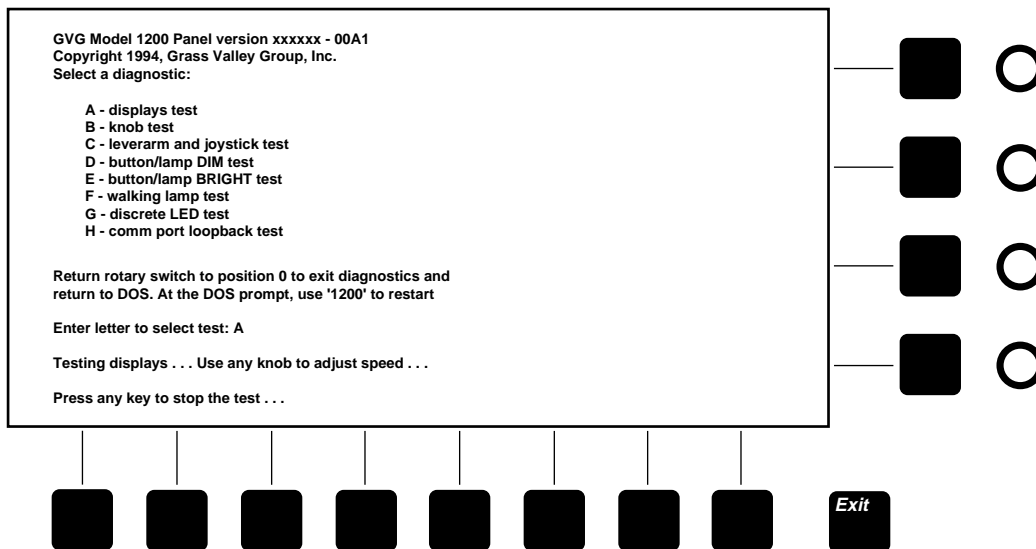


Figure 5-6. Displays Test Menu

Knob Test

Selecting [B - knob test] from the Diagnostic menu will cause the menu screen to appear as in Figure 5-7.

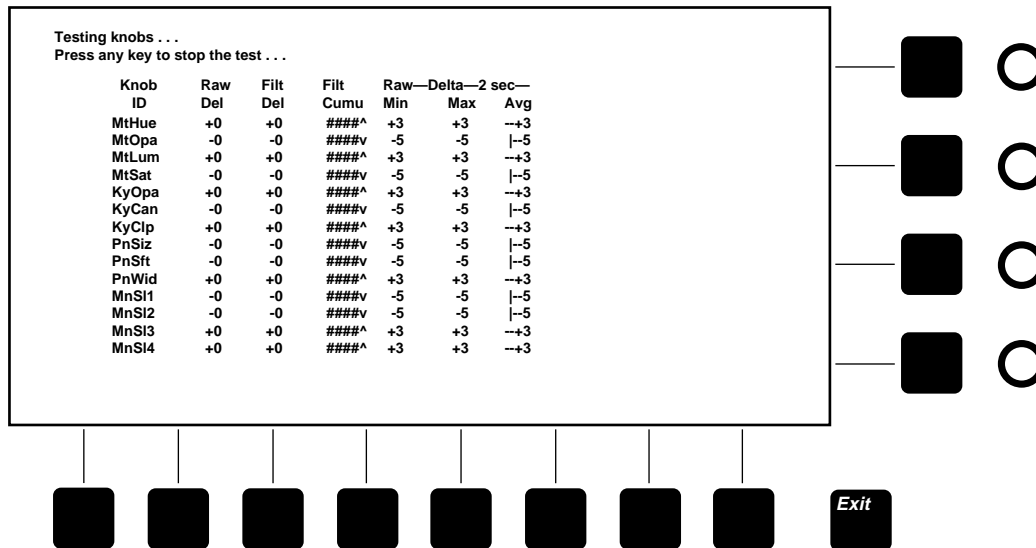


Figure 5-7. Knob Test Menu

There is one row of data for each of the fourteen knobs on the control panel. Rotating a knob will cause the data in the row associated with that knob to change.

The columns identify different components of each knob:

- **Knob ID**—Identifying name for a knob
- **Raw Del**—The raw delta or change in the knob position (+ or - followed by 1-3 digits)
- **Filt Del**—The filtered delta or change in the knob position, derived from the raw position (+ or - followed by 1-3 digits)
- **Filt Cumu**—A cumulative counter, beginning at 0, derived from adding the filtered delta (four digit hexcode followed by ^ or v)
- **Raw-Delta-2 sec-Min**—The minimum value of Raw Del over each 2 second interval (+ or - followed by 1-3 digits)
- **Raw-Delta-2 sec-Max**—The maximum value of Raw Del over each 2 second interval (+ or - followed by 1-3 digits)
- **Raw-Delta-2 sec-Avg**—The average value of Raw over each 2 second interval (- - or | - followed by + or - then 1-3 digits)

The purpose of the test is to verify the range of each knob. If the numbers change as the knob is moved then the knob is okay. The knob is not functioning if the numbers stay at 0 or default when the knob is moved.

To stop the test, press any key on the keyboard.

Lever Arm and Joystick Test

Selecting [C - leverarm and joystick test] from the Diagnostic menu will cause the menu screen to appear as in Figure 5-8.

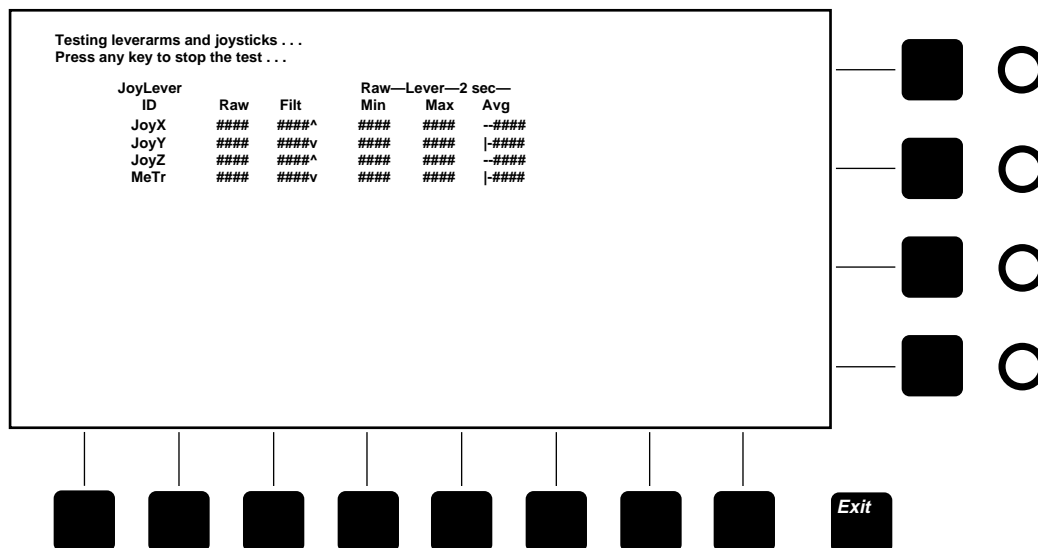


Figure 5-8. Lever Arm and Joystick Test Menu

There is one row of data for each leverarm or joystick. Rotating the leverarm or joystick will cause the data in the row associated with that leverarm or joystick to change.

The columns identify different components:

- **JoyLever**—Identifying name for lever arm or joystick
- **Raw**—The raw analog value read from the lever arm or joystick axis (four digit hexcode)
- **Raw-Lever-2 sec-Min**—The minimum value of Raw over each 2 second interval (+ or - followed by 1-3 digits)
- **Raw-Lever-2 sec- Max**—The maximum value of Raw over each 2 second interval (+ or - followed by 1-3 digits)
- **Raw-Lever-2 sec-Avg**—The average value of Raw over each 2 second interval (- - or | - followed by + or - then 1-3 digits)

The purpose of the test is to verify the range of each lever arm or joystick axis. If the numbers change as the lever arm or joystick axis is moved then the lever arm or joystick axis is okay. The lever arm or joystick axis is not functioning if the numbers stay at default when the lever arm or joystick axis is moved.

To stop the test, press any key on the keyboard.

Button/Lamp DIM Test

Selecting [D - button/lamp DIM test] from the Diagnostic menu will cause the screen to appear as in Figure 5-9.

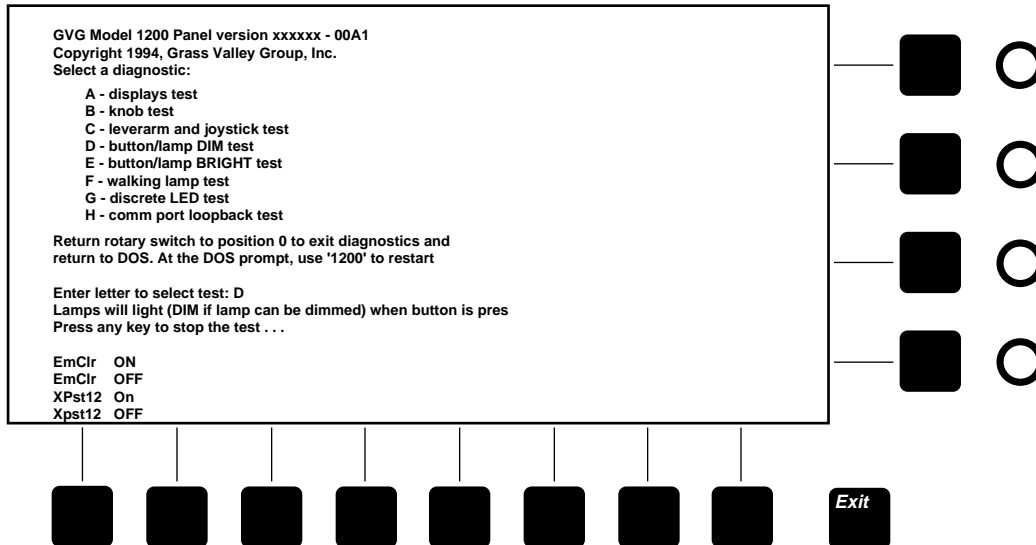


Figure 5-9. Button/Lamp DIM Test Menu

As you press a button the name of that button will appear on the screen with the word 'ON' and the button will light dimly. When the button is released the name of the button will appear on the screen with the word 'OFF'. Any lamps that cannot be dimmed will display bright.

The purpose of this test is to verify the DIM feature of an individual button.

To stop the test, press any key on the keyboard.

Button/Lamp BRIGHT Test

Selecting [E - button/lamp BRIGHT test] from the Diagnostic menu will cause the screen to appear as in Figure 5-10.

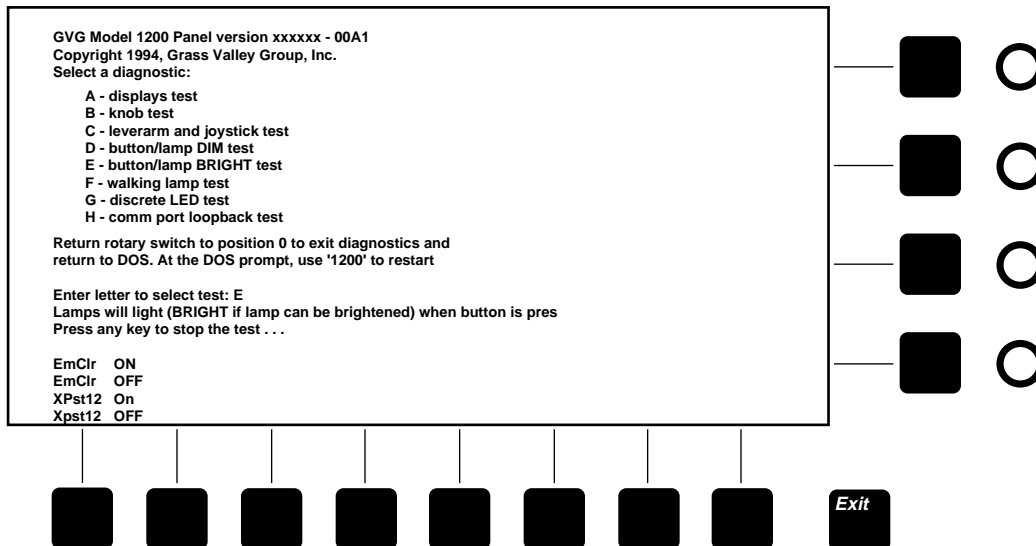


Figure 5-10. Button/Lamp BRIGHT Test Menu

As you press a button the name of that button will appear on the screen with the word 'ON' and the button will light brightly. When the button is released the name of the button will appear on the screen with the word 'OFF'.

The purpose of this test is to verify the BRIGHT feature of an individual button.

To stop the test, press any key on the keyboard.

Walking Lamp Test

Selecting [F - walking lamp test] from the Diagnostic menu will cause the screen to appear as in Figure 5-11.

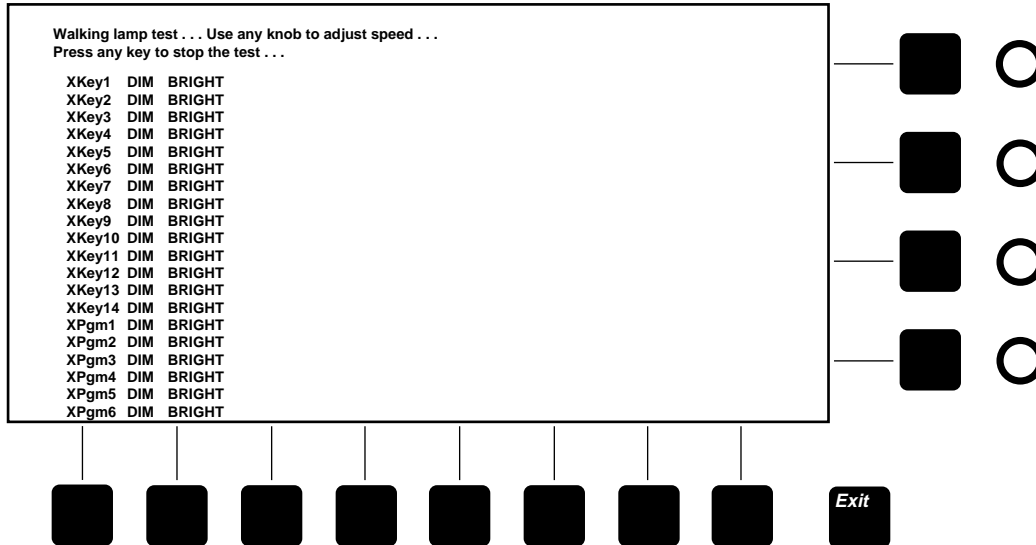


Figure 5-11. Walking Lamp Test Menu

Each lamp and discrete LED will light in sequence according to the hardware lamp register map. When one bank of lamps has completed the test, the next bank in the hardware map will start the test. Since some of the banks, such as the wipe panel buttons, are separate from the other banks, it may be necessary to adjust the speed or direction of the test using any knob. Turning a knob clockwise will increase the speed and counter-clockwise will slow the speed until the test reverses. The test will continue to cycle through the entire hardware register map.

The purpose of the test is to determine whether any lamps are not functioning and need to be replaced.

To stop the test, press any key on the keyboard.

Discrete LED Test

Selecting [G - discrete LED test] from the Diagnostic menu will cause the screen to appear as in Figure 5-12.

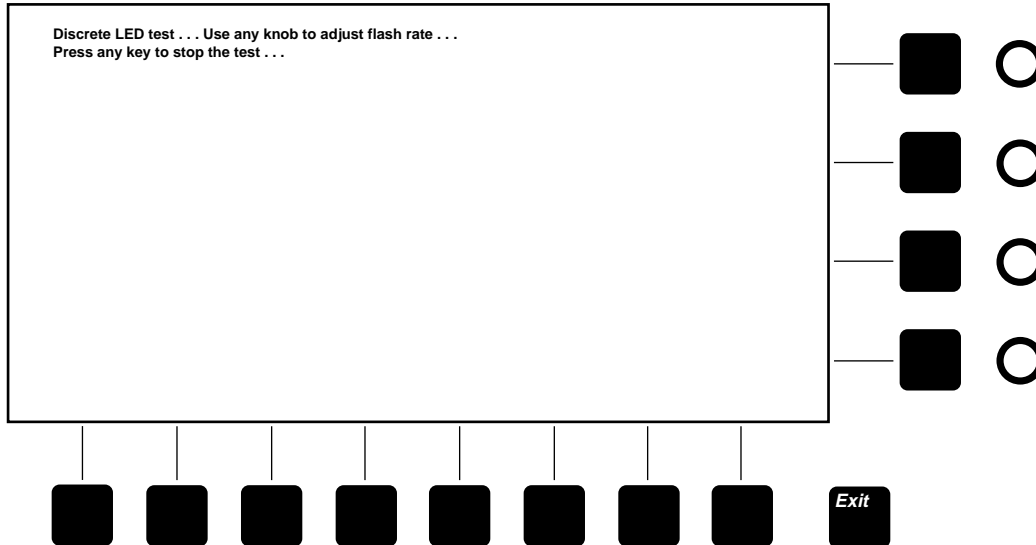


Figure 5-12. Discrete LED Test Menu

Each discrete LED should flash in unison with the others. The flash rate can be adjusted using any knob.

The purpose of this test is to verify that all the discrete LEDs are functioning properly.

To stop the test, press any key on the keyboard.

Comm Port Loopback Test

Selecting [H - comm port loopback test] from the Diagnostic menu will cause the screen to appear as in Figure 5-13.

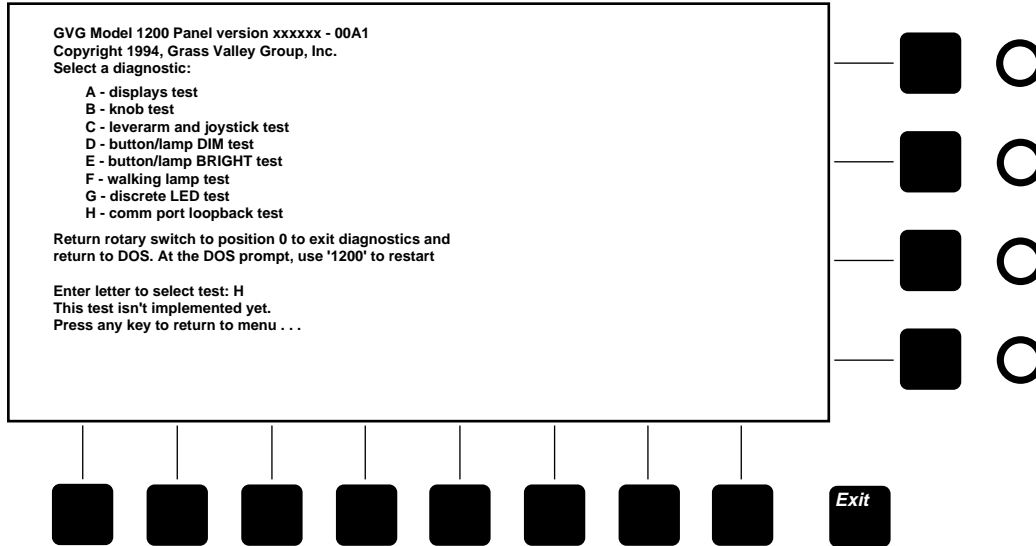


Figure 5-13. Comm Port Loopback Test Menu

CAUTION

The Comm Port Loopback test requires special equipment and trained personnel to operate the test properly. Damage to the equipment is possible if the test is run incorrectly.

Using a loopback connector (see Figure 5-14), data is sent out the COM ports on the I/O board and monitored to see if the data is returned.

The purpose of this test is to verify that the comm path on the control panel to the frame is operating correctly.

To stop the test, press any key on the keyboard.

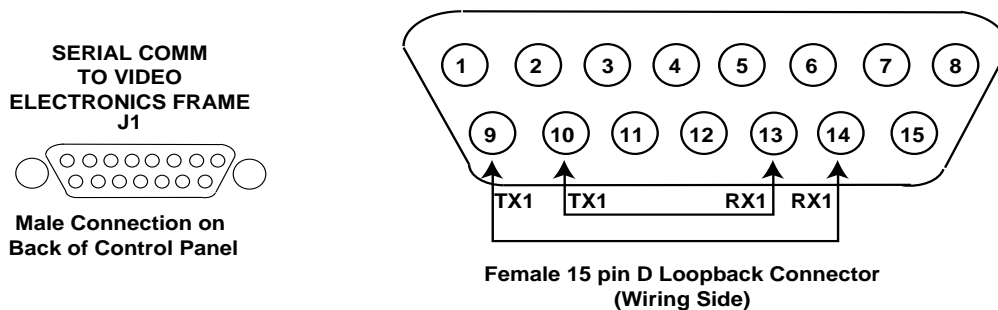


Figure 5-14. Loopback Connector

Exiting Diagnostics

To return to normal operation:

1. Open the control panel and locate the I/O board (064919).
2. On the I/O board, turn the rotary switch to 0 (see Figure 5-15).

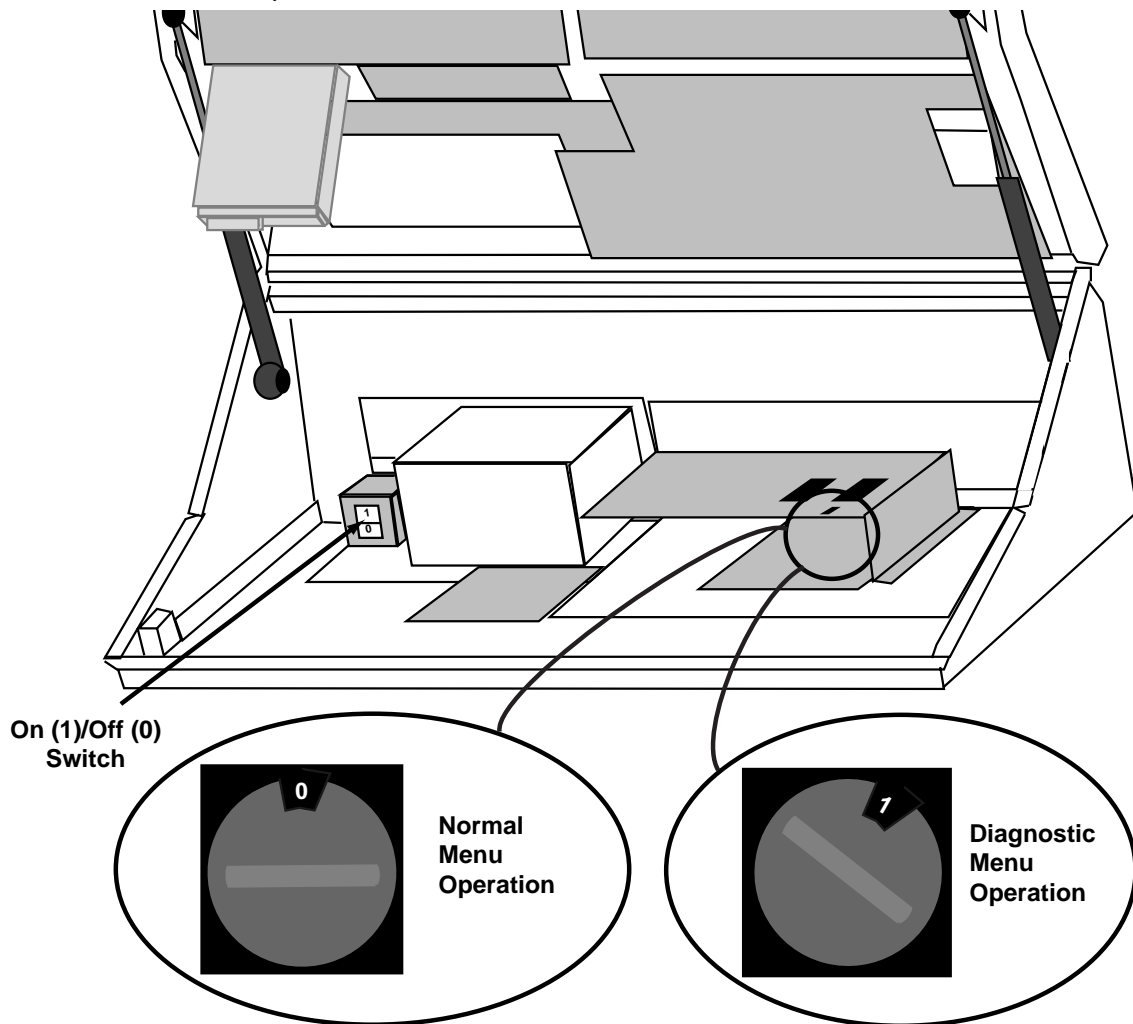


Figure 5-15. Exiting the Diagnostic Menu

3. Reboot the control panel using the On/Off switch.



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